

D S P M Inc.

User's Manual

Power Lynx III & Power Lynx III HE
Uninterruptible Power System / Central Lighting Inverter

Technical Manual #018-0056-15 Revision NR



Congratulations on selecting one of the fine products from DSPM, the leader in power protection technology. Our wide product offering includes Uninterruptible Power Systems (UPS), Power Conditioners, Frequency Converters and Specialty Transformers. Since our beginnings DSPM has shipped many of these fine products to discerning customers for use on sensitive equipment and critical loads.

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SAFETY

Important Safety Instructions **Save These Instructions**

This manual contains important instructions for the Power Lynx UPS System and should be followed during the installation, operation and maintenance of the UPS system.

IMPORTANT SAFETY

When using Electrical Equipment, basic safety precautions should always be followed, including the following:

IMPORTANT SAFEGUARDS **READ AND FOLLOW ALL SAFETY INSTRUCTIONS**

1. Do not mount near gas or electric heaters.
2. Check that all electrical connections are tightened properly.
3. Equipment should be mounted in a location to prevent tampering by unauthorized personal.
4. Equipment should be locked at all times.
5. Only DSPM trained personnel should be permitted to service or maintain equipment.
6. Only accessories recognized by DSPM shall be used with this equipment.

Contact DSPM if options are desired.

BATTERY SHELF LIFE-STORAGE

The batteries must be recharged every 4 months for at least eight hours or the batteries can be damaged. If the UPS is placed in storage, failure to re-charge batteries will invalidate your warranty.

BATTERY SAFETY

1. Person knowledgeable of batteries and the required precautions should perform servicing of batteries.
2. Do not dispose of batteries in a fire. The battery may explode.
3. Do not open and manipulate the battery. Released electrolyte is harmful to the skin and eyes.
4. A battery can present a risk of electrical shock and high short circuit current. Remove watches, rings or any other metal objects. Use only insulated tools.
5. Install in a protected environment.
6. Always turn off the battery circuit breaker before testing or performing maintenance on the battery system.

WARNING

It is strongly advised not to open the UPS cabinet as the components have very high voltages and touching them may be fatal. It is recommended that a technician from DSPM or a DSPM trained technician service the unit. 24 hour phone support is available for questions.

SECTION 1- OPERATION

1-1 INTRODUCTION

The POWER LYNX UPS (uninterruptible power system) from DSPM provides an exceptional level of load protection and monitoring capabilities. The critical load is provided with conditioned, regulated, battery backed up power at all times. Both the voltage level and frequency are controlled at all times to the load.

When the input power is lost to the UPS, such as during a power outage, the UPS automatically draws power from its battery supply. The critical load receives only clean sine wave power at all times. There are no disturbances or power interruptions on the output when the UPS transfers to battery operation. Transfers to and from battery operations are “No Break” transfers. The internal maintenance-free batteries provide a few minutes to hours (depending upon model) of backup power. Upon restoration of input power, the UPS automatically resumes normal operation. Also the UPS immediately begins to recharge the batteries.

The POWER LYNX is a dual conversion three phase UPS available in output ratings of 3.0 to 120 Kw. The UPS is U.L. listed under UL1778 and/or UL924. The UPS is available with input voltages of 208 and 480 VAC; and output voltages of 120, 208, 480 and 277 VAC (Other voltages available, consult factory). This information is provided on the nameplate located on the inside of the front door.

1-2 BENEFITS

The POWER LYNX is designed to fit the needs for virtually all power conditioning and UPS applications. It has been specifically designed to power all forms of modern data processing, communications, process control equipment, lighting and emergency lighting equipment. The UPS does not require any derating as other UPS products may when powering 100% electronic loads including switch-mode power supplies.

The POWER LYNX protects sensitive electrical equipment, such as computer systems, telecommunication networks, LANs, multi-user systems and instrumentation systems from electrical interference. The UPS protects these systems from power problems associated with poor quality AC power including complete power outages.

Electrical disturbances can come from practically anywhere: from the incoming power lines and from within a building. Outside electrical disturbances include lightning strikes, utility switching, brownouts, and accidents. Electrical disturbances from within the building can be caused by load cycling (elevators, HVAC systems) fault conditions, welders, and other electrically noisy equipment. Whether the electrical disturbances are generated outside or from within the facility, the following power problems will occur:

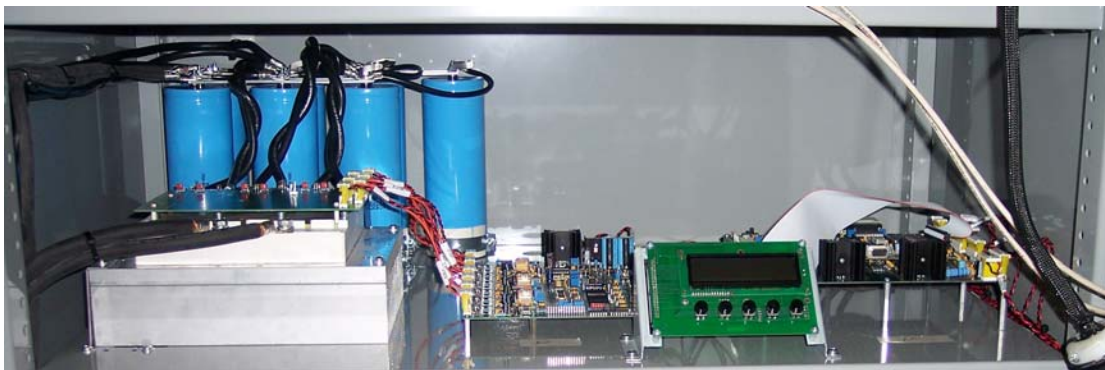
- Complete power outages
- Brown-outs including momentary sags
- Voltage surges
- Transients including common-mode and transverse-mode noise
- Frequency shifts and fluctuations

