

TOSHIBA

288V SCiB Energy Storage System INSTALLATION AND OPERATION MANUAL



Part # 203810-000
April 2021
Manufactured in the USA

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288V SCiB ENERGY STORAGE SYSTEM INSTALLATION AND OPERATION MANUAL

Part # 203810-000
April 2021

Please complete the following information and retain for your records.

JOB NUMBER	_____
MODEL NUMBER	_____
SERIAL NUMBER	_____
APPLICATION	_____
SHIPMENT DATE	_____
INSTALLATION DATE	_____
STARTUP PERFORMED BY	_____

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QUALIFIED PERSONNEL ONLY

Only qualified persons are to install, operate, or service this equipment according to all applicable codes and established safety practices. The definition of Qualified Personnel is detailed in Section 2.3

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.

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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 SCiB Energy Storage System.

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Attn.: SCiB Product Manager

For further information on Toshiba products and services, please visit our website at:

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1 Introduction

Thank you for your purchase of your Toshiba Energy Storage System device. This manual provides information on how to safely install and operate your SCiB Energy Storage System (ESS). 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 SCiB ESS. In addition they should have a thorough understanding of the information provided in the chapters titled:

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

Read this SCiB ESS Installation and Operation Manual for important instructions on operating the UPS with the SCiB ESS. 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 SCiB ESS 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 SCiB Energy Storage System, 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 SCiB Energy Storage System (ESS). Contact the Toshiba Customer Support Center for assistance in locating the factory-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 SCiB ESS.





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.

3.1 Maximum Operating Temperature

The maximum operating ambient temperature for the Energy Storage System is 104 °F (40 °C).

3.2 SCiB Energy Storage System Safety

The following contains important instructions that should be followed during the installation, operation, and maintenance of the SCiB Energy Storage System.

 DANGER 
Hazardous DC voltages are present in the system. This hazard will always be present in a battery system including when it is offline. The Toshiba SCiB Modules within the SCiB ESS can present a risk of electrical shock and high short circuit current. Use extreme caution when installing and maintaining the system.
In the event of a fire, use carbon dioxide gas, a powder fire extinguisher, or dry sand to extinguish the flames.

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

1. Verify that the UPS is off and that the power is disconnected from the power source.
2. Remove watches, ring, jewelry, or other metal objects.
3. Use tools with insulated handles to prevent inadvertent shorts.
4. Wear rubber gloves and boots.
5. Do not place tools or any metal parts on top of Toshiba SCiB Modules.
6. Determine if the SCiB modules are inadvertently grounded. If inadvertently grounded, remove source of ground.

Contact with any part of a grounded Toshiba SCiB Module can result in electrical shock.

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



INSTRUCTIONS IMPORTANTES CONCERNANT LA SÉCURITÉ

CONSERVER CES INSTRUCTIONS Cette notice contient des instructions importantes concernant la sécurité

ATTENTION

Un SCiB module peut présenter un risque de choc électrique, de brûlure par transfert d'énergie.

ATTENTION

L'élimination des SCiB modules est réglementée. Consulter la réglementation locale pour toute conformité.

3.3 Unintended Usage



Never use this Energy Storage System in any of the following applications:

- a. Medical Operation Room Equipment
- b. Life Support Equipment
- c. Fire Prevention or Suppression Equipment

Use of this Energy Storage System in any of the above applications will result in serious personal injury or death.



Always read all applicable regulations and standards for the specific application of this Energy Storage System.

Special precautions must be undertaken when this Energy Storage System is used in the following applications:

- a. Nuclear Power Plants
- b. Communications Equipment
- c. Transportation Equipment

Always consult highly trained and qualified technicians in these applications.



Improper use of the Energy Storage System in any of the above applications may result in serious personal injury or death.

3.4 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 SCIB ESS.

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.





3.5 General Maintenance

 WARNING	
	<p>DO NOT remove the rear/side panels, or any sheet metal not designed to be removed.</p> <p>Removing rear/side panels may result in electric shock, burns, personal injuries or ESS failure.</p>
	<p>Keep the area around the ESS clean.</p> <p>Use a vacuum cleaner to clean dust and foreign material from and ESS. Keep the exterior clean.</p>
	<p>Only factory authorized personnel should perform internal general maintenance on the SCiB ESS and accompanying cabinets.</p>
	<p>Contact the authorized Toshiba Customer Support Center or an authorized Toshiba representative for information on proper disposal of SCiB ESS components.</p> <p>It is illegal to dispose of certain components without conforming to environmental regulations for industrial/commercial waste.</p>

3.6 Transporting

 WARNING	
	<p>DO NOT tilt any cabinets in the ESS more than 10° from upright position.</p> <p>Tilting the units more than 10° may cause crushing, trapping or other personal injuries.</p>
 CAUTION	
	<p>DO NOT transport, move, store, or place any of the units in the SCiB ESS on its side.</p> <p>Excessive force applied from heavy components inside may damage the unit.</p>
	<p>Avoid vibration or shock exceeding 0.5 G.</p> <p>Failing to observe this precaution may cause damage to the SCiB ESS.</p>
	<p>DO NOT allow any units to suffer shock or impact when unpacking.</p> <p>Tools used to remove packaging materials may cause damage to the SCiB ESS system.</p>
	<p>DO NOT install any units where water may fall on or enter it.</p> <p>Water may cause electrical shock, personal injury or system failure.</p>
	<p>DO NOT push or pull on the sides of the packaging or any units to move them. Always use a crane, forklift, or pallet jack for transporting and positioning the units.</p> <p>Pushing/pulling on the sides of the unit to move it may result in damage to the SCiB ESS.</p>

3.7 Battery Disposal

 CAUTION	
	Do not dispose of lithium ion batteries via incineration.
	Lithium battery disposal shall be in compliance with the local and/or regional hazardous waste disposal regulations for your area Other nations and some US states may differ in the requirements for disposing of hazardous waste. Contact your state and/or local environmental agency for specifics on disposing of hazardous waste in your area.
	Steps shall be taken to prevent the short circuit of disposed batteries by insulating the terminals (e.g. insulating tape) (Ref. Section 13, MSDS SB-SDS-P5001E dated 4/08/2016)

For any questions regarding disposal please contact Toshiba Customer Support Center (855) 803-7087.

3.8 Defective Battery Handling

For shipping (returning) Damaged / Defective / Recalled SCiB Lithium Batteries (Modules), the following requirements are to be followed:

- Contact Toshiba International Corporation UPS Service for RMA#.
- SCiB Modules being returned must be packaged to meet shipping regulations outlined in UN 3480, 49 CFR 173.185 (f).
 - This is for lithium batteries that have been damaged or identified by the manufacturer as being defective for safety reasons and may be transported by highway, rail, or vessel.
- Place the SCiB module in non-metallic inner packaging that completely encloses the battery.
 - Inner packaging is surrounded by cushioning material that is non-combustible, non-conductive, and absorbent. It should prevent:
 - Short circuits.
 - Movement within the package.
 - *e.g. non-conductive plastic bag, non-conductive bubble wrap, non-conductive packaging cushion paper*
- Each SCiB Module properly inner packaged is individually placed in a UN specification package meeting Packing Group I performance level (metal, wooden, or solid plastic box) (*This means if shipping multiple SCiB modules, each one has to be individually wrapped before being placed in an appropriate shipping container (wood, or solid plastic box).*)
- Returned SCiB module must ship by highway, rail, or vessel. Air shipment is forbidden.
- Returned SCiB module must be marked with the Lithium Battery mark
- Returned SCiB module must also be marked with an indication the package contains “damaged / defective lithium-ion / lithium-metal battery”
 - Characters are to be at least 12 mm (0.47in.) high.
- Returned SCiB module must be marked with the Toshiba International Corporation UPS RMA#.

