

# TOSHIBA

UNINTERRUPTIBLE POWER SYSTEM  
THREE PHASE- 15/ 25/ 50 KVA UPS

## 4200FA

MANUFACTURED IN THE U.S.A.

OPERATION MANUAL

Part Number: 53878-004  
Date: April 1, 2004

**TOSHIBA**

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**4200FA**

**THREE PHASE- 15/25/50 kVA**

**UNINTERRUPTIBLE POWER SYSTEM**

**OPERATION MANUAL  
FOR MODELS**

**T42F3F150XAMBN**

**T42#3#150#AM#N**

**T42F3F250XAMBN**

**T42#3#250#AM#N**

**T42F3F500XAMBN**

**T42#3#500#AM#N**

**TOSHIBA INTERNATIONAL CORPORATION**

**INDUSTRIAL DIVISION**

**13131 West Little York Rd., Houston, Texas 77041**

## NOTE

These Instructions 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. This manual may change without notice. Contact your local Toshiba sales office to verify that this is the latest revision. 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 equipment, 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

Please complete the enclosed Extended Warranty Card, and return it by prepaid mail to Toshiba. This activates the extended warranty. If additional information or technical assistance is required call Toshiba's UPS Marketing Department toll free at 1-800-231-1412, or write to: Toshiba International Corporation, 13131 West Little York Road, Houston, TX 77041-9990.

Please complete the following information for your records; however, please keep this manual with the UPS equipment.

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

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

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

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

## GENERAL SAFETY INSTRUCTIONS

Warnings in this manual appear in any of four ways:

- 1) *Danger* - The danger symbol is a lightning bolt mark enclosed in a triangle, which precedes the 3/16" high letters spelling the word "DANGER". The danger symbol is used to indicate imminently hazardous situations, locations, and conditions which, if not avoided, WILL result in death, serious injury, and/or severe property damage.



**DANGER**

- 2) *Warning* - The warning symbol is an exclamation mark enclosed in a triangle, which precedes the 3/16" high letters spelling the word "WARNING". The warning symbol is used to indicate potentially hazardous situations and conditions, which, if not avoided COULD result in serious injury or death. Severe property damage COULD also occur.



**WARNING**

- 3) *Caution* - The caution symbol is an exclamation mark enclosed in a triangle, which precedes the 3/16" high letters spelling the word "CAUTION". The caution symbol is used to indicate potentially hazardous situations and conditions, which, if not avoided COULD result in injury. Equipment damage may also occur.



**CAUTION**

- 4) *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 COULD cause operator injury and/or equipment damage.



**ATTENTION**

Other warning symbols may appear along with the *Danger* and *Caution* symbol. The additional symbols 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 COULD 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 that COULD cause serious injury or death if the proper precautions are not observed:



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## IMPORTANT SAFETY INSTRUCTIONS SAVE THESE INSTRUCTIONS

This manual contains important instructions for 4200FA that should be followed during the installation, operation, and maintenance of the UPS Systems. Refer to the Battery System Manual for details on operating and maintaining the battery units for each system.

UPS System's output is not equipped with an over-current protection device, or an output disconnect for the AC output; therefore, a circuit breaker should be provided, by the user, between the UPS output and the critical load input. This device should be rated as follows:

Rated Output	15 kVA Device Rating	25 kVA Device Rating	50 kVA Device Rating
208/120 VAC	240V, 60A	240V, 90A	240V, 175A
220/127 VAC	240V, 50A	240V, 90A	240V, 175A
240	240V, 50A	240V, 80A	240V, 175A
380/220	480V, 30A	480V, 50A	480V, 100A
480/277	480V, 25A	480V, 40A	480V, 80A
600	600V, 20A	600V, 35A	600V, 70A

The maximum ambient temperatures in which the Uninterruptible Power System (UPS) should be operated in is 104°F (40°C). (89°F (32°C) max. if battery cabinet is subject to the same ambient)

The nominal battery voltage for the internal battery models 15 is 240VDC, 25 and 50 is 300VDC. The nominal battery voltage for all external battery models is 300VDC.

An Authorized Toshiba Service Representative who is knowledgeable of batteries and the required precautions should perform service on the batteries. Keep unauthorized personnel away from batteries.

Refer to the Battery System Manual, when scheduling maintenance or battery replacement.



### 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.



### CAUTION

Do not open or mutilate the batteries. Released electrolyte is harmful to the eyes and skin and could also be toxic.



### WARNING

This unit contains sealed lead acid batteries. Lack of preventative maintenance could result in batteries exploding and emitting gasses and/or flame. An authorized, trained technician must perform annual preventative maintenance.

## IMPORTANT SAFETY INSTRUCTIONS



### 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

Personnel knowledgeable of batteries and the required precautions should perform installation and servicing of batteries. Keep Unauthorized personnel away from the batteries.



### WARNING

A qualified service technician must do proper maintenance to the battery system of this unit. This is essential for 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 Input Circuit Breaker is in the off position.
- 2) Remove watches, rings or other metal objects.
- 3) Use tools with insulated handles to prevent accidental 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 grounded. If grounded, remove source of the ground.

***Contact with any part of a grounded battery can result in an electrical shock.***

Electrical shock will be reduced if 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; create a flame or a spark in the immediate area of the batteries. This includes static electricity.
- 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) ***Dispose of lead acid batteries through proper channels in accordance with Local, State and Federal EPA Regulations.***

## INSTRUCTIONS IMPORTANTES CONCERNANT LA SÉCURITÉ

### CONSERVER CES INSTRUCTIONS

Cette notice contient des instructions importantes concernant la sécurité



### ATTENTION

Un battery puet présenter un risque de choc électrique, de brûlure par transfert d' énergie.



### ATTENTION

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



### ATTENTION

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



## 1.0 Product Description

### 1.1 Theory of Operation

An Uninterruptible Power Supply (UPS) is a system that is installed between the commercial power and the critical load. The UPS provides steady AC output power during commercial power fluctuations and interruptions.

During "Normal Operation" the UPS utilizes commercial AC power and removes high voltage spikes and transients caused by switching and faults on the utility. 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 without interruption. This power is provided for a long enough time so that the load can be shut down in an orderly fashion. This prevents loss of data and possible damage to both hardware and software.

When the AC input power becomes available again, the operation returns to normal and the batteries begin to recharge for the next power interruption.

### 1.2 Application and Use

Toshiba's 4200FA of On-Line, Uninterruptible Power Systems (UPS) provide continuous computer grade isolated AC power in a compact, efficient, high performance unit. The UPS assures safe, reliable operation of critical office equipment, ranging from personal computers to mini-computers to local area networks (LAN). All units feature an audible alarm that sounds if the battery voltage drops below the standard during use. This is an additional aid to help in retaining valuable data and equipment. All units are capable of interfacing to a computer network.

### 1.3 Power Backup

During an electrical power failure the UPS batteries automatically supply DC power to the inverter that supports the load equipment, without interruption. For example, when used to support a computer, the UPS's back up assures additional time to complete your activity, store data and initiate an orderly shutdown after a power failure occurs.

### 1.4 Power Conditioning

While commercial power is present, the UPS supplies conditioned power to the load while maintaining its batteries in a charged condition. The UPS protects the connected load against the normal, everyday problems associated with heavy use of raw commercial power, including power sags, surges, signal interference, and spikes. In addition, the models with transformers provide total isolation to reduce the common and normal mode noises. This adds further protection to keep power-line problems from reaching your load, where it can cause equipment to operate erratically, or damage hardware and software.

## 2.0 Uncrating/Inspection/Storage/Disposal

### 2.1 Uncrating the new UPS equipment:

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

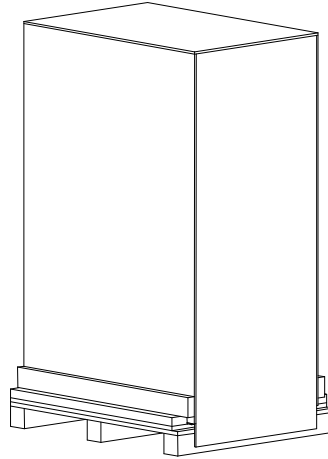


Figure 2.1

1) Remove the screws that attach the shipping crate to the pallet; remove the crate and foam packing material.

2) Unbolt the rails from both the unit and the shipping pallet. Place the rails on the front of the pallet as shown in figure 2.2 and figure 2.3. Use the four 1/2x3" bolts used to secure the rails to the shipping pallet to attach the rails as shown to the front of the pallet.

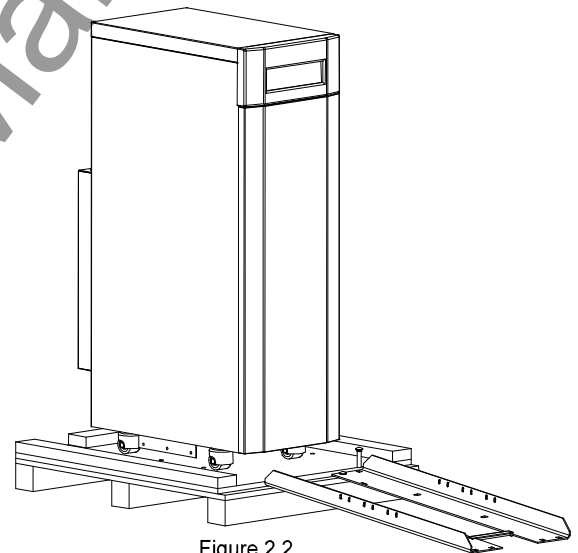


Figure 2.2

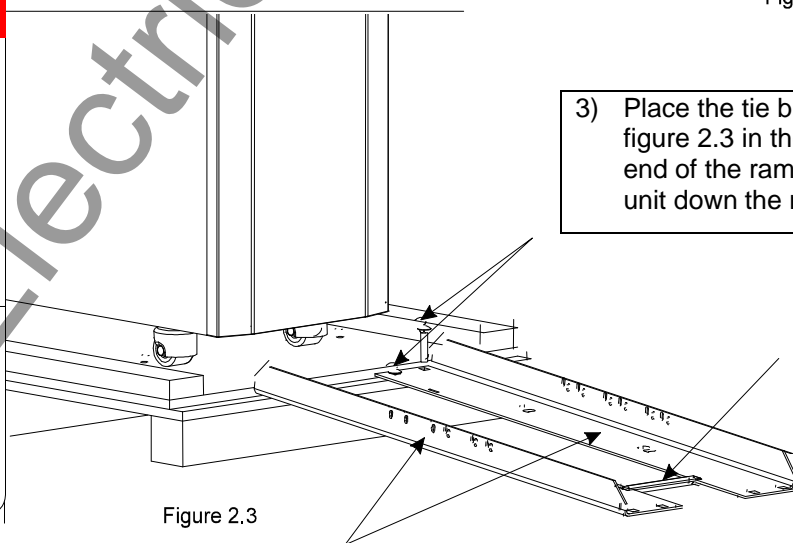
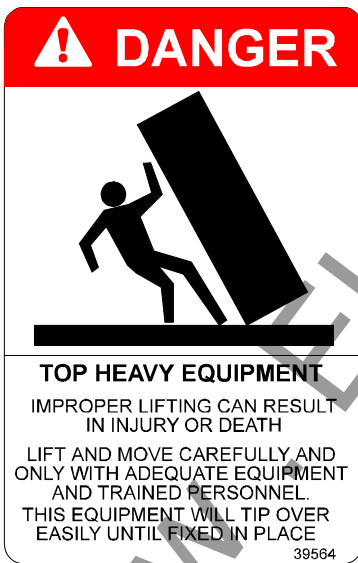


Figure 2.3

3) Place the tie brackets as shown in figure 2.3 in the slots at the lower end of the ramps. SLOWLY roll the unit down the ramp.

## 2.2 Uncrating the new UPS equipment:

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

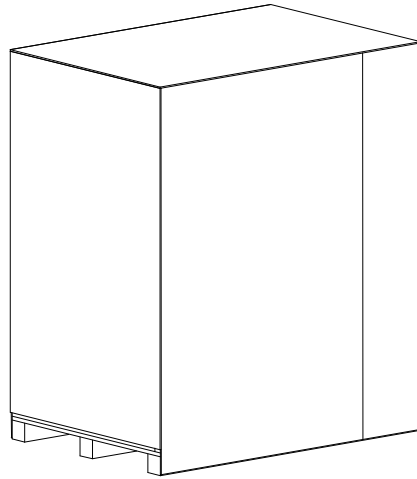


Figure 2.4

- 1) Remove the screws that attach the shipping crate to the pallet; remove the crate and foam packing material.

- 2) Unbolt the rails from both the unit and the shipping pallet. Place the rails on the front of the pallet as shown in Figure 2.5 and Figure 2.6. Use the four 1/2x3" bolts used to secure the rails to the shipping pallet to attach the rails as shown to the front of the pallet.

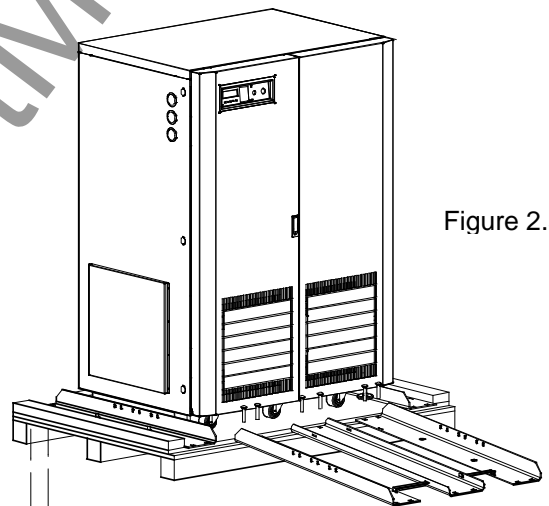
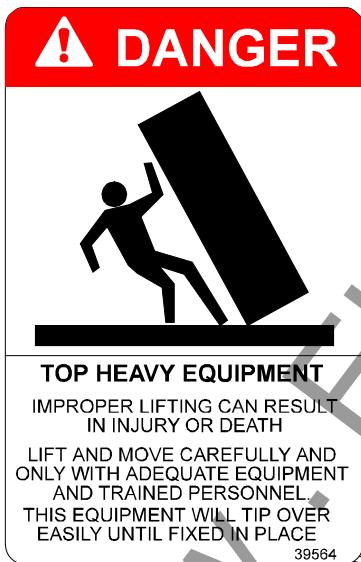


Figure 2.5



- 3) Place the tie brackets as shown in Figure 2.6 in the slots at the lower end of the ramps. SLOWLY roll the unit down the ramp.

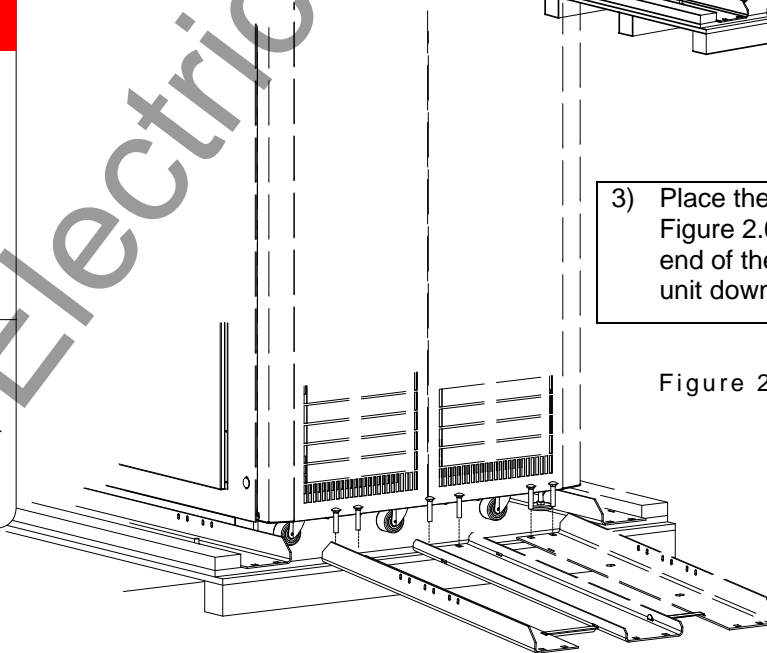


Figure 2.6

## 2.3 Inspection of the new UPS equipment

### After Uncrating:

- 1) Check the unit for loose, broken, bent or other damaged parts. If damage has occurred during shipment, keep all original crating and packing materials for return to the shipping agent. The equipment warranty will not apply to units that 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.

## 2.4 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 system's batteries.
- 2) Perform a complete system shutdown as described in section 6.12 of this manual.

### Storing:

- 1) Store within a temperature range of - 4° to 104° F (-20° to 40° C).
- 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 70° F (21° C). Higher ambient temperatures cause UPS batteries to need recharging more frequently.
- 4) If stored in an ambient temperature under 68° F (20° C), recharge the batteries every 9 months.
- 5) If stored in an ambient temperature of 68° to 86° F (20° to 30° C), recharge the batteries every 6 months.
- 6) If stored in an ambient temperature of 86° to 104° F (30° to 40° C), recharge the batteries every 3 months.

