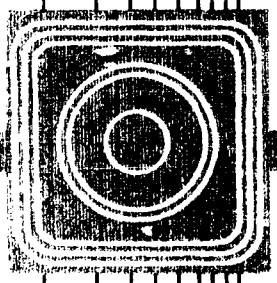
NONOPERATING RELIABILITY DATABOOK



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NONOPERATING RELIABILITY DATABOOK

1987

Prepared by:

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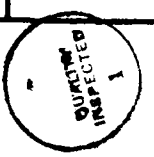
IIT Research Institute



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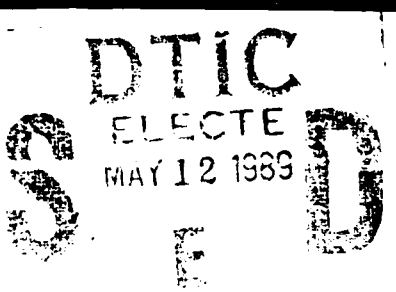

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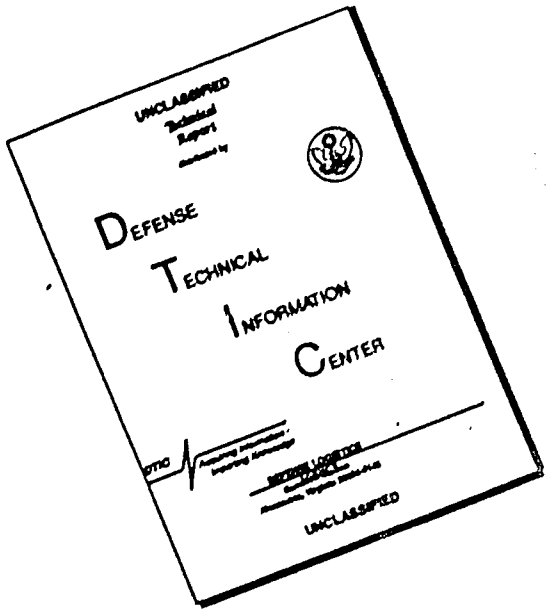

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This publication provides nonoperating failure rates for various electronic and nonelectronic components. The data contained in this document was derived from military and commercial equipment used in nonoperating field or storage environments.

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PREFACE

This publication is the first RAC databook devoted entirely to one specific field use condition. NONOP-1 is a compilation of nonoperating field and test data for an assortment of electrical and electro-mechanical parts. The data presented have been collected by the Reliability Analysis Center (RAC) from many government and nongovernment sources and resides in RAC databases.

NONOP-1 provides summarized and unsummarized data on a variety of part types. Records are grouped into various logical sub-categories to allow quick comparisons between related part types. Summary data tables provide field failure rates for the merged data records along with their respective predicted failure rate values. Predicted failure rates have been derived using RAC's Nonoperating Reliability Prediction System (RAC-NPRS) which is based on RADC Technical Report, Impact of Nonoperating Periods on Equipment Reliability, RADC-TR-85-91. A component failure rate section for miscellaneous components which are not currently represented by reliability prediction models and a section outlining the effects of periodically testing nonoperating systems are also presented. This book is intended to complement documents such as RADC-TR-85-91 or MIL-HDBK-217. **Users are cautioned that any data presented herein may not be used in lieu of contractually cited references.**

The author would like to acknowledge all those who participated in this project and send a special thanks to Mr. David J. Dekkers, Mr. David W. Coit, Ms. Mary G. Priore and Mr. William Cesare for their technical assistance and expertise to Ms. Shirley Thomson for her efforts in data input and to Ms. Shawn Gentile and Ms. Susan B. Stockman for their efforts in graphics and document production.

TABLE OF CONTENTS

TABLE OF CONTENTS (CONT'D)

LIST OF TABLES

LIST OF TABLES (CONT'D)

LIST OF FIGURES

LIST OF FIGURES (CONT'D)

INTRODUCTION

For years reliability experts have agreed that equipments exposed to long periods of storage experience some measurable degree of degradation. Many of these experts have been using 10 percent of the operational failure rate as an approximation for the nonoperational failure rate (Ref. #1). The use of a multiplicative "K" factor such as 10% has merit under certain circumstances. For example, the "K" factor can be accurately used to predict nonoperating failure rate if it was based on equipment level data from the same contractor on a similar equipment type with similar derating and screening. In any other circumstances, however, the use of a "K" factor is a very approximate method at best. Additionally, it is intuitively wrong to assume that operating and nonoperating failure rates are directly proportional. Many application and design variables would be anticipated to have a pronounced effect on operating failure rate, yet negligible effect on nonoperating failure rate. Derating is one example. It has been observed that derating results in a significant decrease in operating failure rate, but a similar decrease would not be expected with no power applied. Additionally, the stresses on parts are different in the nonoperating state, and therefore, there is no reason to believe that the operating factors for temperature, environment, quality and application would also be applicable for nonoperating reliability prediction purposes. In some cases, the nonoperational component failure rates have the same or even greater values as the operational failure rate. This is especially true for components in systems which are continuously cycled on and off or for systems that are prone to wearout.

The intent of this publication is to illustrate the impact which nonoperational periods have on equipment reliability. For example, if a piece of equipment had a nonoperational failure rate of 12 failures per million storage hours, the reliability (or probability of mission success) after just 1 year of storage would be 90 percent. The same system after 10 years of storage would have a reliability of merely 35%.

These are important considerations for spare part circuit cards or missile systems which may spend mary years in storage. With the data outlined in this publication it is possible to derive accurate nonoperating failure rates which when used in conjunction with the RAC Nonoperating Reliability Prediction System (RAC-NRPS) or RADC-TR-85-91 will estimate system reliability. The system reliability information may be used to perform design trade offs, to help establish testing intervals, to determine when to scrap old supplies or to help compute cost effective warranty periods. Electronic equipment can in some respects be compared to items at the corner grocery store. Obviously, the new products on the shelf will be the freshest and will last the longest. As the expiration date becomes near the probability of purchasing a bad product becomes greater and consequently the life expectancy of that product once opened is much shorter.

It is intended that this document be used as a building block for future research in this area. Much more information is needed to better understand the impact which nonoperating periods have on systems in storage. The Reliability Analysis Center expects to continue supporting the component nonoperating reliability database from which this publication was generated, and to publish updates to this databook in a timely fashion.

Section 1
Background

Background

This nonoperating reliability data publication provides failure rate, failure mechanism and environmental analysis information on numerous electrical and electromechanical components. Data utilized in this document represents part failures extracted from equipment-level experience during nonoperating field conditions in military and commercial applications. These equipments may be fielded or in storage stock piles so long as they are nonoperational. Two key conditions cause failure data collection to be particularly difficult for the nonoperating condition. The first is the inherently low failure rate which many part types exhibit in storage or dormant applications. Many potential data sources could not be used simply because insufficient nonoperating time had accumulated to expect any failures. The second is the inability of many data collection systems to distinguish between operating and nonoperating failures.

To insure an efficient and effective data collection process, five criteria were established for an acceptable data source. Each potential data source was evaluated with these criteria before proceeding with data summarization. These five criteria were:

1. Data available to the part level.

2. Primary failures can be separated from total maintenance actions.

3. Nonoperating failures can be separated from operating failures.

4. Sufficient detail can be identified for components.

5. Sufficient equipment nonoperating hours to expect failures.

These five attributes were used as a guide to determine suitable candidate data sources. The conclusion was reached, after the evaluation of all potential data sources, to concentrate data collection efforts on large, preferably automated data bases which had already been summarized (i.e., nonoperating failures identified, part characterization performed, part hours computed) and pertained only to nonoperating reliability. The separation of nonoperating and operating failures proved to be the most difficult issue and prevented the inclusion of many possible data sources. Examples of equipments which met the 5 criterion, and how they met them follow.

The Product Performance Agreement Center at Wright-Patterson Air Force Base provided information regarding U.S. Air Force equipments purchased under Reliability Improvement Warranty (RIW) contracts. RIW failure reporting allows for decisions to be made regarding primary versus secondary failures, and is generally more complete. As with other data sources, the issue of separating nonoperating failures from total failures was difficult. The F-16 heads-up-display (HUD) was selected from the list of RIW contracts to summarize for nonoperating reliability data. The F-16 HUD met each of five requirements for an acceptable data source. Additionally, there was a relatively wide range of component styles included in the design. Distinction between operating versus nonoperating failures was made possible using the on-equipment maintenance action "when discovered" code.

The Storage Reliability of Missile Materiel Program maintained by U.S. Army MICOM, Redstone Arsenal provided the best source of nonoperating failure rate data. Nonoperating failure rate data were available for a wide range of part types for a number of missile programs. Time and budget constraints would have prevented independent summarization of a data base as large as the MICOM data base. MICOM has periodically issued a set of documents presenting the data in various formats, describing data analyses, and presenting nonoperating failure rate prediction models for missile electronics. The successful

completion of this study relied heavily on the use of large summarized data from sources such as MICOM. Also presented are vendor storage life test data on microcircuits at the component level. The following sections describes in detail the basic assumptions which were used in preparing this report, including the type of data which is presented, from what sources the data was derived, and what the data consists of.

Assumptions

Failure times for most electronic equipment and components have long been assumed to be exponentially distributed and therefore exhibit a constant failure rate (Ref. #2). This may not necessarily represent the majority of nonelectronic components, but due to the lack of individual times-to-failure represented in the field data, the exponential assumption was adapted as the best estimate. For many complex nonelectronic parts this is a reasonable assumption. For other parts the constant failure rates presented herein reflect an average failure rate over the useful life of an equipment.

Failure rates presented in the summary data tables reflect the mean point estimate expressed in failures per million nonoperating hours. The failure rate (λ) is derived by dividing the cumulative number of failures by the total part hours, where part hours are presented in millions of hours. Therefore, the failure rates shown are given by:

$$\lambda = f/t$$

where

λ = point estimate nonoperating failure rate (failures/10^6 nonoperating hours)
f = cumulative number of failures
t = total nonoperating part hours ($x10^6$)

It is common practice to express the point estimate of the failure rate with some measure of confidence. The confidence intervals have not been computed here but can be calculated by using the chi-square distribution to compute the interval limits for a desired confidence level. Upper and lower confidence limits can be computed by,

$$\lambda_{UL} = \frac{\chi^2(2f + 2, \alpha/2)}{2t}$$

$$\lambda_{LL} = \frac{\chi^2(2f, 1-\alpha/2)}{2t}$$

where

λ_{UL} = upper confidence limit
λ_{LL} = lower confidence limit
f = number of failures
t = nonoperating part hours ($x10^6$)
$1 - \alpha$ = confidence
$\chi^2(a,b)$ = chi-squared statistic (from tables with "a" degrees of freedom at the "bth" percentile)

Certain assumptions regarding data censoring were required for proper application of these equations.

Some merged data records consist of survival data or zero failure data only. Upper limits on failure rate for zero failure records were determined using a 60% upper single-sided confidence limit. This was computed by dividing 0.916 by the total nonoperating hours. 0.916 is the chi-square value with 2 degrees of freedom at a 60% confidence. The zero failure approximation is designated in the tables with either a (<) or a (<<) sign before the failure rate. The (<<) sign signifies a value which is expected to be much less than the value given in the tables. It is used when the total zero failure nonoperating times are less than 50 million hours.

Data Types

The Reliability Analysis Center (RAC) has numerous sources for acquiring data throughout industry and government. Data is routinely collected and summarized from vendor test reports, vendor warranty databases, government maintenance data collection systems and government industry data exchange programs. Data used in this publication were extracted from existing RAC microcircuit, nonelectronic, discrete semiconductor and failure event data bases as well as from other non-RAC data sources. These data were merged and a new data base was implemented which will be maintained to accommodate new data as it becomes available.

The majority of part-level data contained in the RAC nonoperating data base is field experience data from fielded or stored equipments. However, for microcircuits there is also a large amount of storage life test data at elevated temperatures. Each type of data has inherent strengths and weaknesses. Life test data has two major deficiencies. The first is that tests are usually run for short durations with small part quantities being tested. For example, if one hundred parts are tested for 1,000 hours, there are only one hundred thousand hours logged on that part type. The second problem is that test conditions are generally not representative of the actual usage environment. Field data on the other hand is a good indicator of what has actually been experienced in a storage environment and therefore, more realistically

represents nonoperating failure rates. The problem with field data is the manner in which it is recorded. Accurate reporting of hours, failures and stress levels are often difficult to obtain.

A large portion of the detailed data presented in this document is a result of the study presented in Reference 3. The detailed data tables, including predicted and observed failure rates, have been presented for information only to make available data on individual cases. Failure rates of these individual data records should not be used to yield the lowest or most advantageous failure rate for a given situation. When performing a nonoperating reliability prediction, the reliability engineer should utilize failure rate models contained in RADC technical report RADC-TR-85-91 (Reference 3) first and then NONOP-1 for components which are not covered by this report. Additional reasons for presenting detailed data records are to allow user's to identify specific part numbers or part characteristics which directly pertain to their systems and to confidently merge RAC nonoperating data with data that the user may be tracking. Other data used in this study were taken second source from other RAC and non-RAC studies. These data points may be found in the miscellaneous component data section and are presented here for the user's convenience and to make this document as comprehensive as possible.

Section 2

Overview

General

For the purpose of this study the terms storage, nonoperational and dormant will be used interchangeably. The criteria for inclusion in this study is that when a device is in a dormant state, that device is not experiencing any of the electrical stresses which it was designed to withstand. The device, either a system, sub-system, assembly or component, ideally should not degrade or breakdown when no external stresses are applied. However, it is very likely that the device, even though it is not operating, may be experiencing the effects of environmental stresses. These stresses would include factors such as temperature cycling, humidity, vibration due to transportation and handling, electrostatic fields, or any number of other factors. Section 2 of this databook will discuss the effects that environmental factors have on nonoperating reliability and will look into many of the failure mechanisms which can be attributed to these effects. Also presented is a brief discussion on the effects of power cycling devices by periodic testing and finally, a section on tools which are currently available to predict the reliability of nonoperating devices.

Environmental Analysis

Many systems are designed to withstand periods of nonoperation up to 20 years while maintaining a high probability of operational success. One-shot devices such as missiles will in all likelihood spend their entire useful life in storage. Therefore, designers must select not only optimum operating performance specifications but also appropriate fabrication and packaging materials to ensure a high reliability throughout prolonged periods of storage.

The storage environment has a very significant effect on nonoperating reliability for all major part categories. The type of storage environment and the extent with which these environmental stresses can be controlled are two of the most important aspects in evaluating nonoperating reliability. The system's service environment

should be considered early in the design stages when selecting fabrication and packaging materials. The designer should understand and account for all of the possible environmental stresses which may be encountered. Table E-1 illustrates the primary stresses for many of the key application environments. For example, if a system is to be stored in an uncontrolled ground fixed environment, all of the components within that system must be able to withstand significant changes in relative humidity and temperature. This table was taken directly from the RAC data base operating guidelines.

TABLE E-1:
ENVIRONMENTAL STRESSES

CODE	ENVIRONMENT	PRIMARY STRESSES
GB	Ground, Benign	EMI Humidity Loads Shock Temperature Shock/Cycling Fungus/Microbes
GF	Ground, Fixed	Humidity EMI Temperature Extremes Temperature Shock/Cycling Fungus/Microbes Salt Fog Solar Radiation
GM	Ground Mobile	Temperature Shock/Cycling Loads Shock Temperature Extremes Dust/Sand Humidity Leakage Sine Vibration EMI Random Vibration Salt Fog Fungus/Microbes Acoustical Noise Solar Radiation

TABLE E-1:

ENVIRONMENTAL STRESSES (CONT'D)

CODE	ENVIRONMENT	PRIMARY STRESSES
MP	Manpack	Temperature Shock/Cycling Leakage Humidity Loads Shock Temperature Extremes Random Vibration Fungus/Microbes Sine Vibration Salt Fog EMI
AIC	Airborne, Inhabited Cargo	Temperature Shock/Cycling Random Vibration Temperature-Altitude Humidity Sine Vibration EMI Loads Shock Acoustical Noise Temperature Extremes Acceleration Altitude Fungus/Microbes Temperature-Humidity-Altitude
AIF	Airborne, Inhabited Fighter	Random Vibration Temperature Shock/Cycling Acceleration Temperature-Altitude Humidity Temperature-Humidity-Altitude Temperature Extremes EMI Sine Vibration Acoustical Noise Loads Shock Altitude Fungus/Microbes

TABLE E-1:

ENVIRONMENTAL STRESSES (CONT'D)

CODE	ENVIRONMENT	PRIMARY STRESSES
AUC	Airborne, Uninhabited Cargo	Altitude Temperature-Altitude Temperature Shock/Cycling Temperature-Humidity-Altitude Random Vibration Temperature Extremes Loads Shock Acoustical Noise EMI Humidity Sine Vibration Solar Radiation Salt Fog Acceleration Fungus/Microbes Explosive Atmosphere
AUF	Airborne, Uninhabited Fighter	Temperature Shock/Cycling Random Vibration Altitude Temperature-Humidity-Altitude Temperature Extremes Loads Shock Humidity Sine Vibration EMI Acoustical Noise Pressure Shock Solar Radiation Salt Fog Fungus/Microbes Explosive Atmosphere
HEL	Airborne Rotary Wing (Helicopter)	Random Vibration Temperature Shock/Cycling Sine Vibration Temperature Extremes Loads Shock Temperature-Altitude Acoustical Noise Humidity Dust/Sand Temperature-Humidity-Altitude EMI Acceleration Altitude Salt Fog Fungus/Microbes

TABLE E-1:

ENVIRONMENTAL STRESSES (CONT'D)

CODE	ENVIRONMENT	PRIMARY STRESSES
NS	Naval, Sheltered	Humidity Explosive Atmosphere Random Vibration EMI Sine Vibration Loads Shock Salt Fog Temperature Shock/Cycling Acceleration Fungus/Microbes Acoustical Noise
NSB	Naval, Submarine	Salt Fog Sine Vibration Humidity Loads Shock Fungus/Microbes Random Vibration Acoustical Noise EMI Low Temperature Explosive Atmosphere
NU	Naval, Unsheltered	Salt Fog Humidity Leakage Loads Shock Temperature Extremes Random Vibration Fungus/Microbes Sine Vibration Temperature Shock/Cycling EMI Pressure Shock Solar Radiation Acceleration Acoustical Noise Explosive Atmosphere

TABLE E-1:

ENVIRONMENTAL STRESSES (CONT'D)

CODE	ENVIRONMENT	PRIMARY STRESSES
NUU	Naval, Undersea, Unsheltered	Salt Fog Humidity Leakage Pressure Shock Loads Shock Sine Vibration Temperature Shock/Cycling Temperature Extremes Random Vibration Fungus/Microbes EMI
USL	Undersea, Launch	Leakage Loads Shock Pyrotechnic Shock Random Vibration Humidity Pressure Shock Temperature Shock/Cycling Acoustical Noise Salt Fog Acceleration Sine Vibration Temperature Extremes Temperature-Altitude Fungus/Microbes Temperature-Humidity-Altitude EMI
ML	Missile, Lauch	Pyrotechnic Shock Random Vibration Acceleration Temperature-Humidity-Altitude Loads Shock Temperature Shock/Cycling Acoustical Noise Temperature-Altitude EMI Sine Vibration Humidity Temperature Extremes Pressure Shock Altitude Space Simulation Explosive Atmosphere

TABLE E-1:

ENVIRONMENTAL STRESSES (CONT'D)

CODE	ENVIRONMENT	PRIMARY STRESSES
SF	Space, Flight	Solar Radiation Space Simulation Temperature-Altitude Temperature Extremes EMI Temperature Shock/Cycling Altitude Random Vibration

Possibly the most significant failure mechanism during storage of any system is corrosion. The rate of corrosion depends upon the type of atmosphere the system is exposed to. The availability of moisture, galvanic couples, high temperatures and particle or gas contaminants can can cause corrosion. Consequently, relative humidities of greater than 65 percent can often cause significant increases in the corrosion rate of materials (Ref. #4). Extreme ambient temperatures are another significant environmental problem encountered during storage. Thermal stresses due to large changes in temperature cause materials to expand and contract. This can cause certain materials to form cracks allowing contaminants into the system. High temperatures for prolonged periods may also cause certain materials to react with one another.

The storage environment is composed of many different environmental conditions. Some of the primary environmental stresses are listed in Table E-2. To minimize the effects of these conditions, alternatives to storing a system in an uncontrolled ground fixed environment should be considered. Delicate components or assemblies should be stored in hermetically sealed containers to protect against the outside atmosphere. The use of desiccant can be effective in maintaining a

moisture free environment in a sealed container. However, for prolonged storage, periodic inspection of the desiccant should be conducted to determine its moisture content, thus insuring that the absorption process is not reversed. Guard against severe temperature extremes by storing items in a building with a controlled climate. Though neither of these approaches are inexpensive, they may slow the effects of device degradation caused by environmental stress.

TABLE E-2:
PRIMARY ENVIRONMENTAL FACTORS
ENCOUNTERED DURING STORAGE

High Temperature Extremes
Low Temperature Extremes
Temperature Cycling
Moisture
Atmospheric Pollutants
Thermal Shock
Mechanical Shock and Vibration
Bacteria, Fungus
Nuclear Radiation
Electromagnetic Fields

Component Failure Mechanisms Due to the Effects of Storage

Accurate nonoperational component failure mechanism information was difficult to obtain due to the numerous variations in storage environments, data reporting techniques and component level data availability. Most of the information presented in this section have been derived from published sources.

Quantitative failure mechanism data are presented in percentages for several component types and represent a best estimate based on our findings. Failure mechanism percentages were derived using Army Fuze and missile storage reliability data and RAC failure event data base records. The component types addressed in this section are microcircuits, diodes, transistors, tubes, resistors, capacitors, inductors and connectors.

Microcircuit Failure Mechanisms

Failure mechanisms of microcircuits are to a large degree independent of the device function. Most IC's experience similar anomolies because their physical characteristics are the same. Microcircuits typically have bulk material with diffusions, a metallization layer, an oxide layer, a glassivation layer, die attach material, wire bonds and a package enclosure (see Figure E-1). The package style often varies considerably, and since environmental stresses typically accelerate package related failure mechanisms more predominantly than die related mechanisms, these variations can have very significant influences on nonoperating failure rates. The failure mechanisms occuring in storage appear to be time-related and environment dependent. These failures are induced by temperature or mechanical stresses, and occur at different rates depending on how severe or benign the environment is.

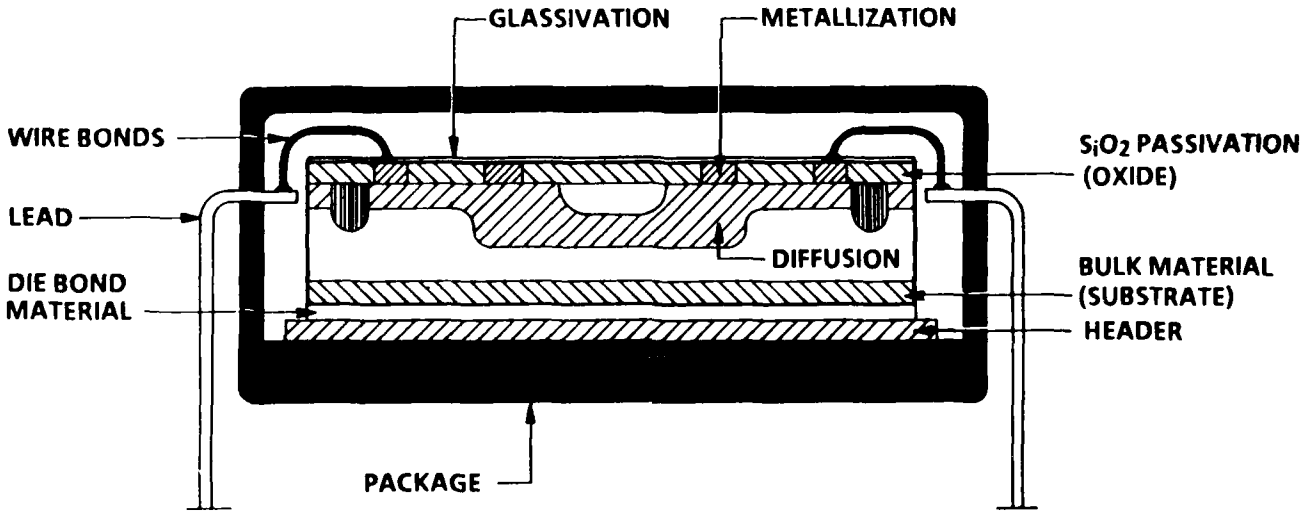

FIGURE E-1:
GENERIC MICROCIRCUIT STRUCTURE

In the operational environment there are significant differences between the failure mechanisms of bipolar digital and linear devices and MOS devices. However, due to the above cited reasons, failure mechanisms between these device types are approximately the same when in their nonoperating mode. Table E-3 (Ref. 4), lists microcircuit nonoperating failure mechanisms and the conditions which tend to accelerate them.

TABLE E-3:
MICROCIRCUIT FAILURE MECHANISMS

FAILURE MECHANISM	CAUSE	ACCELERATING ENVIRONMENT
Bulk Defects		
Dislocation and Stacking Faults	Lattice strain due to steep concentration gradients finally released as dislocations	Mechanical Stress High Temp
Impurity Diffusion and Precipations	Diffusions along dislocations during epitaxial growth	High Temp Power Burn-in Thermal Cycling
Resistivity Gradients	Large local stresses	Mechanical Shock Vibration Neutron Bombardment
Cracks in Bulk Material	Thermal shock during processing	Mechanical Shock Thermal Cycling High Temp
Metallization Defects		
Surface Flaws	Scratched or smeared metallization during processing	Thermal Cycling
Insufficient Coverage at Oxide Step	1) Misalignment of masks 2) Insufficient deposition at oxide steps 3) Oxide step too steep 4) Oversintering of metal to silicon 5) Incomplete removal of oxide	High Temp Thermal Cycling Power Burn-in

TABLE E-3:

MICROCIRCUIT FAILURE MECHANISMS (CONT'D)

FAILURE MECHANISM	CAUSE	ACCELERATING ENVIRONMENT
Metallization Defects (Cont'd)		
Under-etched Metallization	Improper Etching	High Temp Thermal Cycling Power Burn-in
Voids under Metallization	1) Overetching causing undercutting of metallization 2) Kirkendall effect of disimilar alloys	High Temp Thermal Cycling Mechanical Stress
Non-adhesion of Metallization	1) Contamination of surface 2) Improper alloying temp or time	High Temp Thermal Cycling
Metal Migration	Insufficient metal thickness, Scratches, grain size	High Temp & Current Density
Final Seal Defects		
Poor Hermetic Seal	Fractured glass or incomplete Weld, Braze	Thermal & Mechanical Stress
Fractured Package	Improper handling or improper Seal Leak Test	Thermal & Mechanical Stress
Internal Wires Shorted to Conductive Lids or Chip Periphery	Slack in leads	Mechanical Stress Temp Cycling
Current Leakage Between Leads	Low resistance leak due to reduction of P_bO glass to P_b	High Temp Mechanical Stress
Broken or Bent External Leads	Improper brazing or handling	High Temp Mechanical Stress
Improper Marking	Process control problem	

TABLE E-3:
MICROCIRCUIT FAILURE MECHANISMS (CONT'D)

FAILURE MECHANISM	CAUSE	ACCELERATING ENVIRONMENT
Wire Bonding Defects		
Separation of Bonds	1) Underbonding 2) Contamination of Bonding 3) Cracks in bond due to over-bonding	High Temp Shock Vibration
Bond Shorts	1) Overbonding 2) Insufficient bonding pad area or spacing 3) Improper alignment	High Temp Power Burn-in Vibration Shock Thermal Cycling
Broken Wires & Reduced Wire Size	1) Overbonding 2) Nicks or abrasions in wire during processing	High Temp Shock Vibration
Wire Shorts	Unremoved pigtails	High Temp Shock Vibration
Intermetallic Compound Formation	Time-dependent formations of chemical compounds at metal-metal contacts	High Temp
Glassivation Defects		
Inversion Phenomenon	Poor Interface between oxide layer & glassivation layer	High Temp & Reverese Bias
Metal Migration	Damaged Glass - Pressure Between oxide & glassivation layers	High Temp & Current Density
Oxide Cracks	Thermal shock during processing	Temp Cycling Moisture

TABLE E-3:

MICROCIRCUIT FAILURE MECHANISMS (CONT'D)

FAILURE MECHANISM	CAUSE	ACCELERATING ENVIRONMENT
Die Bonding Defects		
Voids between Header & Die	Incomplete coverage of bonding material	High Temp Vibration Shock
Cracked or lifted Die to Header bond	1) Weak metal eutectic bond due to oxide on reverse side of silicon 2) Glass frit facture in flexible package	Acceleration Shock Vibration High Temp Thermal Cycling
Cracked Silicon Die	Strains during die attach.	Acceleration Shock Vibration Thermal Cycling
Oxide Defects		
Inversion Layer Phenomena	1) Thermal oxidation of Silicon producing n or p type surface 2) Charged impurities	High Temp Power Burn-in Reverse Bias
Pinhole	Faulty Oxide Growth due to: 1) Dust particles or other contaminants 2) Mask flaws 3) Etch undercut 4) Poor photo resist	High Temp Thermal Cycling Power Burn-in Voltage Stress
Cracks	Mismatch in thermal expansion rate	High Temp
Thin Oxide	Improper process control	High Temp

TABLE E-3:

MICROCIRCUIT FAILURE MECHANISMS (CONT'D)

FAILURE MECHANISM	CAUSE	ACCELERATING ENVIRONMENT
Contamination		
Surface, Wire or Bond Corrosion	Corrosive residue & moisture such as: 1) Photo-resist 2) Chlorine in wire lubricant 3) Etch pits in oxide, trapping sodium or other corrosive agents 4) Outgassing from organic materials 5) Weld glasses 6) Incorrect Atmosphere sealed in package 7) Loss of package hermiticity	High Temp Storage
Conductive Particles in Package	1) Solder particles 2) Wire particles 3) Flaking metallization 4) Die particles 5) Die bond material particles	Vibration Shock Thermal Cycling
Corrosion at Glass Ceramic Interface	Small lead material junction at interface exposed to environment after lead plating	High Temp Storage
Diffusion Defects		
Improper Diffusions	1) Faulty mask alignment 2) Dust or other contaminants 3) Defects in mask itself 4) Cracks in oxide	High Temp Thermal Cycling
Improper Doping Profile	Process control problem	Thermal Cycling High Temp Storage

o Wire Bond Failures

Wire bond defects are a major consideration for the storage reliability of an IC. Processing deficiencies related to bonding materials and the bonding system seem to be the major contributing factors to this problem. Underbonding, overbonding, misalignment of bonds, contamination and wire nicks are the primary causes of wire bond failures. Another major concern in long term storage applications for IC's with numerous wire bonds is chemical reactions of dissimilar metals. Intermetallic compound formation is a time-temperature dependent failure mechanism which occurs when two metals have electrochemical differences. Although this has historically been more of a problem than it currently is, there are still many fielded microcircuits having the potential to fail in this manner.

o Die Bonds

Die bond failure mechanisms account for less than 10% of all microcircuit failures. The primary failure mechanism of a die bond is the formation of voids between the header and die. The application of mechanical stresses or temperature cycling to a defective bond may result in the separation of the die from the package.

o Glassivation

The glassivation layer offers protection to the surface area of the chip by guarding against contamination and moisture ingression and to some extent loose particle shorts. Unfortunately, this protection layer can be sensitive to failure mechanisms in nonoperating components. In the device fabrication, windows are masked in the glassivation layer in the bond pad area to provide the connections to the metallization. A metal is evaporated on the exposed metallization which is intended to completely cover the exposed window area. The lead connections are then made to these metal bumps. If these processes are not properly controlled and misalignment occurs, moisture ingression may result through the exposed glassivation window. Moisture tapped between the glassivation and the chip will result in surface defects.

Likewise, if cracks occur in any portion of the glassivation layer a path will be provided for moisture ingression. Glassivation cracks can result from exposure to extended temperature cycling conditions or poor process controls in the glassivation procedure.

o Oxide

Approximately 5 to 35 percent of nonoperating failures can be attributed to oxide defects. Inversion, pinholes, cracks, thin oxide areas and contamination are the major areas of concern. Cracks occur when the thermal expansion rates of silicon and silicon dioxide are not matched. Pinholes may be caused by faulty oxide growth, a damaged mask, poor photo-resist or fabrication defects during the etching process.

o Metallization

Nearly 15% of nonoperational failures are due to metallization defects. Corrosion resulting from contamination and moisture is the primary metallization defect encountered during storage. Most metallization defects are process-related and should be readily identified in sample testing of device lots. Faulty metallization conditions, where the step coverage is not adequate, can often be accelerated to failure by thermal stresses.

o Diffusion & Bulk

Bulk defects typically require severe mechanical or high temperature stresses to induce a failure. The primary areas of concern are dislocations, impurity diffusions, resistivity gradients and cracks in the bulk material. The majority of these defects usually result during the preparation of the crystal and should be easily detected during testing. Duffusion defects include mask alignment, contamination, mask defects, cracks in the oxide layer and improper doping problems usually associated with the diffusion process. Diffusion defects are primarily accelerated to failure by high temperatures and temperature cycles.

o Packaging

Microcircuits are packaged in a number of ways with a number of different materials. Several problems can occur during the microcircuit sealing process. The presence of loose particles or bent wire bond leads, poor package seal or a fractured package case are just a few of the major defects which may occur. Most packaging defects tend to be caused by process-related faults.

Diodes & Transistors

Discrete semiconductor nonoperating failure mechanisms are generally the direct result of deficiencies in materials and fabrication processes implemented during the device manufacturing process. The major area of emphasis is the bulk area on discrete semiconductors. Bulk defects are common due to the large blocks of silicon required for fabrication. This increases the probability f crystal imperfections which collect contaminants. The contaminants can lead to thermal problems, gain failures and leakage defects. Diffusion and metallization defects tend not to be a problem with discrete semiconductors due to their relatively smal complexities. There are fewer junctions and leads on diodes and transistors than on microcircuits. However, a large percentage of semiconductor failures are the result of die and wire bonding defects and contamination.

Electronic Tubes

The predominant storage defect of electronic tubes is the loss of vacuum in the tube. Nearly 40% of all observed tube storage failures exhibit this problem. Gases inside the tube leak through the tube seals. Another failure problem with tubes are internal short circuits. Filaments become brittle and corrode over time causing open circuits and heater problems. Table TUB-1 illustrates tube failure mechanisms and their percentage of occurrence.

TABLE TUB-1:
TUBE FAILURE MECHANISMS

FAILURE	PERCENTAGE
Loss of Vacuum	42
Internal Short	13
Open Filament	9
Handling	9
Others	27

Resistors

The primary reliability concern for resistors in storage is moisture. Long storage periods in a humid environment can cause significant changes in resistance values. Open circuits in film resistors caused by corrosive surface contaminants are another problem. Moisture in wirewound resistors can cause insulation breakdown leading to short circuits. Resistors in operation tend to minimize these effects due to heat dissipation. However, when in storage many resistors act like sponges and absorb moisture. Moisture absorbed during storage will typically not manifest itself as a failure until after a period of operation.

Capacitors

Capacitors, like resistors, are very susceptible to moisture. Moisture can deteriorate the dielectric materials in the capacitor. Cracks in the capacitor seals should be guarded against. Cracks can form during component installation when stresses are placed on the component leads. Solid tantalum capacitors are prone to oxide defects during the manufacturing process. When exposed to temperature cycling the capacitance value drifts and the capacitor performance becomes out of specification.

Inductors

The most common problems associated with inductive devices are short and open circuits. Chemical changes and deterioration accelerated by moisture and heat can cause insulation breakdown leading to short circuits. Poor manufacturing processes or improper handling car cause windings to become bent or cracked. These defects can be accelerated by moisture and heat and ultimately lead to open circuits.

Connectors

Corrosion and connection fatigue due to moisture and temperature variations are the primary failure mechanisms of connectors. If the system is transportable, connection fatigue is quite likely.

Effects of Periodic Testing on System Reliability

It has been shown that electronic and electromechanical equipments fail during long periods of storage. In many military and commercial applications it is necessary to maintain a high level of reliability throughout the storage life of the system. However, the reliability of an equipment in storage often falls to an unacceptably low level prior to the end of the nonoperating period. One method of partially restoring the system to its inherent reliability is to periodically test the equipment in storage and repair or replace all failed items.

There are differing opinions regarding the effectiveness of periodic testing of items in storage. Critics of periodic testing feel that it is a costly process which induces system failures rather than detects failures. Missile storage test data compiled by Hughes Aircraft Co. indicates that missile testing is itself the dominant variable degrading the performance of missile electronics in storage. Equipment level test data were collected by Hughes for the Maverick and TOW missiles. The data indicates that a similar percentage of missiles fail regardless of the storage interval. It was concluded by Hughes that this observation was because the testing process had induced a large majority of the observed failures.

Despite the opinions described in the previous paragraph, the general concensus, which is also supported by RAC, is that periodic testing is an effective process to enhance the reliability of items in storage. However, the strong warning is also offered that periodic test plans must be designed intelligently. Poorly designed test plans can indeed induce a significant number of failures. Two important guidelines to follow in the design of an effective test are:

- to minimize the amount of handling and transportation required for testing

- to ensure that testing is not performed too often (for most systems, periodic testing more frequently than yearly is excessive)

Determination of an optimal test duration can be done through the use of reliability theory and models, tailored to the specific application of electronic equipments or components in storage. The following paragraphs describe this process. Derivation of the periodic test model is presented as Appendix A.

Reliability is defined as the probability that an item in service or in storage survives for a specified time interval without failure. The reliability for an item in storage without periodic testing (assuming an exponential time-to-failure distribution) is given by,

$$R(t) = e^{-\lambda t}$$

where

$R(t)$ = reliability at time t

λ = system nonoperating failure rate

t = storage time

Given a periodic testing schedule to identify failures and restore failed equipment to operational status, the reliability after the Nth test interval is given by,

$$R(N, t) = e^{-[N(1-\ )\cdot T_T]} \times e^{-[t-NT_T]}$$

where

$R(N, t)$ = reliability following test N at time t
N = test number
t = total storage time
T_T = test interval
$\ $ = test effectiveness (percentage of failures detected by test sequence)

This relationship is depicted graphically in Figure PT-1. Derivation of this equation is presented in Appendix A.

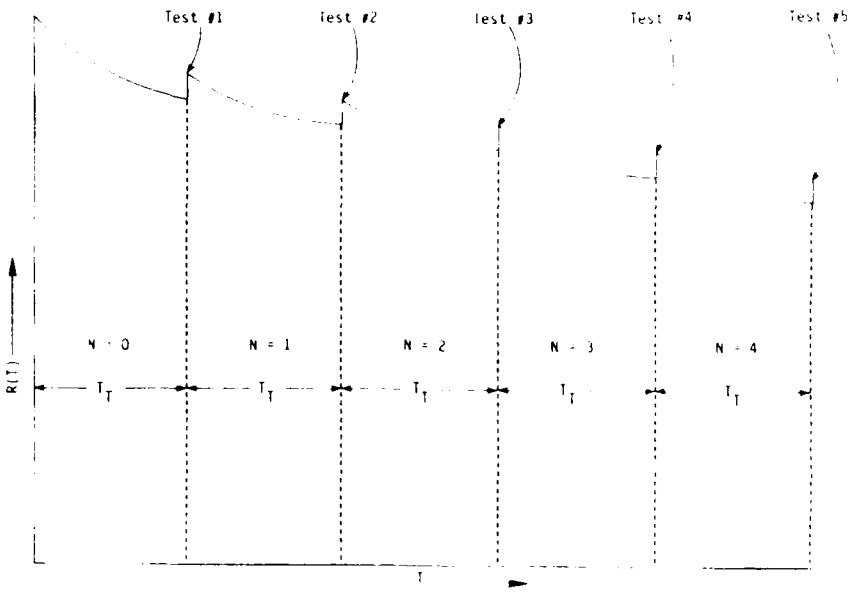

FIGURE PT-1:
EFFECTS OF PERIODIC TESTING ON RELIABILITY

For purposes of comparison, the test interval (one, two and three years) and test effectiveness factors (60%, 70% and 80%) were varied for an electromechanical system with a storage failure rate of 23.0 failures per million storage hours. The reliability was calculated at twelve month intervals over a thirty year period. The reliability value for the exponential failure distribution (given by $R(T) = e^{-\lambda T}$) was also calculated.

The following three tables show the results of applying the periodic testing model to these profiles.

EFFECTS OF PERIODIC TESTING - 1 YEAR TEST INTERVAL

		TEST EFFECTIVENESS						
		60%		70%		80%		
Test Number	Dormant Time	Reliability Before Test	Reliability After Test	Reliability Before Test	Reliability After Test	Reliability Before Test	Reliability After Test	Reliability (No Testing)
0	0	----	1 0	----	1 0	----	1 0	1 0
1	8760	818	923	818	941	818	961	818
2	17520	754	851	768	886	785	923	669
3	26280	696	785	725	834	754	886	547
4	35040	642	725	682	785	725	851	447
5	43800	593	669	642	739	696	818	366
6	52560	547	617	605	697	669	785	299
7	61320	504	569	569	655	642	754	244
8	70080	465	525	536	617	617	725	200
9	78840	429	485	504	581	593	696	163
10	87600	396	447	475	547	569	669	134
11	96360	366	412	447	515	547	642	109
12	105120	337	381	421	485	525	617	089
13	113880	311	351	396	456	504	593	073
14	122640	287	324	373	429	485	569	060
15	131400	265	299	351	404	465	547	049
16	140160	244	276	331	381	447	525	040
17	148920	225	254	311	358	429	504	033
18	157680	208	235	293	337	412	485	027
19	166440	192	217	276	317	396	465	022
20	175200	177	200	260	299	381	447	018
21	183960	163	184	244	281	366	429	014
22	192720	151	170	230	265	351	412	012
23	201480	139	157	217	249	337	396	010
24	210240	128	145	204	235	324	381	008
25	219000	118	134	192	221	311	366	007
26	227760	109	123	181	208	298	351	005
27	236520	101	114	170	196	287	337	004
28	245280	093	105	160	184	276	324	004
29	254040	086	097	151	174	265	311	003
30	262800	079	089	142	163	254	299	002

Test Interval = 8760 Hrs. (1yr)	Failure Rate = 22.98

EFFECTS OF PERIODIC TESTING - 2 YEAR TEST INTERVAL

		TEST EFFECTIVENESS						
		60%		70%		80%		
Test Number	Dormant Time	Reliability Before Test	Reliability After Test	Reliability Before Test	Reliability After Test	Reliability Before Test	Reliability After Test	Reliability (No Testing)
0	0	----	1.0	----	1.0	----	1.0	1.0
	8760	818	----	818	----	818	----	818
1	17520	667	851	667	886	669	923	669
	26280	696	----	725	----	754	----	547
2	35040	569	725	593	785	617	851	447
	43800	593	----	642	----	696	----	366
3	52560	484	617	525	696	569	785	299
	61320	504	----	569	----	642	----	244
4	70080	412	525	465	617	525	725	200
	78840	429	----	504	----	593	----	163
5	87600	351	447	412	547	485	669	134
	96360	365	----	447	----	547	----	109
6	105120	299	381	366	485	447	617	089
	113880	311	----	396	----	504	----	073
7	122640	254	324	324	429	412	569	060
	131400	265	----	351	----	465	----	049
8	140160	217	276	287	381	381	525	040
	148920	225	----	311	----	429	----	033
9	157680	184	235	254	337	351	485	027
	166440	192	----	276	----	396	----	022
10	175200	157	200	225	299	324	447	018
	183960	163	----	244	----	366	----	015
11	192720	134	170	200	265	299	412	012
	201480	139	----	216	----	337	----	010
12	210240	114	145	177	235	275	381	008
	219000	118	----	192	----	311	----	007
13	227760	097	123	157	208	254	351	005
	236520	101	----	170	----	257	----	004
14	245280	082	105	139	184	235	324	004
	254040	086	----	151	----	265	----	003
15	262800	070	089	123	163	217	299	002

Test Interval = 17520 Hrs. (2yr)

Failure Rate = 22.98

EFFECTS OF PERIODIC TESTING - 3 YEAR TEST INTERVAL

		TEST EFFECTIVENESS						
		60%		70%		80%		
Test Number	Dormant Time	Reliability Before Test	Reliability After Test	Reliability Before Test	Reliability After Test	Reliability Before Test	Reliability After Test	Reliability (No Testing)
0	0	----	1.0	----	1.0	----	1.0	1.0
	8760	818	----	818	----	818	----	818
	17520	669	----	667	----	669	----	669
1	26280	547	785	547	834	547	886	547
	35040	642	----	682	----	725	----	447
	43800	525	----	558	----	593	----	366
2	52560	429	617	456	696	485	785	299
	61320	504	----	569	----	642	----	244
	70080	412	----	465	----	525	----	200
3	78840	337	485	381	580	429	696	163
	87600	396	----	474	----	569	----	134
	96360	324	----	388	----	465	----	109
4	105120	265	381	317	485	381	617	089
	113880	311	----	396	----	504	----	073
	122640	254	----	324	----	412	----	060
5	131400	208	299	265	404	337	547	049
	140160	244	----	331	----	447	----	040
	148920	120	----	270	----	366	----	033
6	157680	163	235	221	337	299	485	027
	166440	192	----	276	----	396	----	022
	175200	157	----	225	----	324	----	018
7	183960	128	184	184	281	265	429	015
	192720	151	----	230	----	351	----	012
	201480	123	----	188	----	287	----	010
8	210240	101	145	154	235	235	381	008
	219000	118	----	192	----	311	----	007
	227760	097	----	157	----	254	----	005
9	236520	079	114	128	196	208	336	004
	245280	093	----	139	----	235	----	004
	254040	076	----	131	----	225	----	003
10	262800	062	089	107	164	184	299	002

Test Interval = 26280 Hrs. (3yr)

Failure Rate = 22.98

RAC Tools for Predicting Nonoperational Reliability

The Reliability Analysis Center (RAC) has developed the Nonoperating Reliability Prediction System (RAC-NRPS). This comprehensive software system predicts the impact of nonoperating periods on equipment reliability. The results of this analysis are extremely useful when the target system is subjected to extensive storage periods and relatively short operating times. In this situation, the disparity in the two time periods will cause the majority of the failures to occur during the nonoperating period, regardless of the fact that the operating failure rate is generally much higher. It is intended that this analysis will complement an operational reliability prediction. All models used in the prediction program are based on the research described in RADC-TR-85-91, "Impact of Nonoperating Periods on Equipment Reliability" (Ref. 3).

The software was developed for an IBM Personal Computer PC, XT, AT or Compatible and its features are described below:

- A system hierarchy capability which includes system, subsystem, set, group, unit, assembly, subassembly, and part as defined in MIL-STD-280A, with a maximum of 90 levels of assembly allowed.
- Models used are a complete implementation of RADC-TR-85-91, with part classifications complementary to MIL-HDBK-217.
- Parts can be associated with any level of assembly.
- Includes a specialized statistical model to analyze the effects of test and repair actions on system reliability.
- Features a single keystroke menu system, a complete set of data input and editing functions, on-screen help features, and extensive data quality checking.
- A global change menu allows environment, power test cycles, ambient temperature, and assembly names to be altered for the entire system or for specific assemblies (if the system is distributed in several storage locations with different characteristics).
- A comprehensive set of reports may be produced on any printer. All reports can be generated for an entire system or a particular assembly.

Section 3
Data Tables

Data Files

NONOP-1 is subdivided into 14 component detail data sections which are preceded by the nonoperational component reliability summary section. Each detail data section contains information regarding a particular component family. The following part categories are contained below:

(1) Resistors
(2) Capacitors
(3) Inductors
(4) Diodes
(5) Transistors
(6) Microcircuits (Field Data)
(7) Microcircuits (Test Data)
(8) Hybrids
(9) Tubes
(10) Relays
(11) Switches
(12) Meters
(13) Connectors
(14) Miscellaneous

Each data table is comprised of component specific information called characteristic data fields and fields which are common to all component types called universal data fields. Universal data fields include part hours, number of devices fielded or tested, number failed, application environment and component part number. These data fields have consistent meanings for all part categories. Characteristic data fields are those which vary depending on the part category. An example of a characteristic data field is quality level. Quality levels are unique for each of the part types. For example, microcircuit quality levels (B, D, D-1, etc.) cannot be applied to resistor quality levels (M, R, P, etc.).

In the detail data tables failure rates were not computed for each unique part number but may be calculated by the user by dividing the number failed by the part hours for components with at least one failure. An estimate for zero failure parts can be derived by computing the 60% upper single-sided confidence interval as described in Section 1.

In the component summary tables, when greater than 50 million cumulative part hours were logged on a device with zero failures, we can be relatively sure that the failure rate will be somewhat less than the one depicted. When less than 50 million cumulative part hours were seen on a device with zero failures, the number shown is a gross upper limit and will most likely be much less than the value given. Predicted failure rates derived using the Reliability Analysis Center's Nonoperating Reliability Prediction System (RAC-NRPS) are given as a baseline to illustrate the correlation of field failure rates. Both predicted and field failure rates are given in failures per million hours. For various part types, there is also a graphical analysis (histogram) of the observed failure rate vs. the predicted value obtained from the models contained in RADC-TR-85-91. Since models contained in the RADC-TR were derived from much of the data contained in this document, there is a high correlation between the predicted and observed values. These histograms are given only to provide the reader information on this correlation for subcategories of devices. For example, since a single model was developed for diodes, the mean predicted and mean observed values for the entire diode population should be very close, whereas for individual subcategories of diodes (i.e., groups IV, V, and VI per MIL-HDBK-217), the correlation will inevitably decrease.