Sensitive electrical equipment needs protection from power problems. Without power protection, users of sensitive equipment may experience:

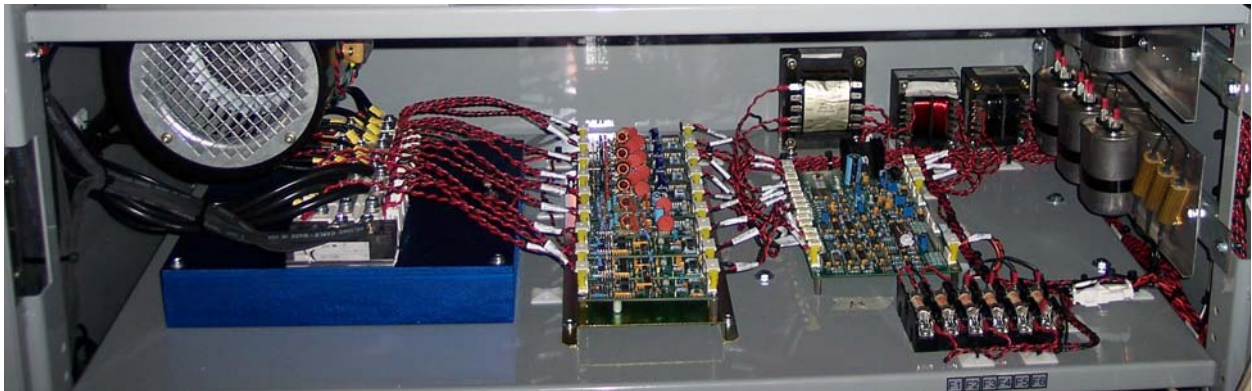
- Loss of data including data corruption
- Database corruption
- Equipment and component deterioration
- Premature equipment failures
- Unexpected equipment failures
- Missed deadlines, especially during batch processing
- Loss of real-time transaction processing
- Loss of employee productivity



Typical Front View (Door(s) Closed)



Typical Right Hand Door View / Inverter Panel



Typical Left Hand Door View /Rectifier Panel

1-3 PRODUCT FEATURES

The following describes the major sub-systems within the POWER LYNX UPS.

INPUT AND OUTPUT FILTER – The input filter reduces the input transients and harmonics on the input line. This helps protect the electronic circuitry of the UPS. The output filter filters and noise and line spikes from loads.

RECTIFIER/INVERTER

The Rectifier-Inverter system provides controlled sine wave power to the output. The output voltage and frequency are monitored by the microprocessor and controlled to provide precision power with changing inputs and outputs to the UPS system.

MICROPROCESSOR DISPLAY

The microprocessor monitors the input and the output to the UPS system and corrects for any abnormal condition that may occur. This is displayed on the LCD for operator information.

DIAGNOSTIC TESTS

When you start the UPS, a diagnostic test is automatically executed that checks the electronics, batteries, and reports the problems on the display.

MAINTENANCE BYPASS SWITCH (MBS) (optional)

The MBS is a two position switch (Auto, and ByPass). The “Auto” position is the “normal” position and allows full operation of the unit with the load being fed from the inverter. The “Bypass” (MAN) position allows the load to be fed from the utility with no power provided to the inverter. The unit must be de-energized (all feeders OFF) before conducting service or repairs.

