TOSHIBA

G9000 Series

G9000 ENHANCED SERIES UPS
INSTALLATION AND OPERATION MANUAL

480/480 V 100/160/225 kVA

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TOSHIBA

IMPORTANT NOTICE

Never attempt to install, operate, maintain or dispose of this equipment until you have first read and understood all of the relevant product warnings and user directions that are contained in this Installation manual.

The installation of this equipment must only be performed by qualified personnel.

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 to be met in connection with installation, operation, or maintenance. Should further information be required or should particular problems arise which are not covered sufficiently the matter should be referred to the local TOSHIBA sales office.

Nothing in this manual shall alter Toshiba International Corporation's standard terms and conditions or the conditions of any written sales contract.

Any Electrical or mechanical modifications to this equipment without prior written consent of TOSHIBA will void all warranties and may void UL/CUL listing. Unauthorized modifications may also result in personal injury, death, or equipment damage.

UNINTERRUPTIBLE POWER SYSTEM

If additional information or technical assistance is required call TOSHIBA Customer Support Center toll free at 1-877-867-8773, or write to: Toshiba International Corporation, 13131 West Little York Road, Houston, TX 77041-9990 Attn: UPS Product Manager.

Keep this manual with the UPS equipment.

Job Number:_____

Model Number: _____

Serial Number:_____

Application:_____

Shipping Date:_____

Date of Installation:_____

Inspected By:_____

TOSHIBA

Purpose and Scope of Manual

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

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

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The TOSHIBA Customer Support Center can be contacted to obtain help in resolving any **Uninterruptible Power System** problem that you may experience or to provide after sales service support.

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8 a.m. to 5 p.m. (CST) – Monday through Friday
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E-mail – *TIC-UPSservice@toshiba.com*

You may contact TOSHIBA by writing to:

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

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

http://www.toshibaups.com/

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1 How to use this Manual

This manual is designed for ease of use, giving the user easy and quick reference to information.

This manual uses notice icons to draw attention to the user important information regarding the safe operation and installation of the UPS.

1.1 Notice Icons

The notice icons used in this manual are explained below, and should be taken into account and adhered to whenever they appear in the text of this manual.

WARNING

Warning: A warning symbol shows potentially hazardous situation or condition which could result in personal injury or death, if not avoided.

CAUTION

Caution: A caution symbol shows potentially hazardous situation or condition which could result in personal injury or equipment damage, if not avoided.

NOTE

Note: A Note symbol shows the information the user or the service personnel should observe during the UPS operation or service work.

PROHIBIT

Prohibit: A prohibit symbol shows the act the user or the service personnel should NEVER perform during the UPS installation, operation or service work.

Safety Recommendations: If any problems are encountered while following this manual, contact the Toshiba Customer Support Center.

1.2 Qualified Personnel

Only qualified persons are to install, operate or service this equipment according to all applicable codes and established safety practices.

A qualified person must:

1) Read this entire instruction manual carefully.

2) Be skilled in the installation, construction or operation of the equipment and aware of the hazards involved.

3) Be trained and authorized to safely energize, de-energize, clear, ground, lockout and tag circuits in accordance with established safety practices

4) Be trained and authorized to perform the service, maintenance or repair of this equipment

5) Be trained in the proper care and use of protective equipment such as rubber gloves, hard hat, safety glasses, face shield, flash clothing, etc. in accordance with established practices

6) Be trained in rendering first aid.

2 INTRODUCTION

The Toshiba Uninterruptible Power Supply System (UPS) is designed to provide many years of reliable protection from power failure, brown-outs, line noise, and voltage transients. To ensure optimum performance of the equipment, follow the manufacturer's instructions. This manual contains descriptions required to operate the UPS. Please read this manual carefully and retain it for future reference.

CAUTION

IMPORTANT SAFETY INSTRUCTIONS
SAVE THESE INSTRUCTIONS

This manual contains important instructions for the G9000 ENHANCED SERIES Uninterruptible Power Supply Systems that should be followed during installation and maintenance of the UPS and batteries.

WARNING

WARNING 1

Lethal voltages exist within the equipment during operation. Observe all warning and cautions in this manual. Failure to comply may result in serious injury or death. Obtain qualified service for this equipment as instructed.

CAUTION

WARNING 2

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

PROHIBIT

Don't modify the UPS entirely or partially.
Any modifications without authorization by TOSHIBA could result in personal injuries, death or destruction of the UPS.

2.1 SAFETY PRECAUTIONS

UNINTENDED USAGE

This UPS shall NOT be used in the following applications. Use of this UPS in any of the below applications will result in serious injury or death:

PROHIBIT

- Medical operation room equipment
- Life support equipment
- Fire Prevention or Suppression Equipment

Always read all applicable regulations and standards for the application of this UPS. Special considerations are required when using this UPS in the following applications:

NOTE

- Nuclear Power Plants.
- Control Equipment.
- Transportation Equipment

NOTE

WARNING 3

The UPS is to be installed in a controlled environment.

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

Maintain the installation environment as follows:

Table 2–1 UPS Installation Environment

No.	Item	Environment standard	
1	Installation location	Indoors	
2	Ambient temperature	Minimum temperature: 32 °F(0 °C) Maximum temperature: 104 °F(40 °C) The average temperature over any 24-hour period must be in the range 41 °F (5 °C) to 95 °F(35 °C).	
3	Relative humidity	The relative humidity must be held between 5 and 95%. There must be no condensation due to temperature changes.	
4	Altitude	This equipment must not be applied at altitude that exceeds 2250m (7380ft) above sea level.	
5	Dust	Dust in the room where the UPS is installed must not exceed normal atmospheric dust levels. In particular, that dust should not include iron particles, oils or fats, or organic materials such as silicone.	
6	Inflammable gas following IEC654-4 Part 4	There should be no inflammable/explosive gas.	
		Hydrogen sulfide (H_2S)	No more than 0.003 PPM
		Sulfurous acid gas (SO_2)	No more than 0.01 PPM
		Chlorine gas (Cl_2)	No more than 0.002 PPM
		Ammonia gas (NH_3)	No more than 1 PPM
		Nitrous oxides (NO_x)	No more than 0.05 PPM
		Ozone (O_3)	No more than 0.002 PPM

NOTE

WARNING 4

This UPS does not include a Bypass input circuit breaker (MCCB) to protect the bypass circuit. The Bypass input circuit breaker (MCCB) is to be supplied and installed by others. Recommended Breaker (MCCB)'s Specifications are as follows:

Table 2–2 Rating of Bypass Input Circuit Breaker

Capacity (kVA)	Bypass Voltage (Vac)	Bypass Rating (Aac)	Breaker (A)
100	480	120	150
160	480	192	250
225	480	271	350

AC input and AC output overcurrent protection and disconnect devices shall be supplied and installed by others.
The DC circuit breaker (MCCB) shall be supplied and installed by others.
The overcurrent protection device should be installed in the Battery cabinet and rated as indicated in Table 3–7.

Note: The DC input overcurrent protection (Battery disconnect breaker) hereinafter will be referred as “CB2”.

3 GENERAL

The Toshiba G9000 UPS is designed to provide continuous and clean electrical power to a critical load. Additionally the UPS monitors power conditions affecting the load. In the event of an input power failure, the UPS will supply power to the critical load for the specified battery time.

If the input power is not restored promptly, backup power from the UPS battery permits the orderly shutdown of equipment supported by the UPS. The UPS is simple to start-up, operate and maintain.

The G9000 ENHANCED SERIES UPS is available in three kVA sizes - 100, 160 and 225 kVA. Specifications for each kVA model are given in Section 3.3. The principles of operation described herein are applicable to all models.

This manual provides an overview of the G9000 ENHANCED SERIES components and their functions. The appearance and purpose of operator controls and indicators is described with procedures for operation, start-up, shutdown and basic maintenance included.

3.1 DEFINITIONS

UNINTERRUPTIBLE POWER SUPPLY SYSTEM (UPS) – All components within the UPS Module Cabinet and associated batteries that function as a system to provide continuous, conditioned AC power to a load. This is sometimes referred to as the "System".

UPS MODULE CABINET – The metal enclosure which contains the Converter / Charger, Inverter, Static Transfer Switch, Internal Bypass line, operator controls, and internal control systems required to provide specified AC power to a load.

UPS MODULE – The Converter / Charger and Inverter assemblies which, under the direction of the internal control system and operator controls, provide specified AC power to a load.

INVERTER – The UPS components which contain the equipment and controls necessary to convert DC power from the Converter / Charger, or the battery, to AC power required by the critical load.

CONVERTER / CHARGER – The UPS components which contain the equipment and controls necessary to convert input AC power to regulated DC power required for battery charging and for supplying power to the Inverter.

STATIC TRANSFER SWITCH (STS) – The device which connects the critical load to the bypass line when the Inverter cannot supply continuous power.

BYPASS LINE – The line which conducts electricity directly from the input power source to the critical load during Maintenance or whenever the UPS is not completely operational.

AC INPUT POWER – Power provided by the electrical utility company, or auxiliary generator, which is connected to the UPS for supplying the critical load.

BATTERY – The rechargeable battery strings which supply DC power to the inverter to maintain continuous AC power to the load during AC input power failure conditions.

3.2 OPERATION OVERVIEW

The UPS provides two power paths between the utility source and the critical load.

Figure 3-1 shows the path for normal operation, with the load powered by the inverter.

Figure 3-2 shows the path for bypass operation, with the load supplied through the static bypass line.

Figure 3-3 shows the path for battery operation, with the load powered by the inverter.

3.2.1 Normal Operation: Load power supplied by each system UPS inverter.

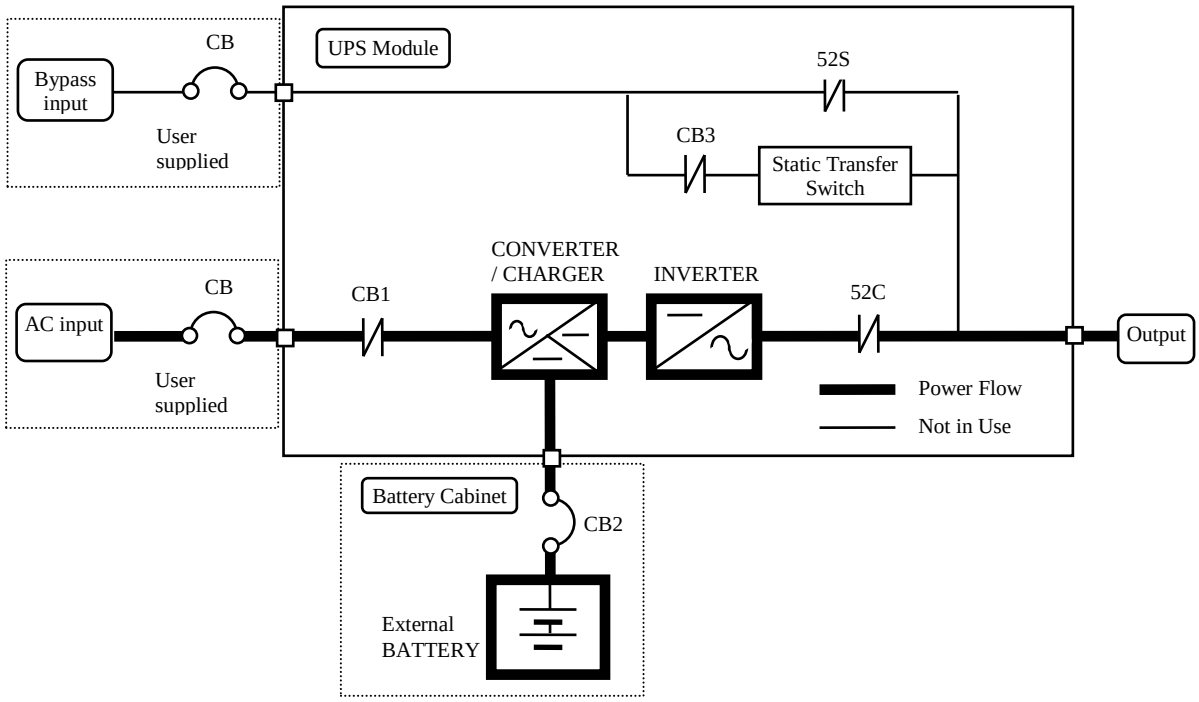


Figure 3-1 Single Line Diagram – Normal Operation: Load fed by UPS Inverter

During normal operation, the path through the UPS inverter is used to power the load.

In Figure 3-1 input AC power is converted to DC by the Converter. DC power is utilized to charge the UPS battery and to provide power to the Inverter. The Inverter converts the DC power to clean AC power to supply the critical load.

The conversion - inversion process eliminates any voltage transients or fluctuations existing in the input power before it reaches the critical load.

The power drawn by the critical load is equally shared between all UPS systems when multiple UPSs are in Parallel Operation. (Figure 5-4 shows an example of Parallel Operation System Configuration.) Note that a maximum of four (4) G9000 100-225kVA UPS modules may be in parallel operation.

CAUTION

When in Parallel Operation, the rectifier inputs to all G9000 UPS Systems must be fed from the same source at all times. All bypass inputs must also be fed from the same source.

In the event of a UPS module failure during Parallel Operation, the critical load power will be continually supplied and shared by all other UPS.

NOTE

The Bypass Input breaker and cables are to be supplied and installed by the user or the contractor. (See WARNING 4 on page 6)

3.2.2 Bypass Operation: Load Power supplied through UPS internal static bypass line.

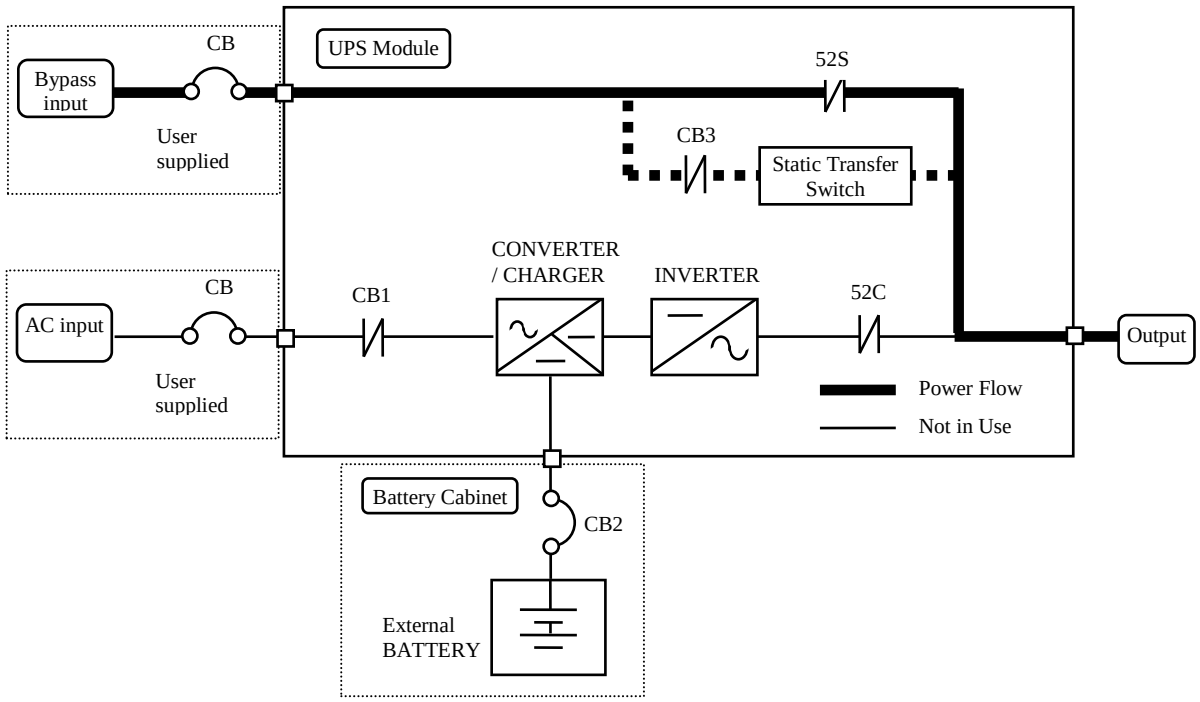


Figure 3-2 Single Line Diagram – Bypass Operation: Load fed through static bypass line

Figure 3-2 shows the Internal Bypass line is a Hard-wired line through 52S which supplies the critical load with unconditioned bypass input power. Upon switching to the Internal Bypass line, the Static Transfer Switch line through CB3 (herein after STS contactor CB3) supplies the power immediately, and then the Internal Bypass line through 52S supplies the power. In the event of a switching to the Bypass line, the power to the critical load will be uninterrupted. The purpose of this Internal Bypass line is to route power to the critical load while the UPS module is de-energized (converter and inverter), and during Start-up before the system is fully operational.

Each UPS internal static bypass line will equally share the power supplied to the critical load whenever the system is in the Parallel Operation.

In the event of a load overcurrent, the UPS transfers to bypass without interruption to the critical load. In the case of the Parallel Operation, all UPS will transfer to bypass without interruption to the critical load.

The internal control system determines the operation of the two paths, with the load powered from the inverter being the normal operation.

3.2.3 Battery operation: Load Power supplied by UPS battery.

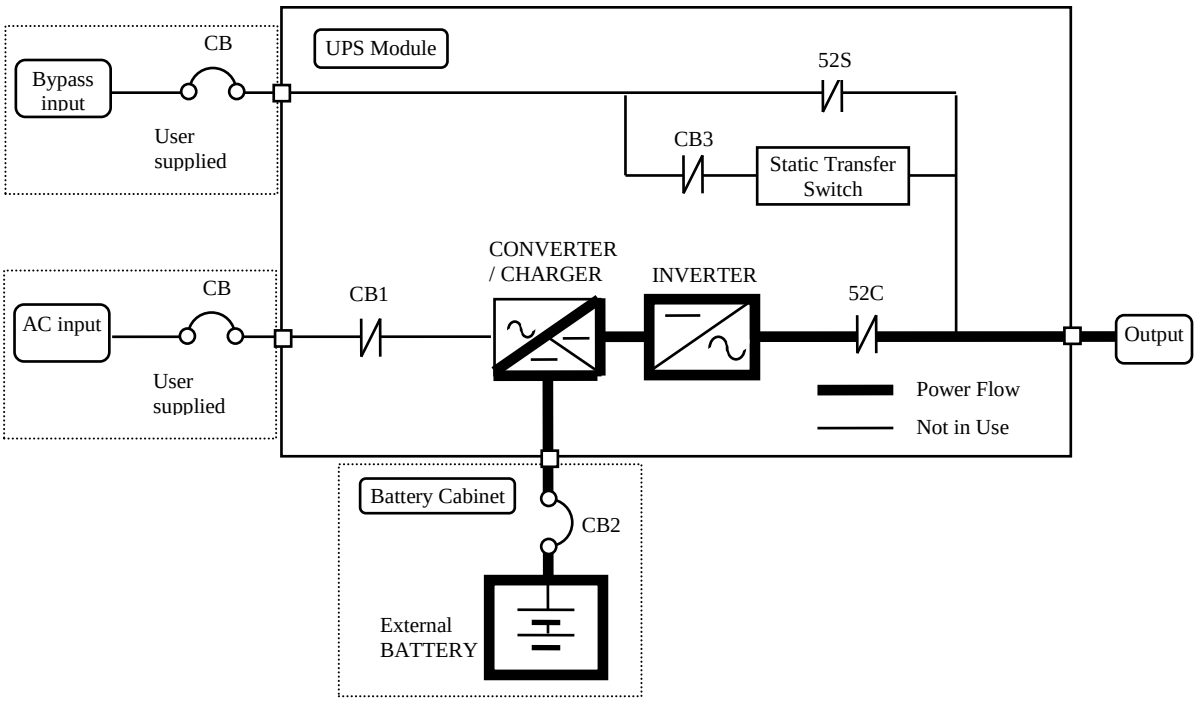


Figure 3-3 Single Line Diagram – Battery Operation – Load fed by Battery

Figure 3-3 shows that in the event of AC input source failure or interruption, the UPS Converter(s)* will de-energize and the UPS battery(s)* will immediately discharge and supply DC power to the Inverter to maintain continuous AC power to the load. This operation will continue until:

a) The battery capacity expires and the inverter turns off, or
b) Input power is restored. (When input power is restored the converter will simultaneously power the inverter and critical load, and recharge the batteries.)

A fully charged battery will provide power for the specified time at the rated load, or longer, at a reduced load.

* (s) : In the case of the Parallel Operation

When power is restored after a low battery shutdown, the UPS response is dependent upon whether it is operating in standalone (SMS) or parallel (MMS) operation.

Standalone Operation:

After restoration of power, the UPS will automatically restart normal operation: rectifier will resume conversion, the charger recharges the batteries, and the inverter restarts without operator intervention. Load is automatically assumed by the inverter without operator intervention.

Parallel Operation:

After restoration of power, the UPS will remain offline until an operator restarts the unit using the startup procedures shown in Section 5.4 E) MMS Start-up Procedure.

Whenever the system is in Parallel Operation, the power drawn by the load is equally shared between all UPS regardless of the presence or absence of the UPS that are in battery operation.

3.2.4 Battery Charging Operation

As shown in **Section 3.2.1** when the UPS is in normal operation, DC Power is utilized to charge the UPS batteries. The lead acid charging characteristics of the G9000 UPS are shown in Figure 3-4 and descriptions of the two charging periods are below.

Period (A): Charging voltage increases steadily from its minimum until it reaches the float voltage of the battery system. During this period, the charging current will be at its maximum as long as sufficient power is supplied to the UPS and there are no load conditions that prevent it. The maximum current is either the Maximum Recharge Current that the UPS system can provide (see the Battery portion of **Section 3.3**) or a lower current limit set via the LCD screen to comply with the battery manufacturer recommendations. This current limit adjustment should only be performed by a Toshiba Authorized Service Provider.

Period (B): This period begins when the Charging Voltage reaches the float voltage of the batteries. The charging current will steadily decrease as the batteries approach their maximum state of charge. Once reached, the UPS will maintain the maximum state of charge on the batteries with minimal Charging Current.

