

APPLICATION OF STATISTICAL PREDICTIVE MODELS FOR FIELD FAILURE  
AND CISCO TESTING DATA  
(BIG DATA SOURCE: CISCO)

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Master of Science in Industrial Engineering

by  
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TITLE:           Application of Statistical Predictive  
Models for Field Failure and Cisco  
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(Big Data Source: Cisco)

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## ABSTRACT

Application of Statistical Predictive Models for Field Failure and Cisco Testing Data

(Big Data Source: Cisco)

Alyssa Marie Carter

Cisco was interested in how field failure categories relate to manufacturing test failures to better predict the tests that should be performed on a product after a return by a customer and what tests will be failed by a product before and after a return by a customer based on what type of failure occurred in the field. A study was conducted on one product type and 5 years of field data and the associated test data were captured. For each combination of field failure, shipping status, test area result, and test area a statistical model of the population proportion was created. The 95% and 99% confidence intervals were found. The critical test areas and a ranking of the criticality of the test areas were arranged from the confidence intervals. These findings will reduce the time spent on unnecessary tests.

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## 1. INTRODUCTION

Companies collect data every day and if they store that data it will accumulate and become more numerous than can be easily counted. These data sets are often referred to as big data. Storing big data is useful as it grants the ability to reference past occurrences or items. More than storing, though, there is a need for the organization and analysis of big data.

### 1.1 Background

Every product produced by Cisco goes through a series of tests and the results of those tests are recorded and stored in a database called the Cisco manufacturing report center (CMRC).

When a customer finds a product that has failed in the field, they work with a team at Cisco called the technical assistance center team (TAC). TAC helps the customer to define the failure of the product so that when it is sent back to Cisco for repair the testers have an idea of what to start testing. All of the details of the customer, their product, and the failure are combined into a service order that is processed and then stored in the return material authorization (RMA) database.

Tests performed on the returned product are stored in the CMRC with the data from before the product was shipped to the customer. The two databases, CMRC and RMA,

store the data collected, but organization and analysis is necessary on the big data to combine the data sets and find useful information from the combination.

## 1.2 Problem Statement

Data is stored in the RMA and CMRC for field failures and manufacturing test failures, before and after shipping to a customer, respectively. Cisco wants to know how field failure categories relate to manufacturing test failures to better predict the tests that should be performed on a product after a return by a customer and what tests will be failed by a product before and after a return by a customer based on what type of failure occurred in the field.

## 1.3 Scope

This study is conducted on a single product type, UCSB-B200-M3, a Cisco blade server. For the product 17,950 rows and 24 columns of RMA data from 2012 to 2017 are extracted for analysis. The corresponding 346,634 rows and 34 columns of CMRC data are compiled from the unique serial numbers. There are 83 test areas, 2957 unique test failures, and 34 unique field failures in the data set. For this study only the top 10 field failures are considered. The objective of the study is to find the proportion of products that are failed, repaired, or passed in each test area before and after shipping to a customer with respect to the specific field failures. For example, the proportion of products that fail in XRAY that were returned to Cisco with motherboard failure.

Along with the proportion analysis, an organization of the serial numbers and their corresponding field failures and number and list of test failures is done.

## 2. LITERATURE REVIEW

Companies like Cisco accumulate data from many sources, from within the company and from external resources such as suppliers and customers. Through the collection and storage of this data big data databases are created. The organization and analysis of the data contained in these databases can be done in an infinite number of ways. It is important to companies to make use of the organization and analysis of their big data to do things like find trends in failed tests or estimate the percentage of products that will have specific issues.

It is the goal of this literature review to investigate the role of big data in supply chain and manufacturing, big data analytics, and methods of organization of big data. Though the data from is from a big data source, please note that this study looks at a large data set rather than big data.

### 2.1 Big Data in Supply Chain

Every step of the supply chain in a manufacturing setting creates data that is collected and stored. The big data from supply chain can be accessed and managed in ways that can provide important information for companies about key metrics that affect production and quality.

“Big Data Driven Supply Chain Management and Business Administration” by Wang and Alexander (2015) looks at how big data has the potential to revolutionize supply chain dynamics and business management because of the value of integrated data sources and actionable information. They found that big data can help with efficiency, defect identification, procurement, supply chain collaboration, end-to-end supply chain execution, supply chain planning, inventory control and risk management, etc. The challenges of big data in supply chain management include but are not limited to data capture, data visualization, data integration, and data sharing.

The authors of “Manufacturing in the world: where next?” (Brennan, et al. 2015) discuss the changing of the configuration of manufacturing production around the globe. They address the major emerging themes that might impact global manufacturing including big data. They conclude that big data can have a great impact on global manufacturing, but it is just starting to change the landscape of global manufacturing and has not yet made a disruptive impact on it.

The impact of big data in manufacturing comes from the access to past data, the ability to see data in real time, and the analysis of data. Big data in manufacturing supply chain, like product testing results in quality or consumer demographics, is altering business practices in allowing the visibility, sharing, and analysis of information critical to processes.

## 2.2 Big Data Analytics

Big data analytics is the process of examining big data to find patterns, trends, and other useful information. The inspection of big data can be done through advanced statistical analysis.

In “Big Data Analytics” (Russom 2011), the author talks about the importance of enterprises using advanced analytics to study big data to understand the current state of businesses. He notes the combination of two technical entities, big data and advanced analytics, and how it is an emerging practice in business intelligence. He recommends combining big data and advanced analytics to capture information and learn from big data.

Biswas and Sen propose to exploit the current state of data management, analytics, and visualization in “A Proposed Architecture for Big Data Driven Supply Chain Analytics” (2016). They describe the relevance of big data in supply chain strategy and the significance of big data analytics in supply chain management.

### 3. METHODOLOGY

#### 3.1 Population Proportion

The statistical tool of population proportion was used to analyze manufacturing test areas relation to field failure. Population proportion analysis takes the proportion of a sample from a population, in this case the population of the product type UCSB-B200-M3, and produces confidence intervals. The top 10 field failures were chosen for analysis.

##### 3.1.1 Filtering/Capturing Subsections

The combination of RMA and CMRC data sets allowed for the division of the data by field failure and by test area. Serial numbers were separated into sections by field failure from the RMA data set and the corresponding serial numbers of the top 10 field failures were included in the CMRC data set through filtering by the unique serial numbers. From the subsection of data created through filtering, the unique combinations of serial number, shipping status, test area, and test area result were taken. The shipping status being test performed before or after shipping to customer and the test area results being failed, repaired, or passed. The resulting data set was then filtered by shipping status, test area result, and test area. A count of records was taken and recorded to be used to calculate the sample proportion. This was done for all combinations of the top 10 field failures and all shipping statuses, test areas, and test area results. For example, first finding the serial numbers that had a DIMM issue. Then, filtering the CMRC data set by those serial

numbers. Next, taking the unique combinations of serial number, shipping status, test area, and test area result. Then, filtering the data by before shipping then by passed and finally by ASSY and taking a count of the records.

### 3.1.2 Calculation

The calculations of the 95% and 99% confidence intervals for the population proportions of each combination of the top 10 field failures and all test areas and test area failures were calculated in the statistical analysis software, Minitab. The equation that is used to calculate the confidence interval of a population proportion is in Figure 1.

$$\hat{p} \pm z_{\alpha/2} \sqrt{\frac{\hat{p}(1 - \hat{p})}{n}}$$

Figure 1

Where  $\hat{p}$  = the population proportion estimate,  $n$  = the sample size, and  $z_{\alpha/2}$  = the appropriate confidence level from a  $z$  table. An example calculation from the study is the 95% confidence interval of the population proportion of the product with shipping status: before shipping, field failure: motherboard issue, test area: ICT, and test area code: failed. The calculation is as follows:  $\hat{p} = 0.036$ ,  $n = 4497$ , and  $z_{\alpha/2} = z_{0.025} = 1.96$  so the 95% confidence interval is (0.031, 0.042) or 3.1% to 4.2%.

### 3.2 Comparison Table

Another thing taken from the crossing of the RMA and CMRC data sets was a comparison table of each unique serial number and the test failures from before and after shipping. It took the serial number, field failure, and return date of the product from the RMA data set and combined it with the associated test failures, sorting by before and after shipping.

## 4. RESULTS

### 4.1 Population Proportions

Once a confidence interval is calculated how do you interpret it? If you have a 99% confidence interval for population proportion, it does not mean that there is a 99% probability that the population proportion will fall within the computed limits. Rather, it means that if the procedure of taking a sample and calculating the confidence interval was repeated many times the 99% of the times the population proportion will be included in the computed confidence intervals. This concept is visually interpreted in Figure 2.

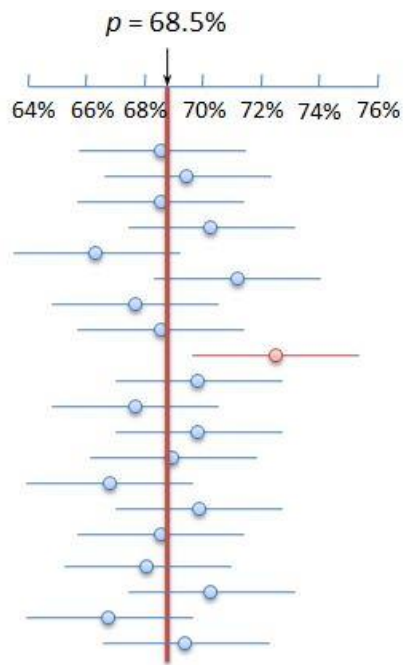


Figure 2

This study calculated 810 95% confidence intervals and 810 99% confidence intervals that are shown in Tables 1-30 and an explanation of acronyms is in Figure 3.

CI	Confidence Interval
LCL	Lower Confidence Limit
UCL	Upper Confidence Limit

Figure 3

Table 1

Failed Before Shipping	Field Failure				Field Failure			
	Motherboard Issue				Motherboard Failure			
	95% CI		99% CI		95% CI		99% CI	
Test Area	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
DBGHTHV	1.9539%	2.8681%	1.8335%	3.0285%	1.6919%	2.7095%	1.5634%	2.8924%
ICT	3.0976%	4.2130%	2.9450%	4.4044%	2.2822%	3.4363%	2.1319%	3.6400%
OPCBPB								
OSYSBI	0.0138%	0.1948%	0.0075%	0.2439%				
PCB2C	4.4053%	5.7050%	4.2233%	5.9247%	3.7342%	5.1574%	3.5408%	5.4023%
PCBBI	0.2035%	0.5771%	0.1684%	0.6546%	0.1234%	0.5114%	0.0939%	0.5983%
PCBCEV					0.0008%	0.1669%	0.0002%	0.2224%
PCBDL	0.3960%	0.8724%	0.3449%	0.9655%	0.2970%	0.8144%	0.2475%	0.9208%
PCBFA	0.0626%	0.3205%	0.0453%	0.3806%	0.0185%	0.2625%	0.0101%	0.3286%
PCBFT	7.0589%	8.6513%	6.8297%	8.9156%	6.3949%	8.1850%	6.1424%	8.4856%
PCBP2	0.0054%	0.1606%	0.0023%	0.2061%	0.0073%	0.2163%	0.0031%	0.2776%
PCBPEP	0.0138%	0.1948%	0.0075%	0.2439%				
PCBST	4.2592%	5.5400%	4.0802%	5.7568%	4.2060%	5.7035%	4.0006%	5.9597%
POSTBI	0.1380%	0.4657%	0.1100%	0.5362%	0.0844%	0.4317%	0.0611%	0.5127%
RSYSBI	0.0242%	0.2276%	0.0150%	0.2798%				
SYSADBG	0.0006%	0.1238%	0.0001%	0.1651%				
SYSAPK	0.3601%	0.8196%	0.3116%	0.9101%	0.6074%	1.2809%	0.5333%	1.4111%
SYSBI	0.0242%	0.2276%	0.0150%	0.2798%	0.0185%	0.2625%	0.0101%	0.3286%
SYSCEV					0.0073%	0.2163%	0.0031%	0.2776%
SYSFA	9.0806%	10.8517%	8.8226%	11.1432%	8.7539%	10.7958%	8.4606%	11.1345%
SYSFT	5.1802%	6.5745%	4.9831%	6.8085%	4.5961%	6.1516%	4.3815%	6.4166%
SYSINT	0.1540%	0.4938%	0.1242%	0.5662%	0.1036%	0.4718%	0.0771%	0.5559%
SYSBP	0.0138%	0.1948%	0.0075%	0.2439%	0.0008%	0.1669%	0.0002%	0.2224%
SYSPEP	0.0006%	0.1238%	0.0001%	0.1651%	0.0008%	0.1669%	0.0002%	0.2224%
SYSPI	0.0490%	0.2902%	0.0342%	0.3479%	0.0487%	0.3493%	0.0323%	0.4234%
UNKNOWN	0.0006%	0.1238%	0.0001%	0.1651%				
WPCBASIC1								
XRAY	0.2893%	0.7129%	0.2464%	0.7980%	0.2743%	0.7775%	0.2270%	0.8817%
XTD4C					0.0008%	0.1669%	0.0002%	0.2224%
XTDSNT	0.1540%	0.4938%	0.1242%	0.5662%	0.1438%	0.5504%	0.1115%	0.6401%

