ИБП Liebert EXL S1 (1000-1200 кВт) - брошюра на продукцию. Юниджет

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Liebert® EXL S1™ UPS

Operation and Maintenance Manual — 1000-1200kVA, 60Hz, Three-Phase,
Single-Module & Multi-Module (Distributed Bypass)

CONTACTING VERTIV™ FOR SUPPORT

To contact Vertiv Services for information or repair service in the United States, call 800-543-2378. Vertiv Services offers a complete range of star-up services, repair services, preventive maintenance plans and service contracts.

For repair or maintenance service outside the 48 contiguous United States, contact Vertiv Services, if available in your area. For areas not covered by Vertiv Services, the authorized distributor is responsible for providing qualified, factory-authorized service.

For Vertiv Services to assist you promptly, have the following information available:

Part numbers: _____

Serial numbers: _____

Rating: _____

Date purchased: _____

Date installed: _____

Location: _____

Input voltage/frequency: _____

Output voltage/frequency: _____

DC source reserve time: _____

Product Warranty Registration

To register for warranty protection, visit the Service and Support section of our Web site at:

www.vertivco.com

Click on Product Registration and fill out the form.

TABLE OF CONTENTS

FIGURES

TABLES

IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

This manual contains important instructions that should be followed during operation and maintenance of the Liebert EXL S1 uninterruptible power system and DC source.

⚠ WARNING

Risk of electric shock. Can cause equipment damage, injury or death.

Exercise extreme care when handling UPS cabinets to avoid equipment damage or injury to personnel. Refer to separate installation manual for equipment handling information and installation procedures.

Follow all DC source safety precautions in **4.0 - Maintenance** when installing, charging or servicing DC sources. In addition to the hazard of electric shock, gas produced by batteries can be explosive and sulfuric acid can cause severe burns.

In case of fire involving electrical equipment, use only carbon dioxide fire extinguishers or others approved for use in electrical fire fighting.

Extreme caution is required when performing maintenance. Service and maintenance work must be performed only by properly trained and qualified personnel and in accordance with applicable regulations as well as with manufacturers' specifications.

Be constantly aware that the UPS contains high DC as well as AC voltages. With input power off and the DC source disconnected, high voltage at filter capacitors and power circuits should be discharged within 5 minutes. However, if a power circuit failure has occurred, assume that high voltage still exists after shutdown. Check with a voltmeter before making contact.

AC voltage will remain on the system bypass, the UPS output terminals and the static bypass switch, unless associated external circuit breakers are opened.

Check for voltage with both AC and DC voltmeters prior to making contact.

When the UPS is under power, both the operator and any test equipment must be isolated from direct contact with earth ground and the UPS chassis frame by using rubber mats.

Some components within the cabinets are not connected to the chassis ground. Any contact between floating circuits and the chassis is a lethal shock hazard. Exercise caution that the test instrument exterior does not make contact, either physically or electrically, with earth ground.

AVERTISSEMENT

Risque de décharge électrique pouvant entraîner des dommages matériels, des blessures et même la mort.

Faites preuve d'une extrême prudence lors de la manutention des armoires ASC afin d'éviter de les endommager ou de blesser le personnel. Reportez-vous au manuel d'installation approprié pour connaître les consignes de manutention et les procédures d'installation de l'équipement. Observez toutes les mesures de sécurité relatives à la source d'alimentation c.c. décrites dans la section 4.0 - Entretien lors de l'installation, de la charge ou de l'entretien des sources c.c. Outre les risques de décharge électrique associés aux batteries, les gaz qu'elles produisent peuvent être explosifs et l'acide sulfurique qu'elles contiennent peut provoquer des brûlures graves.

En cas d'incendie associé à du matériel électrique, n'utilisez que des extincteurs à dioxyde de carbone ou homologués pour la lutte contre les incendies d'origine électrique.

Les opérations d'entretien requièrent une extrême prudence. Les opérations d'entretien ne doivent être confiées qu'à du personnel qualifié et dûment formé. Toutes les interventions doivent être effectuées conformément aux règlements applicables et aux spécifications du fabricant. Soyez toujours conscient du fait que le système ASC contient des tensions c.c. et c.a. élevées.

Une fois l'alimentation d'entrée coupée et la source d'alimentation c.c. débranchée, la haute tension aux condensateurs de filtrage et aux circuits d'alimentation devrait se dissiper en moins de 5 minutes. En cas de défaillance d'un circuit d'alimentation, toutefois, il importe de présumer qu'une tension élevée est présente même après l'arrêt. Vérifiez toujours les tensions avec un voltmètre avant d'établir des contacts.

Le circuit de dérivation, les bornes de sortie ASC et le commutateur statique de derivation continueront d'afficher une tension c.a. à moins que les disjoncteurs externes associés ne soient ouverts.

Vérifiez les tensions avec des voltmètres c.a. et c.c. avant d'établir tout contact.

Lorsque le système ASC est sous tension, les responsables de l'entretien et l'équipement d'essai doivent reposer sur des tapis de caoutchouc pour prévenir tout contact direct avec le sol et avec le châssis du système lors des interventions.

Certains composants à l'intérieur des armoires ne sont pas connectés à la masse du châssis. Tout contact entre les circuits flottants et le châssis présente un risque de décharge mortelle. Il importe de veiller à ce que l'extérieur des équipements d'essai n'entre pas en contact physique ou électrique avec le sol.

This equipment contains circuitry that is energized with high voltage. Only test equipment designated for troubleshooting should be used. This is particularly true for oscilloscopes. Always check with an AC and DC voltmeter to ensure safety before making contact or using tools. Even when the power is turned Off, dangerously high voltage may exist at the capacitor banks.

Observe all DC source precautions when near the DC source for any reason.

ONLY properly trained and qualified service personnel should perform maintenance on the UPS system. When performing maintenance on any part of the equipment under power, service personnel and test equipment should be standing on rubber mats. The service personnel should wear insulating shoes for isolation from direct contact with the floor (earth ground).

One person should never work alone. A second person should be standing by to assist and summon help in case an accident should occur. This is particularly true when work is performed on the DC source.

BATTERY CABINET PRECAUTIONS

The following warning applies to all battery cabinets supplied with UPS systems. Additional warnings and cautions applicable to battery cabinets may be found in **Important Safety Instructions on page 1** and **4.3 - Battery Maintenance**.

⚠ WARNING

Internal battery strapping must be verified by manufacturer prior to moving a battery cabinet (after initial installation).

- Battery cabinets contain non-spillable batteries.
- Keep units upright.
- Do not stack.
- Do not tilt.

Failure to heed this warning could result in smoke, fire or electric hazard.

Call 800-543-2378 before moving battery cabinets (after initial installation).

For systems using DC sources other than batteries, refer to the manufacturer's recommendations for handling and care.

⚠ AVERTISSEMENT

L'arrimage des batteries internes doit être vérifié par le fabricant avant de déplacer une armoire de batteries (après l'installation initiale).

- Les armoires de batteries contiennent des batteries étanches.
- Maintenir les systèmes à la verticale.
- Ne pas empiler.
- Ne pas incliner.
- Le non-respect de ces consignes comporte des risques liés à la fumée, au feu ou à l'électricité.
- Composez le 800 543-2378 avant de déplacer des armoires de batteries (après l'installation initiale).

Reportez-vous aux recommandations du fabricant relatives à la manipulation et à l'entretien pour les systèmes qui utilisent d'autres sources d'alimentation c.c. que les batteries.

1.0 INTRODUCTION

1.1 General Description

The Liebert EXL S1 provides continuous, high-quality AC power to business-critical equipment, such as telecommunications and data processing equipment. The Liebert EXL S1 supplies power that is free of the disturbances and variations in voltage and frequency common to utility power, which is subject to brownouts, blackouts, surges and sags.

The Liebert EXL S1 utilizes the latest in high-frequency, double-conversion pulse-width modulation technology and fully digital controls to enhance its reliability and increase the ease of use.

As shown in **Figure 1**, the AC utility source is input at the rectifier and the rectifier converts the AC utility into DC power. The inverter converts that DC power from the rectifier or DC power from the DC source- into AC power for the load. The DC source will power the load through the inverter in the event of a power failure. The utility source can also power the load through the static bypass.

If maintenance or repair of the UPS is necessary, the load can be switched without interruption in service to the optional maintenance bypass.

Figure 1 Typical single module UPS one-line diagram, single input, with static bypass and back-feed disconnect

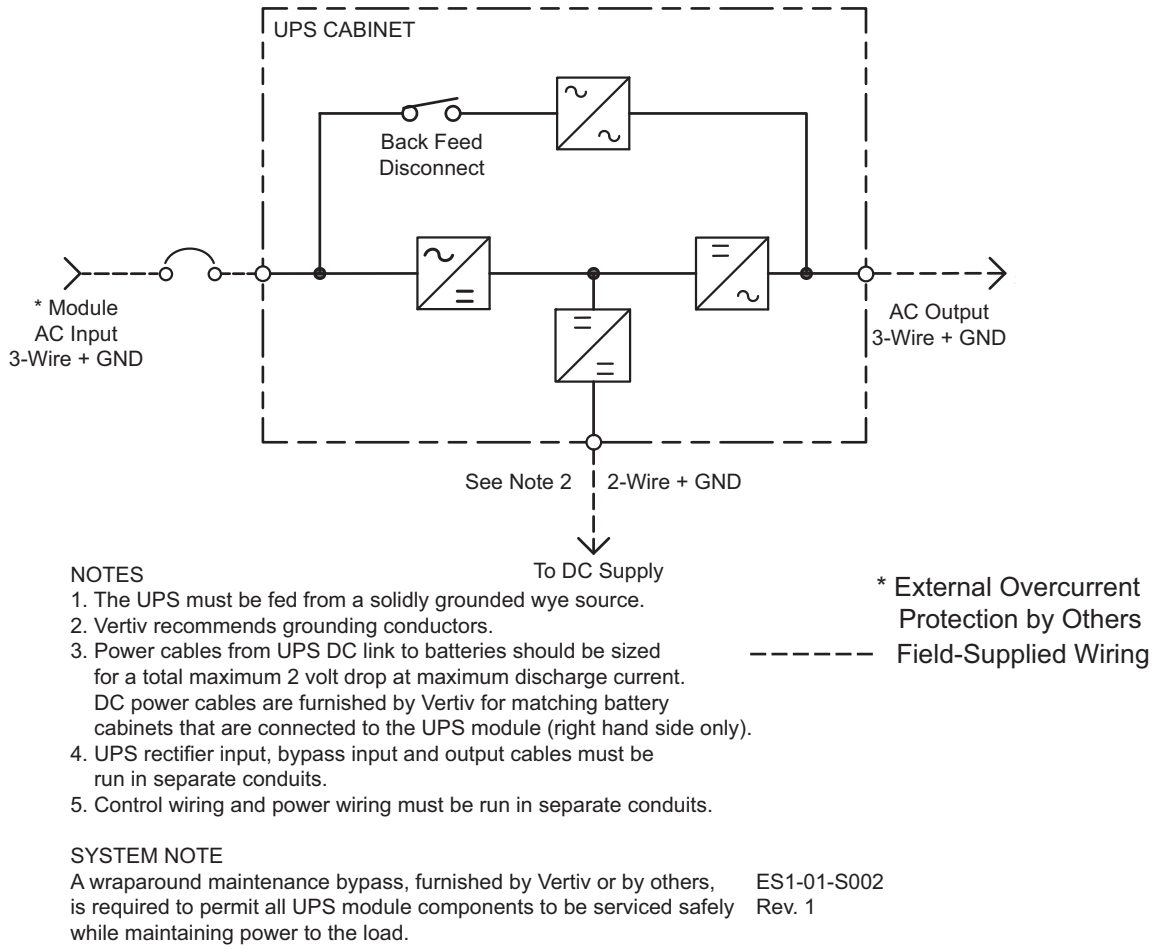
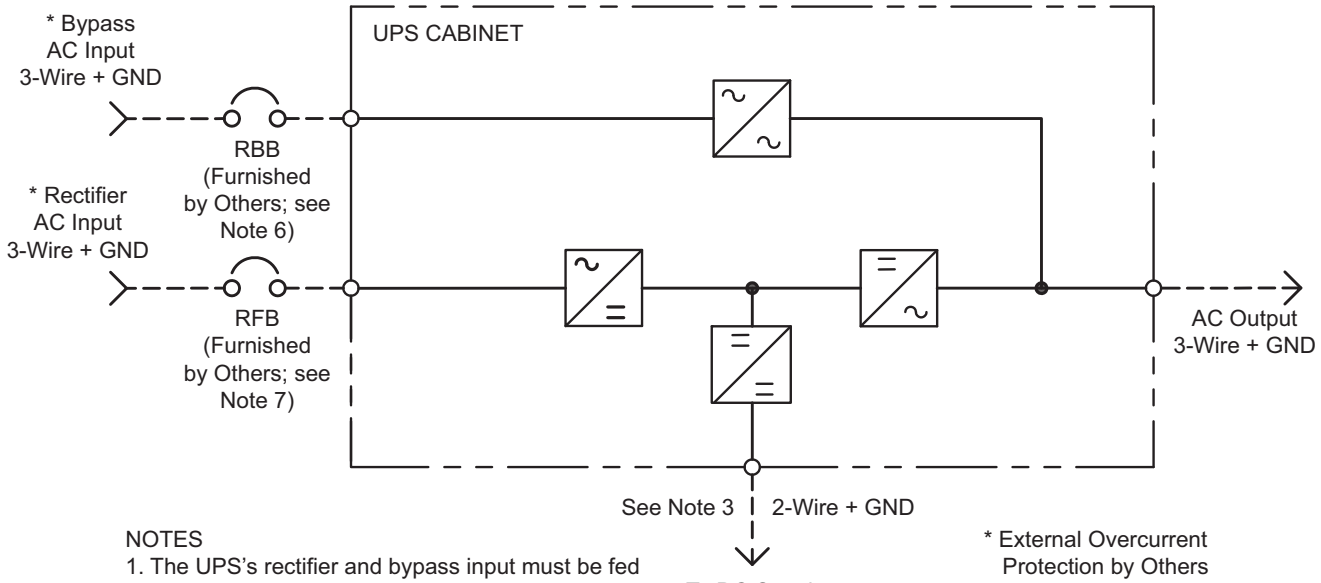


Figure 2 Typical single module UPS one-line diagram, dual input with static bypass and back-feed disconnect



NOTES

1. The UPS's rectifier and bypass input must be fed from a solidly grounded wye source. When the rectifier and bypass input are not fed from the same solidly grounded wye source a common mode choke must be ordered with the UPS (factory-installed in the UPS input/output cabinet).
2. Vertiv recommends grounding conductors.
3. Power cables from the UPS DC link to the batteries should be sized for a total maximum 2 volt drop at maximum discharge current. DC power cables are factory-supplied for matching battery cabinets that are connected to the UPS module (right side only).
4. UPS rectifier input, bypass input and output cables must be run in separate conduits.
5. Control wiring and power wiring must be run in separate conduits.
6. Remote Backfeed Breaker must be furnished with:
   - Shunt trip with a maximum 120VAC/30VDC operating voltage and maximum 5A current. If outside of these limits, an external relay with maximum 120VAC/30VDC coil operating voltage and maximum 5A coil pull-in current must be furnished to operate the shunt trip. Shunt trip power provided by others.
   - 1A/1B auxiliary contact
7. The Rectifier Feed Breaker must be furnished with a 1A/1B auxiliary contact.

* External Overcurrent Protection by Others

– – – – Field-Supplied Wiring
RBB: Remote Backfeed Breaker
RFB: Rectifier Feed Breaker

SYSTEM NOTE

A wrap-around maintenance bypass (furnished by Vertiv or others) is required to permit all components of the UPS module to be safely serviced while maintaining power to the load.

ES1-01-S007
Rev. 0

Figure 3 Main components—1000kVA-1200kVA, single-module and multi-module units (typical)

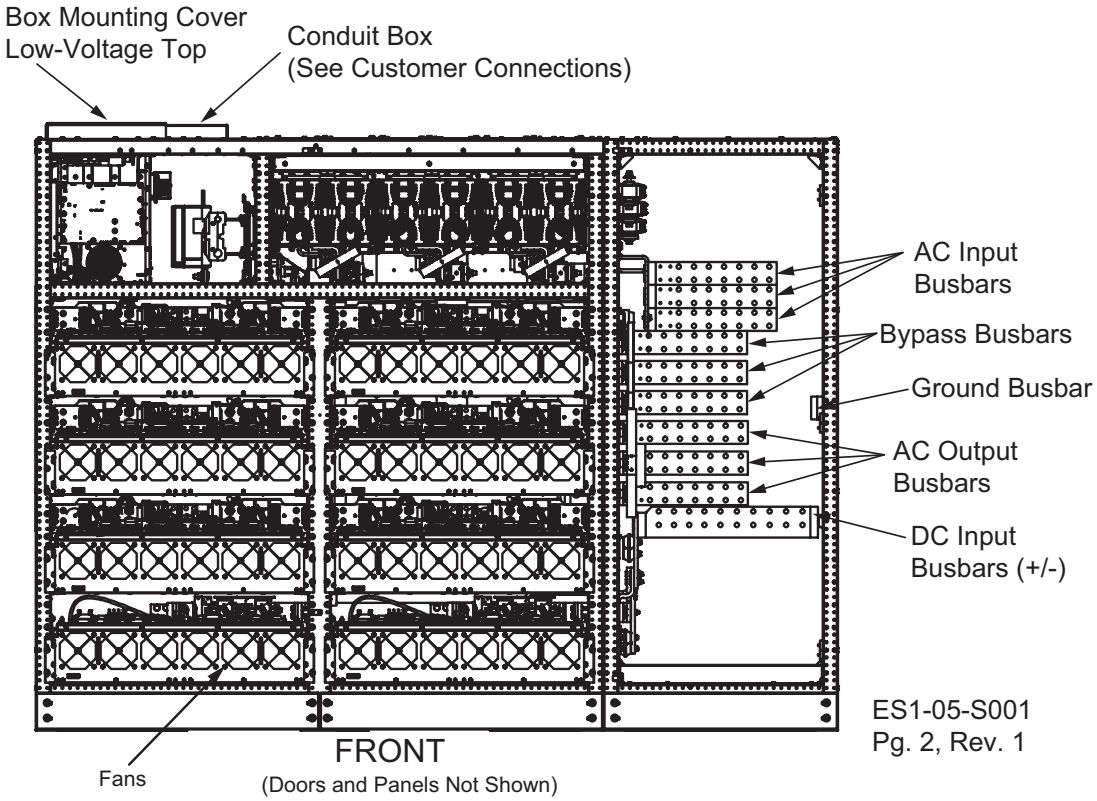
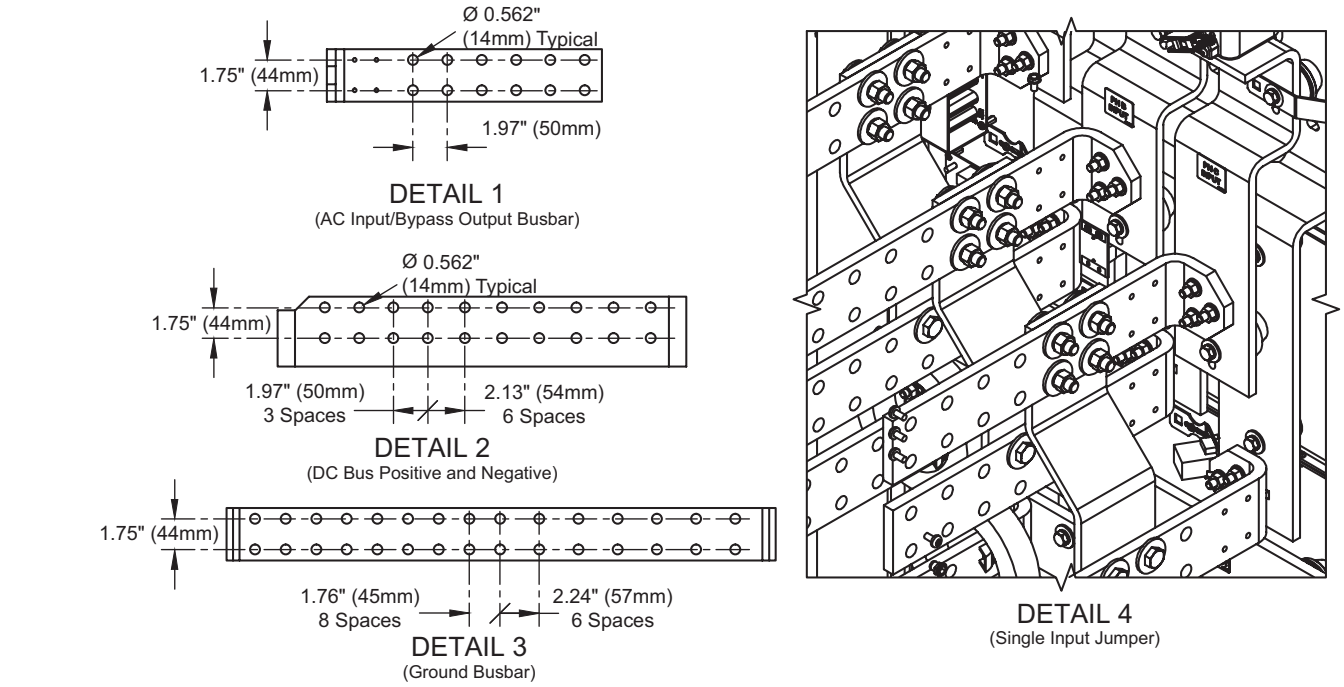
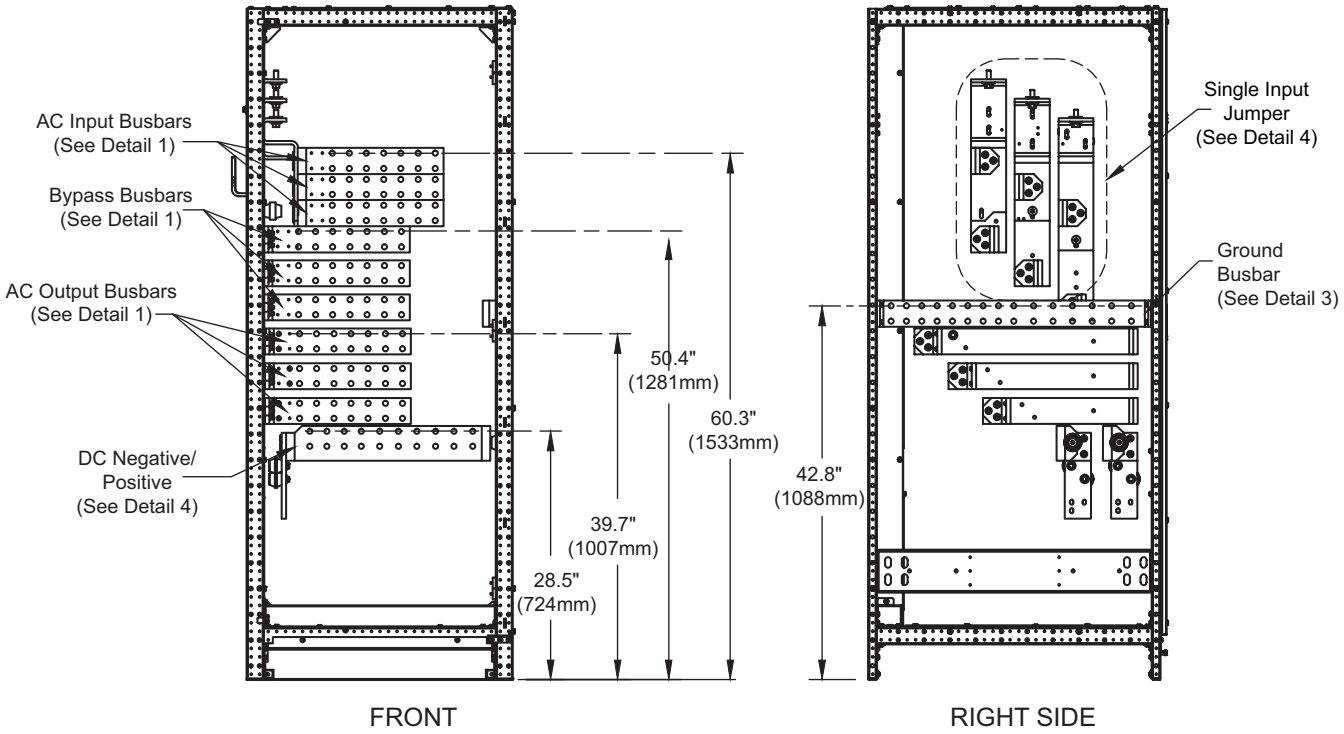


Figure 4 Electrical connections—1000-1200kVA, single and multi-module input output cabinet





NOTES
1. Control and power wiring must be run in separate conduits.
2. All wiring must be in accordance with national and local electrical codes.
3. Copper or aluminum cables may be used.