## 2.5 Disposal

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



## ATTENTION

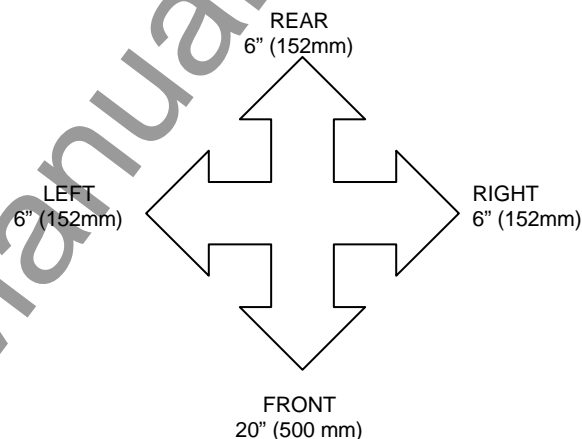
*It is ILLEGAL to dump lead-acid batteries in landfills or dispose of improperly.* Please help our Earth by contacting the environmental protection agencies in your area, the battery manufacturer, or call Toshiba toll-free at (800) 231-1412 for more information about recycling batteries.

## 3.0 Installation Precautions

Based on the 4200FA UPS external dimensions and the way the outer panels are removed; minimum amounts of unobstructed space around the unit are necessary for ventilation and maintenance access. Figure 3.1 shows the minimum clearances required for proper UPS site installation.

### 3.1 Equipment Placement

- 1) Do not install the UPS on an inclined surface, or areas that are subject to frequent vibrations or jolting. This could damage UPS circuits.
- 2) Do not allow liquids or foreign objects to get inside the UPS.
- 3) Allow at least 20" (500 mm) on the front side and 6" (152 mm) on the rear and sides of the UPS unit for air ventilation and maintenance access.
- 4) Do not install the UPS in a location that is subject to high humidity. Also, do not install the unit in areas that are exposed to direct sunlight, or contaminated areas subject to high levels of airborne dust, metal particles, or flammable gasses.
- 5) Verify the ventilation and air conditioning system at the site is capable of removing the heat generated by the UPS unit (see Section, 5.1 Specifications, "Environment").



Ambient temperature range for operating the UPS is 32° ~ 104°F (0° ~ 40°C); **77°F (25°C) is the recommended operating temperature for maximum battery life.**



- 6) Avoid installation near sources of electrical noise. Always make sure that the unit's ground is intact to prevent **electrical shock** and help prevent electrical noise.
- 7) This UPS generates and radiates 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 in near proximity. If such interference occurs, the UPS should either be installed farther away from the affected equipment and/or powered from a different source than the affected equipment.

## 3.2 System Preparation (Pre-Power)



Before connecting the UPS to a power source; move the Circuit Breakers (ON/OFF), on the front panel, to the OFF position and move the operation STOP/RUN key switch, on the front panel (See Section 9 for location), to the STOP position.

## 3.3 Operating Precautions

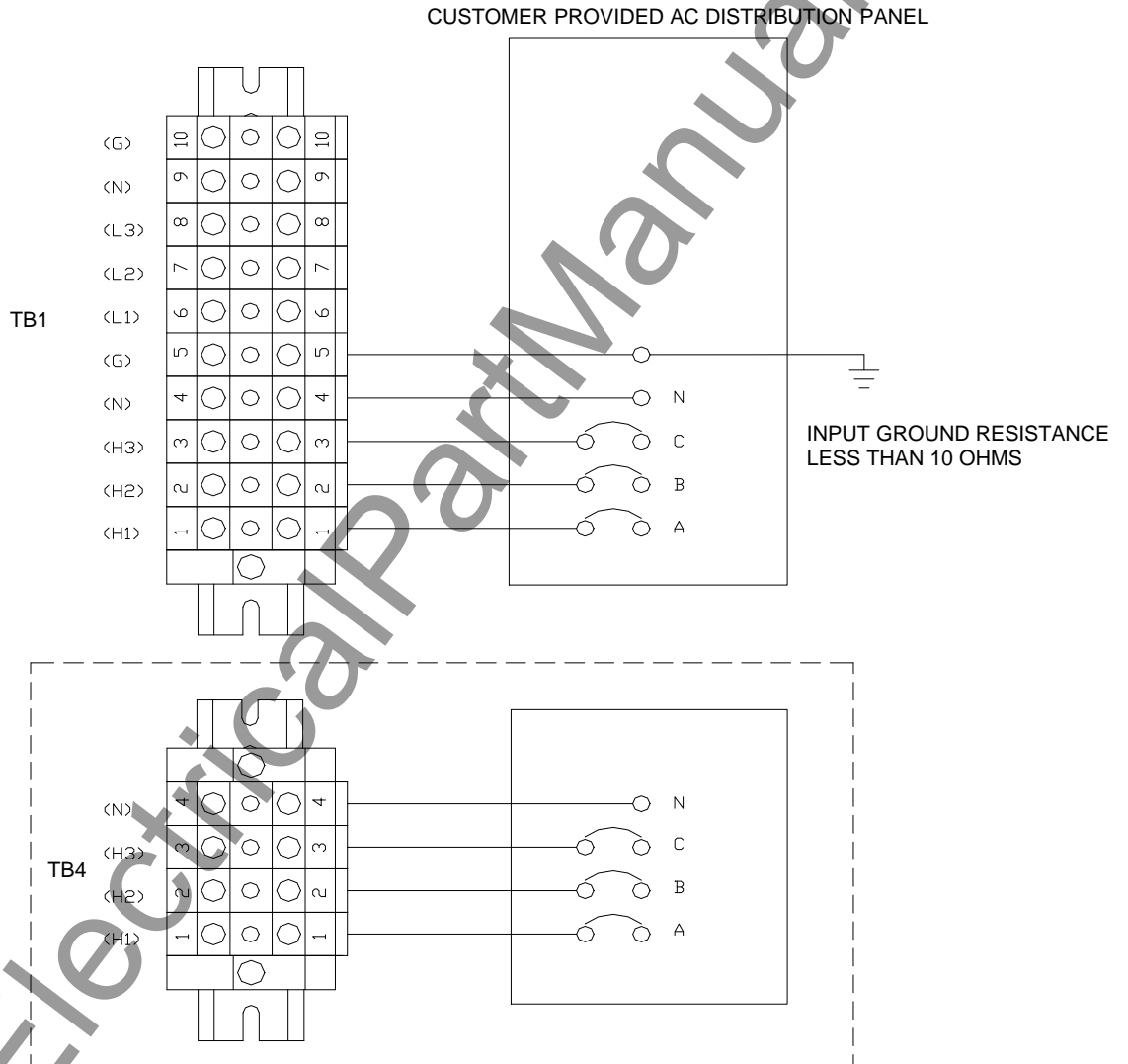


- 1) The UPS should not be powered up until the entire operation manual has been reviewed, and understood.
- 2) The input power source voltage must be within +10% to -15% (to start UPS) of the rated input voltage. The input frequency must be within the rated input frequency range. Voltages and frequencies outside of the permissible range may cause internal protection devices to activate.
- 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.
- 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 on the exterior surfaces of the UPS.

## 4.0 UPS Connections

### 4.1 Power Connections 15 / 25kVA with Internal Batteries

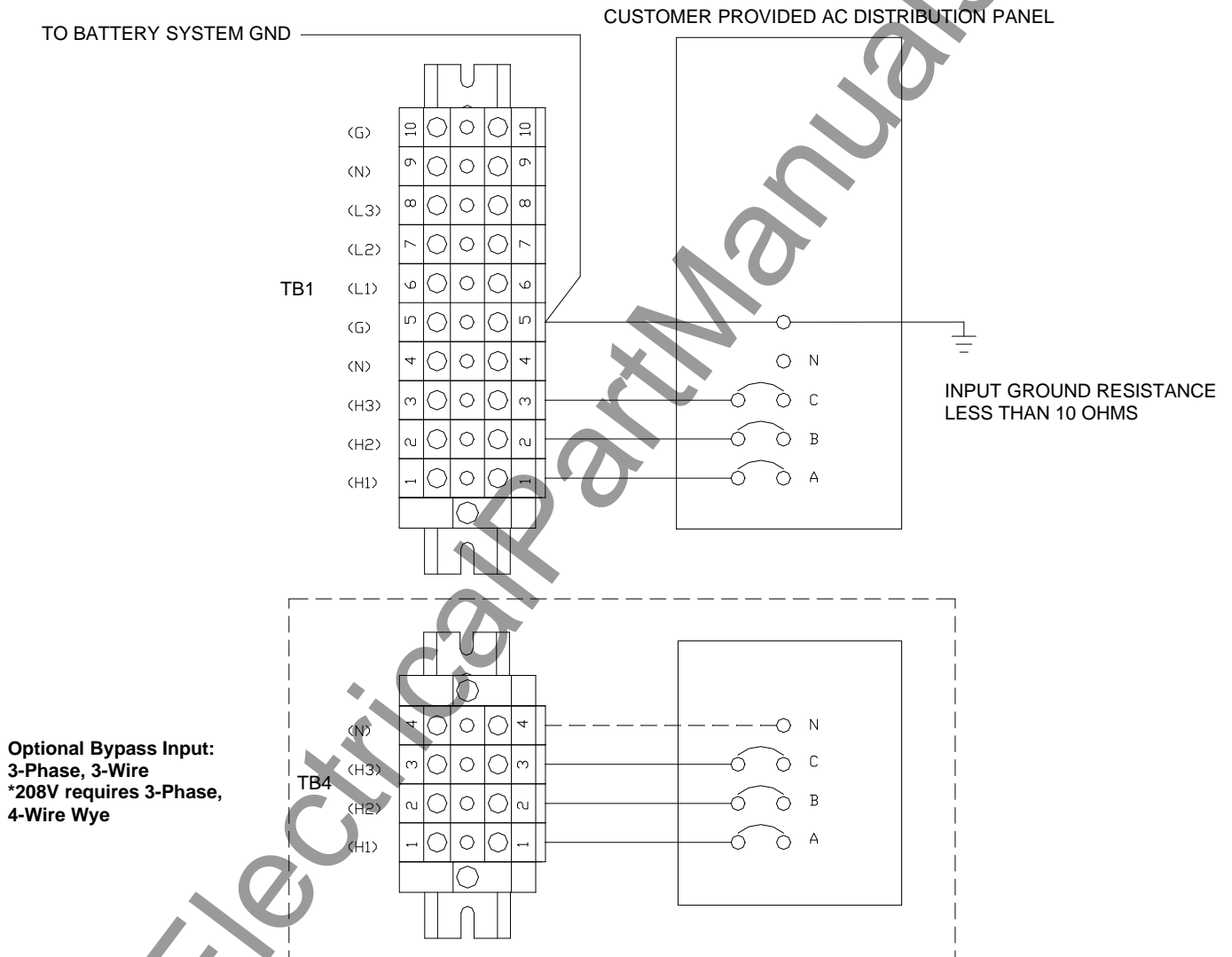
The following illustrates the wiring connections from the power distribution panel (not part of the UPS) to the terminal block of the 15 / 25 kVA UPS Models



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## 4.1.1 Power Connections 15 / 25kVA with Internal Transformer

The following illustrates the wiring connections from the power distribution panel (not part of the UPS) to the terminal block of the 15 / 25 kVA UPS Models





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## 4.1.2 Recommended Wire Size and Torque Requirements UPS Input and Output Terminals

Minimum Wire Size and Torque Requirements UPS Input and Output Terminals 15 / 25kVA (USE MINIMUM 75° C INSULATED COPPER WIRING)				
Phase: (A) (B) (C) Input: (H1) (H2) (H3)	15 kVA		25 kVA	
	AWG	Tightening Torque	AWG	Tightening Torque
208	8	51 in-lbs.	4	51 in-lbs.
220	8	51 in-lbs.	4	51 in-lbs.
240	8	51 in-lbs.	4	51 in-lbs.
380	10	35 in-lbs.	8	51 in-lbs.
400	10	35 in-lbs.	8	51 in-lbs.
415	10	35 in-lbs.	8	51 in-lbs.
480	10	35 in-lbs.	8	51 in-lbs.
600	10	35 in-lbs.	10	35 in-lbs.

All wire sizes are per the NEC

Output: (L1) (L2) (L3) (N)	15 kVA				25 kVA			
	AWG (L1)-(L3)	AWG (N)	Tightening Torque (inch-lbs.) (L1)-(L3) (N)		AWG (L1)-(L3)	AWG (N)	Tightening Torque (inch-lbs.) (L1)-(L3) (N)	
120/208	8	4	51	51	4	1	51	87
127/220	8	4	51	51	4	1	51	87
240	8	N/A	51	N/A	4	N/A	51	N/A
220/380	10	8	35	51	8	4	51	51
230/400	10	8	35	51	8	4	51	51
240/415	10	8	35	51	8	4	51	51
277/480	10	8	35	51	8	6	51	51
600	10	N/A	35	N/A	10	N/A	35	N/A

Neutral Conductors are rated @ 1.73 or 200% of phase conductors, per NEC

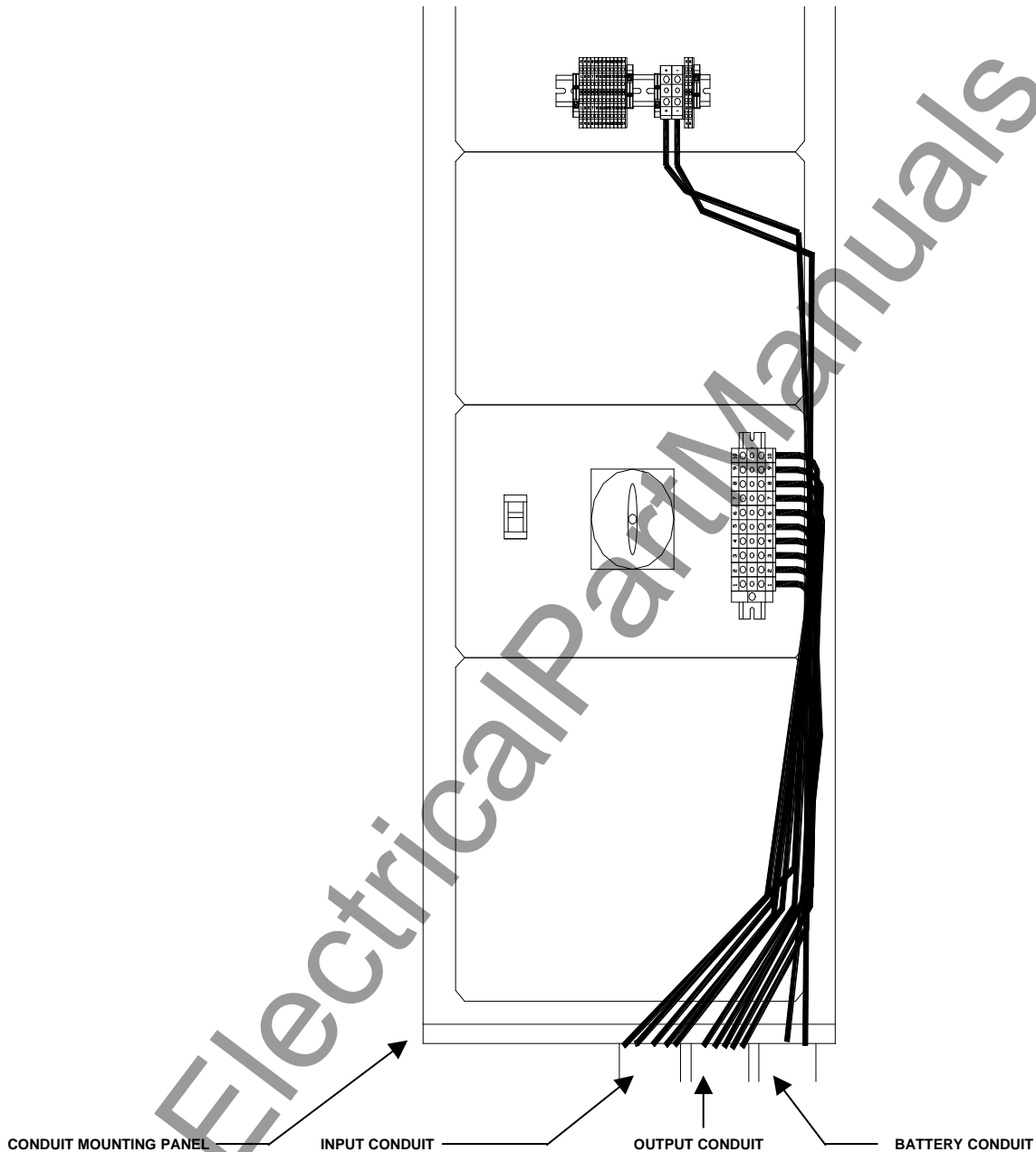
Input/ Output (GND) (G)	15 kVA		25 kVA	
	AWG	Tightening Torque	AWG	Tightening Torque
(G)	10	35 in-lbs.	8	51 in-lbs.

