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CRUCIAL POWER PRODUCTS

User's Manual

Super Charged Econosine Central Lighting Inverter

Doc #. 6002-1804
Revision A

Installation and Operating Documentation

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Crucial Power Products

REVISION HISTORY

REV	DATE	PRIMARY REASON FOR CHANGE
A	June. 21, 2007	Production Release.

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Crucial Power Products

Congratulations on selecting one of the fine products from Crucial Power, the leader in power protection technology. Our wide product offering includes UPS (**U**ninterruptible **P**ower **S**ystems), power conditioners, automatic voltage regulators and specialty transformers (e.g., computer-grade, medical-grade). Since our founding in 1972, Crucial Power has shipped many of these fine products to discerning customers around the world for use on sensitive equipment and 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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If you require assistance, please call our 24-hour toll free hot line **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: _____

SECTION 1 - SAFETY

Following safety precautions is important when operating or servicing electrical equipment. The following symbols 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 **Caution** symbol indicate that there is a high probability of equipment failure, damage, or destruction if 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 **P**ower **S**ystem**) 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.

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 – INTRODUCTION

2.1 INTRODUCTION

The SC Econosine Emergency Power Systems are manufactured to provide critical power for lighting during a power outage. The SC Econosine System meet 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 which will allow safe and orderly evacuation from the facility.

When input power to the SC Econosine System 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 SC Econosine System automatically resumes normal operation, and immediately begins to recharge the batteries.

The SC Econosine System has an internal bypass circuit, which maintains the power to the load in case of internal UPS failure.

The SC Econosine System provides comprehensive monitoring capabilities. In addition to the LCD display, it provides five dry relay contacts for remote monitoring capabilities. The SC Econosine System contains, as standard feature, an AS 400 interface. It also have RS232 protocol interface and RS485 data transmission ports and many other communication options.

The SC Econosine is an on-line single phase PWM inverter available in output rating of 2.1 KW and 3 KW. The SC Econosine is listed for compliance to UL1778, UL924, UL924A and CSA107.1 standards. The SC Econosine 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 SC Econosine. See Appendix A for a complete listing of the SC Econosine specifications.

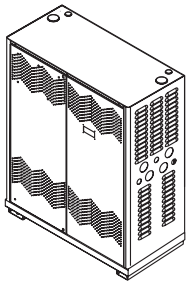


ILLUSTRATION 2-1: SC ECONOSINE

2.2 BENEFITS

The SC Econosine System 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.

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

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

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

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

2.3 PRODUCT FEATURES

The following describes the major blocks within the SC Econosine System. Please refer to Illustration 2-4 Functional Block Diagram for additional information.

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

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

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 assembly.

2.3.3 Power Board with IGBT's

The Power board is bolted onto the IGBT blocks that are mounted on a heat sink. The complete heat sink assembly with IGBT's and power board is replaceable as one part. This assembly processes 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 smooth AC sine wave. In case of a catastrophic failure, if required, the complete heat sink assembly is easily replaceable using only a screwdriver. This board also has the housekeeping power supplies and drivers for IGBT's. 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 programmable logic memory and control circuit is located on this board. It is mounted on the door and controls, and monitors the power board via a ribbon cable. This board monitors the input voltage and sends the command to close/open the input contactor, bypass static switch and output static switch. The control board also sends all the data to the LCD display panel located on the door. It also has AS400, RS232, and RS485 output capabilities and supports various communication options.

2.3.5 Output Bypass Static Switch

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

2.3.6 LCD Display Panel (Illustration 2.2, Item 11)

This LCD 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.

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

This transformer is provided for isolation between the inverter and 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

The manual MBS bypasses the complete UPS and provides utility input directly to the load in case of problem with 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 Product Features (Component Layout)

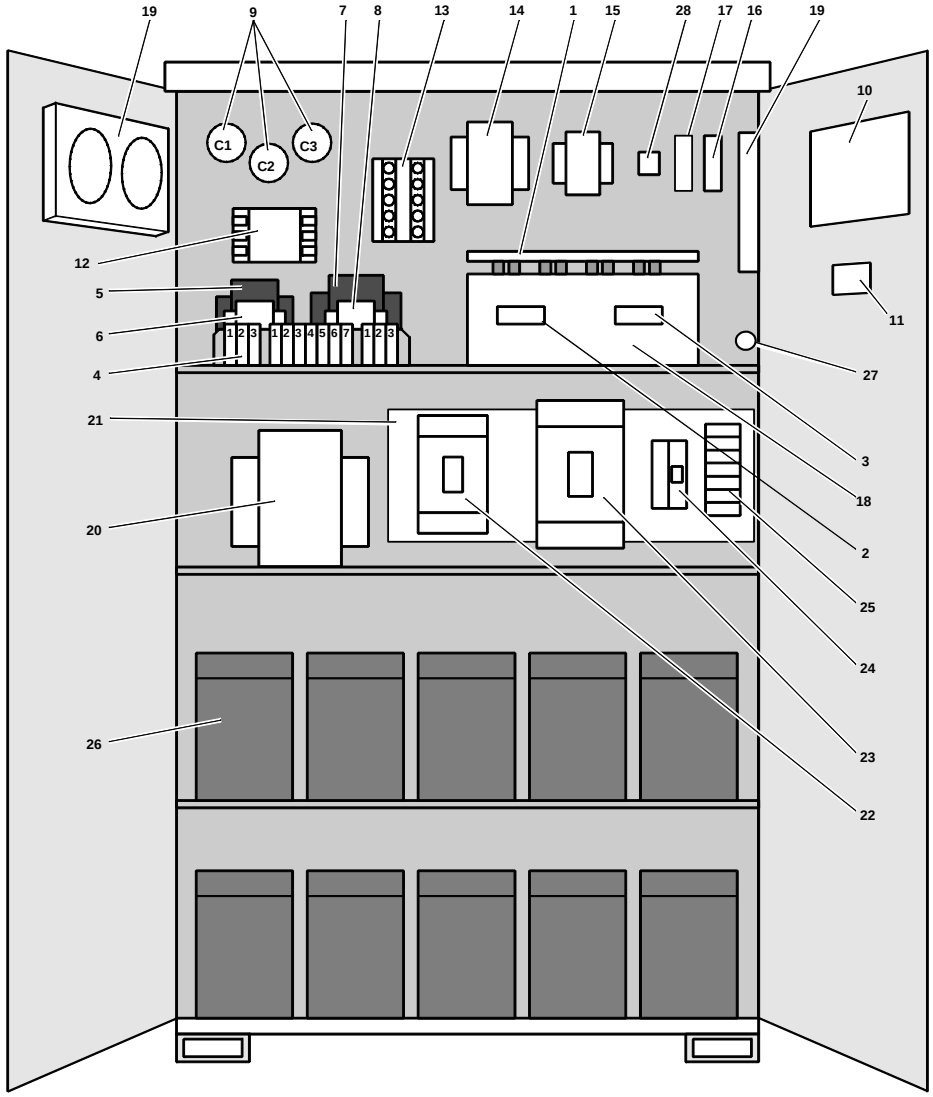


ILLUSTRATION 2-2: Component Layout

2.3.11 Product Features

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 Acit Battery(s)
27. Inverter Test Switch (S2)
28. Rectifier Block (BR1)

2.4 FUNCTIONAL DESCRIPTIONS

Illustrations 2-3 depict simplified block diagram of the SC Econosine. This diagram provides an excellent tool in identifying the major building blocks within the SC Econosine.

2.4.1 Optional Main input circuit breaker (CB1)

The main input circuit breaker provides over current protection to the input side of the SC Econosine.

2.4.2 Input Contactor (K1)

The microprocessor based control circuitry 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. It also commands the closure of contactor K1 via control transformer T2 and fuse F1.

2.4.3 Input Filter

The Capacitor C1 and input inductors L1, L2 are part of an input filters.

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, 32, 12 Volt batteries, providing the reserve energy to power the load when suitable AC input power is not present. The batteries are sealed, maintenance-free, VRLA construction.

2.4.7 Output Filter (L2-A, -B, -C)

The L-C circuit acts as a filter reducing high frequency noise to the output transformer.

2.4.8 Output Transformer (T1) (used only for multiple output voltage units)

The transformer performs a number of critical functions. First, it provides excellent common mode and normal mode noise isolation of the load from the input or inverter power. Secondly, it provides voltage transformation and tight regulation of the output voltage while the SC Econosine is operating from its internal inverter.

2.4.9 Inverter Test Switch (SW-2)

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

2.4.10 Control Transformer (T2)

This transformer with fuse (F1), provides (internal housekeeping) power supply as well as 120 VAC for the coil of the input contactor. The primary of this transformer has taps to match with the input voltages.

2.4.11 Maintenance Bypass Switch (SW-1)

This MBS can be used for maintenance purpose when the inverter fails or PM is required. This MBS will transfer the input power to critical load directly. Prior to 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.