Table 2

Failed Before Shipping	Field Failure				Field Failure			
	DIMM Issue				Blade Failure			
	95% CI		99% CI		95% CI		99% CI	
Test Area	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
DBGHTHV	0.8856%	1.7433%	0.7879%	1.9060%	2.2036%	3.9049%	1.9987%	4.2178%
ICT	2.1677%	3.4017%	2.0102%	3.6219%	2.8377%	4.7210%	2.6037%	5.0613%
OPCBPB	0.0009%	0.1952%	0.0002%	0.2602%				
OSYSBI	0.0085%	0.2531%	0.0036%	0.3248%				
PCB2C	3.0528%	4.4776%	2.8647%	4.7270%	5.3413%	7.7780%	5.0175%	8.2013%
PCBBI	0.0382%	0.3587%	0.0236%	0.4409%	0.2496%	1.0323%	0.1900%	1.2073%
PCBCEV								
PCBDL	0.1212%	0.5520%	0.0902%	0.6502%	1.1794%	2.5130%	1.0334%	2.7704%
PCBFA	0.0009%	0.1952%	0.0002%	0.2602%	0.1335%	0.7893%	0.0932%	0.9457%
PCBFT	3.9834%	5.5781%	3.7681%	5.8533%	6.1183%	8.6937%	5.7718%	9.1377%
PCBP2					0.0015%	0.3370%	0.0003%	0.4492%
PCBPEP								
PCBST	2.6715%	4.0184%	2.4959%	4.2559%	2.5722%	4.3822%	2.3499%	4.7115%
POSTBI	0.0987%	0.5050%	0.0715%	0.5997%	0.1335%	0.7893%	0.0932%	0.9457%
RSYSBI					0.0015%	0.3370%	0.0003%	0.4492%
SYSADBG					0.0375%	0.5301%	0.0205%	0.6633%
SYSAPK	0.1927%	0.6891%	0.1517%	0.7971%	0.1706%	0.8716%	0.1235%	1.0346%
SYSBI	0.0382%	0.3587%	0.0236%	0.4409%	0.2496%	1.0323%	0.1900%	1.2073%
SYSCEV	0.0009%	0.1952%	0.0002%	0.2602%				
SYSFA	7.7862%	9.9009%	7.4867%	10.2547%	8.9287%	11.9286%	8.5123%	12.4353%
SYSFT	5.2178%	7.0055%	4.9713%	7.3100%	5.2861%	7.7124%	4.9639%	8.1342%
SYSINT	0.0085%	0.2531%	0.0036%	0.3248%	0.2908%	1.1111%	0.2255%	1.2916%
SYSPB	0.0382%	0.3587%	0.0236%	0.4409%	0.6009%	1.6435%	0.5009%	1.8572%
SYSPEP	0.0009%	0.1952%	0.0002%	0.2602%				
SYSPTM	0.0085%	0.2531%	0.0036%	0.3248%	0.0015%	0.3370%	0.0003%	0.4492%
UNKNOWN					0.0015%	0.3370%	0.0003%	0.4492%
WPCBASIC1								
XRAY	0.2176%	0.7338%	0.1735%	0.8448%	0.3310%	1.1890%	0.2622%	1.3748%
XTD4C								
XTDSNT	0.0772%	0.4573%	0.0539%	0.5481%	0.0375%	0.5301%	0.0205%	0.6633%

Table 3

Failed Before Shipping	Field Failure				Field Failure			
	Server Issue				Hardware Failure			
	95% CI		99% CI		95% CI		99% CI	
Test Area	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
DBGHTHV	2.2641%	4.8622%	1.9797%	5.3613%	1.2010%	3.6430%	0.9787%	4.1511%
ICT	2.5640%	5.2850%	2.2597%	5.8023%	2.1666%	5.1583%	1.8559%	5.7462%
OPCBPB								
OSYSBI					0.0040%	0.8675%	0.0008%	1.1551%
PCB2C	4.9490%	8.4443%	4.5178%	9.0746%	3.1847%	6.6243%	2.8009%	7.2770%
PCBBI	0.1321%	1.2352%	0.0815%	1.5168%	0.0040%	0.8675%	0.0008%	1.1551%
PCBCEV								
PCBDL	0.2670%	1.5743%	0.1865%	1.8848%	0.9725%	3.2523%	0.7760%	3.7369%
PCBFA	0.0031%	0.6727%	0.0006%	0.8960%	0.0379%	1.1243%	0.0162%	1.4408%
PCBFT	6.6657%	10.5860%	6.1639%	11.2777%	3.8384%	7.5239%	3.4142%	8.2121%
PCBP2	0.0031%	0.6727%	0.0006%	0.8960%				
PCBPEP	0.0031%	0.6727%	0.0006%	0.8960%				
PCBST	1.9681%	4.4356%	1.7047%	4.9156%	2.6706%	5.8961%	2.3220%	6.5178%
POSTBI	0.1321%	1.2352%	0.0815%	1.5168%	0.0040%	0.8675%	0.0008%	1.1551%
RSYSBI								
SYSADBG	0.0031%	0.6727%	0.0006%	0.8960%	0.0040%	0.8675%	0.0008%	1.1551%
SYSAPK	0.3414%	1.7382%	0.2472%	2.0616%	0.0040%	0.8675%	0.0008%	1.1551%
SYSBI								
SYSCEV								
SYSFA	8.7428%	12.0915%	8.1689%	13.8445%	8.0658%	12.9328%	7.4436%	13.7891%
SYSFT	5.0552%	8.5792%	4.6193%	9.2137%	4.3688%	8.2365%	3.9145%	8.9509%
SYSINT	0.1968%	1.4069%	0.1307%	1.7036%	0.0379%	1.1243%	0.0162%	1.4408%
SYSPIB	0.0293%	0.8719%	0.0125%	1.1178%	0.0040%	0.8675%	0.0008%	1.1551%
SYSPEP								
SYSPIB	0.0293%	0.8719%	0.0125%	1.1178%	0.0040%	0.8675%	0.0008%	1.1551%
UNKNOWN								
WPCBASIC1								
XRAY	0.1321%	1.2352%	0.0815%	1.5168%	0.0379%	1.1243%	0.0162%	1.4408%
XTD4C								
XTDSNT	0.1321%	1.2352%	0.0815%	1.5168%	0.0040%	0.8675%	0.0008%	1.1551%

Table 4

Failed Before Shipping	Field Failure				Field Failure			
	Memory Issue				CPU Failure			
	95% CI		99% CI		95% CI		99% CI	
Test Area	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
DBGHTHV	0.8874%	3.9916%	0.6613%	4.6875%	1.0034%	4.5048%	0.7479%	5.2877%
ICT	1.9711%	5.9347%	1.6075%	6.7510%	1.1962%	4.8802%	0.9118%	5.6884%
OPCBPB								
OSYSBI					4.0273%	9.4687%	3.4546%	10.5200%
PCB2C	2.3568%	6.5603%	1.9540%	7.4104%	0.1792%	2.5129%	0.0979%	3.1363%
PCBBI	0.0620%	1.8354%	0.0265%	2.3499%				
PCBCEV								
PCBDL	0.2794%	2.5985%	0.1724%	3.1858%	0.1792%	2.5129%	0.0979%	3.1363%
PCBFA	0.0065%	1.4167%	0.0013%	1.8847%				
PCBFT	3.7651%	8.6959%	3.2420%	9.6475%	3.7959%	9.1283%	3.2415%	10.1646%
PCBP2								
PCBPEP								
PCBST	3.7651%	8.6959%	3.2420%	9.6475%	1.8047%	5.9798%	1.4413%	6.8563%
POSTBI	0.0065%	1.4167%	0.0013%	1.8847%	0.0073%	1.5997%	0.0014%	2.1276%
RSYSBI	0.0620%	1.8354%	0.0265%	2.3499%				
SYSADBG	0.0065%	1.4167%	0.0013%	1.8847%				
SYSAPK					0.0073%	1.5997%	0.0014%	2.1276%
SYSBI	0.0620%	1.8354%	0.0265%	2.3499%	0.0073%	1.5997%	0.0014%	2.1276%
SYSCEV								
SYSFA	5.8808%	11.6486%	5.2162%	12.7155%	6.6564%	13.1333%	5.9070%	14.3249%
SYSFT	5.6652%	11.3572%	5.0135%	12.4137%	2.8879%	7.7503%	2.4118%	8.7219%
SYSINT								
SYSPB	0.1585%	2.2258%	0.0866%	2.7790%	0.0701%	0.0724%	0.0300%	2.6523%
SYSPEP								
SYSPM					0.0073%	1.5997%	0.0014%	2.1276%
UNKNOWN								
WPCBASIC1	0.0620%	1.8354%	0.0265%	2.3499%				
XRAY	0.1585%	2.2258%	0.0866%	2.7790%	0.0701%	0.0724%	0.0300%	2.6523%
XTD4C								
XTDSNT					0.0073%	1.5997%	0.0014%	2.1276%

Table 5

Failed Before Shipping	Field Failure				Field Failure			
	Booting Issue				DOA			
	95% CI		99% CI		95% CI		99% CI	
Test Area	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
DBGHTHV	0.9463%	4.7639%	0.6859%	5.6338%	2.2256%	7.7668%	1.7557%	8.9330%
ICT	2.3350%	7.3202%	1.8867%	8.3498%	0.6551%	4.6236%	0.4355%	5.5790%
OPCBPB								
OSYSBI								
PCB2C	2.3350%	7.3202%	1.8867%	8.3498%	1.6658%	6.7503%	1.2705%	7.8552%
PCBBI					0.0102%	2.2172%	0.0020%	2.9458%
PCBCEV								
PCBDL	0.0085%	1.8492%	0.0017%	2.4584%				
PCBFA								
PCBFT	4.3999%	10.5359%	3.7590%	11.7216%	8.9591%	17.6556%	7.9445%	19.2325%
PCBP2								
PCBPEP								
PCBST	2.8347%	8.1394%	2.3335%	9.2126%	0.6551%	4.6236%	0.4355%	5.5790%
POSTBI	0.0811%	2.3953%	0.0347%	3.0641%	0.0102%	2.2172%	0.0020%	2.9458%
RSYSBI								
SYSADBG								
SYSAPK	0.0811%	2.3953%	0.0347%	3.0641%				
SYSBI	0.0085%	1.8492%	0.0017%	2.4584%	0.0102%	2.2172%	0.0020%	2.9458%
SYSCEV								
SYSFA	7.7201%	15.1496%	6.8552%	16.5065%	9.3014%	18.1060%	8.2673%	19.6962%
SYSFT	3.6065%	9.3476%	3.0324%	10.4801%	4.3403%	11.1843%	3.6516%	12.5237%
SYSINT	0.0085%	1.8492%	0.0017%	2.4584%				
SYSPB	0.0085%	1.8492%	0.0017%	2.4584%				
SYSPEP								
SYSPI								
UNKNOWN								
WPCBASIC1					0.0102%	2.2172%	0.0020%	2.9458%
XRAY	0.0811%	2.3953%	0.0347%	3.0641%	0.0974%	2.8712%	0.0416%	3.6704%
XTD4C								
XTDSNT	0.0085%	1.8492%	0.0017%	2.4584%				

Table 6

Failed After Shipping	Field Failure				Field Failure			
	Motherboard Issue				Motherboard Failure			
	95% CI		99% CI		95% CI		99% CI	
Test Area	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
FDBGHTHV	9.4652%	11.2672%	9.2021%	11.5633%	8.4685%	10.4825%	8.1796%	10.8170%
FPCB2C	5.3904%	6.8088%	5.1893%	7.0465%	4.1503%	5.6394%	3.9464%	5.8943%
FPCBAPK	0.2204%	0.6046%	0.1836%	0.6836%	0.1036%	0.4718%	0.0771%	0.5559%
FPCBDG	2.7480%	3.8070%	2.6045%	3.9897%	2.6623%	3.8943%	2.4996%	4.1099%
FPCBFT	10.7070%	12.6031%	10.4287%	12.9134%	9.8126%	11.9527%	9.5032%	12.3062%
FPCBP2								
FSYSFT	0.1703%	0.5218%	0.1387%	0.5959%	0.0660%	0.3909%	0.0461%	0.4686%
FUNKOWN								

Table 7

Failed After Shipping	Field Failure				Field Failure			
	DIMM Issue				Blade Failure			
	95% CI		99% CI		95% CI		99% CI	
Test Area	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
FDBGHTHV	3.7900%	5.3514%	3.5799%	5.6215%	8.0242%	10.8985%	7.6286%	11.3868%
FPCB2C	3.5648%	5.0862%	3.3612%	5.3503%	5.2308%	7.6468%	4.9104%	8.0670%
FPCBAPK	0.0569%	0.4086%	0.0378%	0.4953%	0.0984%	0.7053%	0.0653%	0.8647%
FPCBDG	1.8561%	3.0130%	1.7109%	3.2214%	2.7845%	4.6533%	2.5527%	4.9915%
FPCBFT	6.5301%	8.4951%	6.2549%	8.8264%	12.1808%	15.5686%	11.6997%	16.1321%
FPCBP2								
FSYSFT	0.0009%	0.1952%	0.0002%	0.2602%	0.0661%	0.6192%	0.0407%	0.7608%
FUNKOWN					0.0015%	0.3370%	0.0003%	0.4492%

Table 8

Failed After Shipping	Field Failure				Field Failure			
	Server Issue				Hardware Failure			
	95% CI		99% CI		95% CI		99% CI	
Test Area	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
FDBGHTHV	8.0831%	12.3040%	7.5308%	12.0388%	8.3456%	13.2749%	7.7129%	14.1398%
FPCB2C	6.2333%	10.0537%	5.7482%	10.7311%	3.5756%	7.1654%	3.1672%	7.8398%
FPCBAPK	0.1968%	1.4069%	0.1307%	1.7036%	0.0968%	1.3637%	0.0529%	1.7046%
FPCBDG	2.5640%	5.2850%	2.2597%	5.8023%	2.2915%	5.3438%	1.9711%	5.9404%
FPCBFT	12.4190%	17.3755%	11.7411%	18.2139%	12.3221%	18.0054%	11.5591%	18.9743%
FPCBP2					0.0040%	0.8675%	0.0008%	1.1551%
FSYSFT	0.0750%	1.0577%	0.0409%	1.3226%	0.0379%	1.1243%	0.0162%	1.4408%
FUNKOWN								

