



LAYERZERO
POWER SYSTEMS, LLC.

The Foundation Layer

Series 70: eSTS

250 A 208 V 3-Pole Static Transfer Switch



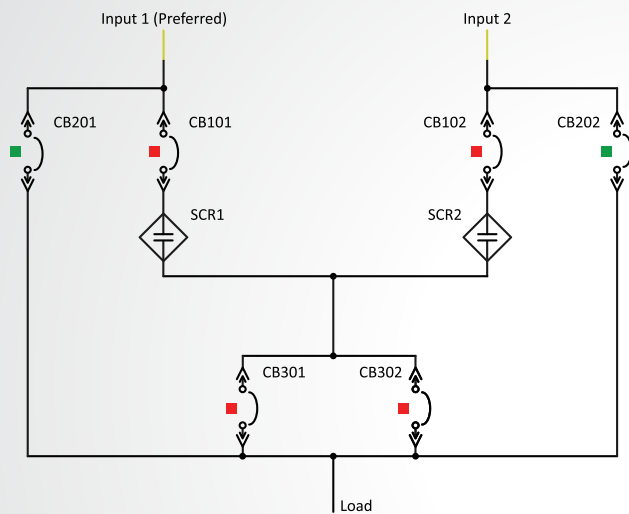
Product Brochure

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 device that automatically or manually performs transfers between two in-phase AC sources in a quarter cycle. Transfers are open-transition, ensuring that connected load disruption is minimized without ever cross-connecting the power sources. One source is designated as the preferred source. If the preferred source fails, the eSTS automatically and seamlessly transfers the load to the alternate source via an open-transition transfer. For emergency transfers between asynchronous sources, dynamically phase-compensated transfers minimize transformer saturation in three-phase, three-wire systems.

*Optional



eSTS Static Transfer Switch One Line Diagram



Series 70: eSTS 250 A 208 V 3-Pole Static Transfer Switch

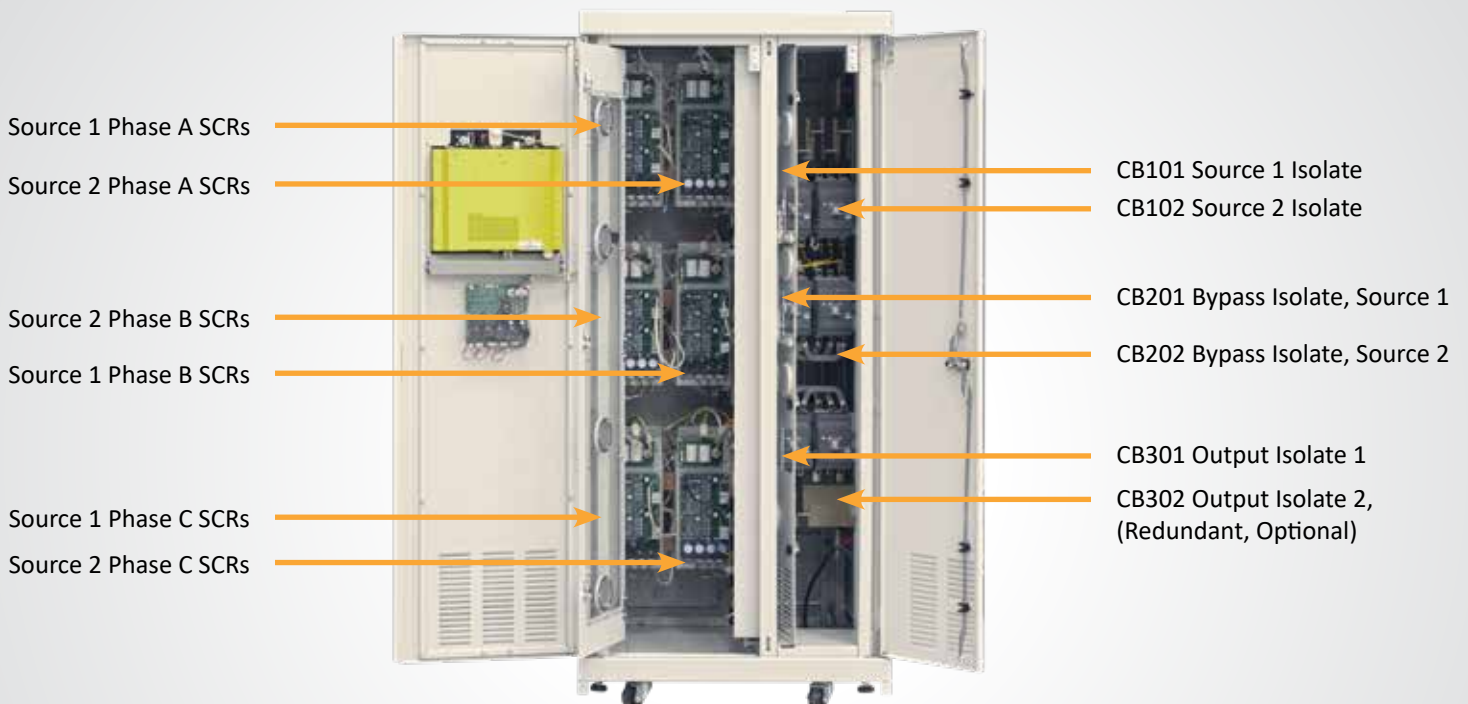
Mechanical Overview: The Inner Workings of the eSTS