2.4.12 Fan Transformer (T-3)

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

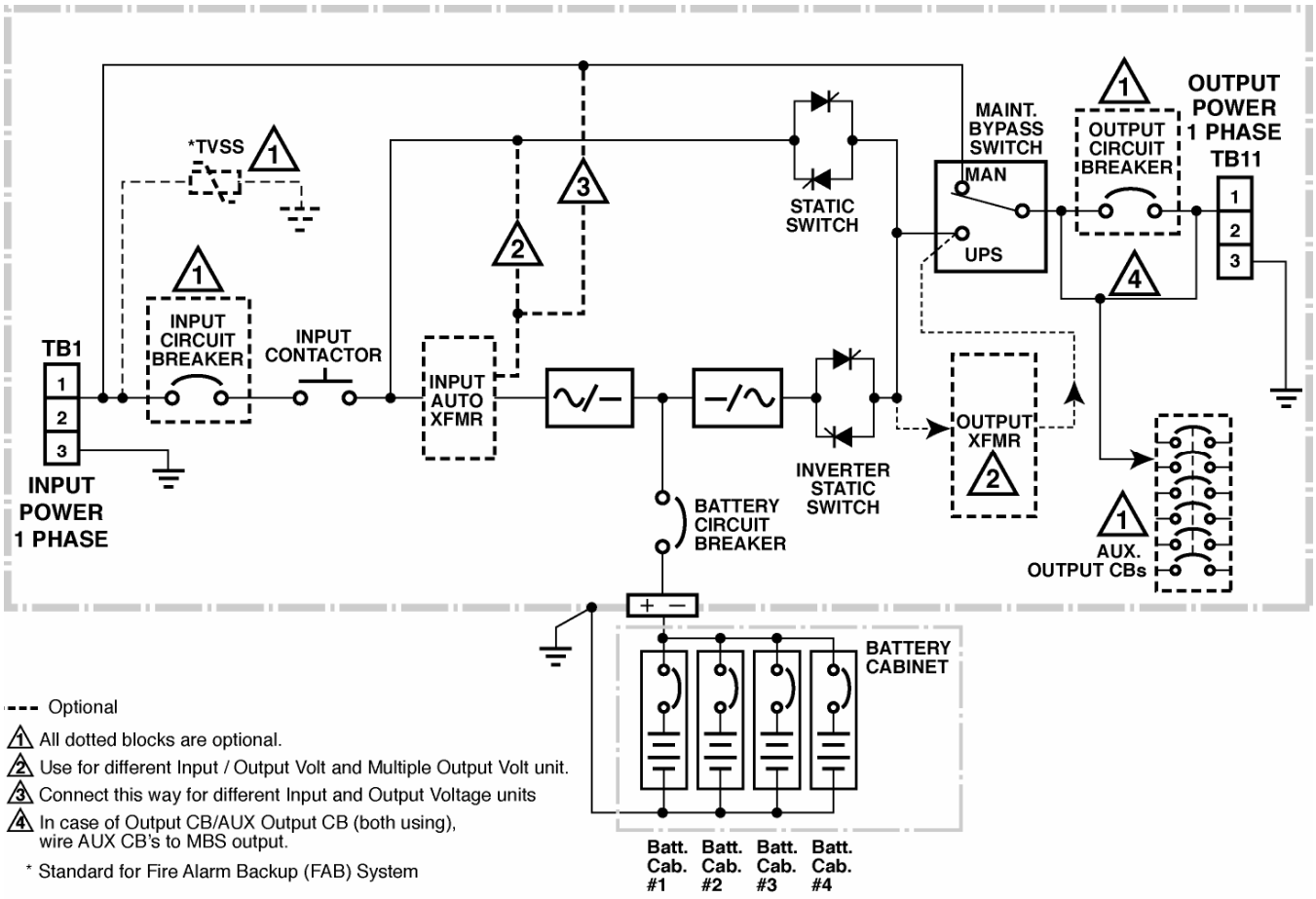


ILLUSTRATION 2-3: Functional Block Diagram

2.5 THEORY OF OPERATION

After power is applied, the system is placed in STANDBY mode and a self-check starts. During this period, the system checks for the proper operation of the inverter and bypass SCR's. If a successful check is completed and verified, the system goes into the NORMAL mode.

2.5.1 Normal Mode

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

2.5.2 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 command the input contactor to open in order to isolate the system from the facility side. At the same time, the charger is turned off and the battery bank becomes a DC supply source to continue supplying the inverter circuit to maintain an uninterrupted supply to AC output. The LCD screen will display a "UPS PROBLEM" message. If the facility power returns, stabilizes and is in phase with the backup power, the system controller commands to close the input contactor and the system is back to NORMAL. If the battery voltage drops below 16% of its nominal value and the facility power remains off, the system will be put into a FAILURE mode.

2.5.3 UPS Failure

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 and inverter SCRs are switched OFF and bypass SCRs are switched ON. A summary alarm signal will be sent out to the remote signaling connection and interface. The system remains in this mode until power is cycled or system has been repaired when needed. (See page 3-6)

2.5.4 UPS Problem

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

- Input power failure
- Output overload

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

2.6 OUTPUT LOADS

Each model of the SC Econosine System is designed to supply a maximum load which is given by its kW (1000's of watt). It is very important that the load is within the rating of the SC Econosine System to ensure that the connected loads will be properly supported.

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

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

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

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

2.7 OPTIONS (See Section 6 for more detail)

The following options are available with the SC Econosine System:

Internal Manual Bypass Switch
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
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
Stackable Cabinet Rack
Seismic Mounting Bracket (Left and Right set per cabinet)
Power Flow Mimic
GMS (Global Monitoring System)
System Output Norm ON/OFF CB

SECTION 3 – INSTALLATION

3.1 SITE PLANNING AND PREPARATION

The SC Econosine System is designed for installation indoors and meets NEMA specifications for operating temperature, humidity, and utility voltage. These cabinets are corrosion resistant and rugged. The footprint of the SC Econosine is less than 6 square feet. Listed below are the environmental specifications for the SC Econosine. 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 SC Econosine 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, 3-2)

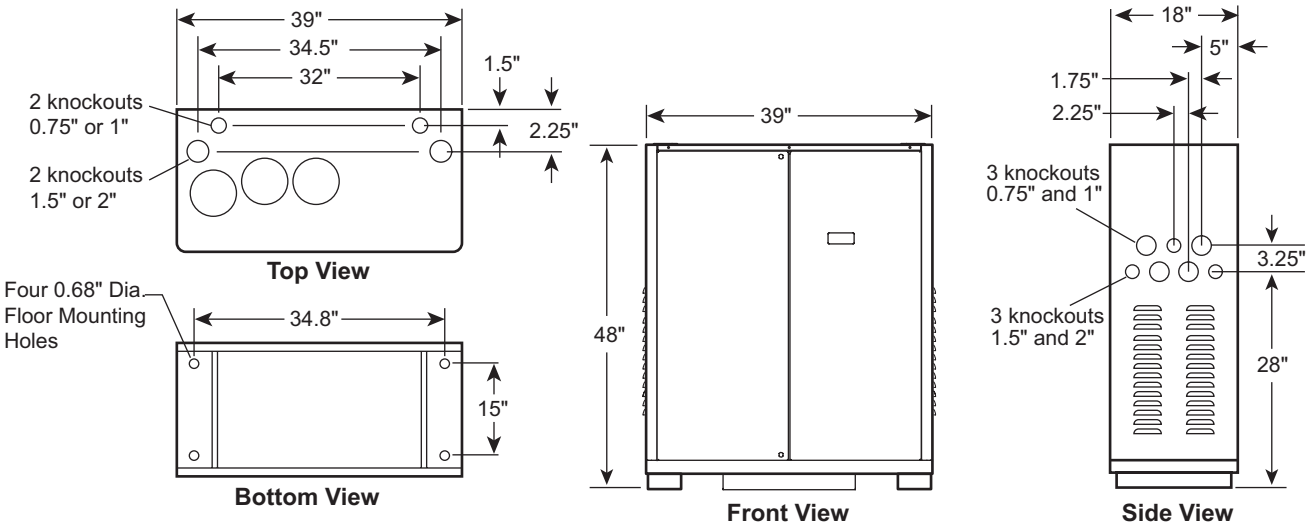


ILLUSTRATION 3-1: 48” CABINET CABLE ACCESS AND MOUNTING

Blocking vents may cause equipment malfunction and failure.

Caution

Each model of the SC Econosine System is designed to supply a maximum load which is determined by its kw rating. It is very important that the load is within the rating of this SC Econosine to ensure that the connected loads will be properly supported.
Each electrical device to be powered by the SC Econosine 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 SC Econosine must not exceed its rating. If the total load is exceeded, the SC Econosine monitoring will sense an overload condition and a summary alarm will occur.

3.1.4 Pre-Installation

The SC Econosine System is designed for indoor installations. All customer connections are brought through knockouts located on the top or side of the SC Econosine. The SC Econosine consists of one (1) 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

Remove the equipment from the shipping carton. Since the SC Econosine is designed for pad-mount installations, there are no casters. It is suggested that a forklift be used to remove the SC Econosine from its shipping pallet.

3.3 UNIT INSTALLATION

3.3.1 Mechanical Installation - Locating Area to Install UPS Unit

1. Before placing the SC Econosine 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 3-1)
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 SC Econosine to the mounting pad at the four (4) mounting locations.
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 ELECTROC**U**TION, INJURY OR DAMAGE TO EQUIPMENT.

Danger!

EVEN WHEN THE SC ECONOSINE IS OFF, THERE ARE POTENTIALLY DANGEROUS VOLTAGES WITHIN THE UNIT DUE TO THE BATTERIES. EXTREME CARE MUST BE TAKEN WHEN WORKING WITHIN THE SC ECONOSINE ENCLOSURE TO AVOID THE POSSIBILITY OF ELECTROC**U**TION, INJURY OR DAMAGE TO THE EQUIPMENT.

3.3.3 Customer Connections (Input And Output)

B. Input Power Connection by Customer (with no Input C/B option)

- Connect input (Hot) at TB-1
- Connect input Hot/Neutral at TB1-2
- Connect input ground at TB1-3

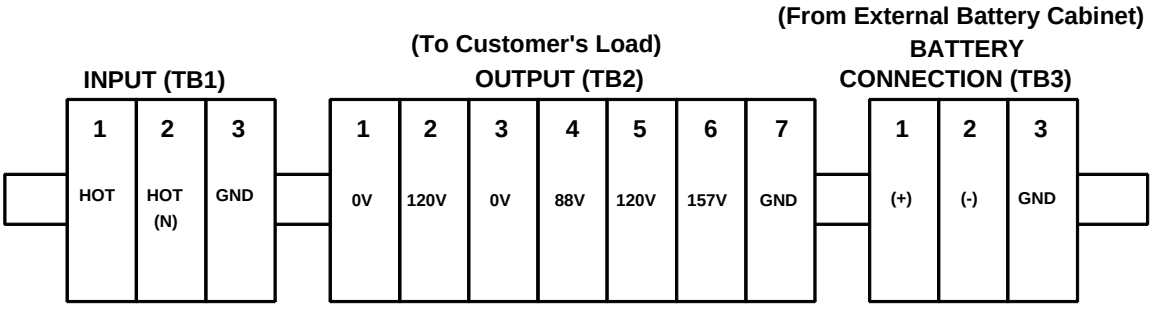


ILLUSTRATION 3-2: SC ECONOSINE CUSTOMER'S CONNECTION INPUT TERMINAL BLOCK

C. Output Power Connection by Customer (with No Output C/B option)

- When optional main output breaker or distribution breakers are installed, connect output or load wires to these breakers, neutral block, and ground link that are provided on breaker panel.
- When output breaker or breakers are not provided, proceed on follows.
- When optional output transformer is used;

<u>For 120V output</u>, verify jumper between TB2-1 to TB2-3 and TB2-2 to TB2-5.
Output is connected at TB2-1 (Neutral), TB2-2 (120 VAC Hot)

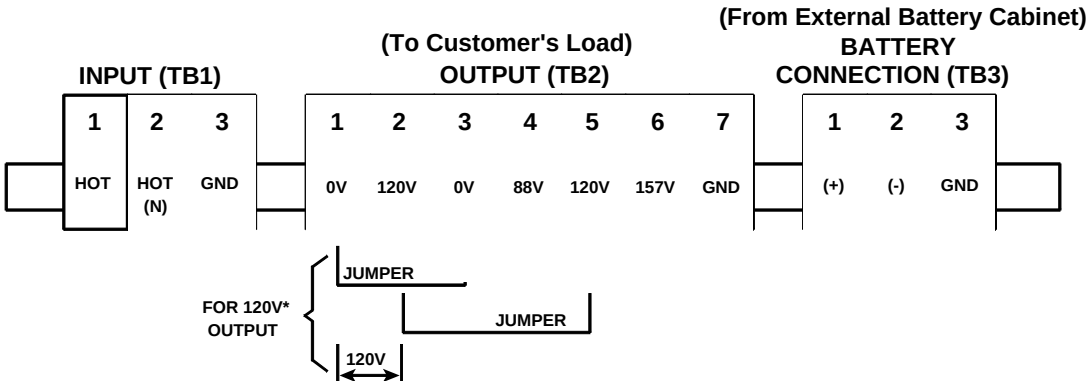


ILLUSTRATION 3-3: CUSTOMER'S CONNECTION TERMINAL BLOCK FOR 120V OUTPUT

<u>For 120/208/240/277V output,</u> 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)

