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## Uninterruptible Power System (UPS)

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### G8000 Series Operation Manual

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#### REQUIREMENT

- Read this operation manual carefully before operating the UPS.
- Retain this manual with the UPS for easy reference when required.
- This manual was written for the UPS operator and maintenance personnel.

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**TOSHIBA CORPORATION**

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## Notice

Please inform Toshiba Corporation or authorized representative in case inconsistencies, omissions, or questions.

The instructions contained in this manual are not intended to cover all of the details or variations in equipment, or to provide for every possible contingency concerning installation, operation, or maintenance. Should further information be required or if problems arise which are not covered sufficiently, contact your 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 the UL/CUL listing. Unauthorized modifications can also result in personal injury, death, or destruction of the equipment.**

## 1. Introduction

This Uninterruptible Power System (UPS) G8000 series is designed to supply power of stable voltage amplitude and frequency to the load, even while the commercial utility line has interruptions, brownouts, blackouts or voltage/frequency deviation.

This instruction is designed to ensure the safe and correct operation of the G8000 UPS. Please read through all of the chapters before operation. Above all, read the "General safety instructions", "Important safety instructions", "Safety Precautions" and "Operation" chapters as these must be carefully read. Please make sure you have a thorough understanding of the information in these 4 chapters.

Personnel who will install, operate and maintain this UPS should carefully read this manual before installation and operation.

Keep this manual close to the UPS so that you can refer whenever necessary.

Also, please read through the installation manual (57490). That manual describes the important instructions during the UPS installation. Both manuals should be kept together.

## UNINTERRUPTIBLE POWER SUPPLY

Complete the information below for the UPS system received.

Unless otherwise specified on the warranty card, the warranty period for the UPS or UPS part is 36 months from the shipment date (see TIC bill of lading).

Unless otherwise specified on the warranty card, the warranty period for a UPS battery is 24 months from the shipment date (see TIC bill of lading).

Please complete the following information and retain for your records.

Job Number: \_\_\_\_\_

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

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

Application: \_\_\_\_\_

Shipment Date: \_\_\_\_\_

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

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

## Manual's Purpose and Scope

This manual provides information on how to safely install, operate, and maintain your TIC power electronics product. This manual includes a section of general safety instructions that describes the warning labels and symbols that are used throughout the manual. Read the manual completely before installing, operating, or performing maintenance on this equipment.

This manual and the accompanying drawings should be considered a permanent part of the equipment and should be readily available for reference and review. Dimensions shown in the manual are in metric and/or the English equivalent.

Toshiba International Corporation reserves the right, without prior notice, to update information, make product changes, or to discontinue any product or service identified in this publication.

TOSHIBA is a registered trademark of the Toshiba Corporation. All other product or trade references appearing in this manual are registered trademarks of their respective owners.

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## Contacting Toshiba's Customer Support Center

Toshiba's Customer Support Center can be contacted to obtain help in resolving any **Uninterruptible Power Supply** system problems that you may experience or to provide application information.

The center is open from 8 a.m. to 5 p.m. (CST), Monday through Friday. The Support Center's toll free number is US (800) 231-1412/Fax (713) 466-8773.

You may also contact Toshiba by writing to:

Toshiba International Corporation  
13131 West Little York Road  
Houston, Texas 77041-9990  
Attn: UPS Product Manager.

For further information on Toshiba's products and services, please visit our website at [www.tic.toshiba.com](http://www.tic.toshiba.com).

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## 3. General Safety Instructions

**DO NOT** attempt to install, operate, maintain or dispose of this equipment until you have read and understood all of the product safety information and directions that are contained in this manual.

### Safety Alert Symbol

The **Safety Alert Symbol** indicates that a potential personal injury hazard exists. The symbol is comprised of an equilateral triangle enclosing an exclamation mark.



### Signal Words

Listed below are the signal words that are used throughout this manual followed by their descriptions and associated symbols. When the words **DANGER**, **WARNING** and **CAUTION** are used in this manual they will be followed by important safety information that must be carefully adhered to.

The word **DANGER** preceded by the safety alert symbol indicates that an imminently hazardous situation exists that, if not avoided, will result in death or serious injury to personnel.



**DANGER**

The word **WARNING** in capital letters preceded by the safety alert symbol indicates that a potentially hazardous situation exists that, if not avoided, could result in death or serious injury to personnel.



**WARNING**

The word **CAUTION** in capital letters preceded by the safety alert symbol indicates that a potentially hazardous situation exists which, if not avoided, may result in minor or moderate injury.



**CAUTION/ATTENTION**

The word **CAUTION** or **ATTENTION** in capital letters without the safety alert symbol indicates a potentially hazardous situation exists which, if not avoided, may result in equipment and property damage.

**CAUTION**

## Special Symbols

To identify special hazards, other symbols may appear in conjunction with the **DANGER**, **WARNING** and **CAUTION** signal words. These symbols indicate areas that require special and/or strict adherence to the procedures to prevent serious injury to personnel or death.

### Electrical Hazard Symbol

A symbol which indicates a hazard of injury from electrical shock or burn. It is comprised of an equilateral triangle enclosing a lightning bolt.



### Explosion Hazard Symbol

A symbol which indicates an injury hazard from exploding parts. It is comprised of an equilateral triangle enclosing an explosion image.



## Equipment Warning Labels

**DO NOT** attempt to install, operate, maintain, or dispose of this equipment until you have read and understood all of the product warnings and user directions that are contained in this instruction manual.

**DO NOT** remove or cover any of the labels. If the labels are damaged or if additional labels are required, contact your Toshiba representative for additional labels.

Labels attached to the equipment are there to provide useful information or to indicate an imminently hazardous situation that may result in serious injury, severe property and equipment damage, or death if the instructions are not followed (see Labeling Requirements for further information on labeling).

## 4. Maintenance Precautions

1. Turn off, lockout, and tagout all power sources before connecting the power wiring to the equipment or when performing maintenance.
2. Hardwire type UPS units are not equipped with an over-current protection device, nor do they have an output disconnect for the ac output. Therefore, a user-installed circuit breaker should be provided between the UPS output and the load input.
3. The maximum ambient operating temperature is 104°F (40°C).
4. Battery servicing should be performed by a qualified Toshiba Representative only.
5. Unauthorized personnel should not service batteries.
6. Contact your nearest Toshiba authorized service center for battery replacement.

### Qualified Personnel ONLY!

**Qualified Personnel** is one that has the skills and knowledge relating to the construction, installation, operation, and maintenance of the electrical equipment and has received safety training on the hazards involved (Refer to the latest edition of NFPA 70E for additional safety requirements).

### Qualified Personnel shall:

- 1) Have read the entire operation manual.
- 2) Be trained and authorized to safely energize, de-energize, ground, lockout and tag circuits and equipment, and clear faults in accordance with established safety practices.
- 3) Be trained in the proper care and use of protective equipment such as safety shoes, rubber gloves, hard hats, safety glasses, face shields, flash clothing, etc., in accordance with established safety practices.
- 4) Be trained in rendering first aid.
- 5) Be knowledgeable of batteries and the required handling and maintenance precautions.

**For further information on workplace safety visit [www.osha.gov](http://www.osha.gov).**



### WARNING

Misuse of this equipment could result in 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 misuse 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.



### DANGER



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

— Strict adherence to the following precautions is a requirement when working with batteries —

To be performed by **Qualified Personnel** only.

- 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 place tools or any metal parts on top of batteries.
- 6) Determine if the battery is inadvertently grounded. If inadvertently grounded, remove source of ground.

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

The likelihood of shock will be reduced if such grounds are removed prior to installation or maintenance.

## 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**

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

## Inspection/Storage/Disposal

### CAUTION

#### Inspection

Upon receipt of the UPS, an inspection for shipping damage should be performed. Use caution when removing the unit from the pallet. Refer to labels or documentation attached to packing material.

#### Uncrating

Check the unit for loose, broken, bent or otherwise damaged parts. If damage has occurred during shipping, keep all original crating and packing materials for return to the shipping agent. The warranty does not apply to damage incurred during shipping.

Ensure that the rated capacity and the model number specified on the nameplate conform to the order specifications.

#### Storage

During periods of non-use, the following guidelines are recommended for storage.

#### Storage Preparation

- 1) Power up the UPS and allow it to operate with no load for 24 hours to fully charge the batteries.
- 2) Stop the unit.
- 3) Place the MCCB switch in the "Off" position.

#### Storing Conditions

- For best results, store the UPS in the original shipping container and place on a wood or metal pallet.
- Storage temperature — -20 – 40°C (-4 – 104°F).
- The optimum storage temperature is 21° C (70° F). A higher ambient temperature will require recharging more frequently during storage.

Avoid the following storage locations:

- Locations that are subject to extreme temperature changes or high humidity.
- Locations that are subject to high levels of dust or metal particles.
- Locations that are subject to excessive vibration.
- Inclined floor surfaces.

## Storage Maintenance

- If stored at an ambient temperature less than 20° C (68°F), recharge the batteries every 9 months.
- If stored at an ambient temperature of 20°– 30° C (68°– 86°F), recharge the batteries every 6 months.
- If stored at an ambient temperature of 30°– 40° C (86°– 104°F), recharge the batteries every 3 months.

## Disposal

Please contact your local or 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.

## 5. 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 that is free of excessive vibration.
- 3) Install the unit where the ambient temperature is within the specified range.
- 4) Do not install the UPS in areas that are subject to high humidity.
- 5) Do not install the UPS in areas that allow exposure to direct sunlight.
- 6) Do not install the UPS in areas that allow exposure to high levels of airborne dust, metal particles, or flammable gases.
- 7) Do not install the UPS in areas near sources of electrical noise. Ensuring a proper earth ground will reduce the effects of electrical noise and will reduce the potential for electrical shock.
- 8) Do not install the UPS in areas that would allow fluids or any foreign object to get inside the UPS.
- 9) The UPS generates and can radiate radio-frequency energy during operation. Although RFI noise filters are installed inside of the unit, there is no guarantee that the UPS will not influence some sensitive devices that are operating near by. If such interference is experienced, the UPS should be installed farther away from the affected equipment and/or powered from a different source than that of the affected equipment.
- 10) The user should provide output over-current protection for hardwired UPS systems.
- 11) After ensuring that all power sources are turned off and isolated in accordance with established lockout/tagout procedures, connect the power source wiring of the correct voltage to the input terminals of the UPS.
- 12) Connect the output terminals of the UPS to the load (refer to NEC Article 300 – Wiring Methods and Article 310 – Conductors For General Wiring). Size the branch circuit conductors in accordance with NEC Table 310.16.

### Conductor Routing and Grounding

- 1) Use separate metal conduits for routing the input power, output power, and control circuits.
- 2) Follow the wire size and tightening torque specifications.
- 3) Always ground the unit to reduce the potential for electrical shock and to help reduce electrical noise.
- 4) A separate ground cable should be run inside the conduit with the input power, output power, and control circuits.



### WARNING



**THE METAL OF CONDUIT IS NOT AN ACCEPTABLE GROUND.**

**Please have the certified/qualified electrician install the UPS per local, state and National Electrical Code.**

UPS faults or improper operation may occur if not installed properly per Codes and the installation manual.



**MANDATORY**

**The UPS is to be installed in a controlled environment.**

High temperature/humidity may shorten the life of components within the UPS.



**MANDATORY**

**Do NOT install the UPS close to a water source.**

It may cause electrical shock, UPS fault or other accidents.



**PROHIBITED**

**Please ask Toshiba or authorized representatives when the UPS and/or components are to be disposed.**

It may be illegal to dispose of certain components without conforming to environmental regulation for industrial/commercial waste.



**MANDATORY**

**Connect ground wire to the earth ground terminal only.**

Missing ground wire may cause electrical shock. Connecting to more than one ground may cause ground loop.

Refer to the installation manual for ground wiring details.



**MANDATORY**

## 6. Operating Precautions



### CAUTION

- 1) The UPS should not be powered up until the entire operation manual has been read.
- 2) The voltage of the input power source must be within the range of +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 range may activate the internal protection devices.
- 3) The UPS should not be used with a load that has a rated input that is greater than the rated output of the UPS.
- 4) Do not use the UPS to provide power to motors that require high starting current or with motors that require a long starting time, such as vacuum cleaners and machine tools (over sizing the UPS for lock rotor current would be required).
- 5) Do not insert metal objects or combustible materials in the ventilation slots of the UPS.
- 6) Do not place, hang, or paste any objects on the exterior surfaces of the UPS.
- 7) The capacitors of the UPS maintain a residual charge for a while after turning the UPS off. The required discharge time for each UPS typeform is provided via a cabinet label and a **CHARGE LED**. Wait for at least the minimum time indicated on the label and ensure that the **CHARGE LED** has gone out before opening the door of the UPS once the UPS power has been turned off.
- 8) Do not attempt to disassemble, modify, or repair the UPS. Call your Toshiba sales representative for repair information.
- 9) Turn the power on only after attaching **ALL** of the covers.
- 10) **Do Not** remove any covers of the UPS when the power is on.
- 11) If the UPS should emit smoke or an unusual odor or sound, turn the power off immediately.
- 12) The heat sink and other components may become extremely hot to the touch. Allow the unit to cool before coming in contact with these items.
- 13) Warning signs should be placed on or near the load as a notification that the load is being powered by the UPS.
- 14) Additional warnings and notifications shall be posted at the equipment installation location as deemed required by **Qualified Personnel**.



### WARNING

While operating in the inverter mode, placing the breaker in the **OFF** position will switch the UPS to the battery backup mode. The output of the UPS will continue uninterrupted to the load. The unit must be in the bypass mode at the time that the breaker is placed in the **OFF** position for the UPS to shutdown power to the load.



### CAUTION

After an Emergency Power Off (EPO), do not reset the breaker until the UPS has been fully discharged. The UPS could be damaged if the unit is not fully discharged before the breaker is reset.

## 7. Important Safety Instructions

**SAVE THESE INSTRUCTIONS** This instruction contains important instructions for G8000U Series 100, 150, 225 and 300kVA that should be followed during the installation, operation, and maintenance of the UPS systems. Please refer to the battery manufacturer's instructions for details on operating and maintaining the batteries for each system.

UPS System's input and output are NOT equipped with an over-current protection device, or an output disconnection at the AC output. Therefore, a circuit breaker should be provided by the user between the UPS output and the critical load input. The minimum device ratings should be as follows:

<u>Model</u>	<u>Rated Output</u>	<u>Breaker Rating</u>	<u>Model</u>	<u>Rated Output</u>	<u>Breaker Rating</u>
100kVA	480V/277Vac	480V-150A	225kVA	480V/277Vac	480V-350A
150kVA	480V/277Vac	480V-225A	300kVA	480V/277Vac	480V-450A

Circuit breakers should be provided by the user between AC input (or Bypass input) and power sources. The minimum device ratings should be as follows:

<u>Model</u>	<u>Rated Input</u>	<u>Breaker Rating</u>	<u>Model</u>	<u>Rated Input</u>	<u>Breaker Rating</u>
100kVA	480V/277Vac	480V-150A	225kVA	480V/277Vac	480V-350A
150kVA	480V/277Vac	480V-225A	300kVA	480V/277Vac	480V-450A

The maximum ambient temperatures in which the UPS should be operated is 40°C (104°F) or 32°C (90°F) maximum if the battery system is to be subjected to the same temperature.

The nominal battery voltage for these models is 360Vdc. The nominal battery float voltage is 405Vdc.

Only a certified service representative with battery experience should perform service on batteries. Keep unauthorized people away from batteries.

Please refer to the battery manufacturer's instruction when battery maintenance and/or replacement are scheduled.



### **CAUTION**

Misuse of this equipment could result in personal injury and/or equipment damage.

In no event will Toshiba Corporation be responsible or liable for either indirect or consequential damage or injury that may come from the use of this equipment.