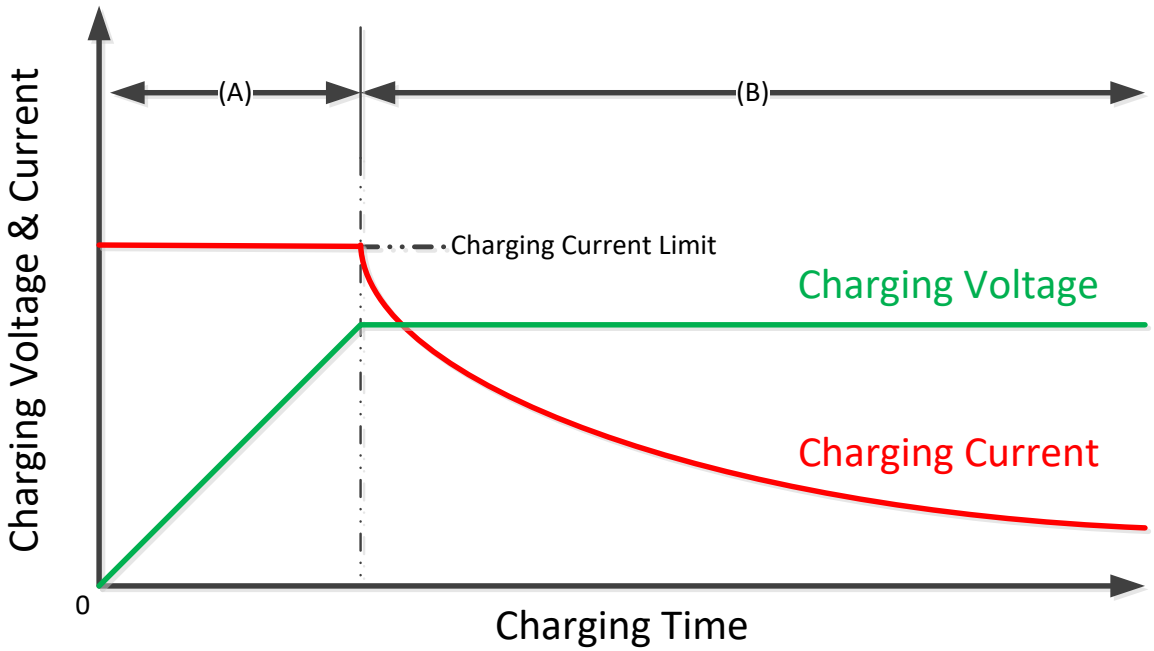
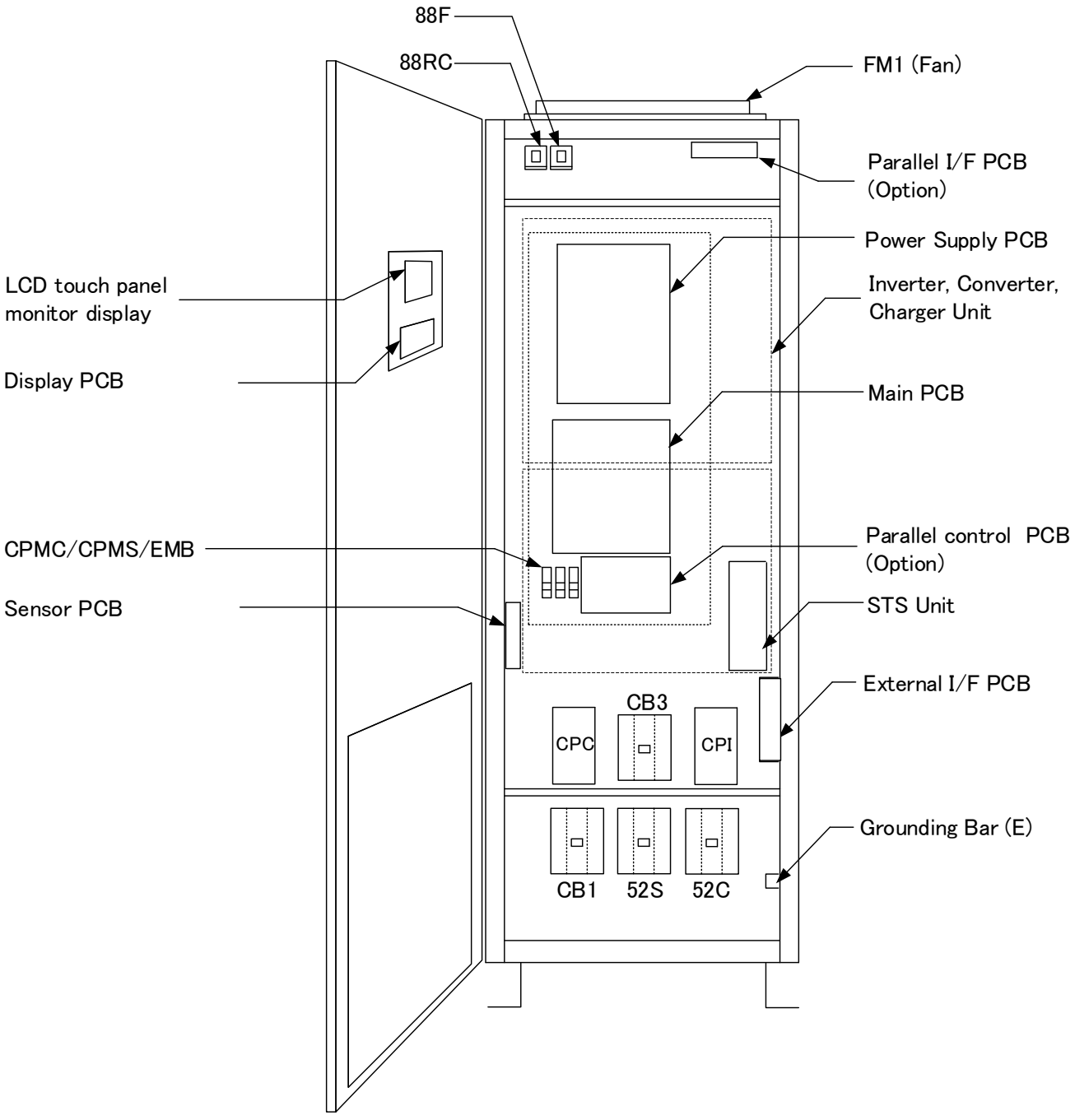


Figure 3-4 Typical Battery Charging Curve

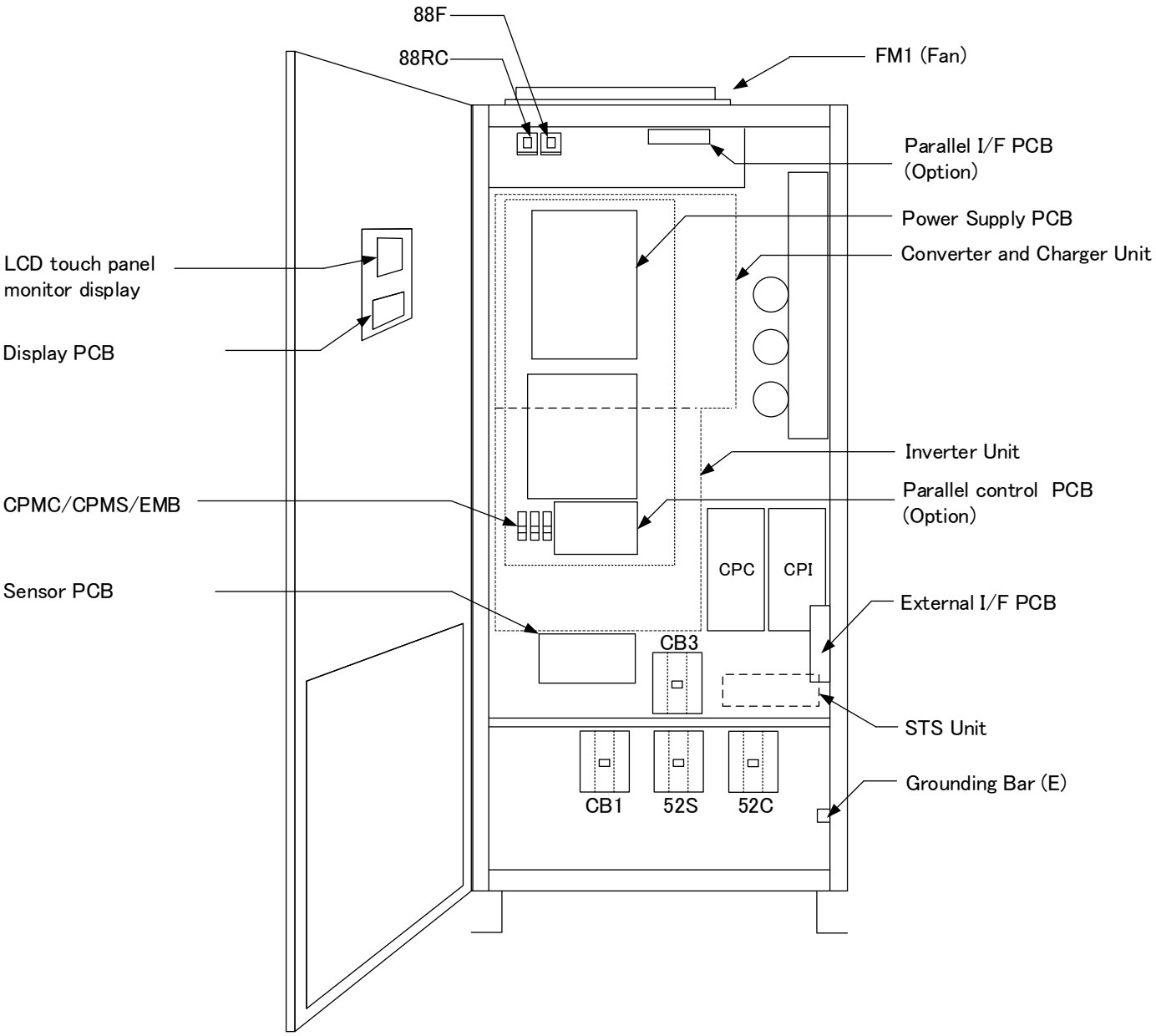
3.2.5 UPS Parts Location

See Figure 3-5 and Figure 3-6 for parts location in the UPS.



* Refer to Figure 5-2 for details of AC input, AC output, DC input terminals

Figure 3-5 UPS Parts Location (100 and 160kVA)



* Refer to Figure 5-2 for details of AC input, AC output, DC input terminals

Figure 3-6 UPS Parts Location (225 kVA)

3.3 SPECIFICATIONS

The UPS nameplate displays the rated kVA as well as nominal voltages and currents. The nameplate is located on the inside of the UPS front door.

Table 3–1 Power Specifications

Rated output Power	Input voltage 3 phase / 3 wire	Bypass input voltage 3 phase / 3 wire	Output voltage 3 phase / 3 wire
100 kVA / 90 kW	480 V	480 V	480 V
160 kVA / 144 kW	480 V	480 V	480 V
225 kVA / 202.5 kW	480 V	480 V	480 V

Table 3–2 UPS Module Information (Overall Dimension)

UPS [kVA]	Width in. (mm)	Depth in. (mm)	Height in. (mm)	Net Weight lbs. (kg)	Typ. Heating at 100% Load [kBTU/h]	Cable Knockout
100	27.6 (700)	32.7 (830)	80.7 (2,050)	780 (350)	10.8	BOTTOM
160	27.6 (700)	32.7 (830)	80.7 (2,050)	860 (390)	18.3	BOTTOM
225	35.4 (900)	32.7 (830)	80.7 (2,050)	1,080 (490)	22.8	BOTTOM

Table 3–3 UPS Module Information (Packing Dimension)

UPS [kVA]	Width in. (mm)	Depth in. (mm)	Height in. (mm)	Gross Weight lbs. (kg)
100	41.0 (1,045)	37.0 (940)	88.0 (2,235)	955 (432)
160	41.0 (1,045)	37.0 (940)	88.0 (2,235)	1,015 (466)
225	45.0 (1,145)	37.0 (940)	88.0 (2,235)	1,235 (560)

Table 3–4 Specifications

Rated Output kVA	**100**	**160**	**225**
Rated Output kW	**90**	**144**	**202.5**
AC INPUT			
Configuration	3 phase, 3 wire		
Voltage	480 V (+15% to -20%)		
Frequency	60 Hz ±10%		
Reflected Current THDi	3% typ. at 100% load (no input filter required)		
STATIC BYPASS INPUT			
Configuration	3 phase, 3 wire		
Voltage	480 V ±10%		
Frequency	60 Hz ±5%		
BATTERY			
Type	VRLA, Wet Cell, SCiB Lithium Ion		
Ride Through	Application Specific		
Nominal Voltage (Lead Acid)	480 VDC		
Minimum Voltage (Lead Acid)	400 VDC		
Number of Cells (Lead Acid)	240		
Maximum Charge Current	25 A	40 A	56 A
AC OUTPUT			
Configuration	3 phase, 3 wire		
Voltage	480 V		
Voltage Regulation	±1%		
Frequency	60 Hz		
Frequency Regulation	±0.01% in free running mode		
Power Factor	0.9 nominal (0.9 Lagging to 1.0 within output kW rating)		
Power Factor Range	0.9 to 1.0 Lagging (within output kW rating)		
Voltage THD	< 2% maximum THD at 100% linear load < 5% maximum THD at 100% non-linear load		
Transient Response	±2% maximum at 100% load step ±1% maximum at loss/return of AC power ±5% maximum at load transfer to/from static bypass		
Transient Recovery Time	Less than 20ms		
Voltage Unbalance	1% maximum at 100% unbalanced load		
Phase Displacement	±1° maximum at 100% Load		
Inverter Overload	125% for 2 minutes; 150% for 60 seconds		
Bypass Overload	1000% for 1 cycle		
ENVIRONMENTAL**			
Cooling (Forced Air)	2,200 cfm		
Operating Temperature	Minimum/Maximum: 32 °F to 104 °F (0 °C to 40 °C). Recommended : 68° F to 86° F (20 °C to 30 °C)		
Relative Humidity	5% – 95% Non-Condensing		
Altitude	0 to 7,400 ft. (2255 m) No Derating at 40° C		
Location	Indoor (free from corrosive gases and dust)		
Paint Color	Munsell N1.5 (Black)		
Clearance Required	Top : 19.7 in. (500 mm) Front : 39.4 in. (1000 mm) Rear : 0 in. (0 mm) Sides: 0 in. (0 mm) if sidecars used, 1 in. (25 mm) if no sidecars used.		
Enclosure	NEMA 1		
Audible Noise	70 dB @ 1 m		

Rated Output kVA	100	160	225
Listings/Standards	ENERGY STAR® certified UPS, UL; cUL; FCC Class A-Article 47 – Part 15 B; ISO 9001; ISO14001; ANSI C62.41 (IEEE 587 Cat. B), OSHPD & IBC Seismic		
Emergency Power Off	Included		
MONITORING			
Dry Contacts Included	Yes, for Input and Output Signals		
RS232 Port	Included		
Intelligent Monitoring (Optional)	SNMP; MODBus RTU; MODBus TCP; BACNET; METASYS		
Display	LCD Touch Panel for Local Monitoring, Operation, and Control		

**Indication that the unit is intended for installation in a temperature-regulated, indoor area that is relatively free of conductive contaminants.

Table 3–5 Typical AC-AC UPS Efficiencies at Various Loads

UNIT	% Full Load			
	25%	50%	75%	100%
100 kVA	94.2%	96.1%	96.5%	96.6%
160 kVA	95.1%	96.3%	96.5%	96.4%
225 kVA	95.7%	96.8%	96.9%	96.8%

Table 3–6 MTBF and MTTR

Parameter	100-225kVA
MTBF (Mean Time Between Failures): System (With Bypass) Inverter (Without Bypass)	3,080,000 h 160,000 h
MTTR (Mean Time to Repair) – Excluding Travel and Shipping Time	4 h

Table 3–7 Rating of Contactors, Breakers, and Fuses

	NUMBER	APPLICATION	OUTPUT CAPACITY OF EQUIPMENT		
			100 kVA	160 kVA	225 kVA
			90 kW	144 kW	202.5 kW
Contactor	CB1	AC input contactor	135 A	200 A	260 A
	CB3	STS contactor	135 A	200 A	260 A
	52C	Inverter output contactor	135 A	200 A	260 A
	52S	Bypass contactor	135 A	200 A	260 A
	88RC	Control circuit contactor	20 A	20 A	20 A
Breaker	User supply* CB2	Battery disconnect breaker (Recommended)	**See Appendix A: Installation Planning Guide**		
	User supply*	AC input breaker (Recommended)	**See Appendix A: Installation Planning Guide**		
	User supply*	AC output breaker (Recommended)	**See Appendix A: Installation Planning Guide**		
Fuses	FCC, FCI	DC fuse	315 A / 690 V	315 A / 690 V	315 A / 500 V
	FP	DC fuse	315 A / 690 V	400 A / 1300 V	630 A / 1300 V
	FRU, V, W	Control power fuse	30 A / 600 V	30 A / 600 V	30 A / 600 V
	(OPTION) FSU, FSV, FSW	Bypass input fuse**	315 A / 690 V	400 A / 690 V	315 A / 690 V
	FBS1, 2, 3	Control power fuse	30 A / 600 V	30 A / 600 V	30 A / 600 V
	(OPTION) FEA, FEB, FEC	Parallel control circuit fuse	3 A / 600 V	3 A / 600 V	4 A / 600 V

*Indication that DC and Output overcurrent protection, its rating and disconnect devices shall be provided by others on all ungrounded conductors.

**Provides 65kAIC short circuit interrupt rating when installed

4 OPERATOR CONTROLS AND INDICATORS

The G9000 Enhanced Series operator controls and indicators are located as follows (Door exterior) :

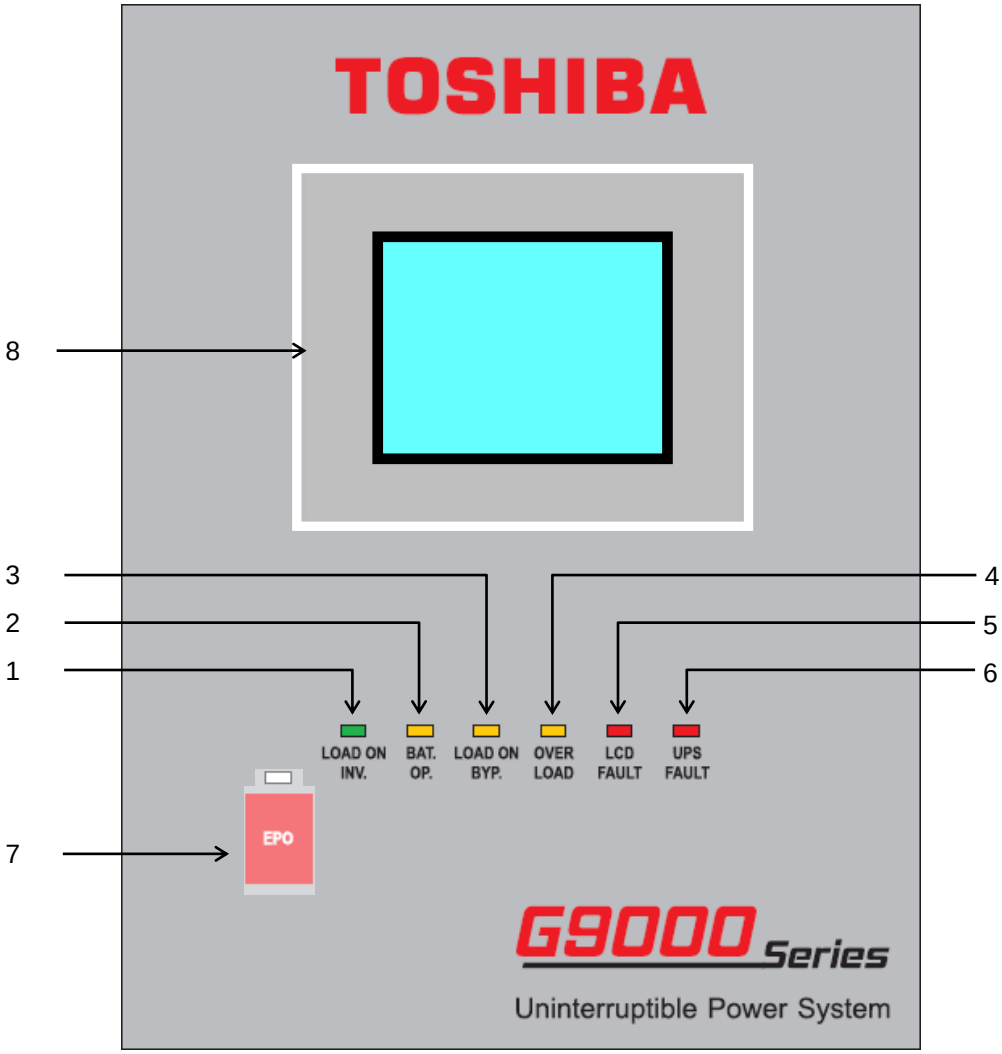


Figure 4-1 Operation/Display Panel (Front panel)

4.1 LED INDICATORS

1) **Load on inverter [LOAD ON INVERTER](green)**

Illuminates when power is supplied from inverter to the critical load.

(Indicates the state of inverter transfer switch "52C".)

2) **Battery operation [BATTERY OP.] (yellow)**

Illuminates when power is supplied from batteries following a power failure.

3) **Load on bypass [LOAD ON BYPASS] (yellow)**

Illuminates when power is supplied to load devices by static bypass.

(Indicates the state of bypass transfer switch "52S".)

4) **Overload [OVERLOAD] (yellow)**

Illuminates in overload condition.

5) **LCD fault [LCD FAULT](red)**

Illuminates when LCD is not responding.

6) **UPS fault [UPS FAULT](red) [Annunciator: intermittent or constant tones]**

Illuminates when an error occurs in the system. In this case, the details of the error are indicated on the display panel.

4.2 EPO BUTTON (Emergency Power Off button) (7)

When activated, the Emergency Power Off (EPO) function shuts down the UPS module. The critical load will lose power and also shutdown. The EPO function can be performed both locally and remotely.

4.3 LIQUID CRYSTAL DISPLAY (8)

The Liquid Crystal Display (LCD) touch panel indicates power flow, measured values, operational guidance, data records and error messages. The LCD panel has a back-light which facilitates viewing in different ambient lighting conditions. The LCD will automatically clear and turn off, if the screen is not activated within 3 minute period. The LCD is turned back on when it is touched again. The LCD ERROR indicator is cleared after 24 hours and can be reproduced by pressing any key on the panel.

4.3.1 Menu

A) MAIN MENU (Figure 4-2)

The LCD panel indicates power flow and measured values, while also operating the start/stop function. The LCD panel also allows the user to verify the status and operation of the UPS Module.

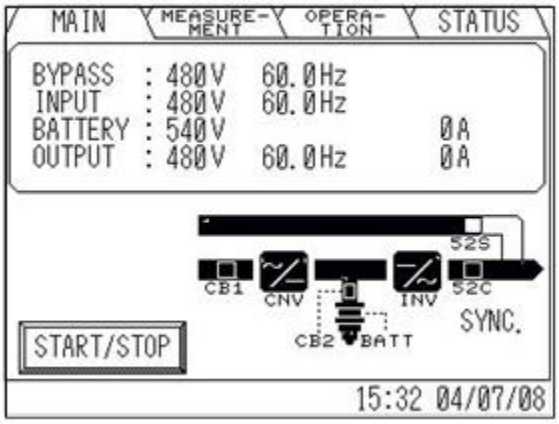


Figure 4-2 Main Screen

The following will be displayed when the START/STOP key on the MAIN MENU is pressed (Jump into **OPERATION MENU**):

1) Startup/Shutdown Guidance (Figure 4-3 to Figure 4-5)

The display indicates the Startup and Shutdown guidance for the UPS system. If this operation is PIN protected, the user is required to enter the security PIN before the screen can be accessed.

When in remote mode, the message “REMOTE operating model” will appear on this Screen. The user cannot operate the start and stop functions without changing the setup from remote mode to local mode.

When bypass voltage is abnormal, the message “Bypass voltage abnormal” will appear.

-Start: When the bypass voltage is abnormal, the LCD asks the operator if an interrupted transfer is acceptable (Load may be lost).

-Stop: When the bypass voltage is abnormal, the user cannot transfer from inverter to bypass line.

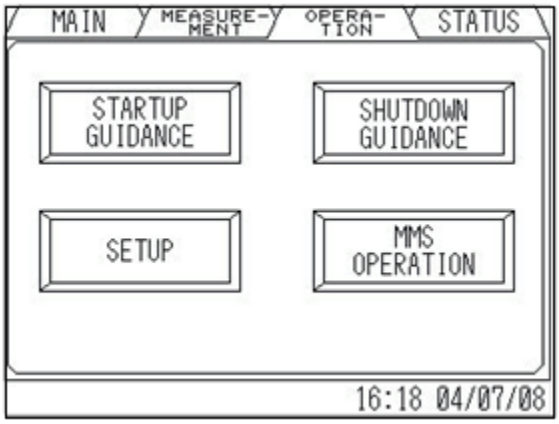


Figure 4-3 Startup/Shutdown Screen

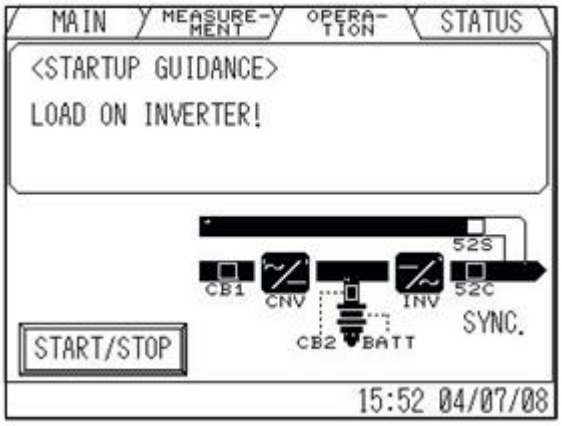


Figure 4-4 Startup Guidance

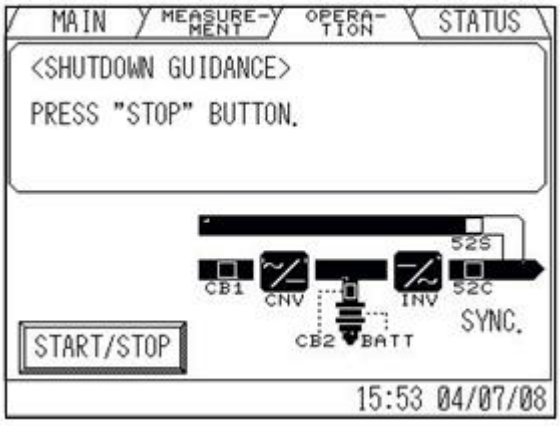


Figure 4-5 Shutdown Guidance

Follow Startup/Shutdown guidance accordingly.

B) MEASUREMENT MENU (Figure 4-6 to Figure 4-8)

This screen shows details of measured values. Input and Output values are displayed. During Battery operation, battery power (voltage and current) is displayed.

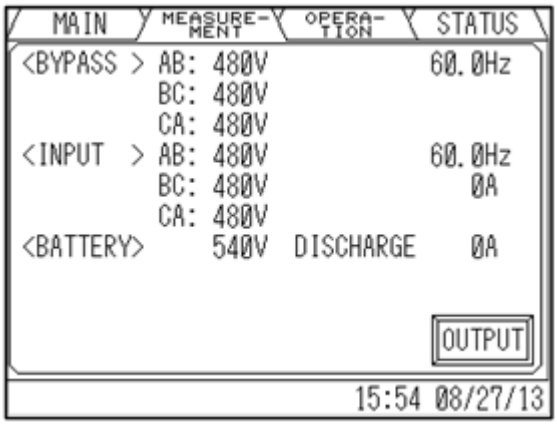


Figure 4-6 Input Values

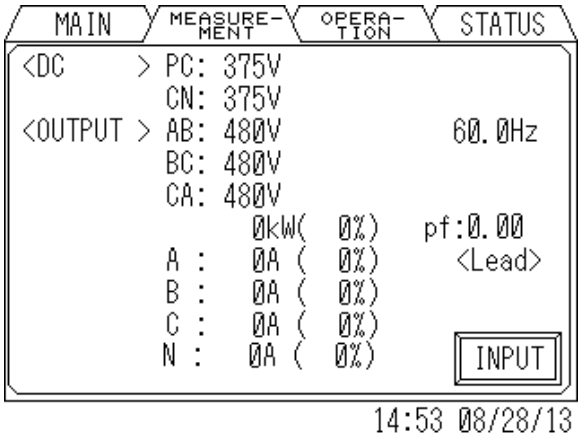


Figure 4-7 Output Values

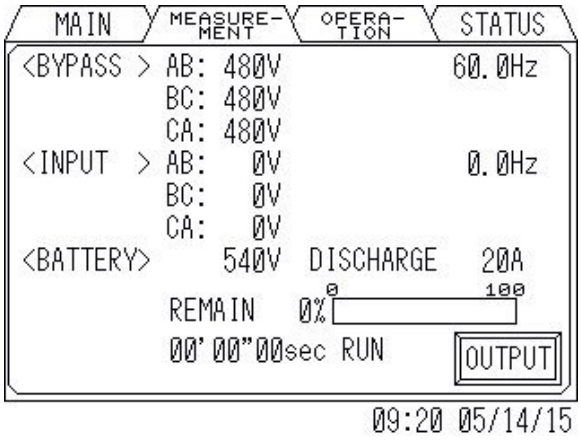


Figure 4-8 Values in Battery operation

C) OPERATION MENU (Figure 4-9 and Figure 4-10)

This screen prompts the user to select: (a) whether the start & stop operation will be performed by local or remote operation; (b) date & time adjustment; (c) battery equalizing charge. The battery equalizing charge operation key will appear when battery equalizing charge is set up (Setup is based on battery type).

