

***UNINTERRUPTIBLE***  
***AC POWER SYSTEM***  
MODEL 302-1B

OPERATION MANUAL

**ELGAR ELECTRONICS CORPORATION**

9250 Brown Deer Road  
San Diego, CA 92121-2294  
1-800-733-5427  
Tel: (858) 450-0085  
Fax: (858) 458-0267  
Email: [sales@elgar.com](mailto:sales@elgar.com)  
[www.elgar.com](http://www.elgar.com)

©1993 by Elgar Electronics Corporation

This document contains information proprietary to Elgar Electronics Corporation. The information contained herein is not to be duplicated or transferred in any manner without prior written permission from Elgar Electronics Corporation.

May 24, 1993

Document No. M261035-01 Rev A







## **ELGAR ONE-YEAR WARRANTY**

---

Elgar Electronics Corporation (hereinafter referred to as Elgar) warrants its products to be free from defects in material and workmanship. This warranty is effective for one year from the date of shipment of the product to the original purchaser. Liability of Elgar under this warranty shall exist provided that:

- the Buyer exposes the product to normal use and service and provides normal maintenance on the product;
- Elgar is promptly notified of defects by the Buyer and that notification occurs within the warranty period;
- the Buyer receives a Return Material Authorization (RMA) number from Elgar's Repair Department prior to the return of the product to Elgar for repair, phone 800-73-ELGAR (800-733-5427), ext. 2295;
- the Buyer returns the defective product in the original, or equivalent, shipping container;
- if, upon examination of such product by Elgar it is disclosed that, in fact, a defect in materials and/or workmanship does exist, that the defect in the product was not caused by improper conditions, misuse, or negligence; and,
- that Elgar QA seal and nameplates have not been altered or removed and the equipment has not been repaired or modified by anyone other than Elgar authorized personnel.

This warranty is exclusive and in lieu of all other warranties, expressed or implied, including, but not limited to, implied warranties of merchantability and fitness of the product to a particular purpose. Elgar, its agents, or representatives shall in no circumstance be liable for any direct, indirect, special, penal, or consequential loss or damage of any nature resulting from the malfunction of the product. Remedies under this warranty are expressly limited to repair or replacement of the product.

### **CONDITIONS OF WARRANTY**

- To return a defective product, contact an Elgar representative or the Elgar factory for an RMA number. Unauthorized returns will not be accepted and will be returned at the shipper's expense.
- For Elgar products found to be defective within thirty days of receipt by the original purchaser, Elgar will absorb all ground freight charges for the repair. Products found defective within the warranty period, but beyond the initial thirty-day period, should be returned prepaid to Elgar for repair. Elgar will repair the unit and return it by ground freight pre-paid.
- Normal warranty service is performed at Elgar during the weekday hours of 7:30 am to 4:30 pm Pacific time. Warranty repair work requested to be accomplished outside of normal working hours will be subject to Elgar non-warranty service rates.
- Warranty field service is available on an emergency basis. Travel expenses (travel time, per diem expense, and related air fare) are the responsibility of the Buyer. A Buyer purchase order is required by Elgar prior to scheduling.
- A returned product found, upon inspection by Elgar, to be in specification is subject to an inspection fee and applicable freight charges.
- Equipment purchased in the United States carries only a United States warranty for which repair must be accomplished at the Elgar factory.

**ELGAR**

*Committed to Quality...Striving for Excellence*



# SAFETY NOTICE

BEFORE APPLYING POWER to the System, verify that the Series 302-1B Uninterruptible Power System is properly configured for the user's particular application.

## WARNING

HAZARDOUS VOLTAGES IN EXCESS OF 230 VRMS, 400V PEAK MAY BE PRESENT WHEN COVERS ARE REMOVED. QUALIFIED PERSONNEL MUST USE EXTREME CAUTION WHEN SERVICING THIS EQUIPMENT. CIRCUIT BOARDS, TEST POINTS AND OUTPUT VOLTAGES MAY ALSO BE FLOATING ABOVE (BELOW) CHASSIS GROUND.

Installation and servicing must be performed by QUALIFIED PERSONNEL who are aware of properly dealing with attendant hazards.

Ensure that the AC power line ground is properly connected to the Series 302-1B input connector. Similarly, other power ground lines including those to application and maintenance equipment **MUST** be properly grounded for both personnel and equipment safety.

Always ensure that facility AC input power is de-energized prior to connecting or disconnecting the power cable. Similarly, the Series 302-1B circuit breaker must be switched OFF prior to connecting or disconnecting output power.

In normal operation, the operator does not have access to hazardous voltages within the chassis. However, depending on the user's application configuration, **HIGH VOLTAGES HAZARDOUS TO HUMAN SAFETY** may be normally generated on the output terminals. The Customer/User must ensure that the output power (and sense) lines be properly labeled as to the SAFETY hazards and any that inadvertent contact with hazardous voltages is eliminated.

Guard against risks of electrical shock during open cover checks by **NOT TOUCHING** any portion of the electrical circuits. Even when power is OFF, capacitors may retain an electrical charge. Use **SAFETY GLASSES** during open cover checks to avoid personal injury by any sudden component failure.



