TOSHIBA

Leading Innovation

UNINTERRUPTIBLE POWER SYSTEM (UPS)

4400 SERIES

INSTALLATION AND OPERATION MANUAL

THREE PHASE - 15/20/25/30/50/80/100 KVA

Part # 64527-007
June 2017
Manufactured in the USA

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Product Use and Warranty Restrictions

The Toshiba products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). 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, transportation instruments, traffic signal instruments, combustion control 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: *toshibaups3@tic.toshiba.com* or visit us at:

www.toshiba.com/tic/industrial/uninterruptible-power-systems

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 UPS Division. The warranty contained in the contract between the parties is the sole warranty of Toshiba International Corporation UPS 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 construction, 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 _____

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 (877) 867-8773 Fax (713) 896-5212
E-mail – *TIC-UPS-AppEngr@tic.toshiba.com*
Web – *https://www.toshibaups.com*

You may also contact Toshiba by writing to:

TOSHIBA INTERNATIONAL CORPORATION
SOCIAL INFRASTRUCTURE SYSTEMS GROUP
POWER ELECTRONICS DIVISION - UPS
13131 West Little York Road
Houston, Texas 77041-9990
Attn.: 4400 UPS Product Manager

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

Contents

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1 Introduction

This manual provides information on how to safely operate your 4400 Series 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 4400 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.

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.**

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.**

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.**

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 construction, 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 construction and function of the 4400 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 factory trained and certified to install, service, and repair the UPS. Contact the Toshiba Customer Support Center for assistance in locating the factory 4400-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 4400 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 46

The maximum operating ambient temperature for the UPS is 104 °F (40 °C) 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 BATTERY 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 general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). 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, traffic signal instruments, combustion control 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.

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 MODIFICATIONS 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 clean. Use a vacuum cleaner to clean dust and foreign material the UPS. Keep the exterior clean.
	Only factory authorized personnel should perform internal general maintenance on the UPS.
	Contact the authorized Toshiba Customer Support Center 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 10° from upright position.

Tilting the UPS more than 10° 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 where water may fall on or enter it.

Water 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

Unpack the UPS indoors on a paved floor. The UPS should be as close as possible to its final location. Allow enough space for forklift 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.
- Make sure that exterior paint is not scratched and that the UPS cabinet is not damaged before uncrating.
- DO NOT damage the UPS when using tools to remove packaging materials.
- If provided, DO NOT remove the protective plastic sheet cover until installation.
- Do not remove the protective fan covers over the fans 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.
- Retain the packing rails for offloading the UPS from the shipping pallet, and for final UPS installation.

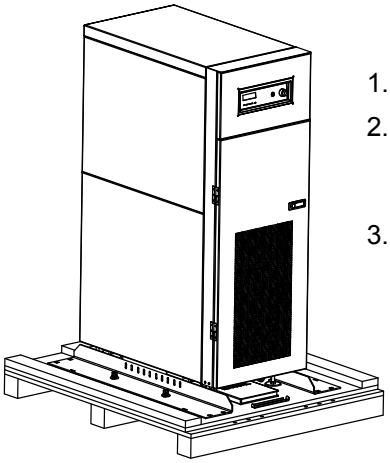
4.2 Unpack the 15-30kVA Model UPS (with Casters)

NOTE: The 4400 UPS is equipped with casters and leveling feet. It is attached to the shipping pallet by two unloading rails that double as floor anchors during final placement of the UPS.

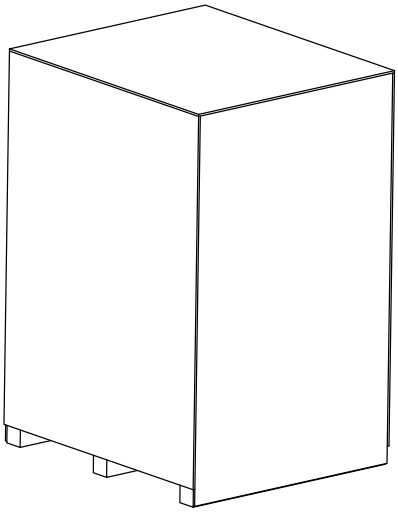
⚠ CAUTION

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 rails from both the unit and the shipping pallet.
3. Place the rails on the front of the pallet.



4. Attach the rails as shown to the front of the pallet.
5 Use the four 1/2 x 3” bolts to secure the rails to the shipping pallet.
6. Place the tie brackets in the slots at the upper and lower ends of the ramps.
7 SLOWLY roll the unit down the ramp.
8. Save the loading rails for anchoring of the UPS. See Section 8.3.

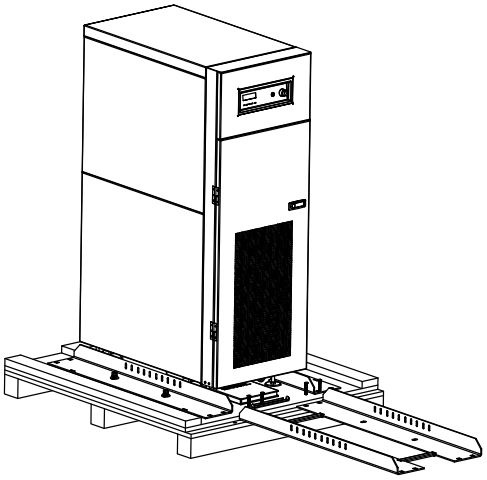


FIGURE 4.1 – UNSHIPPING 15-30KVA UPS

4.3 Unpack the 50kVA Model UPS (with Casters)

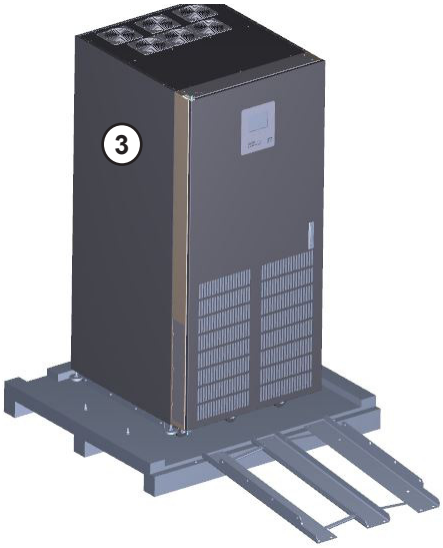
The 4400 UPS is equipped with casters and leveling feet. It is attached to the shipping pallet by unloading rails that can double as floor anchors during final placement of the UPS.

⚠ 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 Shipping rails on each side of the base of the UPS from both the unit and the shipping pallet.
3. Place the two side (A) and one center (B) rails on the front of the pallet.
4. Use the six 1/2 x 3” bolts to secure the rails to the shipping pallet.



5. Place the tie brackets in the slots at the upper and lower ends of the ramps.
6. SLOWLY roll the unit down the ramp.
7. Save the loading rails for anchoring the UPS. See Section 8.3.

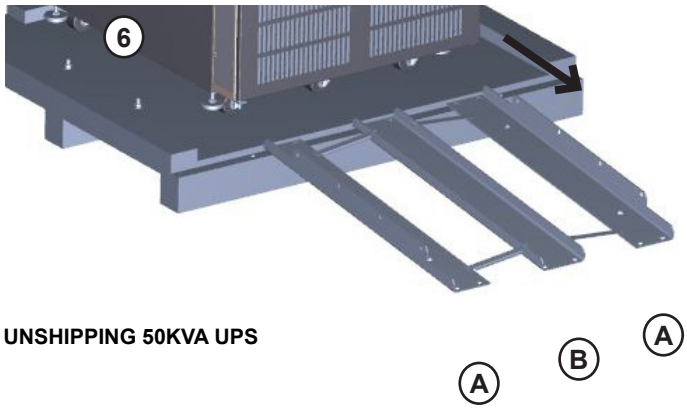


FIGURE 4.2 – UNSHIPPING 50KVA UPS

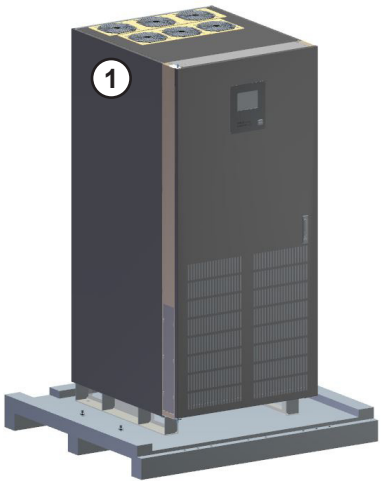
4.4 Unpack the 80-100kVA Model UPS

The 4400 80kVA UPS has C_channel skids for a base. The skids are bolted to the shipping pallet to secure the UPS during shipping. Folow the directions below to unship the 80kVA UPS.

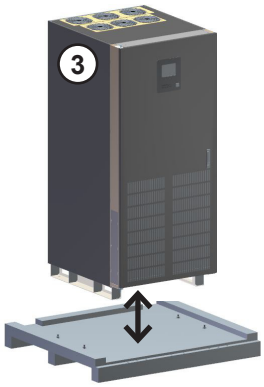
⚠ CAUTION

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 or pallet jack to transport the UPS to it's installation location. See Section 8.3.

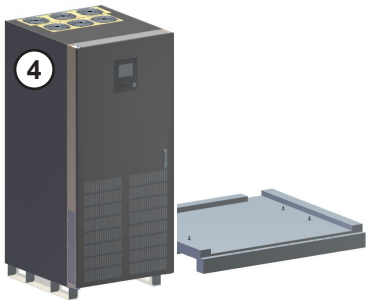


FIGURE 4.3 – UNSHIPPING 80KVA UPS

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 104 °F (-20 to 40 °C)
- The optimum storage temperature is 70 °F (21 °C). A higher ambient temperature will require recharging more frequently during storage.

Avoid the following storage locations:

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

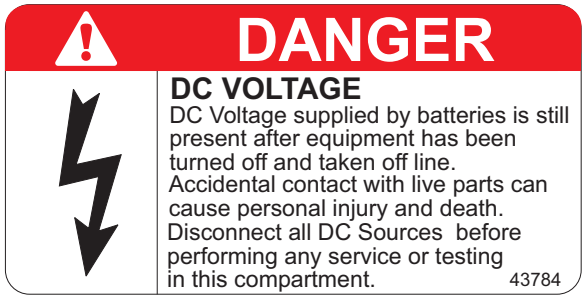
TENSION AC

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

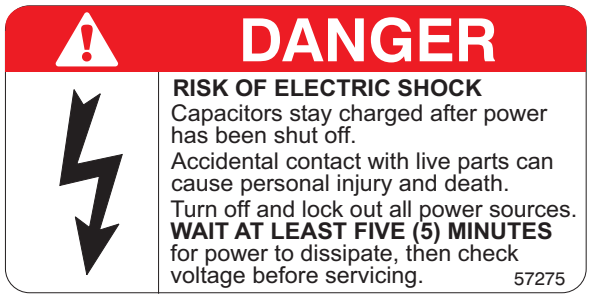
FIGURE 5.1 – WARNING LABELS

C – 43784

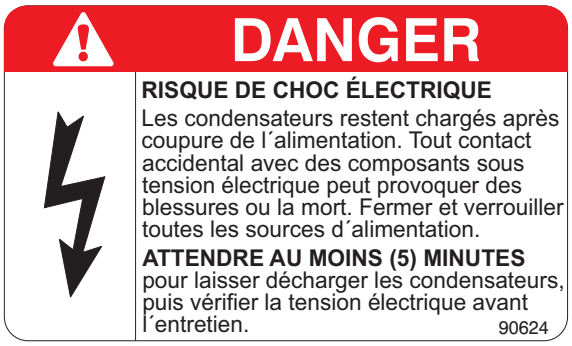


C1 – 90632

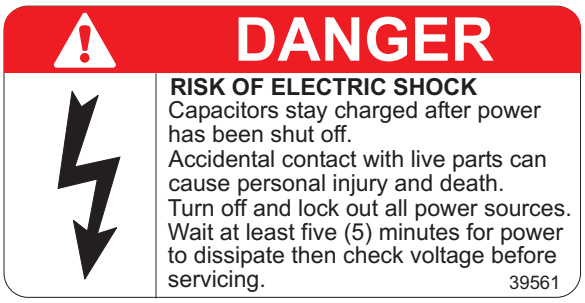
D – 57275



D1 – 90624

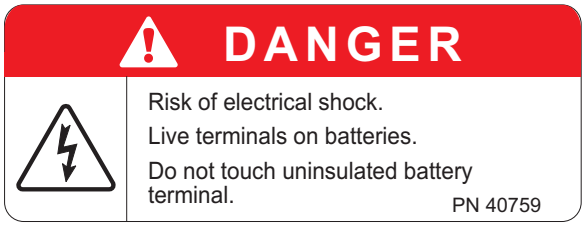


E – 39561



E1 – 39561F

F – 40759



F1 – 90637

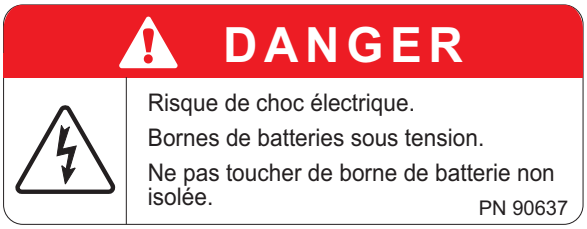
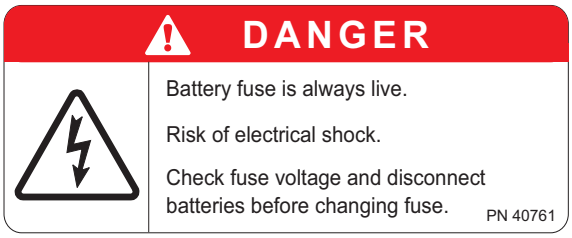
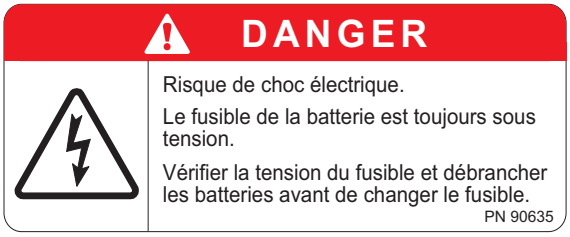


FIGURE 5.1 – WARNING LABELS (CONT.)

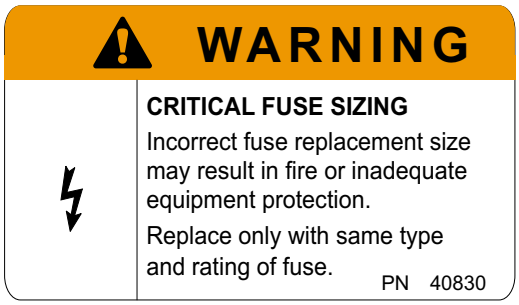
G – 40761



G1 – 90635

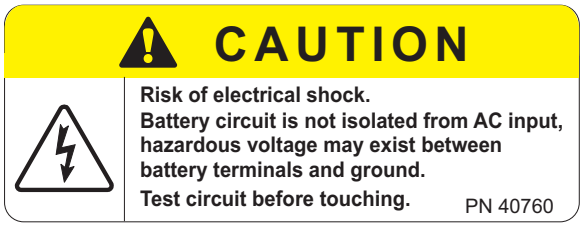


H – 40830



H1 – 91348

J – 40760



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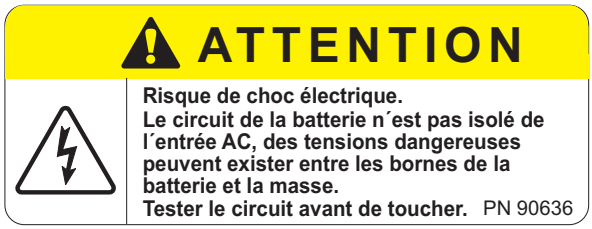

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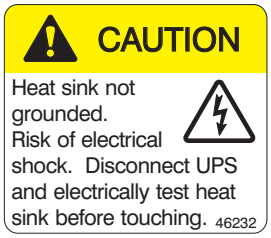

K1 – 90623

L – 46231

L1 – 90631

M

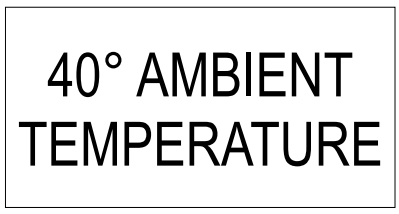

FIGURE 5.1 – WARNING LABELS (CONT.)

The warning labels identified on the previous pages are located on the front and interior of the UPS. Their location in the 15-30kVA UPS cabinet is shown in Figures 5.2 – 5.3, for the 50kVA cabinet in Figures 5.4 – 5.5, and for the 80-100kVA cabinet in Figures 5.6 – 5.7.

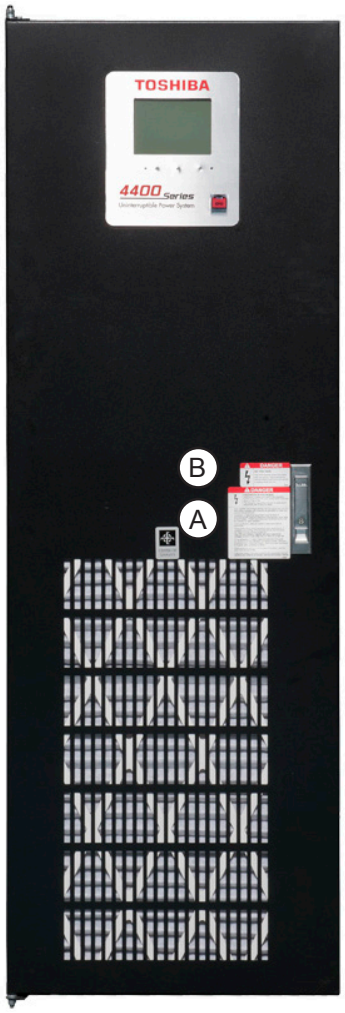

FIGURE 5.2 – 15-30KVA CABINET EXTERNAL WARNING LABEL LOCATIONS

FIGURE 5.3 – 15-30KVA CABINET INTERNAL WARNING LABEL LOCATIONS

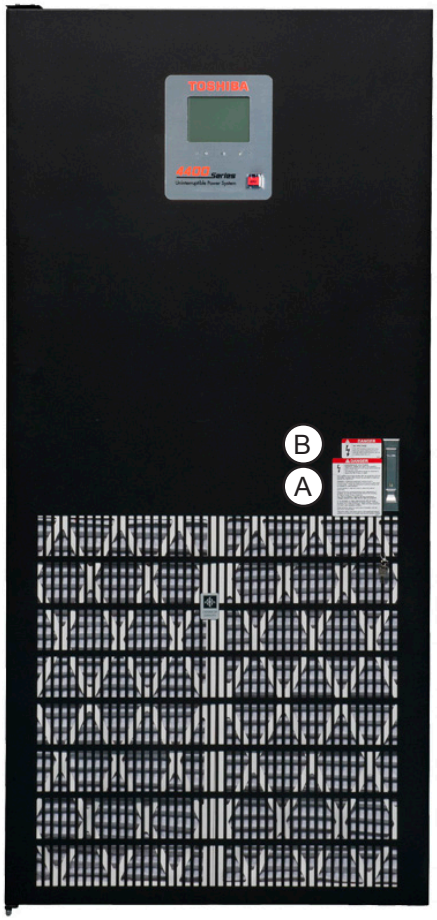

FIGURE 5.4 – 50KVA CABINET EXTERNAL WARNING LABEL LOCATIONS

FIGURE 5.5 – 50KVA CABINET INTERNAL WARNING LABEL LOCATIONS

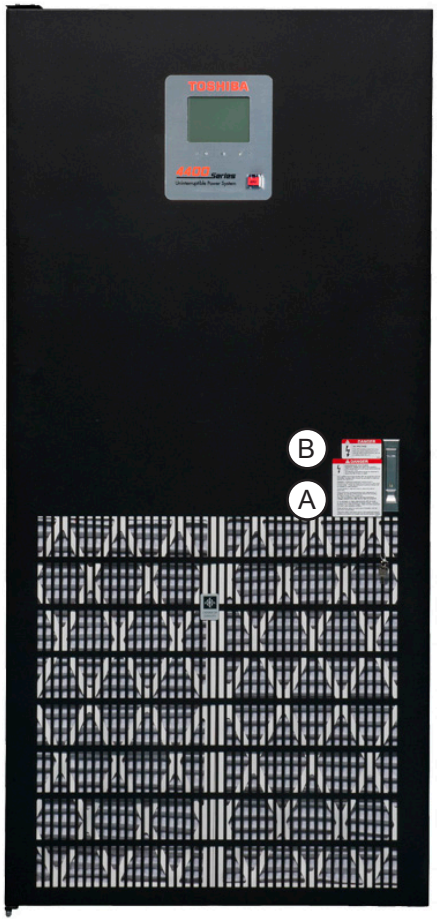

FIGURE 5.6 – 80-100KVA CABINET EXTERNAL WARNING LABEL LOCATIONS

FIGURE 5.7 – 80-100KVA CABINET INTERNAL 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 32 – 104 °F (0 – 40 °C) should be observed.
- The optimal relative humidity at the storage location should be between 50 – 60%.
- Humidity must not exceed 90%.
- 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: 32 °F (0 °C)	
	Maximum storage temperature: 104 °F (40 °C)	
Relative Humidity	The relative humidity must be between 30 and 90% and without condensation due to temperature changes.	
Altitude	This equipment is rated for installations up to 3240 ft. (1000 m) above sea level. Consult with the factory to determine the derating factor for installations above 3240 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. The input frequency range must be within the rated input frequency range.

3. The UPS should not be used with a load that has a rated input that is greater than the rated output of the UPS.
4. 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 over sizing the UPS for lock rotor current.
5. DO NOT insert metal objects or combustible materials in the ventilation slots of the UPS.
6. DO NOT place, hang, or paste any objects on the exterior surfaces of the UPS.
7. The capacitors in the UPS maintain a residual charge for a while after turning the UPS off. The required discharge time for each UPS typeform is provided via a cabinet label and a CHARGE LED. Wait for at least the minimum time indicated on the label and ensure that the CHARGE LED has gone out before opening the door of the UPS once the UPS power has been turned off.
8. DO NOT attempt to disassemble, modify, or repair the UPS. Call your Toshiba sales representative for repair information.
9. Turn the power on only after installing ALL of the covers.
10. DO NOT remove any covers of the UPS when power is on.
11. If the UPS should emit smoke or an unusual odor or sound, turn the power off immediately.
12. Warning signs should be placed on or near the load as a notification that the load is being powered by the UPS.
13. Additional warnings and notifications shall be posted at the equipment installation location as deemed required by Qualified Personnel.

⚠ 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 1.0 PF is 86 °F (30 °C) , and at 0.9 PF 104 °F (40 °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 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 10.1 – 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.
	**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. See Figure 4.1 Exterior Handling label.

⚠ CAUTION

Install the UPS in a controlled environment.

Improper storage and installation environment may deteriorate insulation, shorten component life and cause malfunctions.

See Table 5.1 – UPS Installation Environment Standards

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.

⚠ WARNING

Keep the SPECIFIED CLEARANCE around the UPS.

Inadequate space around the UPS makes it difficult to perform maintenance/inspections, will lead to insufficient ventilation, and/or cause malfunctions.

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.

Only factory authorized personnel should relocate, modify, or replace parts in the UPS after initial installation.

Electrical shock, injury or UPS failure may occur if non-authorized technicians attempt to modify or relocate the UPS.
Please contact Toshiba Customer Support Center if you plan to move or make modifications to the UPS

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.

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 Installation

8.1 Unpacking

Unpack the UPS indoors on a paved floor. 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.

8.2 UPS Clearance

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

NOTE: Minimum front clearance for unobstructed airflow is 20 inches. However, minimum front clearance when physically accessing the UPS must be at least the width of the front door of the UPS, or per NEC 110.34(A)(36 i n./900 mm) and local requirements, whichever is greater.

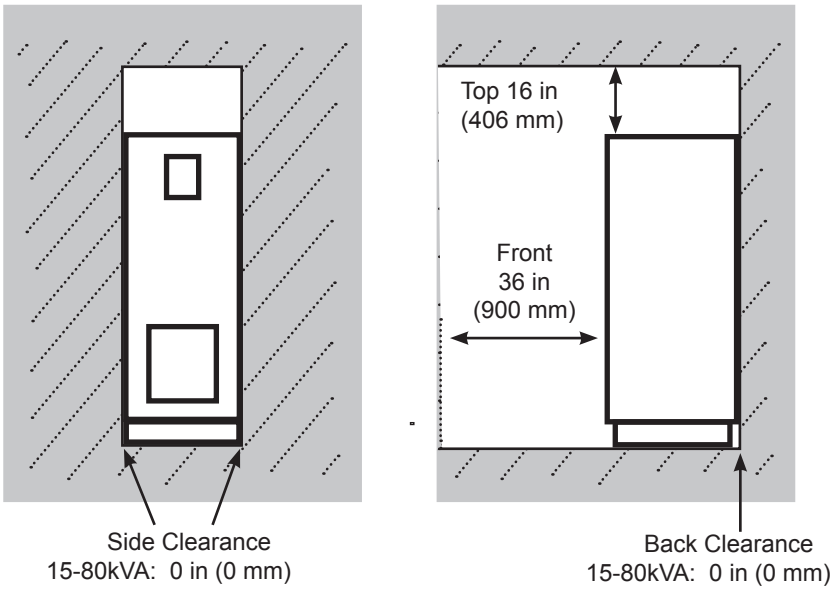

FIGURE 8.1 CLEARANCE FOR UPS USING LEVELING FEET

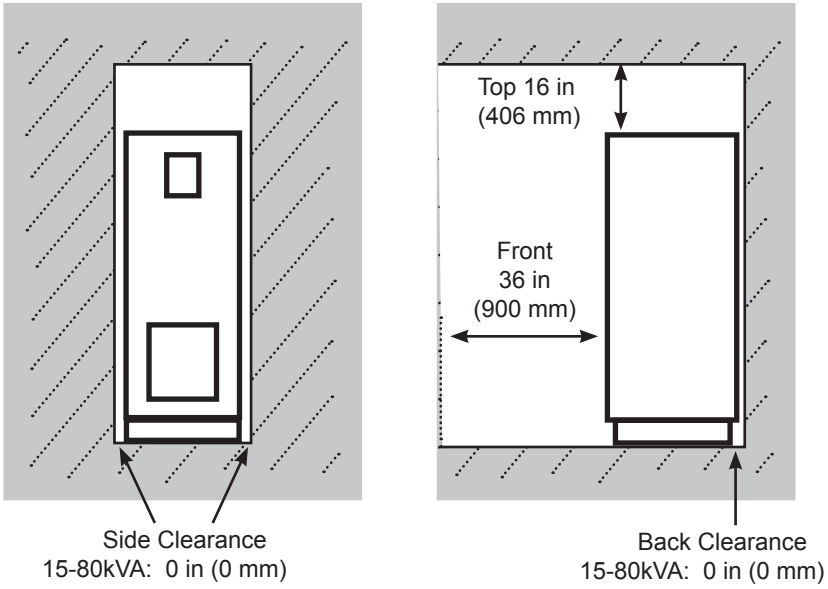

FIGURE 8.2 CLEARANCE FOR SEISMIC INSTALLATIONS

8.3 UPS Anchorage

All 4400 Series models, except the 80-100 kVA, come with casters and leveling feet. The 80kVA model comes with Angle Bracket skids.

The leveling feet allow the 15-50kVA models to be rolled into place, then the leveling feet extended to remove weight from the casters to ensure the UPS remains stationary.

The skids on the 80kVA serve the same function. The 80-100kVA UPS can be bolted directly to the floor via the Angle Bracket skids on the base.

Seismic Installations

For additional stability, an optional Seismic Kit is available for each cabinet model (P/N 440300SEISMICKIT for the 15-30kVA, P/N 440500SEISMICKIT for the 50kVA, P/N 440800SEISMICKIT for the 80kVA). This kit enables the UPS system to conform to the OSHPD seismic certification requirements. See the 4400 Seismic Kit Installation Instructions, P/N 94016, for details.

Anchorage Bolts for 80-100kVA Cabinets

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

Use 5/8" (16 mm) diameter anchor bolts. There are 0.7" (17.9 mm) diameter holes provided in the UPS base. See Figure 8.3 and 8.6 for the hole locations and dimensions.