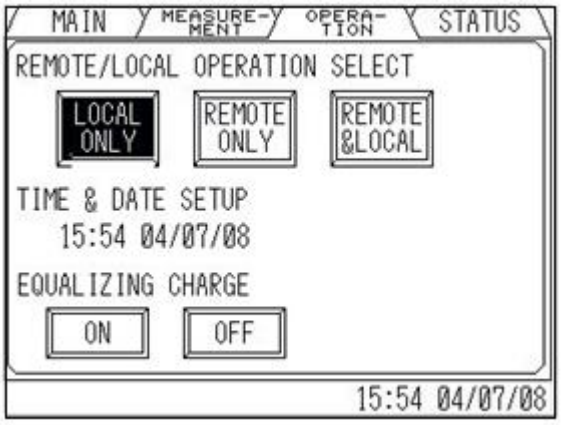


Figure 4-9 Remote/Local Operation Select

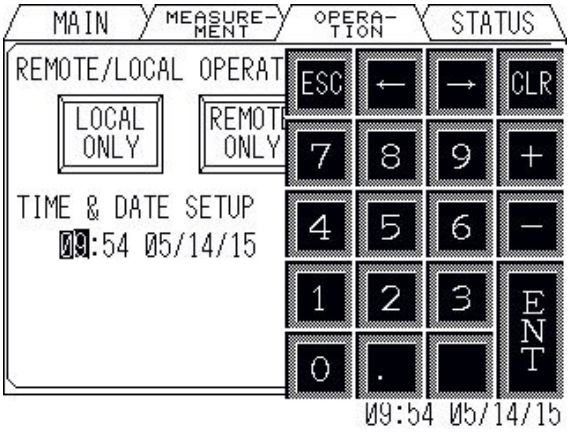


Figure 4-10 Date & Time Adjustment

D) STATUS MENU (Figure 4-11 to Figure 4-13)

This STATUS MENU displays two touch icons: EVENT LOG and BATTERY LOG.

Pressing the EVENT LOG icon will display the last 50 condition/operation records in chronological order. Once the log exceeds 50 entries, the oldest entries are removed.

Press ▲ or ▼ button for page turning.

Pressing the BATTERY LOG icon displays Battery Operation, the number of times battery operations have occurred, and Total Battery Operation Times, the total amount of time the UPS has been in battery backup operation mode.

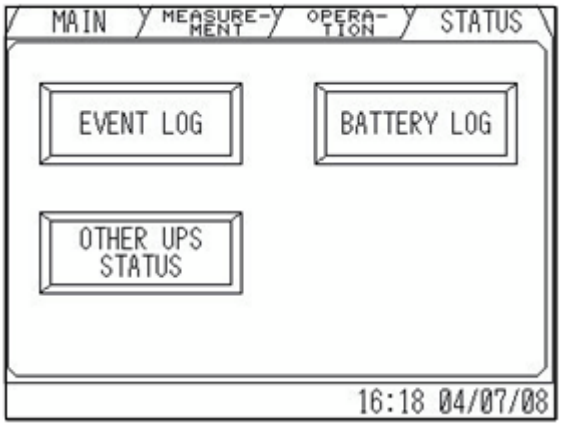


Figure 4-11 Log Menu

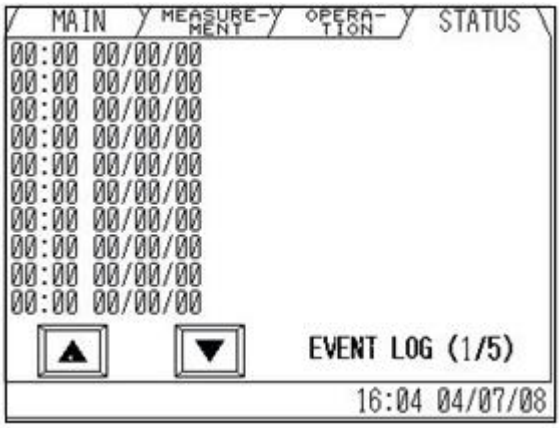


Figure 4-12 Event Log

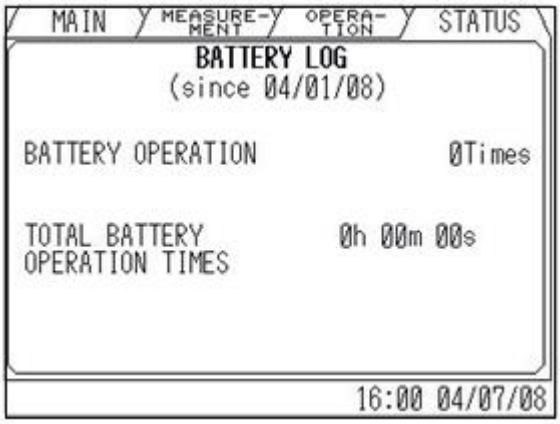


Figure 4-13 Battery Log

4.3.2 Input Power Failure

During an Input Power Failure, the UPS inverter will be powered by the DC Energy Storage System. The following will be displayed on the main and measurement screen (Indication of battery operation and remaining battery time).

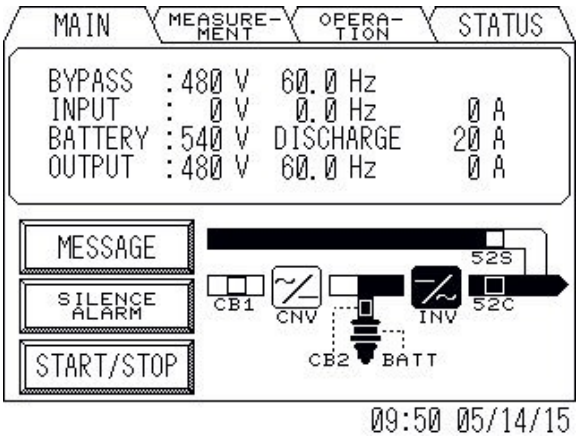


Figure 4-14 Main Screen (Battery Operation)

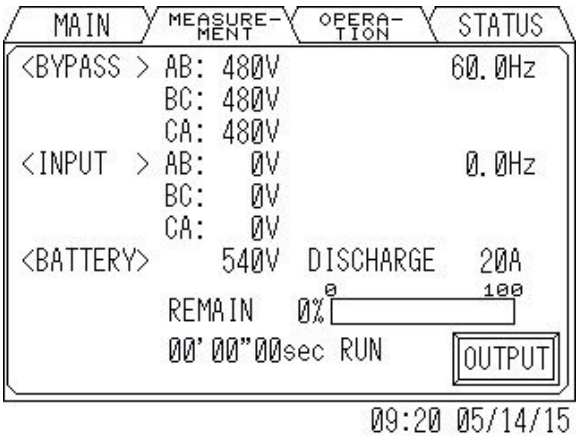


Figure 4-15 Measurement Screen (Battery Operation)

The LCD will display a battery low voltage message when the battery capacity is near depletion. The End of Battery Discharge announcement is displayed when the battery cutoff voltage is reached. At this time, the UPS will disconnect from the DC energy source to prevent battery loss of life typical from extreme deep discharge conditions. The End of Battery announcement is shown at the bottom of the screen. When the input power is restored, the inverter will automatically restart to power the load, and simultaneously recharge the batteries.

4.3.3 Fault/Alarm Indication

"MESSAGE" and "SILENCE ALARM" icons will appear on the main menu when the UPS encounters either a fault or alarm condition.

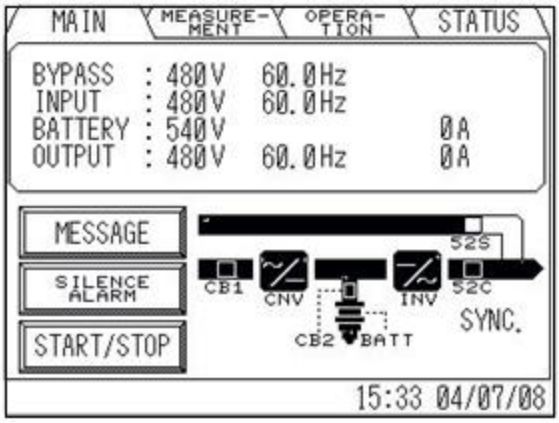


Figure 4-16 Main Screen (Fault/Alarm Indication)

The following will be displayed when the MESSAGE icon on the main menu is pressed.

1) MESSAGE

The display shows the fault/alarm code, the description of the event, and guidance of what action should be taken by the user. A maximum of 10 events are displayed at one time. If an input power failure occurs during a fault/alarm condition, the event indication and input power failure announcement are displayed at 5 second alternating intervals.

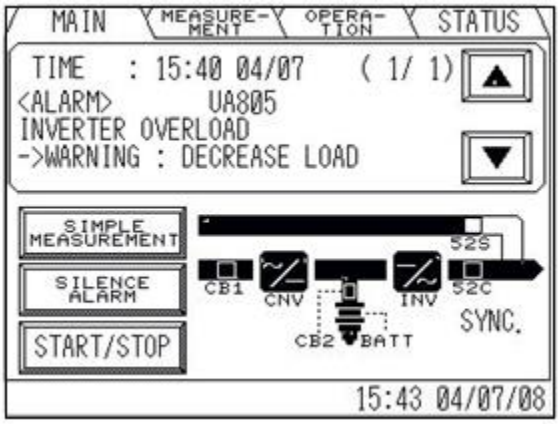


Figure 4-17 Message Screen

2) SILENCE ALARM

This icon will appear when an alarm/fault condition occurs. The audible alarm (announcing the event) can be silenced by pressing this icon.

4.4 EXTERNAL SIGNAL TERMINAL BLOCK

The UPS is equipped with terminals strips, TN1 (Input) and TN2 (Output), on the Auxiliary Connection Board, IOAU-09 for external annunciation of alarms and for remote access of certain UPS functions. Some of these terminals are user-assignable to a variety of functions. These can be programmed to:

- Inputs (TN1): Control the UPS remotely, or report environmental data to the UPS.
- Outputs (TN2): Report status data from the UPS to external annunciation/monitoring devices. Adding a second external I/F PCB “IOAU-09” will double the number of signal outputs (applicable for OUT1 to OUT8.)

4.4.1 Aux Contacts - Input

The UPS is equipped with a series of input/output terminals for external annunciation of alarms and for remote access of certain UPS functions. The layout of terminals is shown in Section 4.4.1 and 4.4.2. Figure 4-18 and Figure 4-19 with a functional description of the input/output port presented. OUT1 to OUT8 are user programmable; factory default settings are shown in Table 4–1.

Adding a second external I/F PCB “IOAU-09” will double the number of signal outputs (applicable for OUT1 to OUT8.)

Input terminal provides four (N1 – N4) programmable contacts that can be set to any of the functions in Table 4–1. External contacts are provided by the user of the UPS system. Terminal voltage at the UPS is 24VDC. Provide external dry contact accordingly.

Inputs require a dry NO (Normally Open) contact to be wired on the corresponding terminals on TN1 of IOAU-09. Closing this contact activates the selected function for that input. The Inputs provide a signal or "wetting" voltage of 12VDC / 16.7 mA. See Figure 4-18.

PROHIBIT

Do not apply voltages to remote access input terminals.
Damage to UPS may result.

Refer to Figure 4-18 for a typical wiring configuration. Although this Figure applies to the remote start/stop terminals, the same wiring arrangement is used for emergency stop; power demand; and battery temperature high.

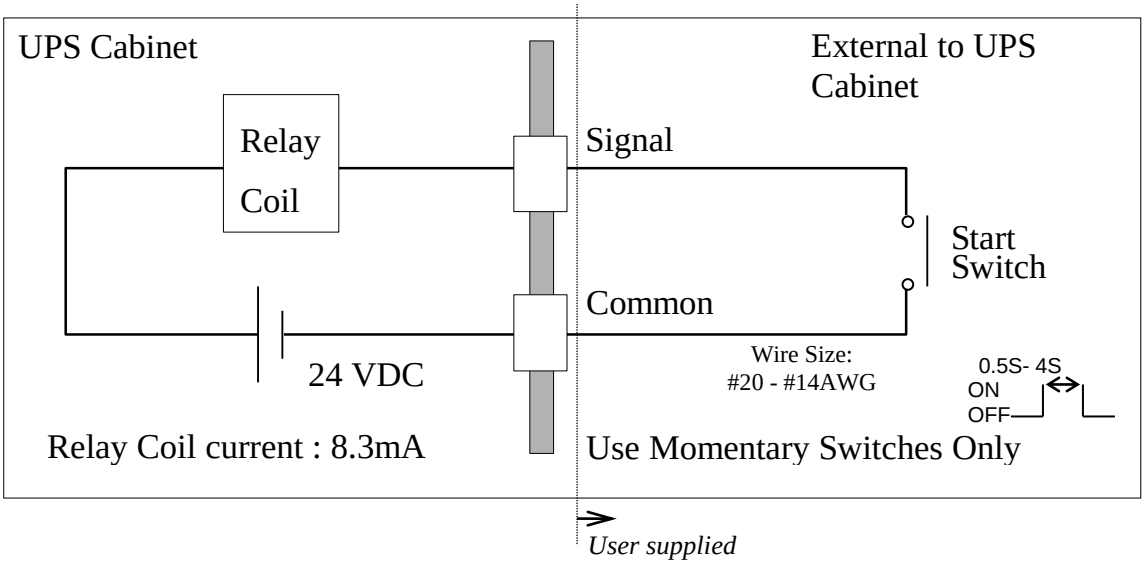


Figure 4-18 Control Wiring for Aux Input Contacts

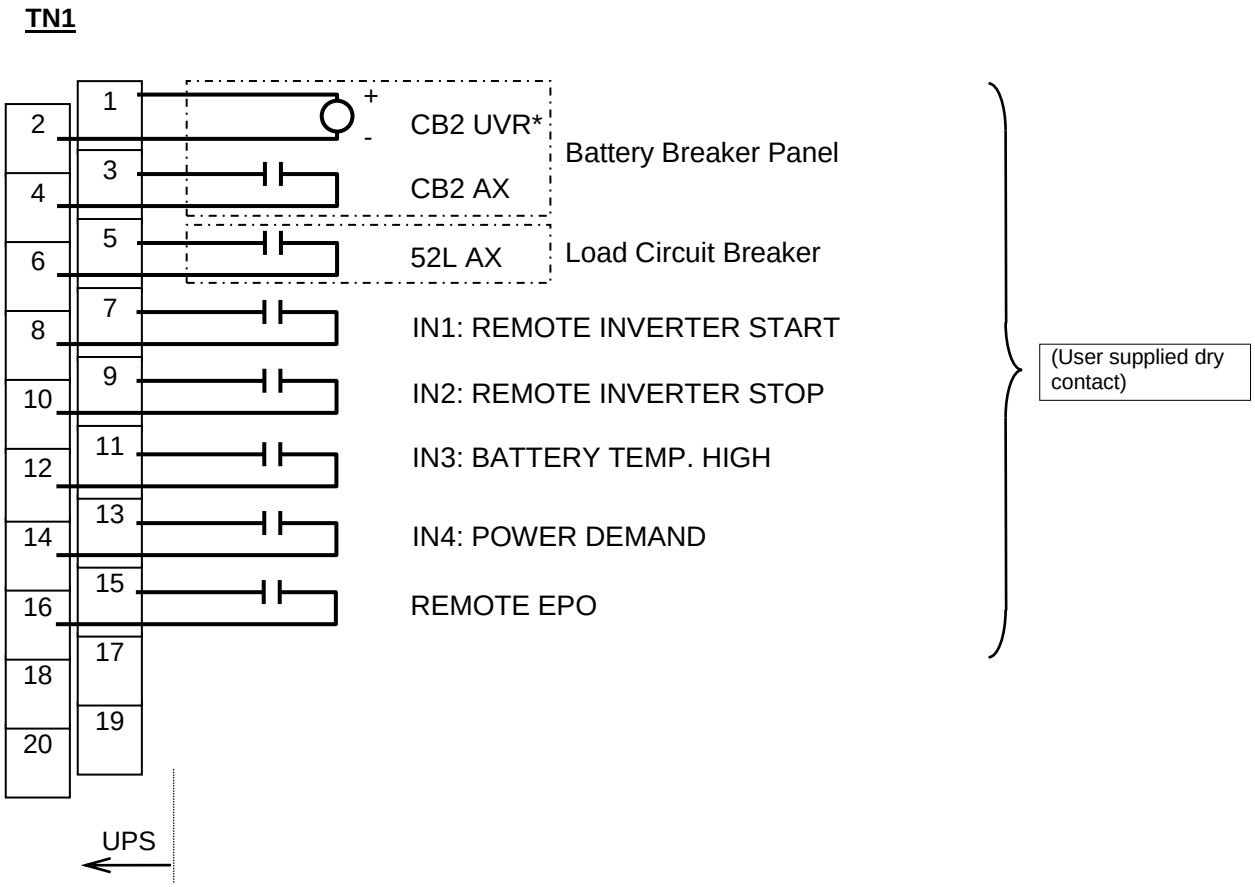


Figure 4-19 External Signal Terminal Block – TN1 (NEC Class2)

NOTE: For multiple battery cabinets, the UVR signals must be connected in parallel with UPS TN1-1 &-2.
For multiple battery cabinets, the Auxiliary Switches must be wired in series with UPS TN1-3 & -4.

The UPS is equipped with programmable input contact parameters.
The above items are the default settings.
Contact Toshiba International Corporation for setup information.

NOTE

*** UVR is required for proper operation of system. If the UVR is not present or it is not properly installed, the system warranty is voided. If you encounter this condition, stop and do not continue with start-up. (See Figure 4-19 and Figure 5-3 for connection.)**

CAUTION

The input logic can be reversed by setting the Active Level to "Neg" when selecting the input function. This will be annunciated on the Setup screen for the inputs by an "R" next to the Input Port.

For Example:

"**IN1 1**" indicates the UPS will remote start when contact closes.

"**IN1 R1**" indicates the UPS will remote start when contact opens.

CAUTION

In all cases, a switch having a protective cover is recommended in order to reduce the possibility of accidental operation.

The available programmable Input parameters are detailed in Table 4–1.

Table 4–1 External Input Functions

Code	Function	Description
0	**NONE**	
1 *	**REMOTE START**	Starts UPS inverter from remote location. Use momentary (0.5 to 4 sec.) switches only. *This is the default setting on IN1*
2 *	**REMOTE STOP**	Stops UPS inverter from remote location. Use momentary (0.5 to 4 sec.) switches only. *This is the default setting on IN2*
3	**POWER DEMAND 1**	Driven by any customer-provided NO (Normally Open) dry contact. Closing the contact limits the input current to a value (10-150% of the UPS's rated input) set in the TEST MENU – "Power Demand Level 1" by an Authorized Toshiba Service Provider. Opening the contact returns the UPS to its normal operation parameters. *This is the default setting on IN4*.
4 *	**POWER DEMAND 2**	Driven by any customer-provided NO (Normally Open) dry contact. Closing the contact limits the input current to a value (10-150% of the UPS's rated input) set in the TEST MENU – "Power Demand Level 2" by an Authorized Toshiba Service Provider. Opening the contact returns the UPS to its normal operation parameters.
5	**BATTERY LIQUID LOW**	Annunciates "UF158 BATTERY LIQUID LOW", and is used with an electrolyte level sensor in a wet cell battery system.
6 *	**BATTERY TEMP ABNORMAL**	Driven by any customer-provided NO (Normally Open) dry contact thermal detection device installed in the UPS's Battery Cabinet(s). When the contact closes, the UPS decreases its battery charging maximum limit to 95% of the set charging voltage. If the contacts stay closed (the battery temp is still abnormal) for two hours, the UPS will shut off its battery charger. (Battery operation will still possible) *This is the default setting on IN3*
7	**GENERATOR RUN**	Inhibits transfer to bypass.
8	**ASYNCHRONOUS**	Inverter operates in free run mode. (In other words, inverter does not track bypass as sync source.)
9	**ANOTHER BUS SYNC**	Inverter will sync to an external source. For use with External Sync packages.
10	**REMOTE INVERTER (MMS)**	Remotely changes the operating mode of all UPS in an MMS system from "On Bypass" to "On-line".
11	**REMOTE BYPASS (MMS)**	Remotely changes the operating mode of all UPS in an MMS system from "On-line" to "On Bypass".
12	**EXT.BYP dV STR**	Inverter voltage is adjusted to match bypass voltage.
13	**USE IB LIMIT 2**	Changes the Battery Charge Current to a different preset level. This level is set in the TEST MENU by an Authorized Toshiba Service Provider.
14	**CHARGER STOP**	Battery charger will be stopped.
15	**EXTERNAL ALARM**	Annunciates "UA890 EXTERNAL ALARM".
16	**CB2 EX**	Provides for another aux battery breaker (CB2) contact, similar in function to the standard battery aux contact.
17	**CHARGE DEVICE ERR**	Energy storage device error signal. Mainly used with flywheels to annunciate recharge fault.
18	**CB1 ON IL**	Stops the rectifier converter remotely.
31	**TRACE TRIGGER**	For use with the internal wave capture tool; for use by Authorized Toshiba Service Providers.

*Default Settings from Factory.

4.4.2 Output Contacts (for external alarm annunciation)

Output contacts consist of form “A”(NO) dry type contacts. Rated capacity of all output contacts is NEC Class2 (30Vdc/1Adc). All dry contacts should be operated at their rated values or lower. Figure 4-20 illustrates a typical installation. The external relay can also be a lamp, LED, computer, etc.

These eight output contacts can be programmed to provide any of the parameters listed in Table 4–2.