Minimum Wire Size and Torque Requirements UPS Optional Separate Bypass Input "TB4" 15 / 25kVA (USE MINIMUM 75° C INSULATED COPPER WIRING)				
Phase: (A) (B) (C) Input: (H1) (H2) (H3)	15 kVA		25 kVA	
	AWG	Tightening Torque	AWG	Tightening Torque
120/208	8 (#4-N)	51 in-lbs.	4 (#1-N)	51 in-lbs. (N-87in-lbs)
220	8	51 in-lbs.	4	51 in-lbs.
240	8	51 in-lbs.	4	51 in-lbs.
380	10	35 in-lbs.	8	51 in-lbs.
400	10	35 in-lbs.	8	51 in-lbs.
415	10	35 in-lbs.	8	51 in-lbs.
480	10	35 in-lbs.	8	51 in-lbs.
600	10	35 in-lbs.	10	35 in-lbs.

# TOSHIBA

## 4.1.3 Power Connection Cable Routing and Conduit Placement

The following illustrates the proper cable routing that should be followed during the power connection process of the 15 / 25 kVA.



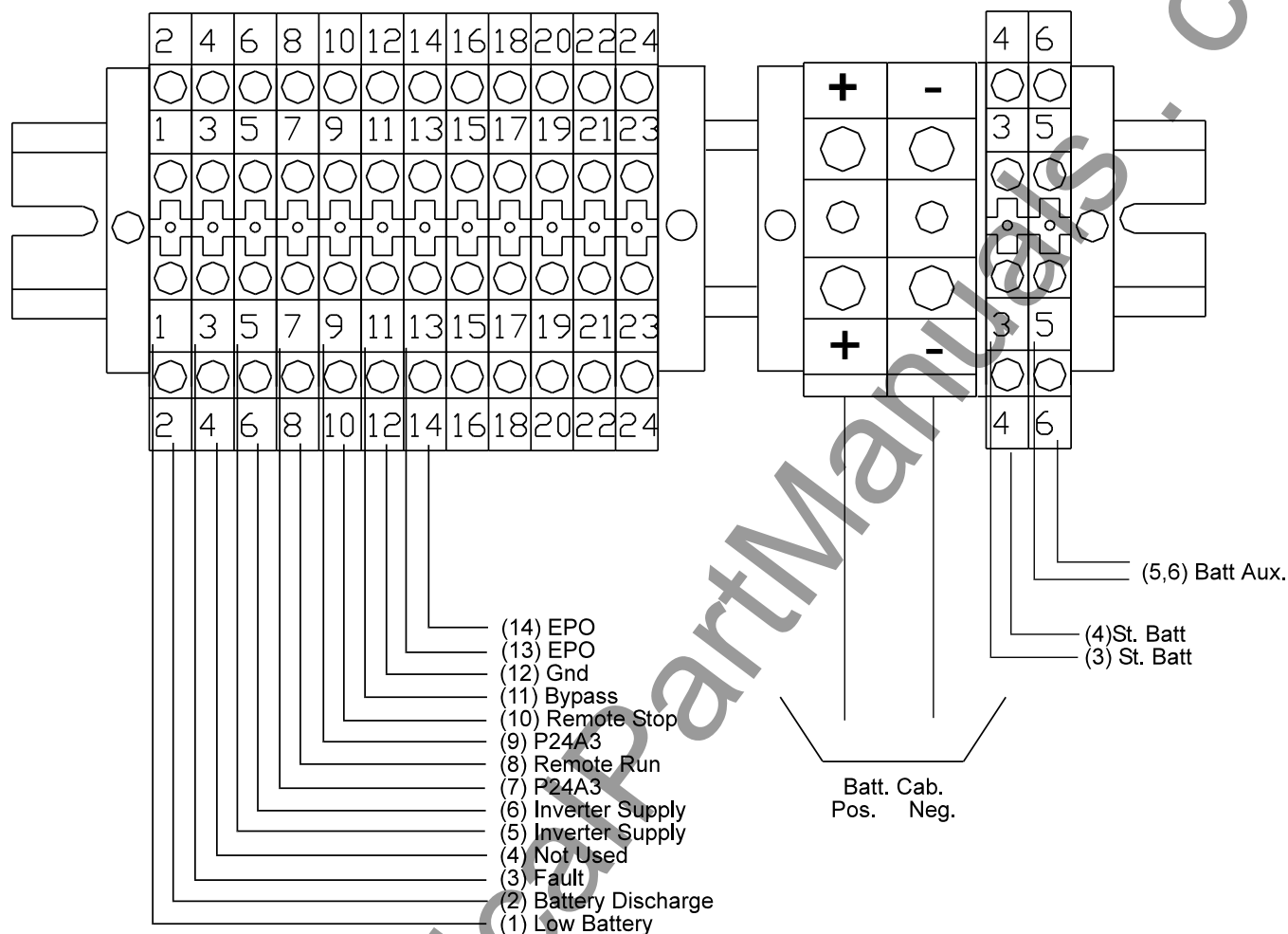
**Note:**

- 1) Input and Output conductors shall be installed in separate conduits, and installed in accordance with the latest edition of NEC and the Local Authority having jurisdiction.
- 2) Battery conductors shall be installed in a separate conduit and be of low resistance type.

# TOSHIBA

## 4.2 Control Circuit and External Battery Interface Connections 15 / 25 kVA

The following illustrates the wiring connections of the Control Circuits, and Battery Interface Circuits.



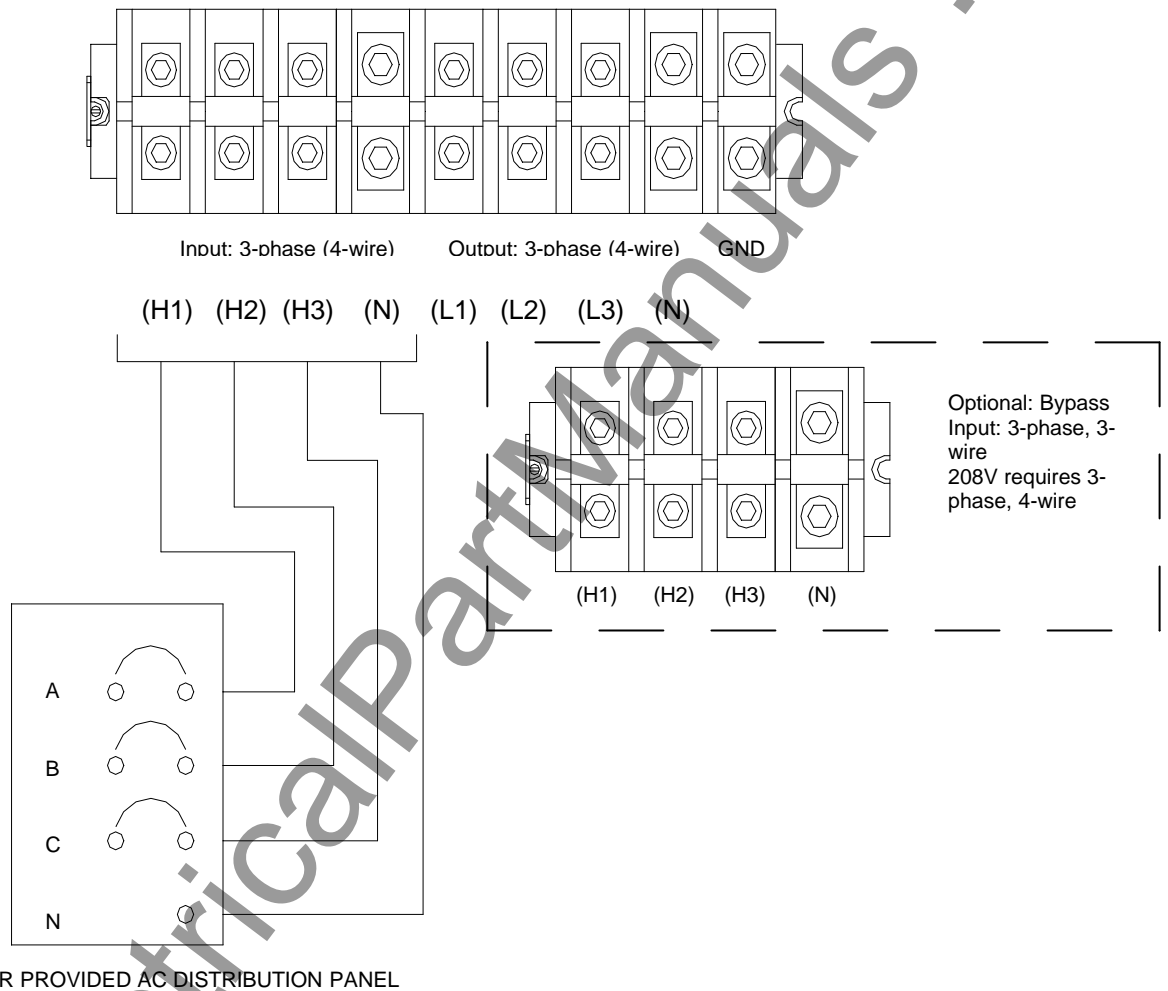
### 4.2.1 Recommended Wire Size and Torque Requirements UPS Control and Battery Interface 15 / 25kVA

Minimum Wire Size and Torque Requirements UPS Control and Battery Interface Circuits <b>USE MINIMUM 75° C COPPER WIRING</b>				
TERMINAL (TERMINAL #)	15 kVA		25 kVA	
	AWG	TIGHTENING TORQUE	AWG	TIGHTENING TORQUE
UPS CONTROL CIRCUITS (1-24)*	14-16	8 in-lbs.	14-16	8 in-lbs.
BATTERY CONTROL CIRCUITS (3-6)*	14-16	8 in-lbs.	14-16	8 in-lbs.
BATTERY (+/-)	4	51 in-lbs.	2	51 in-lbs.

\*Indicates Class 1 wiring methods is to be used.

## 4.3 Power Connections 50 kVA

The following illustrates the wiring connections from the power distribution panel (not part of the UPS) to the terminal block of the 50 kVA UPS Model



# TOSHIBA

## 4.3.1 Recommended Wire Size and Torque Requirements For UPS Input and Output Terminals

Minimum Wire Size and Torque Requirements  
UPS Input and Output Terminals 50 kVA  
**(USE MINIMUM 75° C INSULATED COPPER WIRING)**

INPUT:			OUTPUT:			
(H1) (H2) (H3) (N)	AWG	Tightening Torque	(L1)(L2)(L3) (N)	AWG (L1)-(L3)	AWG (N)	Tightening Torque
208	1/0	200 in-lbs.	208/120	1/0	250MCM	200 in-lbs.
220	1/0	200 in-lbs.	220/127	1/0	4/0	200 in-lbs.
240	1	200 in-lbs.	240	1	N/A	200 in-lbs.
380	4	200 in-lbs.	380/220	4	1/0	200 in-lbs.
400	4	200 in-lbs.	400/230	4	1/0	200 in-lbs.
415	4	200 in-lbs.	415/240	4	1	200 in-lbs.
480	6	200 in-lbs.	480/277	6	2	200 in-lbs.
600	6	200 in-lbs.	600	6	N/A	200 in-lbs.

All wire sizes are per the NEC

Neutral Conductors are rated @ 1.73 or 200% of phase conductors, per NEC

Input/ Output (GND)	50 kVA	
	AWG	Tightening Torque
208-240VAC	6	200 in-lbs.
380-480VAC	6	200 in-lbs.
600VAC	8	200 in-lbs.

Battery (+) / (-)	50 kVA	
	AWG	Tightening Torque
(+) (-)	250MCM	200 in-lbs.

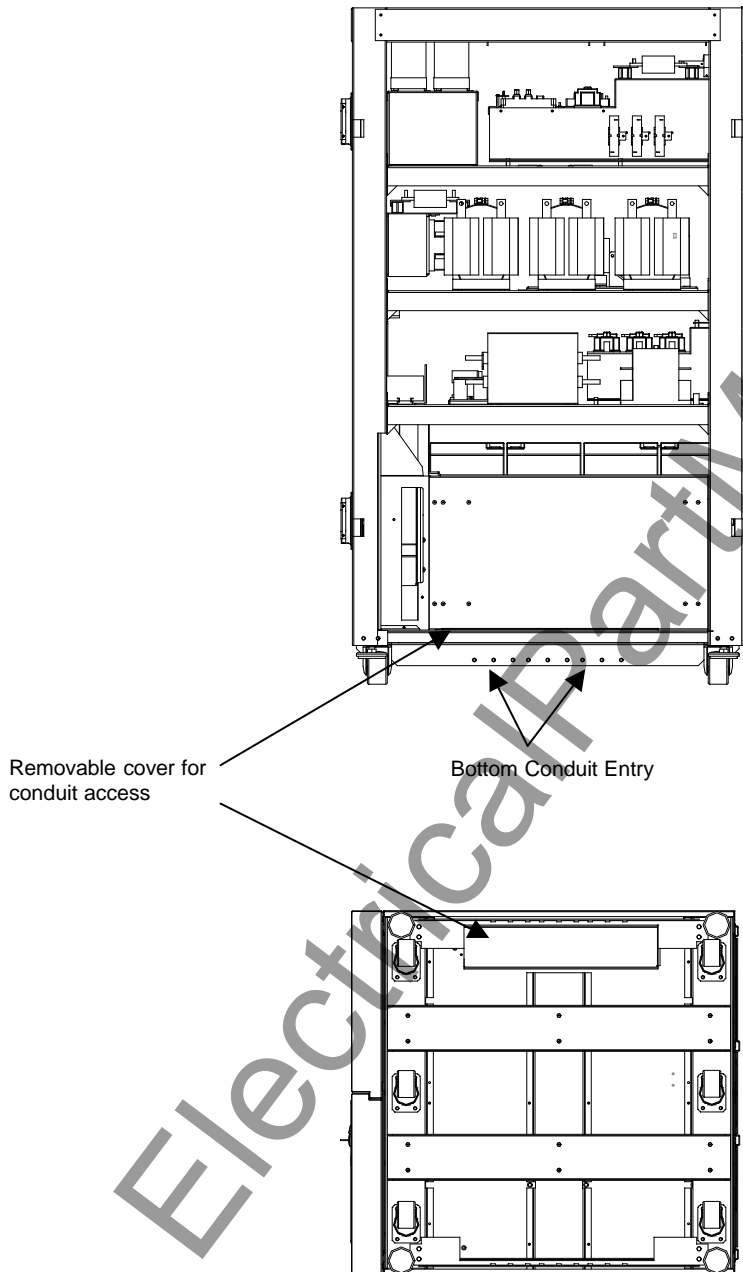
Minimum Wire Size and Torque requirements  
UPS Optional Bypass Input Terminals TB4 50 kVA  
**(USE MINIMUM 75° C INSULATED COPPER WIRING)**

Phase: (A) (B) (C) Input: (H1) (H2) (H3)	50 kVA	
	AWG	Tightening Torque
208/120	1/0	200 in-lbs.
220	1/0	200 in-lbs.
240	1	200 in-lbs.
380	4	200 in-lbs.
400	4	200 in-lbs.
415	4	200 in-lbs.
480	6	200 in-lbs.
600	6	200 in-lbs.

# TOSHIBA

## 4.3.2 Power Connection Cable Routing

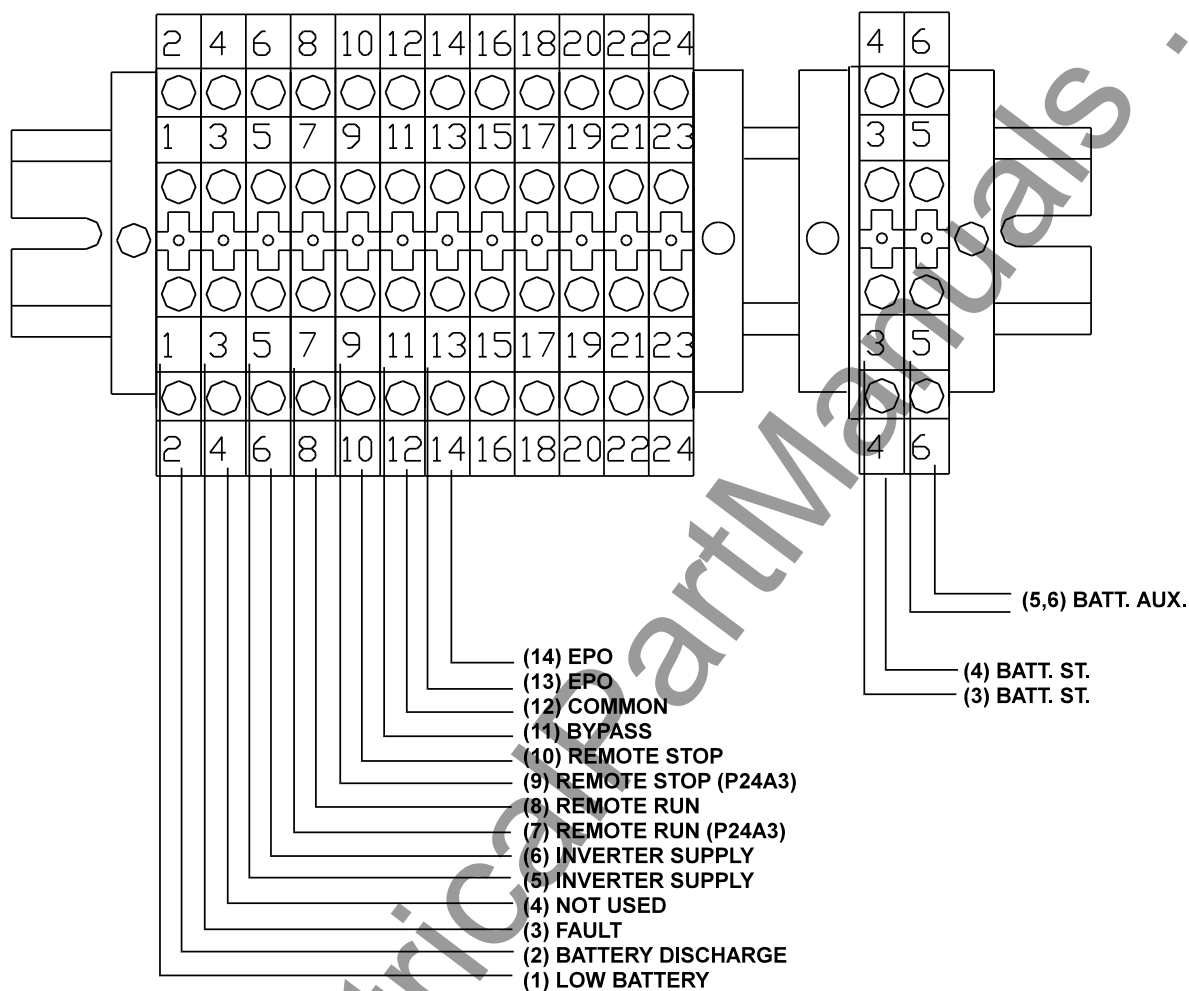
The following illustrates the proper cable routing that should be followed during the power connection process.