Table 9

Failed After Shipping	Field Failure				Field Failure			
	Memory Issue				CPU Failure			
	95% CI		99% CI		95% CI		99% CI	
Test Area	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
FDBGHTHV	6.0971%	11.9393%	5.4199%	13.0163%	5.4446%	11.4836%	4.7705%	12.6163%
FPCB2C	3.3550%	8.0930%	2.8640%	9.0177%	4.9672%	10.8167%	4.3254%	11.9237%
FPCBAPK	0.2794%	2.5985%	0.1724%	3.1858%				
FPCBDG	1.2331%	4.6530%	0.9571%	5.3931%	2.0155%	6.3393%	1.6280%	7.2363%
FPCBFT	9.8681%	16.7910%	9.0028%	18.0128%	12.4635%	20.4969%	11.4376%	21.8909%
FPCBP2								
FSYSFT								
FUNKOWN								

Table 10

Failed After Shipping	Field Failure				Field Failure			
	Booting Issue				DOA			
	95% CI		99% CI		95% CI		99% CI	
Test Area	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
FDBGHTHV	9.7323%	17.7686%	8.7593%	19.2033%	5.9458%	13.5374%	5.1278%	14.9741%
FPCB2C	5.2105%	11.7078%	4.5078%	12.9419%	3.7171%	10.2254%	3.0856%	11.5204%
FPCBAPK	0.3657%	3.3897%	0.2257%	4.1519%	0.0102%	2.2172%	0.0020%	2.9458%
FPCBDG	2.5832%	7.7313%	2.1079%	8.7832%	1.3971%	6.2322%	1.0419%	7.3037%
FPCBFT	11.4889%	19.9825%	10.4329%	21.4745%	10.6832%	19.8954%	9.5744%	21.5355%
FPCBP2								
FSYSFT					0.0974%	2.8712%	0.0416%	3.6704%
FUNKOWN								

Table 11

Repaired Before Shipping	Field Failure				Field Failure			
	Motherboard Issue				Motherboard Failure			
	95% CI		99% CI		95% CI		99% CI	
Test Area	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
DBGHTHV	0.0490%	0.2902%	0.0342%	0.3479%	0.0844%	0.4317%	0.0611%	0.5127%
ICT								
IPAOI	9.3156%	11.1057%	9.0544%	11.4000%	10.4724%	12.6701%	10.1536%	13.0322%
IPMVI	3.2626%	4.4035%	3.1060%	4.5987%	3.1549%	4.4793%	2.9774%	4.7091%
PCB2C								
PCBBI								
PCBDG	0.0768%	0.3502%	0.0572%	0.4126%	0.0327%	0.3066%	0.0202%	0.3769%
PCBFA					0.0008%	0.1669%	0.0002%	0.2224%
PCBFT	0.0006%	0.1238%	0.0001%	0.1651%				
SYSBI	0.0006%	0.1238%	0.0001%	0.1651%				
SYSFA	0.9420%	1.6141%	0.8600%	1.7372%	1.0882%	1.9367%	0.9866%	2.0936%
SYSFT	0.2374%	0.6319%	0.1991%	0.7125%	0.1859%	0.6273%	0.1483%	0.7222%
SYSBP	0.0006%	0.1238%	0.0001%	0.1651%	0.0008%	0.1669%	0.0002%	0.2224%

Table 12

Repaired Before Shipping	Field Failure				Field Failure			
	DIMM Issue				Blade Failure			
	95% CI		99% CI		95% CI		99% CI	
Test Area	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
DBGHTHV	0.0772%	0.4573%	0.0539%	0.5481%	0.0375%	0.5301%	0.0205%	0.6633%
ICT								
IPAOI	10.1180%	12.4727%	9.7792%	12.8625%	9.7804%	12.8906%	9.3457%	12.4136%
IPMVI	2.5450%	3.8648%	2.3738%	4.0981%	3.2660%	5.2596%	3.0141%	5.6165%
PCB2C					0.0015%	0.3370%	0.0003%	0.4492%
PCBBI								
PCBDG	0.1927%	0.6891%	0.1517%	0.7971%				
PCBFA					0.0015%	0.3370%	0.0003%	0.4492%
PCBFT								
SYSBI								
SYSFA	0.7397%	1.5393%	0.6512%	1.6932%	0.7415%	1.8647%	0.6287%	2.0905%
SYSFT	0.0569%	0.4086%	0.0378%	0.4953%	0.2094%	0.9525%	0.1559%	1.1217%
SYSBP	0.0009%	0.1952%	0.0002%	0.2602%				

Table 13

Repaired Before Shipping	Field Failure				Field Failure			
	Server Issue				Hardware Failure			
	95% CI		99% CI		95% CI		99% CI	
Test Area	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
DBGHTHV	0.0031%	0.6727%	0.0006%	0.8960%	0.0968%	1.3637%	0.0529%	1.7046%
ICT	0.0031%	0.6727%	0.0006%	0.8960%				
IPAOI	9.7378%	14.2673%	9.1332%	15.0459%	10.4635%	15.8212%	9.7572%	16.7457%
IPMVI	2.7658%	5.5652%	2.4487%	6.0939%	2.5436%	5.7126%	2.2041%	6.3261%
PCB2C								
PCBBI								
PCBDG	0.0031%	0.6727%	0.0006%	0.8960%				
PCBFA								
PCBFT					0.0040%	0.8675%	0.0008%	1.1551%
SYSBI								
SYSFA	0.4190%	1.8994%	0.3121%	2.2348%	0.2541%	1.8137%	0.1688%	2.1951%
SYSFT	0.0750%	1.0577%	0.0409%	1.3226%	0.0379%	1.1243%	0.0162%	1.4408%
SYSBP					0.0040%	0.8675%	0.0008%	1.1551%

Table 14

Repaired Before Shipping	Field Failure				Field Failure			
	Memory Issue				CPU Failure			
	95% CI		99% CI		95% CI		99% CI	
Test Area	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
DBGHTHV	0.0620%	1.8354%	0.0265%	2.3499%	0.0701%	0.0724%	0.0300%	2.6523%
ICT								
IPAOI	6.5320%	12.5186%	5.8300%	13.6152%	7.1475%	13.7871%	6.3698%	15.0004%
IPMVI	1.0578%	4.3244%	0.8062%	5.0430%	1.5975%	5.6172%	1.2693%	6.4720%
PCB2C					0.0073%	1.5997%	0.0014%	2.1276%
PCBBI					0.0073%	1.5997%	0.0014%	2.1276%
PCBDG	0.0065%	1.4167%	0.0013%	1.8847%				
PCBFA	0.1585%	2.2258%	0.0866%	2.7790%				
PCBFT	0.0065%	1.4167%	0.0013%	1.8847%				
SYSBI								
SYSFA					0.1792%	2.5129%	0.0979%	3.1363%
SYSFT					0.0073%	1.5997%	0.0014%	2.1276%
SYSBP								

Table 15

Repaired Before Shipping	Field Failure				Field Failure			
	Booting Issue				DOA			
	95% CI		99% CI		95% CI		99% CI	
Test Area	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
DBGHTHV								
ICT								
IPAOI	6.0354%	12.8662%	5.2752%	14.1446%	9.6450%	18.5551%	8.5917%	20.1583%
IPMVI	1.6152%	6.0645%	1.2543%	7.0207%	1.6658%	6.7503%	1.2705%	7.8552%
PCB2C								
PCBBI					0.0102%	2.2172%	0.0020%	2.9458%
PCBDG	0.0811%	2.3953%	0.0347%	3.0641%	0.0102%	2.2172%	0.0020%	2.9458%
PCBFA								
PCBFT	0.0085%	1.8492%	0.0017%	2.4584%				
SYSBI								
SYSFA	0.5451%	3.8591%	0.3623%	4.6604%	0.0102%	2.2172%	0.0020%	2.9458%
SYSFT	0.0085%	1.8492%	0.0017%	2.4584%				
SYSBP								

Table 16

Repaired After Shipping	Field Failure				Field Failure			
	Motherboard Issue				Motherboard Failure			
	95% CI		99% CI		95% CI		99% CI	
Test Area	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
DGI	9.0806%	10.8517%	8.8226%	11.1432%	6.4797%	8.2798%	6.2256%	8.5820%
FGI	38.5463%	41.4312%	38.1010%	41.8848%	32.9673%	36.2237%	32.4695%	36.7388%
PRESCREEN	49.0058%	51.9498%	48.5468%	52.4083%	42.7457%	46.1463%	42.2197%	46.6785%
SERVICE	40.1375%	43.0400%	39.6888%	43.4957%	33.3523%	36.6171%	32.8529%	37.1334%

Table 17

Repaired After Shipping	Field Failure				Field Failure			
	DIMM Issue				Blade Failure			
	95% CI		99% CI		95% CI		99% CI	
Test Area	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
DGI	5.7413%	7.6027%	5.4829%	7.9184%	7.9678%	10.8340%	7.5735%	11.3211%
FGI	32.0992%	35.6058%	31.5649%	36.1613%	41.7417%	46.5892%	40.9976%	47.3466%
PRESCREEN	38.9676%	42.6082%	38.4077%	43.1801%	50.3144%	55.1876%	49.5565%	55.9393%
SERVICE	30.5438%	34.0088%	30.0171%	34.5588%	39.8198%	44.6416%	39.0819%	45.3972%

Table 18

Repaired After Shipping	Field Failure				Field Failure			
	Server Issue				Hardware Failure			
	95% CI		99% CI		95% CI		99% CI	
Test Area	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
DGI	7.6452%	11.7772%	7.1078%	12.4993%	7.5081%	12.2468%	6.9078%	13.0850%
FGI	46.8969%	53.8269%	45.8301%	54.8920%	40.3272%	48.1638%	39.1431%	49.3819%
PRESCREEN	55.5166%	62.3369%	54.4475%	63.3653%	49.1739%	57.0472%	47.9579%	58.2248%
SERVICE	44.3667%	51.2905%	43.3067%	52.3604%	39.7111%	47.5358%	38.5306%	48.7538%

Table 19

Repaired After Shipping	Field Failure				Field Failure			
	Memory Issue				CPU Failure			
	95% CI		99% CI		95% CI		99% CI	
Test Area	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
DGI	5.8808%	11.6486%	5.2162%	12.7155%	5.4446%	11.4836%	4.7705%	12.6163%
FGI	32.5296%	42.3439%	31.0997%	43.8953%	50.0822%	60.8056%	48.4272%	62.4012%
PRESCREEN	41.2658%	51.3739%	39.7475%	52.9278%	56.2092%	66.7125%	54.5554%	68.2411%
SERVICE	31.2954%	41.0402%	29.8824%	42.5869%	40.0447%	50.7865%	38.4416%	52.4397%

Table 20

Repaired After Shipping	Field Failure				Field Failure			
	Bootling Issue				DOA			
	95% CI		99% CI		95% CI		99% CI	
Test Area	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
DGI	9.4422%	17.3970%	8.4838%	18.8214%	5.6200%	13.0712%	4.8265%	14.4898%
FGI	42.7025%	54.3176%	40.9573%	56.0816%	36.3493%	48.9703%	34.5082%	50.9231%
PRESCREEN	53.3910%	64.8195%	51.6076%	66.4876%	43.0265%	55.7832%	41.1133%	57.7054%
SERVICE	43.6935%	55.3132%	41.9414%	57.0716%	32.8620%	45.3159%	31.0738%	47.2701%