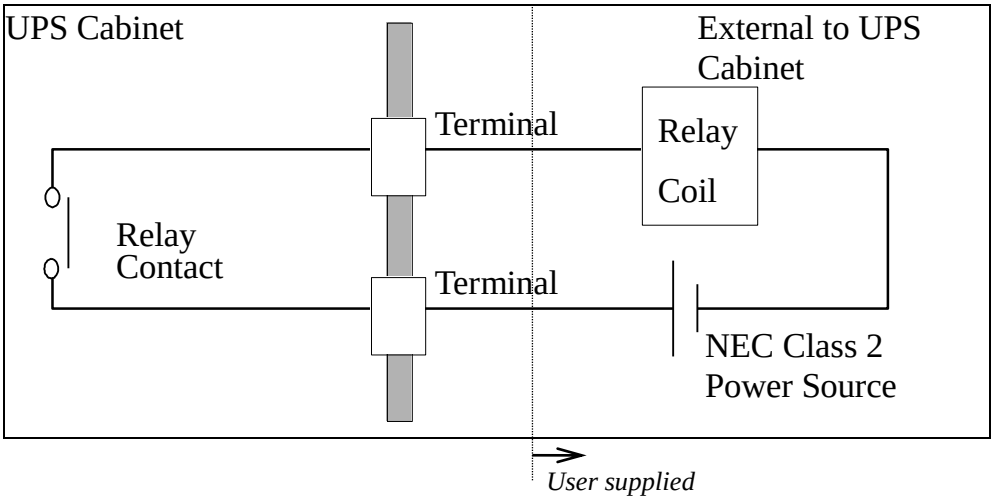


Figure 4-20 Control Wiring for External Contacts

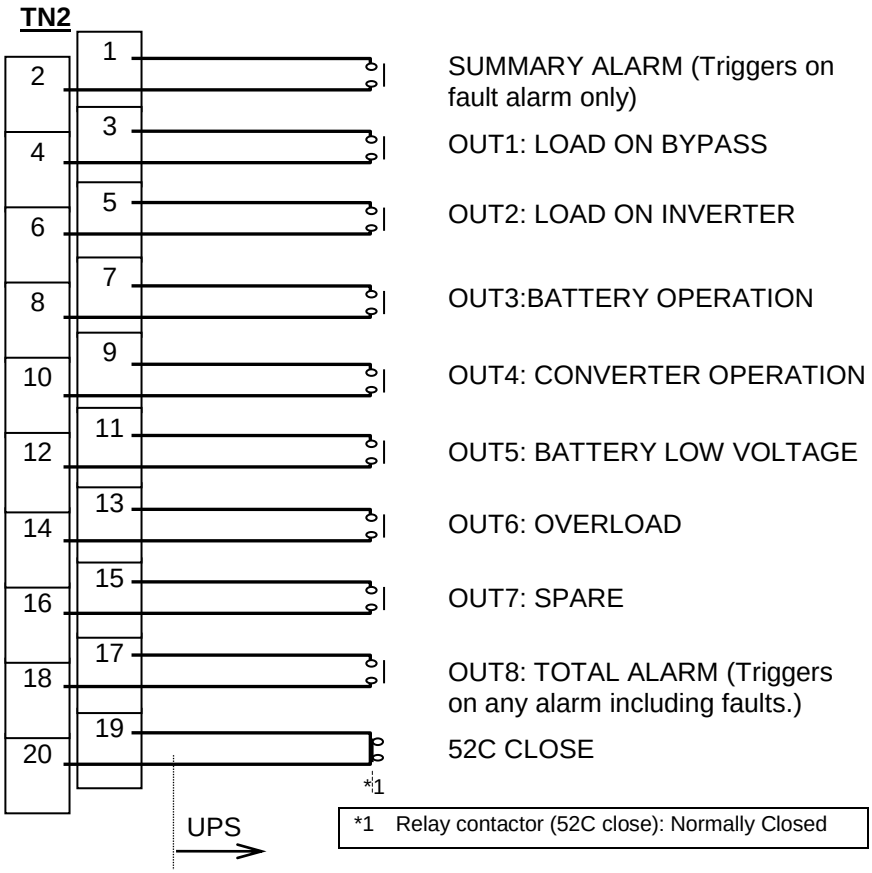


Figure 4-21 External Signal Terminal Block – TN2 (NEC Class2)

Table 4–2 TN2 Output Contact Alarm Programming Options

Code	Function	Description
0	NONE	
1 *	TOTAL ALARM	Summary alarm; activated only when a minor or major fault, or alarm has occurred with the system. *This is the default setting on OUT8.*
2 *	MINOR FAULT**	Activated when a minor fault has occurred with the system.
3	ALARM	Activated when an alarm has occurred with the system.
4	AC INPUT ABNORMAL	Activated when the input voltage or frequency is abnormal.
5	BYPASS ABNORMAL	Activated when the bypass voltage or frequency is abnormal.
6	BATTERY ABNORMAL	Activated when the battery is abnormal.
7	BATTERY LOW VOL.1	Activated when the battery voltage drops below Discharge Warning Voltage Level 1 during inverter operation. This level is set in the TEST MENU by an Authorized Toshiba Service Provider.
8 *	BATTERY LOW VOL.2	Activated when the battery voltage drops below Discharge Warning Voltage Level 2 during inverter operation. This level is set in the TEST MENU by an Authorized Toshiba Service Provider. *This is the default setting for OUT5.*
9	BATTERY DEPLETION	Activated when the battery voltage drops below discharge end voltage level during backup operation.
10 *	OVERLOAD	Activated when an overload of 105% or more had occurred to the system. *This is the default setting on OUT6.*
11	OVERLOAD PREALARM	Activated when the load goes over 100%. This level is adjustable by an Authorized Toshiba Service Provider.
12	FAULT GROUP 1	Activated when the preset group of alarms (Fault Group 1) all occur to the system at once. These groups are set in the TEST MENU by an Authorized Toshiba Service Provider.
13	FAULT GROUP 2	Activated when the preset group of alarms (Fault Group 2) all occur to the system at once. These groups are set in the TEST MENU by an Authorized Toshiba Service Provider.
14	BYPS.SYNCHRONOUS	Activated when the inverter voltage and bypass voltage are synchronous.
15	BYPS.ASYNCHRONOUS	Activated when the inverter voltage and bypass voltage are asynchronous.
16	REMOTE OPE.ENABLE	Activated when any remote operation occurs (Stop/Start Inverter, etc.)
17 *	LOAD ON INVERTER	Activated when the power is supplied from the inverter. *This is the default setting on OUT2.*
18 *	LOAD ON BYPASS	Activated when the power is supplied by the bypass. *This is the default setting on OUT1.*
19	LOAD ON AC	Activated when the power is supplied from the input via the UPS's rectifier/converter - inverter.
20 *	BATTERY OPERATION	Activated when the battery is operating following an AC power failure. *This is the default setting on OUT3.*
21 *	CONVERTER OPERATION	Activated when the converter is operating. *This is the default setting on OUT4*
22	INVERTER OPERATION	Activated when the inverter is operating.
23	CB1 CLOSE	Activated when CB1 (Input Contactor) is closed.
24	CB2 CLOSE	Activated when CB2 (Battery Breaker) is closed.
25	52S CLOSE	Activated when 52S (Bypass Contactor) is closed.
26	POWER DEMAND ON	Activated when a Power Demand is activated by one of the Inputs.
27	EQUALIZING CHARGE	Activated when the UPS is charging the batteries at the equalizing charge level. This command boosts the charge voltage (500-640 V) for a preset duration (0-100 hr.)
28	ANOTHER BUS SYNC.OK	Annunciates that the UPS is successfully synchronized to an external source

*Default Settings from Factory.

** “Minor Fault” refers to a warning of a condition where the UPS is operating abnormally or there is potential for a major fault.

4.5 RemotEye® 4 INTRODUCTION

The RemotEye® 4 is available as a UPS system monitoring tool. The RemotEye® supplies a network function to monitor UPS units via Simple Network Management Protocol (SNMP) and Hypertext Transfer Protocol (HTTP) methods.

The RemotEye® 4 module is installed at the rear of the front door in G9000 UPS units. The configuration of the RemotEye® 4 is shown in Figure 4-22.

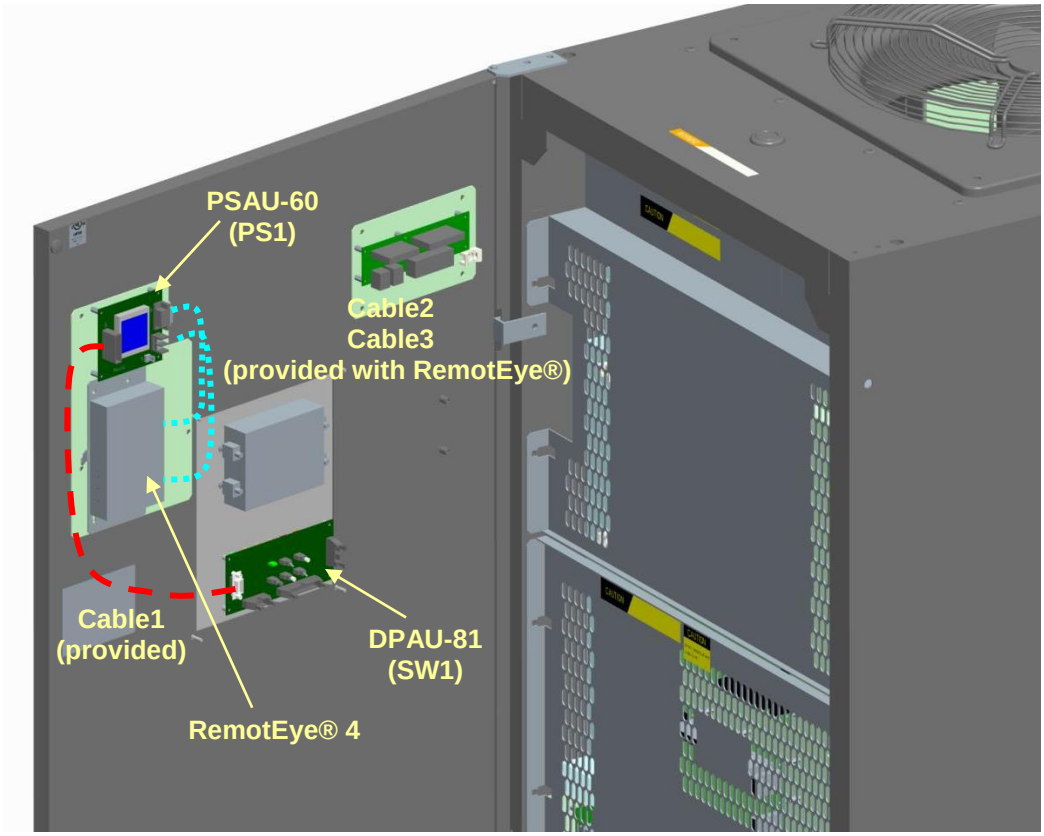


Figure 4-22 RemotEye® 4 Configuration

** Consult Toshiba International Corporation or visit below URL for details on "RemotEye® 4" monitoring software and its capabilities.*

https://www.toshiba.com/tic/power-electronics/uninterruptible-power-systems/ups-monitoring-solutions/RemotEye®4

The Power Supply PCB (PSAU-60, designated as PS1) and the Cable1 (designated as 3BBA0083P001) are equipped with G9000 UPS units.

The Cable2 (D-sub 9pin) and the Cable3 (12V power cable) are included in the RemotEye® 4 package.

The Power Supply PCB (PS1) provides connectivity between the Display Control PCB (DPAU-81, designated as SW1) and the RemotEye® 4 module in G9000 UPS units.

The RemotEye® II communicates with the UPS via a Cable2. The connection is described in Figure 4-23 below.

CAUTION

The UPS has to be de-energized when the RemotEye® 4 module is installed for safety reason.

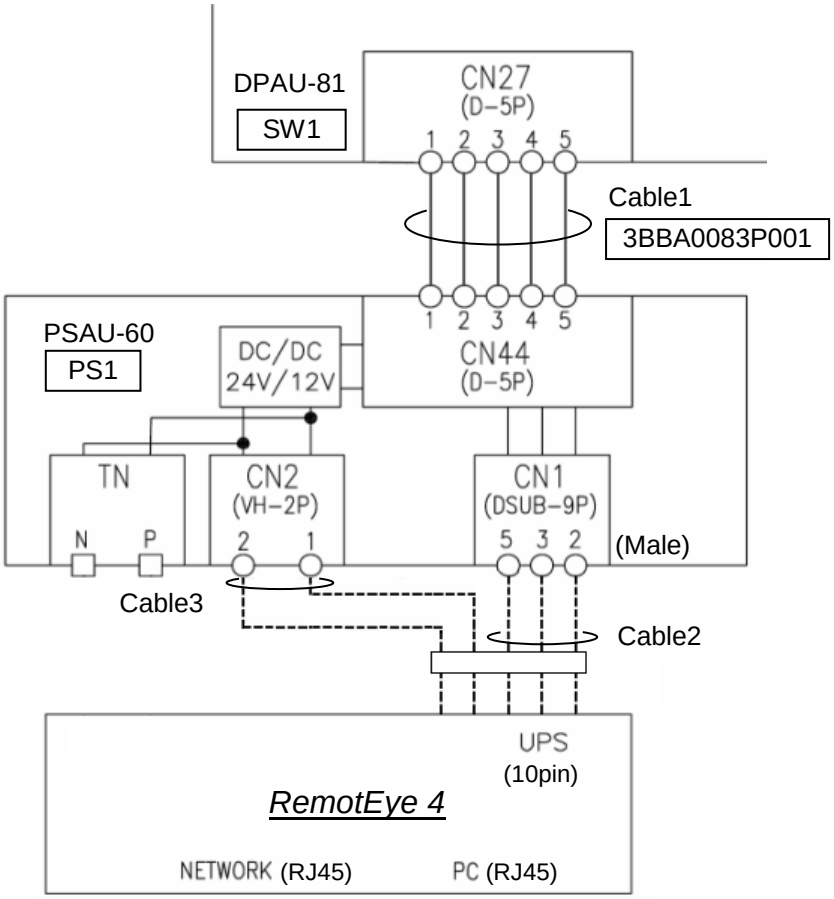


Figure 4-23 Connection between Display Control PCB (SW1) and RemotEye® 4 Module

The parts (included RemotEye® 4) for UPS monitoring are listed below.

Table 4–3 Parts List for UPS Monitoring

Parts No.	Part name	Qt'y
1	Power supply PCB (PS1): PSAU-60*	1
2	Cable1: 3BBA0083P001	1
3	RemotEye® 4 module	1
4	Cable2: D-sub 9-pin to RJ45 Cable	1
5	Cable3: 12V Power Cable	1

* – PCB revision suffix may be applied.

Figure 4-24 PSAU-60 PCB (PS1)

Connected with
3BBA0083P001(Cable1)
Shown in FIGURE 2.17.

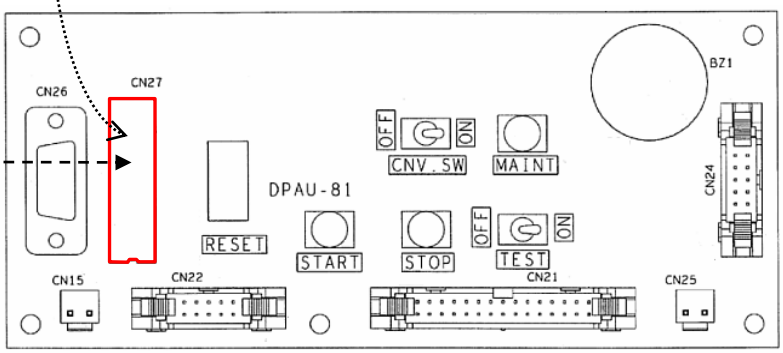


Figure 4-25 DPAU-81 (SW1)

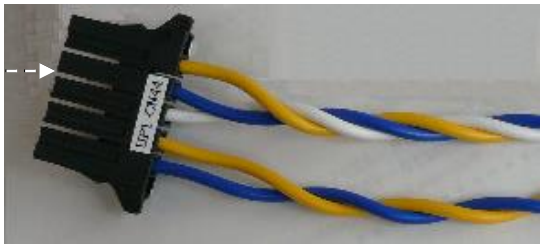
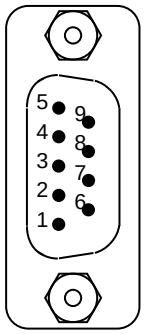


Figure 4-26 3BBA0083P001 (Cable1)

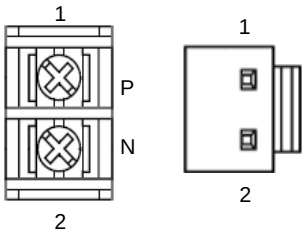
4.6 CONNECTOR DEFINITION



D-SUB 9Pin (male)

DB9	Description	
Pin 1	-	Not used
Pin 2	RXD	Receive Data
Pin 3	TXD	Transmit Data
Pin 4	-	Not used
Pin 5	GND	Signal Ground
Pin 6	-	Not used
Pin 7	-	Not used
Pin 8	-	Not used
Pin 9	-	Not used

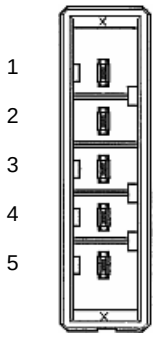
Figure 4-27 Connector (CN1) of PSAU-60 (PS1)



Terminal Block 2Pin VH 2Pin

TB2	Description	
Pin 1	+12VS	+12VDC
Pin 2	GND(S)	+12VDC ground

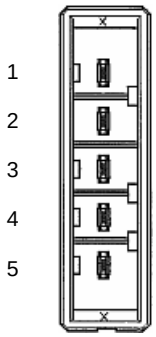
Figure 4-28 Terminal Block (TN) and VH connector (CN2) of PSAU-60 (PS1)



D3200 5Pin (contact)

D5	Description	
Pin 1	RXD	Receive data
Pin 2	TXD	Transmit data
Pin 3	GND	Signal ground
Pin 4	+24VS	+24VDC
Pin 5	GND(S)	+24VDC ground

Figure 4-29 Connector (CN44) of PSAU-60 (PS1)



D3200 5Pin (contact)

D5	Description	
Pin 1	RXD	Receive data
Pin 2	TXD	Transmit data
Pin 3	GND	Signal ground
Pin 4	+24VS	+24VDC
Pin 5	GND(S)	+24VDC ground

Figure 4-30 Connector (CN27) of DPAU-60 (SW1)

5 INSTALLATION AND OPERATION

5.1 TRANSPORTATION AND INSTALLATION

Table 5–1 How to Transport and Install the System

Transportation	Installation
Transport unit with forklift. If carry by overhead crane, use four M12 eyebolts. (Provided by Others)	Using the pre-drilled holes in the UPS channel base, anchor the unit using appropriate hardware. (Provided by Others)

PROHIBIT

Do not transport UPS cabinet laid horizontally.

Cabinets must be maintained upright within ± 15° of the vertical during handling.

NOTE

Floor shall be flat and level. 3 inches surrounding mounting holes shall be flush with cabinet mounting rails.

5.2 INSTALLATION PROCEDURE

A) Note the load tolerance of the floor

Refer to Table 5–2 for list of UPS weights.

Table 5–2 List of UPS Weights

UPS Capacity (kVA)	100	160	225
Weight lb. (kg)	775 (350)	860 (390)	1080 (490)

B) Minimum clearance required for ventilation

Right side ..... 1 inch (25 mm) (not required when sidecars are used)

Left side ..... 1 inch (25 mm) (not required when sidecars are used)

Back side ..... 0.0 inch (0 mm)

Top side ..... 20 inches (500 mm) (for air flow)

C) Space requirement for routine maintenance

Allow for the following space at the time of installation.

Front ..... 40 inches (1000 mm)

Sides ..... 0.0 inch (0 mm)

Back side ..... 0.0 inch (0 mm)

Top side ..... 20 inches (500 mm)

D) External Battery Supply

Please refer to the following when installing and maintaining batteries:

NOTE

1. The customer shall refer to the battery manufacturer's installation manual for battery installation and maintenance instructions.
2. The maximum permitted fault current from the remote battery supply, and the DC voltage rating of the battery supply over-current protective device are shown in Table 5–3.

Table 5–3 Maximum Permitted Fault Current

UPS Capacity (kVA)	DC Voltage Rating (V)	Maximum Fault Current Permitted (A)
100	480	25,000
160	480	25,000
225	480	25,000

5.3 PROCEDURE FOR CABLE CONNECTIONS

1. Confirm the capacity of the UPS being installed. Identify the input/output power terminal blocks accordingly as shown in the Figure 5-1 and Figure 5-2.

2. Connect the internal control wire and power wire.
   (1) Control wire Inter-connect
      a) CB2 UVR to terminal TN1-1, 2 of external I/F PCB IOAU-09.

CAUTION

UVR is required for proper operation of system. If the UVR is not present or it is not properly installed, the system warranty is voided. If you encounter this condition, stop and do not continue with start-up. (See Figure 4-19 and Figure 5-3 for connection.)

      b) CB2 ON Auxiliary to terminal TN1-3, 4 of external I/F PCB IOAU-09.
   (2) Power wire (AC input, Bypass input, AC output) Inter-connect
      a) From user's distribution panel
         1. X1 (A-phase) to A bus bar in UPS
         2. X2 (B-phase) to B bus bar in UPS
         3. X3 (C-phase) to C bus bar in UPS
      b) DC Input to UPS
         1. Positive cable to BP bus bar in UPS
         2. Negative cable to BN bus bar in UPS

NOTE

After the completion of the input power cables connection:
With a phase rotation meter, check that the phase rotation of the AC Input power terminals A, B and C as well as the Bypass Input power terminals A40, B40 and C40 are correct. The proper phase rotation is clockwise A(R) → B(S) → C(T).

3. Connect the grounding conductor from the input service entrance to the UPS Ground Bar (E).

REQUIRED

4. Two (2) sources feeding the UPS:

(1) Connect the AC input power cables from the input service entrance to the AC input power terminals, identified as A, B, C in Figure 5-1 and Figure 5-2. Input cables must be sized for an ampere rating larger than the maximum input drawn by the converter. (Refer to equipment nameplate for current ratings.) Confirm that an external bypass input circuit breaker (MCCB) is installed (refer to WARNING 4, page 5). Connect the bypass input power cables from the input service entrance to the bypass input power terminals, identified as A40, B40 and C40 in Figure 5-1 and Figure 5-2. Bypass input cables must be sized for an ampere rating larger than the maximum output current capacity of the UPS. Refer to Table 5–4 for recommended cable sizes.

(2) Connect the external signal terminal blocks (TN1 & TN2) as desired. Refer to Section 4.4 and Figure 4-18 through Figure 4-21 for functional description. 14 AWG ($2mm^2$), or less, shielded conductor is recommended.

5. One (1) source feeding the UPS:

(1) Confirm that an external input circuit breaker sized to protect both the AC input and the bypass line is installed. (Refer to equipment nameplate for current ratings.) Connect the bypass input power cables from the input service entrance to the bypass input power terminals, identified as A40, B40 and C40 in Figure 5-1 and Figure 5-2. Input cables must be sized for an ampere rating larger than the maximum current capacity of the UPS. Refer to Table 5–4 for recommended cable sizes.

(2) Using adequately sized conductors and referring to the appropriate Figure identified in Figure 5-1 and Figure 5-2, connect jumper bypass terminals A40, B40, C40 to AC input power terminals A, B, C as identified in Figure 5-1 and Figure 5-2.

(3) Connect the external signal terminal blocks (TN1 & TN2) as desired. Refer to Section 4.4 and Figure 4-18 through Figure 4-21 for functional description. 14 AWG (2mm^2), or less, shielded conductor is recommended.

NOTE

1. Confirm that all UPS internal contactors (breakers) "CB1", "CB2", and "CB3" are open before energizing UPS.

2. UPS power terminals are supplied with stud type fittings.

It is recommended that compression lugs be used to fasten all input/output power cables.

6. Procedure for Cable Connections for Parallel Operation System

(1) Confirm the number of units to be connected in parallel. Identify the input/output power terminal blocks and control wire connections for parallel operation systems as shown in the appropriate Figure 5-4 and Figure 5-5.

(2) Connect the external control wire and power wire.

NOTE

Use Ethernet STP (Shielded Twisted Pair) Cable for all communication cabling.

Use of UTP (Unshielded Twisted Pair) Cable may cause a malfunction.

a) Control wire connection

Parallel configuration wiring (Refer to Figure 5-4 and Figure 5-5)

52L control signal from Toshiba Tie Cabinet (TTC) to UPS-n IOAU-09 (TN1– 5 , 6).

Parallel control signal for CN94 as shown in Figure 5-5.

Parallel control signal for CN96 and CN95 as shown in Figure 5-5.

b) Power wire connection

From UPS AC Output Terminals to Toshiba Tie Cabinet (TTC)

(Refer to Figure 5-4 and Figure 5-5)

Table 5–4 Recommended Cable Sizes

kVA Capacity	Input Voltage	Output Voltage	Input Side		Output Side		Bypass Side		DC Input Side	
			Cable Size	Torque ft. lbs	Cable Size	Torque ft. lbs	Cable Size	Torque ft. lbs	Cable Size	Torque ft. lbs
100kVA	480V	480V	3/0 AWG	17-22 ft. lbs	3/0 AWG	17-22 ft. lbs	3/0 AWG	17-22 ft. lbs	(2) x 3/0 AWG	17-22 ft. lbs
160kVA	480V	480V	(2) x 1/0 AWG	17-22 ft. lbs	(2) x 1/0 AWG	17-22 ft. lbs	(2) x 1/0 AWG	17-22 ft. lbs	(3) x 1/0 AWG	17-22 ft. lbs
225kVA	480V	480V	(2) x 3/0 AWG	17-22 ft. lbs	(2) x 3/0 AWG	17-22 ft. lbs	(2) x 3/0 AWG	17-22 ft. lbs	(3) x 3/0 AWG	17-22 ft. lbs

*1 – Voltage drop across power cables not to exceed 2% of nominal source voltage.
*2 – Allowable ampere-capacities based on copper conductors with 75°C. insulation at ambient temperature of 40°C.
*3 – If using different cable type, rating, or in different site conditions, ensure that adjusted ampacity is equal to or larger than the sizes listed in the table.
*4 – Sized based on necessary overcurrent protection for maximum load.
*5 – The cable wire rating shown for each UPS model in this table is selected for general best fit for use on all input and outputs of the UPS. For complete set of cable rating/quantity recommendations, refer to Installation Planning Guides in Appendix A.
*6 – All wiring to be in accordance with all applicable national and/or local electrical codes.

Table 5–5 Crimp Type Compression Lug

WIRE SIZE (CODE)	WIRE STRAND CLASS	RECOMMENDATION		CRIMP TOOL REQUIRED BURNDY TYPE Y35 OR Y46	
		VENDOR	CAT. NO.	COLOR KEY	DIE INDEX
1 AWG	B I	BURNDY ILSCO BURNDY	YA1C CRA-1L YA25-LB	GREEN GREEN ---	11 / 375 11 / 375 1019
1/0 AWG	B I	BURNDY ILSCO BURNDY	YA25 CRA-1/OL YA25-LB	PINK PINK ---	12 / 348 12 / 348 1020
2/0 AWG	B I	BURNDY ILSCO BURNDY	YA26 CRA-2/OL YA27-LB	BLACK BLACK ---	13 13 1021
3/0 AWG	B I	BURNDY ILSCO BURNDY	YA27 CRB-3/OL YA28-LB	ORANGE ORANGE ---	14 / 101 14 / 101 1022
4/0 AWG	B I	BURNDY ILSCO BURNDY	YA28 CRB-4/OL YA29-LB	PURPLE PURPLE ---	15 15 1023
250 MCM	B I	BURNDY ILSCO BURNDY	YA29 CRA-250L YA30-LB	YELLOW YELLOW ---	16 16 1024
300 MCM	B I	BURNDY ILSCO BURNDY	YA30 CRA-300L YA32-LB	WHITE WHITE ---	17 / 298 17 / 298 1026
350 MCM	B I	BURNDY ILSCO BURNDY	YA31 CRA-350L YA34-LB	RED RED ---	18 / 324 18 / 324 1027
400 MCM	B I	BURNDY ILSCO BURNDY	YA32 CRA-400L YA36-LB	BLUE BLUE ---	19 / 470 19 / 470 1027
500 MCM	B I	BURNDY ILSCO BURNDY	YA34 CRA-500L YA38-LB	BROWN BROWN ---	20 / 299 20 / 299 1029

NOTE: When using crimp type lugs, the lugs should be crimped to the specifications given in the manufacturer's instructions for both crimp tool and lug.

