



Vertiv™ Liebert® STS2 Static Transfer Switch2

The Cornerstone of High-Availability
Power Systems



Vertiv™ Liebert® STS2 Static Transfer Switch2

The Power to Protect Your Critical Operations

Vertiv™ Liebert® is the market leader in dual-bus power systems, building the world's most reliable UPS and Static Transfer Switch products. For maximum availability applications, the Liebert® Static Transfer Switch2 (STS2) with its robust and innovative design provides an automatic, seamless transfer between your critical load and the outputs of two independent UPS systems in a dual-bus power configuration. If the primary UPS should fail, the switch will automatically transfer the loads to the alternate UPS.

Liebert® STS2 further extends our market leadership with design benefits unmatched by competitive products. Liebert STS2 is a family of system static switches available in 100A-1850A capacities.

Optimized Performance and Reliability

- Employing a Liebert STS2 static switch adds another layer of security for mission critical loads.
- Optimized Transfer is a patented industry leading transfer control algorithm.
- Ensures a truly redundant power supply by enabling controlled switching between two independent AC Power supply sources
- Switching is performed whenever the line that supplies power to the load goes out of tolerance.
- Triple redundant control logic with dual power feeds.
- Fast, break-before-make switching with 1/4 cycle maximum transfers.

Designed for easy serviceability

- True front access design for installation, maintenance and easy serviceability.
- Top and bottom cable entry/access.

Flexibility

- Compact single cabinet (100-1000A) conserves valuable floor space compared to nonpackaged solutions.
- 1200-1850A unit flexibility supporting choice of switchgear options to couple with. E+I switchgear or third-party providers.
- Easily relocated when site needs change.

Higher Availability

- Standard on-unit monitoring and optional centralized monitoring capability provide continuous system visibility.

Comprehensive Offering

- Liebert STS2 covers a wide range of models from 100A up to 1000A in 208V through 600V and 1200-1850A in 380-600V.
- Wide variety of units offered as with controls and switchgear all in 100-1000A only along with a stand-alone chassis offering (1200-1850A) with flexibility to couple with any switchgear.

Key Applications

- Data Centers
- IT/Telecom
- Financial Institutions

Flexibility for Customized Solutions

Liebert STS2 can be fully customized according to customer's load and environment requirements.

Low Total Cost of Ownership

- When applied as primary side switching, cost are lower due to requiring only one power distribution unit, a lower current due to 480V vs. 208V, and lower installation and wiring cost.
- Robust design with excellent overload capacity.
- UL listed.

Comprehensive testing

- Liebert STS2 offers the benefits of a custom-tailored power system, with the convenience and cost savings of a pre-packaged, factory tested unit.
- All units undergo thorough factory testing as a complete system to assure reliable, consistent performance.

Optimized Transfer Option Enhances Cost-Efficient System Operation and Reliability

