

TOSHIBA

**UNINTERRUPTIBLE POWER SYSTEM
THREE PHASE- 75kVA UPS**

4200FA *SERIES*

MANUFACTURED IN THE U.S.A.

OPERATION MANUAL

Part Number: 56418-000
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4200FA SERIES
THREE PHASE- 75 kVA
UNINTERRUPTIBLE POWER SYSTEM

OPERATION MANUAL
FOR MODELS

T42B3F750FAXXN

T42D3F750FAXXN

T42F3F750FAXXN

T42M3F750FAXXN

T42N3F750FAXXN

TOSHIBA INTERNATIONAL CORPORATION

INDUSTRIAL DIVISION

13131 West Little York Rd., Houston, Texas 77041

IMPORTANT NOTICE

The Instructions are not intended to cover all of the details or variations in equipment or to provide for every possible contingency to be met in connection with installation, operation, or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the local Toshiba sales office.

The contents of this instruction manual shall not become a part of or modify any prior or existing 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

If additional information or technical assistance is required call Toshiba's marketing department toll free at 1-800-231-1412, or write to: Toshiba International Corporation, 13131 W. Little York Rd., 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: _____

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Purpose and Scope of Manual

This manual provides information on how to safely install, operate, and maintain your TIC power electronics product. This manual includes a section on 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.

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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 problem 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) 846-5212.

You may 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.

GENERAL SAFETY INSTRUCTIONS

Warnings in this manual appear in any of three ways:

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



DANGER

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



CAUTION

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



ATTENTION

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

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



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

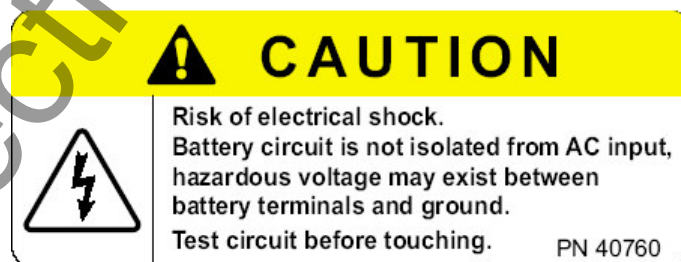
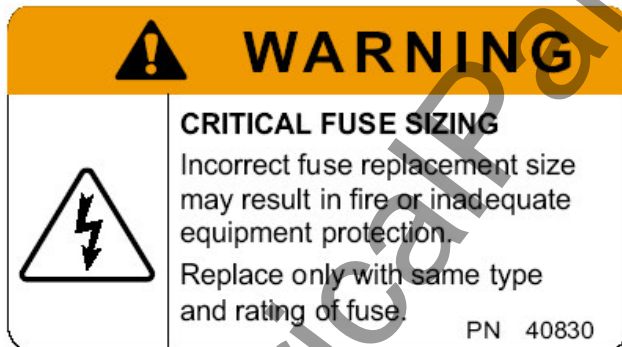
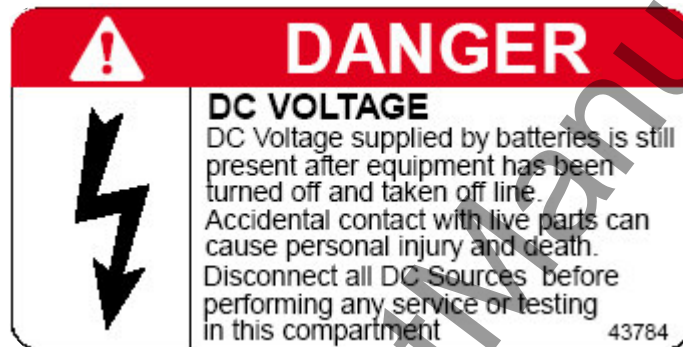




EQUIPMENT WARNING LABELS



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.

Shown below are examples of warning labels that may be found attached to the equipment. **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.

The following are examples of the warning labels that may be found on the equipment and 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.



 CAUTION	
	Heat sink not grounded.
	Risk of electrical shock.
	Disconnect UPS and electrically test heat sink before touching.
PN 40831	

	CAUTION - Risk of electric shock
<p>DO NOT REMOVE COVER. NO USER SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL. HAZARDOUS LIVE PARTS INSIDE THIS UPS ARE ENERGIZED FROM THE BATTERY SUPPLY EVEN WHEN THE INPUT AC POWER IS DISCONNECTED.</p> <p>CAPACITORS STORE HAZARDOUS ENERGY. DO NOT REMOVE COVER UNTIL 5 MINUTES AFTER DISCONNECTING ALL SOURCES OF SUPPLY.</p> <p>TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, INSTALL IN A TEMPERATURE AND HUMIDITY CONTROLLED INDOOR AREA FREE OF CONDUCTIVE CONTAMINANTS.</p>	
	ATTENTION
<p>EN CAS D'UTILISATION EN ATMOSPHERE CONTROLEE. CONSULTER LA NOTICE TECHNIQUE.</p> <p>BATTERY BACK-UP TIME, WHICH WAS FACTORY-SET AT A PREDETERMINED LEVEL, DECREASES GRADUALLY BETWEEN SERVICE PERIODS. THE BATTERIES SHOULD BE REPLACED EVERY THREE YEARS AFTER THE LAST SERVICING, THE DATE OF WHICH IS WRITTEN ON THE ID PLATE LOCATED ON THE REAR SIDE OF THE UPS UNIT, OR IN THE BOX BELOW.</p> <p>DATE OF LAST BATTERY CHARGE:</p>	
PN 41750	<div><div></div><div></div></div>

IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

This manual contains important instructions that should be followed during the installation, operation, and maintenance of the UPS and its batteries. Turn off, lockout, and tagout all power sources before proceeding to connect the power wiring to the equipment or when performing maintenance. Hardwire type UPS units are not equipped with an over-current protection device nor an output disconnect for the ac output. Therefore, a circuit breaker should be provided by the user between the UPS output and the load input. This device should be rated as follows:

Rated Output: 208/120Vac
Device Rating: 240V, 270A

The maximum ambient temperature in which the UPS unit should be operated in is **40°C (104°F)**.

The nominal battery voltage for 75kVA is 288VDC

Servicing of the batteries should only be performed by a qualified Toshiba Representative who is knowledgeable of batteries and the required precautions. Keep unauthorized personnel away from batteries. To arrange for battery replacement, contact your nearest Toshiba authorized service center.

Qualified Personnel ONLY

A Qualified Person is one that has the skills and knowledge relating 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 carefully 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 required precautions.

For further information of workplace safety visit www.osha.gov.

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



DANGER

Misuse of this equipment could result in human injury and equipment damage. In no event will Toshiba Corporation be responsible or liable 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.



CAUTION

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.



CAUTION

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



CAUTION

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



CAUTION

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



DANGER

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

The following precautions should be observed when working with batteries:

QUALIFIED PERSONNEL ONLY!

- 1) Verify that the UPS is off and is disconnected from the power source.
- 2) Remove watches, rings or other metal objects.
- 3) Use tools with insulated handles to prevent inadvertent shorts.
- 4) Wear rubber gloves and boots.
- 5) Do not lay tools or metal parts on top of batteries.
- 6) Determine if the battery is inadvertently grounded. If inadvertently grounded, remove source of ground. **Contact with any part of a grounded battery can result in electrical shock.** The likelihood of such shock will be reduced if such grounds are removed during installation and maintenance.
- 7) 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, or create a flame or spark in the immediate area of the batteries. This includes static electricity from the body.
- 10) Do not attempt to open the batteries in order to add water or sample the specific gravity of the electrolyte. The batteries are valve regulated lead acid type and such servicing is not possible without damaging the battery.
- 11) Use proper lifting means when moving batteries and wear all appropriate safety clothing and equipment.
- 12) Do not dispose of lead acid batteries except through channels in accordance with local, state and federal regulations.

INSTRUCTIONS IMPORTANTES CONCERNANT LA SÉCURITÉ

CONSERVER CES INSTRUCTIONS

Cette notice contient des instructions importantes concernant la sécurité



ATTENTION

Un battery puet 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

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 load equipment. 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 main 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 with no 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 AC input power becomes available again, operation returns to normal. The UPS batteries begin to recharge, so they will be ready for the next power interruption.

1.2 Application and use

Toshiba's 4200FA Series of on-line, Uninterruptible power systems (UPS) provide continuous computer grade 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 standard during use. This is an additional aid to help in retaining the valuable office data banks, and all units allow for computer interfacing.

1.3 Power Backup

During an electrical power failure the UPS unit's 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' back-up assures additional time to complete your activity and store data after a power failure occurs.

