

■ AC Power
For Business-Critical Continuity

Liebert NX™ UPS

Operation and Maintenance Manual—10-30kVA, 208V, 60Hz



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1.0 GENERAL DESCRIPTION

1.1 Introduction

Liebert's NX™ Uninterruptible Power Supply system provides continuous, high-quality AC power to your business-critical equipment, such as telecommunications and data processing equipment. The NX 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.

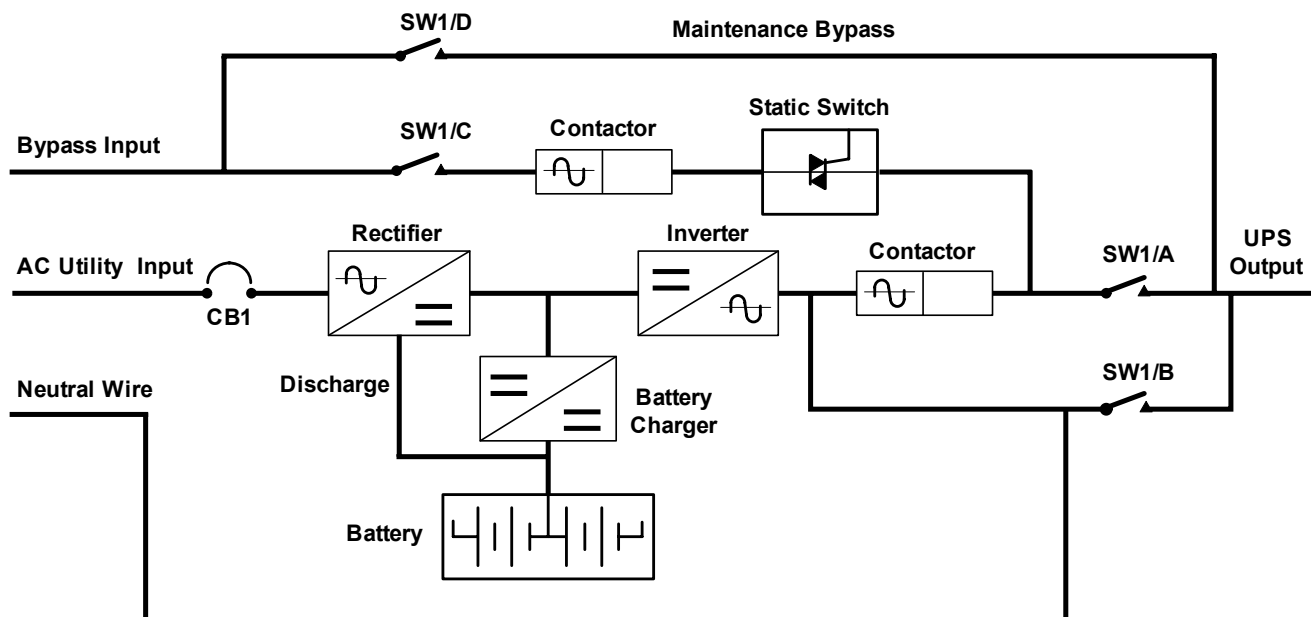
The NX utilizes the latest in high-frequency, double-conversion pulse width modulation (PWM) technology and fully digital controls to enhance its reliability and increase the ease of use.

The standard NX consists of the UPS and internal batteries in a compact, single cabinet.

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 batteries—into AC power for the load. The batteries 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 maintenance bypass.

Figure 1 Single module block diagram (dual input configuration)



1.1.1 Bypass Supplies

The circuit block labeled “Static Switch” and “Contactor” in **Figure 1** contains an electronically controlled switching circuit that enables the critical load to be connected to either the inverter output or to a bypass power source via the static bypass line. During normal system operation the load is connected to the inverter and the inverter contactor is closed; but in the event of a UPS overload or inverter failure, the load is automatically transferred to the static bypass line.

To provide a clean (no-break) load transfer between the inverter output and static bypass line, the static switch activates, connecting the load to bypass. To achieve this, the inverter output and bypass supply must be fully synchronized during normal operating conditions. This is achieved through the inverter control electronics, which make the inverter frequency track that of the static bypass supply, provided that the bypass remains within an acceptable frequency window.

A manually controlled, maintenance bypass supply is incorporated into the UPS design. It enables the critical load to be powered from the utility (bypass) supply while the UPS is shut down for routine maintenance.



NOTE

When the UPS is operating in bypass mode or on maintenance bypass, the connected equipment is not protected from power failures or surges and sags.

1.1.2 Operating Modes

The UPS is designed to operate as an on-line, double-conversion, reverse-transfer system in the following modes:

Normal Mode

Operating in normal mode, the NX'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 batteries.

Battery Mode

When utility AC power fails, the NX protects the critical load by instantaneously channeling battery power to the inverter which continues supporting the critical load without interruption. When utility power returns and is within acceptable limits, the NX automatically shifts back to Normal mode, with the rectifier powering the critical load.

Bypass Mode

When the NX is in bypass mode, the load is directly supported by utility power and is without battery backup protection.

The NX's static transfer 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 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 15ms (in 50Hz), or less than 13.33ms (in 60Hz). This interruption time may be altered by modifying the Output transfer interrupt time setting.

Maintenance Mode

For maintenance or repair, the NX may be operated in maintenance mode. To place the NX in maintenance mode, the load must be transferred to bypass and the inverter must be turned off. When those conditions are met, the rotary switch may be turned to MAINT and the UPS may be shut down, permitting disconnecting the batteries for maintenance.



CAUTION

The internal maintenance bypass must not be used when the UPS system is in 1+N parallel.



WARNING

The UPS input and output must be protected with external overcurrent protection devices. In maintenance mode, the input and output busbars remain energized.

Parallel Redundancy Mode (System Expansion)

For higher capacity, higher reliability or both, the outputs of up to four UPS modules can be programmed for directly paralleling while a built-in parallel controller in each UPS ensures automatic load sharing.

Frequency Converter Mode

The Liebert NX can be programmed into frequency converter mode for either 50Hz or 60Hz stable output frequency. The input frequency may vary from 40Hz to 70Hz. In this mode, the static bypass operation is disabled and the battery becomes optional, depending on any requirement to operate in battery mode (stored energy mode).

2.0 OPERATOR CONTROL AND DISPLAY PANEL

2.1 Operator Control Panel

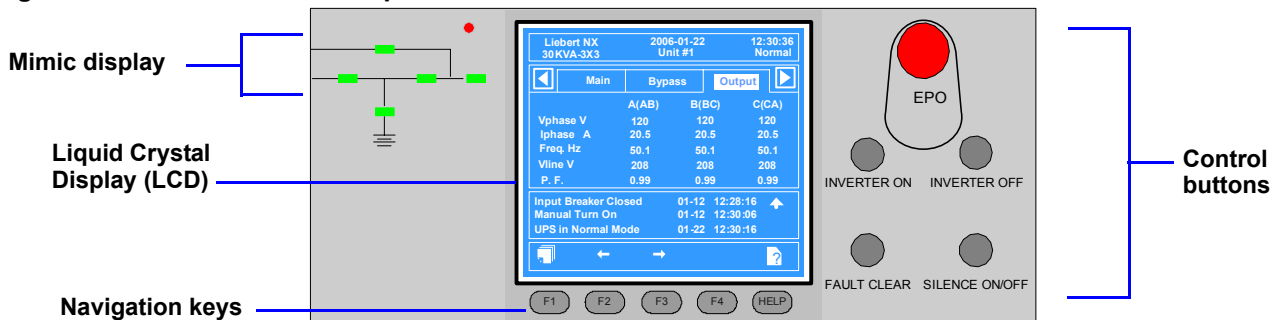
The control panel and LCD on the front of the Liebert NX lets the operator:

- turn the UPS on or off
- transfer into the various operating modes
- silence alarms
- check the status of the UPS and its batteries, including all measured parameters, events and alarms

The main areas of the control panel are shown below in **Figure 2** and detailed in **Figure 3**.

- **Mimic Display** - view the status of the NX in single-line diagram format—indicators show status by changing color when ON, flashing or OFF
- **Liquid Crystal Display (LCD) and Navigation keys** - view status and operational data from the NX in tabular format
- **Control buttons** - turn the NX on or off, silence alarms

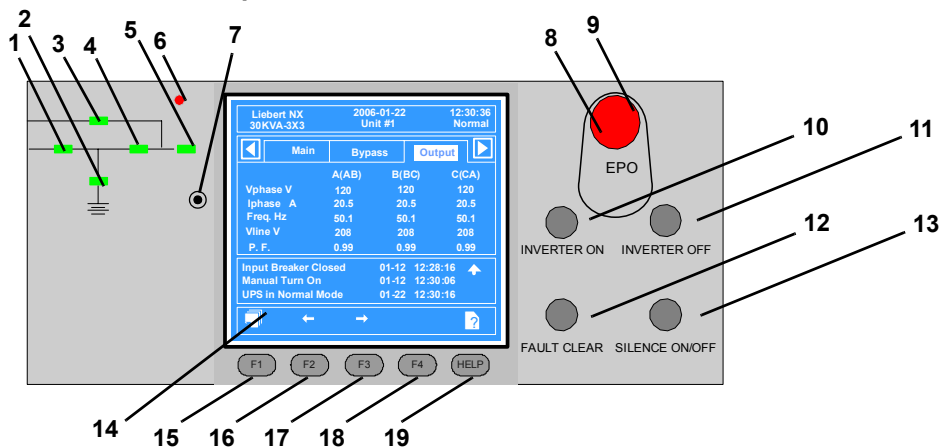
Figure 2 Overview of control panel



2.1.1 Display Panel Layout

Figure 3 shows the control panel in greater detail, identifying individual items that are described in the rest of this section.

Figure 3 Detailed view of control panel

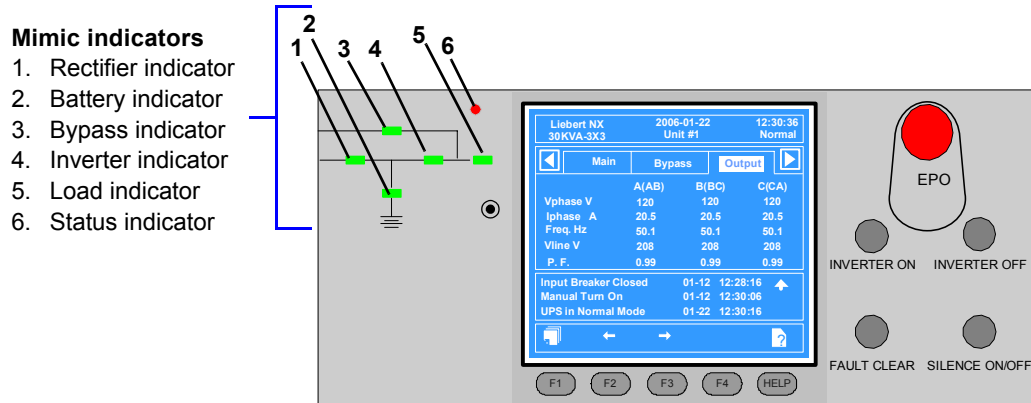


Mimic indicators	Control buttons	Navigation keys
1. Rectifier indicator	8. Button cover	15. F1
2. Battery indicator	9. EPO button	16. F2
3. Bypass indicator	10. INVERTER ON button	17. F3
4. Inverter indicator	11. INVERTER OFF button	18. F4
5. Load indicator	12. FAULT CLEAR button	19. Help
6. Status indicator	13. SILENCE ON/OFF button	
7. Buzzer	14. LCD	

2.2 Mimic Display Indicators

The Mimic display on the front panel consists of six indicators arranged in a single-line diagram depicting the various paths of UPS power, as shown in **Figure 4**.

Figure 4 Mimic display indicators location



The current operational status of the Liebert NX is indicated by the color of the indicators—green, amber or red—and whether they are ON (solid), flashing or OFF. **Table 1** provides a guide to interpreting the various states of the indicators.