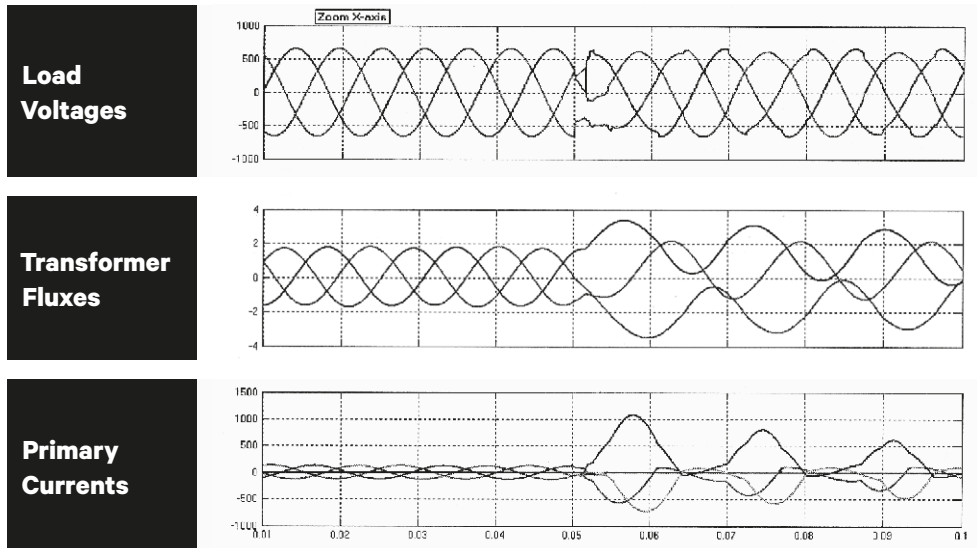


Figure 1 Standard STS2 transfer.

Figures 1 and 2

Show results for the standard STS2 vs. the optimized STS2 for the same condition (alternate source lags 120 degrees) respectively. The optimized transfer control algorithm minimizes the transformer saturation current resulting from an out of phase transfer.

Liebert offers a patented optimized transfer option for the Vertiv™ Liebert® STS2 that greatly improves operation when used in primary side switching applications.

The Liebert® STS2 can be used in two different types of high-availability dual bus configurations—as primary or secondary side switches. For primary side switching, the unit is connected to the primary or input of a downstream transformer.

On secondary side switching the Liebert STS2 is connected to the secondary or output of two transformers.

One of the main advantages of using primary side switching is lower cost.

These savings are the result of only one power distribution unit, a lower current due to 480V vs. 208V, and lower installation and wiring cost thanks to use of smaller three wire cable.

The one drawback of this configuration is the creation of transformer inrush saturation current each time switching occurs. The downstream transformer can cause large peak saturation current during automatic transfers. The transformer saturation is caused by DC-flux built-up during transfer, especially when the sources are not in phase.

See also

White Paper: “Using an Optimized Transfer Approach” (April 2014) at VertivCo.com/en-US/pages/default.aspx

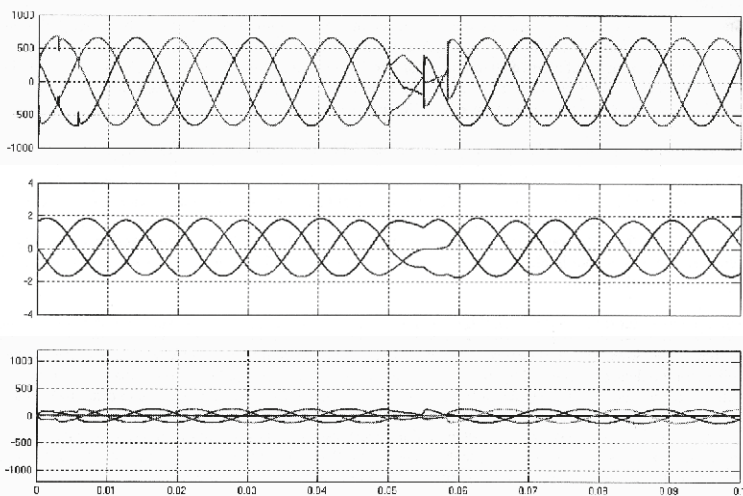


Figure 2 Optimized STS transfer.

The patented Vertiv™ Liebert® static switch optimized transfer control algorithm significantly reduces the downstream transformer inrush saturation.

The Vertiv™ Liebert® algorithm is designed to optimize transfer timing such that the volt-seconds applied to the downstream transformer primary is balanced, thus minimizing peak saturation current. This balance is achieved by directly computing the volt-second applied to the transformer during transfer events and determining the optimum time to turn on the alternate source SCRs in order to balance the volt-second within specified tolerance.

This results in a volt-second balancing algorithm that is independent of voltage wave shape, voltage failure decay rate, etc., making it superior to other algorithms based on voltage phase angle difference only.