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 Power Systems eSTS is equipped with a suite of standard features designed to maximize power reliability, safety, and operational efficiency. Explore the elements that make LayerZero static transfer switches the industry's preferred choice.

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.



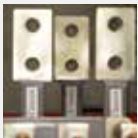
Voice Guided Bypass:
Audio-video guidance offers step-by-step instructions for operators.



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.

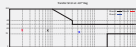
NTP Time Clock Synchronization:
Enables timeline-based event logging.

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 ensuring consistent and reliable operation.
 - **TMR (Triple Modular Redundancy, Optional):** LayerZero's TMR goes beyond SMR with three independent control systems. Each system operates in isolation, which individually assess and act on voltage and current data, ensuring that even if one control path fails, the STS can seamlessly continue its operation. This is not merely "triple-redundancy"; it's a meticulously designed system for unmatched reliability.
- **Control Power Supply Reliability:** Designed for consistent power delivery and preventing unforeseen interruptions.
- **Signal Reliability:** Designed for clear and precise signal transmission, minimizing the risk of errors.
- **Operator Procedural Reliability:** Features that prioritize intuitive, error-free operations, ensuring the system's integrity.

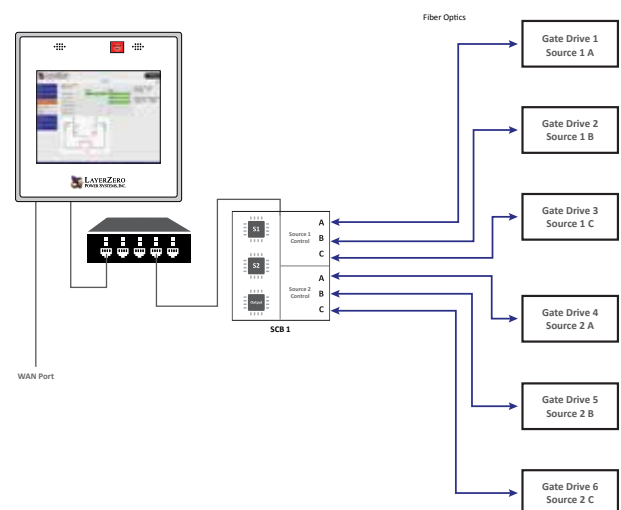


The Series 70: eSTS is designed for maximum reliability

Single Module Redundancy (SMR) Reliability (Standard)

The Single Module Redundancy (SMR) topology provides a cost-effective means of achieving redundant power paths to mission-critical loads. Each source in the SMR configuration includes triple-redundant processors, and an independent gate-drive board manages each phase.

What distinguishes LayerZero's SMR design is its fail-safe operation. Even in the rare event of a critical board failure, the eSTS retains full switching functionality, ensuring uninterrupted operation and continuous power availability.