Table 1 Mimic display status indicators

Indicator (see Figure 4)	Green	Flashing Green / Amber	Red	Off
1. Rectifier	Load on rectifier	Flashing Green: Utility normal, but rectifier not operating	Rectifier fault	Rectifier is normal, but utility is abnormal
2. Battery	Battery powering the load	Flashing Green: Battery pre-warning (low battery)	Battery or battery converter abnormal*	Battery and converter are normal, and battery is not discharging
3. Bypass	Load on Bypass power	—	Bypass out of normal range	Bypass Normal
4. Inverter	Inverter powering the load normally	Flashing Green: Inverter on standby	Inverter fault	Inverter normal, but off
5. Load	UPS output on	—	UPS output overloaded	UPS no output power
6. Status	No alarms—UPS working normally	Amber: UPS has a general alarm	UPS has a serious alarm	—

* Battery or battery converter abnormal events include these event messages (see **Table 11** in **Appendix A**): No Battery, Battery Replaced, Battery Reverse, Batt. Conv. Over. Curr., Batt. Converter Fault, Batt. Converter Overtemp.

2.3 Control Buttons

The **Control Buttons** on the front panel may be used to shut down the UPS completely, turn the inverter on or off, restart the UPS after a fault and silence the alarm, as shown in **Figure 5**. The function of each button is described in **Table 2**.



NOTE

To activate a button properly, press and hold until you hear a short beep—about two seconds.

Figure 5 Location of control buttons

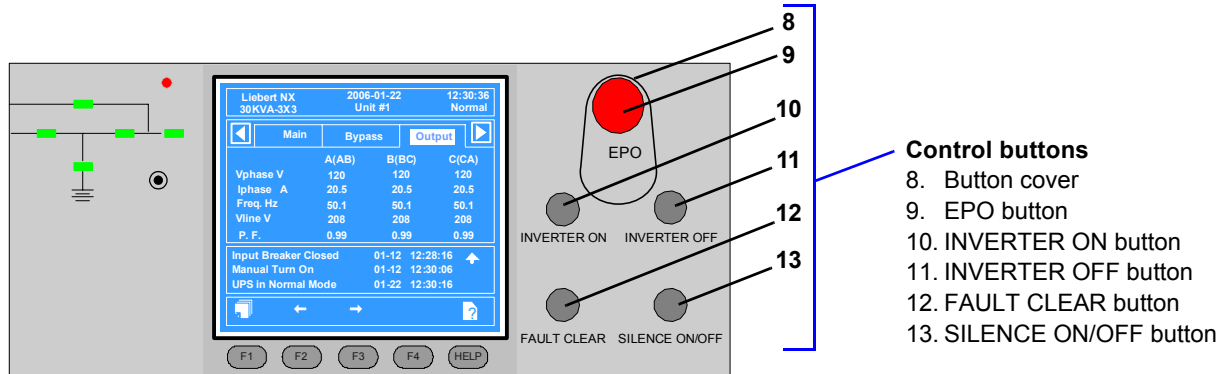


Table 2 Control buttons

Button (see Figure 5)	Function
14. EPO	Completely shuts down the UPS, including the static switch. CAUTION: Use caution before pressing the Emergency Power Off (EPO) button. This button completely shuts down the unit and the critical load.
15. INVERTER ON	Press this button to start the inverter and transfer from static bypass to inverter. NOTE: If the inverter is not ready, this will not activate the UPS.
16. INVERTER OFF	Press this button to shut down the inverter during operation. The load will be transferred to static bypass.
17. FAULT CLEAR	After the UPS shuts down due to a fault and the alarm condition has been resolved, press this button to clear the fault and restart the UPS.
18. SILENCE ON/OFF	Press this button once to silence the alarm buzzer when an alarm is active. Any new fault will sound the buzzer again. If the alarm buzzer is not beeping, press this button to test the alarm sound.

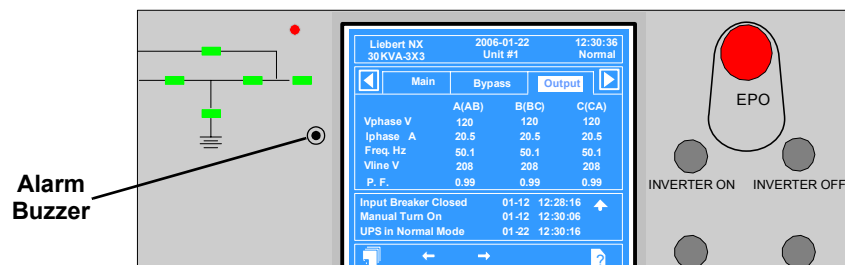
2.4 Alarm Buzzer

The alarm buzzer produces three types of sounds:

- **Single beep** - when any Control button is pressed
- **Single beep repeating every two seconds** - the system has a general alarm
- **Continuous** - the system has a serious fault

If the alarm buzzer makes no sound, the system may be operating properly or the alarm may have been silenced manually.

Figure 6 Alarm buzzer location



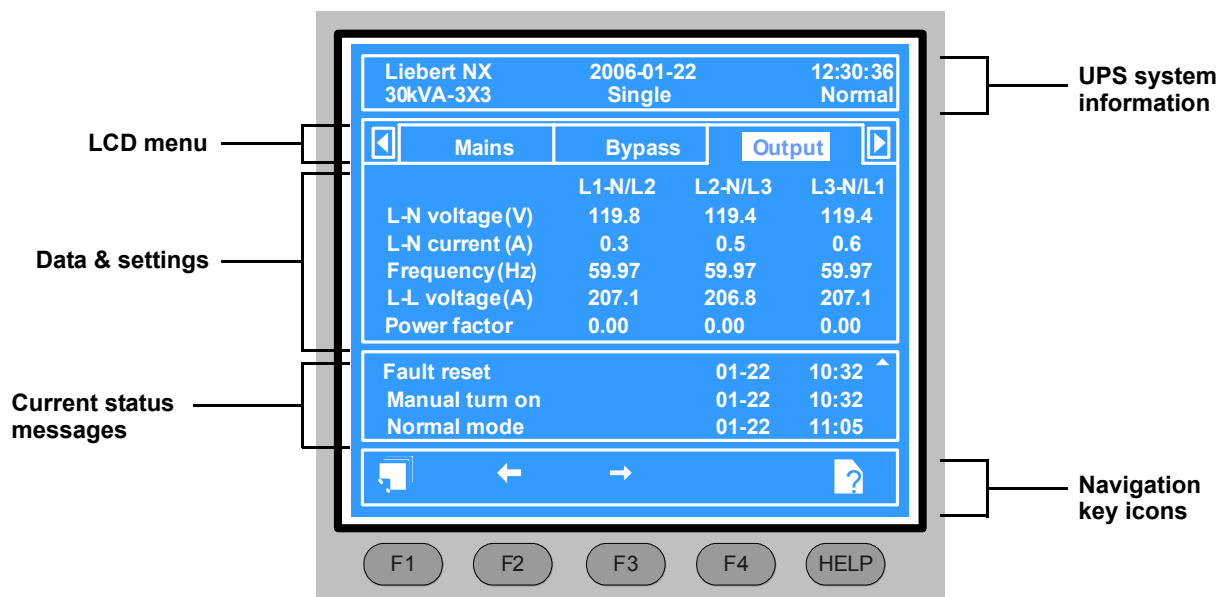
2.5 LCD Overview

The LCD on the front panel has five main sections, as shown in **Figure 7**. Press the F1 key below the LCD to scroll through these sections.

- **UPS system information** - view UPS name and model, date and time, overall status (see **Table 4**).
- **LCD Menu** - choose a category of data items to appear below the menus (see **Table 5**).
- **Data and settings** - view data items for the selected menu (see **Table 5**).
- **Current status messages** - check the most recent UPS event and alarm messages (see **Table 11** in **Appendix A**).
- **Navigation key icons** - look at the icon above each navigation key to determine how the key operates when pressed (see **2.6 - Navigation Keys**).

The LCD displays alarm information in real time. After appearing in the current status section of the LCD, status messages are stored in the history log—512 records can be stored and retrieved.

Figure 7 Sections of the LCD






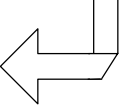



2.6 Navigation Keys

The navigation keys on the front panel—F1 through F4 and Help—are used to access the LCD to view the current status and other information about the NX.

Navigation key icons on the LCD appear above each key to indicate its operation (see **Table 3**). The keys are “soft keys” that can change functions according to the icon.

- Use **F1** either to move to a different portion of the LCD (shift icon) or to escape to a previous view (ESC icon).
- Use **F2** and **F3** as cursor keys to move left and right or up and down, depending on the icons displayed above the keys.
- Use **F4** as an Enter key to confirm a choice.
- Use **HELP** to access help information on the LCD.

Table 3 Icons for navigation keys

Key	F1	F2	F3	F4	HELP
Functions Available	 Shift	 Left	 Right	 Enter	 Help
	ESC Exit	 Up	 Down		

2.7 UPS System Information

The UPS system information displayed at the top of the LCD is detailed in **Table 4**.

Table 4 Description of items in UPS system window

No.	Item Type	Explanation
1	Liebert NX	UPS name
2	2002-10-12	Current date
3	12:30:36	Current time
4	030kVA-3x3	030 means UPS model is 30kVA; 3x3 means 3 by 3 system (three phase input and output)
5	Unit #1	#1 of 6 Paralleled changed to “Unit #1”
	Single	UPS is configured as a single unit system running in Normal mode
6	Normal	UPS in normal operation, inverter powering load, no warnings
	Warning	UPS has a general alarm
	Fault	UPS has a serious fault

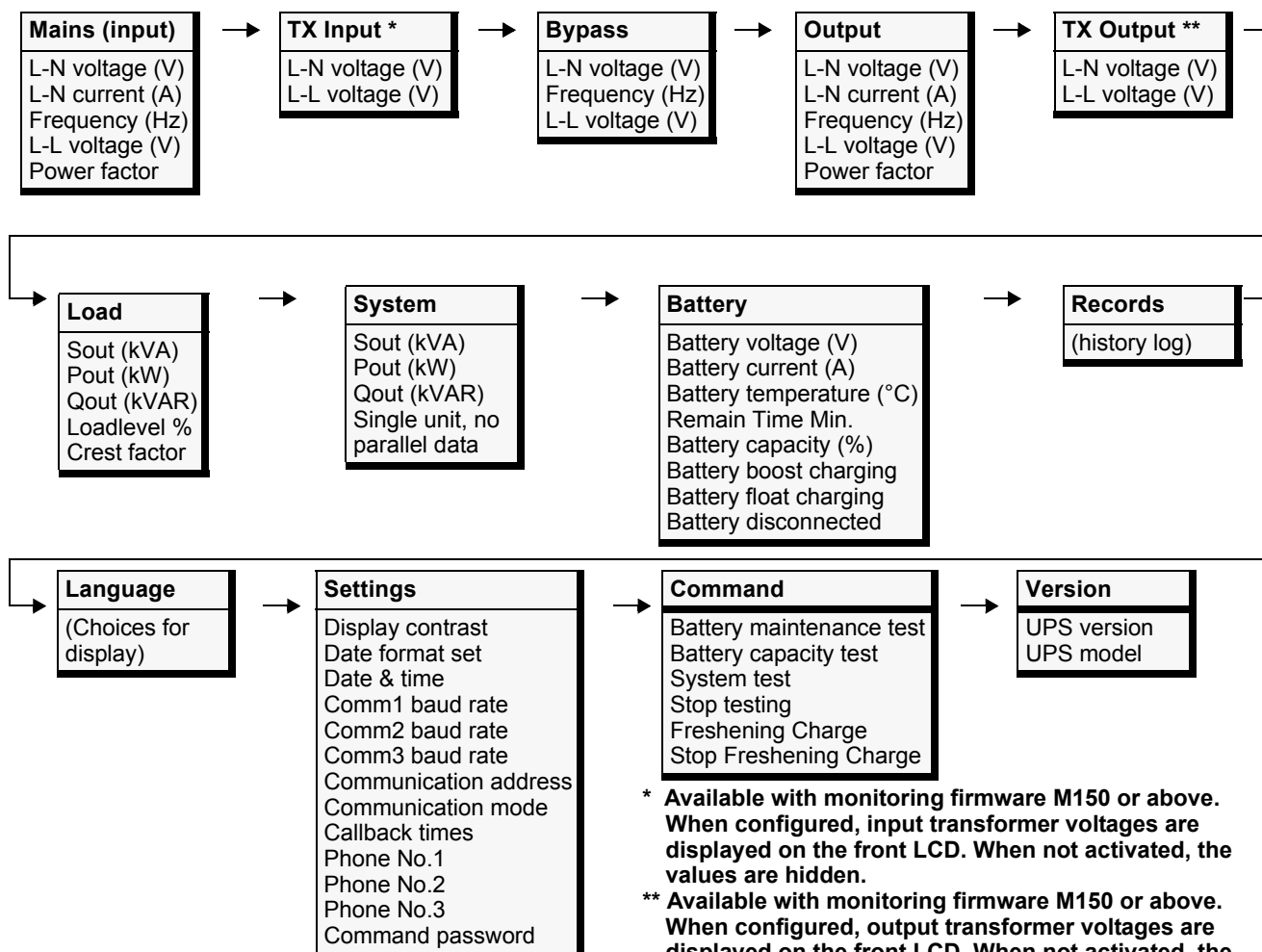
2.8 LCD Menus and Data Items

The LCD menus provide access to the following categories of information and settings for the UPS. Selecting a menu changes the information displayed in the UPS data items portion of the LCD. The menu choices are listed below and described in detail in **Table 5**.

