TOSHIBA

Leading Innovation

UNINTERRUPTIBLE POWER SYSTEM (UPS)

5000 SERIES
NEMA-3R 3-Phase UPS
INSTALLATION AND OPERATION MANUAL
20/30 KVA

Part # 92975-000
April 2017
Manufactured in the USA

UNINTERRUPTIBLE POWER SYSTEM (UPS)

5000 SERIES
INDUSTRIAL DUTY 3-Phase UPS

INSTALLATION AND OPERATION MANUAL

20/30 KVA

Part # 92975-000
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Product Use and Warranty Restrictions

The Toshiba products listed in this document are intended for usage in standard UPS applications. These Toshiba products are neither intended nor warranted for usage in equipment where a malfunction or failure may cause loss of human life or bodily injury (Unintended Usage). Unintended Usage includes atomic energy control instruments, airplane or spaceship instruments, life-support equipment, all types of safety devices, etc. Unintended Usage of Toshiba products listed in this document shall be made at the customer's own risk.

NOTICE

PLEASE INFORM TOSHIBA INTERNATIONAL CORPORATION OR AUTHORIZED REPRESENTATIVE IN CASE OF INCONSISTENCIES, OMISSIONS, OR QUESTIONS.

Contact us at: *toshibaups@toshiba.com* or visit us at:

www.toshibaups.com

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 or call Toshiba UPS at 855-803-7087

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 Power Electronics Division. The warranty contained in the contract between the parties is the sole warranty of Toshiba International Corporation Power Electronics Division and any statements contained herein DO NOT create new warranties or modify the existing warranty.

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

QUALIFIED PERSONNEL ONLY

Qualified Personnel are those who have the skills and knowledge relating to the installation, operation, and maintenance of the electrical equipment described herein and have received safety training on the hazards involved (Refer to the latest edition of NFPA 70E for additional safety requirements).

UNINTERRUPTIBLE POWER SYSTEM (UPS)

Please complete the following information and retain for your records.

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

Unless otherwise specified, the warranty period for a UPS battery or battery cabinet is 36 months from the shipment date (see Toshiba International Corporation bill of lading).

JOB NUMBER _____

MODEL NUMBER _____

SERIAL NUMBER _____

APPLICATION _____

SHIPMENT DATE _____

INSTALLATION DATE _____

UPS STARTUP
PERFORMED BY _____

Purpose

This manual provides information on how to safely install your Toshiba International Corporation 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 customary equivalent.

Toshiba International Corporation reserves the right, without prior notice, to update information, make product changes, or discontinue any product or service identified in this publication. (See *https://www.toshiba.com/tic/industrial/uninterruptible-power-systems.)*

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.

Toshiba International Corporation shall not be liable for direct, indirect, special, or consequential damages resulting from the use of the information contained within this manual.

Toshiba Customer Support Center

Contact the Toshiba Customer Support Center for assistance with application information or for any problems that you may experience with your Toshiba Uninterruptible Power System (UPS).

Toshiba Customer Support Center
8 a.m. to 5 p.m. (CST) – Monday through Friday
USA Toll Free (855) 803-7087
Tel (713) 466-0277 Fax (713) 466-8773
E-mail – *toshibaups@toshiba.com*
Web – *www.toshiba.com/tic/industrial-systems/uninterruptible-power-systems*

You may also contact Toshiba by writing to:

TOSHIBA INTERNATIONAL CORPORATION
SOCIAL INFRASTRUCTURE SYSTEMS GROUP
POWER ELECTRONICS DIVISION
13131 West Little York Road
Houston, Texas 77041-9990
Attn.: 5000 UPS Product Manager

For further information on Toshiba products and services, please visit our website at:
www.toshiba.com/tic/industrial-systems/uninterruptible-power-systems

Contents

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1 Introduction

This manual provides information on how to safely operate your 5000 Series Industrial Duty 3-Phase Uninterruptible Power System (UPS). 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.

Qualified personnel should read this manual carefully before transporting, installing, and wiring the UPS. In addition they have a thorough understanding of the information provided in the chapters titled:

- General Safety Instructions
- Important Safety Instructions
- Safety Precautions
- Installation Precautions

Read this 5000 Series Operation Manual for important instructions on operating the UPS. This manual and the accompanying drawings should be considered a permanent part of the equipment and should be readily available for reference and review.

Keep the Installation Manual and the Operation Manual near the UPS for necessary reference.

Dimensions shown in the manual are in metric and/or the English customary equivalent.

SAVE THESE INSTRUCTIONS

2 General Safety Instructions

DO NOT attempt to transport, install, operate, maintain or dispose of this equipment until you have read and understood all of the product safety information provided in this manual.

2.1 Symbols

The symbols listed below are used throughout this manual. When symbols are used in this manual they will include important safety information that must be carefully followed.

Safety Alert Symbol indicates that a potential personal injury hazard exists.

Prohibited Symbol indicates **DO NOT** take action.

Mandatory Symbol indicates that the following instruction is required.

Ground Symbol indicates the location of the equipment grounding conductor.

Electrical – Voltage & Shock Hazard Symbol indicates parts inside may cause electric shock.

Explosion Hazard Symbol indicates parts may explode.

2.2 Signal Words

The signal words listed below are used throughout this manual. When the words DANGER, WARNING, CAUTION and ATTENTION are used in this manual they will include important safety information that must be carefully followed.

⚠ DANGER

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

⚠ WARNING

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

⚠ CAUTION

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

NOTICE

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

2.3 Qualified Personnel

Installation, operation, and maintenance shall be performed by Qualified Personnel Only. A Qualified Person is one that has the skills and knowledge relating to the installation, operation, and maintenance of the electrical equipment described herein and has received safety training on the hazards involved (Refer to the latest edition of NFPA 70E for additional safety requirements).

Qualified Personnel shall:

- Have read the entire operation manual.
- Be familiar with the layout and function of the 5000 UPS, the equipment being driven, and the hazards involved.
- Be trained and authorized to safely energize, de-energize, ground, lockout/tagout circuits and equipment, and clear faults in accordance with established safety practices.
- 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.
- Be trained in rendering first aid.

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

2.4 Factory Authorized Personnel

Factory authorized personnel have been trained and certified by Toshiba to install, service, and repair the 5000 Series UPS. Contact Toshiba Customer Support at TIC-UPS-RST-CSR@toshiba.com for assistance in locating the 5000 Series-authorized personnel nearest you.

3 Important Safety Instructions

The following contains important instructions that should be followed during the installation, operation, and maintenance of the 5000 Series UPS.

⚠ 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.

The UPS system output is NOT equipped with an over-current protection device, or an output disconnect at the AC output. The user should provide circuit breakers between the UPS AC input (or Bypass input) and the power sources and between the UPS output and the critical load input. The minimum device ratings are listed in “9.5 External Breakers” on page 36

The maximum ambient operating temperature for the UPS is 122 °F (50 °C) with heat exchanger at 0.9 PF.

If the UPS is exposed to the same ambient temperature as the DC backup supply, the maximum operating ambient temperature is:

- Battery backup: 90 °F (32 °C) at 0.9 PF. Table 3.1 lists the nominal battery voltage.

TABLE 3.1: UPS NOMINAL DC SUPPLY VOLTAGE

Capacity	Nominal Voltage	Float Voltage
All kVA	288 Vdc	324 V

3.1 Unintended Usage

The Toshiba products listed in this document are intended for usage in Industrial electronics applications. These Toshiba products are neither intended nor warranted for use in equipment that, if a malfunction or failure occurs, may result in loss of human life or bodily injury (collectively referred to as “Unintended Usage”). Unintended Usage includes atomic energy control instruments, aircraft or spaceship instruments, transportation instruments, life support equipment, etc. Unintended Usage of Toshiba products listed in this document shall be made at the customer’s own risk.

The application of the UPS without special consideration for equipment that supports human safety and/or maintain public services may cause serious accidents.

3.2 Disclaimer

IN NO EVENT WILL TOSHIBA CORPORATION BE RESPONSIBLE OR LIABLE FOR EITHER INDIRECT OR CONSEQUENTIAL DAMAGE OR INJURY THAT MAY COME FROM THE MISUSE OF THIS EQUIPMENT. ANY MODIFICATION TO EQUIPMENT WITHOUT AUTHORIZATION BY TOSHIBA COULD RESULT IN PERSONAL INJURIES, DEATH OR DESTRUCTION OF THE UPS.

TOSHIBA RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. TOSHIBA DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR UPS DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

3.3 General Maintenance

⚠ WARNING	
	**DO NOT remove the rear/side panels, or any sheet metal not designed to be removed.** Removing rear/side panels may result in electric shock, burns, personal injuries or UPS failure.
	Keep the area around the UPS free of debris that could enter the fan. Remove dust and foreign material from the area surrounding the UPS. Keep the exterior clean.
	Only factory authorized personnel should perform internal general maintenance on the UPS.
	Contact the authorized Toshiba Customer Support or an authorized Toshiba representative for information on proper disposal of UPS components. It is illegal to dispose of certain components without conforming to environmental regulations for industrial/commercial waste.

3.4 Transporting

⚠ WARNING	
	**DO NOT tilt the UPS more than 15° from upright position.** Tilting the UPS more than 15° may cause crushing, trapping or other personal injuries.

⚠ CAUTION	
	**DO NOT transport, move, store, or place the UPS on its side.** Excessive force applied from heavy components inside may damage the UPS.
	**Avoid vibration or shock exceeding 0.5 g.** Failing to observe this precaution may cause damage to the UPS.
	**DO NOT allow the UPS to suffer shock or impact when unpacking.** Tools used to remove packaging materials may cause damage to the UPS.
	**DO NOT install the UPS in environments unsuitable for a NEMA-3R enclosure.** Submersion may cause electrical shock, personal injury or UPS failure.
	**DO NOT push or pull on the sides of the packaging or the UPS to move it. Always use a crane, forklift, or pallet jack for transporting and positioning the UPS.** Pushing/pulling on the sides of the unit to move it may result in damage to the UPS.

4 Unpacking

4.1 General Instructions

The UPS should be as close as possible to its final location when unpacking. Allow enough space for forklift/crane operations to unpack the UPS from the packing crate. Then remove the crate. Properly dispose of the crate.

Points to observe:

- Retain all small articles during unpacking and installation.
- Examine the UPS cabinet to ensure that it is not damaged and no paint is scratched before uncrating.
- Take precaution to not damage the UPS when using tools to remove packaging materials.
- If provided, DO NOT remove the protective plastic sheet cover until installation at final location.
- Immediately report any cabinet abnormalities to Toshiba Customer Support Center or an authorized representative.

4.2 Unpack the 5000 Series UPS

NOTE: The 5000 Series UPS is available in either a single Electronics cabinet or dual (Electronics and Magnetics) cabinet configuration. This manual covers unpacking

⚠ CAUTION

TOP HEAVY EQUIPMENT. THIS EQUIPMENT WILL TIP OVER EASILY UNTIL FIXED IN PLACE. DO NOT EXCEED 15° TILT LIMIT.
Lift and move carefully, and only with adequate equipment and trained personnel.
IMPROPER LIFTING CAN RESULT IN INJURY OR DEATH.

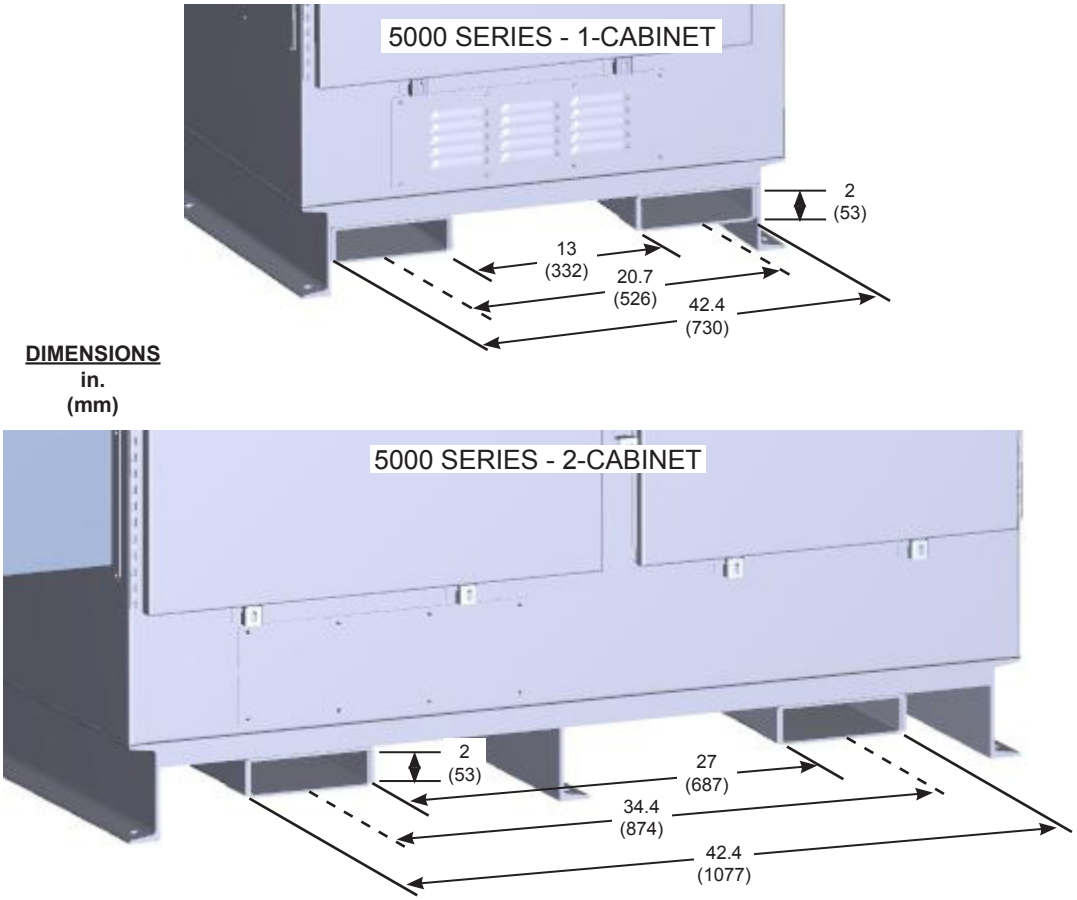


FIGURE 4.1: FORK POCKET DIMENSIONS FOR 1-BAY AND 2-BAY

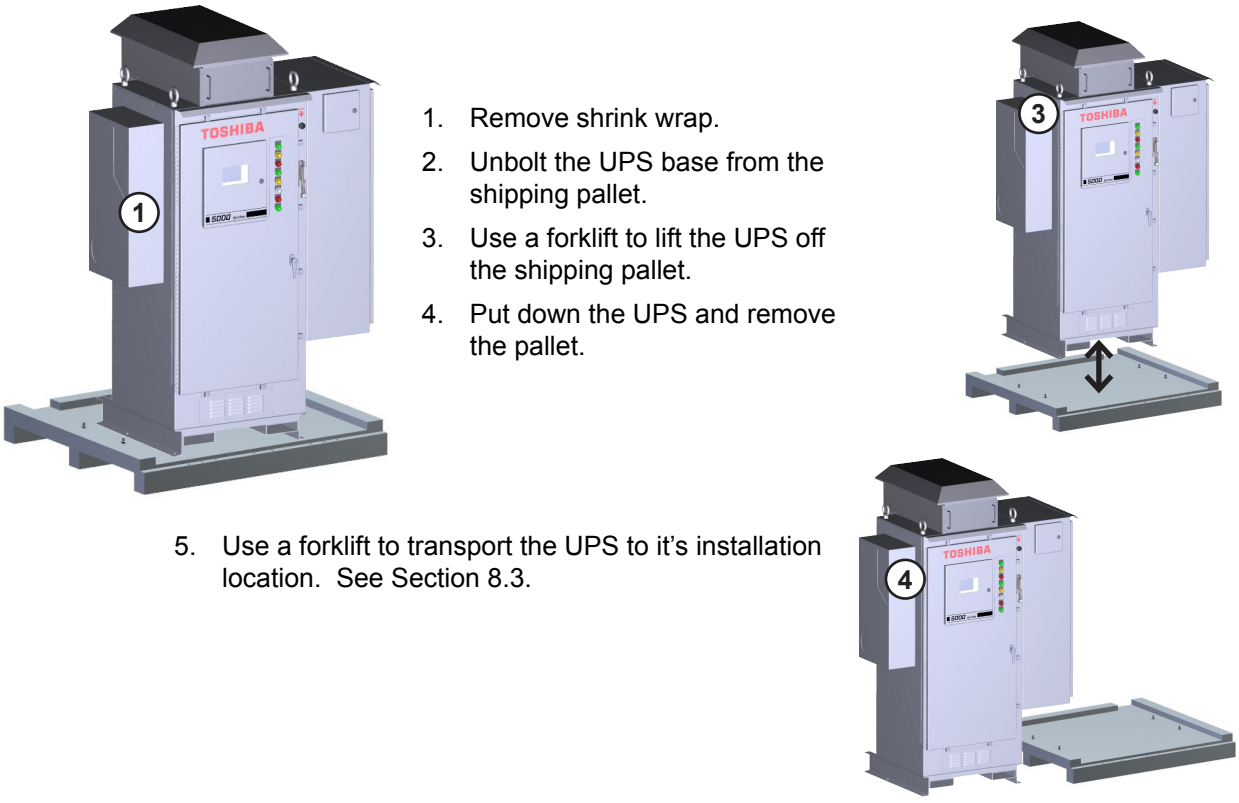
4.3 Unship the 5000 Series UPS

The 5000 Series Industrial Duty UPS has a C-channel skids base with fork pockets for font/back forklift access, and four lifting eyes for hoisting. The skids are bolted to the shipping pallet to secure the UPS during shipping. Follow the directions below to unship the UPS.

⚠ CAUTION

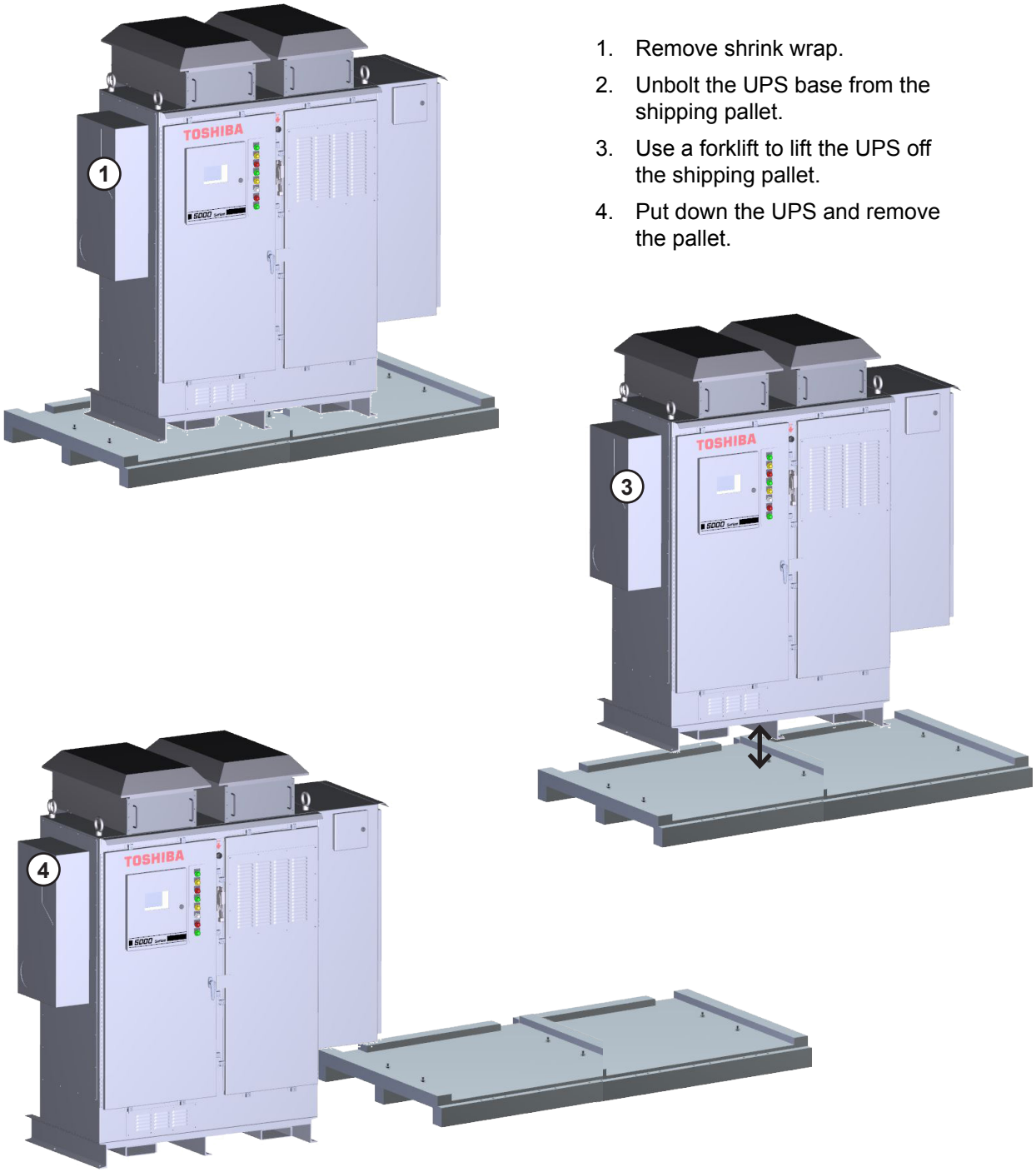
TOP HEAVY EQUIPMENT. THIS EQUIPMENT WILL TIP OVER EASILY UNTIL FIXED IN PLACE.
Lift and move carefully, and only with adequate equipment and trained personnel. IMPROPER LIFTING CAN RESULT IN INJURY OR DEATH.

Carefully inspect the UPS for shipping damage. Units shipped within North America and NAFTA are shrink wrapped.



1. Remove shrink wrap.
2. Unbolt the UPS base from the shipping pallet.
3. Use a forklift to lift the UPS off the shipping pallet.
4. Put down the UPS and remove the pallet.
5. Use a forklift to transport the UPS to it's installation location. See Section 8.3.

FIGURE 4.2: UNSHIPPING SINGLE-CABINET 5000 SERIES UPS



1. Remove shrink wrap.
2. Unbolt the UPS base from the shipping pallet.
3. Use a forklift to lift the UPS off the shipping pallet.
4. Put down the UPS and remove the pallet.
5. Use a forklift to transport the UPS to it's installation location. See Section 8.3.

FIGURE 4.3: UNSHIPPING DOUBLE CABINET 5000 SERIES UPS

4.4 Transporting By Crane

Cables should have sufficient load ratings and be of the same length. Ensure the suspension cables are hooked at eyebolts. See Figure 4.4.

Use a spreader bar between the Front and rear pair of lifting eye cables as shown below to avoid bending or damaging the fan exhaust hood(s). Use 30 in. (min.) spreader bars for the single cabinet UPS, and 55 in. (min.) spreader bars for the dual cabinet UPS.

Keep the angle less than 60° between cables. Figure 4.5 and 4.6 show unacceptable lifting practices.

Refer to Appendix A - Weight and Dimension for UPS cabinet.

Keep UPS leveled when lifting. DO NOT swing or tilt the UPS. Minimize the impact when lowering the UPS to the floor. Figure 4.7 and 4.8 show examples of acceptable and unacceptable operations.

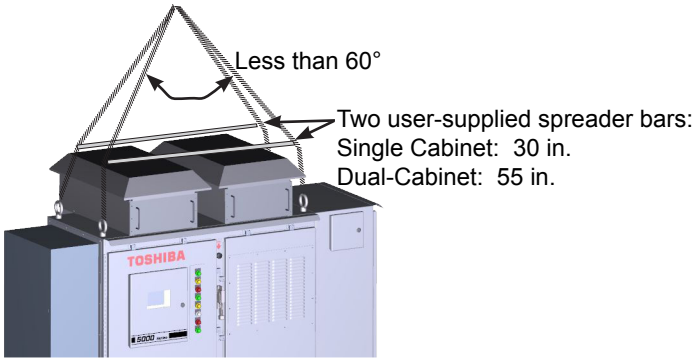


FIGURE 4.4: CABLES AND EYEBOLTS TO LIFT THE UPS

FIGURE 4.5: ANGLE MORE THAN 60°

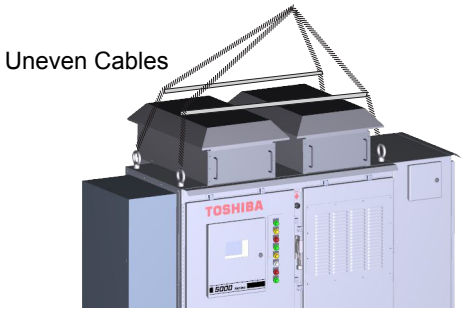


FIGURE 4.6: UNEVEN CABLES

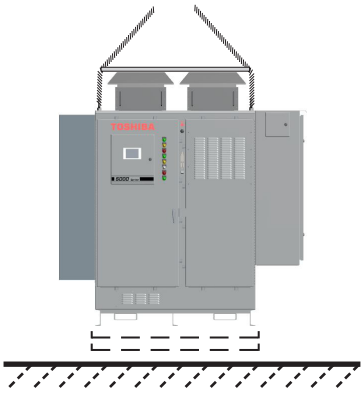


FIGURE 4.7 ACCEPTABLE OPERATION

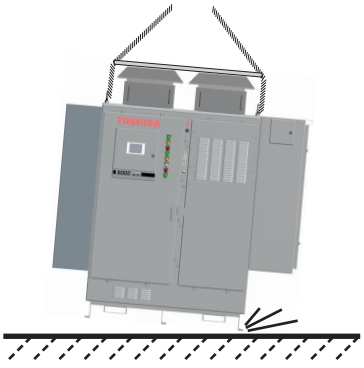


FIGURE 4.8: UNACCEPTABLE OPERATION

4.5 Inspection/Storage

Inspection

Upon receipt of the UPS, perform 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.

Unpacking

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.

NOTE: The factory warranty does not apply to damage incurred during shipping!

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

Storage

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

These instructions apply to installations that have already been through initial Start-up with Toshiba Service. For installations that have not been through initial startup, arrange the power up with Toshiba Service.

Storage Preparation

1) If the UPS has a battery backup, power up the UPS and allow it to operate with no load for 24 hours to fully charge the batteries.
2) Stop the UPS.
3) Place the UPS Main Circuit Breaker switch in the “OFF” position.

Storage Conditions

- For best results, store the UPS in the original shipping container and place on a wood or metal pallet.
- Storage temperature range: -4 to 158 °F (-20 to 70 °C)
- The optimum storage temperature is 70 °F (21 °C). At higher ambient temperature backup batteries 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
- Falling Particles

5 Warning Labels

Below are representative warning labels and their location on the UPS.

NOTICE

Make sure all the warning labels are installed in the appropriate locations.

If a label is missing or illegible, contact Toshiba Customer Support Center or an authorized representative.

A – 40308

DANGER

HAZARDOUS VOLTAGES
Hazardous voltages are used in the operation of this equipment and could cause severe personal injury or loss of life.
The following precautions should be observed to reduce the risk of injury or death.

Only qualified technicians familiar with this equipment and the information supplied with it should be permitted to install and operate this equipment.

Installation of electrical equipment must be done in accordance with National Electrical Code and any other state or local codes. Proper grounding and conductor sizing must be installed for safe operation.

During operation, keep all covers in place and cabinet doors shut.

When performing visual inspections and maintenance, if possible, be sure the UPS is turned off and the incoming AC feed is turned off and locked out.
The UPS and Battery Cabinet will have hazardous voltages present even after the AC feed is turned off.

If it is necessary to make measurements with the power on, do not touch any electrical connection points. Remove all jewelry from wrists and fingers. Make sure test equipment is in good, safe operating condition.

While servicing, stand on some type of insulation, and be sure not to be grounded.

Follow the safety instructions given in the equipment manual carefully and observe all danger, warning and caution notices.

40308

A1 – 90638

DANGER

TENSIONS DANGEREUSES
Des tensions dangereuses sont utilisées dans l´opération de cet appareil et pourraient causer des blessures graves ou des pertes de vie.
Les mesures de sécurité suivantes doivent être observées pour réduire le risque de blessure ou de mort.

Seulement des techniciens qualifiés et familiarisés avec ce matériel, ainsi que la documentation fournie avec elle, devraient être autorisés à installer et à utiliser cet équipement.

L´installation de l´équipement électrique doit être effectuée selon les normes électriques reconnues par les organismes nationaux ou provinciaux accrédités. Une bonne mise à la terre et un calibre de câble approprié doivent être installés pour un fonctionnement sécuritaire.

Pendant le fonctionnement, maintenir tous les couvercles en place et les portes de l´armoire fermées.

Lors des inspections visuelles et d´entretien, si possible, vérifier que l´UPS soit éteinte et que l´alimentation AC est éteninte et verrouillée.

L´UPS et l´armoire de batterie auront des tensions dangereuses présentes même après avoir coupé l´alimentation AC.

Si des mesures sur l´appareil sous tension doivent être effectuées, ne toucher à aucun point de connexion électrique. Retirer tous les bijoux des poignets et des doigts. S´assurer que l´équipement de test est en bon état de fonctionnement.