## 8. Safety Precautions

### Application

**This UPS shall NOT be applied to support equipment (\*) that could affect the human lives.**

**Special considerations are required when applying this UPS to the equipment (\*\*) that affect human safety and/or maintain public services.**

**Be sure to contact/inform Toshiba if it is such a case. The application without special consideration may cause serious accidents.**

- \*
  - Medical operation room equipment
  - Life support equipment (artificial dialysis, incubators, etc.)
  - Toxic gas or smoke eliminators
  - Equipment that must be provided under fire laws, construction standards or other ordinances
  - Equipment equivalent to the above

**\*\*Equipment to supervise or control airways, railways, roads, sea-lanes or other transportation.**

- Equipment in nuclear power plants.
- Equipment to control communications.
- Equipment equivalent/similar to the above mentioned.

### Disclaimer

**In no event will Toshiba Corporation be responsible or liable for either indirect or consequential damage or injury that may come from the use of this equipment.**

**Any modifications without authorization by Toshiba could result in personal injuries, death or destruction of the UPS.**

### Warning Labels Check

**Make sure all the warning labels are accordingly placed in the appropriate locations.**

**If a label is missing or illegible, contact Toshiba or authorized representatives.**



# WARNING

**If the UPS produces smoke or smells strange, turn off AC input breaker and battery breaker immediately.**

Continued running may result in fire. Contact Toshiba or authorized representatives.



**MANDATORY**

**Contact the Toshiba or authorized representatives in case of malfunction or fault.**

This UPS should be repaired by authorized Toshiba service personnel only. Service by untrained personnel may extend the fault further and/or may result in electric shock or personal injury.



**MANDATORY**

**Do NOT modify the UPS, relocate after initial installation or replace parts by untrained personnel.**

Electrical shock, injury or UPS faults may happen if non-certified technicians attempt to modify or relocate the UPS.

Please contact Toshiba if you need UPS modifications or plan to move the UPS.



**PROHIBITED**

**Do NOT open the front cover.**

There are energy-high current areas and parts within the UPS.

Electric shock, burns or other personal injuries may occur if untrained personnel open the front cover.



**PROHIBITED**



## WARNING

**Do NOT remove the rear/side panels.**

The parts inside carry energy-high current. That may result in electric shock, burns, personal injuries or UPS faults by removing these panels.



**PROHIBITED**



## CAUTION

**Operators should be certified\* personnel.**

Operation of the UPS by uncertified or untrained personnel may result in electric shock, personal injury or UPS fault.

\* In accordance with the customers' requirements.



**MANDATORY**

**Make sure the air vents on the front and top of the UPS are not blocked.**

Blocking the vents will cause the temperature inside the UPS to rise and may result in fire or UPS faults.



**PROHIBITED**

**Please understand the warning labels and follow the warnings or procedures indicated.**

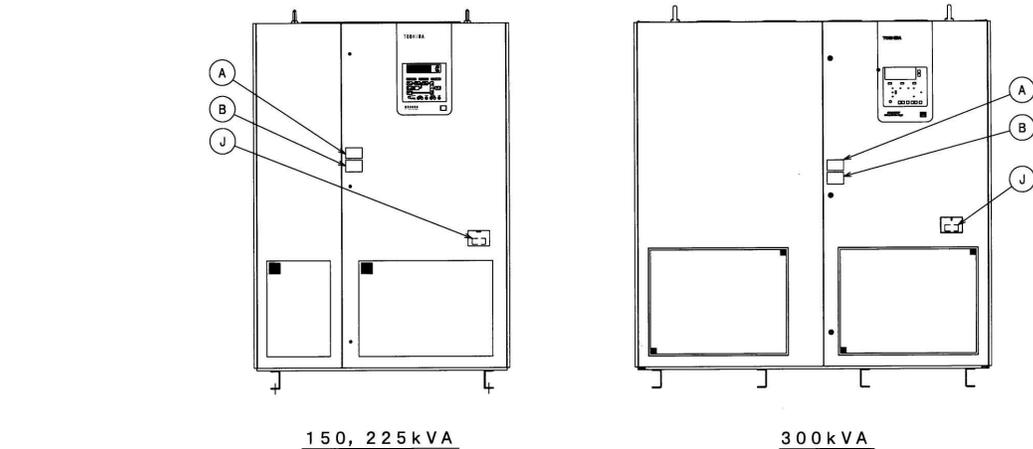
Operating the equipment without thorough understanding of these labels may result in electric shock, burns or personal injuries.



**MANDATORY**

# 9. Labeling Requirements

## Locations of the Warning Labels



**(A)**

<b>DANGER</b>
CONTAINS PARTS NOT SERVICEABLE BY THE USER Do not remove cover No user serviceable parts inside. Refer servicing to qualified service personnel. Intended for installation in a controlled environment.

**(B)**

<b>DANGER</b>
<b>RISK OF ELECTRIC SHOCK</b> This UPS receives power from more than one source-disconnection of all sources is required to de-energize this unit before servicing. Dangerous electric charge may be stored in capacitors and associated circuitry. Wait at least five (5) minutes for power to dissipate then check voltage before servicing.

**(J)**

<b>CAUTION</b>
8A ( control power source switch ) Do not turn off while operating.

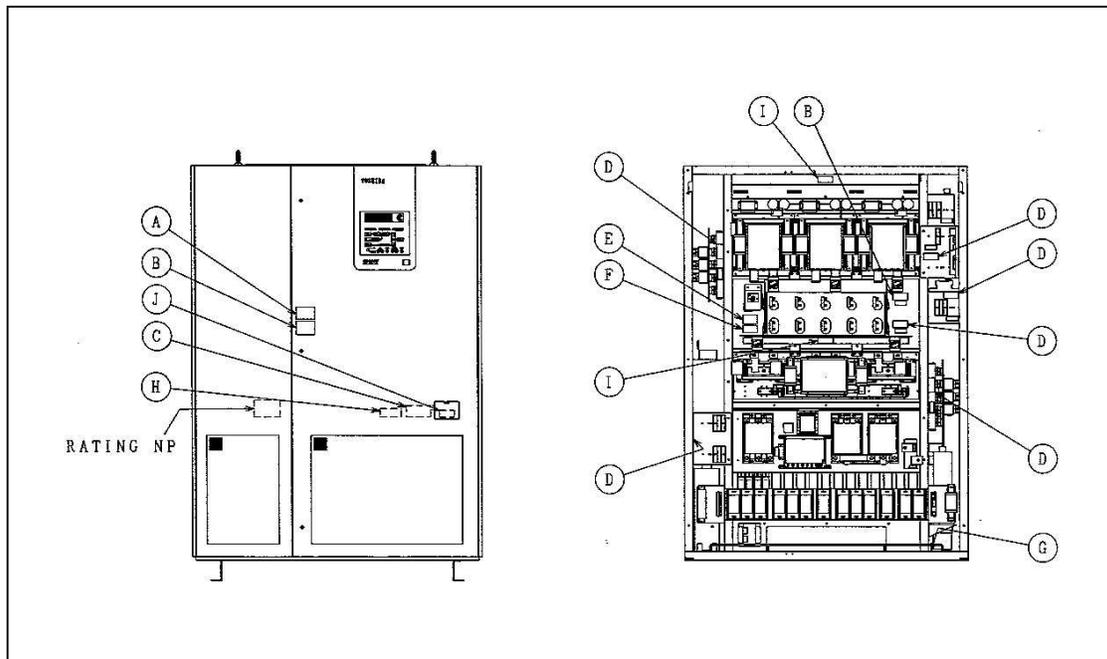
The exclamation mark within a triangle is intended to tell the user or the service personnel that cautionary markings are located with "CAUTION," "WARNING," or "DANGER."

**Figure 1 - UPS exterior showing warning label locations**



# TOSHIBA

## Locations of the Warning Labels (150, 225 kVA).



## Locations of the Warning Labels (300 kVA).

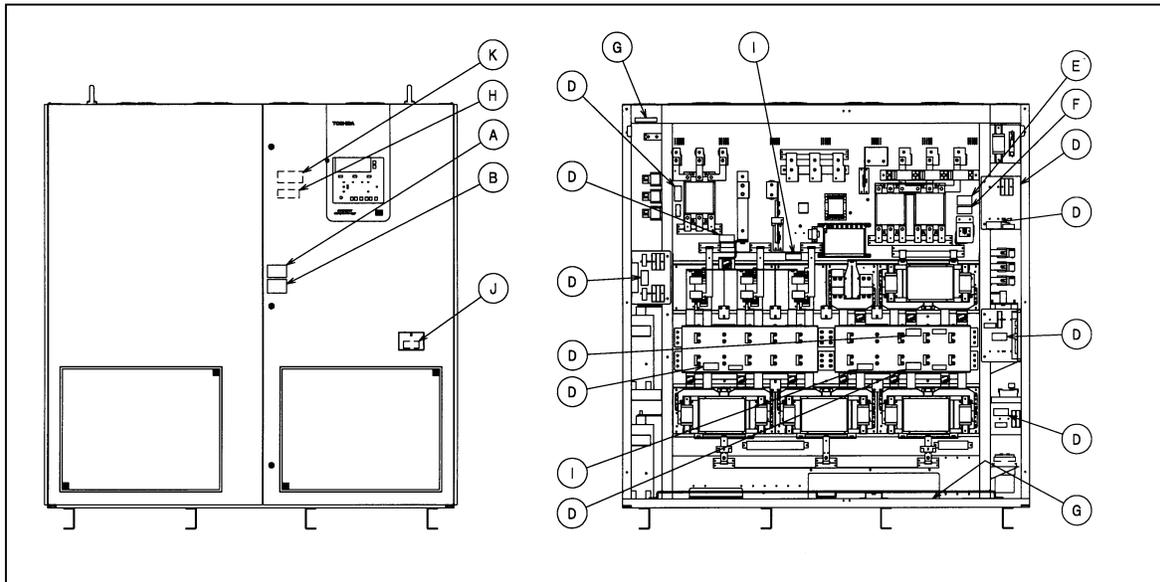


Figure 2 - UPS exterior/interior showing warning labels.

The meaning of symbols used in the cautionary markings are as follows:

- 1)  The exclamation mark within a triangle is intended to tell the user or the service personnel that cautionary markings are located with “CAUTION,” “WARNING,” or “DANGER.”
- 2)  The lightning flash with arrowhead within a triangle is intended to tell the user or the service personnel that parts inside the product are a risk of electric shock to personnel.
- 3)  The ground symbol in a blue circle is intended to tell the user or the service personnel the location of the equipment-grounding conductor.

(A)

 <b>DANGER</b>
CONTAINS PARTS NOT SERVICEABLE BY THE USER Do not remove cover No user serviceable parts inside. Refer servicing to qualified service personnel. Intended for installation in a controlled environment.

(C)

(For 100/150/225kVA)

USE COPPER CONDUCTORS ONLY REFER TO INSTRUCTION MANUAL REGARDING TIGHTENING TORQUE OF TERMINAL BLOCKS.												
1	2	3	4	5	6	7	8	9	10	11	12	13
U	V	W	U	V	W	N	U	V	W	N	-	+
480V			480V			480V			400V			
AC INPUT			BYPASS INPUT			AC OUTPUT			BATTERY			

(B)

<b>RISK OF ELECTRIC SHOCK</b>
This UPS receives power from more than one source-disconnection of all sources is required to de-energize this unit before servicing. Dangerous electric charge may be stored in capacitors and associated circuitry. Wait at least five (5) minutes for power to dissipate then check voltage before servicing.

(D)

 <b>WARNING</b>

<b>CRITICAL FUSE SIZING</b> Incorrect fuse replacement size may result in fire or inadequate equipment protection. Replace only with same type and rating of fuse.

(E)

 <b>DANGER</b>

<b>RISK OF ELECTRIC SHOCK</b> Capacitors stay charged after power has been shut off. Accidental contact with live parts can cause personal injury and death. Turn off and lock out all power sources. Wait at least five (5) minutes for power to dissipate then check voltage before servicing.

(F)

 <b>DANGER</b>

<b>RISK OF ELECTRIC SHOCK OR ELECTRIC ENERGY-HIGH CURRENT LEVELS</b> Dangerous electric charge may be stored in capacitor and associated circuitry. Test before touching.

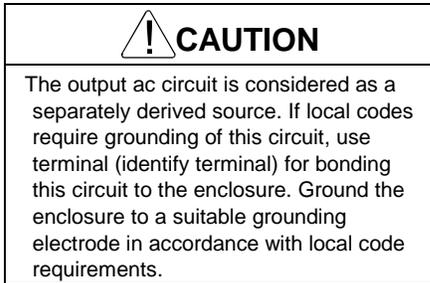
Ⓒ



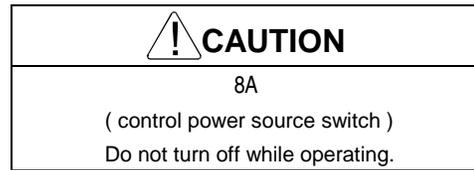
Ⓘ



Ⓗ



Ⓙ



Ⓚ

(For 300kVA)

USE COPPER CONDUCTORS ONLY  
REFER TO INSTRUCTION MANUAL REGARDING  
TIGHTENING TORQUE OF TERMINAL BLOCKS.

1	2	3	4	5	6	7	8	9	10	11	12
U	V	W	-	+	U	V	W	N	U	V	W

480V

AC INPUT

400V

BATTERY

480V

BYPASS INPUT

480V

AC OUTPUT

\* The label G is attached at the ground wire connection point.

\*\* The label E is mounted in the vicinity of the main circuit transformers and reactors that can be seen from the back of the UPS.

**Figure 3 - Warning Labels.**

## 10. Handling Precautions

### **Perform daily inspections and planned periodic maintenance.**

In order to extend the service life and optimal performance, the UPS must be installed in a suitable environment, and should have adequate daily/periodic inspections.

The periodic inspection is significantly effective to prevent the UPS from faults or accidents. It is recommended to have preventive maintenance by Toshiba service technicians.

For service information, contact Toshiba.

### **Conditioned environment in the room the UPS and the battery are installed is required.**

Turning off the air conditioner will cause high temperatures and may result in an UPS fault.

High temperatures shorten the life of components within the UPS and battery systems.



**PROHIBITED**

### **Please operate the UPS using the procedures described in Chapter 14 "Operation," while referring to the instruction/information on graphic panel LCD.**

Operation procedures other than specified may result in an UPS fault.

- \* The startup and stop procedures described in this manual are only for the UPS.  
For system operation procedure with maintenance bypass and/or distribution cabinet, please refer to the system operating procedures.

### **Do NOT turn off the control power source switch (8A) during operation.**

This may result in UPS faults.



**PROHIBITED**

**Do NOT place pieces of metal, flammable objects or fingers into the air vents or mechanical gaps of the UPS.**

It may cause fire, explosions, or may give an electrical shock.



**PROHIBITED**

**Do NOT operate the UPS in wet locations.**

Operation in wet location may cause electrical shock, UPS fault or other accidents may occur.



**PROHIBITED**

**Keep the reset button pressed for 5 seconds to reset the UPS.**

The UPS may not be reset if the duration is too short.



**MANDATORY**

# 11. Outline and Layout

 <b>WARNING</b>	<b>Do NOT open the front and/or rear panel.</b> The parts inside carry energy-high current. Touching them may result in electric shock, burns or UPS fault.
 <b>CAUTION</b>	<b>Make sure the air vents on the front and top of the UPS are not covered.</b> Covering the vents will cause the temperature inside the UPS to rise and may result in fire and/or UPS faults.

Figure 4 shows the outline dimensions of the 100kVA, 150kVA, and 225kVA UPS.