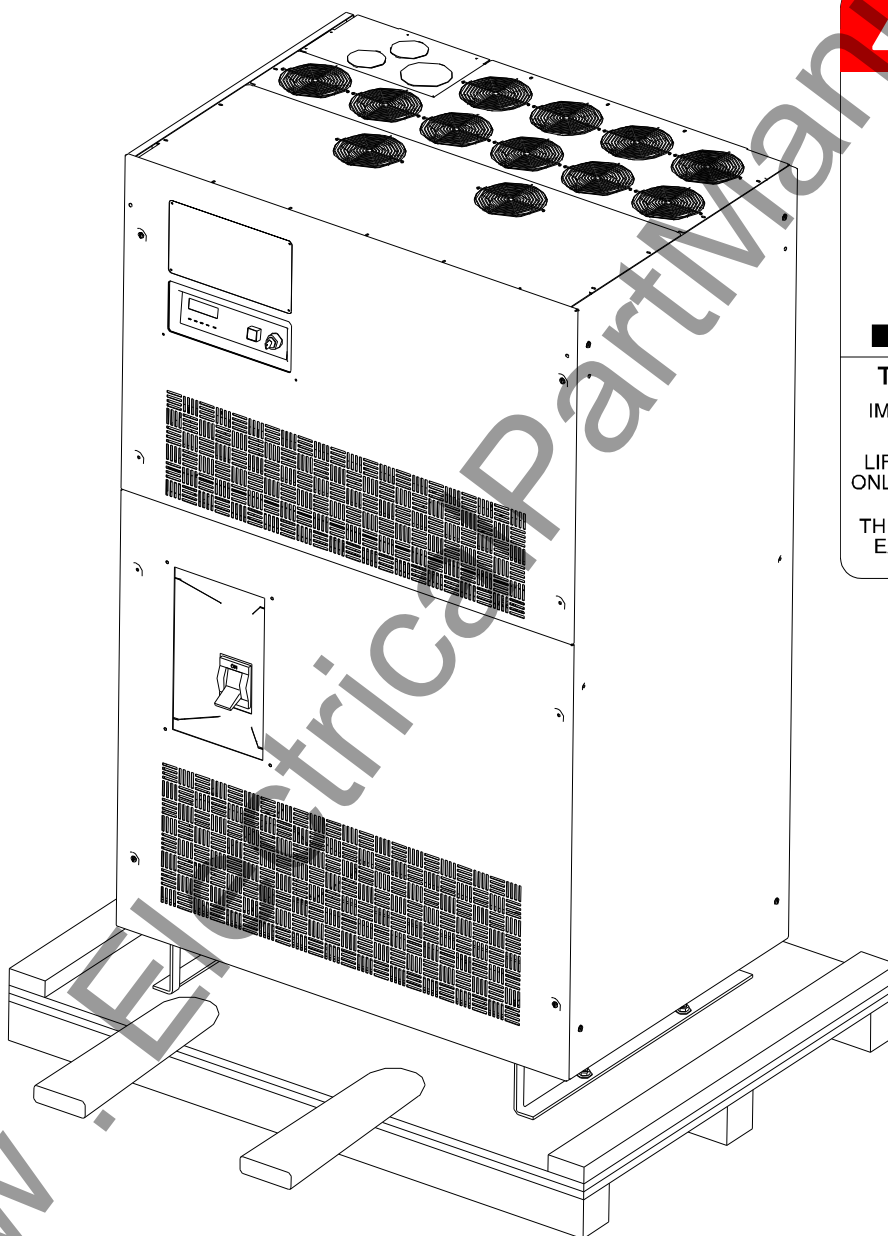
1.4 Power Conditioning

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. This protection keeps power-line problems from reaching your load, where it can cause equipment to operate erratically, or damage software and hardware.

2.0 Unpacking/Inspection/Storage/Disposal

2.1 Unpacking the new UPS equipment:

- 1) Upon receipt of the UPS, a careful inspection for shipping damage should be made.
- 2) For units shipped in a crate, remove the screws that attach the shipping crate panels to each other and to the pallet. Remove the crate and foam packing material.
- 3) Unbolt the unit from the shipping pallet.
- 4) Lift the UPS from the pallet using a forklift that has sufficient capacity. Approach the UPS only from the front or rear.



2.2 Inspection of the new UPS equipment

Inspection if the new UPS equipment

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

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.

2.3 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) Allow the UPS to be operated for 24 hours to ensure that the batteries are fully charged.
- 2) Stop the unit (see "Stopping the UPS" in section 6.12).
- 3) Place the unit's MCCB switch (see section 4.1 for location) in the "OFF" position.

Storing:

- 1) Store within a temperature range of -20°C to 40°C (-4°F to 104°F).
- 2) For best results, store the UPS in the original shipping container and place on a wood or metal pallet.
- 3) The optimum storage temperature is 21°C (70°F). Higher ambient temperatures cause UPS batteries to need recharging more frequently.

After storing:

- 1) If stored in an ambient temperature under 20°C (68°F); recharge the batteries every 9 months.
- 2) If stored in an ambient temperature of 20°C to 30°C (68°F to 86°F); recharge the batteries every 6 months.
- 3) If stored in an ambient temperature of 30°C to 40°C (86°F to 104°F); recharge the batteries every 3 months.

2.4 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 Precautions

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

3.1 Installation Precautions

- 1) Install the UPS in a stable, level, and upright position which is free of vibration.
- 2) Install the UPS in a well-ventilated location; with the required allowances for ventilation and servicing shown in figure 3.1.
- 3) Install the UPS where the ambient temperature is within the correct operating range (see the UPS Specifications in section 5.1). Verify that 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 0°C to 40°C (32°F ~ 104°F); **25°C (77°F) is the recommended operating temperature for maximum battery life.**
- 4) Do not install the UPS in a location that is subject to high humidity.
- 5) Do not allow direct sunlight to shine on the unit.
- 6) Do not install the UPS in areas that are subject to contamination such as high levels of airborne dust, metal particles, or flammable gasses.
- 7) Avoid installation near sources of electrical noise and ways make sure that the unit's earth ground is intact to prevent **electrical shock** and help prevent electrical noise.
- 8) Do not install the UPS where water or any foreign object may get inside.
- 9) This UPS generates and radiates radio-frequency energy during operation. There is no guarantee that the UPS will not influence some sensitive devices that are operating close 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 the affected equipment.
- 10) The user should provide output over current protection for hardwired UPS versions. See Safety Instructions on page 7 for the correct device rating.

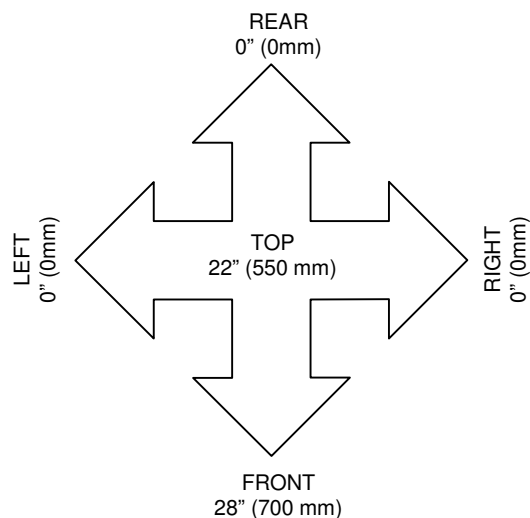
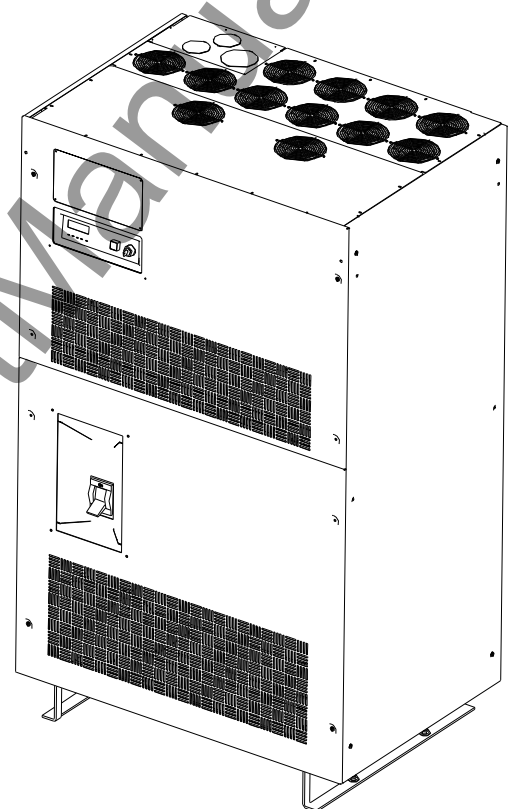


Figure 3.1

- 11) After ensuring that all power sources are turned off and isolated in accordance with established lockout/tagout procedures, connect power source wiring of the correct voltage to the input terminals of the UPS. Connect the output terminals of the UPS to an applicable load type application (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.

3.2 Pre-start Precautions



Before connecting the UPS to a power source; move the MCCB switch (ON/OFF), on the side 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.
- 2) The input power source voltage must be within +10% to -30% of the rated input voltage. The input frequency must be within the rated input frequency range. Voltages and frequencies outside of the permissible 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 (over sizing for locked rotor current required).
- 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.
- 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 removing the front panel 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** the covers and **DO NOT** remove any covers of the UPS when the power is on.
- 10) If the UPS should emit smoke or an unusual odor or sound, turn the power off immediately.
- 11) The heat sink and other components may become extremely hot to the touch. Allow the unit to cool before coming into contact with these items.
- 12) Warning signs should be placed on or near the load to let people know that the load is being powered by the UPS.
- 13) Additional warnings and notifications shall be posted at the equipment installation location as deemed required by **Qualified Personnel**.



CAUTION

When the UPS is in the inverter mode, turning the breaker to the “OFF” position will cause the unit to go into the battery backup mode. The UPS will continue to provide power to the load. The unit must be in bypass mode and then the breaker turned to the “OFF” position for the UPS to shutdown power to the load.



