

TOSHIBA INTERNATIONAL CORPORATION
1000 Series Single Phase Uninterruptible Power Systems
Product Specifications – Rev 10.0 May 2013
1.0kVA, 1.5kVA, 2.0kVA, 3.0kVA & 6.0kVA

1.0 Scope

This document describes the specification for Toshiba 1000 Series On-Line Uninterruptible Power System (UPS). The UPS will supply a computer grade AC output sine wave which is unaffected by the quality of the AC input. The input voltage is single phase and the output voltage is single phase.

2.0 General Operation

3.0

Under normal operating conditions, the UPS' rectifier converts alternating current AC power to direct current (DC) power, which is required for the system's inverter and battery charger. The charger supplies regulated DC power to keep the batteries constantly charged. The inverter uses pulse width modulation (PWM) that fully utilizes the characteristics of insulated-gate bipolar transistors (IGBT) to convert DC power to regulated AC power. Therefore there is a constant supply of power. The batteries will instantaneously supply the inverter DC power when an AC power line failure occurs.

3.1 Performance Standards

The UPS is designed with the applicable sections of UL, CUL, and ISO 9001 14001. The UPS has UL and CUL listing for 120V, CE for 230V and the 6kVA Models.

3.0 General

3.1 Materials

All materials used are of new manufacture using the latest technology and have not been in prior service except for specified factory testing. IGBT's are used exclusively in the rectifier inverter and chopper sections.

3.2 Components

All functioning components are solid state with no moving parts.

3.3 Installation

Wiring practices and materials is in accordance with the National Electric Code, NFPA70 and other applicable standard.

3.4 Assembly

The UPS is delivered fully assembled and be fully functional.

4.0 System Theory and Operation

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4.1 Theory

AC input from the utility system is converted into DC power. The stepped up DC power is then converted to AC power by the inverter. The output voltage waveform of the inverter will be the pulse voltage waveform modulated by the PWM control using the 19.2 kHz switching frequency sine wave. The PWM-Modulated voltage waveform is transformed into a sine voltage waveform by the inductive component of the inverter inductor and by the capacitive component of the capacitor filter. The chopper, inverter, and charger use IGBT's that has a high switching speed.

4.2 Modes of Operation

4.2.1 Battery (Backup)

In the event the AC power from the utility system fails, the DC power is supplied from the batteries to the chopper and to the inverter to provide a continued and stable AC power supply to the load without interruption.

4.2.2 Normal (Inverter)

The rectifier converts AC to DC to power the inverter, which supplies power to the critical load and simultaneously float charging the batteries.

4.2.3 Battery Charge

The charger will float charge the batteries while also supplying power to the inverter.

4.2.4 Static Bypass

If the UPS unit is in severely overloaded or develops an internal fault, power is automatically switched from the units' main circuit to the bypass circuit. Power is conditioned by line filters, during static bypass operation.

5.0 System Parameters

5.1 UPS Input

System Ratings: The UPS's are sized to supply a load with an output power factor of 0.70.

Sizes: 1kVA, 1.5kVA, 2kVA, 3kVA & 6kVA

Electrical Requirements

Voltage: 1-3kVA 120VAC or 230VAC Single Phase
6kVA 208Vin/208Vout & 240Vin/240Vout

Voltage Range: 1-3kVA 80V~144V (+20% to -33%),

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1-3kVA 161V~276V (+20% to -30%)
6kVA 160V~276V (+15% to -34%)

Frequency: 50 or 60 Hz (45-65 Hz)

Synchronization: ± 3 Hz

Input Power Factor: Greater than 0.97

Input Total Harmonic Distortion: 1-3kVA Less than 9% (current)
6kVA Less Than 15% (current)

5.2 UPS Output

Rated Voltage: 100/110/115/120/127VAC, 208/220/230/240VAC Single Phase

Output Capacity:	<u>kVA</u>	<u>kW (@ 0.70PF)</u>
	1.0 kVA	700 W
	1.5 kVA	1050 W
	2.0 kVA	1400 W
	3.0 kVA	2100 W
	6.0 kVA	4200 W

Regulation: $\pm 2\%$ (with AC power and during battery backup)

Distortion: Less than 5% THD at Full Non-Linear Load
Less than 3% THD at full Linear Load

Step Load: $\pm 9\%$ max from 100% to 20% or from 20% to 100% linear load

Output Current:	<u>kVA</u>	<u>120V RMS</u>	<u>PEAK</u>
	1.0	8.3A	24.9A
	1.5	12.5A	37.5A
	2.0	16.6A	50.1A
	3.0	25.0A	75.0A