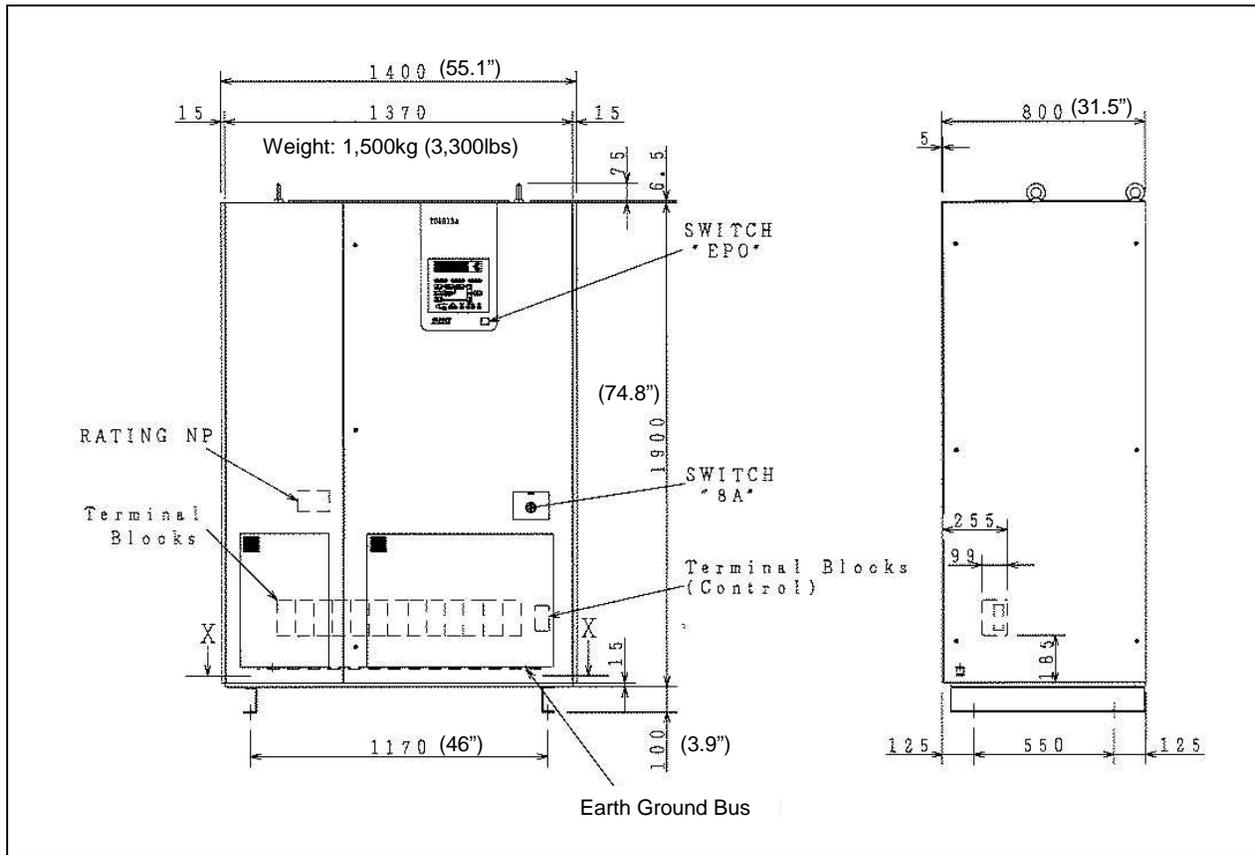


Figure 4 - 150 & 225kVA UPS Exterior dimensions (front & right side).

Figure 5 shows the outline dimensions of the 300kVA UPS.

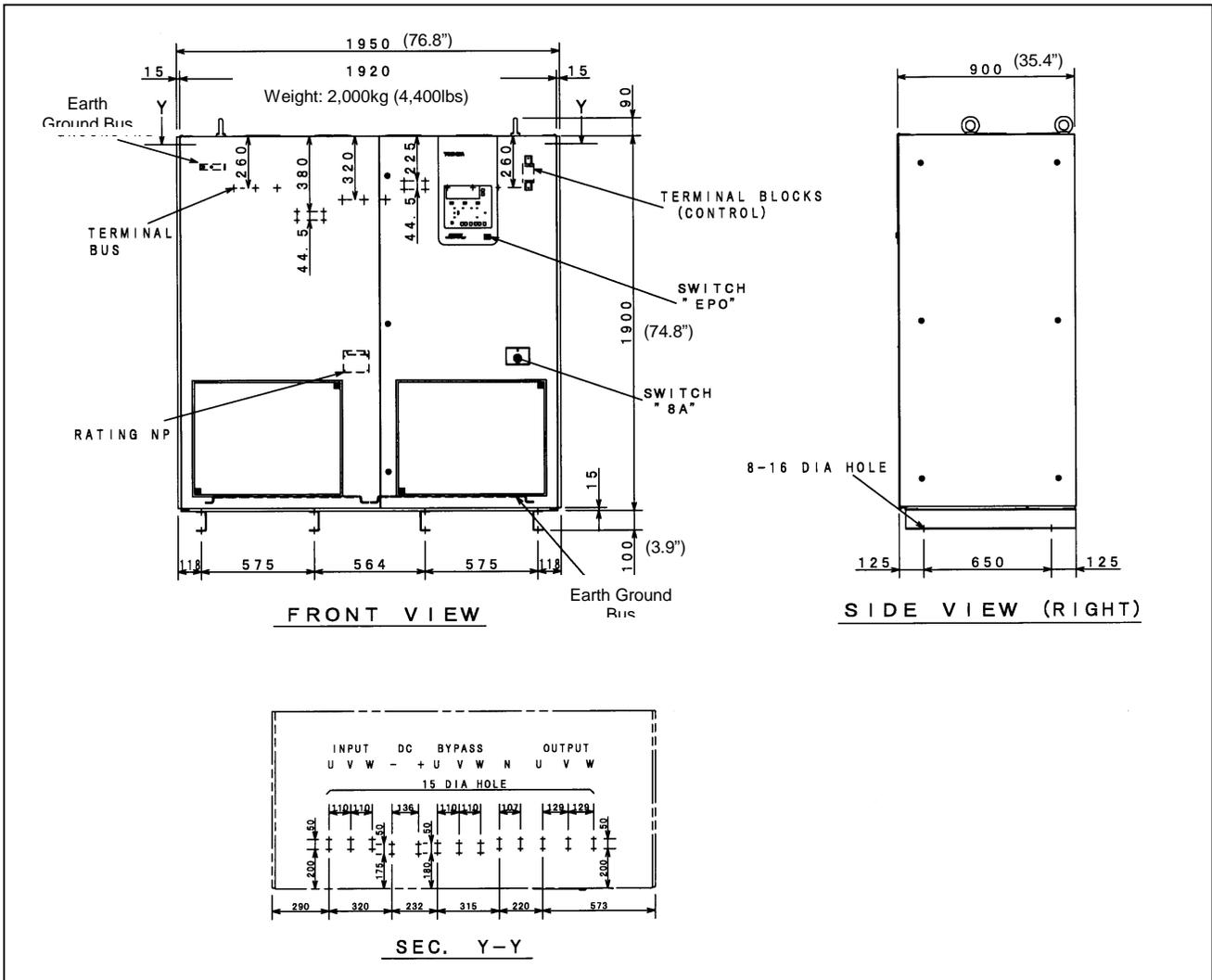
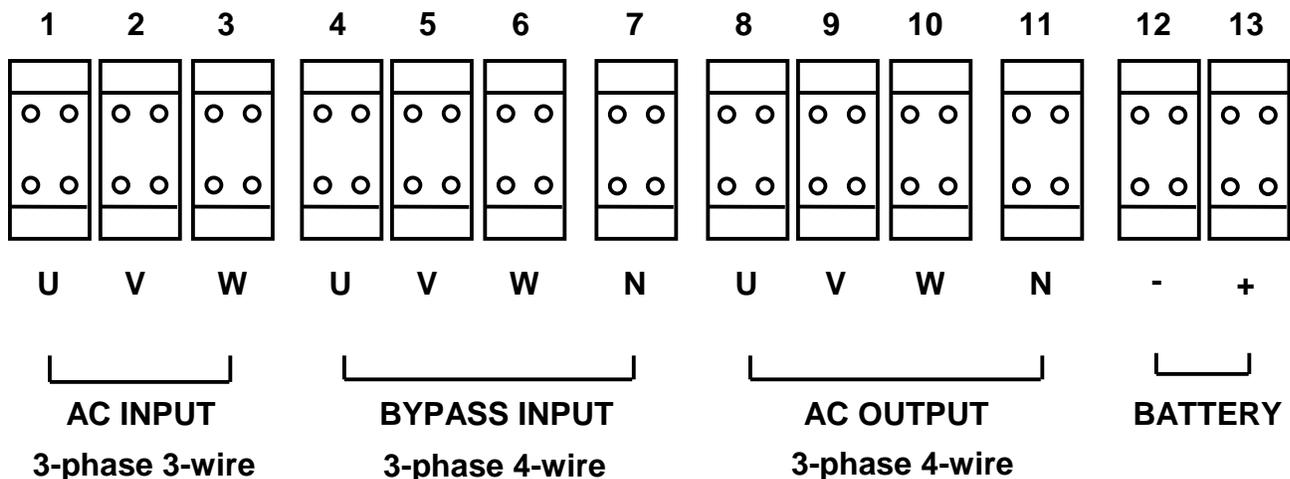


Figure 5 - 300kVA UPS Exterior dimensions (front & right side).

## 11.1 UPS Connections

Terminal Blocks 100, 150, and 225kVA.



The terminals shown are located at the bottom inside of the 150/225kVA UPS. External cable size is recommended in the Table 1 and 2.

**Table 1 Recommended Cable Size and Tightening Torque for 150kVA UPS.**

The tightening torque must be greater than 90 percent of the recommended torque.

Cable Size and Tightening Torque for 150kVA UPS (Only copper wires allowed)		
Block Number	Cable Size	Tightening Torque
1	AWG 4/0 or larger	275 in-lbs
2	AWG 4/0 or larger	275 in-lbs
3	AWG 4/0 or larger	275 in-lbs
4	AWG 4/0 or larger	275 in-lbs
5	AWG 4/0 or larger	275 in-lbs
6	AWG 4/0 or larger	275 in-lbs
7	AWG 4/0 or larger	275 in-lbs
8	AWG 4/0 or larger	275 in-lbs
9	AWG 4/0 or larger	275 in-lbs
10	AWG 4/0 or larger	275 in-lbs
11	AWG 4/0 or larger	275 in-lbs
*12	Two 350MCM or larger	275 in-lbs
*13	Two 350MCM or larger	275 in-lbs

NOTE: Maximum cable size is 350MCM.

\*One battery string (consult factory if using multiple battery strings).

**Table 2 Recommended Cable Size and Tightening Torque for 225kVA UPS.**

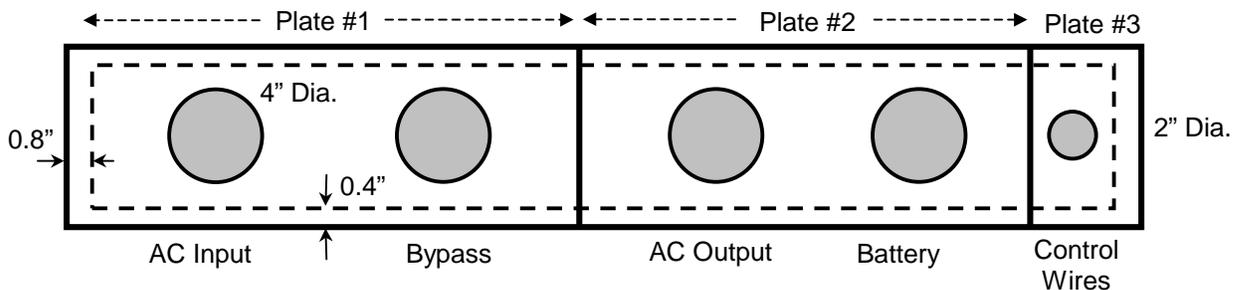
The tightening torque must be greater than 90 percent of the recommended torque.

Cable Size and Tightening Torque for 225kVA UPS (Only copper wires allowed)		
Block Number	Cable Size	Tightening Torque
1	Two 2/0 or larger	5.8 kG-m (500 in-lbs)
2	Two 2/0 or larger	5.8 kG-m (500 in-lbs)
3	Two 2/0 or larger	5.8 kG-m (500 in-lbs)
4	Two 2/0 or larger	5.8 kG-m (500 in-lbs)
5	Two 2/0 or larger	5.8 kG-m (500 in-lbs)
6	Two 2/0 or larger	5.8 kG-m (500 in-lbs)
7	Two 2/0 or larger	5.8 kG-m (500 in-lbs)
8	Two 2/0 or larger	5.8 kG-m (500 in-lbs)
9	Two 2/0 or larger	5.8 kG-m (500 in-lbs)
10	Two 2/0 or larger	5.8 kG-m (500 in-lbs)
11	Two 2/0 or larger	5.8 kG-m (500 in-lbs)
12	Two 4/0 or larger	5.8 kG-m (500 in-lbs)
13	Two 4/0 or larger	5.8 kG-m (500 in-lbs)

NOTE: Maximum cable size is 350MCM.

\*Two battery strings (consult factory if using one battery string).

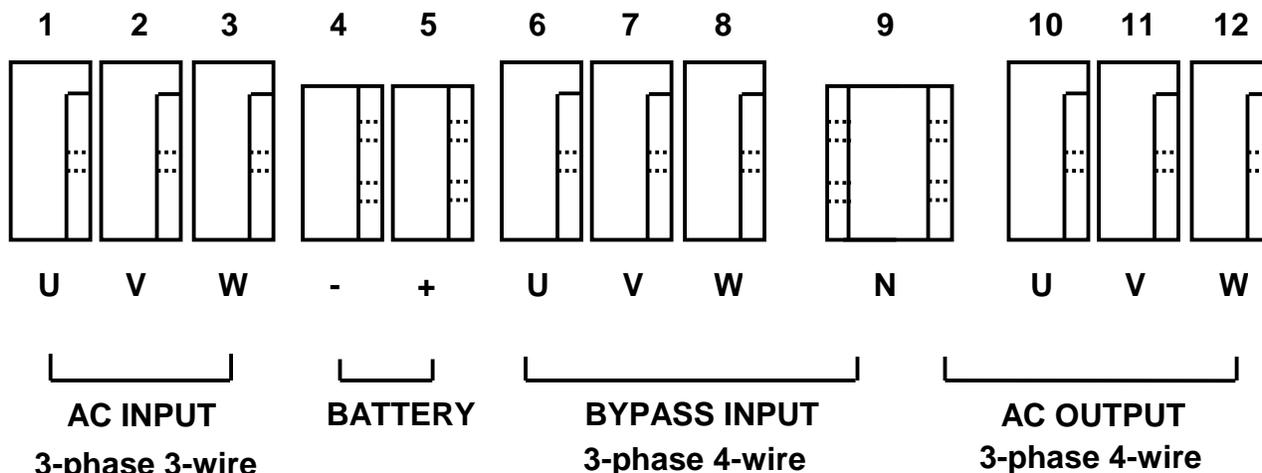
Three cable knockout plates are provided at bottom of the 150/225kVA UPS. Holes are recommended in Figure 6. The installing electrical contractor must punch the 5 holes.



3 solid rectangles show the cable knockout plates' outline. The dashed rectangle shows the UPS opening under the plates.

**Figure 6 - Cable knockout plates at the bottom (150 and 225kVA).**

## Terminal Bus 300kVA



The terminal buses shown are located at the top inside of the 300kVA UPS. Dashed line in each terminal stands for side view of screw holes to tighten lugs.

External cable size is recommended in the Table 3. This table shows only the torque to tighten a terminal bus and a corresponding lug. Torque to tighten the cable end in a compression lug shall be specified by the lug vendor recommended in Table 4.

**Table 3 - Recommended Cable Size and Tightening Torque for 300kVA UPS.**

The tightening torque must be greater than 90 percent of the recommended torque.

