

User's Manual

Protector 1

Central Lighting Inverter

3-20 KVA (2.1 – 15 KW)

Doc #. 6002-1406
Revision F

Installation and
Operating Documentation

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Congratulations on selecting one of the fine products from OnLine Power, the leader in power protection technology. Our wide product offering includes UPS (Uninterruptible Power Systems), power conditioners, automatic voltage regulators and specialty transformers (e.g., computer-grade, medical-grade). Since our founding in 1972, OnLine Power has shipped many of these fine products to discerning customers around the world for use on sensitive equipment and in critical applications.

One of our goals is to make our manuals both comprehensive and easy to use. The new format of our user manual is the result of ideas and inputs from customers like you who have taken an active interest in our continued success. We invite and appreciate your feedback on our products and documentation via e-mail, fax, mail, or telephone.

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SERVICE

If you require assistance, please call our 24-hour toll free hot line 800-PWR-SRVC (800-797-7782) or email to info@800pwrsrv.com. 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: | _____ |

IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

SECTION 1 - 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

failure, damage, or destruction if



symbol indicate that there is a high probability of equipment instructions are not followed.

Danger!

ONLY FACTORY TRAINED OR AUTHORIZED PERSONNEL SHOULD ATTEMPT TO INSTALL OR REPAIR THE UPS 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.

Danger!

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

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:

| |
|-------|
| _____ |
| _____ |
| _____ |
| _____ |
| _____ |

Danger!

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.

Danger!

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

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.

Danger!

OBSERVE ALL BATTERY SAFETY PRECAUTIONS DURING INSTALLATION OR SERVICE OF THE UPS 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 UPS. 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.

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Danger!

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.



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.



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.



Danger!

BE CONSTANTLY AWARE THAT THE UPS 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.

Danger!

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 UPS TO PREVENT AN ACCIDENT THAT COULD RESULT IN INJURY OR DEATH.

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:
 1. DO NOT SMOKE WHEN NEAR BATTERIES.
 2. 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.

SECTION 2 – OVERVIEW

2.1 INTRODUCTION

The Protector 1 Central Lighting Inverters are manufactured to provide critical power for lighting during a power outage. The Protector 1 meets or exceeds the life safety codes of UL924 and UL1778. These codes were established to allow the emergency lighting inverters to provide critical power to the lighting circuits during a power failure. The emergency lighting inverter will then provide power for 90 minutes that will allow safe and orderly evacuation from the facility.

When input power to the Protector 1 is lost during a power outage, the system will automatically draw power from its internal battery supply without any interruption. The critical load will receive only clean sine wave power. The optional output transformer allows multiple output voltages as well as input voltages that are different than output voltages. The internal VRLA (valve regulated lead-acid), maintenance-free batteries provide 90 minutes of backup power.

Upon restoration of input power, the Protector 1 automatically resumes normal operation, and immediately begins to recharge the batteries.

The Protector 1 has an internal bypass circuit, which maintains the power to the load in case of internal UPS failure.

The Protector 1 provides comprehensive monitoring capabilities. In addition to the LCD display, it provides five dry relay contacts for remote monitoring capabilities. The Protector 1 contains, as standard features, an AS 400, RS 232 protocol interface, RS485 data transmission ports and many other communication options.

The Protector 1 is an on-line single phase PWM inverter available in output rating of 3, 5, 7.5, 12.5, 15, 20 kVA, and 3, 5, 7.5, 12.5, 15 KW. The Protector 1 is listed for compliance to UL1778, UL924, UL924A and CSA107.1 standards. The Protector 1 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 UPS. See Appendix A for a complete listing of the Protector 1 specifications.

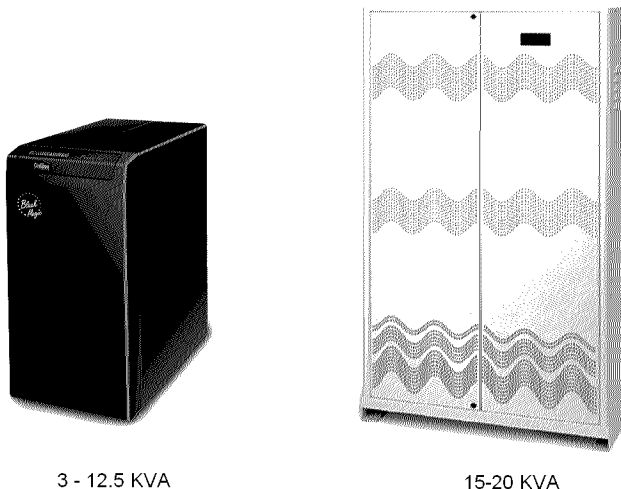


ILLUSTRATION 2-1: PROTECTOR 1

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2.2 BENEFITS

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 in a facility can be caused by load cycling (elevators, HVAC systems, etc.), fault conditions, welders, and other electrically noisy equipment. Whether the electrical disturbances are generated outside or within the facility, the following power problems can 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;
- 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

The Protector 1 is a self-contained unit a simple solution for back-up power for any fluorescent or incandescent lighting source such as overhead fixtures, exit signs, etc. It has been specifically designed to maintain 90 minutes of lighting power and ensure a safe building evacuation.

It offers significant advantages over other alternatives. For example, just one Protector 1 Central Lighting Inverter can replace 70 "bug eyes" to make service and maintenance much quicker and easier.

The convection cooled, OnLine PWM inverter system, is virtually silent and can be installed anywhere.

On-line PWM technology provides switchover from utility to battery power without any interruption.

The Protector 1 is designed to fit the needs of virtually all power conditioning and UPS applications. It has been designed to power all forms of modern data processing, communication, and process control equipment. The Protector 1 does not require any de-rating, as other UPS products may, when powering 100% electronic loads including switching mode power supplies.

The Protector 1 protects sensitive electrical equipment, such as computer servers, telecommunication networks, LANs, multi-user, and instrumentation systems from electrical interference including problems associated with poor quality AC power sags and complete power outages.

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2.3 PRODUCT FEATURES

The following describes the major blocks within the Protector 1. Please refer to Illustration 2-2, System Component Layout to find specific items.

2.3.1 Input Contactor K1 (Illustration 2-2, Item 12)

The input contactor is multifunctional. First, it 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. Finally, 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.

2.3.2 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. This circuit is on the Power Board.

2.3.3 Power Board Assembly with IGBT's (Illustration 2.2, Item 1)

The Power Board is bolted onto the IGBT (Insulated Gate Bipolar Transistor) blocks that are mounted on a heat sink. The complete Heat Sink Assembly with IGBTs and Power Board is replaceable as a single part. This FRU (Field Replaceable Assembly) converts all the power, i.e. 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 a smooth AC sine wave. In case of a catastrophic failure, the complete Heat Sink Assembly is easily replaceable using only a screwdriver. The Power Board also contains the housekeeping power supplies and drivers for the IGBTs. The entire assembly provides the landing place for all internal input, output, DC cables and metering devices for control and monitoring of the unit input and output currents.

2.3.4 Control Board (Illustration 2.2, Item 10)

The microprocessor with unit specific firmware and control circuitry is located on the Control Board. The Control Board is mounted on the cabinet door and communicates with the Power Board (A2) via a ribbon cable. It monitors the input and output voltages and generates the command to close or open the input contactor and to sense and change the status of the bypass static switch. The Control Board sends data to the LCD panel located on the door where actual status and parameters are displayed. It additionally has AS400, RS232, and RS485 output capabilities and supports various communication options.

2.3.5 Output Static Switch (Illustration 2.2, Item 3)

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. This switch shuts off in case of a problem or failure within the UPS and transfers the load directly to the utility input via the bypass static switch. It maintains it's status opposite to that of bypass switch.

2.3.6 LCD Display Panel (Illustration 2.2, Item 11)

The LCD (Liquid Crystal Display) panel provides all the input, output, battery metering and alarm data, and UPS status for customer use on a constantly scrolling set of 2 default screens with continuous update.

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2.3.7 Optional Output Isolation Transformer (Illustration 2.2, Item 20)

The output isolation transformer provides isolation between the inverter and protected output. The power to the primary of this transformer is received from UPS and is transformed to required output voltage levels.

2.3.8 Optional Maintenance Bypass Switch (Illustration 2.2, Item 2)

The MBS (Maintenance Bypass Switch) removes the UPS from the power grid providing utility input directly to the load in case of a problem with the UPS.

2.3.9 Battery Bank (Illustration 2.2, Item 26)

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.

2.3.10 System Component Layout)

- 1) Power Board (A1)
- 2) Bypass Static Switch (PB1)
- 3) Output Static Switch (PB2)
- 4) Input/Output/Battery Terminal Block for customer's use (TB1, TB2, 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) Fan Transformer (T3)
- 15) Control Power Transformer (T2)
- 16) Control Transformer Fuse (F2)
- 17) Fan Fuse (F1)
- 18) Heat Sink
- 19) Fan(s)
- 20) Optional Output Isolation Transformer (T1)
- 21) Breaker Panel
- 22) Input Breaker (CB2)
- 23) Battery Breaker (CB1)
- 24) Output Breaker (CB3)
- 25) Output Distribution Breakers (CB4 and on)
- 26) Maintenance Free Lead Acid Battery(s)
- 27) Inverter Test Switch (S2)
- 28) Rectifier Block (BR1)

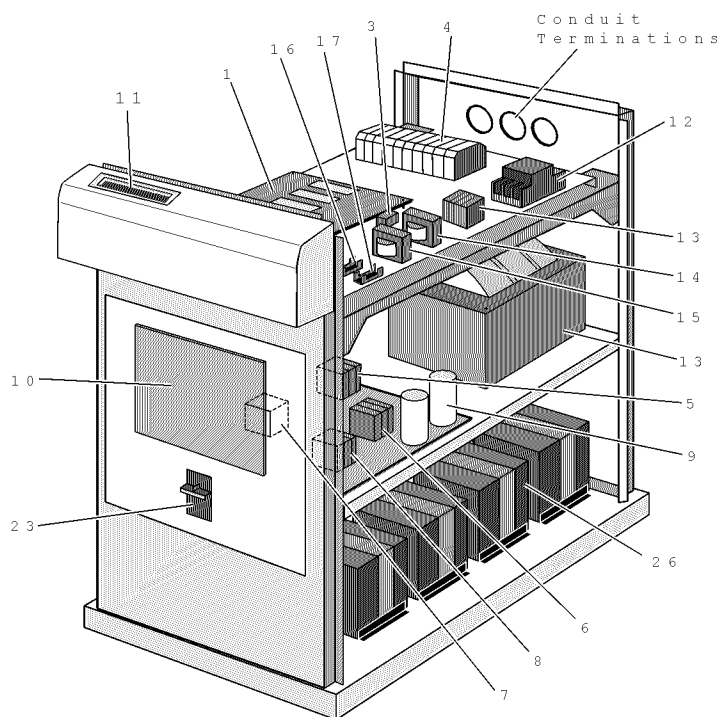
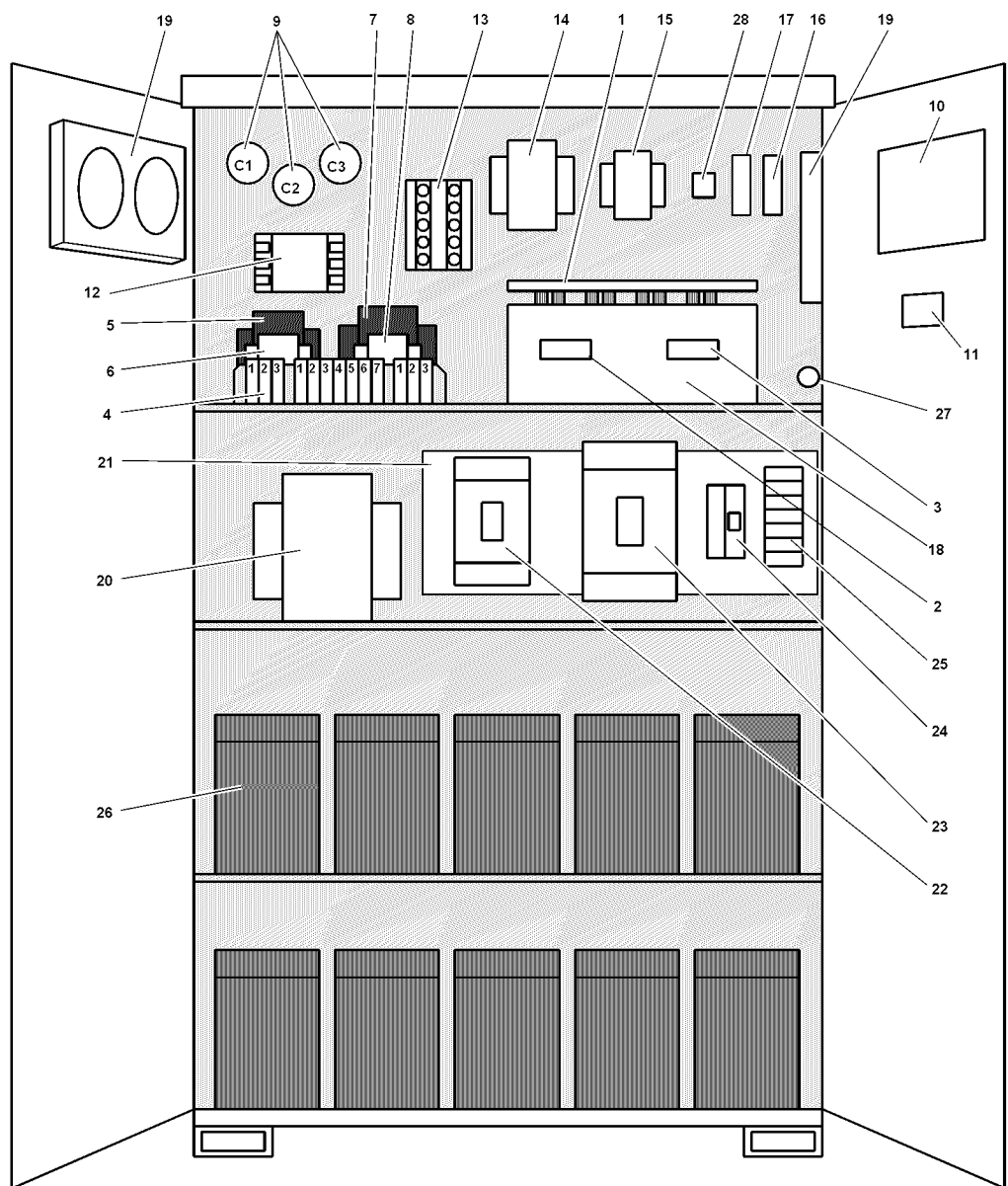


ILLUSTRATION 2-2: BLACK MAGIC
(3-12.5 KVA) COMPONENT LAYOUT

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2.4 FUNCTIONAL DESCRIPTION

Illustrations 2-3 depict FUNCTIONAL block diagrams of the Protector 1. These diagrams provide an excellent tool for identifying the major building blocks within the Protector 1.

2.4.1 Main input circuit breaker - optional

The main input circuit breaker provides Protector 1 with incoming power isolation and input overcurrent protection.

2.4.2 Input Contactor

Input contactor controls power applied to the unit. The microprocessor control circuit verifies that the UPS is in "normal" and not at a "fault" condition and that the input voltage and frequency are within an acceptable range. Only then it energizes the contactor closing coil via control transformer and fuse.

2.4.3 Input Inductors

The input inductors are a single phase input filter.

2.4.4 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 power to the load. The pulse width modulated (PWM) inverter utilizes high speed, high efficiency IGBT's for fast response, sinusoidal power.

2.4.5 Battery charger

The battery charger converts AC power into regulated DC power to re-charge and to maintain the charge on the battery bank. The charger is fully automatic with a current limiting feature so that battery damage will be prevented 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.

2.4.6 Battery

The battery bank, shall consist of 8, 12, 16, 20, or 32, 12 Volt batteries, providing the reserve energy to sustain the load when suitable AC input power is not present. The batteries are sealed, maintenance-free, VRLA (Valve Regulated Lead Acid) construction.

2.4.7 Output Filter

The DC choke helps boost battery voltage to a higher internal DC bus voltage.

2.4.8 Output Transformer (used only for multiple output voltage units)

The transformer performs a number of critical functions. First, it provides excellent common and normal mode noise isolation between the load and the input or inverter power. Secondly, it provides tight regulation and voltage transformation to the output voltage while the Protector 1 is operating on inverter.

2.4.9 Inverter Test Switch

The SW-2 test momentary switch is a push button switch for testing the Protector 1 and the batteries for proper operation. When the Protector 1 is running and Switch SW-2 is pushed and held in, the Protector 1 will automatically transfer to battery operation. The Protector 1 will continue to run on batteries until the switch is released. When the switch is released, the Protector 1 returns to normal operation (provided input power is present).

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2.4.10 Step Down Transformer

This transformer with fuse (F1), provides internal housekeeping DC power supply. The primary of this transformer has taps to match with the input voltage.

2.4.11 Control Transformer (T2)

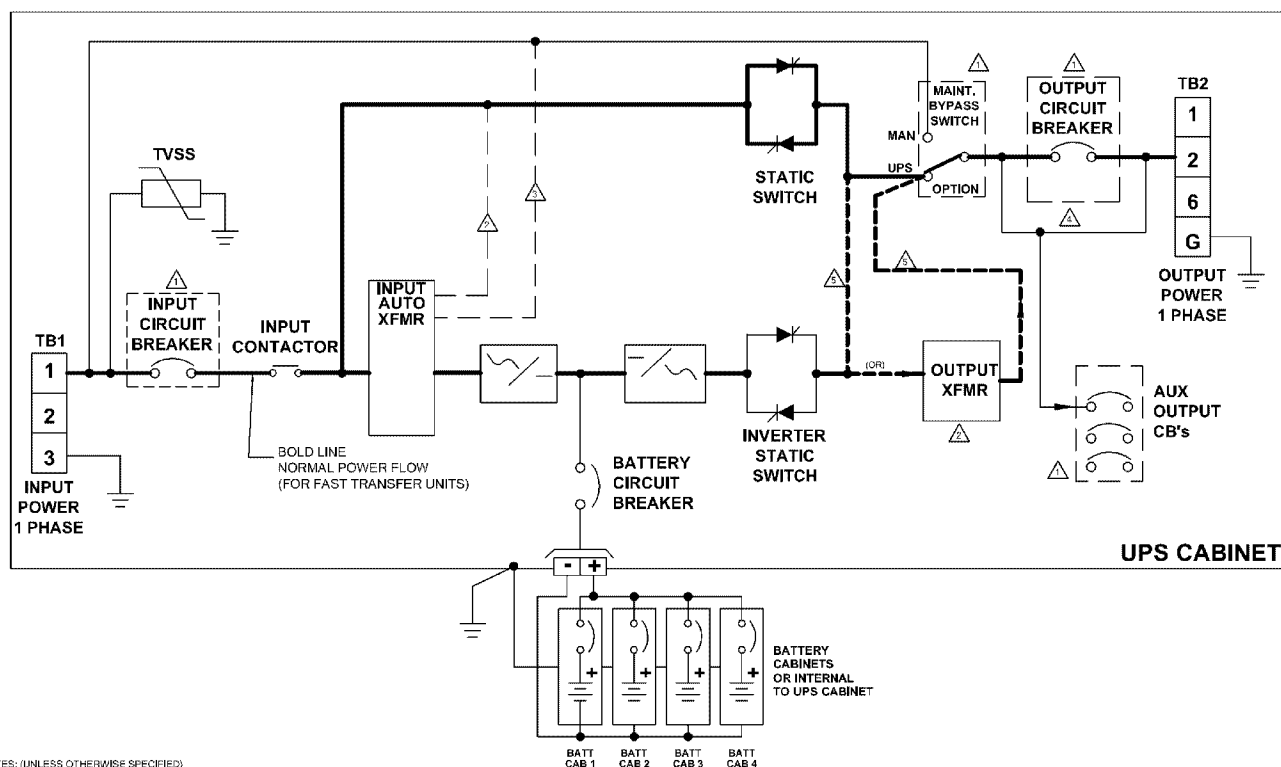
Transformer with 120 VAC secondary for control of the K1 contactor coil from the A1 control board.

2.4.12 Maintenance Bypass Switch

This MBS can be used for maintenance when the inverter fails or PM is required. This MBS will transfer the input power directly to critical load. Before switching this MBS to maintenance position, first, turn on S1 (toggle switch), then switch to maintenance (MAN) position. Refer to the operation label on the unit. After repair or PM, the MBS can be switched to UPS position. First turn-off S1 (toggle switch), then switch MBS to UPS (AUTO) position.

2.4.13 Fan Transformer

The Fan transformer provides 120 VAC to the fans(s) with taps to match UPS output voltages. Fuse F2 protects fans & transformer.



NOTES: (UNLESS OTHERWISE SPECIFIED)

1. ALL DOTTED LINE ARE OPTIONAL.

2. USE FOR DIFFERENT INPUT/ OUTPUT VOLTAGE UNITS.

3. CONNECT THIS WAY FOR DIFFERENT INPUT/OUTPUT VOLTAGE UNITS.

4. IN CASE OF OUTPUT CB / AUX OUTPUT CB BOTH USED, WIRES AUX CB's TO MBS OUTPUT.

5. FAST TRANSFER UNITS (INVERTER IS AT STAND-BY MODE WITH OR WITHOUT OUTPUT XFMR).

ILLUSTRATION 2-3: FUNCTIONAL BLOCK DIAGRAM

Online Power

2.5 THEORY OF OPERATION

2.5.1 Standby Mode

After power is applied, the system is placed in STANDBY mode and a self-check starts. During this period, the start subroutine checks for the input voltage and proper operation of the inverter and bypass SCR's. After the routine is completed and check confirmed OK, the system goes into the NORMAL mode.

2.5.2 Normal Mode

The input contactor K1 receives a closing signal, connecting input power to the DC supply transformer. The DC rectifier supplies the battery charger, Control Board and the DC/AC inverter circuit. The battery charger is then activated allowing the batteries to be continuously charged. The on-line DC/AC inverter converts the DC voltage to a pulse-width-modulation (PWM) waveform. This waveform is filtered and reconstructed back to a desired AC output.

2.5.3 Response To Input Power Failure

If the system controller senses a change in input frequency of more than ± 3 Hz or an out of range input voltage, it will consider it an input failure and will immediately open the input contactor, isolating the UPS from the facility. At the same time, the charger is turned off and the battery bank becomes a DC supply source to the inverter circuit, maintaining an uninterrupted AC supply to the protected load. The LCD screen will display a "UPS PROBLEM" message. When the facility power returns, stabilizes and is in phase with the backup power, the system controller closes the input contactor and the system returns to NORMAL. If the battery voltage drops below 16% of its nominal value and the facility power remains off, then the system will assume a FAILURE mode.

2.5.4 UPS Failure

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

- Internal failure
- System overheats
- Battery bank undervoltage

During a FAILURE, the system stops its backup operation, inverter SCRs are switched OFF, and bypass SCRs are switched ON. A summary alarm 5V signal is sent to the hardwired interface. The system remains in this mode until power is cycled or system has been repaired when needed.

2.5.5 UPS Problem

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

- Input power failure
- Output overload

During a PROBLEM mode, inverter IGBs remain on and an alarm signal may be sent to the signal interface. The system will reset itself as soon as the problems disappears.

Online Power

2.6 OUTPUT LOADS

The Protector 1 is designed to power any fluorescent or incandescent lighting. There are, however, certain types of loads that exhibit an excessive inrush current when first turned on or at other times during operation.

The capacity of the Protector 1 may need to be greater than what would be estimated based on the nameplate requirements of loads previously discussed. Contact your Online Power dealer or the factory directly if you have any questions about powering unusual loads from your Protector 1.

