

■ AC Power
For Business-Critical Continuity™

Liebert® NXL™

Operation and Maintenance Manual—250-750kVA, 60Hz, Three Phase Single-Module & Multi-Module



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 and 4.4 - **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 1-800-LIEBERT before moving battery cabinets (after initial installation).

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

Contacting Liebert for Support

Contact Emerson Network Power Liebert Services for information or repair service in the United States at 1-800-LIEBERT (1-800-543-2378).

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

Have the following information available before calling Liebert Services:

Part Numbers: _____

Serial Numbers: _____

kVA Rating: _____

Date Purchased: _____

Date Installed: _____

Location: _____

Input Voltage/Frequency: _____

Output Voltage/Frequency: _____

DC Source Reserve Time: _____

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IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

This manual contains important instructions that should be followed during installation and maintenance of your Liebert NXL UPS 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 system 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 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 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.

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.

1.0 INTRODUCTION

1.1 General Description

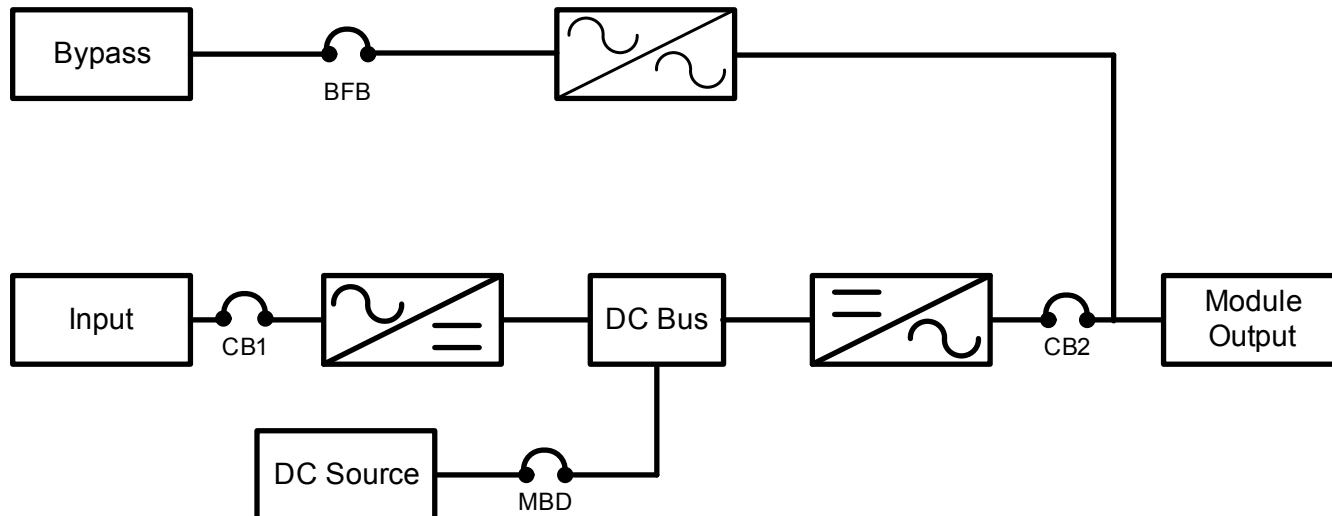
The Liebert NXL UPS provides continuous, high-quality AC power to your business-critical equipment, such as telecommunications and data processing equipment. The Liebert NXL UPS supplies power that is free of the disturbances and variations in voltage and frequency common to utility power, which is subject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

The Liebert NXL 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 CB1 and the rectifier converts the AC utility into DC power. The inverter converts that DC power from the utility—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 system one-line diagram



1.2 Modes of Operation

1.2.1 Normal Mode

Operating in normal mode, the Liebert NXL'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 NXL is in bypass mode, the load is directly supported by utility power and is without DC source backup protection.

The Liebert NXL'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 by the user



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 will be less than 10ms. This interruption time may be altered by modifying the Output transfer interrupt time setting.

1.2.3 Battery Mode

When utility AC power fails, the Liebert NXL 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 NXL automatically shifts back to Normal mode, with the rectifier powering the critical load.

1.2.4 Maintenance Bypass

The installation of a Maintenance Bypass Cabinet or Assembly is recommended to allow you to totally isolate the UPS from all power sources. Use of the Maintenance Bypass is described in **2.0 - Operation**.

1.2.5 ECO Mode

The ECO Mode feature improves the overall efficiency by powering the critical bus from the bypass static switch instead of the inverter.

The user has the ability to start/stop ECO Mode manually via HMI or automatically based on time and day of week schedule entries.

When the critical bus goes out of tolerance (voltage, frequency or slew rate), the BPSS is turned off and the inverter powers the critical bus.

The inverter is always ready to take the load in the event that the bypass source fails.

1.2.6 Intelligent Paralleling

Intelligent Paralleling is intended to increase system efficiency and to reduce the operating hours on the modules. Intelligent Paralleling will put one or more paralleled modules into standby operation when the number of redundant modules is above the user-specified threshold, plus some hysteresis.

1.3 Options

A number of options are available from Liebert for your UPS system. (Some options are not available for all ratings.) Described below are the most frequently provided options. Other options are available. Contact your Liebert sales representative for more information.

- **Battery and Racks**—The batteries provide power in the event of a power outage. The Liebert NXL UPS can use a variety of battery types, provided the battery plant is designed for the UPS DC voltage range and the load requirements of your 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.
- **Module Battery Disconnect**—The UPS system utilizes a separate Module Battery Disconnect 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. This option is required to complete the UPS system.
- **Two Breaker Maintenance Bypass**—This switchboard provides make-before-break maintenance bypass. It includes: Maintenance Bypass Breaker (MBB) and Maintenance Isolation Breaker (MIB).
- **Load Bus Synchronization**—The Load Bus Sync (LBS) option keeps two or more independent UPS systems (and therefore their critical load buses) in sync, even when the modules are operating on DC source or asynchronous AC sources. This means that critical loads connected to both load buses can switch seamlessly between the two.
- **Customer Alarm Interface**—This optional interface board allows the input and display of eight alarms from customer-supplied contacts, each with a customer-selected name.
- **Temperature-Compensated Charging**—When the battery temperature exceeds a preset limit (typically 77°F [25°C]), this optional circuit proportionally reduces float charging voltage to prevent overcharging the battery.
- **Battery Load Testing**—When activated, this option forces the battery string to assume the load for a short period of time. The UPS then compares the test results to data collected during the UPS commissioning to see if the battery system appears to meet specifications.

2.0 OPERATION

The Liebert NXL UPS is equipped with a microprocessor-based display touchscreen designed for convenient and reliable operation. The display is driven by an easy-to-follow, menu-prompted software.

2.1 Features

The Liebert NXL interface display enables the operator to perform such tasks as:

- Quickly check operational status
- Monitor the power flow through the UPS system and all meter readings
- Execute operational procedures
- Check status reports and history files
- Adjustment programmable parameters (access limited by security access function)
- Adjustment output voltage before performing a manual load transfer.

The touchscreen is a white-background display with multicolor text. The display turns on automatically, but after 15 minutes of inactivity the backlight will go out and the display will appear very dim. Touching the screen will reactivate the backlight; the backlight will again be active for 15 minutes. If any screen other than the mimic screen is accessed, that screen will be displayed for 5 minutes without any interaction. If there is no activity for 5 minutes, the display will revert to the basic mimic screen.

Figure 2 Main component locations—250 to 400kVA

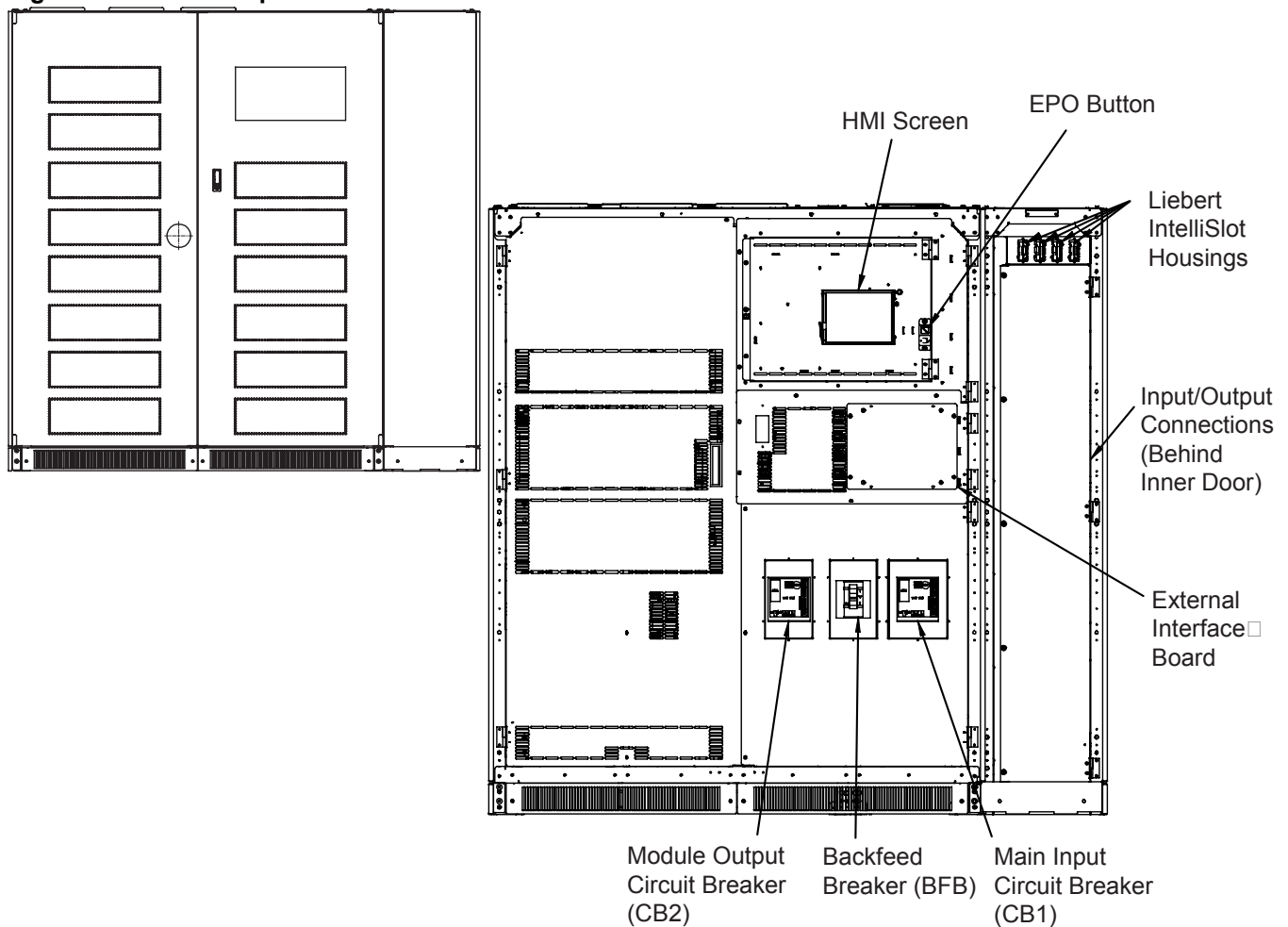
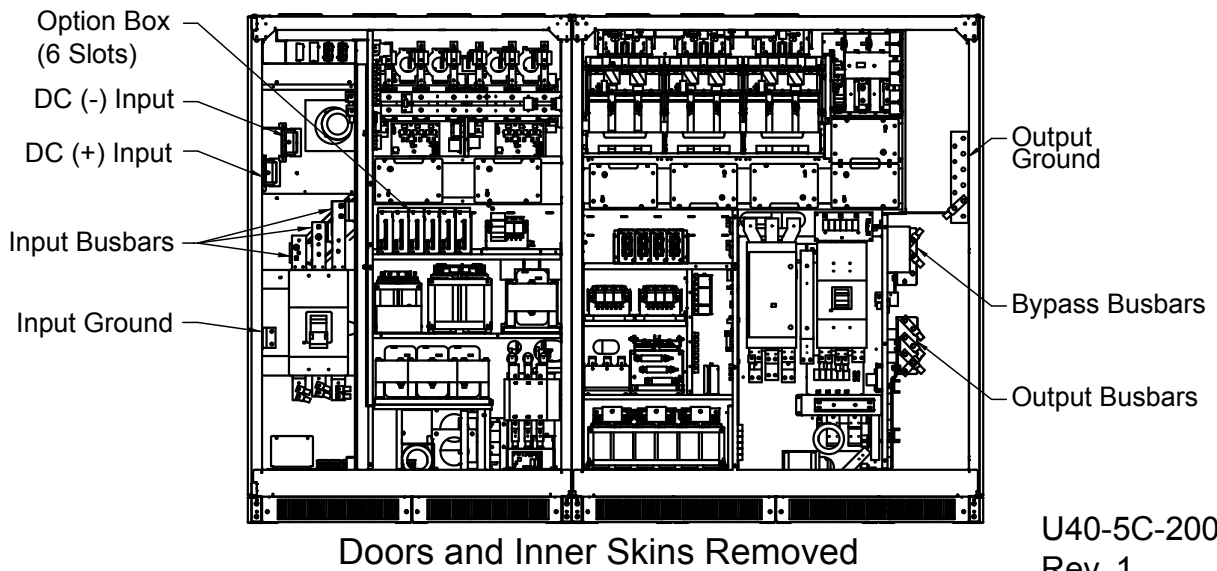
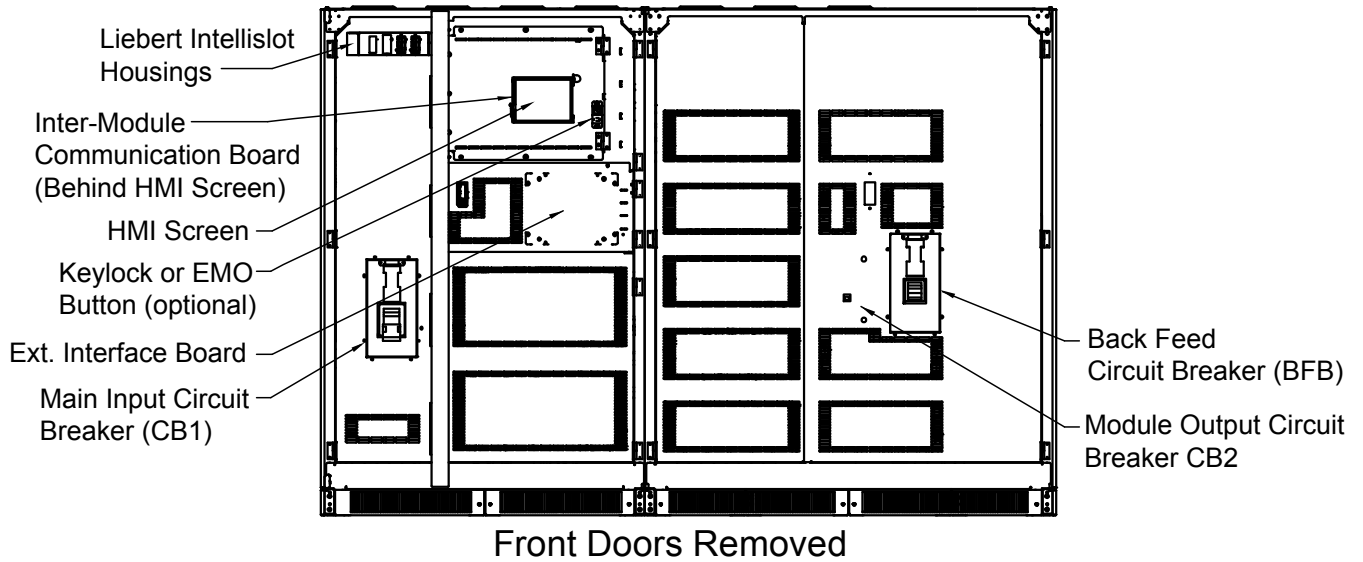


Figure 3 Main component locations—500kVA



U40-5C-2000
Rev. 1

Figure 4 Main component locations—750kVA with Static Bypass

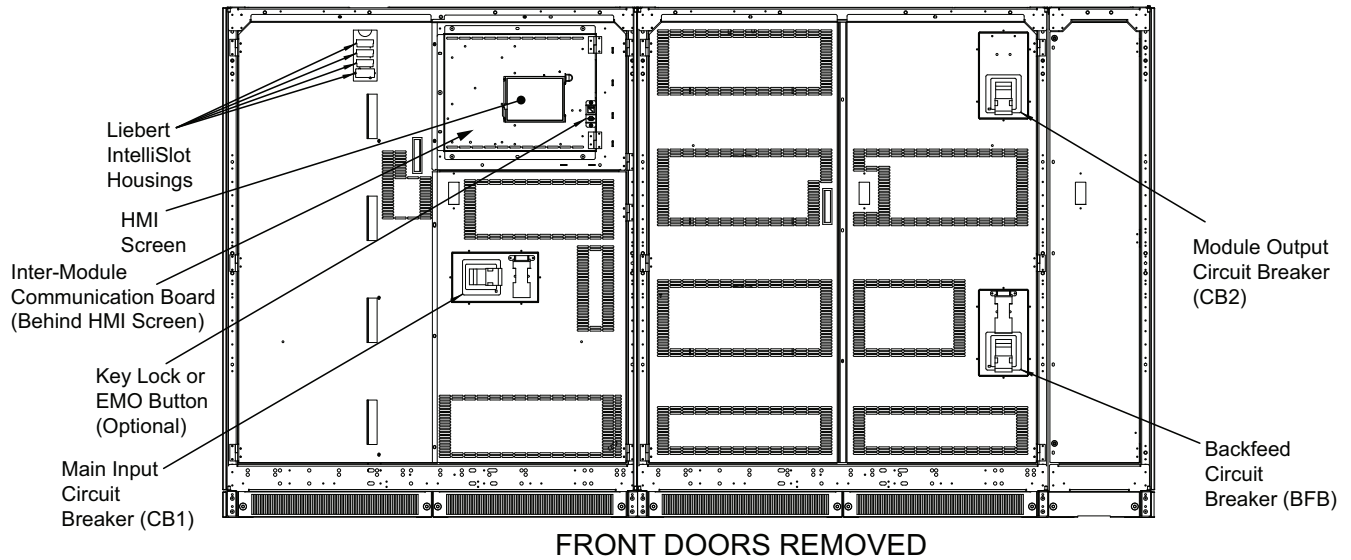


Figure 5 Main component locations—750kVA without Static Bypass

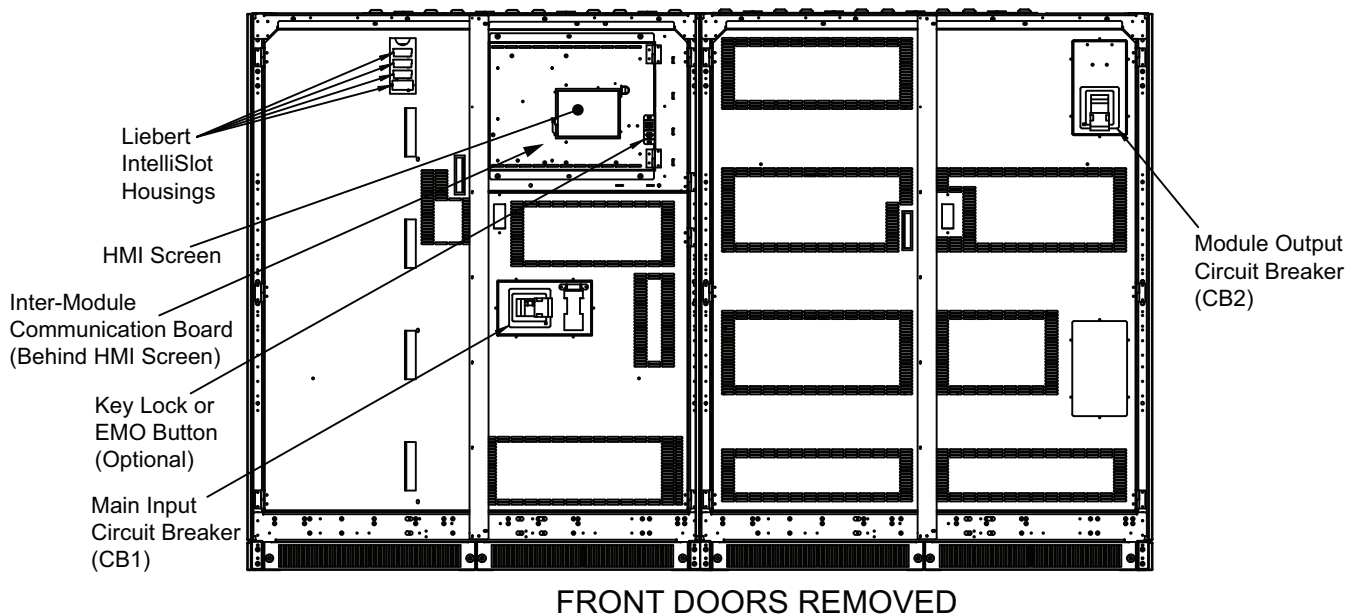


Figure 6 Main Display Screen, typical

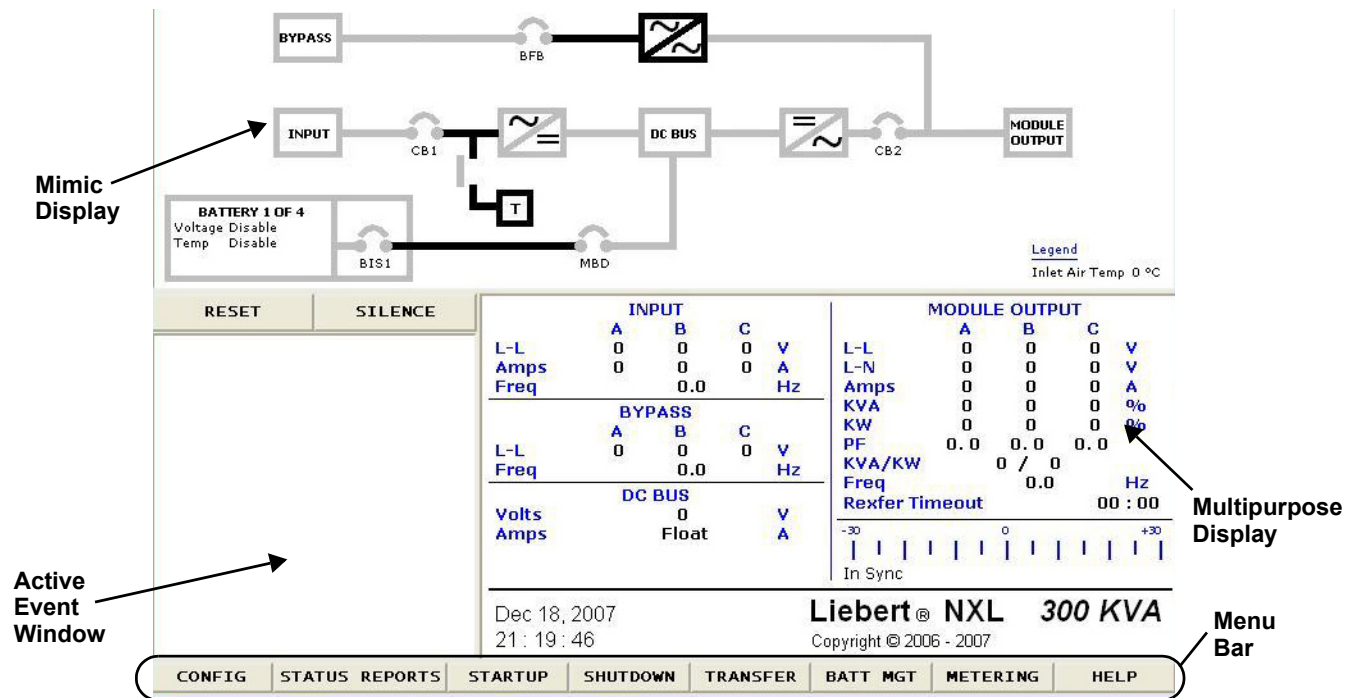
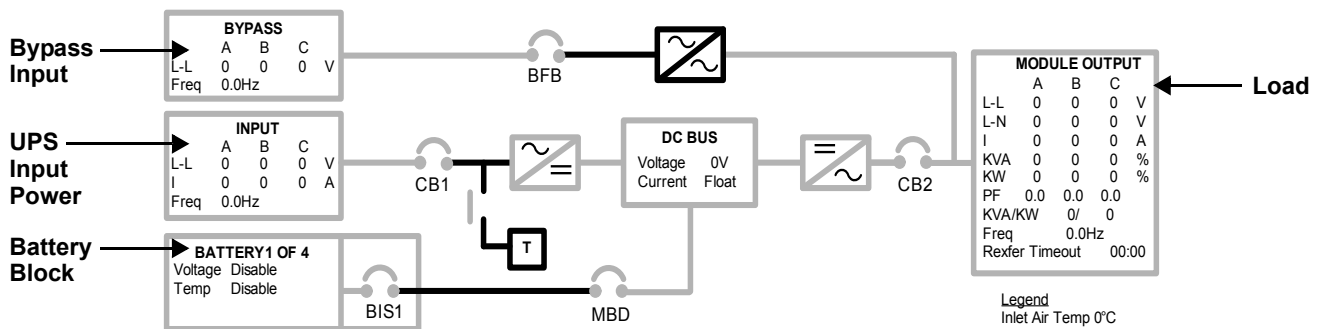


Figure 7 Mimic display



Bypass Input—Displays the bypass input voltage and the bypass input frequency. The bypass circuit breaker (BFB) is to the right of this block. The circuit breaker status is shown as open or closed.

NOTE
This Bypass Input information does not apply to N+1 Multi-Module systems

UPS Input Power—Displays the UPS input voltage, current and frequency. The input circuit breaker (CB1) is to the right of this block. The circuit breaker status is shown as open or closed.

Battery Block—Displays the DC source voltage and the charge or discharge current to or from the DC source. Pressing this icon switches among the connected DC sources. The Module Battery Disconnect (MBD) is to the right of this block. The circuit breaker status is shown as open or closed.

DC Bus—Displays the DC Bus voltage and the state of the charger.

Load—Displays the output line voltage, phase voltage, current, kVA, kW, power factor and frequency. The critical load current per phase is also displayed in this block. During an overload, the time remaining before transfer is displayed at the bottom of the load box. After an overload transfer, retransfer timeout is displayed at the bottom of the load box.

Figure 8 Monitor/mimic display example: Normal power flow

Green – Normal
 Orange – Marginal
 Gray – Absent
 Black – Unknown

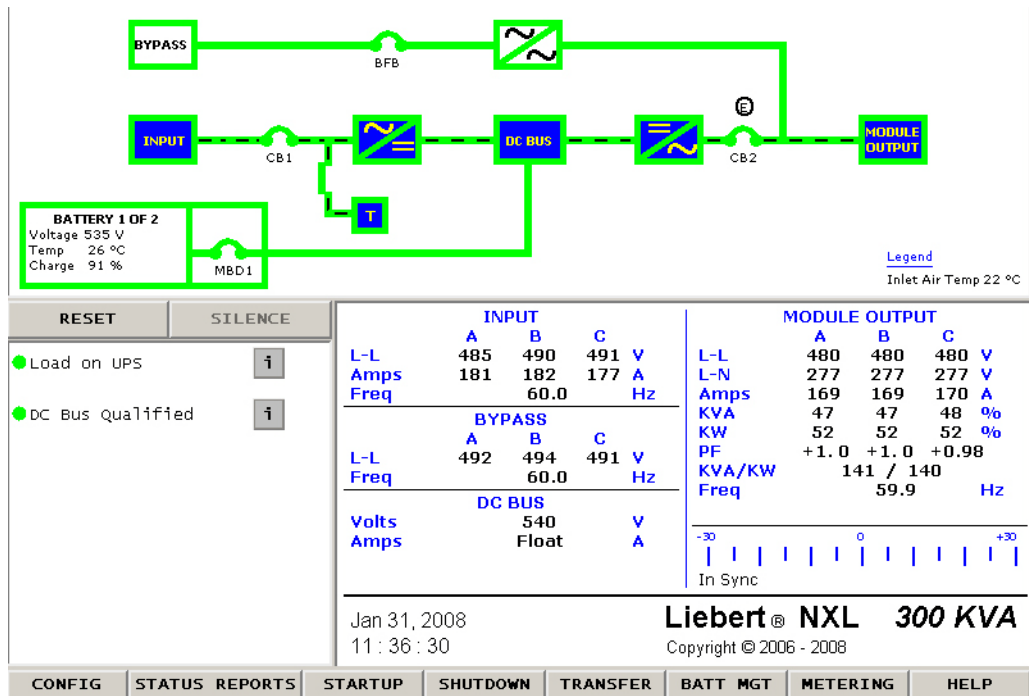


Figure 9 Monitor/mimic display example: Utility fail

Green – Normal
 Orange – Marginal
 Gray – Absent
 Black – Unknown

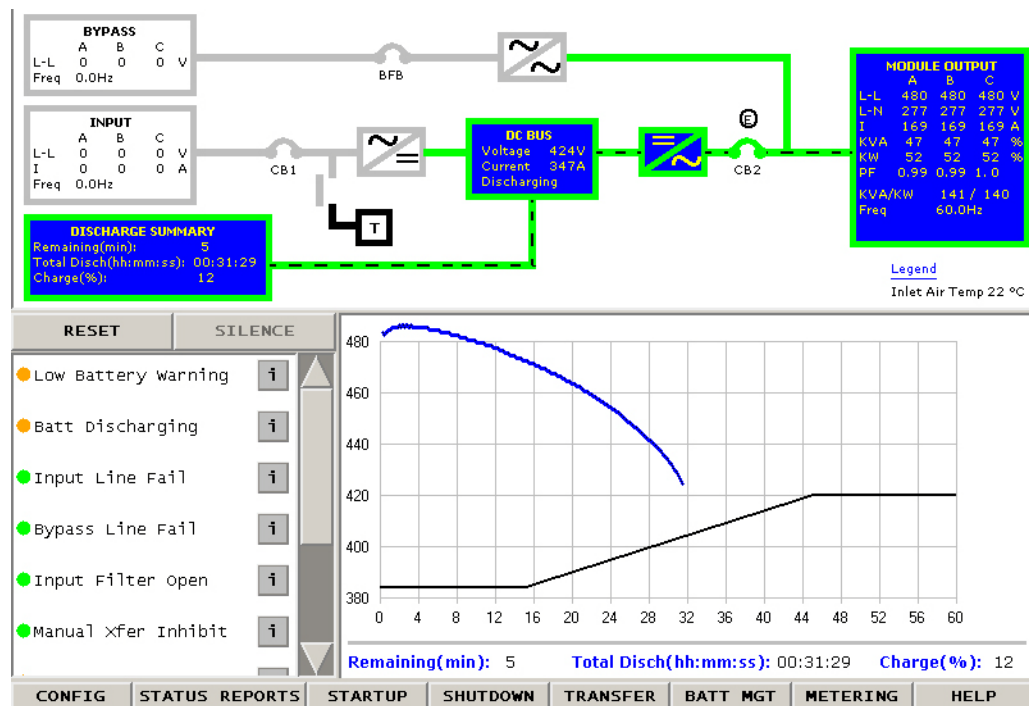


Figure 10 Monitor/mimic display example: load on bypass, UPS On

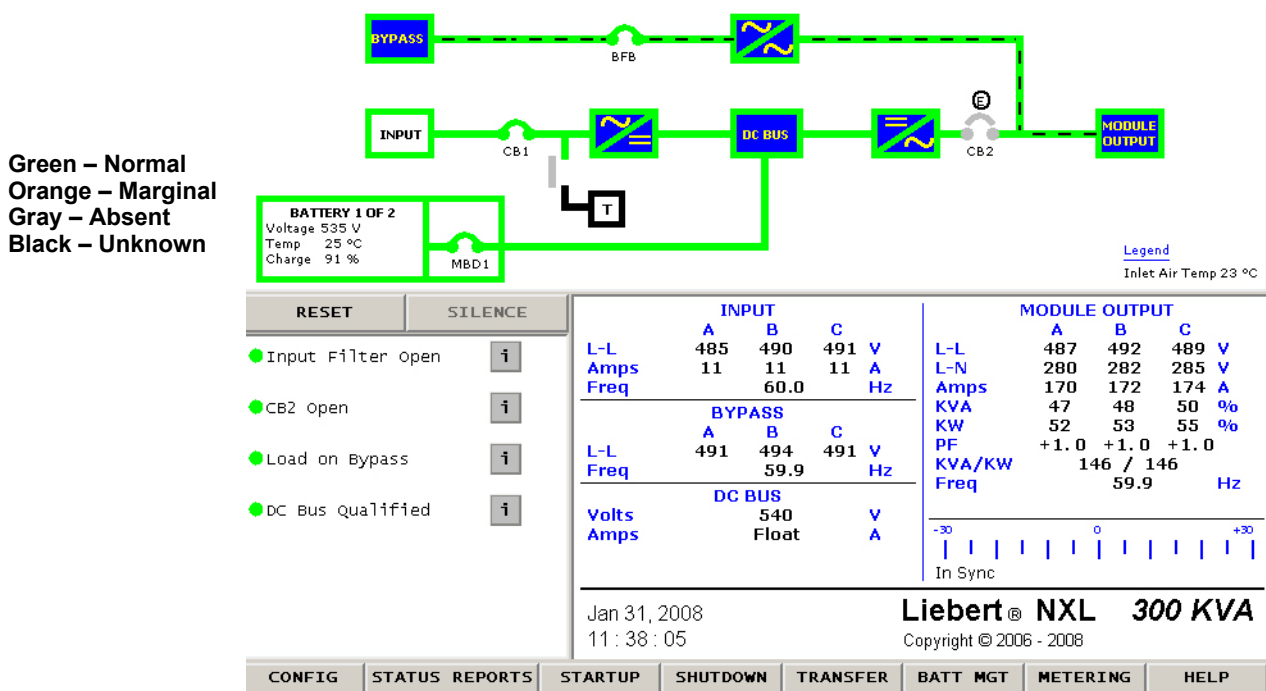
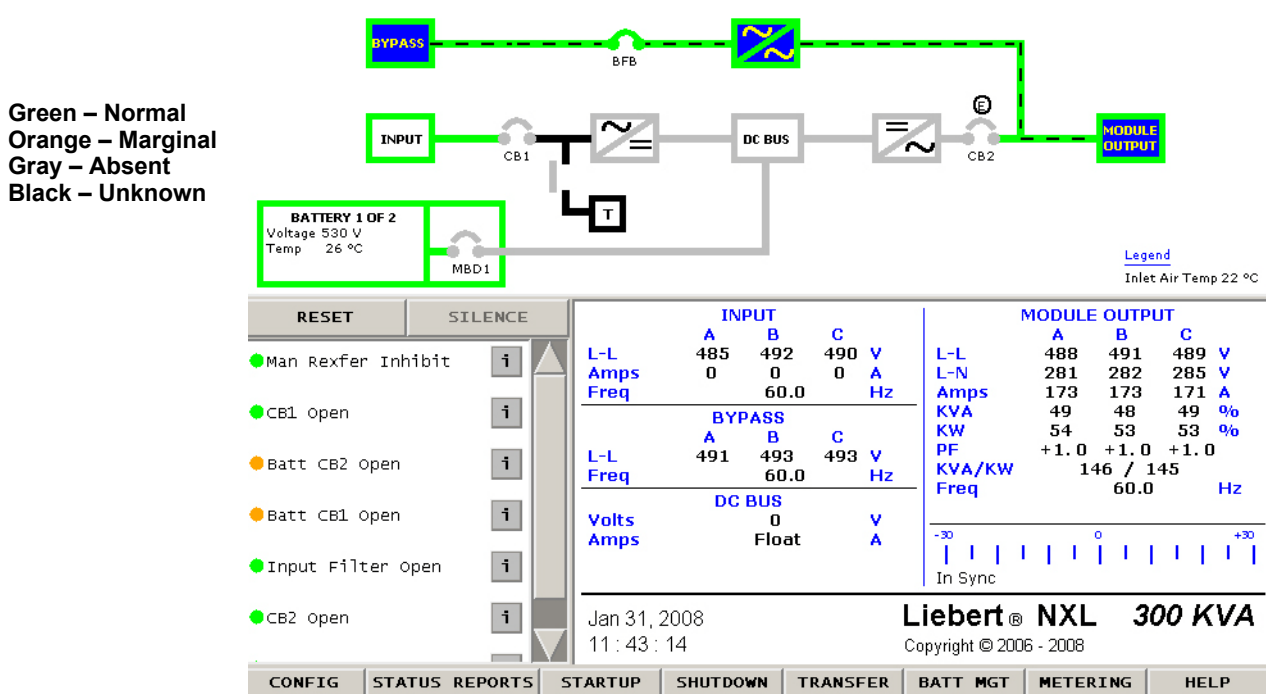


Figure 11 Monitor/mimic display example: load on bypass, UPS module Off



2.2 Touchscreen Navigation

2.2.1 Main Display Screen

Several menu items can be accessed from the main display screen (see **Figure 6**). These menu items are detailed in subsequent sections.

