Liebert®
Keeping Business In Business®

POWER PROTECTION

Npower™ UPS

OPTIONS MANUAL
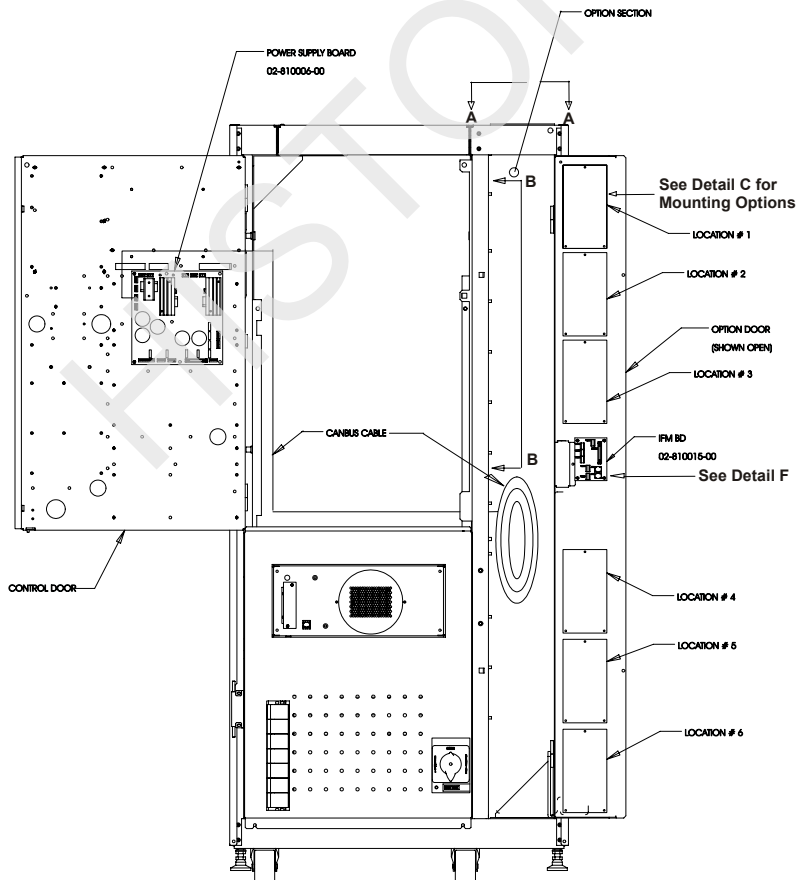
30-130 kVA , 60 Hz
Single-Module Three Phase

POWER SUPPLY BOARD
02-810006-00

OPTION SECTION

A   A

B

See Detail C for
Mounting Options

LOCATION # 1

LOCATION # 2

OPTION DOOR
(SHOWN OPEN)

LOCATION # 3

CANBUS CABLE

B

IFM BD
02-810015-00

See Detail F

LOCATION # 4

LOCATION # 5

CONTROL DOOR

LOCATION # 6

EMERSON™
Network Power

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IMPORTANT SAFETY INSTRUCTIONS

Save These Instructions.

This manual contains important safety instructions that should be followed during installation and maintenance of the options packages for the Npower UPS. Before the installer begins the installation process for any option, we recommend that he read through the safety precautions and the option installation instructions, taking all necessary safety precautions to protect himself and the equipment he will be installing.

⚠️ **WARNING**
LETHAL VOLTAGES MAY BE PRESENT WITHIN THIS UNIT EVEN WHEN IT IS APPARENTLY NOT OPERATING. OBSERVE ALL CAUTIONS AND WARNINGS IN THIS MANUAL. FAILURE TO DO SO COULD RESULT IN SERIOUS INJURY OR DEATH.

REFER UNIT TO QUALIFIED SERVICE PERSONNEL IF MAINTENANCE IS REQUIRED. NO ONE SHOULD WORK ON THIS EQUIPMENT UNLESS HE IS FULLY QUALIFIED TO DO SO. AN INSTALLER SHOULD NEVER WORK ALONE.

⚠️ **WARNING**
WHEN INSTALLING OPTIONS IN AN NPOWER UPS ALWAYS PUT THE UNIT ON MAINTENANCE BYPASS AND OPEN THE BATTERY CIRCUIT BREAKER. INSTRUCTIONS ON HOW TO DO THIS ARE IN THE FOLLOWING SECTIONS.

⚠️ **WARNING**
WHEN REMOVING POWER FROM THE UPS, ALLOW FIVE MINUTES FOR CAPACITORS TO DISCHARGE BEFORE WORKING ON THE EQUIPMENT.

⚠️ **CAUTION**
This equipment complies with the requirements in Part 15 of FCC rules for a Class A computing device. Operation of this equipment in a residential area may cause interference to radio and TV reception, requiring the operator to take whatever steps are necessary to correct the interference.

⚠️ **CAUTION**
Do not put option control wiring in the same conduit as the UPS input or output power cables.

1.0   INTRODUCTION

The Liebert Npower Uninterruptible Power System (UPS) protects valuable equipment, data, and processes from the consequences of disturbances in the utility power source. To enhance the flexibility and performance of the Npower UPS, Liebert offers several features and options that can be ordered as standard equipment or purchased separately and field-installed by a qualified Liebert Customer Service and Support technician or distributor. This manual describes the options available for the UPS and gives detailed installation and operating instructions for each.

NOTE
It will be helpful to have the Npower Operation and Maintenance Manual available during the installation process, as it contains information referred to here.

2.0   OPTION DESCRIPTIONS

The NpowerUPS features an Option Door that covers the UPS input and output connection section. The general layout of the UPS and Option Door is shown in the illustration on the cover of this manual. With a few exceptions, most of the following options are installed on or near the Option Door. The required hardware and cabling to attach the boards to the UPS system are included. Additional cables and wiring required to connect to the customer's equipment outside the UPS are to be supplied by others.

2.1   Open Comms - Discrete Output Option (OC-DO) (Programmable Relay Board)

The Npower UPS offers a Programmable Relay Board option allowing the Operator to program certain alarms or events to activate single or multiple output relays. In addition to the user-defined programming capability of the system, the Npower offers two pre-defined relay assignments: AS400, where only the first 3 relay assignments are pre configured (with the other 5 assignments available for user definition, and Standard Set, where the first 7 relays are assigned with the remaining one left unprogrammed. (The 8th assignment is not available for user definition.)

Programming of the output relays is performed through the LCD display of the UPS unit. Each relay output has two sets of Form-C dry contacts rated for 1 Amp @ 30 VDC or 250 mAmps @ 125 VAC.

2.2   Open Comms – Discrete Input Option (OC-DI) (Input Contact Isolator)

Provides an interface for up to eight user alarm or message inputs (normally open / dry contacts). The user can program the alarm messages through the LCD display of the UPS unit. The input alarm can also be configured to activate a programmable relay output on the OC-DO.

2.3   Option Power Supply (OPS)

An additional control power supply is required when a Remote Alarm Status Panel or Multiple Battery Circuit Breaker Option is to be installed.

> **NOTE**
> **The above-listed options can be installed at the factory for new UPS modules or retrofitted in the field for existing UPS modules. The following options are not installed in the Npower UPS cabinet or are not installed in the Option Door location**

2.4   Internal Modem

Provides a 2400-baud modem in the UPS capable of dialing out from the UPS or accepting incoming calls and connecting to a remote terminal, computer or PC. A command set allows the user to view the alarm status, event log status, history status and system settings. The modem can also be configured to dial out two different telephone numbers, a primary and a back up number as a result of a significant UPS event. The selection of Dial Out events is user programmable.

2.5   Remote Alarm Status Panel (RAS)

Includes individual alarm LEDs for: Load On UPS, Load On Bypass, Battery Discharge, Low Battery Reserve, Overload, Ambient Overtemp, System Summary, New Alarm, audible alarm, and lamp test/reset push button. It is provided in a NEMA 1 enclosure for wall mounting and can be located up to 1000 feet from the UPS. NOTE: An Option Power Supply (OPS) is also required.

2.6   Battery Circuit Breaker

Circuit breaker with Under Voltage Release (UVR) and auxiliary contacts in NEMA 1 enclosure for use with battery plants other than Liebert matching battery packs.

2.7   Network Interface Card (NIC)

Provides multiple connectivity options for the Liebert equipment. Provides standard Ethernet / IP connectivity to view status and alarm information via HTTP (web pages) and a full SNMP agent for Network Management System interaction. Ethernet cabling is the responsibility of the customer.

2.8   Multiple Battery Breaker Option

This option provides a multiple battery breaker kit harness that interfaces to the existing system control harness. The kit contains an Input Contact Isolator (ICI) board allowing the Npower system to sense multiple battery cabinets.

2.9   AS/400 Signal Cable

A 50-foot cable with a 9-PIN subminiature "D" shell plug (male) is provided to connect the alarm contacts from the UPS to the IBM AS/400.

2.10   AS/400 Extender Cable

Provides an additional 50 feet of interface signal cable with connectors on each end.

2.11   Battery Ground Fault Detector

The DC Ground Fault Detector circuit detects an unbalance in current on the two battery cables. An unbalance in current means the current is flowing to the ground. Detection of a ground fault condition will trigger an alarm.

2.12   Auto Restart

This option provides the Operator Fuse Kit that allows the Auto Restart feature to function. This feature automatically restarts the UPS without operator intervention after shutting down due to loss of input power and an end-of-battery discharge shutdown. This option requires a battery cabinet with a motor-operated breaker.

2.13   Input Trap Filter

This feature allows the Operator to decide whether or not the input trap filter should be disconnected at light loads to prevent a leading power factor at the input. With this feature, the Operator can select the percent power level at which the input trap filter contactor is opened.

2.14   Battery Supplement

This feature allows the UPS to continue to supply power to the output from both the rectifier and the battery when the input voltage sags. This mode of operation will keep conditioned-uninterruptible power at the output for a longer period of time as compared to just turning off the rectifier when the input voltage sags.

The feature is permanently enabled at the present time, and can be identified by an alarm reading "Battery Supplement Active". The alarm will clear when the Input Undervoltage alarm clears and/or if the rectifier turns off and/or if the Battery Discharge alarm clears. There will be 1-second delay before setting or clearing this alarm.

2.15   Battery Low Warning

The Battery Low Warning Feature alerts the Operator to the battery time remaining in minutes. (**See the Operation and Maintenance Manual.**)

3.0 GENERAL INFORMATION CONCERNING 4 X 7 OPTION CARDS

The Npower cabinet has a dedicated area where option hardware must be installed. Figure 1 indicates the option area where the 4 x 7 option cards are installed. The Internal Modem, LBS, Battery Ground Fault Detector, Multiple Battery Circuit Breaker and Remote Status Panel install in different locations, as will be discussed in later sections of this manual.

Options A, B, and C (Relay boards 1 and 2 and ICI board) can be installed in locations 1,2, 3 and 4, whereas Option D (the Optional Power Supply and Remote Gateway) can only be installed in location 5. Option E (Network Interface Card or NIC) must be installed in Location 6. Installation details and drawings for each option are included in the section dedicated to that option.

3.1 Option Locations and Mounting

The following table shows locations and part numbers.

Table 1   Locations and Part Numbers

Option Door Location	A Relay Board 1	B Relay Board 2	C ICI Board	D OPS & Remote Gateway	E NIC Board
Part Number	37OP000PRB8	370P000PRB8	37OP000ICI8	37OP000OPS8	37OP000NIC8
1	YES	YES	YES	NO	NO
2	YES	YES	YES	NO	NO
3	YES	YES	YES	NO	NO
4	YES	YES	YES	NO	NO
5	NO	NO	NO	YES	NO
6	NO	NO	NO	NO	YES

All of the Npower options require internal access to the unit for installation and wiring purposes. If multiple options will be installed, we recommend opening the unit once and installing all options at the same time. Before beginning the installation process, the installer must read through these instructions and the installation procedures for each option, taking all necessary safety precautions to protect himself and the equipment he is about to install.

Figure 1   Npower Option Locations

OPTION SECTION

POWER SUPPLY BOARD
02-810006-00

A   A

B

See Detail C for
Mounting Options

LOCATION # 1

LOCATION # 2

OPTION DOOR
(SHOWN OPEN)

LOCATION # 3

CANBUS CABLE

IFM BD
02-810015-00

B

See Detail F

CONTROL DOOR
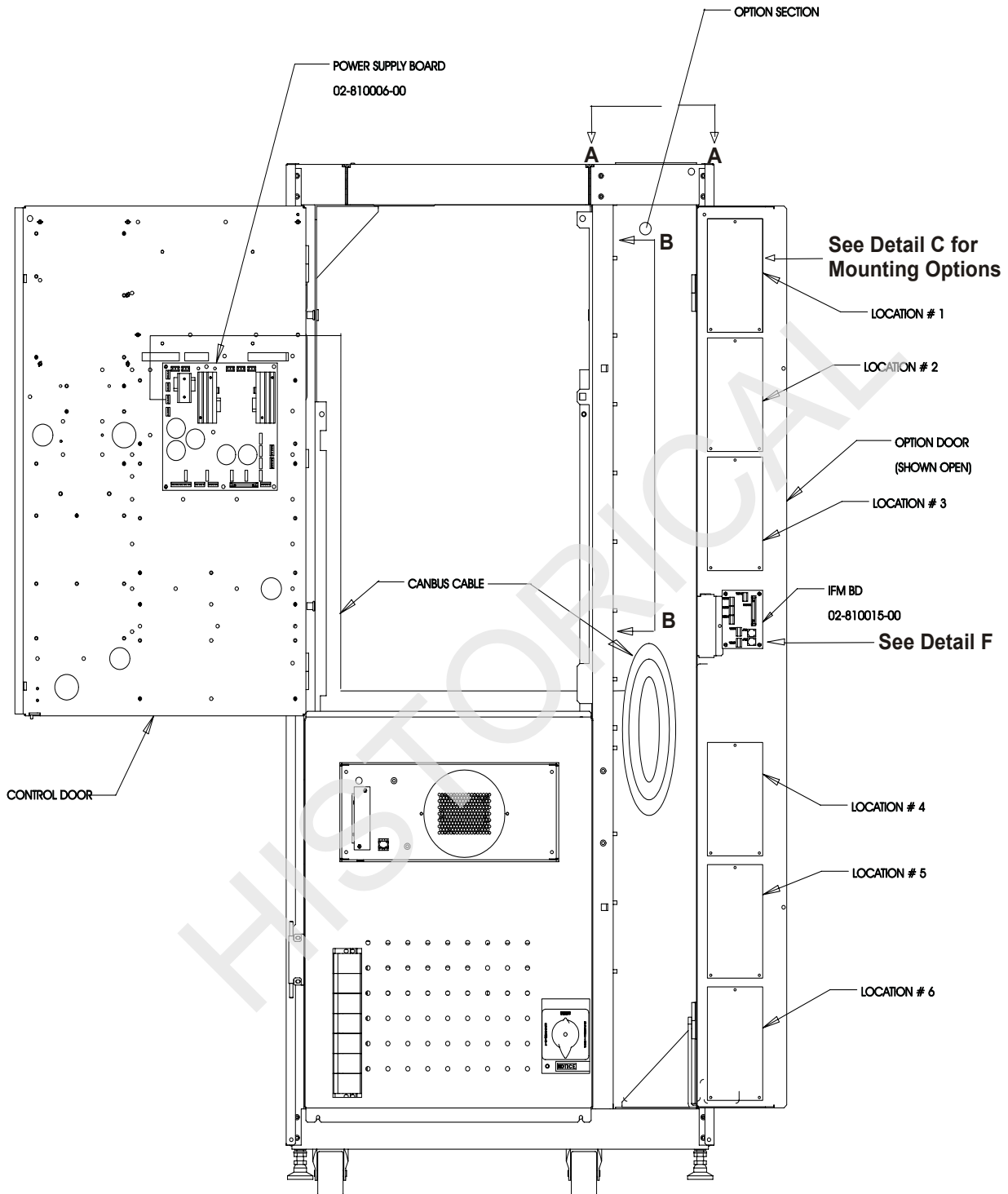
LOCATION # 4

LOCATION # 5

LOCATION # 6

UPS MODULE
(FRONT DOOR REMOVED)

Figure 2   Detail F and View B-B

IFM
02-810015-00

TB 51

TB 52
1 DCD
RX
TX

TX
RX
GND

TB 53
1 DTR
GND
DSR

P200A

TB 54
1 RTS
CTS
RI

TB 55
1 SS-
SS+

J1A

TB 56
1 RX
TX
GND

J1B

DETAIL F

TB 69
1
12

TB 70
1
12

TB 71
1
12

TB 72
1
12

TB 73
1
12

VIEW B-B
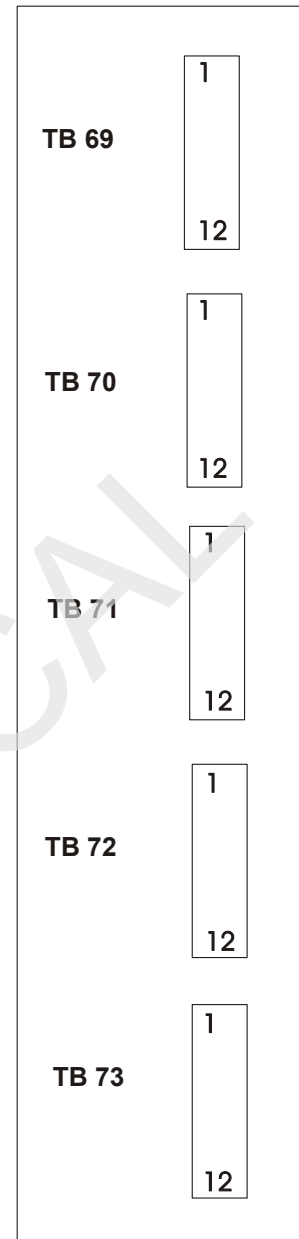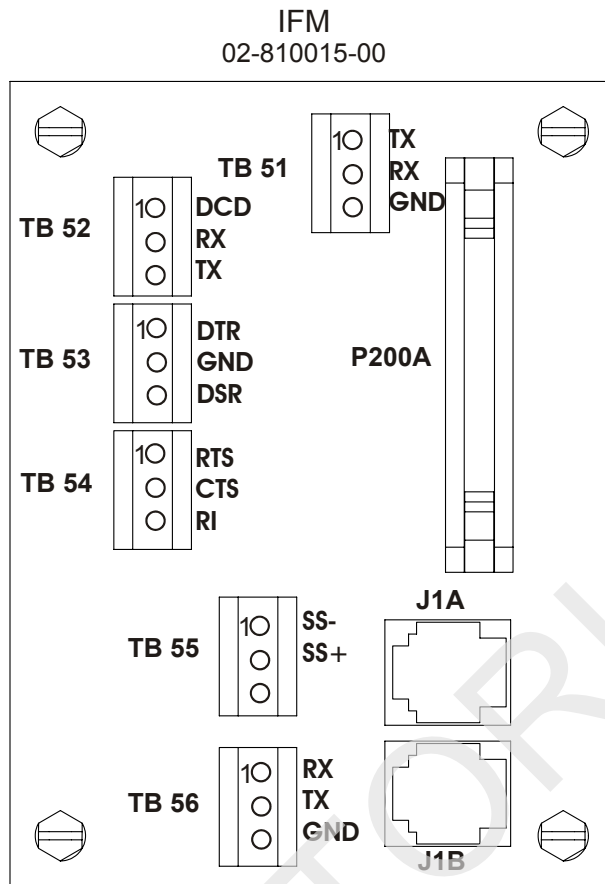
Figure 3   Option Location and Mounting Detail

3.2   CANbus Termination

The CANbus in the Npower system is used to communicate system status, history data and commands to various logic boards in the system. To perform in a reliable manner the CANbus must be properly terminated on each end of the CANbus with a 120 ohm resistor. This is accomplished by connecting the terminating resistor in the first and last unit on the CANbus. There are different means to accomplish this depending on which option or logic board is on the end of the bus. The UPS Control Board is considered to be the first element on the bus and has a permanent termination resistor installed on it. In a standard system with no options installed the second terminator is installed via a jumper in the MicroMonitor board. The Remote Status Panel (RAS), Open Comms Discrete Input (OCDI) and Open Comms Discrete Output (OCDO) options have built in termination resistors that are enabled with a jumper.

NOTE
On a fully optioned Npower there will more than one CANbus utilized. Refer to **Figure 4** for a diagram of a basic Npower without options.

Figure 4   Diagram of a Basic Npower Without Options
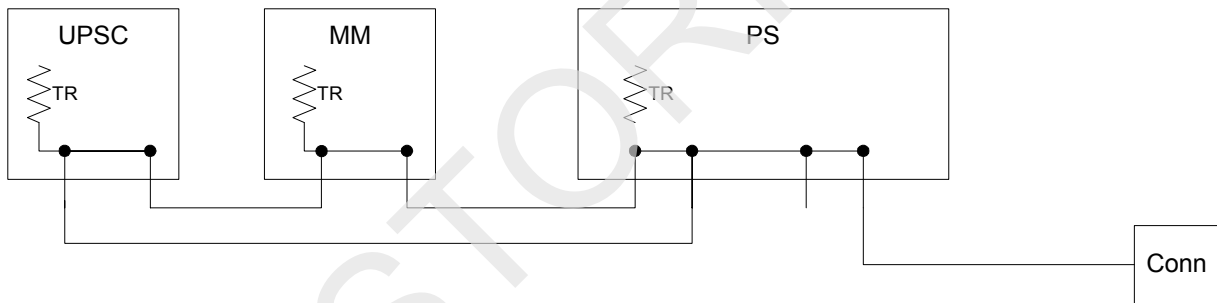
In **Figure 4** the CANbus is terminated on the UPS Control Board that connects to the MicroMonitor (MM) board and to the Power Supply. The Power Supply provides an electrical connection point for the CANbus in addition to power for the CANbus. It does not actively connect to it. The final CANbus termination is on the Micro Monitor board.

Figure 5   Diagram of Npower with OPS and RAS Added

TOP

P966

P999

⟨7⟩
⟨4⟩

LOCATION 1
OPTION A, B, OR C

P966

P999

LOCATION 2
OPTION A, B, OR C

⟨7⟩
⟨4⟩

P966

P999

LOCATION 3
OPTION A, B, OR C

POWER SUPPLY BD.
02-810006-00

P966

P999

⟨8⟩
⟨4⟩

P966

P999

LOCATION 4
OPTION A, B, OR C

⟨1⟩ ⟨2⟩ ⟨3⟩   P999

INTERNAL CONNECTIONS

LOCATION 5
OPTION D
(OPS)
See Section 8.0

LOCATION 6
OPTION E **(NIC)**
DOES NOT CONNECT TO OTHER OPTIONS
See Section 15.0

TB3

BOTTOM

OPTION CONTROL DOOR

OPTION
BOARD

3x M4 KEPNUT
(PN 09-258052-00)

DETAIL C
OPTION MOUNTING
(ISOMETRIC DISPLAY)

VIEW A-A
OPTION PLATE ISOMERTIC DISPLAY
HOLE LOCATION REF ONLY
(1) TOP UNIT
(1) BOTTOM UNIT
⟨5⟩   ⟨6⟩

In **Figure 5** an Option Power Supply (OPS) and a Remote Status Panel (RAS) have been added to the CANbus. The Option Power Supply contains an isolated CANbus repeater so the CANbus in the OPS/RAS loop is considered to have originated at that point only to the RAS panel. The isolated output of the OPS is pre-configured with a terminator on the included terminal block.

Notes For Figure 5

1. CANbus cable for providing power and signals for the communication option is installed in the UPS and is coiled up in the option section.
2. Connect the CANbus cable to P999 of the option located in Location 4. **See Section 8** if option D, Option Power Supply is to be installed.
3. Always insure that the CANbus cable originating from the power supply PWA gets connected to P999 of the bottom-most option of the group in Locations 1 through 5. (Option in Location 6 is not considered as part of this group.)
4. Additional options can be cabled together using one of the CANbus jumper cables. The jumpers plug into connector P966 of the lower option and into connector P999 of the next option above.
5. All user option connecting cables are to be provided by others and are to be 16 gauge 300V Min. tinned copper stranded wire. All option connections are made in the option section. Customer wires route through option plate.
6. Option connection cables must be run in separate conduit from CANbus power cables.
7. Use short CANbus jumper (PN 77-814000-04) to daisy chain options.
8. Use long CANbus jumper (PN 77-814000-03) to connect P966 at Location 3 and 4.

Figure 6   Diagram of Npower with Additional RAS Panel
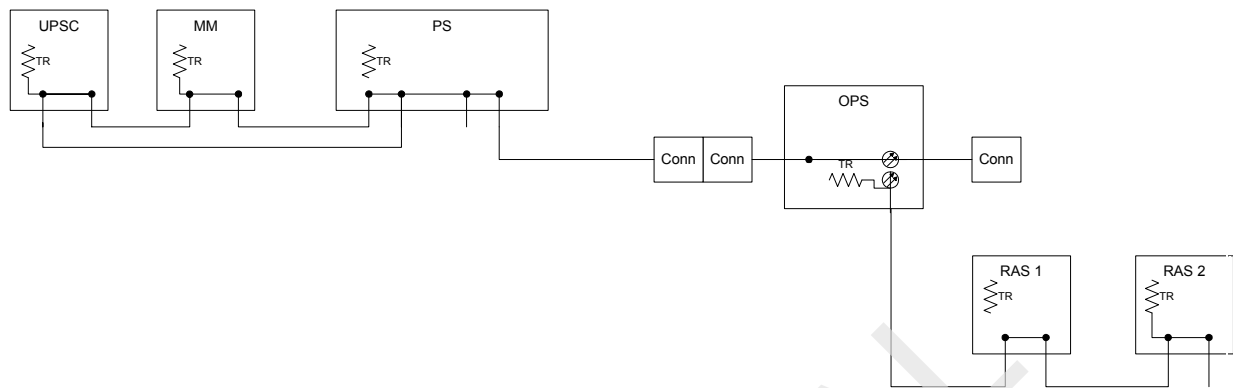
Figure 6 shows an additional RAS panel and the termination jumper moved from RAS #1 to RAS #2. This is accomplished by removing the termination jumper from RAS #1 and installing the jumper in RAS #2.

Figure 7   Diagram of Npower with Additional Options
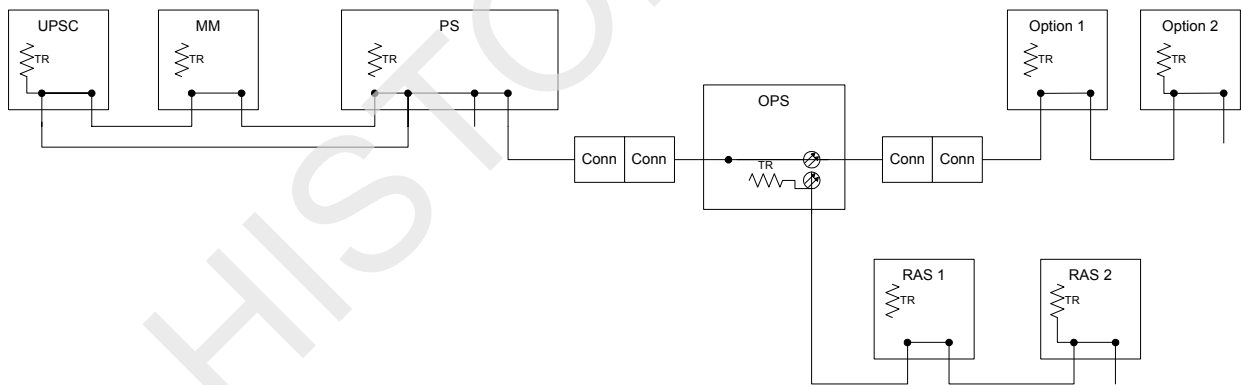
Figure 7 shows two additional options connected to the CANbus. These options could be an OCDO or an OCDI option. When these options are installed, the termination is enabled on the last unit on the CANbus.

There is one other possible configuration that must be considered. When a system has one or more options installed and an OPS is not installed, then all termination is accomplished via board jumpers. If an OPS is later added it will always be installed inside the CANbus loop and will not require termination. (See **Figure 8**.)

Figure 8   Diagram of Npower with One or More Options Installed, and an OPS is not Installed
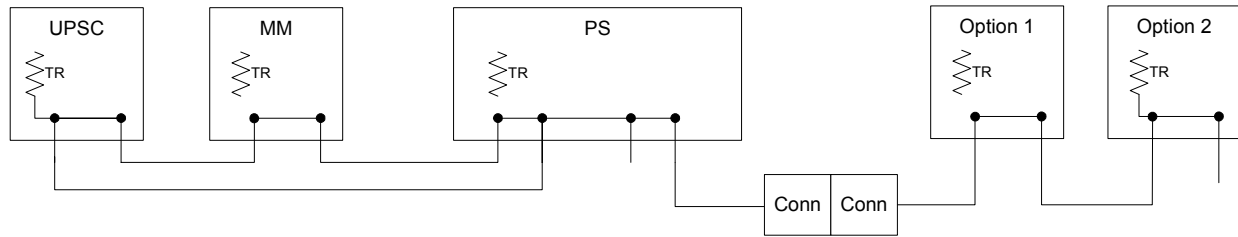
Figure 9   Jumper Removal
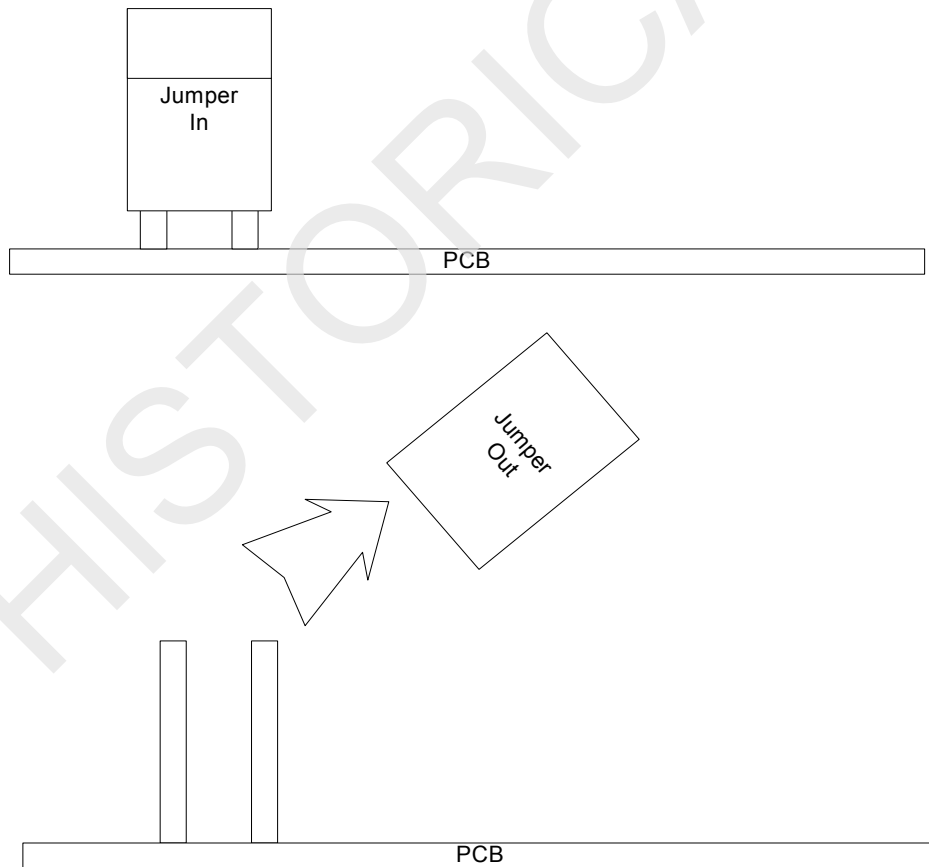
Figure 9 shows an example of jumper removal. Please consult the documentation with each option to determine the location of the termination resistor jumper.

4.0 GENERAL OPTION INSTALLATION INSTRUCTIONS

Using the Npower front control panel, put the Npower UPS to bypass and open the battery circuit breaker in accordance with instructions in the Operations and Maintenance Manual.

With the Npower on bypass, unlock and open the front door of the Npower. **See Figure 1**.

Use the rotary switch (at knee level) to mechanically set the Npower to Bypass. The rotary switch is located in the lower right front of the unit (**Figure 1**). Open the fuses for control power and fans, in accordance with the Operations and Maintenance Manual. With the switch in the Bypass position and the control power fuse open, the load will be supported by the utility but power will not be supplied to the option installation area in the Npower.

With the front door open locate the option door on the right hand side of the cabinet. Loosen the two screws located on the left hand side of the option door. The option door will open to the right. **See Figure 1**. At the back of the option area are red composite shield panels, to prevent accidental contact with the input and output power terminals. Leave these shields in position.

⚠️ **CAUTION**
Do not remove the red I/O Protective Shields. Behind the shields are input and output power terminals that will remain energized.

As a minimum there will be an communications interface module (IFM board) mounted on the side of the compartment near the mid-point on the door. Other options may also have been previously installed.

The Option boards mount on the inside of the option door (**See Figure 1**). Options should be located in accordance with **Table 1** in **Section 3.1**.

If other options have been previously installed, install the new option in the next higher adjacent available position.

When the installer has selected the proper mounting position, he should use the KEPNUTS supplied with the Kit to attach the Option to the inside of the Option Door (**See Figure 3)** mounted on the studs as indicated.

If this is the first option, and is not the option power supply or the NIC, install in Location 4. The UPS will have an already installed (CANbus) interface harness that is coiled up and located in the center of the option door. Attach this harness to the connector marked P999 on the left hand side of the option board. (**See Figure 3** and **Figure 10**.)

If this option is being installed in a UPS system that has previously installed option boards, the UPS CANbus harness will already be routed to the existing Option board(s). Two jumper cables will be supplied with the installation kit. A long jumper, to be used if the new board to be installed is distant from the existing connected board, and a short jumper if the new board and existing board are to be installed adjacent to each other. The jumper cables are numbered 77-814000-03 (short) and 77-814000-04 (long). The short cable is 14 inches and the long cable is 27 inches.

Attach the correct jumper cable to the previously installed option, using the connector labeled P966 on the lower left section of the previously installed option. Run the jumper to the connector labeled P999 on the left of the New Option. (**See Figure 3 and Figure 10).**

Subsequent new options will be installed in a similar fashion. The option located in position 4 (bottommost) should receive the UPS CANbus harness. Subsequent options will be connected in a daisy chain fashion via the jumper cable 77-814000-03 or 04 depending upon required length.

See **Section 8** for the installation of the OPS and **Section 15** for the installation of the NIC.

Figure 10 Typical CANbus Connections

NEW INSTALLED OPTION

CUSTOMER HOOKUPS

TBI-16

 Depending on location
Use Jumper Cable 77-8140-03 (Long)
Or Jumper Cable 77-814000-04 (Short)

P966

P999

CANbus Cable
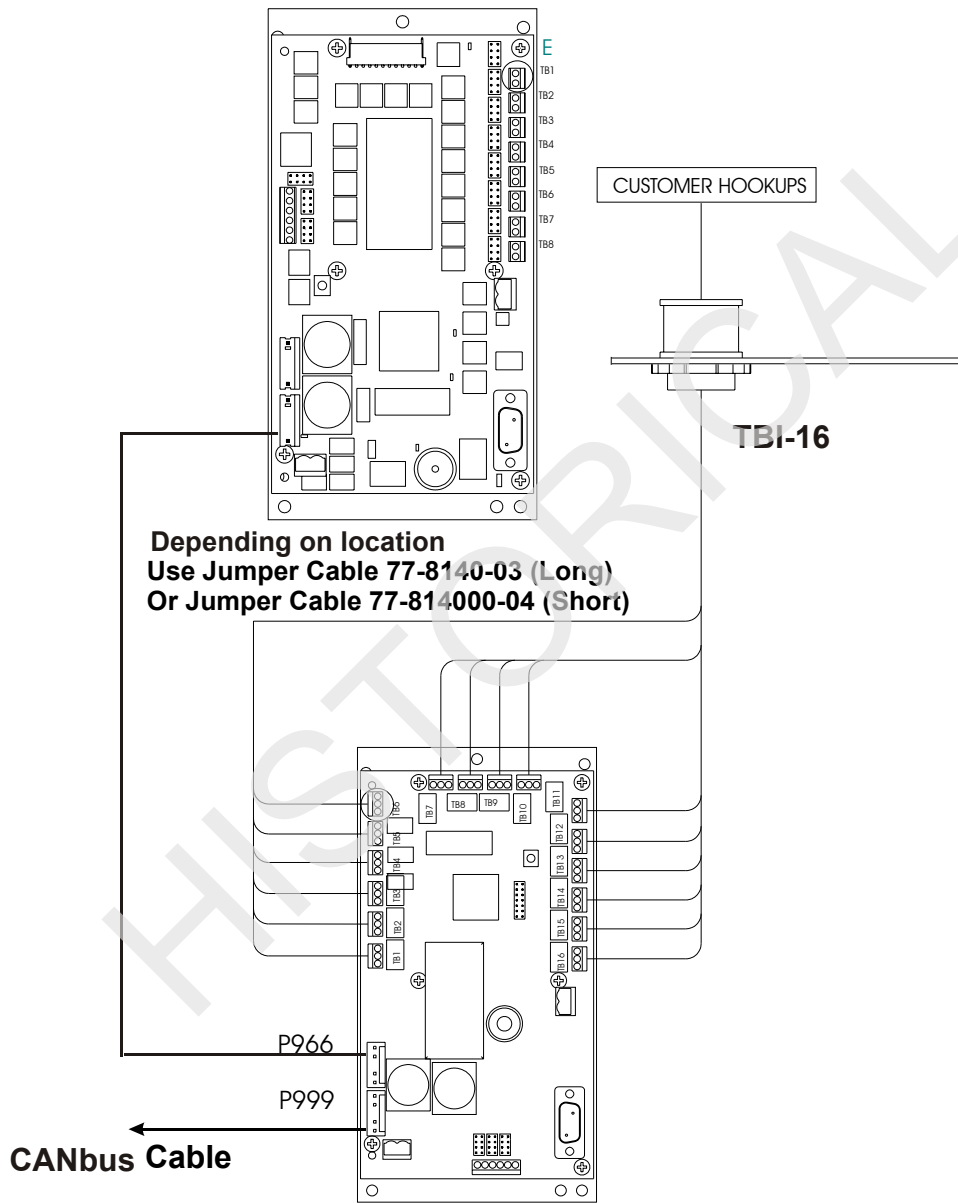
PRE- INSTALLED OPTION

5.0 ENABLING COMMUNICATION OPTIONS

The physical option must be installed and properly wired in the Npower before it can be enabled. If the option device is not installed and wired properly, the installer will be unable to configure or enable the option.

Figure 11 Operator Control Panel
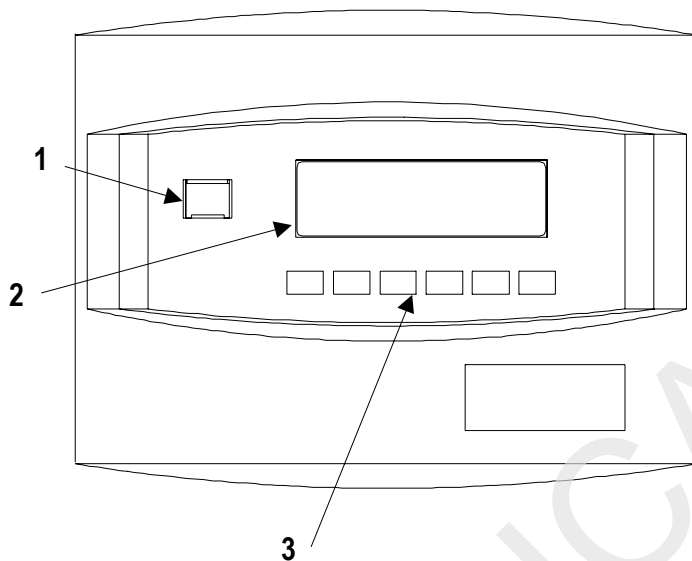
Item	Description	Function
1	Emergency Power Off Button	Turns power off in an emergency situation.
2	Display Screen	Enables Operator to monitor power flow and meter readings, receive reports, and execute operational procedures.
3	Navigation Buttons	Enables Operator to access menu screens and make selections.

All communication options are enabled through the Operator Control Panel. The Operator Control Panel has 6 buttons marked SELECT, UP, DOWN, ALARM RESET, ALARM SILENCE, and ESCAPE. Pressing the ESCAPE key will always return the Operator back to the default mimic display. ALARM RESET and ALARM SILENCE are self-explanatory. The UP and DOWN buttons allows the Operator to scroll through the various screens. If the screens scroll up or down these keys work as labeled. Some screens scroll right and left or in a circular fashion. UP can also be Left or Clockwise, and DOWN can also be Right or Counter-clockwise. Further information concerning the navigation structure of the Npower menus can be found in the Npower Operations and Maintenance Manual.