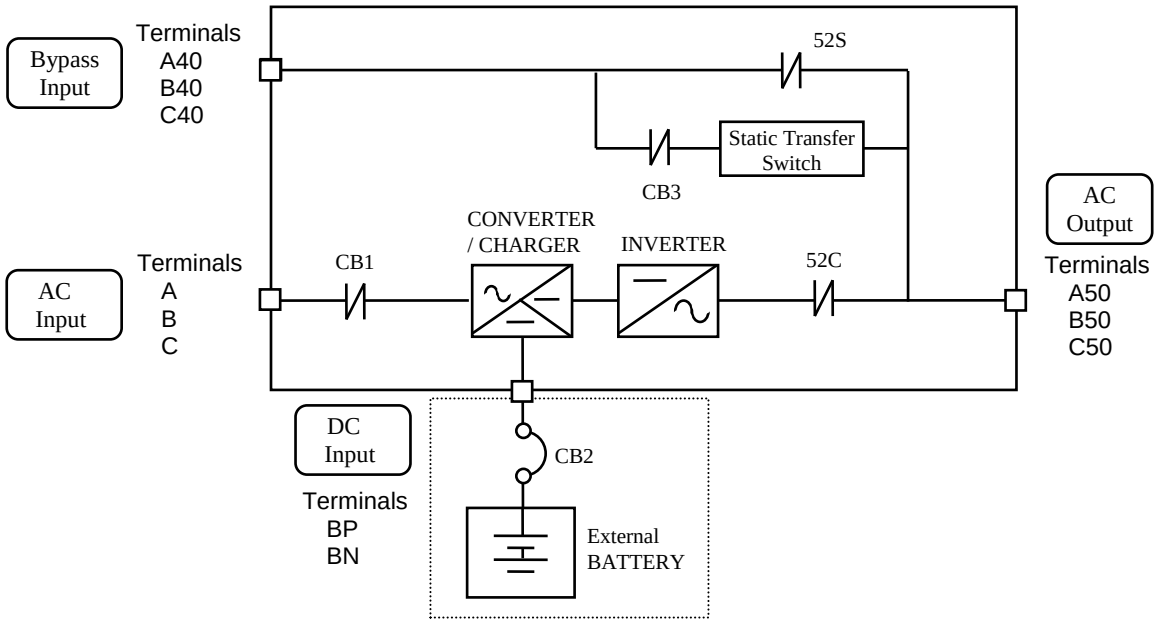


Figure 5-1 UPS Terminal Designations

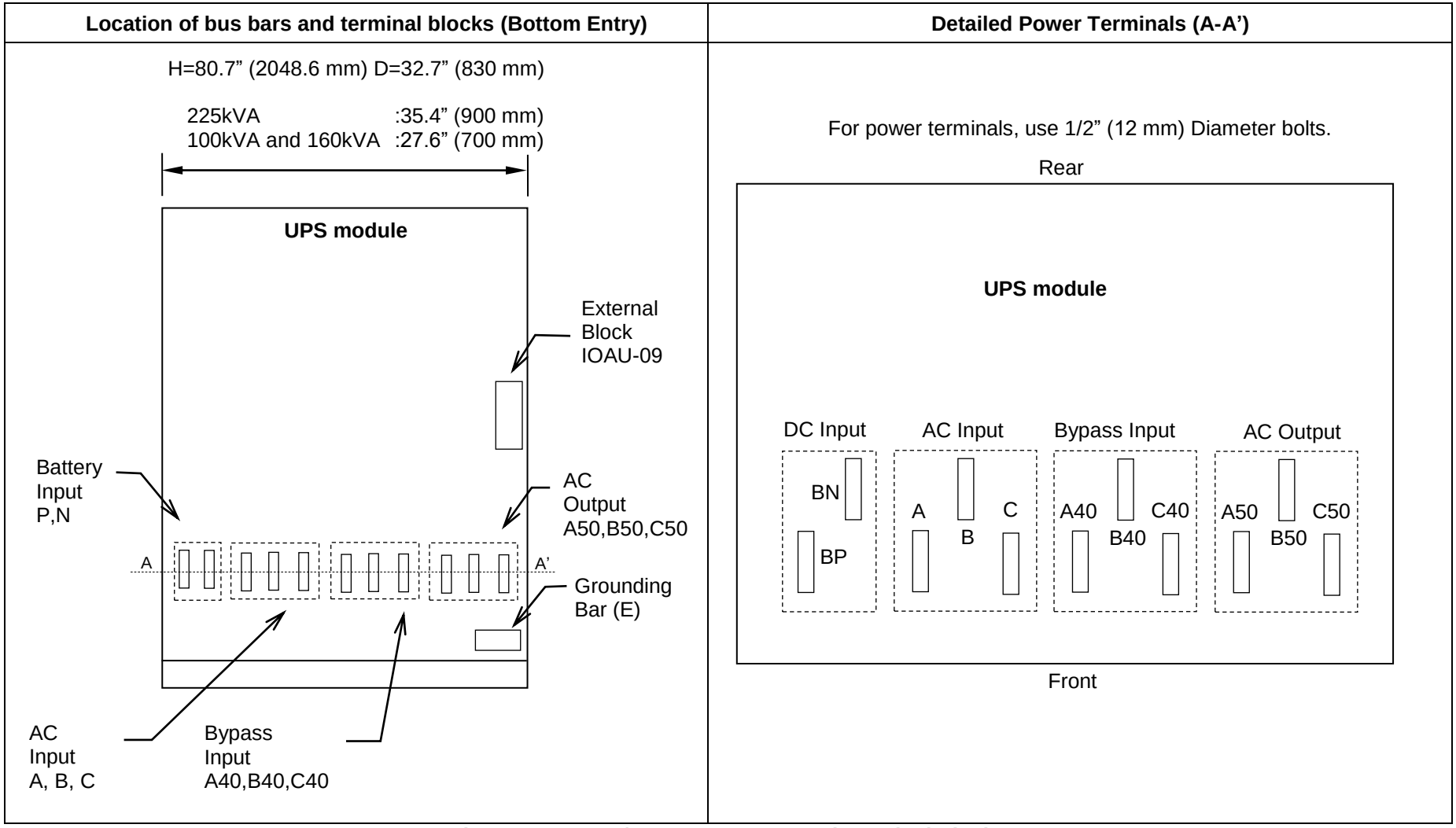


Figure 5-2 Input/Output Bus Bars and Terminal Blocks

NOTE

UVR is required for proper operation of system. If the UVR is not present or it is not properly installed, the system warranty is voided. If you encounter this condition, stop and do not continue with start-up. (See Figure 4-19 and Figure 5-3 for Connections)

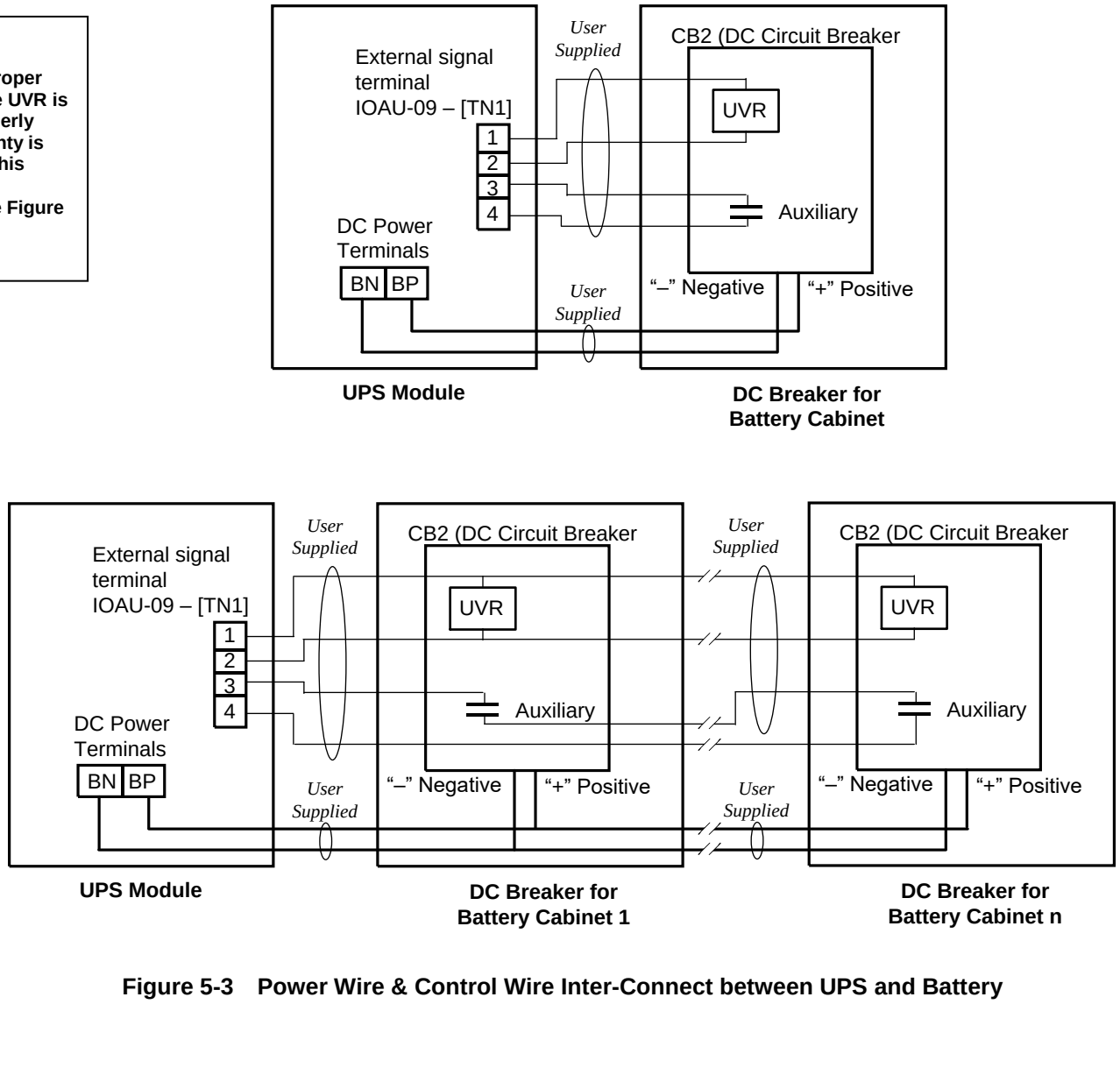


Figure 5-3 Power Wire & Control Wire Inter-Connect between UPS and Battery

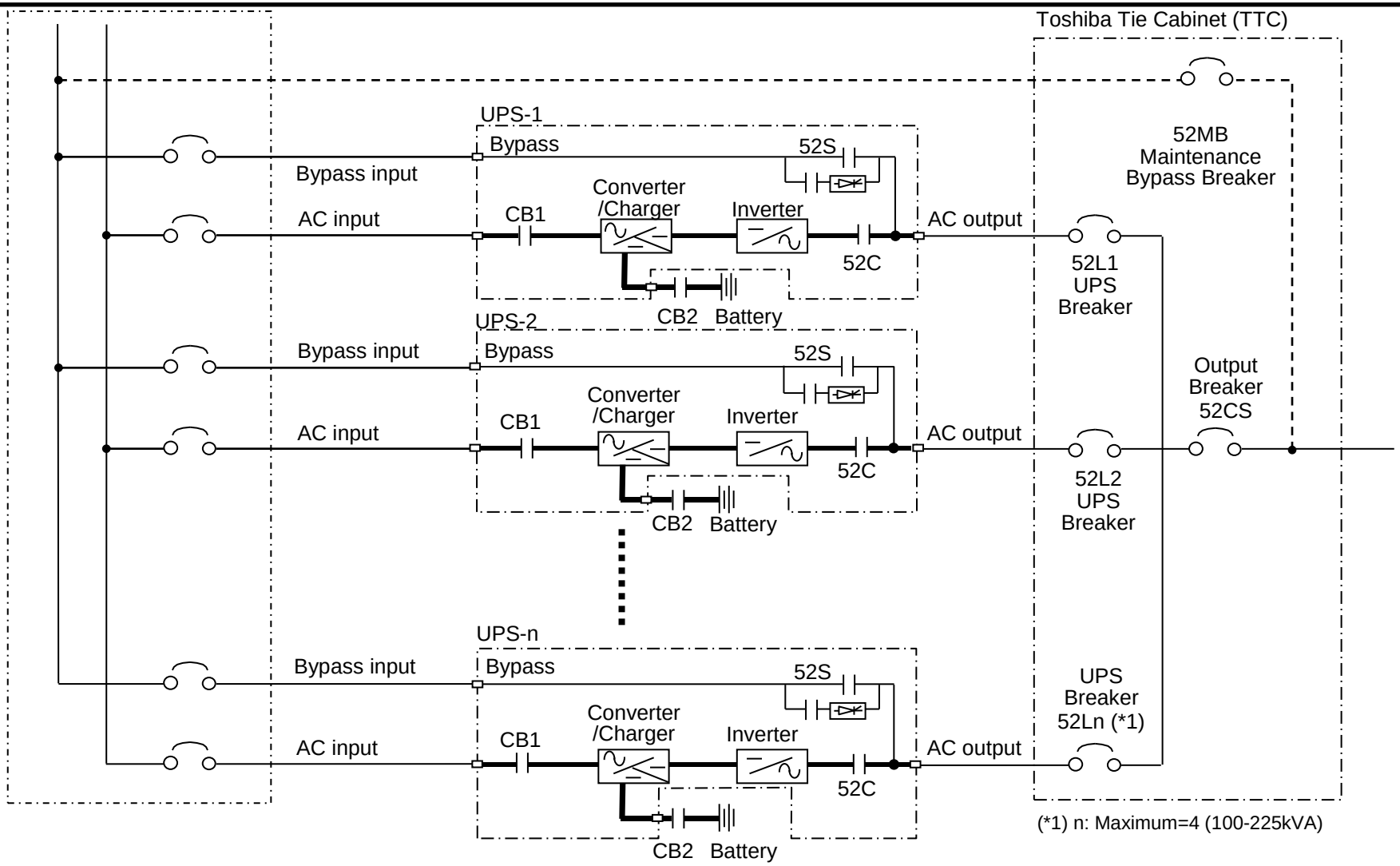


Figure 5-4 Power Wire Connections (Parallel System Configuration)

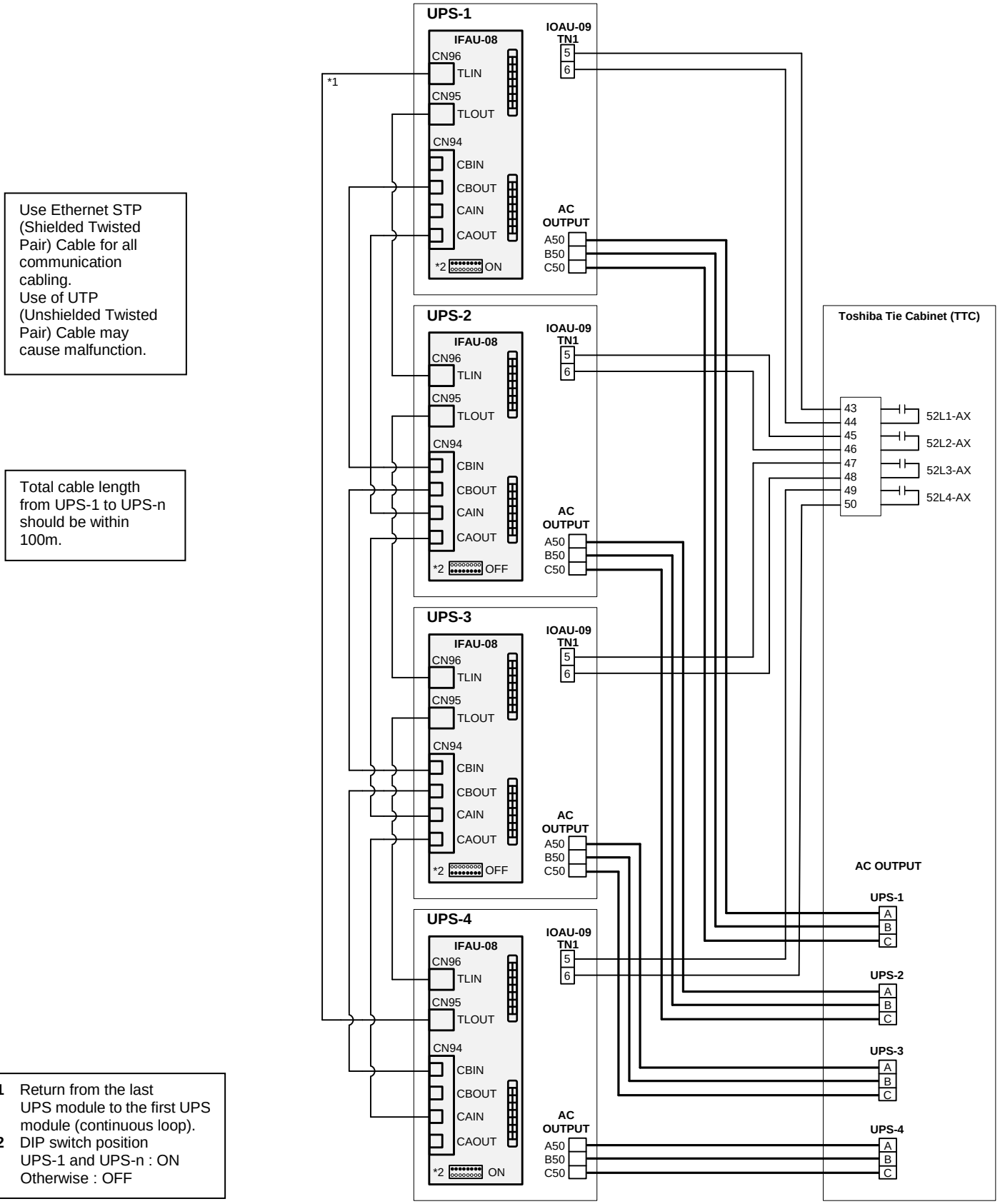


Figure 5-5 Power Wire & Control Wire Connections for 4 units in MMS Configuration

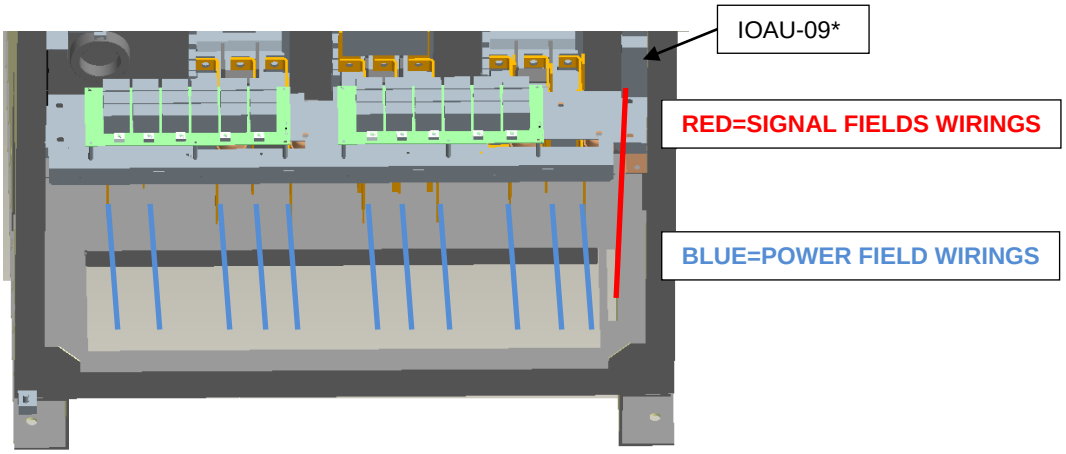


Figure 5-6 Cable Entry on Bottom (Example of 225kVA)

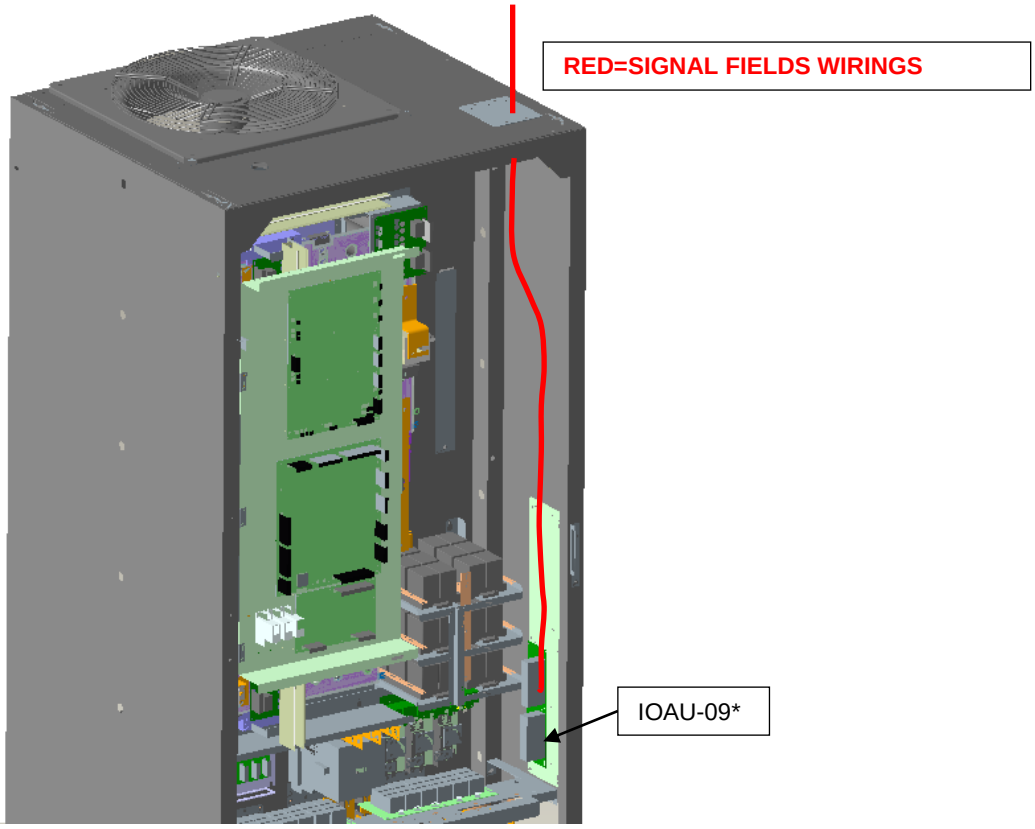


Figure 5-7 Cable Entry on Top (Example of 225kVA)

5.4 OPERATING PROCEDURES

NOTE: To avoid inadvertently placing the UPS online or offline the START and STOP switches must be pressed and held for a period of several seconds to execute the command.

- START – Press and hold the START switch for approximately 2 seconds.
- STOP – Press and hold the STOP switch for approximately 5 seconds.

For Parallel Operation system, refer to section "D) MMS Start-up Procedure".

(Parallel Operation system is herein after MMS [Multi Module System])

On-screen guidance for Starting and Stopping the UPS can be obtained by pressing the OPERATION tab icon.

A) Start-up Procedure

NOTE

Before the UPS startup, the internal Bypass line starts to supply the unconditioned bypass input power to the load if the External input (or Bypass) Circuit Breaker is closed. Be extremely careful with closing the External input (or Bypass) Circuit Breaker.

Confirm the position of the circuit protectors (CPMC, CPMS and EMB) located at the middle part of the cabinet.

1) CPMC and CPMS: ON;

2) EMB: OFF.

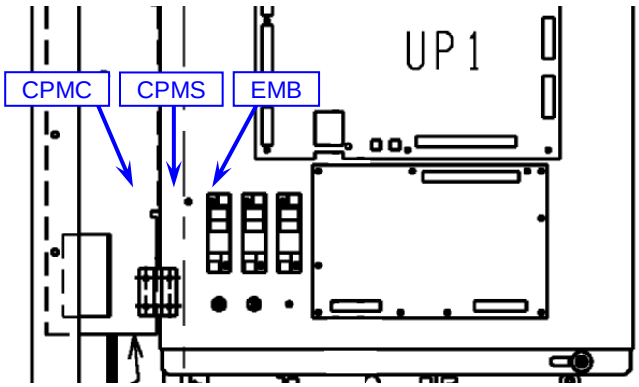


Figure 5-8 Circuit Protectors Location

a.) Verify that the External Bypass Input Circuit Breaker for each unit is closed. (user supplied)

b.) Verify that Battery Disconnect Circuit Breaker (CB2) is opened or in tripping position. (user supplied)

c.) If a dual source is feeding the UPS, close the External AC Input Circuit Breaker manually (user supplied).

d.) The LCD panel boots up automatically, and the screen will show that the Load is powered by bypass line.

e.) On the LCD panel, select "OPERATION" tab, and then press the "STARTUP GUIDANCE" button to continue UPS start-up. (Refer to Figure 4-4)

NOTE: On the initial startup of the G9000, both the Bypass (52S) and the Inverter (52C) contactors will be open (Figure 5-9b). After the initial startup, the UPS will subsequently startup in Bypass mode (Figure 5-13).

f.) **FOR GUIDANCE IN STARTING THE UPS**, select "OPERATION" tab on the LCD panel, then press the "STARTUP GUIDANCE" icon (Figure 4-3) and follow the on-screen directions to continue UPS start-up (Figure 4-4). (The directions are the same as given in the following steps.)