Liebert's transfer control does more than balance the flux.

Due to our unique approach to the optimized transfer algorithm, transfer time should not be the only performance measure for this new optimized switch. Liebert's method, whenever possible, also seeks to minimize voltage disturbances while maintaining transformer flux balance. It takes both voltage disturbance and volt-second balance into consideration.

Liebert has a unique flux balance algorithm that doesn't just "sit and wait" for the balance point to occur. Rather, we will "pulse fire" the SCRs as soon as possible in order to minimize the load discontinuity and hence the voltage disruption.

So how safe is this new optimized Vertiv™ Liebert® STS2 for your critical loads?

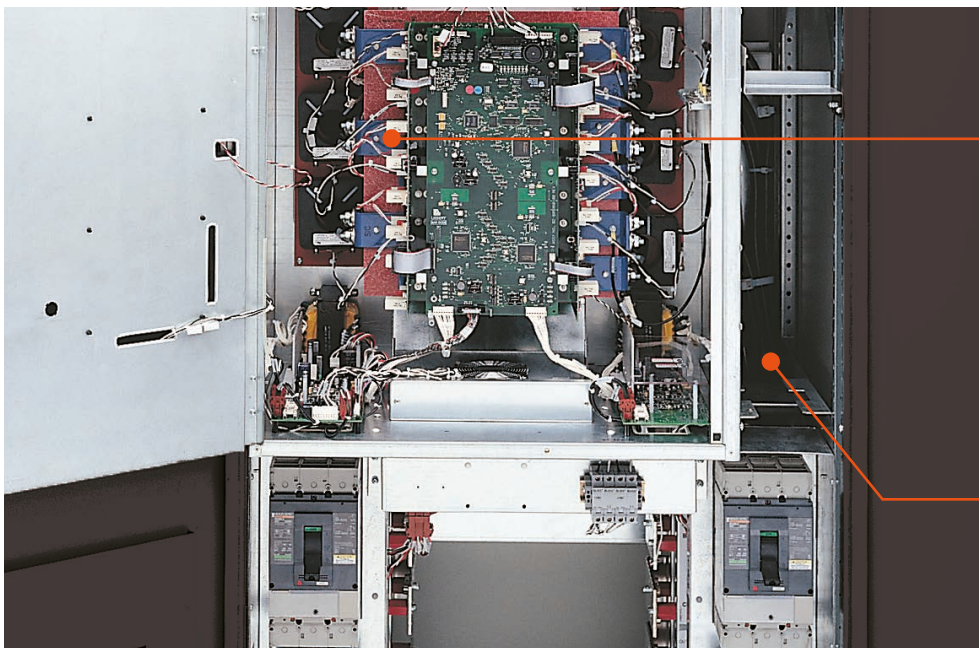
The optimized Liebert® STS2 safely meets both the CBEMA standard (prior to 1996) and the latest ITIC standard (1996) for critical loads. Liebert's optimized Liebert STS2 minimizes the risk of transformer saturation problems during automatic transfers, while its algorithm control ensures minimum voltage disturbance during transfers while still balancing the flux.

Designed for Easy Serviceability – True Front-Access Design

All mechanical and electronic components of the Vertiv™ Liebert® STS2 are accessible from the front of the unit for installation and service—no side or rear access required.

This gives you several immediate benefits:

- Greater freedom in system design. The Liebert® STS2 can be placed adjacent to or in back of other equipment. It can also be placed against a wall or partition.
- Simplified installation, with ample space for cable connections through top and bottom access plates.
- Less floor space required for maintenance access.
- Designed for maintainability, with all key components visible and accessible from the front of the unit, without shutting down the connected load.



For units up to 600 amps, the entire power and control module can be removed as an assembly.