Cable Size and Tightening Torque at 300kVA UPS Terminals		
Bus Number	Cable Size (Only copper wires allowed)	Torque to tighten the terminal bus
1	Two 4/0 AWG or larger	215-386 in-lbs
2	Two 4/0 AWG or larger	215-386 in-lbs
3	Two 4/0 AWG or larger	215-386 in-lbs
*4	Three 350 MCM or larger	215-386 in-lbs
*5	Three 350 MCM or larger	215-386 in-lbs
6	Two 4/0 AWG or larger	215-386 in-lbs
7	Two 4/0 AWG or larger	215-386 in-lbs
8	Two 4/0 AWG or larger	215-386 in-lbs
9	Two 4/0 AWG or larger	215-386 in-lbs
10	Two 4/0 AWG or larger	215-386 in-lbs
11	Two 4/0 AWG or larger	215-386 in-lbs
12	Two 4/0 AWG or larger	215-386 in-lbs

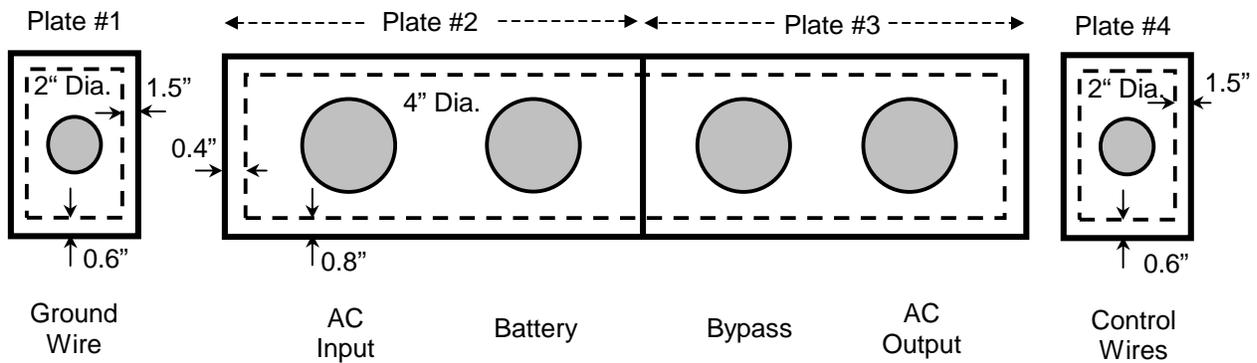
NOTE: Maximum cable size is 350MCM.

\*Two battery strings (consult factory if using one battery string).

**Table 4 - Recommended Lugs.**

At Terminal Bus #	Recommendation	
	Vendor	Catalog #
1	ILSCO	TA-600
2		AU-600
3		
4	ILSCO	TA-600
5		T3A2-600N
6	ILSCO	TA-600
7		AU-600
8		
9		TA-600, T3A2-600N
10		
11		
12	TA-600	
		AU-600

Four cable knockout plates are provided at the top of the 300kVA UPS. Holes are recommended in Figure 7. The installing electrical contractor must punch the six holes.



Four solid rectangles show the cable knockout plates' outline. The 3 dashed rectangles show the UPS opening under the plates.

**Figure 7 - Cable knockout plates at the top (300kVA).**

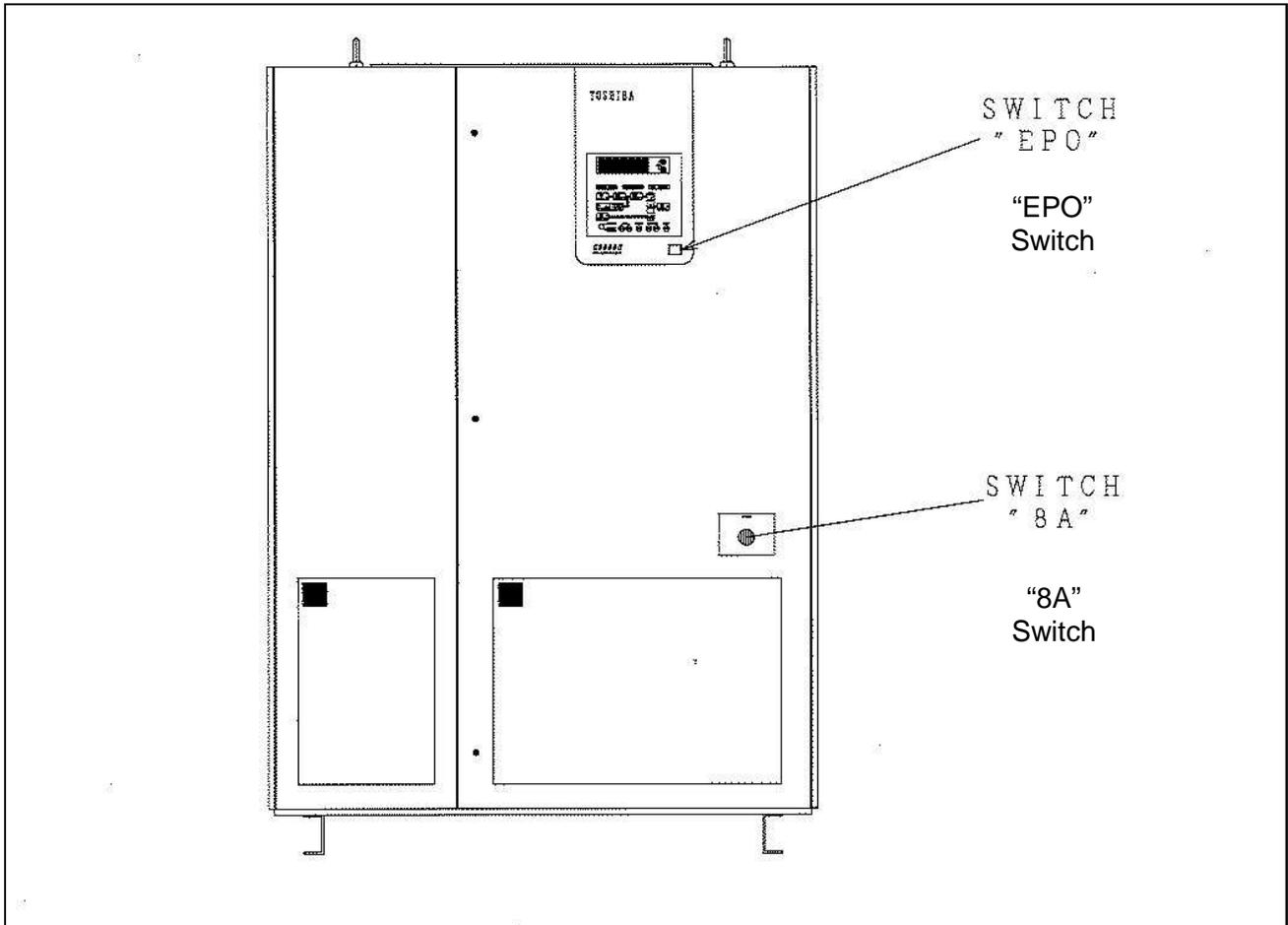
# 12. Operating Interface

 <b>WARNING</b>	<p><b>If the UPS produces smoke or smells strange, immediately turn off circuit breakers of AC and DC input.</b></p> <p>Continued use may result in fire. Contact Toshiba or Authorized representatives.</p>
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## 12.1 Operating Switches

Figure 8 and Table 5 show the location and functions of the operating switches to operate the UPS circuit shown in Figure 9.

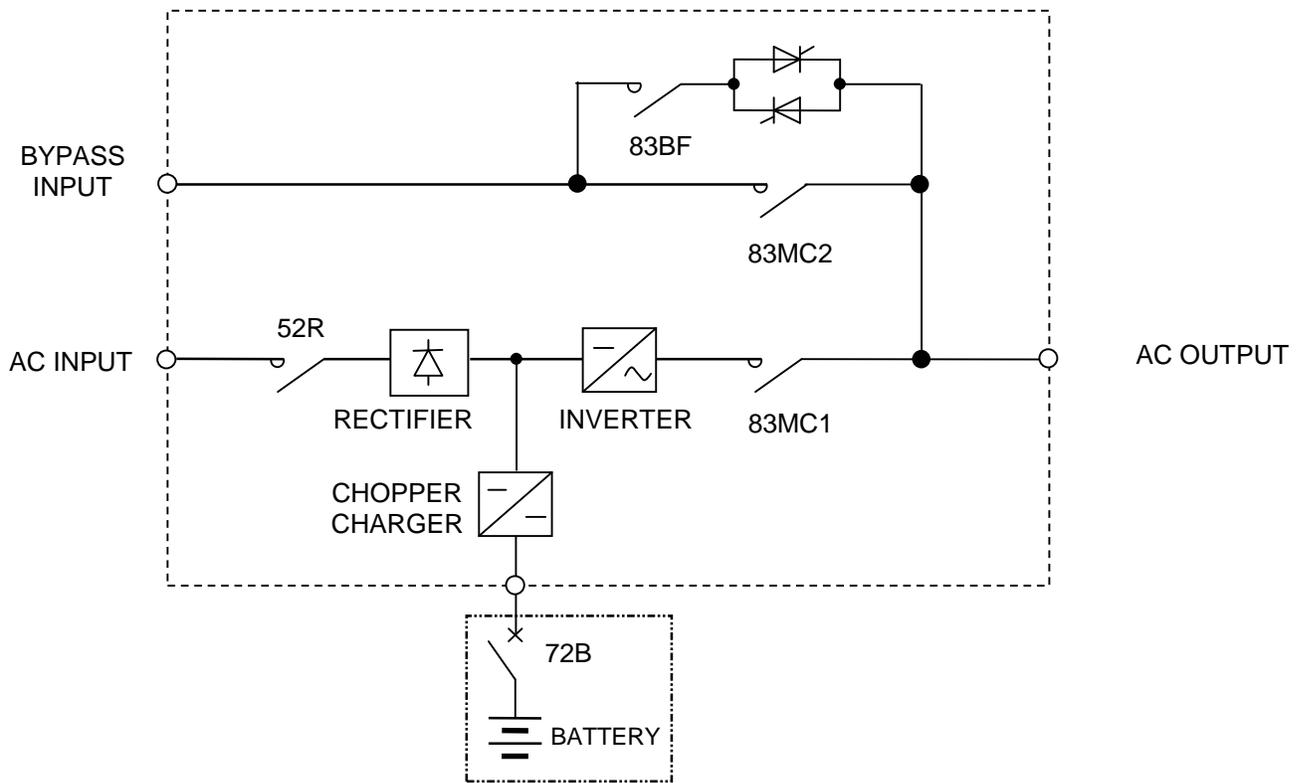
<b>NOTES</b>	<p><b>Do NOT turn off the control power source switch (8A) during UPS operation.</b></p> <p>This may result in UPS faults.</p>
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**Figure 8 - Operating Switches.**

**Table 5 - Control Functions.**

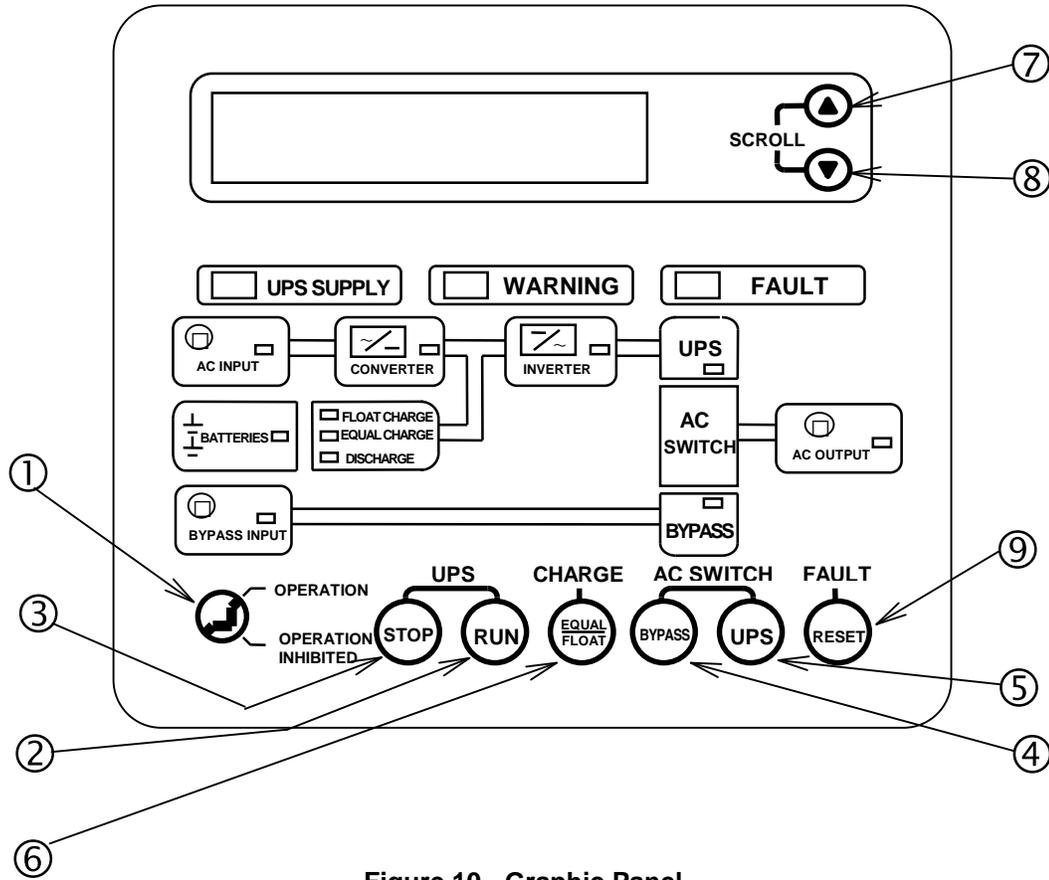
No.	Device	Name / Function	Normal Position During Operation	Remarks
1	"8A" Switch	<u>Control power source switch</u> When AC input is normal, this switch energizes the control circuit.	ON	
2	"EPO" Switch	<u>Emergency power off switch</u> Whenever this switch is pressed, UPS will stop operation, and all the breakers will be tripped/opened.	OFF	



**Figure 9 - UPS Circuit Configuration.**

## 12.2 Key-Switch and Buttons

The key-switch and operating buttons on the graphic panel are shown in Figure 10. See the sections titled "Key-switch" and "Operating buttons" for each function.



**Figure 10 - Graphic Panel.**

### 12.2.1 Key-switch

Table 6 shows the function of the key-switch on the graphic panel.

**Table 6 - Key-switch function.**

No.	Name	Function	Remarks
①	OPERATION LOCK	<p>This key-switch enables operation buttons pressed when it is in "OPERATION" mode.</p> <p>When the key-switch is at "OPERATION INHIBITED" mode, the operation is disabled, and buttons ② ~ ⑥ and ⑨ shown in Table 7 are not operative. They have no effect upon the UPS operation.</p> <p>LCD scroll buttons ⑦ and ⑧ still work regardless of the key-switch position.</p>	<p>The key-switch at the "OPERATION INHIBITED" can eliminate misoperation procedures.</p>

## 12.2.2 Operating Buttons

Table 7 shows the functions of the operating buttons on the graphic panel.

<b>NOTES</b>	<b>Keep an operating button pressed for 0.5 seconds at least, when changing UPS modes.</b>
	<b>Keep the reset button pressed for 5 seconds to reset the UPS.</b>
	The UPS may not respond if this duration is too short.

**Table 7 Button functions.**

No.	Name	Function	Remarks
②	RUN	To start up the UPS.	The UPS starts up when this button is pressed. (Key-Switch in OPERATION mode)
③	STOP	To stop the UPS.	The UPS stops when this button is pressed. (Key-Switch in OPERATION mode)
④	UPS	To transfer to normal operation from bypass operation	The UPS transfers to normal operation, if this button is pressed while bypass operation. (Key-Switch in OPERATION mode)
⑤	BYPASS	To transfer to bypass operation from normal operation	The UPS transfers to bypass operation, if this button is pressed while normal operation. (Key-Switch in OPERATION mode)
⑥	FLOAT / EQUAL	To flip the recharge mode between float charge and equalize charge.	The UPS flips recharge voltage between float charge and equalize charge. Equalize charge voltage can be programmed as protection charge, with battery overheat contact on, if desired. (Key-Switch in OPERATION mode)
⑦	SCROLL UP	To scroll the LCD screens.	See the section titled "LCD Scroll with faults or warnings" and section "LCD Scroll" for details.
⑧	SCROLL DOWN		
⑨	RESET	To reset the UPS faults and warnings shown on the LCD.	