Characteristic data fields will be addressed in detail proceeding each component detail data section. The following are descriptions of the universal data fields.

- Part Number: Number which uniquely identifies an individual component. This number may represent a vendor part number, schematic part number or National Stock Number. The type of part number assigned depends entirely on the data source.

- Number Fielded (Tested): Total number of components which make up this data record.

- Number Failed: Total number of components which have failed to properly perform their intended function.

- Part Hours: The total hours at the part level. Part hours are derived by multiplying the part population for a specific part in a system by that system's observed nonoperating hours. Part hours are represented in millions of hours.

- Application Environment: For the purposes of this document the application environments given in the data tables represent the worst case system exposure. Many systems will be exposed to a composite of different environments while being nonoperational. For example, an aircraft may have many backup systems which are not in use. These systems are exposed to both airborne and ground conditions. Because the airborne environment is considered the harshest of the two environments, it is

o Application Environment (Cont'd): the one illustrated in the data tables. The following table lists all 26 application environments as per MIL-HDBK-217 with a brief description of each one. It is highly likely that combinations of these categories could better describe storage and non-operational conditions but because of the ways in which data have been reported and collected and the ways in which reliability predictions are performed and applied it made sense to conform to the standard definitions.

Application	Data Base Designation	Description
Ground, Benign	G_B	Nonmobile, laboratory environment, readily accessible to maintenance; includes laboratory instruments and test equipment, medical electronic equipment, business and scientific computer complexes.
Ground, Missile Silo	G_{MS}	Missiles and support equipment in ground silos.
Ground, Fixed	G_F	Conditions less than ideal such as installation in permanent racks with adequate cooling air and possible installation in unheated buildings; includes permanent installation of air traffic control, radar and communications facilities.

Application	Data Base Designation	Description
Ground, Mobile	G_M	Equipment installed on wheeled or tracked vehicles; includes tactical missile ground support equipment, mobile communication equipment, and tactical fire direction systems.
Space, Flight	S_F	Earth orbital. Approaches benign ground conditions. Vehicle neither under powered flight nor in atmospheric reentry; includes satellites and shuttles.
Manpack	M_P	Portable electronic equipment being manually transported while in operation; includes portable field communications equipment and laser designations and range finders.
Naval, Sheltered	N_S	Sheltered or below deck conditions, protected from weather; includes surface ships communication, computer, and sonar equipment.
Naval, Unsheltered	N_U	Nonprotected surface shipborne equipment exposed to weather conditions; includes most mounted equipments and missile/projectile fire control equipment.
Naval, Undersea, Unsheltered	N_{UU}	Equipment immersed in salt water; includes sonar sensors and special purpose anti-submarine warfare equipment.
Naval, Submarine	N_{SB}	Equipment installed in submarines; includes navigation and launch control systems.

Application	Data Base Designation	Description
Naval, Hydrofoil	N_H	Equipment installed in a hydrofoil vessel.
Airborne, Inhabited, Cargo	A_{IC}	Typical conditions in cargo compartments occupied by aircrew without environment extremes of pressure, temperature, shock and vibration and installed on long mission cargo aircraft.
Airborne, Inhabited, Trainer	A_{IT}	Same as A_{IC} but installed on high performance aircraft as trainer aircraft.
Airborne, Inhabited, Bomber	A_{IB}	Typical conditions in bomber compartments occupied by aircrew without environment extremes of pressure, temperature, shock and vibration and installed on long mission bomber aircraft.
Airborne, Inhabited, Attack	A_{IA}	Same as A_{IC} but installed on high performance aircraft such as used for ground support.
Airborne, Inhabited, Fighter	A_{IF}	Same as A_{IC} but installed on performance aircraft such as fighters and intercepters.
Airborne, Uninhabited, Cargo	A_{UC}	Bomb bay, equipment bay, tail where extreme pressure, vibration and temperature cycling may be aggravated by contamination from oil, hydraulic fluid and engine exhaust. Installed on long mission transport aircraft.

Application	Data Base Designation	Description
Airborne, Uninhabited, Trainer	A_{UT}	Same as A_{UC} but installed on high performance aircraft such used for trainer aircraft.
Airborne, Uninhabited, Bomber	A_{UB}	Bomb bay, equipment bay, tail or where extreme pressure, vibration and temperature cycling may be aggravated by contamination from oil, hydraulic fluid and engine exhaust. Installed on long mission bomber aircraft.
Airborne, Uninhabited, Attack	A_{UA}	Same as A_{UC} but installed on high performance aircraft such as used for ground support.
Airborne, Uninhabited, Fighter	A_{UF}	Same as A_{UC} but installed on high performance aircraft such as fighters and intercepters.
Airborne, Rotary, Wing	A_{RW}	Equipment installed on helicopters, includes laser designators and fire control systems.
Missile, Launch	M_L	Severe conditions related to missile launch (air and ground), and space vehicle boost into orbit, vehicle re-entry and landing by parachute. Conditions may also apply to rocket propulsion powered flight.
Cannon, Launch	C_L	Extremely severe conditions related to cannon launching of 155 mm and 5 inch guided projectiles. Conditions apply from launch to target impact.
Undersea, Launch	U_{SL}	Conditions related to undersea torpedo mission and missile launch.

Application	Data Base Designation	Description
Missile, Free Flight	M_{FF}	Missiles in non-powered free flight.
Airbreathing, Missile, Flight	M_{FA}	Conditions related to powered flight of air breathing missile; includes cruise missiles.

Nonoperational Component Reliability Summary Section

Nonoperational Component
Reliability Summary
Section

Component Classification	Component Description		Field Failure Rate	Cumulative Part Hours	Number Failed	MTBF
** ACCELEROMETER						
ACCELEROMETER	ANGULAR	<<	0.1767657	5.182	0	5657206
ACCELEROMETER	GENERAL		0.4191471	329.240	138	2385797
ACCELEROMETER	LINEAR	<<	0.3241331	2.826	0	3085152
ACCELEROMETER	PENDULUM		1.9233852	6.239	12	519917
** ACCUMULATOR						
ACCUMULATOR	HYDRAULIC		0.2056321	179.933	37	4863054
** ACTUATOR						
ACTUATOR	EXPLOSIVE		0.0627716	207.100	13	15930771
ACTUATOR	LINEAR		0.3544069	36.681	13	2821615
ACTUATOR	LINEAR, PNEUMATIC		0.2461084	32.506	8	4063250
** BATTERY						
BATTERY	GENERAL		0.0049377	405.049	2	202523442
BATTERY	LITHIUM	<<	12.2750000	N/R	0	81466
BATTERY	MERCURY		1.4984079	5.339	8	667375
BATTERY	RECHARGEABLE		0.0163808	732.564	12	61047080
** BEARING						
BEARING	BALL		0.0099663	903.040	9	100338140
** BELLOWS						
BELLOWS	DIAPHRAGM BURST	<<	1.3836858	0.662	0	722707
BELLOWS	EXPLOSIVE	<	0.0139634	65.600	0	71615796
BELLOWS	GENERAL	<<	0.0677515	13.520	0	14759821

Nonoperational Component
Reliability Summary
Section

Component Classification	Component Description		Field Failure Rate	Cumulative Part Hours	Number Failed	MTBF
** CAPACITORS						
CAPACITORS	CC	<	0.0003244	2823.481	0	3082614057
CAPACITORS	CCR		0.0191644	208.720	4	52180084
CAPACITORS	CFR		0.0121418	82.360	1	82360111
CAPACITORS	CHR		0.0041366	241.742	1	241744428
CAPACITORS	CK		0.0007670	3911.570	3	1303780965
CAPACITORS	CKR		0.0007238	11052.966	8	1381597126
CAPACITORS	CL		0.0051241	1756.413	9	195156223
CAPACITORS	CLR		0.0108610	184.145	2	92072553
CAPACITORS	CM	<	0.0003633	2521.156	0	2752546105
CAPACITORS	CMR		0.0010520	1901.110	2	950570342
CAPACITORS	CP		0.0046005	652.096	3	217367677
CAPACITORS	CPV		0.0023158	1295.449	3	431816219
CAPACITORS	CQ	<	0.0013952	656.559	0	716743119
CAPACITORS	CQR		0.0158549	63.072	1	63071984
CAPACITORS	CSR		0.0004794	14601.881	7	2085940759
CAPACITORS	CT		0.0394633	50.680	2	25339999
CAPACITORS	CU	<<	0.5183928	1.767	0	1929039
CAPACITORS	CV	<<	0.1086209	8.433	0	9206331
CAPACITORS	CY	<<	0.1832000	5.000	0	5458515
CAPACITORS	CYR	<	0.0006147	1490.145	0	1626809826
CAPACITORS	CZ	<<	0.4580000	2.000	0	2183406

Nonoperational Component
Reliability Summary
Section

Component Classification	Component Description		Field Failure Rate	Cumulative Part Hours	Number Failed	MTBF
CAPACITORS	PC	<	0.0054178	169.073	0	184576765
** CIRCUIT BOARD						
CIRCUIT BOARD	PLATED THROUGH HOLES	<	0.0001119	8183.538	0	8936550492
CIRCUIT BOARD	SINGLE SIDED		0.8264463	1.210	1	1210000
** CIRCUIT BREAKERS						
CIRCUIT BREAKERS	GENERAL	<<	0.2900000	N/R	0	3448276
CIRCUIT BREAKERS	THERMAL		0.0558316	17.911	1	17911004
** COMPRESSOR						
COMPRESSOR	GENERAL	<<	3.7540984	0.244	0	266376
** CONNECTIONS						
CONNECTIONS	SOLDER, GENERAL	<	0.0001501	6101.826	0	6662225183
CONNECTIONS	SOLDER, HAND LAP		0.0001901	52594.180	10	5260389269
** CONNECTOR PINS						
CONNECTOR PINS	GENERAL	<	0.0003273	2798.310	0	3055300947
** CONNECTORS						
CONNECTORS	CYLINDRICAL	<	0.0132269	69.253	0	75603505
CONNECTORS	GENERAL	<<	3.5095785	0.261	0	284935
CONNECTORS	PIN	<	0.0003273	2798.310	0	3055300947
CONNECTORS	PRINTED WIRING BOARD	<<	0.0647808	14.140	0	15436673
** DIODES						
DIODES	GROUP IV		0.0000798	25061.000	2	12531328321
DIODES	GROUP IV, SI, GENERAL		0.0004649	243059.482	113	2151000215

Nonoperational Component
Reliability Summary
Section

Component Classification	Component Description		Field Failure Rate	Cumulative Part Hours	Number Failed	MTBF
DIODES	GROUP V, ZENER & AVALANCHE		0.0003912	33230.903	13	2556237219
DIODES	GROUP VI, THYRISTORS		0.0262522	685.657	18	38092046
DIODES	GROUP VII, MICROWAVE DETECTOR	<	0.0053836	170.147	0	185749313
DIODES	GROUP VIII, STEP RECOVERY	<<	0.0538349	17.015	0	18575311
DIODES	GROUP VIII, TUNNEL	<<	0.4580000	2.000	0	2183406
DIODES	GROUP VIII, VARACTOR		0.1051801	19.015	2	9507502
** DUMMY LOADS						
DUMMY LOADS	N/R	<<	0.0110000	N/R	0	90909091
** ELECTRIC MOTORS						
ELECTRIC MOTORS	AC	<<	0.0450000	N/R	0	22222222
ELECTRIC MOTORS	DC	<<	0.0450000	N/R	0	22222222
ELECTRIC MOTORS	FULL H.P.		0.4990020	2.004	1	2004000
ELECTRIC MOTORS	SENSOR		0.5452563	18.340	10	1834000
ELECTRIC MOTORS	SOLENOID	<<	2.3792208	0.385	0	420306
ELECTRIC MOTORS	TORQUE	<<	0.2202982	4.158	0	4539302
** ENGINE						
ENGINE	DIESEL		0.8983573	7.792	7	1113143
** FAN						
FAN	AXIAL	<<	0.1355030	6.760	0	7379910
FAN	CENTRIFUGAL	<<	1.6745887	0.547	0	597162
FAN	GENERAL	<<	0.4163636	2.200	0	2401747

Nonoperational Component
Reliability Summary
Section

Component Classification	Component Description		Field Failure Rate	Cumulative Part Hours	Number Failed	MTBF
** FIBER OPTIC CABLES						
FIBER OPTIC CABLES	SINGLE (PER FIBER KM)	<<	0.0140000	N/R	0	71428571
** FILTER						
FILTER	FLUID	<<	0.0341028	26.860	0	29323105
** FITTINGS, HYDRAULIC						
FITTINGS, HYDRAULIC	QUICK DISCONNECT		0.4611483	8.674	4	2168500
** FUSES						
FUSES	GENERAL	<<	0.0014000	N/R	0	714285714
** GASKETS						
GASKETS	GENERAL	<	0.0112919	81.120	0	88559056
** GENERATOR						
GENERATOR	AC		1.2234457	8.991	11	817364
GENERATOR	GENERAL	<<	1.0663562	0.859	0	937773
GENERATOR	HOT GAS	<<	0.7809037	1.173	0	1280568
GENERATOR	TURBINE		38.4615385	0.078	3	26000
** GYROSCOPE						
GYROSCOPE	GENERAL		0.2471042	518.000	128	4046876
GYROSCOPE	RATE INTEGRATING		0.4086111	178.654	73	2447315
** HEATER						
HEATER	ELECTRIC, GENERAL	<<	0.2681499	3.416	0	3729257
** HOSE						
HOSE	HYDRAULIC	<<	2.7757576	0.330	0	360262

Nonoperational Component
Reliability Summary
Section

Component Classification	Component Description		Field Failure Rate	Cumulative Part Hours	Number Failed	MTBF
HOSE	HYDRAULIC, FLEXIBLE		1.7460713	4.009	7	572714
** HYBRID						
HYBRID	MODULE		0.0417297	49820.638	2079	23963748
** IGNITERS						
IGNITERS	ELECTRIC		0.0193611	516.500	10	51649958
IGNITERS	EXPLOSIVE BOLTS	<<	0.0561963	16.300	0	17794766
IGNITERS	EXPLOSIVE MOTOR	<<	0.0383264	23.900	0	26091676
IGNITERS	EXPLOSIVE SWITCH		0.0048193	415.000	2	207499014
IGNITERS	EXPLOSIVE, GENERAL	<<	0.3259786	2.810	0	3067686
IGNITERS	GAS GENERATOR	<<	0.0275133	33.293	0	36346058
IGNITERS	PYROGEN	<<	0.0366444	24.997	0	27289299
IGNITERS	PYROTEC		0.3035362	13.178	4	3294500
IGNITERS	ROCKET, JET MOTOR		0.1034501	38.666	4	9666496
IGNITERS	SOLID PROPELLENT	<<	0.5344224	1.714	0	1871179
IGNITERS	SQUIB EXPLOSIVE	<<	0.5328679	1.719	0	1876638
** INDUCTORS						
INDUCTORS	COILS, FIXED RF		0.0014304	1398.217	2	699105145
INDUCTORS	COILS, GENERAL		0.0031706	1892.406	6	315397717
INDUCTORS	INDUCTORS, NOT REPORTED		0.0000839	166828.963	14	11918951132
INDUCTORS	TRANSFORMERS, AUDIO, MIL-T-27	<<	0.0358920	25.521	0	27861362
INDUCTORS	TRANSFORMERS, DIS, MIL-T-55631	<<	0.0538349	17.015	0	18575311
INDUCTORS	TRANSFORMERS, GENERAL		0.0068999	4058.015	28	144929637

Nonoperational Component
Reliability Summary
Section

Component Classification	Component Description		Field Failure Rate	Cumulative Part Hours	Number Failed	MTBF
INDUCTORS	TRANSFORMERS, POWER, MIL-T-27		0.0304484	65.685	2	32842448
INDUCTORS	TRANSFORMERS, RF, MIL-T-55631	<	0.0033926	270.000	0	294759182
** LAMPS						
LAMPS	INCANDESCENT	<<	0.1100000	N/R	0	9090909
LAMPS	NEON	<<	0.0290000	N/R	0	34482759
** MAGNETIC CORES						
MAGNETIC CORES	N/R	<	0.0000256	35799.142	0	39062500000
** MANIFOLD						
MANIFOLD	GENERAL		0.6129329	3.263	2	1631500
** MECHANICAL DEVICE						
MECHANICAL DEVICE	POWER TRANSMITTER		0.1119946	8.929	1	8929002
MECHANICAL DEVICE	SPRING	<<	5.5515152	0.165	0	180131
** MEMORY DISK						
MEMORY DISK	N/R		0.1479290	6.760	1	6760000
** METERS						
METERS	AMMETER		1.8266694	4.927	9	547444
METERS	ELAPSED TIME		5.0341604	2.781	14	198643
METERS	GENERAL	<<	1.4000000	N/R	0	714286
METERS	VOLTMETER		3.5252644	1.702	6	283667
METERS	WATTMETER		1.6963528	2.358	4	589500
** MICROCIRCUITS						
MICROCIRCUITS	DIGITAL, LSTTL		0.0058166	687.684	4	171921741

Nonoperational Component
Reliability Summary
Section

Component Classification	Component Description		Field Failure Rate	Cumulative Part Hours	Number Failed	MTBF
MICROCIRCUITS	DIGITAL, STTL	<	0.0004385	2089.006	0	2280501710
MICROCIRCUITS	DIGITAL, TTL		0.0021811	7335.736	16	458484251
MICROCIRCUITS	LINEAR, BIP JNCT		0.0118619	2444.807	29	84303526
MICROCIRCUITS	LINEAR, CMOS		0.0256904	38.925	1	38925046
MICROCIRCUITS	MEMORY, PROM, STTL		0.0081128	493.050	4	123262006
MICROCIRCUITS	MEMORY, SRAM, STTL	<	0.0117661	77.851	0	84989929
MICROCIRCUITS	MEMORY, SRAM, TTL	<	0.0039221	233.550	0	254965452
MICROCIRCUITS	MEMORY, UVEPROM, NMOS	<	0.0044123	207.600	0	226639168
** MICROWAVE ELEMENTS						
MICROWAVE ELEMENTS	ATTENUATORS AND FIXED	<<	0.0000001	N/R	0	.100000E+14
MICROWAVE ELEMENTS	VARIABLE	<<	0.0140000	N/R	0	71428571
** MICROWAVE FERRITE DEVICE						
MICROWAVE FERRITE DEVICE	N/R	<<	0.0430000	N/R	0	23255814
** MOTOR GENERATOR SET						
MOTOR GENERATOR SET	DIESEL		9.5435685	2.410	23	104783
MOTOR GENERATOR SET	GASOLINE		2.7027027	0.740	2	370000
MOTOR GENERATOR SET	GENERAL		56.1122244	0.499	28	17821
** PUMP						
PUMP	CENTRIFUGAL		0.2000000	160.000	32	5000000
PUMP	FIXED DISPLACEMENT		0.2500000	540.000	135	4000000
PUMP	FUEL	<<	0.0378356	24.210	0	26430135
PUMP	HYDRAULIC		0.1266384	142.137	18	7896499

Nonoperational Component
Reliability Summary
Section

Component Classification	Component Description		Field Failure Rate	Cumulative Part Hours	Number Failed	MTBF
PUMP	PISTON		0.5814815	270.000	157	1719745
PUMP	VANE		0.2761905	210.000	58	3620689
PUMP	VARIABLE DISPLACEMENT		0.2000000	100.000	20	5000000
** QUARTZ CRYSTALS						
QUARTZ CRYSTALS	GENERAL	<<	0.0390000	N/R	0	25641026
** REGULATOR						
REGULATOR	PRESSURE	<<	0.9060336	1.011	0	1103712
REGULATOR	TEMPERATURE	<<	0.1[illegible]3248	5.024	0	5484717
** RELAYS						
RELAYS	CRYSTAL CAN	<<	0.0210725	43.469	0	4745521[illegible]
RELAYS	DRY CIRCUIT	<<	0.0254113	36.047	0	39352571
RELAYS	GENERAL PURPOSE		0.0249790	1601.340	40	40033628
RELAYS	LATCHING		0.0336796	59.383	2	29691564
RELAYS	THERMAL	<<	2.0000000	0.458	0	500000
RELAYS	TIME DELAY	<	0.0142546	64.260	0	70152793
** RESISTORS						
RESISTORS	RB	<	0.0032954	277.966	0	303453299
RESISTORS	RBR	<	0.0035590	257.374	0	280977803
RESISTORS	RC		0.0002214	4517.159	1	4516711834
RESISTORS	RCR	<	0.0003079	2974.630	0	3247807730
RESISTORS	RJ		0.0076282	131.092	1	131092525
RESISTORS	RLR	<	0.0001129	8110.975	0	8857395926

Nonoperational Component
Reliability Summary
Section

Component Classification	Component Description		Field Failure Rate	Cumulative Part Hours	Number Failed	MTBF
RESISTORS	RN	<	0.0000703	13024.610	0	14224751067
RESISTORS	RNC		0.0076645	2348.500	18	130471655
RESISTORS	RNR	<	0.0000737	12427.769	0	13568521031
RESISTORS	RR	<	0.0076908	119.103	0	130025485
RESISTORS	RTR		0.0045335	220.580	1	220580126
RESISTORS	RW	<<	0.0248913	36.800	0	40174680
RESISTORS	RWR		0.0016242	1847.014	3	615687723
** SAFE AND ARM DEVICE						
SAFE AND ARM DEVICE	N/R		0.4818890	74.706	36	2075167
** SEALS						
SEALS	GENERAL	<<	0.0225838	40.560	0	44279528
SEALS	O-RING	<<	0.0782973	11.699	0	12771832
SEALS	PACKING	<	0.0015756	581.360	0	634678853
SEALS	STATIC SEAL	<	0.0091600	100.000	0	109170306
** SENSORS						
SENSORS	GENERAL		0.5452563	18.340	10	1834000
** SLIP RING ASSEMBLY						
SLIP RING ASSEMBLY	GENERAL	<<	0.1101491	8.316	0	9078603
** SOLENOID						
SOLENOID	GENERAL	<<	0.2996402	3.057	0	3337336
** SPARK GAP						
SPARK GAP	SURGE PROTECTION		0.0117938	84.790	1	84790314

Nonoperational Component
Reliability Summary
Section

Component Classification	Component Description		Field Failure Rate	Cumulative Part Hours	Number Failed	MTBF
** SWITCHES						
SWITCHES	GENERAL		0.1920895	822.533	158	5205907
SWITCHES	INERTIAL		0.0656455	137.100	9	15233337
SWITCHES	PRESSURE		0.0828157	48.300	4	12075005
SWITCHES	PUSHBUTTON		0.0548817	18.221	1	18221010
SWITCHES	REED	<<	0.9502075	0.964	0	1052402
SWITCHES	ROTARY		0.2732240	7.320	2	3660001
SWITCHES	SENSITIVE	<<	0.0880938	10.398	0	11351537
SWITCHES	STEPPING		0.4000000	5.000	2	2500000
SWITCHES	THERMOSTAT	<<	0.1701970	5.382	0	5875544
SWITCHES	TOGGLE		0.0718545	180.921	13	13917013
** SYNCHROS						
SYNCHROS	RESOLVER		0.1346076	14.858	2	7429001
** TANK						
TANK	STORAGE		0.2374733	4.211	1	4211000
** TERMINATIONS						
TERMINATIONS	FILM LOADS	<<	0.0100000	N/R	0	100000000
** TRANSDUCERS						
TRANSDUCERS	PRESSURE		1.9980020	2.002	4	500500
** TRANSISTORS						
TRANSISTORS	GROUP I, GE, NPN	<<	0.0436190	21.000	0	22925789
TRANSISTORS	GROUP I, GE, PNP	<	0.0041074	223.010	0	243463018

Nonoperational Component
Reliability Summary
Section

Component Classification	Component Description		Field Failure Rate	Cumulative Part Hours	Number Failed	MTBF
TRANSISTORS	GROUP I, SI, NPN		0.0005560	84535.678	47	1798561151
TRANSISTORS	GROUP I, SI, PNP		0.0002445	69528.884	17	4089979550
TRANSISTORS	GROUP II		0.0011475	2614.340	3	871459695
TRANSISTORS	GROUP II, SI, FET		0.0023057	3469.721	8	433707768
TRANSISTORS	GROUP III, UNIJNCT	<	0.0006148	1489.800	0	1626545213
TRANSISTORS	GROUP IX, MICROWAVE		0.0587751	17.014	1	17014008
** TUBES						
TUBES	KLYSTRON		2.5512916	56.442	144	391958
TUBES	MAGNETRON		1.0406425	156.634	163	960945
TUBES	PULSED GRIDDED		4.3688204	8.698	38	228895
TUBES	RECEIVER, N/R	<	0.0079239	115.600	0	126200482
TUBES	RECEIVER, PENTODE		0.0270234	370.050	10	37004966
TUBES	RECEIVER, TRIODE		0.0023048	433.870	1	433877126
TUBES	TRANSMITTING, N/R		6.5989848	1.970	13	151538
TUBES	TRAVELING WAVE		2.3288309	4.294	10	429400
TUBES	TWYSTRON		4.8721072	1.642	8	205250
TUBES	VACUUM TUBE		9.8107919	1.427	14	101929
TUBES	VIDICON		0.1457018	20.590	3	6863333
** TURBINE						
TURBINE	GAS		37.9746835	0.079	3	26333
TURBINE	GENERAL	<<	0.2489130	3.680	0	4017468

Nonoperational Component
Reliability Summary
Section

Component Classification	Component Description		Field Failure Rate	Cumulative Part Hours	Number Failed	MTBF
** VALVE, HYDRAULIC						
VALVE, HYDRAULIC	BALL	<<	0.1871680	4.894	0	5342794
VALVE, HYDRAULIC	CHECK		0.0572541	52.398	3	17465998
VALVE, HYDRAULIC	FUEL	<<	0.1268698	7.220	0	7882096
VALVE, HYDRAULIC	GENERAL		0.0017484	571.949	1	571951499
VALVE, HYDRAULIC	RELIEF		0.3145643	3.179	1	3179000
VALVE, HYDRAULIC	SERVO		0.1826713	87.589	16	5474314
VALVE, HYDRAULIC	SOLENOID		0.0086701	807.376	7	115338923
** VALVE, PNEUMATIC						
VALVE, PNEUMATIC	CHECK	<<	0.1106280	8.280	0	9039303
VALVE, PNEUMATIC	PNEUMATIC ACT'VATED		0.0189007	52.908	1	52908093
VALVE, PNEUMATIC	RELIEF	<<	1.3836858	0.662	0	722707
** VIBRATORS						
VIBRATORS	N/R	<<	3.3000000	N/R	0	303030

Nonoperational Component Reliability Detail Data Section

Resistors

Resistor Data File Description:

Field experience data for various composition, film, network, wirewound and variable resistors are presented in the following section. Data in the resistor storage field experience detail data section have been sorted according to resistor classification, resistor type, quality level, application environment and part number. The data are in sub groupings by resistor classification and type. Each resistor data record consists of the following characteristic data fields:

- o Resistor Classification: General description of the resistor. Classes included in this study are fixed composition, fixed film, fixed networks, fixed wirewound, thermistor, variable non-wirewound and variable wirewound.

- o Resistor Type: Two or three digit code used to further breakdown the resistor classifications (e.g., RCR). Table R-1 describes the resistor type codes.

- o Quality: Codes used to indicate the level of quality control to which a device has been subjected. These codes are typically based on the level of screening and testing that the component received before being installed into a system. Quality levels are defined in the appropriate military specifications. Table R-2 depicts the various resistor quality levels.

TABLE R-1:
RESISTOR CLASSIFICATIONS AND RESISTOR TYPES

Specification		Type
Composition, Fixed		
MIL-R-11	Resistors, Fixed, Composition (Insulated)	RC
MIL-R-39008	Resistors, Fixed, Composition (Insulated) Established Reliability	RCR
Film, Fixed		
MIL-R-10509	Resistors, Fixed, Film (High Stability)	RN
MIL-R-11804	Resistors, Fixed, Film (Power Type)	RD
MIL-R-22684	Resistors, Fixed, Film, Insulated	RL
MIL-R-39017	Resistors, Fixed, Film, Insulated, Established Reliability	RLR
MIL-R-55182	Resistors, Fixed, Film, Established Reliability	RN(R, C or N)
Network, Film, Fixed		
MIL-R-83401	Resistor Network, Fixed, Film	RZ
Wirewound, Fixed		
MIL-R-26	Resistors, Fixed, Wirewound (Power Type)	RW
MIL-R-93	Resistors, Fixed, Wirewound (Accurate)	RB
MIL-R-18546	Resistors, Fixed, Wirewound (Power Type, Chassis Mounted)	RE
MIL-R-19005	Resistors, Fixed, Wirewound (Accurate), Established Reliability	RBR
MIL-R-39007	Resistors, Fixed, Wirewound (Power Type) Established Reliability	RWR
MIL-R-39009	Resistors, Fixed, Wirewound (Power Type Chassis Mounted) Established Reliability	RER
Thermistor		
MIL-T-23648	Thermistor (Thermally Sensitive Resistor) Insulated	RTH
Non-wirewound, Variable		
MIL-R-94	Resistors, Variable, Composition	RV
MIL-R-22097	Resistors, Variable, Non-wirewound (Lead Screw Actuated)	RJ
MIL-R-23285	Resistors, Variable, Film	RVC
MIL-R-39023	Resistors, Variable, Non-wirewound, Precision	RQ
MIL-R-39035	Resistors, Variable, Cermet, or Carbon Film (Lead Screw Actuated) Established Reliability	RJR
Wirewound, Variable		
MIL-R-19	Resistors, Variable, Wirewound (Low Operating Temperature)	RA
MIL-R-22	Resistors, Variable, Wirewound (Power Type)	RP
MIL-R-12934	Resistors, Variable, Wirewound, (Precision)	RR
MIL-R-27208	Resistors, Variable, Wirewound, (Lead Screw Actuated)	RT
MIL-R-39002	Resistors, Variable, Wirewound, Semi-Precision	RK
MIL-R-39015	Resistors, Variable, Wirewound, (Lead Screw Actuated), Established Reliability	RTR

TABLE R-2:
RESISTOR QUALITY LEVELS

Quality Level
S
R
P
M
MIL-SPEC
Lower

- Ohms: The resistance value give in ohms.
- Power Watts: Typical rated power dissipation given in watts.
- Actual Temperature: Average temperature which the resistor is exposed to during nonoperation. The actual temperature is given in degrees centigrade.

Resistor Storage
Field Experience

Resistor Classification	Resistor Type	Component Part Number	Quality	Ohms	Power Watts	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
** FIXED COMPOSITION, N/R										
FIXED COMPOSITION	N/R	N/R	MIL-SPEC	N/R	N/R	25	GF	0	0	40.000
FIXED COMPOSITION	N/R	N/R	MIL-SPEC	N/R	N/R	25	GF	0	0	147.000
FIXED COMPOSITION	N/R	N/R	MIL-SPEC	N/R	N/R	25	GF	0	0	420.000
FIXED COMPOSITION	N/R	N/R	MIL-SPEC	N/R	N/R	25	GF	0	0	20.000
FIXED COMPOSITION	N/R	G57109	R	N/R	N/R	N/R	GF	345348	0	4204.905
FIXED COMPOSITION	N/R	G57110	R	N/R	N/R	N/R	GF	1749	0	21.296
FIXED COMPOSITION	N/R	G57111	R	N/R	N/R	N/R	GF	1272	0	15.488
FIXED COMPOSITION	N/R	G57112	R	N/R	N/R	N/R	GF	4770	0	58.079
** FIXED COMPOSITION, RC										
FIXED COMPOSITION	RC	RC07GFJ	MIL-SPEC	N/R	0.500	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC20GF100J	MIL-SPEC	10	0.500	20	GF	1748	0	25.521
FIXED COMPOSITION	RC	RC20GF101J	MIL-SPEC	100	0.500	20	GF	18354	0	267.968
FIXED COMPOSITION	RC	RC20GF102J	MIL-SPEC	1K	0.500	20	GF	5244	0	76.562
FIXED COMPOSITION	RC	RC20GF103J	MIL-SPEC	10K	0.500	20	GF	9614	0	140.364
FIXED COMPOSITION	RC	RC20GF104J	MIL-SPEC	100K	0.500	20	GF	6220	1	382.812
FIXED COMPOSITION	RC	RC20GF105J	MIL-SPEC	1M	0.500	20	GF	15732	0	229.687
FIXED COMPOSITION	RC	RC20GF113J	MIL-SPEC	11K	0.500	20	GF	1748	0	25.521
FIXED COMPOSITION	RC	RC20GF114J	MIL-SPEC	110K	0.500	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC20GF120J	MIL-SPEC	12	0.500	20	GF	1748	0	25.521
FIXED COMPOSITION	RC	RC20GF124J	MIL-SPEC	120K	0.500	20	GF	2622	0	38.281
FIXED COMPOSITION	RC	RC20GF125J	MIL-SPEC	1.2M	0.500	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC20GF131J	MIL-SPEC	130	0.500	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC20GF132J	MIL-SPEC	1.3K	0.500	20	GF	874	0	12.760

Resistor Storage
Field Experience

Resistor Classification	Resistor Type	Component Part Number	Quality	Ohms	Power Watts	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED COMPOSITION	RC	RC20GF133J	MIL-SPEC	13K	0.500	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC20GF134J	MIL-SPEC	130K	0.500	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC20GF151J	MIL-SPEC	150	0.500	20	GF	1748	0	25.521
FIXED COMPOSITION	RC	RC20GF152J	MIL-SPEC	1.5K	0.500	20	GF	1748	0	25.521
FIXED COMPOSITION	RC	RC20GF153J	MIL-SPEC	15K	0.500	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC20GF154J	MIL-SPEC	150K	0.500	20	GF	1748	0	25.521
FIXED COMPOSITION	RC	RC20GF155J	MIL-SPEC	1.5M	0.500	20	GF	5244	0	76.560
FIXED COMPOSITION	RC	RC20GF161J	MIL-SPEC	160	0.500	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC20GF162J	MIL-SPEC	1.6K	0.500	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC20GF182J	MIL-SPEC	1.8K	0.500	20	GF	1748	0	25.521
FIXED COMPOSITION	RC	RC20GF183J	MIL-SPEC	274K	0.250	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC20GF184J	MIL-SPEC	180K	0.500	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC20GF185J	MIL-SPEC	1.8M	0.500	20	GF	1748	0	25.521
FIXED COMPOSITION	RC	RC20GF200J	MIL-SPEC	20	0.500	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC20GF201J	MIL-SPEC	200	0.500	20	GF	6992	0	102.083
FIXED COMPOSITION	RC	RC20GF202J	MIL-SPEC	2K	0.500	20	GF	1748	0	25.521
FIXED COMPOSITION	RC	RC20GF203J	MIL-SPEC	20K	0.500	20	GF	1748	0	25.521
FIXED COMPOSITION	RC	RC20GF204J	MIL-SPEC	200K	0.500	20	GF	8740	0	127.604
FIXED COMPOSITION	RC	RC20GF205J	MIL-SPEC	2M	0.500	20	GF	1748	0	25.521
FIXED COMPOSITION	RC	RC20GF220J	MIL-SPEC	22	0.500	20	GF	8740	0	127.604
FIXED COMPOSITION	RC	RC20GF221J	MIL-SPEC	220	0.500	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC20GF223J	MIL-SPEC	22K	0.500	20	GF	2622	0	38.281
FIXED COMPOSITION	RC	RC20GF224J	MIL-SPEC	220K	0.500	20	GF	874	0	12.760

Resistor Storage
Field Experience

Resistor Classification	Resistor Type	Component Part Number	Quality	Ohms	Power Watts	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED COMPOSITION	RC	RC20GF225J	MIL-SPEC	2.2M	0.500	20	GF	1748	0	25.521
FIXED COMPOSITION	RC	RC20GF242J	MIL-SPEC	2.4K	0.500	20	GF	2622	0	38.281
FIXED COMPOSITION	RC	RC20GF243J	MIL-SPEC	24K	0.500	20	GF	6992	0	102.083
FIXED COMPOSITION	RC	RC20GF244J	MIL-SPEC	240K	0.500	20	GF	2622	0	38.281
FIXED COMPOSITION	RC	RC20GF271J	MIL-SPEC	270	0.500	20	GF	1748	0	25.521
FIXED COMPOSITION	RC	RC20GF273J	MIL-SPEC	27K	0.500	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC20GF274J	MIL-SPEC	270K	0.500	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC20GF301J	MIL-SPEC	82K	0.500	20	GF	2622	0	38.281
FIXED COMPOSITION	RC	RC20GF303J	MIL-SPEC	30K	0.500	20	GF	1748	0	25.521
FIXED COMPOSITION	RC	RC20GF304J	MIL-SPEC	300K	0.500	20	GF	1748	0	25.521
FIXED COMPOSITION	RC	RC20GF305J	MIL-SPEC	3M	0.500	20	GF	4370	0	63.802
FIXED COMPOSITION	RC	RC20GF331J	MIL-SPEC	330	0.500	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC20GF332	MIL-SPEC	3.3K	0.500	20	GF	2622	0	38.281
FIXED COMPOSITION	RC	RC20GF333J	MIL-SPEC	33K	0.500	20	GF	2622	0	38.281
FIXED COMPOSITION	RC	RC20GF335J	MIL-SPEC	3.3M	0.500	20	GF	1748	0	25.521
FIXED COMPOSITION	RC	RC20GF360J	MIL-SPEC	36	0.500	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC20GF362J	MIL-SPEC	N/R	0.500	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC20GF364J	MIL-SPEC	N/R	0.500	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC20GF391J	MIL-SPEC	390	0.500	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC20GF393J	MIL-SPEC	39K	0.500	20	GF	2622	0	38.281
FIXED COMPOSITION	RC	RC20GF394J	MIL-SPEC	390K	0.500	20	GF	6992	0	102.083
FIXED COMPOSITION	RC	RC20GF395J	MIL-SPEC	3.9M	0.500	20	GF	2622	0	38.281
FIXED COMPOSITION	RC	RC20GF431J	MIL-SPEC	430	0.500	20	GF	1748	0	25.521

Resistor Storage
Field Experience

Resistor Classification	Resistor Type	Component Part Number	Quality	Ohms	Power Watts	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED COMPOSITION	RC	RC20GF432J	MIL-SPEC	4.3K	0.500	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC20GF434J	MIL-SPEC	430K	0.500	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC20GF435J	MIL-SPEC	4.3M	0.500	20	GF	2622	0	38.281
FIXED COMPOSITION	RC	RC20GF472J	MIL-SPEC	4.7K	0.500	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC20GF473J	MIL-SPEC	47K	0.500	20	GF	1748	0	25.521
FIXED COMPOSITION	RC	RC20GF474J	MIL-SPEC	470K	0.500	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC20GF475J	MIL-SPEC	4.7M	0.500	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC20GF510J	MIL-SPEC	510K	0.500	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC20GF511J	MIL-SPEC	510	0.500	20	GF	1748	0	25.521
FIXED COMPOSITION	RC	RC20GF512J	MIL-SPEC	5.1K	0.500	20	GF	6118	0	89.323
FIXED COMPOSITION	RC	RC20GF513J	MIL-SPEC	51K	0.500	20	GF	5244	0	76.562
FIXED COMPOSITION	RC	RC20GF514J	MIL-SPEC	510K	0.500	20	GF	6118	0	89.323
FIXED COMPOSITION	RC	RC20GF515J	MIL-SPEC	5.1M	0.500	20	GF	1748	0	25.521
FIXED COMPOSITION	RC	RC20GF563J	MIL-SPEC	56K	0.500	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC20GF622J	MIL-SPEC	6.2K	0.500	20	GF	1748	0	25.521
FIXED COMPOSITION	RC	RC20GF623J	MIL-SPEC	62K	0.500	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC20GF624J	MIL-SPEC	620K	0.500	20	GF	1748	0	25.521
FIXED COMPOSITION	RC	RC20GF682J	MIL-SPEC	6.8K	0.500	20	GF	6800	0	12.760
FIXED COMPOSITION	RC	RC20GF683J	MIL-SPEC	68K	0.500	20	GF	1748	0	25.521
FIXED COMPOSITION	RC	RC20GF752J	MIL-SPEC	7.5K	0.500	20	GF	4370	0	63.802
FIXED COMPOSITION	RC	RC20GF754J	MIL-SPEC	750K	0.500	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC20GF822J	MIL-SPEC	8.2K	0.500	20	GF	1748	0	25.521
FIXED COMPOSITION	RC	RC20GF823J	MIL-SPEC	82K	0.500	20	GF	3496	0	51.042

Resistor Storage
Field Experience

Resistor Classification	Resistor Type	Component Part Number	Quality	Ohms	Power Watts	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED COMPOSITION	RC	RC20GF825J	MIL-SPEC	8.2M	0.500	20	GF	1748	0	25.521
FIXED COMPOSITION	RC	RC20GF911J	MIL-SPEC	910	0.500	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC20GF912J	MIL-SPEC	9.1K	0.500	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC20GF913J	MIL-SPEC	91K	0.500	20	GF	1748	0	25.521
FIXED COMPOSITION	RC	RC20GFJ	MIL-SPEC	N/R	0.500	20	GF	25346	0	370.052
FIXED COMPOSITION	RC	RC32GF	MIL-SPEC	N/R	1.000	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC32GF134J	MIL-SPEC	130K	1.000	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC32GF154J	MIL-SPEC	150K	1.000	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC32GF183J	MIL-SPEC	18K	1.000	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC32GF202J	MIL-SPEC	2K	1.000	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC32GF203J	MIL-SPEC	20K	1.000	20	GF	2622	0	38.281
FIXED COMPOSITION	RC	RC32GF223J	MIL-SPEC	22K	1.000	20	GF	1748	0	25.521
FIXED COMPOSITION	RC	RC32GF242J	MIL-SPEC	2.4K	1.000	20	GF	1748	0	25.521
FIXED COMPOSITION	RC	RC32GF273J	MIL-SPEC	27K	1.000	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC32GF303J	MIL-SPEC	30K	1.000	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC32GF332J	MIL-SPEC	3.3K	1.000	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC32GF473J	MIL-SPEC	47K	1.000	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC32GF515J	MIL-SPEC	5.1M	1.000	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC32GF563J	MIL-SPEC	56K	1.000	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC32GF751J	MIL-SPEC	750	1.000	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC32GF753J	MIL-SPEC	75K	1.000	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC32GF822J	MIL-SPEC	82K	1.000	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC42GF102J	MIL-SPEC	1K	2.000	20	GF	874	0	12.760

Resistor Storage
Field Experience

Resistor Classification	Resistor Type	Component Part Number	Quality	Ohms	Power Watts	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED COMPOSITION	RC	RC42GF103J	MIL-SPEC	10K	2.000	20	GF	1748	0	25.521
FIXED COMPOSITION	RC	RC42GF104J	MIL-SPEC	100K	2.000	20	GF	1748	0	25.521
FIXED COMPOSITION	RC	RC42GF123J	MIL-SPEC	12K	2.000	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC42GF183J	MIL-SPEC	18K	2.000	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC42GF203J	MIL-SPEC	20K	2.000	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC42GF220J	MIL-SPEC	22	2.000	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC42GF303J	MIL-SPEC	30K	2.000	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC42GF393J	MIL-SPEC	39K	2.000	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC42GF472J	MIL-SPEC	4.7K	2.000	20	GF	874	0	12.760
FIXED COMPOSITION	RC	RC42GF822J	MIL-SPEC	8.2K	2.000	20	GF	5244	0	76.562
** FIXED COMPOSITION, RCR										
FIXED COMPOSITION	RCR	VARIOUS	R	N/R	N/R	N/R	AIF	111946	0	2893.500
FIXED COMPOSITION	RCR	RCR07G102J	R	N/R	N/R	N/R	GF	120	0	2.620
FIXED COMPOSITION	RCR	RCR07G103J	R	N/R	N/R	N/R	GF	120	0	2.628
FIXED COMPOSITION	RCR	RCR07G105J	R	N/R	N/R	N/R	GF	1440	0	31.536
FIXED COMPOSITION	RCR	RCR07G123J	R	N/R	N/R	N/R	GF	480	0	10.512
FIXED COMPOSITION	RCR	RCR07G184J	R	N/R	N/R	N/R	GF	120	0	2.628
FIXED COMPOSITION	RCR	RCR20G203J	R	N/R	N/R	N/R	GF	120	0	2.628
FIXED COMPOSITION	RCR	RCR20G432J	R	N/R	N/R	N/R	GF	120	0	2.628
FIXED COMPOSITION	RCR	RE19-11	S	2.2M	0.250	N/R	AIF	1004	0	25.950
** FIXED COMPOSITION, RNC										
FIXED COMPOSITION	RNC	VARIOUS	R	N/R	N/R	N/R	AIF	90862	18	2348.500

Resistor Storage
Field Experience

Resistor Classification	Resistor Type	Component Part Number	Quality	Ohms	Power Watts	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
** FIXED FILM, N/R										
FIXED FILM	N/R	N/R	LOWER	N/R	N/R	N/R	GF	0	9	3422.000
FIXED FILM	N/R	N/R	MIL-SPEC	N/R	N/R	155	GB	0	0	54.900
FIXED FILM	N/R	N/R	MIL-SPEC	N/R	N/R	25	GF	0	1	299.000
FIXED FILM	N/R	N/R	MIL-SPEC	N/R	N/R	18	GF	0	2	4448.000
FIXED FILM	N/R	N/R	MIL-SPEC	N/R	N/R	25	GF	0	0	2383.000
FIXED FILM	N/R	N/R	MIL-SPEC	N/R	N/R	25	GF	0	0	84.000
FIXED FILM	N/R	N/R	MIL-SPEC	N/R	N/R	25	GF	0	0	155.000
FIXED FILM	N/R	PRH250-28	MIL-SPEC	28.7K	0.250	20	GF	1748	0	25.521
FIXED FILM	N/R	G657328	R	N/R	N/R	N/R	GF	12084	0	147.133
FIXED FILM	N/R	N/R	R	N/R	N/R	N/R	GF	0	0	4273.000
** FIXED FILM, RLR										
FIXED FILM	RLR	RE18-01A	M	75	0.800	N/R	AIF	502	0	12.975
FIXED FILM	RLR	VARIOUS	R	N/R	N/R	N/R	AIF	308730	0	7979.700
FIXED FILM	RLR	MIS13732/1	R	N/R	N/R	N/R	GF	5400	0	118.300
** FIXED FILM, RN										
FIXED FILM	RN	280MR/52P1	MIL-SPEC	750	0.250	20	GF	874	0	12.760
FIXED FILM	RN	280MR033P	MIL-SPEC	N/R	0.250	20	GF	54188	0	791.145
FIXED FILM	RN	280MR033P1	MIL-SPEC	20.5K	0.250	20	GF	2622	0	38.281
FIXED FILM	RN	280MR033P3	MIL-SPEC	1.1M	0.250	20	GF	1748	0	25.521
FIXED FILM	RN	280MR033P3	MIL-SPEC	1.96M	0.250	20	GF	1748	0	25.521
FIXED FILM	RN	280MR033P3	MIL-SPEC	1.65M	0.250	20	GF	874	0	12.760
FIXED FILM	RN	280MR033P3	MIL-SPEC	1.27M	0.250	20	GF	1748	0	25.521
FIXED FILM	RN	280MR033P3	MIL-SPEC	1.5M	0.250	20	GF	1748	0	25.521

Resistor Storage
Field Experience

Resistor Classification	Resistor Type	Component Part Number	Quality	Ohms	Power Watts	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED FILM	RN	280MR143P	MIL-SPEC	30.1K	0.130	20	GF	1748	0	25.521
FIXED FILM	RN	280MR143P2	MIL-SPEC	95.3K	0.130	20	GF	874	0	12.760
FIXED FILM	RN	280MR143P2	MIL-SPEC	30.1K	0.130	20	GF	874	0	12.760
FIXED FILM	RN	280MR143P3	MIL-SPEC	121K	0.130	20	GF	874	0	12.760
FIXED FILM	RN	280MR143P3	MIL-SPEC	487K	0.130	20	GF	874	0	12.760
FIXED FILM	RN	280MR143P3	MIL-SPEC	487K	0.130	20	GF	874	0	12.760
FIXED FILM	RN	280MR169P	MIL-SPEC	N/R	0.250	20	GF	7866	0	114.844
FIXED FILM	RN	280MT/98P3	MIL-SPEC	267K	0.500	20	GF	874	0	12.760
FIXED FILM	RN	280MT098P	MIL-SPEC	N/R	0.500	20	GF	1748	0	25.521
FIXED FILM	RN	280MT098P2	MIL-SPEC	100K	0.500	20	GF	874	0	12.760
FIXED FILM	RN	280MT098P2	MIL-SPEC	121K	0.500	20	GF	874	0	12.760
FIXED FILM	RN	280MT098P3	MIL-SPEC	150K	0.500	20	GF	874	0	12.760
FIXED FILM	RN	280MT098P3	MIL-SPEC	604K	0.500	20	GF	874	0	12.760
FIXED FILM	RN	418E47R50F	MIL-SPEC	48	0.130	20	GF	874	0	12.760
FIXED FILM	RN	PRH250-1-0	MIL-SPEC	1.07K	0.250	20	GF	3495	0	51.042
FIXED FILM	RN	PRH250-1-0	MIL-SPEC	1.05M	0.250	20	GF	1748	0	25.521
FIXED FILM	RN	PRH250-1-3	MIL-SPEC	1.3M	0.250	20	GF	1748	0	25.521
FIXED FILM	RN	PRH250-1-4	MIL-SPEC	1.47M	0.250	20	GF	5244	0	76.562
FIXED FILM	RN	PRH250-1-5	MIL-SPEC	1.54M	0.250	20	GF	874	0	12.760
FIXED FILM	RN	PRH250-1-7	MIL-SPEC	1.78K	0.250	20	GF	874	0	12.760
FIXED FILM	RN	PRH250-1-9	MIL-SPEC	1.96K	0.250	20	GF	3496	0	51.042
FIXED FILM	RN	PRH250-100	MIL-SPEC	100K	0.250	20	GF	3496	0	51.042
FIXED FILM	RN	PRH250-111	MIL-SPEC	110K	0.250	20	GF	1748	0	25.521