2.7 OPTIONS (See Section 6 for details)

The following options are available with the Protector 1:

Internal / External Manual Bypass Switch

Audio Alarms with Silence Switch

Remote UPS Status Display, 1 phase Monitor

Form "C" N/O Contacts for Alarms

TVSS (Transient Voltage Surge Suppressor)

Normally ON/OFF Output Aux. Circuit Breakers

External Output Aux. Circuit Breakers in Panel Board

Stackable Cabinet Rack

System Input CB Standard/Higher KAIC

System Output CB Standard/Higher KAIC

Higher KAIC Norm. ON/OFF Output Circuit Breaker, Molded case

Higher KAIC Norm. ON/OFF Output Circuit Breaker 1 Phase. Din rail

Seismic Mounting Bracket (Left and Right set per cabinet)

Power Flow Mimic

GMS (Global Monitoring System)

ECC – Emergency Circuit Converter

ECM – Emergency Control Module

SECTION 3 – INSTALLATION

3.1 SITE PLANNING AND PREPARATION

The Protector 1 is designed for installation indoors and meets NEMA specifications for operating temperature, humidity, and utility voltage. These cabinets are rugged and corrosion resistant. The footprint of the Protector 1 is less than 6 square feet. Listed below are the environmental specifications for the Protector 1. Adequate clearance in the front of the equipment **MUST** be provided for service access.

3.1.1 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 Protector 1 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).

3.1.2 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
- NOTE System should be stored in its original packaging

3.1.3 Location Considerations

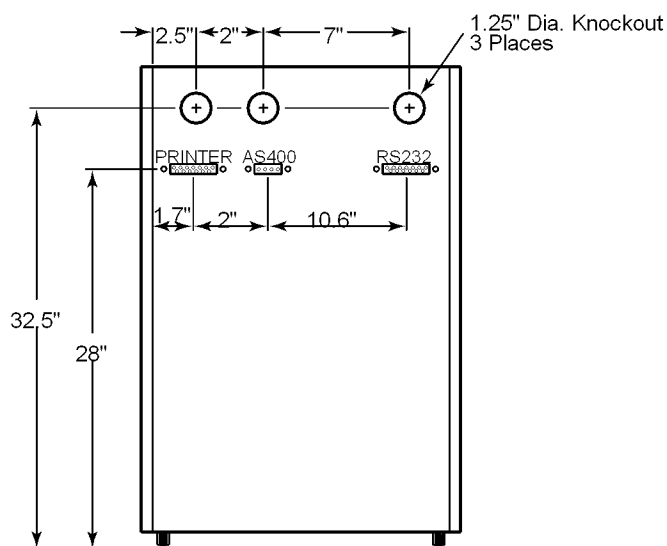


ILLUSTRATION 3-1: CABINET (rear view) Cable access and mounting

Online Power

3.1.4 Cable Access

Caution Blocking vents may cause equipment malfunction and failure.

The Protector 1 Cabinet Installation Diagrams for 3~20 KVA models provide cable/conduit openings on the top and sides of the cabinet. Refer to Illustration 3-2.

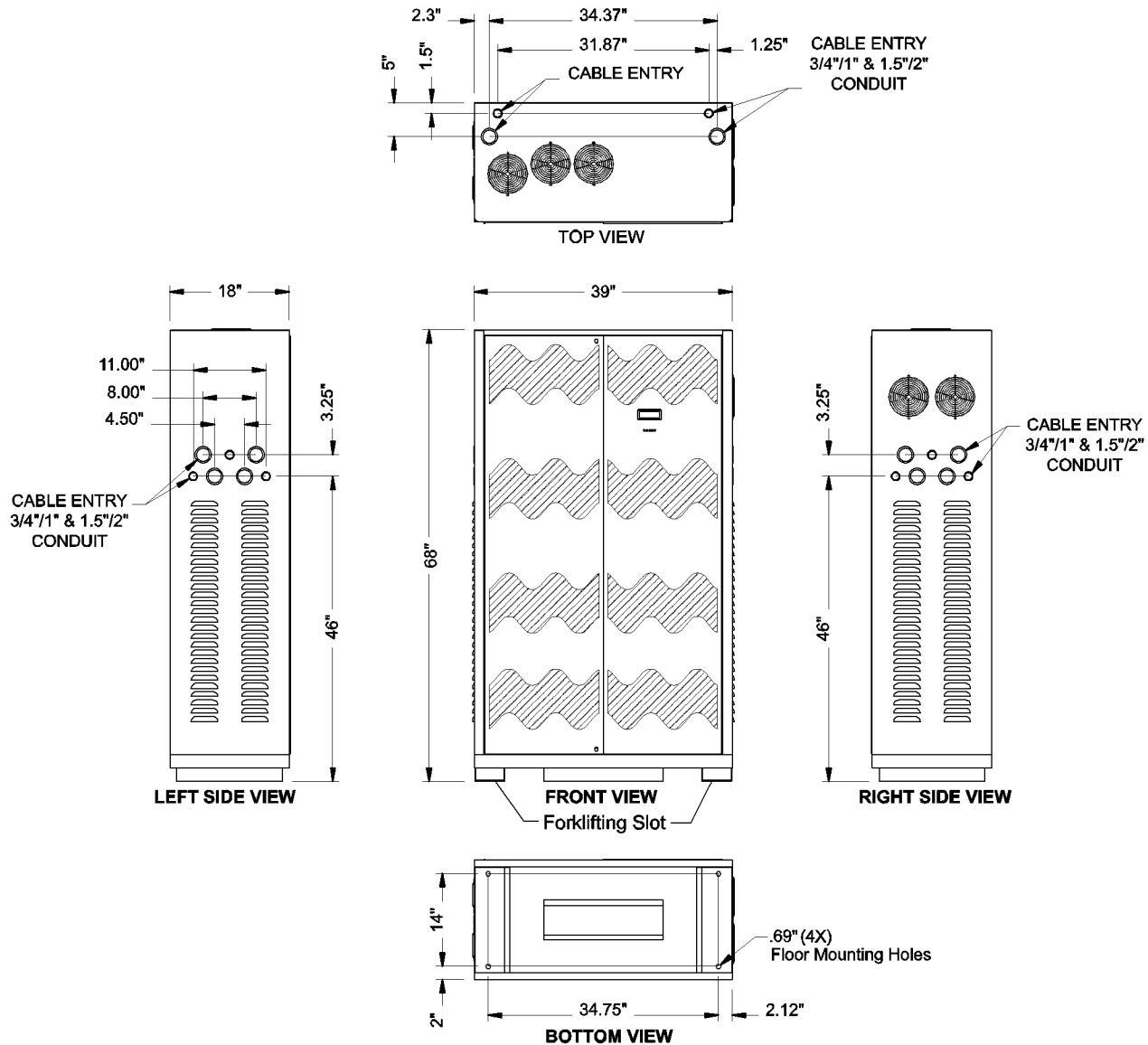


ILLUSTRATION 3-2: 68" CABINET CABLE ACCESS AND MOUNTING

Online Power



Caution

Each model of the Protector 1 is designed to supply a maximum load which is determined by its kVA (1000's of volt-amperes) and kW rating. It is very important that the load is within the rating of this Protector 1 to ensure that the connected loads will be properly supported.


Each electrical device to be powered by the Protector 1 should have a specification sheet attached to it, which specifies the amount of power it requires. In addition, this information should be listed in the manual supplied with each piece of equipment. The device's nameplate should also list the electrical requirements of the device.

The total load to be powered by the Protector 1 must not exceed its kVA rating. If the total load is exceeded, the Protector 1 monitoring will sense an overload condition and a summary alarm will occur.

3.1.5 Pre-Installation

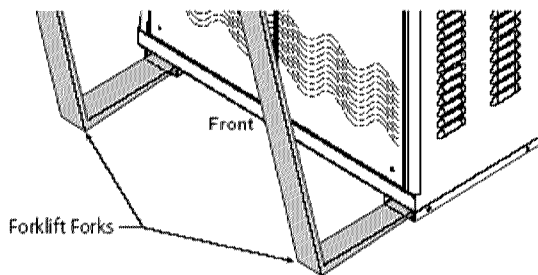
All customer connections are brought through knockouts located on the top or on the sides of the unit. The Protector 1 consists of one electronics and one or more battery cabinets. Before unpacking the equipment, inspect the exterior, the shipping container, and the equipment itself for damage that may 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.

3.2 EQUIPMENT UNPACKING



Danger!

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



Remove the equipment from the shipping carton. Since the Protector 1 is designed for pad-mounting installations, there are no casters. It is suggested that a forklift be used to remove the Protector 1 from its shipping pallet. See Illustration 3-3 for the location of forklift slot.

ILLUSTRATION 3-3: FORKLIFTING

Online Power

3.3 UNIT INSTALLATION

3.3.1 Mechanical Installation - Preparing to Install UPS Unit

- 1) Before placing the Protector 1 onto the mounting bolts (where it will be installed), the conduit knockouts need to be removed. The conduit knockouts are located on the sides and top of the cabinet. (See illustration 3-2) **NOTE: If site restrictions prevent routing of conduit to the locations where conduit knockouts are located, do not drill holes in the cabinet without first consulting Online Power at 800-PWR-SRVC (800-797-7782). The conduit knockouts provided are positioned to prevent airflow disruptions that could cause the unit to overheat. Our engineers will be happy in assisting you in locating the conduit to maintain unit reliability.**
- 2) Determine which knockouts will be used to bring cables into and out of the unit. Only remove the conduit knockouts that are to be used.
- 3) Measure the locations for the conduits on the conduit knockouts.
- 4) Punch holes in the conduit knockouts for the conduits.
- 5) Anchor the Protector 1 to the mounting pad at the four (4) mounting locations (Shown on Illustration 3-2).
- 6) Anchor the conduits to the conduit knockouts

If equipment is not ready for normal operation, it must be protected from dust to prevent damage to equipment. This concludes the mechanical installation.

3.3.2 Electrical Connection Arrangements



Danger!

VERIFY THAT ALL CUSTOMER-SUPPLIED WIRING IS DE-ENERGIZED BEFORE PERFORMING ANY ELECTRICAL WORK. FAILURE TO DO SO COULD RESULT IN ELECTROCUTION, INJURY OR DAMAGE TO EQUIPMENT.



Danger!

EVEN WHEN THE PROTECTOR 1 IS OFF, THERE ARE POTENTIALLY DANGEROUS VOLTAGES WITHIN THE PROTECTOR 1 UNIT DUE TO THE BATTERIES. EXTREME CARE MUST BE TAKEN WHEN WORKING WITHIN THE PROTECTOR 1 ENCLOSURE TO AVOID THE POSSIBILITY OF ELECTROCUTION, INJURY OR DAMAGE TO THE EQUIPMENT.

Online Power

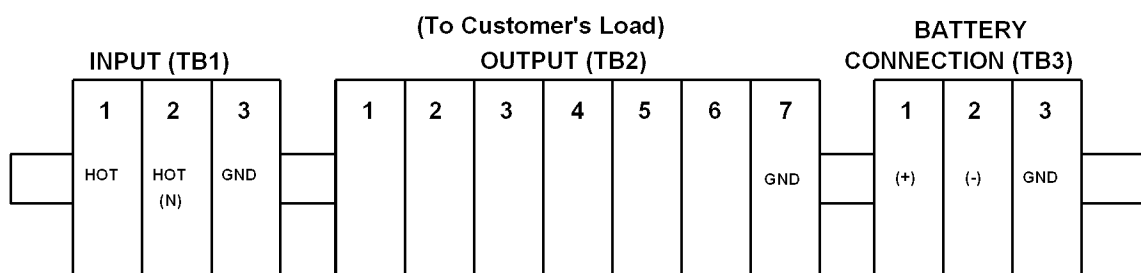
3.3.3 Customer Connections

A. Input Power Connection by Customer

Connect input (Hot) at TB-1

Connect input Hot/Neutral at TB1-2

Connect input ground at TB1-3



**ILLUSTRATION 3-4: PROTECTOR 1 CUSTOMER'S CONNECTION
INPUT TERMINAL BLOCK**

| INPUT POWER | | | |
|-------------|----------|---|-----|
| VOLT | TERMINAL | | |
| | 1 | 2 | 3 |
| 120 | H | N | GND |
| 208 | H | N | GND |
| 240 | H | N | GND |
| 277 | H | N | GND |

B. Output Load Connection by Customer

Connect the critical load to one output terminal TB2 as shown in the voltage connection diagram with the main output circuit breaker. Refer to Section 3.

However, when any aux. output CBs are used, follow the instructions below.

- (1) No main output CB but only aux. output CBs are used.
Connect their critical loads to aux CBs directly, [not TB2 – Do Not Use].
- (2) Both main output CB and aux output CBs are used.
Connects the main load to TB2 as shown in the voltage connection diagram and connect other aux load directly to aux output CBs.
Locate the aux output CBs. Neutral and grounding terminals are provided.

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For 120/208/240/277V output, verify jumper between TB2-2 and TB2-3.

- 120V output is connected at TB2-1 - TB2-2
- 208V output is connected at TB2-1 (Neutral), TB2-4 (208VAC, Hot)
- 240V output is connected at TB2-1 (Neutral), TB2-5 (240VAC, Hot)
- 277V output is connected at TB2-1 (Neutral), TB2-6 (277VAC, Hot)

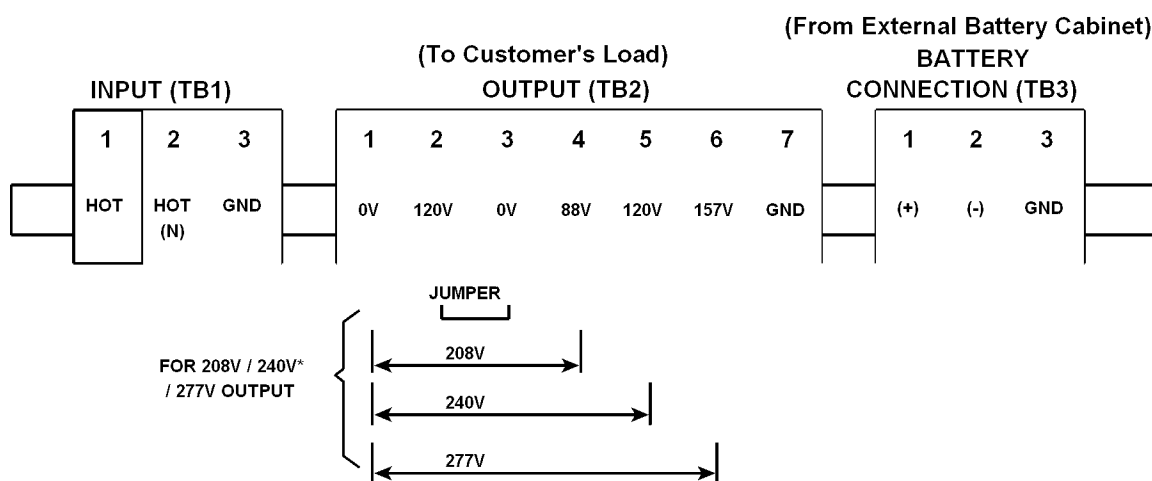


ILLUSTRATION 3-5: CUSTOMER'S CONNECTION TERMINAL BLOCK

For 208V/240/277V output

| INPUT POWER | | | | OUTPUT POWER | | | |
|-------------|----------|---|-----|--------------|----------------------------------|-------------------------|----------------------|
| VOLT | TERMINAL | | | VOLT | TB2- TERMINAL NO. | NEUTRAL BUS. MOVE TO | GND. BUS. MOVE TO |
| | 1 | 2 | 3 | | | | |
| 120 | H | N | GND | 120/240 | 1 TO 2 (120 V) 2 TO 5 (120 V) | TB2-2 | TB2-3 |
| 208 | H | N | GND | 208 | 1 TO 4 | | 7 |
| 240 | H | N | GND | 240 | 1 TO 5 | | 7 |
| 277 | H | N | GND | 277 | 1 TO 6 | TB2-1 | TB2-1 |
| | | | | 120 | 1 TO 2 | TB2-1 | TB2-1 |

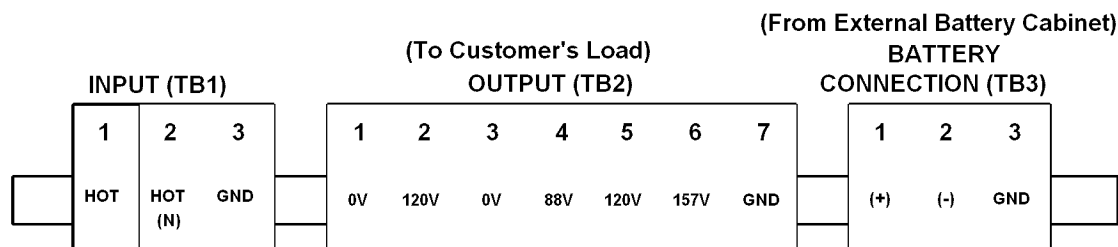


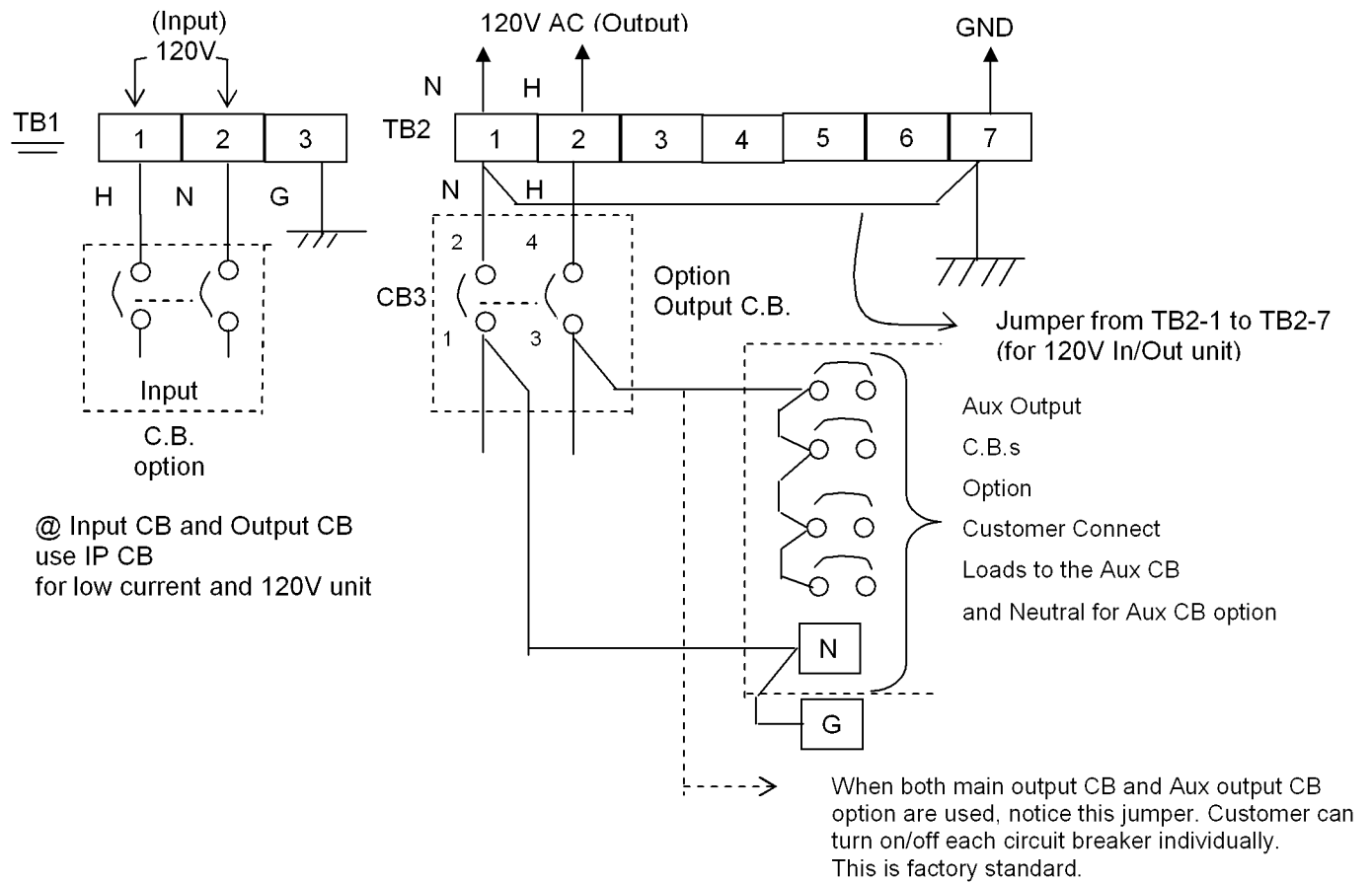
ILLUSTRATION 3-6: CUSTOMER'S CONNECTION TERMINAL

If there are no requirements for remote signaling, section 3.4 may be skipped.

Online Power

(3) Same input voltage and output voltage unit

(A) 120V Unit



@ Input CB and Output CB use IP CB for low current and 120V unit

To locate all aux output CBs after the main output CB, move this jumper to CB3-4.