ES1-05-S001
Pg. 3, Rev. 1

Figure 5 Main components—1000kVA-1200kVA, single- and multi-module input/output cabinet with back-feed disconnect

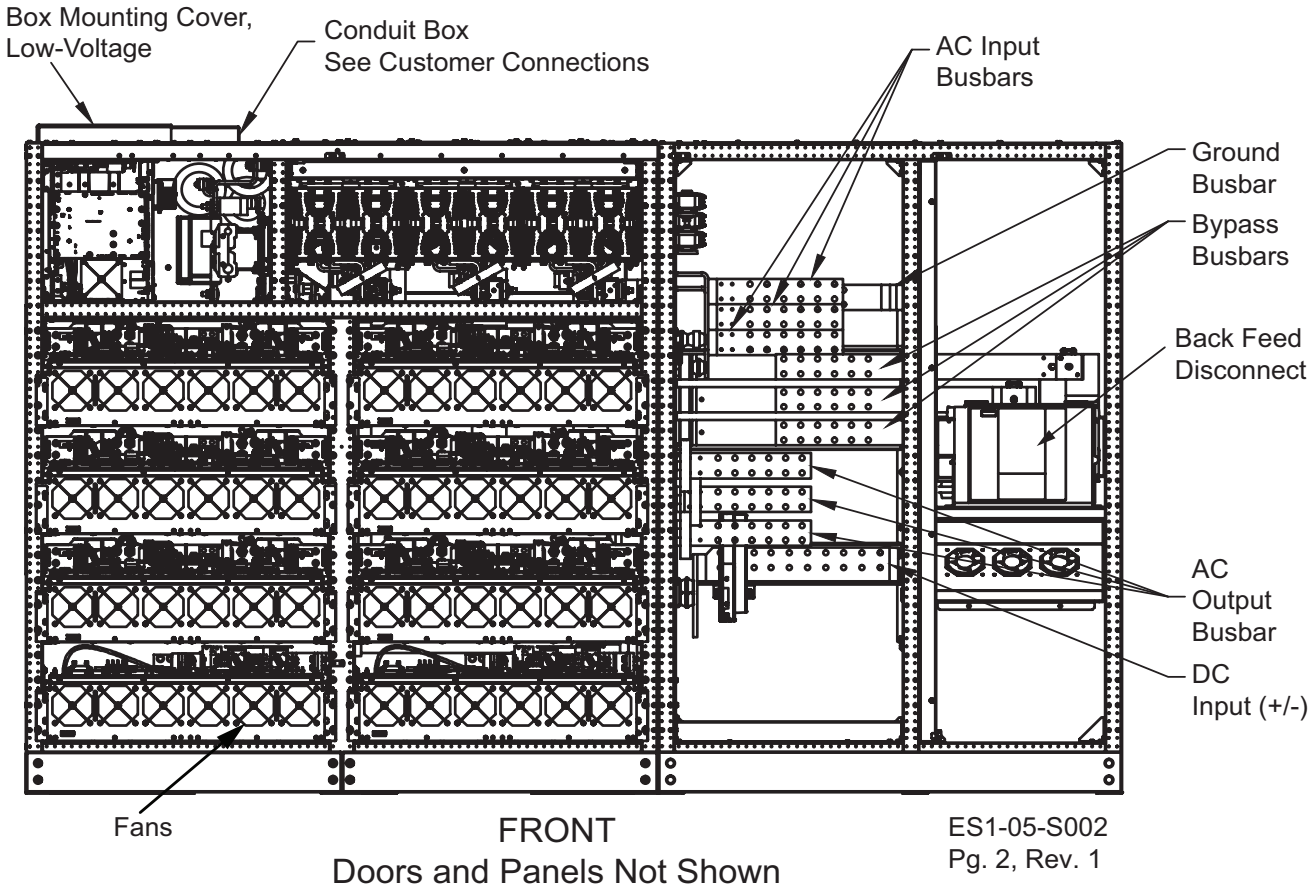
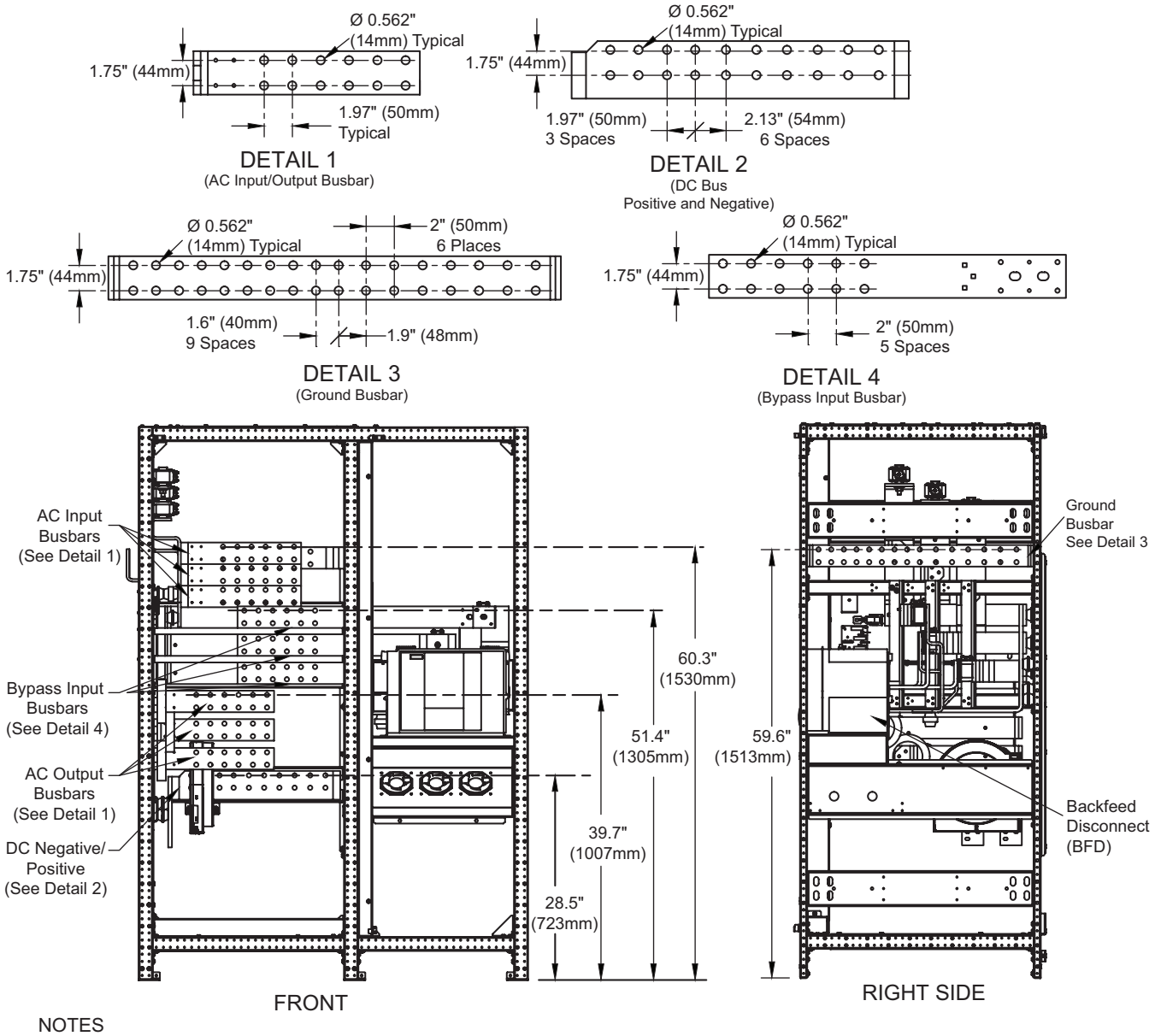


Figure 6 Electrical connections—1000kVA-1200kVA, single and multi-module input/output cabinet with back-feed disconnect



NOTES

1. Control and power wiring must be run in separate conduits.
2. All wiring must be in accordance with national and local electrical codes.
3. Copper or aluminum cables may be used.

ES1-05-S002
Pg. 3, Rev. 1

Figure 7 Main components—1000kVA-1200kVA, single and multi-module units with optional sharing inductor

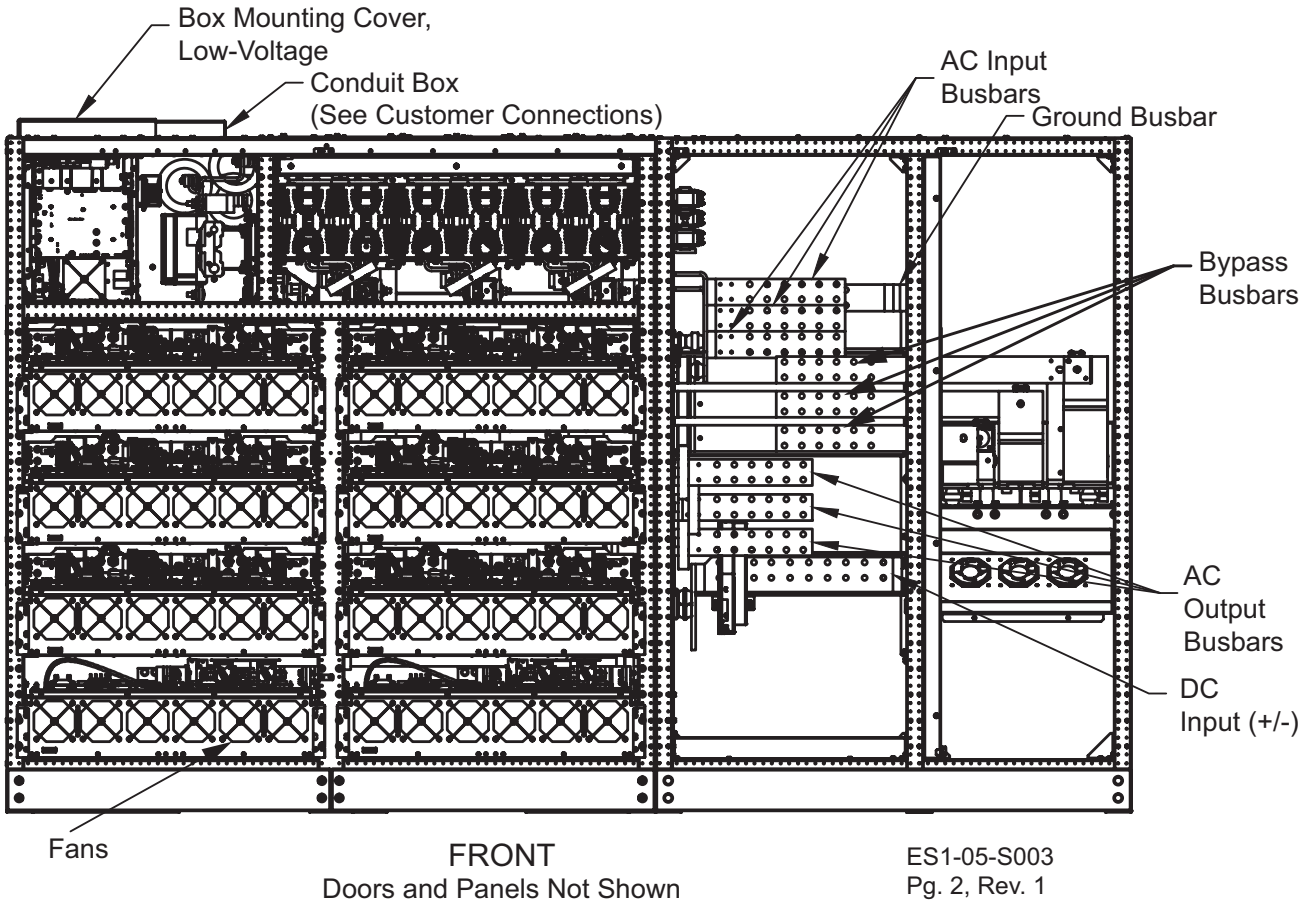
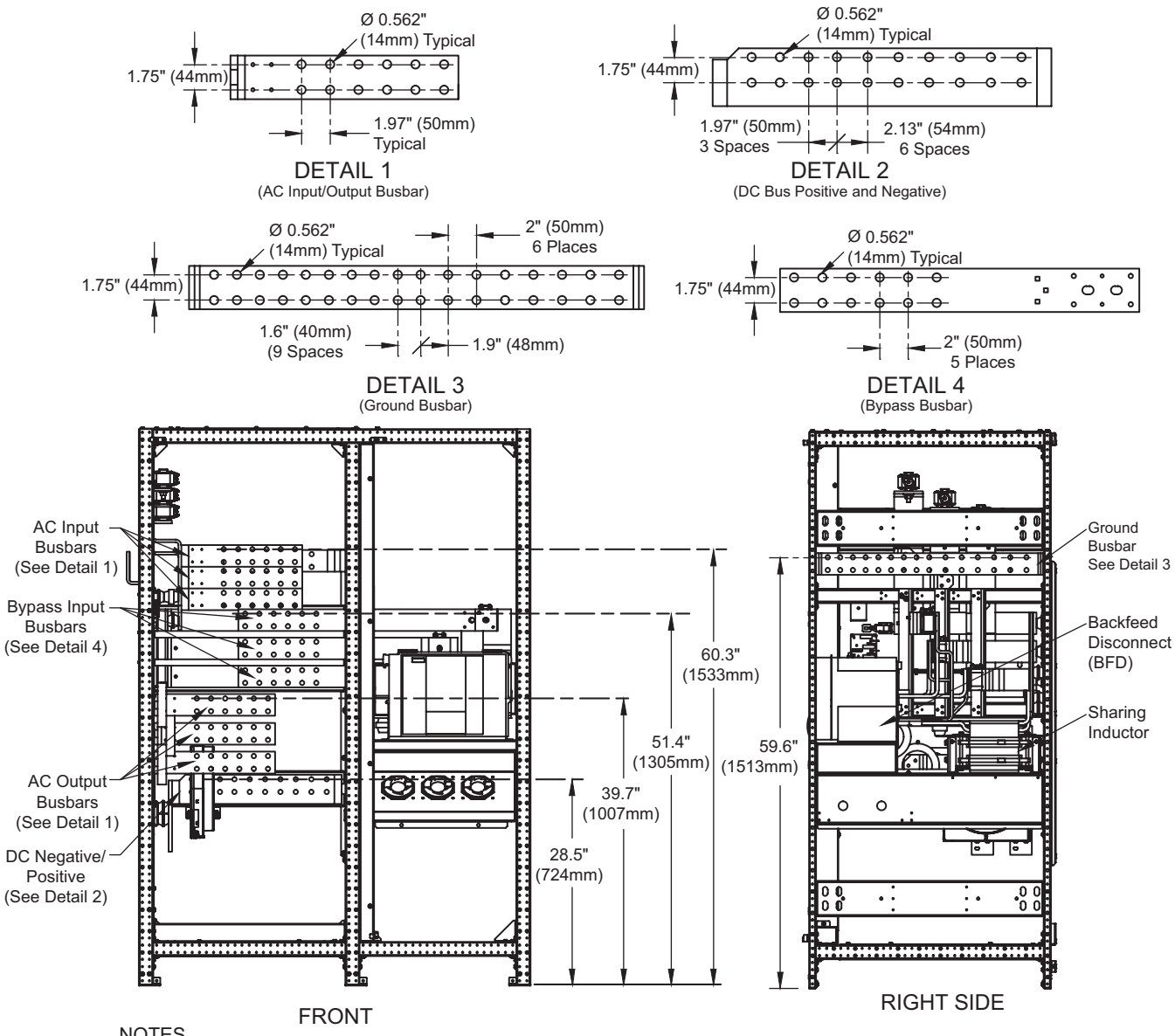


Figure 8 Electrical connections—1000-1200kVA, single and multi-module input/output cabinet with optional sharing inductor



NOTES

1. Control and power wiring must be run in separate conduits.
2. All wiring must be in accordance with national and local electrical codes.
3. Copper or aluminum cables may be used.

ES1-05-S004
Pg. 3, Rev. 1

Figure 9 Main components—1000kVA-1200kVA, single and multi-module units with optional common mode choke

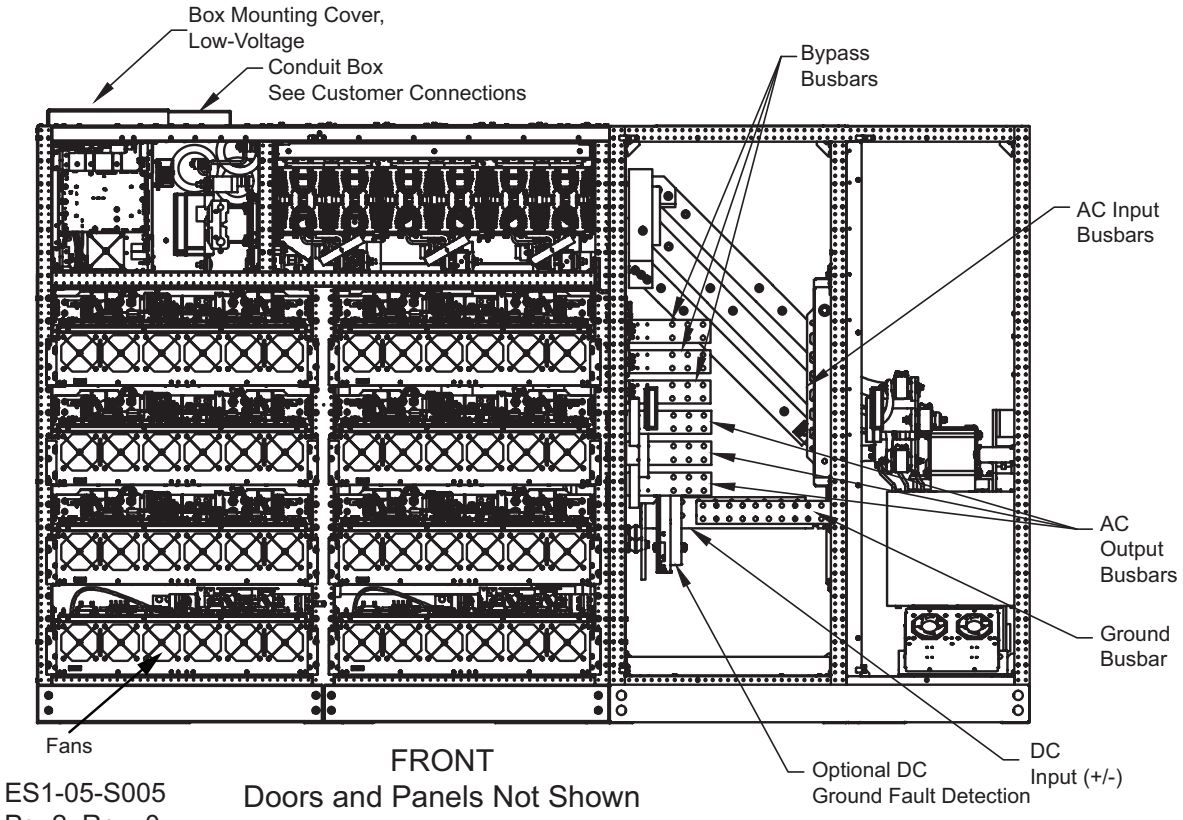
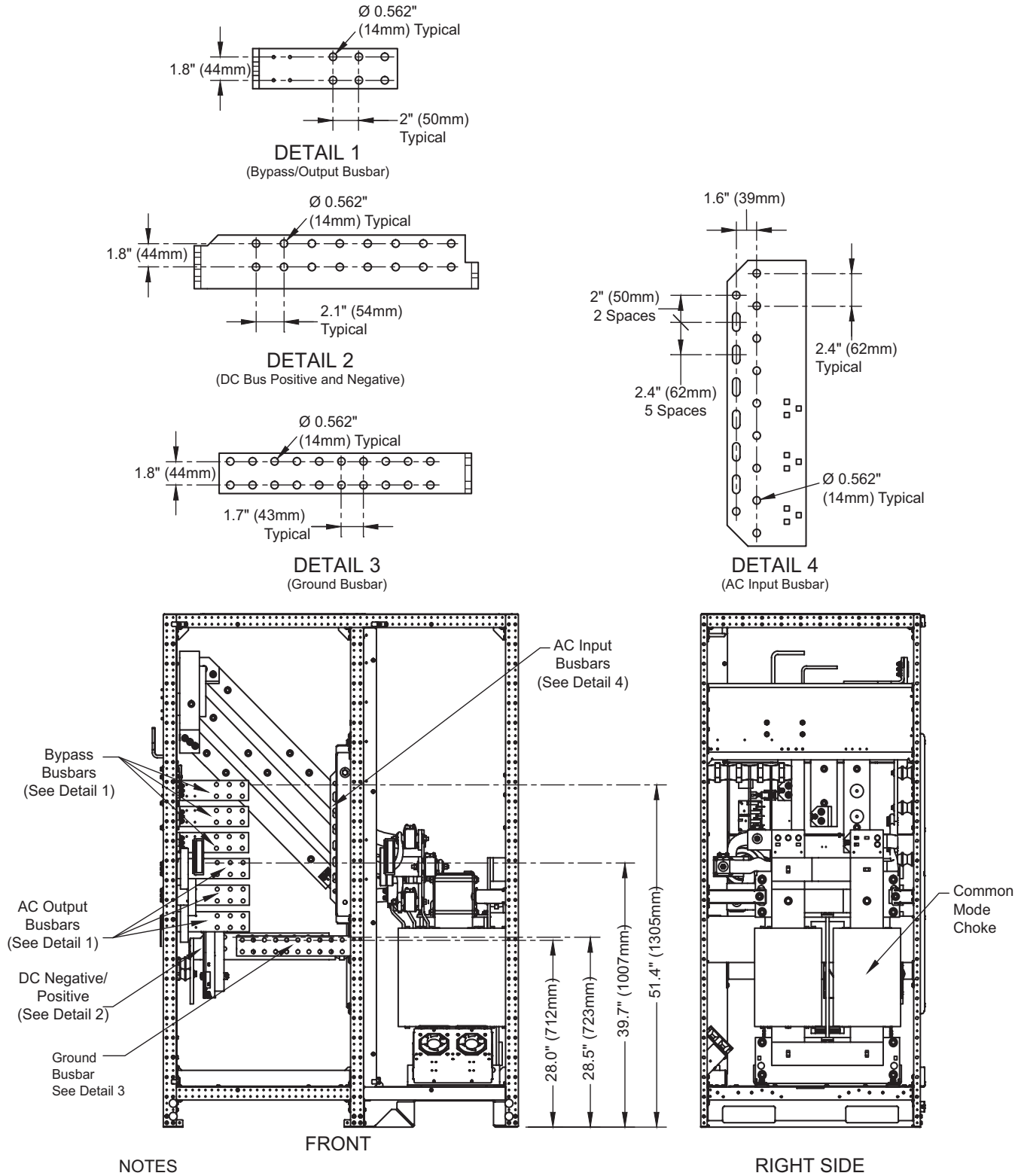


Figure 10 Electrical connections—1000kVA-1200kVA, single and multi-module units with optional common mode choke



NOTES
1. Control and power wiring must be run in separate conduits.
2. All wiring must be in accordance with national and local electrical codes.
3. Copper or aluminum cables may be used.

ES1-05-S005
Pg. 3, Rev. 1

Figure 11 Main components—1000kVA-1200kVA, single and multi-module units with optional common mode choke and back-feed disconnect

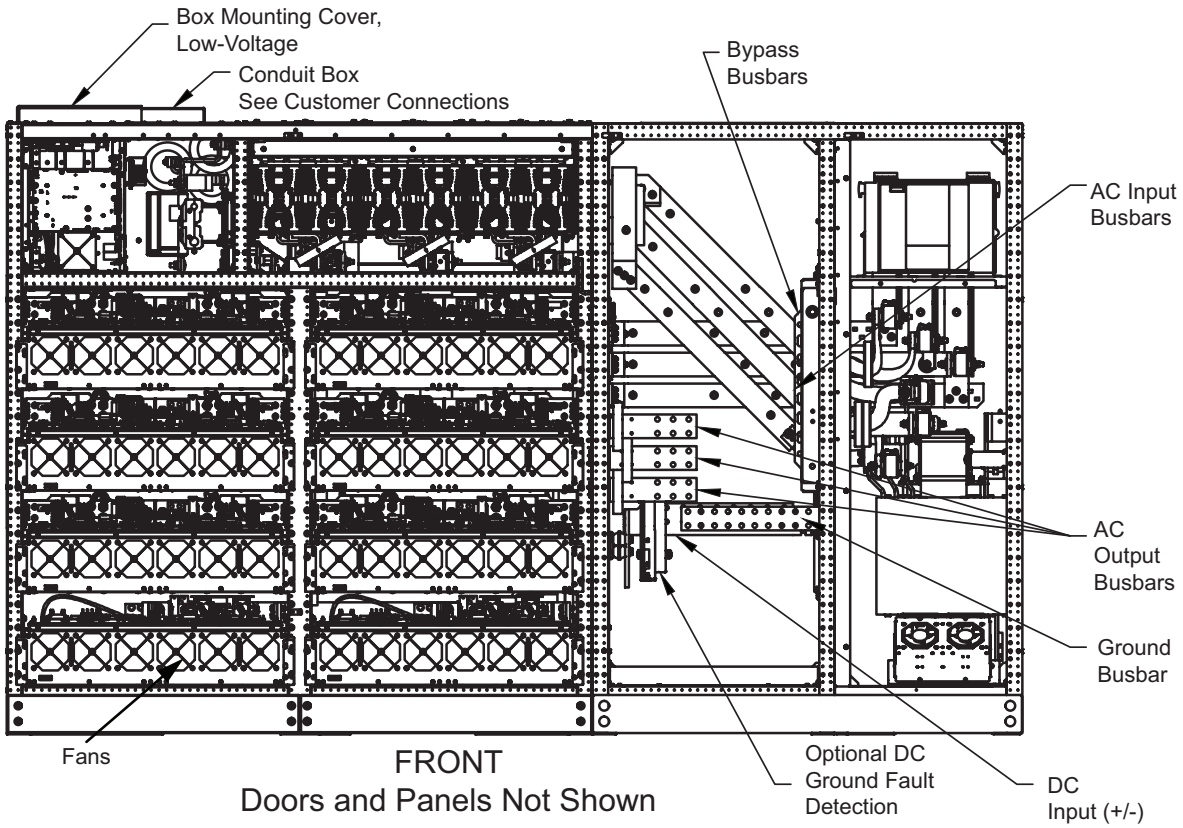
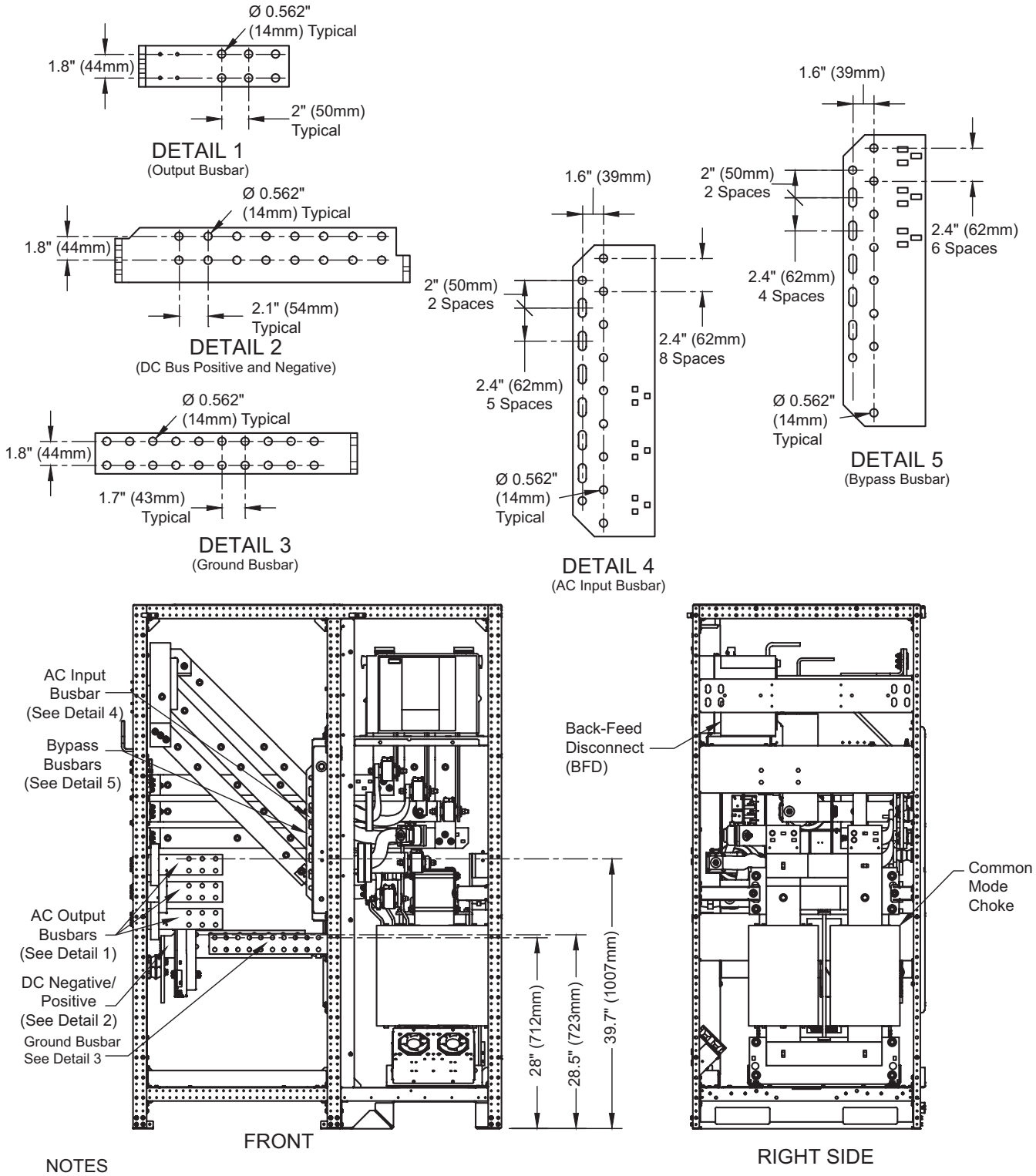


Figure 12 Electrical connections—1000kVA-1200kVA, single and multi-module units with optional common mode choke and back-feed disconnect



NOTES

1. Control and power wiring must be run in separate conduits.
2. All wiring must be in accordance with national and local electrical codes.
3. Copper or aluminum cables may be used.