	<u>Page</u>
Warranty .....	i
Safety Notice .....	ii
Table of Contents .....	iii

**SECTION I – GENERAL DESCRIPTION**

1.1	INTRODUCTION .....	1-1
1.2	GENERAL DESCRIPTION .....	1-1
	1.2.1 Major Components .....	1-1
	1.2.2 Interface Definition .....	1-1
	1.2.3 Standard Features .....	1-3
	1.2.4 Optional Features .....	1-3
1.3	SPECIFICATIONS .....	1-4
	1.3.1 Facility Power .....	1-4
	1.3.2 Battery Power .....	1-4
	1.3.3 Battery Characteristics .....	1-4
	1.3.4 Charging Capability .....	1-4
	1.3.5 Electrical Output Power .....	1-4
	1.3.6 Efficiency .....	1-5
	1.3.7 Physical Characteristics .....	1-5
1.4	ADDITIONAL ELECTRICAL/OPERATIONAL CHARACTERISTICS .....	1-5
	1.4.1 Rectifier/Charger Characteristics .....	1-5
	1.4.2 Inverter Characteristics .....	1-5
	1.4.3 Electro-Mechanical Bypass Switch Characteristics .....	1-5
	1.4.4 Critical Load and Inverter Protection .....	1-6
	1.4.5 Static Bypass Switch (SBS) Characteristics .....	1-6

**SECTION II - INSTALLATION**

2.1	INTRODUCTION .....	2-1
2.2	UNPACKING AND RECEIVING INSPECTION .....	2-1
2.3	INSTALLATION .....	2-2
2.3.1	Power Requirement .....	2-2
2.3.2	Receptacle Pinouts .....	2-2
2.3.2.1	J-1 - Battery Input Power .....	2-2
2.3.2.2	J-2 - Remote Alarm .....	2-2
2.3.2.3	J-3 - AC Input Power .....	2-6
2.3.2.4	J-4 - AC Output Power .....	2-6
2.3.3	Installation Instructions .....	2-6
2.3.4	Preliminary Functional Checkout .....	2-6

**SECTION III - OPERATION**

3.1	INTRODUCTION .....	3-1
3.2	CONTROLS AND INDICATORS .....	3-1
3.2.1	AC Input Switch-Circuit Breaker (CB1) .....	3-1
3.2.2	Battery Switch-Circuit Breaker (CB2) .....	3-1
3.2.3	AC Input On .....	3-1
3.2.4	AC Input Fail .....	3-1
3.2.5	Low Battery .....	3-1
3.2.6	High Battery .....	3-1
3.2.7	Bypass .....	3-1
3.2.8	Overload .....	3-1
3.2.9	Normal .....	3-1
3.2.10	AC Voltmeter (M1) .....	3-2
3.2.11	DC Voltmeter (M2) .....	3-2
3.3	SUMMARY ALARM CONNECTOR .....	3-2
3.4	OPERATING INSTRUCTIONS .....	3-2
3.4.1	Battery Connect .....	3-2
3.4.2	UPS Power On .....	3-2
3.4.3	Battery Operation .....	3-3

**LIST OF FIGURES**

1-1	UPS 302-1B System Block Diagram .....	1-2
2-1	UPS 302-1B (Front View) .....	2-3
2-2	UPS 302-1B (Rear View) .....	2-4
2-3	UPS 302-1B (Top View) .....	2-5

# **SECTION I**

## **GENERAL DESCRIPTION**



**1.1 INTRODUCTION**

This manual contains the operating instructions for the Model UPS 302-1B Uninterruptible AC Power System manufactured by Elgar Electronics San Diego, California. The manual includes all information necessary for the installation and operation of the UPS. The separate Series 302-1B Service Manual (available from Elgar) contains the theory of operation, maintenance instructions, parts lists, and schematics to aid in the preventive and corrective maintenance of the unit. Standard and/or optional features are defined by the following model numbers:

<u>Model</u>	<u>Features</u>
UPS 302-1B-01	No Meters, Relay Bypass
UPS 302-1B-02	Analog Meters, Relay Bypass
UPS 302-1B-03	No Meters, Static Bypass
UPS 302-1B-04	Analog Meters, Static Bypass

**1.2 GENERAL DESCRIPTION**

The Model UPS 302-1B is a 3.0 kVA Uninterruptible Power System (UPS) that provides conditioned 120 VAC, 60 Hz, single phase power to a critical load. The UPS utilizes normal facility input power of 120 VAC, 60 Hz. In the event of a facility power failure, the UPS continues to supply power to the critical load without interruption or degradation of power quality. An auxiliary battery will supply power to the UPS for a time period specified by the batteries used.

**1.2.1 Major Components**

The UPS 302-1B is comprised of the following major components:

- Rectifier/Charger with logic circuitry;
- Inverter/Power Switching Assembly with logic circuitry;
- Bypass Switch with logic circuitry;
- Input/Output circuitry; and,
- Status Indicators.

An auxiliary storage battery, not part of the UPS 302-1B unit, is a major component of the overall power system. The Elgar Model BP03B is recommended for use with the UPS 302-1B.

**1.2.2 Interface Definition**

The major components of the UPS, their interfaces with each other, and the interfaces among the UPS, facility electrical power, auxiliary battery, and critical load are illustrated in Figure 1-1.

In normal operation, facility power is supplied to a rectifier/charger which provides input power to the inverter while simultaneously maintaining the auxiliary battery in a fully charged condition. In the event of a facility power failure, the inverter draws power directly from the battery. When normal facility power returns, the rectifier/charger automatically resumes supplying power to the inverter while simultaneously recharging the battery. In the event of UPS failure, the bypass switch causes the critical load power input to switch with minimal power interruption to facility power.