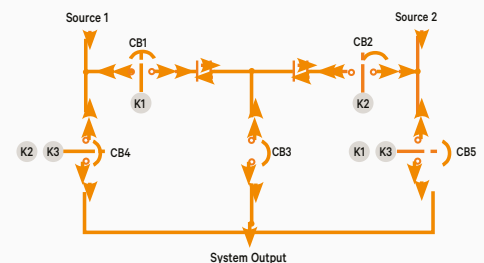
A separate compartment for option modules provides safe and convenient field access.

True Internal Redundancy

The Liebert STS2 has triple-redundant logic. Each DSP controller is capable of working independently, and each helps monitor the other two. If one malfunctions, the other two lock it out. Each controller has power feeds from both power supplies.

The two power supplies feature true dual-bus power distribution. Both have dual inputs, one from each AC input source. All power connections have diode protection, so that internal or external faults cannot propagate. The result is a rugged, fault-resilient package that is optimized for real-world applications.

One-Line Diagram



Vertiv™ Liebert® STS2 Static Transfer Switch2

Higher Availability – Color Touch-Screen Interface

The color touch-screen LCD interface allows you to quickly check the status of the unit and identify problems. The controls of the Liebert STS2 are intuitive and simple.

The color LCD monitor is divided into three segments. In addition to a system mimic diagram, there is a Status/Alarm panel and a section dedicated to operator instructions and menus. The screen allows you to configure the unit, including the control of the preferred source, auto/manual retransfer selection, alarm notification and other system setpoints. You benefit from improved operator effectiveness, reduced training time, and less chance of operator error.



Critical Support from Vertiv Services

Total Service Capability

Vertiv provides a Basic, Essential, and Preferred level of maintenance and service that allows you to select the complement of critical power system services that best fits your requirements. These programs include guaranteed four-hour response time, emergency service and preventive maintenance. With more than 300 Vertiv employed Customer Engineers and a network of over 900 factory authorized service personnel, our technical capabilities, geographical coverage and ability to respond are second to none. These factory-trained service professionals have direct access to the most comprehensive factory authorized parts network in the industry. We also provide them with immediate online access to detailed schematics and your equipment's complete service record from the time it was started up.

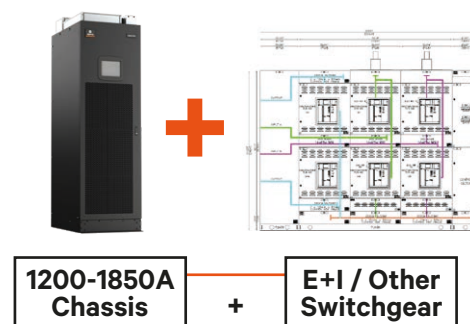
Remote Monitoring Always There, Always Alert

The key to providing proper service for your critical power systems is being aware of that equipment's operating status at any given time. For customers who need to have these vital protection systems continuously monitored, but don't want to do it themselves, Vertiv Service offers Remote Monitoring Service. This seamless, rapid-response system is designed to maximize the capabilities of your Liebert equipment by maximizing the effectiveness of its monitoring capabilities.

Continuous 24-hour remote monitoring of UPS/power conditioning equipment, environmental products and other critical space support systems is available. When a problem is detected, the monitoring system immediately alerts the Customer Response Center where each alarm is evaluated and processed. Vertiv will coordinate all service vendors, track the response and solution time for service calls and provide comprehensive reports on alarms and corrective actions.

Comprehensive Offering

Vertiv™ Liebert® STS2 is available in 100 – 1850 A capacity systems, the Liebert STS2 offers flexible expansion capabilities to fit growing sites.



Liebert STS2 Static Transfer Switch (STS) 100-1000A

- **Ratings:** 100, 250, 400, 600, 800, and 1000 Amp 3-pole designs.
- **Voltages:** 208, 220, 240, 380, 400, 415, 480, 600 Volts, 50 or 60Hz.
- Housed in a single, self-contained cabinet, it combines dual-source switching, isolation, and as well as power monitoring, to provide the protection your vital computer or communications equipment demands.
- Ideal for minimal floor spaces with front-access only, top or bottom cable entry/exit.
- Integral maintenance bypass to both sources.
- Triple-redundant control logic with optional Liebert Optimized Transfer.