Resistor Storage
Field Experience

Resistor Classification	Resistor Type	Component Part Number	Quality	Ohms	Power Watts	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED FILM	RN	PRH250-13K	MIL-SPEC 13K		0.250	20	GF	1748	0	25.521
FIXED FILM	RN	PRH250-147	MIL-SPEC 147K		0.250	20	GF	1748	0	25.521
FIXED FILM	RN	PRH250-150	MIL-SPEC 150K		0.250	20	GF	1748	0	25.521
FIXED FILM	RN	PRH250-174	MIL-SPEC 174K		0.250	20	GF	2622	0	38.281
FIXED FILM	RN	PRH250-1ME	MIL-SPEC 1M		0.250	20	GF	1748	0	25.521
FIXED FILM	RN	PRH250-2-8	MIL-SPEC 2.8M		0.250	20	GF	6118	0	89.323
FIXED FILM	RN	PRH250-2-8	MIL-SPEC 2.8M		0.250	20	GF	1748	0	25.521
FIXED FILM	RN	PRH250-261	MIL-SPEC 261K		0.250	20	GF	874	0	12.760
FIXED FILM	RN	PRH250-280	MIL-SPEC 280K		0.250	20	GF	3622	0	38.281
FIXED FILM	RN	PRH250-2K0	MIL-SPEC 4.7M		0.500	20	GF	1748	0	25.521
FIXED FILM	RN	PRH250-3-1	MIL-SPEC 3.16M		0.250	20	GF	874	0	12.760
FIXED FILM	RN	PRH250-324	MIL-SPEC 324K		0.250	20	GF	1748	0	25.521
FIXED FILM	RN	PRH250-332	MIL-SPEC 332K		0.250	20	GF	874	0	12.760
FIXED FILM	RN	PRH250-348	MIL-SPEC 39K		2.000	20	GF	1748	0	25.521
FIXED FILM	RN	PRH250-40	MIL-SPEC 40.2K		0.250	20	GF	1748	0	25.521
FIXED FILM	RN	PRH250-402	MIL-SPEC 402K		0.250	20	GF	874	0	12.760
FIXED FILM	RN	PRH250-42	MIL-SPEC 42.2K		0.250	20	GF	1748	0	25.521
FIXED FILM	RN	PRH250-422	MIL-SPEC 422K		0.250	20	GF	5244	0	76.561
FIXED FILM	RN	PRH250-432	MIL-SPEC 432K		0.250	20	GF	1748	0	25.521
FIXED FILM	RN	PRH250-442	MIL-SPEC 442K		0.250	20	GF	874	0	12.760
FIXED FILM	RN	PRH250-46	MIL-SPEC 46.4K		0.250	20	GF	874	0	12.760
FIXED FILM	RN	PRH250-499	MIL-SPEC 4.99K		0.250	20	GF	2622	0	38.281
FIXED FILM	RN	PRH250-51	MIL-SPEC 51.1K		0.250	20	GF	874	0	12.760

Resistor Storage
Field Experience

Resistor Classification	Resistor Type	Component Part Number	Quality	Ohms	Power Watts	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED FILM	RN	PRH250-549	MIL-SPEC	549K	0.250	20	GF	1748	0	25.521
FIXED FILM	RN	PRH250-562	MIL-SPEC	562K	0.250	20	GF	1748	0	25.521
FIXED FILM	RN	PRH250-665	MIL-SPEC	665K	0.250	20	GF	874	0	12.760
FIXED FILM	RN	PRH250-866	MIL-SPEC	866K	0.250	20	GF	1748	0	25.521
FIXED FILM	RN	PRH250-97	MIL-SPEC	97600	0.250	20	GF	1748	0	25.521
FIXED FILM	RN	RN605112F	MIL-SPEC	5.1K	0.130	20	GF	874	0	12.760
FIXED FILM	RN	RN60B1761F	MIL-SPEC	1.96K	0.130	20	GF	2622	0	38.281
FIXED FILM	RN	RN60B5623F	MIL-SPEC	562K	0.130	20	GF	6992	0	102.083
FIXED FILM	RN	RN60C	MIL-SPEC	N/R	0.130	20	GF	874	0	12.760
FIXED FILM	RN	RN60C	MIL-SPEC	N/R	0.130	20	GF	20102	0	293.489
FIXED FILM	RN	RN60C1000F	MIL-SPEC	100	0.130	20	GF	8740	0	127.604
FIXED FILM	RN	RN60C1001F	MIL-SPEC	1K	0.130	20	GF	874	0	12.760
FIXED FILM	RN	RN60C1002F	MIL-SPEC	10K	0.130	20	GF	4370	0	63.802
FIXED FILM	RN	RN60C1003F	MIL-SPEC	100K	0.130	20	GF	2622	0	38.281
FIXED FILM	RN	RN60C1103F	MIL-SPEC	110K	0.130	20	GF	874	0	12.760
FIXED FILM	RN	RN60C1130F	MIL-SPEC	113	0.130	20	GF	874	0	12.760
FIXED FILM	RN	RN60C1212F	MIL-SPEC	12.1K	0.130	20	GF	874	0	12.760
FIXED FILM	RN	RN60C1472F	MIL-SPEC	14.7K	0.130	20	GF	3496	0	51.041
FIXED FILM	RN	RN60C1503F	MIL-SPEC	150K	0.130	20	GF	874	0	12.760
FIXED FILM	RN	RN60C1543F	MIL-SPEC	154K	0.130	20	GF	874	0	12.760
FIXED FILM	RN	RN60C1651F	MIL-SPEC	1.65K	0.130	20	GF	1748	0	25.521
FIXED FILM	RN	RN60C1821F	MIL-SPEC	1.82K	0.130	20	GF	874	0	12.760
FIXED FILM	RN	RN60C1913F	MIL-SPEC	191K	0.130	20	GF	874	0	12.760

Resistor Storage
Field Experience

Resistor Classification	Resistor Type	Component Part Number	Quality	Ohms	Power Watts	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED FILM	RN	RN60C2002F	MIL-SPEC	20K	0.130	20	GF	2622	0	38.281
FIXED FILM	RN	RN60C2003F	MIL-SPEC	200K	0.130	20	GF	1748	0	25.521
FIXED FILM	RN	RN60C2052F	MIL-SPEC	20.5K	0.130	20	GF	874	0	12.760
FIXED FILM	RN	RN60C2211	MIL-SPEC	2.21K	0.130	20	GF	874	0	12.760
FIXED FILM	RN	RN60C2212F	MIL-SPEC	22.1K	0.130	20	GF	1748	0	25.521
FIXED FILM	RN	RN60C2262F	MIL-SPEC	22.6K	N/R	20	GF	874	0	12.760
FIXED FILM	RN	RN60C2371F	MIL-SPEC	2.37K	0.130	20	GF	1748	0	25.521
FIXED FILM	RN	RN60C2490P	MIL-SPEC	249	0.130	20	GF	1748	0	25.521
FIXED FILM	RN	RN60C2491F	MIL-SPEC	2.49K	0.130	20	GF	2622	0	38.281
FIXED FILM	RN	RN60C3011F	MIL-SPEC	3.01K	0.130	20	GF	874	0	12.760
FIXED FILM	RN	RN60C3013F	MIL-SPEC	301K	0.130	20	GF	1748	0	25.521
FIXED FILM	RN	RN60C3243F	MIL-SPEC	324K	0.130	20	GF	1748	0	25.521
FIXED FILM	RN	RN60C3323F	MIL-SPEC	332K	0.130	20	GF	874	0	12.760
FIXED FILM	RN	RN60C3401F	MIL-SPEC	3.4K	0.130	20	GF	3496	0	51.041
FIXED FILM	RN	RN60C3653F	MIL-SPEC	365K	0.130	20	GF	1748	0	25.521
FIXED FILM	RN	RN60C3743F	MIL-SPEC	374K	0.130	20	GF	874	0	12.760
FIXED FILM	RN	RN60C391F	MIL-SPEC	3.92K	0.130	20	GF	874	0	12.760
FIXED FILM	RN	RN60C3922F	MIL-SPEC	39.2K	0.130	20	GF	874	0	12.760
FIXED FILM	RN	RN60C4021F	MIL-SPEC	4.02K	0.130	20	GF	874	0	12.760
FIXED FILM	RN	RN60C4023F	MIL-SPEC	402K	0.130	20	GF	874	0	12.760
FIXED FILM	RN	RN60C4642F	MIL-SPEC	46.4K	0.130	20	GF	1748	0	25.521
FIXED FILM	RN	RN60C4750F	MIL-SPEC	475	0.130	20	GF	3496	0	51.042
FIXED FILM	RN	RN60C4990F	MIL-SPEC	499	0.130	20	GF	1748	0	25.521

Resistor Storage
Field Experience

Resistor Classification	Resistor Type	Component Part Number	Quality	Ohms	Power Watts	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED FILM	RN	RN60C5110F	MIL-SPEC	511	0.130	20	GF	3496	0	51.042
FIXED FILM	RN	RN60C5111F	MIL-SPEC	5.11K	0.130	20	GF	5244	0	76.562
FIXED FILM	RN	RN60C6192F	MIL-SPEC	61.9K	0.130	20	GF	1748	0	25.521
FIXED FILM	RN	RN60C6811F	MIL-SPEC	6.81K	0.130	20	GF	874	0	12.760
FIXED FILM	RN	RN60C7500F	MIL-SPEC	750	0.130	20	GF	1748	0	25.521
FIXED FILM	RN	RN60C82R5F	MIL-SPEC	83	0.130	20	GF	7866	0	114.844
FIXED FILM	RN	RN60C9091F	MIL-SPEC	9.09K	0.130	20	GF	1748	0	25.521
FIXED FILM	RN	RN60C9092F	MIL-SPEC	90.9K	0.130	20	GF	1748	0	25.521
FIXED FILM	RN	RN60D1004F	MIL-SPEC	1M	0.250	20	GF	1748	0	25.521
FIXED FILM	RN	RN60D8253F	MIL-SPEC	825K	0.250	20	GF	874	0	12.760
FIXED FILM	RN	RN651004F	MIL-SPEC	1M	0.250	20	GF	6992	0	102.083
FIXED FILM	RN	RN65C	MIL-SPEC	N/R	0.250	20	GF	18354	0	267.968
FIXED FILM	RN	RN65C1002F	MIL-SPEC	10K	0.250	20	GF	3496	0	51.042
FIXED FILM	RN	RN65C1003F	MIL-SPEC	100K	0.250	20	GF	10488	0	153.125
FIXED FILM	RN	RN65C1101F	MIL-SPEC	1.1K	0.250	20	GF	874	0	12.760
FIXED FILM	RN	RN65C1103F	MIL-SPEC	N/R	N/R	20	GF	874	0	12.760
FIXED FILM	RN	RN65C1302F	MIL-SPEC	13K	0.250	20	GF	2622	0	38.281
FIXED FILM	RN	RN65C1303F	MIL-SPEC	130K	0.250	20	GF	2622	0	38.281
FIXED FILM	RN	RN65C1402F	MIL-SPEC	14K	0.250	20	GF	3496	0	51.042
FIXED FILM	RN	RN65C1503F	MIL-SPEC	150K	0.250	20	GF	1748	0	25.521
FIXED FILM	RN	RN65C1583F	MIL-SPEC	158K	0.250	20	GF	874	0	12.760
FIXED FILM	RN	RN65C1693F	MIL-SPEC	169K	0.250	20	GF	2622	0	38.281
FIXED FILM	RN	RN65C1742F	MIL-SPEC	17.4K	0.250	20	GF	1748	0	25.521

Resistor Storage
Field Experience

Resistor Classification	Resistor Type	Component Part Number	Quality	Ohms	Power Watts	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED FILM	RN	RN65C2002F	MIL-SPEC	20K	0.250	20	GF	874	0	12.760
FIXED FILM	RN	RN65C2003F	MIL-SPEC	200K	0.250	20	GF	2622	0	38.281
FIXED FILM	RN	RN65C2004F	MIL-SPEC	2M	0.250	20	GF	874	0	12.760
FIXED FILM	RN	RN65C2053F	MIL-SPEC	205K	0.250	20	GF	1748	0	25.521
FIXED FILM	RN	RN65C2374F	MIL-SPEC	2.37M	0.250	20	GF	874	0	12.760
FIXED FILM	RN	RN65C2432F	MIL-SPEC	24.3K	0.250	20	GF	874	0	12.760
FIXED FILM	RN	RN65C2433F	MIL-SPEC	243K	0.250	20	GF	1748	0	25.521
FIXED FILM	RN	RN65C2552F	MIL-SPEC	25.5K	0.250	20	GF	2622	0	38.281
FIXED FILM	RN	RN65C2743F	MIL-SPEC	274K	0.250	20	GF	874	0	12.760
FIXED FILM	RN	RN65C2744F	MIL-SPEC	2.74M	0.250	20	GF	874	0	12.760
FIXED FILM	RN	RN65C2801F	MIL-SPEC	2.8K	0.250	20	GF	874	0	12.760
FIXED FILM	RN	RN65C2803F	MIL-SPEC	280K	0.250	20	GF	1748	0	25.521
FIXED FILM	RN	RN65C2873F	MIL-SPEC	287K	0.250	20	GF	1748	0	25.521
FIXED FILM	RN	RN65C2943F	MIL-SPEC	294K	0.250	20	GF	1748	0	25.521
FIXED FILM	RN	RN65C3012F	MIL-SPEC	30.1K	0.250	20	GF	1748	0	25.521
FIXED FILM	RN	RN65C3013F	MIL-SPEC	30.1K	0.250	20	GF	2622	0	38.281
FIXED FILM	RN	RN65C3093F	MIL-SPEC	309K	0.250	20	GF	1748	0	25.521
FIXED FILM	RN	RN65C3162F	MIL-SPEC	31.6K	0.250	20	GF	874	0	12.760
FIXED FILM	RN	RN65C3322F	MIL-SPEC	33.2K	0.250	20	GF	1748	0	25.521
FIXED FILM	RN	RN65C3403F	MIL-SPEC	340K	0.250	20	GF	874	0	12.760
FIXED FILM	RN	RN65C3483F	MIL-SPEC	348K	0.250	20	GF	874	0	12.760
FIXED FILM	RN	RN65C3653F	MIL-SPEC	365K	0.250	20	GF	1748	0	25.521
FIXED FILM	RN	RN65C3833F	MIL-SPEC	383K	0.250	20	GF	874	0	12.760

Resistor Storage
Field Experience

Resistor Classification	Resistor Type	Component Part Number	Quality	Ohms	Power Watts	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED FILM	RN	RN65C4123F	MIL-SPEC	412K	0.250	20	GF	1748	0	25.521
FIXED FILM	RN	RN65C4423F	MIL-SPEC	665K	0.250	20	GF	874	0	12.760
FIXED FILM	RN	RN65C4642F	MIL-SPEC	46.4K	0.250	20	GF	1748	0	25.521
FIXED FILM	RN	RN65C4873F	MIL-SPEC	487K	0.250	20	GF	5244	0	76.562
FIXED FILM	RN	RN65C4993F	MIL-SPEC	499K	0.250	20	GF	3496	0	51.042
FIXED FILM	RN	RN65C5112F	MIL-SPEC	51.1K	0.250	20	GF	874	0	12.760
FIXED FILM	RN	RN65C5113F	MIL-SPEC	511K	0.250	20	GF	874	0	12.760
FIXED FILM	RN	RN65C5493F	MIL-SPEC	549K	0.250	20	GF	1748	0	25.521
FIXED FILM	RN	RN65C6042F	MIL-SPEC	60.4K	0.250	20	GF	874	0	12.760
FIXED FILM	RN	RN65C6043F	MIL-SPEC	604K	0.250	20	GF	1748	0	25.521
FIXED FILM	RN	RN65C6192F	MIL-SPEC	61.9K	0.250	20	GF	3496	0	51.042
FIXED FILM	RN	RN65C6981F	MIL-SPEC	6.98K	0.250	20	GF	874	0	12.760
FIXED FILM	RN	RN65C7152F	MIL-SPEC	71.5K	0.250	20	GF	874	0	12.760
FIXED FILM	RN	RN65C7322F	MIL-SPEC	73.2K	0.250	20	GF	1748	0	25.521
FIXED FILM	RN	RN65C7503	MIL-SPEC	750K	0.250	20	GF	1748	0	25.521
FIXED FILM	RN	RN65C8063F	MIL-SPEC	806K	0.250	20	GF	874	0	12.760
FIXED FILM	RN	RN65C8662F	MIL-SPEC	86.6K	0.250	20	GF	874	0	12.760
FIXED FILM	RN	RN65C9092	MIL-SPEC	90.9K	0.250	20	GF	874	0	12.760
FIXED FILM	RN	RN65C9761F	MIL-SPEC	9.76K	0.250	20	GF	874	0	12.760
FIXED FILM	RN	RN65C9762F	MIL-SPEC	97.6K	0.250	20	GF	2622	0	38.281
FIXED FILM	RN	RN65C9763F	MIL-SPEC	976K	0.250	20	GF	3496	0	51.042
FIXED FILM	RN	RN70C	MIL-SPEC	1	0.500	20	GF	874	0	12.760
FIXED FILM	RN	RN70C2003F	MIL-SPEC	200K	0.500	20	GF	874	0	12.760

Resistor Storage
Field Experience

Resistor Classification	Resistor Type	Component Part Number	Quality	Ohms	Power Watts	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED FILM	RN	RN70C2672F	MIL-SPEC	26.7K	0.500	20	GF	874	0	12.760
FIXED FILM	RN	RN70C5900F	MIL-SPEC	590	0.500	20	GF	874	0	12.760
FIXED FILM	RN	RN70C7502F	MIL-SPEC	75K	0.500	20	GF	874	0	12.760
FIXED FILM	RN	MIS13731/3	R	N/R	N/R	N/R	GF	1320	0	3468.960
FIXED FILM	RN	MIS13731/5	R	N/R	N/R	N/R	GF	1320	0	3468.960
** FIXED FILM, RNR										
FIXED FILM	RNR	C2873FW	MIL-SPEC	287K	0.130	27	GF	10	0	0.324
FIXED FILM	RNR	10174954	R	N/R	0.500	18	GF	19278	0	306.265
FIXED FILM	RNR	10176189	R	N/R	0.250	18	GF	62118	0	986.853
FIXED FILM	RNR	10178303	R	N/R	0.250	18	GF	17136	0	272.235
FIXED FILM	RNR	10180306	R	N/R	0.100	18	GF	46053	0	731.632
FIXED FILM	RNR	10181751	R	N/R	0.100	18	GF	436968	0	6941.998
FIXED FILM	RNR	10181753	R	N/R	0.130	18	GF	130662	0	2075.793
FIXED FILM	RNR	10181754	R	N/R	0.130	18	GF	68544	0	1088.941
FIXED FILM	RNR	C1000FA	R	100	0.125	27	GF	40	0	1.282
FIXED FILM	RNR	C1101FA	R	1.1K	0.130	27	GF	10	0	0.374
FIXED FILM	RNR	C1101FA	R	1.1K	0.100	27	GF	10	0	0.252
FIXED FILM	RNR	C1102FA	R	11K	0.130	27	GF	5	0	0.202
FIXED FILM	RNR	C1103FA	R	110K	0.130	27	GF	3	0	0.127
FIXED FILM	RNR	C1153FA	R	115K	0.130	27	GF	10	0	0.310
FIXED FILM	RNR	C1212FA	R	12.1K	0.130	27	GF	10	0	0.288
FIXED FILM	RNR	C1271FA	R	1.27K	0.130	27	GF	10	0	0.288
FIXED FILM	RNR	C1273FA	R	5.9K	0.130	27	GF	10	0	0.281

Resistor Storage
Field Experience

Resistor Classification	Resistor Type	Component Part Number	Quality	Ohms	Power Watts	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED FILM	RNR	C1331FA	R	1.33K	0.130	27	GF	10	0	0.331
FIXED FILM	RNR	C1403FA	R	140K	0.130	27	GF	10	0	0.360
FIXED FILM	RNR	C1471FA	R	1.47K	0.130	27	GF	10	0	0.266
FIXED FILM	RNR	C1471FA	R	1.47K	0.500	27	GF	10	0	0.382
FIXED FILM	RNR	C1473FA	R	147K	0.130	27	GF	10	0	0.338
FIXED FILM	RNR	C1542FA	R	15.4K	0.130	27	GF	10	0	0.338
FIXED FILM	RNR	C1621FA	R	1.62K	0.130	27	GF	10	0	0.386
FIXED FILM	RNR	C1622FA	R	16.2K	0.130	27	GF	3	0	0.127
FIXED FILM	RNR	C1623FA	R	162K	0.130	27	GF	10	0	0.266
FIXED FILM	RNR	C1783FA	R	178K	0.130	27	GF	10	0	0.302
FIXED FILM	RNR	C1871FA	R	1.87K	0.130	27	GF	10	0	0.374
FIXED FILM	RNR	C1872FA	R	18.7K	0.130	27	GF	10	0	0.266
FIXED FILM	RNR	C1873FA	R	187K	0.130	27	GF	10	0	0.396
FIXED FILM	RNR	C1960FA	R	196	0.130	27	GF	40	0	0.878
FIXED FILM	RNR	C1963FA	R	196K	0.130	27	GF	30	0	0.857
FIXED FILM	RNR	C2053FA	R	205K	0.130	27	GF	10	0	0.396
FIXED FILM	RNR	C2150FA	R	215	0.130	27	GF	10	0	0.389
FIXED FILM	RNR	C2153FA	R	215K	0.130	27	GF	10	0	0.238
FIXED FILM	RNR	C2373FA	R	237K	0.130	27	GF	10	0	0.353
FIXED FILM	RNR	C2610FA	R	261	0.130	27	GF	10	0	0.173
FIXED FILM	RNR	C2741FA	R	2.74K	0.130	27	GF	20	0	0.583
FIXED FILM	RNR	C3010FA	R	300	0.130	27	GF	10	0	0.288
FIXED FILM	RNR	C3011FA	R	3.01K	0.130	27	GF	20	0	0.288

Resistor Storage
Field Experience

Resistor Classification	Resistor Type	Component Part Number	Quality	Ohms	Power Watts	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED FILM	RNR	C3013FA	R	301K	0.130	27	GF	10	0	0.245
FIXED FILM	RNR	C3161FA	R	3.16K	0.130	27	GF	10	0	0.302
FIXED FILM	RNR	C322FA	R	33.2K	0.130	27	GF	20	0	0.554
FIXED FILM	RNR	C3481FA	R	3.48K	0.130	27	GF	10	0	0.389
FIXED FILM	RNR	C3832FA	R	3.83K	0.130	27	GF	20	0	0.360
FIXED FILM	RNR	C4020FA	R	402	0.130	27	GF	5	0	0.202
FIXED FILM	RNR	C4021FW	R	4.02K	0.130	27	GF	10	0	0.410
FIXED FILM	RNR	C4022FA	R	42.2K	0.130	27	GF	3	0	0.119
FIXED FILM	RNR	C4871FA	R	4.87K	0.130	27	GF	5	0	0.385
FIXED FILM	RNR	C4873FA	R	487K	0.130	27	GF	40	0	1.605
FIXED FILM	RNR	C5622FA	R	56.2K	0.130	27	GF	10	0	0.310
FIXED FILM	RNR	C6490FA	R	649	0.130	27	GF	3	0	0.121
FIXED FILM	RNR	C7150FA	R	715	0.130	27	GF	20	0	0.286
FIXED FILM	RNR	C7500FA	R	750	0.130	27	GF	10	0	0.331
FIXED FILM	RNR	C7502FA	R	75K	0.130	27	GF	10	0	0.274
FIXED FILM	RNR	C8251FA	R	8.25K	0.130	27	GF	20	0	0.706
FIXED FILM	RNR	C8660FA	R	866	0.130	27	GF	10	0	0.288
FIXED FILM	RNR	C8661FW	R	8.66K	0.130	27	GF	10	0	0.410
FIXED FILM	RNR	C9091FW	R	9.09K	0.130	27	GF	15	0	0.457
FIXED FILM	RNR	C9530FA	R	953	0.130	27	GF	3	0	0.153
FIXED FILM	RNR	C9532FA	R	95.3K	0.130	27	GF	30	0	0.770
FIXED FILM	RNR	C1051EA	R	2.05K	0.130	27	GF	21	0	0.826
FIXED FILM	RNR	CU000FW	R	100	0.125	27	GF	15	0	0.619

Resistor Storage
Field Experience

Resistor Classification	Resistor Type	Component Part Number	Quality	Ohms	Power Watts	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED FILM	RNR	CU002FA	R	10K	0.125	27	GF	30	0	1.130
FIXED FILM	RNR	CU003FA	R	100K	0.125	27	GF	10	0	0.137
FIXED FILM	RNR	CU053FA	R	105K	0.125	27	GF	10	0	0.360
** FIXED NETWORK, FILM, RZ										
FIXED NETWORK, FILM	RZ	955201		N/R	N/R	N/R	GB	150568	0	1319.000
FIXED NETWORK, FILM	RZ	955202		N/R	N/R	N/R	GB	75204	0	659.490
FIXED NETWORK, FILM	RZ	955204		N/R	N/R	N/R	GB	131747	0	1154.700
FIXED NETWORK, FILM	RZ	955205		N/R	N/R	N/R	GB	131747	0	1154.700
** FIXED WIREWOUND, N/R										
FIXED WIREWOUND	N/R	N/R	LOWER	N/R	N/R	N/R	GF	0	1	143.000
FIXED WIREWOUND	N/R	N/R	MIL-SPEC	N/R	N/R	N/R	GF	0	0	13.000
FIXED WIREWOUND	N/R	12100BA	R	1.21K	0.250	27	GF	10	0	0.410
FIXED WIREWOUND	N/R	B19601BA	R	19.6K	0.150	27	GF	10	0	0.166
FIXED WIREWOUND	N/R	F1001C	R	1K	6.000	27	GF	10	0	0.346
FIXED WIREWOUND	N/R	F46R4A	R	46	1.000	27	GF	10	0	0.144
FIXED WIREWOUND	N/R	G57014	R	N/R	N/R	N/R	GF	1113	0	135.517
FIXED WIREWOUND	N/R	G57015	R	N/R	N/R	N/R	GF	636	0	7.744
FIXED WIREWOUND	N/R	G657013	R	N/R	N/R	N/R	GF	795	0	9.680
FIXED WIREWOUND	N/R	N/R	R	N/R	N/R	N/R	GF	0	0	26.000
** FIXED WIREWOUND, RB										
FIXED WIREWOUND	RB	140055-100	MIL-SPEC	5	3.000	20	GF	874	0	12.760
FIXED WIREWOUND	RB	140056300	MIL-SPEC	6.3K	3.000	20	GF	874	0	12.760
FIXED WIREWOUND	RB	1400591-00	MIL-SPEC	[illegible]	3.000	20	GF	874	0	12.760

Resistor Storage
Field Experience

Resistor Classification	Resistor Type	Component Part Number	Quality	Ohms	Power Watts	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED WIREWOUND	RB	223E5K00H	MIL-SPEC	5.6K	2.500	20	GF	3495	0	51.042
FIXED WIREWOUND	RB	226E3K400H	MIL-SPEC	3.4K	7.000	20	GF	874	0	12.760
FIXED WIREWOUND	RB	280MR039P	MIL-SPEC	N/R	3.000	20	GF	1748	0	25.521
FIXED WIREWOUND	RB	280MR039P0	MIL-SPEC	10	3.000	20	GF	1748	0	25.521
FIXED WIREWOUND	RB	280MR128P	MIL-SPEC	N/R	7.000	20	GF	3496	0	51.042
FIXED WIREWOUND	RB	280MR128P0	MIL-SPEC	6.3K	7.000	20	GF	874	0	12.760
FIXED WIREWOUND	RB	280MR188P	MIL-SPEC	N/R	2.500	20	GF	874	0	12.760
FIXED WIREWOUND	RB	280MR188P0	MIL-SPEC	4K	2.500	20	GF	874	0	12.760
FIXED WIREWOUND	RB	280MT040P0	MIL-SPEC	140	5.000	20	GF	874	0	12.760
FIXED WIREWOUND	RB	305E1002F	MIL-SPEC	10K	1.000	20	GF	874	0	12.760
FIXED WIREWOUND	RB	N/R	MIL-SPEC	N/R	N/R	25	GF	0	0	10.000
** FIXED WIREWOUND, RBR										
FIXED WIREWOUND	RBR	F2R49B	MIL-SPEC	2	6.000	27	GF	10	0	0.353
FIXED WIREWOUND	RBR	F7500A	MIL-SPEC	750	2.500	27	GF	10	0	0.151
FIXED WIREWOUND	RBR	VARIOUS	R	N/R	N/R	N/R	AIF	9036	0	233.550
FIXED WIREWOUND	RBR	10XM.4750H	R	1	2.500	27	GF	30	0	0.878
FIXED WIREWOUND	RBR	10XM.7320H	R	1	10.000	27	GF	5	0	0.187
FIXED WIREWOUND	RBR	10XM1.220H	R	5	10.000	27	GF	10	0	0.343
FIXED WIREWOUND	RBR	10XM1.220H	R	1	10.000	27	GF	35	0	0.889
FIXED WIREWOUND	RBR	4501BA	R	46.4K	0.150	27	GF	25	0	0.972
FIXED WIREWOUND	RBR	45R0BA	R	845	0.750	27	GF	10	0	0.288
FIXED WIREWOUND	RBR	511R0BA	R	511	0.150	27	GF	10	0	0.302
FIXED WIREWOUND	RBR	A8R560FA	R	9	0.150	27	GF	3	0	0.132

Resistor Storage
Field Experience

Resistor Classification	Resistor Type	Component Part Number	Quality	Ohms	Power Watts	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED WIREWOUND	RBR	AR090FA	R	9	0.150	27	GF	3	0	0.123
FIXED WIREWOUND	RBR	B10001BA	R	10K	0.150	27	GF	10	0	0.454
FIXED WIREWOUND	RBR	B10501BA	R	10.5K	0.150	27	GF	10	0	0.166
FIXED WIREWOUND	RBR	B10501FA	R	10.5K	0.150	27	GF	10	0	0.230
FIXED WIREWOUND	RBR	B12R70FA	R	12	0.150	27	GF	10	0	0.310
FIXED WIREWOUND	RBR	B1690LBA	R	61.9K	0.150	27	GF	10	0	0.331
FIXED WIREWOUND	RBR	B17800BA	R	1.78K	0.250	27	GF	10	0	0.295
FIXED WIREWOUND	RBR	B36R50FA	R	37	0.150	27	GF	10	0	0.288
FIXED WIREWOUND	RBR	B45301BA	R	45.3K	0.150	27	GF	5	0	0.187
FIXED WIREWOUND	RBR	B825R0BA	R	825	0.150	27	GF	10	0	0.288
FIXED WIREWOUND	RBR	B90901BA	R	90.9K	0.250	27	GF	10	0	0.238
FIXED WIREWOUND	RBR	B953R0BA	R	953	0.150	27	GF	10	0	0.230
FIXED WIREWOUND	RBR	BR2R70FA	R	13	0.150	27	GF	20	0	0.684
FIXED WIREWOUND	RBR	BU2701BA	R	12.7K	0.150	27	GF	10	0	0.281
FIXED WIREWOUND	RBR	C10202BA	R	102K	0.750	27	GF	10	0	0.295
FIXED WIREWOUND	RBR	C21002BA	R	210K	0.750	27	GF	10	0	0.367
FIXED WIREWOUND	RBR	C61901BA	R	61.9K	0.150	27	GF	3	0	0.127
FIXED WIREWOUND	RBR	C66R50BW	R	67	0.250	27	GF	15	0	0.475
FIXED WIREWOUND	RBR	F1001A	R	1000	2.500	27	GF	10	0	0.274
FIXED WIREWOUND	RBR	F10R0A	R	10	2.500	27	GF	10	0	0.324
FIXED WIREWOUND	RBR	F1330A	R	133	2.500	27	GF	5	0	0.198
FIXED WIREWOUND	RBR	F13R3	R	13	1.000	27	GF	10	0	0.259
FIXED WIREWOUND	RBR	F1470A	R	147	2.500	27	GF	15	0	0.551

Resistor Storage
Field Experience

Resistor Classification	Resistor Type	Component Part Number	Quality	Ohms	Power Watts	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED WIREWOUND	RBR	F1621S	R	1.6K	2.500	27	GF	10	0	0.187
FIXED WIREWOUND	RBR	F16R2A	R	16	2.500	27	GF	10	0	0.382
FIXED WIREWOUND	RBR	F1960	R	196	1.000	27	GF	10	0	0.446
FIXED WIREWOUND	RBR	F1960A	R	196	1.000	27	GF	10	0	0.245
FIXED WIREWOUND	RBR	F22R6	R	23	2.000	27	GF	5	0	0.223
FIXED WIREWOUND	RBR	F2370A	R	237	2.500	27	GF	5	0	0.191
FIXED WIREWOUND	RBR	F2870A	R	287	2.000	27	GF	10	0	0.310
FIXED WIREWOUND	RBR	F2870W	R	287	1.000	27	GF	10	0	0.396
FIXED WIREWOUND	RBR	F2R74A	R	3	2.500	27	GF	10	0	0.166
FIXED WIREWOUND	RBR	F301A	R	3	2.500	27	GF	10	0	0.266
FIXED WIREWOUND	RBR	F3480A	R	348	2.500	27	GF	25	0	0.911
FIXED WIREWOUND	RBR	F34R8A	R	35	2.500	27	GF	10	0	0.238
FIXED WIREWOUND	RBR	F3R16A	R	3	2.500	27	GF	10	0	0.382
FIXED WIREWOUND	RBR	F42R2C	R	42	6.000	27	GF	10	0	0.338
FIXED WIREWOUND	RBR	F51R1A	R	51	2.000	27	GF	15	0	0.464
FIXED WIREWOUND	RBR	F5620A	R	562	2.000	27	GF	15	0	0.637
FIXED WIREWOUND	RBR	F6190A	R	619	2.500	27	GF	10	0	0.291
FIXED WIREWOUND	RBR	F6810A	R	681	2.000	27	GF	26	0	0.753
FIXED WIREWOUND	RBR	F7500C	R	750	6.000	27	GF	20	0	0.482
FIXED WIREWOUND	RBR	F7500FA	R	750	6.000	27	GF	3	0	0.134
FIXED WIREWOUND	RBR	F7R50A	R	8	2.000	27	GF	10	0	0.264
FIXED WIREWOUND	RBR	F14R9A	R	23	1.000	27	GF	10	0	0.130
FIXED WIREWOUND	RBR	FR100A	R	86	6.000	27	GF	5	0	0.177

Resistor Storage
Field Experience

Resistor Classification	Resistor Type	Component Part Number	Quality	Ohms	Power Watts	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED WIREWOUND	RBR	FR196A	R	261	6.000	27	GF	65	0	2.632
FIXED WIREWOUND	RBR	FR261A	R	1	6.000	27	GF	3	0	0.136
FIXED WIREWOUND	RBR	FR464A	R	1	6.000	27	GF	3	0	0.136
FIXED WIREWOUND	RBR	G657215	R	1	2.500	27	GF	15	0	0.464
FIXED WIREWOUND	RBR	G657215	R	1	2.500	27	GF	10	0	0.187
FIXED WIREWOUND	RBR	G657215	R	1	2.500	27	GF	10	0	0.166
FIXED WIREWOUND	RBR	N/R	R	287	2.000	27	GF	11	0	0.310
FIXED WIREWOUND	RBR	DXM11.250+	R	11	10.000	27	GF	10	0	0.310
** FIXED WIREWOUND, Rw										
FIXED WIREWOUND	RW	N/R	MIL-SPEC	N/R	N/R	30	GF	0	0	36.000
FIXED WIREWOUND	RW	N/R	MIL-SPEC	N/R	N/R	25	GF	0	0	0.800
** FIXED WIREWOUND, RWR										
FIXED WIREWOUND	RWR	10182024	MIL-SPEC	N/R	0.660	18	GF	4284	0	68.059
FIXED WIREWOUND	RWR	VARIOUS	R	N/R	N/R	N/R	AIF	22088	2	570.910
FIXED WIREWOUND	RWR	10180328	R	N/R	3.000	18	GF	19278	1	306.265
FIXED WIREWOUND	RWR	10180329	R	N/R	5.500	18	GF	9639	0	153.133
FIXED WIREWOUND	RWR	10180709	R	N/R	2.000	18	GF	47124		748.647
** N/R, N/F										
N/R	N/R	C2493FA	R	249K	0.130	27	GF	10	0	0.958
** THERMISTOR (RTH), N/R										
THERMISTOR (RTH)	N/R	41TF53	MIL-SPEC	10K	0.700	20	GF	874	1	12.760
** VARIABLE (NOC), N/R										
VARIABLE (NOC)	N/R	N/R	LOWER	N/R	N/R	N/R	GF	0	4	300.000

Resistor Storage
Field Experience

Resistor Classification	Resistor Type	Component Part Number	Quality	Ohms	Power Watts	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
VARIABLE (NOC)	N/R	N/R	MIL-SPEC	N/R	N/R	25	GF	0	0	78.000
VARIABLE (NOC)	N/R	N/R	R	N/R	N/R	N/R	GF	0	0	11.000
** VARIABLE NON-WIREWOUND, N/R										
VARIABLE NON-WIREWOUND	N/R	960542		100K	N/R	N/R	GB	75284	0	659.490
VARIABLE NON-WIREWOUND	N/R	LA2N040525	MIL-SPEC	250K	0.500	20	GF	1748	0	25.521
** VARIABLE NON-WIREWOUND, RJ										
VARIABLE NON-WIREWOUND	RJ	240MR036G0	MIL-SPEC	N/R	1.000	20	GF	2622	0	38.281
VARIABLE NON-WIREWOUND	RJ	240MR067P0	MIL-SPEC	N/R	2.000	20	GF	1748	1	25.521
VARIABLE NON-WIREWOUND	RJ	34730A	MIL-SPEC	N/R	1.000	20	GF	874	0	12.760
VARIABLE NON-WIREWOUND	RJ	LA2H036550	MIL-SPEC	5K	0.500	20	GF	1748	0	25.521
VARIABLE NON-WIREWOUND	RJ	LW2N040S50	MIL-SPEC	500K	0.500	20	GF	1748	0	25.521
VARIABLE NON-WIREWOUND	RJ	2901PS979	R	10K	N/R	27	GF	10	0	0.144
VARIABLE NON-WIREWOUND	RJ	2901PS979	R	1K	N/R	27	GF	20	0	0.677
VARIABLE NON-WIREWOUND	RJ	2901PS979	R	2K	N/R	27	GF	10	0	0.288
VARIABLE NON-WIREWOUND	RJ	2901PS979	R	500	N/R	27	GF	5	0	0.202
VARIABLE NON-WIREWOUND	RJ	2901PS979	R	100	N/R	27	GF	20	0	0.684
VARIABLE NON-WIREWOUND	RJ	2901WS979	R	5K	N/R	27	GF	10	0	0.365
VARIABLE NON-WIREWOUND	RJ	2901WS979	R	10K	N/R	27	GF	25	0	0.869
VARIABLE NON-WIREWOUND	RJ	2901WS979	R	100	N/R	27	GF	10	0	0.259
** VARIABLE WIREWOUND, N/R										
VARIABLE WIREWOUND	N/R	N/R	MIL-SPEC	N/R	N/R	25	GF	0	0	28.000
VARIABLE WIREWOUND	N/R	N/R	MIL-SPEC	N/R	N/R	25	GF	0	0	25.000

Resistor Storage
Field Experience

Resistor Classification	Resistor Type	Component Part Number	Quality	Ohms	Power Watts	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
** VARIABLE WIREWOUND, RR										
VARIABLE WIREWOUND	RR	10177603	R	50K	1.000	18	GF	1071	0	17.015
VARIABLE WIREWOUND	RR	10180725	R	50K	1.000	18	GF	2142	0	34.029
VARIABLE WIREWOUND	RR	10182305	R	50K	1.000	18	GF	4284	0	68.059
** VARIABLE WIREWOUND, RTR										
VARIABLE WIREWOUND	RTR	M39015/03	R	N/R	N/R	N/R	AIF	8534	1	220.580

Resistor Summary

The following table presents the results of the nonoperating resistor data base data merge. The data from this summary table were derived directly from the proceeding detail data section. A merged data point was computed for all records which had identical part classifications, part types, application environments and quality levels. Part hours and failures were cumulated for components meeting these criteria. Field and predicted failure rates were derived for each merged data point. Predicted values were derived using a power cycling rate of zero in the resistor prediction model.

Resistor Field
Data Summary
Table

Resistor Type	Quality Level	Application Environment	Cumulative Part Hours	Number Failed	Field Failure Rate	Predicted Failure Rate
** RB						
RB	MIL-SPEC	GF	277.966	0	< 0.0032954	0.00287280
** RBR						
RBR	MIL-SPEC	GF	0.504	0	<< 1.8174603	0.00287280
RBR	R	AIF	233.550	0	< 0.0039221	0.00207480
RBR	R	GF	23.320	0	<< 0.0392796	0.00033516
** RC						
RC	MIL-SPEC	GF	4517.159	1	0.0002214	0.00043848
** RCR						
RCR	R	AIF	2893.500	0	< 0.0003166	0.00011466
RCR	R	GF	55.180	0	< 0.0166002	0.00005116
RCR	S	AIF	25.950	0	<< 0.0352987	0.00006142
** RJ						
RJ	MIL-SPEC	GF	127.604	1	0.0078367	0.03120000
RJ	R	GF	3.488	0	<< 0.2626147	0.00364000
** RLR						
RLR	M	AIF	12.975	0	<< 0.0705973	0.00095000
RLR	R	AIF	7979.700	0	< 0.0001148	0.00026600
RLR	R	GF	118.300	0	< 0.0077430	0.00006720
** RN						
RN	MIL-SPEC	GF	6086.690	0	< 0.0001505	0.00057600
RN	R	GF	6937.920	0	< 0.0001320	0.00006720

Resistor Field
Data Summary
Table

Resistor Type	Quality Level	Application Environment	Cumulative Part Hours	Number Failed	Field Failure Rate	Predicted Failure Rate
** RNC						
RNC	R	AIF	2348.500	18	0.0076645	0.00026600
** RNR						
RNR	MIL-SPEC	GF	0.324	0	<< 2.8271605	0.00057600
RNR	R	GF	12427.445	0	< 0.0000737	0.00006720
** RR						
RR	R	GF	119.103	0	< 0.0076908	0.00364000
** RTR						
RTR	R	AIF	220.580	1	0.0045335	0.00388080
** RW						
RW	MIL-SPEC	GF	36.800	0	<< 0.0248913	0.00287280
** RWR						
RWR	MIL-SPEC	GF	68.059	0	< 0.0134589	0.00287280
RWR	R	AIF	570.910	2	0.0035032	0.00207480
RWR	R	GF	1208.045	1	0.0008278	0.00033516

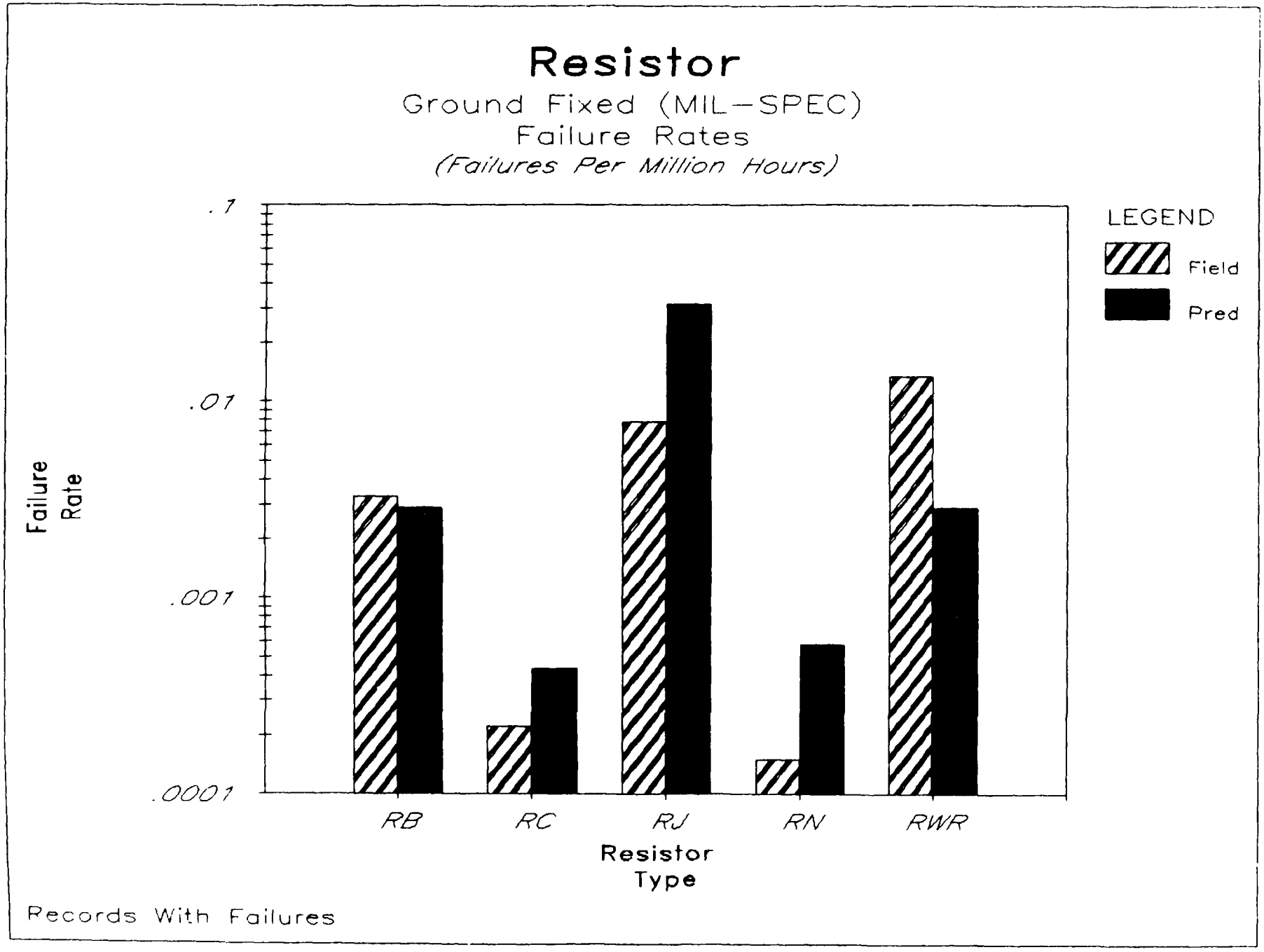

FIGURE R-1: RESISTOR FAILURE RATE VS. RESISTOR TYPE

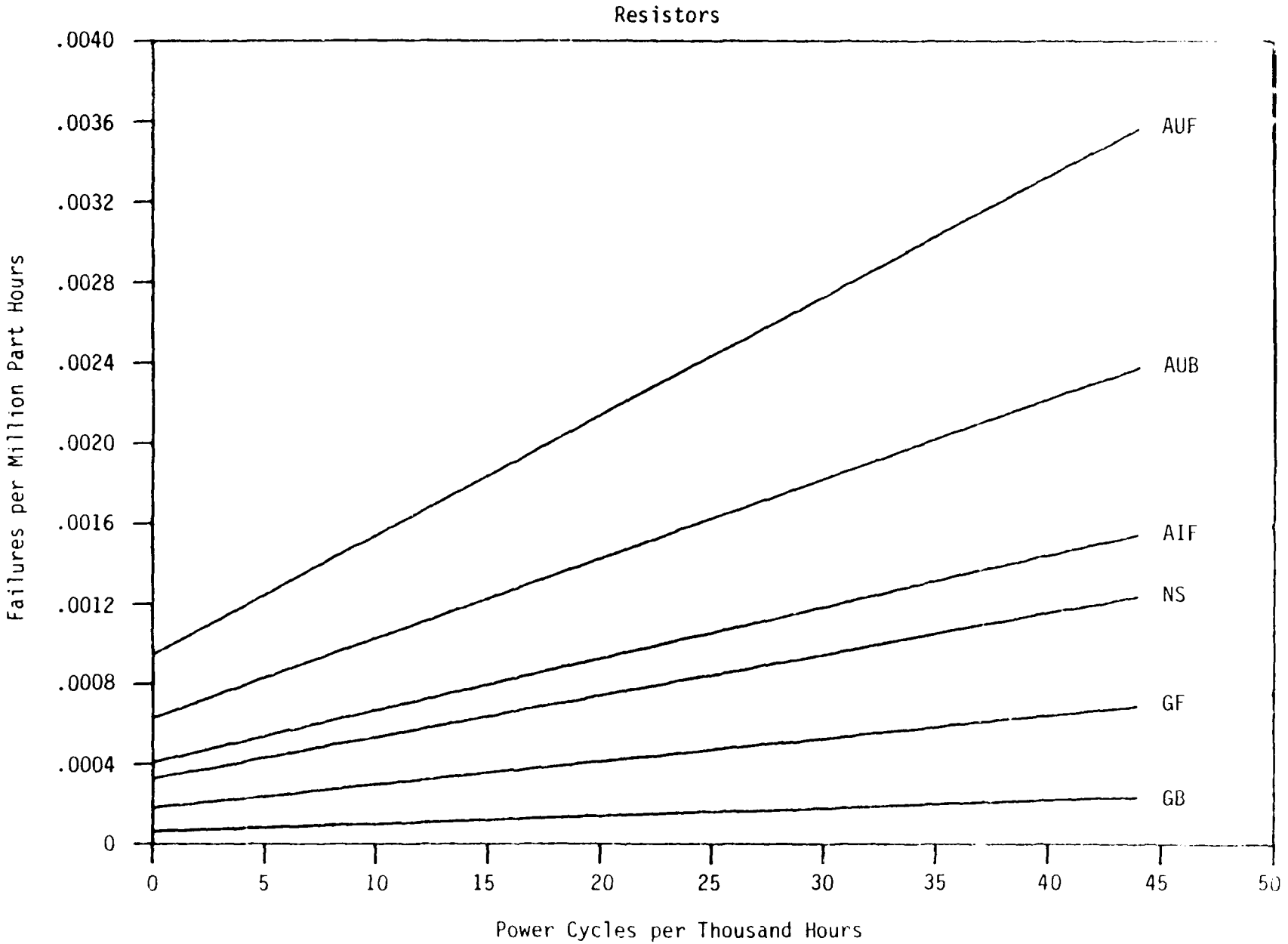

FIGURE R-2: RESISTOR PREDICTED FAILURE RATE V.. POWER CYCLING

Capacitors

Capacitor Data File Description

Field experience data on ceramic, electrolytic, glass, mica, paper/plastic and variable capacitors are outlined in this section. Data from the capacitor nonoperating field experience detail data section have been sorted and grouped according to their classification and part type. Individual records have been sorted by capacitor classification, capacitor type, quality, application environment and part number. Each capacitor data record consists of the following characteristic data fields:

- o Capacitor Classification: General description of the capacitor indicating its material and characteristics. This report presents data on fixed ceramic, electrolytic, glass, mica, paper/plastic and variable capacitors.