If possible the Returned SCiB module should be shipped at 30% SOC

3.9 DC Arc Flash Warning

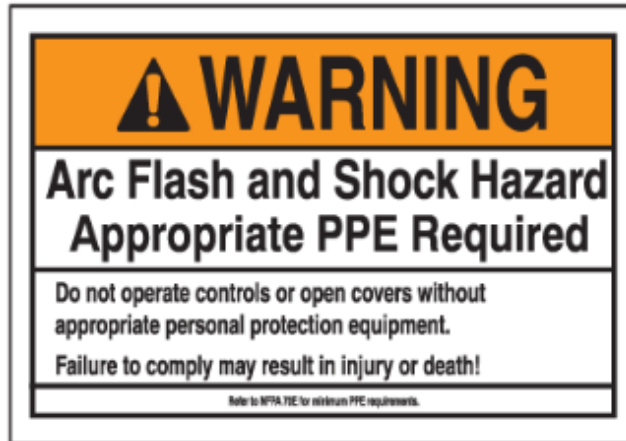


FIGURE 3.1: ARC FLASH WARNING

4 Unpacking

4.1 General Instructions

Unpack the SCiB ESS Cabinet indoors on a paved floor. The system should be as close as possible to its final location. Allow enough space for forklift operations to unpack the units from their packing crates. Then remove the crates. 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 no cabinets are damaged before uncrating.
- DO NOT damage the units when using tools to remove packaging materials.
- If provided, DO NOT remove the protective plastic sheet cover until installation.
- Immediately report any abnormalities to Toshiba Customer Support Center or an authorized representative.

4.2 Unpacking the SCiB ESS Cabinet



1. Remove shrink wrap and honeycomb packing from the cabinet.
2. Carefully inspect the SCiB ESS Cabinet for shipping damage.
3. Unbolt the unit rails from the shipping pallet.

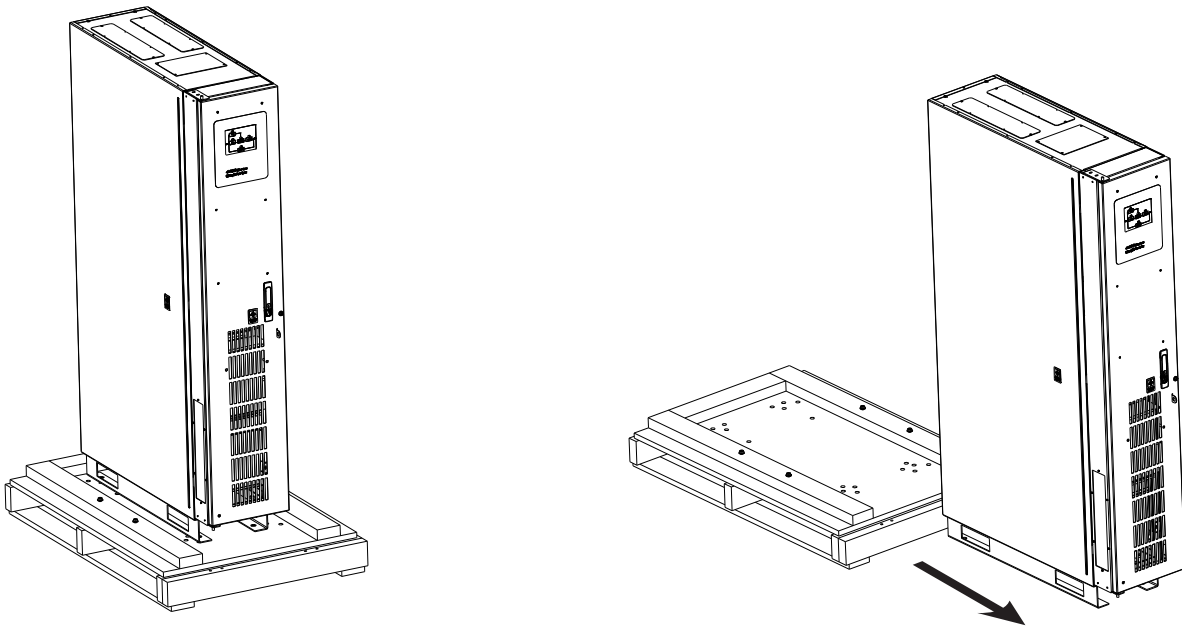


FIGURE 4.1: UNSHIPPING SCiB ESS CABINET

4.3 Transporting By Forklift

Verify forklift maximum load capacity and ensure that the forks are long enough to properly support the SCiB Cabinet. Insert the forks into the space shown in Figure 4.2. Spaces for the forks are provided underneath the maintenance bypass cabinet which can be accessed from either the front or the back.

DO NOT tilt units when lifting and/or transporting. Minimize the impact when lowering the cabinet to the floor.

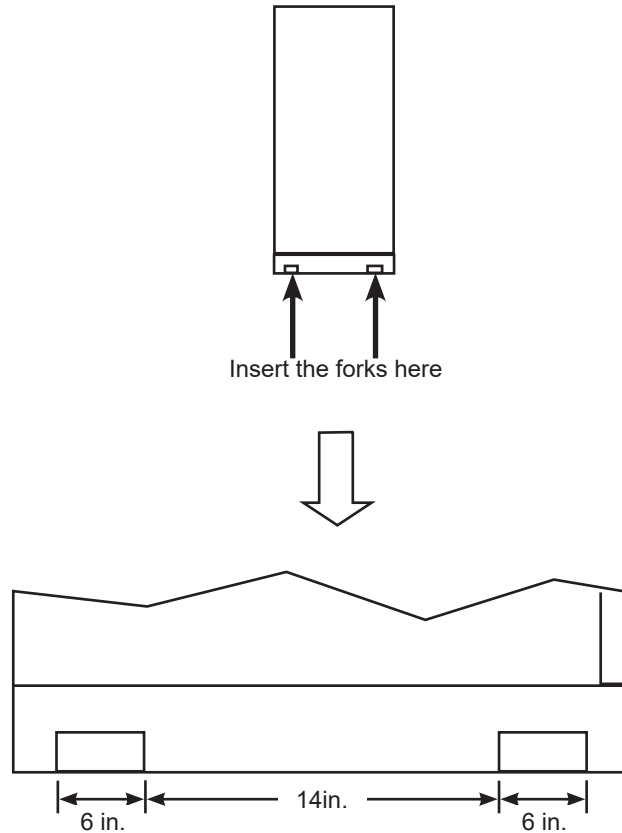


FIGURE 4.2: 288V SCiB ESS CABINET: SIDE VIEW - FORK ACCESS DIMENSIONS IN CHANNEL BASE

5 Warning Labels

5.1 SCiB ESS Warning Labels

Below are representative warning labels and their location on the SCiB Energy Storage System.



FIGURE 5.1: LABEL 98038



FIGURE 5.2: LABEL 98039

6 Storage/Operating Environment

6.1 Inspection/Storage

Inspection

Upon receipt of the SCiB Energy Storage System, an inspection for shipping damage should be performed. Use caution when removing units from pallets. Refer to labels or documentation attached to packing material.

Unpacking

Check the exterior of units for loose, broken, bent or otherwise damaged parts. Interior inspection should only be performed by qualified personnel. 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 conform to the order specifications.

Storage

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

Storage Preparation

1. Power up the UPS and allow it to operate with no load for at least two (2)* hours to fully charge the SCiB ESS. (*For a single-cabinet ESS. Additional cabinets will require more time.)
2. Stop the UPS.
3. Place the UPS Main Circuit Breaker switch in the “OFF” position.
4. Place all SCiB ESS Circuit Breaker switches in the “OFF” position.
5. If present, place all MBS Circuit Breaker switches in the “OFF” position.

6.2 Storage Environment

Observe the following when storing the SCiB Energy Storage System.

- Store indoors.
- Maximum storage time for the SCiB ESS between powered operation cycles is three years. If the ESS has been stored for a period exceeding 36 months, contact your factory authorized representative for 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 6.2 – 1: SCiB ESS STORAGE/OPERATING ENVIRONMENT STANDARD

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.
Dust	Dust must not exceed normal atmospheric levels and must not include conductive particles, silicone or oils.

6.3 Operating Precautions

Initial startup/commissioning of the UPS & SCiB Energy Storage System should be performed by factory authorized personnel.

1. The UPS & ESS system should not be powered up until the entire operation manual has been read.
2. DO NOT insert metal objects or combustible materials in the ventilation slots of the SCiB ESS.
3. DO NOT place, hang, or paste any objects on the exterior surfaces of the SCiB ESS.
4. DO NOT attempt to disassemble, modify, or repair the SCiB ESS. Call your Toshiba sales representative for repair information.
5. Turn the power on only after installing ALL of the covers.
6. DO NOT remove any covers of the SCiB ESS when power is on.
7. If the SCiB ESS should emit smoke or an unusual odor or sound, remove power from the input and disconnect the load from the output of the system immediately.
8. Operating temperatures:
 - a. Minimum: 32°F (0°C)
 - b. Maximum: 104°F (40°C)

6.4 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. Only **factory authorized** personnel should service the SCiB ESS. Contact Toshiba for the nearest authorized service center.