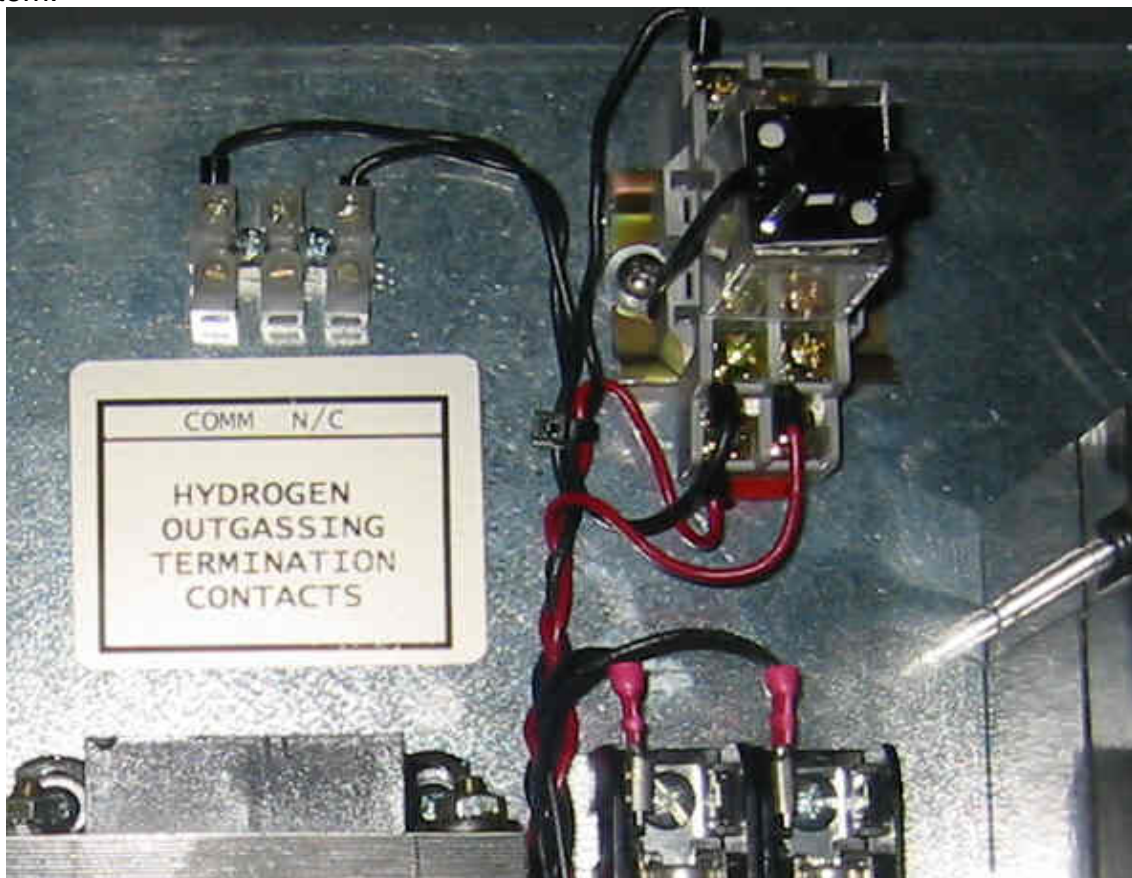


Hydrogen Out-gassing Switch (“HOT” Switch) (optional)

The HOT switch option prevents battery charging when a system exhaust fan is not functioning. This option incorporates the usage of a “sail switch” (Honeywell # S688A 1007 , provided by others) in the exhaust ducting of the facility. Upon exhaust fan failure, the sail switch will close a contact which will eliminate the battery charging of the Power Lynx.

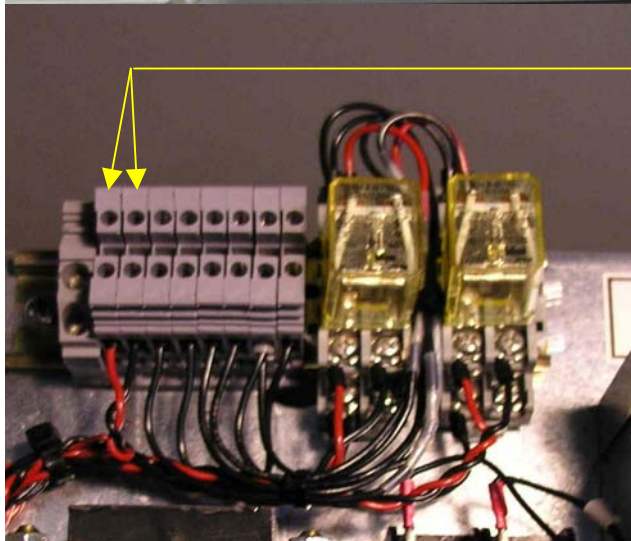
Connect the Normally Closed and the Common contacts of the sail switch to the Hot Switch terminal block (1 & 3) shown in the picture below.

To verify function, ensure that the system has been started up and is fully operational. With the system battery breaker OPEN, turn off the facility exhaust fan (the sail switch will return to its “at rest” position). Measure the DC bus voltage at the battery breaker (the bottom of the breaker, not the top). This voltage should drop to approx. 220 VDC in an 18 battery system and to approx. 120 VDC in a 10 battery system. Turn on the facility exhaust fan. Measure the DC bus voltage at the battery breaker. The voltage should rise to approx. 237 VDC for an 18 battery system and to approx. 132 VDC in a 10 battery system.



EXTERNAL "WRAP AROUND" BYPASS SWITCH (EMBS) (optional)

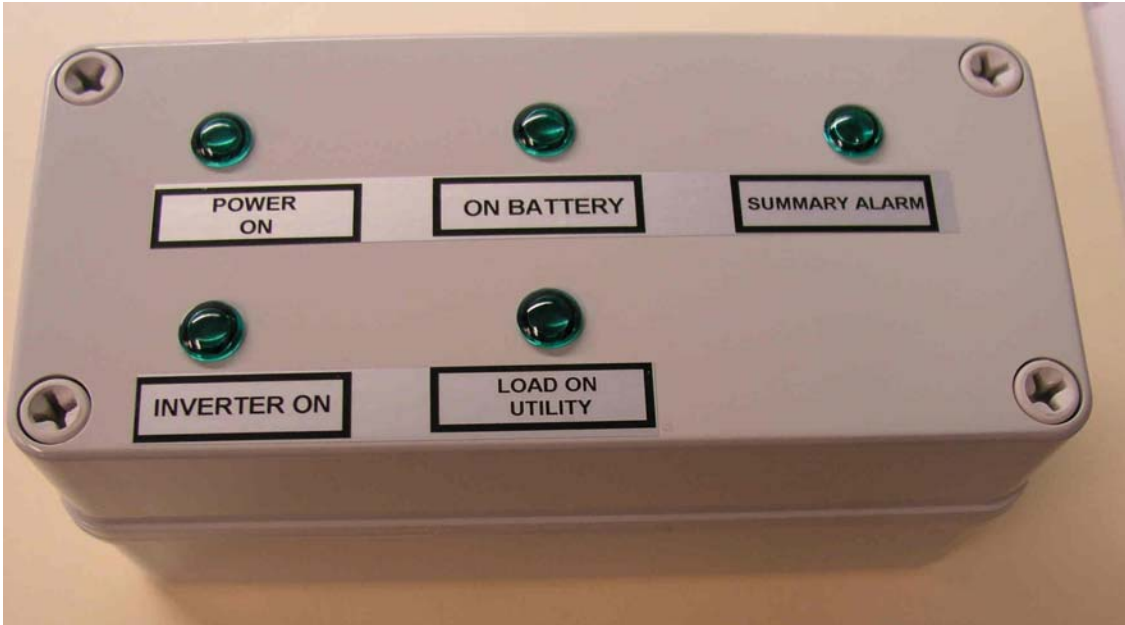
The EMBS is a three position switch (Auto, Test and Bypass). The "Auto" position is the "normal" position and allows full operation of the unit with the load being fed from the inverter. The "Bypass" position allows the load to be fed from the utility with no power provided to the inverter. The "Test" position allows power to the Inverter while the load is being fed from the Utility.