- **Mains** - view utility power input data: voltage, current, frequency and power factor
- **TX Input** - view input transformer voltages
- **Bypass** - view bypass data: voltage and frequency
- **Output** - view output data: voltage, current, frequency and power factor
- **Load** - view load data: load percent, output current, output power and crest factor (CF)
- **System** - view system data
- **Battery** - view battery characteristics—voltage, current, temperature, remaining time and capacity—and messages when the battery is boost/float charging or disconnected
- **Records** - access the history log—displays all records in the log (newest records added at end)
- **Language** - select a language for LCD text (choices appear in the native language)
- **Settings** - configure UPS settings: adjust the display contrast, choose a format for date display, set the date and time, set up the UPS for modem communications (baud rate, address, mode and phone numbers to dial for alarm notifications) and change the password
- **Command** - start or stop a battery maintenance test, battery capacity test or system test
- **Version** - view firmware versions for the inverter, rectifier and software display board and the model information for the UPS

Figure 8 shows a menu tree of the options available from the LCD menus.

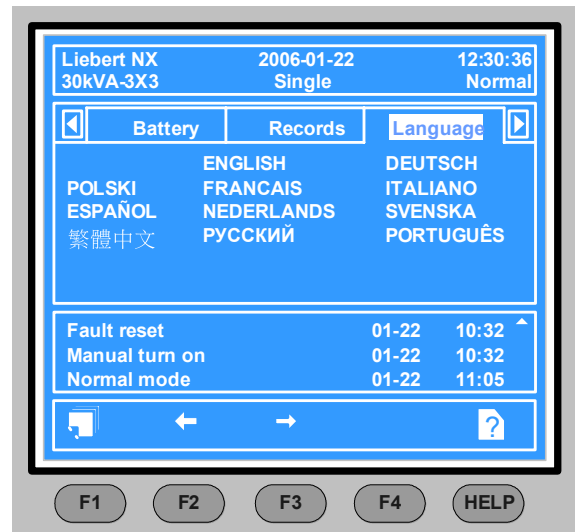
Figure 8 Menu tree



2.9 Language Selection

The LCD menus and data display are available in 12 languages (Chinese, Dutch, English, French, German, Italian, Japanese, Polish, Portuguese, Russian, Spanish and Swedish). To select a different language:

- From the main menu, press the **F1** (shift) key to move the cursor to the menu at the top of the screen.
- Press **F2** and **F3** (left and right arrows) as needed to select the **Language** menu.
- Press **F1** (shift) to move the cursor to the data and settings area of the LCD.
- Use **F2** and **F3** (up and down) to select the required language.
- Press the **F4** (enter) key to accept the language selection.
- Return to the main menu by repeatedly pressing **F1** (ESC) as needed; all text on the LCD will now be displayed in the selected language.



2.10 Current Date and Time

To change the system date and time:

- From the main menu, press the **F1** (shift) key to move the cursor to the menu at the top of the screen.
- Press **F2** and **F3** (left and right arrows) as needed to select the **Settings** menu.
- Press **F1** (shift) to move the cursor to the data and settings area of the LCD.
- Use **F2** and **F3** (up and down) to select the **Date & Time** option, then press **F4** (enter).
- Position the cursor on the row in which the date and time are displayed, then press **F4** (enter).
- Using the **F2** and **F3** (up and down) keys, enter the current time and date information.
- Press **F4** (enter) to save the settings, then press **F1** (ESC) to return to the main menu.



Table 5 Descriptions of UPS menus and data window items

Menu Type	Item Type	Explanation
Mains (input)	L-N voltage (V)	Phase voltage
	L-N current (A)	Phase current
	Frequency (Hz)	Input frequency
	L-L voltage (v)	Line-line voltage
	Power factor	Power factor
TX Input	L-N voltage (V)	Phase voltage
	L-L voltage (V)	Line-line voltage
Bypass	L-N voltage (V)	Phase voltage
	Frequency (Hz)	Bypass frequency
	L-L voltage (A)	Line-line voltage
Output	L-N voltage (V)	Phase voltage
	L-N current (A)	Phase current
	Frequency (Hz)	Input frequency
	L-L voltage (V)	Line-line voltage
	Power factor	Power factor
TX Output	L-N voltage (V)	Phase voltage
	L-L voltage (V)	Line-line voltage
Load	Sout (kVA)	Sout: Apparent power
	Pout (kW)	Pout: Active power
	Qout (kVAR)	Qout: Reactive power
	Loadlevel %	The percent of the UPS rating load
	Crest factor	Output current Crest Factor
System	Sout (kVA)	Sout: Apparent power
	Pout (kW)	Pout: Active power
	Qout (kVAR)	Qout: Reactive power
	Single unit, no parallel data	When configured as a single unit, UPS has only native load, no system load.
Battery	Battery voltage (V)	Battery bus voltage
	Battery current (A)	Battery bus current
	Battery temperature (°C)	Internal battery temperature °C
	Remain Time Min.	Battery run time remaining
	Battery boost charging	Battery is boost charging
	Battery float charging	Battery is float charging
	Battery disconnected	Battery is not connected
Records	(history log)	Displays all records in the history log
Language	(choices for text displayed)	User may select any of 12 languages for LCD text.

Table 5 Descriptions of UPS menus and data window items (continued)

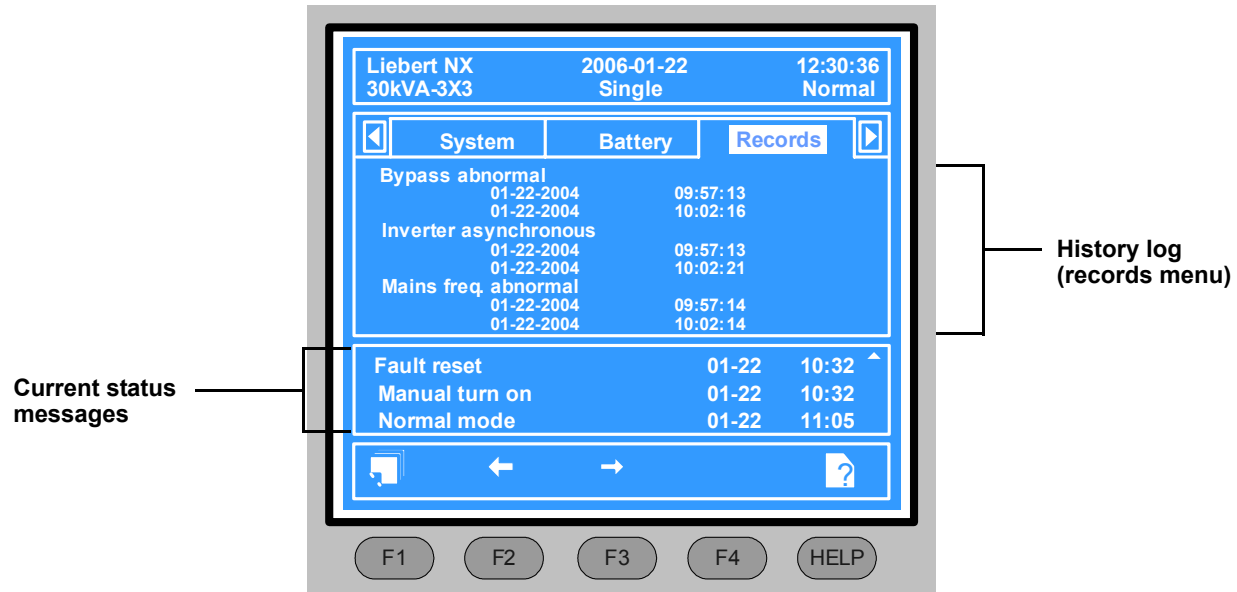
Menu Type	Item Type	Explanation
Settings	Display contrast	Adjust the LCD display contrast
	Date format set	Choose the format for date display: M/D/Y, D/M/Y, M/D/Y, Y/M/D
	Date & time	Set the date and time
	Comm1 baud rate	Communication baud rate setting for Intellislot 1
	Comm2 baud rate	Communication baud rate setting for Intellislot 2
	Comm3 baud rate	Communication baud rate setting for Intellislot 3
	Communication address	This setting is applicable to RS485 communication mode
	Communication mode	Communication Mode Setting
	Callback times	When Intellislot 1 Communication mode is Modem, this parameter sets the number of times a number is redialed to send an alarm notification.
	Phone No.1	When Intellislot 1 Communication mode is Modem, this is the first phone number to be dialed (to send an alarm notification).
	Phone No.2	When Intellislot 1 Communication mode is Modem, this is the second phone number to be dialed (to send an alarm notification).
	Phone No.3	When Intellislot 1 Communication mode is Modem, this is the third phone number to be dialed (to send an alarm notification).
Command password	User can modify the command password.	
Command (start/stop battery & system tests)	Battery maintenance test	This test performs a partial discharge of the battery to obtain a rough estimate of the battery capacity. Load must be between 20% and 80%.
	Battery capacity test	This test performs a full discharge of the battery to obtain a precise measure of the battery capacity. Load must be between 20% and 80%.
	System test	This is a self-test of the UPS. When the user activates this function, a pop-up window appears about 5 seconds later to show the results.
	Stop testing	Manually stops a battery maintenance test, battery capacity test or system test.
	Freshening Charge	Allows a temporary Equalize charge for the batteries. This charge is configurable for 1 to 36 hours.
	Stop Freshening Charge	Manually stops a Freshening Charge
Version	UPS version	Provides UPS firmware version numbers for the inverter, rectifier and software display board.
	UPS model	Provides UPS model information—for example, 208V-60Hz.

2.11 UPS Status Messages

The NX displays status changes as they occur in the **current status window of the LCD**, then stores that data in the **history log**, as shown in **Figure 9**.

- **Current Status Window:** The status messages are displayed chronologically and include the date and time of the events. Three status messages are visible in the window at a time. To see other messages, use the navigation keys to scroll up or down the list. A status message remains in the current status area of the LCD until the status changes, when it is moved to the history log.
- **History Log:** When a record moves to the history log, the time the status changed is recorded. The history log can hold up to 512 records. History log records may be viewed by accessing the Records menu.

Figure 9 Current status and history log records



See **Table 11** in **Appendix A** for a complete list of status messages, along with a description and any recommended actions.

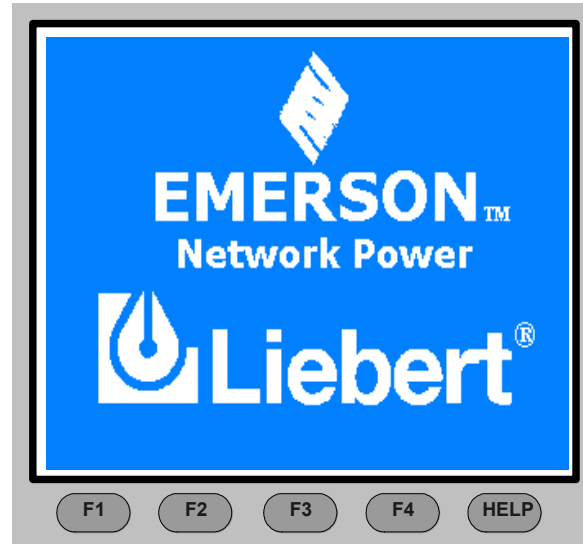
2.12 Types of LCD Screens

This section provides a quick guide to the main types of LCD screens.

2.12.1 Opening Display

As the UPS begins powering up, the opening display appears, as shown in **Figure 10**.