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 SCiB ESS and the required handling and maintenance precautions.

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

 WARNING	
	<p>Misuse of equipment could result in injury and equipment damage.</p> <p>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.</p>

7 Installation






7.1 Installation Precautions

 WARNING	
	<p>Keep the SPECIFIED CLEARANCE around the SCiB ESS.</p> <p>Inadequate space around the ESS makes it difficult to perform maintenance/inspections, lead to insufficient ventilation, and/or will cause malfunctions.</p> <p><i>See 7.2 Installation Procedure</i></p>
	<p>DO NOT tilt the SCiB ESS cabinet(s) more than 10° from upright position.</p> <p>Tilting the SCiB ESS cabinet(s) more than 10° may cause crushing, trapping or other personal injuries.</p>
	<p>Install anchor bolts to secure the SCiB ESS to the installation floor.</p> <p>The SCiB ESS may fall during an earthquake if the anchor bolts are not installed and secured.</p>
	<p>DO NOT transport, move, store, or place the SCiB ESS on its side.</p> <p>Forces due to heavy components inside may damage the cabinet(s).</p>
	<p>DO NOT allow the SCiB ESS to suffer shock or impact when unpacking.</p> <p>Tools used to remove packaging materials may cause damage to the cabinet(s).</p>
	<p>DO NOT push or pull on the sides of the SCiB ESS packaging to move it. ONLY use a forklift to transport the SCiB ESS.</p> <p>Pushing/pulling on the sides of the unit to move it may result in damage to the SCiB ESS.</p> <p><i>See Section 4.</i></p>
	<p>Only factory authorized personnel should relocate, modify, or replace parts in the SCiB ESS after initial installation.</p> <p>Electrical shock, injury or UPS/ESS failure may occur if non-authorized technicians attempt to modify or relocate the SCiB ESS.</p> <p>Please contact Toshiba Customer Support Center if you plan to move or make modifications to the ESS</p>
 CAUTION	
	<p>Install the UPS system in a controlled environment.</p> <p>Improper storage and installation environment may deteriorate insulation, shorten component life and cause malfunctions. In order to comply with UL954 Clause 23.1, fire detection and suppression shall be added by the installer.</p> <p><i>See Section 6.2 Storage Environment</i></p>

7.2 Installation Procedure

1. Note the load tolerance of the floor in the installation location. The SCiB ESS cabinet is 600lbs. (220lbs./ft²)
2. Take the below clearance requirements for ventilation into account when choosing installation location:
Right SideZero (0) Inches
Left Side.....Zero (0) Inches
Top Ten (10) Inches
Front..... Thirty-Six (36) Inches
BackZero (0) Inches
3. Refer to the 4400 Installation and Operation Manual for installation steps for the rest of the UPS system.

7.3 Wiring Safety

 WARNING	
	<p>Perform wiring and connections with correct polarity.</p> <p>Be careful when connecting the UPS to the SCiB ESS. A wrong connection may cause damage to the UPS, ESS, or charger.</p>
	<p>DO NOT use excessive force when handling wires. Do NOT pull or bend wires needlessly. DO NOT damage wire insulation. DO NOT place heavy objects on top of the SCiB ESS.</p>
	<p>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.</p>
	<p>Voltage exists at battery terminals. Proper PPE should be worn when making electrical connections</p>

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 in the UPS Installation Manual.
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.

NOTICE

Cabinets must be properly grounded to Earth.
Improperly grounded cabinets may cause non-warrantable damage to equipment.

7.4 Anchorage

Once unpacked and moved to final location, install the ESS using the four holes in the channel base. Anchor the unit using appropriate hardware. Reference **Figure 7.1** for base dimensions and anchoring hole details..

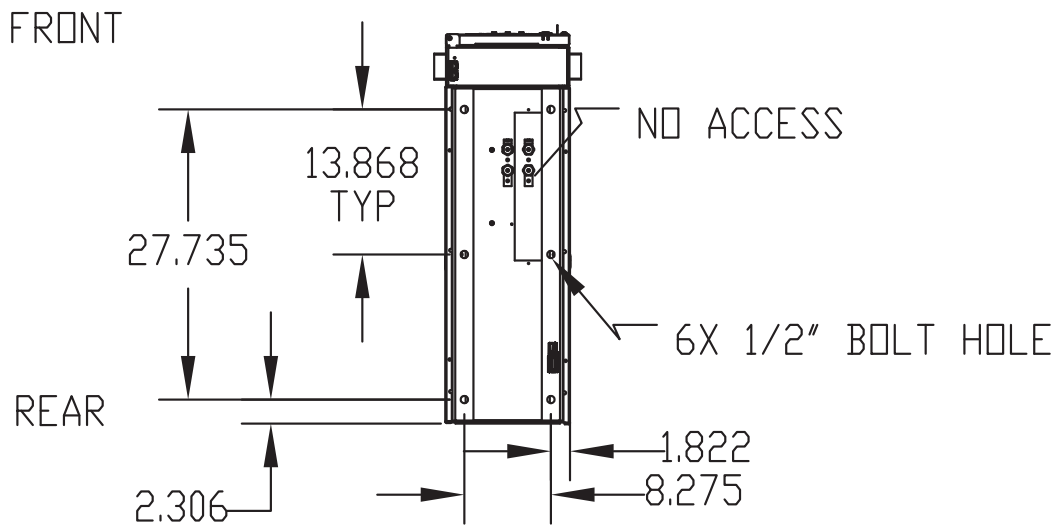


FIGURE 7.1: BOTTOM VIEW OF SCiB ESS

7.5 Seismic Anchorage

1. Prepare the wall anchorages. Key measurements off the final installation location. (Figure 7.2)
2. Assemble the fastener group (3/8" x 1.0" Long Bolt, Lock Washer + Flat Washer). (Figure 7.3)
3. Secure the Top Seismic Bracket to the top rear of the UPS using two (2) fastener groups. Skip this step if the bracket is pre-installed. (Figure 7.4)
4. Secure the Top Seismic Bracket to the wall anchors prepared in Step 1. (Figure 7.4)