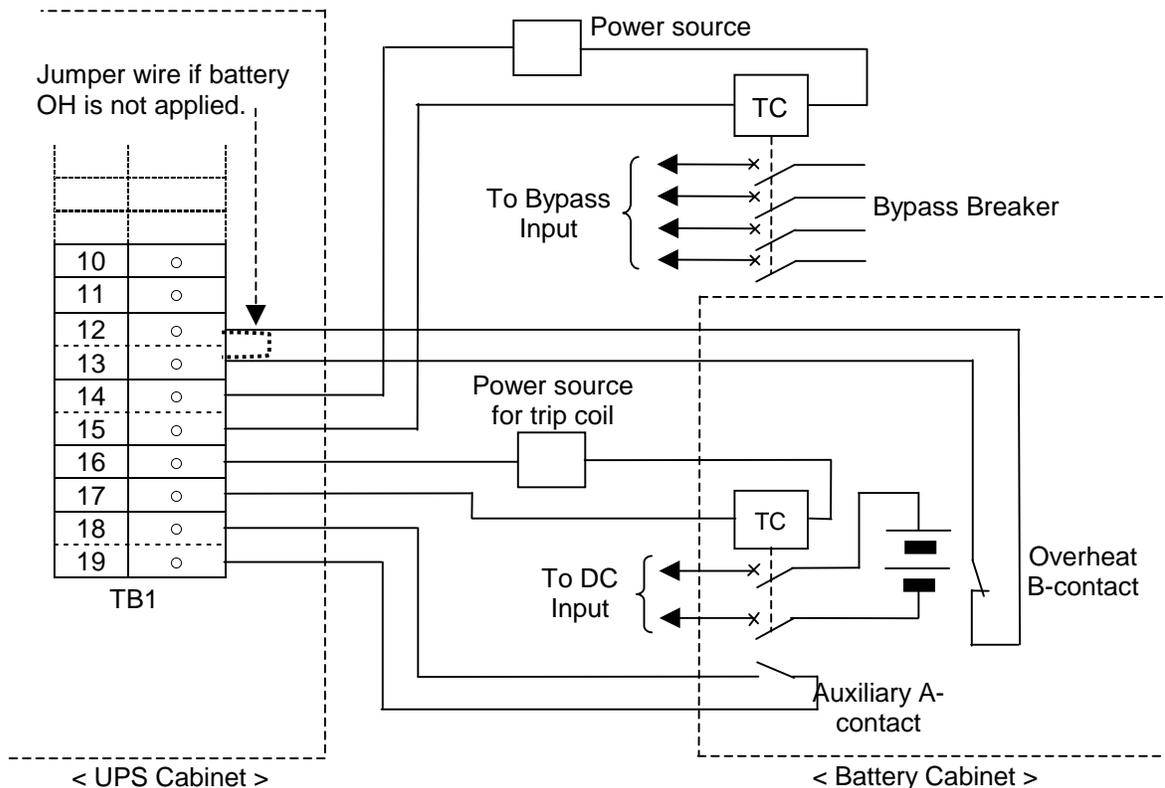
## 12.3 External Connections

The terminal layout of external connection TB1 is shown in Table 8.

**Table 8 External Connections.**

No.	I/O	Signal Name	Operation
1	Output	Low Battery	Close at Low Battery
2	Output	Backup Operation	Close while Backup Operation
3	Output	Fault	Close by Faults
4	Output	Inverter Supply	Close during Normal Operation
5	Output	Warning	Close by Warnings
6	Input	P24 Remote Run	Close to run UPS
7	Input		
8	Input	P24 Remote Stop	Close to stop UPS
9	Input		
10	Output	Bypass Supply	Close during Bypass Operation
11	Output	Output Signal Ground	(Ground for pin #1~5 and #10)
12	Input	P24 Battery Overheat	Battery's Overheat B-contact
13	Input		
14	Output	52C Trip Signal	Bypass Breaker Shunt Trip Signal by EPO
15	Output		
16	Output	72B Trip Signal	Battery Breaker shunt trip by EPO or Battery shutdown
17	Output		
18	Output	72B Aux. Contact	Battery breaker's Auxiliary A-contact
19	Output		

The UPS, the battery cabinet and the bypass breaker should be wired as shown in Figure 11.



**Figure 11 Connection among UPS, battery cabinet & bypass breaker.**

# 13. Graphics Interface

## 13.1 LED Indication

Figure 12 and Table 9 show the graphic panel detail.

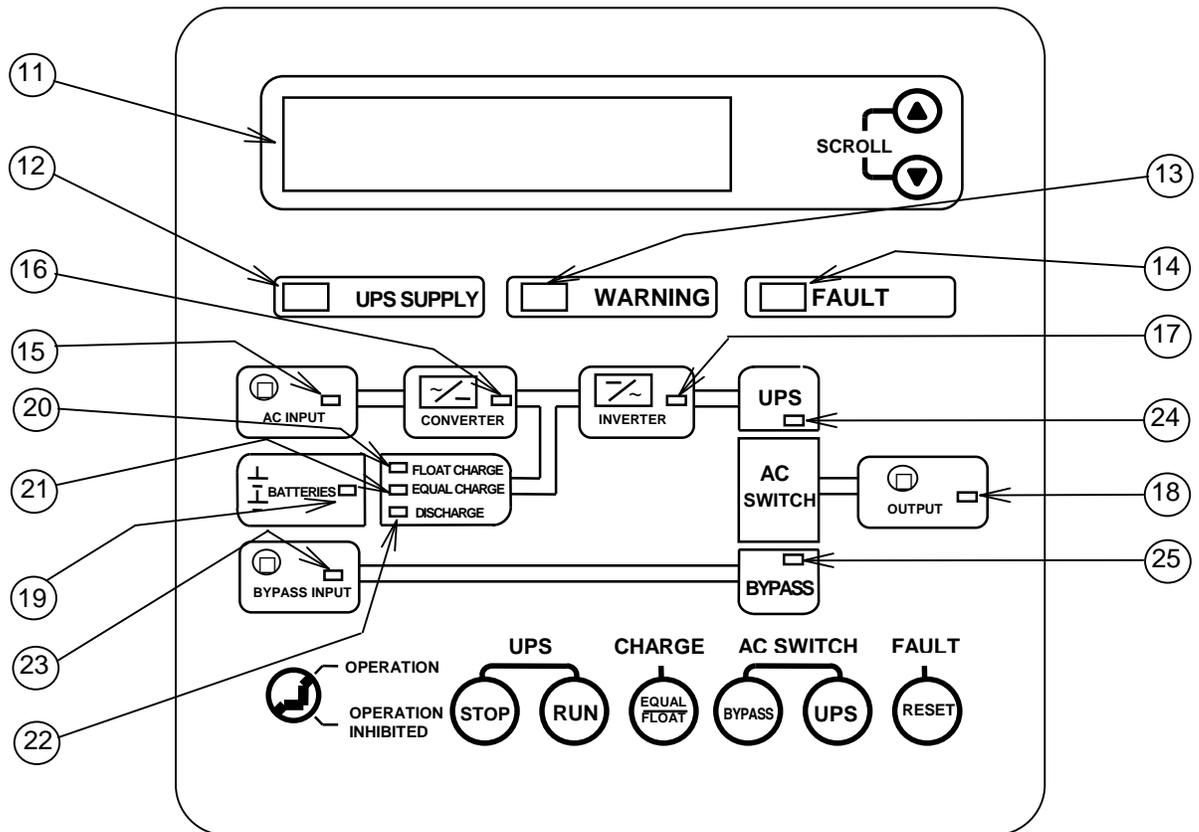


Figure 12 - Graphics Panel.

**Table 9 - LCD/LED Legend.**

<b>No.</b>	<b>Name</b>	<b>Function</b>
⑪	LCD	LCD indicates operation procedure, measured data and warnings/faults. Detailed in the section titled "LCD Display."
⑫	UPS SUPPLY LED	Turned on while the inverter is on. Flashes during start-up or stop procedure.
⑬	WARNING LED	Normally off. Turned on with warnings, flashes with AC input abnormality.
⑭	FAULT LED	Normally off. Turned on with faults.
⑮	AC INPUT LED	Normally on with regular AC input. Flashes with AC input under-voltage (85%).
⑯	RECTIFIER LED	Turned on after DC caps are charged up through the rectifier.
⑰	INVERTER LED	Flashes during start-up or stop procedure. Turned on after the inverter starts up, and during available.
⑱	AC OUTPUT LED	Turned on with AC output fed by either the bypass or inverter sources.
⑲	BATTERY LED	Turned on with battery connected. (Aux-contact on)
⑳	FLOAT CHARGE LED	Turned on during float charge.
㉑	EQUALIZE CHARGE LED	Turned on during equalize charge or protection charge with battery OH contact open.
㉒	DISCHARGE LED	Turned on during battery discharge.
㉓	BYPASS INPUT LED	Normally on with regular bypass input. Flashes with bypass under-voltage (85%).
㉔	UPS LED	Turned on during UPS Supply.
㉕	BYPASS LED	Turned on during Bypass Supply.

## 13.2 LCD Indication

LCD screens consist of the following terms.

- (1) Normal Display - Initial display, operation guidance, and measured data.
- (2) Fault Display - Displays detailed data when a fault occurs.
- (3) Warning Display - Displays detailed data when a warning occurs.

The operator can scroll through these menu items using the scroll buttons.

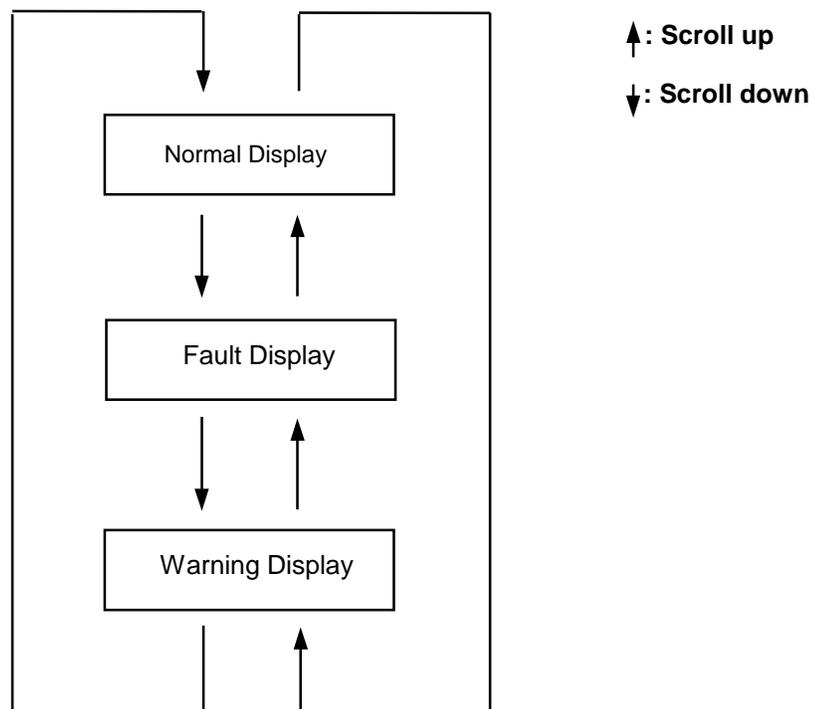
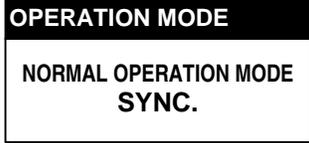
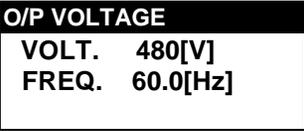
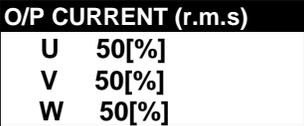


Figure 13 - LCD indication terms.

## 13.2.1 Normal Display

The Normal Display screen indicates the UPS operational status and provides 15 screens: an operation guidance screen, an operation mode screen and 13 screens of measured data. Table 10 shows these screens page by page.

**Table 10 - Normal Display.**

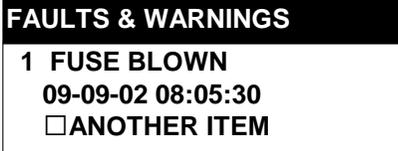
No.	LCD Screen	Description
1	<u>Operation Guidance</u> (Example 1) 	Shows the UPS status at the top and guidance message or measured data underneath. (Example 1) Shows a guidance message at start up.
	(Example 2) 	(Example 2) Shows the output voltage and current after start up. Voltage (example) Current ratio (example)
2	<u>Operation Mode</u> (Example) 	Shows the UPS Operation mode.
3	<u>Measurement screen #1</u> Output voltage 	Shows the output voltage between lines.
4	<u>Measurement screen #2</u> Output current (RMS) 	Shows the output current RMS (%) for each phase.

5	<p>Measurement screen #3 Output current (peak)</p> <div style="border: 1px solid black; padding: 5px;"> <p><b>O/P CURRENT (PEAK)</b></p> <p>U 50[%] V 50[%] W 50[%]</p> </div>	<p>Shows the output current peak (%) for each phase.</p> $\frac{\text{Peak value of output current}}{\text{RMS value for rated current} \times 1.41} \times 100 [\%]$
6	<p>Measurement screen #4 AC input</p> <div style="border: 1px solid black; padding: 5px;"> <p><b>AC INPUT</b></p> <p>AC I/P-V 480[V] FREQ. 60.0[Hz]</p> </div>	<p>Shows the voltage and frequency of the AC input.</p>
7	<p>Measurement screen #5 Bypass input</p> <div style="border: 1px solid black; padding: 5px;"> <p><b>BYPASS INPUT</b></p> <p>BYP I/P-V 480[V] FREQ. 60.0[Hz]</p> </div>	<p>Shows the voltage and frequency of the Bypass input.</p>
8	<p>Measurement screen #6 Battery</p> <div style="border: 1px solid black; padding: 5px;"> <p><b>BATTERY</b></p> <p>BACK-UP RATING 10[MIN] DISCHARGING 15[MIN]</p> </div>	<p>Shows the rated battery backup time with rated load and cumulative discharged time.</p>
9	<p>Measurement screen #7 DC circuit</p> <div style="border: 1px solid black; padding: 5px;"> <p><b>DC INPUT</b></p> <p>DC-V 632[V] BATT-V 400[V] BATT-I 0[A]</p> </div>	<p>Shows the DC bus voltage, battery voltage and battery current.</p> <p>Negative battery current stands for recharge current and positive stands for discharge.</p>
10	<p>Measurement screen #8 Counter values</p> <div style="border: 1px solid black; padding: 5px;"> <p><b>MODE COUNT</b></p> <p>UPS 35[H] BATTERY 56[MIN] 32[TIM]</p> </div>	<p>Shows the cumulative UPS operation time, the cumulative battery backup time and the number of battery backup operations.</p>
11	<p>Measurement screen #9 Clock</p> <div style="border: 1px solid black; padding: 5px;"> <p><b>CLOCK</b></p> <p>TIME 03-24-02 12:58</p> </div>	<p>Shows the present time. ( 24-hour clock )</p>

## 13.2.2 Fault Display

The Fault Display screen indicates the fault records until they are reset.

**Table 11 - Fault Display Screen**

LCD Screen	Description
Indication of no fault 	This screen is displayed if there is no fault recorded, or after the reset button is pressed.
Indication if faults recorded 	A fault record is shown with time stamp if recorded.  An arrow shows up with another record that can be scrolled by pressing the up/down buttons.