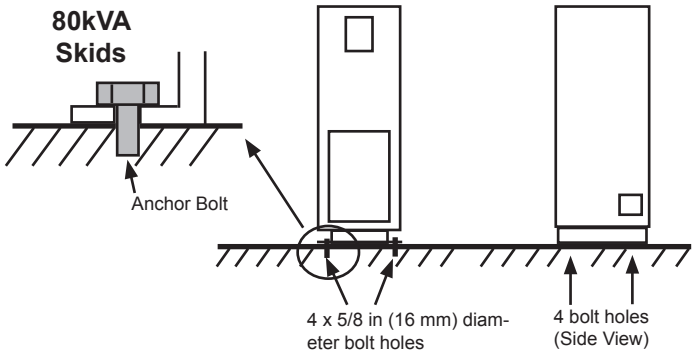

FIGURE 8.3 ANCHOR BOLT INSTALLATION DETAIL

8.4 15-50kVA Anchorage - Standard

Place the UPS in the final installation location.

Extend the threaded leveling feet until all weight has been removed from the casters and the UPS is level.

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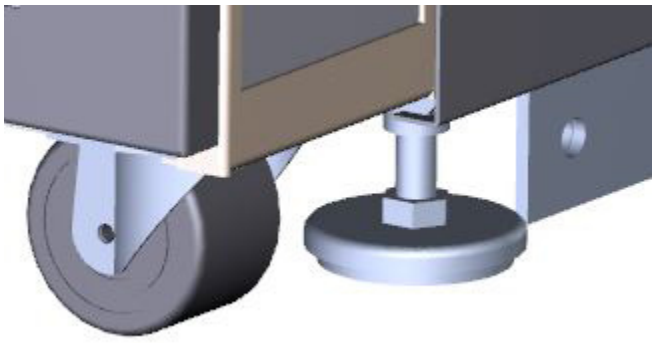


DETAIL - Load Leveling Foot

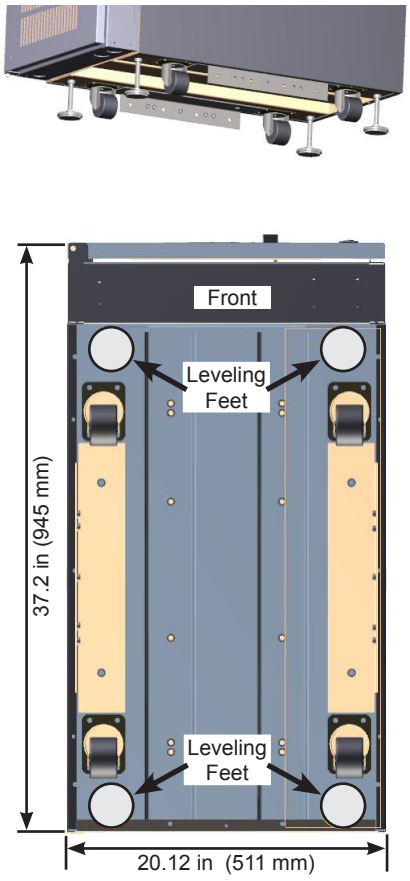


FIGURE 8.4 – FOOTPRINT FOR 15-30 KVA USING LOAD LEVELING FEET

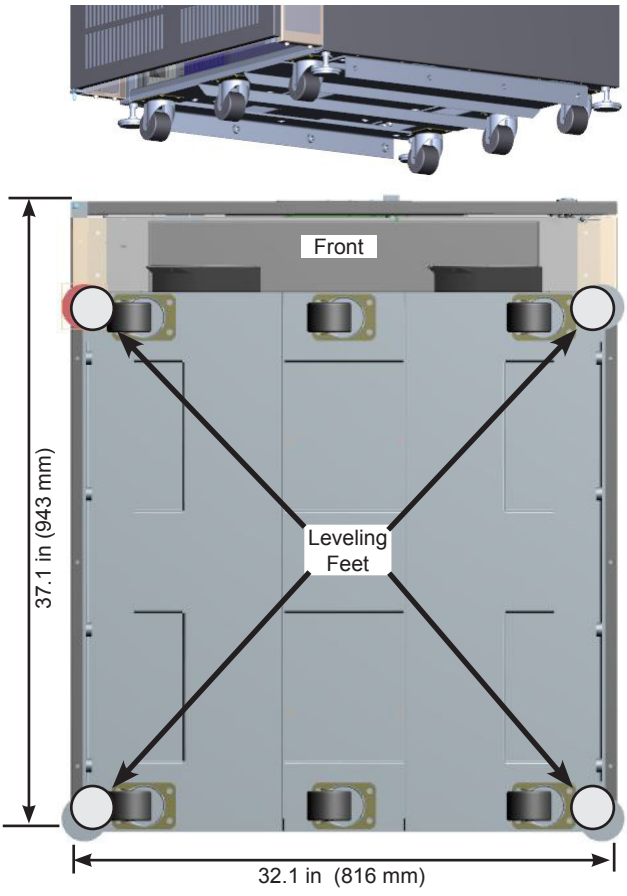


FIGURE 8.5 FOOTPRINT FOR 50 KVA USING LOAD LEVELING FEET

8.5 80-100kVA Anchorage - Standard

Install the anchor bolts per Section 8.3 in the pattern shown in Figure 8.6.

Secure the UPS Angle Bracket skids to the floor with the anchor bolts..

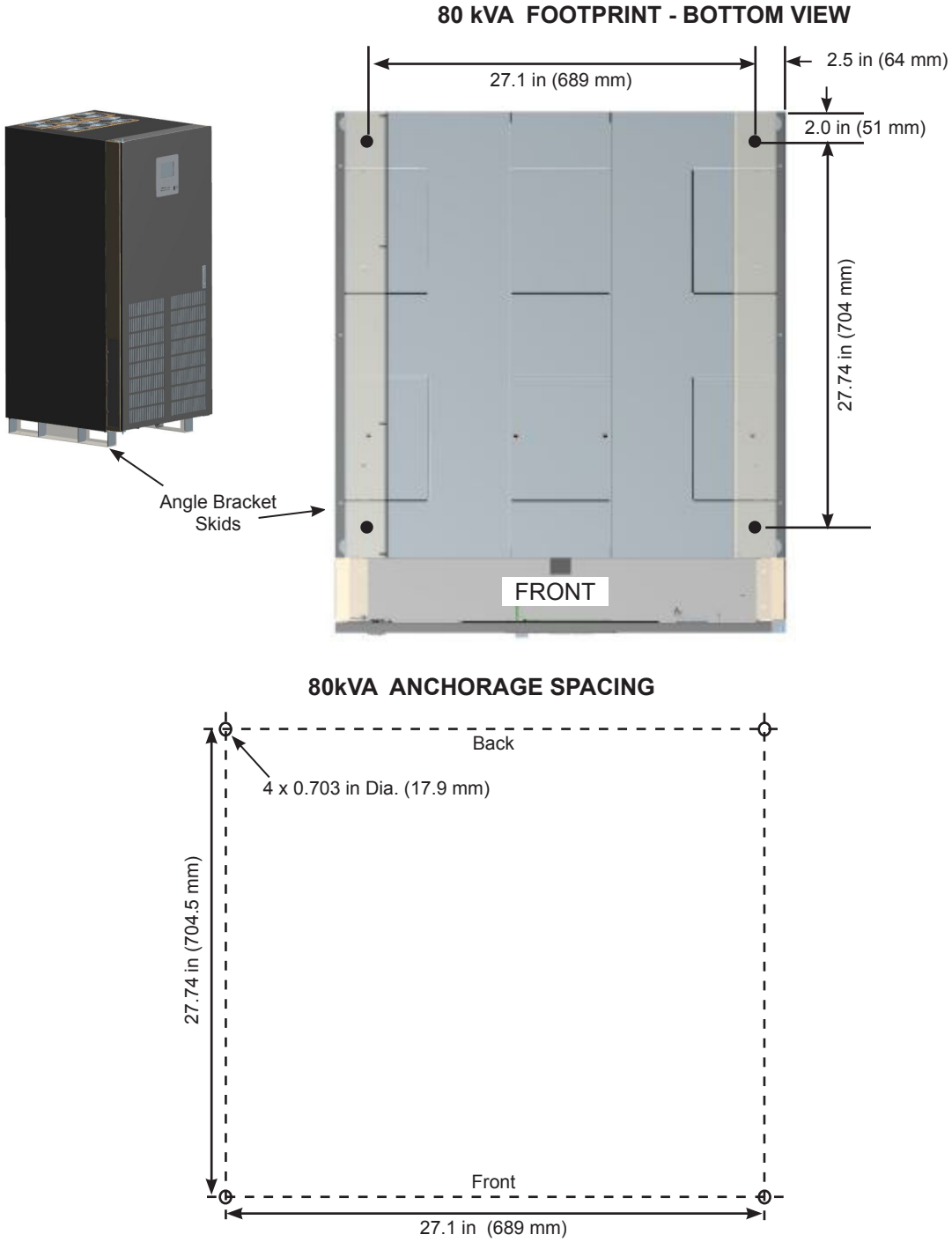


FIGURE 8.6 ANCHORAGE HOLE LOCATIONS – 80kVA UNITS (Standard)

8.6 Power Cable Access

Power and control cable access conduit landing plates are provided via. the expansion band immediately behind the front door of the UPS.

For top access conduit for control/Ethernet wiring can be installed in the top left cable access knock-out plate. Conduit holes can be drilled in the to right side of the expansion band. The dimensions of the openings and their locations are shown below.

Top Access Conduit Landing: Control and Ethernet wiring conduit should be landed on the top left side conduit landing plate, and power cabling conduit should be landed on the right side of the main conduit landing plate. NOTE: the 50-100kVA units have a knockout on the right side of the top plate.

Side Access Conduit Landing: Control and Ethernet wiring conduit should be landed on the conduit landing plate provided at the bottom left and bottom right side of the expansion band.

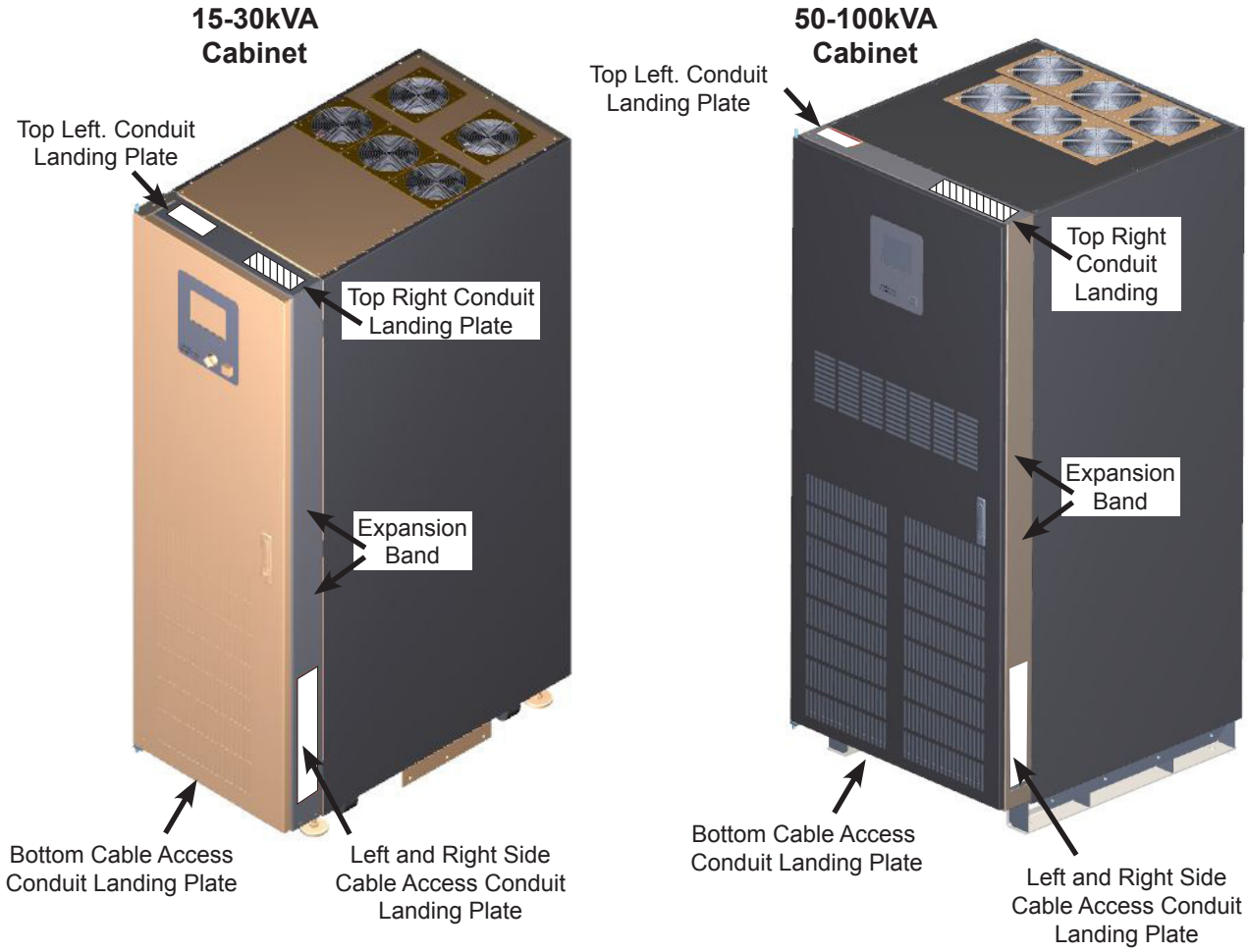
Bottom Access Conduit Landing: Control and Ethernet wiring conduit should be landed on the bottom left side conduit knockout, and power cabling conduit should be landed on the bottom right side of the main conduit landing plate knockouts.

Access Port Dimensions See Appendix A for additional details.

TABLE 8.1 4400 ACCESS PORT DIMENSIONS

Port Location	Dimensions	
	15-30kVA Cabinet	**50-100kVA Cabinet**
Top Left Conduit Landing Plate (Control Wiring)	1.57 in x 4.76 in (40 mm x 121 mm)	1 in conduit knockout (top left)
Top Conduit Landing Area (Power Cables)	1.57 in x 4.76 in (40 mm x 121 mm)	3.25 in x 21.1 in (83 mm x 537 mm)
L & R Side Conduit Landing Plate (Control Wiring and Power Cables)	2.6 in x 14.1 in (67 mm x 359 mm)	3.25 in x 21.2 in (83 mm x 537 mm)
Bottom Conduit Landing Area (Control Wiring)	1 x 0.75 in (20 mm) dia. knockout	1 in conduit knockout (bottom left)
Bottom Conduit Landing Area (Power Cables)	3 x 0.75 in (20 mm) dia. knockouts	Drill as necessary 8.6 in x 37.4 in

*NOTE: Although the entire width of the top and bottom main conduit landing plates can be used for cable access, using the far right and left sides of the plates will make it easier to remove the UPS deadfront panel(s) for servicing and battery replacement.



NOTE: See Appendix A – Dimensional Drawings for Conduit Landing Plate dimensions

FIGURE 8.7 – CONDUIT LANDING LOCATIONS

8.7 UPS Parts Identification – 15–30kVA

The following table identifies the major components of the UPS.

TABLE 8.2 15-30KVA UPS COMPONENT LOCATION AND IDENTIFICATION

No.	Description
1	Front Panel Display
2	Locking Door Latch with optional Lockout/Tagout Hasp
3	Upper Deadfront
4	Middle Deadfront
5	Lower Deadfront
6	MCCB1 – Primary Input Circuit Breaker
7	MCCB2 Secondary Input Circuit Breaker (on Dual Input)
8	***(Optional)*** Air filter
9	PCB 9 – Display Control Board
10	RemotEye Control Board – PCB-9B
11	RS-232C Plug
12	Dry Contact Plug

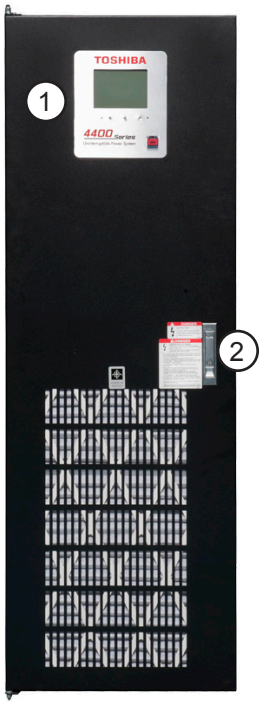
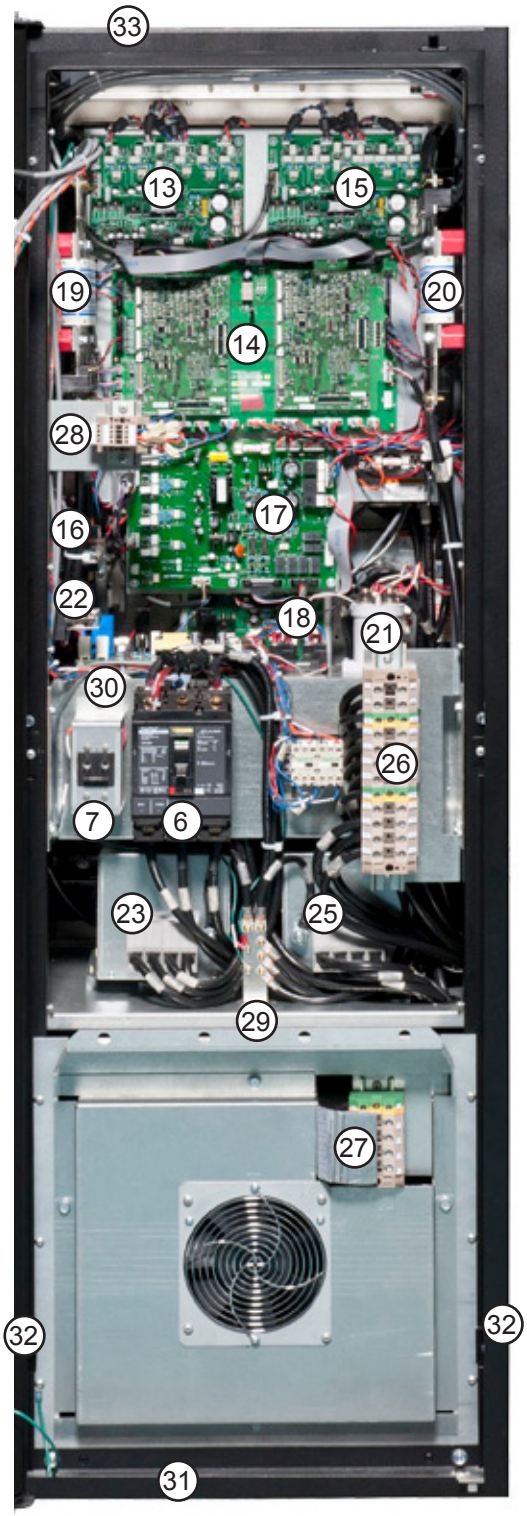


TABLE 8.2 15-30KVA UPS COMPONENT LOCATION AND IDENTIFICATION (CONT.)

No.	Description
13	PCB 2 – Converter Board
14	PCB 1 – Control Board
15	PCB 3 – Inverter Board
16	Test Switch SW 4
17	PCB 4 – Charger Board
18	PCB 5 – Bypass Driver Board
19	AC Input Fuses
20	AC Output fuses
21	DC Contactor
22	DC Power supply for PCB-9A (Display Control Board)
23	AC Input EMI Filter
24	***(This Number Not Used)***
25	AC Output EMI Filter
26	TB1 with (from bottom to top) Primary Input, Output, and Backup DC Supply Lugs
27	***(Optional)*** TB4 with Secondary Input Power Lugs
28	TB3 – Terminals for Battery Cabinet Breaker Shunt Trip and Aux.
29	Ground Bus
30	Shunt Trip DC Power Supply
31	Bottom Cable Access Port
32	Side Cable Access Ports
33	Top Cable Access Port

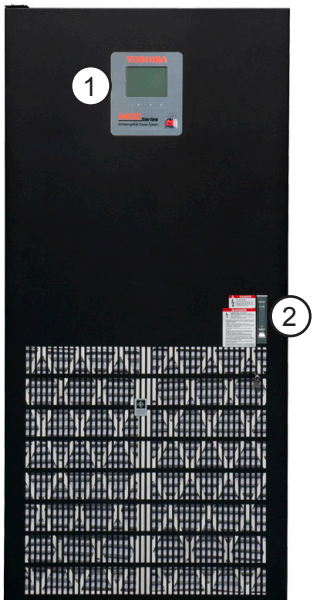


8.8 UPS Parts Identification – 50kVA

The following table identifies the major components of the UPS.

TABLE 8.3 50KVA UPS COMPONENT LOCATION AND IDENTIFICATION

No.	Description
1	Front Panel Display
2	Locking Door Latch with optional Lock-out/Tagout Hasp
3	Upper Deadfront
4	Middle Deadfront
5	Lower Deadfront
6	MCCB1 – Primary Input Circuit Breaker
7	MCCB2 Secondary Input Circuit Breaker (Dual Input)
8	***(Optional)*** Air filter
9	PCB 9 – Display Control Board
10	RemotEye Control Board – PCB-9B
11	RS-232 Plug
12	Dry Contact Connector Plug



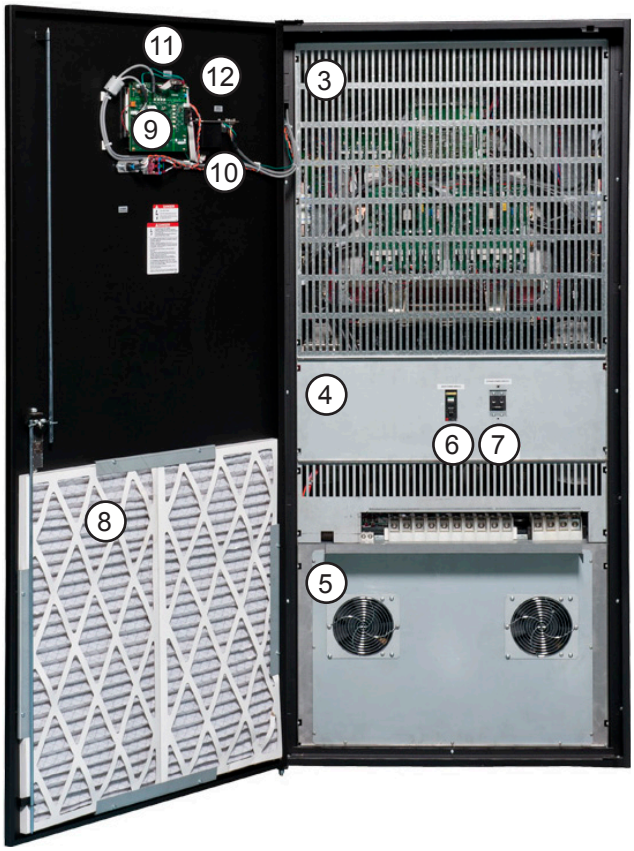
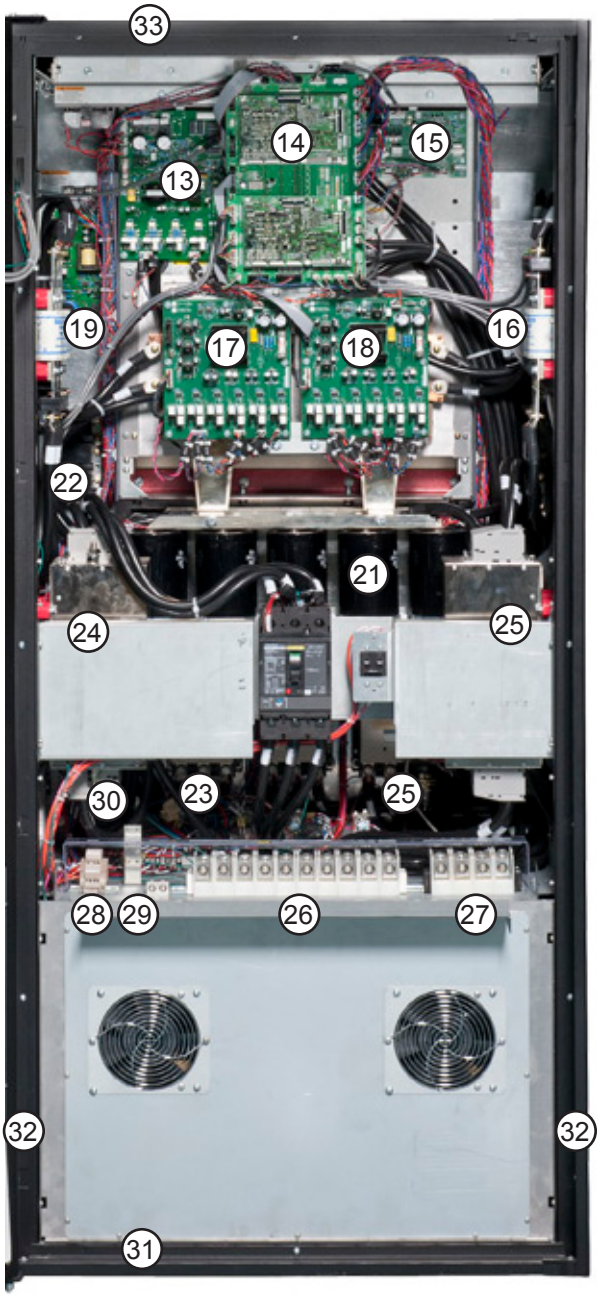


TABLE 8.3 50KVA UPS COMPONENT LOCATION AND IDENTIFICATION (CONT.)

No.	Description
13	PCB 4 – Charger Board
14	PCB 1 – Control Board
15	PCB 5 – Bypass Driver Board
16	AC Output Fuses
17	PCB 2 – Converter Board
18	PCB 3 – Inverter Board
19	AC Input Fuses
20	***(This Number Not Used)***
21	DC Capacitor Bank
22	DC Power supply for PCB-9A (Display Control Board)
23	Primary Input Contactor
24	AC Input EMI Filter
25	AC Output EMI Filter
26	TB1 with Primary Input, Output, and Backup DC Supply Box Lugs
27	***(Optional)*** TB4 with Secondary Input Power Box Lugs
28	TB3 – Terminals for Battery Cabinet Breaker Shunt Trip and Aux.
29	Ground Bus
30	Shunt Trip DC Power Supply
31	Bottom Cable Access Port
32	Side Cable Access Ports
33	Top Cable Access Port

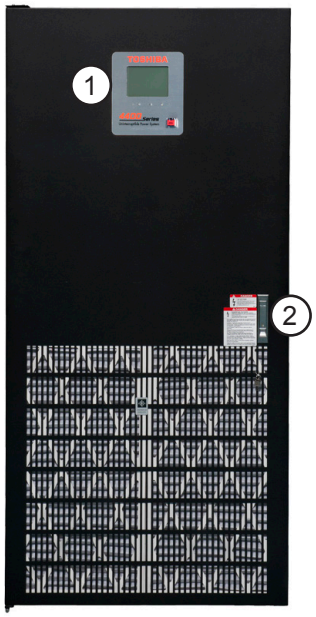


8.9 UPS Parts Identification – 80-100kVA

The following table identifies the major components of the UPS.