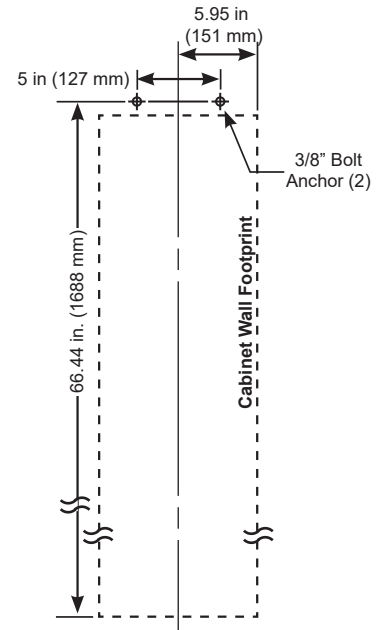


FIGURE 7.2: SEISMIC ANCHORAGE - WALL PATTERN

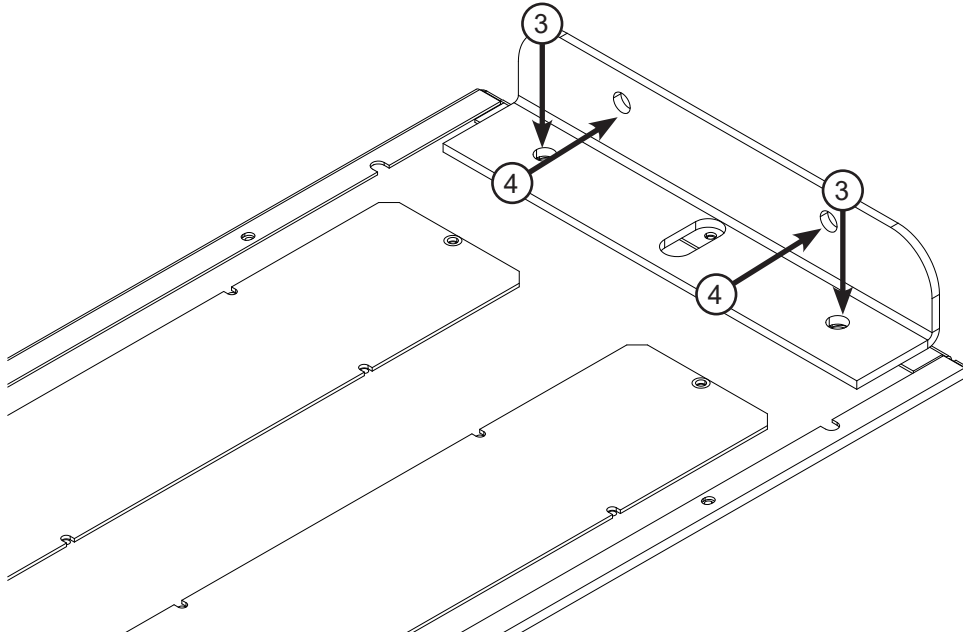


FIGURE 7.4: TOP SEISMIC BRACKET INSTALLATION

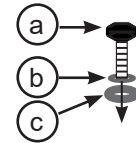


FIGURE 7.3: FASTENER GROUP (BOLT + LOCK WASHER + WASHER)

Seismic Specifications ¹		
Value	Floor & Wall Mounted	Floor Mount Only
S_{DS} (z/h=1)	1.06g	0.53g
S_{DS} (z/h=0)	1.70g	0.85g
I_P	1.5	1.5

¹Values apply to both standalone or a group of modules with or without being physically connected together.

7.6 Procedure for Cable/Wire Connections (4400 Series UPS)

1. Follow all customer supplied wiring connections shown in Figure 7.5 for control and signal connections between the UPS and SCiB ESS and between the individual SCiB ESS cabinets.
2. Connect 208VAC from distribution fed by UPS output to the orange connector in the SCiB as shown in Figure 7.5. Toshiba provides the connector CN-UPS-1 and CN-UPS-2. Strip the wire and firmly press into the connector. Use only one conductor per port. Ensure the wire is not exposed after firmly pushing into the connector.
3. DC Power Cable Connection:
 - a. Size cables according to the Installation Planning Guide in Appendix C of the 4400 UPS IO Manual.
 - b. Connect positive cables to Battery + terminal in UPS (TB1-11).
 - c. Connect negative cables to Battery - terminal in UPS (TB1-12).
 - d. Refer to Figure 7.8 and Figure 7.9 when paralleling multiple SCiB ESS cabinets and routing cables from ESS lugs to UPS terminals.

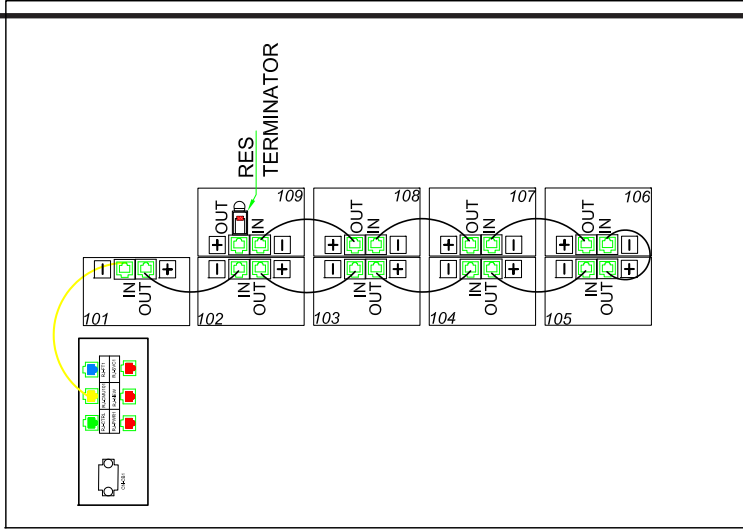
7.7 Customer Supplied Equipment (Not Included with ESS)

1. CAT 6 SSTP Cables – Cables for cabinet to cabinet communication (if using more than one ESS cabinet)
2. Control Wiring – 208VAC control power should be supplied from MBS (2-wire, 208VAC). See **Figure 7.2**.

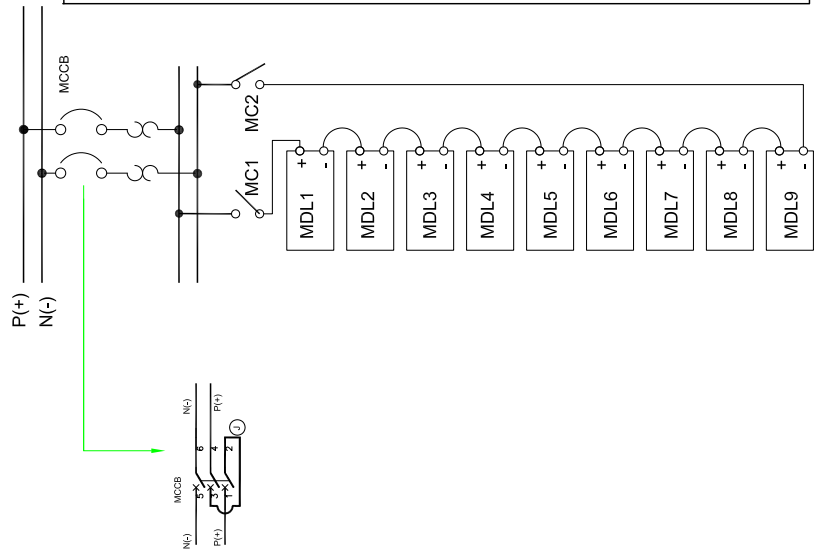
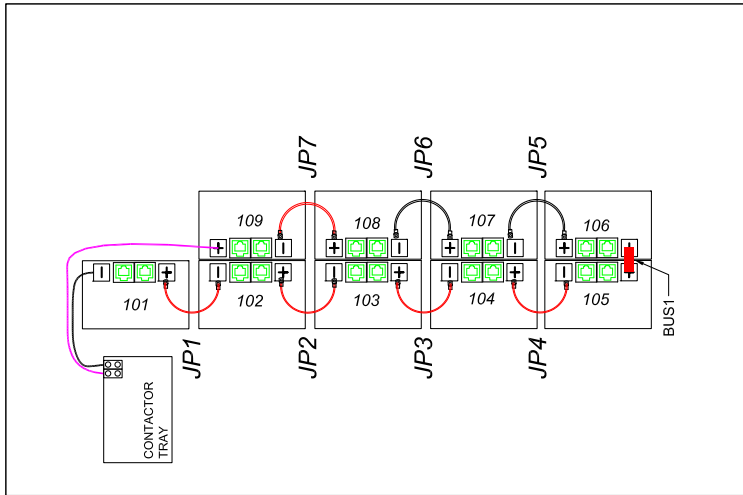
Control Wiring Recommendations		
Wire Type	Wire Size	Voltage
Solid	#12 – #14	600VAC
Stranded	#12 – #14 (19 Strand or Less)	600VAC
Stranded Tin-Bonded	#12 – #14 (19 Strand or Less)	600VAC

