

# TOSHIBA

---

**UNINTERRUPTIBLE POWER SYSTEM**  
**SINGLE PHASE - 2.4/3.6/6.0/8.0 kVA PLUS**

---

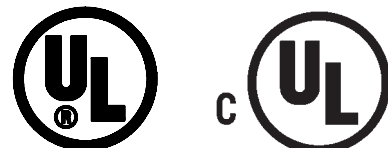
**1400XL PLUS SERIES**

---

**OPERATION MANUAL**

---

July, 2003  
Part # 43535-005



**NOTE**

The instructions contained in this manual are not intended to cover all of the details or variations in equipment, nor to provide for every possible contingency to be met in connection with installation, operation, or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the local Toshiba sales office.

The contents of this instruction manual shall not become a part of or modify any prior or existing agreement, commitment, or relationship. The sales contract contains the entire obligation of Toshiba International Corporation's UPS Division. The warranty contained in the contract between the parties is the sole warranty of Toshiba International Corporation's UPS Division and any statements contained herein do not create new warranties or modify the existing warranty.

***Any electrical or mechanical modifications to this equipment, without prior written consent of Toshiba International Corporation, will void all warranties and may void UL/CUL listing. Unauthorized modifications also can result in personal injury, death, or destruction of the equipment.***

**UNINTERRUPTIBLE POWER SUPPLY**

If additional information or technical assistance is required call Toshiba's marketing department toll free at (800) 231-1412 or write to: Toshiba International Corporation, 13131 W. Little York Road, Houston, TX 77041-9990.

Please complete the following information for your records and to remain within this equipment manual:

Model Number: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Date of Installation: \_\_\_\_\_

Inspected By: \_\_\_\_\_

---

**CONTENTS**

<b><u>SECTION</u></b>	<b><u>PAGE</u></b>
<b>Disclaimer .....</b>	<b>i</b>
<b>Contents .....</b>	<b>ii-iii</b>
<b>Introduction .....</b>	<b>iv</b>
<b>General Safety Instructions.....</b>	<b>v</b>
<b>Important Safety Instructions .....</b>	<b>vi-vii</b>
<b>1.0 Product Description .....</b>	<b>1-1</b>
1.1 Theory of Operation .....	1-1
1.2 Application and Use .....	1-1
1.3 Power Backup .....	1-1
1.4 Power Conditioning .....	1-1
<b>2.0 Inspection/Storage/Disposal .....</b>	<b>2-1</b>
2.1 Inspection of the new UPS equipment .....	2-1
2.2 Storage of UPS equipment .....	2-1
2.3 Disposal .....	2-1
<b>3.0 Precautions .....</b>	<b>3-1</b>
3.1 Installation Precautions .....	3-1
3.2 Prestart Precautions .....	3-1
3.3 Operating Precautions .....	3-1
<b>4.0 UPS Connections .....</b>	<b>4-1</b>
4.1 Power Connections .....	4-1
4.2 Terminal Block Details .....	4-1
4.3 Wire Size and Tightening Torque .....	4-2
4.4 Communication Interface .....	4-2
4.4.1 Remote Contact (IBM AS/400) .....	4-2
4.4.2 RS-232C .....	4-3
4.4.3 UPS Shutdown (via RS-232C) .....	4-3
<b>5.0 Specifications .....</b>	<b>5-1</b>
5.1 XL Plus Series Specifications .....	5-1
<b>6.0 Operating the UPS .....</b>	<b>6-1</b>
6.1 Initial Battery Charge .....	6-1
6.2 Start-up Procedure .....	6-1

---

**CONTENTS (Cont'd)**

<b><u>SECTION</u></b>	<b><u>PAGE</u></b>
<b>6.0 Operating the UPS (Cont'd) .....</b>	<b>6-1</b>
6.3 Battery Check Function .....	6-1
6.4 Shutdown Procedure .....	6-2
6.5 Restart Procedure .....	6-2
6.5.1 Restart After Non-Fatal Fault .....	6-2
6.5.2 Restart After Fatal Fault .....	6-2
6.6 Battery Backup Time and Discharge Process .....	6-3
6.7 Battery Low Voltage Tolerances .....	6-3
6.8 Battery Recharging .....	6-4
6.9 Operation Modes .....	6-5
6.9.1 AC Input Mode (normal operation) .....	6-5
6.9.2 Circuit Bypass Mode .....	6-5
6.9.3 Battery Backup Mode .....	6-6
6.10 Audible Alarm Functions .....	6-6
6.11 EPO (Emergency Power Off) Function .....	6-7
6.12 System Protection Features .....	6-7
6.13 Front Panel Layout .....	6-8
6.13.1 Front Panel Indicator LED Lamps .....	6-8
6.13.2 Front Panel Indicator LED Functions .....	6-8
6.13.3 Front Panel Buzzer Reset .....	6-9
6.14 UPS Run Mode Display .....	6-9
<b>7.0 Troubleshooting Procedures .....</b>	<b>7-1</b>
7.1 Non-Fatal Fault Mode .....	7-1
7.2 Fatal Fault Mode .....	7-2
<b>8.0 Preventive Maintenance/Parts Replacement .....</b>	<b>8-1</b>
8.1 Preventive Maintenance .....	8-1
8.2 Parts Replacement .....	8-1
<b>9.0 External Layouts/Dimensions/Shipping Weights .....</b>	<b>9-1</b>
9.1 External Layouts (hardwired units) .....	9-1
9.2 Dimensions . 9-2	
9.3 Shipping Weights .....	9-2

## INTRODUCTION

Thank you for purchasing the 1400XL Plus Series UPS. This Series features the very latest state of the art microprocessor technology and IGBT transistors for fast, high power and low noise PWM (pulse width modulation) switching. The Plus Series features a low impedance output transformer to provide total power conditioning and noise isolation even during bypass operation.

It is the intent of this manual to provide a guide for installing, operating, and maintaining the UPS. ***Please read this manual thoroughly before installation and operation.*** All warnings and precautions should be observed for both personal safety and for proper equipment performance and longevity.

Read the important safety instructions on page v and vi. Save these safety instructions for future reference.

This manual is divided into major sections of interest. Product description and application information can be found in Section 1. Sections 2 and 3 contain information about initial inspection, storage, installation and operating precautions.

Section 4 contains information about the equipment's electrical connections and communication interfaces. The equipment specifications are located in Section 5.

Section 6 outlines the start-up, shutdown and restart procedures and explains operating modes, protective features, battery recharging, battery low voltage tolerances, alarm and panel indicator functions.

Section 7 is devoted to troubleshooting procedures utilizing the fault mode display.

Section 8 should be reviewed before scheduling preventive maintenance and/or periodic parts replacement.

Section 9 shows front, rear, and side panel layout views. Connectors, switches, dimensional data and shipping weights are also shown.

Finally, we hope that you find this manual informative and easy to understand. Once again thank you for the purchase of this product.

TOSHIBA INTERNATIONAL CORPORATION

© Copyright 1994

## GENERAL SAFETY INSTRUCTIONS

Warnings in this manual appear in either of three ways:

- 1) *Danger warnings* - The danger warning symbol is an exclamation mark enclosed in a triangle which precedes the 3/16" high letters spelling the word "DANGER". The Danger warning symbol is used to indicate situations, locations, and conditions that exist and can cause serious injury or death:



- 2) *Caution warnings* - The caution warning symbol is an exclamation mark enclosed in a triangle which precedes the 3/16" high letters spelling the word "CAUTION". The Caution warning symbol is used to indicate situations and conditions that can cause operator injury and/or equipment damage:



- 3) *Attention warnings* - The attention warning symbol is an exclamation mark enclosed in a triangle which precedes the 3/16" high letters spelling the word "ATTENTION". The Attention warning symbol is used to indicate situations and conditions that can cause operator injury and/or equipment damage:



Other warning symbols may appear along with the *Danger* and *Caution* symbol and are used to specify special hazards. These warnings describe particular areas where special care and/or procedures are required in order to prevent serious injury and possible death:

- 1) *Electrical warnings* - The electrical warning symbol is a lightning bolt mark enclosed in a triangle. The Electrical warning symbol is used to indicate high voltage locations and conditions that may cause serious injury or death if the proper precautions are not observed:



- 2) *Explosion warnings* - The explosion warning symbol is an explosion mark enclosed in a triangle. The Explosion warning symbol is used to indicate locations and conditions where molten, exploding parts may cause serious injury or death if the proper precautions are not observed:



## IMPORTANT SAFETY INSTRUCTIONS

**SAVE THESE INSTRUCTIONS** This manual contains important instructions for 2.4, 3.6, 6.0, and 8.0 kVA units that should be followed during the installation and use of the UPS and its batteries.

Hardwire type UPS units are not equipped with an overcurrent-protection device, nor an output disconnect for the ac output. Therefore, a circuit breaker should be provided by the user between the UPS output and the load input. This device should be rated as follows:

2.4 kVA:	220 or 240/208 Vac, 15A
3.6 kVA:	220 or 240/208 Vac, 20A
6 kVA:	220 or 240/208 Vac, 30A
8 kVA	240/208 Vac, 40A

The maximum ambient temperatures in which the UPS units should be operated are as follows:

2.4 kVA:	104° F (40° C).
3.6 kVA:	104° F (40° C).
6 kVA:	104° F (40° C).
8 kVA	104° F (40° C).


The nominal battery voltages for these models are as follows:



2.4kVA:	96Vdc
3.6kVA:	144Vdc
6 kVA:	216Vdc
8 kVA	252Vdc


Servicing of the batteries should only be performed by a qualified Toshiba Representative who is knowledgeable of batteries and the required precautions. Keep unauthorized personnel away from batteries.


When having batteries replaced, use the same number and type of one of the following sealed, lead-acid batteries:

Model Capacity	Manufacturer	Type	Quantity
2.4 kVA	Panasonic Yuasa	LCV 12V-7.2P	8
		NP7-12FR	8
3.6 kVA	Panasonic Yuasa	LCV 12V-7.2P	12
		NP7-12FR	12
6 kVA	Panasonic Yuasa	LCV 12V-7.2P	18
		NP7-12FR	18
8 kVA	Panasonic Yuasa	LCV 12V-7.2P	21
		NP7-12FR	21
		NPX-35FR (9Ah)	21

 **CAUTION** Misuse of this equipment could result in human injury and equipment damage. In no event will Toshiba Corporation be responsible or liable for either indirect or consequential damage or injury that may result from the use of this equipment.

 **CAUTION**  Do not dispose of the batteries in a fire. The batteries may explode.

 **WARNING** This unit contains sealed lead acid batteries. Lack of preventative maintenance could result in batteries exploding and emitting gasses and/or flame. Annual preventative maintenance must be performed by an authorized, trained technician.

 **WARNING** Failure to replace a battery before it becomes exhausted may cause the case to crack, possibly releasing electrolytes from inside the battery, and resulting in secondary faults such as odor, smoke, and fire.

**WARNING**

Installation and servicing of batteries should be performed by personnel knowledgeable of batteries and the required precautions. Keep unauthorized personnel away from the batteries.

**WARNING**

Proper maintenance to the battery system of this unit must be done by a qualified service technician, this is essential to the safety and reliability of your UPS system. Refer to service manual.

**DANGER**

**A battery can present a risk of electrical shock and high short circuit current.**

The following precautions should be observed when working with batteries:

- 1) Verify that the UPS is off and that the power cord is disconnected from the power source.
- 2) Remove watches, rings or other metal objects.
- 3) Use tools with insulated handles to prevent inadvertent shorts.
- 4) Wear rubber gloves and boots.
- 5) Do not lay tools or metal parts on top of batteries.
- 6) Determine if the battery is inadvertently grounded. If inadvertently grounded, remove source of ground. **Contact with any 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) Verify circuit polarities prior to making connections.
- 8) Disconnect charging source and load prior to connecting or disconnecting terminals.
- 9) VRLA batteries contain an explosive mixture of hydrogen gas. Do not smoke, cause a flame or spark in the immediate area of the batteries. This includes static electricity from the body.
- 10) Do not attempt to open the batteries in order to add water or sample the specific gravity of the electrolyte. The batteries are valve regulated lead acid type and such servicing is not possible without damaging the battery.
- 11) Use proper lifting means when moving batteries and wear all appropriate safety clothing and equipment.
- 12) Do not dispose of lead acid batteries except through channels in accordance with local, state and federal regulations.