To enable the option, begin by navigating to the MAIN MENU. The screen will appear as below.

Figure 12 Main Menu Screen

```
                    MAIN MENU


          MIMIC DISPLAY            MANUAL TRANSFER
          STARTUP / SHUTDOWN       BATTERY MANAGEMENT
          STATUS REPORTS
          CONFIGURATION
```
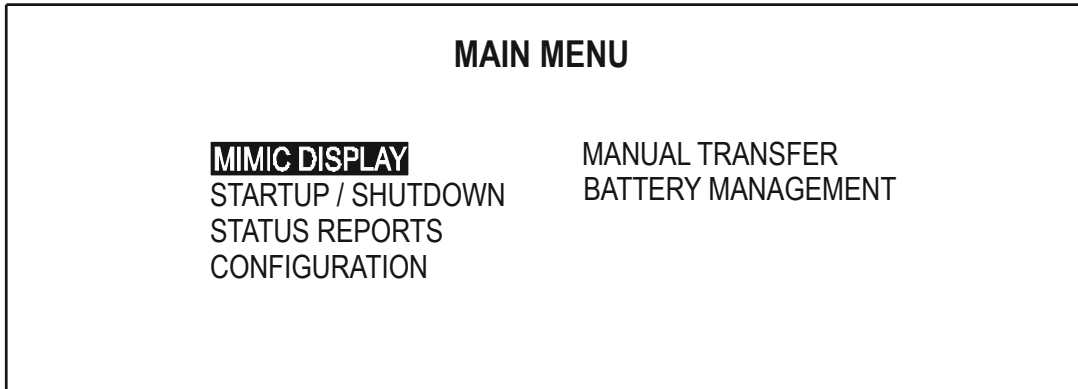
Using the arrow keys move the cursor (reverse video display) to CONFIGURATION. Press SELECT (enter). This will bring up the CONFIGURATION SCREEN shown below

Figure 13 Configuration Screen

```
                    CONFIGURATION

              SYSTEM RATINGS
              SYSTEM SETTINGS
              USER SETTINGS
              FACTORY SETTINGS
              ALARM MASK
              CUSTOMER ALARM INTERFACE
                                          EXIT
```
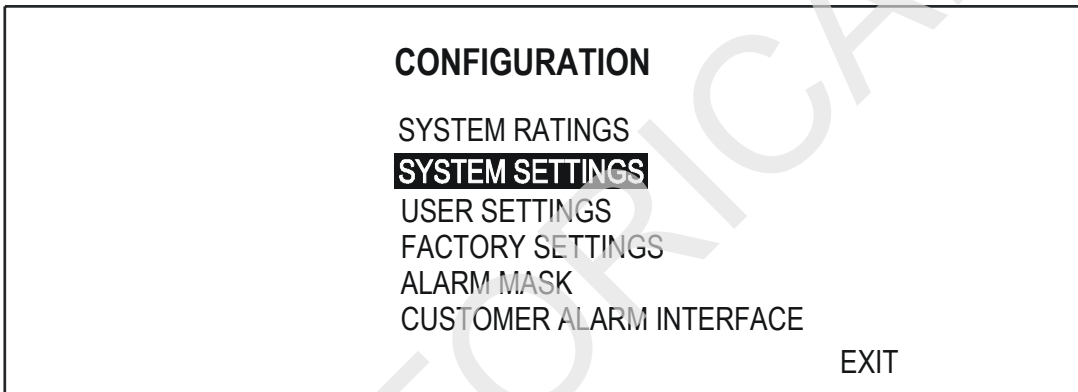
Using the arrow keys, move the cursor to SYSTEM SETTINGS and press SELECT. This will bring up the SYSTEM SETTINGS Screen as shown below.

Figure 14 Systems Settings Screen

```
                 SYSTEM SETTINGS

          DATE                 01/05/2001
          TIME                 11: 16: 441
          LANGUAGE             ENGLISH
          ID NUMBER            00000000
          TAG NUMBER           00000000

              NEXT      CANCEL    SAVE & EXIT
```
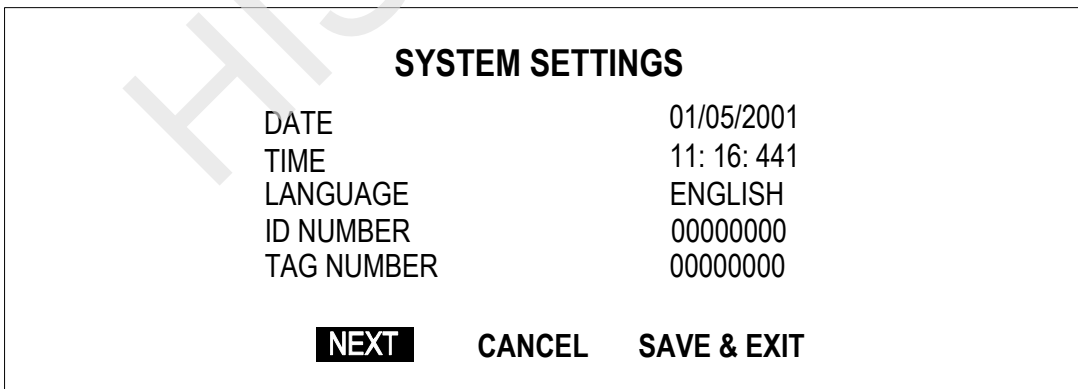
The cursor should have highlighted NEXT, but if it has not, use the arrow keys to highlight NEXT, press SELECT 2 times to scroll through the next setting screens to reach the screen containing the COMM OPTIONS selection as seen below.

Figure 15 System Settings Screen with COMM OPTIONS highlighted

<div style="border:1px solid">

SYSTEM SETTINGS

SINGLE/DUAL INPUT	SINGLE
OUTPUT TRANSFORMER BYP	NO
BYPASS AUTO TRANSFORMER T3	NO
OPTIONS...	
COMM OPTIONS...	

PREVIOUS   CANCEL   SAVE & EXIT

</div>

Use the arrow keys to move to COMM OPTIONS and press SELECT. The next 3 screens will show the possible COMMUNICATIONS OPTIONS.

Figure 16 Communications Options Screen

<div style="border:1px solid">

COMMUNICATION OPTIONS

MODEM	DISABLED
PROGRAMMABLE RELAY # 1	NO
PROGRAMMABLE RELAY #2	NO
INPUT CONTACT ISOLATOR	NO
REMOTE ALARM #1	NO

PREVIOUS   CANCEL   SAVE & EXIT

</div>

Use the arrow keys to move through the option screens (3 total). When the Operator has located the option he wishes to enable, the right hand column will indicate the status of the option as either ENABLED (or YES) or DISABLED (or NO). If the option is not enabled, press SELECT. Unless asked for a password in the last 5 minutes (see the Operation and Maintenance Manual for this feature) the operator will have to enter the system password to be able to turn on this option. If a password is required, the following screen will appear.

Figure 17 Password Screen

<div style="border:1px solid">

ENTER PASSWORD

0000
∧

</div>

For password information refer to the Npower Operation and Maintenance Manual, Section on Security Access and Passwords.

Enter the password by using the UP and DOWN arrow keys to scroll through the number and letter in each location until the proper letter (number or character) appears. Press SELECT. This will move the cursor to the next digit. Repeat the process until the password is complete. Since it is not possible to go back, if an error is made in entering the password, continue to press SELECT until returned to the COMMUNICATIONS OPTION screen. Select the option to enable again and press SELECT. This action returns the Operator to the password screen for another try. When the password is entered correctly a screen will briefly appear indicating password access for the next 5 minutes. The operator will then be passed on to the screen for enabling the option. Example for PROGRAMMABLE RELAY #1

Figure 18 Programmable Relay Screen
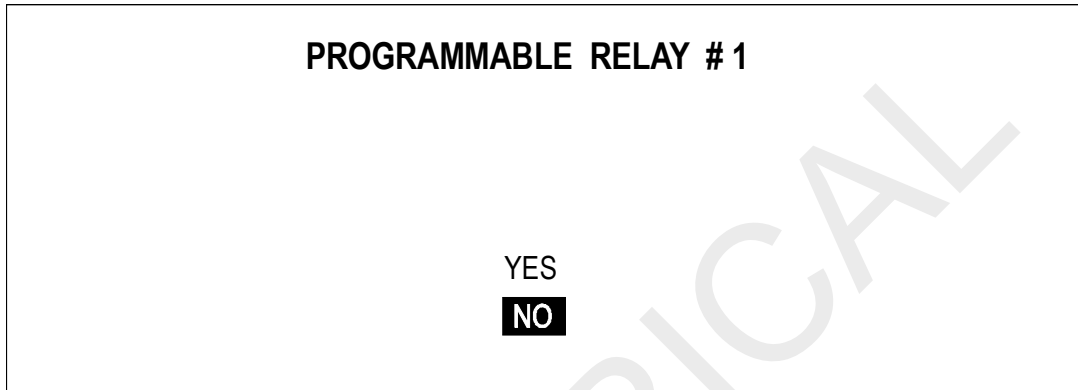
Use the UP and DOWN arrow keys to select YES or NO to enable this option. Once the selection is made Press SELECT. This will return the Operator to the COMMUNICATIONS OPTIONS screen. He may now enable or disable any of the other options he may be installing at this time. When all options to be installed have been enabled; from the COMMUNICATIONS OPTIONS screen select EXIT.

This will return the Operator to the SYSTEM SETTING SCREEN. At this screen he *must* select SAVE & EXIT. If he does not, the setting changes will not be saved.

NOTE

Operator must select SAVE & EXIT from the system setting screen or selections will not be saved.

Once the Operator has enabled all of the options that are installed, he is ready to configure the options. If he is unable or prevented from configuring one of the following options, he must perform the following checks:

Check to see if the device is enabled by going to the CONFIGURATION MENU and verifying that the option is enabled.
Check the option board to see if there is a flashing green LED on the board. If the LED is not flashing, Have a trained service technician check the wiring to the board and to the power supply or other source.

If no wiring problems are found, and the option is enabled but still cannot be configured, contact Liebert Global Services.

6.0   OPEN COMMS – DISCRETE OUTPUT OPTION (OC-DO) (PROGRAMMABLE RELAY BOARD)

6.1   Introduction

The Npower Open Comms – Discrete Output Option (Programmable Relay Board) allows configuration of the dry contact interfaces on the relay board to provide notification of particular events at the UPS. With the OC-DO, the Operator can select which events or UPS states are assigned to the contacts on the relay board.

In addition to the user-defined assignments, the Npower offers pre-assigned relays. (See **"Customer Alarm Interface" on page 25.)**

If the OC-DO is the first option to be installed, then it should be positioned in Location #4. **See Figure 3**. Mount the OC-DO board in accordance with the instructions in **Section 4.0 - General Option Installation Instructions**.

If there is a pre-installed option, then mount and wire the OC-DO board in accordance with **Figure 20** using the supplied jumper cable.

The OD-DO uses eight single-pole, double-throw (SPDT) relays that are tied to external circuits to give immediate feedback. Each relay contact has an associated event list that affects the closure of the relay. Up to four definitions, or events can be specified to activate each relay.

Each contact is rated for 0.25 Amps at 125 VAC or 1 Amp at 30 VDC and is electrically isolated from the UPS electronics and other contact sets.

One or two OC-DO boards can be installed depending upon needs and the number of events or UPS states to be monitored. The following sections describe how to install and configure the OC-DO.

Figure 19 OC-DO as the First Option

POWER SUPPLY BOARD

P966

CUSTOMER HOOKUPS

OC-DO

PROGRAMMABLE RELAY BOARD

P999

CANbus Cable UPS Connection
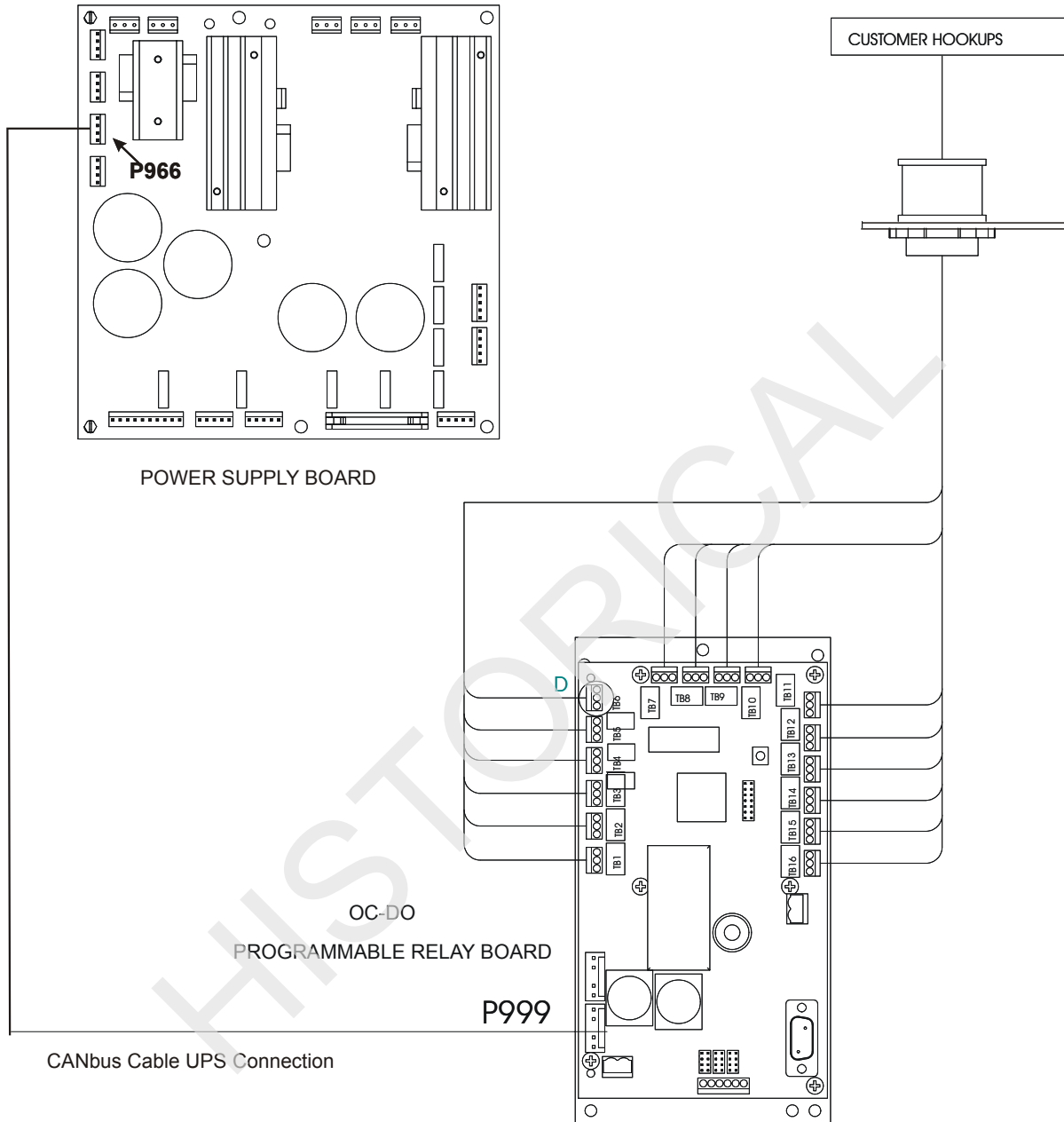
First Option

Figure 20 Installing OC-DO with a Pre-Installed Option

CUSTOMER HOOKUPS

TBI-16

**Wiring Provided
by Others**

**Depending on Location
Use PN 77-814000-03
Or PN 77-814000-04**

P999

Programmable Relay Board

P966

P999

CANbus
UPS Connection

Pre-Installed Option
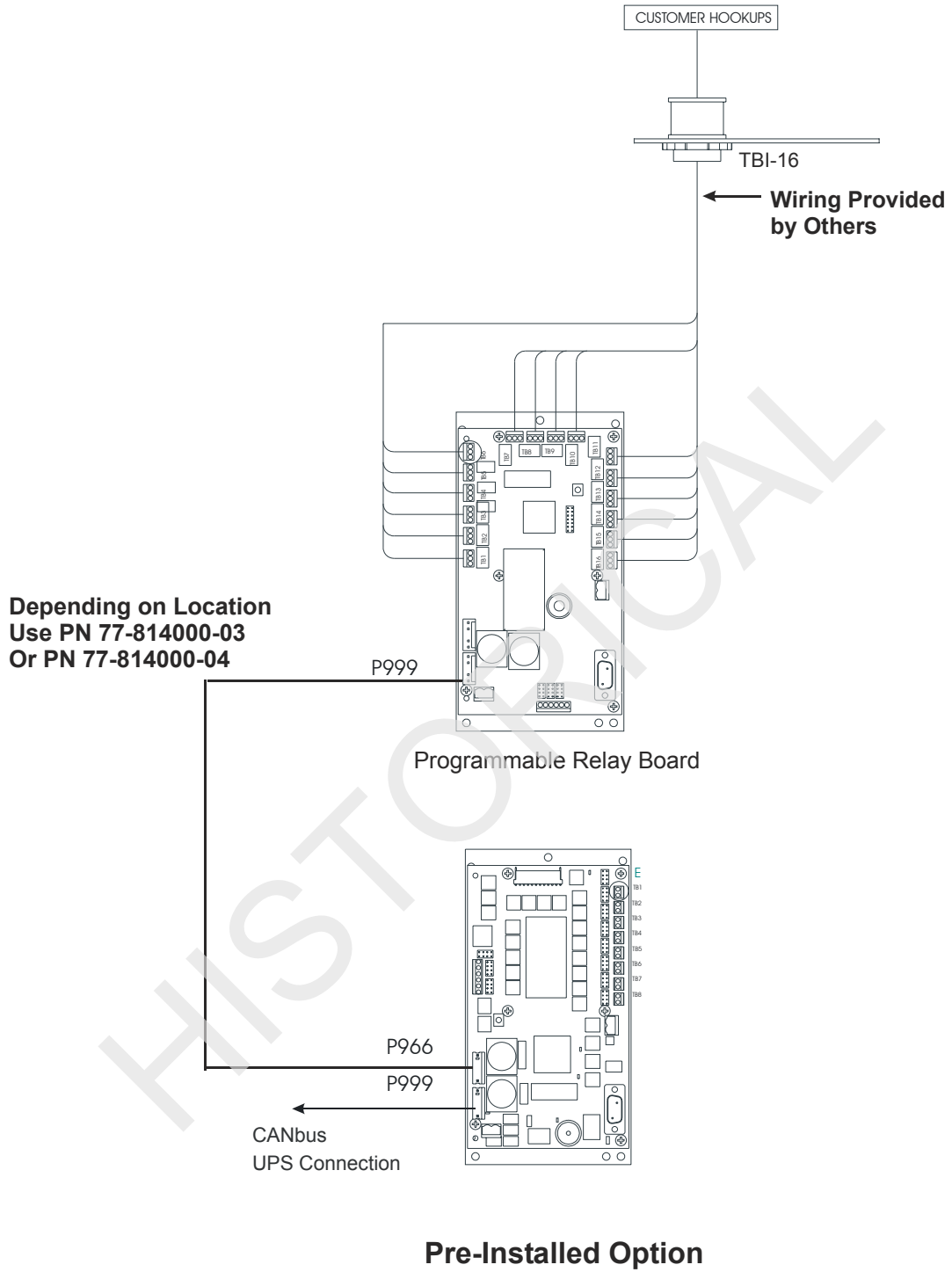
6.2   Installing the OC-DO (Programmable Relay Board)

Before beginning the installation process, read through these instructions and take all necessary safety precautions for protection of the installer and the equipment to be installed. Observe all warnings and cautions listed in the front of this manual when wiring the OC-DO option.

Once installed the OC-DO board needs to be connected to the CANbus. If it is the first option installed, utilize the system CANbus cable that is coiled in the center of the option area. If another option has been previously installed and connected to the system CANbus cable, use either the short (77-814000-03) or the long (77-814000-04) jumper cable as required.

Two wires should be brought to each Terminal Block position on the OC-DO requiring a NO/NC output signal. Wire should be brought to the Npower via appropriately sized conduit and attached to either the top or bottom entry mounting plates. Wire should be routed down the right side of the Option area and then at a 90-degree angle to the Option board. (**See Figure 21**)

All user option connecting cables are to be provided by others and are to be 16 gauge 300 V Min. tinned copper stranded wire. All option connections are made in the option section. Customer wires route through option plate.

Figure 21 Customer Connections

CUSTOMER HOOKUPS

OPTION PLATE
(1) TOP
(1) BOTTOM
SEE SHT. 2, VIEW A-A

D

TB7 TB8 TB9 TB10 TB11
TB6
TB5 TB4 TB3 TB12
TB13
TB2 TB14
TB1 TB15
TB16

See previous Figures
for Internal
Connections

P966

P999

PROGRAMMABLE RELAY BOARD

5 C
TYPICAL NC
NO

1
2
3

TB6

DETAIL D
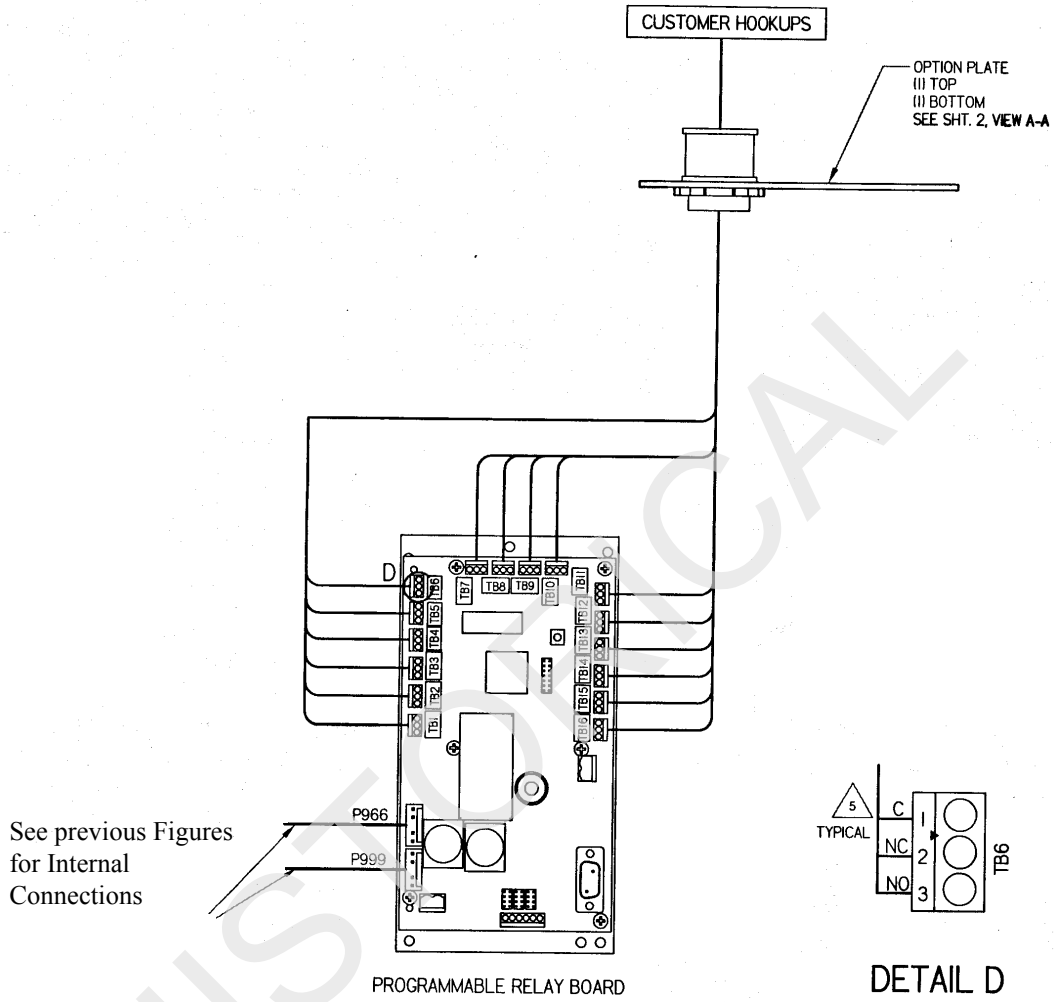
Table 2   Tabulation Contacts

Tabulation Contacts	
Channel 1	TB1 and TB2
Channel 2	TB3 and TB4
Channel 3	TB5 and TB6
Channel 4	TB7 and TB8
Channel 5	TB9 and TB10
Channel 6	TB11 and TB12
Channel 7	TB13 and TB14
Channel 8	TB15 and TB16

⚠ **CAUTION**

Do not put option wiring in the same conduit as the UPS input or output power cables.

Make all necessary connections to customer-supplied equipment.

All harnesses and cables should be dressed and secured via tie wraps to make sure they do not move when the option door is closed. Excess cabling should be neatly coiled and tie wrapped.

6.3 Programming the Open Comms – Discrete Output (OC-DO)

Follow the instructions in **Section 5** to ENABLE the option. When the option is ENABLED continue with the following instructions to program the relays.

6.3.1 Customer Alarm Interface

The Npower UPS offers a Programmable Relay Board option allowing the Operator to program certain alarms or events to activate single or multiple output relays. **(See Section 6 in the Options manual**.) In addition to the user-defined programming capability of the system, the Npower offers two pre-defined relay assignments: AS400, where only the first 3 relay assignments are pre configured (with the other 5 assignments available for user definition, and Standard Set, where the first 7 relays are assigned with the remaining one left unprogrammed. (The 8th assignment is not available for user definition.)

This means that the Operator can choose between the following three configurations for each of the two Programmable Relay Boards.

- AS400
- Standard Set
- User Defined

The default configuration is set at User Defined

To access the proper screen for configuring the Programmable Relay Boards, navigate from the MAIN MENU to the CONFIGURATION screen.

From the CONFIGURATION screen, use the arrow keys to highlight CUSTOMER ALARM INTERFACE and press SELECT.

This action will bring up the following screen.

Figure 22 Customer Alarm Interface Screen

```
┌─────────────────────────────────────────────────────────┐
│                                                         │
│              CUSTOMER ALARM INTERFACE                   │
│                                                         │
│                                                         │
│      RELAY BOARD # 1              USER DEFINED          │
│      RELAY BOARD # 2              NOT INSTALLED         │
│      CONTACT BOARD                                      │
│                                                         │
│          NEXT      CANCEL    SAVE & EXIT                │
│                                                         │
└─────────────────────────────────────────────────────────┘
```
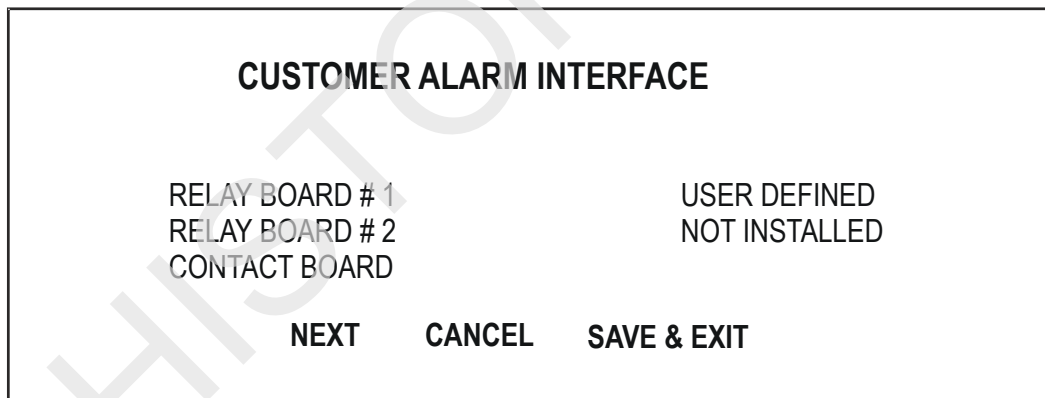
If there is no board, the "NOT INSTALLED" message is displayed.

Pressing NEXT will bring up the second page.

Figure 23 Customer Alarm Interface Screen, page 2

```
                    CUSTOMER ALARM INTERFACE


              REMOTE LED BOARD # 1
              REMOTE LED BOARD # 2
              REMOTE LED BOARD # 3

                    PREV      CANCEL     SAVE & EXIT
```
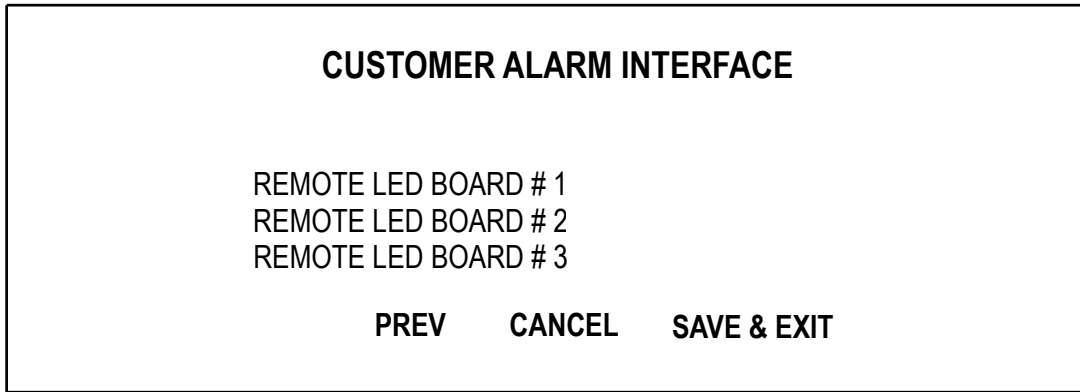
6.3.2   Configuring the Programmable Relay Boards

To access the Programmable Relay Board #1, highlight RELAY BOARD #1 from the first page of the CUS-
TOMER ALARM INTERFACE screen and press SELECT to bring up the following screen.

Figure 24 Programmable Output Relay Board #1, AS400 Assignment

```
          PROGRAMMABLE OUTPUT RELAY BOARD # 1

            RELAY ASSIGNMENTS.........................AS400

       PROGRAMMABLE RELAY # 1    BATTERY DISCHARGING
       PROGRAMMABLE RELAY # 2    LOW BATTERY WARNING
       PROGRAMMABLE RELAY # 3    LOAD ON UPS / BYPASS

               CANCEL            SAVE & EXIT
```
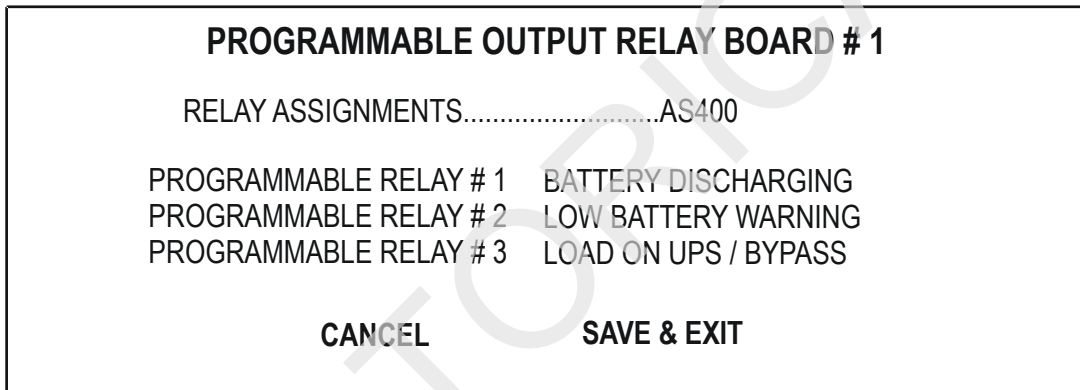
The AS400 pre-assigned relays are shown in this screen.

To change the relay assignment, select RELAY ASSIGNMENTS from the screen and press SELECT. The fol-
lowing screen will appear.

Figure 25 Relay Assignments

```
                    RELAY ASSIGNMENTS


                  AS400
                  STD SET
                  USER DEFINED
```
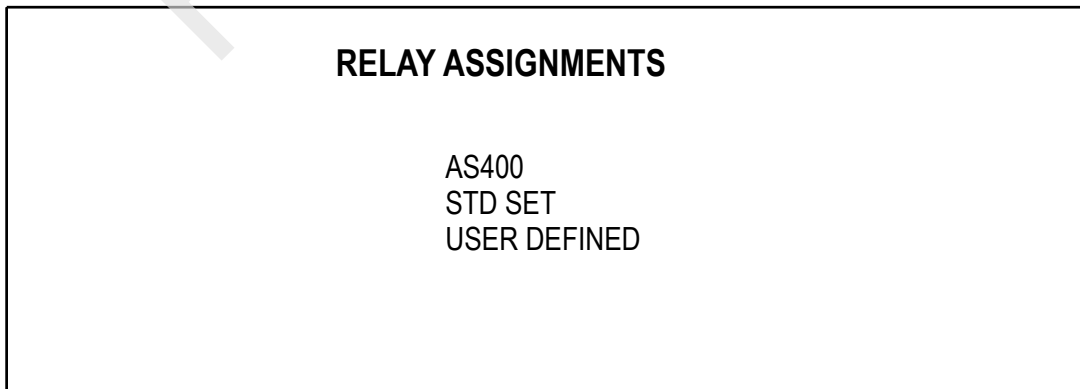
If you select STD SET, the following screen will be displayed.

Figure 26 Programmable Output Relay Board, Std. Set

```
┌─────────────────────────────────────────────────────────┐
│         PROGRAMMABLE OUTPUT RELAY BOARD # 1              │
│                                                          │
│    RELAY ASSIGNMENTS.........................STD SET     │
│                                                          │
│    PROGRAMMABLE RELAY # 1    LOAD ON UPS                 │
│    PROGRAMMABLE RELAY # 2    LOAD ON BYPASS              │
│    PROGRAMMABLE RELAY # 3    BATTERY DISCHARGE           │
│    PROGRAMMABLE RELAY # 4    LOW BATTERY WARNING         │
│                                                          │
│          CANCEL              SAVE & EXIT                 │
│                                                          │
└─────────────────────────────────────────────────────────┘
```

Figure 27 Programmable Output Relay Board, Std. Set, page 2

```
┌─────────────────────────────────────────────────────────┐
│         PROGRAMMABLE OUTPUT RELAY BOARD # 1              │
│                                                          │
│    RELAY ASSIGNMENTS.........................STD SET     │
│                                                          │
│    PROGRAMMABLE RELAY # 5    OVERLOAD                    │
│    PROGRAMMABLE RELAY # 6    AMBIENT OVER TEMP           │
│    PROGRAMMABLE RELAY # 7    SYS SUMMARY ALARM           │
│                                                          │
│          PREV                SAVE & EXIT                 │
│                                                          │
└─────────────────────────────────────────────────────────┘
```

If the Operator selects USER DEFINED from the RELAY ASSIGNMENTS screen, the following screen will come up.

Figure 28 Programmable Output Relay Board, User Defined

```
┌─────────────────────────────────────────────────────────┐
│         PROGRAMMABLE OUTPUT RELAY BOARD # 1              │
│                                                          │
│    RELAY ASSIGNMENTS.........................USER DEFINED│
│                                                          │
│    PROGRAMMABLE RELAY # 1    PROGRAMMABLE RELAY #5       │
│    PROGRAMMABLE RELAY # 2    PROGRAMMABLE RELAY #6       │
│    PROGRAMMABLE RELAY # 3    PROGRAMMABLE RELAY #7       │
│    PROGRAMMABLE RELAY #4     PROGRAMMABLE RELAY #8       │
│          CANCEL              SAVE & EXIT                 │
│                                                          │
└─────────────────────────────────────────────────────────┘
```

All User Defined relays are programmable.

To begin programming the User Defined Relays, highlight the relay to be programmed and press the SELECT button. This action will bring up the List of Alarms/Faults screen. (**Figure 29**). Initially, the box beneath the relay will be empty.

To attach alarms to each relay, follow the steps below under Navigating Protocol.

CAUTION

Navigating through screens with additional navigational selections at the bottom of the display screen is slightly different from navigation involving only the navigation buttons below the display screen. Specific instruction is given below.

Figure 29 List of Alarm Faults Screen


```
ALARM / FAULT NAME          PROG RELAY # 1

   BATT. FUSE FAIL
   BATT. LOW XFER
   DC OV TRANSIENT
   INP PHASE ROT ERROR
   RECT. FUSE FAIL
   RECT DRIVE 1 FAIL

   UP      DOWN    ADD    REMOVE    CLEAR    EXIT
```
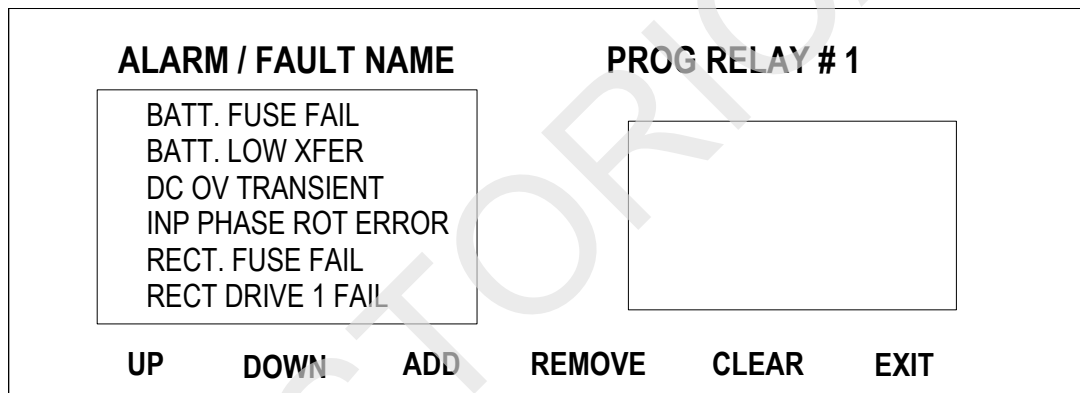
The alarm at the top of the screen will be flashing.

NOTE

*If the Npower has Open Comms-Discrete Inputs (Input Contact Isolators, **Section 2.2 of the Options Manual**, these will show up on the alarm list and can be selected to connect to a programmable output relay.*

NAVIGATING PROTOCOL

For the screen above and others like it, the normal screen navigation rules are changed. It is important to differentiate between the selections at the bottom of the display screen (UP/DOWN/ADD/REMOVE/CLEAR/EXIT) and the navigation buttons or arrow keys below the display screen. To scroll up the Alarm/Fault list, use the arrow keys to highlight the UP selection at the bottom of the display screen. Next, press the SELECT navigation button. Continue this sequence until you have positioned the proper Alarm/Fault in the active position at the top of the list. To scroll down the list, use the arrow key to highlight the DOWN selection at the bottom of the display screen. Next, press the SELECT navigation. Continue until the proper alarm is positioned at the top of the list.

When the selected Alarm/Fault is in the active position at the top of the list, it will be flashing. To attach this alarm to a Programmable Relay, use the arrow keys to highlight ADD at the bottom of the display screen. Press SELECT and your selection will now appear in the right hand box.

You may attach up to four alarms to each relay by following this procedure. Since there are almost 200 alarms, it is advised that you review the entire list and note which alarms you want connected to each relay before beginning your selections. A complete list of alarms is located in **Table 14** in the appendix. Keep in mind that if you attach more than 1 alarm to the relay, and the relay is triggered, you will not be advised which of the alarms is activated. You may be able to determine this through other diagnostic features of the Npower, but it will not be evident from this feature.

If you decide to remove an alarm from the selected alarm set, scroll the list to put the alarm you want to remove in the top (flashing) position on the ALARM/FAULT NAME list. Use the arrow keys to move the cursor to REMOVE. Press SELECT to remove the alarm from the right hand (connected) list.

If you wish to clear all the alarms and start over, move the cursor to CLEAR and press SELECT.

After you have selected the alarms you want connected to PROG RELAY #1 use the arrow keys to move the cursor to EXIT, press SELECT. This will put you back to the PROGRAMMABLE OUTPUT RELAY BOARD # 1screen. Follow the procedure above to program the next relay. When all of the relays you wish to program have been completed, highlight SAVE & EXIT and press SELECT.

> ⚠️ **CAUTION**
> **YOU MUST SELECT SAVE & EXIT FROM THE PROGRAMMABLE OUTPUT RELAY BOARD SCREEN OR YOUR SELECTIONS WILL NOT BE SAVED.**

If you have a second relay board installed, from the CUSTOMER ALARM INTERFACE screen, repeat the same procedures for RELAY BOARD # 2.

6.4   Configuring the Programmable Relay Option to support an AS/400 Shutdown

The IBM AS/400 ® System has a UPS monitoring feature to aid in the orderly shutdown of the AS/400 should the loss of input power become imminent. To make use of this feature, use the Npower Open Comms-DIS-

Relay #1

CRETE OUTPUT option and the AS/400 interconnection cable (part number 37OP000ASC8) to supply the required information to the AS/400 system.This cable must be field-installed. If the 50 ft. length of the AS 400 option cable is inadequate, an optional AS/400 extender cable is available, part number 370P000ASE8.