2.2.2 Configurations Menu

Rating

This menu item will display a popup showing the following parameters (see **Figure 12**). These parameters are entered during commissioning when the UPS is installed.

- Nominal Input Voltage
- Nominal Bypass Voltage
- Nominal Output Voltage
- Nominal Source Frequency
- Nominal Output Frequency
- Nominal Cell Count
- Output kVA
- Output KW
- Configuration Type
- Rectifier Type
- Input Isolation Transformer
- Unit Model
- Unit Serial
- Maintenance Bypass Model
- Maintenance Bypass Serial
- Battery Cabinet Model
- Battery Cabinet Serial
- Order Number 1
- Order Number 2
- Service Telephone Number
- Site ID Number
- Tag Number

Figure 12 Rating Parameters

The figure consists of two side-by-side screenshots of a touchscreen interface for entering rating parameters. The left screenshot shows a list of parameters with their corresponding input fields. The right screenshot shows a similar list of parameters, with some fields already populated with text.

Parameter	Value
Nominal Input Voltage	480
Nominal Bypass Voltage	480
Nominal Output Voltage	480
Nominal Source Frequency	60.0
Nominal Output Frequency	60.0
Nominal Cell Count	240
Output KVA	300
Output KW	270
Configuration Type	SMS 44
Rectifier Type	6P, F
Input Isolation Transformer	No
Unit Model	40sa300aaaac
Unit Serial	
Maintenance Bypass Model	
Maintenance Bypass Serial	
Battery Cabinet Model	
Battery Cabinet Serial	
Order Number 1	
Order Number 2	
Service Telephone Number	
Site ID Number	
Tag Number	

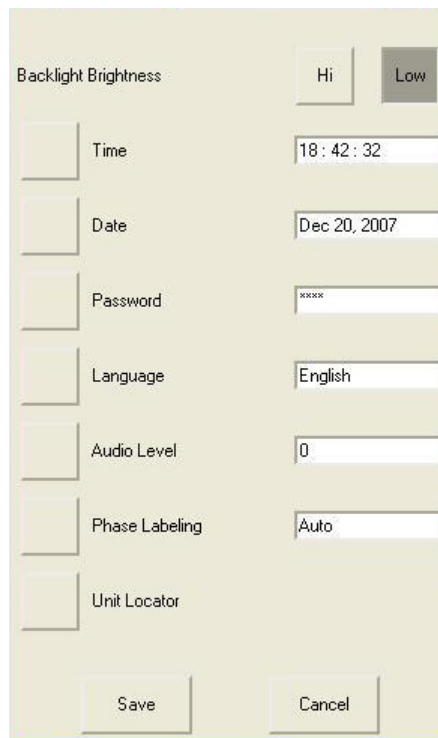
User Settings

System Settings

These display settings can be changed from the touchscreen. Press the box to the left of each parameter to bring a popup window that will allow the parameter to be changed.

- Backlight Brightness—High or Low (default: Low)
- Time (24hr format)—Adjust Hour, Minute or Seconds
- Date (MM DD, YYYY format)—Adjust Month, Day or Year
- Password – Reset the password (4 characters, alphanumeric, case-sensitive)
- Language—English, Chinese, *French*, *Spanish*, *German*, *Italian*, *Portuguese*
- Audio level—Range 1 to 10 (default: 5)
- Phase labeling—Auto, ABC, RST, XYZ, RYB, RWB, UVW, 123, L1L2L3 (default: Automatic)
- Unit Locator
 - Location ID—Alphanumeric
 - System Number—Alphanumeric
 - Module Label—Alphanumeric

Figure 13 System Settings parameters



The screenshot shows a System Settings popup window with the following parameters and values:

Parameter	Value
Backlight Brightness	Low
Time	18:42:32
Date	Dec 20, 2007
Password	****
Language	English
Audio Level	0
Phase Labeling	Auto
Unit Locator	

At the bottom of the window are two buttons: Save and Cancel.

Adjustable Setpoints

These warning and alarm settings can be changed from the touchscreen. Press the box to the left of each parameter to bring a popup window that will allow the parameter to be changed.

Max Load Alarm

- Phase A (%)—10% to 105% (default: 100%)
- Phase B (%)—10% to 105% (default: 100%)
- Phase C (%)—10% to 105% (default: 100%)
- Delay (second)—0 to 60 (default: 5 seconds)

Manual Xfer Bypass Voltage Limits

- Manual Xfer Bypass Voltage Low Limit (%)—1% to 20% (default: 5%)
- Manual Xfer Bypass Voltage High Limit (%)—1% to 15% (default: 5%)

Inlet Air Temp Warning

- Inlet Air Temp Warning—30°C to 40°C (default: 35°C)



NOTE

Temperature will display in both Celsius and Fahrenheit.

Figure 14 Adjustable setpoints parameters

Phase A (%) 0

Phase B (%) 0

Phase C (%) 0

Delay (seconds) 0

Save Cancel

Manual Xfer Bypass Voltage Low Limit (%) 0

Manual Xfer Bypass Voltage High Limit (%) 0

Save Cancel

Inlet Air Temp Warning 0 °C 32.0 °F

Save Cancel

Battery Management

These DC source settings can be changed from the touchscreen. Press the box to the left of each parameter to bring a popup window that will allow the parameter to be changed.

Battery Equalize

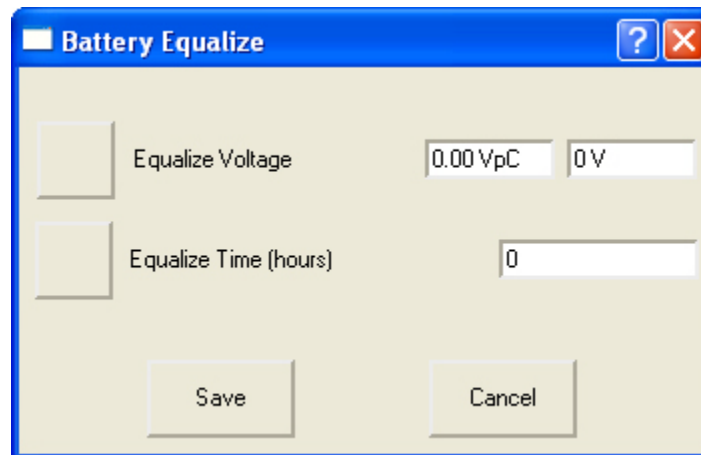
- Equalize Voltage, Vpc - 2.30 to 2.45 (default: 2.3)
- Equalize Time, hours - 0 to 200hours (default: 0)



NOTE

Battery Equalize must be enabled by service to be functional. If Battery Equalize is disabled, the feature will not be available and the menu item will not be displayed.

Figure 15 Battery Equalize settings



Battery Test

- Auto Test—Enable/Disable (default: disabled)
- Test Cycle, weeks—1 to 26 (default: 13 weeks)
- Time of day, hh:mm—Set Hour and Minute; sets the start time of the automatic battery test
- Start Date, mm dd, yyyy—Set Month, Day and Year
- Test Duration, minutes—0.5 minute to 30% of full load Operating Time (default: 0.5 minute)
- Minimum Battery Voltage, lead-acid only—1.75VPC to 1.95VPC (default: 1.75VPC); this is the minimum voltage the battery test will stop.

Low Battery Warning Time

- Low Battery Warning Time, minutes—2 to 60, depending on configured batteries (default: 5 minutes)

Battery Temperature

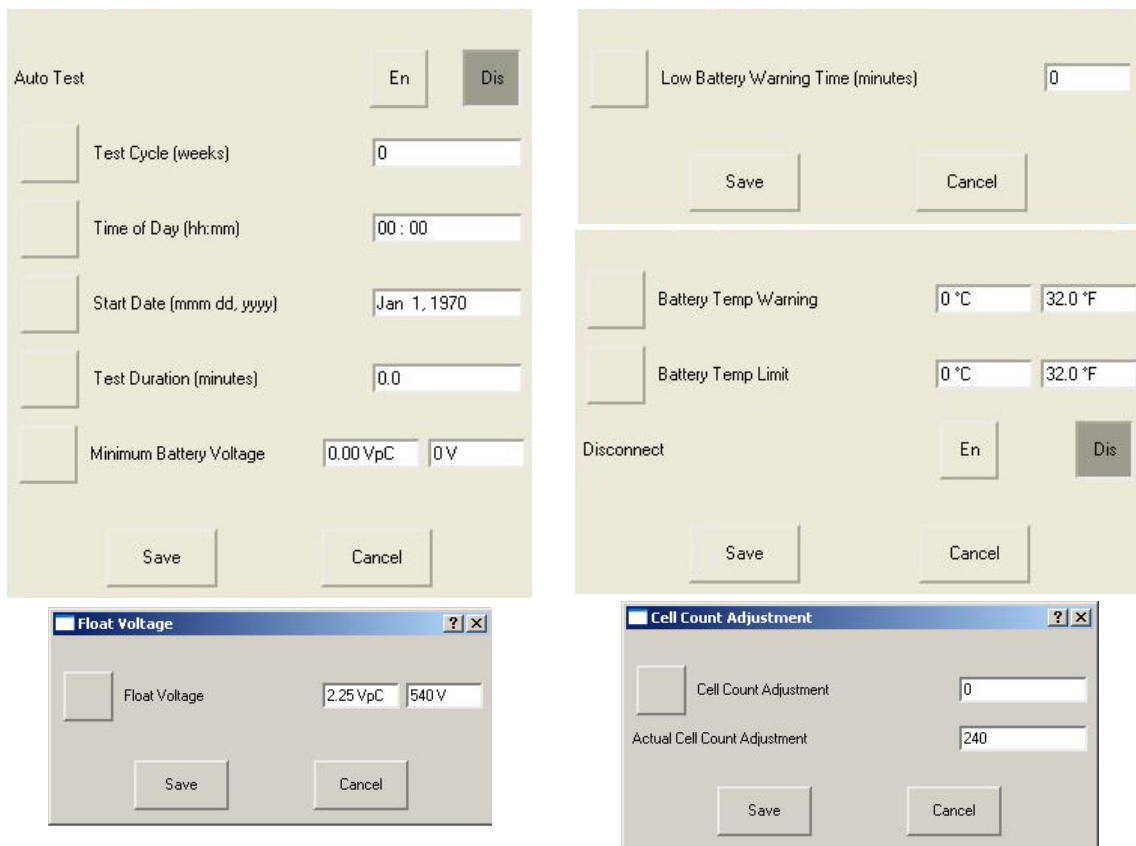
- Battery Temp Warning—30°C to 50°C (default: 40°C)
- Battery Temp Limit—35°C to 60°C (default: 50°C)
- Disconnect—Enable/Disable (default: disabled)



NOTE

If Disconnect is set to Enable and the Battery Temp Limit is met, the Battery breaker will open.

Figure 16 Battery Management Parameters



Cell Count Adjustment

- Cell Count Adjustment— -12 cells to 0 cells (default: 0)

Float Voltage

- Battery Float Voltage, Vpc—2.15 to 2.3 (default: 2.25)

2.3 Event Management

This menu item permits changing how the Liebert NXL handles Alarms, Faults and Status information. Each event can be configured for the following:

- Latch (yes/no)—Event stays active in the event window, even if the fault condition has been cleared, until user acknowledges it by pressing the “Reset” button.
- Audible (yes/no)—Will set Audible alarm when event occurs
- Event log (yes/no)—Will display event in Event log when it occurs



NOTE

You must press “Save” for changes to take effect.

See **Table 10** for a list of alarms, fault and status messages.

Figure 17 Typical Event Management Parameters

Status	Latch	Audible	Event Log
Batt Equalizing	No	No	No
Batt Self Test	No	No	No
Batt Test Inhibit	No	No	No
Batt Test Passed	No	No	No
LBS Operating	No	No	No
Load on Bypass	No	No	No

Alarms Faults **Status** Save Cancel

2.4 Status Reports Menu

This menu accesses the events records.

- **Event Log**—Up to 2048 time/date stamped events are captured in the log. The oldest record will be overwritten with a new record once the buffer reaches 2048 events.
- **System Status**
 - Total Operating Hours—Total number hours the UPS has been operational

2.5 Startup Menu

This menu is used to start the UPS and individual devices.

Manual—This will begin the UPS startup. See **2.15 - Manual Operations—All Systems** for details.

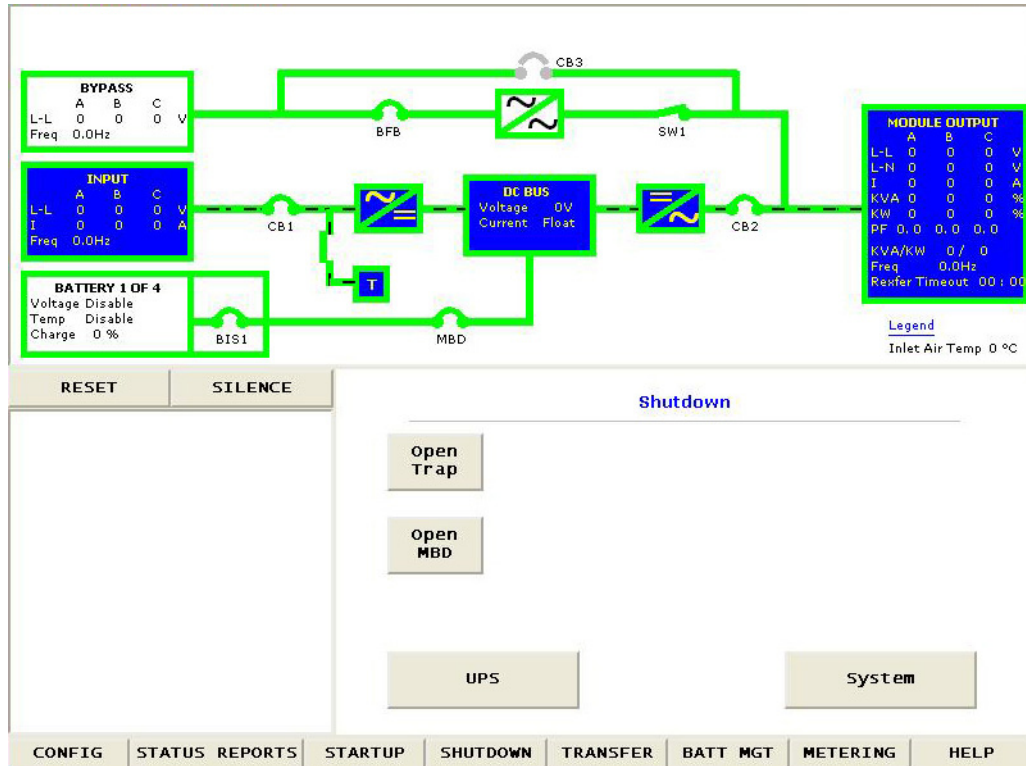
Devices

- Close Trap—This will start the Input filter, if installed
- Close MBD/BCB—If the MBD is motor-operated, the Close command will enable and energize the motor to close. If the MBD is not motorized, the Close command will enable the breaker UVR. The MBD/BCB must be closed manually. If no MBD is selected, this setting is not displayed.

2.6 Shutdown Menu

This menu permits shutting down the UPS and individual devices. See 2.15 - Manual Operations—All Systems for details.

Figure 18 Shutdown menu



Open Trap—Open the input trap filter

Open MBD/BCB—Opens the associated MBD or BCB breaker

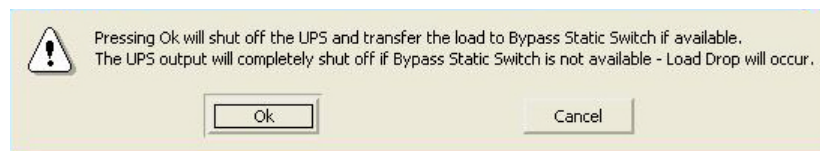
UPS—Turns off inverter, rectifier and trips all DC source breakers. Transfers to bypass, if available.



NOTE

The following popup window is displayed when the UPS is about to be shut down. To shut down the UPS, an operator must press OK.

Figure 19 UPS shutdown popup

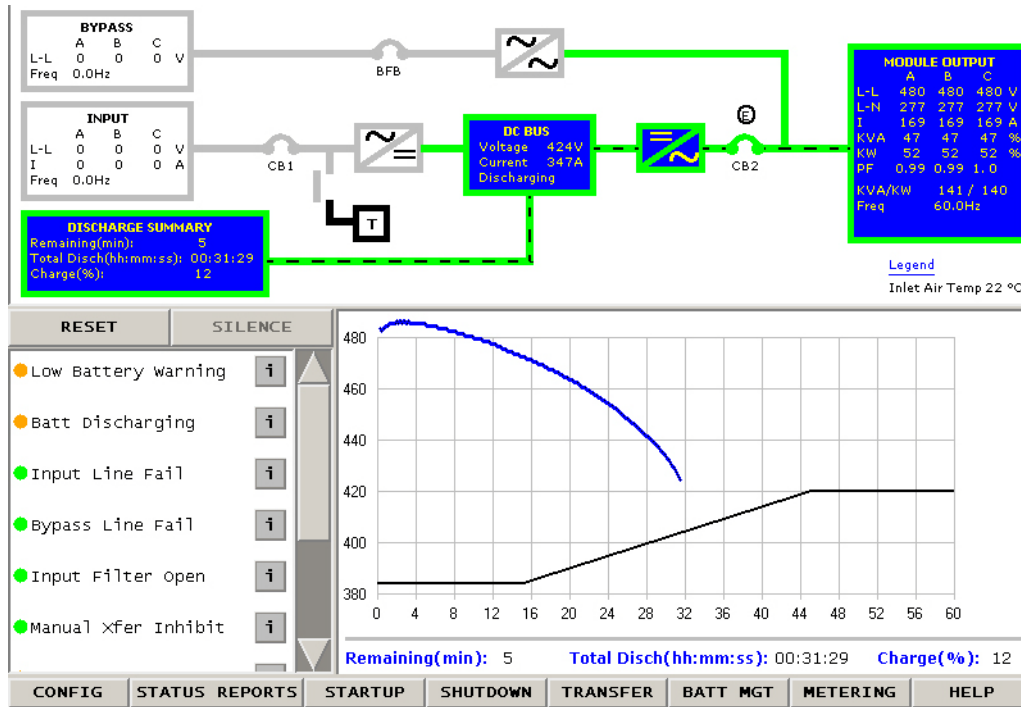


2.8 Battery Management Menu

This menu permits configuring DC source settings.

Time Remaining Graph—Displays the time remaining graph in the multipurpose window; plot the DC source voltage against elapsed time during a Battery Discharge Cycle (see **Figure 22**).

Figure 22 Time remaining display



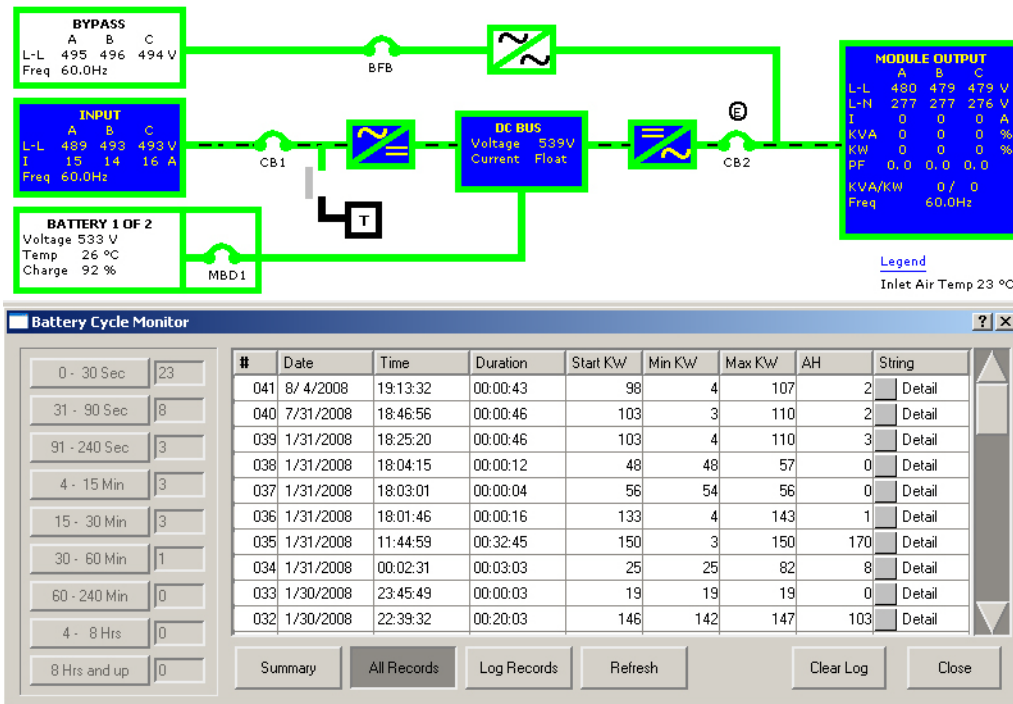
Manual Battery Test—Start/Stop

Manual Battery Equalize—Start/Stop; must be enabled by Liebert Services to be active

Battery Cycle Monitor—Displays how many discharges have occurred for these time periods: 0-30sec, 31-90sec, 91-240sec, 4-15min, 15-30min, 30-60min, 60-240min, 4-8hr, 8hr and up. Each discharge record will include: (see **Figure 23**)

- #
- Date
- Time
- Duration
- Start kW
- Min kW
- Max KW
- AH
- Start Temp °C
- End Temp °C
- Battery CB Start
- Battery CB End

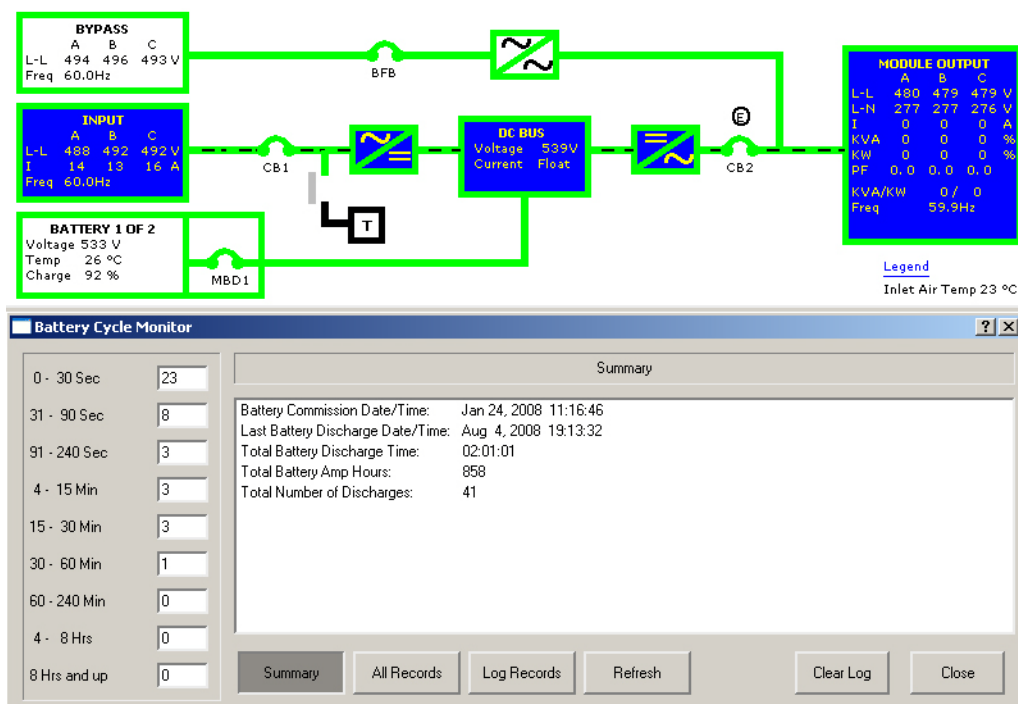
Figure 23 Battery cycle monitor



Display summary (see Figure 24)

- Battery Commission Date/Time
- Last Battery Discharge Date/Time
- Active Battery Discharge Time
- Active Battery Amp Hours
- Active Battery KW
- Total Number of Discharges

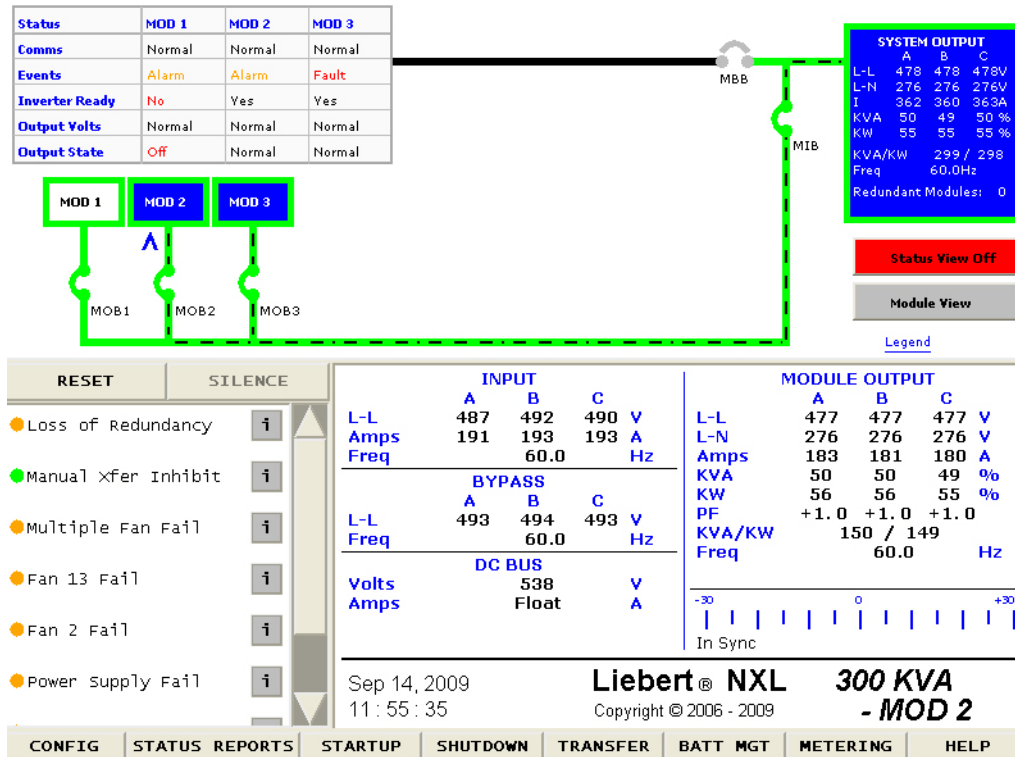
Figure 24 Battery cycle monitor summary



2.9 System View—1+N Systems Only

System View will display the status of each of the system breakers (MOB's, MIB, MBB). It will display the system output information including, voltage, current, kVA/kW, frequency and number of redundant modules in the system.

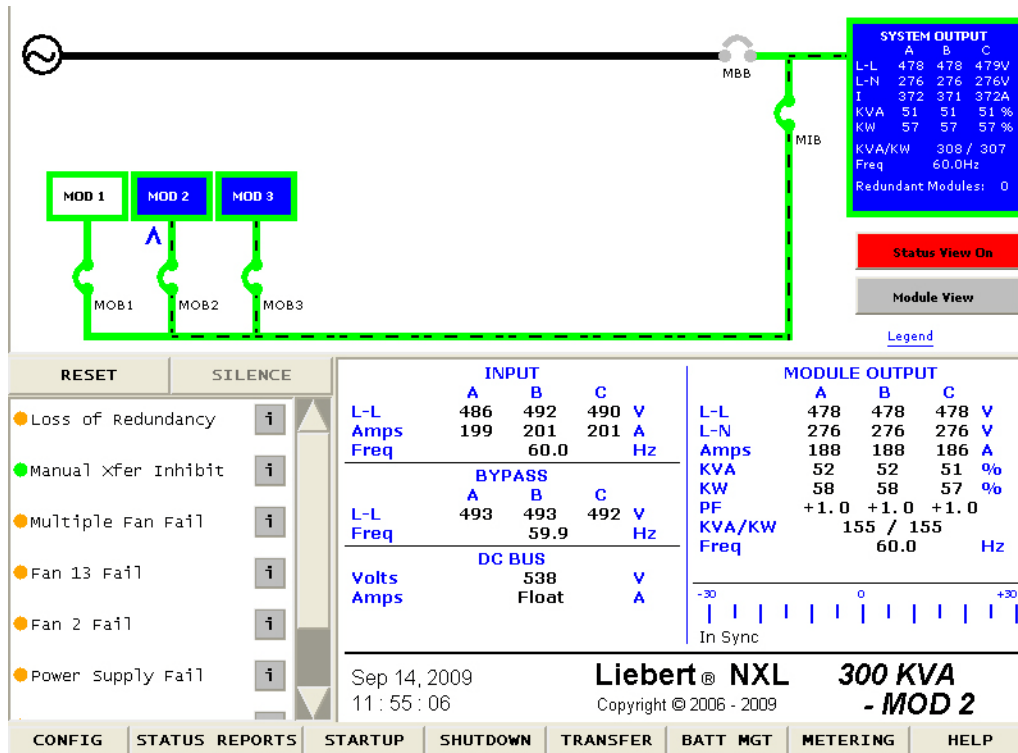
Figure 25 Status View - 1+N systems only



This button will show the following status of each module in the system:

- **Comms**
 - Normal—UPS connected to System Cabinet
 - Failed—UPS not communicating to System Cabinet
- **Events**
 - None—UPS has no active events
 - Alarms—UPS has an Alarm
 - Fault—UPS has Fault
- **Inverter Ready**
 - NO—UPS Inverter is off
 - Yes—UPS Inverter is ready to take load
- **Output Volts**
 - Normal (UPS Output voltage is OK)
 - Marginal (UPS Output Voltage is not OK)
 - Fail (UPS Output voltage is outside of range)
- **Output State**
 - Normal (UPS is in Normal Mode)
 - Off (UPS Inverter is off)

Figure 26 1+N status view



2.10 Metering

This button will place the metering tables in the multipurpose window.

2.11 Help

This button will display the help menu.

2.12 Reset

This button will reset any non-active latched events.