## INSTRUCTIONS IMPORTANTES CONCERNANT LA SÉCURITÉ

### CONSERVER CES INSTRUCTIONS

Cette notice contient des instructions importantes concernant la sécurité.

**ATTENTION**

Une battery peut présenter un risque de choc électrique, de brûlure par transfert d'énergie.

**ATTENTION**

Pour le remplacement, utiliser le même nombre de batteries du modèle suivant.

Model Capacity	Manufacturer	Type	Quantity
2.4 kVA	Panasonic	LCV 12V-7.2P	8
	Yuasa	NP7-12	8
3.6 kVA	Panasonic	LCV 12V-7.2P	12
	Yuasa	NP7-12	12
6 kVA	Panasonic	LCV 12V-7.2P	18
	Yuasa	NP7-12	18
8 kVA	Panasonic	LCV 12V-7.2P	21
		NPX-35FR (9Ah)	21

**ATTENTION**

L'élimination des batteries est réglementée. Consulter les codes locaux à cet effet.

© Copyright 1994



## 1.0 Product Description

### 1.1 Theory of Operation

An uninterruptible power supply is a system that is installed between the commercial power and the load equipment. It is used during short-term blackouts or brownouts. The UPS provides steady ac output power during these commercial power interruptions. This power is provided for a sufficient amount of time to allow the load to be shutdown in an orderly fashion. This prevents loss of data and possible damage to both hardware and software.

During normal operation the UPS uses commercial ac power. In addition, it suppresses high voltage spikes and transients caused by switching and faults. It also filters common and normal mode noise which is associated with commercial ac power. The UPS converts this noise to flat dc power. From this dc power, the UPS charges the batteries and generates its own extremely high quality ac waveform output. The result of this process is maximum power conditioning and regulation.

If the ac power supplied to the UPS drops below a specified voltage level, the unit's batteries automatically begin supplying power instead of receiving it. This insures that the loads connected to the UPS continue to receive power with no interruption. When ac input power becomes available again, operation returns to normal. The unit's batteries begin to recharge so they will be ready for the next power interruption.

### 1.2 Application and Use

Toshiba's 1400XL Plus Series of on-line uninterruptible power supply (UPS) systems provide continuous computer-grade ac power in a compact, high performance, and energy efficient unit. The UPS unit assures safe and reliable operation of critical office equipment. This can range from word processors and personal computers to mini-computers and local area networks. All units feature an audible alarm which sounds if the battery voltage drops below an allowable level during use. This is an additional aid to help in retaining valuable office data banks. All units allow for computer interfacing.

### 1.3 Power Backup

When an electrical power failure occurs, the UPS unit's internal maintenance-free batteries automatically supply backup power to the load without interruption. For example, when used to support a computer, the UPS backup assures enough additional time to complete the activity and store data. This allows an orderly shutdown after a power failure has occurred. Toshiba's 1400XL Plus Series offers UPS models with the following capacities and voltages: When input and output voltage are both 240 volts, UPS models UC3G2L024C6(P#), UC3G2L036C6(P#), UC3G2L060C6(P#), and UC3G2L080C6(P#) will supply the maximum rated power to the loads (output capacity: 2.4/3.6/6/8 kVA). If input or output voltage for these models is 208 volts, UPS output capacity will be reduced to 87% of maximum rated power capacity. Units with input voltage ratings greater than 208V will supply full kVA to the load.

### 1.4 Power conditioning

When commercial power is present, the UPS supplies conditioned power to the load while maintaining its batteries in a charged condition. The UPS protects against the normal, every day problems associated with heavy use of raw commercial power, including power sags, surges, signal interference, and spikes. This protection keeps power-line problems from reaching your load, where they can cause equipment to operate erratically, or damage software and hardware.

## 2.0 Inspection/Storage/Disposal

### 2.1 Inspection of the new UPS equipment

Upon receipt of the UPS, a careful inspection for shipping damage should be made.

#### After Uncrating:

- 1) Check the unit for loose, broken, bent or otherwise damaged parts. If damage has occurred during shipment, keep all original crating and packing materials for return to shipping agent. Warranty will not apply to units which are damaged during shipment.
- 2) Check to see that the rated capacity and the model number specified on the nameplate conform to the order specifications.

### 2.2 Storage of UPS equipment.

If the UPS equipment is to be subject to long or short term storage, the following guidelines should be used.

#### Avoid:

- 1) Storage in sites subject to extreme changes in temperature or high humidity.
- 2) Storage in sites subject to exposure of high levels of dust or metal particles
- 3) Storage on inclined floor surfaces or in sites subject to excessive vibration.

#### Before storing:

- 1) Charge the units batteries.
- 2) Place the UPS ON/OFF switch in the OFF position.
- 3) Place the UPS MCCB switch to the OFF position.

#### Storing:

- 1) Store within a temperature range of -20° to 40° C (-4° to 104° F).
- 2) For best results, store the UPS in the original shipping container and place on a wood or metal pallet.
- 3) The optimum storage temperature is 21° C (70° F). Higher ambient temperatures cause UPS batteries to need recharging more frequently.
- 4) If storing in an ambient temperature under 20° C (68° F); recharge the batteries every 9 months.
- 5) If storing in an ambient temperature of 20° to 30° C (68° to 86° F); recharge the batteries every 6 months.
- 6) If storing in an ambient temperature of 30° to 40° C (86° to 104° F); recharge the batteries every 3 months.

### 2.3 Disposal

Please contact your state environmental agency for details on disposal of electrical components and packaging in your particular area.

#### ***It is illegal to dump lead-acid batteries in landfills or dispose of improperly.***


Please help our Earth by contacting the environmental protection agencies in your area, the battery manufacturer, or call Toshiba toll-free at (800) 231-1412 for more information about recycling.

### 3.0 Precautions

#### 3.1 Installation Precautions



### CAUTION

- 1) Install the unit in a well ventilated location; allow at least 10 cm (4 inches) on all sides for air ventilation and for maintenance.
- 2) Install the unit in a stable, level, and upright position which is free of vibration.
- 3) Install the unit where the ambient temperature is within the correct operating range (see Specifications Section 5.1).
- 4) Do not install the UPS in areas that are subject to high humidity.
- 5) Do not allow direct sunlight to shine on the unit.
- 6) Do not install the UPS in areas which are subject to contamination such as high levels of airborne dust, metal particles, or inflammable gas.
- 7)  **CAUTION** Avoid installation near sources of electrical noise and always make sure that the unit ground is intact to prevent electrical shock and to help reduce electrical noise.
- 8) Do not install where water or any foreign object may penetrate the UPS.
- 9) This UPS generates and can radiate radio-frequency energy during operation. Although RFI noise filters are installed inside the unit, there is no guarantee that the UPS will not influence some sensitive devices which are operating close by. If such interference is experienced, the UPS should be installed farther away from the effected equipment and/or powered from a different source than that of the affected equipment.
- 10) User should provide output overcurrent protection for hardwired UPS versions. See Safety Instructions on page vi for the correct device rating.

#### 3.2 Prestart Precautions



### CAUTION

- 1) Before connecting the UPS to a power source; move the MCCB switch (ON/OFF), on the rear panel (See Section 9.1), to the OFF position and move the operation switch (RUN/STOP), on the front panel (See Section 9.1), to the STOP position.
- 2) Before starting the UPS unit, on dual voltage units, one of the two jumper-selection options available for UPS terminals 11 through 13 (see Section 9.1 for location) must be used to select correct input voltage (see Section 4.0 for connection details).

#### 3.3 Operating Precautions



### CAUTION

- 1) The UPS should not be powered up until the entire operation manual has been reviewed.
- 2) The input power source voltage must be within +10% to -30% of the rated input voltage. The input frequency must be within the rated input frequency range. Voltages and frequencies outside of the permissible tolerance range may cause internal protection devices to activate.

**3.0 Precautions****3.3 Operating Precautions (Cont'd)****CAUTION**

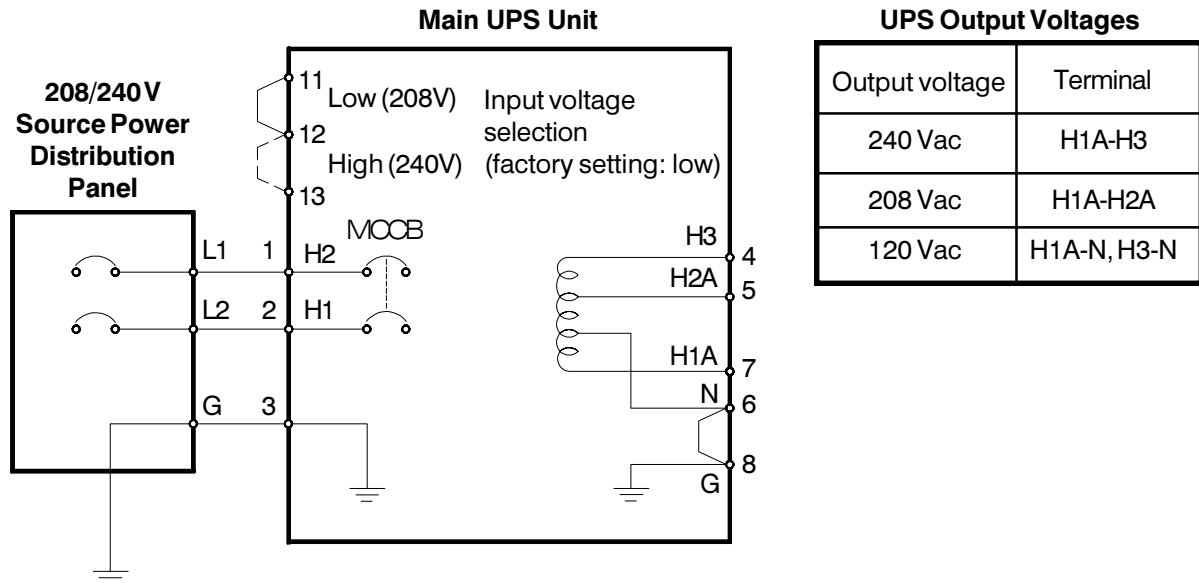
- 3) The UPS should not be used with a load whose rated input is greater than the rated UPS output.
- 4) Do not use the UPS to provide power to motors that require high starting current or a long starting time such as vacuum cleaners and machine tools. If an application arises contact Toshiba for proper sizing.
- 5) Do not insert metal objects or combustible materials in the unit's ventilation slots.
- 6) Do not place, hang, or paste any objects on the top or the exterior surfaces of the UPS.

## 4.0 UPS Connections

### 4.1 Power Connections

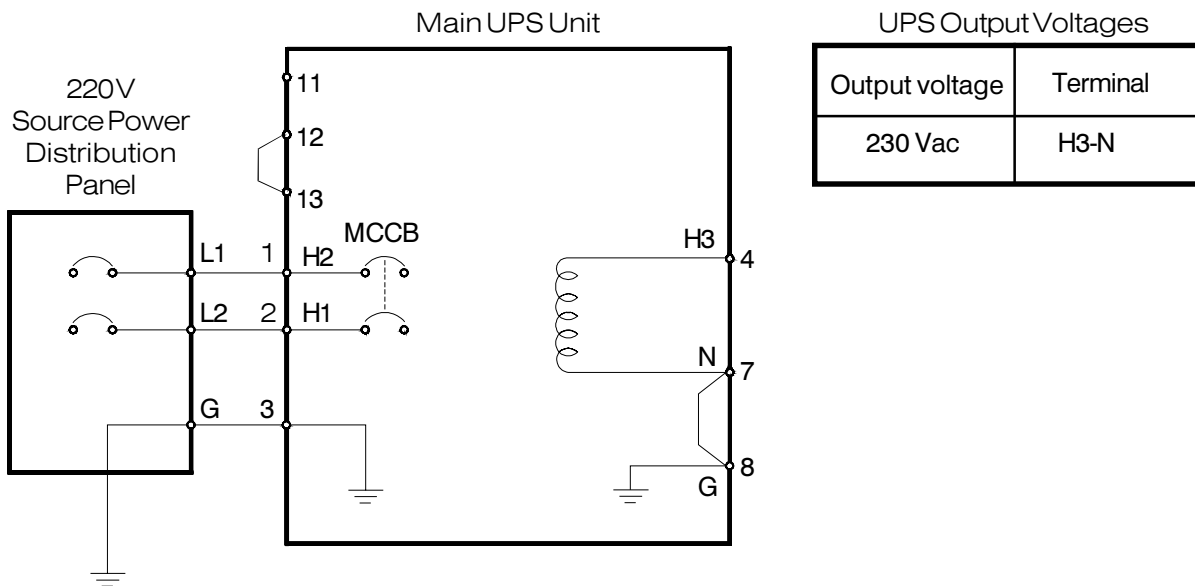
#### 4.1.1 UPS model numbers UC3G2L024C6, UC3G2L036C6, UC3G2L060C6, and UC3G2L080C6

The following illustration details the wiring connections from the power distribution panel (not part of the UPS) to the UPS unit and the available input voltage selection jumper setting. The available UPS output voltages are shown in the table.