Liebert STS2 Static Transfer Switch (STS) 1200-1850A

- **Ratings:** 1200, 1250, 1400, 1600, 1800, 1850 Amp 3-pole designs.
- **Voltages:** 380, 400, 415, 480, 575, 600 Volts, 50 or 60 Hz.
- Same features and benefits of 100-1000A STS2.
- Maximizing power and flexibility.
- For applications above 1000A, the Liebert STS2 Chassis provides the advantages and performance of the Liebert STS2 in a compact cabinet that can be easily integrated with switchgear as required by the project site.
- Close-couples to switchgear offered by E+I division, as well as third-party providers.

Unique Optimized Transfer Capability. Most Reliable with 22 million hours of demonstrated MTBF.

Vertiv™ Liebert® STS2 Static Transfer Switch2

E+I Switchgear

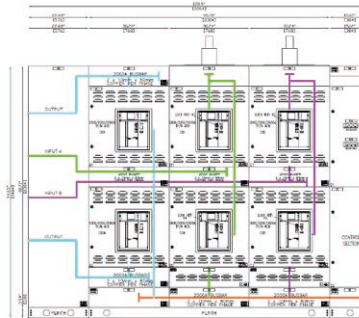
Vertiv™ E+I offers UL891-rated switchboards for the North American market.

Designed originally to meet the stringent European International Electrotechnical Commission (IEC) 60349-1 standard, Form 4b, these Vertiv™ E+I switchboards exceed North American UL891 safety requirements, offering buyers added value in the form of greater safety features. In addition, our solutions provide compliance and have been shake-table tested to determine their operating resilience.

Chassis



E+I UL891 Offering



Switchgear Adaptability

The Chassis connects through its side to desired switchgear. This can be either supplied by Vertiv or a third-party switchgear manufacturer. The Vertiv-supplied switchgear utilizes E+I Engineering expertise to provide a UL891 solution that close-couples to the Chassis. E+I switchgear offers Form 4B separation of energized components, and its modular design allows for compact variations of cable entry and exit, switch configuration and output distribution to meet your project's needs.

STS2 Chassis

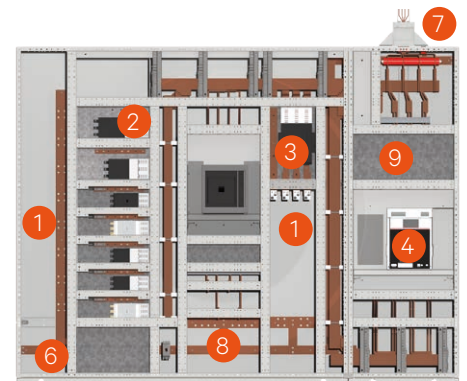
- Controls, HMI and SCR's
- UL1008S
- 3P Optimized Transfer
- Side access connections to a switch cabinet

Switch Cabinet

- Molded Case Switches
- I/O Connections
- UL891
- Provided through E+I

E+I UL891 Switchgear

- 1. Cableway Compartment:** Designated for customer connection hookups
- 2. MCCB Compartment:** Housing unit for the MCCB
- 3. MCCB:** fixed-mount circuit breaker Equipment designed to break an electrical circuit if tripped. The housing of a MCCB is made of and supported by an insulating material
- 4. ACB:** draw-out circuit breaker Equipment meant to provide protection to an electrical circuit from overcurrent and short circuits using air
- 5. Main Busbar:** 100% current rated
- 6. Panel Flange Connection:** The connection point for our busway trunking system from the panel to the busway route in the facility
- 7. Ground Busbar:** The grounding busbar network with connections for individual pieces of equipment
- 8. Instrument Compartment:** designated as the metering and control section