\* The fault records will remain in the memory until the reset button is pressed for at least 5 seconds, even after the actual cause of the fault has been resolved. Note that the fault records are not deleted when the UPS is turned off.

## 13.2.3 Warning Display

The Warning Display screen indicates the warning records until they are reset.

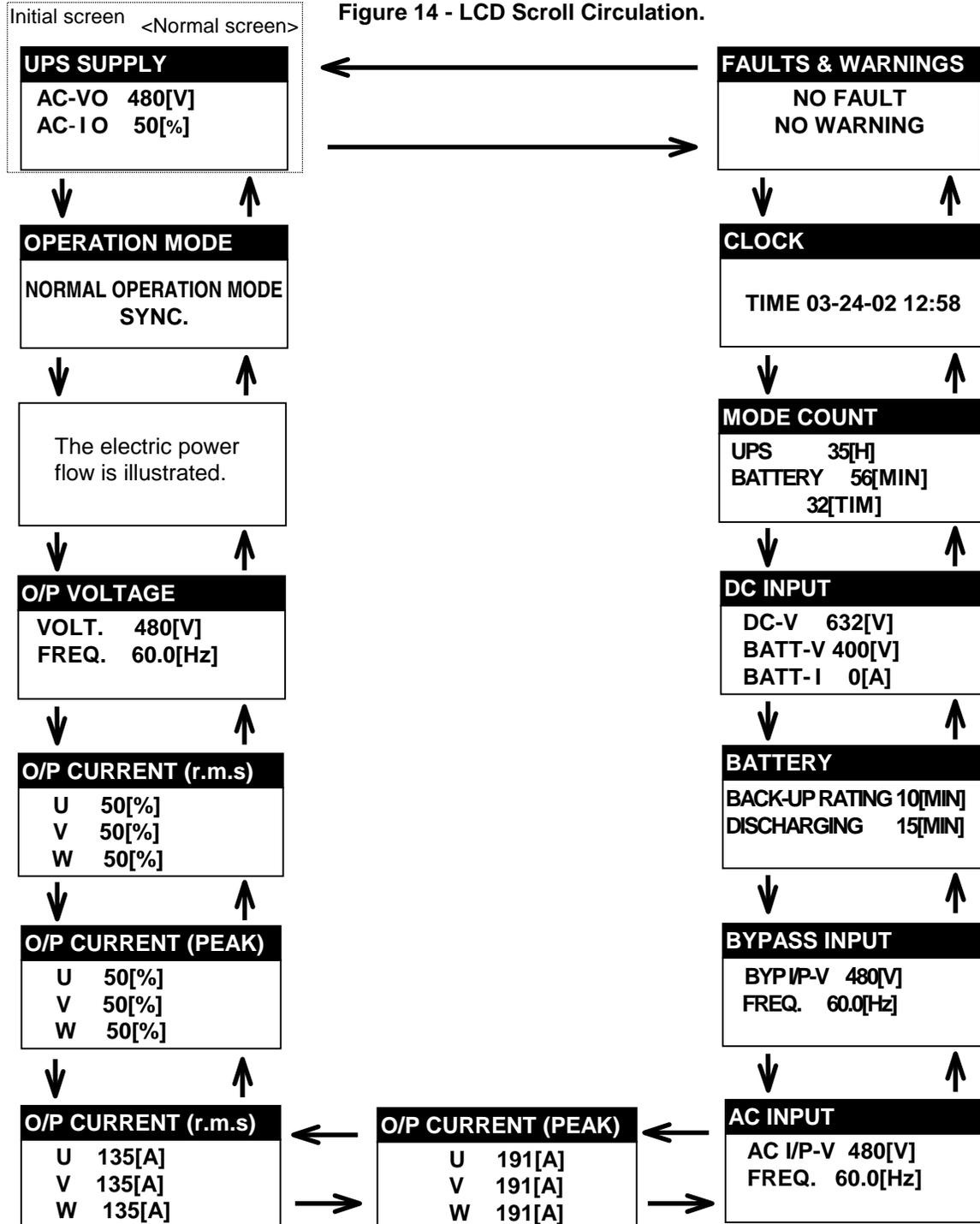
**Table 12 - Warning Display Screen.**

LCD Screen	Description
Indication of no warning 	This screen is displayed if there is no warning recorded, or after the reset button is pressed.
Indication if warnings recorded 	A warning record is shown with time stamp if recorded.  An arrow shows up with another record that can be scrolled by pressing the up/down buttons.

## 13.2.4 LCD Scroll

All the screens can be scrolled with the up/down buttons on the graphic panel.

Name	Description
SCROLLUP	Moves back to the previous screen (see Figure 10)
SCROLL DOWN	Moves forward to the next screen (see Figure 10)



## 14. Operation

This section describes the basic procedures to operate the UPS.

 <b>CAUTION</b>	<b>Operators should be qualified/trained personnel.</b> Operation of the UPS by unqualified or untrained personnel may result in electric shock, personal injury or fault.
	<b>Make sure you understand the meaning of the warning labels on the equipment, and follow the precautions indicated.</b> Operating the equipment without understanding of these labels may result in electric shock or burns.

<b>NOTES</b>	<b>Operate the UPS in the specified condition.</b> Operating the UPS in other conditions may result in fault.
	<b>During operation, do not turn off the air conditioner for the UPS room and the battery room.</b> This will cause the temperature to rise and will result in UPS or battery fault.
	<b>When you start or stop the UPS, follow the instruction on the LCD and perform the proper procedures.</b>

### 14.1 Operation Types

The operation summary is shown below.

No.	Operation	Description	Page No.
1	Startup	Starting up and operating the UPS.	43
2	Switch Power Supply	Switching power supply source between UPS and Bypass.	45
3	Stop	Stop the inverter and chopper/charger.	46
4	Complete Shutdown	Turn off the control power supply. Shutting down the UPS completely.	47
5	Float / Equalize Charge	Changing the battery recharge mode between float charge and equalize charge.	48
6	Protection Charge	Automatic recharge mode transition from protection charge to float charge.	50

## 14.2 Pre-operational check

Be sure to check the following items before operating the UPS:

- (1) Make sure all covers/panels are in place and secured.
- (2) Make sure the temperature control in the UPS/Battery room is within specified limits.
- (3) Before starting the UPS, check the power source for the UPS to make sure AC input power is on.
- (4) Make sure battery breaker's auxiliary A-contact is connected to the terminal block TB1.

## 14.3 Procedures

### 14.3.1 Startup

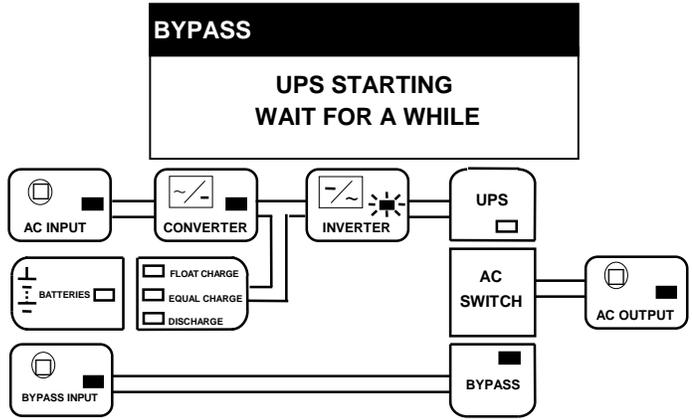
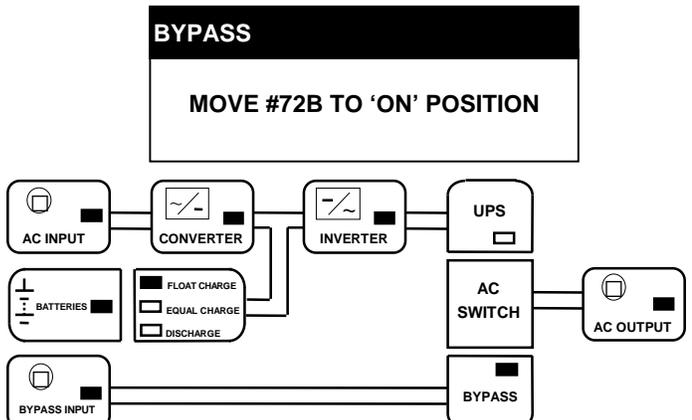
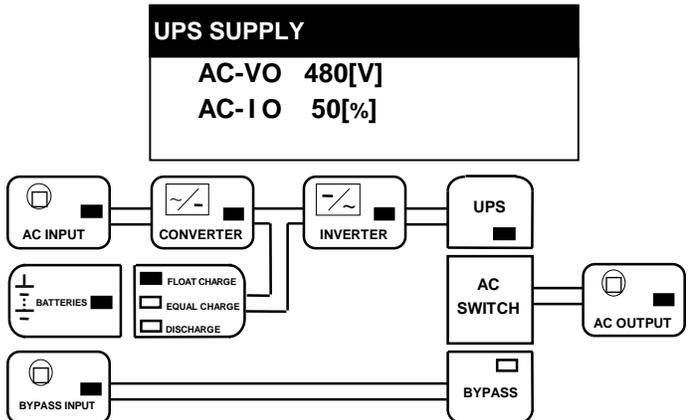
Table 13 shows the procedure to start up the UPS.

LED legend     : Off     : On     : Flash

**Table 13 - Startup Procedures.**

Step	Procedure	LCD/LED Status
1	Turn on the control power supply switch (8A).	
2	Wait for a few seconds.	

Table 13 - Startup Procedures (Cont'd).

<p>3</p> <p>Press the "RUN" button for 0.5 sec.</p>		 <p>CONVERTER LED is on and INVERTER LED flashes.</p>
<p>4</p> <p>Turn on the DC input breaker.</p>		 <p>BATTERIES LED is on.</p>
<p>5</p> <p>Press the "UPS" button for 0.5 sec.*</p> <p>→This completes UPS startup procedure.</p>		 <p>BYPASS LED is off and UPS LED is on.</p>

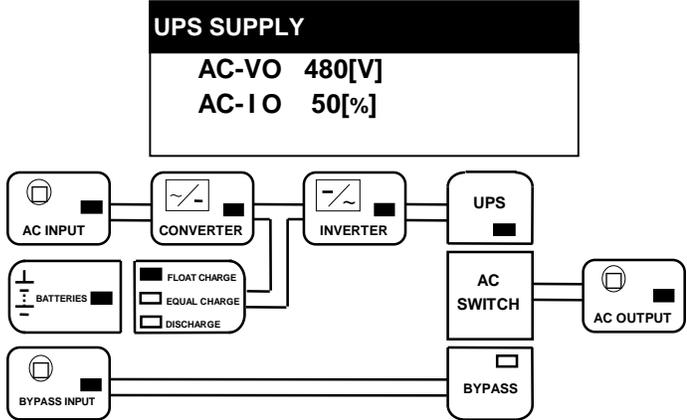
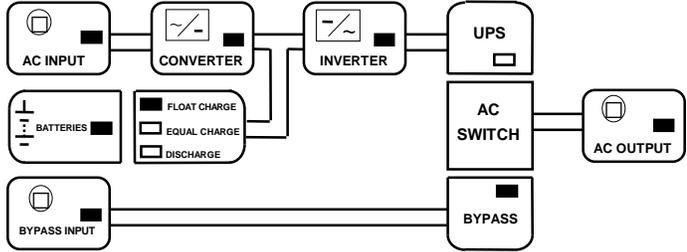
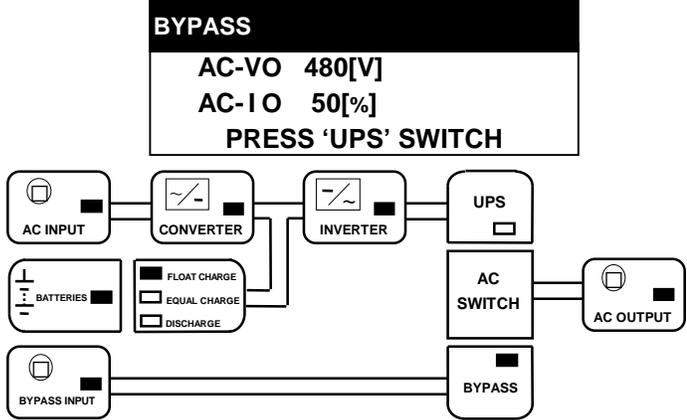
\* Notes:

- If the AC switch dose not function, contact Toshiba or authorized representatives.
- If the bypass power source is out of specification, this operation will be inhibited. In order to switch manually, press the "UPS" button for 5 seconds or more.

## 14.3.2 Switch Power Supply (UPS→Bypass)

Table 14 shows the procedure to transfer between the UPS supply and the bypass.

**Table 14 - UPS Power Supply → Bypass Power Supply.**

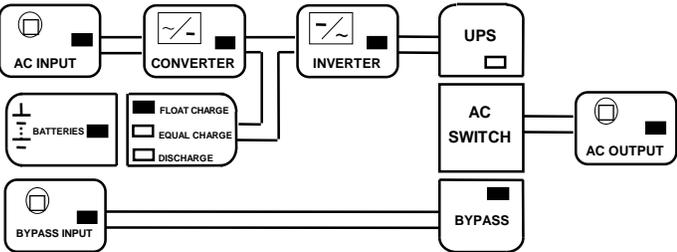
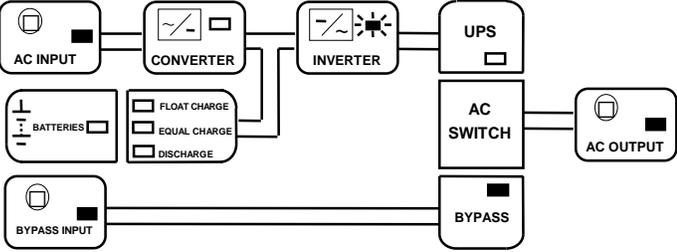
Step	Procedure	LCD/LED Status
1	Check AC INPUT LED and BYPASS LED are on to make sure power is being delivered to the UPS.	 <p>The diagram shows the UPS system components: AC INPUT, CONVERTER, INVERTER, UPS, BATTERIES (with sub-indicators for FLOAT CHARGE, EQUAL CHARGE, DISCHARGE), BYPASS INPUT, AC SWITCH, and AC OUTPUT. The LCD display at the top shows 'UPS SUPPLY' with 'AC-VO 480[V]' and 'AC-I O 50[%]'. The AC INPUT and BYPASS LEDs are lit. The UPS LED is also lit. The AC SWITCH and BATTERIES LEDs are off.</p>
2	Press the "BYPASS" button for 0.5 sec.	 <p>The diagram shows the same components as in Step 1. The AC INPUT LED is still lit, but the BYPASS LED is now lit, and the UPS LED is off. The AC SWITCH and BATTERIES LEDs remain off.</p> <p>UPS LED is off and BYPASS LED is on.</p>
3	Please wait. →Procedure completed.	 <p>The diagram shows the same components as in Step 1. The LCD display at the top shows 'BYPASS' with 'AC-VO 480[V]', 'AC-I O 50[%]', and 'PRESS 'UPS' SWITCH'. The AC INPUT and BYPASS LEDs are lit. The UPS LED is off. The AC SWITCH and BATTERIES LEDs are off.</p>

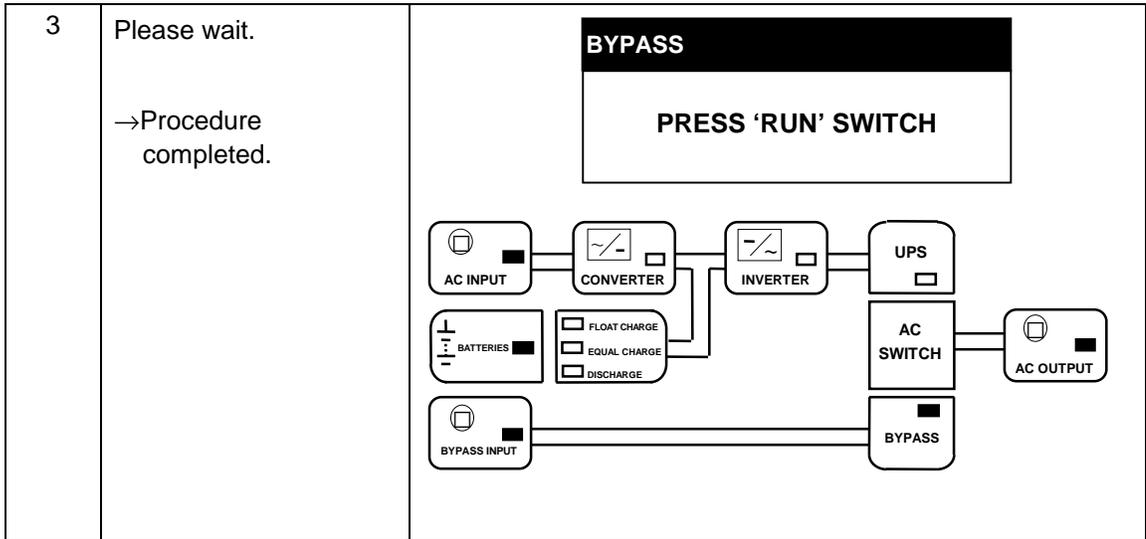
\* To change from Bypass to UPS supply, follow the procedure step #5 in Table 13. If the AC switch does not function, contact Toshiba or authorized representatives.

