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## Strata CTX Mean Time Between Failure

We are pleased to provide current Mean Time Between Failure (MTBF) rates for the Toshiba Strata CTX100 and CTX670 systems, and the 3000-series digital telephones.

This information is intended to assist your sales efforts by substantiating Toshiba's reputation for producing high quality and very reliable telecommunication products.

One of the primary customer concerns when purchasing business equipment is quality and reliability. That's why Toshiba telecommunication products are specifically designed for reliability as well as efficiency and performance.

Toshiba has established a well deserved reputation for quality and reliability as a world wide manufacturer of all types of electronic equipment. This reputation has contributed significantly to our growth as one of the leading suppliers of telecommunication systems, and it is a key component of our marketing strategy. As such, it is important to have a method of measuring and quantifying just how reliable these products are.

## MTBF Rates

Based on actual field data compiled over a minimum of 12 months, the minimum MTBF rates for the Toshiba Strata CTX100, CTX670, and 3000-series digital telephones are as follows:

- Strata CTX100 and CTX670 Average MTBF:
  - Major: 43.3 years
  - Minor: 14.5 years
- 3000-Series Digital Telephones Average MTBF: 37.1 years

## Definition

Toshiba TSD distinguishes between the following two types of failures.

- **Major Failures** are those where a problem is diagnosed that renders the system completely inoperative.

Parts used to calculate major failures in the Toshiba Strata CTX systems are key service unit (KSU) equipment cabinets, common control components, and power supplies.

- **Minor Failures** are those where a problem is diagnosed that affects only part of the system, such as a single telephone circuit or trunk circuit failure.

Parts used to calculate minor failures include all system and common control components, including trunk and station interfaces, but not telephones.

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Because the same proprietary digital telephones are utilized throughout the Toshiba TSD product line, MTBF rates for them are provided separately.

## Methodology

An industry standard method of determining reliability is through Mean Time Between Failure rates. Although an officially recognized way of calculating these rates does exist, various manufacturers use different information, which can make their figures look better than they actually are. For example, some manufacturers count each circuit on a KSU, or printed circuit board (PCB) as one unit, so that an eight circuit card counts as eight units. This increases the total number of units in operation, so MTBF rates would be stated higher than normal. Toshiba believes that the method used and described below represents the most accurate statement of industry standard MTBF rates.

The following is a description of the industry standard method used by Toshiba America Information Systems, Inc., Telecommunication Systems Division (TAIS/TSD) to calculate MTBF rates for the Strata CTX100, CTX670 and 3000-series digital telephones.

### 1. Individual PCB/sub-assembly MTBF:

- The total number of each component in the field is multiplied by the number of hours of operation.
- This number is then divided by the total number of reported failures during the same calendar period.

Formula:

$$\text{MTBF (Hours)} = \frac{(\text{Number of pieces}) \times (\text{Operation Time in Hours})}{\text{Number of Failures}}$$

### 2. System MTBF: The MTBF for a group of components, such as those used in the Major and Minor system failure calculations, is calculated by adding the reciprocals of the individual MTBF values and then taking the reciprocal of that sum as follows.

- The individual component MTBF value is divided into 1 to produce the reciprocal.
- If more than one of that component (5 for example) is included in the system calculation, that reciprocal is multiplied by that quantity (5 in this example).
- All of the individual MTBF reciprocals are added together and that sum is divided into 1 to produce the total MTBF.
- Any necessary conversions are done to convert the value to years.

Formula:

$$\text{MTBF} = T$$

$$T (\text{total}) = \frac{1}{1/T_1 + 1/T_2 + 1/T_3 + 1/T_n}$$

## Toshiba Product Reliability

Every manufacturer claims their products are the most reliable. In most cases they have no way to substantiate their claims. Some manufacturers offer MTBF rate statistics, but differences in methodology can often result in wide variations in outcome and make comparisons difficult between various manufacturers products.

Toshiba provides MTBF rates on Strata CTX systems and telephones, and they are indeed very impressive. However, to get an appreciation of why Toshiba products are so reliable, it is important to note some engineering and design considerations.

- Large Scale Integration (LSI) technology enables circuit design to be compact and efficient. Toshiba proprietary gate arrays save vast amounts of space by using the latest LSI technology. More circuitry fits onto smaller circuit cards for a more compact design and less heat generation. In any electronic product, less heat means longer life and greater reliability.
- Very strict design standards are used by Toshiba engineers. Component selection is made after substantial evaluation assuming high temperatures and other severe conditions affecting reliability. Before manufacturing, all equipment is put through a series of tests proprietary to Toshiba. This includes full environmental, EMI, electrostatic, and stress tests.
- After product release, failure data is constantly monitored to ensure that high reliability is maintained.
- Built-in power surge protection is provided by the Strata CTX's switching-type regulated power supply that provides line filtering and is protected by circuit breakers that can be reset. External primary power surge protectors are still recommended for proper system protection, especially in lightning areas, but this design provides the Strata CTX one of the most highly reliable power supplies available.
- Built-in gas tubes on ground and loop start CO line cards helps provide secondary protection of each circuit from lightning and other power surges.
- Stored program control keeps all programming, option settings, and customer database information in Random Access Memory (RAM). A lithium battery in the CPU, with a life span of at least ten years, preserves RAM when AC power is not present. There is no volatile memory loss and no external memory storage components to worry about.
- Because there are no moving parts, stored program control data is much safer and the system is much more reliable than systems using disk drives to store data. Having no moving parts is another reason for less heat generation. Once again, less heat means longer life and greater reliability.

## Competitive Advantages

These Toshiba MTBF figures are very impressive and we welcome comparison with the MTBF rates of other manufacturers' telecommunication products. As authorized Toshiba dealers, you have the facts and figures to back up Toshiba's reputation for quality and reliability. Other manufacturers make the same claims, but they lack the quantifiable proof.

This type of data is very important in many selling situations in which prospective customers ask for statistical data to substantiate claims of superior reliability. This includes sales presentations, specific inquiries, and responses to RFPs issued by consultants and end users. We are confident you will find this information very useful.