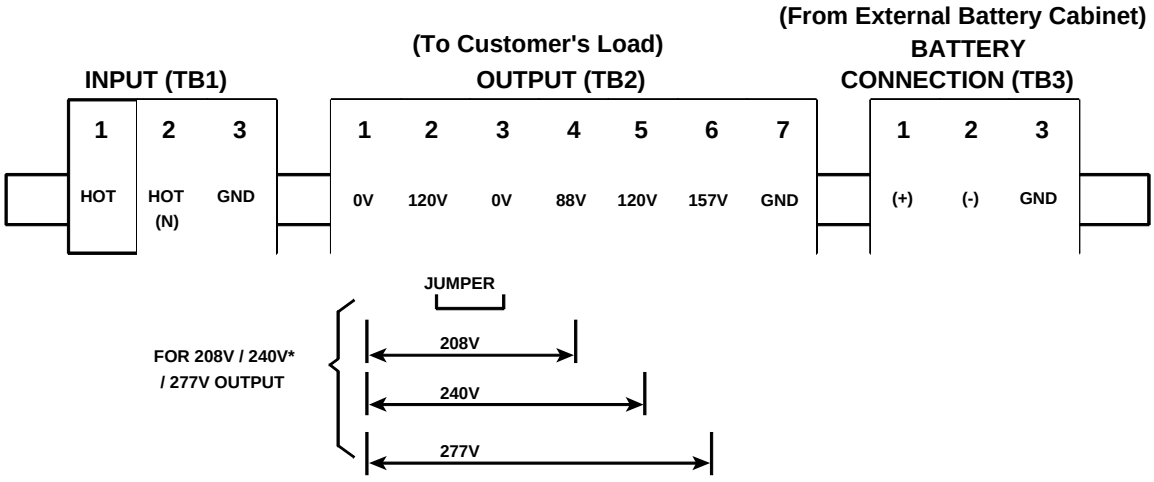


ILLUSTRATION 3-4: CUSTOMER'S CONNECTION TERMINAL BLOCK FOR 208V/240/277V OUTPUT

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	TB2-1	TB2-1
240	H	N	GND		240	1 TO 5	TB2-1	TB2-1
277	H	N	GND		277	1 TO 6	TB2-1	TB2-1

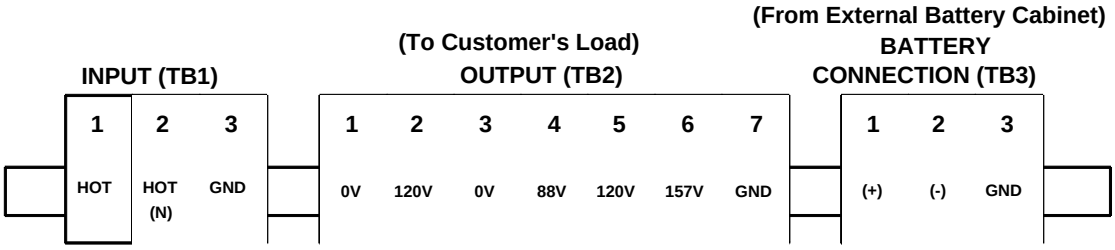


ILLUSTRATION 3-5: CUSTOMER'S CONNECTION TERMINAL

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

3.4 REMOTE SIGNALING CONNECTIONS (Optional)

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

"INPUT FAIL"

This is a normally open contact that closes upon loss of input power to the SC Econosine.

"LOW BATTERY"

This is a normally open contact that closes when the SC Econosine is on battery operation and the batteries are approaching complete discharge.

"BYPASS ON"

This is a normally open contact that closes when the SC Econosine transfers the load to static by-pass.

"SUMMARY ALARM"

This is a normally open contact that closes when the SC Econosine has any one of the following alarm conditions. Internal Failure, System Overheat, Battery Undervoltage.

3.4.1 The dry relay contacts for remote signaling are provided via connector (P2) of control board (A2) located on the right door inside of the SC Econosine. See illustration 1-2 for location of Control PCB.

3.4.2 The dry relay contacts have the following maximum ratings:

- 125 volts (AC or DC) maximum
- 1.25 amperes maximum
- 30 watts / 50 VA maximum

It is imperative that the relay contact ratings are not exceeded. Otherwise, damage to the relays within the SC Econosine 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 for the steps necessary to start-up the SC Econosine.

3.5 STORAGE

The SC Econosine 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 SC Econosine System 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 Crucial Power dealer or the Crucial 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.

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 CB (if provided) and wait for 1 minute,
4. Close battery CB, 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 Crucial Power service personnel or an authorized representative. To request start-up, fax a completed Request for Turn-On form to Crucial Power at 323-278-9550. The Request for Turn On form is attached in this manual as Appendix E. Start-up procedure described in this manual refers to a start up of the SC Econosine System after a maintenance shutdown or rectified abnormal condition.

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 Crucial 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 SC Econosine.

- 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 Crucial 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 SC Econosine runs through its internal diagnostic routines.

- Hear the sound of K1 contactor closing.
- See the fan(s) running.
- See the LCD display screen showing UPS Normal message.

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 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 SC Econosine should be providing AC line power. If the SC Econosine is not operating in the normal mode, turn off the input circuit breaker. Contact Crucial 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 same as nameplate, turn on the loads which will be powered from this SC Econosine Unit.

4.1.9 Verify battery operation and the inverter test switch.

- To place the SC Econosine in battery operation (simulate loss of input power), press and hold yellow Inverter Test Push Button. With Push Button in the hold position, the SC Econosine 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".

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

4.1.10 The SC Econosine 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.

4.2 OPERATION

4.2.1 Turning On the SC Econosine

1 Apply input power.

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

4.2.2 Turning Off the SC Econosine

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 renewed parts from the factory. Supply the information from the nameplate of the unit, such as serial number, model number, KW, P.F., input/output battery voltages, and date of manufacture, when ordering parts from factory. Call Toll Free (800) PWR-SRVC in North America. These parts are to be replaced by qualified factory trained service personnel only.

4.3.1 Control Board

This board is located on the right door at 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 new board. Reconnect all above connectors into their correct designations and orientation.

4.3.2 All Other Parts

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

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. See Illustration 4-1 for details. Verify that all cables and connectors have labels and are identified as shown. This is important for reinstalling the assembly.
   Disconnect connectors P7, P6, P4, P1 from the PCB, A1, which is mounted horizontally on the big black heat sink.
3. Disconnect 5 power cables at TB4-1 through TB4-5 using flat screw driver. Verify and install label ID for each cable before disconnecting.
4. 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 up. See illustration 4-1.

5. 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.
6. Reinstall all the cables and connectors in the reverse order. Verify per illustration 4-1.
7. Verify connections prior to starting up the unit.

Heat Sink Assembly (FRU)

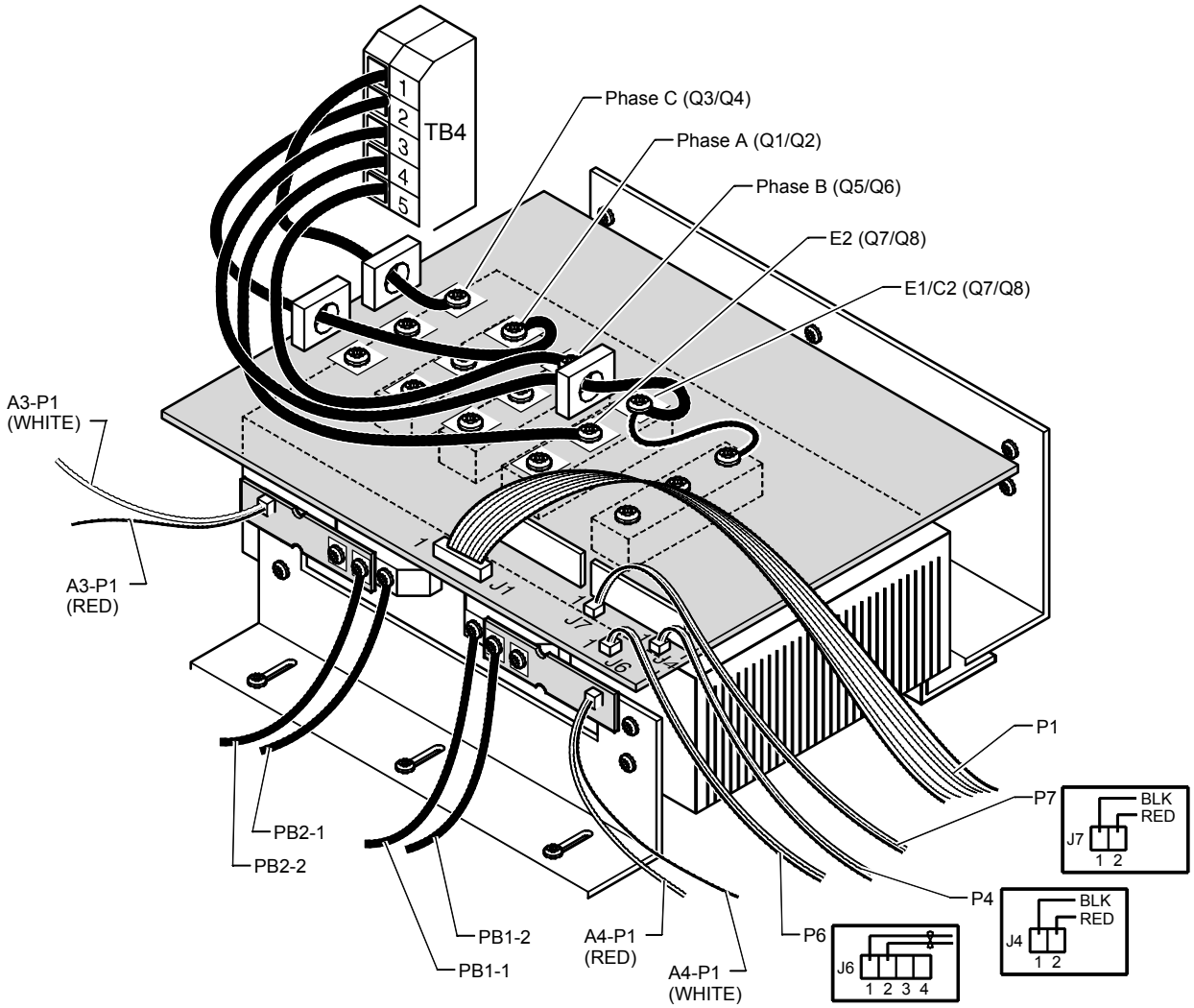


ILLUSTRATION 4-1: HEAT SINK ASSEMBLY

4.4 RENEWAL PARTS

Renewal Parts

ITEM	QTY	DESCRIPTION	DESIGN	CPP PART NUMBER
1	1	Power Board	A1	1625-288-01
2	1	Bypass Static Switch	PB2	1690-102
3	1	Output Static Switch	PB1	1690-002 or / -100
4	1	Input/Output/Battery Terminal Block for customer's use	TB1, TB2, TB3	4025-210
5	1	Input Choke	L1, L3	1450-1470-01 thru 03
6	1	Output Choke	L2	1450-1470-01 thru 03
7	1	DC Choke	L4	1450-1472-01 thru 03
8	1	The Frequency Noise Filter Capacitors for output Power	C1, C2, C3	1525-206
9	1	Control Board	A2	1625-288-01
10	1	LCD Display Board	A5	1690-164
11	1	Input Contactor	K1	1680-242/ -093/ -139/ -187
12	1	Terminal Block to remove heat sink assembly	TB4	4025-211
13	1	Fan Transformer	T3	1400-110
14	1	Control Power Transformer	T2	1400-105
15	1	Control Transformer Fuse	F1	2075-024
16	1	Fan Fuse	F2	2075-065
17	1	Heat Sink Assembly	HS1	9100-1338-01 thru -04
18	1	Fan(s)	B1 thru B5	1000-036
19	1	Optional Output Isolation Transformer	T1	1450-1473-01 thru -06
20	1	Input Breaker	CB2	Optional, See Nameplate
21	1	Battery Breaker	CB1	2025-xxx, Consult Factory
22	1	Output Breaker	CB3	Optional, See Nameplate
23	1	Output Distribution Breaker	CB4 and Up	Optional, See Nameplate
24	8, 10, 16, 20	Maintenance Free Lead Acid Battery(s)	B1 and Up	See Nameplate

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.