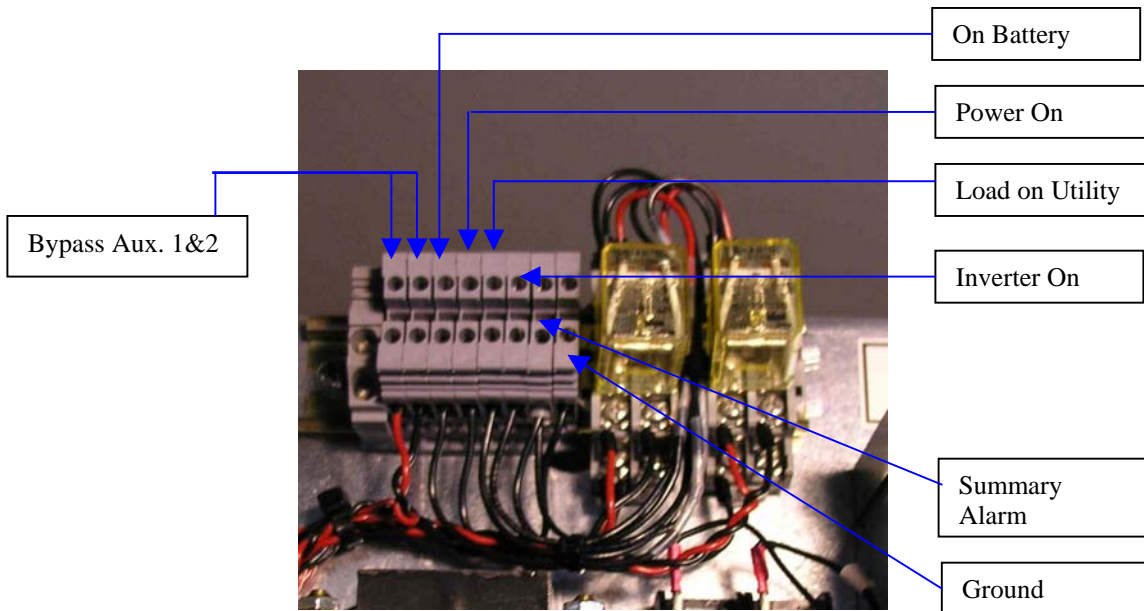
**Connect the
Auxilliary Contacts
here.**

System Remote Indicator Panel (Optional)

The Remote Indicator Panel provides an illuminated indication of several System operating parameters. LED indicators as labeled below.



Terminations from the Remote Indicator Panel are made to the terminal block on the Inverter control panel (shown below). Terminations are as indicated. All connections must be made to the "top" of the Terminal block.



PL3 Uninterruptable Power System									
Kilo-Watts	Input Voltage	Output Voltage	Utility Feed Amps	Max Output Amps	Kilo-Watts	Input Voltage	Output Voltage	Utility Feed Amps	Max Output Amps
3	208	208	15	8.3	24	208	208	117	66.6
		480		3.6			480		28.8
	480	208	7	8.3		480	208	51	66.6
		480		3.6			480		28.8
4.5	208	208	22	12.4	40	208	208	195	111.0
		480		5.4			480		48.1
	480	208	10	12.4		480	208	85	111.0
		480		5.4			480		48.1
6	208	208	30	16.6	60	208	208	292	166.5
		480		7.2			480		72.1
	480	208	13	16.6		480	208	127	166.5
		480		7.2			480		72.1
8	208	208	39	22.2	80	208	208	389	222.0
		480		9.6			480		96.2
	480	208	17	22.2		480	208	169	222.0
		480		9.6			480		96.2
12	208	208	59	33.3	100	208	208	486	277.5
		480		14.4			480		120.2
	480	208	26	33.3		480	208	211	277.5
		480		14.4			480		120.2
16	208	208	78	44.4	120	208	208	583	333.0
		480		19.2			480		144.3
	480	208	34	44.4		480	208	253	333.0
		480		19.2			480		144.3
20	208	208	98	55.5					
		480		24.0					
	480	208	43	55.5					
		480		24.0					

All Circuit Breakers provided by end user, that are connected to the inputs and outputs need to have a Trip Curve which is at least 10 times the rated current for .3 seconds, this is to prevent the breakers from tripping during startup of the unit or the loads, attached to the units. Some Manufacturers refer to these breakers as "High Inrush" breakers.

SECTION 3 – INSTALLATION

The POWER LYNX UPS system is shipped on a pallet with the batteries outside the UPS. This Manual, battery jumper wires and accessories may be included within the packaging, ensure that these are not discarded with the packaging. Unwrap the UPS and carefully inspect the external surfaces for abrasions, indentations, or other obvious damage.