- o Capacitor Type: 2 or 3 digit code used to further describe the capacitor classifications. Table C-1 illustrates the capacitor type codes.

- o Package Seal: Indicates the type of seal used in packaging the capacitor. This will either be hermetic or non-hermetic for records where seal type could be determined.

TABLE C-1:
CAPACITOR CLASSIFICATIONS AND TYPES

Specification		Type
Paper/Plastic Film		
MIL-C-25	Capacitors, Fixed, Paper	CP
MIL-C-11693	Capacitors, Fixed, Paper, Metallized Paper, Metallized Plastic, RFI Feed-Thru, Established Reliability and Non-Established Reliability	CZ
MIL-C-12889	Capacitors, Fixed, Paper, RFI Bypass	CA
MIL-C-14157	Capacitors, Fixed, Paper-Plastic, Established Reliability	CPV
MIL-C-18312	Capacitors, Metallized Paper, Paper-Plastic, Plastic	CH
MIL-C-19978	Capacitors, Fixed, Plastic (or Paper-Plastic), Established and Non-Established Reliability	CQ/CQR
MIL-C-39022	Capacitors, Fixed, Metallized, Paper-Plastic Film or Plastic Film Dielectric, Established Reliability	CHR
MIL-C-55514	Capacitors, Plastic, Metallized Plastic, Established Reliability	CFR
MIL-C-83421	Capacitors, Super-Metallized Plastic, Established Reliability	CRH
Mica		
MIL-C-5	Capacitors, Fixed, Mica	CM
MIL-C-10950	Capacitors, Fixed, Mica, Button Sytle	CB
MIL-C-39001	Capacitors, Fixed, Mica, Established Reliability	CMR
Glass		
MIL-C-11272	Capacitors, Glass	CY
MIL-C-23269	Capacitors, Fixed, Glass, Established Reliability	CYR
Ceramic		
MIL-C-20	Capacitors, Fixed, Ceramic (Temperature Compensating)	CC/CCR
MIL-C-11015	Capacitors, Fixed, Ceramic (General Purpose)	CK
MIL-C-39014	Capacitors, Fixed, Ceramic (General Purpose), Established Reliability	CKR
Electrolytic		
MIL-C-62	Capacitors, Fixed, Electrolytic (DC, Aluminum, Dry Electrolyte, Polarized)	CE
MIL-C-3965	Capacitors, Fixed, Electrolytic (Non-solid Electrolyte), Tantalum	CL
MIL-C-39003	Capacitors, Fixed, Electrolytic, Tantalum, Solid Electrolyte, Established Reliability	CSR
MIL-C-39006	Capacitors, Fixed, Electrolytic, Tantalum, Non-solid Electrolyte, Established Reliability	CLR
MIL-C-39018	Capacitors, Fixed, Electrolytic, Aluminum Oxide	CU
Variable Capacitors		
MIL-C-81	Capacitors, Variable, Ceramic	CV
MIL-C-92	Capacitors, Air, Trimmer	CT
MIL-C-14409	Capacitors, Variable, Piston Type, Tubular Trimmer	PC
MIL-C-23183	Capacitors, Vacuum or Gas, Fixed and Variable	CG

- o Actual Temperature: Average temperature which the capacitor is exposed to during periods of non-operation. The actual temperature is given in degrees centigrade.

- o Quality: Codes which indicate the level of quality control a device has been subjected to. These codes are based on the level of testing the component received before being installed into a system. Quality levels are defined in the appropriate military specification. Table C-2 shows the various capacitor quality levels.

TABLE C-2:
CAPACITOR QUALITY LEVELS

Quality Levels
T
S
R
P
M
L
MIL-SPEC
Lower

Capacitor Storage
Field Experience

Capacitor Classification	Capacitor Type	Component Part Number	Quality	Package Seal	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
** FIXED, N/R									
FIXED	N/R	M83439/06	T	HERMETIC	N/R	AIF	2008	0	51.901
FIXED	N/R	235MR049P	T	N/R	20	GF	2622	0	38.281
FIXED	N/R	GA2-OUUFP0	T	N/R	20	GF	874	0	12.760
FIXED	N/R	NCJ794	T	N/R	20	GF	4370	0	53.802
** FIXED CERAMIC, CC									
FIXED CERAMIC	CC	10180778	L	N/R	N/R	GF	61047	0	989.838
FIXED CERAMIC	CC	10180779	L	N/R	N/R	GF	114597	0	1820.573
FIXED CERAMIC	CC	LA5C152RF	L	HERMETIC	27	GF	10	0	0.319
FIXED CERAMIC	CC	235MR337P0	MIL-SPEC	N/R	20	GF	874	0	12.760
** FIXED CERAMIC, CCR									
FIXED CERAMIC	CCR	10246815	L	HERMETIC	N/R	GF	39	0	1.118
FIXED CERAMIC	CCR	CCR05CF101FM	M	NON-HERMETIC	N/R	AIF	502	0	12.975
FIXED CERAMIC	CCR	CCR06CG103JM	M	NON-HERMETIC	N/R	AIF	1004	0	25.950
FIXED CERAMIC	CCR	CCR06CG153KM	M	NON-HERMETIC	N/R	AIF	502	0	12.975
FIXED CERAMIC	CCR	CCR75CG221JM	M	NON-HERMETIC	N/R	AIF	2008	1	51.901
FIXED CERAMIC	CCR	CCR75CG470JM	M	NON-HERMETIC	N/R	AIF	2008	2	51.901
FIXED CERAMIC	CCR	CCR75CG820JM	M	NON-HERMETIC	N/R	AIF	1004	1	25.950
FIXED CERAMIC	CCR	CCR76CG271JM	MIL-SPEC	NON-HERMETIC	N/R	AIF	1004	0	25.950
FIXED CERAMIC	CCR	CCR06CG103KM	N/R	NON-HERMETIC	N/R	AIF	502	0	12.975
FIXED CERAMIC	CCR	CCR06CG183JM	N/R	NON-HERMETIC	N/R	AIF	1004	0	25.950
FIXED CERAMIC	CCR	CCR75CG181JM	N/R	NON-HERMETIC	N/R	AIF	1004	2	25.950
** FIXED CERAMIC, CK									
FIXED CERAMIC	CK	10183503	L	N/R	N/R	GF	5355	0	85.074

Capacitor Storage
Field Experience

Capacitor Classification	Capacitor Type	Component Part Number	Quality	Package Seal	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED CERAMIC	CK	10183505	L	N/R	N/R	GF	58905	0	935.809
FIXED CERAMIC	CK	235MR075P	MIL-SPEC	N/R	20	GF	5244	0	76.562
FIXED CERAMIC	CK	235MR075P0	MIL-SPEC	N/R	20	GF	6118	0	89.323
FIXED CERAMIC	CK	235MR075P0	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED CERAMIC	CK	235MR075P0	MIL-SPEC	N/R	20	GF	4370	0	63.802
FIXED CERAMIC	CK	235MR075P0	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED CERAMIC	CK	235MR075P0	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED CERAMIC	CK	235MR075P0	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED CERAMIC	CK	235MR075P0	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED CERAMIC	CK	235MR075P0	MIL-SPEC	N/R	20	GF	7866	0	114.844
FIXED CERAMIC	CK	235MR075P0	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED CERAMIC	CK	235MR075P0	MIL-SPEC	N/R	20	GF	5244	0	76.562
FIXED CERAMIC	CK	235MR075P0	MIL-SPEC	N/R	20	GF	6992	0	102.083
FIXED CERAMIC	CK	235MR075P0	MIL-SPEC	N/R	20	GF	3496	0	51.042
FIXED CERAMIC	CK	235MR075P0	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED CERAMIC	CK	235MR134P0	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED CERAMIC	CK	235MR235P	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED CERAMIC	CK	235MR235P0	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED CERAMIC	CK	235MR235P0	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED CERAMIC	CK	235MR235P0	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED CERAMIC	CK	235MR235P0	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED CERAMIC	CK	235MR235P0	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED CERAMIC	CK	235MR235P0	MIL-SPEC	N/R	20	GF	1748	0	25.521

Capacitor Storage
Field Experience

Capacitor Classification	Capacitor Type	Component Part Number	Quality	Package Seal	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED CERAMIC	CK	235MR235P0	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED CERAMIC	CK	235MR235P0	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED CERAMIC	CK	235MR235P0	MIL-SPEC	N/R	20	GF	13110	0	191.406
FIXED CERAMIC	CK	235MR235P0	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED CERAMIC	CK	235MR235P0	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED CERAMIC	CK	C10A332K	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED CERAMIC	CK	C10A394J	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED CERAMIC	CK	C10A504K	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED CERAMIC	CK	C10B103J	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED CERAMIC	CK	C10B104J	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED CERAMIC	CK	C10B223J	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED CERAMIC	CK	C10B273K	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED CERAMIC	CK	C10B333K	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED CERAMIC	CK	C10B472J	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED CERAMIC	CK	C10B683K	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED CERAMIC	CK	CK06BX272K	MIL-SPEC	N/R	20	GF	37582	0	548.697
FIXED CERAMIC	CK	CK06CW390	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED CERAMIC	CK	CY10B333K	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED CERAMIC	CK	CY132C221J	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED CERAMIC	CK	CY13C101J	MIL-SPEC	N/R	20	GF	3496	0	51.042
FIXED CERAMIC	CK	CY13C620J	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED CERAMIC	CK	CY13CJ	MIL-SPEC	N/R	20	GF	4370	0	63.802
FIXED CERAMIC	CK	CY17C102J	MIL-SPEC	N/R	20	GF	2622	0	38.281

Capacitor Storage
Field Experience

Capacitor Classification	Capacitor Type	Component Part Number	Quality	Package Seal	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED CERAMIC	CK	CY17C301J	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED CERAMIC	CK	CY17C331J	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED CERAMIC	CK	CY17C511J	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED CERAMIC	CK	CY17C751J	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED CERAMIC	CK	CY17CJ	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED CERAMIC	CK	CY20C621J	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED CERAMIC	CK	CY22C122J	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED CERAMIC	CK	CY22G511J	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED CERAMIC	CK	CYK01BT332	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED CERAMIC	CK	N/R	MIL-SPEC	N/R	N/R	GF	N/R	3	729.000
FIXED CERAMIC	CK	N/R	MIL-SPEC	N/R	N/R	GF	N/R	0	18.000
FIXED CERAMIC	CK	235MR075P0	N/R	N/R	N/R	GF	874	0	12.760
** FIXED CERAMIC, CKR									
FIXED CERAMIC	CKR	10180326	L	N/R	N/R	GF	84609	0	1344.161
FIXED CERAMIC	CKR	10180327	L	N/R	N/R	GF	80325	0	1276.103
FIXED CERAMIC	CKR	10180704	L	N/R	N/R	GF	93177	1	1480.279
FIXED CERAMIC	CKR	10180753	L	N/R	N/R	GF	5355	1	85.074
FIXED CERAMIC	CKR	10182003	L	N/R	N/R	GF	5355	0	85.074
FIXED CERAMIC	CKR	10182087	L	N/R	N/R	GF	33201	0	527.456
FIXED CERAMIC	CKR	CK05B	L	HERMETIC	N/R	GF	117	0	3.355
FIXED CERAMIC	CKR	CK06B	L	HERMETIC	N/R	GF	117	0	3.355
FIXED CERAMIC	CKR	CKR06B	L	HERMETIC	N/R	GF	156	0	4.473
FIXED CERAMIC	CKR	G657113	L	HERMETIC	N/R	GF	36888	0	449.143

Capacitor Storage
Field Experience

Capacitor Classification	Capacitor Type	Component Part Number	Quality	Package Seal	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED CERAMIC	CKR	G657114	L	HERMETIC	N/R	GF	24009	0	292.330
FIXED CERAMIC	CKR	G657173	L	HERMETIC	N/R	GF	11925	0	145.197
FIXED CERAMIC	CKR	G657173-12	L	HERMETIC	27	GF	10	0	0.317
FIXED CERAMIC	CKR	G657327	L	HERMETIC	N/R	GF	1113	0	13.552
FIXED CERAMIC	CKR	M39014	L	HERMETIC	N/R	GF	6000	0	131.400
FIXED CERAMIC	CKR	M39014	L	HERMETIC	N/R	GF	200790	0	1997.230
FIXED CERAMIC	CKR	MIS13295	L	HERMETIC	N/R	GF	39	0	1.118
FIXED CERAMIC	CKR	MIS13296	L	HERMETIC	N/R	GF	117	0	3.355
FIXED CERAMIC	CKR	N/R	L	HERMETIC	N/R	GF	795	0	9.680
FIXED CERAMIC	CKR	N/R	L	HERMETIC	N/R	GF	N/R	2	3103.000
FIXED CERAMIC	CKR	M39014/02	N/R	N/R	N/R	AIF	58232	2	1505.100
FIXED CERAMIC	CKR	M39014/03	N/R	HERMETIC	N/R	AIF	10040	0	259.500
FIXED CERAMIC	CKR	M39014/05	N/R	N/R	N/R	AIF	68774	2	1776.600
FIXED CERAMIC	CKR	M39014/01	R	N/R	N/R	AIF	37650	4	97.314
** FIXED CERAMIC, N/R									
FIXED CERAMIC	N/R	N/R	L	HERMETIC	N/R	GF	N/R	0	82.000
FIXED CERAMIC	N/R	N/R	L	HERMETIC	N/R	GF	N/R	0	518.000
FIXED CERAMIC	N/R	N/R	LOWER	NON-HERMETIC	N/R	GF	N/R	0	1657.000
FIXED CERAMIC	N/R	N/R	MIL-SPEC	HERMETIC	28	GF	N/R	1	25.000
FIXED CERAMIC	N/R	N/R	MIL-SPEC	HERMETIC	18	GF	N/R	0	835.000
FIXED CERAMIC	N/R	N/R	MIL-SPEC	HERMETIC	25	GF	N/R	5	1637.000
FIXED CERAMIC	N/R	N/R	T	HERMETIC	25	GF	N/R	0	84.000

Capacitor Storage
Field Experience

Capacitor Classification	Capacitor Type	Component Part Number	Quality	Package Seal	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
** FIXED ELECTROLYTIC, CL									
FIXED ELECTROLYTIC	CL	N/R	L	HERMETIC	N/R	GF	N/R	4	430.000
FIXED ELECTROLYTIC	CL	122D405C31	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED ELECTROLYTIC	CL	130D406C20	MIL-SPEC	N/R	20	GF	3496	0	51.042
FIXED ELECTROLYTIC	CL	130D805C20	MIL-SPEC	N/R	20	GF	5244	0	76.562
FIXED ELECTROLYTIC	CL	130D805C20	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED ELECTROLYTIC	CL	140D605X03	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED ELECTROLYTIC	CL	151N1400-1	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED ELECTROLYTIC	CL	235MR273P0	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED ELECTROLYTIC	CL	235MR273P0	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED ELECTROLYTIC	CL	235MR273P0	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED ELECTROLYTIC	CL	235MR314P0	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED ELECTROLYTIC	CL	235MT398P0	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED ELECTROLYTIC	CL	29F1606	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED ELECTROLYTIC	CL	29F2134	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED ELECTROLYTIC	CL	29F7014	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED ELECTROLYTIC	CL	405T304P0J	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED ELECTROLYTIC	CL	CL10BT040T	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED ELECTROLYTIC	CL	CL10DR080T	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED ELECTROLYTIC	CL	CL14DR250U	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED ELECTROLYTIC	CL	CL31CQ050M	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED ELECTROLYTIC	CL	CL32CD350M	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED ELECTROLYTIC	CL	CL33B0010M	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED ELECTROLYTIC	CL	CL65CC250K	MIL-SPEC	N/R	20	GF	874	0	12.760

Capacitor Storage
Field Experience

Capacitor Classification	Capacitor Type	Component Part Number	Quality	Package Seal	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED ELECTROLYTIC	CL	CL65CG101K	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED ELECTROLYTIC	CL	CL65CH080K	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED ELECTROLYTIC	CL	CL65CK040K	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED ELECTROLYTIC	CL	CL65CK500K	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED ELECTROLYTIC	CL	CL65CL150K	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED ELECTROLYTIC	CL	CL65CL3R5K	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED ELECTROLYTIC	CL	CL65CP090K	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED ELECTROLYTIC	CL	CL65CP1R7K	MIL-SPEC	N/R	20	GF	5244	0	76.562
FIXED ELECTROLYTIC	CL	CL65CP250K	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED ELECTROLYTIC	CL	N/R	MIL-SPEC	HERMETIC	25	GF	N/R	3	560.000
FIXED ELECTROLYTIC	CL	N/R	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED ELECTROLYTIC	CL	N/R	MIL-SPEC	N/R	N/R	GF	N/R	2	0.800
FIXED ELECTROLYTIC	CL	XTH25E	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED ELECTROLYTIC	CL	XTK40ST170	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED ELECTROLYTIC	CL	XTL60SU360	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED ELECTROLYTIC	CL	XTM40ST305	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED ELECTROLYTIC	CL	XTM40ST340	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED ELECTROLYTIC	CL	XTM8D5T170	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED ELECTROLYTIC	CL	XTV306T360	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED ELECTROLYTIC	CL	XTV757T060	MIL-SPEC	N/R	20	GF	874	0	12.760
** FIXED ELECTROLYTIC, CLR									
FIXED ELECTROLYTIC	CLR	CL65B	L	HERMETIC	N/R	GF	507	2	14.539
FIXED ELECTROLYTIC	CLR	CL65C	L	HERMETIC	N/R	GF	39	0	1.118

Capacitor Storage
Field Experience

Capacitor Classification	Capacitor Type	Component Part Number	Quality	Package Seal	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED ELECTROLYTIC	CLR	G739265	L	HERMETIC	N/R	GF	1272	0	15.488
FIXED ELECTROLYTIC	CLR	N/R	L	HERMETIC	N/R	GF	N/R	0	145.000
FIXED ELECTROLYTIC	CLR	N/R	MIL-SPEC	N/R	N/R	GF	N/R	0	8.000
** FIXED ELECTROLYTIC, CSR									
FIXED ELECTROLYTIC	CSR	10084347	L	HERMETIC	N/R	GF	360	0	7.884
FIXED ELECTROLYTIC	CSR	10180309	L	N/R	N/R	GF	80325	0	1276.103
FIXED ELECTROLYTIC	CSR	1018037	L	N/R	N/R	GF	86751	0	1378.191
FIXED ELECTROLYTIC	CSR	10180761	L	N/R	N/R	GF	80325	0	1276.103
FIXED ELECTROLYTIC	CSR	11301075-1	L	HERMETIC	27	GF	10	0	0.259
FIXED ELECTROLYTIC	CSR	11301075-3	L	HERMETIC	27	GF	10	0	0.410
FIXED ELECTROLYTIC	CSR	CSR13D	L	HERMETIC	N/R	GF	156	0	4.473
FIXED ELECTROLYTIC	CSR	CSR13F	L	HERMETIC	N/R	GF	78	0	2.237
FIXED ELECTROLYTIC	CSR	CSR13G	L	HERMETIC	N/R	GF	39	0	1.118
FIXED ELECTROLYTIC	CSR	G657119-1	L	HERMETIC	27	GF	5	0	0.205
FIXED ELECTROLYTIC	CSR	G657119-13	L	HERMETIC	27	GF	10	0	0.310
FIXED ELECTROLYTIC	CSR	G657119-13	L	HERMETIC	27	GF	10	0	0.252
FIXED ELECTROLYTIC	CSR	G657119-2	L	HERMETIC	27	GF	10	0	0.425
FIXED ELECTROLYTIC	CSR	G657119-3	L	HERMETIC	27	GF	20	0	0.641
FIXED ELECTROLYTIC	CSR	G657119-4	L	HERMETIC	27	GF	10	0	0.418
FIXED ELECTROLYTIC	CSR	G657119-5	L	HERMETIC	27	GF	20	0	0.590
FIXED ELECTROLYTIC	CSR	G657119-5	L	HERMETIC	27	GF	20	0	0.742
FIXED ELECTROLYTIC	CSR	G657119-6	L	HERMETIC	27	GF	20	0	0.518
FIXED ELECTROLYTIC	CSR	G657119-7	L	HERMETIC	27	GF	5	0	0.238

Capacitor Storage
Field Experience

Capacitor Classification	Capacitor Type	Component Part Number	Quality	Package Seal	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED ELECTROLYTIC	CSR	G657120	L	HERMETIC	N/R	GF	3180	0	38.719
FIXED ELECTROLYTIC	CSR	G657120-1	L	HERMETIC	27	GF	20	0	0.835
FIXED ELECTROLYTIC	CSR	G657120-1	L	HERMETIC	27	GF	10	0	0.439
FIXED ELECTROLYTIC	CSR	G657120-10	L	HERMETIC	27	GF	10	0	0.454
FIXED ELECTROLYTIC	CSR	G657120-17	L	HERMETIC	27	GF	10	0	0.425
FIXED ELECTROLYTIC	CSR	G657120-17	L	HERMETIC	27	GF	10	0	0.324
FIXED ELECTROLYTIC	CSR	G657120-3	L	HERMETIC	27	GF	10	0	0.410
FIXED ELECTROLYTIC	CSR	G657120-5	L	HERMETIC	27	GF	10	0	0.209
FIXED ELECTROLYTIC	CSR	G657121	L	HERMETIC	N/R	GF	1908	0	23.232
FIXED ELECTROLYTIC	CSR	G657121-1	L	HERMETIC	27	GF	20	0	0.425
FIXED ELECTROLYTIC	CSR	G657121-11	L	HERMETIC	27	GF	20	0	0.598
FIXED ELECTROLYTIC	CSR	G657121-2	L	HERMETIC	27	GF	10	0	0.374
FIXED ELECTROLYTIC	CSR	G657121-7	L	HERMETIC	27	GF	30	0	0.900
FIXED ELECTROLYTIC	CSR	G657124-4	L	HERMETIC	27	GF	10	0	0.367
FIXED ELECTROLYTIC	CSR	G657314-1	L	HERMETIC	27	GF	20	0	0.655
FIXED ELECTROLYTIC	CSR	G657314-1	L	HERMETIC	27	GF	10	0	0.410
FIXED ELECTROLYTIC	CSR	G657314-3	L	HERMETIC	27	GF	10	0	0.346
FIXED ELECTROLYTIC	CSR	G657314-7	L	HERMETIC	27	GF	10	0	0.314
FIXED ELECTROLYTIC	CSR	G657315-1	L	HERMETIC	27	GF	10	0	0.425
FIXED ELECTROLYTIC	CSR	G657315-3	L	HERMETIC	27	GF	10	0	0.342
FIXED ELECTROLYTIC	CSR	G657315-5	L	HERMETIC	27	GF	10	0	0.339
FIXED ELECTROLYTIC	CSR	M39003	L	HERMETIC	N/R	GF	2520	0	55.188
FIXED ELECTROLYTIC	CSR	M39003	L	HERMETIC	N/R	GF	428490	0	4262.130

Capacitor Storage
Field Experience

Capacitor Classification	Capacitor Type	Component Part Number	Quality	Package Seal	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED ELECTROLYTIC	CSR	N/R	L	HERMETIC	N/R	GF	N/R	2	2612.000
FIXED ELECTROLYTIC	CSR	N/R	L	HERMETIC	N/R	GF	N/R	1	2030.000
FIXED ELECTROLYTIC	CSR	N/R	L	HERMETIC	N/R	GF	N/R	0	5.000
FIXED ELECTROLYTIC	CSR	N/R	L	HERMETIC	N/R	GF	57960	0	576.520
FIXED ELECTROLYTIC	CSR	N/R	LOWER	N/R	N/R	GF	N/R	0	4.000
FIXED ELECTROLYTIC	CSR	CSR13G126K	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED ELECTROLYTIC	CSR	CSR13G186K	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED ELECTROLYTIC	CSR	G657119	MIL-SPEC	N/R	N/R	GF	2226	0	27.103
FIXED ELECTROLYTIC	CSR	N/R	MIL-SPEC	HERMETIC	25	GF	N/R	2	855.000
FIXED ELECTROLYTIC	CSR	N/R	MIL-SPEC	HERMETIC	25	GF	N/R	0	46.000
FIXED ELECTROLYTIC	CSR	N/R	MIL-SPEC	HERMETIC	18	GF	N/R	1	27.000
FIXED ELECTROLYTIC	CSR	N/R	MIL-SPEC	HERMETIC	28	GF	N/R	1	42.000
FIXED ELECTROLYTIC	CSR	M39003/01	N/R	N/R	N/R	AIF	26602	1	687.680
FIXED ELECTROLYTIC	CSR	M39003/03	N/R	N/R	N/R	AIF	12550	1	324.380
** FIXED ELECTROLYTIC, CU									
FIXED ELECTROLYTIC	CU	11301074-1	L	HERMETIC	27	GF	10	0	0.302
FIXED ELECTROLYTIC	CU	11301074-1	L	HERMETIC	27	GF	10	0	0.158
FIXED ELECTROLYTIC	CU	11301074-3	L	HERMETIC	27	GF	10	0	0.403
FIXED ELECTROLYTIC	CU	11301074-3	L	HERMETIC	27	GF	3	0	0.127
FIXED ELECTROLYTIC	CU	11301074-7	L	HERMETIC	27	GF	20	0	0.496
FIXED ELECTROLYTIC	CU	11301074-9	L	HERMETIC	27	GF	10	0	0.281
** FIXED ELECTROLYTIC, N/R									
FIXED ELECTROLYTIC	N/R	N/R	LOWER	NON-HERMETIC	N/R	GF	N/R	0	425.000

Capacitor Storage
Field Experience

Capacitor Classification	Capacitor Type	Component Part Number	Quality	Package Seal	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED ELECTROLYTIC	N/R	N/R	MIL-SPEC	HERMETIC	18	GF	N/R	1	225.000
FIXED ELECTROLYTIC	N/R	N/R	MIL-SPEC	HERMETIC	18	GF	N/R	8	1072.000
FIXED ELECTROLYTIC	N/R	N/R	MIL-SPEC	HERMETIC	N/R	GF	N/R	0	20.000
FIXED ELECTROLYTIC	N/R	N/R	MIL-SPEC	HERMETIC	25	GF	N/R	0	69.000
** FIXED GLASS, CY									
FIXED GLASS	CY	N/R	MIL-SPEC	N/R	N/R	GF	N/R	0	5.000
** FIXED GLASS, CYR									
FIXED GLASS	CYR	G657020	L	HERMETIC	N/R	GF	5883	0	71.631
FIXED GLASS	CYR	G657022-1	L	HERMETIC	27	GF	10	0	0.194
FIXED GLASS	CYR	G657022-17	L	HERMETIC	27	GF	10	0	0.410
FIXED GLASS	CYR	N/R	L	HERMETIC	N/R	GF	N/R	0	295.000
FIXED GLASS	CYR	235MR055P	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED GLASS	CYR	235MR055P0	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED GLASS	CYR	235MR055P0	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED GLASS	CYR	235MR055P0	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED GLASS	CYR	235MR055P0	MIL-SPEC	N/R	20	GF	6992	0	102.083
FIXED GLASS	CYR	235MR055P0	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED GLASS	CYR	235MR056P0	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED GLASS	CYR	235MR056P0	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED GLASS	CYR	235MR056P0	MIL-SPEC	N/R	20	GF	3496	0	51.042
FIXED GLASS	CYR	235MR056P1	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED GLASS	CYR	235MR056P1	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED GLASS	CYR	235MR056P1	MIL-SPEC	N/R	20	GF	6118	0	89.323

Capacitor Storage
Field Experience

Capacitor Classification	Capacitor Type	Component Part Number	Quality	Package Seal	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED GLASS	CYR	235MR085P0	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED GLASS	CYR	235MR085P0	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED GLASS	CYR	CY10C100C	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED GLASS	CYR	CY10C101J	MIL-SPEC	N/R	20	GF	6118	0	25.521
FIXED GLASS	CYR	CY10C201J	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED GLASS	CYR	CY10C221J	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED GLASS	CYR	CY10C241J	MIL-SPEC	N/R	20	GF	6992	0	102.083
FIXED GLASS	CYR	CY10C470G	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED GLASS	CYR	CY10C510G	MIL-SPEC	N/R	20	GF	6118	0	89.323
FIXED GLASS	CYR	CY10C510J	MIL-SPEC	N/R	20	GF	3496	0	51.042
FIXED GLASS	CYR	CY10C5R1C	MIL-SPEC	N/R	2(	GF	874	0	12.760
FIXED GLASS	CYR	CY10C620J	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED GLASS	CYR	CY10C750J	MIL-SPEC	N/R	20	GF	4370	0	63.802
FIXED GLASS	CYR	CY10C910G	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED GLASS	CYR	CY10CJ	MIL-SPEC	N/R	20	GF	6118	0	89.323
FIXED GLASS	CYR	CY15C102J	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED GLASS	CYR	CY15C112G	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED GLASS	CYR	CY15C122J	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED GLASS	CYR	CY15C301J	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED GLASS	CYR	CY15C331J	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED GLASS	CYR	CY15C511J	MIL-SPEC	N/R	20	GF	5244	0	76.562
FIXED GLASS	CYR	CY15C751J	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED GLASS	CYR	M23269/01	N/R	N/R	N/R	AIF	1004	0	25.950

Capacitor Storage
Field Experience

Capacitor Classification	Capacitor Type	Component Part Number	Quality	Package Seal	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
** FIXED GLASS, N/R									
FIXED GLASS	N/R	N/R	MIL-SPEC	HERMETIC	25	GF	N/R	0	1.000
** FIXED MICA, CM									
FIXED MICA	CM	10180331	L	N/R	N/R	GF	50337	0	799.691
FIXED MICA	CM	10180332	L	N/R	N/R	GF	34272	0	544.470
FIXED MICA	CM	10180772	L	N/R	N/R	GF	23562	0	374.323
FIXED MICA	CM	CM06FD	L	HERMETIC	N/R	GF	39	0	1.118
FIXED MICA	CM	N/R	L	HERMETIC	N/R	GF	N/R	0	12.000
FIXED MICA	CM	235MR328P	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED MICA	CM	235MR328P0	MIL-SPEC	N/R	20	GF	2622	0	38.281
FIXED MICA	CM	235MR328P1	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED MICA	CM	235MR328P2	MIL-SPEC	N/R	20	GF	3496	0	51.042
FIXED MICA	CM	CM15FD101J	MIL-SPEC	N/R	20	GF	4370	0	6.380
FIXED MICA	CM	CM15FD111J	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED MICA	CM	CM15FD201J	MIL-SPEC	N/R	20	GF	874	0	1.276
FIXED MICA	CM	CM15FD241J	MIL-SPEC	N/R	20	GF	6992	0	102.083
FIXED MICA	CM	CM15FD301J	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED MICA	CM	CM15FD331J	MIL-SPEC	N/R	20	GF	1748	0	25.520
FIXED MICA	CM	CM15FDJ	MIL-SPEC	N/R	20	GF	2622	0	38.281
FIXED MICA	CM	CM15FDS11J	MIL-SPEC	N/R	20	GF	5244	0	76.562
FIXED MICA	CM	CM20FD102J	MIL-SPEC	N/R	20	GF	6118	0	89.329
FIXED MICA	CM	CM20FD122J	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED MICA	CM	N/R	MIL-SPEC	N/R	N/R	GF	N/R	0	297.000

Capacitor Storage
Field Experience

Capacitor Classification	Capacitor Type	Component Part Number	Quality	Package Seal	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
** FIXED MICA, CMR									
FIXED MICA	CMR	01714-G657	L	HERMETIC	27	GF	5	0	0.151
FIXED MICA	CMR	01714-G657	L	HERMETIC	27	GF	5	0	0.115
FIXED MICA	CMR	01714-G657	L	HERMETIC	27	GF	5	0	0.043
FIXED MICA	CMR	01714-G657	L	HERMETIC	27	GF	5	0	0.115
FIXED MICA	CMR	01714-G657	L	HERMETIC	27	GF	5	0	0.162
FIXED MICA	CMR	01714-G657	L	HERMETIC	27	GF	5	0	0.079
FIXED MICA	CMR	01714-G657	L	HERMETIC	27	GF	5	0	0.104
FIXED MICA	CMR	10163099	L	HERMETIC	N/R	GF	78	0	2.237
FIXED MICA	CMR	10189342	L	HERMETIC	N/R	GF	3000	0	65.700
FIXED MICA	CMR	11301017	L	HERMETIC	N/R	GF	159	0	1.936
FIXED MICA	CMR	11301018	L	HERMETIC	N/R	GF	159	0	1.936
FIXED MICA	CMR	221M173	L	HERMETIC	27	GF	36	0	1.228
FIXED MICA	CMR	CER1A341SP	L	HERMETIC	27	GF	15	0	0.461
FIXED MICA	CMR	CM20FD	L	HERMETIC	N/R	GF	39	0	1.118
FIXED MICA	CMR	G657115	L	HERMETIC	N/R	GF	6519	1	79.374
FIXED MICA	CMR	G657119-14	L	HERMETIC	27	GF	10	0	0.418
FIXED MICA	CMR	G657361	L	HERMETIC	N/R	GF	11766	0	143.261
FIXED MICA	CMR	G657372	L	HERMETIC	N/R	GF	159	0	1.936
FIXED MICA	CMR	G657389	L	HERMETIC	N/R	GF	159	0	1.936
FIXED MICA	CMR	M5	L	HERMETIC	N/R	GF	99360	0	988.320
FIXED MICA	CMR	N/R	L	HERMETIC	N/R	GF	N/R	0	0.400
FIXED MICA	CMR	N/R	L	HERMETIC	N/R	GF	N/R	1	354.000

Capacitor Storage
Field Experience

Capacitor Classification	Capacitor Type	Component Part Number	Quality	Package Seal	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED MICA	CMR	N/R	L	HERMETIC	N/R	GF	N/R	0	9.000
FIXED MICA	CMR	N/R	L	HERMETIC	N/R	GF	24840	0	247.080
** FIXED MICA, N/R									
FIXED MICA	N/R	N/R	MIL-SPEC	HERMETIC	25	GF	N/R	0	87.000
FIXED MICA	N/R	N/R	MIL-SPEC	HERMETIC	25	GF	N/R	0	30.000
** FIXED PAPER/PLASTIC, CFR									
FIXED PAPER/PLASTIC	CFR	910102-232	L	HERMETIC	N/R	GF	8280	1	82.360
** FIXED PAPER/PLASTIC, CHR									
FIXED PAPER/PLASTIC	CHR	10163179	L	HERMETIC	N/R	GF	39	0	1.118
FIXED PAPER/PLASTIC	CHR	10164134	L	HERMETIC	N/R	GF	351	0	10.065
FIXED PAPER/PLASTIC	CHR	10164380	L	HERMETIC	N/R	GF	39	0	1.118
FIXED PAPER/PLASTIC	CHR	10245669	L	HERMETIC	N/R	GF	117	0	3.355
FIXED PAPER/PLASTIC	CHR	M39022	L	HERMETIC	N/R	GF	18630	0	185.310
FIXED PAPER/PLASTIC	CHR	MIS13297-1	L	HERMETIC	N/R	GF	507	0	14.539
FIXED PAPER/PLASTIC	CHR	MIS13300-1	L	HERMETIC	N/R	GF	78	0	2.237
FIXED PAPER/PLASTIC	CHR	N/R	L	HERMETIC	N/R	GF	N/R	1	24.000
** FIXED PAPER/PLASTIC, CP									
FIXED PAPER/PLASTIC	CP	195P104925	L	HERMETIC	27	GF	20	0	0.598
FIXED PAPER/PLASTIC	CP	195P105945	L	HERMETIC	27	GF	10	0	0.403
FIXED PAPER/PLASTIC	CP	195P474945	L	HERMETIC	27	GF	5	0	0.220
FIXED PAPER/PLASTIC	CP	235MR319P0	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED PAPER/PLASTIC	CP	235MT015P	MIL-SPEC	N/R	20	GF	2622	0	38.281
FIXED PAPER/PLASTIC	CP	96P10296S2	MIL-SPEC	N/R	20	GF	874	0	12.760

Capacitor Storage
Field Experience

Capacitor Classification	Capacitor Type	Component Part Number	Quality	Package Seal	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED PAPER/PLASTIC	CP	96P1039252	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED PAPER/PLASTIC	CP	96P10393S2	MIL-SPEC	N/R	20	GF	2622	1	38.281
FIXED PAPER/PLASTIC	CP	96P1039452	MIL-SPEC	N/R	20	GF	6118	0	89.323
FIXED PAPER/PLASTIC	CP	96P1049152	MIL-SPEC	N/R	20	GF	3496	0	51.042
FIXED PAPER/PLASTIC	CP	96P15392S2	MIL-SPEC	N/R	20	GF	874	1	12.760
FIXED PAPER/PLASTIC	CP	96P1539352	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED PAPER/PLASTIC	CP	96P1549352	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED PAPER/PLASTIC	CP	96P2229652	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED PAPER/PLASTIC	CP	96P2239252	MIL-SPEC	N/R	20	GF	2622	0	38.281
FIXED PAPER/PLASTIC	CP	96P2239652	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED PAPER/PLASTIC	CP	96P22491S2	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED PAPER/PLASTIC	CP	96P2739452	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED PAPER/PLASTIC	CP	96P33396S2	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED PAPER/PLASTIC	CP	96P33491S2	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED PAPER/PLASTIC	CP	96P339452	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED PAPER/PLASTIC	CP	96P47296S2	MIL-SPEC	N/R	20	GF	2622	1	38.281
FIXED PAPER/PLASTIC	CP	96P47393S2	MIL-SPEC	N/R	20	GF	4370	0	63.802
FIXED PAPER/PLASTIC	CP	96P56296S2	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED PAPER/PLASTIC	CP	96P56394S2	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED PAPER/PLASTIC	CP	96P68296S2	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED PAPER/PLASTIC	CP	96P68393S2	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED PAPER/PLASTIC	CP	96P68493S2	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED PAPER/PLASTIC	CP	96P82393S2	MIL-SPEC	N/R	20	GF	874	0	12.760

Capacitor Storage
Field Experience

Capacitor Classification	Capacitor Type	Component Part Number	Quality	Package Seal	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED PAPER/PLASTIC	CP	N/R	MIL-SPEC	N/R	N/R	GF	N/R	0	0.100
** FIXED PAPER/PLASTIC, CPV									
FIXED PAPER/PLASTIC	CPV	M14157	L	HERMETIC	N/R	GF	6210	0	61.770
FIXED PAPER/PLASTIC	CPV	N/R	L	HERMETIC	N/R	GF	12420	0	123.540
FIXED PAPER/PLASTIC	CPV	196P103515	MIL-SPEC	N/R	20	GF	3496	0	51.042
FIXED PAPER/PLASTIC	CPV	196P103915	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED PAPER/PLASTIC	CPV	196P104915	MIL-SPEC	N/R	20	GF	3496	0	51.042
FIXED PAPER/PLASTIC	CPV	196P122965	MIL-SPEC	N/R	20	GF	3496	0	51.042
FIXED PAPER/PLASTIC	CPV	196P124515	MIL-SPEC	N/R	20	GF	1748	1	25.521
FIXED PAPER/PLASTIC	CPV	196P153515	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED PAPER/PLASTIC	CPV	196P154915	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED PAPER/PLASTIC	CPV	196P182515	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED PAPER/PLASTIC	CPV	196P223535	MIL-SPEC	N/R	20	GF	2622	0	38.281
FIXED PAPER/PLASTIC	CPV	196P332915	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED PAPER/PLASTIC	CPV	196P334515	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED PAPER/PLASTIC	CPV	196P334915	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED PAPER/PLASTIC	CPV	196P39293S	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED PAPER/PLASTIC	CPV	196P473515	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED PAPER/PLASTIC	CPV	196P473915	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED PAPER/PLASTIC	CPV	196P683925	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED PAPER/PLASTIC	CPV	196P823915	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED PAPER/PLASTIC	CPV	235MR015P	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED PAPER/PLASTIC	CPV	235MR019P	MIL-SPEC	N/R	20	GF	874	0	12.760

Capacitor Storage
Field Experience

Capacitor Classification	Capacitor Type	Component Part Number	Quality	Package Seal	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED PAPER/PLASTIC	CPV	235MR019P0	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED PAPER/PLASTIC	CPV	235MR019P0	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED PAPER/PLASTIC	CPV	CP041KC684	MIL-SPEC	N/R	20	GF	874	0	12.750
FIXED PAPER/PLASTIC	CPV	CP04A1KB10	MIL-SPEC	N/R	20	GF	1748	1	25.521
FIXED PAPER/PLASTIC	CPV	CP04A1KB15	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED PAPER/PLASTIC	CPV	CP04A1KB22	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED PAPER/PLASTIC	CPV	CP04A1KC22	MIL-SPEC	N/R	20	GF	4370	1	63.802
FIXED PAPER/PLASTIC	CPV	CP04A1KC33	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED PAPER/PLASTIC	CPV	CP04A1KE10	MIL-SPEC	N/R	20	GF	8740	0	127.604
FIXED PAPER/PLASTIC	CPV	CP04A1KE15	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED PAPER/PLASTIC	CPV	CP04A1KE22	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED PAPER/PLASTIC	CPV	CP04A1KE22	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED PAPER/PLASTIC	CPV	CP04A1KF10	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED PAPER/PLASTIC	CPV	CP04A1KF23	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED PAPER/PLASTIC	CPV	CP04A1KF47	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED PAPER/PLASTIC	CPV	CP04A1KF56	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED PAPER/PLASTIC	CPV	CP04A1KF82	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED PAPER/PLASTIC	CPV	CP05A1KE56	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED PAPER/PLASTIC	CPV	CP08A1K	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED PAPER/PLASTIC	CPV	CP08A1KB10	MIL-SPEC	N/R	20	GF	2622	0	38.281
FIXED PAPER/PLASTIC	CPV	CP08A1KB22	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED PAPER/PLASTIC	CPV	CP08A1KB47	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED PAPER/PLASTIC	CPV	CP08A1KE	MIL-SPEC	N/R	20	GF	874	0	12.760

Capacitor Storage
Field Experience

Capacitor Classification	Capacitor Type	Component Part Number	Quality	Package Seal	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
FIXED PAPER/PLASTIC	CPV	CP08A1KF10	MIL-SPEC	N/R	20	GF	1748	0	25.521
FIXED PAPER/PLASTIC	CPV	LMR9A1E124	MIL-SPEC	N/R	20	GF	874	0	12.760
FIXED PAPER/PLASTIC	CPV	XHF2518NFT	MIL-SPEC	N/R	20	GF	2622	0	38.281
** FIXED PAPER/PLASTIC, CQ									
FIXED PAPER/PLASTIC	CQ	10180330	L	N/R	N/R	GF	35343	0	561.485
FIXED PAPER/PLASTIC	CQ	10182321	L	N/R	N/R	GF	5355	0	85.074
FIXED PAPER/PLASTIC	CQ	N/R	L	HERMETIC	N/R	GF	N/R	0	10.000
** FIXED PAPER/PLASTIC, CQR									
FIXED PAPER/PLASTIC	CQR	10084348	L	HERMETIC	N/R	GF	2520	1	55.188
FIXED PAPER/PLASTIC	CQR	MIS13707/1	L	HERMETIC	N/R	GF	240	0	5.256
FIXED PAPER/PLASTIC	CQR	MIS13708/1	L	HERMETIC	N/R	GF	120	0	2.628
** FIXED PAPER/PLASTIC, CZ									
FIXED PAPER/PLASTIC	CZ	N/R	L	HERMETIC	N/R	GF	N/R	0	2.000
** FIXED PAPER/PLASTIC, N/R									
FIXED PAPER/PLASTIC	N/R	N/R	L	N/R	N/R	GF	N/R	0	19.000
FIXED PAPER/PLASTIC	N/R	N/R	L	N/R	N/R	GF	N/R	1	30.000
FIXED PAPER/PLASTIC	N/R	N/R	MIL-SPEC	N/R	N/R	GF	N/R	2	329.000
FIXED PAPER/PLASTIC	N/R	N/R	MIL-SPEC	HERMETIC	18	GF	N/R	0	36.000
FIXED PAPER/PLASTIC	N/R	N/R	MIL-SPEC	HERMETIC	25	GF	N/R	0	2.000
FIXED PAPER/PLASTIC	N/R	N/R	MIL-SPEC	HERMETIC	N/R	GF	N/R	0	31.000
FIXED PAPER/PLASTIC	N/R	N/R	MIL-SPEC	HERMETIC	25	GF	N/R	1	42.000
FIXED PAPER/PLASTIC	N/R	N/R	MIL-SPEC	HERMETIC	18	GF	N/R	0	18.000
FIXED PAPER/PLASTIC	N/R	N/R	MIL-SPEC	HERMETIC	25	GF	N/R	0	37.000

Capacitor Storage
Field Experience

Capacitor Classification	Capacitor Type	Component Part Number	Quality	Package Seal	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
** VARIABLE, CT									
VARIABLE	CT	G657300	L	HERMETIC	N/R	GF	795	1	9.680
VARIABLE	CT	N/R	L	HERMETIC	N/R	GF	N/R	1	41.000
** VARIABLE, CV									
VARIABLE	CV	3956	L	HERMETIC	27	GF	5	0	0.133
VARIABLE	CV	N/R	L	HERMETIC	N/R	GF	N/R	0	0.300
VARIABLE	CV	N/R	L	HERMETIC	N/R	GF	N/R	0	8.000
** VARIABLE, PC									
VARIABLE	PC	10181731	L	N/R	N/R	GF	3213	0	51.044
VARIABLE	PC	10181732	L	N/R	N/R	GF	2142	0	34.029
VARIABLE	PC	N/R	MIL-SPEC	N/R	N/R	GF	N/R	0	84.000

The following table presents the results of the nonoperating capacitor data base data merge. Data in this section were derived from the capacitor detail data section. A merged data record was computed for all records having identical part classifications, part type codes, application environments and quality levels. Part hours and failures were cumulated for capacitors meeting these criteria. Field and predicted failure rates were derived for each merged data record. Predicted values were computed using a power cycling rate of zero in the capacitor prediction model.

