

**TOSHIBA INTERNATIONAL CORPORATION**  
**T1000 Series Single Phase Uninterruptible Power Systems**  
**Product Specifications – Rev 1 November 2018**  
**1.0kVA, 1.5kVA, 2.0kVA, 3kVA**

1.0 Scope

This document describes the specification for Toshiba T1000 Series On-Line Uninterruptible Power System (UPS) 1000-3000VA. 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.

|                       |                |                |                |                     |
|-----------------------|----------------|----------------|----------------|---------------------|
| Model# Tower          | T1S0A1000AXA   | T1S0A1500AXA   | T1S0A2000AXA   | T1S0A3000AXA        |
| Model# Rack (2U)      | T1S0A1000AXAR2 | T1S0A1500AXAR2 | T1S0A2000AXAR2 | T1S0A3000AXAR2 / P1 |
| Power Rating VA/Watts | 1000/900       | 1500/1350      | 2000/1800      | 3000/2700           |

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 when an AC power line failure occurs.

Performance Standards

The UPS has UL and CUL listing for 120V

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.

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## 4.0 System Theory and Operation

### 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 and inverter 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

#### 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 0.90.

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

Electrical Requirements

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Voltage: 1-3kVA 120VAC

Frequency: 50 or 60 Hz Auto-sensing

Synchronization:  $\pm 5\%$

Input Power Factor: Greater than 0.97

5.2

UPS Output  
 Nominal Voltage: 120VAC, Single Phase  
 Other Voltages: 100V/110V/115V

|                  |            |                      |
|------------------|------------|----------------------|
| Output Capacity: | <u>kVA</u> | <u>kW (@ 0.90PF)</u> |
|                  | 1.0 kVA    | 900 W                |
|                  | 1.5 kVA    | 1350 W               |
|                  | 2.0 kVA    | 1800 W               |
|                  | 3.0 kVA    | 2700 W               |

Distortion: < 2.5% THD at full 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        | 16.7A           | 50.1A       |
|                 | 3.0        | 25A             | 75A         |

Overload Capacity (Inverter): 106-120% 30 sec., 121-150% 10 sec.

Crest Factor: 3:1

Frequency: 50/60Hz Auto Sensing

Regulation:  $\pm 0.25\text{Hz}$

Wave Form: Sine wave, Zero Transfer Time

Load Power Factor: 0.90

Efficiency AC to AC: 1-3kVA; 86% (at 100% Linear load)

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Leakage Current: <3.5mA

5.3 Environmental Operation

Operating Ambient Temperature: 0°C ~ 40°C

Recommended Temperature: 15°C ~ 25°C

Storage Temperature: -20°C ~ 50°C

Humidity: 0-95%, Non-Condensing

Audible Noise 1 meter from surface: <50dBA

Altitude: 2,000 meters max (no de-rating under 1,000 meters)

6.0 UPS Batteries

Battery DC Bus Volts:

|                                |                |
|--------------------------------|----------------|
| 1.0 kVA (Tower & Rackmount 2U) | 36 VDC nominal |
| 1.5 kVA (Tower & Rackmount 2U) | 48 VDC nominal |
| 2.0 kVA (Tower & Rackmount 2U) | 72 VDC nominal |
| 3.0 kVA (Tower)                | 96 VDC nominal |
| 3.0 kVA (Rackmount 2U)         | 72 VDC nominal |

Backup time: 0.9PF

|                             |           |
|-----------------------------|-----------|
| 1.0 kVA (Tower & Rackmount) | 5 minutes |
| 1.5 kVA (Tower & Rackmount) | 5 minutes |
| 2.0 kVA (Tower & Rackmount) | 5 minutes |
| 3.0 kVA (Tower)             | 5 minutes |
| 3.0 kVA (Rackmount)         | 3 minutes |

Type of Battery: Flame Retardant Lead-Acid 9AH/12V

Number of Battery: 3 for 1.0 kVA Tower & 2U Rack  
 4 for 1.5 kVA Tower & 2U Rack  
 6 for 2.0 kVA Tower & 2U Rack

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6 for 3.0 kVA 2U Rack  
8 for 3.0 kVA Tower  
Hot Swappable Battery Tray with exception of 3kVA Tower Model

Average Recharge: 4 hours over 90%

Charge Current: 1.0Amp (Max)  
The auto-regulated charging system changes the current based of different factors including the operating temperature.