Output Current:	<u>kVA</u>	<u>230V RMS</u>	<u>PEAK</u>
	1.0	4.3A	12.9A
	1.5	6.5A	19.5A
	2.0	8.7A	26.1A
	3.0	13.0A	39.0A
	6.0	25.0A (240V)	75.0A

Overload Capacity (Inverter): 130% for 10 seconds, 125% for 1 minute

Crest Factor: 3.0

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Frequency:	50/60Hz Auto Sensing
Switching Frequency:	19.2kHz
Regulation:	± 0.25Hz
Synchronous Range:	+/- 1Hz
Wave Form:	Sine wave, Zero Transfer Time
Load Power Factor:	0.70 lagging
Efficiency AC to AC:	1-3kVA Greater than 86% 6.0kVA Greater than 89%
Leakage Current:	0.51mA
Surge Protection:	MOV 260 Joules on Output
Bypass:	Manual bypass provided with switch with less than 4 milliseconds transfer.

5.3 Environmental Operation

BTU:	1.0kVA = 390 BTU/Hour 1.5kVA = 584 BTU/Hour 2.0kVA = 778 BTU/Hour 3.0kVA = 1167 BTU/Hour 6.0kVA = 2334 BTU/Hour
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Operating Ambient Temperature:	32 °F ~ 104°F (0 °C ~ 40°C)
Recommended Temperature:	59 °F ~ 77°F (15°C ~ 25°C)
Storage Temperature:	5 °F ~ 122°F (-15°C ~ 50°C)
Humidity:	0-95%, Non-Condensing
Audible Noise:	1-3kVA 45dB (A) maximum @ 1 meter from Front Panel 6.0kVA 50dB (A) maximum @ 1 meter from Front Panel
Altitude:	11500 ft. (3500 m) above Sea Level

6.0 UPS Batteries

Battery DC Bus Volts:

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1.0 ~ 1.5kVA (Tower & Rackmount 2U)	36 VDC nominal
2.0 kVA (Tower & Rackmount 2U)	72 VDC nominal
3.0 kVA (Tower & Rackmount 2U)	72 VDC nominal
6.0 kVA (Rackmount)	240 VDC nominal

Backup time: 0.7PF

1.0 kVA (Tower & Rackmount)	7 minutes
1.5 kVA (Tower & Rackmount)	6 minutes
2.0 kVA (Tower & Rackmount)	6 minutes
3.0 kVA (Tower & Rackmount)	5 minutes
6.0 kVA (Rackmount)	7 minutes

Type of Battery: Yuasa Flame Retardant Lead Acid 9Ah/12V
Yuasa Flame Retardant Lead Acid 7.2Ah/12V

Number of Battery: 3 for 1.0 ~ 1.5kVA Tower & 2U
6 for 2.0 ~ 3kVA Tower & 2U
Batteries are packed in trays.
Battery trays can be hot-swappable.

20 for 6.0kVA Tower – Battery are not hot swappable.

Average Recharge: 8 hours (4 hours for 90%)

Charge Current: 1.5Amp

7.0 System Status and Control Indicators

7.1 Panel

The UPS has a panel on the front for complete monitoring control of UPS.

Operation panel features:

- 1) AC input voltage indicator
- 2) Inverter status indicator
- 3) Alarm indicator
- 4) Fault indicator
- 5) Liquid Crystal Display (LCD)

The UPS has menu driven LCD that displays operating conditions, warning messages and fault indication messages for the unit.

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Operating Conditions Display:

- 1) Output Voltage
- 2) Output Frequency
- 3) Input Voltage
- 4) Input Frequency
- 5) Battery Voltage
- 6) Output Load %
- 7) Output Watt
- 8) Output VA
- 9) Output Current
- 10) Backup Time
- 11) Battery Capacity
- 12) Temperature
- 13) External Battery Pack Number
- 14) UPS Rating
- 15) CPU Version
- 16) Frequency Conversion (Option)

Warning messages:

- 1) Output Overload
- 2) Battery Test
- 3) Over Charge
- 4) Low Battery
- 5) On-Battery
- 6) Charger Failure
- 7) Over Temperature
- 8) Output Short
- 9) High Output Voltage
- 10) Low Output Voltage
- 11) Bus Fault
- 12) Site Wiring Fault
- 13) Line Abnormal

8.0 UPS Line Cord & Receptacles

kVA Model	Line Cord	Receptacles
1.0kVA 120V (Tower)	5-15P	(6) 5-15R
1.0kVA 120V (Rack)	5-15P	(6) 5-15R
1.5kVA 120V (Tower)	5-15P	(6) 5-15R
1.5kVA 120V (Rack)	5-15P	(6) 5-15R
2.0kVA 120V (Tower)	5-20P	(12) 5-20R
2.0kVA 120V (Rack)	5-20P	(4) 5-15R
3.0kVA 120V (Tower)	L5-30P	(12) 5-20R