Recommended Breaker Size	
Trip Rating	Voltage
10A, 2-Pole	600VAC

SCiB Communication Connections

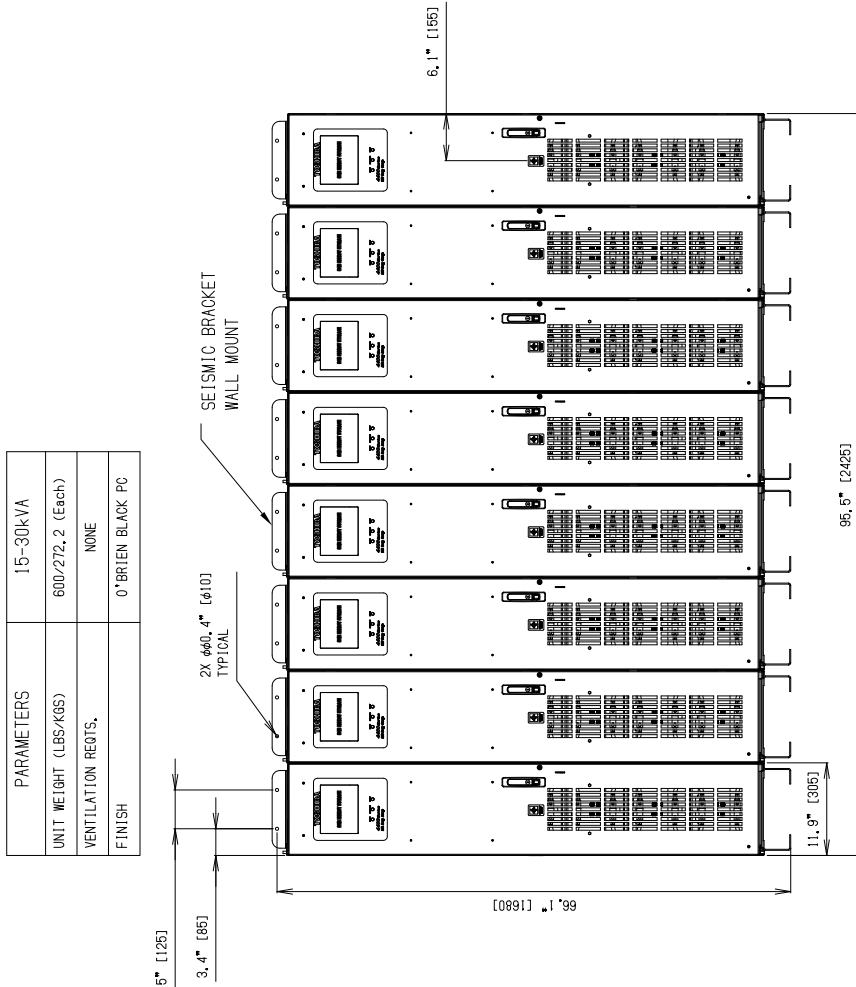
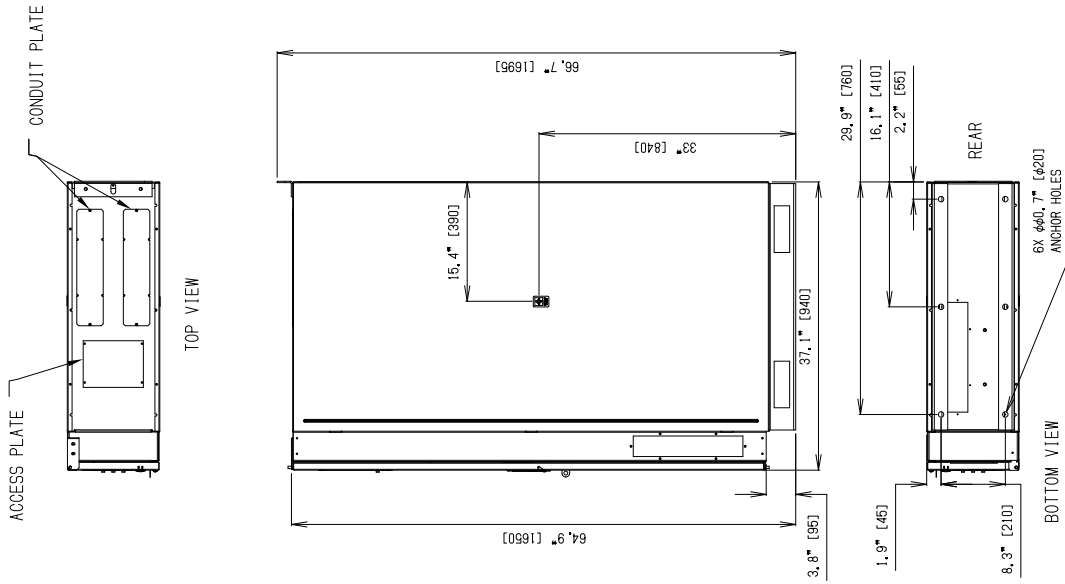