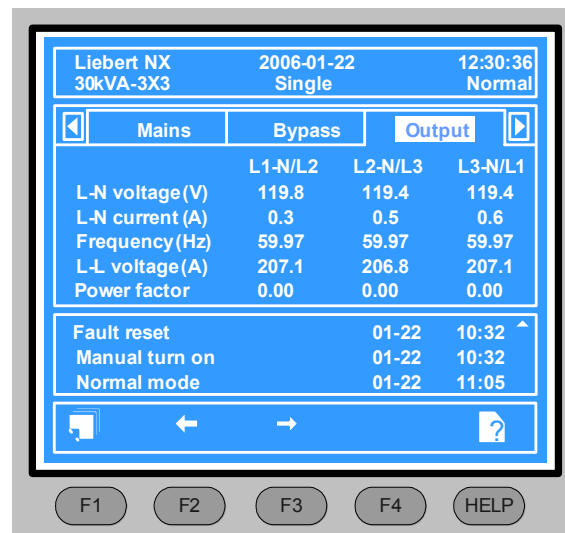
Figure 10 Opening display



2.12.2 Default Screen

After the UPS has powered up and completed a self-test, the output screen appears, as shown in **Figure 11**. This window is the default screen.

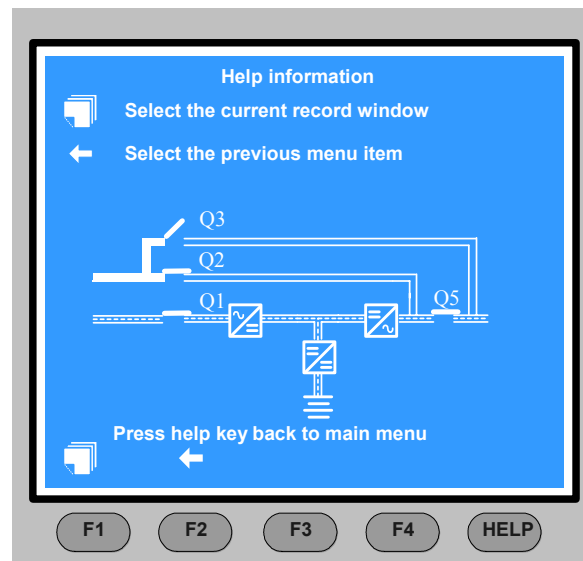
Figure 11 Default screen



2.12.3 UPS Help Screen

Press the HELP key below the LCD to display the Help window shown in **Figure 12**. (Press the HELP key again to exit the Help window.)

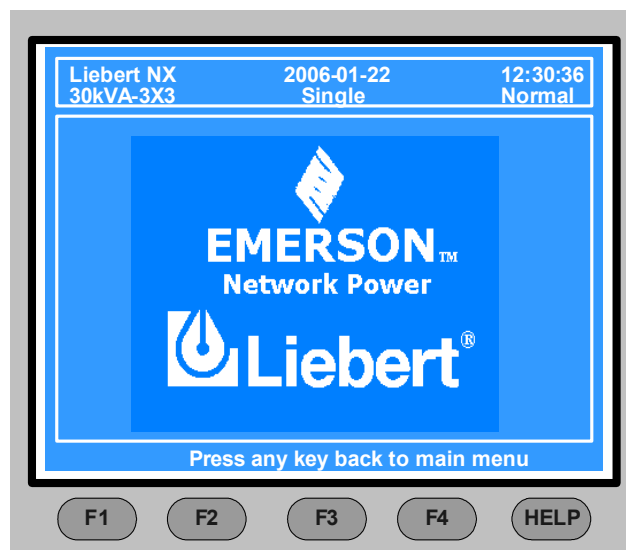
Figure 12 Help screen



2.12.4 Screen Saver Window

If there has been no interaction with the NX's LCD for 2 minutes, the screen saver window appears. It remains on the LCD for 2 minutes, then the screen will go dark. The LCD will become active again when any key is pressed.

Figure 13 Screen saver window



2.13 Pop-Up Windows

Pop-up prompt windows appear when the user must confirm a choice or perform an operation. This section describes the pop-up windows.

2.13.1 From Bypass to Inverter Mode With Power Interruption

If the bypass voltage or frequency exceeds the synchronized range and utility voltage or frequency is normal, the inverter cannot be in synchronization with the bypass, and the output can only transfer to inverter after an interruption of about 15ms when the user presses the INVERTER ON button. Before transferring, the system will let the user confirm whether the interruption can be accepted, as shown at right. If the bypass voltage returns to normal before the user makes confirmation, the UPS will transfer to inverter mode automatically. At the same time, the prompt window will close.

Transfer with Interrupt,
please confirm or cancel

2.13.2 From Inverter to Bypass Mode With Interruption

If the bypass voltage or frequency exceeds the synchronized range and the UPS is in inverter mode, the system must let the user to confirm and accept the power interruption danger before pressing the INVERTER OFF button to shut down the output of the inverter. The user can also cancel the shutdown operation, as shown at right. If the bypass voltage returns to normal before the user makes the confirmation, the UPS will transfer to bypass operation mode automatically, and at the same time the prompt window will disappear soon.

This operation leads to
output shutdown
Confirm or cancel

2.13.3 System Self-Test

When a system self-test is completed, a pop-up window reports the results of the test, as shown at right.

- Press the **F4** (Enter) key and the pop-up window closes.

System Self-Test finished,
Everything is OK

2.13.4 Battery Capacity Test Confirmation

When a battery capacity test is started from the Command menu, the battery will be discharged to low-battery warning level. The NX asks for confirmation before the test is started, as shown at right.

- To confirm the choice and begin the battery capacity test, press the **F4** (Enter) key and the pop-up window disappears.
- To cancel the test, press the **F1** (ESC) key. The pop-up window disappears.

Battery will be depleted,
Confirm or cancel



NOTE

For a battery capacity test to function properly, the load must be between 20% and 100%.

2.13.5 Battery Self-Test Aborted, Condition Not Met

When a battery capacity test is started from the Command menu and the battery self-test condition is inadequate, the NX will not perform a battery test. User should check whether the battery state is boost charging and whether the load level is greater than 20 percent.

- Press the **F4** (Enter) key and the pop-up window closes.

Battery Self-Test aborted,
Conditions not met

2.13.6 Battery Refresh Charge Aborted, Condition Not Met

When a battery refreshing charge is started from the Command menu and battery refreshing condition fails to meet requirements, the NX will not perform a battery refreshing charge. User should check if boost charging condition is not enough, such as (No battery, charger failed, etc.).

- Press the **F4** (Enter) key and the pop-up window closes.

Battery Refresh Charge
aborted,
Conditions not met

3.0 OPERATING INSTRUCTIONS

3.1 NX Operating Modes

The NX can operate in any of four modes, as shown in **Table 6**. This section provides instructions on switching between modes, resetting the UPS, switching the inverter On and Off and performing other operations.

Table 6 UPS operating modes

Operating Mode	Rotary Switch Position	Description
Normal Operation	NORMAL	The UPS is powering the load.
On Maintenance Bypass	MAINT	The UPS is shut down but the load is connected to utility power via the Maintenance Bypass Supply line. NOTE: The load is not protected against disturbances in AC input power in this mode.
On Test	TEST	No load power is supplied by the UPS. The load is connected to utility power via the Maintenance Bypass Supply line. NOTE: The load is not protected against disturbances in AC input power in this mode.
On Static Bypass	BYPASS or NORMAL	The load power is supplied through the static bypass line. This may be considered as a temporary mode during load transfers between inverter and maintenance bypass or supply under abnormal operating conditions.



NOTE

1. The user controls and indicators mentioned in these procedures are identified in **2.0 - Operator Control and Display Panel**.
2. The audible alarm may sound at various points during these procedures. It can be canceled at any time by pressing the **SILENCE ON/OFF** push button.



NOTE

This unit refers to some modes and conditions that are set or adjusted using proprietary service software. To take advantage of all the available features for the NX, the unit must be commissioned by a Liebert factory-trained service engineer.

3.1.1 Power Switches

The UPS can be isolated by means of power switches, mounted inside the cabinet and accessible after opening the front door.

The location of the UPS power switches is shown in **Figure 14**.

Figure 14 Power switches - 10kVA NX



The UPS unit power switches are CB1 and SW1.

- **CB1 - Input Isolator.** Connects the utility supply to the UPS input.
- **SW1 - Rotary switch.** Has four positions—NORMAL, BYPASS, TEST and MAINT—that correspond to different positions of the SW1-A/B/C/D.

The positions of the rotary switch (SW1) are:

- **SW1-A - Output Isolator.** Connects the output of the UPS to the load.
- **SW1-B - Neutral Isolator.** Connects neutral to the UPS.
- **SW1-C - Bypass Isolator.** Connects the UPS with the bypass supply.
- **SW1-D - Maintenance Bypass Isolator.** Permits supply of the load directly by the bypass line for maintenance of the UPS unit.

The functions of the rotary switch are shown in **Table 7**.

Table 7 Rotary switch configuration

Rotary switch position	OUTPUT (SW1-A)	BYPASS (SW1-C)	MAINT (SW1-D)	NEUTRAL (SW1-B)
NORMAL	✓	✓		✓
BYPASS	✓	✓		✓
TEST		✓	✓	✓
MAINT			✓	



NOTE

Do NOT turn the rotary switch too fast. Allow the rotary switch to stay in each position at least three seconds before turning it to the next position.

3.2 UPS Start Up

The NX must be fully installed and commissioned before start up, and external power isolators must be closed. Once those general conditions are met, the UPS may be started.

3.2.1 Start-Up Procedure

To start the UPS from a fully powered-down condition:

1. Open the UPS door to gain access to the main power switches.



WARNING

During this procedure the output terminals will become live.

If any load equipment is connected to the UPS output terminals, please check with the load user and ascertain whether it is safe to apply power to the load. If the load is not ready to receive power, then ensure that it is safely isolated from the UPS output terminals.



CAUTION

Do not operate the rotary switch too fast. Always wait at least three seconds when rotating the switch from one position to another.

2. Turn the rotary switch to TEST.
3. Close CB1.

The bypass contactor (M2) closes automatically and the LCD begins to show start-up screens.

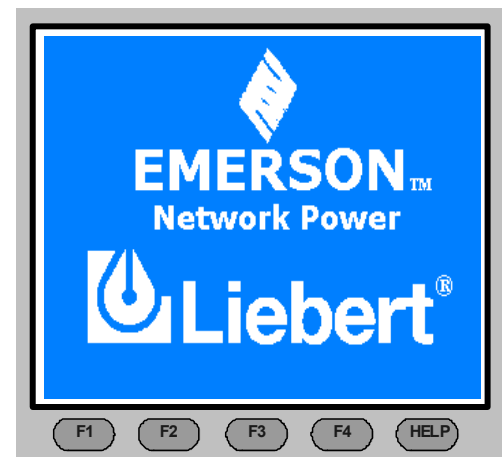
The Rectifier indicator flashes green while the rectifier is starting up. It stops flashing and becomes solid green about 30 seconds after the rectifier enters the normal operation state.

After initialization, the bypass static switch closes. Because output switch SW1-A is still open, the UPS channels power through Maintenance Bypass Supply line (SW1-D). The bypass indicator extinguishes, provided that the bypass is normal.

The opening display is shown in the figure at right.

The UPS Mimic display indicators will be:

Indicator	State
Rectifier indicator	Off
Battery indicator	Off
Bypass indicator	Off
Inverter indicator	Off
Load indicator	Off
Status indicator	Off



WARNING

Do NOT turn the rotary switch until the rectifier indicator stops flashing green.

4. Turn the rotary switch to BYPASS.

Indicator	State
Rectifier indicator	Green
Battery indicator	Off
Bypass indicator	Green
Inverter indicator	Off
Load indicator	Green
Status indicator	Amber

The maintenance switch SW1-D opens and output switch SW1-A closes. The UPS powers from static bypass instead of from maintenance bypass. The bypass and load indicators turn on. The design of the rotary switch ensures uninterrupted output.

5. Turn the rotary switch to NORMAL, then press the INVERTER ON control button for 2 seconds. The inverter will start and the inverter indicator will flash green. After the inverter is ready, the UPS transfers from bypass to inverter, the bypass indicator turns off and the inverter and load indicators turn on.