ILLUSTRATION 3-7

Online Power

(3) continued

(B) 208V Unit

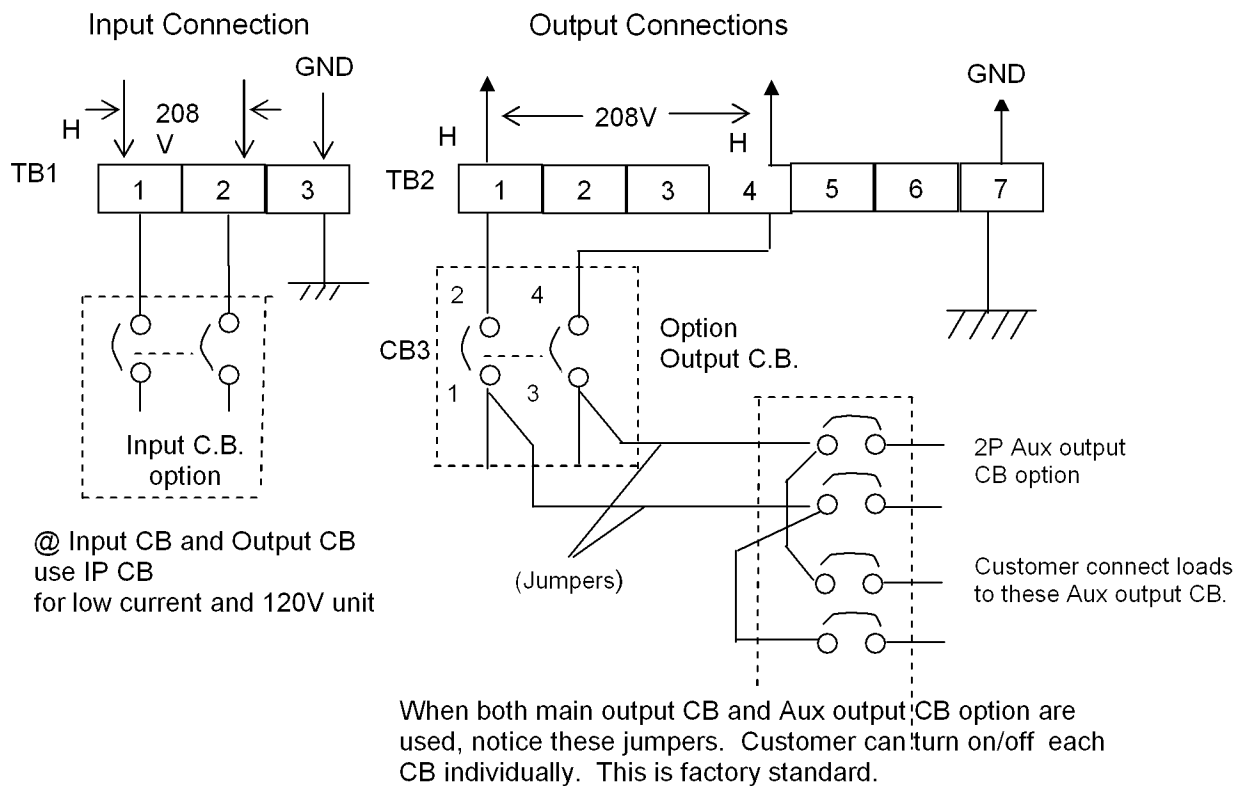
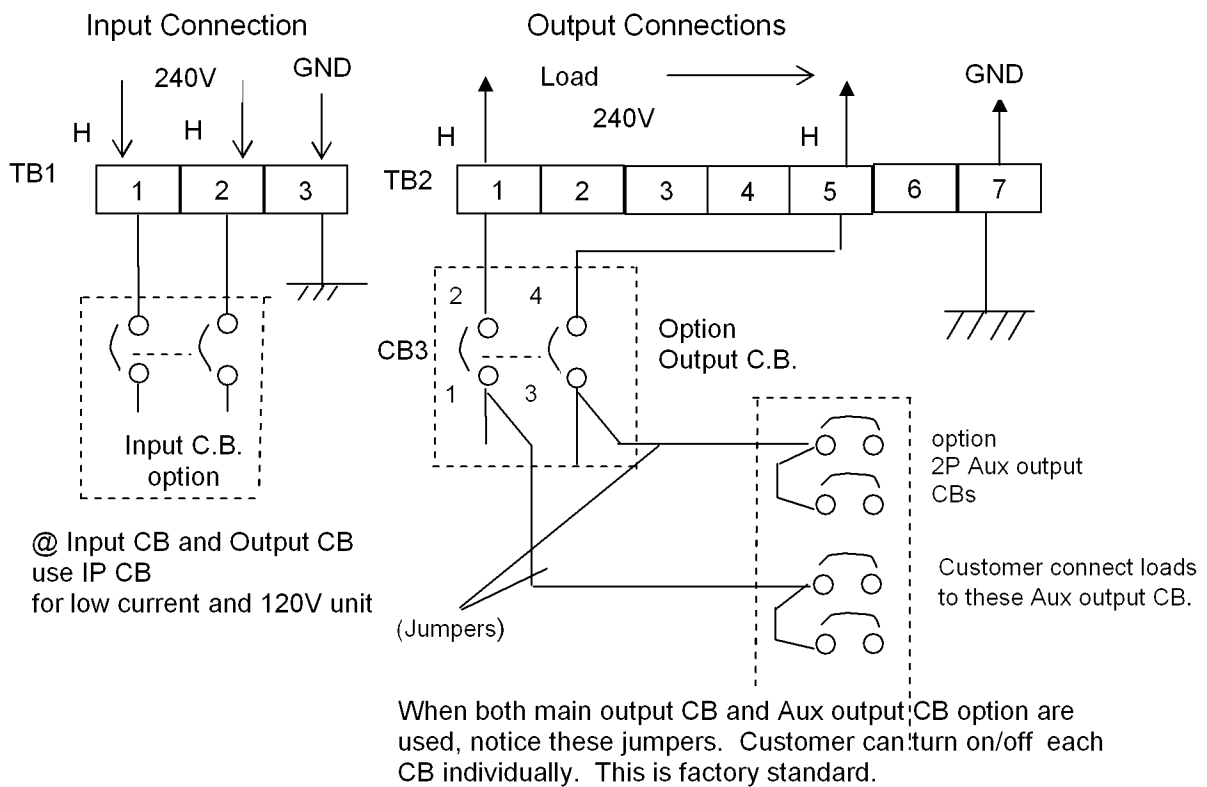


ILLUSTRATION 3-8

Online Power

(3) continued

(C) 240V Unit



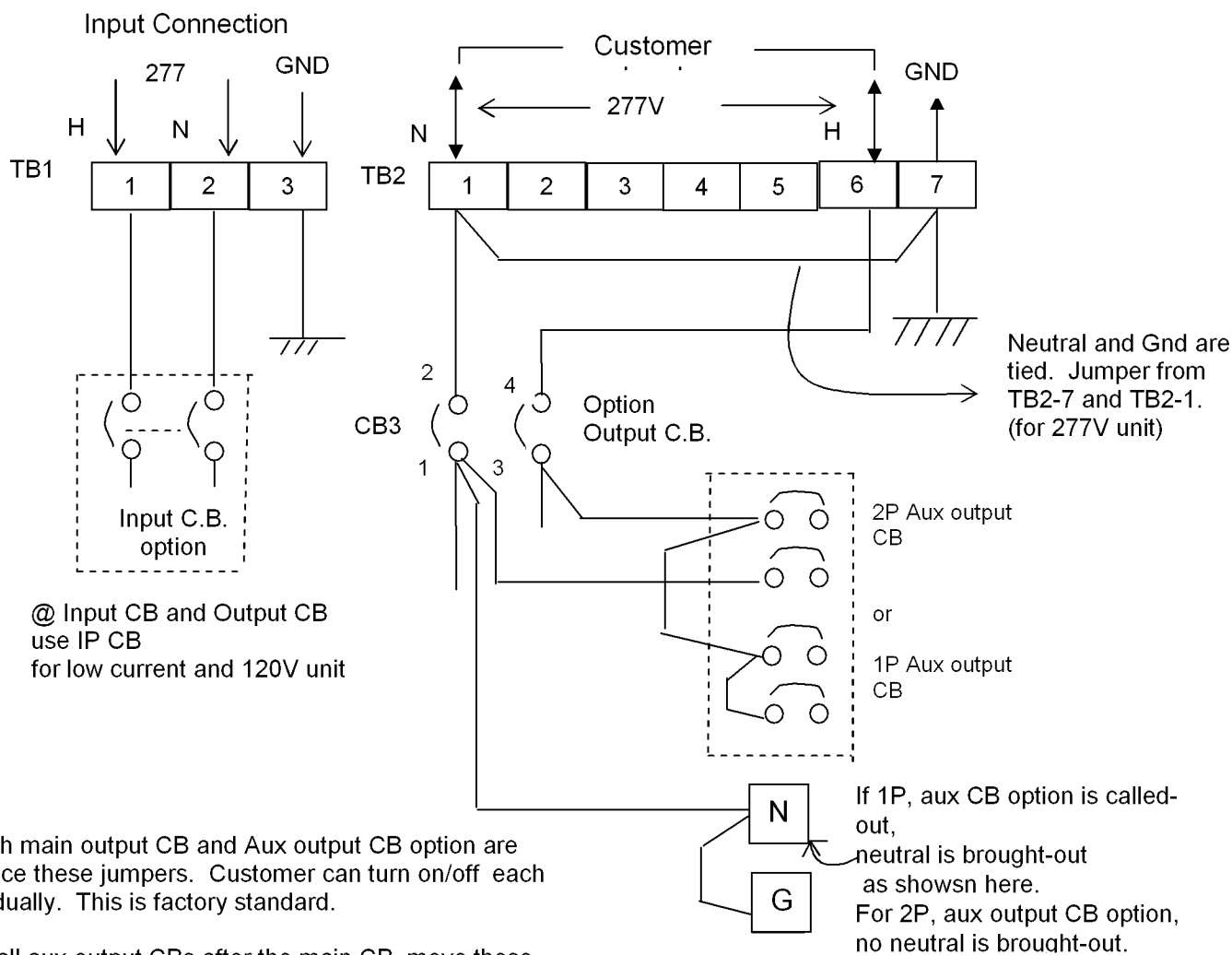
To locate all aux output CBs after the main CB, move these jumpers to CB3-2 and CB3-4.

ILLUSTRATION 3-9

Online Power

(3) continued

(D) 277V Unit



When both main output CB and Aux output CB option are used, notice these jumpers. Customer can turn on/off each CB individually. This is factory standard.

To locate all aux output CBs after the main CB, move these jumpers to CB3-2 and CB3-4.

ILLUSTRATION 3-10

Online Power

(4) Customer Connection

Output connection with output transformer

The following Illustrations 3-11 to 3-17 are standard Aux CB / Output CB's connections.

(Note): When desire to locate all Aux Output CBs after the main output CB, move Aux CB wiring to CB3-2, & CB3-4.

For multiple output unit and different input/output voltage application. There is an output transformer.

Input power connections are same as (I) refer to each voltage (I) – (A), (B), (C),)(D).

