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 MS3000 Reliability Analysis Report

**Standard** Telcordia SR-332 Issue 1

 Method I Case 3

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Key Words：MS3000, MTBF, Availability, Downtime

Abstract： In this report the units and system reliability of MS3000 is analyzed according to Telcordia SR-332” Reliability Prediction Procedure for Electronic Equipment” and SR-TSY-001171 “Methods and Procedures for System Reliability Analysis”.

List of abbreviations：

|  |  |
| --- | --- |
| Abbreviations | Full Name |
| A | Availability |
| MTBF | Mean Time between Failure |
| MTTR | Mean Time to Repair |
| FIT | Failure in Time |
| PSU | Power Supply Unit |
| SPU | Storage Processor Unit |

# Reliability Prediction Methodology

## Component Reliability Prediction Method

In this report, prediction of component reliability is performed with Method I, Case 3 of Telcordia SR-332.

Component steady-state failure rate is given by:



Where

λSSi = Operating steady-state failure rate of the ith component

λGi = generic steady-state failure rate for ith component

πQi = quality factor of ith component

πSi = stress factor of ith component

πTi = temperature factor of ith component due to normal operating temperature during the steady state.

## Unit Reliability Prediction Method

Unit failure rate is computed as the sum of the component failure rate for all components in the unit, multiplied by environmental factor:



Where

n = number of different component types in the unit

Ni = quantity of the ith component types

πE = unit environment factor, for the fixed and controlled ground, πE =1.0.

According to the formula MTBF = 1/λSS, the MTBF of each unit can be calculated.

## Calculation Method of System Reliability

Markov model of the repairable system is adopted for calculating redundancy system.

The failure rate of series system is the sum of the failure rate of each unit.

MTBF is the reciprocal of failure rate: MTBF=1/λ

A (Availability) = MTBF/ (MTBF+MTTR)

Downtime = 525600×(1-A) mins/yr

## Determination of Other Related Parameters

The MTTR in this report only include the field repairing time. The time for the maintenance personnel’s journey and the logistic management is not included.

In this report, the MTTR of each unit and equipment is determined to be 0.5 hours according to MIL-HDBK-472, the engineering experience and field data.

The coverage probability of redundant units is 90-percent according to engineering experience.

# Unit Reliability Prediction

According to the prediction methodology above, reliability of each unit can be calculated below.

Unit reliability prediction

|  |  |  |  |
| --- | --- | --- | --- |
| Unit | Unit Description | Failure Rate（FIT） | MTBF(yrs) |
| PSU |  DPS-770CB C | 2876.3 | 39.7 |
| SPU MainBoard |  MS1MS1B | 6156 | 18.5 |
| Hardisk interface card | MS01SS2A | 240 | 475.6 |
| Back Board  | MS01XCVT | 42.3 | 2698.7 |
| Power Extend Board | MS01PSBS | 375.2 | 304.3 |
|  |  |  |  |
|  |  |  |  |
| Hard disk | 300G, 450G,600G,1T,2TSAS; 1T,2T SATA; | 1000 | 114.2 |

# Calculation for System Reliability

## Definition of System Failure

The definition of system failure is a crucial element in predicting system reliability. Different method

should be applied depending on different system failure definition. According to the typical application of the product in the market, typical configuration is selected for considering the system reliability. The faults causing service interruption of the system typical configurations are defined as system failure here.

## Typical Configuration and Reliability Model

Based on the definition of system fault, the following reliability model can be formed for the product.

![C:\Users\Administrator\AppData\Roaming\Tencent\Users\2234122362\QQ\WinTemp\RichOle\CP~8RXNF9~H]LJTI(M)U%2Y.png]()SCU

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Figure-1 Reliability model diagram of the product

## System Reliability Prediction

The SPU Hard disk confirmation is Raid 5.

System reliability prediction of product is shown in the following table.

System reliability of the product

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| System | Availability | MTBF(yrs) | MTTR(hrs) | Downtime(min/yr) |
| SPU | 0.999998 | 28.8 | 0.5 | 1.0 |