File a claim with the shipping agency for any damage caused by shipping. Forward a copy of the damage claim to DSPM.

Mount the UPS system so each side and the top has six inches of clearance for airflow. Leave appropriate space in the front so the front door can be opened fully for operation and installation.

3-1 INSTALLATION EQUIPMENT

The following instructions cover general requirements for standard installation of the input and output power circuits, battery connections and control interface connections. Install the UPS using the procedures in this section. Care must be taken to insure the unit is properly connected. Connections should be torqued as shown in Table 2-1.

TABLE 2-1
WIRING TERMINAL TORQUE

Wire Gauge (AWG)	Terminal Torque pound-inches (neutons)
1 - 4	35 (6)
6 - 10	25 (4.4)

DANGER!!

THE UPS CONTAINS POTENTIALLY LETHAL VOLTAGES INSIDE, EVEN IF THE UNIT IS NOT CONNECTED TO AN EXTERNAL SOURCE OF POWER. ALL INSTALLATION AND SERVICE PROCEDURES SHOULD BE PERFORMED BY QUALIFIED PERSONNEL ONLY.

The input power circuit is supplied by the customer. This provides power from the building source to the UPS system. This circuit should be a dedicated branch circuit that

is hard wired in conduit. Size the branch circuit feeder conductors according to the specific power rating of the unit. Refer to the latest edition of National Electric Code (NEC) for the exact wire size required.

An insulated grounding conductor must be installed as part of the input circuit. Size the grounding conductor in accordance with NEC and local codes. The manufacturer recommends a parity-sized ground, with respect to the input power wires.

3-1 INSTALLATION OF EQUIPMENT (continued)

The UPS is designed to provide superior isolation and protection for sensitive loads. The UPS can be wired as a separately derived source that allows the re-establishing of the ground reference at the output of the UPS. This method of installation will provide additional load isolation from noise and other disturbances.

DANGER!!

INSURE THAT ALL CODE REQUIREMENTS ARE FOLLOWED IN GROUNDING THE UPS AND ITS LOADS. BODILY INJURY OR DAMAGE TO EQUIPMENT MAY OCCUR IF UNIT IS NOT PROPERLY GROUNDED.

NOTE

The equipment to be connected to the UPS may require special grounding procedures. Refer to technical documentation which accompanies that equipment.

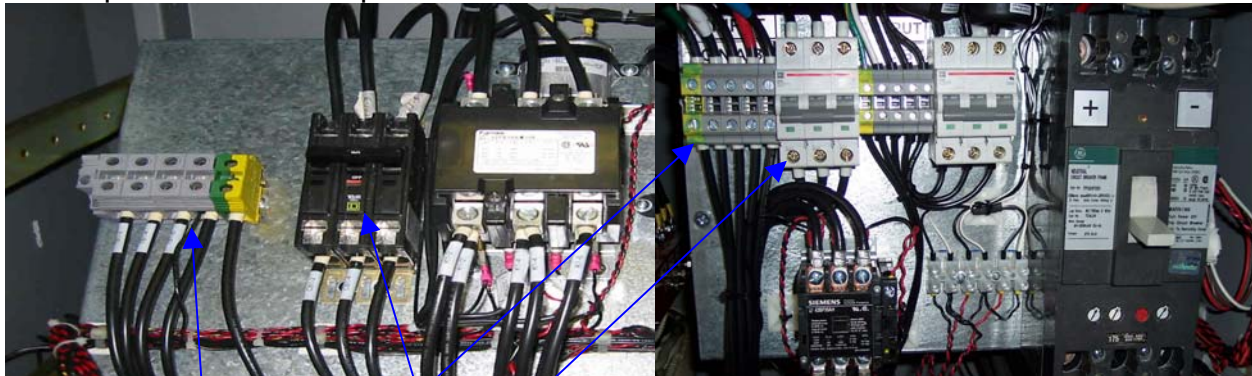
3-2 INPUT CONNECTIONS

1. Verify that power source to the unit is OFF, locked and tagged according to OSHA requirements.

CAUTION

Verify that the input voltage as stated on the UPS nameplate, matches the customer-supplied voltage. If the voltage does not match, STOP installation of the UPS and contact Customer Service at DSPM.

2. Verify that Input cable and conduit are routed correctly and are in position to connect the unit.
3. Open front doors of UPS
4. Select desired mounting location and connect conduit.
5. Pass wires through the mounting hole.
6. Secure conduit fitting to the panel of unit.
7. Connect input wires to the input, neutral and ground terminal blocks. These are pre-wired to the input circuit breaker.