TABLE 8.4 80-100KVA UPS COMPONENT LOCATION AND IDENTIFICATION

No.	Description
1	Front Panel Display
2	Locking Door Latch with optional Lockout/Tagout Hasp
3	Upper Deadfront
4	Middle Deadfront
5	Lower Deadfront
6	MCCB1 – Primary Input Circuit Breaker
7	MCCB2 Secondary Input Circuit Breaker (Dual Input)
8	***(Optional)*** Air filter
9	PCB 9 – Display Control Board
10	RemotEye Control Board – PCB-9B
11	RS-232 Plug
12	Dry Contact Plug



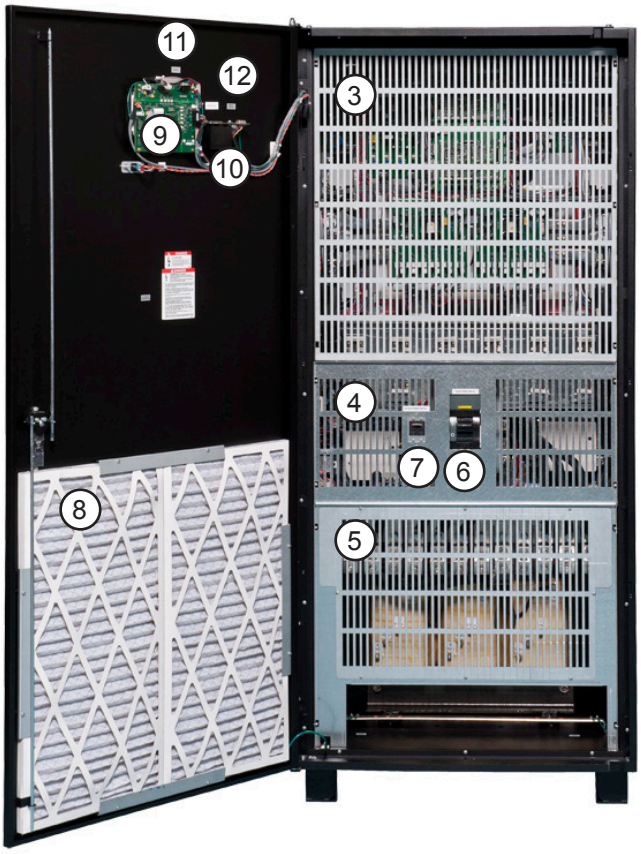
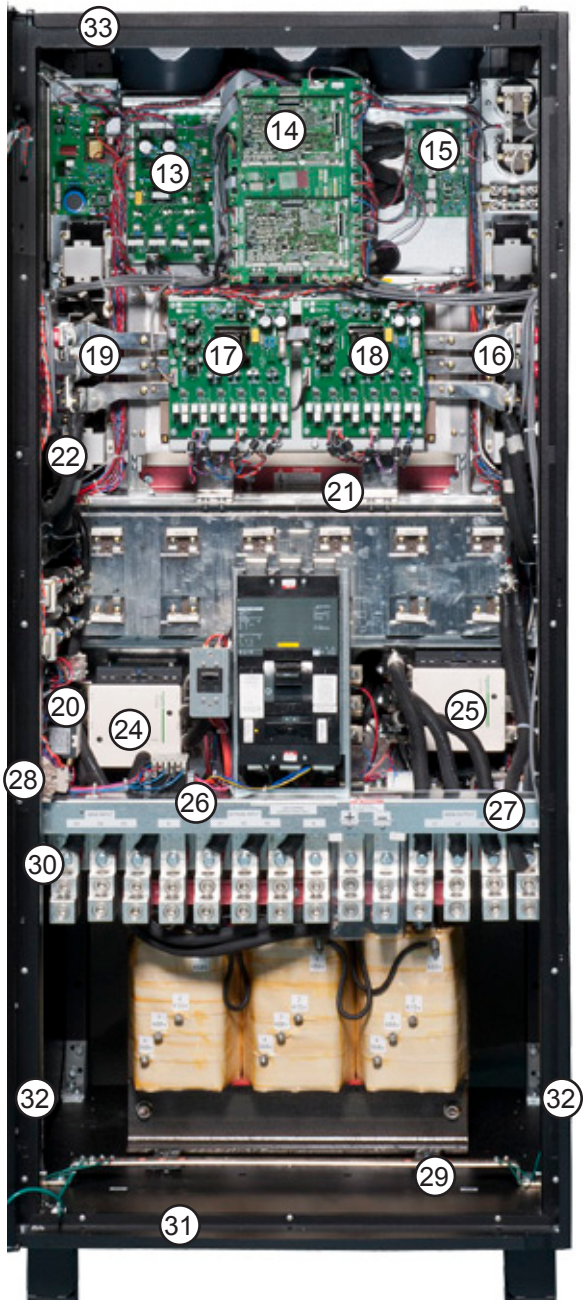


TABLE 8.4 80-100KVA UPS COMPONENT LOCATION AND IDENTIFICATION (CONT.)

No.	Description
13	PCB 4 – Charger Board
14	PCB 1 – Control Board
15	PCB 5 – Bypass Driver Board
16	AC Output Fuses
17	PCB 2 – Converter Board
18	PCB 3 – Inverter Board
19	AC Input Fuses
20	AC Input Soft-start Resistors
21	DC Bus Capacitor Bank
22	DC Power supply for PCB-9A (Display Control Board)
23	***(This Number Not Used)***
24	Input Contactor
25	Output Contactor
26	TB1 with Primary Input, Output, DC Supply, and Backup Box Lugs
27	***(Optional)*** TB4 with Secondary Input Power Box Lugs
28	TB3 – Terminals for Battery Cabinet Breaker Shunt Trip and Aux.
29	Ground Bus
30	Shunt Trip DC Power Supply
31	Bottom Cable Access Port
32	Side Cable Access Ports
33	Top Cable Access Port



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 One-Line Diagram

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

Figure 9.1 shows the external wiring of the 4400 UPS with a single input.
Figure 9.2 shows the external wiring needed for the 4400 UPS with the optional dual input.
Figure 9.3 shows the cabling for the 4400 UPS with the optional line-up and match Battery Cabinet.

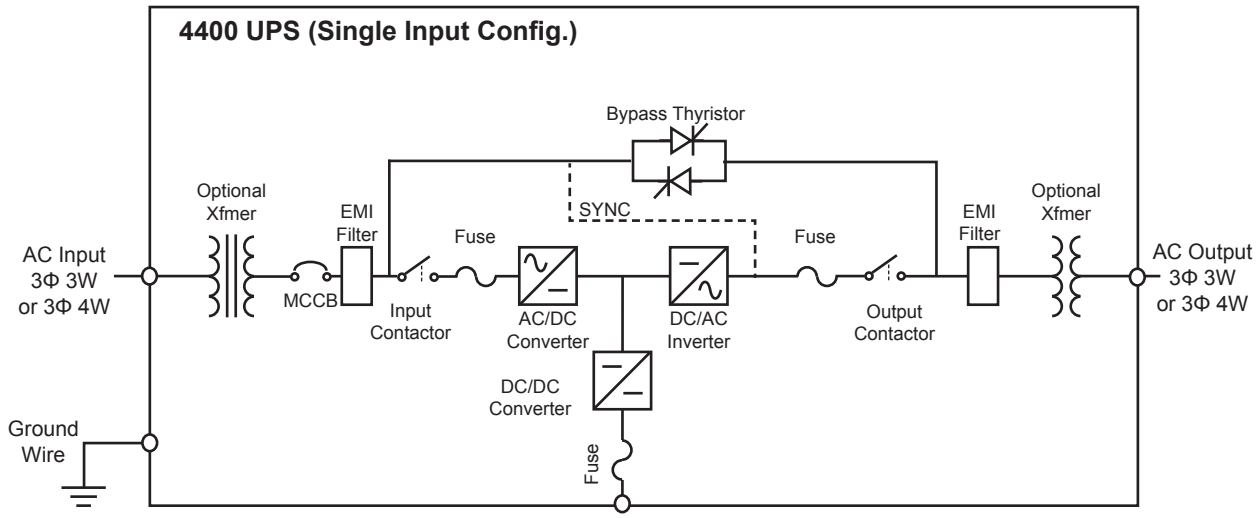


FIGURE 9.1 – 4400 SINGLE INPUT ONE-LINE DIAGRAM

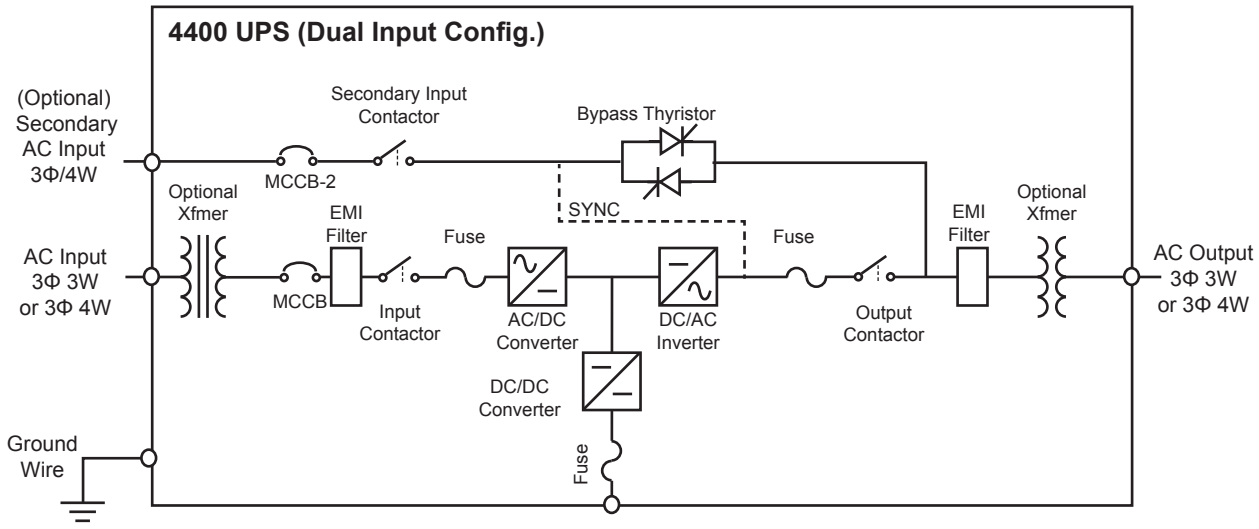


FIGURE 9.2 – 4400 DUAL INPUT ONE-LINE DIAGRAM

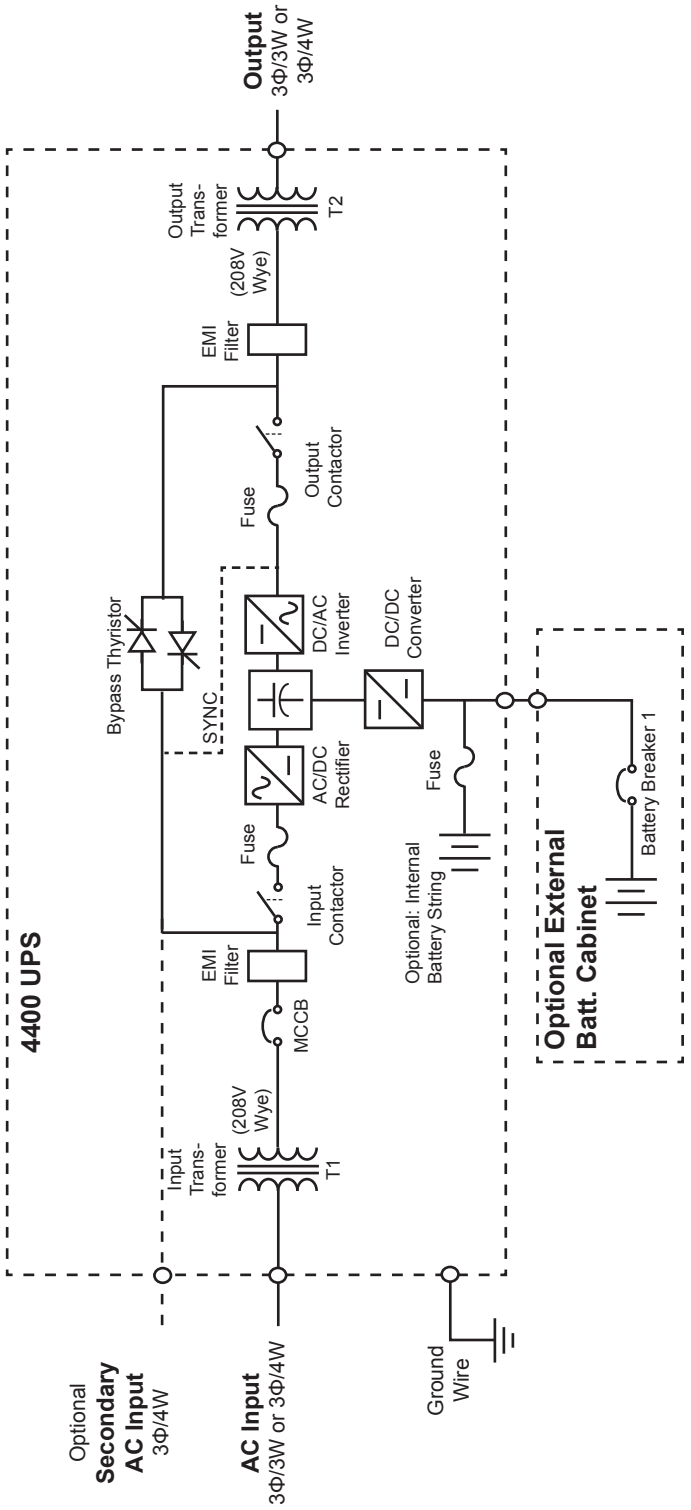
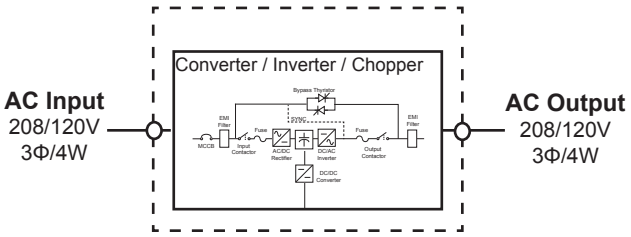
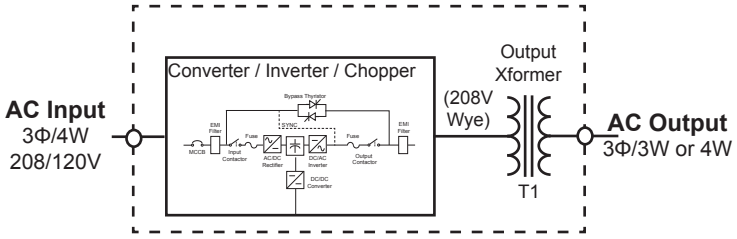


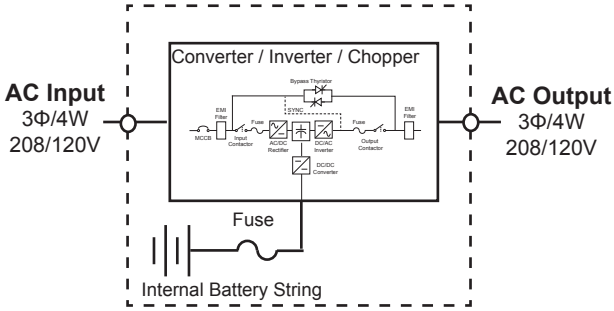
FIGURE 9.3 – ONE LINE DIAGRAM OF 4400 UPS WITH OPTIONAL MATCHING 4400 BATTERY CABINET



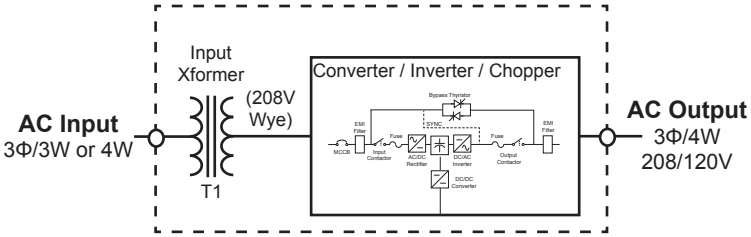
1. 4400 – NO BATTERIES, NO TRANSFORMERS (ALL)



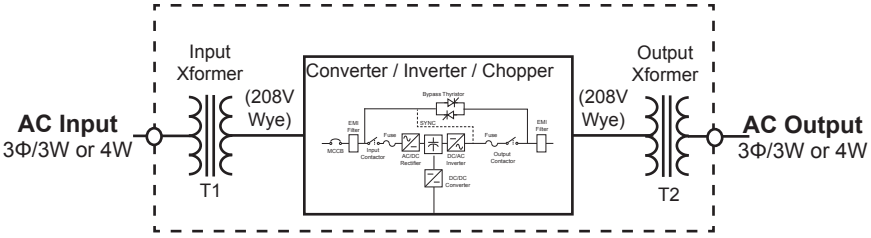
2. 4400 WITH OUTPUT TRANSFORMER (15-80KVA)



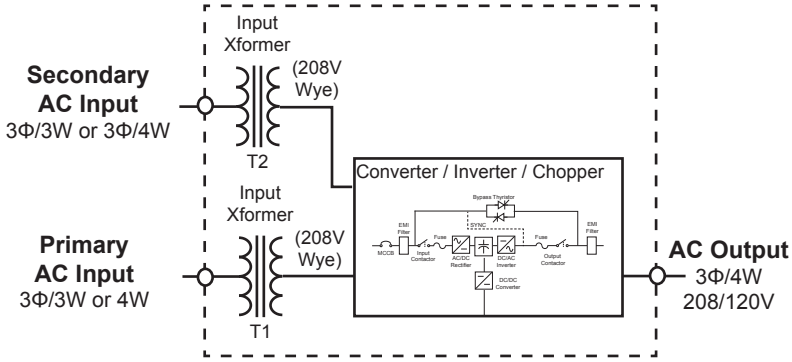
3. 4000 – WITH INTERNAL BATTERIES (15-50KVA)



4. 4400 WITH INPUT TRANSFORMER (15-80KVA)



5. 4400 WITH INPUT AND OUTPUT TRANSFORMERS (15-50KVA)



6. 4400 WITH DUAL INPUT TRANSFORMERS (15-50KVA)

FIGURE 9.4 – ONE LINE DIAGRAMS OF POSSIBLE 4400 CONFIGURATIONS (NOT INCLUDING MATCHING EXTERNAL BATTERY OR AUXILIARY CABINETS)

9.3 Multiple Battery Cabinets

Multiple DC Backup Source cabinets may be combined to extend the UPS backup runtime. Typically these cabinets must be connected to a single point connection outside the UPS. Contact the factory if using more than one DC Source Backup cabinet.

9.4 Power Terminal Blocks and Cable Sizing

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

NOTICE

The Power Lugs for the 50-100kVA UPS are not designed for use with high-flex/locomotive-type cabling.

Use of these conductors may lead to conductor strand breakage effectively reducing the current carrying capacity of the conductor.

The terminal blocks for the 15-30 kVA UPS are shown in Figure 9.5.

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

TABLE 9.1 RECOMMENDED MINIMUM CABLE SIZE & TIGHTENING TORQUE FOR 15-30KVA UPS FOR 120/208V IN, 120/208V OUT

Block Number	Cable Size (Min-Max) 75 °C Copper Wire in Conduit					Tightening Torque [2]
	Terminal Lug Capacity (AWG)	15 kVA (AWG)	20 kVA (AWG)	25 kVA (AWG)	30 kVA (AWG)	
AC Input A, B, C	#12 – #2	#4	#3	#2[3]	#2[3]	35-44 in-lb (4-5 N•m) (6.5 x 1.2 mm Flat blade screwdriver)
AC Input Neutral (N)[2]	#12 – #2	#2	#2	#2	#2	
AC Output A, B, C	#12 – #2	#4	#3	#2	#2	
AC Output Neutral (N)[2]	#12 – #2	#2	#2	#2	#2	
Secondary Input A, B, C	#12 – #2	#6	#4	#3	#2	
Secondary Neutral (N)[2]	#12 – #2	#2	#2	#2	#2	
Battery Terminals +/- [1]	#12 – #2	#4	#3	#2[3]	#2[3]	

[1] One battery string. (Consult factory if using more than one battery string.)
[2] Size neutral cable appropriate to actual load type: balanced, unbalanced, non-linear.
[3] No more than 3 conductors per conduit for these sizing recommendations.

The terminal blocks for the 15-30 kVA UPS are shown in Figure 9.4.

Use only copper wires for external cables.

TABLE 9.2 RECOMMENDED MINIMUM CABLE SIZE & TIGHTENING TORQUE FOR 50KVA UPS FOR 120/208V IN, 120/208V OUT

Block Number	Cable Size (Min-Max) 75 °C Copper Wire in Conduit		Tightening Torque [2]
	Terminal Lug Capacity	50 kVA	
AC Input A, B, C	#6 – 250 kcmil	4/0	225-250 in-lb (25.4-28.2 N•m) (Hex drive socket)
AC Input Neutral (N)[2]	#6 – 250 kcmil	250 kcmil	
AC Output A, B, C	#6 – 250 kcmil	4/0	
AC Output Neutral (N)[2]	#6 – 250 kcmil	250 kcmil	
Secondary Input A, B, C	#6 – 250 kcmil	3/0	
Secondary Neutral (N)[2]	#6 – 250 kcmil	250 kcmil	
Battery Terminals +/- [1]	#6 – 250 kcmil	250 kcmil	

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

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

Use only copper wires for external cables.

TABLE 9.3 RECOMMENDED MINIMUM CABLE SIZE & TIGHTENING TORQUE FOR 80-100KVA UPS FOR 120/208V IN, 120/208V OUT

Block Number	Cable Size (Min-Max) 75 °C Copper Wire in Conduit			Tightening Torque [2]
	Terminal Lug Capacity	80 kVA	100kVA	
AC Input (A, B, C)	(2) x (1/0 – 600 kcmil)	(2) x 3/0 AWG – (1) x 400 kcmil	(2) x 250 kcmil – (1) x 600 kcmil	375 in-lb (42 N•m) (3/8 in Hex drive socket)
AC Input Neutral (N)[2]	(2) x (1/0 – 600 kcmil)	(2) x 250 kcmil	(2) x 600 kcmil	
AC Output Neutral (N)	(2) x (1/0 – 600 kcmil)	(2) x 500 kcmil	(2) x 600 kcmil	
AC Output (A, B, C)	(2) x (1/0 – 600 kcmil)	2 x 3/0 AWG – (1) x 400 kcmil	(2) x 4/0 AWG – (1) x 600 kcmil	
Secondary Input (A, B, C)	(2) x (1/0 – 600 kcmil)	2 x 2/0 AWG – (1) x 300 kcmil	(2) x 4/0 AWG – (1) x 500 kcmil	
Secondary Neutral (N)[2]	(2) x (1/0 – 600 kcmil)	(2) x 250 kcmil	(2) x 600 kcmil	
Battery Terminals (+/-) [1]	(2) x (1/0 – 600 kcmil)	(2) x 250 kcmil – (1) x 600 kcmil	(2) x 350 kcmil	

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

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

See Appendix D – Input/Output Cabling Guide, for current calculations for different input and output transformer combinations. Use these values to determine the correct power cable size per the 2014 National Electrical Code (Ref. Table 310.15(B)(16))

Lug tightening torque is the same as given in Tables 9.1 through 9.3.

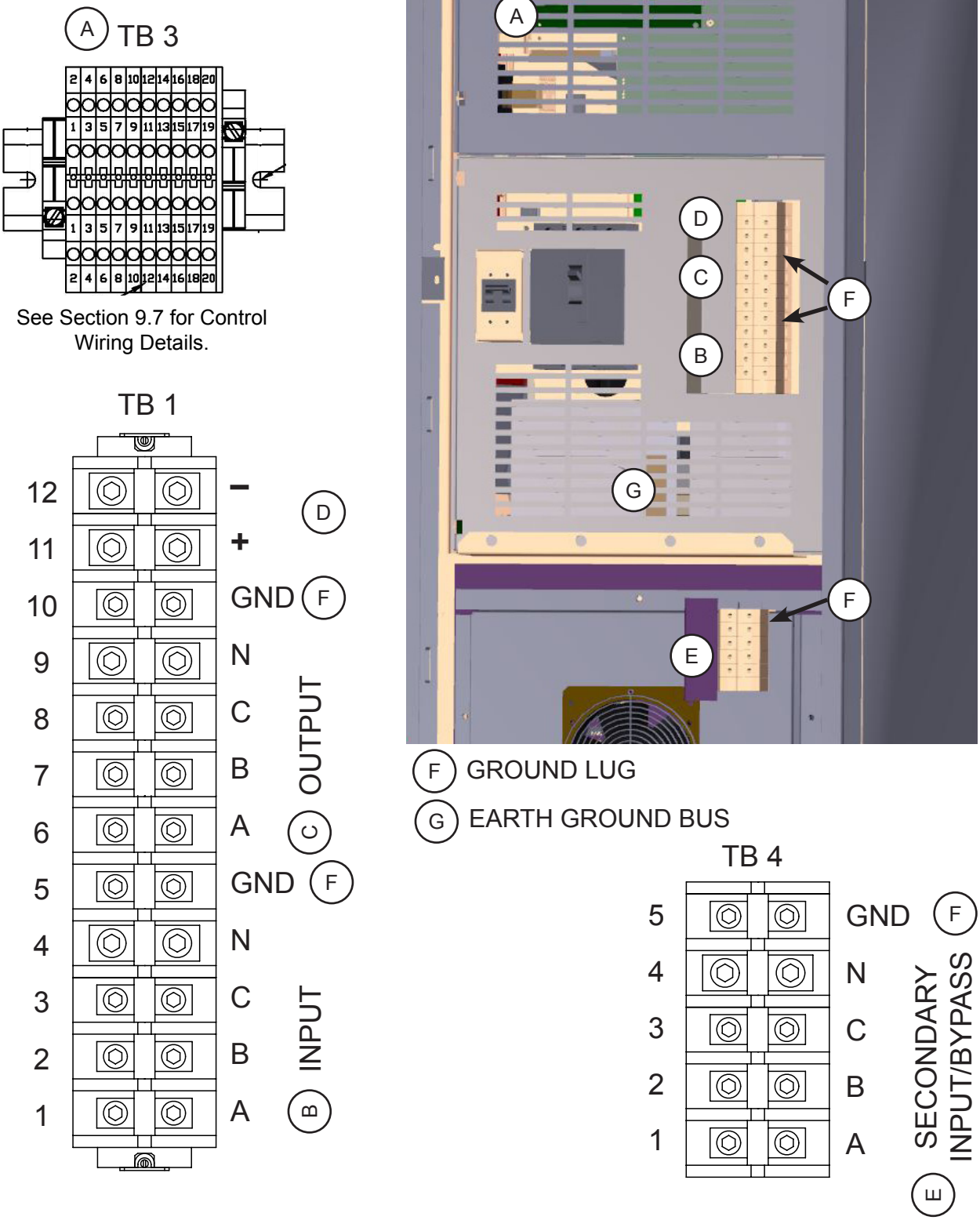
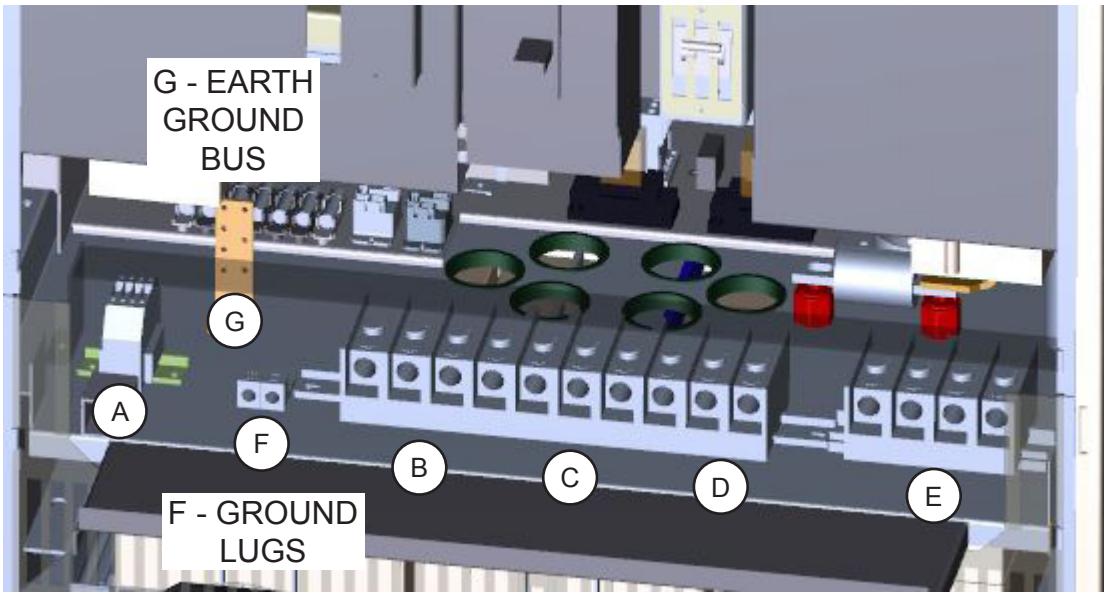
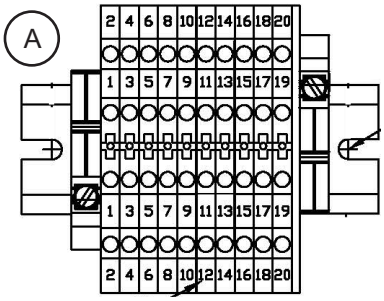


FIGURE 9.5 – 15–30KVA POWER CABLING LUGS

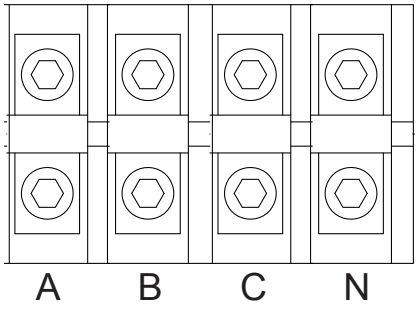


TB 3



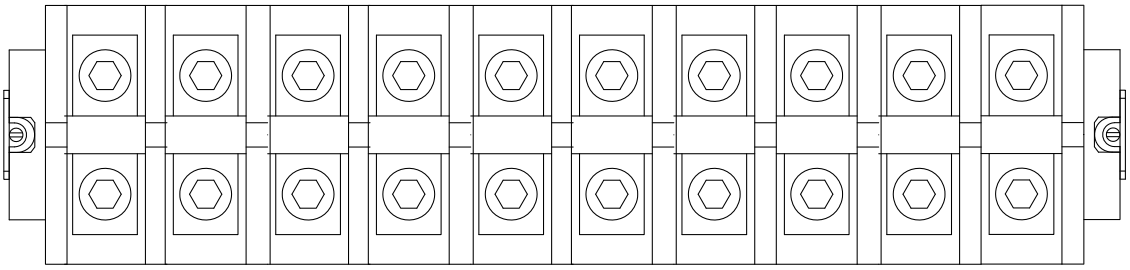
See Section 9.7 for Control Wiring Details.