#### 4.1.2 UPS model number UC3E1E024C5

The following illustration details the wiring connections from the power distribution panel (not part of the UPS) to UPS model number UC3E1E024C5. The available UPS output voltages are shown in the table.

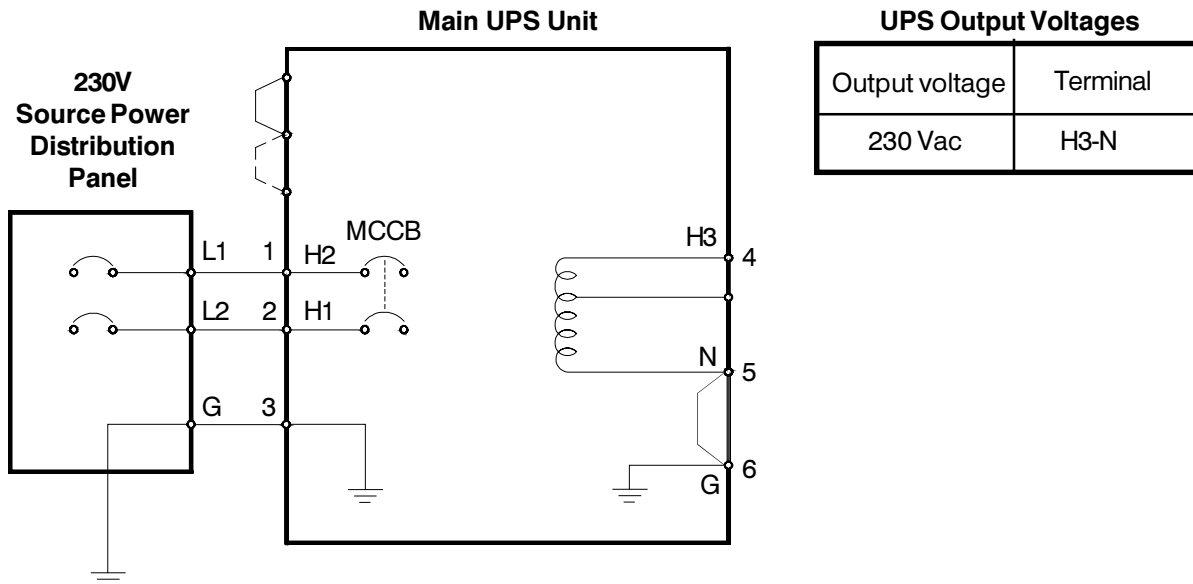


## 4.0 UPS Connections

### 4.1 Power Connections (cont'd)

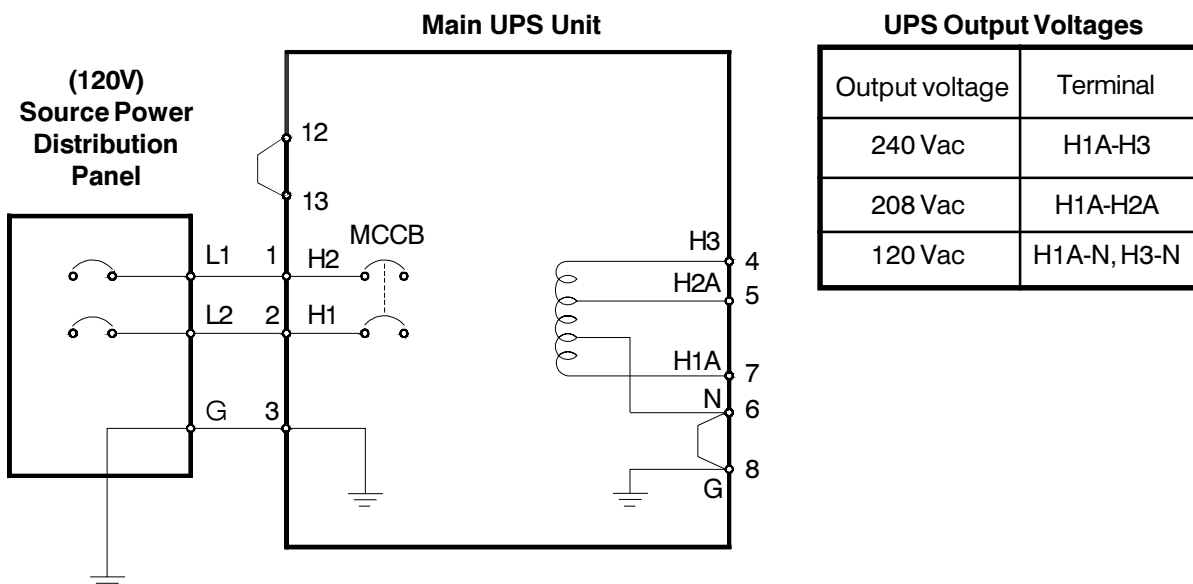
#### 4.1.3 UPS model numbers UC3E1E036-51, UC3E1E060-51, and UC3E1E080-51

The following illustration details the wiring connections from the power distribution panel (not part of the UPS) to UPS model numbers UC3E1E036-51, UC3E1E060-51, and UC3E1E080-51 and the available input voltage selection jumper setting. The available UPS output voltages are shown in the table.



#### 4.1.4 UPS model number UC3A2L024C6

The following illustration details the wiring connections from the power distribution panel (not part of the UPS) to UPS model number UC3A2L024C6. The available UPS output voltages are shown in the table.

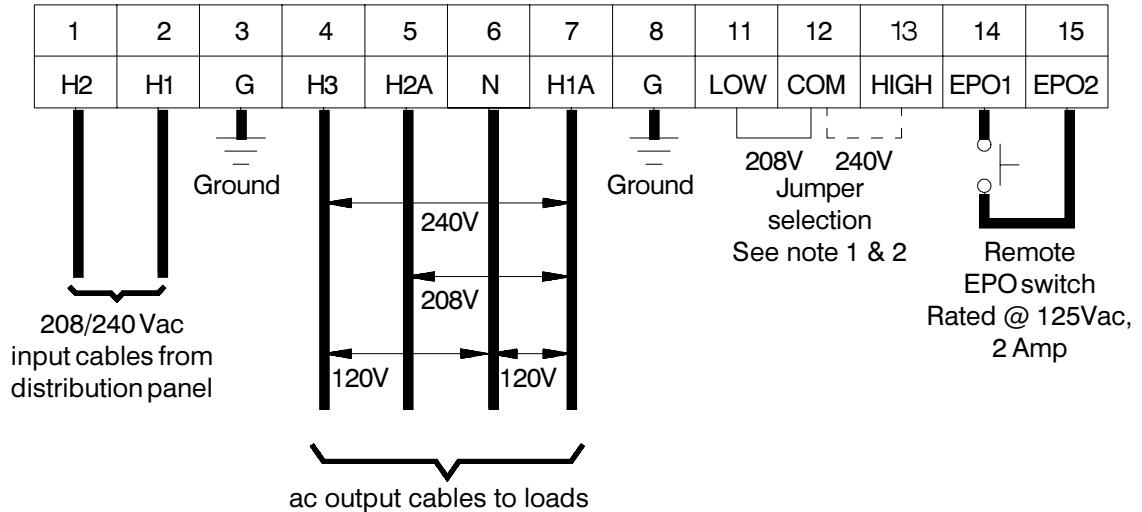


## 4.0 UPS Connections

### 4.2 Terminal Block details

#### 4.2.1 UPS model numbers UC3G2L024C6, UC3G2L036C6, UC3G2L060C6, and UC3G2L080C6

The following illustration is a detail of the UPS unit's terminal block (see Section 9.1 for terminal block location).

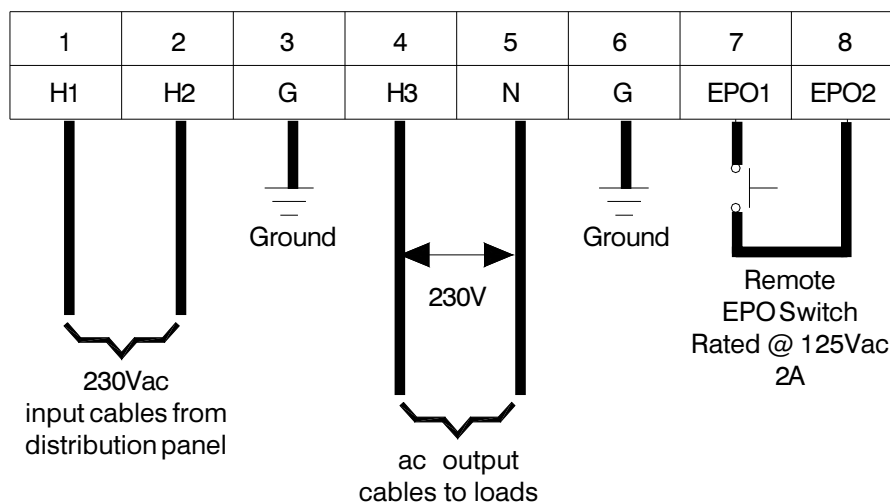


#### Notes:

- 1) If ac input power is 208 Vac rated, terminals 11 and 12 must be shorted by a jumper wire. **Do not jumper terminal 13 to either 12 or 11.**  
**Factory setting is 208 Vac.**
- 2) If ac input power is 240 Vac rated, terminals 12 and 13 must be shorted by a jumper wire. **Do not jumper terminal 11 to either 12 or 13.**

#### 4.2.2 UPS model number UC3E1E024C5

The following illustration is a detail of the UPS unit's terminal block (see Section 9.1 for terminal block location).

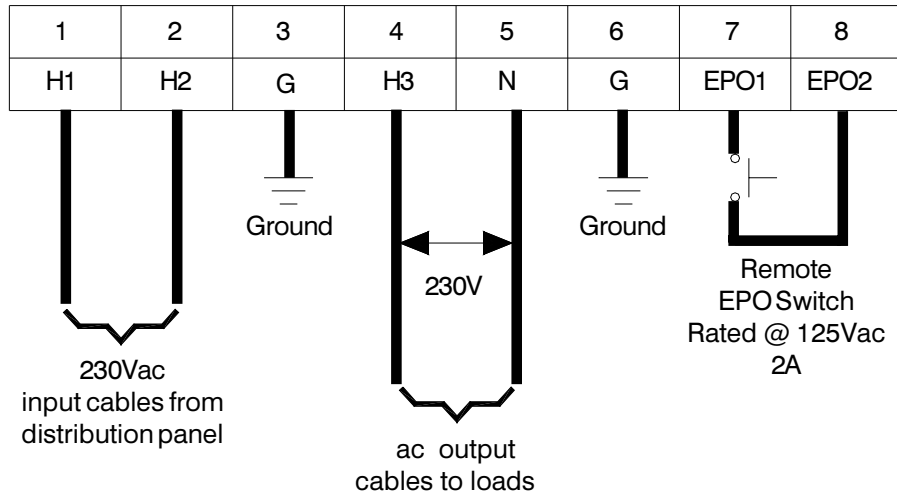


## 4.0 UPS Connections

### 4.2 Terminal Block details (cont'd)

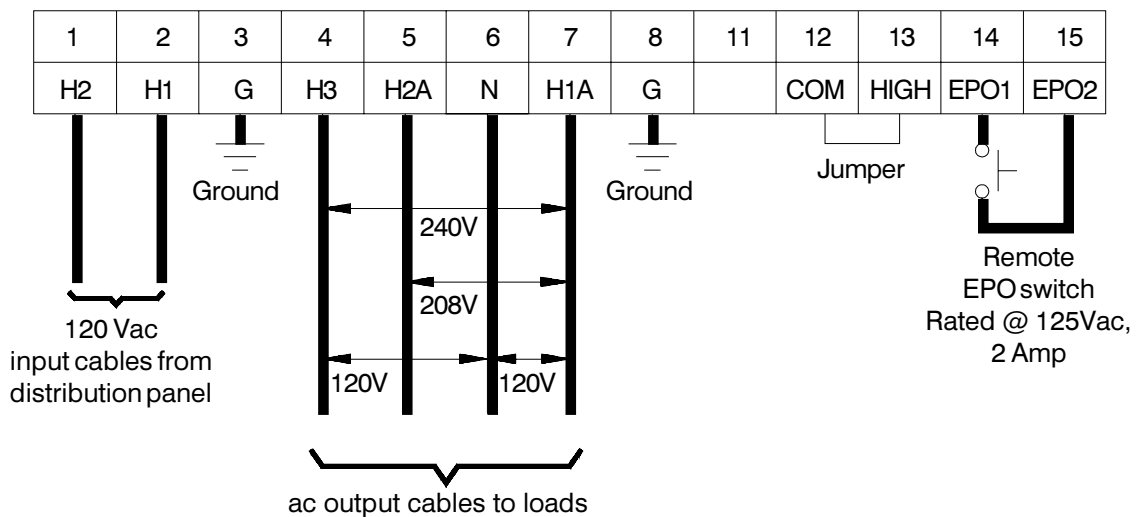
#### 4.2.3 UPS model numbers UC3E1E036-51, UC3E1E060-51, and UC3E1E080-51

The following illustration is a detail of the UPS unit's terminal block (see Section 9.1 for terminal block location).