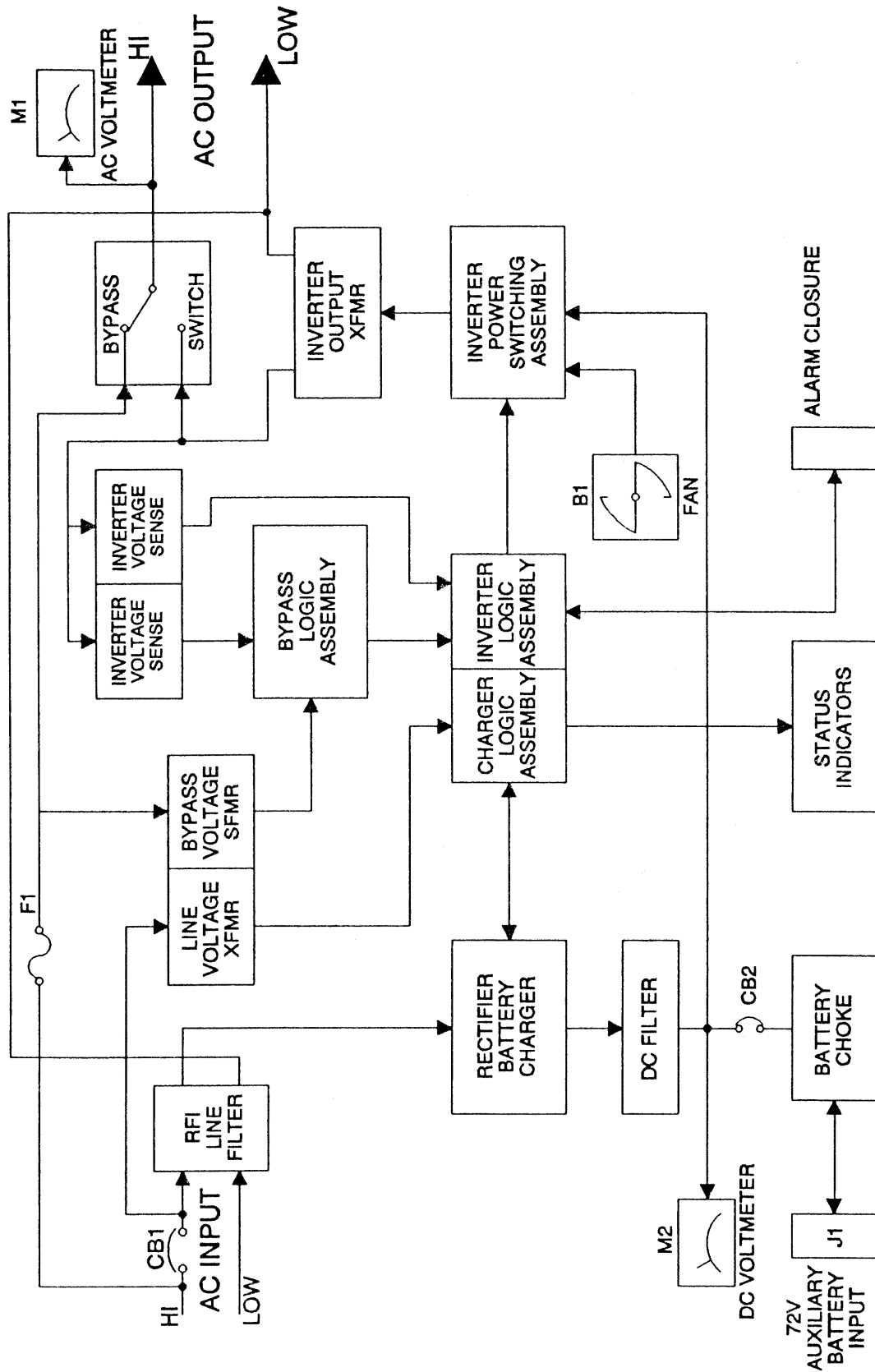


Figure 1-1. UPS 302-1B System Block Diagram

**1.2.3 Standard Features**

The UPS 302-1B contains the following standard features:

1. Input AC power switch-circuit breaker.
2. Input DC power switch-circuit breaker.
3. Separate fused line between the input power and the bypass switch.
4. High DC voltage protection/charger shutdown.
5. Low DC voltage protection/inverter shutdown.
6. Automatic transfer to bypass at overload.
7. Automatic transfer to normal operation at power on and automatic transfer to normal operation after an overload is removed.
8. Overtemperature inverter shutdown.
9. Status indicators for the following conditions:
  - a. AC Input On
  - b. AC Input Fail
  - c. Low Battery
  - d. High Battery
  - e. Bypass
  - f. Overload
  - g. Overtemperature
  - h. Normal Operation

10. Contact closure using summary, 120VAC 5, form C, 3-wire configuration. J2 closure 1 to 3 is the alarm condition; 2 to 3 is the normal condition.
11. A slow slew oscillator providing  $\pm 3$  Hz frequency window with no output phase shift upon sync or re-sync to the input frequency.
12. Inverter oscillator line synchronization.

**1.2.4 Optional Features**

The UPS 302-1B has provisions for the following optional features:

1. AC output and DC bus analog meters.

Analog Meter. The optional analog meters are accurate to  $\pm 3\%$ . The AC voltmeter range is 0-150 VAC and the DC voltmeter range is 0-100 VDC.

2. Plug-in static bypass switch assembly and Logic Board.

Static Bypass Switch (SBS) Assembly. The optional SBS is modular in form and can be field installed with no additional wiring required.

### 1.3 SPECIFICATIONS

#### 1.3.1 Facility Power

Facility power for normal operation of the UPS 302-1B must be within the following limits:

**Power Level:** 6.0 kVA minimum.

**Voltage:** 96 to 132 VAC (120 VAC +10%, -20%). For normal maintenance of the auxiliary battery at 2.16V per cell at full inverter load, the facility input voltage must be not less than 96.0 VAC.

