

User Manual

Harsh Environment UPS

EX-Series (3KVA ~ 20 KVA)

Document No. 6005-056 Revision D

Installation and Operation

^{*}Due to continuous product improvement this document is subject to change without prior notice.

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EX UPS

Congratulations on selecting one of the fine products from Perfect Power Systems, the Leader in Power Protection Technology. Our wide product offering includes Uninterruptible Power Systems (UPS), Power Conditioners, Automatic Voltage Regulators and Specialty Transformers (e.g. computer-grade, medical-grade). Since our beginning, Perfect Power Systems has shipped many of these fine products around the world, to discerning customers, for use on sensitive equipment and critical applications. Our customers, both new and long-time, continue to enjoy security and peace of mind as they realize what it means to "When the lights go out, we turn on".

One of our goals is to make these manuals both comprehensive and easy to use. This **new-format** Technical Manual is the result of ideas and inputs from customers who have taken an active interest in our continued success. We invite constructive feedback on our products and documentation via fax, mail or telephone.

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IMPORTANT SAFETY INSTRUCTIONS SAVE THESE INSTRUCTIONS

SAFETY

Following safety precautions is important when operating or servicing electrical equipment. The symbols shown are used extensively throughout this manual. Always heed these precautions since they are essential to the safe operation and servicing of this product.

Boxes labeled with the "Danger!" symbol indicate that there is a high risk of personal injury or death if instructions are not followed.

Warnings labeled with the •••••••• symbol indicate that there is a high probability of equipment failure, damage, or destruction if instructions are not followed.



ONLY FACTORY TRAINED OR AUTHORIZED PERSONNEL SHOULD ATTEMPT TO INSTALL OR REPAIR THE UNIT OR ITS BATTERY SYSTEM. IMPROPER INSTALLATION HAS PROVEN TO BE THE SINGLE MOST SIGNIFICANT CAUSE OF START-UP PROBLEMS. HIGH AC AND DC ELECTRICAL VOLTAGES ARE PRESENT THROUGHOUT THE UNIT(S) AND INCORRECT INSTALLATION OR SERVICING COULD RESULT IN ELECTROCUTION, FIRE, EXPLOSION, OR EQUIPMENT FAILURE.



READ THIS MANUAL IN ITS ENTIRETY BEFORE PERFORMING THE INSTALLATION, START-UP, OPERATION, OR MAINTENANCE OF THE UNIT (Uninterruptible Power System) OR BATTERY SYSTEMS. FAILURE TO DO SO COULD RESULT IN ELECTROCUTION, FIRE, EXPLOSION, OR EQUIPMENT

If you require assistance, call toll free 800-PWR-SRVC (800-797-7782). Please have the following information from your unit's nameplate available to speed assistance:

Serial Number:	
kVA/Power Rating:	
Input Voltage:	
Output Voltage:	
Manufacturer Date:	

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ALL POWER CONNECTIONS MUST BE COMPLETED BY A LICENSED ELECTRICIAN WHO IS EXPERIENCED IN WIRING THIS TYPE OF EQUIPMENT. WIRING MUST BE INSTALLED IN ACCORDANCE WITH ALL APPLICABLE NATIONAL AND LOCAL ELECTRICAL CODES. IMPROPER WIRING MAY CAUSE DAMAGE TO THE EQUIPMENTS, INJURY OR DEATH OF PERSONNEL. VERIFY THAT ALL HIGH AND LOW VOLTAGE INPUT POWER CIRCUITS ARE DE-ENERGIZED AND LOCKED OUT BEFORE INSTALLING CABLES OR MAKING ANY ELECTRICAL CONNECTIONS.

A Danger!

EXERCISE EXTREME CARE WHEN HANDLING UNIT AND BATTERY CABINETS TO AVOID EQUIPMENT DAMAGE OR INJURY TO PERSONNEL. CABINETS WEIGH SEVERAL HUNDRED POUNDS.

A Danger!

TEST LIFT AND BALANCE THE CABINETS BEFORE MOVING. MAINTAIN MINIMUM TILT FROM VERTICAL AT ALL TIMES. THE BOTTOM STRUCTURE WILL SUPPORT THE UNIT ONLY IF THE FORKLIFT FORKS ARE COMPLETELY UNDERNEATH THE UNIT.

A Danger!

OBSERVE ALL BATTERY SAFETY PRECAUTIONS DURING INSTALLATION OR SERVICE OF THE UNIT OR BATTERIES. EVEN WITH THE BATTERY CIRCUIT BREAKER IN THE OFF POSITION, THE DANGER OF ELECTROCUTION MAY STILL BE PRESENT. THE BATTERY POWER TO THE UNIT MUST BE LOCKED AND TAGGED "OFF" BEFORE PERFORMING ANY SERVICE OR WORK ON THE UNIT. THE BATTERY MANUFACTURER'S SAFETY INFORMATION AND MATERIAL SAFETY DATA SHEET IS LOCATED IN A POCKET ATTACHED TO THE INSIDE OF LEFT DOOR OF EACH UNIT. FAILURE TO FOLLOW THOSE INSTRUCTIONS AND THE INSTRUCTION LISTED ABOVE AND ELSEWHERE IN THIS MANUAL COULD RESULT IN AN EXPLOSION, FIRE, EQUIPMENT FAILURE, OR ELECTROCUTION.

ALL POWER TO THE UNIT MUST BE LOCKED AND TAGGED "OFF" BEFORE PERFORMING ANY SERVICE OR WORK ON THE UNIT. FAILURE TO DO SO COULD RESULT IN ELECTROCUTION.

A Danger!

IN CASE OF FIRE INVOLVING ELECTRICAL EQUIPMENT. ONLY CARBON DIOXIDE FIRE EXTINGUISHERS, OR THOSE APPROVED FOR USE ON ELECTRICAL EQUIPMENT, SHOULD BE USED. USE OF WATER ON FIRES INVOLVING LIVE HIGH VOLTAGE ELECTRICAL CIRCUITS COULD PRESENT AN ELECTROCUTION HAZARD.

A Danger!

EXTREME CAUTION IS REQUIRED WHEN PERFORMING MAINTENANCE.
LETHAL VOLTAGES EXIST WITHIN THE EQUIPMENT DURING OPERATION.
OBSERVE ALL WARNINGS AND CAUTIONS IN THIS MANUAL. FAILURE TO
COMPLY MAY RESULT IN SERIOUS INJURY OR DEATH. OBTAIN QUALIFIED
SERVICE FOR THIS EQUIPMENT AS INSTRUCTED.

A Danger!

BE CONSTANTLY AWARE THAT THE UNIT SYSTEM CONTAINS HIGH DC AS WELL AS AC VOLTAGES. WITH INPUT POWER OFF AND THE BATTERY, DISCONNECTED, HIGH VOLTAGE AT THE FILTER CAPACITORS AND POWER CIRCUITS SHOULD DISCHARGE WITHIN 30 SECONDS. HOWEVER, POWER CIRCUIT FAILURES CAN OCCUR, SO YOU SHOULD ALWAYS ASSUME THAT HIGH VOLTAGE MIGHT STILL EXIST AFTER SHUTDOWN. VERIFY THAT POWER IS OFF USING AC AND DC VOLTMETERS BEFORE MAKING CONTACT.

🛕 Danger!

SOME COMPONENTS WITHIN THE CABINETS ARE NOT CONNECTED TO CHASSIS GROUND. ANY CONTACT BETWEEN FLOATING CIRCUITS AND THE CHASSIS IS A LETHAL SHOCK HAZARD.

INTERNAL BATTERY STRAPPING MUST BE VERIFIED BY THE CUSTOMER PRIOR TO MOVING THIS UNIT.

THIS UNIT CONTAINS NON-SPILLABLE BATTERIES. KEEP THE UNIT UPRIGHT. DO NOT STACK. DO NOT TIP. ALWAYS FOLLOW THE BATTERY MANUFACTURER'S SAFETY INFORMATION LOCATED IN A POCKET ATTACHED TO THE INSIDE OF THE LEFT DOOR OF YOUR UNIT TO PREVENT AN ACCIDENT THAT COULD RESULT IN INJURY OR DEATH.

A Danger!

LEAD-ACID BATTERIES CONTAIN HAZARDOUS MATERIALS. BATTERIES MUST BE HANDLED, TRANSPORTED, AND RECYCLED OR DISCARDED IN ACCORDANCE WITH FEDERAL, STATE, AND LOCAL REGULATIONS. BECAUSE LEAD IS A TOXIC SUBSTANCE, LEAD-ACID BATTERIES SHOULD BE RECYCLED RATHER THAN DISCARDED.

DO NOT DISPOSE OF BATTERIES IN A FIRE, THE BATTERIES MAY EXPLODE.

DO NOT OPEN OR MUTILATE THE BATTERIES. RELEASED ELECTROLYTE IS HARMFUL TO THE SKIN AND EYES AND MAY BE TOXIC.

A BATTERY CAN HAVE A HIGH SHORT CIRCUIT CURRENT AND PRESENT A RISK OF ELECTRICAL SHOCK. THE FOLLOWING PRECAUTIONS SHOULD BE OBSERVED WHEN WORKING ON BATTERIES:

- 1. REMOVE WATCHES, RINGS OR OTHER METAL OBJECTS.
- 2. USE TOOLS WITH INSULATED HANDLES.
- 3. WEAR RUBBER GLOVES AND BOOTS.
- 4. DO NOT LAY TOOLS OR METAL PARTS ON TOP OF BATTERIES.
- 5. DISCONNECT CHARGING SOURCE PRIOR TO CONNECTING OR DISCONNECTING BATTERY TERMINALS.
- 6. DETERMINE IF BATTERY IS INADVERTENTLY GROUNDED. IF SO, REMOVE THE SOURCE OF THE GROUND. CONTACT WITH ANY PART OF A GROUNDED BATTERY CAN RESULT IN ELECTRICAL SHOCK. THE LIKELIHOOD OF SUCH SHOCK WILL BE REDUCED IF SUCH GROUNDS ARE REMOVED DURING INSTALLATION AND MAINTENANCE.
- 7. LEAD-ACID BATTERIES CAN PRESENT A RISK OF FIRE BECAUSE THEY GENERATE HYDROGEN GAS. THE FOLLOWING PROCEDURES SHOULD BE FOLLOWED:
 - DO NOT SMOKE WHEN NEAR BATTERIES.
 - DO NOT CAUSE FLAME OR SPARK IN BATTERY AREA.
- 8. DISCHARGE STATIC ELECTRICITY FROM YOUR BODY BEFORE TOUCHING BATTERIES BY FIRST TOUCHING A GROUNDED SURFACE.

The use of a physically damaged battery can cause a catastrophic system failure and can even result in a fire or explosion that could endanger life and property. Before accepting a battery shipment from the carrier, please read and follow these instructions:

- 1. Thoroughly inspect each battery for any signs of damage. If there is any damage, reject the shipment and notify the manufacturer at 800-PWR-SRVC (800-797-7782). If possible, photograph the damage for future reference.
- 2. As you unpack the pallet or container, check each battery box for damage on all sides, the top and bottom. If there is any sign of damage, photograph the damage if possible, and contact Online Power at 800-PWR-SRVC (800-797-7782).
- 3. Before you install each battery in the cabinet, remove it from its carton and thoroughly inspect it again on every side, the top and bottom for any signs of physical damage including, but not limited to, cracks, chips, leaks, bulges, and so forth.
- 4. If battery is dropped or makes hard contact with any abject, inspect it again.
- 5. Batteries are heavy, so exercise care when lifting them to the shelves of a battery cabinet.
- 6. If at any time you have any questions regarding the condition of a battery, set it aside and notify the manufacturer at 800-PWR-SRVC (800-797-7782). Do not use a questionable battery under any circumstances, even temporarily.

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SECTION 1 – INTRODUCTION

1-1 INTRODUCTION

The EX Emergency Lighting Inverters are manufactured to provide critical power for lighting during a power outage. The EX Series meets or exceeds the life safety codes of UL924. This code was established to allow the emergency lighting inverters (during a power failure) to provide critical power to the lighting. The emergency lighting inverter will then provide power for up to 90 minutes which will allow the safe and orderly evacuation from the facility.

When input power to the EX Series is lost such as during a power outage, the EX Series automatically draws power from its internal battery supply without any interruption. The critical load receives only clean sine wave power. The optional output transformer allows multiple output voltages as well as input voltage that is different than output voltage. The internal maintenance-free batteries provide 90 minutes of backup power.

Upon restoration of input power, the EX Series automatically resumes normal operation. Also the EX Series immediately begins to recharge the batteries.

The EX Series has internal bypass circuit, which maintains the power to load in case of internal UPS failure.

The EX Series provides comprehensive monitoring capabilities. In addition to the LCD display, it provides five dry relay contacts for remote signaling capabilities. The EX Series contains, as standard features, an AS 400 interface. It also has RS232 and RS485 capabilities.

The EX Series is an on-line single phase PWM inverter available in output rating of 3, 5, 7.5, 10, 12.5, 15, and 20 KW/KVA. The EX Series is listed for compliance to UL1778, UL924, and CSA107.1 standards. The EX Series is available with an input or output voltages of 120, 208, 240, or 277 VAC, single phase. This information is provided on the nameplate located on the inside front door of the EX Series. See Appendix A for a complete listing of the EX Series specifications.