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3.0kVA 120V (Rack)	L5-30P	(4) 5-15R
1.0kVA 230V (Tower)	IEC 320	(4) IEC 320 C13
1.0kVA 230V (Rack)	IEC 320	(4) IEC 320 C13
1.5kVA 230V (Tower)	IEC 320	(4) IEC 320 C13
1.5kVA 230V (Rack)	IEC 320	(4) IEC 320 C13
2.0kVA 230V (Tower)	IEC 320	(8) IEC 320 C13
		(1) IEC 320 C19
2.0kVA 230V (Rack)	IEC 320	(4) IEC 320 C13
3.0kVA 230V (Tower)	IEC 320	(8) IEC 320 C13
		(1) IEC 320 C19
3.0kVA 230V (Rack)	IEC 320	(4) IEC 320 C13
6.0kVA 240V (Rack)	Hardwire & L6-30P	(2) L6-30R

9.0 Dimensions & Weights

	<u>1.0~1.5 kVA (Tower)</u>	<u>1.0~1.5 kVA (2U)</u>
Weight:	35.6/37.4 lbs	37.6 lbs
Depth:	16.5 in.	16.7 in.
Width:	6 in.	16.9 in.
Height:	9.4 in.	3.5 in.
	<u>2.0~3.0 kVA (Tower)</u>	<u>2.0~3.0 kVA (2U)</u>
Weight:	68.4/72.6 lbs	69.5 lbs/71.5 lbs
Depth:	16.7"	25"
Width:	8.9"	16.9"
Height:	14.2"	3.5"
	<u>6.0 kVA (UPS 3U)</u>	<u>6.0 kVA (Battery 3U)</u>
Weight:	48 lbs	100 lbs
Depth:	23.5"	23.5"
Width:	16.8"	16.8"
Height:	5.25"	5.25"

10.0 External Communications

10.1 RS-232C Communication

The RS-232C serial communication interface is available through a DB9 female connector. The interface allows monitoring of the UPS from a personal computer running terminal emulation program (included).

10.2 USB Communication

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The USB serial communication interface is available through a USB port. The interface allows monitoring of the UPS from a personal computer running terminal emulation program (included).

10.3 EPO Control

The UPS comes with terminals on its rear side for receiving an Emergency Power Off (EPO) and Remote Run/Stop command from a remote locations.

11.0 Reliability

Mean time between failures (MTBF) of 80,000 hours.

12.0 Conformance

FCC Part 15 Class A (2-3kVA), Class B (1-1.5kVA), UL 1778, ICES-003, CE
 Safety: EN50091-1-1/EN62040-1
 Emissions: EN50091-2/EN62040-2
 Immunity: EN50091-2 B(1000/1500VA), A(2000VA/3000VA)
 Insulation: TX 401, L 501, TX 101, L 402, and L 301: Class B

13.0 Warranty

Toshiba Standard warranty includes 3 Years of depot service which covers electronics and labor, and a 2 year warranty on the batteries.

14.0 Options

14.1 Matching Battery Cabinets

Toshiba UPS offers matching battery cabinets. Battery runtime may vary based upon: environmental conditions and percentage of load.

kVA	Battery Cabinet	Additional Runtime
1.0 (Tower)	UT1-BC-0125	25 minutes
1.0 (2U)	UT1-BR-0125	25 minutes
1.5 (Tower)	UT1-BC-0125	20 minutes
1.5 (2U)	UT1-BR-0125	20 minutes
2.0 (Tower)	UT1-BC-0225	25 minutes
2.0 (2U)	UT1-BR-0225	25 minutes
3.0 (Tower)	UT1-BC-0320	20 minutes
3.0 (2U)	UT1-BR-0320	20 minutes

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14.2 Remote Monitoring

The UPS has a communication slot that allows field installation of an optional RemotEye II card. The RemotEye II card allows the UPS to communicate with the Local Area Network via Ethernet SNMP and HTTP (web).

14.3 Environmental Monitoring Device (EMD)

The EMD is an environmental monitoring device that provides remote monitoring of temperature, humidity and other environmental conditions via standard web browser or network management systems. The EMD provides automated events notification when temperature, humidity or user defined dry contacts is out of configured tolerance.

14.4 Dry Contact Communication

The remote interface is an option feature. Signals are available through a DB9 male connector option card.

- 1) Fault (Output)
- 2) Remote Shutdown (input)
- 3) Bypass active (Output)
- 4) Battery Low (Output)
- 5) Loss of utility (Output)

14.5 Frequency Conversion (Optional)

The 1000 Series offers a software upgrade to enable the frequency conversion feature. The frequency can be set via the LCD display.

15.0 1000 Series is manufactured in Taiwan.