ES1-05-S006
Pg. 3, Rev. 0

Figure 13 Main components—1000kVA-1200kVA, single and multi-module units with optional common mode choke and sharing inductor

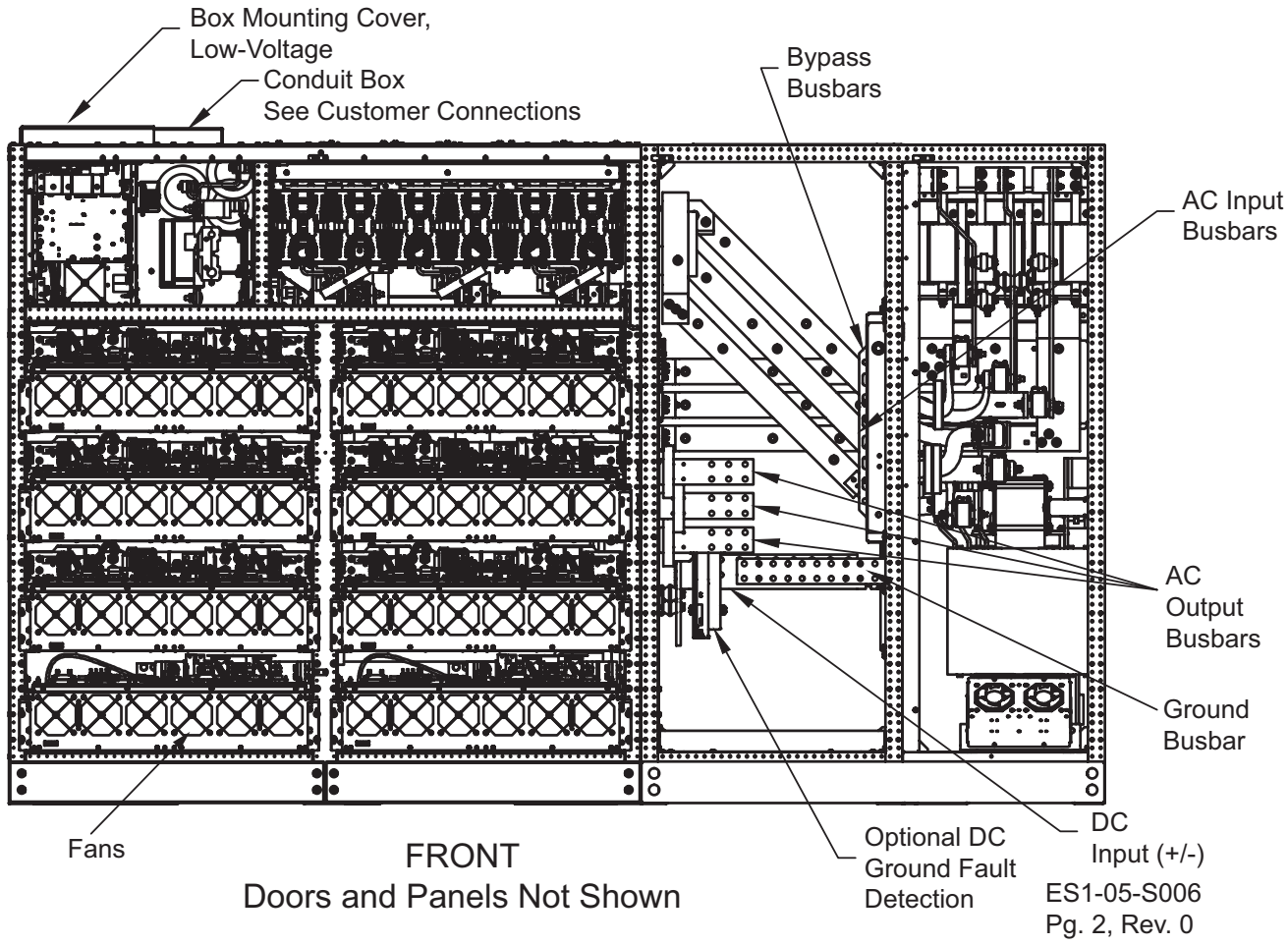
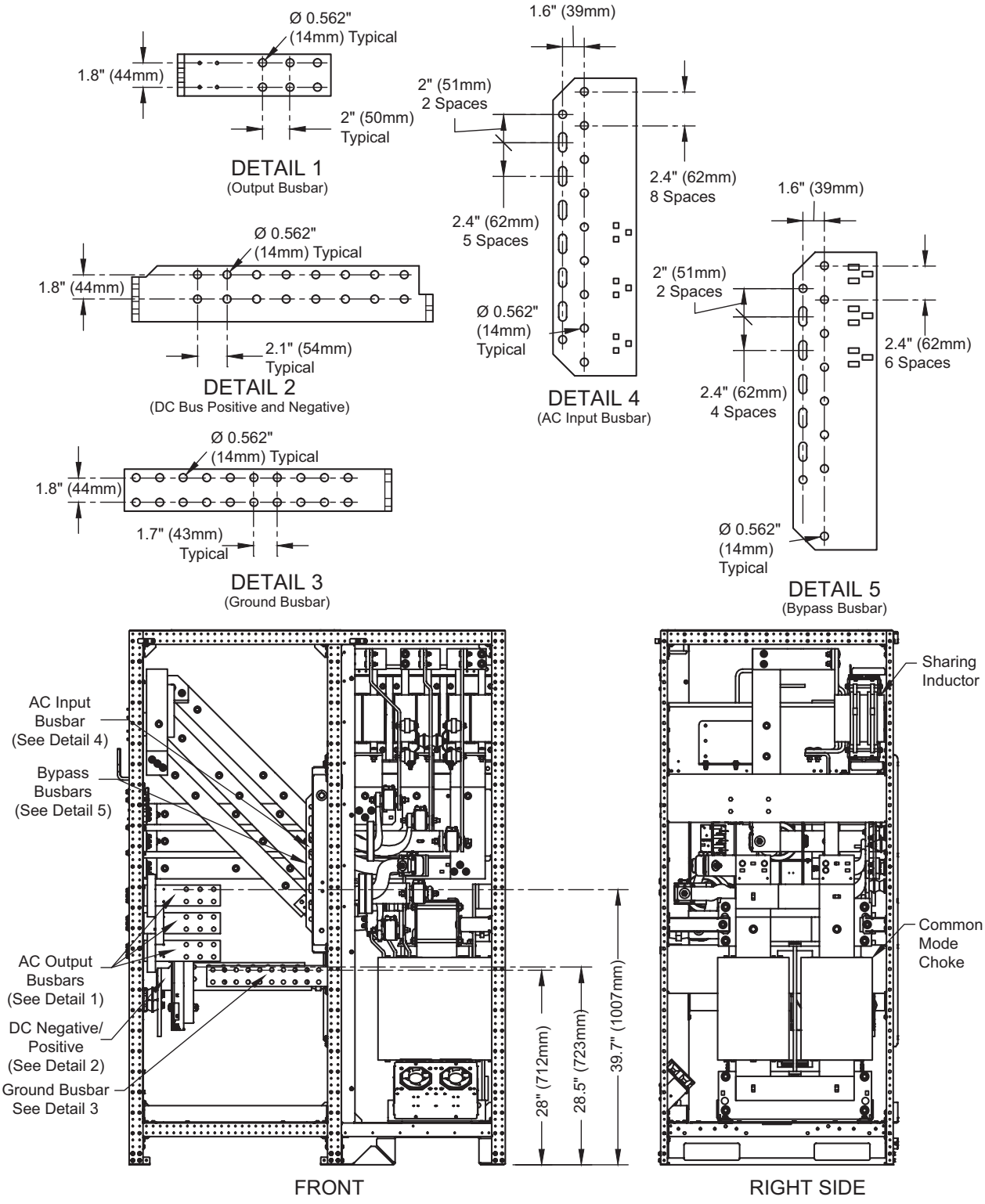


Figure 14 Electrical connections—1000kVA-1200kVA, single and multi-module units with optional common mode choke and sharing inductor



NOTES

1. Control and power wiring must be run in separate conduits.
2. All wiring must be in accordance with national and local electrical codes.
3. Copper or aluminum cables may be used.

ES1-05-S007
Pg. 3, Rev. 0

Figure 15 Main components—1000kVA-1200kVA, single and multi-module units with optional common mode choke, back-feed disconnect and sharing inductor

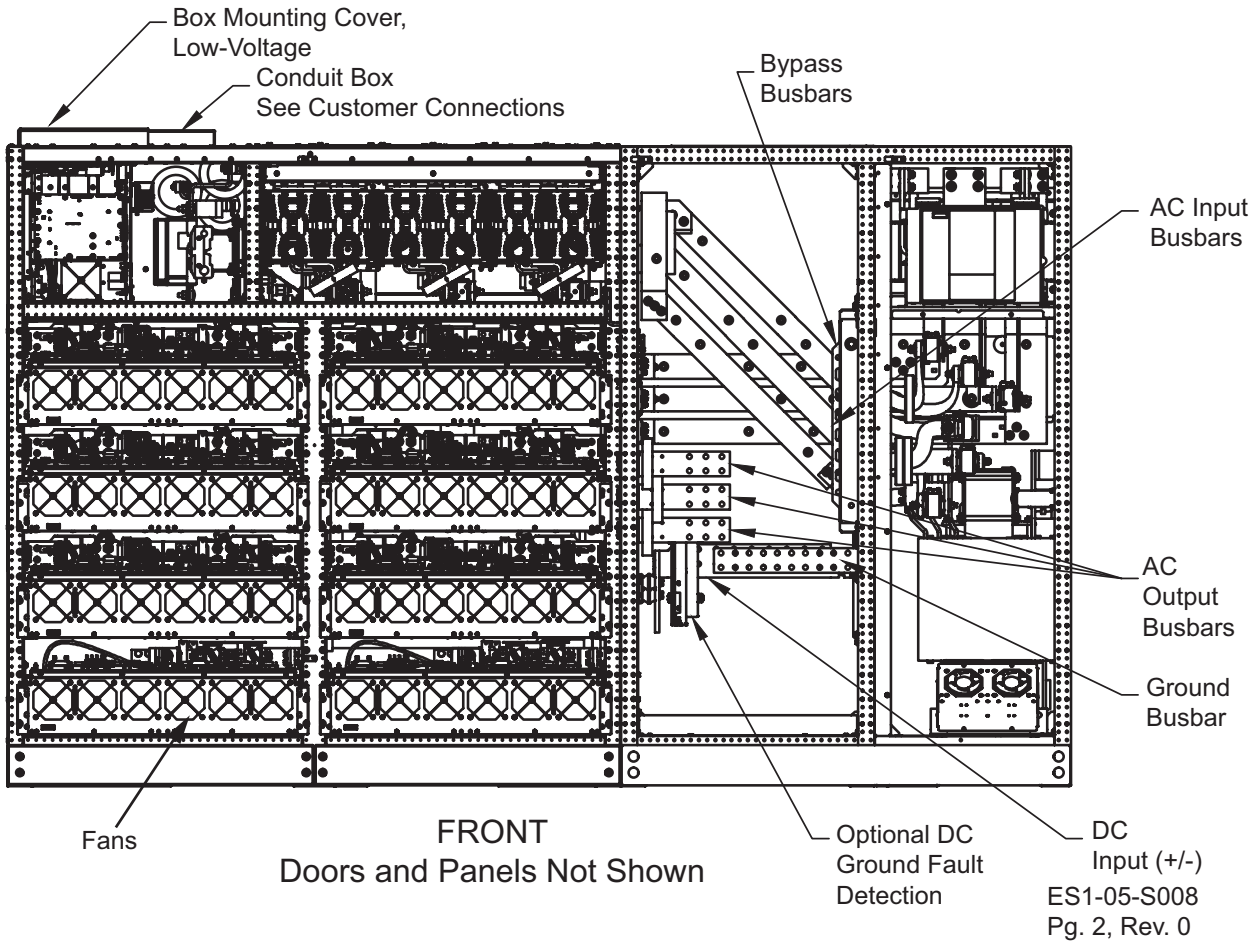
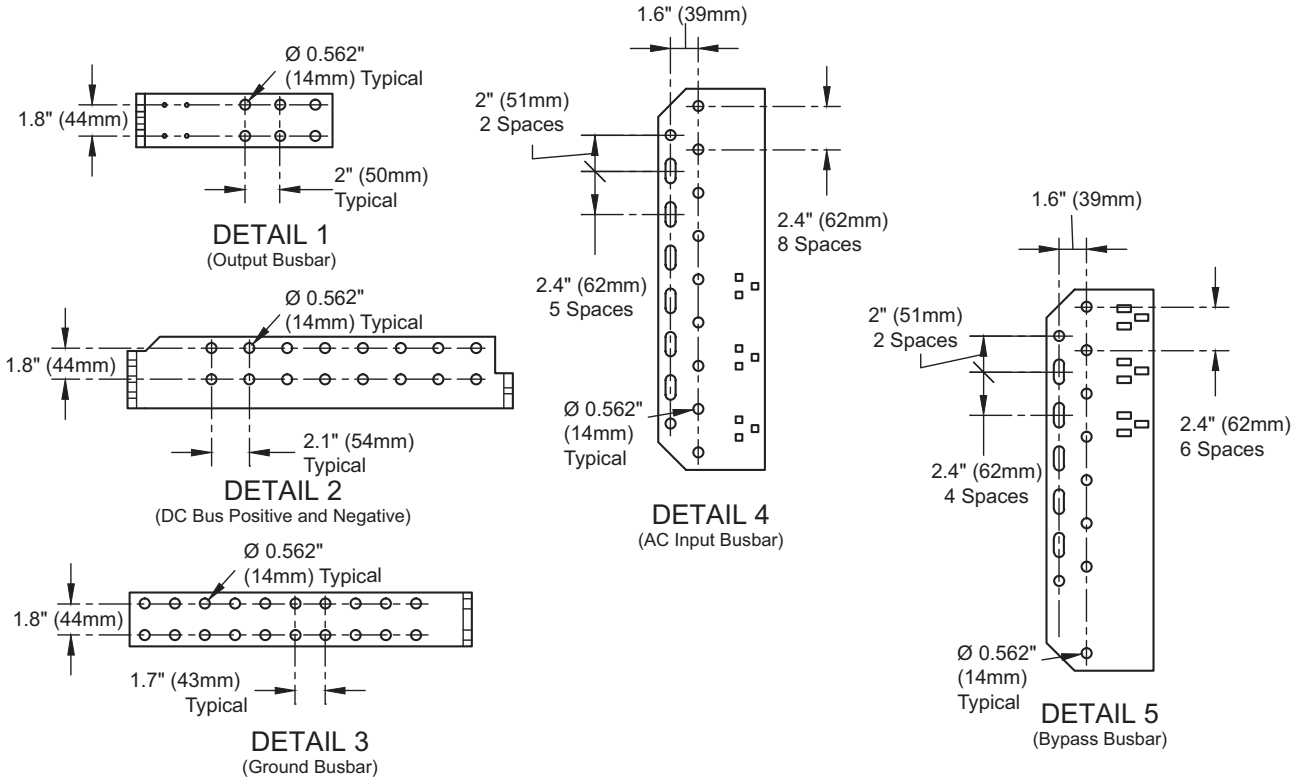


Figure 16 Electrical connections—1000kVA-1200kVA, single and multi-module units with optional common mode choke, back-feed disconnect and sharing inductor



NOTES
1. Control and power wiring must be run in separate conduits.
2. All wiring must be in accordance with national and local electrical codes.
3. Copper or aluminum cables may be used.

ES1-05-S008
Pg. 3, Rev. 0

1.2 Modes of Operation

1.2.1 Normal Mode

Operating in normal mode, the Liebert EXL S1's rectifier derives power from a utility AC source and supplies regulated DC power to the inverter, which regenerates precise AC power to supply the connected equipment. The rectifier also uses the utility source power to charge the DC sources.

1.2.2 Bypass Mode

When the Liebert EXL S1 is in bypass mode, the load is directly supported by utility power and is without DC source backup protection.

The Liebert EXL S1's inverter and bypass static switch will shift the load from the inverter to bypass mode without an interruption in AC power if the inverter is synchronous with the bypass and any of the following occurs:

- Inverter fails
- Inverter overload capacity is exceeded
- Inverter is manually turned Off

NOTE

If the inverter is asynchronous with the bypass, the static switch will transfer the load from the inverter to the bypass WITH interruption in AC power to the critical load. This interruption is 16ms.

1.2.3 Battery Mode

When utility AC power fails, the Liebert EXL S1 protects the critical load by instantaneously channeling DC source power to the inverter, which continues supporting the critical load without interruption.

When utility power returns and is within acceptable limits, the Liebert EXL S1 automatically shifts back to Normal mode, with the rectifier powering the critical load.

1.2.4 Eco Mode

Liebert EXL S1 1000-1200kVA systems have Intelligent Eco Mode available as an option. The feature must be enabled at the factory or in the field through the configuration menu on the Touchscreen Control Panel as described in SL-26094, the user interface manual, available at Vertiv's Web site, **www.vertivco.com**

This operation allows powering the critical load from the bypass source when that source is within acceptable operating limits. If the bypass source voltage or frequency goes outside of the acceptable operation band, the critical load is automatically transferred to the UPS inverter without interruption. The load can be transferred from the bypass source to the inverter in a make-before-break operation.

1.2.5 Intelligent Paralleling

Intelligent Paralleling operation increases overall efficiency of multi-module systems by automatically placing individual modules in standby mode so that only the modules required to provide the output power required by the connected load are operating. The system adjusts the number of modules in standby mode according to load conditions so that the system operates at maximum efficiency. Modules will switch between standby and normal mode automatically so that each module operates an equal amount of time, prolonging service life for each module.

Intelligent Paralleling may be activated through the Touchscreen Control Panel. For details, refer to the panel's user manual, SL-26094, available at Vertiv's Web site, **www.vertivco.com**

1.2.6 Maintenance Bypass

The installation of a Maintenance Bypass Cabinet or Assembly is recommended to allow total isolation of the UPS from all power sources while continuing to supply power to the critical load. Maintenance Bypass use is described in **2.0 - Operation**.

1.3 OPTIONS

A number of options are available from Vertiv for the Liebert EXL S1. Described below are the most frequently provided options. Other options are available. Contact your Vertiv representative for more information.

- **Back-Feed Disconnect (BFD)**—Isolates back-feed voltage from the upstream source, eliminating the need for a shunt trip accessory in external upstream back-feed breaker. The BFD does not provide overcurrent protection.
- **Battery and Racks**—The batteries provide power in the event of a power outage. The Liebert EXL S1 can use a variety of battery types, provided the battery plant is designed for the UPS DC voltage range and the load requirements of the application.
- **Battery Cabinets**—Valve-regulated, lead-acid (VRLA) sealed batteries are available in matching cabinets for convenient installation and maintenance in otherwise unprotected space. Depending on the UPS module rating, two or more cabinets may be connected in parallel to provide the additional run time. This option is required to complete the UPS system.
- **Lithium-Ion Battery Cabinets**
- **Flywheel**
- **Bypass Current Sharing Inductors**—For multi-module UPS configurations where load cables differ significantly in length, bypass sharing inductors help to ensure even load sharing while the UPS modules power the load via their static bypass switches.
- **Common Mode Choke**—Typically installed in the UPS when dual asynchronous sources feed the UPS. The common mode choke reduces the third harmonic current during parallel operation of the inverter and bypass.
- **Maintenance Bypass**—This switchboard provides make-before-break maintenance bypass. It includes: Maintenance Bypass Breaker (MBB) and Maintenance Isolation Breaker (MIB). The Maintenance Bypass is a buyout item and not available from Vertiv for the Liebert EXL S1.
- **DC (Battery) Ground Fault**—Permits setting a user-defined alarm caused by detection of a DC ground fault. The UPS can be configured to allow the circuit breaker to open or to remain closed upon detection of a ground fault.
- **Seismic Bracing**—A separate kit for tying down the UPS module allows the unit to meet International Building Code (IBC) regulations.
- **Remote Alarm Status Panel**—Provides alarm lamps for up to eight UPS alarms. Available as surface mount or flush mount.
- **Module Battery Disconnect**—The UPS system utilizes a separate Module Battery Disconnect (MBD) for remotely located batteries. A sensing circuit in the UPS module, set at the battery low voltage limit, trips the Module Battery Disconnect to safeguard the battery from excessive discharge. The Module Battery Disconnect has an undervoltage release mechanism designed to ensure that during any shutdown or failure mode all battery potential is removed from the UPS system.
- **Battery Isolation Switch**—A Battery Isolation Switch (BIS) is used to isolate individual battery strings when a system MBD is used. When the optional Battery Interface Box is used, the status of the Battery Isolation Switch is displayed on the UPS HMI. A temperature sensor is recommended to allow proper battery charging and overtemperature protection.
- **Battery Interface Box**—A Battery Interface Box (BIB) is available to support the UPS and third-party battery cabinets or rack-mounted batteries. A BIB is required for each MBD (stand-alone or inside the third-party battery cabinet). A BIB is optional with each Battery Isolation Switch. A BIB is required for each temperature sensor.
- **Battery Temperature Sensor**—Allows the UPS module to compensate battery charging voltage, depending on temperature, to prolong battery life. The Temperature Sensor is required for battery solutions utilizing a non-matching Module Battery Disconnect or Battery Isolation Switch. Liebert battery packs have built-in temperature sensors. The Temperature Sensor option includes a remote sensor that must be field-installed.
- **LIFE™ Services**—This card provides an independent external modem interface for communication with the LIFE Services service station. Ask your local Vertiv representative for more details on LIFE Services and its benefits for your UPS system.
- **MBSM**—This module is available to support up six or up to 11 UPS modules, and is generally configured to synchronize all modules to a reference bus (e.g., bypass line). See the manual for this module for more details.
- **Network and BMS Connectivity**—The Liebert IntelliSlot™ platform includes the Liebert IS-UNITY-DP™ and Liebert IS-485 EXI™ cards. The platform communicates with Vertiv software tools and services, including Trellis®, Liebert SiteScan® Web and Liebert Nform®. The Liebert IS-UNITY-DP supports up to two third-party protocols (BACnet, Modbus SNMP), along with HTTP/S (Web), Vertiv Protocol, SMTP and SMS.
- **EPO**—A local Emergency Power Off (EPO) button with protective cover is available. This option is typically installed at the factory but may be field-installed by Vertiv Services.

1.3.1 Setpoints (User Adjustable)

The following will change the settings of the modules:

- Screen Saver - Enable/Disable
- Display Options
  - Customize Layout
  - Display Properties (Language, Theme, Backlight Off Timer, Alarm Window Timeout, Auto-Logout Timer, Display Brightness, Status Indicator Brightness, Calibrate Touchscreen)
  - Date & Time (Time Zone, Date, Local Time)
  - Format (Date. Time, Measurement System)
  - Custom Labels (Settings, Network Interfaces)
- Audible Alarm - Silence, Enable, Disable
- Automatic Battery Test - Enable/Disable, Test Duration (hh:mm:ss), Test Cycle (1-45-days), Test Inhibit Time (1 - 1092-hrs), Minimum Cell Voltage (1.65 - 2.9 V/cell)
- Manual Battery Test - Start, Duration, Minimum Cell Voltage (1.65 - 2.9 V/cell)
- Battery Equalize - Start, Charge Duration (1 - 72-hrs), Charge Voltage (2.3 - 2.9V/cell)
- Manage Permissions - Operator and Admin pin number
- Dial Control Setup - Center, Upper, and Lower Meter
- UPS Setting - Enable/Disable ECO Mode, Enable/Disable Audible Alarm, Enable/Disable Intelligent Parallel Mode

2.0 OPERATION

2.1 Touchscreen Navigation

Several menu items can be accessed from the main display screen (refer to the Touchscreen Control Panel user manual, SL-26094).

2.2 Manual Operations—All Systems

The Liebert EXL S1 is designed to function unattended by an operator. The system control logic automatically handles many important functions. Other procedures must be performed manually.

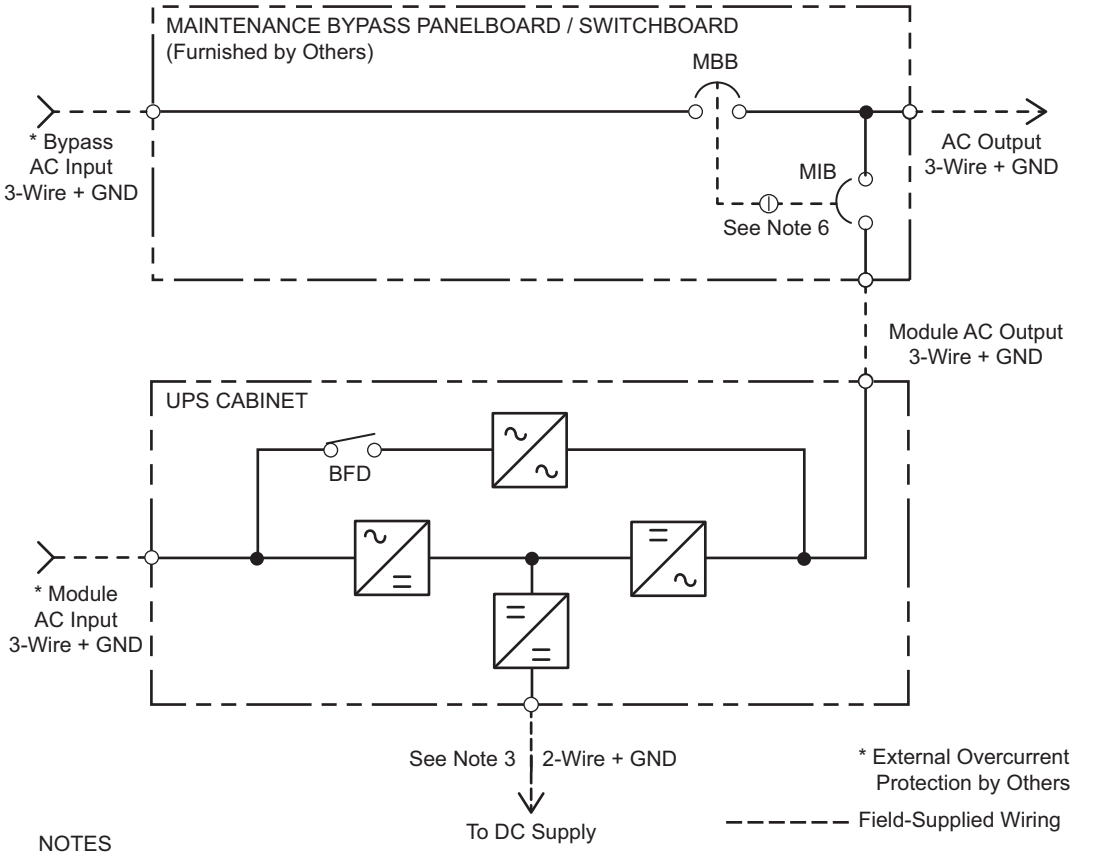
Manual procedures available to the operator include startup, load transfers and shutdowns. These are performed with the touchscreen and some manually operated circuit breakers and switches.

This section lists typical step-by-step instructions.