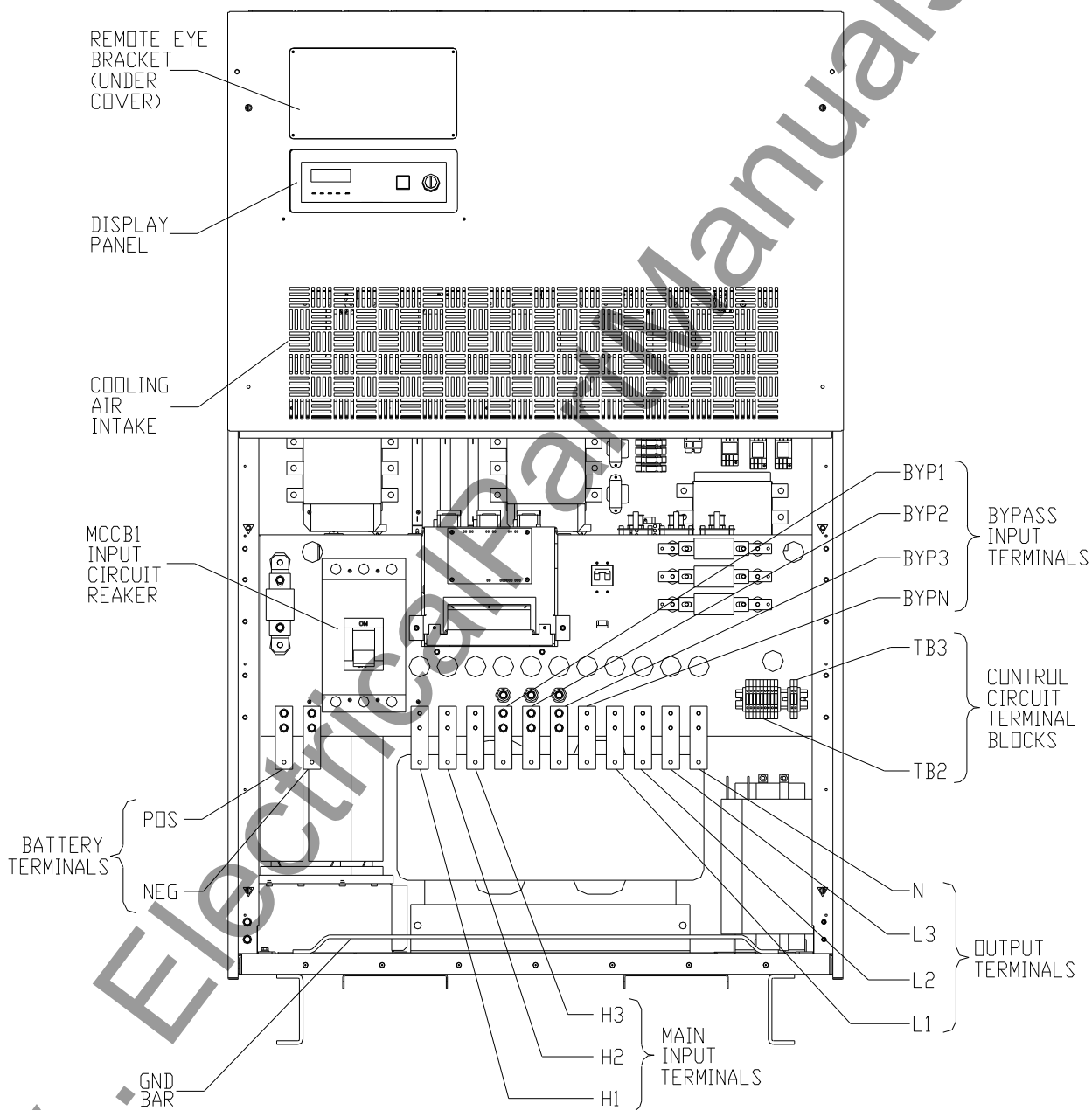
CAUTION

Do not EPO (Emergency Power OFF) the UPS and then reset the breaker until the UPS has been fully discharged. The UPS could be Damaged if the unit is not fully powered down before the breaker is reset.

4.0 UPS Connections

4.1 UPS Power and Control Connections

The following illustrates the wiring connections to the Input and Output Terminations points and Control Circuit Terminal Blocks for the 4200FA Series 75kVA UPS.



TOSHIBA

4.1.1 Recommended Wire Size and Tightening Torque For UPS Input and Output Terminals

Minimum/Maximum Wire Size and Tightening Torque of UPS Input and Output Terminals 4200FA Series 75kVA UPS			
Main Input & Bypass Input	AWG (H1 – H3, BYP1, BYP2, BYP3)	AWG (BYPN)	Tightening Torque (in-lbs.)
208VAC	300MCM to 500MCM	400MCM to 500MCM	375
380, 400, 415VAC	2/0 to 500MCM	400MCM to 500MCM	375
480VAC	1/0 to 500MCM	400MCM to 500MCM	375
600VAC	1/0 to 500MCM	400MCM to 500MCM	375

Output	AWG (L1, L2, L3)	AWG (N)	Tightening Torque (in-lbs.)
208V/120VAC	300MCM to 500MCM	400MCM to 500MCM	375

Battery Circuit	AWG (POS, NEG)	Tightening Torque (in-lbs.)
288VDC Nominal	400MCM to 600MCM	500

Input/Output Ground	AWG (GND)	Tightening Torque (in-lbs.)
	2 minimum (see note 1)	(see note 2)

All wire sizes are per NEC

Use copper wiring with at least 90°C rated insulation

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

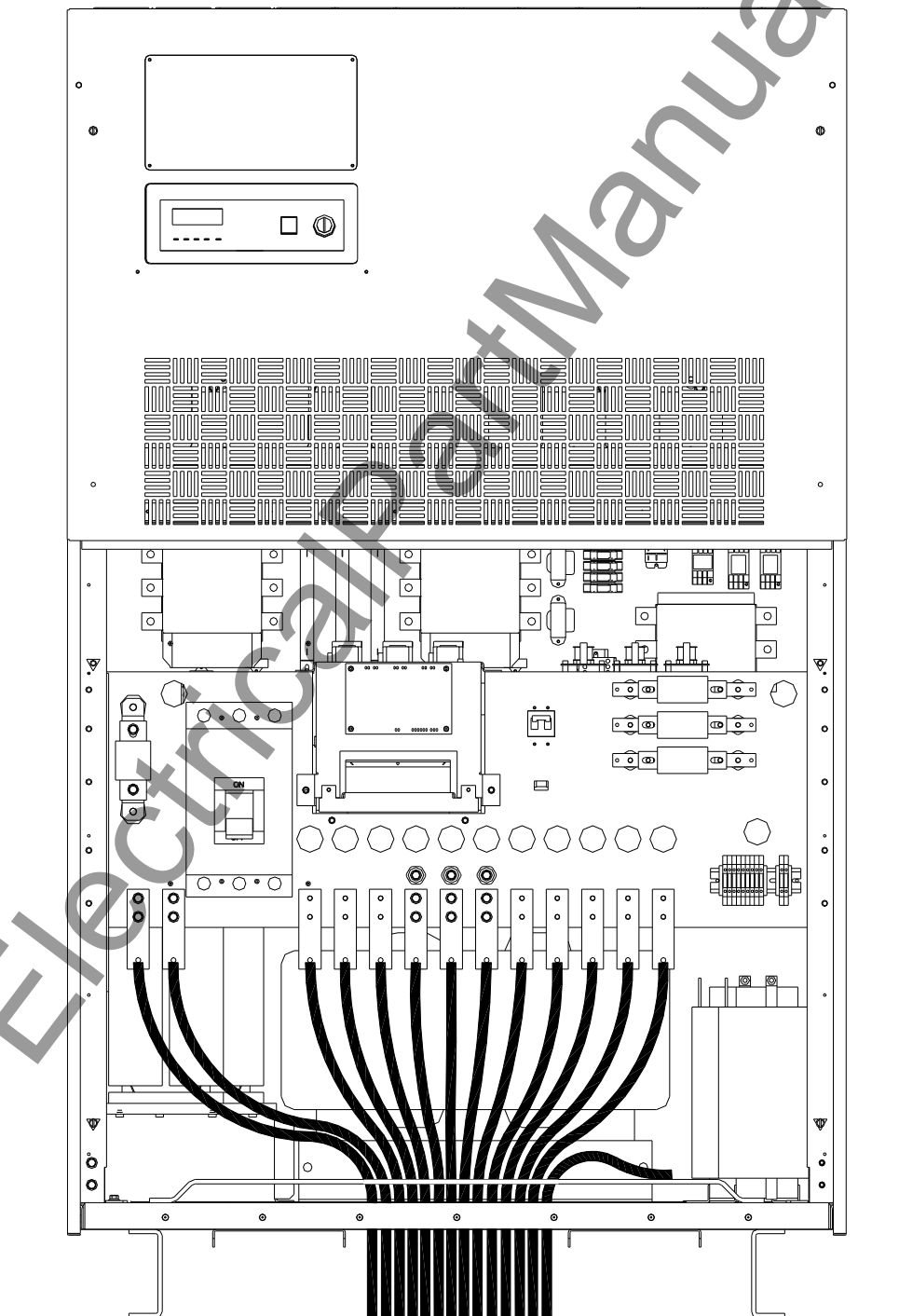
Note 1: Use a UL listed lug suitable for the wire size used.

Note 2: Use tightening torque recommended by manufacturer of lug used.