**Phase:** Single.

**Voltage Transient Limit:** 2500 VAC, 10  $\mu$ sec.

**Frequency:** 57 to 63 Hz.

**Current:** 60 amperes.

#### 1.3.2 Battery Power

Battery power for operation of the UPS 302-1B during a facility power failure must be within the following limits:

**Power Level:** 3.6 kVA minimum.

**Voltage:** 63V Minimum; 72V Nominal; 82.5V Float.

**Current:** 60 amperes.

#### 1.3.3 Battery Characteristics

The auxiliary battery must be a 36-cell lead acid type providing a 72 VDC nominal and 82.5 VDC float output voltage. The battery capacity shall be in accordance with user backup requirements.

#### 1.3.4 Charging Capability

The UPS 302-1B rectifier/charger is capable of charging the auxiliary battery at a rate of 8.0 amperes DC with the inverter supplying full load output of 3.0 kVA. After a discharge cycle the rectifier/charger requires 24 hours to recharge the batteries to full capacity.

#### 1.3.5 Electrical Output Power

The UPS 302-1B will provide output power having the following characteristics when supplied with either normal facility power or battery power as defined herein. All characteristics apply for line, load and temperature extremes except where noted.

**Power:** 3.0 kVA available from 0.7 power factor (P.F.) lag to 0.9 P.F. lead.

**Voltage:** 120 VAC  $\pm$ 2%.

**Phase:** Single.

**Frequency:** 60 Hz  $\pm$ 0.5% or line sync.

**Distortion:** 5% total harmonic distortion (THD) maximum.

**Overload Rating:** 150% for 5 seconds; 125% for thermal shutdown.

**Peak voltage response to transient load change from 0% to 50%, 50% to 0%, 50% to 100%, and 100% to 50%:**  $\pm$ 15% maximum with recovery within 2 cycles for a linear resistive load.

**Audible Noise:** Typically 65 dB(A) at 6 feet maximum.

**1.3.6 Efficiency**

The efficiency of the UPS 302-1B at 3.0 kVA, 1.0 P.F. load is not less than 72% during normal AC to AC operation. The efficiency of the UPS 302-1B is not less than 78% during DC to AC operation.

**1.3.7 Physical Characteristics**

**Operating Temperature Range:** 0°C to +40°C (+32°F to +104°F).

**Storage Temperature Range:** -20°C to +70°C (-36°F to +158°F).

**Relative Humidity:** To 95% (maximum) without condensation.

**Overall Physical Size:**

Width:	19" (483 mm)
Height:	14" (356 mm)
Depth:	20" (508 mm)

**Weight:** 225 lbs. (102 kg).

**1.4 ADDITIONAL ELECTRICAL/ OPERATIONAL CHARACTERISTICS****1.4.1 Rectifier/Charger Characteristics**

The rectifier/charger simultaneously provides input power to the inverter and maintains the battery in a fully charged condition.

**Rated Output:** The rectifier/charger maintains the external battery at 82.5 VDC nominal float voltage.

**Output Voltage Regulation:** DC bus float voltage is regulated at 82.5 VDC (2.3V per cell) controlled by the charger logic circuitry. No load to full load regulation is  $\pm 0.5V$ .

**Output Overvoltage Protection:** A high battery condition of 95.0V (2.6V per cell) will cause the charger to shut down. When battery voltage returns to normal float of 82.5 VDC, the charger will resume normal operation.

**1.4.2 Inverter Characteristics**

The inverter provides output power having the characteristics defined in paragraph 1.3.5 above during normal operation from facility power or, upon a facility power failure, from the auxiliary battery.

**Rated Output:** The inverter has a rated output of 3.0 kVA at 120 VAC nominal voltage and 60 Hz nominal frequency.

**Overload Rating:** The inverter will provide 150% load for 5 seconds, 125% load to thermal shutdown (30 minutes minimum), and 100% continuously.

**1.4.3 Electro-Mechanical Bypass Switch Characteristics**

In the event of UPS failure, the bypass switch will transfer input power to the critical load from the UPS to the facility power source by means of an electro-mechanical relay.

**Overload Protection:** If the overload exceeds 125%, the bypass switch will transfer the load to the bypass line. If the bypass line is not present or if the bypass fuse is open, the inverter will shut down. Re-transfer to inverter will not occur until the load is decreased to 100% under the 125% condition with the bypass line present.

**Relay Transfer Characteristics:** The relay and control logic will transfer the critical load from the UPS to facility power in less than 30 msec under all load conditions.

**Relay Rating:** The relay bypass switch rating shall exceed all output requirements detailed in paragraph 1.3.5 above.

#### **1.4.4 Critical Load and Inverter Protection**

The bypass circuit provides protection from the following load or inverter faults:

**Output Current Overload:** If the output load current exceeds 125% of full load, bypass will occur.

**Inverter Undervoltage:** If the inverter output voltage drops below -10% of nominal, bypass will occur.

**Inverter Overvoltage:** If the inverter output voltage exceeds +10% of nominal, bypass will occur.

Automatic re-transfer to the inverter occurs when the inverter or load faults are cleared.

A critical load short circuit will cause bypass and the bypass fuse to open if the short is of sufficient duration. The inverter cannot be enabled until the fuse is replaced.

#### **1.4.5 Static Bypass Switch (SBS) Characteristics**

The optional SBS will transfer the critical load to the facility power in the event of a UPS failure by means of SCRs connected back to back. This allows very fast transfer.

**SBS Transfer Characteristics:** The SBS and control logic will transfer the critical load from the UPS to facility power in less than 2 milliseconds under all load conditions.

**SBS Rating:** The SBS rating shall exceed all output requirements as detailed in paragraph 1.3.5 above.

**SPECIFICATIONS ARE SUBJECT TO CHANGE  
WITHOUT NOTICE.**

## **SECTION II**

# **INSTALLATION**



**2.1 INTRODUCTION**

The Elgar Model UPS 302-1B has been calibrated and tested prior to shipment. Therefore, the unit is ready for installation and operation upon receipt. The following initial physical inspections should be made to ensure that no damage had been sustained during shipment.