- **Startup**—Including initial startup, recovering from input power failure, recovering from DC source shutdown and recovering from shutdowns for emergencies or maintenance.
- **Load Transfers**—Including transfers from UPS to bypass and retransfers from bypass to the UPS system.
- **Maintenance Bypass Load Transfers**—Including transfers from internal bypass to maintenance bypass and transfers from maintenance bypass to internal bypass.
- **Shutdowns**—Including module shutdowns for maintenance and emergency shutdowns.

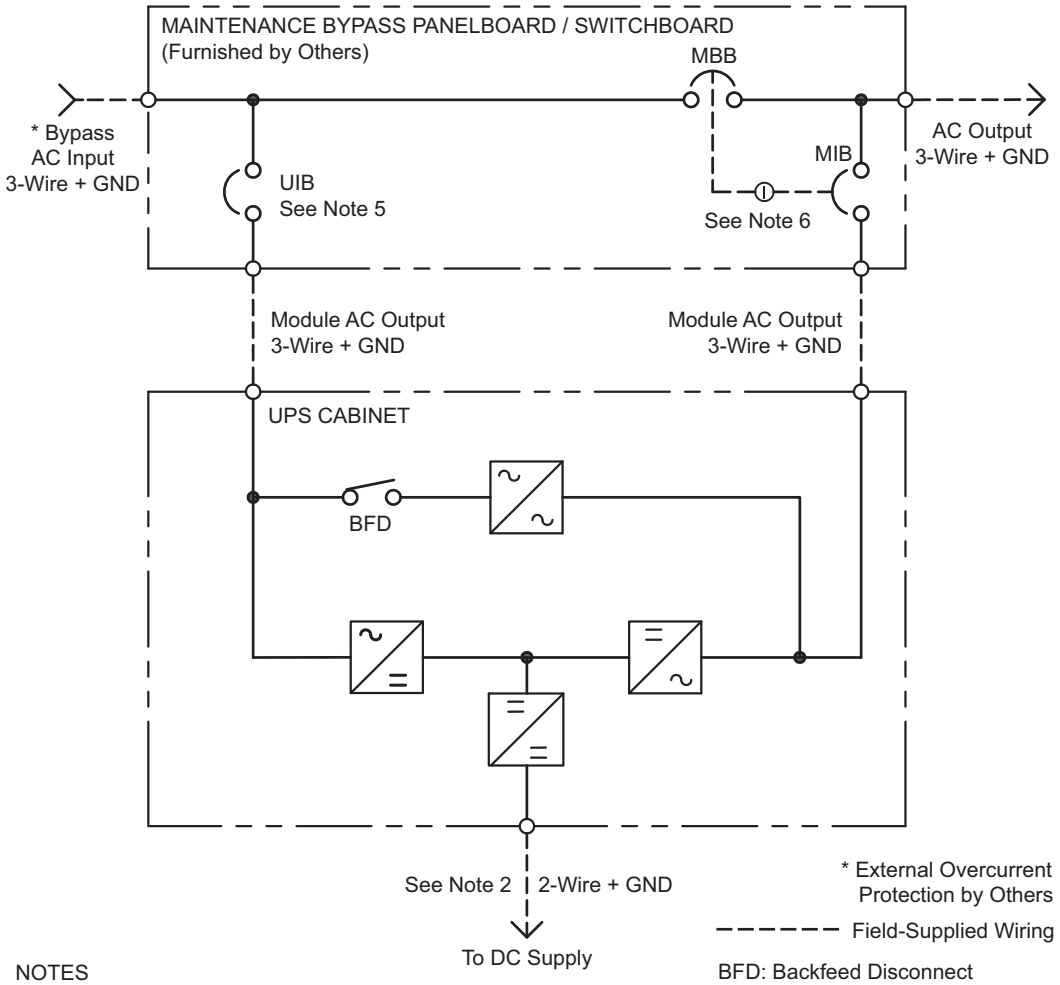
Figures 17 through **20** illustrate several of the possible maintenance bypass configurations for Liebert EXL S1 systems.

Figure 17 Maintenance bypass configurations—Two breaker and back-feed disconnect



NOTES
1. The UPS's rectifier and bypass inputs must be fed from a solidly grounded wye source.
2. Vertiv recommends grounding conductors.
3. Power cables from the UPS DC link to the batteries should be sized for a total maximum 2 volt drop at maximum discharge current. DC power cables are factory-supplied for matching battery cabinets connected to the UPS (right side only).
4. UPS rectifier input, bypass input and output cables must be run in separate conduits.
5. Control wiring and power wiring must be run in separate conduits.
6. Optional interlock shown.

Figure 18 Maintenance bypass configurations—Three breakers and back-feed disconnect for single-input UPS

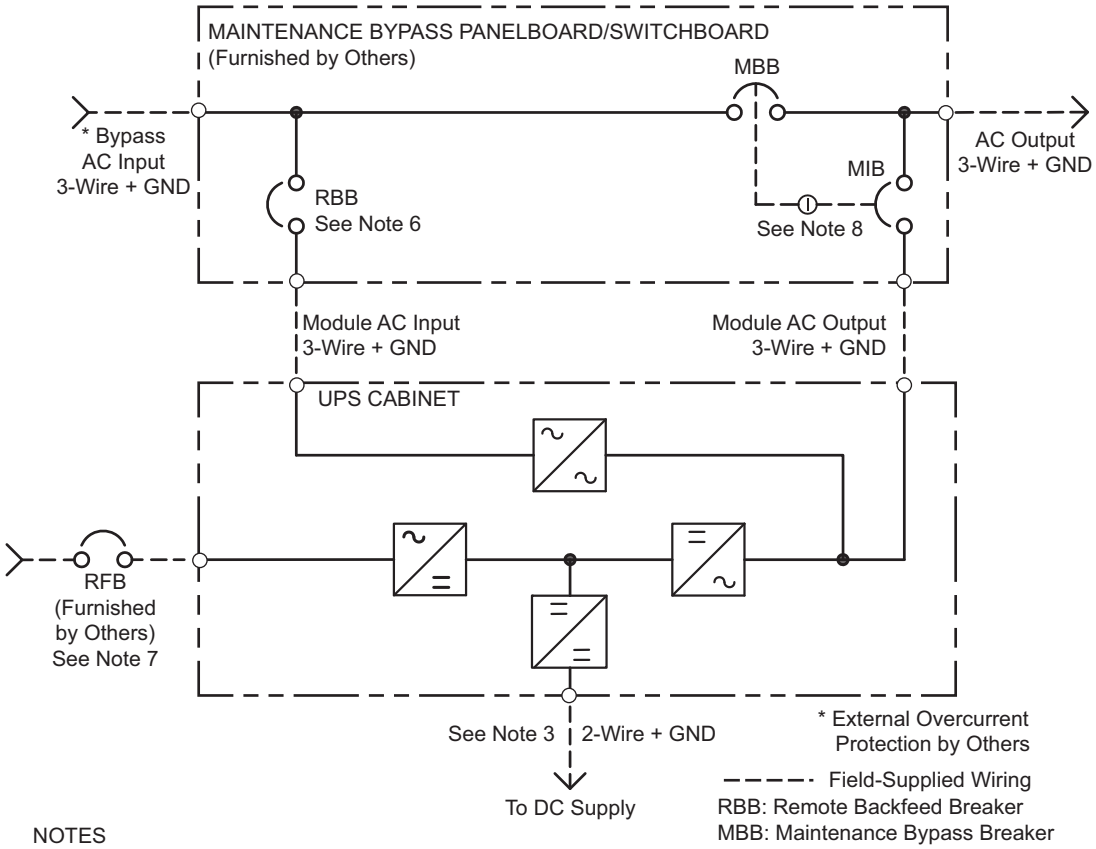


NOTES
1. The maintenance bypass input must be fed from a solidly grounded wye source.
2. Vertiv recommends grounding conductors.
3. Power cables from the UPS DC link to the batteries should be sized for a total maximum 2 volt drop at maximum discharge current. DC power cables are factory-supplied for matching battery cabinets connected to the UPS (right side only).
4. UPS rectifier input, bypass input and output cables must be run in separate conduits.
5. Control wiring and power wiring must be run in separate conduits.
6. UIB must be furnished with auxiliary contact.
7. Optional interlock shown.

BFD: Backfeed Disconnect
UIB: UPS Input Breaker
MBB: Maintenance Bypass Breaker
MIB: Maintenance Isolation Breaker

ES1-01-S006
Rev. 1

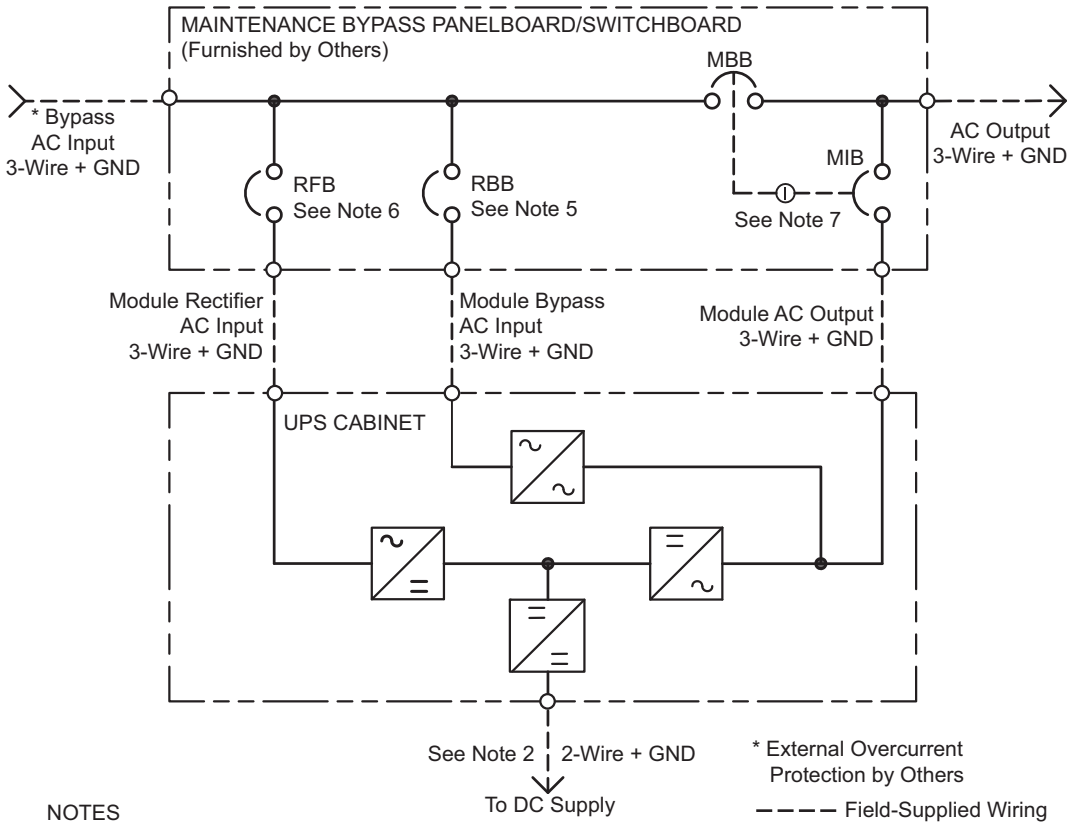
Figure 19 Maintenance bypass configurations—Three breaker for dual-input UPS



NOTES

1. The UPS's rectifier and bypass inputs must be fed from a solidly grounded wye source. If the UPS's rectifier input and the maintenance bypass input are not fed from the same solidly grounded wye source, a common mode choke must be ordered with the UPS (factory-installed in the UPS input/output cabinet).
2. Vertiv recommends grounding conductors.
3. Power cables from the UPS DC link to the batteries should be sized for a total maximum 2 volt drop at maximum discharge current. DC power cables are factory-supplied for matching battery cabinets connected to the UPS (right side only).
4. UPS rectifier input, bypass input and output cables must be run in separate conduits.
5. Control wiring and power wiring must be run in separate conduits.
6. Remote Backfeed Breaker must be furnished with:
   - Shunt trip with a maximum 120VAC/30VDC operating voltage and maximum 5A current. If outside of these limits, an external relay with maximum 120VAC/30VDC coil operating voltage and maximum 5A coil pull-in current must be furnished to operate the shunt trip. Shunt trip power provided by others.
   - 1A/1B auxiliary contact
7. The Rectifier Feed Breaker must be furnished with 1A/1B auxiliary contact.
8. Optional interlock shown.

Figure 20 Maintenance bypass configurations—Four breaker for dual-input UPS



NOTES

1. The maintenance bypass input must be fed from a solidly grounded wye source.
2. Vertiv recommends grounding conductors.
3. Power cables from the UPS DC link to the batteries should be sized for a total maximum 2 volt drop at maximum discharge current. DC power cables are factory-supplied for matching battery cabinets connected to the UPS (right side only).
4. UPS rectifier input, bypass input and output cables must be run in separate conduits.
5. Control wiring and power wiring must be run in separate conduits.
6. Remote Backfeed Breaker must be furnished with:
   - Shunt trip with a maximum 120VAC/30VDC operating voltage and maximum 5A current. If outside of these limits, an external relay with maximum 120VAC/30VDC coil operating voltage and maximum 5A coil pull-in current must be furnished to operate the shunt trip. Shunt trip power provided by others.
   - 1A/1B auxiliary contact
7. The Rectifier Feed Breaker must be furnished with 1A/1B auxiliary contact.
8. Optional interlock shown.

2.2.1 Startup—Single Module System

NOTE

The following procedure assumes that the UPS installation inspection and initial startup have been performed by Vertiv Services. A Vertiv-authorized representative must perform the initial system startup to ensure proper system operation.

This section lists step-by-step instructions for UPS's with maintenance bypass configurations as shown in this manual. If the system has a different maintenance bypass operation, consult the provider of that system for operating procedures. The procedure assumes that the UPS installation, inspection and initial startup were previously performed by Vertiv Services™. A Vertiv-authorized representative must perform the initial system startup to ensure proper system operation.

WARNING

Risk of electric shock. Can cause equipment damage, personal injury and death.

The following procedure provides power to the critical load distribution system. Verify that the critical load distribution is ready to accept power. Make sure that personnel and equipment are ready for the critical load distribution system to be energized.

AVERTISSEMENT

Risque de décharge électrique pouvant entraîner des dommages matériels, des blessures et même la mort.

La procédure suivante fournit de l'énergie au système de distribution de la charge critique. Vérifiez que ce système est prêt à être alimenté. Assurez-vous que le personnel et les équipements sont préparés pour la mise sous tension du système de distribution de la charge critique.

Starting the Unit without Power Supplied to the Connected Load

If the installation includes a Maintenance Bypass, power may already be supplied to the critical load equipment through the Maintenance Bypass. If there is no power to the critical load, apply power through the UPS bypass line per the following procedure.

During startup, power is supplied to the load through the UPS (internal) bypass line while the UPS system is being energized. Depending on the reason for the UPS shutdown, power may be present in the bypass line. To determine this, check the Touchscreen Control Panel after control power is available.

NOTE

If the system was shut down because of an Emergency Off, *there may be alarm messages on the touchscreen that describe system conditions before (or at the time of) the shutdown. Some or all of the alarm conditions may have been resolved. Contact Vertiv Services for assistance in clearing any remaining alarm messages.*

If the system is a multi-module system, verify that the UPS is in Maintenance Bypass mode, then open the Module Output Breakers (in the distribution switchboard) because the output bus provides an additional source of control power.

Wait at least 10 minutes for the control power circuitry to completely de-energize. After 10 minutes, turn control power back On.

WARNING

Risk of electric shock and high short circuit current. Can cause equipment damage, injury and death.

If the UPS has been shut down for maintenance, verify that all of the UPS system doors are closed and latched. All test equipment must be removed from the system. All electrical connections must be secure.

AVERTISSEMENT

Risque de décharge électrique et de présence de courant de court-circuit élevé pouvant entraîner des dommages matériels, des blessures et même la mort.

Si l'alimentation sans coupure a été interrompue à des fins d'entretien, assurez-vous que toutes les portes du système ASC sont fermées et verrouillées. Tous les appareils de test doivent être retirés du système.

Tous les branchements électriques doivent être serrés.

This section lists typical step-by-step instructions.

1. Before applying power to the UPS module, determine the location and position of the following circuit breakers and switches. External/remote breakers will be located in the appropriate switchgear.
   - **Input Circuit Breaker** - Verify that this breaker is in the Open position.
     External Remote Backfeed Breaker (RBB) for single input/feed applications
     External Rectifier Feed Breaker (RFB) for dual input/feed applications
   - **Module Battery Disconnect** (MBD) - Verify that this external breaker is Open or tripped. If DC source cabinets are used, verify that breakers on all the cabinets are Open.
   - **Bypass Circuit Breaker** - Verify that this breaker is in the Open position.
     External Remote Backfeed Breaker (RBB) for single input/feed applications.
     (Optional) Internal Back-Feed Disconnect (BFD).
   - **Maintenance Isolation Breaker** (MIB) - Verify that this breaker, if installed, is in the Open position.
2. Close the external rectifier feeder breaker.
   External Remote Backfeed Breaker (RBB) for single input/feed applications.
   External Rectifier Feed Breaker (RFB) for dual input/feed applications.

NOTE

The rectifier will start at this time. Do not proceed until the Touchscreen Control Panel is fully operational.

3. Verify that the rectifier has started. The rectifier icon on the Touchscreen Control Panel should be green. If not, the issue must be corrected before proceeding.
4. Close the external Remote Backfeed Breaker (RBB), if installed.
5. If installed, close the optional internal Back-Feed Disconnect (BFD). The Bypass Static Switch (BPSS) will activate.
6. Verify that the Bypass Static Switch (BPSS) has started. The BPSS icon on the Touchscreen Control Panel should be green. If it is not, the issue must be corrected before proceeding.
7. Close the external Module Battery Disconnect(s) (MBD's).
8. Verify that the MBD contact icon on the Touchscreen Control Panel is Closed and that the battery icon is green. If it is not, the issue must be corrected before proceeding.
9. Close the external MIB, if used. The load should be on the UPS bypass.
10. From the Touchscreen Control Panel, touch the *OPERATE* tab.
11. Touch the inverter *On* button. When asked for confirmation to turn the inverter On, touch *On* again. The load should be on the UPS Inverter.

NOTICE

Risk of equipment damage. If an abnormal situation occurs during this startup procedure, open the circuit breakers and investigate the problem. Call Vertiv Services if help is required.

WARNING

Risk of electric shock, explosive reaction, hazardous chemicals and fire. Can cause equipment damage, personal injury and death.

Do not use equalize charging with valve-regulated, lead-acid batteries. Refer to the battery manufacturers manual, available on the manufacturer's Web site, for specific information about equalize charging.

AVERTISSEMENT

Risque de décharge électrique, de réaction explosive, d'incendie et d'exposition à des produits chimiques dangereux pouvant entraîner des dommages matériels, des blessures et même la mort.
N'utilisez pas de charge d' égalisation avec les batteries au plomb-acide à régulation par soupape. Reportez-vous au manuel du fabricant des batteries, disponible sur le site Web du fabricant, pour obtenir des renseignements précis sur la charge d'égalisation.

2.2.2 Load Transfer and Retransfer—Single-Module System

Changing the load from the UPS system to the UPS bypass is called a *transfer*. Changing the load from UPS bypass to the UPS system is called a *retransfer*. Note that the UPS system control logic can initiate automatic load transfers and retransfers.

Transfer Procedure

1. From the Touchscreen Control Panel, touch the *Operate* tab.
2. Touch the Inverter *Off* button. When asked for confirmation to turn the inverter Off, touch *Off* again. The load should transfer from the UPS Inverter to the UPS Bypass.

Retransfer Procedure

1. From the Touchscreen Control Panel, touch the *OPERATE* tab.
2. Touch the Inverter *On* button. When asked for confirmation to turn the Inverter On, touch *On* again. The load should transfer from the UPS Bypass to the UPS Inverter.

2.2.3 Maintenance Bypass Load Transfers—Single Module System

Follow these instructions to manually transfer the load between the Maintenance Bypass and the UPS bypass line. Do not transfer the load between the Maintenance Bypass and the UPS module (Inverter) output. Use the Touchscreen Control Panel to verify that the UPS bypass line is available.

NOTICE

Risk of equipment damage. Failing to follow the proper sequence when operating any circuit breaker may cause damage to the connected equipment. Operating a Maintenance Bypass circuit breaker out of sequence could cut off power to the critical load.

NOTICE

Risk of equipment damage. The UPS must be on internal bypass before performing the following procedures and operating the MIB or the MBB, or damage to the UPS may occur and the critical load may be lost.

Maintenance Bypass Load Transfers—Single Module System: If Load is on UPS Bypass

After the UPS been transferred to bypass (see **2.2.2 - Load Transfer and Retransfer—Single-Module System**), the OK to transfer lamp on the key-release unit will light.

NOTE

If the maintenance bypass cabinet or switchboard has any other type of custom interlock, follow the specific instructions for that interlock system to remove the key.

1. If using a key interlock system, depress the key-release unit push button, turn the key and remove it from key-release unit.

NOTE

The UPS is now locked in bypass and cannot be retransferred to the inverter until the key is reinserted.

2. If using a key interlock system, insert the key into the lock for the Maintenance Bypass Breaker (MBB); retract the bolt.
3. Close the Maintenance Bypass Breaker (MBB).

NOTICE

Risk of improper operation sequence. May cause equipment damage.

Failure to close the Maintenance Bypass Breaker (MBB) will interrupt power to the load.

4. Open the Maintenance Isolation Breaker (MIB). The UPS is now isolated from the critical load and the load is now on Maintenance Bypass.
5. If using a key interlock system, remove the key from the lock for the Maintenance Isolation Breaker (MIB).
6. If the maintenance bypass cabinet or switchboard has an optional two-key interlock system, replace the key into the solenoid.
7. If UPS bypass shutdown is required, following instructions in **2.2.4 - UPS Shutdown—Single-Module System**.

Maintenance Bypass Load Transfers—Single Module System: If Load is on Maintenance Bypass

1. Verify that power is available to the module's bypass and rectifier inputs.
2. Verify that the UPS is started and in Bypass Mode.
3. If using a key interlock system:
   a. Depress the key-release unit push button
   b. Turn the key and remove it from the key-release unit.

NOTE

The UPS is now locked in bypass and cannot be retransferred to the Inverter until the key is returned.

4. If using a key interlock system:
   a. Insert the key into the lock for the Maintenance Isolation Breaker (MIB)
   b. Retract the bolt.
5. Close the Maintenance Isolation Breaker (MIB).

NOTICE

Risk of improper operation sequence. May cause equipment damage.

Failure to close the Maintenance Isolation Breaker (MIB) will interrupt power to the load.

6. Open the Maintenance Bypass Breaker (MBB). Load is now on UPS Internal Bypass.
7. If using a key interlock system, remove the key from the lock for the Maintenance Bypass Breaker (MBB) to lock it open.
8. If the maintenance bypass cabinet or switchboard has an optional two-key interlock system, insert the key into the solenoid.

The UPS system may now be transferred from bypass to UPS (see **2.2.2 - Load Transfer and Retransfer—Single-Module System**).

2.2.4 UPS Shutdown—Single-Module System

Follow these instruction to completely shut down and de-energize the UPS module.

NOTE

This shutdown turns Off the inverter, rectifier and bypass static switch. This will shut down the UPS completely.

1. From the Touchscreen Control Panel, touch the *OPERATE* tab.
2. Touch the Inverter *Off* button. When asked for confirmation to turn the Inverter off, touch *Off* again. The load should transfer from the UPS Inverter to the UPS Bypass.
3. Open the external Module Battery Disconnect(s) (MBD's).
4. Open the external MIB if used.

NOTE

This will remove the UPS output completely

5. Open the external Remote Backfeed Breaker (RBB) and optional internal Back-Feed Disconnect (BFD) if installed. The Bypass Static Switch (BPSS) will turn off.
6. Open the external rectifier feeder breaker.
   - External Remote Backfeed Breaker (RBB) for single input/feed applications
   - External Rectifier Feed Breaker (RFB) for dual input/feed applications
7. Once shutdown is complete, the Touchscreen Control Panel will turn Off.

2.3 Manual Operations—1+N Systems

2.3.1 Startup—1+N Module System

WARNING

Risk of electrical shock. Can cause equipment damage, personal injury and death.

The following procedure provides power to the critical load distribution system. Verify that the critical load distribution is ready to accept power. Make sure that personnel and equipment are ready for the critical load distribution system to be energized.

AVERTISSEMENT

Risque de décharge électrique pouvant entraîner des dommages matériels, des blessures et même la mort.

La procédure suivante fournit de l'énergie au système de distribution de la charge critique. Vérifiez que ce système est prêt à être alimenté. Assurez-vous que le personnel et les équipements sont préparés pour la mise sous tension du système de distribution de la charge critique.

If the installation includes a Maintenance Bypass, power may already be supplied to the critical load equipment through the Maintenance Bypass. If there is no power to the critical load, apply power through the UPS bypass line per the following procedure.

During startup, power is supplied to the critical load through the UPS (internal) bypass line while the UPS system is being energized. Depending on the reason for the UPS system shutdown, power may be present in the bypass line. To determine this, check the Touchscreen Control Panel screen after control power is available.

NOTE

If the system was shut down in response to an Emergency Off, there may be alarm messages on the touchscreen that describe system conditions before (or at the time of) the shutdown. Some or all of the alarm conditions may have been resolved. Contact Vertiv Services for assistance in clearing any remaining alarm messages.

WARNING

Risk of electrical shock and high short circuit current. Can cause equipment damage, personal injury and death.

If the UPS has been shut down for maintenance, verify that all of the UPS doors are closed and latched. All test equipment must be removed from the system. All electrical connections must be secure.

AVERTISSEMENT

Risque de décharge électrique et de présence de courant de court-circuit élevé pouvant entraîner des dommages matériels, des blessures et même la mort.

Si l'alimentation sans coupure a été interrompue à des fins d'entretien, assurez-vous que toutes les portes du système ASC sont fermées et verrouillées. Tous les appareils de test doivent être retirés du système. Tous les branchements électriques doivent être serrés.

WARNING

The following procedure must be performed exactly as described. Deviating from the procedure can result in electric shock hazard to personnel and the risk of fire.

AVERTISSEMENT

La procédure suivante doit être suivie à la lettre. Dévier de cette procédure peut entraîner des risqué d'électrocution à la personne ainsi que des risques d'incendie.

This section lists typical step-by-step instructions to start a 1+N Module System with and without remote breakers. The Touchscreen Control Panel will list all steps required for the process, based on the unit's operational status and other factors.

- **Startup**—Including initial startup, recovering from input power failure, recovering from DC source shutdown and recovering from shutdowns for emergencies or maintenance.
- **Load** Transfers—Including transfers from UPS to bypass and retransfers from bypass to the UPS system.
- **Maintenance Bypass Load Transfers**—Including transfers from internal bypass to maintenance bypass and transfers from maintenance bypass to internal bypass.
- **Shutdowns**—Including module shutdown for maintenance and emergency shutdown.

NOTE

The following procedure assumes that the UPS installation inspection and initial startup have been performed by Vertiv Services. A Vertiv-authorized representative must perform the initial system startup to ensure proper system operation

1. Before applying power to the UPS modules, determine the location and position of the following circuit breakers and switches. External/Remote breakers will be located in the appropriate switch gear.
   - **Input Circuit Breaker**—Verify that these breakers are in the open position.
     External Remote Backfeed Breaker (RBB) for single input/feed applications.
     External Rectifier Feed Breaker (RFB) for dual input/feed applications.
   - **Module Battery Disconnect** (MBD)—Verify that this external breaker is open or tripped. If DC source cabinets are used, verify that breakers on all the cabinets are open.
   - **Bypass Circuit Breaker**—Verify that these breakers are in the open position.
     External Remote Backfeed Breaker (RBB) for single input/feed applications.
     (Optional) Internal Back-Feed Disconnect (BFD).
   - **Maintenance Isolation Breaker** (MIB)—Verify that this breaker is in the open position if installed.
   - **Module Output Breakers** (MOB)—Verify that these breakers are in the open position.