Lors des opérations de maintenance, l´opérateur doit se tenir sur une surface isolée non reliée à la mise à la terre.

Suivre attentivement les consignes de sécurité indiquées dans le manuel d´opération et respecter tous les avis de danger, les avertissements et les mises en garde.

90638

B – 48082

DANGER

AC VOLTAGE

This UPS receives power from more than one source. Disconnect all AC sources before performing any service or testing inside this unit

48082

B1 – 90630

DANGER

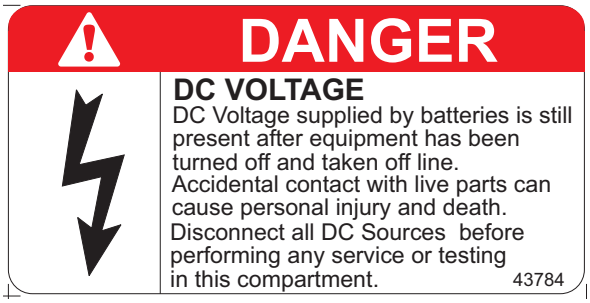
TENSION AC

Cette UPS est alimentée par plus d´une source. Débrancher toutes les sources AC avant d´effectuer des entretiens ou des tests à l´intérieur de cette unité.

90630

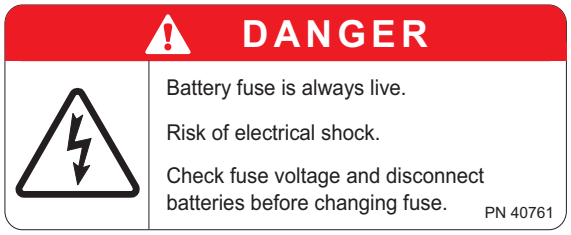
FIGURE 5.1: WARNING LABELS

C – 43784

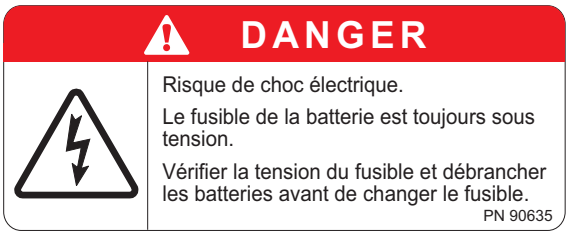


C1 – 90632

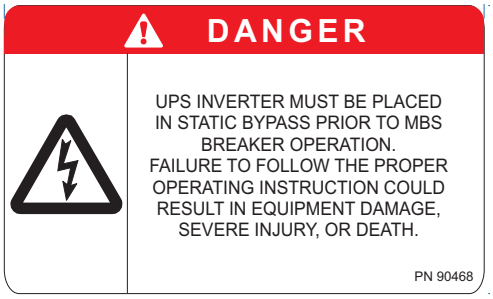
D – 40761



D1 – 90635



E – 90468



F – 39564

F1 – 91345

G – 94046

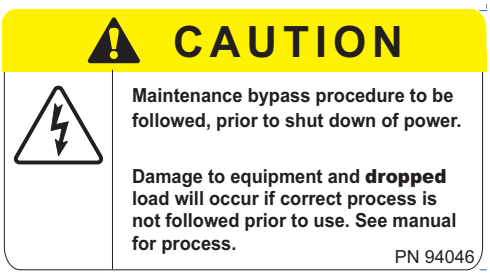


FIGURE 5.1: WARNING LABELS (CONT.)

H – 94045

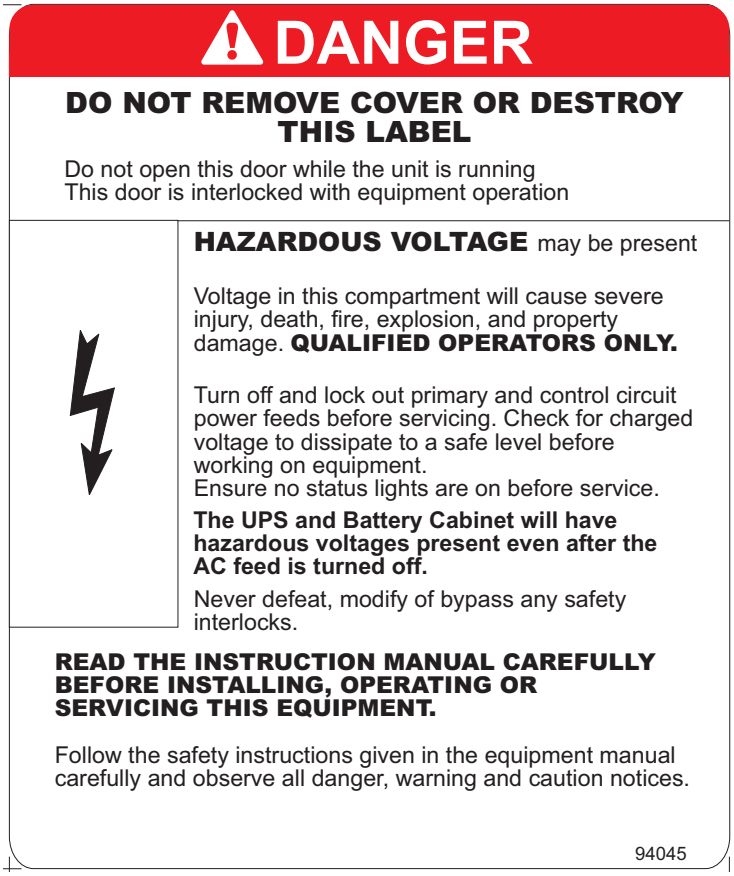


FIGURE 5.1: WARNING LABELS (CONT.)

J – 39561

DANGER

RISK OF ELECTRIC SHOCK
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.
39561

J1 – 39561F

DANGER

RISQUE DE CHOC ÉLECTRIQUE
Les condensateurs restent chargés après que l'alimentation a été coupée.
Un contact accidentel avec des pièces sous tension peut entraîner des blessures personnelles et la mort.
Couper et verrouiller toutes les sources d'alimentation. Attendre au moins cinq (5) minutes que le courant soit dissipé et vérifier ensuite la tension avant de faire l'entretien.
39561F

K – 57275

DANGER

RISK OF ELECTRIC SHOCK
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.
57275

K1 – 90624

DANGER

RISQUE DE CHOC ÉLECTRIQUE
Les condensateurs restent chargés après coupure de l´alimentation. Tout contact accidental avec des composants sous tension électrique peut provoquer des blessures ou la mort. Fermer et verrouiller toutes les sources d´alimentation.
ATTENDRE AU MOINS (5) MINUTES pour laisser décharger les condensateurs, puis vérifier la tension électrique avant l´entretien.
90624

L – 40830

WARNING

CRITICAL FUSE SIZING
Incorrect fuse replacement size may result in fire or inadequate equipment protection.
Replace only with same type and rating of fuse.
PN 40830

L1 – 91348

AVERTISSEMENT

CALIBGAGE DE FUSIBLE CRITIQUE
le remplacement incorrect du calibre de fusible pourrait provoquer un incendie ou une protection inadéquate de l´équipement.
Remplacer seulement par un fusible de même type et de meme calibre.
91348

M – 48231

CAUTION

HOT SURFACE.
Contact may result in burn injury. Allow equipment to cool before servicing.
PN 46231

M1 – 906314

ATTENTION

SURFACE CHAUDE
Risque de se brûler au contact. Laisser l´équipement se refroidir avant l´entretien.
PN 90631

N1 – 46232

CAUTION

Heat sink not grounded. Risk of electrical shock. Disconnect UPS and electrically test heat sink before touching.
46232

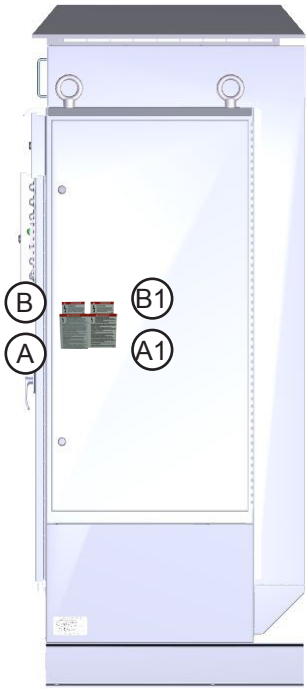
FIGURE 5.1: WARNING LABELS (CONT.)

5.1 Warning Label Locations - Exterior

The warning labels identified on the previous pages are located on the front and interior of the UPS. Their location in the UPS cabinet is shown in Figure 5.2.

Front View

Right Side View
(Interior)



Right Side View
(Exterior)

FIGURE 5.2: CABINET WARNING LABEL LOCATIONS

6 Storage/Operating Environment

6.1 Storage Environment

Observe the following when storing the UPS.

- Store UPS indoors.
- Maximum storage time for the UPS between powered operation cycles is three years. If the UPS has been stored for a period exceeding 36 months, contact your factory authorized representative of guidance in starting the unit.
- Temperature fluctuations should be minimized.
- The optimal storage temperature range is 68 – 77 °F (20 – 25° C).
- A maximum temperature range of 4 to 158 °F (-20 to 70 °C) should be observed.
- The optimal relative humidity at the storage location should be between 50 – 60%.
- Humidity must not exceed 95%.
- Avoid locations where UPS may be exposed to corrosive gas.
- Avoid locations with dirt and/or dust.

TABLE 6.1: UPS STORAGE/OPERATING ENVIRONMENT STANDARDS

Item	Environment standard	
Storage Location	Indoors	
Ambient Temperature	Minimum storage temperature: -4 °F (-20 °C)	
	Maximum storage temperature: 158 °F (70 °C)	
Relative Humidity	The relative humidity must be between 5% and 95% and without condensation due to temperature changes.	
Altitude	This equipment is rated for installations up to 3280 ft. (1000 m) above sea level. Consult with the factory to determine the derating factor for installations above 3280 ft. (1000 m).	
Dust	Dust must not exceed normal atmospheric levels and must not include conductive particles, silicone or oils.	
Flammable Gas	No flammable and/or explosive gas.	
	Hydrogen sulfide (H_2S)	Less than or equal to 0.0001 PPM
	Sulfurous acid gas (SO_2)	Less than or equal to 0.05 PPM
	Chlorine gas (Cl_2)	Less than or equal to 0.002 PPM
	Ammonia gas (NH_3)	Less than or equal to 0.1 PPM
	Nitrous acid gas (NO_2)	Less than or equal to 0.02 PPM
	Nitrous oxides (NOx)	Less than or equal to 0.02 PPM
	Ozone (O_3)	Less than or equal to 0.002 PPM
	Hydrochloric acid mist (HCl)	Less than or equal to 0.1 mg/m^3

6.2 Operating Precautions

Initial startup/commissioning of the UPS should be performed by factory authorized personnel.

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 rated input voltage range.

3. The input frequency must be within the rated input frequency range.
4. The UPS should not be used with a load that has a rated input that is greater than the rated output of the UPS.
5. If using the UPS to provide power to motors that require high starting current or with motors that require a long starting time, call Toshiba support for guidance in oversizing the UPS for locked rotor current.
6. DO NOT insert metal objects or combustible materials in the ventilation slots of the UPS.
7. DO NOT place, hang, or paste any objects on the exterior surfaces of the UPS.
8. The capacitors in the UPS maintain a residual charge for a while after turning the UPS off. Wait five (5) minutes before opening cabinet. This allows the system capacitors to fully discharge.
9. DO NOT attempt to disassemble, modify, or repair the UPS. Call your Toshiba sales representative for repair information.
10. Turn the power on only after securing **ALL** of the bay access doors.
11. DO NOT open any UPS bay access doors when power is on.
12. If the UPS should emit smoke or an unusual odor or sound, turn the power off immediately.
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 input breaker in the "OFF" position will switch the UPS to the DC supply 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 internal circuits have been fully discharged.

The UPS could be damaged if the unit is not fully discharged before the breaker is reset.

6.3 Maintenance Precautions

All internal maintenance should be performed by factory authorized personnel.

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. A user-installed circuit breaker should be provided between the UPS output and the load input.
3. The maximum ambient operating temperature at 0.9 PF 122 °F (50 °C).
4. Only factory authorized personnel should service the UPS. Contact Toshiba for the nearest authorized service center.
5. Battery/Flywheel servicing should be performed by factory authorized personnel only.

   Note: Contact your nearest factory authorized service center for battery replacement.

Qualified Personnel ONLY!

Qualified Personnel have 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 use and care 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 the DC backup supply system and the required handling and maintenance precautions.

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

⚠ WARNING

Misuse of 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.

7 Component Location

7.1 UPS Component Location – External

The following table identifies the major external components of the UPS.

TABLE 7.1: COMPONENT LOCATION AND IDENTIFICATION

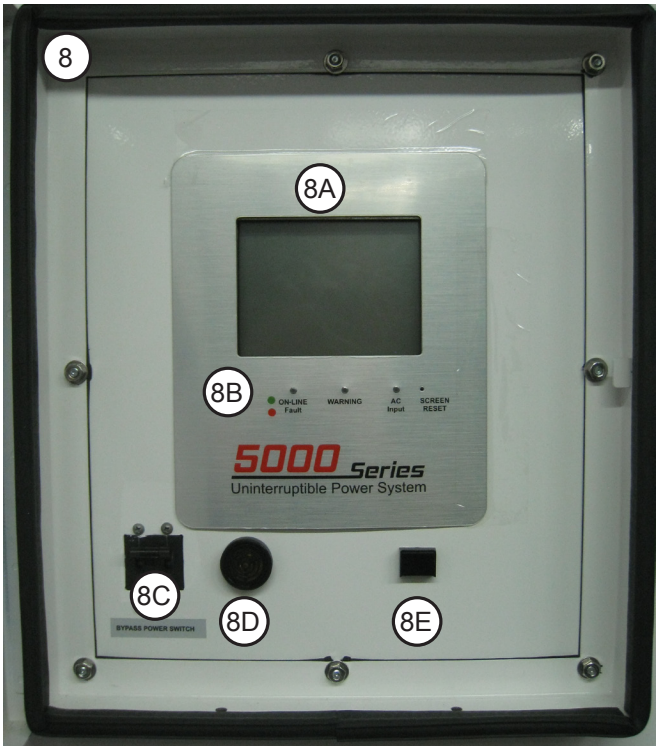
No.	Description	No.	Description
1	Heat Exchange Module	9	Status Indicators - External
2	Lifting Eyes	10	Air exhaust for Magnetics Bay
3	Cooling Fan Bay	11	MCCB-Door Manual Interlock
4	Rotary Maintenance Bypass Switch	12	Locking Door Latch
5	Electronics Bay	13	(Not Used)
6	Magnetics Bay	14	Future Use Access Cover
7	Input/Output (I/O) Bay	15	Fork Boxes
8	HMI Touchscreen Cover		

7.2 UPS Component Identification – Display and Indicators

The following table identifies the major components of the Display and Status Indicators.

TABLE 7.2 HMI AND STATUS INDICATORS LOCATION AND IDENTIFICATION

No.	Description	No.	Description
8	Display and Controls	9B	Label: ON-LINE Color: Green - Steady
8A	Touchscreen Display	9C	Label: ON BY-PASS Color: Yellow - Blinking
8B	LED Indicators (See Section 12.1)	9D	Label: ON BATTERY Color: Blue - Blinking
8C	Bypass Pwr. Switch	9E	Label: BATTERY WARNING Color: Yellow - Blinking
8D	Audible Alarm	9F	Label: FAN FAILURE Color: Amber (Orange) - Blinking
8E	Test button for ***9 - Status Indicator LED Light Tree***	9G	Label: UPS WARNING Color: Yellow - Blinking
9	Status Indicators LED Light Tree	9H	Label: UPS FAULT Color: Red - Steady
9A	Label: AC INPUT Color: White - Steady		

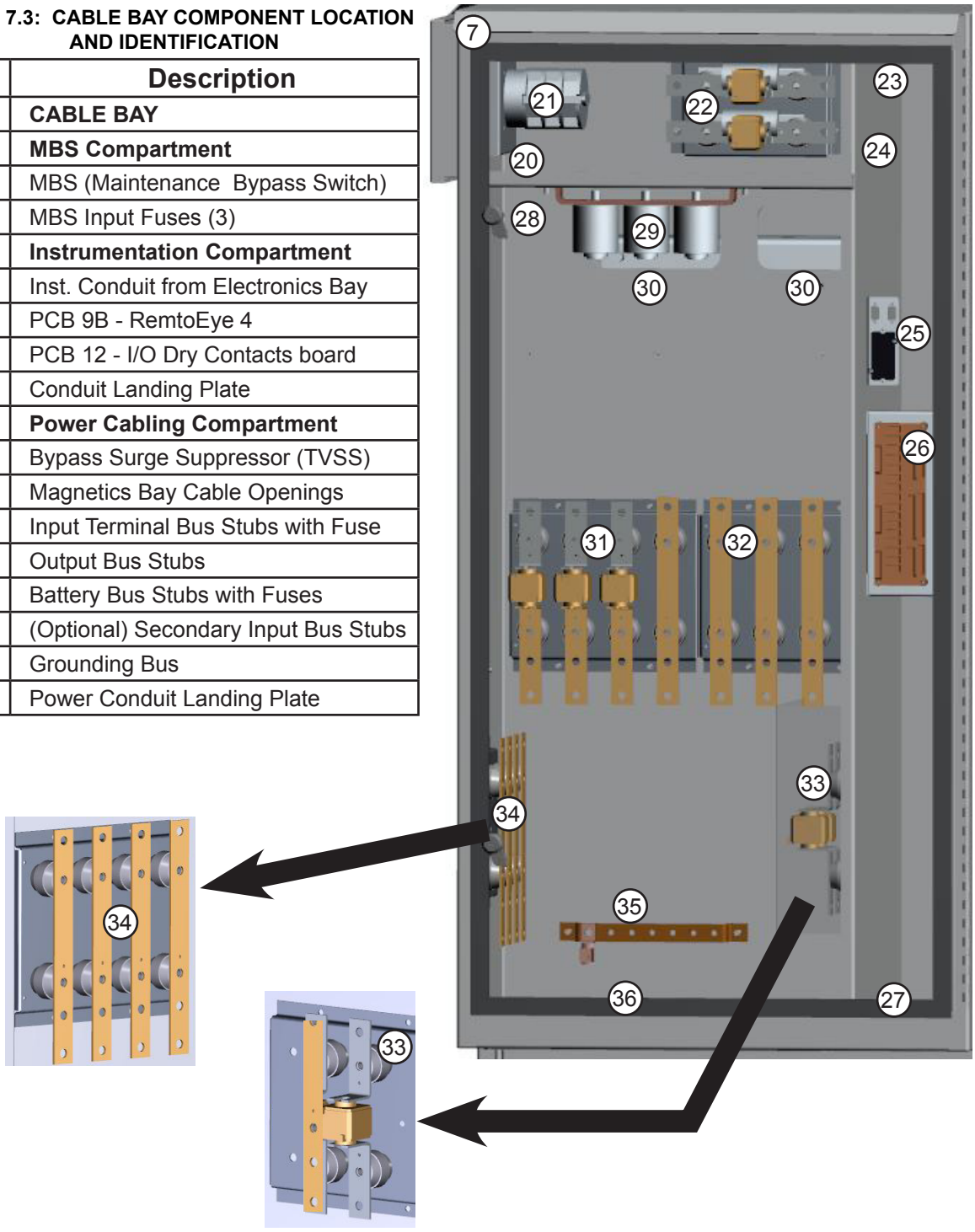


7.3 UPS Component Identification – Cable Bay

The following table identifies the major components of the Cable Bay.

TABLE 7.3: CABLE BAY COMPONENT LOCATION AND IDENTIFICATION

No.	Description
7	**CABLE BAY**
20	**MBS Compartment**
21	MBS (Maintenance Bypass Switch)
22	MBS Input Fuses (3)
23	**Instrumentation Compartment**
24	Inst. Conduit from Electronics Bay
25	PCB 9B - RemtoEye 4
26	PCB 12 - I/O Dry Contacts board
27	Conduit Landing Plate
28	**Power Cabling Compartment**
29	Bypass Surge Suppressor (TVSS)
30	Magnetics Bay Cable Openings
31	Input Terminal Bus Stubs with Fuse
32	Output Bus Stubs
33	Battery Bus Stubs with Fuses
34	(Optional) Secondary Input Bus Stubs
35	Grounding Bus
36	Power Conduit Landing Plate



8 Installation

8.1 Installation Safety

⚠ WARNING	
	**Keep the SPECIFIED CLEARANCE around the UPS.** Inadequate space around the UPS makes it difficult to perform maintenance/ inspections, lead to insufficient ventilation, and/or will cause malfunctions. *See Figure 8.1-8.2 – UPS Clearance*
	**DO NOT tilt the UPS more than 10° from upright position.** Tilting the UPS more than 10° may cause crushing, trapping or other personal injuries and cause physical damage to internal components.
	**Install anchor bolts to secure the UPS to the installation floor.** The UPS may fall during an earthquake if the anchor bolts are not installed and secured.
	**DO NOT transport, move, store, or place the UPS on its side.** Forces due to heavy components inside may damage the UPS.
	**DO NOT allow the UPS to suffer shock or impact when unpacking.** Tools used to remove packaging materials may cause damage to the UPS.
	**DO NOT push or pull on the sides of the packaging, or the UPS to move it. Always use a crane, forklift, or pallet jack for transporting and positioning the UPS.** Pushing/pulling on the sides of the unit to move it may result in damage to the UPS.
⚠ CAUTION	
	**Install the UPS in an appropriate environment.** Improper storage and installation environment may deteriorate insulation, shorten component life and cause malfunctions. *See Table 6.1 – UPS Installation Environment Standards*

1. 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 further away from the affected equipment and/or powered from a different source than that of the installed equipment.
2. The user should provide over-current protection for hardwired UPS systems between the UPS output and the load input.
3. 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.

NOTE: Ensure the input phasing is connected in clockwise rotation (CW). UPS internal circuitry is designed to disable further UPS operation if the input phasing is installed in counter-clockwise rotation (CCW).

4. 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 as published 9/2008.

⚠ WARNING

METAL CONDUIT IS NOT AN ACCEPTABLE GROUND.

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.

8.2 Unpacking

The UPS should be as close as possible to its final storage location. Allow enough space for forklift operations to unpack the UPS crate. Then remove the crate.

Points to observe

- Retain all small articles during unpacking and installation.
- Make sure that exterior paint is not scratched and that the UPS cabinet is not damaged.
- DO NOT damage the UPS when using tools to remove packaging materials.
- If provided, DO NOT remove the plastic sheet cover, until installation.
- Do not remove the fan covers until UPS start up. The fan covers should be removed by factory authorized personnel. Packing materials should be disposed by the appropriate means.
- Immediately report any abnormalities to Toshiba Customer Support Center or an authorized representative.

8.3 UPS Clearance

Maintain the indicated clearance during installation. See Figures 8.1 - 8.2. Ensure that the front and top air vents are NOT blocked.

NOTE: Mminimum front clearance when physically accessing the UPS must be at least the width of the front and side door of the UPS, or per NEC 110.34(A)(36 in./900 mm) and local requirements, whichever is greater.

8.4 UPS Clearance

The 5000 Series is front--access for installation, operation, and maintenance, and side-access for wiring and cable installation. The clearance around the Single Cabinet and Double Cabinet configurations are shown in Table 8.1, Figure 8.1, and Figure 8.2.

TABLE 8.1: 5000 SERIES CLEARANCE REQUIREMENTS

5000 SERIES CLEARANCE REQUIREMENTS					
CONFIGURATION	**FRONT**	**LEFT SIDE**	**RIGHT SIDE**	**BACK**	**TOP**
1-Cabinet	36 in. (914 mm)	6 in. (152 mm)	36 in. (914 mm)	0 in. (0 mm)	6 in. (152 mm)
2-Cabinet	36 in. (914 mm)	6 in. (152 mm)	36 in. (914 mm)	0 in. (0 mm)	6 in. (152 mm)

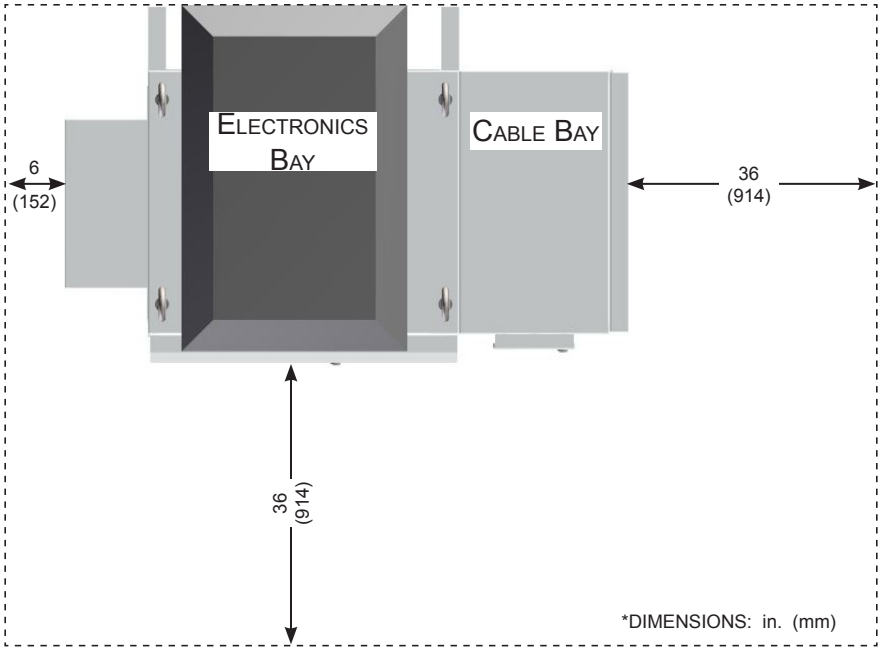


FIGURE 8.1: 5000 SERIES SINGLE CABINET UPS MINIMUM CLEARANCES

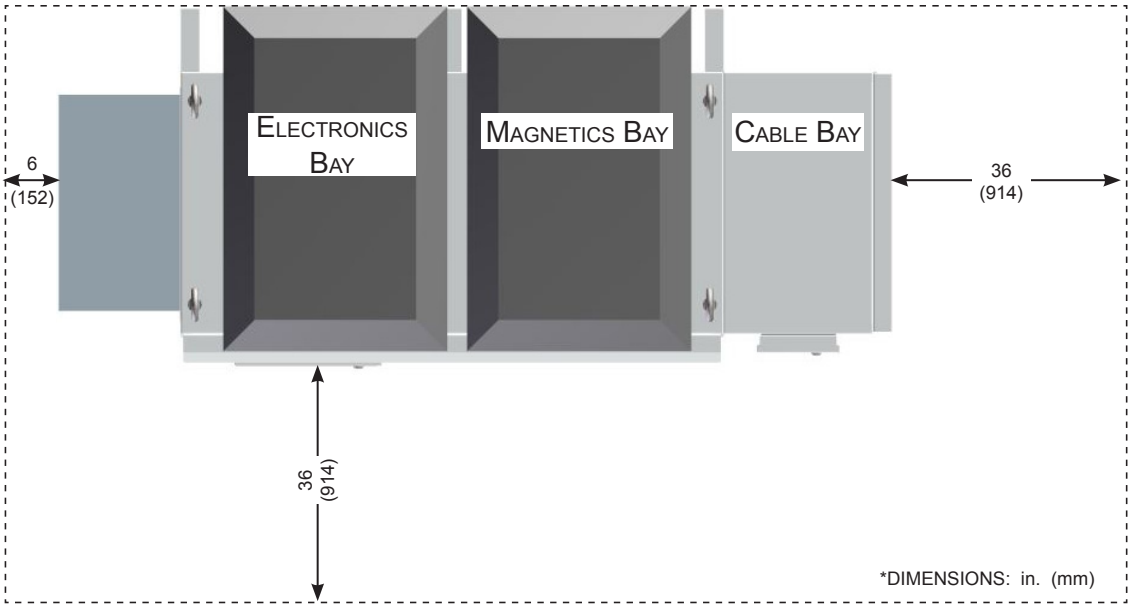


FIGURE 8.2: 5000 SERIES DOUBLE CABINET UPS MINIMUM CLEARANCES

8.3 UPS Anchorage

Anchorage Bolts

Install the anchor bolts to secure the UPS on the floor. See Figure 8.3 for anchor bolt installation detail.

Use 5/8 in. (16 mm) diameter anchor bolts. There are 0.63 in. (16 mm) diameter holes provided in the UPS base. See Figure 8.4 – 8.10 for the hole locations and dimensions for the specified UPS models.

8.4 UPS Anchorage - Single Cabinet

Use 5/8 in. (16 mm) diameter anchor bolts. There are four (4) x 0.63 in. (16 mm) diameter holes provided in the UPS base. See Figure 8.4 for the hole locations and dimensions in inches (mm) for the specified UPS model. Following is the layout for the anchorages and footprint the Single Cabinet 5000 Series UPS.