TB 4



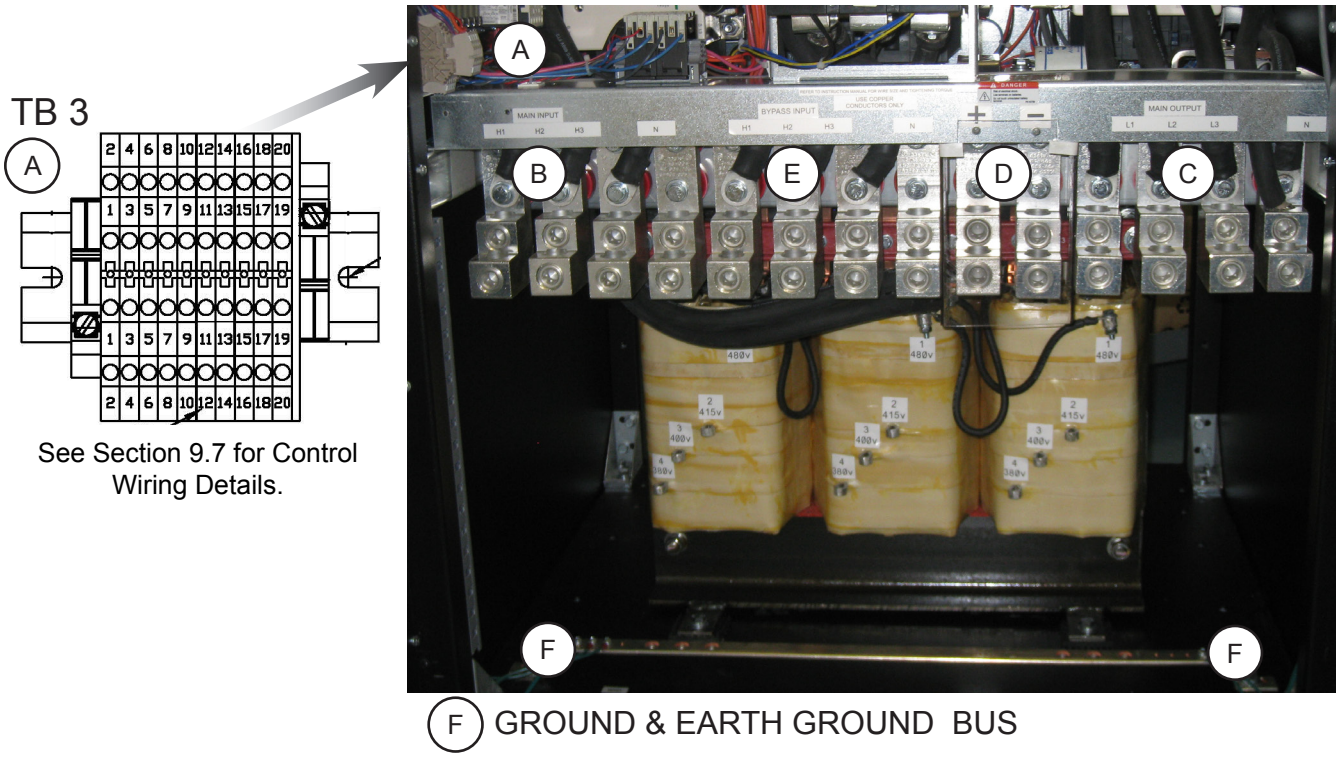
E SECONDARY INPUT/ BYPASS

TB 1



B INPUT C OUTPUT D BATTERY

FIGURE 9.6 – 50KVA POWER CABLING LUGS



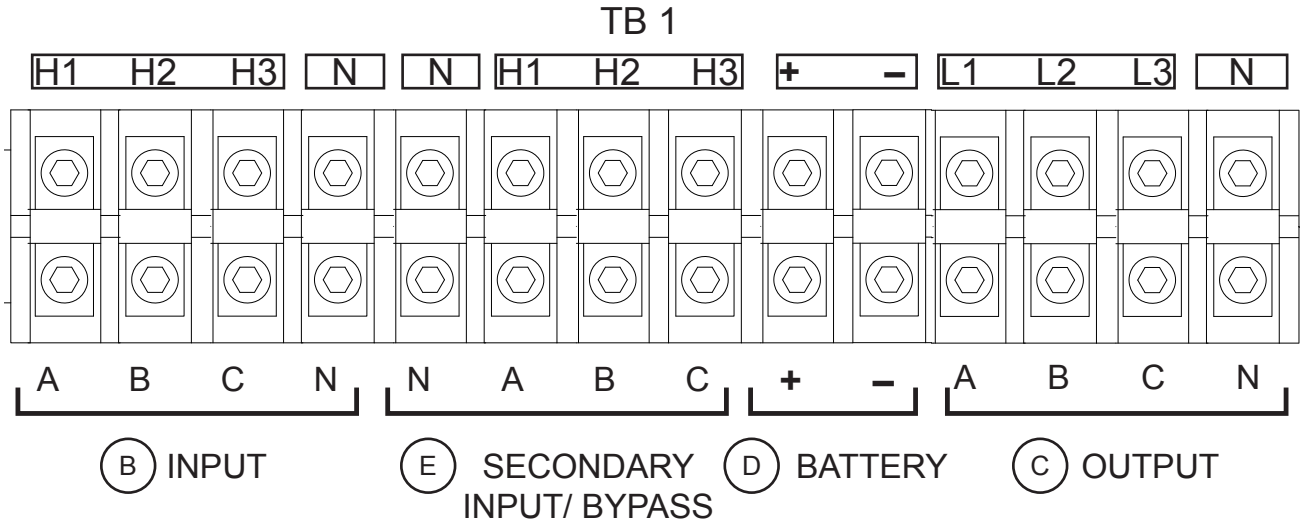


FIGURE 9.7 – 80-100KVA POWER CABLING LUGS

9.5 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.

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

TABLE 9.4 UPS MINIMUM BREAKER RATINGS

Voltage	Capacity						
	15kVA	20kVA	25kVA	30kVA	50kVA	80kVA	100kVA
208/120V	240V/60A	240V/80A	240V/100A	240V/110A	240V/200A	240V/300A	240V/400A
220/127V	240V/60A	240V/70A	240V/90A	240V/110A	240V/175A	240V/300A	240V/350A
240V	240V/50A	240V/70A	240V/80A	240V/100A	240V/175A	240V/300A	240V/350A
380/220V	480V/40A	480V/50A	480V/50A	480V/60A	480V/100A	480V/175A	480V/200A
400/227V	480V/30A	480V/40A	480V/50A	480V/60A	480V/100A	480V/175A	480V/200A
415/240V	480V/30A	480V/40A	480V/50A	480V/60A	480V/90A	480V/150A	480V/200A
480/277V	480V/30A	480V/35A	480V/40A	480V/50A	480V/90A	480V/150A	480V/200A
600V	600V/25A	600V/30A	600V/35A	600V/40A	600V/70A	600V/110A	600V/150A

Note: Above Amp trip ratings are sized for the worst case in the UPS System (Primpary Input Breaker). For more exact recommendations, please refer to “Appendix C – Installation Planning Guide”.

TABLE 9.5 DC (BATTERY) MINIMUM BREAKER RATINGS*

Voltage Capacity (Min.)	15kVA	20kVA	25kVA	30kVA	50kVA	80kVA	100kVA
500VDC	70A	100A	100A	125A	250A	300A	400A

* For Battery Cabinet Systems not equipped with built-in over-current protection devices.

9.6 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 behind the dead front, close to the power lugs. See Section 8.5-8.7. Connect the grounding wire to the earth ground bus.

The 15-50kVA UPS have a bus strip with 7 (seven) threaded holes for M4 bolts. Use a AWG 2 (or 38 mm^2) or larger cable for the grounding wire. Connect the crimp terminal and ground bus together using a M4 bolt.

The 80-100kVA UPS has a ground bus with 10 (ten) M5x0.8 threaded holes, and 6 (six) 0.5118 in (13 mm) unthreaded holes for 1/2 in bolts. Ground wire must have a crimp terminal with a corresponding diameter bolt hole. Connect the crimp terminal and ground bus together using the appropriate diameter bolt.

9.7 Control Wiring

TB3 provides terminals for connecting the UPS to external control functions. The functions of the terminal pairs are given below.

TABLE 9.6 TB3 TERMINAL FUNCTIONS

TB3 Terminals	Status*, ** (NO - Normally Open) (NC - Normally Closed)	Function
1 & 2	NO*	Bypass Status - Bypass / Gnd (Closed when UPS is in Bypass mode)
3 & 4	NO*	EPO Status (Closed when UPS is shut down)
5 & 6	NO*	Remote EPO (Closing external switch will shut down the UPS)
7 & 8	Default: NC* (Configurable NO or NC from Display)	Battery Breaker Open/Battery Overheat Sense (Batt Cab CB Aux Switch)
9 & 10	NO**	P24 A3 / Remote Run (Closing user-supplied external switch will Transfer UPS from Bypass to Online)
11 & 12	NO**	P24 A3 / Remote Stop (Closing user-supplied external switch will transfer the UPS from Online to Bypass)
13 & 14	NO**	P24 / Charge Stop (Closing user-supplied external switch will stop the UPS Battery Charger circuit)
15 & 16	–	Shunt Trip (Places Battery Breaker shunt trip coil in parallel with UPS MCCB, so EPO will open both UPS and BC circuit breakers simultaneously)
17 & 18	NO	(Not Assigned)
19 & 20	NO	(Not Assigned)

* Dry contacts.

** Controller board is programmed to accept momentary signals only. Signal duration of 20 seconds or greater will trigger the warning **LBABNL** (Local Button Abnormal)

TABLE 9.7 TB3 TERMINAL FASTENING TORQUE

TB3 Terminals	Wire Size	Fastener Torque
1 thru 20	14 – 16 AWG	8 in-lb (0.9 N·m)

10 Communication Interfaces

10.1 Remote Contacts

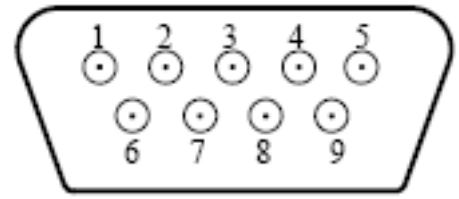
The remote contacts interface is provided as a set of solid state switching devices. The switches are available through a DB9 male connector on the door of the UPS. The following chart shows the pin assignment for each signal.

MAXIMUM CURRENT CARRYING CAPACITY OF THE SWITCH

Voltage	Current
30 Vdc peak	70 mA peak
30 V rms (42 Vac peak)	50 mA rms (70 mA peak)

NOTE:

- Pin switches are shown in their inactive states.
- Action example: If battery voltage is low, Pin 7 switch closes, connecting pin 7 to pin 5.
- Pin number 3 is not used.



DB9 MALE CONNECTOR OUTLINE (FACING CONNECTOR)

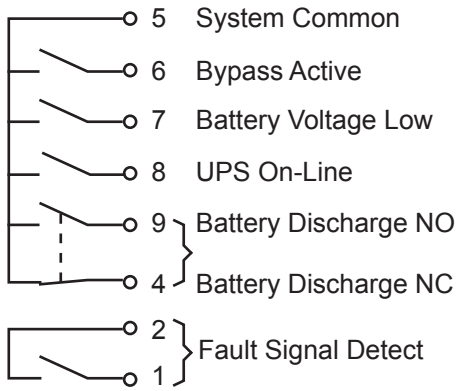


FIGURE 10.1 – COMMUNICATION INTERFACE

10.2 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.

10.3 RS-232C

The RS-232C port just to the right of the display PCB can be used by authorized service personnel. The port is provided using a DB9 female connector located to on the inside of the UPS door just to the right of the Display PCB. For reference, the pinout of the connector is illustrated below.

NOTE: Use the cross cable provided by Toshiba to avoid potential communications problems.

RS-232C CONNECTOR PIN ASSIGNMENT

Pin	I/O	Symbol	Description
1	This pin is not used		
2	Input	RXD	Receive data
3	Output	TXD	Transmit data
4	Output	DTR	Data Terminal Ready
5	-	SG	Signal ground
6	Input	DSR	Data Set Ready
7	Output	RTS	Request to Send
8	Input	CTS	Clear to Send
9	This pin is not used		

DB9 FEMALE CONNECTOR OUTLINE (FACING CONNECTOR)

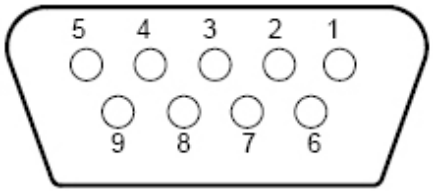


FIGURE 10.2 – RS-232C INTERFACE

10.4 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.

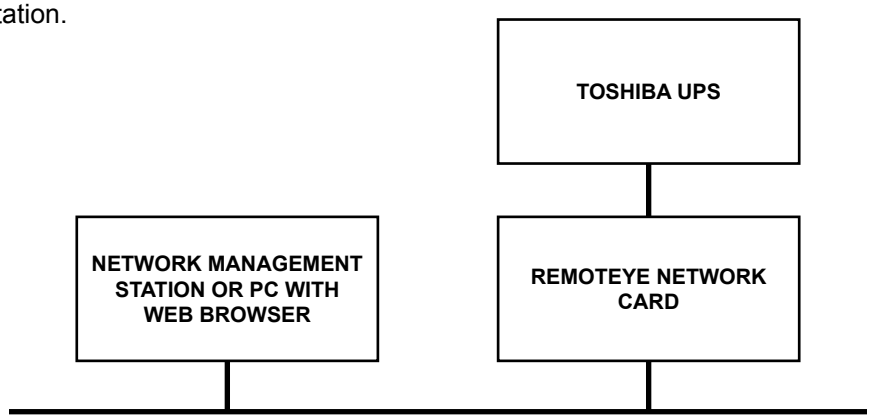


FIGURE 10.3 – NETWORK INTERFACE

11 Specifications

11.1 15-30kVA Specifications – w/ Internal Battery Backup

4400 SPECIFICATIONS: 15–30kVA w/ Internal Battery Backup				
Specification	**15kVA**	**20kVA**	**25kVA**	**30kVA**
General				
Model Number (B – Internal Batt. Backup)	4400F3F150XAB	4400F3F200XAB	4400F3F250XAB	4400F3F300XAB
Capacity Output	15 kVA (13.5kW)	20 kVA (18kW)	25 kVA (22.5kW)	30 kVA (27kW)
Topology	Double conversion all-IGBT UPS			
Input				
Voltage (V)	208/120 V +10% to -15% (Intermittently to -30% at 70% load [1]) 3P/4W +GND			
No. Internal Transformers (Max)	0 (No Internal Transformers)			
Current (Nominal) (A)	42 A	56 A	70 A	84 A
Current (Max) (A)	52 A	69 A	87 A	104 A
Current Limit (%)	125% of Rated Load Current			
Current THD (%)	< 5%			
Frequency (Hz)	50/60 Hz ± 5 Hz			
Input Power Factor (PF) @ full load	>0.98			
Walk-in Function (sec)	20% to 100% over 3, 5, or 9 sec. (Selectable)			
Cold Start (0-100% load) (sec)	25 sec. from cold start			
Bypass				
Voltage (V)	208/120 V, 3P/4W +GND			
Frequency (Hz)	50/60 Hz ±5%			
Bypass Overload @ 125% Load	10 min. @ 125% Load			
Bypass Overload @ 150% Load	2 min. @ 150% Load			
Bypass Overload @ 1000% Load	1 cycle @ 1000% Load			
Automatic Retransfer (Max load % for Retansfer)	Yes			
Output				
Voltage (V)	208/120 V, 3P/4W +GND			
Voltage Regulation (%)	± 2% at 0-100% Balanced Load			
Voltage Total Harmonic Distortion (Full Linear Load) (%)	< 3%			
Output Voltage Adjustment (%)	± 5% via Touchscreen			
Voltage Transient Response (%) @ 100% Step Load Change	± 3% @ 100% Step Load Change			

1 - Requires adjustment of factory/service adjustable parameters.

4400 SPECIFICATIONS: 15–30kVA w/ Internal Battery Backup				
Specification	**15kVA**	**20kVA**	**25kVA**	**30kVA**
Voltage Transient Response (%) @ Loss and Return of Input V	± 2%			
Voltage Transient Response (%) @ Xfer from Bypass to Inverter	± 3%			
Current (A)	42 A	56 A	69 A	83 A
Max Continuous Overload Current (A)	109% of Nominal Output			
Crest Factor	2.5			
Inrush Current Protection	Fuse			
Interrupt Rating (RMS Symmetrical kA)	18 kAIC			
Frequency (Hz)	50 or 60 Hz			
Frequency Selectable (Converter)	No			
Frequency Regulation (%) Free Running Mode	± 0.1%			
Frequency Sync Range (%)	± 5 Hz			
Frequency Slew Rate Range (Hz/s)	± 0.5 Hz/sec.			
Output Power Factor (PF)	0.9			
Loads Supported (PF)	0.4 Lagging to 0.4 Leading			
Phase Displacement: 100% Balanced Load (deg.), 100% Unbalanced Load (deg.)	± 2° for Balanced Load			
Inverter Overload Capacity (% for sec)	125% for 90 sec. 150% for 30 sec.			
Efficiency AC-DC-AC 100% Full Load (%)	91%			
Surge Protection	Auto transfer to bypass, retransfer to inverter			
Battery General, External (N/A)				
Battery – Internal				
Internal Back-up Time at Full Load (at 25 °C) (min)	See: Section 11.2 - Estimated Run time on Internal Batteries			
Type / Rating (Ah)	Yuasa NPX-L35, 12V, 9AH			
Number of Batteries	48 (2 x 24)			
Replaceable Batteries	Yes – Field Replaceable			
Environment				
Cooling -Forced Air (cfm)	5 x 250 cfm (Max)			
Operating Temperature (°F/°C)	32°F – 104°F (0 °C – 40 °C)			
Storage Temperature (°F/°C)	14°F – 122°F (-10 °C – 50 °C)			
Operating Humidity (%)	5 – 95% RH			

4400 SPECIFICATIONS: 15–30kVA w/ Internal Battery Backup				
Specification	**15kVA**	**20kVA**	**25kVA**	**30kVA**
Altitude (ft./m)	3300 ft. (1000 m) w/o derating			
Location	Indoors in dust and moisture free environment			
Audible Noise	~63dB ('A' Scale @ 1m)			
Heat Rejection at 100% Full Load (BTU/Hour)	4556	6074	7593	9111
Mechanical				
Weight [2] lb/(kg) Without Internal Batteries With Internal Batteries	 725 lb (329 kg) 1015 lb (460 kg)	 730 lb (331 kg) 1020 lb (463 kg)	 750 lb (340 kg) 1035 lb (469 kg)	 760 lb (345 kg) 1045 lb (474 kg)
Dimensions WxDxH (in/mm)	20.12 in x 37.4 in x 65.06 in (511 mm x 950 mm x 1653 mm)			
Shipping Weight [2] lb/(kg) Without Internal Batteries With Internal Batteries	 875 lb (397 kg) 1165 lb (528 kg)	 880 lb (399 kg) 1170 lb (5313 kg)	 900 lb (408 kg) 1185 lb (538 kg)	 910 lb (413 kg) 1195 lb (542 kg)
Shipping Dimensions WxDxH (in/mm)	46 in x 48 in x 90 in (1168 mm x 1219 mm x 2286 mm)			
Clearance (in/mm)	36 in (900 mm) Front[1] / 16 in (406 mm) Top / Zero clearance Sides/Back			
Enclosure	NEMA 1			
Construction	Welded Steel Chassis			
Color	Powder Coat, DuPont O'Brien Black			
Emergency Power Off (EPO)	Yes			
Control Panel	Touchscreen and LED			
Monitoring				
Operator Interface (Front Panel)	Touchscreen and LED			
Dry Contacts Included	Yes			
RS-232 Inrterface	Yes			
Optional – Intelligent Monitoring	Yes – RemotEye 4			
Optional – Remote Status Alarm Panel (RSAP)	Yes			
Additional Features				
Optional Matching Battery Cabinets	Yes			
Optional Matching MBS/PDU Cabinet	Yes			
OTHER				
Warranty (yr.)	3 Years			
Certifications	UL 1778, CUL, NEC (NFPS-70), CE, IBC, CBC, ANSI C62.41 (IEEE 587), NEMA/PET-1993, OSHA, ISO9000, ISO 14001:2004.			

1 - *Minimum front clearance for unobstructed airflow is 20 inches. However, minimum front clearance when physically accessing the UPS must be at least the width of the front door of the UPS, or per NEC 110.34(A)(36 in./900 mm) and local requirements, whichever is greater.*

2 - *Approximate weights for dual-input units. Actual weights may vary depending on exact UPS configuration.*

11.2 Estimated Runtime on Internal Batteries – 15-30kVA

Following are charts of the estimated runtime for the 4400 Series 15, 20, 25, and 30kVA 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.

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%
15kVA (0.8 PF)	>60	74	50	36	26	20	15	12	10	10
20kVA (0.8 PF)	-	-	-	-	-	-	-	-	-	6.5
25kVA (0.8 PF)										4.5
30kVA (0.8 PF)						9	6	5	4	2

1 – Subject to change without notice.

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%
15kVA (0.9 PF)	>80	72	50	33	24	18	16	11	9	8
20kVA (0.9 PF)	>80	50	33	20	15	10	8	7	6	5
25kVA (0.9 PF)	76	35	24	17	10	9	7	5	4	3
30kVA (0.9 PF)	72	33	18	11	8	6	5	4	2	1.5

1 – Subject to change without notice.

11.3 15-30kVA Specifications – w/ External Battery Backup

4400 SPECIFICATIONS: 15–30kVA w/ External Battery Backup				
Specification	**15kVA**	**20kVA**	**25kVA**	**30kVA**
General				
Model Number	4400X3X150XA	4400X3X200XA	4400X3X250XA	4400X3X300XA
Capacity Output	15 kVA (13.5kW)	20 kVA (18kW)	25 kVA (22.5kW)	30 kVA (27kW)
Topology	Double conversion all-IGBT UPS			

1 - Requires adjustment of factory/service adjustable parameters.

4400 SPECIFICATIONS: 15–30kVA w/ External Battery Backup				
Specification	**15kVA**	**20kVA**	**25kVA**	**30kVA**
Input				
Voltage (V)	Nominal (Xfmr.) Input Voltage +10% to -15% (Intermittently to -30% at 70% load [1]), 3P/4W +GND or 3P/3W + GND **Key** **Transformer Voltage** **Key** **Transformer Voltage** A 200V Iso Xfmr M 380V Iso Xfmr B 208V Iso Xfmr N 400V Iso Xfmr C 220V Iso Xfmr P 415V Iso Xfmr D 230V Iso Xfmr Q 230/133V Auto-Xfmr E 240V Iso Xfmr R 240/139V Auto-Xfmr F 208/120V (No Xfmr) S 480V Iso Xfmr G 220/127V Auto-Xfmr T (Undefined) H 380/220V Auto-Xfmr U 600/347V Auto-Xfmr I 400/230V Auto-Xfmr V 600V Iso Xfmr J 415/240V Auto-Xfmr X Not Used K 480/277V Auto-Xfmr Z 200/115V Auto-Xfmr			
No. Internal Transformers (Max)	0 to 2			
Current @ 208V (Nominal) (A)	42 A	56 A	69 A	83 A
Current @ 208V (Max) (A)	52 A	69 A	87 A	104 A
Current Limit (%)	125% of Rated load			
Current THD (%)	< 5%			
Frequency (Hz) [and range]	50/60 Hz ± 5 Hz			
Input Power Factor (PF) @ full load	>0.98			
Walk-in Function (sec)	20% to 100% over 3, 5, or 9 sec. (Selectable)			
Cold Start (0-100% load) (sec)	25 sec. from cold start			
Bypass				
Voltage (V)	Nominal Bypass Voltage, 3P/4W +GND or 3P/3W + GND See Input Voltage Transformer Key			
Frequency (Hz)	50/60 Hz ±5%			
Bypass Overload @ 125% Load	10 min. @ 125% Load			
Bypass Overload @ 150% Load	2 min. @ 150% Load			
Bypass Overload @ 1000% Load	1 cycle @ 1000% Load			
Automatic Retransfer (Max load % for Retansfer)	Yes			
Output				
Voltage (V)	Nominal Output Voltage, 3P/4W +GND or 3P/3W + GND See Input Voltage Transformer Key			
Voltage Regulation (%)	± 2% at 0-100% Balanced Load			
Voltage Total Harmonic Distortion (Full Linear Load) (%)	< 3%			
Output Voltage Adjustment (%)	± 5% via Touchscreen			
Voltage Transient Response (%) @ 100% Step Load Change	± 3% @ 100% Step Load Change			

4400 SPECIFICATIONS: 15–30kVA w/ External Battery Backup				
Specification	**15kVA**	**20kVA**	**25kVA**	**30kVA**
Voltage Transient Response (%) @ Loss and Return of Input V	± 2%			
Voltage Transient Response (%) @ Xfer from Bypass to Inverter	± 3%			
Current @ 208V (A)	42 A	56 A	69 A	83 A
Max Continuous Overload Current (A)	109% of Nominal Output			
Crest Factor	2.5			
Inrush Current Protection	Fuse			
Interrupt Rating (RMS Symmetrical kA)	18 kAIC			
Frequency (Hz)	50 or 60 Hz			
Frequency Selectable (Converter)	No			
Frequency Regulation (%) Free Running Mode	± 0.1%			
Frequency Sync Range (%)	± 5 Hz			
Frequency Slew Rate Range (Hz/s)	± 0.5 Hz/sec.			
Output Power Factor (PF)	0.9			
Loads Supported (PF)	0.4 Lagging to 0.4 Leading			
Phase Displacement: 100% Balanced Load (deg.), 100% Unbalanced Load (deg.)	± 2° for Balanced Load			
Inverter Overload Capacity (% for sec)	125% for 90 sec. 150% for 30 sec.			
Efficiency AC-DC-AC 100% Full Load (%)	91% w/ No Transformer 88% w/ One Internal Transformer 85% w/ Two Internal Transformers			
Surge Protection	Auto transfer to bypass, retransfer to inverter			
BATTERY GENERAL, EXTERNAL				
Type	VRLA Batteries			
Voltage – Nominal (Vdc)	288 Vdc			
Voltage – Minimum (Vdc)	230.4 Vdc			
Voltage -Float (Vdc)	324 Vdc			
Max Recharge Current – (Adc)	6 Adc (Default)/20Adc Max Factory Adj.* **(Max. Charge Current + Input Current cannot exceed 125% of Rated Load Current)*			
Max Discharge Current – (Adc)	64 Adc	85 Adc	107 Adc	128 Adc
Battery Capacity Required at Full Load (kWB)	14.7 kWB	19.6 kWB	24.5 kWB	29.4 kWB
Battery Test (Interval per hr)	Yes			
Pre-alarm Level (Vdc)	250 Vdc			
Battery Protection	Internal – Fuse / Ext. – MCCB			
Overvoltage Protection	Cutoff @ 110% Floating Charge			

4400 SPECIFICATIONS: 15–30kVA w/ External Battery Backup				
Specification	**15kVA**	**20kVA**	**25kVA**	**30kVA**
Protection against Batteries Deep Discharge	Automatically adjust cutoff voltage			
Efficiency DC-AC (%)	>90%			
Battery – Internal (N/A)				
Environment				
Cooling -Forced Air (cfm)	5 x 250 cfm			
Operating Temperature (°F/°C)	32°F – 104°F (0 °C – 40 °C)			
Storage Temperature (°F/°C)	14°F – 122°F (-10 °C – 50 °C)			
Operating Humidity (%)	5 – 95% RH			
Altitude (ft./m)	3300 ft. (1000 m) w/o derating			
Location	Indoors in dust and moisture free environment			
Heat Rejection at 100% Full Load (BTU/Hour)	4506	6074	7593	9111
Audible Noise (dBA)	~63dB ('A' Scale @ 1m)			
Mechanical				
Weight [2] lb/(kg) with 1 Transformer with 2 Transformers	 930 lb (422 kg) 1170 lb (531 kg)	 935 lb (424 kg) 1175 lb (533 kg)	 975 lb (510 kg) 1180 lb (535 kg)	 985 lb (447 kg) 1185 lb (538 kg)
Dimensions WxDxH (in/mm)	20.12 in x 37.4 in x 65.06 in (511 mm x 950 mm x 1653 mm)			
Shipping Weight [2] lb/(kg) with 1 Transformer with 2 Transformers	 1080 lb (490 kg) 1320 lb (599 kg)	 1085 lb (492 kg) 1325 lb (601 kg)	 1125 lb (510 kg) 1330 lb (603 kg)	 1135 lb (515 kg) 1335 lb (606 kg)
Shipping Dimensions WxDxH (in/mm)	46 in x 48 in x 90 in (1168 mm x 1219 mm x 2286 mm)			
Clearance (in/mm)	36 in (900 mm) Front[1] / 16 in (406 mm) Top / Zero clearance Sides/Back			
Enclosure	NEMA 1			
Construction	Welded Steel Chassis			
Color	Powder Coat, DuPont O'Brien Black			
Emergency Power Off (EPO)	Yes			
Control Panel	Touchscreen and LED			
Monitoring				
Operator Interface (Front Panel)	Touchscreen and LED			
Dry Contacts Included	Yes			
RS-232 Inrterface	Yes			
Optional – Intelligent Monitoring	Yes – RemotEye 4			
Optional – Remote Status Alarm Panel (RSAP)	Yes			
Additional Features				
Optional Matching Battery Cabinets	Yes			
Optional Matching MBS/PDU Cabinet	Yes			

4400 SPECIFICATIONS: 15–30kVA w/ External Battery Backup				
Specification	**15kVA**	**20kVA**	**25kVA**	**30kVA**
OTHER				
Warranty (yr.)	3 Years			
Certifications	UL 1778, CUL, NEC (NFPS-70), CE, IBC, CBC, ANSI C62.41 (IEEE 587), Nema/PET-1993, OSHA, ISO9000, ISO 14001:2004.			