1-2 BENEFITS

The EX System is a simple, self-contained solution to providing back-up power for any fluorescent or incandescent lighting source such as overhead fixtures, exit signs, etc. It is designed specifically to maintain 90 minutes of lighting and ensure a safe building evacuation. And it offers significant advantages over other alternatives. For example, just one EX Series can replace 70 "bugeyes" to make service and maintenance much quicker and easier.

As a connection cooled, on-line PWM inverter system, it's virtually silent and can be installed anywhere. On-line PWM technology provides switchover from utility to battery power without any interruption. It's compatible with power factor corrected (PFC) ballast, runs at 90% efficiency, provides true sine-wave output, and offers an extraordinary mean-time-between-failure.

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

The EX Series protects sensitive electrical equipment, such as computer systems, telecommunication networks, LANs and multi-user systems, and instrumentation systems, from electrical interference. The EX Series 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 even from within a building. Outside electrical disturbances include lightning strikes, utility switching, brown-outs, and accidents. Electrical disturbances from within a 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 equipment needs protection from power problems. Without power protection, users of sensitive equipment may experience:

Loss of data including data corruption;

Database corruption;

Rebuilding of files;

Equipment and component deterioration;

Premature equipment failures;

Unexpected equipment malfunctions;

Missed deadlines, especially during batch processing;

Loss of real time transaction processing;

Loss of employee productivity

1-3 PRODUCT FEATURES

The following describes the major blocks within the EX Series. Please refer to Illustration 1-4 Functional Block Diagram for additional information.

Bypass Static Switch - The SCR solid state switch bypasses the complete UPS and provides utility input directly to the load in case of problem with UPS. This switch also supplies input power to the load during the start up. It is connected on the primary side of the optional output isolation Transformer, when used. This switch maintains its status opposite of that of the output SCR solid state switch.

Output Static Switch - This SCR solid state switch connects the output of the inverter (UPS) to the load. It is connected on the primary side of the optional output isolation transformer, when used. This switch shuts-off in case of a problem or failure within the UPS and transfers the load directly to the utility input via bypass static switch. It maintains its status opposite to that of bypass switch.

Power Board with IGBTs - The Power board is bolted onto the IGBT blocks that are mounted on a heat sink. The complete heat sink assembly with IGBT and power board is replaceable as one part. This assembly processes all the power, ie. input AC power converted to DC bus, battery power boosted to DC bus and finally DC bus power converted to output AC power using PWM technology for smooth AC sine wave. The complete heat sink assembly is easily replaceable using only a screwdriver, in case of a catastrophic failure, if required. This board also has the housekeeping power supplies and driver circuits for IGBTs. This board also provides the landing place for all internal input, output, and DC cables as well as it monitors the input-output current for control and metering.

Control Board - The microprocessor with programmable logic controllers and on board memory is located on this board. It is mounted on the door and communicates, controls, and monitors the power board via a ribbon cable. This board also senses the input AC and sends the command to close/open the input contactor, bypass static switch and output static switch. This board also sends all the data to the LCD display panel located on the door. It also has modem, AS400, RS232, and RS485 output capabilities.

LCD Display Panel - This front panel provides all the metering data for input, output and battery; alarm data and UPS status for customer use in a constantly changing and updating, the 3 sets of the screens.

Optional Output Isolation Transformer - This transformer is provided when the input and output voltages are different, or multiple output voltages are required or an isolation at output is required. The power to the primary of this transformer is selected either from UPS via output static switch and from utility input via bypass static switch. The two static switches toggle on/off as controlled by control board.

Battery Charger - The battery charger maintains the batteries at full charge. After a battery discharge, the charger will automatically recharge the batteries upon restoration of input power.

Battery Bank - The battery bank consists of sealed, maintenance-free batteries. The batteries provide emergency power during power outages. The battery bank includes a breaker for over current protection and DC disconnect.

1-3 PRODUCT FEATURES (continued)

Input Contactor - The input contactor serves several functions. First, the input contactor provides connections for the input power to the UPS. Secondly, the contactor disconnects the input line when an outage occurs so that there is no back-feeding of power into the power line. Thirdly, the contactor allows for automatic UPS operation upon a complete discharge of the batteries. No operator intervention is required when power to the UPS is restored after a complete battery discharge.

Control Electronics - The control electronics, utilizing a micro-processor, for monitoring provides all required logic signals within the UPS and interfaces with remote devices via the interface ports such as the AS/400 interface.

1-5

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1-3 PRODUCT FEATURES (continued) TYPE: 1 CABINET

- 1. Power Board (A1)
- 2. Bypass Static Switch (PB1)
- 3. Output Static Switch (PB2)
- 4. Output/Battery Terminal Block for customer's use (TB5, TB3)
- 5. Input Choke (L2)
- 6. Output Choke (L4)
- 7. DC Choke (L3)
- 8. Input Choke (L1)
- 9. High Frequency Noise Filter Capacitors for Input (C1), Output (C2), and Battery (C3) Power
- 10. Control Board (A2)
- 11. LCD Display Board
- 12. Input Contactor (K1)
- 13. Terminal Block to remove heat sink assembly (TB4)
- 14. Transformer Control T3, T4.
- 15. Control Power Transformer (T2)
- 16. Control Transformer Fuse (F2)
- 17. Fan Fuse (F1)
- 18. Heat Sink
- 19. Fan(s)
- 20. Output XFMR.
- 21. Output Breaker
- 22. Input Breaker (CB1)
- 23. Battery Breaker (CB2)
- 24. Input TB (TB1), Alarm TB4
- 25. Output Distribution Breakers (CB3-CB14)
- 26.
- 27.
- 28. Rectifier Block (BR1)
- 29. Maintenance By Pass (SW1)
- 30. Ground
- 31. Neutral
- 32. (Option)
- 33. LED Indicator
- 34. (Option)
- 35. (Option)
- 36. (Option)
- 37. (Option)
- 38. Air Filter
- 39. Air Filter
- 40. Sensaphone (option)
- 41. TVSS
- 42. Fusses (TVSS)

TYPE: 1 CABINET

DIM: 39" W X 74.5" H X 17" D

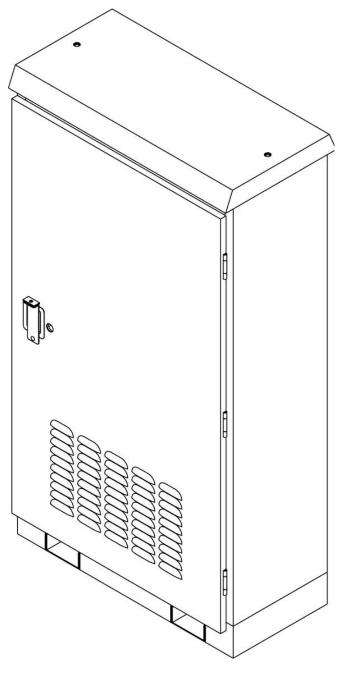
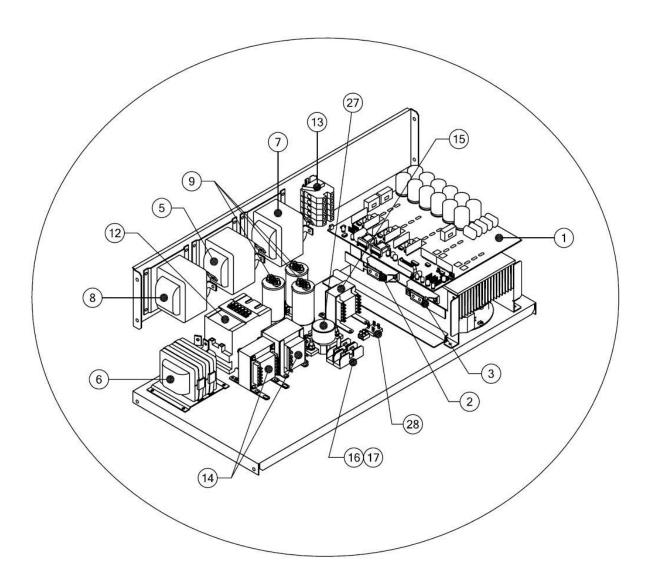
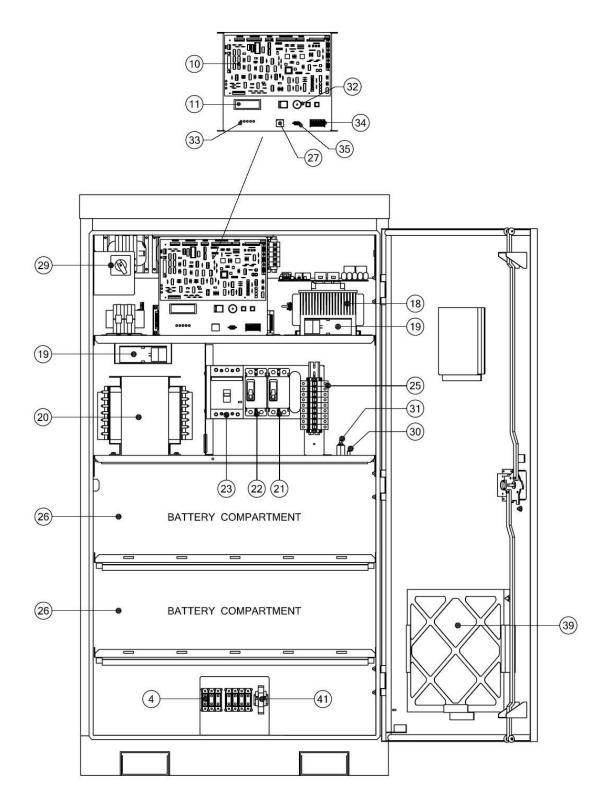


ILLUSTRATION 1-1

1-7



ELECTRONIC TRAY



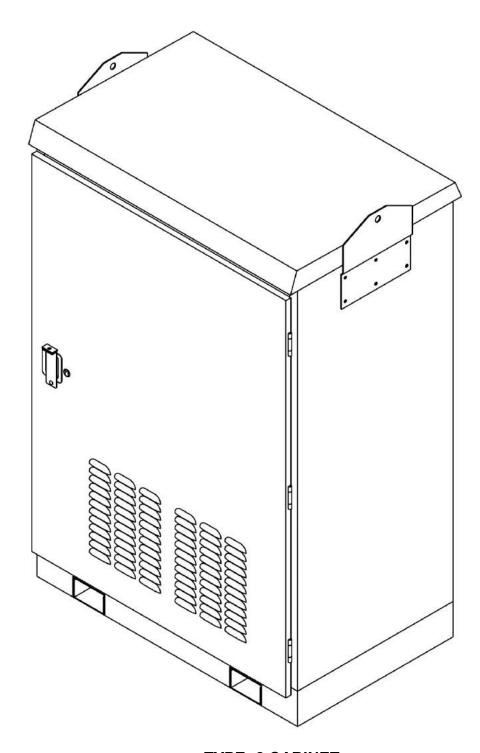
UPS CABINET

ILLUSTRATION 1-2

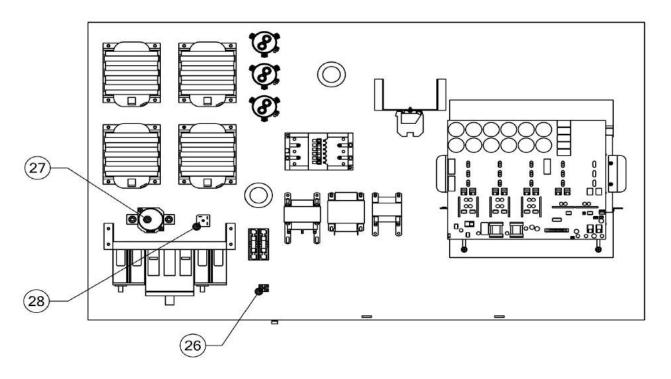
1-9

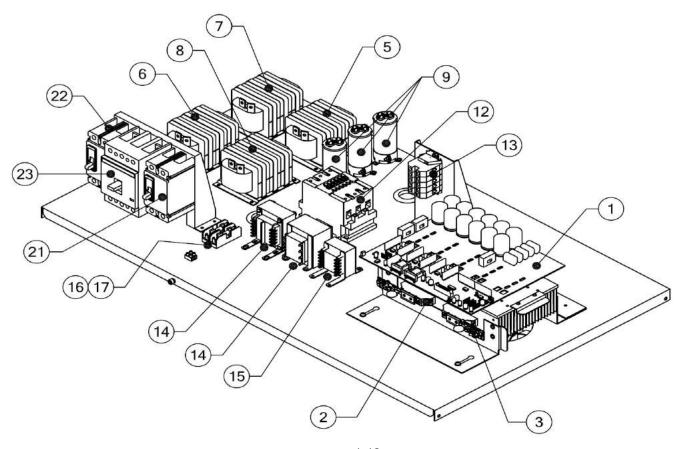
1-3PRODUCT FEATURES (continued) TYPE: 2 CABINET