2. Close the external rectifier feeder breaker for each UPS in the system.
   - External Remote Backfeed Breaker (RBB) for single input/feed applications
   - External Rectifier Feed Breaker (RFB) for dual input/feed applications

NOTE

The Rectifier will start on each UPS at this time. Do not proceed until the Touchscreen Control Panel is fully operational on each UPS.

3. Verify that the Rectifier has started on each UPS. The Rectifier icon on the Touchscreen Control Panel should be green. If it is not, the issue must be corrected before proceeding.
4. Close the external Remote Backfeed Breaker (RBB) and optional internal Back-Feed Disconnect (BFD) on each UPS, if installed.
5. Close the external Module Battery Disconnect(s) (MBD's) for each UPS module.
6. Verify that the MBD contact icon on the Touchscreen Control Panel is closed and that the Battery icon on each UPS module is green. If it is not, the issue must be corrected before proceeding.
7. Close the external Module Output Breaker (MOB) on each UPS.
8. Verify that the Bypass Static Switch (BPSS) has started on each UPS module. The BPSS icon on the Touchscreen Control Panel should be Green. The UPS module output should be on Bypass. If it is not, the issue must be corrected before proceeding.
9. Close the external MIB if used. If a maintenance bypass interlocking scheme is available, then proceed with the operation of the interlock until the MIB is closed and the MBB is opened.
10. The critical load should be on the UPS bypass.
11. From the Touchscreen Control Panel, touch the *OPERATE* tab.
12. On one of the UPS modules, touch the *Inverter On* button. When asked for confirmation to turn the Inverter On, touch *On* again.
13. Repeat **Steps 11** and **12** on each UPS module in the system.
14. Verify that each UPS automatically transferred to the Inverter. The load should be on the UPS Inverter.

2.3.2 Load Transfer-1+N System: Remove a UPS from System (Collective)

This section lists typical step-by-step instructions to remove one UPS module from the collector bus.

1. Verify that enough UPS modules will remain present to support the load if one module is removed from the collector bus.
2. Open the Module Output Breaker (MOB) of the UPS module to be removed from service. The inverter will turn Off after the MOB is opened. The other UPS modules in the system should be supporting the load.
3. Open the Module Battery Disconnect(s) (MBD's) of the module that was removed from service.
4. Open the optional internal Back-Feed Disconnect (BFD), if installed, of the module that was removed from service.
5. Open the upstream feed breakers (RBB, RFB) to the UPS rectifier and bypass buses. The UPS module rectifier will shut Off.

2.3.3 Load Transfer-1+N System: Add a UPS to the System (Collective)

This section lists typical step-by-step instructions to add one UPS module to the collector bus.

NOTE

A load drop will occur if the UPS modules supporting the load are in bypass mode and control power is applied to the offline module (assuming that paralleling cables are installed in the offline module when control power is turned On).

1. Verify that all parallel cables are properly connected to the UPS units.
2. Close the external rectifier feeder breaker on the UPS module to be added to the system.
   - External Remote Backfeed Breaker (RBB) for single input/feed applications
   - External Rectifier Feed Breaker (RFB) for dual input/feed applications

NOTE

The Rectifier will start the UPS module at this time. Do not proceed until the Touchscreen Control Panel is fully operational on the UPS module.

3. Verify that the Rectifier on the UPS module has started. The Rectifier icon on the Touchscreen Control Panel should be green. If it is not, the issue must be corrected before proceeding.
4. Close the external Remote Backfeed Breaker (RBB) and optional internal Back-Feed Disconnect (BFD) on the UPS module, if installed.
5. Verify that the Bypass Static Switch (BPSS) on the UPS module is Off. If it is not, the issue must be corrected before proceeding.
6. Close the external Module Battery Disconnect(s) (MBD's) on the UPS module.
7. Verify that the MBD contact icon on the Touchscreen Control Panel is closed and that the Battery icon on the UPS module is green. If it is not, the issue must be corrected before proceeding.
8. Close the external Module Output Breaker (MOB) on the UPS module.
9. Verify that the Inverter on the UPS module is active. If the Inverter does not start, touch the *OPERATE* tab on the Touchscreen Control Panel.
10. Touch the Inverter *On* button on the UPS module. When asked for confirmation to turn the Inverter On, touch *On* again.
11. Verify that all inverters are connected to the collector bus.

2.3.4 Load Transfer-1+N System: Transfer System Inverter to Bypass

This section lists typical step-by-step instructions to transfer the UPS system from Inverter Mode to Bypass Mode.

The critical load should be on the UPS Inverter.

1. From the Touchscreen Control Panel, touch the *OPERATE* tab.
2. On each of the UPS modules, touch the Inverter *Off* button. When asked for confirmation to turn the Inverter Off, touch *Off* again.
   The UPS modules will not transfer from Inverter to Bypass mode of operation until the last UPS module is turned Off.
3. Verify that each UPS automatically transferred to Bypass.

NOTE

The load will now be on static bypass in each UPS.

2.3.5 Load Transfer-1+N System: Transfer System from Bypass to Inverter

This section lists typical step-by-step instructions to transfer the UPS system from Bypass to Inverter mode of operation.

The critical load should be on the UPS Bypass.

1. From the Touchscreen Control Panel, touch the *OPERATE* tab.
2. On each of the UPS modules, touch the Inverter *On* button. When asked for confirmation to turn the Inverter On, touch *On* again.
   The UPS modules will not transfer from Bypass to Inverter mode of operation until the last UPS module is turned On.
3. Verify that each UPS automatically transferred to Inverter.

2.3.6 Maintenance Bypass Load Transfers—1+N Module System

Follow these instructions to manually transfer the load between Maintenance Bypass and the UPS bypass line. Do not transfer the load between Maintenance Bypass and the UPS module inverter output. Use the Touchscreen Control Panel screen to verify that the UPS bypass line is available.

NOTICE

Risk of improper operating sequence. Can cause equipment damage.
Failing to follow the proper sequence when operating any circuit breaker may cause damage to the connected equipment.
Operating a Maintenance Bypass circuit breaker out of sequence could cut off power to the critical load.

NOTICE

Risk of improper load transfer. Can cause equipment damage.
The UPS must be on internal bypass before performing the following procedures and operating the MIB or the MBB, or damage to the UPS may occur and the critical load may be lost.

Maintenance Bypass Load Transfers-1+N Module System: If Load is on UPS Bypass

This section lists typical step-by-step instructions to transfer the UPS system from Bypass to Maintenance Bypass.

1. Transfer the UPS system to bypass (see **2.3.4 - Load Transfer-1+N System: Transfer System Inverter to Bypass**). The OK to transfer lamp on the key-release unit will light.

NOTE

If the maintenance bypass cabinet or switchboard has any other type of custom interlock, follow the instructions for that interlock systems to remove the key.

2. If using a key interlock system:
   a. Press the key-release unit push button.
   b. Turn the key and remove it from key-release unit.

NOTE

The UPS is now locked in bypass and cannot be retransferred to the inverter until the key is reinserted.

3. If using a key interlock system, insert the key into the lock for the Maintenance Bypass Breaker (MBB); retract the bolt.
4. Close the MBB.

NOTICE

Risk of improper operation sequence. May cause equipment damage.
Failure to close the MBB will interrupt power to the load.

5. Open the Maintenance Isolation Breaker (MIB). The UPS system is now isolated from the critical load and the load is now on Maintenance Bypass.
6. If using a key interlock system, remove the key from the lock for the MIB.
7. If the maintenance bypass cabinet or switchboard has an optional, two-key interlock system, insert the key into the solenoid.
8. If UPS bypass shutdown is required, follow the instruction in **2.3.7 - Shutdown-1+N System Shutdown** or **2.3.2 - Load Transfer-1+N System: Remove a UPS from System (Collective)**

Maintenance Bypass Load Transfers—1+N Module System: If Load is on UPS Bypass

This section lists typical step-by-step instructions to transfer the UPS system from Maintenance Bypass to Bypass

1. If the UPS modules are Off, start the system. Refer to **2.3.1 - Startup—1+N Module System**.
2. Place all the UPS units in the system in Bypass Mode. Refer to **2.3.4 - Load Transfer-1+N System: Transfer System Inverter to Bypass**.
3. If using a key interlock system:
   a. Press the key-release unit push button.
   b. Turn the key and remove it from the key-release unit.

NOTE

The UPS is now locked in bypass and cannot be retransferred to the inverter until the key is reinserted.

4. If using a key interlock system, insert the key into the lock for the Maintenance Isolation Breaker (MIB); retract the bolt.
5. Close the MIB.

NOTICE

Risk of improper operation sequence. May cause equipment damage.
Failure to close MIB will interrupt power to the load.

6. Open the Maintenance Bypass Breaker (MBB). The load is now on UPS internal bypass.
7. If using a key interlock system, remove the key from the lock for the MBB to lock it open.
8. If the maintenance bypass cabinet or switchboard has an optional two-key interlock system, insert the key into the solenoid.

The UPS system can now be transferred from bypass to UPS (see **2.3.5 - Load Transfer-1+N System: Transfer System from Bypass to Inverter**).

2.3.7 Shutdown-1+N System Shutdown

Perform a system shutdown procedure to remove power from the entire UPS system.

NOTE

Service and maintenance must be performed only by properly trained and qualified personnel and in accordance with applicable regulations as well as with manufacturer's specifications.

1. If the UPS system is operating in Inverter mode, transfer the UPS system to bypass (see **2.3.4 - Load Transfer-1+N System: Transfer System Inverter to Bypass**). The OK to transfer lamp on the key-release unit will light.
2. If an external, wraparound bypass is installed, perform the following steps; otherwise skip to **Step 3**.
   If using a key interlock system:
   a. Press the key-release unit push button.
   b. Turn the key and remove it from the key-release unit.

NOTE

The UPS system is now locked in bypass and cannot be transferred until the key is returned.

   c. If using a key interlock system, insert the key into the lock for the MBB; retract the bolt.
   d. Close the MBB.

NOTE

Failure to close the Maintenance Bypass Breaker (MBB) will interrupt power to the load.

   e. Open the MIB. The UPS system is now isolated from the critical load and the load is now on Maintenance Bypass.
   f. If using a key interlock system, remove the key from the lock for the MIB.
   g. If the maintenance bypass cabinet or switchboard has an optional, two-key interlock system, insert the key into the solenoid.
3. Open the external Module Output Breaker (MOB) on each UPS.
4. Open the external Module Battery Disconnect(s) (MBD's) for each UPS module.
5. Open the external Remote Backfeed Breaker (RBB) and optional internal Back-Feed Disconnect (BFD) on each UPS, if installed.
6. Open the external rectifier feeder breaker for each UPS in the system.
   - External Remote Backfeed Breaker (RBB) for single input/feed applications
   - External Rectifier Feed Breaker (RFB) for dual input/feed applications

NOTE

The Rectifier will shut down on each UPS at this time. Once shutdown is complete, the Touchscreen Control Panel will turn Off.

3.0 OPTIONS

NOTE

These items must be enabled by service before they become functional. If a feature is disabled, the feature will not be available and the menu item will not be displayed.

3.1 Remote Alarm Status Panel

The Remote Alarm Status Panel (RAS) uses LED status indicators that allow the operator to monitor the UPS.

The main purpose of the Remote Alarm Status Panel option is to report the status of the load and the UPS. To interpret the LED indicators, see **Table 1**.

Table 1 RAS indicators

LED Name	LED Color	Meaning
Load on UPS	Green	The load is fully protected and no alarm conditions are present. The UPS is supplying uninterrupted power to the load.
Load on Bypass Alarm	Red	Power to the load is bypassing the UPS. The UPS is no longer supplying power to the load.
Battery Discharge Alarm	Red	The DC source is providing power to the UPS.
Low Battery Warning	Red	DC source capacity is low and has reached the low-battery alarm setting.
Overload	Red	System load has exceeded the system rating.
Ambient Overtemp	Red	UPS inlet cooling air temperature has exceeded the specified limits.
System Summary Alarm	Red	An alarm has occurred at the UPS.

The RAS also includes:

- An audible alarm
- Lamp Test/Reset push button to test the LED indicators
- Audio Reset push button to silence an audible alarm

3.1.1 Lamp Test/Reset Push Button

The Lamp Test/Reset push button is used to verify that each LED indicator is in working condition and to reset an LED indicator that has been triggered by a condition at the load or UPS.

To test the LEDs, press the *Lamp Test/Reset* push button. This lights all of the LED indicators for visual inspection.

If an LED indicator does not respond to the lamp test, contact your local Vertiv® representative for assistance.

To reset an activated LED, press the *Lamp Test/Reset* push button.

3.1.2 Audio Reset Push Button

The *Audio Reset* push button is used to silence an audible alarm that has been triggered and reset the alarm to activate on the next alarm condition. After correcting the alarm condition, press the push button to reset the audible alarm.

3.2 Liebert MBSM

The Liebert MBSM provides a frequency reference signal to each connected UPS. Each UPS uses the frequency reference signal, when appropriate, to automatically phase lock the inverter.

Each UPS in the system is supplied by a common electrical bus; the UPS synchronization source (reference) is per default the power source connected on its reserve input and, because it is the power source common to all the UPS's, the inverters' outputs will be in synchronization.

If the main power (reserve inputs) fail, each UPS will synchronize its inverter to the signal coming from the Liebert MBSM (Fref.) and, as a result, the inverters will remain synchronized.

3.3 Intelligent Paralleling

The Intelligent Paralleling technology allows the UPS to optimize the double conversion efficiency when operating at partial load.

When this feature is enabled the total System capacity will be adapted to meet the load requirements and switch excess units to standby mode, while ensuring continuous system availability.

Units are running in standby mode still have the inverter control active and synchronized, as well as the DC bus charged in order to be ready to start up in case of load increase.

The specific load thresholds and tolerances used by the Intelligent Paralleling algorithm can be customized to meet specific requirements in terms of available power, redundancy and reliability levels.

The Intelligent Paralleling mode allows each UPS unit to operate in standby for the same amount of time, ensuring an equal life-span of module components.

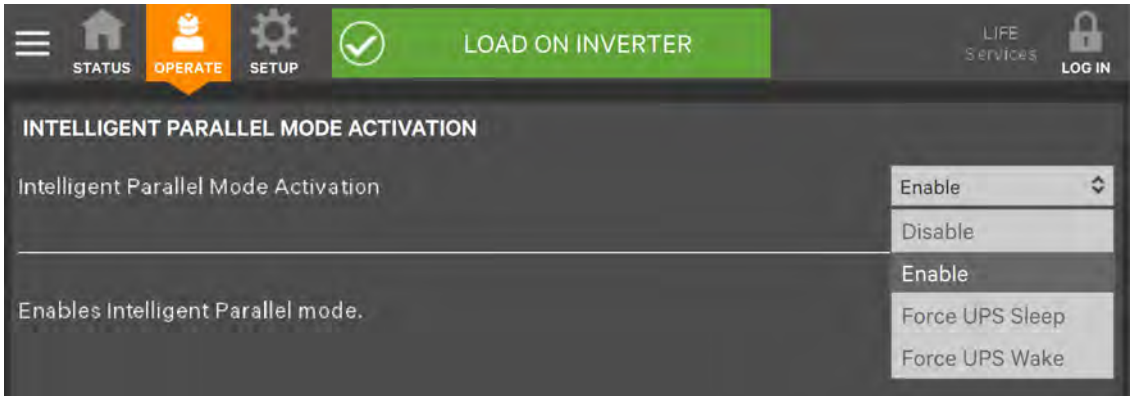
Enabling and Disabling Intelligent Paralleling

Intelligent Parallel puts units in Sleep Mode until required to support the load or until the unit is rotated into operation. Intelligent Parallel rotates units into and out of service so that each unit runs the same amount of time.

NOTICE

Intelligent Paralleling can be enabled only in paralleled units.
Activating Intelligent Paralleling Mode in a parallel system requires enabling the mode on each UPS in the parallel system.
Disabling Intelligent Paralleling Mode on one unit in a Parallel System will disable the mode on the entire system.

Figure 21 Intelligent Parallel screen



The example below is for a system with two UPS modules in parallel. Once the mode has been enabled in the system, it will remain active until a UPS goes into standby or until manually disabled on one or all of the UPS modules in the parallel system.

To enable Intelligent Paralleling mode:

1. Verify that each UPS in the parallel system running is operating in Normal Mode.
2. Press the “Enable Intell. Parall. Mode” button icon on the screen on all machines of the parallel system.

NOTE

If the mode has not been enabled in one of the UPS, the system will not switch to Intelligent Paralleling. On the System status, on the LCD of the UPS with the mode enabled, it is shown “Pending request: Intelligent Paralleling” while on the LCD where the mode has not been enabled the pending request is not present.

3.4 DC Ground Fault

Vertiv offers battery DC ground fault detection solutions for the Liebert EXL S1. Some regulatory agencies require a system to detect battery DC ground faults in ungrounded DC systems. Generally, this applies to DC systems, both battery and flywheel systems, field-wired to the UPS. The National Electrical Code does not require this for DC systems directly attached to the UPS and which have no field wiring.

Vertiv recommends that customers understand the applicable requirements in their area because local codes may have different interpretations and there may be internal requirements that systems have DC ground fault detection systems. For details, contact your local Vertiv representative.

4.0 MAINTENANCE

4.1 Safety Precautions

Observe the safety precautions in the **Important Safety Instructions on page 1** of this manual.

Observe all of the warnings and cautions in this document before performing any maintenance on the UPS and associated equipment. Also observe the manufacturer's safety precautions pertaining to the battery system, along with the battery safety precautions in this section.

⚠ WARNING

Risk of electric shock. Can cause injury and death.

Only Vertiv or Vertiv-trained service personnel should work on this equipment. Both AC and DC high voltages are present in lethal amounts within this equipment. Extreme care should be taken when working around UPS equipment.

Always identify the source of connecting wiring before disconnecting it. Mark any disconnected wires so they can be properly reconnected.

Do not substitute parts except as authorized by Vertiv.

Keep the UPS cabinets free of foreign materials such as solder, wire cuttings, etc.

Call Vertiv Services if you are not sure of the procedures to follow or if you are not familiar with the design or operation of the equipment.

AVERTISSEMENT

Risque de décharge électrique et de présence de courant de court-circuit élevé pouvant entraîner des dommages matériels, des blessures et même la mort.

L'entretien et la réparation de cet équipement doivent être confiés exclusivement à un personnel qualifié du Vertiv ou formé par Vertiv. Des hautes tensions c.a. et c.c. mortelles sont présentes dans cet équipement. Faites preuve d'une grande prudence lorsque vous travaillez à proximité d'un système ASC.

Identifiez tous les circuits de connexion avec de débrancher des câbles.

Ne remplacez aucun composant sans l'autorisation expresse du Vertiv.

Assurez-vous que les armoires d'ASC sont exemptes de matériaux étrangers tels que des résidus de soudure, des bouts de câble, etc.

Communiquez avec Vertiv Services si vous doutez de la procédure à suivre ou si les circuits ne vous sont pas familiers.

WARNING

Extreme caution is required when performing maintenance.

Be constantly aware that the UPS system contains high DC as well as AC voltages. With input power off and the battery disconnected, high voltage at filter capacitors and power circuits should be discharged within 30 seconds. However, if a power circuit failure has occurred, assume that high voltage still exists after shutdown. Check with a voltmeter before making contact.

AC voltage will remain on the bypass and output contactors and the static bypass switch unless associated external circuit breakers are opened. Check for voltage with both AC and DC voltmeters before making contact.

When the UPS system is under power, both the operator and any test equipment must be isolated from direct contact with earth ground and the UPS chassis frame by using rubber mats.

Some components within the cabinets are not connected to chassis ground.

Any contact between floating circuits and the chassis is a lethal shock hazard. Use differential oscilloscopes when measuring a floating circuit. The differential input should have at least 800 vrms common mode input rating and a common mode rejection ratio of at least 80db.

Exercise caution that the test instrument exterior does not make contact either physically or electrically with earth ground.

In case of fire involving electrical equipment, use only carbon dioxide fire extinguishers or others approved for use in fighting electrical fires.

AVERTISSEMENT

Faire preuve d'une extrême prudence lors de travaux d'entretien.

Soyez conscient en tout temps que le système d'alimentation sans coupure contient des tensions élevées c.c. et c.a. Lorsque la tension d'entrée est coupée et que les batteries sont déconnectées, les tensions élevées aux condensateurs de filtrage et aux circuits de puissance devraient être dissipées en moins de 30 secondes. Toutefois, si une panne est survenue dans un circuit de puissance, il est présumé qu'une tension élevée est toujours présente après l'arrêt du système. Vérifiez à l'aide d'un voltmètre avant d'établir le contact.

Une tension c.a. reste présente sur les contacteurs de dérivation et de sortie et sur le sectionneur de dérivation statique, à moins que les disjoncteurs externes associés ne soient ouverts (position Off). Vérifiez si une tension est présente à l'aide de voltmètres c.c. et c.a. avant d'établir le contact.

Lorsqu'un système d'alimentation sans coupure est sous tension, l'exploitant et l'équipement de test doivent être isolés de tout contact direct avec la terre et le cadre de châssis du système d'alimentation sans coupure en utilisant des tapis de caoutchouc.

Certains composants à l'intérieur des armoires ne sont pas raccordés à la masse du châssis.

Tout contact entre des circuits isolés et le châssis représente un danger de secousse électrique fatale. Utiliser des oscilloscopes différentiels lors de mesures sur un circuit isolé. L'entrée différentielle doit avoir une tension d'entrée nominale en mode commun d'au moins 800 V efficace et un rapport de réjection en mode commun d'au moins 80 décibels.

Prendre les précautions nécessaires pour empêcher l'extérieur de l'instrument de test d'entrer en contact physique ou électrique avec la terre.

En cas d'incendie impliquant de l'équipement électrique, n'utiliser que des extincteurs au dioxyde de carbone ou autres extincteurs approuvés pour combattre des incendies d'origine électrique.

4.2 Routine Maintenance

Become thoroughly familiar with the equipment, but never go beyond the specific procedures in this manual while performing maintenance or correcting a malfunction. If there is any doubt as to what must be done, call Vertiv Services at 800-543-2378 for assistance.

The UPS is designed for unattended operation, but does require some common sense maintenance.

- Keep good records—Troubleshooting is easier there are good service records.
- Keep it clean—Keep the UPS free of dust and moisture.
- Keep it cool—Battery systems must be kept in the range of 72-77°F (22-25°C) to meet design specifications for capacity and longevity. The UPS will reliably meet all performance specifications at temperatures up to 104°F (40°C) and can be slightly derated for operation at even higher temperatures. However, performance and longevity will be optimized when the UPS is operated at the same temperature as the batteries.
- Keep connections tight—Tighten all connections at installation and at least annually thereafter.

4.2.1 Record Log

Set up a maintenance log to record scheduled checks and any abnormal conditions.

The log should have space for all metered data, including phase readings, alarm messages, UPS mode of operation, air filter replacement date and observations. Maintain a second log for the battery module as directed by the battery manufacturer.

Vertiv recommends periodic walk-through inspections of the UPS and battery rooms to check for visible and audible indications of problems. Log the inspection, metered parameter indications and any discrepancies.

4.2.2 Air Filters

The air filters must be inspected and serviced regularly. The frequency of inspections will depend on environmental conditions. Under normal conditions, the air filters will require cleaning or replacement approximately every two months. Abnormal or dusty conditions will require more frequent cleaning and replacement of air filters.

Inspect installations in new buildings more often, then alter the inspection period as experience dictates.

All Liebert EXL S1 models have a replaceable air filter inside the front doors. These filters can be changed while the UPS is in operation.

NOTE

Service and maintenance must be performed only by properly trained and qualified personnel and in accordance with applicable regulations as well as with manufacturer's specifications.

4.2.3 Limited Life Components

The Liebert EXL S1 has a design life well in excess of 10 years. Well-maintained units can continue to provide economic benefits for 20 years or more. Long-life components are used in the UPS wherever practical and cost-effective. However, due to the currently available component material, manufacturing technology limitations and the general function and use of the component, a few components in the Liebert UPS will have a shorter life cycle and require replacement in less than 10 years.

The following components utilized in the UPS have a limited life cycle and are specifically exempt from warranty. To prevent a wear-out failure of one of these components affecting the critical load operations, Vertiv® recommends these components be periodically inspected and replaced before the expected expiration of their life cycle. The expected life of each component listed below is simply an estimate and is not a guarantee. Individual users may have site-specific requirements, maintenance and other environmental conditions that affect the length of the component's useful life cycle.

In most cases, replacement components must exactly match the original component specifications.

These replacement components are not readily available from third-party component distributors.

For assistance with specific component specifications, replacement component selection and sourcing, call 800-543-2378. For customers using Vertiv Services' preventive maintenance services, periodic inspection of these components is part of this service, as well as recommending component replacement intervals to customers to avoid unanticipated interruptions in critical load operations.

Table 2 UPS component service life

Component	Expected Life	Replace in:
Power AC Filter Capacitors	15 Years	12 to 15 Years
Power DC Filter Capacitors	15 Years	12 to 15 Years
Low-Profile Fans	> 7 Years	5 to 6 Years
Air Filters	1 to 3 Years	Check Four Times per Year
Battery, Lithium Logic Memory Backup	10 Years	8 to 9 Years
Battery, Storage		
Lead-Acid Wet-Cell (User Selection)	15 to 20 Years	12 to 15 Years
Valve-Regulated, Lead-Acid (VRLA)	5 Years	2 to 3 Years
	10 Years	3 to 4 Years
	20 Years	8 to 12 Years
Lithium-Ion	15 Years	10 Years

Expected Life is sometimes referred to as *Design Life*.

4.3 Battery Maintenance

WARNING

Risk of electrical shock and high short circuit current. Can cause equipment damage, personal injury and death.

These maintenance procedures will expose hazardous live parts. Refer servicing to qualified personnel.

DC fuses operate at the rated battery voltage at all times. A blown DC bus fuse indicates a serious problem. Serious injury or damage to the equipment can result if the fuse is replaced without knowing why it failed. Call Vertiv Services for assistance.

AVERTISSEMENT

Risque de secousse électrique et de courrant élevé de court-circuit. Peuvent causer des dommages aux équipements, des blessures corporelles et la mort. Des composants affichant des tensions dangereuses seront accessibles durant ces procédures d'entretien. Faire exécuter l'entretien par du personnel qualifié. Les fusibles c.c. fonctionnent en tout temps à la tension nominale des batteries. Un fusible c.c. grillé indique un problème majeur. De graves blessures ou des dommages importants aux équipements peuvent survenir si le fusible est remplacé sans avoir identifié la cause de la panne. Communiquer avec le centre de service de Liebert pour de l'assistance.

4.3.1 Battery Safety Precautions

Servicing of batteries must be performed or supervised by personnel experienced with batteries and the required precautions. Keep unauthorized personnel away from batteries.

When replacing batteries, use the same number and type of batteries.

Regular maintenance of the battery module is an absolute necessity. Periodic inspections of battery and terminal voltages, specific gravity, and connection resistance should be made. Strictly follow the procedures in the battery manufacturer's manual. (See battery manufacturer's Web site.)

