

TOSHIBA INTERNATIONAL CORPORATION

1000 Single Phase Uninterruptible Power Supply Systems Guide Specifications 1.0kVA, 1.5kVA, 2.0kVA, 3.0kVA, Tower and Rackmount

1.0 Scope

This specification describes the requirements for an 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

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 should an AC power line failure occur.

2.1 Performance Standards

The UPS shall be designed with the applicable sections of UL, CUL, and ISO 9001 14001. The UPS shall have UL and CUL listing for 120V and CE for 230V Model. Both models should be RoHS compliance.

3.0 General

3.1 Materials

All materials used are of new manufacture using the latest technology and should not have been in prior service except for specified factory testing. IGBT's (insulated-gate bipolar transistors) are used exclusively in inverter and chopper sections.

3.2 Components

All functioning components are solid state with no moving parts.

3.3 Installation

The installation of the UPS must comply with the UPS manufacturer's recommendations that will be supplied before delivery of the UPS. Local electrical codes and the National Electric Code must be complied with. All wiring must comply exactly with what is specified.

3.4 Assembly

The UPS shall be delivered fully assembled and be fully functional.

4.0 System Theory and Operation

4.1 Theory

AC input from the utility system is converted into DC power chopper. 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

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inductor and by the capacitive component of the capacitor filter. The chopper, inverter, and charger use the IGBT with a self-extinguishing function and a high switching speed.

4.2 Modes of Operation

4.2.1 Emergency (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 no load is being powered by normal mode.

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 UPS Input

5.1 System Rating The UPS's are sized to supply a load with a power factor of 0.70.
Sizes: 1.0, 1.5, 2kVA & 3kVA

5.2 Electrical Requirements

Voltage: 120 VAC or 230VAC Single Phase

Voltage Range: 80V~144V (+20% to -33%), 161V~276V (+20% to -30%)

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

Synchronization: ± 3 Hz

Power Factor: Greater than 0.97

Input Total Harmonic Distortion: Less than 9% (current)

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6.0 UPS Output

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

Capacity:	kVA	kW (@ 0.70PF)
	1.0 kVA	700 W
	1.5 kVA	1050 W
	2.0 kVA	1400 W
	3.0 kVA	2100 W

Regulation: +/-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: ± 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	25.0A
	1.5	12.5A	37.5A
	2.0	16.7A	50.0A
	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

Overload Capacity (Inverter): 150% for 10 seconds
125% for 1 minute

Crest Factor: 3.0

Frequency: 50/60Hz Auto Sensing

Regulation: ± 0.25Hz

Synchronous Range: +/- 1 Hz

Wave Form: Sine wave, Zero Transfer Time

Load Power Factor: 0.70 lagging (0.6 to 1.0)

Efficiency AC to AC: Greater than 86%

Bypass: Manual bypass provided with switch with less than 4 ms transfer

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7.0 UPS Battery

Battery Bus Volts:

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

Backup time: 0.7PF

1.0 ~ 1.5kVA (Tower & Rackmount)	7 minutes
2.0 kVA (Tower & Rackmount)	7 minutes
3.0 kVA (Tower & Rackmount)	7 minutes

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

Number of Battery: Three (1.0 ~ 1.5kVA Tower & 2U)
Six (2.0 ~ 3kVA Tower & 2U)

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

8.0 System Status and Control Indicators

8.1 Panel

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

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

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- 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

9.0 Dimensions

	<u>1.0 ~1.5 kVA (Tower)</u>	<u>1.0~1.5 kVA (2U)</u>
Weight	35.6 lbs	37.6 lbs
Depth	16.5"	16.7"
Width	6"	16.9"
Height	9.4"	3.5"

	<u>2.0 ~3.0 kVA (Tower)</u>	<u>2.0~3.0 kVA (2U)</u>
Weight	72.6 lbs	37.6 lbs
Depth	16.7"	16.7"
Width	8.9"	16.9"
Height	14.2"	3.5"

10.0 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 program.

10.2 USB Communication

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

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10.2 EPO Control

The UPS shall come 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 200,000 hours.

12.0 Environment Operation

Operating Ambient Temperature: 0 ~ 40°C (32 ~ 104°F)

Recommended Temperature: +15°C ~ 25°C

Storage Temperature: -15°C ~ 50°C

Humidity: 0-95%, Non-Condensing

Audible Noise: 45dB (A) maximum @ 1 meter from Front Panel

Altitude: 3300 ft (1,000 m) above sea level

13.0 Conformance

FCC Part 15 Class B, UL 1778, ICES-003, CE

14.0 Warranty

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

15.0 Options

15.1 Matching Battery Cabinets

Toshiba UPS offers two 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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15.2 Remote Monitoring

The UPS contains a communication slot this allows the operator to field install an optional RemotEye II card. The RemotEye II card shall allow the UPS to communicate via Ethernet SNMP, connected directly to the Local Area Network. SNMP/ Web based monitoring – Toshiba UPS system provides comprehensive monitoring of the UPS operation. The optional RemotEye II features an HTTP (web-based) interface for Toshiba UPS. This allows easy access to the Toshiba UPS information from any PC/Network with a web browser.

15.3 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.

15.4 Dry Contact Communication

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

- 1) AC input present
- 2) Battery operation
- 3) Inverter
- 4) Bypass active
- 5) Fault
- 6) Loss of utility

15.5 Frequency Conversion

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