OR remain on the "MAIN" tab and continue with step g)..

NOTE

When "REMOTE OPERATION MODE" is displayed on the LCD panel, the inverter start operation can only be performed remotely. If local inverter start operation is required (at the UPS), select "LOCAL ONLY" or "REMOTE & LOCAL" in the OPERATION MENU.

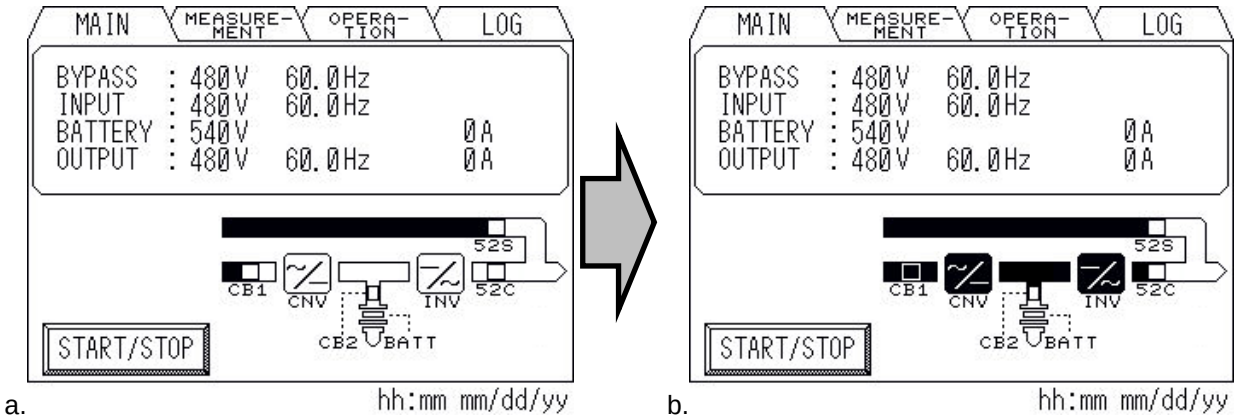


Figure 5-9 Automatic Startup of Inverter and Converter

g) Close the Battery Breaker. (The START/STOP icon will not work until the battery breaker is closed.) The display will show CB2 is closed and the battery backup is now online. (Figure 5-10)

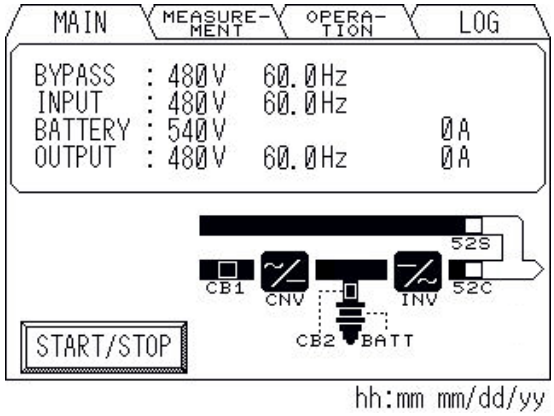


Figure 5-10 Close Battery Breaker

h) Press the STOP/START icon on the display, then press and hold the START button (Figure 5-11a) for two (2) seconds until the UPS transfers to load on INV. (Figure 5-11b)

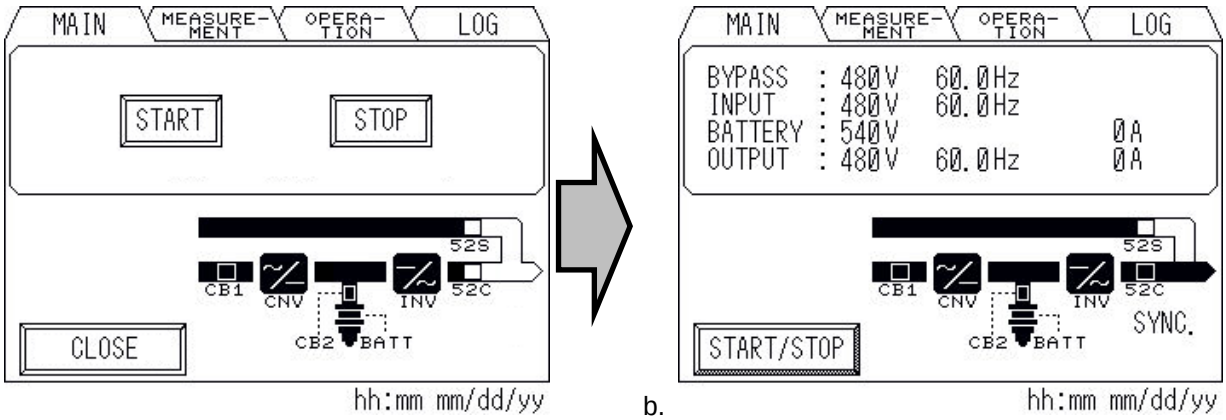


Figure 5-11 Press and Hold START Button

When "REMOTE OPERATION MODE" is displayed on the LCD panel, the inverter start operation can only be performed remotely. If local inverter start operation is required (at the UPS), select "LOCAL ONLY" or "REMOTE & LOCAL" in the OPERATION MENU.

NOTE

B) Transfer from Online to Bypass Procedure

Transfer to Bypass to remove power from the inverter but continue to provide utility power to the critical load.

a) Press the "START/STOP" icon from the “MAIN” Menu on the LCD.

b) On the LCD panel, press and hold STOP for five (5) seconds. (Figure 5-11a)

c) The UPS transfers to Bypass. (Figure 5-12) The Bypass contactor (52S) closes and the Inverter contactor (52C) opens. (Figure 5-12b)

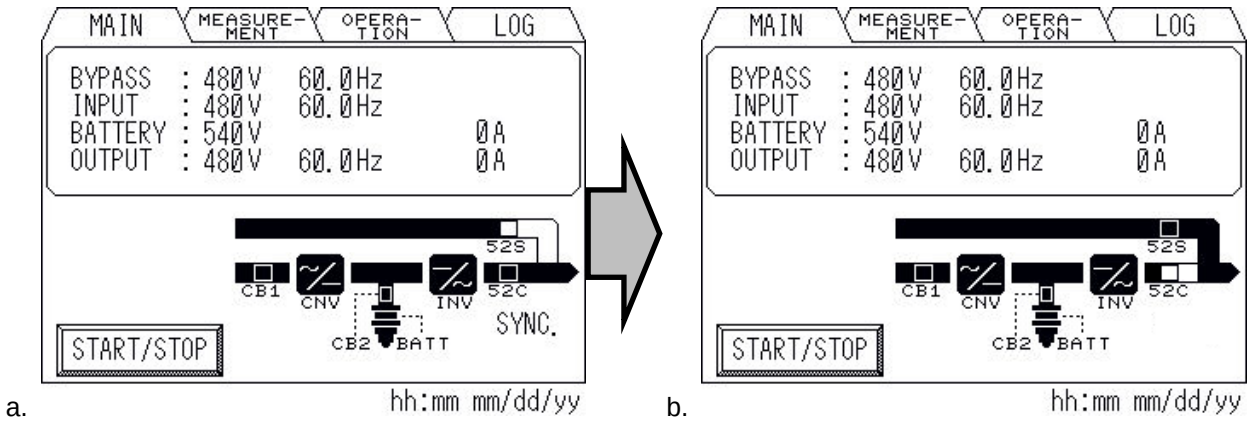


Figure 5-12 Transfer from Online to Bypass

C) Transfer from Bypass to Online Procedure

Transfer from Bypass to Online to provide the load with conditioned, reliable power.

a) Press the "START/STOP" icon from the “MAIN” Menu on the LCD.

b) On the LCD panel, press and hold START for two (2) seconds.

c) The UPS transfers to Online. The Bypass contactor (52S) opens and the Inverter contactor (52C) closes. (Figure 5-12a)

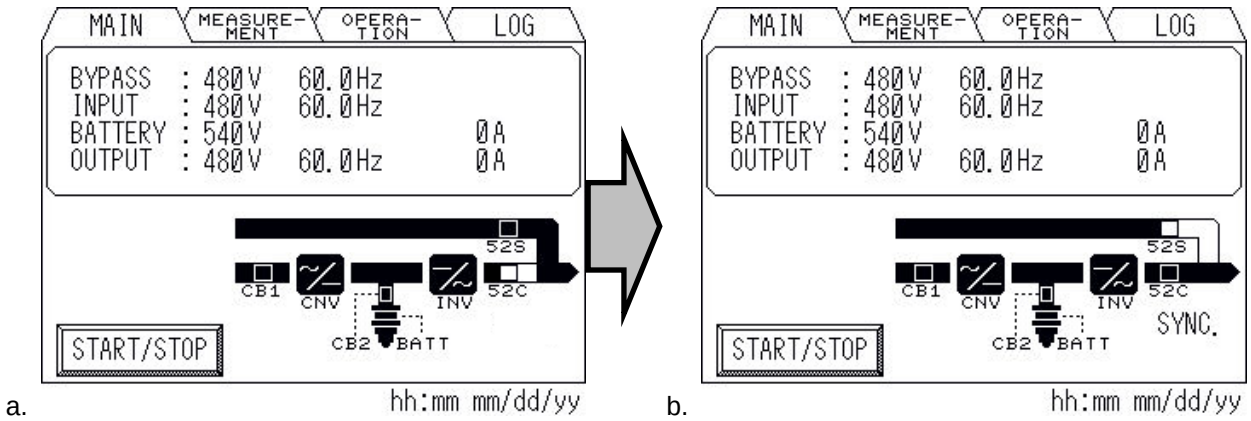


Figure 5-13 Transfer from Bypass to Online

D) Shut-down Procedure

If a total UPS shutdown is required, verify that the critical load is OFF.

CAUTION

Verify the load is OFF if the next step is to be performed.

Power to the load has been supplied through the bypass line. Power to load will be lost after execution of the next step. The load will drop.

a) Press the "START/STOP" icon from the Main Menu or the Operation Menu on the LCD.

b) On the LCD panel, press “START/STOP” icon, and then press and hold STOP for 5 seconds. (Figure 5-14b)

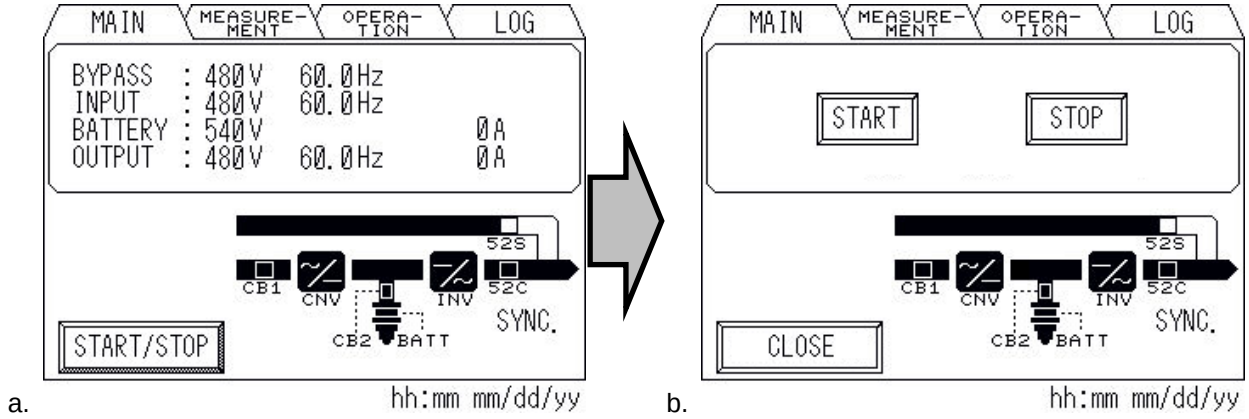


Figure 5-14 Initiate Shutdown

c) The UPS transfers to Bypass. The Bypass contactor (52S) closes and the Inverter contactor (52C) opens. (Figure 5-15)

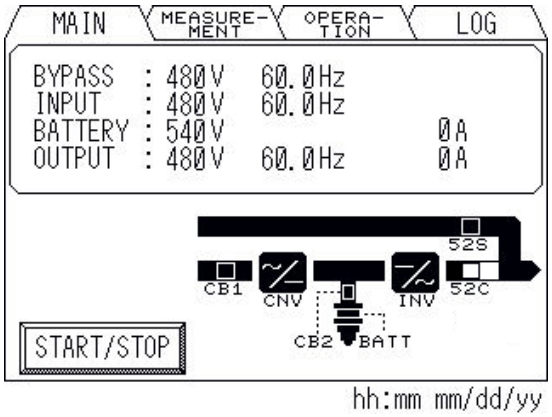


Figure 5-15 UPS Transfers to Bypass

d) In Bypass, only the Inverter is stopped, the Converter remains energized to charge the batteries.

WARNING

In bypass mode, all UPS power terminals are still alive. Lethal voltages are present. De-energize all external sources of AC and DC power. Before removing the covers, wait 5 minutes after de-energizing. Check no-voltage before handling UPS. Be careful of the devices even when the UPS has been de-energized, since internal devices may be energized.

e) If stopping both the Inverter and Converter is required, open the Battery Disconnect circuit breaker CB2. (Figure 5-16)

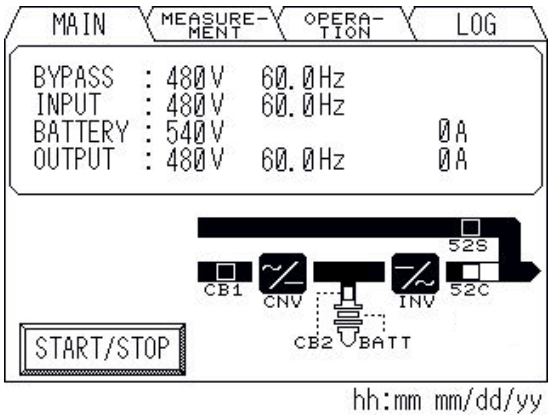


Figure 5-16 Open Battery Breaker

NOTE

When "REMOTE OPERATION MODE" is displayed on the LCD panel, the inverter start operation can only be performed remotely. If local inverter stop operation is required (at the UPS), select "LOCAL ONLY" or “REMOTE & LOCAL” in the OPERATION MENU.

f) If a dual source is feeding the UPS, open the External AC Input Circuit Breaker (user supplied).

g) To remove all power to the critical load, open the External Bypass Input Circuit Breaker (user supplied).

E) MMS Start-up Procedure

External Circuit Check (Ensure System is in Maintenance Bypass)

1. Verify that Tie cabinet Maintenance bypass breaker 52MB is closed.
2. Verify that Tie cabinet Output breaker 52CS is open.
3. Verify that Tie cabinet UPS breakers 52L1, 52L2…and 52Ln are closed.

Start-up from UPS-1 to UPS-n

Start-up each UPS in accordance with “A) Start-up Procedure”. Each UPS will start Inverter Operation synchronized with the bypass input. The Maintenance Bypass Switch is synchronized with the Static Transfer Switch.

Transfer from Maintenance Bypass to MMS Bypass Operation

1. Close Tie cabinet breaker 52CS.
2. Open Tie cabinet Breaker 52MB.

NOTE

When "REMOTE OPERATION MODE" is displayed on the LCD panel, the inverter start operation can only be performed remotely. If local inverter start operation is required (at the UPS), select "LOCAL ONLY" or “REMOTE & LOCAL” in the OPERATION MENU.

Transfer from UPS MMS Bypass Operation To UPS MMS Inverter Operation

Transfer MMS Bypass Operation to MMS Inverter Operation from Operation Menu on any UPS LCD as shown in Figure 5-17.

Transfer from UPS MMS Inverter Operation To UPS MMS Bypass Operation

Transfer MMS Inverter Operation to MMS Bypass Operation from Operation Menu on any UPS LCD as shown in Figure 5-17.

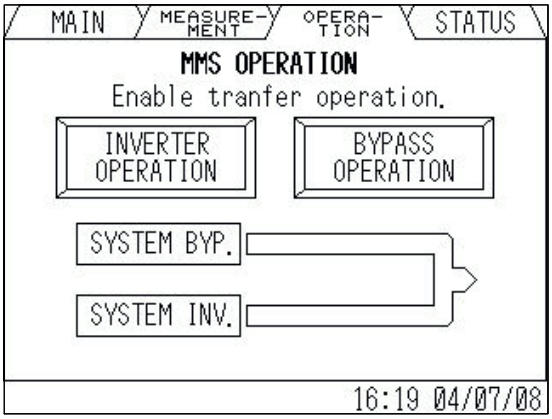
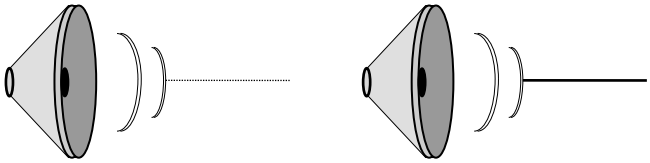


Figure 5-17 LCD Screen (MMS Operation)

6 RESPONSE TO UPS FAILURE



UPS FAULT

Annunciator Silence

Depress “SILENCE ALARM” icon on Main Menu.

Recording of Fault

Refer to the list of fault codes in section 6.0 for error description.

Primary Action

Take necessary action according to display guidance.

Information to Service

When faults happen, contact the Authorized Toshiba Service Representatives or call Toshiba International Corporation at **1-877-867-8773**.

NOTE

Note

The error code indicated on the LCD display panel when an UPS alarms is very important.

In order to reduce repair time, please include this information, along with the operation and load status for all correspondence to Toshiba field service group.

7 PARTS REPLACEMENT

Contact Toshiba International Corporation on all issues regarding the replacement of parts, preventative maintenance, or repair service on the Toshiba UPS or peripheral equipment.

A) Recommended Maintenance

Toshiba International Corporation recommends the UPS have regular preventative maintenance (PM) visits to ensure optimum operation and longevity. Toshiba recommends two Major PM's per year, at six month intervals.

A Major PM includes maintenance of the batteries and an offline inspection of the UPS. Contact Toshiba International Corporation Service Department at 1-877-867-8773 for further details.

B) Battery

Battery lifetime may vary according to the frequency of use and the average ambient operating temperature. The end of battery life is defined as the state of charge resulting in an ampere-hour capacity less than, or equal to, 80% of nominal capacity.

Replace battery if its capacity is within this percentage.

C) UPS Component Parts

UPS components have a defined life expectancy (Fans, Capacitors, Filters, etc.)

Contact Toshiba International Corporation for a complete parts replacement schedule. Recommended replacement time interval varies with operating environment.

Contact Toshiba International Corporation for application specific recommendations.

Table 7–1 Standard Replacement Parts List

Parts Name	Life Expectancy*
Cooling Fans	5 Years
Electrolytic Capacitors	15 Years
AC Filter Capacitors	15 Years
Control Relays	15 Years
Contactors	15 Years
PCB (Printed Circuit Boards)	15 Years
Control Power Supply	15 Years
LCD	10 Years
Fuses	10 Years
Thermal Relays	10 Years

*The Life Expectancy may vary depending on the environmental conditions of use.

WARNING

Any parts replacements (including modification) without authorized by Toshiba could result in personal injuries, death or destruction of the UPS.

D) UPS Component Parts

Air filters can be obtained in bulk quantities from Toshiba International Corporation. Use only air filters specified by Toshiba.

Table 7–2 Air Filters

Unit	Toshiba Part Number	Quantity (per Unit)
G9000 N-Series 100 kVA	T90-AF-24x30x1	1
G9000 N-Series 160 kVA	T90-AF-24x30x1	1
G9000 N-Series 225 kVA	65905	2

8 FAULT CODES

This section covers fault codes, their description and required action at time of error:

A) Verify and record the occurrence of the alarm.

Note details of alarm message displayed on the LCD display panel.

Contact Toshiba International Corporation at 1-877-867-8773.

B) If a circuit breaker (MCCB) has tripped, depress the toggle to reset the breaker before closing it again.

Table 8–1 Fault Codes

Note 3 Code indication	Status message	Meaning	Guidance	Buzzer	Note 1 External relay contact	Note 2 Failure lamp
UA801	AC INPUT VOLTAGE OUT OF RANGE	Input line voltage is out of the specified range.	CHECK INPUT POWER SOURCE	Intermittent sound	Alarm AC input abnormal	—
UA802	AC INPUT FREQUENCY OUT OF RANGE	Input line frequency is out of the specified range.	CHECK INPUT POWER SOURCE	Intermittent sound	Alarm AC input abnormal	—
UA803	AC INPUT PHASE ROTATION ERROR	Input line power conductors are not wired in a proper phase sequence.	CHECK INPUT POWER SOURCE	Intermittent sound	Alarm AC input abnormal	—
UA804	CONVERTER OPE. PROHIBITED	The converter interlock is active.	—	Intermittent sound	Alarm	—
UA805	INVERTER OVERLOAD	The output load current has exceeded 105% of the rated current.	WARNING : DECREASE LOAD	Intermittent sound	Alarm Overload	—
UA806	INVERTER OVERLOAD	The output load current has exceeded 110% of the rated current.	WARNING : DECREASE LOAD	Intermittent sound	Alarm Overload	—
UA807	INVERTER OVERLOAD	The output load current has exceeded 125% of the rated current.	WARNING : DECREASE LOAD	Intermittent sound	Alarm Overload	—
UA808	INVERTER OVERLOAD	The output load current has exceeded 150% of the rated current.	WARNING : DECREASE LOAD	Intermittent sound	Alarm Overload	—
UA810	INVERTER OVERLOAD	Short time over-current has been detected during the inverter operation.	WARNING : DECREASE LOAD	Intermittent sound	Alarm Overload	—
UA812	BYPASS VOLTAGE OUT OF RANGE	Bypass line voltage is out of the specified range.	CHECK BYPASS INPUT	Intermittent sound	Alarm Bypass input abnormal	—
UA813	BYPASS PHASE ROTATION ERROR	Bypass line power conductors are not wired in a proper phase sequence.	CHECK BYPASS INPUT	Intermittent sound	Alarm Bypass input abnormal	—
UA814	BYPASS FREQUENCY OUT OF RANGE	Bypass line frequency is out of the specified range.	CHECK BYPASS INPUT	Intermittent sound	Alarm Bypass input abnormal	—
UA815	TRANSFER PROHIBITED	Transfer to the bypass is not available due to bypass abnormality.	—	Intermittent sound	Alarm	—
UA817	EMERGENCY STOP ACTIVATED	The emergency stop was activated by the EPO switch or an external contact.	—	—	Alarm	—
UA821	TRANSFER PROHIBITED	The UPS could not transfer to the bypass because the inverter output was not synchronized to the bypass.	—	—	Alarm	—
UA822	TRANSFER PROHIBITED	The UPS could not transfer to the bypass because external “generator operation” signal indicates a backup generator is in operation.	—	—	Alarm	—
UA824	CB2 OPEN	The battery circuit breaker (CB2) is open.	TURN ON CB2	Intermittent sound	Alarm	—
UA827	52C OPEN PROHIBITED	The interlock for the inverter output contactor (52C) is active.	—	Intermittent sound	Alarm	—
UA831	EMERGENCY BYPASS SWITCH ON	Emergency bypass switch has been turned on.	—	Intermittent sound	Alarm	—
UA833	52L OPEN	The load circuit breaker(52L) is turned off.	—	Intermittent sound	Alarm	—