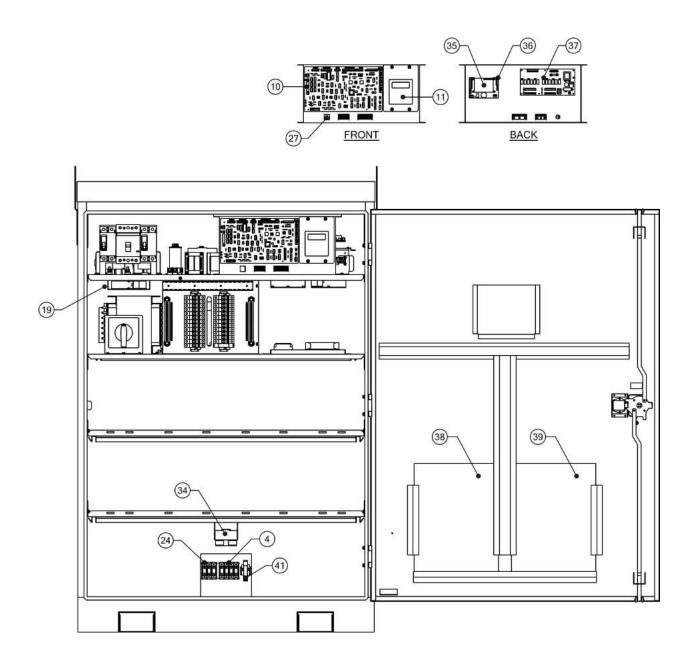
- 1. Power Board (A1)
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- 6. Output Choke (L4)
- 7. DC Choke (L3)
- 8. Input Choke (L1)
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- 17. Fan Fuse (F1)
- 18. Heat Sink
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- 21. Output Breaker
- 22. Input Breaker (CB1)
- 23. Battery Breaker (CB2)
- 24. Input TB (TB1), Alarm TB4
- 25. Output Distribution Breakers (CB3-CB14)
- 26. TB Selectable
- 27. DC SW. (SW2)
- 28. Rectifier Block (BR1)
- 29. Maintenance By Pass (SW1)
- 30. Ground
- 31. Neutral
- 32. (Option)
- 33. LED Indicator
- 34. (Option)
- 35. (Option)
- 36. (Option)
- 37. (Option)
- 38. Air Filter
- 39. Air Filter
- 40. Sensaphone (option)
- 41. TVSS
- 42. Fuses (TVSS)
- 43. (OPTION) GMS
- 44. (OPTION) INPUT XFMR
- 45. (OPTION) GMS
- 46. (OPTION) GMS

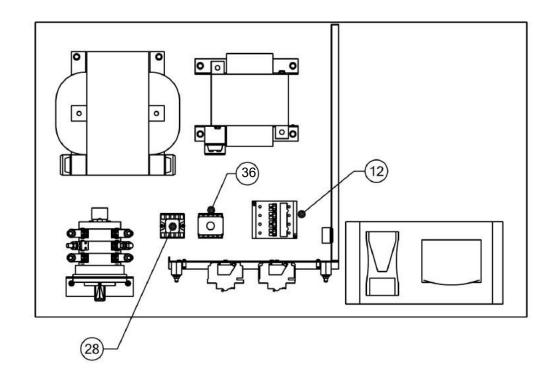


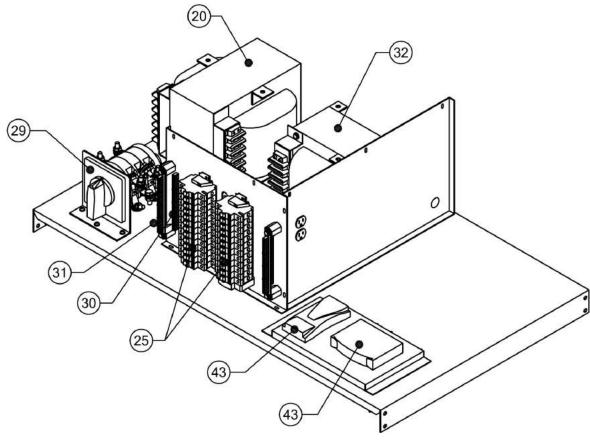
TYPE: 2 CABINET
DIM: 51" W X 77.5" HX 33.5" D







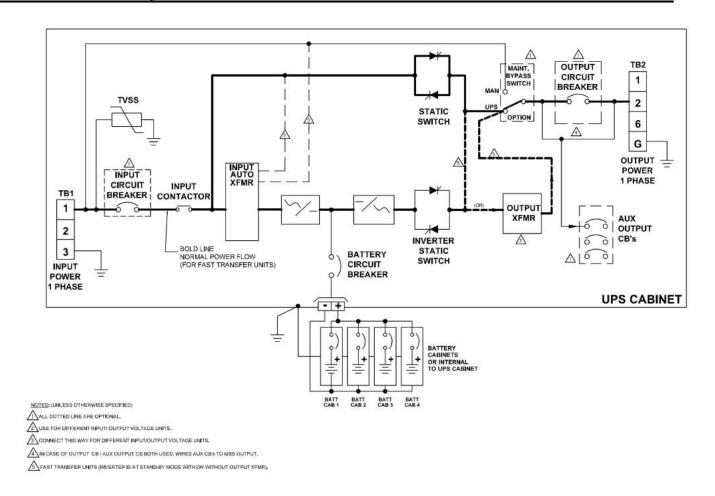




1-4 FUNCTIONAL DESCRIPTIONS

Illustration 1-4 is a simplified block diagram of the EX. This diagram provides an excellent tool in identifying the major building blocks within the EX.

- 1. **Main input circuit breaker (CB1)** The main input circuit power provides over-current protection to the input side of the EX.
- 2. **Input Contactor (K1)** The microprocessor based control circuitry:
 - verifies UPS to be normal condition and not the one "at fault".
 - verifies correct input voltage and frequency to be within acceptable range and commands the closure of this contactor via control transformer T2 and fuse F1.
- 3. **Input Chokes (L1, L3)** They act as a filter and an important circuitry of an up chopper, boosting input voltage to a higher internal DC bus voltage.
- 4. **Battery charger** The battery charger converts AC power into regulated DC power to charge and to maintain the charge on the battery bank. The charger is fully automatic with a current limiting feature so that damage will not occur to the batteries in case of a charger malfunction. The charger is sized such that the batteries will be maintained at full charge even when the input voltage is at the low line limit for indefinite periods of time.
- 5. **Battery** The battery bank, consisting of eight (8) 12 volt, VRLA batteries, provides the reserve energy to power the load when suitable AC input power is not present. The batteries are sealed, maintenance-free construction.
- 6. **Inverter** When the AC input power is not available to power the load, the inverter converts the energy stored in the battery bank to AC power to supply the powers the load. The pulse width modulated (PWM) inverter utilizes high speed, high efficiency IGBTs for fast response, sinusoidal power.
- 7. DC Choke (L4) If helps boosting battery voltage to an internal higher DC bus voltage.
- 8. **Output AC Choke (L2)** This acts as a buck circuit component connecting high DC bus voltage to an appropriate AC output voltage.
- 9. **Inverter Test Switch (SW2)** This switch is a manually operated switch which tests the EX and the batteries for proper operation. When the EX is running and Switch SW2 is pushed and held in, the EX will automatically transfer to battery operation. The EX will continue to run on batteries until the switch is released back to the "normal" position (Switch is a momentary switch). When the switch is released, the EX returns to normal operation (provided input power is present).
- 10. **Control Transformer (T2)** This transformer with fuse (F1), provides (internal housekeeping) power supply as well as 120 VAC for the coil of the input contactor. The primary of this transformer has various taps that needs to be matched with the various input voltages.



FUNCTIONAL BLOCK DIAGRAM OF U.P.S. ILLUSTRATION 1-4

1-5 THEORY OF OPERATION

After power is applied, the system is placed in STANDBY mode and a self-check starts. During this period, the system checks for the proper operation of the inverter and bypass SCRs. If a successful check is completed and verified, the system goes into the NORMAL mode. Refer to functional block diagram: illustration 1-4.

Normal Mode:

The input contactor is commanded to close and the input power is delivered to the step-down input transformer. A DC rectifier at the secondary side of the transformer converts AC voltage to a DC source which supplies the battery charger and the DC/AC inverter circuit. The battery charger is then activated allowing batteries to be continuously charged. The DC/AC inverter on the other hand converts the DC voltage to a Pulse-width-modulation (PWM) waveform. Finally this waveform is re-constructed and filtered back to a desired AC output.

RESONSE TO INPUT POWER FAILURE:

If the system controller senses a drop in input frequency of more than $2Hz \pm 0.2Hz$ due to a facility outage or a voltage instability, it will consider as an input failure and immediately command the input contactor to open in order to isolate the system from the facility side. At the same time, the charger is turned off and the battery bank becomes a DC supply source to continue supplying the inverter circuit and maintain an uninterruptible supply to AC output. The LCD screen will display a "UPS PROBLEM" message. If the facility power returns, stabilizes and is in phase with the backup power, the system controller commands to close the input contactor and the system is back to NORMAL. If the battery voltage drops below 10% of its nominal value and the facility power remains off, the system will be into a FAILURE.

The frequency change slow rate is limited to 0.1Hz per seconds. When frequency change is fast than above, the input contactor may be disconnected.

UPS FAILURE.

System controller will issue a FAILURE message on LCD screen if any of the following conditions happen:

- Internal failure
- System overheats
- Battery bank is under voltage

During a FAILURE, the system stops its backup operation with inverter SCRs are switched OFF and bypass

SCRs are switched on. An alarm signal will be sent out to the remote signaling connection and interface. The system remains in this mode until power is cycled.

UPS PROBLEM:

System controller will issue a UPS PROBLEM message on the LCD screen if any of the following conditions happen:

- Input power failure
- Output overloads

During a PROBLEM mode, inverter SCRs remain on and an alarm signal may be sent out to the remote signaling connection and interface. The system will reset itself as soon as the problems disappear.

1-6 EX SERIES SIZING

Each model of the EX Series is designed to supply a maximum load which is given by its kVA (1000's of voltamperes) and KW rating. It is very important that the load is within the rating of the EX Series to ensure that the connected loads will be properly supported.

Volt-amperes (VA) are the number of current in amps a device draws multiplied by the nominal voltage supplied to the device. The total kVA of all the loads to be connected to the EX Series is simply the sum of the kVA requirements of each device.

Each electrical device to be powered by the EX Series should have a specification sheet attached to it, which specifies the amount of power it requires. In addition, this information should also be listed in the manual supplied with each piece of equipment. The device's nameplate should list the electrical requirements of the device in some or all of the following units: nominal voltage, current, VA or kVA, and watts or KW. If VA or kVA is not given, then multiply the nominal input voltage by the current shown on the nameplate. Add up the kVA requirements of each device to be powered by the EX Series.

The total load to be powered by the EX Series must not exceed its rating. If the total load is exceeded, the EX Series monitoring will sense an overload condition and a summary alarm will occur. The overload condition must be corrected by increasing the kVA rating of the EX Series.

1-7 OUTPUT LOADS

The EX Series is designed to power any florescent or incandescent lighting. There are some types of loads, which require an excessive inrush current when first turned on or at other times during its operation.

The capacity of the EX Series may need to be greater than what would be estimated based on the nameplate requirements of loads previously discussed. Contact your Perfect Power Systems dealer or the factory directly if you have any questions about powering unusual loads from your EX Series.

1-8 Maintenance By-Pass Switch (Manual) "MTS"

This MTS is designed into UPS to Supply the Input Power directly to critical load through "By-Pass" position when UPS is out of Service. It is designed such that the UPS can be repaired while MTS is supplying the Power to Critical load without interruption.

MTS is "Make Before Break" type. The output of UPS should be no interrupted during switching from normal to By-pass. There will be an interruption from By-pass to Normal position because the UPS must be turned ON first.



"Warning" Prior to replacing the Inverter Heatsink Assembly (FRU) or other Components, Caution must Taken since there is live voltage on Certain Components and Certain Areas

1-9 OPTIONS FOR OUTDOOR SINGLE PHASE UPS (EX)

1	9100-1343-XX	NORM ON/OFF AUX CBS OPTION. FROM -01 TO -30 DEPEND ON FEATURES	
2	9100-1359-01	INTERNAL MANUAL MAINT. BYPASS SWT. SAME IN/OUT V (3-7.5KW)	
3	9100-1359-02	INTERNAL MANUAL MAINT. BYPASS SWT. DIFFERENT IN/OUT V (3-7.5KW)	
4	9100-1359-03	INTERNAL MANUAL MAINT. BYPASS SWT. SAME IN/OUT V (8-20KW)	
5	9100-1359-04	INTERNAL MANUAL MAINT. BYPASS SWT. DIFF. IN/OUT V (8-20KW)	
6	9100-1362-01	(5) FORM "C" DRY CONTACTS ALARM (AS400)	
7	9100-1363-01	AUDIO ALARMS WITH SILENCE SWITCH.	
8	9100-1020-03	REMOTE UPS STATUS DISPLAY UNIT.	
9	3000-044	EXTERNAL WRAP AROUND MBS ASSY. / 55 AMPS (3-7.5KW)	
	3000-045	EXTERNAL WRAP AROUND MBS ASSY. / 110 AMPS (8-20KVA)	
11	9100-651-01	HEATER STRIP WITH THERMOSTAT CONTROL ASSY. OPTION	
12	9100-1404-01	HEATING PAD ASSY. FOR QTY. 8 BATT SYSTEM	
13	9100-1404-02	HEATING PAD ASSY. FOR QTY. 10 BATT SYSTEM	
14	9100-1404-03	HEATING PAD ASSY. FOR QTY. 16 BATT SYSTEM	
15	9100-1404-04	HEATING PAD ASSY. FOR QTY. 20 BATT SYSTEM	
20	9100-1401-02	TVSS ASSY. FOR 120V, 1PHASE	
21	9100-1401-12	TVSS ASSY. FOR 208/240/277V UNIT, 1PHASE	
23	9100-1444-01 THE	RU 9100-1444-04 EMI FILTER.	
24	INPUT / OUTPUT CB BREAKERS FOR HIGHER KAIC. REFER TO SEPARATE TABLE FOR DETAIL		
25	HIGHER KAIC NO	RM / ON/ OFF OUTPUT AUX CBs.	
	9100-1434-01 THRU 9100-1434-86		
	9100-1435-01 THRU 9100-1435-86. REFER TO SEPARATE TABLE FOR DETAILS		
26	5007-000-SM	CABINET COLD STEEL PAINTED. STANDARD CABINET (UPS)	
27	5007-100-SM	CABINET STAINLESS STEEL (UPS)	
	5007-200-SM	CABINET ZINC ANODIZED ALUMINUM (UPS)	
	5007-300-SM 5007-500-SM	CABINET COLD STEEL PAINTED (BATT. CAB) CABINET ZINC ANODIZED ALUMINUM (UPS)	
		,	

GMS LOCAL MONITORING SYSTEM ASSY.