(A) 120V Output connection

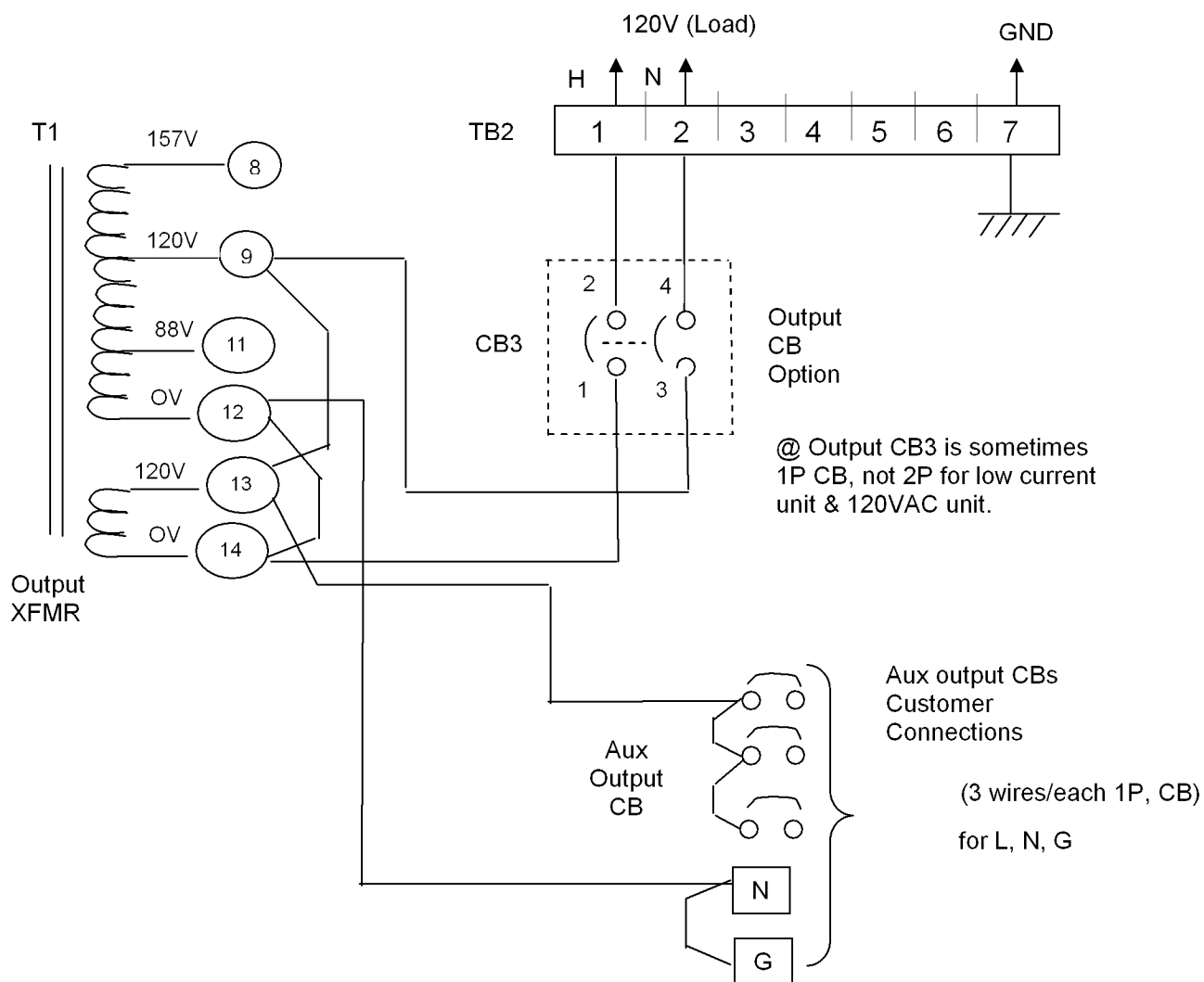


ILLUSTRATION 3-11

Online Power

(4) continued

(B) 208V Output connection

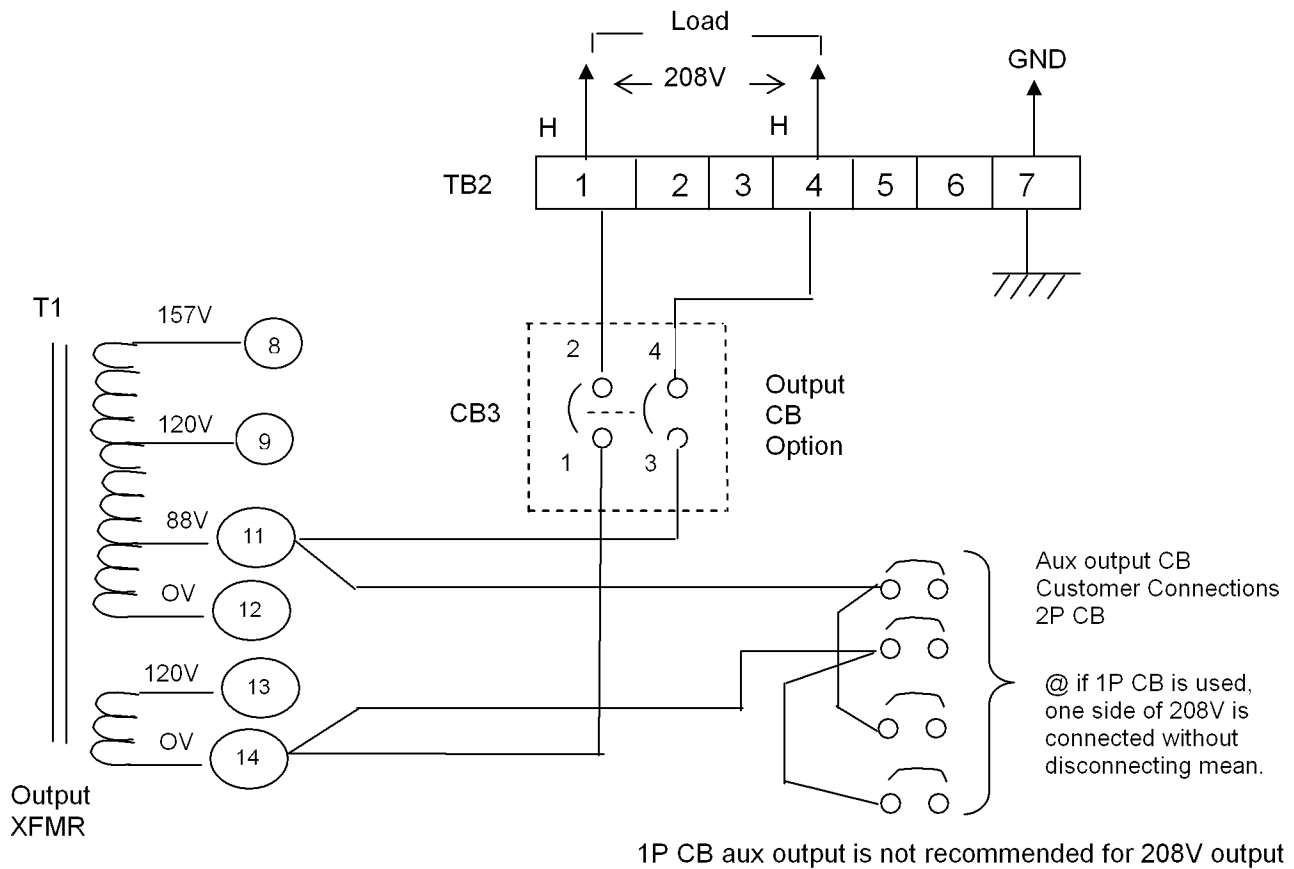


ILLUSTRATION 3-12

Online Power

- (4) continued
- (C) 240V Output connection

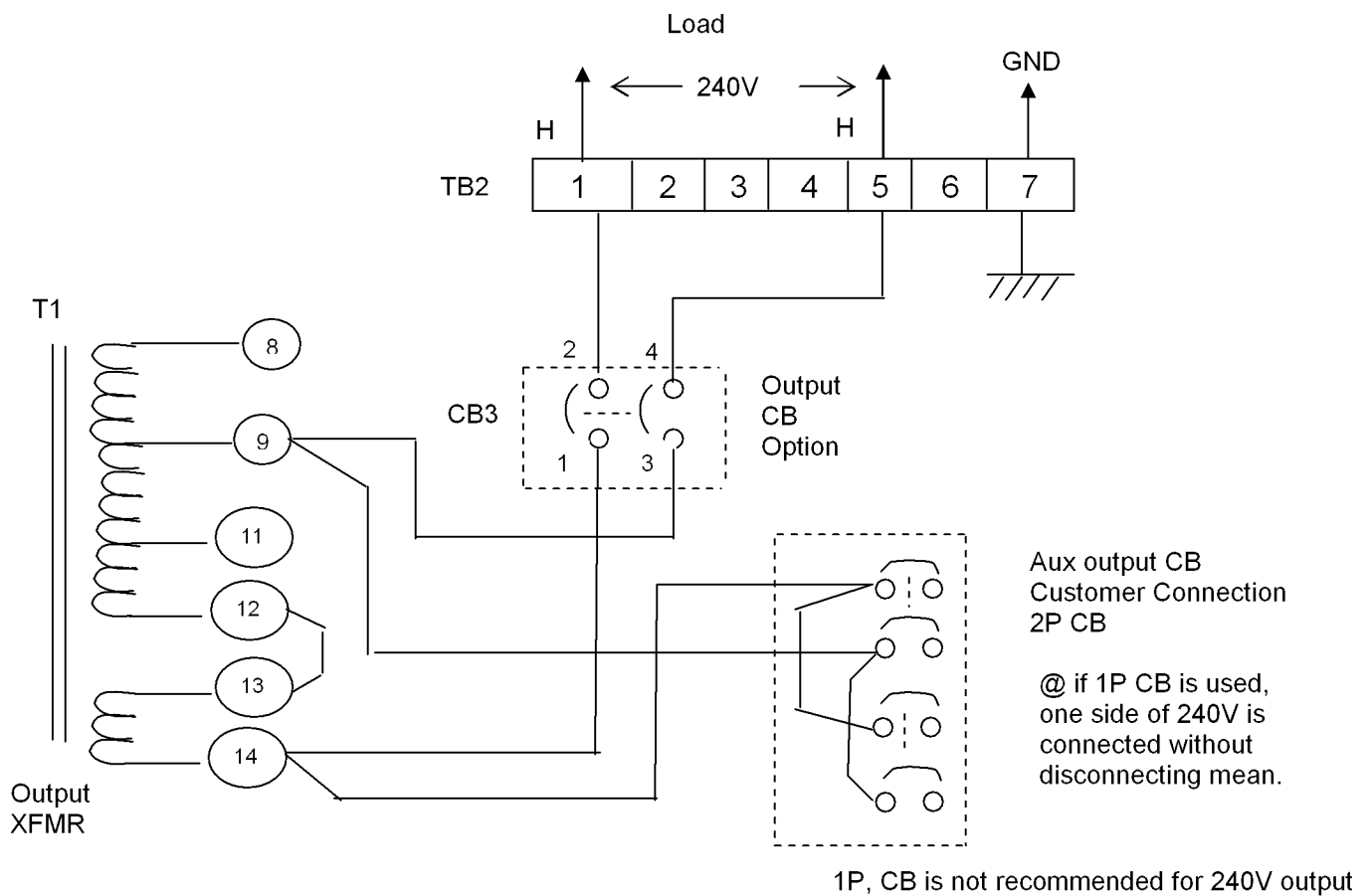


ILLUSTRATION 3-13

Online Power

- (4) continued
- (D) 277V Output connection

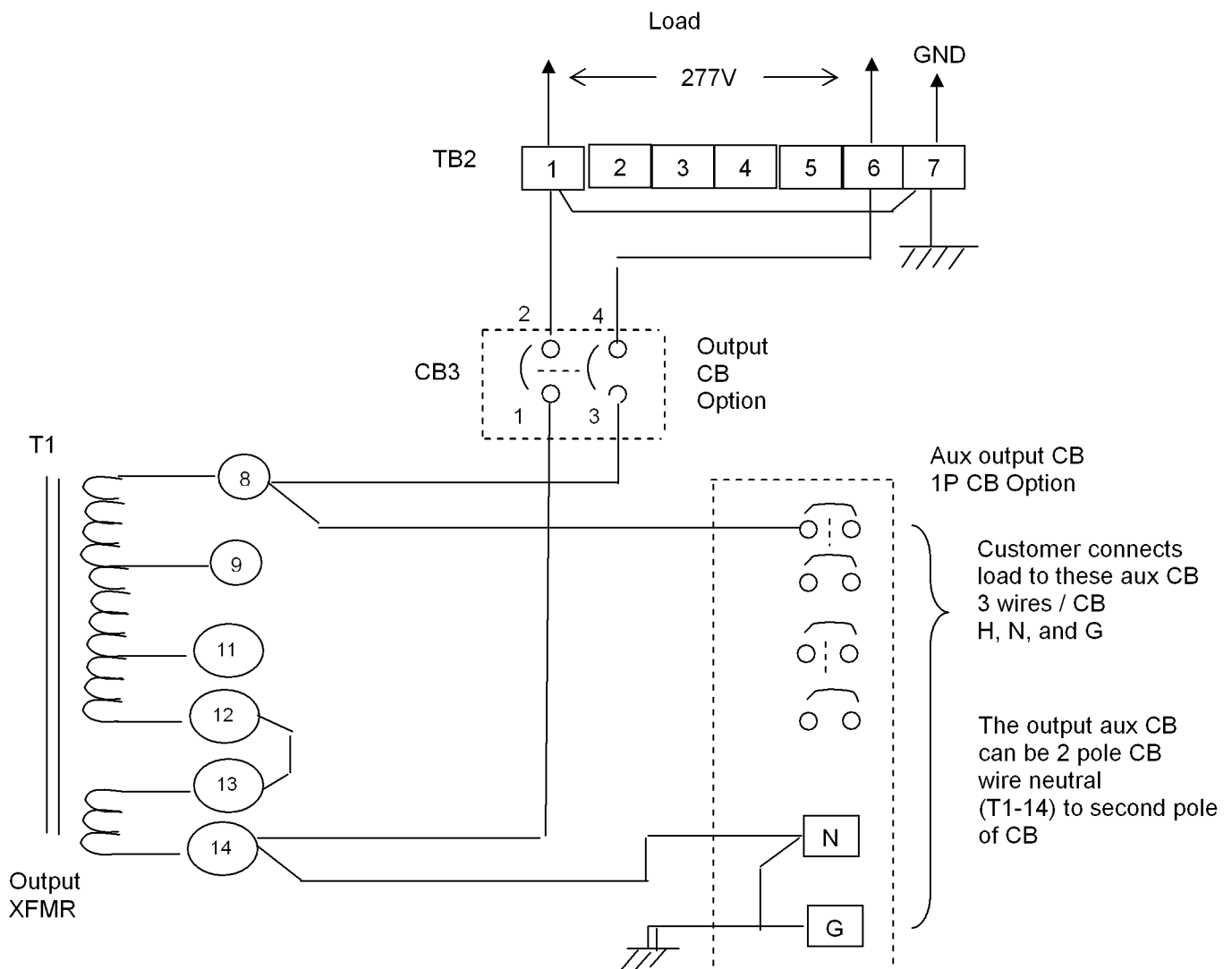


ILLUSTRATION 3-14

(4) continued

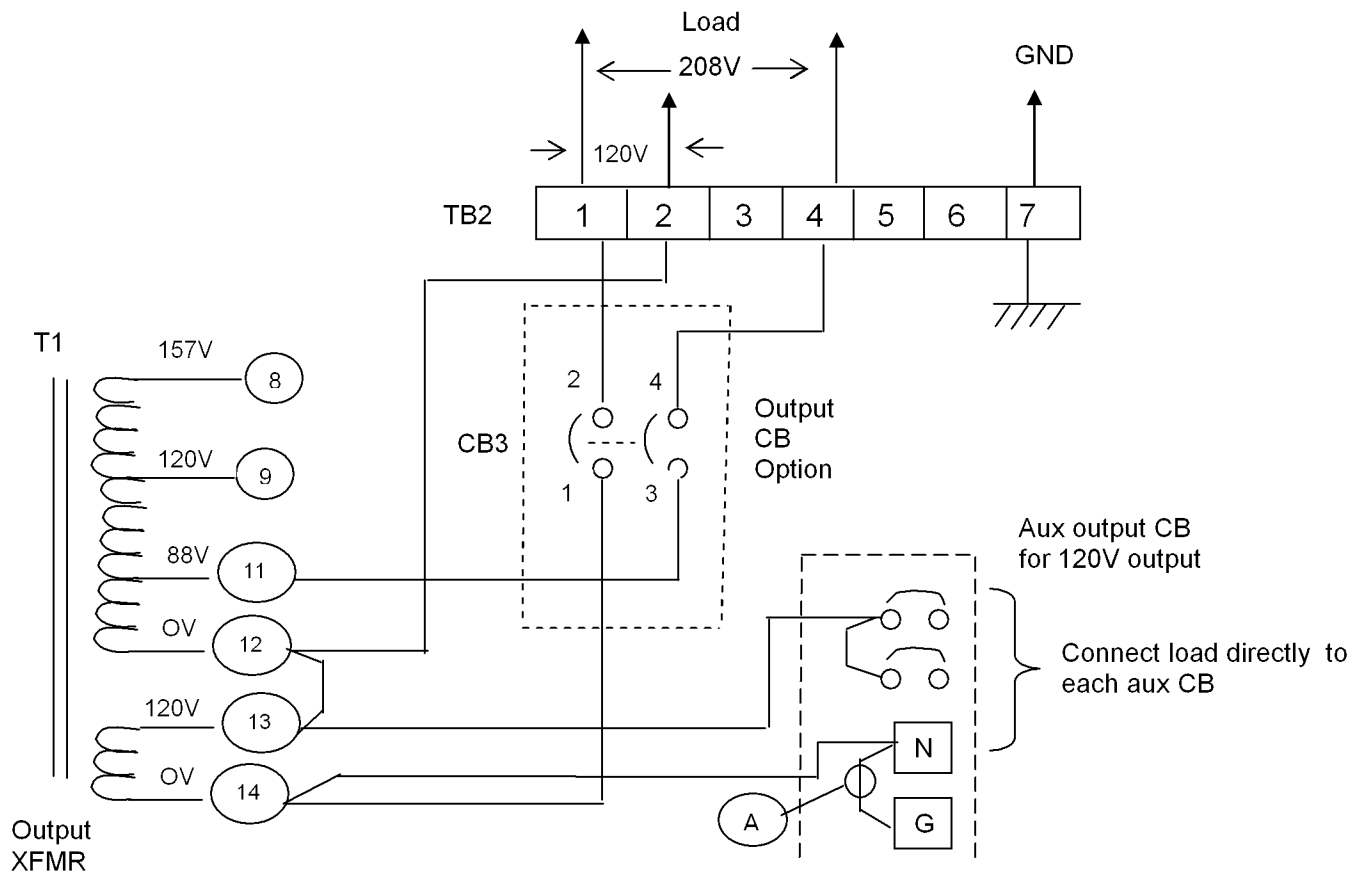
(E) 120/240V Dual Output connection



Online Power

(4) continued

(F) 120V / 208V Dual Output connections



(NOTE) For 120V and 208V dual output case, TB2-1 or T1-14 can be treated as a neutral point and can be tied together neutral and ground. If neutral and ground isolation is needed, disconnect (A) jumper.

ILLUSTRATION 3-16

Online Power

(4) continued

(G) 120V / 277V Dual Output connections

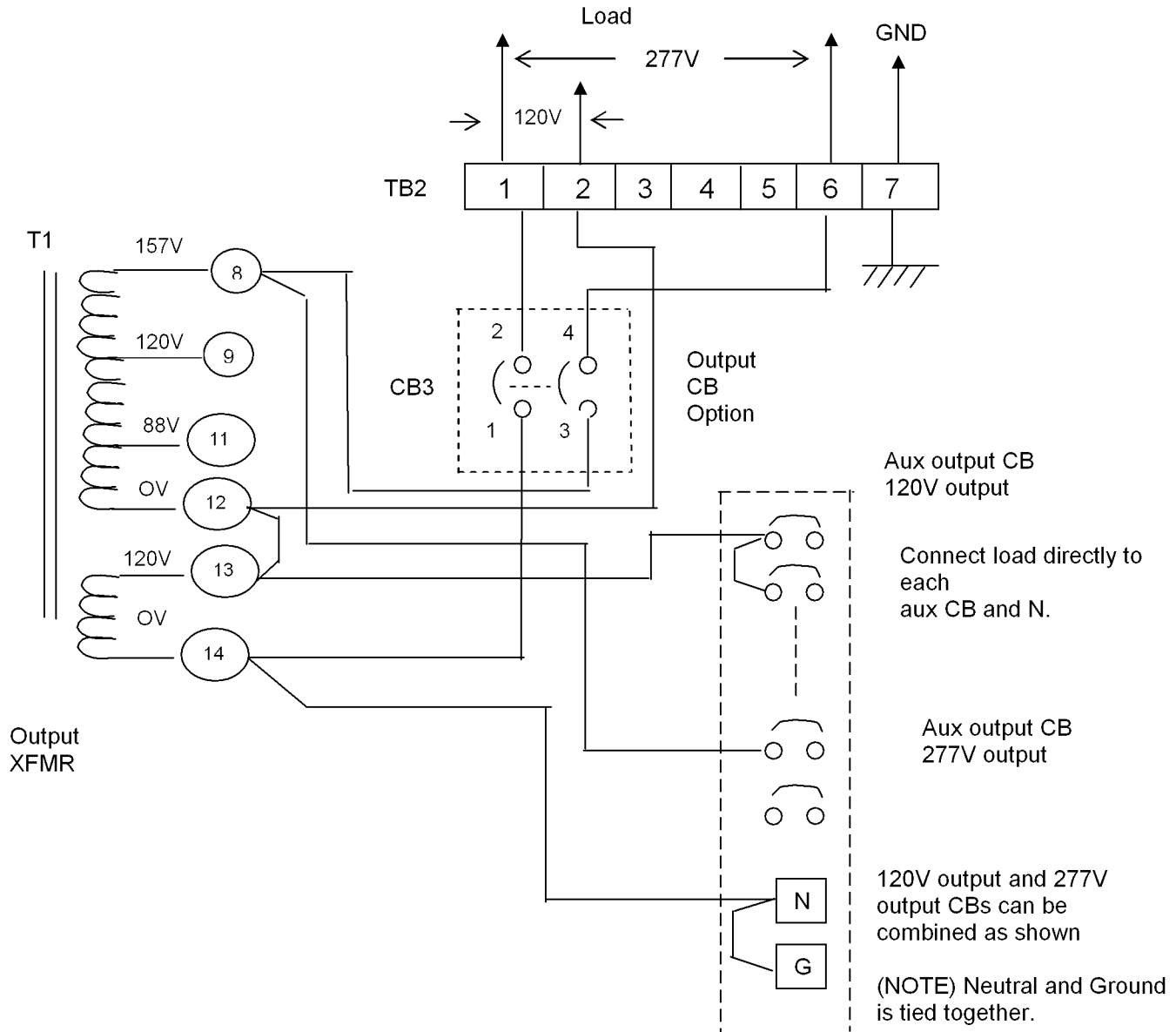


ILLUSTRATION 3-17

Online Power

C. Battery Connections

For battery connections, please refer to the battery connection diagram for each sales order. There are various configurations due to battery run time and battery bus voltages. Appendix C-2, C-3, C-4, and C-5 shows the maximum strings of each battery system as reference only.



WARNING!

USE BATTERY CONNECTION DIAGRAM FROM THE ACTUAL UNIT. EACH BATTERY CABINET SHOULD HAVE A COPY OF THE CONNECTION DIAGRAM. EACH UPS CABINET SHOULD HAVE A COPY OF CONNECTION DIAGRAM. MAKE SURE THE BATTERY CONNECTION DIAGRAM NUMBER IN THE NAMEPLATE OF EACH UNIT MATCHES THE BATTERY CONNECTION DIAGRAM IN THE BATTERY CABINET.

REFER TO A SAMPLE NAMEPLATE BELOW:

| <u>On – Line Power</u> | |
|--------------------------------------|----------------------------------|
| Powerwave 1 / Protector 1 | |
| Serial No.: _____ | ← 1 |
| Model No.: _____ | ← 2 |
| Rating: _____ KVA, P.F. _____ | ← 3 |
| Frequency: _____ Hz _____ Phase | |
| Input Voltage: _____ AC Volts | |
| Input Current: _____ Amps | |
| Output Voltage: _____ AC Volts | |
| Output Current: _____ Amps | |
| Battery Volt: _____ VDC | ← 4 |
| Battery Current: _____ Amps max. | |
| Back-up Time: _____ Minutes | ← 5 |
| Battery Quantity: _____, 12 VDC each | |
| Battery P/N: _____ | ← 6 |
| All Values are Nominal | |
| Mfg. Date: _____ | |
| Dwg. No.: 6002- _____ | ← 7 (Battery Connection Diagram) |

Verify the following items 1 thru 7 against the nameplate information on front of the unit.

ILLUSTRATION 3-18

Online Power

3.4 REMOTE SIGNALING CONNECTIONS (OPTION)

The Protector 1 includes the feature of providing dry relay contacts for remote signaling capabilities. Signals available for remote annunciation are:

“INPUT FAILURE” - N/O contact that closes upon loss of input power.

“LOW BATTERY” - N/O contact that closes when the unit is on battery operation and the batteries approach inadmissible discharge status.

“BYPASS ON” - N/O contact that closes when the unit transfers the load to static by-pass.

”SUMMARY ALARM” - N/O contact that closes when the unit has any one of the following alarm conditions. Internal Failure, System Overheat, Battery Undervoltage.

- .4.1 Dry relay contacts for remote signaling are provided via connector (P2) on Control Board (A2), located on the inside of the right door of the enclosure. See illustration 1-2 for location of Control PCB.
 - .4.2 Dry relay contacts have the following maximum ratings:
 - 125 volts (AC or DC) maximum
 - 1.25 amperes maximum
 - 30 watts / 50 VA maximumIt is imperative that the relay contact ratings are not exceeded. Otherwise, damage to the relays within the Protector 1 will occur.
- 3.4.3 Determine which signals will be used. Connect wires (customer-supplied) to the connector.
- 3.4.4 See illustration 1-2 for location of dry C contacts terminal.
This concludes the installation procedures. Please proceed to Section 4 - Start-Up.

3.5 STORAGE

The Protector 1 System 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 Protector 1 will be stored for three 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.

3.5.1 Battery Maintenance

During long-term storage, the batteries are subject to aging and deterioration. After visual inspection, if the batteries need to be replaced, contact your Online Power dealer or the Online Power factory directly to purchase new batteries. Batteries matching sequence numbers used should be purchased to set-up a string.

If the UPS is stored in its original packaging, unpack UPS using unpacking procedures outlined in Equipment Unpacking Section 3.2.

Online Power

If the UPS is not connected to a source of power, first connect the UPS to an appropriate power source using the procedures in Unit Installation Section 3.3.

Then recharge batteries as follows:

1. Unlock and open front doors.
2. Set AC input power source to ON.
3. Close input circuit breaker and wait for 1 minute,
4. Close battery circuit breaker, only when UPS Normal is displayed on screen.
5. The UPS automatically recharges batteries. The LCD panel will indicate the battery voltage and charging current.
6. Allow UPS to run for 24 hours to fully charge batteries.
7. When batteries have reached partial charge, the battery charging current will be under 1 Amp on LCD panel.
8. Open CB2 Battery Breaker
9. Turn OFF input power to the UPS.
10. Close and lock front door.

SECTION 4 – OPERATION

4.1 START-UP PROCEDURES

Initial start-up must be performed by Online Power service personnel or an authorized representative. To request start-up, fax a completed Request for Turn-On form to Online Power at 323-721-5017. The Request for Turn On form is attached in this manual as Appendix E. The start-up procedure described in this manual refers to a start up of the Protector 1 after a maintenance shutdown or rectified fault.

4.1.1 Verify that the main input circuit breaker, battery breaker, and output circuit breaker(s), are in the "OFF" or "down" positions. Refer to illustration 2-2 for the location of the circuit breakers.

4.1.2 Check all cable connections are firmly secured.

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

Caution The main input power and reserve input power should be available at same time when dual input power sources are used.

4.1.3 Apply input power to the Protector 1

- Input Circuit Breaker remains open.
- Verify that the voltage measured on the input circuit breaker is 120/208/240/ or 277 VAC and is the same as nameplate voltage rating. If the voltage is not the same as on nameplate within +15% to -10% tolerance, do not proceed any further. Contact Online Power at (800) 797-7782 for technical assistance.
- Verify that there are no voltages measured on the output terminal block.

4.1.4 Turn on the main input circuit breaker.

4.1.5 After turning on the system, wait one (1) minute while the Protector 1 runs through its internal diagnostic routines.

- Hear the sound of contactor closing.
- See the fan(s) running.
- See the LCD display screen showing UPS Normal message.

Online Power

| | |
|--------|----------------------|
| Line 1 | UPS NORMAL @ 15 kVA |
| Line 2 | INPUT OK @ CHRG ON |
| Line 3 | BATTERY OK @ DC OK |
| Line 4 | ON INVERTER @ OUT OK |

- Verify that the LCD display panel indicates all correct parameters - see Appendix D for details.
- Verify that the output voltage is 120/208/240/277 VAC per the nameplate.

4.1.6 Close battery breaker in the UPS cabinet [and in battery cabinet(s)].

4.1.7 At this time, the Protector 1 should be providing AC line power. If the Protector 1 is not operating in the normal mode, turn off the input circuit breaker. Contact Online Power at (800) 797-7782 for technical assistance.

4.1.8 Recheck that the output voltage is 120/208/240/ or 277 VAC.

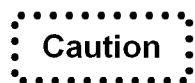
- If the output voltage is approximately the same as the nameplate, turn on the loads.

4.1.9 Verify battery operation and the inverter test switch.

- To place the Protector 1 in battery operation (simulate loss of input power), press and hold yellow Inverter Test Push Button. With Push Button in the hold position, the Protector 1 should be running on its internal batteries.
- Verify that the LCD panel displays is as below, where “xx” is the kVA of this unit:

| | |
|--------|----------------------|
| Line 1 | UPS NORMAL @ xx kVA |
| Line 2 | INPUT BAD @ CHRGR ON |
| Line 3 | BATTERY OK @ DC OK |
| Line 4 | ON INVERTER @ OUT OK |

- Release the yellow Inverter Push Button and Verify that the LCD PANEL displays “INPUT OK @ CHRGR OFF”.



Be sure to release the Push Button, after the test, so it will not deplete the batteries.

4.1.10 The Protector 1 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.

Online Power

4.2 OPERATION

4.2.1 Turning On the Protector 1

1. Apply input power.
2. With input power available, turn on the main input circuit breaker.
3. Wait until you hear the input contactor closing and fan running.
4. Close the battery circuit breaker, only after the LCD display is lit and displays screens per Appendix D.
5. Verify that all parameters on the LCD display panel are proper. See Appendix D for display details.
6. Close the output circuit breaker.
7. Turn On the auxiliary output circuit breakers.

4.2.2 Turning Off the Protector 1

Turn off the Output Breaker(s), Battery Breaker, and Input Breaker.

4.3 FIELD REPLACEABLE UNITS (FRUS)

Refer to Table 4-1 for ordering the replacement parts from the factory. Supply the information from the unit's nameplate, including the 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. Replacement parts must be replaced by qualified factory trained service personnel only.



Circuit boards and IGBTs contain ESDS (ElectroStatic Discharge Susecptable) components. Handle and package ESDS devices in accordance with JEDEC standard JESD625-A. Use a grounded ESD wrist strap when handling the devices and circuit boards. Always package components and circuit boards in static-dissipative plastic bags before transporting even if a device has failed. Failure to do so could result in further damage, complicating repair and failure analysis.

4.3.1 Control Board

This Control Board is located on the inside right door at the top and mounted at 4 corners with screws and washers. Verify that all connectors are matches with their designations and pins #1, 2, etc. Unplug P1 through P15. Install the new board. Reconnect all plugs and connections maintaing them with their original orientations.

4.3.2 All Other Parts

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

Online Power

4.3.3 Heat Sink Assembly Replacement Procedure

- 1) Disconnect and isolate all sources of power.
- 2) The Heat Sink Assembly is located on the right side of the top electronic shelf, inside the UPS cabinet (Illustration 4-1). Verify that all cables and connectors have labels and are identified as shown. This is important for reinstalling the assembly.
- 3) Disconnect connectors P7, P6, P4, P1 from the PCB, A1, which is mounted horizontally on the big black heat sink.
- 4) Disconnect 5 power cables at TB4-1 through TB4-5 using flat screw driver. Verify and install label ID for each cable before disconnecting.
- 5) Loosen 3 Phillips head screws at front holding heat sink bracket. Pull the complete assembly forward and up. Remove it from tray gently, making sure that no cables or wires are catching (See illustration 4-1).
- 6) 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.
- 7) Reinstall all the cables and connectors in the reverse order. Verify per illustration 4-1.
- 8) Verify connections prior to starting up the unit.

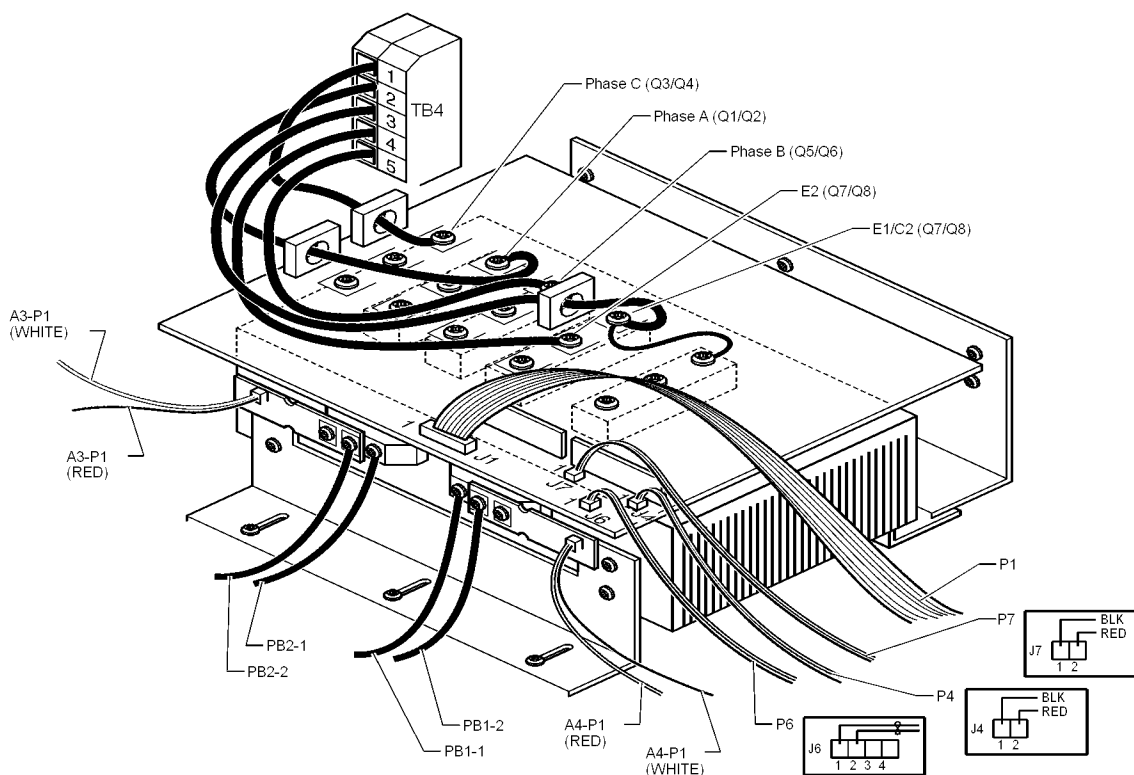


ILLUSTRATION 4-1: HEAT SINK ASSEMBLY (FRU)

Online Power

4.4 RENEWAL PARTS

System Parts

| ITEM | QTY | DESCRIPTION | DESIGN |
|------|---------------|--|---------------|
| 1 | 1 | Power Board | A1 |
| 2 | 1 | Bypass Static Switch | PB2 |
| 3 | 1 | Output Static Switch | PB1 |
| 4 | 1 | Input/Output/Battery Terminal Block for customer's use | TB1, TB2, TB3 |
| 5 | 1 | Input Choke | L1, L3 |
| 6 | 1 | Output Choke | L2 |
| 7 | 1 | DC Choke | L4 |
| 8 | 1 | The Frequency Noise Filter Capacitors for output Power | C1, C2, C3 |
| 9 | 1 | Control Board | A2 |
| 10 | 1 | LCD Display Board | A5 |
| 11 | 1 | Input Contactor | K1 |
| 12 | 1 | Terminal Block to remove heat sink assembly | TB4 |
| 13 | 1 | Fan Transformer | T3 |
| 14 | 1 | Control Power Transformer | T2 |
| 15 | 1 | Control Transformer Fuse | F1 |
| 16 | 1 | Fan Fuse | F2 |
| 17 | 1 | Heat Sink Assembly | HS1 |
| 18 | 1 | Fan(s) | B1 thru B5 |
| 19 | 1 | Optional Output Isolation Transformer | T1 |
| 20 | 1 | Input Breaker | CB2 |
| 21 | 1 | Battery Breaker | CB1 |
| 22 | 1 | Output Breaker | CB3 |
| 23 | 1 | Output Distribution Breaker | CB4 and Up |
| 24 | 8, 10, 16, 20 | Maintenance Free Lead Acid Battery(s) | B1 and Up |

SECTION 5 – MAINTENANCE

5.1 SAFETY PRECAUTIONS

Danger!

READ AND UNDERSTAND THIS SECTION THOROUGHLY BEFORE PERFORMING ANY MAINTENANCE WORK ON OR AROUND THE UPS. READ THE BATTERY MANUFACTURER'S MANUAL AND MATERIAL SAFETY DATA SHEETS BEFORE WORKING ON OR NEAR THE BATTERIES.

ONLY NORMAL SAFETY PRECAUTIONS ARE REQUIRED WHEN THE UPS IS OPERATING WITH ALL CABINET DOORS CLOSED. HOWEVER, THE UPS AND BATTERY CABINETS MUST BE KEPT FREE OF STANDING PUDDLES OF WATER, EXCESS MOISTURE, OR DEBRIS. DEBRIS CAN CONSIST OF EXCESSIVE DUST IN AND AROUND THE UNIT, AS THE COOLING FANS IN THE UPS WILL PULL THIS DUST INTO THE UNIT.

Danger!

ONLY FACTORY TRAINED OR AUTHORIZED PERSONNEL SHOULD ATTEMPT TO INSTALL OR REPAIR THE UPS OR ITS BATTERY SYSTEM. IMPROPER INSTALLATION HAS PROVEN TO BE THE SINGLE MOST SIGNIFICANT CAUSE OF START-UP PROBLEMS. SERVICE PERSONNEL SHOULD WEAR INSULATING SHOES FOR ISOLATION FROM DIRECT CONTACT WITH THE FLOOR (EARTH GROUND), AND SHOULD MAKE USE OF RUBBER MATS WHEN PERFORMING MAINTENANCE ON ANY PORTION OF THE UNIT WHILE IT IS UNDER POWER. 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.

Danger!