Valve-regulated lead-acid batteries require periodic visual inspections and checks of battery voltage and connection resistance.

Since individual battery characteristics are not identical and may change over time, the UPS module is equipped with circuitry to equalize battery cell voltages. This circuit temporarily increases charging voltage to maintain flooded type battery cells at full capacity.

WARNING

Risk of electrical shock. Can cause personal injury and death.

Special care must be taken when working with the batteries associated with this equipment. Be constantly aware that the battery system contains high DC as well as AC voltages. Check for voltage with AC and DC voltmeters before making contact.

Observe all DC safety precautions before working on or near the DC system.

Follow all battery safety precautions when installing, charging or servicing batteries. In addition to the hazard of electric shock, gas produced by batteries can be explosive and sulfuric acid can cause severe burns.

Lead-acid batteries contain hazardous materials. Batteries must be handled, transported, and recycled or discarded in accordance with federal, state and local regulations. Because lead is a toxic substance, lead-acid batteries should be recycled rather than discarded.

Do not dispose of battery or batteries in a fire. The battery may explode.

Do not open or mutilate the battery or batteries. Released electrolyte is harmful to the skin and eyes. It is toxic.

A battery can present a risk of electrical shock and high short circuit current. The following precautions should be observed when working on batteries:

- Remove watches, rings and other metal objects.
- Use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of batteries.
- Disconnect charging source prior to connecting or disconnecting battery terminals.
- Determine if battery is inadvertently grounded. If inadvertently grounded, remove source of ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock will be reduced if such grounds are removed during installation and maintenance.
- Lead-acid batteries can present a risk of fire because they generate hydrogen gas. In addition, the electrical connections must be protected against accidental short circuits which can cause sparks. The following procedures should be followed:
- Do not smoke when near batteries.
- Do not cause flame or spark in battery area.
- Discharge static electricity from body before touching batteries by first touching a grounded metal surface.
- After replacing battery jars in a battery cabinet, replace the retaining straps that hold the jars in place on the shelves. This will limit accidental movement of the jars and connectors should the cabinet ever need to be repositioned or relocated.

AVERTISSEMENT

Risque de secousse électrique. Peut causer des blessures corporelles et la mort.

Il faut prendre des précautions particulières lors de tout travail exécuté sur les batteries associées à cet équipement. Soyez conscient en tout temps que le système de batteries contient des tensions élevées c.c. et c.a. Vérifiez si une tension est présente à l'aide de voltmètres c.c. et c.a. avant d'établir le contact.

Observer toutes les mesures de sécurité relatives aux tensions c.c. avant de travailler sur le système c.c. ou près de celui-ci.

Observer toutes les mesures de sécurité relatives aux batteries avant d'installer ou de charger des batteries ou d'en faire l'entretien. En plus du danger de secousse électrique, les gaz produits par les batteries peuvent causer des explosions et l'acide sulfurique peut causer de graves brûlures.

Les batteries au plomb-acide contiennent des matières dangereuses. Les batteries doivent être manipulées, transportées et recyclées selon les stipulations de la réglementation fédérale, provinciale et locale. Puisque le plomb est une substance toxique, les batteries au plomb-acide doivent être recyclées plutôt que d'être mises aux rebuts.

Ne pas jeter une ou plusieurs batteries dans un feu. Elle(s) pourrai(en)t exploser.

Ne pas ouvrir ou abîmer la ou les batteries. Les projections d'électrolyte sont dangereuses pour la peau et les yeux. L'électrolyte est également toxique.

Une batterie peut présenter un risque de secousse électrique et un courrant élevé de court-circuit. Il faut observer les mesures de sécurité suivantes lors de travaux exécutés sur les batteries :

- Retirer les montres, les bijoux et tout autre objet métallique.
- Utiliser des outils dont les manches sont isolés.
- Porter des gants et des bottes de caoutchouc.
- Ne pas déposer d'outils ou de pièces métalliques sur le dessus des batteries.
- Débrancher l'équipement de charge avant de connecter ou de déconnecter les bornes de batteries.
- Vérifier si les batteries sont accidentellement mises à la terre. Si elles sont accidentellement mises à la terre, enlever la source de mise à la terre. Tout contact avec une partie quelconque d'une batterie mise à la terre peut causer une secousse électrique. Le danger d'une telle secousse sera réduit si de telles mises à la terre sont enlevées durant l'installation et l'entretien.
- Les batteries au plomb-acide peuvent présenter un risque d'incendie, car elles génèrent de l'hydrogène sous forme de gaz. De plus, les connexions électriques doivent être protégées contre les courts-circuits accidentels, lesquels peuvent produire des étincelles. Suivre les procédures suivantes :
- Ne pas fumer près des batteries.
- Ne pas produire de flamme ou d'étincelles dans l'environnement immédiat des batteries.
- Décharger l'électricité statique de votre corps avant de toucher aux batteries en touchant d'abord une surface de métal mise à la terre.
- Après avoir remplacé des bacs de batteries dans une armoire de batteries, remettre en place les sangles de rétention maintenant les bacs en place sur les étagères. Ceci limitera tout mouvement accidentel des bacs et connecteurs si l'armoire doit éventuellement être repositionnée ou déplacée.

NOTE

Do not use cleaners on the batteries. Solvents can make the battery cases brittle. Use only a dry cloth or a cloth moistened in water

NOTE

Do not use equalize charging with valve-regulated lead-acid batteries, such as those used in Liebert battery cabinets.

Consult the battery manufacturer's manual for specific information about equalize charging.

The equalizing charge time is adjustable from zero to 200 hours and can be initiated automatically or manually.

4.3.2 Torque Requirements

All electrical connections must be tight. Refer to the torque values for the connections in the UPS below. Use these values unless the equipment is labeled otherwise.

Table 3 Recommended torque values

Grade 5 Steel: Unified Thread System Torque, lbf.*in.			
Fastener Finish		Plain Steel	Zinc Plating
Size	Threads/ Inch, Tpi	No Washer/ Flat Washer	No Washer/ Flat Washer
1/4	20	101	91
	28	116	104
5/16	18	209	188
	24	231	208
3/8	16	370	333
	24	420	378
7/16	14	593	534
	20	662	596
1/2	13	904	814
	20	1020	918
9/16	12	1305	1175
	18	1456	1310

Class 8.8 Steel: Metric Thread System Torque, N*m			
Fastener Finish		Plain Steel	Zinc Plating
Size	Thread Pitch, Tp	No Washer/ Flat Washer	No Washer/ Flat Washer
M5	0.8	6.1	5.5
	0.5	6.9	6.2
M6	1	10	9
	0.75	11	10
M8	1.25	25	23
	1	27	24
M10	1.5	50	45
	1.25	53	47
M12	1.75	87	78
	1.25	95	86
M14	2	139	125
	1.5	151	136

4.4 Detecting Trouble

The operator must check the instrument readings if abnormal equipment performance is suspected. Any metered value that differs appreciably from normal could mean an impending malfunction, and should be investigated.

Items to check on the various UPS display screens include:

- **Output Voltage Levels**: Output voltages of all phases should be within 1% of normal voltage. Output currents on each phase should not normally differ by more than 20%. If difference is greater, the load is unbalanced and must be corrected.
- **Battery Charge Current Levels**: If the UPS has not operated on battery power during the last 10 hours, the batteries should require little charging current. Battery mimic should indicate normal DC voltage with relatively little battery charge current.
- **Input Current**: Input current on each phase should be within 10% of the average input current. Alarm messages indicate malfunction or impending malfunction. A daily check of the control panel will help to provide an early detection of problems. Refer to **Table 7** to interpret alarm messages.
- **Event Log**: Alarm messages and the metered parameter indications help in tracing a problem to a particular section. These are stored in the UPS Event Log and can be displayed at the touchscreen or downloaded by Vertiv Services.

4.5 Reporting a Problem

If a problem occurs within the UPS, review all alarm messages along with other pertinent data. This information should be given via telephone to the Vertiv Services dispatcher. This information can also be automatically sent by telephone modem. Call 800-543-2378 to report a problem or to request assistance.

4.6 Upstream Feeder Circuit Breaker Setting Inspections

During normal UPS operations, short-term overload current demand from the bypass source may reach 10 times the UPS output current rating. This overload current demand may be caused by the magnetizing inrush current of one or more downstream transformers (i.e., power distribution units) or faults on downstream branch circuits.

The instantaneous trip point(s) of the upstream bypass feeder breaker(s) must be set to support these temporary overloads. The magnitude of short-term overload bypass current demand is typically six to eight times the UPS current rating, but must be determined by analysis on a per-site basis. This analysis, generally known as an End-to-End Fault Coordination Study, must be done by a registered professional engineer experienced in this activity and familiar with local codes and related requirements.

Vertiv® highly recommends periodic inspections of the bypass feeder breaker instantaneous trip settings, as well as the module input (rectifier) feeder breaker trip settings, to ensure that they are correct. For a variety of reasons, although typically during circuit breaker maintenance procedures by others, trip settings have been inadvertently left improperly set. Correct trip setting of these circuit breakers is most important to achieving high-availability from the Liebert UPS.

For further information regarding proper trip settings for the feeder breakers, call 800-543-2378.

NOTE

The instantaneous trip setting of the breaker feeding the UPS bypass input should be high enough to accommodate short-duration overloads. The bypass static switch power path inside the UPS can draw up to 10 times the system's rated current for up to three cycles.

NOTE

While Vertiv can provide typical guidelines, the responsibility for the proper breaker trip settings outside the Liebert-manufactured UPS equipment resides with the owner. Contact Vertiv Services at 800-543-2378 for further details.

5.0 SPECIFICATIONS

5.1 Battery Operation

The separate battery manufacturer's manual, available on the manufacturer's Web site, provides the necessary information for the installation, operation and maintenance of the battery. Use the battery manual in conjunction with this manual.

The float charge voltage for a battery is equal to the number of cells in series making up the battery multiplied by the charge voltage for each cell.

Because the charging voltage level is critical to proper battery operation, refer to the battery manual, available on the manufacturer's Web site, for information about the system.

For models with nominal 240-cell battery, the DC bus nominal float voltage range is 2.15 to 2.3VPC.

Maximum equalize voltage is 2.45VPC. The number of battery cells required ranges from 228 to 246, depending on the application.

5.2 Other DC Sources

The separate DC source manufacturer's manual, available on the manufacturer's Web site, provides the necessary information for installing, operating and maintaining the DC source. Use the DC source manual in conjunction with this manual.

5.3 Environmental Conditions

Table 4 Environmental specifications

Parameter	Specification
Enclosure	The UPS is housed in a NEMA-1 enclosure. The enclosure is designed for indoor use only and is not to be subjected to falling objects or precipitation.
Recommended Operating Temperature, °F (°C)	77 (25) ambient
Maximum Operating Temperature, °F (°C)	104 (40) ambient (design temperature) without derating
Minimum Operating Temperature, °F (°C)	32 (0)
Storage Temperature, °F (°C)	-4 to 104 (-20 to 40). Contact factory for information about storage above 104°F (40°C)
Typical Battery Temperature Requirements	Average annual temperature must not exceed 80°F (27°C). Peak temperature must not exceed 109°F (43°C). See battery manufacturer's recommendations.
Relative Humidity	0 to 95% without condensation
Operating Elevation	Sea level to 3300 ft. (1000m) without derating
Storage Elevation	Sea level to 50,000 ft. (15,240m)
Acoustical Noise at 39 inches (990mm), dBA	78 (72 at partial load)

Notes on Environmental Specifications

1. This category of electronic equipment is agency rated for use in an atmosphere free of conductive particles. Some industrial facilities may require a room air filtration system to keep the UPS free of excess moisture and contaminants.
2. The UPS is designed to operate continuously at 104°F (40°C). However, design equipment life expectancy will be extended with lower temperatures (77°F [25°C] is recommended).
3. Ambient temperature is the maximum ambient temperature during any 24-hour period. For operation at higher temperatures or higher elevations, consult your Vertiv® sales representative or call Vertiv Services at 800-543-2378.
4. Exercise care during installation to ensure unimpeded airflow through the UPS.

Table 5 Liebert EXL S1 specifications and standards

UPS Rating (kVA)	1000	1100	1200
Output Active Power at 104°F (40°C), kW	1000	1100	1200
Input AC Parameters			
Input Voltage to Rectifier, VAC	480, 3-phase, 3-wire		
Input Voltage to Bypass, VAC	480, 3-phase, 3-wire		
Permissible Input Voltage Range	+10%, -15%		
Input Frequency, Hz	60		
Permissible Input Frequency Range, Hz	55 to 65		
Input Power Factor	≥ 0.99		
Input Current Distortion (THDi) at Nominal Voltage at Full Load, %	≤ 3.0		
Power Walk-In (seconds)	1 to 90 (Selectable in 1 Second Increments)		
Input/Bypass Withstand Rating	100kA		
Battery and DC Parameters			
Battery Type	Lithium-Ion; VRLA (Valve-Regulated, Lead Acid); VLA (Vented Lead Acid)		
Nominal Battery Bus, VDC	480		
Battery Float Voltage, VDC	540		
DC Ripple at Float Voltage	< 1.0% (RMS value) < 3.4% Vpp		
Temperature Compensated Battery Charging	Standard with Vertiv Battery Cabinets		
Output Parameters			
Load Power Factor Supported (Without Derating)	0.7 Leading to 0.7 Lagging		
Output Voltage, VAC	480, 3-phase, 3-wire		
Output Voltage Regulation, %	< 1.0 (3-phase RMS average)		
Output Voltage Regulation (50% Unbalanced Load), %	< 2.0 (3-phase RMS average)		
Output Frequency, Hz	60		
Output Frequency Regulation, %	± 0.1		
Output THD at Nominal Voltage (Linear Load), %	≤ 1.5 (RMS value)		
Output THD at Nominal Voltage Including a 100kVA Non-Linear Load per IEC 62040-3, %	≤ 5.0 (RMS value)		
Efficiency AC-AC Double Conversion	up to 97%		
Efficiency AC-AC Eco Mode	up to 99%		
Transient Recovery	IEC 62040-3: 2010 Figure 2 Curve 1, Class 1		
Voltage Displacement (Balanced Loads)	120 degrees ± 1 degree		
Voltage Displacement (50% Unbalanced Loads)	120 degrees ± 2 degrees		
Overload at Nominal Voltage and 77°F (25°C)	110% continuous, 150% for 60 seconds, 200% for 200 milliseconds		
Physical Characteristics			
Color	Black (RAL 7021)		
Protection Class, UPS Enclosure	NEMA 1, IP 20 (with and without front door open)		
General and System Data			
Inverter Type	High-Efficiency, Transformer-Free IGBT, Three-Level PWM Inverter		
Rectifier Type	High-Efficiency, Transformer-Free IGBT, Three-Level PWM Inverter		
Parallel Configuration	Up to 8 units in parallel		

Table 5 Liebert EXL S1 specifications and standards *(continued)*

UPS Rating (kVA)	1000	1100	1200
Access	Front and Top (no rear access required)		
Communications			
Options	2 Liebert IntelliSlot Bays		
Card Compatibility	IS-UNITY-DP, IS-485EXI		
Protocols Available	Modbus-IP, Modbus-485, BACnet-IP, BACnet-MSTP, SNMP, HTTP, LIFE™ Services		
Standards			
Transportation	ISTA Procedure 1H		
Safety	UL 1778 5th Edition; CSA 22.2 NO 107.3		
EMI	IEC 62040-2; FCC Part 15, Class A		
Surge	ANSI C62.41, Category B3		
ENERGY STAR® Qualified UPS	Pending		
Seismic	2015 International Building Code (IBC); 2016 California Building Code (CBC). Consult the factory for further details.		

Table 6 **Dimensions and Weights—With and Without Options**

UPS Rating		Installed Options			Dimensions WxDxH in (mm)	Approx. Weight Unpackaged, lb (kg)
kVA	kW	Back-Feed Disconnect (BFD)	Bypass (Sharing) Inductors	Common Mode Choke		
1000/1100/1200	1000/1100/1200	—	—	—	104.5 x 36.0 x 79.1 (2654 x 914 x 2009)	4667 (2117)
1000/1100/1200	1000/1100/1200	✔	—	—	128.1 x 36.0 x 79.1 (3254 x 914 x 2009)	5116 (2321)
1000/1100/1200	1000/1100/1200	—	✔	—		5286 (2398)
1000/1100/1200	1000/1100/1200	—	—	✔		5645 (2561)
1000/1100/1200	1000/1100/1200	✔	✔			5416 (2457)
1000/1100/1200	1000/1100/1200	✔	—	✔		5954 (2701)
1000/1100/1200	1000/1100/1200	—	✔	✔		6315 (2864)
1000/1100/1200	1000/1100/1200	✔	✔	✔		6523 (2959)

1. Minimum clearance above the UPS is 2 ft. (0.6m).
2. Top or bottom cable entry are available through removable access plates. Cut plate to suit conduit size. If aluminum cable is to be used, top and bottom cable entry may be required. Contact Applications Engineering for assistance.
3. Control wiring and power cables must be run in separate conduits. Control wiring must be stranded tinned conductors.

Appendix A - UPS AC-AC Efficiency

Figure 22 Liebert EXL S1 1000kVA/kW inverter AC-AC efficiency

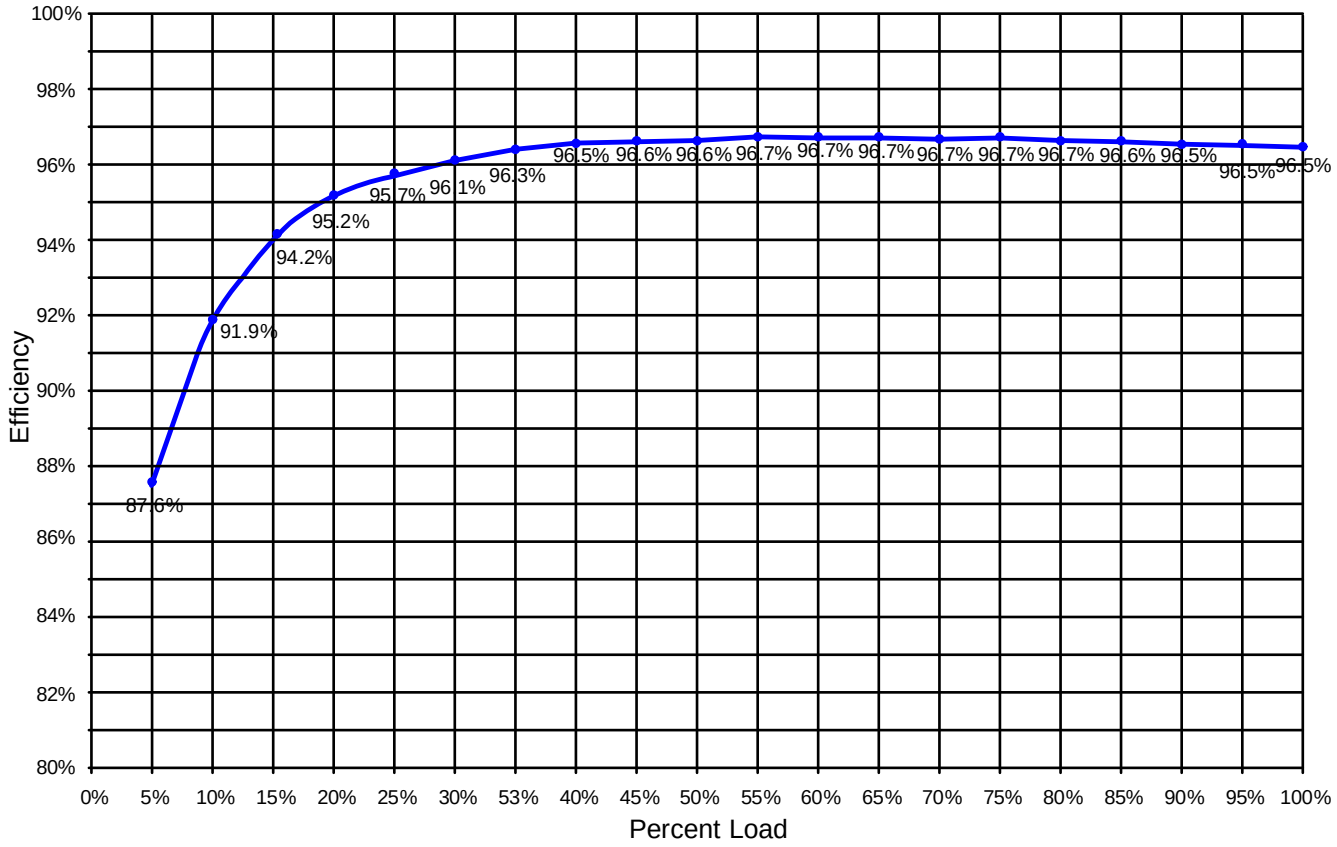


Figure 23 Liebert EXL S1 1100kVA/kW inverter AC-AC efficiency

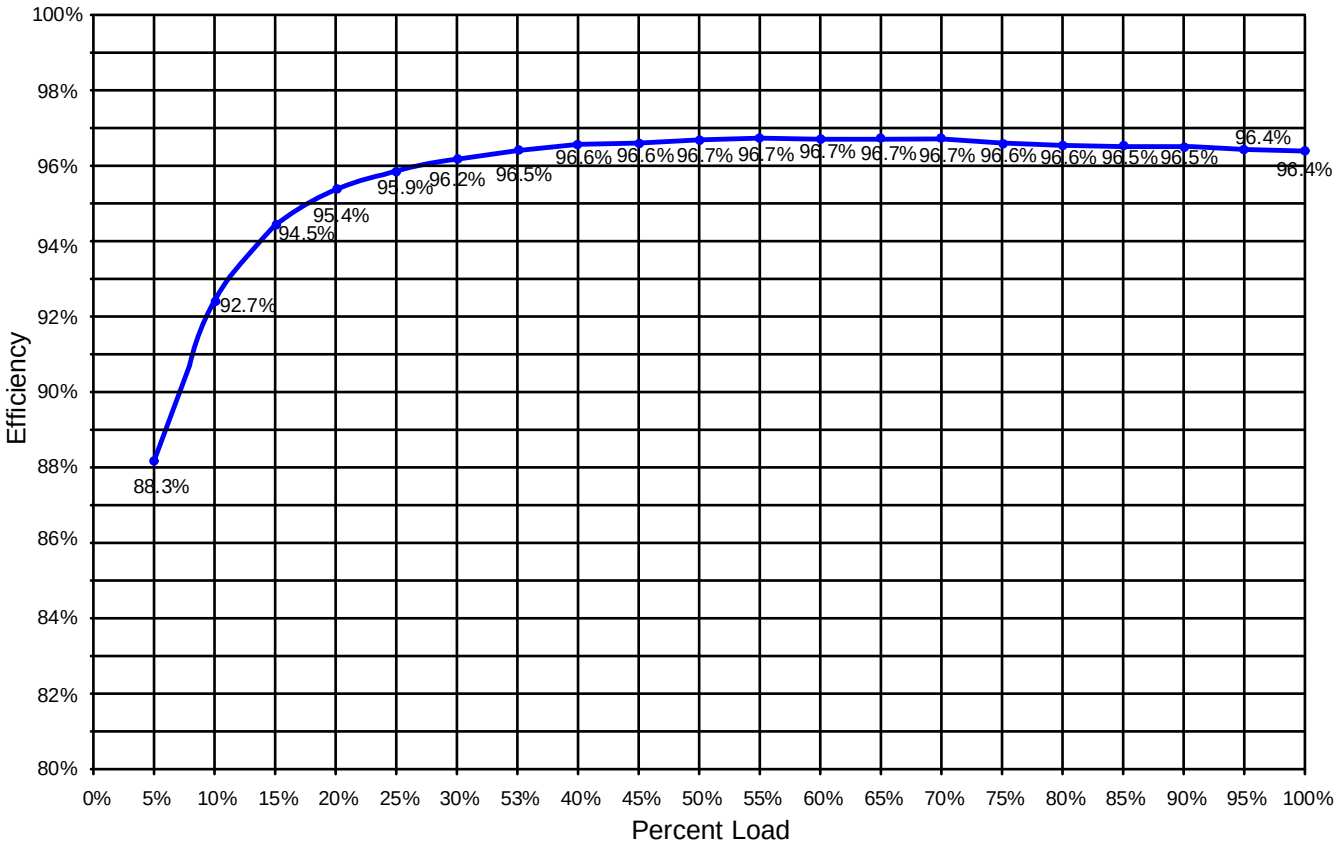
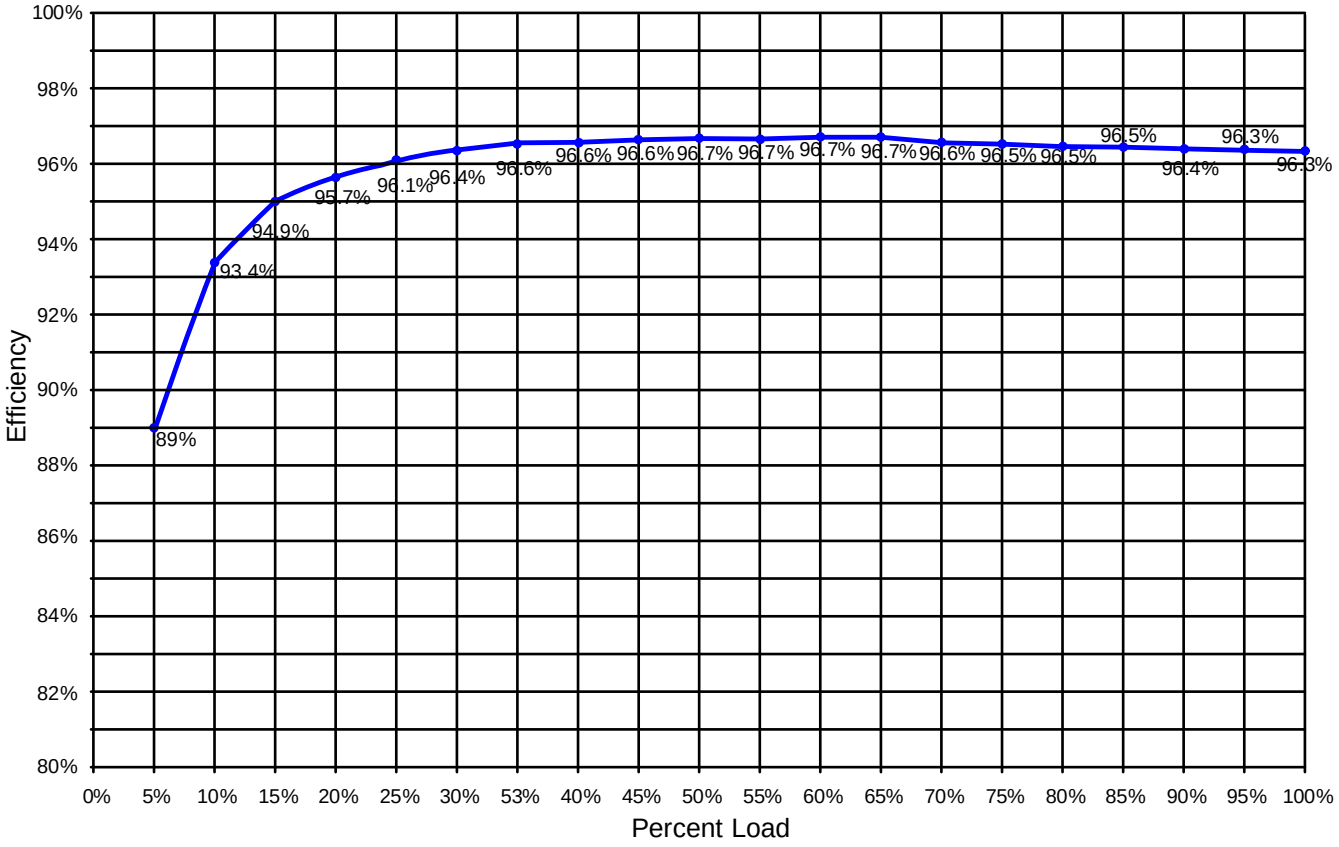