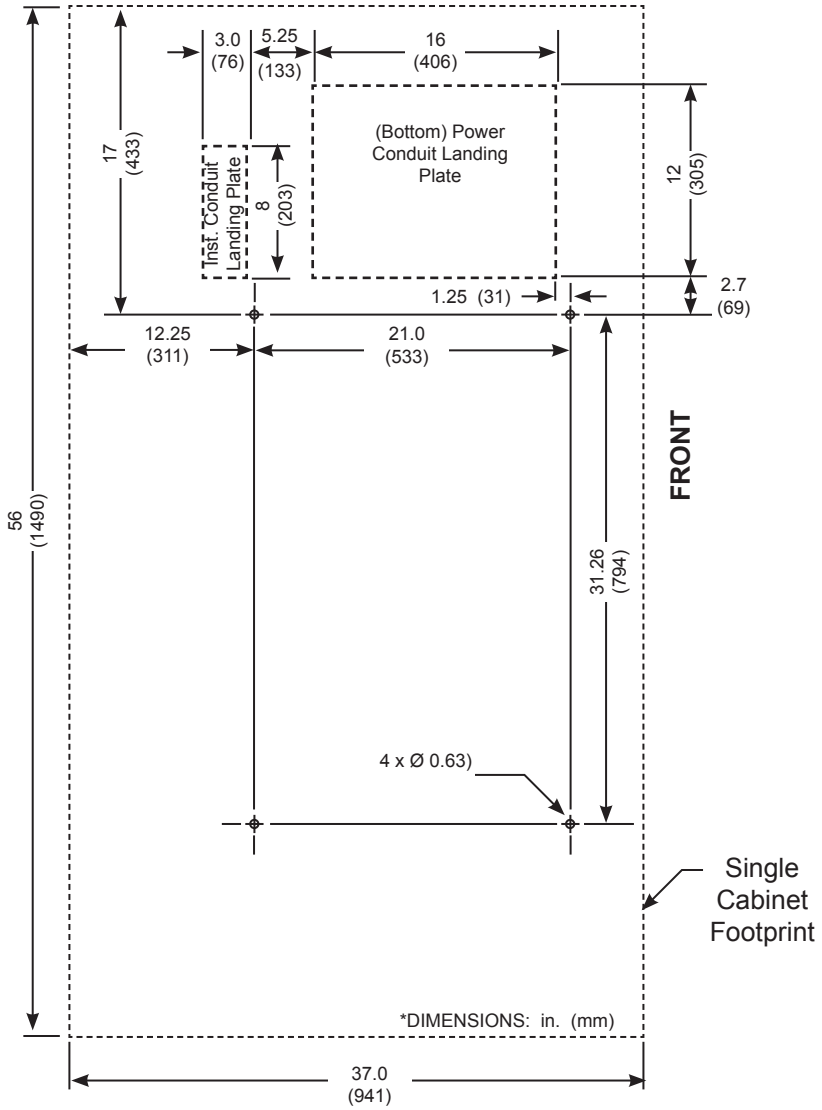


FIGURE 8.3: 5000 SERIES SINGLE CABINET UPS ANCHORAGE AND FOOTPRINT

8.5 UPS Anchorage - Double Cabinet

Use 5/8” (16 mm) diameter anchor bolts. There are six (6) x 0.63 in. (16 mm) diameter holes provided in the UPS base. See Figure 8.4 for the hole locations and dimensions for the specified UPS model. Following is the layout for the anchorages and footprint the Single Cabinet 5000 Series UPS.

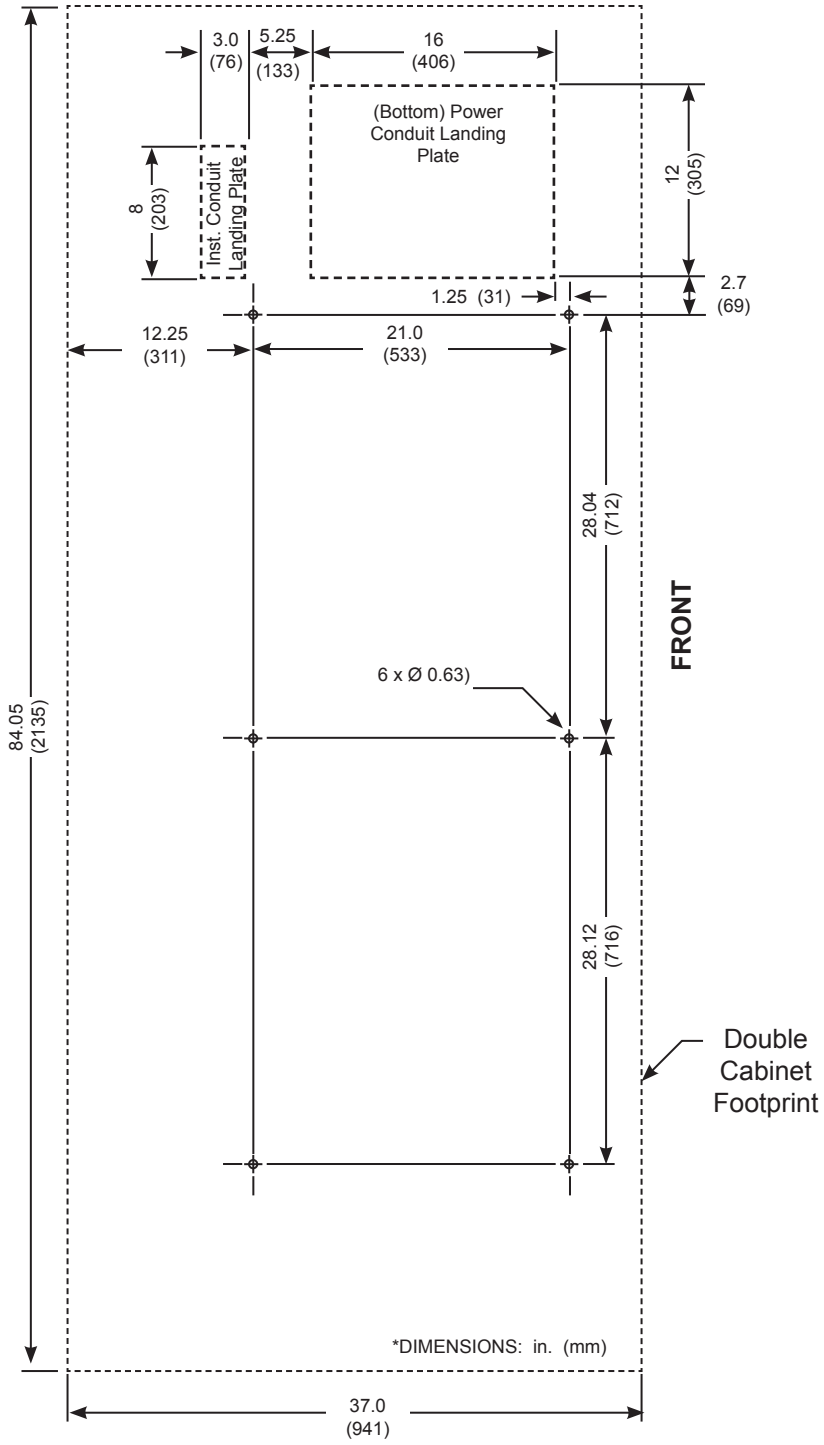


FIGURE 8.4: 5000 SERIES DOUBLE CABINET UPS ANCHORAGE AND FOOTPRINT

8.6 Conduit Risers

Conduit runs from the floor/pad to the conduit landing plate on the bottom of the I/O Bay rise 22 in. Figure 8.5 shows the open distance between the mounting pad and the UPS conduit landing plates. This rise is the same for both the Single Cabinet and Double Cabinet versions.

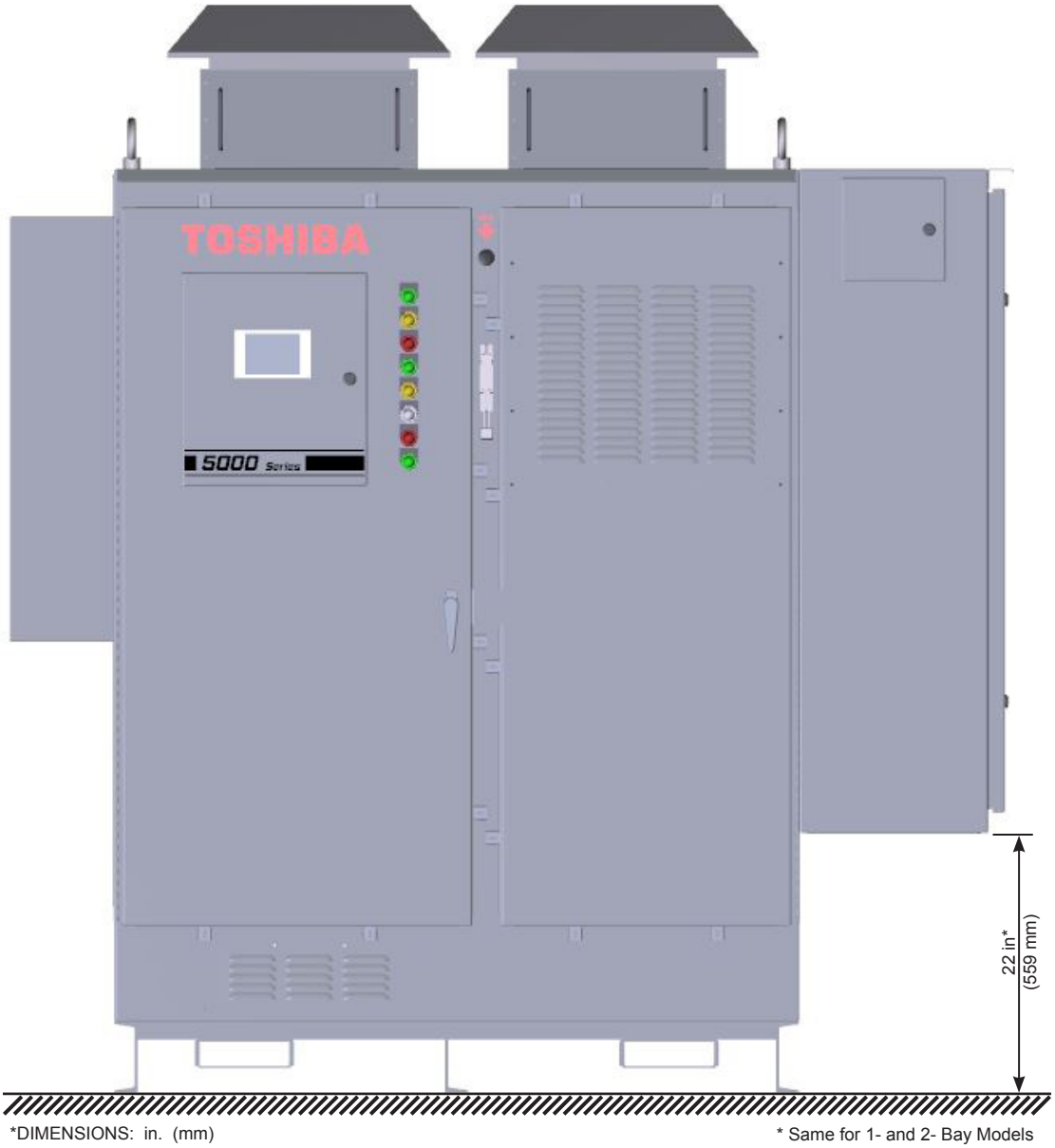


FIGURE 8.5: I/O BAY CONDUIT LANDING PLATE ELEVATION

9 UPS Wiring

9.1 Wiring Safety

⚠ WARNING

Perform wiring and connections with correct polarity.

Be careful when connecting the UPS to the DC backup system. A wrong connection may cause damage to the UPS, DC backup system, or charger.

Connect ONLY one (1) ground wire to the earth ground terminal.

A missing ground wire may cause an electrical shock hazard. Connecting to more than one ground may cause a ground loop.

See Chapter 9 – UPS Wiring

DO NOT force, bend, or pull wires.
DO NOT damage wire insulation.
DO NOT place heavy objects on top of UPS.

Observe the above precautions when making wire connections or handling the wires. Failing to observe these precautions may damage the insulation of the wires or may cause a fire or an electric shock hazard.

NOTICE

Follow the torque criteria for tightening screws.

Loose connections may cause fire due to heating.

See Chapter 9 – UPS Wiring

9.2 Power Cable Access

Power and control cable conduit landing plates are provided in the bottom of the I/O Bay.

The 5000 Series Industrial Duty 3-Phase UPS is Bottom entry only.

Bottom Access Conduit Landing: Control and Ethernet wiring conduit should be landed on the Instrument Terminal compartment conduit landing plate. Power conduit should be landed on Power Terminal compartment conduit landing plate See Figure 8.3 - 8.5 for positioning relative to UPS base anchors.

TABLE 9.1: CONDUIT LANDING PLATES

Function	Landing Plate Location	Landing Plate Dimensions W x D x Thickness
Control Wiring	Rear-Bottom of IO Bay	8 in x 3 in (203 mm x 76 mm) x 14 Gauge Steel
Power Cables	Forward-Bottom of IO Bay	12 in x 16 in (305 mm x 406 mm) x 14 Gauge Steel

9.3 Power Terminals and Cable Sizing

Note: Always consult your site specific, local, state, and NEC electrical codes for wiring, cabling, and circuit protection device requirements.

The Input/Output bus stubs for the UPS are shown in Figure 9.1.

Use only copper wires for external cables. See Appendix D for alternate voltage and cabling configurations.

The tables below show the recommended cable sizing for the basic 208/120Vin, 208/120Vout UPS configuration, and a 480V unit. For other Input/Output volage Cabling recommendatons, see Appendix D.

TABLE 9.2: RECOMMENDED TIGHTENING TORQUE FOR 5000 SERIES POWER LUGS

Bus Stub	Fastener	Tightening Torque [2]
All power and neutral cable lugs	3/8 bolt	18 - 22 Lb-Ft (24.4 - 71.9 Nm)

TABLE 9.3: RECOMMENDED CABLE SIZE FOR 120/208V IN, 120/208V OUT @ 84 °F (30 °C) Ambient

Bus Stub	Cable Size (Min-Max) 75 °C Copper Wire in Conduit	
	20kVA	30kVA
AC Input A, B, C	#3 – #2	1/0 – 2/0
AC Input Neutral (N)[2]	2/0 – 3/0	4/0 – 250 kcmil
AC Output A, B, C	#3 – #2	1/0 – 2/0
AC Output Neutral (N)[2]	2/0 – 3/0	4/0 – 250 kcmil
Secondary Input A, B, C	#3 – #2	1/0 – 2/0
Secondary Neutral (N)[2]	2/0 – 3/0	4/0 – 250 kcmil
Battery Terminals +/- [1]	#3 – #2	#1 – 1/0

[1] One battery string. (Consult factory if using more than one battery string.)

[2] Size neutral cable appropriate to actual load type: e.g. balanced, unbalanced, non-linear.

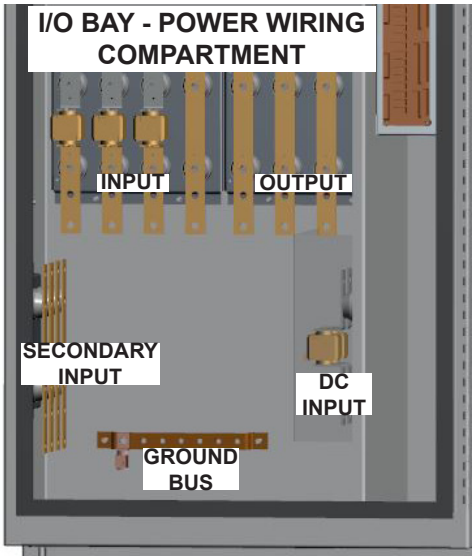
TABLE 9.4: RECOMMENDED CABLE SIZE FOR 480V IN, 480/277V OUT @ 84 °F (30 °C) Ambient

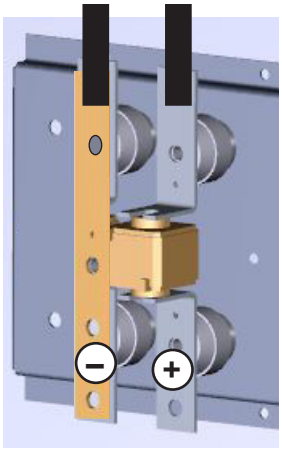
Bus Stub	Cable Size (Min-Max) 75 °C Copper Wire in Conduit	
	20kVA	30kVA
AC Input A, B, C	#8 – #6	#6 – #4
AC Input Neutral (N)[2]	–	–
AC Output A, B, C	#8 – #6	#6 – #4
AC Output Neutral (N)[2]	#4 – #3	#3 – #2
Secondary Input A, B, C	#8 – #6	#6 – #4
Secondary Neutral (N)[2]	#4 – #3	#3 – #2
Battery Terminals +/- [1]	#3 – #2	#1 – 1/0

[1] One battery string. (Consult factory if using more than one battery string.)

[2] Size neutral cable appropriate to actual load type: e.g. balanced, unbalanced, non-linear.

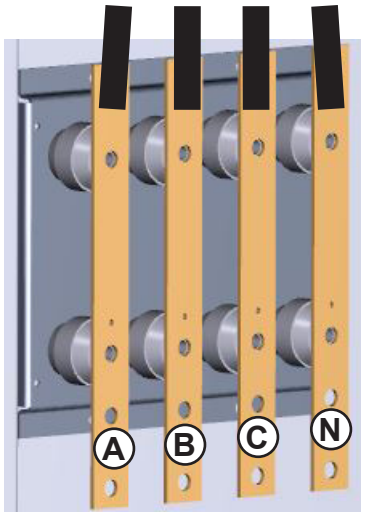
NOTE: Cable sizing for ambient operating temperatures other than 84 °F (30 °C) will require derating per the correction factors in the NEC Handbook Table 310.16



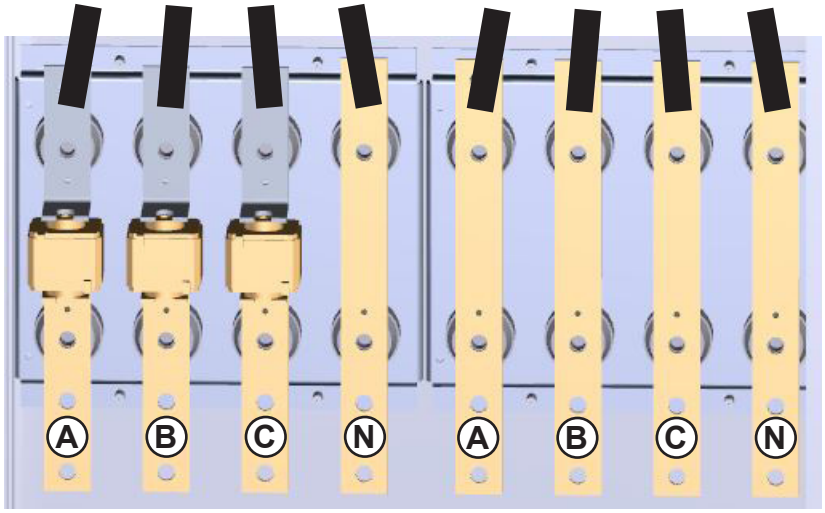


DC INPUT

NOTE: The INPUT, SECONDARY INPUT, DC INPUT, and OUTPUT bus stubs are all drilled to accept NEMA 2-Hole terminal lugs with 3/8 in. bolt holes on 1.75 in. centers.



SECONDARY INPUT



INPUT OUTPUT

FIGURE 9.1: I/O BAY POWER CABLING - DETAIL

9.4 Grounding Wire

⚠WARNING

Be sure to ground the UPS as specified.

Using the UPS without a proper ground will deteriorate the insulation, cause leakage of currents and electric shock. The resistance to ground should be less than or equal to 10 ohms.

The earth grounding bus is located at the lower rear of the Power Wiring Compartment. See Figure 9.1. Connect the grounding wire to the earth ground bus.

The UPS has a bus strip with 6 (six) embedded nuts: 5/16" - 18. Use an AWG 2 (or 38 mm^2) or larger cable for the grounding wire. Connect the crimp terminal and ground bus together using a 5/16" - 18 bolt.

TABLE 9.5: RECOMMENDED CABLE SIZE & TIGHTENING TORQUE FOR 20KVA UPSGND BUS

Bus Stub	Cable Size (Min-Max) 75 °C Copper Wire in Conduit (AWG)	Fastener	Tightening Torque [2]
Ground Bus	#3 – #1	3/8 bolt	18 - 22 Lb-in (24.4 - 71.9 Nm)

9.5 One-Line Diagram

Note: Always consult your local and NEC electrical codes for wiring, cabling, and circuit protection device requirements.

Figure 9.2 shows the external wiring of the 5000 Series UPS with a single input.
Figure 9.3 shows the external wiring needed for the 5000 Series UPS with the optional dual input.
Figure 9.4 shows the cabling for the 5000 Series UPS with the optional external Battery Cabinet.

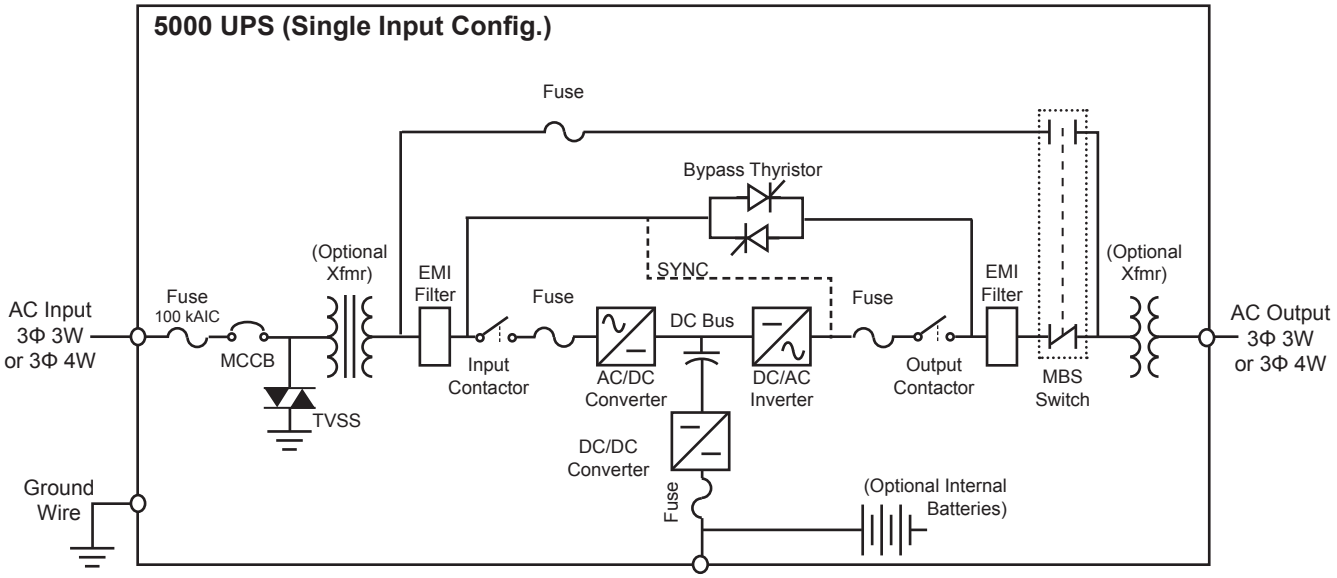


FIGURE 9.2: 5000 SERIES SINGLE INPUT W/ INTERNAL BATTERIES ONE-LINE DIAGRAM

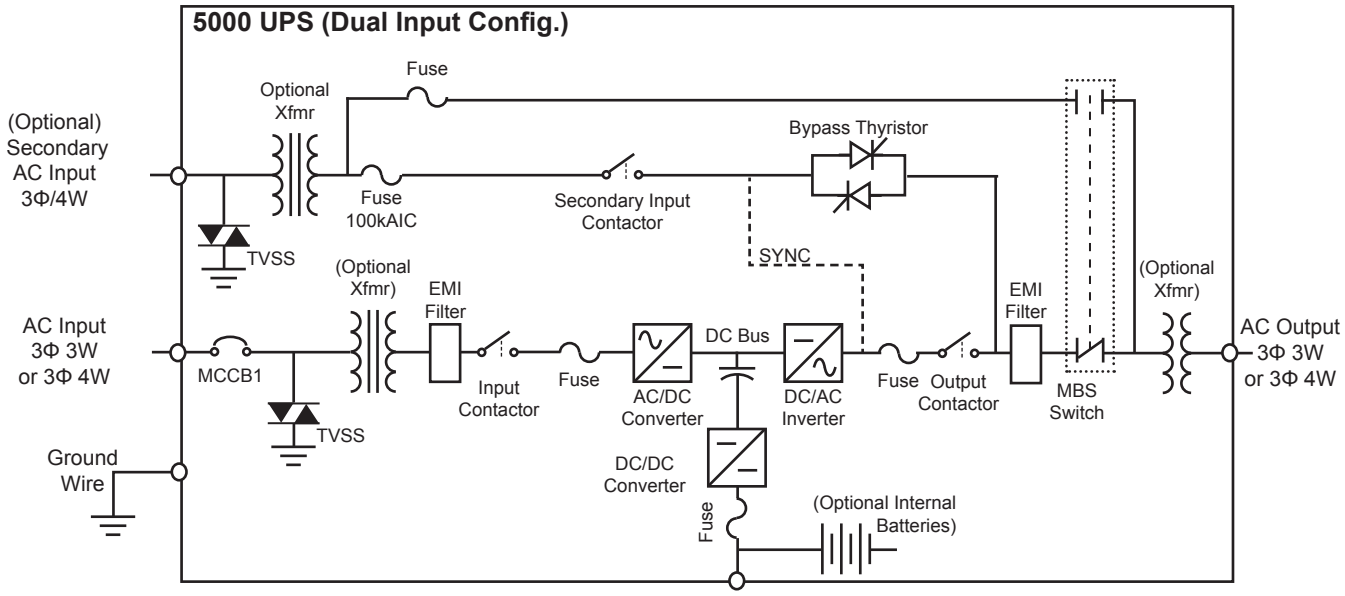


FIGURE 9.3 – 5000 SERIES DUAL INPUT W/ INTERNAL BATTERIES ONE-LINE DIAGRAM

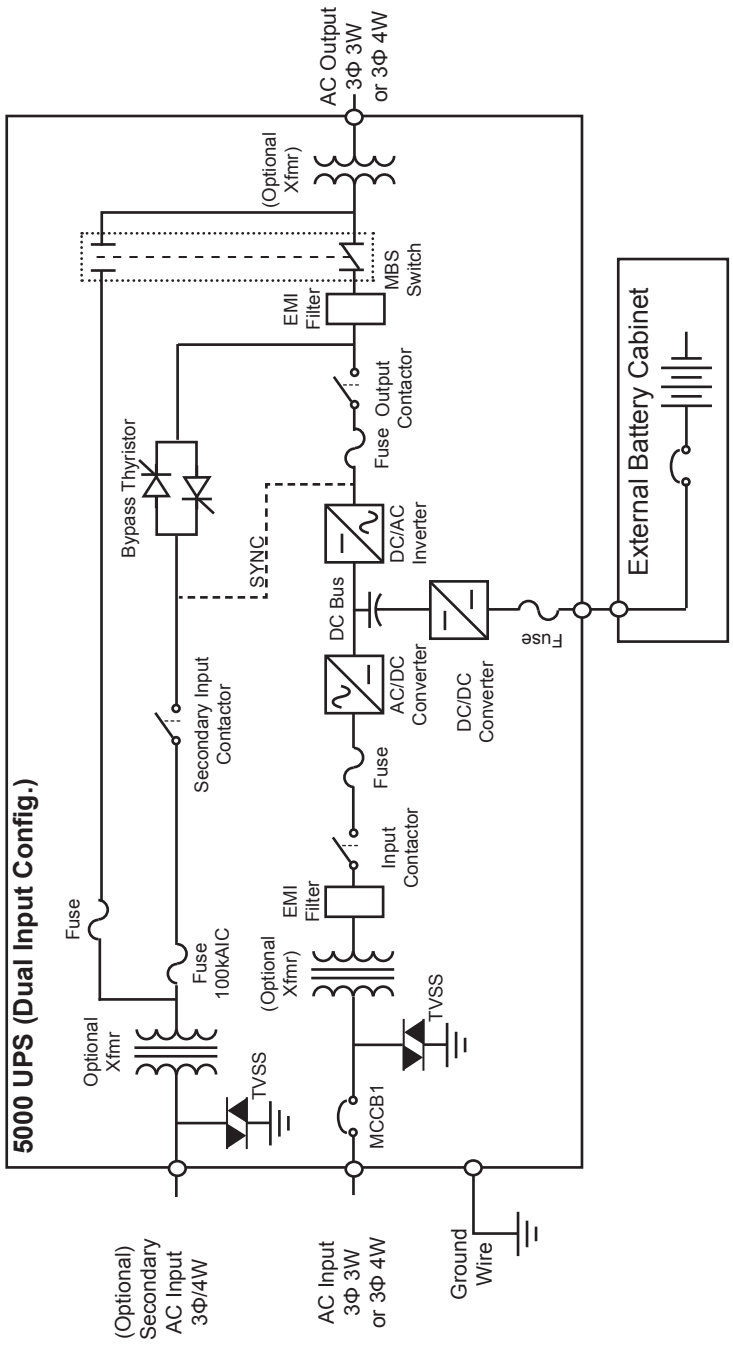


FIGURE 9.4: 5000 SERIES DUAL INPUT ONE-LINE W/ EXTERNAL BATTERY BACKUP

9.7 External Breakers

The UPS is not equipped with isolation circuit breakers. Qualified personnel should provide the external breakers for the AC input/output, bypass input and DC input.