Capacitor Field
Data Summary
Table

Capacitor Type	Quality Level	Application Environment	Cumulative Part Hours	Number Failed	Field Failure Rate	Predicted Failure Rate
** CC						
CC	L	GF	2810.721	0	< 0.0003259	0.0013260
CC	MIL-SPEC	GF	12.760	0	<< 0.0717868	0.0019500
** CCR						
CCR	L	GF	1.118	0	<< 0.8193202	0.0013260
CCR	M	AIF	181.652	4	0.0220201	0.0031200
CCR	MIL-SPEC	AIF	25.950	0	<< 0.0352987	0.0078000
** CFR						
CFR	L	GF	82.360	1	0.0121418	0.0041140
** CHR						
CHR	L	GF	241.742	1	0.0041366	0.0041140
** CK						
CK	L	GF	1020.833	0	< 0.0008973	0.0013260
CK	MIL-SPEC	GF	2890.737	3	0.0010378	0.0019500
** CKR						
CKR	L	GF	10955.652	4	0.0003651	0.0013260
CKR	R	AIF	97.314	4	0.0411041	0.0007176
** CL						
CL	L	GF	430.000	4	0.0093023	0.0152320
CL	MIL-SPEC	GF	1326.413	5	0.0037696	0.0224000
** CLR						
CLR	L	GF	176.145	2	0.0113543	0.0152320

Capacitor Field
Data Summary
Table

Capacitor Type	Quality Level	Application Environment	Cumulative Part Hours	Number Failed	Field Failure Rate	Predicted Failure Rate
CLR	MIL-SPEC	GF	8.000	0	<< 0.1145000	0.0224000
** CM						
CM	L	GF	1731.602	0	< 0.0005290	0.0026775
CM	MIL-SPEC	GF	789.554	0	< 0.0011601	0.0039375
** CMR						
CMR	L	GF	1901.110	2	0.0010520	0.0026775
** CP						
CP	L	GF	1.221	0	<< 0.7502048	0.0041140
CP	MIL-SPEC	GF	650.875	3	0.0046092	0.0060500
** CPV						
CPV	L	GF	185.310	0	< 0.0049431	0.0041140
CPV	MIL-SPEC	GF	1110.139	3	0.0027024	0.0060500
** CQ						
CQ	L	GF	656.559	0	< 0.0013952	0.0041140
** CQR						
CQR	L	GF	63.072	1	0.0158549	0.0041140
** CSR						
CSR	L	GF	13562.497	3	0.0002212	0.0007344
CSR	LOWER	GF	4.000	0	<< 0.2290000	0.0022896
CSR	MIL-SPEC	GF	1035.384	4	0.0038633	0.0010800
** CT						
CT	L	GF	50.680	2	0.0394633	0.0841500

Capacitor Field
Data Summary
Table

Capacitor Type	Quality Level	Application Environment	Cumulative Part Hours	Number Failed	Field Failure Rate	Predicted Failure Rate
** CU						
CU	L	GF	1.767	0	<< 0.5183928	0.0217600
** CV						
CV	L	GF	8.433	0	<< 0.1086209	0.0673200
** CY						
CY	MIL-SPEC	GF	5.000	0	<< 0.1832000	0.0023625
** CYR						
CYR	L	GF	367.235	0	< 0.0024943	0.0016065
CYR	MIL-SPEC	GF	1122.910	0	< 0.0008157	0.0023625
** CZ						
CZ	L	GF	2.000	0	<< 0.4580000	0.0041140
** PC						
PC	L	GF	85.073	0	< 0.0107672	0.0213180
PC	MIL-SPEC	GF	84.000	0	< 0.0109048	0.0313500

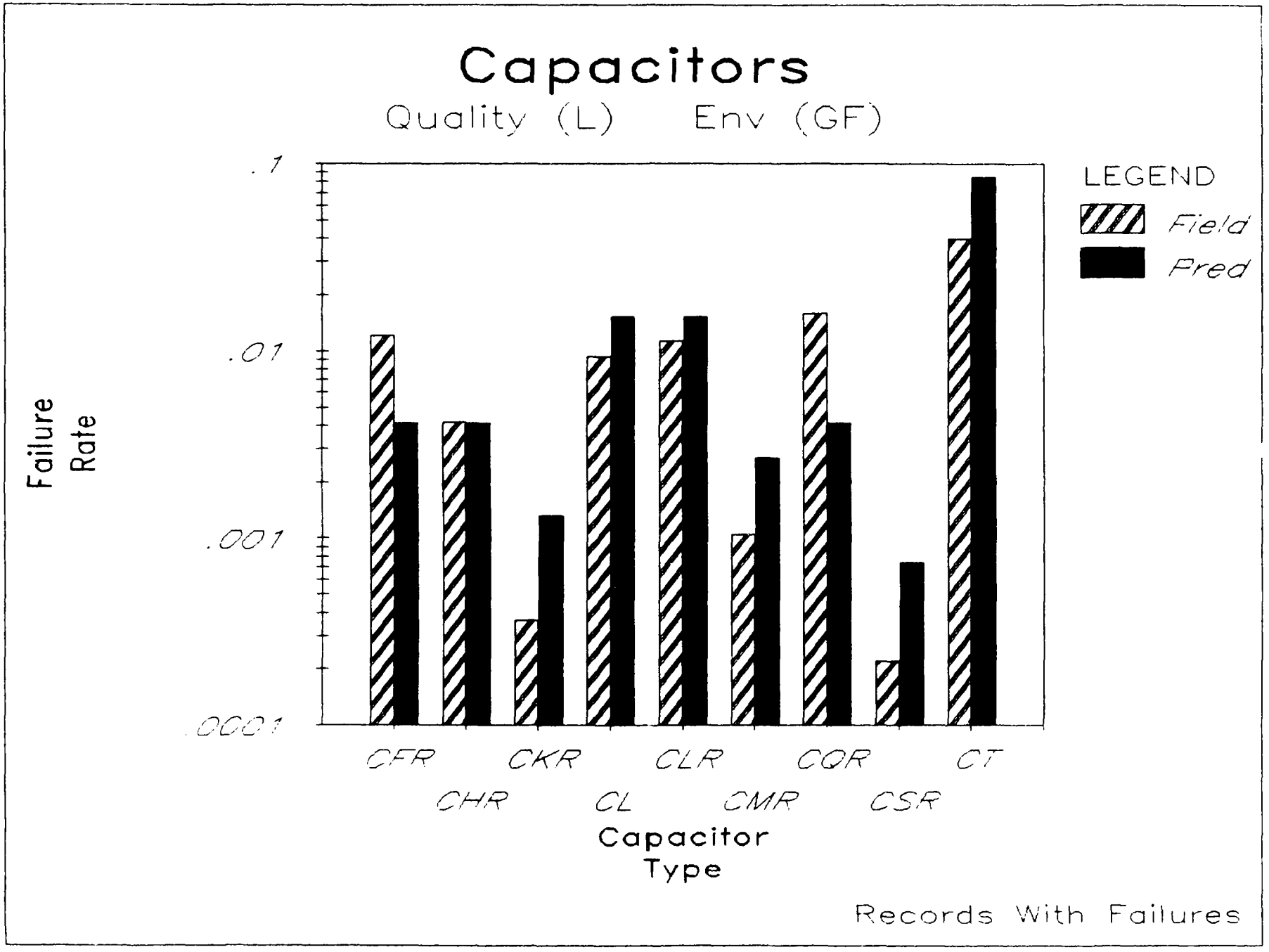

FIGURE C-1: CAPACITOR FAILURE RATE VS. CAPACITOR TYPE

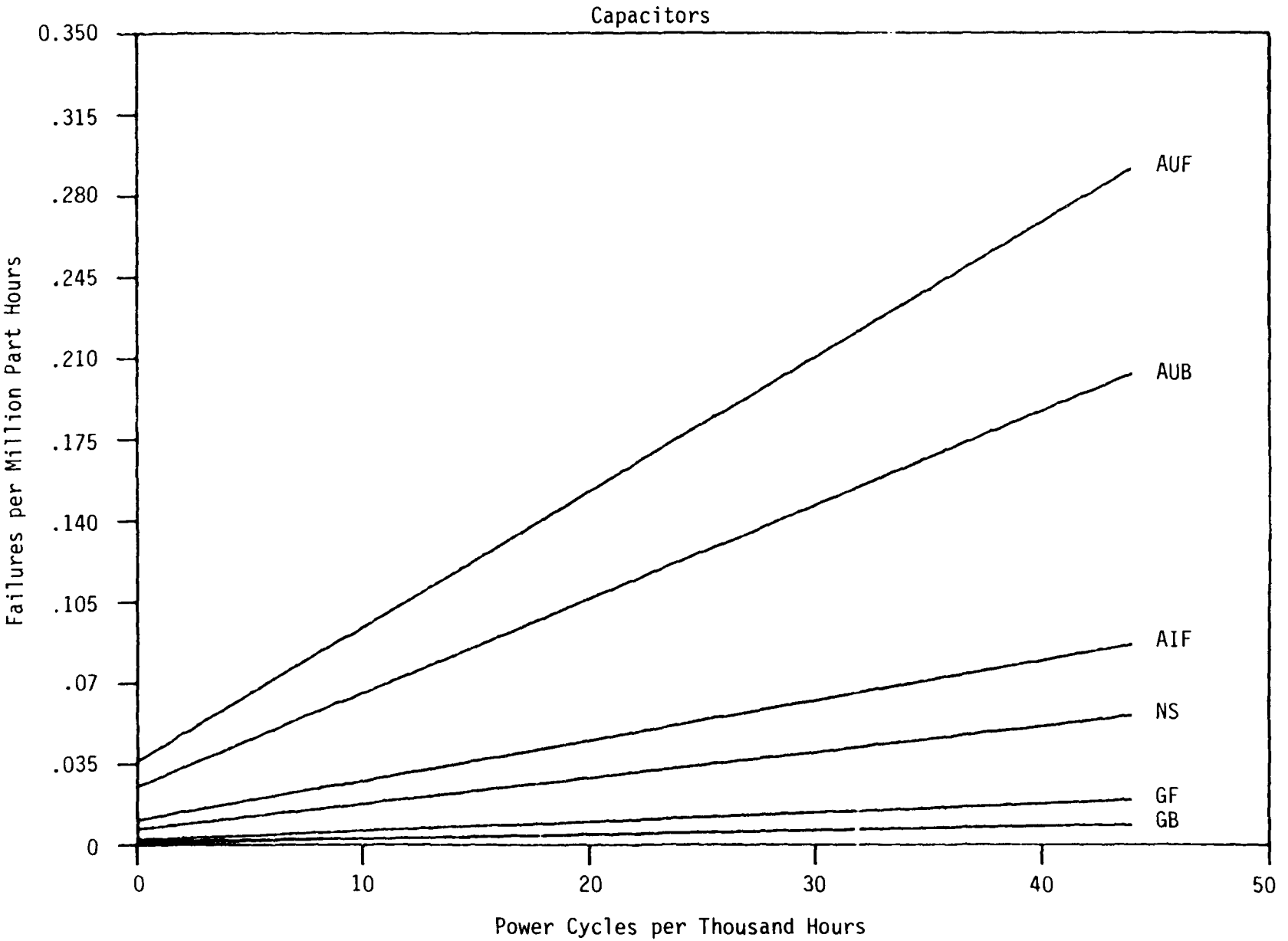

FIGURE C-2: CAPACITOR PREDICTED FAILURE RATE VS. POWER CYCLING

Inductors

Inductor Data File Description

Field experience data on coils and transformers are presented in this section. Data from the inductor nonoperational field experience detail data section have been sorted according to inductor classification, quality, application environment and part number. The data in this section are grouped into sub-categories by their inductor classifications. Each inductor data record consists of the following characteristic data fields:

- o Inductor Classification: General description of the inductor describing its function, characteristics and in some cases MIL-SPEC number. This document outlines data for fixed RF coils, MIL-T-27 transformers, MIL-T-55631 transformers, and general inductor and coil groupings.

- o Actual Temperature: Average temperature which the inductor is exposed to during periods of nonoperation. The actual temperature is given in degrees centigrade.

- o Quality: Codes which indicate the level of quality control a device has been subjected to. These codes are based on the level of testing a component received before system installation. Quality levels are defined in the appropriate military specifications. Table I-1 shows the various inductor quality levels used in this report.

TABLE I-1:
INDUCTOR QUALITY LEVELS

Quality Levels
HI-REL
MIL-SPEC
Lower

Inductor Storage
Field Experience

Inductor Classification	Component Part Number	Quality	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
** COILS, FIXED RF							
COILS, FIXED RF	LT4K085	HI-REL	N/R	AIF	2008	0	51.901
COILS, FIXED RF	N/R	HI-REL	N/R	GF	0	0	5.418
COILS, FIXED RF	11301033	MIL-SPEC	N/R	GF	2385	0	29.039
COILS, FIXED RF	11301045	MIL-SPEC	N/R	GF	477	0	5.808
COILS, FIXED RF	11301046	MIL-SPEC	N/R	GF	795	0	9.680
COILS, FIXED RF	11301048	MIL-SPEC	N/R	GF	477	0	5.808
COILS, FIXED RF	G657140	MIL-SPEC	N/R	GF	4770	0	58.079
COILS, FIXED RF	G657141	MIL-SPEC	N/R	GF	795	0	9.680
COILS, FIXED RF	N/R	MIL-SPEC	N/R	GF	0	0	285.800
COILS, FIXED RF	10180391	MIL-SPEC	18	GM	50337	1	799.691
COILS, FIXED RF	10180395	MIL-SPEC	18	GM	3213	1	51.044
COILS, FIXED RF	10180724	MIL-SPEC	18	GM	5355	0	85.073
COILS, FIXED RF	5950-00-116-3471	N/R	N/R	GM	21	0	0.299
COILS, FIXED RF	5950-00-116-3613	N/R	N/R	GM	21	0	0.299
COILS, FIXED RF	5950-00-116-3616	N/R	N/R	GM	21	0	0.299
COILS, FIXED RF	5950-01-018-0230	N/R	N/R	GM	21	0	0.299
** COILS, GENERAL							
COILS, GENERAL	MS14046-10	HI-REL	N/R	AIF	1004	0	25.950
COILS, GENERAL	MS75084-12	HI-REL	N/R	AIF	2008	0	51.901
COILS, GENERAL	MS75089	HI-REL	N/R	AIF	1004	0	25.950
COILS, GENERAL	N/R	LOWER	25	GF	0	0	0.400
COILS, GENERAL	N/R	LOWER	15	GF	0	0	16.000
COILS, GENERAL	N/R	LOWER	N/R	GF	0	1	212.000

Inductor Storage
Field Experience

Inductor Classification	Component Part Number	Quality	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
COILS, GENERAL	N/R	LOWER	25	GF	0	0	15.000
COILS, GENERAL	N/R	MIL-SPEC	N/R	GF	33120	0	329.440
COILS, GENERAL	N/R	MIL-SPEC	N/R	GF	0	0	79.181
COILS, GENERAL	229-003151	N/R	N/R	AIF	502	0	12.970
COILS, GENERAL	5-575-01	N/R	N/R	AIF	502	0	12.975
COILS, GENERAL	5-693-01	N/R	N/R	AIF	2008	0	51.901
COILS, GENERAL	5-697-01	N/R	N/R	AIF	2008	0	51.901
COILS, GENERAL	5-826-01	N/R	N/R	AIF	502	0	12.975
COILS, GENERAL	5-829-01	N/R	N/R	AIF	1004	0	25.950
COILS, GENERAL	5-848-01	N/R	N/R	AIF	1004	0	25.950
COILS, GENERAL	5-953-01	N/R	N/R	AIF	502	0	12.975
COILS, GENERAL	5-954-01	N/R	N/R	AIF	502	0	12.975
COILS, GENERAL	5-955-01	N/R	N/R	AIF	502	0	12.975
COILS, GENERAL	MS75085	N/R	N/R	AIF	9538	3	246.530
COILS, GENERAL	MS90538	N/R	N/R	AIF	2008	2	51.901
COILS, GENERAL	5950-00-024-1000	N/R	N/R	GM	21	0	0.299
COILS, GENERAL	5950-00-024-1052	N/R	N/R	GM	76	0	1.078
COILS, GENERAL	5950-01-010-0007	N/R	N/R	GM	21	0	0.299
COILS, GENERAL	5950-01-018-0230	N/R	N/R	GM	76	0	1.078
COILS, GENERAL	5950-01-051-0124	N/R	N/R	GM	148	0	2.113
COILS, GENERAL	N/R	N/R	N/R	GM	5244	0	76.562
COILS, GENERAL	N/R	N/R	N/R	GM	1748	0	25.521
COILS, GENERAL	N/R	N/R	N/R	GM	34086	0	497.656

Inductor Storage
Field Experience

Inductor Classification	Component Part Number	Quality	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
** INDUCTORS, NOT REPORTED							
INDUCTORS, NOT REPORTED	N/R	LOWER	N/R	GF	0	13	640.000
INDUCTORS, NOT REPORTED	986161	N/R	N/R	GB	75284	1	659.490
INDUCTORS, NOT REPORTED	986082	N/R	N/R	N/R	112926	0	98923.000
INDUCTORS, NOT REPORTED	986083	N/R	N/R	N/R	376420	0	32.974
INDUCTORS, NOT REPORTED	986084	N/R	N/R	N/R	37642	0	3.297
INDUCTORS, NOT REPORTED	986085	N/R	N/R	N/R	131747	0	11.541
INDUCTORS, NOT REPORTED	986087	N/R	N/R	N/R	282315	0	24.731
INDUCTORS, NOT REPORTED	986088	N/R	N/R	N/R	75284	0	65949.000
INDUCTORS, NOT REPORTED	MS21424	N/R	N/R	N/R	18821	0	1.648
INDUCTORS, NOT REPORTED	MS90587	N/R	N/R	N/R	207031	0	181.360
INDUCTORS, NOT REPORTED	N/R	N/R	N/R	N/R	0	0	261.557
INDUCTORS, NOT REPORTED	N/R	N/R	N/R	N/R	7866	0	114.844
INDUCTORS, NOT REPORTED	N/R	N/R	N/R	N/R	1748	0	25.521
** TRANSFORMERS, AUDIO, MIL-T-27							
TRANSFORMERS, AUDIO, MIL-T-27	N/R	N/R	N/R	GM	1748	0	25.521
** TRANSFORMERS, DIS, MIL-T-55631							
TRANSFORMERS, DIS, MIL-T-55631	10180396	MIL-SPEC	18	GM	1071	0	17.015
** TRANSFORMERS, GENERAL							
TRANSFORMERS, GENERAL	N/R	HI-REL	N/R	GF	0	0	18.000
TRANSFORMERS, GENERAL	N/R	HI-REL	N/R	GF	0	9	509.000
TRANSFORMERS, GENERAL	N/R	HI-REL	N/R	GF	0	0	22.000
TRANSFORMERS, GENERAL	N/R	LOWER	N/R	GF	0	15	265.000

Inductor Storage
Field Experience

Inductor Classification	Component Part Number	Quality	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
TRANSFORMERS, GENERAL	N/R	LOWER	18	GF	0	1	9.000
TRANSFORMERS, GENERAL	N/R	LOWER	N/R	GF	0	0	3.000
TRANSFORMERS, GENERAL	N/R	LOWER	25	GF	0	0	80.000
TRANSFORMERS, GENERAL	10158636	MIL-SPEC	N/R	GF	39	0	1.118
TRANSFORMERS, GENERAL	11301026	MIL-SPEC	N/R	GF	159	0	1.936
TRANSFORMERS, GENERAL	11301027	MIL-SPEC	N/R	GF	477	0	5.808
TRANSFORMERS, GENERAL	11301028	MIL-SPEC	N/R	GF	318	0	3.872
TRANSFORMERS, GENERAL	1131072	MIL-SPEC	N/R	GF	477	0	5.808
TRANSFORMERS, GENERAL	G657387	MIL-SPEC	N/R	GF	1113	0	13.552
TRANSFORMERS, GENERAL	MIS13685/6	MIL-SPEC	N/R	GF	120	0	2 628
TRANSFORMERS, GENERAL	N/R	MIL-SPEC	N/R	GF	0	3	2928.309
TRANSFORMERS, GENERAL	N/R	MIL-SPEC	N/R	GF	4140	0	41.180
TRANSFORMERS, GENERAL	N/R	N/R	15	GF	0	0	16.000
TRANSFORMERS, GENERAL	5950-00-024-1000	N/R	N/R	GM	16	0	0.232
TRANSFORMERS, GENERAL	5950-00-024-1000	N/R	N/R	GM	69	0	0.981
TRANSFORMERS, GENERAL	5950-00-024-1002	N/R	N/R	GM	76	0	1.078
TRANSFORMERS, GENERAL	5950-00-327-9625	N/R	N/R	GM	16	0	0.232
TRANSFORMERS, GENERAL	5950-00-327-9625	N/R	N/R	GM	76	0	1.078
TRANSFORMERS, GENERAL	5950-00-333-0759	N/R	N/R	GM	76	0	1.078
TRANSFORMERS, GENERAL	5950-00-333-0759	N/R	N/R	GM	69	0	0.981
TRANSFORMERS, GENERAL	5950-00-600-0645	N/R	N/R	GM	76	0	1.078
TRANSFORMERS, GENERAL	5950-00-600-0840	N/R	N/R	GM	16	0	0.232
TRANSFORMERS, GENERAL	5950-00-600-0840	N/R	N/R	GM	76	0	1.078

Inductor Storage
Field Experience

Inductor Classification	Component Part Number	Quality	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
TRANSFORMERS, GENERAL	5950-00-600-0840	N/R	N/R	GM	69	0	0.981
TRANSFORMERS, GENERAL	5950-00-600-0843	N/R	N/R	GM	76	0	1.078
TRANSFORMERS, GENERAL	5950-00-600-0844	N/R	N/R	GM	69	0	0.981
TRANSFORMERS, GENERAL	5950-00-600-0844	N/R	N/R	GM	16	0	0.232
TRANSFORMERS, GENERAL	5950-00-600-0844	N/R	N/R	GM	76	0	1.078
TRANSFORMERS, GENERAL	5950-00-600-0845	N/R	N/R	GM	16	0	0.232
TRANSFORMERS, GENERAL	5950-00-600-0845	N/R	N/R	GM	69	0	0.981
TRANSFORMERS, GENERAL	5950-00-601-6296	N/R	N/R	GM	76	0	1.078
TRANSFORMERS, GENERAL	5950-00-603-6986	N/R	N/R	GM	69	0	0.981
TRANSFORMERS, GENERAL	5950-00-603-6989	N/R	N/R	GM	76	0	0.078
TRANSFORMERS, GENERAL	5950-00-603-6989	N/R	N/R	GM	69	0	0.981
TRANSFORMERS, GENERAL	5950-00-603-6989	N/R	N/R	GM	16	0	0.232
TRANSFORMERS, GENERAL	N/R	N/R	N/R	GM	1748	0	25.521
TRANSFORMERS, GENERAL	N/R	N/R	N/R	GM	5244	0	76.562
TRANSFORMERS, GENERAL	N/R	N/R	N/R	GM	874	0	12.760
** TRANSFORMERS, POWER, MIL-T-27							
TRANSFORMERS, POWER, MIL-T-27	N/R	LOWER	25	GF	0	0	6.000
TRANSFORMERS, POWER, MIL-T-27	N/R	LOWER	15	GF	0	2	10.000
TRANSFORMERS, POWER, MIL-T-27	11301016	MIL-SPEC	N/R	GF	159	0	1.936
TRANSFORMERS, POWER, MIL-T-27	11301019	MIL-SPEC	N/R	GF	636	0	7.744
TRANSFORMERS, POWER, MIL-T-27	11301035	MIL-SPEC	N/R	GF	318	0	3.872
TRANSFORMERS, POWER, MIL-T-27	11301037	MIL-SPEC	N/R	GF	159	0	1.936
TRANSFORMERS, POWER, MIL-T-27	G657184	MIL-SPEC	N/R	GF	159	0	1.936

Inductor Storage
Field Experience

Inductor Classification	Component Part Number	Quality	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
TRANSFORMERS, POWER, MIL-T-27	10182034	MIL-SPEC	18	GM	1071	0	17.015
TRANSFORMERS, POWER, MIL-T-27	5550-00-600-0842	N/R	N/R	GM	21	0	0.299
TRANSFORMERS, POWER, MIL-T-27	5950-00-148-6069	N/R	N/R	GM	21	0	0.299
TRANSFORMERS, POWER, MIL-T-27	5950-00-327-926	N/R	N/R	GM	21	0	0.299
TRANSFORMERS, POWER, MIL-T-27	5950-00-327-9625	N/R	N/R	GM	69	0	0.981
TRANSFORMERS, POWER, MIL-T-27	5950-00-333-0754	N/R	N/R	GM	21	0	0.299
TRANSFORMERS, POWER, MIL-T-27	5950-00-333-0759	N/R	N/R	GM	16	0	0.232
TRANSFORMERS, POWER, MIL-T-27	5950-00-600-0645	N/R	N/R	GM	21	0	0.299
TRANSFORMERS, POWER, MIL-T-27	5950-00-600-0842	N/R	N/R	GM	16	0	0.232
TRANSFORMERS, POWER, MIL-T-27	5950-00-600-0843	N/R	N/R	GM	16	0	0.232
TRANSFORMERS, POWER, MIL-T-27	5950-00-600-0843	N/R	N/R	GM	21	0	0.299
TRANSFORMERS, POWER, MIL-T-27	5950-00-600-0843	N/R	N/R	GM	69	0	0.981
TRANSFORMERS, POWER, MIL-T-27	5950-00-601-6296	N/R	N/R	GM	16	0	0.232
TRANSFORMERS, POWER, MIL-T-27	5950-00-601-6296	N/R	N/R	GM	21	0	0.299
TRANSFORMERS, POWER, MIL-T-27	5950-00-601-6296	N/R	N/R	GM	69	0	0.981
TRANSFORMERS, POWER, MIL-T-27	5950-00-603-6986	N/R	N/R	GM	16	0	0.232
TRANSFORMERS, POWER, MIL-T-27	5950-00-603-6990	N/R	N/R	GM	21	0	0.299
TRANSFORMERS, POWER, MIL-T-27	5950-00-624-1052	N/R	N/R	GM	21	0	0.299
TRANSFORMERS, POWER, MIL-T-27	5950-01-049-9899	N/R	N/R	GM	148	0	2.113
TRANSFORMERS, POWER, MIL-T-27	5950-01-050-0576	N/R	N/R	GM	148	0	2.113
TRANSFORMERS, POWER, MIL-T-27	5950-01-052-9854	N/R	N/R	GM	148	0	2.113
TRANSFORMERS, POWER, MIL-T-27	5950-01-055-1266	N/R	N/R	GM	148	0	2.113

Inductor Storage
Field Experience

Inductor Classification	Component Part Number	Quality	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
** TRANSFORMERS, RF, MIL-T-55631							
TRANSFORMERS, RF, MIL-T-55631	11301034	MIL-SPEC	N/R	GF	477	0	5.809
TRANSFORMERS, RF, MIL-T-55631	11301043	MIL-SPEC	N/R	GF	636	0	7.744
TRANSFORMERS, RF, MIL-T-55631	11301049	MIL-SPEC	N/R	GF	3816	0	46.463
TRANSFORMERS, RF, MIL-T-55631	11301064	MIL-SPEC	N/R	GF	318	0	3.872
TRANSFORMERS, RF, MIL-T-55631	G657358	MIL-SPEC	N/R	GF	159	0	1.936
TRANSFORMERS, RF, MIL-T-55631	10180744	MIL-SPEC	N/R	GM	2142	0	34.029
TRANSFORMERS, RF, MIL-T-55631	10180752	MIL-SPEC	18	GM	9639	0	153.132
TRANSFORMERS, RF, MIL-T-55631	10181719	MIL-SPEC	18	GM	1071	0	17.015

Inductor Summary

The following table presents the results of the nonoperating inductor data base merge. Data in this section are based entirely on the data from the inductor detail data section. A merged data record was computed for all records having identical inductor classifications, quality levels and application environments. Part hours and failures were cumulated for inductors meeting these criteria. Field and predicted failure rates were derived for each merged data record. In some instances it was not possible to compute a predicted failure rate due to missing model parameters. These data points are depicted with an N/R in the predicted failure rate column. Predicted values were derived assuming a power cycling rate of zero in the inductor model.

Inductor Field
Data Summary
Table

Inductor Classification	Quality Level	App Env	Number Fielded	Cumulative Part Hours	Number Failed	Field Failure Rate	Predicted Failure Rate
** COILS, FIXED RF							
COILS, FIXED RF	HI-REL	AIF	2008	51.901	0 <	0.0176490	0.0002025
COILS, FIXED RF	HI-REL	GF	N/R	5.418	0 <<	0.1690661	0.0000810
COILS, FIXED RF	MIL-SPEC	GF	9699	403.894	0 <	0.0022679	0.0016740
COILS, FIXED RF	MIL-SPEC	GM	58905	935.808	2	0.0021372	0.0055800
COILS, FIXED RF	N/R	GM	84	1.196	0 <<	0.7658863	N/R
** COILS, GENERAL							
COILS, GENERAL	HI-REL	AIF	4016	103.801	0 <	0.0088246	0.0002025
COILS, GENERAL	LOWER	GF	N/R	243.400	1	0.0041085	0.0059400
COILS, GENERAL	MIL-SPEC	GF	33120	408.621	0 <	0.0022417	0.0016740
COILS, GENERAL	N/R	AIF	20582	531.978	5	0.0093989	N/R
COILS, GENERAL	N/R	GM	41420	604.606	0 <	0.0015150	N/R
** INDUCTORS, NOT REPORTED							
INDUCTORS, NOT REPORTED	LOWER	GF	N/R	640.000	13	0.0203125	N/R
INDUCTORS, NOT REPORTED	N/R	GB	75284	659.490	1	0.0015163	N/R
INDUCTORS, NOT REPORTED	N/R	N/R	1251800	165529.473	0 <	0.0000055	N/R
** TRANSFORMERS, AUDIO, MIL-T-27							
TRANSFORMERS, AUDIO, MIL-T-27	N/R	GM	1748	25.521	0 <<	0.0358920	N/R
** TRANSFORMERS, DIS, MIL-T-55631							
TRANSFORMERS, DIS, MIL-T-55631	MIL-SPEC	GM	1071	17.015	0 <<	0.0538349	0.0104160
** TRANSFORMERS, GENERAL							
TRANSFORMERS, GENERAL	HI-REL	GF	N/R	549.000	9	0.0163934	N/R

Inductor Field
Data Summary
Table

Inductor Classification	Quality Level	App Env	Number Fielded	Cumulative Part Hours	Number Failed	Field Failure Rate	Predicted Failure Rate
TRANSFORMERS, GENERAL	LOWER	GF	N/R	357.000	16	0.0448179	N/R
TRANSFORMERS, GENERAL	MIL-SPEC	GF	6843	3004.211	3	0.0009986	N/R
TRANSFORMERS, GENERAL	N/R	GF	N/R	16.000	0 <<	0.0572500	N/R
TRANSFORMERS, GENERAL	N/R	GM	9129	131.804	0 <	0.0069497	N/R
** TRANSFORMERS, POWER, MIL-T-27							
TRANSFORMERS, POWER, MIL-T-27	LOWER	GF	N/R	16.000	2	0.1250000	0.0175560
TRANSFORMERS, POWER, MIL-T-27	MIL-SPEC	GF	1431	17.424	0 <<	0.0525712	0.0049476
TRANSFORMERS, POWER, MIL-T-27	MIL-SPEC	GM	1071	17.015	0 <<	0.0538349	0.0104160
TRANSFORMERS, POWER, MIL-T-27	N/R	GM	1068	15.246	0	0.0600813	N/R
** TRANSFORMERS, RF, MIL-T-55631							
TRANSFORMERS, RF, MIL-T-55631	MIL-SPEC	GF	5406	65.824	0	0.0139159	0.0049476
TRANSFORMERS, RF, MIL-T-55631	MIL-SPEC	GM	12852	204.176	0	0.0044863	0.0104160

Diodes

Diode Data File Description

Field experience data on Group IV, V, VI, VII and VIII diodes (as defined in MIL-HDBK-217) are presented in this section. Data from the diode nonoperating field experience detail data section have been sorted by diode classification, diode application, quality level, application environment and part number. The data in this section has been sub grouped according to diode style classification and application. All diode detail data records contain the following characteristic data fields:

- o Diode Classification: Discrete semiconductor group and description for which the diode data point belongs. This report summarizes data for Group IV, V, VI, VII and VIII diodes. Table D-1 depicts the diode classification groups.

- o Diode Application: Brief description of diode in circuit implementation.

- o Actual Temperature: Average temperature which the diode is exposed to during periods of nonoperation. The actual temperature is given in degrees centigrade.

- o Quality: Codes which indicate the level of quality control a device has been subjected to. These codes are based on testing and screening levels that the diode received prior to system installation. Quality levels are defined in MIL-S-19500. Table D-2 illustrates the various diode quality levels.

TABLE D-1:
DIODE CLASSIFICATIONS

Part Type	Group	Description
Diodes	IV	Si, Gen. Purpose
		Ge, Gen. Purpose
	V	Zener/Avalanche
	VI	Thyristors
	VII	Detectors
		Mixers
	VIII	Varactors
		Step Recovery

TABLE D-2:
DIODE QUALITY LEVELS

Quality Level
JANTXV
JANTX
JAN
Lower, (Hermetic)
Plastic

Diode Storage
Field Experience

Component Part Number	Quality	Actual Temp	App Env	Diode Classification	Diode Application	Number Fielded	Number Failed	Part Hours
** GROUP IV COULD NOT BE DETERMINED								
JAN1N277	JAN	N/R	GB	GROUP IV	COULD NOT BE DETERMINED	2868792	2	25061.000
** GROUP IV, SI, GENERAL PURPOSE COULD NOT BE DETERMINED								
1N23F	JAN	20	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	1748	0	25.521
1N23RF	JAN	20	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	1748	0	25.521
1N250A	JAN	20	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	5244	0	76.562
1N3064	JAN	20	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	3496	0	51.042
1N647	JAN	20	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	874	0	12.760
1N661	JAN	20	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	20976	2	306.250
322MR156P0	JAN	20	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	4370	0	63.802
322MR203G0	JAN	20	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	874	2	12.760
322MR265P0	JAN	20	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	1748	0	25.521
322MR265P0	JAN	20	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	1748	0	25.521
322MR340P0	JAN	20	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	1748	0	25.521
394MR001P0	JAN	20	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	874	2	12.760
394MR001P0	JAN	20	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	874	2	12.760
JAN1N255	JAN	20	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	5244	0	76.562
JAN1N256	JAN	20	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	1748	0	25.521
JAN1N30413	JAN	20	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	874	0	12.760
JAN1N458	JAN	20	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	25345	3	370.052
JAN1N459	JAN	20	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	6118	0	89.323
JAN1N4868	JAN	20	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	874	0	12.760
JAN1N645	JAN	20	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	874	0	12.760
JAN1N647	JAN	20	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	2622	0	38.281

Diode Storage
Field Experience

Component Part Number	Quality	Actual Temp	App Env	Diode Classification	Diode Application	Number Fielded	Number Failed	Part Hours
JAN1N9818	JAN	20	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	874	0	12.760
JAN4982	JAN	20	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	1748	0	25.521
N/R	JAN	25	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	0	0	41.000
N/R	JAN	18	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	0	0	67.000
N/R	JAN	25	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	0	0	30.000
N/R	JAN	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	0	4	906.000
N/R	JAN	25	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	0	1	247.000
N/R	JAN	25	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	0	2	136.000
N/R	JAN	25	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	0	0	36.000
N/R	JAN	15	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	0	1	1200.000
N/R	JAN	25	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	0	2	16000.000
USN1N3043	JAN	20	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETEPMINED	874	0	12.760
1N648	JAN	20	N/R	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	6992	3	102.083
N/R	JAN	N/R	N/R	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	0	41	6262.000
11301069	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	318	0	3.872
1N1202A	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	4140	0	41.180
1N1202A	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	39	0	1.118
1N2624A	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	39	0	1.118
1N277	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	53820	0	535.340
1N3070	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	10350	0	102.950
1N3581B	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	39	0	1.118
1N3596	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	16560	0	164.720
1N3600	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	351900	0	3500.300

Diode Storage
Field Experience

Component Part Number	Quality	Actual Temp	App Env	Diode Classification	Diode Application	Number Fielded	Number Failed	Part Hours
1N4247	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	26910	2	267.670
1N4306	JANTX	18	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	24633	0	391.338
1N4454	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	702	0	20.130
1N4476	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	2070	0	20.590
1N4477	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	2070	0	20.590
1N458A	JANTX	18	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	175644	0	2790.411
1N5073	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	39	0	1.118
1N5180	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	39	0	1.118
925512-1C	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	12420	0	123.540
EDH6144	JANTX	27	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	190	0	5.454
FSA1433	JANTX	27	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	79	0	2.459
C657308	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	636	0	7.747
JAN1N3189	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	156	0	4.473
JAN1N3611	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	195	0	5.592
JAN1N458	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	702	0	20.130
JAN1N645	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	429	0	12.302
MIS13286	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	39	0	1.118
MIS13302	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	117	0	3.355
MIS13302-3	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	39	0	1.118
MIS13302-4	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	39	0	1.118
MIS13674/0	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	840	0	18.396
MIS13674/0	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	1080	0	23.652
MIS13674/1	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	120	0	2.628

Diode Storage
Field Experience

Component Part Number	Quality	Actual Temp	App Env	Diode Classification	Diode Application	Number Fielded	Number Failed	Part Hours
MIS13674/2	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	120	0	2.628
MIS13674/5	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	480	0	10.512
MIS13674/5	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	120	1	2.628
MIS13674/9	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	480	0	10.512
MIS13674/9	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	4560	3	99.864
N/R	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	0	0	3422.000
N/R	JANTX	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	0	0	72.000
925400	N/R	N/R	GB	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	169389	0	3483.838
925512	N/R	N/R	GB	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	225852	0	1978.500
N/R	N/R	18	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	0	1	400.000
N/R	PLASTIC	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	0	20	779.000
N/R	PLASTIC	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	0	5	675.000
N/R	PLASTIC	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	0	15	104.000
** GROUP IV, SI, GENERAL PURPOSE POWER RECTIFIER (>=500mA)								
JAN1N1202A	JAN	N/R	GB	GROUP IV, SI, GENERAL PURPOSE	POWER RECTIFIER (>=500mA)	263494	0	230.200
JAN1N4247	JAN	N/R	GB	GROUP IV, SI, GENERAL PURPOSE	POWER RECTIFIER (>=500mA)	1261007	1	11046.000
1N649	JANTX	18	GF	GROUP IV, SI, GENERAL PURPOSE	POWER RECTIFIER (>=500mA)	13923	0	221.191
4JA388R204	JANTX	27	GF	GROUP IV, SI, GENERAL PURPOSE	POWER RECTIFIER (>=500mA)	23	0	0.773
CD1000005	JANTX	27	GF	GROUP IV, SI, GENERAL PURPOSE	POWER RECTIFIER (>=500mA)	10	0	0.360
CM1023	JANTX	27	GF	GROUP IV, SI, GENERAL PURPOSE	POWER RECTIFIER (>=500mA)	20	0	0.619
MR1033A	JANTX	18	GF	GROUP IV, SI, GENERAL PURPOSE	POWER RECTIFIER (>=500mA)	1071	0	17.015
UT591	JANTX	27	GF	GROUP IV, SI, GENERAL PURPOSE	POWER RECTIFIER (>=500mA)	15	0	0.505
UTX1090	JANTX	27	GF	GROUP IV, SI, GENERAL PURPOSE	POWER RECTIFIER (>=500mA)	20	0	0.612

Diode Storage
Field Experience

Component Part Number	Quality	Actual Temp	App Env	Diode Classification	Diode Application	Number Fielded	Number Failed	Part Hours
C5AR218	N/R	27	GF	GROUP IV, SI, GENERAL PURPOSE	POWER RECTIFIER (>=500mA)	23	0	0.717
** GROUP IV, SI, GENERAL PURPOSE POWER RECTIFIER (H.V. STACKS								
A70MR214	JANTX	27	GF	GROUP IV, SI, GENERAL PURPOSE	POWER RECTIFIER (H.V. STACKS	21	0	0.569
** GROUP IV, SI, GENERAL PURPOSE SWITCHING (< 500mA)								
JAN1N3070	JAN	N/R	GB	GROUP IV, SI, GENERAL PURPOSE	SWITCHING (< 500mA)	188216	0	1648.700
JAN1N3600	JAN	N/R	GB	GROUP IV, SI, GENERAL PURPOSE	SWITCHING (< 500mA)	20439606	8	179050.000
1N3595	JAN	20	GF	GROUP IV, SI, GENERAL PURPOSE	SWITCHING (< 500mA)	874	0	12.760
JAN1N3595	JAN	20	GF	GROUP IV, SI, GENERAL PURPOSE	SWITCHING (< 500mA)	4370	0	63.802
1N660	JAN	20	N/R	GROUP IV, SI, GENERAL PURPOSE	SWITCHING (< 500mA)	20102	0	293.489
1N3595	JANTX	18	GF	GROUP IV, SI, GENERAL PURPOSE	SWITCHING (< 500mA)	25704	0	413.353
1N914	JANTX	18	GF	GROUP IV, SI, GENERAL PURPOSE	SWITCHING (< 500mA)	37485	3	603.514
JAN1N4150	N/R	N/R	GF	GROUP IV, SI, GENERAL PURPOSE	SWITCHING (< 500mA)	18821	0	1.870
** GROUP IV, SI, GENERAL PURPOSE VOLTAGE REGULATOR								
JAN1N3595	JAN	N/R	GB	GROUP IV, SI, GENERAL PURPOSE	VOLTAGE REGULATOR	602272	1	5275.900
JAN1N4977	JAN	N/R	GB	GROUP IV, SI, GENERAL PURPOSE	VOLTAGE REGULATOR	56463	1	494.620
6657156	JANTX	27	GF	GROUP IV, SI, GENERAL PURPOSE	VOLTAGE REGULATOR	20	0	0.677
6657156	JANTX	27	GF	GROUP IV, SI, GENERAL PURPOSE	VOLTAGE REGULATOR	10	0	0.151
S211707H	JANTX	27	GF	GROUP IV, SI, GENERAL PURPOSE	VOLTAGE REGULATOR	35	0	1.296
** GROUP V, ZENER & AVALANCHE COULD NOT BE DETERMINED								
JAN1N4476	JAN	N/R	GB	GROUP V, ZENER & AVALANCHE	COULD NOT BE DETERMINED	94105	0	824.360
N/R	JAN	N/R	GF	GROUP V, ZENER & AVALANCHE	COULD NOT BE DETERMINED	0	1	130.000
N/R	JAN	25	GF	GROUP V, ZENER & AVALANCHE	COULD NOT BE DETERMINED	0	2	14.000
N/R	JAN	15	GF	GROUP V, ZENER & AVALANCHE	COULD NOT BE DETERMINED	0	0	624.000

Diode Storage
Field Experience

Component Part Number	Quality	Actual Temp	App Env	Diode Classification	Diode Application	Number Fielded	Number Failed	Part Hours
N/R	JAN	25	GF	GROUP V, ZENER & AVALANCHE	COULD NOT BE DETERMINED	0	0	24.000
N/R	JAN	18	GF	GROUP V, ZENER & AVALANCHE	COULD NOT BE DETERMINED	0	0	150.000
N/R	JAN	25	GF	GROUP V, ZENER & AVALANCHE	COULD NOT BE DETERMINED	0	0	12.000
N/R	JANTX	N/R	GF	GROUP V, ZENER & AVALANCHE	COULD NOT BE DETERMINED	0	1	175.000
N/R	PLASTIC	N/R	GF	GROUP V, ZENER & AVALANCHE	COULD NOT BE DETERMINED	0	5	47.000
** GROUP V, ZENER & AVALANCHE POWER RECTIFIER >=500mA								
DT60214E	JANTX	27	GF	GROUP V, ZENER & AVALANCHE	POWER RECTIFIER >=500mA	30	0	0.929
DZ80429C	JANTX	27	GF	GROUP V, ZENER & AVALANCHE	POWER RECTIFIER >=500mA	10	0	0.353
SZ11720H	JANTX	27	GF	GROUP V, ZENER & AVALANCHE	POWER RECTIFIER >=500mA	25	0	1.000
** GROUP V, ZENER & AVALANCHE VOLTAGE REFERENCE								
JAN1N943B	JAN	N/R	GB	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	131747	0	1154.100
N/R	JAN	N/R	N/R	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	0	0	607.000
11176514	JANTX	N/R	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	159	0	1.936
1N3016B	JANTX	18	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	2142	0	34.029
1N3024B	JANTX	18	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	1071	0	17.015
1N4063A	JANTX	18	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	1071	1	17.015
1N4066A	JANTX	18	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	1071	0	17.015
1N40L7A	JANTX	18	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	1071	0	17.015
1N7544	JANTX	18	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	1071	0	17.015
1N757A	JANTX	18	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	1071	0	17.015
1N827	JANTX	18	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	1071	0	17.015
1N938B	JANTX	18	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	2142	0	34.029
1N942B	JANTX	18	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	2142	0	34.029

Diode Storage
Field Experience

Component Part Number	Quality	Actual Temp	App Env	Diode Classification	Diode Application	Number Fielded	Number Failed	Part Hours
1N943B	JANTX	N/R	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	2070	1	20.590
1N944B	JANTX	18	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	2142	0	34.029
1N945B	JANTX	18	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	2142	0	34.029
1N945B	JANTX	N/R	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	39	0	1.118
1N965B	JANTX	N/R	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	117	0	3.355
DT50258B	JANTX	18	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	5355	0	85.074
DT60214	JANTX	27	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	10	0	0.381
DT60214F	JANTX	27	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	10	0	0.389
DT60214G	JANTX	27	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	28	1	1.007
DT60214J	JANTX	27	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	75	0	2.430
DT60214L	JANTX	27	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	30	0	1.102
G657092	JANTX	N/R	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	477	0	5.808
G657127	JANTX	N/R	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	477	0	5.808
G657130	JANTX	27	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	10	0	0.358
G657130	JANTX	N/R	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	954	0	11.616
G657130	JANTX	27	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	10	0	0.432
G657156	JANTX	N/R	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	1113	0	13.552
G657206	JANTX	N/R	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	159	0	1.936
G657385	JANTX	N/R	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	3339	0	40.655
GZ114984	JANTX	27	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	10	0	0.230
GZ50346H	JANTX	27	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	20	0	0.576
GZ50346H-2	JANTX	27	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	19	0	0.555
GZ50395H	JANTX	27	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	30	0	1.317

Diode Storage
Field Experience

Component Part Number	Quality	Actual Temp	App Env	Diode Classification	Diode Application	Number Fielded	Number Failed	Part Hours
GZ50396H	JANTX	27	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	20	0	0.590
JAN1N754A	JANTX	N/R	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	39	0	1.118
JAN1N755A	JANTX	N/R	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	117	0	3.355
JAN1N966B	JANTX	N/R	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	78	0	2.237
JANTX1N966	JANTX	N/R	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	120	0	2.628
MIS13674??	JANTX	N/R	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	120	0	2.628
N/R	JANTX	N/R	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	0	1	898.000
UZ1306	JANTX	27	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	20	0	0.446
GZ11086H	N/R	27	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	20	0	0.496
** GROUP V, ZENER & AVALANCHE VOLTAGE REGULATOR								
JAN1N4135	JAN	N/R	GB	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	169389	0	1483.800
JAN1N4476	JAN	N/R	GB	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	18821	0	164.870
JAN1N746A	JAN	N/R	GB	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	282315	0	2473.100
JAN1N750A	JAN	N/R	GB	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	169389	0	1483.800
JAN1N754A	JAN	N/R	GB	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	56463	0	494.620
JAN1N755A	JAN	N/R	GB	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	169389	0	1483.800
JAN1N756A	JAN	N/R	GB	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	357599	0	3132.600
JAN1N757A	JAN	N/R	GB	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	225852	0	1978.500
JAN1N758A	JAN	N/R	GB	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	75284	0	6594.900
JAN1N965B	JAN	N/R	GB	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	75284	0	6594.900
JAN1N970B	JAN	N/R	GB	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	18821	0	164.870
JAN1N972B	JAN	N/R	GB	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	131747	0	1154.100
JAN1N973B	JAN	N/R	GB	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	18821	0	164.870

Diode Storage
Field Experience

Component Part Number	Quality	Actual Temp	App Env	Diode Classification	Diode Application	Number Fielded	Number Failed	Part Hours
1N4975	JAN	20	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	1748	0	25.521
1N9658	JAN	20	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	1748	0	25.521
1N9708	JAN	20	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	874	0	12.760
1N9748	JAN	20	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	874	0	12.760
1N9848	JAN	20	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	1748	0	25.521
FD3008	JAN	20	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	874	0	12.760
JAN19848	JAN	20	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	874	0	12.760
JAN1N755A	JAN	20	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	2622	0	38.281
JAN1N9383	JAN	20	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	3495	0	51.042
JAN1N9628	JAN	20	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	874	0	12.760
JAN1N9708	JAN	20	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	1748	0	25.521
JAN1N9738	JAN	20	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	874	0	12.760
JAN1N9758	JAN	20	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	1748	0	25.521
USN1N9658	JAN	20	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	874	0	12.760
1N746A	JANTX	N/R	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	8280	0	82.360
1N750	JANTX	N/R	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	4140	0	41.180
1N751A	JANTX	N/R	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	2070	0	20.590
1N754A	JANTX	N/R	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	2070	0	20.590
1N755A	JANTX	N/R	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	8280	0	82.360
1N756A	JANTX	N/R	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	10350	0	102.950
1N758A	JANTX	N/R	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	2070	0	20.590
1N965B	JANTX	N/R	GF	GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	2070	0	20.590

Diode Storage
Field Experience

Component Part Number	Quality	Actual Temp	App Env	Diode Classification	Diode Application	Number Fielded	Number Failed	Part Hours
** GROUP VI, THYRISTORS COULD NOT BE DETERMINED								
N/R	JAN	15	GF	GROUP VI, THYRISTORS	COULD NOT BE DETERMINED	0	0	16.000
N/R	JAN	25	GF	GROUP VI, THYRISTORS	COULD NOT BE DETERMINED	0	1	130.000
N/R	JAN	25	GF	GROUP VI, THYRISTORS	COULD NOT BE DETERMINED	0	0	19.000
G657123	JANTX	N/R	GF	GROUP VI, THYRISTORS	COULD NOT BE DETERMINED	33867	1	412.359
G657124	JANTX	N/R	GF	GROUP VI, THYRISTORS	COULD NOT BE DETERMINED	2385	0	29.039
G657125	JANTX	N/R	GF	GROUP VI, THYRISTORS	COULD NOT BE DETERMINED	5565	0	67.759
N/R	PLASTIC	N/R	GF	GROUP VI, THYRISTORS	COULD NOT BE DETERMINED	0	16	10.000
N/R	PLASTIC	N/R	GF	GROUP VI, THYRISTORS	COULD NOT BE DETERMINED	0	0	1.500
** GROUP VII, MICROWAVE DETECTOR COULD NOT BE DETERMINED								
10182272	JANTX	18	GF	GROUP VII, MICROWAVE DETECTOR	COULD NOT BE DETERMINED	10710	0	170.147
** GROUP VIII, STEP RECOVERY COULD NOT BE DETERMINED								
10182311	N/R	18	GF	GROUP VIII, STEP RECOVERY	COULD NOT BE DETERMINED	1071	0	17.015
** GROUP VIII, TUNNEL COULD NOT BE DETERMINED								
N/R	JANTX	N/R	GF	GROUP VIII, TUNNEL	COULD NOT BE DETERMINED	0	0	2.000
** GROUP VIII, VARACTOR COULD NOT BE DETERMINED								
8J4C01	JANTX	18	GF	GROUP VIII, VARACTOR	COULD NOT BE DETERMINED	1071	2	17.015
N/R	JANTX	N/R	GF	GROUP VIII, VARACTOR	COULD NOT BE DETERMINED	0	0	2.000

Diode Summary

The following table presents the results of the nonoperating diode data base data merge. Data in this section were derived using the detailed data tables immediately proceeding this section. Data were merged for records having identical diode classifications, diode applications, quality levels and application environments. Part hours, number failed and number fielded were summed for diodes meeting this merge criteria. Field and predicted failure rates were then derived for each merged record. In cases where all model parameters could not be determined, a N/R appears in the predicted failure rate column. Predicted failure rates were derived with the following default model parameters.