The UPS is operating normally. The UPS Mimic display indicators will:

Indicator	State
Rectifier indicator	Green
Battery indicator	Off
Bypass indicator	Off
Inverter indicator	Green
Output indicator	Green
Status indicator	Green

3.2.2 Verify Switching Between Operation Modes

Switch from Normal Mode to Battery Mode

- Open CB1 to enter battery mode. This breaks the utility connection to the NX.

To return to normal mode, close CB1 after a few seconds. The rectifier will restart automatically after 10 seconds and resume feeding power to the inverter.

Switch from Normal Mode to Bypass Mode

- Press INVERTER OFF button to switch to bypass mode.



NOTE

In bypass mode, the load is being powered by the utility and is not receiving conditioned power through the inverter.

Switch from Bypass Mode to Normal Mode

- Turn the rotary switch to NORMAL.
- In bypass mode, press the INVERTER ON button. When the inverter is ready, the UPS will switch to normal mode.

3.3 Switching the UPS from Normal to Maintenance Bypass

Follow the procedure below to transfer the load from the inverter output to the Maintenance Bypass line of the UPS.



CAUTION

Before performing this operation, read the messages on the LCD to be sure that bypass supply is regular and the inverter is synchronous with it. If those conditions are not present, there is a risk of a short interruption in powering the load.

This procedure assumes that UPS is operating normally.

1. Press the INVERTER OFF button on the right side of the operator control panel for longer than 2 seconds.

The Inverter indicator will turn off and the status indicator (6) will turn amber and an audible alarm will sound. The load will transfer to static bypass and the inverter will shut off.



NOTE

Pressing the Alarm Silence Switch cancels the audible alarm, but leaves the warning message displayed until the appropriate condition is rectified.

2. Open the UPS door to gain access to the main power switches, SW1 and CB1.
3. Turn the rotary switch to BYPASS position. The UPS Bypass Static Switch still supply power to load.
4. Turn the rotary switch to TEST. The load is now on maintenance bypass.
5. Turn the rotary switch to MAINT.
6. Open rectifier switch CB1. All operator indicators and messages will turn off as the utility driven internal power supplies decay. The unit will power down, but the load will continue to be supplied by the manual Maintenance bypass.



WARNING

Wait 5 minutes for the internal DC busbar capacitors to discharge before attempting to remove the internal protective barriers.



WARNING

Even with the UPS in maintenance bypass and “Off,” portions of the unit are still energized. Service is to be performed by qualified personnel only.



CAUTION

The load equipment is not protected from normal supply aberrations when operating in the maintenance bypass mode.

3.4 Powering Down the UPS

To power down the UPS completely, follow the procedures in **3.3 - Switching the UPS from Normal to Maintenance Bypass**.

To completely isolate the UPS from the AC supplies, the main external power input isolator (both isolators, where separate supplies are provided for rectifier and bypass) should be opened (see **Figure 15**).



WARNING

To prevent injury to personnel, lockout or tagout the service supplies.

3.5 Powering Down the UPS and Maintaining Power to Load



NOTE

An external Maintenance Bypass Cabinet must be installed before attempting to perform the following procedure.

If the UPS needs to be shut down completely while maintaining power to the load, follow these steps:

1. Perform **Steps 1 through 5 in 3.3 - Switching the UPS from Normal to Maintenance Bypass.**

2. Close the external maintenance bypass rotary switch to Maint position.

On the primary input distribution panel, which is often located distant from the UPS area, a label should be posted advising service personnel that the UPS circuit is under maintenance.



WARNING

Wait 5 minutes for the internal DC busbar capacitors to discharge.

The UPS is now completely powered down.

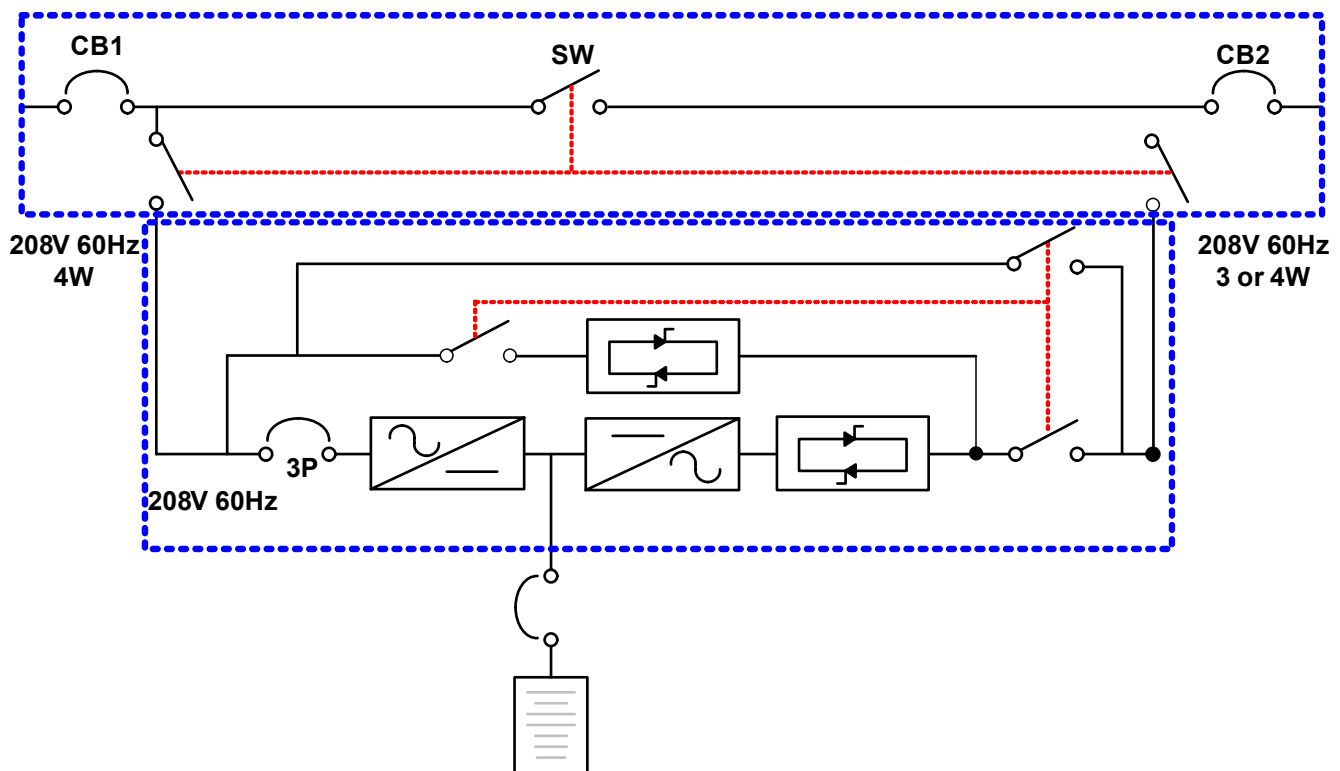


NOTE

The Maintenance Bypass Power switch may be operated at any time while the UPS is powered down to connect the load to the maintenance bypass supply if required.

The procedure can be performed only after the installation has been completed (which includes the maintenance bypass cabinet), after the system has been placed in operation by authorized personnel. See the reference drawing of **Figure 15** for more information.

Figure 15 Typical configuration for single UPS with external maintenance bypass cabinet



3.6 Emergency Shutdown With EPO

This circuit has been designed to switch off the UPS in emergency conditions (i.e., fire, flood, etc.). The system will turn off the rectifier, inverter and stop powering the load immediately (including the inverter and bypass), and the battery stops charging or discharging.

If the input utility is present, the UPS's controls will remain active; however, the output will be turned off. To remove all power from the UPS, the external feeder breaker should be opened.

3.7 Auto Restart

When the main and bypass sources fail, the UPS draws power from the battery system to supply the load until the batteries are depleted. When the UPS reaches its end of discharge (EOD) threshold, it will shut down.

The UPS will automatically restart and enable output power:

- after utility power is restored
- if “Auto Recovery after EOD Enabling” is enabled
- after the “Auto Recovery after EOD Delay Time” expires (the default delay is 10 minutes)

During the auto recovery delay, the NX will be charging its batteries to provide a safety margin for equipment shutdown if input power fails again.

If the “Auto Recovery after EOD Enabling” feature is disabled, the user must restart the system manually.

3.8 Reset After Shutdown for Emergency Stop (EPO Action) or Other Conditions

Once all appropriate measures have been taken to correct the problem indicated by the alarm message appearing on the operator control panel display, carry out this procedure to restore the UPS to regular operation following an EPO action or for the following reasons: Inverter Overtemperature, Cut-off Overload, Battery Overvoltage, excessive switching (BYP: XFER COUNT BLOCK), etc.

When the user confirms that the fault is cleared:

1. Press the FAULT CLEAR button to let the system exit the emergency off state.



NOTE:

A UPS manufactured before March 2006 may first require a full power down, i.e., manual opening of the input breakers, for the "Fault Clear" to take effect.



NOTE

The rectifier will start again, the battery contactor will close and the bypass will begin to power the load. The Rectifier indicator (1) flashes while the rectifier is starting up. When the rectifier enters the normal operation state (about 30 seconds), the rectifier indicator turns green.

2. Press the INVERTER ON button (10) on the right side of the operator control panel for longer than 2 seconds.



NOTE

The rectifier will be turned on automatically when the overtemperature fault disappears at 5 minutes after the disappearance of overtemperature signals.

After the EPO button is pressed, if the input utility is removed, the UPS will shut down completely. When input utility is returned, if the rotary switch (SW1) is in either Bypass or in Normal position, the UPS will start up on Bypass. There will be power at the output terminals of the UPS.



WARNING

If the rotary switch is in the Maint. position and input utility is present, there will be power at the output terminals of the UPS.

3.9 Battery Protection

3.9.1 Battery Undervoltage Pre-Warning

Before the end of discharge, the NX displays a battery undervoltage pre-warning. After this pre-warning, the battery has the capacity for 5 minutes discharging with full load (default time). The NX can be user-configured to display this warning from 3 to 60 minutes before end-of-discharge.

3.9.2 Battery End-of-Discharge (EOD) Protection

If the battery voltage is lower than the end-of-discharge voltage, the battery converter will be shut down.

3.9.3 Battery Fuse-Blow Warning

Battery current protection is provided by the battery fuses FU7 and FU8. If a battery fuse blows, the NX displays the battery fuse-blow warning and the battery converter will be shut down.



NOTE

All equipment servicing procedures must be carried out only by trained personnel.

3.10 Isolating and Integrating One Module in a Multi-Module System

1. Turn Off inverter
2. Open External Output CB1
The UPS enters Isolation Status automatically, parallel signaling and communication becomes masked, and output becomes inhibited.
3. Power Off unit for maintenance.
4. Power On unit with External Output CB1 open.
5. Unit enters Test Mode by configuration software setting.
6. Diagonosis or testing.
7. The UPS exits Test Mode by configuration software setting.
Output becomes inhibited because of Isolation Status.
8. Return all switches to the Normal position, including External Output Circuit Breaker 1.
9. Close External Output Circuit Breaker 1.
The UPS exits Isolation Status automatically, parallel signaling and communication recovers, output becomes enabled but interlocking works now.
10. Turn On inverter and join the parallel system.



WARNING

Hazardous Battery Voltage

No operator serviceable parts are located behind covers that require a tool for their removal. Only qualified service personnel are authorised to remove such covers.

The UPS battery and connecting terminals remains energized at hazardous voltage levels at all times. The battery is located behind protective covers that require a tool for their removal: inside the UPS cabinet, inside a free-standing battery cabinet or on open racks inside a dedicated battery room that may be locked.

3.11 Inserting One Module into a Multi-Module System

This procedure outlines how to integrate a UPS module that has been previously isolated from other modules of a group of paralleled UPS modules. It is assumed that the installation is complete, the system has been commissioned by authorized personnel and the external power isolators are closed.



WARNING

Mains voltage will be applied to UPS output terminals.

No operator serviceable parts are located behind covers that require a tool for their removal.

Only qualified service personnel are authorised to remove such covers.

1. Open the UPS door to gain access to the main power switches.
2. Rotate the switch to Test position. The LCD becomes active.
3. Close Input breaker CB1
The Rectifier indicator flashes on the UPS mimic panel during the startup of the rectifier and becomes steady green once the rectifier reaches normal operation state after about 30s.
4. Close external battery circuit breaker QF1 (where an external battery is used). This breaker is inside the battery cabinet (if used) or is otherwise adjacent to the battery racks.
5. After the UPS detects the batteries, the red battery indicator extinguishes when the battery charger starts operation.
6. Rotate switch to Bypass position
7. Turn the rotary switch to NORMAL, then press the INVERTER ON control button for 2 seconds. The inverter will start up and the inverter indicator flashes while it synchronizes to the load voltage and frequency. After the inverter is ready, the UPS connects to the load, the inverter indicator becomes steady green and the output indicator turns green.
8. Check that no “Warning” message is displayed in the top right corner of the LCD Monitor and that the indicators have the status shown below.