Table 9.6 shows the minimum external breaker rating for each UPS. The bypass, input and output require 3-pole breakers.

TABLE 9.6: UPS MINIMUM BREAKER RATINGS

UPS MINIMUM BREAKER RATINGS		
Voltage	**20kVA**	**30kVA**
208 v or 208/120 V	80	110
220 V or 220/127 V	70	110
230 V or 230/132 V	70	100
240 V or 240/138 V	60	100
380 V or 380/220 V	40	60
400 V or 400/230 V	40	60
415 V or 415/240 V	35	60
480 V or 480/277 V	30	50
575 V or 575/332 V	25	40
600 V or 600/346 V	25	40

TABLE 9.7: DC (BATTERY) MINIMUM BREAKER RATINGS*

Voltage Capacity (Min.)	20kVA	30kVA
500 VDC	90A	150 A

* Toshiba supplied battery cabinets are UL-approved and come pre-installed circuit breakers

10 Communication Interfaces

10.1 Remote Contacts

The remote contacts interface is provided as a set of solid state switching devices. The switches are available through an I/O Switching Interface board located in the Instrumentation compartment of the I/O Bay on the right side of the UPS. The following chart shows the pin assignment for each signal.

TABLE 10.1: DRY CONTACT BOARD (PCB 12) TB 1-4 SPECIFICATIONS

Specifications	Value
DC Volts TB1: SPDT (NO) TB2: TB3, TB4:	 30 Vdc / 3 A, 125Vac / 3A 24Vdc / 8.3 mA 24Vdc / 1 A
TB1-4 - Wire Capacity	#26 AWG - #12 AWG
TB1-4 - Stripping Length	0.25 in. (6 mm)
TB1-4 - Torque	4.4 - 5.3 in.-lb (0.5 - 0.6 N·m)

TABLE 10.2: DRY CONTACT BOARD - TB2 & TB1 SIGNAL MAP

TB	No.	SIGNAL	
TB2			
TB2	-1	Switch1-A (GND)	IN1: REMOTE RUN
	-2	Switch1-B	
	-3	Switch2-A (GND)	IN2: REMOTE STOP
	-4	Switch2-B	
	-5	Switch3-A (GND)	IN3: CHARGE STOP
	-6	Switch3-B	
	-7	Switch4-A (GND)	IN4: SPARE
	-8	Switch4-B	
	-9	Switch5-A (GND)	IN5: SPARE
	-10	Switch5-B	
	-11	Switch6-A (GND)	IN6: SPARE
	-12	Switch6-B	
	-13	Switch7-A (GND)	IN7: SPARE
	-14	Switch7-B	
	-15	Switch8-A (GND)	IN8: SPARE
	-16	Switch8-B	

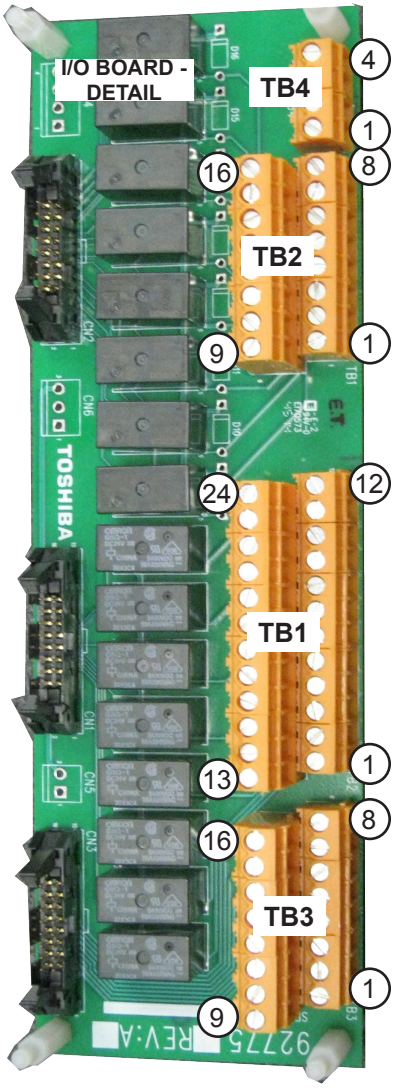


FIGURE 10.1 – I/O BOARD

TB	No.	SIGNAL	
TB1*			
TB1	**-1**	COM	OUT1: On Bypass
	-2	NC	
	-3	NO	
	-4	COM	OUT2: Online
	-5	NC	
	-6	NO	
	-7	COM	OUT3: On Backup
	-8	NC	
	-9	NO	
	-10	COM	OUT4: Warning
	-11	NC	
	-12	NO	
	-13	COM	OUT5: Fault
	-14	NC	
	-15	NO	
	-16	COM	OUT6: Fan Failure
	-17	NC	
	-18	NO	
	-19	COM	OUT7: Battery Low Voltage
	-20	NC	
	-21	NO	
	-22	COM	OUT8: Overload
	-23	NC	
	-24	NO	

* NOTE: The Output terminal strip TB1 provides eight (OUT1 thru OUT8) Form “C” NO (Normally Open) / NC (Normally Closed) dry type programmable contacts to drive annunciation signals sourced, or “wetted”, by external monitoring devices.

All output contacts are rated for NEC Class 2 operation (30VDC / 1ADC.)

See Table 10.1 for wiring and cabling details

TABLE 10.2: DRY CONTACT BOARD - TB3 & TB4 SIGNAL MAP *

TB	No.	TYPE	FUNCTION	DESCRIPTION
TB3				
TB3	**1**	NO Contact	Bypass Status	Bypass / Gnd (Switch is closed when UPS is in Bypass mode)
	2			
	3	NO Contact	SPARE	
	4			
	5	NO Contact	SPARE	
	6			
	7	Input	BBO/BOH	Battery Breaker Open/Battery Overheat Sense (Batt Cab CB Aux Switch)
	8			
	9	Input	Remote Run	P24 A3 / Remote Run (Closing external switch will start the UPS)
	10			
	11	Input	Remote Stop	P24 A3 / Remote Stop (Closing external switch will stop the UPS)
	12			
	13	Input	Charge Stop	P24 / Charge Stop (Closing external switch will stop the UPS Battery Charger circuit.)
	14			
	15	Input	Bat Cab Shunt Trip	(Places Battery Breaker shunt trip coil in parallel with UPS MCCB, so EPO will open both UPS and circuit breakers simultaneously)
	16			
TB4				
TB4	**1**	NO Contact	EPO Status	(Contact is closed when UPS is shut down)
	2			
	3	Input	Remote EPO	(Closing external switch will shut down the UPS)
	4			

*See Table 10.1 for wiring and cabling details

10.2 RemotEye Network Card

The optional RemotEye network card for the Toshiba UPS permits network monitoring and control of the UPS. This card is located on the back side of the UPS door next to DB9. The card provides a network, or LAN-based communication interface for the UPS. When installed, the UPS can be managed remotely using the common SNMP, HTTP , BACnet, or Modbus RS-232/RS-485 or web-based network protocols. The following diagram shows the flow of the Network Management Station.

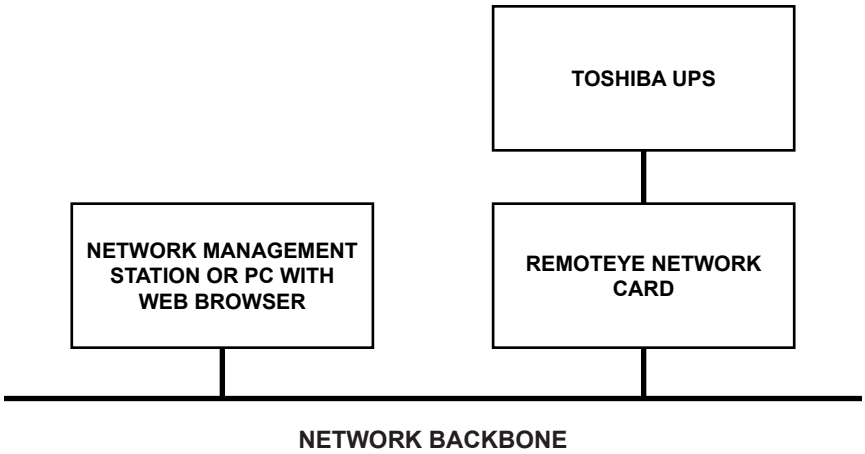


FIGURE 10.4: NETWORK INTERFACE

10.3 UPS LAN Shutdown Signal Operation

When the UPS stop signal is sent to the UPS through pin 2 and 3 of the external contact interface, it is possible to automatically reset the following operating systems (OS), which can automatically implement the shutdown function and restart the operation: **Windows NT, IBM OS/2 LAN server, LANtastic**

Parameter 641 – UPS Shutdown by LAN Input Signal Enabled/Disabled

Parameter 642 – UPS Shutdown by LAN Signal Permitted Time Window (Adjustable)

With the **UPS Shutdown by LAN Signal** function enabled, when line power fails and the UPS goes to backup the LAN will shutdown even if the UPS returns to normal mode during the shutdown process.

LAN shutdown can take several minutes. The **UPS Shutdown by LAN Signal** function has a companion **UPS Shutdown by LAN Signal Permitted Time Window** parameter that can be set to allow sufficient time to complete the LAN shutdown process (default: 10 minutes) even if line power is restored during LAN shutdown.

LAN shutdown is treated as a restart after battery shutdown. The restart of the LAN will be determined by the **Restart After Battery Shutdown** timer.

Connect only the UPS stop signal to the external contact interface for automatic processing so that the UPS output will not be turned off by mistake.

If the computer is started/restarted within 10 minutes after the recovery from a power failure, the power supply may be reset while the computer is restarting.

11 Specifications

11.1 Specifications – 208/120V$_{in}$, 208/120V$_{out}$ Single/Dual Cabinet

5000 Series Industrial Duty 3-Phase In/3-Phase Out		
Specifications	**20 kVA**	**30 kVA**
Input		
KVA rating	20 kVA	30 kVA
Phase/Line	3PH-4W + Ground	
Voltage	208/120 V (+10% to -15%)	
Frequency	50/60 Hz (±5 Hz)	
Input power factor	>0.98	
THD	< 3% @ 100% Load	
Input Current Limit %	135%	
Walk-in Function	From 20 to 100% over 5 sec	
Start-up Delay	30 sec	
Output		
Phase/Line	3PH-4W + Ground	
Voltage	208/120 V	
Voltage adjustable range	±5% of Rated Voltage	
Frequency	50/60 Hz	
Rated load power factor	0.9	
Admissible output crest factor	2.5	
Frequency Regulation	±0.1% in free running mode	
Frequency Slew Rate	0.5 Hz/sec	
Frequency Synchronous Range	50/60 Hz (±5 Hz)	
Voltage Regulation	±3%	
Regulation time	Regulation time to +/-1 % <60 msec Regulation time to +/-3 % <20 msec	
Voltage distortion rate / THD	Linear load: ≤3%, Non-linear load: ≤5%	
Overload	109% Continuous 110 - 124% for 6 min., 125 - 149% for 90 sec, 150% for 30 sec	
Transient Response	±3% Max with a 100% Step Loads, ±2% Max with Loss/Return AC input, ±3% Max when load transfers To/From Bypass	
System Efficiency	89% for 208/120V unit	88% for 208/120V unit
Battery		
Battery Nominal Voltage	288 Vdc	
Battery Minimum Voltage	230.4 Vdc (@1.6V/Cell)	
Battery Float Voltage	324 Vdc	
DC Ripple voltage	< 0.5% RMS Ripple @ 100% Load with Battery Connected	

5000 Series Industrial Duty 3-Phase In/3-Phase Out		
Specifications	**20 kVA**	**30 kVA**
Maximum Re-charge Current *(Batt. Charge Current + Load cannot exceed 135% or Rated Input)*	4 A default (20 A max. factory adjustable)	6 A default (20 A max. factory adjustable)
Bypass		
Configuration	3PH-4W + Ground	
Voltage	208/120 V	
Frequency	50/60 Hz (+/-5 Hz)	
Bypass Overload Capacity	125% for 10 min, 150% for 2 min, 1000% for 1 Cycle	
Bypass Disable	No	
Mechanical		
Cables entry	Bottom	
Dimensions Single Cabinet Dual-Cabinet	 59.38 in. x 38.70 in. x 92.09 in. (1508 mm x 983 mm x 2340 mm) 84.34 in. x 38.72 in. x 92.09 in. (2143 mm x 984 mm x 2340 mm)	
Weight Single Cabinet Dual Cabinet	 1700 lb (771.1 kg) (No Internal Batteries) 2680 lb (1215.6 kg) (With Internal Batteries)	
Shipping Weight Single Cabinet Dual Cabinet	 (TBD) lb ((TBD) kg) (No Internal Batteries) (TBD) lb ((TBD) kg) (With Internal Batteries)	
Cooling	Forced Air	
Paint Color	White	
Environmental		
Operating temperature	14 to 122 °F (-10 to 50 °C)	
Storage temperature	-4 to 158 °F (-20 to 70 °C)	
Humidity	5% to 95% Non-Condensing	
Audible noise	<65 dBA @ 1 m Typical	
Operating Altitude	3280 ft. (1000 m)	
Degree of Protection	NEMA 3R	
Electromagnetic Compatibility	IEC 62040-2, Cat. 3 UPS	
Communication		
Communication	RemotEye 4	
Dry Contacts	Included	
Emergency Power Off (EPO)	(User-provided remote contact)	
Other		
Compliance	UL 1778, cUL, NEC, ISO9001, ISO14001, ANSI C62.41 (IEEE 587), NEMA PE 1-1993	

11.2 Specifications – Dual Cabinet w/ Internal Transformers

5000 Series Industrial Duty 3-Phase In/3-Phase out		
Specifications	**20 kVA**	**30 kVA**
Input		
KVA rating	20 kVA	30 kVA
Phase/Line	3PH-4W + Ground OR 3PH-3W + Ground	
Voltage	Nominal (Xfmr.) Input Voltage +10% to -15%, 3P/4W +GND or 3P/3W + GND **Key** **Transformer Voltage** **Key** **Transformer Voltage** C 208/120V (Auto-Xfmr) O 200V (Iso Xfmr) D 380/220V (Auto-Xfmr) P 208V (Iso Xfmr) E 220/127V (Auto-Xfmr) Q 220V (Iso Xfmr) F 230/132V (Auto-Xfmr) R 230V (Iso Xfmr) G 240/138V (Auto-Xfmr) S 240V (Iso Xfmr) H 380/220V (Auto-Xfmr) T 380V (Iso Xfmr) I 400/230V (Auto-Xfmr) U 400V (Iso Xfmr) J 415/240V (Auto-Xfmr) V 415V (Iso Xfmr) K 480/277V (Auto-Xfmr) W 480V (Iso Xfmr) L 575/332V (Auto-Xfmr) Y 575V (Iso Xfmr) M 600/346V (Auto-Xfmr) Z 600V (Iso Xfmr)	
Frequency	50/60 Hz (±5 Hz)	
Input power factor	>0.98	
THD	< 3% @ 100% Load	
Input Current Limit %	135%	
Walk-in Function	From 20 to 100% over 5 sec	
Start-up Delay	30 sec	
Output		
Phase/Line	3PH-4W + Ground OR 3PH-3W + Ground	
Voltage	Nominal (Xfmr.) Input Voltage +10% to -15%, 3P/4W +GND or 3P/3W + GND **Key** **Transformer Voltage** **Key** **Transformer Voltage** C 208/120V (Auto-Xfmr) O 200V (Iso Xfmr) D 380/220V (Auto-Xfmr) P 208V (Iso Xfmr) E 220/127V (Auto-Xfmr) Q 220V (Iso Xfmr) F 230/132V (Auto-Xfmr) R 230V (Iso Xfmr) G 240/138V (Auto-Xfmr) S 240V (Iso Xfmr) H 380/220V (Auto-Xfmr) T 380V (Iso Xfmr) I 400/230V (Auto-Xfmr) U 400V (Iso Xfmr) J 415/240V (Auto-Xfmr) V 415V (Iso Xfmr) K 480/277V (Auto-Xfmr) W 480V (Iso Xfmr) L 575/332V (Auto-Xfmr) Y 575V (Iso Xfmr) M 600/346V (Auto-Xfmr) Z 600V (Iso Xfmr)	
Voltage adjustable range	±5% of Rated Voltage	
Frequency	50/60 Hz	
Rating Load power factor	0.9	
Admissible output crest factor	2.5	
Frequency Regulation	±0.1% in free running mode	

5000 Series Industrial Duty 3-Phase In/3-Phase out		
Specifications	**20 kVA**	**30 kVA**
Frequency Slew Rate	0.5 Hz/sec	
Frequency Synchronous Range	50/60 Hz (±5 Hz)	
Voltage Regulation	±3%	
Regulation time	Regulation time to +/-1 % <60 msec Regulation time to +/-3 % <20 msec	
Voltage distortion rate / THD	Linear load: ≤3%, Non-linear load: ≤5%	
Overload	109% Continuous 110 - 124% for 6 min., 125 - 149% for 90 sec, 150% for 30 sec	
Transient Response	±3% Max with a 100% Step Loads, ±2% Max with Loss/Return AC input, ±3% Max when load transfers To/From Bypass	
System Efficiency	85% - 89% (Depending on configuration)	
Battery		
Battery Nominal Voltage	288 Vdc	
Battery Minimum Voltage	230.4 Vdc (@1.6V/Cell)	
Battery Float Voltage	324 Vdc	
DC Ripple voltage	< 0.5% RMS Ripple @ 100% Load with Battery Connected	
Maximum Re-charge Current *(*Batt. Charge Current + Load cannot exceed 135% or Rated Input)*	4 A default (20 A max. factory adjustable*)	6 A default (20 A max. factory adjustable*)
Bypass		
Configuration	3PH-4W + Ground OR 3PH-3W + Ground	
Voltage	Nominal (Xfmr.) Input Voltage +10% to -15%, 3P/4W +GND or 3P/3W + GND **Key — Transformer Voltage** C 208/120V (Auto-Xfmr) D 380/220V (Auto-Xfmr) E 220/127V (Auto-Xfmr) F 230/132V (Auto-Xfmr) G 240/138V (Auto-Xfmr) H 380/220V (Auto-Xfmr) I 400/230V (Auto-Xfmr) J 415/240V (Auto-Xfmr) K 480/277V (Auto-Xfmr) L 575/332V (Auto-Xfmr) M 600/346V (Auto-Xfmr) **Key — Transformer Voltage** O 200V (Iso Xfmr) P 208V (Iso Xfmr) Q 220V (Iso Xfmr) R 230V (Iso Xfmr) S 240V (Iso Xfmr) T 380V (Iso Xfmr) U 400V (Iso Xfmr) V 415V (Iso Xfmr) W 480V (Iso Xfmr) Y 575V (Iso Xfmr) Z 600V (Iso Xfmr)	
Frequency	50/60 Hz (+/-5 Hz)	
Bypass Overload Capacity	125% for 10 min, 150% for 2 min, 1000% for 1 Cycle	
Bypass Disable	No	
Mechanical		

5000 Series Industrial Duty 3-Phase In/3-Phase out		
Specifications	**20 kVA**	**30 kVA**
Cables entry	Bottom	
Dimensions (Dual-Cabinet)	84.34 in. x 38.72 in. x 92.09 in. (2143 mm x 984 mm x 2340 mm)	
Weight (Dual-Cabinet, 3 XFMRS)	2680 lb (1215.6 kg)	2680 lb (1215.6 kg)
Shipping Weight (Dual-Cabinet)	(TBD) lb ((TBD) kg)	(TBD) lb ((TBD) kg)
Cooling	Forced Air	
Paint Color	White	
Environmental		
Operating temperature	14 to 122 °F (-10 to 50 °C)	
Storage temperature	-4 to 158 °F (-20 to 70 °C)	
Humidity	5% to 95% Non-Condensing	
Audible noise	<65 dBA @ 1 m Typical	
Operating Altitude	3280 ft. (1000 m)	
Degree of Protection	NEMA 3R	
Electromagnetic Compatibility	IEC 62040-2, Cat. 3 UPS	
Communication		
Communication	RemotEye 4	
Dry Contacts	Included	
Emergency Power Off (EPO)	(User-provided remote contact)	
Other		
Compliance	UL 1778, cUL, NEC, ISO9001, ISO14001, ANSI C62.41 (IEEE 587), NEMA PE 1-1993	

11.3 Efficiency vs. Load (Typical)

TABLE 11.3: % EFFICIENCY AT VARIOUS LOADS 208/120V$_{IN}$, 208/120V$_{OUT}$* (SINGLE AND DUAL CABINET MODELS)

UPS Load Capacity	Efficiency at Percent Full Load*			
	25%	50%	75%	100%
20kVA	76%	85%	88%	89%
30kVA	77%	87%	87%	88%

* Subject to change without notice.

TABLE 11.4: % EFFICIENCY AT VARIOUS LOADS WITH THREE TRANSFORMERS (IN-, OUT-, ALTERNATE)*

UPS Load Capacity	Efficiency at Percent Full Load*			
	25%	50%	75%	100%
20kVA	72%	81%	84%	85%
30kVA	73%	83%	83%	84%

* Subject to change without notice.

11.4 Thermal Loss vs. Load (Typical)

TABLE 11.5: THERMAL LOSS AT VARIOUS LOADS 208/120V$_{IN}$, 208/120V$_{OUT}$* (SINGLE AND DUAL CABINET MODELS)

UPS Load Capacity	BTU/hr. Loss at Percent Full Load*				
	0%	25%	50%	75%	100%
20kVA	1365	4849	5419	6281	7591
30kVA	1706	6880	6883	10,325	12,563

* Subject to change without notice.

TABLE 11.6: THERMAL LOSS AT VARIOUS LOADS THREE TRANSFORMERS (IN-, OUT-, ALTERNATE)*

UPS Load Capacity	BTU/hr. Loss at Percent Full Load*				
	0%	25%	50%	75%	100%
20kVA	1365	5971	7203	8774	10,833
30kVA	1706	8519	9435	14,152	17,584

* Subject to change without notice.

11.5 Estimated Runtime on Internal Batteries

Following are charts of the estimated runtime for the 5000 Series 20kVA on internal batteries at various loads at a 0.8 and 0.9 Power Factor.

These runtimes are estimates based on new batteries operating at 76 °F. Actual runtimes may vary due to manufacturing variations, previous discharge profiles, battery age, and operating temperature.

TABLE 11.1: ESTIMATED RUNTIME ON INTERNAL BATTERIES AT VARIOUS LOADS – 0.8 PF [1]

UPS	Estimated Runtime in Minutes at Percent Full Load [1]									
	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
20kVA (0.8 PF)	>60	42	28.5	25	21.5	19	17	14.5	13.5	11.5

1 – Subject to change without notice.

TABLE 11.2: ESTIMATED RUNTIME ON INTERNAL BATTERIES AT VARIOUS LOADS – 0.9 PF [1]

UPS	Estimated Runtime in Minutes at Percent Full Load [1]									
	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
20kVA (0.9 PF)	>60	38	25	23	20	17.5	14.5	13	12.5	10.5

1 – Subject to change without notice.

12 Operator Interface

12.1 Operator Controls

Figure 12.1 shows the function and location of the LED lights and operating button on the graphic display panel. The exterior indicator lights location and function are shown in Section 7.2.

NOTICE

Press the reset button for at least 2 seconds to reset the display.

The display may not respond if the button press is too short.

Touch Screen Display and Control Panel

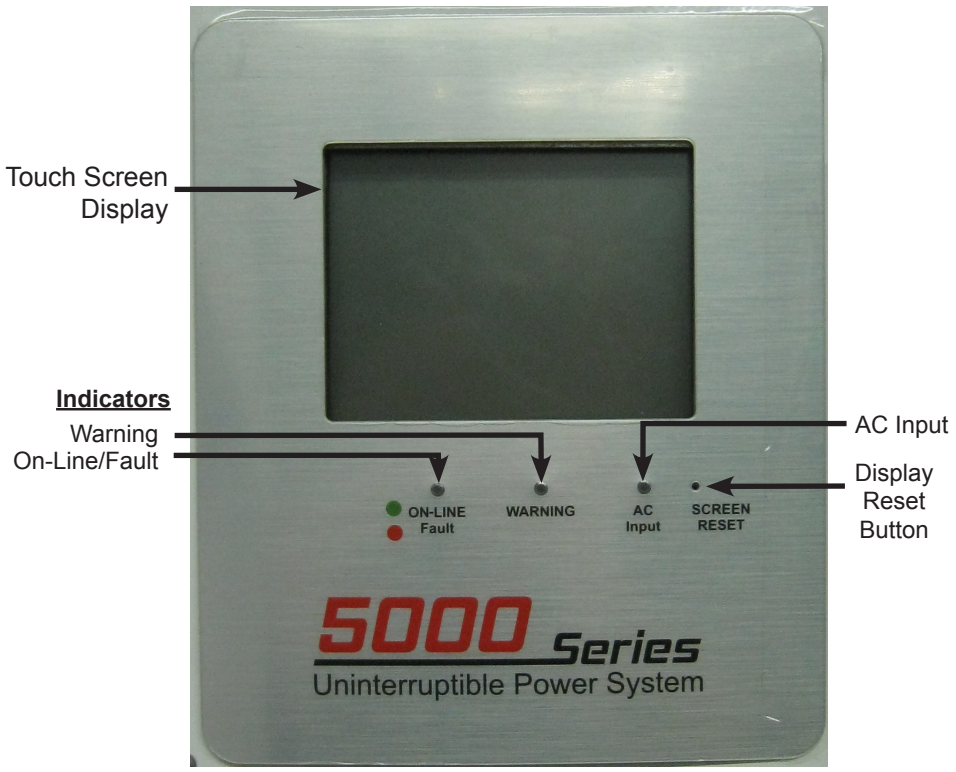


FIGURE 12.1: UPS DISPLAY PANEL

12.2 Operator Controls – Light Emitting Diodes (LED)

The following table describes the front panel LED behaviors and the associated meaning.

TABLE 12.1: LED BEHAVIOR KEY

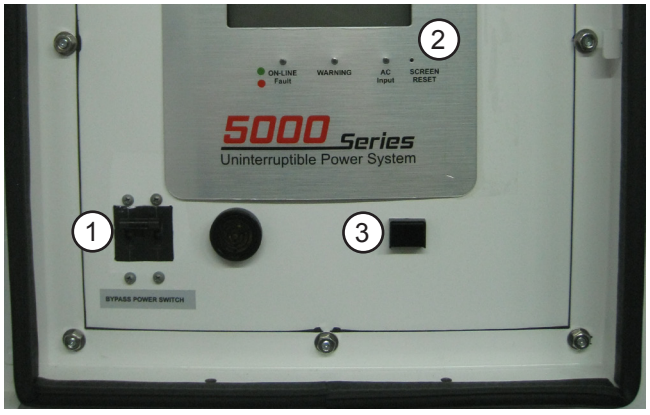
LED	Behavior	Significance/Meaning
On-Line/ Fault	Green – ON	UPS is in On-Line, Backup, or Battery Test mode.
	Green – OFF	UPS in Bypass or Shutdown mode.
	Red – ON	One or more Ffaults occurred. See *Records> Fault/Warning* for details.
	Red – OFF	No fault occurred.
Warning	Amber – Flashing	One or more Warnings occurred. See *Records > Fault/Warning* for details.
	Amber – OFF	No Warning occurred.
A/C Input	Green – ON	Input or Bypass voltage is within specified range.
	Green – Flashing	Input or Bypass voltage is over specified range.
	Green – OFF	Input or Bypass voltage is under specified range.

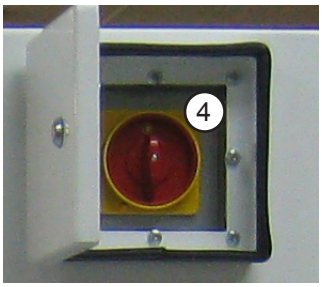
NOTE: On-Line/Fault LEDs – Appear Amber if Green and Red flash concurrently.

12.3 Operator Controls

TABLE 12.2: MANUAL OPERATOR SWITCHES

Operator Controls	
No.	**Function**
1	**UPS MCCB (Main Power Switch)** – LSwitches main power to the UPS “ON” and “OFF”.
2	**Screen Reset Switch** – Allows the display to be rebooted without powering down the UPS. The display can be reset by pressing the recessed Reset Switch with a thin probe, such as a paper clip.
3	**LED Test** –Test button for *Status Indicator LED Light Tree.* Press and hold to verify LEDs illuminate. Release to end test.
4	**Bypass/On-Line Rotary Switch** – Switches main power to the UPS “ON” and “OFF”.