(TB1) L1 /L2 /L3 / N /G

(Input terminals blocks and Main breaker)

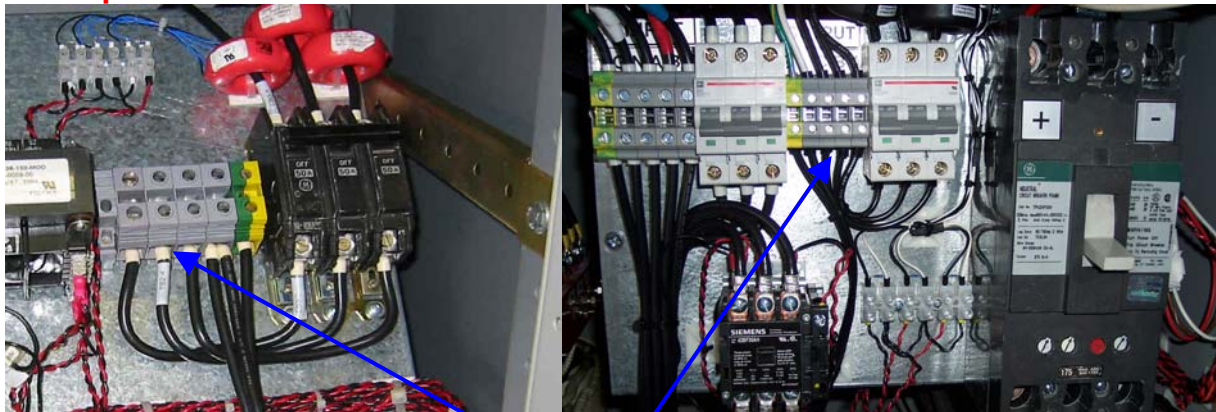
3-3 OUPUT CONNECTIONS

1. Verify that power source to the unit is OFF, locked and tagged according to OSHA requirements.

CAUTION

Verify that the output voltage as stated on the UPS nameplate matches the actual output voltage of the unit. Ensure that the intended connected load does not exceed unit capacity. If the voltage does not match, or the intended applied load exceeds unit capacity, STOP installation of the UPS and contact Customer Service at DSPM.

2. Verify that Output cable(s) and conduit(s) are routed correctly and are in position to connect the unit.
3. Open front doors of UPS.
4. Select desired mounting location and connect the conduit.
5. Pass wires through the mounting hole.
6. Secure conduit fitting to the panel of unit.
7. Connect the output wires to the output phase, neutral and ground terminal blocks. **Note: Ensure that the applied loads wired to the unit are evenly balanced. Loads to be evenly distributed to all output circuit breakers provided.**



Output Terminal
Blocks (TB2), 3 Phase,
Neutral, Ground
(X1, X2, X3, XO, G)

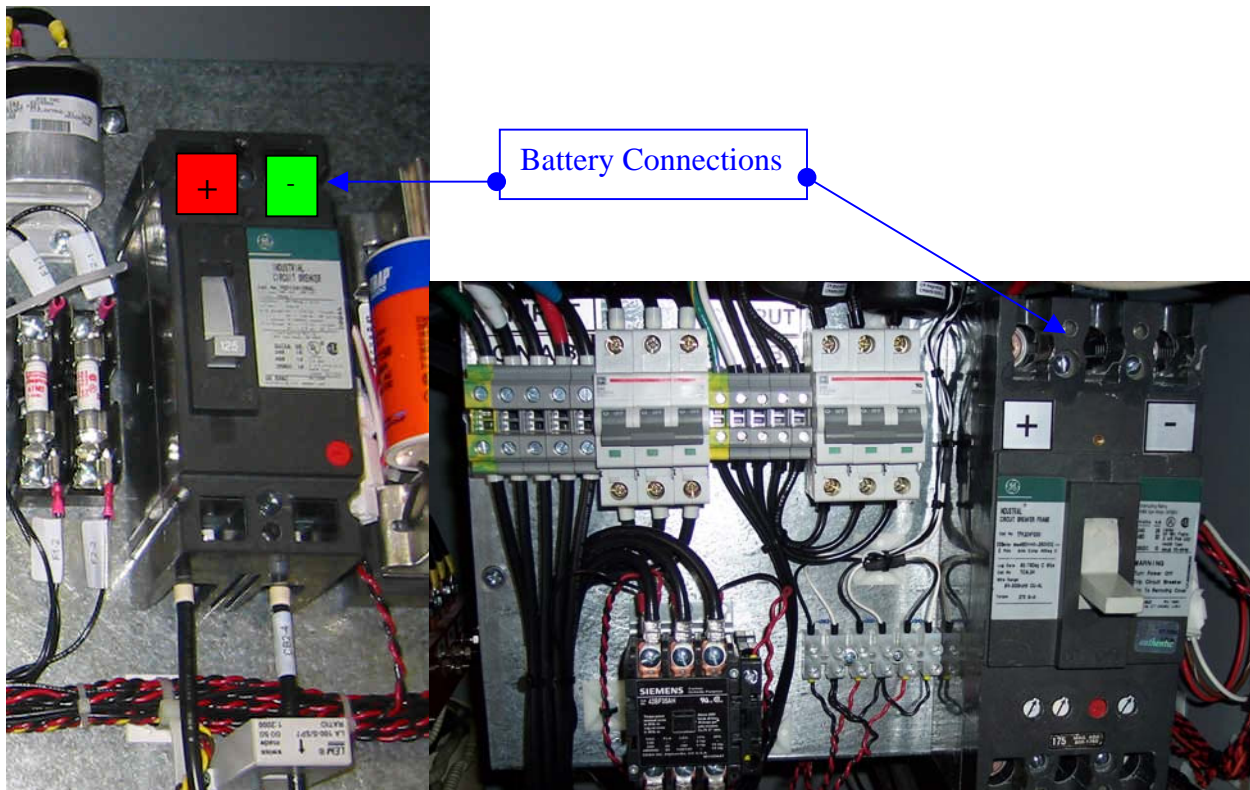
Note: If output Options where ordered with the unit they will be connected to the Main Output Terminals.

3-4 BATTERIES AND BATTERY CABLES

WARNING!!

FOLLOW THE BATTERY SAFETY PROCEDURE IN THE FRONT OF THIS MANUAL.