# TOSHIBA

## 4.4 Control Circuit and External Interface Connections

The following illustrates the wiring connections of the Control Circuits, and Battery Interface Circuits for the 50 kVA.



### 4.4.1 Recommended Wire Size and Torque Requirements UPS Control and Battery Interface 50 kVA

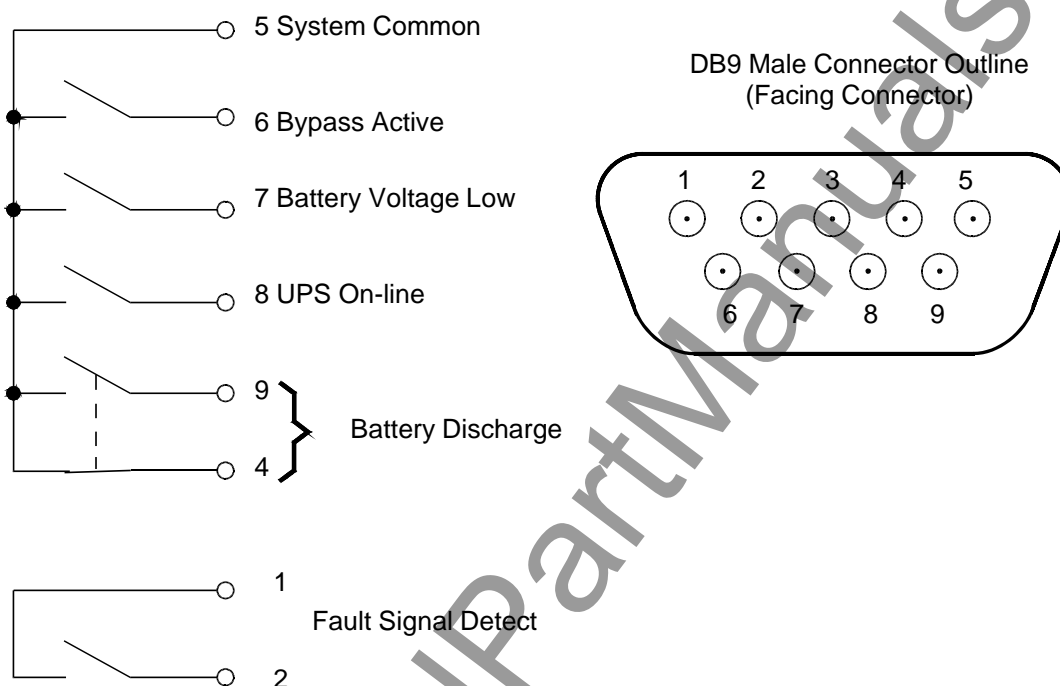
Minimum Wire Size and Torque Requirements UPS Control and Battery Interface Circuits <b>USE MINIMUM 75° C COPPER WIRING</b>		
TERMINAL (TERMINAL #)	50 kVA	
	AWG	TIGHTENING TORQUE
UPS CONTROL CIRCUITS (1-24)*	14-16	8 in-lbs.
BATTERY CONTROL CIRCUITS (3-6)*	14-16	8 in-lbs.

\*Indicates Class 1 wiring methods is to be used.

## 4.5 Communication Interface

### 4.5.1 Remote Contact

This interface is a standard feature and is available as dry switch contacts through a DB9 male connector located on the front of the UPS (see Section 9 for Interface ports location). The following schematic shows the contact state and pin assignment for each signal and the associated DB9 connector pin-out.



#### Notes:

- 1) Pin "switches" are shown in their **inactive states**. **Example:** (if battery voltage is low, pin 7 will be connected to System Common).
- 2) Contacts are rated at 30 VDC, 0.1 amps; 125 VAC, 3 amps.
- 3) Pin number "3" is not used.



# TOSHIBA

## 4.5.2 RS-232C

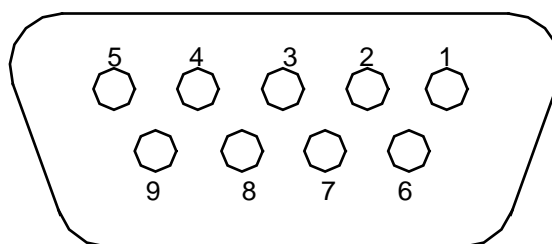
The RS-232C serial communication interface is available through a DB9 female connector located on the backside of the UPS (see Section 9 for Interface ports location). This interface allows control of the UPS from a computer network running Toshiba RemotEyell™ software. The computer and the UPS are connected 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 Input Frequency Battery Voltage	Output Voltage Output Frequency Output Current
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 Over-Current DC Bus Over-Voltage DC Bus Under-Voltage Input Over-Current Overheat Overload Being Timed Overload (allowable time exceeded) Output Over-Voltage (during Normal Mode) Output Under-Voltage (during Normal Mode)	

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

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)



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

When the UPS is operating from its internal batteries, a 'shutdown' order can be sent to the UPS instructing 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 by following the directions listed on the RS-232C screen.

# TOSHIBA

## 5.0 Technical Data

### 5.1 4200FA 15 / 25kVA @ 208 VAC Input/ 208 VAC Output w/Internal Batteries

	Model Number	T42F3F150X#MBN	T42F3F250X#MBN
	Rated Output Capacity	<b>15 kVA</b>	<b>25 kVA</b>
	External Dimensions W x D x H (mm)	20" x 36.25" x 59.85" 508mm x 90.75mm x 1520.2mm	20" x 36.25" x 59.85" 508mm x 90.75mm x 1520.2mm
Input	Rated Voltage	208 VAC	
	Voltage Variation	+10% to -30%; (-15% to -30%)	
	Rated Frequency	50 / 60 Hz	
	Input Cables required	3 Ø; 3 Wire + GND	
	Dual Input Option Cables required	3 Ø; 4 Wire + GND (when wye output is required)	
	* Power Factor	Greater than 0.98 when in inverter mode	
	Required Input kVA	16.5	27.5
	Walk-in Function	From 20% to 100% over 5 seconds	
	Inrush Current	Less than 8 times the rated current under synchronous operation	
	Current Limit	115% maximum	
	* Harmonic Currents	Less than 3% THD	
Battery	DC Nominal (Voltage Range)	240 VDC (180 to 276 VDC)	300 VDC (225 to 345 VDC)
	Float Charge (Regulation)	270 VDC (± 2%)	337.5 VDC (± 2%)
	Ripple Voltage	2% R.M.S.	
	**Rated Back-up Time	Refer to Battery System Manual	
	Rated Charge Current	2.0 Amps per string	
Output	Rated Voltage	208 / 120 VAC	
	Rated Current	42.0 Amps	69.5 Amps
	Rated Power Factor	0.8 lagging	
	Output Cables Required	3Ø; 4 Wire + GND	
	Voltage Regulation (phase-phase)	± 2% (0-100% balanced load); ± 3% (0-100% unbalanced load)	
	Voltage Adjustment Range	± 5V Manually from the key pad	
	Phase Displacement	± 2° (0-100% balanced load); ± 4° (unbalanced load)	
	Rated Frequency	50 / 60 Hz	
	Frequency Regulation	± 0.1% in free running mode	
	Frequency Synchronous	± .5/1.0/1.5 Hz (± 1.0 Hz. std.) switch selectable by qualified technician	
	Frequency Slew Rate	1 Hz/s to 3Hz/s (in 0.5 Hz steps)	
	Voltage Transients (Recovery time: 50 msec)	± 5% (100% load step change); ± 3% (loss or return of input voltage); ± 8% (transfer of bypass to inverter)	
	Inverter Overload Capacity	125% 90 sec; 150% 30 sec	
	Bypass Overload Capacity	1000% 10 msec; 125% 10 min.	
	Crest Factor	2.5-3.0 within the kW range	
	Neutral Line Conductor	1.73 (200%) times line rating	
Harmonic Voltage Distortion	1.5% max (linear load)		
Inrush Current protection	Automatic Transfer to bypass, then retransfer to inverter		
Environment	Efficiency	AC/DC/AC: 86%; DC/AC: 90%	
	Heat loss to be removed	5733 BTU/hr (1445kcal/hr)	9554 BTU/hr (2407kcal/hr)
	Audible Noise	60dB (A) at 1 meter from the front of the unit	
	Operating Temperature	32°- 104° F (0°-40° C); optimal temperature is 77° F (25° C)	
	Operating Humidity	30-90% RH (non condensing)	
Altitude ***	Less than 2000 meters		

Items marked with an (\*) are specified at rated conditions under balanced linear loads.

(\*\*) Battery backup time may vary depending on the operating conditions and ambient temperature at the installation site, and an initial charge time of 24 hrs is necessary to obtain proper battery performance level before the unit is placed in operation.

(\*\*\*) At 6600-ft (2000 m) above sea level, output capacity should be derated by 3%. (Consult Factory for higher elevations)

# TOSHIBA

## 5.2 4200FA 15/ 25Kva w/Internal Transformer

	Model Number	T42#3*150#AMXN		T42#3*250#AMXN	
		Input	Output	Input	Output
		# =(F: 208; H: 220; C: 240; N: 380-415; D: 480; M: 600) VAC		*(F: 208; H: 220 wye; J: 240; P: 380-400 wye; K: 480 wye; M: 600V)	
	Rated Output Capacity	15 kVA		25 kVA	
	External Dimensions W x D x H (mm)	20" x 36.25" x 59.85" 508mm x 90.75mm x 1520.2mm		20" x 36.25" x 59.85" 508mm x 90.75mm x 1520.2mm	
Input	Rated Voltage	208; 220; 240; 380; 400; 415; 480; 600 VAC (Determined by Input Transformer internal to the unit)			
	Voltage Variation	+10% to -30%; (-15% to -30%)			
	Rated Frequency	50/60 Hz			
	Input Cables Required	3 Ø; 3 Wire + GND			
	Dual Input Option Cables required	3 Ø; 4 Wire + GND (when wye output is required)			
	* Power Factor	Greater than 0.98 when in inverter mode			
	Required Input kVA	16.5		27.5	
	Walk-in Function	From 20% to 100% over 5 seconds			
	Inrush Current	Less than 12 times the rated current under synchronous operation			
	Current Limit	115% maximum			
	* Harmonic Currents	Less than 3% THD			
	Battery	DC Nominal (Voltage Range)	300 VDC (225 to 345 VDC)		
Float Charge (Regulation)		337.5 VDC (± 2%)			
Ripple Voltage		2% R.M.S.			
**Rated Back-up Time		Refer to Battery System Manual			
Rated Charge Current		2.0 Amps per string			
Output	Rated Voltage	(Determined by Input Transformer internal to the unit)			
	Rated Current	VA / Nominal Output Voltage / 1.73			
	Rated Power Factor	0.8 lagging			
	Output Cables Required	3 Ø; 4 Wire + GND			
	Voltage Regulation (phase-phase)	± 5% (0-100% balanced load); ± 6% (0-100% unbalanced load)			
	Voltage Adjustment Range	± 5V Manually from key pad			
	Phase Displacement	± 2° (0-100% balanced load); ± 4° (unbalanced load)			
	Rated Frequency	50 / 60 Hz			
	Frequency Regulation	± 0.1% in free running mode			
	Frequency Synchronous	± .5/1.0/1.5 Hz (± 1.0 Hz. std.) switch selectable by qualified technician			
	Frequency Slew Rate	1 Hz/s to 3Hz/s (in 0.5 Hz steps)			
	Voltage Transients (Recovery time: 50 msec)	± 5% (100% load step change); ± 3% (loss or return of input voltage); ± 8% (transfer of bypass to inverter)			
	Inverter Overload Capacity	125% 90 sec; 150% 30 sec			
	Bypass Overload Capacity	1000% 10msec; 125% 10 min.			
	Crest Factor	2.5-3.0 within the kW range			
	Neutral Line Conductor	1.73 (200%) times line rating			
	Harmonic Voltage Distortion	1.5% max (linear load)			
Inrush Current protection	Automatic Transfer to bypass, then retransfer to inverter				
Environment	Efficiency	AC/DC/AC: 84%; DC/AC: 88%			
	Heat loss to be removed	6552 BTU/hr (1651kcal/hr)		10918 BTU/hr (2751kcal/hr)	
	Audible Noise	60dB (A) at 1 meter from the front of the unit			
	Operating Temperature	32° - 104° F (0°-40° C); optimal temperature is 77° F(25° C)			
	Operating Humidity	30- 90% RH (non condensing)			
	Altitude ***	Less than 2000 meters			

Items marked with an (\*) are specified at rated conditions under balanced linear loads.

(\*\*) Battery backup time may vary depending on the operating conditions and ambient temperature at the installation site, and an initial charge time of 24 hrs is necessary to obtain proper battery performance level before the unit is placed in operation.

(\*\*\*) At 6600-ft (2000 m) above sea level, output capacity should be derated by 3%. (Consult Factory for higher elevations)

# TOSHIBA

## 5.3 4200FA 50kVA @ 208 VAC Input/ 208 VAC Output w/Internal Batteries

Input	Model Number	T42F3F500X#MBN
	Rated Output Capacity	<b>50 kVA</b>
	External Dimensions W x D x H (mm)	35.6" X 38.9" X 59.4" (904mm x 970mm x 1509mm)
	Rated Voltage	208 VAC
	Voltage Variation	+10% to -30%; (-15% to -30%) ****
	Rated Frequency	50 / 60 Hz
	Input Cables Required	3 Ø; 4 Wire + GND
	Dual Input Option Cables required	3 Ø; 4 Wire + GND (when wye output is required)
	* Power Factor	Greater than 0.98 when in inverter mode
	Required Input kVA	55.0
	Walk-in Function	From 20% to 100% over 5 seconds
	Inrush Current	Less than 12 times the rated current under synchronous operation
	Current Limit	115% maximum
* Harmonic Currents	Less than 3% THD	
Battery	DC Nominal (Voltage Range)	300 VDC (225 to 345 VDC)
	Float Charge (Regulation)	337.5 VDC (± 2%)
	Ripple Voltage	2% R.M.S.
	**Rated Back-up Time	5 min. at full load
	Rated Charge Current	11.5 Amps
Output	Rated Voltage	208 / 120 VAC
	Rated Current	138.9 Amps
	Rated Power Factor	0.8 lagging
	Output Cables Required	3Ø; 4 Wire + GND
	Voltage Regulation (phase-phase)	± 2% (0-100% balanced load); ± 3% (0-100% unbalanced load)
	Voltage Adjustment Range	± 5V Manually from key pad
	Phase Displacement	± 2° (0-100% balanced load); ± 4° (unbalanced load)
	Rated Frequency	50 / 60 Hz
	Frequency Regulation	± 0.1% in free running mode
	Frequency Synchronous	± .5/1.0/1.5 Hz (± 1.0 Hz. std.) switch selectable by qualified technician
	Frequency Slew Rate	1 Hz/s to 3Hz/s(in 0.5 Hz steps)
	Voltage Transients (Recovery time: 50 msec)	± 5% (100% load step change); ± 3% (loss or return of input voltage); ± 8% (transfer of bypass to inverter)
	Inverter Overload Capacity	125% 90 sec; 150% 30 sec
	Bypass Overload Capacity	1000% 10 msec; 125% 10 min.
	Crest Factor	2.5-3.0 within the kW range
	Neutral Line Conductor	1.73 (200%) times line rating
	Harmonic Voltage Distortion	1.5% max (linear load)
Inrush Current protection	Automatic Transfer to bypass, then retransfer to inverter	
Environment	Efficiency	AC/DC/AC: 88%; DC/AC: 89%
	Heat loss to be removed	17743BTU/hr (4472kcal/hr)
	Audible Noise	~65dB @ 1 meter from the front of the unit
	Operating Temperature	32°- 104° F (0°-40° C); optimal temperature is 77° F(25° C)
	Operating Humidity	30-90% RH (non condensing)
	Altitude ***	Less than 2000 meters

Items marked with an (\*) are specified at rated conditions under balanced linear loads.