EPO (Emergency Power Off) Function

These units are equipped to accept a remote-mounted EPO switch only.

The remote EPO feature enables quick shutdown of the UPS AC output and battery circuits.

The EPO function is initiated by pressing the EPO switch. The effect of using the EPO switch is the same whether the UPS is in the AC Input Mode, Battery Backup Mode, or the Bypass Mode.

The Figure 13-2 shows the UPS condition after application of the EPO switch. See **Section 13.6 Restore System Power after an EPO Shutdown**.

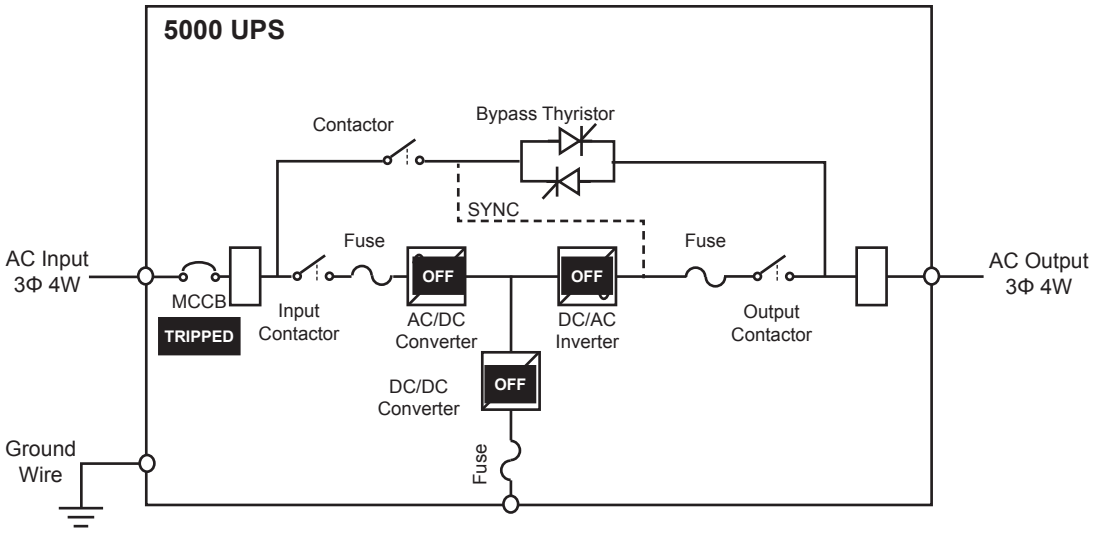
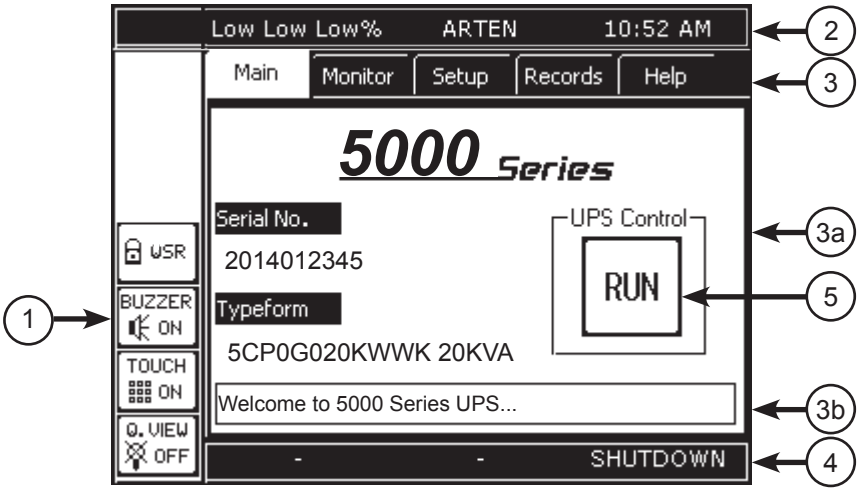


FIGURE 12-3: EFFECT OF EPO ACTIVATION

12.4 Touch Screen Display

The various components of the touchscreen display are identified in Figure 12-3.

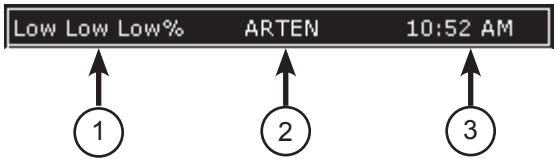


Touchscreen Layout	
No.	**Function**
1	**Quick Access Toolbar** – Interface/Status Switches (push-button icon changes to reflect current status) (See Section 12.13)
2	**Header Bar** – Displays system load, status, and time.
3	**Menu TABS** – Top level menu. Touch a Tab to activate the display mode
3a	Data display area
3b	Update – Displays current status and operation hints.
4	**Footer Bar** – Displays Faults, Warnings, and UPS Operating Mode.
5	**UPS Control** – Toggles between On-Line (**RUN**) and bypass (**STOP**) modes. (See Sections 13.2, 13.3) Press **RUN:** UPS switches to On-Line mode, label changes to **STOP**. Press **STOP:** UPS switches to Bypass mode, label changes to **RUN**.

FIGURE 12.3: TOUCHSCREEN DISPLAY COMPONENTS (INITIAL MAIN DISPLAY)

12.5 Header Bar

The Header Bar on the graphic display panel displays three system parameters: the System Load, Current Status, and System Time.

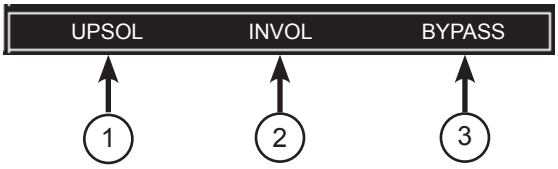


Header Bar Components	
No.	**Function**
1	**System Load** – Load per each phase as percent of full load. **Low** – Less than 10% Load.
2	**Current Status** – UPS status at the moment. (Status is delayed by a few seconds)
3	**System Time** – Current time in AM-PM format

FIGURE 12.4: HEADER BAR DISPLAY COMPONENTS

12.6 Footer Bar

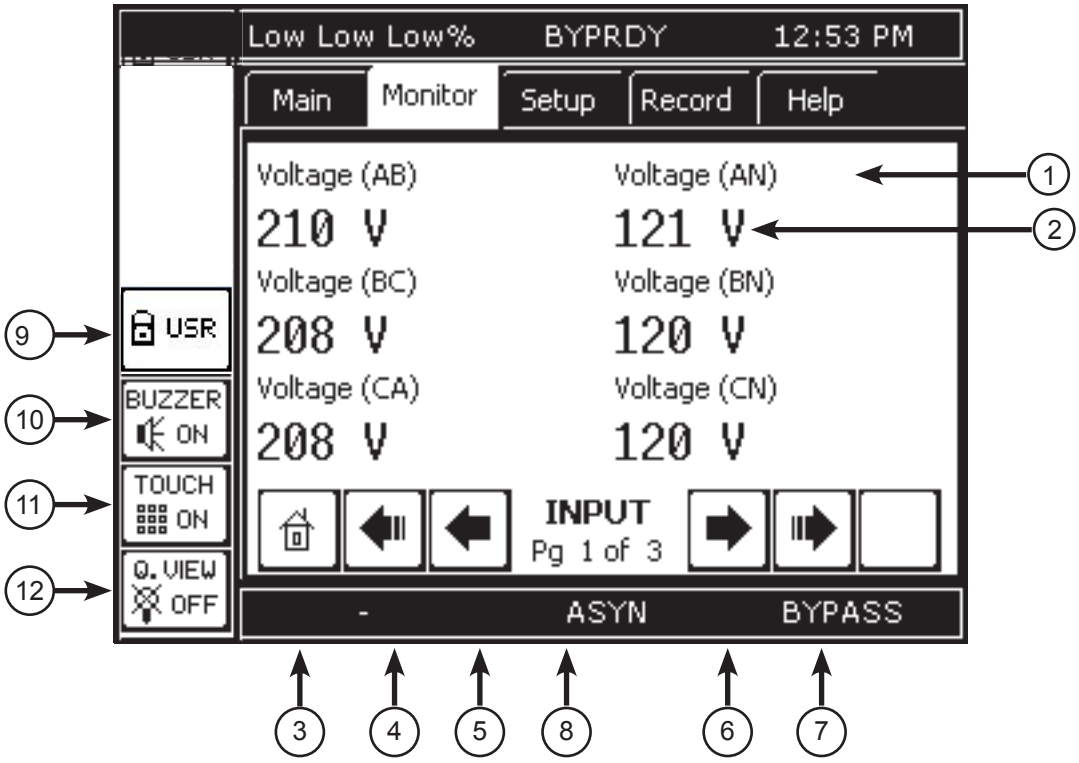
The Footer Bar on the graphic display panel displays three system parameters:



Footer Bar Components	
No.	**Function**
1	**Fault** – Displays last fault sensed by UPS. A Fault causes the UPS to switch to bypass and it will not automatically reset.
2	**Warning** – Displays last warning sensed by UPS. Multiple frequent warnings of the same type may induce a fault condition.
3	**UPS Mode** – Current state of UPS.

FIGURE 12.5: FOOTER BAR DISPLAY COMPONENTS

12.7 Touchscreen Data and Controls



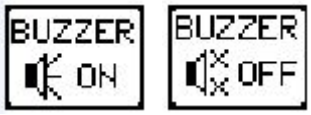
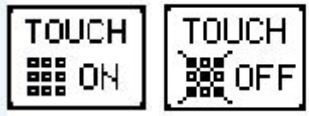
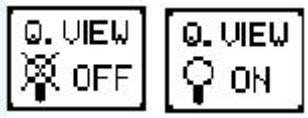
Touch Screen Controls	
No.	**Function**
Display	
1	Parameter Description
2	Parameter Value
Navigation Bar	
3	Home
4	Go To First Page
5	Go To Previous Page
6	Go To Next Page
7	Go To Last Page
8	Parameter Type (Input, Output, Communication, DC) and Pages of Data.
Quick Access Toolbar	
9	Security Level (USR, ADM)
10	Warning Buzzer Switch/Status (press for ON, press again for OFF)
11	Touchscreen Enable/Disable
12	Quick View Selector (press for Quick View, press again for Normal View)

FIGURE 12.6: TOUCHSCREEN CONTROLS

12.8 Quick Access Toolbar

The Quick Access Toolbar allows the operator easily perform routine commands. The Quick Access Toolbar buttons and their function are listed below.

TABLE 12.2: QUICK ACCESS TOOLBAR CONTROLS

Quick Access Toolbar Controls	
Icon	**Function**
	Security/Access Level – Access levels are: USR, ADM
	Warning Buzzer mute. Press to silence buzzer. Buzzer will sound again at next fault event. (To silence buzzer for all fault events set to “Disable”.)
	Touch Screen ON/OFF button. Press to toggle between ON and OFF. • ON enables all touchscreen active areas. • OFF disables all touchscreen areas except the TOUCH button.
	Quick View On/Off Selector – Press to toggle between Normal view and Quick view. Quick view displays a simultaneous summary of the Input/Output/Bypass/DC Voltages and Currents **See Section 12.13**.

12.9 5000 Menu Tree

Below is a menu tree for the 5000 display.

- Quick Access Toolbar buttons allow immediate control of important functions.
- Menu Tabs allow access to varying degrees of detailed information concerning the UPS operation, performance and parameters. The degree of information available is determined by the Security mode, which can be changed pressing the top Quick Access Toolbar button and entering the appropriate password.

(Quick Access Toolbar Buttons)

ADM – Security Mode: USR and ADM

BUZZER ON – Toggles between BUZZER ON, BUZZER OFF

TOUCH ON – Toggles between enabling and disabling the touchscreen.

Q. VIEW ON – Toggles between Quick View and standard view (Q. VIEW OFF)

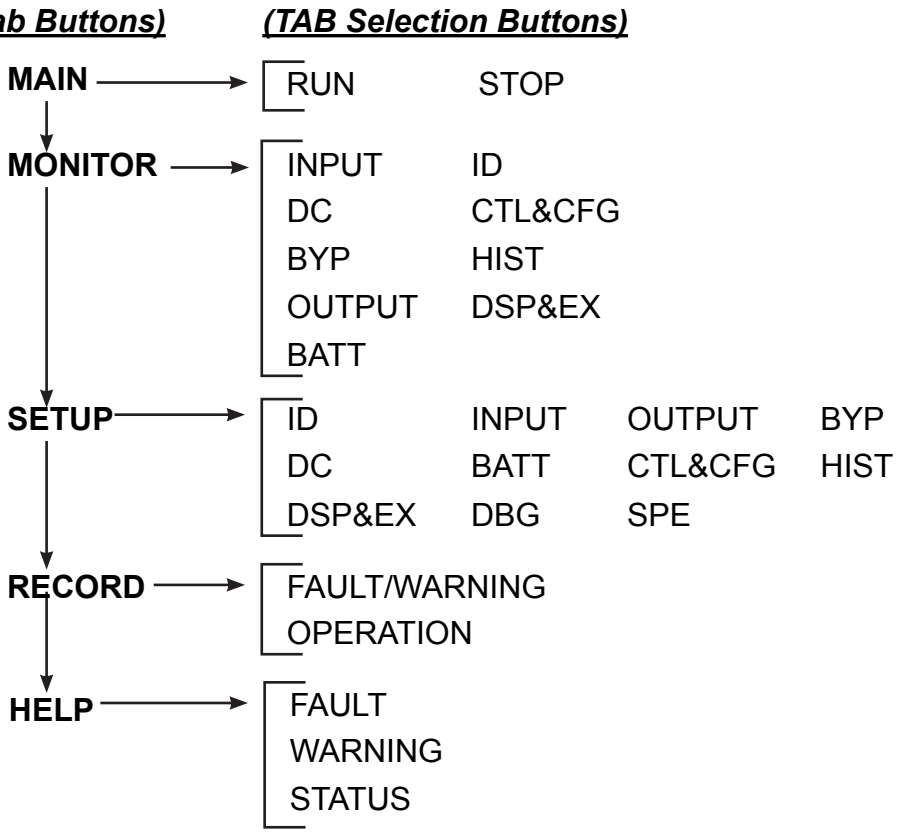


FIGURE 12.7 – MENU TREE

12.10 Toolbar: Security

The UPS initializes in the USR, or lowest security mode. To change the display security level, press the Security button.

The screen displays an alpha/numeric keypad to enter the appropriate password for the desired security level. The UPS ships with a default ADM password of ADMIN.

In the example below, to change the security level from USR to ADM:

1. Press the Security button. The alpha/numeric keypad is displayed.
2. Type in the ADM password “ADMIN” – Press the ABC button once for A, twice rapidly for B, etc.
3. After entering the password, press WRITE.
4. If the password is accepted the display will show “Successful”. Press QUIT to return to the Main display, and the Security button will display the ADM security level.

   If the password is not accepted, you can retry submitting the password as many time as desired. Press QUIT to exit the Change Password without changing the password and return to the main screed.

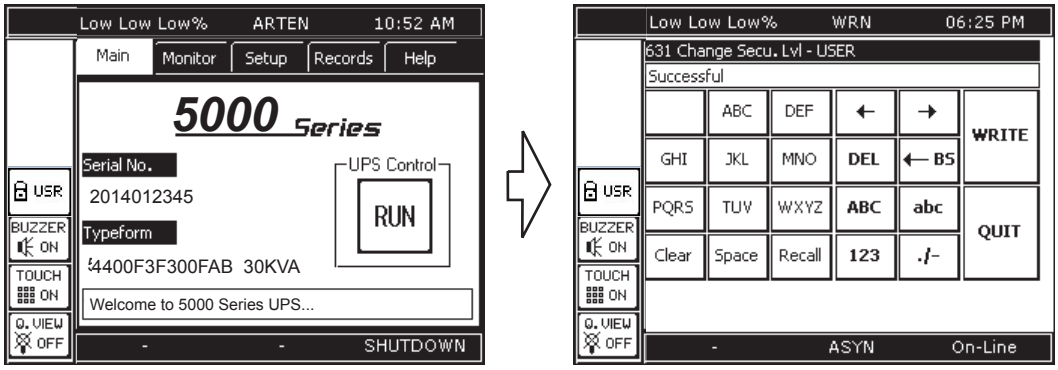


FIGURE 12.8: CHANGING SECURITY LEVEL

12.11 Toolbar: Buzzer ON/OFF

The UPS Buzzer sounds when a fault occurs or when the UPS switched to backup mode. The Toolbar allows the user to turn on/off the buzzer.

The buzzer can also be enabled or disabled through the setup menu. If the Buzzer is disabled through the setup menu, the Toolbar Buzzer button will be disabled.

12.12 Toolbar: Touch ON/OFF

The touchscreen can be turned OFF (locked) by pressing the TOUCH ON/OFF button. With TOUCH OFF, only the TOUCH button is active, the rest of the display will not respond to touch.

12.13 Toolbar: QUICK VIEW ON/OFF

At anytime while using the tabs to view system details, the summary of the UPS Input, Output, and DC Bus can be viewed by pressing the Q. VIEW button (Button will display Q. VIEW ON). The illustration below highlights the critical features of the Quick View display.

Exit Quick View by pressing the Q. VIEW button again. (Button will display Q. VIEW OFF)

TABLE 12.3 – QUICK VIEW DISPLAY

No.	Description
1	Displays Vin, Vout, and Vbyp for all three phases
2	Changes voltage display mode: Press repeatedly to display sequentially the voltage as: Line-to-Line (LL), Line-to-Neutral (LN), and Voltage as a % of rated Voltage (%). The highlighted icon indicates the voltage display mode.
3	Displays output current for all three phases.
4	Changes current display mode: Press repeatedly to display alternately the current in Amps (A), or as a % of rated current (%). The highlighted icon indicates the current display mode.
5	Displays DC Bus voltage, Battery voltage, Battery discharge current, and DC-AC Efficiency.

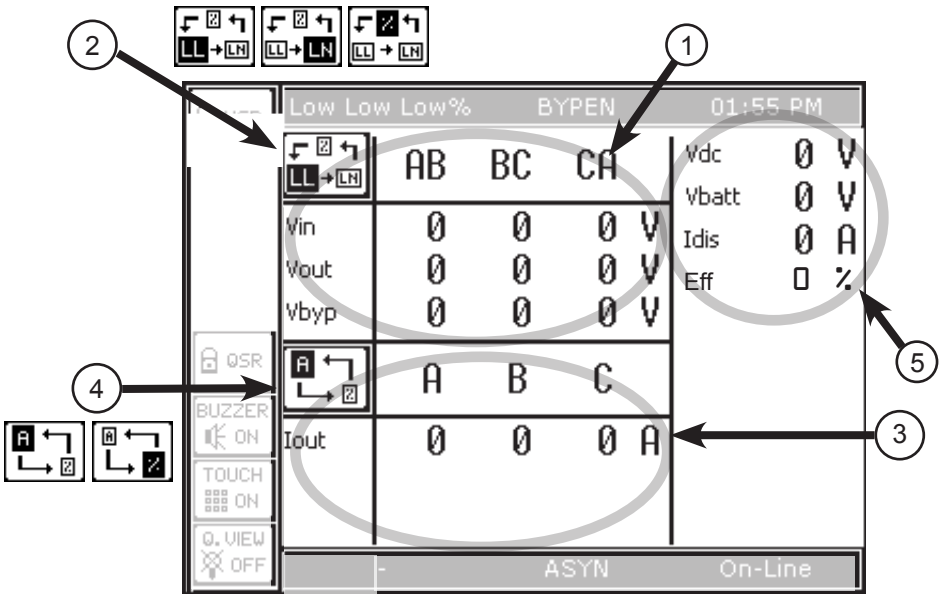
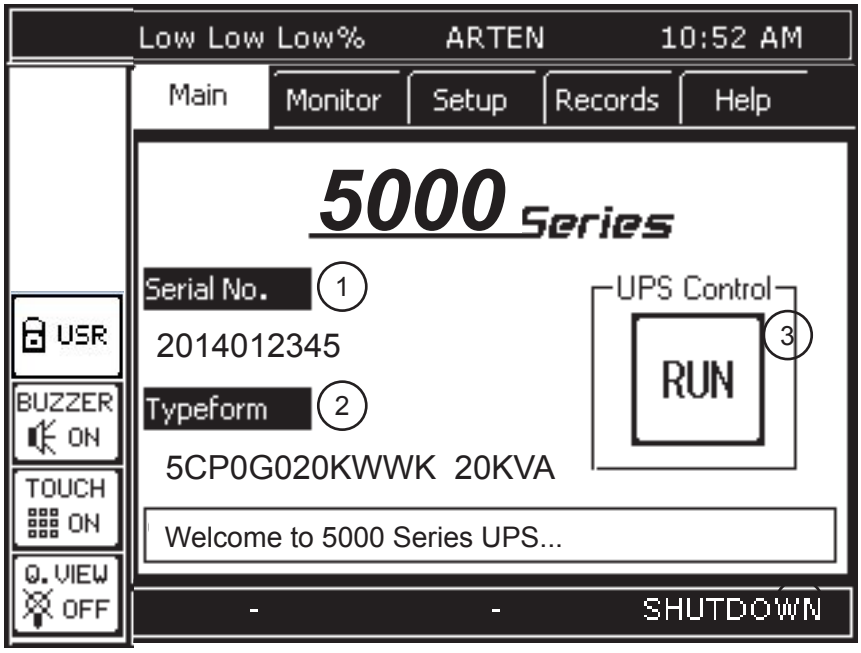


FIGURE 12-9: QUICK VIEW DISPLAY

12.14 Tab: Main – RUN/STOP

The Main tab displays the UPS Serial Number,Typeform and RUN/STOP button.



Main Tab Components	
No.	**Function**
1	**Serial Number** – UPS Serial Number
2	**Typeform** – UPS typeform
3	**UPS Control** – Toggles between On-Line (**RUN**) and Bypass (**STOP**) modes. Press **Run:** UPS switches to On-Line mode, label changes to **STOP**. Press **STOP:** UPS switches to Bypass mode, label changes to **RUN**.
4	**Information Bar** – Randomly displays status, helpful hints, acronym definitions every two seconds.

FIGURE 12.10: MAIN TAB COMPONENTS

RUN/STOP Button Operation

Operation of the RUN/STOP button:

When the UPS is in BYPASS mode, the RUN button is displayed.

1. To switch the UPS to In-Line operation, press the RUN button.

2. The RUN icon changes to an Hourglass for 3 seconds. The control button is disabled while the hourglass is displayed.

   The same delay occurs when switching from RUN to STOP.

3. After the hourglass icon clears the STOP icon is displayed. The UPS is in In-Line mode.

4. To put the UPS back into Bypass mode, press the STOP button. The hourglass will display as in step 2, then the button will display the RUN icon.

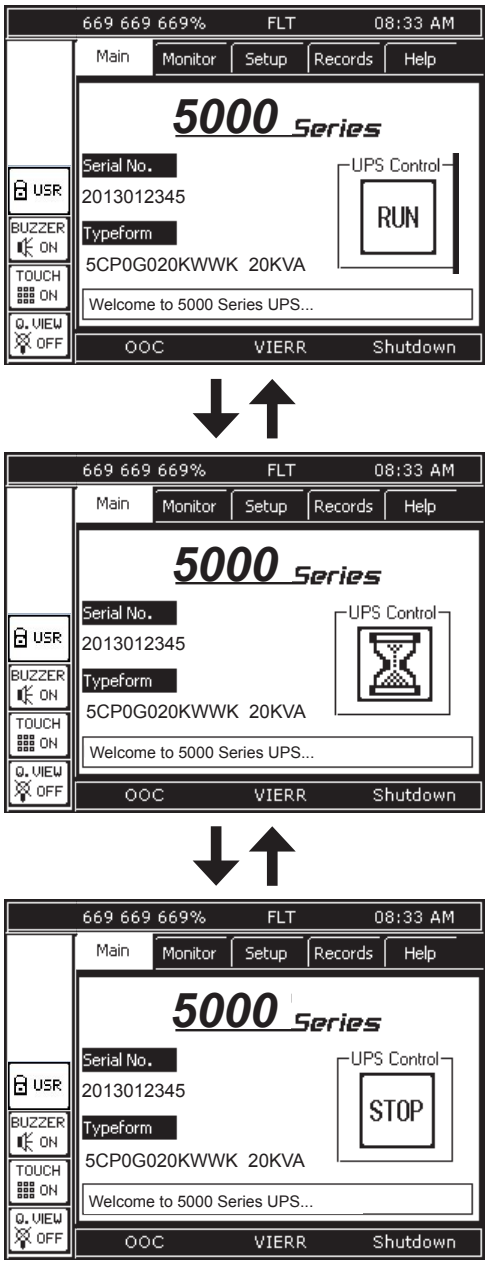


FIGURE 12.11: RUN/STOP BUTTON OPERATION

12.15 Tab: Monitor

The MONITOR tab allows the user to select a specific group of performance parameters to view; Input, Output, Bypass, DC Link, ID, Control and Configuration, History, and Display and External Communications (RemotEye).

The right side of the display is a vertical stack of five buttons: 4 active and 1 reserved for future use.

The middle of the display contains five buttons arranged in a diagram representing the functional model of the UPS. The lines connecting the mimic buttons represent the power flow from input to output. A thin line indicates no current flow, and a thick or bold line indicates current flow. See the Mimic Display current Flow Indicator illustration on the following page.

The figure below illustrates the data displayed when the corresponding button is pressed.

MONITOR TAB

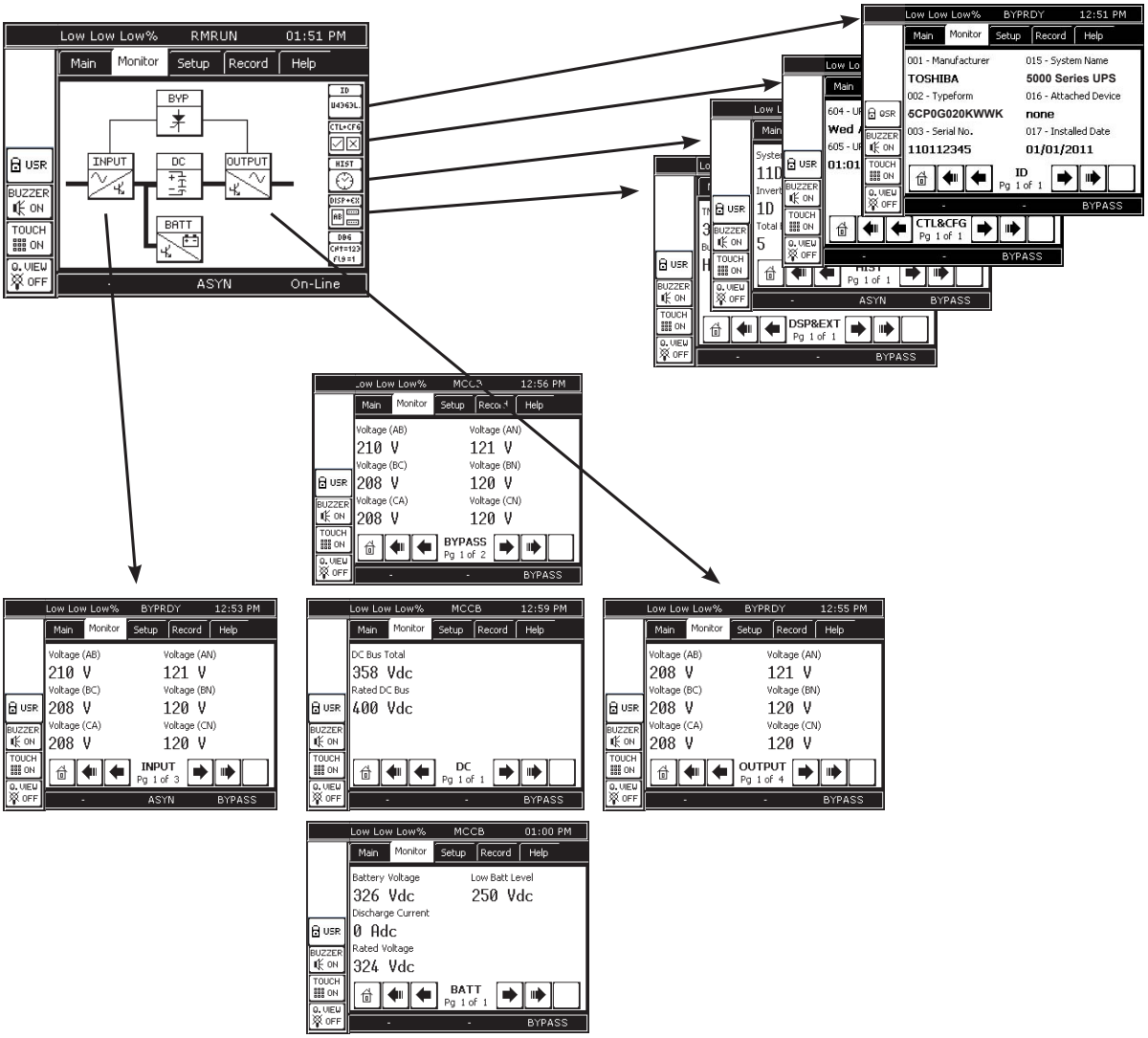


FIGURE 12.12: MONITOR TAB DISPLAY OPTIONS

The mimic display indicates the power flow through, or around, the UPS. There are four possible modes the UPS operates in: Off, Bypass, On-Line, and Backup. The figure below illustrates the display for each of these modes.