Table 21

Passed Before Shipping	Field Failure				Field Failure			
	Motherboard Issue				Motherboard Failure			
	95% CI		99% CI		95% CI		99% CI	
Test Area	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
ASSY	68.4816%	71.1857%	68.0522%	71.5986%	68.7809%	71.9086%	68.2831%	72.3835%
DBGHTHV	35.0600%	37.8951%	34.6239%	38.3424%	31.3693%	34.5881%	30.8783%	35.0982%
DBGHTLV	0.0006%	0.1238%	0.0001%	0.1651%				
DBGLTLV	3.3246%	4.4748%	3.1665%	4.6715%	3.0451%	4.3497%	2.8708%	4.5764%
HIPOT								
ICT	98.6887%	99.2882%	98.5767%	99.3588%	98.7543%	99.4172%	98.6257%	99.4896%
OSYSBI*	0.0054%	0.1606%	0.0023%	0.2061%				
PASTE	98.6633%	99.2692%	98.5503%	99.3408%	98.7896%	99.4417%	98.6627%	99.5124%
PCB2C	70.1253%	72.7865%	69.7020%	73.1919%	73.4714%	76.4397%	72.9961%	76.8870%
PCBBI	3.4901%	4.6648%	3.3281%	4.8653%	2.9629%	4.2523%	2.7910%	4.4767%
PCBBI*								
PCBBS								
PCBCEV	0.5057%	1.0290%	0.4471%	1.1293%	2.2822%	3.4363%	2.1319%	3.6400%
PCBDG					0.0008%	0.1669%	0.0002%	0.2224%
PCBDL	2.9946%	4.0938%	2.8447%	4.2826%	2.4719%	3.6656%	2.3153%	3.8754%
PCBDL*					0.0008%	0.1669%	0.0002%	0.2224%
PCBFA	1.1957%	1.9379%	1.1026%	2.0718%	0.8577%	1.6287%	0.7683%	1.7738%
PCBFA*					0.0008%	0.1669%	0.0002%	0.2224%
PCBFT	98.6887%	99.2882%	98.5767%	99.3588%	98.6840%	99.3680%	98.5522%	99.4436%
PCBINT	3.5522%	4.7360%	3.3888%	4.9379%	5.9714%	7.7103%	5.7272%	8.0032%
PCBP2	0.5613%	1.1066%	0.4993%	1.2102%	0.2076%	0.6653%	0.1674%	0.7626%
PCBPB	3.8428%	5.0677%	3.6727%	5.2758%	3.4026%	4.7705%	3.2182%	5.0069%
PCBPB*	0.0054%	0.1606%	0.0023%	0.2061%				
PCBPEP								
PCBPM	98.3859%	99.0580%	98.2628%	99.1400%	98.4749%	99.2181%	98.3341%	99.3032%
PCBST	41.3984%	44.3125%	40.9473%	44.7695%	42.9545%	46.3566%	42.4282%	46.8890%
POSTBI	3.2213%	4.3559%	3.0657%	4.5502%	2.6896%	3.9269%	2.5260%	4.1434%
SYSADBG	0.0242%	0.2276%	0.0150%	0.2798%				
SYSAPK	1.0002%	1.6891%	0.9155%	1.8149%	2.5806%	3.7964%	2.4205%	4.0096%
SYSAPK*	11.3079%	13.2466%	11.0226%	13.5634%	14.2809%	16.7658%	13.9148%	17.1706%
SYSBI	0.3780%	0.8460%	0.3282%	0.9378%	0.3665%	0.9241%	0.3107%	1.0366%
SYSBI*								
SYSCEV	0.0626%	0.3205%	0.0453%	0.3806%	0.2295%	0.7029%	0.1869%	0.8026%
SYSCEV*	0.2374%	0.6319%	0.1991%	0.7125%	1.5329%	2.5095%	1.4108%	2.6860%
SYSDL	0.0626%	0.3205%	0.0453%	0.3806%	0.1036%	0.4718%	0.0771%	0.5559%
SYSFA	85.4457%	87.4665%	85.1166%	87.7651%	81.7524%	84.3266%	81.3343%	84.7076%
SYSFA*					0.0008%	0.1669%	0.0002%	0.2224%
SYSFT*	86.3171%	88.2839%	85.9961%	88.5738%	82.6472%	85.1683%	82.2370%	85.5404%
SYSINT	68.2790%	70.9883%	67.8490%	71.4020%	62.4451%	65.7291%	61.9264%	66.2320%
SYSINT*					0.0008%	0.1669%	0.0002%	0.2224%
SYSPB	1.1173%	1.8386%	1.0274%	1.9694%	1.0882%	1.9367%	0.9866%	2.0936%
SYSPEP	69.0218%	71.7122%	68.5943%	72.1227%	63.4736%	66.7366%	62.9577%	67.2356%
SYSPM	83.7294%	85.8493%	83.3855%	86.1643%	79.8739%	82.5523%	79.4406%	82.9506%
SYSVF	5.1383%	6.5276%	4.9419%	6.7609%	4.5961%	6.1516%	4.3815%	6.4166%
UNKNOWN								
WPCBAPK								
WPCBASIC1					0.0008%	0.1669%	0.0002%	0.2224%
WPCBASIC3	0.0054%	0.1606%	0.0023%	0.2061%	0.0073%	0.2163%	0.0031%	0.2776%
XRAY	22.5990%	25.1113%	22.2188%	25.5132%	24.3826%	27.3829%	23.9298%	27.8628%
XTD4C	0.0138%	0.1948%	0.0075%	0.2439%	0.0185%	0.2625%	0.0101%	0.3286%
XTDSNT	1.0391%	1.7391%	0.9527%	1.8665%	0.7819%	1.5251%	0.6968%	1.6659%
ZSYSBI								

Table 22

Passed Before Shipping	Field Failure				Field Failure			
	DIMM Issue				Blade Failure			
	95% CI		99% CI		95% CI		99% CI	
Test Area	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
ASSY	76.9164%	79.9674%	76.4243%	80.4222%	55.8459%	60.6601%	55.0909%	61.3963%
DBGHTHV	25.0668%	28.3472%	24.5727%	28.8720%	35.0316%	39.7560%	34.3144%	40.5018%
DBGHTLV								
DBGLTLV	1.7324%	2.8567%	1.5923%	3.0601%	6.5645%	9.2147%	6.2057%	9.6698%
HIPOT								
ICT	95.3318%	96.7877%	95.0777%	96.9807%	96.8544%	98.3662%	96.5701%	98.5407%
OSYSBI*	0.0009%	0.1952%	0.0002%	0.2602%				
PASTE	98.1757%	99.0554%	98.0096%	99.1566%	96.7154%	98.2636%	96.4255%	98.4439%
PCB2C	66.4530%	69.9051%	65.9047%	70.4295%	75.2500%	79.3464%	74.5858%	79.9485%
PCBBI	1.5478%	2.6211%	1.4159%	2.8168%	7.1804%	9.9288%	6.8055%	10.3984%
PCBBI*	0.0009%	0.1952%	0.0002%	0.2602%				
PCBBS								
PCBCEV	1.2133%	2.1855%	1.0975%	2.3657%	1.4809%	2.9361%	1.3155%	3.2118%
PCBDG								
PCBDL	1.0634%	1.9854%	0.9555%	2.1580%	7.3488%	10.1231%	6.9697%	10.5965%
PCBDL*	0.0085%	0.2531%	0.0036%	0.3248%				
PCBFA	0.2947%	0.8660%	0.2420%	0.9852%	4.4607%	6.7244%	4.1650%	7.1218%
PCBFA*								
PCBFT	92.0994%	93.9962%	91.7784%	94.2603%	96.8544%	98.3662%	96.5701%	98.5407%
PCBINT	3.7256%	5.2757%	3.5174%	5.5441%	8.5891%	11.5428%	8.1803%	12.0428%
PCBP2	0.2429%	0.7782%	0.1959%	0.8920%	1.3798%	2.7957%	1.2206%	3.0655%
PCBPB	1.7324%	2.8567%	1.5923%	3.0601%	9.2690%	12.3138%	8.8452%	12.8272%
PCBPB*	0.0009%	0.1952%	0.0002%	0.2602%				
PCBPEP					0.0147%	0.4369%	0.0063%	0.5605%
PCBPM	98.1757%	99.0554%	98.0096%	99.1566%	94.8075%	96.7877%	94.4526%	97.0374%
PCBST	44.6850%	48.3797%	44.1129%	48.9563%	30.0904%	34.6607%	29.4031%	35.3880%
POSTBI	1.4560%	2.5028%	1.3283%	2.6945%	6.3970%	9.0195%	6.0427%	9.4705%
SYSADBG					0.9336%	2.1553%	0.8052%	2.3958%
SYSAPK	1.1232%	2.0656%	1.0120%	2.2413%	0.2908%	1.1111%	0.2255%	1.2916%
SYSAPK*	14.1881%	16.8789%	13.7938%	17.3185%	9.3258%	12.3780%	8.9007%	12.8924%
SYSBI	0.0217%	0.3071%	0.0118%	0.3844%	2.9444%	4.8560%	2.7058%	5.2005%
SYSBI*					0.0984%	0.7053%	0.0653%	0.8647%
SYSCEV	0.0987%	0.5050%	0.0715%	0.5997%	0.1335%	0.7893%	0.0932%	0.9457%
SYSCEV*	1.0038%	1.9050%	0.8992%	2.0744%	1.0312%	2.2990%	0.8956%	2.5465%
SYSDL	0.0382%	0.3587%	0.0236%	0.4409%	0.0661%	0.6192%	0.0407%	0.7608%
SYSFA	70.7606%	74.0741%	70.2312%	74.5739%	84.1139%	87.5321%	83.5461%	88.0182%
SYSFA*								
SYSFT*	82.3604%	85.1015%	81.9133%	85.5042%	85.2580%	88.5644%	84.7064%	89.0319%
SYSINT	64.8908%	68.3849%	64.3369%	68.9169%	71.7045%	75.9995%	71.0131%	76.6366%
SYSINT*								
SYSPB	0.4016%	1.0384%	0.3387%	1.1676%	4.4607%	6.7244%	4.1650%	7.1218%
SYSPEP	65.4231%	68.9034%	64.8711%	69.4329%	72.6979%	76.9408%	72.0136%	77.5686%
SYSPM	80.3363%	83.2026%	79.8709%	83.6262%	81.4570%	85.1104%	80.8553%	85.6363%
SYSVF	4.5988%	6.2936%	4.3674%	6.5840%	2.9979%	4.9234%	2.7570%	5.2701%
UNKNOWN	0.0009%	0.1952%	0.0002%	0.2602%	0.0015%	0.3370%	0.0003%	0.4492%
WPCBAPK	0.0009%	0.1952%	0.0002%	0.2602%				
WPCBASIC1	0.0009%	0.1952%	0.0002%	0.2602%	0.0015%	0.3370%	0.0003%	0.4492%
WPCBASIC3								
XRAY	15.8810%	18.6886%	15.4673%	19.1454%	33.9576%	38.6533%	33.2462%	39.3959%
XTD4C	0.0009%	0.1952%	0.0002%	0.2602%	0.0015%	0.3370%	0.0003%	0.4492%
XTDSNT	0.1212%	0.5520%	0.0902%	0.6502%	1.9430%	3.5613%	1.7514%	3.8617%
ZSYSBI					0.0147%	0.4369%	0.0063%	0.5605%

Table 23

Passed Before Shipping	Field Failure				Field Failure			
	Server Issue				Hardware Failure			
	95% CI		99% CI		95% CI		99% CI	
Test Area	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
ASSY	57.7184%	64.4778%	56.6538%	65.4918%	54.6672%	62.4407%	53.4507%	63.6068%
DBGHTHV	34.9287%	41.6688%	33.9191%	42.7217%	39.8650%	47.6929%	38.6836%	48.9109%
DBGHTLV								
DBGLTLV	4.6314%	8.0385%	4.2148%	8.6561%	3.8384%	7.5239%	3.4142%	8.2121%
HIPOT					0.0040%	0.8675%	0.0008%	1.1551%
ICT	97.1726%	99.0704%	96.7763%	99.2426%	97.5519%	99.4588%	97.1211%	99.5969%
OSYSBI*								
PASTE	97.1726%	99.0704%	96.7763%	99.2426%	97.3473%	99.3550%	96.9020%	99.5087%
PCB2C	75.9923%	81.6687%	75.0562%	82.4732%	70.9693%	77.8651%	69.8427%	78.8478%
PCBBI	3.8968%	7.0854%	3.5162%	7.6711%	3.8384%	7.5239%	3.4142%	8.2121%
PCBBI*								
PCBBS								
PCBCEV	1.2965%	3.4222%	1.0881%	3.8520%	0.8610%	3.0545%	0.6782%	3.5266%
PCBDG								
PCBDL	3.0709%	5.9830%	2.7355%	6.5282%	3.7068%	7.3449%	3.2904%	8.0262%
PCBDL*								
PCBFA	0.8406%	2.6763%	0.6782%	3.0634%	1.6752%	4.4086%	1.4063%	4.9590%
PCBFA*								
PCBFT	97.1726%	99.0704%	96.7763%	99.2426%	97.5519%	99.4588%	97.1211%	99.5969%
PCBINT	5.6957%	9.3855%	5.2323%	10.0441%	4.7702%	8.7674%	4.2945%	9.5003%
PCBP2	0.3414%	1.7382%	0.2472%	2.0616%	0.2541%	1.8137%	0.1688%	2.1951%
PCBPB	5.3748%	8.9830%	4.9249%	9.6297%	5.3099%	9.4710%	4.8068%	10.2273%
PCBPB*								
PCBPEP								
PCBPM	96.5778%	98.7035%	96.1480%	98.9119%	96.9455%	99.1390%	96.4734%	99.3218%
PCBST	33.2698%	39.9499%	32.2734%	41.0074%	27.3732%	34.6787%	26.3107%	35.8530%
POSTBI	4.1057%	7.3587%	3.7145%	7.9538%	3.3145%	6.8051%	2.9224%	7.4652%
SYSDBG	0.0293%	0.8719%	0.0125%	1.1178%	0.0040%	0.8675%	0.0008%	1.1551%
SYSAPK	0.5820%	2.2151%	0.4514%	2.5727%	1.7966%	4.5974%	1.5169%	5.1575%
SYSAPK*	10.6274%	15.3075%	9.9971%	16.1073%	8.9072%	13.9570%	8.2539%	14.8388%
SYSBI	0.4190%	1.8994%	0.3121%	2.2348%	1.0859%	3.4485%	0.8763%	3.9450%
SYSBI*								
SYSCEV	0.0293%	0.8719%	0.0125%	1.1178%	0.1705%	1.5925%	0.1052%	1.9547%
SYSCEV*	1.1111%	3.1266%	0.9203%	3.5401%	0.5412%	2.4481%	0.4031%	2.8789%
SYSDL					0.0040%	0.8675%	0.0008%	1.1551%
SYSFA	82.1098%	87.1308%	81.2625%	87.8198%	83.0003%	88.5381%	82.0512%	89.2757%
SYSFA*								
SYSFT*	83.1401%	88.0304%	82.3109%	88.6968%	85.0241%	90.2459%	84.1184%	90.9288%
SYSINT	62.3898%	68.9744%	61.3420%	69.9507%	53.2501%	61.0583%	52.0324%	62.2339%
SYSINT*								
SYSPB	0.9296%	2.8274%	0.7574%	3.2237%	2.0424%	4.9722%	1.7418%	5.5510%
SYSPEP	64.1191%	70.6227%	63.0801%	71.5825%	55.1402%	62.9008%	53.9244%	64.0635%
SYSPLM	79.1660%	84.5262%	78.2722%	85.2745%	79.8279%	85.8016%	78.8199%	86.6158%
SYSVF	5.9104%	9.6532%	5.4381%	10.3194%	4.1028%	7.8810%	3.6634%	8.5824%
UNKNOWN								
WPCBAPK								
WPCBASIC1								
WPCBASIC3	0.0031%	0.6727%	0.0006%	0.8960%				
XRAY	31.9695%	38.5964%	30.9845%	39.6485%	30.2421%	37.7197%	29.1440%	38.9121%
XTD4C								
XTDSNT	0.5820%	2.2151%	0.4514%	2.5727%	0.1705%	1.5925%	0.1052%	1.9547%
ZSYSBI								