(\*\*) Battery backup time may vary depending on the operating conditions and ambient temperature at the installation site, and an initial charge time of 24 hrs is necessary to obtain proper battery performance level before the unit is placed in operation.

(\*\*\*) At 6600-ft (2000 m) above sea level, output capacity should be derated by 3%. (Consult Factory for higher elevations)

(\*\*\*\*) Prolonged operation at this level requires some derating of the output capacity.

# TOSHIBA

## 5.4 4200FA 50kVA w/Internal Transformer

	Model Number	T42#3*500#AMBN		
		Input	# =(F: 208; H: 220; C: 240; N: 380-415; D: 480; M: 600) VAC	
		Output	*=(F: 208; H: 220 wye; J: 240; P: 380-400 wye; K: 480 wye; M: 600V)	
	Rated Output Capacity	<b>50 kVA</b>		
External Dimensions W x D x H (mm)	35.6" X 38.9" X 59.4" (904mm x 970mm x 1509mm)			
Input	Rated Voltage	208 VAC		
	Voltage Variation	+10% to -30%; (-15% to -30%) ****		
	Rated Frequency	50 / 60 Hz		
	Input Cables Required	3 Ø; 4 Wire + GND		
	Dual Input Option Cables required	3 Ø; 4 Wire + GND (when wye output is required)		
	* Power Factor	Greater than 0.98 when in inverter mode		
	Required Input kVA	55.0		
	Walk-in Function	From 20% to 100% over 5 seconds		
	Inrush Current	Less than 12 times the rated current under synchronous operation		
	Current Limit	115% maximum		
	* Harmonic Currents	Less than 3% THD		
	Battery	DC Nominal (Voltage Range)	300 VDC (225 to 345 VDC)	
		Float Charge (Regulation)	337.5 VDC (± 2%)	
Ripple Voltage		2% R.M.S.		
**Rated Back-up Time		Refer to Battery System Manual		
Rated Charge Current		11.5 Amps		
Output	Rated Voltage	208 / 120 VAC		
	Rated Current	138.9 Amps		
	Rated Power Factor	0.8 lagging		
	Output Cables Required	3Ø; 4 Wire + GND		
	Voltage Regulation (phase-phase)	± 2% (0-100% balanced load); ± 3% (0-100% unbalanced load)		
	Voltage Adjustment Range	± 5V Manually from key pad		
	Phase Displacement	± 2° (0-100% balanced load); ± 4° (unbalanced load)		
	Rated Frequency	50 / 60 Hz		
	Frequency Regulation	± 0.1% in free running mode		
	Frequency Synchronous	± .5/1.0/1.5 Hz (± 1.0 Hz. std.) switch selectable by qualified technician		
	Frequency Slew Rate	1 Hz/s to 3Hz/s(in 0.5 Hz steps)		
	Voltage Transients (Recovery time: 50 msec)	± 5% (100% load step change); ± 3% (loss or return of input voltage); ± 8% (transfer of bypass to inverter)		
	Inverter Overload Capacity	125% 90 sec; 150% 30 sec		
	Bypass Overload Capacity	1000% 10 msec; 125% 10 min.		
	Crest Factor	2.5-3.0 within the kW range		
	Neutral Line Conductor	1.73 (200%) times line rating		
Harmonic Voltage Distortion	1.5% max (linear load)			
Inrush Current protection	Automatic Transfer to bypass, then retransfer to inverter			
Environment	Efficiency	AC/DC/AC: 88%; DC/AC: 89%		
	Heat loss to be removed	17743BTU/hr (4472kcal/hr)		
	Audible Noise	~65dB @ 1 meter from the front of the unit		
	Operating Temperature	32°- 104° F (0°-40° C); optimal temperature is 77° F(25° C)		
	Operating Humidity	30-90% RH (non condensing)		
	Altitude ***	Less than 2000 meters		

Items marked with an (\*) are specified at rated conditions under balanced linear loads.

(\*\*) Battery backup time may vary depending on the operating conditions and ambient temperature at the installation site, and an initial charge time of 24 hrs is necessary to obtain proper battery performance level before the unit is placed in operation.

(\*\*\*) At 6600-ft (2000 m) above sea level, output capacity should be derated by 3%. (Consult Factory for higher elevations)

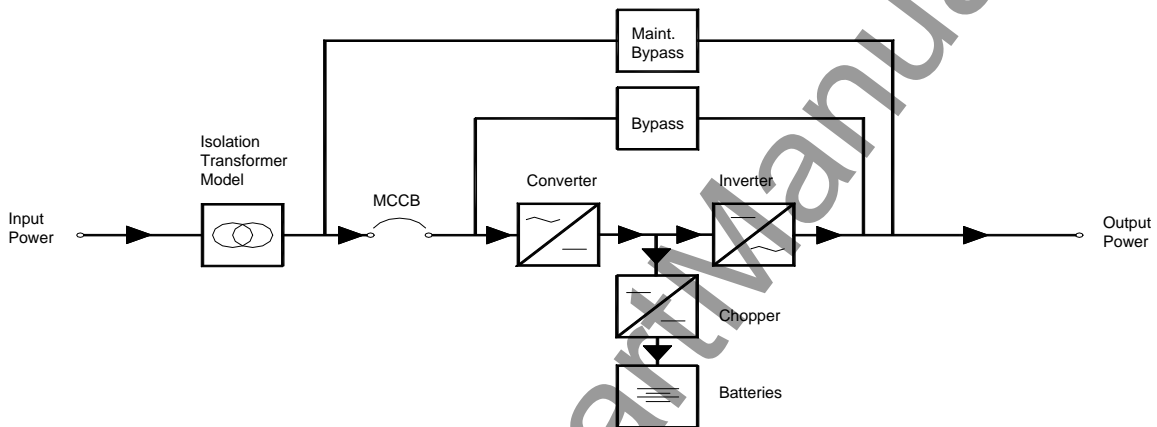
(\*\*\*\*) Prolonged operation at this level requires some derating of the output capacity.

## 6.0 Operating the UPS

### 6.1 Operating the UPS

#### 6.1.1 AC Input Mode (Normal Operation)

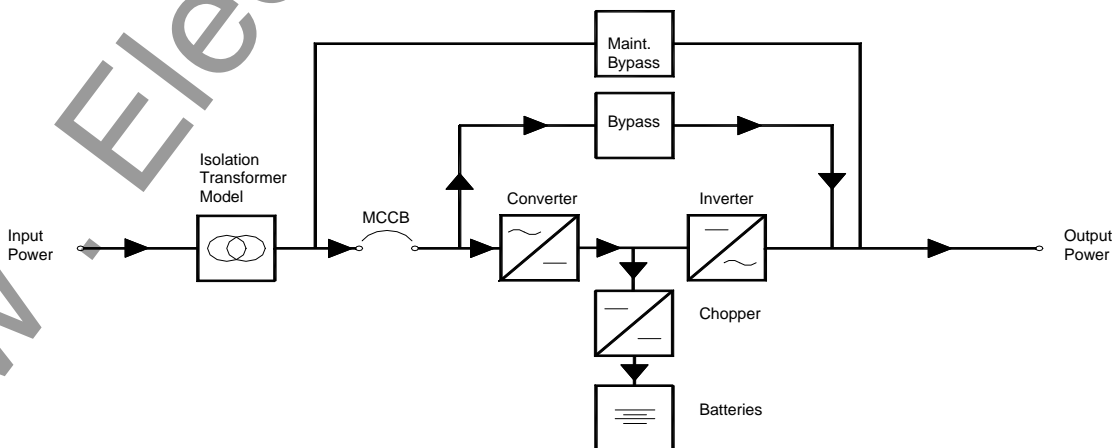
The following illustration shows circuit power flow when the UPS is operating normally in the AC Input Mode. The rectifier includes a boost chopper circuit that converts the AC input power into DC power. The boost chopper circuit maintains a constant voltage with current limiting abilities for charging the batteries. The rectifier supplies a DC voltage of the proper level to the inverter section. The inverter section generates a high quality sine wave output voltage. The batteries are maintained in a constantly charged state when the UPS is in the "Normal Operation Mode".



Power flow in AC Input Mode

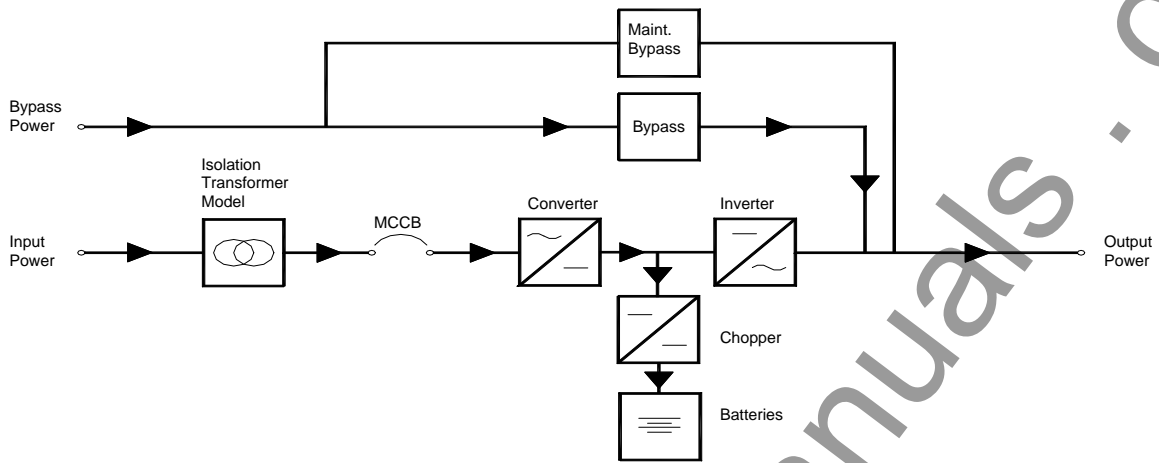
#### 6.1.2 Bypass Mode

If the UPS unit is severely overloaded or develops an internal fault, power flow is automatically switched from the main circuit to the Bypass circuit. Power flow through the bypass is shown in the following illustration. This changeover occurs automatically in less than 4 milliseconds in phase (Make-Before-Break). 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 "re-transfer" 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*** (see Section 6.11 "Start-up Procedure"). ***If the power flow is transferred to the Bypass circuit due to an overload condition, then the power flow will automatically transfer from the UPS's Bypass circuit back to the Inverter circuit after removing the overload*** (see Section 6.17 "Overload Operation").



Power flow in Bypass mode

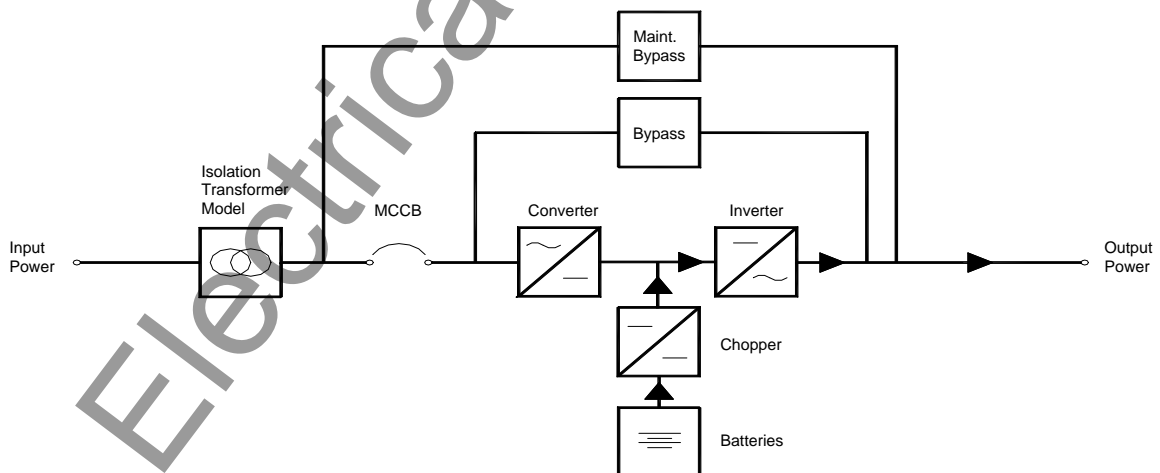
## 6.1.2.1 Bypass Mode for Optional Alternate Input Models



**Power flow in Bypass mode for the Alternate Input Models**

## 6.1.3 Battery Backup Mode

The following illustration shows power flow during the battery backup mode. When commercial AC power failures occur, the batteries instantly begin supplying DC voltage to the main inverter circuit. This circuit inverts (hence; Inverter) the DC power into AC power. The AC power is available at the output. This back-up process will continue until the 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 ( $V_{min}$ ). The rated battery voltage chart on 'Page 35' shows ( $V_{min}$ ). The battery backup time and discharge process is explained in Section 6.2.



**Power flow in battery backup mode**

## 6.2 Battery Backup Time and Discharge Process

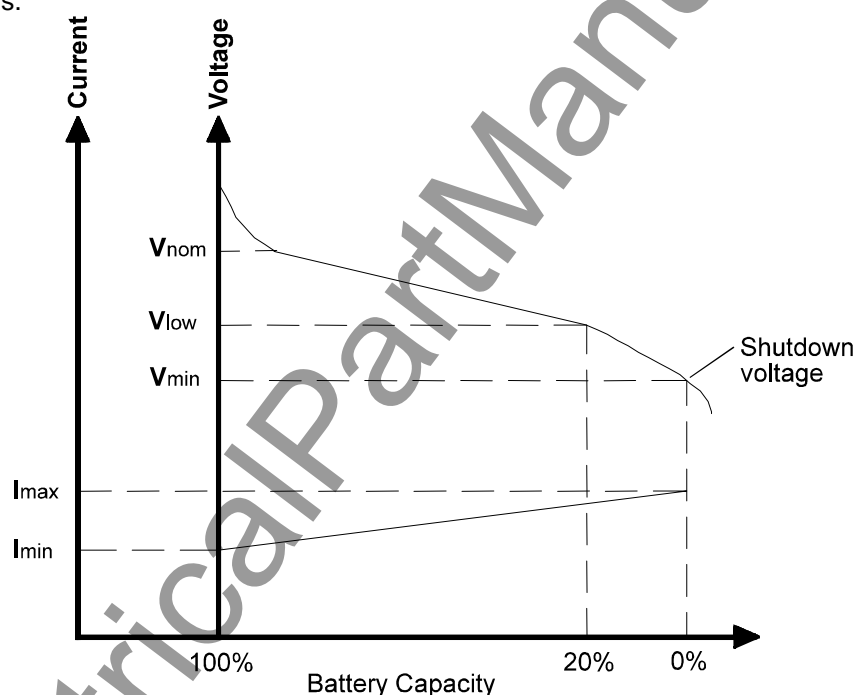
The UPS system, when used in conjunction with a Toshiba designed Battery System, is designed to provide several minutes of back-up time (Refer to the Battery System Manual for back-up times). These times are valid when the unit is operating under full load. When these models are operating at half load, the batteries can provide approximately 2 times the specified value. 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.



### CAUTION

Contact Toshiba when using other than Toshiba designed Battery Systems to determine proper compliance. Using other systems could void Warranty and or Safety Certifications.

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



## 6.3 Battery Low Voltage Tolerances

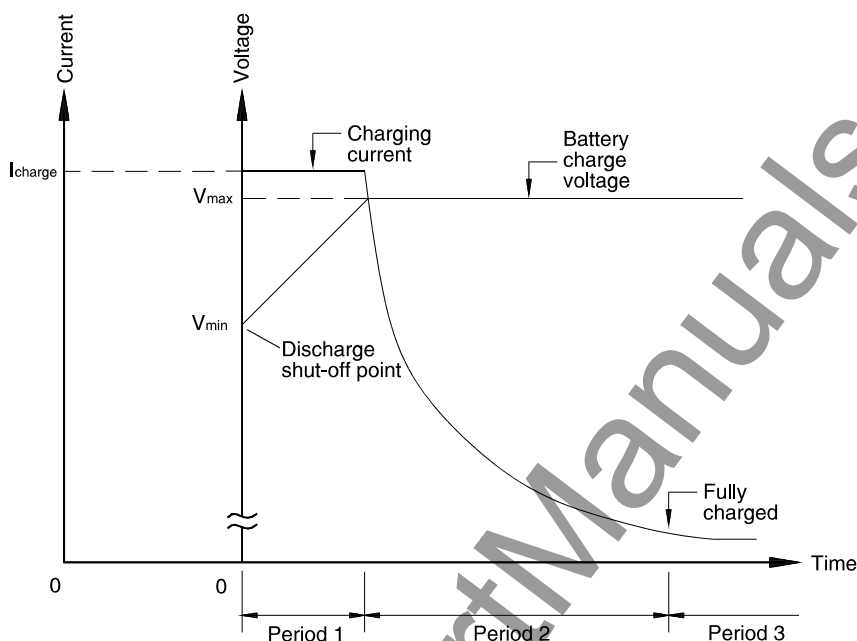
Excessive discharge will cause the UPS battery voltage to drop below tolerable levels. The chart shown below lists the voltage level at which each UPS unit's low-voltage alarm will sound, and also at what level the low-voltage condition will cause the unit to automatically shut down.