# LED	LED Function	Status
1	Rectifier indicator	Green
2	Battery indicator	Off
3	Bypass indicator	Off
4	Inverter indicator	Green
5	Output indicator	Green
6	Alarm indicator	Off

The UPS is now operating in NORMAL mode.

3.12 Shutting Down a Multi-Module System Without System Bypass Switch

**NOTE**

Before beginning this procedure, shut down the connected load to prevent the possibility of damage. This procedure will shut off power to the load.

1. Open the UPS door to gain access to the main power switches, SW1 and CB1 of a UPS in the system.
2. Turn the rotary switch to BYPASS position. Rotating any UPS Rotary Switch (SW1) to the Bypass position will force all UPS modules to Static Bypass
3. Repeat **Steps 1** and **2** for the rest of the units in the system.

**NOTE**

If this operation will be performed on multiple units, the procedures should be performed on each unit with as little delay as possible.

4. Turn the rotary switch of each unit in the system to TEST. The load is now on maintenance bypass.
5. Turn the rotary switch of each unit in the system to MAINT.

**NOTE**

The following step will shut off power to the connected load.

6. Open system output breaker. The load will now be disconnected.
7. Open rectifier switch CB1. All operator indicators and messages will turn off as the utility-driven internal power supplies decay.
8. To isolate a module:
 - a. For systems that have UPS input breakers in paralleling cabinet, open the UPS input breaker for the unit you want to isolate.
 - b. For systems that do not have UPS input breakers in paralleling cabinet, the utility source to the UPS will need to be opened.

3.13 Shutting Down a Multi-Module System With System Bypass Switch

1. In the Bypass Cabinet, rotate the system bypass switch to the Bypass position. This will force the UPS's in the system to Static Bypass.
2. Open the UPS door to gain access to the main power switches, SW1 and CB1 of a UPS in the system.
3. Turn the UPS SW1 to BYPASS position for each module in the system
4. Repeat **Steps 2** and **3** for the rest of the units in the system.
5. Turn the rotary switch of each unit in the system to TEST.
6. Turn the rotary switch of each unit in the system to MAINT.
7. Open rectifier switch CB1. All operator indicators and messages will turn off as the utility driven internal power supplies decay.
8. To isolate the UPS(s) from the bypass cabinet, open the module input and output isolation breaker(s).

4.0 OPTIONS

Several items of optional equipment are available for connection to the Liebert NX UPS.

4.1 Communication and Other User Terminals

The UPS can be integrated into advanced networking environments via UPS monitoring software such as Windows-based UPS Monitor, MultiLink, Nform , SiteNet, Modbus / Jbus, SiteScan, SiteScan 2, SNMP, etc. They allow UPS status monitoring and automatic and safe shutdown of the server and PCs.

4.1.1 Analog Input Interface

At the X6 slot, there are two analog signal channels. Input range is from 0 to +5V, and the precision is 2 percent. “ENV-T” is used for environment temperature detecting.

4.1.2 Power Output

The X5 slot can provide power for a modem or an external SNMP card. Available voltage is from 9V to 12V. The maximum current is 500mA.

4.1.3 Intellislot™ Communication

The NX has three Intellislot ports to allow field-installation of optional communication cards. Intellislot cards communicate via Liebert’s proprietary ESP2 protocol to cards that translate the information into such protocols as SNMP, IGMnet, Modbus or Jbus. Other cards provide dry contact signals for external signaling of operating status.

The Intellislot communication ports may be installed or removed while the NX is operating..

4.1.4 Communication and Monitoring

OC Web Card - SNMP/HTTP Network Interface Card

This network interface card provides all real-time data and status information as SNMPv1 traps for connection to a 10/100-baseT Ethernet connection. The same card also will transmit the same status information and all measured parameters for display via a Web browser.

Table 8 NX communication options

Physical description of port	Labeled ID Name of Port	On the UPS LCD screen, under Settings, controlled by:	Monitoring Devices supported	Baud rate	Comments
Top Intellislot	Intellislot 2 (On Monitor Board)	Comm 1	Multiport 4	any	
			Relaycard-int	any	
			OCWEB-LB	2400	Not simultaneous with Multilink in RS232-1
			Modbus/Jbus	2400	
Middle Intellislot	Intellislot 1 (On Monitor Board)	Comm 2	Multiport 4	any	
			Relaycard-int	any	
			OCWEB-LB	2400	Not simultaneous with Multilink in RS232-2
			Modbus/Jbus	2400	
Bottom Intellislot	Intellislot 3 (On Monitor Board)	Comm 3	Multiport 4	any	
			Relaycard-int	any	
			OCWEB-LB	2400	
			Modbus/Jbus	2400	
Top DB9 port	RS232-1	Comm 1	Multilink Serial	9600	Not simultaneous with Web card in top intellislot.
Bottom DB9 port	RS232-2	Comm 2	Service Software (Reserved)	9600	Not simultaneous with Web card in middle intellislot.

4.2 LBS Mode (Load Bus Synchronization)

The function of LBS is to keep the output of two independent UPS systems (single unit or multiple unit) in synchronization even when the two systems are operating in different modes (bypass/inverter) or on batteries. It is usually used with an STS (Static Transfer Switch) connected to the critical load to achieve dual bus configuration.



CAUTION

In LBS configuration, both units must be supplied from the same utility source.

4.3 Battery Start (Optional)

With this option, the NX UPS can be started with power supplied only by the batteries (at charged condition). This type of start, in the absence of utility power, allows independent utilization of battery power and provides for higher availability in some circumstances.



CAUTION

Before attempting to start the UPS without utility power present, ensure that the batteries are fully charged—over 2.1V per cell—and will supply adequate run time to the load.

Figure 16 OC Web card display

EMERSON Network Power

monitor configure support

Summary: Updated: September 21, 2004 01:22:21PM

Device Information:
NXa UPS
Block N3, Regents Park...
NX UPS - Technical sup...
142.100.150.244

Device Status:
Load Protected:
No Alarms Present

Monitor Categories:
Summary
Active Alarms
Battery
Bypass
Input
Rectifier
Inverter
Output
Parallel System
Hardware
Configuration
Other

Legend
Normal
Marginal/Fault
Absent

Active Alarms:
No Alarms Present

EMERSON Network Power

monitor configure support

Battery: Updated: September 21, 2004 01:25:58PM

Device Information:
NXa UPS
Block N3, Regents Park...
NX UPS - Technical sup...
142.100.150.244

Device Status:
Load Protected:
No Alarms Present

Monitor Categories:
Summary
Active Alarms
Battery
Bypass
Input
Rectifier
Inverter
Output
Parallel System
Hardware
Configuration
Other

Supported Status	Value	Units
Battery Time Remaining	783	min
Battery Voltage	547.1	V
Battery Current (Charge/Discharge)	0.2	A
Battery Charge Percentage	99	%
Battery Temperature	24.0	°C
Battery Charge Compensation	False	
Battery Test Result	Unknown	
Battery Charge Mode	Float	

Supported Alarms	Status
Battery Under Test	Normal
Load On Battery	Normal
Charger Failed	Normal
Low Battery - Shutdown Imminent	Normal
Battery Fault	Normal
Battery Contact Fail	Normal
Battery Converter Over Temperature	Normal
Battery Converter Over Current	Normal
Battery Converter Fail	Normal
UPS Load Joint Mode	Normal

Relay Card

The relay card provides voltage-free contact closures for remote monitoring of alarm conditions.

Delivering **On Battery, On Bypass, Low Battery, Summary Alarm, UPS Fault** and **On UPS** signals, the easy-to-install card integrates with AS/400 computers (additional cable required) and other relay contact monitoring systems.

The relay card is rated for 24 VAC/DC at 1A. and supported in any of the three Intellislot bays on the NX.

Table 9 Relay Card pin configuration

Pin	Function	Operation
1	UPS Fault	Closed if no UPS failure
2-3	Not Used	
4	UPS Fault	Closed if UPS fails
5	Summary Alarm**	Closed if SUMMARY ALARM** occurs
6	Summary Alarm**	Closed if no alarm conditions are present
7	Any Mode Shutdown return	Not supported – use External EPO terminal
8	Not Used	
9	Common - Low Battery	
10	Low Battery	Closed if battery is OK
11	Low Battery	Closed if LOW BATTERY point occurs.
12-13	Not Used	
14	UPS Any Mode Shutdown	Not supported – use External EPO terminal
15	On UPS	Closed if ON UPS (inverter) power
16	On Battery	Closed if ON BATTERY power (Utility failure)
17	Common - UPS Fault, Summary Alarm, On UPS, On Battery, On Bypass	
18	On Battery	Closed if not ON Battery power (Utility OK)
19±23	Not Used	
24	On Bypass	Closed if ON BYPASS
25	Not Used	

**A Summary Alarm occurs when any of the following conditions exist:

1. Utility power is out of the acceptable range (voltage and/or frequency).
2. UPS is in BYPASS MODE (load not on Inverter power).
3. UPS Battery is LOW.
4. UPS fault has occurred.

Table 10 Relay card jumper configuration

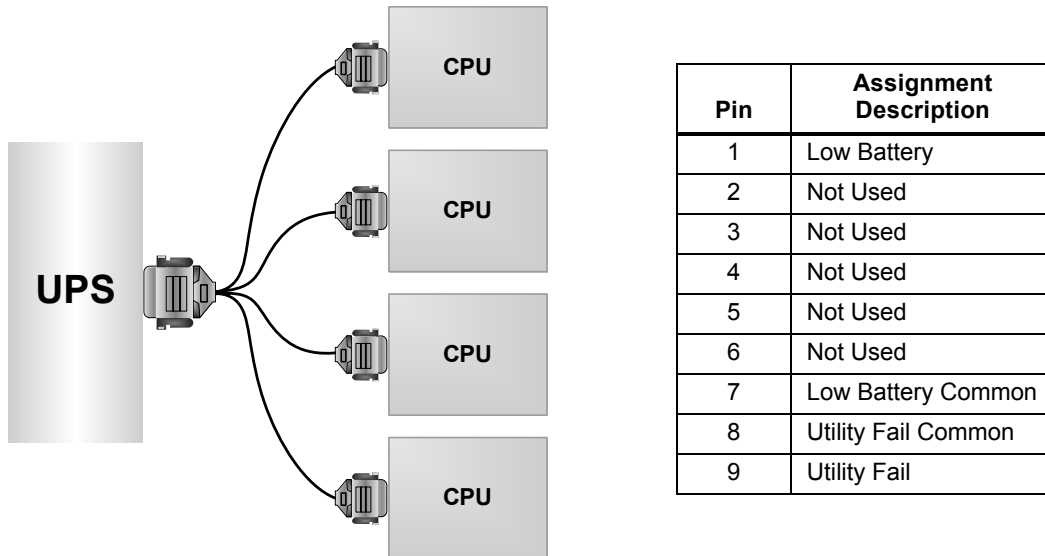
Number	Connection	Description
JP01	Pin 9 to Pin 17	Allows all relay COMMONS to be tied together.
ANY JP02	Pin 7 to Pin 17	REMOVE - (Interconnects all relay COMMONS and the (not supported) MODE SHUTDOWN Return

MultiPort 4 Card

The MultiPort 4 card provides four sets of voltage-free contact closures for remote monitoring of alarm conditions UPS operation On Battery and battery low condition. A typical application is to allow a maximum of four computer systems to simultaneously monitor the status (e.g., utility power failure-low battery) of a single UPS.

This card is supported in any of the three Intellislot bays on the NX.