2.13 Silence

This button will silence the audible alarm.

2.14 Modes of Operation

This section illustrates the flow of power through circuit breakers, switches and UPS components during various modes of operation. The same modes of operation apply to all configurations of the Liebert NXL. Highlighted (thick) lines in the diagrams indicate power flow and power availability.

These illustrations do not show an alternate power source (generator) and automatic transfer switch (external to the UPS) that might be present at your installation.

2.14.1 Load on Bypass

Load on Bypass, with the UPS not available, is shown in **Figure 27**. The UPS system could be in this mode of operation during either initial startup or UPS system shutdown and isolation for maintenance.



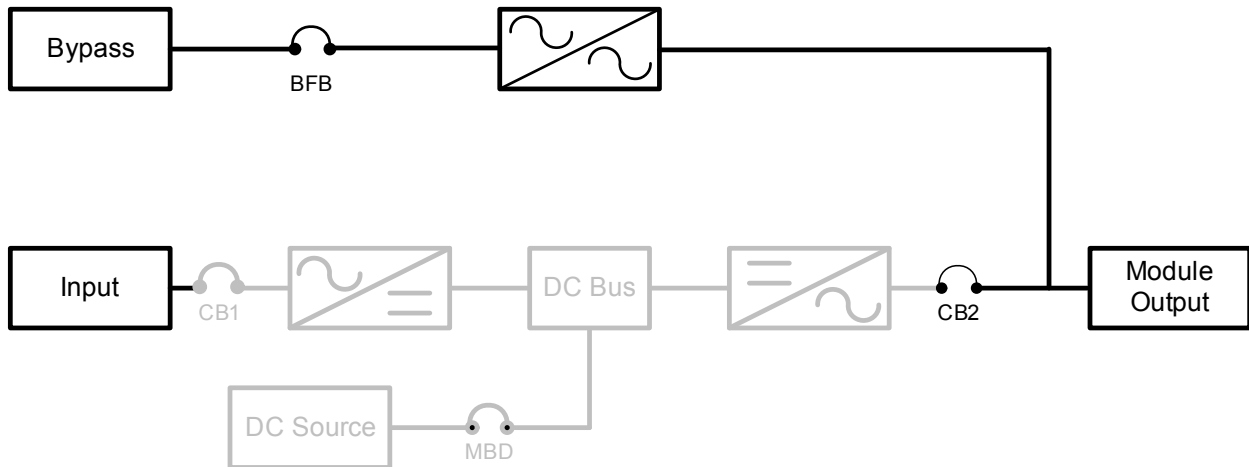
NOTE

The bypass modes of operation do not apply to N+1 multi-module systems.

NOTICE

Risk of equipment damage. When the critical load is being supplied power from the bypass line, it is exposed to utility failure and fluctuations.

Figure 27 Load on bypass (UPS not available)



2.14.2 OK to Transfer

The OK to Transfer status message will be displayed when the bypass line and UPS output power are both available, their voltage, frequency and phase synchronization are matched within specifications, and the Static Switch Disconnects are closed (ON). An alarm message may be displayed to indicate Load On Bypass (**Figure 28**). If no alarm is displayed, the operating status is Load On UPS (**Figure 29**).

When the OK to Transfer message is displayed, the load can be manually transferred from the UPS to bypass or the load can be manually retransferred from the bypass to the UPS.

To perform a manual transfer, Use the Load Transfer Procedures screen. Refer to **2.15.4 - Load Transfer and Retransfer—Single Module System**.

The UPS control logic will initiate an automatic transfer to bypass if an overload condition exceeds the system current versus time window or if a UPS fault is detected. The control logic may initiate an automatic retransfer to the UPS system when the system is recovering from overloads lasting less than five minutes. Refer to **2.16 - Automatic Operations**.

Figure 28 Load on bypass, UPS available

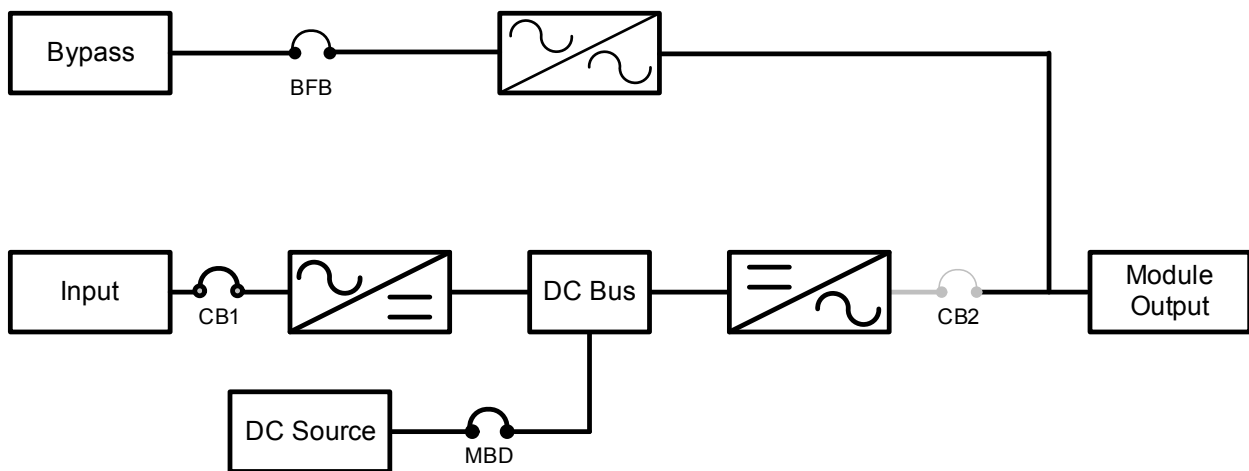
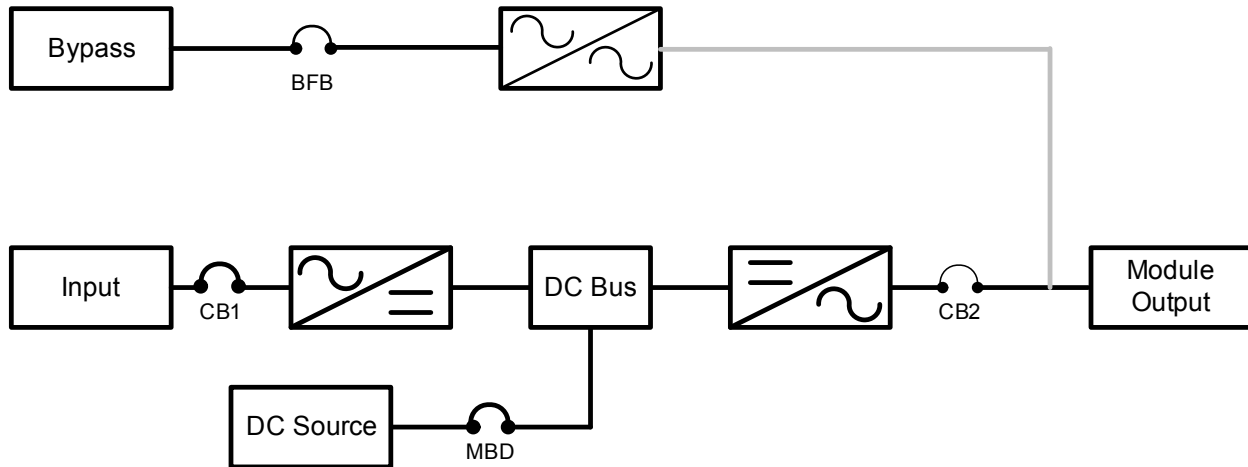


Figure 29 Load on UPS, bypass available



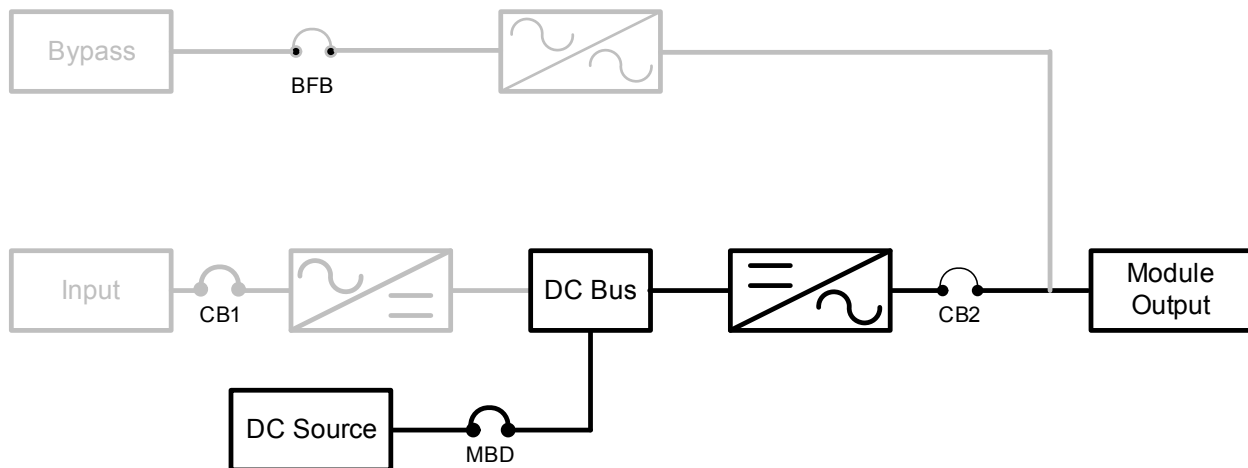
2.14.3 Input Power Failure—Load on DC Source

If the utility AC power source fails or is outside the acceptable range, the DC source becomes the power source for the UPS module inverters. The UPS continues to supply power to the critical load and also to the UPS controls.

Use the Battery Time screen at the UPS modules to monitor the present DC source voltage compared to the shutdown value. The time the DC source can sustain the load depends on the size of the load and the size and condition of the DC source.

Alarm messages that indicate DC source status are Battery Discharge, Low Battery and Battery Shutdown. The voltage limits for these alarms are displayed on the UPS module Alarm Limit Settings screen. These limits were selected for your installation by Liebert Services during initial startup. The battery block in the UPS module Monitor/Mimic Display indicates Charge or Discharge and the current in amperes.

Figure 30 Input power fail, load on DC source



2.14.4 Off DC Source

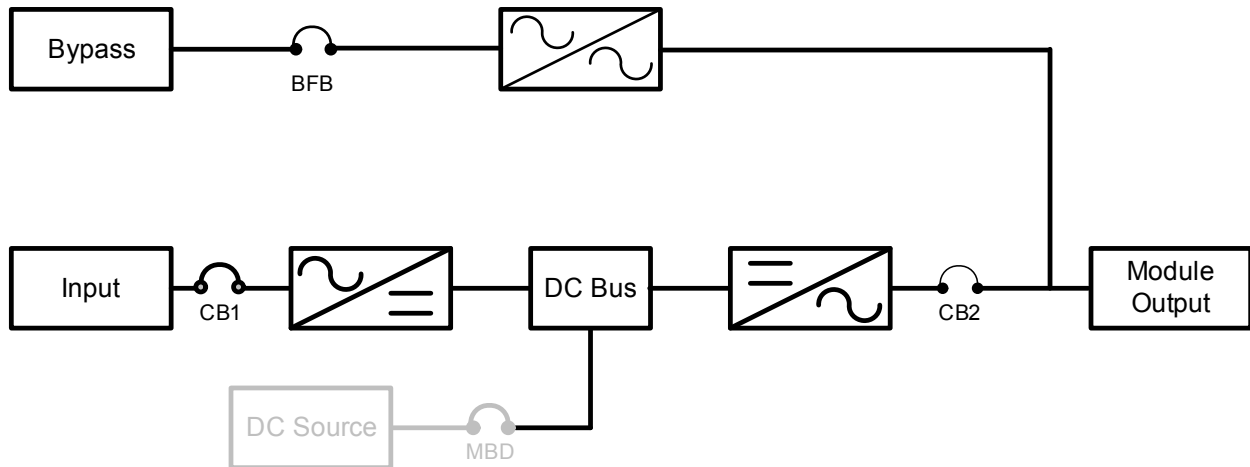
The DC source can be disconnected from the UPS, if required for maintenance, by opening the module battery disconnect (MBD) circuit breaker. In this situation the UPS module will continue to supply conditioned power to the critical load, but if input power fails the UPS system cannot supply power to the load.



CAUTION

When the UPS system is operating with the module battery disconnect (MBD) circuit breaker(s) open, the critical load is not protected from loss of the utility source power.

Figure 31 Load on UPS, DC source not available



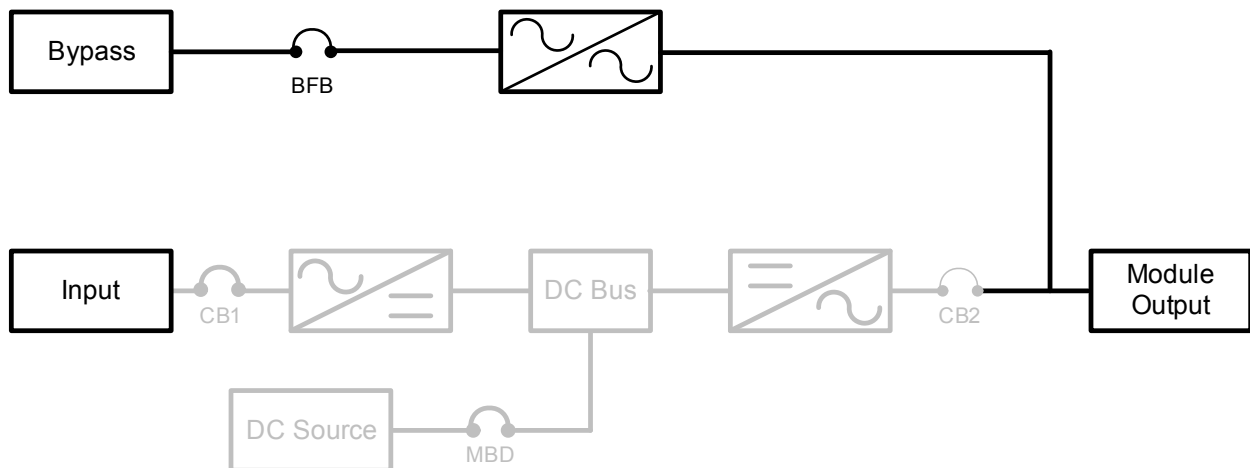
2.14.5 Emergency Module Off (Optional)

The Emergency Module Off (EMO) mode will transfer the critical load to the bypass line and remove power from all UPS module components except the controls, bypass circuit breaker and the static switch.

If installed, the Emergency Module Off control is a guarded pad next to the display touchscreen (Figures 2, 4 and 5).

Lift the cover and press the pad. The load will be transferred to bypass, and the DC source (MBD), input and output circuit breakers will be opened (tripped). Refer to 2.15.13 - Shutdown—Single Module UPS System.

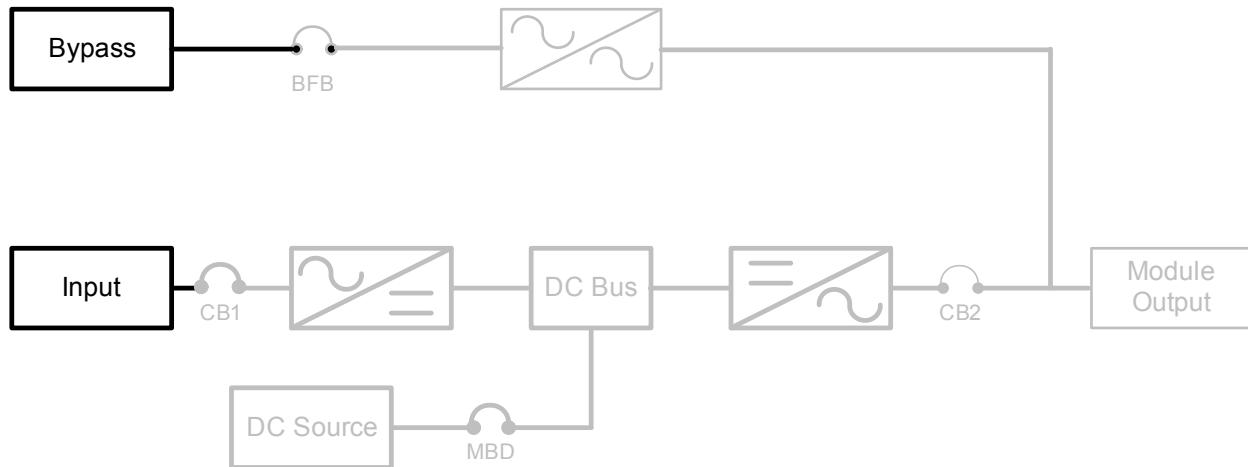
Figure 32 Emergency modules off



2.14.6 Remote Emergency Power Off

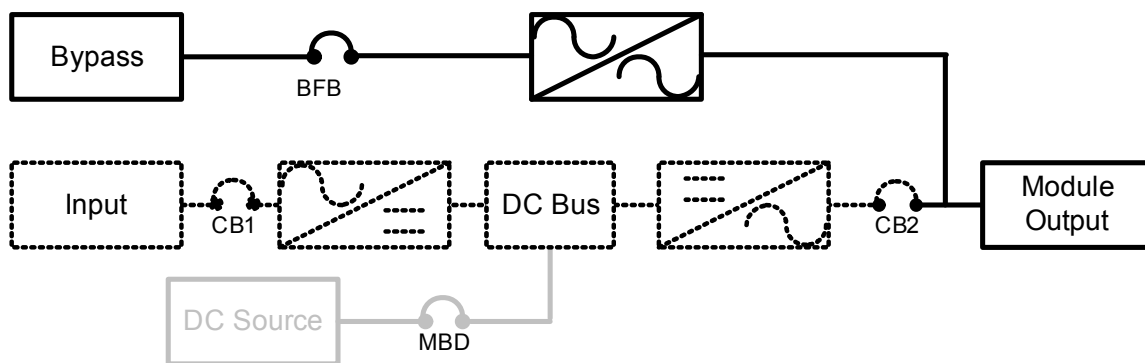
The Remote Emergency Power Off control is a user-provided switch located remotely from the UPS system. It usually is installed in the same room as the critical load equipment. This mode can also be initiated by an automatic contact closure in the same external circuit as the manually operated switch.

When the Remote Emergency Power Off switch is operated, all UPS circuit breakers are opened, including the bypass circuit breaker. All power through the UPS is removed from the load. Typically, the REPO circuit also opens the circuit breakers that provide power to the bypass lines and the UPS controls. Refer to 2.15.13 - Shutdown—Single Module UPS System.

Figure 33 Remote emergency power off

2.14.7 ECO Mode

When ECO Mode is active, the critical load is supported by the bypass source. The rectifier is On and providing power to the DC source for charging. The inverter is on standby, available to provide power to the critical load if a fault occurs on the bypass line. See **Figure 24**.

Figure 34 ECO Mode power flow

2.15 Manual Operations—All Systems

The Liebert NXL UPS is designed to function while unattended by an operator. The system control logic automatically handles many important functions, as explained in **2.16 - Automatic Operations**. Other procedures must be performed manually.

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

This section lists typical step-by-step instructions. The touchscreen will list all steps required for the process, based on the unit's condition 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 shutdowns for maintenance and emergency shutdowns.



NOTE

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

2.15.1 Startup—Single Module System

This section lists typical step-by-step instructions. The touchscreen will list all steps required for the process, based on the unit's condition and other factors.

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.

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 Monitor/Mimic Display 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. To clear these alarm messages, turn Off control power (see **Figures 2, 4 and 5**). 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 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 system doors are closed and latched. All test equipment must be removed from the system. All electrical connections must be secure.

1. Before applying power to the UPS modules, determine the position of the following circuit breakers and switches:
 - **Input Circuit Breaker (CB1)**—Verify that this breaker on the front of the UPS cabinet (**Figures 2, 4 and 5**) is in the open position.
 - **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 (BFB)**—This circuit breaker (**Figures 2, 4 and 5**) should be open.



NOTE

If power to the critical load is already supplied through this breaker, keep this breaker closed.

- **Output Circuit Breaker (CB2)**—This motorized circuit breaker (**Figures 2, 4 and 5**) should be open.
2. Provide power to the UPS controls of all UPS modules starting up to permit the display touchscreen and system logic to function properly.
 - a. Close the Bypass Input Breaker (BIB). This breaker is external to the UPS; it may be in the Maintenance Bypass Cabinet. The display touchscreen should start.
 - b. Close the Rectifier Feed Breaker (RFB). This breaker is external to the UPS; it may be in the Maintenance Bypass Cabinet.
 3. Start the module:
 - a. Press the “Start-Up” then “Manual Start” menu buttons (see **Figure 35**). The message “Close BFB” will appear in the multipurpose window.
 - b. Close the BFB breaker (see **Figures 2, 4 and 5**). The message “Press OK to issue BPSS On Command” will appear.

- c. Press OK to continue. This will energize the load on the UPS internal bypass. The message “Close CB1” will appear.
- d. Close CB1 (see **Figures 2, 4 and 5**). The “Press OK to Issue Rectifier On Command” message will appear.
- e. Press “OK.” This will start the UPS’s rectifier. Load is still on internal bypass. The message “Press OK to Issue Inverter On Command” will appear.
- f. Press “OK.” The rectifier will be On and the Inverter will be on standby. Load is still on internal bypass. The message “Press OK to Issue MBD Enable Command” will appear.
- g. Press “OK.”
- h. Close all battery/DC breakers. The UPS will stay in this mode until all breakers are closed. If the DC sources are not ready to be started up, skip this command. The DC breakers can be closed individually from the startup command at a later time (see **2.5 - Startup Menu**).



NOTE

The DC source charge current may increase quickly, but should slowly decrease. If the system is recovering from a DC source shutdown or an input power failure, the UPS rectifier will be recharging the DC source. Recharge current can be more than 100A. The maximum allowable recharge current for any unit depends on the kVA rating and the DC source recharge current limit.

The message “Press OK to Issue Transfer Command” will appear.

- i. Press “OK.” The load is now energized from the UPS inverter.

NOTICE

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

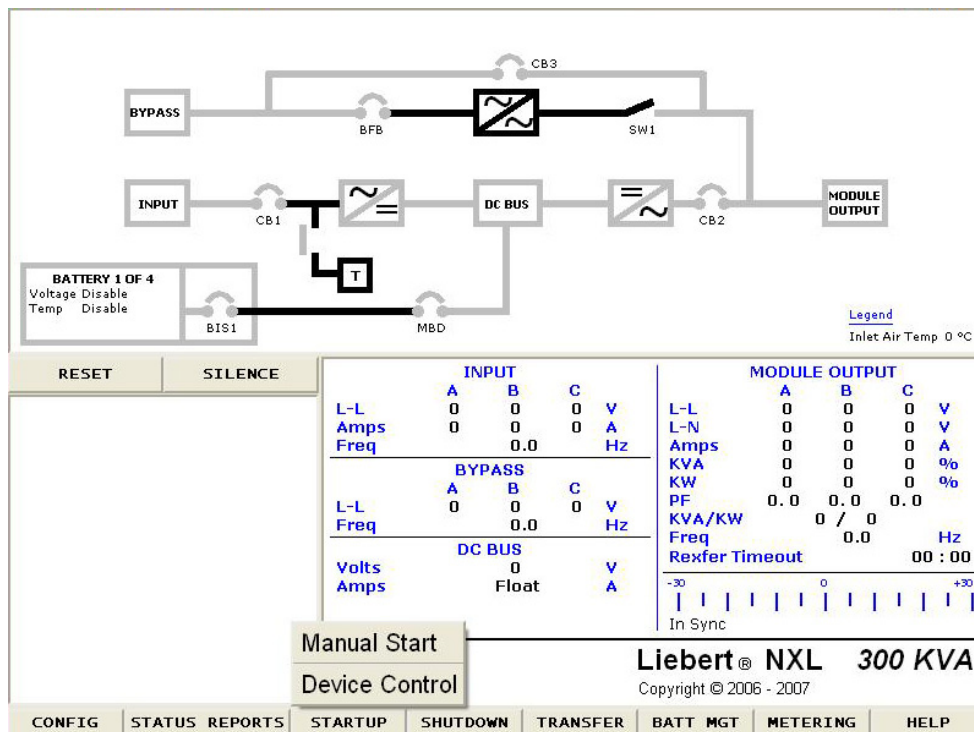


WARNING

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 manufacturer’s manual, available on the manufacturer’s Web site, for specific information about equalize charging.

Figure 35 Startup commands



2.15.2 Startup—N+1 System

The following instructions will start an individual UPS module. Repeat these steps for all the UPS units in the system that will be started.

This section lists typical step-by-step instructions. The touchscreen will list all steps required for the process, based on the unit's condition and other factors.



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 system doors are closed and latched. All test equipment must be removed from the system. All electrical connections must be secure



WARNING

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

The following procedure may provide power (with DC source available) to the critical load distribution system. Verify that the critical load distribution is ready to accept power. Ensure that personnel and equipment are ready for the critical load distribution system to be energized.

NOTICE

Risk of improper startup. May cause equipment damage.

These steps should be performed after the SCC startup has been initialized.

NOTICE

Risk of equipment damage. If an abnormal situation occurs during this startup procedure, open the input circuit breaker and investigate the problem. Call Liebert Services if help is needed.



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.

*To clear these alarm messages, turn Off control power (see **Figure 4**). Wait at least 10 minutes for the control power circuitry to completely de-energize. After 10 minutes, turn control power back On.*

1. Before applying power to the UPS modules, determine the position of the following circuit breakers and switches:
 - **Input Circuit Breaker (CB1)**—Verify that this breaker on the front of the UPS cabinet (**Figure 4**) is in the open position.
 - **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.
 - **Output Circuit Breaker (CB2)**—This motorized circuit breaker (**Figure 4**) should be open.
 - **Module Output Breaker (MOB)** Optional—This circuit breaker should be open. This breaker is external to UPS, possibly in the paralleling gear.
2. Close the Rectifier Feed Breaker (RFB). This breaker is external to UPS, possibly in the paralleling gear. The display touchscreen should start.
3. Close the MOB breaker, if present on the system.
4. Press the “Start-Up,” then the “Manual Start” menu button (see **Figure 35**). The “Close CB1” message will appear.
5. Close CB1 (see **Figure 4**). The “Press OK to Issue Rectifier On Command” message will appear.
6. Press “OK.” This will start the UPS’ rectifier. The message “Press OK to Issue Inverter On Command” will appear.
7. Press “OK.” The rectifier will be On and the Inverter will be on standby. The message “Press OK to Issue MBD Enable Command” will appear.
8. Press “OK.”

9. Close all Battery/DC breakers associated with this module. The UPS will stay in this mode until all breakers are closed.

Skip this command if the DC sources are not ready to be started. The DC breakers can be closed later from the startup command (see **2.5 - Startup Menu**).



NOTE

The DC source charge current may increase quickly, but should slowly decrease. If the system is recovering from a DC source shutdown or an input power failure, the UPS rectifier will be recharging the battery. Recharge current can be more than 100A. The maximum allowable recharge current for a unit depends on the kVA rating and the DC source recharge current limit.

The UPS is ready to be placed online. Go to the SCC Startup screen to complete the startup.

2.15.3 Startup—1+N System

This section lists typical step-by-step instructions. The touchscreen will list all steps required for the process, based on the unit's condition and other factors.



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 system doors are closed and latched. All test equipment must be removed from the system. All electrical connections must be secure.



WARNING

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

The following procedure may provide 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.

NOTICE

Risk of equipment damage. If an abnormal situation occurs during this startup procedure, open the input circuit breaker and investigate the problem. Call Liebert Services if help is needed.



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.

*To clear these alarm messages, turn Off control power (see **Figures 2, 4 and 5**). Wait at least 10 minutes for the control power circuitry to completely de-energize. After 10 minutes, turn control power back On.*

Startup—1+N System with External Maintenance Bypass

- Before applying power to the UPS modules, determine the position of the following circuit breakers and switches:
 - Input Circuit Breaker (CB1)**—Verify that this breaker on the front of the UPS cabinet is in the open position (see **Figures 2** and **4** for the location).
 - 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.
 - Output Circuit Breaker (CB2)**—This motorized circuit breaker should be open (see **Figures 2** and **4**).
 - Bypass Circuit Breaker (BFB)**—This circuit breaker should be open (see **Figures 2** and **4** for the location).
 - Module Output Breaker (MOB)** optional—This circuit breaker should be open. This breaker is located external to UPS, possibly in the paralleling gear.
 - Maintenance Bypass Breaker (MBB)** optional—This circuit breaker should be open. This breaker is external to UPS, possibly in the paralleling gear.

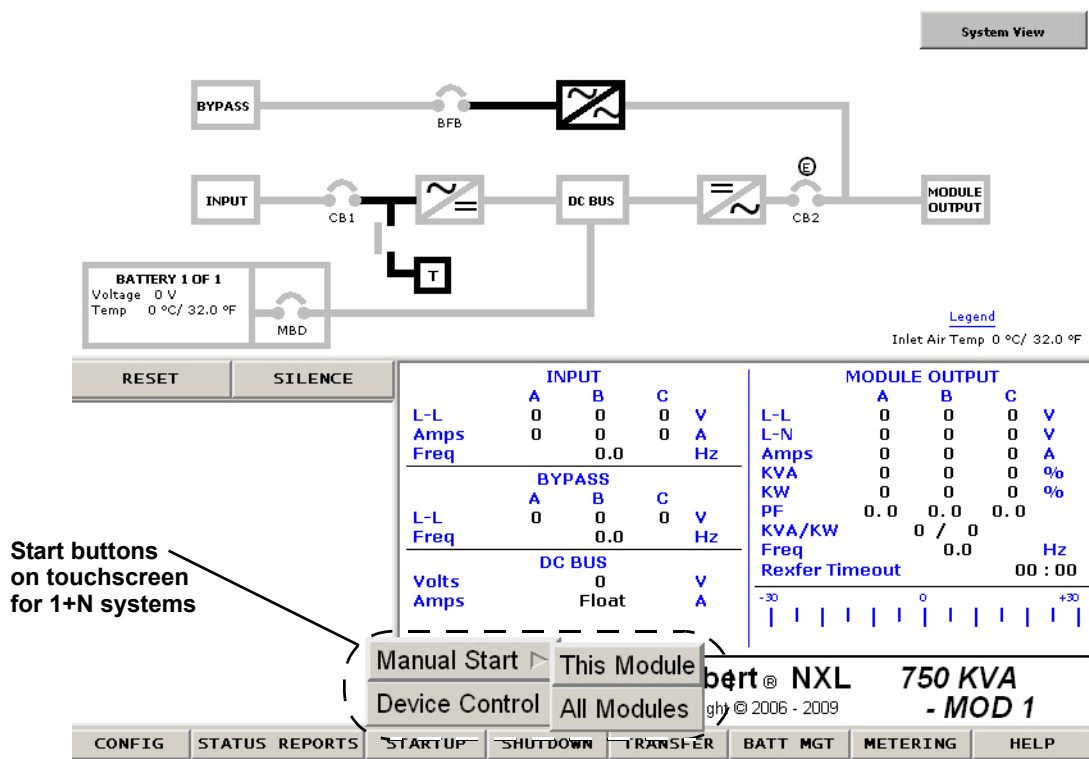


NOTE

If power to the critical load is already supplied through this breaker, keep this breaker closed.

- Maintenance Isolation Breaker (MIB)** optional—This circuit breaker should be open. This breaker is external to UPS, possibly in the paralleling gear.
 - Close the Bypass Input Breaker (BIB). These breakers are external to the UPS units, possibly in the Maintenance Bypass Cabinet. The display touchscreens should start.
 - Close the Rectifier Feed Breaker (RFB). These breakers are external to the UPS units, possibly in the Maintenance Bypass Cabinet.
- On the first module, press “Start-up” then “Manual Start,” then the “All Modules” menu buttons (see **Figure 36**).

Figure 36 1+N system start menu commands



3. If the system has optional Bypass breakers (MBB/MIB), the message “Close MBB” will appear in the multipurpose window.
 - a. Close the MBB breaker. The message “Press OK to begin startup of this module” will appear.
 - b. Press “OK” to continue. This will begin the startup procedure for the UPS module.
The message “Close BFB” will appear in the multipurpose window.
4. Close the BFB breaker (see **Figures 2** and **4**). The message “Press OK to issue BPSS On Command” will appear.
5. Press “OK” to continue. This will energize the UPS internal bypass. The message “Close CB1” will appear.
6. Close CB1 (see **Figures 2** and **4**). The message “Press OK to Issue Rectifier On Command” will appear.
7. Press “OK.” This will start the UPS’ rectifier. The message “Press OK to Issue Inverter On Command” will appear.
8. Press “OK.” The rectifier will be On and the Inverter will be on standby. The message “Press OK to Issue MBD Enable Command” will appear.
9. Press “OK.”
10. Close all battery/DC breakers. The UPS will stay in this mode until all breakers are closed. Skip this command if the DC sources are not ready to be started. The DC breakers can be closed later individually from the startup command (see **2.5 - Startup Menu**).

**NOTE**

The DC source charge current may increase quickly, but then should slowly decrease. If the system is recovering from a DC source shutdown or an input power failure, the UPS rectifier will be recharging the DC source. Recharge current can be more than 100A. The maximum allowable recharge current for a unit depends on the kVA rating and the DC source recharge current limit.

This message will appear: “Close the MOB’s of this module and enough of the other modules, then press ‘OK’ [x of y MOB’s closed].”