Note 3 Code indication	Status message	Meaning	Guidance	Buzzer	Note 1 External relay contact	Note 2 Failure lamp
UA834	BATTERY DEPLETED/AC OUT STOPPED	The battery voltage has reached the depleted level.	—	—	Major End-of-Discharge	Lit on
UA835	TRANSFER PROHIBITED	The UPS could not transfer to the bypass because the bypass source has an abnormality.	—	—	Alarm	—
UA860	REMOTE BUTTON ABNORMAL	Remote start or stop signal is being received continuously for a considerable time.	—	Intermittent sound	Alarm	—
UA861	LOCAL BUTTON ABNORMAL	Local start or stop signal is being received continuously for a considerable time.	—	Intermittent sound	Alarm	—
UA870	BALANCER OVERLOAD	The UPS detected a neutral point voltage unbalance.	—	Intermittent sound	Alarm Overload	—
UA890	EXTERNAL ALARM	External Alarm relay turned on.	—	Intermittent sound	Alarm	—
UF001	INPUT CIRCUIT ABNORMAL	The MMS input reference error signal exceeds specifications.	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF002	CONVERTER OVERCURRENT	Detection of MMS converter overcurrent.	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF003	CONVERTER ABNORMAL	Pre-charging circuit is not working properly.	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF011	CB1 ABNORMAL	Major discrepancy between reference signal and actual state of contactor CB1.	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF052	CB1 ABNORMAL	Minor discrepancy between reference signal and actual state of contactor CB1.	CALL SERVICE ENGINEER	Intermittent sound	Minor	Flicker
UF056	CONVERTER OVERCURRENT	Detection of SMS converter overcurrent.	CALL SERVICE ENGINEER	Intermittent sound	Minor	Flicker
UF059	INPUT CIRCUIT ABNORMAL	The SMS input reference error signal exceeds specifications.	CALL SERVICE ENGINEER	Intermittent sound	Minor	Flicker
UF102	DC OVERVOLTAGE	DC voltage surpasses the overvoltage level.	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF103	DC UNDERVOLTAGE	DC voltage dropped below the undervoltage level.	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF108	CHOPPER OVERCURRENT	Detection of DC overcurrent from backup battery.	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF109	DC UNBALANCED	Major unbalance of the neutral point voltage.	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF110	ZERO PHASE OVERCURRENT	Detection of converter zero-sequence overcurrent.	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF111	UPS CONTROL CIRCUIT ERROR	Battery current unbalance.	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF112	DC CIRCUIT ABNORMAL	Sudden change of the DC voltage level.	CALL SERVICE ENGINEER	Continuoussoun d	Major	Lit on
UF119	DC GROUND FAULT	Detection of DC ground fault UF159 exceeds 10 seconds. UPS transfers to bypass.	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF128	CONTROL POWER SUPPLY ABNORMAL	Power supply voltage to IGBT driver PCB is below the specified level.	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF151	DC VOLTAGE ABNORMAL	24 hours after input power restoration, batteries does not reach float voltage level.	CALL SERVICE ENGINEER	Intermittent sound	Minor	Flicker
UF152	DC VOLTAGE ABNORMAL	Unable to equalize the voltage of various batteries after 24 hours.	CALL SERVICE ENGINEER	Intermittent sound	Minor	Flicker
UF154	CB2 ABNORMAL	During UVR, status signal from CB2 is ON.	CALL SERVICE ENGINEER	Intermittent sound	Minor	Flicker
UF156	CHG.STOPPED (BATTERY OVERTEMP.)	UF157 failure persisted for over 2 hours.	CHECK BATTERY	Intermittent sound	Minor Battery abnormal	Flicker
UF157	BATTERY OVERTEMPERA-TURE	Detection of over temperature at the batteries.	CHECK BATTERY	Intermittent sound	Minor Battery abnormal	Flicker

Note 3 Code indication	Status message	Meaning	Guidance	Buzzer	Note 1 External relay contact	Note 2 Failure lamp
UF158	BATTERY LIQUID LOW	Low level of battery electrolyte solution.	CHECK BATTERY	Intermittent sound	Minor Battery abnormal	Flicker
UF159	DC GROUND FAULT	Detection of DC ground fault. Chopper operation is stopped.	CALL SERVICE ENGINEER	Intermittent sound	Minor	Flicker
UF160	UPS CONTROL CIRCUIT ERROR	Abnormal behavior of DC current sensor.	CALL SERVICE ENGINEER	Intermittent sound	Minor	Flicker
UF161	CHG.STOPPED(DC VOLT. ABNORMAL)	UF151 failure is running for over 24 hours.	CALL SERVICE ENGINEER	Intermittent sound	Minor	Flicker
UF162	BATTERY ABNORMAL	Failure detection based on battery self-check.	CALL SERVICE ENGINEER	Intermittent sound	Minor	Flicker
UF163	BATTERY VOLTAGE ABNORMAL	Battery voltage is abnormal.	CALL SERVICE ENGINEER	Intermittent sound	Minor	Flicker
UF170	VDB SENSOR ABNORMAL	Detection of a large variation of the difference between control-only and protection-only battery voltage.	CALL SERVICE ENGINEER	Intermittent sound	Minor	Flicker
UF171	UPS CONTROL CIRCUIT ERROR	Poor shared current in parallel chopper circuit; or improper charging current.	CALL SERVICE ENGINEER	Intermittent sound	Minor	Flicker
UF172	CHG. STOPPED (DEVICE STATUS)	Energy storage device error.	CALL SERVICE ENGINEER	Intermittent sound	Minor	Flicker
UF201	INVERTER OVERVOLTAGE	Detection of output overvoltage.	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF202	INVERTER UNDERVOLTAGE	Output voltage dropped.below specs.	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF203	INVERTER OVERCURRENT	Detection of inverter overcurrent.	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF204	OUTPUT CIRCUIT ABNORMAL	Detection of a large variation of the reference error signal (current reference and actual current).	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF206	UPS CONTROL CIRCUIT ERROR	Discrepancy between output voltage and external voltage (bypass, common ac bus)	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF207	ZERO PHASE OVERCURRENT	Inverter zero-sequence overcurrent.	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF208	UPS CONTROL CIRCUIT ERROR	Cross current is abnormal.	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF209	52C ABNORMAL	Error to close the contactor 52C.	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF210	52C ABNORMAL	Error to open the contactor 52C.	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF211	52C ABNORMAL	No answer from contactor 52C during inverter operation.	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF213	OVERTEMP	Heatsinks temperature exceeds thermal settings.	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF214	COOLING FAN ABNORMAL	Thermal relay activated protection.	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF217	INVERTER OVERVOLTAGE	Detection of inverter output phase overvoltage.	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF230	ZERO PHASE OVERCURRENT	Detection of zero-sequence overcurrent.	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF253	UPS CONTROL CIRCUIT ERROR	Discrepancy between output voltage and inverter voltage, or between output voltage and bypass voltage.	CALL SERVICE ENGINEER	Intermittent sound	Minor	Flicker
UF256	OUTPUT VOLTAGE ABNORMAL	Output voltage is outside of the specified range.	CALL SERVICE ENGINEER	Intermittent sound	Minor	Flicker
UF257	52C ABNORMAL	Contactor 52C failed to open during load transfer from inverter to bypass.	CALL SERVICE ENGINEER	Intermittent sound	Minor	Flicker
UF258	LOAD ABNORMAL	Load transfer due to overload for over 4 times within 5 minutes.	CALL SERVICE ENGINEER	Intermittent sound	Minor	Flicker

Note 3 Code indication	Status message	Meaning	Guidance	Buzzer	Note 1 External relay contact	Note 2 Failure lamp
UF259	ANOTHER UPS ABNORMAL	No detection of another UPS voltage signal.	CALL SERVICE ENGINEER	Intermittent sound	Minor	Flicker
UF301	UPS CONTROL CIRCUIT ERROR	AD reference has an abnormal value.	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF302	UPS CONTROL CIRCUIT ERROR	Detection of an external interruption during the software execution.	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF303	UPS CONTROL CIRCUIT ERROR	Timer does not reset in the specified period (WDT settings)	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF305	UPS CONTROL CIRCUIT ERROR	Detection of an abnormal clock speed in the DSP or FPGA.	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF306	UPS CONTROL CIRCUIT ERROR	Control power supply voltage is below the specified level.	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF309	INVERTER VOLTAGE ABNORMAL	Inverter voltage is out of the specified range.	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF310	CONTROL POWER SUPPLY ABNORMAL	MMS backup control power supplies exhibit abnormal condition.	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF320	UPS CONTROL CIRCUIT ERROR	Cable disconnection in the parallel interface board during load supply.	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF323	UPS CONTROL CIRCUIT ERROR	Major communication error during parallel operation.	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF331	UPS CONTROL CIRCUIT ERROR	Gate driver abnormal for phase U (Note 4)	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF332	UPS CONTROL CIRCUIT ERROR	Gate driver abnormal for phase V (Note 4)	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF333	UPS CONTROL CIRCUIT ERROR	Gate driver abnormal for phase W (Note 4)	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF334	UPS CONTROL CIRCUIT ERROR	Gate driver abnormal for chopper (Note 4)	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF352	CONTROL POWER SUPPLY ABNORMAL	SMS backup control power supplies exhibit abnormal.	CALL SERVICE ENGINEER	Intermittent sound	Minor	Flicker
UF363	UPS CONTROL CIRCUIT ERROR	Synchronization error signal is being received for a considerable time.	CALL SERVICE ENGINEER	Intermittent sound	Minor	Flicker
UF371	UPS CONTROL CIRCUIT ERROR	Minor communication error during parallel operation.	CALL SERVICE ENGINEER	Intermittent sound	Minor	Flicker
UF372	UPS CONTROL CIRCUIT ERROR	Unable to synchronize the inverter output and the bypass voltage when the bypass is normal.	CALL SERVICE ENGINEER	Intermittent sound	Minor	Flicker
UF374	UPS CONTROL CIRCUIT ERROR	Cable disconnection in the parallel interface board.	CALL SERVICE ENGINEER	Intermittent sound	Minor	Flicker
UF375	UPS CONTROL CIRCUIT ERROR	Unable to achieve synchronization for parallel operation.	CALL SERVICE ENGINEER	Intermittent sound	Minor	Flicker
UF376	UPS CONTROL CIRCUIT ERROR	No control response from another UPS although its detection is possible.	CALL SERVICE ENGINEER	Intermittent sound	Minor	Flicker
UF377	UPS CONTROL CIRCUIT ERROR	Overload detection signal is being received continuously for a considerable time.	CALL SERVICE ENGINEER	Intermittent sound	Minor	Flicker
UF378	UPS CONTROL CIRCUIT ERROR	No answer for sending synchronizing signal.	CALL SERVICE ENGINEER	Intermittent sound	Minor	Flicker
UF379	UPS CONTROL CIRCUIT ERROR	Abnormal clock speed of the parallel control board processor.	CALL SERVICE ENGINEER	Intermittent sound	Minor	Flicker
UF401	52S ABNORMAL	Error to close the contactor 52S.	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF402	52S ABNORMAL	Error to open the contactor 52S.	CALL SERVICE ENGINEER	Continuous sound	Major	Lit on
UF420	52L OPERATION ERROR	Load circuit breaker 52L opened during inverter operation.	CHECK 52L	Continuous sound	Major	Lit on
UF451	52S ABNORMAL	Contactor 52S failed during load transfer from inverter to bypass.	CALL SERVICE ENGINEER	Intermittent sound	Minor	Flicker

Note 3 Code indication	Status message	Meaning	Guidance	Buzzer	Note 1 External relay contact	Note 2 Failure lamp
UF452	CB3 ABNORMAL	Contactor CB3 is not working properly.	CALL SERVICE ENGINEER	Intermittent sound	Minor	Flicker

(Note 1) 1) "Major" is defined as major failure. Inverter transferred to the static bypass line;

2) "Minor" is defined as a minor failure. UPS continues to operate normally, but cause of alarm must be identified;

(Note 2) Indicates one of two possible LED illumination patterns - continuously on (lit) or intermittent (flicker).

(Note 3) Code indication means:

UA+++---------- Alarm
UF+++ ---------- Failure
U%0++ ---------- Rectifier circuit failure
U%1++ ---------- DC circuit failure
U%2++ ---------- Inverter circuit failure
U%3++ ---------- Control circuit failure
U%4++ ---------- Bypass system failure
U%8++ ---------- Alarm
U%+00 - U%+49 ---------- Major failure
U%+50 - U%+99 ---------- Minor failure

*) “+” denotes any numeral from 0 to 9

*) “%” denotes either “A” or “F”

9 DAILY INSPECTION

Please perform the daily inspection while the UPS is running. The daily inspection items are shown in Table 7.1.

NOTE

The customers can only inspect exterior or environment of cabinet. When the customers want to perform the detailed inspection, contact the Authorized Toshiba Service Representatives or call Toshiba International Corporation at 1-877-867-8773.

Table 9–1 Customer's Inspection Schedule

No.	Subject	Procedure			Criteria and/or Action needed
		Term	Period	Method/Tool	
1.	Environmental ambient	Dust or Gas	Daily	Visual check and smelling	Ventilate room atmosphere if dusty or smelling gas.
		Dewdrops or Condensation	Daily	Visual check	Fix the dripping source. Dehumidify upon necessity.
		Temperature Humidity	Daily	Thermometer hygrometer	Temperature: 32 – 104 °F Humidity: 30 – 90% No condensation. To be controlled at 77 °F or about by A/C.
2.	Cabinet Construction	Vibration or Audible noise	Daily	Touch and hearing	Check if fans have irregular sound. Contact service representative in case of abnormalities.
		Overheating	When needed	Touching exterior	Contact service representative in case of abnormalities.
		Air filter clog	When needed	Visual check	Clean/wipe if clogged or dusty.
3.	Operation	LCD sharpness Brightness Left-bottom LED	Daily	Visual check	No characters faded, illegible or any other abnormalities. Left-bottom LED should be green. Contact service representative when the LED shows red with the backlight lost.
		Indication terms: Output voltage Output current AC input voltage Output frequency Battery voltage Battery current DC voltage	Daily	Visual check	Check indication terms/values if within the adequate window. Also check indication meters on surface of optional cabinet, if installed.
4.	LEDs	4 status LEDs	Daily	Visual check	Check if LEDs turn on, off or flash according to the operation.
		2 fault LEDs	Daily	Visual check	If UPS fault LED turns on, scroll the screen to see fault codes and record the codes. Contact service representative to tell about fault codes and UPS symptom.

TOSHIBA

APPENDIX A Installation Planning Guides (IPG) & Outline Drawings

Installation Planning Guide for 100kVA UPS

Standard System: 480V Input, 480V Output

General Mechanical Information

Dimensions (W x D x H)	Weight	Floor Loading	Approximate Full-Load Heat Rejection	Mechanical Clearance (Inches)from UPS for Ventilation and Maintenance Access				
Inches	Lbs.	Lbs./ft. ^{2}	kBtu/Hr	Top	Front	Bottom	Sides**	Back
27.6” x 32.8” x 80.6”*	772	123	10.8	20”	40”	0”	0”	0”

* Height includes removable fan housing – Frame height is 78.7.”

** 0” clearance for peripheral equipment, 1” clearance for walls.

Primary AC Input (480V 3-Phase / 3-Wire)

Maximum Input Power Demand Normal Mode (Recharge Mode)			Suggested External Overcurrent Protection	External Feeder Wire Size Per Phase:					
				Cable Quantity of Below kcmil at 75º C Temp. Rating					
kVA	PF	Amps (Max.)	Amps	1/0	2/0	3/0	4/0	250kcmil	300kcmil
94 (105)	>0.99	112 (125)	175 AT	2	2	1	1	1	1

Alternate (Bypass) AC Input (480V 3-Phase / 3-Wire)

Input Power Demand			Suggested External Overcurrent Protection	External Feeder Wire Size Per Phase:					
				Cable Quantity of Below kcmil at 75º C Temp. Rating					
kVA	PF	Amps	Amps	1/0	2/0	3/0	4/0	250kcmil	300kcmil
100	0.9	120	150 AT	2	2	1	1	1	1

Battery Input (480VDC Nominal)

Battery Capacity Required for Full Load Output	Maximum Discharge at Full Load Output	Suggested External Overcurrent Protection	External Feeder Wire Size:					
			Cable Quantity of Below kcmil at 75º C Temp. Rating					
kWB	Amps DC	Amps	1/0	2/0	3/0	4/0	250kcmil	300kcmil
93 @ 0.9 PF	233	300 AT	2	2	2	2	2	1

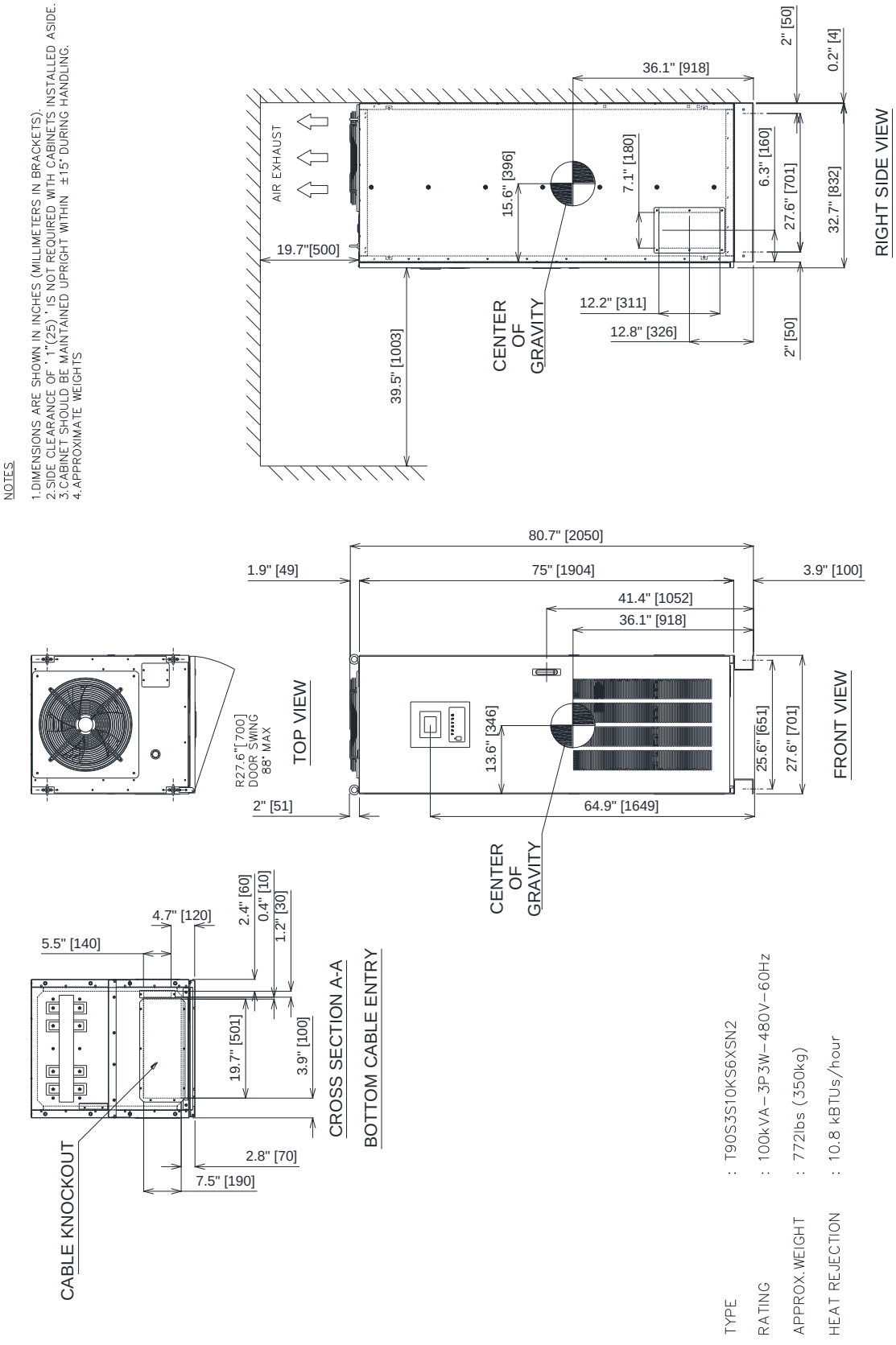
AC Output (480V 3-Phase / 3-Wire)

Rated Output Power			Suggested External Overcurrent Protection	External Feeder Wire Size Per Phase:					
				Cable Quantity of Below kcmil at 75º C Temp. Rating					
kVA	PF	Amps	Amps	1/0	2/0	3/0	4/0	250kcmil	300kcmil
100	0.9	120	150 AT	2	2	1	1	1	1

Important Notes:

1. Maximum input current is limited to 108% of the full-load input 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 215.3.
5. Wiring shall comply with all applicable national and local electrical codes.
6. Grounding conductors to be sized per NEC Article 250-122. Neutral conductors to be sized per NEC Article 310.15.
   - Primary AC Input: 3ϕ, 3-wire + ground.
   - Alternate AC Input: 3ϕ, 3-wire + ground.
   - AC Output: 3ϕ, 3-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 for VRLA (1.67VPC).
9. DC wires should be sized to allow not more than a 2-volt drop at maximum discharge current.
10. Weights do not include batteries or other auxiliary equipment external to the UPS.
11. Cable sizing calculations based on the following method:
    - Base cable ampacity is determined by 75ºC rated copper conductor values in NEC Table 310.16.
    - Cable ampacity is derated using adjustment factor for 36-40ºC Ambient Operating Temperature per NEC Table 310.15(B)(1).
    - 3-Phase Cable ampacity is derated using correction factor for quantity 4-6 conductors in conduit per NEC Table 310.15(C)(1).
    - Cable meets bend radius limitations at the UPS terminals.

    NOTE: Consult latest edition of applicable national and local codes for possible variations.
12. Ratings/Quantities of wires and overcurrent protection devices are suggested minimums. Consult with a registered Professional Engineer within your local area for proper size selections.
13. All Overcurrent Protection Devices at or above 1200AT are assumed to be rated for 100% continuous load operation.


NOTES
1.DIMENSIONS ARE SHOWN IN INCHES (MILLIMETERS IN BRACKETS).
2.SIDE CLEARANCE OF "1"(25) " IS NOT REQUIRED WITH CABINETS INSTALLED ASIDE.
3.CABINET SHOULD BE MAINTAINED UPRIGHT WITHIN ±15° DURING HANDLING.
4.APPROXIMATE WEIGHTS
AIR EXHAUST
36.1" [918]
2" [50]
0.2" [4]
15.6" [396]
7.1" [180]
6.3" [160]
27.6" [701]
32.7" [832]
19.7"[500]
39.5" [1003]
CENTER OF GRAVITY
12.2" [311]
12.8" [326]
2" [50]
RIGHT SIDE VIEW
80.7" [2050]
1.9" [49]
75" [1904]
3.9" [100]
41.4" [1052]
36.1" [918]
R27.6"[700] DOOR SWING 88° MAX
TOP VIEW
13.6" [346]
25.6" [651]
27.6" [701]
FRONT VIEW
2" [51]
64.9" [1649]
CENTER OF GRAVITY
4.7" [120]
2.4" [60]
0.4" [10]
1.2" [30]
5.5" [140]
19.7" [501]
3.9" [100]
CROSS SECTION A-A
BOTTOM CABLE ENTRY
2.8" [70]
7.5" [190]
CABLE KNOCKOUT
TYPE : T90S3S10KS6XSN2
RATING : 100kVA–3P3W–480V–60Hz
APPROX.WEIGHT : 772lbs (350kg)
HEAT REJECTION : 10.8 kBTUs/hour

NOTES

5.EXTERNAL WIRES OR CABLES SHALL BE PROVIDED BY CUSTOMERS FOR AC INPUT, DC INPUT, BYPASS INPUT AND AC OUTPUT (OUT OF TOSHIBA PROVISION).
6.ROTATION OF A, B & C PHASE IS CLOCKWISE.

Installation Planning Guide for 160kVA UPS

Standard System: 480V Input, 480V Output

General Mechanical Information

Dimensions (W x D x H)	Weight	Floor Loading	Approximate Full-Load Heat Rejection	Mechanical Clearance (Inches)from UPS for Ventilation and Maintenance Access				
Inches	Lbs.	Lbs./ft. ^{2}	kBtu/Hr	Top	Front	Bottom	Sides**	Back
27.6" x 32.8" x 80.6"*	860	137	18.3	20"	40"	0"	0"	0"

* Height includes removable fan housing – Frame height is 78.7."
** 0" clearance for peripheral equipment, 1" clearance for walls.