Figure 17 MultiPort 4 card pin assignment



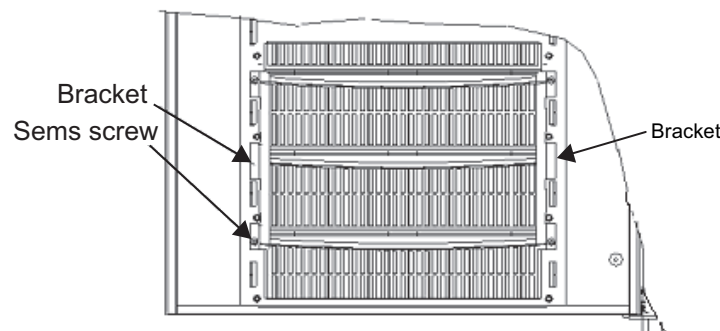
4.3.1 Remote Alarm Monitor

Status and alarm conditions are available on an optional remote alarm monitor (RAM) panel which is driven by voltfree alarm status contacts (from an optional relay alarm board).

4.3.2 Replacing Dust Filters

1. Open the UPS door.
2. The dust filters are behind the door. For each filter, there is a bracket on either side holding the dust filter in place, as shown in **Figure 18**.
3. Remove one bracket and loosen the other. The second bracket need not be removed.
4. Remove the old filter and replace with the new filter
5. Reinstall the bracket that was removed and tighten the other bracket.

Figure 18 Dust filter replacement



4.4 Maintenance Bypass Cabinet Operating Procedures

4.4.1 Start Up and Initialization

Follow these steps to start the UPS while connected to the Maintenance Bypass.

1. Set Maintenance Bypass switch to the Normal position on Maintenance Bypass Cabinet.
2. Close the system input circuit breaker.
3. Start the UPS as instructed in **3.2 - UPS Start Up**.
4. Close system output circuit breaker.

4.4.2 Shutting Down the UPS

Use the following procedure to power down the system.

1. Turn the NX off by following the procedures in **3.4 - Powering Down the UPS**
2. Open system output circuit breaker.
3. Open system input circuit breaker.

4.4.3 Transferring System from UPS to Maintenance Bypass Operation

1. Turn the bypass switch (SW) to the bypass position on the Maintenance Bypass Cabinet. The UPS will switch to bypass mode.
The connected equipment is now powered from the bypass source and is NOT protected.
2. To isolate the UPS from the system, rotate the bypass switch to the maintenance position.

4.4.4 Transfer the System from Maintenance Bypass to UPS Operation

1. Turn the bypass switch (SW) to the Normal position on the Maintenance Bypass Cabinet. The UPS will go to bypass mode.
2. Press the “Inverter On” button on the UPS and allow the UPS to go to normal mode.
3. The connected equipment is now powered and protected by the UPS.

4.4.5 Transfer the System from UPS Operation to Maintenance Bypass

If the UPS needs to be shut down completely while maintaining power to the load, follow these steps:

1. Perform **Steps 1 through 5 in 3.3 - Switching the UPS from Normal to Maintenance Bypass**.
2. Rotate Maintenance Bypass Switch to Maintenance position.
3. Post a label on the primary input distribution panel, which often is installed outside the UPS area, advising personnel that the UPS circuit is under maintenance.

The UPS is now completely powered down.



WARNING

Wait 5 minutes for the internal DC busbar capacitors to discharge.

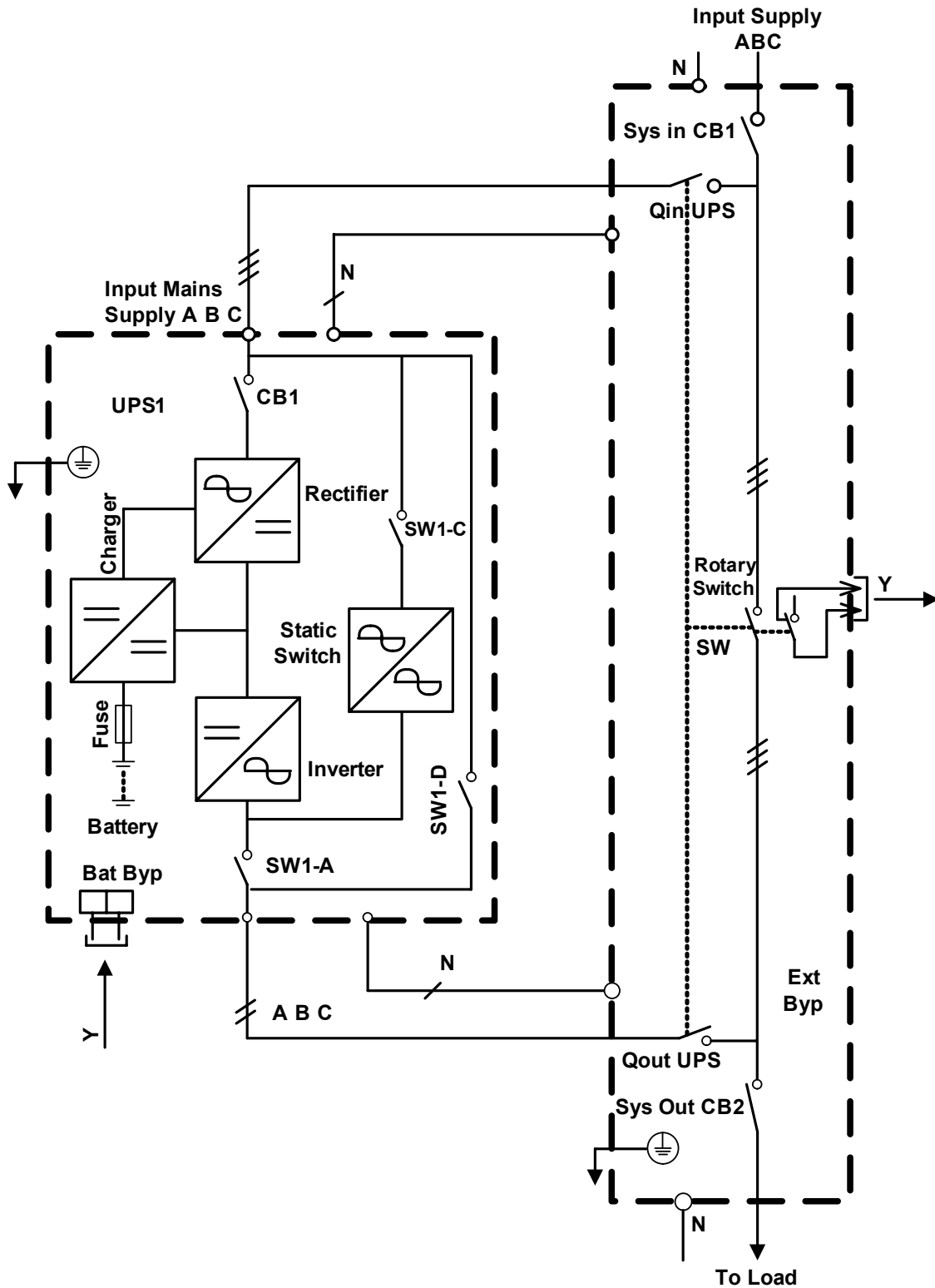


NOTE

The Maintenance Bypass power switch may be operated at any time while the UPS is powered down to connect the load to the maintenance bypass supply.

The procedure can be performed only after the installation has been completed (which includes the maintenance bypass cabinet), after the system has been placed in operation by authorized personnel and after the external power switches have been closed. See **Figure 19** for more information.

Figure 19 Single UPS with external Maintenance Bypass Cabinet—typical configuration



4.5 Commissioning a Parallel System



CAUTION

The operations described in this section must be performed by authorized electricians or qualified technical personnel. If you have any difficulty, do not hesitate to contact Liebert Global Service at **1-800-LIEBERT**.

Check the input and output wiring of each UPS module. Ensure that the phase rotation sequence of the main inputs and the bypass inputs and outputs of each UPS module are the same. Ensure the parallel cables are connected firmly.

It is assumed that the installation is complete, the system has been commissioned by authorized personnel and the external power isolators are closed. **Before start up, disconnect the load.**

4.6 Parallel System Start Up

1. Start each UPS normally as described in **3.2 - UPS Start Up**
2. Turn on the inverter of each UPS module one at a time.
3. Apply the load after the last UPS module transfers to inverter. The total load can be determined through the LCD of either UPS.
4. Verify the load rate of each UPS module. If the load rates are roughly the same, then the parallel system may be assumed to be operating normally.



NOTE

If one module cannot transfer to inverter mode long after its inverter is on, its output connection may not be good or its output phase rotation may not be coincident with other modules. At this time, the LCD for the UPS module will display “inverter asynchronous” and the inverter indicator will flash continuously. If either UPS module makes abnormal noise after it transfers to inverter, its parallel cables may be incorrectly connected.

APPENDIX A - UPS STATUS MESSAGES

Table 11 shows all event messages as they appear in the current status area of the LCD or the history log, along with a description and recommended actions, if any. For further information on the current status area and the history log, see **2.11 - UPS Status Messages**.

Table 11 UPS status messages

Event Message	Description / Suggested Action (if any)
Inverter Comm. Fail	The RS485 communication between internal monitor and inverter fails. Contact Liebert Global Services at 800-543-2378 for assistance.
Rectifier Comm. Fail	The RS485 communication between internal monitor and rectifier fails. Contact Liebert Global Services at 800-543-2378 for assistance.
Parallel Comm. Fail	The CAN communication between different UPSs within a parallel system fails. 1. Check if there are some UPSes not powered on in the parallel system. If so, power on these UPSs and check if the alarm disappears. 2. Press Fault Clear push button. 3. If alarm does not clear, contact Liebert Global Services at 800-543-2378
Battery Overtemp.	The Battery temperature is over limit. Check the battery temperature and ventilation
Ambient Overtemp.	The Ambient temperature is over limit. Check the ventilation of UPS room.
Battery Fault	Battery is bad. (Reserved) Contact Liebert Global Services at 800-543-2378 for assistance.
Replace Battery	Battery should be replaced. Contact Liebert Global Services at 800-543-2378 for assistance.
Battery Low Pre-warning	Before the end of discharging, battery under-voltage pre-warning should occur. After this pre-warning, battery should have the capacity for 3 minutes discharging with full load. The time is user configured from 3 to 60 minutes. Shut down the load in time
Battery End of Discharge	Inverter turned off due to low battery voltage. Check the utility failure and try to recover it.
Mains Volt. Abnormal	Mains Voltage exceeds the upper or lower limit and results in rectifier shutdown. Check the input line-to-neutral voltage amplitude of rectifier.
Mains Undervoltage	Mains Voltage is undervoltage (120v~176v) with derated load. Check the input line-to-line voltage amplitude of rectifier.
Mains Freq. Abnormal	Mains frequency is out of limit range and results in rectifier shutdown. Check the rectifier's input voltage frequency
Battery Fuse Fail	Battery Fuse is open. Contact Liebert Global Services at 800-543-2378 for assistance.
Rectifier Fault	Rectifier Fault; Contact Liebert Global Services at 800-543-2378 for assistance.
Input Inductor Overtemp.	The temperature of rectifier inductor is too high to keep the rectifier running. Check the ambient temperature and ventilation; contact Liebert Global Services at 800-543-2378 for assistance.
Rectifier Overtemp.	The temperature of heat sink is too high to keep the rectifier running. The UPS can recover automatically. Check the environment and ventilation.
Charger Fault	The Charger is fault. Contact Liebert Global Services at 800-543-2378 for assistance.
Input Fuse Fail	Input fuse is open. Contact Liebert Global Services at 800-543-2378 for assistance.
Control Power 1 Fail	Control Power 1 has failed or has been lost. Contact Liebert Global Services at 800-543-2378 for assistance.
Mains Phase Reversed	Input phase sequence is inverse. Contact Liebert Global Services at 800-543-2378 for assistance.
Rectifier Overcurrent	The current of Rectifier is over limit. Contact Liebert Global Services at 800-543-2378 for assistance.
Soft Start Fail	Rectifier could not start due to low DC bus voltage. Contact Liebert Global Services at 800-543-2378 for assistance.