1 - *Minimum front clearance for unobstructed airflow is 20 inches. However, minimum front clearance when physically accessing the UPS must be at least the width of the front door of the UPS, or per NEC 110.34(A)(36 i n./900 mm) and local requirements, whichever is greater.*

2 - *Approximate weights for dual-input units. Actual weights may vary depending on exact UPS configuration.*

11.4 15–30kVA Efficiency vs. Load (Typical, No Transformer)

% EFFICIENCY AT VARIOUS LOADS*

UPS	Efficiency at Percent Full Load*			
	25%	**50%**	**75%**	**100%**
15kVA	88.8%	90.9%	91.0%	91.0%
15kVA + 1 Xfmr.	85.8%	87.9%	88.0%	88.0%
15kVA + 2 Xfmr.	82.8%	84.9%	85.0%	85.0%
20kVA	88.8%	90.9%	91.0%	91.0%
20kVA + 1 Xfmr.	85.8%	87.9%	88.0%	88.0%
20kVA + 2 Xfmr.	82.8%	84.9%	85.0%	85.0%
25kVA	88.8%	90.9%	91.0%	91.0%
25kVA + 1 Xfmr.	85.8%	87.9%	88.0%	88.0%
25kVA + 2 Xfmr.	82.8%	84.9%	85.0%	85.0%
30kVA	88.8%	90.9%	91.0%	91.0%
30kVA + 1 Xfmr.	85.8%	87.9%	88.0%	88.0%
30kVA + 2 Xfmr.	82.8%	84.9%	85.0%	85.0%

* Subject to change without notice.

11.5 15–30kVA Thermal Loss vs. Load (Typical)

THERMAL LOSS AT VARIOUS LOADS*

UPS	BTU/hr. Loss at Percent Full Load*				
	0%	25%	50%	75%	100%
15kVA	1024	1457	2308	3417	4556
15kVA + 1 Xfmr.	1365	1911	3173	4711	6281
15kVA + 2 Xfmr.	1365	2397	4100	6097	8129
20kVA	1365	1942	3078	4556	6074
20kVA + 1 Xfmr.	1706	2547	4231	6281	8375
20kVA + 2 Xfmr.	1706	3196	5466	8129	10,838
25kVA	1706	2428	3847	5695	7593
25kVA + 1 Xfmr.	2047	3184	5289	7852	10,469
25kVA + 2 Xfmr.	2047	3995	6833	10,161	13,584
30kVA	2047	2914	4617	6834	9111
30kVA + 1 Xfmr.	2388	3821	6347	9422	12,563
30kVA + 2 Xfmr.	2388	4794	8199	12,193	16,258

* Subject to change without notice.

11.6 50kVA Specifications – w/ Internal Battery Backup

Note: The 4400 80kVA unit is not available with internal battery backup.

4400 SPECIFICATIONS: 50kVA w/ Internal Battery Backup	
Specification	**50kVA**
GENERAL	
Model Number B – Internal Batt. Backup	4400F3F500XAB
Capacity Output	50kVA (45kW)
Topology	Double conversion all-IGBT UPS
INPUT	
Voltage (V)	208/120 V +10% to -15% (Intermittently to -30% at 70% load [1]) 3P/4W +GND
Current (Nominal) (A)	140 A
Current (Max) (A)	173 A
Current Limit (%)	125% of Rated load
Current THD (%)	< 5%
Frequency (Hz) [and range]	50/60 Hz ± 5 Hz
Input Power Factor (PF) @ full load	>0.98
Walk-in Function (sec)	20% to 100% over 3, 5, or 9 sec. (Selectable)
Cold Start (0-100% load) (sec)	25 sec. from cold start
BYPASS	
Voltage (V)	208/120 V, 3P/4W +GND
Frequency (Hz)	50/60 Hz ±5%
Bypass Overload @ 125% Load	10 min. @ 125% Load

4400 SPECIFICATIONS: 50kVA w/ Internal Battery Backup	
Specification	**50kVA**
Bypass Overload @ 150% Load	2 min. @ 150% Load
Bypass Overload @ 1000% Load	1 cycle @ 1000% Load
Automatic Retransfer (Max load % for Retansfer)	Yes
OUTPUT	
Voltage (V)	208/120 V, 3P/4W +GND
Voltage Regulation (%)	± 2% at 0-100% Balanced Load
Voltage Total Harmonic Distortion (Full Linear Load) (%)	< 3%
Output Voltage Adjustment (%)	± 5% via Touchscreen
Voltage Transient Response (%) @ 100% Step Load Change	± 3% @ 100% Step Load Change
Voltage Transient Response (%) @ Loss and Return of Input V	± 2%
Voltage Transient Response (%) @ Xfer from Bypass to Inverter	± 3%
Current (A)	139 A
Max Continuous Overload Current (A)	109% of Nominal Output
Crest Factor	2.5
Inrush Current Protection	Fuse
Interrupt Rating (RMS Symmetrical kA)	18 kAIC
Frequency (Hz)	50 or 60 Hz
Frequency Selectable (Converter)	No
Frequency Regulation (%) Free Running Mode	± 0.1%
Frequency Sync Range (%)	± 5 Hz
Frequency Slew Rate Range (Hz/s)	± 0.5 Hz/sec.
Output Power Factor (PF)	0.9
Loads Supported (PF)	0.4 Lagging to 0.4 Leading
Phase Displacement: 100% Balanced Load (deg.) 100% Unbalanced Load (deg.)	± 2° for Balanced Load
Inverter Overload Capacity (% for sec)	125% for 90 sec. 150% for 30 sec.
Efficiency AC-DC-AC 100% Full Load (%)	91%
Surge Protection	Auto transfer to bypass, retransfer to inverter
BATTERY GENERAL, EXTERNAL (N/A)	
BATTERY – INTERNAL	
Internal Back-up Time at Full Load (at 25 °C) (min)	See: Section 11.7 - Estimated Runtime on Internal Batteries
Type / Rating (Ah)	Yuasa NPX-150RFR, 12 V, 40 Ah
Number of Batteries	24
Replaceable Batteries	Yes – Field Replaceable

1 - Requires adjustment of factory/service adjustable parameters.

4400 SPECIFICATIONS: 50kVA w/ Internal Battery Backup	
Specification	**50kVA**
ENVIRONMENT	
Cooling -Forced Air (cfm)	5 x 452 cfm (max.
Operating Temperature (°F/°C)	32°F – 104°F (0 °C – 40 °C)
Storage Temperature (°F/°C)	14°F – 122°F (-10 °C – 50 °C)
Operating Humidity (%)	5 – 95% RH
Altitude (ft./m)	3300 ft. (1000 m) w/o derating
Location	Indoors in dust and moisture free environment
Heat Rejection at 100% Full Load (BTU/Hour)	15,034
Audible Noise (dBA)	~63dB ('A' Scale @ 1m)
MECHANICAL	
Weight [3] lb/(kg) Without Internal Batteries With Internal Batteries	 965 lbs. (438 kg) 1920 lbs. (871 kg)
Dimensions WxDxH (in/mm)	32.1 in x 37.2 in x 73.8 in (816 mm x 944 mm x 1874 mm)
Shipping Weight [3] lb/(kg) Without Internal Batteries With Internal Batteries	 1115 lbs. (506 kg) 2070 lbs. (939 kg)
Shipping Dimensions WxDxH (in/mm)	46 in x 48 in x 90 in (1168 mm x 1219 mm x 2286 mm)
Clearance (in/mm) [2]	36 in (900 mm) Front / 16 in (406 mm) Top / 0.0 in (Zero) clearance Sides/Back
Enclosure	NEMA 1
Construction	Welded Steel Chassis
Color	Powder Coat, DuPont O'Brien Black
Emergency Power Off (EPO)	Yes
Control Panel	Touchscreen and LED
MONITORING	
Operator Interface (Front Panel)	Touchscreen and LED
Dry Contacts Included	Yes
RS-232 Interface	Yes
Optional – Intelligent Monitoring	Yes – RemotEye 4
Optional – Remote Status Alarm Panel (RSAP)	Yes
ADDITIONAL FEATURES	
Optional Matching Battery Cabinets	Yes
Optional Matching MBS/PDU Cabinet	Yes

2 - Minimum front clearance for unobstructed airflow is 20 inches. However, minimum front clearance when physically accessing the UPS must be at least the width of the front door of the UPS, or per NEC 110.34(A) (36 i n./900 mm) and local requirements, whichever is greater.

3 - *Approximate weights for dual-input units. Actual weights may vary depending on exact UPS configuration.*

4400 SPECIFICATIONS: 50kVA w/ Internal Battery Backup	
Specification	**50kVA**
OTHER	
Warranty (yr.)	3 Years
Certifications	UL 1778, CUL, NEC (NFPS-70), CE, IBC, CBC, ANSI C62.41 (IEEE 587), Nema/PET-1993, OSHA, ISO9000, ISO 14001:2004.

11.7 Estimated Runtime on Internal Batteries – 50kVA

Below are charts of the estimated runtime for the 4400 Series 50kVA on internal batteries at various loads at a 0.9 and 0.8 Power Factor.

The 80-100kVA UPS is not available with internal batteries. An external battery cabinet (or equivalent) is required to provide backup power.

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.

ESTIMATED RUNTIME ON INTERNAL BATTERIES AT VARIOUS LOADS [1]

UPS	Estimated Runtime in Minutes at Percent Full Load [1]									
	10%	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**	**100%**
50kVA (0.8 PF)	>60	50	29	19	14	11	9	7	6	5
50kVA (0.9 PF)	>60	41	25	16	12	9	7.5	5.5	4.5	3.5

1 – Subject to change without notice.

11.8 50–100kVA Specifications – w/ External Battery Backup

4400 SPECIFICATIONS: 50–100kVA w/ External Battery Backup			
Specification	**50kVA**	**80kVA**	**100kVA**
GENERAL			
Model Number	4400X3X500XA	4400X3X800XA	4400F3F10KXA
Capacity Output	50kVA (45kW)	80 kVA (72kW)	100kVA (90kW)
Topology	Double conversion all-IGBT UPS		
INPUT			
Voltage (V)	Nominal (Xfmr.) Input Voltage +10% to -15% (Intermittently to -30% at 70% load [1]), 3P/4W +GND or 3P/3W + GND 100kVA: +10% to -10% only **Key — Transformer Voltage** A 200V Iso Xfmr B 208V Iso Xfmr C 220V Iso Xfmr D 230V Iso Xfmr E 240V Iso Xfmr F 208/120V (No Xfmr) G 220/127V Auto-Xfmr H 380/220V Auto-Xfmr I 400/230V Auto-Xfmr J 415/240V Auto-Xfmr K 480/277V Auto-Xfmr **Key — Transformer Voltage** M 380V Iso Xfmr N 400V Iso Xfmr P 415V Iso Xfmr Q 230/133V Auto-Xfmr R 240/139V Auto-Xfmr S 480V Iso Xfmr T (Undefined) U 600/347V Auto-Xfmr V 600V Iso Xfmr X Not Used Z 200/115V Auto-Xfmr		
Current (Nominal) (A)	140 A	224 A	278 A
Current (Max) (A)	173 A	278 A	347 A
Current Limit (%)	125% of Rated load		
Current THD (%)	< 5%		
Frequency (Hz) [and range]	50/60 Hz ± 5 Hz		
Input Power Factor (PF) @ full load	>0.98		
Walk-in Function (sec)	20% to 100% over 3, 5, or 9 sec. (Selectable)		
Cold Start (0-100% load) (sec)	25 sec. from cold start		
BYPASS			
Voltage (V)	Nominal Output Voltage, 3P/4W +GND or 3P/3W + GND See Input Voltage Transformer Key		
Frequency (Hz)	50/60 Hz ±5%		
Bypass Overload @ 125% Load	10 min. @ 125% Load		
Bypass Overload @ 150% Load	2 min. @ 150% Load		
Bypass Overload @ 1000% Load	1 cycle @ 1000% Load		
Automatic Retransfer (Max load % for Retransfer)	Yes		

1 - Requires adjustment of factory/service adjustable parameters.

4400 SPECIFICATIONS: 50–100kVA w/ External Battery Backup			
Specification	**50kVA**	**80kVA**	**100kVA**
OUTPUT			
Voltage (V)	Nominal Output Voltage, 3P/4W +GND or 3P/3W + GND See Input Voltage Transformer Key		
Voltage Regulation (%)	± 2% at 0-100% Balanced Load		
Voltage Total Harmonic Distortion (Full Linear Load) (%)	< 3%		
Output Voltage Adjustment (%)	± 5% via Touchscreen		
Voltage Transient Response (%) @ 100% Step Load Change	± 3% @ 100% Step Load Change		
Voltage Transient Response (%) @ Loss and Return of Input V	± 2%		
Voltage Transient Response (%) @ Xfer from Bypass to Inverter	± 3%		
Current (A)	139 A	222 A	278 A
Max Continuous Overload Current (A)	109% of Nominal Output		
Crest Factor	2.5		2
Inrush Current Protection	Fuse		
Interrupt Rating (RMS Symmetrical kA)	18 kAIC		
Frequency (Hz)	50 or 60 Hz		
Frequency Selectable (Converter)	Yes: 50 or 60Hz (Setup by Factory or Factory Technician Only)		
Frequency Regulation (%) Free Running Mode	± 0.1%		
Frequency Sync Range (%)	± 5 Hz		
Frequency Slew Rate Range (Hz/s)	± 0.5 Hz/sec.		
Output Power Factor (PF)	0.9		
Loads Supported (PF)	0.4 Lagging to 0.4 Leading		
Phase Displacement: 100% Balanced Load (deg.) 100% Unbalanced Load (deg.)	± 2° for Balanced Load ± 3° for Unbalanced Load		
Inverter Overload Capacity (% for sec)	110%-124% for 6 min. 125-149% for 60 sec. 150% for 30 sec.		105%-124% for 6 min. 125-149% for 60 sec. 150% for 30 sec.
Efficiency AC-DC-AC 100% Full Load (%)	91% w/ No Transformer 88% w/ One Internal Transformer (50 & 80kVA Only) 85% w/ Two Internal Transformers (50kVA Only)		
Surge Protection	Auto transfer to bypass, retransfer to inverter		
BATTERY GENERAL, EXTERNAL			
Type	VRLA Batteries		
Voltage – Nominal (Vdc)	288 Vdc		
Voltage – Minimum (Vdc)	230.4 Vdc		
Voltage -Float (Vdc)	324 Vdc		
Max Recharge Current – (Adc)	16 Adc (Default)/ 20Adc Max Factory Adj.		20 Adc (Default) / Factory Adjustable

4400 SPECIFICATIONS: 50–100kVA w/ External Battery Backup			
Specification	**50kVA**	**80kVA**	**100kVA**
Max Discharge Current – (Adc)	217 Adc	347 Adc	433 Adc
Battery Capacity Required at Full Load (kWB)	49.5 kWB	79.2 kWB	98.9 kWB
Battery Test (Interval per hr)	Yes		
Pre-alarm Level (Vdc)	250 Vdc		
Battery Protection	Internal – Fuse / Ext. – MCCB		
Overvoltage Protection	Cutoff @ 110% Floating Charge		
Protection against Batteries Deep Discharge	Automatically adjust cutoff voltage		
Efficiency DC-AC (%)	>92%		
BATTERY – INTERNAL (N/A)			
ENVIRONMENT			
Cooling -Forced Air (cfm)	5 x 452 cfm (max.)		
Operating Temperature (°F/°C)	32°F – 104°F (0 °C – 40 °C)		
Storage Temperature (°F/°C)	14°F – 122°F (-10 °C – 50 °C)		
Operating Humidity (%)	5 – 95% RH		
Altitude (ft./m)	3300 ft. (1000 m) w/o derating		
Location	Indoors in dust and moisture free environment		
Heat Rejection at 100% Full Load (BTU/Hour)	15,034 (Ref. Table 11.10)	24,054 (Ref. Table 11.10)	30,372 (Ref. Table 11.10)
Audible Noise (dBA)	~63dB ('A' Scale @ 1m)		<70 dB ('A' Scale @ 1m)
MECHANICAL			
Weight [2] lb/(kg) with No Transformer with 1 Transformer with 2 Transformers	 965 lbs. (438 kg) 1370 lbs. (612 kg) 1695 lbs. (612 kg)	 1550 lbs. (612 kg) 1735 lbs. (612 kg) N/A	 1650 lbs. (748 kg) N/A N/A
Dimensions WxDxH (in/mm)	32.1 in x 37.2 in x 73.8 in (816 mm x 944 mm x 1874 mm)		
Shipping Weight [2] lb/(kg) with No Transformer with 1 Transformer with 2 Transformers	 1115 lbs. (612 kg) 1520 lbs. (612 kg) 1845 lbs. (612 kg)	 1670 lbs. (612 kg) 1855 lbs. (612 kg) N/A	 1,770 lbs. (803 kg) N/A N/A
Shipping Dimensions WxDxH (in/mm)	46 in x 48 in x 90 in (1168 mm x 1219 mm x 2286 mm)		
Clearance (in/mm) [2]	Front – 36 in (900 mm) (per NEC or Local Code) / Top – 16 in (406 mm) Sides/Back – Zero clearance		
Enclosure	NEMA 1		
Construction	Welded Steel Chassis		
Color	Powder Coat, Dupont O'Brien Black		
Emergency Power Off (EPO)	Yes		
Control Panel	Touchscreen and LED		
MONITORING			
Operator Interface (Front Panel)	Touchscreen and LED		
Dry Contacts Included	Yes		
RS-232 Interface	Yes		
Optional – Intelligent Monitoring	Yes – RemotEye 4		

4400 SPECIFICATIONS: 50–100kVA w/ External Battery Backup			
Specification	**50kVA**	**80kVA**	**100kVA**
Optional – Remote Status Alarm Panel (RSAP)	Yes		
ADDITIONAL FEATURES			
Optional Matching Battery Cabinets	Yes		
Optional Matching MBS/PDU Cabinet	Yes		
OTHER			
Warranty (yr.)	3 Years		
Certifications	UL 1778, CUL, NEC (NFPS-70), CE[4], IBC, CBC, ANSI C62.41 (IEEE 587), Nema/PET-1993, OSHA, ISO9000, ISO 14001:2004		

2 - Minimum front clearance for unobstructed airflow is 20 inches. However, minimum front clearance when physically accessing the UPS must be at least the width of the front door of the UPS, or per NEC 110.34(A) (36 i n./900 mm) and local requirements, whichever is greater.

3 - Approximate weights for dual-input units. Actual weights may vary depending on exact UPS configuration.

4 - No CE certification for 100kVA

11.9 50–100kVA Efficiency vs. Load (Typical, No Transformer)

% EFFICIENCY AT VARIOUS LOADS*

UPS	Percent Full Load			
	25%	**50%**	**75%**	**100%**
50kVA	88.8%	90.9%	91.0%	91.0%
50kVA + 1 Xfmr.	85.8%	87.9%	88.0%	88.0%
50kVA + 2 Xfmr.	82.8%	84.9%	85.0%	85.0%
80kVA	88.8%	90.9%	91.0%	91.0%
80kVA + 1 Xfmr	85.8%	87.9%	88.0%	88.0%
100kVA	89%	90%	91%	91%

* Subject to change without notice.

11.10 50–100kVA Thermal Loss vs. Load (Typical)

THERMAL LOSS AT VARIOUS LOADS*

UPS	BTU/hr. Loss at Percent Full Load				
	0%	**25%**	**50%**	**75%**	**100%**
50kVA	3412	4856	7695	11,389	15,186
50kVA + 1 Xfmr.	4095	6369	10,578	15,703	20,938
50kVA + 2 Xfmr.	4095	7991	13,665	20,322	27,096
80kVA	5459	7770	12,312	18,223	24,297
80kVA + 1 Xfmr	6824	10,190	16,925	25,125	33,501
100kVA	6824	9,489	17,061	22,779	30,372

* Subject to change without notice.

12 Operator Interface

12.1 Operator Controls

Figure 12.1 shows the functions of the operating buttons on the graphic display panel.

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.

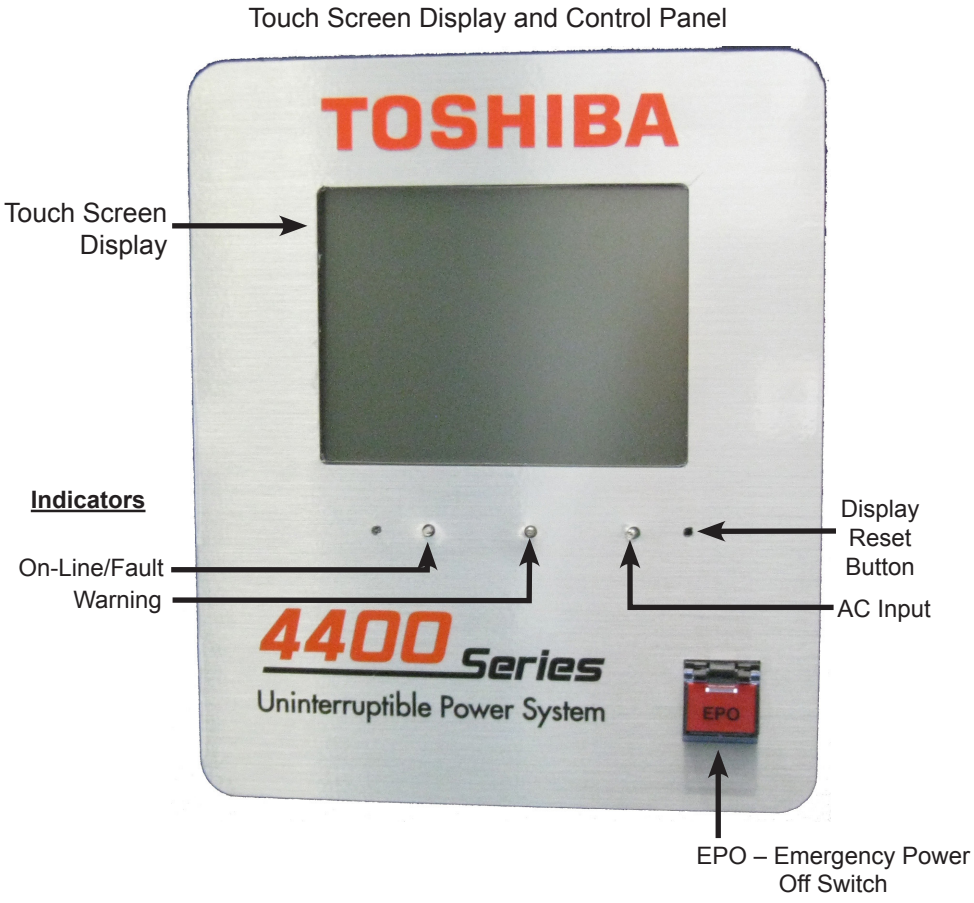


FIGURE 12.1 – UPS DISPLAY PANEL

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 faults occurred. See *Records: Faults* for details.
	Red – OFF	No fault occurred.
Warning	Amber – ON	Service Call needed.
	Amber – Flashing	One or more Warnings occurred.
	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

Bypass/On-Line Switch

Switches the UPS between On-Line and Bypass modes.

Display Reset Switch

Allows the display to be rebooted without powering down the UPS. The display can be reset by pressing the Reset Switch with a thin probe, such as a paper clip.

EPO (Emergency Power Off) Function

These units are equipped with a front panel mounted EPO switch.

This safety feature enables quick shutdown of the UPS AC output and battery circuits.

The EPO function is initiated by pressing the red 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 following figure shows the UPS condition after application of the EPO switch. See **Section 13.4 Restore System Power after an EPO Shutdown**.

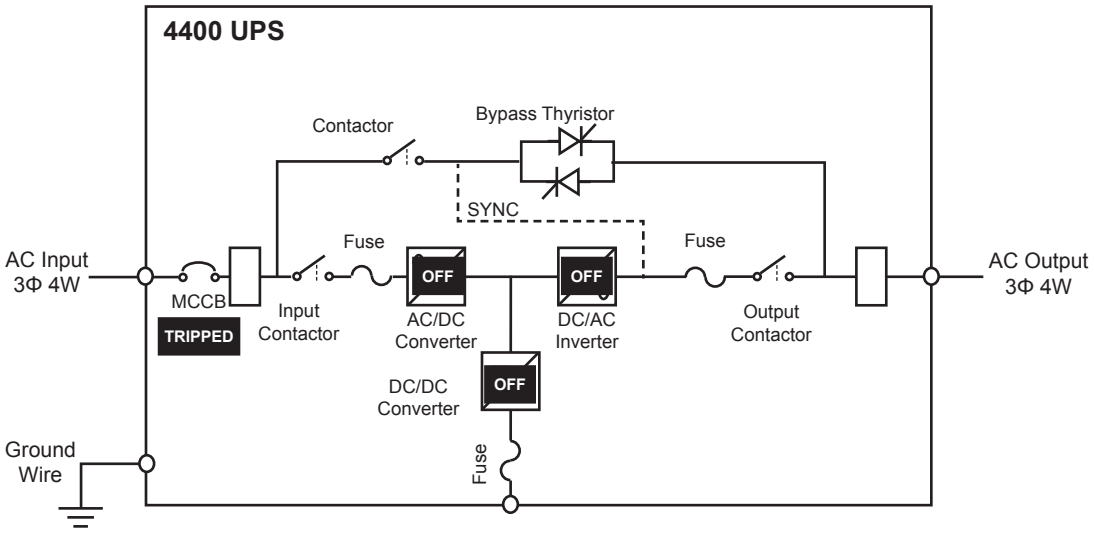
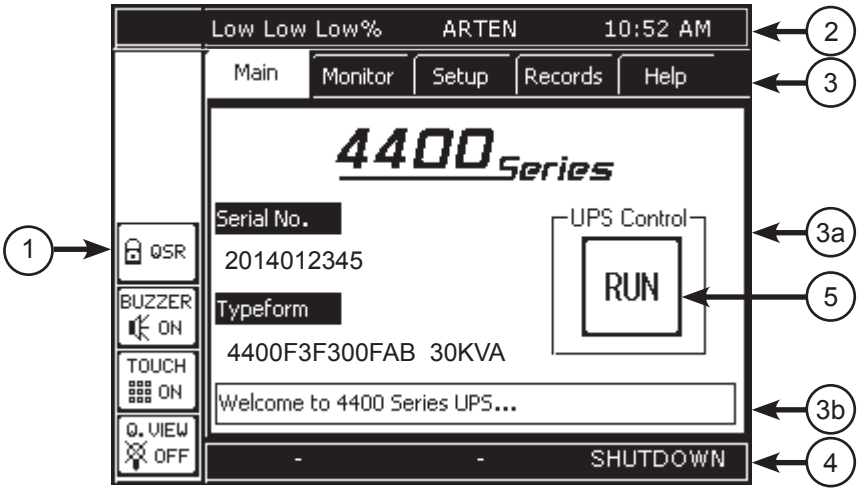


FIGURE 12-2 – EFFECT OF EPO ACTIVATION

12.4 Touch Screen Display

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

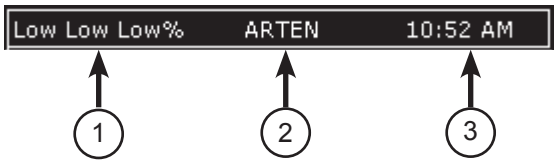


Touchscreen Layout	
No.	**Function**
1	**Quick Access Toolbar** – Interface/Status Switches (push-button icon changes to reflect current status) (See Section 12.5)
2	**Header Bar** – Displays system load, status, and time.
3	**Menu TABS** – Top level menu. Touch a Tab to activate the display mode
3a	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 Section 12.13) 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.