**WARNING**

**Hazardous voltages are present when operating this equipment. Read the "SAFETY" notices on page ii prior to performing installation, operation, or maintenance.**

**2.2 UNPACKING AND RECEIVING INSPECTION**

The UPS 302-1B has been packed in accordance with industrial standards for safe shipment. Upon receipt of the unit, unpack and inspect the unit as follows:

1. Visually inspect the shipping container prior to accepting the package from the carrier. If damage to the instrument is evident, a description of the damage should be noted on the carrier's receipt and signed by the driver or carrier agent.
2. If there is no visible damage to the shipping container, carefully unpack the unit and save the container and filler materials until the preliminary inspection is completed.
3. Visually inspect the unit for evidence of external damage such as chassis dents, scratches and distortion.
4. Ensure that the front panel switch-circuit breakers operate with ease.
5. Ensure that the front panel meters, if installed, are not damaged.
6. If required, forward a report of any damage to the Elgar Repair Department, 9250 Brown Deer Road, San Diego, CA 92121-2294, 1-800-733-5427. Elgar will provide instructions for the repair or replacement of the instrument.
7. Retain the original packing container should subsequent repacking for return to the factory be required. Repacking is straightforward and is essentially the reverse of unpacking. Should only a subassembly need to be repackaged for re-shipment, use the original containers. Elgar will provide shipping instructions and containers, if necessary.

## 2.3 INSTALLATION

The UPS 302-1B unit is designed for installation in a standard 19" (483 mm) RETMA rack or on any table surface (refer to Figures 2-1 through 2-3 for mounting dimension requirements).

### CAUTION

Support is required for the chassis rear; the unit must not be mounted by the front panel only. For slide-out from a rack-type installation, the unit has threaded inserts located on each side for the mounting of rack slides.

### CAUTION

Do NOT apply AC input voltage to this instrument nor connect any load(s) without first verifying correct input line voltage and output wiring. This instrument and any external loads or cables may be damaged by improper voltage settings, cable mis-wiring, etc.

### WARNING

Disconnect the input power cord from facility power before making any connections to this instrument.

### CAUTION

Avoid blocking instrument air intakes or exhaust.

Install the UPS 302-1B so that the flow of cooling air into and out of the unit is unobstructed. If the UPS becomes overheated due to restricted air flow, the overload circuits will function, illuminating the front panel Overtemperature indicator.

#### 2.3.1 Power Requirement

The UPS 302-1B operates from 120 VAC +10%/-20%, single phase, 57-63 Hz, 60 ampere input power.

#### 2.3.2 Receptacle Pinouts

##### 2.3.2.1 J1 – Battery Input Power

This receptacle is a 7 pin, 60 amp, Type MS3102A-24-10S. The pinouts are as follows:

A	Positive (+)
B	Negative (-)
C	Chassis Ground

Pinouts F and G are also used for output.

##### 2.3.2.2 J2 – Remote Alarm

This receptacle is a 6 pin, 5 amp, 600 VAC, Type 207153-1.

The Summary Alarm Closure is J2-2 to J2-3; Normal Closure is J2-1 to J2-3.