#### 4.2.4 UPS model number UC3A2L024C6

The following illustration is a detail of the UPS unit's terminal block (see Section 9.1 for terminal block location).



#### Notes:

- 1) When ac input power is 120 Vac rated, terminals 12 and 13 must be shorted by a jumper. **Do not use terminal 11.**



## 4.0 UPS Connections

### 4.3 Wire Size and Tightening Torque

Use the following table to select the correct wire size and terminal lug tightening torque for I/O wire connections.

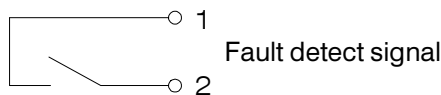
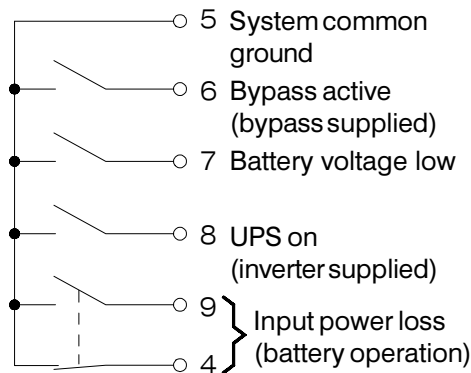
Item	Terminal Number	AWG for 2.4 kVA	AWG for 3.6 kVA	AWG for 6.0 kVA	AWG for 8.0 kVA	Tightening torque (lbs-inches)
AC input	#1 and #2	14	12	8	4	13.0
AC output	#4 through #7	14	12	8	6	13.0
Ground	#3 and #8	14	12	8	6	13.0
Jumper selection	#11 through #13	14 or attached wire	12 or attached wire	8 or attached wire	6 or attached wire	13.0
Remote EPO switch	#14 and #15	16 through 18	16 through 18	16 through 18	16 through 18	13.0

(1 Newton-meter = 8.8 pound-inches)

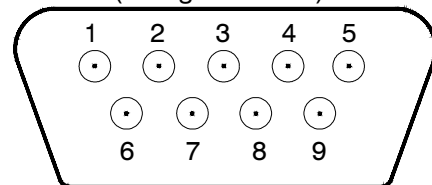
## 4.4 Communication Interface

### 4.4.1 Remote Contact (IBM AS/400)

The AS/400 interface is a standard feature and is available as dry switch contacts through a DB9 male connector located on the back side of the UPS (see Section 9.1 for DB9 connector location). The following schematic shows the contact state and pin assignment for each signal and the associated DB9 connector pinout.



**DB9 Male Connector Outline**  
(facing connector)



### Notes:

- 1) Pin "switches" are shown in their **inactive states** (if battery voltage is low pin 7 will be connected to ground).
- 2) Contacts are resistive loads rated at 30 Vdc, 0.1 amp.
- 3) Pin number 3 is not used.

## 4.0 UPS Connections

### 4.4 Communication Interface (Cont'd)

#### 4.4.2 RS-232C

The RS-232C serial communication interface is available through a DB9 female connector located on the rear of the UPS (see Section 9.1 for DB9 connector location). This interface allows control of the UPS from a personal computer running special Toshiba software. The computer and the UPS are connected through a serial RS-232C communication port. The available data from the UPS, via the RS-232C communication link, is shown below:

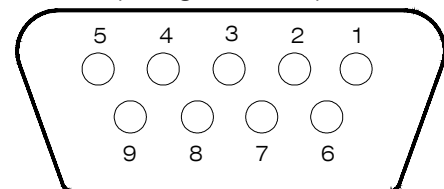
Operating conditions	Input voltage Output voltage Output current Battery voltage Input frequency Output frequency
UPS operating status (described as 'yes' or 'no')	Utility power OK Low battery voltage detected UPS in BYPASS mode UPS in NORMAL mode Input and output frequency synchronized UPS 'fault' occurred
'Fault' details (described as 'occurred' or 'not occurred')	DC bus overcurrent DC bus overvoltage DC bus undervoltage Input overcurrent Overheat Overload being timed Overload (allowable time exceeded) Output overvoltage (during NORMAL mode) Output undervoltage (during NORMAL mode)

The connector pin assignment and female connector outline are illustrated below.

#### RS-232C Connector Pin Assignment

Pin	I/O	Symbol	Description
1			This pin is not used
2	Input	RXD	Receive data
3	Output	TXD	Transmit data
4	Output	DTR	Data terminal ready
5	—	SG	Signal ground
6	Input	DSR	Data set ready
7	Output	RTS	Request to send
8	Input	CTS	Clear to send
9			This pin is not used

#### DB9 Female Connector Outline (facing connector)



#### 4.4.3 UPS Shutdown (via RS-232C)

When the UPS is operating from its internal batteries, a 'shutdown' order can be sent to the UPS telling it to turn OFF after a user-specified amount of time. This function can allow you to stop discharging the UPS batteries after an orderly system shutdown has been completed. The UPS can be programmed to turn OFF up to 8 minutes after the 'shutdown' command is given. This command can be cancelled before the specified time has elapsed.

## 5.0 Specifications

### 5.1 XL Plus Series Specifications

MODEL NUMBER		UC3G2L024C6	UC3G2L036C6	UC3G2L060C6
CAPACITY		2.4 kVA (1.68 kW) (*)	3.6 kVA (2.52 kW) (*)	6 kVA (4.2 kW) (*)
Input	Input voltage	Single phase, 208/240 Vac, +10% to -30% *		
	Input frequency	45 to 65 Hz		
	Input capacity	2.4 kVA	3.6 kVA	6 kVA
	Input power factor	Approximate unity (0.98 to 1.0 lagging)		
	Input harmonic distortion	Less than 5% (typ)		
Battery	Battery rated voltage	96 Vdc	144 Vdc	216 Vdc
	Battery backup time when fully charged with 0.7 power factor and 77° F (25° C)	7 mins. at full load (**) 30 mins. at half load (**)		
	Recharge time	Maximum 24 hrs to 100%, 90% in 10 hrs (***)		
	Type of batteries	Sealed lead-acid, maintenance free		
Output	Output voltage	Single-phase, 240/208/120 volts		
	Output voltage regulation	±3%, steady state (during normal or battery-backup operation)		
	Output frequency	50/60 Hz ±0.1% in free-running mode (line sync range ±1.0%)		
	Output voltage waveform	Computer-grade sine wave; less than 3.0% total harmonic distortion with linear load		
	Rated load power factor	0.7 lagging		
	Voltage transient characteristic	±8% under 100% load step change		
	Rated output current (rms)	10.0A	15.0A	25.0A
	Maximum peak output current (peak)	30.0A	45.0A	75.0A
	Inverter overload capacity	125% for 1 minutes; 150% for 30 seconds		
	Bypass overload capacity	125% for 10 minutes; 1000% for 1 cycle		
	Crest factor	3.0		
	Environment	Operating temperature	32 to 104° F (0 to 40° C)	
Storage temperature		-4 to 104° F (-20 to 40° C)		
Operating humidity		30 to 90%, no condensation		
Altitude		Less than 3000 ft (1000 m) above sea level (****)		
External dimensions		9.9W x 22.2H x 27.2D in (250W x 564H x 690D mm)	9.9W x 22.2H x 27.2D in (250W x 564H x 690D mm)	9.9W x 28.0H x 31.6D in (250W x 700H x 790D mm)
Weight		175 lb (80.0 kg)	220 lb (100.0 kg)	321 lb (146.0 kg)
Acoustical noise		50 dB (A) max. output, measured 3.3 ft (1 m) from front panel		
Efficiency (ac-dc-ac)		Greater than 85%		
Heat generation		300W (1030 Btu/hr)	450W (1550 Btu/hr)	750W (2580 Btu/hr)
Switches		Bypass switch	Manual bypass provided	
	Bypass transfer switch	Static switch standard (transfer time: less than 4 mS)		
	Automatic retransfer switch	Provided (this function can be disabled)		
Interface	IBM AS/400™ compatible signals (normally open contacts)	Signals: (1) UPS on (2) UPS battery low (3) UPS bypass active (4) utility failure		
	RS232C ASCII interface	Provided		
Options	Novell™ local area network	Contact Toshiba for details on these options		
	SNMP Network Adapter			

(\*) Input/output figures rated for 240 volts. Output capacity will be reduced when input voltage is below 204 volts.

(\*\*) Battery backup time may vary depending on the operating conditions and ambient temperature at the installation site.

(\*\*\*) An initial charge time of 24 hrs. is necessary to obtain proper battery performance level before unit is placed in operation.

(\*\*\*\*) At 6000 ft (2000 m) above sea level, output capacity should be derated by 3%.

Novell™ is a registered trademark of Novell Inc.; IBM AS/400™ is a registered trademark of International Business Machines, Inc.

## 5.0 Specifications

### 5.1 XL Plus Series Specifications

MODEL NUMBER		UC3G2L080C6
CAPACITY		8 kVA (5.6 kW) (*)
Input	Input voltage	Single phase, 208/240 Vac, +10% to -30% *
	Input frequency	45 to 65 Hz
	Input capacity	8.0 kVA
	Input power factor	Approximate unity (0.98 to 1.0 lagging)
	Input harmonic distortion	Less than 5% (typ)
Battery	Battery rated voltage	252 Vdc
	Battery backup time when fully charged with 0.7 power factor and 77° F (25° C)	9 mins. at full load (**) 32 mins. at half load (**)
	Recharge time	Maximum 24 hrs to 100%, 90% in 10 hrs (***)
	Type of batteries	Sealed lead-acid, maintenance free
Output	Output voltage	Single-phase, 240/208/120 volts
	Output voltage regulation	±3%, steady state (during normal or battery-backup operation)
	Output frequency	50/60 Hz ±0.1% in free-running mode (line sync range ±1.0%)
	Output voltage waveform	Computer-grade sine wave; less than 3.0% total harmonic distortion with linear load
	Rated load power factor	0.7 lagging
	Voltage transient characteristic	±8% under 100% load step change
	Rated output current (rms)	33.3A
	Maximum peak output current (peak)	100.0A
	Inverter overload capacity	125% for 1 minutes; 150% for 30 seconds
	Bypass overload capacity	125% for 10 minutes; 1000% for 1 cycle
	Crest factor	3.0
	Environment	Operating temperature
Storage temperature		-4 to 104° F (-20 to 40° C)
Operating humidity		30 to 90%, no condensation
Altitude		Less than 3000 ft (1000 m) above sea level (****)
External dimensions		9.9W x 28.0H x 35.2D in (250W x 700H x 890D mm)
Weight		447 lb (203.2 kg)
Acoustical noise		50 dB (A) max. output, measured 3.3 ft (1 m) from front panel
Efficiency (ac-dc-ac)		Greater than 85%
Heat generation		1000W (3444 Btu/hr)
Switches	Bypass switch	Manual bypass provided
	Bypass transfer switch	Static switch standard (transfer time: less than 4 mS)
	Automatic retransfer switch	Provided (this function can be disabled)
Interface	IBM AS/400™ compatible signals (normally open contacts)	Signals: (1) UPS on (2) UPS battery low (3) UPS bypass active (4) utility failure
	RS232C ASCII interface	Provided
Options	Novell™ local area network	Contact Toshiba for details on these options
	SNMP Network Adapter	

(\*) Input/output figures rated for 240 volts. Output capacity will be reduced when input voltage is below 204 volts.