SPECIAL SAFETY PRECAUTIONS AND LOCKOUT TAGOUT PROCEDURES ARE REQUIRED FOR ALL OPERATIONS INVOLVING THE HANDLING, INSTALLATION, OR MAINTENANCE OF THE UPS SYSTEM AND ANY ASSOCIATED BATTERY CABINETS. FAILURE TO FOLLOW SAFETY PROCEDURES COULD RESULT IN DEATH, INJURY OR DAMAGE TO EQUIPMENT.

Danger!

THIS EQUIPMENT CONTAINS CIRCUITS THAT ARE ENERGIZED WITH HIGH VOLTAGES. ONLY TEST EQUIPMENT DESIGNED FOR TROUBLESHOOTING HIGH VOLTAGES SHOULD BE USED, PARTICULARLY FOR OSCILLOSCOPES AND PROBES.

ALWAYS CHECK WITH AN AC AND DC VOLTMETER TO ENSURE SAFETY BEFORE INITIATING CONTACT OR USING TOOLS. EVEN WHEN THE POWER IS OFF, DANGEROUSLY HIGH POTENTIAL VOLTAGES MAY EXIST AT CAPACITOR BANKS. ALWAYS OBSERVE BATTERY PRECAUTIONS WHEN OPERATING NEAR ANY BATTERIES.

FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN DEATH, INJURY OR DAMAGE TO EQUIPMENT.

Danger!

OBSERVE ALL BATTERY SAFETY PRECAUTIONS DURING INSTALLATION OR SERVICE OF THE UPS 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 UPS. 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.

Danger!

BE CONSTANTLY AWARE THAT THE UPS 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.

Online Power

5.2 WHEN TO CALL

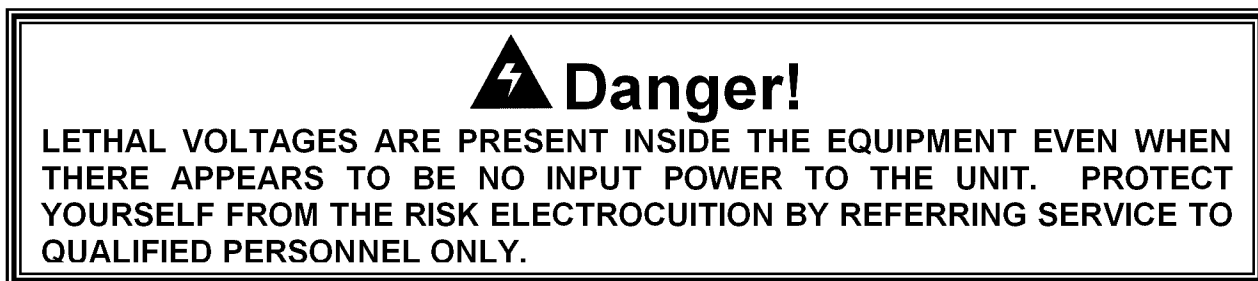
Call for service if you encounter any of the following conditions:

- 1) Repeated start-up attempts are unsuccessful.
- 2) A UPS fault occurs which cannot be cleared.
- 3) Normal operation of the critical load repeatedly causes an overload condition. This is not a UPS fault but a qualified person must analyze the total load connected to the UPS to prevent unit failure. Momentary overload conditions will be handled within the parameters of the UPS Unit but sustained overloads will cause the UPS Unit to fail.
- 4) Any indicators or alarms operate abnormally or continuously.
- 5) Any other abnormal function of the system occurs.
- 6) If any abnormal battery condition is detected.
- 7) When you are unsure of what action to take.

5.3 STEPS TO TAKE

If any of the above occur:

- 1) Consult Appendix C, LCD Display Menu and Troubleshooting Guide. Record information on the LCD Display to relay to Online Power Customer Service and Support.
- 2) Call Online Power Customer Support at 1-800-797-7782 or 1-800-PWR-SRVC.



5.4 PREVENTATIVE MAINTENANCE

UPS Operator Maintenance consists of the basic tasks listed in this section. Other maintenance functions require Online Power Service personnel.

5.4.1 Maintaining an Operator's Log

Careful record keeping will ensure proper maintenance of the UPS Unit, and assist in the correction of any abnormal conditions.

The operator's log should contain the following information:

- Date of system start-up
- Dates that battery maintenance was performed
- Dates that input, output, and battery status readings were checked and the values displayed for these readings.
- Dates and summaries of all communications with Online Power Service Personnel.

Online Power

5.4.2 Periodic Testing of UPS

The UPS Unit should be manually exercised on a periodic basis (once every three months, for example). This forces the UPS unit to transfer to the battery and return to main power. This process activates self-diagnostic testing which may reveal conditions that require attention.

5.4.3 Maintaining the Batteries



Danger!

BATTERY CIRCUIT BREAKER OPERATES AT THE RATED BATTERY VOLTAGES AT ALL TIMES. TRIPPED BATTERY CIRCUIT BREAKER INDICATES A SERIOUS PROBLEM THAT MAY RESULT IN SERIOUS INJURY OR DAMAGE TO THE EQUIPMENT IF CLOSE THE CIRCUIT BREAKER WITHOUT KNOWING WHY IT FAILED. CHECK SHORT IN BATTERY OR CALL ONLINE POWER CUSTOMER SERVICE AND SUPPORT FOR ASSISTANCE AT 1-800-PWR-SRVC.



Danger!

THE BATTERY ELECTROLYTE IS A DILUTED SULFURIC ACID THAT IS HARMFUL TO THE SKIN AND EYES. IT IS ELECTRICALLY CONDUCTIVE AND CORROSIVE. WEAR FULL EYE AND HAND PROTECTION ALONG WITH PROTECTIVE CLOTHING. IF THE ELECTROLYTE CONTACTS THE SKIN, WASH IT OFF IMMEDIATELY WITH WATER. IF ELECTROLYTE CONTACTS THE EYES, FLUSH THOROUGHLY AND IMMEDIATELY WITH WATER. SEEK IMMEDIATE MEDICAL ATTENTION. SPILLED ELECTROLYTE SHOULD BE WASHED DOWN WITH A SUITABLE ACID NEUTRALIZING AGENT. ONE COMMON PRACTICE IS TO USE A SOLUTION OF APPROXIMATELY ONE POUND (500 GRAMS) OF BICARBONATE OF SODA TO APPROXIMATELY ONE GALLON (4 LITERS) OF WATER. THE BICARBONATE OF SODA SOLUTION SHOULD BE APPLIED TO THE SPILL UNTIL EVIDENCE OF CHEMICAL REACTION (FOAMING) HAS CEASED. THE RESULTING LIQUID SHOULD BE FLUSHED WITH WATER AND THE AREA DRIED.



Danger!

DO NOT DISPOSE OF A BATTERY OR BATTERIES IN A FIRE. THE BATTERIES MAY EXPLODE CAUSING DEATH OR SERIOUS INJURY.

Online Power

Caution

Do not substitute batteries from other manufacturers without the express approval of Online Power Customer Service personnel.

- Power Battery PRC-12xxx is one battery manufacturer used by Online Online Power, with xxx representing the amp-hour size of the battery.
- Universal Battery UB12xxx is another battery manufacturer authorized by Crucial Power, the xxx is the amp-hour size of battery.

Caution

Lead-acid batteries contain hazardous materials and must be handled, transported, and recycled or scrapped in accordance with federal, state, and local regulations. Since lead is a toxic substance, lead-acid batteries should be recycled rather than scrapped.

Caution

A battery can present a risk of electrical short and high short circuit current. The following precautions should be observed when working on or around batteries:

- Remove watches, rings, necklaces, or other metal objects.
- Use only tools with insulated handles.
- Wear rubber insulating gloves and boots.
- Do not lay tools or metal parts on top of batteries.
- Disconnect charging source prior to connecting or disconnecting battery terminals.
- Verify that batteries are properly grounded.



Danger!

DO NOT GROUND BATTERY POSITIVE OR NEGATIVE.

Caution

Lead-acid batteries can present a risk of fire because they generate hydrogen gas. The following safety procedures must be followed:

- DO NOT SMOKE when near batteries.
- DO NOT cause flame or sparks in battery areas.
- Discharge static electricity from your body before touching batteries by first touching a grounded metal surface.

Caution

When replacing batteries, use with the same number of batteries, and same manufacturer, type, and model that was supplied with the unit. To avoid system failure, replace all batteries if one or more batteries fail to perform to specifications.

Online Power

5.4.4 Battery Cabinets

Although the individual batteries are sealed and require only minimal maintenance, the batteries should be given a periodic inspection and electrical check. Checks should be performed annually to ensure years of trouble-free service. Tightness of battery terminal connections should be tested to recommended torque values. Battery Service Agreements are available through Online Power. Although the individual batteries are sealed and require only minimal maintenance, the batteries should Customer Service and Support at 1-800-PWR-SRVC (800-797-7782).

5.4.5 Power Connections

- Check for corrosion and connection integrity. Visually inspect wiring for discolored or cracked insulation. Clean and / or re-torque as required.
- All Battery Terminal connections shall be initially torqued to 75 in / lbs. Subsequent re-torquing shall be to 65 in / lbs.

5.4.6 Battery Terminals

- Check for discoloration, corrosion, and connection integrity. Clean and tighten as necessary. Note: Initial Torque Values are greater than re-torque values.
- To access battery terminals, remove the top strapping material located at the lower front of the battery shelf. Pull the battery forward to access the battery connections. Disconnect the cables connected to the battery. Once disconnected, insulate the cables to prevent accidental shorts. (Use a protective boot or electrical tape.) Before replacing the battery connections you must clean and re-torque the connection hardware.
- Online Power Customer Service Personnel must approve non-Standard Batteries. Please call at 1-800-PWR-SRVC (800-797-7782).

5.5 ONLINE POWER CUSTOMER SERVICE AND SUPPORT

Start-up, UPS Maintenance, battery maintenance, and preventative maintenance programs are available through your Online Power sales representative or through Online Power Customer Service & Support.

5.5.1 Start-Up Services

Various Start-up services are available. See your sales representative or telephone Online Power Customer Service at 1-800-PWR-SRVC (800-797-7782).

5.5.2 Maintenance Agreements

Standard Full Service, 24/7 Full Service, and Extended On or OFF Site Maintenance agreements are available. See your sales representative or telephone Online Power Customer Service at 1-800-PWR-SRVC (800-797-7782).

5.5.3 Warranties

Contact Online Power Customer Service and Support at 1-800-PWR-SRVC (800-797-7782) if you have any questions regarding the warranty on your UPS System or the batteries.

SECTION 6 – SYSTEM OPTIONS

This section describes options available with the Protector 1 phase. The following are available:

| Part Number | Options |
|------------------------|---|
| 3000-044 thru -056 | External Manual Bypass Switch |
| 9100-1339-01 thru -04 | Internal Manual Bypass Switch |
| 9100-1363-02 | Audio Alarms with Silence Switch |
| 9100-1020-03 | Remote UPS Status Display, 3 phase Monitor |
| 9100-1362-02 | Form "C" N/O Contacts for Alarms |
| 9100-1440-XX | TVSS (Transient Voltage Surge Suppressor), 208v |
| 9100-1343-01 thru -16 | Normally ON/OFF Output Aux. Circuit Breakers |
| 9100-1439-01 thru -03 | External Output Aux. Circuit Breakers in Panel Board |
| 9100-1429-xx | Stackable Rack (1 rack per 2 cabinets) |
| N/A | System Input CB Standard/Higher KAIC |
| N/A | System Output CB Standard/Higher KAIC |
| 9100-1434-31 thru 86 | Higher KAIC Norm .ON/OFF Output Circuit Breaker, Molded case |
| 9100-1435-01-26, 61-86 | Higher KAIC Norm. ON/OFF Output Circuit Breaker 1 Phase. Din rail |
| 9100-1317-02 | Seismic Mounting Bracket (Left and Right set per cabinet) |
| 9100-1493-01 | Power Flow Mimic |
| | GMS (Global Monitoring System) |
| 9100-1466-01 | Local On UPS -Event Log |
| 9100-1453-01 | Aux Output CB Trip Monitor w. Event Log |
| 9800-03-25 thru -150 | Local on PC - via RS232 |
| 9800-04-150 thru -1000 | Local on PC - via RS485 |
| 9100-1468-01 | Remote Dial-Up |
| 9100-1469-01 | SNMP / WEB |
| 9100-1501 | ECC – EMERGENCY CIRCUIT CONVERTER |
| 9100-1502 | ECM – EMERGENCY CONTROL MODULE |

Online Power

6.1 Optional External Maintenance Bypass Switch – P/N 3000-044 thru -056

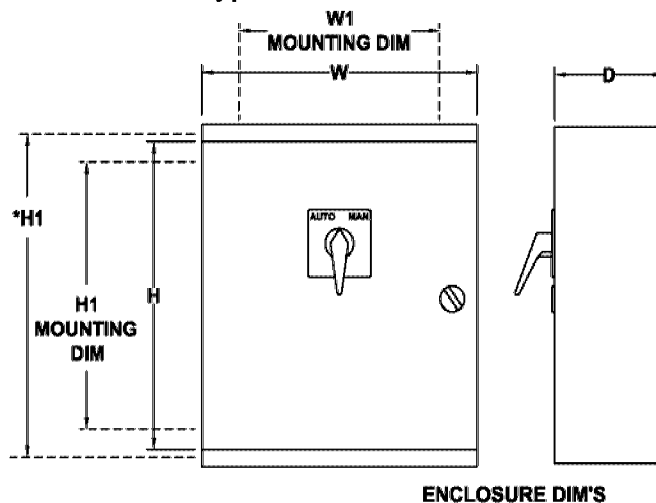


ILLUSTRATION 6-1: EXTERNAL MAINTENANCE BYPASS SWITCH

Notes:

- Switch contacts are 1 phase L & N “make-before-break”.
- Contacts marked “AUTO” are closed in the “AUTO” position.
- Contacts marked “MAN” are closed in the “MAN” position.
- For different input/output should be used with external transformer.
- Wrap around Bypass SW should be used with any built in distribution Secondary Aux Circuit Breaker.

6.1.1 Installation

Allow front access to the MBS box at all times for maintenance and servicing. Electrical codes require that the MBS box be installed with no less than 3 feet at the front of the cabinet. Side and rear panels do not require service clearance, however side vents must not be blocked.

Danger!

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 DEATH, INJURY, EXPLOSION, FIRE OR DAMAGE TO THE EQUIPMENT. VERIFY THAT ALL INCOMING HIGH AND LOW VOLTAGE POWER CIRCUITS ARE DE-ENERGIZED AND LOCKED OUT BEFORE INSTALLING CABLES OR MAKING ANY ELECTRICAL CONNECTIONS.

Online Power

Refer to Section 3.1, Site Planning and Preparation

Verify the following connections have been made per wiring diagrams: 6001-032-11, 6001-032-12, and specific application related sheets.

Wiring Inspection:

- 1) Verify all power connections are tight.
- 2) Verify all control wire terminations are tight.
- 3) Verify all power wires and connections have proper spacing between exposed surfaces, phase-to-phase and phase-to-ground.
- 4) Verify that all control wires are run in individual, separate steel conduit.

6.1.2 Operation

The external maintenance bypass switch is mounted in a box which is field installed on the UPS cabinet. This box includes a rotary switch to provide a single control for transferring to and from maintenance bypass. For ratings, wiring diagram enclosure dimensions and installation refer to drawings # 6001-032-11 for 3-pole, and 6001-032-12 for 4-pole panels.

The operator control switch for external manual bypass switch can be accessed by opening the cabinet front door.

Caution The single control simplifies the operation of the external manual bypass switch, however operating instructions must be carefully observed before using the bypass switch. Using the improper sequence in operation of the bypass switch SW-1 and toggle switch S-1 could result in unwanted action.

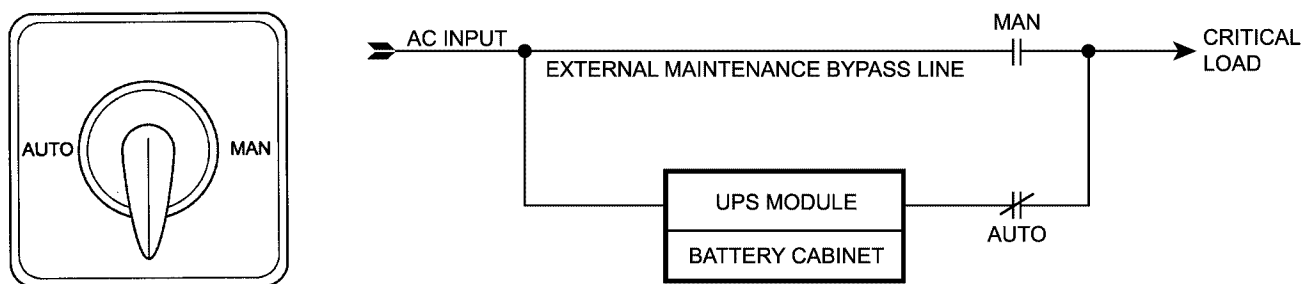


ILLUSTRATION 6-2: MAINTENANCE BYPASS SWITCH

The two Manual Bypass Switch Positions are:

- 1) **"MAN"** – Connects power to the critical load through the external maintenance bypass line. UPS needs to be de-energized for maintenance purposes.
- 2) **"AUTO"** – Connects the critical load to the output of the UPS and establishes normal operation.

Online Power

6.1.3 Specification. Optional External Manual Bypass Switch

| Part Number | Description |
|-------------|--|
| 3000-044 | EXTERNAL MANUAL BYPASS SWITCH, MAKE BEFORE BREAK, 55AMP, 3 POLES / LINE ONLY, 14”(W) x 8.00(D) x 16.00 (H). USE FOR: 3, 5, and 7.5 KVA UNITS |
| 3000-045 | EXTERNAL MANUAL BYPASS SWITCH, MAKE BEFORE BREAK, 110AMP, 3 POLES / LINE ONLY, 14”(W) x 8.00(D) x 16.00 (H). USE FOR: 10, 15, and 20 KVA UNITS |

6.2 OPTIONAL INTERNAL MANUAL BYPASS SWITCH – P/N 9100-1359-01 THRU -04

6.2.1 Specifications

| Part Number | Description |
|--------------|---|
| 9100-1359-01 | FOR: 3, 5, and 7.5 KVA UNITS , SAME IN/OUT VOLT UNIT). |
| 9100-1359-02 | FOR: 3, 5, and 7.5 KVA UNITS , DIFFERENT IN/OUT VOLT UNIT). |
| 9100-1359-02 | FOR: 10, 15, and 15 KVA UNITS , SAME IN/OUT VOLT UNIT). |
| 9100-1359-02 | FOR: 10, 15, and 15 KVA UNITS , DIFFERENT IN/OUT VOLT UNIT). |

6.2.2 Instruction for Internal Maintenance Bypass Switch:

“UPS to BYPASS”

- 1) Turn Battery Breaker Off
- 2) Switch Manual Bypass switch to “BYPASS” position.

Note: Leave Battery Breaker Off except when set on

“UPS” position Manual Bypass Switch.

“BYPASS to UPS”

- 1) Turn Battery Breaker Off
- 2) Switch Manual Bypass switch to “UPS” position.
- 3) Turn on battery CB for Normal operation.

6.3 OPTIONAL AUDIO ALARM WITH SILENCE SWITCH – P/N 9100-1363-01

6.4 OPTIONAL REMOTE UPS STATUS PANEL - P/N 9100-1020-06

6.4.1 Installation

The Remote UPS Status Panel is available in a console mount style box in black finish.

It can also be wall mounted and comes with a 10 foot long “DB” connector signal cable or optional length cable that can be up to 1000 feet long.

6.4.2 Operation

Remote Status Panel requires 120 VAC power, comes with 6 ft power cord, SILENCE, LED / HORN test switches and includes following status LED's.

- INPUT FAIL
- ON BYPASS
- INVERTER ON
- LOW BATTERY
- SUMMARY ALARM
- SILENCE SWITCH
- LAMP TEST SWITCH

Online Power

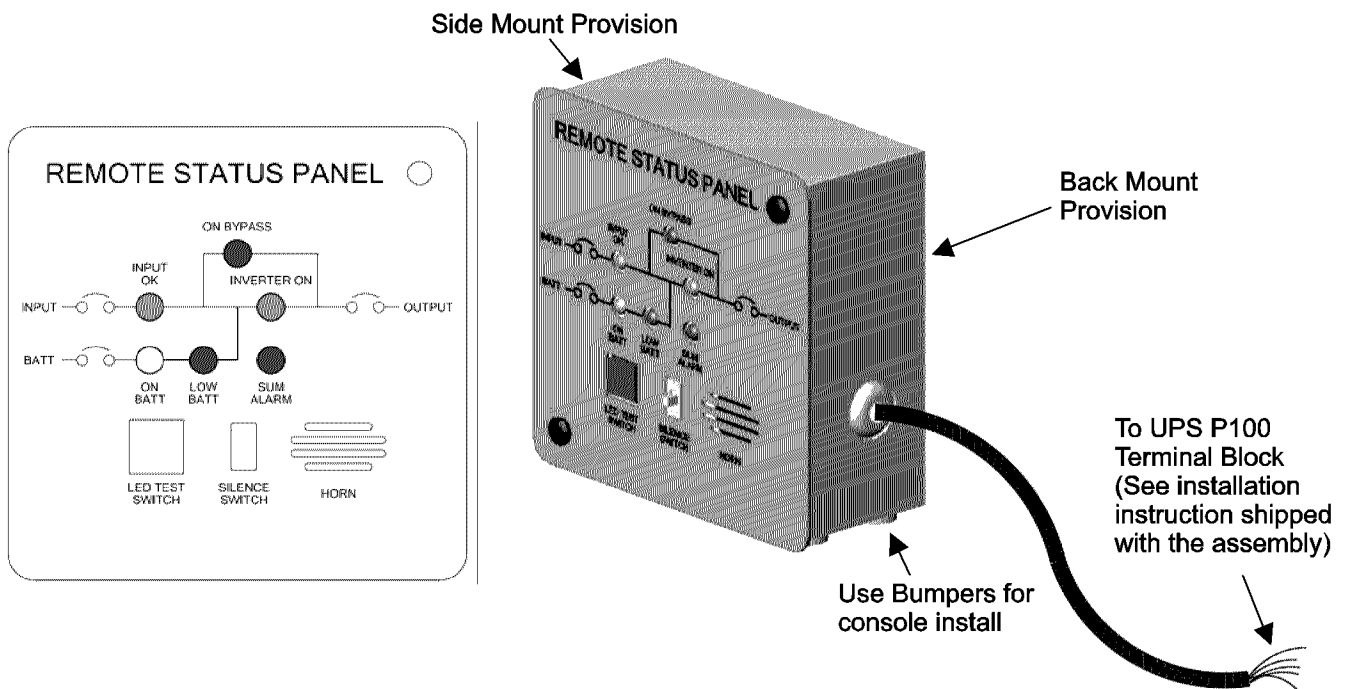


ILLUSTRATION 6-3: REMOTE STATUS PANEL

6.4.3 Specifications

UPS Remote Status Panel Installation Drawing 9100-1020-06, revision A, attached at the end of System Options Section.

Online Power

6.5 OPTIONAL FORM “C” CONTACTS FOR ALARMS – P/N 9100-1362-01

6.5.1 Installation

Terminal strip TB is provided on the optional alarm relay board for user connection to the individual alarm contacts.

6.5.2 Operation

The Remote Contact Board includes isolated Form C contacts for the following alarm signals:

| | |
|------|---------------|
| TB-1 | LOW BATTERY |
| TB-2 | ON BYPASS |
| TB-3 | SUMMARY ALARM |
| TB-4 | NOT USED |
| TB-5 | INPUT FAIL |
| TB-6 | COMMON |

6.6 OPTIONAL TVSS P/N – 9100-1440-02

6.6.1 Operation

TVSS contains energy absorbing components designed for specific line configurations. The device has two-stage protection. When protection components are damaged by absorbed transients, the device will show a reserve flag indicating a need for replacement. At this time the device is still operational, due to redundant circuits. After the second spike, the device will show an alarm condition indicating replacement is mandatory. Remote indication contacts "TS" allows remote control of the protection status.