LOCAL

A LOCAL PC VIA RS232

25FT	9800-001-25
50FT	9800-001-50
75FT	9800-001-75
100FT	9800-001-100
150FT	9800-001-150

LOCAL PC VIA RS485 В

> 150FT 9800-002-150 250FT 9800-002-250 500FT 9800-002-500 1000FT 9800-002-1000

С LOCAL EVENT LOGGING 9100-1466-01/9100-1538-XX

REMOTE

D DIAL-UP / VOICE / EVENT LOG / PAGER

9100-1467-01 (PENDING)

Ε DIAL-UP / DATA / FX / MAIL / EVENT LOG /

PAGER

9100-1468-01 (SENSAPHONE)

F WEB / SNMP STATUS / ALARM / EVENT METERING

> ASSY BASIC NETAGENT SNMP 9800-007-01 ASSY ADVANCED NETAGENT SNMP 9800-008-01 ASSY ADVANCED NETAGENT SNMP W/WI-FI, HUB 9800-009-01 ASSY ADVANCED NETAGENT SNMP W/DIAL-UP MODEM 9800-010-01 ASSY ADVANCED NETAGENT SNMP W/MOBILE MODEM 9800-011-01

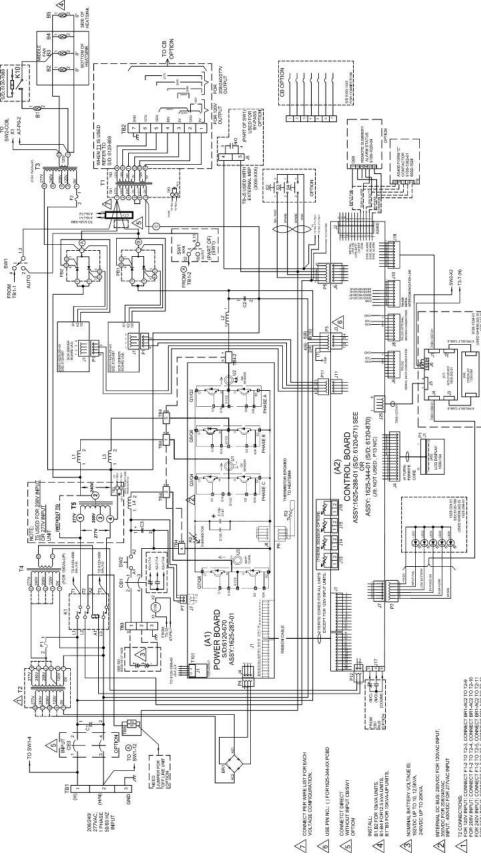
AUX OUTPUT CB WITH ALARM Н

> **MONITORING 1CB** 9100-1453-01

ASSY ANVANCED NETAGENT

1-21 6005-056 Rev D

1-10 SYSTEM SCHEMATIC DIAGRAM (TYP):



SECTION 2 - INSTALLATION

2-1 SITE PLANNING AND PREPARATION

The EX Series is designed for installation indoors and meets NEMA specifications for operating temperature, humidity, and utility voltage. These cabinets are corrosion resistant and rugged. The footprint of the EX is less than 6 square feet. Listed below are the environmental specifications for the EX Series.

Adequate clearance in the front of the equipment should be provided for service access.

OPERATING ENVIRONMENT.

- AMBIENT TEMPERATURE 0° to 40° C
- OPERATING ALTITUDE 1,829 M (6,000 FT) DERATE 10% FOR EACH ADDITIONAL 305 M (1,000 FT) UP TO 2,744 m (9,000 FT)
- RELATIVE HUMIDITY 0% to 95% (non-condensing)

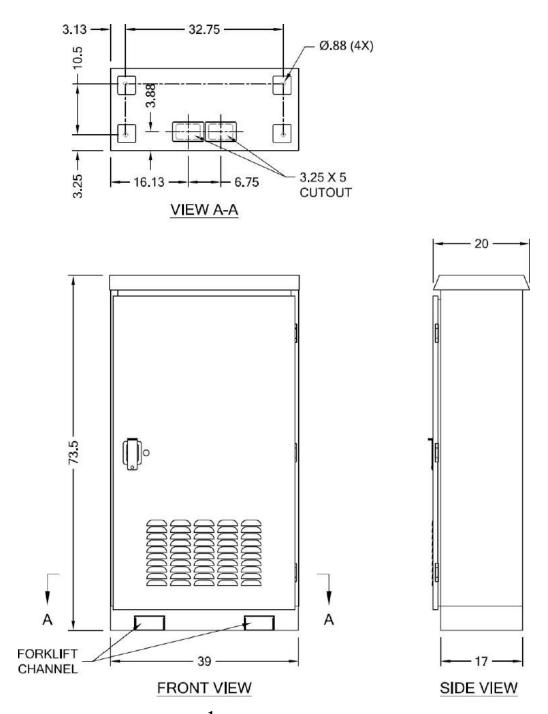
Operating the EX and batteries at either extreme of the temperature range may affect the long-term reliability of the system. This is especially true of the sealed, maintenance-free batteries. Sealed, maintenance-free batteries are designed to operate at normal room temperatures (72 to 77 °F).

STORAGE ENVIRONMENT. Provide a storage environment, which meets the following conditions:

- AMBIENT TEMPERATURE -20°C to 68°C
- RELATIVE HUMIDITY 0% to 95% non-condensing

2-2 CABLE ACCESS

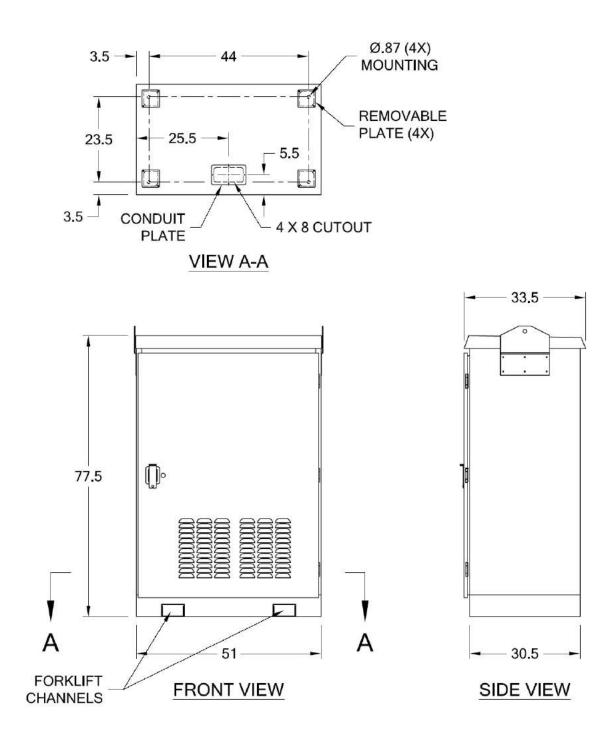
The EX Series provides cable/conduit openings in the bottom of the cabinet. Refer to Illustration 2-1 and Illustration 2-2.



TYPE: 1 CABINET (39X 74.5 X 17.0)

ILLUSTRATION 2-1

If input CB option is not included in the UPS, customer must provide I/O circuit protection.



TYPE: 2 CABINET (51 X 77.5 X 30.5)ILLUSTRATION 2-1

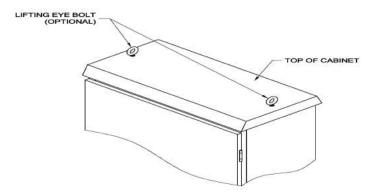
If input CB option is not included in the UPS, customer must provide I/O circuit protection.

2-3 PRE-INSTALLATION

The EX Series is designed for outdoor installations. All customer connections are brought through conduit plate located on the bottom of the unit. The EX consists of one (1) integrated cabinet - housing both the electronics and batteries (depending on KVA). Before unpacking the equipment, inspect the exterior the shipping container and the equipment itself for damage that may have occurred during transit. If the shipping container or equipment itself shows evidence of damage, note the damage on the receiving document before signing for receipt of the equipment. Damage claims should be filed directly with the carrier.

2-3-1 Equipment Unpacking

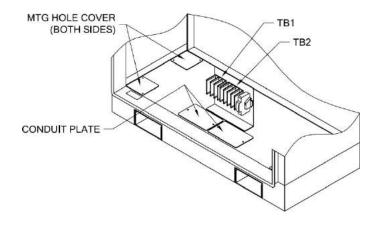
Remove the equipment from the shipping carton. Since the EX is designed for pad-mount installations, there are no casters. It is suggested that a fork lift be used to remove the unit from its shipping pallet after installing 5/8-11 X 1-3/4 lifting eye bolt (2X) to the threaded holes on top of unit (optional item).



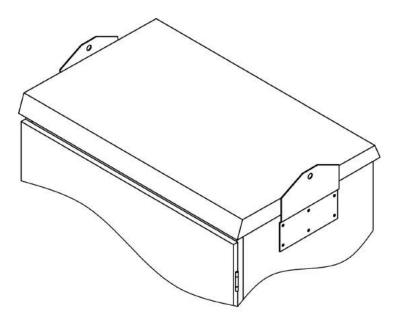
TYPE: 1 CABINET

2-3-2 Mechanical Installation

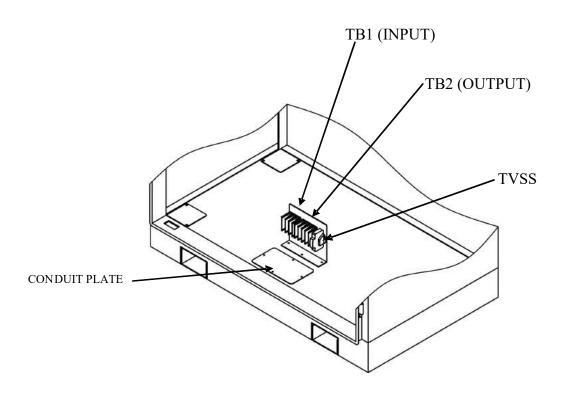
- 1. Remove the conduit plate located on the bottom of unit before placing the HU onto the mounting bolts (where it will be installed).
- 2. Drill or punch appropriate holes in the conduit plate.
- 3. Anchor the EX to the mounting pad at the four (4) mounting locations.
- 4. Anchor the conduits to the conduit plate.
- 5. Install skirts to the base of unit.



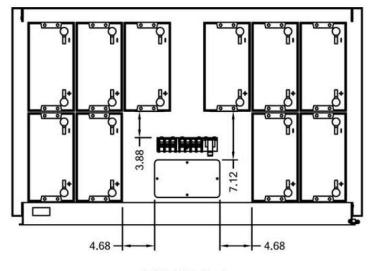
TYPE: 1 CABINET



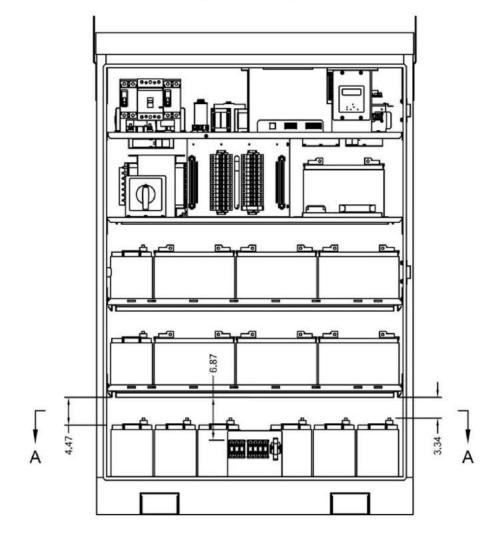
TYPE: 2 CABINET



TYPE: 2 CABINET



VIEW A-A



TYPE: 2 CABINET

2-4 ELECTRICAL CONNECTIONS



Verify that all customer-supplied wiring is de-energized before performing any electrical work,



Even when the EX is off, there are potentially dangerous voltages within the EX due to the batteries. Extreme care must be taken when working within the EX enclosure.