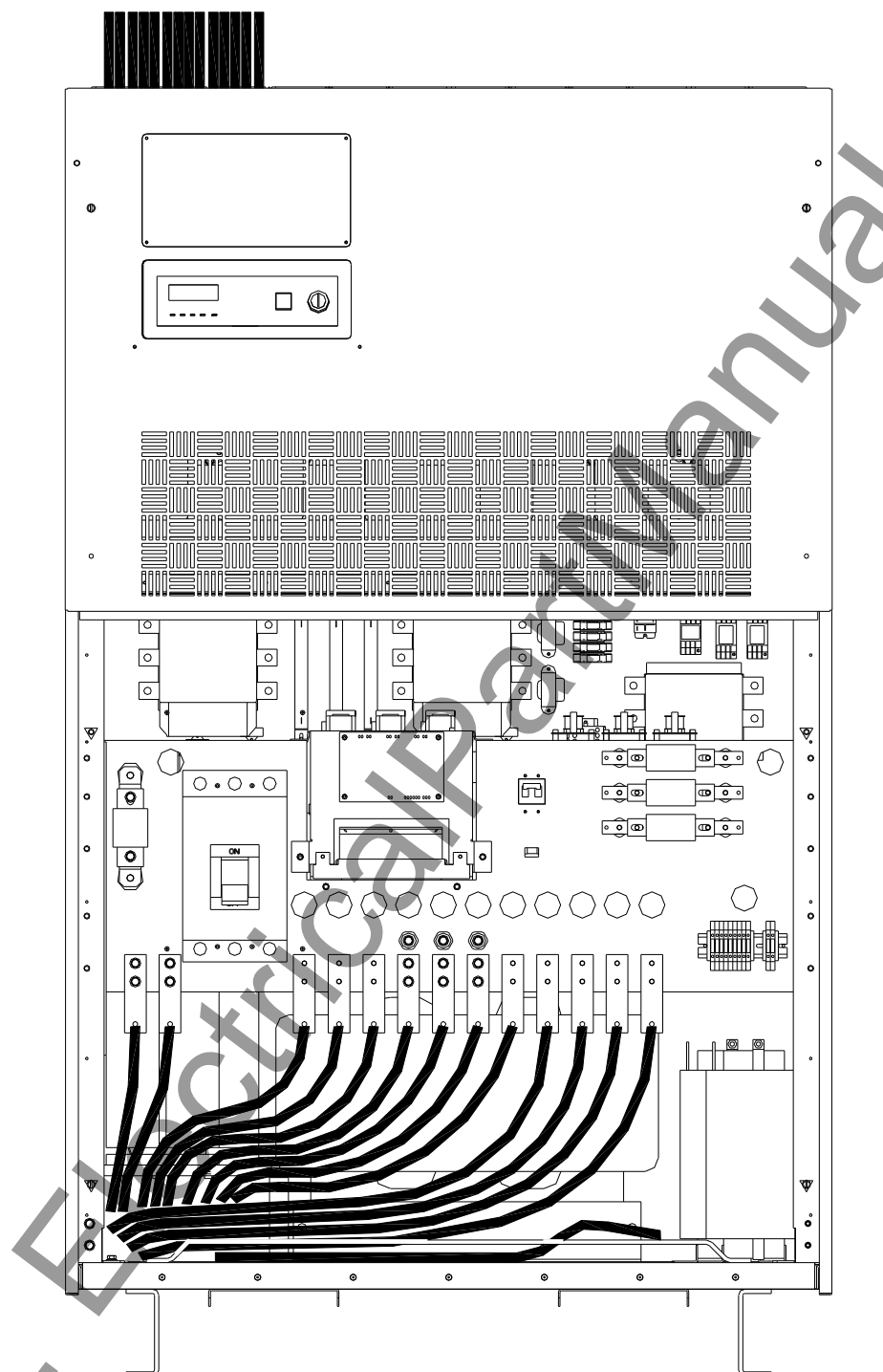
4.1.2 Power Connection Cable Routing

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

4200FA series 75kVA UPS with bottom cable entry configuration



4200FA series 75kVA UPS with top cable entry configuration

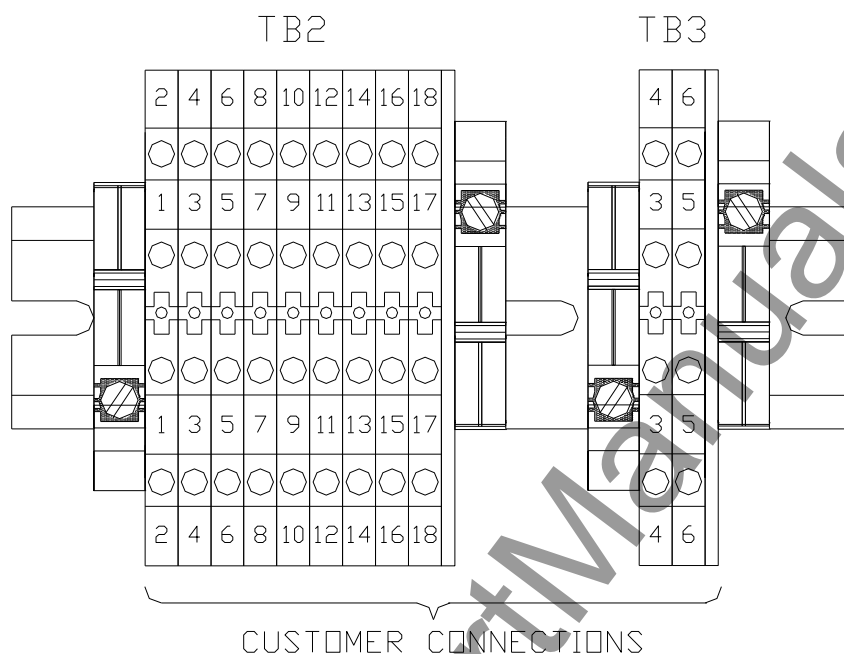


CAUTION

THE METAL OF A CONDUIT IS NOT AN ACCEPTABLE GROUND

4.2 Control Circuit and External Battery Interface Connections

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



TB2 CONNECTIONS			
1	-	LOW BATTERY	2 - BATTERY DISCHARGE
3	-	FAULT	4 - not used
5	-	INVERTER SUPPLY	6 - INVERTER SUPPLY
7	-	REMOTE RUN (P24A3)	8 - REMOTE RUN
9	-	REMOTE STOP (P24A3)	10 - REMOTE STOP
11	-	BYPASS	12 - COMMON
13	-	EPO	14 - EPO

TB3 CONNECTIONS			
3	-	BATT. SHUNT TRIP OUT	4 - BATT. SHUNT TRIP OUT
5	-	BATT. AUX. IN	6 - BATT. AUX. IN

4.2.1 Recommended Wire Size and Tightening Torque UPS Control and Battery Interface

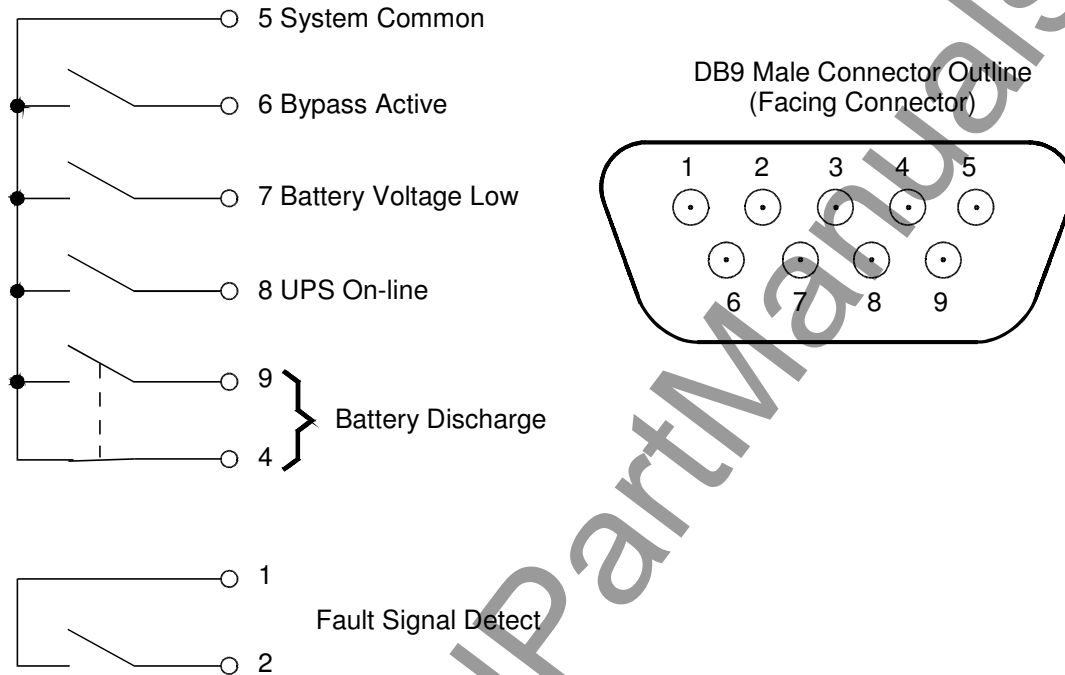
Minimum Wire Size and Tightening Torque for UPS Control and Battery Interface Circuits USE MINIMUM 75° C COPPER WIRING		
TERMINAL (TERMINAL #)	AWG	TIGHTENING TORQUE
UPS CONTROL CIRCUITS (1-24)*	14-16	8 in-lbs.
BATTERY CONTROL CIRCUITS (3-6)*	14-16	8 in-lbs.

*Indicates Class 1 wiring methods is to be used.

4.3 Communication Interface

4.3.1 Remote Contact

The remote contact interface is a standard feature and is available as dry switch contacts through a DB9 male connector located on the back side of the UPS (see Section 9 for DB9 connector 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** (if battery voltage is low pin 7 will be connected to System Common).
- 2) Contacts are resistive loads rated at 30 Vdc, 0.1 amp. (125VAC 3A)
- 3) Pin number 3 is not used.