(\*\*) Battery backup time may vary depending on the operating conditions and ambient temperature at the installation site.

(\*\*\*) An initial charge time of 24 hrs. is necessary to obtain proper battery performance level before unit is placed in operation.

(\*\*\*\*) At 6000 ft (2000 m) above sea level, output capacity should be derated by 3%.

Novell™ is a registered trademark of Novell Inc.; IBM AS/400™ is a registered trademark of International Business Machines, Inc.

## 5.0 Specifications

### 5.1 XL Plus Series Specifications (cont'd)

MODEL NUMBER		UC3E1E024C5	UC3E1E036-51	UC3E1E060-51	UC3E1E080-51
(*) CAPACITY		2.4 kVA (1.68 kW)	3.6 kVA (2.52 kW)	6 kVA (4.2 kW)	8 kVA (5.6kW)
Input	Input voltage	Single phase, 230 Vac, +10% to -30% *			
	Input frequency	45 to 65 Hz			
	Input capacity	2.4 kVA	3.6 kVA	6 kVA	8 kVA
	Input power factor	Approximate unity (0.98 to 1.0 lagging)			
	Input harmonic distortion	Less than 5% (typ)			
Battery	Battery rated voltage	96 Vdc	144 Vdc	216 Vdc	252 Vdc
	Battery backup time when fully charged with 0.7 power factor and 77° F (25° C)	7 mins. at full load / 9 min. at full load (8kVA only) (**) 30 mins. at half load / 32 min. at half load (8kVA only) (**)			
	Recharge time	Maximum 24 hrs to 100%, 90% in 10 hrs (***)			
	Type of batteries	Sealed lead-acid, maintenance free			
Output	Output voltage	Single-phase 230 V			
	Output voltage regulation	±3%, steady state (during normal or battery-backup operation)			
	Output frequency	50/60 Hz ±0.1% in free-running mode (line sync range ±1.0Hz)			
	Output voltage waveform	Computer-grade sine wave; less than 3.0% total harmonic distortion with linear load			
	Rated load power factor	0.7 lagging			
	Voltage transient characteristic	±8% under 100% load step change			
	Rated output current (rms)	11.0A	15.6A	26.0A	34.7A
	Maximum peak output current (peak)	33.0A	46.8A	78.0A	104.3A
	Inverter overload capacity	125% for 1 minute; 150% for 30 seconds			
	Bypass overload capacity	125% for 10 minutes; 1000% for 1 cycle			
	Crest factor	3.0			
	Environment	Operating temperature	32 to 104° F (0 to 40° C)		
Storage temperature		-4 to 104° F (-20 to 40° C)			
Operating humidity		30 to 90%, no condensation			
Altitude		Less than 3000 ft (1000 m) above sea level (****)			
External dimensions (mm)		9.9W x 22.2H x 27.2D (250W x 564H x 690D)	9.9W x 22.2H x 27.2D (250W x 564H x 690D)	9.9W x 28.0H x 31.2D (250W x 700H x 790D)	9.9W x 28.0H x 35.2D (250W x 700H x 890D)
Weight		175 lb (80.0 kg)	220 lb (100.0 kg)	321 lb (146.0 kg)	447 lb (203.2 kg)
Acoustical noise		50 dB (A) max. output, measured 3.3 ft (1 m) from front panel			
Efficiency (ac-dc-ac)		Greater than 85%			
Heat generation		300W (1030 Btu/hr)	450W (1550 Btu/hr)	750W (2580 Btu/hr)	1000W (3444 Btu/hr)
Switches		Bypass switch	Manual bypass provided		
	Bypass transfer	switchStatic switch standard (transfer time: less than 4 mS)			
	Automatic retransfer switch	Provided (this function can be disabled)			
Interface	IBM AS/400™ compatible signals (normally open contacts)	Signals: (1) UPS on (2) UPS battery low (3) UPS bypass active (4) utility failure			
	RS232C ASCII interface	Provided			
Options	Novell™ local area network	Contact Toshiba for details on these options			
	SNMP Network Adapter				

(\*) Input/output figures rated for 240 volts. Output capacity will be reduced when input voltage is below 204 volts.

(\*\*) Battery backup time may vary depending on the operating conditions and ambient temperature at the installation site.

(\*\*\*) An initial charge time of 24 hrs. is necessary to obtain proper battery performance level before unit is placed in operation.

(\*\*\*\*) At 6000 ft (2000 m) above sea level, output capacity should be derated by 3%.

Novell™ is a registered trademark of Novell Inc.; IBM AS/400™ is a registered trademark of International Business Machines, Inc.

## 5.0 Specifications

### 5.1 XL Plus Series Specifications (cont'd)

	MODEL NUMBER	UC3A2L024C6
	CAPACITY	2.4 kVA (1.68 kW)
Input	Input voltage	Single phase, 120 Vac, +10% to -30%
	Input frequency	45 to 65 Hz
	Input capacity	2.4 kVA
	Input power factor	Approximate unity (0.98 to 1.0 lagging)
	Input harmonic distortion	Less than 5% (typ)
Battery	Battery rated voltage	96 Vdc
	Battery backup time when fully charged with 0.7 power factor and 77° F (25° C)	7 mins. at full load (*) 30 mins. at half load (*)
	Recharge time	Maximum 24 hrs to 100%, 90% in 10 hrs (**)
	Type of batteries	Sealed lead-acid, maintenance free
Output	Output voltage	Single-phase 240/208/120 volts
	Output voltage regulation	±3%, steady state (during normal or battery-backup operation)
	Output frequency	50/60 Hz ±0.1% in free-running mode (line sync range ±1.0Hz)
	Output voltage waveform	Computer-grade sine wave; less than 3.0% total harmonic distortion with linear load
	Rated load power factor	0.7 lagging
	Voltage transient characteristic	±8% under 100% load step change
	Rated output current (rms)	10.0A
	Maximum peak output current (peak)	30.0A
	Inverter overload capacity	125% for 10 minutes; 150% for 30 seconds
	Bypass overload capacity	125% for 10 minutes; 1000% for 1 cycle
	Crest factor	3.0
	Environment	Operating temperature
Storage temperature		-4 to 104° F (-20 to 40° C)
Operating humidity		30 to 90%, no condensation
Altitude		Less than 3000 ft (1000 m) above sea level (***)
External dimensions		9.9W x 22.2H x 27.2D in (250W x 564H x 690D mm)
Weight		175 lb (80.0 kg)
Acoustical noise		50 dB (A) max. output, measured 3.3 ft (1 m) from front panel
Efficiency (ac-dc-ac)		Greater than 82%
Heat generation		300W (1030 Btu/hr)
Switches	Bypass switch	Manual bypass provided
	Bypass transfer switch	Static switch standard (transfer time: less than 4 mS)
	Automatic retransfer switch	Provided (this function can be disabled)
Interface	IBM AS/400™ compatible signals (normally open contacts)	Signals: (1) UPS on (2) UPS battery low (3) UPS bypass active (4) utility failure
	RS232C ASCII interface	Provided
Options	Novell™ local area network	Contact Toshiba for details on these options
	SNMP Network Adapter	

(\*) Battery backup time may vary depending on the operating conditions and ambient temperature at the installation site.

(\*\*) An initial charge time of 24 hrs. is necessary to obtain proper battery performance level before unit is placed in operation.

(\*\*\*) At 6000 ft (2000 m) above sea level, output capacity should be derated by 3%.

Novell™ is a registered trademark of Novell Inc.; IBM AS/400™ is a registered trademark of International Business Machines, Inc.

## 6.0 Operating the UPS

### 6.1 Initial Battery Charge

The UPS batteries must be charged before it is used for the first time or when the unit has not been used (ac source power removed) for more than 10 days. Use the following procedure to recharge the batteries:

- 1) Close breaker (power on) at the UPS input distribution panel.
- 2) Move the UPS unit's MCCB switch on the rear panel ON (see Section 9.1 for location). The UPS unit's battery charging circuit is now activated (**Allow 24 hours for the batteries to fully charge**).

#### Notes:

- 1) The UPS can be used while the batteries are being charged. However, if a power loss occurs before the batteries are fully charged, the back up time can be affected.
- 2) If the UPS is to be stored for long periods; the batteries should be recharged (see Section 2.2 Storage of UPS Equipment).

### 6.2 Start-up Procedure

When turning on the UPS for the first time or if source power has been removed for several minutes, the following full start-up procedure should be used:

- 1) Check that the MCCB switch, located on the rear panel (see Section 9.1), is in the OFF position.
- 2) Check that the UPS STOP/RUN switch, located on the front panel (see Section 9.1), is to the left (STOP position).
- 3) Switch **on** power to the UPS from the distribution panel (see Section 4.1).
- 4) Move the MCCB switch to ON. Output power is now provided to the load via the unit's bypass circuit (See section 6.9.2 Circuit Bypass Mode). **While in this mode if a power failure occurs in the commercial power source, the UPS system will lose power and power to the load device will be interrupted.** The unit's battery charging circuit and chopper circuit are now activated.
- 5) Move the unit's UPS STOP/RUN switch to RUN. Operation of the unit's inverter begins and output power is now provided to the load through the inverter circuit (see Section 6.9.1 AC Input Mode). The unit is now capable of providing conditioned uninterruptible power to the load should the commercial ac power source fail.

### 6.3 Battery Check Function

Part of the UPS start-up procedure is an automatic 'Battery Check' to see if its internal batteries need to be replaced. During start-up, the UPS will discharge its batteries for about five seconds. If the total battery voltage drops below acceptable limits during this time, a 'Battery problem' fault is displayed (see Section 7.1 Non-Fatal Fault Mode). This display will continue for approximately 20 minutes.

#### Notes:



- 1) The 'Battery problem' display may occur immediately after a full battery discharge even if the batteries do not require replacement. However, if this display occurs after at least 20 minutes of charging, the batteries should be replaced.

## 6.0 Operating the UPS

### 6.4 Shutdown Procedure

When turning off the UPS, the following shutdown procedure should be used:

- 1) Move the unit's UPS STOP/RUN switch, located on the front panel, to STOP. Operation of the UPS unit's inverter stops. Output power is now provided to the load through the unit's bypass circuit. **While in this mode if a power failure occurs in the commercial power source, then the UPS will lose power and power to the load device will be interrupted.** The UPS unit's battery charging circuit and chopper circuit remain activated.

 **DANGER**  **Do not touch the UPS terminals even though the operation switch has been moved to the STOP position. The UPS may be supplying power through the bypass circuit.**

- 2) Move the MCCB switch, located on the rear panel, to OFF. Output power to the load is removed.
- 3) Switch **off** power at the UPS input distribution panel.

### 6.5 Restart Procedures

#### 6.5.1 Restart After Non-Fatal Fault


When restarting the unit, after a Non-Fatal Fault (see non-fatal faults Section 7.1) has occurred and the unit is in bypass mode, use the following **"warm"** start-up procedure:



- 1) Move the UPS STOP/RUN switch, located on the front panel, to STOP.
- 2) Move the UPS STOP/RUN switch to RUN.
- 3) If unit does not restart then use the "cold start" procedures in Section 6.5.2

#### 6.5.2 Restart After Fatal Fault

When restarting the unit, after a fatal fault (see Fatal Faults Section 7.2) has occurred, use the following **"cold start"** start-up procedure:

- 1) Move the UPS STOP/RUN switch, located on the front panel, to STOP.
- 2) Move the MCCB switch, located on the rear panel, to OFF.
- 3) Check the #1 position **green** lamp in the OUTPUT/BATTERY level meter (see Front Panel Layout Section 6.13) and then:

a)  **CAUTION**  If the **green #1** lamp is flashing do not reapply power (main dc bus capacitors are still charged).

b)  **CAUTION**  If the **green #1** lamp continues to flash for longer than 2 minutes do not reapply power (main dc bus capacitors discharge path fuse is blown). **Contact your Toshiba service representative.**

- c) If the **green #1** lamp is extinguished power may be re-applied (main dc bus capacitors have discharged) in the following steps:
  - 1) Move the MCCB switch to ON. Output power is now provided to the load through the unit's bypass circuit. The unit's battery charging circuit and chopper circuit are now activated.
  - 2) Move the UPS STOP/RUN switch to RUN. Operation of the unit's inverter begins and output power is available.