6.6.2 Specifications

| Part Number | Description |
|--------------|---|
| 9100-1401-02 | TVSS, 120 VOLT INPUT UNIT, 40KA, 150V, 8/10US REPLACEABLE IN DINRAIL. IEC 61643-1/EN61643-11, ANSI/IEEE C62.41/ UL1449 CULUS/ UL94-V2. USE FOR 120 VOLT INPUT UNITS, ALARM LED WITH DISCONNECTOR. |
| 9100-1401-12 | TVSS, 277 VOLT INPUT UNIT, 40KA, 320V, 8/10US REPLACEABLE IN DINRAIL. IEC 61643-1/EN61643-11, ANSI/IEEE C62.41/ UL1449 CULUS/ UL94-V2. USE FOR 208/240/277 VOLT INPUT UNITS, ALARM LED WITH DISCONNECTOR. |

6.7 OPTIONAL NORMALLY ON/ NORMALLY OFF OUTPUT AUX. CIRCUIT BREAKERS – P/N 9100-1343-01 THRU –16

These circuit breakers are 1 pole, 20 A devices for protection of customer's circuits.

| |
|--|
| Normally ON C.B. Option Normally OFF C.B. Option Normally OFF Delay C.B. Option |
|--|

NORM ON/OFF OUTPUT AUX. CBS, STANDARD KAIC CB. Refer to the table for details in the separate attachment. 10 KAIC @ 120/240 VOLT, 6 KAIC @ 277 VOLT.

Online Power

6.8 OPTIONAL EXTERNAL OUTPUT AUX. CIRCUIT BREAKERS IN PANEL BOARD – P/N 9100-1439-01 THRU -03

6.8.1 Description

A matching external panel board with 1P 20A, (QO-Square D) circuit breakers is provided for power distribution from the UPS output to critical loads. The panel board accommodates up to 42 breakers. A main circuit breaker is provided with each panel board. See drawing 6001-03-15 for panel mounting arrangement.

6.8.2 Specification

| Part Number | Description |
|--------------|--|
| 9100-1439-01 | EXTERNAL OUTPUT AUX CBS OPTION IN A PANEL BOARD 1PH, CB. UP TO 24 (QO BREAKER) 125AMP. |
| 9100-1439-02 | EXTERNAL OUTPUT AUX CBS OPTION IN A PANEL BOARD 1PH, CB. UP TO 30 (QO BREAKER) 200AMP. |
| 9100-1439-03 | EXTERNAL OUTPUT AUX CBS OPTION IN A PANEL BOARD 1PH, CB. UP TO 42 (QO BREAKER) 225AMP. |
| 2025-125 | 10KAIC @240V, 120/240V, APPLICATION CB, 1PH, 20AMP QO BREAKER FOR 9100-1439-xx. |

6.9 OPTIONAL HIGHER KAIC NORM ON/OFF OUTPUT CIRCUIT BREAKER

HIGHER KAIC NORMALLY ON/NORMALLY OFF OUTPUT AUX CBs OPTION, 1-PHASE, 20AMP

| Part Number | Description |
|------------------|--------------------------------------|
| 9100-1434-31~~56 | 42 KAIC @120/240V, Din Rail |
| 9100-1434-61~~86 | 65 KAIC @208/240V ONLY. Din Rail |
| 9100-1435-01~~26 | 14 KAIC @277V ONLY. Molded Case C.B. |
| 9100-1435-61~~86 | 65 KAIC @277V ONLY. Molded Case C.B. |

6.10 OPTIONAL INPUT CB STANDARD / HIGHER KAIC

INPUT CIRCUIT BREAKER OPTION, STANDARD AND HIGHER KAIC

Refer to the separate table in Appendix “B”

6.11 OPTIONAL OUTPUT CB STANDARD / HIGHER KAIC

OUTPUT CIRCUIT BREAKER OPTION, STANDARD AND HIGHER KAIC

Refer to the separate table in Appendix “B”

6.12 OPTIONAL SEISMIC MOUNTING BRACKET – P/N 9100-1317-02

Left / Right seismic floor mounting bracket, 1 set per cabinet.

6.13 OPTIONAL STACKABLE RACK – P/N 9100-1429-XX

Drawings: 6001-033-02. (One rack per 2 cabinets)

Online Power

6.14 OPTIONAL SYSTEM OUTPUT CB NORM. OFF / NORM. ON – P/N 9100-1451-01 THRU -04

This option is a special feature for certain application which the system output power is only used upon the input power failure and continuously available until the battery voltage reaches to a shut down point. When the input power restores, the circuit disconnects the output power to critical load without delay or with adjustable 2-20 minutes delay.

| Part Number | Description |
|--------------|-------------------------------------|
| 9100-1451-01 | WITHOUT DELAY ADJUSTMENT 3-5 KVA |
| 9100-1451-02 | WITHOUT DELAY ADJUSTMENT 7.5-20 KVA |
| 9100-1451-03 | WITH DELAY ADJUSTMENT 3-5 KVA |
| 9100-1451-04 | WITH DELAY ADJUSTMENT 7.5-20 KVA |

6.15 OPTIONAL POWER FLOW MIMIC – P/N 9100-1493-02 (illustration 6-3)

6.15.1 Operation

Power Flow Mimic allows unit power status verification at-a-glance. It has 6 LED's indicating the following conditions: GREEN – Input OK, GREEN – Inverter On, YELLOW – On Battery, YELLOW – On Bypass, RED – Low Battery, RED – Summary Alarm. The LED's are located on the pictogram below for quick status assessment.

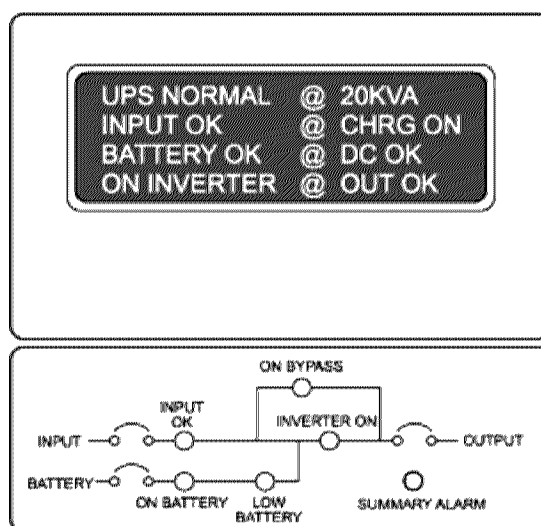


ILLUSTRATION 6-3: MIMIC PAD

6.15.2 Specification

Description: POWER FLOW MIMIC OPTION – 1 PHASE
Part Number: 9100-1493-02
Color: Blue with black lettering
Dimensions: 4.25" x 4"
Mounting: Self-adhesive Scotch pad
LED's: Water clear lens, 20 mA, View Angle 140. Nicom.ZU55W-05,
Connectors: Nicomatic 8 Pin, Black

Online Power

6.16 OPTIONAL GMS – GLOBAL MONITORING SYSTEM, LOCAL ON UPS

6.16.1 Local On UPS - EVENT LOG – P/N9100-1466-01

6.16.1.1 Operation

Control and Monitoring PCB acquires event data and displays up to 50 most recent Date and Time stamped events. The default setting is a scroll of monitoring and alarm screens. When the log is full, the first (oldest) events is erased from the register. System events are in Appendix B.

Key pad functions and resulting screens are presented below:

LOG – Press one time to activate the event log display. After approximately 5-seconds, the screen will show the event log. All stored events will be continuously scrolled on display. Press Log once again to return to the main menu.

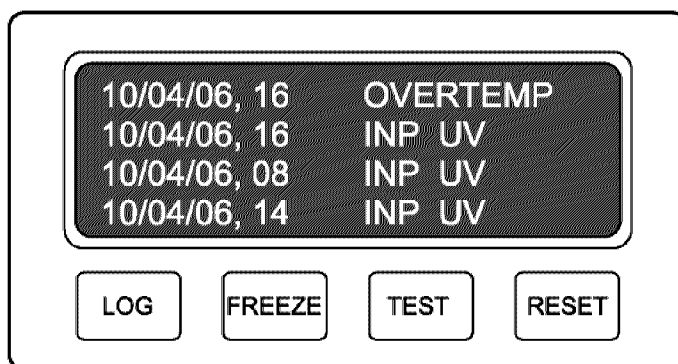


ILLUSTRATION 6-4: LOGGED EVENTS

FREEZE – Press one time. The display will freeze the next default monitoring and alarms screen. Press the Freeze key again to return the display to the initial menu with scrolling operation.

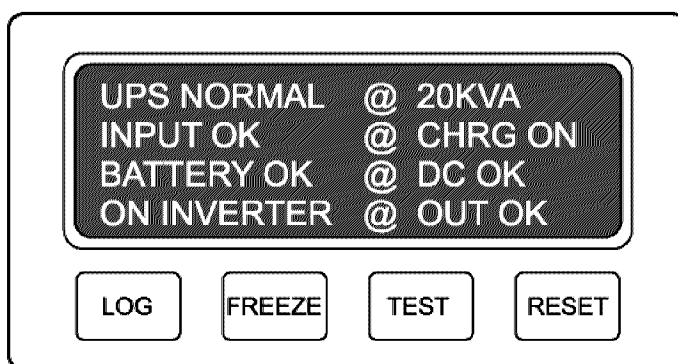


ILLUSTRATION 6-5: STATUS SCREEN

TEST – Press the key one time. System data appears on the screen after few seconds. Pressing the key once again returns the display to default screen.

Online Power

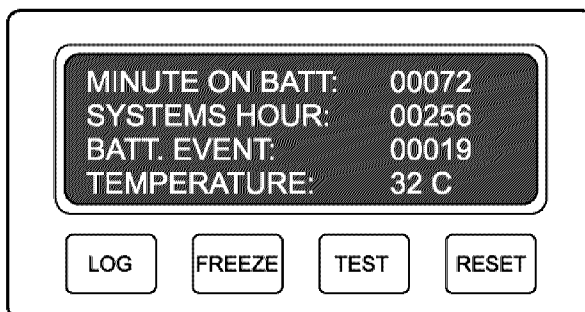


ILLUSTRATION 6-6: SYSTEM INFO

RESET – Pressing the "Reset" and "Test" keys together clears the screen and deletes the event log.

6.16.1.2 Specification

Description: Local On UPS - Event Log

Part Number: 9100-1466-02

Components:

Monitoring PCBA: P/N 1625-344-01

Power Supply: P/N 1625-339, 5, 12 VDC, 25W

Com Cable: P/N 7060-1187-01

Keypad Overlay: P/N 1250-064

6.16.2 Local On UPS - Aux CB's Trip Monitor – P/N 9100-1453-01

6.16.2.1 Operation

Trip signals coming from the breakers are displayed on the circuit breaker trip screen. The circuit breaker is a part of default monitoring and alarm display, that scrolls continuously when the unit is in operation. Below is an illustration of a typical circuit breaker trip screen.

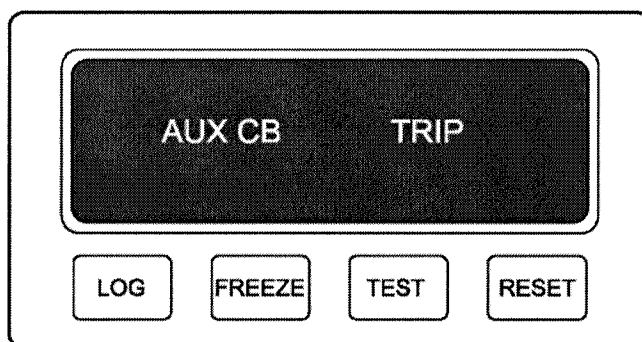


ILLUSTRATION 6-7: AUXILLIARY CB TRIP

6.16.2.2 Specification

Description: Local On UPS – Aux. CB'S Trip Monitor With Event Log

Part Number: 9100-1453-01

Components:

Event Log Option – P/N 9100-1466-02

Trip monitoring modules: ABB S2C-S/H 6R, DIN rail mount

Monitored CBs: only ABB MCB series

Online Power

6.16.3 Local On PC – Via RS 232 – P/N 9800-01 – 25 THRU 150 (25-150ft)

6.16.3.1 Description

This option requires a PC and LabView monitoring software. The software is provided on a disc that is easily installed on any Windows platform. An attached cable of a specified length plugs into a PC serial port and connector J6 on the Control PCB 1625-296.

LabView software must selected for COM port 1.

6.16.3.2 Operation

LabView software translates data protocol coming to COM port 1 from an active unit via the RS232/RS485 Interface and displays the parameters and active alarms on a PC monitor in the appropriate form. Below is a sample of a PC screen with measured parameters and actual unit status.

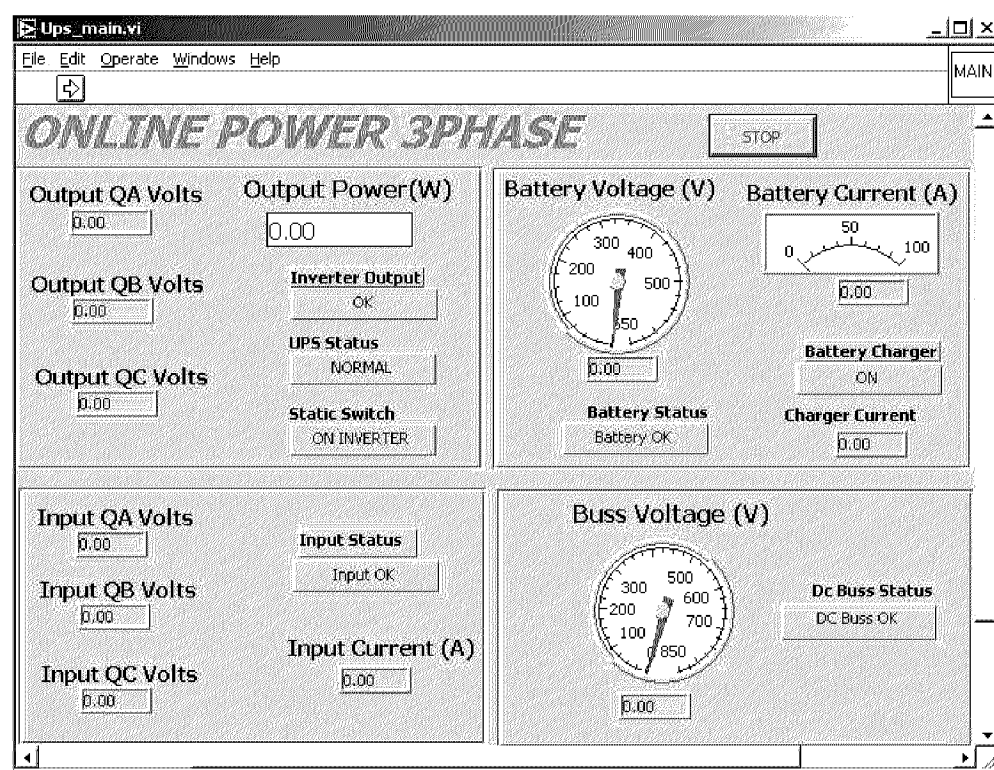


ILLUSTRATION 6-8: SAMPLE PC SCREEN

6.16.3.3 Specification

Description: Local On PC – Via RS 232

Part Number: 9800-03-25 thru 150

PC system requirements: 98 and higher Windows OS, serial port.

Viewing software: Lab View, included

RS232 cable: 25 thru 15-ft, as specified, included

6.16.4 Local On PC – Via RS 485 – P/N 9800-02-150 thru 1000 (150-1000 ft)

Online Power

Installation, Operation, Specification as above (except RS 485 cable)

6.16.5 Remote Dial Up: Data, Voice, Fax, Pager, PC, E-mail, Event Log, Stats = p/n 9100-1468-02

6.16.5.1 Description

Monitor 2000 requires a phone line for remote operation. It comes with an interface PCB, that provides monitor inputs with isolated signals from the unit. The option comes wired and fully functional. For local PC communication, you must connect your computer serial port to the 2000 RS232 data communication port.

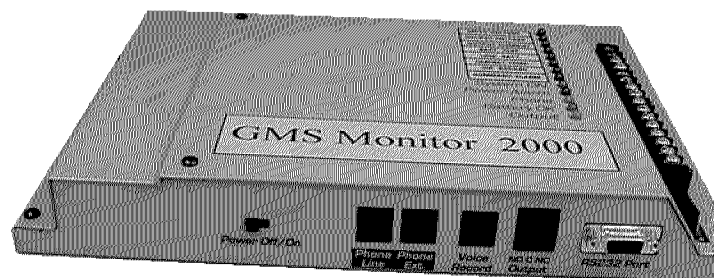


ILLUSTRATION 6-9: MONITOR 2000 FRONT VIEW

The Manager 2000 Windows setup program makes installation quick and easy. Picture below is an actual Manager 2000 screen.

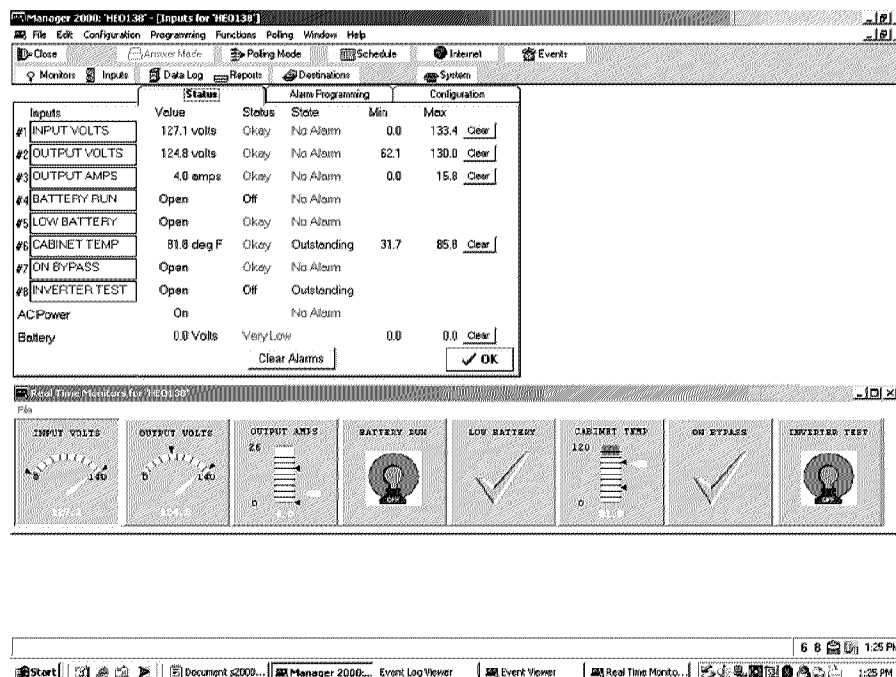


ILLUSTRATION 6-10: MANAGER 2000 SCREEN

Online Power

6.16.5.2 Operation

The dial up Monitor 2000 measures and monitors the following set of parameters and status contacts: Input Volts, Output Volts, Output Current, Battery Test, Low Battery, Cabinet Temperature, On Bypass, and Summary Alarm. It also checks and reports device supply power and back up battery condition. When an alarm occurs, the unit will dial out and send a message to all programmed destination, such as phone, fax mail, pager and PC. Message from will depend on type of the receiving device. Below is a sample of a remote PC screen showing an alarm situation.

6.16.5.3 Specification

Description: Remote Dial Up: Data, Voice, Fax, Pager, E-mail, Event Log, Stats.

Part Number: 9100-1468-02

Minimum system requirements 486 or better PC, 4 MB of free disk space, 4MB RAM, VGA graphics card, WIN 3.1, NT, 98 or better.

Power requirements: 120 VAC, 10 W with power surge protection.

6 (six) C-cell rechargeable NiCad batteries (not included)

Inputs: 8 universal, AC power and battery

Communication: phone line connected to RJ11 jack, pulse & tone dialing

Data retention: 2 years typical

Environmental: Operating temp. 32-122F, 0-90 RH, non-condensing

Enclosure: Aluminum, 12.1"W x 7.2"H x 1.6"D

Weight: 3 lbs.

6.16.6 WEB/SNMP – Web Pages, Status, Alarm, Event Log, E-mail 0- P/N 9100-1469-01

6.16.6.1 Description

Web/SNMP option card is a web enabled monitoring device for a UPS with Internet access. RJ45 jack on the front of the card marked "Network" is the connecting point for the Ethernet cable. The unique IP internet address is a pre-assigned and can be changed to fit customer network settings.

6.16.6.2 Operation

The Web/SNMP card can monitor the UPS on the network through a web browser or a Network Management System. The Alarm Viewer utility program provides monitoring of multiple units through a single console application. Entering IP address assigned to the Web card into the browser brings up the Log-In screen with password protecting the actual web site. The main, UPS Status screen has links to subsequent Web pages as depicted below.

Online Power

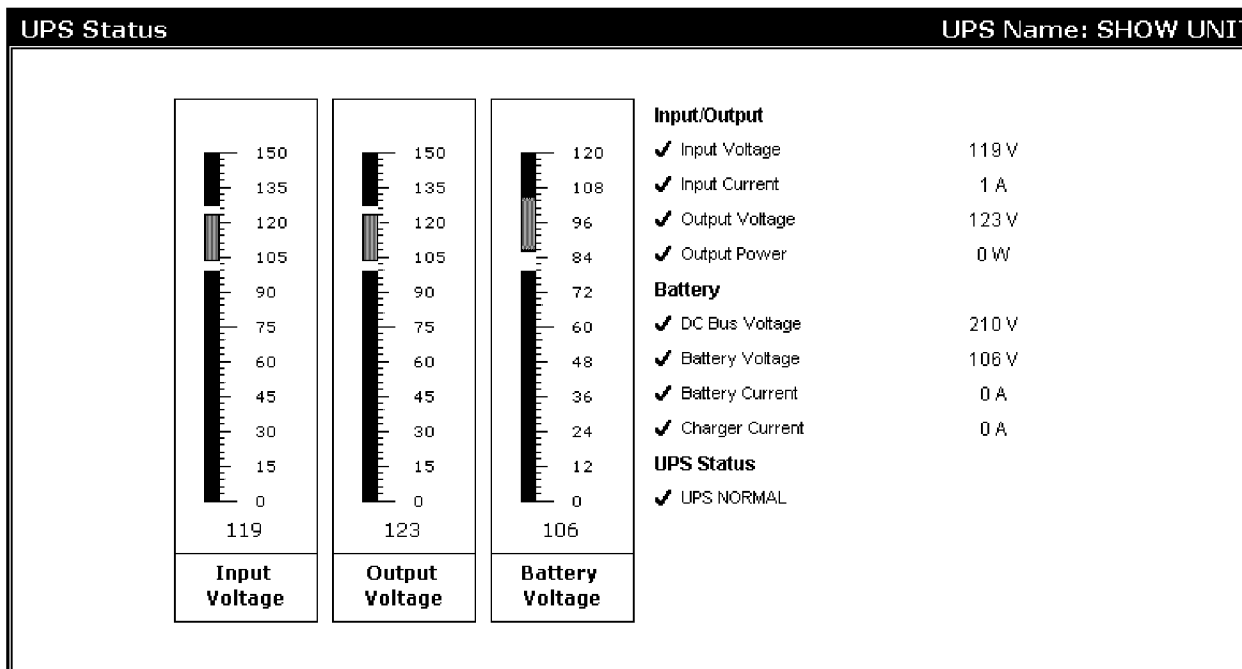


ILLUSTRATION 6-11: UPS MAIN STATUS SCREEN

The Web/SNMP card IP site has the following pages:

- **UPS Status:** displays overall status of the unit
- **Identification:** provides UPS identification data, serial #, Model, start up date, last battery installation date, and customer info.
- **Variables:** displays groups of input, output and status parameters and on line measurement values
- **Event Log:** displays up to 500 events with date/time stamp
- **Configuration:** page used for date/time and page identification
- **Nominal Values:** input, output and battery voltage selection
- **SNMP Setup:** set up page for NMS and trap receivers
- **E-Mail Setup:** set up page for E-mail server and mail recipients addresses

6.16.6.3 Specification

| | |
|----------------------|--|
| Description: | WEB/SNMP – Web Pages, Status, Alarm, EVENTS, E-mail |
| Part Number: | 9100-1469 |
| System requirements: | Internet access with direct or network IP Web browser – IE 5.0 or higher |
| Power requirements: | 12 VDC, 1A |
| Dimensions: | 3.0"W x 5.5"L x 1.0"H |
| Weight: | 0.45lbs. |

Online Power

6.17 OPTIONAL ECC – EMERGENCY CIRCUIT CONVERTER – P/N 9100-1501

6.17.1 Installation

Indoor use only. Simple and fast installation in ceiling or wall mounted standard single gang E-box. Installation must be performed by a qualified electrician per Installation, Operation and Maintenance Instructions, provided with the ECC.