Redundant Control Paths of LayerZero SMR Gate Drives

Reliability Features: Triple Modular Redundancy (TMR) *Optional

Triple Modular Redundancy (TMR) Reliability (Optional)

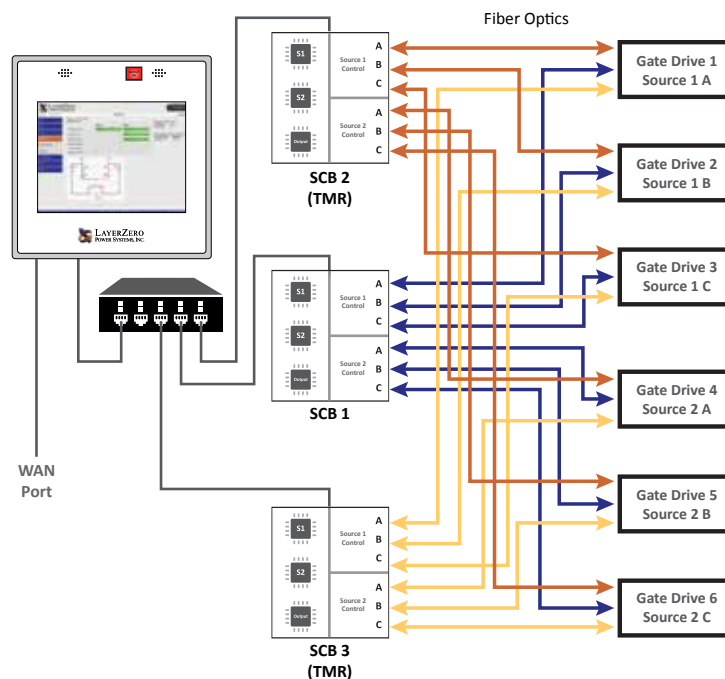
LayerZero’s Triple Modular Redundancy (TMR) configuration builds upon the SMR design, introducing three independent sets of analog and digital data acquisition and control systems. Each operates without shared communication or a common system clock, ensuring complete independence.

Each control system individually analyzes voltage and current data, evaluates source quality, and makes autonomous transfer decisions. Even in the event of a control path failure combined with a source failure, the STS maintains its core mission: transferring power to the alternate source.

Based on proven statistical methods and stringent mathematical analysis, LayerZero’s TMR offers a level of reliability unmatched by products using less rigorous “tri-redundant” or “triple-redundant” terminology.



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

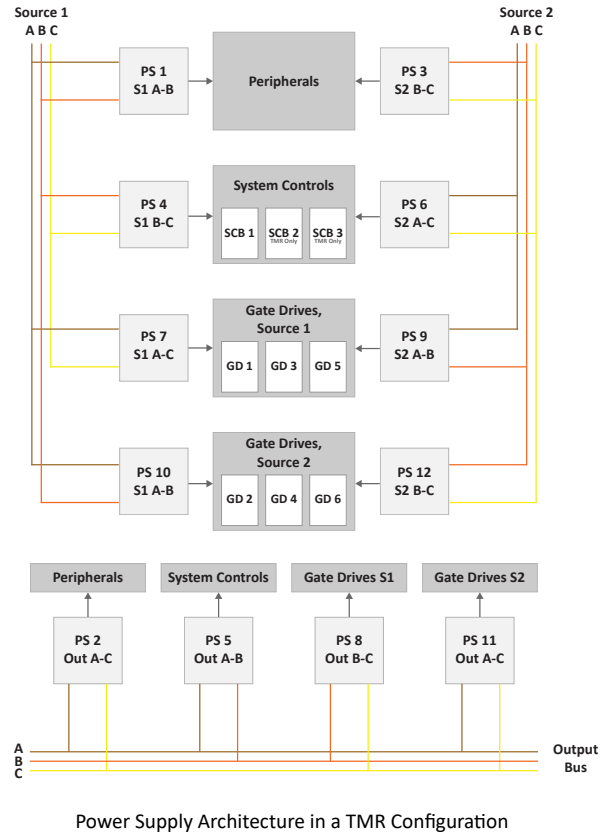
Divided into four (4) logical failure groups:

- 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:

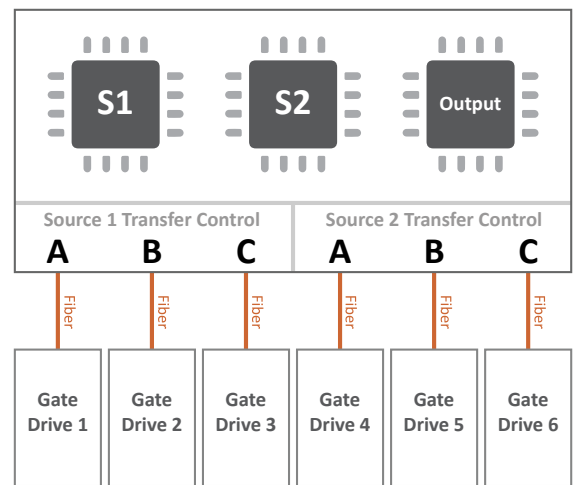
- Source 1
- Source 2
- STS Output.