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 Crucial Power Customer Service and Support.
2. Call Crucial Power Customer Support at 1-800-797-7782 or 1-800-PWR-SRVC.

Danger!

LETHAL VOLTAGES ARE PRESENT INSIDE THE EQUIPMENT EVEN WHEN THERE APPEARS TO BE NO INPUT POWER TO THE UNIT. PROTECT YOURSELF FROM THE RISK ELECTROCUITION BY REFERRING SERVICE TO OUALIFIED PERSONNEL ONLY.

5.4 PREVENTATIVE MAINTENANCE

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

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 CRUCIAL 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 ELECTROLYE 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.

Crucial Power Products

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

- **Power Battery PRC-12xxx is one battery manufacturer used by Crucial 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.**

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.**

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 re-torque values. Battery Service Agreements are available through Crucial Power. Although the individual batteries are sealed and require only minimal maintenance, the batteries should Customer Service and Support at 1-800-PWR-SRVC.

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.
- Crucial Power Customer Service Personnel must approve non-Standard Batteries. Please call at 1-800-PWR-SRVC.

5.5 CRUCIAL POWER CUSTOMER SERVICE AND SUPPORT

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

5.5.1 Start-Up Services

Various Start-up services are available. See your sales representative or telephone Crucial Power Customer Service at 1-800-PWR-SRVC.

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 Crucial Power Customer Service at 1-800-PWR-SRVC.

5.5.3 Warranties

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

SECTION 6 – SYSTEM OPTIONS

This section describes the following options available with the SC Econosine single phase.

Part Number	Options
9100-1339-01 thru -04	Internal Manual Bypass Switch
3000-044 thru -056	External Manual Bypass Switch
9100-1363-02	Audio Alarms with Silence Switch
9100-1020-03	Remote UPS Status Display, 1 phase Monitor
9100-1362-01	Form “C” N/O Contacts for Alarms
9100-1440-01	TVSS (Transient Voltage Surge Suppressor)
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, Event Log
9100-1453-01	Aux Output CBs Trip Monitor with Event Log
9800-01-25 thru -150	Local on PC via RS232
9800-02-150 thru -1000	Local on PC via RS485
9100-1468-01	Remote Dial-Up
9100-1469-01	SNMP / WEB
9100-1451-01 thru 04	System Output Norm ON/OFF CB

6.1 Optional External Manual Bypass Switch – P/N 3000-044 thru -045

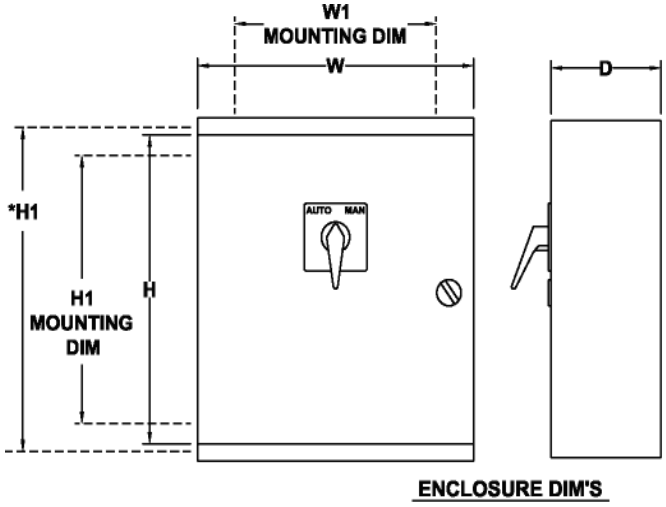


ILLUSTRATION 6-1: External Manual Bypass Switch

Notes:

1. Switch contacts are 1 phase L & N “make-before-break”.
2. Contacts marked “AUTO” are closed in the “AUTO” position.
3. Contacts marked “MAN” are closed in the “MAN” position.
4. Wrap around Bypass SW should be used with same input/output voltage.
5. For different input/output should be used with external transformer.
6. 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 can 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.

Refer to Section 3.1, Site Planning and Preparation

Verify the following connections have been made per wiring diagrams for specific application. Please contact factory for assistance.

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 manual bypass switch in 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.**

Manual Bypass Switch

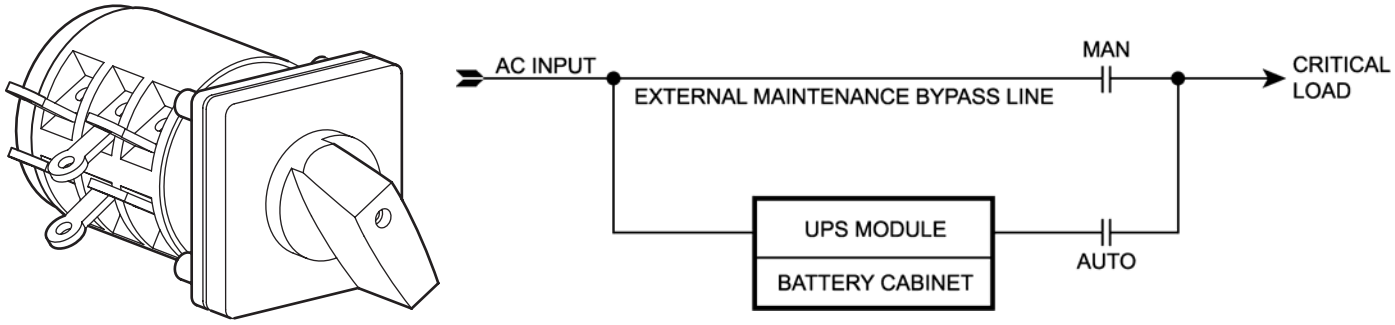


ILLUSTRATION 6-2

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.

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).

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

6.2.1 Specifications

Part Number	Description
9100-1359-01	FOR: **2.1 and 3 KW UNITS,** SAME IN/OUT VOLT UNIT).
9100-1359-02	FOR: **2.1 and 3 KW UNITS,** DIFFERENT IN/OUT VOLT UNIT).

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

6.4 OPTIONAL REMOTE UPS STATUS PANEL - P/N 9100-1020-03

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

6.4.3 Specifications

UPS Remote Status Panel Installation Drawing 9100-1020-10, revision A, attached at the end of System Options Section.

6.5 OPTIONAL FORM "C" N.O. 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 UPS ON
TB-5 INPUT FAIL
TB-6 COMMON

6.6 OPTIONAL TVSS P/N – 9100-1401-02

6.6.1 Installation

TVSS is DIN rail mounted and connected to the UPS input. Its plug-in individual phase modules are easily replaceable. The device guards against transient over voltages, call transients, spikes or surges, hence the name Transient Voltage Surge Suppressor. Transients are known to damage sensitive electronic equipment in homes, schools, commercial, industrial and medical facilities, wastewater treatment plants, factories, etc.

6.6.2 Operation

TVSS contains an energy absorbing components designed for specific line configuration. The device has a two-stage protection. When the protection components are damaged by absorbed transient, 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 shows alarm condition indicating mandatory replacement. Remote indication contacts "TS" allows remote control of the protection status.

6.6.3 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 CB's 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.

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

6.8.1 Installation

A matching external panelboard with 1P 20A, (QO-Square D) CB's shall be provided for power distribution from the UPS output to critical loads. The panelboard accommodates up to 42 breakers. A main CB shall be provided with each panelboard. See Dwg. 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	5KAIC @277V APPLICATION CB, 1PH, 20AMP QO BREAKER FOR 9100-1439-01/02/03

6.9 OPTIONAL HIGHER KAIC NORM ON/OFF OUTPUT CB.

6.9.1 Specifications

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

Refer to Drawing No 6001-033-02 (1 rack per 2 cabinets)

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
9100-1451-03	WITH DELAY ADJUSTMENT

6.15 OPTIONAL POWER FLOW MIMIC – P/N 9100-1493-01 (illustration 6-3)

6.15.1 Installation

Power Flow Mimic is easily installed. Its self adhesive pad is placed on the front door of the unit, with clear window over the display panel. It plugs directly to the J7 connector on the control PCB (P/N 1625-288-XX)

6.15.2 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.

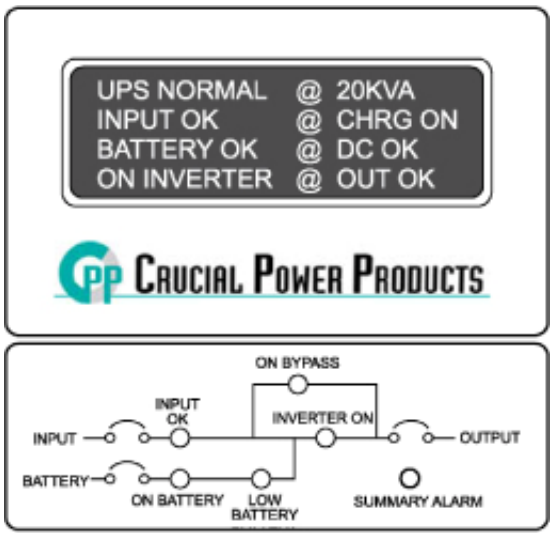


ILLUSTRATION 6-3

6.15.3 Specification

Description:	POWER FLOW MIMIC OPTION – 1 PHASE
Part Number:	9100-1493-01
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

6.16 OPTIONAL GMS – GLOBAL MONITORING SYSTEM, LOCAL ON UPS

6.16.1 EVENT LOG – P/N9100-1466-01

6.16.1.1 Installation

Event Log option requires monitoring PCB, that is mounted on studs on the inside of the front door panel, under control PCB. This option includes an additional AC/DC P.S mounted in the cabinet, its harness plugged in J1 on the monitoring board. The option includes a communcation cable on J8 connector, going to J6 on the control board. The display harness is now reconnected from J4 on the control PCB to J17 on the monitoring board, routing expanded screens to display panel. The keypad is placed on the front door. It has adhesive pad with the display showing thru its clear window and connects directly to J12 on the monitoring PCB.

6.16.1.2 Operation

Monitoring PCB acquires event data and displays up to 50 most recent Date/Time stamped events. The default setting is a scroll of monitoring and alarm screens. When the log is full, the first (oldest) events will be pushed out/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 event log display. After app. 5 second the screen goes to event log. All stored events will be continuously scrolled on display. Press Log once again to return to the main menu.