The AS/400 interconnection cable comes with a DB9 connector on one end. This end connects to the appropriate connector on the AS/400. The alternate end of the cable will have 5 wires that connect to common and to the TB1 through TB5 on the OC-DO option. Each AS/400 connected will consume 4 relay alarm positions. Wire and program per following table:

Table 3   OC-DO Configuration for AS400

Program Relays at the Npower display	...for the following alarms/faults	...and connect the AS400 wires to the following points on the relay board
Relay #1	Batt Discharging	White wire to TB1 (or TB2), Pin 3 (NO)
Relay #2	BATT LOW WARNING	Red wire to TB3 (or TB4), Pin 3 (NO)
Relay #3	LOAD ON BYPASS	Black wire to TB5 (or TB6) Pin 3 (NO) Brown wire to TB5 (or TB6) Pin 2 (NC) Green wire to TB5 (or TB6) Pin 1(Common) TB1 (or TB2) Pin 1 to TB3 (or TB4) Pin 1 w/jumper wire TB3 (or TB4) Pin 1 to TB5 (or TB6) Pin 1 w/jumper wire

Notes:
1. Set dip switches on option card for SW1-5 on, all others off.
2. Option must be enabled in the Npower display prior to programming relays:
[CONFIGURATION], [SYSTEM SETTINGS], [COMM OPTIONS], [PROGRAMMABLE RELAY #1], [YES].

Figure 30 Connections for the AS/400 Configuration

6.5 Configuring the Programmable Relay Option to support a Standard Set

Table 4   Wire and Program Configuration

Terminal Block	Relay Contact
TB1-1 Common TB1-2 Normally Closed TB1-3 Normally Open	Load On UPS
TB3-1 Common TB3-3 Normally Open	Load On Bypass
TB5-1 Common TB5-3 Normally Open	On Battery (Battery Discharging)
TB7-1 Common TB7-3 Normally Open	Low Battery Warning
TB9-1 Common TB9-3 Normally Open	Overload (SBS or Inverter)
TB11-1 Common TB11-3 Normally Open	UPS Ambient Overtemp
TB13-1 Common TB13-3 Normally Open	Summary Alarm

NOTE
Channel 8 is left open to be programmed by Operator.

7.0 OPEN COMMS – DISCRETE INPUT OPTION (OC-DI) (INPUT CONTACT ISOLATOR)

7.1 Introduction

This Option will allow the user to bring up to 8 outside signals into the Npower UPS. A customer contact closure (no voltage) is needed to activate the relay. The UPS can then be programmed to alarm on receipt of one or more of these signals and to display the user settable name of the signal source. In addition the signals can be set to trigger NO or NC relays on the Open Comms Discrete Output Option (OC-DO), **Section 6**, if the system is configured with this option.

7.2 Installation

Physically install the OC-DI board in the Npower UPS in accordance with the instructions in Section 4 of this manual. This option can be installed in Locations 1, 2, 3 or 4. Once installed, the OC-DI board needs to be connected to the CANbus. If it is the first option installed, install in location 4 (See Figure **3**), and utilize the system CANbus cable that is coiled in the center of the option area. If another option has been previously installed and connected to the system CANbus cable, use either the short (77-814000-03) or the long (77-814000-04) jumper cable as required. Connect this system harness to the P966 connector on the left side of the OC-DI board.

Bring up to 8 pairs of wires (one pair for each customer signal, up to 16 wires total) to the Npower UPS from the customers Normally Open or Normally Closed sources. These wires should be delivered to the Npower in appropriately sized conduit. The wires connect to the UPS through the cable landing area in the upper or lower front of the UPS (Figure **3**). Wires should be routed down the right side of the option area and then at a 90 degree angle to the option board. Next, connect the wire pairs to TB1.

All user connecting cables are to be provided by others and are to be 16 gauge 300 V Min. tinned copper stranded wire. All option connections are made in the option section. Customer wires route through option plate.

Figure 31 Wire Routing for OC-DI

OPTION SECTION

POWER SUPPLY BOARD
02-810006-00

LOCATION # 1

LOCATION # 2

OPTION DOOR
(SHOWN OPEN)

LOCATION # 3

IFM BD
02-810015-00

CANbus Cable

CANBUS CABLE

CONTROL DOOR

LOCATION # 4

LOCATION # 5

LOCATION # 6

UPS MODULE
(FRONT DOOR REMOVED)
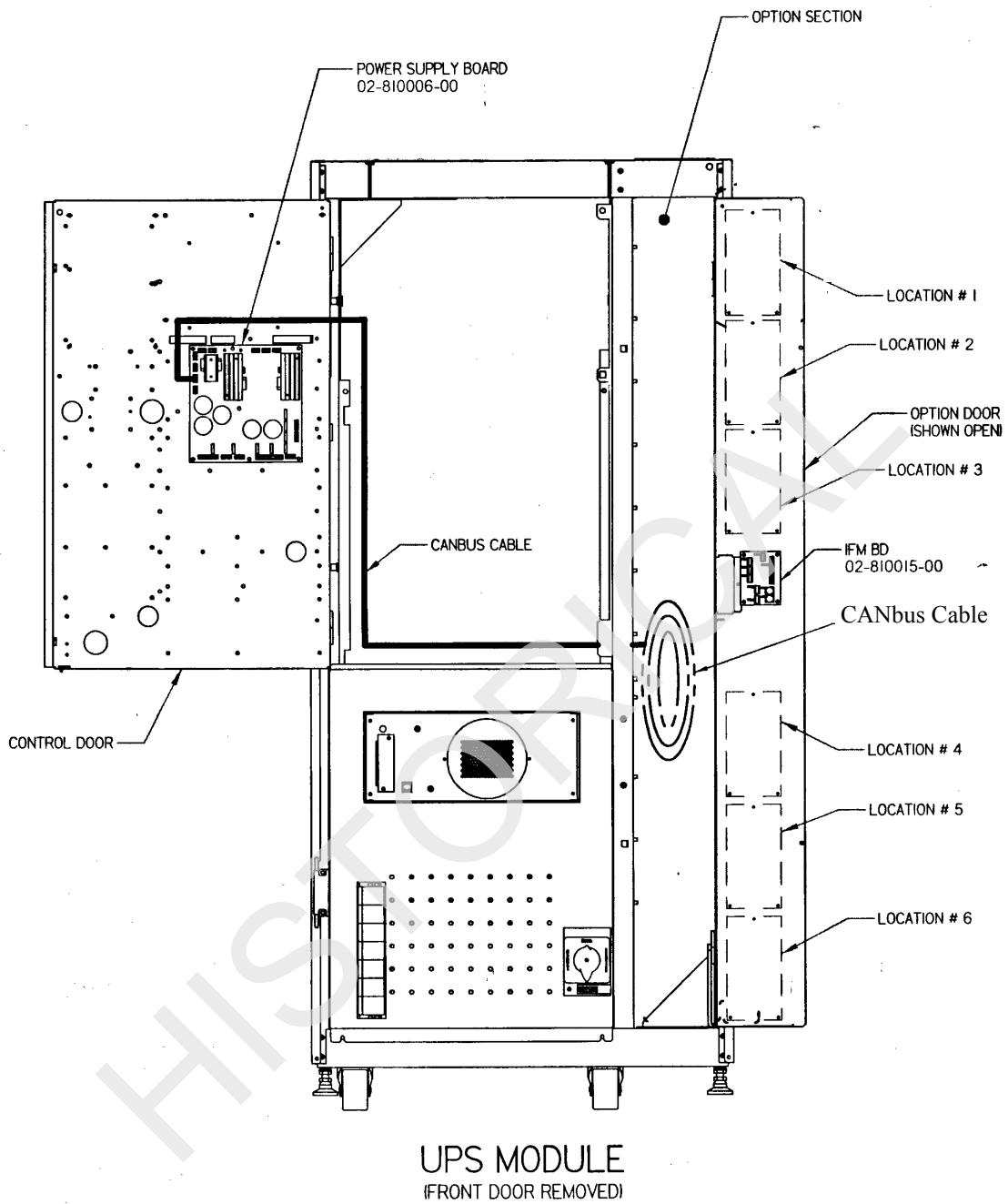
Figure 32 Customer Hookups for ICI
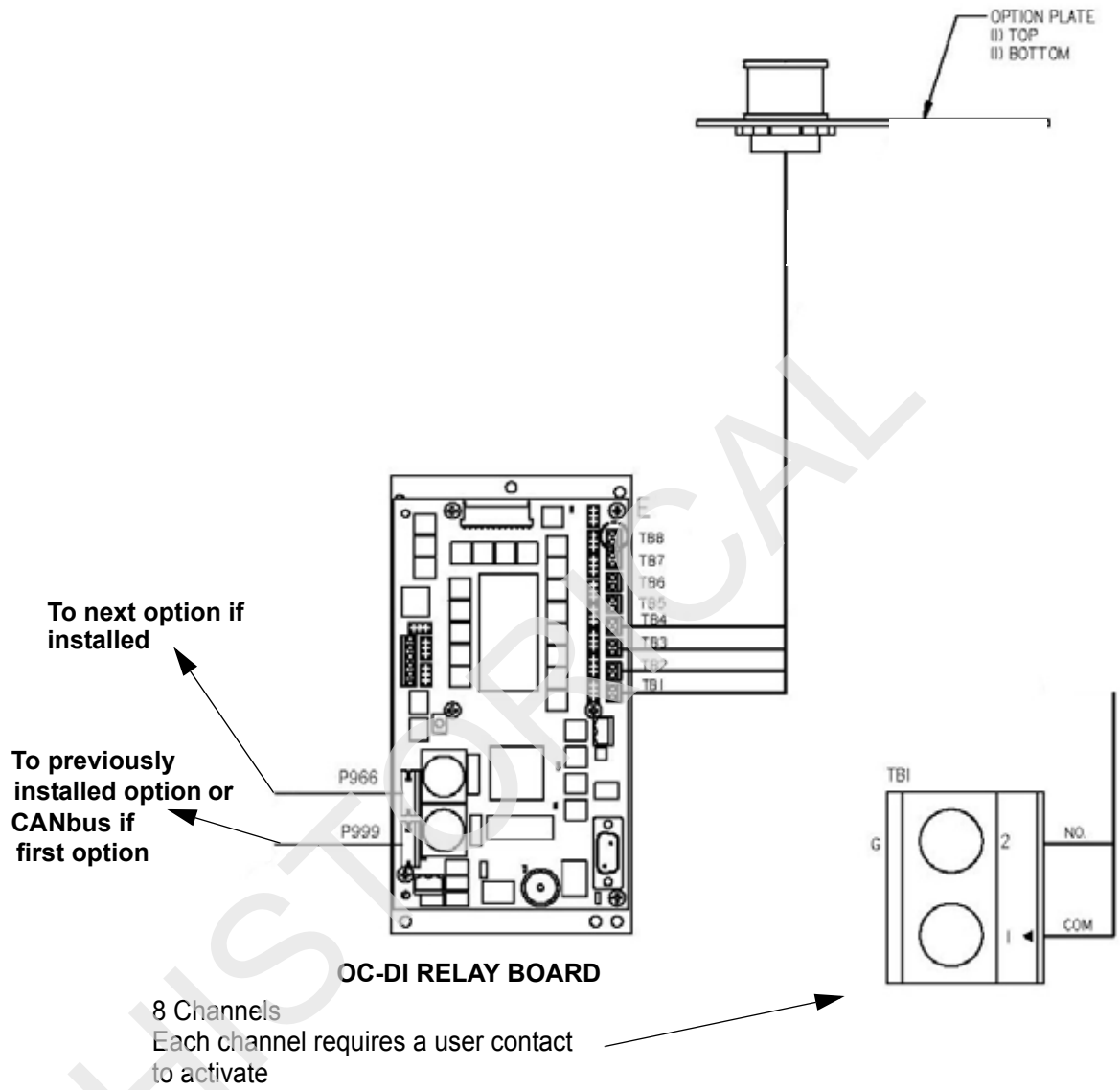
OPTION PLATE
(1) TOP
(1) BOTTOM

To next option if installed

To previously installed option or CANbus if first option

P966

P999

TB8
TB7
TB6
TB5
TB4
TB3
TB2
TB1

OC-DI RELAY BOARD

8 Channels
Each channel requires a user contact
to activate

TBI

G   2   NO.

1   COM

All harnesses and cables should be dressed and secured via tie wraps to make sure they do not move when the option door is closed. Excess cabling should be neatly coiled and tie wrapped

NOTE
Installation instructions are the same as for the OC-DO (Programmable Relay Board). See Section 6.

7.3   Programming the OC-DI (Input Contact Isolator Option)

Enable the OC-DI option by following the instructions in Section 5 and selecting INPUT CONTACT ISOLATOR from the options list in the COMMUNICATIONS OPTIONS screen and follow the instructions for enabling an option.

When the OC-DI Option has been enabled go to the CUSTOMER ALARM INTERFACE screen from the CONFIGRUATION menu. Use the arrow keys to move to CONTACT BOARD, press SELECT. The following screen will appear:

Figure 33   Alarm / Fault Name Screen

```
                    ALARM / FAULT NAME
          ALARM / FAULT NAME          L  D  F  E  DELAY
         ┌─────────────────────────────────────────────┐
         │ INPUT CONTACT # 1              Y  Y  N  Y   0.0 │
         │ INPUT CONTACT # 2              Y  Y  N  Y   0.0 │
         │ INPUT CONTACT # 3              Y  Y  N  Y   0.0 │
         │ INPUT CONTACT # 4              Y  Y  N  Y   0.0 │
         │ INPUT CONTACT # 5              Y  Y  N  Y   0.0 │
         │ INPUT CONTACT # 6              Y  Y  N  Y   0.0 │
         └─────────────────────────────────────────────┘
     UP    DOWN   SELECT   EXIT    DESCRIPTION: L - Latching...D - Dial...
```

The top line will be blinking, indicating it is the selected contact. To scroll through the contacts use the indicators at the bottom of the screen. To move down through the list use the arrow keys to move the reverse video cursor to DOWN and Press SELECT. This will move INPUT CONTACT #2 to the top position of the list and it will be blinking, indicating it is the active contact ready to be configured. To return to INPUT CONTACT # 1, use the arrow keys to move to the UP indicator and Press SELECT. #1 will now be active. Along the bottom right of the display will be scrolling text to the right and including the word DESCRIPTION: This is defining the letters L,D,F,E, and DELAY for times when these instructions are not at hand. The letters stand for:

L= Latching   When set to Y and an alarm occurs, that alarm will stay active in the UPS system until the alarm condition is no longer true and the ALARM RESET button on the front panel of the UPS has been pushed. When set to N, the alarm will disappear from the UPS when the alarm conditions are no longer true.

D= Dial Out – When an alarm condition occurs, a modem-equipped system can dial out to a number in accordance with the Dial Out instructions set in the UPS.

F=Freeze - This function is factory set up as N and does not affect the operation of this option.

E= Event – If Y is selected for this contact, and an alarm occurs, that alarm will be entered into the UPS's Event Log. If N is selected and this alarm occurs, the event will not be posted in the event log and there will be no history of the event once the alarm is reset or the alarm condition disappears.

DELAY= a delay in seconds that must occur before the UPS recognizes this alarm function. The delay can be anywhere from 0 to 99.9 seconds in 0.1 second intervals. Some customer-created alarms may be transitory and Operator may not want to alarm immediately unless the alarm condition persists. Use this function to set the

delay to the selected time period. If an alarm is set to Latch, it will only recognize the alarm and latch, after the delay period.

To set the alarm parameters, select the CONTACT number to be configured and move it to the top position in the register. Using the arrow keys, move the cursor to Select, press SELECT. The following screen will appear.

Figure 34 Set Alarm Parameters Screen

```
ALARM / FAULT NAME    INPUT CONTACT # 1

            LATCHING            YES
            DIAL                YES
            FREEZE (UPSC)       NO
            EVENT LOG           YES
            DELAY               0.0
        CANCEL              SAVE & EXIT
```

Use the arrow keys to move to the characteristic to be configured or changed and press SELECT. For Latching, Dial and Event log, pressing SELECT will allow the Operator to toggle between YES and NO and set the desired parameter. (Selecting FREEZE is an exception; it will remain on NO, and cannot be changed.) Pressing DELAY will open a new screen enabling the Operator to set the Delay time:

Figure 35 Set Delay Time Screen

```
                        DELAY
    MIN                                     MAX
    0.0                                     99.9

                    00.0  SEC
                    ^
```

The cursor ^ is located under the highlighted 00.0. To set the number of seconds use the arrow keys to increase or decrease the counter. Press SELECT to set the number and move the cursor to the next position. If you make a mistake or need to start over, press SELECT to return to the prior screen. After setting the Delay time accurately, continue to press SELECT until the ALARM/FAULT NAME screen appears. To give the Contact a custom name, use the arrow keys to highlight the words ALARM/FAULT NAME. Press SELECT. This action will move you to the following screen.

Figure 36 Contact Signal Assignment Screen

OPEN CONTACT # 1
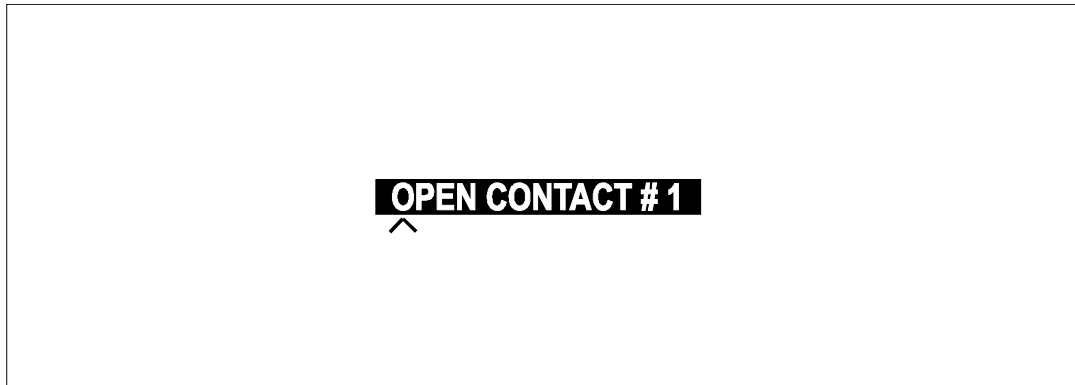
Again, the cursor will be under the first letter of the default name for this contact. By using the arrow keys, move through the alpha/numeric character string and select the letter, number or character desired for the name you want to assign to this contact signal. Press SELECT to choose the character shown and the cursor will move to the next position. Continue until each position has the appropriate character or space. Blank spaces come after the letter Z in the character scroll. Press SELECT until the last character is entered and the configuration screen appears. If an error is made, press Select repeatedly to return to the ALARM/FAULT NAME screen and start over. In the upper right of the ALARM/FAULT NAME screen the DEFAULT contact name and number (e.g. OPEN CONTACT #1) will be alternately blinking with the NEW name assigned to this contact. This will assist, should you ever wish to know what alarm is connected to which of the contact terminals.   In the UPS alarm screens only the NEW alarm name will appear. When the first contact is properly configured, use the arrow keys to scroll to SAVE & EXIT. Press SELECT. This will save the configuration of Contact #1. Repeat this procedure for each of the contacts that are connected.

NOTE

Select SAVE & EXIT from the alarm / fault screen to save selections

When all contacts are configured, select Exit from the Contact Table screen.

8.0 OPTION POWER SUPPLY

The Optional Power Supply (OPS) is required when either a Remote Alarm Status Panel or the Multiple Circuit Breaker Option is to be installed.

The OPS option must be installed in Location 5. (See **Figure 3** for option locations.)

⚠️ **CAUTION**

To install the Optional Power Supply the UPS will need to be in Maintenance Bypass and the battery circuit breaker(s) will need to be turned off. The Control Power and Fan fuses must be opened.

8.1 Installation

Install the OPS option in the Npower UPS per the instructions in **Section 4** and in this section. Once installed, the OPS option needs to be connected to the CANbus. If it is the first option installed, utilize the system CANbus cable that is coiled in the center of the option area. If another option has been previously installed and connected to the system CANbus cable, disconnect the CANbus cable from the previously installed option at terminal P999 and reconnect the CANbus cable into terminal P999 of the Option Power Supply as shown in Figure **37** and Figure **38**. Connect the jumper cable from OPS terminal P966 to the previously installed option terminal P999.

Connect one end of harness 77-814000-04, supplied in this kit, to TB2 behind the lower front UPS panel as shown in Figure **37** and Figure **38**, Detail B. Connect the other end to the bottom left side of the Option Power Supply as shown in Figure **39**

See OPS Installation Notes at the end of this section.

⚠️ **CAUTION**

Do not run signal cable in the same conduit as the UPS input or output wiring.

Figure 37 OPS Installation
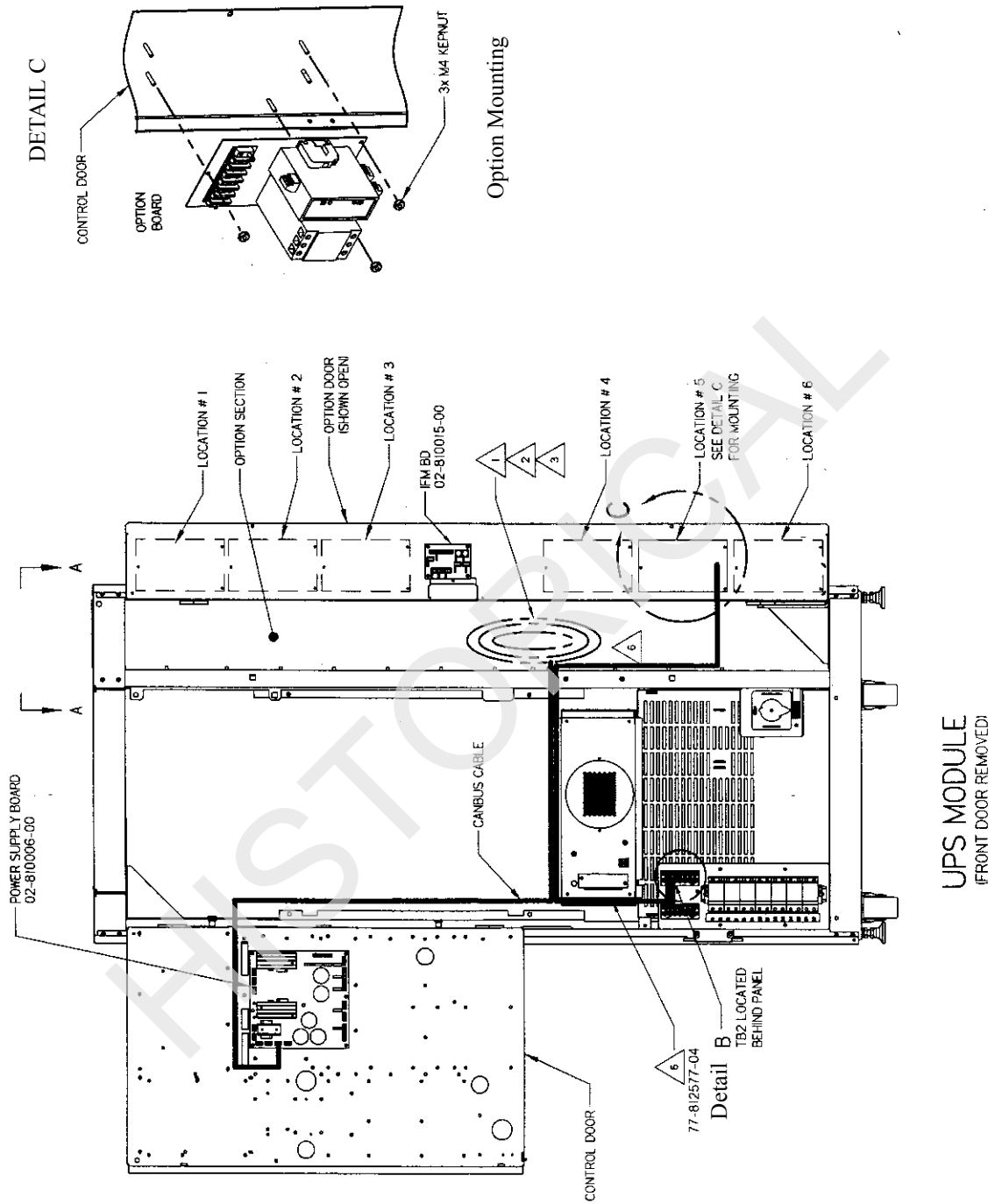
Figure 38 OPS Location and Details

TOP

IP966
IP999
LOCATION 1
OPTION A, B, OR C

IP966
IP999
LOCATION 2
OPTION A, B, OR C

IP966
IP999
LOCATION 3
OPTION A, B, OR C

POWER SUPPLY BD.
02-810006-00

IP966
IP999

IP966
IP999
LOCATION 4
OPTION A, B, OR C

⚠5

P966

P999
E

LOCATION 5
(OPTION POWER SUPPLY AND
REMOTE GATEWAY)
OPTION D

BLK

⚠6

TB2-1
TB2-2

WHT

DETAIL B

SEE SHT. 3 FOR
CONNECTION

FIG. 2
INTERNAL CONNECTIONS

SHOWN WITH OPTION D
INSTALLED

⚠1 ⚠2 ⚠3

LOCATION 6
OPTION E

TB3

BOTTOM

⚠12

DETAIL E
EXPLODED VIEW

DETAIL E

Figure 39 OPS Customer Connections

DETAIL D

TERMINATION RESISTOR

CUSTOMER CONNECTIONS

OPTION PLATE
(1) TOP
(1) BOTTOM

See notes for connections

FOR INTERNAL CONNECTIONS

OPS INSTALLATION NOTES for Figure **37**, Figure **38** and Figure **39**.

1. CANbus cable for providing power and signals for the communication option is installed in the UPS and is coiled up in the Option Section.
2. Connect the CANbus cable to P999 of OPS, location 5.
3. Always ensure that the CANbus cable originating from the power supply PWA gets connected to P999 of the bottom-most option of the group in location 1 through location 5. Option in location 6 is not considered to be part of this group.
4. No option connection cables are to be run in conduit with power cables.
5. Connect P966 from Option Power Supply to P999 of the option at Location 4.
6. Cable 77-812577-04 is provided in the kit. Route the cable according to **Figure 37**
7. Use Belden 3082F Devicenet Highflex thick cable provided by others for connection to optional Remote Alarm Status Panel.
8. Cable originates from RAS option (PN 370P000RAS8). Refer to RAS option drawing for acceptable wiring configuration.
9. Remove or retain termination resistor according to configuration chart in RAS option (See figure **40**.)
10. GRN/YEL connect to frame of option assembly.
11. Observe polarity when connecting CANbus cable to option PIN 1 of CANbus cable. Must mate to PIN 1 of option cable.

9.0   REMOTE ALARM STATUS PANEL (RAS)

9.1   Introduction

The Remote Alarm Status Panel (RAS) uses LED status indicators that allow the Operator to monitor the UPS. The RAS includes LED indicators for:

1. Load on UPS (Green LED)
2. Load on Bypass Alarm (Red LED)
3. Battery Discharge Alarm (Red LED)
4. Low Battery Reserve Alarm (Red LED)
5. Overload (Red LED)
6. Ambient Over Temp (Red LED)
7. Sys. Summary Alarm (Red LED)
8. New Alarm Condition (Red LED)

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

The Remote Alarm Status Panel is an external option and must be installed on a wall or column within 1000 feet of the Npower. The enclosure is NEMA Type 1. The panel interfaces with the UPS through CANbus cable between terminal strips on the Optional Power Supply Board and the Remote Alarm Status Panel. The CANbus cable must be Belden 3082F or equivalent, and is to be supplied by others.

Figure 40 Remote Alarm Status Panel Base and Cover

59.6
(2.35)

77.0
(3.03)

35.2
1.38)

145.8
5.74)

B

DIP SWITCH FUNCTION CHART

TB1
1
2
3
4

/4\

BASE

83-812552-00

P999

/6\ **P16**

Termination
Resistor
Shunt (Jumper)

C

/7\

DIP SWITCH
See Settings in
Table 3

COVER
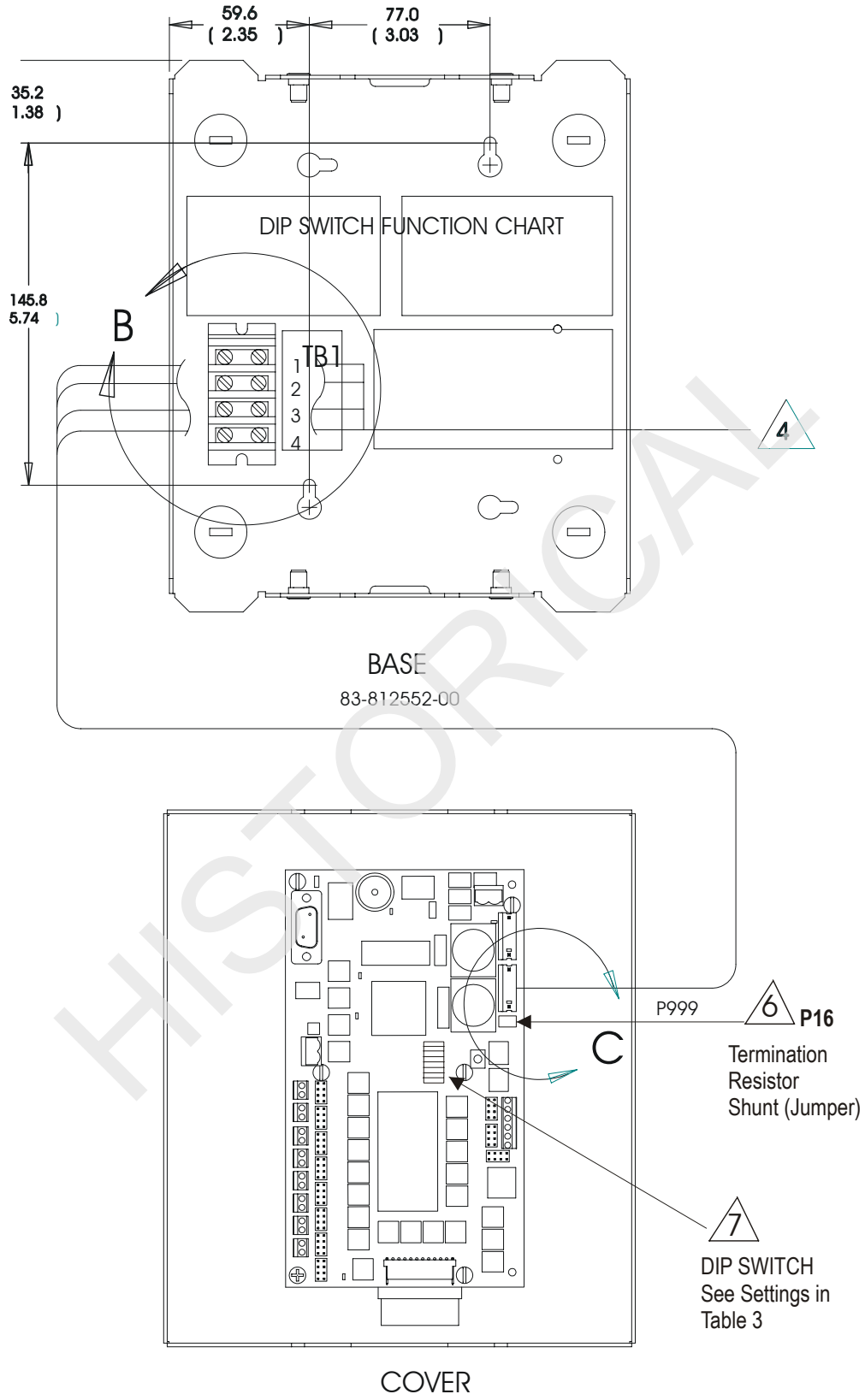
Figure 41 RAS Details B and C

DETAIL B

DETAIL C

Figure 42 RAS Detail D

WHT #18AWG (CAN_L)
BLU#18AWG (CAN_H)
DRAIN WIRE (GND)
RED #16AWG (PWR +)
BLK #16AWG (PWR _)

Twisted Pair
Foil Shield
Twisted Pair
Foil Shield
Braided Shield
Outer Insulation
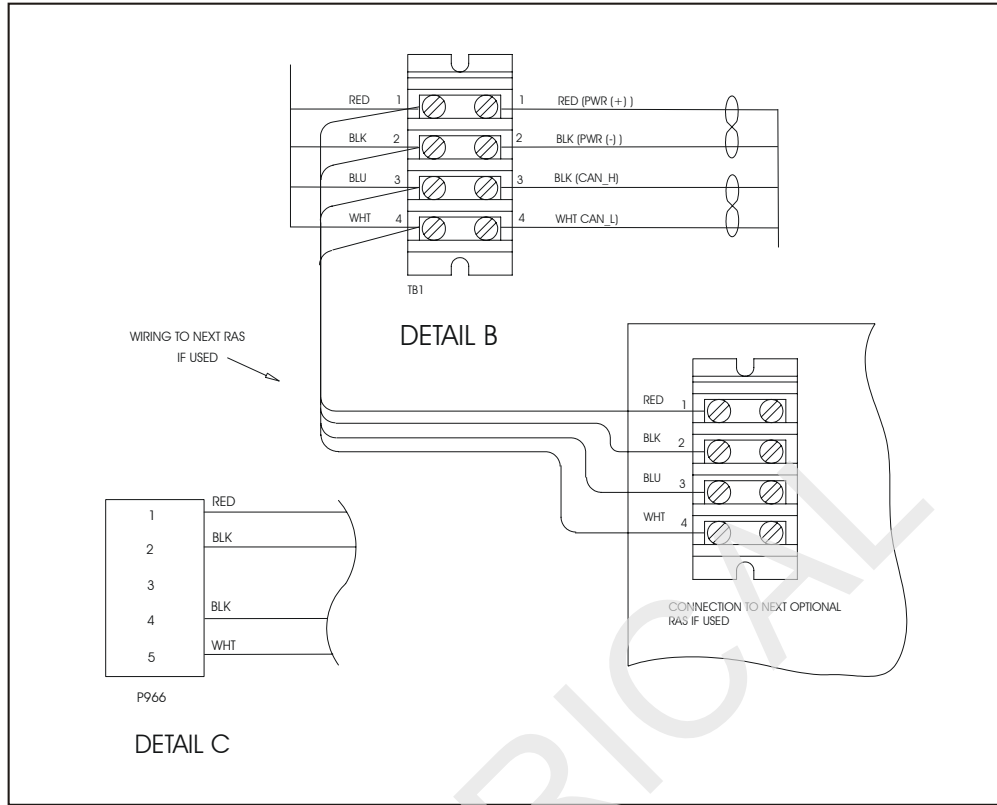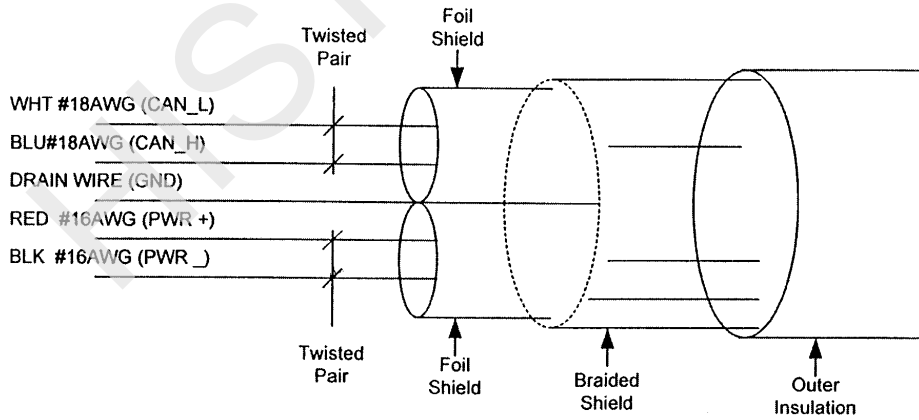
Note: Connection to Drain Wire automatically connects Braided Shield and Foil Shield

Belden 3082F DeviceBus
HighFlex Thick Cable
1 Pair #16AWG for Power
1 pair #18AWG for Signal

9.2   Installing the Remote Alarm Status Panel

Before beginning the installation process, read through these instructions and take all necessary safety precautions to protect yourself and the equipment to be installed.

The Remote Alarm Status Panel option cannot stand alone. It requires that an Optional Power Supply board be installed in the Npower.   See the instructions for installing the OPS in **Section 8**.

Observe all warnings and cautions listed in the front of this manual when wiring the Remote Alarm Status Panel option: Mount the Remote Alarm Status Panel in a convenient location such as on a wall or column near the UPS. The RAS should not be mounted more than 1000 feet from the UPS.

Up to 3 RAS may be installed. (See **Figure 43 - RAS Configuration Options**, for optional methods of attaching multiple RAS.)

The Remote Alarm Status Panel consists of two parts that will need to be disassembled to install. Remove the two screws in the top of the box and the two screws in the bottom of the box and separate the two halves. Proceed to locate and install the back panel at the wall location selected for the Remote Alarm Status Panel. Use the appropriate fasteners to attach the rear panel to the wall through the two keyhole slots.

The back panel also has four knockouts in the back of the panel as well as knockouts in the top and bottom. Knockouts in the rear of the box are for cable access through the wall depending on the particular wiring configuration to be used, knock out the appropriate holes. Install the end fitting supplied with the conduit being used.

On the back panel is a 4-position terminal block for the 4 communication wires that will run to the Optional Power Supply in the UPS. Use CANbus cable Belden 3082F. A detail of this is shown in **Figure 42 - RAS Detail D**.

Table 5   Remote Alarm Status Panel Wiring

Optional Power Supply Located in the UPS	Remote Alarm Status Panel Wall Mounted	Wire Color
TB1-1	TB1-2	Black
TB1-2	TB1-1	Red
TB1-3	No Connection	No Connection
TB1-4	No Connection	Green
TB1-5	TB1-3	Blue
TB1-6	TB1-4	White

⚠ **CAUTION**
Do not run signal cable in the same conduit as the UPS input or output wiring.

Check to make sure the DIP Switches (See **Figure 40**) are set in accordance with the label on the back of the mounting plate. (See **Table** .)

Up to 3 RAS may be installed. Set the switches accordingly. It does not matter which RAS is designated 1,2, or 3, but switches must be set according to the label and **Table** .

Reattach the cover of the RAS to the wall-mounted plate, being careful to reattach the wire harness (77-811678-00) from the terminal block to the Printed Circuit Board (PCB) by plugging the wire harness connector into P966 on the PCB. Secure the top cover using the 4 supplied screws; two on the top and two on the bottom.

Table 6   Remote Alarm Status DIP Switch Settings

Remote Alarm Status DIP Switch Setting

Switch No.	RAS #1	RAS #2	RAS #3
1	OFF (0)	ON (1)	OFF (0)
2	OFF (0)	OFF (0)	ON (1)
3	OFF (0)	OFF (0)	OFF (0)
4	OFF (0)	OFF (0)	OFF (0)
5	ON (1)	ON (1)	ON (1)
6	ON (1)	ON (1)	ON (1)
7	ON (1)	ON (1)	ON (1)
8	OFF (0)	OFF (0)	OFF (0

RAS INSTALLATION NOTES for **Figure 40**, **Figure 41**, **Figure 42** and **Figure 43**

1. Remote Alarm Status option connects to Option Power Supply/Remote Gateway option located at Location 5 of the Option Section. Refer to **Section 8** for connections to Remote Gateway.
2. A maximum of (3) RAS options can be connected to the external CANbus remote gateway. Connections are limited to the configurations shown in **Figure 43**.
3. For reliable operation, configure termination resistors located at RAS option and Option Power Supply/ Remote Gateway according to the configuration selected. Refer to **Figure 39 - OPS Customer Connections** for location of termination resistors on RAS option. Refer to **Figure 39** for location of termination resistor on OPS/RG option.
4. Use Belden 3082F DeviceNet Highflex thick cable or equivalent.(**See Figure 42 - RAS Detail D**.) Cable provided by others.
5. No option connection cables are to be run in conduit with power cables.
6. Remove shunt (jumper) P16 to disconnect termination resistor as required in configuration 2, 3 and 5 shown in **Figure 43**.
7. See **Figure 40** for DIP switch location. See **Table** for DIP switch settings.