Table 24

Passed Before Shipping	Field Failure				Field Failure			
	Memory Issue				CPU Failure			
	95% CI		99% CI		95% CI		99% CI	
Test Area	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
ASSY	67.6603%	76.7542%	66.1738%	78.0259%	58.2698%	68.6631%	56.6220%	70.1637%
DBGHTHV	27.6149%	37.1068%	26.2595%	38.6328%	25.2710%	35.1898%	23.8783%	36.7988%
DBGHTLV								
DBGLTLV	1.7820%	5.6184%	1.4390%	6.4170%	1.8047%	5.9798%	1.4413%	6.8563%
HIPOT								
ICT	96.3463%	99.2773%	95.6745%	99.4763%	97.4871%	99.8208%	96.8637%	99.9021%
OSYSBI*	0.0065%	1.4167%	0.0013%	1.8847%				
PASTE	96.3463%	99.2773%	95.6745%	99.4763%	97.4871%	99.8208%	96.8637%	99.9021%
PCB2C	65.7999%	75.0616%	64.2961%	76.3679%	72.9902%	82.0191%	71.4760%	83.2319%
PCBBI	1.7820%	5.6184%	1.4390%	6.4170%	2.0155%	6.3393%	1.6280%	7.2363%
PCBBI*								
PCBBS	0.0065%	1.4167%	0.0013%	1.8847%				
PCBCEV	0.2794%	2.5985%	0.1724%	3.1858%	1.8047%	5.9798%	1.4413%	6.8563%
PCBDG	0.0065%	1.4167%	0.0013%	1.8847%				
PCBDL	1.7820%	5.6184%	1.4390%	6.4170%	2.4464%	7.0496%	2.0131%	7.9854%
PCBDL*								
PCBFA	0.5652%	3.3099%	0.3948%	3.9558%	1.1962%	4.8802%	0.9118%	5.6884%
PCBFA*								
PCBFT	96.0084%	99.1126%	95.3125%	99.3387%	97.4871%	99.8208%	96.8637%	99.9021%
PCBINT	2.1628%	6.2486%	1.7793%	7.0821%	7.6418%	14.4377%	6.8369%	15.6718%
PCBP2	0.1585%	2.2258%	0.0866%	2.7790%	0.3159%	2.9334%	0.1949%	3.5950%
PCBPB	2.1628%	6.2486%	1.7793%	7.0821%	2.6659%	7.4011%	2.2109%	8.3551%
PCBPB*	0.0065%	1.4167%	0.0013%	1.8847%				
PCBPEP	0.0065%	1.4167%	0.0013%	1.8847%				
PCBPM	96.3463%	99.2773%	95.6745%	99.4763%	96.2640%	99.3610%	95.5369%	99.5536%
PCBST	40.2591%	50.3501%	38.7483%	51.9063%	36.3715%	47.0102%	34.8048%	48.6677%
POSTBI	1.5957%	5.2996%	1.2741%	6.0796%	1.5975%	5.6172%	1.2693%	6.4720%
SYSADBG	0.0065%	1.4167%	0.0013%	1.8847%				
SYSAPK					1.8047%	5.9798%	1.4413%	6.8563%
SYSAPK*	6.7505%	12.8072%	6.0364%	13.9134%	17.1833%	26.0886%	15.9944%	27.5885%
SYSBI	0.1585%	2.2258%	0.0866%	2.7790%	0.4708%	3.3400%	0.3129%	4.0357%
SYSBI*								
SYSCEV					0.0701%	0.0724%	0.0300%	2.6523%
SYSCEV*	0.1585%	2.2258%	0.0866%	2.7790%	1.1962%	4.8802%	0.9118%	5.6884%
SYSDL	0.0065%	1.4167%	0.0013%	1.8847%				
SYSFA	83.2090%	90.1319%	81.9872%	90.9972%	72.0717%	81.2188%	70.5440%	82.4548%
SYSFA*								
SYSFT*	85.4733%	91.9259%	84.3138%	92.7086%	73.2969%	82.2853%	71.7874%	83.4902%
SYSINT	47.8597%	57.9778%	46.3079%	59.5014%	58.5650%	68.9410%	56.9182%	70.4374%
SYSINT*								
SYSPB	0.4165%	2.9589%	0.2767%	3.5767%	1.1962%	4.8802%	0.9118%	5.6884%
SYSPEP	49.1677%	59.2378%	47.5826%	60.7525%	59.4516%	69.7734%	57.8085%	71.2567%
SYSPM	81.2499%	88.5395%	79.9803%	89.4702%	69.9384%	79.3414%	68.3823%	80.6277%
SYSVF	9.8681%	16.7910%	9.0028%	18.0128%	3.3382%	8.4428%	2.8218%	9.4478%
UNKNOWN								
WPCBAPK	0.1585%	2.2258%	0.0866%	2.7790%				
WPCBASIC1	0.1585%	2.2258%	0.0866%	2.7790%				
WPCBASIC3								
XRAY	14.6962%	22.6185%	13.6503%	23.9684%	25.2710%	35.1898%	23.8783%	36.7988%
XTD4C					0.0701%	0.0724%	0.0300%	2.6523%
XTDSNT	0.0065%	1.4167%	0.0013%	1.8847%	0.0073%	1.5997%	0.0014%	2.1276%
ZSYSBI								

Table 25

Passed Before Shipping	Field Failure				Field Failure			
	Booting Issue				DOA			
	95% CI		99% CI		95% CI		99% CI	
	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
ASSY	57.4680%	68.6888%	55.6914%	70.2998%	39.4771%	52.1908%	37.5976%	54.1336%
DBGHTHV	36.4789%	47.9594%	34.7943%	49.7424%	29.7914%	42.0385%	28.0591%	43.9852%
DBGHTLV								
DBGLTLV	3.6065%	9.3476%	3.0324%	10.4801%	2.8088%	8.7624%	2.2706%	9.9838%
HIPOT								
ICT	96.6103%	99.6343%	95.8481%	99.7743%	84.6165%	92.7315%	83.1127%	93.6417%
OSYSBI*								
PASTE	96.6103%	99.6343%	95.8481%	99.7743%	84.6165%	92.7315%	83.1127%	93.6417%
PCB2C	75.6577%	84.9282%	74.0719%	86.1292%	64.1856%	75.8864%	62.2773%	77.4894%
PCBBI	3.8688%	9.7457%	3.2718%	10.8965%	3.1076%	9.2537%	2.5371%	10.5007%
PCBBI*								
PCBBS								
PCBCEV	0.0085%	1.8492%	0.0017%	2.4584%	0.2492%	3.4804%	0.1361%	4.3386%
PCBDG								
PCBDL	2.0907%	6.9056%	1.6703%	7.9119%	2.2256%	7.7668%	1.7557%	8.9330%
PCBDL*								
PCBFA	0.2074%	2.9040%	0.1133%	3.6227%	0.0974%	2.8712%	0.0416%	3.6704%
PCBFA*								
PCBFT	96.6103%	99.6343%	95.8481%	99.7743%	84.6165%	92.7315%	83.1127%	93.6417%
PCBINT	2.0907%	6.9056%	1.6703%	7.9119%	1.1376%	5.7062%	0.8248%	6.7419%
PCBP2	0.0811%	2.3953%	0.0347%	3.0641%				
PCBPB	4.3999%	10.5359%	3.7590%	11.7216%	2.8088%	8.7624%	2.2706%	9.9838%
PCBPB*								
PCBPEP					0.0102%	2.2172%	0.0020%	2.9458%
PCBPM	96.6103%	99.6343%	95.8481%	99.7743%	84.6165%	92.7315%	83.1127%	93.6417%
PCBST	30.0303%	41.1643%	28.4411%	42.9358%	18.5542%	29.4733%	17.1167%	31.3072%
POSTBI	3.3466%	8.9473%	2.7960%	10.0608%	2.5147%	8.2669%	2.0098%	9.4614%
SYSADBG								
SYSAPK	0.5451%	3.8591%	0.3623%	4.6604%				
SYSAPK*	4.1333%	10.1417%	3.5141%	11.3103%	2.2256%	7.7668%	1.7557%	8.9330%
SYSBI								
SYSBI*								
SYSCEV	0.0085%	1.8492%	0.0017%	2.4584%				
SYSCEV*	0.0811%	2.3953%	0.0347%	3.0641%	0.0974%	2.8712%	0.0416%	3.6704%
SYSDL								
SYSFA	87.5185%	94.2411%	86.2545%	94.9825%	77.4522%	87.2114%	75.7470%	88.4223%
SYSFA*								
SYSFT*	88.8120%	95.0614%	87.4627%	95.7440%	79.6600%	88.9685%	78.0083%	90.0951%
SYSINT	64.3540%	75.0459%	62.6169%	76.5333%	58.7852%	70.9718%	56.8418%	72.6887%
SYSINT*								
SYSPB	88.8120%	95.0614%	87.4627%	95.7440%	0.2492%	3.4804%	0.1361%	4.3386%
SYSPEP	64.3540%	75.0459%	62.6169%	76.5333%	58.3731%	70.5904%	56.4280%	72.3151%
SYSPL	88.8120%	95.0614%	87.4627%	95.7440%	75.2670%	85.4311%	73.5151%	86.7193%
SYSVF	64.3540%	75.0459%	62.6169%	76.5333%	5.2964%	12.6029%	4.5280%	14.0028%
UNKNOWN								
WPCBAPK								
WPCBASIC1								
WPCBASIC3								
XRAY	24.9541%	35.6460%	23.4667%	37.3831%	23.3650%	34.9761%	21.7819%	36.8767%
XTD4C								
XTDSNT	0.3657%	3.3897%	0.2257%	4.1519%	0.6551%	4.6236%	0.4355%	5.5790%
ZSYSBI								

Table 26

Passed After Shipping	Field Failure				Field Failure			
	Motherboard Issue				Motherboard Failure			
	95% CI		99% CI		95% CI		99% CI	
Mfg Test	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
FDBGHTHV	42.1952%	45.1157%	41.7428%	45.5734%	36.4959%	39.8209%	35.9854%	40.3448%
FPCB2C	39.2533%	42.1464%	38.8064%	42.6010%	33.4115%	36.6777%	32.9119%	37.1941%
FPCBAPK	38.7672%	41.6547%	38.3214%	42.1087%	33.0857%	36.3448%	32.5874%	36.8602%
FPCBDG	0.0006%	0.1238%	0.0001%	0.1651%				
FPCBFA								
FPCBFT	40.5577%	43.4643%	40.1081%	43.9205%	34.3894%	37.6758%	33.8861%	38.1949%
FPCBINT								
FPCBP2								
FPCBPEP								
FSYSBI								
FSYSFA	33.4519%	36.2587%	33.0210%	36.7022%	28.4158%	31.5534%	27.9392%	32.0525%
FSYSFT	37.7512%	40.6262%	37.3078%	41.0786%	32.8489%	36.1026%	32.3515%	36.6174%
FSYSFT*	1.4727%	2.2829%	1.3688%	2.4273%	0.4854%	1.1040%	0.4200%	1.2257%
FSYSINT	33.6941%	36.5054%	33.2624%	36.9495%	28.5633%	31.7053%	28.0859%	32.2050%
FSYSPEP	33.6721%	36.4830%	33.2405%	36.9270%	28.5633%	31.7053%	28.0859%	32.2050%
FUNKOWN	0.0006%	0.1238%	0.0001%	0.1651%				

Table 27

Passed After Shipping	Field Failure				Field Failure			
	DIMM Issue				Blade Failure			
	95% CI		99% CI		95% CI		99% CI	
Mfg Test	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
FDBGHTHV	28.6114%	32.0182%	28.0951%	32.5603%	44.8124%	49.6856%	44.0607%	50.4435%
FPCB2C	27.5088%	30.8791%	26.9990%	31.4162%	42.4634%	47.3186%	41.7172%	48.0764%
FPCBAPK	32.6873%	36.2086%	32.1504%	36.7660%	42.0423%	46.8932%	41.2973%	47.6508%
FPCBDG	0.0009%	0.1952%	0.0002%	0.2602%	0.0015%	0.3370%	0.0003%	0.4492%
FPCBFA					0.0147%	0.4369%	0.0063%	0.5605%
FPCBFT	25.8572%	29.1681%	25.3578%	29.6971%	43.3662%	48.2297%	42.6177%	48.9877%
FPCBINT					0.0147%	0.4369%	0.0063%	0.5605%
FPCBP2					0.0147%	0.4369%	0.0063%	0.5605%
FPCBPEP					0.0147%	0.4369%	0.0063%	0.5605%
FSYSBI					0.0147%	0.4369%	0.0063%	0.5605%
FSYSFA	28.9562%	32.3739%	28.4380%	32.9175%	36.7047%	41.4687%	35.9794%	42.2188%
FSYSFT	32.2376%	35.7477%	31.7026%	36.3036%	40.7202%	45.5550%	39.9793%	46.3116%
FSYSFT*	0.9446%	1.8243%	0.8434%	1.9904%	1.8394%	3.4232%	1.6535%	3.7184%
FSYSINT	29.0252%	32.4450%	28.5066%	32.9890%	36.9440%	41.7131%	36.2176%	42.4638%
FSYSPEP	29.0252%	32.4450%	28.5066%	32.9890%	36.9440%	41.7131%	36.2176%	42.4638%
FUNKOWN								