Ambient, Nonoperating Temperature = 20°C
Power Cycling Rate = 0.0

Diode Field
Data Summary
Table

Diode Style Classification	Diode Application	Quality Level	App Env	Number Fielded	Cumulative Part Hours	Number Failed	Field Failure Rate	Predicted Failure Rate
** GROUP IV, COULD NOT BE DETERMINED								
GROUP IV	COULD NOT BE DETERMINED	JAN	GB	2860792	25061.000	2	0.0000798	N/R
** GROUP IV, SI, GENERAL PURPOSE, COULD NOT BE DETERMINED								
GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	JAN	GF	93517	20028.361	18	0.0008987	0.0018563
GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	JAN	N/R	6992	6364.083	41	0.0064424	N/R
GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	JANTX	GF	692153	11717.907	2	0.0001707	0.0005156
GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	N/R	GB	395241	3462.338	0 <	0.0002646	N/R
GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	N/R	GF	N/R	400.000	1	0.0025000	N/R
GROUP IV, SI, GENERAL PURPOSE	COULD NOT BE DETERMINED	PLASTIC	GF	N/R	1558.000	40	0.0256739	0.0018598
** GROUP IV, SI, GENERAL PURPOSE, POWER RECTIFIER >=500mA								
GROUP IV, SI, GENERAL PURPOSE	POWER RECTIFIER >=500mA	JAN	GB	1524501	11276.200	1	0.0000887	0.0004760
GROUP IV, SI, GENERAL PURPOSE	POWER RECTIFIER >=500mA	JANTX	GF	15082	241.075	0 <	0.0037996	0.0005156
GROUP IV, SI, GENERAL PURPOSE	POWER RECTIFIER >=500mA	N/R	GF	23	0.717	0 <<	1.2775453	N/R
** GROUP IV, SI, GENERAL PURPOSE, POWER RECTIFIER H.V. STACKS								
GROUP IV, SI, GENERAL PURPOSE	POWER RECTIFIER H.V. STACKS	JANTX	GF	21	0.669	0 <<	1.3692078	0.0005156
** GROUP IV, SI, GENERAL PURPOSE, SWITCHING < 500mA								
GROUP IV, SI, GENERAL PURPOSE	SWITCHING < 500mA	JAN	GB	20627822	180698.700	8	0.0000443	0.0004760
GROUP IV, SI, GENERAL PURPOSE	SWITCHING < 500mA	JAN	GF	5244	76.562	0 <	0.0119642	0.0018563
GROUP IV, SI, GENERAL PURPOSE	SWITCHING < 500mA	JAN	N/R	20102	293.489	0 <	0.0031211	N/R
GROUP IV, SI, GENERAL PURPOSE	SWITCHING < 500mA	JANTX	GF	63189	1003.867	0 <	0.0009125	0.0005156
GROUP IV, SI, GENERAL PURPOSE	SWITCHING < 500mA	N/R	GF	18821	164.870	0 <	0.0055559	N/R

Diode Field
Data Summary
Table

Diode Style Classification	Diode Application	Quality Level	App Env	Number Fielded	Cumulative Part Hours	Number Failed	Field Failure Rate	Predicted Failure Rate
** GROUP IV, SI, GENERAL PURPOSE, VOLTAGE REGULATOR								
GROUP IV, SI, GENERAL PURPOSE	VOLTAGE REGULATOR	JAN	GB	658735	5770.520	2	0.0003466	0.0004787
GROUP IV, SI, GENERAL PURPOSE	VOLTAGE REGULATOR	JANTX	GF	65	2.124	0 <<	0.4312618	0.0005156
** GROUP V, ZENER & AVALANCHE, COULD NOT BE DETERMINED								
GROUP V, ZENER & AVALANCHE	COULD NOT BE DETERMINED	JAN	GB	94105	824.360	0 <	0.0011112	0.0012116
GROUP V, ZENER & AVALANCHE	COULD NOT BE DETERMINED	JAN	GF	N/R	954.000	3	0.0031447	0.0047254
GROUP V, ZENER & AVALANCHE	COULD NOT BE DETERMINED	JANTX	GF	N/R	175.000	1	0.0057143	0.0013126
GROUP V, ZENER & AVALANCHE	COULD NOT BE DETERMINED	PLASTIC	GF	N/R	47.000	5	0.1063830	0.0301901
** GROUP V, ZENER & AVALANCHE, POWER RECTIFIER >=500mA								
GROUP V, ZENER & AVALANCHE	POWER RECTIFIER >=500mA	JANTX	GF	65	2.282	0 <<	0.4014023	0.0013126
** GROUP V, ZENER & AVALANCHE, VOLTAGE REFERENCE								
GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	JAN	GB	131747	1154.100	0 <	0.0007937	0.0012116
GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	JAN	N/R	N/R	607.000	0 <	0.0015091	N/R
GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	JANTX	GF	33232	1400.477	4	0.0028562	0.0013126
GROUP V, ZENER & AVALANCHE	VOLTAGE REFERENCE	N/R	GF	20	0.496	0 <<	1.8467742	N/R
** GROUP V, ZENER & AVALANCHE, VOLTAGE REGULATOR								
GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	JAN	GB	1769174	27368.730	0 <	0.0000335	0.0012116
GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	JAN	GF	20975	306.248	0 <	0.0029910	0.0047254
GROUP V, ZENER & AVALANCHE	VOLTAGE REGULATOR	JANTX	GF	39330	391.210	0 <	0.0023415	0.0013126
** GROUP VI, THYRISTORS, COULD NOT BE DETERMINED								
GROUP VI, THYRISTORS	COULD NOT BE DETERMINED	JAN	GF	N/R	165.000	1	0.0060606	0.0070285
GROUP VI, THYRISTORS	COULD NOT BE DETERMINED	JANTX	GF	41817	509.157	1	0.0019640	0.0019524

Diode Field
Data Summary
Table

Diode Style Classification	Diode Application	Quality Level	App Env	Number Fielded	Cumulative Part Hours	Number Failed	Field Failure Rate	Predicted Failure Rate
GROUP VI, THYRISTORS	COULD NOT BE DETERMINED	PLASTIC	GF	N/R	11.500	16	1.3913043	0.0449044
** GROUP VII, MICROWAVE DETECTOR, COULD NOT BE DETERMINED								
GROUP VII, MICROWAVE DETECTOR	COULD NOT BE DETERMINED	JANTX	GF	10710	170.147	0 <	0.0053836	0.0151141
** GROUP VIII, STEP RECOVERY, COULD NOT BE DETERMINED								
GROUP VIII, STEP RECOVERY	COULD NOT BE DETERMINED	N/R	GF	1071	17.015	0 <<	0.0538349	N/R
** GROUP VIII, TUNNEL, COULD NOT BE DETERMINED								
GROUP VIII, TUNNEL	COULD NOT BE DETERMINED	JANTX	GF	N/R	2.000	0 <<	0.4580000	0.0086804
** GROUP VIII, VARACTOR, COULD NOT BE DETERMINED								
GROUP VIII, VARACTOR	COULD NOT BE DETERMINED	JANTX	GF	1071	19.015	2	0.1051801	0.0086804

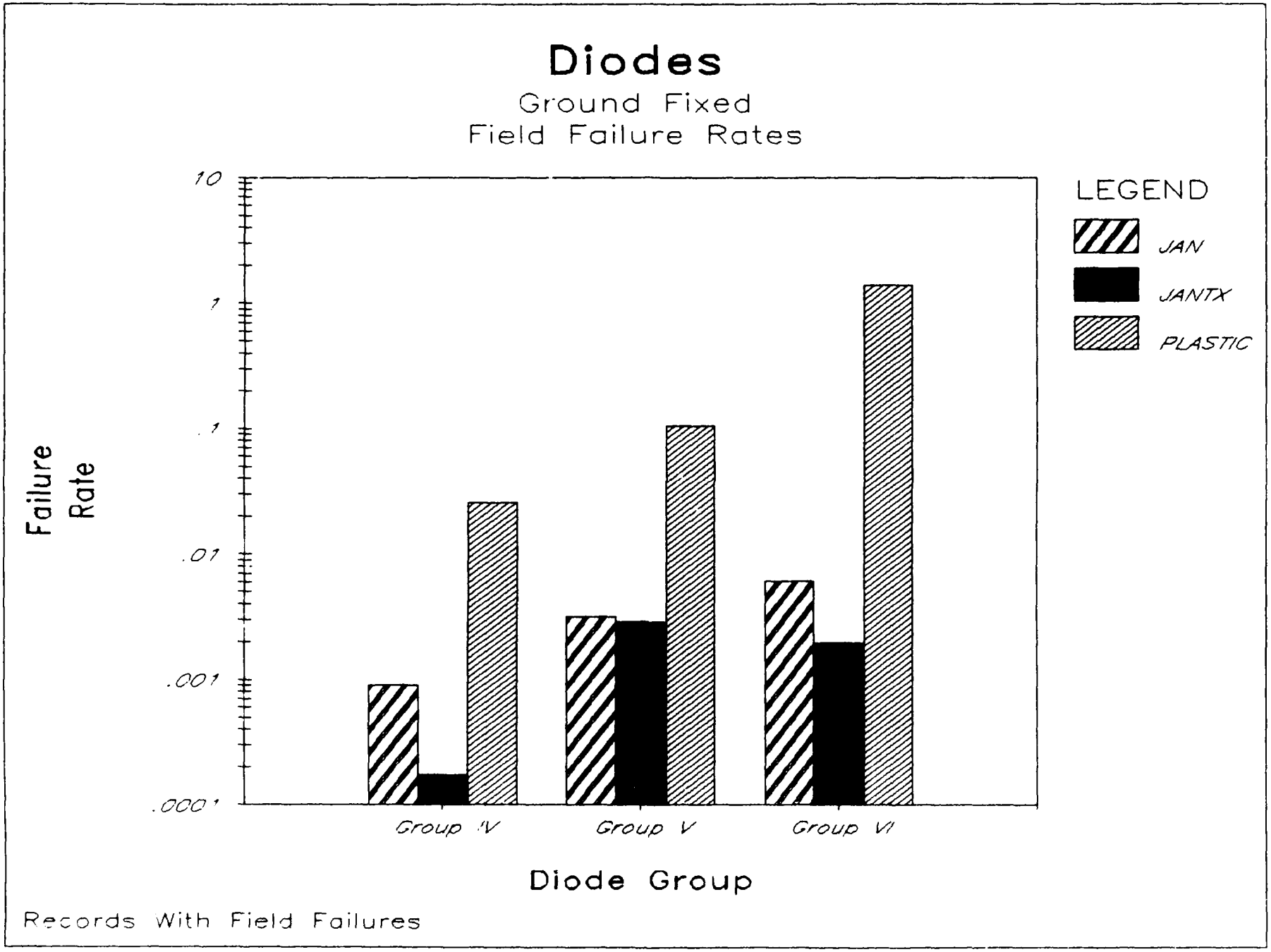

FIGURE D-1: DIODE FAILURE RATE VS. DIODE GROUP

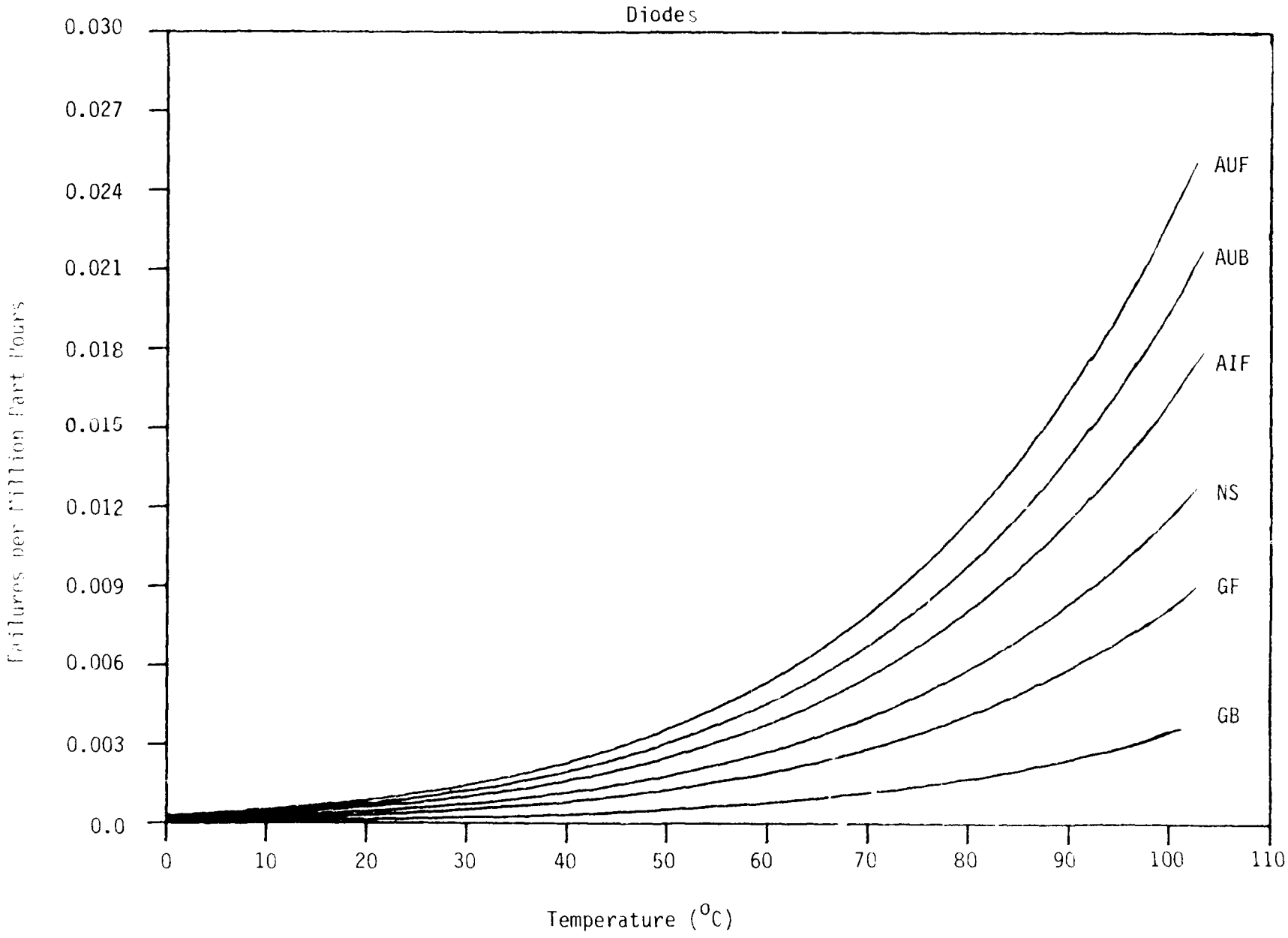

FIGURE D-2: DIODE PREDICTED FAILURE RATE VS. TEMPERATURE

Transistors

Transistor Data File Description

Field experience data on Group I, II, III, and IX transistors (as defined in MIL-HDBK-217) are presented in this section. Data from the transistor nonoperating field experience detail data section have been sorted by transistor classification, transistor application, quality level, application environment and part number. The data in this section has been subgrouped according to transistor classification and application. All transistor detail data records contain the following characteristic data fields:

- o Transistor Classification: Discrete semiconductor group and description for which the transistor data point belongs. This report summarizes data for Group I, II, III, and IX transistors. Table T-1 depicts the transistor classification groups.

- o Transistor Application: Brief description of diode in circuit implementation.

- o Transistor Complexity: Device complexity per package.

- o Actual Temperature: Average temperature which the transistor is exposed to during periods of nonoperation. The actual temperature is given in degrees centigrade.

o Quality: Codes which indicate the level of quality control a device has been subjected to. These codes are based on testing and screening levels that the diode received prior to system installation. Table T-2 illustrates the various transistor quality levels.

TABLE T-1:
TRANSISTOR CLASSIFICATIONS

Part Type	Group	Description
Transistors	I	Si, NPN Si, PNP Ge, PNP Ge, PNP
	II	FET
	III	Unijunction
	IX	Microwave Transistors

TABLE T-2:
TRANSISTOR QUALITY LEVELS

Quality Level
JANTXV
JANTX
JAN
Lower (Hermetic)
Plastic

Transistor Storage
Field Experience

Component Part Number	Quality	Actual Temp	App Env	Transistor Classification	Complexity	Transistor Application	Watts	Number Fielded	Number Failed	Part Hours
** GROUP I, GE, NPN, N/R										
N/R	JANTX	N/R	N/R	GROUP I, GE, NPN	N/R	N/R	N/R	0	0	21.000
** GROUP I, GE, PNP, N/R										
JAN2N627	JAN	N/R	GB	GROUP I, GE, PNP	N/R	N/R	N/R	18221	0	164.870
M1S13674/4	JANTX	N/R	GF	GROUP I, GE, PNP	N/R	N/R	N/R	120	0	2.628
M1S13674/4	JANTX	N/R	GF	GROUP I, GE, PNP	N/R	N/R	N/R	240	0	5.256
M1S13674/9	JANTX	N/R	GF	GROUP I, GE, PNP	N/R	N/R	N/R	240	0	5.256
N/R	JANTX	N/R	N/R	GROUP I, GE, PNP	N/R	N/R	N/R	0	0	45.000
** GROUP I, SI, NPN, HIGH FREQUENCY										
A70MR214	N/R	N/R	N/R	GROUP I, SI, NPN	N/R	HIGH FREQUENCY	N/R	21	0	0.669
** GROUP I, SI, NPN, LINEAR										
JAN2N2484	JAN	N/R	GB	GROUP I, SI, NPN	SINGLE DEVICE	LINEAR	N/R	376420	0	3297.400
2N1890	JAN	20	GF	GROUP I, SI, NPN	SINGLE DEVICE	LINEAR	N/R	9614	0	140.364
2N1893	JAN	N/R	GF	GROUP I, SI, NPN	SINGLE DEVICE	LINEAR	N/R	10488	1	153.125
2N930	JAN	N/R	GF	GROUP I, SI, NPN	SINGLE DEVICE	LINEAR	N/R	1748	0	25.521
** GROUP I, SI, NPN, N/R										
JAN2N2920	JAN	N/R	GB	GROUP I, SI, NPN	DUAL (MATCHED)	N/R	N/R	263494	0	2308.200
N/R	JAN	200	GB	GROUP I, SI, NPN	N/R	N/R	90	0	2	3.250
N/R	JAN	150	GB	GROUP I, SI, NPN	N/R	N/R	40	0	0	4.350
N/R	JAN	150	GB	GROUP I, SI, NPN	N/R	N/R	65	0	1	3.000
N/R	JAN	200	GB	GROUP I, SI, NPN	N/R	N/R	N/R	0	7	10.160
2N1050A	JAN	N/R	GF	GROUP I, SI, NPN	SINGLE DEVICE	N/R	N/R	1748	0	25.521
2N2513	JAN	N/R	GF	GROUP I, SI, NPN	SINGLE DEVICE	N/R	2.5	10488	2	153.125
2N697	JAN	N/R	GF	GROUP I, SI, NPN	SINGLE DEVICE	N/R	N/R	4370	0	63.802

Transistor Storage
Field Experience

Component Part Number	Quality	Actual Temp	App Env	Transistor Classification	Complexity	Transistor Application	Watts	Number Fielded	Number Failed	Part Hours
N/R	JAN	28	GF	GROUP I, SI, NPN	N/R	N/R	N/R	0	0	42.000
N/R	JAN	25	GF	GROUP I, SI, NPN	N/R	N/R	N/R	0	1	30.000
N/R	JAN	25	GF	GROUP I, SI, NPN	N/R	N/R	N/R	0	3	1100.000
N/R	JAN	25	GF	GROUP I, SI, NPN	N/R	N/R	N/R	0	4	2800.000
N/R	JAN	28	GF	GROUP I, SI, NPN	N/R	N/R	N/R	0	0	72.000
10084344	JANTX	N/R	GF	GROUP I, SI, NPN	N/R	N/R	N/R	120	0	2.628
292N16	JANTX	18	GF	GROUP I, SI, NPN	DUAL (UNMATCHED)	N/R	N/R	6426	0	102.088
2N2219	JANTX	N/R	GF	GROUP I, SI, NPN	N/R	N/R	N/R	6210	1	61.770
2N2222A	JANTX	N/R	GF	GROUP I, SI, NPN	N/R	N/R	N/R	113850	2	1132.450
2N2432	JANTX	N/R	GF	GROUP I, SI, NPN	N/R	N/R	N/R	156	0	4.473
2N2484	JANTX	N/R	GF	GROUP I, SI, NPN	N/R	N/R	N/R	2070	0	20.590
2N3019	JANTX	N/R	GF	GROUP I, SI, NPN	N/R	N/R	N/R	6210	0	61.770
2N31167	JANTX	18	GF	GROUP I, SI, NPN	SINGLE DEVICE	N/R	N/R	53550	1	850.735
2N3501	JANTX	N/R	GF	GROUP I, SI, NPN	N/R	N/R	N/R	4140	1	41.180
2N3700	JANTX	18	GF	GROUP I, SI, NPN	SINGLE DEVICE	N/R	N/R	183141	3	2909.513
2N4150	JANTX	N/R	GF	GROUP I, SI, NPN	N/R	N/R	N/R	78	0	2.236
2N706	JANTX	18	GF	GROUP I, SI, NPN	SINGLE DEVICE	N/R	N/R	21420	1	340.294
2N720A	JANTX	N/R	GF	GROUP I, SI, NPN	N/R	N/R	N/R	10350	0	102.950
2N915	JANTX	18	GF	GROUP I, SI, NPN	SINGLE DEVICE	N/R	N/R	25704	1	408.352
2N918	JANTX	18	GF	GROUP I, SI, NPN	SINGLE DEVICE	N/R	N/R	14994	0	238.205
45734	JANTX	18	GF	GROUP I, SI, NPN	SINGLE DEVICE	N/R	N/R	6426	0	102.088
G657133	JANTX	N/R	GF	GROUP I, SI, NPN	N/R	N/R	N/R	7950	0	96.798
G657137	JANTX	N/R	GF	GROUP I, SI, NPN	N/R	N/R	N/R	1908	1	23.232

Transistor Storage
Field Experience

Component Part Number	Quality	Actual Temp	App Env	Transistor Classification	Complexity	Transistor Application	Watts	Number Fielded	Number Failed	Part Hours
G657155	JANTX	N/R	GF	GROUP I, SI, NPN	N/R	N/R	N/R	108915	1	1326.133
JAN2N1890	JANTX	N/R	GF	GROUP I, SI, NPN	N/R	N/R	N/R	31	0	8.947
JAN2N720A	JANTX	N/R	GF	GROUP I, SI, NPN	N/R	N/R	N/R	78	0	2.236
M1S13674/0	JANTX	N/R	GF	GROUP I, SI, NPN	N/R	N/R	N/R	120	0	2.628
M1S13674/1	JANTX	N/R	GF	GROUP I, SI, NPN	N/R	N/R	N/R	1800	0	39.420
M1S13674/9	JANTX	N/R	GF	GROUP I, SI, NPN	N/R	N/R	N/R	2520	0	55.188
MHT8071	JANTX	18	GF	GROUP I, SI, NPN	SINGLE DEVICE	N/R	N/R	2142	0	34.029
PRT 5912	JANTX	18	GF	GROUP I, SI, NPN	SINGLE DEVICE	N/R	N/R	16065	0	255.220
N/R	JANTX	N/R	N/R	GROUP I, SI, NPN	N/R	N/R	N/R	0	4	3036.000
N/R	JANTX	N/R	N/R	GROUP I, SI, NPN	N/R	N/R	N/R	0	2	791.000
N/R	JANTX	N/R	N/R	GROUP I, SI, NPN	N/R	N/R	N/R	0	0	249.000
N/R	JANTX	N/R	N/R	GROUP I, SI, NPN	N/R	N/R	N/R	0	1	1253.000
2N744	JANTXV	N/R	GF	GROUP I, SI, NPN	N/R	N/R	N/R	28	0	1.886
** GROUP I, SI, NPN, SWITCH										
JAN2N2219A	JAN	N/R	GB	GROUP I, SI, NPN	SINGLE DEVICE	SWITCH	.8	338778	1	2967.700
JAN2N2222A	JAN	N/R	GB	GROUP I, SI, NPN	SINGLE DEVICE	SWITCH	.5	5495732	3	48143.000
JAN2N3019	JAN	N/R	GB	GROUP I, SI, NPN	SINGLE DEVICE	SWITCH	N/R	376420	0	3294.700
JAN2N3501	JAN	N/R	GB	GROUP I, SI, NPN	N/R	SWITCH	N/R	357599	0	3132.600
JAN2N3700	JAN	N/R	GB	GROUP I, SI, NPN	SINGLE DEVICE	SWITCH	N/R	75284	0	659.490
JAN2N720A	JAN	N/R	GB	GROUP I, SI, NPN	SINGLE DEVICE	SWITCH	N/R	282315	0	2473.100
2N338	JAN	N/R	GF	GROUP I, SI, NPN	SINGLE DEVICE	SWITCH	3	5244	1	76.562
** GROUP I, SI, PNP, LINEAR										
2N2907A	JAN	N/R	GF	GROUP I, SI, PNP	SINGLE DEVICE	LINEAR	N/R	1748	0	25.521

Transistor Storage
Field Experience

Component Part Number	Quality	Actual Temp	App Env	Transistor Classification	Complexity	Transistor Application	Watts	Number Fielded	Number Failed	Part Hours
** GROUP I, SI, PNP, N/R										
N/R	JAN	200	GB	GROUP I, SI, PNP	N/R	N/R	90	0	0	1.300
N/R	JAN	150	GB	GROUP I, SI, PNP	N/R	N/R	65	0	0	2.910
N/R	JAN	175	GB	GROUP I, SI, PNP	N/R	N/R	N/R	0	3	0.880
N/R	JAN	25	GF	GROUP I, SI, PNP	N/R	N/R	N/R	0	0	5.000
N/R	JAN	25	GF	GROUP I, SI, PNP	N/R	N/R	N/R	0	0	18.000
N/R	JAN	N/R	GF	GROUP I, SI, PNP	N/R	N/R	N/R	0	6	1900.000
N/R	JAN	N/R	GF	GROUP I, SI, PNP	N/R	N/R	N/R	0	0	38.000
N/R	JAN	150	N/R	GROUP I, SI, PNP	N/R	N/R	40	0	0	3.620
11300086	JANTX	N/R	GF	GROUP I, SI, PNP	N/R	N/R	N/R	318	0	3.872
11301083	JANTX	N/R	GF	GROUP I, SI, PNP	N/R	N/R	N/R	32913	0	400.743
2N2905A	JANTX	N/R	GF	GROUP I, SI, PNP	N/R	N/R	N/R	39	0	1.118
2N2905A	JANTX	N/R	GF	GROUP I, SI, PNP	N/R	N/R	N/R	16560	0	164.720
2N2907A	JANTX	N/R	GF	GROUP I, SI, PNP	N/R	N/R	N/R	132480	4	1317.760
2N2920	JANTX	N/R	GF	GROUP I, SI, PNP	N/R	N/R	N/R	2070	0	20.590
2N3305	JANTX	18	GF	GROUP I, SI, PNP	SINGLE DEVICE	N/R	N/R	96390	1	1531.323
2N3635	JANTX	18	GF	GROUP I, SI, PNP	SINGLE DEVICE	N/R	N/R	32130	1	510.441
2N3726	JANTX	18	GF	GROUP I, SI, PNP	DUAL (UNMATCHED)	N/R	N/R	10710	0	170.147
2N4399	JANTX	N/R	GF	GROUP I, SI, PNP	N/R	N/R	N/R	78	0	2.236
G657317	JANTX	N/R	GF	GROUP I, SI, PNP	N/R	N/R	N/R	636	0	7.743
G657318	JANTX	N/R	GF	GROUP I, SI, PNP	N/R	N/R	N/R	3657	0	44.527
G657319	JANTX	N/R	GF	GROUP I, SI, PNP	N/R	N/R	N/R	1272	0	15.487
IT400A	JANTX	18	GF	GROUP I, SI, PNP	SINGLE DEVICE	N/R	N/R	11781	0	187.162

Transistor Storage
Field Experience

Component Part Number	Quality	Actual Temp	App Env	Transistor Classification	Complexity	Transistor Application	Watts	Number Fielded	Number Failed	Part Hours
JAN2N3251A	JANTX	N/R	GF	GROUP I, SI, PNP	N/R	N/R	N/R	195	0	5.591
JAN2N3635	JANTX	N/R	GF	GROUP I, SI, PNP	N/R	N/R	N/R	78	0	2.236
M1S13674/0	JANTX	N/R	CF	GROUP I, SI, PNP	N/R	N/R	N/R	720	0	15.768
M1S13674/0	JANTX	N/R	GF	GROUP I, SI, PNP	N/R	N/R	N/R	480	0	10.512
M1S13674/4	JANTX	N/R	GF	GROUP I, SI, PNP	N/R	N/R	N/R	120	0	2.628
N/R	JANTX	N/R	GF	GROUP I, SI, PNP	N/R	N/R	N/R	1272	0	15.485
RS2263	JANTX	18	GF	GROUP I, SI, PNP	SINGLE DEVICE	N/R	N/R	6426	0	102.088
N/R	JANTX	N/R	N/R	GROUP I, SI, PNP	N/R	N/R	N/R	0	0	189.000
N/R	JANTX	N/R	N/R	GROUP I, SI, PNP	N/R	N/R	N/R	0	1	686.000
N/R	JANTX	N/R	N/R	GROUP I, SI, PNP	N/R	N/R	N/R	0	0	452.000
2N1132	JANTXV	N/R	GF	GROUP I, SI, PNP	N/R	N/R	N/R	37	0	2.493
2N2412	JANTXV	N/R	GF	GROUP I, SI, PNP	N/R	N/R	N/R	64	0	4.312
2N722	JANTXV	N/R	GF	GROUP I, SI, PNP	N/R	N/R	N/R	51	0	3.435
G657046	N/R	N/R	GF	GROUP I, SI, PNP	N/R	N/R	N/R	159	0	1.936
** GROUP I, SI, PNP, SWITCH										
JAN 2N2905A	JAN	N/R	GB	GROUP I, SI, PNP	SINGLE DEVICE	SWITCH	.6	978692	1	8573.300
JAN2N2907A	JAN	N/R	GB	GROUP I, SI, PNP	SINGLE DEVICE	SWITCH	.4	6060362	0	53089.000
** GROUP II, N/R										
2N2608	JANTX	N/R	GF	GROUP II	N/R	N/R	N/R	4140	0	41.180
2N3384	JANTX	18	GF	GROUP II	SINGLE DEVICE	N/R	N/R	4284	0	68.059
2N3437	JANTX	18	GF	GROUP II	SINGLE DEVICE	N/R	N/R	78183	1	1242.073
2N3823	JANTX	18	GF	GROUP II	SINGLE DEVICE	N/R	N/R	14994	0	238.205
2N3823	JANTX	18	GF	GROUP II	SINGLE DEVICE	N/R	N/R	38556	1	612.529

Transistor Storage
Field Experience

Component Part Number	Quality	Actual Temp	App Env	Transistor Classification	Complexity	Transistor Application	Watts	Number Fielded	Number Failed	Part Hours
2N3921	JANTX	18	GF	GROUP II	DUAL (UNMATCHED)	N/R	N/R	21420	1	340.294
N/R	JANTX	N/R	N/R	GROUP II	N/R	N/R	N/R	0	0	72.000
** GROUP II, SI, FET, LINEAR										
JAN2N2608	JAN	N/R	GB	GROUP II, SI, FET	SINGLE DEVICE	LINEAR	N/R	263494	0	2308.200
** GROUP II, SI, FET, N/R										
2N3968	JAN	N/R	GF	GROUP II, SI, FET	SINGLE DEVICE	N/R	N/R	1748	0	25.521
N/R	JAN	25	GF	GROUP II, SI, FET	N/R	N/R	N/R	0	8	1000.000
N/R	JAN	25	GF	GROUP II, SI, FET	N/R	N/R	N/R	0	0	6.000
N/R	JAN	25	GF	GROUP II, SI, FET	N/R	N/R	N/R	0	0	6.000
N/R	JAN	25	GF	GROUP II, SI, FET	N/R	N/R	N/R	0	0	28.000
N/R	JAN	18	GF	GROUP II, SI, FET	N/R	N/R	N/R	0	0	96.000
** GROUP III, UNIJNCT, N/R										
JAN2N4948	JAN	N/R	GB	GROUP III, UNIJNCT	SINGLE DEVICE	N/R	N/R	169389	0	1483.800
N/R	JAN	25	GF	GROUP III, UNIJNCT	N/R	N/R	N/R	0	0	5.000
N/R	JANTX	N/R	N/R	GROUP III, UNIJNCT	N/R	N/R	N/R	0	0	1.000
** GROUP IX, MICROWAVE, N/R										
5556	JANTX	18	GF	GROUP IX, MICROWAVE	N/R	N/R	N/R	1071	1	17.014

Transistor Summary

The following table presents the results of the nonoperating transistor data base merge. Data in this section were derived using the detailed data tables immediately proceeding this section. Data were merged for records having identical transistor classifications, transistor applications, quality levels and application environments. Data in the summary table are grouped according to their part classification, application and complexity. Part hours, number failed and number fielded were summed for diodes meeting this merge criteria. Field and predicted failure rates were then derived for each merged record. In cases where all model parameters could not be determined, a N/R appears in the predicted failure rate column. Predicted failure rates were derived with the following default model parameters.

Ambient, Nonoperating Temperature = 20°C

Power Cycling Rate = 0.0

Transistor Field
Data Summary
Table

Transistor Classification	Transistor Application	Transistor Complexity	Quality Level	App Env	Number Fielded	Cumulative Part Hours	Number Failed	Field Failure Rate	Predicted Failure Rate
** GROUP I, GE, NPN, N/R, N/R									
GROUP I, GE, NPN	N/R	N/R	JANTX	N/R	N/R	21.000	0	<< 0.0436190	N/R
** GROUP I, GE, PNP, N/R, N/R									
GROUP I, GE, PNP	N/R	N/R	JAN	GB	18221	164.870	0	< 0.0055559	0.0003129
GROUP I, GE, PNP	N/R	N/R	JANTX	GF	600	13.140	0	<< 0.0697108	0.0018149
GROUP I, GE, PNP	N/R	N/R	JANTX	N/R	N/R	45.000	0	<< 0.0203556	N/R
** GROUP I, SI, NPN, HIGH FREQUENCY, N/R									
GROUP I, SI, NPN	HIGH FREQUENCY	N/R	N/R	N/R	21	0.669	0	<< 1.3692078	N/R
** GROUP I, SI, NPN, LINEAR, SINGLE DEVICE									
GROUP I, SI, NPN	LINEAR	SINGLE DEVICE	JAN	GB	376420	3297.400	0	< 0.0002778	0.0008114
GROUP I, SI, NPN	LINEAR	SINGLE DEVICE	JAN	GF	21850	319.010	1	0.0031347	0.0047061
** GROUP I, SI, NPN, N/R, DUAL (MATCHED)									
GROUP I, SI, NPN	N/R	DUAL (MATCHED)	JAN	GB	263494	2308.200	0	< 0.0003968	0.0008114
** GROUP I, SI, NPN, N/R, DUAL (UNMATCHED)									
GROUP I, SI, NPN	N/R	DUAL (UNMATCHED)	JANTX	GF	6426	102.088	0	< 0.0089727	0.0013072
** GROUP I, SI, NPN, N/R, N/R									
GROUP I, SI, NPN	N/R	N/R	JAN	GB	N/R	20.760	12	0.5780347	0.0008114
GROUP I, SI, NPN	N/R	N/R	JAN	GF	N/R	4044.000	8	0.0019782	0.0047061
GROUP I, SI, NPN	N/R	N/R	JANTX	GF	266506	2984.629	6	0.0020103	0.0013072
GROUP I, SI, NPN	N/R	N/R	JANTX	N/R	N/R	5329.000	7	0.0013136	N/R
GROUP I, SI, NPN	N/R	N/R	JANTXV	GF	28	1.886	0	<< 0.4856840	0.0007451

Transistor Field
Data Summary
Table

Transistor Classification	Transistor Application	Transistor Complexity	Quality Level	App Env	Number Fielded	Cumulative Part Hours	Number Failed	Field Failure Rate	Predicted Failure Rate
** GROUP I, SI, NPN, N/R, SINGLE DEVICE									
GROUP I, SI, NPN	N/R	SINGLE DEVICE	JAN	GF	16606	242.448	2	0.0082492	0.0047061
GROUP I, SI, NPN	N/R	SINGLE DEVICE	JANTX	GF	323442	5138.436	6	0.0011677	0.0013072
** GROUP I, SI, NPN, SWITCH, N/R									
GROUP I, SI, NPN	SWITCH	N/R	JAN	GB	357599	3132.600	0 <	0.0002924	0.0008114
** GROUP I, SI, NPN, SWITCH, SINGLE DEVICE									
GROUP I, SI, NPN	SWITCH	SINGLE DEVICE	JAN	GB	6568529	57537.990	4	0.0000695	0.0008114
GROUP I, SI, NPN	SWITCH	SINGLE DEVICE	JAN	GF	5244	76.562	1	0.0130613	0.0047061
** GROUP I, SI, PNP, LINEAR, SINGLE DEVICE									
GROUP I, SI, PNP	LINEAR	SINGLE DEVICE	JAN	GF	1748	25.521	0 <<	0.0358920	0.0046140
** GROUP I, SI, PNP, N/R, DUAL (UNMATCHED)									
GROUP I, SI, PNP	N/R	DUAL (UNMATCHED)	JANTX	GF	10710	170.147	0 <	0.0053836	0.0012817
** GROUP I, SI, PNP, N/R, N/R									
GROUP I, SI, PNP	N/R	N/R	JAN	GB	N/R	5.090	3	0.5893910	0.0007955
GROUP I, SI, PNP	N/R	N/R	JAN	GF	N/R	1961.000	6	0.0030597	0.0046140
GROUP I, SI, PNP	N/R	N/R	JAN	N/R	N/R	3.620	0 <<	0.2530387	N/R
GROUP I, SI, PNP	N/R	N/R	JANTX	GF	192888	2031.016	4	0.0019695	0.0012817
GROUP I, SI, PNP	N/R	N/R	JANTX	N/R	N/R	1327.000	1	0.0007536	N/R
GROUP I, SI, PNP	N/R	N/R	JANTXV	GF	152	10.240	0 <<	0.0894531	0.0007305
GROUP I, SI, PNP	N/R	N/R	N/R	GF	159	1.936	0 <<	0.4731405	N/R
** GROUP I, SI, PNP, N/R, SINGLE DEVICE									
GROUP I, SI, PNP	N/R	SINGLE DEVICE	JANTX	GF	146727	2331.014	2	0.0008580	0.0012817

Transistor Field
Data Summary
Table

Transistor Classification	Transistor Application	Transistor Complexity	Quality Level	App Env	Number Fielded	Cumulative Part Hours	Number Failed	Field Failure Rate	Predicted Failure Rate
** GROUP I, SI, PNP, SWITCH, SINGLE DEVICE									
GROUP I, SI, PNP	SWITCH	SINGLE DEVICE	JAN	GB	7039054	61662.300	1	0.0000162	0.0007955
** GROUP II, N/R, DUAL (UNMATCHED)									
GROUP II	N/R	DUAL (UNMATCHED)	JANTX	GF	21420	340.294	1	0.0029386	0.0012860
** GROUP II, N/R, N/R									
GROUP II	N/R	N/R	JANTX	GF	4140	41.180	0 <<	0.0222438	0.0012860
GROUP II	N/R	N/R	JANTX	N/R	N/R	72.000	0 <	0.0127222	N/R
** GROUP II, N/R, SINGLE DEVICE									
GROUP II	N/R	SINGLE DEVICE	JANTX	GF	136017	2160.866	2	0.0009256	0.0012860
** GROUP II, SI, FET, LINEAR, SINGLE DEVICE									
GROUP II, SI, FET	LINEAR	SINGLE DEVICE	JAN	GB	263494	2308.200	0 <	0.0003968	0.0011574
** GROUP II, SI, FET, N/R, N/R									
GROUP II, SI, FET	N/R	N/R	JAN	GF	N/R	1136.000	8	0.0070423	0.0046295
** GROUP II, SI, FET, N/R, SINGLE DEVICE									
GROUP II, SI, FET	N/R	SINGLE DEVICE	JAN	GF	1748	25.521	0 <<	0.0358920	0.0046295
** GROUP III, UNIJNCT, N/R, N/R									
GROUP III, UNIJNCT	N/R	N/R	JAN	GF	N/R	5.000	0 <<	0.1832000	0.0148960
GROUP III, UNIJNCT	N/R	N/R	JANTX	N/R	N/R	1.000	0 <<	0.9160000	N/R
** GROUP III, UNIJNCT, N/R, SINGLE DEVICE									
GROUP III, UNIJNCT	N/R	SINGLE DEVICE	JAN	GB	169389	1483.800	0 <	0.0006173	0 0010344
** GROUP IX, MICROWAVE, N/R, N/R									
GROUP IX, MICROWAVE	N/R	N/R	JANTX	GF	1071	17.014	1	0.0587751	0.0591639

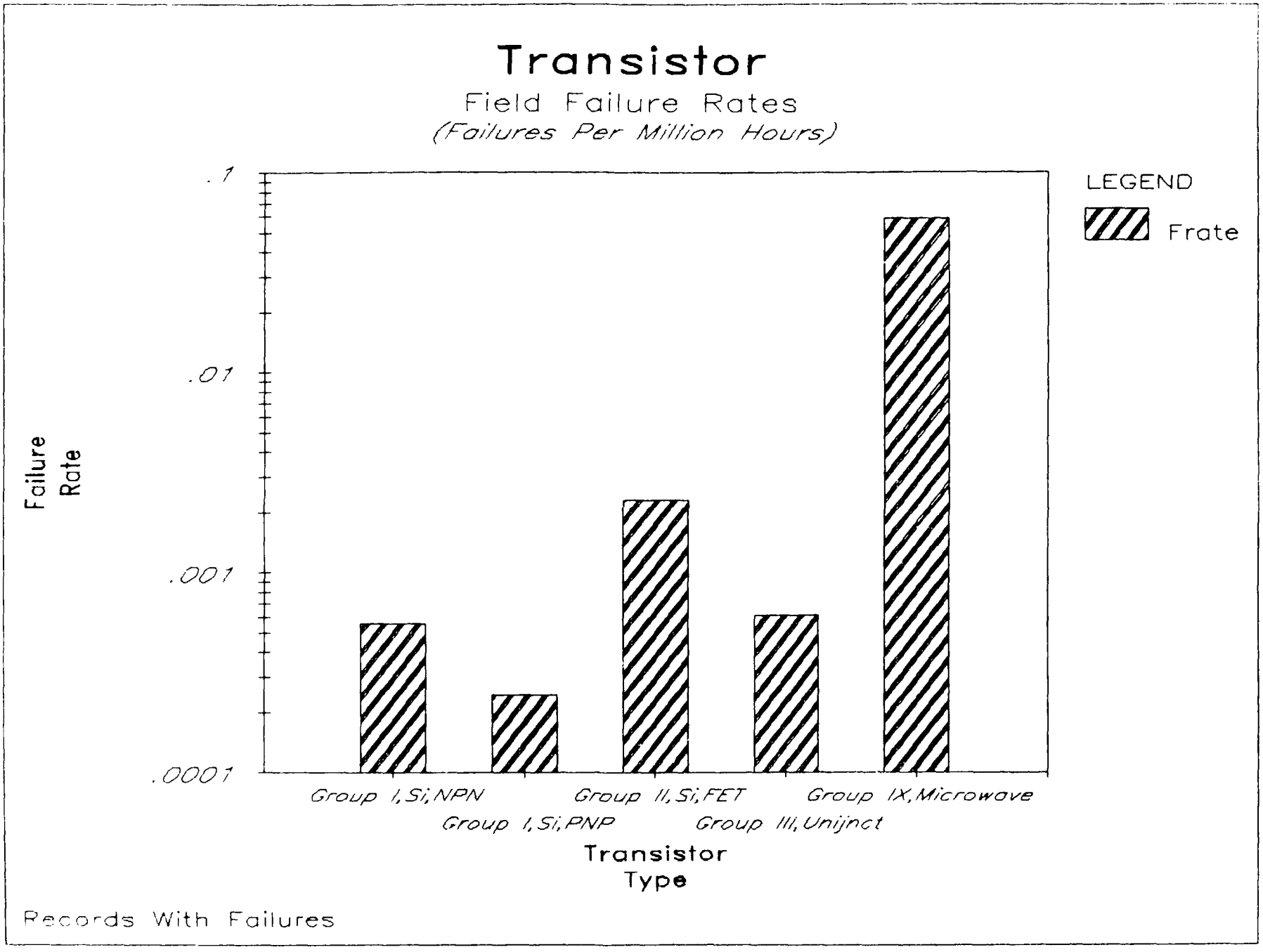

FIGURE T-1: TRANSISTOR FAILURE RATE VS. TRANSISTOR TYPE

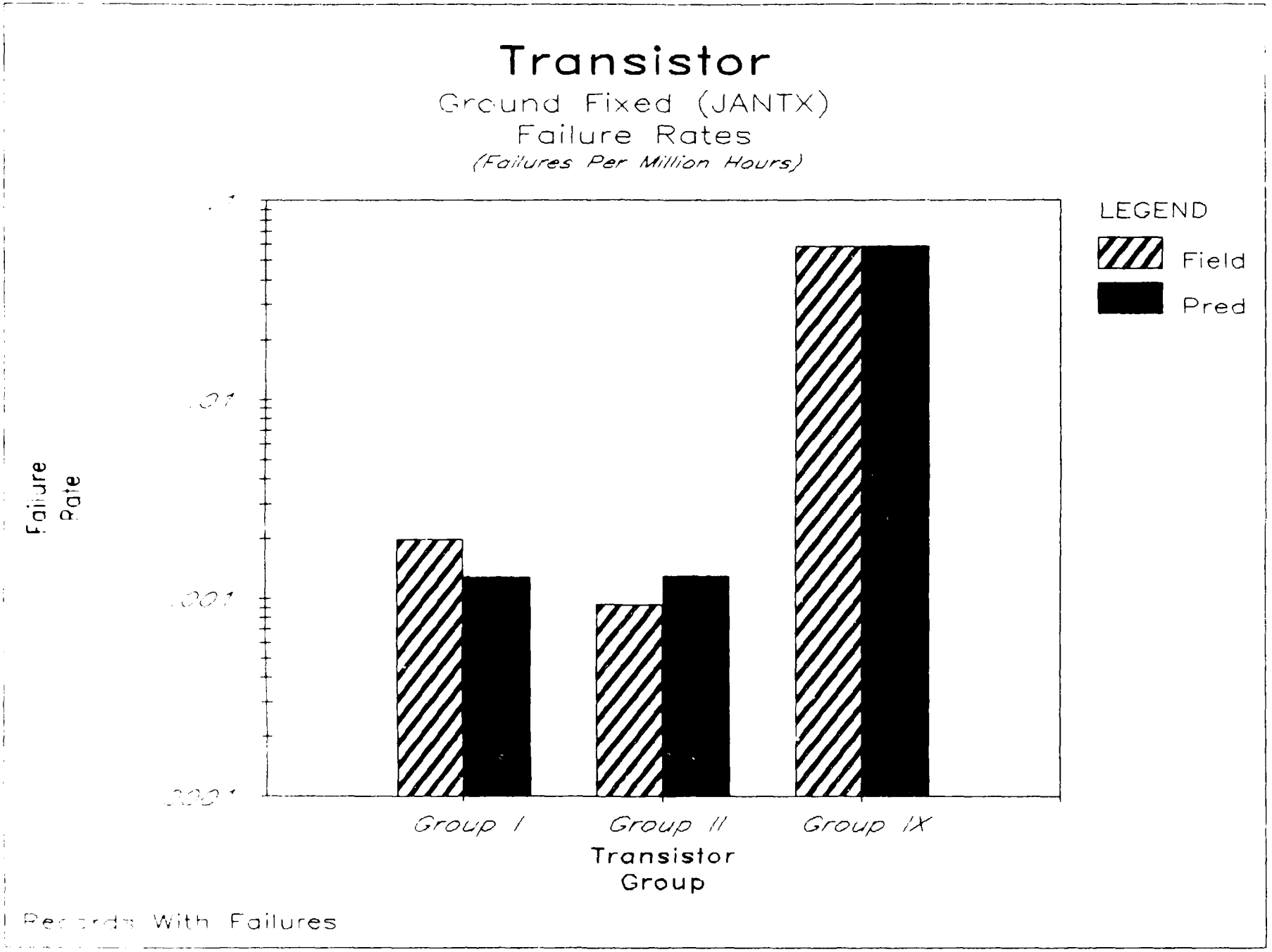

FIGURE T-2: TRANSISTOR FAILURE RATE VS. TRANSISTOR GROUP

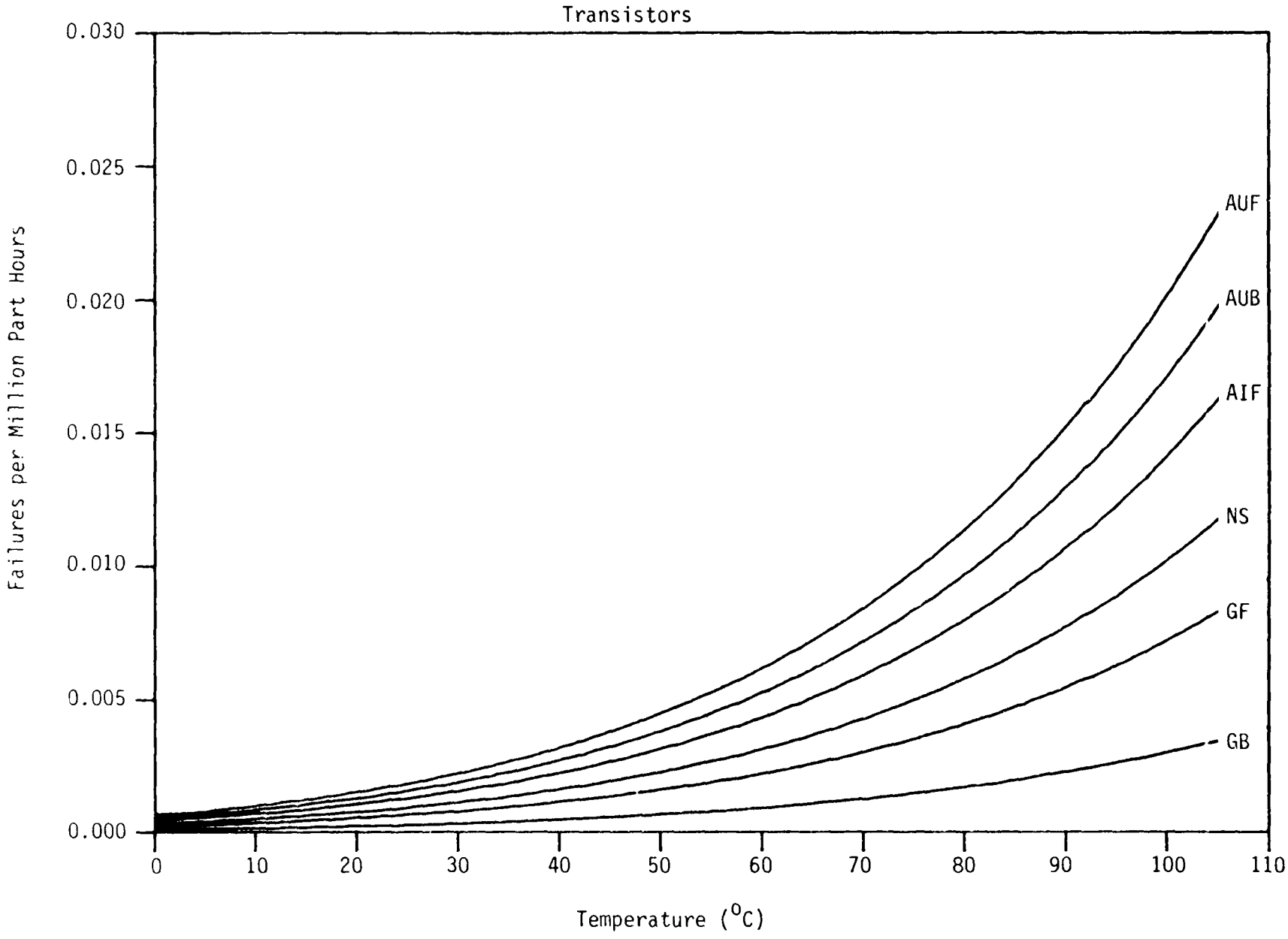

FIGURE T-3: TRANSISTOR PREDICTED FAILURE RATE VS. TEMPERATURE

Microcircuit Field Data

Microcircuit Field Data File Description

Field experience data on digital, linear and memory microcircuit devices are presented in this section. Data from the microcircuit nonoperating field experience detail data section have been sorted by the device functional group, memory type (when applicable), technology, package enclosure, package construction, package material, quality level, application environment and component part number. Data were then grouped according to the device functional group, technology and memory type (when applicable). All microcircuit detail data records contain the following characteristic data fields:

- o Functional Group: The family to which the particular device belongs. Functional groups for which data exist include digital, linear and memory.