6.17.2 Operation

When used with an inverter system, the ECC is designed to allow you the ability to turn off ALL of the lighting in a given area via the local switch, and still provide emergency lighting during a power failure. The device will provide single phase power from the emergency source to the designated emergency fixtures regardless of their current status (on or off), thereby insuring safe egress from the facility at all times. The automatic Diagnostic feature will confirm the emergency system is ready to provide back up power.

6.17.3 Specification

| | |
|------------------------|--|
| Description: | ECC – EMERGENCY CIRCUIT CONVERTER OPTION |
| Part Number: | 9100-1501-01 – 120 VAC 9100-1501-02 – 277 VAC |
| Rating: | 120 VAC – 20 A Ballast load, 1000 W Tungsten Lamp load, 20 A, 1 HP 277 VAC – 20 A Ballast load, 1800 W Tungsten Lamp load, 20 A, 1.5 HP |
| Operating Temperature: | 20 to 150 F |
| Flame rating: | UL 94V-O |
| Size: | 2.75"W x 4.75"H x 1.75"D (overall) Low profile – recessed portion is only 1.5" deep |
| Color: | White |
| Weight: | 8 oz. |

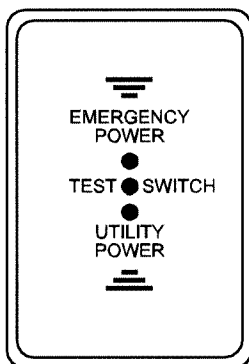


ILLUSTRATION 6-12: ECC EMERGENCY CIRCUIT CONVERTER

Online Power

6.18 OPTIONAL ECM – EMERGENCY CONTROL MODULE – P/N 9100-1502

6.18.1 INSTALLATION

Indoor use only> ECM is a universal mount unit. simple and fast installation inc ceiling or wall mounted standard single gang E-box, recommended box size 4". Installation must be performed by a qualified electrician per Installation, Operation and dMaintenance Instructions provided with the EMC.

6.18.2 Operation

The emergency power is provided from a central lighting inverter that is automatically switched over to 24 hour emergency power distribution panel. The room switch turns on and off both regular and emergency lights simultaneously. This is accomplished by having the room switch leg power activate the Emergency Control Module. Wire input#1 is connected internally to a sensing circuit. During a power interruption, this circuit causes contact X to drop into a N.C. position. Please review wiring schematics.

6.18.3 Specification

Description: ECM – EMERGENCY CONTROL MODULE
Part Number: 9100-1502-01 – 120 VAC
9100-1502-02 – 277 VAC
Rating: Maximum Ballast load 1500 W, 120 and 277 VAC
20 A N.C. UL contact rating
High Voltage surge protectors
Approvals: UL 924, NFPA 1104-2.4.1, OSHA
NEC 700 thru 700-26, 701-717, 702-709, 705-750
Operating Temperature: 210 to 150 F
Size: 2.75"W x 1.5"H x 1.25"D (overall)
Color: Black
Weight: 8 oz.

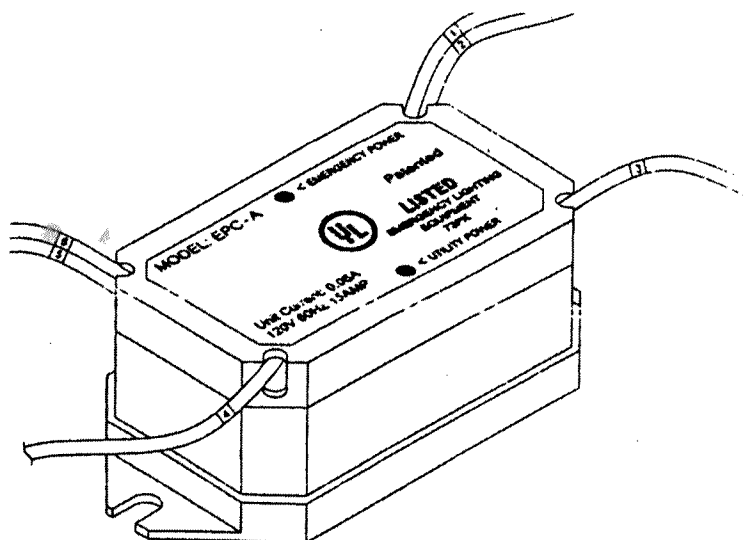


ILLUSTRATION 6-13: ECM EMERGENCY CONTROL MODULE

APPENDIX 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 / 14 |
|------------------------|---|-------------|-------------------------------|-------------|-------------|-------------|--------------|
| INPUT | | | | | | | |
| VOLTAGE (VAC) | Single Phase, 120/208/240/277 VAC | | Single Phase, 208/240/277 VAC | | | | |
| MAXIMUM CURRENT | 29/17/15/13 | 44/25/22/19 | 36/30/26 | 74/40/35 | 57/49/43 | 68/59/51 | 89/77/66 |
| TOLERANCE | +15% to -15% | | | | | | |
| FREQUENCY (Hz) | 60 +/- 3% | | | | | | |
| POWER FACTOR | 0.98 to 1.0 (Typical) | | | | | | |
| OVERCURRENT PROTECTION | Electronic / Circuit Breaker | | | | | | |
| NUMBER OF WIRES | 2 Wires plus Ground | | | | | | |
| POWER CONNECTION | 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 Phase, 120/208/240/277 VAC | | | | | | |
| VOLTAGE REGULATION | +/-3% No Load to Full Load; +/-3% High Line to Low Line | | | | | | |
| FREQUENCY (Hz) | 60 Hz +/-0.25 Hz (When on Inverter) | | | | | | |
| WAVESHAPE | Sine Wave | | | | | | |
| HARMONIC DISTORTION | <5% THD; <3% Single Harmonic | | | | | | |
| CREST FACTOR | Up to 3 to 1 | | | | | | |
| POWER FACTOR | 0.65 Lagging or Leading to Unity | | | | | | |
| STEADY-STATE CURRENT | 18/10/9/8 | 29/17/15/13 | 44/25/22/19 | 58/34/29/25 | 73/42/36/32 | 88/50/44/38 | 117/67/58/51 |
| OVERLOAD | 125 % for One (1) minutes, surge 150 % | | | | | | |
| PROTECTION | Electronic / Circuit Breaker | | | | | | |
| NOISE REJECTION | -120 kB Common Mode; -60 kB Normal Mode | | | | | | |
| NUMBER OF WIRES | 2 Wires plus Ground | | | | | | |
| POWER CONNECTION | Hard Wired (Terminal Block) | | | | | | |

Online Power

| 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 | | | | | | | |
| BATTERY RUN TIME | 90 Minutes Minimum | | | | | | |
| BATTERY TYPE | Sealed, Maintenance-Free, AGM, VRLA type | | | | | | |
| NOMINAL DC VOLTAGE | 96 VDC | 120 VDC | 120 VDC | 192 VDC | 192 VDC | 240 VDC | |
| OVERCURRENT PROTECTION | Circuit Breaker | | | | | | |
| PACKAGING | Batteries Housed in Same Enclosure and/or additional battery cabinet (See Table 2-1) | | | | | | |
| MONITORING AND COMMUNICATIONS | | | | | | | |
| LCD SCREEN | Input Voltage; Battery Charger; UPS Output; On Battery; Low Battery; Summary Alarm | | | | | | |
| INDICATORS | LCD 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 | 125 Volts (AC or DC) Maximum; 1.25 Amperes Maximum; 30 Watts / 50 VA Maximum | | | | | | |
| INTERFACE CONNECTION | Hard Wired (Terminal Block) | | | | | | |
| ENVIRONMENTAL | | | | | | | |
| USRGE WITHSTANDABILITY | ANSI C62.41-1980 Categories A & B | | | | | | |
| OPERATING TEMPERATURE | Meets NEMA Requirements | | | | | | |
| OPERATING RELATIVE HUMIDITY | 0 to 95% Non-Condensing | | | | | | |
| ALTITUDE | Up to 6,000 Feet (1,829 Meters) with No De-Rating | | | | | | |
| COOLING | Air Cooled-Forced Fan | | | | | | |
| PHYSICAL | | | | | | | |
| SIZE HxWxD in. (cm) | 70 x 39 x 20 (177.8 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 Steel Enclosure with 3 Point Double Locking Front Door; and Full-Length Door Hinge. | | | | | | |
| ENCLOSURE | Designed for Inside Installations | | | | | | |
| COLOR | Natural finish | | | | | | |
| ACCESSIBILITY | Front - All Servicing is Through the Front; No Side or Rear Access is Required. | | | | | | |
| CABLE ENTRY | Bottom or sides | | | | | | |
| MOUNTING | Four (4) Holes Provided to Anchor Enclosure to Pedestal (Supplied by Others) | | | | | | |

Online Power

SPECIFICATIONS FOR KW, 1.0PF UNITS

| POWER RATING (KW) | 3 / 3 | 5 / 5 | 7.5 / 7.5 | 10 / 10 | 12.5 / 12.5 | 15 / 15 |
|--|---|-------------|-------------------------------|-------------|--------------|--------------|
| INPUT | | | | | | |
| VOLTAGE(VAC) | Single Phase, 120/208/240/277 VAC | | Single Phase, 208/240/277 VAC | | | |
| 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% | | | | | |
| POWER FACTOR | 0.98 to 1.0 (Typical) | | | | | |
| OVERCURRENT PROTECTION | Electronic / Circuit Breaker | | | | | |
| NUMBER OF WIRES | 2 Wires plus Ground | | | | | |
| POWER CONNECTION | Hard Wired (Terminal Block) | | | | | |
| OUTPUT | | | | | | |
| RATING (KVA/KW) | 3 / 3 | 5 / 5 | 7.5 / 7.5 | 10 / 10 | 12.5 / 12.5 | 15 / 15 |
| VOLTAGE(VAC) | Single Phase, 120/208/240/277 VAC | | | | | |
| VOLTAGE REGULATION | +/-3% No Load to Full Load; +/-3% High Line to Low Line | | | | | |
| FREQUENCY (Hz) | 60 Hz +/-0.25 Hz (When on Inverter) | | | | | |
| WAVESHAPE | Sine Wave | | | | | |
| HARMONIC DISTORTION | <5% THD; <3% Single Harmonic | | | | | |
| 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) minutes, surge 150 % | | | | | |
| PROTECTION | Electronic / Circuit Breaker | | | | | |
| NOISE REJECTION | -120 kB Common Mode; -60 kB Normal Mode | | | | | |
| NUMBER OF WIRES | 2 Wires plus Ground | | | | | |
| POWER CONNECTION | Hard Wired (Terminal Block) | | | | | |

Online Power

| POWER RATING (KW) | 3 / 3 | 5 / 5 | 7.5 / 7.5 | 10 / 10 | 12.5 / 12.5 | 15 / 15 |
|--------------------------------|--|------------|------------|-------------|-------------|-------------|
| BATTERY | | | | | | |
| BATTERY RUN TIME | 90 Minutes Minimum | | | | | |
| BATTERY TYPE | Sealed, Maintenance-Free, AGM, VRLA type | | | | | |
| NOMINAL DC VOLTAGE | 96 VDC | 120 VDC | 120 VDC | 192 VDC | 192 VDC | 240 VDC |
| OVERCURRENT PROTECTION | Circuit Breaker | | | | | |
| PACKAGING | Batteries Housed in Same Enclosure and/or additional battery cabinet (See Table 2-2) | | | | | |
| MONITORING AND COMMUNICATIONS | | | | | | |
| LCD SCREEN | Input Voltage; Battery Charger; UPS Output; On Battery; Low Battery; Summary Alarm | | | | | |
| INDICATORS | LCD 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 | 125 Volts (AC or DC) Maximum; 1.25 Amperes Maximum; 30 Watts / 50 VA Maximum | | | | | |
| INTERFACE CONNECTION | Hard Wired (Terminal Block) | | | | | |
| ENVIRONMENTAL | | | | | | |
| USRGE WITHSTANDABILITY | ANSI C62.41-1980 Categories A & B | | | | | |
| OPERATING TEMPERATURE | Meets NEMA Requirements | | | | | |
| OPERATING RELATIVE HUMIDITY | 0 to 95% Non-Condensing | | | | | |
| ALTITUDE | Up to 6,000 Feet (1,829 Meters) with No De-Rating | | | | | |
| COOLING | Air Cooled-Forced Fan | | | | | |
| PHYSICAL | | | | | | |
| SIZE HxWxD in. (cm) | 70 x 39 x 20 (177.8 x 99.1 x 50.8) | | | | | |
| WEIGHT lbs (kg) with batteries | 725 (330) | 1650 (750) | 1700 (773) | 2200 (1000) | 2550 (1159) | 3150 (1432) |
| CONSTRUCTION | Painted Steel Enclosure with 3 Point Double Locking Front Door; and Full-Length Door Hinge. | | | | | |
| ENCLOSURE | Designed for Inside Installations | | | | | |
| COLOR | Natural finish | | | | | |
| ACCESSIBILITY | Front - All Servicing is Through the Front; No Side or Rear Access is Required. | | | | | |
| CABLE ENTRY | Bottom or sides | | | | | |
| MOUNTING | Four (4) Holes Provided to Anchor Enclosure to Pedestal (Supplied by Others) | | | | | |

Online Power

APPENDIX B – OPTIONAL MAIN INPUT & MAIN OUTPUT BREAKERS FOR VARIOUS MODELS.

(*All values are typical as reference only)

| KVA/ KW | TABLE B-1: Output Breaker (Standard KAIC) | | | |
|------------|--|--|--|---|
| | 120 Vac | 208 Vac | 240 Vac | 277 Vac |
| 3 | 30 Amps, 120 VAC, 1 Pole, 14 KAIC CPP P/N: 2025-782 | 20 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-788 | 15 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-787 | 15 Amps, 277 VAC, 2 Pole, 14 KAIC CPP P/N: 2025-761 |
| 5 | 50 Amps, 120 VAC, 1 Pole, 14 KAIC CPP P/N: 2025-784 | 30 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-790 | 25 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-789 | 25 Amps, 277 VAC, 2 Pole, 14 KAIC CPP P/N: 2025-763 |
| 7.5 | 80 Amps, 120 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-804 | 50 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-792 | 40 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-791 | 35 Amps, 277 VAC, 2 Pole, 14 KAIC CPP P/N: 2025-765 |
| 10 | 100 Amps, 120 VAC, 1 Pole, 14 KAIC CPP P/N: 2025-786 | 60 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-793 | 50 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-792 | 50 Amps, 277 VAC, 2 Pole, 14 KAIC CPP P/N: 2025-767 |
| 12.5 | 125 Amps, 120 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-759 | 80 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-795 | 70 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-794 | 60 Amps, 277 VAC, 2 Pole, 14 KAIC CPP P/N: 2025-768 |
| 15 | 150 Amps, 120 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-760 | 90 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-796 | 80 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-795 | 70 Amps, 277 VAC, 2 Pole, 14 KAIC CPP P/N: 2025-769 |
| 20 | 200 Amps, 120 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-842 | 125 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-759 | 125 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-759 | 100 Amps, 277 VAC, 2 Pole, 14 KAIC CPP P/N: 2025-772 |
| KVA/ KW | TABLE B-2: Output Breaker (High KAIC) | | | |
| | 120 Vac | 208 Vac | 240 Vac | 277 Vac |
| 3 | 30 Amps, 120 VAC, 1 Pole, 42 KAIC CPP P/N: 2025-798 | 20 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-762 | 15 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-761 | 15 Amps, 277 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-773 |
| 5 | 50 Amps, 120 VAC, 1 Pole, 42 KAIC CPP P/N: 2025-800 | 30 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-764 | 25 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-763 | 25 Amps, 277 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-775 |
| 7.5 | 80 Amps, 120 VAC, 2 Pole, 42 KAIC CPP P/N: 2025-802 | 50 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-767 | 40 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-766 | 35 Amps, 277 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-776 |
| 10 | 100 Amps, 120 VAC, 1 Pole, 42 KAIC CPP P/N: 2025-803 | 60 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-768 | 50 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-767 | 50 Amps, 277 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-777 |
| 12.5 | 125 Amps, 120 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-759 | 80 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-770 | 70 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-769 | 60 Amps, 277 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-778 |
| 15 | 150 Amps, 120 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-760 | 90 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-771 | 80 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-770 | 70 Amps, 277 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-779 |
| 20 | 200 Amps, 120 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-842 | 125 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-759 | 125 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-759 | 100 Amps, 277 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-1007 |

Online Power

| OUT PUT KVA | TABLE B-3: Input Breaker Ampacity (Standard KAIC) | | | |
|-------------------|---|--|--|---|
| | 120 Vac | 208 Vac | 240 Vac | 277 Vac |
| 3 | 40 Amps, 120 VAC, 1 Pole, 14 KAIC CPP P/N: 2025-783 | 20 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-788 | 20 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-788 | 20 Amps, 277 VAC, 2 Pole, 14 KAIC CPP P/N: 2025-762 |
| 5 | 60 Amps, 120 VAC, 1 Pole, 14 KAIC CPP P/N: 2025-785 | 30 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-790 | 30 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-790 | 25 Amps, 277 VAC, 2 Pole, 14 KAIC CPP P/N: 2025-763 |
| 7.5 | N/A | 50 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-792 | 40 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-791 | 35 Amps, 277 VAC, 2 Pole, 14 KAIC CPP P/N: 2025-765 |
| 10 | N/A | 80 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-795 | 50 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-792 | 50 Amps, 277 VAC, 2 Pole, 14 KAIC CPP P/N: 2025-767 |
| 12.5 | N/A | 70 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-794 | 60 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-793 | 50 Amps, 277 VAC, 2 Pole, 14 KAIC CPP P/N: 2025-767 |
| 15 | N/A | 90 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-796 | 80 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-795 | 70 Amps, 277 VAC, 2 Pole, 14 KAIC CPP P/N: 2025-769 |
| 20 | N/A | 125 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-759 | 100 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-797 | 90 Amps, 277 VAC, 2 Pole, 14 KAIC CPP P/N: 2025-771 |

| OUT PUT KVA | TABLE B-4: External Input Breaker Ampacity (High KAIC) | | | |
|-------------------|---|--|--|---|
| | 120 Vac | 208 Vac | 240 Vac | 277 Vac |
| 3 | 40 Amps, 120 VAC, 1 Pole, 42 KAIC CPP P/N: 2025-799 | 20 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-762 | 20 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-762 | 20 Amps, 277 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-774 |
| 5 | 60 Amps, 120 VAC, 1 Pole, 42 KAIC CPP P/N: 2025-801 | 30 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-764 | 30 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-764 | 25 Amps, 277 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-775 |
| 7.5 | NA | 50 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-767 | 40 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-766 | 35 Amps, 277 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-776 |
| 10 | NA | 80 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-770 | 50 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-767 | 50 Amps, 277 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-777 |
| 12.5 | N/A | 70 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-769 | 60 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-768 | 50 Amps, 277 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-777 |
| 15 | N/A | 90 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-771 | 80 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-770 | 70 Amps, 277 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-779 |
| 20 | N/A | 125 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-759 | 125 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-759 | 90 Amps, 277 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-781 |

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| OUT PUT KW | TABLE B-5:Input Breaker Ampacity (Standard KAIC) | | | |
|------------------|---|--|--|---|
| | 120 Vac | 208 Vac | 240 Vac | 277 Vac |
| 3 | 50 Amps, 120 VAC, 1 Pole, 14 KAIC CPP P/N: 2025-784 | 30 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-790 | 25 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-789 | 25Amps, 277 VAC, 2 Pole, 14 KAIC CPP P/N: 2025-763 |
| 5 | 80 Amps, 120 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-804 | 50 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-792 | 40 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-791 | 35 Amps, 277 VAC, 2 Pole, 14 KAIC CPP P/N: 2025-765 |
| 7.5 | N/A | 60 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-793 | 50 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-792 | 50 Amps, 277 VAC, 2 Pole, 14 KAIC CPP P/N: 2025-767 |
| 10 | N/A | 90 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-796 | 70 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-794 | 60 Amps, 277 VAC, 2 Pole, 14 KAIC CPP P/N: 2025-768 |
| 12.5 | N/A | 100 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-797 | 90 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-796 | 80 Amps, 277 VAC, 2 Pole, 14 KAIC CPP P/N: 2025-770 |
| 15 | N/A | 125 Amps, 240 VAC, 2 Pole, 10 KAIC CPP P/N: 2025-759 | 100 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-797 | 90 Amps, 277 VAC, 2 Pole, 14 KAIC CPP P/N: 2025-771 |

| OUT PUT KW | TABLE B-6:Input Breaker Ampacity (High KAIC) | | | |
|------------------|---|--|--|---|
| | 120 Vac | 208 Vac | 240 Vac | 277 Vac |
| 3 | 50 Amps, 120 VAC, 1 Pole, 42 KAIC CPP P/N: 2025-800 | 30 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-764 | 25 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-763 | 25 Amps, 277 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-775 |
| 5 | 80 Amps, 120 VAC, 2 Pole, 42 KAIC CPP P/N: 2025-802 | 50 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-767 | 40 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-766 | 35 Amps, 277 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-776 |
| 7.5 | NA | 60 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-768 | 50 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-767 | 50 Amps, 277 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-777 |
| 10 | NA | 90 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-771 | 70 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-769 | 60 Amps, 277 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-778 |
| 12.5 | N/A | 100 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-772 | 90 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-771 | 80 Amps, 277 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-780 |
| 15 | N/A | 125 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-759 | 125 Amps, 240 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-759 | 90 Amps, 277 VAC, 2 Pole, 65 KAIC CPP P/N: 2025-781 |

APPENDIX C - BATTERY CONNECTIONS



For the actual battery connection diagram for your system, refer to the diagram on each unit. The drawings below are shown for electrical connection only and do not necessarily match the actual battery layout in your unit. The arrangement may be different from drawings.



Danger!

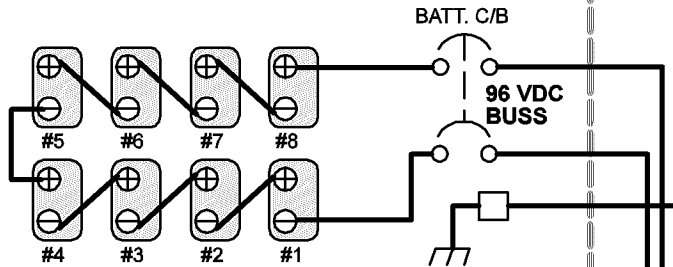
The use of a physically damaged battery can cause a catastrophic system failure and can even result in a fire or explosion that could endanger life and property. Before accepting a battery shipment from the carrier, please read and follow these instructions:

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 object, 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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96 Volt Nominal

Typical 1 Strings of 8 Battery system.



Maximum 4 Strings of 8 Battery system are available in maximum 2 Cabinets depend upon Battery Run Time requirement. Consult Factory for detail.