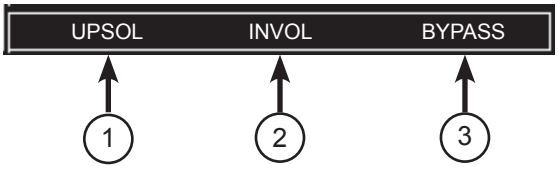


Header Bar Components	
No.	**Function**
1	**System Load** – Load per each phase as percent of full load. **Low** – Less than 10% Load.
2	**Current Status** – UPS status at the moment. (Status is delayed by a few seconds)
3	**System Time** – Current time in AM-PM format

FIGURE 12.4 – HEADER BAR DISPLAY COMPONENTS

12.6 Footer Bar

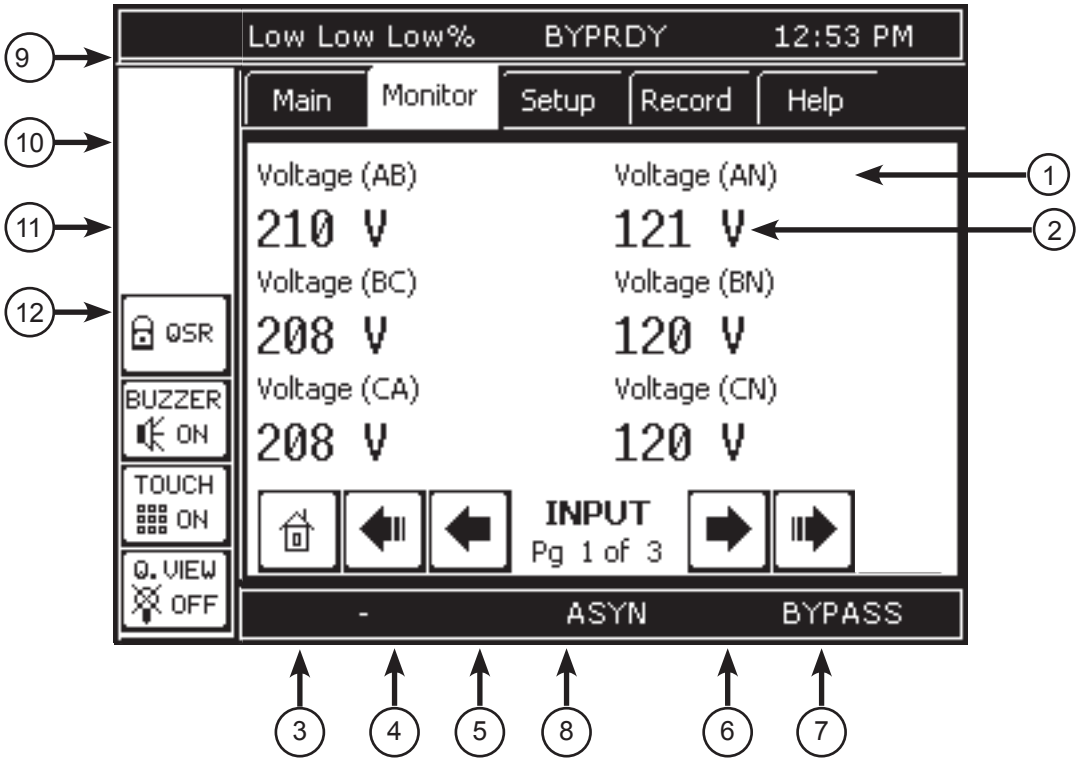
The Footer Bar on the graphic display panel displays three system parameters:



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

12.5 Touchscreen Data and Controls



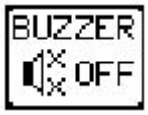
Touch Screen Controls	
No.	**Function**
Display	
1	Parameter Description
2	Parameter Value
Navigation Bar	
3	Home
4	Go To First Page
5	Go To Previous Page
6	Go To Next Page
7	Go To Last Page
8	Parameter Type (Input, Output, Communication, DC) and Pages of Data.
Quick Access Toolbar	
9	Security Level (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

12.7 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 12.12**.

12.8 4400 Menu Tree

Below is a menu tree for the 4400 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)

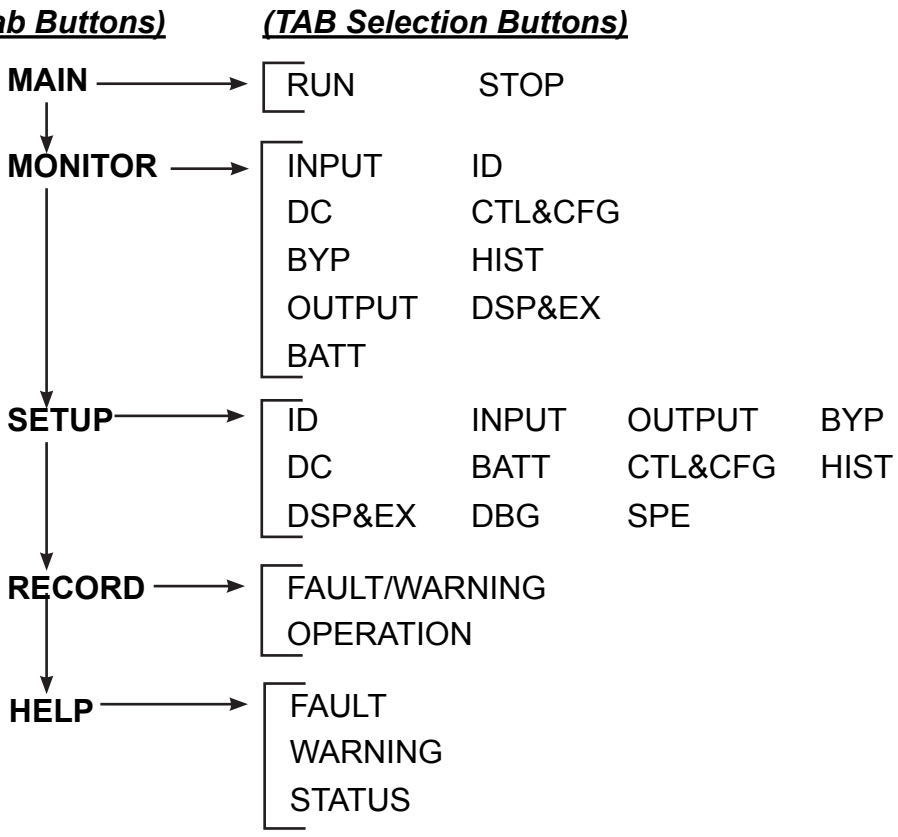


FIGURE 12.7 – MENU TREE

12.9 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, the screen will return to the Main display and the Security button will display the USR level.

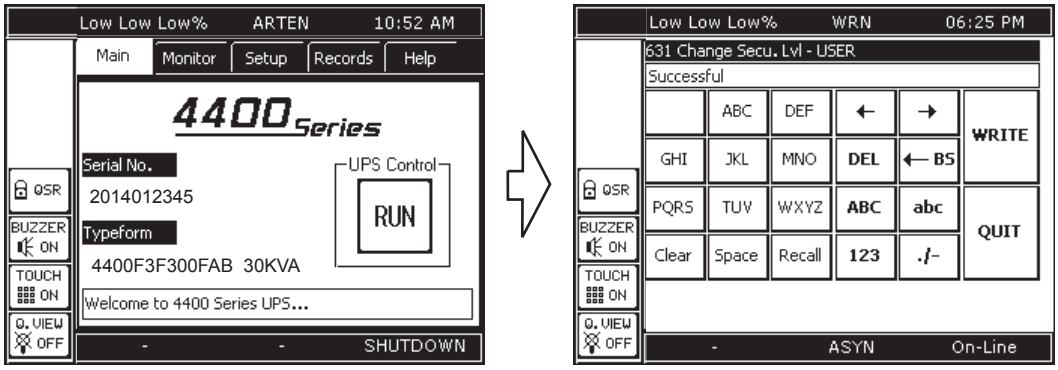


FIGURE 12.8 CHANGING SECURITY LEVEL

12.10 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.

12.11 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.

12.12 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, and Battery discharge current.

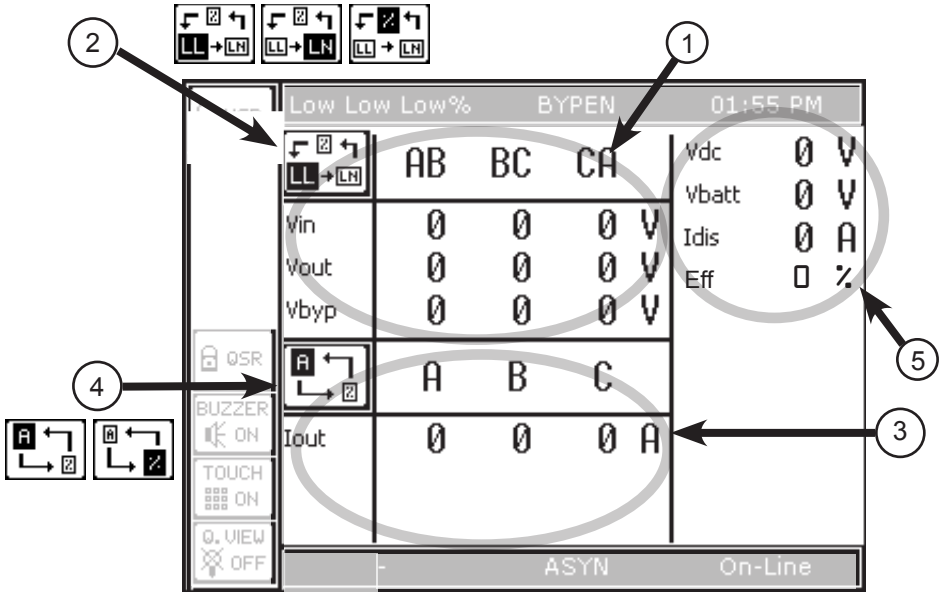
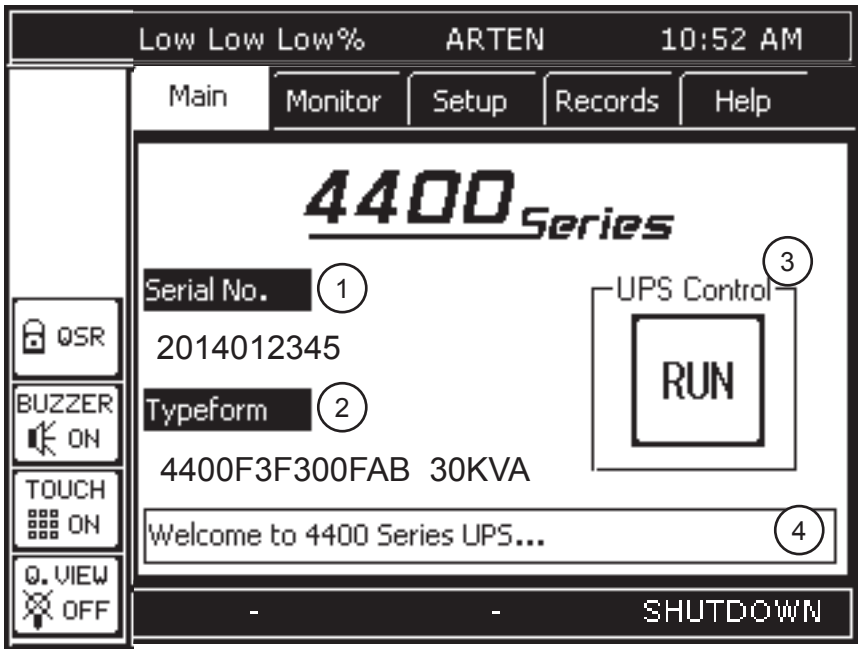


FIGURE 12-9 QUICK VIEW DISPLAY

12.13 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.

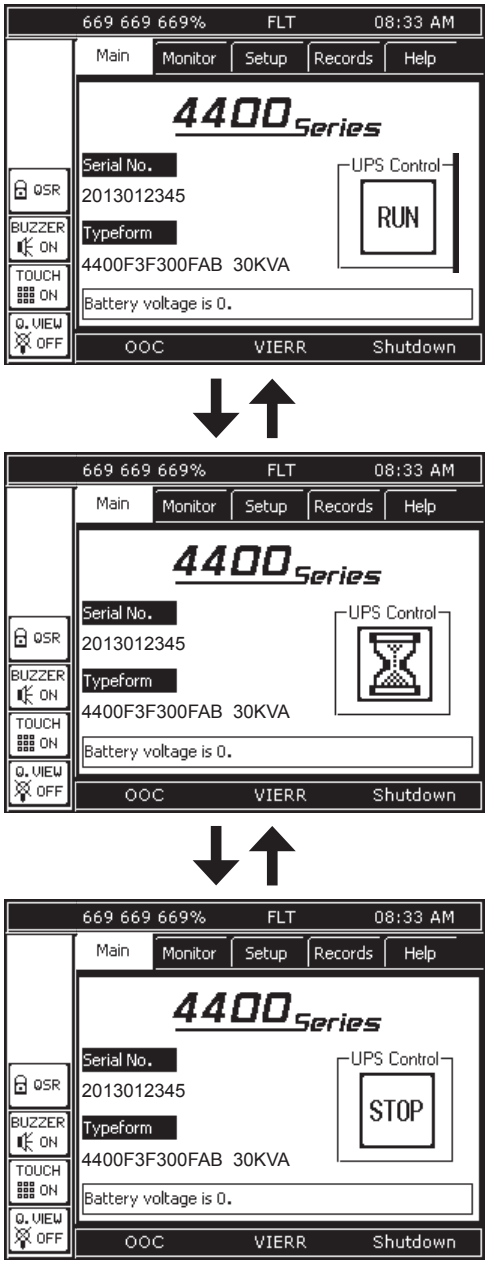


FIGURE 12.11 – RUN/STOP BUTTON OPERATION

12.14 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

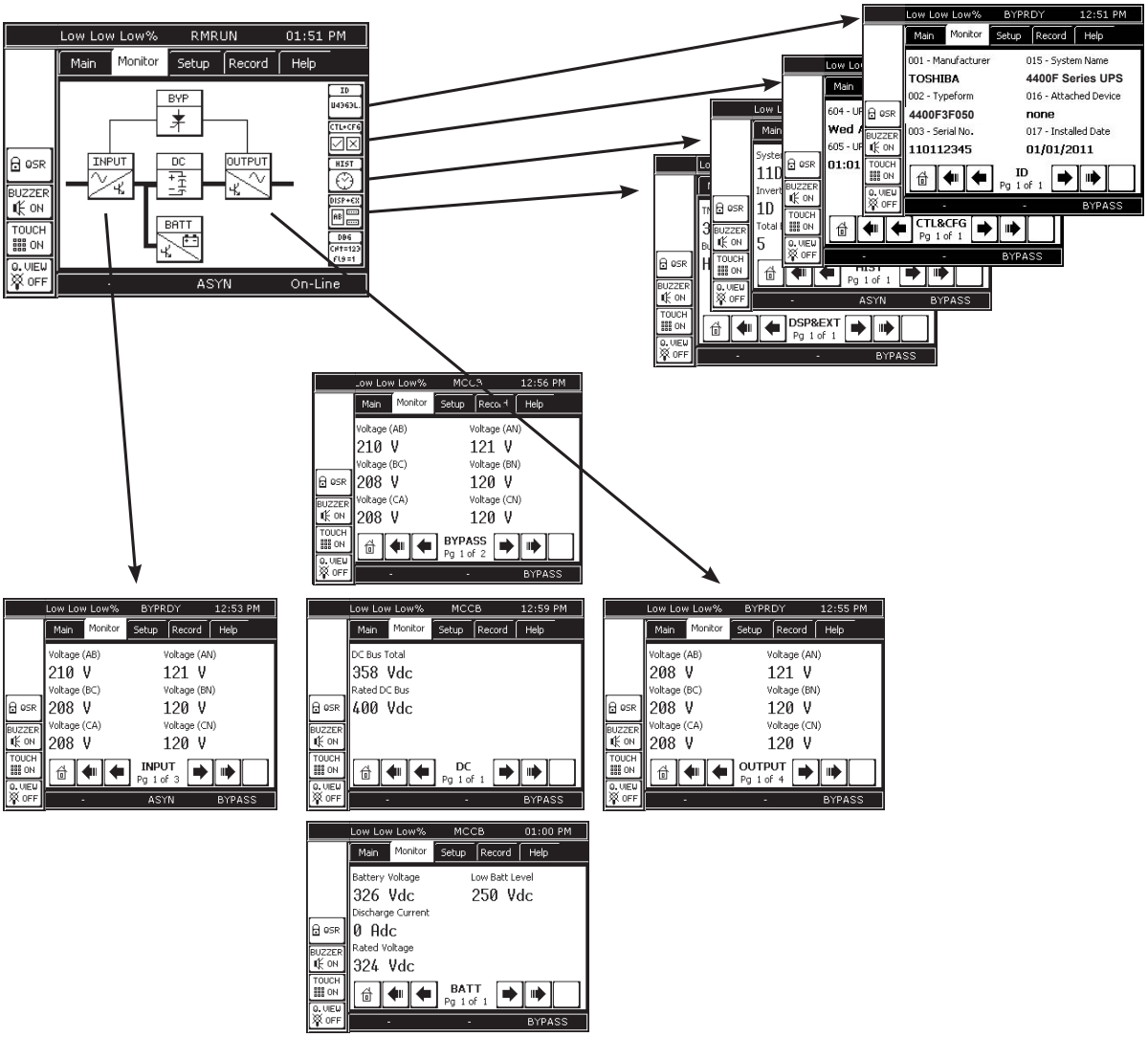


FIGURE 12-12 MONITOR TAB DISPLAY OPTIONS

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.

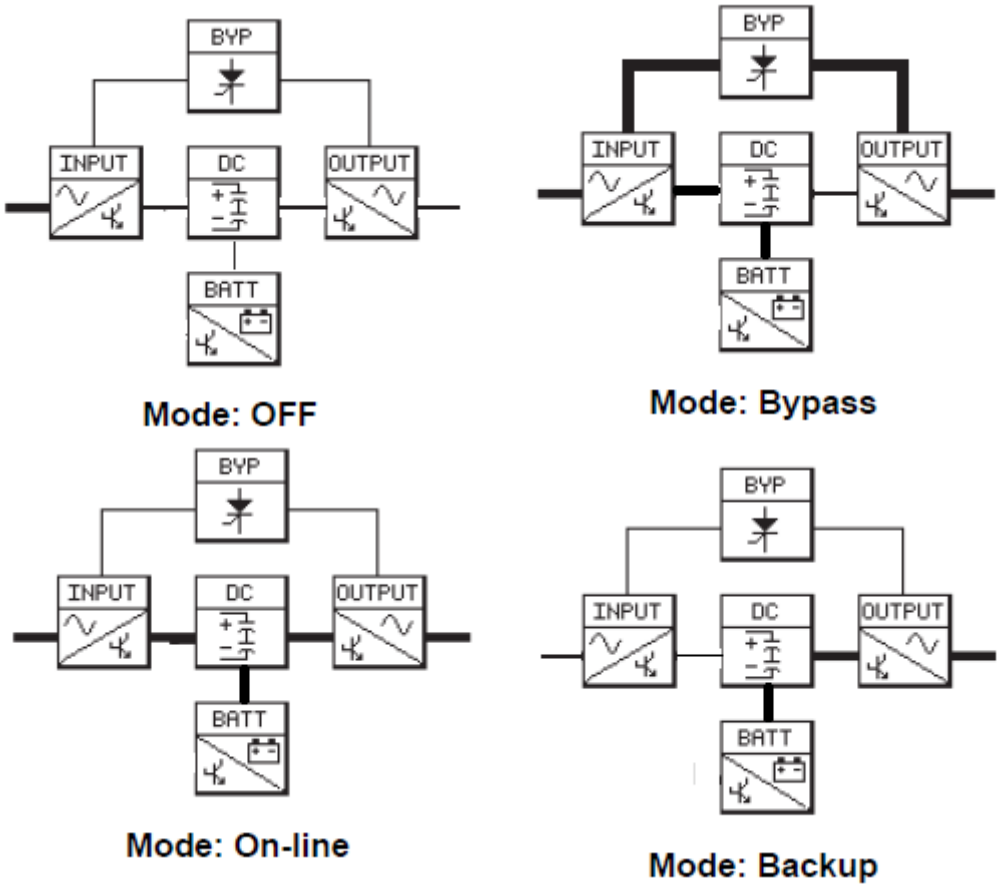
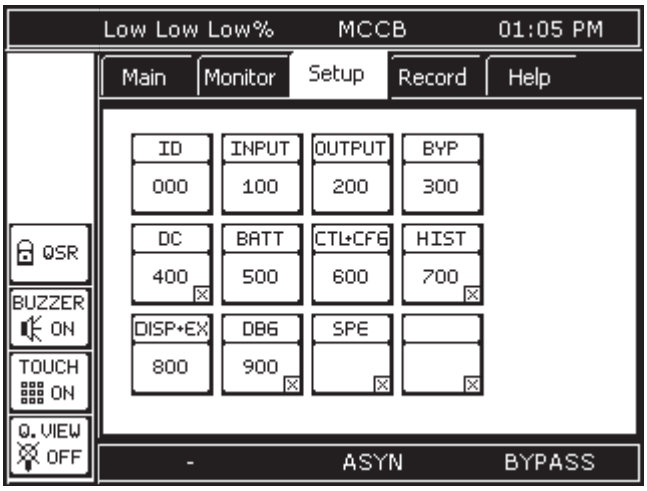


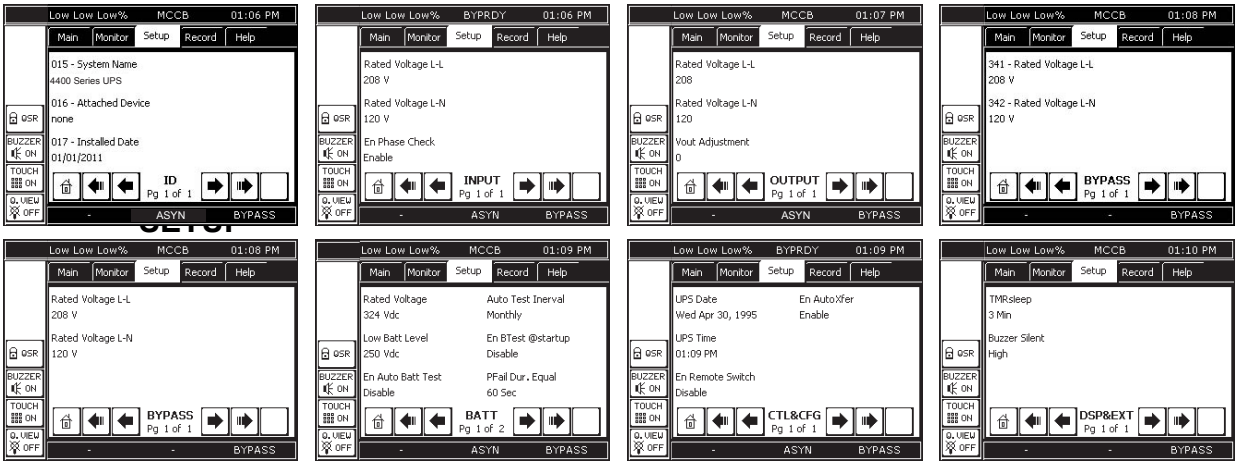
FIGURE 12-13 MIMIC DISPLAY CURRENT FLOW INDICATOR

12.15 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.

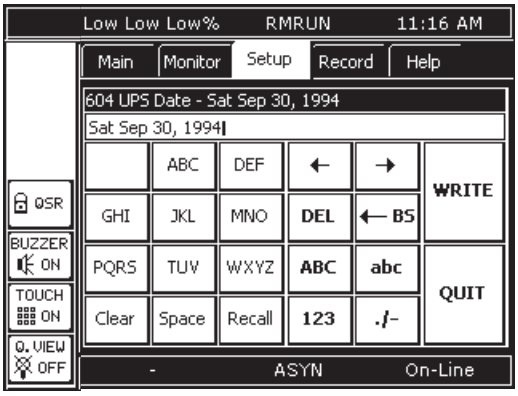
FIGURE 12.14 – PARAMETER CATEGORIES

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 (*)

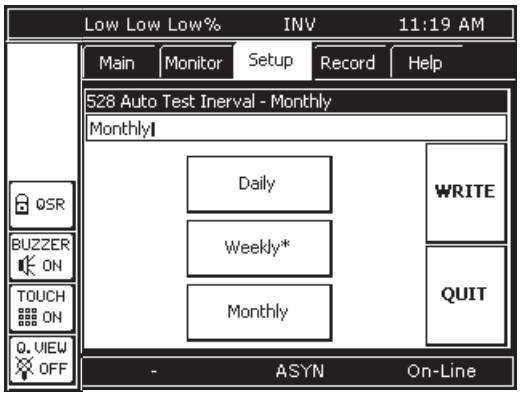
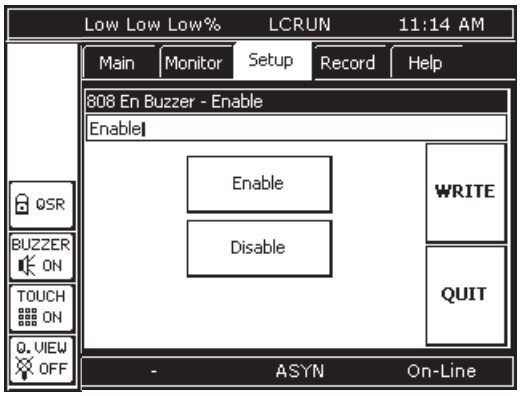


TABLE 12.4 – TOUCHSCREEN KEYPAD IDENTIFICATION

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)



12.16 Setup: Calibrating the Touchscreen

At anytime while using the tabs to view system details, the touchscreen can be calibrated by executing the built-in calibration routine.

To calibrate the touchscreen:

1. Press the **Setup** Tab.
2. Press the **DISP-EX 800** button.
3. Press the entry **Cali** (Parameter 8211) to begin the calibration routine.
4. Follow the directions on the display to press the "+" at each location it flashes on the display. To exit the calibration routine press QUIT at any time. See Fig. 12-15 A, B.
5. After the touchscreen has been recalibrated the display will indicate that the calibration routine has passed. Press Quit to return to the main display. See Fig. 12-15 C.