Figure 43 RAS Configuration Options
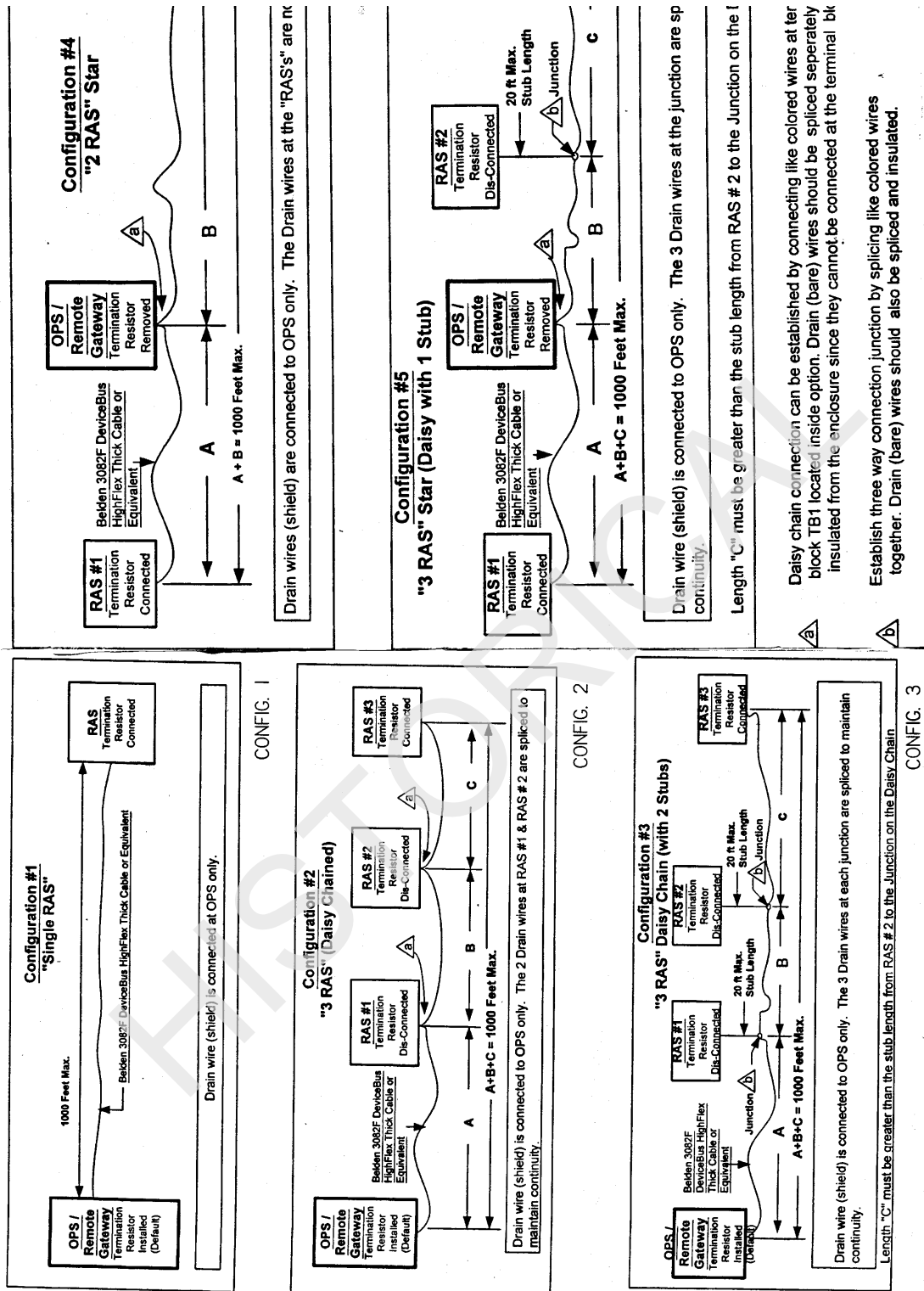
9.3 Interpreting the LED indicators

Because the main function of the Remote Status Panel option is to report the status of the load and the UPS, this section describes how to interpret the LED indicators when they are lit in response to a condition at the load or UPS.

The following are the Remote Status Panel LED indicators when lit:

1. Load on UPS (Green LED) - indicates that the load is fully protected and no alarm conditions are present. The UPS is supplying uninterrupted power to the load.
2. Load on Bypass Alarm (Red LED) - indicates that power to the load is bypassing the UPS. The UPS is no longer supplying power to the load.
3. Battery Discharge Alarm (Red LED) - indicates that the battery is providing power to the UPS.
4. Low Battery Reserve Alarm (Red LED) - indicates that the battery capacity is low and has reached the low-battery alarm setting.
5. Overload - Indicates that the system load has exceeded the system rating.
6. Ambient Over Temp - Indicates that UPS inlet cooling air temperature has exceeded the specified limits.
7. System Summary Alarm (Red LED) - indicates that an alarm situation has occurred at the UPS.
8. New Alarm Condition (Red LED) - indicates that a second alarm condition 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.

9.4 The 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 the Liebert representative for assistance.

To reset an activated LED, simply press the Lamp Test/Reset push button after having received and corrected the associated alarm condition.

9.5 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.

To reset the audible alarm after correcting the alarm condition, simply press the push button.

After installing the Remote Alarm Status Panel, this option must be enabled. See **Section 5** for instructions on how to enable an option. From the CUSTOMER ALARM INTERFACE screen, select REMOTE ALARM BOARD #1 and follow the instructions in Section 5 to enable an alarm. If additional RAS's have been installed, it will be necessary to repeat this procedure to enable REMOTE ALARM BOARD #2 and then #3.

There is no further action necessary for programming this option.

10.0 INTERNAL MODEM

10.1 Introduction

The internal modem option allows the Liebert Npower to communicate with the "outside world" over any standard analog telephone line. This feature makes it possible for someone at a properly equipped remote computer or a "dumb" terminal with a modem (PC compatible or MAC) to be notified automatically when an event requiring attention takes place at the UPS or the load.

The internal modem works with standard analog telephone lines and most standard telephone equipment. (RJ 11 equipped telephone cable required.) The UPS internal modem option will not work with specialized digital (data) telephone lines designed for nonstandard telephone equipment.

> **NOTE**
> **The modem requires a minimum No. 26 AWG telecommunication cord.**

The internal modem option offers several communication options. Its features include the following:

1. Accept incoming calls from a remote computer, thereby serving as a monitoring station.
2. Make outgoing calls to a computer in order to report an alarm condition.

It may be necessary to purchase and install a communication software package on your computer. Several packages are available commercially including ProComm® and Telix®. You can even use the Microsoft Windows® Hyperterminal.

10.2 Installing the Internal Modem Option

Before beginning the installation process, read through these instructions and take all necessary safety precautions to protect the installer and the equipment. Observe all warnings and cautions listed in the front of this manual when wiring the modem.

> **NOTE**
> **It should be noted that the modem can only be used to monitor information. No control functions are available via modem.**

Figure 44 Installation of the Internal Modem
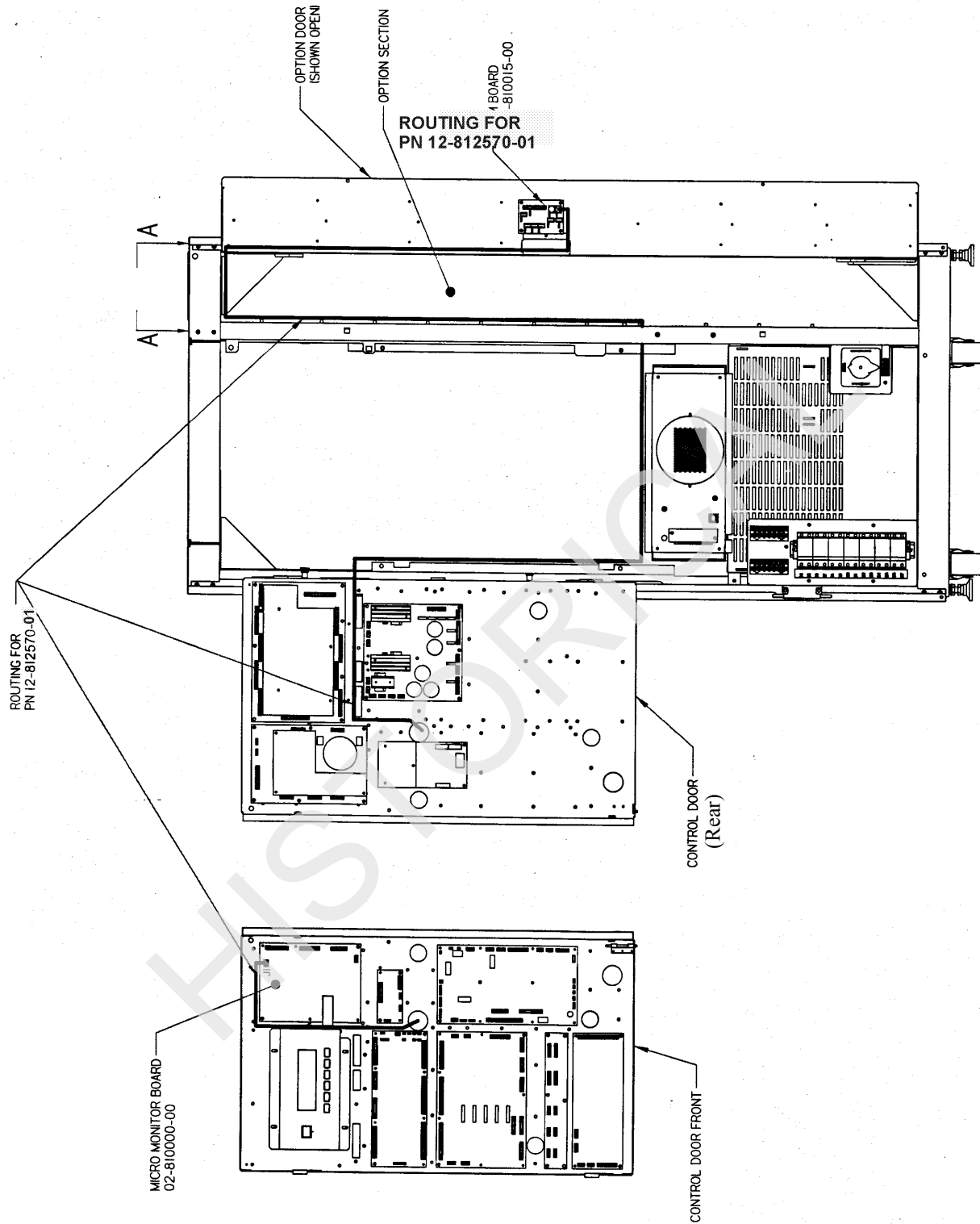
Figure 45 Micro Monitor Board
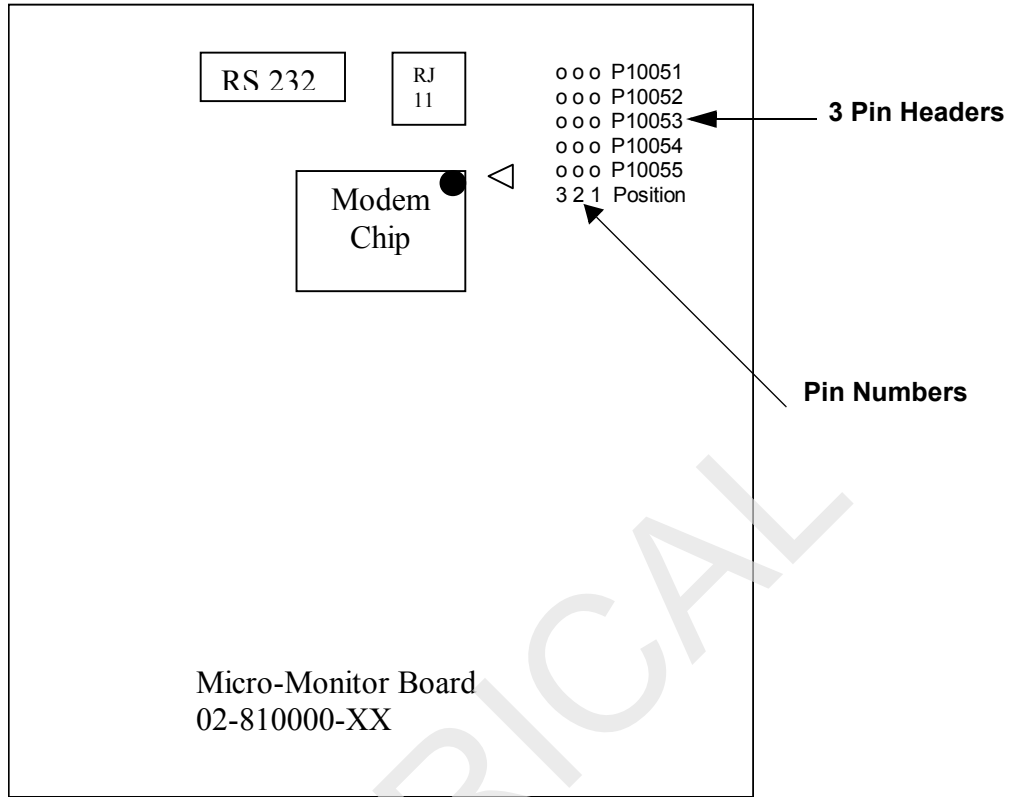
Figure 46 Internal Connections
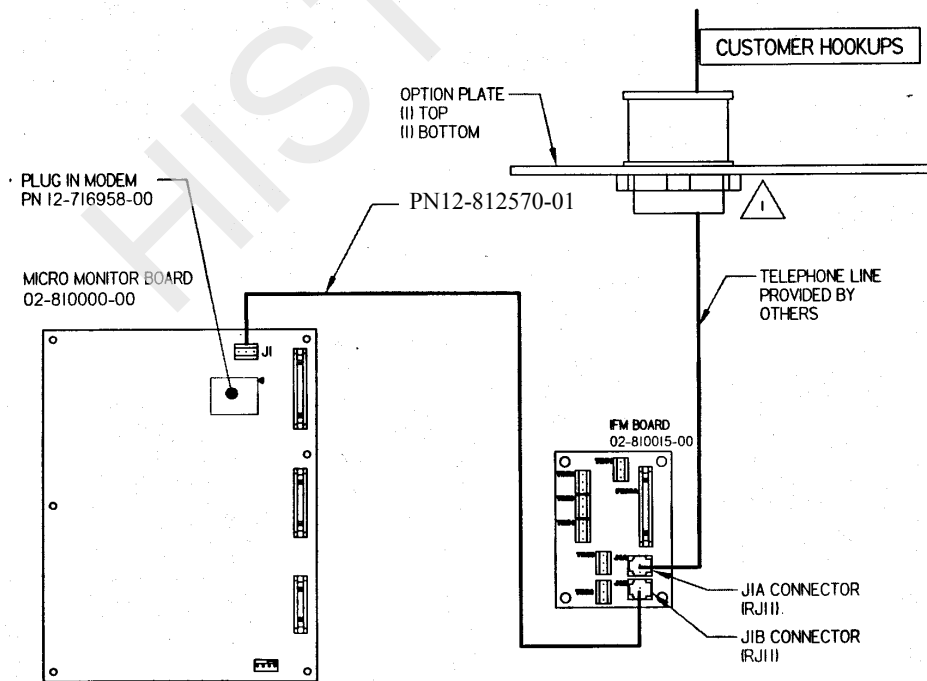
10.3   Installation Instructions for the Internal Modem

Some systems will come with the internal modem installed at the factory. If the internal modem is already installed, add the telephone cable to the UPS, route the telephone cable per **Figure 46** and connect to the RJ-11 jack (J1B) on the IFM board in the center of the option door. All harnesses and cables should be dressed and secured via tie wraps to make sure they do not move when the option door is closed. Excess cabling should be neatly coiled and tie wrapped.

Once the telephone cable is attached, follow the Operating Instructions.

If the unit did not come with an internal modem installed and the modem option kit (37OP000MOD8) was ordered later, follow these instructions to install the modem in the Npower UPS.

1. Follow the instructions in **Section 4** to put the unit on Maintenance Bypass.
2. Locate the Micro-monitor board. Before working on this board make sure you are grounded using an appropriate type of wrist strap to discharge static electricity, or some other type of grounding to prevent damage to the Micro-monitor board due to static electricity.
3. Using, **Figure 45 - Micro Monitor Board**, locate the line of 3 pin headers labeled P10051 through P10055. All of these headers will have a jumper connecting pin 2 and pin 3. Remove and replace these jumpers so that they connect pin 1 and pin 2 on ALL FIVE SETS of headers. (See note below.)
4. Locate the socket for the Modem Chip as shown in **Figure 45**. The modem chip will have a dot on one side of the chip, near pin one. That dot should be on the "top" edge of the chip when it's mounted in the socket. The board will also have a small triangle etched in the corner of the socket position, indicating pin one (indicated by the dot). Carefully insert the modem chip in the socket, making sure it is fully seated, and that no pins are bent during the insertion. The modem is now ready for use.
5. Install telephone cable, 12-812570-00, from RJ11 on the Micro Monitor board to J1B connector on the IFM board as shown in **Figure 44** and **Figure 46**.
6. Re-close the front doors of the system and follow the operating instructions, to enable and use the internal modem. Remember the internal modem cannot be used if an external modem is also installed.

NOTES
1. The Npower cannot support both an external modem and an internal modem simultaneously.

2. The default jumper setting for the external modem is connecting pins 2 and 3. For this reason, when installing the internal modem, it is essential to reset the jumpers to connect pins 1 and 2 on all five sets of headers.

10.4   Operating Instructions

From the Main Menu Screen, select the CONFIGURATION SCREEN. From this screen use the arrow keys to select SYSTEM SETTINGS and Press Select. When in the SYSTEM SETTINGS screens, select NEXT until the COMM OPTIONS screen appears. Highlight COMM OPTIONS by using the arrow keys and press SELECT. This will bring up the following screen.

Figure 47 Communication Options Screen

```
┌──────────────────────────────────────────────────────┐
│                                                        │
│              COMMUNICATION OPTIONS                     │
│                                                        │
│   ▐MODEM                        DISABLED▌              │
│     PROGRAMMABLE RELAY # 1          NO                 │
│     PROGRAMMABLE RELAY #2           NO                 │
│     INPUT CONTACT ISOLATOR          NO                 │
│     REMOTE ALARM #1                 NO                 │
│                                                        │
│        NEXT                    EXIT                    │
│                                                        │
└──────────────────────────────────────────────────────┘
```

Use the arrow keys to select the MODEM line. Press SELECT. This will prompt for the password. Enter the system password to give access to the screens that will ENABLE the modem. For information on the Password see the **Password Section 3.2** in the Operation and Maintenance manual. Successful entry of the password will bring up the following screen.

Figure 48 Auto Dial Screen

```
┌──────────────────────────────────────────────────────┐
│                                                        │
│                   AUTO DIAL                            │
│                                                        │
│   ▐MODEM                        DISABLED▌              │
│     PRIMARY LINE                                       │
│     SECONDARY LINE                                     │
│     INIT. STRING                   ATSO = 1            │
│     AX. BAUD RATE                   2400               │
│        NEXT                    EXIT                    │
│                                                        │
└──────────────────────────────────────────────────────┘
```

Use the arrow keys to move the highlight to the MODEM line and press SELECT. This leads to the selection screen.

Figure 49 Modem Selection Screen

```
┌──────────────────────────────────────────────────────┐
│                                                        │
│                   DISABLED                             │
│                                                        │
│                                                        │
│                 EXTERNAL                               │
│                 INTERNAL                               │
│                 DISABLED                               │
│                                                        │
│                                                        │
└──────────────────────────────────────────────────────┘
```

The default status of the Modem should be DISABLED. If one of the modem states is enabled it will be indicated at the top of the screen.

Use the arrow keys to highlight the modem type to be used, EXTERNAL, INTERNAL or DISABLED. Press SELECT. Only one modem type can be used. If the INTERNAL MODEM is being used an EXTERNAL MODEM cannot be used. Once a modem has been enabled, the header at the top of the screen reflects the modem status.

Selecting INTERNAL MODEM returns the AUTO DIAL screen. Use the arrow keys to highlight PRIMARY LINE. Depending on the time since last entry, Operator may be prompted for a password again. Successful entry of the password brings up the PRIMARY LINE screen.

Figure 50 Dial Out Phone Number Screen
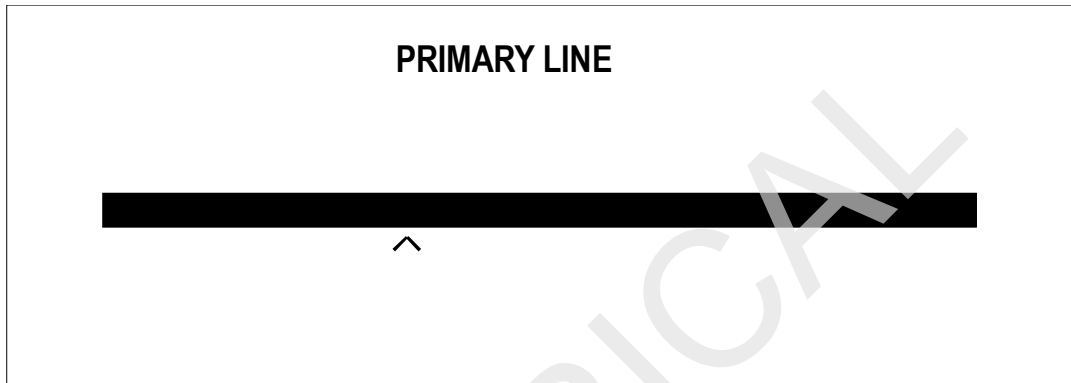
Enter the primary Dial Out number to be contacted in the event of a system alarm. Be sure to include all digits necessary to make an outside call, system access numbers, 1's and area codes if necessary for the dial out line. Enter a (,) after a system access number such as an 8 or a 9. Spaces and dashes are not necessary. The (,) causes a 2 second delay in most modems. See the modem manual if an external modem is being used.

At each character position use the UP and DOWN keys to scroll through the alphanumeric character list until the correct character comes up. Press Select. This will move the cursor to the next position. Repeat this procedure until all the digits of the Dial Out number have been entered. Continue to press SELECT until the AUTO DIAL SCREEN returns. Follow the same procedure to enter the Secondary number. See the Alarm Mask Screen sections of the Operation and Maintenance Manual for setting Alarms to trigger the dial out function.

After setting the secondary line return to the AUTO DIAL screen. The INIT STRING selection will be factory set for the internal modem. If an external modem is being installed, this string will need to be set in accordance with the dial out protocol for the external modem. See the modem instructions for this information. For external modems make sure to enable data compression and software flow control.

The Baud rate selection is also factory set for the internal modem and cannot be changed from 2400 baud if Internal Modem is selected. If the installer is installing an external modem, he should select this line and enter the baud rate of the modem from this screen. Selections are 2400 and 9600. 9600 is the highest speed supported by the Npower. Higher speed modems (28.8, 38.4 and 56k) will adapt to the 9600 rate and can be used with no problem. For modems with baud rates higher than 9600, select 9600.

When all selections have been made, use the arrow keys to highlight NEXT and press SELECT. This will bring up the AUTO DIAL screen, second page. The screen in **Figure 51** will come up.

NOTE

Select SAVE & EXIT from the System Setting screen to save changes.

Figure 51 Auto Dial Screen, Second Page

```
┌─────────────────────────────────────────────────────────┐
│                                                         │
│                      AUTO DIAL                          │
│                                                         │
│         MODEM HEALTH CHECK        EVERY DAY             │
│         AUTO DIAL IN              NO                     │
│         AUTO DIAL OUT             NO                     │
│         PAGER                      NO                    │
│                                                         │
│                                                         │
│            PREV.              SAVE AND  EXIT            │
│                                                         │
│                                                         │
└─────────────────────────────────────────────────────────┘
```

To set the Modem Health parameters, highlight MODEM HEALTH CHECK and press SELECT. A screen will appear allowing the Operator to set the time and day(s) for the Modem Health check.

To enable or disable Dial In, use the arrow keys to select the AUTO DIAL IN line and press SELECT. This will bring up a screen with YES and NO as Options, use the arrow keys and highlight selection, Press SELECT. Perform the same operation to SELECT AUTO DIAL OUT and Select YES or NO. AUTO DIAL OUT will allow the UPS to dial a designated person or a service organization, and transmit the System ID, time stamp and system status in ASCII text. After having made the selections for AUTO DIAL IN and AUTO DIAL OUT, be sure to highlight SAVE & EXIT, to save these setting.

NOTE

Select SAVE & EXIT from the System Setting screen to save changes.

The following sections provide information on using the internal modem option for incoming and outgoing calls. The internal modem can receive incoming calls from another modem any time the UPS control logic has power. Almost any ANSI-compatible terminal equipped with a modem can call into the Npower internal modem to monitor activity at the UPS.

The internal modem can also receive incoming calls from a remote computer equipped with modem and communication software. Most communication software programs (such as ProComm and Microsoft Windows Terminal application) provide an ANSI terminal emulation mode that can make a call into a modem in an Npower UPS.

Because a wide variety of terminals and communication software products are available, we cannot provide universally applicable, step-by-step instructions for dialing into the Npower internal modem from a remote modem. Consult the documentation that came with the communications software or terminal to find out how to connect to a remote host.

10.4.1   Configuring the Modem to Accept Incoming Calls

Before the internal modem will answer any incoming calls, the Dial In command must be enabled; see above. By default, the modem mode is set to NO

The modem uses the following communication parameters:

Data Rate (Baud Rate)2400

Parity   None

Data Bits   8

Stop Bits   1

Terminal Emulation

ANSI is the most popular emulation; however, some communication software programs will work using VT-51, VT-52, VT-100, or other terminal emulation protocols. Feel free to try other emulations for the best option.

The modem on the remote computer should also be configured with the same communication parameters to ensure accurate data transmission.

Receiving Incoming Calls

The internal modem in an Npower UPS receives incoming calls just as an online service such as CompuServe or a server on the Internet. In this case, the UPS is the host and the ANSI terminal (or PC) is the remote unit that receives data as it is transmitted from the UPS. When a connection is made, the Npower will send the prompt SVTP-MM>. Following this prompt Operator may enter the commands from the table below. These commands will allow the Operator to access the alarm and status information contained in the UPS. When the remote computer is no longer needed to monitor the UPS, the command to hang up and disconnect (QUIT) should be given from the remote computer.

Table 7 below gives a list of Service Terminal Commands.

> **NOTE**
> **The Order, Tag and ID number fields will not be "0" but will contain the unique numbers for your UPS system.**

Table 7   Service Terminal Commands

```
? or     SVTP-MM>?
HELP?    Npower ORDER NUMBER:00000000 TAG NUMBER:00000000 ID NUMBER:00000000
         List of Service Terminal Commands:
         SPT?          View Set points
         CA            Clear Alarms
         DATE?         Date Query
         EL?           Event Log
         HELP? OR ?    List of Commands
         HL1?          History Log # 1
         HL2?          History Log # 2
         HL?           History Logs 1 & 2
         LANG?         Language
         AA?           Active Alarms
         AF?           Active Faults
         CEL           Clear Events Log
         CHL           Clear History Log
         SR?           Status Request
         SS?           System Status
         TIME?         Time Query
         UPMDR?        Metering Data
         QUIT          Hang Up*
         CNTRL-C ABORTS CNTRL-S PAUSES CNTRL-Q RESUMES
         *modem only
```

AA?	Active Alarms - Prints out an Identification Header followed by Alarm strings. SVTP-MM>AA? Npower ORDER NUMBER:00000000 TAG NUMBER:00000000 ID NUMBER:00000000 Active Alarms (A) BATT DISCHARGING ((A) INPUT LINE FAIL (A) INPUT PHASE LOSS (A) INPUT OVERVOLTAGE (A) BYPASS SYNC ERROR (A) SBS OVLD PHASE A (A) INPUT OF/UF (A) INPUT UNDERVOLTAGE (A) INPUT OVERCURRENT (A) BYPASS LINE FAIL SVTP-MM>
AF?	Active Faults - Prints out an Identification Header followed by Fault strings. SVTP-MM>AF? Npower ORDER NUMBER:00000000 TAG NUMBER:00000000 ID NUMBER:00000000 Active Faults (F) BATTERY OVERCHARGE (F) BATTERY FUSE FAIL (F) BATTERY LOW XFER (F) DC OV TRANSIENT (F) INP PHASE ROT ERROR(F) RECTIFIER FUSE FAIL (F) RECT DRIVE 1 FAIL (F) RECT DRIVE 2 FAIL (F) BYP FREQ ERROR (F) BYP OVLD SHUTDOWN (F) BYP PHASE ROT ERROR(F) IDC PEAK (F) IGBT DRIVE FAIL (F) INVERTER OVLD XFER (F) INVERTER FUSE FAIL (F) OUTPUT OV XFER SVTP-MM>
DATE?	SVTP-MM>DATE? 11/03/00 (MM/DD/YYYY) SVTP-MM>
EL?	Entire Event Log, most recent event sent out first. The total size of the event log buffer is 512. Once full, it will be overwritten with new events starting from event 1 (circular buffer). SVTP-MM>EL? Npower ORDER NUMBER:00000000 TAG NUMBER:00000000 ID NUMBER:00000000 There are 4 event log records available. ALARM ID# ALARM/FAULT TIME DATE EVENT# 101 SBS OVLD PHASE C (A) 13:45:32 04/29/2011 4 64 CTRL FAULT SBS ON (F) 13:45:32 03/29/2011 3 40 OUTLET OVTEMP LIMIT (F) 13:45:32 02/29/2011 2 0 BATTERY OVERCHARGE (F) 13:45:32 01/29/2011 1 SVTP-MM>

HLn?	History Log 1, History Log 2, or both (with no argument). The size of each log is 64 frames.
	
	Npower ORDER NUMBER:00000000 TAG NUMBER:00000000 ID NUMBER:00000000
	History Log 1 Page 1-Metering 18:01:51 10/30/2000 Frame:-40
	      OUT-V OUT IN-V IN LOAD LOAD DC FREQ
	      (L-N) (I) (L-L) (I) (KVA) (KW) (HZ)
	
	A 124 40 215 27 5 5 541 V 60.0 O
	B 121 42 213 21 5 5 +11 A 60.0 I
	C 123 35 214 8 4 4 +21 deg C
	-- 	
	History Log 1 Page 2-Status 18:01:51 10/30/2000 Frame: -40
	Internal Maint. Switch: NORMAL
	External Maintenance Switch: OPEN
	Battery Breaker: OPEN
	Static Bypass Switch: OFF
	Rectifier: OFF
	Inverter: OFF
	LBS: OFF
	ON-GEN: OFF
	Static Switch Line Contactor:OPEN
	Static Switch Load Contactor:OPEN
	Input Delta Contactor: OPEN
	Output Contactor: OPEN
	Trap Filter Contactor: OPEN
	-- 	
	History Log 1 Page 3-Alarms/Faults 18:01:51 10/30/2000 Frame:-40
	(F) BATTERY LOW XFER
	(A) BYPASS SYNC ERROR (A) HEATSINK OVTEMP
	(A) SBS UNABLE (A) LOAD ON BYPASS

LANG?	SVTP-MM>LANG? ENGLISH SVTP-MM>
SR?	Active Status Reports - The status of the following data points will be returned in response to this command: SVTP-MM>SR? Npower ORDER NUMBER:00000000 TAG NUMBER:00000000 ID NUMBER:00000000 Active Status Report Internal Maint. Switch: NORMAL External Maintenance Switch: OPEN Battery Breaker: CLOSED Static Bypass Switch: ON Rectifier: ON Inverter: ON LBS: OFF* ON-GEN: OFF* Static Switch Line Contactor:CLOSED Static Switch Load Contactor:CLOSED Input Delta Contactor: CLOSED Output Contactor: OPEN Trap Filter Contactor: CLOSED* SVTP-MM> * depending on the configuration, some status messages may not appear
TIME?	SVTP-MM>TIME? 09:55:32 SVTP-MM>

10.4.2 Using the Modem for Outgoing Calls

The modem can also make outgoing calls and initiate communication with a remote computer or terminal. This feature is especially useful when an alarm event requiring immediate attention happens. The UPS can be configured to notify someone about alarm conditions affecting the load or the UPS.

The modem can be configured to dial one of two telephone numbers. Either of these telephone numbers can be another modem. The modem will dial out on the primary line. If that line is busy or does not answer, the modem will wait 45 seconds and then attempt to dial out again on the Primary Line. If the Primary Line continues to be busy or does not answer, the Modem will wait 45 seconds and then try Line One a third time. If it gets a continued busy or no answer, the modem will dial the Secondary Line up to (3) times with 45-second wait intervals. Following the third cycle the modem will revert back to the Primary Line and cycle through 3 attempts on this line. The modem will continue in this pattern until it reaches one of the numbers or is disabled.   If the Modem is configured as Dial Out, the Npower Internal Modem attempts an outgoing call whenever a critical event occurs. The outgoing call initiates a communication link so the UPS can transmit notification to a responsible party. In the Alarm Mask screen the Operator can set the Npower's reaction to each event. **See Section 3.2.5.5** of the Operation and Maintenance Manual. In this Screen, for each of the over 190 events, the Operator can set the alarm to Dial Out and he can select a delay (among other settings), before the system recognizes the alarm.   If the Operator has selected the Dial Out setting for any events, the Modem will automatically dial out using the above priority procedure any time one of the selected Dial Out events occurs.

On connection with the modem the UPS will send the following ASCII information:

Date & Time Stamp of 1st Alarm:

> 18:01:51   11/22/2000

Unit ID information:

> ORDER NUMBER:0000000 TAG NUMBER:00000000 ID NUMBER:000000

Snapshot of the alarms that occurred with the 1st alarm:

> Active Alarms
>
> (A) BATT DISCHARGING
>
> (A) INPUT LINE FAIL
>
> (A) INPUT PHASE LOSS
>
> (A) INPUT OVERVOLTAGE

If there has been a change in the alarm status between the time of the 1st alarm and the time of the modem connection, the system will send the current alarm status, including the time stamp, system ID and updated alarm status.

Following the sending of the second alarm information data the system will disconnect.

11.0 SITESCAN INTERFACE

SiteScan can be connected to the IFM board on the option door of the Npower UPS. Bring the SiteScan interconnecting cables from the source to the Npower using the appropriate size conduit. Land the conduit in the signal conduit landing areas in the top or bottom of the Npower (**Figure 1** and **Figure 3**). Route the cable from the landing to the IFM board. Connect the SiteScan SS+ connection to TB55-1 and the SiteScan SS- wire to TB55-2 of the IFM board.

Refer to the SiteScan operation manual for information on how to utilize SiteScan with the Npower UPS.

> **NOTE**
> **SiteScan cannot be installed if there is a NIC card installed.**

12.0 EXTERNAL MODEM

The Npower comes equipped with an external modem connection for sending alarm messages or receiving calls via RS232 Terminal emulation or service diagnostics using a customer-supplied modem. DIAL IN operations are password protected. The External modem cannot be utilized if the system is configured with an internal modem.

12.1 Installation

Bring the standard 9 wire Modem cable from the external Modem location to the Npower UPS via appropriately sized conduit. Conduit can be landed in the lower or upper front customer cable landing areas. Route the wiring to the IFM board in the center of the option area.

Connect the modem to TB52 as follows:

TB52-1 DCD

TB52-2 TX

TB52-3 RX

TB53-1 GND

TB53-2 DTR

TB53-3 RTS

TB54-1 DSR

TB54-2 CTS

TB54-3 RI

> **NOTE**
> **If an internal modem is not installed, the jumper configuration on the Micro Monitor PWA is set to connect pins 1 and 2 which is the default setting. With pins 1 and 2 jumpered, the Npower is set to use an external modem. If an internal modem is installed, however, the jumpers will have been reset to connect pins 2 and 3. (See Section 10.3).**

12.2 Modem Operation

Refer to **Section 10.4 - Operating Instructions** for the Internal Modem. The set up screens for the External Modem are the same, however it is necessary to select External modem type in the enabling screen. Primary and Secondary dial out number instructions are exactly the same as for the Internal Modem. The Init String will need to be changed to correspond to the required string for the modem. Refer to the modem instructions for this information. As a minimum the string will require ATS0=1.

It is necessary to select the Baud rate that your modem supports. The Npower supports up to 9600 Baud. Faster modems will operate, but will negotiate to the 9600 baud rate. Remember to follow the instructions to Save & Exit to make sure the modem selections are saved.

Other information on receiving and making calls will be the same as for an internal modem.

12.3 Dial Out Pager

The Dial Out Pager requires the modem option to be installed. It is supported by both external and internal modems. The function of the Dial Out Pager is to provide pager support (alphanumeric and numeric) for the Npower system. The Dial Out Pager supports Skytel Compatible pagers only.

The Pager Support Screen can be accessed by starting at the MAIN MENU, and navigating through the following screens: CONFIGURATION, SYSTEM SETTINGS, COMMUNICATION OPTIONS, and MODEM. At the MODEM screen, highlight PAGER and press SELECT. The following screen will appear.

Figure 52 Pager Support Screen

```
┌─────────────────────────────────────────────────────────────┐
│                                                               │
│            PAGER SUPPORT CONFIGURATION                        │
│                                                               │
│     PAGER ENABLED              : YES                          │
│     PAGER PHONE NUMBER         : 8003433433                   │
│     PIN NUMBER                 : 11111111                     │
│                                                               │
│                                                               │
│                             EXIT                              │
│                                                               │
└─────────────────────────────────────────────────────────────┘
```

From this screen the Operator can enable or disable the pager, as well as set the pager phone number and the pin number required for alphanumeric paging on Skytel.

The PAGER ENABLED field can be set to YES or NO. This is interlocked with the modem option. Pager support requires the modem.

The PAGER PHONE NUMBER: can have a maximum of 20 digits. This entry is blank when the NVRAM is first initialized.

The PIN NUMBER can have a maximum of 20 digits. The default pin number is 00000000

> **NOTE**
> **Changes to these pager parameters aren't saved into NVRAM until the
> Operator selects "Save & Exit" after exiting the configuration menu screens.**

PROTOCOL

Since the pager option uses the same modem that the modem option uses, careful thought has gone into the sharing of one modem. For example, incoming connections take precedence over dial-out alarms or pager alarms. When a dial-out alarm is articulated, each number is tried at least 3 times before giving up. After giving up, the pager module gains access to the modem, and will begin trying to send the alarm to a pager. If modem dial out is disabled but pager dial out is enabled, the pager alarm will skip the modem dial out module and proceed immediately to the pager module dial out.

The pager module will use the Telocator Alphanumeric Protocol (TAP) which is used for SkyTel pagers. This protocol is included with the dial out pager option package.

When an alarm message is sent to the pager, it includes a system header and a data portion that looks like the following:

    System ID# 00000000 System Tag # 00000000
    BATTERY FUSE FAIL 5/11/01 3:22 PM

The table of alarms, alarm masks and corrective actions is shown in **Operation and Maintenance Manual.**

The Alarm Mask sets parameters for all alarms that affect the UPS and output channels. The programmable attributes are described below. The letters L,D,F and E refer to these features, allowing the Operator to determine their status.

LATCHING

This option latches the alarm when it occurs. Latching alarms will not automatically clear from the screen when the alarm condition ends, and must be cleared from the screen by the Operator.

DIAL

When an alarm condition occurs, and the system has an Auto Dial option, the system will dial out to a designated number in accordance with the Dial Out (Auto Dial) instructions set in the UPS. See the section on Auto Dial in the Operations and Maintenance Manual for more information on this feature.

FREEZE

This feature will freeze the History Log Buffer(s) if an alarm is detected. This feature is used mainly for diagnostic purpose by LGS and Engineering.

EVENT LOGGING

The list of alarms that can be masked are shown in **Table 14**. Events are automatically logged into the Event History Buffer. Those which can be selected or deselected by the user are:

Input Line Fail
Input Under Voltage
Input Over Voltage
Bypass Sync Error
Bypass Voltage Out of Tolerance
Bypass Line Fail
Input Contact Alarms (if this option is installed)

When the Alarm / Fault Name Screen is displayed, the highlighted alarm will be flashing. The DESCRIPTION at the bottom of the screen defines the letters L, D, F, and E. The DESCRIPTION scrolls forward, allowing the Operator to see the entire list of features. Operator can press SELECT to determine the status of the Latching, Dial, Freeze, and Event Log Mask features.

13.0 RS 232 PORT

As a standard feature the Npower comes equipped with an RS-232 port, which can be used to connect a dumb ASCII Terminal. The same information as available on a modem connection will be available to the ASCII terminal. Use **Table 7 - Service Terminal Commands**, the list of ASCII commands, in this manual, to communicate with the Npower.

13.1 Installation

Bring the 3-wire ASCII TERMINAL cable from the terminal location to the Npower UPS via appropriately sized conduit. Conduit can be landed in the lower or upper front customer cable landing areas (**Figure 31**). Route the wiring to the IFM board in the center of the option area per (**Figure 1**).