Primary AC Input (480V 3-Phase / 3-Wire)

Maximum Input Power Demand Normal Mode (Recharge Mode)			Suggested External Overcurrent Protection	External Feeder Wire Size Per Phase:					
				Cable Quantity of Below kcmil at 75º C Temp. Rating					
kVA	PF	Amps (Max.)	Amps	1/0	2/0	3/0	4/0	250kcmil	300kcmil
151 (168)	>0.99	180 (200)	250AT	2	2	2	2	2	1

Alternate (Bypass) AC Input (480V 3-Phase / 3-Wire)

Input Power Demand			Suggested External Overcurrent Protection	External Feeder Wire Size Per Phase:					
				Cable Quantity of Below kcmil at 75º C Temp. Rating					
kVA	PF	Amps	Amps	1/0	2/0	3/0	4/0	250kcmil	300kcmil
160	0.9	192	250AT	2	2	2	2	2	1

Battery Input (480VDC Nominal)

Battery Capacity Required for Full Load Output	Maximum Discharge at Full Load Output	Suggested External Overcurrent Protection	External Feeder Wire Size:					
			Cable Quantity of Below kcmil at 75º C Temp. Rating					
kWB	Amps DC	Amps	1/0	2/0	3/0	4/0	250kcmil	300kcmil
149 @ 0.9 PF	372	500AT	3	3	3	2	2	2

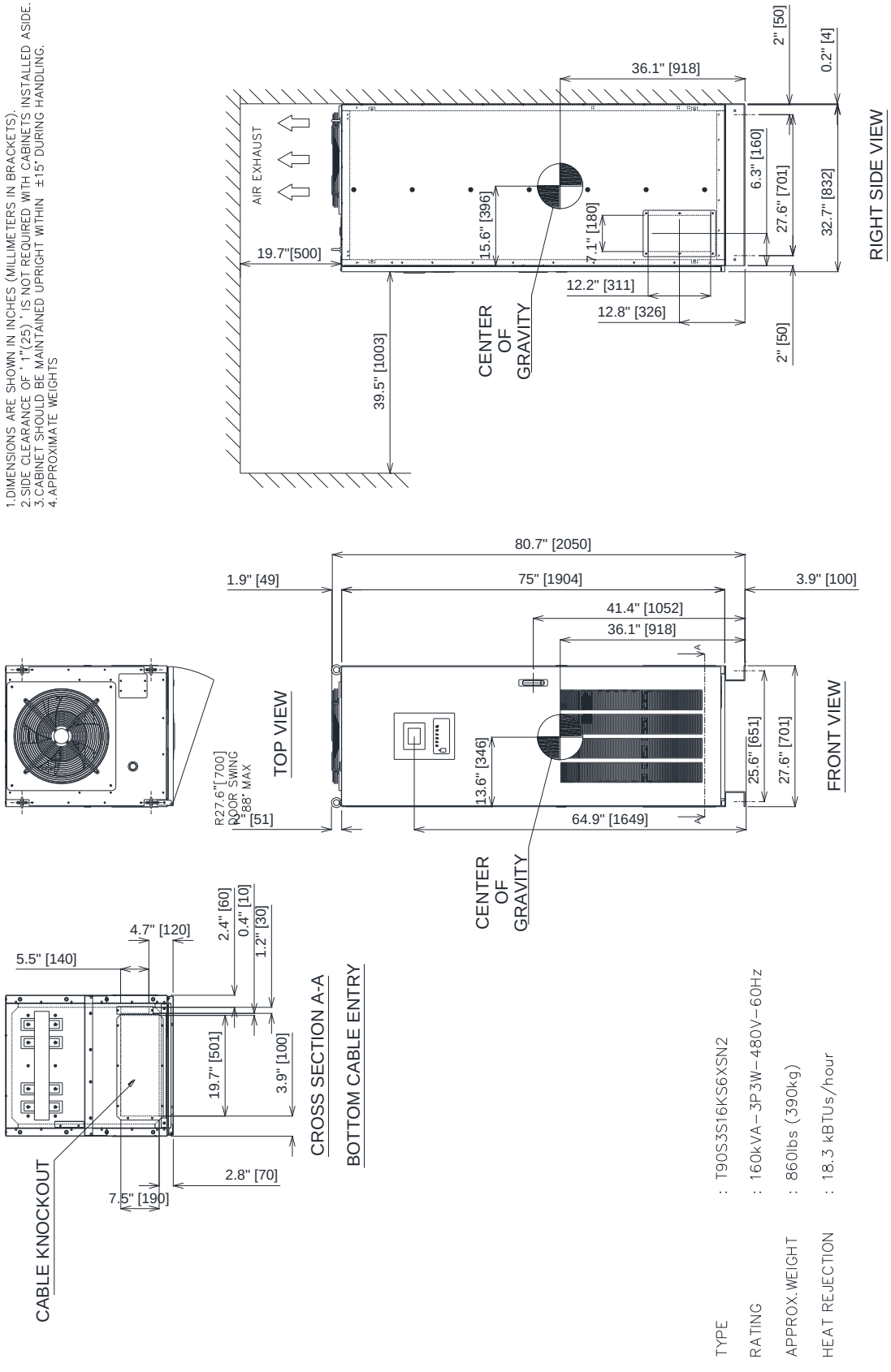
AC Output (480V 3-Phase / 3-Wire)

Rated Output Power			Suggested External Overcurrent Protection	External Feeder Wire Size Per Phase:					
				Cable Quantity of Below kcmil at 75º C Temp. Rating					
kVA	PF	Amps	Amps	1/0	2/0	3/0	4/0	250kcmil	300kcmil
160	0.9	192	250AT	2	2	2	2	2	1

Important Notes:

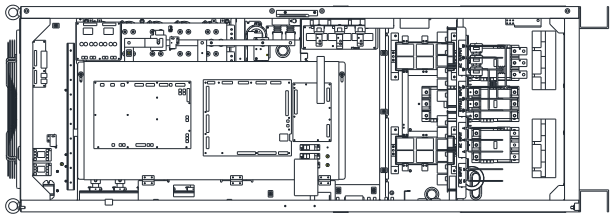
1. Maximum input current is limited to 108% of the full-load input current.
2. Output load conductors are to be installed in separate conduit from input conductors.
3. Control wires and power wires are to be installed in separate conduits.
4. Recommended AC input and output overcurrent protection based on continuous full load current per NEC 215.3.
5. Wiring shall comply with all applicable national and local electrical codes.
6. Grounding conductors to be sized per NEC Article 250-122. Neutral conductors to be sized per NEC Article 310.15.
   - Primary AC Input: 3ϕ, 3-wire + ground.
   - Alternate AC Input: 3ϕ, 3-wire + ground.
   - AC Output: 3ϕ, 3-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 for VRLA (1.67VPC).
9. DC wires should be sized to allow not more than a 2-volt drop at maximum discharge current.
10. Weights do not include batteries or other auxiliary equipment external to the UPS.
11. Cable sizing calculations based on the following method:
    - Base cable ampacity is determined by 75ºC rated copper conductor values in NEC Table 310.16.
    - Cable ampacity is derated using adjustment factor for 36-40ºC Ambient Operating Temperature per NEC Table 310.15(B)(1).
    - 3-Phase Cable ampacity is derated using correction factor for quantity 4-6 conductors in conduit per NEC Table 310.15(C)(1).
    - Cable meets bend radius limitations at the UPS terminals.

    NOTE: Consult latest edition of applicable national and local codes for possible variations.
12. Ratings/Quantities of wires and overcurrent protection devices are suggested minimums. Consult with a registered Professional Engineer within your local area for proper size selections.
13. All Overcurrent Protection Devices at or above 1200AT are assumed to be rated for 100% continuous load operation.

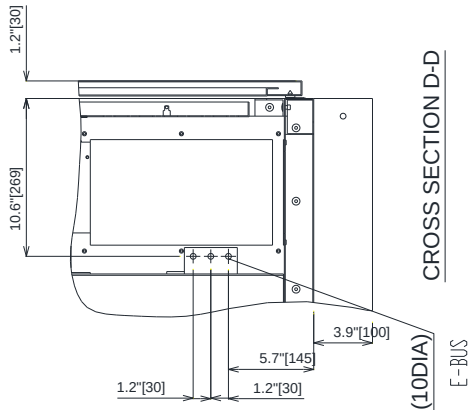

1.DIMENSIONS ARE SHOWN IN INCHES (MILLIMETERS IN BRACKETS).
2.SIDE CLEARANCE OF "1"(25)" IS NOT REQUIRED WITH CABINETS INSTALLED ASIDE.
3.CABINET SHOULD BE MAINTAINED UPRIGHT WITHIN ±15° DURING HANDLING.
4.APPROXIMATE WEIGHTS
AIR EXHAUST
19.7"[500]
39.5" [1003]
15.6" [396]
7.1" [180]
12.2" [311]
12.8" [326]
36.1" [918]
2" [50]
0.2" [4]
6.3" [160]
27.6" [701]
32.7" [832]
2" [50]
CENTER OF GRAVITY
RIGHT SIDE VIEW
80.7" [2050]
1.9" [49]
75" [1904]
3.9" [100]
41.4" [1052]
36.1" [918]
13.6" [346]
25.6" [651]
27.6" [701]
64.9" [1649]
R27.6"[700]
DOOR SWING
88° MAX
2" [51]
TOP VIEW
FRONT VIEW
CENTER OF GRAVITY
4.7" [120]
5.5" [140]
2.4" [60]
0.4" [10]
1.2" [30]
19.7" [501]
3.9" [100]
2.8" [70]
7.5" [190]
CABLE KNOCKOUT
CROSS SECTION A-A
BOTTOM CABLE ENTRY
TYPE : T90S3S16KS6XSN2
RATING : 160kVA-3P3W-480V-60Hz
APPROX.WEIGHT : 860lbs (390kg)
HEAT REJECTION : 18.3 kBTUs/hour

NOTES

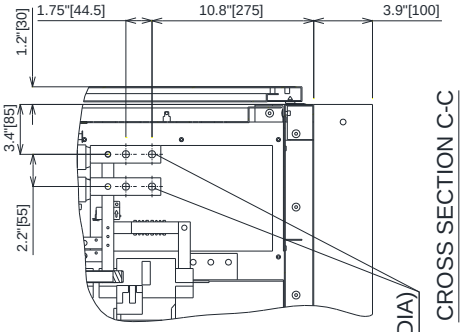
5.EXTERNAL WIRES OR CABLES SHALL BE PROVIDED BY CUSTOMERS FOR AC INPUT, DC INPUT, BYPASS INPUT AND AC OUTPUT (OUT OF TOSHIBA PROVISION).
6.ROTATION OF A, B & C PHASE IS CLOCKWISE.



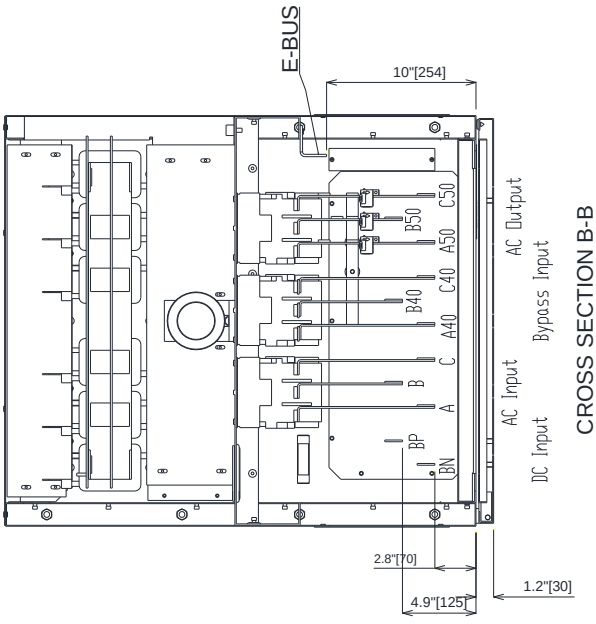
FRONT INSIDE VIEW



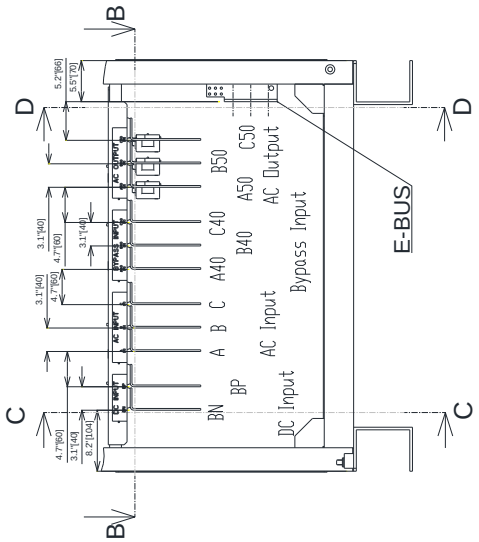
CROSS SECTION D-D



CROSS SECTION C-C



CROSS SECTION B-B



DETAIL OF TERMINALS

TOSHIBA

Installation Planning Guide for 225kVA UPS

Standard System: 480V Input, 480V Output

General Mechanical Information

Dimensions (W x D x H)	Weight	Floor Loading	Approximate Full-Load Heat Rejection	Mechanical Clearance (Inches)from UPS for Ventilation and Maintenance Access				
Inches	Lbs.	Lbs./ft.^{2}	kBtu/Hr	Top	Front	Bottom	Sides**	Back
35.4” x 32.8” x 80.6”*	1080	134	22.8	20”	40”	0”	0”	0”

* Height includes removable fan housing – Frame height is 78.7.”

** 0” clearance for peripheral equipment, 1” clearance for walls.

Primary AC Input (480V 3-Phase / 3-Wire)

Maximum Input Power Demand Normal Mode (Recharge Mode)			Suggested External Overcurrent Protection	External Feeder Wire Size Per Phase:					
kVA	PF	Amps (Max.)	Amps	Cable Quantity of Below kcmil at 75º C Temp. Rating					
				1/0	2/0	3/0	4/0	250kcmil	300kcmil
212 (235)	>0.99	252 (280)	350AT	3	3	2	2	2	2

Alternate (Bypass) AC Input (480V 3-Phase / 3-Wire)

Input Power Demand			Suggested External Overcurrent Protection	External Feeder Wire Size Per Phase:					
kVA	PF	Amps	Amps	Cable Quantity of Below kcmil at 75º C Temp. Rating					
				1/0	2/0	3/0	4/0	250kcmil	300kcmil
225	0.9	271	350AT	3	3	2	2	2	2

Battery Input (480VDC Nominal)

Battery Capacity Required for Full Load Output	Maximum Discharge at Full Load Output	Suggested External Overcurrent Protection	External Feeder Wire Size:					
kWB	Amps DC	Amps	Cable Quantity of Below kcmil at 75º C Temp. Rating					
			1/0	2/0	3/0	4/0	250kcmil	300kcmil
210 @ 0.9 PF	524	700AT	4	4	3	3	3	3

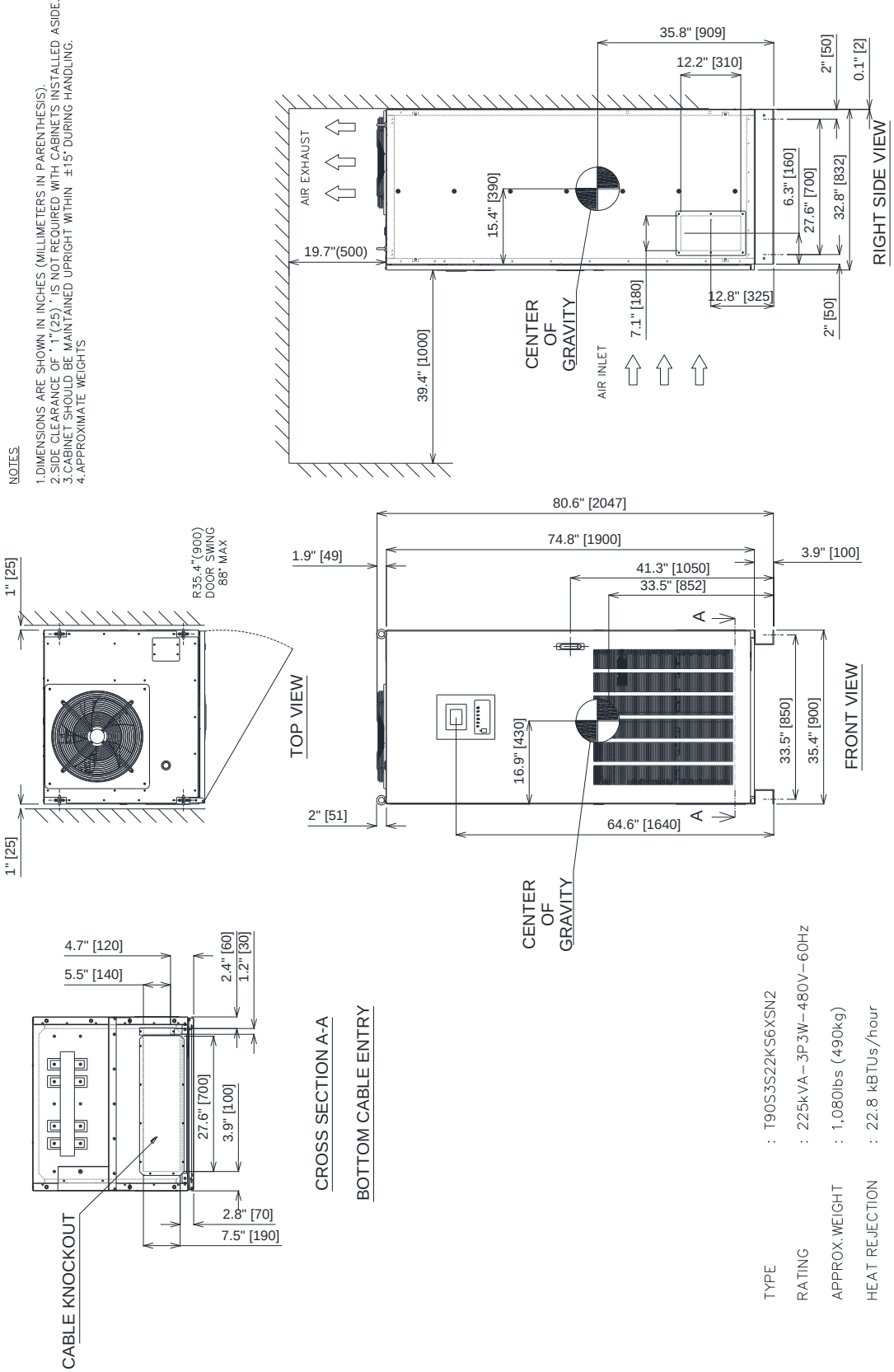
AC Output (480V 3-Phase / 3-Wire)

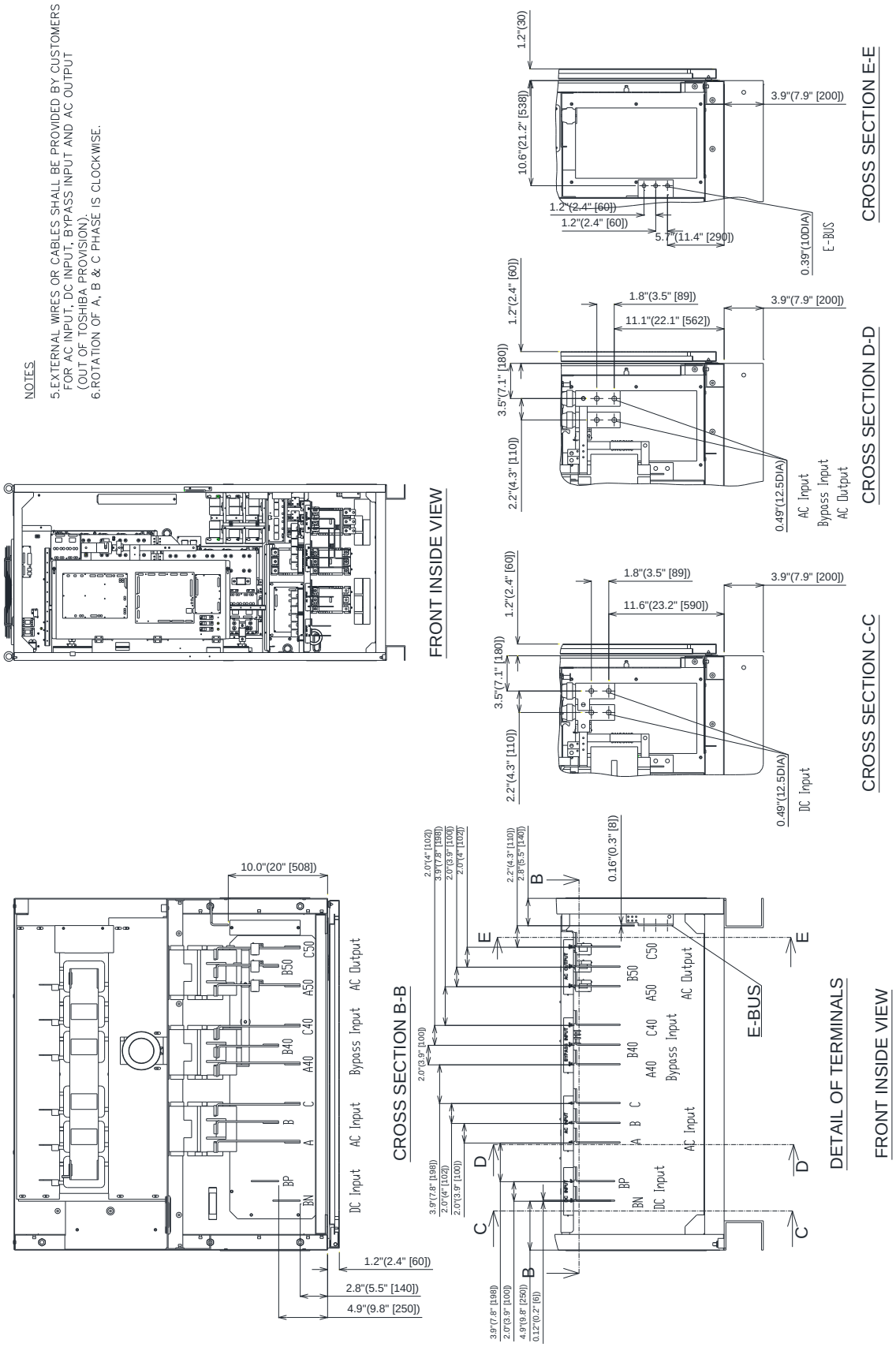
Rated Output Power			Suggested External Overcurrent Protection	External Feeder Wire Size Per Phase:					
kVA	PF	Amps	Amps	Cable Quantity of Below kcmil at 75º C Temp. Rating					
				1/0	2/0	3/0	4/0	250kcmil	300kcmil
225	0.9	271	350AT	3	3	2	2	2	2

Important Notes:

1. Maximum input current is limited to 108% of the full-load input 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 215.3.
5. Wiring shall comply with all applicable national and local electrical codes.
6. Grounding conductors to be sized per NEC Article 250-122. Neutral conductors to be sized per NEC Article 310.15.
   - Primary AC Input: 3ϕ, 3-wire + ground.
   - Alternate AC Input: 3ϕ, 3-wire + ground.
   - AC Output: 3ϕ, 3-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 for VRLA (1.67VPC).
9. DC wires should be sized to allow not more than a 2-volt drop at maximum discharge current.
10. Weights do not include batteries or other auxiliary equipment external to the UPS.
11. Cable sizing calculations based on the following method:
    - Base cable ampacity is determined by 75ºC rated copper conductor values in NEC Table 310.16.
    - Cable ampacity is derated using adjustment factor for 36-40ºC Ambient Operating Temperature per NEC Table 310.15(B)(1).
    - 3-Phase Cable ampacity is derated using correction factor for quantity 4-6 conductors in conduit per NEC Table 310.15(C)(1).
    - Cable meets bend radius limitations at the UPS terminals.

    NOTE: Consult latest edition of applicable national and local codes for possible variations.
12. Ratings/Quantities of wires and overcurrent protection devices are suggested minimums. Consult with a registered Professional Engineer within your local area for proper size selections.
13. All Overcurrent Protection Devices at or above 1200AT are assumed to be rated for 100% continuous load operation.


NOTES
1.DIMENSIONS ARE SHOWN IN INCHES (MILLIMETERS IN PARENTHESIS).
2.SIDE CLEARANCE OF ' 1"(25) ' IS NOT REQUIRED WITH CABINETS INSTALLED ASIDE.
3.CABINET SHOULD BE MAINTAINED UPRIGHT WITHIN ±15° DURING HANDLING.
4.APPROXIMATE WEIGHTS
35.8" [909]
12.2" [310]
2" [50]
0.1" [2]
AIR EXHAUST
15.4" [390]
19.7"(500)
6.3" [160]
27.6" [700]
32.8" [832]
RIGHT SIDE VIEW
12.8" [325]
2" [50]
CENTER OF GRAVITY
7.1" [180]
AIR INLET
39.4" [1000]
80.6" [2047]
74.8" [1900]
1.9" [49]
3.9" [100]
41.3" [1050]
33.5" [852]
A
1" [25]
R35.4"(900)
DOOR SWING
88° MAX
TOP VIEW
16.9" [430]
33.5" [850]
35.4" [900]
FRONT VIEW
2" [51]
64.6" [1640]
A
1" [25]
CENTER OF GRAVITY
4.7" [120]
5.5" [140]
2.4" [60]
1.2" [30]
27.6" [700]
3.9" [100]
CROSS SECTION A-A
BOTTOM CABLE ENTRY
2.8" [70]
7.5" [190]
CABLE KNOCKOUT
TYPE : T90S3S22KS6XSN2
RATING : 225kVA–3P3W–480V–60Hz
APPROX.WEIGHT : 1,080lbs (490kg)
HEAT REJECTION : 22.8 kBTUs/hour


NOTES
5.EXTERNAL WIRES OR CABLES SHALL BE PROVIDED BY CUSTOMERS FOR AC INPUT, DC INPUT, BYPASS INPUT AND AC OUTPUT (OUT OF TOSHIBA PROVISION).
6.ROTATION OF A, B & C PHASE IS CLOCKWISE.
FRONT INSIDE VIEW
CROSS SECTION E-E
1.2"(30)
10.6"(21.2" [538])
3.9"(7.9" [200])
1.2"(2.4" [60])
1.2"(2.4" [60])
5.7"(11.4" [290])
0.39"(10DIA)
E-BUS
CROSS SECTION D-D
1.2"(2.4" [60])
1.8"(3.5" [89])
11.1"(22.1" [562])
3.9"(7.9" [200])
3.5"(7.1" [180])
2.2"(4.3" [110])
0.49"(12.5DIA)
AC Input
Bypass Input
AC Output
CROSS SECTION C-C
1.2"(2.4" [60])
1.8"(3.5" [89])
11.6"(23.2" [590])
3.9"(7.9" [200])
3.5"(7.1" [180])
2.2"(4.3" [110])
0.49"(12.5DIA)
DC Input
10.0"(20" [508])
DC Input
AC Input
Bypass Input
AC Output
BP
BN
A
B
C
A40
B40
C40
A50
B50
C50
1.2"(2.4" [60])
2.8"(5.5" [140])
4.9"(9.8" [250])
CROSS SECTION B-B
2.0"(4" [102])
3.9"(7.8" [198])
2.0"(3.9" [100])
2.0"(4" [102])
2.2"(4.3" [110])
2.8"(5.5" [140])
0.16"(0.3" [8])
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FRONT INSIDE VIEW

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TOSHIBA

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