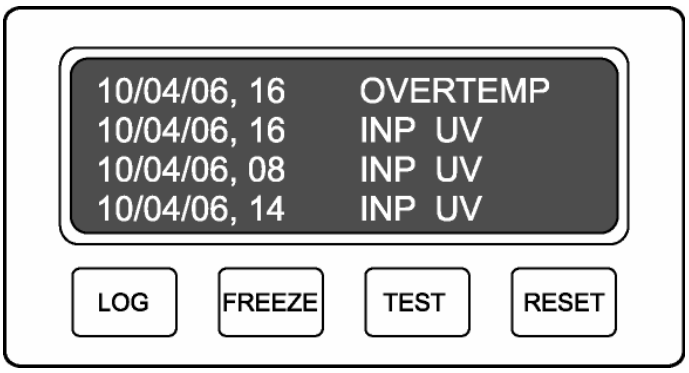


ILLUSTRATION 6-4

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

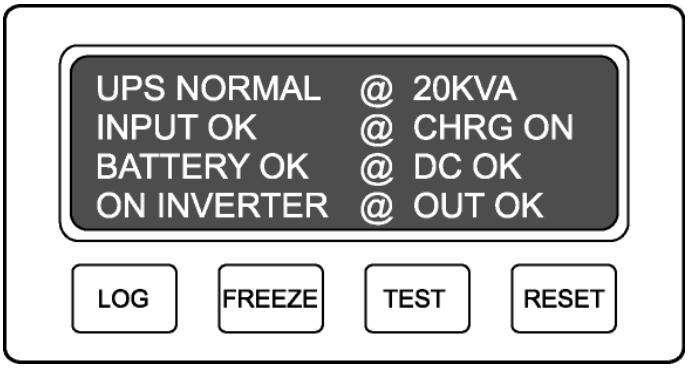


ILLUSTRATION 6-5

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.

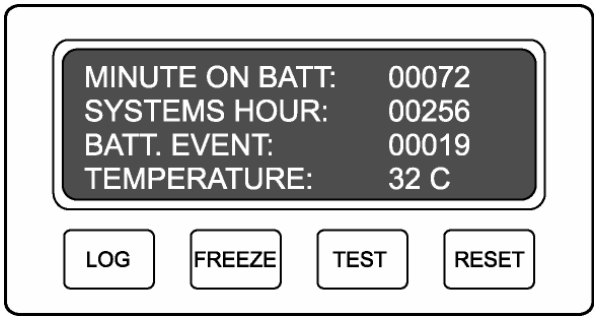


ILLUSTRATION 6-6

RESET – pressing **Reset and Test** keys at the same time clears screen and deletes the event log.

6.16.1.3 Specification

Description: EVENT LOG OPTION – 1 PHASE
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 AUX CB/S TRIP MONITOR WITH EVENT LOG – P/N 9100-1453-01

6.16.2.1 Installation

Trip monitors easily mount on a DIN-rail, next to corresponding CB's. Wire harness connects the trip monitors to J6 on the event log PCB.

6.16.2.2 Operation

This option must be purchased with local Event Log P/N 910-1466-01, since it uses monitoring PCBA to scan, register and display aux. output breakers trips. It also uses 12 VDC from the Event Log power supply. Trip signals coming from the breakers are displayed on a CB trip screen. There is a dedicated set of 5 screens for a total of 20 CBs. The CB screens are part of default monitoring and alarm display, that scrolls continuously when the unit is in operation. The number of displayed CB trip screens will depend on the number of actual trips.

Below is an illustration of a typical CB trip screen. Please note, that pressing the Freeze key stops the trip screens from rolling.

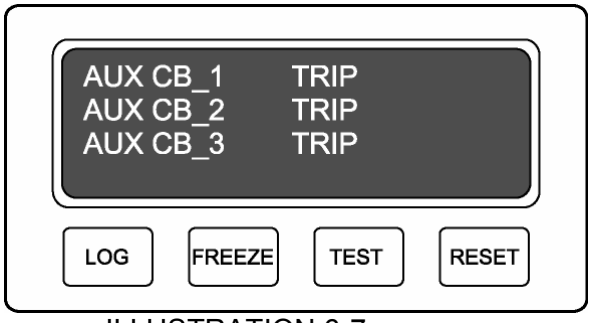


ILLUSTRATION 6-7

6.16.2.3 Specification

Description: AUX CB'S TRIP MONITOR WITH EVENT LOG

Part Number: 9100-1453-01
Components:
Event Log Option – P/N 9100-1466-01
Trip monitoring modules: ABB S2C-S/H 6R, DIN rail mount
Monitored CBs: only ABB MCB series

6.17 OPTIONAL GMS – GLOBAL MONITORING SYSTEM, LOCAL ON PC

6.17.1 LOCAL ON PC VIA RS232 – P/N 9800-01 – 25 THRU 150 (25-150ft)

6.17.1.1 Installation

This option requires a PC and LabView monitoring software. The software is provided on a disc and it is easily installed on any Windows platform. Attached cable, with a specified length plugs into PC serial port and connector J6 on the control PCB 1625-288.
LabView software needs to be selected for COM port 1.

6.17.1.2 Operation

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

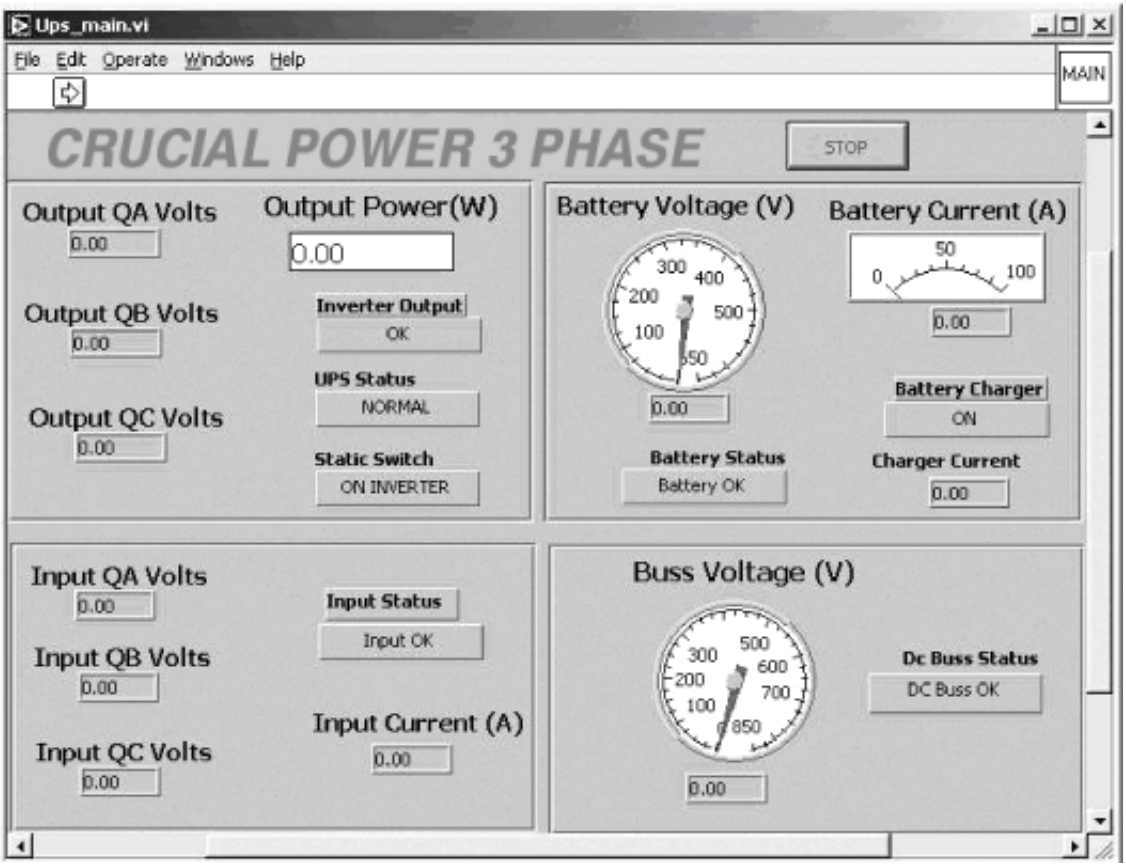


ILLUSTRATION 6-10

6.17.1.3 Specification

Description: LOCAL ON PC RS232

Part Number: 9800-01-25 thru 150
PC system requirements: 98 and higher Windows OS, serial port.
Viewing software: LabView, included
RS232 cable: 25 thru 150ft, as specified, included

6.17.2 LOCAL ON PC VIA RS485 – P/N 9800-02 – 150 THRU 1000 (150-100ft)

Installation, Operation, Specification as above (except RS485 cable)

6.17.3 REMOTE DIAL UP: DATA, VOICE, FAX, PAGER, PC, MAIL, METERING, EVENT LOG, STATS GRAPH – P/N 9100-1468-01

6.17.3.1 Installation

The dial up Monitor 2000 installs in the unit cabinet. It requires a phone line for remote operation. It comes with a interface PCB, that provides monitor inputs with isolated signals from the unit. The option comes wired and fully functional, it can also easily be added in the field. For local communication you must connect your computer serial port to the 2000 RS232 port. The Manager 2000 Windows setup program makes installation quick and easy. Picture below is an actual Manager 2000 screen.

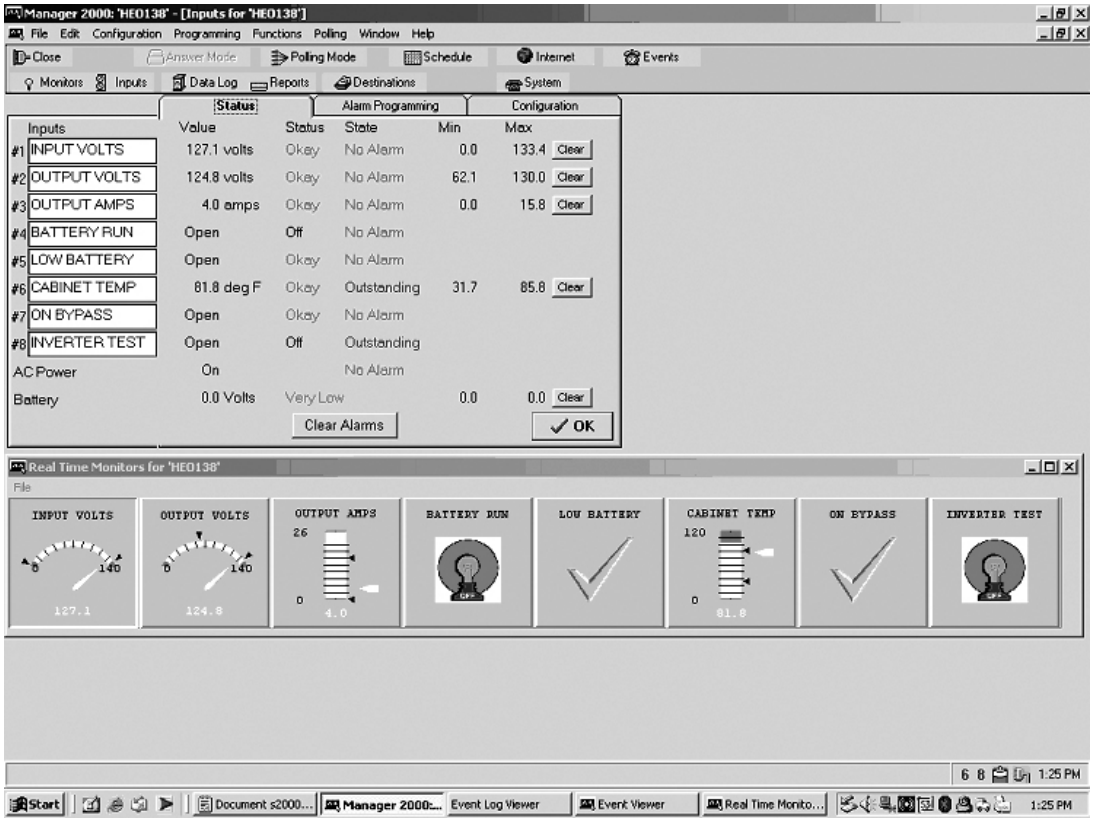


ILLUSTRATION 6-11

6.17.3.2 Operation

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, Summary Alarm. It also checks and reports device supply power and back up battery condition. When 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.