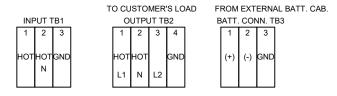
- 1. Verify that the main input circuit breaker, battery circuit breaker, and output circuit breaker(s), if provided are in the "OFF" position. See illustration 1-2 for the locations of the circuit breakers.
- 2. Verify BY Switch is on **Normal** Position. (Internal maintenance bypass option)
- 3. Run the power wires up through the center area of the EX. Exercise care when working around the battery area.
- 4. Refer to Section 1-4 for various different installation configurations.
- 5. Connect the input wires to the input terminal block, TB1. Three (3) wires total: "hot", neutral (or Hot), and ground.
- 6. Connect the output wires to the output terminal block, TB2. Three (3) wires total: "hot", neutral (or Hot), and ground.
- 7. This concludes the electrical connections.

Do not apply power to the EX at this time.

2-5 CUSTOMERS CONNECTIONS

REFER TO PAGE 2-2 (2.2 CABLE EXCCESS AREA)

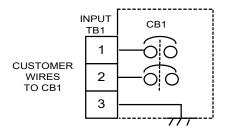
REMOVE CABLE ENTRY PLATES AND PUNCH HOLES FOR A PROPER SEZE. AND USE FOR CABLE ENTRY.



PROTECTOR CUSTOMER'S CONNECTION TERMINAL BLOCK ILLUSTRATION 1-5

REFER TO 2-5-2 FOR PROPER OUTPUT VOLTAGE CONNECTION

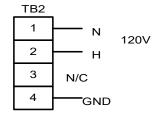
2-5-1 INPUT WIRINGS FOR VARIOUS INPUT VOLTAGES ARE SAME.
WHEN INPUT CIRUCIT BREAKER IS USED, INPUT CB1 IS INSTALLED IN INSIDE OF THE UPS.



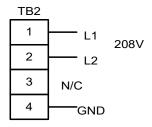
PROTECTOR CUSTOMER'S CONNECTION TERMINAL BLOCK ILLUSTRATION 1-6

2-5-2 OUTPUT WIRING

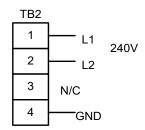
2-5-2-1 120V IN/OUTPUT UNIT



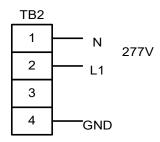
2-5-2-2 208V IN/OUTPUT UNIT



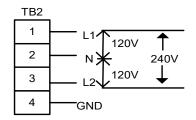
2-5-2-3 240V IN/OUTPUT UNIT



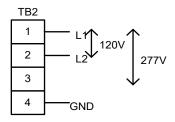
2-5-2-4 277V IN/OUTPUT UNIT



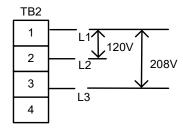
2-5-2-5 MULTIPLE OUTPUT 240 / 120V OUTPUT UNIT



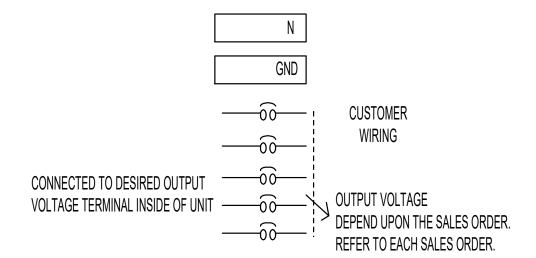
2-5-2-6 MULTIPLE OUTPUT 120 / 277V OUTPUT UNIT



2-5-2-7 MULTIPLE OUTPUT 120 / 208V OUTPUT UNIT



2-5-2-8 WITH EXTRA AUX. OUTPUT CIRCUIT BREAKERS FOR VARIOUS OUTPUT VOLTAGES



2-5-3 Remote Signaling Connections

The EX includes the feature of providing dry relay contacts for remote signaling capabilities. Signals available for remote annunciation are:

"UTILITY FAILURE" - This is a normally open contact, which closes upon loss of input power to the EX.

"LOW BATTERY" - This is a normally open contact, which closes when the EX is on battery operation and the batteries are approaching complete discharge.

"ON INVERTER or ON BYPASS" - This is a normally open contact, which closes when the EX goes to battery operation.

"SUMMARY ALARM" - This is a normally open contact, which closed when the EX has any one of the alarm condition.

If there are no requirements for remote signaling, section 2-5-3 may be skipped.

- 1. The dry relay contacts for remote signaling are provided via connector (P2) of control board (A2) located on the right door inside of the EX. See illustration 1-2 for locations of Control Board.
- 2. The dry relay contacts have the following maximum ratings:
 - 125 volts (AC or DC) maximum
 - 1.25 amperes maximum
 - 30 watts / 50 VA maximum

It is imperative that the relay contact ratings are not exceeded. Otherwise, damage to the relays within the EX will occur.

- 3. Determine which signals will be used. Connect wires (customer-supplied) to the connector.
- 4. This concludes the remote signaling connection procedures.
- 5. This concludes the installation procedures. Please proceed to Section 3 Start-Up for the steps necessary to start-up the EX.

2-6 STORAGE

The EX Series can be placed in storage while not in use. Provide a protected environment, which meets the environmental parameters listed below.

- AMBIENT TEMPERATURE -4° to 140°F -20° to 60°C
- RELATIVE HUMIDITY 0% to 95% non-condensing

If the EX Series will be stored for several months or longer, it should be serviced by charging the batteries for 24 hours at regular, three-month intervals. While in storage, service the unit using the procedures in this section.

During long-term storage, the batteries are subject to aging and deterioration. If after visual inspection, the batteries need to be replaced contact your Perfect Power Systems dealer or the Perfect Power Systems factory directly to obtain new batteries.

If the UPS is stored in its original packaging, unpack UPS using unpacking procedures outlined in

Section 2-3-1.

If the UPS is not connected to a source of power, first connect the UPS to an appropriate source of power using the procedures in Section 2-4, Electrical Connections.

When the UPS is unpacked and first connected to an AC power source, recharge batteries as follows:

- 1. Unlock and open front doors.
- 2. Visually inspect batteries for signs of deterioration and leakage. Replace batteries if required.
- 3. Set AC power source to ON.
- 4. Close input CB, if provided (CB1)
- 5. Close battery CB, if provided (CB2)
- 6. The UPS automatically recharges batteries. The LCD panel will indicate the battery voltage and charging current.
- 7. Allow UPS to run for 24 hours to fully charge batteries.
 - When batteries have reached partial charge, the battery charging current will be under 1 Amps on LCD panel.
- 8. Turn OFF input power to the UPS.
- 9. Close and lock front door.

SECTION 3 - OPERATION

3-1 START-UP PROCEDURES

1. Verify that the main input circuit breaker, battery breaker, and output circuit breaker(s), if provided, are in the "OFF" or "down" positions. Maintenance By Pass Switch is on Normal Position.

Refer to illustration 1-2 for the locations of the circuit breakers.



If during the start-up procedures anything unusual occurs, immediately turn off the input circuit breaker, and contact Perfect Power Systems at (800) 797-7782 for technical assistance. Also, use this number for other question or additional information.

- 2. Apply input power to the EX.
 - Verify that the voltage appearing on the input terminal block is same as on nameplate
 - Verify that there are no voltages appearing on the output terminal block.
- 3. Turn on the main input circuit breaker CB1.
- 4. After turning on the System, wait one (1) minute while the EX runs through its internal diagnostic routines.
 - Hear the sound of contactor closing.
 - See the fan(s) running.
 - See the LCD panel displaying correct messages. See Appendix A for LCD displays.
 - Verify that the LCD display panel indicates all correct parameters see Appendix A for details. Verify that the output voltage is 120/the nameplate.
- 5. Close battery breaker (CB2) in the UPS cabinet.
- 6. At this point in time, the EX should be operating as Normal. If the EX is not operating in the normal mode, turn off the input circuit breaker (CB1). Request for technical assistance. Refer to LCD display in Appendix A.

3-1 START-UP PROCEDURES (continued)

If LCD display shows Normal, then

- 7. Recheck that the output voltage is same as in the nameplate On LCD Display.
 - If the output voltage is approximately same as nameplate, turn on the loads, which will be powered from the EX Series.
- 8. The next steps verify battery operation and the inverter test switch.
 - To place the EX in battery operation (to simulate loss of input power), press and hold yellow Inverter Test Switch. With switch in the hold position, the EX should be running on its internal batteries.
 - Verify that the LCD panel displays such.
 - Verify that the "Battery Charger" is OFF in LCD panel.

Note: Be sure to release the switch, after the test, so it will not deplete the batteries.

9. The EX is now fully functional - providing clean, sine wave power to the load with battery back up in case of an input power failure. This concludes the start-up procedures.

3-2 OPERATIONS

3-2-1 Turning On the EX

Make sure that all Circuit Breakers are in OFF position

- 1. Apply input power.
- 2. With input power available, turn on the main input circuit breaker, CB1 (if provided).
- 3. Close battery breaker (CB2), only after the LCD display is lit & displays screens per Appendix A.
- 4. Wait till you hear the input contactor closing and fan running.
- 5. Verify that all parameters on LCD display panel are proper. See Appendix A for display details.
- 6. Close the output circuit breaker.

3-2-2 Turning off the EX:

- (A) If the Maintenance By pass switch is on Normal position and MTS is not being used, then, verify that SI switch is at OFF position.
 - 1. Turn off the Battery Breaker.
 - 2. Turn off the Input Breaker.

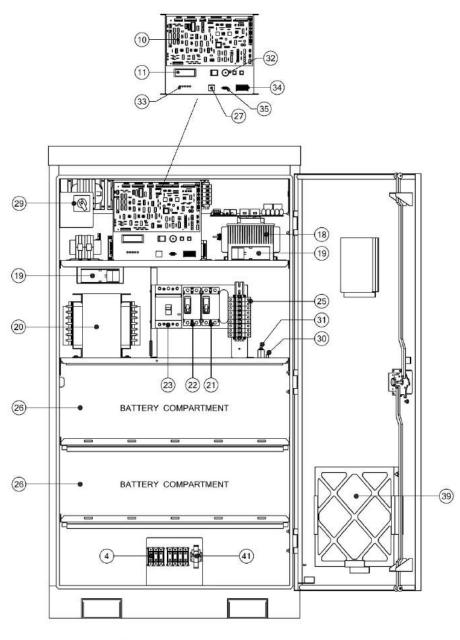
- (B) If using "MTS" Switch you need to switch SI to on position first and switch "MTS" (Maintenance By-Pass Switch) to By-Pass position first, (do not turn off output CB's)
 - 1. Turn off the Battery Breaker.
 - 2. Turn off the Input Breaker.

WARNING

LIVE HIGH VOLTAGE WILL BE PRESENT AT VARIOUS COMPONENTS EVEN AFTER INPUT AND BATTERY CB ARE OFF

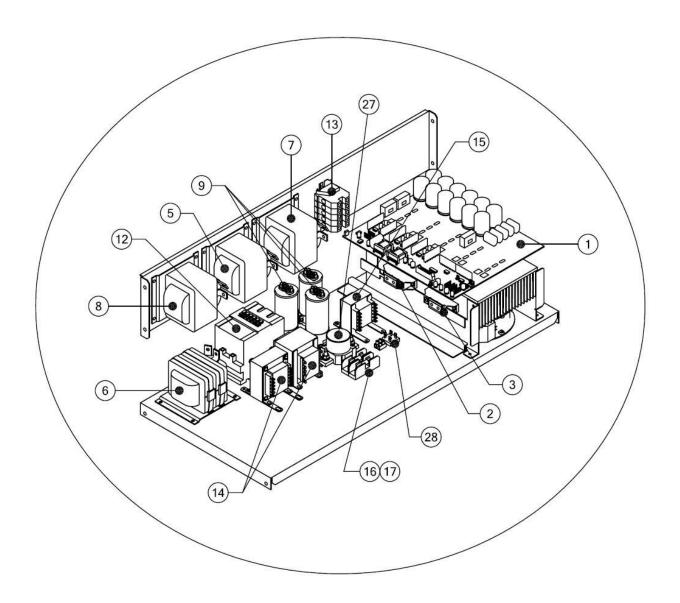
3-3 RENEWAL PARTS

On the following pages are pictorials of the parts location in the EX. The page after the pictorials is a chart of the part numbers for each part by the size or voltage of the particular EX that requires parts.