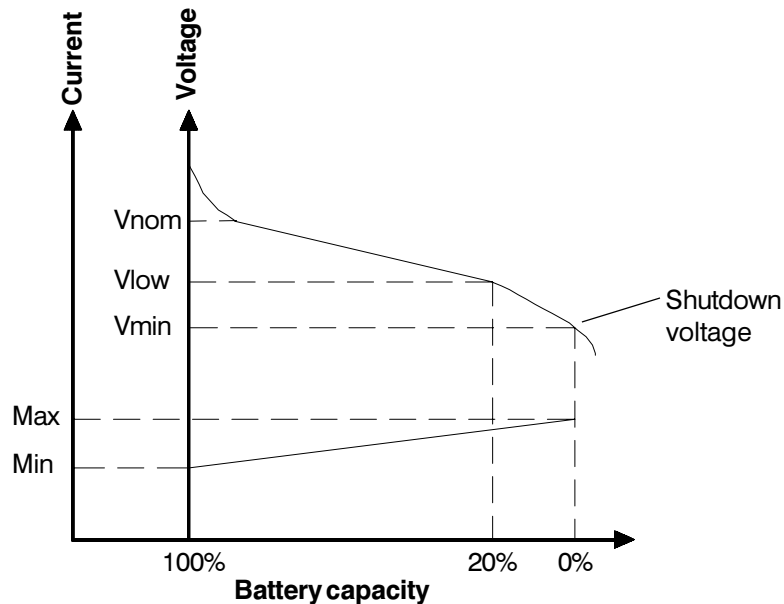


## 6.0 Operating the UPS

### 6.6 Battery Backup Time and Discharge Process

The UPS unit's batteries provide about 7 minutes of back-up time for the 2.4kVA, 3.6kVA, 6 kVA, and 8 kVA models. These times are valid when the unit is operating under full load and the output capacity has been derated to 87% of nominal (input or output voltage is 208Vac). When these models are operating at half load, the batteries can provide about 30 minutes of back-up time. The exact length of these times will depend on the UPS model used, condition of the batteries, amount and type of load, temperature and other variables. See battery backup time in the Standard Specifications section 5.1.

The following illustration graphically shows the battery discharge process at full load conditions.



### 6.7 Battery Low Voltage Tolerances

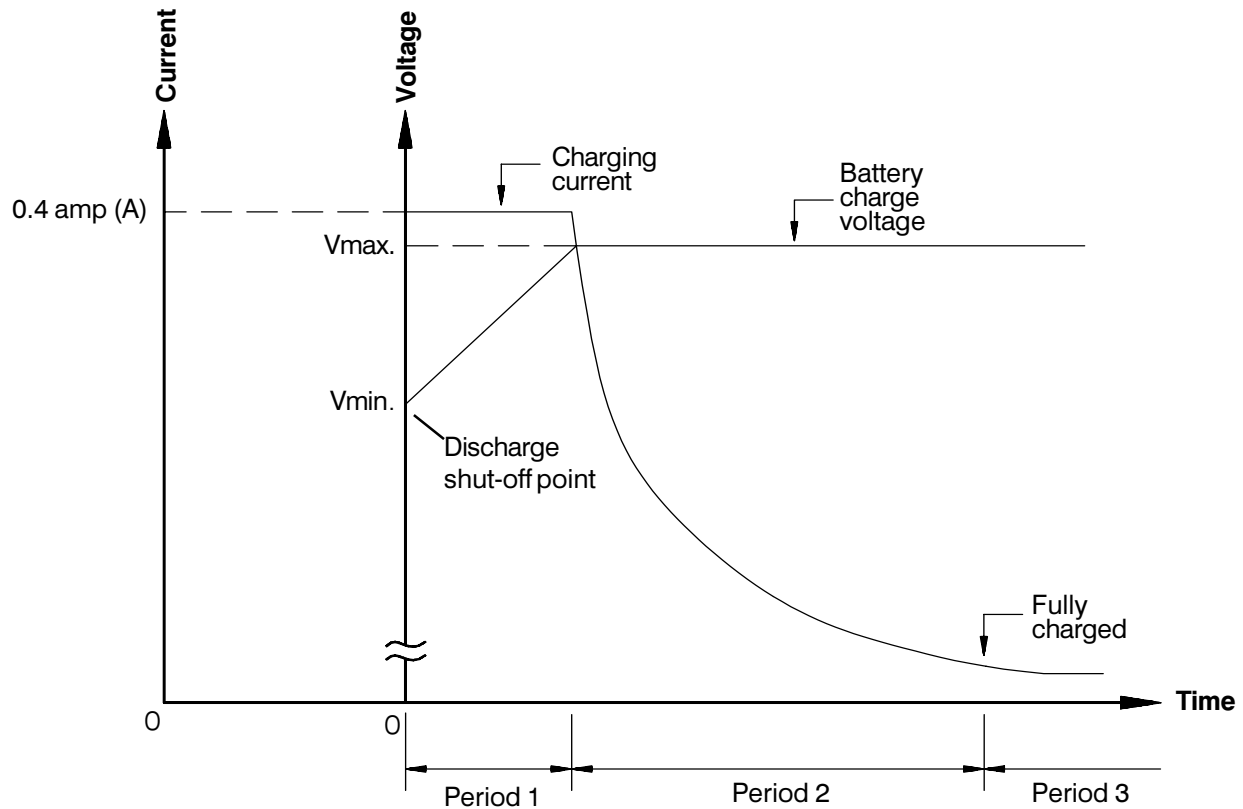
Excessive discharge will cause the UPS unit's battery voltage to drop. The chart shown below lists the voltage level at which each UPS unit's low-voltage alarm will sound and also at what level the low-voltage condition will cause the unit to automatically shut down.

UPS Capacity	2.4 kVA	3.6 kVA	6 kVA	8 kVA
Nominal voltage ( $V_{nom}$ )	96Vdc	144Vdc	216Vdc	252Vdc
Alarm voltage ( $V_{low}$ )	88Vdc	132Vdc	198Vdc	231Vdc
Shutdown voltage ( $V_{min}$ )	77Vdc	115Vdc	175Vdc	202Vdc

## 6.0 Operating the UPS (Cont'd)

### 6.8 Battery Recharging

The illustration below shows a graphical representation of the UPS battery recharge process after a full discharge.



The recharge process usually consists of three periods. During the first period, the current is maintained at approximately 0.4 amperes. This current limit is the maximum value that can be used to charge the batteries (for minimal recharge time) while assuring safety and long battery life. In the second period, constant-voltage control starts and current gradually decreases as the batteries charge to their normal fully charged state. In the third period, a slight "trickle" current continues to flow into the batteries to keep them fully charged and "floating" at the normal Vdc level. A full recharge usually requires 24 hours (90% recharge in 10 hours) after a complete discharge.

The following chart shows the rated maximum and minimum battery voltages, and the charge current for each of the sizes.

**Rated Battery Voltages**

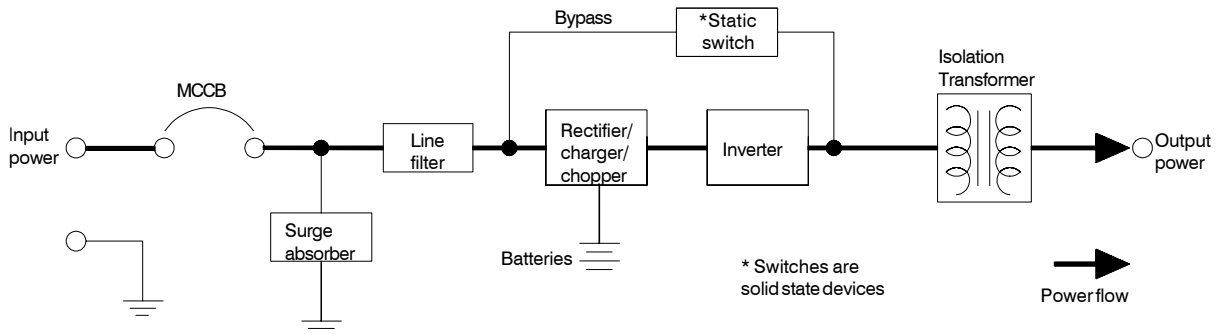
Model	Vmax.	Vmin.	Charge (A)
2.4 kVA	109.2	77	0.4
3.6 kVA	163.8	115	0.4
6 kVA	245.7	175	0.4
8 kVA	286.7	201	0.4

## 6.0 Operating the UPS

### 6.9 Operation Modes

#### 6.9.1 AC Input Mode (normal operation)

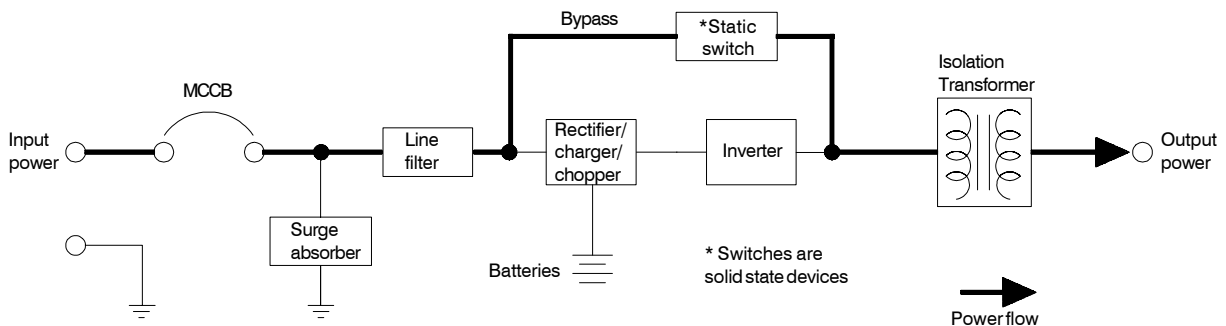
The following illustration shows circuit power flow when the UPS is operating normally in the ac input mode. The UPS unit's rectifier, included in a boost chopper circuit, converts ac input power to dc power. The boost chopper circuit maintains a constant voltage, with current limiting, for charging the batteries. It also supplies a dc voltage of the proper level to the inverter section. The inverter section generates a high quality sinewave output voltage. The unit's batteries are always maintained in a constantly charged state when the UPS is in the normal operation mode.



Power flow in AC input mode for the 2.4, 3.6, 6 and 8 kVA Models

#### 6.9.2 Circuit-bypass Mode

If the UPS unit is severely overloaded or develops an internal fault, power flow is automatically switched from the unit's main circuit to the bypass circuit. Power flow through the bypass is shown in the following illustration. This change-over occurs automatically in less than 4 milliseconds in phase. The switching period is not long enough to cause interruptions to occur in most loads. If the power flow is transferred to the bypass circuit because of an overload and that overload condition ends within a specified period of time then the power flow will be "re-transferred" to the AC input mode (normal operation) automatically. **If the power flow is transferred to the bypass circuit due to a fault condition, then the power flow must be transferred manually from the UPS's bypass circuit back to the inverter circuit after repairing the fault.** This may be possible by toggling the STOP/RUN switch (on the unit's front panel) first to STOP and then back to RUN. This action resets (clears) the non-fatal faults (See Restart Procedures Section 6.5).



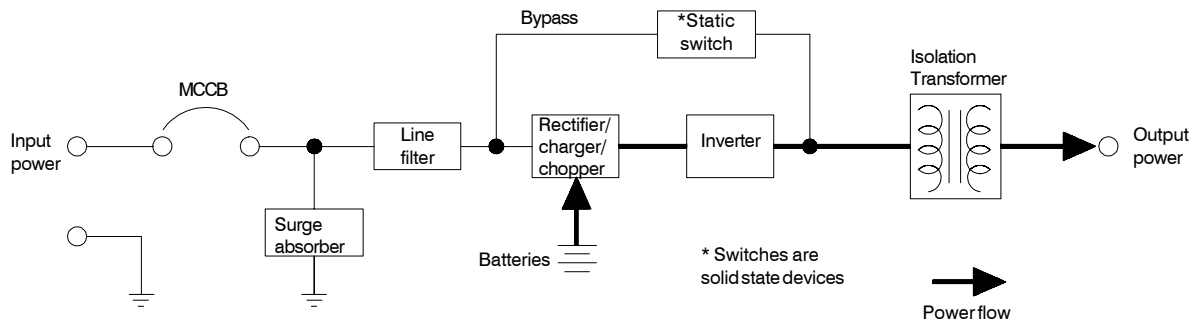
Power flow in circuit-bypass mode for 2.4, 3.6, 6 and 8 kVA Models

## 6.0 Operating the UPS

### 6.9 Operation Modes (Cont'd)

#### 6.9.3 Battery Backup Mode

The following illustration shows power flow during the battery backup mode. When commercial ac power failures occur, the UPS's batteries instantly begin supplying dc voltage to the UPS's main inverter circuit. This circuit changes (converts) the dc power into ac power. The ac power is available at the unit's output. This back-up process will continue until the UPS's battery voltage drops below a specific minimum level. When this occurs, the batteries will stop supplying power to the load. This minimum level is the rated minimum voltage (Vmin). The rated battery voltage chart on page 6-4 (see Section 6.6 for battery backup time and discharge process) shows (Vmin).