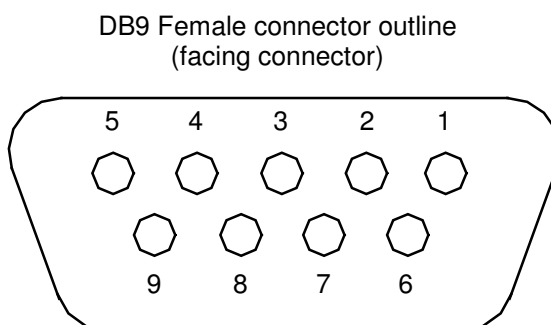
4.3.2 RS-232C

The RS-232C serial communication interface is available through a DB9 female connector located on the backside of the UPS (see Section 9 for DB9 connector location). This interface allows control of the UPS from a personal computer running special Toshiba software. The computer and the UPS are connected through a serial RS-232C communication port. The available data from the UPS, via the RS-232C communication link, is shown below:

Operating Conditions	Input Voltage Output Voltage Output Current Battery Voltage Input Frequency Output Frequency
UPS Operating Status (Described as "yes or "no")	Utility Power OK Low Battery Voltage Detected UPS in BYPASS Mode UPS in NORMAL Mode Input and Output Frequency Synchronized UPD 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		



4.3.3 UPS Shutdown (via RS-232C)

When the UPS is operating from its internal batteries, a 'shutdown' order can be sent to the UPS telling it to turn OFF after a user-specified amount of time. This function can allow you to stop discharging the UPS batteries after an orderly system shutdown has been completed. The UPS can be programmed to turn OFF up to 8 minutes after the 'shutdown' command is given. This command can be cancelled before the specified time has elapsed by following the directions listed on the RS232 screen.

5.0 Specifications

5.1 Specifications - Standard 480Vac Main Input, 208Vac Output

Main Input	Model Number	T42D3F750FAXXN
	Rated Output Capacity	75kVA
	External Dimensions	44 inch W x 31 inch D x 74 inch H
	Weight	2150 pounds
	Rated Voltage	480 Vac with 208, 220, 240, 380, 400, 415 and 600 Vac options
	Voltage Variation	+10% to -15% ; (-15% to -30%) ****
	Rated Frequency	50/60 Hz
	Number Phases / Wires	3 Phase / 3 Wire
	* Power Factor	Greater than 0.99 when in inverter mode
	Required Input Power	70kW when in inverter mode
	Walk-in Function	From 20% to 100% over 5 seconds
	Inrush Current	Less than 12 times rated current under synchronous operation
	Current Limit	115% maximum
	* Harmonic Currents	Less than 3% THD
Optional Bypass Input	Rated Voltage	208Vac
	Voltage Variation	+10% to -15%
	Rated Frequency	50/60 Hz
	Number Phases / Wires	3 Phase / 4 Wire + GND
Battery	DC Nominal (Voltage Range)	288VDC (230 to 332VDC)
	Float Charge (Regulation)	328VDC (+2%) with 2.28V/cell
	Ripple Voltage	2% R.M.S.
	**Rated Back-up Time	Refer to Battery System Manual
	Rated Charge Current	20.0 Amps ****
Output	Rated Voltage	208 / 120 VAC
	Rated Current	208 Amps
	Rated Power Factor	0.8 lagging
	Number Phases / Wires	3-phase / 4 Wire + GND
	Voltage Regulation (phase-phase)	± 2% (0-100% balanced load) ± 3% (0-100% unbalanced load)
	Voltage Adjustment Range	± 5V Manually from front 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 Operation Range	± .5/1.0/1.5 Hz (± 1.0 Hz. std.) switch selectable by qualified technician
	Frequency Slew Rate	1 Hz/s to 3 Hz/s
	Voltage Transients (Recovery time: 50 msec.)	± 3% (100% load step change) ± 5% (loss or return of input voltage) ± 3% (transfer of bypass to inverter)
	Inverter Overload Capacity	125% 30sec ; 150% 5sec
	Bypass Overload Capacity	1000% 10msec; 125% 10min.
	Crest Factor	2.5
	Neutral Line Conductor	1.73 times line rating
	Harmonic Voltage Distortion	1.5% max (linear load)
	Inrush Current protection	Automatic transfer to bypass, then retransfer to inverter
	Efficiency	AC/DC/AC: 87% typical; DC/AC: 90% typical
	Heat loss to be removed	40,000Btu/hr (10kcal/kg/hr)
	Audible Noise	dB (A) at 1 meter from the units front display
	Operating Temperature	0 to 40°C; optimal operating temperature is 25°C
	Operating Humidity	Less than 90% RH (non-condensing)
	Altitude ***	Less than 1000 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)

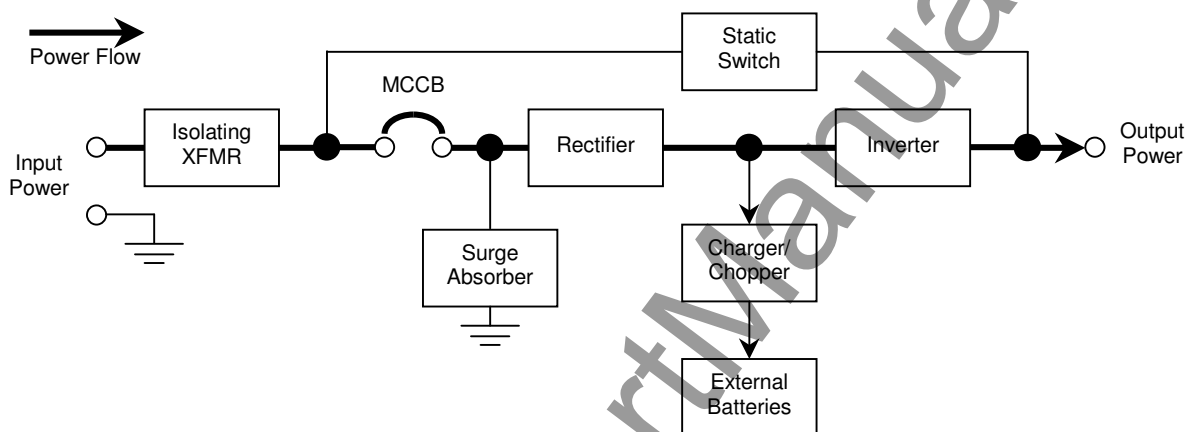
(****) Prolonged operation at this level requires some derating of maximum Operating Temperature to 35°C.

6.0 Operating the UPS

6.1 Operating the UPS

6.1.1 AC Input Mode (normal operation)

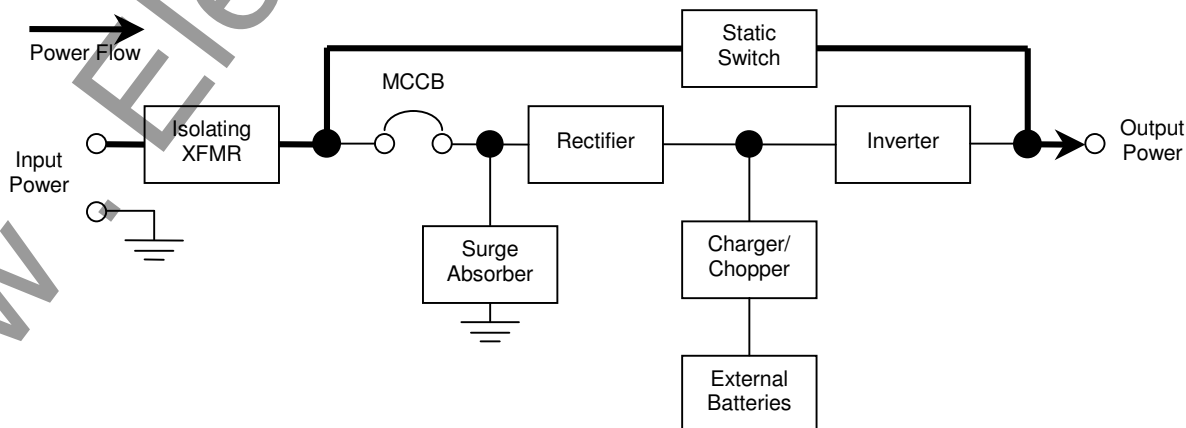
The following illustration shows circuit power flow when the UPS is operating normally in the AC input mode. The UPS unit's rectifier, including a boost chopper circuit, converts AC input power to DC power. The boost chopper circuit maintains a constant voltage, with current limiting, for charging the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



Power flow in AC input mode for the 4200FA Series 75kVA UPS

6.1.2 Circuit-bypass Mode

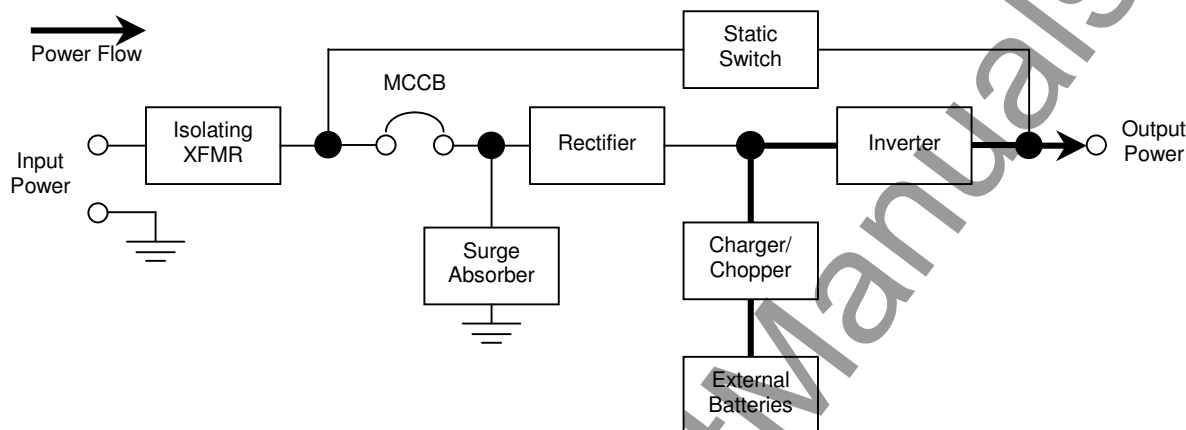
If the UPS unit is severely overloaded or develops an internal fault, power flow is automatically switched from the unit's main circuit to the units bypass circuit. Power flow through the bypass is shown in the following illustration. This changeover occurs automatically in less than 4 milliseconds in phase. The switching period is not long enough to cause interruptions to occur in most loads. If the power flow is transferred to the bypass circuit because of an overload, and that overload condition ends within a specified period of time, then the power flow will be "re-transferred" to the AC input mode (normal operation) automatically. If the power flow is transferred to the bypass circuit due to a fault condition, then the power flow must be transferred manually from the UPS' 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' bypass circuit back to the inverter circuit after removing the overload (see Section 6.16 "Overload Operation").