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 the Source 1 processor malfunctions, the system can still be commanded to transfer to Source 2 and vice versa.
- If the main control system fails, the STS continues to conduct power from the current source (though it cannot transfer).
- Each phase of each source is governed by a separate gate drive circuit board.

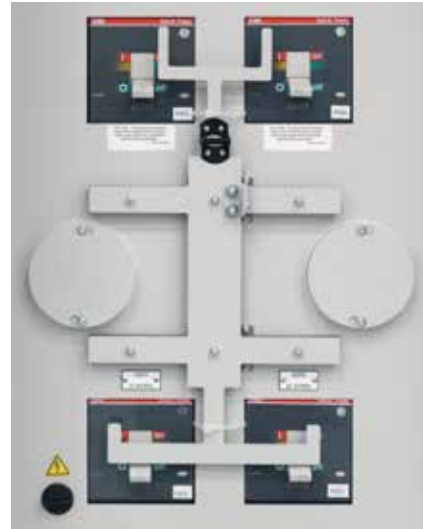


Reliability Features

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.



Mechanical Bypass Interlock "Goalpost" Design

Voice Guided Bypass

Maintenance bypass errors are a known reliability risk. To mitigate this, LayerZero's voice-guided bypass system leads the operator through the bypass process step-by-step, allowing only one action per screen. Clear voice and visual prompts ensure proper sequencing and dramatically reduce the chance of operator error.



The Voice Guided Bypass Screen in the LZA GUI

No Fans, Dust Filters, or Fan Fuses

The Series 70 eSTS uses natural convection cooling for its systems. By eliminating fans, dust filters, and fan fuses (all common failure points), LayerZero enhances long-term system reliability and reduces maintenance needs.

The heat sink architecture is carefully staggered between sources and phases to prevent extreme thermal gradients during conduction, ensuring consistent temperature balance and reliable thermal performance over time.



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 enhances operator safety and overall system reliability by eliminating the potential for bus-to-bus faults. Each bus joint is permanently brazed, resulting in maintenance-free performance and long-term stability.

Silver Plating

All bus joints and terminals feature silver plating to deliver superior conductivity and minimal resistance, ensuring the highest possible electrical performance and connection integrity.



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

Machined Hardware

Bolted connections utilize precision-machined cap screws paired with engineered disc springs. This design creates a flat pressure-versus-deflection profile, maintaining constant torque over the product's lifespan.

These connections have been proven reliable across wide temperature ranges, ensuring that once tightened, they remain secure.



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

Fiber Optic Controls Increase System Reliability

LayerZero employs fiber optic-based controls to eliminate electrical noise and interference while providing isolation from high-voltage components. In the eSTS design, control signals are transmitted to gate drives via optical fibers, ensuring accurate communication, reduced risk of interference, and enhanced system reliability.



Fiber Optic Connections (highlighted) in a Gate Drive

Safety - Ease of Maintenance

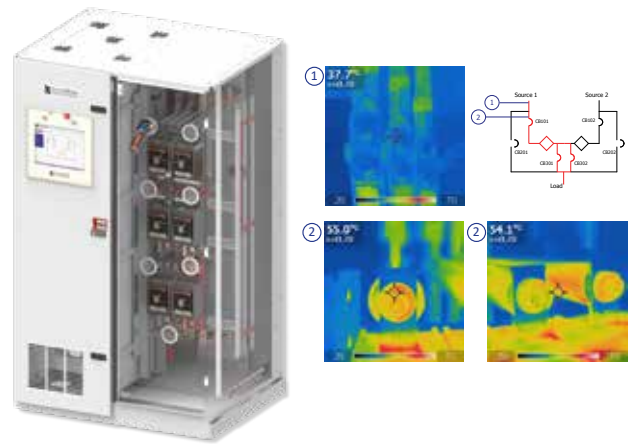
INSIGHT IR® Portholes Permit Scanning of Bolted Connections with Dead-Front Doors Closed

Strategically positioned 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.



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

INSIGHT IR® is a thermal monitoring system that is designed to continuously monitor the temperatures of critical components. INSIGHT IR® captures data from a network of fixed infrared cameras, and displays a live image of the temperature of each connection. INSIGHT IR® has the capability to view temperatures by-phase. If a problematic area is detected early, repairs can be made on equipment before the problem leads to downtime.