UPS CABINET

6005-056 Rev D



ELECTRONIC TRAY

ITEM	QTY	DESCRIPTION	DESIG.	ONLINE P/N	REMARKS
1	1	POWER BOARD	Al	1625-288-01	INCLUDED IN ITEM 18
2	1	BYPASS STATIC SWITCH	PB1		
3	1	OUTPUT STATIC SWITCH	PB2		
4	1	T/B (INPUT/OUTPUT/BATTERY)	TB1, 2, 3		
5	1	INPUT CHOKE	L2		
6	1	OUTPUT CHOKE	L4		
7	1	DCCHOKE	L3		,
8	1	INPUT CHOKE	L1		
9	3	HI FREQ NOISE FILTER CAP FORINPUT, OUTPUTAND BATTERYPOWER	C1, C2, C3,		
10	1	CONTROL BOARD	A2		
11	1	LCD DISPLAY BOARD		1690-164	
12	1	INPUT CONTACTOR	K1		
13	1	TERMINAL BLOCK (HEAT SINK)	TB4		
14	2	TRANSFORMER CONTROL	T3, T4		
15	1	CONTROL POWER TRANSFORMER	T2		
16	1	FUSE (CONTROL TRANSFORMER)	F2		
17	1	FUSE (FAN)	FI		
18	1	HEATSINKASSY			
19	3	FANS (HEATSINK/OUTPUTX-FMR)		1000-050	
20	1	OUTPUT TRANSFORMER	T1		
21	1	INPUT BREAKER	CB1		
22	1	OUTPUT BREAKER	CB3		
23	1	BATTERY BREAKER	CB2		
24	1	T/B (BATTERY INTERCONNECT)	TB5		AVAIL W/BATT CAB ONLY
25	1	OUTPUT DISTRIBUTION BREAKERS	CB4-15	9100-1343-XX	OPTIONAL
26		MAINTENANCE FREE LEAD ACID BAIT			
27	1	INVERTER TEST SWITCH	S2		
28	1	RECTIFIER BLOCK	BR1	1690-052	
29	1	MAINTENANCE BYPASS SWITCH	SW1	1680-258	OPTIONAL
30	1	GROUND		1175-002	AVAIL WITH ITEM 25 ONLY
31	1	NEUTRAL			AVAIL WITH ITEM 25 ONLY
32	1	AUDIO/SILENCE ALARM		9100-1363-01	OPTIONAL
33	1	LED INDICATOR		1625-324-01	
34	1	5 FORM C CONTACTS ALARMS ASSY		9100-1362-01	OPTIONAL
35	1	RS232 CONNECTION		9100-1405-01	OPTIONAL
36	1	THERMOSTAT		8010-014	INCLUDED IN ITEM 37
37	1	HEATER		9100-651-01	OPTIONAL
38	1	AIR FILTER		7010-031	
39	1	AIR FILTER		7010-011	· .
40	1	SENSAPHONE		9100-1468-01	OPTIONAL
41	1	TVSS		9i00-1401-XX	OPTIONAL
42	2	FUSES (TVSS)		2075-117	INCLUDED IN ITEM 41
43	2	TOP FANS		1000-036	
44	1	INPUT TRANSFORMER			
45	1	SENSAPHONE INTERFACE BOARD		1625-276-01	INCLUDED IN ITEM 40
46	2	FUSES		2075-049	INCLUDED IN ITEM 40

Table 3-1

3-4 FIELD REPLACEABLE UNITS (FRUS)

Refer to Table 3-1 for ordering the renewed parts from the factory. Supply the information from the nameplate of the unit, such as serial number, model number, KVA, P.F., input/output battery voltages, and date of manufacture, when ordering parts from factory. Call Toll Free (800) PWR-SRVC in North America. Qualified factory trained service personnel should only replace these parts.

3-4-1 Control Board

This board is located on the right door at top and mounted at 4 corners with nuts and washers. Verify that all connectors are marked with their designations and pin #1, 2, etc.... Unplug P1, P3, P4, P5, P7, P11, P12. Install new board. Reconnect all above connector into their correct designations and orientation.

3-4-2 All Other Parts

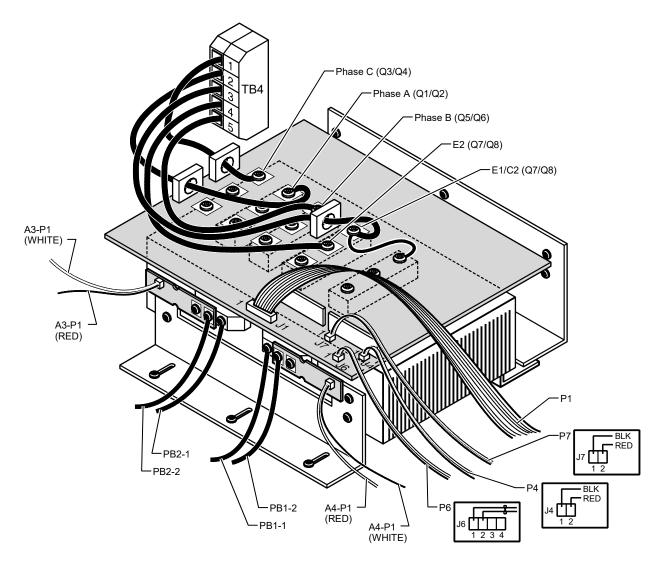
Verify that the cables are marked before disconnecting. Replace the part with the new part. Reconnect wiring same way as it was disconnected.

3-4-3 Heat Sink Assembly Replacement Procedure

Note: Verify that the MTS is on By-Pass Position and SI is at ON position

- 1. The heat sink assembly is located on the right side of the top electronic shelf, inside the UPS cabinet. See Illustration 3-2 for details. Verify that all cables and connectors has label or identify as shown. This is important for reinstalling the assembly.
 - Disconnect connectors P7, P6, P4, P1 from the top side of the main big PWBD, A1, (1625-287-01) which is sitting horizontally on the big black heat sink.
- 2. Disconnect 5 power cables at TB4-1 through TB4-5 using flat screw driver. Verify and install label id for each cable before disconnecting.
- 3. Disconnect power cables at PB2-2, PB2-1, PB1-1, and PB1-2 from the front side of the assembly. Watch for small copper plate coming out from front and rear of the power boards for reinstalling.
- 4. Disconnect 2 small connector from front at PB2 and PB1. They should be labeled A3-P1 and A4-P1 respectively.
- 5. Remove the jumper from PB2-1 to PB1-1, if installed.
- 6. Remove 3 phillips screws at front holding heat sink bracket. Pull the complete assembly forward and up. Remove it from tray gently, verifying that no cables or wires are latching up. See illustration 3-3.
- 7. Install new assembly in the reverse order. Note that the rear bracket attached to the heat sink slides under the bracket secured on to the back panel. Slide the assembly back and reinstall 3 phillips screws.
- 8. Reinstall all the cables and connectors in the reverse order. Verify with illustration 3-2.
- 9. Visually inspect connections prior to starting up the unit.

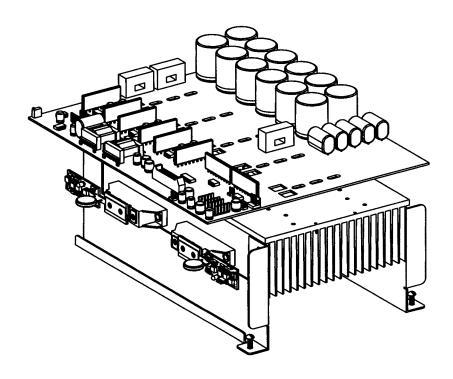
3-4 Field Replaceable Units (FRUs) (continued)



HEAT SINK ASSEMBLY ILLUSTRATION 3-2

3-4 Field Replaceable Units (FRUs) (continued)

- 1. Disconnect cables of TB4-1 through TB4-5 (See ill. 3-2).
- 2. Remove 2 mounting screws.
- 3. Remove Heat Sink Assy out of the unit.



REMOVAL OF HEAT SINK ASSEMBLY (SIMPLIFIED) ILLUSTRATION 3-3

SECTION 4: BATTERY MAINTENANCE

4.1 INTRODUCTION

The battery is a component that degrades with time in service.

The Cell/Unit internal resistance impedance will increase. The actual life achieved will be a function not only of the Battery design but also of the Application.

To achieve the optimum life of the battery and avoid problems **Battery Maintenance** should be considered.

Battery Maintenance Testing & Specifications

Battery Specifications

- Float Voltage The specified float voltage "wind "is.2.25 \sim 2.30 V.P.C. @ 25°C. This Value will help in reducing recharge times and keeping the batteries at the highest state of charge.
- Recommended Procedures
 - These methods are designed to be used on a battery system installed for a minimum period of 6 month, in a steady state of Float condition and not under conditions of high current recharge or discharge.
- Measure Float Voltage
- When the battery voltage is low over 24 hours test system, remove the Battery.
- Measure and record system voltage directly across the battery circuit breaker.
- If the battery system is determined to be low voltage system after 24 hours of charging the system voltage will be only 3% low, remove and replace the Battery.
- Battery Servicing
- Measure and record a 10% sample of individual battery temperatures at the negative terminal post.
- Identify batteries that are greater than 3° C above ambient from the calculated average. If no external causes for higher battery temperatures are noted.
- Check that the filters are clean and Fans are operational.
- If no change is noted, remove and replace the Battery.
- If no change is noted, remove and replace the Battery.
- Visual Inspections.

- Examine batteries for any abnormalities in end wall bulge, post leakage, cover to cells leakage, etc.
- Identify any end wall bulges that exceed 1/2 inches compared to the other batteries in tray.
- Battery Date Coding.
- The manufacturer stamps the Negative terminal post of the battery, with the month and year date code.
- Shelf life is based on normal storage temperature conditions, $66\,^{0}\text{F} \sim 90\,^{0}\text{F}$, and requires recharging every 6 months from the last full charge date.

! WARNING!

BATTERY SHELF TIME, WHEN STORED UNDER TEMPERATURE CONDITIONS of $66\,^{\circ}F \sim 90\,^{\circ}F$, is FIVE (5) MONTHS MAXIMUM AFTER THE SHIP DATE.

BATTERY MUST BE RECHARGED AFTER THIS DATE OTHERWISE THEY WILL BE DAMAGED.

THE SHIP DATE IS PART OF THE SERIAL NUMBER.

APENDIX A - SPECIFICATIONS

SPECIFICATIONS FOR KVA, 0.7PF UNITS

POWER RATING (KVA)	3 / 2.1	5/3.5	7.5 / 5.25	10 / 7	12.5 / 8.75	15 / 10.5	20 / 15			
INPUT		1	I		1	1				
VOLTAGE (VAC)		Phase, 0/277 VAC		Sing	le Phase, 208/24	0/277 VAC				
MAXIMUM CURRENT	29/17/15/13	44/25/22/19	36/30/26	74/40/35	57/49/43	68/59/51				
TOLERANCE				+15% to -	-15%					
FREQUENCY (Hz)				60 +/- 3	3%					
POWER FACTOR		0.98 to 1.0 (Typical)								
OVERCURRENT PROTECTION		Electronic / Circuit Breaker								
NUMBER OF WIRES	2 Wires plus Ground									
POWER CONNECTION	NNECTION Hard Wired (Terminal Block)									
OUTPUT										
RATING (KVA/KW)	3 / 2.1	5 / 3.5	7.5 / 5.25	10 / 7	12.5 / 8.75	15 / 10.5	20/15			
VOLTAGE (VAC)			Single I	Phase, 120/20	8/240/277 VAC					
VOLTAGE REGULATION		+/-39	% No Load to	Full Load; +/	-3% High Line to	Low Line				
FREQUENCY (Hz)			60 Hz +	/-0.25 Hz (W	hen on Inverter)					
WAVESHAPE				Sine Wa	ave					
HARMONIC DISTORTION			<5% 7	THD; <3% Si	ngle Harmonic					
CREST FACTOR				Up to 3	to 1					
POWER FACTOR			0.65 I	agging or Le	ading to Unity					
STEADY-STATE CURRENT	18/10/9/8	29/17/15/13	44/25/22/19	58/34/29/25	73/4236/32	88/50/44/38				
OVERLOAD			125 % fo	r One (1) min	utes, surge 150 %	6				
PROTECTION			Ele	ectronic / Circ	cuit Breaker					
NOISE REJECTION			-120 dB Con	nmon Mode;	-60 dB Normal N	/lode				
NUMBER OF WIRES				2 Wires plus	Ground					
POWER CONNECTION			Har	d Wired (Ten	minal Block)					

POWER RATING (KVA)	3 / 2.1	5/3.5	7.5 / 5.25	10 / 7	12.5 / 8.75	15 / 10.5	20 / 15				
BATTERY	1										
BATTERY RUN TIME			90	Minutes Mi	nimum						
BATTERY TYPE			Sealed, Mainte	nance-Free,	AGM, VRLA ty	ype					
NOMINAL DC VOLTAGE	96 VDC	120 VDC	120 VDC	192 VDC	192 VDC	240) VDC				
OVERCURRENT PROTECTION	Circuit Breaker										
PACKAGING	Batte	ries Housed in	Same Enclosu	re and/or ad	ditional battery	cabinet (See Ta	able 2-1)				
MONITORING AND COMMU	NICATION	NS									
LCD SCREEN	Input V	oltage; Batter	y Charger; UPS	S Output; Or	n Battery; Low F	Battery; Summ	ary Alarm				
INDICATORS			L	CD Display	Panel						
RELAY INTERFACE	Dry Contacts for: UPS On (N.C.); On Inverter (N.O.); Loss of Input Power (N.O.); Low Battery (N.O.)										
CONTACT RATING	ACT RATING 125 Volts (AC or DC) Maximum; 1.25 Amperes Maximum; 30 Watts / 50 VA Maximum										
INTERFACE CONNECTION			Hard V	Wired (Term	inal Block)						
ENVIRONMENTAL											
USRGE WITHSTANDABILITY			ANSI C62	.41-1980 Ca	tegories A & B						
OPERATING TEMPERATURE			Meets	NEMA Red	quirements						
OPERATING RELATIVE HUMIDITY			0 to 9	95% Non-Co	ondensing						
ALTITUDE		Up	to 6,000 Feet	(1,829 Mete	rs) with No De-I	Rating					
COOLING			Air	Cooled-For	ced Fan						
PHYSICAL											
SIZE H x W x D in. (cm)			70 x 39 x	x 20 (177.8 z	x 99.1 x 50.8)						
WEIGHT lbs (kg) with batteries	600 (273)	900 (409)	1150 (523)	1600 (727)	1850 (841)	2250 (1023)					
CONSTRUCTION	Painted Sto	eel Enclosure	with 3 Point Do	ouble Lockin	ng Front Door; a	nd Full-Lengtl	n Door Hinge.				
ENCLOSURE			Designe	d for Inside	Installations						
COLOR				Natural fir	ish						
ACCESSIBILITY	Fro	ont - All Servi	cing is Through	n the Front;	No Side or Rear	Access is Req	uired.				
CABLE ENTRY				Bottom or s	sides						
MOUNTING	Fo	our (4) Holes F	Provided to And	chor Enclosi	re to Pedestal (S	Supplied by Ot	hers)				