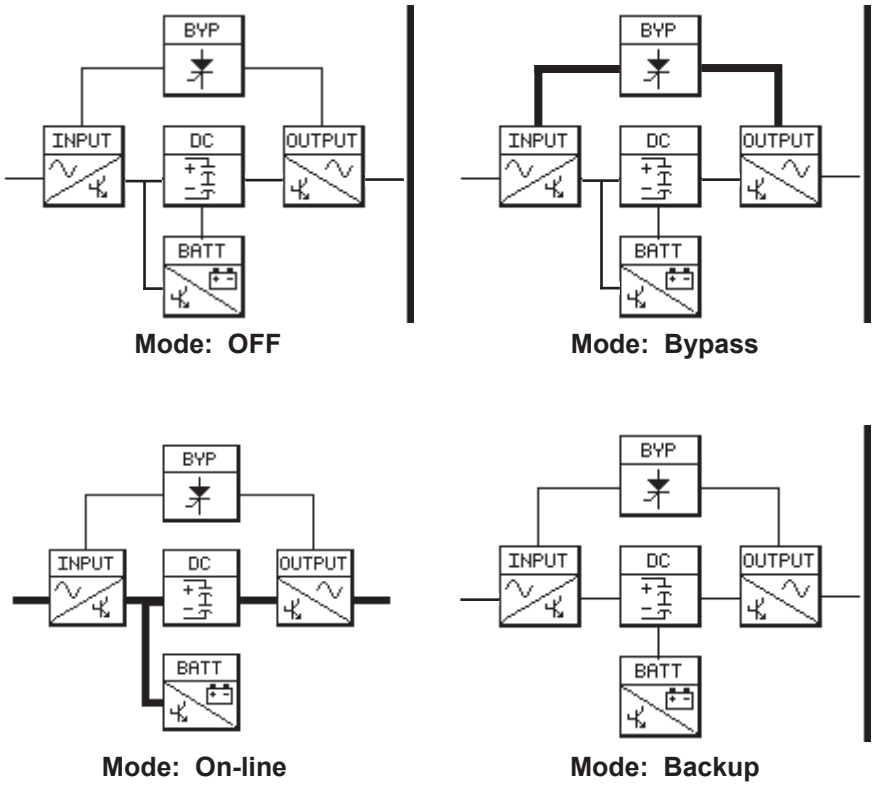
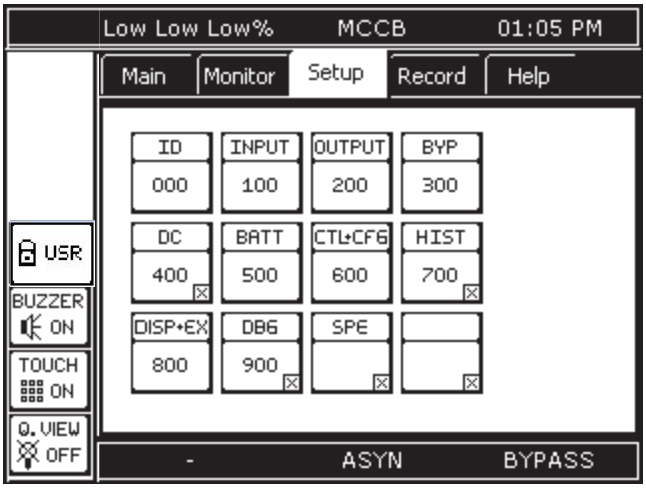


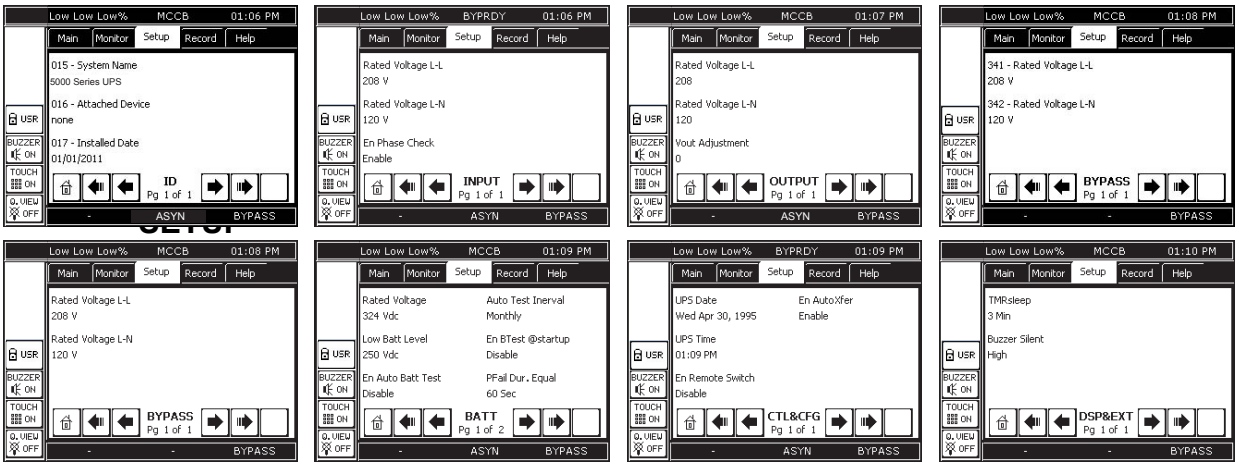
FIGURE 12.13: MIMIC DISPLAY CURRENT FLOW INDICATOR

12.16 Tab: Setup

The SETUP tab allows the user to adjust certain UPS parameters. The setup tab shows 12 buttons. Inactive buttons are indicated with a “x” in the lower right-hand corner of the button. The table below, right, shows a typical SETUP button.



Typical Button	Significance
	No “x” in the lower right corner indicates the button is active. Pressing the button will open a data page displaying the parameters available at the current security level.
	A button that has an “x” in the lower right corner is inactive and cannot be accessed at the current security level.



Param. Prefix	Parameter Category
0	UPS Identification, Serial number, Start-up Date, software version
1	Input line-line and line-neutral V/I values, V/I percent of rated value, and frequency
2	Output line-line and line-neutral V/I values, V/I percent of rated value, and frequency
3	Bypass line-line and line-neutral V/I values, V/I percent of rated value, and frequency
4	DC Bus Voltage, DC Under Voltage Level, Startup Voltage Level
5	Battery Voltage/Current, shutdown voltage, battery test enable
6	Control and Configuration – UPS time/date/status, faults, warnings, password management
7	UPS Operation time, Number of Faults, Backup, Operations.
8	Display and Ext Comm. – Disp. S/W version, buzzer status, display calibration values. RemotEye I/P address, data and network status.

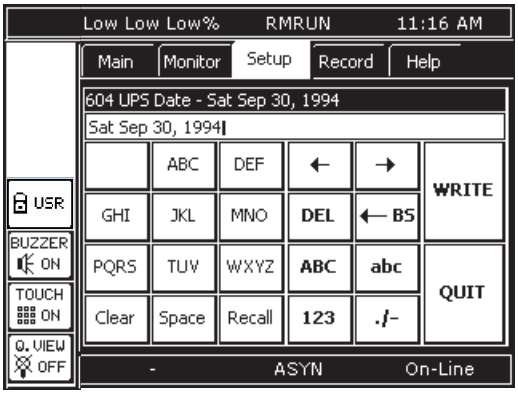
FIGURE 12.14: PARAMETER CATEGORIES

Tab: SETUP (cont.)

Pressing an active button will cause a list of parameters to be displayed (See previous page). Pressing a listed parameter will activate a display appropriate to the parameter selections available If the parameter cannot be edited at the current security level, the display will not change. If the parameter can be edited or changed, an appropriate keypad will displayed as shown below. Either a alpha/numeric keypad, a multiple choice, or binary choice display will appear.

After entering data or selecting an options, press WRITE to save the selections, or QUIT to leave the current value unchanged.

Example 1 – Alpha/numeric display.



Example 2 – Multiple Choice Display with Default value Marked (*)

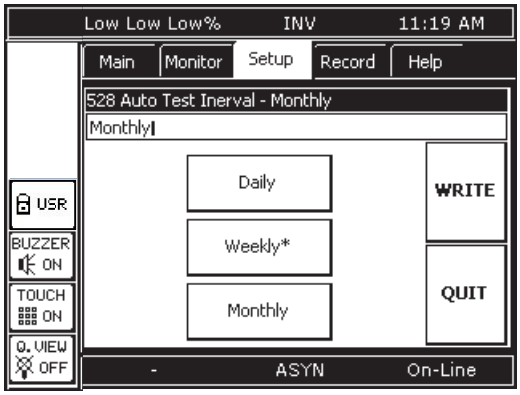
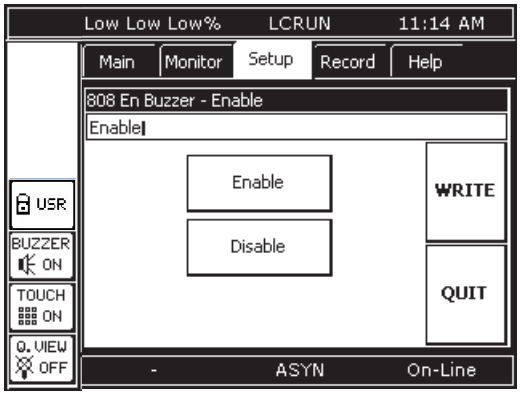


TABLE 12.4: TOUCHSCREEN KEYPAD IDENTIFICATION

Button	Action
Clear	Delete all characters on input line
Space	(Space bar)
Recall	Restores previous entered value
← →	Move cursor one space left or right
DEL	Delete character to right of cursor
← BS	Back Space – Delete character to left of cursor
ABC	Set Keypad to capital letters (A,B, C...)
abc	Set Keypad to lower case letters (a, b, c...)
123	Set Keypad to numbers (1, 2, 3...)
./-	Set Keypad to write Special Characters (. , – : /)
Write	Write information (Enter) (Pressing Quit without first pressing Write will cause the newly entered data to be lost.)
Quit	Exit keypad.

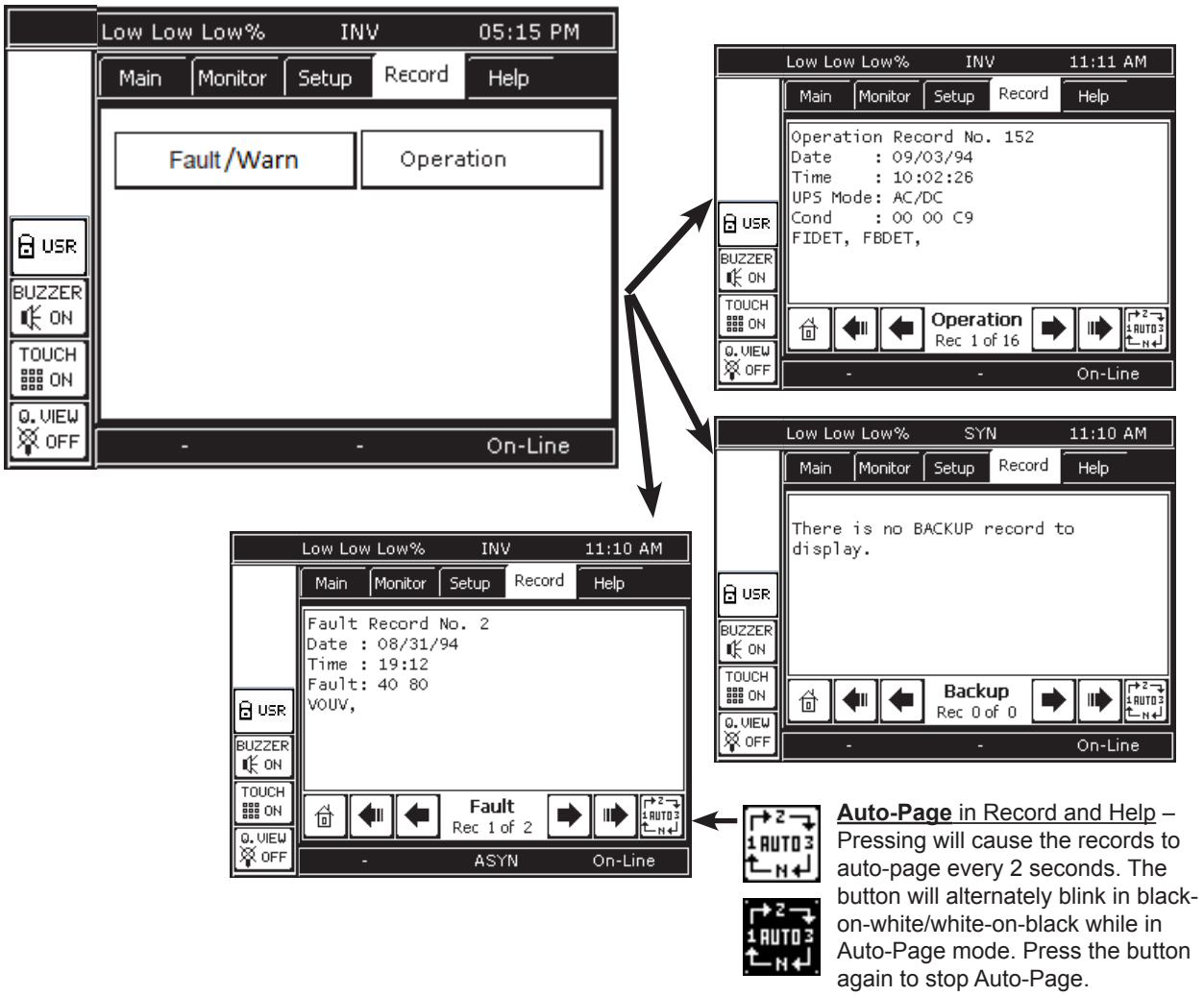
Example 3 – Binary choice (On/Off, Enable/Disable, Contact A/Contact B)



12.17 Tab: Record

The tab Record offers three types of records: Operation, Backup, and Fault.

Backup Record	Description	Max. Number of Records
Operation	Every change in operating mode is recorded by time, date, and mode.	64 records before overwrite (First In, First Out)
Fault/Warn	Every time a fault/warning occurs, the date, time and fault/warning is recorded.	64 records before overwrite (First In, First Out)



Auto-Page in Record and Help – Pressing will cause the records to auto-page every 2 seconds. The button will alternately blink in black-on-white/white-on-black while in Auto-Page mode. Press the button again to stop Auto-Page.

FIGURE 12.16: RECORDS

12.18 Tab: Help

This on-line help provides ready definitions of the Acronyms displayed on the touchscreen and their definitions. Each acronym and accompanying definition is displayed on a single page.


The navigation bar has an additional button in Record and Help called Auto-Page. Pressing Auto-Page will cause the records to auto-page every 2 seconds. The button will alternately blink in black-on-white/white-on-black while in Auto-Page mode. Press the button again to exit Auto-Page mode.

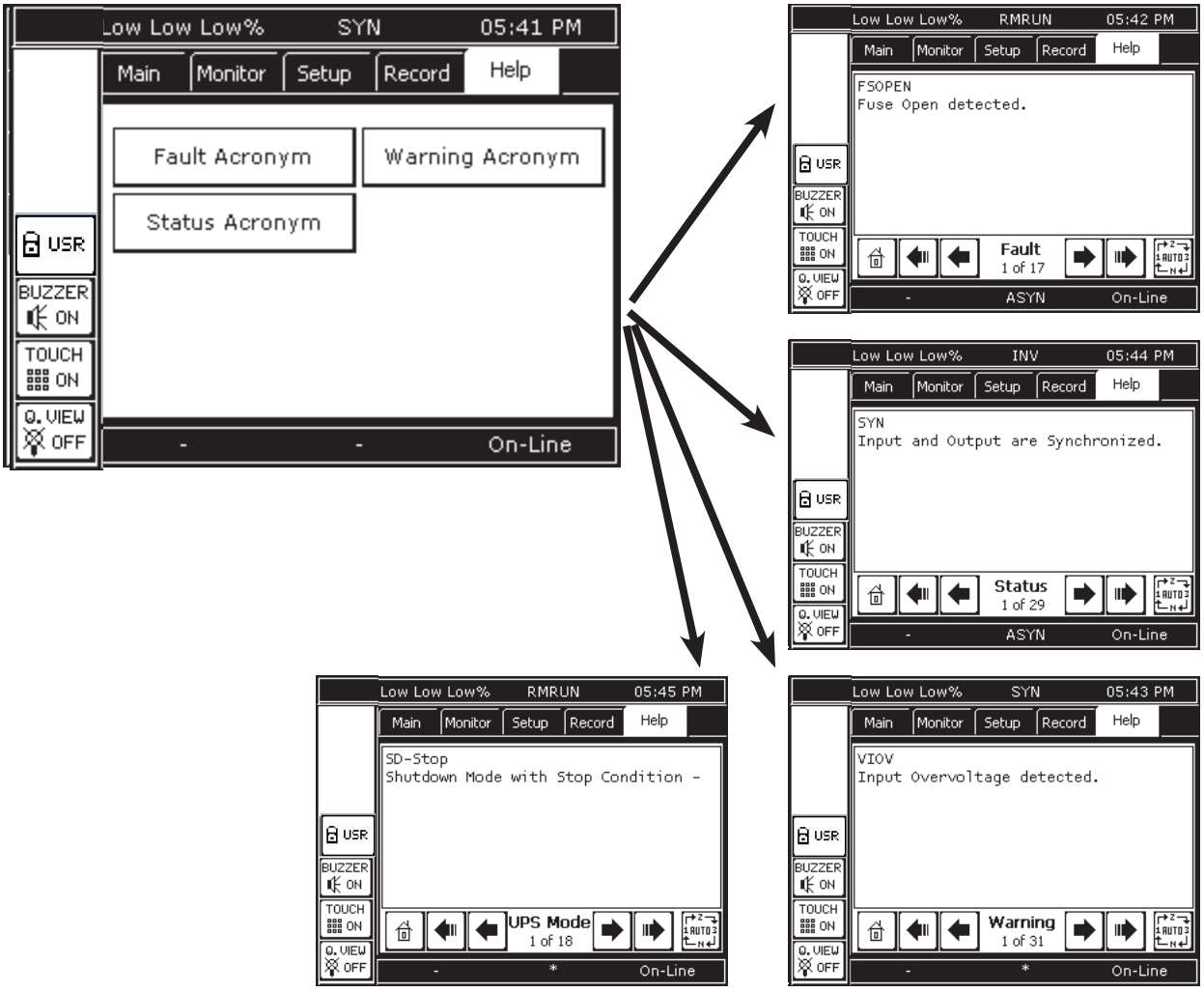


FIGURE 12.17: HELP CATEGORIES

12.19 5000 Series Parameter Definitions

See Appendix A for a list of the definitions and functions of the Command Parameters accessable in the USR and ADM modes..

12.20 System Fault Messages

A Fault message is generated when either a fault condition occurs, or a warning condition occurs three times within ten minutes. The table below shows the possible fault messages and what actions need be taken.

If the input voltage is normal when the fault occurs then the UPS will switch immediately to the bypass mode to continuously feed power to the load.

If the fault condition occurs while the input power is abnormal and the UPS is in Bypass mode the UPS will shut down the output to prevent load equipment damage.

When a Fault condition exists, the red LED on the UPS display panel will illuminate until the fault is cleared.

TABLE 12.5: SYSTEM FAULT MESSAGES

System Fault Messages		
Display	**Meaning**	**Action**
Display	Meaning	Action
COC	CHOPPER OVERCURRENT	Contact nearest Toshiba Authorized service representative.
DBUSAB	DC CIRCUIT ABNORMAL	Contact nearest Toshiba Authorized service representative.
DCOV	DC OVERVOLTAGE	UPS is possibly faulty, input wiring error, input overvoltage or connection of a motor load. Try restarting. If condition persists, call for service.
DCUB	DC UNBALANCED	Contact nearest Toshiba Authorized service representative.
DCUV	DC UNDERVOLTAGE	UPS is possibly faulty, input wiring error, input overvoltage or connection of a motor load. Try restarting. If condition persists, call for service.
DMYFLT	DUMMY FAULT	Used by Engineering to troubleshoot issues.
DOH	OVERTEMPERATURE	Reduce equipment load to 100% or less and try restarting.
EPOTR/ EPO	EMERGENCY STOP ACTIVATED	Emergency stop activated. Restart UPS after Emergency cleared.
GVERR	CONTROL POWER SUPPLY ABNORMAL	Contact nearest Toshiba Authorized service representative.
INABNL	INPUT CIRCUIT ABNORMAL	Contact nearest Toshiba Authorized service representative.
INVABN	INVERTER VOLTAGE ABNORMAL	Voltage out of spec. Contact nearest Toshiba Authorized service representative.
INVBYP	UPS CONTROL CIRCUIT ERROR	Inverter voltage/Bypass Voltage is out of spec. Contact nearest Toshiba Authorized service representative.
INVCER	OUTPUT CIRCUIT ABNORMAL	Contact nearest Toshiba Authorized service representative.
INVERR	UPS CONTROL CIRCUIT ERROR	Inverter voltage is out of spec. Contact nearest Toshiba Authorized service representative.

System Fault Messages		
Display	**Meaning**	**Action**
INVOC	INVERTER OVERCURRENT	Contact nearest Toshiba Authorized service representative.
INVOV	INVERTER OVERVOLTAGE	Contact nearest Toshiba Authorized service representative.
INVUV	INVERTER UNDERVOLTAGE	Contact nearest Toshiba Authorized service representative.
IOC	INPUT OVERCURRENT	Reduce Load. If problem persists, contact nearest Toshiba Authorized service representative.
LDABNL	LOAD ABNORMAL	Onlly triggered when output overload occurs more than four (4) times in 5 minutes. Lower load below 96%. If condition persists, Contact nearest Toshiba Authorized service representative.
NOCONN	No connection established	Contact nearest Toshiba Authorized service representative.
OCERR	Current is more than rated output current	Lower Load and restart UPS. If condition persists, contact nearest Toshiba Authorized service representative.
OVABNL	OUTPUT VOLTAGE ABNORMAL	Contact nearest Toshiba Authorized service representative.
PCBER	UPS CONTROL CIRCUIT ERROR	Check Fault Code on history log and present it to the nearest Toshiba Authorized service representative .
PCHGER	PRECHARGE FAULT	Contact nearest Toshiba Authorized service representative.
PHBRER	BYPASS PHASE ROTATION ERROR	Bypass phase rotation is reversed. Contact nearest Toshiba Authorized service representative.
PHIRER	AC INPUT PHASE ROTATION ERROR	Input phase rotation is reversed. Contact nearest Toshiba Authorized service representative.
PWRERR	CONTROL POWER SUPPLY ABNORMAL	Contact nearest Toshiba Authorized service representative.
VOUV	OUTPUT UNDERVOLTAGE	Contact nearest Toshiba Authorized service representative.

12.21 System Warning Messages

Warning messages are generated when a noncritical abnormal operating condition occurs. The following tables shows possible messages and their meaning.

When a Warning condition exists, the amber LED on the UPS display panel will flash for the duration of the Warning condition.

TABLE 12.6: SYSTEM WARNING MESSAGES

System Warning Messages		
Display	**Meaning**	**Action**
ASYN	Output and Input do not match	Contact nearest Toshiba Authorized service representative
BCO	Battery Contact is Open	Check battery connection. If connection is OK and warning is still present contact nearest Toshiba Authorized service representative
BBO/BOH	Battery breaker open/BATTERY OVERTEMPERATURE	Close battery breaker. If warning persists. Contact nearest Toshiba Authorized service representative
BOH2HR	(BATTERY OVERTEMP.). It has persisted for more than 2 hours	Contact nearest Toshiba Authorized service representative
BTABNL	BATTERY VOLTAGE ABNORMAL	Contact nearest Toshiba Authorized service representative
BTBKON	BATTERY VOLTAGE ABNORMAL.	Battery Breaker On. Battery voltage exceeded. Contact nearest Toshiba Authorized service representative
BTFAIL	BATTERY ABNORMAL	Battery Test Failed. Contact nearest Toshiba Authorized service representative
BYPPCB	UPS CONTROL CIRCUIT ERROR	Contact nearest Toshiba Authorized service representative
CL	INVERTER CURRENT LIMIT	Current not within specs. Contact nearest Toshiba Authorized service representative
CVABL	BATTERY VOLTAGE ABNORMAL	Contact nearest Toshiba Authorized service representative
DCHWRN	DISCHARGE WARNING	DC Bus is still charged. Do not open the UPS
FBYER	BYPASS FREQUENCY OUT OF RANGE	Contact nearest Toshiba Authorized service representative
FIERR/PFAIL	AC INPUT FREQUENCY OUT OF RANGE	Contact nearest Toshiba Authorized service representative
FNABNL	COOLING FAN ABNORMAL	Contact nearest Toshiba Authorized service representative
INVOL	INVERTER OVERLOAD	Shutdown excess load equipment.
INVSPY	UPS CONTROL CIRCUIT ERROR	Contact nearest Toshiba Authorized service representative
INVWRN	UPS CONTROL CIRCUIT ERROR	Contact nearest Toshiba Authorized service representative
LBABNL	LOCAL BUTTON ABNORMAL	Contact/Buttons are latched into one state for longer time than expected. Contact nearest Toshiba Authorized service representative
OCWRN	INVERTER OVERLOAD	Reduce load immediately
OOL	OVERLOAD	Shutdown down excess equipment to reduce load.
UPSOL	INVERTER OVERLOAD	Shutdown excess equipment to reduce load.
VBBSD	BATTERY VOLTAGE ABNORMAL	Batteries are not connected. Check if battery cabinet crcuit breaker is open.
VBLO/LB	BATTERY DEPLETED ALARM	Battery voltage reached low levels. Charging is required.

System Warning Messages		
Display	**Meaning**	**Action**
VBSD	BATTERY DEPLETED/AC OUT STOPPED	Charge the batteries. If this persists, contact nearest Toshiba Authorized service representative
VBYERR	BYPASS VOLTAGE OUT OF RANGE	Contact nearest Toshiba Authorized service representative
VDABNL	VDB SENSOR ABNORMAL	Contact nearest Toshiba Authorized service representative
VIERR/PFAIL	AC INPUT VOLTAGE OUT OF RANGE	Contact nearest Toshiba Authorized service representative
XDIS	TRANSFER INHIBITION	Contact nearest Toshiba Authorized service representative

12.22 System Mode Messages

A UPS Mode message is generated when the UPS changes operating mode. The following tables list the possible operating modes for the UPS.

TABLE 12.7: SYSTEM MODE MESSAGES

Display	Meaning
Backup	Backup – No input, power is being supplied by the battery.
BattTest	Battery Test – Battery test in progress.
Bypass	Bypass – UPS is offline, power is being provided directly from UPS input.
On-Line	On-Line – Input converter and inverter are running (Double conversion mode).
Shutdown	Shutdown – No output, DC Bus is discharging.
Startup	Startup – UPS is starting up.

12.23 System Status Messages

A UPS Status message is generated when the UPS changes its status (from inverter to bypass mode, for example). The table below shows the possible Status messages and their meaning.

TABLE 12.8: SYSTEM STATUS MESSAGES

5000 System Status Messages		
Display	**Meaning**	**Action**
ARTEN	Auto Retransfer Enable	No action needed.
BTDIS	Battery Test Disabled	No action needed.
BTING	Battery Test in Progress	
BYP	Bypass mode – Power is supplied by UPS input.	No action needed.
BYPEN	Bypass Enable	No action needed.

5000 System Status Messages		
Display	**Meaning**	**Action**
DEFCAL	Touchscreen is using default values instead of calibrated values.	No action needed.
DLYSTRTUP	Delay Start – UPS is counting down prior to startup.	No action needed.
EE1ST	EEPROM is loaded with default values.	No action needed.
EPO	EPO circuit is active.	Reset EPO switch to start.
EQCHRG	Equalized Charging	No action needed.
FLT	A fault has occurred.	See Fault records.
FRCDBYP	UPS forced into bypass mode. Many fault codes can cause a transfer to Bypass (e.g. Batt Shutdown, Phase Rotation Error) See **Appendix B - Command Table** for additional information.	Secure the load and contact the nearest Toshiba authorized representative for service.
FWUPD	Firmware updated.	No action needed.
INVSTUP	UPS starts up in inverter mode (skips bypass)	No action needed.
INV	Inverter mode.	Inverter is running (it can be On-Line, Battery Test, or Backup)
LANSD	UPS goes to Shutdown triggered from LAN SD (shutdown) circuit.	Deactivate LAN shutdown signal to reset.
LB	Low Battery – The battery voltage has dropped low (about 90% or less) during operation. Continued operation in this mode will deplete battery and cause output shut down. (This can be adjusted by the operator	Immediately shut down the load equipment in an orderly fashion and then press the STOP key.
LCRUN	Local run command issued.	No action needed.
MANUAL	UPS is in Manual mode	No action needed.
OUT50HZ	UPS set for 50 Hz Output.	No action needed.
PFAIL	Input power failure.	No action needed.
PRCHRG	Protective charging	No action needed.
RMRUN	Remote Run command issued.	No action needed.
RMTSD	Remote shutdown occurred.	One or more warnings occurred. Check the Warnings field for details. Disconnect LAN signal to reset.
RMTSWEN	Remote switch control enable.	No action needed.
SYN	Synchronous mode.	Input and output are synchronized.
TIMEDSD	UPS is counting down prior to shutdown.	Immediately shut down the load equipment in an orderly fashion and then press the STOP key.
WRN	A warning has occurred.	See Warning record.