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

To enhance safety, operator sections (such as breaker or switch compartments) are physically isolated from the power and control electronics sections. This compartmentalized design allows maintenance to be safely performed on one section while another remains energized. When necessary, power can be bypassed to an alternate section to permit safe repair procedures.



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 principles, the Series 70 design allows operators to view diagnostic LED indicators and SafePanel® circuit breaker positions without opening the dead-front door.

This approach drastically reduces exposure risk, enhancing operational safety during inspection and monitoring activities.



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 eSTS is designed for complete front-only installation, operation, diagnostics, and maintenance. Its dead-front panels are hinged, eliminating the need to remove side or rear covers during service.

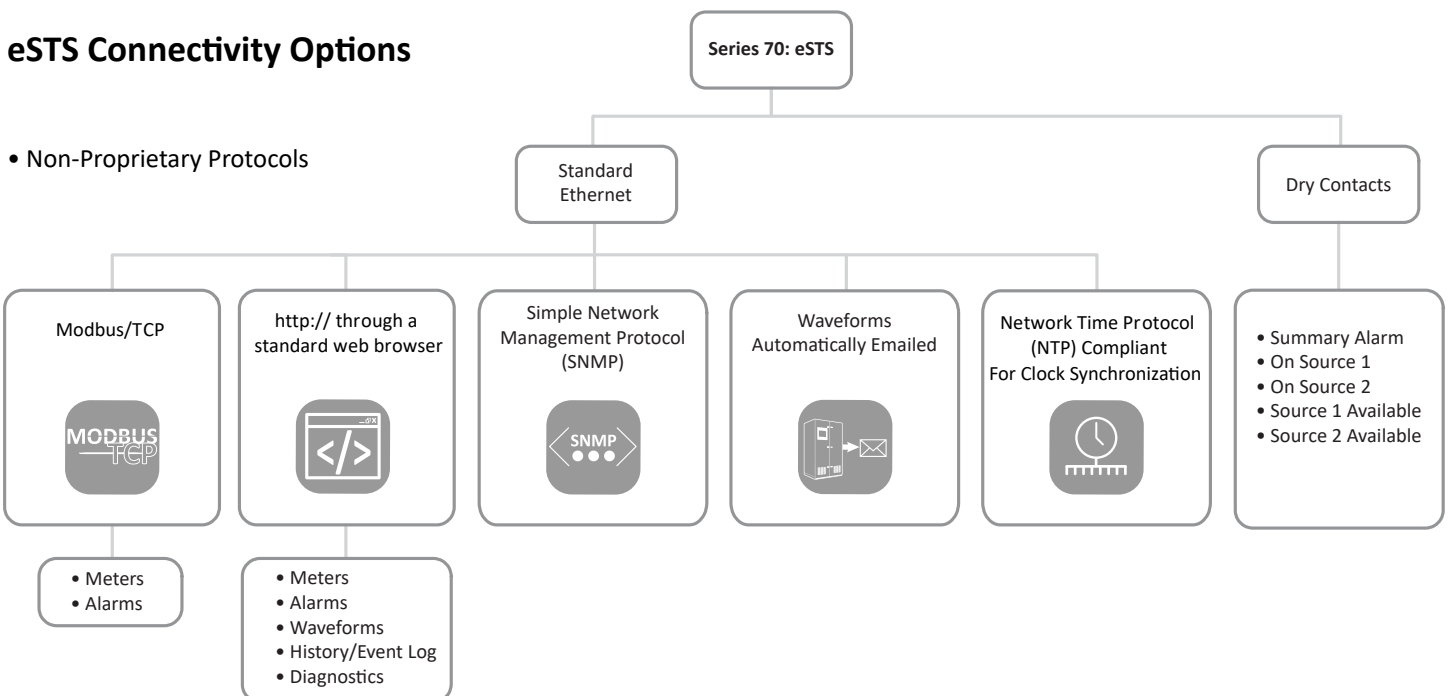
Traditional unhinged panels can be cumbersome and risky to handle, occasionally leading to operational errors that threaten system reliability. By enabling fully non-invasive front access, the Series 70 simplifies maintenance and enhances uptime.

Additionally, the system includes dead-front hinged doors equipped with sensors that trigger alarms whenever an outer door is opened, further improving safety and system security.