Power Connections



LINE
DIAGRAM

FIGURE 7.6: INTERNAL CONNECTION DIAGRAM



PARAMETERS	15-30kVA
UNIT WEIGHT (LBS/KGS)	600/272.2 (Each)
VENTILATION REQTS.	NONE
FINISH	0'BRIEN BLACK PC

FIGURE 7.7: MAXIMUM SYSTEM (8 CABINET) LINEUP DRAWING

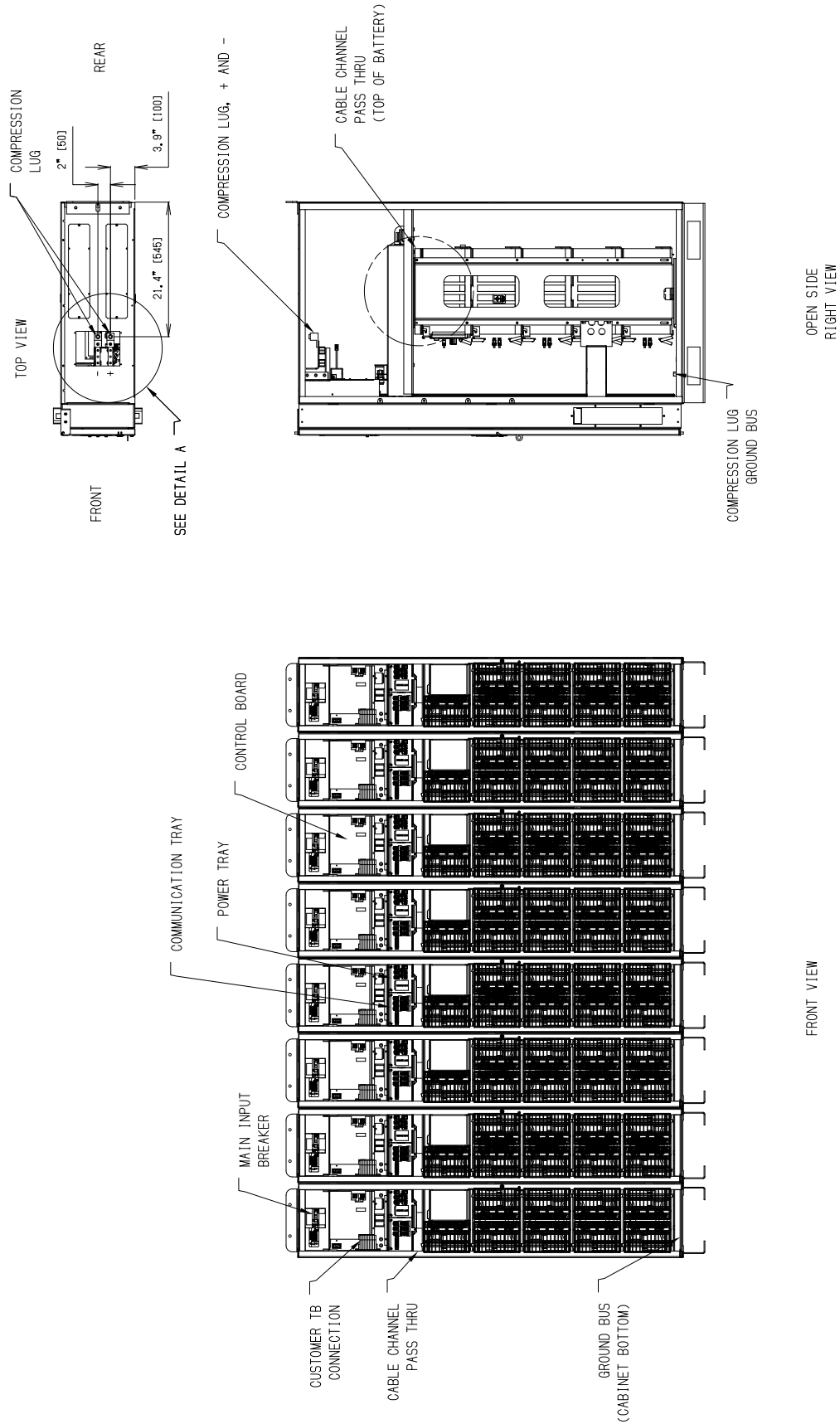


FIGURE 7.8: CABINET INTERCONNECT MECHANICAL DRAWING

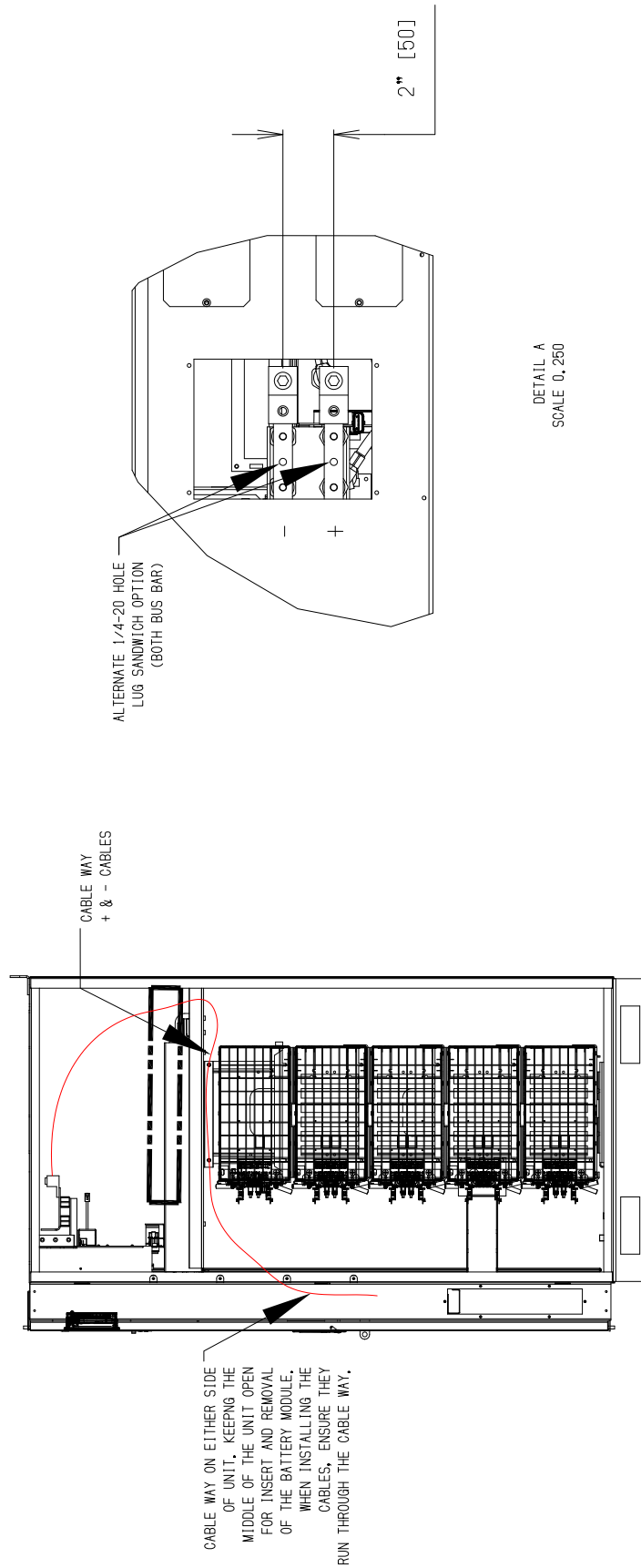


FIGURE 7.9: DC POWER CONNECTION AND ROUTING DRAWING

8 Operation

8.1 Operating Instructions (4400 UPS 15-30kVA)

Before operation of 4400 Series UPS and ESS system, initial startup must be performed by Authorized Service Personnel (ASP). The ASP must set the voltage and charge current parameters in the UPS and program external input/output terminals. These actions should be done in accordance with the 4400 IO Manual.

Starting the UPS and Charging the Batteries

1. Turn on the 4400 Series UPS. Wait until the display appears, the converter turns on, and the unit becomes fully energized (around 1 minute). Press the “RUN” button on the touch screen to switch the UPS to “ONLINE” mode. If the UPS is already online, proceed to step 2 to start the charging the SCiB ESS batteries.
2. Turn on the control power to the ESS SCiB cabinet by turning on the control breaker (CB1). If you have more than one cabinet, turn on the control power to each cabinet by turning on CB1. If you have more than one cabinet, then the control breakers must all be turned on in less than 30 seconds so the Host cabinet can detect how many clients are connected through the CAN communication.
3. Wait until the fault light blinks 2 times on the cabinet. If there are multiple cabinets, then wait until all cabinets have their fault light blinking 2 times every 8 seconds.
4. Turn on the Main Breaker (MCCB) on the cabinet. If you have multiple cabinets, then turn on each main breaker (MCCB) on every cabinet within 30 seconds. The red fault light will turn off once the breaker is closed on the cabinet unless there are other faults.
5. The green and red LEDs will start scanning to indicate the unit is being initialized. The Host cabinet will communicate to each cabinet and determine the cabinet with the lowest voltage and then that cabinet will close its contactors. The cabinet will charge up to the level of the next cabinet with the lowest voltage and then that cabinet's contactors will close. This process will continue until all the cabinets have closed their contactors and then the system will charge up to the final voltage.
6. The “Ready” LED will blink if the battery voltage is below 280VDC. Once the voltage exceeds 280VDC, the “Ready” light will stop blinking and become steady on to indicate the batteries are fully charged.

Discharging the Batteries

1. The SCiB ESS will provide power to the UPS if the main power of the UPS is lost.
2. The “Discharge” LED is illuminated to indicate the battery cabinet is discharging and the “Ready” and “Fault” LED will be off.
3. The “Discharge” LED will be steady on.
4. As the ESS battery voltage comes down and gets close to the UPS cutoff or shutdown set point (215VDC), the “Discharge” LED will start blinking indicating the SCiB ESS is close to the shutdown voltage.
5. As the UPS hits the setpoint for the shutdown voltage, the UPS will shutdown. When this happens, the control power on the SCiB ESS will turn off and the UVR in the MCCB1 of the SCiB ESS will be activated and will trip the MCCB1 breaker.

NOTICE

Anytime control power is lost to the SCiB ESS, the MCCB1 breaker will trip due to the UVR. This could be due to the control power breaker (CB1) in the ESS being turned off while MCCB1 is in the “ON” position or after a battery backup where the UPS hits the shutdown setpoint before power is restored.

Charging the Batteries after a Complete Discharge

1. When the UPS has fully discharge the batteries and hits the shutdown voltage, the UPS will shutdown and lose output. This will cause the SCiB ESS to lose control power which will trigger the UVR in the SCiB ESS MCCB1 causing it to trip.
2. Once power is restored and the UPS is back in the “ONLINE” mode, ensure that the control power breaker in the MBS (CB6) is still closed.
3. Ensure the control power breaker (CB1) is closed in the SCiB ESS. This breaker should still be in the “ON” position since the UVR only effects MCCB1.
4. Ensure the red LED is flashing 2 times and then off for 8 seconds. The green and amber LEDs will be off.
5. Turn on MCCB1.
6. The green and amber LEDs will flash indicating the contactor is open and then will turn off once the contactors close. The alarm on the UPS “ESS Alarm” should clear.
7. The green LED will start flashing indicating the batteries are being charged. When the green LED is solid, this indicates the batteries are fully charged.

9 Specifications

288V SCiB ENERGY STORAGE SYSTEM	
Capacity	11kWh, 45Ah
Nominal Voltage	248VDC
Voltage Range	215-285VDC
Maximum Charge Voltage	285VDC
Maximum System Charge Current	10ADC
Max Discharge Current	125A
DC Breaker Rating	125AT, 500VDC, 20kAIC
Breaker Control	Shunt Trip
Parallel Capability	2-8 Cabinets
Module Type	Type 3-23 2P12S Module
Modules Per String	9
Operating Temperature	0 to 40°C
Ambient Humidity	5-80% non-condensing
Enclosure	NEMA 1, Indoor Only
Storage Temperature	-10 to 55°C
Storage Humidity	5-85% non-condensing
Unit Weight	600lbs (272kg)
Shipping Weight	665lbs.(302kg)
Unit Dimensions	11.9” W x 37.1” D x 66.8” H
Shipping Dimensions	31” W x 46” D x 76” H
Cable Entry	Top, Bottom
AC Input (Control Power)	208VAC, 5A, 2 wire

10 Interfaces

10.1 LEDS

Each SCiB ESS cabinet has three LEDS which is controlled by each system host controller. The three LED indicators are:

1. Battery Ready (Green) – The light will come on when the batteries have reached certain State of Charge (SOC) set-point. The light will blink if the batteries are charging but have not reached the pre-determined SOC setpoint. (See table for more information.)
2. Discharging (Amber) – The light will come on when the UPS system is in discharge mode and the batteries are providing power to the UPS. The light will start to blink when the battery voltage has reached 98% of the cutoff voltage to indicate the UPS system is fixing to shutdown. (See table for more information.)
3. Fault (Red) – The fault light will come on if the host controller determines there is an issue with the system. The light will come on initially when the system is started up and turn off when the battery breaker is closed if there are no other faults present. The light will be steady for any fault that the system can't recover from but will blink if the system can recover from the fault. For example, loss of communication will cause the light to blink but will go off if communication recovers. (See table for more information.)