- o Circuit Tech: Fabrication technology applied in the implementation of a device. Table MF-1 illustrates the various device technologies for which there is data.

- o Comp: The complexity of the device in terms of the number of gates (G), the number of transistors (T), or the number of bits (B).

- o Package Description: The package description column from the detail data report is comprised of three pieces of information; package enclosure, package construction and package material. See Table MF-2 on the following page.

TABLE MF-1:

DEVICE TECHNOLOGY

Code	Description
TTL	Transistor, Transistor Logic
STTL	Schottky Transistor Transistor Logic
LSTTL	Low Power Schottky Transistor Transistor Logic
LTTL	Low Power Transistor Transistor Logic
HTTL	High Speed Transistor Transistor Logic
DTL	Diode Transistor Logic
ECL	Emitter Coupled Logic
IIL	Integrated Injection Logic
MOS	Metal Oxide Semiconductor
CMOS	Complementary Metal Oxide Semiconductor
NMOS	N Channel Metal Oxide Semiconductor
PMOS	P Channel Metal Oxide Semiconductor
BIP JNCT	Bipolar Junction

TABLE MF-2:

PACKAGE DESCRIPTION

Package Enclosure:
H - Hermetic N - Non-Hermetic
Package Construction:
DIP Dual In-Line Package CAN CAN Package FPK Flatpack Package
Package Material:
Ceramic Metal Metal/Glass Epoxy Metal/Cermic

- Die Bond: The attachment material used to bond or adhere the circuit die to a package substrate. The attachment serves as a mechanical support, thermal path and sometimes as an electrical contact.

- Pins/Inter: The first number represents the quantity of pins on the package while the second number represents the number of functional pins actually interconnected to the die.

- Quality: Codes used to indicate the level of quality control to which a device has been subjected. These codes are based on the level of screening and testing that the component received before being installed into a system. Quality levels are defined in MIL-M-38510. Table MF-3 show the various microcircuit quality levels.

- Temp: Actual temperature is the average temperatures which the microcircuit is exposed to during periods of nonoperation. The temperature is illustrated in degrees centigrade.

TABLE MF-3:

MICROCIRCUIT QUALITY LEVELS

Quality Level	Description
S	Procured in full accordance with MIL-M-38510, Class S requirements. Class S listing on QPL-38510.
S-1	Procured in full compliance with the requirements of MIL-STD-975 or MIL-STD-1547 and have procuring activity specification approval.
B	Procured in full accordance with MIL-M-38510, Class B requirements. Class B listing on QPL-38510.
B-1	Fully compliant with all requirements of Paragraph 1.2.1 of MIL-STD-883 and procured to a MIL Drawing, DESC Drawing or other government approved documentation.
B-2	Not fully compliant with requirements of Paragraph 1.2.1 of MIL-STD-883 and procured to government approved documentation including vendor's equivalent Class B requirements.
D	Hermetically sealed parts with normal reliability screening and manufacturer's quality assurance practices. *Nonhermetic parts encapsulated with organic material must be subjected to 160 hours burn-in at 125°C, 10 temperature cycles (-55°C to 125°C) with end point electricals and high temperature continuity test at 100°C.
D-1	Commercial (or non-mil standard) part, encapsulated or sealed with organic materials (e.g., epoxy, silicone or phenolic).

Microcircuit Storage
Field Experience

Part Number	Circuit tech	Comp	Package Description	Die Bond	Pins/ Inter	App Env	Quality	Temp	Number Fielded	Part Hours	Number Failures
** DIGITAL	LSTTL										
54LS00	LSTTL	4G	HDIP CERAMIC	N/R	14/14	AIF	B	N/R	502	12.975	0
54LS14	LSTTL	29G	HDIP CERAMIC	EUTECTIC	14/14	AIF	B	N/R	502	12.975	0
54LS153	LSTTL	16G	HDIP CERAMIC	N/R	16/16	AIF	B	N/R	502	12.975	0
54LS161	LSTTL	50G	HDIP CERAMIC	EUTECTIC	16/16	AIF	B	N/R	2510	64.875	0
54LS175	LSTTL	24G	HDIP CERAMIC	N/R	16/16	AIF	B	N/R	3012	77.851	0
54LS373	LSTTL	66G	HDIP CERAMIC	EUTECTIC	20/20	AIF	B	N/R	2510	64.876	0
54LS74	LSTTL	12G	HDIP CERAMIC	N/R	14/14	AIF	B	N/R	3012	77.850	1
54LS86	LSTTL	4G	HDIP CERAMIC	N/R	14/14	AIF	B	N/R	3012	77.851	2
25LS2538	LSTTL	34G	HDIP CERAMIC	EUTECTIC	20/20	AIF	D	N/R	502	12.975	0
54LS73	LSTTL	16G	HDIP METAL	N/R	14/14	AIF	B	N/R	502	12.975	1
54LS157	LSTTL	15G	HDIP N/R	N/R	16/16	AIF	B	N/R	4016	103.800	0
54LS32	LSTTL	4G	HFPK N/R	N/R	14/14	AIF	B	N/R	4518	116.780	0
54LS93	LSTTL	25G	HFPK N/R	N/R	14/14	AIF	B	N/R	1506	38.926	0
** DIGITAL	N/R										
RM30	N/R	N/R	HCAN METAL	N/R	11/	GF	B	18	8568	136.118	0
SC2208	N/R	2G	HCAN METAL	N/R	8/	GF	B	20	1002	70.220	0
SC2210	N/R	1G	HCAN METAL	N/R	8/	GF	B	20	2382	166.931	1
SC2211	N/R	1G	HCAN METAL	N/R	8/	GF	B	20	1250	87.600	0
SC2213	N/R	4G	HCAN METAL	N/R	8/	GF	B	20	2992	209.679	0
SC2221	N/R	1G	HCAN METAL	N/R	8/	GF	B	20	949	66.506	2
SC2207	N/R	2G	HDIP METAL	N/R	8/	GF	B	20	1002	70.220	0
** DIGITAL	STTL										
54S112	STTL	16G	HDIP CERAMIC	N/R	16/16	AIF	B	N/R	502	12.975	0

Microcircuit Storage
Field Experience

Part Number	Circuit tech	Comp	Package Description	Die Bond	Pins/ Inter	App Env	Quality	Temp	Number Fielded	Part Hours	Number Failures
54S113	STTL	16G	HDIP CERAMIC	N/R	14/14	AIF	B	N/R	9538	246.530	0
54S194	STTL	54G	HDIP CERAMIC	EUTECTIC	16/16	AIF	B	N/R	2008	51.901	0
54S20	STTL	2G	HDIP CERAMIC	N/R	14/12	AIF	B	N/R	2008	51.901	0
54S253	STTL	16G	HDIP CERAMIC	EUTECTIC	16/16	AIF	B	N/R	3514	90.826	0
54S163	STTL	52G	HDIP CERAMIC	EUTECTIC	16/16	AIF	D	N/R	1004	25.950	0
54S260	STTL	2G	HDIP CERAMIC	EUTECTIC	14/14	AIF	D	N/R	502	12.975	0
54S32	STTL	4G	HDIP CERAMIC	N/R	14/14	AIF	D	N/R	1004	25.950	0
54S02	STTL	4G	HDIP METAL	N/R	14/14	AIF	B	N/R	502	129.750	0
54S04	STTL	6G	HDIP N/R	N/R	14/14	AIF	B	N/R	12550	324.380	0
54S08	STTL	4G	HDIP N/R	N/R	14/14	AIF	B	N/R	5552	168.680	0
54S10	STTL	3G	HDIP N/R	N/R	14/14	AIF	B	N/R	5552	142.730	0
54S11	STTL	3G	HDIP N/R	N/R	14/14	AIF	B	N/R	3012	77.851	0
54S138	STTL	16G	HDIP N/R	N/R	16/16	AIF	B	N/R	1506	38.926	0
54S153	STTL	16G	HDIP N/R	N/R	16/16	AIF	B	N/R	2008	51.901	0
54S157	STTL	15G	HDIP N/R	N/R	16/16	AIF	B	N/R	1506	38.926	0
54S158	STTL	15G	HDIP N/R	N/R	16/16	AIF	B	N/R	2008	51.901	0
54S174	STTL	36G	HDIP N/R	N/R	16/16	AIF	B	N/R	502	12.975	0
54S175	STTL	24G	HDIP N/R	N/R	16/16	AIF	B	N/R	1004	25.950	0
54S64	STTL	5G	HDIP N/R	N/R	14/14	AIF	B	N/R	1506	38.926	0
54S74	STTL	12G	HDIP N/R	N/R	14/14	AIF	B	N/R	5020	129.750	0
54S85	STTL	31G	HDIP N/R	N/R	16/16	AIF	B	N/R	1506	38.926	0
54S00	STTL	4G	HFPK CERAMIC	N/R	14/14	AIF	B	N/R	10040	259.500	0
54S139	STTL	16G	HFPK N/R	N/R	16/16	AIF	B	N/R	1506	38.926	0

Microcircuit Storage
Field Experience

Part Number	Circuit tech	Comp	Package Description	Die Bond	Pins/ Inter	App Env	Quality	Temp	Number Fielded	Part Hours	Number Failures
** DIGITAL	TTL										
9301	TTL	32G	N/R	N/R	/	GF	B	N/R	26910	267.670	1
SN5400	TTL	5G	N/R	N/R	/	GF	B	N/R	16560	164.720	0
SN5404	TTL	5G	N/R	N/R	/	GF	B	N/R	16560	164.720	1
SN5410	TTL	5G	N/R	N/R	/	GF	B	N/R	10350	102.950	0
SN5473	TTL	32G	N/R	N/R	/	GF	B	N/R	4140	41.180	0
5408	TTL	4G H	N/R	N/R	14/14	AIF	B	N/R	10542	272.480	0
54180	TTL	14G H	N/R	N/R	14/14	AIF	B	N/R	2510	64.876	0
54153	TTL	16G HDIP	CERAMIC	N/R	16/16	AIF	B	N/R	4016	103.800	0
54366	TTL	7G HDIP	CERAMIC	N/R	16/16	AIF	B	N/R	1004	25.950	0
5470	TTL	11G HDIP	CERAMIC	N/R	14/13	AIF	B	N/R	1004	25.950	0
54L5670	TTL	163G HDIP	CERAMIC	EUTECTIC	16/16	AIF	B	N/R	3012	77.850	0
9324	TTL	32G HDIP	CERAMIC	N/R	16/16	AIF	B	N/R	1506	38.926	0
5411	TTL	3G HDIP	CERAMIC	N/R	14/14	AIF	D	N/R	1004	25.950	0
54166	TTL	100G HDIP	CERAMIC	EUTECTIC	16/16	AIF	D	N/R	2008	51.901	0
54198	TTL	111G HDIP	CERAMIC	EUTECTIC	24/24	AIF	D	N/R	3012	77.851	0
5421	TTL	2G HDIP	CERAMIC	N/R	14/12	AIF	D	N/R	502	12.975	0
5497	TTL	54G HDIP	CERAMIC	EUTECTIC	16/16	AIF	D	N/R	1004	25.950	0
5402	TTL	4G HDIP	N/R	N/R	14/14	AIF	B	N/R	4016	103.800	0
5406	TTL	6G HDIP	N/R	N/R	14/14	AIF	B	N/R	502	12.975	0
5412	TTL	3G HDIP	N/R	N/R	14/14	AIF	B	35	1004	25.950	0
54121	TTL	8G HDIP	N/R	N/R	14/10	AIF	B	N/R	502	12.975	0
54123	TTL	20G HDIP	N/R	N/R	16/16	AIF	B	N/R	1506	38.926	0

Microcircuit Storage
Field Experience

Part Number	Circuit tech	Comp	Package Description	Die Bond	Pins/ Inter	App Env	Quality	Temp	Number Fielded	Part Hours	Number Failures
54125	TTL	4G	HDIP N/R	N/R	14/14	AIF	B	N/R	6526	168.680	0
54126	TTL	4G	HDIP N/R	N/R	14/14	AIF	B	N/R	15060	389.260	0
54151	TTL	17G	HDIP N/R	N/R	16/16	AIF	B	N/R	3012	77.851	0
54160	TTL	60G	HDIP N/R	N/R	16/16	AIF	B	N/R	1506	38.926	1
54164	TTL	36G	HDIP N/R	N/R	14/14	AIF	B	N/R	4016	103.800	0
54165	TTL	62G	HDIP N/R	N/R	16/16	AIF	B	N/R	1004	25.950	0
54174	TTL	36G	HDIP N/R	N/R	16/16	AIF	B	N/R	1506	38.926	0
54175	TTL	24G	HDIP N/R	N/R	16/16	AIF	B	N/R	502	12.975	0
54194	TTL	47G	HDIP N/R	N/R	16/16	AIF	B	N/R	502	12.975	0
5427	TTL	3G	HDIP N/R	N/R	14/14	AIF	B	N/R	3514	90.826	0
5430	TTL	1G	HDIP N/R	N/R	14/11	AIF	B	N/R	1506	38.926	0
5432	TTL	4G	HDIP N/R	N/R	14/14	AIF	B	N/R	6526	168.680	0
5475	TTL	24G	HDIP N/R	N/R	16/16	AIF	B	N/R	4518	11.678	0
54191	TTL	60G	HDIP N/R	N/R	16/16	AIF	D	N/R	3514	908.260	0
54157	TTL	19G	HFPK CERAMIC	N/R	16/16	AIF	B	N/R	4016	103.800	0
5476	TTL	16G	HFPK CERAMIC	N/R	16/16	AIF	B	N/R	502	12.975	0
9614	TTL	6G	HFPK CERAMIC	N/R	16/16	AIF	B	N/R	502	12.975	0
54279	TTL	8G	HFPK CERAMIC	EUTECTIC	16/16	AIF	D	N/R	5020	129.750	3
55452	TTL	2G	HFPK CERAMIC	N/R	8/ 8	AIF	D	N/R	1004	25.950	0
SG141	TTL	4G	HFPK METAL	N/R	14/14	GF	B	18	19278	306.264	1
SG19102	TTL	3G	HFPK METAL	N/R	14/	GF	B	18	2310	119.103	0
SG41	TTL	2G	HFPK METAL	N/R	10/	GF	B	18	5355	85.074	0
5410	TTL	3G	HFPK METAL/GLASS	N/R	14/12	AIF	B	N/R	6024	155.700	0

Microcircuit Storage
Field Experience

Part Number	Circuit tech	Comp	Package Description	Die Bond	Pins/ Inter	App Env	Quality	Temp	Number Fielded	Part Hours	Number Failures
5420	TTL	2G	HFPK METAL/GLASS	N/R	14/12	AIF	B	N/R	3012	77.851	0
5400	TTL	4G	HFPK N/R	N/R	14/14	AIF	B	N/R	19076	493.060	0
5404	TTL	6G	HFPK N/R	N/R	14/14	AIF	B	N/R	9036	233.550	0
54150	TTL	26G	HFPK N/R	N/R	24/24	AIF	B	N/R	502	12.975	0
54154	TTL	25G	HFPK N/R	N/R	24/24	AIF	B	N/R	1506	38.926	1
54161	TTL	57G	HFPK N/R	N/R	16/16	AIF	B	N/R	9538	246.530	0
54181	TTL	63G	HFPK N/R	N/R	24/24	AIF	B	N/R	2008	51.901	0
54367	TTL	8G	HFPK N/R	N/R	16/16	AIF	B	N/R	12048	311.400	5
5442	TTL	18G	HFPK N/R	N/R	16/16	AIF	B	N/R	1506	38.926	2
5451	TTL	6G	HFPK N/R	N/R	14/12	AIF	B	N/R	1004	25.950	0
5473	TTL	16G	HFPK N/R	N/R	14/14	AIF	B	N/R	3514	90.826	0
5474	TTL	12G	HFPK N/R	N/R	14/14	AIF	B	N/R	24096	622.810	1
5486	TTL	4G	HFPK N/R	N/R	14/14	AIF	B	N/R	7028	181.650	0
9338	TTL	98G	HFPK N/R	N/R	16/16	AIF	B	N/R	3514	90.826	0
26S02	TTL	14G	NDIP EPOXY	EUTECTIC	16/16	AIF	D	N/R	1506	38.926	0
** LINEAR	BIP JNCT										
MC1514	BIP JNCT	16T	N/R	N/R	/	GF	B	N/R	26910	267.670	1
MC1539	BIP JNCT	11T	N/R	N/R	/	GF	B	N/R	2070	20.590	1
UA709	BIP JNCT	15T	N/R	N/R	/	GF	B	N/R	8280	82.360	2
UA741	BIP JNCT	24T	N/R	N/R	/	GF	B	N/R	51750	514.750	2
723	BIP JNCT	20T	HCAN METAL	N/R	10/10	AIF	B	N/R	4016	103.800	2
LM109	BIP JNCT	19T	HCAN METAL	N/R	3/ 3	AIF	B	N/R	502	12.970	0
LM110	BIP JNCT	19T	HCAN METAL	N/R	8/ 7	AIF	B	N/R	1004	25.950	2

Microcircuit Storage
Field Experience

Part Number	Circuit tech	Comp	Package	Description	Die Bond	Pins/ Inter	App Env	Quality	Temp	Number Fielded	Part Hours	Number Failures
UA702	BIP JNCT	9T	HCAN	METAL	N/R	8/	GF	B	18	18207	289.250	1
UA710	BIP JNCT	10T	HCAN	METAL	N/R	8/	GF	B	18	37485	595.515	2
LM119	BIP JNCT	22T	HCAN	METAL	EUTECTIC	10/10	AIF	D	N/R	1004	25.950	0
VFC32SM	BIP JNCT	N/R	HCAN	METAL	N/R	10/ 9	AIF	N/R	N/R	502	12.975	0
78M15	BIP JNCT	17T	HCAN	METAL/GLASS	EUTECTIC	3/ 3	AIF	D	N/R	502	12.950	0
555	BIP JNCT	23T	HCAN	N/R	N/R	8/ 8	AIF	B	N/R	1004	25.950	0
LM101A	BIP JNCT	21T	HCAN	N/R	N/R	8/ 8	AIF	B	N/R	1506	38.920	1
LM111	BIP JNCT	23T	HCAN	N/R	N/R	8/ 8	AIF	B	N/R	1506	38.930	0
LM741	BIP JNCT	23T	HCAN	N/R	N/R	8/ 7	AIF	B	N/R	502	12.970	0
ICL 8038	BIP JNCT	52T	HDIP	CERAMIC	EUTECTIC	14/12	AIF	D	N/R	502	12.975	1
LM161	BIP JNCT	23T	HDIP	CERAMIC	EUTECTIC	14/10	AIF	D	N/R	3012	77.851	3
MN5205	BIP JNCT	370T	HDIP	CERAMIC	EUTECTIC	24/23	AIF	D	N/R	502	12.975	2
LM108A	BIP JNCT	29T	HDIP	METAL/GLASS	N/R	14/ 7	AIF	B	N/R	1004	25.950	0
LM139	BIP JNCT	32T	HDIP	METAL/GLASS	EUTECTIC	14/14	AIF	D	N/R	2008	51.901	0
2101	BIP JNCT	42T	HDIP	N/R	N/R	16/15	AIF	B	N/R	5020	129.750	9
55114	BIP JNCT	40T	HDIP	N/R	N/R	16/16	AIF	B	N/R	1004	25.955	0
55115	BIP JNCT	38T	HFPK	CERAMIC	EUTECTIC	16/16	AIF	B	N/R	1004	25.950	0
** LINEAR	CMOS											
HI9-200-8	CMOS	N/R	HCAN	METAL	EUTECTIC	10/10	AIF	D	N/R	502	12.975	0
HI7-506-8	CMOS	358T	HDIP	METAL/CERAMIC	EUTECTIC	28/26	AIF	D	N/R	502	12.975	0
DG302AP	CMOS	36T	HDIP	METAL/CERAMIC	EUTECTIC	14/13	AIF	N/R	N/R	502	12.975	1
** LINEAR	N/R											
H29-2600-8	N/R	40T	H	N/R	EUTECTIC	8/ 8	AIF	D	N/R	3514	90.826	1

Microcircuit Storage
Field Experience

Part Number	Circuit tech	Comp	Package Description		Die Bond	Pins/ Inter	App Env	Quality	Temp	Number Fielded	Part Hours	Number failures
UA709	N/R	8T	HCAN	METAL	N/R	8/	GF	B	18	14994	238.206	0
HA5-2600-8	N/R	40T	HCAN	METAL	EUTECTIC	8/ 8	AIF	D	N/R	2008	51.901	0
LM124	N/R	96T	HFPK	METAL/GLASS	EUTECTIC	14/14	AIF	D	N/R	2008	51.901	0
** MEMORY PROM STTL												
HM1-7608-8	STTL	8192B	HDIP	CERAMIC	EUTECTIC	24/22	AIF	D	N/R	8032	207.600	0
HM7-7641-8	STTL	4096B	HDIP	CERAMIC	EUTECTIC	24/24	AIF	D	N/R	7028	181.650	3
HM9-7611-8	STTL	1024B	HFPK	CERAMIC	EUTECTIC	16/16	AIF	D	N/R	4016	103.800	1
** MEMORY SRAM STTL												
27S03	STTL	64B		N/R	N/R	16/16	AIF	D	35	3012	77.851	0
** MEMORY SRAM TTL												
93425	TTL	1024B	HDIP	CERAMIC	EUTECTIC	16/16	AIF	D	N/R	9036	233.550	0
** MEMORY UVEPROM NMOS												
2716	NMOS	16384B	HDIP	CERAMIC	EUTECTIC	24/24	AIF	B	N/R	8032	207.600	0

Microcircuit Field Data Summary

The following microcircuit field data summary table presents the results of the nonoperating microcircuit field data base data merge. Data from this section were derived using the detailed data from the proceeding section. Data were merged when devices had identical functional groups, memory types (when applicable), technologies, complexity factors, quality levels and application environments. Complexity factors are numbers assigned to group device gate and transistor complexity ranges. For example, if a device had a 25 gate complexity and another device had a 26 gate complexity we would want the records to merge. The complexity values shown in the summary table represent the largest complexity within that group. Complexity factors for memory devices are not applicable when computing the predicted failure rates. Table MF-4 shows the complexity groupings. Data in the summary table are grouped according to their functional group, technology and memory type (when applicable). Part hours and number failed were summed for microcircuits meeting the merge criteria. Field and predicted failure rates were then derived for each merged record.

TABLE MF-4:
COMPLEXITY FACTORS

Complexity Range	Complexity Factor
Not Applicable	N/A
1 - 20	20
21 - 40	40
41 - 60	60
61 - 80	80
81 - 100	100
101 - 200	200
201 - 400	400

In cases where all the prediction model parameters could not be determined, a N/R appears in the predicted failure rate column. Predicted failure rates were derived using the following default model parameters.

Ambient Nonoperating Temperature = 20°C

Power Cycling Rate = 0.0

Microcircuit Field
Data Summary
Table

Functional Group	Technology	Memory Type	Complexity	Quality Level	Application Environment	Cumulative Part Hours	Number Failed	Field Failure Rate	Predicted Failure Rate
** DIGITAL, LSTTL,									
DIGITAL	LSTTL		20G	B	AIF	415.206	4	0.0096338	0.0055151
DIGITAL	LSTTL		40G	B	AIF	129.752	0	< 0.0070596	0.0076762
DIGITAL	LSTTL		40G	D	AIF	12.975	0	<< 0.0705973	0.0191904
DIGITAL	LSTTL		60G	B	AIF	64.875	0	< 0.0141195	0.0093141
DIGITAL	LSTTL		80G	B	AIF	64.876	0	< 0.0141192	0.0106840
** DIGITAL, N/R,									
DIGITAL	N/R		N/R	B	GF	136.118	0	< 0.0067295	N/R
DIGITAL	N/R		20G	B	GF	671.156	3	0.0044699	N/R
** DIGITAL, STTL,									
DIGITAL	STTL		20G	B	AIF	1894.379	0	< 0.0004835	0.0055417
DIGITAL	STTL		20G	D	AIF	38.925	0	<< 0.0235324	0.0138542
DIGITAL	STTL		40G	B	AIF	77.851	0	< 0.0117661	0.0077132
DIGITAL	STTL		60G	B	AIF	51.901	0	< 0.0176490	0.0093590
DIGITAL	STTL		60G	D	AIF	25.950	0	<< 0.0352987	0.0233974
** DIGITAL, TTL,									
DIGITAL	TTL		20G	B	AIF	3983.378	8	0.0020083	0.0055663
DIGITAL	TTL		20G	B	GF	942.831	2	0.0021213	0.0028424
DIGITAL	TTL		20G	D	AIF	233.551	3	0.0128452	0.0139158
DIGITAL	TTL		40G	B	AIF	258.206	1	0.0038729	0.0077475
DIGITAL	TTL		40G	B	GF	308.850	1	0.0032378	0.0039562
DIGITAL	TTL		60G	B	AIF	298.431	1	0.0033509	0.0094006

Microcircuit Field
Data Summary
Table

Functional Group	Technology	Memory Type	Complexity	Quality Level	Application Environment	Cumulative Part Hours	Number Failed	Field Failure Rate	Predicted Failure Rate
DIGITAL	TTL		60G	D	AIF	934.210	0	< 0.0009805	0.0235015
DIGITAL	TTL		80G	B	AIF	77.851	0	< 0.0117661	0.0107833
DIGITAL	TTL		100G	B	AIF	90.826	0	< 0.0100852	0.0119944
DIGITAL	TTL		100G	D	AIF	51.901	0	< 0.0176490	0.0299859
DIGITAL	TTL		200G	B	AIF	77.850	0	< 0.0117662	0.0166943
DIGITAL	TTL		200G	D	AIF	77.851	0	< 0.0117661	0.0417357
** LINEAR, BIP JNCT,									
LINEAR	BIP JNCT		N/R	N/R	AIF	12.975	0	<< 0.0705973	N/R
LINEAR	BIP JNCT		20T	B	AIF	142.720	4	0.0280269	0.0123963
LINEAR	BIP JNCT		20T	B	GF	1255.385	7	0.0055760	0.0063300
LINEAR	BIP JNCT		20T	D	AIF	12.950	0	<< 0.0707336	0.0309907
LINEAR	BIP JNCT		40T	B	AIF	194.625	1	0.0051381	0.0229247
LINEAR	BIP JNCT		40T	B	GF	514.750	2	0.0038854	0.0117063
LINEAR	BIP JNCT		40T	D	AIF	155.702	3	0.0192676	0.0573119
LINEAR	BIP JNCT		60T	B	AIF	129.750	9	0.0693642	0.0328471
LINEAR	BIP JNCT		60T	D	AIF	12.975	1	0.0770713	0.0821178
LINEAR	BIP JNCT		400T	D	AIF	12.975	2	0.1541426	0.4418192
** LINEAR, CMOS,									
LINEAR	CMOS		N/R	D	AIF	12.975	0	<< 0.0705973	N/R
LINEAR	CMOS		40T	N/R	AIF	12.975	1	0.0770713	N/R
LINEAR	CMOS		400T	D	AIF	12.975	0	<< 0.0705973	0.4314929

Microcircuit Field
Data Summary
Table

Functional Group	Technology	Memory Type	Complexity	Quality Level	Application Environment	Cumulative Part Hours	Number Failed		Field Failure Rate	Predicted Failure Rate
** LINEAR, N/R,										
LINEAR	N/R		20T	B	GF	238.206	0	<	0.0038454	N/R
LINEAR	N/R		40T	D	AIF	142.727	1		0.0070064	N/R
LINEAR	N/R		100T	D	AIF	51.901	0	<	0.0176490	N/R
** MEMORY, STTL, PROM										
MEMORY	STTL	PROM	N/A	D	AIF	493.050	4		0.0081128	0.0389108
** MEMORY, STTL, SRAM										
MEMORY	STTL	SRAM	N/A	D	AIF	77.851	0	<	0.0117661	0.0389108
** MEMORY, TTL, SRAM										
MEMORY	TTL	SRAM	N/A	D	AIF	233.550	0	<	0.0039221	0.0390839
** MEMORY, NMOS, UVEPROM										
MEMORY	NMOS	UVEPROM	N/A	B	AIF	207.600	0	<	0.0044123	0.0071589