Connect the ASCII Terminal to TB51 as follows:

TB51-1 TX

TB51-2 RX

TB51-3 GND

All harnesses and cables should be dressed and secured via tie wraps to make sure they do not move when the option door is closed. Excess cabling should be neatly coiled and tie wrapped

13.2 ASCII Terminal Operation

See Table 7 for the list of ASCII Terminal commands. If the terminal is properly connected the Operator should be receive a prompt: SVTP-MM> For a list of available terminal commands type HELP? Or?

14.0 MULTIPLE BATTERY BREAKER OPTION

This option allows for the installation of more than two battery cabinets for the Npower UPS system. The option consists of a Multiple Battery Breaker (MBB) board that mounts on the control door **(See Figure 53)** and an Input Contact Isolator (ICI) board that mounts in the option area **(See Section 4.0 - General Option Installation Instructions.**

The ICI board allows the Npower system to sense multiple battery cabinets, and the MBB board allows the UPS to support multiple battery cabinets by supplying power to the UVR coil of additional battery cabinets.

The retrofit kit for field installation (Part No. 370P000MBB) includes all the necessary parts and installation instructions required to retrofit and test the Multiple Battery Breaker Option in a Liebert Npower UPS System. It is recommended that a qualified Liebert Global Service Customer Engineer perform the installation of this option. Please call 1-800-LIEBERT for service.

With more than two battery cabinets connected, the following conditions apply.

1. All battery cabinets must be wired according to **Figure 55**.
2. Only one battery cabinet will have its BIB board connected to the UPS to monitor battery voltage, battery temperature and status of its circuit breaker.
3. Input Contact Isolator Board (02-810012-00) is required for detecting status of battery circuit breakers of all the other battery cabinets (battery cabinets 3 to 6).
4. Use the following connections for connecting N/O (normally open) contacts of the battery circuit breaker Aux contacts to the Input Contact Isolator (ICI) Board

Table 8   Connections to ICI Board

Battery Cabinet No.	Battery Cabinet BIB	ICI Board (UPS)
3	TB1-7	TB1-2
3	TB1-6	TB1-1
4	TB1-7	TB2-2
4	TB1-6	TB2-1
5	TB1-7	TB3-2
5	TB1-6	TB3-1
6	TB1-7	TB4-2
6	TB1-6	TB4-1

14.1   MBB Board

14.1.1   Kit Contents and Tools

Table 9   Field Installation Kit, Contents

Contents of Kit	Part Number	Quantity
Instruction sheet	91-812561-55	1
Multiple UVR Control PWA	02-810044-00	1
Wire Harness Assembly with Quick-disconnect Crimp Lugs (male and female)	77-812561-47	1
PWA Mounting Standoffs (Black Plastic--1 spare)	12-811751-38	4
Reference Drawing	88-812561-55	1
Quick-disconnect female Crimp Lug (Spare)	12-714250-02	1
Quick-disconnect male Crimp Lug (Spare)	12-714251-02	1
Test Procedure MBB Option	94-812561-55	1

⚠ **CAUTION**
This equipment contains lethal voltages. Remove all power and verify that there is no stored energy in the equipment before proceeding with the installation

14.1.2   Installation and Wiring

To install the Multiple Battery Breaker Option, follow the steps below.

1.   Verify Kit Contents.
2.   Refer to 88-812561-55 (sheet 2 -- figure #1) to determine the location for the Multiple Battery UVR Control PWA (part #02-810044-00).

> **NOTE**
> **When the four 1/4 inch diameter mounting holes are not in the locations specified, follow the instructions below.**

>   1.   Using the assembly, mark the control door to match-drill the 4 mounting holes.

> ⚠ **CAUTION**
> **There may be wires behind the door where the holes are to be drilled**.

>   2.   Open the control Door and move or protect wires to prevent damage. Cover the other circuit boards on the door to prevent accidental damage.
>   3.   Drill ¼ inch diameter holes (4) in Control Door (with door open to prevent removed material from entering the unit.
>   4.   Remove drilling burrs.

3.   Install a PWA Standoff (black plastic) in each hole and secure by pushing in slotted end until the other end expands. Hint: the Standoff is the same type that is used to mount the other PWAs on the Control door.
4.   Install PWA (02-810044-00) on the Standoffs and secure by turning the slotted part of the standoff a ¼ turn clockwise.
5.   Install the wire harness between P1 (PWA) and P14024 (Power Supply) using the connector identification (on the Harness). Route the harness using 88-812561-55 (sheet 2 figure #2).
6.   Disconnect the male and female lugs to modify the wiring between the P116-1 (Switchgear PWA -- 02-810010-00) and TB69-1(terminal block that connects control wires from UPS to Battery Cabinet) to match drawing 88-812561-55 (sheet 2, figure 3, detail A).
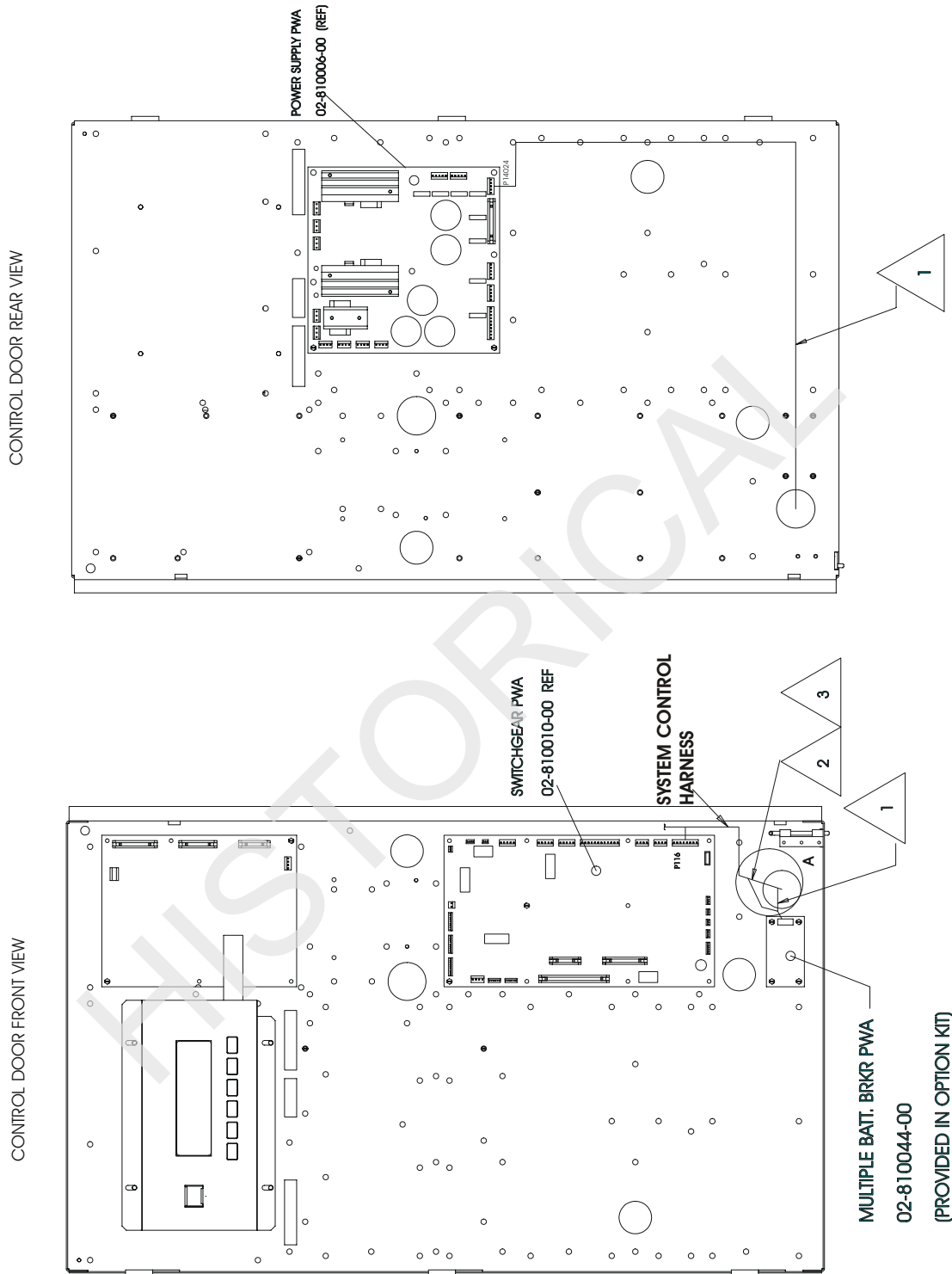
> **NOTE**
> **When the quick disconnect male and female lugs are not in the locations specified, follow the instructions below.**

>   1.   Cut the wire between P116-1 (Switchgear PWA) and the large hole (where the wire harness transverses to the back side of the Control door). Allow enough length to easily crimp on the Quick Disconnect
>   2.   Strip each end of the cut wire. Insert and crimp the wire in the Mating Quick Disconnect (found on the option harness) or remove the Quick Disconnect Mate before inserting and crimping.
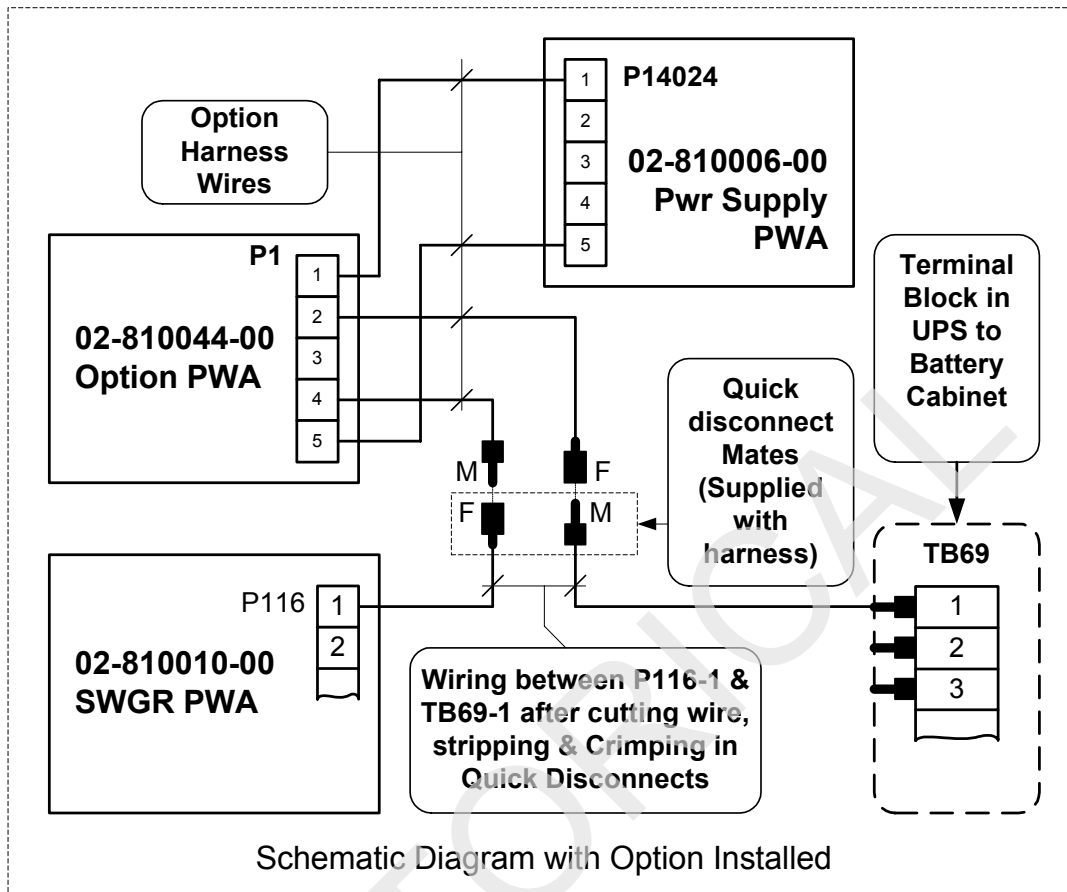
The finished wiring must match the schematic diagram in **Figure 53**.

Figure 53 Multiple Battery Breaker Board Mounting Position

14.1.3 Wiring

Figure 54 Schematic Diagram with Option Installed

Schematic Diagram with Option Installed

14.1.4 Testing of MBB Board

> **NOTE**
> **When field testing the MBB option remove all power to UPS and verify that there is no stored energy in the equipment before proceeding.**

1. Disconnect wire at TB69-1 (the wire between TB69-1 and Battery Cabinet).
2. Apply power to the UPS to create Control Power.
3. Using a General Purpose VOM, verify approximately 22 to 28VDC between TB69-1and TB69-9.
4. Activate Local EPO (on front door).
5. Using the meter, verify that there is no voltage between TB69-1 and TB69-2.
6. Reset EPO by depressing the Momentary Push-Button Switch (located near the top of the Switchgear PWA).
7. Using a meter, verify approximately 24VDC between TB69-1and TB69-9.
8. Remove power to the UPS and reconnect wire that was disconnected in Step 1 (above).

14.2 Input Contact Isolator (ICI or OC-DI) Board

The ICI board is an important component of the Multiple Battery Breaker option because it is needed to detect the status of battery circuit breakers in multiple battery cabinets.

The ICI Board is Part No. OC-DI.

14.2.1 Installation

Install the ICI board exactly as described in **Section 7** of the Options Manual.

> **NOTE**
> **It is important to set the address for the OC-DI board on S2 (position 1 - 8)
> "10001000"**

14.2.2 Wiring

With more than two battery cabinets connected, the ICI board will detect the status of battery circuit breakers of multiple battery cabinets.
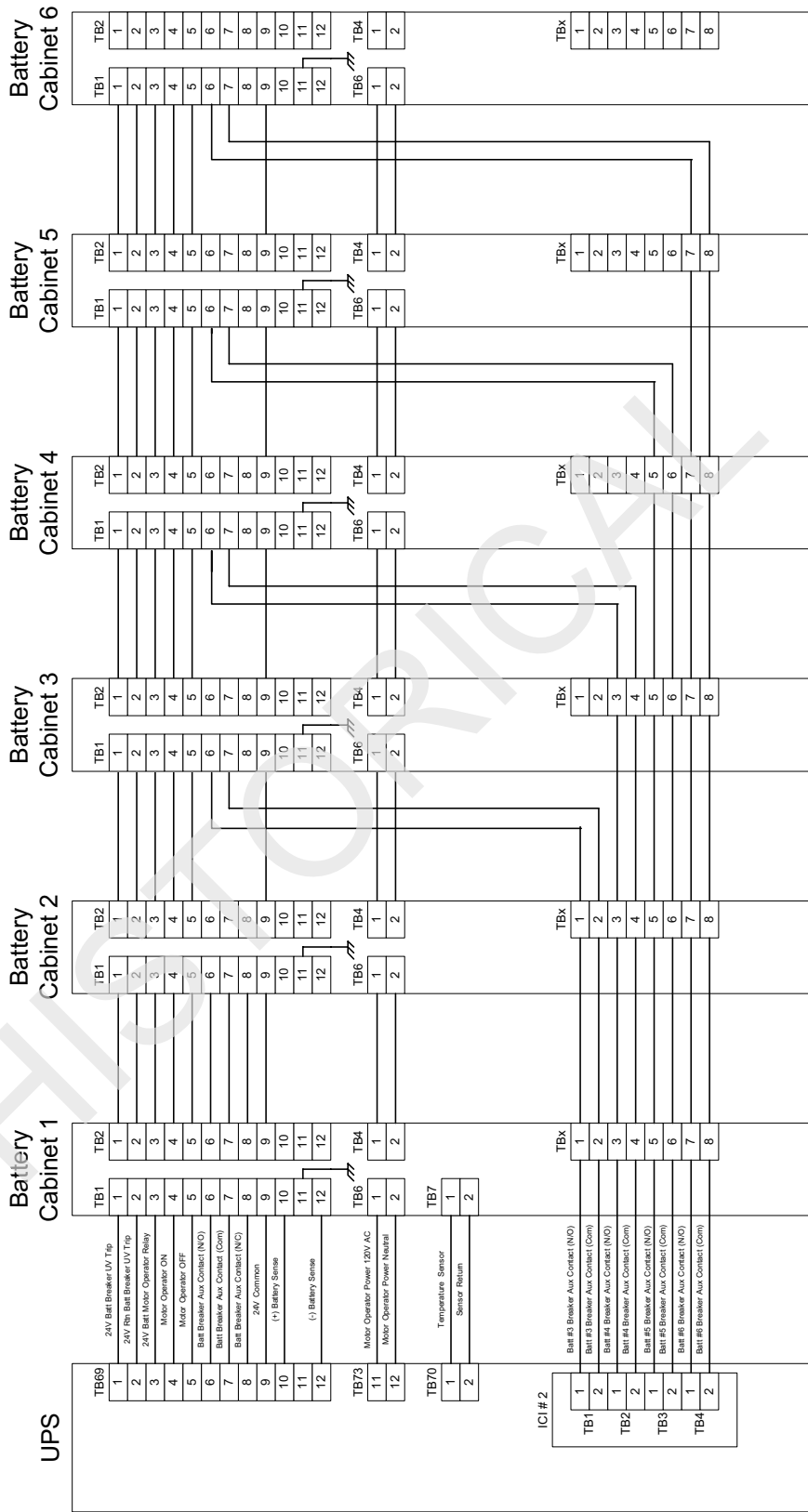
See Table 8, "Connections to ICI Board," on page 66 for proper connections of the battery circuit breakers to the ICI board.

Figure 55 Wiring Diagram, Six Battery Cabinets

Multiple Battery Cabinets Wiring Diagram

14.2.3 Testing of ICI Board

1. Perform Auto Start Up. When prompted, close Manual Battery Cabinet Circuit Breakers. Verify the Mimic Display shows Normal Power Flow.
2. Open Battery Cabinet #3 Circuit Breaker. After 2 minutes the System Status box will flash on mimic screen and display alarm "LOW BATT CAPACITY". When this alarm is detected the horn will sound. Press the Alarm Silence Button. Perform Manual Start Up.
3. When prompted, close Battery Cabinet #3 Circuit Breaker. Verify the Mimic Display shows Normal Power Flow. Press Alarm Reset on the display panel to clear active alarms and horn.
4. Open all Battery Cabinet Circuit Breakers. System Status box flashes on mimic screen, and displays "BATT CB OPEN." When alarm is detected the horn will sound; press Alarm Silence Button. Perform Manual Start Up. When prompted, close Manual Battery Cabinet Circuit Breakers. Verify the Mimic Display shows Normal Power Flow. Press Alarm Reset on the display panel; active alarms clear and horn stops.

14.2.4 Setting Number of Battery Cabinets

To access the screen for setting the number of battery cabinets in the system, navigate from the MAIN MENU to CONFIGURATION to SYSTEM SETTINGS, page 3. Select NUMBER OF BATTERY CABINETS to bring up the following password-protected screen.

Figure 56 Set Number of Battery Cabinets Screen
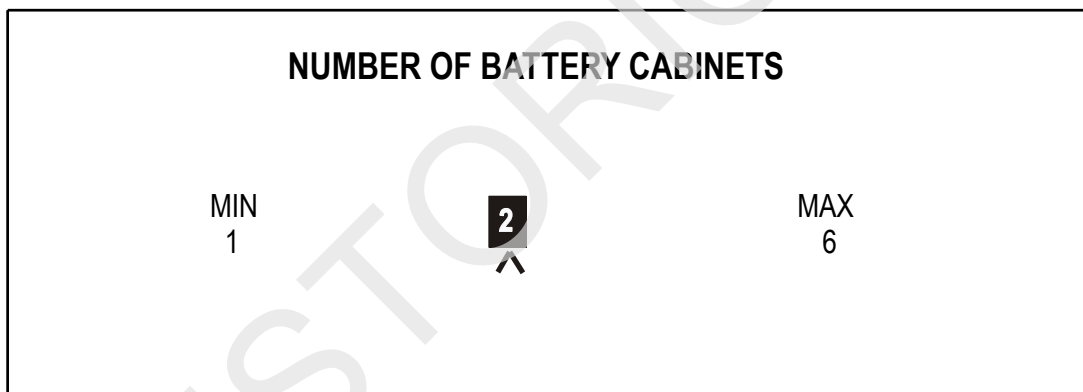
Set the number of battery cabinets by changing the number in the highlighted box.

To save the number you input, press SELECT. This action saves the information and returns you to the SYSTEM SETTINGS screen.

14.2.5 Alarms

If one battery cabinet is installed and an open battery circuit breaker is detected, an alarm reading "Batt CBs Open" will be posted in the Alarm/Faults status box.

If two or more battery cabinets are installed, and one or more open battery circuit breakers are detected, alarms reading "Batt CBs Open" and "Low Batt Capacity" will be posted in the Alarm/Faults status box.

15.0 OPEN COMMS – NETWORK INTERFACE CARD (NIC)

15.1 Introduction

The Liebert OpenComms Network Interface Card provides multiple connectivity options for your Liebert equipment.

The OpenComms Network card transforms Liebert units to intelligent managed nodes on your network, enabling in-band communications with network management systems (NMS). The OpenComms Network card can also easily integrate to your existing Building Management System (BMS) or out-of-band monitoring system using a standard, well-defined multi-drop protocol.

The OpenComms family of interface cards communicates with external systems via the following industry-standard open protocols:

- Modbus RTU over EIA-485
- SNMP v1
- HTTP v1.1

The OpenComms Network card is designed to provide redundant paths for communications. It is possible to connect to your existing BMS system using Modbus while simultaneously communicating to your NMS through SNMP and HTTP.

Additionally, these protocols allow simple integration into the network and building management systems, thus leveraging prior investment and established procedures. Even without an installed monitoring system, Liebert units may be monitored "on-demand" via a web browser, from anywhere network access is permitted.

15.2 Specifications

Electrical Requirements:

    Voltage:
        18VAC to 24VAC
        50/60 Hz, Single Phase
        12VDC to 36VDC
    Power:
        6VA maximum

Environmental Conditions:

    Operating Ambient Temperature:
        5°C to 40°C
        41°F to 104°F
    Storage Ambient Temperature:
        -20°C to 60°C
        -4°F to 140°F
    Relative Humidity:
        10% to 90% RH
        (Non-condensing)

Dimensions:

Net:

178mm x 102mm x 38mm 0.2kg

7.0" x 4.0" x 1.5"   0.4lbs

As shipped:

248mm x 178mm x 64mm 0.6kg

9.75" x 7.0" x 2.5" 1.3 lbs

Environmental Compatibility:

• Advanced Microprocessor / Graphics
• Standard Microprocessor
• MiniMate2 (1.5 – 5 ton & 8 ton)
• Level 10
• Level 00 / 05

3-Phase UPS Compatibility:

• NPower
• 7200 Series

15.3   Installation

The OpenComms NIC card may be ordered as a factory-installed option, or in a kit for field retrofit to existing Liebert units, or as a self-contained unit in its own enclosure.

As a retrofit kit, the circuit board is secured to a metal mounting plate. The mounting plate then is attached to a flat metal surface in a section of the UPS.

As a minimum there will be an IFM board (communications interface) mounted at the mid-point on the door. Other options may have been previously installed.

The option boards mount on the inside of the option door. **See Figure 57** and **Figure 58**. The Open Comms - Network Interface Card is to be mounted in the lowermost position (position 6).

After mounting the NIC card in the proper position, route the wire harness 77-814000-02 from TB3 on the lower left of the NIC card to P999 on the power supply board on the back of the control door. Follow the routing path indicated in **Figure 58 - Installing the NIC Option (Details)**.
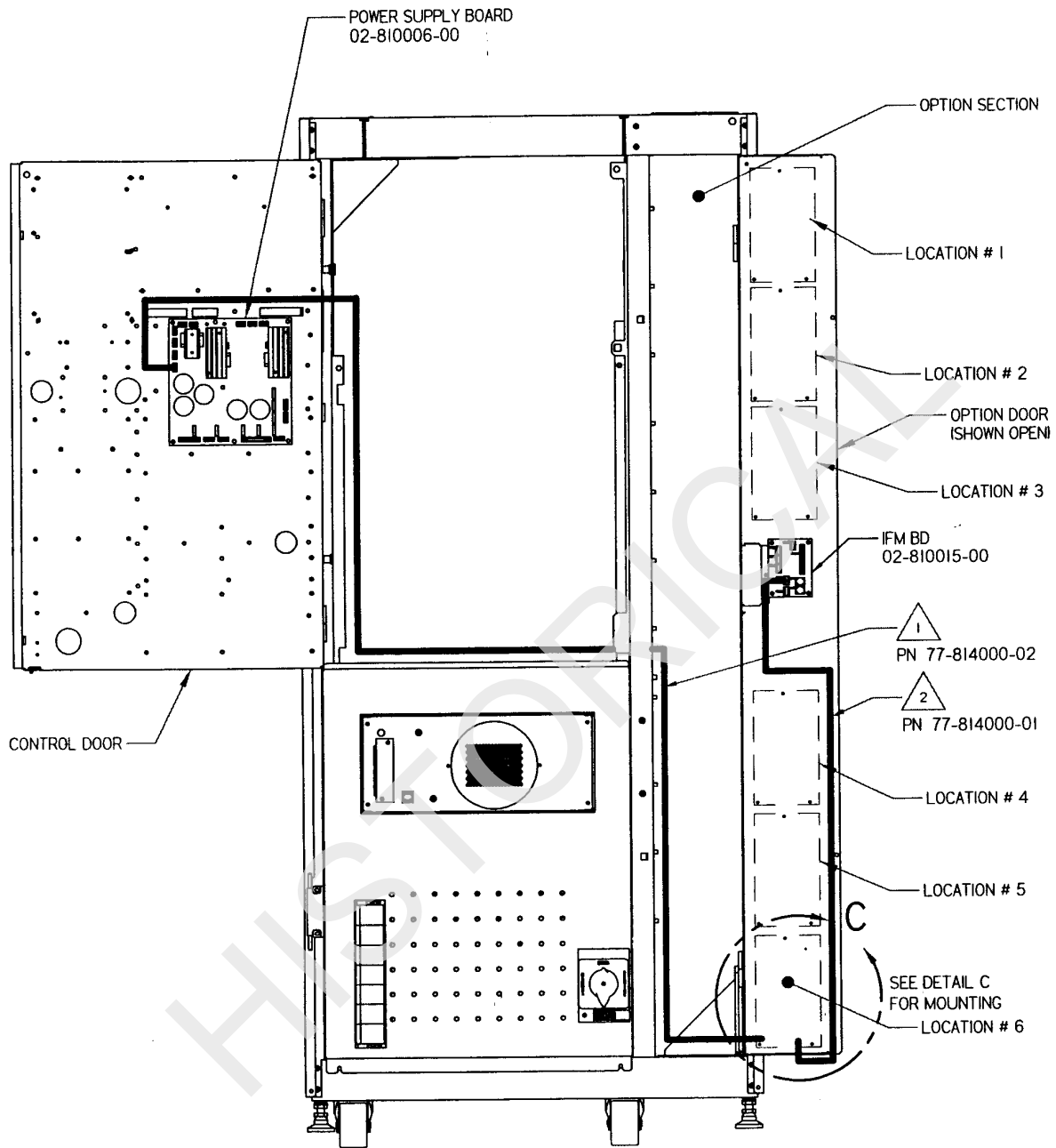
Connect the 2-wire harness 77-814000-01 from TB1 on the bottom center of the NIC card to TB55 on the IFM card. The board is now ready to connect customer inputs, which should be routed from either the top or bottom cable entry points.

The customers network (Ethernet) cable (to be provided by others), should be attached to the NIC card via J3 (RJ45) receptacle in the upper center of the NIC Board. **See Figure 58**.

INSTALLATION NOTES

1. User option connecting cables are to be provided by others and are to be twisted pair 16 gauge 300 V Min. tinned copper stranded wire. All option connections are made in the option section. Customer wires route through option conduit plate.
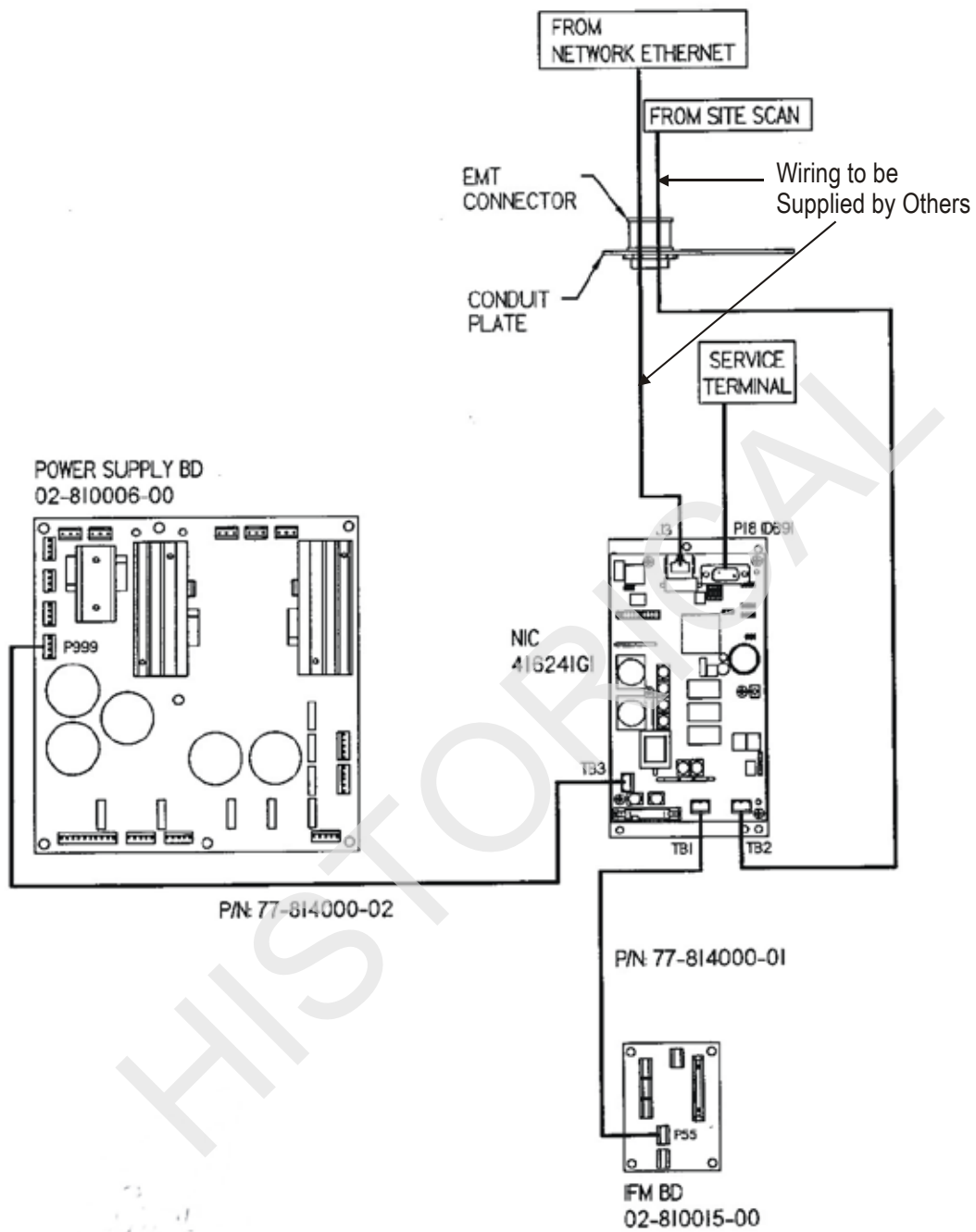2. Run signal cables in separate conduit from power cables.

Figure 57 Installing the NIC Option

POWER SUPPLY BOARD
02-810006-00

OPTION SECTION

LOCATION # I

LOCATION # 2

OPTION DOOR
(SHOWN OPEN)

LOCATION # 3

IFM BD
02-810015-00

⚠1
PN 77-814000-02

⚠2
PN 77-814000-01

LOCATION # 4

LOCATION # 5

CONTROL DOOR

C

SEE DETAIL C
FOR MOUNTING

LOCATION # 6

UPS MODULE
(FRONT DOOR REMOVED)

Figure 58 Installing the NIC Option (Details)

Liebert Global Services can attach a service terminal at P18 (DB9) on the top right side of the board.

All harnesses and cables should be dressed and secured via tie wraps to make sure they do not move when the option door is closed. Excess cabling should be neatly coiled and tie wrapped.

15.4 User Connections

Since the OpenComms NIC can use simultaneous connections, up to 3 user connections may be required: a permanent network connection, a Modbus 485 connection and a temporary serial connection for configuration/setup.

Confer with the network administrator or other responsible party for arranging a network drop to the Liebert equipment. The OpenComms Network card communicates via standard 10baseT Ethernet network connection. Route the 10baseT cable to the Liebert unit and connect to J3, the RJ45 jack on the interface card. The Open-Comms Network card will operate with any 10baseT Ethernet, regardless of operating system used.

The Modbus 485 connection will use the terminals marked "Repeater." (TB2) The Modbus server uses RTU protocol and will allow for a maximum of 32 units on 4000ft. of wire on a common line. EIA-485 repeaters may be necessary in order to accommodate additional units or cable length. Point availability may be referenced in the document, "NIC Reference Library," which may be downloaded at www.liebert.com under the OpenComms product family.

A serial connection to the interface card is necessary for configuration and setup, but does not need to be permanently installed. Using a DB9F-DB9F null-modem serial cable, connect the "DTE Serial Port" P18 to an ASCII terminal or computer running terminal emulation application. Proceed to configuration as detailed in Section 3. Disconnect the serial connection when configuration is completed. *Hyperterminal® and Procomm® are examples of terminal emulation applications running on Microsoft Windows® operating systems. All trademarks are property of their respective owners.*

15.5 System Configuration - Network Interface Card

15.5.1 Dip Switch Settings

A four-position DIP switch is provided, but no user configuration via DIP switches is necessary at this time.

15.5.2 Enabling the NIC Option

To enable the NIC option, navigate to the Communications Options Screen. See Section "Enabling Communication Options" on page 15. Select NEXT to go to page 2. The following screen will come up.

Figure 59 Communications Options, page 2

```
┌─────────────────────────────────────────────────────────┐
│                                                           │
│              COMMUNICATION OPTIONS                        │
│                                                           │
│       REMOTE ALARM  #2                    NO              │
│       REMOTE ALARM  # 3                   NO              │
│       SITE SCAN                           NO              │
│       N I C                               NO              │
│                                                           │
│                                                           │
│              ▐NEXT▌     PREV.     EXIT                    │
│                                                           │
└─────────────────────────────────────────────────────────┘
```

Highlight NIC and press SELECT. A password screen will appear. After entering the correct password and pressing SELECT, the NIC enablement screen will come up, giving the Operator the option to enable the NIC. Highlighting YES and pressing SELECT will enable this option.

15.5.3   Configuring the NIC on a Service Terminal (External Computer)

Configuration of the NIC takes place on a Service Terminal consisting of either an ASCII terminal or a PC which is running terminal emulation software configured for 9600 Baud, no parity, 8 data bits, and 1 stop bit.

The first step is to connect the service terminal to the NIC board. A user-supplied DB9F-DB9F null modem serial cable will be necessary. Connect the service terminal to DB9 connector P18 at the top of the NIC Board. Disconnect the serial connection when configuration is completed. Hyperterminal® and Procomm® are examples of terminal emulation applications running on Microsoft Windows® operating systems. All trademarks are property of their respective owners. The Open Comms NIC supports Static, BOOTP and DHCP network address configurations.

After connecting to the Open Comms NIC card, press the space bar or ENTER key to activate the service terminal session. If no response is apparent, and you have verified connections, cycle power on the Open Comms NIC and the service terminal session should open automatically.

After pressing ENTER, a screen will appear that looks like **Figure 60** but will contain only the seven main menu items.

Figure 60 NIC Configuration Menu Screen

```
Main Menu
        1.  System Information
                1.1 Name
                1.2 Contact
                1.3 Location
                1.4 Description
        2.  Network Interface
                2.1  Speed / Duplex [fixed]
                2.2  Boot Mode
                        2.2.1    Static
                        2.2.2    BootP
                        2.2.3    DHCP
                2.3  IP Address
                2.4  NetMask
                2.5  Default Gateway
        3.  SNMP Communications
                3.1  Enable SNMP agent [y/n]
                3.2  Enable Authentication Traps [y/n]
                3.3  Display / Modify Communities
                3.4  Display / Modify Trap Communities
        4.  Web Server
                4.1  Enable Web Server [y/n]
                4.2  Change User Name / Password
                        4.2.1    Enter User Name (prompt)
                        4.2.2    Enter New Password (prompt)
                        4.2.3    Verify Password  (prompt)
        5.  Firmware Updates
                5.1  Initiate Xmodem Session
        6.  Factory Settings
                6.1  Reset to Factory Defaults [y/n]
                        6.1.1    Manufacture Date
                        6.1.2    MAC Address
                        6.1.3    Serial Number
        7.  Auxiliary Communications
                7.1  Enable Application [y/n]
                        7.1.1    None
                        7.1.2    Modbus Server
                7.2  Enter Server ID
                7.3  Communication Rate
```

15.5.3.1 System Information Menu

The System Information menu holds descriptive input enabling the unit to be identified. This data can be obtained via SNMP queries.

> **NOTE**
>
> **The (") character is not permitted in any of the descriptive fields.**

15.5.3.2 Network Interface Menu

The Network Interface Menu configures network parameters essential for proper network opera-tion. The network administrator or other personnel responsible for the network should be consulted for the proper parameters to be entered.

Refer to **Figure 60** for the following third-level submenus. In the static mode, the IP address is entered. Use the standard four-part dotted decimal format. The Netmask and Default Gateway should also be entered in dotted decimal format. The Netmask, also known as subnet mask, delineates devices on the same physical network segment, versus devices that require the services of a network router for access to other networks. The Default Route is the address of default router on the local segment.

> **NOTE**
>
> **Consult your network administrator to determine the parameters appropriate to your network.**

15.5.3.3 SNMP Communications Menu

The SNMP (Simple Network Management Protocol) Communications Menu specifies parameters particular to the SNMP interface. Communities are used as a means of security for SNMP v1; only specified hosts with the appropriate community name(s) are allowed to perform particular SNMP operations.

Up to 20 different communities can be assigned. For each community, specify the dotted decimal IP address of the remote host, the privilege level (read or read/write), and community name.

Trap Communities specify the recipient(s) of SNMP trap messages generated by the Open-Comms Network Interface Card. Typically, the recipient is the management station of the NMS. Specify the destination IP address, and the community name for that host. Up to 20 trap communities can be assigned.

For Communities and Trap Communities, the information can be entered as a "complex" line — all parameters space-delimited on the command line. Otherwise, the menu items will prompt for each individual parameter.

> **NOTE**
>
> **SNMP v1 communities are transmitted in plain (unencrypted) text across the network.**

Authentication failure traps may be enabled, so that the network management system can be warned when unauthorized access (i.e., incorrect community name) is attempted.

15.5.3.4 Firmware Update Menu

The Firmware Update Menu is intended for Liebert service personnel only. No user configurable parameters are accessed in this selection. If entered, to escape, power must be cycled on the card.

15.5.3.5 Factory Settings Menu

The Factory Settings Menu displays the manufacture date, serial number and MAC address of the card. These parameters are read-only.

Once all parameters have been entered, press <escape> to return to the Main Menu; then press <x> to save configuration, exit and reboot to enable the new configuration. All parameters are stored in non-volatile flash memory. Alternately, pressing <q> after <escape> will abort all changes. Neither selection is case sensitive.

15.5.3.6 BOOTP and DHCP Mode

The Open Comms NIC supports DHCP & BOOTP. To use this ability, a DCHP or BOOTP server must exist on the network. When this feature is enabled, at bootup the card will perform a DHCP or BOOTP request for configuration information, including automatic assignment of IP address. If the card receives the information, then no further requests are made. If, at bootup, a response is not received, the card will continue to send a request once approximately every 30 seconds until a response is received. When this condition is encountered, pushing the enter key returns the unit to the service terminal mode

15.5.3.7 Web Server

The Web Server section will allow the user to disable / enable the HTTP session for the card. Disabling the Web Server means that web browsers will not be able to access the devices status graphical page (GUI).

15.5.3.8 Auxiliary Communications

The Auxiliary Communications Menu allows the user to set up the parameters necessary for Modbus communications. The user can enable / disable the Modbus sessions as well as assign the slave ID.

Once all parameters have been entered, press ESCAPE to return to the Main menu; then press <x> to save configuration, exit and reboot using the new configuration. All parameters are stored in non-volatile flash memory. Alternately, <q> will abort all changes. Both selections are not case-sensitive

To begin configuring the NIC, click on the first item on the menu, System Information. This action brings up the following submenus:

1. Name
2. Contact
3. Location
4. Description

Open each of these submenus and enter the appropriate information. Press ENTER on the keyboard to confirm your entry.

The ESCAPE key will cancel the current menu item and redisplay the menu one level up.

Next, proceed to the next item on the menu and follow the same procedure until all fields have been properly configured.