11. Close the MOB’s for the UPS’s in the system being started. The [x of y MOB’s closed] will update as the MOB’s are closed (“x” is number of MOB’s closed and “y” is number of MOB’s in the system). This message will appear: “Start enough other modules to support the total system load, then press ‘OK’ [x of y inverters started].”
12. At each module, Press “Start-up,” then “Manual Start,” then “This Module” menu buttons (see **Figure 36**).
 - a. Perform **Steps 6** through **9** on the rest of the UPS units in the system ready to be placed on-line.
 - b. The [x of y inverters started] will update as inverters are brought to standby (“x” is the number of inverters on standby and “y” is the number of inverters in the system).

**NOTE**

Do not transfer the module from the transfer screen from any of these modules.

13. Go to the first UPS and press “OK.” The message “Close MIB” will appear in the multipurpose window.
14. Close the MIB breaker. The message “Open MBB” will appear in the multipurpose window.
15. Open the MBB breaker. The message “Press OK to transfer all modules to inverters” will appear.
16. Press “OK.”

This will put the system online and the load on the UPS.

Startup—1+N System Without External Maintenance Bypass

1. Before applying power to the UPS modules, determine the position of the following circuit breakers and switches:
 - **Input Circuit Breaker (CB1)**—Verify that this breaker on the front of the UPS cabinet is in the open position (see **Figures 2** and **4** for the location).
 - **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.
 - **Output Circuit Breaker (CB2)**—This motorized circuit breaker should be open (see **Figures 2** and **4** for the location).
 - **Bypass Circuit Breaker (BFB)**—This circuit breaker should be open (see **Figures 2** and **4** for the location).
 - **Module Output Breaker (MOB)** Optional—This circuit breaker should be open. This breaker is external to UPS, possibly in the paralleling gear.
2. Provide power to the UPS controls of all UPS modules starting up to permit the display touchscreen and system logic to function properly.
 - a. Close the Bypass Input Breaker (BIB). These breakers are external to each UPS, possibly in the Maintenance Bypass Cabinet. The display touchscreens should start.
 - b. Close the Rectifier Feed Breaker (RFB). These breakers are external to each UPS, possibly in the Maintenance Bypass Cabinet.
3. On the first module, press “Start-up,” then “Manual Start,” then the “All Modules” menu buttons (see **Figure 36**). The message “Caution: Starting into an unknown load with less than required number of modules may result in an Overload” will appear.
4. Press “OK.” The message “Close this Module’s BFB & MOB Breaker” will appear.
5. Close the BFB Breaker and the MOB Breaker connected to this unit. This message will appear: “Close enough other Modules BFBs & MOBs to support the total system load, then press OK.”
6. Close the BFB breakers and MOB breakers of all the UPS units in the system that are to be brought online.
7. Press “OK.” This message will appear: “Press OK to turn on all available Bypass Static Switches.”
8. Press “OK.” This will turn On the Bypass Static Switch of the modules with BFB breaker and MOB breaker closed in **Step 5**. The message “Press OK to start this module’s UPS” will appear.
9. Press “OK.” The message “Close CB1” will appear.
10. Close CB1 (see **Figures 2** and **4**). The message “Press OK to Issue Rectifier On Command” will appear.
11. Press “OK.” This will start the UPS’ rectifier. The message “Press OK to Issue Inverter On Command” will appear.
12. Press “OK.” The rectifier will be On and the inverter will be on standby. The message “Press OK to Issue MBD Enable Command” will appear.
13. Press “OK.”
14. Close all Battery/DC breakers associated with this module. The UPS will stay in this mode until all breakers are closed.
Skip this command if the DC sources are not ready to be started. The DC breakers can be closed individually from the startup command (see **2.5 - Startup Menu**) at a later time.



NOTE

The DC source charge current may increase quickly, but then should slowly decrease. If the system is recovering from a DC source shutdown or an input power failure, the UPS rectifier will be recharging the DC source. Recharge current can be more than 100A. The maximum allowable recharge current for a unit depends on the kVA rating and the DC source recharge current limit.

This message will appear: “Go to other modules and select ‘This Module’ from start-up menu and start-up that module’s UPS.”

15. At each module, press “Start-up” then “Manual Start,” then “This Module” menu buttons (see **Figure 36**).

16. Perform **Steps 10** through **14** on the rest of the UPS units in the system ready to be placed on line. This message will appear: “This Module Startup is complete. Finish the All Module Startup in process or proceed to the Transfer menu to transfer.”
17. Press “Exit.”

**NOTE**

Do not transfer the module from the transfer screen from any of these modules.

18. Go to the first UPS and press “OK.” This message will appear: “Press OK to transfer all modules to inverters.”
19. Press “OK.” This will put the system online and the load on the UPS.

2.15.4 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. Refer to **2.16 - Automatic Operations**.

Transfer Procedure

1. Press the “Transfer” menu button on the touchscreen. The Transfer/Retransfer screen will appear in the multipurpose window (see **Figure 21**).
2. If the UPS output is in synchronization with the bypass, press the “Bypass” button. This will transfer the load from the UPS to the bypass.

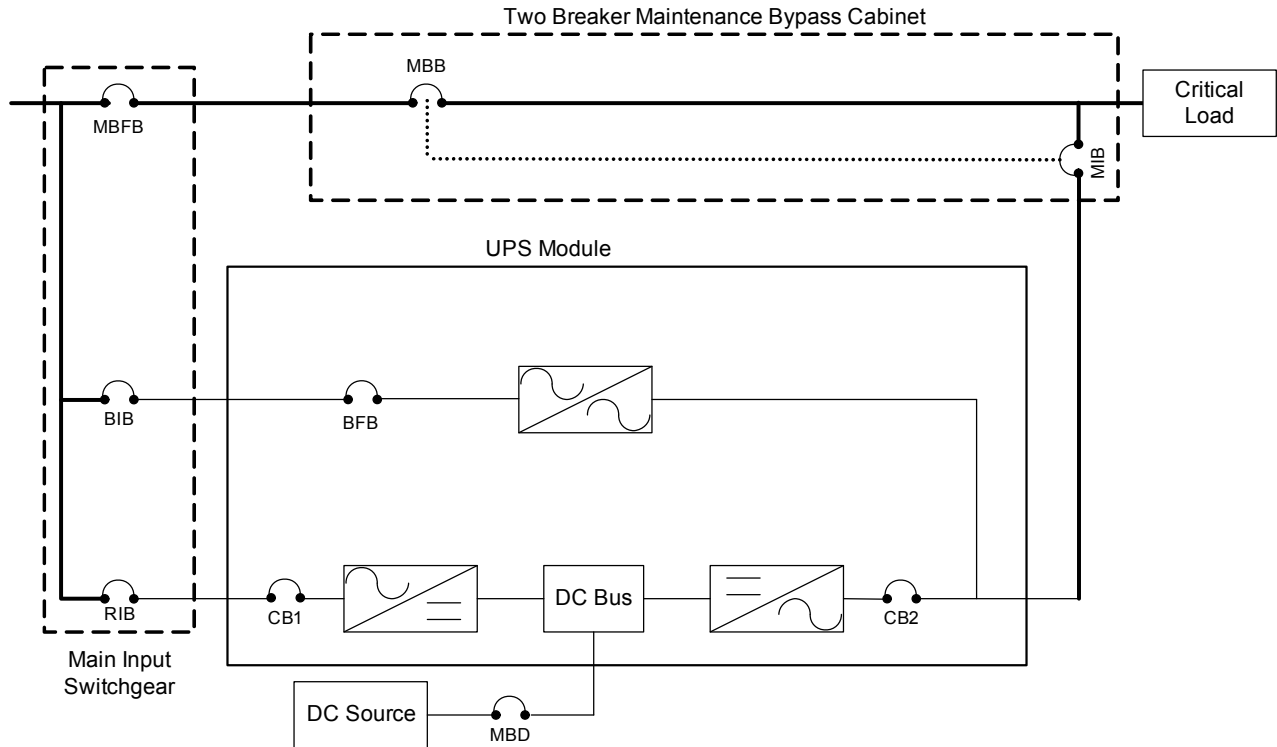
Retransfer Procedure

1. Press the “Transfer” menu button on the touchscreen. The Transfer/Retransfer screen will appear in the multipurpose window (see **Figure 21 - Transfer/retransfer commands**).
2. If the UPS output is in synchronization with the bypass, press the “UPS” button. This will transfer the load from Bypass to UPS.

2.15.5 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 Monitor/Mimic Display screen to verify that the UPS bypass line is available.

Figure 37 UPS with two-breaker bypass cabinet



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 system 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

1. Transfer the UPS system to bypass (see **2.15.4 - 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.

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



NOTE

The UPS system 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 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.

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 Maintenance Isolation Breaker (MIB).
7. If the maintenance bypass cabinet or switchboard has an optional two-key interlock system, replace the key into the solenoid.
8. If UPS bypass shutdown is required, open the Bypass Input Breaker (BIB).

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

1. Close the Bypass Input Breaker (BIB) or verify that it is closed. Note that the UPS Bypass circuit breaker (motorized) must also be closed. Refer to **2.15.1 - Startup—Single Module System**.
2. If using a key interlock system, depress the key-release unit push button, turn the key and remove it from the key-release unit.



NOTE

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

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

5. Open the Maintenance Bypass Breaker (MBB). Load is now on UPS Internal Bypass.
6. If using a key interlock system, remove the key from the lock for the Maintenance Bypass Breaker (MBB) to lock it open.
7. If the maintenance bypass cabinet or switchboard has an optional two-key interlock system, reinsert the key into the solenoid.
8. The UPS system may now be transferred from bypass to UPS (see **2.15.4 - Load Transfer and Retransfer—Single Module System**).

2.15.6 Load Transfer—N+1 System: Remove UPS from N+1 System (Collective)

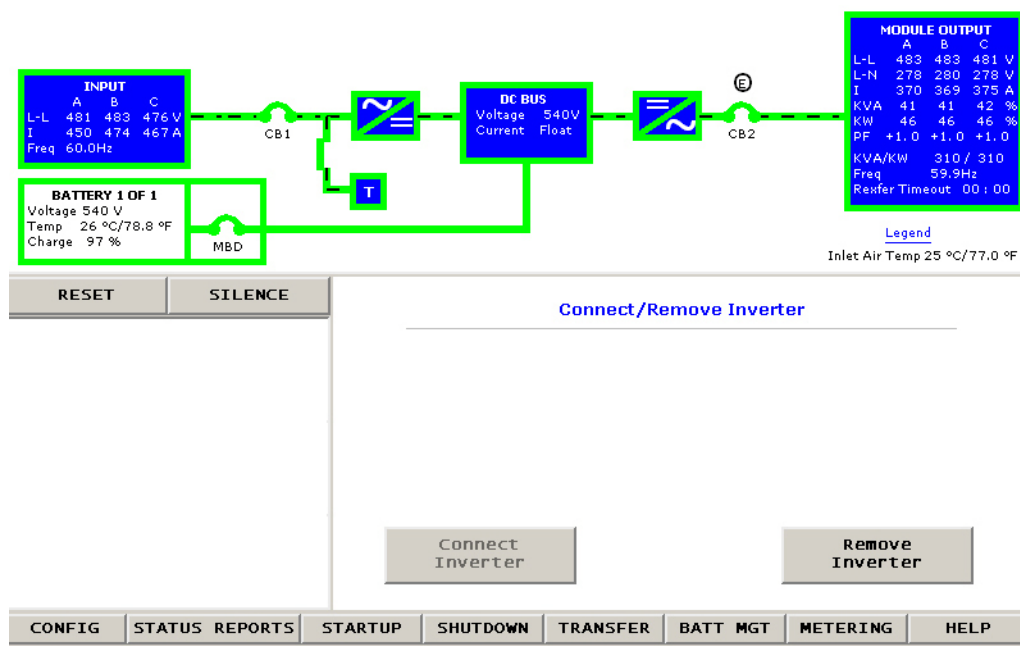
1. Press the “Transfer” menu button on the touchscreen. The Connect/Remove Inverter screen will appear in the multipurpose window (see **Figure 38 - N+1 Transfer menu commands**).
2. Press “Remove Inverter” button. This will open CB2.



NOTE

If disengaging this UPS from the system will cause the other UPS units in the system to overload, then the “Remove Inverter” will not be activated.

Figure 38 N+1 Transfer menu commands



2.15.7 Load Transfer—N+1 System: Add UPS to N+1 System (Collective)

1. Verify that the UPS is On and the Inverter is in standby mode (see 2.15.2 - **Startup—N+1 System**).
2. Press the “Transfer” menu button on the touchscreen. The Connect/Remove Inverter screen will appear in the multipurpose window (see **Figure 38 - N+1 Transfer menu commands**).
3. Press “Connect Inverter” button. This will close CB2.



NOTE

If the UPS is not synchronized with the other units in the system, then the “Connect Inverter” button will be disabled.

2.15.8 Load Transfer—1+N System: Remove a UPS from System (Collective)

1. Under the “Transfer” menu button on the touchscreen, press the “This Module” button. The Transfer/Retransfer screen will appear in the multipurpose window (see **Figure 39**).
2. If the system has enough capacity to turn Off the unit, press the “Remove Inverter” button. This will open CB2.

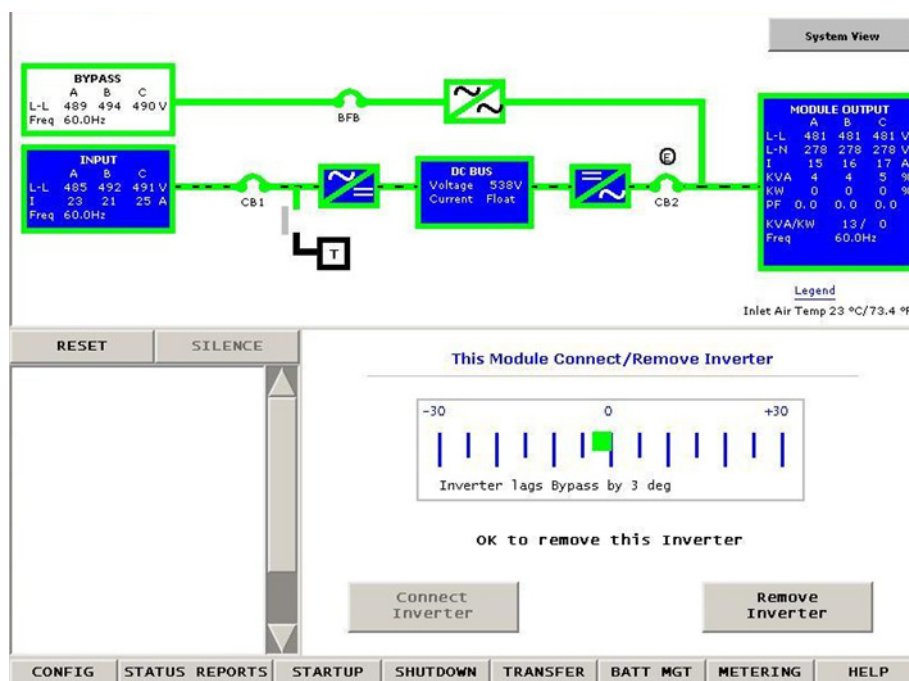


NOTE

If disengaging this UPS from the system will cause the other UPS units in the system to overload, then the “Remove Inverter” will be disabled.

3. To isolate the UPS from the critical bus, open the MOB breaker. This breaker is external to UPS, possibly in the paralleling gear.
4. See 2.15.7 - Load Transfer—N+1 System: Add UPS to N+1 System (Collective) to reconnect the module to the collective.

Figure 39 1+N UPS Transfer to Bypass menu commands



2.15.9 Load Transfer—1+N System: Add a UPS to the System (Collective)

This section lists typical step-by-step instructions. The touchscreen will list all steps required for the process, based on the unit's condition and other factors.

1. Provide power to all the UPS controls to permit the display touchscreen and system logic to function properly.
 - a. Close the Bypass Input Breaker (BIB). This breaker is external to the UPS, possibly in the Maintenance Bypass Cabinet. The display touchscreen should startup.
 - b. Close the Rectifier Feed Breaker (RFB). This breaker is external to the UPS, possibly in the Maintenance Bypass Cabinet
 - c. Bypass Circuit Breaker (BFB)—This circuit breaker should be open (see **Figures 2** and **4** for the location).
 - d. Optional Module Output Breaker (MOB)—This circuit breaker should be open. This breaker is external to UPS, possibly in the paralleling gear.
2. Start the UPS and put the Inverter in Standby Mode.
 - a. Close the MOB breaker associated with this module.
 - b. Press “Start-up,” then “Manual Start,” then “This Module” menu buttons (see **Figure 36**). The “Close BFB” message will appear in the multipurpose window.
 - c. Close the BFB breaker (see **Figures 2** and **4**). The “Close CB1” message will appear.
 - d. Close CB1 (see **Figures 2** and **4**). This message will appear: “Press OK to Issue Rectifier On Command.”
 - e. Press “OK.” This will start the UPS’ rectifier. The message “Press OK to Issue Inverter On Command” will appear.
 - f. Press “OK.” The rectifier will be On and the Inverter will be on standby. The message “Press OK to Issue MBD Enable Command” will appear.
 - g. Press “OK.”
 - h. Close all Battery/DC breakers associated with this module. The UPS will stay in this mode until all breakers are closed.



NOTE

Skip this command if the DC sources are not ready to be started. The DC breakers can be closed individually from the startup command later (see 2.5 - Startup Menu).

This message will appear: “This Module Startup’ is complete. Proceed to Transfer menu to connect this Inverter.”

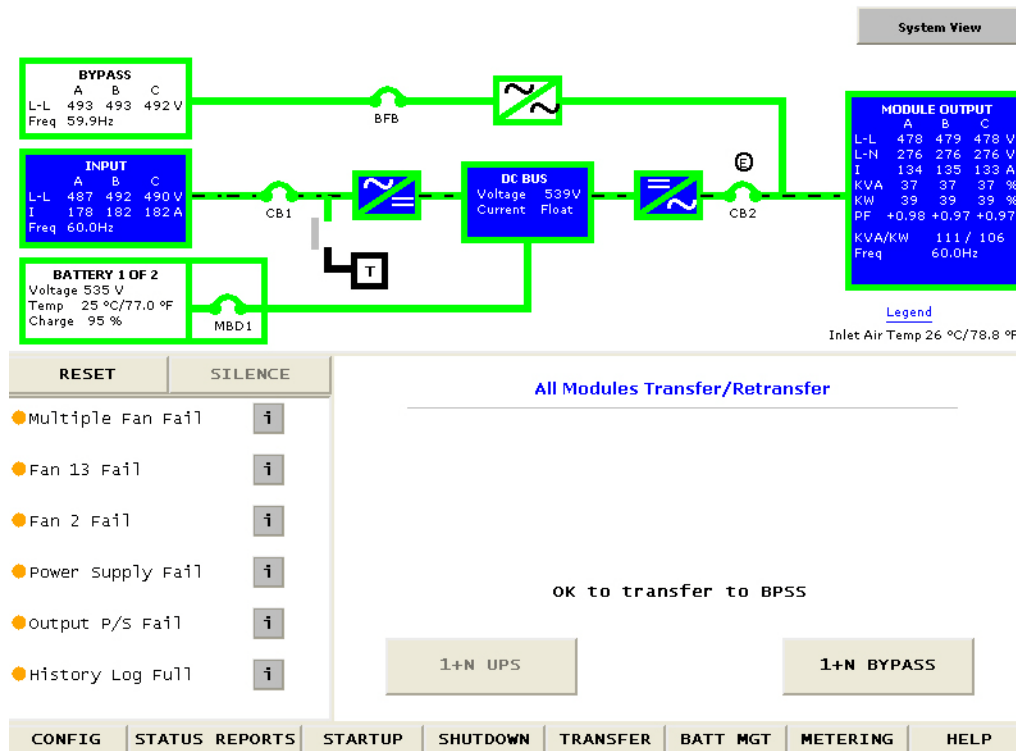
3. Press “Exit.”
4. Under the Transfer menu on the touchscreen, press the “This Module” button. The Transfer/Retransfer screen will appear in the multipurpose window (see **Figure 39**).
5. Press the “Connect Inverter” button. This will close CB2.



NOTE

If the UPS is not synchronized with the other units in the system, then the “Connect Inverter” will be disabled.

Figure 41 1+N System Transfer menu commands



2.15.11 Load Transfer—1+N System: Transfer System to Inverter

1. Verify that all the UPS units are On and the Inverters are in standby mode (See 2.15.3 - Startup—1+N System.)
2. Under the “Transfer” menu button on the touchscreen, press the “All Modules” menu button. The Transfer/Retransfer screen will appear in the multipurpose window (see Figure 39).
3. Press “1+N UPS” button. This will close CB2 and open the Bypass Static Switch in all the modules.



NOTE

If the UPS is not synchronized with the other units in the system, then the “1+N UPS” will not be activated.

2.15.12 Load Transfer—1+N System: Transfer to Maintenance Bypass

Follow these instructions to manually transfer the load between Maintenance Bypass and the System Static Bypass. Do not transfer the load between Maintenance Bypass and the System Inverter output. Use the Monitor/Mimic Display screen to determine whether the UPS bypass line is available.

Load Transfer—1+N System: Transfer to Maintenance Bypass if Load is on System Static Bypass

This section lists typical step-by-step instructions. The touchscreen will list all steps required for the process, based on the unit's condition and other factors.

1. Transfer the UPS system to bypass (see **2.15.10 - Load Transfer—1+N System: Transfer System 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 specific instructions for that interlock system to remove the key.

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

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 Maintenance Bypass Breaker (MBB).



NOTE

Failure to close the Maintenance Bypass Breaker (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 Maintenance Isolation Breaker (MIB).
7. If the maintenance bypass cabinet or switchboard has an optional, two-key interlock system, reinsert the key into the solenoid.
8. If UPS bypass shutdown is required, open the Bypass Input Breaker (BIB).

Load Transfer—1+N System: Transfer to UPS if Load is on Maintenance Bypass

1. If the UPS modules are Off, start the system. Refer to **2.15.3 - Startup—1+N System**.
2. Place all the UPS units in the system on Static Bypass. Refer to **2.15.10 - Load Transfer—1+N System: Transfer System to Bypass**.
3. If using a key interlock system, depress the key-release unit push button, turn the key and remove from key-release unit.
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 Maintenance Isolation Breaker (MIB).



NOTE

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 System Static 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, reinsert the key into the solenoid.

The UPS system can now be transferred from bypass to UPS (see **2.15.11 - Load Transfer—1+N System: Transfer System to Inverter**).

2.15.13 Shutdown—Single Module UPS System

Perform a Module Shutdown to remove power from a UPS module.

Read all warnings in **4.0 - Maintenance** before performing any maintenance on your Liebert NXL UPS. These warnings and cautions must be observed during any work on the UPS.



NOTE

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.

Use the module Monitor/Mimic Display to determine the operating condition of the UPS module.

UPS Shutdown



NOTE

This shutdown turns Off the inverter and the rectifier and trips all DC source breakers. Transfers to bypass if available

1. Press the “Shutdown” menu button on the touchscreen.
The Shutdown screen will appear in the multipurpose window (see **Figure 18**).
2. Press the “UPS” button. This brings up a warning that pressing “OK” will shut down the UPS and, if bypass is not available, drop the load (see **Figure 19**).
3. Press “OK” to shut down the UPS.

UPS System Shutdown



NOTE

This shutdown turns Off the inverter and the rectifier and trips all DC source breakers. Will shut down UPS completely.

1. Press the “Shutdown” menu button on the touchscreen. The Shutdown screen will appear in the multipurpose window (see **Figure 18**).
2. Press the “System” button. This brings up a warning that pressing “OK” will shut down the UPS and, if bypass is not available, drop the load (see **Figure 19**).
3. Press “OK” to shut down the system.

2.15.14 Shutdown—N+1 UPS System

Perform a Module Shutdown Procedure when you want to disconnect power from a UPS module. For System shutdown, see the SCC operation and maintenance manual, SL-25514, available at the Liebert Web site: www.liebert.com

Read all warnings in **4.0 - Maintenance** before performing any maintenance on a Liebert NXL UPS. These warnings and cautions must be observed during any work on the UPS.



NOTE

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.

Use the module Monitor/Mimic Display to determine the operating condition of the UPS module.

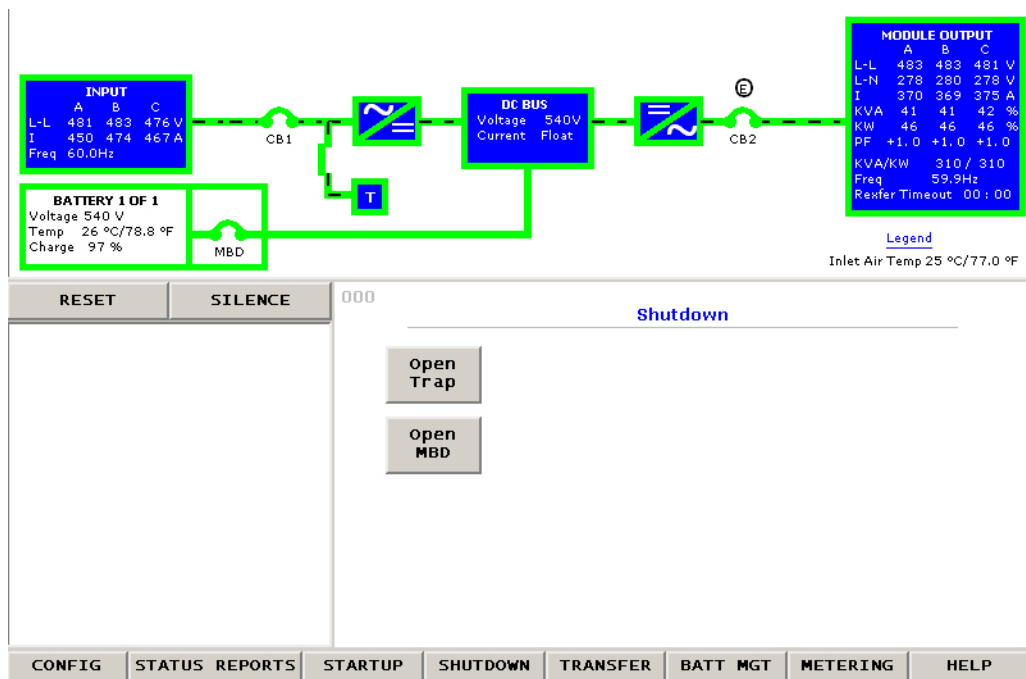


NOTE

This shutdown turns Off the inverter and the rectifier and trips all DC source breakers. Transfers load to bypass, if available.

1. Press the “Shutdown” menu button on the touchscreen. The Shutdown screen will appear in the multipurpose window (see **Figure 42**).
2. Press the “UPS” button. This brings up a warning that pressing “OK” will shut off the UPS and transfer the load to bypass, if available (see **Figure 19**).
3. Press “OK” to shut down the UPS.

Figure 42 N+1 Shutdown menu commands



2.15.15 Shutdown—1+N UPS: UPS Shutdown

This section lists typical step-by-step instructions. The touchscreen will list all steps required for the process, based on the unit's condition and other factors.

Perform a Module Shutdown Procedure to remove power from a single UPS module in the system.

Read all warnings in **4.0 - Maintenance** before performing any maintenance on your Liebert NXL UPS. These warnings and cautions must be observed during any work on the UPS.



NOTE

This shutdown turns Off the inverter and the rectifier and trips all DC source breakers. Transfers to bypass if available

Use the module Monitor/Mimic Display to determine the operating condition of the UPS module.

1. Press “Shutdown” then “This Module” menu buttons (see **Figure 36**). The Shutdown screen will appear in the multipurpose window (see **Figure 43**).
2. Press the “UPS” button to transfer the load to Bypass Static Switch Bypass and shut down the UPS.

2.15.16 Shutdown—1+N UPS: System Shutdown

This section lists typical step-by-step instructions. The touchscreen will list all steps required for the process, based on the unit's condition and other factors.

Perform a Module Shutdown Procedure when you want to remove power from a single UPS module in the system.

Read all warnings in **4.0 - Maintenance** before performing any maintenance on your Liebert NXL UPS. These warnings and cautions must be observed during any work on the UPS.

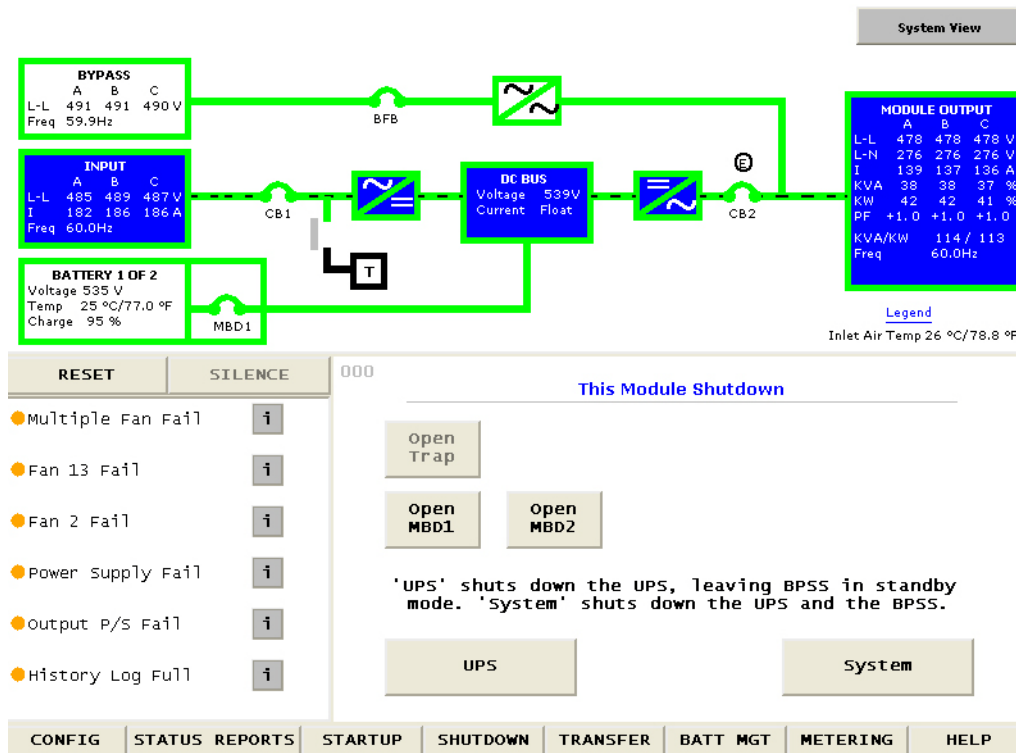


NOTE

This shutdown turns Off the inverter and the rectifier and trips all DC source breakers. This will shut down the UPS completely.

1. Press the “Shutdown” then “This Module” menu buttons (see **Figure 36**). The Shutdown screen will appear in the multipurpose window (see **Figure 43**).
2. Press the “System” button to shut down the UPS including the Bypass Static Switch.

Figure 43 1+N UPS shutdown menu commands



2.15.17 1+N System Shutdown

This section lists typical step-by-step instructions. The touchscreen will list all steps required for the process, based on the unit’s condition and other factors.

Perform a System Shutdown Procedure when you want to remove power from the entire UPS system.

Read all warnings in **4.0 - Maintenance** before performing any maintenance on your Liebert NXL UPS. These warnings and cautions must be observed during any work on the UPS.



NOTE

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

Use the module Monitor/Mimic Display to determine the operating condition of the UPS module.

System Shutdown Procedure

1. On any module, press “Shutdown,” then press the “All Modules” menu button (see **Figure 36**). This message will appear: “This system has no MBB. If shutdown is started, the load will no longer be support by the UPS. Load drop may occur.”
2. Press “OK”. The Shutdown screen will appear in the multipurpose window (see **Figure 44**).
3. Press the “1+N” button. All modules in the system will transfer to Bypass.
4. If an external wrap-around bypass is not installed:
 - a. This message will appear: “UPS output will turn-off. Do you want to proceed?” Press “Yes” to continue the shutdown.
 - b. All the UPS breakers—CB1, CB2, BFB and DC source—will open. The message “Open all MOB’s” will appear.
 - c. Open all the MOB breakers to isolate the UPS units from each other
 - d. To isolate the system, open all the MOB breakers and utility feeds to the bypass and rectifier inputs

5. If an external, wraparound bypass is installed:
 - a. If using a key interlock system, depress the key-release unit push button, 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.

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



NOTE

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

- d. Open the Maintenance Isolation Breaker (MIB). The UPS system is now isolated from the critical load and the load is now on Maintenance Bypass.