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

TABLE 10.1 – 1: LED STATUS BEHAVIOR

Condition	LED STATUS			Affects System or Unit	Description
	Battery Ready	Discharging	Fault		
Initializing/Waiting for Charging	Scanning Between Green, Amber, and Red			Unit	Sequence control, blink ready then discharge then fault back to ready. While the contactors are waiting to close stay in this state
Control Power supplied. Waiting for contactor closure.	Scanning Between Green and Amber		Off	Unit	First state when starting up UPS System. No action needed.
Battery Charging. Voltage is less than Startup Voltage (<280V)	Blinking (On 1 sec, Off 1 sec)	Off	Off	Unit	Battery is charging and hasn't reached full capacity yet. No Faults detected.
Battery Charging. Voltage is greater than Startup Voltage. (>280V)	On Steady	Off	Off	Unit	Battery has reached full capacity and is on stand by. No Faults detected.
Discharging and DC voltage is above 4% of Cutoff Voltage. (<280V)	Off	On Steady	Off	Unit	Battery is discharging and has more than 2% capacity remaining.
Discharging and DC voltage is within 4% of Cutoff Voltage. (<223V)	Off	Blinking	Off	Unit	Battery is discharging and is nearly depleted
Loss of communication	Blinking	Blinking	Blink 8 times every 5 Seconds	Unit	Loss of communication between host controller and BMU or Abnormal BMU. Contact Toshiba Field Service if problem persists.
Host to Host (CN5 PCB 90700) loss of communication.	On Steady	Off	Blink One Time Every 5 Seconds	System	General Communication Error.

Condition	LED STATUS			Affects System or Unit	Description
	Battery Ready	Discharging	Fault		
Breaker Open	Off	Off	Blink 2 Times every 5 Seconds	System	Breaker is Open
Hardware Fault	Blinking	Blinking	Blinking	System	BMU Communication
Multiple Faults	Off	Off	Blink N Times every 5 seconds.	n/a	When multiple faults occur, Fault LED will blink N times, where N = the sum of blinks of the individual faults.

¹Variable based on the current DC voltage of the system.

10.2 Unit Fault Conditions

A fault condition is any of the following

1. If CAN communication is lost more than CAN Communication Timeout Threshold (5* Seconds).
2. If Cell Voltage <= Minimum Cell Voltage Threshold (1.5*V)
3. If Cell Voltage >= Maximum Cell Voltage Threshold (2.8*V)
4. If SOC percentage <= Minimum SOC Percentage Threshold (5*%).
5. If optional fuse indicators are opened. (Only if installed)
6. If battery breaker is opened.

*value is subject to change.

Appendix A – Dimensional Drawings

PARAMETERS	15-30kVA
UNIT WEIGHT (LBS/KGS)	600/272.2
VENTILATION REQS.	NONE
FINISH	0'BRIEN BLACK PC

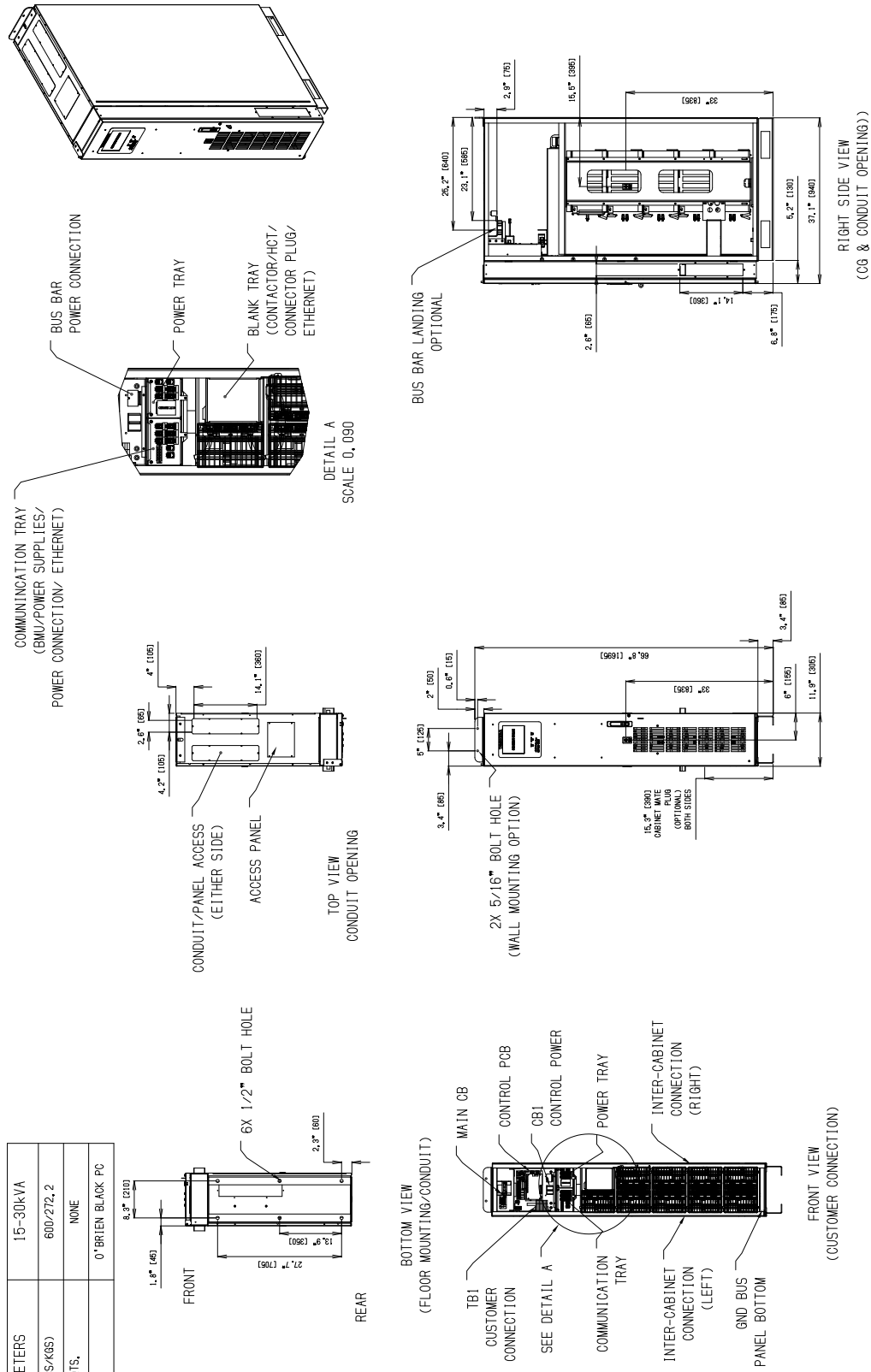


FIGURE A.1 – SCiB ESS CABINET OUTLINE

Appendix B – Modbus Register Map

Details of Modbus RTU connection interface:

- Protocol: Modbus RTU @ Full Duplex (4-wire RS485)
- Baud: 115200
- Data bits: 8
- Parity: None
- Stop bits: 1
- Device ID = ID + 10 (for example: SCiB cabinet ID = 0, Modbus RTU Device ID = 10)
- Function: Read Holding Register(s)
- Duration: up to 11 bytes
- Error: Modbus RTU specifications

System Status Modbus Holding Registers																		
Name	Register Number	Bit Number																
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Host Status	40010	Reserved							Contactor Status	Host Status			Cabinet ID					
Cabinet Fault Status	40011	Reserved											b3	b2	b1	b0		
String Fault Status	40012	Reserved											b5	b4	b3	b2	b1	b0
Warning Status	40014	Reserved			b12	b11	b10	b9	b8	Reserved			b4	b3	b2	b1	b0	