Power flow in circuit-bypass mode for the 4200FA Series 75kVA UPS

6.1.3 Battery Backup Mode

The following illustration shows power flow during the battery backup mode. When commercial ac power failures occur, the UPS' batteries instantly begin supplying DC voltage to the UPS' main inverter circuit. This circuit changes (inverts) the DC power into AC power. The AC power is available at the unit's output. This back-up process will continue until the UPS' 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 shutdown voltage minimum (V min). The rated battery voltage chart on page 22 shows (V min). The battery backup time and discharge process is explained in Section 6.2.



Power flow in battery backup mode for the 4200FA Series 75kVA UPS

6.2 Battery Backup Time and Discharge Process

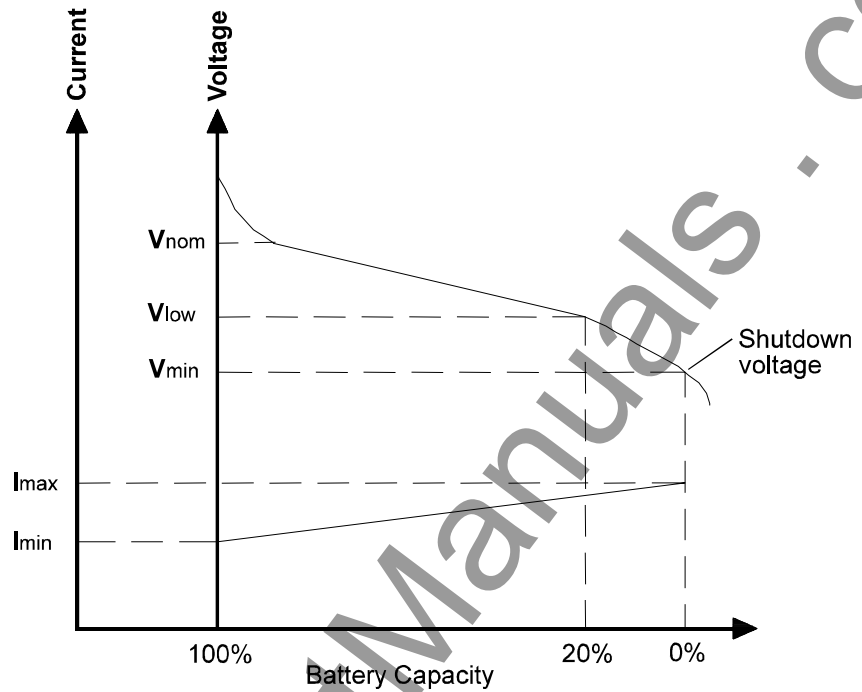
The UPS system, when used in conjunction with a Toshiba designed Battery System, is designed to provide several minutes of back-up time for the 4200FA Series 75kVA UPS (Refer to the Battery System Manual for back-up times). These times are valid when the unit is operating under full load. When these 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.



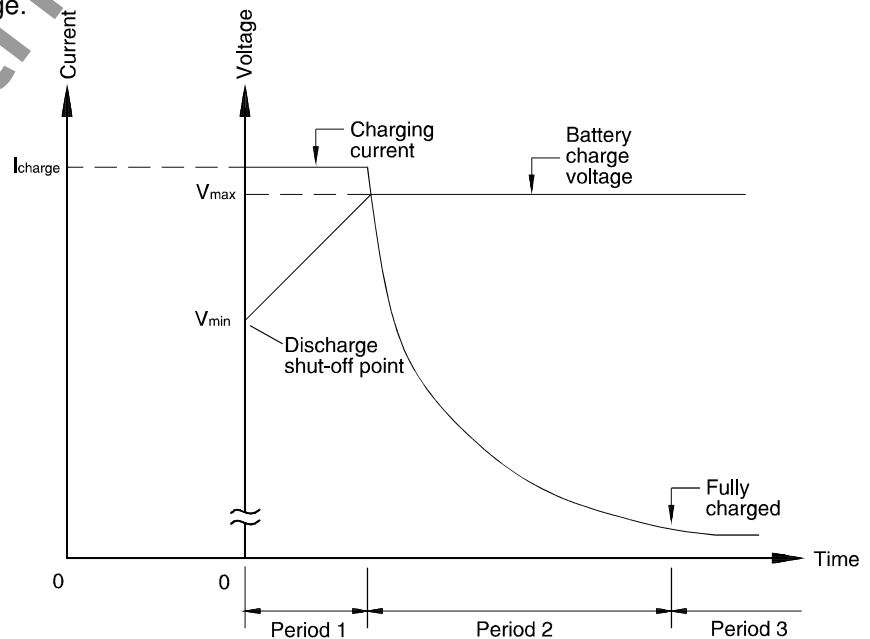
6.3 Battery Low Voltage Tolerances

Excessive discharge will cause the UPS system's 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.

Nominal Voltage	288Vdc
Alarm Voltage	252Vdc
Shutdown Voltage min.	230Vdc

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 periods. During the first period, the charging current is maintained at approximately 20.0 amperes. 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 period, constant-voltage control starts and current gradually decreases as the batteries charge to their normal fully charged state. In the third period, a slight "trickle" current continues to flow into the batteries to keep them fully charged and "floating" at the normal DC Voltage level. A full recharge usually requires approximately 24 hours (90% recharge in 10 hours) after a complete discharge.

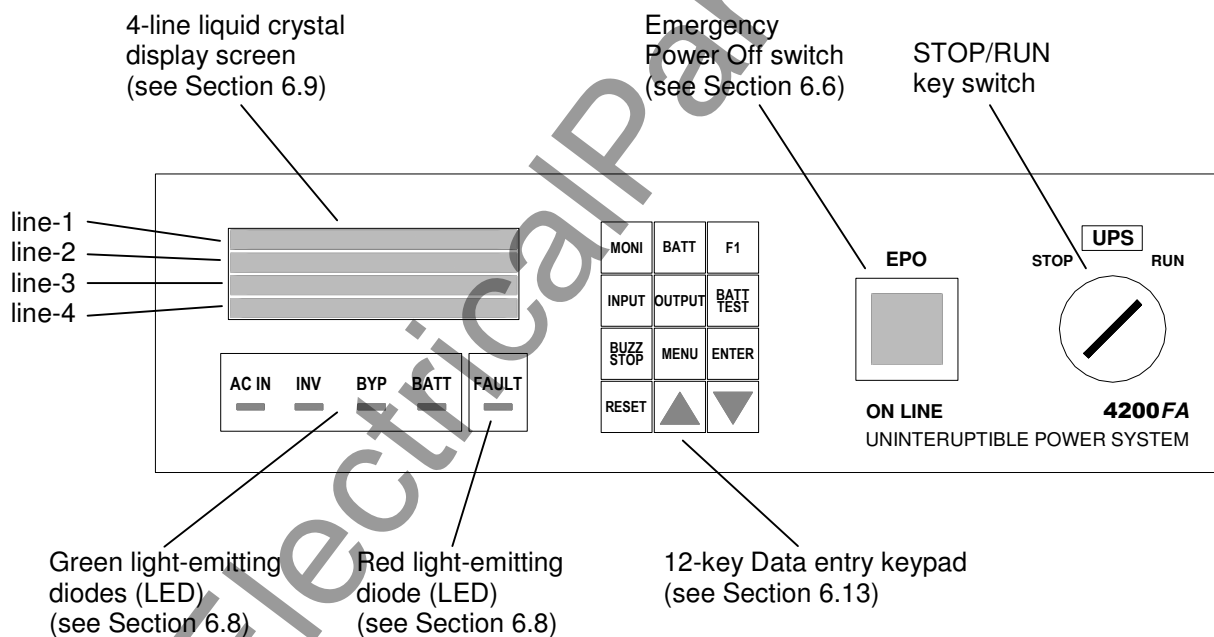
The following chart shows the rated maximum and minimum battery voltages, and the charge current for each of the sizes while the unit is maintained in a 75°F ambient.