Table 28

Passed After Shipping	Field Failure				Field Failure			
	Server Issue				Hardware Failure			
	95% CI		99% CI		95% CI		99% CI	
Mfg Test	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
FDBGHTHV	50.4053%	57.3151%	49.3338%	58.3691%	43.5722%	51.4509%	42.3719%	52.6659%
FPCB2C	35.1660%	41.9140%	34.1546%	42.9776%	40.7898%	48.6344%	39.6030%	49.8524%
FPCBAPK	35.1660%	41.9140%	34.1546%	42.9776%	40.3272%	48.1638%	39.1431%	49.3819%
FPCBDG	35.9973%	42.7715%	34.9799%	43.8372%	0.0040%	0.8675%	0.0008%	1.1551%
FPCBFA	42.4449%	49.3521%	41.3919%	50.4238%				
FPCBFT					41.5614%	49.4180%	40.3705%	50.6355%
FPCBINT								
FPCBP2								
FPCBPEP								
FSYSBI								
FSYSFA					38.0198%	45.8055%	36.8504%	47.0225%
FSYSFT	46.1731%	53.1031%	45.1080%	54.1699%	39.2493%	47.0644%	38.0717%	48.2823%
FSYSFT*	1.2965%	3.4222%	1.0881%	3.8520%	1.3176%	3.8362%	1.0831%	4.3554%
FSYSINT	42.4449%	49.3521%	41.3919%	50.4238%	38.1733%	45.9630%	37.0029%	47.1802%
FSYSPEP	42.4449%	49.3521%	41.3919%	50.4238%	38.1733%	45.9630%	37.0029%	47.1802%
FUNKOWN								

Table 29

Passed After Shipping	Field Failure				Field Failure			
	Memory Issue				CPU Failure			
	95% CI		99% CI		95% CI		99% CI	
Mfg Test	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
FDBGHTHV	36.2534%	46.2341%	34.7794%	47.7928%	53.8656%	64.4718%	52.2084%	66.0288%
FPCB2C	32.7769%	42.6042%	31.3438%	44.1564%	51.2431%	61.9369%	49.5864%	63.5216%
FPCBAPK	33.0243%	42.8644%	31.5880%	44.4173%	50.6623%	61.3716%	49.0064%	62.9618%
FPCBDG								
FPCBFA								
FPCBFT	34.7602%	44.6818%	33.3026%	46.2387%	51.8246%	62.5015%	50.1674%	64.0804%
FPCBINT								
FPCBP2								
FPCBPEP								
FSYSBI								
FSYSFA	28.5930%	38.1591%	27.2212%	39.6916%	43.7479%	54.5330%	42.1178%	56.1725%
FSYSFT	31.2954%	41.0402%	29.8824%	42.5869%	49.2135%	59.9553%	47.5603%	61.5584%
FSYSFT*	1.5957%	5.2996%	1.2741%	6.0796%	0.6390%	3.7360%	0.4464%	4.4631%
FSYSINT	28.5930%	38.1591%	27.2212%	39.6916%	44.3202%	55.1067%	42.6868%	56.7433%
FSYSPEP	28.5930%	38.1591%	27.2212%	39.6916%	44.3202%	55.1067%	42.6868%	56.7433%
FUNKOWN								

Table 30

Passed After Shipping	Field Failure				Field Failure			
	Booting Issue				DOA			
	95% CI		99% CI		95% CI		99% CI	
Mfg Test	LCL	UCL	LCL	UCL	LCL	UCL	LCL	UCL
FDBGHTHV	45.6824%	57.2975%	43.9184%	59.0427%	38.3011%	50.9861%	36.4351%	52.9336%
FPCB2C	43.6935%	55.3132%	41.9414%	57.0716%	37.1288%	49.7779%	35.2774%	51.7289%
FPCBAPK	42.7025%	54.3176%	40.9573%	56.0816%	36.7388%	49.3743%	34.8925%	51.3262%
FPCBDG								
FPCBFA								
FPCBFT	43.6935%	55.3132%	41.9414%	57.0716%	37.5191%	50.1810%	35.6628%	52.1310%
FPCBINT								
FPCBP2								
FPCBPEP								
FSYSBI								
FSYSFA	38.4342%	49.9772%	36.7275%	51.7573%	33.6340%	46.1309%	31.8332%	48.0857%
FSYSFT	42.3726%	53.9852%	40.6300%	55.7510%	35.1831%	47.7559%	33.3585%	49.7103%
FSYSFT*	0.7399%	4.3163%	0.5170%	5.1533%	1.1376%	5.7062%	0.8248%	6.7419%
FSYSINT	38.4342%	49.9772%	36.7275%	51.7573%	33.6340%	46.1309%	31.8332%	48.0857%
FSYSPEP	38.4342%	49.9772%	36.7275%	51.7573%	33.6340%	46.1309%	31.8332%	48.0857%
FUNKOWN								

The results from Tables 1-30 were used to identify the critical test areas for the top 10 field failures, which are shown in Tables 31-40. Any test area that has a confidence interval that contains 10% or above was chosen for failed and repaired tests and 40% or above was chosen for passed tests. If the tests in these areas were run first recognizing the problems of the product would be achieved faster and repairs for those problems could be scheduled earlier, even while the rest of the testing was still being performed. Also, with a ranking of the proportion of the population that will be failed, repaired, or passed each test on Tables 41-52, if the product continues to have problems after the critical tests are performed, the product can be sent to the next test area in the ranking knowing that there is more of a chance to find the problem in one area over another. The distinguishing of these critical tests saves time and labor and would increase the amount of useful information collected while decreasing the amount of unproductive information.

Table 31

Critical Test Areas- Most Critical to Least Critical		
Over 10%		
Failed Before Shipping		
Field Failure	Motherboard Issue	
	95% CI	99% CI
Test Areas	SYSFA	SYSFA
Over 10%		
Failed After Shipping		
Field Failure	Motherboard Issue	
	95% CI	99% CI
Test Areas	FPCBFT	FPCBFT
	FDBGHTHV	FDBGHTHV
Over 10%		
Repaired Before Shipping		
Field Failure	Motherboard Issue	
	95% CI	99% CI
Test Areas	IPAOI	IPAOI
Over 10%		
Repaired After Shipping		
Field Failure	Motherboard Issue	
	95% CI	99% CI
Test Areas	PRESCREEN	PRESCREEN
	SERVICE	SERVICE
	FGI	FGI
	DGI	DGI
Over 40%		
Passed Before Shipping		
Field Failure	Motherboard Issue	
	95% CI	99% CI
Test Areas	ICT	ICT
	PCBFT	PCBFT
	PASTE	PASTE
	PCBPM	PCBPM
	SYSFT*	SYSFT*
	SYSFA	SYSFA
	SYSPM	SYSPM
	PCB2C	PCB2C
	SYSPEP	SYSPEP
	ASSY	ASSY
	SYSINT	SYSINT
	PCBST	PCBST
Over 40%		
Passed After Shipping		
Field Failure	Motherboard Issue	
	95% CI	99% CI
Test Areas	FDBGHTHV	FDBGHTHV
	FPCBFT	FPCBFT
	FPCB2C	FPCB2C
	FPCBAPK	FPCBAPK
	FSYSFT	FSYSFT

Table 32

Critical Test Areas- Most Critical to Least Critical		
Over 10%		
Failed Before Shipping		
Field Failure	Motherboard Failure	
	95% CI	99% CI
Test Areas	SYSFA	SYSFA
Over 10%		
Failed After Shipping		
Field Failure	Motherboard Failure	
	95% CI	99% CI
Test Areas	FPCBFT	FPCBFT
	FDBGHTHV	FDBGHTHV
Over 10%		
Repaired Before Shipping		
Field Failure	Motherboard Failure	
	95% CI	99% CI
Test Areas	IPAOI	IPAOI
Over 10%		
Repaired After Shipping		
Field Failure	Motherboard Failure	
	95% CI	99% CI
Test Areas	PRESCREEN	PRESCREEN
	SERVICE	SERVICE
	FGI	FGI
Over 40%		
Passed Before Shipping		
Field Failure	Motherboard Failure	
	95% CI	99% CI
Test Areas	PASTE	PASTE
	ICT	ICT
	PCBFT	PCBFT
	PCBPM	PCBPM
	SYSFT*	SYSFT*
	SYSFA	SYSFA
	SYSMP	SYSMP
	PCB2C	PCB2C
	ASSY	ASSY
	SYSPEP	SYSPEP
	SYSINT	SYSINT
	PCBST	PCBST
Over 40%		
Passed After Shipping		
Field Failure	Motherboard Failure	
	95% CI	99% CI
Test Areas		FDBGHTHV

Table 33

Critical Test Areas- Most Critical to Least Critical		
Over 10%		
Failed Before Shipping		
Field Failure	DIMM Issue	
	95% CI	99% CI
Test Areas		SYSFA
Over 10%		
Failed After Shipping		
Field Failure	DIMM Issue	
	95% CI	99% CI
Test Areas		
Over 10%		
Repaired Before Shipping		
Field Failure	DIMM Issue	
	95% CI	99% CI
Test Areas	IPAOI	IPAOI
Over 10%		
Repaired After Shipping		
Field Failure	DIMM Issue	
	95% CI	99% CI
Test Areas	PRESCREEN	PRESCREEN
	FGI	FGI
	SERVICE	SERVICE
Over 40%		
Passed Before Shipping		
Field Failure	DIMM Issue	
	95% CI	99% CI
Test Areas	PASTE	PASTE
	PCBPM	PCBPM
	ICT	ICT
	PCBFT	PCBFT
	SYSFT*	SYSFT*
	SYSPM	SYSPM
	ASSY	ASSY
	SYSFA	SYSFA
	PCB2C	PCB2C
	SYSPEP	SYSPEP
	SYSINT	SYSINT
	PCBST	PCBST
Over 40%		
Passed After Shipping		
Field Failure	DIMM Issue	
	95% CI	99% CI
Test Areas		

Table 34

Critical Test Areas- Most Critical to Least Critical		
Over 10%		
Failed Before Shipping		
Field Failure	Blade Failure	
	95% CI	99% CI
Test Areas	SYSFA	SYSFA
Over 10%		
Failed After Shipping		
Field Failure	Blade Failure	
	95% CI	99% CI
Test Areas	FPCBFT	FPCBFT
	FDBGHTHV	FDBGHTHV
Over 10%		
Repaired Before Shipping		
Field Failure	Blade Failure	
	95% CI	99% CI
Test Areas	IPAOI	IPAOI
Over 10%		
Repaired After Shipping		
Field Failure	Blade Failure	
	95% CI	99% CI
Test Areas	PRESCREEN	PRESCREEN
	FGI	FGI
	SERVICE	SERVICE
	DGI	DGI
Over 40%		
Passed Before Shipping		
Field Failure	Blade Failure	
	95% CI	99% CI
Test Areas	ICT	ICT
	PCBFT	PCBFT
	PASTE	PASTE
	PCBPM	PCBPM
	SYSFT*	SYSFT*
	SYSFA	SYSFA
	SYSMP	SYSMP
	PCB2C	PCB2C
	SYSPEP	SYSPEP
	SYSINT	SYSINT
	ASSY	ASSY
		DBGHTHV
Over 40%		
Passed After Shipping		
Field Failure	Blade Failure	
	95% CI	99% CI
Test Areas	FDBGHTHV	FDBGHTHV
	FPCBFT	FPCBFT
	FPCB2C	FPCB2C
	FPCBAPK	FPCBAPK
	FSYSFT	FSYSFT
	FSYSINT	FSYSINT
	FSYSPEP	FSYSPEP
	FSYSFA	FSYSFA

Table 35

Critical Test Areas- Most Critical to Least Critical		
Over 10%		
Failed Before Shipping		
Field Failure	Server Issue	
	95% CI	99% CI
Test Areas	SYSFA	SYSFA
	PCBFT	PCBFT
Over 10%		
Failed After Shipping		
Field Failure	Server Issue	
	95% CI	99% CI
Test Areas	FPCBFT	FPCBFT
	FDBGHTHV	FDBGHTHV
	FPCB2C	FPCB2C
Over 10%		
Repaired Before Shipping		
Field Failure	Server Issue	
	95% CI	99% CI
Test Areas	IPAOI	IPAOI
Over 10%		
Repaired After Shipping		
Field Failure	Server Issue	
	95% CI	99% CI
Test Areas	PRESCREEN	PRESCREEN
	FGI	FGI
	SERVICE	SERVICE
	DGI	DGI
Over 40%		
Passed Before Shipping		
Field Failure	Server Issue	
	95% CI	99% CI
Test Areas	ICT	ICT
	PCBFT	PCBFT
	PASTE	PASTE
	PCBPM	PCBPM
	SYSFT*	SYSFT*
	SYSFA	SYSFA
	SYSPM	SYSPM
	PCB2C	PCB2C
	SYSPEP	SYSPEP
	SYSINT	SYSINT
	ASSY	ASSY
	DBGHTHV	DBGHTHV
		PCBST
Over 40%		
Passed After Shipping		
Field Failure	Server Issue	
	95% CI	99% CI
Test Areas	FDBGHTHV	FDBGHTHV
	FSYSFT	FSYSFT
	FSYSINT	FSYSINT
	FSYSPEP	FSYSPEP
	FPCBFA	FPCBFA
	FPCBDG	FPCBDG
	FPCB2C	FPCB2C
	FPCBAPK	FPCBAPK