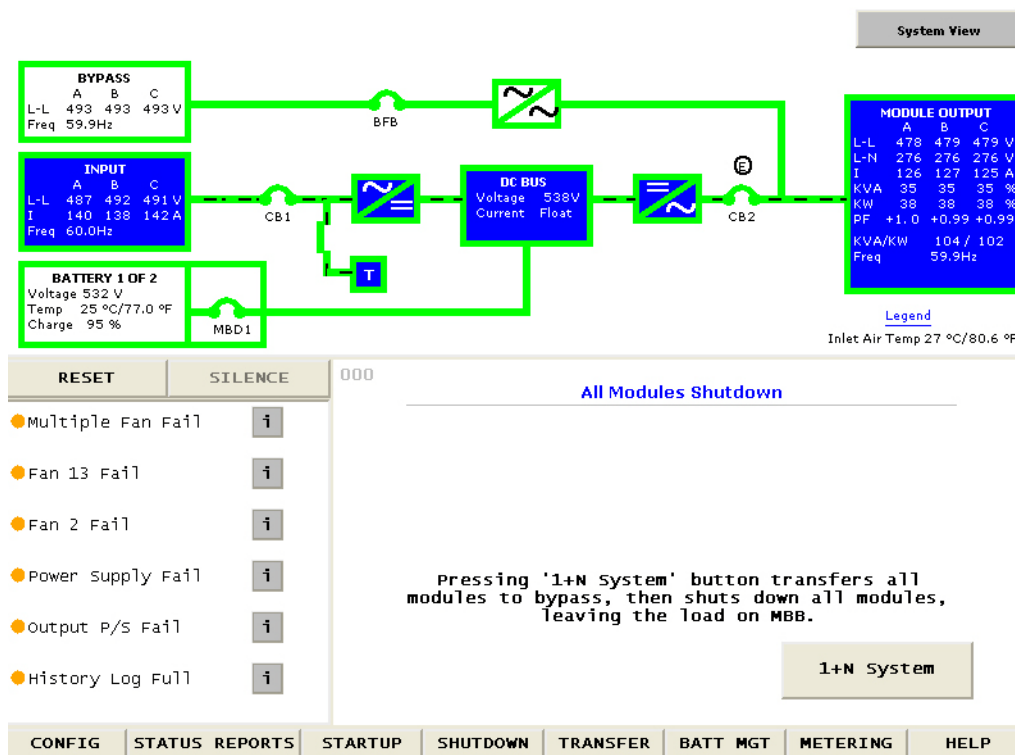


NOTE

The UPS units will shut down

- e. If using a key interlock system, remove the key from the lock for the Maintenance Isolation Breaker (MIB).
- f. If the maintenance bypass cabinet or switchboard has an optional two-key interlock system, reinsert the key into the solenoid.
- g. All the UPS breakers—CB1, CB2, BFB and DC source—will open. The message “Open all MOB’s” will appear.
- h. Open all the MOB breakers to isolate the UPS units from each other
- i. To isolate the system, open all MOB breakers and utility feeds to the bypass and rectifier inputs.

Figure 44 1+N System Shutdown menu commands



2.16 Automatic Operations

The Liebert NXL UPS system is designed to function while unattended by an operator. The system control logic monitors the performance of the UPS, the availability of power sources and the current required by the critical load.

The system control logic:

- Determines what overload conditions can be sustained without a transfer to bypass.
- Initiates an automatic transfer to bypass to sustain an overload or when selected UPS faults occur.
- Can initiate an automatic retransfer to the UPS after an overload has been cleared.
- Initiates an automatic transfer to bypass and emergency module shutdown when specified UPS faults occur.

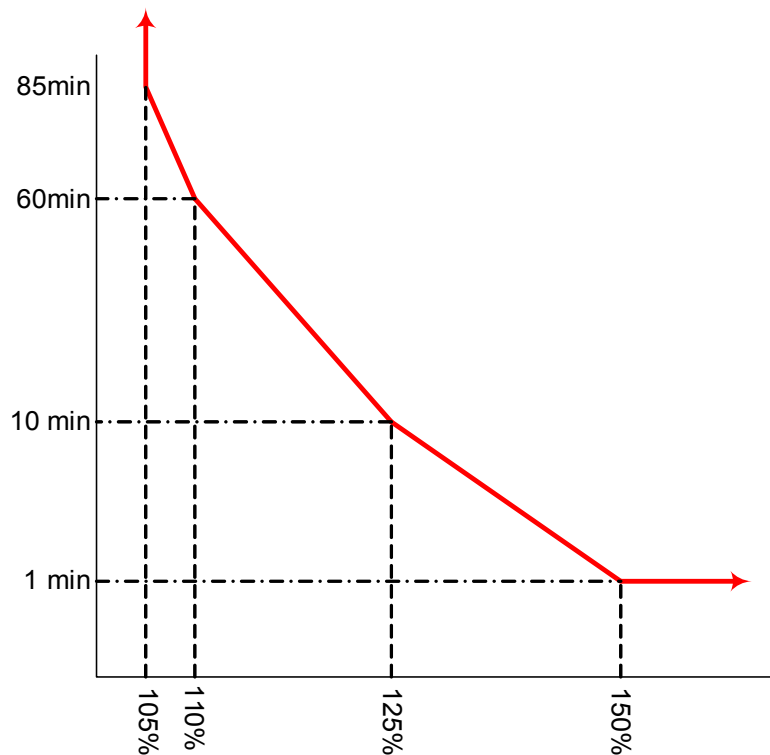
2.16.1 Overloads (Without Transfer)

The UPS system is capable of sustaining full output voltage ($\pm 2\%$ of the nominal voltage) for overload conditions that remain within (under) the current versus time curve of overload capacity (**Figure 45**). Note that the time scale is not linear.

For high current demands of short duration (momentary overloads) the critical load is supplied simultaneously by both the UPS system and the bypass line. Whenever an overload condition occurs, you should determine the cause of the overload. If an overload condition exceeds the overload capacity, the UPS system initiates an automatic load transfer to the bypass line.

For overloads above the Input Current Limit, a DC source, such as a battery system or a generation source, must be available. The Input Current limit has a default setting of 125% rated output current.

Figure 45 Current-versus-time curves of overload capacity



2.16.2 Automatic Transfers to Bypass (Overload Condition)

The UPS system will initiate an automatic transfer to the bypass line if an overload condition exceeds the current-versus-time curve of overload capacity or if specified UPS system faults occur. Load On Bypass is illustrated in **Figure 28**.

The Overload Transfer and Output Undervoltage alarm messages will initiate an automatic transfer to bypass and the Load On Bypass message will be displayed. The active event window will display the Automatic Transfer to Bypass message. Other UPS system faults will initiate an automatic transfer to bypass followed immediately by the shutdown and isolation of the UPS system. Refer to **2.16.3 - Automatic Transfers to Bypass, UPS System Faults**.

In an automatic transfer to bypass the output and bypass circuit breakers do not overlap as they do in a manual transfer. The static bypass switch is fired (closed), the output circuit breaker is opened, and the bypass circuit breaker is closed. Bypass power is supplied to the critical load through the static bypass switch during the short time while both circuit breakers are open.



NOTE

A load transfer to the bypass line will be completed whenever an automatic transfer to bypass is initiated. If the OK to Transfer condition is present, the load transfer will be uninterrupted. If the Static Switch Unable alarm message is present for any reason, the automatic transfer will be interrupted for 40 to 120 milliseconds. Because of the reliability of the UPS components, an interrupted load transfer is a very unlikely occurrence.

2.16.3 Automatic Transfers to Bypass, UPS System Faults

For specified UPS system faults, the control logic will initiate an automatic transfer to bypass followed immediately by a shutdown and isolation of the UPS system. The output, DC source (MBD) and input circuit breakers are open. The bypass breaker will be closed if the bypass line is available. Note that the bypass line is usually not available during Low Battery Shutdown. The circuit diagram is the same as illustrated in **Figure 32** for Emergency Module Off.

The following UPS system faults will initiate an automatic transfer to bypass:

- DC Overvoltage Shutdown
- Inverter Fault
- Low-Battery Shutdown
- Output Overvoltage and Undervoltage
- Overload Shutdown
- Equipment Overtemperature
- Rectifier Fuse Blown

Refer to **Table 10** for more information about these alarm messages.



NOTE

A load transfer to the bypass line will be completed whenever an automatic transfer to bypass is initiated and the bypass line is available. If the OK to Transfer condition is present, the load transfer will be uninterrupted. If the Static Switch Unable alarm message is present for any reason, the automatic transfer will be interrupted for 40 to 120 milliseconds. Because of the reliability of the UPS components, an interrupted load transfer is a very unlikely occurrence.

Some installations may include a Remote Emergency Power Off mode that can be initiated automatically by a contact closure in the critical load equipment. Refer to **2.14.6 - Remote Emergency Power Off**.

2.16.4 Automatic Retransfers to UPS

In an automatic retransfer, the two circuit breakers (bypass and inverter output) are both closed simultaneously for a short period of time (overlap).

The following critical bus conditions must be present to initiate an automatic retransfer of the critical load from the bypass source to the UPS inverter:

1. Critical load was initially transferred to the bypass source due to a system overload only. A manual retransfer from bypass is required if the transfer to bypass was caused by any condition other than output overload.
2. Overload has since dropped below 100% of the rated load.
3. Both the Input and the DC source (MBD) circuit breakers have remained closed since the overload transfer.
4. OK to Transfer signal received from the control logic for at least 10 seconds, within 5 minutes of the system overload transfer. A manual retransfer from bypass is required for overloads lasting 5 minutes or more.
5. Cyclic-type overloads, which occur up to five (select range is 0 to 5) times in 60 minutes, are automatically returned to the inverter for each event including the Nth overload.

**NOTE**

If you do not want the UPS system to initiate any automatic retransfers, this can be set during the initial commissioning or by calling your local Liebert Services representative.

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 Input Contact Isolator Board

The Input Contact Isolator Board (ICI) provides a Liebert NXL module interface for up to eight external user alarm or message inputs to be routed through the NXL's alarm network. The eight contacts are normally open dry contacts. When a contact closes, an event is triggered.



NOTE

Up to two (2) ICI's can be installed in a Liebert NXL.

The Input Contact Isolator options are configured through the Input Contact Isolator dialog box, which is accessed from the Internal Option Settings under Config dialog box on the HMI touchscreen display. The Input Contact Isolator dialog box contains eight choices to match the eight channel input board. You can label each button to identify the event associated with the contact. When the dialog box is accessed, each button flashes to display the Input Contact Isolator number and the user entered label. This label also appears in the Display Panel when an event related to an Input Isolator Connector is triggered.

The Input Contact Isolator dialog box allows you to:

- Label the input contact assignments for your setup.
- Set the delay for an external event triggering an alarm.
- Review the isolator contact assignments, once the labels are entered.

The delay allows setting the number of seconds that a condition must exist before it will trigger an alarm. To configure the Input Contact Isolator relays:

1. Press **Internal Option Settings** from the **Config** menu.
2. Press which Input Contact Isolator is to be configured. The Input Contact Isolator dialog box is displayed.

Figure 46 Input contact isolator dialog box

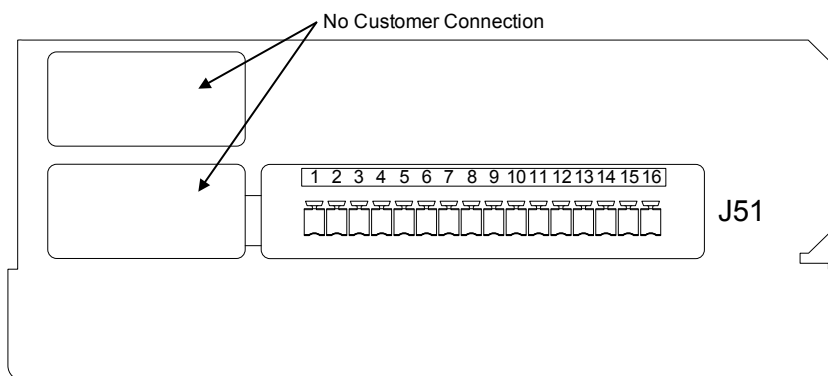
Channel	Assignment	Pre-assigned	Contact Label	Delay	Delay Value
Ch #1	Custom	Pre-assigned	Input Contact 11	Delay	0.0
Ch #2	Custom	Pre-assigned	Input Contact 12	Delay	0.0
Ch #3	Custom	Pre-assigned	Input Contact 13	Delay	0.0
Ch #4	Custom	Pre-assigned	Input Contact 14	Delay	0.0
Ch #5	Custom	Pre-assigned	Input Contact 15	Delay	0.0
Ch #6	Custom	Pre-assigned	Input Contact 16	Delay	0.0
Ch #7	Custom	Pre-assigned	Input Contact 17	Delay	0.0
Ch #8	Custom	Pre-assigned	Input Contact 18	Delay	0.0

Buttons: Save, Cancel

- Assignment—Custom, Pre-assigned (default: “Input Contact” XY)
 - Delay, sec—0 to 99.9 (default: 0)
 - Message—Custom: 0-19 characters
3. To assign labels for each channel:
 - a. Press **Pre-assigned** for default labels on Channels 1-6 (See **Table 1**)
 - b. For Custom labels
 1. Press **Custom** to unique labels.
 2. Click on **Input Contact XX** button. A keyboard is displayed to allow naming alarms.
 3. Enter the name of the alarm set for that input. For example, a fan problem could be indicated by naming the button FAN.
 4. Press OK on the keyboard to keep your label.
 4. Press **DELAY**.
 - a. A keypad is displayed prompting you for a delay time, in seconds, for a condition to exist before the alarm is triggered.
 - b. Enter the delay value. The range for the values are from 0 (zero) to 99.9 seconds.
 - c. Press OK on the keypad to keep your setting. The value you entered is displayed in the field adjacent to the corresponding input contact.
 5. Repeat **Steps 3** and **4** for each input contact.
 6. Press **SAVE** after you have configured all input contacts.
Be sure to press Save even if you have accessed this dialog only to change a setting.
 7. This information is not saved if control power is removed.

Table 1 Input Contact Isolator Board pre-assigned values

Channel Number	ICI #1 Pre-Assigned Label	ICI #2 Pre-Assigned Label
1	Reduced Rect ILimit	Stop Battery Charge
2	Reduced Batt ILimit	Stop Battery Charge
3	Stop Battery Charge	Stop Battery Charge
4	Inhibit Rect Restr	Stop Battery Charge
5	Inhibit Byp Restr	Stop Battery Charge
6	Inhibit Inv Restr	Stop Battery Charge
7	Input Trap Filter Disconnect	Inhibit IP Standby
8	Suspend ECO Mode	

Figure 47 Optional Input Contact Isolator Board

1. Customer control wiring connection points are terminals 1 through 16 (see **Table 2**).
2. Customer provided normally open dry contacts for user alarm messages.
3. All control wiring (by others) must be run separate from power wiring. Control wiring runs should not be combined in the same conduit.
4. Signal voltage: 100mA @ 12VDC.
5. Maximum cable length 500 ft. (152m) with #16AWG and flexible stranded cable.
6. All wiring must be in accordance with national and local electrical codes.

Table 2 Input Contact Isolator Board control wiring connections

Input Contact	Pin No.
1	1
	2
2	3
	4
3	5
	6
4	7
	8
5	9
	10
6	11
	12
7	13
	14
8	15
	16

3.2 Programmable Relay Board

The Programmable Relay Board (PRB) provides a means to trigger an external device when an event occurs in the Liebert NXL. Each PRB has eight channels. Each channel has Form-C dry contacts rated at 1A @ 30VDC.

Any alarm/event can be programmed to any channel or channels. Up to four (4) events can be programmed to a relay. If multiple events are grouped to one relay, group the events logically to simplify troubleshooting when an event is triggered. The same alarm/event can be programmed to more than one channel. Up to two Programmable Relay Boards can be installed in the Liebert NXL for a total of 16 channels. Programming is performed through the HMI touchscreen display.



NOTE

Up to two (2) PRB's can be installed in the Liebert NXL.

Figure 48 Control wiring, Programmable Relay Board



1. Customer control wiring connection points are terminals 1 through 15. (Pin 16 not used on J71, J72, and J73.)
2. Programmable Relay Board option includes eight signal channels with two Form-C dry contacts per channel (see **Table 3**).
3. All control wiring (by others) must be run separate from power wiring. Control wiring runs should not be combined in the same conduit.
4. Contact ratings: 1A @ 30VDC
5. Maximum cable length 500 ft. (152m) with #16AWG and flexible stranded cable.
6. All wiring must be in accordance with national and local electrical codes.

Table 3 Programmable Relay Board pinout

Terminal Block	Channel	Pin No.	Common	Normally Closed	Normally Open	
J71	CH1	A	1-3	1	2	3
		B	4-6	4	5	6
	CH2	A	7-9	7	8	9
		B	10-12	10	11	12
J72	CH3	A	13-15	13	14	15
		B	1-3	1	2	3
	CH4	A	4-6	4	5	6
		B	7-9	7	8	9
CH5	A	10-12	10	11	12	
	B	13-15	13	14	15	
TB3	CH6	A	1-3	1	2	3
		B	4-6	4	5	6
	CH7	A	7-9	7	8	9
		B	10-12	10	11	12
CH8	A	13-15	13	14	15	
	B	1-3	1	2	3	

Note: Pin 16 not used on J71, J72, and J73.

3.2.1 Configuring the Programmable Relay Board Settings

1. Press **Internal Option Settings** from the **Config** menu.
2. Press which Programmable Relay Board will be configured. The Programmable Relay Board dialog box is displayed.
3. Press the Relay channel
4. Press up to four (4) events. Selected events will show up under Relay 1 Assignment.

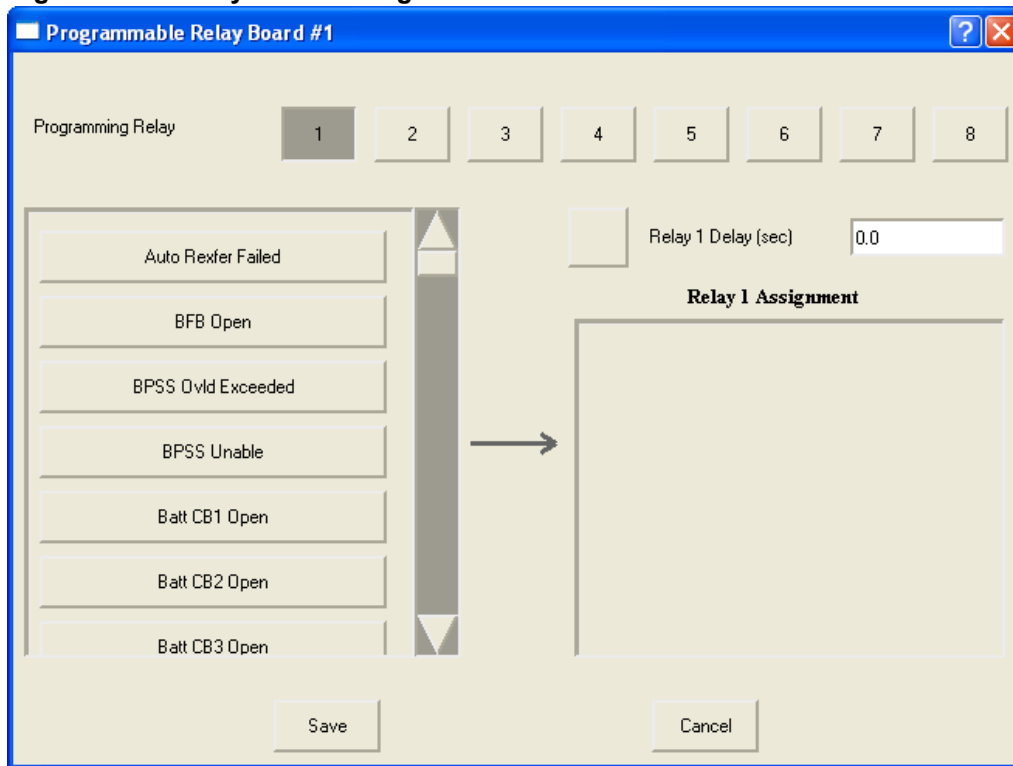


NOTE

To deselect an event, click on the event.

5. Repeat **Steps 3** and **4** for each relay.
6. Press **SAVE** to keep the settings.

Figure 49 Programmable relay board dialog box



- Assignment—0 to 4 event (default: 0)
- Delay, sec—0 to 99.9 (default: 0)

3.3 Remote Alarm Status Panel RAS

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 4**.

Table 4 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 Reserve Alarm	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.
New Alarm Condition	Red	A second alarm has occurred at the UPS. The New Alarm Condition LED lights when the UPS Alarm Condition LED has been triggered and has not been reset.

The RAS also includes:

1. An audible alarm
2. Lamp Test/Reset push button to test the LED indicators
3. Audio Reset push button to silence an audible alarm

3.3.1 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 Emerson Network Power representative for assistance.

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

3.3.2 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.

3.4 Digital Load Bus Sync

3.4.1 System Description

Liebert's Load Bus Sync™ (LBS) option keeps the output of two or more independent Uninterruptible Power Systems in synchronization, even when the systems are operating from different power sources. The Liebert Load Bus Sync option works by synchronizing the Designates Slave System (DSS) to the output of the Designated Master System (DMS). There are no other connections between the logic or controls of either UPS. This ensures maximum system independence and reliability.

3.4.2 LBS Configurations

- Load Bus Sync – Enable or Disabled (default: Disable)
- LBS Master Select - Master or Slave (default: Slave)



NOTE

The LBS settings permit proper operation with only one UPS set as the Master unit.

- LBS Slave Priority – 0 to 7 (default: 0)



NOTE

Setting of '0' will disable LBS Slave Priority

3.4.3 Normal Operations

The LBS will synchronize the Designated Slave Systems (DSS) to the Designated Master System (DMS). The DSS will synchronize to the DMS output if the DMS is in Normal, Battery, Bypass or Maintenance Bypass Mode

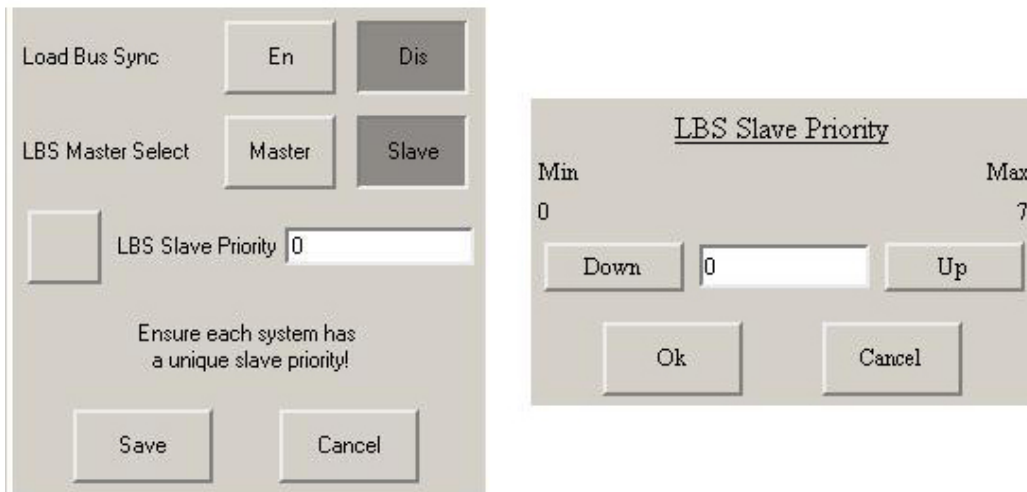
If the DSS transfers to Bypass Mode or Maintenance Bypass mode, the DMS will then synchronize to the output bus of the DSS. This re-selection of master will be accomplished automatically.

3.4.4 Slave Priority

When Slave Priority is enabled, the LBS system will work the same as Normal operations (See **3.4.2 - LBS Configurations**) except when the DMS disqualifies it bypass source. If the DMS's bypass is disqualified, the LBS system will synchronize to the output of the DSS with the lowest Slave Priority number that has a qualified bypass. The LBS system will synchronize back to the DMS when the DMS's bypass is qualified or all DSS's bypass are disqualified.

If a DSS LBS Slave Priority is set to "0", it will not assume the synchronization of the system if the DMS disqualifies its bypass.

Figure 50 LBS configuration



3.4.5 Master System

The unit designated at power-up/reset to be the Master will monitor the LBS Sync Pulse line.

If two units are designated as Master, the second designated Master Unit to come on-line will inhibit the LBS and synch to its own bypass.

The LBS Master will monitor the LBS Sync Pulse continuously; if the LBS Master detects that another unit has transferred to bypass, the LBS Master will follow the unit on bypass.

- Slave can no longer follow the Master; the Master must follow the Slave.

When the Master unit is following a Slave LBS Sync Signal, it will generate the LBS Active event.

If the Slave LBS Sync Pulse stops, the Master will resume generating the LBS Sync Pulse.

3.4.6 Slave System

Any unit designated as the Slave upon power-up / reset will monitor and lock to the Master LBS Sync Pulse.

When the Slave unit is on bypass, the Slave will generate the LBS Sync Pulse.

- The Slave will slew to be locked to its own bypass source. The inverter in the LBS Slave system will follow the local bypass.
- When the Slave unit is on UPS, the Slave will stop generating the LBS Sync Pulse.

When more than one Slave unit goes to bypass:

- All systems on UPS will follow the first Slave's LBS Sync Pulse
- All other Slave systems on Bypass will follow their own local Bypass Source.

3.5 ECO Mode

ECO Mode improves the overall efficiency by powering the critical bus from the bypass static switch instead from the inverter.

3.5.1 ECO Mode Setup

ECO Mode Operation—To enable or disable ECO mode via the front touchscreen.

- Enable, Disable
- Default: Disabled

Maximum Auto Suspensions—Used to specify how many times the system is allowed to automatically reactivate ECO Mode before the current ECO Mode session is terminated and Excessive ECO Mode Suspension event is set.

- Min., 1; Max., 5; Iteration, 1
- Default, 3

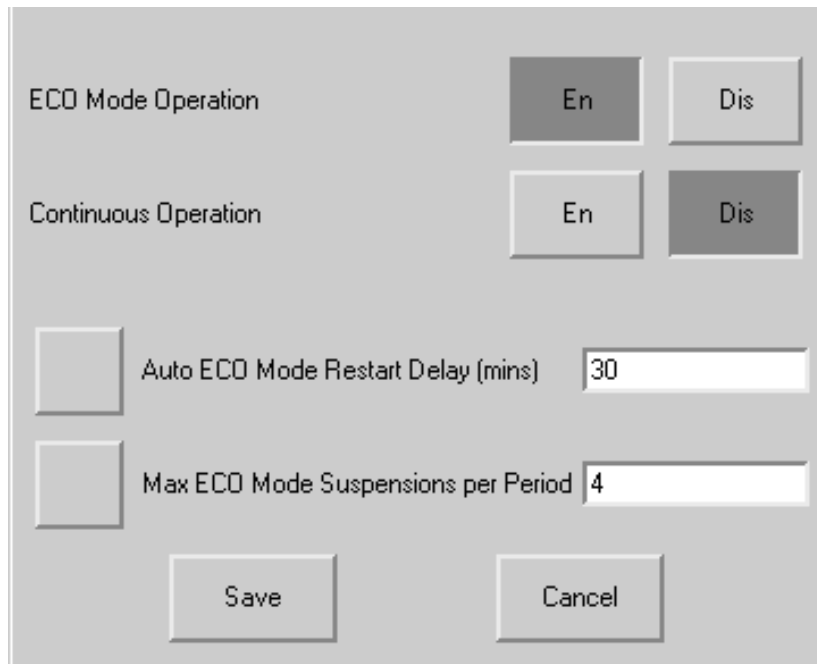
Restart Delay—Used to specify how long the conditions to activate must be satisfied before reactivating ECO Mode. Once Automatic Reactivation has been satisfied, the conditions must remain satisfied for the full Restart Delay before ECO Mode is active.

- Min., 10 minutes; Max., 60 minutes; Iteration, 10 minutes
- Default, 30 minutes

Continuous Operation—Permits running ECO Mode continuously through the Start command and Stop command.

- Enable, Disable
- Default: Disabled

Figure 51 ECO Mode settings



The screenshot shows a dialog box for ECO Mode settings. It contains the following elements:

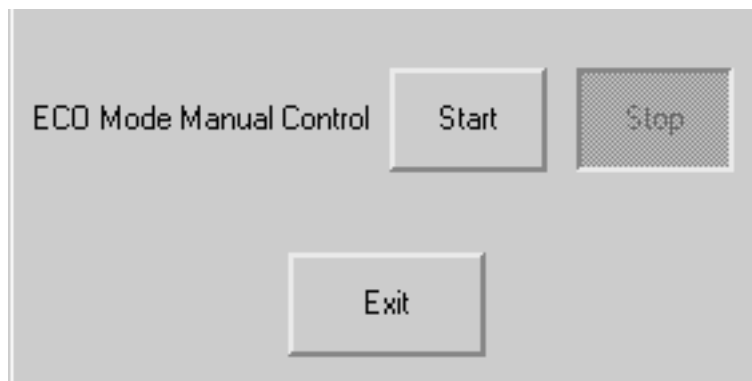
- ECO Mode Operation:** A label followed by two buttons, "En" (highlighted) and "Dis".
- Continuous Operation:** A label followed by two buttons, "En" and "Dis" (highlighted).
- Auto ECO Mode Restart Delay (mins):** A label followed by a text input field containing the value "30".
- Max ECO Mode Suspensions per Period:** A label followed by a text input field containing the value "4".
- Save:** A button at the bottom left.
- Cancel:** A button at the bottom right.

3.5.2 Operation

ECO Mode can be started either manually or automatically.

Manually—If “Continuous Operation” is enabled under ECO Mode - Operations, pressing Start will activate ECO Mode.

Figure 52 ECO Mode manual operation



The screenshot shows a dialog box for ECO Mode manual operation. It contains the following elements:

- ECO Mode Manual Control:** A label followed by two buttons, "Start" and "Stop" (highlighted).
- Exit:** A button at the bottom center.

Automatically—If ECO Mode schedule has been programmed (see **Figure 53**), the system will start ECO Mode at the next scheduled start time.

- Schedule Entry Enable: Permits enabling or disabling an Schedule Entry Action Start entry in the operation schedule
 - Enable, Disable
 - Default: Enable
- Schedule Entry Day of the Week: Permits choosing the day of the week for an associated schedule entry action to take effect
 - Sun, Mon, Tues, Wed, Thurs, Fri, Sat
 - Default: Sun
- Schedule Entry Time: Permits choosing the time of day for an associated schedule entry action to take effect.
 - hh:mm (24-hour clock)
 - Default: 00:00
- Schedule Entry Action: Permits choosing the action an associated schedule entry will take.
 - Start, Stop
 - Default: Start (1st entry), Opposite of previous entry afterwards

Figure 53 ECO Mode scheduling—overall and example

The figure illustrates the ECO Mode scheduling interface, divided into two main sections: an overall schedule view and a detailed entry configuration view.

Overall Schedule View (Left Panel):

	Action	Day	Time	Operation
1	Stop	Mon	05:00	Enabled
2	Start	Mon	19:00	Enabled
3	Stop	Tue	05:00	Enabled
4	Start	Tue	17:00	Enabled
5	Stop	Wed	05:00	Enabled
6	Start	Wed	17:00	Enabled
7	Stop	Thu	05:00	Enabled
8	Start	Fri	16:00	Enabled
9				
10				
11				
12				
13				
14				
15				
16				

Timeline: Mon Tue Wed Thu Fri Sat Sun

Buttons: Up, Down, Edit, Disable, Delete, Clear All, Save, Cancel

Detailed Entry Configuration View (Right Panel):

Stop Tue 05:00

Action: Start, Stop

Day: Up, Down

Hour: Up, Down

Minute: Up, Down

Buttons: Ok, Cancel

3.5.3 Bypass Qualification limits

All of the following conditions must be true to qualify ECO Mode operations based on the bypass source:

- Bypass voltage is within Manual Transfer Bypass Voltage High Limit setting and Manual Transfer Bypass Voltage Low Limit setting or Max Bypass range of $\pm 10\%$
- Bypass Frequency is within the Bypass Tracking Window setting
- Bypass is within the slew limits per Bypass Tracking Slew Rate setting
- Bypass Sync Error event is not active
- Backfeed Breaker is closed
- Bypass Static Switch Unable event is not active

3.5.4 Conditions to Activate ECO Mode

All the following conditions must be satisfied to start ECO Mode

- ECO Mode Session is active
- Bypass Source Qualification is satisfied
- The Load On UPS event must be active for a short, specified amount of time
- Input Contact Interface 1 (Channel 8) event is not active
- Load is greater than 10%

3.5.5 Conditions to Suspend ECO Mode

The following will stop ECO Mode and transfer the system to Normal Mode:

- Stop command is received.
- Scheduled stop time is reached.
- Excessive ECO Mode Suspension event is set.
- ECO Mode Operation setting is disabled.
- Critical Bus Voltage Disqualification is satisfied.
- Input Contact Interface 1 (Channel 8) event active.

3.6 Intelligent Paralleling

Intelligent Paralleling is intended to increase system efficiency and reduce operating hours on the modules. Intelligent Paralleling will put one or more paralleled modules into standby operation when the number of redundant modules is above the user specified threshold.

3.6.1 Intelligent Paralleling Setup

Operation

- Enable, Disable
- Default: Disabled

Minimum System Redundancy—Permits setting the redundancy threshold at which Intelligent Paralleling will operate. This is the minimum Number of Redundant Modules that the system will allow before bringing one or more modules back to normal operation and terminating Intelligent Paralleling.

- Min: 0; Max: Number of Modules - 1; Iteration: 1
- Default: 1

Maximum Time Module In Standby—Permits cycling a module that has had Intelligent Paralleling active the longest with another module currently in normal operation after the selected amount of time. After the cycle is successful, the new module that has had Intelligent Paralleling active the longest will go into standby mode. Disable this feature by selecting 0 days.

- Min: 0 Days; Max: 30 Days; Iteration: 1 Day
- Default: 30 Days

Shutdown Delay—Permits choosing how long a module should wait before Intelligent Paralleling is active and module is in standby.

- Min. 5 minutes; Max. 60 minutes; Iteration 1 minute
- Default: 5 minutes



NOTE

These are global settings. The settings only have to be configured from one module.

Figure 54 Intelligent Paralleling settings

3.6.2 Intelligent Paralleling Target Area

The Intelligent Paralleling Target Area is the Number of Redundant Modules that fall between the Minimum System Redundancy setting and the internal Maximum System Redundancy (Minimum System Redundancy + 1.25).