Models	15 kVA (Internal Batteries)	25 kVA/ 50kVA (15 kVA External Batteries)
Nominal Voltage	240 VDC	300 VDC
Alarm Voltage	228 VDC	240 VDC
Shutdown Voltage min.	188 VDC	225 VDC



## 6.4 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 steps. During the first step, the charging current is maintained at approximately 4.0 amperes (2.0A per string) for the 15 and 25 kVA internal battery models and approximately 11.5 amperes for the 50 kVA. This current 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 step, constant-voltage control starts and current gradually decreases as the batteries charge to their normal fully charged state. In the third step, a slight "trickle" current continues to flow into the batteries to keep them fully charged and "floating" at the normal DC Voltage level. A full recharge usually requires approximately 24-72 hours (90% recharge in 10 hours) after a complete discharge.

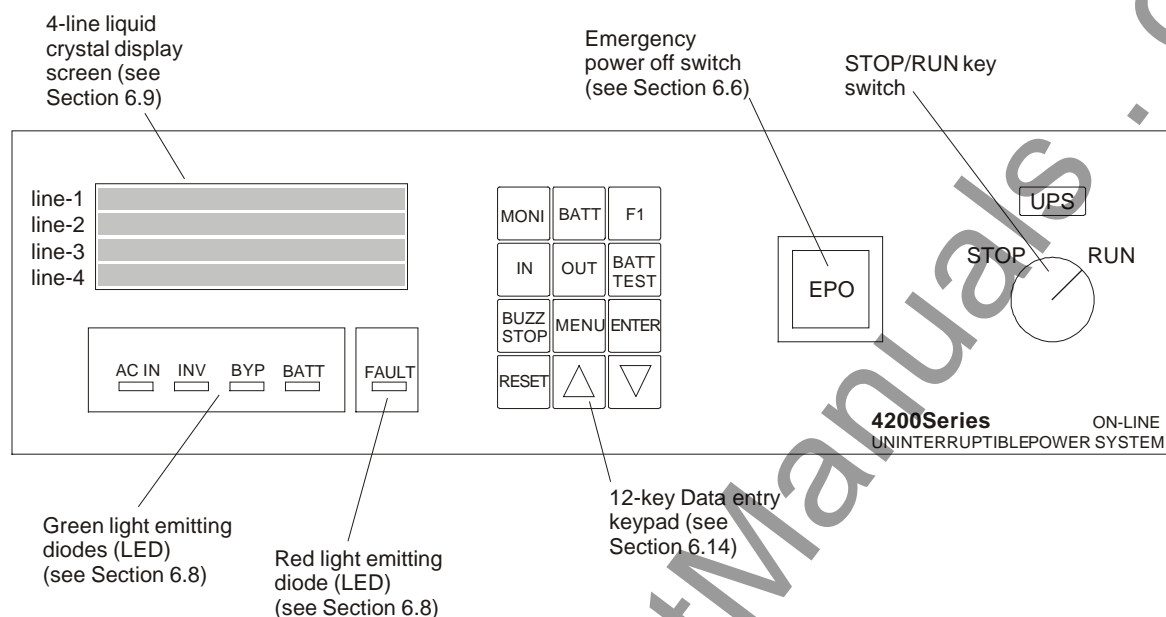
The following chart shows the rated maximum and minimum battery voltages, and the charge current for each of the sizes while the unit is maintained in a 75°F (24° C) ambient.

**Rated Battery Voltages**

Model	15 kVA (Internal Batteries)	25 kVA (15 kVA External Batteries)	50 kVA
<b>V float</b>	270 VDC	337.5 VDC	337.5 VDC
<b>V min</b>	210 VDC	263 VDC	263 VDC
<b>I charge</b>	4.0 Amps	4.0 Amps	11.5 Amps

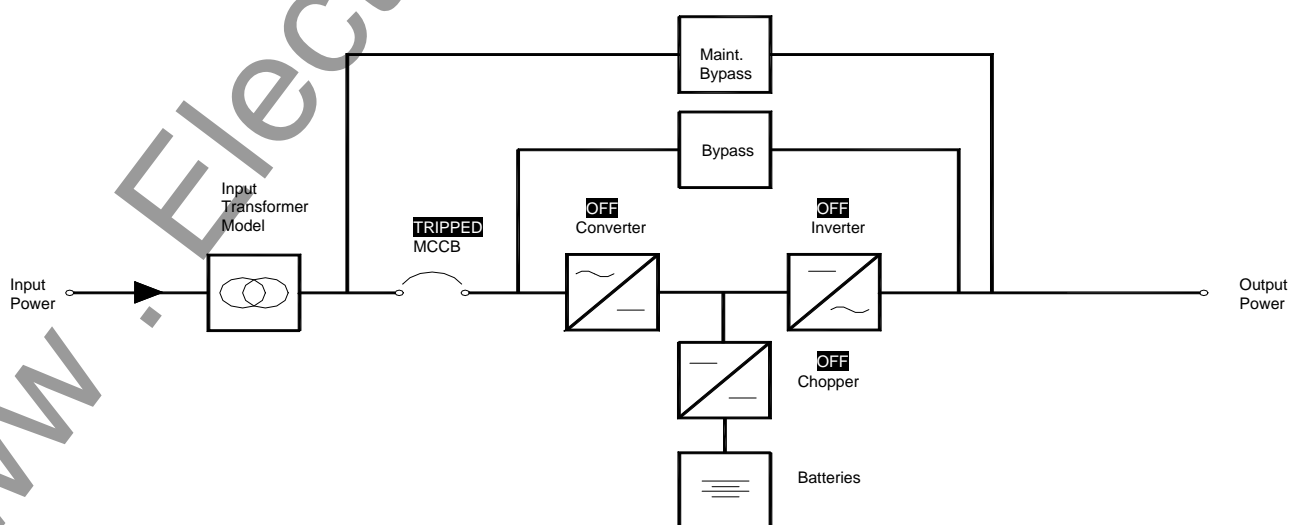
## 6.5 Front Panel Layout (All Units)

Refer to the following illustration for the entire UPS front panel operating procedures.



## 6.6 EPO (Emergency Power Off) Function

These units are equipped with terminals for receiving an EPO (Emergency Power Off) "closed contact" switch command from two locations: (1) a remote location (see Section 4.2, 4.4 and 4.6 Terminal Block Details) and (2) from a front panel mounted EPO switch (see Section 6.5 "Front Panel Layout"). This safety feature enables quick shutdown of the UPS AC output and battery circuits. Usually the EPO switch is installed in a central location that is easily accessible to personnel concerned with the operation of the UPS and the 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 is in the AC Input Mode (see Section 6.1.1), Battery Backup Mode (see Section 6.1.3), or the Bypass Mode (see Section 6.1.2). See 'EMERGENCY OFF' screen in Section 6.12 "Shutdown Procedure." The following figure shows the UPS condition after application of the EPO switch. **Use the Start-up Procedure (see Section 6.11) for restarting the unit.**



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## 6.7 Audible Alarm Functions

Audible alarms will sound when the UPS is in the Battery Backup Mode, has a fault, is at the low battery voltage, or is in an overload condition. The following chart shows the audible alarm pattern duration for each condition. Time intervals are shown in seconds. The audible alarm can be silenced, by pressing "BUZZ STOP" on the keypad (see Section 6.5 "Front Panel Layout").

Condition	Audible pattern
UPS in Battery Backup Mode (Battery Voltage 100-92%)	
UPS Low Battery (Battery Voltage < 92%)	
Overload	
Fault	

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## 6.8 LED (Light Emitting Diode) Functions

The following list describes the conditions necessary for each LED lamp to be "on".

**AC IN**

GREEN

INV

GREEN

BYP

GREEN

BYP

GREEN

**FAULT**

RED

This green LED lamp is "on" when the UPS is operating normally within specifications. If there is no power failure and the input voltage is in an under-voltage condition, the AC IN lamp will be "off". If there is no power failure and the input voltage is in an over-voltage condition, the AC IN lamp will flicker on and off rapidly (0.4 sec "on" and 0.4 sec "off").

This green LED lamp is "on" when the UPS inverter is operating.

This green LED lamp is "on" when the UPS is in the static Bypass Mode.

This green LED lamp is "on" when the UPS is in the Battery-Discharge Mode. If the battery is low during a battery discharge, the BATT lamp will flicker on and off slowly (1.2 sec "on" and 1.2 sec "off"). The BATT lamp will go "off" if the battery voltage reaches the shutdown level during the Battery-Discharge Mode.

This red LED lamp is "on" when the UPS is in a fault condition.

### 6.8.1 LED (Light Emitting Diode) System Status

The following chart shows the UPS system status that can be determined by decoding the "on" and "off" condition of the LED lamps. It should be used in conjunction with the LCD display (see Section 6.9) and the audible alarms (see Section 6.7) for total system monitoring.

LED	ON/OFF STATUS	LED	ON/OFF STATUS
Normal UPS Operation (UPS On-Line, no abnormal conditions)		Output Shutdown (After EPO received (Emergency Power Off))	
AC IN	ON	AC IN	OFF
INV	ON	INV	OFF
BYP	OFF	BYP	OFF
BATT	OFF	BATT	OFF
FAULT	OFF	FAULT	OFF
Bypass Operation; UPS Fault		Fatal Communication Error (Display to Control Interface)	
AC IN	ON	AC IN	ALL ON OR FLICKERING RAPIDLY
INV	OFF	INV	
BYP	ON	BYP	
BATT	OFF	BATT	
FAULT	ON	FAULT	
Battery Back-up; (Battery Voltage Low)			
AC IN	OFF		
INV	ON		
BYP	OFF		
BATT	ON (Blinking)		
FAULT	OFF		

## 6.9 LCD (Liquid Crystal Display) Functions

The LCD screen is a 4-line by 20-character wide display. The LCD display contains information about the operation of the UPS. It should be used in conjunction with the LED display (see Section 6.8) and the audible alarms (see Section 6.7) for total system monitoring. The LCD displays certain information only on specific lines of the display. The UPS operating mode and conditions determines the information shown. These messages are shown in the following line message charts.

### 6.9.1 Line-1 System Messages

Line-1 messages are based on the operating mode. The following chart shows all allowable Line-1 messages, which occur while starting up and while in main monitor (MONI) screen mode.

**LINE-1 MESSAGES**

Display Message	Translation
- START UP -	Displayed when UPS is in the start-up condition or display board is resetting.
- BYPASS OPERATION -	Displayed when the UPS is in Bypass Operation.
- UPS ON-LINE -	Displayed when the inverter is running, and no Utility abnormality exists.
- BATTERY DISCHARGE -	Displayed during abnormal Utility occurrences; inverter is supplying power from batteries. (UPS shuts down after V (min.) is reached.
- OUTPUT SHUTDOWN -	Displayed during power failure if V (min.) is reached, an EPO is received, or after completion of Start-Up Sequence of the Inverter and Bypass is not available.
- BATTERY BACKUP -	Displayed during input power failure.

### 6.9.2 Line-2 System Fault Messages

Line-2 fault messages are automatically displayed when a system fault is detected.

**LINE-2 MESSAGES**

Display Message	Translation
DCOC	DC Over-current
DCUB	DC Unbalanced
DCOV	DC Over-voltage
OH	Overheat (internal)
OL	Output Overload
VOUV	Inverter Under-voltage
VOOV	Inverter Over-voltage

### 6.9.3 Line-3 System Messages

Line-3 messages show load current information, and user selected instructions.

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## 6.9.4 Line-4 System Messages

Line-4 messages reflect the UPS operating conditions. Warning messages will be displayed when an abnormal operating condition occurs. The following chart shows the allowable Line-4 messages.

**Line-4 Messages**

Displayed Message	Translation
<b>PHEI</b>	Displayed when Input Phase rotation has been wired in a counter-clockwise rotation.
<b>I/O NOT SYNCHRONIZE</b>	Displayed when input and output frequencies are not synchronized. (Abnormal)
<b>* AUTOTRANSFER *</b>	Displayed when Auto-transfer to Bypass is active (i.e. current limit reached). (Abnormal)
<b>* LOW BATTERY *</b>	Displayed when battery voltage is low (abnormal) or the UPS batteries have failed self-diagnostic test. (Abnormal)
<b>* UPS OL: REDUCE LOAD *</b>	Displayed when UPS has tripped due to an overload condition. (Abnormal)
<b>* DCOC *</b>	Displayed when the UPS has an internal failure. (Abnormal)
<b>* DCOV *</b>	Displayed when the UPS has an internal DC bus over-voltage. (Abnormal)
<b>* DCUB *</b>	Displayed when the UPS has an internal DC bus unbalance referenced to Neutral. (Abnormal)
<b>* OL *</b>	Displayed when UPS has tripped due to an overload condition. (Abnormal)
<b>* FUSE *</b>	Displayed when an internal transistor fuse opens.
<b>* INOV *</b>	Displayed when inverter output over-voltage has occurred. (Abnormal)
<b>* INUV *</b>	Displayed when inverter output under-voltage has occurred. (Abnormal)
<b>* BATT. OH *OR MCCB-B OPEN</b>	Displayed when the <b>optional</b> battery over-temp sensor has activated, or if the external battery disconnect is open. (Verify TB3-5, 6)
<b>* MM/DD/YY (DAY) HH:MM *</b>	Displayed when none of the above abnormal conditions are present. (Normal)
<b>* TRANSFER INHIBITED *</b>	Displayed when key switch position is changed and frequency is not synchronized. (Abnormal)
<b>* ENTER FOR DETAILS *</b>	Displayed when a Fault or Faults have occurred. (Abnormal)

Note:

- 1) Line-4 will be blank when the BATT key is pressed during Battery Backup Mode with normal battery voltage.
- 2) The # symbol signifies numerical values or other information supplied by the UPS.

## 6.10 Initial Battery Charge

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

- 1) Switch on power at the UPS input distribution panel, and battery disconnects.
- 2) Move the UPS MCCB1 (Circuit Breaker 1) power switch on the rear panel to "on" (see Section 9 for location). Note: If the unit is supplied with a Maintenance Bypass option, indicated with suffix (MB) on the model number, MCCB2 (Circuit Breaker 2) will this need to be energized. The UPS battery charging circuit is now activated. The AC IN lamp will be "on". The LCD screen (see Section 6.5 "Front Panel Layout") should display the following message:

```
- UPS START UP -  
  
> PLEASE WAIT
```

- 3) With the key switch in the STOP position, the AC IN and the BYP lamp will be "on" and the LCD screen should display the following message:

```
- BYPASS OPERATION -  
OUTPUT VOLTAGE=208V  
>CURRENT 100/100/100%  
(DATE) DAY (TIME)
```

- 4) Turn the Key Switch to "RUN" and the UPS automatically performs a controlled system battery test. (Note: The Automatic Battery Test is performed only when the software is enabled for this function. The standard default is set to disable.)

**(Allow 24-72 hours for the batteries to fully charge).**

When automatic battery test fails and the "LOW BATTERY" message is displayed use the following procedure:

- 1) Turn the key switch to STOP.
- 2) Allow 24-72 hours for the batteries to charge and then move the Circuit Breaker (see Section 9 for location) to "off".
- 3) Repeat Initial Battery Charge procedure. (A failure indicates battery replacement may be necessary).

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## 6.11 Start-up Procedure

The UPS batteries must be charged before the UPS is used for the first time or if the unit has not been used (AC power source removed) for more than 10 days (Refer to Section 6.10).

If the batteries are charged then use the following start-up procedure:

- 1) Verify that all power switches are off, and that the "STOP/RUN" Switch on the UPS is in the "STOP" position.
- 2) Switch on the power at the Customer Provided UPS input distribution panel.
- 3) Move the UPS Circuit Breakers to "on" (see Section 9 for location). The AC IN lamp will be "on". The LCD screen (see Section 6.5 "Front Panel Layout") should display the following message:

```
- UPS START UP -  
  
> PLEASE WAIT
```

With the key switch in the "STOP" position, both the AC IN and the BYP lamp will be "on" and the LCD screen should display the following message:

```
- BYPASS OPERATION -  
OUTPUT VOLTAGE=207V  
>CURRENT 100/80/90%  
DATE (DAY) TIME
```

The UPS battery charging circuit is now activated. Move the "STOP/RUN" key switch to the "RUN" position. The inverter will then start and the UPS will transfer to the Normal Operating Mode. Both the AC IN and the INV lamp will be "on". The following system message is an example of the main MONI (monitor) screen for standard operation (see Section 6.15.1 "MONI Function"):

```
- UPS ON-LINE -  
OUTPUT VOLTAGE=208V  
>CURRENT 100/80/90%  
DATE (DAY) TIME
```

If a fault occurs during start-up, the red FAULT lamp will be "on" and the LCD screen will display a FAULT(s) DETECTED at start-up message such as the following:

```
UPS FAULT (BYPASS ON)  
(DESCRIPTION)  
PRESS DOWN TO DETAIL  
> ENTER FOR DETAILS
```

Refer to Section 6.9.2 "Line-2 System Fault Messages" for details.