13 UPS Operation

The 5000 Series UPS is hardwired to both utility power and the critical loads. The two main operating states are:

1. On-Line (double conversion) mode with the UPS providing clean power to the load.
2. Bypass mode, where the unconditioned utility power is routed around the converter-inverter of the UPS and fed directly to the load.
3. Maintenance Bypass mode, which removed power from the UPS, excepting internal transformers.

A fourth state, Emergency shut-down, EPO, is for emergency use only and is discussed separately in Section 13.4.

The UPS can be switched between On-Line and Bypass by pressing and momentarily pressing the RUN/STOP button on the touchscreen display.

13.1 Initial UPS Startup

The first time the UPS is started after installation, use the touchscreen to enter the current time and date.

1. Ensure the UPS main circuit breaker, MCCB is closed. (Start the UPS as described in 13.2 steps 1-5.
2. Enter **Param. 604 - UPS Date***:
   Press the **Setup** tab.
   Press **UPS Date** in the Data Display Area.
   Enter the date in the following format: **Www Mmm DD YYYY**
   Www is the three character day of the week: Mon, Tue, Wed...
   Mmm is the three character Month: Jan, Feb, Mar...
   DD is the two digit day of the month: 01, 12, 30...
   YYYY is the four digit year: 2011
   Press **Write** to store the date.
   Press **Quit** to exit **UPS Date*** setup.
3. Enter the **Param. 605 - UPS Time***:
   Press the **Setup** tab.
   Press **UPS Time*** in the Data Display Area.
   Enter the Time in the following format: **HH:MM AM**
   HH is the two digit hour followed by a colon (:)
   MM is the two digit month.
   AM/PM is before or after noon.
   Press **Write** to set the time.
   Press Quit to exit **UPS Time*** setup.

13.2 Start the UPS

1. Switch the main circuit breaker (MCCB) on the front of the UPS to the **ON** position.

2. If the UPS is equipped with dual inputs, switch on the optional second Circuit Breaker. The breaker(s) should normally remain in the **ON** position.
3. If the UPS is equipped with an External Battery Cabinet, switch the cabinet breaker **ON**
4. Verify that the **AC Input** LED on the front panel lights green. All LED's on the front panel may light for a moment when the input breaker is turned on. This is normal. The UPS will now be supplying power in the bypass mode.

NOTICE

When running the UPS for the first time or after the power failure backup operation, charge the battery cabinet batteries, if any, for at least 24 hours (input breaker on) before operating the connected load.

Using the UPS without charging the battery shortens the battery backup operation time, which may result in the loss of data in case of a power failure.

5. Press and hold, for 2 seconds, the **RUN** button on the touchscreen to begin UPS operation.
6. Press the **Quick View** button on the Quick Access Toolbar and verify the UPS has input/output power. If the UPS has backup batteries, verify the batteries are being charged.

13.3 Stop (Switch to Bypass) the UPS

To stop the UPS, press and hold, for 2 seconds, the STOP button on the touchscreen display. The **On-Line** LED changes from green to off. The UPS is now in Bypass mode.

NOTICE

If the input breaker is turned off while UPS is in the bypass state, the output power stops. Any load devices will lose power.

Ensure that all sensitive loads have been previously shut down.

To completely stop the UPS, open the input breaker MCCB, the secondary Input breaker (if available), and the External Battery Cabinet breaker (if available).

13.4 Switch the UPS from Online to Maintenance Bypass

The UPS is equipped with a rotary maintenance bypass switch on the front of the Cable Bay. The access to the switch is secured by a locking weather-proof panel.
To switch the UPS to Maintenance Bypass,

1. Open the weather-tight doors to the MBS and the Touchscreen. Press the touchscreen MAIN Tab.
2. Press the "**STOP**" icon on the touchscreen MAIN display. This sets the UPS in Bypass Mode. Output power is now provided through the bypass circuit. ***While in this mode, if a power failure occurs on the commercial power source, the UPS will loose power. Power to the critical load will be interrupted.*** The battery charging circuit and chopper circuit remain active.
3. Verify the "**ONLINE/FAULT**" LED is OFF.

DO NOT physically place the UPS in Maintenance Bypass with the rotary Maintenance Bypass Switch until the touchscreen indicates the unit is in BYPASS Mode.

4. If an external Battery Cabinet is attached, switch the battery cabinet MCCB to "**OFF**"
5. Rotate the large red Bypass switch clockwise to the "**BYPASS**" position.
6. Switch (swing the interlock lever to the up position, see Section 7.1, #11) the UPS MCCB to "**OFF**".

   The unit is now in the Maintenance Bypass mode and may be serviced. For units with internal transformers, the transformers are still energized.
7. Secure the weather-tight doors on the Maintenance Byapss and the touchscreen display.

13.5 Switch the UPS from Maintenance Bypass to Online

To switch the UPS to from Maintenance Bypass to Online,

1. Open the weather-tight doors to the MBS and the Touchscreen.
2. Switch (swing the interlock lever to the down position, see Section 7.1, #11) the UPS main power switch, MCCB, to "**ON**".
3. Wait until:
   - The System Mode message (left side of the message screen footer) indicates the UPS in "**BYPASS**" mode
   - The System Status message (right side of the message screen footer) indicates the UPS is in "**BYP"** mode.
   - The A/C Input LED is "**ON**" (steady Green), and the "**ONLINE/FAULT**" LED is off
4. If an external Battery Cabinet is attached, switch the battery cabinet MCCB to "**ON**"
5. Slowly rotate the large red Bypass switch clockwise to the "**UPS MODE**" position.
6. Press the "**RUN**" icon on the touchscreen MAIN display. This sets the UPS in "On-Line" Mode. Verify the System Mode message (left side of the message screen footer changed from "STARTUP" to "ON-LINE".
7. Secure the weather-tight doors on the Maintenance Byapss and the touchscreen display.

13.6 Restore System Power after an EPO Shutdown

After shutting down the UPS by pressing the EPO switch, restore system power as follows:

1. Ensure the cause of the EPO action has been resolved.
2. Reset the UPS main circuit breaker MCCB, located behind the UPS front door, by first switching the breaker OFF, then ON.
3. Reset the Battery Cabinet (if any) circuit breaker(s) by first switching the breaker OFF, then ON.
4. Continue the startup procedure as given in Section 13.2.

13.7 Battery Backup Time and Discharge Process

The optional battery cabinet provides some period of back-up time depending on the UPS kVA rating and system load. 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.

Figure 13.1 graphically illustrates the battery discharge process under full load conditions.

The UPS battery voltage to drops as the battery discharges. The chart in Figure 13.1 lists the voltage level at which each UPS low-voltage alarm will sound and at what level the low-voltage condition will cause the unit to automatically shut down.

UPS Capacity	20 kVA	30 kVA
Nominal voltage (V_{nom})	288 Vdc	288 Vdc
Alarm voltage (V_{low})	246 Vdc	246 Vdc
Shutdown voltage (V_{min})	230 Vdc	230 Vdc

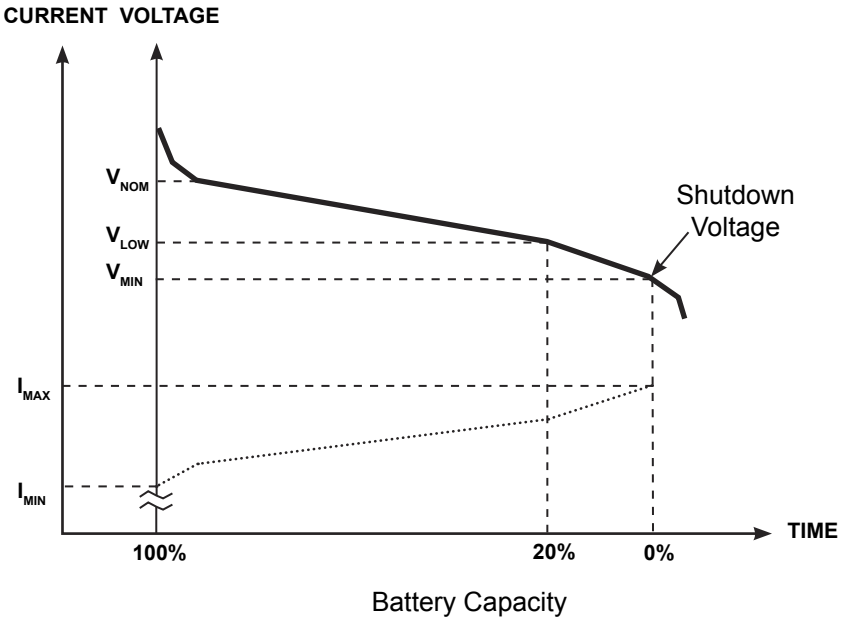


FIGURE 13.1: TYPICAL BATTERY DISCHARGE CURVE

13.8 Battery Low Voltage Tolerances

The battery charging period varies depending on the amount of discharge during backup. Figure 13.2 shows the typical recharge curve for a fully discharged battery.

Charging Period	Explanation
Period 1	Initial charging at maximum current (limited by charger). V_{min} is minimum voltage at which the UPS will shut down power to the load.
Period 2	Charging rate drops as battery voltage increases.
Period 3	Battery cells are at maximum voltage, UPS continues to provide a "trickle charge" to keep the batteries a maximum charge capacity.

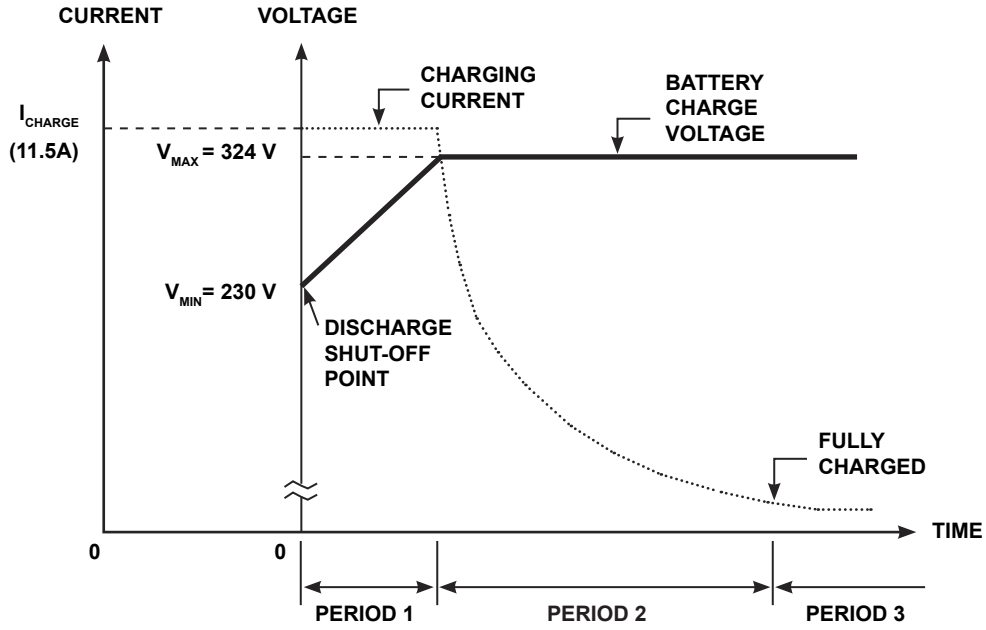
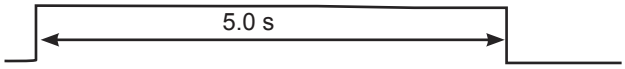
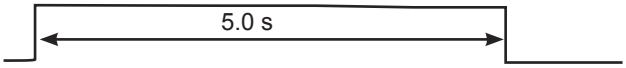
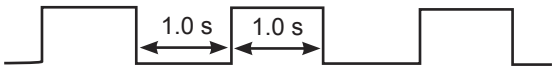
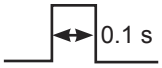


FIGURE 13.2: TYPICAL BATTERY CHARGING CURVE

13.9 Audible Alarm Functions

An audible alarm (buzzer) will sound when the UPS is in the battery backup mode, has a fault, has low battery voltage, or is in an overload condition. The buzzer will also beep each time an effective item is touched on the touchscreen. The following chart shows the buzzer pattern durations for each condition. Time units are shown in seconds.

TABLE 13.2: AUDIBLE ALARMS

Condition	Audible Pattern
Any Fault (Intermittent buzz until fault clears)	
Switch to Backup (Single five-second buzz)	
Backup Operation (Intermittent buzz once every ten seconds)	
UPS Battery Shutdown Voltage (Batt. Voltage 79% Normal)	
Warnings: OL110 (Overload Timer) LB (Low Battery – Batt. Voltage 90% Normal) BLFN (Battery Life Pre-alarm – Batt expires in 6 mo.) BLFE (Battery Life End) CHRGOV (Charger Over Voltage) BTSTFL (Battery Test Fail) BOH (Battery Overheat) AOH (Ambient Overheat) CLMT (Current Limit) DCER (Display Disconnected) BDEPL (Battery Depletion)	 
Touching Effective Item on Touchscreen	

The buzzer can be silenced most easily by pressing the Buzzer Silent button on the Quick Access Toolbar.

Alternatively, the buzzer can also be silenced by selecting the Settings tab, then set the Buzzer Silent parameter to Disable. This will turn off the buzzer for the current alarm status, but the buzzer will still sound when the next Fault/Warning condition occurs.

The buzzer can be disabled permanently by selecting the Settings tab then setting the parameter **Buzzer Disable** to Disable. This will disable the alarm so that no alarm sounds for any Fault or Warning condition.

14 Options

14.1 Remote Monitoring System – RemotEye 4

The 5000 Series can be monitored and controlled remotely via. the optional RemotEye 4 10/100 Base-T network card with embedded software that allows network administrators to monitor and control the UPS via any of the following protocols:

- Hypertext Transfer Protocol (HTTP/HTTPS)
- SNMP (Simple Network Management Protocol)
- Modbus TCP/RTU (Transmission Control Protocol/Remote Terminal Unit)
- BACnet IP/MSTP (Internet Protocol /Master Slate Token Passing)

14.2 Remote System Monitoring – Remote Radar

A network of Toshiba UPS's equipped with the RemotEye network cards can be viewed and monitored using the optional RemotRadar application software on any MS-Windows machine.

- Real-Time Monitoring & Management of up to a combined total of 5,000 RemotEye® II, III, 4, & Remote-D® Devices.
- SNMP-Based UPS Monitoring & Management Across Global Locations
- Customizable Alarm Management System to Meet Location Requirements
- Auto-Detects RemotEye® II & III & Remote-D® Presence on a Network with a Click of a Button
- Auto-Track & Report UPS Status & Events
- Sends Fault/Incident Alerts via Text Message (SMS) and/or E-mail.
- Notify Fault/Incident Alerts up to 8 Recipients via E-mail & Text Message (SMS) (for a Total of 16 Recipients Combined)
- Provides Remote Control Capability
- Compatible with GSM Modems to Send Text Messages (SMS)
- Import/Export Network Settings via csv text file.

15 Service and Maintenance

15.1 Fan Filters

The fan filters on the UPS are a reusable aluminum wire mesh, and are designed to user-serviced.

Clean the filters as often as is appropriate to the operating environment. At minimum, it's recommended the filters ber cleaned annually.

To clean the G5000 fan filters:

1. Place the UPS in MAINTENANCE BYPASS mode. Ensure the fans on the top of the unit have stopped running.
2. Unbolt the six (6) M4 hex bolts on front of the fan tray.
3. Pull out the fan tray, and carefully unplug the fan power cord.
4. Set the fan tray aside.
5. Inside the Fan Bay, locate the two filter retainer brackets, one each on the left and right side of the bay.
6. Loosten the four M4 nuts on the filter retainer bracket studs.
7. Slip the wire mesh filter out from behind the retaining bracket,
8. Wash the wire mesh filter with a mild soapy solution, rinse, and thoroughly dry the filter.
9. Reinstall the dry wire mesh filter behind filter retaining bracket.
10. Tighten the four M4 nuts on the retainer bracket studs.
11. Repeat Steps 6-10 for the second filter.
12. Insert the fan tray into the Fan Bay; ensure the fan tray is plugged in.
13. Tighten the six (6) M4 hex bolts on front of the fan tray to ensure the fan tray presses against the fan tray gasket.
14. For 2-Cabinet systems, repeat Steps 2-13 for the second fan module.
15. Restore the UPS to ONLINE mode.

15.1 Fan Replacement

The fan modules are critical to the internal temperature regulation of the UPS and can be monitored remotely. While the fans are designed for a long service life, the fan trays are designed for quick replacement to minimize system down-time.

1. Place the UPS in MAINTENANCE BYPASS mode. Ensure the fans on the top of the unit have stopped running.
2. Unbolt the six (6) M4 hex bolts on front of the fan tray.
3. Pull out the fan tray, and carefully unplug the fan power cord.
4. Set the fan tray aside.
5. Insert the replacement fan tray into the Fan Bay; ensure the fan tray is plugged in.
6. Tighten the six (6) M4 hex bolts on front of the fan tray to ensure the fan tray presses against the fan tray gasket.
7. For 2-Cabinet systems, repeat Steps 2-6 for the second fan module.
8. Restore the UPS to ONLINE mode.
9. Verify the fan modules are functioning properly.

16 External Layouts/Dimensions/Shipping Weights

Dimensional Data

TABLE 16.1: DIMENSIONAL DATA

EXTERNAL DIMENSIONS				SHIPPING DIMENSIONS[1]		
Unit	**Width**	**Depth**	**Height**	**Width**	**Depth**	**Height**
20/30 kVA (Single Cabinet)	59.38 in (1509 mm)	38.70 in (983 mm)	92.09 in (2340 mm)	TBD in (TBD mm)	TBD in (TBD mm)	TBD in (TBD mm)
20/30 kVA (Double Cabinet)	84.34 in (2143 mm)	38.72 in (984 mm)	92.09 in (2340 mm)	TBD in (TBD mm)	TBD in (TBD mm)	TBD in (TBD mm)

1 - Subject to change without notice.

Unit and Shipping Weights

TABLE 16.2: UNIT AND SHIPPING WEIGHTS

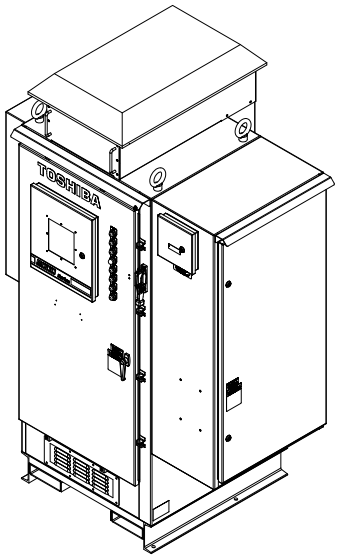
Model	Unit Weight [1]		Shipping Weight [1,2]	
	Pounds	**Kilograms**	**Pounds**	**Kilograms**
Single Cabinet	1700	771.1	-	-
Dual Cabinet	2680	1215.6	-	-

1. Subject to change without notice.
2. Shipping weights include 120 lb. (54.4 kg) for shipping pallet, and 35 lb. (15.9 kg) for shipping rails.

Appendix A – Dimensional Drawings

PARAMETERS	20kVA
UNIT WEIGHT (LBS/KGS)	1700/771.1
VENTILATION REQTS.	FRONT–36", RIGHT–36", LEFT–6", TOP–N/A
FINISH	WHITE OR S.S.

NOTE:
1. ENCLOSURE IS NEMA–3R RATED
2. OUTDOOR DESIGN INDOOR/OUTDOOR USE
3. PAD MOUNTED, SEE PG 2
4. SEE PRODUCT MANUAL FOR COMPLETE DETAILS



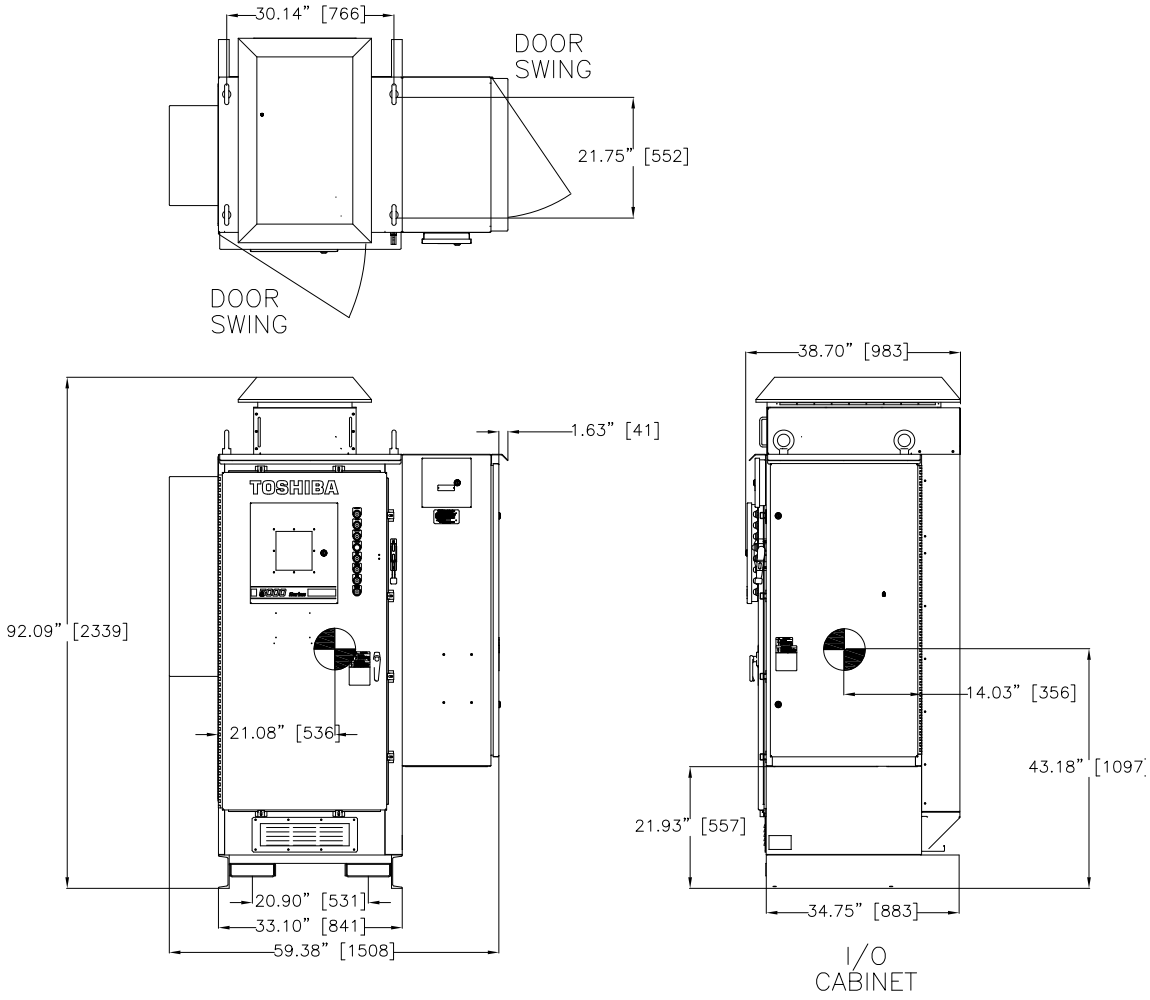


FIGURE A.1 – 5000 SERIES SINGLE CABINET OUTLINE

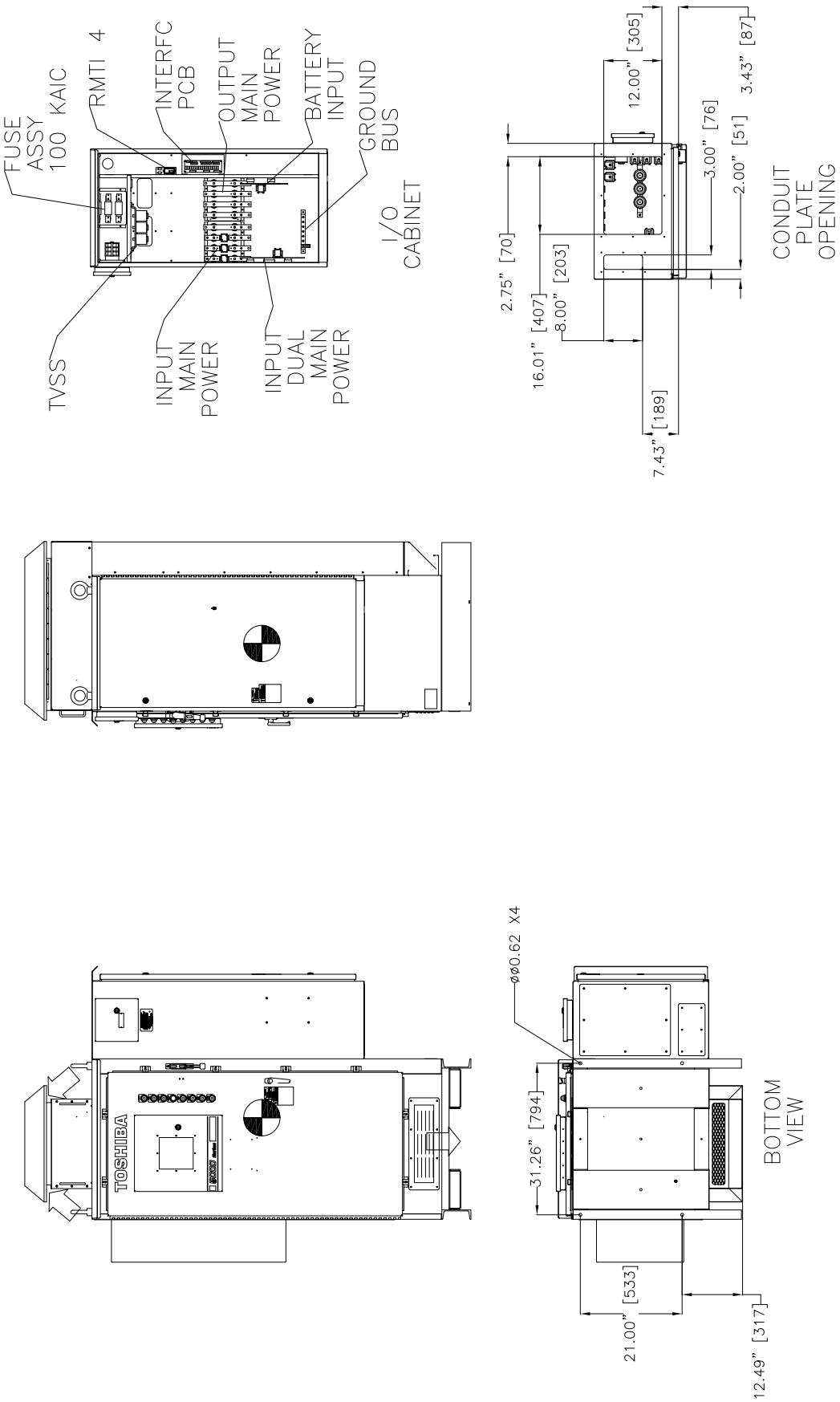
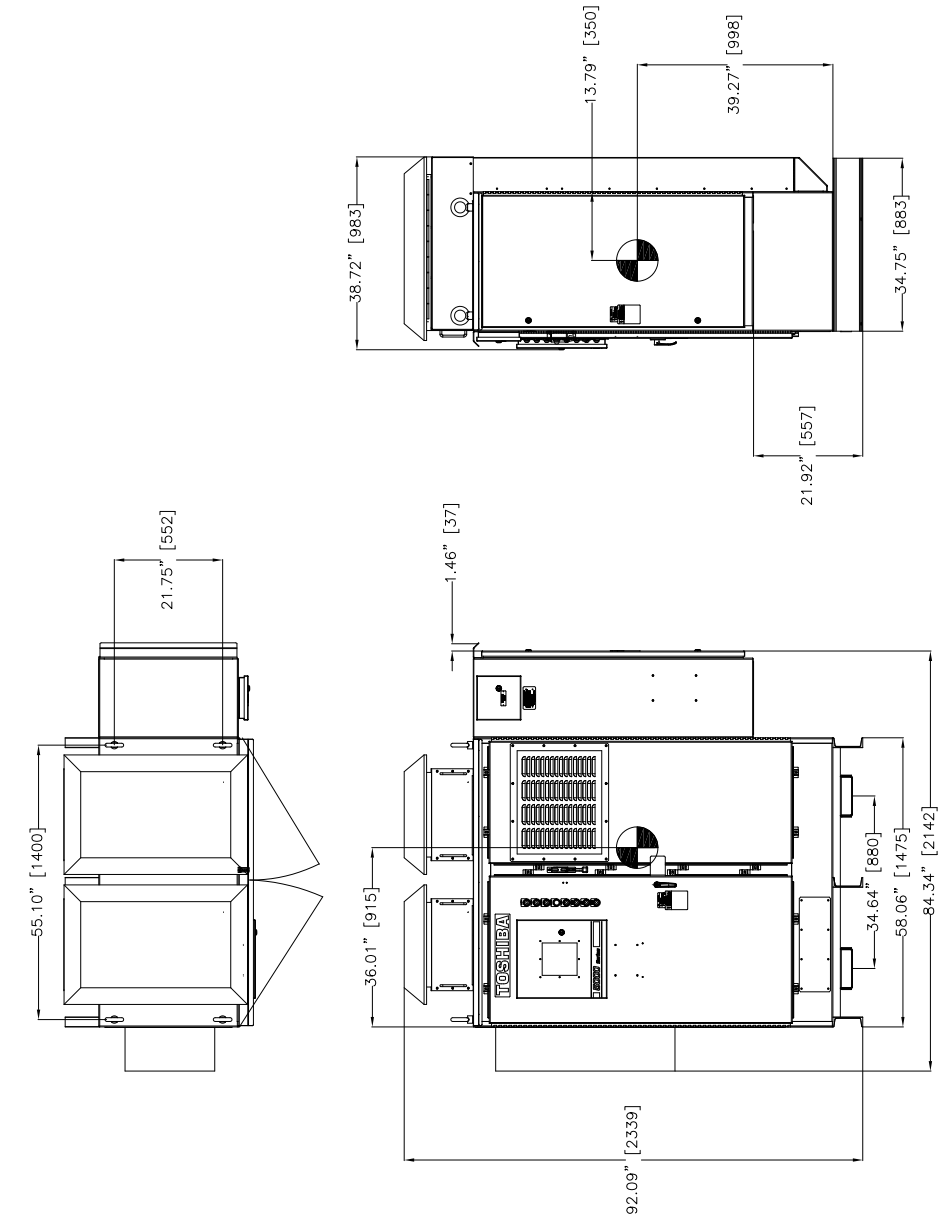
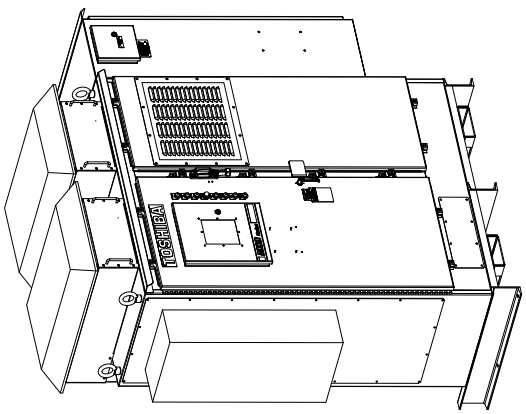


FIGURE A.2 – 5000 SERIES SINGLE CABINET OUTLINE (CONT.)