**Power flow in battery backup mode for the 2.4, 3.6, 6 and 8 kVA Models**

### 6.10 Audible Alarm Functions

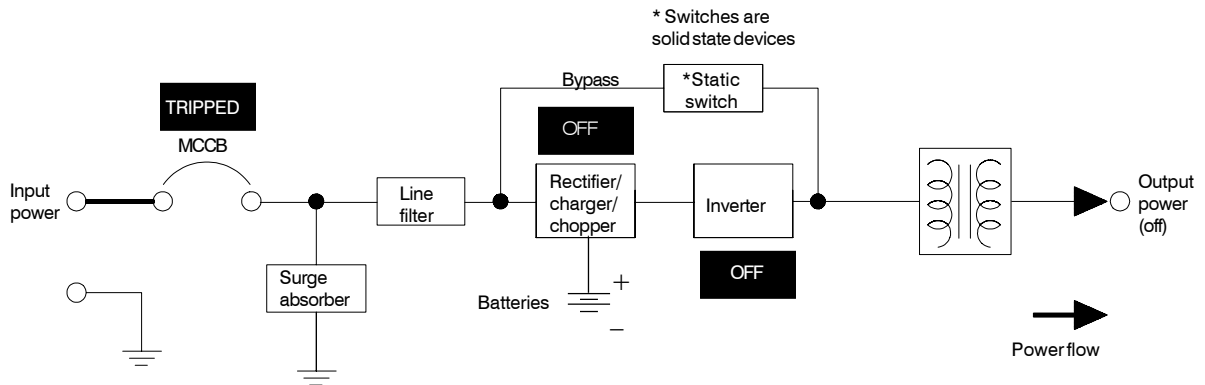
Audible alarms will sound when the UPS unit is in the battery backup mode, has low battery voltage, or is in an overloaded condition. The following chart shows the audible alarm pattern durations for each condition. Time units are shown in seconds. The audible alarm, **for overload and faults only**, can be stopped by pressing BUZZER RESET on the front panel (see Front Panel Buzzer Reset Section 6.13.3).

Condition	Audible Pattern
UPS in battery backup mode (battery voltage: 100% - 92%)	
UPS low battery voltage (voltage less than 92%)	
Overload	
Fault	

## 6.0 Operating the UPS

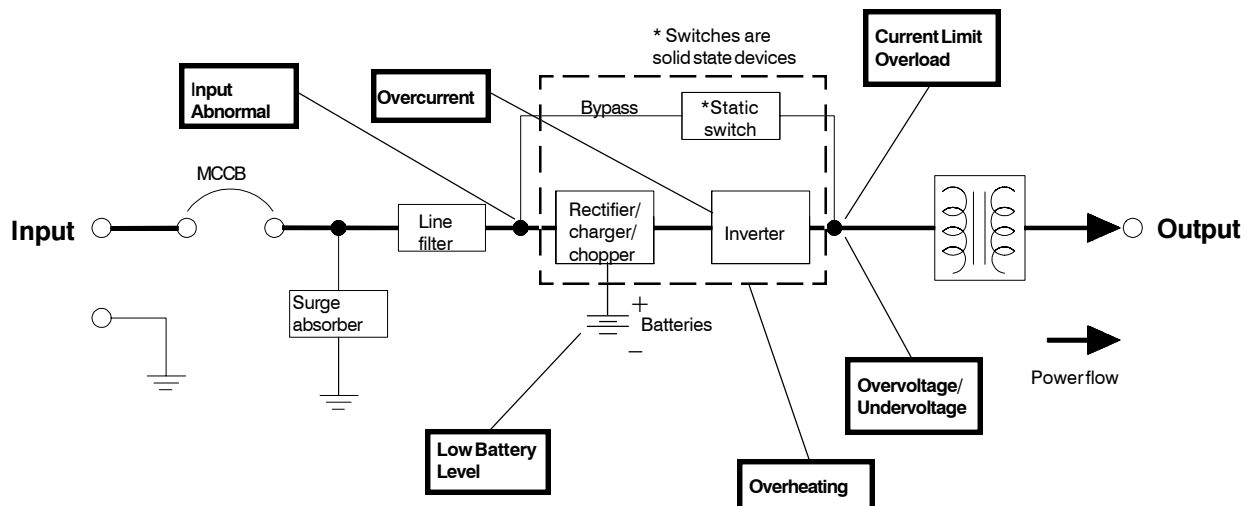
### 6.11 EPO (Emergency Power Off) Function

These units are equipped with terminals for receiving an emergency power-off (EPO) "closed contact" switch command from a remote location (See section 4.2 Terminal Block Details). This safety feature enables quick shut-down of the UPS's ac output and battery circuits, as well as all load equipment connected to the unit. It also prevents power backfeed from the UPS to the EPO switch. Usually the emergency power off switch is installed in a central location that is easily accessible to personnel concerned with the operation of the UPS unit and the load equipment connected to it. The EPO function is initiated by pressing the switch to the closed "shutdown" position. The effect of using the EPO switch is the same whether the UPS unit is in the ac input mode (see Section 6.9.1), battery backup mode (see Section 6.9.3), or the circuit bypass mode (see Section 6.9.2). The following figure shows the UPS condition after application of the EPO switch. **Use the Restart After Fatal Fault procedures (see Section 6.5.2) for restarting the unit.**



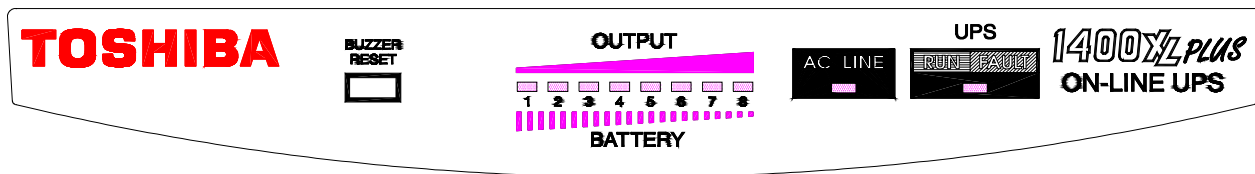
### 6.12 System Protection Features

The following schematic shows the electrical locations of the protection devices on the 2.4, 3.6, 6.0, and 8.0 kVA UPS models.

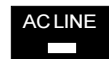


## 6.0 Operating the UPS

### 6.13 Front Panel Layout



#### 6.13.1 Front Panel Indicator LED Lamps



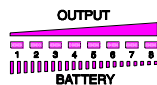
AC LINE (green lamp)

Lights **green** when normal ac input power is being supplied to the UPS unit.



UPS RUN/FAULT (green/red lamp)

Lights **green** when the UPS unit is operating in the run mode and the output is normal. Lights **red** when the UPS unit has tripped in the fault mode. This condition occurs when an overcurrent, overvoltage, overload, or overheating problem is detected. Operation of the unit's inverter is inhibited until the fault is corrected and the system has been restarted.



OUTPUT/BATTERY (green/red lamp level meter)

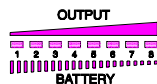
The UPS unit's level meter consists of six green LED lamps (left) and two red LED lamps (right).

#### 6.13.2 Front Panel Indicator LED Lamp Functions

The three front panel LED indicators are used in combination to identify three different modes of operation and the various operating conditions within these modes:



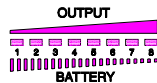
- 1) UPS Run Mode - This is a normal operational mode where no faults are detected and the UPS RUN/FAULT (green/red lamp) is **green**. See the UPS Run Mode Display Chart in section 6.14 for OUTPUT/BATTERY level meter display status and functional explanation.



- 2) UPS Fault Mode - This is an abnormal operation mode where the UPS unit has tripped because of detected faults (**can be either fatal or non-fatal**) and the UPS RUN/FAULT (green/red lamp) is **red**.

The unit may:

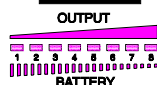
- 1) continue to output power on bypass.
- 2) not go to bypass and output power will be off.



**The condition of the output will depend on the type of fault that has occurred.** See the Non-Fatal Fault Mode Display Chart in section 7.1 or the Fatal Fault Mode Display Chart in section 7.2 for OUTPUT/BATTERY level meter display status and functional explanation.



- 3) Battery Backup Mode - During battery backup mode the the AC



## 6.0 Operating the UPS

### 6.13 Front Panel Layout (Cont'd)

#### 6.13.3 Front Panel Buzzer Reset



The UPS unit's audible alarm can be turned off (**battery alarms excluded**) by pressing this front panel switch. The switch does not completely defeat the audible alarm system and if a new condition appears the audible alarm will again sound. See Audible Alarm Functions in Section 6.10 for details.

### 6.14 UPS Run Mode Display

The following chart shows existing normal operating output conditions when the UPS RUN/FAULT lamp is **green**.

**UPS Run Mode Display Chart**

Output	Display status	Explanation
Normal		When output current is between 30% and 100%, the <b>green</b> lamps light in 15% increments (from left to right) to indicate relative output value (This sample display shows a value level of approximately 40% to 55% of available output current). LED 1 and 2 will only illuminate when output current is 30% or greater.
Overload		All <b>green</b> lamps light and one or two <b>red</b> lamps flash twice per second. <b>Remove overload as quickly as possible to prevent fault (fault timeouts vary depending on overload condition).</b>
Battery backup		During battery backup all <b>green</b> and all <b>red</b> lamps flash twice per second. As the batteries discharge, the green lamps extinguish from left to right to indicate remaining battery capacity (This sample display shows a value level of approximately 55% to 70% of available battery capacity).
Low battery during battery backup		All green lamps are off and one or two <b>red</b> lamps continue to flash.

= Flashing LED

= Steady-lit LED

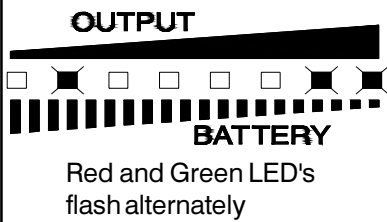
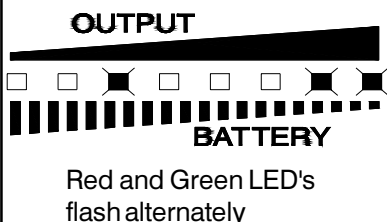
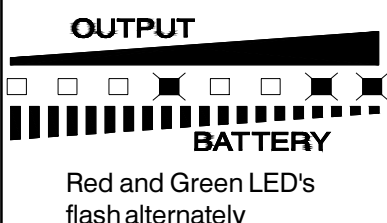
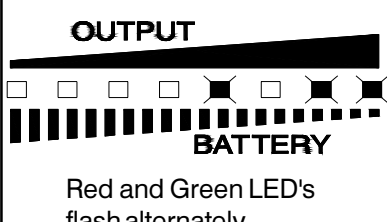
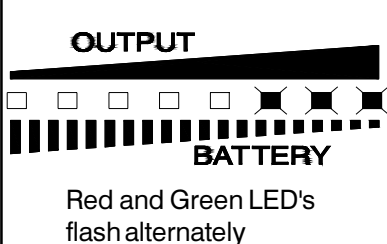
## 7.0 Troubleshooting Procedures

Faults are those abnormal conditions that can occur and can cause the unit to shutdown normal operation. The faults are detected by the protection circuitry (see System Protection Features Section 6.12) in the unit. The UPS RUN/FAULT lamp will light **red**. "Troubleshooting" involves monitoring the OUTPUT/BATTERY level meter lamps on the front panel and then interpreting the readout by using the fault mode display charts.