Table 36

Critical Test Areas- Most Critical to Least Critical		
Over 10%		
Failed Before Shipping		
Field Failure	Hardware Failure	
	95% CI	99% CI
Test Areas	SYSFA	SYSFA
Over 10%		
Failed After Shipping		
Field Failure	Hardware Failure	
	95% CI	99% CI
Test Areas	FPCBFT	FPCBFT
	FDBGHTHV	FDBGHTHV
Over 10%		
Repaired Before Shipping		
Field Failure	Hardware Failure	
	95% CI	99% CI
Test Areas	IPAOI	IPAOI
Over 10%		
Repaired After Shipping		
Field Failure	Hardware Failure	
	95% CI	99% CI
Test Areas	PRESCREEN	PRESCREEN
	FGI	FGI
	SERVICE	SERVICE
	DGI	DGI
Over 40%		
Passed Before Shipping		
Field Failure	Hardware Failure	
	95% CI	99% CI
Test Areas	ICT	ICT
	PCBFT	PCBFT
	PASTE	PASTE
	PCBPM	PCBPM
	SYSFT*	SYSFT*
	SYSFA	SYSFA
	SYSPM	SYSPM
	PCB2C	PCB2C
	SYSPEP	SYSPEP
	ASSY	ASSY
	SYSINT	SYSINT
	DBGHTHV	DBGHTHV
Over 40%		
Passed After Shipping		
Field Failure	Hardware Failure	
	95% CI	99% CI
Test Areas	FDBGHTHV	FDBGHTHV
	FPCBFT	FPCBFT
	FPCB2C	FPCB2C
	FPCBAPK	FPCBAPK
	FSYSFT	FSYSFT
	FSYSINT	FSYSINT
	FSYSPEP	FSYSPEP
	FSYSFA	FSYSFA

Table 37

Critical Test Areas- Most Critical to Least Critical		
Over 10%		
Failed Before Shipping		
Field Failure	Memory Issue	
	95% CI	99% CI
Test Areas	SYSFA	SYSFA
	SYSFT	SYSFT
Over 10%		
Failed After Shipping		
Field Failure	Memory Issue	
	95% CI	99% CI
Test Areas	FPCBFT	FPCBFT
	FDBGHTHV	FDBGHTHV
Over 10%		
Repaired Before Shipping		
Field Failure	Memory Issue	
	95% CI	99% CI
Test Areas	IPAOI	IPAOI
Over 10%		
Repaired After Shipping		
Field Failure	Memory Issue	
	95% CI	99% CI
Test Areas	PRESCREEN	PRESCREEN
	FGI	FGI
	SERVICE	SERVICE
	DGI	DGI
Over 40%		
Passed Before Shipping		
Field Failure	Memory Issue	
	95% CI	99% CI
Test Areas	ICT	ICT
	PASTE	PASTE
	PCBPM	PCBPM
	PCBFT	PCBFT
	SYSFT*	SYSFT*
	SYSFA	SYSFA
	SYSPM	SYSPM
	ASSY	ASSY
	PCB2C	PCB2C
	SYSPEP	SYSPEP
	SYSINT	SYSINT
	PCBST	PCBST
Over 40%		
Passed After Shipping		
Field Failure	Memory Issue	
	95% CI	99% CI
Test Areas	FDBGHTHV	FDBGHTHV
	FPCBFT	FPCBFT
	FPCBAPK	FPCBAPK
	FPCB2C	FPCB2C
	FSYSFT	FSYSFT

Table 38

Critical Test Areas- Most Critical to Least Critical		
Over 10%		
Failed Before Shipping		
Field Failure	CPU Failure	
	95% CI	99% CI
Test Areas	SYSFA	SYSFA
		OSYSBI
		PCBFT
Over 10%		
Failed After Shipping		
Field Failure	CPU Failure	
	95% CI	99% CI
Test Areas	FPCBFT	FPCBFT
	FDBGHTHV	FDBGHTHV
	FPCB2C	FPCB2C
Over 10%		
Repaired Before Shipping		
Field Failure	CPU Failure	
	95% CI	99% CI
Test Areas	IPAOI	IPAOI
Over 10%		
Repaired After Shipping		
Field Failure	CPU Failure	
	95% CI	99% CI
Test Areas	PRESCREEN	PRESCREEN
	FGI	FGI
	SERVICE	SERVICE
	DGI	DGI
Over 40%		
Passed Before Shipping		
Field Failure	CPU Failure	
	95% CI	99% CI
Test Areas	ICT	ICT
	PASTE	PASTE
	PCBFT	PCBFT
	PCBPM	PCBPM
	SYSFT*	SYSFT*
	PCB2C	PCB2C
	SYSFA	SYSFA
	SYSPM	SYSPM
	SYSPEP	SYSPEP
	SYSINT	SYSINT
	ASSY	ASSY
	PCBST	PCBST
Over 40%		
Passed After Shipping		
Field Failure	CPU Failure	
	95% CI	99% CI
Test Areas	FDBGHTHV	FDBGHTHV
	FPCBFT	FPCBFT
	FPCB2C	FPCB2C
	FPCBAPK	FPCBAPK
	FSYSFT	FSYSFT
	FSYSINT	FSYSINT
	FSYSPEP	FSYSPEP
	FSYSFA	FSYSFA

Table 39

Critical Test Areas- Most Critical to Least Critical		
Over 10%		
Failed Before Shipping		
Field Failure	Booting Issue	
	95% CI	99% CI
Test Areas	SYSFA	SYSFA
	PCBFT	PCBFT
		SYSFT
Over 10%		
Failed After Shipping		
Field Failure	Booting Issue	
	95% CI	99% CI
Test Areas	FPCBFT	FPCBFT
	FDBGHTHV	FDBGHTHV
	FPCB2C	FPCB2C
Over 10%		
Repaired Before Shipping		
Field Failure	Booting Issue	
	95% CI	99% CI
Test Areas	IPAOI	IPAOI
Over 10%		
Repaired After Shipping		
Field Failure	Booting Issue	
	95% CI	99% CI
Test Areas	PRESCREEN	PRESCREEN
	SERVICE	SERVICE
	FGI	FGI
	DGI	DGI
Over 40%		
Passed Before Shipping		
Field Failure	Booting Issue	
	95% CI	99% CI
Test Areas	ICT	ICT
	PASTE	PASTE
	PCBFT	PCBFT
	PCBPM	PCBPM
	SYSFT*	SYSFT*
	SYSMP	SYSMP
	SYSBP	SYSBP
	SYSFA	SYSFA
	PCB2C	PCB2C
	SYSPEP	SYSPEP
	SYSINT	SYSINT
	SYSVF	SYSVF
	ASSY	ASSY
	DBGHTHV	DBGHTHV
	PCBST	PCBST
Over 40%		
Passed After Shipping		
Field Failure	Booting Issue	
	95% CI	99% CI
Test Areas	FDBGHTHV	FDBGHTHV
	FPCBFT	FPCBFT
	FPCB2C	FPCB2C
	FPCBAPK	FPCBAPK
	FSYSFT	FSYSFT
	FSYSINT	FSYSINT
	FSYSPEP	FSYSPEP
	FSYSFA	FSYSFA

Table 40

Critical Test Areas- Most Critical to Least Critical		
Over 10%		
Failed Before Shipping		
Field Failure	DOA	
	95% CI	99% CI
Test Areas	SYSFA	SYSFA
	PCBFT	PCBFT
	SYSFT	SYSFT
Over 10%		
Failed After Shipping		
Field Failure	DOA	
	95% CI	99% CI
Test Areas	FPCBFT	FPCBFT
	FDBGHTHV	FDBGHTHV
	FPCB2C	FPCB2C
Over 10%		
Repaired Before Shipping		
Field Failure	DOA	
	95% CI	99% CI
Test Areas	IPAOI	IPAOI
Over 10%		
Repaired After Shipping		
Field Failure	DOA	
	95% CI	99% CI
Test Areas	PRESCREE	PRESCREE
	FGI	FGI
	SERVICE	SERVICE
	DGI	DGI
Over 40%		
Passed Before Shipping		
Field Failure	DOA	
	95% CI	99% CI
Test Areas	ICT	ICT
	PASTE	PASTE
	PCBFT	PCBFT
	PCBPM	PCBPM
	SYSFT*	SYSFT*
	SYSFA	SYSFA
	SYSPPM	SYSPPM
	PCB2C	PCB2C
	SYSINT	SYSINT
	SYSPEP	SYSPEP
	ASSY	ASSY
	DBGHTHV	DBGHTHV
Over 40%		
Passed After Shipping		
Field Failure	DOA	
	95% CI	99% CI
Test Areas	FDBGHTHV	FDBGHTHV
	FPCBFT	FPCBFT
	FPCB2C	FPCB2C
	FPCBAPK	FPCBAPK
	FSYSFT	FSYSFT
	FSYSINT	FSYSINT
	FSYSPEP	FSYSPEP
	FSYSFA	FSYSFA

Table 41

Failed Before Shipping					
Field Failure	Motherboard Issue	Motherboard Failure	DIMM Issue	Blade Failure	Server Issue
Test Areas	SYSFA	SYSFA	SYSFA	SYSFA	SYSFA
	PCBFT	PCBFT	SYSFT	PCBFT	PCBFT
	SYSFT	SYSFT	PCBFT	PCB2C	SYSFT
	PCB2C	PCBST	PCB2C	SYSFT	PCB2C
	PCBST	PCB2C	PCBST	ICT	ICT
	ICT	ICT	ICT	PCBST	DBGHTHV
	DBGHTHV	DBGHTHV	DBGHTHV	DBGHTHV	PCBST
	PCBDL	SYSAPK	XRAY	PCBDL	SYSAPK
	SYSAPK	PCBDL	SYSAPK	SYSBP	PCBDL
	XRAY	XRAY	PCBDL	XRAY	SYSINT
	PCBBI	XTDSNT	POSTBI	SYSINT	PCBBI
	SYSINT	PCBBI	XTDSNT	PCBBI	POSTBI
	XTDSNT	SYSINT	PCBBI	SYSBI	XRAY
	POSTBI	POSTBI	SYSBI	SYSAPK	XTDSNT
	PCBFA	SYSBP	SYSBP	PCBFA	SYSBP
	SYSBP	PCBFA	OSYSBI	POSTBI	SYSBP
	RSYSBI	SYSBI	SYSINT	SYSADBG	PCBFA
	SYSBI	PCBP2	SYSBP	XTDSNT	PCBP2
	OSYSBI	SYSCEV	OPCBPB	PCBP2	PCBP2
	PCBP2	PCBP2	PCBP2	RSYSBI	SYSADBG
	SYSBP	SYSBP	SYSCEV	SYSBP	
	PCBP2	SYSPEP	SYSPEP	UNKNOWN	
	SYSADBG	XTD4C			
	SYSPEP				
	UNKNOWN				

Table 42

Failed Before Shipping					
Field Failure	Hardware Failure	Memory Issue	CPU Failure	Bootling Issue	DOA
Test Areas	SYSFA	SYSFA	SYSFA	SYSFA	SYSFA
	SYSFT	SYSFT	OSYSBI	PCBFT	PCBFT
	PCBFT	PCBFT	PCBFT	SYSFT	SYSFT
	PCB2C	PCBST	SYSFT	PCBST	DBGHTHV
	PCBST	PCB2C	PCBST	ICT	PCB2C
	ICT	ICT	ICT	PCB2C	ICT
	DBGHTHV	DBGHTHV	DBGHTHV	DBGHTHV	PCBST
	PCBDL	PCBDL	PCB2C	POSTBI	XRAY
	PCBFA	SYSBP	PCBDL	SYSAPK	PCBBI
	SYSINT	XRAY	SYSBP	XRAY	POSTBI
	XRAY	PCBBI	XRAY	PCBDL	SYSBI
	OSYSBI	RSYSBI	POSTBI	SYSBI	WPCBASIC1
	PCBBI	SYSBI	SYSAPK	SYSINT	
	POSTBI	WPCBASIC1	SYSBI	SYSBP	
	SYSADBG	PCBFA	SYSBP	XTDSNT	
	SYSAPK	POSTBI	XTDSNT		
	SYSBP	SYSADBG			
	SYSBP				
	XTDSNT				

Table 43

Failed After Shipping				
Field Failure	Motherboard Issue	Motherboard Failure	DIMM Issue	Blade Failure
Test Areas	FPCBFT	FPCBFT	FPCBFT	FPCBFT
	FDBGHTHV	FDBGHTHV	FDBGHTHV	FDBGHTHV
	FPCB2C	FPCB2C	FPCB2C	FPCB2C
	FPCBDG	FPCBDG	FPCBDG	FPCBDG
	FPCBAPK	FPCBAPK	FPCBAPK	FPCBAPK
	FSYSFT	FSYSFT	FSYSFT	FSYSFT
				FUNKOWN

Table 44

Failed After Shipping					
Field Failure	Hardware Failure	Memory Issue	CPU Failure	Bootling Issue	DOA
Test Areas	FPCBFT	FPCBFT	FPCBFT	FPCBFT	FPCBFT
	FDBGHTHV	FDBGHTHV	FDBGHTHV	FDBGHTHV	FDBGHTHV
	FPCB2C	FPCB2C	FPCB2C	FPCB2C	FPCB2C
	FPCBDG	FPCBDG	FPCBDG	FPCBDG	FPCBDG
	FPCBAPK	FPCBAPK		FPCBAPK	FSYSFT
	FSYSFT				FPCBAPK
	FPCBP2				

Table 45

Repaired Before Shipping					
Field Failure	Motherboard Issue	Motherboard Failure	DIMM Issue	Blade Failure	Server Issue
Test Areas	IPAOI	IPAOI	IPAOI	IPAOI	IPAOI
	IPMVI	IPMVI	IPMVI	IPMVI	IPMVI
	SYSFA	SYSFA	SYSFA	SYSFA	SYSFA
	SYSFT	SYSFT	PCBDG	SYSFT	SYSFT
	PCBDG	DBGHTHV	DBGHTHV	DBGHTHV	DBGHTHV
	DBGHTHV	PCBDG	SYSFT	PCBFA	PCBDG
	PCBFT	SYSFB	SYSFB	PCB2C	ICT
	SYSBI	PCBFA			
	SYSFB				