Front of the eSTS Static Transfer Switch

eSTS Connectivity Options

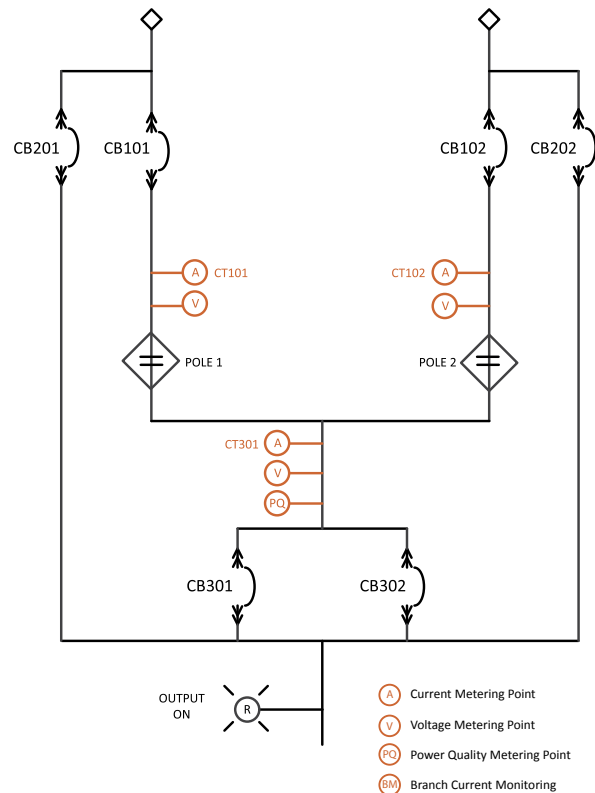


Features/Power Quality Monitoring

LayerZero Power Quality Monitoring

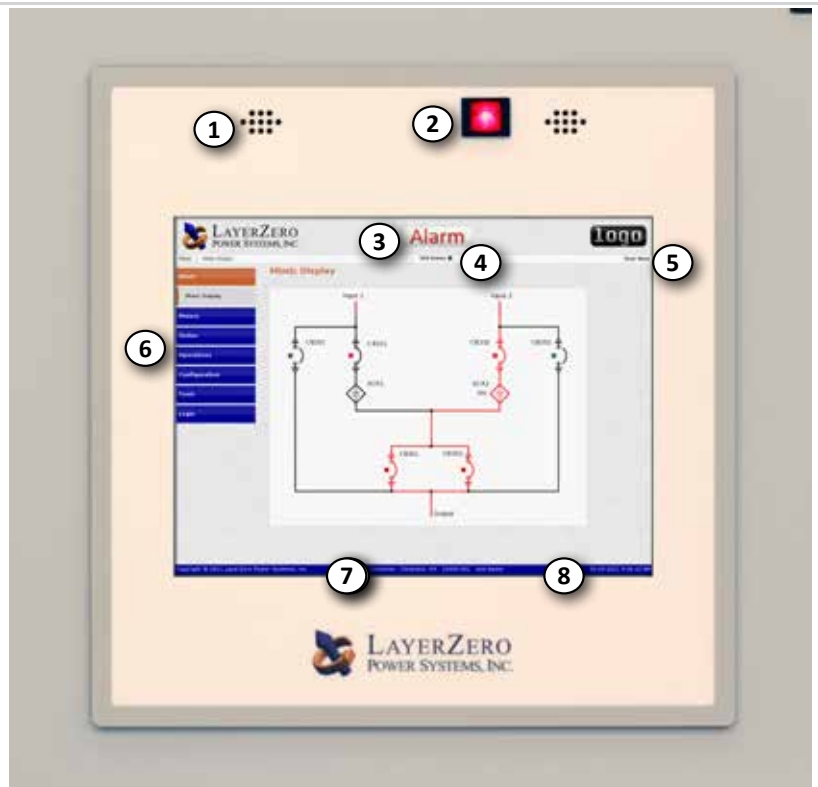
LayerZero PQM (Power Quality Monitoring) provides complete visibility into activity within your critical power infrastructure. With both local and remote communication capabilities, PQM supports a wide range of monitoring functions, from alarms and source quality analysis to advanced event tracing.

The system delivers a vendor-neutral, “bird’s eye” view of the entire power distribution environment, instantly notifying operators of quality deviations, UPS output anomalies, or active alarms. Users can also review historical data and retrace event sequences, an industry-leading capability that provides unmatched insight into power performance and reliability.