PARAMETERS	20kVA
UNIT WEIGHT (LBS/KGS)	2680/1215.6
VENTILATION REQTS.	FRONT–36", RIGHT–36", LEFT–6", TOP–N/A
FINISH	WHITE OR S.S.

NOTE:
1. ENCLOSURE IS NEMA–3R RATED
2. OUTDOOR DESIGN INDOOR/OUTDOOR USE
3. PAD MOUNTED, SEE PG 2
4. SEE PRODUCT MANUAL FOR COMPLETE DETAILS

FIGURE A3 – 5000 SERIES UPS 2-CABINET OUTLINE 1/2

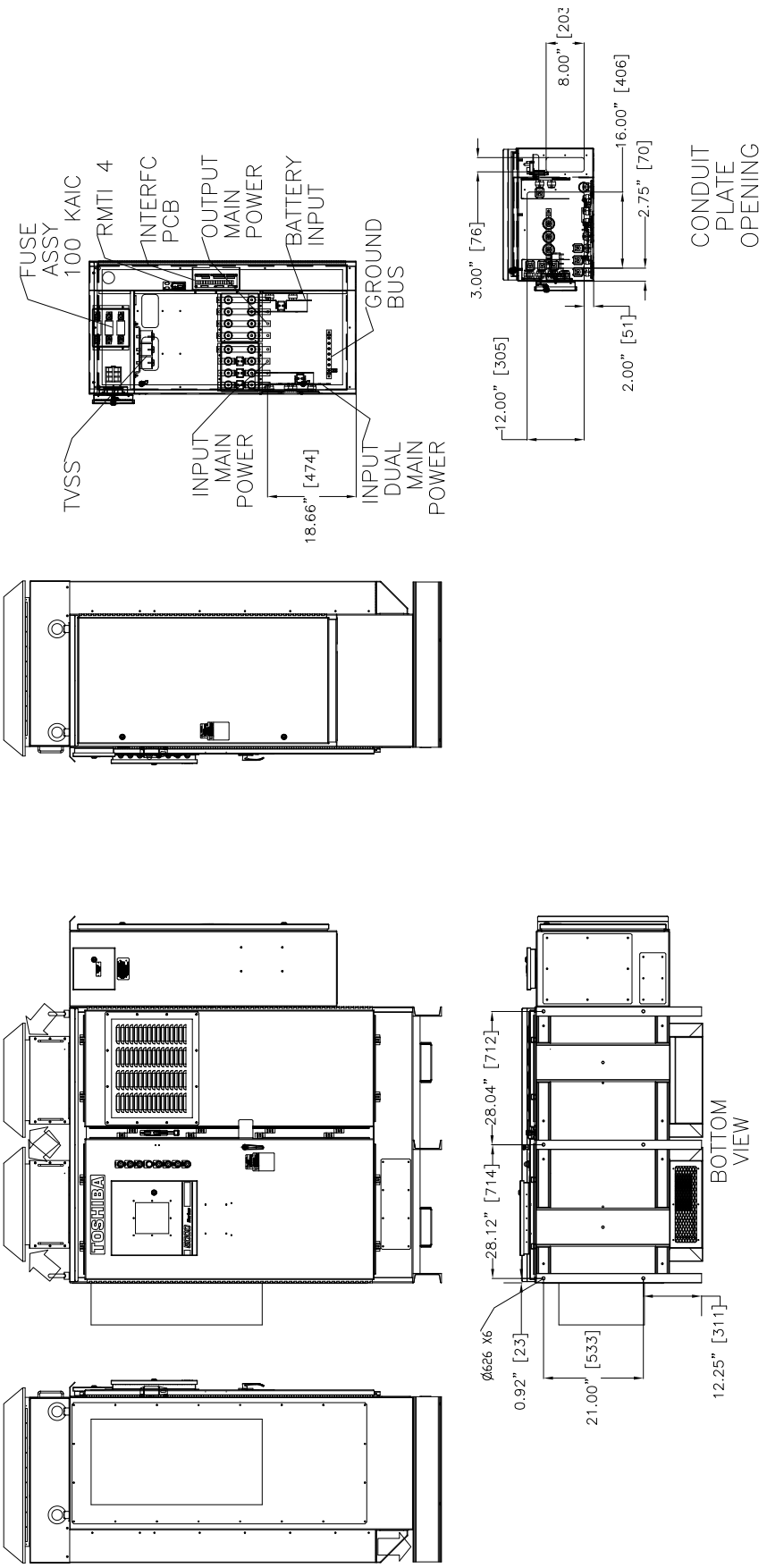


FIGURE A.4 – 5000 SERIES UPS 2-CABINET OUTLINE 2/2

5000 Series Parameter Definitions

The following table lists those parameters that can viewed and/or changed at the User and Admin security level. Parameters are identified as a three digit number composed of the Block and Item number. E.g. Parameter 003 is the UPS serial Number. The Short Descriptions is the labeling shown in the UPS display. All parameters can viewed with RemotEye 4.

Blk	Item	Long Description	Short Description	Units	Permiissions		Remark
					User	Admin	
0	01	UPS Manufacturer	Manufacturer		R	R	
0	02	UPS Typeform	Typeform		R	R	See Toshiba UPS Typeform document.
0	03	UPS Serial Number	Serial No.		R	R	YYYYMMNNNNN Where YYYY is four digits year MM is two digits month NNNNN is five digit number
0	08	UPS System Name	System Name		R	R/W	Such as Plant3, Upstair...
0	09	UPS Attached Devices	Attached Device		R	R/W	
0	10	UPS Installation Date	Installed Date		R	R/W	YYYYMMDD
1	01	Input Line to Line Voltage (AB)	Voltage (AB)	V	R	R	
1	02	Input Line to Line Voltage (BC)	Voltage (BC)	V	R	R	
1	03	Input Line to Line Voltage (CA)	Voltage (CA)	V	R	R	
1	04	Input Line to Neutral Voltage (AN)	Voltage (AN)	V	R	R	
1	05	Input Line to Neutral Voltage (BN)	Voltage (BN)	V	R	R	
1	06	Input Line to Neutral Voltage (CN)	Voltage (CN)	V	R	R	
1	07	Input Current % (A)	Current % (A)	%	R	R	
1	08	Input Current % (B)	Current % (B)	%	R	R	
1	09	Input Current % (C)	Current % (C)	%	R	R	
1	10	Input Frequency	Frequency	Hz	R	R	600 for 60.0 Hz, 500 for 50.0 Hz. UPS will send you one decimal point and format it according to decimal points
1	21	Input Voltage in % (A)	Voltage (A) %	%	R	R	
1	22	Input Voltage in % (B)	Voltage (B) %	%	R	R	
1	23	Input Voltage in % (C)	Voltage (C) %	%	R	R	

Blk	Item	Long Description	Short Description	Units	Permiissions		Remark
					User	Admin	
1	24	Input Phase Current (A)	Current (A)	A	R	R	
1	25	Input Phase Current (B)	Current (B)	A	R	R	
1	26	Input Phase Current (C)	Current (C)	A	R	R	
1	40	No of Input Lines	No of Input Line		R	R	
1	41	Rated Line to Line Input Voltage	Rated Voltage L-L	V	R	R/W	
1	42	Rated Line to Neutral Input Voltage	Rated Voltage L-N	V	R	R/W	
1	43	Rated Input Current	Rated Current	A	R	R	
1	44	Rated Input Frequency	Rated Frequency	Hz	R	R	
1	45	Rated Input Power (W)	Rated Power (W)	W	R	R	
1	46	Rated Input Power (VA)	Rated Power (VA)	VA	R	R	
2	01	Output Line to Line Voltage (AB)	Voltage (AB)	V	R	R	
2	02	Output Line to Line Voltage (BC)	Voltage (BC)	V	R	R	
2	03	Output Line to Line Voltage (CA)	Voltage (CA)	V	R	R	
2	04	Output Line to Neutral Voltage (AN)	Voltage (AN)	V	R	R	
2	05	Output Line to Neutral Voltage (BN)	Voltage (BN)	V	R	R	
2	06	Output Line to Neutral Voltage (CN)	Voltage (CN)	V	R	R	
2	07	Output Phase Current (A)	Current (A)	A	R	R	
2	08	Output Phase Current (B)	Current (B)	A	R	R	
2	09	Output Phase Current (C)	Current (C)	A	R	R	
2	10	Output Frequency	Frequency	dHz	R	R	600 for 60.0 Hz, 500 for 50.0 Hz. UPS will send you one decimal point and format it according to decimal points
2	13	Output Power KW (Total)	Power KW (Total)	kW	R	R	
2	14	On-Line Efficiency	On-Line Effi-ciency	%	-	-	
2	21	Output Voltage % (A)	Voltage % (A)	%	R	R	
2	22	Output Voltage % (B)	Voltage % (B)	%	R	R	
2	23	Output Voltage % (C)	Voltage % (C)	%	R	R	

Blk	Item	Long Description	Short Description	Units	Permiissions		Remark
					User	Admin	
2	24	Output Current % (A)	Current % (A)	%	R	R	
2	25	Output Current % (B)	Current % (B)	%	R	R	
2	26	Output Current % (C)	Current % (C)	%	R	R	
2	28	Output Power W % (Total)	Power W % (Total)	%	R	R	
2	36	Output Power Factor	Power Factor	0.01	R	R	
2	39	Rated Power Factor	Rated Power Factor	0.01	R	R	
2	40	No of Output Line	No of Output Line		R	R	
2	41	Rated Line to Line Output Voltage	Rated Voltage L-L	V	R	R/W	
2	42	Rated Line to Neutral Output Voltage	Rated Voltage L-N	V	R	R/W	
2	44	Rated Output Frequency	Rated Frequency	Hz	R	R	
2	45	Rated Output Power (W)	Rated Power (W)	W	R	R	
2	46	Rated Output Power (VA) *	Rated Power (VA)	VA	R	R	
2	47	VOUV Detection Level	VOUV DeLevel	%	R	R	
2	49	VOOV Detection Level	VOOV DeLevel	%	R	R	
2	60	Output Voltage Adjustment (Customer)	Vout Adjustment	V	R	R/W	
3	01	Bypass Line to Line Voltage (AB)	Voltage (AB)	V	R	R	
3	02	Bypass Line to Line Voltage (BC)	Voltage (BC)	V	R	R	
3	03	Bypass Line to Line Voltage (CA)	Voltage (CA)	V	R	R	
3	04	Bypass Line to Neutral Voltage (AN)	Voltage (AN)	V	R	R	
3	05	Bypass Line to Neutral Voltage (BN)	Voltage (BN)	V	R	R	
3	06	Bypass Line to Neutral Voltage (CN)	Voltage (CN)	V	R	R	
3	07	Bypass Phase Current (A)	Current (A)	A	R	R	

Blk	Item	Long Description	Short Description	Units	Permiissions		Remark
					User	Admin	
3	08	Bypass Phase Current (B)	Current (B)	A	R	R	
3	09	Bypass Phase Current (C)	Current (C)	A	R	R	
3	10	Bypass Frequency	Frequency	Hz	R	R	600 for 60.0 Hz, 500 for 50.0 Hz. UPS will send you one decimal point and format it according to decimal points
3	21	Bypass Voltage % (A)	Voltage % (A)	%	R	R	
3	22	Bypass Voltage % (B)	Voltage % (B)	%	R	R	
3	23	Bypass Voltage % (C)	Voltage % (C)	%	R	R	
3	40	No of Bypass Line	No of Bypass Line		R	R	
3	41	Rated Line to Line Bypass Voltage	Rated Voltage L-L	V	R	R	
3	42	Rated Line to Neutral Bypass Voltage	Rated Voltage L-N	V	R	R	
3	47	Bypass UV Detection Level	VbUV DeLevel	%	R	R	
3	49	Bypass OV Detection Level	VbOV DeLevel	%	R	R	
4	01	DC Bus Total	DC Bus Total	Vdc	-	R	
4	02	DC Bus Positive	DC Bus (+)	Vdc	-	R	
4	03	DC Bus Negative	DC Bus (-)	Vdc	-	R	
5	01	Battery Voltage	Battery Voltage	Vdc	R	R	
5	02	Battery Current	Battery Current	A	R	R	
5	04	Battery Backup Time	Backup Time	Sec	R	R	
5	05	Battery Capacity	Battery Capacity	%	R	R	
5	06	Charger Status	Charger Status		R	R	1 – Charging 4 – Equalize 8 – Protective 16 – Discharging 32 – Stopped All other values show Off
5	07	Rated Battery Voltage	Rated Voltage	Vdc	R	R	
5	08	Rated Battery Discharged Current	Rated Dis Current	Adc	R	R	
5	11	Equalized Charging*	Equal Ch		-	R	0 – Disable 1 – Enable

Blk	Item	Long Description	Short Description	Units	Permiissions		Remark
					User	Admin	
5	12	Manual Equalize Chrg*	Man. Equalize Ch		-	R	0 – Start 1 – Stop
5	13	Equalized Charge Time*	Equalize Time	Hrs	-	R	
5	15	Preventive Charging Voltage*	VChrg Prev*	Vdc	-	R	
5	16	Equalized Charging Voltage*	Vchrg Equal*	Vdc	-	R	
5	21	Rated Ahr*	Rated AHr	Ah	R	R	
5	22	Low Battery Detection Level*	Low Batt Level	Vdc	R	R	
5	24	Battery Shutdown Level*	Batt SDown Level	Vdc	R	R	
5	27	Auto Battery Test*	Auto Batt Test		R	R/W	0 – Disable 1 – Enable
5	28	Battery Auto Test Inerval*	Auto Test Inerval	Hrs	R	R/W	
5	30	Equalized Power Failure Duration*	PFail Dur. Equal	Min	R	R	
5	31	Number of Batteies in Series	No Batt(Series)		R	R	
5	32	Number of Batteries in Parallel	No Batt(Paral)		R	R	
5	35	Battery Installed Date	Batt Ins. Date		R	R/W	
6	04	UPS Date*	UPS Date		R	R/W	
6	05	UPS Time*	UPS Time		R	R/W	
6	08	Current State	Current State		R	R	1 – On-Line 2 – Bypass 4 – Backup 8 – BattTest 32 – Shutdown 64 – Pre-Charge 128 – Gate-Check All other numbers show Unknown
6	11	Faults	Faults		R	R	
6	12	Warnings	Warnings		R	R	
6	13	UPS Status(Comm)	UPS Status(Comm)		R	R	
6	31	Change Secu. Lvl	Change Secu. Lvl		R/W	R/W	
6	32	Manage Admin PW	Manage Admin PW		-	R/W	

Blk	Item	Long Description	Short Description	Units	Permiissions		Remark
					User	Admin	
7	01	System Operation Time	System Op Time		R	R	
7	02	Inverter Op Time	Inverter Op Time		R	R	
7	03	Backup Op Time	Backup Op Time	Min	R	R	
7	23	Total Backups	Total Backups		R	R	
7	25	Total Faults	Total Faults		R	R	
7	26	Fault/Warn Record	Fault Record				
7	27	Total Operations	Total Operations		R	R	
7	28	Operation Record	Operation Record				
8	01	Display Firmware Version	DFW Ver		R	R	UXXYFVMMRRR T – Toshba UPS XX – 2 Alpha Numeric UPS Product Line (50 – 5000) Y – uC Projects (M – Main, S – Sub, D – Display) FV – Firmware Version MM – Major version RRR – Minor version Note: Only display can write. Others, read only.
8	02	Display Firmware Built Date	DFW BDate		R	R	Mmm DD, YYYY (Ex. Jan 04, 2006 Automatically read by compiler) Note: Only display can write. Others, read only.
8	03	Display Firmware Built Time	DFW BTime		R	R	HH:MM:SS (Ex. 18:45:45 Automatically read by compiler) Note: Only display can write. Others, read only.
8	50	RemotEye Installation Date	REye Ins Dat		R/W	R/W	YYYYMMDD Note: Only RemoteEye IV can write. Others, read only.
8	51	RemotEye Version	REye Ver		R/W	R/W	Note: Only RemoteEye IV can write. Others, read only.
8	52	RemotEye IP Address	REye IP		R/W	R/W	Ex. 10.128.33.5 Cfg. Of RE parms can be done via re comm.port Note: Only RemoteEye IV can write. Others, read only.
8	53	RemotEye Network Mask Address	REye Mask IP		R/W	R/W	Ex. 255.0.0.0 Note: Only RemoteEye IV can write. Others, read only.
8	54	RemotEye Gateway Address	REye Gway IP		R/W	R/W	Ex. 10.128.33.1 Note: Only RemoteEye IV can write. Others, read only.
8	55	RemotEye Installation Status	Sreye		R/W	R/W	Note: Only RemoteEye IV can write. Others, read only.

Blk	Item	Long Description	Short Description	Units	Permissions		Remark
					User	Admin	
8	57	RemotEye Data Link Status	Sreye Datlink		R/W	R/W	0: Unknown 1: Link Down 2: Link Up Note: Only RemoteEye IV can write. Others, read only.
8	58	RemotEye Network Link Status	Sreye Netlink		R/W	R/W	0: Unknown 1: Link Down 2: Link Up Note: Only RemoteEye IV can write. Others, read only.

Appendix C – Installation Planning Guide

TOSHIBA 5000 UPS

Installation Planning Guide for Outdoor 20kVA UPS

Standard System: 208/120V Input, 208/120V Output

Important Notes:

1. Maximum Current required at Primary AC Input based on full load output and maximum battery charging current.
2. Output load conductors are to be installed in separate conduit from input conductors.
3. Control wires and power wires are to be installed in separate conduits.
4. Recommended AC input and output overcurrent protection based on continuous full load current per NEC.
5. Wiring shall comply with all applicable national and local electrical codes.
6. Grounding conductors to be sized per NEC Article 250-122. Neutral conductors to be sized per NEC Article 310.15.
   - Primary AC Input: 3ϕ, 4-wire + ground.
   - AC Output: 3ϕ, 4-wire + ground.
   - DC Input: 2-wire (Positive/Negative) + ground.
7. Nominal battery voltage based on the use of VRLA type batteries (2.0 volts / cell nominal).
8. Maximum battery discharge current based on lowest permissible discharge voltage of 1.6 VPC.
9. DC Circuit Breaker size based on breakers external to Toshiba-supplied Battery Cabinet(s) or UPS(s). (Toshiba-supplied Battery Cabinets come equipped with internal circuit breakers sized to meet specific operating conditions)
10. DC wires should be sized to allow not more than a 2-volt drop at maximum discharge current.
11. Weights do not include batteries or other auxiliary equipment external to the UPS.
12. Sizing calculations based on the following assumptions:
    - Not more than 6 current-carrying conductors installed in steel conduit in ambient temperature of 30°C.
    - Temperature rating of copper conductors and terminals: 75°C.
    - Feeder distance calculations based on NEC Chapter 9, Tables 8 and 9 data, allowing for 2% AC voltage drop.
    - Reference: 2014 NEC Handbook, Table 310.16.

NOTE: Consult latest edition of applicable national and local codes for possible variations.

Ratings of wires and overcurrent devices are suggested minimums. Local conditions may vary. Consult with a registered Professional Engineer within your local area for proper size selections.

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TOSHIBA 5000 Series UPS

Installation Planning Guide for Industrial Duty UPS 20/30kVA

Standard System: 208/120V Input, 208/120V Output

GENERAL MECHANICAL INFORMATION									
UPS kVA/ kW Rating	Config	Dimensions	Weight	Est. Heat Loss	Mechanical Clearance for Ventilation and Maintenance Access				
		Inches (mm)	Lbs.	kBTU/Hr	Front	Left Side	Right Side	Back	Top
20/30 kVA/ 18/27kW	1-Cab.	59.38 x 38.70 x 92.09 (1508 x 983 x 2340)	1700	7.6 / 12.6	36 in. (914 mm)	6 in. (152 mm)	36 in. (914 mm)	0.0 in. (0.0 mm)	6 in. (152 mm)
20/30 kVA/ 18/27kW	2-Cab.	84.34 x 38.72 x 92.09 (2143 x 984 x 2340)	2680	7.6 / 12.6	36 in. (914 mm)	6 in. (152 mm)	36 in. (914 mm)	0.0 in. (0.0 mm)	6 in. (152 mm)

PRIMARY AC INPUT (208/120V 3-PHASE / 4-WIRE)					
Maximum Input Power Demand			Suggested External Feed Breaker	Suggested Minimum Feeder Wire Size per Phase / Neutral	Suggested Max. Feeder Length for Min. Wire Size in Steel Conduit
kVA	PF	Amps	Amps	AWG or kcmil a 75 °C Temp. Rating	Feet
20	>0.99	57 (62)	80 A	#3 – #2 / 2/0 – 3/0	380
30	>0.99	86 (91)	110 A	1/0 – 2/0 / 4/0 – 250 kcmil	380

BYPASS AC INPUT (208/120V 3-PHASE / 4-WIRE)					
Maximum Input Power Demand			Suggested External Feed Breaker	Suggested Minimum Feeder Wire Size per Phase / Neutral	Suggested Max. Feeder Length for Min. Wire Size in Steel Conduit
kVA	PF	Amps	Amps	AWG or kcmil a 75 °C Temp. Rating	Feet
20	>0.99	56	80 A	#3 – #2 / 1/0 – 2/0	380
30	>0.99	83	110 A	1/0 – 2/0 / 4/0 – 250 kcmil	380

BATTERY BACKUP (288 VDC NOMINAL)					
Battery Capacity Required for Full Load Output		Maximum Discharge at Full Load Output	Suggested External Feeder Breaker [1]	Suggested Minimum Feeder Wire Size[2]	Suggested Max. Feeder Length for Min. Wire Size in Steel Conduit
kVA	kWB	Amps	Amps	AWG or kcmil a 75 °C Temp. Rating	Feet
20	20	87 A	90 A	#4 – #3	70
30	30	130 A	150 A	#1 – 1/0	70

1 - External overcurrent overprotection not needed if battery cabinet(s) are each equipped with an appropriate internal circuit breaker.
2 - External feeder cables may change depending on number of battery cabinets placed in parallel.

AC OUTPUT (208/120V 3-PHASE / 4-WIRE)					
Maximum Output Power Demand			Suggested External Feed Breaker	Suggested Minimum Feeder Wire Size per Phase / Neutral	Suggested Max. Feeder Length for Min. Wire Size in Steel Conduit
kVA	PF	Amps	Amps	AWG or kcmil a 75 °C Temp. Rating	Feet
20	0.9	56	80 A	#3 – #2 / 1/0 – 2/0	380
30	0.9	83	110 A	1/0 – 2/0 / 4/0 – 250 kcmil	380

Appendix D – Input/Output Cabling Guide

The 5000 Series UPS can be configured with a variety of Input and Output voltage transformers to accommodate different Input/Output voltage combinations.

Table D.1 – Recommended Cable Size by Input/Output/Bypass Voltage(3P/4W + G)
Table D.2 – Recommended Cable Size by Input/Output/Bypass Voltage(3P/3W + G)
Table D.3 – Input Transformer Current at Input Voltage
Table D.4 – Output Transformer Current at Output Voltage

Tables D.1 and D.2 lists the recommended Power Cable sizing for each of the UPS – Vin/Vout transformers.

NOTE: Ampacity should be determined uisng Table 310.16 of the NEC (National Electrical Code) for 75°C copper conductors, and derated to accomidate the ambient temperature of the operating environment.

Neutral cable sizing in Table D.1 is based on allowing, when possible, 1.7 x Imax for current carrying Neutral. Sizing calculations are based on 4-6 current carrying conductors per conduit. I

TABLE D.1 – RECOMMENDED CABLE SIZE BY INPUT/OUTPUT/BYPASS VOLTAGE FOR 3P/4W + GND AT 30 °C AMBIENT [1]

Vin/out/byp 3P/4W+G		20kVA (AWG)	30kVA (AWG)
208/120V	Phase	#3	1/0
	Neutral	2/0	4/0
220/127V	Phase	#3	#1
	Neutral	1/0	41/0
240/139V	Phase	#4	#1
	Neutral	1/0	3/0
380/220V	Phase	#6	#4
	Neutral	#3	#1
400/227V	Phase	#8	#4
	Neutral	#4	#1
415/240V	Phase	#8	#4
	Neutral	#4	#2
480/277V	Phase	#8	#6
	Neutral	#4	#3
600/347V	Phase	#8	#6
	Neutral	#6	#4

1 – Cable sizing based on Table 310.16 Allowable Ampacities of Insulated Conductors , for 75C Copper conductors; National Electrical Code 2008 ed.

TABLE D.2 – RECOMMENDED CABLE SIZE BY INPUT/OUTPUT/BYPASS VOLTAGE FOR 3P/3W + GND AT 30 °C AMBIENT [1]

Vin/out 3P/3W+G		20kVA (AWG)	30kVA (AWG)
208V	Phase	#4	#2
220V	Phase	#4	#2

Vin/out 3P/3W+G		20kVA (AWG)	30kVA (AWG)
240V	Phase	#6	#2
380V	Phase	#8	#6
400V	Phase	#8	#6
415V	Phase	#8	#6
480V	Phase	#10	#8
600V	Phase	#10	#10

Calculated values of Input current at different voltages are listed in Table D.3. Calculated values for Output/ Bypass current at different voltages are listed in Table D.4.

TABLE D.3 – INPUT TRANSFORMER CURRENT AT INPUT VOLTAGE

Input Voltage	Input Current (Input Current + Charging Current) at Full Load	
	20 kVA	**30 kVA**
208/120V	55A (60A)	83A (88A)
220/127V	52A (57A)	79A (83A)
240/139V	48A (52A)	72A (76A)
380/220V	30A (33A)	46A (48A)
400/227V	29A (31A)	43A (46A)
415/240V	28A (30A)	42A (44A)
480/277V	24A (26A)	36A (26A)
600/347V	19A (21A)	29A (31A)

TABLE D.4 – OUTPUT TRANSFORMER CURRENT AT OUTPUT VOLTAGE

Output Voltage	Output Current at Full Load	
	20 kVA	**30 kVA**
208/120V	56A	81A
220/127V	52A	79A
240/139V	48A	72A
380/220V	30A	46A
400/227V	29A	43A
415/240V	28A	42A
480/277V	24A	36A
600/347V	19A	29A

NOTE: Recommend allowing 1.7 x I_{max} (when possible) for current carrying Neutral.
Allow for additional derating per NEC if:

- Accommodating more than three current-carrying conductors in a conduit.
- Operating at ambient temperatures above **30** °**C**.

TOSHIBA

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