System Parameters and Firmware Modbus Holding Registers																
Name	Register Number	Bit Number														
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Fully charged string voltage	40015	Fully charged voltage indicated by 0.1V/LSB (285V)														
Cutoff string voltage	40016	Cutoff voltage indicated by 0.1V/LSB (215V)														
Over-charge current (warning)	40017	Over charge current value indicated by 0.01A/LSB (40A)														
Over-discharge current (warning)	40018	Over discharge current value indicated by 0.01A/LSB (400A)														
Max cell voltage (fault protected by BMU)	40019	Max. cell voltage indicated by 1mV/LSB (3.0V)														
Min. cell voltage (fault protected by BMU)	40020	Min. cell voltage indicated by 1mV/LSB (1.3V)														
Over temp. (fault protected by BMU)	40021	Fault temp. indicated by 1°C/LSB (75°C)														
Max. cell voltage (warning)	40022	Max. cell voltage indicated by 1mV/LSB (2.75V)														
Min. cell voltage (warning)	40023	Min. cell voltage indicated by 1mV/LSB (1.5V)														
Over temp. (warning)	40024	Fault temp. indicated by 1°C/LSB (55°C)														

Cell balancing function	40025	Reserved	b1	b0				
LED status	40026	Reserved	b5	b4	b3	b2	b1	b0
7-seg. LED for warning	40027	System warning status (65535-0)						
7-seg. LED for cabinet fault	40028	Cabinet fault status (65535-0)						
7-seg. LED for fault	40029	Fault status (65535-0)						
Firmware Version	40031	Version(12 bit)	Revision (4 bit)					

String Information Holding Registers																
Name	Register Number	Bit Number														
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
String voltage	40032	String voltage value is indicated by 0.1V/LSB (6553.5V to 0V)														
Charge current	40034	Current value in the charge direction is indicated by 0.01A/LSB (655.35A to 0A)														
Discharge current	40035	Current value in the discharge direction is indicated by 0.01A/LSB (655.35A to 0A)														
Min. cell temp. / module No.	40038	Min. temp. value / of all cells indicated by 1°C/LSB. Usage range -40°C to 125°C										Module No. containing the minimum cell temperature value in string. Usage range: module No. 1 to 28.				
Max. cell temp. / module No.	40039	Max. temp. value / of all cells indicated by 1°C/LSB. Usage range -40°C to 125°C										Module No. containing the maximum cell temperature value in string. Usage range: module No. 1 to 28.				
Average cell temp.	40042	Average temp. value of all cells indicated by 1°C/LSB. Usage range -40°C to 125°C														
Min. cell voltage	40043	Min. voltage value of all cells indicated by 1mV/LSB														
Max. cell voltage	40044	Max voltage value of all cells indicated by 1mV/LSB														
Min./Max. cell voltage module No.	40045	Module No. containing the minimum cell voltage value. Usage range: module No. 1 to 28.										Module No. containing the maximum cell voltage value. Usage range: module No. 1 to 28.				
SOC (%)	40049															
SOH (%)	40050															
SOC(%) / Avg Cell Temp	40053															
SOC(%) / Avg Cell Temp	40054															

Register Details

Registers with additional information beyond what is shown in the above tables are detailed below.

40010 – Host Status

- Bits 0-2: cabinet ID
 - Up to eight cabinets with ID from 0x000 to 0x111 determined by DIP switch setting
- Bits 3-5 : Host Status
 - Abnormal (b3): 1 – System is in fault or short start-up period. Both contactors are open.
 - Ready (b4): 1 – System has no fault. One or more contactors is open.
 - Service (b5): 1 – System has not fault. Both contactors are closed.
- Bits 6: contactor status
 - 0 – Open; 1 – Closed
- Bits 7-15: reserved

40011 – Cabinet Fault Status

- Values: 1 – True, 0 – False
 - Bit 0: Breaker Open
 - Bit 1: Fuse Open
 - Bit 2: Tray Open
 - Bit 3: Host-Host CAN COM Fault
 - Bits 4-15: Reserved

40012 – String Fault Status

- Values: 1 – True, 0 – False
 - Bit 0: Over cell temperature fault (protected by BMU)
 - Bit 1: Over cell voltage fault (protected by BMU)
 - Bit 2: Under cell voltage fault (protected- by BMU)
 - Bit 3: BMU-Host COM fault
 - Bit 4: BMU hardware failure
 - Bit 5: Close contactor failure
 - Bits 6-15: Reserved

40014 – Warning Status

- Values: 1 – True, 0 – False
 - Bit 0: Contactor open
 - Bit 1: Over cell temperature warning
 - Bit 2: Over cell voltage warning
 - Bit 3: Under cell voltage warning
 - Bit 4: Overcurrent
 - Bits 5-15: reserved

40025 – Cell Balancing Function

- Values: 1 – True, 0 – False
 - Bit 0: BMU cell balancing is enabled

- Bits 2-15: reserved

40026 – LED Status

- Values: 1 – True, 0 – False
 - Bit 0: BMU cell balancing is enabled
 - Bit 1: BMU cell balancing is enabled
 - Bits 2-15: reserved

40027–40029 – LED Status

- Bit 1 and Bit 0: red LED off (0x00), red LED blinking (0x01), red LED solid (0x02)
- Bit 3 and Bit 2: amber LED off (0x00), amber LED blinking (0x01), amber LED solid (0x02)
- Bit 5 and Bit 4: green LED off (0x00), green LED blinking (0x01), green LED solid (0x02)
- Bits 6-15: reserved
- 7-seg. LED
 - If system has no warning or fault, it will only display cabinet ID
 - If system has warning or fault, it will display repeatedly in the sequence of cabinet ID, warning, cabinet fault, and string fault. Each of them will be displayed for 5 sec with 5 sec interval of LED-blank after. During the 5 sec display, the cabinet ID (1 digit) will be on always; the warning or fault status (5 digits) will display from the highest digit to the lowest digit (0.5 sec on/off time for each digit)

Cell Level Monitoring Registers

Cell Data Registers (BMU 1)									
Register Description	Module Number								
	1	2	3	4	5	6	7	8	9
Cell Voltage Cell 1	40086	40104	40122	40140	40158	40176	40194	40212	40230
Cell Voltage Cell 2	40087	40105	40123	40141	40159	40177	40195	40213	40231
Cell Voltage Cell 3	40088	40106	40124	40142	40160	40178	40196	40214	40232
Cell Voltage Cell 4	40089	40107	40125	40143	40161	40179	40197	40215	40233
Cell Voltage Cell 5	40090	40108	40126	40144	40162	40180	40198	40216	40234
Cell Voltage Cell 6	40091	40109	40127	40145	40163	40181	40199	40217	40235
Cell Voltage Cell 7	40092	40110	40128	40146	40164	40182	40200	40218	40236
Cell Voltage Cell 8	40093	40111	40129	40147	40165	40183	40201	40219	40237
Cell Voltage Cell 9	40094	40112	40130	40148	40166	40184	40202	40220	40238
Cell Voltage Cell 10	40095	40113	40131	40149	40167	40185	40203	40221	40239
Cell Voltage Cell 11	40096	40114	40132	40150	40168	40186	40204	40222	40240
Cell Voltage Cell 12	40097	40115	40133	40151	40169	40187	40205	40223	40241
Cell Temperature 1	40098	40116	40134	40152	40170	40188	40206	40224	40242
Cell Temperature 2	40099	40117	40135	40153	40171	40189	40207	40225	40243
Cell Temperature 3	40100	40118	40136	40154	40172	40190	40208	40226	40244
Cell Temperature 4	40101	40119	40137	40155	40173	40191	40209	40227	40245
Cell Temperature 5	40102	40120	40138	40156	40174	40192	40210	40228	40246
Cell Temperature 6	40103	40121	40139	40157	40175	40193	40211	40229	40247

CMU Registers	
Name	Register Number
CMU STATUS BYTE 1	40736
CMU STATUS BYTE 2	40737
CMU STATUS BYTE 3	40738
CMU STATUS BYTE 4	40739

TOSHIBA

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POWER ELECTRONICS DIVISION - UPS

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