Technical Specifications (3-Pole STS2)

Amp Ratings	100	250	400	600	800	1000	1200-1850
Heat Output							
(KW)	0,8	1,37	2,04	3,08	4,03	5,09	6,3
Uncrated Dimensions (WxDxH)							
(Inches)	30x32x77	30x32x77	38x32x77	38x32x77	84x32x77	84x32x77	26x36x88
(mm)	762x813x1956	762x813x1956	965x813x1956	965x813x1956	2134x813x1956	2134x813x1956	661x915x2236
Uncrated Weight							
(lbs)	780	780	1200	1200	2500	2500	1430
(kg)	354	354	544	544	1134	1134	650
Shipping Dimensions (WxDxH)							
(Inches)	48x44x82	48x44x82	48x44x82	48x44x82	92x53x82	92x53x82	49x50x90
(mm)	1016x1194x2082	1016x1194x2082	1016x1194x2082	1016x1194x2082	2337x1346x2082	2337x1346x2082	1245x1270x2286
Shipping Weight							
(lbs)	880	880	1300	1300	2600	2600	1542
(kg)	399	399	590	590	1179	1179	700

Note: *Shipping dimensions and weight include the pallet and packing material. Actual weights will vary depending on installed options.

Operating Specifications

- **Voltage:** 208, 220, 240, 380, 400, 415, 480, 575 or 600 VAC (field selectable), +/- 10%
1200-1850A chassis is 380, 400, 415, 480, 575 or 600 VAC +/-10%
- **Frequency:** 50 or 60Hz (field selectable), +/-10%
- **Overload Capacity:** 125% for 10 minutes, 150% for 2 mins
- **Operating Temperature:** 0 to 40°C
- Ultra fast switching under one-fourth of a cycle

Standard Features

- Front accessible for easy installation and serviceability
- Color touch-screen LCD interface eliminates mechanical pushbuttons
- Intuitive user interface with drop-down menus and dialog boxes
- Triple redundant digital logic
- Dual-redundant power supplies
- 100% rated, fuseless design
- Hot-swappable circuit breakers
- Flash memory enables firmware updates while supporting critical load
- CANBUS internal control wiring
- Rack-out control/power assembly on units up to 600A, to allow maintenance, service or full replacement without disrupting the critical load
- Top and bottom cable entry
- Dual-lug installation bus
- UL Listed

Optional Features

- Vertiv™ Liebert® STS2 has a full range of monitoring and communications options via Vertiv Liebert Intellislot 485 Webcard ADPT
- Programmable output relays for custom customer alarms and connections
- Customizable input relays allow alarms from other devices to be displayed on Vertiv™ Liebert® STS2 display
- TVSS
- Key lockout Switch
- Remote Source Selection
- Subfeed breakers
- On 1200-1850A, can close couple with to switchgear offered by E+I division, as well as third-party providers

Liebert® STS2 Communication and Product Options

Liebert STS2 has a wide choice of monitoring and communications options to keep you connected to your critical power protection system.

RS-232 Terminal Port: Standard on all units, this port is primarily used as an alternate user interface to configure, control, and diagnose the system.

Input Contact Isolator (ICI) Board: Customizable input relays allow alarms from other devices to be displayed on Liebert STS2 display. Provides an interface for up to eight user inputs. External messages and alarms can be routed to the unit, via the ICI.

Programmable Relay Board (PRB): Programmable output relays for custom customer alarms and connections. Up to two PRBs can be installed in the Liebert STS2 to route system events to external devices.

Comms Board (100-1000A): This board provides a direct connection to a Vertiv™ Liebert® SiteScan™ Web system, via an RS-422. Vertiv™ Liebert® SiteLink-12 or Vertiv™ Liebert® SiteLink-4 is required for Liebert SiteScan to communicate with the Liebert STS2.