- The Maximum Number of Redundant modules is designed to provide hysteresis so that modules are not started and stopped when the load oscillates a few percentage points.
- When the Number of Redundant Modules goes above the Target Area, the system puts one or more modules into standby operation until the Number of Redundant Modules is inside the Target Area.
- When the Number of Redundant Modules goes below the Target Area, the system puts one or more modules back into normal operation until the Number of Redundant Modules is inside the Target Area or all available modules are supporting the load.

3.6.3 Conditions to Activate Intelligent Paralleling

All of the following conditions must be true for the system to activate Intelligent Paralleling

- Intelligent Paralleling is enabled.
- The Number of Redundant Modules is above the Intelligent Paralleling Target Area for longer than the Shutdown Delay setting.
- The Critical Load is on UPS.
- The module is part of the collective.
- No modules are on DC source.
- The module is selected as the next module to activate Intelligent Paralleling.
- Input Contact Interface 2 (Channel 7) event is not active

3.6.4 Conditions to Suspend Intelligent Paralleling

Suspend Intelligent Paralleling for a Module

At least one of the conditions below must be true for the module to terminate Intelligent Paralleling at a module and return the module to normal operation:

- Intelligent Paralleling is disabled.
- The Number of Redundant Modules is below the Intelligent Paralleling Target Area.
- One or more modules is on DC source.
- Module is removed or user has issued a UPS/System shutdown.
- All Module Termination is initiated.
- Maximum Time Module In Standby has expired.
- Inhibit IP Standby (Input Contact Interface 2, Channel 7) event active.

Suspend Intelligent Paralleling for the system

Any of the following conditions will terminate Intelligent Paralleling and place all modules in normal operation:

- All modules transfer to bypass
- System overload
- One or more modules go on DC source

3.6.5 Intelligent Paralleling Module Selection

Intelligent Paralleling Module Activation

The next module chosen to activate Intelligent Paralleling and put into standby operation will be done by cycling through the Module Numbers, starting with Module 1.

- The module chosen to be next must be a part of the collective (load on UPS). Otherwise, this module will be skipped.
- When the last Module Number is chosen, the next module will be Module 1 (start cycle over).

Intelligent Paralleling Module Termination

The next module chosen to terminate Intelligent Paralleling normally and put back into normal operation will be done by selecting the module that has had Intelligent Paralleling active the longest.

3.6.6 Module Standby Rotation

Module Standby Rotation will limit the time a module is in standby operation when the Number of Redundant Modules doesn't change for a long period.

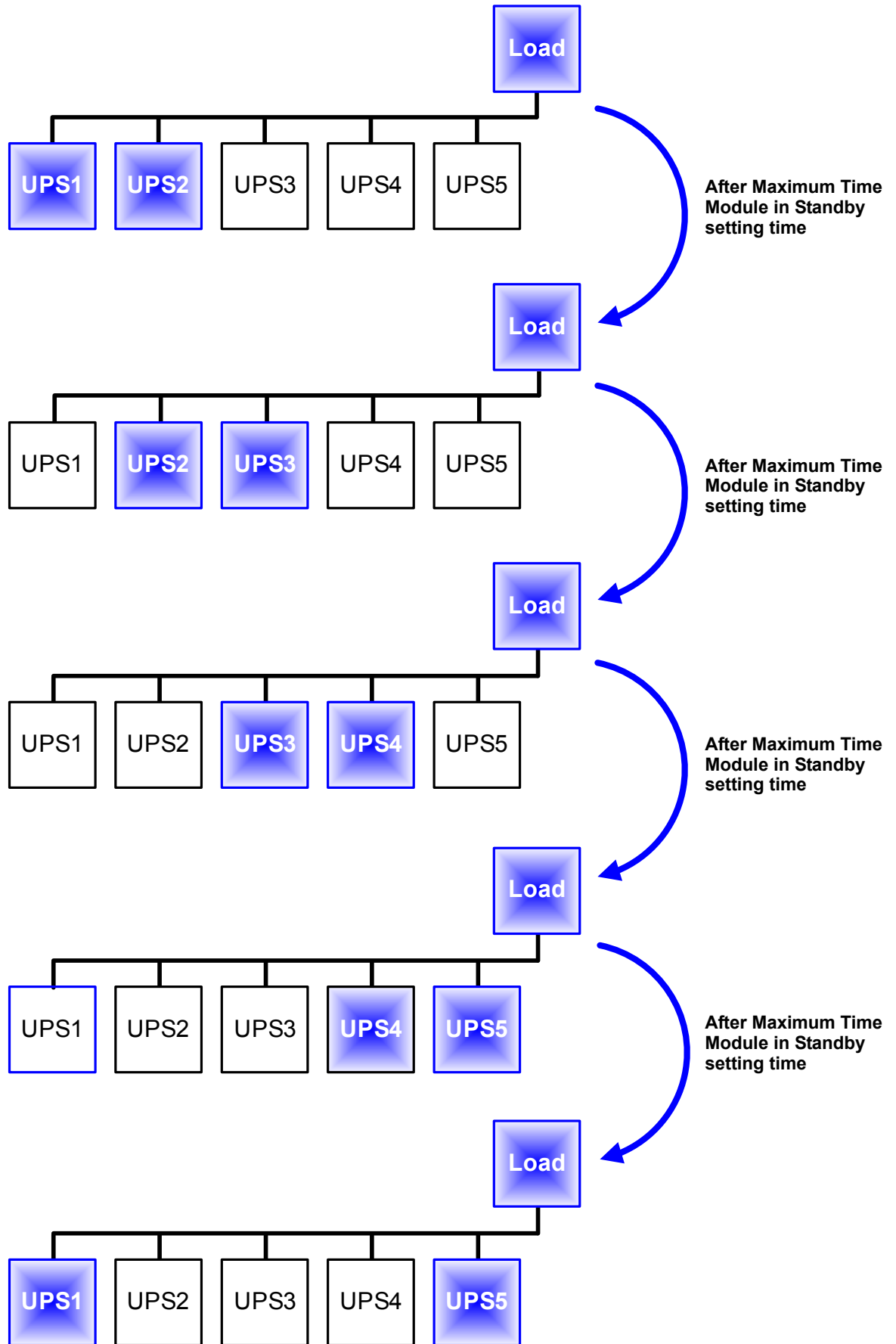
- The module selected as the next to terminate Intelligent Paralleling per Module Selection - Termination, (see **Intelligent Paralleling Module Termination on page 62**), will not be in standby operation for longer than Maximum Time Module In Standby (see **3.6.1 - Intelligent Paralleling Setup**).
- When this time expires, the module will terminate Intelligent Paralleling and come back online.
- The next module selected to activate Intelligent Paralleling will be put into standby operation.



NOTE

When Maximum Time Module In Standby setting is 0, Module Standby Rotation is disabled.

Figure 55 Module standby rotation



4.0 MAINTENANCE

4.1 Safety Precautions

Observe the safety precautions in **Battery Cabinet Precautions** inside the front cover.



NOTE

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.

Observe ALL of the WARNINGS below before performing ANY maintenance on the UPS System and associated equipment. Also observe the manufacturer's safety precautions pertaining to the DC source, along with the DC source safety precautions in this section.



WARNING

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

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 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, you should assume that high voltage may still exist after shutdown. Check with a voltmeter before making contact.

AC voltage will remain on the bypass and output circuit breakers 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 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.

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.



WARNING

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

Always identify connecting wiring prior to disconnecting any wiring.

Do not substitute parts except as authorized by Liebert Corporation.

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

Contact Liebert Services if you are not sure of the procedures to follow or if you are not familiar with the circuitry.

4.2 Liebert Services

Startup, UPS maintenance, DC source maintenance and training programs are available for the Liebert NXL UPS through your Liebert sales representative.

4.2.1 Professional Startup

UPS Startup—Liebert's Customer Engineers perform a thorough non-powered inspection of the units and will then conduct a complete electrical checkout. The DC source installation is also inspected and placed on an initialization charge to ensure cell equalization. Customer Operation training will be conducted during DC source charge time.

Load bank testing and full site acceptance testing are additional services that can be performed during a UPS startup. One preventive maintenance service call can be added to the initial UPS startup agreement.

Battery Installation/Startup—When purchased with a UPS Startup, this Agreement provides consistent, professional service for your entire UPS system. This one-source approach avoids conflicts that may occur during a multisource installation. Note that Liebert requires a mandatory installation inspection for all batteries not installed by Liebert Customer Engineers.

Battery IEEE Certification Inspection—The Battery Specialist will perform a detailed inspection of the entire battery system to ensure it meets current IEEE standards.

Maintenance Agreements: The Signature Program

UPS Service Agreements—Liebert Services (LGS) has a variety of available maintenance agreements, depending on specific site needs. Choose the level of support appropriate for each installation.

Mission-critical sites can have the standard parts-and-labor, around-the-clock coverage for their UPS, with or without scheduled preventive maintenance visits. Other sites can benefit from a variety of money-saving options.

Liebert recommends two preventive maintenance visits per year for the UPS. The first can be conducted with the UPS operational and includes an infrared scan of key UPS components.

The annual visit will require taking the UPS off-line for a thorough non-powered inspection.

These visits are in addition to the general housekeeping tasks (changing air filters, etc.) that can be performed by customer personnel.

Battery Service Agreements—The same flexible Signature Program can also be applied to contracts for battery maintenance. Again, the coverage needed will depend on the type of battery purchased and the degree of support required from Liebert Services.

Training

Customer training courses include the proper operation of the system, emergency procedures, preventive maintenance and some corrective maintenance.

Warranties

Contact Liebert Services if you have any questions regarding the warranty on your Liebert NXL UPS or the batteries.

4.3 Routine Maintenance

You should become thoroughly familiar with the equipment, but at no time should you go beyond the specific procedures in this manual while performing maintenance or correcting a malfunction.

If you have any doubt as to what must be done, call Liebert Services at 1-800-LIEBERT for further instructions.



NOTE

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.

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

- **Keep good records**—Troubleshooting is easier if you have historical background.
- **Keep it clean**—Maintain the UPS free of dust and any moisture.
- **Keep it cool**—Battery systems must be kept in the range of 72-77°F (22-26°C) in order to meet design specifications for capacity and longevity.

The UPS will reliably meet all performance specifications and design life at temperatures up to 104°F (40°C). However, performance and longevity will be optimized when the UPS is operated at the same temperature as the batteries. Contact your local Liebert sales representative or call 1-800-LIEBERT for further details.

- **Keep connections tight**—Tighten all connections at installation and at least annually thereafter (see torque requirements, **Table 7**.)
- **Keep it inspected**—Periodically inspect external upstream and downstream circuit breakers to assure that the trip current settings are correct.

Become familiar with typical ambient conditions surrounding equipment so that abnormal conditions may be more quickly recognized. Know what typical meter readings are and where adjustable settings should be.

4.3.1 Record Log

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

The log should have space for all metered parameter indications including phase readings, alarm messages, UPS mode of operation, air filter replacement date and observation notes. A second log should be maintained for the DC source as directed by the DC source manufacturer.

A periodic walk-through inspection of the UPS and DC source rooms is advised to check for visible and audible indications of problems. Log the inspection, metered parameter indications and any discrepancies.

4.3.2 Air Filters

The air filters must be inspected and serviced on a regular schedule. The period between inspections will depend upon 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 extend the inspection period as experience dictates.

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

4.3.3 Limited Life Components

The Liebert NXL UPS 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 your Liebert UPS will have a shorter life cycle and require replacement in less than 10 years.

The following components utilized in your UPS system have a limited life cycle and are specifically exempt from warranty. To prevent a wear-out failure of one of these components affecting your critical load operations, Liebert 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.

Table 5 UPS component service life

Component	Expected Life	Replace in:
Power AC filter capacitors	> 7 years (~62,000 hours)	5 to 6 years
Power DC filter capacitors	> 7 years (~62,000 hours)	5 to 6 years
Low-profile fans	> 7 years (~62,000 hours)	5 to 6 years
Air filters	1 to 3 years	Check four times per year
Battery, lithium logic memory backup	10 years (~87,600 hours)	8 to 9 years
Battery, storage		
Lead-acid wet-cell (user selection)	10 to 20 years	1 to 2 years before end-of-life
Valve-regulated, lead-acid (VRLA)	5 years	3 to 4 years
	10 years	6 to 8 years

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 your specific component specifications, replacement component selection and sourcing, call 1-800-LIEBERT. For customers using Liebert 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.

4.4 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 properly trained and qualified personnel working in accordance with applicable regulations as well as with manufacturers' specifications.

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. Contact Liebert Services for assistance.

4.4.1 Battery Safety Precautions

Servicing of batteries should be performed or supervised by personnel knowledgeable of batteries and the required precautions. Keep unauthorized personnel away from batteries.

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



WARNING

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

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 must 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.



WARNING

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

The following precautions must 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 whether the battery is grounded. If it is 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.

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 outlined in the battery manufacturer's manual, available on the manufacturer's Web site.

Valve-regulated lead-acid (sealed-cell) batteries do require periodic maintenance. Although maintenance of electrolyte levels is not required, visual inspections and checks of battery voltage and connection resistance should be made.

NOTICE

Risk of equipment damage. Batteries should be cleaned with a dry cloth or a cloth lightly moistened with water. Do not use cleaners on the batteries. Solvents can make the battery cases brittle.

Because 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 increases charging voltage to maintain flooded type battery cells at full capacity.



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 manufacturer's manual, available on the manufacturer's Web site, for specific information about equalize charging.

Matching Battery Cabinets—Optional

Although the individual battery cells are sealed (valve-regulated) and require only minimal maintenance, the Battery Cabinets should be given a periodic inspection and electrical check. Checks should be performed at least annually to ensure years of trouble-free service.

Voltage Records: With the Battery Cabinet DC circuit breaker closed and the connected UPS operating, measure and record battery float voltage. With the DC circuit breaker open, measure and record the nominal (open circuit) voltage. Both these measurements should be made across the final positive and negative terminal lugs. Compare these values with those shown below. The recorded nominal voltage should be no less than the value shown; while the recorded float voltage should be within the range shown. If a discrepancy is found, contact Liebert Services.

Table 6 Battery voltage, nominal and float

Number of Cells	Battery Voltage, VDC	
	Nominal	Float
240	480	527 - 552

Power Connections: Check for corrosion and connection integrity. Inspect wiring for discolored or cracked insulation. Clean and/or retighten as required. Refer to torque specifications in **Table 7**.

Battery Cell Terminals: Check for discoloration, corrosion and connection integrity. Clean and tighten if necessary. Note that when installing a new battery, the initial torque value is 5 lb.-in. more than the retorquer value. **Table 7** shows battery retorquer values.

Table 7 Battery retorquer values

Battery Mfr.	Battery Model #	Retorque Value
C&D	UPS12-300MR	110 in-lb
	UPS12-350MR	110 in-lb
	UPS12-400MR	110 in-lb
	UPS12-490MRLP	110 in-lb
	UPS12-540MR	110 in-lb
Energys	HX205-FR	65 in-lb
	HX300-FR	65 in-lb
	HX330-FR	65 in-lb
	HX400-FR	65 in-lb
	HX500-FR	65 in-lb
	HX540-FR	65 in-lb
	16HX800F	100 in-lb
	16HX925F	100 in-lb
East Penn	24HR3000	65 in-lb
	27HR3500	65 in-lb
	31HR4000	65 in-lb
	31HR5000	65 in-lb

If the system uses a different model battery, contact Liebert Services for the required torque value.

To access battery cell terminals, disconnect the inter-tier cable and two shelf retaining screws. Once disconnected, insulate (with protective boot or electrical tape) the cables to prevent accidental shorts. The battery shelf can now be pulled out. Tighten each terminal connection to the retorquer value. When replacing a battery, the terminal connections must be cleaned and tightened. Disconnect and insulate the cables connected to the battery. Secure each battery shelf with retaining screws when maintenance is complete.

Other DC Sources

If the UPS system uses a DC source other than a factory-supplied Matching Battery Cabinet, perform maintenance on the DC source as recommended in the DC source manufacturer's maintenance manual, available on the manufacturer's Web site.

4.5 Detecting Trouble

It is important that the operator 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 include:

- 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 the battery charge current no more than 1% of maximum discharge 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 Display Screen will help to provide an early detection of problems. Refer to **Table 10** for information about interpreting alarm messages.
- Tracing a problem to a particular section is facilitated by alarm messages and the metered parameter indications.

NOTICE

If the UPS system has an open fuse, the cause should be determined before replacing the fuse. Contact Liebert Services for assistance.

4.6 Reporting a Problem

If a problem occurs within the UPS, review all alarm messages along with other pertinent data. Contact Liebert Services at 1-800-LIEBERT to report a problem or to request assistance.

4.7 Corrective Actions

The recommended corrective action for each alarm message on the Display Screen is in **Table 10**.

4.8 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.

Liebert strongly 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 known to be inadvertently left improperly set. Correct trip setting of these circuit breakers is most important to achieving high-availability from your Liebert UPS system. For further information regarding proper trip settings for your feeder breakers, call 1-800-LIEBERT.



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 Liebert can provide typical guidelines, the responsibility for the proper breaker trip settings outside the Liebert-manufactured UPS equipment resides with the owner. Contact Liebert Services at 1-800-LIEBERT for further details.

5.0 SPECIFICATIONS

5.1 DC Sources

5.1.1 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 your battery manual, available on the manufacturer's Web site, for information about your system.

For models with nominal 240-cell battery, the DC bus nominal float voltage range is 2.15 to 2.30VPC. Maximum equalize voltage is 2.45VPC. Battery voltage at end of discharge is 1.60VPC at the UPS terminals. 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 the installation, operation and maintenance of the DC source. Use the DC source manual in conjunction with this manual.

5.3 Environmental Conditions

Table 8 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; (see Notes 2 and 3).
Minimum Operating Temperature, °F (°C)	0°C
Storage Temperature, °F (°C)	-13 to 158 (-25 to 70)
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 4900 ft. (1500m) without derating
Storage Elevation	Sea level to 50,000 ft. (15,240m)
Audible Noise, 5 Feet (1.5m) from Unit	68 dBA typical

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 system is designed to operate continuously at 104°F (40°C). However, design equipment life expectancy will be extended with lower temperatures (25°C is recommended).
3. Ambient temperature is the maximum ambient temperature during any 24-hour period. For operation at higher temperatures, consult your Liebert sales representative or call Liebert Services at 1-800-LIEBERT.
4. Exercise care during installation to ensure unimpeded airflow through the UPS.
5. For operation at higher elevations, consult your Liebert sales representative or call Liebert Services at 1-800-LIEBERT.

Table 9 Electrical specifications

Liebert NXL Model Size	250	300	400	500	625	750
Input Parameters						
Input Voltage to Rectifier, VAC, 3-phase, 3-wire	480V					480V/575V/600V
Input Voltage to Bypass, VAC, 3-phase, 3- or 4-wire	480V					480V/575V/600V
Input Voltage Range, VAC	+10% to -15; -15% to -20%* -20% to -30%**; <-30%***					
Input Frequency, Hz	60					
Permissible Input Frequency Range, Hz	55 to 65					
Reflected Input THDi at nominal voltage at full load, %	<10%			<5%		
Rectifier Power Walk-In, sec	1 to 30 (selectable) in 1 sec. Increments					
DC Parameters						
Battery Type	VRLA (Valve Regulated Lead Acid) or FLA (Flooded Lead Acid)					
Nominal DC Bus, VDC	480V					
DC Float Voltage, VDC	540V					
End-Cell Voltage, VDC	384 (for VRLA / FLA)					
DC Ripple Voltage in Float and Const V Ch. mode, %	<1 (RMS value) < 3.4% Vpp					
Output Parameters						
Inverter Type	IGBT-based Sine-Sine PWM Controlled					
Output Power, kW	225	270	360	450	562.5	675
Output Voltage, 3-phase, 4-wire	480V					480V / 575V/600V
Output Voltage Regulation, %	< 1% (3-phase RMS average)					
Output Voltage Regulation (Unb. Load)	< 2% (3-phase RMS average)					
Output Frequency, Hz	60					
Output Frequency Regulation, %	± 0.1					
Output THDu at Nominal Voltage (Linear Load), %	<2%					
Output THDu at nominal voltage Including a 100kVA Non Linear Load per EN 62040-3, %	2.5% (max)					
Capacity to Handle Step Load, %	0-100 or 100-0					
Transient Recovery (Linear Loads), %, msec	within 5% peak to peak in one-line cycle					
Capacity to Handle Leading PF Load						
0.9 lag to Unity	Subject to maximum kW rating					
at 0.95 Lead	Subject to maximum. kW rating					
at 0.9 Lead	Subject to 12,5% kW derate or same rating and 10°C temp. derate					
Voltage Displacement, ° el	120° ±1° el (with unbalanced load)					
Compliance to FCC Class-A	Standard					
Overload Conditions, % FL (with DC source available)	105% for 85 minutes; 110% for 60 minutes; 125% for 10 minutes; 150% for 1 minute					

* The UPS will operate at full load, but the DC source charge will be either reduced or Off (depending on input current).

** The UPS will operate at full load, but UPS may source-share with the DC source (depending on input current).

*** UPS will be in Battery mode

Table 9 Electrical specifications (continued)

Liebert NXL Model Size	250	300	400	500	625	750
Physical Parameters & Standards, in (mm)						
Width ¹	71.8 (1823)	78.5 (1993)	78.5 (1993)	11.6 (2835)	w/Static Bypass: 140.5 (3568) w/o Static Bypass: 125 (3175)	
Depth ²	33.5 (850)	33.5 (850)	39.4 (1000)	39.4 (1000)	39.4 (1000)	
Height	76.8 (1950)	76.8 (1950)	76.8 (1950)	76.8 (1950)	76.8 (1950)	
Weight, unpackaged, lb (kg) approx.	3965 (1798)	4690 (2127)	5250 (2381)	9450 (4286)	w/ Static Bypass: 13,800 (6259) w/o Static Bypass: 13,100 (5942)	
Front Door Opening (for serviceability)	More than 180°					
Degree of Protection for UPS Enclosure	IP 20 (with and without front door open)					
Standards & Conformities	UL 1778, 4th Edition CSA 22.2 107.3 FCC Part 15, Class A IEC62040-2, Level 4, Criteria A EN61000-4-3, Level 3, Criteria A EN61000-4-6, Level 4, Criteria A EN61000-2-2, Criteria A EN61000-4-4, Level 4, Criteria A ANSI C62.41, Category A3 & B3 ISTA Procedure 1H WEEE					

1. Width dimensions are with side panels attached. Subtract 1.4" (35mm) for dimensions with both side panels removed.

2. The depth dimensions include the front door and rear panel.

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APPENDIX A - UPS ALARM AND STATUS MESSAGES

Table 10 shows alarm and status messages as they appear in the Liebert NXL's touchscreen and in the history log, along with a description and recommended actions, if any.

If the recommended action fails to correct the condition, contact your factory-authorized service provider.

The "Service Telephone Number" can be found by pressing "CONFIG," "Ratings," "More>>" on the menu bar.



NOTE

In Event log, take the number for the "Data" Column. Convert that number from Decimal to Hex. Each digit will explain the reason for the Inhibit signals.

Example: Data = 512d =0200h->"Removing Module will cause Overload or Drop the Load"

Table 10 Liebert NXL alarm and status messages

Event Message	Event Definition	Recommended Action
Auto Restart Fail	An Automatic Restart was enabled, but has failed to complete. With Automatic Restart enabled, the unit automatically restarts after an End of Discharge (EOD) event. This alarm means that one of the auto restart requirements was true, but failed before the restart sequence completed. For example, one conditional requirement for Automatic Restart to occur is that the Rectifier Input Voltage must be within acceptable limits. If, during the restart sequence, the input voltage drops out of tolerance, the Automatic Restart will fail. This alarm is self-clearing. When the condition is no longer present, the alarm and any control activity tied to the alarm reverts to normal.	Press "SILENCE" to silence the audible alarm. Check the active events to determine the status of the UPS. If "Auto Restart Fail" is the only alarm present, attempt a manual start of the unit by pressing "Startup," "Manual Start," then following the prompts to attempt to place the unit back online. If the manual start fails, or if there are other alarms present that won't clear, contact your factory-authorized service provider.
Auto Rexfer Failed	The condition that caused the system to automatically disconnect the inverter from the critical bus has failed to clear within a specified time delay. An example of a recoverable condition (one which the controls may attempt to recover from automatically) is an overload that exceeded the overload capability.	Press "SILENCE" to silence the audible alarm. Press "RESET" to attempt to clear active events. This does not clear the "Auto Retransfer Failed" alarm. If all other alarm conditions are clear, for a single module system attempt a manual transfer to Inverter by pressing "Transfer," "UPS." For a multi-module system attempt to manually reconnect this inverter by pressing "Transfer," "Connect This Inverter." If successful, press "RESET" to clear this alarm from the Active Event Window. If the UPS fails connect the inverter to the critical bus and the active messages do not explain the reason, contact your factory-authorized service provider.
Bat Mon 1 Critical	Battery Monitor 1 is reporting a critical alarm.	Check the Battery Monitor Module for more details on this condition. Contact your factory-authorized service representative for service.
Bat Mon 1 Maint	Battery Monitor 1 has an active Maintenance Alarm.	Check the Battery Monitor Module for more details on this condition. Contact your factory-authorized service representative for service.
Batt CB"# Open	Battery Circuit Breaker "#" is open. This status message is self-clearing. When the condition is no longer present, the message and any control activity tied to the status event reverts to normal.	Press "SILENCE" to silence the audible alarm. Check the status of Battery Circuit Breaker 1. If it is open, the alarm is normal. If Battery Circuit Breaker 1 is closed, contact your factory-authorized service provider.

Table 10 Liebert NXL alarm and status messages (continued)

Event Message	Event Definition	Recommended Action
Batt Discharging	<p>The UPS is on Battery. The most common reason for going to battery is a loss of Rectifier input power (power outage). This alarm is self-clearing. When the condition is no longer present, the alarm and any control activity tied to the alarm reverts to normal.</p>	<p>Press "SILENCE" to silence the audible alarm. Observe the One-Line Display. If the input line is orange, black, or gray, the battery discharging condition is normal. If the input line on the One-Line Display is green, check the Active Event Window for potential fault conditions that could explain why the UPS is on battery. An example of this could be "Rectifier Fault." Monitor the UPS during the battery discharge. The display shows the discharge curve of the battery. When the Battery Voltage Line touches the End of Discharge Line, the UPS shuts down. Check the bypass line on the One-Line Display. If the line feeding the Static Bypass Switch (BPSS) is green, the unit can be transferred to bypass by pressing "Transfer," "Bypass" to transfer the load to the bypass source. Note that transferring to bypass could expose the load to an outage if the bypass source fails. If the battery is discharging because of a fault such as "Rectifier Fault" in the Active Event Window rather than an actual power outage, transfer to bypass if available, and contact your factory-authorized service provider.</p>
Batt Equalizing	<p>The Batteries are being equalized. Battery equalization stops automatically based on the Equalize Time Setting. This status message is self-clearing. When the condition is no longer present, the message and any control activity tied to the status event reverts to normal.</p>	<p>In normal operation, no user response is required. Equalize charge can be terminated at any time by pressing "Battery Management," "Manual Battery Equalize," "Stop."</p>
Batt Ground Fault	<p>Detected Battery ground current exceeds the trip setting. A possible symptom that could cause this alarm is a leaking battery. This alarm has a higher detection setpoint than "Battery Ground Fault Current Warning," and if present, means that the Battery Ground Fault Current is excessive. This alarm could cause Battery Breakers to trip if the "Battery Ground Fault Trip Enable" setting is enabled.</p>	<p>Press "SILENCE" to silence the audible alarm. Are any Battery Circuit Breakers tripped? Perform a visual inspection of the batteries in the tripped string(s). Look for signs of leaking battery acid or excessively corroded battery terminals. If there are no visible signs of defective batteries, press "RESET" to try and clear the alarm. Close any open breakers one at a time, pressing "RESET" after each one to see which string is causing the alarm. The string reporting the fault, when online, will not allow the alarm to reset. Once the location is identified, or if the battery string tests are inconclusive, contact your factory-authorized service provider.</p>
Batt Not Charging	<p>The UPS just passed a Manual or Automatic Battery Test and the float voltage has not yet returned to normal. This alarm is self-clearing. When the condition is no longer present, the alarm and any control activity tied to the alarm reverts to normal.</p>	<p>Press "SILENCE" to silence the audible alarm. Wait 30 minutes and check to see if the alarm has cleared. If the alarm does not clear 15 minutes after the battery test, but does clear within 30 minutes after the battery test, check the condition of the batteries (contact your factory-authorized service provider). If the alarm is still present 30 minutes after the battery test concluded, check the Event Log by pressing "Status Reports," "Event Log" for additional information and contact your factory-authorized service provider.</p>

Table 10 Liebert NXL alarm and status messages (continued)

Event Message	Event Definition	Recommended Action
Batt Ovtemp Limit	<p>One or more of the Battery Temperature Sensors is reporting a temperature above the limit setpoint.</p> <p>There are two user adjustable Battery Temperature Setpoints: Battery Over Temperature Warning and Battery Overtemperature Limit. The temperature in one or more battery compartments has risen above the limit setpoint.</p> <p>Depending on user settings, the controls may trip the battery breaker associated with the over temperature condition.</p>	<p>Press "SILENCE" to silence the audible alarm. Observe the One-Line Display. To identify which battery cabinet is reporting the temperature condition, press the "Battery Box" on the One-Line Display to cycle through each battery compartment or string. The temperature display is located under the voltage reading in the Battery Box.</p> <p>If the Common Battery Disconnect and/or the individual battery cabinet or string reporting the over temperature condition is tripped, check the following settings.</p> <p>Press "User Settings," "Battery Management," "Battery Temperature" to check the current Battery Temperature Setpoints. If none of the Battery Boxes on the One-Line Display exhibit a temperature in excess of the temperature setpoint in the user settings, contact your factory-authorized service provider.</p> <p>If the over temperature limit is being reported correctly, investigate potential causes such as faulty air conditioning, or air flow blockage and resolve. Otherwise, contact your factory-authorized service provider.</p>
Batt Ovtemp Warning	<p>One or more of the Battery Temperature Sensors is reporting a temperature above the warning setpoint.</p> <p>There are two user adjustable Battery Temperature Setpoints: Battery Over Temperature Warning and Battery Overtemperature Limit. This alarm means the temperature in one or more battery compartments has risen above the warning setpoint.</p> <p>This alarm is self-clearing. When the condition is no longer present, the alarm and any control activity tied to the alarm reverts to normal.</p>	<p>Press "SILENCE" to silence the audible alarm. Observe the One-Line Display. To identify which battery cabinet is reporting the temperature condition, press the "Battery Box" on the One-Line Display to cycle through each battery compartment or string. The temperature display is located under the voltage reading in the Battery Box.</p> <p>Press "User Settings," "Battery Management," "Battery Temperature" to check the current Battery Temperature Setpoints. If none of the Battery Boxes on the One-Line Display exhibit a temperature in excess of the temperature setpoint in the user settings, contact your factory-authorized service provider.</p> <p>If the over temperature warning is being reported correctly, investigate potential causes, such as faulty air conditioning or air flow blockage and resolve. Otherwise, contact your factory-authorized service provider.</p>
Batt Self Test	<p>The UPS is performing a battery self test. The battery self test terminates automatically at the end of the test.</p> <p>Battery test settings are adjustable and can be accessed by pressing "Config," "User Settings," "Batt Mgt," "Battery Test."</p> <p>This status message is self-clearing. When the condition is no longer present, the message and any control activity tied to the status event reverts to normal.</p>	<p>During normal operation, no user response is required.</p> <p>The battery test can be terminated at any time by the user by pressing "Batt Mgt," "Manual Battery Test," "Stop."</p>
Batt Sensor Fail	<p>The controls are sensing a failed Battery Temperature Sensor.</p> <p>If a sensor reports a value outside the normal operating range of the sensor, it is considered failed.</p> <p>This alarm is self-clearing. When the condition is no longer present, the alarm and any control activity tied to the alarm reverts to normal.</p>	<p>Press "SILENCE" to silence the audible alarm. Try to identify which sensor has failed by observing the temperature reading inside the Battery Box on the One-Line Display. Cycle through all connected batteries by pressing the Battery Box on the display.</p> <p>Contact your factory-authorized service provider.</p>

Table 10 Liebert NXL alarm and status messages (continued)

Event Message	Event Definition	Recommended Action
Batt Temp Imbalance	With more than one Battery Temperature Sensor installed, the controls are detecting too great a temperature difference between the individual sensors.	Press "SILENCE" to silence the audible alarm. To attempt to identify which sensor is reporting an inconsistent temperature or an overheating battery, observe the temperature reading inside the Battery Box on the One-Line Display. Cycle through all connected batteries by pressing the Battery Box. If it appears this alarm is due to a specific cabinet or battery string being warmer than the others, verify through investigation whether the string is actually getting warmer than the others, or if the sensor appears to be reporting incorrectly. Contact your factory-authorized service provider.
Batt Test Failed	An Automatic or Manual Battery Test Failed. The battery "Test Duration" is adjustable. The battery test fail criteria were met before the end of the timed battery test. For example, there must be at least 25% load to run the battery test. If, during the battery test the load drops below 25%, the test fails.	Press "SILENCE" to silence the audible alarm. Contact your factory-authorized service provider.
Batt Test Inhibit	The conditions required to perform an automatic battery test are not met. When the battery test is inhibited, the system delays the test for 7 days. If conditions are satisfied after 7 days, the UPS performs the battery test at that time. Examples of conditions required to run the automatic battery test are at least 25% load, all battery breakers closed, normal operation, etc.	Check the Active Event Window and investigate other events to further analyze. If there are other active events in the Active Event Window, press "RESET" to clear the events. Check the One-Line display to verify the UPS is online. Check the Module Output Meter and verify the kW load is between 25%-100%. Press the Battery Box on the One-Line Display and verify all battery strings show at least 96% charged and all battery breakers are closed. If the issue cannot be resolved, contact your factory-authorized service provider.
Batt Test Passed	The Battery Test passed.	
BFB Open	The Backfeed Breaker is open. The Backfeed Breaker feeds the Static Bypass Switch (BPSS). The physical location of the breaker depends on unit configuration. It may be located in the UPS, or it may be located external to the UPS. The purpose of the Backfeed Breaker is to prevent leakage current through the bypass circuit during an outage. This status message is self-clearing. When the condition is no longer present, the message and any control activity tied to the status event reverts to normal.	This status message is informational. If the breaker was not opened intentionally, or if the breaker is actually closed and this message is active, contact your factory-authorized service provider.
BPSS is On	The Bypass Static Switch is On.	
BPSS Ovld Exceeded	The Bypass Static Switch (BPSS) was turned Off due to an extended overload. While the BPSS can sustain an overload greater than the Inverter and for a longer period of time, there are still limits on the amplitude and duration of overload that the BPSS can handle. This alarm indicates the overload was greater in amplitude and time than the BPSS can handle, and therefore shut Off to prevent damage to the equipment.	Press "SILENCE" to silence the audible alarm. If CB3 is available (visible if present on the One-Line Display), close it to restore power to the load. DO NOT ATTEMPT TO CLOSE CB3 UNTIL THE SOURCE OF THE OVERLOAD IS IDENTIFIED AND ISOLATED. Once the overload source is isolated, restart the UPS by pressing "Startup," "Manual Start" and follow the prompts. If the overload condition does not clear, or the overload is cleared but the UPS does not restart, contact your factory-authorized service provider.