The System Information Menu seeks descriptive input to enable the unit to be identified. This data is readable via SNMP queries. The (") character is not permitted in any of the descriptive fields.

NOTE

Consult your network administrator to determine the parameters appropriate to your network.

15.6   Operation of the NIC Option

15.6.1   SNMP

The Open Comms Network Interface Card supports "get," "getnext," "set," "response" and "trap" packets of SNMP (Simple Network Management Protocol). The Open Comms NIC supports MIB-II, RFC1628 and Liebert Global Products MIBs. The terms, "alarms" and "conditions" will be used interchangeably through out this description.

Alarms are generated and maintained through the RFC 1628 UPS MIB. Conditions are generated and maintained through the Liebert Global Products MIB. The RFC 1628 UPS MIB provides information for the supported UPS devices. The Liebert Global Products MIB provides information for the supported environmental devices. All conditions that are listed are dependent upon what the unit itself supports.

When a condition occurs within the unit, it is logged into the condition table within the appropriate MIB and a unique ID is assigned. A description of the condition along with the value of the system up-time when the condition was generated is placed into the table as well. A trap is then sent out to the monitoring system.

15.6.1.1   Liebert Global Products MIB

Environmental units log conditions in the Liebert Global Products MIB. Traps for the environmental units are generated out of the Liebert Global Products MIB. Currently, there are only two traps that are sent for environmental units through the MIB: Event Condition Entry Added and Event Condition Entry Removed.

The Event Condition Entry Added is sent each time a condition is inserted into the conditions table. This trap provides the condition ID, the condition description, and the condition time.

The Event Condition Entry Removed is sent each time a condition is removed from the conditions table. This trap provides the condition ID, the condition description, and the condition time.

15.6.1.2   RFC 1628 UPS MIB

UPS units log alarms in the RFC 1628 UPS MIB. Traps for the UPS units are generated out of the RFC 1628 UPS MIB. There are four traps that may be sent for the UPS units: Trap On Battery, Trap Test Completed, Trap Alarm Entry Added and Trap Alarm Entry Removed.

The Trap on Battery is sent when the UPS is operating on battery power. This trap will be sent once per minute until the UPS either shuts down or is no longer running on battery power. This trap provides the Estimated Minutes Remaining on Battery, the Seconds on Battery and the Configured Low Battery Time.

The Trap Test Completed is sent when a UPS diagnostic test is completed. This trap provides the Test ID of the test that has been performed, the Test Spin Lock, the Test Results Summary, the Test Results Detail, the Test Start Time and the Test Elapsed Time.

The Trap Alarm Entry Added is sent when an alarm is placed into the alarm table and provides the alarm ID and the alarm description. This trap is *not* sent on the following alarms: On Battery and Test In Progress. The Trap Alarm Entry Removed is sent when an alarm is removed from the alarm table and provides the alarm ID and the alarm description. This trap is *not* sent out when the Test In Progress alarm is removed from the alarm table.

15.6.2   MIB

The Management Information Base (MIB) is a formal document declaring the specifics of the information supported by the SNMP implementation. The administrator for the NMS (or other applications utilizing SNMP to communicate with the Liebert units) will need the MIB in order to integrate the Liebert units into the monitoring system. The MIBs for the Open Comms Network Interface Card are available for download on the Liebert Web site, www.liebert.com. Navigate through Products, then Site Monitoring & Software and proceed to the Open Comms support information area. The RCF 1628 MIB can be downloaded at www.ietf.org (the Internet Engineering Task Force).

Physical media containing MIB files do not ship with the hardware.

15.6.3 HTTP

Status and alarm information can be queried by Web browsers via HTTP v1.1 (Hyper Text Trans-fer Protocol). The data is shown in an intuitive graphical format, akin to the unit's front bezel con-trols. Currently, the follow-ing browsers have been tested and are supported:

- Microsoft Internet Explorer, versions 5.x and later
- Netscape Navigator/Communicator, version 4.x and later

Font sizing may need to be adjusted on your browser for optimal viewing. With appropriate NMS software and configuration, HTTP pages may be initiated on receipt of SNMP traps in order to view the overall operating sta-tus of the unit or HTTP may be used on its own to monitor "on-demand" the unit operation. HTTP pages will automatically refresh (reload) approximately every 20 seconds.

By means of the Internet, the NIC card can establish a communication link with the Liebert device.The IP address for accessing information is proprietary and must be obtained by a system administrator. An error message indicates a faulty communication.

The home page is shown in **Figure 61**. On this screen all active alarms are shown at the bottom of the page in red. Normal power flow is shown in green. Yellow indicates marginal/fault, and grey means the power flow is absent.

The Operator can access screens for input, static switch, battery, rectifier, inverter and load by clicking on the appropriate box or on the folders on the lower left. These screens are shown in the figures following **Figure 61.** The top frame in these screens presents status/metering information. The second frame an associated list of alarms.Active alarms are indicated in red on these screens.

Clicking on "Other" at the bottom of the list of general alarms excluding the individual alarms generated by the UPS. (See **Figure 70.)** General alarms differ from critical alarms and faults in that they are usually of lesser importance.

Figure 61 HTTP Home Page
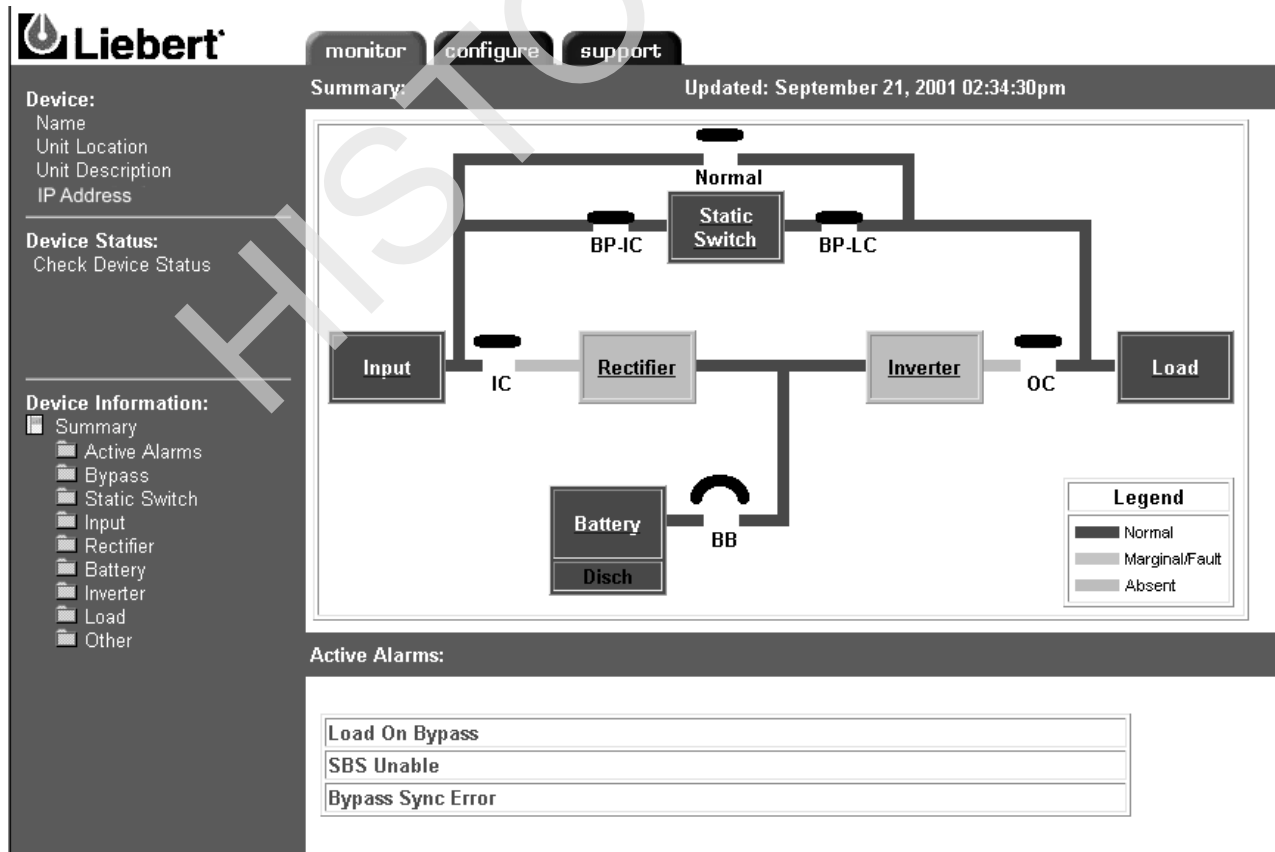
Figure 62 HTTP Active Alarms screen

Figure 63 HTTP Bypass Screen

Figure 64   HTTP Input Screen

Figure 65 HTTP Static Switch Screen

Figure 66 HTTP Battery Screen

Supported Status	Value	Units
Battery Voltage	550	V
Battery Current (Charge/Discharge)	-19.5	A
Battery Charge Percentage	0	%
Battery Temperature	25	C
Battery Time Remaining	0	min
Battery Breaker	Open	

Supported Alarms	Status
Battery Fuse Fail	Normal
Battery Low Transfer	Normal
Battery Low Warning	Normal
Battery Overtemp CB Trip	Normal
Battery Ground Fault CB Trip	Normal
Battery Discharging	Normal
Battery CB Open	Normal
Battery Test Failed	Normal
DC Overvoltage Transient	Normal

Supported Settings	Value	Units

Figure 67 HTTP Rectifier Screen

Supported Status	Value	Units

Supported Alarms	Status
DC Overvoltage Transient	Normal
Rectifier Fuse Fail	Normal
Rectifier Fail	Normal
Input OverCurrent	Normal

Supported Settings	Value	Units

Figure 68 HTTP Inverter Screen

Figure 69 HTTP Load Screen

Supported Status	Value	Units
Output Voltage A-B	208	V
Output Voltage B-C	208	V
Output Voltage C-A	208	V
Output Voltage A-N	121	V
Output Voltage B-N	120	V
Output Voltage C-N	120	V
Output Current A	70.6	A
Output Current B	65.6	A
Output Current C	67.0	A
Output Power A	9	KVA
Output Power B	8	KVA
Output Power C	8	KVA
Output Power A	9	KW
Output Power B	8	KW
Output Power C	8	KW
Output Frequency	60.0	Hz
Percent Rated KVA	80	%KVA
Percent Rated KW	103	%KW
Output Contactor	Open	

Supported Alarms	Status
Output Overvoltage Transfer	Normal

Figure 70 HTTP "Other" Alarms Screen

Supported Status	Value	Units

Supported Alarms	Status
General Alarm	Normal
Heatsink Overtemp Limit	Normal
Input Power Supply Fail	Normal
Output Power Supply Fail	Normal
UPS Ambient Overtemp Limit	Normal
Power Supply F1 Fail	Normal
Overtemp Timeout Shutdown	Normal
Hardware Shutdown	Normal
MM Control Power Fail	Normal
Option Power Supply Fail	Normal
Excessive Auto Retransfers	Normal
Aux Overtemp Warning	Normal
Battery Overtemp Warning	Normal
Heatsink Overtemp Warning	Normal
Inlet Air Overtemperature Warning	Normal
UPS Ambient Overtemp Warning	Normal
Powerpole Fan 1 Fail	Normal
Powerpole Fan 2 Fail	Normal
Powerpole Fan 3 Fail	Normal
Primary Fan 1 Fail	Normal

> **NOTE**
> **The figure above shows only the top half of the screen. To view the rest of the alarms and their respective status it will be necessary to scroll down.**

15.6.4   Modbus RTU

See **Section 15.7** for a complete explanation of the Modbus slave.

15.6.5   System Reset

The Open Comms Network card contains an on-board real time clock and watchdog circuitry. The card is self-monitoring and self-correcting. Nevertheless, a push button is provided in the event that a manual system reset is desired. The Reset push button is labeled S1 on the interface card. Press and hold for 3 seconds before releasing to initiate a hardware reset.

15.6.6   Diagnostics

A number of LEDs are provided on the interface card to provide diagnostic information according to the following table.

Table 10   LED Identifiers

LED Identifier	Description
DS1	Ethernet Port Collision
DS2	Ethernet Port Receive
DS3	Ethernet Port Transmit
DS4	Ethernet Port Link
DS5	Not used
DS6	Not used
DS7	IGM Repeater Port Receive
DS8	IGM Port Receive
DS9	Microprocessor in Operation
DS10	Serial Port Receive
DS11	Serial Port Transmit
DS12	IGM Repeater Port Transmit
DS13	IGM Port Transmit
DS14-19	Not used

Figure 71 LED Locations
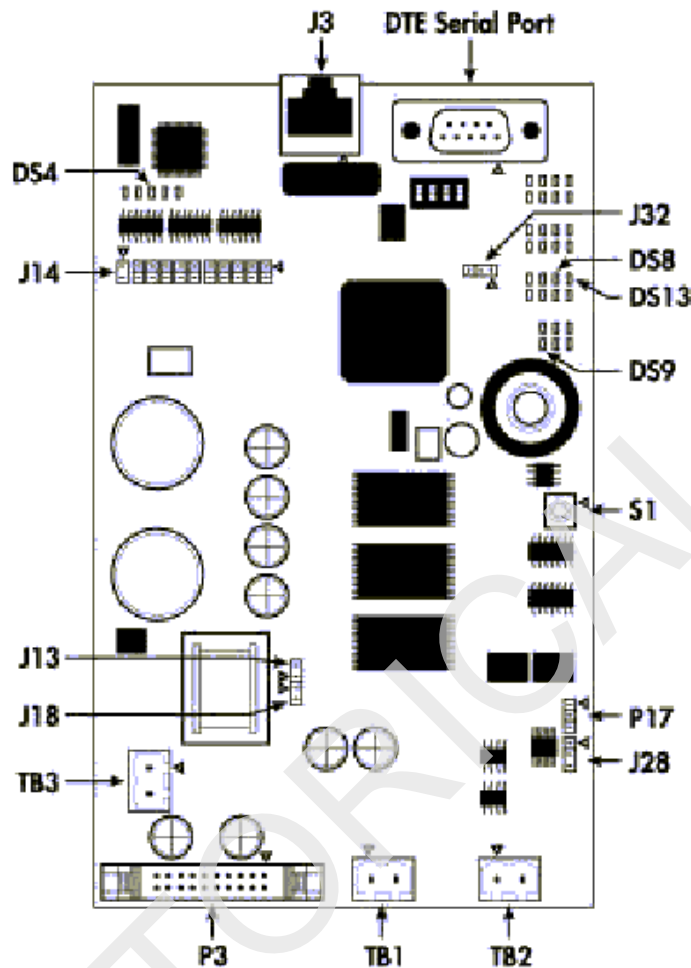
15.7 Modbus Communications and Connectivity

This section describes the Modbus communications protocol as supported by the OpenComms NIC card. It includes information on how to pass information to and from the OpenComms NIC card via Modbus. It is also intended to help facilitate answering questions regarding supported types, frame format, function code support, etc.

15.7.1 Implementation Basics

The OpenComms NIC module is configured to act as a slave device on a common network. The common network is a multi-drop or "daisy chain" configuration over EIA-485, where multiple slaves reside on a common wire or loop.

15.7.2 Constraints

The OpenComms NIC communicates with local database and therefore is subject to the time delay resulting from the local database updating policies. Use of "Preset Multiple Holding Registers" and "Preset a single Holding Register" functions requires accessing the Liebert device connected and to the OpenComms NIC card database service. Users should be aware that the Modbus application coexists with other on-board application servers (HTTP and SNMP specifically) and competes for the database service and CPU time. This may lead to uncer-

tainty of responding time of the OpenComms NIC. The user or third party integrator may have to compensate for the delay time if HTTP, SNMP and Modbus are going to be utilized simultaneously.

15.7.3   Transmission Format

The OpenComms NIC module supports Modbus RTU (Remote Terminal Unit) transmission modes. The Open-Comms NIC communication rate is fixed at 9600 baud, 8 data bits, No parity, 1 Stop bit. The communication media is fixed using EIA-485 standards.

15.7.4   Physical Connection

A Modbus network should consist of one, and only one, host client, and up to 255 slaves uniquely identifiable by their slave ID. The slave ID of each Open Comms NIC is set through the service terminal (configuration) port. (See **SectionSystem Configuration - Network Interface Card** for more details.) The Open Comms NIC supports multi-drop connection over RS485. On the Open Comms NIC, a client should connect to the Open Comms NIC as a multi-drop connection via the RS485 "Repeater" port (TB2), (Pin1 as minus and Pin2 as plus. J28-1 and J28-2 should be shorted.)

The Open Comms NIC card is designed to reside on a maximum common line of 32 devices with a total cable length of 4000 feet. In a "normal environment" all devices should be connected in "daisy-chain" fashion, with "star configurations" or branches, being used at a minimum. See **Figure 72 - Typical Maximum Installation** for details. A "normal environment" consists of an installation where noise or electrical interference is minimal. This is typical of communication wiring run in properly grounded conduit or in areas where high voltage or radio transmissions are not present. Otherwise, these conditions are designated as "noisy."

Figure 72 Typical Maximum Installation
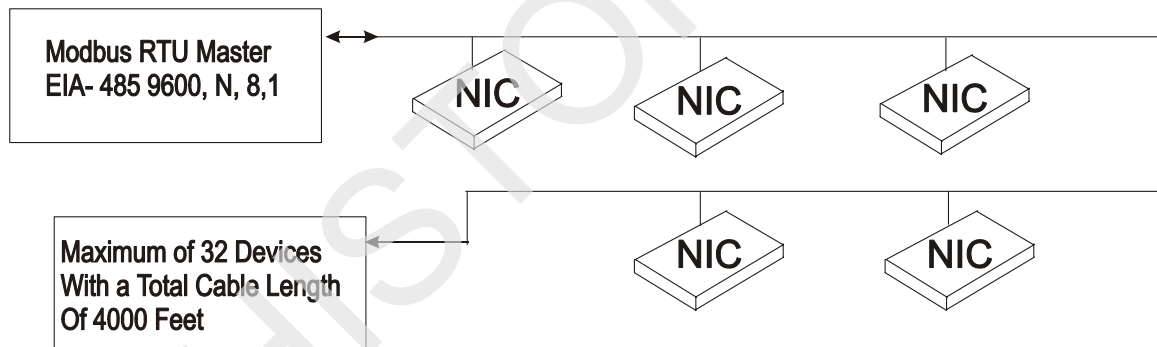
Figure 73 Installation Exceeding Maximum Specifications
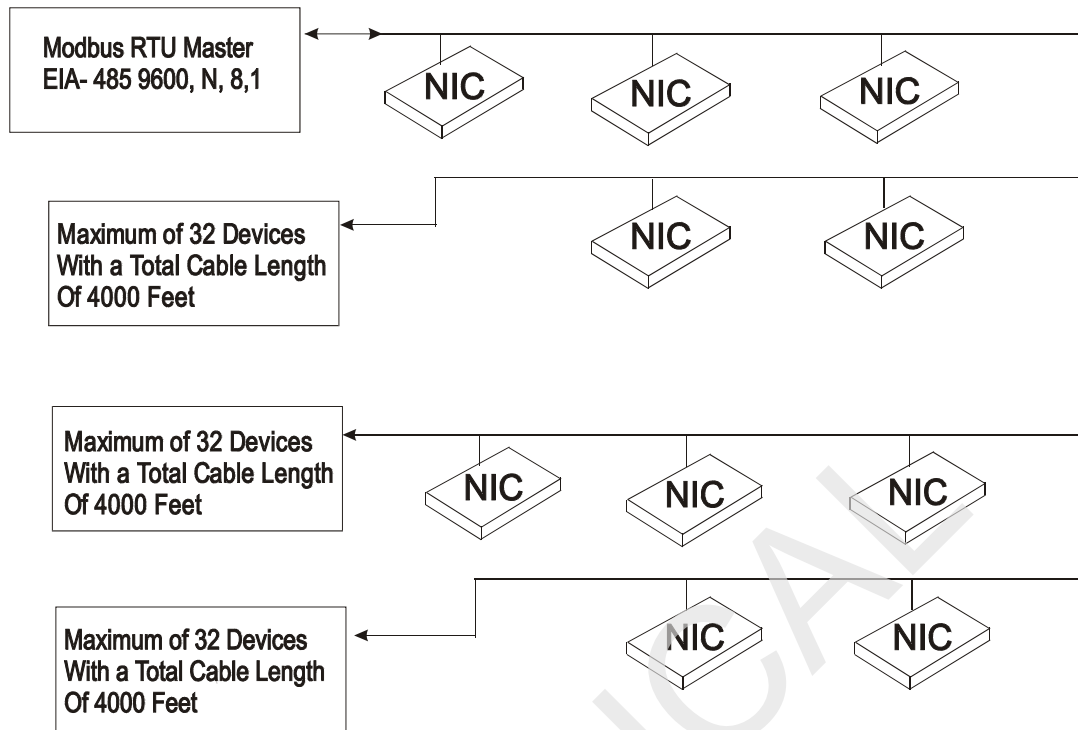
The recommended cable characteristics are:

Normal Environments:

•18-22 gauge, twisted-pair, stranded (non- shielded)

Typical type is: Belden 8442

Noisy Environments:

•18-22 gauge, twisted-pair, stranded (shielded)

Typical type is: Belden 9461

The maximum specification may be exceeded if measures are taken to drive or boost the EIA-485 communication line. Two wire EIA485 repeaters are available through the Liebert Corporation. SiteScan's "REPOPT" will work sufficiently for this application. Consult the SiteScan price book for pricing schedule and alternative solutions.

15.7.5 Modbus Slave Functions

Data Type

The OpenComms NIC supports data in a register block as one of the following types: Signed integer (16 bit) / Unsigned integer (16 bit) / Signed long (32 bit); IEEE floating-point (32 bit); Null terminated String.

A datum should consist of one or multiple registers. The leftmost byte contains the MSB and the rightmost byte contains the LSB.

Function Code Support

The OpenComms NIC implements the following Modbus functions. However, integrators will use function code 0x03, and 0x06 most often due to the type of data to be acquired.

      0x01 Read Coil Status

      0x02 Read Input Status

      0x03 Read Holding Registers

      0x04 Read Input Registers

      0x06 Write Single Holding Register

      0x0F Force Multiple Coils

      0x10 Preset Multiple Holding Registers

Read/Write Holding Registers (0x03, 0x06, 0x10)

A holding register is a 16-bit message unit. In principle, a message in a holding register is write / readable, but holding registers can be used by read-only data as well. Holding registers are mapped into 40001- 49999 logic address range.

Holding registers can be read by function code 0x03. A maximum of 125 registers can be read by a single query.

Function code 0x06 requests the server to change the content of a single holding register, and function code 0x10 requests server to change the contents of multiple holding registers adjacent to each other.

Read Input Registers (0x04)

The input register block contains read-only data accessible to the user. A datum in the input register block occupies one or multiple registers such as described in the previous section. The input registers are mapped into 30000-39999 of the logic address range.

Up to 125 input registers can be read by a single query using function code 0x04.

Read, Set Coil Status (0x01, 0x05, 0x0F)

Coil status contains bit-mapped status accessible to the users. In principle, a coil status can be read, set or cleared by the host client. Multiple coil status can be read by specifying the index of bits of the first coil and the number of consecutive coils in a single query.

Coil status can be read by function code 0x01.

Function code 0x05 set or clear a single coil, and function code 0x0F set or clear multiple coils.

Read Input Status (0x02)

The input status block contains read-only status accessible to the users. It can be read by using function code 0x02 in the same as reading coil status.

Error Handling

According to the Modbus specification, the Open Comms NIC composes the following exception responses to the client if an exception or error occurs.

Table 11   Exception Response

Server Address	Function Code (0x80)	Exception code	16 bit CRC
1 byte	1 byte	1 byte	2 bytes

Exception code is one of the following:

01: Unsupported Function code

02: Out-of-range data addresses

03: Out-of-range data value (write to holding registers)

04: There is currently no LMD device connected to the server

05: Server is composing response but cannot response to the client within the time limit required by Modbus specification.

Modbus Packet Formats

Each Modbus packet consists of the following fields:

- Device Address
- Function Code
- Data Field(s)
- Error Check Field

Device Address:

The address field immediately follows the beginning of the frame and consists of 8-bits. These bits indicate the user assigned address of the slave device that is to receive the message sent by the attached master device.

Each slave OpenComms NIC must be assigned a unique address and only the addressed slave will respond to a query that contains its address.

Function Code:

The function code field tells the addressed slaves what function to perform. Function codes are specifically designed invoke a specific action by the slave device. The function code range is from 1 to 127. However, the OpenComms NIC module primarily uses Function Code 3 (Read Holding Registers) and Function Code 6 (Pre-set Single Register).

Data Field(s):

The data field varies in length depending on whether the message is a request or a response to a packet. This field typically contains information required by the slave device to perform the command specified or to pass back data to the master device.

Error Check Field:

The Error Check Field consists of a 16-bit (2 byte) Cyclical Redundancy Check (CRC16). It allows the receiving device to detect a packet that has been corrupted with transmission errors.

RTU Framing Examples

READ REGISTERS (FUNCTION CODE 0X03 & 0X04)

Query: For reading holding /input registers (requested by a client)

Server Address	Function Code (0x3/0x4)	Index of starting register	Number of registers to be read	16 bit CRC
1 byte	1 byte	2 bytes	2 bytes	2 bytes

Response: for reading holding/input registers (response by the server)

Server Address	Function Code (0x3/0x4)	Byte Count	Data from registers	16 bit CRC
1 byte	1 byte	1 bytes	2*m bytes (= Byte Count)	2 bytes

WRITE SINGLE HOLDING REGISTER (FUNCTION CODE 0X06)

Query: for writing a single holding register (requested by a client)

Server Address	Function Code (0x06)	Index of the register	16 bit value to be written	16 bit CRC
1 byte	1 byte	2 bytes	2 bytes	2 bytes

Response: for writing a holding registers (response by the server)

Server Address	Function Code (0x06)	Index of the register	16 bit value been written	16 bit CRC
1 byte	1 byte	2 bytes	2 bytes	2 bytes

15.8 NIC Setup and Testing

The NIC has a specific setup that must be in place before the card will function properly. There are jumpers on the board that must be in the correct locations. The positions of these jumpers are numbered on the board itself. A small triangle silk screened on the board represents pin 1 for each set of pins to which jumpers may be applied.

15.8.1 Jumper Placements

J13, J14, and J18 on the board must have jumpers installed on them.

J32 must have a jumper installed on pins 2 and 3.

J28 jumper positions will apply to future capabilities, but are not currently usable on the NIC.

Your card was shipped with the jumpers properly installed.

15.8.2 Testing the Network

"Ping" is a tool used to test the network. At the command prompt, type, "ping <address of card>". Ping will respond that it received a reply from the card if the card is functioning properly on the network.

If the card is not functioning properly or is not connecting to the network, ping will respond that the request it sent to the card has timed out.

If the ping request times out, go to the Service Terminal to verify that the card initialized the network when it powered up. If the card is sitting at the text "Initializing network…" then the card has not connected to the network. Hit <enter> to go into the Service Terminal. Select number 2 for the Network Interface Menu. Verify that you have the boot mode set up correctly. If you choose a static IP Address, verify that the IP Address is valid for your network.

If you obtain your network information from a BootP or DHCP server, verify that the server is valid and that it is responding to requests. Once the information has been verified, press <escape> to return to the main menu and select "x" to exit out of the card. Then, reboot the card. The card may be rebooted by pressing switch S1 on the card for approximately 2 seconds until the DS9 link light turns off.

If the card still does not connect to the network, or ping still does not receive a reply from the card, verify proper set up on the card itself. DS4 should be illuminated if the card detects the network. Verify that the network cable is connected to Ethernet port J3 and that the hub/router/switch to which the card is connected is operating correctly.

Once this information is verified, reboot the card.

15.8.3 Service Terminal Troubleshooting

If the card does not bring up a Service Terminal, check link light DS9. DS9 should be illuminated within approximately 0.5 seconds of application of power. If DS9 is not illuminated and no other LEDs are on, verify that power has been applied to the card. If power has been applied, verify wiring connected to TB3 is correct. TB3 should have 24VAC or 12 VDC applied. Reboot the card once the power to the card has been verified.

15.8.4 SNMP Troubleshooting

If SNMP is not functioning, first make sure that the card powers up, the Service Terminal is functioning and the card is connected to the network (verified by using ping). If all of those conditions are met, verify that the community strings are set up correctly. To do this, go into the Service Terminal and select number 3 for SNMP Communications. Then, select number 2 for Display/Modify

Communities. Verify that the IP Addresses listed are valid for your network. Verify that you are typing in the correct community name when trying to access SNMP. The community name is case sensitive.

Once this information is verified, reboot the card and try to access SNMP again.

15.8.5 Web Troubleshooting

If the card does not serve up a web page, but the Service Terminal is functioning, SNMP is functioning, and the card is connected to the network (verified through ping), then reboot the card. In this case, the web server has been lost and needs to be restarted.

If the card serves up a web page, but the web page only displays "Discovering connected device…" verify that the card is connected to the desired device. Verify that the link lights DS13 and DS8 are blinking on and off. DS13 indicates that the card is receiving from the connected device. DS8 indicates that the card is transmitting to the connected device.

If neither of the link lights is blinking, check the connection between TB1 and P3. TB1 is used to interface to the Environmental units and to some UPS's. P3 is used to interface with some UPS's. If DS13 is blinking and DS8 is not, this indicates a communication problem between the card and the connected device. Replace the NIC card and retry connecting to the web. If the problem persists, change the card in the device that the NIC card is trying to interface with. Try to reconnect to the web.

15.8.6   Modbus Troubleshooting

If the card does not respond to Modbus requests, verify that DS7, "repeater port receive" is flashing during a request. In proper communications DS12 will also be flashing indicating, "repeater port transmit"

Verify proper wiring on the EIA 485 network. OpenComms NIC cards should observe a "plus to plus" and "minus to minus" daisy chain configuration.

Also verify that the proper slave ID has be set in service terminal. Refer to Section 3 for initiating a service terminal session

16.0 DC GROUND FAULT DETECTOR

16.1 Introduction

The DC Ground Fault Detector circuit senses any imbalance in current on the two battery cables. An imbalance in current indicates that the current is flowing to the ground.

When programmed for the Normal Sensitivity, a warning signal is generated if the unbalance current exceeds 0.015 Amps. For reduced sensitivity the warning signal is generated when the unbalance current exceeds 0.03 Amps. A jumper J5 is provided (**See Table 12**) to adjust the fault current sensitivity level.

When the system is operated from the battery with input power off and the rectifier phased off, one ground fault at the battery cells would not cause any ground fault current to flow and therefore would not be detected. The same is also true when the UPS has an input isolation transformer.

The assembly has two Form C dry relay contacts. One Form A contact is used to interface with the Switchgear PCB and the other Form C contact is available for the customer.

16.2 Installing the DC Ground Fault Detector

> ⚠️ **WARNING**
> **BEFORE YOU BEGIN THE INSTALLATION PROCESS, PLEASE READ THROUGH AND TAKE ALL NECESSARY SAFETY PRECAUTIONS LISTED IN THE INSTALLATION MANUAL TO PROTECT YOURSELF AGAINST LETHAL VOLTAGES AND OTHER EXTREME HAZARDS ASSOCIATED WITH THE POWER CONVERSION PRODUCTS WHICH COULD CAUSE SERIOUS INJURY, BURNS, OR DEATH. DO NOT PERFORM THIS INSTALLATION UNTIL YOU ARE AUTHORIZED TO DO SO AND HAVE READ AND UNDERSTAND ALL PERTINENT SAFETY INSTRUCTIONS.**

16.2.1 Field Installation:

Perform the following steps for field installation of this option.

1. De-energize the DC bus:
   - When the UPS is operating normally supplying load through its inverter, power down the load or transfer it to **EXTERNAL MAINTENANCE BYPASS** cabinet (if present) before de-energizing the DC BUS.

> ⚠️ **WARNING**
> DO NOT TRY TO INSTALL THIS OPTION BY TRANSFERRING LOAD TO **INTERNAL MAINTENANCE BYPASS SWITCH** AS THE CUSTOMER INPUT, SINCE OUTPUT AND THE BYPASS BUS BARS WILL HAVE HIGH VOLTAGE PRESENT ON THEM AND IT IS NOT SAFE TO WORK ON THE DC BUS CONNECTIONS THAT ARE SURROUNDED BY THE HIGH VOLTAGE BUS BARS.

2. Power down the UPS:
   - Navigate to the UPS shutdown instruction screen on the mimic panel and perform UPS shutdown. Turn off the load breaker downstream of the UPS.
   - Make sure the battery breaker is off to disconnect the battery from the UPS.
   - Turn off the input and bypass breakers upstream of the UPS.
   - Wait 5 minutes for all AC and DC capacitors to discharge.

⚠ WARNING
**ENSURE THAT ALL CUSTOMER BUS BAR CONNECTIONS HAVE NO DC
OR AC VOLTAGE ON THEM BEFORE CONTINUING.**

16.2.2 Installation Procedure

1. Install the DC Ground Fault Detector assembly on the back of the control door. (See **Figure 74** and **Figure 75**.)

2. Install the battery ground fault CT:

    a. Disconnect the battery cables connected to the UPS Busbar_Bat positive and negative terminals. Push the disconnected cables through the battery ground fault CT hole and reconnect them to the terminals. Make sure the five colored CT wires are facing in a direction away from the Busbars as shown below in **Figure 77**.

    b. Connect the five wires from the CT to the DC Ground fault PWA as follows:

    • CT wires should be separated from DC sense wires going to TB1-1 and TB1-3 on Ground Fault Detector PWA. All CT wires should also be separated from all power cables as much as possible.

    • Connect the Orange wire to TB2-6.

    • Connect the Yellow wire to TB2-5.

    • Connect the Black wire to TB2-4.

    • Connect the Wht/Blk wire to TB2-3.

    • Connect the White wire to TB2-2.

3. Wire the DC Ground Fault PWA to the Power Supply PWA (02-810006-00).

    a. Connect a red wire (provided) from TB2-1 on the DC Ground Fault to P42 -1 on the Power Supply.

    b. Connect a white wire (provided) from TB3-6 on the DC Ground Fault to P42 - 5 on the power supply.

4. Wire the DC Ground Fault PWA to the System Switchgear PWA (02-810010-00):

    a. Connect a red wire (provided) from TB3-1 on the DC Ground Fault Detector to P117-1 on the System Switchgear PWA.

    b. Connect a white wire (provided) from TB3-2 on the DC Ground Fault Detector to P117-3 on the System Switchgear PWA.

Figure 74 Npower UPS 100/130 KVA Front and Side Views
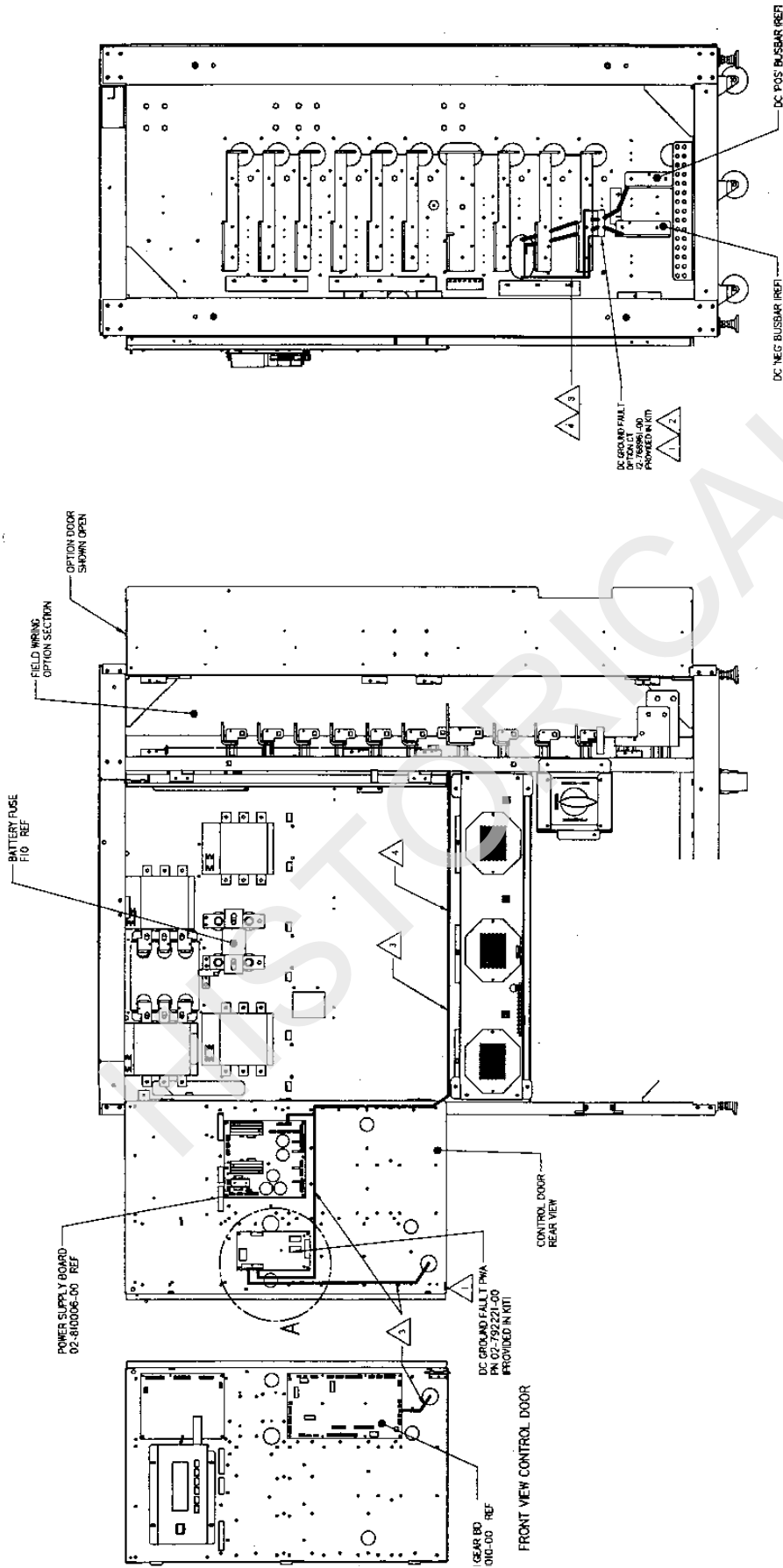
Figure 75 Npower UPS 80 - 130 KVA

SECTION B-B

DC POS BUSBAR (REF)

DC NEG BUSBAR (REF)

DETAIL A
VIEW ISO DC GROUND
FAULT PWA

DC GND FAULT PWA
02-792221-00

STANDOFF
PN 12-712860-10

DC GROUND FAULT OPTION CT
PN 12-768961-00
(PROVIDED IN KIT)

FIELD WIRING

OPTION SECTION

OPTION DOOR
SHOWN OPEN

BATTERY FUSE
F10 REF

POWER SUPPLY BOARD
02-810004-00 REF

CONTROL DOOR
REAR VIEW

DC GROUND FAULT PWA
PN 02-792221-00
(PROVIDED IN KIT)

SWITCH GEAR BD
02-810010-00 REF

FRONT VIEW CONTROL DOOR

Figure 76 Wiring Diagram for Battery Ground Fault Option

Figure 77 DC Ground Fault Wiring Connections
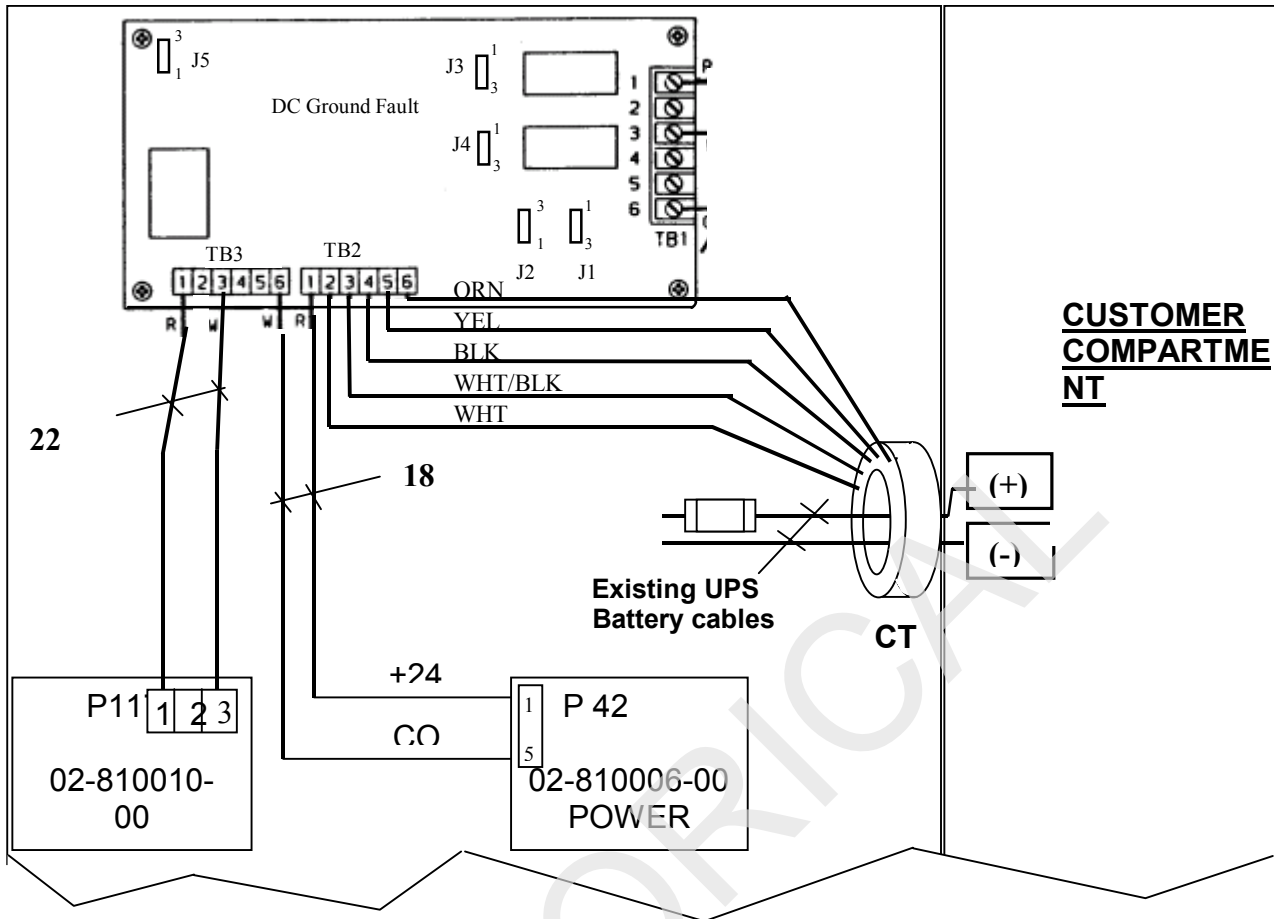
5. Configure the program jumpers on the DC Ground Fault Detector as follows:

Table 12   **Program Jumper Selection**

For DC Bus	J1	J2	J3	J4	J5
540 VDC	3-4	3-4	3-4	3-4	Normal Sensitivity: 3-4 Reduced Sensitivity: 1-2

6. Before restoring load on the UPS, with control power on, navigate to the **Battery Gnd Fault** screen in the UPS Configuration- System Settings- Options screen on the mimic panel and select Yes for the option. Also navigate to the **Battery Gnd Fault Breaker Trip** screen in the User Settings and select YES.