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## 6.12 Shutdown Procedure

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

- 1) Move the "STOP/RUN" key switch, located on the front panel, to "STOP". Operation of the inverter stops. Output power is now provided to the load through the unit's Bypass circuit. *While in this state of operation; if a power failure occurs in the commercial power source, the UPS will lose power. Power to the critical load device will be interrupted.* The battery charging circuit and chopper circuit remains 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.**

The green AC IN lamp is "on" and the green BYP lamp is "on". The LCD screen shows the following message:

```
- BYPASS OPERATION
  OUTPUT VOLTAGE=207V
>CURRENT 100/100/100%
  DATE (DAY) TIME
```

Move the Circuit Breakers to the "off" position. **Power is removed from the UPS and to any attached loads.** All lamps are "off" and the LCD screen shows the following message as long as sufficient power remains to display it:

```
- OUTPUT SHUT DOWN -
  OUTPUT VOLTAGE= 0V
CURRENT=LOW/LOW/LOW%
```

When the EPO (Emergency Power Off) switch, located on the front panel (or from a remote located EPO switch) is pushed, all of the Circuit Breakers are tripped and power is removed from the UPS and to any attached loads (see Section 6.6 "EPO Function"). All LED lamps are "off" and the LCD screen will display the following message:

```
- OUTPUT SHUT DOWN -
  OUTPUT VOLTAGE= 0V
CURRENT=LOW/LOW/LOW%
```

## 6.13 Maintenance Bypass Procedure

When operating the Maintenance Bypass, the following operation procedure should be used:



### WARNING

Failure to adhere to the following instructions could result in damage to your equipment and/or you risk removal of power to any equipment attached to the UPS.

#### From UPS to Maintenance Bypass

- 1) Move the "STOP/RUN" key switch, located on the front panel, to "STOP". Operation of the UPS inverter stops. Output power is now provided to the load through the Bypass circuit. **While in this mode, if a power failure occurs on the commercial power source, the UPS will lose power. Power to the critical load device will be interrupted.** The battery charging circuit and chopper circuit remains activated.
- 2) Verify that step one above is followed, and that the Bypass light indicator on the front panel is lit.
- 3) Locate the Maintenance Bypass Rotary Switch (middle front panel of the UPS); slowly rotate the Cam Switch clockwise until "BYPASS" Position is reached.
- 4) Turn off MCCB1 breaker labeled "MAIN POWER".

**The unit is now in the Maintenance Bypass mode and may be serviced. For units with an internal isolation transformer, the transformer is still active.**

#### From Maintenance Bypass to UPS



- 1) Verify that the "STOP/RUN" switch is in the "STOP" position. Turn on MCCB1 "MAIN POWER".
- 2) Wait until the output fans turn on (This is a good indication that the unit is in the Bypass mode), and that the Bypass indicator light on the front panel is lit.
- 3) For units with an external battery cabinet, turn on MCCB1 "BATTERY CABINET".
- 4) Locate the Maintenance Bypass Switch (Middle front panel of the UPS) slowly rotate the Cam Switch counter-clockwise until "UPS" Position is reached.
- 5) Rotate the "STOP/RUN" switch to the "RUN" position.
- 6) Verify that the Inverter indicator light on the front panel is lit.



**The unit is now back On-Line and supplying conditioned power to the load.**

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## 6.14 Keypad Overview

The following illustrates the 12-key data entry pad with each key functionally labeled (see Section 6.5 “Front Panel Layout”).

<b>MONI</b>	<b>BATT</b>	<b>F1</b>
<b>IN</b>	<b>OUT</b>	<b>BATT TEST</b>
<b>BUZZ STOP</b>	<b>MENU</b>	<b>ENTER</b>
<b>RESET</b>		

<b>MONI</b>	Press to display system-monitoring screens (see Section 6.15.1).
<b>BATT</b>	Press to display UPS battery conditions (see Section 6.15.4).
<b>F1</b>	Press to change settings of various menus (see Section 6.15.5).
<b>IN</b>	Press to display UPS input conditions (see Section 6.15.2).
<b>OUT</b>	Press to display UPS output conditions (see section 6.15.3).
<b>BATT TEST</b>	Press to execute On-Line Battery test (see section 6.15.6).
<b>BUZZ STOP</b>	Press to stop the audible alert buzzer (see section 6.15.7).
<b>MENU</b>	Press to display the main user-selection menu (see section 6.15.5).
<b>ENTER</b>	Press to confirm user-selected command or action (see section 6.15.5).
<b>RESET</b>	Press to reset UPS panel's message-display area (see Section 6.15.8).
	Press to forward through display data values, or to forward through menus (see section 6.15.5).
	Press to reverse through display data values, or to reverse through menus (see section 6.15.5).

## 6.15 Key Functions

### 6.15.1 MONI

After the UPS has been successfully started, the system will be in the normal 'AC Input Mode' of operation. The LCD screen will automatically display the main MONI (monitor) function. If the MONI key is pressed at this time the screen output will not change. The MONI function automatically monitors the entire UPS system. The LCD screen will automatically switch "off" after a period of keypad inactivity and switch "on" if any key is pressed. It will switch "on" automatically during battery discharge or if an abnormality develops in the system (see Section 6.16.3 "Settings for LCD Display Duration"). All system 'line' messages will be displayed from MONI mode when abnormal operating problems are detected. If AC input power is available and the UPS is operating normally, the following system message is displayed:

```
- UPS ON-LINE -  
OUTPUT VOLTAGE= 208V  
CURRENT=100/100/99%  
DATE (DAY) TIME
```

If an AC input power failure occurs, and no abnormal operating conditions are present, the UPS switched to standard 'Battery Backup Mode'. The following system message is displayed:

```
- BATTERY DISCHARGE -  
BATT. CAPACITY=99%  
CURRENT=100/100/99%  
DISCHARGE CURR.=100%
```

### 6.15.2 IN

When the IN key is pressed during normal 'AC Input Mode' of operation, the LCD screen displays details about the unit's input voltage. The following system message is displayed:

```
- UPS ON-LINE -  
INPUT      Vab = 96%  
VOLTAGE    Vbc = 96%  
           Vca = 96%
```

The Bypass Input Voltages, Frequencies / Sync Mode, and Converter Current can be monitored by pressing the "UP/DOWN" keys.

### 6.15.3 OUT

When the OUT key is pressed during normal 'AC Input Mode' of operation, the LCD screen displays details about the output voltage, current, and frequency. The following system message is displayed:

```
- UPS ON-LINE -  
OUTPUT     Ia = 101%  
CURRENT    Ib = 100%  
           Ic = 100%
```

The Output Line Voltages (phase-neutral, and phase to phase), Frequencies / Sync Mode, Inverter Output Power, and Power factor can be monitored by pressing the "up/down" keys.

## 6.15.4 BATT Key

When the BATT key is pressed during normal 'AC Input Mode' of operation, the LCD screen displays details about the battery capacity. The following system message is displayed:

```
- UPS ON-LINE -  
BATTERY VOLTAGE=270V  
CHARGE CURR.=0%
```

If an AC input power failure occurs, and no abnormal operating conditions are present, the UPS will switch to standard 'Battery Backup Mode'. The following system message is displayed when the BATT key is pressed:

```
- BATTERY DISCHARGE -  
BATT. CAPACITY=100%  
DISCHARGE CURR. =76%
```

## 6.15.5 MENU, F1, ENTER, UP, & DOWN Keys

When the MENU key is pressed during normal 'AC Input Mode' of operation, a menu of user adjustable data screens are available. Press 'up' arrow key to scroll up through the available data screens. Press 'down' arrow key to scroll down through the available data screens. Pressing the F1 key changes to the adjustment screen for that menu item. Press 'up' arrow to move display to previously available item. Press 'down' arrow to move display to next available item. From the adjustment screen, if the MENU key is pressed any changes are discarded and the display returns to the regular menu screen with the previous data values shown. If the "ENTER" key is pressed from the adjustment screen, the changes are saved. After pressing the "ENTER" key, the display screen will return to the regular menu screen with the new data values shown (see Section 6.16 "Menu Data Screens").

## 6.15.6 BATT TEST Key

When the BATT TEST key is pressed during normal 'AC Input Mode' of operation, the LCD screen displays details about the battery back-up capacity. The following system message is displayed:

```
- BATTERY TEST -  
BATT. CAPACITY=###%  
> F1+ENTER TO BEGIN
```

Press the F1+ ENTER keys at the same time to begin the battery test and to display the following screen while batteries are tested:

```
- BATTERY TEST -  
BATTERY CAPACITY=###%  
## MINS ## SECS  
> PLEASE WAIT
```

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When the battery test is completed, the previous operation will be resumed and the main system MONI screen will be displayed. If the battery test detects a low DC battery voltage, then the message screen will display:

- UPS ON-LINE -  
OUTPUT VOLTAGE=208V  
CURRENT=38/55/48%  
\* LOW BATTERY \*

If the battery test passes then the following screen message will be displayed:

- UPS ON-LINE -  
OUTPUT VOLTAGE=208V  
CURRENT=38/55/48%  
\* UPS "OK" \*

If the inverter is not operating when the BATT TEST key is press then the function will be inhibited and the following screen message will be displayed:

- BATTERY TEST -  
BATTERY CAPACITY=###%  
BATT. TEST INHIBITED

## NOTE:

After start-up, the battery test function is inhibited for 20-min. (only one battery test can be done approximately every 20-min.).

### 6.15.7 BUZZ STOP Key

The "BUZZ STOP" key has no effect on the LCD screen display. However if the UPS alarm buzzer is on, pressing this key will silence it. If the alarm buzzer is not on, pressing this key has no effect.

### 6.15.8 RESET Key

The RESET key function is used to 'Reset' the LCD display board software should a system lock-up occur. The reset does not reset the variables in the memory. *Use of the RESET function is very important when a fatal communication error has occurred.* Press and hold the RESET key for a period of at least five seconds to reset the display software. The 'display board' to 'main board' interface will begin a new communication sequence. If a communication response is not received by the 'display board' from the 'main board' within 15 seconds, a fatal time-out occurs and the following system message displays:

- DISPLAY ERROR -  
MAIN COMM. ERROR  
PRESS & HOLD RESET KEY

If the 'Reset' function is successful then the display will begin from the 'Start-up screen' and then change to the 'main monitor' screen.

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## 6.16 Menu Data Screens

### 6.16.1 Settings for Calendar and Clock

Press the MENU key to access the menu data screens and press the 'down' arrow key to scroll to the present date and time adjustment screen:

```
CALENDER / CLOCK
DATE (DAY) TIME
>*F1: DATA SET MODE
>Δ/∇ PRV/NEXT SCREEN
```

Press the F1 key to display the following active adjustment screen:

```
CALENDER / CLOCK
DATE (DAY) TIME
> Δ/∇ UP/DOWN
>ENTER:NEXT DATA
```

Press the "up/down" arrows to increment, or decrement the character(s) above the flashing cursor.

Press the ENTER key to advance the cursor.

### 6.16.2 Adjusting the Buzzer Volume

Press the MENU key to access the menu data screens and press the 'down' arrow key to scroll to the present buzzer volume adjustment screen display:

```
BUZZER VOLUME ADJUST
<LOUD> MEDIUM SOFT
>*F1: DATA SET MODE
>Δ/∇:PRV/NEXT SCREEN
```

Press the F1 key to display the following active adjustment screen:

```
BUZZER VOLUME ADJUST
<LOUD> MEDIUM SOFT
>Δ/∇: CHANGE DATA
>ENTER:ACCEPT CHANGE
```

Press the 'up' or 'down' arrow key to move the marker between the three buzzer volume levels. Press ENTER key to confirm the change or press MENU key to discard any changes and return to the menu data screen.

### 6.16.3 Settings for Display Duration

The LCD display is designed to automatically switch off after a user-designated period of inactivity. When setting this feature, press the MENU key to access the menu data screens and press the 'down' arrow key to scroll to the LCD-Idle Mode Select screen display:

```
DISPLAY DURATION SET
<3 MIN> 30 MIN
>F1: DATA SET MODE
>Δ/∇:PRV/NEXT SCREEN
```

Press the F1 key to display the LCD-Idle mode setting adjustment screen:

```
DISPLAY DURATION SET
<3 MIN>      30 MIN
>Δ∇: CHANGE DATA
>ENTER:ACCEPT CHANGE
```

Press the 'up' or 'down' arrow key to move the marker between the two available idle mode times. Press the ENTER key to save the change or press the MENU key to exit to the main menu and discard the change.

**Note:** If any of the following conditions occur, the LCD-Idle Mode will be inhibited and the LCD will remain on continuously:

- 1) The UPS has received an EPO command.
- 2) The UPS is in Battery-Discharge Mode.
- 3) A fault has been detected in the main unit.
- 4) The UPS is in an overload condition.

#### 6.16.4 Run Switch Select

Press the MENU key to access the menu data screens and press the 'down' arrow key to scroll to the "Run Switch Select" setting screen display:

```
RUN SWITCH SELECT
<LOCAL>  REMOTE
>*F1: DATA SET MODE
>Δ∇: PRV/NEXT SCREEN
```

Press the F1 key to display the following active adjustment screen:

```
RUN SWITCH SELECT
<LOCAL>  REMOTE
>Δ∇: CHANGE DATA
>ENTER:ACCEPT CHANGE
```

Press the 'up' or 'down' arrow key to move the marker between the two "RUN SWITCH" selections Press the ENTER key to save the change or press the MENU key to exit to the main menu and discard the change. (Must have Remote Control option.)

#### 6.16.5 Serial Com Station Address

Press the MENU key to access the menu data screens and press the 'down' arrow key to scroll to the "Serial Comm Station Address" setting screen display:

```
SER COM STATION ADDR
STATION ADDRESS: 31H
>*F1: DATA SET MODE
> Δ∇: PRV/NEXT SCREEN
```

Press the F1 key to display the following active adjustment screen:

```
SER COM STATION ADDR
STATION ADDRESS: 31H
> Δ∇: CHANGE DATA
>ENTER: ACCEPT CHANGE
```



## 6.16.6 Output Voltage Adjustment

When the MENU key is pressed and held 3-4 seconds during normal 'AC Input Mode' of operation, the LCD screen displays the output voltage on the present output voltage adjust screen:

```
OUTPUT VOLT. ADJUST
OUTPUT VOLTAGE.=###%
>F1:DATA SET MODE
> Δ/∇ :PREV/NEXT SCREEN
```

Press the F1 key to display the following active adjustment screen:

```
OUTPUT VOLT. ADJUST
REFERENCE ADJUST: ##
> Δ/∇ :CHANGE DATA
>ENTER: ACCEPT CHANGE
```

The locations marked ## will show the numerical value of the allowable voltage adjustment parameter values. Press the 'up' and 'down' arrow keys to adjust the setting from between  $\pm 5$  volts. This will cause the unit's output voltage to adjust to within  $\pm 2\%$  of its nominal value.

If the inverter is not running, and the output voltage cannot be adjusted; the following message will be displayed:

```
OUTPUT VOLT. ADJUST
ADJUSTMENT INHIBITED
> Δ/∇ TO SCROLL
```

Pressing the F1 key will have no effect on this display screen

## 6.16.7 Charge Mode Select

Press the MENU key to access the menu data screens and press the 'down' arrow key to scroll to the "Charge Mode Select" adjustment screen display:

```
CHARGE MODE SELECT
EQUAL CHARGE>OFF ON
>F1:DATA SET MODE
>Δ/∇:PRV/NEXT SCREEN
```

Press the F1 key to display the following active adjustment screen:

```
CHARGE MODE SELECT
EQUAL CHARGE>OFF ON
>Δ/∇:CHANGE DATA
>ENTER:ACCEPT CHANGE
```

**Note: Please consult with the factory when using this option. DAMAGE to the battery system will occur if this is used improperly.**

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## 6.16.8 Reset to Default Settings

Press the MENU key to access the menu data screens and press the 'down' arrow key to scroll to the original factory 'default settings' adjustment screen display.

```
MENU DATA RESET
DATA INITIALIZATION
>F1: TO ACCESS RESET
>Δ/∇:PRV/NEXT SCREEN
```

Press the F1 key to display the following active adjustment screen:

```
MENU DATA RESET
DATA INITIALIZATION
> MENU: NO DATA RESET
>ENTER: ACCEPT CHANGE
```

When the ENTER key is pressed the following factory defaults are reset:

- 1) Resets the voltage-reference setting to +0
- 2) Resets the buzzer volume to 'loud'
- 3) Resets the serial station address to 31h
- 4) Resets the idle mode to 3 minutes

Press the MENU key to abandon the operation and return to the menu data screen.