### 14.3.3 Stop

Table 15 shows the procedure to stop the UPS.

**Table 15 - Stopping procedure.**

Step	Procedure	LCD/LED Status
1	Transfer to Bypass supply as described in Table 14.	<div data-bbox="875 457 1307 625" style="border: 1px solid black; padding: 5px;"> <p><b>BYPASS</b></p> <p>AC-VO 480[V] AC-IO 50[%] PRESS 'UPS' SWITCH</p> </div>  <p>UPS LED is off and BYPASS LED is on.</p>
2	Turn off the DC input breaker, and, press the "STOP" button for 0.5 sec at least.	<div data-bbox="875 989 1307 1150" style="border: 1px solid black; padding: 5px;"> <p><b>BYPASS</b></p> <p>MOVE #72B TO 'OFF' POSITION</p> </div>  <p>BATTERIES LED is off and INVERTER LED flashes then off. FLOAT CHARGE LED and CONVERTER LED are off.</p>



### 14.3.4 Complete Shutdown

This section shows the procedure to turn off the control power and shut down the UPS completely.

**Table 16 - Complete Shutdown.**

Step	Procedure	LCD/LED Status
1-3	Same as steps 1-3 in "Stop" section.	
4	Scroll the LCD screen to see the DC INPUT and make sure DC bus voltage is 0V.	
5	*Turn off the control power supply switch (8A).	Nothing is displayed on the LCD and all LED's are off.
6	Turn off all breakers at AC output, Bypass Input and AC Output.	(Shutdown is completed and UPS is isolated.)

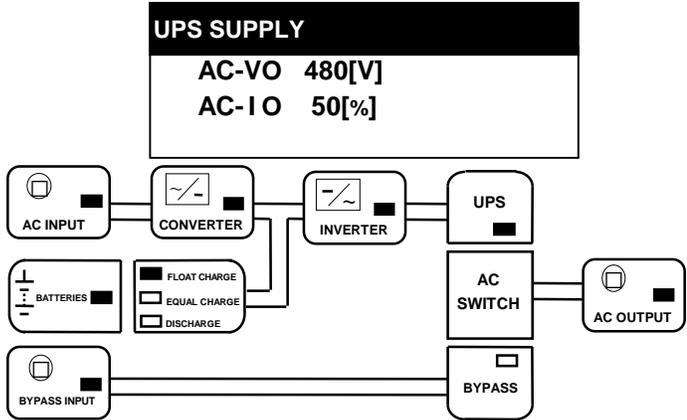
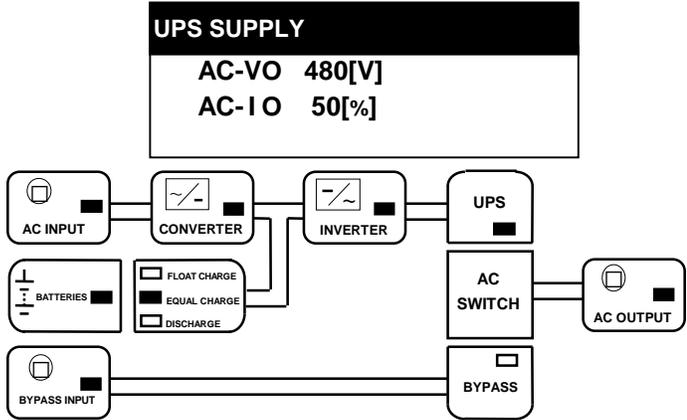
\* This operation is different from the displayed instruction on the screen. Be sure to perform the procedure specified here.

## 14.3.5 Changing Between Float Charge and Equalize Charge

This section shows the procedure to change the recharge mode between float charge and equalize charge.

(1) Table 17 shows the procedure to change from float charge to equalize charge.

**Table 17 - Change From Float Charge to Equalize Charge.**

Step	Procedure	LCD/LED Status
1	Make sure that the FLOAT CHARGE LED is On.	
2	Press FLOAT/EQUAL button for 0.5 sec. → Change completed.	 <p data-bbox="719 1486 1414 1518">EQUAL CHARGE LED is On; FLOAT CHARGE LED is Off.</p>

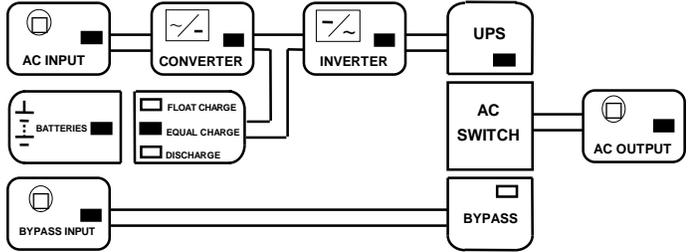
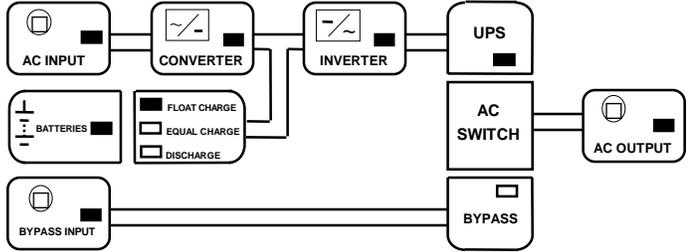
\* In equalize charge mode, the battery is charged for a programmed period at a specified voltage (depending on the battery spec) rather than the float charge, in order to prevent voltage deviations among battery cells. This should be done once every six months if possible.

The G8000 UPS has an automatic function to perform the equalize recharge after battery backup operation.

(2) Table 18 shows the *manual* procedure to change from equalize charge to float charge.

After recharging mode is changed to equalize, the mode will automatically be changed back to float charge after a programmed duration has elapsed. So, manual mode change is not usually required.

**Table 18 - Changing From Equalize Charge to Float Charge.**

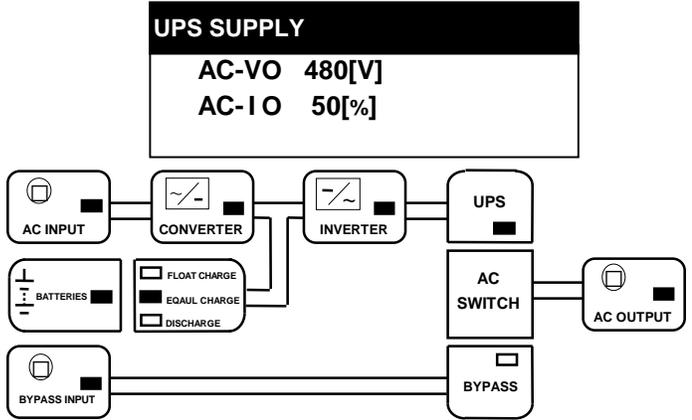
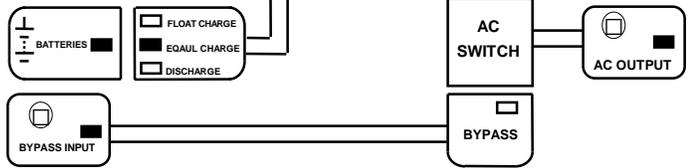
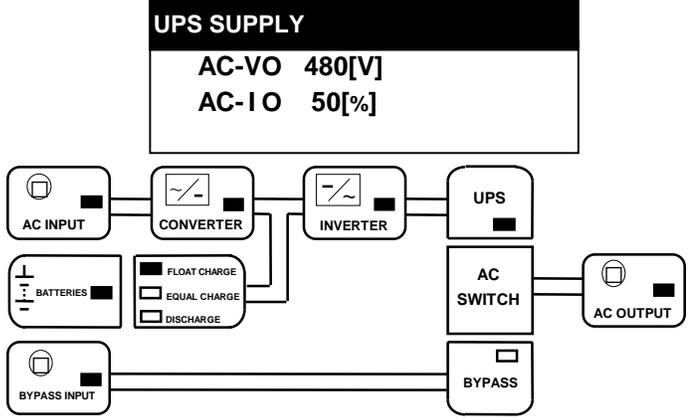
Step	Procedure	LCD/LED Status
1	Make sure EQUAL CHARGE LED is On.	<div style="text-align: center;"> <p><b>UPS SUPPLY</b></p> <p>AC-VO 480[V] AC-IO 50[%]</p> </div> 
2	Press FLOAT/EQUAL button for 0.5 sec. → Change completed.	<div style="text-align: center;"> <p><b>UPS SUPPLY</b></p> <p>AC-VO 480[V] AC-IO 50[%]</p> </div>  <p>FLOAT CHARGE LED is On; EQUAL CHARGE LED is Off.</p>

## 14.3.6 Changing to Float Charge from Protection Charge (If applicable)

Table 19 shows the manual procedure to change from protection charge to float charge. This operation applies to batteries which needs protection charge when over temperature.

- (1) The battery is normally being charged at float charge mode.
- (2) To prevent the battery thermal runaway, this mode will automatically be changed to protection charge when a "BATT FAULT1" (Battery over temperature) warning occurs.
- (3) In protection charge mode, the battery is automatically charged at a voltage about 5% lower than float charge.
- (4) If the "BATT FAULT1" warning message goes away and a programmed duration is elapsed (about 24 hours), this mode will automatically be changed back to float charge. So, it is not usually required to change the recharge mode *manually* back to the float charge.

**Table 19 - Changing from Protection Charge to Float Charge.**

Step	Procedure	LCD/LED Status
1	Make sure PROTECTION LED is On.	
2	Make sure that the "BATT FAULT1" warning goes away.	
3	Press "FLOAT/EQAUL" button for 0.5 sec. * → Change completed.	 <p>FLOAT CHARGE is On; EQUAUL CHARGE* LED is Off.</p>

# 15. Troubleshooting

When an error occurs in the UPS, error data is displayed on the LCD screen and the waveform is saved. This section will describe the types of errors, the error messages displayed on the LCD screen, the process of saving waveforms and the procedures to correct the errors.

## 15.1 Types of Errors

The following types of errors may occur in the UPS:

No.	Name	Description
1	Fault (Trip)	The UPS has been tripped and has stopped operating. The UPS is on Bypass.
2	Warning-1 (Input power failure)	Power is supplied from the battery. When the warning is corrected, power will automatically be supplied from the AC input.
3	Warning-2 (Stop and restart)	The UPS transfers to Bypass supply and the UPS stops operating. When the warning is corrected, the UPS will automatically be restarted and revert to UPS supply.
4	Warning (Operation control)	An error or a phenomena related to an error occurred. Since this problem does not directly affect operation, the system switches to synchronized mode.
	(guidance)	An error or indication of an error has occurred, but operation was not affected.

## 15.2 LCD Fault Displays

When a fault occurs, a screen is shown as in Figure 15.

When a warning occurs, a screen is shown as in Figure 16.



Select the desired fault data with the scroll buttons.  
Detailed fault data will be displayed.

**Figure 15 Fault Display**



Select the desired warning data with the scroll buttons.  
Detailed warning data will be displayed.

**Figure 16 - Warning Display**

### 15.2.1 Fault Data Screen

This screen appears when a trip error is detected.

Up to 10 screens of fault data can be displayed.

Figure 17 and Table 20 show a sample screen and describe the data shown in the screen.



**Figure 17 - Sample Fault Data Screen.**

**Table 20 - Fault Data Screen Descriptions.**

No.	Name	Description
①	No.	The number of the message in the order that it was detected (1 - 10). (Up to 10 screens of fault data can be displayed.)
②	Fault Message	Shows the nature of the fault. For details, see the section titled "Fault Messages."
③	Time	The date and time (in 24-hour format) the fault was detected.
④	Scroll indicator	Indicates whether there is a fault screen before or after this screen. <ul style="list-style-type: none"> <li>• ↑ Indicates there is a previous fault screen.</li> <li>• ↓ Indicates there is a next fault screen.</li> <li>• ↑↓ Indicates there are previous and next fault screens.</li> </ul>

## 15.2.2 Warning Data Screen

These screens appear when a warning has occurred. Up to 10 screens can be displayed. Figure 18 and Table 21 show an example of the screen and describe the data shown in the screen.



Figure 18 - Warning Screen Example.

Table 21 - Warning Data Screen Descriptions.

No.	Name	Description
①	No	The number of the message in the detection order (1 - 10). (Up to 10 screens of warning data can be displayed.)
②	Warning Message	Shows the nature of the warning. For details, see section "Fault Messages".
③	Time	The date and time (in 24-hour format) the warning was detected.
④	Scroll indicator	Indicates whether there is a warning screen before or after this screen. <ul style="list-style-type: none"> <li>• ↑ Indicates there is a warning screen above this screen.</li> <li>• ↓ Indicates there is a warning screen below this screen.</li> <li>• ↑↓ Indicates there are warning screens both above and below this screen.</li> </ul>

## 15.2.3 Fault Messages

Figure 19 show the locations for fault detection. Tables 22 through 26 list the fault messages described in section "Fault Data Screen." The content and display text for the fault and warning messages are in Tables 22 through 26. The UPS unit can be shipped with different protective configurations from the standard shown in Figure 19, if specified by the customer. See the protective configuration indicated on the single line diagram for each UPS.

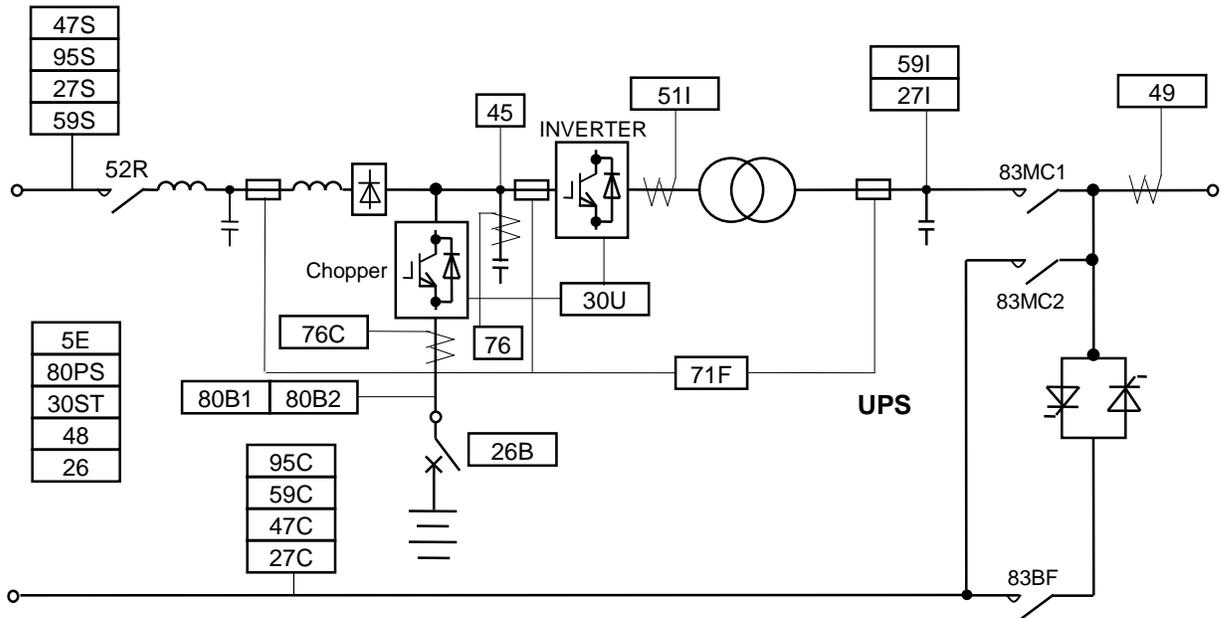


Figure 19 - Protective Detector Locations.