Table 13   Selections

Configuration	Default	Selected	Range
System Settings			
Options			
Battery Ground Fault	Yes	Yes	Yes --- No
User Setting			
Batt Gnd Fault Breaking Trip	Yes	Yes	Yes --- No

17.0 AUTO RESTART

The Auto Restart feature allows the UPS to restart without operator intervention after shutting down due to loss of input power and complete discharge of the batteery. When the utility is restored, this feature directs an automatic restart, delivering the load power through the inverter, connecting the batteries to the DC bus, and recharging the batteries. To utilize this feature your system must have a Liebert Auto Restart Battery Motor Fuse Kit and a motorized Battery Breaker.

To enable and operate the Auto Restart feature, see the section on **Auto Restart** in the Operation and Maintenance Manual.

Figure 78 Auto Restart Fuse Kit

30 - 80KVA   100 - 130KVA
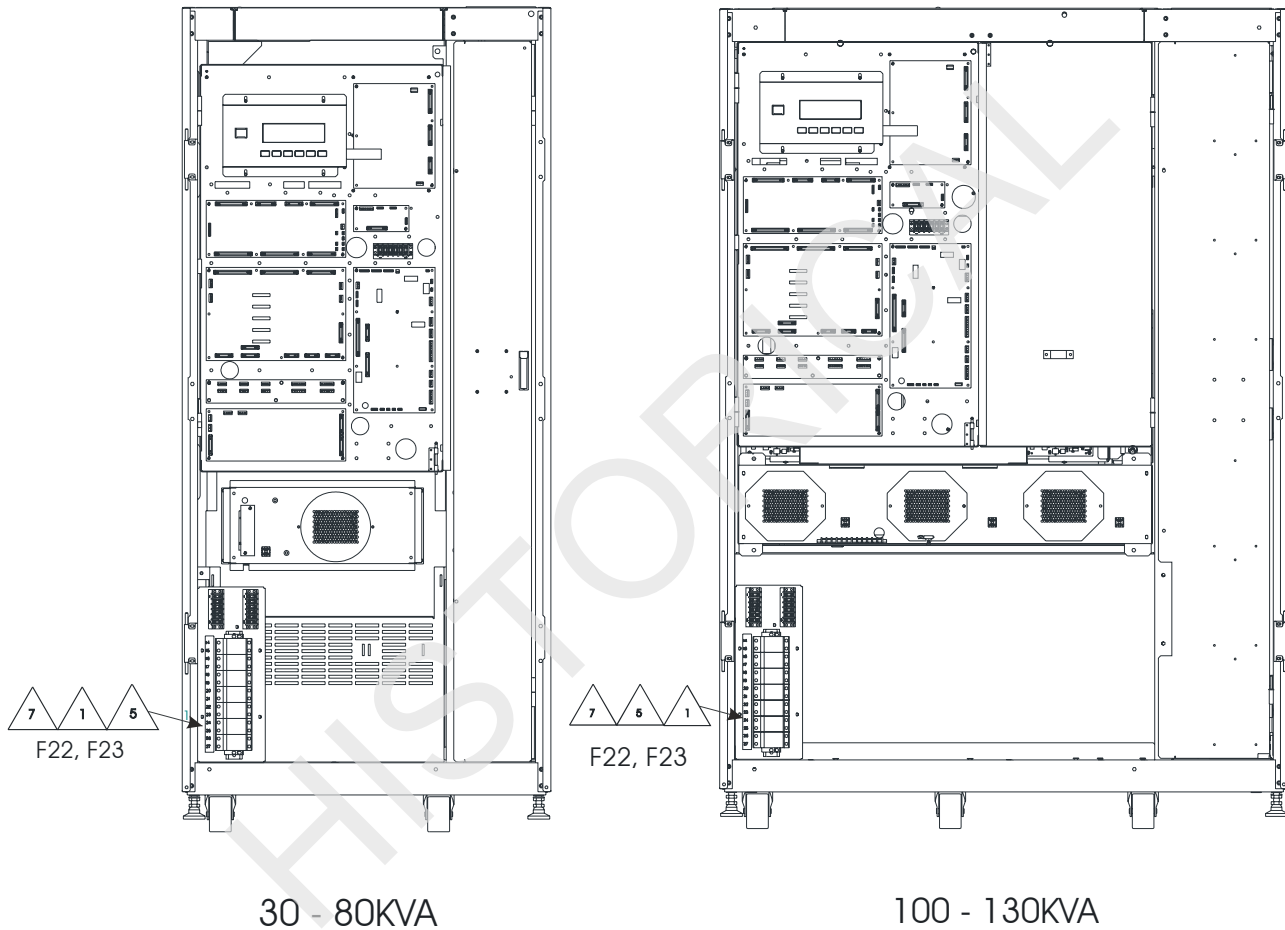
INSTALLATION NOTES

1. Insert fuses (provided in kit) at location F22 and F23.
2. Motor operator fuse kit is required only if motorized battery cabinets are used. Motorized battery cabinets are required for the Auto Restart option.
3. Refer to Operation and Maintenance Manual for safety precautions before inserting fuses. Always replace with same type and fuses of same rating.
4. Refer to Operation and Maintenance Manual for instructions to enable the Auto Restart option.
5. Fuse Liebert part number is 12-714092-19 BUSSMAN part number FNQ2.5.
6. No other fuse is required.
7. Place new fuse label (in kit) over label 12-813534-00 on fuse block assembly.

18.0 LOAD BUS SYNC

18.1 System Description

The Liebert Load Bus Sync (LBS) option keeps the output of two independent Uninterruptible Power Systems (UPSs) in sync, even when the two UPSs are operating from two different power sources. Any UPS will typically sync to its bypass source. As long as both UPSs are tied to the same input and bypass sources, they will automatically stay in sync. However, if the UPSs are operating on batteries, on different backup generators or asynchronous bypass sources, their outputs will tend to drift out of sync.

Maintaining sync is critically important for installations with dual power distribution systems. These sites typically feature Liebert Precision Power Centers (PPC) with Liebert Static Bus Transfer Switches (STS's). Each STS has dual inputs: it can receive power from either UPS, and switch seamlessly between the two as long as the UPS outputs are held in close synchronization. This provides redundancy down to the PPC level. It also permits one entire half of the distribution system (upstream of the STS) to be taken offline for maintenance or repairs.

The Load Bus Sync option consists of interface modules in each UPS plus one LBS Controller installed between the UPSs. The Controller includes an LBS Control Panel and may include a separate LBS Transformer Cabinet or just an LBS Control Panel depending upon the application.

The Load Bus Sync™ (LBS) Option enables the Npower UPS to synchronize its output to that of another Npower UPS or to a Series 300 or Series 600 Liebert UPS module. The LBS interface module can be installed at the factory for new UPS modules or retrofitted in the field for existing UPS modules.

Figure 79 Load Bus Sync (LBS) Control Panel
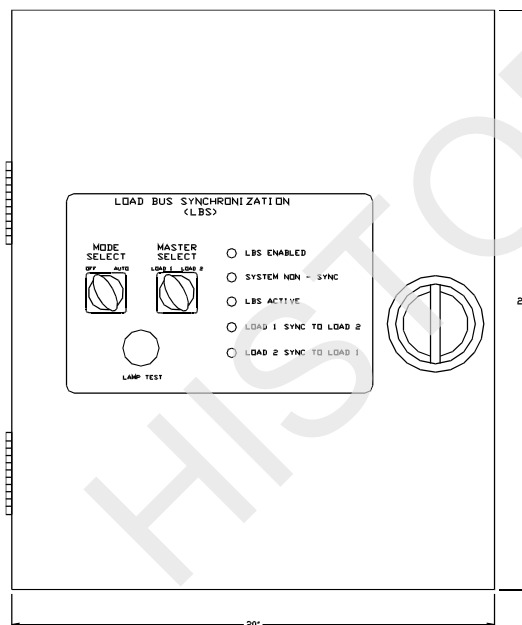
18.2 General Description

The Liebert Load Bus Sync (LBS) option works by switching the internal sync reference signal from the UPS bypass to the Critical Bus of the other UPS. Furthermore, the LBS is dormant until the two UPSs drift more than a predetermined amount out of sync.

The LBS Control Panel contains circuits that fit into a compact 20x24 inch enclosure. Front panel controls are simple and fault tolerant. They enable the operator to select:

- Whether the circuit will function automatically or be "Off," and
- Whether UPS #1 or UPS #2 will be the Designated Master System (DMS). The other UPS system then becomes the Designated Slave System (DSS) unless it is On Bypass.

The LBS Transformer Cabinet contains transformers that compensate for Bypass voltages that are Phase shifted 30 degrees from the UPS Output or that are Phase shifted 30 degrees and also different in magnitude from the UPS Output.

18.3   System Operation

The LBS option performs the following functions:

- Continuously senses the phase relationship between the outputs of the two UPSs that make up the system.
- If the two systems lose sync with each other for more than a predetermined period of time (adjustable 0.1 to 5 seconds), the LBS will sync the Designated Slave System (DSS) to the Designated Master System (DMS) if the Auto/Off switch is in the Auto position. DSS and DMS are selected manually via the master system select switch. If the DSS is on bypass and unable to sync to the DMS, the DMS will then sync to the output bus of the DSS. This re-selection of master will be accomplished automatically.
- Continuously monitors the quality and sync of the bypass input voltage to both systems. Once quality and sync between the two have been re-established for five seconds, the LBS will revert to separate sync for both systems, each synchronized to its own bypass.
- Failure of any part of the LBS controls will not cause system failure. The worst case effect of a failure in the LBS will be a failure of the two systems to synchronize with each other during times when both systems are not synchronized to utility power.

18.4   Load Bus Sync (LBS) Installation

Before you begin the installation process, read through these instructions and take all necessary safety precautions to protect yourself and the equipment you are about to install. Observe all warnings and cautions listed in the front of this manual when wiring the System.

These instructions cover the installation of the LBS interface board in the Npower UPS and installation of the LBS wall-mounted Controller (wall mounted LBS Control Panel and wall-mounted LBS Transformer Cabinet, if applicable). If synchronizing two Npowers, the LBS Interface board installation instructions will be the same for each unit. LBS kits for Controller and Interface cards are ordered separately. Each LBS System requires one Controller (wall mounted) and an Interface Option installed in each UPS. If a S300 Interface option or S600 interface option is ordered it will come with instructions on how to install the option in that unit.

In order to install the LBS Controller and/or LBS Interface Option, both UPS systems to be synchronized must be totally de-energized. This is because of high voltage lines wired between UPSs. To shut down the Npower see **Section 3.2.4 of the Npower Operation and Maintenance Manual.** From the Main Menu screen select the Startup/Shutdown Screen. Select System Shut Down. From the Shut down screen Select Critical Load Shut Down. Press OK. You will be warned that this procedure will dump the critical load. Proceed with the shutdown. When the Npower is shut down, turn off the battery breaker to make sure the unit is fully de-energized. It is a good idea to wait 5 minutes to make sure all the system capacitors have discharged to a safe level. Locate and turn off the circuit breaker on the input line to the UPS. This may be part of a Maintenance Bypass Cabinet, wrap around bypass or upstream feeder breaker. If the other UPS to be synchronized is an Npower, follow the same procedure with that unit, including shutting off its battery circuit breaker. If the other unit is not an Npower, follow the instructions in its Operation Manual to completely de-energize the system, again opening its battery circuit breaker.

WARNING

BOTH UPS SYSTEMS TO BE SYNCHRONIZED MUST BE COMPLETELY DE-ENERGIZED, INCLUDING OPENING THE SYSTEM BATTERY BREAKERS, AND THE UPSTREAM FEEDER OR BYPASS BREAKERS BEFORE YOU ATTACH THE INTER-CONNECTION WIRING BETWEEN THE UNITS AND THE CONTROL MODULE.

The LBS option consists of the Wall Mounted Controller (and in some applications an additional wall mounted LBS Transformer Cabinet) and LBS Interface option for each of the modules to be sync'd together. If you ordered the LBS option from the factory, the LBS Interface option will already be mounted in the unit. The LBS Controller will ship with the UPS in a separate box, as will the LBS Transformer Cabinet.

18.4.1 Mechanical Installation of LBS Controller

Figure 80 LBS Mechanical Installation
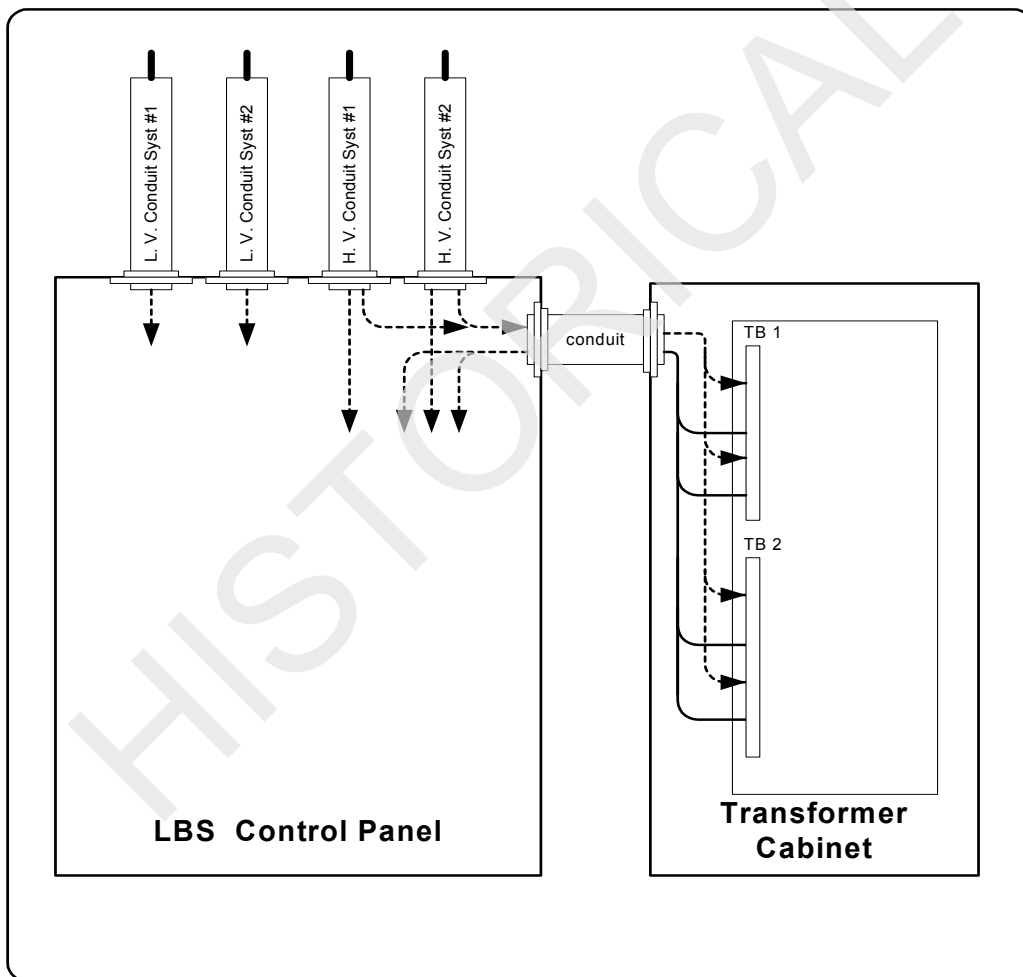
To install the LBS Control Panel, refer to Drawing # 88-813540-00, enclosed in the LBS Controller shipping box. Use the provided key and open the door to the LBS Control Box. Locate a wall or pillar that is on the path between the two modules to be synchronized. Keep the two runs as equal as possible. Do not exceed 500 feet for either run. Mount the Controller on the wall or pillar using the appropriate type of attachment hardware for the class of wall material. Use the 2 keyhole slots in the top back of the Control box to mount the Controller unit. Once the wall mount unit is hung, use the two holes at the bottom of the box to secure the unit.

To install the LBS Transformer Cabinet, refer to Drawing # 88-812571-00, enclosed in the LBS Transformer Cabinet shipping box. Use the provided key and open the door to the LBS Transformer Cabinet. Locate a wall or pillar that is close to the LBS Control Panel. Mount the LBS Transformer Cabinet on the wall or pillar using the appropriate type of attachment hardware for the class of wall material. Use the two keyhole slots in the top back of the LBS Transformer Cabinet to mount the unit. Once the wall mount unit is hung, uses the two holes at the bottom of the box to secure the unit.

Run two appropriately sized conduits from the Control Panel to each UPS. One conduit should assigned to high voltage. The other conduit should be assigned to low voltage control. All wires should be # 14 AWG. Do not mix high and low voltage wires in the same conduit.

The other end of the conduit(s) should be landed on the UPS(s) in the area designated to land control wiring. On the Npower this is either the top front or bottom front signal wire landing areas.

Run one appropriately sized conduit (if applicable) between the LBS Control Panel and the LBS Transformer Cabinet. This will be used to carry high-voltage wires:

- between the LBS Transformer Cabinet and the Control Panel and
- between the LBS Transformer Cabinet and the UPS(s).

Figure 81 LBS Block Diagram
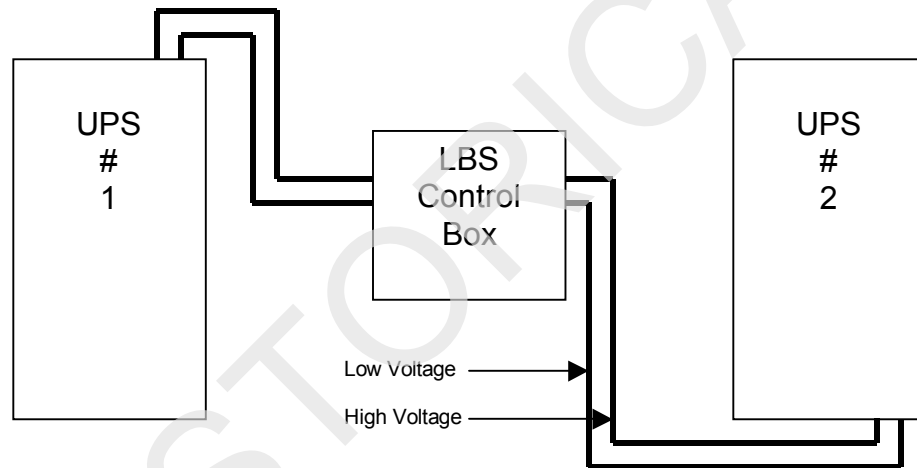
Figure 82 LBS Assembly Diagram
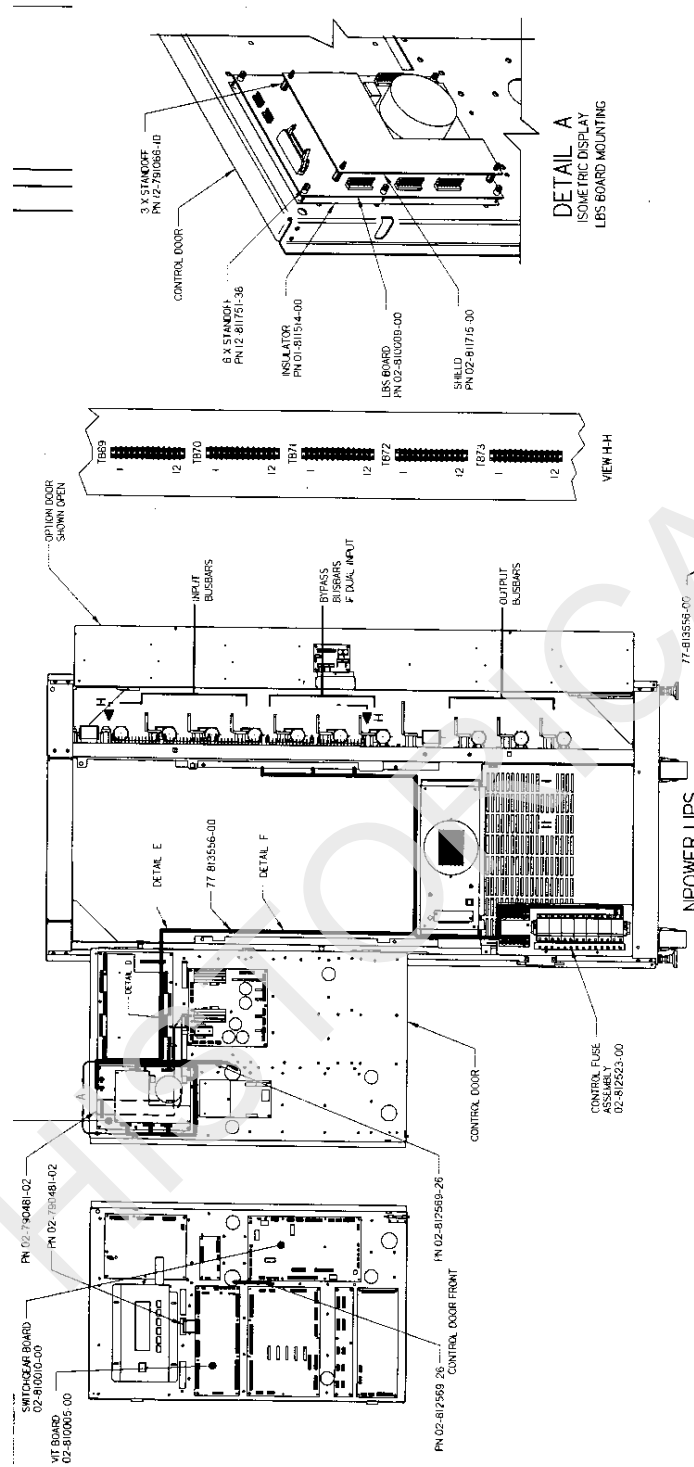
Figure 83 Details of Connection to Terminal Block
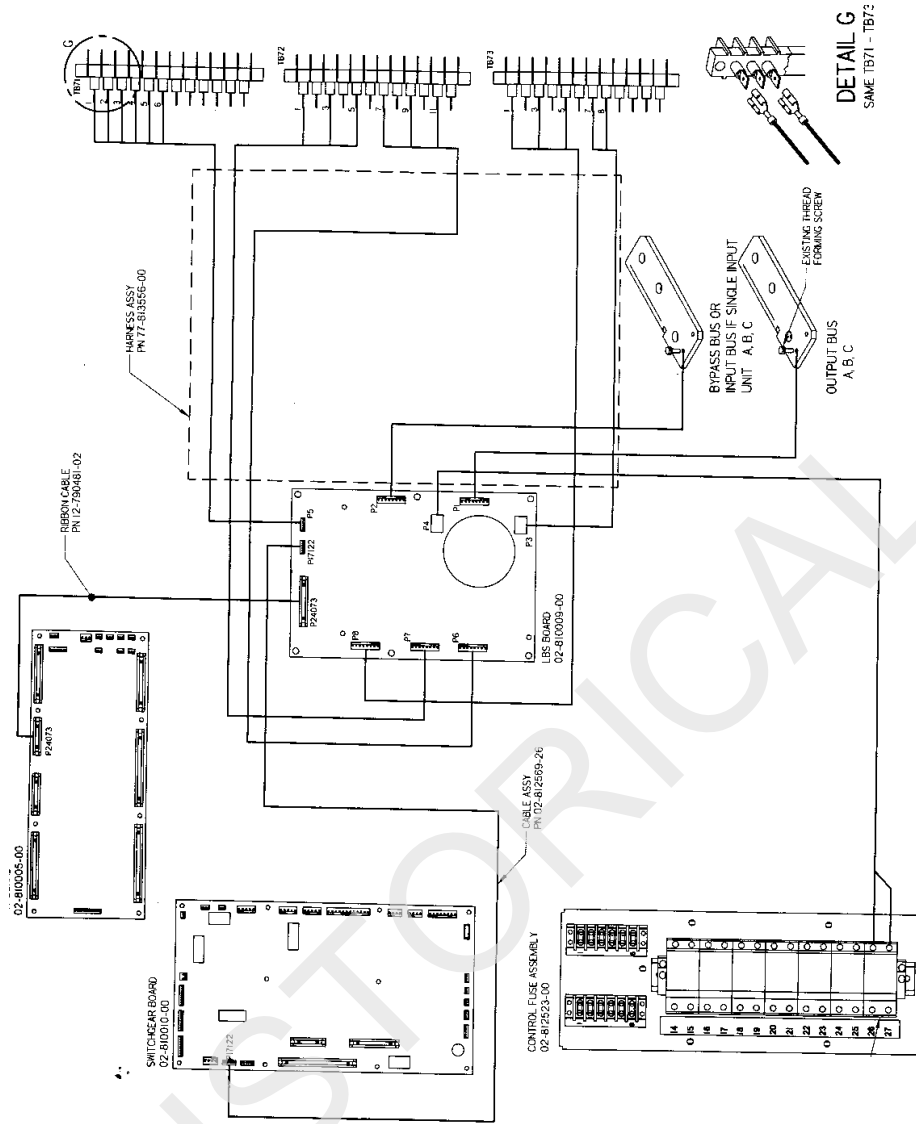
## 18.4.2 LBS Interface Option Installation Procedure

⚠ **WARNING**

BOTH UPS SYSTEMS TO BE SYNCHRONIZED MUST BE COMPLETELY DE-ENERGIZED, INCLUDING CLOSING THE SYSTEM BATTERY BREAKERS, AND THE UPSTREAM FEEDER OR BYPASS BREAKERS BEFORE YOU INSTALL THE LBS INTERFACE BOARD AND ATTACH THE INTER-CONNECTION WIRING BETWEEN THE UNITS AND THE CONTROL MODULE.

A LBS Interface Option is required in each Npower UPS. If the option was not factory installed, then the Printed Wiring Assembly (PWA), wire harnesses, and the mounting hardware (supplied with the kit 83-813556-00)has to be installed. Refer to Installation Drawing 88-812561-30; supplied with the Kit. Mount the PWA on the back of the control door as shown in the Installation drawing. Route the wire from the LBS Interface PWA to the Terminal blocks as shown in the installation drawing. Also route the supplied ribbon cable as shown in the figure, from the LBS Interface PWA on the back of the control door through the slot to connect up with the VIT board on the front of the control door. Attach both ends of the ribbon cable at the plug labeled P24073 on both boards. On the VIT board move the jumpers on J1 through J6 from position 1&2 to position 2&3.

Using harness Part Number 77-813556-00, route the harness as indicated in installation drawing, from the LBS Interface Board to the Fuse control assembly. Connect the wires per the following table:

Control Fuse Assembly	LBS Interface Board
F26-2 (Load Side)	P4-3
F27-2 (Load Side)	P4-4

Using Harness Part Number 77-813556-00, route the harness as indicated in the installation drawing, from the LBS Interface Board to the Customer Terminal block. Connect the wires per the following table:

Customer Terminal Block	LBS Interface Board
TB72-1	P7-1
TB72-3	P7-4
TB72-5	P7-8
TB72-7	P6-1
TB72-9	P6-4
TB72-11	P6-8
TB73-1	P8-1
TB73-3	P8-4
TB73-5	P8-8
TB73-7	P3-2
TB73-8	P3-1

Using Harness Part Number 77-813556-00, route the harness as indicated in the installation drawing, from the LBS Interface Board to the Bypass Bus Bars Connect the wires per the following table:

Bypass Bus Bars	LBS Interface Board
Phase A	P2-1
Phase B	P2-4
Phase C	P2-8

Using Harness Part Number 77-813556-00, route the harness as indicated in the installation drawing, from the LBS Interface Board to the Output Bus Bars. Connect the wires per the following table:

Output Bus Bar's	LBS Interface Board

Phase A	P1-1
Phase B	P1-4
Phase C	P1-8

Using Harness Part Number 02-812569-26, route the harness as indicated in the installation drawing, from the LBS Interface Board to the Switchgear PWA (02-810010-00). Attach both connectors to the connector (labeled P17122) on the PWA's. The attached harness with connector will make the following connections:

Switchgear PWA	LBS Interface Board
P17122-1	P17122-1
P17122-2	P17122-2
P17122-3	P17122-3
P17122-4	P17122-4
P17122-5	P17122-5
P17122-6	P17122-6

Using Harness Part Number 77-813556-00, route the harness as indicated in the installation drawing, from the LBS Interface Board to the Customer Terminal Block. The connector end connects to pins P5-1 to P5-6 on the LBS interface Board. The Customer Terminal Block end is connected per the following table:

Customer Terminal Block	LBS Interface Board
TB71-1	P5-1
TB71-2	P5-2
TB71-3	P5-3
TB71-4	P5-4
TB71-5	P5-5
TB71-6	P5-6

Make sure all of the control wires are properly routed, tire wrapped and excess wire is coiled out of the way. Make sure none of the wiring is pinched or otherwise interferes with the operation of the control door.

This completes the installation of the LBS interface Option. The following section contains information on different wiring configurations, followed by instructions for enabling the LBS Option.

⚠️ **CAUTION**
If the LBS option is not enabled the LBS feature will not operate.

Close and re-latch the control door. Follow the instructions in Section 3.2.3 of the Npower Operation and Maintenance Manual to restart the system.

18.4.3 LBS Wiring (Npower to Npower)

Use **Figure 84 - LBS Npower to Npower Wiring without Transformer Cabinet** for the Npower UPS Systems when there is no phase shift between the UPS Bypass and the UPS Output. Alternatively use drawing 88-813561-00 included with the documents shipped with Controller 83-813561-XX.

Use wiring that includes a Transformer Cabinet (**Figure 85**) when there is a 30 degree phase shift between the UPS Bypass and the UPS Output. Alternatively use drawing 88-813561-00 included with the documents shipped with Controller 83-813561-XX.

18.4.4 LBS Wiring (Npower to Series 300)

Wire without a Transformer Cabinet (**Figure 84**) when there is no phase shift between the UPS Bypass and the UPS Output. Use drawing 88-813562-00 included with the documents shipped with Controller 83-813562-XX.

Wire including a Transformer Cabinet (**Figure 85**) where there is a 30 degree phase shift between the UPS Bypass and the UPS Output. Use drawing 88-813562-00 included with the documents shipped with Controller 83-813562-XX.

18.4.5 LBS Wiring (Npower to Series 600T)

Wire without a Transformer Cabinet (**Figure 84**) when there is no phase shift between the Npower Bypass Source and the Npower Output. Use drawing 88-813563-00 included with the documents shipped with Controller 83-813563-XX.

Wire including a Transformer Cabinet (**Figure 85**) where there is a 30 degree phase shift between the Npower Bypass Source and the Npower Output. Use drawing 88-813563-00 included with the documents shipped with Controller 83-813563-XX.
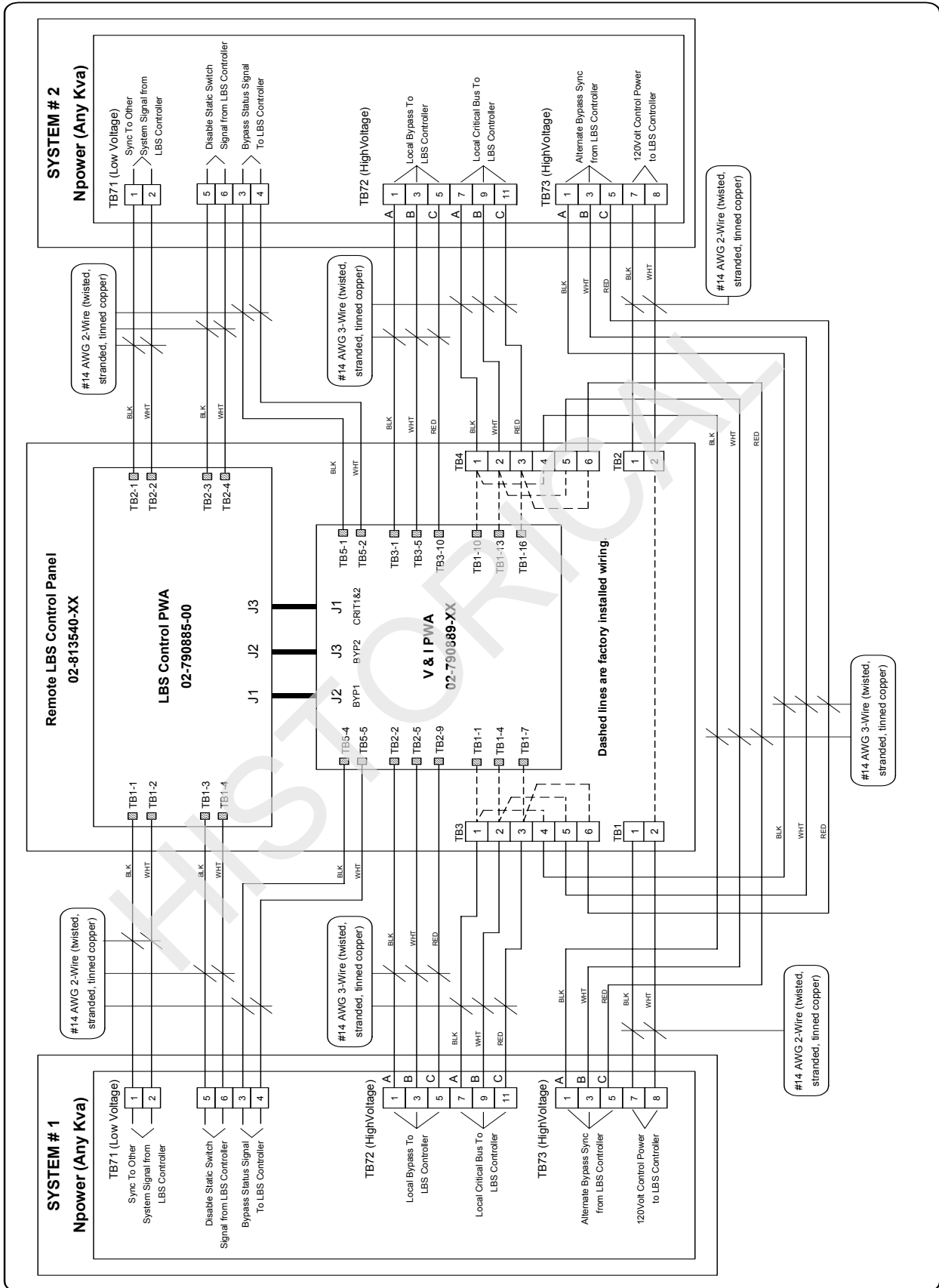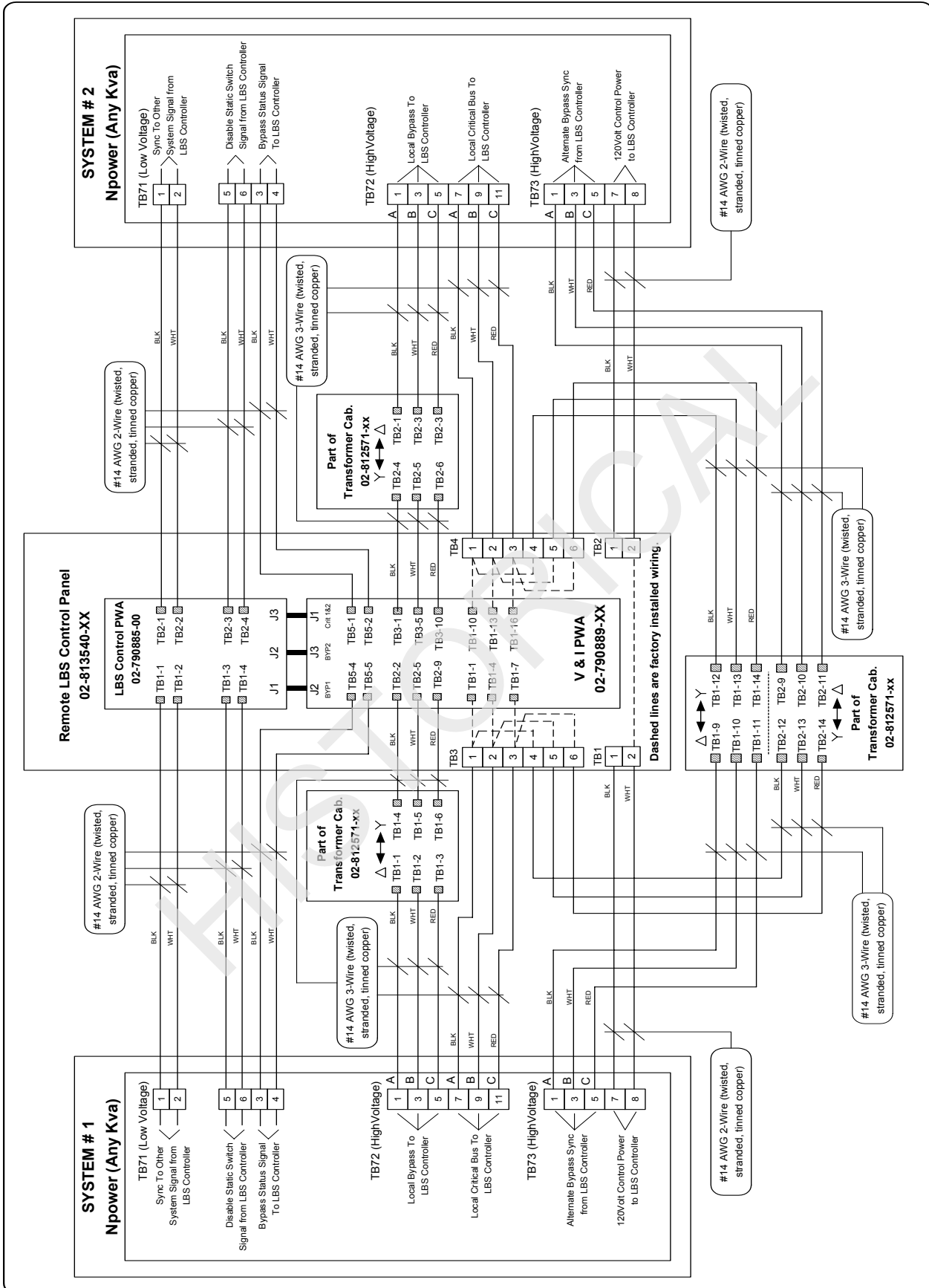
Figure 84 LBS Npower to Npower Wiring without Transformer Cabinet

Figure 85 LBS Npower to Npower Wiring with Transformer Cabinet

Your installation is now complete and you can close the doors to the controller enclosure(s).