Figure 24 Liebert EXL S1 1200kVA/kW inverter AC-AC efficiency



Appendix B - Overload Curves

Figure 25 Inverter overload curves—Temperature v. Time

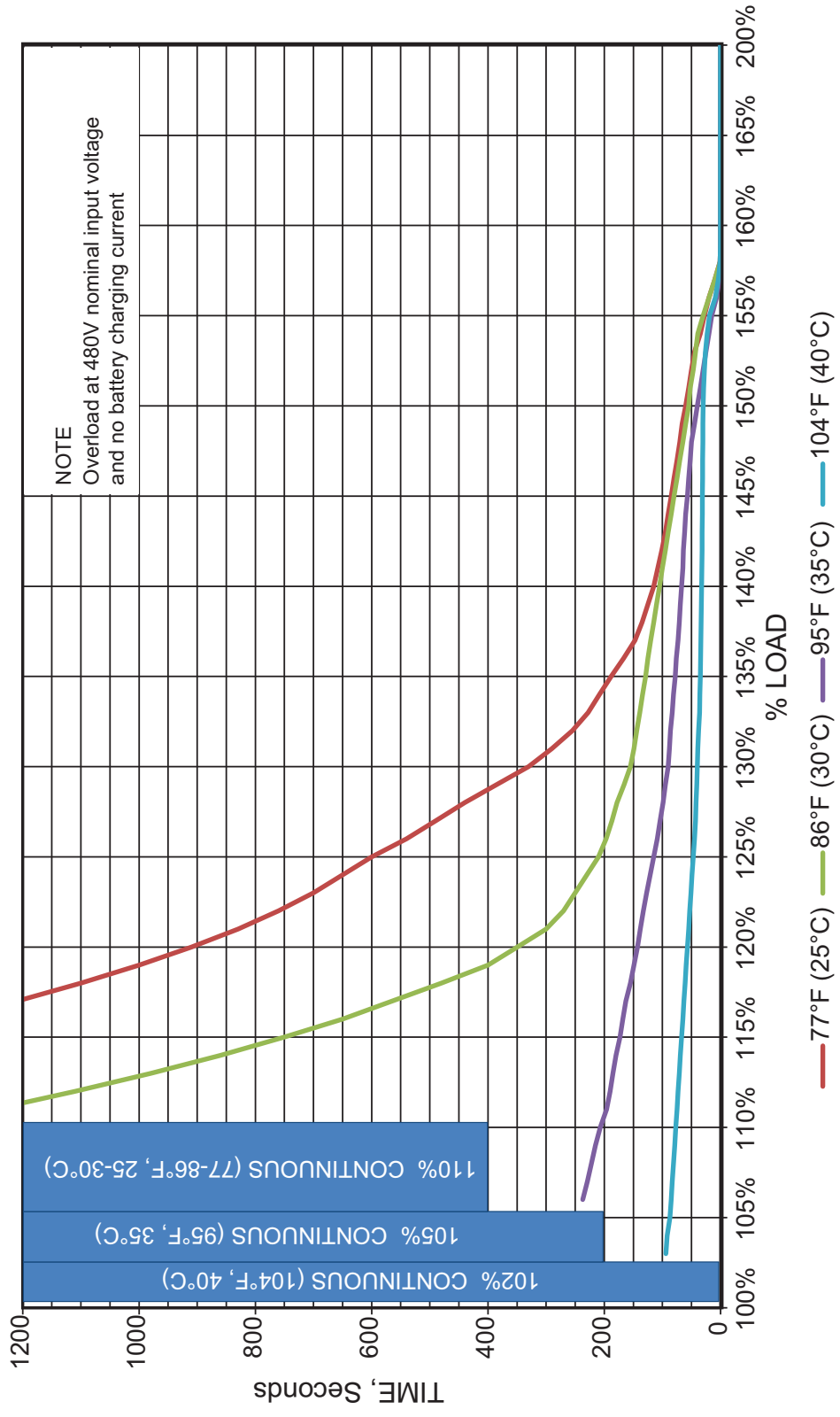
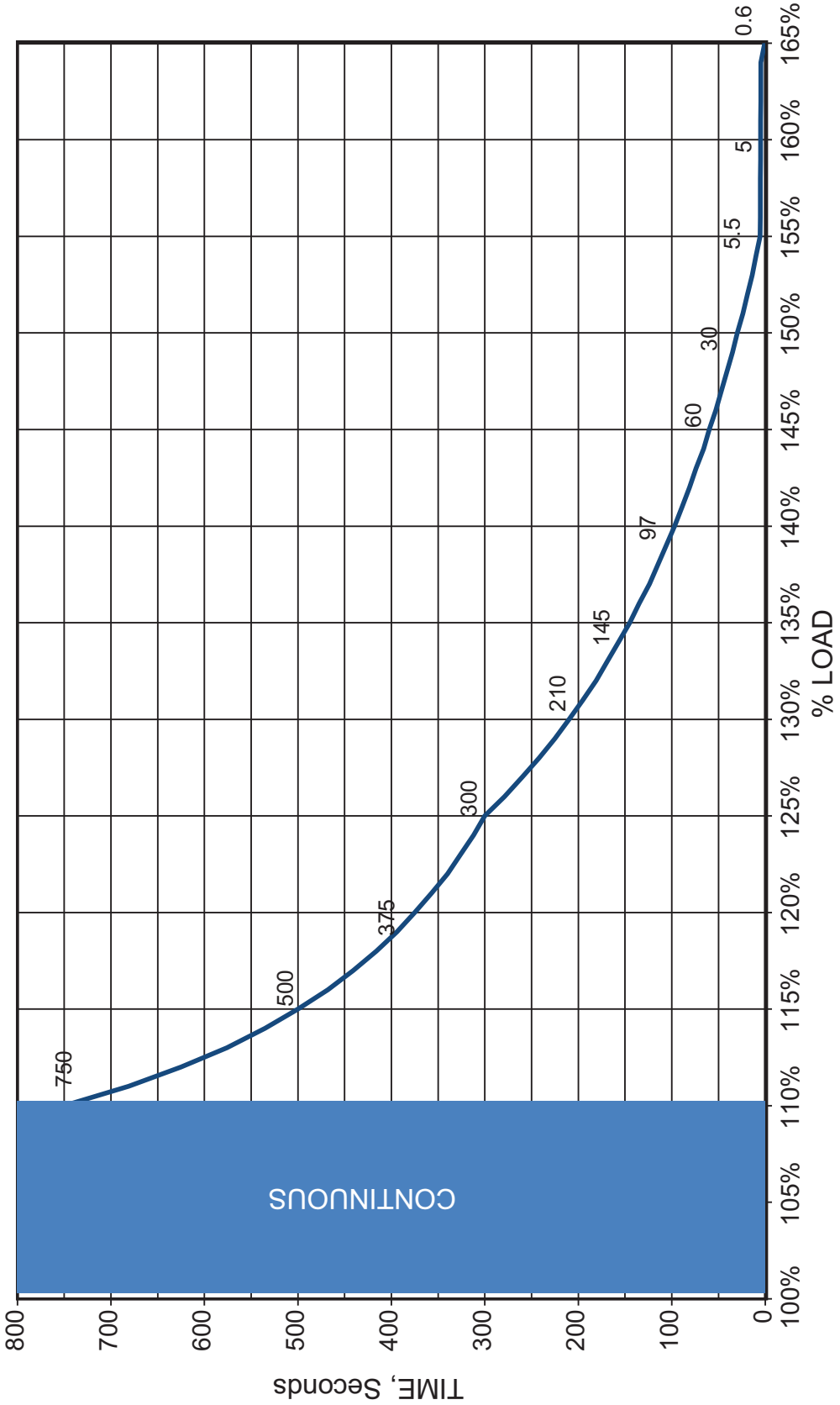


Figure 26 Bypass overload curves—Temperature v. Time



Appendix C - UPS Messages—Status, Alarms, Faults

Table 7 Liebert EXL S1 Status Events

Component	Type	Text Display	ID	Description
Battery	Status	Battery warning	04-000	A warning is pending.
Battery	Status	Battery fault	04-001	A fault is pending.
Battery	Status	Battery idle	04-002	The battery is idle; energy is flowing neither in nor out.
Battery	Status	Battery is discharging	04-004	The battery is discharging.
Battery	Status	Automatic Battery Test Started	04-032	An automatic battery test has been started.
Battery	Status	Battery Test Requested	04-033	(Not supported) see BAW1 bit 4
Battery	Status	Battery Test Failed	04-035	A battery test has failed. Permanent state: a manual reset is required.
Battery	Status	Battery Test Idle	04-048	The battery test function is not being performed.
Battery	Status	Battery Test Start Pending	04-052	In a parallel system with a common battery, the *Start* command is present on some but not all the units.
Battery	Status	Battery Test Stop Pending	04-053	In a parallel system with a common battery, the *Stop* command is present on some but not all the units.
Battery	Status	Battery Non-Blocking Fault	04-054	Set when a non-blocking fault is active in the stage.
Battery	Status	Battery Not Connected	04-065	Set when V_BATT1 < 100V (fix threshold). Control always active independently to battery breaker status.
Battery	Status	Battery is charging	14-003	The battery is being charged.
Battery	Status	Battery Test Running	14-034	Battery test is running.
Battery	Status	Battery Test Not Allowed	14-036	Conditions preclude performing a battery test.
Battery	Status	Battery Test Finished OK	14-037	Battery test finished; active for 5 seconds, then switches to Battery Test Idle.
Battery	Status	Battery Test Canceled	14-038	(Not supported)
Battery	Status	Battery Test Interrupted	14-050	(Not supported)
Battery	Status	Battery Test Stopped by User	14-051	User has stopped the battery test; active for 5 seconds, then switches to Battery Test Idle. Valid only for a manual battery test.
Bypass	Status	Bypass is not present	01-000	—
Bypass	Status	Bypass Is On	01-001	—
Bypass	Status	Bypass Is Off	01-002	—
Bypass	Status	Bypass is stopped due to a fault	01-003	—
Bypass	Status	Bypass not prepared	01-004	Static switch board is not installed or the bypass voltage is over the threshold (P 106.i04).
Bypass	Status	Bypass fault	01-005	Set when a blocking fault is active in the stage.
Bypass	Status	Bypass warning	01-007	Set when at least one warning is active.
Bypass	Status	Bypass available with delay	01-008	Set when the bypass and inverter are not synchronized.
Bypass	Status	Parallel bypass OK	01-029	All bypass inputs are OK.
Bypass	Status	Parallel bypass one fault	01-030	One bypass input fault exists.
Bypass	Status	Parallel bypass at least one OK	01-031	At least one bypass input is OK.
Bypass	Status	Parallel bypass fault	01-032	All bypass inputs are in fault.
Bypass	Status	Undelayed Bypass Ref. Failure	01-040	Bypass reference failure notification without any delay.
Bypass	Status	Bypass is Centralized	01-041	The internal bypass is disabled; the UPS is using the centralized / common (MSS) bypass.

Table 7 Liebert EXL S1 Status Events

Component	Type	Text Display	ID	Description
Bypass	Status	Bypass Non-Blocking Fault	01-042	Set when a non-blocking fault is active in the stage.
Bypass	Status	Bypass Global On Request	01-078	Bypass Static Switch On command request on the shared bus
Bypass	Status	Bypass Global On	01-079	Bypass Static Switch on global status read from the shared bus.
Bypass	Status	Bypass Global Off	01-080	Bypass Static Switch Off Global status read from the shared bus.
Bypass	Status	Bypass mains is out of tolerance	11-006	Bypass failure notification without any delay.
Bypass	Alarm	Bypass Input Switch Open	21-012	Bypass input switch is open.
Charger/Booster	Status	Charger in Standby - (not charging)	03-000	—
Charger/Booster	Status	Charger is on	03-001	—
Charger/Booster	Status	Charger is off	03-002	—
Charger/Booster	Status	Charger Forced On	03-003	—
Charger/Booster	Status	Charger Stopped due to a Fault	03-038	—
Charger/Booster	Status	Charger in Current Limitation	03-039	Displayed as long as the voltage reference is lower than the nominal.
Charger/Booster	Status	Charging Status OFF	03-040	—
Charger/Booster	Status	Charging Status INIT	03-041	—
Charger/Booster	Status	Charging Status FLOAT 1	03-042	—
Charger/Booster	Status	Charging Status FLOAT 2	03-043	—
Charger/Booster	Status	Charging Status POST	03-044	—
Charger/Booster	Status	Charging Status PAUSE	03-045	—
Charger/Booster	Status	Charging Status MANUAL	03-046	—
Charger/Booster	Status	Charging Status FAULT	03-047	—
Charger/Booster	Status	Buck-Booster Fault	03-048	At least one fault is active.
Charger/Booster	Status	Buck-Booster Warning	03-049	Set when at least one warning is active.
Charger/Booster	Status	Booster Off	03-050	—
Charger/Booster	Status	Booster Turning On	03-051	—
Charger/Booster	Status	Booster On	03-052	—
Charger/Booster	Status	Booster Stopped Due To Fault	03-053	—
Charger/Booster	Status	Booster Runs From Battery	03-054	Status set after a fixed delay equivalent to P1110.
Charger/Booster	Status	Buck-Booster Non-Blocking Fault	03-055	At least one non-blocking fault is active.
Charger/Booster	Status	DC Bus Too Low To Charge	03-061	—
General	Status	Warning pending	00-000	Set when at least one stage in the core is in warning.
General	Status	Fault pending	00-001	Set when at least one stage in the core is in fault.
General	Status	General Fault	00-002	Set when a fault is active in general stage.
General	Status	Parallel Unit	00-003	Set when P129 = 1.
General	Status	External Synch enabled	00-005	Set when P700 = 1.
General	Status	Inverter/Rectifier OFF Command Issued	00-006	Set when command *UPS Off* is received; resets when command is not present.
General	Status	Inverter on rectifier	00-009	Inverter is supplied by the rectifier.
General	Status	Inverter on battery	00-010	Inverter is supplied by the battery.

Table 7 Liebert EXL S1 Status Events

Component	Type	Text Display	ID	Description
General	Status	Parameter reset active	00-011	Set after a parameter reset. Resets as soon as the parameter is written.
General	Status	Intelligent Parallel Not Allowed	00-014	Inverter status is not compatible with circular redundancy.
General	Status	Core Running	00-016	Core running.
General	Status	Operating Request for VFI	00-102	—
General	Status	SKRU: Inverter start inhibited	00-131	On B001 (Trinergy-Cube), the DIC1 inverter board will check the status of the input/output contact Function #16 to inhibit the inverter start.
General	Status	General Warning	00-146	Set when a warning is active in the general stage.
General	Status	General Non-Blocking Fault	00-147	Set when a non-blocking fault is active in general stage.
General	Status	Non-Blocking Fault pending	00-148	Set when at least one stage in the CORE is in a non-blocking fault.
General	Status	General Fault	00-171	Set when a fault is active in general stage.
General	Status	General Warning	00-172	Set when a warning is active in general stage.
General	Status	General Non-Blocking Fault	00-173	Set when a non-blocking fault is active in general stage.
General	Status	General Core Summary Warning	00-174	Set when a customer blocking fault flag is present (not yet defined).
General	Status	General Core Summary Fault	00-175	Set when at least one customer warning is active. (Not yet defined)
General	Status	General Core Non-Blocking Fault	00-176	Set when a customer non-blocking fault in stage is set (not yet defined).
General	Status	Manual Mode Command Pending	00-200	Set when manual command is pending but global status not confirmed.
General	Status	Synchronize Rectifier Mains Failure	00-219	Request to synchronize the rectifier in case mains failure affects only one core or unit.
General	Status	One or More Fans Not Working	00-221	Set when one fan out of the entire set of monitored fans is not working.
General	Status	BCB: Trip command issued	00-226	Enabled by Output Function 47 BCB trip. Battery Circuit Breaker (BCB) opening command has been issued.
General	Status	Operating Request for Intelligent ECO	00-273	—
General	Status	Core Sleeping	10-015	Core is sleeping.
General	Status	Intelligent ECO Enabled	10-204	—
General	Status	Intelligent Parallel Enabled	10-205	—
General	Status	Fan Test in Progress	10-220	Set when fan test is in progress. Valid for either Automatic or Manual.
Inverter	Status	Inverter is off	06-000	—
Inverter	Status	Inverter is turning on	06-001	—
Inverter	Status	Inverter is on	06-002	—
Inverter	Status	Inverter is stopped due to a fault	06-003	—
Inverter	Status	Inverter fault	06-004	Set when a blocking fault is present on the inverter stage.
Inverter	Status	Synchronization Source: Bypass	06-005	—
Inverter	Status	Synchronization Source: Output	06-006	—
Inverter	Status	Synchronization Source: Self Clock	06-007	—

Table 7 Liebert EXL S1 Status Events

Component	Type	Text Display	ID	Description
Inverter	Status	Synchronization Source: External	06-008	—
Inverter	Status	Inverter warning	06-010	Set when at least 1 warning is active
Inverter	Status	Inverter out of Synchronization	06-011	Set when the inverter is not synchronized with local bypass
Inverter	Status	Inverter out of Synchronization	06-016	Set when the inverter is not synchronized with external synchronization signal.
Inverter	Status	Online operation / VFI	06-018	—
Inverter	Status	VI	06-019	—
Inverter	Status	Intelligent ECO / VFD	06-020	—
Inverter	Status	Intelligent Parallel / CR	06-079	—
Inverter	Status	Intelligent Parallel / CR	06-079	—
Inverter	Status	Intelligent Parallel / CR	06-079	—
Inverter	Status	Operation: ECO mode	06-086	Active if inverter is turning On, the load is on Bypass and P580=1 (DIM enabled).
Inverter	Status	Inverter in Standby	06-087	—
Inverter	Status	Inverter Ready and Sync	06-088	—
Inverter	Status	Inverter Not Ready	06-089	—
Inverter	Status	Current Limit Last more then 3ms	06-090	Current limit lasts > 3 ms.
Inverter	Status	Inverter Non-Blocking Fault	06-091	Set when a non-blocking fault is active in the stage.
Inverter	Status	Inverter Fault	06-110	Set when CUSTOMER blocking fault flag is present.
Inverter	Status	Inverter warning	06-111	Set when at least one customer warning is active.
Inverter	Status	Inverter Non-Blocking Fault	06-112	Set when a customer non-blocking fault in stage is set.
Inverter	Status	Inverter pending on command	16-029	—
Load	Status	Load supplied by bypass	07-001	Set when load is supplied by Automatic Bypass and Inverter is OFF
Load	Status	Load Supplied By Maint. Bypass	07-002	Set when load is supplied by Manual Bypass
Load	Status	Load is currently not supplied	07-003	Set when module is not supplying load
Load	Status	Load on low priority line	07-004	Set when the load is supplied by the inverter and P568=1 or when the load is supplied by the bypass and P580=0.
Load	Status	Load on phase U-A > 85%	07-005	—
Load	Status	Load on phase V-B > 85%	07-006	—
Load	Status	Load on phase W-C > 85%	07-007	—
Load	Status	Load warning	07-008	Set when at least one warning is active.
Load	Status	Load supplied by battery	07-026	Set when the load is secured by the inverter and energy is provided by the battery.
Load	Status	Load Secured by Inverter	07-027	Set when the load is secured by the inverter. This includes the inverter in VFI or DIM (Eco) Mode.
Load	Status	Load Fault	07-028	Set when a blocking fault is present in the actual stage (not yet implemented)
Load	Status	Load Non-Blocking Fault	07-029	Set when a non-blocking fault is present in the actual stage (not yet implemented).
MUN	Status	MUN has a warning	08-000	Set when at least one MUN stage is in warning.
MUN	Status	MUN has a fault	08-001	Set when at least one non-blocking fault is present on MUN.

Table 7 Liebert EXL S1 Status Events

Component	Type	Text Display	ID	Description
MUN	Status	UPS Model detection in progress	08-003	MUN is searching for Model Information.
MUN	Status	MUN initialisation done	08-004	MUN is setup with autodetection.
MUN	Status	MUN reboot required	08-005	MUN detects difference in environment variable
MUN	Status	System Started	08-011	Set at application startup; never reset
MUN	Status	Acknowledge Button Pressed	08-025	Acknowledge button has been pressed
MUN	Status	UPS Time not valid	08-026	Set when date is < 1 Jan 2009.
MUN	Status	Life call in progress	08-033	Call in progress.
MUN	Status	Life call rescheduled	08-034	Call rescheduled.
MUN	Status	Life modem not detected	08-035	Set when MUN does not receive replies from modem
MUN	Status	Parameter read failed	08-054	Parameter can not be read from DSP. • Set when Parameter Reading returns with an exception • Reset when Parameter Reading returns with an OK.
MUN	Status	Parameter set failed	08-055	Parameter can not be written to DSP. • Set when Parameter Writing returns with an exception. • Reset when Parameter Writing returns with an OK.
MUN	Status	Life Service Mode	08-060	Life is in Service mode, so emergency calls are not sent to station (used when an SE is operating on the device in field).
MUN	Status	Ntp is Disconnected from Touchscreen	08-061	—
MUN	Status	Life interface Init in Progress	08-079	Set at application startup; reset after one second
MUN	Status	Life Events Sampling started	08-095	Ignore events history and restart sampling from current time.
MUN	Status	MUN/DSP are not Sync with SYNW	08-097	—
MUN	Status	Life Measures Sampling Started	08-098	Ignore measures history and restart sampling from current time.
MUN	Status	System Time Moved Ahead	08-110	Set when device time is moved ahead after time adjustment from Life Station.
MUN	Status	System Time Moved Back	08-111	Set when device time is moved back after time adjustment from Life Station.
Rectifier	Status	Rectifier is off	02-000	—
Rectifier	Status	Rectifier is turning on	02-001	—
Rectifier	Status	Rectifier is on	02-002	—
Rectifier	Status	Rectifier fault	02-004	Set either blocking or non blocking
Rectifier	Status	Rectifier Warning	02-009	Set when at least 1 warning is active
Rectifier	Status	No precharge in progress	02-010	No pre-charge active. Active while mains is out of tolerance
Rectifier	Status	Precharge in progress	02-011	Hold off delay and resistor pre-charge
Rectifier	Status	Walk-in in progress	02-012	Rectifier current limit ramp.
Rectifier	Status	Precharge finished	02-013	Pre-charge finished. Active while mains is OK
Rectifier	Status	Rectifier Power Limitation Active	02-048	Set when the input current is limited by standard or customer limit. (See **Figure 25**.)
Rectifier	Status	Rectifier Current Limit	02-049	Set when input current reaches the limit defined by P 1740.11 and lasts more 3 ms but less 10 ms.
Rectifier	Status	Rectifier Non-Blocking Fault	02-050	Set when a non-blocking fault in rectifier stage is set.

Table 7 Liebert EXL S1 Status Events

Component	Type	Text Display	ID	Description
Rectifier	Status	Rectifier fault	02-070	Set when CUSTOMER blocking fault flag is present. (Not yet defined)
Rectifier	Status	Rectifier Warning	02-071	Set when at least one customer warning is active (not yet defined).
Rectifier	Status	Rectifier Non-Blocking Fault	02-072	Set when a customer non-blocking fault in stage is set (not yet defined).
Rectifier	Status	Rectifier Stopped - Fault	02-092	
Rectifier	Status	Rectifier Inhibited	02-093	Set when the rectifier pulse is inhibited due to DC overvoltage.
Rectifier	Status	Rectifier mains is out of tolerance	12-005	Mains failure notification without any delay.

Table 8 Liebert EXL S1 Alarms

Component	Type	Text Display	ID	Description
Battery	Alarm	Battery under voltage	24-012	The battery voltage is under the shutdown voltage defined by 5 points of P1513 *Shutdown Voltage Table*. This warning causes the inverter to stop. This warning will be kept as long as the battery voltage is lower than the Inverter Restart Threshold.
Battery	Alarm	High battery temperature	24-015	RBM battery temperature user alarm (Temp. P1533.1 [0°C] < T <P1533.2 [38°C.])
Battery	Alarm	Battery temperature out of range	24-016	RBM battery temperature is out of range -10°C < T < P 1533.1 or 1533.2 < T < 40°.
Battery	Alarm	Temperature Probe Broken	24-017	RBM temperature probe is not responding (Temp. T < 10°C or T > 50°C or RBM Sensor Status [bit 3-2] = 11.
Battery	Alarm	Battery Switch Wiring Fault	24-056	Core only: Set when the RBM option is installed with Form C wiring and related cubicle breaker wiring fails.
Battery	Alarm	Cubicle Battery Switch Open	24-063	Core and Monolithic. • CORE: set when an RBM option is installed. • Monolithic: set when IO Function 18 is enabled.
Battery	Alarm	Battery Is Not Connected	24-064	Battery is not connected - warning.
Battery	Alarm	Imminent End Of Autonomy - Volt	24-066	Set if P1590 = 2 or 3.The battery voltage is lower than the threshold defined by 5 points of P1513 *Shutdown Voltage Table* + P 1591 *Delta shutdown imminent*.
Battery	Alarm	Imminent End Of Autonomy - Time	24-067	Set if P1590 = 1 or 3. The autonomy is below the defined threshold P1117 *Battery stored energy time limit*.
Battery	Alarm	BCB Breaker Open	24-068	Enabled by Input Function 21 BCB. Battery Circuit Breaker (BCB) is open.
Battery	Alarm	Battery Breaker Open	24-072	One or more BIB boards report an open breaker.
Bypass	Alarm	Bypass Input Switch Open	21-012	Bypass input switch is open.
Bypass	Alarm	Bypass mains failure	21-013	Warning set after delay defined by P 110
Bypass	Alarm	Bypass in Overload Condition	21-014	—
Bypass	Alarm	Bypass disabled	21-016	*Bypass ON* command disabled (SW bypass inhibition to avoid DC capacitor overcurrent. Detected on DIC Inv. when DC link higher than ([SQRT2 * Phase voltage RMS] - 30V), delay 0.4 seconds).
Bypass	Alarm	Bypass overtemperature	21-017	Set when inverter temp. P 151.01 < T < P 151.02.