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

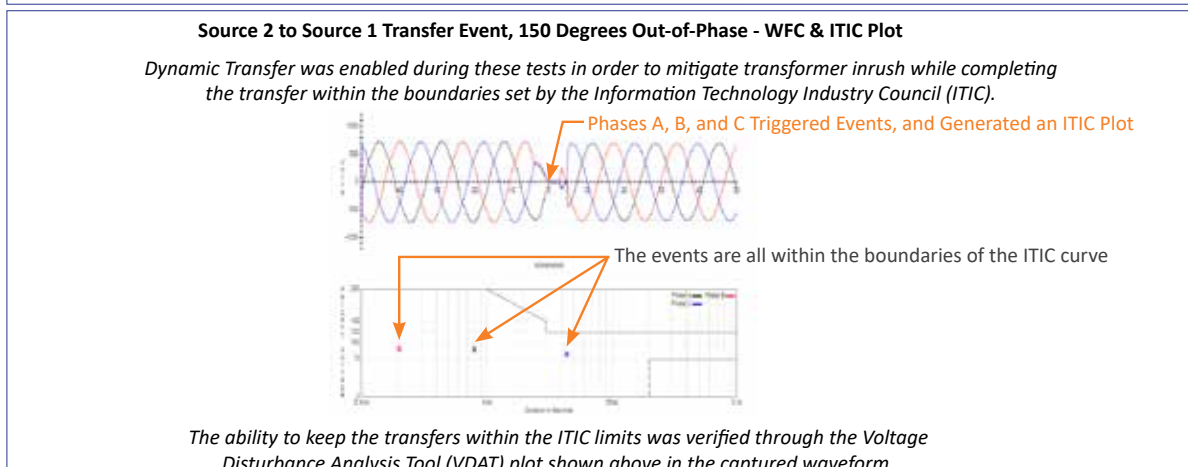
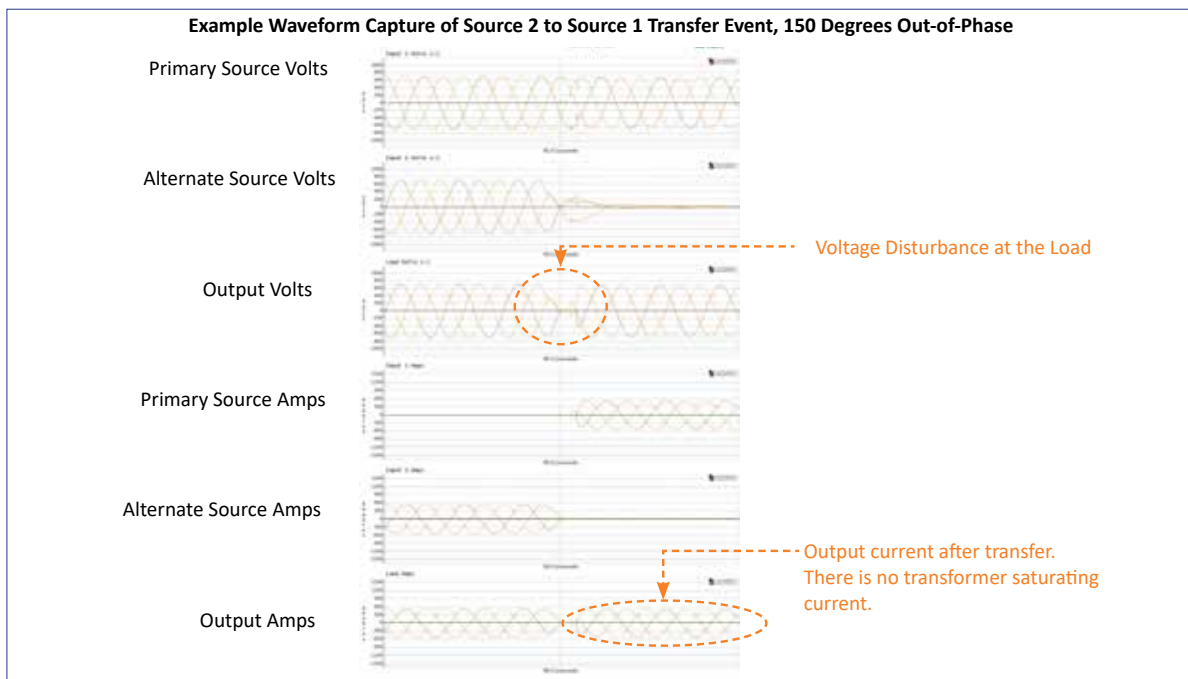


Generate Easy-To-Understand Power Quality Reports with ITIC Plotting

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 VDAT-generated ITIC curves of the event. This data is remotely accessible by connecting to the unit via web browser.