6.17.3.3 Specification

Description: REMOTE DIAL UP: DATA, VOICE, FAX, PAGER, MAIL, METERING, EVENT LOG, STATS GRAPH.
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 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.

6.17.4 WEB/SNMP – STATUS, ALARM, MAIL, EVENTS, METERING – P/N 9100-1469-01

6.17.4.1 Installation

SNMP/Web option card is a web enabled monitoring device for a UPS with Internet access. It is easily mounted on a support bracket in the unit's cabinet, next to the control PCBA. The Web card is powered from an AC/DC converter that comes with it. Connecting the "Device" port on the card with J6 DB-9 connector on the control PCB 1625-286 starts data exchange between the UPS and the Web card. RJ45 jack on the front of the card marked "Network" is the connecting point for the Ethernet cable. The unique internet address, IP- is pre-assigned and can be changed to fit customer network settings.

6.17.4.2 Operation

The SNMP/Web 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.

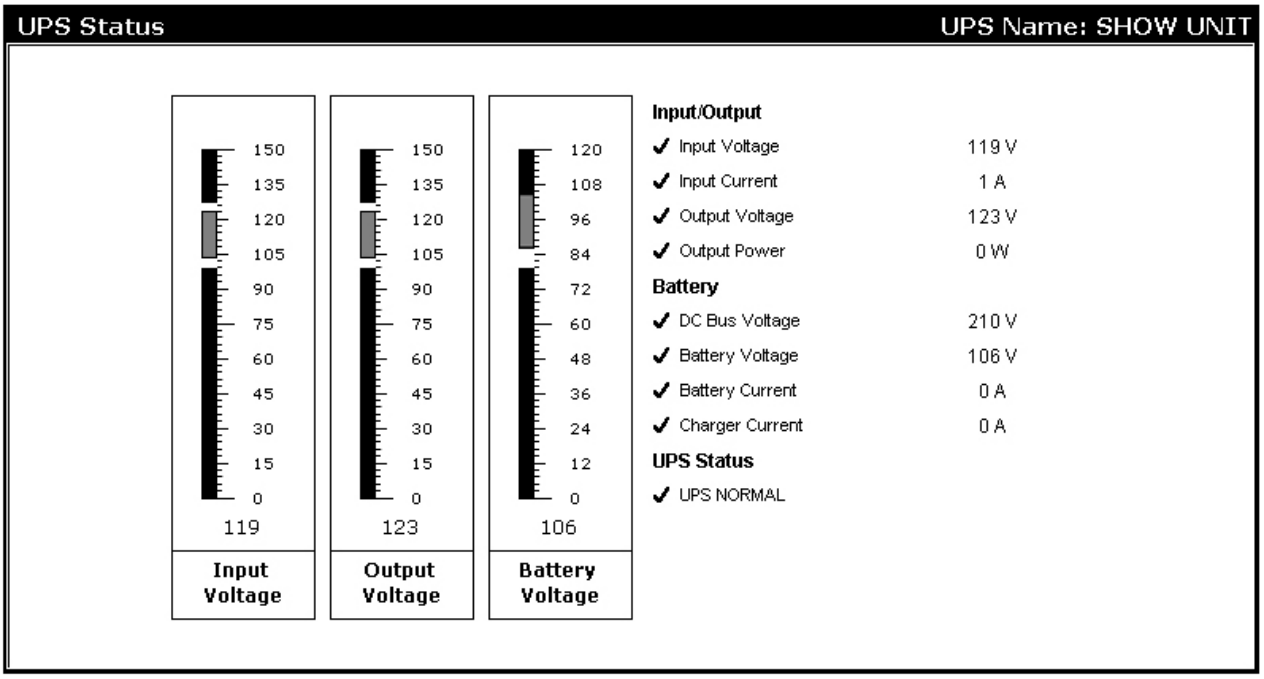


ILLUSTRATION 6-12

The SNMP/Web 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

6.17.4.3 **Specification**

Description: WEB/SNMP – STATUS, ALARM, MAIL, EVENTS, METERING
Part Number: 9100-1469-01
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: 0.45 lbs.

APPENDIX A – SPECIFICATIONS

POWER RATING (KW)	2.1	3
INPUT		
VOLTAGE(VAC)	Single Phase, 120/208/240/277 VAC	
MAXIMUM CURRENT	40/23/20/17	60/35/30/26
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 (KW)	2.1	3
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
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)	

Crucial Power Products

POWER RATING (KW)	2.1	3
BATTERY		
BATTERY RUN TIME	90 Minutes Minimum	
BATTERY TYPE	Sealed, Maintenance-Free, AGM, VRLA type	
NOMINAL DC VOLTAGE	96 VDC	120 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)
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)	

APPENDIX B - Optional Main Input & Main Output Breakers for various models (*All Values are typical as reference only)

TABLE B-1: External Output Breaker (Standard KAIC)				
KW	Output Voltages			
	120 Vac	208 Vac	240 Vac	277 Vac
2.1	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
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	25 Amps, 277 VAC, 2 Pole, 14 KAIC CPP P/N: 2025-763

TABLE B-2: Output Breaker (High KAIC)				
KW	Output Voltages			
	120 Vac	208 Vac	240 Vac	277 Vac
2.1	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
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

TABLE B-3: External Input Breaker Ampacity (Standard KAIC)				
KW	Output Voltages			
	120 Vac	208 Vac	240 Vac	277 Vac
2.1	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
3	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

TABLE B-4: External Input Breaker Ampacity (High KAIC)				
KW	Output Voltages			
	120 Vac	208 Vac	240 Vac	277 Vac
2.1	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
3	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

APPENDIX C - Battery Connections

NOTE: FOR THE ACTUAL BATTERY CONNECTION DIAGRAM, REFER TO DIAGRAM ON EACH UNIT. BELOW DRAWINGS ARE SHOWN ELECTRICAL CONNECTION ONLY. NOT NECESSARILY MATCH TO ACTUAL BATTERY' LAYOUT. THE ARRANGEMENT MAY BE DIFFER FROM DRAWINGS.

96 Volt Nominal

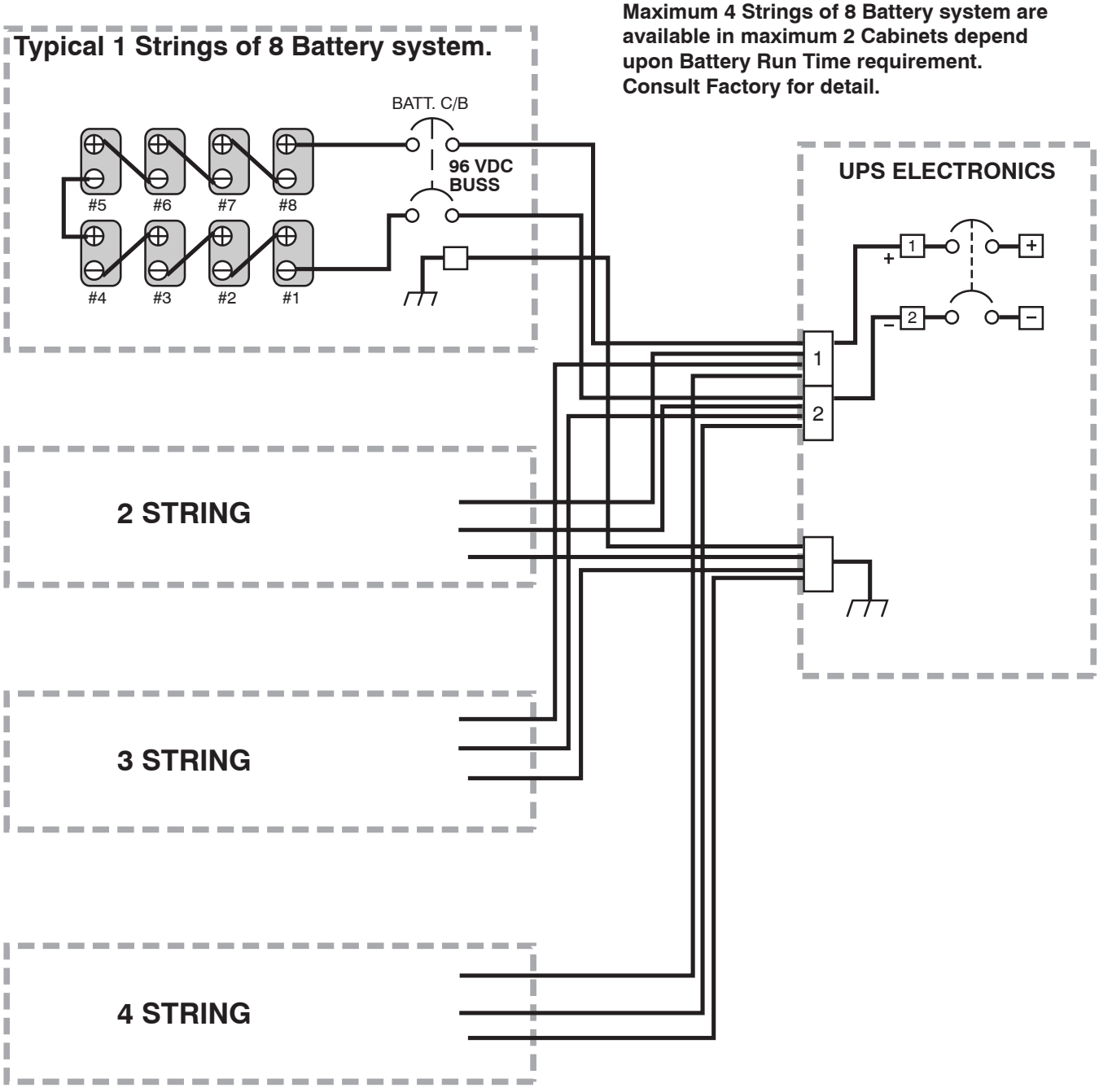


ILLUSTRATION C-1

120 Volt Nominal

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.