SPECIFICATIONS FOR KW, 1.0PF UNITS

POWER RATING (KW)	3/3	5 / 5	6/6	7.5 / 7.5	8/8	10 / 10	12.5 /	15 / 15		
							12.5	20 / 14		
INPUT	1	ı	ı	II.	II.	ı	I	I		
VOLTAGE (VAC)		Single Phase,	se, 208/240/277 120/208/240 Single Phase,							
	120	/208/240/277	VAC	VAC	/277 VAC	2	208/240/277 VA	VC		
MAXIMUM CURRENT	40/23/20/17	60/35/30/26	69/42/36/31	51/41/36	78/45/39/40	64/56/48	64/56/48 79/69/59 95/83/			
TOLERANCE					+15% 1	to -15%				
FREQUENCY (Hz)					60 +	/- 3%				
POWER FACTOR					0.98 to 1.	0 (Typical)				
OVERCURRENT PROTECTION					Electronic / C	ircuit Breaker				
NUMBER OF WIRES					2 Wires pl	us Ground				
POWER CONNECTION					Hard Wired (T	erminal Block)			
OUTPUT			•							
RATING (KVA/KW)	3/3	5/5	6/6	7.5 / 7.5	8/8	10 / 10	12.5 / 12.5	15 / 15		
VOLTAGE(VAC)				Sir	igle Phase, 120	/208/240/277	VAC			
VOLTAGE REGULATION				+/-3% No Lo	ad to Full Load;	+/-3% High Li	ne to Low Line			
FREQUENCY (Hz)				60	Hz +/-0.25 Hz	(When on Inve	erter)			
WAVESHAPE					Sine	Wave				
HARMONIC DISTORTION				<	5% THD; <3%	Single Harmor	nic			
CREST FACTOR					Up to	3 to 1				
POWER FACTOR				().65 Lagging or	Leading to Un	ity			
STEADY-STATE CURRENT (Normal Mode / Emergency Mode)	25/14/13/11	42/24/21/18	50/29/25/22	63/36/31/27	66/38/34/28	83/48/42/36	104/60/52/45	125/72/63/54		
OVERLOAD			125 % for One (1) minutes, surge 150 %							
PROTECTION					Electronic / C	ircuit Breaker				
NOISE REJECTION				-120 dE	Common Mod	e; -60 dB Norr	nal Mode			
NUMBER OF WIRES					2 Wires pl	us Ground				
POWER CONNECTION					Hard Wired (T	erminal Block)			

POWER RATING (KW)	3/3	5/5	6/6	7.5 / 7.5	8 / 8	10 / 10	12.5 /	15 / 15			
							12.5	20 / 14			
INPUT	1	1					I	ı			
VOLTAGE (VAC)	Single Phas	se, 120/208/240	0/277 VAC			Single Phase,	208/240/277 V	AC			
MAXIMUM CURRENT	40/23/20/17	60/35/30/26		51/41/36		64/56/48	79/69/59	95/83/71			
TOLERANCE				,	+15	% to -15%	,				
FREQUENCY (Hz)					60) +/- 3%	3%				
POWER FACTOR					0.98 to	1.0 (Typical)	(Typical)				
OVERCURRENT PROTECTION					Electronic	/ Circuit Break	,,				
NUMBER OF WIRES					2 Wire:	s plus Ground					
POWER CONNECTION					Hard Wired	d (Terminal Blo	ck)				
OUTPUT											
RATING (KVA/KW)	3/3	5/5	6/6	7.5 / 7.5	8/8	10 / 10	12.5 / 12.5	15 / 15			
VOLTAGE(VAC)				Sin	gle Phase,	120/208/240/2	77 VAC				
VOLTAGE REGULATION				+/-3% No Loa	d to Full Lo	ad; +/-3% High	Line to Low Lin	ne			
FREQUENCY (Hz)				60	Hz +/-0.25 l	Hz (When on Ir	nverter)				
WAVESHAPE					Si	ne Wave					
HARMONIC DISTORTION				<	5% THD; <	3% Single Harr	nonic				
CREST FACTOR					Up	to 3 to 1					
POWER FACTOR				0	.65 Lagging	or Leading to	Unity				
STEADY-STATE CURRENT (Normal Mode / Emergency Mode)	25/14/13/11	42/24/21/18		63/36/31/27		83/48/42/36	104/60/52/45	125/72/63/54			
OVERLOAD				125 %	% for One (1	One (1) minutes, surge 150 %					
PROTECTION				Electronic / Circuit Breaker							
NOISE REJECTION			-120 dB Common Mode; -60 dB Normal Mode								
NUMBER OF WIRES					2 Wire:	s plus Ground					
POWER CONNECTION					Hard Wired	d (Terminal Blo	ck)				

APPENDIX B – TROUBLE SHOOTING GUIDE & SYSTEM ALARMS

CASE	SYI	MPTOMS	CAUSES	ACTION
Ş	DESCRIPTION	LCD DISPLAY		
			Output is short- circuited	Replace Heatsink assembly. If problem still persists go to step 2.
2	Attempt to turn on and unit remains in BYPASS_and LCD screen shows input OK	UPS FAILURE @ ## KW INPUT <u>OK</u> @ CHRG OFF BATTERY OK @ DC OK ON BYPASS @ OUT BAD	Heatsink assembly has failed	 Disconnect all loads then turn the unit back on. If it runs normally, request facility manager to check output loads for possible short. If problem still persists, go to step 3.
			3. Not listed	Call tech support at 1-800- PWR-SRVC for further action.
			Connector P3 on control PCB gets loose (see Illustration 4.2 for location of connectors)	Check connector for proper seating. If problem still persists, go to step 2.
3	Attempt to turn on and unit remains in BYPASS_and LCD screen shows input BAD	UPS FAILURE @ ## KW INPUT <u>BAD</u> @ CHRG OFF BATTERY OK @ DC OK ON BYPASS @ OUT BAD	Connector P3 has bad connection	 Unplug P3, verify voltages are present across pin 2 & 4 and 6 & 8 for single-phase and pin 1 & 2 and 3 & 4 for 3- phase. If no voltage is present, go to step 4. Else, go to step 3.
			3. Control PCB failure	 Replace control PCB. If problem still persists, go to step 4.
			4. Not listed	Call tech support at 1-800- PWR-SRVC for further action.

CASE	SYI	MPTOMS	CAUSES	ACTION
ర	DESCRIPTION	LCD DISPLAY		81.393.5946.733.7419
			Charger circuit on Power PCB has failed.	Replace Heatsink assembly. If problem still persists go to step 2.
4	unit remains in BYPASS.	UPS PROBLEM @ ## KW INPUT <u>OK</u> @ CHRG OFF BATTERY OK @ DC LOW ON BYPASS @ OUT OK	Control PCB has failed.	Replace Control PCB assembly. If problem still persists, go to step 3.
l	Jo valugo Iow.		3. Not listed	Call tech support at 1-800- PWR-SRVC for further action.
_				
			Fluctuation in input voltage & frequency	Verify input voltage to be within ± 10% and frequency to be ± 3 Hz compared with nameplate spec. If these readings are OK, go to step 2.
			Contactor coil connector gets loose	Check contactor connections on control PCB. For single- phase, check P12, for 3-phase, check P15. If problem still persists go to step 3.
5	201 00 00 00 00	UPS PROBLEM @ ## KW INPUT BAD @ CHRG ON BATTERY OK @ DC OK ON INVERTER @ OUT OK	3. Control PCB failure	 Unplug P15 (or P12 for single- phase) on control PCB to verify coil resistance on the harness side. If open circuit is found, replace the contactor. Else, go to step 4.
l			4. Control PCB failure	Replace Control PCB. If problem still persists go to step 5.
			Heatsink assembly failure	 Replace Heatsink assembly. If problem still persists go to step, go to step 6.
			6. Not listed	Call tech support at 1-800- PWR-SRVC for further action.

CASE	SYI	MPTOMS	CAUSES ACTION
S	DESCRIPTION	LCD DISPLAY	7,5,1,5,1
			Possible unit is overloading. 1. Use current clamp to verify that output current is within the nameplate range. If the readings are over the range, report the problem to the facility manager. Otherwise, go to
6	Unit shuts down for every run interval of 30 minutes or less.	UPS <u>FAILURE</u> @ ## KW INPUT OK @ CHRG <u>OFF</u> BATTERY OK @ DC OK ON BYPASS @ OUT BAD	Cabinet ventilation
			Not listed Call tech support at 1-800-PWR-SRVC for further action.
7	Output voltage sags	UPS <u>PROBLEM</u> @ ## KW INPUT OK @ CHRG <u>ON</u> BATTERY OK @ DC OK	Describe unit is overloading. Overloading. Output current is within the nameplate range. If the readings are over the range, report the problem to the facility manager. Otherwise, go to
		ON INVERTER @ OUT OL	2. Not listed 2. Call tech support at 1-800-PWR-SRVC for further action.
			Fan fuse blown Substitute of the control o
0	Unit keeps going to FAILURE after running for a considerable time (from few hours to few days)	UPS FAILURE @ ## KW INPUT OK @ CHRG OFF BATTERY OK @ DC OK ON BYPASS @ OUT BAD	Fan failure Verify fan operation. For three-phase units, if fans do not run, go to step 5. For single-phase unit, go to step 3.
			Heatsink overheats Replace power assembly. If problem still persists, go to step 5.
			Not listed 4. Call tech support at 1-800-PWR-SRVC for further action.

SE	SYI	MPTOMS		CAUSES		ACTION
CASE	DESCRIPTION	LCD DISPLAY		OAGGEG		ACTION
			1.	DC buss voltage is too high or two low due to power PCB failure	1.	Replace Power board and recycle the unit. If problem still persists go to step 2.
ı		UPS FAILURE @ ## KW INPUT OK @ CHRG ON or OFF BATTERY OV @ DC OV	07855	Control PCB failure	2.	Replace Control board and recycle the unit. If problem still persists go to step 3.
		ON BYPASS @ OUT BAD OF UPS FAILURE @ ## KW INPUT OK @ CHRG ON BATTERY LOW @ DC UV ON BYPASS @ OUT BAD	3.	Battery voltage is too high (charger failure) or too low	3.	Check if Battery CB is turned on. Check batteries for sight of leakage. Turn the load off and allow unit and the battery to recharge until the LCD screen shows the charging current of 1 Amp or less. If the display does not indicate any drop in charging current in a few minutes, go to step 3
				Not listed	4.	Call tech support at 1-800- PWR-SRVC for further action.
			1.	Control PCB - Loose connectors P4	1.	Open the cabinet door and verify proper seating. If problem still persists go to step 2.
	Input power OK, system	OFF	2.	Damage ribbon cable	2.	Inspect for damage ribbon cable. If damage is found, go to step 4. Else, go to step 3.
	runs OK but no display screen		3.	Control BCB failure	3.	Replace control PCB. If problem still persists go to step 4.
			4.	Not listed	4.	Call tech support at 1-800- PWR-SRVC for further action.