### 7.1 Non-Fatal Fault Mode

Non-fatal faults may or may not cause the unit to shut down; they normally will cause the UPS to transfer to bypass mode. Use "Restart After Non-Fatal Fault" procedures (see Section 6.5.1). Use the following chart to decode the display.

**Non-Fatal Fault Mode Display Chart**

Fault	Display status	Probable cause	Corrective action
Output low voltage	 <p>Red and Green LED's flash alternately</p>	Inverter fault or short circuit in UPS output	Remove cause of short circuit. If none is found, contact your Toshiba service representative.
Output overvoltage	 <p>Red and Green LED's flash alternately</p>	Resonance with load equipment	Remove load equipment one piece at a time.
DC undervoltage	 <p>Red and Green LED's flash alternately</p>	Chopper fault	Contact your Toshiba service representative
Cooling fin overheating	 <p>Red and Green LED's flash alternately</p>	Cooling fan outage or closed cooling airflow path	Check for airflow restriction. If none is found, contact your Toshiba service representative.
Battery problem	 <p>Red and Green LED's flash alternately</p>	Battery damaged or something wrong in the battery circuit (battery not connected)	Contact your Toshiba service representative

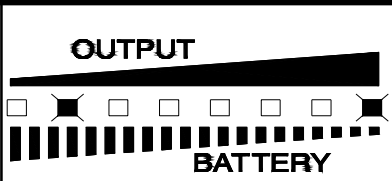
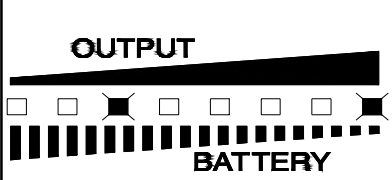
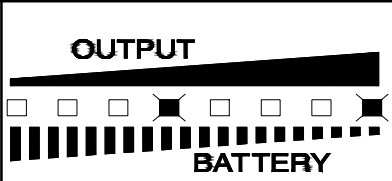
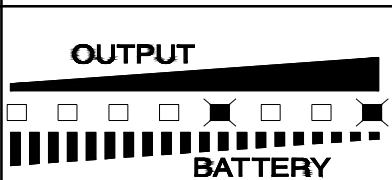
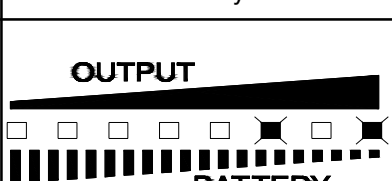


## 7.0 Troubleshooting Procedures

### 7.2 Fatal Fault Mode

Fatal faults may or may not cause the UPS to shutdown. Use "Restart After Fatal Fault" procedures (see Section 6.5.2). Use the following chart to decode the display.

**Fatal Fault Mode Display Chart**

Fault	Display status	Probable cause	Corrective action
DC overcurrent	 <p>Red and Green LED's flash alternately</p>	Inverter fault	
Output overcurrent	 <p>Red and Green LED's flash alternately</p>	Inverter fault or short circuit in UPS output	Contact your Toshiba service representative.
DC overvoltage	 <p>Red and Green LED's flash alternately</p>	Chopper fault	
UPS overload	 <p>Red and Green LED's flash alternately</p>	Capacity of load equipment too high	Review UPS rating or reduce load equipment.
UPS system error	 <p>Red and Green LED's flash alternately</p>	Trouble with the control PWB	Contact your Toshiba service representative.

 = Flashing LED

## 8.0 Preventive Maintenance/Parts Replacement

### 8.1 Preventive Maintenance

Toshiba's 1400XL Plus Series of uninterruptible power systems have been designed to provide years of trouble-free operation requiring a minimum of preventive maintenance.

The best preventive measure that the UPS user can take is to keep the area around the unit, particularly the air inlet vents, clean and free of moisture and dust accumulations. If the atmosphere of the installation site is very dusty, use a vacuum cleaner to periodically remove dust accumulations around and from the unit.



### CAUTION

**Before performing any maintenance, the certified repair technician must be familiar with and follow the important safety instructions located on pages v and vi.**

### 8.2 Parts Replacement

The following list shows recommended intervals for periodic replacement of certain UPS parts:

- 1) Batteries: In order to maintain system reliability, the UPS unit's batteries should be replaced on a regular schedule. To ensure reliable operation, all of the batteries should be replaced at the same time. Use the following chart for replacement:

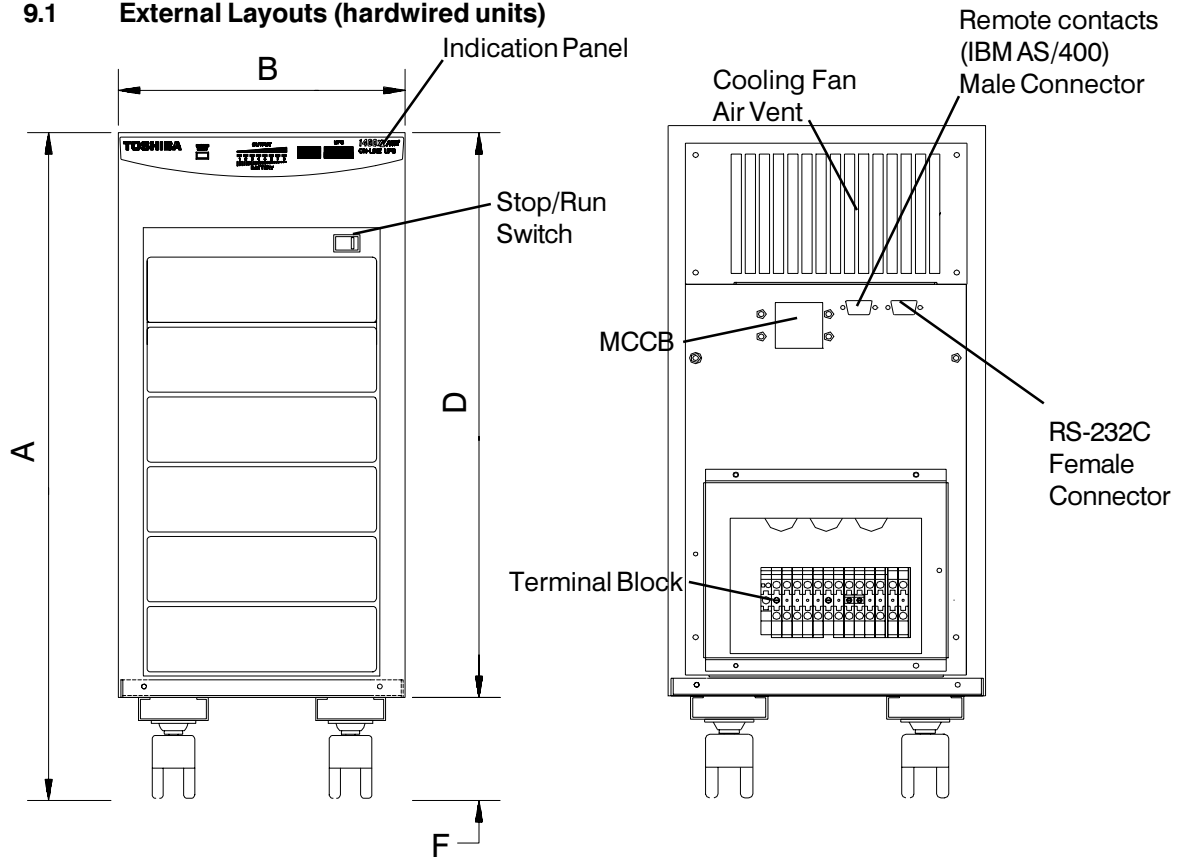
UPS Battery Replacement

Temperature range at installation site	Replace every
5° to 35° C (average 25° C)	3 years (10 discharges/year)
0° to 40° C (average 25° C)	2 years (10 discharges/year)
0° to 40° C (average 40° C)	1 years (10 discharges/year in high temperature)

- 2) Aluminum electrolytic capacitors: Replace once every 5 years.
- 3) Fuses: Replace once every 7 years.
- 4) Cooling fan: Replace once every 3 years.

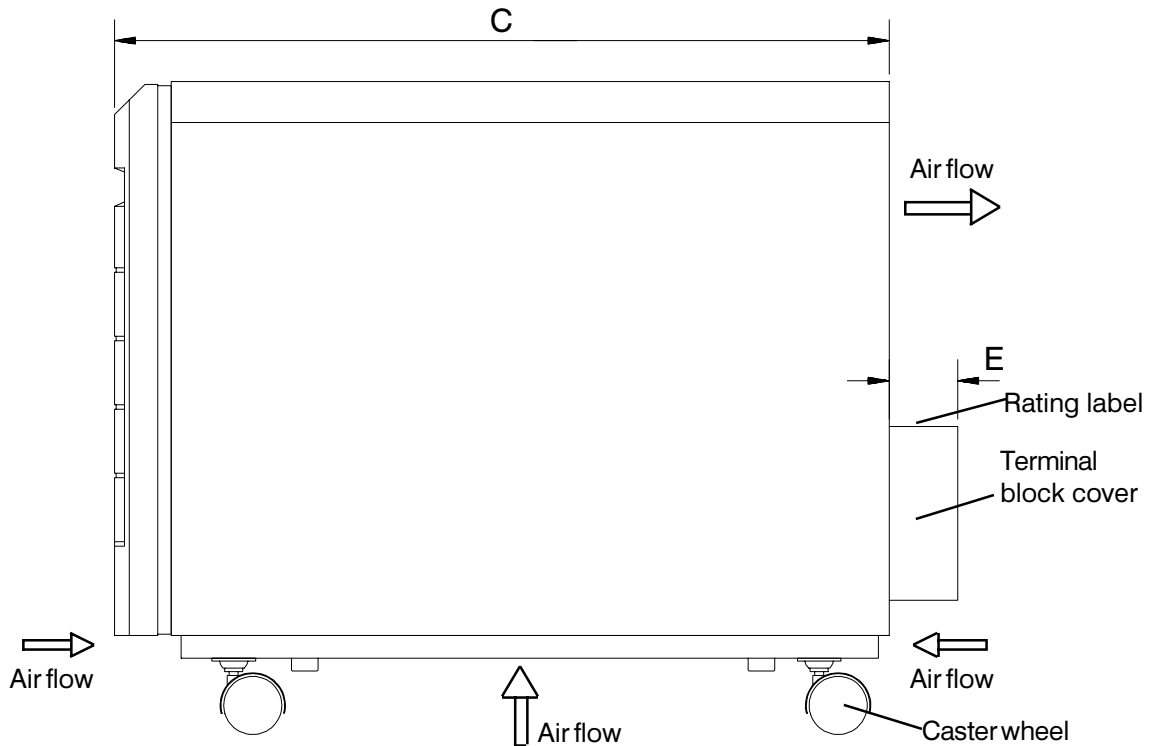
9.0 External Layouts/Dimensions/Shipping Weights

9.1 External Layouts (hardwired units)



Front view of UPS  
(See Dimension Chart Section 9.3)

Rear view of UPS



Side view of UPS  
(See Dimension Chart Section 9.3)

## 9.0 External Layouts/Dimensions/Shipping Weights

### 9.2 Dimensions

Model	Dimensions					
	A	B	C	D	E	F
2.4 kVA	22.2 in. (564 mm)	10 in. (250 mm)	27.2 in. (690 mm)	19.4 in. (486 mm)	2.2 in. (55 mm)	2.76 in. (70 mm)
3.6 kVA	22.2 in. (564 mm)	10 in. (250 mm)	27.2 in. (690 mm)	19.4 in. (486 mm)	2.2 in. (55 mm)	2.76 in. (70 mm)
6 kVA	28 in. (710 mm)	10 in. (250 mm)	31.2 in. (790 mm)	24.6 in. (615 mm)	2.2 in. (55 mm)	3.4 in. (85 mm)
8 kVA	28 in. (710 mm)	10 in. (250 mm)	35.2 in. (890 mm)	24.6 in. (615 mm)	2.2 in. (55 mm)	3.4 in. (85 mm)

### 9.3 Shipping Weights

Model	Shipping Weights	
	Pounds	Kilograms
2.4 kVA	230	105
3.6 kVA	263	120
6 kVA	360	164
8 kVA	490	223

# **TOSHIBA**

**TOSHIBA INTERNATIONAL CORPORATION**

INDUSTRIAL DIVISION

13131 West Little York Rd., Houston Texas 77041

Tel: [713] 466-0277 Fax: [713] 466-8773 Telex: 762078