The UPS system has fixed battery trays. All battery systems connect the batteries in series, i.e. plus terminal to minus terminal from one battery to another battery. **The battery circuit breaker must be off during the installation.** Install the batteries and connect the battery cables. Connect the minus (-) terminal of the battery group to the battery circuit breaker terminal that is labeled (-). Connect the positive (+) terminal of the battery group to the battery circuit breaker terminal that is labeled (+).



BATTERY SYSTEM TEST

1. Make sure A.C. input circuit breaker is OFF.
2. Make sure battery circuit breakers are OFF.
3. Use a meter and note the D.C. voltage at the battery circuit breaker. The voltage must be the correct polarity positive lead of the meter to the positive terminal of the circuit breaker.
4. The D.C. voltage should read between 115 to 130 VDC for a 10 battery string, and 210 to 230 VDC for an 18 battery string. If the D.C voltage reads below these voltage levels, this means the battery cables are not connected correctly.
5. If the battery polarity and voltage level are correct, continue to “Starting the UPS”.

SECTION 4 - OPERATIONS

4-1 STARTING THE UPS

1. Check the input A.C. Circuit Breaker is OFF.
2. Check all output Circuit Breaker(s) (optional) are OFF.
3. Check the Battery Circuit Breaker(s) are OFF.
4. Energize the Utility feeder to the unit.
5. Turn Input Circuit Breaker ON.
6. Wait for the System display message instructing you to close the battery breaker.
7. Turn on the Battery Circuit Breaker.
8. Wait for the System Display message stating that the unit is operational.
9. Turn on the Output Circuit Breaker(s).



System Display Panel

4-2 History Log Key:

The *History Log* is used to record certain events that reflect the status and operating mode of the unit.

There are 64 lines (00 through 63).

It is read by holding down the *Alarm Scan* button. Each time the button is pressed, the log is read sequentially with the most recent event being displayed first. After 00 is displayed, the system will cycle around to 63.

After 64 events are logged, the system will start recording again at 00.

Code	Message	Description
00	00	blank – used in clearing Alarm History
01	alarm clr	Alarm History has been cleared
02	Phase SEQ	Input phase sequence has caused a fault and must be changed
04	Input OV	Input voltage has gone over fault limit
05	Input UV	Input voltage has gone below fault limit
07	Input CONT	System has failed to detect closure of the Input Contactor
08	Output Hi V	Output voltage has gone over fault limit
09	Output Lo V	Output voltage has gone below fault limit
10	Output O Frq	Output frequency has gone over fault limit
11	Output U Frq	Output frequency has gone below fault limit
12	Phase FLT	Input phase sequence fault has not been corrected and system has timed out
13	Invrtr. FLT	a hardware fault has been detected by the inverter control board (IGBT PCBA); caused by IGBT failure, unexpected power on reset, or DC Bus over voltage
14	DC Bus OV	DC Bus has gone over fault limit
15	DC Bus UV	DC Bus has gone below fault limit
16	Input O Frq	Input frequency has gone over fault limit
17	Input U Frq	Input frequency has gone below fault limit
18	RECT off	Rectifier has shut off unexpectedly
20	Invert. O frq	Inverter frequency has gone over fault limit
21	Invert. U Frq	Inverter frequency has gone below fault limit
22	ISBS open	Inverter Static Bypass Switch has not engaged and system has timed out
23	USBS fault	Utility Static Bypass Switch has failed test
24	USBS short	Utility Static Bypass Switch failure, output voltage still detected after off command was issued
26	Output OVL	Output Current has gone over fault limit
28	Estop OPEN	Emergency Stop option enabled during system power-up
35	UPS abort	System faults have caused system to switch to bypass
36	Normal run	Automated system test concluded
37	BATT test	Automated system test initiated (15 minute rectifier shutoff and battery run)
38	Inv start	Inverter has been started and matched with utility voltage
40	NMI trap	NMI button on processor board has been pressed, date and time marker
41	STKUF trap	Software Stack underflow detected
42	STKOF trap	Software Stack overflow detected
43	WDTMR trap	Software has detected a Watchdog timer overflow

45	ISBS xfer	Static Bypass Switch has transferred load to Inverter
46	Inv Stop	Inverter has unexpected shut off
47	Pwr on RST	CPU initialization complete
49	ESTOP trap	Emergency Stop option has caused an emergency transfer to utility
50	RunState0	Power has been applied to system
51	RunState1	Initial system checks complete, awaiting DC breaker closure
52	RunState2	Startup complete, system ready
53	RunState3	Utility power failure, system is on a battery run
54	Bypass on	System is in bypass
56	Battery Low	Battery Voltage is low, causes a system shutdown
57	Key Code OK	Key Code Accepted
58	Air Flow DN	Air Flow fault detected, DC BUS set to minimum value



CAUTION

Verify that the output voltage as stated on the UPS nameplate matches the actual output voltage of the unit. Ensure that the intended connected load does not exceed unit capacity. If the voltage does not match, or the intended applied load exceeds unit capacity, STOP installation of the UPS and contact Customer Service at DSPM.

4-3 TURNING THE UPS SYSTEM OFF

1. Turn OFF the output circuit breakers.
2. Turn OFF the input A.C. circuit breaker.
3. Turn OFF the battery circuit breaker.

SECTION 5 - OUTPUT POWER

1. Normally on circuits can be provided. These circuits are on when AC input power is on and turned off to lower the load requirements where input AC power fails.
2. Normally off circuits can be provided. These circuits provide power only when the UPS system is on battery power. These circuits usually power exits signs and lighting.
3. Normally off hold on circuits can be provided. These normally off circuits can be set to stay on from 1 to 20 minutes after the return of the utility power.