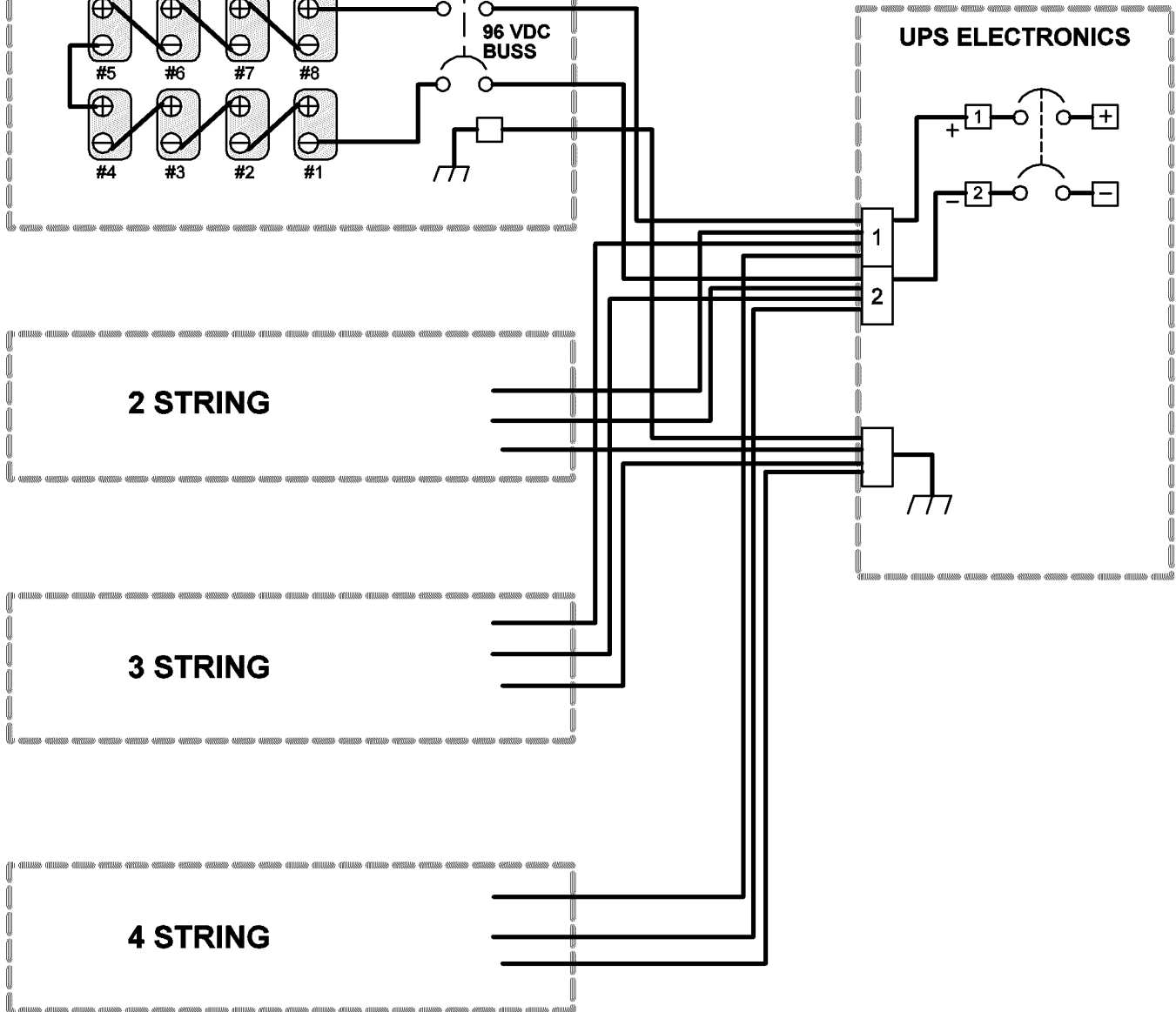
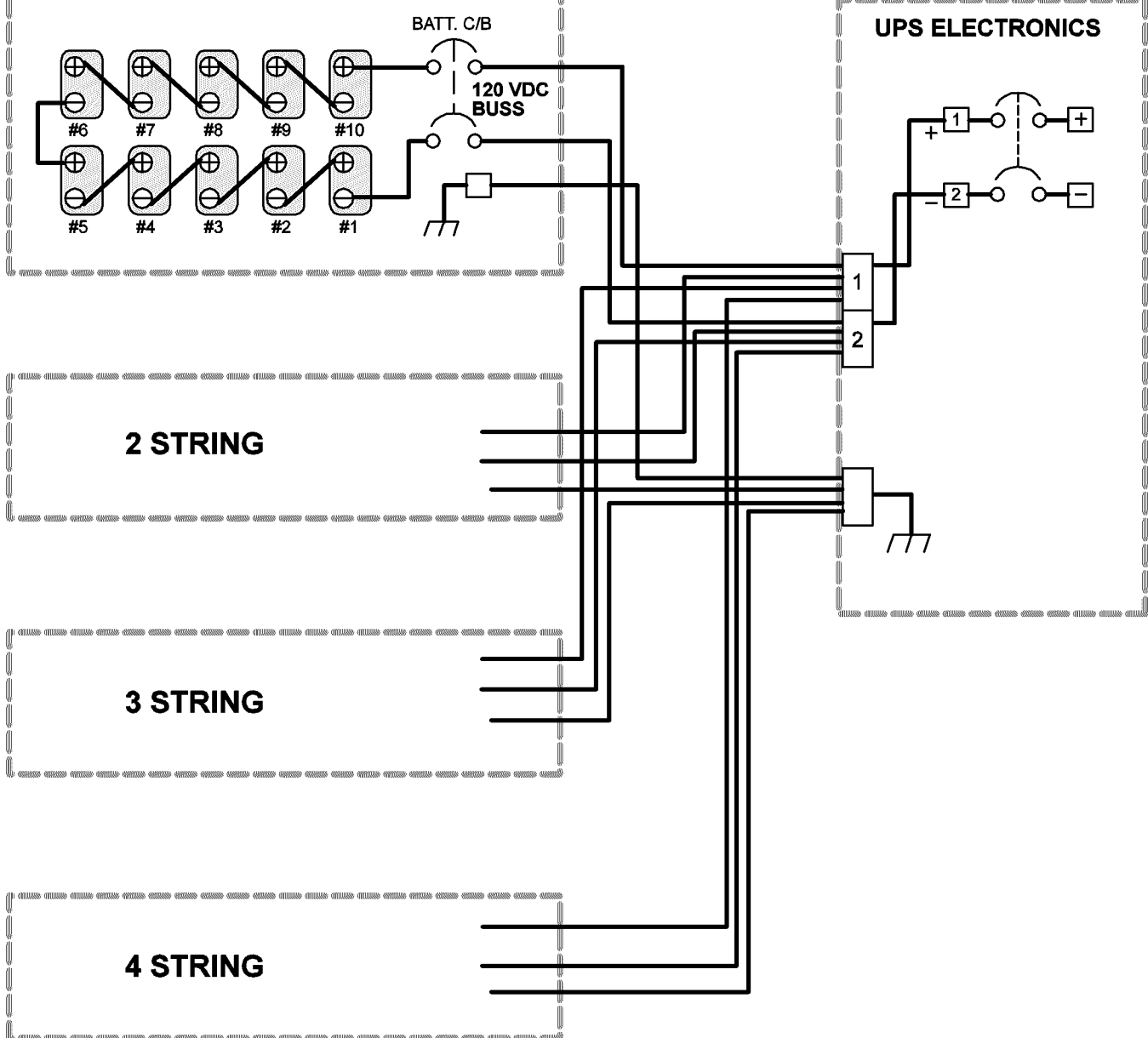


ILLUSTRATION B-1

120 Volt Nominal

Typical 1 Strings of 10 Battery system.



Maximum 4 Strings of 10 Battery system
Depend upon Battery Run Time requirement,
batteries can be in UPS cabinet or separate
maximum of 2 Cabinets.
Consult Factory for detail.

ILLUSTRATION B-2

192 Volt Nominal

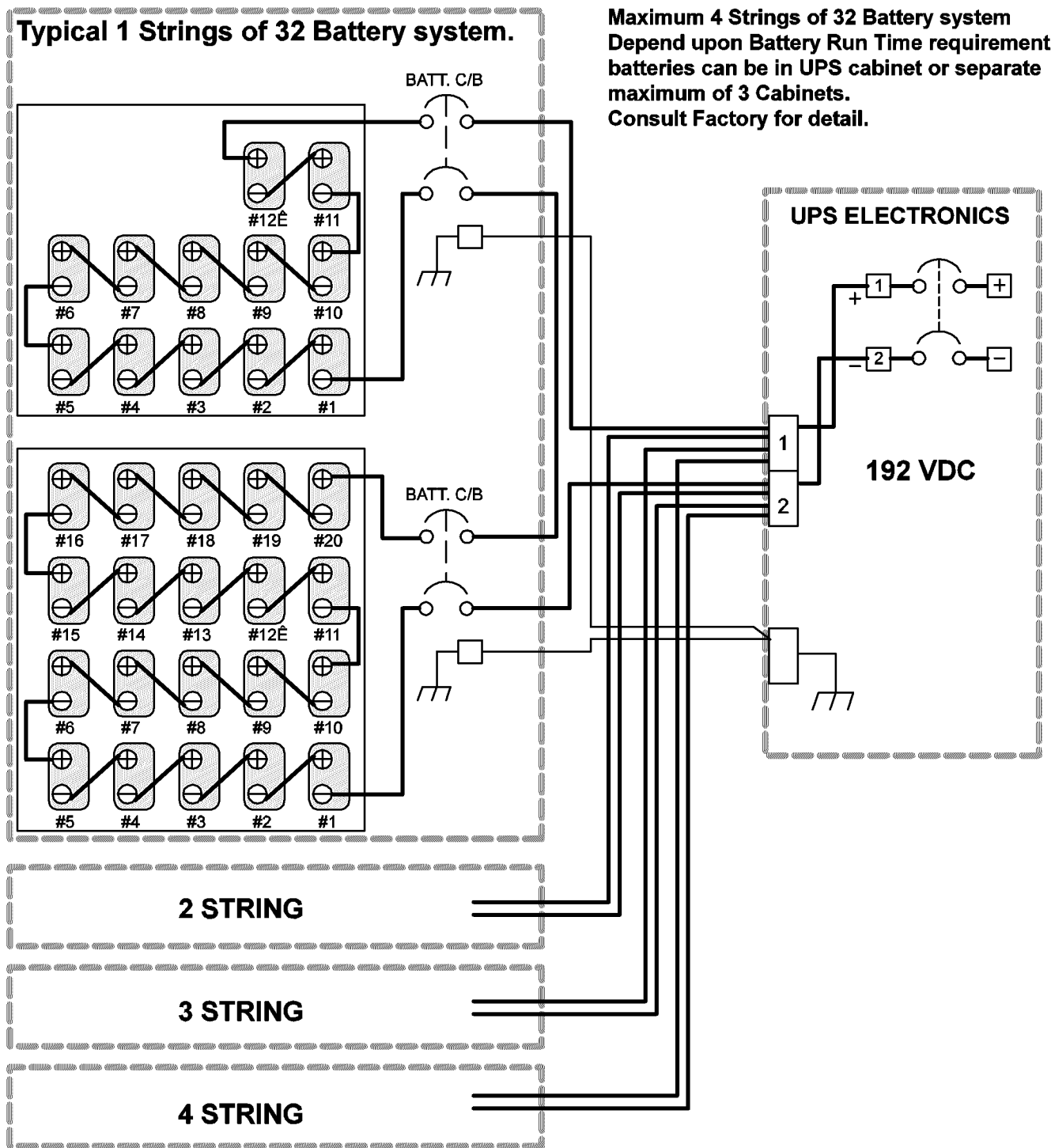


ILLUSTRATION B-3

Online Power

240 Volt Nominal

Typical 1 Strings of 40 Battery system.

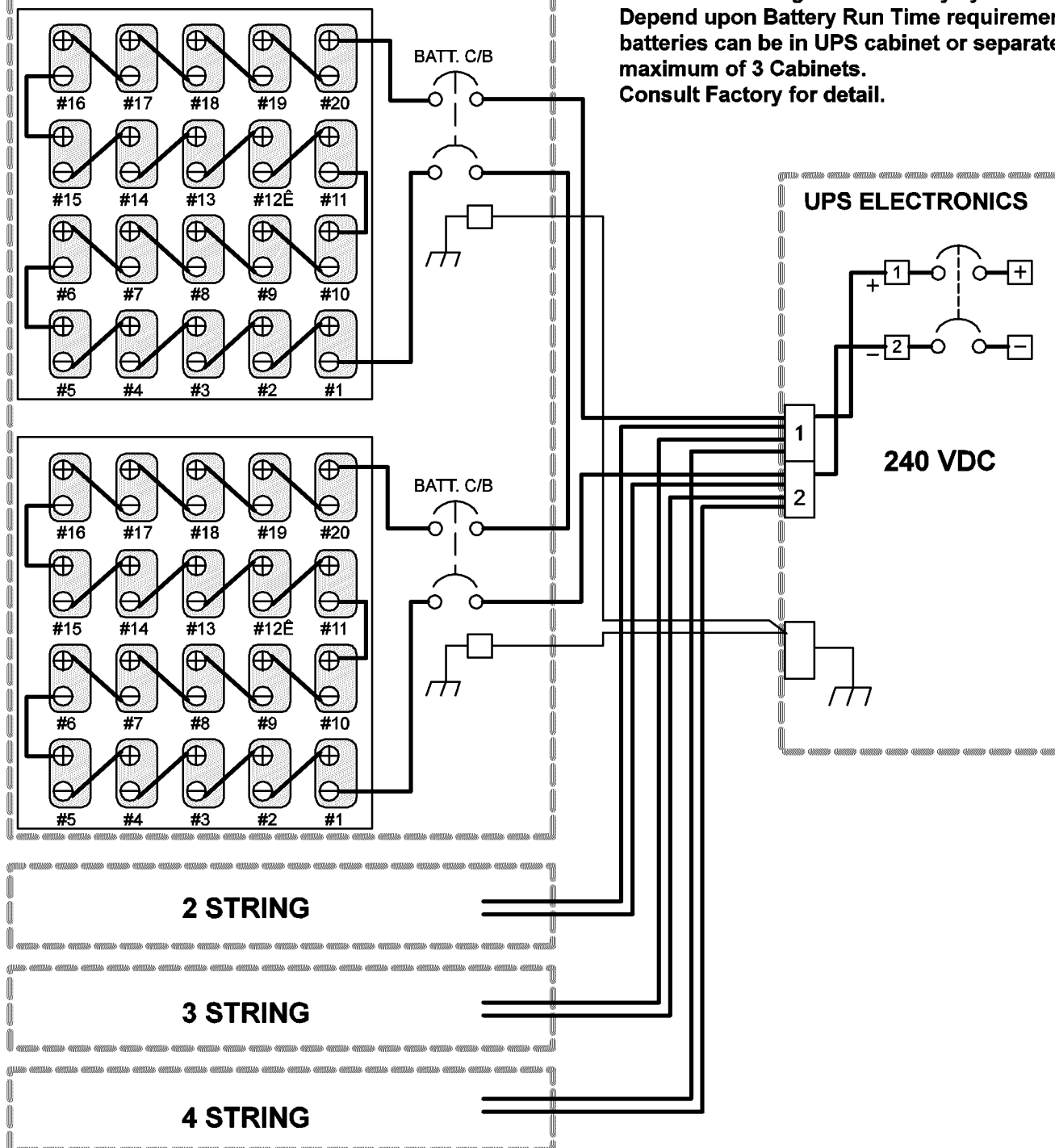


ILLUSTRATION B-4

Online Power

APPENDIX D - LCD DISPLAY MENU AND TROUBLESHOOTING GUIDE

Two screens (A, B) are updated continuously for units without optional output transformer.

Three screens (A, B, C) are updated continuously for units with optional output transformer.

Start-up Screen

When input power is applied for the unit, LCD panel lights up and displays

**Online Power
UPS**

If LCD display panel is not lit, the unit has problem. Contact the factory service at 1-800-PWR-SRVC (800-797-7782)

Screen A: The first default screen appears as below

**UPS NORMAL @ XX KVA
INPUT OK @ CHRG ON
BATTERY OK @ DC OK
ON INVERTER @ OUT OK**

The display may say:

Line 1: UPS NORMAL @ 15 KVA

5 KVA indicates the KVA rating, STAND BY or NORMAL indicating normal operating modes. STAND BY ALARM FAILURE indicates UPS alarm condition and FAILURE indicates UPS failed or had persistent alarm condition. This will require system reset by cycling power. Shut if off and wait till LCD is dark. Restart the unit.

Line 2: INPUT OK @ CHG ON

INPUT OK: Input within an acceptable range.

INPUT BAD: Input out of range.

CHRG ON: Charger on.

CHRG OFF: The charger is off. This will happen if the input capacitor is open or the system is in a failure mode. - UPS ALARM

Line 3: BATTERY OK @ DC OK

BATTERY OK: Battery voltage within an acceptable range.

BATTERY OV: Battery voltage high. This is normal when the battery is charging.

BATTERY LOW: Battery voltage low. Recharge battery.

DC OK: DC bus voltage within an acceptable range.

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DC OV: DC bus voltage too high. - UPS ALARM

DC UV: DC bus voltage too low. - UPS ALARM

NOTE: The typical DC buss voltage should be higher than the battery voltage.

SCREEN B: The second default screen appears as below

| |
|---------------------------|
| OUTPUT: _____ V @ _____ W |
| INPUT: _____ V @ _____ A |
| DC BUS: _____ V @ NA A |
| BATT: _____ V @ + _____ W |

Line 1: Indicates output voltage and power in watts, when an output transformer is not used. It indicates primary voltage of the output transformer (T1) (208 VAC, typically) when T1 is used.

Line 2: Indicates input volts and Amps.

Line 3: Indicates internal DC bus condition for factory use.

Line 4: Indicates battery voltage. The (+) current in Amps indicates charging Amps, while (-) indicates discharging Amps.

SCREEN C: When an optional output transformer is installed, the multiple output voltages are displayed as follows:

| |
|-----------------|
| OUTPUT: 120 V @ |
| OUTPUT: 208 V @ |
| OUTPUT: 277 V @ |
| OUTPUT: 480 V @ |

Line 1: Indicates L-N output voltage 1

Line 2: Indicates L-N output voltage 2

Line 3: Indicates L-N output voltage 3

Line 4: Indicates L-N output voltage 4

APPENDIX E – DRAWINGS FOR SINGLE PHASE UPS

(All drawings are downloadable from Website: www.onlinepower.com)

1. UPS & Battery Cabinet Installations – 1 Phase UPS with 90 Min. Battery Backup 3, 5, 7.5, 10, 12.5, 15, and 20 kVA / 2.1, 3, 3.5, 5, 5.25, 7, 7.5, 8, 8.5, 10, 10.5, 14, 15, kW- 6001-033-01
2. Battery Cabinet Installations – 1 Phase UPS with 90 Min. Battery Backup 3, 5, 7.5, 10, 12.5, 15, and 20 kVA / 2.1, 3, 3.5, 5, 5.25, 7, 7.5, 8, 8.5, 10, 10.5, 14, 15, kW- 6001-033-02
3. 1 Phase UPS Functional Block Diagram – Single Line Diagram Dwg #: 6001-033-03
4. UPS Remote Status Panel – Dwg. #: 9100-1020-xx .
5. UPS & Battery Cabinet Seismic Certification Drawing – Dwg. 04-0959A
6. Single Phase UPS with Load Center – Dwg. #: 6001-032-19
7. Single Phase External Wrap Around By-Pass Panel: 3 kVA to 20 kVA Dwg.6001-032-31 & 6001-032-31S

TABLES

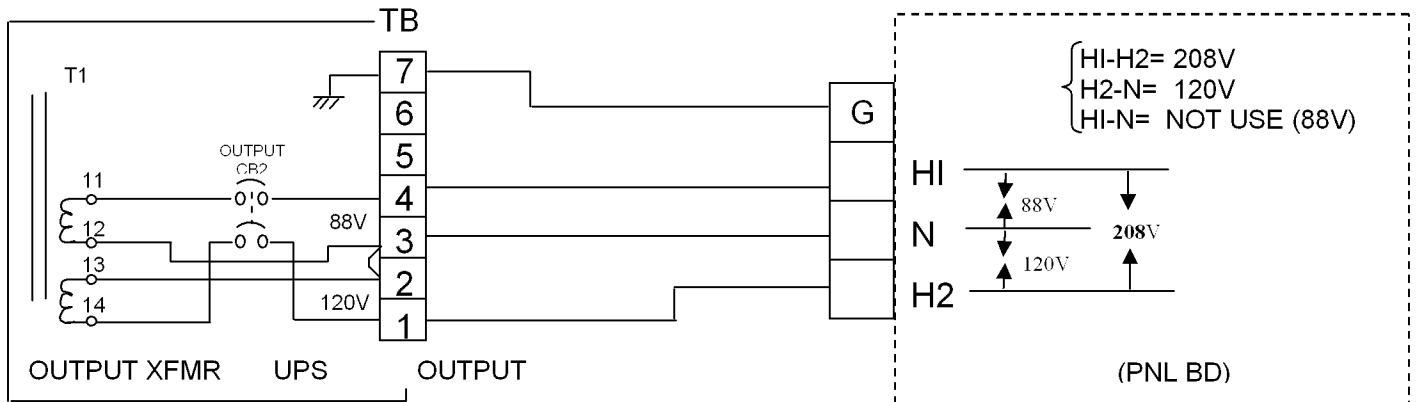
1. Single Phase UPS Chart for recommended output/input protective device rating. BTU/HR and Floor Loading Table XXX-1 and XXX-2
2. Allowable Ampacities of Insulated Conductors Rated 0-2000 V, 60 to 90 deg. C, (140 – 194 deg. F). Table 310-16 of National Electrical Code.
3. Connection Type / Wire Size Range
4. Torque Specifications (Unless Otherwise Labeled)
5. UPS Installation Data
6. Specifications

OnLine Power

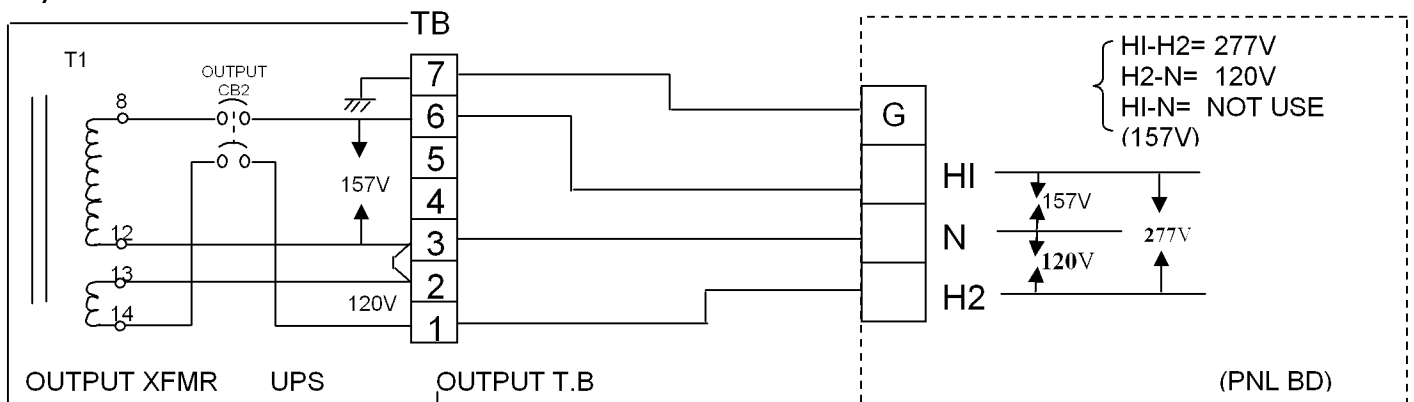
APPENDIX F

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

A)



B)



C)