## 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) UPS On indicator
- 2) Inverter status indicator
- 3) Battery mode indicator
- 4) Bypass mode indicator
- 5) Fault indicator

The UPS has 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
- 12) Temperature
- 13) External Battery Pack Number
- 14) UPS Rating
- 15) CPU Version
- 16) Frequency Conversion (Option)

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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) 5-20R             |
| 3.0kVA 120V (Tower)   | L5-30P    | (8) 5-20R, (1) L5-30R |
| 3.0kVA 120V (Rack)    | L5-30P    | (4) 5-20R             |
| 3.0kVA 120V (Rack P1) | L5-30P    | (2) 5-20R, (1) L5-30R |

9.0 Dimensions & Weights

| <b>Tower Dimensions &amp; Weights</b>                    |                   |                   |                   |                   |
|--|-------------------|-------------------|-------------------|-------------------|
|  | <b>1000VA</b>     | <b>1500VA</b>     | <b>2000VA</b>     | <b>3000VA</b>     |
| DIMS WxDxH (in.)   | 6.0 x 16.5 x 9.4  | 6.0 x 19.7 x 9.4  | 8.9 x 16.5 x 14.1 | 8.9 x 16.5 x 14.1 |
| Net Weight (lbs.)  | 33.4              | 42.7              | 67.1              | 68.4              |
| <b>Rackmount (2U) Rackmount Dimensions &amp; Weights</b> |                   |                   |                   |                   |
|  | <b>1000VA</b>     | <b>1500VA</b>     | <b>2000VA</b>     | <b>3000VA</b>     |
| DIMS WxDxH (in.)   | 16.9 x 16.7 x 3.3 | 16.9 x 19.7 x 3.3 | 16.9 x 25 x 3.3   | 16.9 x 25 x 3.3   |

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|                   |      |      |      |      |
|-------------------|------|------|------|------|
| Net Weight (lbs.) | 35.9 | 39.4 | 65.6 | 73.9 |
|-------------------|------|------|------|------|

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

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 Conformance

The UPS has UL and CUL listing and FCC for 120V  
 FCC Part 15 Class A (2 kVA, 3 kVA), Class B (1 kVA, 1.5 kVA), UL 1778

12.0 Warranty

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

13.0 Options

13.1 Matching Battery Cabinets

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

| kVA         | Battery Cabinet # | Additional Runtime with 1 Battery Cabinet | Additional Runtime with 2 Battery Cabinet |
|-------------|-------------------|---|---|
| 1.0 (Tower) | T1B01000025       | 25 minutes                                | 47 minutes                                |
| 1.0 (2U)    | T1B01000025R2     | 25 minutes                                | 47 minutes                                |
| 1.5 (Tower) | T1B01500021       | 22 minutes                                | 41 minutes                                |
| 1.5 (2U)    | T1B01500021R2     | 22 minutes                                | 41 minutes                                |
| 2.0 (Tower) | T1B02000025       | 25 minutes                                | 47 minutes                                |
| 2.0 (2U)    | T1B02000025R2     | 25 minutes                                | 47 minutes                                |
| 3.0 (Tower) | T1B02000025       | 22 minutes                                | 41 minutes                                |
| 3.0 (2U)    | T1B02000025R2     | 15 minutes                                | 29 minutes                                |

### 13.2 Remote Monitoring

The UPS has a communication slot that allows field installation of an optional RemotEye 4 card. RemotEye® 4 is the newest option for monitoring Toshiba uninterruptible power systems (UPS). The fourth generation UPS monitoring solution boosts speed and memory for history logs, while introducing custom dashboards and universal communications protocols including: Modbus TCP & RTU, BACnet IP & MSTP, HTTP/HTTPS and SNMP.

### 13.3 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.

### 13.4 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)

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5) Loss of utility (Output)

13.5 Frequency Conversion (Optional)

The T1000 Series offers a firmware upgrade to enable the frequency conversion feature.  
The frequency can be set via the LCD display.

14.0 T1000 Series 1-3kVA UPS are manufactured in Taiwan.

15.0 Reliability

Mean time between failures (MTBF) of 50,000 hours.