Table 8 Liebert EXL S1 Alarms

Component	Type	Text Display	ID	Description
Bypass	Alarm	Bypass mode not auto	21-018	Set when the Bypass Control CAN ID 04002300h is not AUTO. Normally set in *Power Circuit Test* page.
Bypass	Alarm	Parallel Bypass Failure	21-038	Set when the input *Bypass OK* is set.
Bypass	Alarm	Bypass Wrong Phase Rotation	21-083	Bypass input wrong phase rotation.
Charger/Booster	Alarm	Battery Not Connected	23-012	Set when -100V < V_BATT1 < 100V (fix threshold). Control always active independently to battery breaker status.
Charger/Booster	Alarm	Reversed polarity	23-014	Set when V_BATT1 < -100V (fix threshold). Control always active independently to Battery breaker status. Inhibits starting the battery charger.
Charger/Booster	Alarm	Buck-Booster DC Voltage Low	23-056	Booster inhibit when DC voltage < P1135.i03 (to be verified).
Charger/Booster	Alarm	Buck-Booster Overtemperature	23-057	Set when the temperature is greater than the P 1151 value (see **Figure 25**).
Charger/Booster	Alarm	Buck-Booster B Overtemperature	23-067	Set when the temperature is greater than the P 1151 value (see **Figure 25**).
Charger/Booster	Alarm	DC Overvoltage	23-080	Set when the DC bus voltage crosses the maximum threshold of P1753.30 for P1753.31 time.
General	Alarm	System Power UP	00-023	—
General	Alarm	Commissioning / Test Mode	20-018	—
General	Alarm	System Maint. Bypass Switch Closed	20-019	—
General	Alarm	Synchronization system fault	20-022	—
General	Alarm	System shutdown	20-024	—
General	Alarm	The ID Card is missing	20-025	—
General	Alarm	Calibration is started	20-026	—
General	Alarm	Input Air High Temperature	20-027	—
General	Alarm	System Output Switch Open	20-031	—
General	Alarm	System Bypass Switch Closed	20-032	—
General	Alarm	Detected Cores Mismatch	20-127	—
General	Alarm	Communication Loss BIB	20-132	—
General	Alarm	AC Ground Fault	20-133	—
General	Alarm	Communication Loss MI Ph. U-A	20-153	—
General	Alarm	Communication Loss MI Ph. V-B	20-154	—
General	Alarm	Communication Loss MI Ph. W-C	20-155	—
General	Alarm	Communication Loss MI BB	20-156	—
General	Alarm	Motherboard Overtemperature	20-165	—
General	Alarm	PIB Overtemperature	20-166	—
General	Alarm	Cable Conduit Overtemperature	20-167	—
General	Alarm	MIB Overtemperature	20-168	—
General	Alarm	Duplicated Parallel Unit Id	20-169	—
General	Alarm	Parallel Unit Number Mismatch	20-170	—
General	Alarm	Communication Loss MI-B Ph. U-A	20-206	—
General	Alarm	Communication Loss MI-B Ph. V-B	20-207	—
General	Alarm	Communication Loss MI-B Ph. W-C	20-208	—

Table 8 Liebert EXL S1 Alarms

Component	Type	Text Display	ID	Description
General	Alarm	Communication Loss MI-B BB	20-209	—
General	Alarm	Fan Failure Phase U	20-210	—
General	Alarm	Fan Failure Phase V	20-211	—
General	Alarm	Fan Failure Phase W	20-212	—
General	Alarm	Fan Failure Buck-Booster	20-213	—
General	Alarm	Battery Switch Open - Do Not Close	20-214	—
General	Alarm	CPU Time Slice	20-215	—
General	Alarm	Fan Failure Static Switch	20-222	—
General	Alarm	Fan Failure Board Slot	20-223	—
General	Alarm	I/O Transformer Overtemperature	20-224	—
General	Alarm	DC Overvoltage	20-227	—
General	Alarm	Communication Loss PIB-S1	20-243	—
General	Alarm	Communication Loss PIB-S1	20-244	—
General	Alarm	Communication Loss PIB-S1- I2C	20-245	—
Inverter	Alarm	Inverter DC Undervoltage	26-025	Inverter inhibit when DC voltage < P135.i04.
Inverter	Alarm	Inverter overload	26-026	RMS overload condition.
Inverter	Alarm	The inverter is off	26-027	—
Inverter	Alarm	Inverter pending off command	26-028	—
Inverter	Alarm	Inverter overload	26-031	Set when the overload timeout has reached 100%. This triggers the request to transfer to bypass with default configuration.
Inverter	Alarm	Overtemperature Phase U-A	26-101	Set when Phase U temperature is greater than the value specified by P 151 (see **Figure 25**).
Inverter	Alarm	Overtemperature Phase V-B	26-102	Set when Phase V temperature is greater than the value specified by P 151 (see **Figure 25**).
Inverter	Alarm	Overtemperature Phase W-C	26-103	Set when Phase W temperature is greater than the value specified by P 151 (see **Figure 25**).
Inverter	Alarm	Overtemperature B Phase U-A	26-119	Set when Phase U temperature is greater than the value specified by P 151 (see **Figure 25**).
Inverter	Alarm	Overtemperature B Phase V-B	26-120	Set when Phase V temperature is greater than the value specified by P 151 (see **Figure 25**).
Inverter	Alarm	Overtemperature B Phase W-C	26-121	Set when Phase W temperature is greater than the value specified by P 151 (see **Figure 25**).
Inverter	Alarm	DC Overvoltage	26-137	Set when DC bus voltage crosses the maximum threshold P753.40 for P753.41 time.
Load	Alarm	Output Switch Open	27-009	The output breaker MOB is open.
Load	Alarm	Load is currently not supplied	27-010	Monolithic only: UPS is not supplying the load
Load	Alarm	Retransfer is inhibited	27-011	Load transfer to inverter inhibited due to overload (to be verified with overload specification; see **Figure 25**).
MUN	Status	MUN has a warning	08-000	Set when at least one MUN stage is in warning.
MUN	Status	MUN has a fault	08-001	Set when at least one non-blocking fault is present on MUN.
MUN	Status	UPS Model detection in progress	08-003	MUN is searching for model information
MUN	Status	MUN initialisation done	08-004	MUN is setup with autodetection.

Table 8 Liebert EXL S1 Alarms

Component	Type	Text Display	ID	Description
MUN	Status	MUN reboot required	08-005	MUN detects difference in environmental variables.
MUN	Status	System Started	08-011	Set at application startup; never reset
MUN	Status	Acknowledge Button Pressed	08-025	Acknowledge button has been pressed.
MUN	Status	UPS Time not valid	08-026	set when date is < 1 Jan 2009
MUN	Status	Life call in progress	08-033	Call in progress
MUN	Status	Life call rescheduled	08-034	Call rescheduled
MUN	Status	Life modem not detected	08-035	Set when MUN does not receive replies from modem.
MUN	Status	Parameter read failed	08-054	Parameter can not be read from DSP. • Set when Parameter Reading returns with an exception. • Reset when Parameter Reading returns with OK.
MUN	Status	Parameter set failed	08-055	Parameter cannot be written to DSP. • Set when Parameter Writing returns with an exception. • Reset when Parameter Writing returns with OK.
MUN	Status	Life Service Mode	08-060	Life is in Service Mode, so emergency calls are not sent to station. (Used when an SE is operating on the device.)
MUN	Status	Ntp is Disconnected from Touchscreen	08-061	—
MUN	Status	Life interface Init in Progress	08-079	Set at application startup; reset after one second.
MUN	Status	Life Events Sampling started	08-095	Ignore events history and restart sampling from current time.
MUN	Status	MUN/DSP are not Sync with SYNW	08-097	—
MUN	Status	Life Measures Sampling Started	08-098	Ignore measures history and restart sampling from current time.
MUN	Status	System Time Moved Ahead	08-110	Set when device time is moved ahead after time adjustment from Life Station.
MUN	Status	System Time Moved Back	08-111	Set when device time is moved back after time adjustment from Life Station.
MUN	Alarm	CAN Communication Loss	28-008	Set when CAN telegram are not received for 10 seconds. Reset when a general stage telegram is received.
MUN	Alarm	UPS Model cannot be identified	28-056	UPS model not detected.
Rectifier	Status	Rectifier is off	02-000	—
Rectifier	Status	Rectifier is turning on	02-001	—
Rectifier	Status	Rectifier is on	02-002	—
Rectifier	Status	Rectifier fault	02-004	Set as either blocking or non-blocking.
Rectifier	Status	Rectifier Warning	02-009	Set when at least one warning is active.
Rectifier	Status	No precharge in progress	02-010	No pre-charge active. Active while mains is out of limits.
Rectifier	Status	Precharge in progress	02-011	Hold off delay and resistor pre-charge.
Rectifier	Status	Walk-in in progress	02-012	Rectifier current limit ramp.
Rectifier	Status	Precharge finished	02-013	Pre-charge finished. Active while mains is OK.
Rectifier	Status	Rectifier Power Limitation Active	02-048	Set when the input current is limited by standard or customer limit. (See T-Cube Overload specification.)
Rectifier	Status	Rectifier Current Limit	02-049	Set when input current reaches the limit defined by P 1740.11 and lasts more 3 ms but less 10 ms.
Rectifier	Status	Rectifier Non-Blocking Fault	02-050	Set when a non-blocking fault in rectifier stage is set.

Table 8 Liebert EXL S1 Alarms

Component	Type	Text Display	ID	Description
Rectifier	Status	Rectifier fault	02-070	Set when a customer blocking fault flag is present (not yet defined).
Rectifier	Status	Rectifier Warning	02-071	Set when at least one customer warning is active (not yet defined).
Rectifier	Status	Rectifier Non-Blocking Fault	02-072	Set when a customer non-blocking fault in stage is set. (not yet defined).
Rectifier	Status	Rectifier Stopped - Fault	02-092	—
Rectifier	Status	Rectifier Inhibited	02-093	Set when the rectifier pulse is inhibited due to DC overvoltage.
Rectifier	Status	Rectifier mains is out of tolerance	12-005	Mains failure notification without any delay.
Rectifier	Alarm	Rectifier Input Switch Open	22-014	—
Rectifier	Alarm	Rectifier mains failure	22-015	Warning set after the delay defined by P1110.
Rectifier	Alarm	Wrong phase rotation	22-017	Input line phase rotation is incorrect.
Rectifier	Alarm	DC voltage low	22-018	DC link voltage under the threshold defined by P1135.2, causing PWM inhibition.
Rectifier	Alarm	Out of synchronization	22-020	During the rectifier running it causes the rectifier to stop temporarily.
Rectifier	Alarm	Peak Input Voltage	22-021	Mains voltage high peak detector trips when instantaneous voltage exceeded the limit defined by P 1140.i05.
Rectifier	Alarm	Overtemperature Phase U-A	22-061	Set when Phase U temperature is greater then P 1151 setting (Def = 80°C)
Rectifier	Alarm	Overtemperature Phase V-B	22-062	Set when Phase V temperature is greater then P 1151 setting (Def = 80°C).
Rectifier	Alarm	Overtemperature Phase W-C	22-063	Set when Phase W temperature is greater then P 1151 setting (Def = 80°C).
Rectifier	Alarm	Overtemperature B Phase U-A	22-073	Set when Phase U temperature is greater then P 1151 setting (Def = 80°C).
Rectifier	Alarm	Overtemperature B Phase V-B	22-074	Set when Phase V temperature is greater then P 1151 setting (Def = 80°C).
Rectifier	Alarm	Overtemperature B Phase W-C	22-075	Set when Phase W temperature is greater then P 1151 setting (Def = 80°C).
Rectifier	Alarm	DC Overvoltage	22-102	Set when the rectifier detects DC bus voltage above threshold P1753.29.

Table 9 Liebert EXL S1 Events - Faults

Component	Type	Text Display	ID	Description
Battery	Fault	Battery Test Failure	34-023	—
Battery	Fault	Battery Overcurrent Fault	34-070	BCB Control algorithm has detected an overcurrent condition. BCB Open command issued.
Battery	Fault	Battery Ground Fault	34-071	Enabled by Input Function 22 BCB GND Fault. Battery ground fault detector is tripped.
Bypass	Fault	E.P.O.	31-020	—
Bypass	Fault	Bypass hardware failure	31-021	Output voltage is out of tolerance and the bypass input is within tolerance (SW detected fault monitoring output signals).

Table 9 Liebert EXL S1 Events - Faults

Component	Type	Text Display	ID	Description
Bypass	Fault	Bypass hardware failure	31-022	Set when the bypass static switch board is not installed (i.e., bypass voltage < 170 V).
Bypass	Fault	Backfeed protection	31-023	Back-feed fault has been detected. Enabled by P142.
Bypass	Fault	Overload	31-026	—
Bypass	Fault	Bypass Failure During Line Support	31-027	—
Bypass	Fault	Parallel Failure During Support	31-028	—
Bypass	Fault	Overtemperature	31-036	Bypass heat sink overtemperature.
Charger/Booster	Fault	Charger Temperature high	33-018	Set when temperature is greater then P 1152 value (see **Figure 25**)
Charger/Booster	Fault	Temperature Probe Broken	33-019	Buck booster temperature sensor fault SW detected; based on M.I. value outside sensor limit interval -15°C < T< +150°C for 60 seconds (P 1780.6).
Charger/Booster	Fault	Charger Temperature high	33-020	Booster/Charger filter overtemperature. (M.I. XP31 pin 1-6).
Charger/Booster	Fault	Charger Desaturation	33-021	Charger desaturation.
Charger/Booster	Fault	Charger Redundant Voltage error	33-022	If the absolute value of the difference between primary and secondary battery voltage acquisition is greater than a predefined threshold, a fault is issued and the Booster/charger is turned Off because the voltage measurement is corrupted.
Charger/Booster	Fault	Charger DC Bus	33-023	Set when DC voltage +/- is greater than the P753.i15 threshold.
Charger/Booster	Fault	E.P.O.	33-035	—
Charger/Booster	Fault	Charger Voltage Out of Limit	33-025	The charger is switched Off due to an overvoltage on the battery. The time until switch Off depends on the overvoltage value.
Charger/Booster	Fault	Buck-Booster Overcurrent	33-058	The current limitation control has tripped the booster.
Charger/Booster	Fault	Booster Desaturation	33-059	Booster desaturation.
Charger/Booster	Fault	Booster and Charger Desaturation	33-060	Charger and booster desaturation.
Charger/Booster	Fault	Charger Temperature High	33-070	—
Charger/Booster	Fault	Charger Temperature High	33-071	—
Charger/Booster	Fault	Temp Probe Module B Broken	33-072	—
Charger/Booster	Fault	Charger Desaturation	33-073	—
Charger/Booster	Fault	Booster B Desaturation	33-074	—
Charger/Booster	Fault	Booster and Charger B Desaturation	33-075	—
Charger/Booster	Fault	Fuse Blown Pos Pole	33-076	Positive line buck booster fuse is blown.
Charger/Booster	Fault	Fuse Blown Neg Pole	33-077	Negative line buck booster fuse is blown.
Charger/Booster	Fault	Fuse Blown Module B Pos Pole	33-078	Positive B line buck booster fuse blown.
Charger/Booster	Fault	Fuse Blown Module B Neg Pole	33-079	Negative B line buck booster fuse is blown.
General	Fault	Incorrect power class	30-036	—
General	Fault	DSP Signal Hardware Failure	30-049	—
General	Fault	DSP Signal Hardware Failure	30-049	—
General	Fault	DSP Signal Hardware Failure	30-049	—
General	Fault	DSAVE active	30-053	—
General	Fault	Ambient Sensor Broken	30-059	—

Table 9 Liebert EXL S1 Events - Faults

Component	Type	Text Display	ID	Description
General	Fault	Parallel cable missing	30-071	—
General	Fault	Parallel timeout	30-078	—
General	Fault	Parallel Identification Error	30-079	—
General	Fault	Parallel impossible	30-080	—
General	Fault	E.P.O.	30-145	—
General	Fault	DSP ADC Serial Comm Failure	30-163	—
General	Fault	DSP Signal Software Failure	30-164	—
General	Fault	Fast Desaturation	30-178	—
General	Fault	High Ambient Temperature	30-202	—
General	Fault	Input Contact Wiring Error	30-203	—
General	Fault	SMPS DC Supply Failure	30-216	—
General	Fault	SMPS Single AC Supply Failure	30-217	—
General	Fault	SMPS Double AC Supply Failure	30-218	—
Inverter	Fault	E.P.O.	36-034	—
Inverter	Fault	Overtemperature	36-035	Set when the Phase U temperature is greater than the value specified by P 152 (see **Figure 25**).
Inverter	Fault	Overtemperature	36-036	Set when the Phase V temperature is greater than the value specified by P 152 (see **Figure 25**).
Inverter	Fault	Overtemperature	36-038	Set when the Phase W temperature is greater than the value specified by P 152 (see **Figure 25**)
Inverter	Fault	Overload	36-044	Set if the inverter stops for DC bus undervoltage four times in 5 minutes.
Inverter	Fault	Overload	36-045	Set when: 1. Current limit condition occurs at inverter start while the output voltage is ramping up. 2. Current limit condition lasts more then 200 ms 3. Current limit condition set again after 2nd Dynamic line Support
Inverter	Fault	Overload	36-046	Set when the RMS overload counter reaches the end.
Inverter	Fault	DC Overvoltage	36-047	Set when DC voltage +/- is greater than P753.i15 threshold
Inverter	Fault	Output out of tolerance	36-048	Set when • output voltage filtered is above V Nominal + (P106.1 + P107.1 + P118.0 + P105.0) OR • output voltage fast is above V Nominal + (P106.2 + P118.8 + P105.0)
Inverter	Fault	Output out of tolerance	36-049	Set when • output voltage filtered is below V Nominal - (P106.1 + P107.1) OR • output voltage fast is below V Nominal - (P106.2)
Inverter	Fault	Output out of tolerance	36-050	—
Inverter	Fault	Output out of tolerance	36-051	—
Inverter	Fault	Output out of tolerance	36-052	—
Inverter	Fault	Output out of tolerance	36-053	—
Inverter	Fault	Output out of tolerance	36-054	—

Table 9 Liebert EXL S1 Events - Faults

Component	Type	Text Display	ID	Description
Inverter	Fault	Inverter DC/AC desaturation	36-055	Desaturation Phase U (Group A)
Inverter	Fault	Inverter DC/AC desaturation	36-056	Desaturation Phase V (Group A)
Inverter	Fault	Inverter DC/AC desaturation	36-057	Desaturation Phase W (Group A)
Inverter	Fault	DC Bus undervoltage	36-059	if (Udc < P135.i04) AND • (rectifier mains within tolerance) AND • (rectifier input breaker closed) AND • (NO Test Mode) AND • (NO HW-Init) AND • (60-second delay expired)
Inverter	Fault	Fuse Blown Phase U-A	36-080	Set by M.I. Phase U XP21 pin 7 -8. Indicates output fuse Phase U open.
Inverter	Fault	Fuse Blown Phase V-B	36-081	Set by M.I. Phase V XP21 pin 7 -8. Indicates output fuse Phase V open.
Inverter	Fault	Fuse Blown Phase W-C	36-082	Set by M.I. Phase W XP21 pin 7 -8. Indicates output fuse Phase W open.
Inverter	Fault	Temp Probe Broken Phase U-A	36-104	Inverter temperature sensor fault SW detected; based on M.I. value outside sensor limit interval -15°C < T< +150°C for 60 seconds (P 780.23).
Inverter	Fault	Temp Probe Broken Phase V-B	36-105	Inverter temperature sensor fault SW detected; based on M.I. value outside sensor limit interval -15°C < T< +150°C for 60 seconds (P 780.23).
Inverter	Fault	Temp Probe Broken Phase W-C	36-106	Inverter temperature sensor fault SW detected; based on M.I. value outside sensor limit interval -15°C < T< +150°C for 60 seconds (P 780.23).
Inverter	Fault	Overtemperature Choke Ph. U-A	36-107	Inverter filter overtemperature. Any of Thermal Switch “ALA” (M.I. XP31 Pin 4-9) active.
Inverter	Fault	Overtemperature Choke Ph. V-B	36-108	Inverter filter overtemperature. Any of Thermal Switch “ALA” (M.I. XP31 Pin 4-9) active
Inverter	Fault	Overtemperature Choke Ph. W-C	36-109	Inverter filter over-temperature. Any of Thermal Switch “ALA” (M.I. XP31 Pin 4-9) active
Inverter	Fault	Fuse Blown B Phase U-A	36-122	Set by M.I. Phase U-B XP21 pin 7 -8. Indicates output fuse Phase U is open.
Inverter	Fault	Fuse Blown B Phase V-B	36-123	Set by M.I. Phase V-B XP21 pin 7 -8. Indicates output fuse Phase V is open.
Inverter	Fault	Fuse Blown B Phase W-C	36-124	Set by M.I. Phase W-B XP21 pin 7 -8. Indicates output fuse Phase W is open.
Inverter	Fault	Overtemperature	36-125	Inverter B overtemperature fault Phase U-A
Inverter	Fault	Overtemperature	36-126	Inverter B overtemperature fault Phase V-B
Inverter	Fault	Overtemperature	36-127	Inverter B overtemperature fault Phase W-C
Inverter	Fault	Inverter DC/AC desaturation	36-128	Desaturation Phase U group B
Inverter	Fault	Inverter DC/AC desaturation	36-129	Desaturation Phase V group B
Inverter	Fault	Inverter DC/AC desaturation	36-130	Desaturation Phase W group B
Inverter	Fault	Temp Probe B Broken Phase U-A	36-131	Inverter temperature sensor fault SW detected; based on M.I. value outside sensor limit interval -15°C < T< +150°C for 60 seconds (P 780.23).
Inverter	Fault	Temp Probe B Broken Phase V-B	36-132	Inverter temperature sensor fault SW detected; based on M.I. value outside sensor limit interval -15°C < T< +150°C for 60 seconds (P 780.23).

Table 9 Liebert EXL S1 Events - Faults

Component	Type	Text Display	ID	Description
Inverter	Fault	Temp Probe B Broken Phase W-C	36-133	Inverter temperature sensor fault SW detected; based on M.I. value outside sensor limit interval -15°C < T< +150°C for 60 seconds (P 780.23).
Inverter	Fault	Overtemperature Choke B Ph. U-A	36-134	Inverter filter overtemperature. Any of Thermal Switch “ALA” (M.I. XP31 Pin 4-9) active.
Inverter	Fault	Overtemperature Choke B Ph. V-B	36-135	Inverter filter overtemperature. Any of Thermal Switch “ALA” (M.I. XP31 Pin 4-9) active.
Inverter	Fault	Overtemperature Choke B Ph. W-C	36-136	Inverter filter overtemperature. Any of Thermal Switch “ALA” (M.I. XP31 Pin 4-9) active.
Rectifier	Fault	E.P.O.	32-024	Depending on application: A02 stops rectifier
Rectifier	Fault	Rectifier precharge failure	32-025	DC bus under threshold P135.101
Rectifier	Fault	Rectifier precharge failure	32-026	DC bus under threshold P135.102
Rectifier	Fault	Rectifier precharge failure	32-027	KM1 feedback not OK.
Rectifier	Fault	Rectifier Temperature fault	32-028	Rectifier Phase U temperature is greater then P 1152 setting (def = 95°C).
Rectifier	Fault	Rectifier Temperature fault	32-029	Rectifier Phase V temperature is greater then P 1152 setting (def = 95°C).
Rectifier	Fault	Rectifier Temperature fault	32-030	Rectifier Phase W temperature is greater then P 1152 setting (def = 95°C).
Rectifier	Fault	Rectifier DC Overvoltage	32-031	DC overvoltage.
Rectifier	Fault	Rectifier desaturation failure	32-032	Desaturation Phase U (group A)
Rectifier	Fault	Rectifier desaturation failure	32-033	Desaturation Phase V (group A)
Rectifier	Fault	Rectifier desaturation failure	32-034	Desaturation Phase W (group A)
Rectifier	Fault	Rectifier synchronization failure	32-035	During startup, synchronization with the mains is not achieved in xxx sec.
Rectifier	Fault	Rectifier Overcurrent failure	32-036	Set when input current reaches the limit defined by P 1740.11 and last more 30 ms.
Rectifier	Fault	Fuse Blown Phase U-A	32-055	Set by M.I. Phase U XP21 pin 1 -2. Indicates input fuse Phase U open.
Rectifier	Fault	Fuse Blown Phase V-B	32-056	Set by M.I. Phase V XP21 pin 1 -2. Indicates input fuse Phase V open.
Rectifier	Fault	Fuse Blown Phase W-C	32-057	Set by M.I. Phase W XP21 pin 1 -2. Indicates input fuse Phase W open.
Rectifier	Fault	Temp Probe Broken Phase U-A	32-064	Rectifier temperature sensor fault SW detected; based on M.I. value outside sensor limit interval -15°C < T< +150°C for 60 seconds (P 1780.6).
Rectifier	Fault	Temp Probe Broken Phase V-B	32-065	Rectifier temperature sensor fault SW detected; based on M.I. value outside sensor limit interval -15°C < T< +150°C for 60 seconds (P 1780.6).
Rectifier	Fault	Temp Probe Broken Phase W-C	32-066	Rectifier temperature sensor fault SW detected; based on M.I. value outside sensor limit interval -15°C < T< +150°C for 60 seconds (P 1780.6).
Rectifier	Fault	Overtemperature Choke Ph. U-A	32-067	Rectifier filter overtemperature. Any of Thermal Switch “ALA” (M.I. XP31 Pin 1-6) active
Rectifier	Fault	Overtemperature Choke Ph. V-B	32-068	Inverter filter overtemperature. Any of Thermal Switch “ALA” (M.I. XP31 Pin 1-6) active
Rectifier	Fault	Overtemperature Choke Ph. W-C	32-069	Inverter filter overtemperature. Any of Thermal Switch “ALA” (M.I. XP31 Pin 1-6) is active.

Table 9 Liebert EXL S1 Events - Faults

Component	Type	Text Display	ID	Description
Rectifier	Fault	Fuse Blown B Phase U-A	32-076	Set by M.I. Phase U-B XP21 Pin 1 -2. Indicates input fuse Phase U is open.
Rectifier	Fault	Fuse Blown B Phase V-B	32-077	Set by M.I. Phase V-B XP21 Pin 1 -2. Indicates input fuse Phase V is open.
Rectifier	Fault	Fuse Blown B Phase W-C	32-078	Set by M.I. Phase W-B XP21 Pin 1 -2. Indicates input fuse Phase W is open.
Rectifier	Fault	Rectifier Temperature fault	32-079	Rectifier Phase U temperature is greater than P 1152 setting (def = 95°C).
Rectifier	Fault	Rectifier Temperature fault	32-080	Rectifier Phase V temperature is greater than P 1152 setting (def = 95°C).
Rectifier	Fault	Rectifier Temperature fault	32-081	Rectifier Phase W temperature is greater than P 1152 setting (def = 95°C).
Rectifier	Fault	Rectifier Desaturation Failure	32-082	Desaturation Phase U Group B.
Rectifier	Fault	Rectifier Desaturation Failure	32-083	Desaturation Phase V Group B.
Rectifier	Fault	Rectifier Desaturation Failure	32-084	Desaturation Phase W Group B.
Rectifier	Fault	Temp Probe B Broken Phase U-A	32-085	Rectifier temperature sensor fault SW has been detected; based on M.I. value outside sensor limit interval -15°C < T< +150°C for 60 seconds (P 1780.6)
Rectifier	Fault	Temp Probe B Broken Phase V-B	32-086	Rectifier temperature sensor fault SW detected; based on M.I. value outside sensor limit interval -15°C < T< +150°C fo60 seconds (P 1780.6)
Rectifier	Fault	Temp Probe B Broken Phase W-C	32-087	Rectifier temperature sensor fault SW detected; based on M.I. value outside sensor limit interval -15°C < T< +150°C for 60 seconds (P 1780.6)
Rectifier	Fault	Overtemperature Choke B Ph. U-A	32-088	Rectifier filter overtemperature. Any of the Thermal Switch “ALA” (M.I. XP31 pin 1-6) active
Rectifier	Fault	Overtemperature Choke B Ph. V-B	32-089	Inverter filter overtemperature. Any of the Thermal Switch “ALA” (M.I. XP31 pin 1-6) is active.
Rectifier	Fault	Overtemperature Choke B Ph. W-C	32-090	Inverter filter overtemperature. Any of the Thermal Switch “ALA” (M.I. XP31 pin 1-6) is active.

NOTES

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SL-26090_REV0_09-17