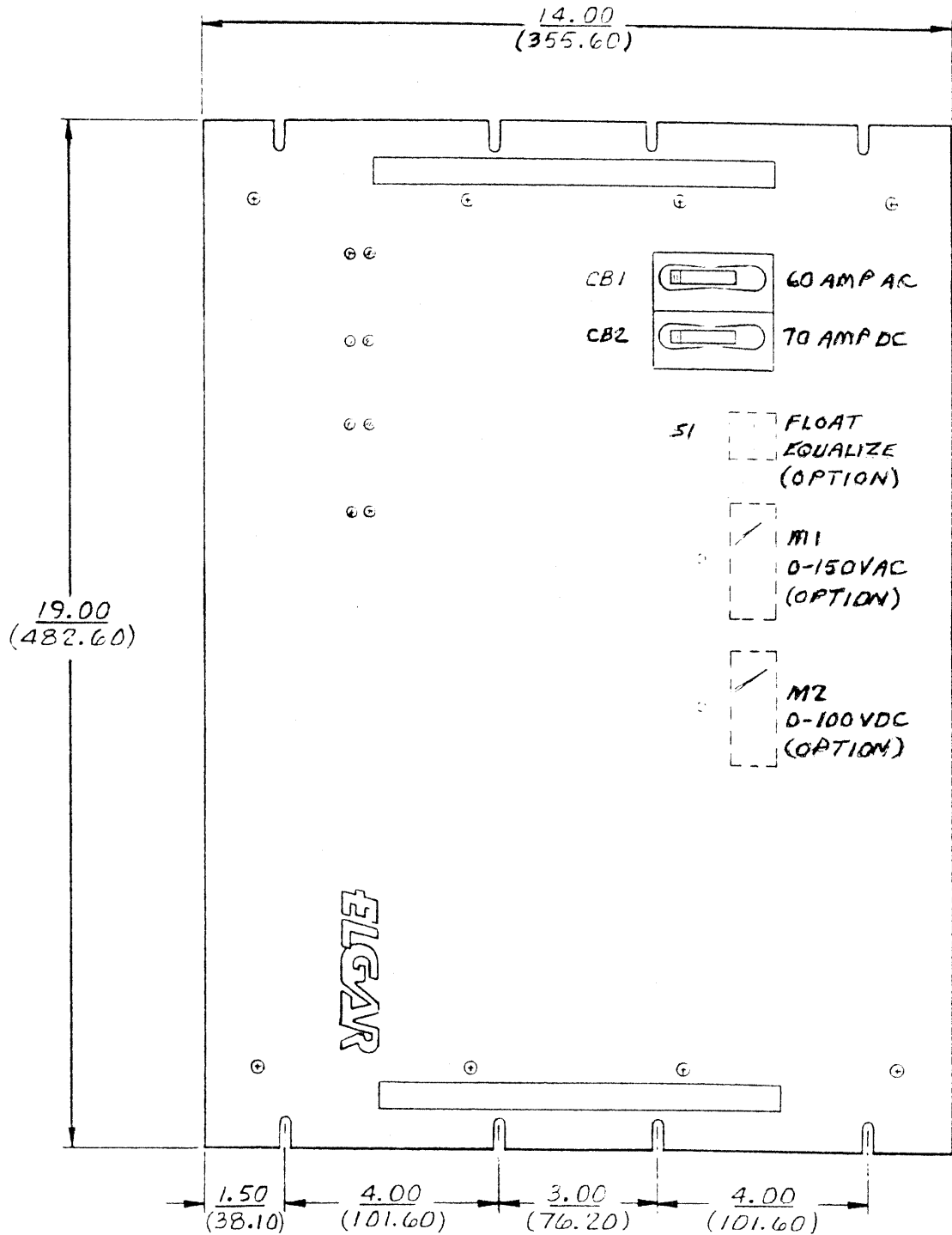


Figure 2-1. UPS 302-1B (Front View)

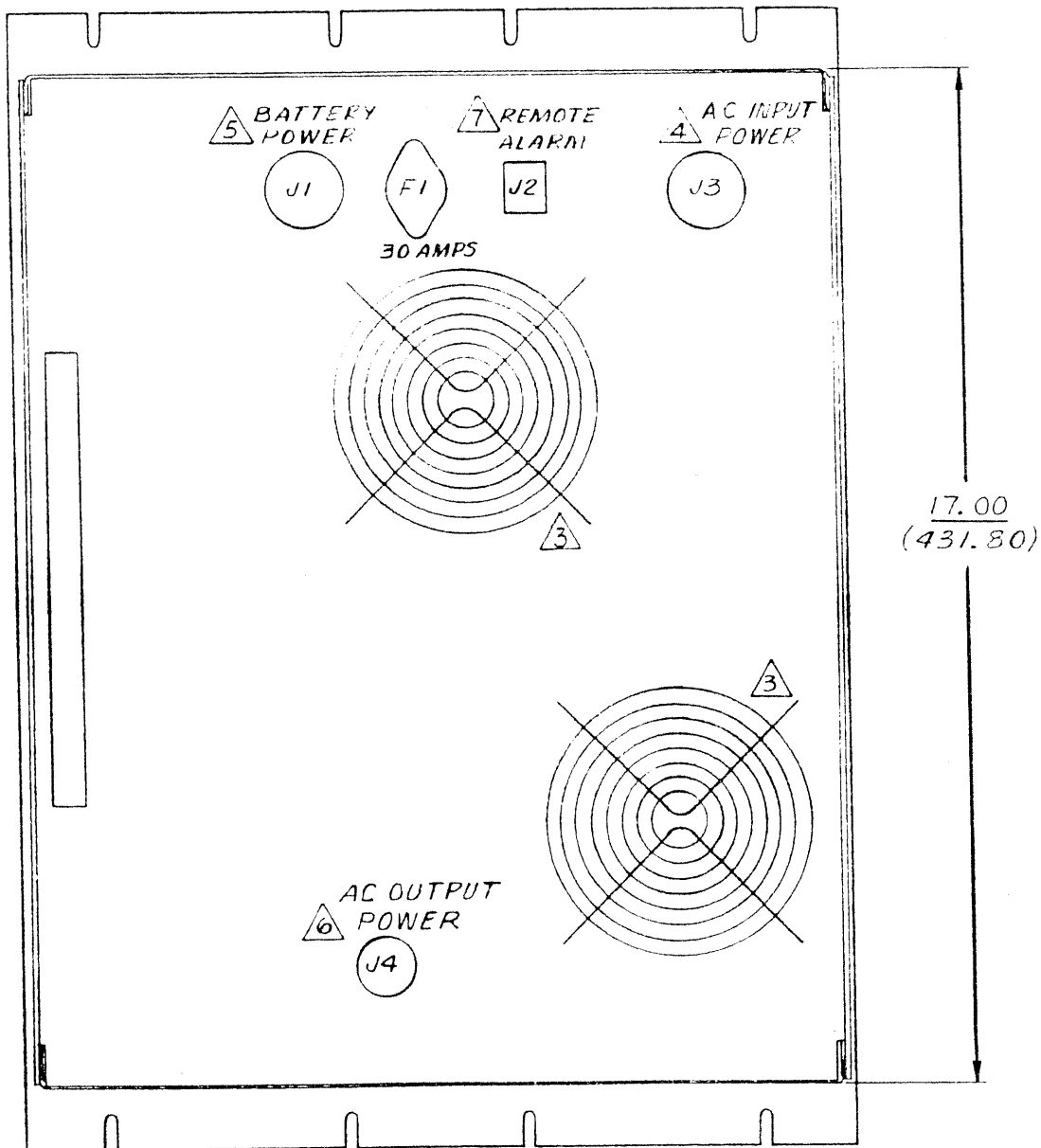


Figure 2-2. UPS 302-1B (Rear View)