Table 11 UPS status messages (continued)

Event Message	Description / Suggested Action (if any)
Bypass Unable to Trace	<p>This alarm is triggered by an inverter software routine when the amplitude or frequency of bypass voltage is beyond the normal range. The amplitude threshold is fixed for positive and negative 10% rating. This alarm automatically resets once the bypass voltage goes normal.</p> <ol style="list-style-type: none"> 1. First verify that the bypass voltage and frequency displayed on the panel is within the selected range. Note here the rated voltage and frequency are specified by "Output voltage level" and "Output frequency level" respectively. 2. If the displayed voltage is believed to be abnormal, then verify the bypass voltage and frequency presented to the UPS. Check the external supply if it is found to be faulty. <p>Contact Liebert Global Services at 800-543-2378 for assistance.</p>
Bypass Abnormal	<p>This alarm is triggered by an inverter software routine when the amplitude or frequency of bypass voltage exceeds the limit. This alarm automatically resets once the bypass voltage goes normal. First check if there are some relevant alarms such as "Bypass disconnect open", "Bypass phase reverse" and "Mains neutral lost". If they appear, solve them first.</p> <ol style="list-style-type: none"> 1. Then verify that the bypass voltage and frequency displayed on the panel is within the bypass limit. Note here the rated voltage and frequency are specified by "Output voltage level" and "Output frequency level" respectively. 2. If the displayed voltage is believed to be abnormal, then verify the bypass voltage and frequency presented to the UPS. Check the external bypass supply if it is found to be faulty. If the utility is likely to trigger this alarm frequently, the bypass limit can be changed a little larger through the configuration software according to the customer's agreement. <p>Contact Liebert Global Services at 800-543-2378 for assistance.</p>
Inverter Asynchronous	<p>This alarm is triggered by an inverter software routine when the inverter and bypass waveforms are misaligned by more than 6 degrees in phase. This alarm resets automatically once the condition is no longer true.</p> <ol style="list-style-type: none"> 1. First check if the alarm "Bypass unable to trace" or "Bypass abnormal" occurs. If so, solve it first. 2. Verify the waveform of the bypass voltage. If it is too distorted, ask the customer to verify and seek any possible measurements. <p>Contact Liebert Global Services at 800-543-2378 for assistance.</p>
Inverter Fault	<p>This alarm indicates a fault condition exists within the inverter. Contact Liebert Global Services at 800-543-2378 for assistance.</p>
Inv. Inductor Overtemp.	<p>The temperature of the output filter inductor is too high to keep inverter running. This alarm is triggered by the signal from a thermostat mounted in the output filter inductor. The UPS would recover automatically after a 5 minute delay from the disappearance of the overtemperature signal.</p> <p>If the overtemperature condition is true then check for and verify:</p> <ol style="list-style-type: none"> 1. high ambient air temperature. 2. blocked cooling airway. 3. any fan failure. 4. prolonged inverter overload. <p>Contact Liebert Global Services at 800-543-2378 for assistance.</p>
Inverter Overtemp.	<p>The temperature of the inverter heat sink is too high to keep inverter running. This alarm is triggered by the signal from a temperature monitoring thermostat on the inverter bridge heat sink. The UPS will recover automatically after a 5 minute delay from the disappearance of the overtemperature signal.</p> <p>If the overtemperature condition is true, then check for and verify:</p> <ol style="list-style-type: none"> 1. high ambient air temperature. 2. blocked cooling airway. 3. any fan failure. 4. prolonged inverter overload. <p>Contact Liebert Global Services at 800-543-2378 for assistance.</p>
Fan Fault	<p>At least one of the cooling fans fails. Contact Liebert Global Services at 800-543-2378 for assistance.</p>
Inverter STS Fail	<p>At least one of the static switches of inverter side is open or short circuit. This fault is locked until power off. Contact Liebert Global Services for assistance at 800-543-2378 for assistance.</p>
Bypass STS Fail	<p>At least one of the static switches of bypass side is open or short circuit. This fault is locked until power off. Contact Liebert Global Services at 800-543-2378 for assistance.</p>

Table 11 UPS status messages (continued)

Event Message	Description / Suggested Action (if any)
Inverter Contactor Fail	The Inverter contactor has failed. This alarm is triggered when the feedback signal and the state of the contactor is not identical for a specified time. Contact Liebert Global Services at 800-543-2378 for assistance.
Output Fuse Fail	At least one of the output fuses is open. Contact Liebert Global Services at 800-543-2378 for assistance.
Control Power 2 Fail	Control Power 2 is abnormal or lost. Contact Liebert Global Services at 800-543-2378 for assistance.
Unit Overload	The UPS is confirmed to be overload when the load arises above 105% nominal rating. The alarm automatically resets once the overload condition is removed. 1. Confirm that the alarm is true by checking the load percent indicated on the LCD panel to determine which phase is being overloaded. 2. If the alarm is true, measure the actual output current to verify that the indications are valid. Disconnect unnecessary load and ensure the safety. In a parallel system, a severe load sharing error can also leads to the alarm. Contact Liebert Global Services at 800-543-2378 for assistance.
System Overload	The UPS parallel system is confirmed to overload when the total load arises above 105% nominal rating for the set basic number of UPSs. The alarm automatically resets once the overload condition is removed. 1. Confirm that the alarm is true by checking the system load percent indicated on the LCD panel to determine which phase is being overloaded. 2. If the alarm is true, measure the actual output current to verify that the indications are valid. Disconnect unnecessary load and ensure the safety. In a parallel system, a severe load sharing error can also leads to the alarm.
Unit Overload Timeout	The UPS is confirmed to overload and the overload times out. Note 1: the highest loaded phase will indicate overload timing-out first. Note 2: When the timer is active then alarm "unit overload" should also be active as the load is above nominal. Note 3: When the timer has expired, the inverter Static Switch is opened and the load transferred to bypass. The inverter shutdown and will restart after 10 seconds. Note 4: If the load decreases lower than 95% after 5 minutes, the system will transfer back to inverter mode. Confirm that the alarm is genuine by checking the load percent indicated on the LCD. If an overload is indicated then check the load, and investigate any additional load connected prior to the alarm (if applicable).
Inverter Overcurrent	The current of inverter IGBT is over limit. If the fault will not reset, contact Liebert Global Services at 800-543-2378 for assistance.
Bypass Phase Reversed	The phase sequence direction of bypass voltage is reversed. Normally, the phase of phase B lags 120 degrees behind phase A, and the phase of phase C lags 120 degrees behind phase B. Verify that the phase rotation of the bypass supply presented to the UPS is correct, and rectify it if it is found to be in error. Contact Liebert Global Services at 800-543-2378 for assistance.
Load Impact Transfer	A transfer to bypass occurred due to a large step load. The UPS should recover automatically. Turn on connected equipment in sequential order to reduce the step loading of the inverter.
Transfer Timeout	The load is on bypass power due to excessive number of transfers that occurred within the last hour. The UPS will recover automatically and will transfer the load back to inverter power within an hour.
Load Sharing Fault	UPS working within a parallel system are not sharing load current correctly. Contact Liebert Global Services at 800-543-2378 for assistance.
DC Bus Abnormal	Shut off inverter due to abnormal DC bus voltage. Contact Liebert Global Services at 800-543-2378 for assistance.
System Transfer	The whole paralleled UPS system transferred to bypass at the same time. This message will appear on the UPS which passive transfer to bypass.
Parallel Board Fault	Parallel board is not working correctly. Contact Liebert Global Services at 800-543-2378 for assistance.

Table 11 UPS status messages (continued)

Event Message	Description / Suggested Action (if any)
DC Bus Overvoltage	Rectifier, inverter and battery converter were shutdown because DC bus voltage is too high. Check whether there is a fault in rectifier side. If no, then check whether overload occurs. Restart the inverter after resetting the fault. If fault does not clear, contact Liebert Global Services at 800-543-2378 for assistance.
Parallel Connect Fault	The parallel cables are not connected correctly in a parallel system. 1. Reset the fault by pressing the "fault clear" button, then restart the inverter by pressing the "inverter on" button. 2. If the UPS does not resume normal operation, contact Liebert Global Services at 800-543-2378 for assistance.
Bypass Overcurrent	Bypass current is over limit above 135% rating. The UPS just alarms and does nothing. Refer to your installation documentation or contact Liebert Global Services at 800-543-2378 for assistance.
LBS Active	The LBS setting is active. The UPS is acting as an LBS master or slave in a dual bus configuration.
Battery ground fault	Battery ground fault from dry contact signal. Contact Liebert Global Services at 800-543-2378 for assistance.
Inverter turned On manually	Manual Turn On via front panel
Inverter turned Off manually	Manual Turn Off via front panel
EPO	Emergency Power Off
Transfer Confirm	Interrupted Transfer Confirm
Transfer Cancel	Interrupted Transfer is cancel
Unit Off Confirm	Unit Turned Off Confirm
System Off Confirm	Parallel System Turned Off Confirm
Fault Reset	Fault Rest
Alarm Silence	Alarm Silence
Turn On Fail	Turn On Fail
Alarm Reset	Audible Alarm Reset
Bypass Mode	UPS in Bypass Mode
Normal Mode	UPS in Normal Mode
Battery Mode	UPS in Battery Mode
Joint Mode	UPS in Inverter Mode
UPS Shutdown	UPS Shutdown, output power-down
Output Disabled	UPS Output Disabled
Generator Connected	Generator is connected and a signal is sent to UPS
Input Disconnect Open	Input Disconnect Open
Input Disconnect Closed	Input Disconnect Closed
Maint. Disconnect Open	Maintenance Disconnect Open
Maint. Disconnect Closed	Maintenance Disconnect Closed
Reserved	
Rotary Sw. Test Pos.	Rotary switch is in test position.
Rotary Sw. Normal Pos.	Rotary switch is in normal position.
Rotary Sw. Bypass Pos.	Rotary switch is in bypass position.
Rotary Sw. Maint. Pos.	Rotary switch is in maintenance position.
Bypass Disconnect Open	Bypass Disconnect Open
Bypass Disconnect Closed	Bypass Disconnect Closed
Output Disconnect Open	Output Disconnect Open
Output Disconnect Closed	Output Disconnect Closed

Table 11 UPS status messages (continued)

Event Message	Description / Suggested Action (if any)
Battery Contactor Open	Battery Contactor Open
Battery Contactor Close	Battery Contactor Close
Battery Reverse	Connect the battery again and check the wiring of batteries
No Battery	Check the battery and the wiring of batteries
Auto start	After UPS was shutdown at EOD, inverter auto starts when utility restore.
BCB closed	BCB closed from dry contact signal.
BCB open	BCB open from dry contact signal.
Battery Float Charging	Battery is float charging
Battery Boost Charging	Battery is boost charging
Battery Discharging	Battery is discharging
Battery Period Testing	Battery is period self-testing.
Batt. Capacity Testing	Battery is capacity self-testing.
Batt. Maint. Testing	Battery is maintenance self-testing.
UPS System Testing	UPS System is testing
Inverter in Setting	Inverter is in parameter setting
Rectifier in Setting	Rectifier is in parameter setting
Balancer Fault	Internal VDC (+) and VDC (-) offset by over 50V exceeding the inverter DC offset compensation capacity. Inverter shuts down. Load transfers to bypass.
Balancer Over Current	Internal Inverter DC offset balancing IGBT current rating exceeded 300%. Inverter shuts down. Load transfers to bypass.
Batt. Contactor Fail	Battery contactor or circuit breaker not responding to control signals.
Batt. Converter Fault	Battery converter output voltage beyond limits or battery fuse failed. Battery converter shuts down. Battery backup not available.
Batt. Conv. Over. Curr.	Battery converter overloaded. Battery converter shuts down. Battery backup not available.
Batt. Converter Overtemp.	Overheating of battery converter heatsinks. Battery converter shuts down. Battery backup not available.
Operation Invalid	This record is registered following an incorrect operation.
By. Abnormal Shutdown	Both bypass and inverter voltages unavailable. Load interruption.
Setting Save Error	History records not saved. (Reserved)
Mains Neutral Lost	AC Input mains reference neutral not detected.
Balancer overtemp.	Inverter voltage offset control choke overheated. Inverter shuts down. Load transfers to bypass.
Protocol version clash	Firmware incompatibility between monitor board and digital signal processor board.
MBP-T cabinet Fan Fault	Maintenance bypass cabinet fans fault.
Ext Input TX Overtemp	External input isolation transformer overtemperature
Ext Output TX Overtemp	External output isolation transformer overtemperature
Battery Room Alarm	Environment in Battery Room Needs Attention
Rec Flash Update	Rectifier firmware is being updated
Inv Flash Update	Inverter firmware is being updated
Monitor Flash Update	Monitor firmware is being updated
Input contactor fault	Input contactor fault
Contactor P.S. 1 fault	Contactor Power Supply board 1 Fault
Contactor P.S. 2 fault	Contactor Power Supply board 2 Fault
LBS abnormal	LBS is abnormal
DSP firmware error	The inverter firmware does not match the rectifier firmware.

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SL-25210_REV6_11-06

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