APPENDIX C – OPTIONAL MAIN INPUT & MAIN OUTPUT BREAKERS FOR VARIOUS MODELS. (*All values are typical as reference only)

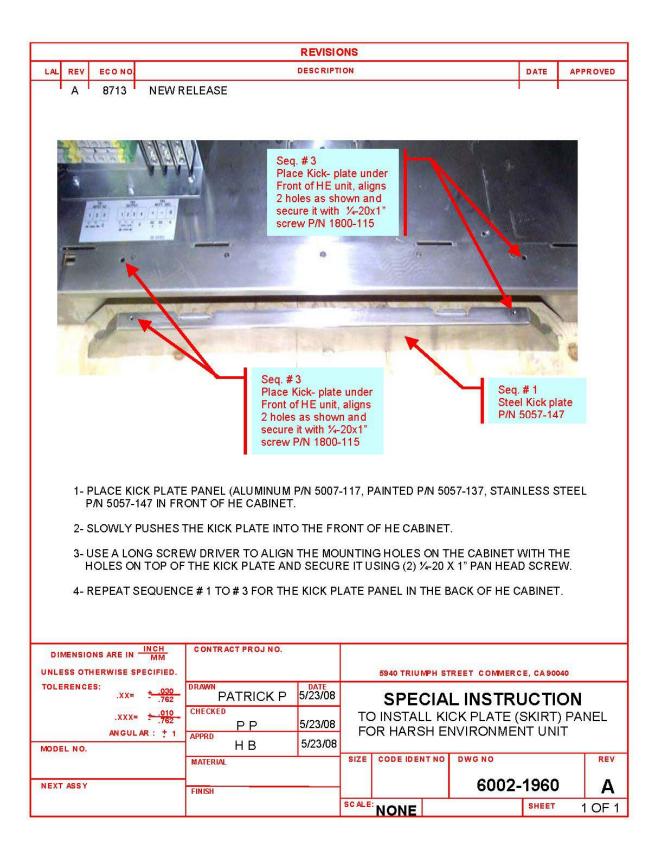
	1 1	20V INPUT		DARD KAIC-1PH UPS INPU				240V INPUT		277V INPUT		
UNIT RATING	RATING/KAIC	C/H P/N	P/N	RATING/KAIC	C/H P/N	P/N	RATING/KAIC	C/H P/N	P/N	RATING/KAIC	C/H P/N	P/N
3 KW	1P, 50A, 14 KA	QC1050	2025-784	2P, 30A, 10 KA	QC2030H	2025-790	2P, 25A, 10 KA	QC2025H	2025-789	1P, 25A, 14 KA	GHC1025	2025-1095
5 KW	2P, 80A, 10 KA	QC2080	2025-795	2P, 50A, 10 KA	QC2050H	2025-792	2P, 40A, 10 KA	QC2040H	2025-791	1P, 40A, 14 KA	GHC1040	2025-1097
6 KW	2P, 90A, 10 KA	QC2090	2025-1320	2P, 50A, 10 KA	QC2050H	2025-792	2P, 50A, 10 KA	QC2050H	2025-792	1P, 40A, 14 KA	GHC1040	2025-1097
7.5 KW	1P, 100A, 14 KA	QC1100	2025-786	2P, 60A, 10 KA	QC2060H	2025-793	2P, 50A, 10 KA	QC2050H	2025-792	1P, 50A, 14 KA	GHC1050	2025-1098
8.0 KW	1P, 100A, 14 KA	QC1100	2025-786	2P, 70A, 10 KA	QC2070H	2025-794	2P, 60A, 10 KA	QC2060H	2025-793	1P, 50A, 14 KA	GHC1050	2025-1098
10 KW	2P, 150A, 65 KA	ED2150L	2025-760	2P, 90A, 10 KA	QC2090H	2025-796	2P, 70A, 10 KA	QC2070H	2025-794	1P, 60A, 14 KA	GHC1060	2025-1099
12.5 KW	2P, 175A, 65 KA	ED2175L	2025-999	2P, 100A, 10 KA	QC2100H	2025-797	2P, 90A, 10 KA	QC2090H	2025-796	1P, 80A, 14 KA	GHC1080	2025-1101
15.0 KW	2P, 200A, 65 KA	ED2200L	2025-541	2P, 125A, 65 KA	ED2125L	2025-759	2P, 125A, 65 KA	ED2125L	2025-759	1P, 100A, 14 KA	GHC1100	2025-1103
20KVA/14 KW	2P, 200A, 65 KA	ED2200L	2025-541	2P, 125A, 65 KA	ED2125L	2025-759	2P, 125A, 65 KA	ED2125L	2025-759	1P, 100A, 14 KA	GHC1100	2025-1103
20KVA/17 KW	2P, 200A, 65 KA	ED2200L	2025-541	2P, 125A, 65 KA	ED2125L	2025-759	2P, 125A, 65 KA	ED2125L	2025-759	1P, 100A, 14 KA	GHC1100	2025-1103

			HIGH	IER KAIC-1	PH UP	S INPU	T CIRCUIT	BREAK	ERS			
	-	120V INPUT		2	08V INPUT			240V INPUT			277V INPUT	
UNIT RATING	RATING/KAIC	C/H P/N	P/N	RATING/KAIC	C/H P/N	P/N	RATING/KAIC	C/H P/N	P/N	RATING/KAIC	C/H P/N	P/N
3 KW	1P, 50A, 42 KA	QHCX1050	2025-800	2P, 30A, 65 KA	GHC2030	2025-764	2P, 25A, 65 KA	GHC2025	2025-763	1P, 25A, 65 KA	HFD1025L	2025-1279
5 KW	2P, 80A, 42 KA	QHCX2080	2025-802	2P, 50A, 65 KA	GHC2050	2025-767	2P, 40A, 65 KA	GHC2040	2025-766	1P, 35A, 65 KA	HFD1035L	2025-1280
6 KW	2P, 90A, 42 KA	QHCX2090	2025-1321	2P, 50A, 65 KA	GHC2050	2025-767	2P, 50A, 65 KA	GHC2050	2025-767	1P, 40A, 65 KA	HDF1040L	2025-1324
7.5 KW	2P, 100A, 65 KA	GHC2100	2025-772	2P, 60A, 65 KA	GHC2060	2025-768	2P, 50A, 65 KA	GHC2050	2025-767	1P, 50A, 65 KA	HFD1050L	2025-1281
8.0 KW	2P, 100A, 65 KA	GHC2100	2025-772	2P, 70A, 65 KA	GHC2070	2025-769	2P, 60A, 65 KA	GHC2060	2025-768	1P, 50A, 65 KA	HFD1050L	2025-1281
10.0 KW	2P, 150A, 65 KA	ED2150L	2025-760	2P, 90A, 65 KA	GHC2090	2025-771	2P, 70A, 65 KA	GHC2070	2025-769	1P, 60A, 65 KA	HFD1060L	2025-1282
12.5 KW	2P, 175A, 65 KA	ED2175L	2025-999	2P, 100A, 42 KA	GHC2100	2025-772	2P, 90A, 65 KA	GHC2090	2025-771	1P, 80A, 65 KA	HFD1080L	2025-1284
15.0 KW	2P, 200A, 65 KA	ED2200L	2025-541	2P, 125A, 65 KA	ED2125L	2025-759	2P, 125A, 65 KA	ED2125L	2025-759	1P, 100A, 65 KA	HFD1100L	2025-1285
20KVA/14 KW	2P, 200A, 65 KA	ED2200L	2025-541	2P, 125A, 65 KA	ED2125L	2025-759	2P, 125A, 65KA	ED2125L	2025-759	1P, 100A, 65 KA	HFD1100L	2025-1285
20KVA/17 KW	2P, 200A, 65 KA	ED2200L	2025-541	2P, 125A, 65 KA	ED2125L	2025-759	2P, 125A, 65 KA	ED2125L	2025-759	1P, 100A, 65 KA	HFD1100L	2025-1285

			STANDA	ARD KAIC-	PH UPS	S OUTF	UT CIRCL	JIT BRE	AKERS			
	12	0V OUTPUT		208V OUTPUT			240V & 240/120V OUTPUT			277V OUTPUT		
UNIT RATING	RATING/KAIC	C/H P/N	P/N	RATING/KAIC	C/H P/N	P/N	RATING/KAIC	C/H P/N	P/N	RATING/KAIC	C/H P/N	P/N
3 KVA/3 KW	1P, 30A, 14 KA	QC1030	2025-782	2P, 20A, 10 KA	QC2020H	2025-788	2P, 15A, 10 KA	QC2015H	2025-787	1P, 15A, 14 KA	GHC1015	2025-1094
5 KVA/5 KW	1P, 50A, 14 KA	QC1050	2025-784	2P, 30A, 10 KA	QC2030H	2025-790	2P, 25A, 10 KA	QC2025H	2025-789	1P, 25A, 14 KA	GHC1025	2025-1095
6 KW	2P, 90A, 10 KA	QC2090	2025-1320	2P, 50A, 10 KA	QC2050H	2025-792	2P, 50A, 10 KA	QC2050H	2025-792	1P, 35A, 14 KA	GHC1035	2025-1323
7.5KVA/7.5 KW	2P, 80A, 10 KA	QC2080	2025-795	2P, 50A, 10 KA	QC2050H	2025-792	2P, 40A, 10 KA	QC2040H	2025-791	1P, 40A, 14 KA	GHC1040	2025-1097
8.0 KW	1P, 100A, 14 KA	QC1100	2025-786	2P, 50A, 10 KA	QC2050H	2025-792	2P, 50A, 10 KA	QC2050H	2025-792	1P, 50A, 14 KA	GHC1050	2025-1098
10KVA/10 KW	1P. 100A, 14 KA	QC1100	2025-786	2P, 60A, 10 KA	QC2060H	2025-793	2P, 60A, 10 KA	QC2060H	2025-793	1P. 50A. 14 KA	GHC1050	2025-1098
12.5KVA/12.5 KW	2P, 125A, 65 KA	ED2135L	2025-759	2P, 80A, 10 KA	QC2080H	2025-795	2P, 70A, 10 KA	QC2070H	2025-794	1P, 60A, 14 KA	GHC1060	2025-1099
15.0KVA/15.0 KW	2P, 150A, 65 KA	ED2150L	2025-760	2P, 90A, 10 KA	QC2090H	2025-796	2P, 80A, 10 KA	QC2080H	2025-795	1P, 70A, 14 KA	GHC1070	2025-1100
20.0 KVA (14KW)	2P, 200A, 65 KA	ED2200L	2025-541	2P, 125A, 65 KA	ED2125L	2025-759	2P, 125A, 65 KA	ED2125L	2025-759	1P, 100A, 14 KA	GHC1100	2025-1103
20.0 KVA (17 KW)	2P, 200A, 65 KA	ED2200L	2025-541	2P, 125A, 65 KA	ED2125L	2025-759	2P, 125A, 65 KA	ED2125L	2025-759	1P, 100A, 14 KA	GHC1100	2025-1103

HIGHER KAIC-1 PH UPS OUTPUT CIRCUIT BREAKERS												
UNIT RATING	120V OUTPUT			208V OUTPUT / 480V			240V & 240/120V OUTPUT			277V OUTPUT		
	RATING/KAIC	C/H P/N	P/N	RATING/KAIC	C/H P/N	P/N	RATING/KAIC	C/H P/N	P/N	RATING/KAIC	C/H P/N	P/N
3 KVA/3 KW	1P, 30A, 65 KA	QHCX1030	2025-798	2P, 20A, 65 KA	GHC2020	2025-762	2P, 15A, 65 KA	GHC2015	2025-761	1P, 15A, 65 KA	HFD1015L	2025-1278
5 KVA/5 KW	1P, 50A, 42 KA	QHCX1050	2025-800	2P, 30A, 65 KA	GHC2030	2025-764	2P, 25A, 65 KA	GHC2025	2025-763	1P, 25A, 65 KA	HFD1025L	2025-1279
6 KW	2P, 90A, 42 KA	QHCX2090	2025-1321	2P, 50A, 65 KA	GHC2050	2025-767	2P, 50A, 65 KA	GHC2050	2025-767	1P, 40A, 65 KA	HFD1040L	2025-1324
7.5KVA/7.5 KW	2P, 80A, 65 KA	QHCX2080	2025-802	2P, 50A, 65 KA	GHC2050	2025-767	2P, 40A, 65 KA	GHC2040	2025-766	1P, 35A, 65 KA	HFD1035L	2025-1280
8.0 KW	2P, 100A, 65 KA	GHC2100	2025-772	2P, 60A, 65 KA	GHC2060	2025-768	2P, 50A, 65 KA	GHC2050	2025-767	1P, 50A, 65 KA	HFD1050L	2025-1281
10KVA/10 KW	1P, 100A, 65 KA	QHCX2100	2025-803	2P, 70A, 65 KA	GHC2070	2025-769	2P, 60A, 65 KA	GHC2060	2025-768	1P, 50A, 65 KA	HFD1050L	2025-1281
12.5KVA/12.5 KW	2P, 125A, 65 KA	ED2125L	2025-759	2P, 80A, 42 KA	GHC2080	2025-770	2P, 70A, 65 KA	GHC2070	2025-769	1P, 60A, 65 KA	HFD1060L	2025-1282
15.0KVA/15.0 KW	2P, 150A, 65 KA	ED2150L	2025-760	2P, 90A, 65 KA	GHC2090	2025-771	2P, 80A, 165 KA	GHC2080	2025-770	1P, 70A, 65 KA	HFD1070L	2025-1283
20.0 KVA (14KW)	2P, 200A, 65 KA	ED2200L	2025-541	2P, 125A, 65 KA	ED2125L	2025-759	2P, 125A, 65 KA	ED2125L	2025-759	1P, 100A, 65 KA	HFD1100L	2025-1285
20.0 KVA (17 KW)	2P, 200A, 65 KA	ED2200L	2025-541	2P, 125A, 65 KA	ED2125L	2025-759	2P, 125A, 65 KA	ED2125L	2025-759	1P, 100A, 65 KA	HFD1100L	2025-1285

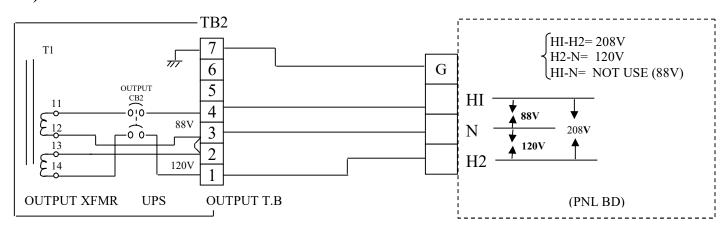
APPENDIX D



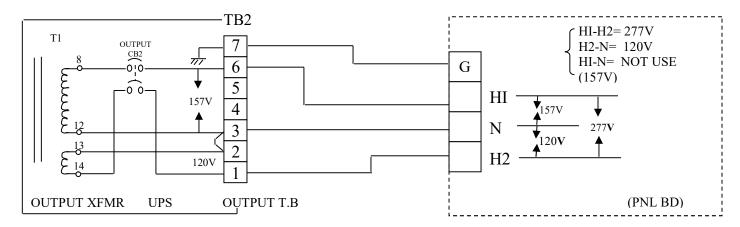
APPENDIX E

Connection Diagram using existing 3pole panel board for dual output voltages.





B)



C)