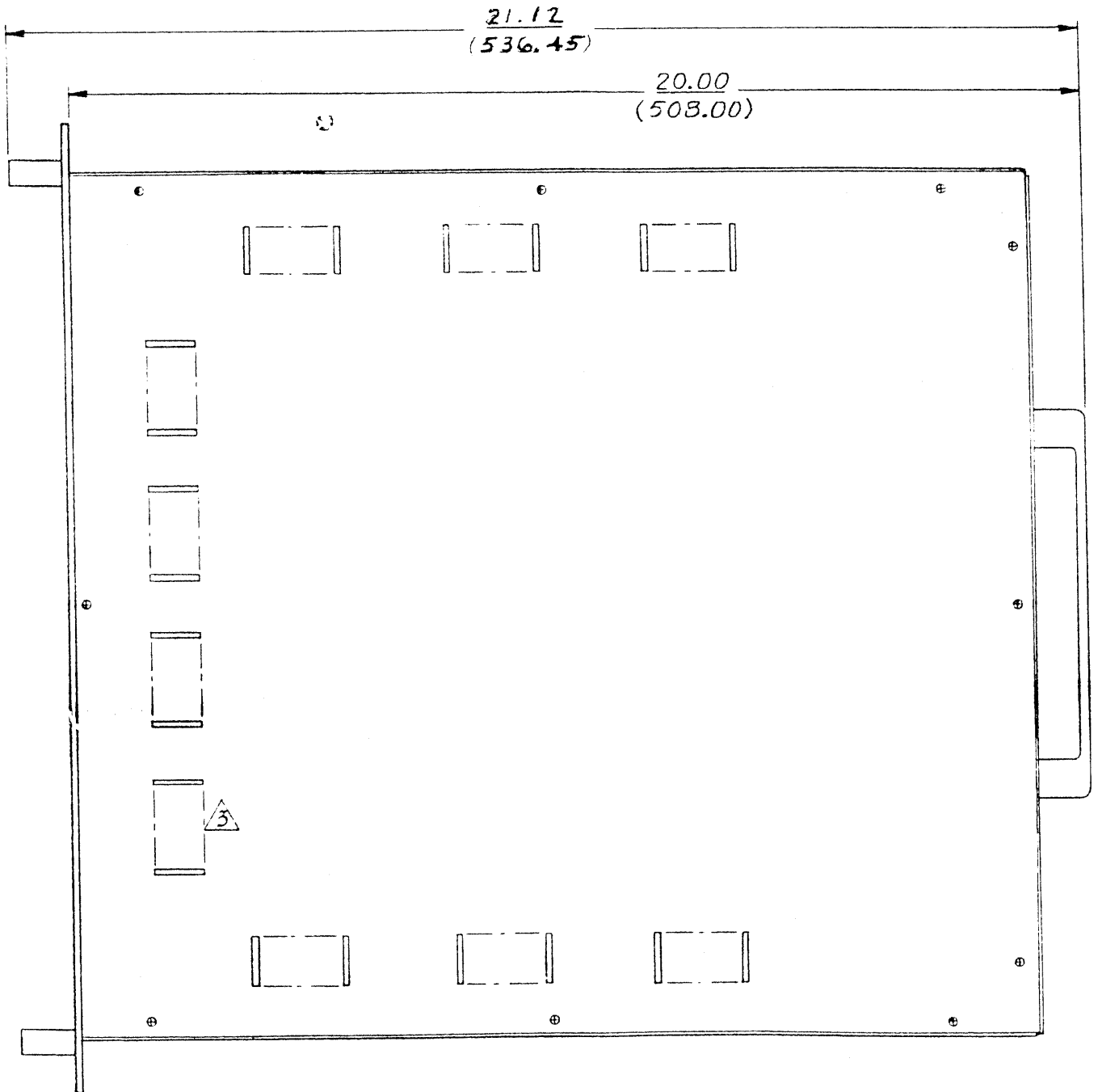


Figure 2-3. UPS 302-1B (Top View)

**2.3.2.3 J3 – AC Input Power**

This receptacle is a 4 pin, 60 amp, Type MS3102A-24-22P. The pinouts are as follows:

A	High
B	Low
C	Chassis Ground
D	Aux. Bypass

**2.3.2.4 J4 – AC Output Power**

This receptacle is a 3 pin, 60 amp, Type MS3102A-20-19S. The pinouts are as follows:

A	High
B	Low
C	Chassis

**2.3.3 Installation Instructions**

To initially install the UPS, perform the following:

1. Install the UPS unit in the appropriate instrument rack such that the flow of air into and out of the unit is unobstructed.
2. Set the **AC POWER** (CB1) and **BATTERY** (CB2) switch-circuit breakers to the down (off) position.
3. Connect the output load to the output voltage connectors, J2 and J3, on the rear panel.
4. Connect one or more battery packs with cable to J1 on the rear panel.

5. Connect the batteries by placing the **BATTERY** switch-circuit breaker (CB2) in the ON position. Ensure that the front panel **AC Input Fail** and the **Bypass** LEDs are illuminated. If the UPS has an optional DC voltmeter (M2), the voltage reading will be approximately 72 VDC.
6. Connect AC power by plugging the line cord into the proper receptacle. If the UPS has the optional AC voltmeter (M1), the voltage reading will be 120 VAC.

**WARNING**

**Whenever the UPS unit is plugged into an outlet, line voltages are present in the unit and at the output voltage connectors. To prevent serious electrical shock, avoid contact with any exposed terminals where these live voltages are present.**

7. Disconnect the batteries by setting the **BATTERY** switch-circuit breaker (CB2) to the OFF position.
8. Proceed with the functional checkout.

**2.3.4 Preliminary Functional Checkout**

To checkout the UPS unit after initial installation, perform the following:

1. Set the **AC POWER** switch-circuit breaker (CB1) to the ON (up) position.

- a. Ensure that the **AC Input On** LED illuminates and, after approximately 2 to 4 seconds, the **Normal** LED illuminates.
  - b. All other indicators will be off.
  - c. If installed, the optional AC voltmeter will indicate 120 VAC.
3. Disconnect AC input power to the UPS unit from the main power line outlet.
    - a. Observe that the **OUTPUT VOLTAGE** meter, if installed, continues to indicate 120 VAC without interruption in any way (if the meter is not installed, refer to the UPS 302-1B Service Manual for testing procedures).
    - b. Observe that the **AC Power Off** LED is continuously illuminated and that all other indicators are off. The UPS is now operating from the battery reserve power.