SECTION 6 - TECHNICAL SUPPORT

1. For Technical Support or any questions not covered in this manual, contact:

DSPManufacturing
5407 E. La Palma Avenue
Anaheim, CA 92807
714.970.2304 Phone
714.970.6171 Fax
Service:

714.970.2304 – 8:00 AM to 5:00 PM PST

951. 840.0811 – 5:00 PM to 8:00 AM PST

customerservice@dspmanufacturing.com

SECTION 7 - MAINTENANCE

CAUTION:

DO NOT DISPOSE OF BATTERIES IN FIRE

CAUTION:

DO NOT ATTEMPT TO OPEN THE BATTERIES

CAUTION:

THE FOLLOWING PRECAUTIONS SHOULD BE TAKEN WHEN REPLACING ANY BATTERIES:

- REMOVE WATCHES, RINGS, ETC...
- USE TOOLS WITH INSULATED HANDLES.

CAUTION:

USE RUBBER PROTECTIVE GLOVES WHEN HANDLING DAMAGED BATTERIES.

WARNING:

HIGH VOLTAGE IS PRESENT ON BATTERIES.

a. Semi-annual

i. Cabinet/Electronics

1. Inspect all fans and insure proper operation.

ii. Batteries/Battery Cabinet

1. Inspect the battery cases for leakage.
2. Perform a battery load test of each individual battery.

a. Turn off the Battery Breaker

- b. Using a Battery load tester connected to only one battery test the battery and record the battery voltage after a 5 to 10 second load test. The picture to the left is an example of the type load tester that can be used.



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- c. Repeat step “b.” using the same timed load test, and record the data.
- d. After the testing all the batteries, compare the test data. All recorded voltages should be approximately the same value. Any batteries that have a reading considerably different then the others needs to be investigated, or considered to be bad and replaced.
- e. Check wiring for proper routing and damage, such as chaffing and/or cutting. Relocate and /or repair and found damaged wires.
- f. Check the torque of each battery connection for 70in/lbs.

CAUTION:

DO NOT OVER TORQUE THESE CONNECTION AS SOME BATTERIES HAVE LEAD POSTS AND THEY ARE VERY EASY TO COMPRESS AND WILL CAUSE FAILURES IN THE FUTURE.

Note: If Batteries are found to be leaking or fail the load test they should be replaced. (Consult DSPM as to the status of your Battery Warranty)

b. Annual

CAUTION:

BEFORE PERFORMING ANY OF THE FOLLOWING STEPS BESURE THAT THE UPS/UNITERRUPTIBLE POWER SYSTEM HAS BEEN TUNED OFF.

- i. Perform all Semi-annual Maintenance.
- ii. Cabinet/Electronics
 - 1. Inspect all power connections for loose connections. Tighten any that are found loose. See the Torque table below.
 - 2. Check wiring for proper routing and damage, such as chaffing and/or cutting. Relocate and /or repair and found damaged wires.
 - 3. Exercise all circuit breakers.

4. If there is a distribution internal to the cabinet and/or a panel attached to the side of the UPS/Uninterruptible Power System, check the power connections and exercise the breakers in the cabinet.

iii. Batteries/Battery Cabinet.

1. Check wiring for proper routing and damage, such as chaffing and/or cutting. Relocate and /or repair and found damaged wires.
2. Check the torque of each battery connection for 70in/lbs.

CAUTION:

DO NOT OVER TORQUE THESE CONNECTION AS SOME BATTERIES HAVE LEAD POSTS AND THEY ARE VERY EASY TO COMPRESS AND WILL CAUSE FAILURES IN THE FUTURE.

Note: If Batteries are found to be leaking or fail the load test they should be replaced. (Consult DSPM as to the status of your Battery Warranty)

SIZE OF WIRE THAT IS TO BE USED FOR CONNECTION OF THE UNIT		TIGHTENING TORQUE POUND-INCHES (N-m)			
		SLOTTED HEAD no.10 or LARGER		HEXAGONAL HEAD – EXTERNAL DRIVE SOCKET WRENCH	
AWG/kcmil	mm ²	SLOT WIDTH <0.47" & <1/4"	SLOT WIDTH >0.47" & >1/4"	Split-Bolt Connectors	Other Connections
18 – 10	0.82 – 5.3	20 (2.3)	35 (4.0)	80 (9.0)	75 (8.5)
8	8.4	25 (2.8)	40 (4.5)	80 (9.0)	75 (8.5)
6 – 4	13.3 – 21.2	35 (4.0)	45 (5.1)	165 (18.6)	110 (12.4)
3	26.7	35 (4.0)	50 (5.6)	275 (31.1)	150 (16.9)
2	33.6	40 (4.5)	50 (5.6)	275 (31.1)	150 (16.9)
1	42.2		50 (5.6)	275 (31.1)	150 (16.9)
1/0 – 2/0	53.5 – 67.4		50 (5.6)	385 (43.5)	180 (20.3)
3/0 – 4/0	85.0 – 107.2		50 (5.6)	500 (56.5)	250 (28.2)
250 350	127 – 177		50 (5.6)	650 (73.4)	325 (36.7)

SECTION 8 - TROUBLE SHOOTING

- i. If unable to resolve any problem please contact DSPM for assistance.

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714.970.6171
customerservice@dspmanufacturing.com