Rated Battery Voltages

V float	332 Vdc
V min	252 Vdc
I charge	20.0 Amps

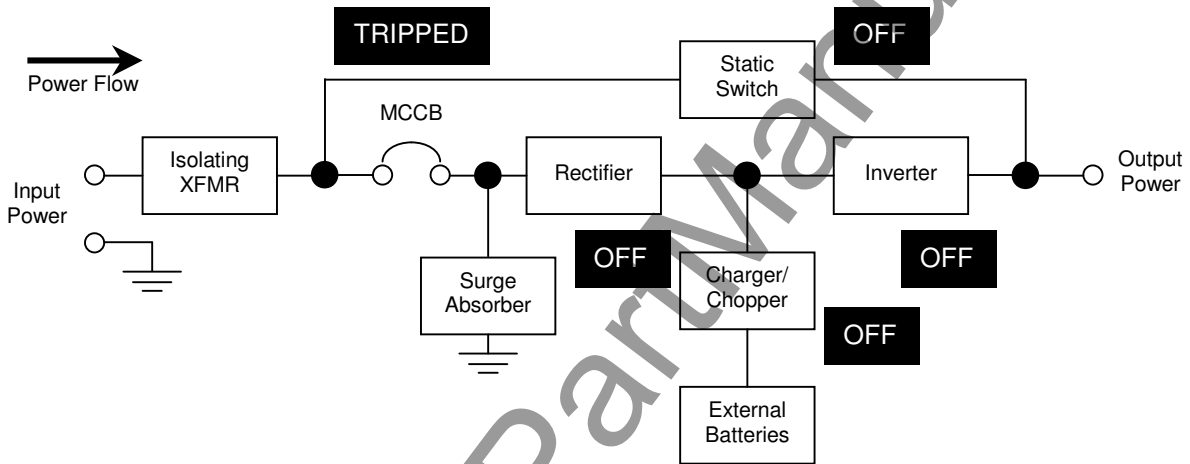
6.5 Front Panel Layout (All Units)

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 emergency power-off (EPO) "closed contact" switch command from two locations: (1) a remote location (see Section 4.3 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 emergency power off switch is installed in a central location that is easily accessible to personnel concerned with the operation of the UPS unit and the equipment connected to it. The EPO function is initiated by pressing the switch to the closed "shutdown" position. The effect of using the EPO switch is the same whether the UPS unit is in the AC input mode (see Section 6.1.1), battery backup mode (see Section 6.1.3), or the circuit bypass mode (see Section 6.1.2). See 'EMERGENCY OFF' screen in Section 6.1.2 "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.



6.7 Audible Alarm Functions

Audible alarms will sound when the UPS unit is in the battery backup mode, has a fault, has 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 stopped by pressing BUZZ STOP on the front panel keypad (see Section 6.5 "Front Panel Layout").

Condition	Audible pattern
UPS in Battery Backup Mode (Battery Voltage 100-90%)	
UPS Low Battery (Battery Voltage < 90%)	
Overload	
Fault	

6.8 Light Emitting Diode (LED) Functions

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



This green LED lamp is "on" when the UPS is not in an input over-voltage condition, input under-voltage condition, or power failure state. If there is an input power failure, this lamp is "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"). If there is no power failure and the input voltage is in an under-voltage condition, the AC IN lamp will be "off".



This green LED lamp is "on" when the UPS unit's 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 Light Emitting Diode (LED) 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 Emergency Power Off received (EPO))			
AC IN	ON	AC IN	OFF	AC IN	OFF	AC IN	OFF
INV	ON	INV	OFF	INV	OFF	INV	OFF
BYP	OFF	BYP	OFF	BYP	OFF	BYP	OFF
BATT	OFF	BATT	OFF	BATT	OFF	BATT	OFF
FAULT	OFF	FAULT	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	AC IN	ALL ON OR FLICKERING RAPIDLY	AC IN	ALL ON OR FLICKERING RAPIDLY
INV	OFF	INV		INV		INV	
BYP	ON	BYP		BYP		BYP	
BATT	OFF	BATT		BATT		BATT	
FAULT	ON	FAULT		FAULT		FAULT	
Battery Back-up; (Battery Voltage Low)							
AC IN	OFF						
INV	ON						
BYP	OFF						
BATT	ON (Blinking)						
FAULT	OFF						

6.9 Liquid Crystal Display (LCD) Functions

The liquid crystal display (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. This information is determined by the UPS operating mode and conditions. 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	Meaning
- 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 abnormal exists.
- BATTERY DISCHARGE -	Displayed during Utility abnormal; inverter is supplying power from batteries. (Unit shuts down after V (min.) is reached.
- OUTPUT SHUTDOWN -	Displayed during power failure if V (min.) is reached, or 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	Meaning
DCUV	DC Under-voltage
DCOC	DC Over-current
DCUB	DC Unbalanced
DCOV	DC Over-voltage
EERR	Main EEPROM error
OH	Overheat (internal)
OL	Output Overload
IVUV	Inverter Under-voltage
IVOV	Inverter Over-voltage

6.9.3 Line-3 System Messages

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

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	Meaning
PHEI	Displayed when input Phase rotation is not wired for clockwise rotation.
I/O NOT SYNCHRONIZE	Displayed when input and output frequencies are not synchronized. (abnormal)
* AUTOTRANSFER *	Displayed when auto-transfer to bypass is active (i.e. current limit reached). (abnormal)
* BATTERY LOW *	Displayed when battery voltage is low (abnormal) or the UPS batteries have failed self-diagnostic test. (abnormal)
* UPS OL: REDUCE LOAD *	Displayed when UPS has tripped due to an overload condition. (abnormal)
* DCOC *	Displayed when the UPS has an internal failure. (abnormal)
* DCOV *	Displayed when the UPS has an internal DC bus over-voltage. (abnormal)
* DCUB *	Displayed when the UPS has an internal DC bus unbalance referenced to Neutral. (abnormal)
* UPS OL *	Displayed when UPS has tripped due to an overload condition. (abnormal)
* FUSE OPEN *	Displayed when an internal transistor fuse opens.
* INOV *	Displayed when inverter output over-voltage has occurred. (abnormal)
* INUV *	Displayed when inverter output under-voltage has occurred. (abnormal)
* BATTOH *OR MCCB-B OPEN	Displayed when the optional battery over-temp sensor has annunciated, or if the external battery disconnect is open. (Verify TB3-5,6)
* UPS OK *	Displayed when none of the above abnormal conditions are present. (normal)
* DISCHARGE CURR=###% *	Displayed when none of the above abnormal conditions are present and the UPS is in battery discharge mode. (normal backup)
* TRANSFER INHIBITED *	Displayed when key switch position is changed and frequency is not synchronized. (abnormal)
* EMERGENCY OFF *	Displayed when an emergency (EPO) signal is received.
* UPS OUTPUT DISABLED *	Displayed when UPS has normally shutdown.
* FAULT(S) DETECTED *	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 System's battery 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 System's battery:

- 1) Switch on power at the UPS input distribution panel.
- 2) Move the UPS unit's MCCB1 power switch to "on" (see Section 9 for location).
Note: The UPS units' 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 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 hours for the batteries to charge and then move the MCCB switch (see Section 9 for location) to "off".
- 3) Repeat Initial Battery Charge procedure. (A failure indicates battery replacement necessary).

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 "RUN / STOP 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 unit's MCCB power switch(es) 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
```

Note: Lines 2 & 3 are blank.

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=208V
>CURRENT 100/100/100%
DATE (DAY) TIME
```

Note: Actual numerical values may differ from these examples.

The UPS units' battery charging circuit is now activated. Move the STOP/RUN key switch to the RUN position. The unit's inverter will then start and the UPS will be in 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 100/100/100%
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
```

Note: UPS will not start when this message is displayed.

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

6.12 Shutdown Procedure

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

- 1) Move the unit's STOP/RUN key switch, located on the front panel, to STOP. Operation of the UPS unit's inverter stops. Output power is now provided to the load through the unit's bypass circuit. *While in this state of operation; if a power failure occurs in the commercial power source, then the UPS will lose power and power to the load device will be interrupted.* The UPS unit's battery charging circuit and chopper circuit 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=208V
>CURRENT 100/100/100%
DATE (DAY) TIME

Note: Actual numerical values may differ from these examples.

Move the MCCB power switch(es) 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 emergency power off (EPO) switch, located on the front panel (or from a remote located EPO switch) is pushed, the MCCB is 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 Keypad Overview

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

MONI	BATT	F1
IN	OUT	BATT TEST
BUZZ STOP	MENU	ENTER
RESET		

MONI	Press to display system-monitoring screens (see Section 6.14.1).
BATT	Press to display UPS battery conditions (see Section 6.14.4).
F1	Press to change settings of various menus (see Section 6.14.5).
IN	Press to display UPS input conditions (see Section 6.14.2).
OUT	Press to display UPS output conditions (see section 6.14.3).
BATT TEST	Press to execute on-line battery test (see section 6.14.6).
BUZZ STOP	Press to stop the UPS unit’s audible alert buzzer (see section 6.14.7).
MENU	Press to display the main user-selection menu (see section 6.14.5).
ENTER	Press to confirm user-selected command or action (see section 6.14.5).
RESET	Press to reset UPS panel’s message-display area (see Section 6.14.8).
	Press to forward through display data values, or to forward through menus (see section 6.14.5).
	Press to reverse through display data values, or to reverse through menus (see section 6.14.5).

6.14 Key Functions

6.14.1 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 6.15.3 "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 no abnormal operating conditions are present the following system message is displayed:

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

Note: Actual numerical values may differ from these examples. If output current drops below 15%, display reads: OUTPUT CURRENT=LOW.

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=100%
CURRENT=100/100/100%
DISCHARGE CURR.=100%

Note: Discharge current display in line-4 will occur **MONI** function only.

6.14.2 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= 100%
VOLTAGE Vbc= 100%
Vca= 100%

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

6.14.3 OUT

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

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

Note: If output current drops below 15% display reads : CURR=LOW.

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

6.14.4 BATT Key

When the BATT key is pressed during normal 'ac input mode' of operation, the LCD screen displays details about the unit's battery capacity. The following system message is displayed:

```
- UPS ON-LINE -
BATTERY VOLTAGE=288V
CHARGE CURR.=0%
```

Note: Discharge current in Line-3 is 0% unless unit is in the battery mode.

Note: Line-4 is left blank.

If an ac input power failure occurs, and no abnormal operating conditions are present, the UPS switches 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%
```

Note: Line-4 is left blank.

6.14.5 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 ENTER, the display screen will return to the regular menu screen with the new data values shown (see Section 6.13 "Menu Data Screens").