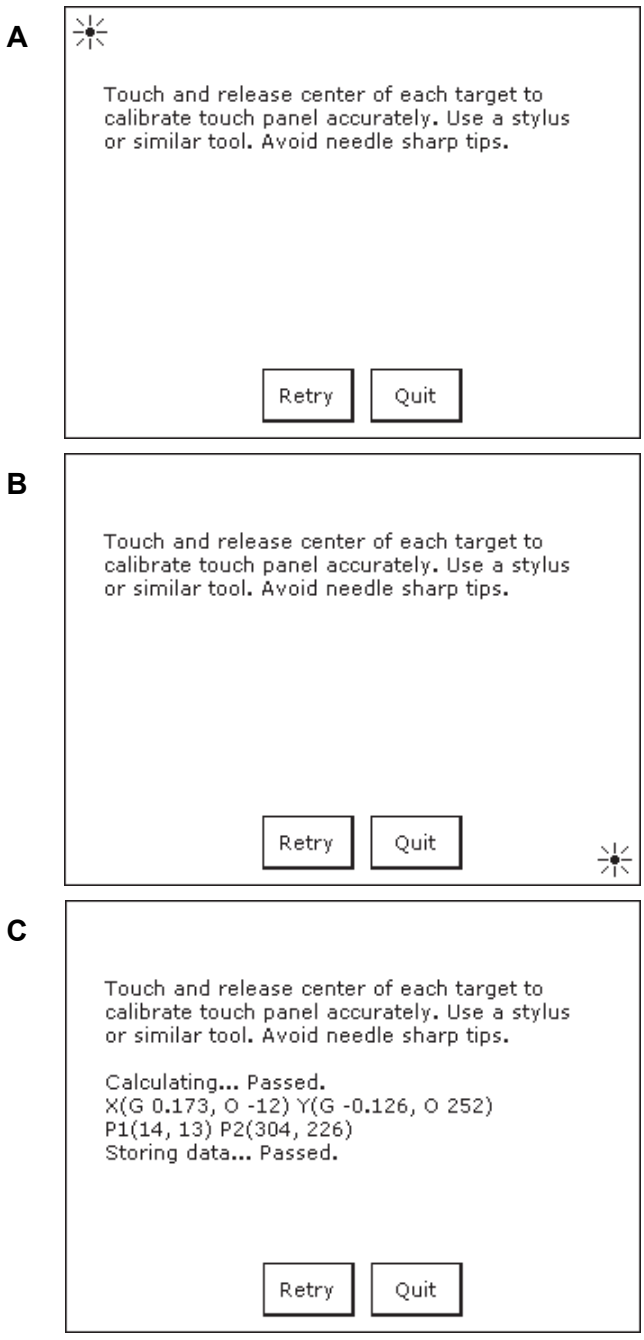
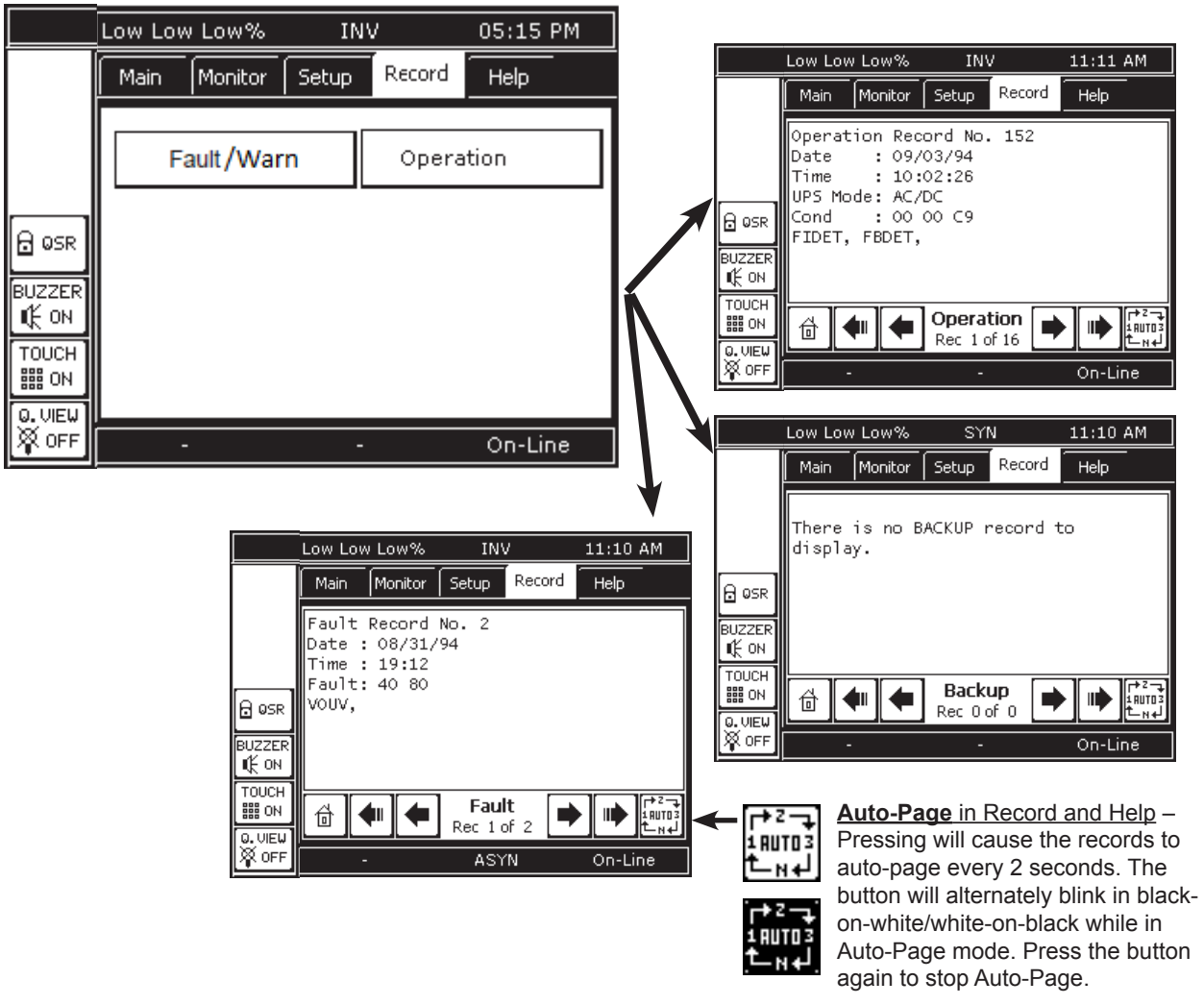


FIGURE 12-15 TOUCHSCREEN DISPLAY CALIBRATION

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
Fault/Warn	Every time a fault/warning occurs, the date, time and fault/warning is recorded.	64 records before overwrite



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.

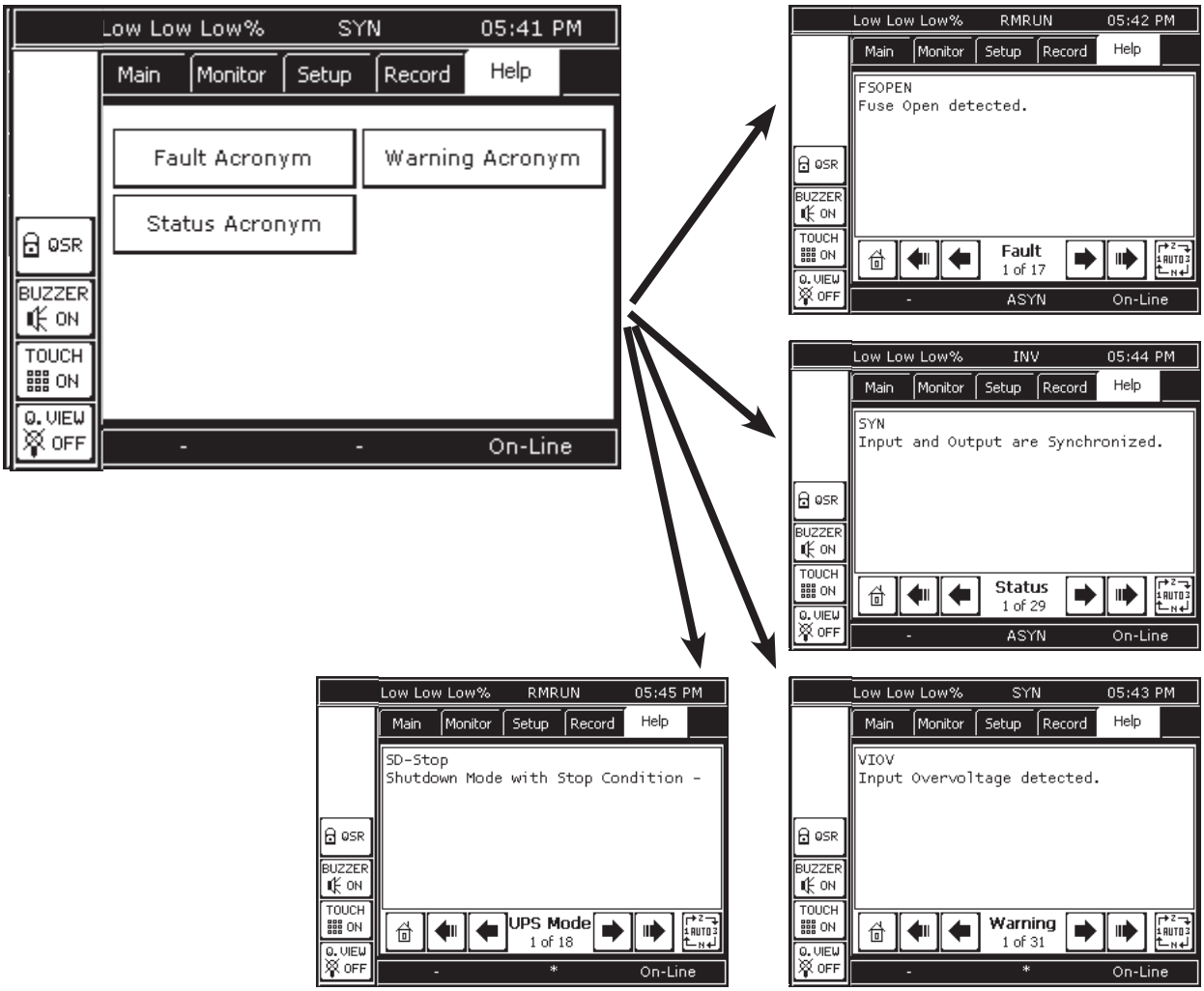


FIGURE 12.17 – HELP CATEGORIES

12.19 4400 Parameter Definitions

See Appendix A for the Command Parameter definitions and functions.

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.
INVOC	INVERTER OVERCURRENT	Contact nearest Toshiba Authorized service representative.

System Fault Messages		
Display	**Meaning**	**Action**
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	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

System Warning Messages		
Display	**Meaning**	**Action**
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	Supplied battery voltage is incorrect or is not connected. Check if battery cabinet circuit breaker is open, the battery polarity is correct, or the battery Voltage is correct..
VBLO/LB	BATTERY DEPLETED ALARM	Battery voltage reached low levels. Charging is required.
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

System Warning Messages		
Display	**Meaning**	**Action**
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

4400 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.
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.

4400 System Status Messages		
Display	**Meaning**	**Action**
EQCHRG	Equalized Charging	No action needed.
FLT	A fault has occurred.	See Fault records.
FRCDBYP	UPS forced into bypass mode.	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 4400 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.

A third state, Emergency shut-down, EPO, is for emergency use only and is discussed separately in Section 12.3.

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. Start the UPS as described in 13.2 steps 1-5.
2. Enter the **System Date**:
   Press the **Setup** tab.
   Press **System 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 **System Date** setup.
3. Enter the **System Time**:
   Press the **Setup** tab.
   Press **System 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 System Time setup.

13.2 Start the UPS

1. Switch the main circuit breaker (MCCB) on the inside 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 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.

13.5 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	All kVA
Nominal voltage (V_{nom})	288 Vdc
Alarm voltage (V_{low})	246 Vdc
Shutdown voltage (V_{min})	230 Vdc

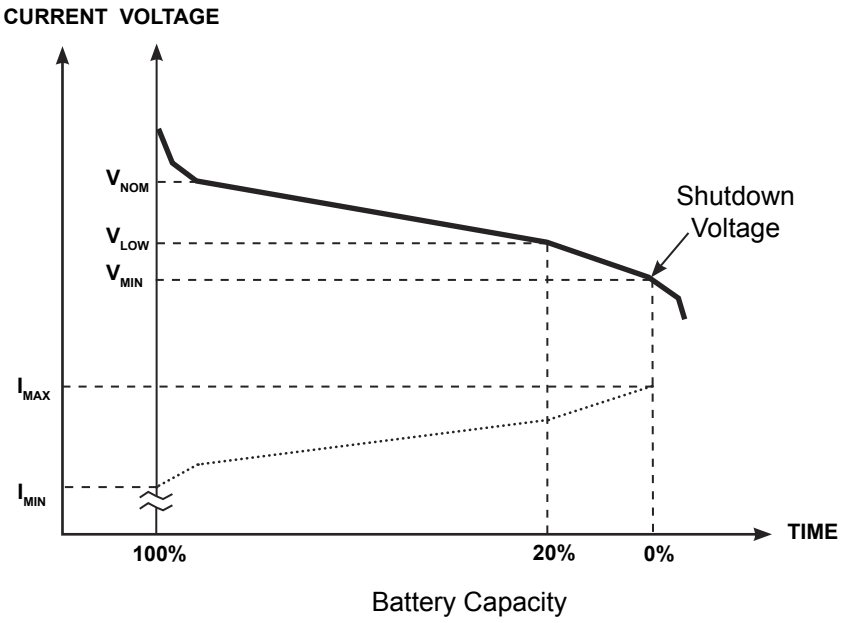


FIGURE 13.1 – TYPICAL BATTERY DISCHARGE CURVE

13.6 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.

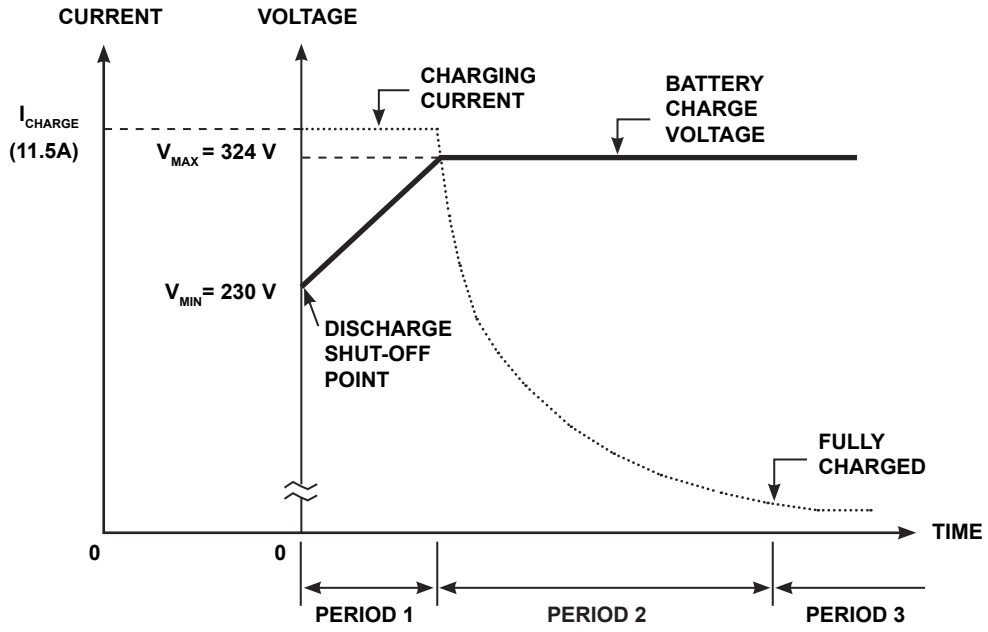
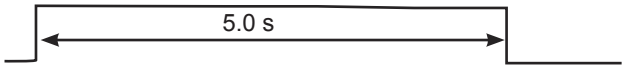
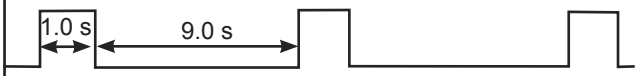
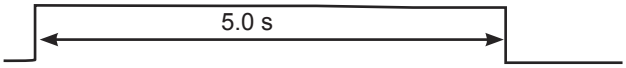
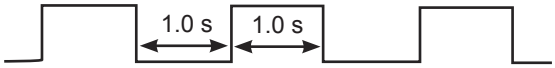
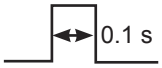


FIGURE 13.2 – TYPICAL BATTERY CHARGING CURVE

13.7 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 Replacement Air Filters

The 4400 has the following option available:

- Air Filter Kit – Replacement air filter for the 4400 front door filter.
- Filter Specifications:

Make:	Air Handler
Model:	6B997
Nominal Dimension (in)	15 x 30 x 1
Actual Dim. (in)	14.5 x 29.5 x 0.75
MERV	7
Quantity:	
15-30kVA	1 per unit
50-100kVA	2 per unit

Contact the factory for pricing.

14.2 Remote Monitoring System – RemotEye 4

The 4400 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)

14.3 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 5,000 RemotEye® II & III & Remote-D® Devices Combined
- 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 External Layouts/Dimensions/Shipping Weights

Dimensional Data

TABLE 15.1 – DIMENSIONAL DATA

EXTERNAL DIMENSIONS				SHIPPING DIMENSIONS[1]		
Unit	**Width**	**Depth**	**Height**	**Width**	**Depth**	**Height**
15-30 kVA	20.12 in (511 mm)	37.4 in (950)	65.06 in (1653 mm)	43 in (1092 mm)	49 in (1245 mm)	72 in (1829 mm)
50 kVA	32.1 in (816 mm)	37.2 in (944 mm)	73.8 in (1874 mm)	46 in (1168 mm)	49 in (1245 mm)	90 in (2286 mm)
80-100 kVA	32.1 in (816 mm)	37.2 in (944 mm)	73.6 in (1869 mm)	46 in (1168 mm)	49 in (1245 mm)	90 in (2286 mm)

1. Subject to change without notice.

Electrical Conduit Knock-out Data

TABLE 15.2 – CONDUIT KNOCKOUT DIMENSIONS

CABLE ACCESS OPENING SIZES (15/20/25/30/50/80/100 KVA)	
Left/Right Side	**6 in (152 mm) x 9 in (229 mm)**
Top	**4.75 in (121 mm) x 16.5 in (419 mm)**
Bottom	**4.75 in (121 mm) x 16.5 in (419 mm)**

Unit and Shipping Weights

TABLE 15.3 – UNIT AND SHIPPING WEIGHTS

Model	Unit Weight [1]		Shipping Weight [1,2]	
	Pounds	Kilograms	Pounds	Kilograms
15 kVA	720	327	875	397
15 kVA w/ Int. Batt.	1000	454	1155	525
15 kVA w/ 2 Xfmrs	-	-	-	-
20 kVA	720	327	875	397
20 kVA w/ Int. Batt.	1000	454	1155	525
20 kVA w/ 2 Xfmrs	-	-	-	-
25 kVA	720	327	875	397
25 kVA w/ Int. Batt.	1000	454	1155	525
25 kVA w/ 2 Xfmrs	1120	508	1275	578
30 kVA	720	327	875	397
30 kVA w/ Int. Batt.	1000	454	1155	525
30 kVA w/ 2 Xfmrs	1115	506	1270	576

Model	Unit Weight [1]		Shipping Weight [1,2]	
	Pounds	Kilograms	Pounds	Kilograms
50 kVA	1350	612	1505	683
50 kVA w/ Int. Batt.	-	-	-	-
50 kVA w/ 2 Xfmrs	-	-	-	-
80 kVA	1500	680	1655	751
80 kVA w/ 1 Xfmr	-	-	-	-
100kVA	1,650	784	1,770	802

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.

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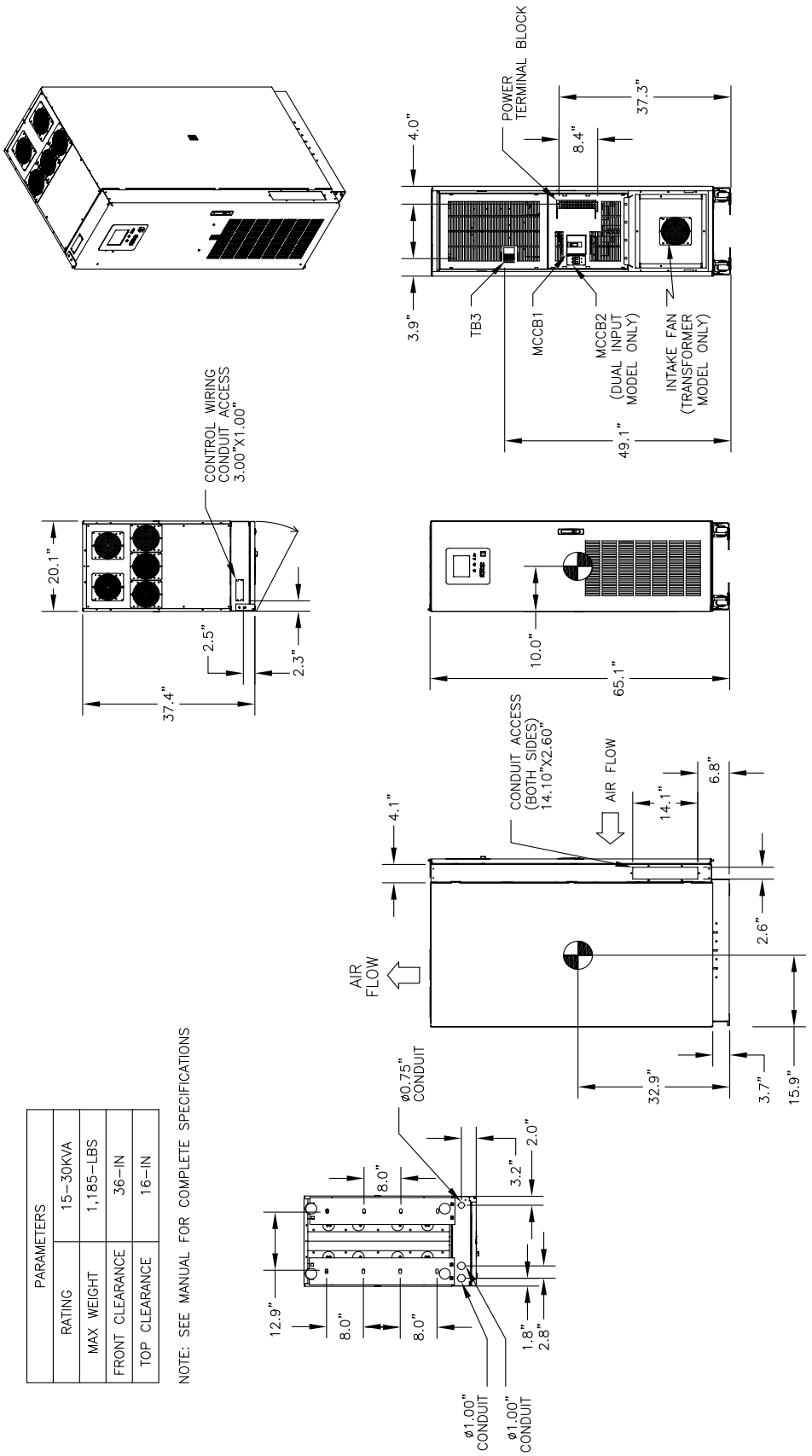
Appendix A – Dimensional Drawings



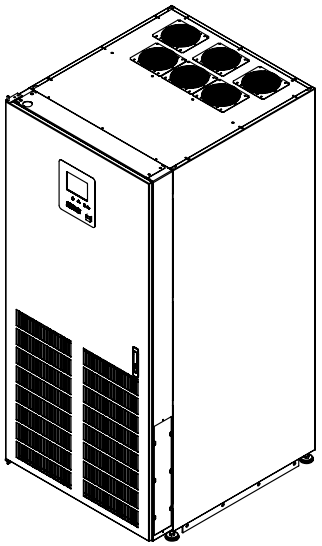
PARAMETERS	
RATING	15–30KVA
MAX WEIGHT	1,185–LBS
FRONT CLEARANCE	36–IN
TOP CLEARANCE	16–IN

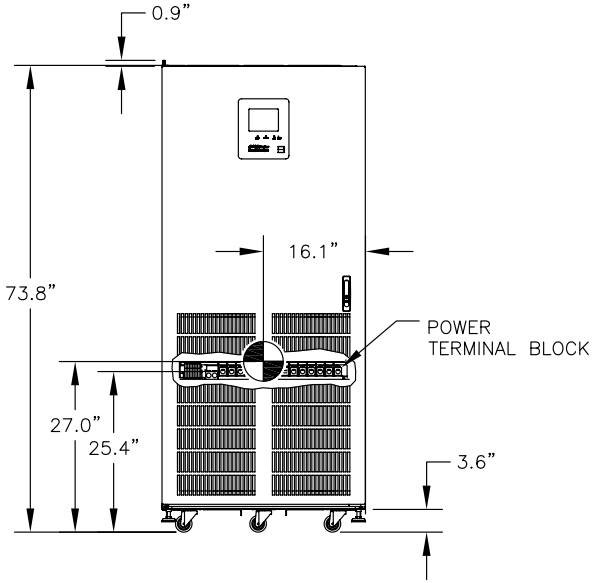
NOTE: SEE MANUAL FOR COMPLETE SPECIFICATIONS

FIGURE A.1 – 4400 15-30 KVA PHYSICAL DIMENSIONS

PARAMETERS	
RATING	50KVA
MAX WEIGHT	1,735–LBS
FRONT CLEARANCE	36–IN
TOP CLEARANCE	16–IN

NOTE: SEE MANUAL FOR COMPLETE SPECIFICATIONS





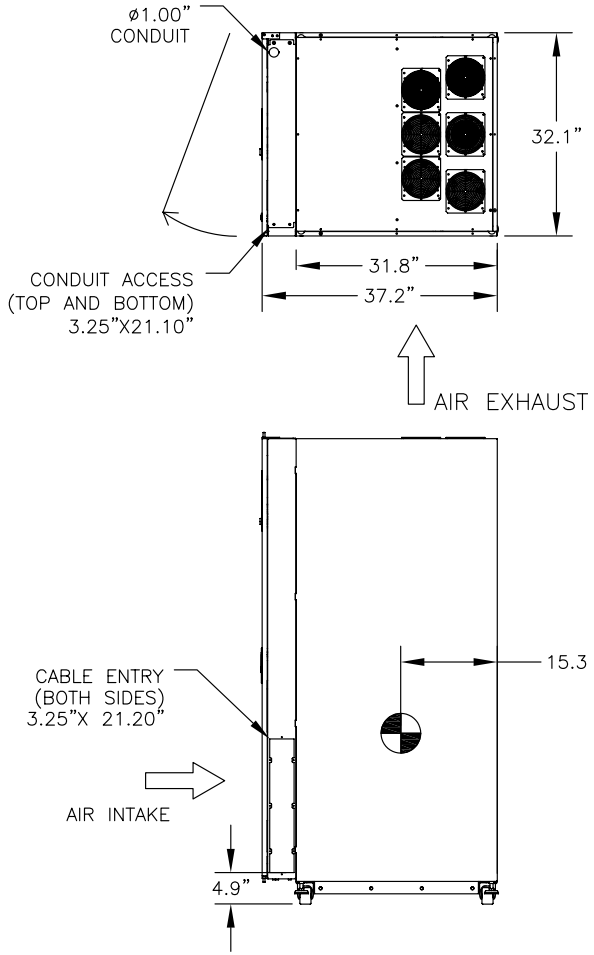


FIGURE A.2 – 4400 50 KVA PHYSICAL DIMENSIONS (1/2)