## 6.17 Overload Operation

When the UPS is operating and an overload condition is first detected, the following "Overload Warning" screen is displayed.

```
- UPS ON-LINE -
OUTPUT VOLTAGE= ###V
OUTPUT CURRENT= ###%
* UPS OL: REDUCE LOAD *
```

After a period of time, if the overload is still not reduced and the STOP/RUN key switch is in the RUN position, the UPS will automatically transfer to Bypass. If the overload condition is still present, the following screen will be displayed:

```
- BYPASS OPERATION -
OUTPUT VOLTAGE=208
CURRENT= 114/116/114%
* UPS OL: REDUCE LOAD *
```

If the STOP/RUN key switch is in the STOP position; the UPS is in the Bypass Mode and, if the overload condition is still present, the following screen will be displayed:

```
- BYPASS OPERATION -
OUTPUT VOLTAGE=208
CURRENT= 114/116/114%
* UPS OL: REDUCE LOAD *
```

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After the load is reduced, if the STOP/RUN key switch is in the RUN position, the UPS will automatically return to 'Inverter Operation' after a period of time. During this wait, the following screen will be displayed:

```
- BYPASS OPERATION -  
OUTPUT VOLTAGE=208V  
CURRENT= 100/100/100  
>PLEASE WAIT
```

Or if the UPS is waiting and the STOP/RUN key switch is switched to the STOP position while the UPS is waiting, the following screen will be displayed:

```
- BYPASS OPERATION -  
OUTPUT VOLTAGE=208V  
CURRENT= 100/100/100  
>PLEASE WAIT
```

If the STOP/RUN key switch remains in the STOP position when the UPS's 'wait' period is complete, then the following screen will be displayed:

```
- BYPASS OPERATION -  
OUTPUT VOLATAGE=###V  
CURRENT=100\100\100%  
DATE (DAY) TIME
```

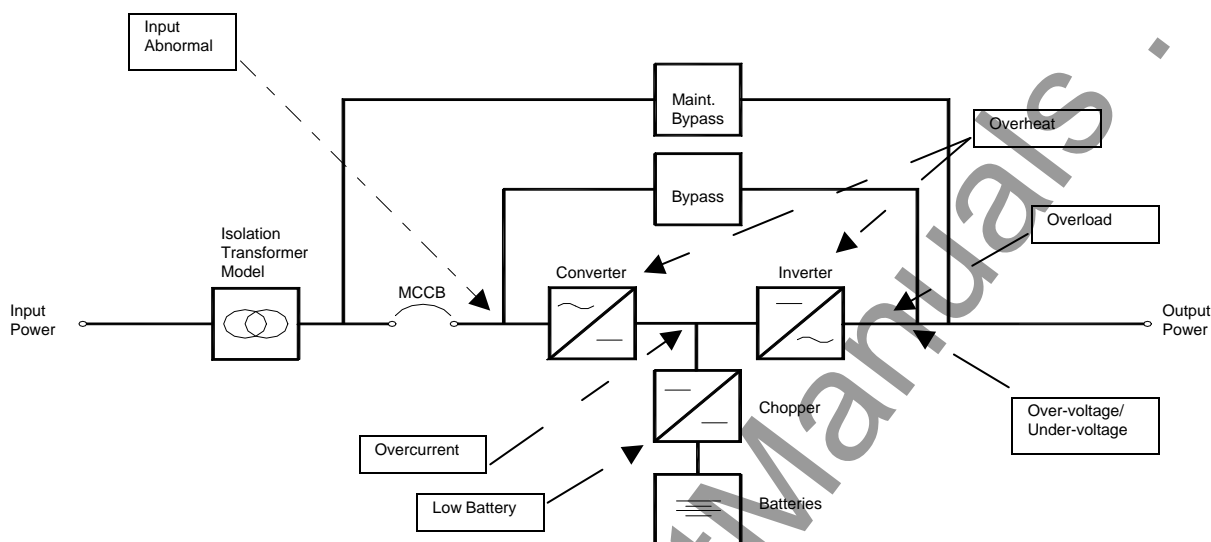
If the STOP/RUN key switch remains in the RUN position when the UPS's 'wait' period is complete, then the following screen will be displayed:

```
- UPS ON-LINE -  
OUTPUT VOLTAGE= 208V  
CURRENT=100/100/99%  
DATE (DAY) TIME
```

## 7.0 UPS Protection System

### 7.1 System Protection Features

The preceding one-line schematic illustrates the electrical locations of the protection devices on all UPS models.



### 7.2 System Protection Functions

The following chart shows the built-in UPS fault protection functions on all models.

Built-in UPS Fault Protection Functions

Protection Item	Inverter Over-voltage (IVOV)	Inverter Under-voltage (IVUV)	UPS Overload
LCD Message	INVERTER OVERVOLTAGE	INVERTER UNDERVOLTAGE	OUTPUT OVERLOAD
Cause	Control Malfunction; Feedback Error		Overload or short circuit at the load.
Operation Mode after Fault	Bypass Operation; Chopper and Inverter Stopped		Inverter Overload: Transfer to bypass; Inverter stopped. Bypass Overload: Inverter, Chopper, and Bypass stopped.
Audible Alarm	Yes: See Section 6.7 Audible Alarm Functions		
Visible Alarm	Red Fault Lamp "on"		Inverter OL: No Fault Lamp Bypass OL: Fault Lamp "on"
Relay Contact Alarm	Fault Relay closed; Bypass Relay closed		Inverter OL: Bypass Relay closed Bypass OL: Bypass Relay open and Fault relay closed
Auto-Retransfer	No		Inverter OL: Yes, if bypass ok Bypass OL: No

Protection Item	Low Battery Voltage (Level-1)	Low Battery Voltage (Level-2)	Inverter Output Current Limit
LCD Message	Line-4 will read "BATTERY LOW"	DC UNDERVOLTAGE	OUTPUT OVERLOAD
Cause	Battery Discharge	Battery Shutdown Level reached	Load Inrush current
Operation Mode after Fault	Battery Discharge	Shutdown: No Output	If Bypass ok, transfer to bypass; if not, current-limit mode
Audible Alarm	Yes: See Section 6.7 Audible Alarm Functions		
Visible Alarm	Battery Lamp Flickers	NO	NO
Relay Contact Alarm	Low Battery Relay closed	Bypass Relay closed	
Auto-Retransfer	No		Yes, if bypass ok

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Protection Item	Memory error (EERR)	Internal overheat (OH)	DC circuit overvoltage (DCOV)	DC circuit overcurrent (DCOC)
<b>LCD Message</b>	MAIN EEPROM ERROR	OVERHEAT; INTERNAL	DC OVERVOLTAGE	DC OVERCURRENT
<b>Cause</b>	Control board chip error	Fan failure; high ambient	Chopper malfunction	Inverter / chopper fault
<b>Operation Mode after Fault</b>	Start is inhibited	Bypass operation; chopper and inverter are stopped		
<b>Audible Alarm</b>	Yes; continuous buzzer			
<b>Visible Alarm</b>	RED fault lamp "ON"			
<b>Relay Contact Alarm</b>	Fault relay closed; bypass relay closed			
<b>Auto-Retransfer</b>	NO			

## 8.0 Authorized Factory Service

### 8.1 Start-up

The startup of the UPS equipment is broken up in several steps. These steps are as follows:

1. Initial Condition: This is where the service technician checks the unit for physical damage and verifies the installation of the UPS (electrically).
2. Static Checks: This step verifies the proper settings within the UPS logic.
3. Wiring Check: The wiring to (power cables) and from (control wires) the battery cabinet.
4. Main Voltage Check: The input voltages are checked to verify they are within the range.
5. Energizing the UPS: This step begins the internal self-checks within the processor logic.
6. Output Voltage Check: The output voltages are checked to verify they are within range.
7. EPO (Emergency Power Off): The EPO is operated to verify its operation in case of an emergency.
8. Load Testing: Performed if load is available.
9. Generator Testing: Performed if Generator is available.
10. Internal Maintenance Bypass: This verifies the operation of the Maintenance Bypass.

### 8.2 Preventive Maintenance

Toshiba's 4200FA 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 from the system. Schedule authorized Toshiba service centers to perform internal parts inspections annually.



## CAUTION

Before performing any maintenance the technician should be familiar with and follow the important safety instructions located on pages vii and ix.



## WARNING

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

## 8.3 Parts Replacement

The following list shows intervals for periodic maintenance and replacement of certain UPS parts.

- 1) Batteries: VRLA (Valve Regulated Lead Acid) batteries do not require the adding of water or electrolyte. The charging voltage, temperature, performance and connection resistance must be monitored periodically. Necessary corrective maintenance must be made in order to assure the UPS supplies safe reliable power. These items affect the life of batteries, so replacement should be once every 3 to 5 years as a minimum. All of the batteries must be replaced at the same time to eliminate the possibility of multiple failures due to resistances of the batteries.

### Quarterly Maintenance

#### A. Visual Checks

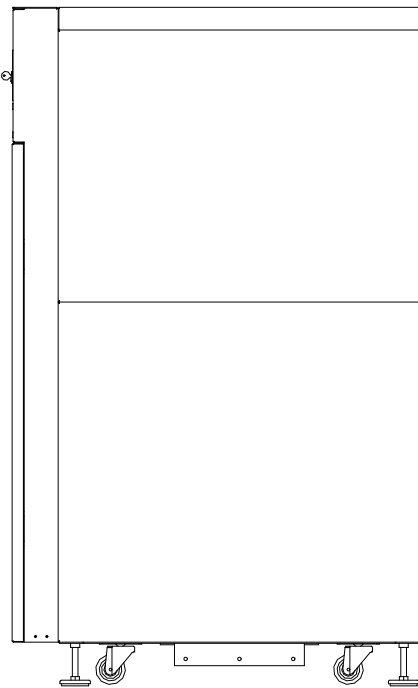
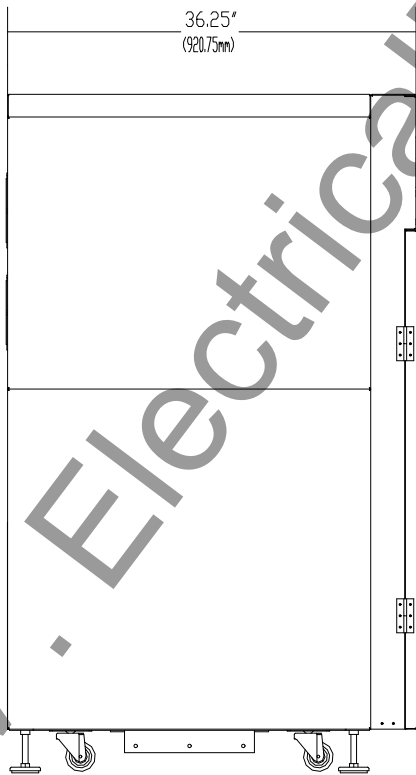
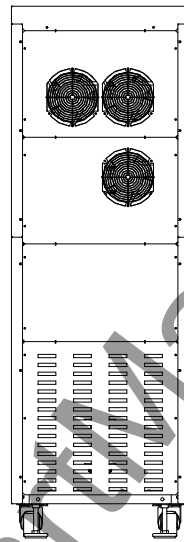
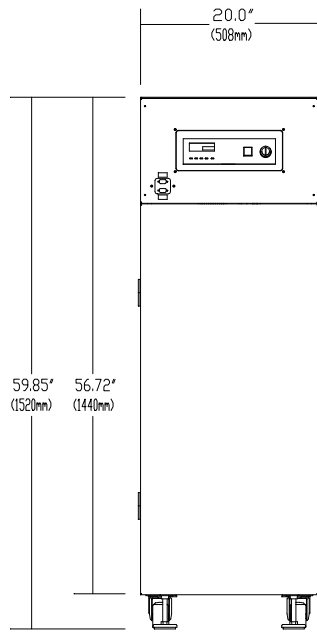
- 1) Leakage
  - 2) Corrosion on positive terminal
- B. Check battery temperature at the negative terminal
  - C. Measure and record the system float charging voltage.
  - D. Measure and record the individual unit's float charging voltage.

### Semi-Annual maintenance

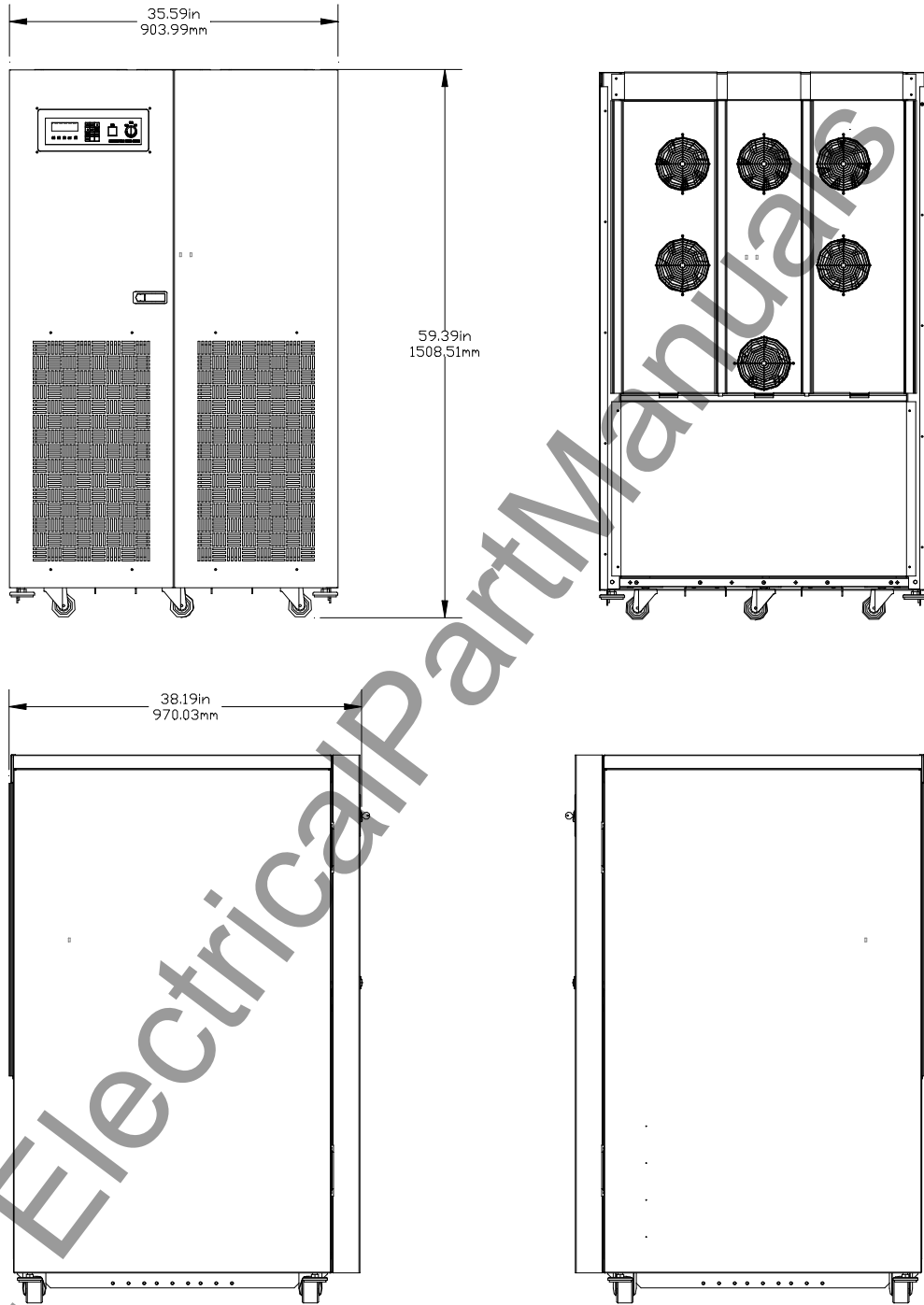
- A. Repeat the quarterly checks.
  - B. Perform a 10-second high rate (e.g. 100 amp) load test on the individual batteries.
  - C. Optionally test for the purpose of trending the battery over time.
  - D. Re-torque all inter-battery connecting hardware (if applicable).
  - E. Perform inter-battery connector resistance checks.
- 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 / Weights

9.1 External Dimensions 15 /25kVA



9.2 External Dimensions 50kVA





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## 9.3 Shipping Dimensions and Weights

Models	Shipping Dimensions W" x D" x H" (WmmxDmmxHmm)	Internal Model	Shipping Weights lbs. (kg)
15 kVA	36.5" x 43.0" x 69.5" (927mm x 1092mm x 1765mm)	Battery	1,303 lbs. (591 kg)
		Transformer	1,260 lbs. (572 kg)
25 kVA	36.5" x 43.0" x 69.5" (927mm x 1092mm x 1765mm)	Battery	1,321 lbs. (599 kg)
		Transformer	1,275 lbs. (579 kg)
50 kVA	55.0" x 44.5" x 69.5" (1397mm x 1130mm x 1765mm)	Battery	2,548 lbs. (1156 kg)
		Transformer	2,523 lbs. (1144 kg)

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**TOSHIBA INTERNATIONAL CORPORATION**

INDUSTRIAL DIVISION

13131 West Little York Road, Houston, Texas 77041

Tel: (713) 466-0277 Fax: (713) 896-5212 Telex: 762078

E-mail: [Toshibaups@tic.toshiba.com](mailto:Toshibaups@tic.toshiba.com)

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