### WARNING

The UPS charger/rectifier and inverter will now be operating. If a circuit breaker trips or the UPS displays excessive audible noise, do not continue operation.

2. Set the **BATTERY** switch-circuit breaker (CB2) to the ON (up) position.
  - a. Normal operation will continue.
  - b. If installed, the optional DC voltmeter will indicate 82.5 VDC.
4. Re-apply AC input power to the UPS unit.
  - a. Observe that the **AC Power Off** LED goes out and that the **AC Power On** and **Normal** LEDs are illuminated.
  - b. Also note that the output voltage remains unchanged without interruption.

**NOTES**

**SECTION III**

**OPERATION**



### 3.1 INTRODUCTION

Before operating the UPS, the user must become familiar with the particular model and configuration. The different models and options available are discussed in Sections I and II.

#### **WARNING**

**Hazardous voltages are present when operating this equipment. Read the "SAFETY" notices on page ii prior to performing installation, operation, or maintenance.**

### 3.2 CONTROLS AND INDICATORS

The UPS 302-1B contains two controls and numerous indicators. All controls and indicators (including meters) are on the front panel.

#### 3.2.1 **AC Input Switch-Circuit Breaker (CB1)**

This control connects facility power to the charger/rectifier circuitry. The control also provides an enable signal to the inverter circuitry which allows the inverter to start. The inverter will remain disabled until facility power is present.

#### 3.2.2 **Battery Switch-Circuit Breaker (CB2)**

This control connects the UPS to and disconnects the UPS from the auxiliary batteries.

#### 3.2.3 **AC Input On**

This indicator consists of a green LED that illuminates when the AC Input switch-circuit breaker is in the ON (up) position.

#### 3.2.4 **AC Input Fail**

This indicator consists of a red LED that illuminates when the input facility power has failed (the voltage is less than 96 VAC) or that the input switch-circuit breaker is off.

#### 3.2.5 **Low Battery**

This indicator consists of a yellow LED that illuminates to indicate that the battery voltage is less than 67.0 VDC.

#### 3.2.6 **High Battery**

This indicator consists of a red LED that illuminates to indicate that the battery voltage is greater than 95.0 VDC.

#### 3.2.7 **Bypass**

This indicator consists of a red LED that illuminates to indicate that the critical load is being powered by facility power.

#### 3.2.8 **Overload**

This indicator consists of a red LED that illuminates to indicate that the critical load current exceeds 125% of the full load rating.

#### 3.2.9 **Normal**

This indicator consists of a green LED that illuminates to indicate normal operation.

**3.2.10 AC Voltmeter (M1)**

This optional analog meter has a 0–150 VAC range to indicate the UPS output voltage. In normal operation, the voltage will be the 120 VAC inverter output. In bypass, the voltmeter reads the bypass voltage.

**3.2.11 DC Voltmeter (M2)**

This optional analog meter has a 0–100 VDC range to indicate the battery condition when CB2 is on, and the charger/rectifier output when CB2 is off.

**3.3 SUMMARY ALARM CONNECTOR**

J2 on the rear panel is the summary alarm output from the UPS. J2 closure 1 to 3 indicates an alarm; J2 closure 2 to 3 indicates normal operation.

**3.4 OPERATING INSTRUCTIONS****3.4.1 Battery Connect**

Perform the following:

1. Set the **BATTERY** switch–circuit breaker (CB2) to the ON (up) position.
  - a. If the optional DC Voltmeter is installed, observe approximately 72 VDC on M2.
  - b. The **AC Input Fail** and **Bypass** LEDs will be illuminated; all other indicators will be out.
- c. The batteries are now connected to the UPS although an AC enable signal is required.

**3.4.2 UPS Power On**

Perform the following:

1. Set the **AC POWER** switch–circuit breaker to the ON (up) position.
  - a. Observe that the **AC Input Fail** LED goes off and that the **AC Input On** LED illuminates.
  - b. The **Bypass** LED will remain illuminated as the inverter starts. After approximately 2 to 4 seconds the internal bypass circuitry will transfer the inverter output to the output receptacle and the critical load.
  - c. The **Bypass** LED will go out and the **Normal** LED will illuminate.
  - d. If the optional AC Voltmeter is installed, observe 120 VAC on M1.
  - e. With the **AC Input On** and **Normal** LEDs illuminated (all others off), the UPS is operating normally and supplying power to the critical load.

### 3.4.3 Battery Operation

If the AC input should fail or drop below 96 VAC, the battery reserve power will supply power to the inverter. This is not a normal operating condition.

To check battery operating, perform the following:

1. Set the **AC POWER** switch-circuit breaker to the OFF (down) position.
  - a. Observe that the UPS AC output remains at 120 VAC.
  - b. Also observe that the **AC Input Fail** LED illuminates.
2. Reset the **AC POWER** switch-circuit breaker to the ON (up) position.
  - a. Normal UPS operation is resumed.
  - b. The UPS will not require further operator attention except for normal maintenance.

### NOTE

Certain loads may require a high in-rush current which may cause the UPS to transfer to bypass from normal operation. This allows the load to start from the bypass power then transfer automatically to the UPS inverter when the load current is within the UPS rating.

### CAUTION

**Do not continue to operate the UPS if either switch-circuit breaker trips at any time. A UPS failure is indicated and further damage may result. Refer to the UPS 302-1B Service Manual for proper action.**

**NOTES**