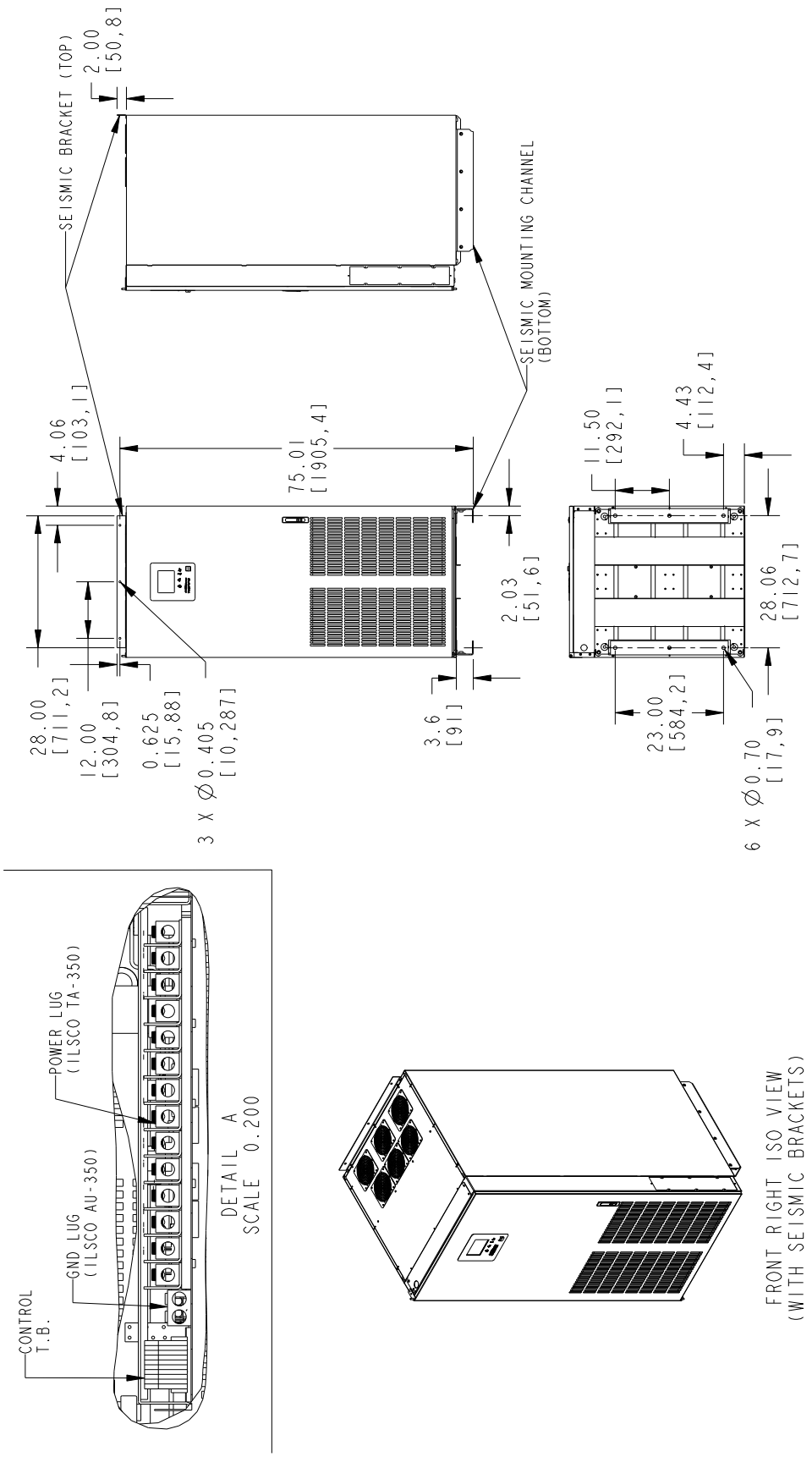


FIGURE A.3 – 4400 50 KVA PHYSICAL DIMENSIONS (2/2)

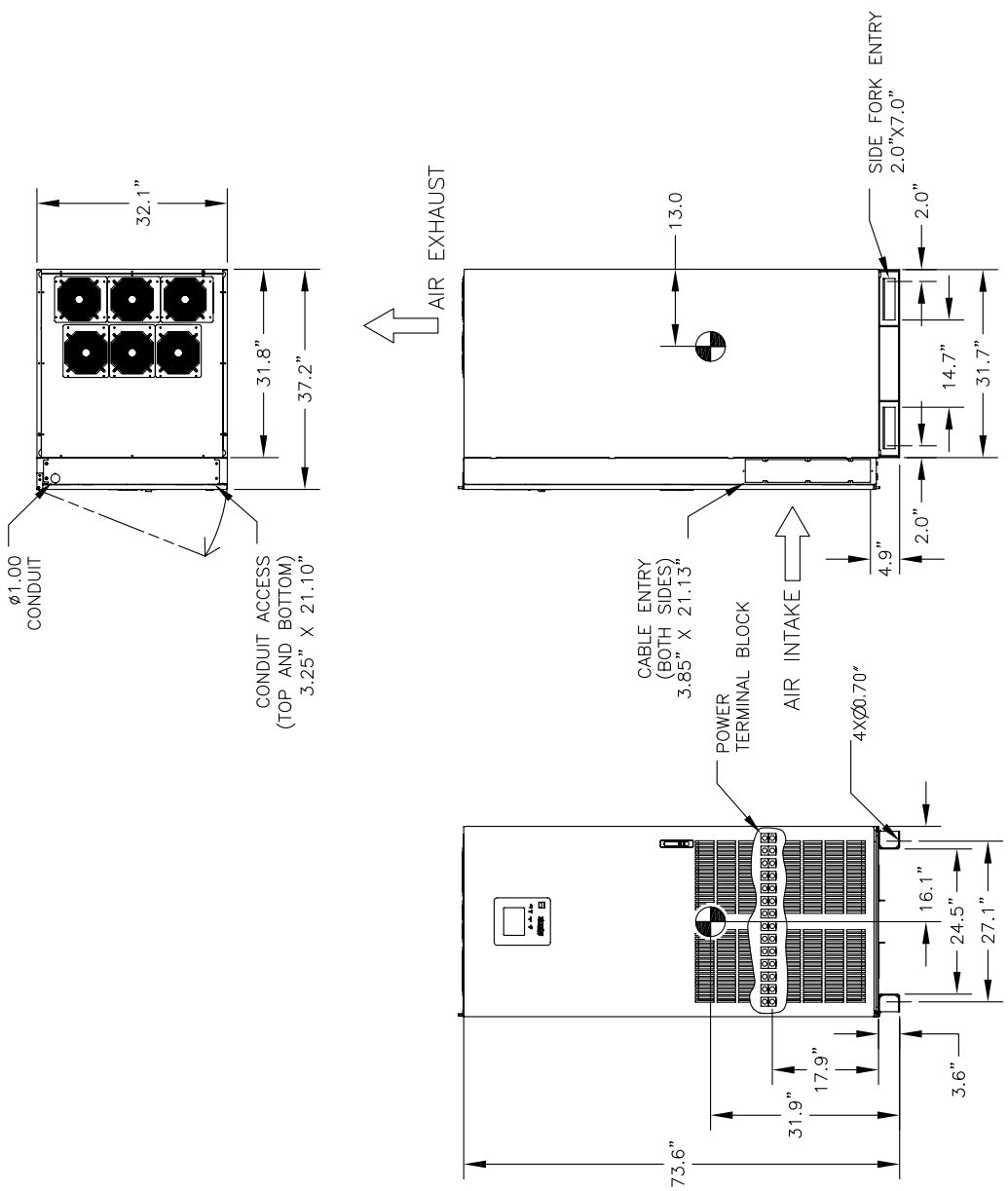
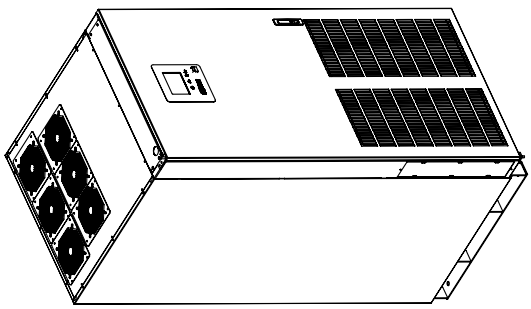
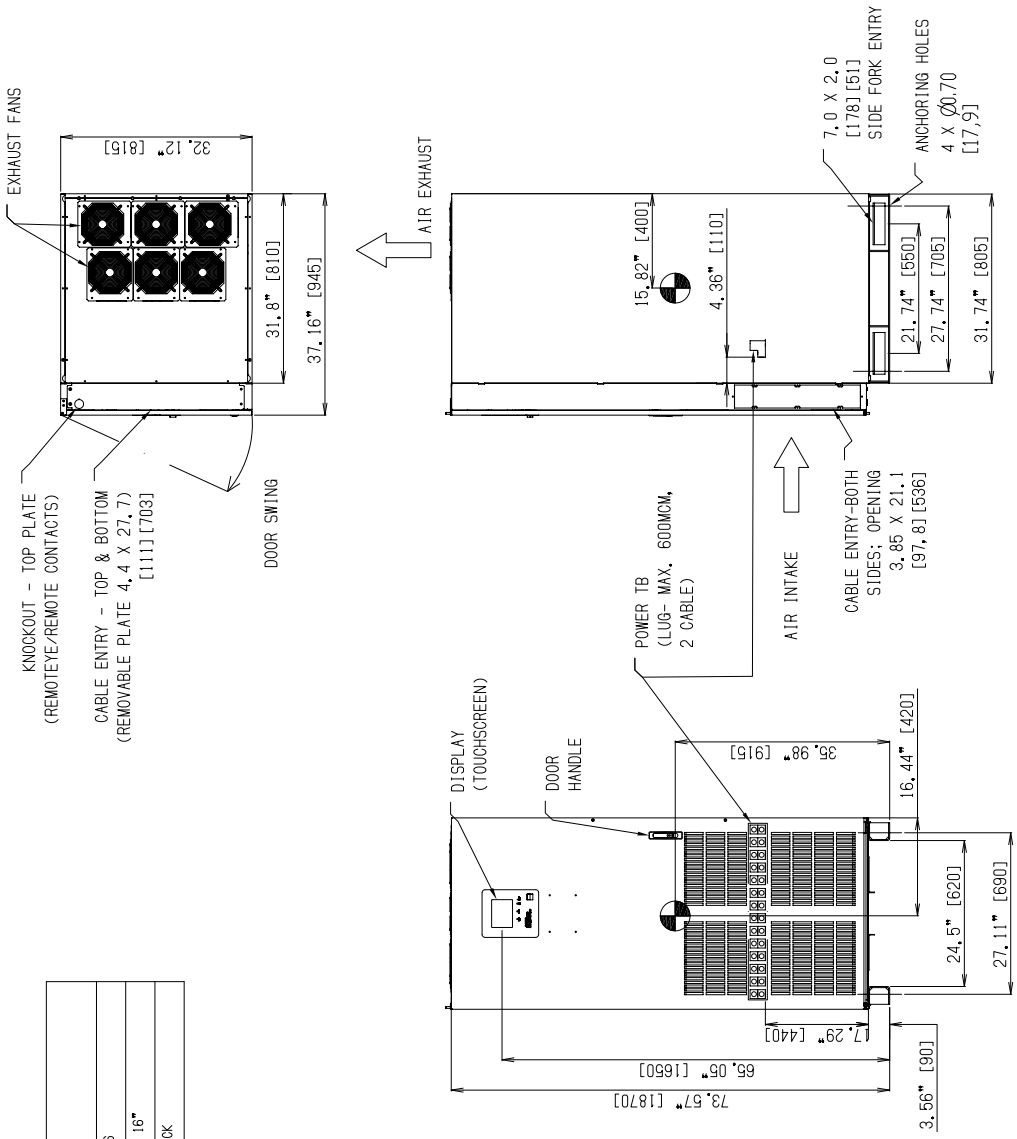


FIGURE A.4 – 4400 80 KVA PHYSICAL DIMENSIONS

PARAMETERS	
RATING	80KVA
MAX WEIGHT	1,735–LBS
FRONT CLEARANCE	36–IN
TOP CLEARANCE	16–IN

NOTE: SEE MANUAL FOR COMPLETE SPECIFICATIONS





PARAMETERS	100 KVA
UNIT WEIGHT (LBS/KGS)	1270 / 576
VENTILATION REQTS.	FRONT 44"; TOP 16"
FINISH	O'BRIEN BLACK

NOTE: SEE MANUAL FOR COMPLETE SPECIFICATIONS

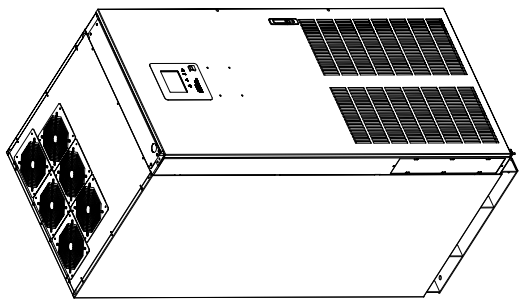


FIGURE A.4 – 4400 100 KVA PHYSICAL DIMENSIONS

4400 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 © %	%	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	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
2	13	Output Power KW (Total)	Power KW (Total)	kW	R	R	
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	
2	24	Output Current % (A)	Current % (A)	%	R	R	
2	25	Output Current % (B)	Current % (B)	%	R	R	

Blk	Item	Long Description	Short Description	Units	Permiissions		Remark
					User	Admin	
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	
3	08	Bypass Phase Current (B)	Current (B)	A	R	R	
3	09	Bypass Phase Current (C)	Current (C)	A	R	R	

Blk	Item	Long Description	Short Description	Units	Permiissions		Remark
					User	Admin	
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
5	12	Manual Equalize Chrg*	Man. Equalize Ch		-	R	0 – Start 1 – Stop

Blk	Item	Long Description	Short Description	Units	Permiissions		Remark
					User	Admin	
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	
7	01	System Operation Time	System Op Time		R	R	
7	02	Inverter Op Time	Inverter Op Time		R	R	

Blk	Item	Long Description	Short Description	Units	Permiissions		Remark
					User	Admin	
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 (43 – 4300) 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 III can write. Others, read only.
8	51	RemotEye Version	REye Ver		R/W	R/W	Note: Only RemoteEye III 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 III 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 III 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 III can write. Others, read only.
8	55	RemotEye Installation Status	Sreye		R/W	R/W	Note: Only RemoteEye III 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 III 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 III can write. Others, read only.

Appendix C – Installation Planning Guide

TOSHIBA 4400 UPS

Installation Planning Guide for 15-100kVA UPS

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

General Mechanical Information						
UPS kVA/ kW Rating	Dimensions (W x D x H)	Weight Bare (w/ Int Batt.)	Approximate Full-Load Heat Loss	Mechanical Clearance for Ventilation and Maintenance Access		
	Inches	Lbs.	kBtu/Hr			
15 kVA/ 13.5 kW	20.12 x 37.4 x 65.06	725 (1015)	4.6	Top: 16 in (406 mm)	Front: 36 in (900 mm)	Bottom/ Sides/ Back: 0 in. (0 mm)
20 kVA/ 22.5 kW	20.12 x 37.4 x 65.06	730 (1020)	6.1			
25 kVA/ 22.5 kW	20.12 x 37.4 x 65.06	750 (1035)	7.6			
30 kVA/ 27 kW	20.12 x 37.4 x 65.06	760 (1045)	9.1			
50 kVA/ 45 kW	32.1 x 37.2 x 73.8	965 (1920)	15.2			
80 kVA/ 72 kW	32.1 x 37.2 x 73.6	1550 (N/A)	24.3			
100 kVA/ 90 kW	32.1 x 37.2 x 73.6	1650 (N/A)	30.4			

Primary AC Input (208/120V 3-Phase / 4-Wire)					
Power Demand at 100% Load			Suggested External Feeder Breaker	Suggested Minimum Feeder Wire Size Per Phase / Neutral	Suggested Maximum Feeder Length For Min. Wire Size in Steel Conduit
kVA	PF	Amps	Amps	AWG or kcmil at 75º C Temp. Rating	Feet
15	>0.99	42 (52)	80 A	(1) x 4 AWG / (1) x 2 AWG	380
20	>0.99	56 (69)	90 A	(1) x 3 AWG / (1) x 2 AWG	380
25	>0.99	70 (85)	110 A	(1) x 2 AWG / (1) x 2 AWG	380
30	>0.99	84 (99)	125 A	(1) x 2 AWG / (1) x 2 AWG	380
50	>0.99	140 (154)	200 A	(1) x 4/0 AWG / (1) 250 kcmil	380
80	>0.99	224 (239)	300 A	(2) x 3/0 AWG – (1) x 400 kcmil / (2) x 250 kcmil	380
100	>0.99	280 (295)	400 A	(2) x 250 kcmil – (1) x 600 kcmil / (2) x 600 kcmil	380

Bypass AC Input (208/120V 3-Phase / 4-Wire)					
Power Demand at 100% Load			Suggested External Feeder Breaker	Suggested Minimum Feeder Wire Size Per Phase / Neutral	Suggested Maximum Feeder Length For Min. Wire Size in Steel Conduit
kVA	PF	Amps	Amps	AWG or kcmil at 75º C Temp. Rating	Feet
15	0.9	38	50 A	(1) x 6 AWG / (1) x 2 AWG	380
20	0.9	50	70 A	(1) x 4 AWG / (1) x 2 AWG	380
25	0.9	63	80 A	(1) x 3 AWG / (1) x 2 AWG	380
30	0.9	75	100 A	(1) x 2 AWG / (1) x 2 AWG	380
50	0.9	125	175 A	(1) x 3/0 / (1) 250 kcmil	380
80	0.9	200	250 A	(2) x 2/0 AWG – (1) x 300 kcmil / (2) x 400 kcmil	380
100	0.9	250	350 A	(2) x 4/0 AWG – (1) x 500 kcmil / (2) x 600 kcmil	380

Battery Backup (288VDC Nominal)					
Battery Capacity Required for Full Load Output		Maximum Discharge at Full Load Output	Suggested External Feeder Breaker[1]	Suggested Minimum Feeder Wire Size Per Polarity	Suggested Maximum Feeder Length For Min. Wire Size in Steel Conduit
kVA	kWB	Amps DC	Amps	AWG or kcmil at 75º C Temp. Rating	Feet
15	14.7	64 A	70 A	(1) x 4 AWG	70
20	19.6	85 A	100 A	(1) x 3 AWG	70
25	24.5	107 A	100 A	(1) x 2 AWG	70
30	29.4	128 A	125 A	(1) x 2 AWG	70
50	49.5	215 A	250 A	(1) x 250 kcmil	70
80	79.2	344 A	300 A	(2) x 250 kcmil – (1) x 600 kcmil	70
100	98.9	430 A	400 A	(2) x 350 kcmil	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.

TOSHIBA 4400 UPS

Installation Planning Guide for 15-100kVA UPS

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

AC Output (208/120V 3-Phase / 4-Wire)					
Rated Output Power			Suggested External Feeder Breaker	Suggested Minimum Feeder Wire Size Per Phase / Neutral	Suggested Maximum Feeder Length For Min. Wire Size in Steel Conduit
kVA	PF	Amps	Amps	AWG or kcmil at 75° C Temp. Rating	Feet
15	0.9	42	60 A	(1) x 4 AWG / (1) x 2 AWG	380
20	0.9	56	80 A	(1) x 3 AWG / (1) x 2 AWG	380
25	0.9	69	90 A	(1) x 2 AWG / (1) x 2 AWG	380
30	0.9	83	110 A	(1) x 2 AWG / (1) x 2 AWG	380
50	0.9	139	200 A	(1) x 4/0 / (1) 250 kcmil	380
80	0.9	222	300 A	(2) x 3/0 AWG – (1) x 400 kcmil / (2) x 500 kcmil	380
100	0.9	278	400 A	(2) x 4/0 AWG – (1) x 600 kcmil / (2) x 600 kcmil	380

TOSHIBA 4400 UPS

Installation Planning Guide for 15-100kVA 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 & optional Secondary 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).

   (NOTE: 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:
    - 3-Phase/3-Wire + Ground: Ref. 2014 NEC Handbook, Table 310.15(B)(16) for 75 °C conductors.
    - 3-Phase/4-Wire + Ground: Not more than 9 current-carrying conductors installed in steel conduit in ambient temperature of 40°C. (Ref. NEC Handbook, Table 310.15(B)(2)(a) and Table 310.15(B)(16))
    - 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.

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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Appendix D – Internal XFMR Unit Input/Output Cabling Guide

The 4400 Series UPS can be configured with a variety of Input and Output voltage transformers to accommodate different Input/Output voltage combinations. The following tables and text assist with sizing cable for units with non-native input and output voltages.

Tables D.2 and D.3 list the recommended Power Cable sizing for each of the UPS – Vin/Vout transformers. Ampacity should be determined using Table 310.15(B)(16) of the NEC (National Electrical Code) for 75° copper conductors.

NOTES:

- 3-Phase/4-Wire cable sizing calculations based on 4-6 current carrying conductors per conduit. *(NEC Table 310.15(B)(2)(a))*
- Neutral cable sizing in Table D.2 and D.3 is based on allowing, when possible, 1.7 x I(line) for current carrying Neutral. Otherwise, the maximum cable size allowed by the UPS power lug is specified.
- **80 kVA** – For ease of installation, consider the alternative of substituting two (2) line-sized neutral cables in place of a single larger neutral cable in 3-Phase, 4-Wire 80kVA installations

D.1 – UPS Power Lug Cable Capacity and Torque Specifications

TABLE D.1 – UPS POWER LUG CABLE CAPACITY AND TORQUE SPECIFICATIONS

UPS	POWER LUG CABLE CAPACITY	TORQUE
15-30kVA	(1) x #12 to #2	87 in-lb (9.8 N·m)
50kVA	(1) x #6 to 250 kcmil	275 in-lb (31 N·m)
80kVA	(2) x 1/0 to 600 kcmil	375 in-lb (42 N·m)

D.2 – Input Cable Size for 3-Phase/4-Wire + G

TABLE D.2 – RECOMMENDED INPUT CABLE SIZE FOR 3-PHASE/4-WIRE + G[1]

Vin, Vout, Vbyp 3P/4W+G		15kVA (AWG)	20kVA (AWG)	25kVA (AWG)	30kVA (AWG)	50kVA (AWG)	80kVA (AWG)
208/120V (no Xfmr)	Phase	#4	#3	#2	#2	4/0	500 kcmil
	Neutral	#2	#2	#2	#2	250 kcmil	2 x 500 kcmil
220/127V	Phase	#4	#3	#2	#2	4/0	500 kcmil
	Neutral	#2	#2	#2	#2	250 kcmil	2 x 350 kcmil
230/133V	Phase	#6	#4	#3	#2	3/0	500 kcmil
	Neutral	#3	#2	#2	#2	250 kcmil	2 x 300 kcmil
240/139V	Phase	#6	#4	#3	#2	4/0	400 kcmil
	Neutral	#2	#2	#2	#2	250 kcmil	2 x 300 kcmil

Vin, Vout, Vbyp 3P/4W+G		15kVA (AWG)	20kVA (AWG)	25kVA (AWG)	30kVA (AWG)	50kVA (AWG)	80kVA (AWG)
380/220V	Phase	#8	#6	#6	#4	#1	3/0
	Neutral	#4	#3	#2	1/0	4/0	500 kcmil
400/227V	Phase	#8	#8	#6	#4	#1	3/0
	Neutral	#6	#4	#2	#1	4/0	400 kcmil
415/240V	Phase	#8	#8	#6	#4	#1	3/0
	Neutral	#6	#4	#3	#2	4/0	400 kcmil
480/277V	Phase	#10	#8	#6	#4	#2	2/0
	Neutral	#6	#4	#3	#2	2/0	300 kcmil
600/347V	Phase	#12	#10	#8	#8	#4	1/0
	Neutral	#8	#6	#4	#4	1/0	4/0

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

D.3 – Output/Bypass Cable Size for 3-Phase/4-Wire + G

TABLE D.3 – RECOMMENDED MINIMUM OUTPUT/BYPASS CABLE SIZE FOR 3-PHASE/4-WIRE + G[1]

Vin, Vout, Vbyp 3P/4W+G		15kVA (AWG)	20kVA (AWG)	25kVA (AWG)	30kVA (AWG)	50kVA (AWG)	80kVA (AWG)
208/120V (no xFMR)	Phase	#4	#3	#2	#2	4/0	500 kcmil
	Neutral	#2	#2	#2	#2	250 kcmil	2 x 350 kcmil
220/127V	Phase	#6	#4	#2	#2	4/0	500 kcmil
	Neutral	#2	#2	#2	#2	250 kcmil	2 x 350 kcmil
230/133V	Phase	#6	#4	#3	#2	3/0	500 kcmil
	Neutral	#3	#2	#2	#2	250 kcmil	2 x 350 kcmil
240/139V	Phase	#6	1/0	#3	#2	3/0	350 kcmil
	Neutral	#2	#2	#2	#2	250 kcmil	2 x 4/0
380/220V	Phase	#10	#8	#6	#4	#1	3/0
	Neutral	#6	#6	#2	#2	4/0	400 kcmil
400/227V	Phase	#10	#8	#6	#4	#2	3/0
	Neutral	#6	#4	#3	#2	3/0	350 kcmil
415/240V	Phase	#10	#8	#8	#6	#2	2/0
	Neutral	#6	#4	#2	#2	3/0	350 kcmil
480/277V	Phase	#10	#8	#8	#6	#3	2/0
	Neutral	#8	#6	#4	#3	2/0	300 kcmil
600/347V	Phase	#12	#10	#8	#6	#4	#1
	Neutral	#8	#6	#6	#4	1/0	4/0

D.4 – Cable Size for 3-Phase/3-Wire + G

TABLE D4 – RECOMMENDED MINIMUM INPUT CABLE SIZE FOR 3-PHASE/3-WIRE + G[1]

Vin, Vout 3P/3W+G		15kVA (AWG)	20kVA (AWG)	25kVA (AWG)	30kVA (AWG)	50kVA (AWG)	80kVA (AWG)
208V	Phase	#6	#4	#3	#2	3/0	350 kcmil
220V	Phase	#8	#6	#4	#3	3/0	250 kcmil
230V	Phase	#6	#6	#4	#3	2/0	300 kcmil
240V	Phase	#6	#6	#4	#3	2/0	300 kcmil
380V	Phase	#10	#8	#6	#6	#3	2/0
400V	Phase	#8	#8	#8	#6	#3	2/0
415V	Phase	#10	#8	#8	#6	#3	2/0
480V	Phase	#12	#10	#8	#8	#4	1/0
600V	Phase	#12	#10	#10	#8	#6	1/0

D.5 – Cable Size for 3-Phase/3-Wire + G

TABLE D5 – RECOMMENDED OUTPUT/BYPASS CABLE SIZE FOR 3-PHASE/3-WIRE + G[1]

Vin, Vout 3P/3W+G		15kVA (AWG)	20kVA (AWG)	25kVA (AWG)	30kVA (AWG)	50kVA (AWG)	80kVA (AWG)
208V	Phase	#6	#4	#3	#2	2/0	300 kcmil
220V	Phase	#8	#6	#4	#3	1/0	250 kcmil
230V	Phase	#8	#6	#4	#3	10	250 kcmil
240V	Phase	#8	#6	#4	#3	1/0	250 kcmil
380V	Phase	#10	#10	#8	#6	#3	1/0
400V	Phase	#10	#10	#8	#6	#3	1/0
415V	Phase	#10	#10	#8	#6	#4	1/0
480V	Phase	#12	#10	#8	#8	#4	1/0
600V	Phase	#12	#12	#10	#8	#6	1/0

D.6 – Battery Cabling

TABLE D.6 – RECOMMENDED BATTERY CABLING

Recommended Battery Cabinet Cable Size (AWG)					
15 kVA	**20 kVA**	**25 kVA**	**30 kVA**	**50 kVA**	**80 kVA**
#6	#4	#2	#2	4/0	500 kcmil

Calculated values of Input current at different voltages are listed in Table D.4. Calculated values for Output/ Bypass current at different voltages are listed in Table D.5.

D.7 – Input Transformer Current for Given Input Voltage

TABLE D.7 – INPUT TRANSFORMER CURRENT FOR GIVEN INPUT VOLTAGE

Input Voltage	Input Current (Input Currrent + Charging Current) at Full Load (A)					
	15 kVA	20 kVA	25 kVA	30 kVA	50 kVA	80 kVA
208/120V	42 (46)	55 (60)	69 (74)	83 (88)	139 (148)	222 (238)
220/127V	41 (45)	54 (59)	68 (72)	81 (86)	136 (144)	217 (232)
230/133V	39 (43)	52 (56)	65 (69)	78 (82)	130 (138)	207 (222)
240/139V	37 (41)	50 (54)	62 (66)	75 (79)	124 (132)	199 (213)
380/220V	24 (26)	31 (34)	39 (42)	47 (50)	78 (84)	126 (134)
400/227V	22 (25)	30 (32)	37 (39)	45 (47)	75 (79)	119 (128)
415/240V	22 (24)	29 (31)	36 (38)	43 (46)	72 (77)	115 (123)
480/277V	19 (21)	25 (27)	31 (33A	37 (39)	62 (66)	99 (106)
600/347V	15 (17)	20 (22)	25 (27)	30 (32)	50 (53)	80 (85)

D.8 – Output Transformer Current for Given Output Voltage

TABLE D.8 – OUTPUT TRANSFORMER CURRENT AT GIVEN OUTPUT VOLTAGE

Output Voltage	Output Current at Full Load (A)					
	15 kVA	20 kVA	25 kVA	30 kVA	50 kVA	80 kVA
208/120V	42	56	69	83	139	222
220/127V	39	52	66	79	131	210
230/133V	38	50	63	75	126	201
240/139V	36	48	60	72	120	192
380/220V	23	30	38	46	76	122
400/227V	22	29	36	43	72	115
415/240V	21	28	35	42	70	111
480/277V	18	24	30	36	60	96
600/347V	14	19	24	29	48	77

Appendix E – Index

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