Table 10 Liebert NXL alarm and status messages (continued)

Event Message	Event Definition	Recommended Action
BPSS Start Inhibit	When starting the module BPSS's in a 1+N system without a MBB, there are not enough module BPSS's ready with their MOB closed to support the rated capacity. This alarm is a latching alarm that must be cleared at each module after enough Bypass Static Switches are available to support the system load.	Press "SILENCE" to silence the audible alarm. Contact your factory-authorized service provider if there are enough Bypass Static Switches available to support the existing system load.
BPSS Unable	A problem has been detected in the Bypass Static Switch.	Press "SILENCE" to silence the audible alarm. Press "RESET" to attempt to clear the fault. Contact your factory-authorized service provider.
Breaker Close Fail	This is a summary event that informs the user that a circuit breaker that was either signaled to close or was manually closed failed to report a closed status. The Breaker Close Fail event indicates a mismatch between the expected state of a breaker and the reported state of the breaker.	Press "SILENCE" to silence the audible alarm. Check the One-Line Display and the Active Event Window to determine which breaker or switch is open. If the open breaker cannot be reset or closed, or if all breakers are closed but the One-Line Display does not agree, or the alarm cannot be cleared, contact your factory-authorized service provider.
Breaker Open Fail	This is a summary event that informs the user a circuit breaker that was either signaled to open or was manually opened failed to report an open status. The Breaker Open Fail event indicates a mismatch between the expected state of a breaker and the reported state of the breaker.	Press "SILENCE" to silence the audible alarm. Check the One-Line Display and the Active Event Window to determine which breaker or switch that should be open is still closed. If a breaker that should be open shows closed, or if the breaker in question actually is open but the fault is still present, attempt to clear the fault by pressing "RESET." If the event does not reset, contact your factory-authorized service provider.
Byp Overload Ph A	The critical load is greater than 110% while the UPS is on bypass. The controls may shut the unit down if the overload condition does not clear within the allotted time. Allotted time is variable, and is inversely proportional to the amplitude of the overload, i.e., the greater the amplitude of the overload, the less time the unit continues to support the load. This alarm is self-clearing. When the condition is no longer present, the alarm and any control activity tied to the alarm reverts to normal.	Press "SILENCE" to silence the audible alarm. Observe the calculated load percentage on A phase displayed on the Module Output Meter. If the A phase steady state load percentage exceeds 110%, perform the following: If Maintenance Bypass is available, follow Standard Operating Procedures to transfer the load to Maintenance Bypass. If Maintenance Bypass is not available but the system has an Internal Bypass Breaker (CB3 on the One-Line Display), close CB3. Note that depending on the severity of the overload, the possibility exists that CB3 could trip if the overload exceeds the breaker rating. Investigate the overload condition. If the Module Output Meter does not indicate an overload condition, perform the previous steps and contact your factory-authorized service provider.

Table 10 Liebert NXL alarm and status messages (continued)

Event Message	Event Definition	Recommended Action
Byp Overload Ph B	<p>The critical load is greater than 110% while the UPS is on bypass. The controls may shut the unit down if the overload condition does not clear within the allotted time. Allotted time is variable, and is inversely proportional to the amplitude of the overload, i.e., the greater the amplitude of the overload, the less time the unit continues to support the load.</p> <p>This alarm is self-clearing. When the condition is no longer present, the alarm and any control activity tied to the alarm reverts to normal.</p>	<p>Press "SILENCE" to silence the audible alarm. Observe the calculated load percentage on B phase displayed on the Module Output Meter. If the B phase steady state load percentage exceeds 110%, perform the following:</p> <p>If Maintenance Bypass is available, follow Standard Operating Procedures to transfer the load to Maintenance Bypass.</p> <p>If Maintenance Bypass is not available but the system has an Internal Bypass Breaker (CB3 on the One-Line Display), close CB3. Note that depending on the severity of the overload, the possibility exists that CB3 could trip if the overload exceeds the breaker rating.</p> <p>Investigate the overload condition.</p> <p>If the Module Output Meter does not indicate an overload condition, perform the previous steps and contact your factory-authorized service provider.</p>
Byp Overload Ph C	<p>The critical load is greater than 110% while the UPS is on bypass. The controls may shut the unit down if the overload condition does not clear within the allotted time. Allotted time is variable, and is inversely proportional to the amplitude of the overload, i.e., the greater the amplitude of the overload, the less time the unit continues to support the load.</p> <p>This alarm is self-clearing. When the condition is no longer present, the alarm and any control activity tied to the alarm reverts to normal.</p>	<p>Press "SILENCE" to silence the audible alarm. Observe the calculated load percentage on C phase displayed on the Module Output Meter. If the C phase steady state load percentage exceeds 110%, perform the following:</p> <p>If Maintenance Bypass is available, follow Standard Operating Procedures to transfer the load to Maintenance Bypass.</p> <p>If Maintenance Bypass is not available but the system has an Internal Bypass Breaker (CB3 on the One-Line Display), close CB3. Note that depending on the severity of the overload, the possibility exists that CB3 could trip if the overload exceeds the breaker rating.</p> <p>Investigate the overload condition.</p> <p>If the Module Output Meter does not indicate an overload condition, perform the previous steps and contact your factory-authorized service provider.</p>
Bypass Breaker (SBB) Open	<p>The bypass circuit breaker indicates that it is in the open position.</p>	
Bypass Not Avail	<p>This summary event indicates a problem with the detected bypass voltage. If bypass is not available, transfers to bypass are disabled.</p> <p>This alarm is self-clearing. When the condition is no longer present, the alarm and any control activity tied to the alarm reverts to normal.</p>	<p>Press "SILENCE" to silence the audible alarm. Observe the One-Line Display. The bypass power line feeding the static switch is green when bypass power is within normal operating range. If the line feeding the static switch is orange, gray, or black, bypass voltage is out of tolerance. Also check the bypass voltage readings on the Bypass Meter.</p> <p>When the bypass returns to normal, this alarm clears automatically. If all indications checked above are normal and the alarm is still present, contact your factory-authorized service provider.</p> <p>If there is a problem indicated with the bypass voltage, investigate and resolve the issue.</p> <p>Examples of conditions which could cause this alarm: Unstable generator voltage; or, Bypass Feeder Breaker tripped.</p>
Bypass OF/UF	<p>The bypass frequency has exceeded the bypass frequency limit of ± 5 Hz of nominal. If this alarm is active, transfers to bypass are disabled.</p> <p>This alarm is self-clearing. When the condition is no longer present, the alarm and any control activity tied to the alarm reverts to normal.</p>	<p>Press "SILENCE" to silence the audible alarm. Check the frequency on the Bypass Meter. If the frequency is outside the synchronization range, investigate and resolve the issue.</p> <p>This alarm is commonly the result of an uncalibrated generator, or power anomalies on the utility feed. Check bypass power for nominal limits. If bypass frequency appears normal, contact your factory-authorized service provider.</p>

Table 10 Liebert NXL alarm and status messages (continued)

Event Message	Event Definition	Recommended Action
Controller Error	<p>This is a summary event that indicates a DSP communication error.</p> <p>The Controller Error event is a fault condition that indicates a loss of communications in the controls.</p>	<p>Press "SILENCE" to silence the audible alarm.</p> <p>Press "RESET" to attempt to reset the fault.</p> <p>Contact your factory-authorized service provider</p>
Controls Come Fail	<p>The Controls Communication Failure event indicates a loss of communications between the Controls and Human Machine Interface (HMI).</p> <p>The Controls Communication Failure event is displayed when the HMI detects a loss of communication with Controls on the Controller Area Network (CAN).</p> <p>An infrequent occurrence that resets immediately is probably not serious.</p>	<p>If the alarm does not clear, or if the alarm condition returns, contact your factory-authorized service provider.</p>
Controls Reset Required	<p>This alarm means one or more critical settings have been changed by user during UPS operation.</p> <p>The change(s) will not take effect until after a UPS Controls reset. This operation should only be performed by an authorized service personnel.</p> <p>This alarm is cleared after UPS Controls reset.</p>	<p>Press "SILENCE" to silence the audible alarm.</p>
DC Link Gnd Fault-	<p>The negative DC Bus has a ground fault.</p> <p>The UPS controls monitor the DC Bus negative half for a voltage imbalance caused by current flow to ground. This fault means excessive ground current is detected.</p> <p>In normal operation, with the batteries connected, the most likely cause of a current path to ground is a leaking battery.</p> <p>If your system includes an optional Battery Ground Fault Monitor, check if the Battery Ground Fault message is present also.</p>	<p>Press "SILENCE" to silence the audible alarm.</p> <p>Press "RESET" to clear the fault.</p> <p>Perform a visual inspection of the batteries. Look for signs of leaking battery acid or excessively corroded battery terminals.</p> <p>If there are no visible signs of defective batteries, open one Battery Breaker. Press "RESET" and see if the condition clears. If the condition clears, you have isolated the problem to that battery string.</p> <p>If the condition will not clear, repeat the test with each connected battery string.</p> <p>Once the location is identified, or if the battery string tests are inconclusive, contact your factory-authorized service provider.</p>
DC Link Gnd Fault+	<p>The positive DC Bus has a ground fault.</p> <p>The UPS controls monitor the DC Bus positive half for a voltage imbalance caused by current flow to ground. This fault means excessive ground current is detected.</p> <p>In normal operation, with the batteries connected, the most likely cause of a current path to ground is a leaking battery.</p> <p>If your system includes an optional Battery Ground Fault Monitor, check if the Battery Ground Fault message is present also.</p>	<p>Press "SILENCE" to silence the audible alarm.</p> <p>Press "RESET" to clear the fault.</p> <p>Perform a visual inspection of the batteries. Look for signs of leaking battery acid or excessively corroded battery terminals.</p> <p>If there are no visible signs of defective batteries, open one Battery Breaker. Press "RESET" and see if the condition clears. If the condition clears, you have isolated the problem to that battery string.</p> <p>If the condition will not clear, repeat the test with each connected battery string.</p> <p>Once the location is identified, or if the battery string tests are inconclusive, contact your factory-authorized service provider.</p>

Table 10 Liebert NXL alarm and status messages (continued)

Event Message	Event Definition	Recommended Action
ECO Mode Active	<p>This event indicates that ECO Mode operation is active.</p> <p>The ECO Mode feature improves the overall efficiency of the UPS system by powering the critical bus from the bypass static switch instead of the inverter. If the critical bus goes out of tolerance (voltage, frequency or slew rate), the BPSS is turned Off and the inverter quickly assumes powering the critical bus. The inverter is always ready to take the load in the event that the bypass source fails.</p> <p>The user has the ability to start and stop ECO Mode manually via the user interface or automatically based on a user-defined schedule.</p>	<p>Under normal circumstances, none.</p> <p>Perform ECO Mode setup and operation by pressing “CONFIG,” “User Settings,” “ECO Mode” from the Menu Bar. ECO Mode can be manually controlled under the “Operation” submenu, or configured to run automatically under the “Schedule” submenu.</p> <p>If this message is active, and there is no clear reason why the UPS is in ECO Mode, contact your factory-authorized service provider.</p>
ECO Mode Suspended	<p>This event indicates that ECO Mode operation is suspended.</p> <p>When the ECO Mode feature is enabled and active, the UPS system powers the critical bus from the bypass static switch instead of the inverter. But if the critical bus goes out of tolerance (voltage, frequency or slew rate), ECO mode is temporarily suspended (or “inhibited.”) The BPSS is turned Off and the inverter quickly assumes powering the critical bus.</p>	<p>Under normal circumstances, none.</p> <p>Typically ECO Mode operation will resume soon after the bypass source becomes qualified again, unless the ECO Mode session is terminated due to a manual or scheduled ‘Stop’ command or if excessive ECO Mode suspensions occur.</p> <p>Perform ECO Mode setup and operation by pressing “CONFIG,” “User Settings,” “ECO Mode” from the Menu Bar. ECO Mode can be configured via the “Settings” submenu and manually controlled under the “Operation” submenu.</p> <p>If this message is active, and there is no clear reason why ECO Mode is inhibited, contact your factory-authorized service provider.</p>
EMO Shutdown	<p>An Emergency Module Off (EMO) command has been detected.</p> <p>The EMO signal means the front panel EMO button was pressed. A Remote EMO would display the “REMO Shutdown” alarm.</p> <p>In response to an EMO, the UPS transfers to Bypass and shuts Off.</p>	<p>Press “SILENCE” to silence the audible alarm. Resolve the issue that precipitated the EMO. For safety, the UPS latches an EPO event. To clear the latch, press the EMO Reset push button on the External Interface Board (EIB). Verify the EMO is cleared by pressing “RESET” and observing that the EPO alarm in the Active Event Window is gone. Restart the UPS by pressing “Startup,” “Manual Start,” and follow the prompts.</p>
EPO Shutdown	<p>The UPS shuts down in response to an active Emergency Power Off (EPO) command.</p>	<p>Press “SILENCE” to silence the audible alarm. Resolve the issue that precipitated the EPO. For safety, the UPS latches an EPO event. There are two ways to clear the latch:</p> <ol style="list-style-type: none"> 1. Press the EPO Reset push button on the External Interface Board (EIB). 2. From HMI front panel display, press OK button when “Press OK to Reset EPO Latched signal” message is displayed in a dialog box. <p>Verify the EPO is cleared by observing the EPO alarm in the Active Event Window is gone. Restart the UPS by pressing “Startup,” “Manual Start,” and follow the prompts.</p>

Table 10 Liebert NXL alarm and status messages (*continued*)

Event Message	Event Definition	Recommended Action
Equip Ovtemp	<p>This summary event indicates the UPS is nearing an over temperature condition. Depending on which sensor is reporting the high temperature, the UPS may do one of three things once the limit is reached: shut down, transfer to bypass, or transfer to battery operation. This is a potentially serious event.</p>	<p>Investigate possible causes for a rising temperature condition, such as loss of air conditioning, airflow obstructions, etc. If the ambient temperature is high due to loss of air conditioning and cannot be addressed immediately, perform the following: Press "Transfer," "Bypass" to transfer the UPS to bypass. Press "SILENCE" to silence the audible alarm. Wait at least 15 minutes, then attempt to reset the alarm by pressing "RESET." If the alarm clears and proper cooling has been restored to the UPS, press "Transfer," "UPS" to transfer back to UPS. If this alarm is present and no external factors are affecting proper cooling of the UPS, contact your factory-authorized service provider.</p>
Equip Ovtemp Limit	<p>This summary event occurs when one or more internal temperatures have exceeded the maximum temperature setpoint. This is the second of two over temperature alarms. The first, "Equipment Overtemperature Warning," sets when the detected temperature is near the limit. The controls react to this condition in various ways, depending on which sensor is reporting the over temperature condition.</p>	<p>Press "SILENCE" to silence the audible alarm. Check the One-Line Display for system status: UPS Off If external Maintenance Bypass is available, close the Maintenance Bypass Breaker (MBB) to restore power to the load. Do not attempt to restart the UPS without first contacting your factory-authorized service provider. If external Maintenance Bypass is not available, but the CB3 option is visible on the One-Line Display, verify the bypass line is green and close CB3 to restore power to the load. Contact your factory-authorized service provider. UPS On Bypass Verify the bypass line is green. If it is not, contact your factory-authorized service provider immediately and prepare to shut down the load. If external Maintenance Bypass is available, close the Maintenance Bypass Breaker (MBB) to place the load on Maintenance Bypass. Do not attempt to re-transfer to UPS without first contacting your factory-authorized service provider. If external Maintenance Bypass is not available, but the CB3 option is visible on the One-Line Display, close CB3. Do not attempt to re-transfer to UPS without first contacting your factory-authorized service provider. UPS On Battery Verify the bypass line is green. If it is not, contact your factory-authorized service provider immediately and prepare to shut down the load. If the bypass line is green, press "Transfer", "Bypass," to transfer the load to bypass. If there is a CB3 present on the One-Line Display, close CB3. If CB3 is not present and external Maintenance Bypass is available, close the MBB to place the load on Maintenance Bypass. If both CB3 and Maintenance Bypass are present, first close CB3, then close the external MBB. If CB3 or external Maintenance Bypass is not available, shut down the UPS by pressing "Shutdown," "UPS" and contact your factory-authorized service provider.</p>

Table 10 Liebert NXL alarm and status messages (continued)

Event Message	Event Definition	Recommended Action
<p>Excess Auto Rxfers</p>	<p>The UPS has tried to reconnect the inverter to the critical bus too many times. For a single module system, the load will be on the bypass static switch. For multi-module systems the load will be supported by the other modules. The UPS will attempt to automatically recover and reconnect the Inverter to the critical bus, if the reason that caused it to disconnect has cleared and the event is recoverable; for example, a temporary overload. The number of times the UPS attempts to recover is limited. When the number of attempts exceed the allowable number (default is 5 attempts per hour), the inverter will remain disconnected from the critical bus and this event will be displayed. An example of a condition that could cause this alarm is a cycling load on the UPS where the peak load exceeds the overload capability. If the cycling load exceeds the overload capability for more than the allowable number, the UPS will have to be put online manually by selecting "Transfer," "UPS."</p>	<p>Press "SILENCE" to silence the audible alarm. Press "RESET" to clear any active faults or alarms. Provided there are no alarms or faults still present that could prevent a transfer, press "Transfer," "UPS," to reconnect the Inverter to the critical bus. If successful, press "RESET" to clear the alarm. Otherwise, contact your factory-authorized service provider.</p>
<p>Excess ECO Suspends</p>	<p>This event indicates that ECO Mode operation has been terminated due to an excessive number of suspensions. When the ECO Mode feature is enabled and active, the UPS system powers the critical bus from the bypass static switch instead of the inverter. But if the critical bus goes out of tolerance (voltage, frequency or slew rate), ECO mode is temporarily inhibited (or "suspended.") This event is generated when ECO mode is repeatedly suspended and exceeds the user setting for the maximum number of automatic suspensions allowed.</p>	<p>This event will clear the next time ECO Mode is initiated by a manual or scheduled 'start' command. Perform ECO Mode setup and operation by pressing "CONFIG," "User Settings," "ECO Mode" from the Menu Bar. ECO Mode can be configured via the "Settings" submenu and manually controlled under the "Operation" submenu. If this message is active, and there is no clear reason why excessive ECO Mode suspensions are occurring, contact your factory-authorized service provider.</p>
<p>Excess Inp Curr THD</p>	<p>Excessive 5th harmonic detected on the input current. When input filter is installed/engaged, the 5th harmonic content of the input current exceeds 10% of the rated input current. The the input filter disconnect will open and inhibit the automatic re-closing of the input filter disconnect. There is a 5 second delay before the alarm can be annunciated, to prevent nuisance alarms. The alarm is self-clearing after the 5th harmonic content of the input current is less than 5% for more than 2 seconds. The alarm will again appear if the input filter disconnect is manually closed and the condition repeats.</p>	<p>Press "SILENCE" to silence the audible alarm. Contact your factory-authorized service provider.</p>

Table 10 Liebert NXL alarm and status messages (continued)

Event Message	Event Definition	Recommended Action
Excess Paralleling	When the controls detect a high amplitude, short duration overload condition on the output, the static switch is turned on momentarily in parallel with the Inverter to attempt to clear the condition. If the fault clears, the controls turn Off the static switch and the load remains on Inverter. This fault condition indicates the UPS pulse paralleled too many times and is now locked on bypass (auto re-transfers to Inverter are inhibited).	Press "SILENCE" to silence the audible alarm. Check the Module Output Meter and verify the output currents are normal, the kVA/kW percentages are less than 100%, and the Rexfer Time out is 00:00. Verify the Inverter box on the One-Line Display is green. Investigate any other active alarms or faults before attempting to clear this fault. Press "RESET" to clear the fault. If the Event Window is clear, press "Transfer," "UPS" to transfer the load back to Inverter. If the "UPS" button is grayed out, or pressing the "UPS" button does not transfer the unit back to Inverter, or if the UPS immediately transfers back to bypass, contact your factory-authorized service provider.
Fuse Fail	This is a summary event that indicates a fuse has opened. There are several fuses that can cause this fault. The Fuse Failure event is caused by one or more fuses reporting a failed status. The UPS may or may not transfer to bypass as a result of the failed fuse.	Press "SILENCE" to silence the audible alarm. Check the One-Line Display and other indicators to determine the state of the unit and take appropriate action. Contact your factory-authorized service provider.
Inlet Ovtmp	The air flowing into the UPS is too warm. This alarm is self-clearing. When the condition is no longer present, the alarm and any control activity tied to the alarm reverts to normal.	Press "SILENCE" to silence the audible alarm. Check the Inlet Air Temperature on the One-Line Display and verify the reading is accurate, i.e. is the room temperature warmer than normal? If the room temperature is warmer than normal, investigate and resolve the issue. If the room temperature is normal, and the Inlet Air Temp reading on the One-Line Display is higher than normal, contact your factory-authorized service provider.
Inp Phase Rotation	The correct input phase rotation should be clockwise, or A-B-C. This alarm indicates the sensed input phase rotation is counter-clockwise. If this alarm occurs on an operational unit, it typically indicates upstream work was performed (input side) and the input wiring was connected incorrectly. This alarm is self-clearing. When the condition is no longer present, the alarm and any control activity tied to the alarm reverts to normal.	Press "SILENCE" to silence the audible alarm. Verify correct phase rotation at the input. If the phase rotation is correct, contact your factory-authorized service provider.
Input Breaker (BIB) Open	The bypass isolation breaker indicates that it is in the open position.	
Input Breaker (RIB) Open	The rectifier isolation breaker indicates that it is in the open position.	

Table 10 Liebert NXL alarm and status messages (continued)

Event Message	Event Definition	Recommended Action
Input Contact "XY"	<p>The displayed text for this alarm depends on settings.</p> <p>In response to this alarm, the user may see any of four possible messages:</p> <ul style="list-style-type: none"> No message at all, but the help icon is present; A custom message programmed by the user; "Input Contact XY" if the contact is unconfigured; "Stop Batt Charge" if the contact is programmed as Pre-assigned. <p>If this event is active, an external signal is wired into channel Y of Input Contact Isolator #X.</p> <p>If the display shows Case 1 above (blank message), it means the contact channel is set to default but the default message was erased.</p> <p>If the display shows Case 2, the user-programmed event is active and the displayed text is customer defined.</p> <p>If the display shows Case 3, the contact is active but was not pre-programmed (default condition).</p> <p>If the display shows Case 4, the controls disable Battery charging operation.</p> <p>This alarm message is self-clearing. When the condition is no longer present, the message and any control activity tied to the alarm will revert to normal.</p>	<p>Check the wires landed on Input Contact Isolator #X.</p> <p>If this signal is not active, or if no signal wires are present, contact your factory-authorized service provider.</p>
Input Current Imbal	<p>The detected input currents are not balanced.</p> <p>This latching alarm indicates a potential problem in the input filter. The controls automatically open the filter contactor in response to this condition. The filter contactor must be manually closed once it opens in response to this alarm.</p>	<p>Press "SILENCE" to silence the audible alarm.</p> <p>Press "RESET" to attempt to clear the alarm condition.</p> <p>If the alarm clears, press "Startup," "Device Control," "Close Trap" to manually close the filter contactor.</p> <p>If the contactor remains closed, check the Input Meter and verify the input currents are balanced.</p> <p>If the contactor re-opens and the "Input Current Imbalance" returns, silence the alarm, leave the filter contactor open, and contact your factory-authorized service provider.</p>
Input Current Limit	<p>An active Input Current Limit alarm means the detected input current (RMS) exceeds the limit setpoint (default is 125%). This may be normal depending on various operating conditions, such as input voltage level, output load level, and whether the batteries have recently discharged.</p> <p>This alarm is self-clearing. When the condition is no longer present, the alarm and any control activity tied to the alarm reverts to normal.</p>	<p>Press "SILENCE" to silence the audible alarm.</p> <p>Observe the meters on the One-Line Display for input voltage level, battery charge/discharge current, and output load percentage kW.</p> <p>Investigate any abnormal readings.</p> <p>If the reason for the alarm cannot be determined, contact your factory-authorized service provider.</p>
Input Filter Cycle	<p>The Input Filter Disconnect is locked open.</p> <p>The Input Filter Disconnect Cycle counter has exceeded the setpoint. The Input Filter Disconnect opens automatically as determined by the disconnect settings, or because of an unusual condition.</p> <p>An example of a setting would be to automatically open the filter disconnect under light load conditions to improve the input power factor. An example of an unusual condition would be unbalanced currents on the input, possibly because of a suspect component in the filter itself.</p>	<p>Press "SILENCE" to silence the audible alarm.</p> <p>Attempt to manually close the disconnect by pressing "Startup," "Device Control," "Close Trap."</p> <p>If the condition which caused the filter disconnect to lock open is still present, it re-opens.</p> <p>If the disconnect cannot be manually closed or the alarm cannot be cleared, contact your factory-authorized service provider.</p>

Table 10 Liebert NXL alarm and status messages (continued)

Event Message	Event Definition	Recommended Action
Input Not Avail	<p>This summary alarm means there is a problem with input power. It is not acceptable to the Rectifier.</p> <p>If the unit is running normally when this event occurs, the UPS goes to battery.</p> <p>This alarm is self-clearing. When the condition is no longer present, the alarm and any control activity tied to the alarm reverts to normal</p>	<p>Press "SILENCE" to silence the audible alarm. Examine the One-Line Display. The Rectifier input line feeding the Input Breaker should be green. If not, investigate source power to the UPS.</p> <p>If input power is good, and this alarm is active, contact your factory-authorized service provider.</p>
Internal Comm Error	<p>This is a summary event caused by an interruption in communication between the controls and a device on the Controller Area Network (CAN).</p> <p>The Internal Communication Error event indicates a loss of communications between the controls and an external device.</p> <p>The Internal Communication Error is displayed when the controls detect a loss of communication to a device on the Controller Area Network (CAN).</p> <p>An infrequent occurrence that resets immediately is probably not serious.</p>	<p>Press "SILENCE" to silence the audible alarm. Press "RESET" to clear the alarm.</p> <p>If the alarm cannot be reset, or if the alarm condition returns, contact your factory-authorized service provider.</p>
Inv Overload Ph A	<p>An overload condition is active on A phase. A phase load condition exceeds 105%.</p> <p>A countdown timer is displayed on the One-Line Display in response to this alarm, and indicates the time remaining until a transfer to bypass occurs. The length of time remaining until transfer is directly proportional to the severity of the overload.</p> <p>This alarm is self-clearing. When the condition is no longer present, the alarm and any control activity tied to the alarm reverts to normal.</p>	<p>Press "SILENCE" to silence the audible alarm. Check the Module Output Meter and note the A phase load percentage.</p> <p>If possible, reduce A phase loading.</p> <p>If the steady state load remains above 105%, allow the UPS to transfer to bypass and contact your factory-authorized service provider.</p> <p>If the displayed load percentage is less than 100% and the alarm is still active, contact your factory-authorized service provider.</p>
Inv Overload Ph B	<p>An overload condition is active on B phase. B phase load condition exceeds 105%.</p> <p>A countdown timer is displayed on the One-Line Display in response to this alarm, and indicates the time remaining until a transfer to bypass occurs. The length of time remaining until transfer is directly proportional to the severity of the overload.</p> <p>This alarm is self-clearing. When the condition is no longer present, the alarm and any control activity tied to the alarm reverts to normal.</p>	<p>Press "SILENCE" to silence the audible alarm. Check the Module Output Meter and note the B phase load percentage.</p> <p>If possible, reduce B phase loading.</p> <p>If the steady state load remains above 105%, allow the UPS to transfer to bypass and contact your factory-authorized service provider.</p> <p>If the displayed load percentage is less than 100% and the alarm is still active, contact your factory-authorized service provider.</p>
Inv Overload Ph C	<p>An overload condition is active on C phase. C phase load condition exceeds 105%.</p> <p>A countdown timer is displayed on the One-Line Display in response to this alarm, and indicates the time remaining until a transfer to bypass occurs. The length of time remaining until transfer is inversely proportional to the severity of the overload.</p> <p>This alarm is self-clearing. When the condition is no longer present, the alarm and any control activity tied to the alarm reverts to normal.</p>	<p>Press "SILENCE" to silence the audible alarm. Check the Module Output Meter and note the C phase load percentage.</p> <p>If possible, reduce C phase loading.</p> <p>If the steady state load remains above 105%, allow the UPS to transfer to bypass and contact your factory-authorized service provider.</p> <p>If the displayed load percentage is less than 100% and the alarm is still active, contact your factory-authorized service provider.</p>

Table 10 Liebert NXL alarm and status messages (continued)

Event Message	Event Definition	Recommended Action
Inv Ovld Exceeded	<p>This message is displayed in response to an overload on one or more output phases. When an overload occurs, the controls display a countdown timer that displays the time remaining until a transfer to bypass occurs. The length of the timer is inversely proportional to the amplitude of the overload. When the timer reaches zero, the UPS transfers to bypass and populates the Active Event Window with this alarm.</p> <p>This fault is non-latching. When the underlying condition is no longer present, this fault and any control activity tied directly to this fault reverts to normal.</p>	<p>Press "SILENCE" to silence the audible alarm. Observe the load percentages for each phase on the Module Output Meter. If the load is less than 100%, attempt to transfer back to Inverter by pressing "Transfer," "UPS."</p> <p>If the transfer is successful, investigate the reason for the overload and take appropriate action. If the transfer is unsuccessful, contact your factory-authorized service provider.</p>
Inverter Fault	<p>This summary event indicates a potentially serious problem in the Inverter. The controls react to an Inverter fault in different ways depending on the root event that caused the fault. If bypass is available, the controls transfer to static bypass.</p> <p>A restart may or may not be possible.</p>	<p>Press "SILENCE" to silence the audible alarm. Check the One-Line Display to determine the state of the UPS. If both the Rectifier and Inverter are shut Off, press "RESET" to attempt to clear any latched alarms or faults.</p> <p>Attempt a restart by pressing "Startup," "Manual Start," and follow the prompts to place the UPS back in service.</p> <p>If the startup fails, contact your factory-authorized service provider.</p> <p>If the Rectifier and Inverter appear to be running, press "RESET" to attempt to clear any latched alarms or faults, then attempt a transfer by pressing "Transfer," "UPS." If the transfer is successful, contact your factory-authorized service provider.</p> <p>If the transfer is unsuccessful, contact your factory-authorized service provider.</p>
Inverter Output Breaker (CB2) Open	<p>The inverter output breaker indicates that it is in the open position.</p>	
LBS Active - Master	<p>This UPS system has been enabled as the functional Master Load Bus Synchronization (LBS) system. The functional Master is sending the LBS sync pulse.</p> <p>This status message is self-clearing when the LBS is disabled or this system is no longer selected as the LBS Master. When the condition is no longer present, the message and any control activity tied to the status event reverts to normal.</p>	<p>Under normal circumstances, none.</p> <p>If this message is active, and there is no clear reason why the LBS circuit should be active, contact your factory-authorized service provider</p>
LBS Inhibited	<p>With LBS operation enabled, conditions required to allow LBS operation are not met. Voltage or Frequency differences sensed by the LBS control are preventing the ability of LBS to function correctly.</p> <p>This alarm is self-clearing. When the condition is no longer present, the alarm and any control activity tied to the alarm reverts to normal.</p>	<p>Press "SILENCE" to silence the audible alarm. Check both Systems and verify normal operation: Both Systems running online on inverter; Neither System in Maintenance Bypass; No Bypass, Input, or Synchronization errors present on either system.</p> <p>If the cause of the alarm cannot be determined by checking both Systems, contact your factory-authorized service provider.</p>

Table 10 Liebert NXL alarm and status messages (continued)