6.14.6 BATT TEST Key

When the BATT TEST key is pressed during normal 'ac input mode' of operation, the LCD screen displays details about the unit's 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
```


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" *

Note: Press the **MONI** key to return to the main monitoring menu.

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.).

6.14.7 BUZZ STOP Key

The BUZZ STOP key has no effect on the LCD screen display. However if the UPS alarm buzzer is sounding it can be disabled by pressing this key. If the alarm buzzer is not sounding, pressing this key has no effect.

6.14.8 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

Note: If this error message persist contact Toshiba Service Center.

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

6.15 Menu Data Screens

6.15.1 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.

6.15.2 Adjusting 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.

6.15.3 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 emergency-off 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.

6.15.4 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 S/U option.)

6.15.5 Serial Com Station Address

Press the MENU key to access the menu data screens and press the 'down' arrow key to scroll to the run switch select 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
```

6.15.6 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
```

Note: ### indicate an actual numerical value.

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 -5 to +5. This will cause the unit's output voltage to adjust to within +/- 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
```

Note: Press **MENU** key to return to previous menu.

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

6.15.7 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 the factory when utilizing this option. DAMAGE to the systems battery will occur if this is used improperly.

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

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

6.16 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 *
```

Note: ### indicates an actual numerical value.

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 *
```

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

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

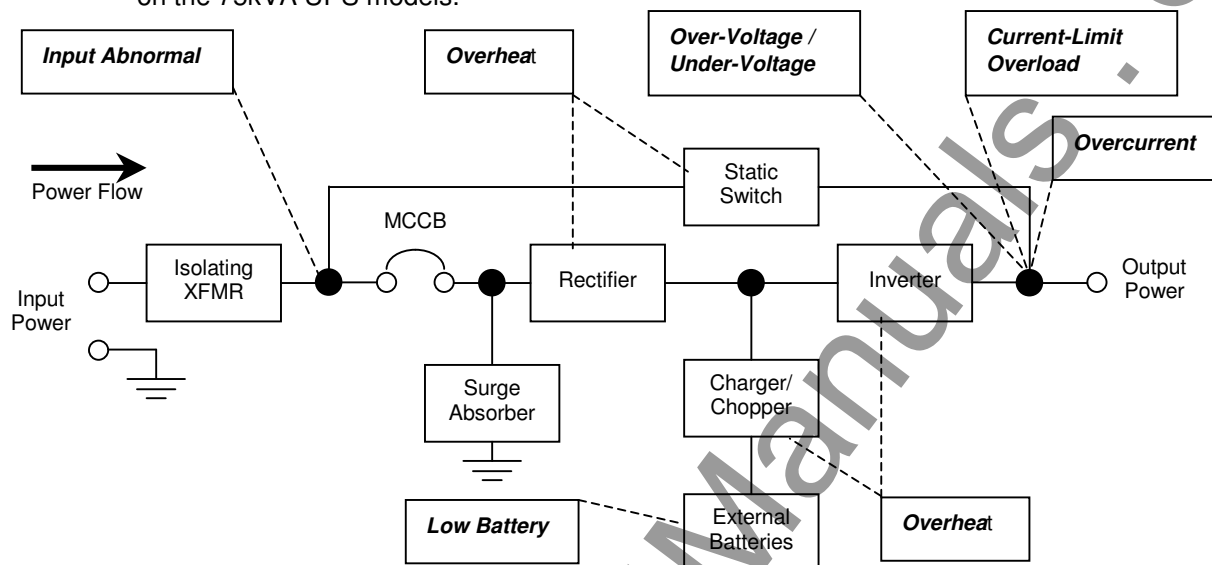
If the RUN/STOP key switch remains in the RUN position when the UPS' 'wait' period is complete, then the following screen will be displayed:

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

7.0 UPS Protection System

7.1 System Protection Features

The following one-line schematic illustrates the electrical locations of the protection devices on the 75kVA UPS models.



7.2 System Protection Functions

The following charts shows the built-in UPS' fault protection functions on the 75kVA models.

Built-in UPS Fault Protection Functions

Protection Item	Inverter Overvoltage (IVOV)	Inverter Undervoltage (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, & 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

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

8.0 Preventive and Scheduled Maintenance / Part Replacement

8.1 Preventive Maintenance

Toshiba's 4200FA Series of Uninterruptible Power Systems have been designed to provide years of trouble-free operation requiring a minimum of preventive maintenance.

The best preventive measure that the UPS user can take is to keep the area around the unit, particularly the air inlet vents, clean and free of moisture and dust accumulations. If the atmosphere of the installation site is very dusty, use a vacuum cleaner to periodically remove dust accumulations 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 3, 6 and 7.



CAUTION

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.

8.2 Parts Replacement

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

- 1) Batteries: VRLA batteries are maintenance free with respect to electrolyte only. The charging voltage, temperature, performance and connection resistance must be monitored periodically. Necessary corrective actions must be made in order to assure safe reliable power is supplied by the UPS. The aforementioned 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.

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.

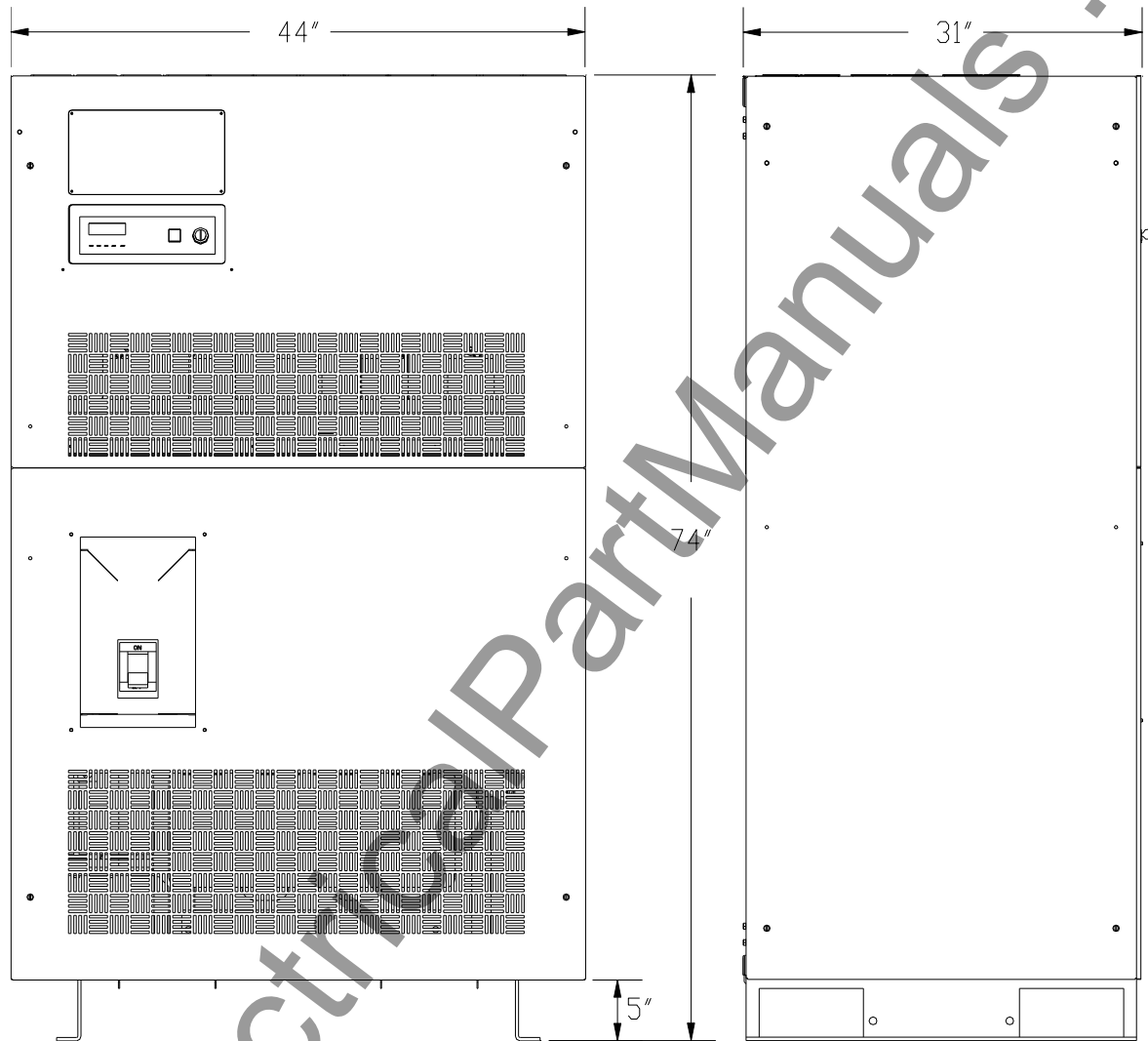
Semi-Annual maintenance

- 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 (see output fuse rating chart below).
- 4) Cooling fan: Replace once every 3 years.

9.0 External Dimensions / Shipping Weights

9.1 External Dimensions



9.2 Shipping Dimensions

All models	Shipping Dimensions, Standard Inches (cm)	Shipping Dimensions, with crate Inches (cm)
Width	56 (142)	56 (142)
Depth	43 (109)	43 (109)
Height	79 (201)	82 (208)
Height with packing material	82 (208)	

9.3 Shipping Weights

Model	Shipping Weight, Standard Pounds (Kilograms)	Shipping Weight, with crate Pounds (Kilograms)
T42B3F750FAXXN	2200 (998)	2300 (1043)
T42D3F750FAXXN	2200 (998)	2300 (1043)
T42F3F750FAXXN	1560 (708)	1660 (753)
T42M3F750FAXXN	2200 (998)	2300 (1043)
T42N3F750FAXXN	2200 (998)	2300 (1043)

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