Table 46

Repaired Before Shipping					
Field Failure	Hardware Failure	Memory Issue	CPU Failure	Bootling Issue	DOA
Test Areas	IPAOI	IPAOI	IPAOI	IPAOI	IPAOI
	IPMVI	IPMVI	IPMVI	IPMVI	IPMVI
	SYSFA	PCBFA	SYSFA	SYSFA	SYSFA
	DBGHTHV	DBGHTHV	DBGHTHV	PCBDG	PCBDG
	SYSFT	PCBFT	SYSFT	SYSFT	PCBBI
	SYSFB	PCBDG	PCB2C	PCBFT	
	PCBFT		PCBBI		

Table 47

Repaired After Shipping					
Field Failure	Motherboard Issue	Motherboard Failure	DIMM Issue	Blade Failure	Server Issue
Test Areas	PRESCREEN	PRESCREEN	PRESCREEN	PRESCREEN	PRESCREEN
	SERVICE	SERVICE	FGI	FGI	FGI
	FGI	FGI	SERVICE	SERVICE	SERVICE
	DGI	DGI	DGI	DGI	DGI

Table 48

Repaired After Shipping					
Field Failure	Hardware Failure	Memory Issue	CPU Failure	Booting Issue	DOA
Test Areas	PRESCREEN	PRESCREEN	PRESCREEN	PRESCREEN	PRESCREEN
	FGI	FGI	FGI	SERVICE	FGI
	SERVICE	SERVICE	SERVICE	FGI	SERVICE
	DGI	DGI	DGI	DGI	DGI

Table 49

Passed Before Shipping					
Field Failure	Motherboard Issue	Motherboard Failure	DIMM Issue	Blade Failure	Server Issue
Test Areas	ICT	PASTE	PASTE	ICT	ICT
	PCBFT	ICT	PCBPM	PCBFT	PCBFT
	PASTE	PCBFT	ICT	PASTE	PASTE
	PCBPM	PCBPM	PCBFT	PCBPM	PCBPM
	SYSFT*	SYSFT*	SYSFT*	SYSFT*	SYSFT*
	SYSFA	SYSFA	SYSPM	SYSFA	SYSFA
	SYSPM	SYSPM	ASSY	SYSPM	SYSPM
	PCB2C	PCB2C	SYSFA	PCB2C	PCB2C
	SYSPEP	ASSY	PCB2C	SYSPEP	SYSPEP
	ASSY	SYSPEP	SYSPEP	SYSINT	SYSINT
	SYSINT	SYSINT	SYSINT	ASSY	ASSY
	PCBST	PCBST	PCBST	DBGHTHV	DBGHTHV
	DBGHTHV	DBGHTHV	DBGHTHV	XRAY	PCBST
	XRAY	XRAY	XRAY	PCBST	XRAY
	SYSAPK*	SYSAPK*	SYSAPK*	SYSAPK*	SYSAPK*
	SYSVF	PCBINT	SYSVF	PCBPB	SYSVF
	PCBPB	SYSVF	PCBINT	PCBINT	PCBINT
	PCBINT	PCBPB	PCBPB	PCBDL	PCBPB
	PCBBI	DBGLTLV	DBGLTLV	PCBBI	DBGLTLV
	DBGLTLV	PCBBI	PCBBI	DBGLTLV	POSTBI
	POSTBI	POSTBI	POSTBI	POSTBI	PCBBI
	PCBDL	SYSAPK	PCBCEV	SYSPB	PCBDL
	PCBFA	PCBDL	SYSAPK	PCBFA	PCBCEV
	SYSPB	PCBCEV	PCBDL	SYSVF	SYSCEV*
	XTDSNT	SYSCEV*	SYSCEV*	SYSBI	SYSPB
	SYSAPK	SYSPB	SYSPB	XTDSNT	PCBFA
	PCBP2	PCBFA	PCBFA	PCBCEV	XTDSNT
	PCBCEV	XTDSNT	PCBP2	PCBP2	SYSAPK
	SYSBI	SYSBI	XTDSNT	SYSCEV*	SYSBI
	SYSCEV*	SYSCEV	SYSCEV	SYSADBG	PCBP2
	SYSCEV	PCBP2	SYSDL	SYSAPK	SYSADBG
	SYSDL	SYSDL	SYSBI	SYSCEV	SYSCEV
	SYSADBG	XTD4C	PCBDL*	SYSBI*	WPCBASIC3
	XTD4C	WPCBASIC3	XTD4C	SYSDL	
	OSYSBI*	PCBDG	WPCBASIC1	PCBPEP	
	PCBPB*	PCBDL*	OSYSBI*	ZSYSBI	
	WPCBASIC3	PCBFA*	PCBPB*	XTD4C	
	DBGHTLV	SYSFA*	PCBBI*	WPCBASIC1	
		SYSINT*	UNKNOWN	UNKNOWN	
		WPCBASIC1	WPCBAPK		

Table 50

Passed Before Shipping					
Field Failure	Hardware Failure	Memory Issue	CPU Failure	Bootling Issue	DOA
Test Areas	ICT	ICT	ICT	ICT	ICT
	PCBFT	PASTE	PASTE	PASTE	PASTE
	PASTE	PCBPM	PCBFT	PCBFT	PCBFT
	PCBPM	PCBFT	PCBPM	PCBPM	PCBPM
	SYSFT*	SYSFT*	SYSFT*	SYSFT*	SYSFT*
	SYSFA	SYSFA	PCB2C	SYSMP	SYSFA
	SYSMP	SYSMP	SYSFA	SYSBP	SYSMP
	PCB2C	ASSY	SYSMP	SYSFA	PCB2C
	SYSPEP	PCB2C	SYSPEP	PCB2C	SYSINT
	ASSY	SYSPEP	SYSINT	SYSPEP	SYSPEP
	SYSINT	SYSINT	ASSY	SYSINT	ASSY
	DBGHTRV	PCBST	PCBST	SYSVF	DBGHTRV
	XRAY	DBGHTRV	DBGHTRV	ASSY	XRAY
	PCBST	XRAY	XRAY	DBGHTRV	PCBST
	SYSAPK*	SYSVF	SYSAPK*	PCBST	SYSVF
	PCBPB	SYSAPK*	PCBINT	XRAY	PCBBI
	PCBINT	PCBPB	SYSVF	PCBPB	PCBPB
	SYSVF	PCBINT	PCBPB	SYSAPK*	DBGTLTV
	DBGTLTV	DBGTLTV	PCBDL	PCBBI	POSTBI
	PCBBI	PCBBI	PCBBI	DBGTLTV	SYSAPK*
	PCBDL	PCBDL	DBGTLTV	POSTBI	PCBDL
	POSTBI	POSTBI	PCBCEV	PCBINT	PCBINT
	SYSBP	PCBFA	SYSAPK	PCBDL	XTDSNT
	SYSAPK	SYSBP	POSTBI	SYSAPK	SYSBP
	PCBFA	PCBCEV	PCBFA	XTDSNT	PCBCEV
	SYSBI	SYSBI	SYSBP	PCBFA	PCBFA
	PCBCEV	SYSCEV*	SYSCEV*	SYSCEV*	SYSCEV*
	SYSCEV*	PCBP2	SYSBI	PCBP2	PCBP2
	PCBP2	WPCBASIC1	PCBP2	PCBCEV	
	XTDSNT	WPCBAPK	SYSCEV	SYSCEV	
	SYSCEV	XTDSNT	XTD4C		
	SYSADBG	SYSADBG	XTDSNT		
	SYSDL	SYSDL			
	HIPOT	PCBP2			
		OSYSBI*			
		PCBPB*			
		PCBDG			
		PCBBS			

Table 51

Passed After Shipping					
Field Failure	Motherboard Issue	Motherboard Failure	DIMM Issue	Blade Failure	Server Issue
Test Areas	FDBGHTHV	FDBGHTHV	FDBGHTHV	FDBGHTHV	FDBGHTHV
	FPCBFT	FPCBFT	FPCBFT	FPCBFT	FSYSFT
	FPCB2C	FPCB2C	FPCB2C	FPCB2C	FSYSINT
	FPCBAPK	FPCBAPK	FPCBAPK	FPCBAPK	FSYSPEP
	FSYSFT	FSYSFT	FSYSFT	FSYSFT	FPCBFA
	FSYSINT	FSYSINT	FSYSINT	FSYSINT	FPCBDG
	FSYSPEP	FSYSPEP	FSYSPEP	FSYSPEP	FPCB2C
	FSYSFA	FSYSFA	FSYSFA	FSYSFA	FPCBAPK
	FSYSFT*	FSYSFT*	FSYSFT*	FSYSFT*	FSYSFT*
	FPCBDG		FPCBDG	FPCBFA	
	FUNKOWN			FPCBINT	
				FPCBP2	
				FPCBPEP	
				FSYSBI	
				FPCBDG	

Table 52

Passed After Shipping					
Field Failure	Hardware Failure	Memory Issue	CPU Failure	Booting Issue	DOA
Test Areas	FDBGHTHV	FDBGHTHV	FDBGHTHV	FDBGHTHV	FDBGHTHV
	FPCBFT	FPCBFT	FPCBFT	FPCBFT	FPCBFT
	FPCB2C	FPCBAPK	FPCB2C	FPCB2C	FPCB2C
	FPCBAPK	FPCB2C	FPCBAPK	FPCBAPK	FPCBAPK
	FSYSFT	FSYSFT	FSYSFT	FSYSFT	FSYSFT
	FSYSINT	FSYSINT	FSYSINT	FSYSINT	FSYSINT
	FSYSPEP	FSYSPEP	FSYSPEP	FSYSPEP	FSYSPEP
	FSYSFA	FSYSFA	FSYSFA	FSYSFA	FSYSFA
	FSYSFT*	FSYSFT*	FSYSFT*	FSYSFT*	FSYSFT*
	FPCBDG				

## 4.2 Comparison Table

The comparison table includes each of the unique serial numbers from the RMA data set that have at least one failed test in the CRMC data set. It lists the name of the failed test

and a count of how many times the test was failed. The failed tests are separated by before shipping to the customer and after return so that comparisons can be made. Table 53 shows a sample of the comparison table that was created as the whole table consists of 13,214 rows which is too large to be included in full in this report.

Table 53

Serial Numbers	Field Failure	Manufacturing Test Failures (before shipping)	Count	Return Date	Manufacturing Test Failures (return from the field)	Count
FCH152770M3	Blade Failure			1/20/2015	VERIFY_UUID	1
FCH15327174	Power Up Issue	COTATI_TEST_PREP	1	5/5/2014		
FCH15327178	Hardware Failure	COTATI_TEST_PREP	1	1/15/2013		
FCH154673HJ	Blade Failure	failed digital or boundary scan tes	1	8/22/2013		
		DIAG_FAIL:HOSTSYS_-CPU-EXT	1			
		UEFI_TEST_FAIL:_IOHX64**PCIE_ER	1			
FCH160175GV	Blade Failure	View File	1	3/19/2013		
		MEMORY_COUNT_MISMATCH	4			
		DETECT_SUBASSEMBLIES	2			
		TELNET_BMC	1			
		BIOS_UPDATE C0	1			
		UEFI_TEST_FAIL:_PCIX64**VERIFY_	2			
		BLADE_STATUS/DISC_FAILED	2			
FCH160278ZC	Motherboard Failure	BUILD_TEST_CONFIG	1	12/23/2016		
		TAN_MISSING	4			
		PCBDL_AREACHECK	2			
		ENQUEUE_CMD	1			
		failed analog test	2			
		failed power supply test	2			
FCH16027907	Motherboard Issue	failed analog test	2	12/10/2014	COTATI_FW_CHK	1
		SEL_UNCORR_ERR C0	2		PMEM_TEST C1	1
		CMOS_BAT_CHK 2.024V	1		EFI_DSH_TEST C1	1
		SEL_UNCORR_ERR C1	1			
		AREA_CHECK	2			
		VERIFY_DIAG_VERSION	2			
		DIAG_VERSION	3			
		VERIFY_BMC_VERSION C0	1			
		INVOKE_DIAGS	2			
		UEFI_TEST_FAIL:_ICHX64**VERIFY_	1			
		LSI_CHECKS	1			
		PCB2C_AREACHECK	1			
		COTATI_TEST_PREP	1			
		CD_TO_FS1/FS0(VMEDIA): C0	1			
		UCSB-B200-M3_CNF_NOT_FOUND	1			
		BLADE_DISCOVERY	6			
		UPDATE_ADAPTER	1			

The full comparison chart will be given to the testers at Cisco to allow them to look at the failed tests before and after the product is sent to the customer and see what failed tests from before may be associated with failed tests after shipping. This will allow them to test after shipping for specific cases based on what tests failed before shipping which will save time because unnecessary tests will not be run.

## 5. CONCLUSIONS

Cisco wanted to know how field failure categories relate to manufacturing test failures to better predict the tests that should be performed on a product after a return by a customer and what tests will be failed by a product before and after a return by a customer based on what type of failure occurred in the field. The data was filtered and sorted by field failure, shipping status, test area result, and test area. For each combination of field failure, shipping status, test area result, and test area a statistical model of the population proportion was created. The 95% and 99% confidence intervals were found. The critical test areas are listed in Tables 31-40 and a ranking of the criticality of the test areas are listed in Tables 41-52. These findings will reduce the time spent on unnecessary tests.

## 6. RECOMMENDATIONS FOR FUTURE WORK

This study looked at only one product type, UCSB-B200-M3, and in the future the methods in this study should be expanded to all other product types at Cisco. Also, different types of statistical analysis should be tried such as hypothesis testing for population proportion to approximate the actual population proportion with statistical significance. In the future, the method in this study and the ones mentioned above should be automated so that they can be run monthly or daily to track changes in failure patterns and rates.

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