Table 22 - Fault (Trip).

#	Item	LCD Message Indication	Description
1	71F	FUSE BLOWN	AC or DC Main circuit fuse blown.
2	30ST	(No indication)	An error occurred in the main control microprocessor (CPU).
3	80PS	CONT. PS. ERR	The control power supply voltage failed.
4	80B2	BATT. UV	Battery voltage is below cutoff voltage.
5	48	STARTUP ERR	Startup was not completed in a time frame.
6	76	DC OC	Over-current in DC circuit.
7	26	OVER HEAT	Temp High in the cabinet.
8	5E	EMG.STOP	An emergency stop was activated by the external contact.

**Table 23 - Warning – 1 (Converter stop/Input power error).**

#	Item	LCD Message Indication	Description
1	27S	AC I/P UV	AC input voltage is low.
2	59S	AC I/P OV	AC input voltage is high.
3	95S	I/P FREQ. ERR	AC input frequency error.
4	47S	AC PHASE ERR	AC Input phase rotation error.

**Table 24 - Warning - 2 (Stop and restart).**

#	Item	LCD Message Indication	Description
1	27I	AC O/P UV	AC output voltage is low.
2	59I	AC O/P OV	AC output voltage is high.
3	49	AC O/P OL	Output overload
4	51I	INV. OC	Inverter over-current.
5	76C	BATT. OC	Over-current in Battery section.
6	45	DC OV	Over-voltage in DC circuit.
7	30U	UNIT FAULT	IGBT Stack Failure.

**Table 25 - Warning (Operation control).**

#	Item	LCD Message Indication	Description
1	27C	BYPASS UV	Bypass voltage is low.
2	59C	BYPASS OV	Bypass voltage is high.
3	95C	BYPASS ASY.	Bypass frequency error.
4	47C	BYPASS ERR.	Bypass phase rotation error.

**Table 26 - Warning (Guidance).**

#	Item	LCD Message Indication	Description
1	26B	BATT. OVER HEAT	Battery temperature is too high.
2	80B1	BATT. UV (ALM)	Battery voltage is near cutoff voltage.

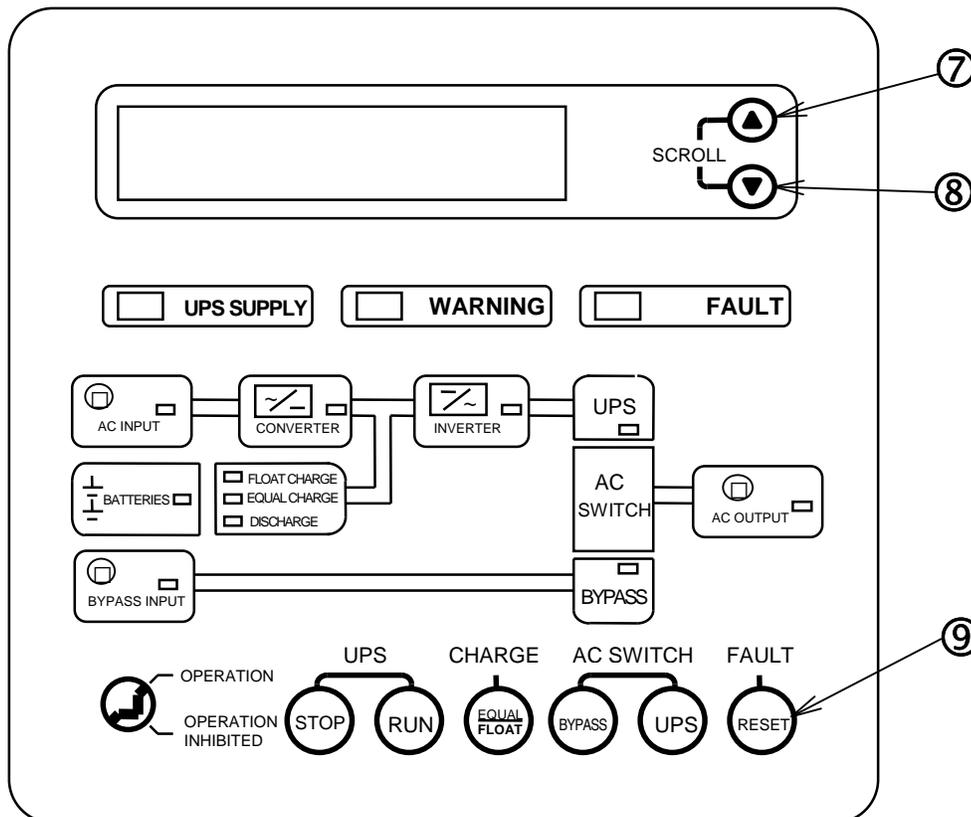
## 15.2.4 LCD Scroll with faults or warnings.

<b>Option:</b>	<b>When the UPS has stopped due to a fault, be sure to remove the memory card before resetting the LCD Fault Error screen on the panel.</b>
	Resetting (restarting) the UPS without removing the memory card will delete the data needed to determine the cause of the fault.
<b>NOTES</b>	<b>When removing the memory card, do NOT touch the other sections of the UPS.</b>
	Touching the other sections of the UPS may result in electric shock.

This section describes how to scroll through the LCD screens when a fault has occurred (when Fault Data screens exist).

Figure 20 shows the locations of the buttons to scroll the LCD screens. See Table 27 and Figure 21 for detail of the scroll buttons and how they are used for screen scrolling.

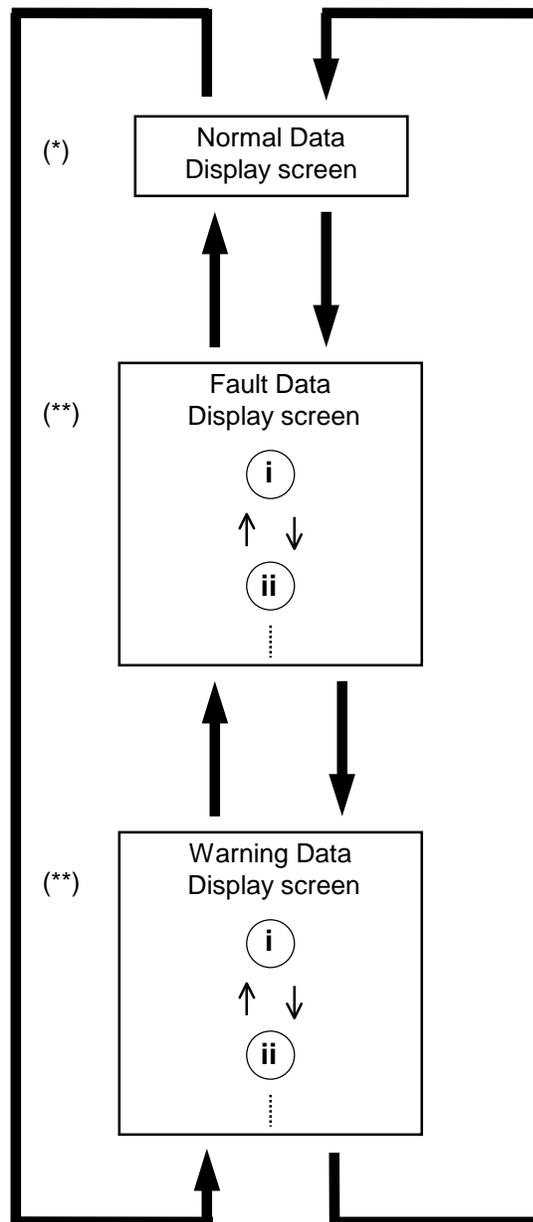
Note that pressing the "RESET" button ⑨ will delete the waveform data stored on the memory card as well as the Fault and Warning Data Screens. Be sure to remove the memory card before pressing the "RESET" button.



**Figure 20 - Position of Scroll buttons in Fault Data Screens.**

**Table 27 - Scroll Buttons.**

No.	Name	Description
⑦	SCROLL UP	Scrolls to the previous screen.
⑧	SCROLL DOWN	Scrolls to the next screen.
⑨	RESET	Deletes the stored waveform and fault and warning data in the memory card. (Optional PC memory card)



**Remarks**

- \* See section "Normal Display" for the screen contents.
- \*\* ①②, etc. represent the order in which the faults occurred.

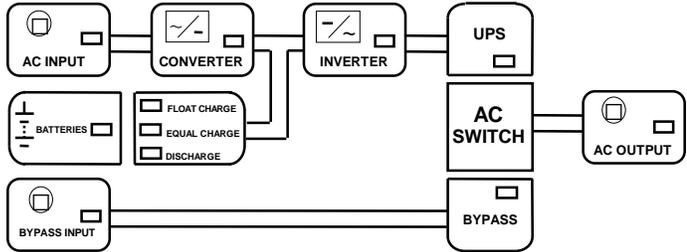
**Figure 21 - Changing screens with scroll buttons.**

## 15.3 Restoring UPS Operation

 <b>WARNING</b>	<p><b>Contact Toshiba in the event of malfunction or fault.</b></p> <p>This UPS should be repaired only by authorized Toshiba service personnel. Servicing by untrained personnel may extend the fault or result in electric shock or personal injury.</p> <p><b>Do NOT attempt to modify or relocate the UPS.</b></p> <p>Electric shock, personal injury or fault may result if personnel other than trained Toshiba technician attempt to modify or relocate the UPS. Be sure to contact Toshiba if you need modifications or if you need to relocate the UPS.</p> <p><b>Do not open the front and/or rear panels.</b></p> <p>The parts inside carry energy-high current. Touching them may result in electric shock, burns or fault.</p>
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This section describes the procedure to restore UPS operation. Table 28 shows an example in which the UPS is restored after a trip fault occurred on inverter over current with the message "INV. OC."

**Table 28 - Restoring UPS Operation (Example).**

Step	Procedure	LCD/LED Status
1	<p>Check the LCD screen.</p> <p>Also check other fault data screens with scroll buttons ⌚ and ⌚ on the graphic panel.</p>	<div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;"><b>FAULTS &amp; WARNINGS</b></p> <p><b>1 INV. OC</b></p> <p><b>09-09-02 08:05:30</b></p> <p><input type="checkbox"/> ANOTHER ITEM</p> </div> 
2	<p>*Remove the memory card in the panel and insert a new memory card.</p>	( Optional )
3	Contact Toshiba.	Follow the directions given by the service personnel.

In the case of other faults as well, restore the UPS by doing the following:

- (1) Check the nature of the fault on the LCD screen.
- (2) Contact Toshiba.
- (3) Follow the directions given by Toshiba service personnel.

**Note:** \* before removing the memory card, always verify the memory card LED shown is off.

# 16. UPS Specifications

## 16.1 General Specification

Terms	Specification	Remarks
Conforming Standard	UL1778-2001	UL, cUL, IEC
Ambient Temperature	0°~40° C ( 32°~104° F)	
Relative Humidity	30% ~ 90%	Non-condensing
Altitude	< 1,000m ( < 3,280ft )	
Insulation Resistance	3MΩ	With 500V-Megger
Insulation withstanding voltage	AC 2kV – 1min. AC 1.5kV – 1min. AC 500V – 1min.	Main Circuit External Interface Electronic Circuit
Audible Noise	68dB(150/225kVA), 72dB(300kVA)	1m (39") away from front

## 16.2 Mechanical Specification

Rated Capacity	150kVA	225kVA	300kVA
Cabinet Protection Conformity	IEC298 IP20 <sup>(*)</sup>		
Exterior Paint	2.8Y7.7/0.3		
Panel Thickness Front	1.6mm (1/16")		
~ Back / Side / Top	1.2mm (3/64")		
~ Bottom	3.2mm ( 1/8")		
Input / Output cabling entrance	Bottom		Top
Ground / Control wiring entrance	Bottom		Top
Clearance in Front	1,100mm (43" 7/16)		
~ in Back and Side	0mm (0")		
~ on Top	400mm (15" 3/4)		
Outline Dimension (Width)	1,400mm (55" 1/8)		1950mm (76" 3/4)
(Depth)	800mm (31" 1/2)		900mm (35" 7/16)
(Height)	2,000mm (78" 3/4)		2,000mm (78" 3/4)
Weight	1,200kg (2,640lbs)	1,500kg (3,300lbs)	2,000kg (4,400lbs)
Floor loading per footprint	1,071 kg/m <sup>2</sup> ( 219 lbs/ft <sup>2</sup> )	1,339 kg/m <sup>2</sup> ( 274 lbs/ft <sup>2</sup> )	1,139 kg/m <sup>2</sup> ( 233 lbs/ft <sup>2</sup> )
Heat Rejection	9,550 kcal/h ( 37,914 BTU/h)	14,370 kcal/h ( 57,049 BTU/h)	19,190 kcal/h ( 76,184 BTU/h)

(\*) IP20 refers to foreign objects entrance and prevents objects of 12mm-diameter(15/32") or larger.

**16.3 Electrical Specification**

Rated Capacity	150kVA (120kW)	225kVA (180kW)	300kVA (240kW)
AC Input			
Input Voltage	480V ( +10% ~ -15% ), 3-Phase 3-Wire		
Input Frequency	60Hz $\pm$ 5%		
Input Power Factor	0.95 ~ 1.00 Lagging ( at 100% Load )		
Current Harmonic Distortion	6% Maximum ( at 100% Load )		
Input Capacity Required	154kVA	232kVA	309kVA
Circuit Breaker Rating at 480V input	225A Trip	350A Trip	450A Trip
DC Input			
Voltage Window	288 ~ 414 V		
Recharge Voltage Regulation	$\pm$ 1.5%		
AC Output			
Output Voltage	480/277V $\pm$ 1%, 3-Phase 4-Wire		
Output Power Factor	0.8 Lagging		
Voltage Distortion	3% with 100% Linear Load / 5% with Non-Linear Load		
Transient Voltage Regulation	< $\pm$ 2%		
Transient Settling Time	< 50msec		
Crest Factor	< 2.0		
Output Frequency	60Hz $\pm$ 0.01% ( at Free-running Mode)		
Synchronous window to the utility line	59Hz ~ 61Hz		
Frequency Slew Rate	1Hz/Sec		
Over Load Rating	100%-Continuous / 125%-10min. / 150%-1min.		

# Appendix

## Word Definitions

(1) Whole UPS concern

- ① UPS: Uninterruptible Power System

(2) Circuit breakers

- ① MCCB: Molded Case Circuit Breaker
- ② ACB: Air Circuit Breaker

(3) Graphical interface

- ① Graphic display panel: It contains push buttons, an LCD and LED's to show the operating procedure and/or the UPS status.
- ② LCD: Liquid Crystal Display. This shows the operational procedures and the status of the UPS.
- ③ LED: Light Emitting Diode. Individual lamps located on the graphic panel indicate the status of the UPS.
- ④ Scroll buttons: The up and down buttons are used to scroll forward/backward LCD screens. It scrolls back to the 1<sup>st</sup> screen after circulating all the screen pages.

(4) Control system

- ① Synchronized mode: The UPS output tracks the phase and frequency of the Bypass.

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