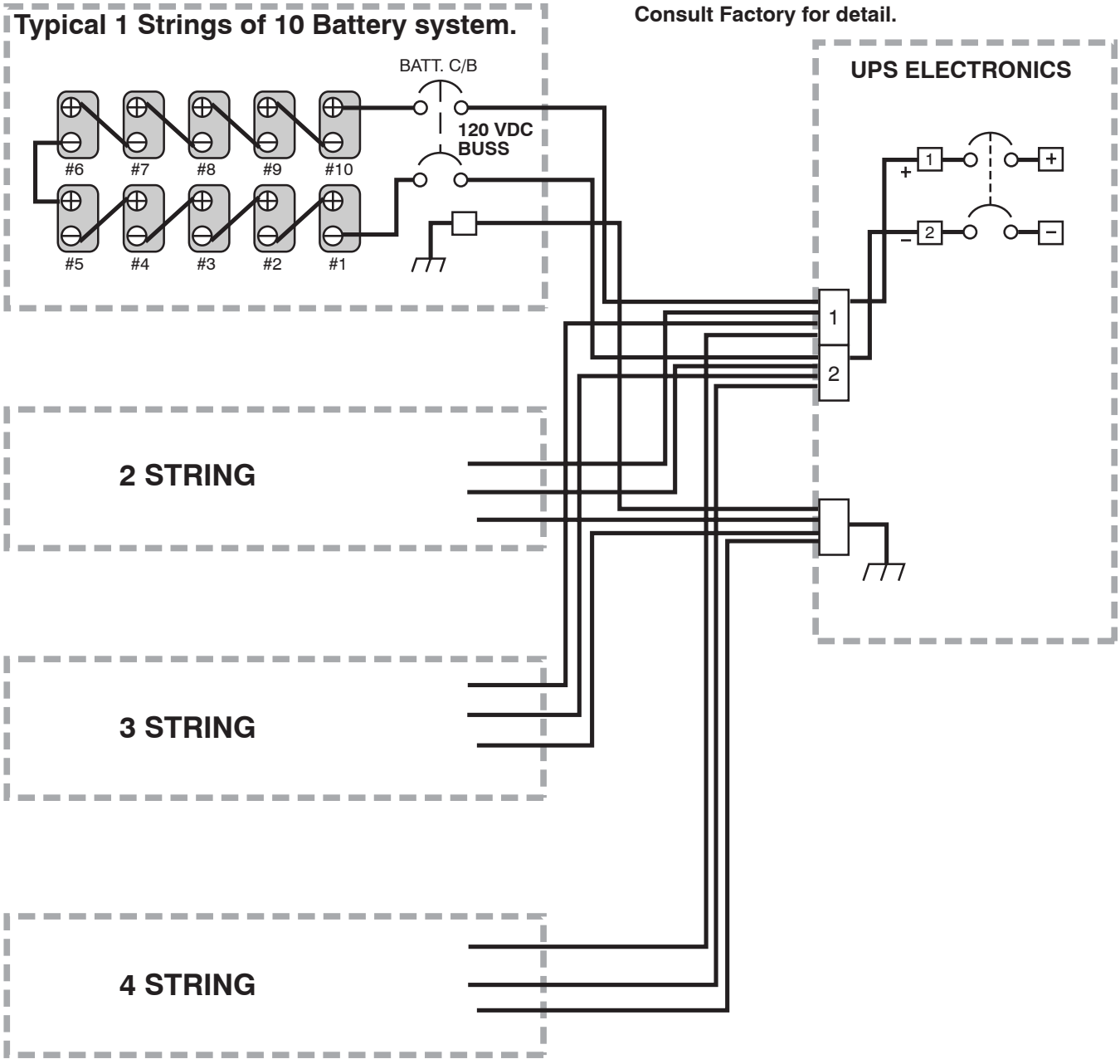


ILLUSTRATION C-2

192 Volt Nominal

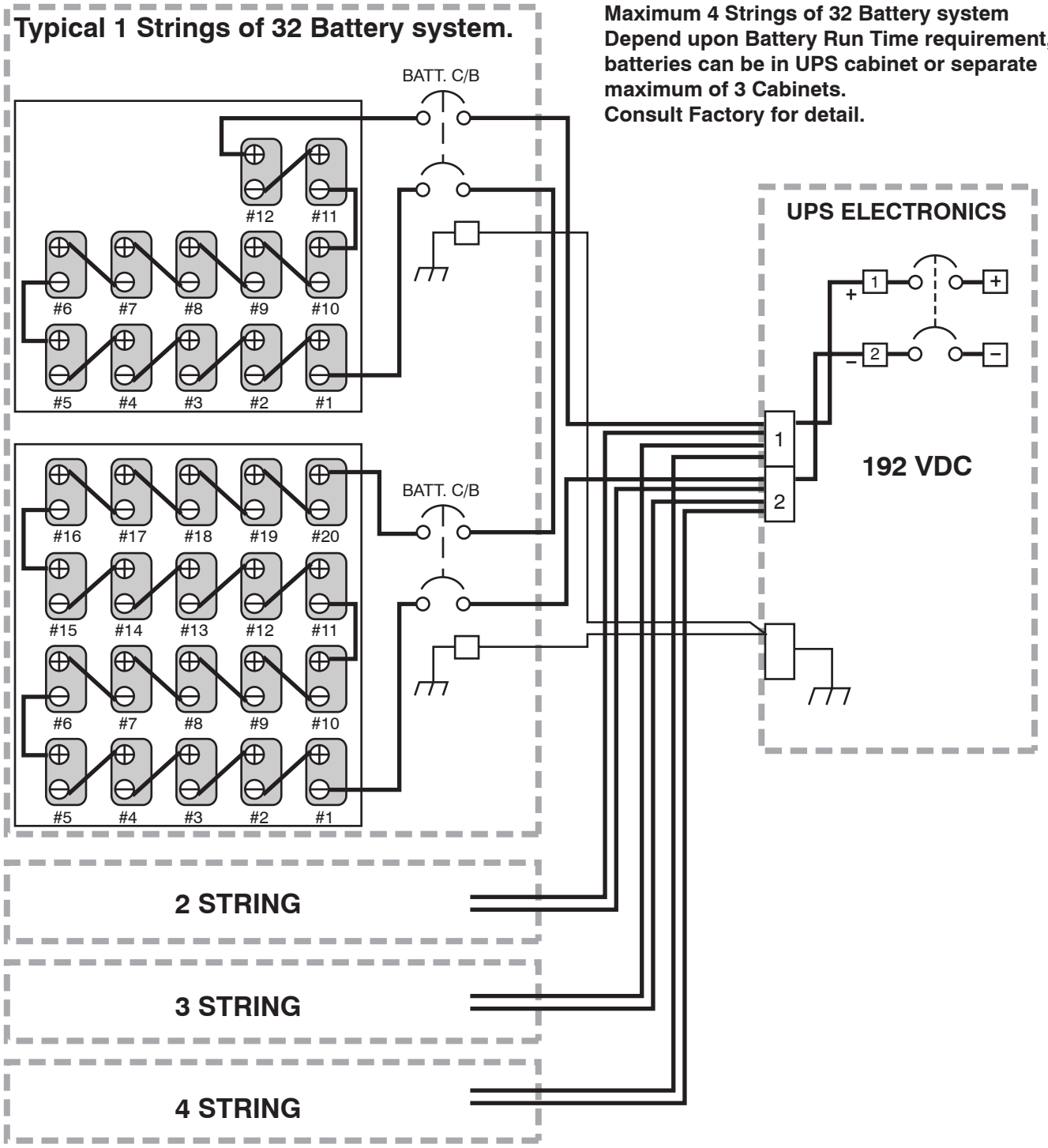


ILLUSTRATION C-3

240 Volt Nominal

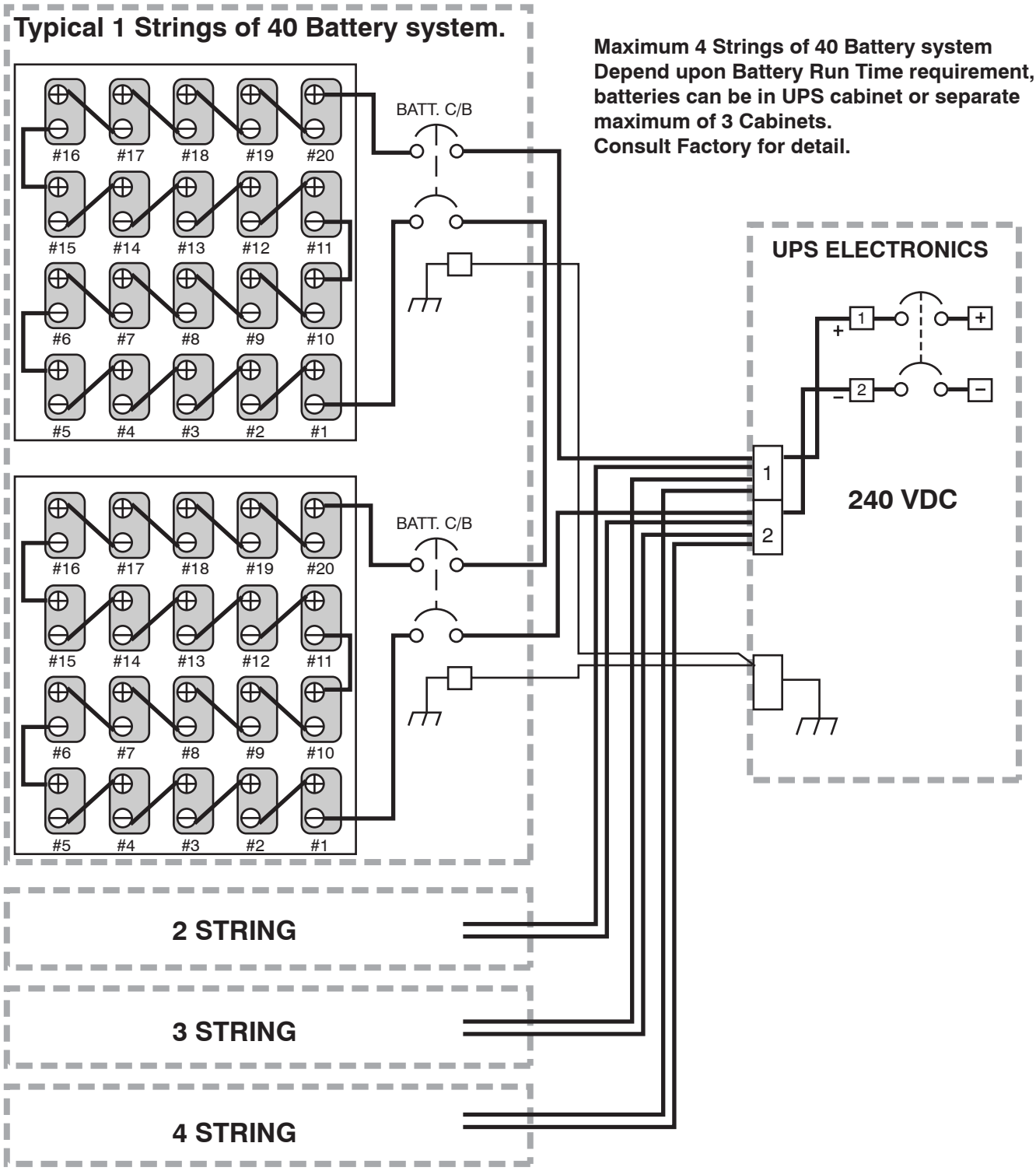


ILLUSTRATION C-4

APPENDIX D - LCD Display Menu & 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

Crucial Power **UPS Project**

If LCD display panel is not lit, the unit has problem. Contact the factory service at 1-800-PWR-SRVC at Crucial Power.