V DAT (Voltage Disruption Analysis Tool) is a quantum leap in the field of power systems data interpretation. By harnessing state-of-the-art algorithms and processing techniques, V DAT effortlessly translates complex power data into discernible, actionable insights. V DAT tackles a major industry challenge: while traditional waveform captures are often intricate and challenging to interpret, V DAT brings clarity with its intuitively designed plots based on Information Technology Industry Council (ITIC) standards, empowering professionals to make quick and informed decisions.

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.



Power Quality Monitoring

Static Switch Power Quality Monitoring

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

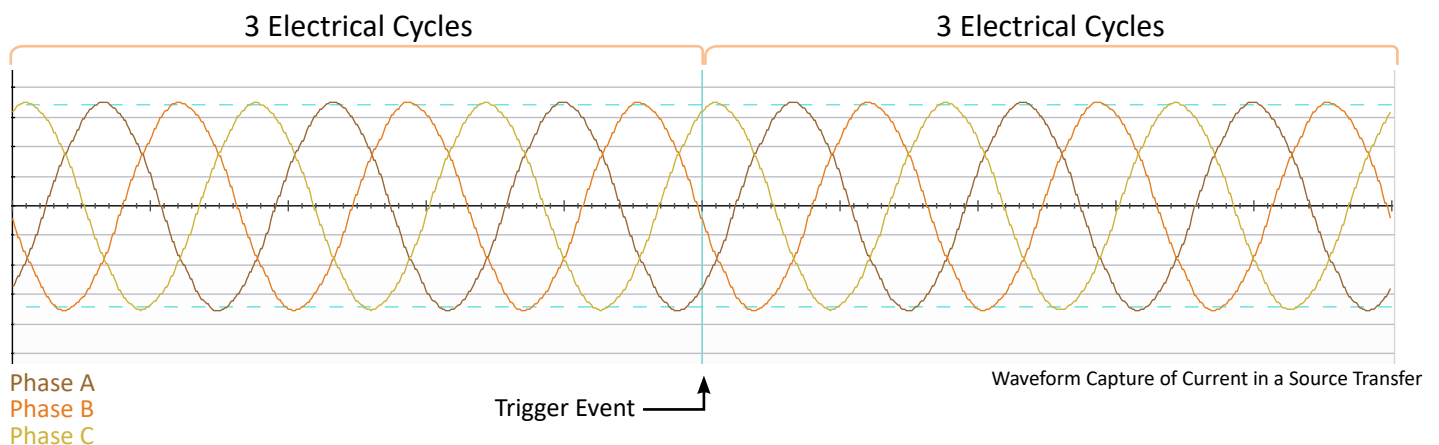
From basic monitoring & alarm reporting, to advanced power quality monitoring functionality, LayerZero’s SSQM provides a wide-range of options to help you be aware, be vigilant, be proactive in your quest to create a safe, stable and reliable operation.



eSTS Touch Screen GUI showing Real Time Waveform Capture

LayerZero’s SSQM Provides Answers

SSQM captures timestamped waveform snapshots before and after events, allowing facilities to trace root causes with precision. By continuously monitoring power quality at the STS, PDU, and RPP levels, LayerZero enables thorough post-event analysis, supporting continuous improvement and enhanced reliability across mission-critical environments.



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	250 A 120/208 V 3-Pole
Heat Dissipation	4,800 BTU/Hr
Weight	1,350 lbs (620 kg)
Dimensions	36"W x 36"D x 80"H (1219 mm x 914 mm x 2032 mm)
Clearances	Front: 36" (914 mm) Rear: 0" Sides: 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 Power 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.

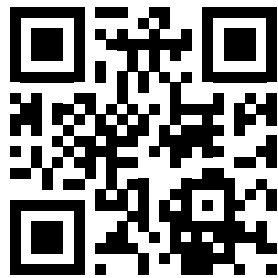
All product specifications are subject to change without notice.

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.

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Learn more at www.LayerZero.com



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