You can now restart the unit. Follow the start up procedures in the **Operations and Maintenance Manual Section 3.2.3**. If one of the units is not an Npower, follow the start up procedures found it that units manual.

18.4.6   LBS Option Enable Procedure

Once the UPS has completely restarted you will need to enable this option.   From the Mimic Screen use the arrow keys to highlight Main Menu. Press SELECT. From the Main Menu Screen use the arrow keys to highlight Configuration, Press SELECT. On the Configuration Screen use the arrow keys to highlight System Settings, press SELECT. On the System Setting Screen use the arrow keys to highlight Options, Press SELECT. On the Options Screen highlight LBS. Use the SELECT key to toggle between NO and YES. Set the LBS Option to YES, this will enable the LBS option. On the Option Screen highlight EXIT, press SELECT. This will take you back to the System Setting Screen. You must select SAVE &EXIT on this screen and press SELECT.

⚠ **CAUTION**
You must press SAVE & EXIT from the System Setting Screen to save the command to enable the LBS Option.

This completes the installation of the LBS option.

18.5   Operator Controls

Operation of the LBS has deliberately been kept as simple as possible. There are only three controls and five indicator lights on the LBS enclosure.

The indicators are:

1. **LBS Enabled**. Indicates that the load bus sync circuitry is in the Automatic mode.
2. **System Non-Sync**. Indicates that the DSS is no longer in sync with the DMS. This alarm will indicate during the transition from internal bypass sync to DMS sync.
3. **LBS Active**. Indicates that the LBS circuitry has taken over the sync of the UPS. If the System Non-Sync indicator is also on, it means that synchronization is in process.
4. **Load 1 Sync to Load 2**. Indicates that the UPS critical bus is synchronized to the output of the DMS, in this case UPS #2. This indicator will turn on when the sync process is complete.
5. **Load 2 Sync to Load 1**. Indicates that the UPS critical bus is synchronized to the output of the DMS, in this case UPS #1. This indicator will turn on when the sync process is complete.

As an option, all indicators mentioned above can be supplied with Form C dry contacts for remote monitoring.

Standard LBS controls are:

1. **Mode Select Switch**. Provides manual selection of automatic operation or "Off" modes. In the Automatic mode, the LBS will be enabled. In the Off mode, both UPSs will synchronize independently.
2. **Master Select Switch**. Provides manual selection of the DMS source. The LBS circuitry will automatically switch DMS sources should the initially selected DMS lose its bypass input.
3. **Lamp Test**. Push this button to test indicator lights.

Operator Procedures:

The only two operator controls are the Mode Select Switch and the Master Select Switch. The Mode Select Switch can be left in the Automatic position all the time. The Off position can be selected at times when it is desired to let the UPSs synchronize independently.

The Master Select Switch allows the operator to choose which UPS bypass source will provide the reference sync signal.

In normal operation, both UPS systems will be functioning and the LBS Mode Select Switch will be in the Automatic position. The LBS Enable indicator will be lighted, as will one of the indicators for Load X Sync to Load Y. If the two UPS drift out of sync (while on generator or battery, for example), the LBS Active and System Non

Sync indicators will be lighted. The Load X Sync to Load Y indicator will be off during the synchronization process and turn back on when the process is complete.

19.0 INPUT TRAP FILTER

This feature allows the Operator to decide whether or not the input trap filter should be disconnected at light loads to prevent a leading power factor at the input. With this feature, the Operator can select the percent power level at which the input trap filter contactor is opened. To access the proper screen, navigate to the CONFIGU-RATION screen, and from there to USER SETTINGS, Page 5. Highlight 10% PASSIVE FILTER SETTINGS, and press SELECT to bring up the following screen.

Figure 86 10% Passive Filter Settings Screen

```
                    10% PASSIVE FILTER SETTINGS


      FILTER DISCONNECT LEVEL              0
      FILTER PREFERRED STATE               CLOSED
      10% PASSIVE FILTER CONTACTOR         DISABLE



                            EXIT
```

If the Operator selects FILTER DISCONNECT LEVEL 0 (a password-protected screen), he is able to select the INPUT POWER DISCONNECT LEVEL by using the UP and DOWN keys on the front panel. The Operator must select a value in increments of 10.

0% Disables the Input Trap Disconnect feature. (Default = O%)

10%

20%

30%

40%

50%

Any non-zero percent power setting will automatically enable this feature, allowing automatic opening and closing of the input trap contactor if needed. When excessive cycling occurs, however, The Excessive Trap Disconnects alarm becomes active. It remains active until the Operator clears the alarm on the front panel. The Operator must also manually change the power trip level to 0% to disable the operation of the filter. Then to re-enable the automatic disconnect feature, the Operator must select a non-zero Power Trip Level.

When the Filter Disconnect Level is set to 0, the Operator can select FILTER PREFERRED STATE, allowing him to choose between OPEN and CLOSED (the state of the contactor once an "Excessive trap Disconnects" alarm is detected.) The default setting is OPEN.

20.0 APPENDIX

Table 14   Alarms, Functions, and Corrective Actions

Actual Alarm/fault Name Displayed On Front Panel	Description of Alarm/ Fault	Fault Or Alarm	Latch Mask	Dial Mask	Freeze Mask	Event Log Mask	Meaning and Corrective Action(s)
Battery Fuse Fail	Battery Fuse Fail	Fault	YES	YES	NO	YES	Control Logic has determined that the battery breaker(s) is closed and the battery fuse has been open for 10 seconds or longer. Battery back-up is no longer available. *Liebert Global Services should be called immediately.*
Battery Low xfer	Battery Low Transfer	Fault	YES	YES	YES	YES	Control Logic has determined that the battery breaker(s) is closed and the battery voltage has dropped below the End of Discharge limit. The UPS will transfer to bypass. If the transfer is successful, the UPS will be shut down. If the transfer was unsuccessful, logic will attempt to complete a System Shutdown before control power is lost. *Verify that input power is now available and restart the UPS following the instructions in this manual. If the system fails to restart properly contact Liebert Global Services.*
DC Ov Transient	DC Overvoltage Transient	Fault	YES	YES	NO	YES	DC bus voltage is 15% or more over the nominal DC Bus Voltage. The UPS will transfer the load to Bypass and will shut down and isolate the UPS Module. *Contact Liebert Global Services immediately*
Inp Phase Rot Error	Input Phase Rotation Error	Fault	NO	NO	NO	YES	The power conductors on the Input line are not wired to the UPS in the required sequence. This alarm should appear only during initial start-up or after a repair to the source power system. *Disconnect power from the Input line and correct the wiring. Liebert Global Services must be present during initial start-up of your UPS System.*
Rectifier Fuse Fail	Rectifier Fuse Fail	Fault	YES	YES	NO	YES	At least one fuse has opened. The UPS automatically transfers the critical load to the bypass line. Contactors trip open to shut down and isolate the UPS module. *Contact Liebert Global Services immediately. Do not attempt to reset the circuit breakers.*
Trap Fuse Fail	Trap Fuse Fail	Fault	NO	YES	NO	YES	On units equipped with an input filter, Control Logic has determined that one or more of the filter fuses is open. The logic will open the Input filter contactor. The UPS will continue to run, without input filtering. *Contact Liebert Global Service to check and repair the input filter.*
On Battery	On Battery	Alarm	NO	NO	NO	YES	Reports an On Battery state as long as the battery CB is closed, Input Undervoltage alarm exists, and the status bit ON UPS is set.

Actual Alarm/fault Name Displayed On Front Panel	Description of Alarm/ Fault	Fault Or Alarm	Latch Mask	Dial Mask	Freeze Mask	Event Log Mask	Meaning and Corrective Action(s)
Battery Overcharge	Battery Overcharge	Fault	YES	YES	NO	YES	Battery charge current is 50% above the Battery Charge Current Limit for longer than 5 seconds. The load will be transferred to Bypass. If Bypass is not available the UPS will attempt to run from the battery. If both battery and bypass are not available, a full system shutdown will be initiated. This fault will inhibit start-up. *Contact Liebert Global Services immediately*
Byp Freq Error	Bypass Frequency Error	Fault	NO	NO	NO	YES	The bypass frequency is outside the ± 5% of the system rating. If the load is on bypass the static switch will be shut down and power will be lost to the load. If the load is on UPS, transfer to bypass will be inhibited, until this fault clears or is corrected. This fault will inhibit startup. *If fault persists check the bypass source for the cause of the frequency irregularity. Contact Liebert Global services if you have questions.*
Byp ovld Shutdown	Bypass OverLoad Shutdown	Fault	YES	YES	NO	YES	With the load on Static Bypass the system has determined that at least one phase of the Bypass has exceeded the KVA, KW, or RMS current vs. Time overload spec. The Static Bypass switch will be turned of and the system will be shut down. Power to the load will be turned off. *Remove the excess load from the UPS and attempt to re-start. If the load is below the rating of the UPS and it will not re-start, contact Liebert Global Services.*
Byp Phase Rot Error	Bypass Phase Rotation Error	Fault	NO	NO	NO	YES	The power conductors on the bypass line are not wired to the UPS in the required sequence. This alarm should appear only during initial start-up or after a repair to the source power system. *Disconnect power from the bypass line and correct the wiring. Liebert Global Services must be present during initial start-up of your UPS System.*
IDC Peak	IDC Peak	Fault	YES	YES	NO	YES	The system has detected a failed IGBT. The unit will transfer to Bypass if available. *Contact Liebert Global Services immediately.*
Inverter Ovld xfer	Inverter Overload Transfer	Fault	YES	YES	YES	YES	With the load on UPS, at least one phase of the UPS KVA or KW has exceeded the rated KVA, KW, or RMS current vs. Time equation. (Note: This fault would have been preceded by an "Inverter Overload Phase x alarm.) The UPS will transfer the load to Static Bypass if it is available. If the fault or overload clears the UPS will automatically transfer from SBS to UPS. *Remove the excess load from the UPS and attempt to re-start. If the load is below the rating of the UPS and it will not re-start, contact Liebert Global Services.*

Actual Alarm/fault Name Displayed On Front Panel	Description of Alarm/ Fault	Fault Or Alarm	Latch Mask	Dial Mask	Freeze Mask	Event Log Mask	Meaning and Corrective Action(s)
Inverter Fuse Fail	Inverter Fuse Fail	Fault	YES	YES	NO	YES	One or more Output Fuses are open. (because of capacitance in the system it may take up to 1 minute after a fuse failure to detect this fault). The system will transfer the load to Static Bypass if available and then shut down the UPS. *Contact Liebert Global Services Immediately.*
Output Ov xfer	Output Overvoltage Transfer	Fault	NO	YES	YES	YES	The UPS module output voltage is above the maximum (+10%) deviation from nominal. The load automatically transfers to the bypass line. The UPS module is shut down and isolated. *Contact Liebert Global Services at once. Do not attempt to reset circuit breakers.*
Output Uv xfer	Output Undervoltage Transfer	Fault	NO	YES	YES	YES	The UPS module output voltage is under the minimum (-12%) deviation from nominal. The load automatically transfers to the bypass line. *If the alarm condition is no longer present, reset the alarm and retransfer the load from bypass to UPS. Contact Liebert Global Services if alarm persists.*
SBS SCR Open	SBS SCR Open	Fault	YES	YES	NO	YES	This fault can only be detected when the load is on bypass. One or more of the Static Bypass phases are open. The static switch will be shut down and the UPS will shut down. Power to the load will be lost. *Contact Liebert Global Services Immediately.*
SBS SCR Shorted	SBS SCR Shorted	Fault	YES	YES	NO	YES	The system has detected a shorted SCR in the Bypass line. If the unit is in the start-up mode, start-up will be inhibited. If the unit is on UPS, the unit will transfer to Bypass and open the output contactor to prevent back feed to the inverter from the Bypass line. Contact Liebert Global Services Immediately.
Inv I limit xfer	Inverter Current Limit Transfer	Fault	NO	YES	NO	YES	The instantaneous inverter current of any one phase has exceeded its Pulse by Pulse current limit value. An "Inverter Current Limit" alarm was already issued and pulse parallel operation was initiated. At the end of pulse parallel the load current has not be reduced below 150% The load will transfer to Static Bypass. If the fault or over load clears the unit will retransfer to UPS. Check the total load compared to the UPS rating, reduce load where necessary. If the UPS does not retransfer when the load is below 100% of the rated load or if the unit shuts down, contact Liebert Global Services Immediately.

Actual Alarm/fault Name Displayed On Front Panel	Description of Alarm/ Fault	Fault Or Alarm	Latch Mask	Dial Mask	Freeze Mask	Event Log Mask	Meaning and Corrective Action(s)
Batt ovtemp cb trip	Battery Overtemp CB Trip	Fault	YES	YES	NO	YES	With the battery breaker closed and the Battery Overtemp…Breaker Trip" option enabled, the internal battery temperature has exceeded its Maximum set point value. The battery UV trip will be activate and the battery will be disconnected from the UPS. Battery Back up is no longer available. Check the battery to determine the possible cause of the overload and remove if possible. Once the battery has cooled below the set point temperature, the battery may be brought on line again. If the problem recurs contact Liebert Global Services.
Batt gnd CB trip	Batt gnd fault CB trip	Fault	NO	YES	NO	YES	With BGF option installed, BGF breaker trip enabled, and batt breaker closed, Comms DPS sees its BGF input asserted by the SWGR. It will issue a batt breaker UV trip and motor op disable. To correct, repair and restart batt via the MM. Contact Liebert Global Services for assistance.
Byp pwr supply fail	Bypass Power Supply Fail	Fault	NO	YES	NO	YES	With Bypass source available, the UPS has determined that the bypass power supply has failed. The SBS will be turned off and the contactors opened. SBS will not be available. This fault will inhibit transfers and start-up. Contact Liebert Global Services immediately.
EPO shutdown	EPO Shutdown	Fault	NO	YES	NO	YES	The Emergency Module Off (or Emergency Power Off) switch has been pressed, which caused the UPS system to shut down and transfer the load to the bypass line (or all power to the critical load has been shut down). Determine the cause of the emergency condition and correct it if possible. Contact Liebert Global Services if you require assistance.
Hsink ovtemp limit	Heatsink Overtemp Limit	Fault	YES	YES	YES	YES	The maximum heat sink temperature limit has been exceeded. (Should be preceded by a "Heatsink" Overtemp Warning alarm). The load will be transferred to the Static Bypass if available. If the load was already on SBS when this alarm occurred, the system will shut down. The fault will clear when the temperature falls below the Heatsink Overtemp Warning threshold. (If this fault doesn't clear soon enough it will lead to an "Overtemp Time-out Shutdown"). If the unit is still running it will make an attempt to auto-retransfer when the fault clears. If the faults do not clear; contact Liebert Global Services.
Inp pwr supply fail	Input Power Supply Fail	Fault	NO	YES	NO	YES	The input source is present, but the input power supply has failed. The unit has redundant power supplies on both the input and the output. Contact Liebert Global Services immediately.

Actual Alarm/fault Name Displayed On Front Panel	Description of Alarm/ Fault	Fault Or Alarm	Latch Mask	Dial Mask	Freeze Mask	Event Log Mask	Meaning and Corrective Action(s)
Out pwr supply fail	Output Power Supply Fail	Fault	NO	YES	NO	YES	The output source is present, but the output power supply has failed. The unit has redundant power supplies on both the input and the output. Contact Liebert Global Services immediately.
Ups Ambient Limit	UPS Ambient Ot Limit	Fault	YES	YES	YES	YES	The Outlet air temperature has exceeded its maximum set point. The UPS will transfer the load to bypass if available. If already on bypass the system will shutdown. The fault will clear when the temperature falls below the Outlet Air Overtemp Warning threshold. (If this fault doesn't clear soon enough it will lead to an "overtemp Time-out Shutdown".). If the unit is still running when the fault clears it will auto retransfer to UPS. Check all air inlets and exhausts for blockage and check the air filter. Check the actual load against the UPS rating. Remove any excess load. Contact Liebert Global Services if the alarm persists.
Pwr Supply F1 Fail	Power Supply F1 Fail	Fault	NO	YES	NO	YES	Failure of this fuse will remove control power. The UPS will attempt to transfer to Static Bypass if available. Locate the cause of any failure, before replacing a fuse or Contact Liebert Global Services Immediately.
SWGR Power Fail	SWGR Power Fail	Fault	NO	YES	NO	YES	UPS will transfer to Static Bypass if available and shut down the UPS. Start-up will be inhibited. Contact Liebert Global Services.
Rectifier Fail	Rectifier Fail	Fault	YES	YES	YES	YES	This is a summary event based on the detection of at least one of these faults being active: Battery Overcharge; DC Overvoltage Steady State; DC Overvoltage Transient; DC Undervoltage Steady State; Delta-Wye Current Imbalance; Rectifier Fuse Fail; Rectifier Drive 1 Fail; Rectifier Drive 2 Fail. All actions are controlled by the causal fault.
Inverter Fail	Inverter Fail	Fault	YES	YES	YES	YES	This is a summary event based on the detection of at least one of the following; IDC Peak; IGBT Drive Fail; Output Overvoltage Transfer; Output Undervoltage Transfer; Inverter DC Offset. All actions are controlled by the causal faults.
Ovtemp time-out Sd	Overtemp Time-out Shutdown	Fault	YES	YES	NO	YES	An Equipment Over-temperature condition has persisted for more than 10 minutes. The load is transferred to the bypass line and the UPS module is shut down. Check the air intake, air exhaust, and filters before attempting to start-up the UPS.
Transfer Failed Sd	Transfer Failed Shutdown	Fault	YES	YES	YES	YES	A transfer to Static Bypass was unsuccessfully attempted and power to the load was lost. Attempt to restart the system. Contact Liebert Global Services.

Actual Alarm/fault Name Displayed On Front Panel	Description of Alarm/ Fault	Fault Or Alarm	Latch Mask	Dial Mask	Freeze Mask	Event Log Mask	Meaning and Corrective Action(s)
Ctrl Fault SBS on	Controller fault SBS on	Fault	YES	YES	NO	YES	Indicates that the unit has transferred to SBS without the knowledge of the UPSC. It occurs when the UPSC's Watchdog Fail line is automatically asserted during a UPSC reset. This is a permanent (latched) condition which requires service. Contact Liebert Global Services at once.
Hardware Sd	Hardware Shutdown	Fault	YES	NO	NO	YES	At least one of the following alarm conditions is present: Inverter Fault, Rectifier Fuse Blown, Reverse Power, Over load Shutdown, logic power supply failure, or inverter output symmetry failure. The load automatically transfers to the bypass line. The UPS module is shut down and isolated. Contact Liebert Global Services at once. Do not attempt to reset the UPS.
Opt pwr supply Fail	Option Power Supply Fail	Fault	YES	YES	NO	YES	The Option Power Supply has failed. Remote Alarm Status panels may be disabled. Contact Liebert Global Service.
Batt Discharging	Battery Discharging	Alarm	NO	YES	NO	YES	The battery is discharging. This occurs whenever the battery supplies power to the load for more than five seconds because of input power failure, a rectifier problem, or an overload condition. If the input power or a source of auxiliary power is restored to the UPS module, the UPS automatically returns to normal operation. Watch the battery voltage carefully. Reduce the load (begin controlled shutdown) to extend the battery back-up time. Start the back-up generator, if available. Reset the UPS alarms after the input power is restored. The message clears after 30 seconds.
Input I Imbalance	Input Current Imbalance	Alarm	NO	YES	NO	YES	With input current levels above 30% of nominal and all three phase voltages within 5% of each other, there is a difference between any single input phase current and the average input phase current of more than 25%. The UPS will open the Input filter Contactor. The alarm will clear when the difference in current falls below 20%, but the Input filter contactor will need to be reset, using the front panel. Refer to manual start up instructions.
Input Line Fail	Input Line Fail	Alarm	NO	NO	NO	YES	The rectifier input line voltage is outside of specified limits or the input circuit breaker is opened while the battery circuit breaker remains closed. The battery supplies power to the critical load through the UPS inverter.

Actual Alarm/fault Name Displayed On Front Panel	Description of Alarm/ Fault	Fault Or Alarm	Latch Mask	Dial Mask	Freeze Mask	Event Log Mask	Meaning and Corrective Action(s)
Input OF/UF	Input OF/UF	Alarm	NO	YES	NO	YES	The input frequency is > ± 5% of the nominal frequency. The UPS will begin using the battery to supply power, if by the end of discharge the problem is not corrected, for single input units power to the load will be lost, for dual input units the system will attempt transfer to Bypass if qualified and available.
Input Phase Loss	Input Phase Loss	Alarm	NO	YES	NO	YES	For all of these input problems the system will supply power from the battery until the end of discharge. At that point single input systems will lose power to the load. Dual input systems will attempt to transfer to bypass if qualified and available. Call Liebert Global Services for Assistance.
Input UnderVoltage	Input Under Voltage	Alarm	NO	NO	NO	YES	For all of these input problems the system will supply power from the battery until the end of discharge. At that point single input systems will lose power to the load. Dual input systems will attempt to transfer to bypass if qualified and available. Call Liebert Global Services for Assistance.
Input OverVoltage	Input Over Voltage	Alarm	NO	NO	NO	YES	For all of these input problems the system will supply power from the battery until the end of discharge. At that point single input systems will lose power to the load. Dual input systems will attempt to transfer to bypass if qualified and available. Call Liebert Global Services for Assistance.
Input current limit	Input Current Limit	Alarm	NO	YES	NO	YES	The RMS input current has reached the Input Current Limit setting. Check the UPS load.
Battery CB Open	Battery CB Open	Alarm	NO	YES	NO	YES	The module battery circuit breaker (MBD) is open. This circuit breaker might have been opened either manually or automatically in a UPS shutdown procedure. If the UPS is operating with this breaker open, the critical load is not protected from loss of the utility source power. Manual closure of the battery breaker is inhibited. You must use the front panel to set up the sequence for manual battery re-closure. Follow the instructions in manual start-up.
Batt Supp Active	Batt supplement is active	Alarm	NO	YES	NO	YES	This condition is indicated when the Batt Discharging and Input Undervoltage alarms are simultaneously active. The alarm will clear when the Inp. Undervoltage alarm clears and/or if the rectifier turns off and/or if the Batt Dischg alarm clears.

Actual Alarm/fault Name Displayed On Front Panel	Description of Alarm/ Fault	Fault Or Alarm	Latch Mask	Dial Mask	Freeze Mask	Event Log Mask	Meaning and Corrective Action(s)
Bypass Sync Error	Bypass Sync Error	Alarm	NO	YES	NO	YES	The bypass is out of sync to a sufficient degree that transfer to Static Bypass is inhibited. An interrupted transfer will be permitted only in the case of a critical fault. If this alarm persists, contact Liebert Global Services.
Byp out Tolerance	Bypass Voltage Out of Tolerance	Alarm	NO	YES	NO	YES	One or more bypass voltages is below 80% or above 115% of the nominal value. If the load is on UPS, and the unit is a dual input unit, transfers to bypass will be inhibited. If the unit is a single input unit, the system will shut down. The Alarm will be cleared 5 seconds after all voltage are again with 85-110% of nominal. If the load has been shut down, re-start will be required.
Bypass Line Fail	Bypass Line Fail	Alarm	NO	YES	NO	YES	The bypass source has dropped below 35V per phase. On single input units, the UPS will shut down. On dual input units, transfer to the bypass will be inhibited. The alarm will be cleared five seconds after all voltages again exceed 45V. If the unit is already on Bypass when this occurs, power to the load will be lost.
SBS Ovld Phase A	SBS Overload Phase A	Alarm	NO	NO	NO	YES	With the load on Static Bypass, the phase A output kVA or kW or RMS current has exceeded 115% of the nominal per-phase kVA or kW or RMS current rating. The UPS will show time remaining until a shutdown will occur, per the Overload vs. time curve. The alarm will clear when the overload falls to below 110% of the rating.
SBS Ovld Phase B	SBS Overload Phase B	Alarm	NO	NO	NO	YES	With the load on Static Bypass, the phase B output kVA or kW or RMS current has exceeded 115% of the nominal per-phase kVA or kW or RMS current rating. The UPS will show time remaining until a shutdown will occur, per the Overload vs. time curve. The alarm will clear when the overload falls to below 110% of the rating.
SBS Ovld Phase C	SBS Overload Phase C	Alarm	NO	NO	NO	YES	With the load on Static Bypass, the phase C output kVA or kW or RMS current has exceeded 115% of the nominal per-phase kVA or kW or RMS current rating. The UPS will show time remaining until a shutdown will occur, per the Overload vs. time curve. The alarm will clear when the overload falls to below 110% of the rating.
Inverter I Limit	Inverter Current Limit	Alarm	NO	NO	NO	YES	The instantaneous inverter current of any one phase has exceeded its pulse-by-pulse current limit value. The UPS will shutdown when the Current Overload vs. time curve is exceeded.

Actual Alarm/fault Name Displayed On Front Panel	Description of Alarm/ Fault	Fault Or Alarm	Latch Mask	Dial Mask	Freeze Mask	Event Log Mask	Meaning and Corrective Action(s)
Output OF/ UF	Output OF/ UF	Alarm	NO	YES	NO	YES	Output frequency differs from the nominal (60Hz) by more than 0.5Hz. No transfer or shutdown occurs. Contact Liebert Global Services at once.
Inv Ovld Phase A	Inverter Overload Phase A	Alarm	NO	YES	NO	YES	With the load on UPS, Phase x output KVA or KW or RMS current has exceeded 105% of the nominal per phase rating. The UPS will begin sending the time remaining until a transfer or shutdown will occur, per the Overload vs. Time Curve. The alarm condition will clear when the overload returns to below the nominal rating.
Inv Ovld Phase B	Inverter Overload Phase B	Alarm	NO	YES	NO	YES	With the load on UPS, Phase A output kVA or kW or RMS current has exceeded 105% of the nominal per phase rating. The UPS will begin sending the time remaining until a transfer or shutdown will occur, per the Overload vs. Time Curve. The alarm condition will clear when the overload returns to below the nominal rating.
Inv Ovld Phase C	Inverter Overload Phase C	Alarm	NO	YES	NO	YES	With the load on UPS, PhaseB output KVA or KW or RMS current has exceeded 105% of the nominal per phase rating. The UPS will begin sending the time remaining until a transfer or shutdown will occur, per the Overload vs. Time Curve. The alarm condition will clear when the overload returns to below the nominal rating.
Low Pwr Factor Warn	Low Power Factor Warning	Alarm	NO	YES	NO	YES	On any output phase that is supplying at least 15% of its rated KVA, the measured output power factor is below 0.50, leading or lagging.
Pulse Paralleling	Pulse Parallel Activated	Alarm	NO	YES	NO	YES	With the load being supplied by the inverter, the measured load current exceeds the auto-Parallel Current Limit or the Pulse-by-Pulse Current Limit set point values. If the Static Bypass is available, the SBS supplies supplemental power. If at the end of 10 cycles the load current has not returned to below 105%, the Static Bypass will be left on and the inverter will be turned off. If the over current has cleared the Inverter will be left on and the SBS will be turned off.
Auto rexfer failed	Auto Retransfer Failed	Alarm	YES	YES	NO	YES	After performing a recoverable transfer to bypass, with Auto Rexfer enabled, the Auto Rexfer time out (default=5minutes) has elapsed before retransfer could be performed. A manual retransfer must be performed, which will then clear the lockout and zero the retransfer/ hour counter. If the manual transfer is inhibited, the Inverter may be latched off due to another fault. Contact Liebert Global Services

Actual Alarm/fault Name Displayed On Front Panel	Description of Alarm/ Fault	Fault Or Alarm	Latch Mask	Dial Mask	Freeze Mask	Event Log Mask	Meaning and Corrective Action(s)
Excessive Auto Rexfer	Excessive Auto Retransfers	Alarm	YES	YES	NO	YES	The UPS has determined that the actual number of Auto Retransfers in the past hour has exceeded the permitted maximum. (user settable, default=5). This alarm should not be issued if auto retransfers are disabled by setting the maximum attempts to "0". A manual retransfer must be performed, which will then clear the lockout and zero the retransfer/hour counter.
Aux Power Fail	Aux Power Fail	Alarm	NO	YES	NO	YES	If the unit is supplying power to an Auxiliary device, this alarm indicates that the system has detected a failure in the Aux. Power circuit.
EPO Power Fail	EPO Power Fail	Alarm	NO	YES	NO	YES	If the unit is supplying power to an Auxiliary device, this alarm indicates that the system has detected a failure in the Aux. Power circuit.
LBS Power Fail	LBS Power Fail	Alarm	NO	YES	NO	YES	Power to the Load Bus Sync circuit has been lost. Check external wiring. Contact Liebert Global Services.
Batt Gnd Fault	Battery ground fault alarm	Alarm	NO	YES	NO	YES	With the Batt Gnd Fault option installed and the batt breaker closed, the DSP sees its BGF input asserted by the SWGR. No action required.
Aux Ovtemp Warning	Aux Overtemp Warning	Alarm	YES	YES	NO	YES	With the Auxiliary temp sensor installed, it is reading 85% or more of the specified Maximum Aux temperature set point value.
Batt Ovtemp Warning	Battery Overtemp Warning	Alarm	NO	YES	NO	YES	With the battery breaker closed the battery has exceeded the "Battery Temperature Alarm Threshold" set point value.
Heatsink Ovtemp	Heatsink Overtemp Warning	Alarm	NO	YES	NO	YES	Sensors on the power semiconductor heatsinks detect temperatures above the steady state limits for these components. The control logic sets off the alarm but does not shut down the UPS module if the condition lasts less than 10 minutes. Check the air intake, air exhaust, and filters. Reduce the load or transfer it to bypass. Contact Liebert Global Services if the alarm persists.
Inlet Air Ovtemp	Inlet Air Overtemp Warning	Alarm	NO	YES	NO	YES	The intake air to the UPS module exceeds the specified maximum temperature. *This condition only causes an alarm, but should be corrected immediately to prevent equipment overheating. Check to make sure nothing is blocking the inlet air and that the air filter is clean.*

Actual Alarm/fault Name Displayed On Front Panel	Description of Alarm/ Fault	Fault Or Alarm	Latch Mask	Dial Mask	Freeze Mask	Event Log Mask	Meaning and Corrective Action(s)
Ups Ambient OvTemp	UPS Ambient OvTemp	Alarm	NO	YES	NO	YES	The Outlet air temperature has exceeded 85% of its "Maximum outlet air temperature" limit.
Pwr pole Fan 1 Fail	Power pole Fan 1 Fail	Alarm	NO	YES	NO	YES	A fault in the designated Fan motor has occurred. This condition only causes an alarm, but if not promptly corrected it could cause an equipment over-temperature condition that would shut down the UPS Module. Check the Fans for proper operation. *Contact Liebert Global Services if you require assistance or to replace a fan.*
Pwr pole Fan 2 Fail	Power pole Fan 2 Fail	Alarm	NO	YES	NO	YES	A fault in the designated Fan motor has occurred. This condition only causes an alarm, but if not promptly corrected it could cause an equipment over-temperature condition that would shut down the UPS Module. Check the Fans for proper operation. *Contact Liebert Global Services to replace a fan.*
Pwr pole Fan 3 Fail	Power pole Fan 3 Fail	Alarm	NO	YES	NO	YES	A fault in the designated Fan motor has occurred. This condition only causes an alarm, but if not promptly corrected it could cause an equipment over-temperature condition that would shut down the UPS Module. Check the Fans for proper operation. *Contact Liebert Global Services to replace a fan.*
System Fan Fail	System Fan Fail	Alarm	NO	YES	NO	YES	A fault in the designated Fan motor has occurred. This condition only causes an alarm, but if not promptly corrected it could cause an equipment over-temperature condition that would shut down the UPS Module. Check the Fans for proper operation. *Contact Liebert Global Services to replace a fan.*
EPO Latched	EPO Latched	Alarm	NO	NO	NO	YES	During start up the EPO switch is sensed as being activated. Startup is inhibited until the alarm is cleared. *Clear the latched EPO via the push-button switch located on the SWGR Board, then perform start up.*
SBS Unable	SBS Unable	Alarm	NO	NO	NO	YES	The UPS output is not synchronized to the bypass power source, the static bypass switch is disconnected, or it has failed internally. Emergency and overload transfer to the bypass source is not available. *If the module does not have a manual disconnect switch, open and re-close the static switch fuseholder. If the alarm conditions are automatically corrected, reset the alarm to clear it. Contact Liebert Global Services if the alarm stays on.*

Actual Alarm/fault Name Displayed On Front Panel	Description of Alarm/ Fault	Fault Or Alarm	Latch Mask	Dial Mask	Freeze Mask	Event Log Mask	Meaning and Corrective Action(s)
Transfer To Byp OK	Transfer To Bypass OK	Alarm	YES	YES	NO	YES	Shows after a successful transfer to Bypass. Display is only momentary.
Low batt capacity	Reduced Battery Capacity	Alarm	YES	YES	NO	YES	Occurs on systems with multiple battery cabinets. Indicates that at least one battery breaker is on and one or more battery breakers in the string are off. In this state, the calculations for battery time remaining and End of Discharge are adjusted accordingly.
Inv Off by User	Inv Off by User	Alarm	YES	YES	NO	YES	The User has turned the inverter off through the front panel. Puts data into the event history log.
Batt Low Warning	Battery Low Warning	Alarm	YES	YES	NO	YES	With the battery breaker closed, the UPS has determined that the DC bus voltage has reached the user settable "Battery Low Warning" set point. *Complete the controlled shutdown of the critical load. Reset the alarms if the input power is restored before shutdown*.
Batt Test Failed	Battery Test Failed	Alarm	YES	YES	NO	YES	With the battery breaker closed, the battery has failed the self-test. Momentary display. Sets flag in the event history log
Batt Test Passed	Battery Test Passed	Alarm	NO	NO	NO	YES	With the battery breaker closed, the battery has passed the self-test. Momentary display. Sets flag in the event history log
Config Modified	Config Modified	Alarm	NO	NO	NO	YES	The User has modified and saved one or more settings on the configuration screen. Momentary display. Sets flag in the event history log
Delayed Batt Charge	Delayed Battery Charge	Alarm	NO	NO	NO	YES	The generator option is installed, the system is on generator and the "Delayed Battery Charge" is suppressing battery charging to reduce the load on the generator.
Reduced I Limit	Reduced Current Limit	Alarm	NO	NO	NO	YES	The UPS recognizes that the source is a generator and has reduced the current limit setting to avoid generator overloading.
Event Log Clear	Event Log Clear	Alarm	NO	NO	NO	YES	Per the user request, all event logs have been cleared. This will be the first alarm in the new log. Momentary display. Sets flag in the event history log.
Batt Not Charging	Battery Not Charging	Alarm	YES	NO	NO	YES	With the battery breaker closed, the battery voltage has not reached 95% of the units "DC Float Voltage" set point within a calculated time (based on the test duration.) This calculation will start immediately at the end of a successful ("Passed") battery self test.

Actual Alarm/fault Name Displayed On Front Panel	Description of Alarm/ Fault	Fault Or Alarm	Latch Mask	Dial Mask	Freeze Mask	Event Log Mask	Meaning and Corrective Action(s)
UPSC-MM comm. Fail	UPSC-MM Comm Fail	Alarm	YES	YES	NO	YES	The UPS has detected a communication failure between its UPS controls and it monitoring system. *Contact Liebert Global Service*.
User Shutdown	User Shutdown	Alarm	YES	YES	NO	YES	The User has initiated an "Inverter Off" or "System Shutdown" through the User Shutdown screen.
Cant Exec Batt Test	Cannot Execute Battery Test	Alarm	NO	NO	NO	YES	The battery test could not be performed.
Batt Not Charged	Battery Not Charged	Alarm	NO	NO	NO	YES	A battery test cannot be executed because the battery charge is less than 90%.
Sys Time Set By Op	System Time Set By Operator	Alarm	YES	YES	NO	YES	The User has changed the Date or Time from the front Panel. Momentary display. Sets flag in the event history log.
Manual XFER	Manual Transfer	Alarm	NO	NO	NO	YES	The User has ordered a manual transfer from UPS to Bypass from the front panel controls. Momentary display. Sets flag in the event history log.
Manual ReXFER	Manual Retransfer	Alarm	NO	NO	NO	YES	The User has ordered a manual transfer from Bypass to UPS from the front panel controls. Momentary display. Sets flag in the event history log.
Batt Cycle Buff Full	Battery Cycle Buffer Full	Alarm	NO	NO	NO	YES	With batt breaker closed, Monitor has determined that the buffer that keeps track of the number of hits the battery has taken is full. No action required.
Auto Restart Failed	Auto Restart Failed	Alarm	NO	NO	NO	YES	If Auto Restart feature is installed and enabled, and the last shutdown was due to a failed Batt Low Transfer, the Monitor will automatically attempt to perform the "normal" startup sequence when power is reapplied to normal value. This alarm is issued if the restart could not be performed before the Auto Restart timeout expired. The Monitor will abort the auto restart.
Auto Rexfer Primed	Auto Retransfer Primed	Alarm	NO	NO	NO	YES	An automatic retransfer will be initiated when the OK to Transfer condition has been present for 10 seconds, if the overload has dropped below 100% of the rated load.
LBS Active	LBS Active	Alarm	NO	NO	NO	YES	The Load Bus Sync Option is active.
On Gen Active	On Gen Active	Alarm	NO	NO	NO	YES	A generator is supplying the system.

Actual Alarm/fault Name Displayed On Front Panel	Description of Alarm/ Fault	Fault Or Alarm	Latch Mask	Dial Mask	Freeze Mask	Event Log Mask	Meaning and Corrective Action(s)
Load On UPS	Load On UPS	Alarm	NO	NO	NO	YES	The Static Switch is off and the load is on UPS. Momentary display. Sets flag in the event history log.
Load On Bypass	Load On Bypass	Alarm	NO	NO	NO	YES	The critical load is being supplied power from the bypass line, and is therefore exposed to utility power disturbances. *Clear all of the alarms before attempting to retransfer the load from the bypass line to the UPS*
Password Entered	Password Entered	Alarm	YES	NO	NO	YES	The User has modified the Password. Momentary display. Sets flag in the event history log.
Auto Restart Init	Auto Restart Initiated	Alarm	NO	NO	NO	YES	If the Auto Restart feature is installed and enabled, and the last shutdown was due to a failed Batt Low Txfer, the Monitor automatically initiates the "normal" startup sequence when the source power is reapplied to normal value. This alarm is issued as notification that auto-restart has begun. No action required.
Normal Operation	Normal Operation	Alarm	NO	NO	NO	YES	Notification that no active alarms/faults exist. Sets flag in the event history log.
User Startup init	User Startup	Alarm	NO	NO	NO	YES	User has initiated either a Manual or Auto Start-up from the Start-up/Shutdown screen.
Input Contact #1	Input Contact #1	Alarm	YES	YES	NO	YES	The System has been notified from the OC-DI option that a customer alarm has been activated. The system will substitute user-defined text when displaying these alarms.
Input Contact #2	Input Contact #2	Alarm	YES	YES	NO	YES	The System has been notified from the OC-DI option that a customer alarm has been activated. The system will substitute user-defined text when displaying these alarms.
Input Contact #3	Input Contact #3	Alarm	YES	YES	NO	YES	The System has been notified from the OC-DI option that a customer alarm has been activated. The system will substitute user-defined text when displaying these alarms.
Input Contact #4	Input Contact #4	Alarm	YES	YES	NO	YES	The System has been notified from the OC-DI option that a customer alarm has been activated. The system will substitute user-defined text when displaying these alarms.
Input Contact #5	Input Contact #5	Alarm	YES	YES	NO	YES	The System has been notified from the OC-DI option that a customer alarm has been activated. The system will substitute user-defined text when displaying these alarms.
Input Contact #6	Input Contact #6	Alarm	YES	YES	NO	YES	The System has been notified from the OC-DI option that a customer alarm has been activated. The system will substitute user-defined text when displaying these alarms.

Actual Alarm/fault Name Displayed On Front Panel	Description of Alarm/ Fault	Fault Or Alarm	Latch Mask	Dial Mask	Freeze Mask	Event Log Mask	Meaning and Corrective Action(s)
Input Contact #7	Input Contact #7	Alarm	YES	YES	NO	YES	The System has been notified from the OC-DI option that a customer alarm has been activated. The system will substitute user-defined text when displaying these alarms.
Input Contact #8	Input Contact #8	Alarm	YES	YES	NO	YES	The System has been notified from the OC-DI option that a customer alarm has been activated. The system will substitute user-defined text when displaying these alarms.

NOTE

There are 8 alarms on the Remote Alarm Status Panel. See Section 9.

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While every precaution has been taken to ensure the accuracy and completeness of this literature, Liebert Corporation assumes no responsibility and disclaims all liability for damages resulting from use of this information or for any errors or omissions.

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