Event Message	Event Definition	Recommended Action
Leading Pwr Factor	<p>With a load of 80% or greater, the controls have calculated the output Power Factor to be less than 0.95 leading.</p> <p>Leading Power Factors result in wasted energy. If the Power Factor is less than 0.95 leading, the UPS output is de-rated to compensate for output losses.</p> <p>This alarm is self-clearing. When the condition is no longer present, the alarm and any control activity tied to the alarm reverts to normal.</p>	<p>Press "SILENCE" to silence the audible alarm. Check the Output Meter readings and verify the Output Power Factor. If the displayed power factor is less than 0.95 leading, and the load is greater than 80%, reduce the load or investigate. Contact your factory-authorized service representative.</p>
Load Bank Breaker (LBB) Open	<p>The load bank breaker indicates that it is in the open position.</p>	
Load on Bypass	<p>The load is being supplied by bypass.</p>	
Load on Maint Byp	<p>The load is on Maintenance Bypass</p>	
Load on UPS	<p>The load is being supplied by the Inverter</p>	
Loss of Redundancy	<p>The multi-module system has less than one redundant module online. The number of redundant modules is calculated by taking the number of modules online minus the numbers of modules of load, rounded down to the nearest whole number (i.e., 3 Modules Online - 1.75 Modules of Load = 1 redundant modules online). This is a "notification only" type alarm, meaning the UPS takes no action other than sounding an audible alarm based on this setpoint.</p> <p>The alarm is self-clearing.</p> <p>The alarm condition can be permanently terminated by selecting NO in the Paralleling Modules selection of the Service Settings located in the configuration screen.</p>	<p>Press "SILENCE" to silence the audible alarm. Check the system load and verify that the system is non-redundant.</p> <p>To enable/disable the setting for the Loss of Redundancy you must select YES/NO (Enable/Disable) in the Paralleling Modules selection located in the User Settings of the Configuration screen. Press "Config." "User Settings," "Paralleling Modules."</p>
Loss of Sync Pulse	<p>A module in a multi-module system has detected a loss of the sync pulse.</p> <p>The system shall change sync master in an attempt to correct the loss of sync pulse.</p> <p>If operating normally, the SCC always posts this event.</p>	<p>Press "SILENCE" to silence the audible alarm. Contact your factory-authorized service provider.</p>
Low Batt Capacity	<p>One or more battery circuit breakers are open. This alarm applies if the system includes more than one battery circuit breaker, and at least one is closed, but one or more are open.</p> <p>This alarm is self-clearing. When the condition is no longer present, the alarm and any control activity tied to the alarm reverts to normal.</p>	<p>Press "SILENCE" to silence the audible alarm. To clear this alarm, verify all battery breakers are closed. Investigate any open breakers.</p>
Low Batt Shutdown	<p>The Battery has reached End of Discharge (EOD).</p> <p>There is no longer enough energy left in the battery to run the Inverter with the current load. If bypass is available, the UPS attempts to transfer the load to bypass at EOD.</p>	<p>Press "SILENCE" to silence the audible alarm. Once power is restored, attempt a normal restart of the UPS.</p> <p>If the restart fails, contact your factory-authorized service provider.</p>

Table 10 Liebert NXL alarm and status messages (continued)

Event Message	Event Definition	Recommended Action
Low Battery Warning	<p>The battery is nearly depleted, and the unit shuts down very soon.</p> <p>The Low Battery Warning setpoint is adjustable under User Settings. This alarm means the calculated time remaining on battery is now less than the Low Battery Warning setpoint.</p> <p>This alarm is self-clearing. When the condition is no longer present, the alarm and any control activity tied to the alarm reverts to normal.</p>	<p>Check to see if bypass is available by observing the One-Line Display. Acceptable bypass voltage is indicated by a green power line feeding the Static Bypass Switch (BPSS) box.</p> <p>If bypass is available, press "Transfer," "Bypass" to transfer to bypass. If the bypass is qualified, the UPS transfers to the bypass source.</p> <p>If bypass is not available, prepare to shut down critical loads, or remove non-essential loads in order to extend battery run time so that critical loads may be shut down in an orderly manner.</p>
Low Power Factor	<p>The output power factor is low.</p> <p>The output power factor is less than 70% leading or lagging. A simplified explanation of power factor is the ratio of energy being supplied to energy being used by the load. For a given load, the current output of the UPS goes up as power factor decreases.</p> <p>This results in the UPS output being derated. For example, study the following: Load = 100 kw @ 480V $\text{amps} = \text{kW} \times 1000 / \text{volts} \times \text{power factor} \times 1.73$ (square root of 3) $100\text{kW} \times 1000 = 100000$ $480\text{V} \times 0.9\text{PF} \times 1.73 = 747.36$ $100000/747.36 = 133.8\text{A}$ Now, replace the 0.9 power factor (typical computer load power factor) with 0.7 power factor: $100\text{kW} \times 1000 = 100000$ $480\text{V} \times 0.7\text{PF} \times 1.73 = 581.28$ $100000/581.28 = 172\text{A}$ The load remains the same, but the current required to supply it is roughly 30% higher. The extra current is wasted energy that can result in nuisance trips of breakers, overheating of cables, and other unwanted conditions. The UPS cannot control the output power factor.</p> <p>This alarm is notification to the user that the load should be evaluated.</p>	<p>Press "SILENCE" to silence the audible alarm. Evaluate the load on the UPS. For more information, contact your factory-authorized service provider</p>
Main Control Fault	<p>The UPS has transferred to Bypass due to a loss of communications with the Main Controller. All Transfers, Startup, Shutdown, and Metering screens are locked out.</p> <p>The Controls attempt to reestablish communications but will not return the load to inverter automatically</p>	<p>Press "SILENCE" to silence the audible alarm. Contact your factory-authorized service provider. If communications are reestablished, the One-Line Display will be restored; however, Liebert does not recommend attempting to return the load to inverter until a service visit has been made and action taken to determine why the fault occurred. Action will involve resetting the UPS controls by removing and then reapplying control power. Therefore, it will be necessary to utilize maintenance bypass, either by closing the optional CB3 internal bypass breaker, or by closing the optional external Maintenance Bypass Breaker (MBB). Liebert does not recommend the user, or operator, attempt this without first speaking with an authorized service associate from Liebert.</p>
Maintenance Bypass Breaker (MBB) Open	<p>The maintenance bypass breaker indicates that it is in the open position</p>	
Maintenance Isolation Breaker (MIB) Open	<p>The maintenance isolation breaker indicates that it is in the open position.</p>	

Table 10 Liebert NXL alarm and status messages (*continued*)

Event Message	Event Definition	Recommended Action																																		
<p>Man Rexfer Inhibit</p>	<p>This summary event means the conditions required to perform a manual transfer to Inverter (online) are not met (Inverter must be in sync with bypass). This status message is self-clearing. When the condition is no longer present, the message and any control activity tied to the status event reverts to normal.</p>	<p>The condition clears from the Active Event Window when manual re-transfers are enabled. A possible reason for this condition is an unstable generator. If the generator frequency is not stable, or not at 60 Hz, the Inverter may have difficulty maintaining or acquiring synchronization with the bypass source.</p> <p>To check the synchronization of the Inverter to bypass, click "Transfer" and observe the synchroscope. A non-sync condition is indicated by a varying phase angle error, rather than a stable "0" degree indication.</p> <p>If the unit is not on generator, and the bypass voltage otherwise appears normal, contact your factory-authorized service provider.</p> <p>Parametric Data (Note 1)</p> <table border="1"> <thead> <tr> <th>Bit</th> <th>Reason</th> </tr> </thead> <tbody> <tr> <td>0x0001</td> <td>Transfer to UPS Inhibited Internally (SCR Open, SCR Shorted, CB3 Closed, MBB & MIB Both Closed)</td> </tr> <tr> <td>0x0002</td> <td>Inverter not Ready (Inverter Walking In or Inverter not Qualified or Bypass not Synchronized)</td> </tr> <tr> <td>0x0004</td> <td>Pulse Parallel Active</td> </tr> <tr> <td>0x0008</td> <td>Bypass to Output Phase Error</td> </tr> <tr> <td>0x0010</td> <td>Critical Bus not Qualified</td> </tr> <tr> <td>0x0020</td> <td>Not Enough Inverters Available to Support the Load</td> </tr> <tr> <td>0x0040</td> <td>Phase Error Exceeds Manual Transfer Limit Setting</td> </tr> <tr> <td>0x0080</td> <td>CB3 Closed</td> </tr> <tr> <td>0x0100</td> <td>Kirk Key Inserted</td> </tr> <tr> <td>0x0200</td> <td>BPSS Board has Failed</td> </tr> <tr> <td>0x0400</td> <td>MBB & MIB Both Closed</td> </tr> <tr> <td>0x0800</td> <td>Bypass Sync Error</td> </tr> <tr> <td>0x1000</td> <td>Inverter not Qualified</td> </tr> <tr> <td>0x2000</td> <td>Inverter in Walkin</td> </tr> <tr> <td>0x4000</td> <td>Loss of Sync Pulse</td> </tr> <tr> <td>0x8000</td> <td>Critical Bus in Overload</td> </tr> </tbody> </table>	Bit	Reason	0x0001	Transfer to UPS Inhibited Internally (SCR Open, SCR Shorted, CB3 Closed, MBB & MIB Both Closed)	0x0002	Inverter not Ready (Inverter Walking In or Inverter not Qualified or Bypass not Synchronized)	0x0004	Pulse Parallel Active	0x0008	Bypass to Output Phase Error	0x0010	Critical Bus not Qualified	0x0020	Not Enough Inverters Available to Support the Load	0x0040	Phase Error Exceeds Manual Transfer Limit Setting	0x0080	CB3 Closed	0x0100	Kirk Key Inserted	0x0200	BPSS Board has Failed	0x0400	MBB & MIB Both Closed	0x0800	Bypass Sync Error	0x1000	Inverter not Qualified	0x2000	Inverter in Walkin	0x4000	Loss of Sync Pulse	0x8000	Critical Bus in Overload
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Table 10 Liebert NXL alarm and status messages (continued)

Event Message	Event Definition	Recommended Action																										
<p>Manual Xfer Inhibit</p>	<p>This summary event means the conditions required to perform a manual transfer to bypass are not met (Inverter must be in sync with bypass). This status message is self-clearing. When the condition is no longer present, the message and any control activity tied to the status event reverts to normal.</p>	<p>The condition clears from the Active Event Window when manual transfers are enabled. A possible reason for this condition is an unstable generator. If the generator frequency is not stable, or not at 60 Hz, the Inverter may have difficulty maintaining synchronization with the bypass source.</p> <p>To check the synchronization of the Inverter to bypass, click "Transfer" and observe the synchroscope. A non-sync condition is indicated by a varying phase angle error, rather than a stable "0" degree indication.</p> <p>If the unit is not on generator, and the bypass voltage otherwise appears normal, contact your factory-authorized service provider.</p> <p>Parametric Data (Note 1)</p> <table border="0"> <tr> <td>Bit</td> <td>Reason</td> </tr> <tr> <td>0x0001</td> <td>Bypass not Qualified</td> </tr> <tr> <td>0x0002</td> <td>Bypass to Output Phase Error</td> </tr> <tr> <td>0x0004</td> <td>Phase Error Exceeds Manual Transfer Limit Setting</td> </tr> <tr> <td>0x0008</td> <td>Voltage Exceeds Manual Transfer Limit Setting</td> </tr> <tr> <td>0x0010</td> <td>BFB or CB3 is Open</td> </tr> <tr> <td>0x0020</td> <td>BPSS Board has Failed</td> </tr> <tr> <td>0x0040</td> <td>Bypass Sync Error</td> </tr> <tr> <td>0x0080</td> <td>Loss of Sync Pulse</td> </tr> <tr> <td>0x0100</td> <td>BPSS not Enabled</td> </tr> <tr> <td>0x0200</td> <td>Removing Module will cause Overload or Drop the Load</td> </tr> <tr> <td>0x0400</td> <td>CB2 Open</td> </tr> <tr> <td>0x0800</td> <td>MOB Open</td> </tr> </table>	Bit	Reason	0x0001	Bypass not Qualified	0x0002	Bypass to Output Phase Error	0x0004	Phase Error Exceeds Manual Transfer Limit Setting	0x0008	Voltage Exceeds Manual Transfer Limit Setting	0x0010	BFB or CB3 is Open	0x0020	BPSS Board has Failed	0x0040	Bypass Sync Error	0x0080	Loss of Sync Pulse	0x0100	BPSS not Enabled	0x0200	Removing Module will cause Overload or Drop the Load	0x0400	CB2 Open	0x0800	MOB Open
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<p>Max Load Alarm Ph A</p>	<p>The user adjustable maximum load alarm threshold was exceeded. This is a "notification only" type alarm, meaning the UPS takes no action other than sounding an audible alarm based on this setpoint. The setting allows the user to monitor the load status of the UPS. For example, if the current load on Phase A is 50%, the user can set this setpoint to 80% and an alarm is received if the added load exceeds 80%. The alarm may also be configured with a delay, to prevent nuisance alarms due to cycling loads. The alarm is self-clearing. Once the load level decreases to less than 95% of the level setting, the alarm clears.</p>	<p>Press "SILENCE" to silence the audible alarm. Check the kW load % displayed for A phase. To check the setpoint for the alarm, press "Config," "User Settings," "Adjustable Setpoints," "Max Load Alarm." Compare the setpoint to the displayed load percentage. If the load percentage displayed is correct and the value exceeds the setpoint, raise the setpoint to clear the alarm, or reduce the load below the setpoint. Contact your factory-authorized service provider.</p>																										

Table 10 Liebert NXL alarm and status messages (continued)

Event Message	Event Definition	Recommended Action
Max Load Alarm Ph B	<p>The user adjustable maximum load alarm threshold was exceeded. This is a "notification only" type alarm, meaning the UPS takes no action other than sounding an audible alarm based on this setpoint. The setting allows the user to monitor the load status of the UPS. For example, if the current load on Phase B is 50%, the user can set this setpoint to 80% and an alarm is received if the added load exceeds 80%.</p> <p>The alarm may also be configured with a delay, to prevent nuisance alarms due to cycling loads. The alarm is self-clearing. Once the load level decreases to less than 95% of the level setting, the alarm clears.</p>	<p>Press "SILENCE" to silence the audible alarm. Check the kW load % displayed for B phase. To check the setpoint for the alarm, press "Config," "User Settings," "Adjustable Setpoints," "Max Load Alarm."</p> <p>Compare the setpoint to the displayed load percentage. If the load percentage displayed is correct and the value exceeds the setpoint, raise the setpoint to clear the alarm, or reduce the load below the setpoint.</p> <p>Contact your factory-authorized service provider.</p>
Max Load Alarm Ph C	<p>The user adjustable maximum load alarm threshold was exceeded. This is a "notification only" type alarm, meaning the UPS takes no action other than sounding an audible alarm based on this setpoint. The setting allows the user to monitor the load status of the UPS. For example, if the current load on Phase C is 50%, the user can set this setpoint to 80% and an alarm is received if the added load exceeds 80%.</p> <p>The alarm may also be configured with a delay, to prevent nuisance alarms due to cycling loads. The alarm is self-clearing. Once the load level decreases to less than 95% of the level setting, the alarm clears.</p>	<p>Press "SILENCE" to silence the audible alarm. Check the kW load % displayed for C phase. To check the setpoint for the alarm, press "Config," "User Settings," "Adjustable Setpoints," "Max Load Alarm."</p> <p>Compare the setpoint to the displayed load percentage. If the load percentage displayed is correct and the value exceeds the setpoint, raise the setpoint to clear the alarm, or reduce the load below the setpoint.</p> <p>Contact your factory-authorized service provider.</p>
MBD Open	<p>The Module Battery Disconnect is open. This alarm is self-clearing. When the condition is no longer present, the alarm and any control activity tied to the alarm reverts to normal.</p>	<p>Press "SILENCE" to silence the audible alarm. Check the status of Module Battery Disconnect (MBD). If it is open, the alarm is normal. If the Module Battery Disconnect is closed, contact your factory-authorized service provider.</p>
MMS Pwr Share Warn	<p>This event indicates that in a multi-module system, a module determines that at least one phase is not sharing the power within some threshold as compared to the per phase average power of all the other modules.</p> <p>This alarm is self clearing.</p>	<p>Press "SILENCE" to silence the audible alarm.</p> <p>Wait 30 seconds and check to see if the alarm has cleared.</p> <p>If the alarm does not clear after 30 seconds, check the Event Log by pressing "Status Reports," "Event Log" for additional information and contact your factory-authorized service provider.</p>
MMS Rexfer Inhibit	<p>This summary event means the conditions required to perform a transfer to inverter are not met.</p> <p>This status message is self-clearing. When the condition is no longer present, the message and any control activity tied to the status event reverts to normal.</p>	<p>The condition clears from the Active Event Window when manual retransfers are enabled. Possible reasons for this condition are: 1. With the collective not on UPS inverters and Module Output Breaker (MOB) open (if installed) active or Output Isolator (QE) open (if installed) active or 2. Manual Retransfer Inhibit is active or 3. Not enough inverters are available to support the measured load or 4. Any module's inverter is connected to the collective.</p>

Table 10 Liebert NXL alarm and status messages (continued)

Event Message	Event Definition	Recommended Action																				
MMS Xfer Inhibit	<p>This summary event means the conditions required to perform a transfer to bypass are not met.</p> <p>This status message is self-clearing. When the condition is no longer present, the message and any control activity tied to the status event reverts to normal.</p>	<p>The condition clears from the Active Event Window when manual transfers are enabled.</p> <p>Possible reasons for this condition are:</p> <ol style="list-style-type: none"> 1. With the collective on UPS inverters and Module Output Breaker (MOB) open (if installed) active or 2. Manual Transfer Inhibit is active or 3. Not enough BPSSs are available to support the measured load or 4. Any module's BPSS is connected to the collective. <p>Parametric Data (Note 1)</p> <table border="0"> <thead> <tr> <th style="text-align: left;">Bit</th> <th style="text-align: left;">Reason</th> </tr> </thead> <tbody> <tr> <td>0x0001</td> <td>Bypass not Qualified</td> </tr> <tr> <td>0x0002</td> <td>Bypass to Output Phase Error</td> </tr> <tr> <td>0x0004</td> <td>Phase Error Exceeds Manual Transfer Limit Setting</td> </tr> <tr> <td>0x0008</td> <td>Voltage Exceeds Manual Transfer Limit Setting</td> </tr> <tr> <td>0x0010</td> <td>BFB Open</td> </tr> <tr> <td>0x0020</td> <td>BPSS Board has Failed</td> </tr> <tr> <td>0x0040</td> <td>Bypass Sync Error</td> </tr> <tr> <td>0x0080</td> <td>BPSS not Enabled</td> </tr> <tr> <td>0x0100</td> <td>Bypass Overload Shutdown</td> </tr> </tbody> </table>	Bit	Reason	0x0001	Bypass not Qualified	0x0002	Bypass to Output Phase Error	0x0004	Phase Error Exceeds Manual Transfer Limit Setting	0x0008	Voltage Exceeds Manual Transfer Limit Setting	0x0010	BFB Open	0x0020	BPSS Board has Failed	0x0040	Bypass Sync Error	0x0080	BPSS not Enabled	0x0100	Bypass Overload Shutdown
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0x0100	Bypass Overload Shutdown																					
Module Alarm Active	One or more modules have active event(s).	<p>Press "SILENCE" to silence the audible alarm. From the front panel display, touch "Status View On" in the mimic one-line pane. A pop-up module status view displays which of the modules have an active event and the type of event (Fault, Alarm). Go to the module(s) and investigate.</p>																				
Module In Standby	<p>This module has gone into standby mode due to Intelligent Paralleling operation. Since the load can be powered and the required redundancy met with fewer modules, this module has automatically been taken offline to conserve power and improve operating efficiency</p> <p>This status message is self-clearing. When the condition is no longer present, the message and any control activity tied to the status event reverts to normal.</p>																					
Module Output Breaker (MOB) Open	The module output breaker indicates that it is in the open position.																					
Multiple Fan Fail	This summary event is active when more than one fan has failed.	<p>Press "SILENCE" to silence the audible alarm. Press "RESET" to clear the alarm. If the alarm will not clear, contact your factory-authorized service provider</p>																				
On Gen Active	<p>The UPS input source is generator. An external signal is being used to inform the UPS when the power source is generator rather than utility, and the signal is active.</p> <p>This status message is self-clearing. When the condition is no longer present, the message and any control activity tied to the status event reverts to normal.</p>	<p>Under normal conditions, no user action is required. If the UPS is not actually on generator and this message is active, contact your factory-authorized service provider.</p>																				

Table 10 Liebert NXL alarm and status messages (continued)

Event Message	Event Definition	Recommended Action
Outlet Ovttemp Limit	<p>The difference between the inlet air temperature and the outlet air temperature is too great. This alarm means excessive heat is being generated internally resulting in a higher than normal exhaust air temperature.</p> <p>If the Bypass is within limits, the UPS reacts to this alarm by transferring to Bypass and shutting Off the Inverter.</p> <p>This alarm is self-clearing. When the condition is no longer present, the alarm and any control activity tied to the alarm reverts to normal.</p>	<p>Press "SILENCE" to silence the audible alarm. Check the Inlet Air Temperature on the One-Line Display and verify the reading is accurate, i.e. is the room temperature warmer than normal? If the room temperature is warmer than normal, investigate and resolve the issue.</p> <p>If the room temperature is normal, and the Inlet Air Temp reading on the One-Line Display is higher than normal, contact your factory-authorized service provider.</p>
Output Fault	<p>This summary event occurs when the detected system output exceeds acceptable voltage limits. If the UPS was on Inverter at the time of the event, the UPS transfers to bypass provided the bypass voltage is available.</p> <p>If the UPS was on bypass at the time of the event, the UPS shuts down rather than allowing unacceptable voltage to reach the load.</p>	<p>Press "SILENCE" to silence the audible alarm. Check the Active Event Window and investigate other events to further analyze. Press "RESET" to attempt to reset any latched events.</p> <p>Check the One-Line Display to determine the system status (On UPS, Bypass, or Off). Check the input and bypass (dual input only) and observe the One-Line color. Green indicates good power present, orange means power is present but outside nominal range, and gray means power is not present.</p> <p>If the load is Off and the input voltage is ok, attempt to restart the UPS by pressing "Startup," "Manual Start," and follow the prompts.</p> <p>If the Input Meter indicates input or bypass is not available, investigate and resolve the power problem.</p> <p>If the load is on bypass and all alarms are reset, press "Transfer," "UPS," to attempt to transfer back to Inverter.</p> <p>If the issue cannot be resolved, contact your factory-authorized service provider.</p>
Output Over/Under Frequency	<p>The output frequency has exceeded the output frequency limit of +/- 0.25 Hz within the bypass frequency.</p> <p>This alarm is self-clearing. When the condition is no longer present, the alarm and any control activity tied to the alarm reverts to normal.</p>	<p>Press "SILENCE" to silence the audible alarm. Check the frequency on the Output Meter. If the frequency is outside the synchronization range, investigate and resolve the issue.</p> <p>This alarm is commonly the result of an inverter not synchronized to the bypass frequency.</p> <p>If output frequency error persists, contact your factory-authorized service provider.</p>
Parallel Comm Warn	<p>The control has detected a communication failure on one of the redundant communication busses. One of the paralleling control communication busses is no longer communicating within the system.</p>	<p>Press "SILENCE" to silence the audible alarm.</p>
Power Supply Fail	<p>The controls have detected a problem with a power supply. This is a summary event. There are several power supplies, most of them redundant. In most cases, the UPS can operate normally even with a failed supply.</p>	<p>Press "SILENCE" to silence the audible alarm. Press "RESET" to attempt to clear the alarm. Check the Active Event Window to check for other events that might explain the Power Supply Fail alarm. For example, if the bypass is not available, a Power Supply Fail alarm is normal, because the Bypass Power Supply has no input power.</p> <p>Contact your factory-authorized service provider.</p>

Table 10 Liebert NXL alarm and status messages (continued)

Event Message	Event Definition	Recommended Action
Rectifier Fault	<p>This summary event indicates a potentially serious condition in the Rectifier circuit. The controls respond to this by turning Off the Rectifier, opening the input filter contactor, and placing the UPS on battery operation. This fault is non-latching. When the underlying condition is no longer present, this fault and any control activity tied directly to this fault reverts to normal.</p>	<p>Observe the One-Line Display and the Active Event Window for current UPS condition - On Battery? Observe the color of the Bypass Line on the One-Line Display. If green, bypass is available. This is significant, because if the batteries fail, the UPS transfers safely to the bypass line. If the UPS is on battery, and the bypass line on the One-Line Display is not green, contact your factory-authorized service provider immediately and prepare to shut down as the UPS turns Off once the batteries are depleted. Press "SILENCE" to silence the audible alarm. Press "RESET" to attempt to clear the fault condition. If the Rectifier Fault clears, press "Startup," "Manual Start," "Rectifier" to attempt to restart the Rectifier. If this is successful, observe normal operation of the Rectifier, indicated on the One-Line Display by a green outline around the Rectifier box, and normal DC Bus voltage on the DC Bus Meter. If the Rectifier starts normally, attempt to close the input filter contactor by pressing "Startup," "Device Control," "Close Trap." If the UPS is not on battery, but transferred to bypass, contact your factory-authorized service provider. If the Rectifier Fault was cleared by pressing "RESET," but the fault returns as soon as a Rectifier restart is attempted, contact your factory-authorized service provider.</p>
Rectifier Input Breaker (CB1) Open	<p>The rectifier input breaker indicates that it is in the open position.</p>	
Redundant Fan Fail	<p>This alarm indicates a fan has failed.</p>	<p>Press "SILENCE" to silence the audible alarm. Contact your factory-authorized service provider.</p>
Regen Active	<p>Regeneration Mode is a service mode that is normally controlled by the service technician. Regeneration Mode Status or Alarm messages are generally intended for the service person. This status message informs the user the UPS is in Regeneration Mode. This status message is self-clearing. When the condition is no longer present, the alarm and any control activity tied to the alarm reverts to normal.</p>	<p>Under normal circumstances, none. If this message is active and there is no clear reason why the UPS is in Regeneration Mode, contact your factory-authorized service provider.</p>
Regen Failure	<p>Regeneration Mode was initiated and terminated because of an abnormal condition. Once Regeneration Mode is active, any condition, for example an Inverter Overload, other than the user manually stopping Regeneration Mode, causes this message to appear. Regeneration Mode is a service mode that is normally controlled by the service technician. Regeneration Mode Status or Alarm messages are generally intended for the service person.</p>	<p>Press "SILENCE" to silence the audible alarm. Press "RESET" to attempt to clear the alarm. If Regeneration Mode was not manually initiated by service, or if this alarm will not reset, contact your factory-authorized service provider.</p>

Table 10 Liebert NXL alarm and status messages (continued)

Event Message	Event Definition	Recommended Action
Regen Terminated	Regeneration Mode is a service mode that is normally controlled by the service technician. Regeneration Mode Status or Alarm messages are generally intended for the service person. This status message informs the user that Regen Mode is no longer active. This status message is self-clearing. When the condition is no longer present, the alarm and any control activity tied to the alarm reverts to normal.	Under normal circumstances, none. If this message is active, and there is no clear reason why the UPS was in Regeneration Mode, or if the command to terminate Regeneration Mode was not issued, contact your factory-authorized service provider.
REPO Shutdown	The UPS shuts down in response to an active Remote Emergency Power Off (REPO) command.	Press "SILENCE" to silence the audible alarm. Resolve the issue that precipitated the REPO. For safety, the UPS latches on REPO event. There are two ways to clear the latch: 1. Press the Reset push button on the External Interface Board (EIB). 2. From the HMI front panel display, press the OK button when the "Press OK to Reset EPO Latched signal" message is displayed in a dialog box. Verify the REPO is cleared by observing the REPO alarm in the Active Event Window is gone. Restart the UPS by pressing "Startup," "Manual Start" and follow the prompts.
Restart in Process	Automatic Restart is in progress. This message clears when the Automatic Restart sequence is complete.	To complete the Automatic Restart, follow the prompts on the display
Restart Inhibited	Automatic Restart of the UPS is not allowed because of an external signal. Automatic Restart Inhibit is active when signaled from an external source. The signal is wired into Input Contact Interface (ICI 1).	Investigate and resolve the external signal forcing the UPS to remain Off. If you do not have an ICI, or if there are no external Off signals input to the UPS, contact your factory-authorized service provider.
Service Code Active	This event is for informational purposes, and informs the user that Service Code is currently running. This status message is self-clearing. When the condition is no longer present, the alarm and any control activity tied to the alarm reverts to normal.	Under normal circumstances, none. If this message is active, and Service Code is not loaded, contact your factory-authorized service provider.
System Comm Fail	The control has detected a communication failure of a device on the multi-module communication bus. For example, the event will be annunciated if a module is not communicating with the SCC. The alarm is self-clearing. Once all modules are communicating with the SCC, the alarm clears.	Press "SILENCE" to silence the audible alarm. Use the System View on the touchscreen to see what modules are not communicating. If one more than one module is not communicating, then the Parallel Communication cables have failed. If one module is not communicating, then that module might have developed a fault. Do not attempt to transfer the load while this alarm is present. Contact your factory-authorized service provider if the condition continues.

Table 10 Liebert NXL alarm and status messages (continued)

Event Message	Event Definition	Recommended Action
System Low Battery	<p>The number of modules with Low Battery Warning event active exceeds the number of redundant modules online.</p> <p>This alarm is self clearing. When the number of modules with Low Battery Warning alarm active is less than the number of redundant modules online or when no modules has a Low battery Warning event, the alarm and any control activity tied to the alarm reverts to normal.</p>	<p>Press "SILENCE" to silence the audible alarm.</p> <p>Check to see if bypass is available by observing the System One-Line Display. Acceptable bypass voltage is indicated by a green power line feeding the Static Bypass Switch (BPSS) box.</p> <p>The Control Software provides optimum load protection by maintaining the load on UPS outputs for as long as possible. If not enough modules recover from a low battery condition to support the load and if bypass is available, the load will be transferred to bypass. Check the bypass line on the one-line display. If the line feeding the Static Bypass Switch (BPSS) is green, the system can be transferred to bypass manually by pressing "TRANSFER," "BYPASS." Note that transferring to bypass could expose the load to an outage if the bypass source fails.</p> <p>If bypass is not available, prepare to shut down critical loads, or remove non-essential loads in order to extend battery run time so that critical loads may be shut down in an orderly manner.</p>
System On Battery	<p>The number of modules on battery exceeds the number of redundant modules online.</p> <p>This alarm is self clearing. When the number of modules on battery is less than the number of redundant modules online or when no module is on battery, the alarm and any control activity tied to the alarm reverts to normal.</p>	<p>Press "SILENCE" to silence the audible alarm.</p> <p>Observe the module one-line display. If the input line is orange, black, or gray, the battery discharging condition is normal.</p> <p>If the input line on the one-line display is green, check the Active Event Window for potential fault conditions that could explain why the UPS is on battery. An example of this could be "Rectifier Fault."</p> <p>Monitor the UPS during the battery discharge. The display shows the discharge curve of the battery. When the battery voltage line touches the End of Discharge line, the UPS shuts down.</p> <p>The Control Software provides optimum load protection by maintaining the load on UPS outputs for as long as possible. If not enough modules recover from a battery discharging condition to support the load and if bypass is available, the load will be transferred to bypass. Check the bypass line on the one-line display. If the line feeding the Static Bypass Switch (BPSS) is green, the system can be transferred to bypass manually by pressing "TRANSFER," "BYPASS" to transfer the load to the bypass source. Note that transferring to bypass could expose the load to an outage if the bypass source fails.</p> <p>If the battery is discharging because of a fault such as "Rectifier Fault" in the Active Event Window rather than an actual power outage, transfer to bypass if available, and contact your factory-authorized service provider.</p>
System Output Breaker (UOB) Open	<p>The system output breaker indicates that it is in the open position.</p>	
System Overload	<p>One or more modules in a multi-module system is reporting an overload on at least one phase.</p>	
Temp Sense Fail	<p>An equipment temperature sensor is reporting an invalid temperature. The controls ignore temperatures from a failed sensor.</p>	<p>Press "SILENCE" to silence the audible alarm.</p> <p>Press "RESET" to clear the alarm.</p> <p>If the alarm cannot be reset, or if the alarm condition returns, contact your factory-authorized service provider.</p>

Table 10 Liebert NXL alarm and status messages (*continued*)

Event Message	Event Definition	Recommended Action
Xfer to Byp Failed	<p>An event (such as an Inverter fault) caused an attempted automatic transfer to bypass and the transfer failed.</p> <p>The controls detect the Static Bypass Switch (BPSS) failed to assume the load and the Inverter was Off.</p>	<p>Press "SILENCE" to silence the audible alarm.</p> <p>Check the Event Log by pressing "Status Reports," "Event Log" to investigate why the UPS tried to transfer to bypass and why the BPSS failed.</p> <p>If CB3 is available (as displayed on the One-Line Display), close CB3 to restore power to the load.</p> <p>Press "RESET" to attempt to clear any latched alarms or faults.</p> <p>If conditions appear normal, attempt to restart the UPS by pressing "Startup," "Manual Start" and follow the prompts.</p> <p>Contact your factory-authorized service provider.</p>
Xfer to Inv Inhibit	<p>Transfers from bypass to Inverter are disabled due to an external signal.</p> <p>The UPS has been fitted with an Input Contactor Isolator Board, and one channel on the board was assigned the transfer to Inverter inhibit function and that contact is now active.</p> <p>This status message is self-clearing. When the condition is no longer present, the message and any control activity tied to the status event reverts to normal.</p>	<p>Remove the external signal forcing the transfer to Inverter inhibit.</p> <p>If an external signal is not wired to the UPS to provide this control, contact your factory-authorized service provider.</p>

NOTES

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SL-25425_REV5_05-11

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