Screen A: The first default screen appears as below

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

The display may say:

Line 1: UPS NORMAL @ 5 KW

3 KW 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 is within an acceptable range.

INPUT BAD: Input is out of range.

CHRG ON: Charger is 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 is within an acceptable range.

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

BATTERY LOW: Battery voltage is low. Recharge battery.

DC OK: DC bus voltage is within an acceptable range.

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

DC UV: DC bus voltage is 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 – OPTIONS FOR SINGLE PHASE UPS

1. 9100-1343-01 thru 9100-1343-30 NORM ON/OFF OUTPUT AUX. CBS. STANDARD KAIC CB. Refer to the table for details in the separate attachment. 10 KAIC @120/240VOLT, 6 KAIC @277 VOLT.
2. 9100-1362-01 (5) FORM C DRY CONTACTS ALARMS.(AS400).
   SINGLE PHASE / NORMALLY OPEN.
   TB1....LOW BATTERY
   TB2....BYPASS
   TB3....SUMMARY ALARM
   TB4....UPS ON.
   TB5....INPUT FAIL
   TB6....COMMON.
3. 9100-1020-03 REMOTE UPS STATUS DISPLAY UNIT. SINGLE PHASE.
   Refer to the attached for details. WALL MOUNTABLE OR DESK TOP MOUNTABLE.
   A. INPUT FAIL LED
   B. BYPASS ON LED
   C. INVERTER ON LED.
   D. LOW BATTERY LED
   E. SUMMARY ALARM LED
   F. SILENCE SWITCH
   G. LAMP TEST SWITCH.
4. 9800-001-25 COMPUTER MONITORING AND CABLE VIA RS232.
   25 FT LONG, SINGLE PHASE.
   9800-001-50 " " 50 FT LONG. SINGLE PHASE
   9800-001-75 " " 75 FT LONG. SINGLE PHASE
   9800-001-100 " " 100 FT LONG. SINGLE PHASE.
5. 9100-1363-01 AUDIO ALARMS WITH SILENCE SWITCH ASSY. SINGLE PHASE.
6. 9100-1017-03 SENSAPHONE 2000 MONITOR. SINGLE PHASE.
7. 9100-1359-01 INTERNAL MANUAL MBS(SAME IN/OUT VOLT UNIT). SINGLE PHASE.
   9100-1359-02 " FOR 3-7.5 KW/KVA. (DIFFERENT IN/OUT VOLT)
8. 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,8/10 US. REPLACEABLE IN DINRAIL.

USE FOR ALL 208/240/277 VOLT INPUT UNITS.

9. 9100-1439-01 EXTERNAL AUX CBS OPTION IN A PANEL BOARD.

   1P,CB UP TO 24(QO BREAKER), 125 AMP.

   9100-1439-02 SAME. UP TO 30 CBS. 200 AMP.

   9100-1439-03 SAME. UP TO 42 CBS. 225 AMP.

10. 2025-125 1P,20 AMP CB FOR 9100-1439-01/02/03. QO BREAKER. 5KAIC@277VAC.

11. 3000-044 EXTERNAL MANUAL MBS ASSY.55 AMPS. WRAP AROUND TYPE.

    USE FOR 2.1-3 KW. INCLUDED NEUTRAL.MAKE BEFORE BREAK

    3000-045 " " 110 AMP. USE FOR 10-20 KVA/KW UNITS. WRAP AROUND.

12. INPUT CIRCUIT BREAKER OPTION,STANDARD KAIC.

    Refer to the separate table in appendix “B”.

    INPUT CIRCUIT BREAKER OPTION, HIGHER KAIC.

    Refer to the separate table in appendix “B”.

13. OUTPUT CIRCUIT BREAKER OPTION. STADARD KAIC / SINGLE.

    Refer to the separate table in appendix “B”.

    OUTPUT CIRCUIT BREAKER OPTION. HIGHER KAIC.

    Refer to the separate table in appendix “B”.

14. HIGHER KAIC NORM ON/OFF OUTPUT AUX CB OPTIONS.

    9100-1434-31 THRU 9100-1434-56 42 KAIC @208/240 VOLT. (ONLY)

    9100-1434-61 THRU 9100-1434-86 65 KAIC @208/240 VOLT. (ONLY)

    9100-1435-01 THRU 9100-1435-26 14 KAIC @ 277 VOLT.

    9100- 1435-61 THRU 9100-1435-86 65 KAIC @277 VOLT.

15. 9100-1317-02 LEFT/RIGHT SISMIC MOUNTING BRACKET FOR FLOOR MOUNTING SET PER EACH CABINET.

16. EMI FILTER OPTIONS: FCC PART 15 CLASS “B” RADIATED / CONDUCTED EMISSION

    9100-1444-01.1 EMI FILTER ASSY.

17. SYSTEM OUTPUT NORM-OFF / NORM-ON

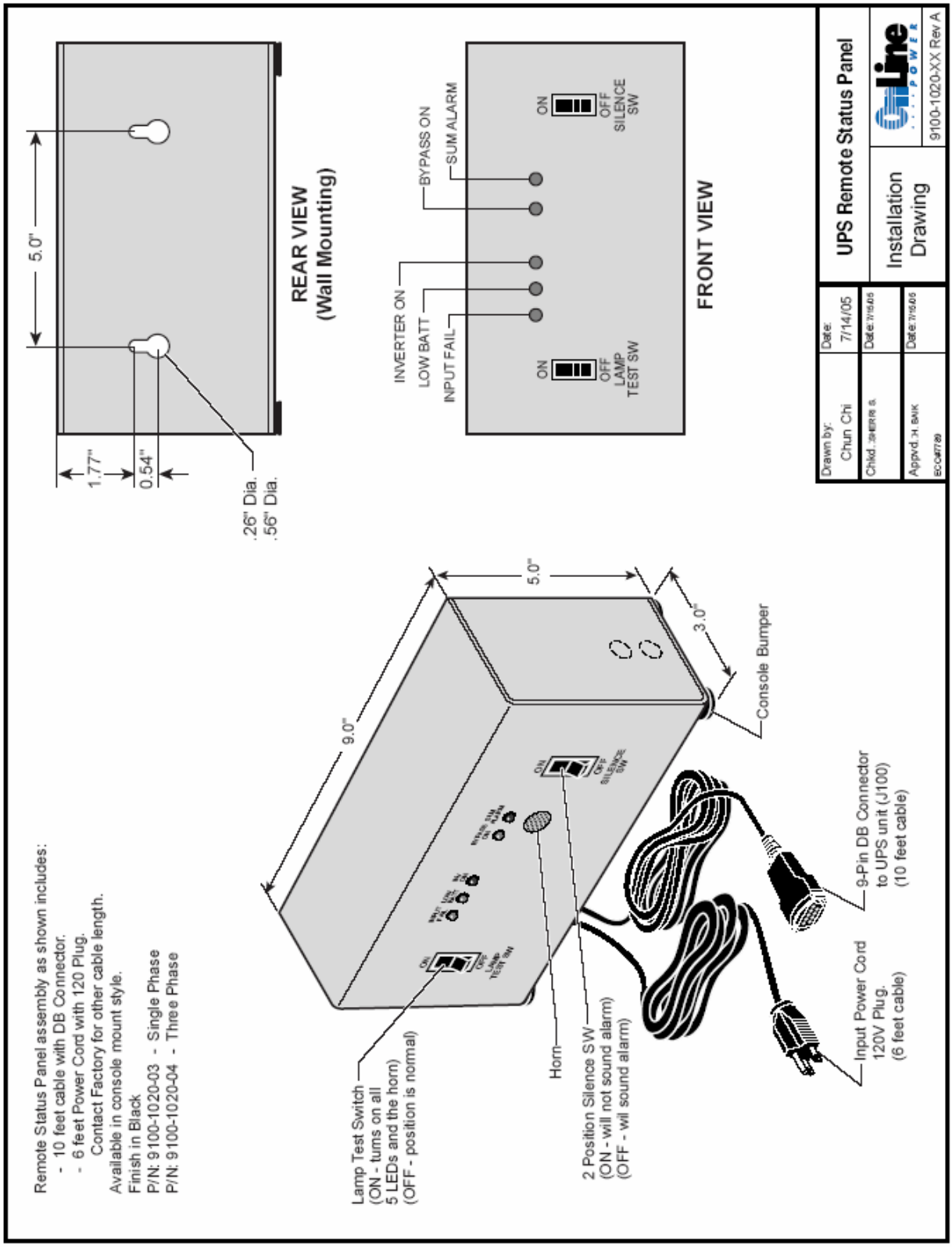
    SELECT TABLE OPTION

    9100-1451-01 WITHOUT DELAY ADJUSTMENT

    9100-1451-02 WITH DELAY ADJUSTMENT

Crucial Power Products

THIS OPTION IS A SPECIAL FEATURE FOR CERTAIN APPLICATION WHICH THE SYSTEM OUTPUT POWER IS ONLY USED UPON THE INPUT POWER FAILURE AND CONTINUEOULSY 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.


Remote Status Panel assembly as shown includes:
- 10 feet cable with DB Connector.
- 6 feet Power Cord with 120 Plug.
Contact Factory for other cable length.
Available in console mount style.
Finish in Black
P/N: 9100-1020-03 - Single Phase
P/N: 9100-1020-04 - Three Phase
REAR VIEW
(Wall Mounting)
5.0"
1.77"
0.54"
.26" Dia.
.56" Dia.
FRONT VIEW
INVERTER ON
LOW BATT
INPUT FAIL
BYPASS ON
SUM ALARM
ON
OFF
LAMP
TEST SW
ON
OFF
SILENCE
SW
5.0"
9.0"
3.0"
Console Bumper
Lamp Test Switch
(ON - turns on all
5 LEDs and the horn)
(OFF - position is normal)
Horn
2 Position Silence SW
(ON - will not sound alarm)
(OFF - will sound alarm)
9-Pin DB Connector
to UPS unit (J100)
(10 feet cable)
Input Power Cord
120V Plug.
(6 feet cable)
Drawn by:
Chun Chi
Date:
7/14/05
UPS Remote Status Panel
Installation
Drawing
9100-1020-XX Rev A

APPENDIX F – DRAWINGS FOR SINGLE PHASE UPS

1. UPS & Battery Cabinet Installations – 1 Phase UPS with 90 Min. Battery Backup 2.1, and 3 kW- 6001-033-01 Rev. A
2. Battery Cabinet Installations – 1 Phase UPS with 90 Min. Battery Backup 2.1, and 3 kW- 6001-033-02 Rev. A
3. 1 Phase UPS Functional Block Diagram – Single Line Diagram Dwg #: 6001-033-03 Rev. A
4. UPS Remote Status Panel – Dwg. #: 9100-1020-xx Rev X.
5. Single Phase UPS with Load Center – Dwg. #: 6001-032-19
6. Single Phase External Wrap Around By-Pass Panel: 2.1, and 3 kW Dwg. 6001-032-17 Rev. X1, Sheet 1 & 2.

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