Options and Accessories

Seismic Anchors: To ensure stability for the unit in the event of seismic activity, anchors are available for securing the unit to a concrete floor to meet seismic Zone 4 requirements.

Seismic Floor Stand (100-1000A): Designed to level the unit and provide bottom cabling access without relying upon a raised floor for support. Available in 18, 24, 30, 36 inch heights.

Distribution Cabinet (Up to 600A): An output distribution cabinet mounts on the side of the STS2. It is a full height section with hinged doors to allow for easy access.

The cabinet contains one vertically mounted I-line panelboard for load distribution. The panelboard is totally enclosed with an accent cover that provides access without exposing other portions of the unit. The panelboard provides space for 100A through 250A three-pole branch circuit breakers. It also includes a separate isolated neutral bus bar and safety-ground bus bar for the neutral and safety-ground connections.

Redundant Output Breaker: An output plug-in, non-automatic circuit breaker provides redundancy in the output power path. The breaker is connected in parallel with the output plug-in non-automatic circuit breaker.

Input Junction Boxes and Cable (Up to 600A): The input junction box option is available to simplify input connections to the STS2. Two input junction boxes and the associated flexible 10-foot long input cables are provided with this option. Available with bottom cable entrance only, typically when the unit is located on a raised floor.

Remote Source Selection: An optional Remote Source Selection board may be installed in your STS2. This option allows you choose the preferred input source from a remote location. Terminal connections enable you to remotely select a preferred source in the same process as the local source transfer selection.

Key Lockout Switch: The key lockout switch activates a software lockout of the touch-screen display to prevent manual transfers and configuration changes. When locked out, the touch-screen becomes a read only display. A key is needed to perform manual transfers or change settings.

Vertiv™ Liebert® IntelliSlot™ 485 Web Card ADPT

- Allows systems to be viewed from the network using a web browser.
- Delivers SNMP, Telnet and web management.
- Provides security using HTTPS message encryption.
- Supports 10 and 100 MBit Ethernet for legacy and modern networks.
- Provides compatibility with **Vertiv™ Liebert® MultiLink** shutdown software, to prevent data loss and ensure data availability.
- Supports **Liebert SiteScan WEB** enterprise monitoring software, to provide trending for proactive analysis and maintenance to ensure facility uptime.
- Interfaces to **Vertiv™ Liebert® Nform** alarm notification software, to facilitate quick corrective action.

Liebert IntelliSlot 485 Web Card ADPT provides connectivity to any TCP/IP-based Ethernet network to allow the device to communicate with network management systems (NMS) via SNMP. Events can be transmitted to the NMS to provide remote status monitoring, plus fault and alarm detection. The card includes an RJ-45 port for an Ethernet connection, via Category 5 cable. The card can also integrate the system with an existing Building Management System (BMS) or out-of-band monitoring, using Modbus.



Power-Packed Testing Center Proves Business-Critical Reliability

The Vertiv™ Power Test Center for large power systems is a state-of-the-art test facility designed to provide customers with pre-installation testing of the performance, interoperability, and efficiency of Vertiv power modules and systems under a variety of conditions. Located in Delaware, Ohio, the 41,000 square-foot facility, including a 2,600 square-foot customer observation suite, is the largest and most comprehensive in the industry.



Testing includes individual UPS modules as well as the complete power system—including large UPS units and associated switchgear and ancillary products—and is essential to the smooth, rapid installation and commissioning of large power systems.

Customers leave the Power Test Center with documented test results and confidence that their complex power system will operate seamlessly and in accordance with business-critical availability requirements.

Test results certify the input and output, AC and DC characteristics of the system. Performance comparisons against specifications include, but are not limited to:

- Voltage and waveform
- Voltage regulation
- Voltage and current harmonics
- Frequency
- Current and Waveform
- I/O power factor
- Efficiency based on kW in and out
- System switching, control and monitoring functionality

Customers may request special tests in addition to the above.



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