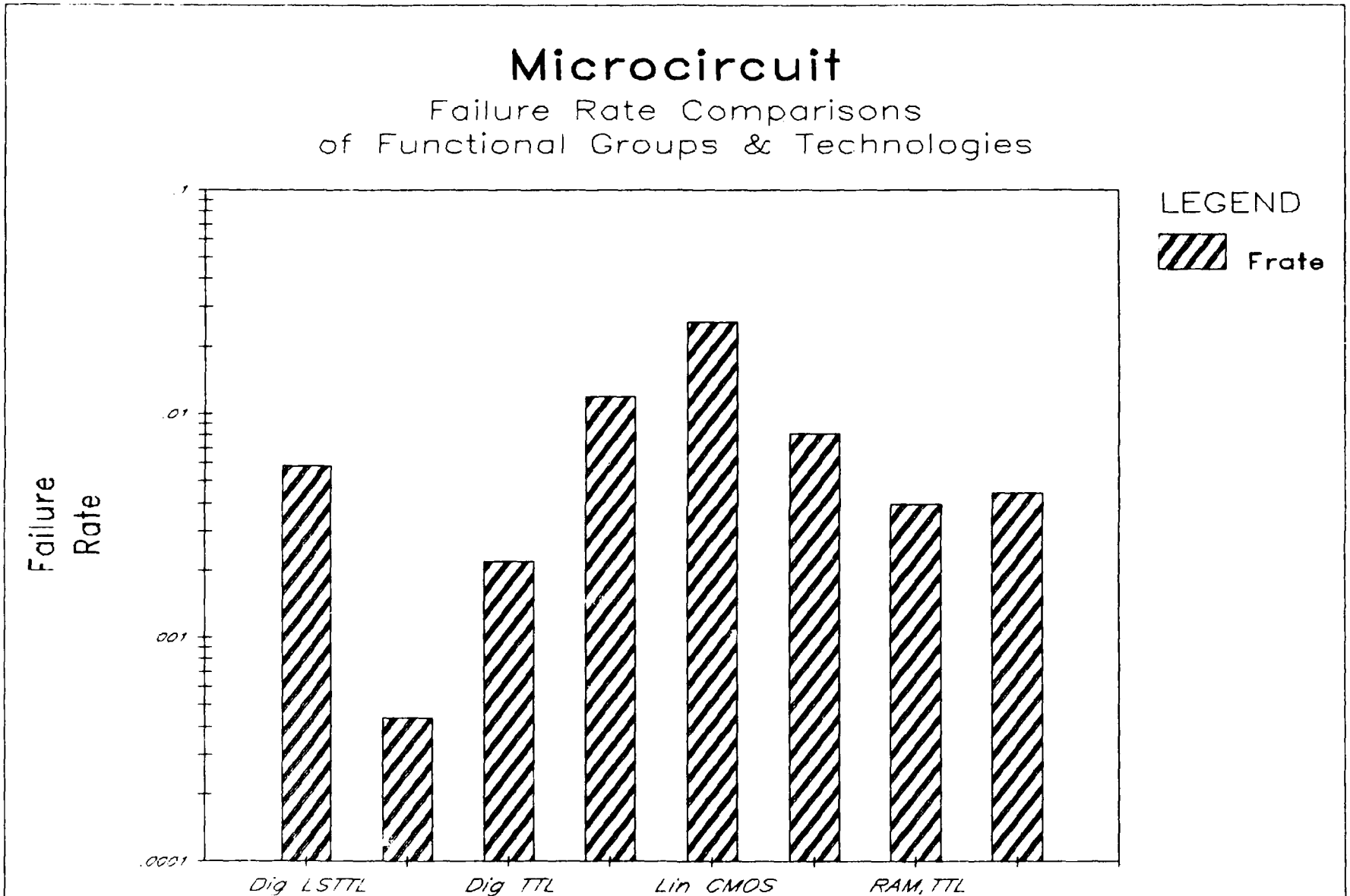

FIGURE M-1: MICROCIRCUIT FAILURE RATE
VS. MICROCIRCUIT DESCRIPTION

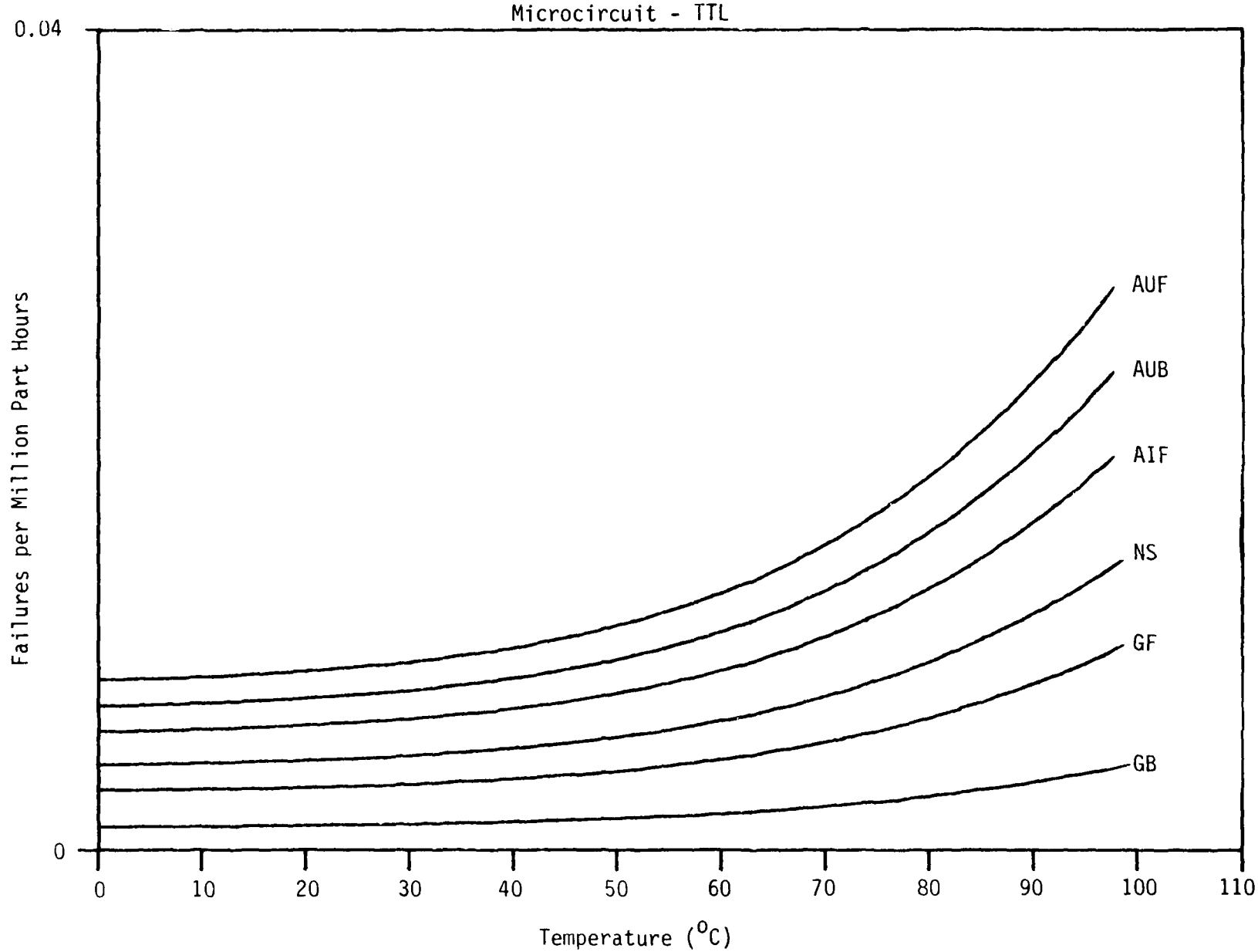

FIGURE M-2: MICROCIRCUIT (TTL) PREDICTED FAILURE RATE VS. TEMPERATURE

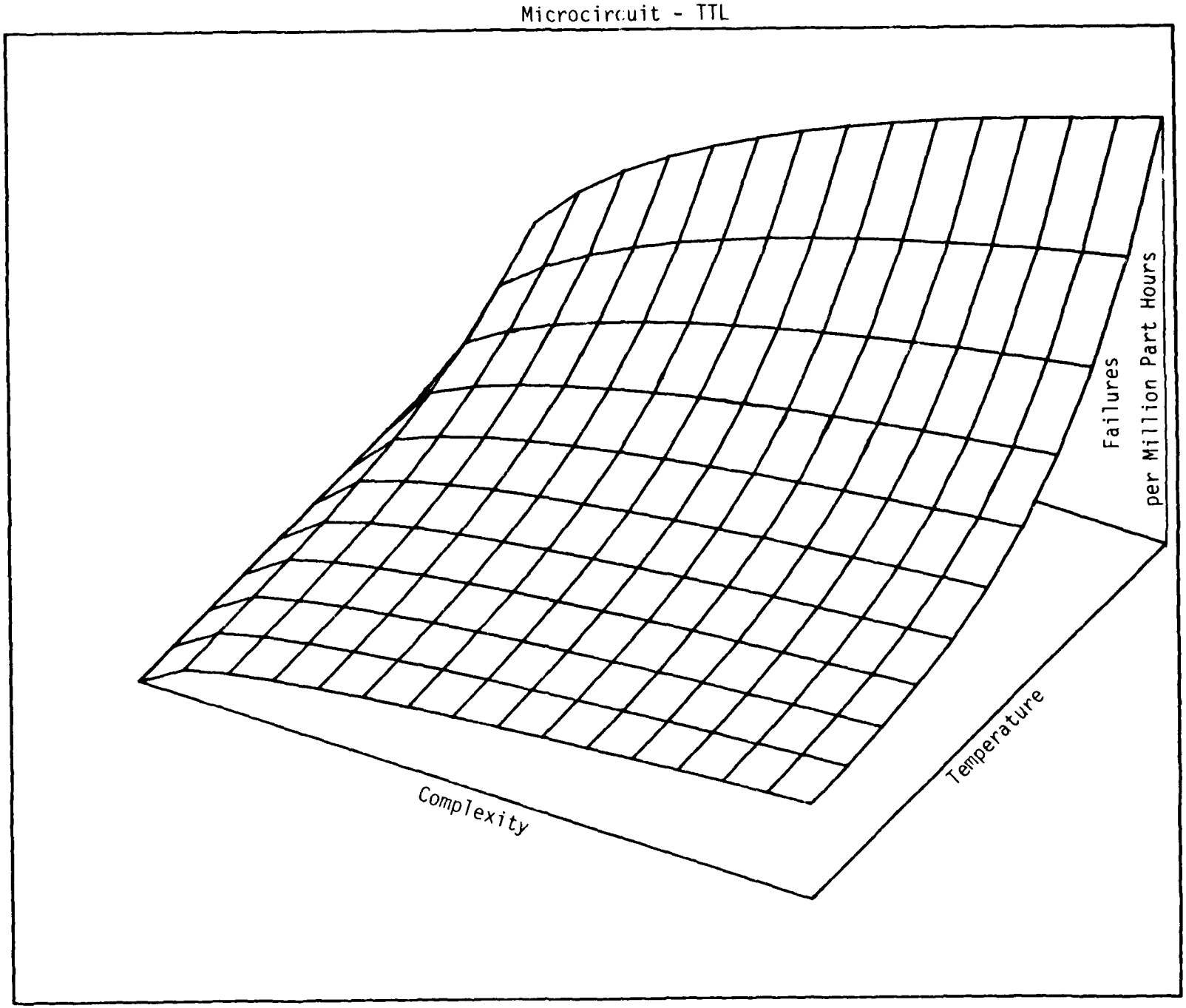

FIGURE M-3: MICROCIRCUIT (ITL) PREDICTED FAILURE RATE VS. COMPLEXITY AND TEMPERATURE

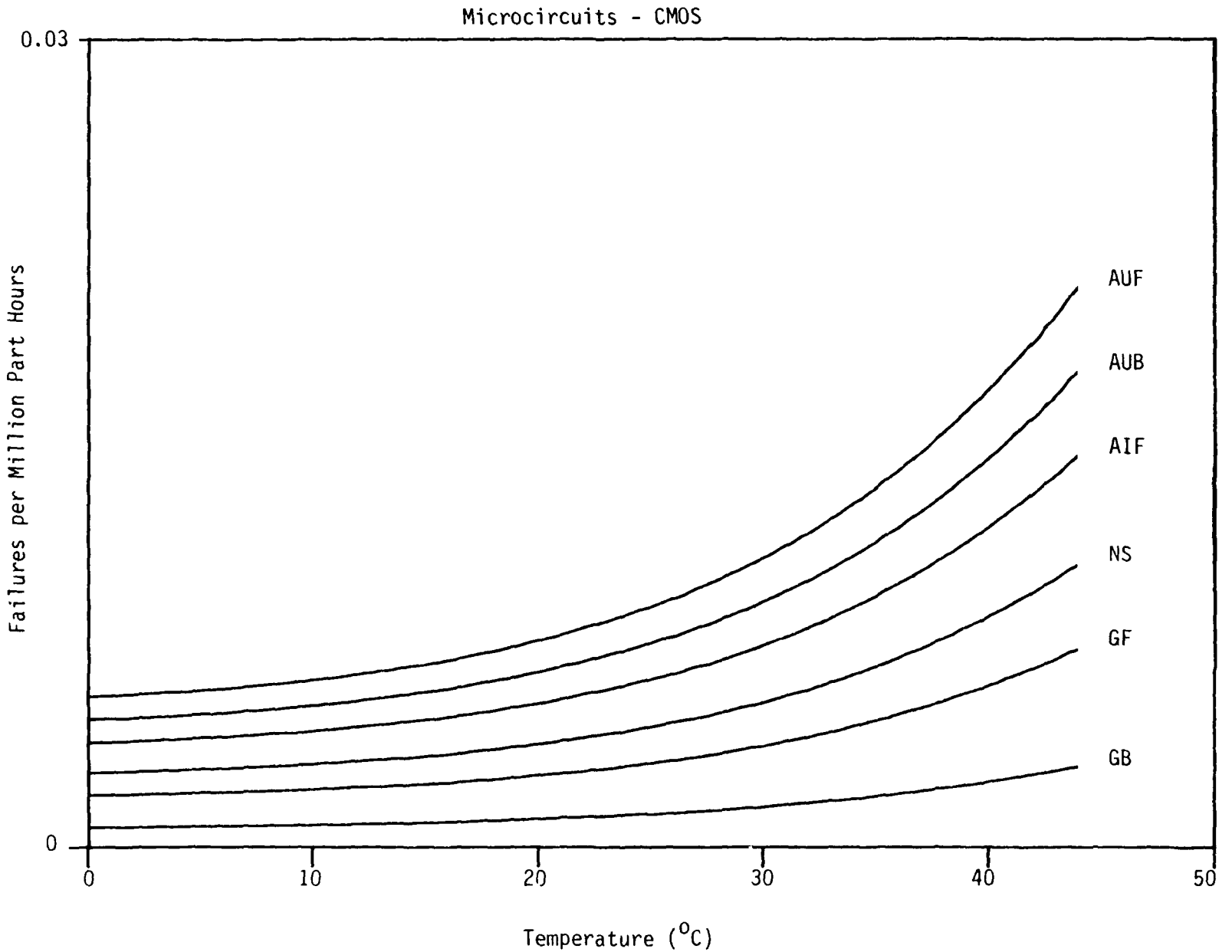

FIGURE M-4: MICROCIRCUIT (CMOS) PREDICTED FAILURE RATE VS. TEMPERATURE

Microcircuit - CMOS

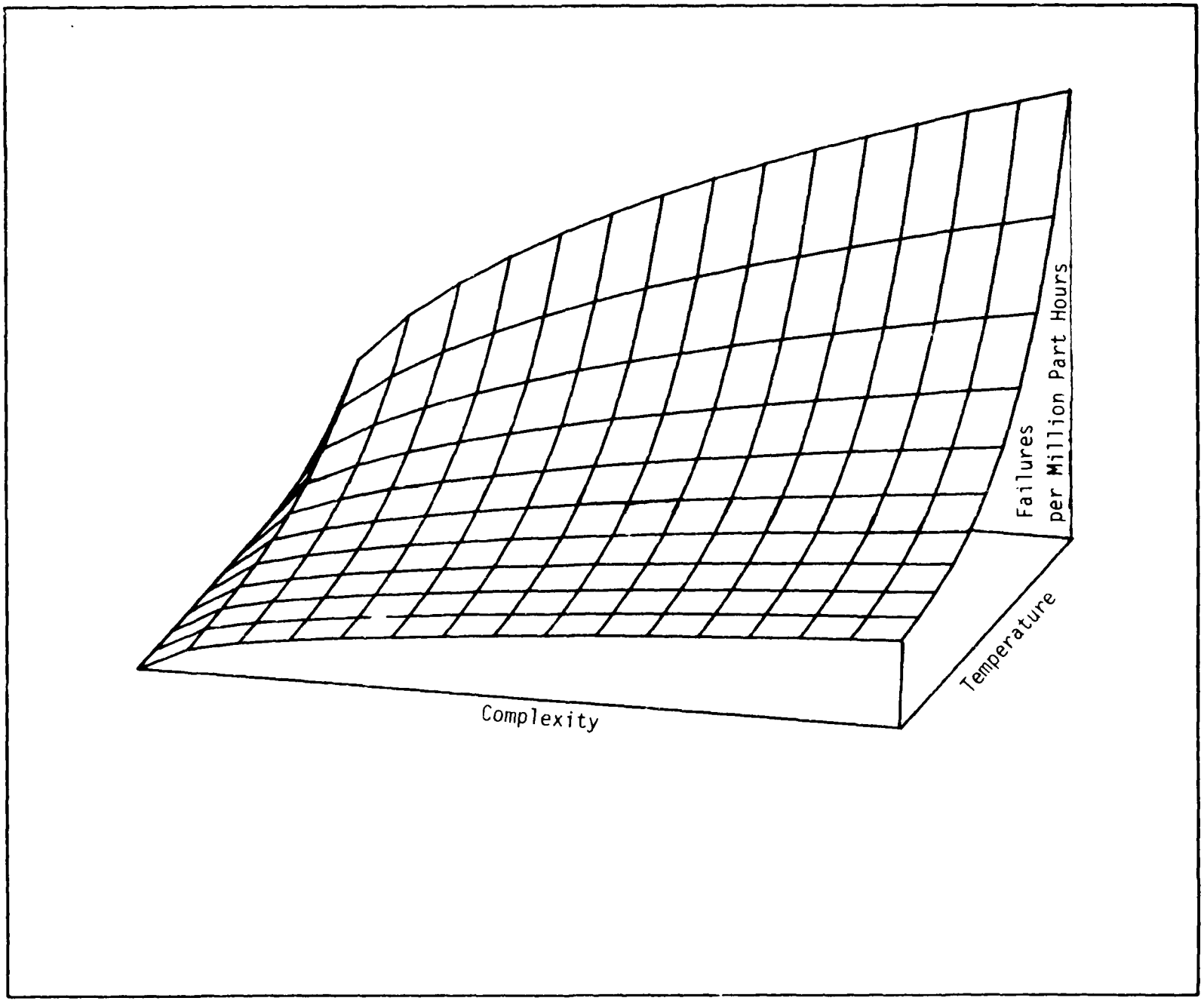

FIGURE M-5: MICROCIRCUIT (CMOS) PREDICTED FAILURE RATE VS. COMPLEXITY AND TEMPERATURE

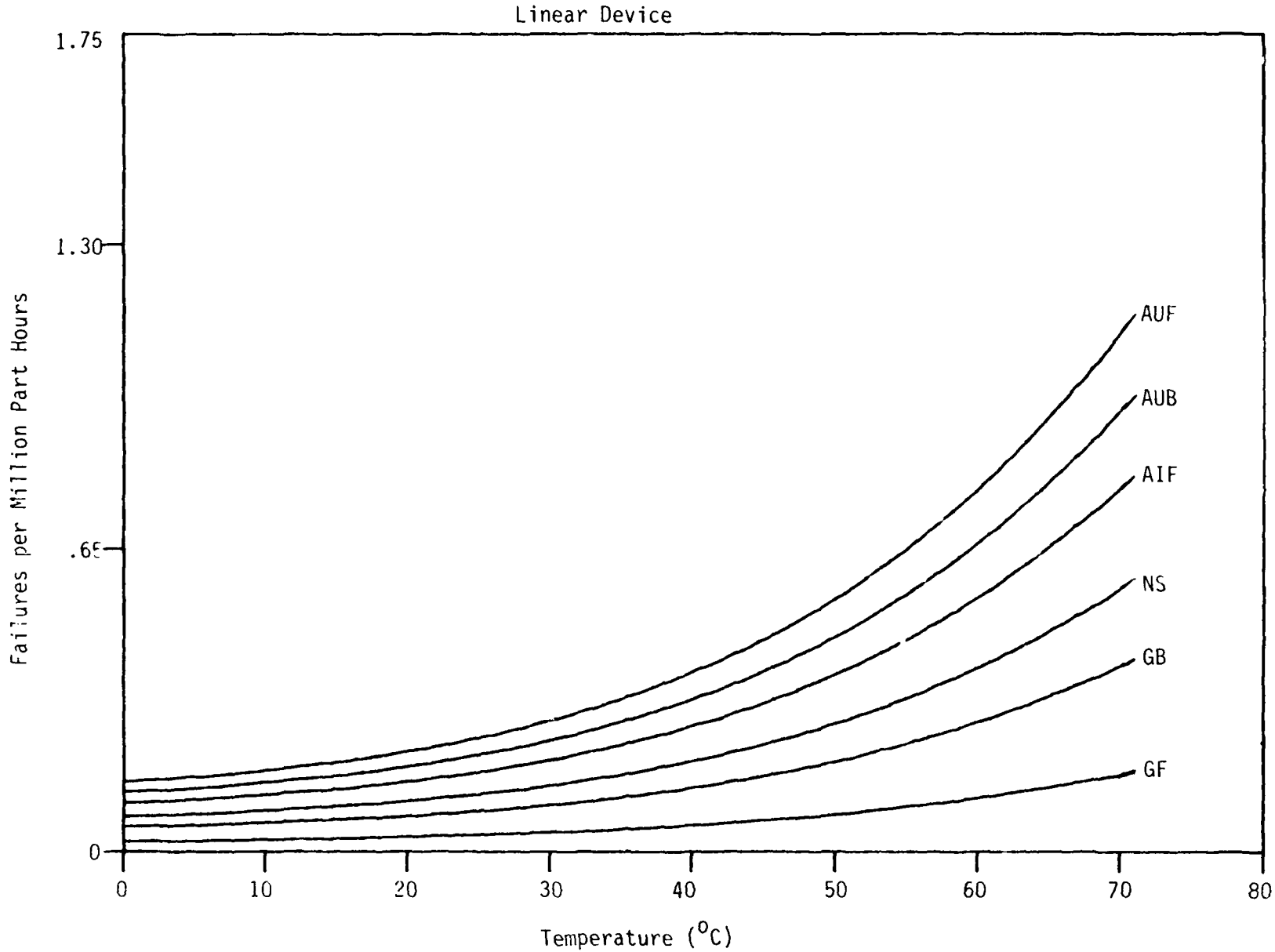

FIGURE M-6: LINEAR DEVICE PREDICTED FAILURE RATE VS. TEMPERATURE

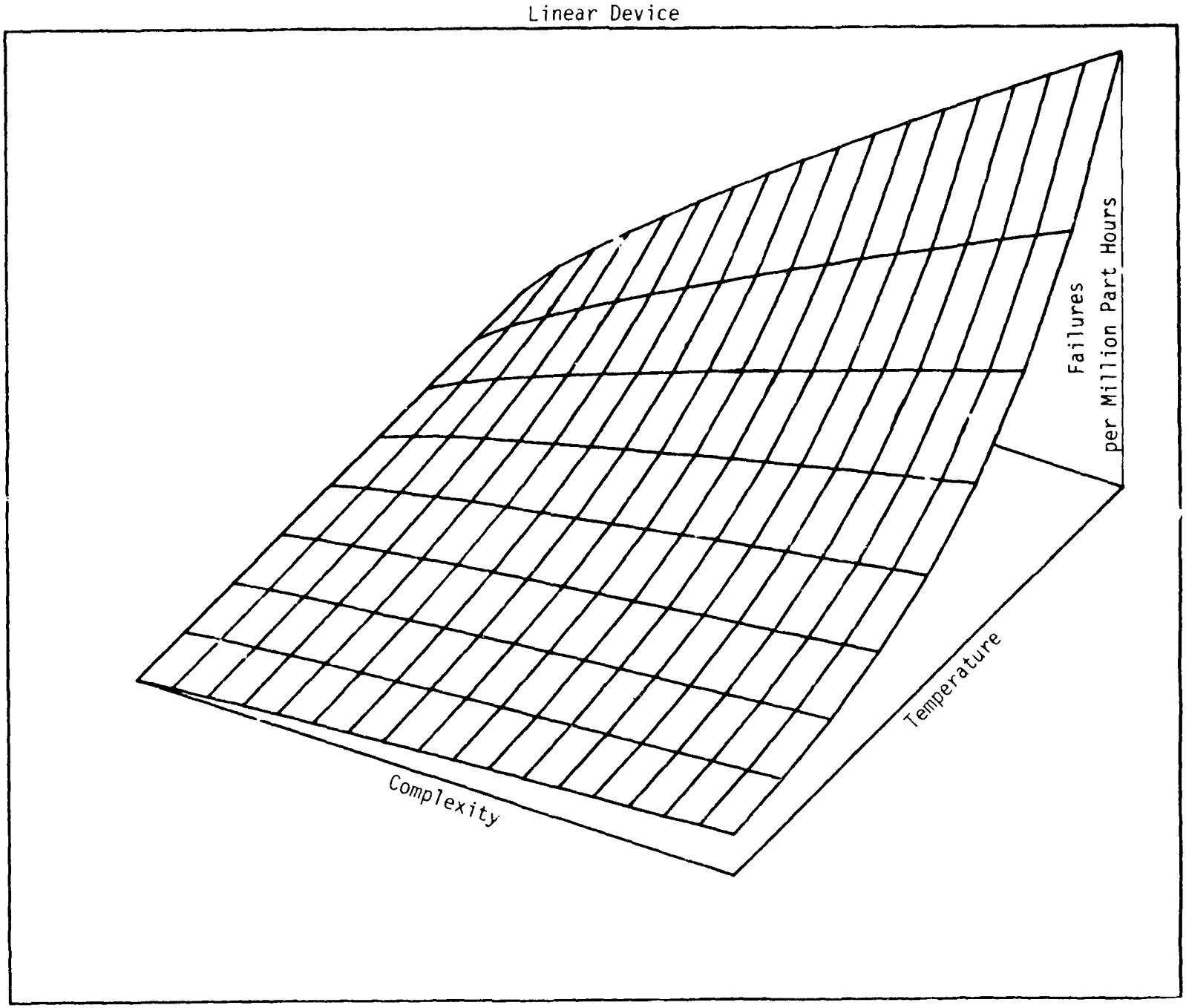

FIGURE M-7: LINEAR DEVICE PREDICTED FAILURE RATE VS. COMPLEXITY AND TEMPERATURE

Microcircuit

Test Data

Microcircuit Test Data File Description

Storage life test data on digital, linear, VLSI and memory microcircuit devices are presented in this section. Data from the microcircuit storage life test detail data section have been sorted by the devices functional group, memory type (when applicable), technology, package enclosure, package construction, package material, quality level and component part number. Data were then grouped according to the devices functional group, technology and memory type (when applicable). All microcircuit detail data records contain the following characteristic data fields:

- o Functional Group: The family to which the particular device belongs. Functional groups for which data exist include digital, linear, VLSI and memory.

- o Circuit Tech: Fabrication technology applied in the implementation of a device. Table MT-1 illustrates the various device technologies for which there is data.

- o Comp: Represents the complexity of the device in terms of the number of gates (G), the number of transistors (T), or the number of bits (B).

- o Package Description: The package description column from the detail data report is comprised of three pieces of information; package enclosure, package construction and package material. See Table MT-2 on the following page.

TABLE MT-1:

DEVICE TECHNOLOGY

Code	Description
TTL	Transistor, Transistor Logic
STTL	Schottky Transistor Transistor Logic
LSTTL	Low Power Schottky Transistor Transistor Logic
LTTL	Low Power Transistor Transistor Logic
HTTL	High Speed Transistor Transistor Logic
DTL	Diode Transistor Logic
ECL	Emitter Coupled Logic
IIL	Integrated Injection Logic
MOS	Metal Oxide Semiconductor
CMOS	Complementary Metal Oxide Semiconductor
NMOS	N Channel Metal Oxide Semiconductor
PMOS	P Channel Metal Oxide Semiconductor
BIP JNCT	Bipolar Junction

TABLE MT-2:

PACKAGE DESCRIPTION

Package Enclosure:
H - Hermetic N - Non-Hermetic
Package Construction:
DIP Dual In-Line Package CAN CAN Package FPK Flatpack Package
Package Material:
Ceramic Metal Metal/Glass Epoxy Metal/Cermic

- Package Description (Cont'd): In Table MT-2 the first character in the column represents the package enclosure. The next three columns depict package construction followed by the devices package material.

- Die Bond: The attachment material used to bond or adhere the circuit die to a package substrate. The attachment serves as a mechanical support, thermal path and sometimes as an electrical contact.

- Pins/Inter: The first number represents the quantity of pins on the package while the second number represents the number of functional pins actually interconnected to the die.

- Quality: Codes used to indicate the level of quality control which a device has been subjected. These codes are based on the level of screening and testing that the component received before being installed into a system. Quality levels are defined in MIL-M-38510. Table MT-3 show the various microcircuit quality levels.

TABLE MT-3:

MICROCIRCUIT QUALITY LEVELS

Quality Level	Description
S	Procured in full accordance with MIL-M-38510, Class S requirements. Class S listing on QPL-38510.
S-1	Procured in full compliance with the requirements of MIL-STD-975 or MIL-STD-1547 and have procuring activity specification approval.
B	Procured in full accordance with MIL-M-38510, Class B requirements. Class B listing on QPL-38510.
B-1	Fully compliant with all requirements of Paragraph 1.2.1 of MIL-STD-883 and procured to a MIL Drawing, DESC Drawing or other government approved documentation.
B-2	Not fully compliant with requirements of Paragraph 1.2.1 of MIL-STD-883 and procured to government approved documentation including vendor's equivalent Class B requirements.
D	Hermetically sealed parts with normal reliability screening and manufacturer's quality assurance practices. Nonhermetic parts encapsulated with organic material must be subjected to 160 hours burn-in at 125°C, 10 temperature cycles (-55°C to 125°C) with end point electricals and high temperature continuity test at 100°C.
D-1	Commercial (or non-mil standard) part, encapsulated or sealed with organic materials (e.g., epoxy, silicone or phenolic).

o Test Temp: The test temperature is the actual temperature which the microcircuit is exposed to during the storage life test. The temperature is in degrees centigrade.

Microcircuit Storage
Life Test Data

Part Number	Circuit tech	Comp	Die Bond	Package Description		Pins/ Inter	Quality	Test Temp	Number Tested	Test Duration	Number Failures
** DIGITAL, CMOS											
4011A	CMOS	4G	EPOXY	HCC	N/R	20/14	D	125	28	0.028	0
056	CMOS	3G	EPOXY	HDIP	CERAMIC	14/14	B-1	150	25	0.025	0
056	CMOS	3G	EPOXY	HDIP	CERAMIC	14/14	B-1	200	25	0.025	0
056	CMOS	3G	EPOXY	HDIP	CERAMIC	14/14	B-1	250	25	0.025	0
056	CMOS	3G	EPOXY	HDIP	CERAMIC	14/14	B-1	300	25	0.024	8
1092	CMOS	3G	EPOXY	HDIP	CERAMIC	14/14	B-1	300	23	0.023	1
1092	CMOS	3G	EPOXY	HDIP	CERAMIC	14/14	B-1	200	25	0.025	0
1092	CMOS	3G	EPOXY	HDIP	CERAMIC	14/14	B-1	250	25	0.024	2
1092	CMOS	3G	EPOXY	HDIP	CERAMIC	14/14	B-1	150	25	0.025	0
4007S	CMOS	3G	EPOXY	HDIP	CERAMIC	14/14	D	250	50	0.049	2
4007S	CMOS	3G	EPOXY	HDIP	CERAMIC	14/14	D	300	48	0.038	26
** DIGITAL, DTL											
124	DTL	8G	EUTECTIC	HCAN	METAL/GLASS	10/ 9	D	150	91	0.091	0
316	DTL	2G	EUTECTIC	HCAN	METAL/GLASS	10/10	D	150	40	0.040	0
110	DTL	1G	EUTECTIC	HFPK	CERAMIC	14/ 7	D	150	40	0.040	0
124	DTL	8G	EUTECTIC	HFPK	CERAMIC	14/ 9	D	150	45	0.045	0
106	DTL	2G	EUTECTIC	HFPK	METAL/GLASS	14/14	D	150	45	0.045	0
106	DTL	2G	EUTECTIC	HFPK	METAL/GLASS	14/14	D	150	40	0.040	0
112	DTL	2G	EUTECTIC	HFPK	METAL/GLASS	14/14	D	150	40	0.040	0
124	DTL	8G	EUTECTIC	HFPK	METAL/GLASS	14/ 9	D	150	360	0.360	0
124	DTL	8G	EUTECTIC	HFPK	METAL/GLASS	14/ 9	D	150	40	0.040	0
** DIGITAL, ECL											
10101	ECL	4G	EUTECTIC	HDIP	CERAMIC	16/16	D	250	15	0.070	2

Mic-ocircuit Storage
Life Test Data

Part Number	Circuit tech	Comp	Die Bond	Package Description	Pins/ Inter	Quality	Test Temp	Number Tested	Test Duration	Number Failures
10101	ECL	4G	EUTECTIC	HDIP CERAMIC	16/16	D	250	15	0.070	0
10102	ECL	4G	EUTECTIC	HDIP CERAMIC	16/16	D	150	93	0.093	0
10102	ECL	4G	EUTECTIC	HDIP CERAMIC	16/16	D	300	95	0.095	0
10105	ECL	3G	EUTECTIC	HDIP CERAMIC	16/16	D	150	46	0.046	0
10106	ECL	3G	EUTECTIC	HDIP CERAMIC	16/16	D	250	15	0.070	1
10106	ECL	3G	EUTECTIC	HDIP CERAMIC	16/ 0	D	250	15	0.070	0
10109	ECL	2G	EUTECTIC	HDIP CERAMIC	16/16	D	150	102	0.102	0
10110	ECL	2G	EUTECTIC	HDIP CERAMIC	16/16	D	150	56	0.046	0
10131	ECL	14G	EUTECTIC	HDIP CERAMIC	16/16	D	150	92	0.092	0
10164	ECL	12G	EUTECTIC	HDIP CERAMIC	16/16	D	150	185	0.185	0
10164	ECL	12G	EUTECTIC	HDIP CERAMIC	16/16	D	150	47	0.095	0
10164	ECL	12G	EUTECTIC	HDIP CERAMIC	16/16	D	300	48	0.048	1
10164	ECL	12G	EUTECTIC	HDIP CERAMIC	16/16	D	300	54	0.054	0
10501	ECL	4G	EUTECTIC	HDIP CERAMIC	16/16	D	250	15	0.070	0
10501	ECL	4G	EUTECTIC	HDIP CERAMIC	16/16	D	300	15	0.060	1
10506	ECL	3G	EUTECTIC	HDIP CERAMIC	16/16	D	300	15	0.060	0
10506	ECL	3G	EUTECTIC	HDIP CERAMIC	16/16	D	250	15	0.070	0
10561	ECL	12G	EUTECTIC	HDIP CERAMIC	16/16	D	300	15	0.060	1
10561	ECL	12G	EUTECTIC	HDIP CERAMIC	16/16	D	325	10	0.003	0
10561	ECL	12G	EUTECTIC	HDIP CERAMIC	16/16	D	250	15	0.070	0
100101	ECL	3G	EUTECTIC	HDIP METAL/CERAMIC	24/24	D	300	15	0.015	0
10176	ECL	42G	EUTECTIC	NDIP EPOXY	16/16	D-1	150	46	0.046	0

Microcircuit Storage
Life Test Data

Part Number	Circuit tech	Comp	Die Bond	Package Description	Pins/ Inter	Quality	Test Temp	Number Tested	Test Duration	Number Failures
** DIGITAL, HTTL										
54H00	HTTL	4G	EUTECTIC	HDIP CERAMIC	14/14	D	150	8	0.008	0
54H01	HTTL	4G	EUTECTIC	HDIP CERAMIC	14/14	D	150	80	0.080	0
54H04	HTTL	6G	EUTECTIC	HDIP CERAMIC	14/14	D	150	7	0.007	0
54H10	HTTL	3G	EUTECTIC	HDIP CERAMIC	14/14	D	150	8	0.008	0
54H101	HTTL	10G	EUTECTIC	HDIP CERAMIC	14/14	D	150	80	0.080	0
54H103	HTTL	12G	EUTECTIC	HDIP CERAMIC	14/14	D	150	80	0.080	1
54H20	HTTL	2G	EUTECTIC	HDIP CERAMIC	14/12	D	150	8	0.008	0
54H22	HTTL	2G	EUTECTIC	HDIP CERAMIC	14/12	D	150	39	0.039	0
54H30	HTTL	1G	EUTECTIC	HDIP CERAMIC	14/11	D	150	8	0.008	0
54H50	HTTL	6G	EUTECTIC	HDIP CERAMIC	14/14	D	150	55	0.055	0
54H51	HTTL	6G	EUTECTIC	HDIP CERAMIC	14/12	D	150	56	0.056	0
54H53	HTTL	5G	EUTECTIC	HDIP CERAMIC	14/1	D	150	47	0.047	0
54H54	HTTL	5G	EUTECTIC	HDIP CERAMIC	14/12	D	150	49	0.049	0
54H55	HTTL	3G	EUTECTIC	HDIP CERAMIC	14/13	D	150	46	0.046	0
54H72	HTTL	8G	EUTECTIC	HDIP CERAMIC	14/13	D	150	13	0.013	1
54H73	HTTL	16G	EUTECTIC	HDIP CERAMIC	14/14	D	150	12	0.012	0
54H74	HTTL	12G	EUTECTIC	HDIP CERAMIC	14/14	D	150	45	0.045	1
54H74	HTTL	12G	EUTECTIC	HDIP CERAMIC	14/14	D	150	13	0.013	0
54H76	HTTL	16G	EUTECTIC	HDIP CERAMIC	16/16	D	150	80	0.080	0
8H90	HTTL	6G	EUTECTIC	HFPK CERAMIC	14/14	D	150	40	0.040	0
** DIGITAL, LSTTL										
54LS283	LSTTL	42G	EUTECTIC	HDIP CERAMIC	16/16	B-1	300	10	0.040	0
54LS283	LSTTL	42G	EUTECTIC	HDIP CERAMIC	16/16	B-1	325	10	0.040	3

Microcircuit Storage
Life Test Data

Part Number	Circuit tech	Comp	Die Bond	Package Description	Pins/ Inter	Quality	Test Temp	Number Tested	Test Duration	Number Failures
54LS283	LSTTL	42G	EUTECTIC	HDIP CERAMIC	16/16	B-1	275	10	0.040	0
54LS283	LSTTL	42G	EUTECTIC	HDIP CERAMIC	16/16	B-1	275	10	0.040	0
54LS283	LSTTL	42G	EUTECTIC	HDIP CERAMIC	16/16	B-1	300	10	0.040	0
54LS283	LSTTL	42G	EUTECTIC	HDIP CERAMIC	16/16	B-1	325	10	0.034	3
546S138	LSTTL	16G	EUTECTIC	HDIP CERAMIC	16/16	D	250	15	0.053	0
54LS00	LSTTL	4G	EUTECTIC	HDIP CERAMIC	14/14	D	300	10	0.027	0
54LS00	LSTTL	4G	EUTECTIC	HDIP CERAMIC	14/14	D	250	10	0.035	0
54LS138	LSTTL	16G	EUTECTIC	HDIP CERAMIC	16/16	D	300	15	0.041	1
74LS00	LSTTL	4G	EUTECTIC	HDIP CERAMIC	14/14	D	150	56	0.056	0
74LS04	LSTTL	6G	EUTECTIC	HDIP CERAMIC	14/14	D	150	60	0.047	1
74LS20	LSTTL	2G	EUTECTIC	HDIP CERAMIC	14/12	D	150	46	0.046	0
9LS00	LSTTL	4G	EUTECTIC	HDIP CERAMIC	14/14	D	300	10	0.027	0
9LS00	LSTTL	4G	EUTECTIC	HDIP CERAMIC	14/14	D	250	10	0.035	0
74LS245	LSTTL	18G	EPOXY	NCC EPOXY	20/20	D-1	150	32	0.032	0
74LS00	LSTTL	4G	EUTECTIC	NDIP EPOXY	14/14	D-1	150	184	0.184	0
74LS04	LSTTL	6G	EUTECTIC	NDIP EPOXY	14/14	D-1	150	48	0.387	1
74LS161	LSTTL	57G	EUTECTIC	NDIP EPOXY	16/16	D-1	150	46	0.046	0
74LS40	LSTTL	2G	EUTECTIC	NDIP EPOXY	14/12	D-1	150	46	0.046	0
74LS74	LSTTL	12G	EUTECTIC	NDIP EPOXY	14/14	D-1	150	92	0.092	0
** DIGITAL, NMOS										
420	NMOS	0	EUTECTIC	NDIP EPOXY	28/28	D-1	150	150	0.150	1
420L	NMOS	0	EUTECTIC	NDIP EPOXY	28/28	D-1	150	75	0.075	0
421	NMOS	0	EUTECTIC	NDIP EPOXY	24/24	D-1	150	150	0.150	0

Microcircuit Storage
Life Test Data

Part Number	Circuit tech	Comp	Die Bond	Package Description	Pins/ Inter	Quality	Test Temp	Number Tested	Test Duration	Number Failures
58142	NMOS	0	EUTECTIC	NDIP EPOXY	24/24	D-1	150	173	0.172	1
58146	NMOS	0	EUTECTIC	NDIP EPOXY	22/22	D-1	150	100	0.099	1
** DIGITAL, STTL										
54S00	STTL	4G	EUTECTIC	HDIP CERAMIC	14/14	D	250	15	0.053	0
54S00	STTL	4G	EUTECTIC	HDIP CERAMIC	14/14	D	300	15	0.041	0
54S138	STTL	16G	EUTECTIC	HDIP CERAMIC	16/16	D	250	15	0.053	3
54S138	STTL	16G	EUTECTIC	HDIP CERAMIC	16/16	D	300	15	0.041	2
74S00	STTL	4G	EUTECTIC	HDIP CERAMIC	14/14	D	150	25	0.025	0
74S00	STTL	4G	EUTECTIC	HDIP CERAMIC	14/14	D	150	56	0.056	0
9S00	STTL	4G	EUTECTIC	HDIP CERAMIC	14/14	D	250	15	0.053	0
9S138	STTL	15G	EUTECTIC	HDIP CERAMIC	16/16	D	250	15	0.053	1
82S101	STTL	70G	EUTECTIC	HDIP METAL/CERAMIC	28/28	D	150	46	0.046	0
74S00	STTL	4G	EUTECTIC	NDIP EPOXY	14/14	D-1	150	92	0.092	0
74S00	STTL	4G	EUTECTIC	NDIP EPOXY	14/14	D-1	150	45	0.091	1
74S10	STTL	3G	EUTECTIC	NDIP EPOXY	14/14	D-1	150	45	0.091	0
74S112	STTL	16G	EUTECTIC	NDIP EPOXY	16/16	D-1	150	46	0.046	0
74S20	STTL	2G	EUTECTIC	NDIP EPOXY	14/12	D-1	150	46	0.093	2
74S40	STTL	2G	EUTECTIC	NDIP EPOXY	14/12	D-1	150	46	0.046	0
82S62	STTL	19G	EUTECTIC	NDIP EPOXY	14/14	D-1	150	46	0.046	0
** DIGITAL, TTL										
5400	TTL	4G	EUTECTIC	HDIP CERAMIC	14/14	B-2	150	40	0.040	0
5439	TTL	4G	EUTECTIC	HDIP CERAMIC	14/14	B-2	150	45	0.045	0
5400	TTL	4G	EUTECTIC	HDIP CERAMIC	14/14	D	150	160	0.160	0

Microcircuit Storage
Life Test Data

Part Number	Circuit tech	Comp	Die Bond	Package Description	Pins/ Inter	Quality	Test Temp	Number Tested	Test Duration	Number Failures
5401	TTL	4G	EUTECTIC	HDIP CERAMIC	14/14	D	150	45	0.045	0
5402	TTL	4G	EUTECTIC	HDIP CERAMIC	14/14	D	150	45	0.045	0
5408	TTL	4G	EUTECTIC	HDIP CERAMIC	14/14	D	150	55	0.055	0
5409	TTL	4G	EUTECTIC	HDIP CERAMIC	14/14	D	150	53	0.053	0
54121	TTL	8G	EUTECTIC	HDIP CERAMIC	14/10	D	150	38	0.038	0
54123	TTL	20G	EUTECTIC	HDIP CERAMIC	16/16	D	150	38	0.038	0
54153	TTL	16G	EUTECTIC	HDIP CERAMIC	16/16	D	150	58	0.058	0
54154	TTL	25G	EUTECTIC	HDIP CERAMIC	24/24	D	150	45	0.045	0
54156	TTL	15G	EUTECTIC	HDIP CERAMIC	16/16	D	150	45	0.045	0
54160	TTL	60G	EUTECTIC	HDIP CERAMIC	16/16	D	150	10	0.010	
54161	TTL	57G	EUTECTIC	HDIP CERAMIC	16/16	D	150	9	0.009	0
54162	TTL	60G	EUTECTIC	HDIP CERAMIC	16/16	D	150	9	0.009	0
54163	TTL	58G	EUTECTIC	HDIP CERAMIC	16/16	D	150	10	0.010	0
54173	TTL	36G	EUTECTIC	HDIP CERAMIC	16/16	D	150	80	0.080	0
54175	TTL	24G	EUTECTIC	HDIP CERAMIC	16/16	D	150	80	0.080	0
5442	TTL	18G	EUTECTIC	HDIP CERAMIC	16/16	D	150	15	0.015	0
5450	TTL	6G	EUTECTIC	HDIP CERAMIC	14/14	D	150	55	0.055	0
5451	TTL	6G	EUTECTIC	HDIP CERAMIC	14/12	D	150	56	0.056	0
5453	TTL	5G	EUTECTIC	HDIP CERAMIC	14/13	D	150	9	0.009	0
5454	TTL	5G	EUTECTIC	HDIP CERAMIC	14/11	D	150	9	0.009	0
5476	TTL	16G	EUTECTIC	HDIP CERAMIC	16/16	D	150	40	0.040	0
5483	TTL	36G	EUTECTIC	HDIP CERAMIC	16/16	D	150	38	0.038	0

Microcircuit Storage
Life Test Data

Part Number	Circuit tech	Comp	Die Bond	Package Description		Pins/ Inter	Quality	Test Temp	Number Tested	Test Duration	Number Failures
5492	TTL	26G	EUTECTIC	HDIP	CERAMIC	14/10	D	150	19	0.019	0
7404	TTL	6G	EUTECTIC	HDIP	CERAMIC	14/14	D	150	40	0.040	0
74175	TTL	24G	EUTECTIC	HDIP	CERAMIC	16/16	D	150	46	0.046	1
7420	TTL	2G	EUTECTIC	HDIP	CERAMIC	14/12	D	150	46	0.046	0
8824	TTL	22G	EUTECTIC	HDIP	CERAMIC	16/14	D	150	45	0.045	0
5400	TTL	4G	EUTECTIC	HDIP	METAL/CERAMIC	14/14	D	150	40	0.040	0
5444	TTL	18G	EUTECTIC	HDIP	METAL/CERAMIC	16/16	D	150	80	0.080	0
5476	TTL	16G	EUTECTIC	HDIP	METAL/CERAMIC	16/16	D	150	80	0.080	0
5476	TTL	16G	EUTECTIC	HDIP	METAL/CERAMIC	16/16	D	150	38	0.038	0
5492	TTL	26G	EUTECTIC	HDIP	METAL/CERAMIC	14/10	D	150	45	0.045	0
8233	TTL	14G	EUTECTIC	HDIP	METAL/CERAMIC	16/16	D	150	45	0.045	0
8233	TTL	14G	EUTECTIC	HDIP	METAL/CERAMIC	16/16	D	150	40	0.040	0
8260	TTL	56G	EUTECTIC	HDIP	METAL/CERAMIC	24/24	D	150	45	0.045	0
5404	TTL	6G	EUTECTIC	HFPK	CERAMIC	14/14	B-2	150	45	0.045	0
5483	TTL	36G	EUTECTIC	HFPK	CERAMIC	16/16	B-2	150	45	0.045	0
5400	TTL	4G	EUTECTIC	HFPK	CERAMIC	14/14	D	150	120	0.120	0
5400	TTL	4G	EUTECTIC	HFPK	CERAMIC	14/14	D	150	40	0.040	0
5401	TTL	4G	EUTECTIC	HFPK	CERAMIC	14/14	D	150	60	0.061	0
54161	TTL	57G	EUTECTIC	HFPK	CERAMIC	16/16	D	150	45	0.045	0
54181	TTL	63G	EUTECTIC	HFPK	CERAMIC	24/24	D	150	45	0.045	0
5440	TTL	2G	EUTECTIC	HFPK	CERAMIC	14/12	D	150	7	0.007	0
5444	TTL	18G	EUTECTIC	HFPK	CERAMIC	16/16	D	150	40	0.040	0
5486	TTL	4G	EUTECTIC	HFPK	CERAMIC	14/14	D	150	45	0.045	0

Microcircuit Storage
Life Test Data

Part Number	Circuit tech	Comp	Die Bond	Package Description		Pins/ Inter	Quality	Test Temp	Number Tested	Test Duration	Number Failures
7400	TTL	4G	EUTECTIC	HFPK	CERAMIC	14/14	D	150	40	0.040	0
8242	TTL	20G	EUTECTIC	HFPK	CERAMIC	14/14	D	150	45	0.045	0
417	TTL	2G	EUTECTIC	HFPK	METAL/GLASS	14/14	D	150	40	0.040	0
490	TTL	6G	EUTECTIC	HFPK	METAL/GLASS	14/14	D	150	45	0.045	0
8230	TTL	17G	EUTECTIC	HFPK	METAL/GLASS	16/16	D	150	40	0.040	0
3002	TTL	377G	EUTECTIC	NDIP	EPOXY	28/28	D-1	150	46	0.046	0
7400	TTL	4G	EUTECTIC	NDIP	EPOXY	14/14	D-1	150	198	0.400	0
7400	TTL	4G	EUTECTIC	NDIP	EPOXY	14/14	D-1	150	46	0.139	0
7400	TTL	4G	EUTECTIC	NDIP	EPOXY	14/14	D-1	150	49	0.099	1
7400	TTL	4G	EUTECTIC	NDIP	EPOXY	14/14	D-1	150	40	0.040	1
7400	TTL	4G	EUTECTIC	NDIP	EPOXY	14/14	D-1	150	46	0.139	0
7400	TTL	4G	EUTECTIC	NDIP	EPOXY	14/14	D-1	150	47	0.095	5
7400	TTL	4G	EUTECTIC	NDIP	EPOXY	14/14	D-1	150	466	0.469	0
7400	TTL	4G	EUTECTIC	NDIP	EPOXY	14/14	D-1	150	241	0.241	0
7400	TTL	4G	EUTECTIC	NDIP	EPOXY	14/14	D-1	150	46	0.139	0
7400	TTL	4G	EUTECTIC	NDIP	EPOXY	14/14	D-1	150	49	0.099	1
7400	TTL	4G	EUTECTIC	NDIP	EPOXY	14/14	D-1	150	46	0.139	0
7404	TTL	6G	EUTECTIC	NDIP	EPOXY	14/14	D-1	150	48	0.048	0
7405	TTL	6G	EUTECTIC	NDIP	EPOXY	14/14	D-1	150	40	0.040	0
7408	TTL	4G	EUTECTIC	NDIP	EPOXY	14/14	D-1	150	25	0.025	0
74123	TTL	20G	EUTECTIC	NDIP	EPOXY	16/16	D-1	150	74	0.074	0
74147	TTL	31G	EUTECTIC	NDIP	EPOXY	16/16	D-1	150	46	0.046	0
74150	TTL	26G	EUTECTIC	NDIP	EPOXY	24/24	D-1	150	45	0.045	0

Microcircuit Storage
Life Test Data

Part Number	Circuit tech	Comp	Die Bond	Package Description		Pins/ Inter	Quality	Test Temp	Number Tested	Test Duration	Number Failures
74156	TTL	15G	EUTECTIC	NDIP	EPOXY	16/16	D-1	150	45	0.045	0
74160	TTL	60G	EUTECTIC	NDIP	EPOXY	16/16	D-1	150	45	0.045	0
74161	TTL	57G	EUTECTIC	NDIP	EPOXY	16/16	D-1	150	102	0.102	0
74193	TTL	48G	EUTECTIC	NDIP	EPOXY	16/16	D-1	150	46	0.046	0
7420	TTL	2G	EUTECTIC	NDIP	EPOXY	14/12	D-1	150	46	0.046	0
7440	TTL	2G	EUTECTIC	NDIP	EPOXY	14/12	D-1	150	46	0.046	0
7440	TTL	2G	EUTECTIC	NDIP	EPOXY	14/12	D-1	150	45	0.040	0
7442	TTL	18G	EUTECTIC	NDIP	EPOXY	16/16	D-1	150	46	0.046	0
7442	TTL	18G	EUTECTIC	NDIP	EPOXY	16/16	D-1	150	40	0.040	0
7443	TTL	18G	EUTECTIC	NDIP	EPOXY	16/16	D-1	150	40	0.040	1
7473	TTL	16G	EUTECTIC	NDIP	EPOXY	14/14	D-1	150	45	0.045	0
7490	TTL	15G	EUTECTIC	NDIP	EPOXY	14/12	D-1	150	102	0.102	0
** LINEAR, BIP JNCT											
309	BIP JNCT	19T	EUTECTIC	HCAN	METAL	3/ 2	D	150	45	0.045	0
107	BIP JNCT	22T	EUTECTIC	HCAN	METAL/GLASS	8/ 5	D	150	46	0.046	0
108	BIP JNCT	29T	EUTECTIC	HCAN	METAL/GLASS	8/ 7	D	150	46	0.046	0
1456	BIP JNCT	19T	EUTECTIC	HCAN	METAL/GLASS	8/ 7	D	150	45	0.045	0
309	BIP JNCT	19T	EUTECTIC	HCAN	METAL/GLASS	3/ 3	D	150	45	0.045	0
536	BIP JNCT	42T	EUTECTIC	HCAN	METAL/GLASS	8/ 7	D	150	46	0.046	0
567	BIP JNCT	61T	EUTECTIC	HCAN	METAL/GLASS	8/ 8	D	150	46	0.046	0
723	BIP JNCT	20T	EUTECTIC	HCAN	METAL/GLASS	10/10	D	150	45	0.045	0
741	BIP JNCT	23T	EUTECTIC	HCAN	METAL/GLASS	8/ 7	D	150	100	0.200	0
748	BIP JNCT	20T	EUTECTIC	HCAN	METAL/GLASS	8/ 8	D	150	45	0.045	0

Microcircuit Storage
Life Test Data

Part Number	Circuit tech	Comp	Die Bond	Package Description		Pins/ Inter	Quality	Test Temp	Number Tested	Test Duration	Number Failures
108	BIP JNCT	29T	EUTECTIC	HDIP	CERAMIC	14/ 7	D	150	46	0.046	0
1488	BIP JNCT	4G	EUTECTIC	HDIP	CERAMIC	14/14	D	175	128	0.128	0
1489	BIP JNCT	4G	EUTECTIC	HDIP	CERAMIC	14/14	D	175	81	0.081	0
311	BIP JNCT	23T	EUTECTIC	HDIP	CERAMIC	14/ 8	D	150	46	0.046	2
5407	BIP JNCT	24T	EUTECTIC	HDIP	CERAMIC	14/14	D	150	45	0.045	0
5426	BIP JNCT	4G	EUTECTIC	HDIP	CERAMIC	14/14	D	150	38	0.038	0
567	BIP JNCT	61T	EUTECTIC	HDIP	CERAMIC	14/ 8	D	150	46	0.046	0
747	BIP JNCT	40T	EUTECTIC	HDIP	CERAMIC	14/13	D	150	40	0.040	1
7524	BIP JNCT	37T	EUTECTIC	HDIP	CERAMIC	16/15	D	150	45	0.045	2
2400	BIP JNCT	00	EUTECTIC	HDIP	METAL/CERAMIC	16/16	D	-99	57	0.057	0
8T13	BIP JNCT	20T	EUTECTIC	HDIP	METAL/CERAMIC	16/16	D	150	40	0.040	0
8T80	BIP JNCT	12T	EUTECTIC	HFPK	CERAMIC	14/14	B-2	150	46	0.046	0
526	BIP JNCT	21T	EUTECTIC	HFPK	CERAMIC	10/10	D	150	45	0.045	0
8T18	BIP JNCT	8T	EUTECTIC	HFPK	CERAMIC	14/ 9	D	150	45	0.045	0
144	BIP JNCT	10T	EUTECTIC	HFPK	METAL/CERAMIC	16/ 9	D	150	55	0.055	0
455	BIP JNCT	8T	EUTECTIC	HFPK	METAL/GLASS	14/12	D	150	40	0.040	0
245	BIP JNCT	0	EUTECTIC	HN/R	METAL/CERAMIC	14/14	D	175	306	0.524	0
1080	BIP JNCT	0	EUTECTIC	HN/R	N/R	24/23	D	175	15	0.015	0
2107	BIP JNCT	22T	EUTECTIC	HN/R	N/R	0/ 5	D	175	166	0.164	0
2500	BIP JNCT	30T	EUTECTIC	HN/R	N/R	0/ 8	D	175	531	0.564	0
2600	BIP JNCT	40T	EUTECTIC	HN/R	N/R	0/ 8	D	175	348	0.379	0
2700	BIP JNCT	75T	EUTECTIC	HN/R	N/R	0/ 7	D	175	318	0.354	0
2X11	BIP JNCT	24T	EUTECTIC	HN/R	N/R	0/ 8	D	175	105	0.105	0

Microcircuit Storage
Life Test Data

Part Number	Circuit tech	Comp	Die Bond	Package Description		Pins/ Inter	Quality	Test Temp	Number Tested	Test Duration	Number Failures
911	BIP JNCT	17T	EUTECTIC	HN/R	N/R	0/ 7	D	175	643	0.811	0
124	BIP JNCT	52T	EUTECTIC	NDIP	EPOXY	14/14	D-1	150	48	0.048	0
1458	BIP JNCT	48T	EUTECTIC	NDIP	EPOXY	8/ 8	D-1	150	46	0.046	0
545	BIP JNCT	0	EUTECTIC	NDIP	EPOXY	16/16	D-1	150	48	0.048	1
545	BIP JNCT	0	EUTECTIC	NDIP	EPOXY	16/16	D-1	150	46	0.046	1
555	BIP JNCT	23T	EUTECTIC	NDIP	EPOXY	8/ 8	D-1	150	77	0.077	1
556	BIP JNCT	46T	EUTECTIC	NDIP	EPOXY	14/14	D-1	150	46	0.046	0
565	BIP JNCT	28T	EUTECTIC	NDIP	EPOXY	14/10	D-1	150	46	0.046	0
566	BIP JNCT	20T	EUTECTIC	NDIP	EPOXY	8/ 7	D-1	150	46	0.046	1
567	BIP JNCT	61T	EUTECTIC	NDIP	EPOXY	8/ 8	D-1	150	45	0.045	0
723	BIP JNCT	20T	EUTECTIC	NDIP	EPOXY	14/11	D-1	150	47	0.047	0
723	BIP JNCT	20T	EUTECTIC	NDIP	EPOXY	14/11	D-1	150	188	0.188	0
7406	BIP JNCT	30T	EUTECTIC	NDIP	EPOXY	14/14	D-1	150	46	0.046	0
741	BIP JNCT	23T	EPOXY	NDIP	EPOXY	14/ 7	D-1	175	75	0.075	0
741	BIP JNCT	23T	EPOXY	NDIP	EPOXY	14/ 7	D-1	150	50	0.050	0
7426	BIP JNCT	4G	EUTECTIC	NDIP	EPOXY	14/14	D-1	150	46	0.046	0
7447	BIP JNCT	0T	EUTECTIC	NDIP	EPOXY	16/16	D-1	150	46	0.046	2
748	BIP JNCT	20T	EPOXY	NDIP	EPOXY	14/ 8	D-1	150	144	0.144	0
7522	BIP JNCT	39T	EUTECTIC	NDIP	EPOXY	16/16	D-1	150	46	0.046	0
75451B	BIP JNCT	10T	EUTECTIC	NDIP	EPOXY	8/ 8	D-1	150	46	0.046	0
75452	BIP JNCT	14T	EUTECTIC	NDIP	EPOXY	16/ 8	D-1	150	46	0.046	0
N/R	BIP JNCT	0	EPOXY	NDIP	EPOXY	0/ 0	[illegible]	150	928	1.030	2
341	BIP JNCT	16T	EUTECTIC	NINL	EPOXY	3/ 3	D-1	150	50	0.050	0

Microcircuit Storage
Life Test Data

Part Number	Circuit tech	Comp	Die Bond	Package Description		Pins/ Inter	Quality	Test Temp	Number Tested	Test Duration	Number Failures
7806	BIP JNCT	17T	EUTECTIC	NINL	EPOXY	3/ 3	D-1	150	82	0.083	1
7818	BIP JNCT	17T	EUTECTIC	NINL	EPOXY	3/ 3	D-1	150	94	0.094	0
78L05	BIP JNCT	14T	EUTECTIC	NINL	EPOXY	3/ 3	D-1	150	46	0.046	0
** LINEAR, ECL											
10114	ECL	27T	EUTECTIC	NDIP	EPOXY	16/16	D-1	150	46	0.046	0
** LINEAR, MOS											
118	MOS	6T	EUTECTIC	HFPK	METAL/CERAMIC	14/14	D	150	22	0.022	0
** LINEAR, STTL											
527	STTL	29T	EUTECTIC	HCAN	METAL/GLASS	10/10	D	150	45	0.045	0
** MEMORY, ECL											
10133	ECL	0B	EUTECTIC	HDIP	CERAMIC	16/16	D	150	46	0.046	0
10141	ECL	4B	EUTECTIC	HDIP	CERAMIC	16/16	D	150	46	0.046	2
10141	ECL	4B	EUTECTIC	HDIP	CERAMIC	16/16	D	300	49	0.049	1
10160	ECL	12B	EUTECTIC	HDIP	CERAMIC	16/16	D	150	46	0.046	0
** MEMORY, NMOS											
N/R	NMOS	4096B	N/R	HDIP	METAL/CERAMIC	16/16	D	125	32	0.032	1
** MEMORY, PMOS											
2503	PMOS	1024B	EUTECTIC	HCAN	METAL/GLASS	8/ 8	D	150	46	0.046	0
2504	PMOS	1024B	EUTECTIC	HCAN	METAL/GLASS	8/ 6	D	150	46	0.046	0
2532	PMOS	320B	EUTECTIC	HDIP	CERAMIC	16/16	D	150	50	0.374	1
2532	PMOS	320B	EUTECTIC	HDIP	METAL/CERAMIC	16/16	D	150	50	0.386	1
2507	PMOS	200B	EUTECTIC	NDIP	SILICONE	8/ 8	D-1	150	40	0.040	0
2510	PMOS	200B	EUTECTIC	NDIP	SILICONE	14/10	D-1	150	48	0.144	0

Microcircuit Storage
Life Test Data

Part Number	Circuit tech	Comp	Die Bond	Package Description	Pins/ Inter	Quality	Test Temp	Number Tested	Test Duration	Number Failures
2518	PMOS	192B	EUTECTIC	NDIP SILICONE	16/16	D-1	150	74	0.074	1
2518	PMOS	192B	EUTECTIC	NDIP SILICONE	16/16	D-1	150	34	0.034	0
2521	PMOS	256B	EUTECTIC	NDIP SILICONE	8/ 8	D-1	150	46	0.046	0
2521	PMOS	256B	EUTECTIC	NDIP SILICONE	8/ 8	D-1	150	53	0.053	0
2525	PMOS	1024B	EUTECTIC	NDIP SILICONE	8/ 8	D-1	150	50	0.150	2
2525	PMOS	1024B	EUTECTIC	NDIP SILICONE	8/ 8	D-1	150	46	0.046	0
2532	PMOS	320B	EUTECTIC	NDIP SILICONE	16/16	D-1	150	130	0.257	0
2532	PMOS	320B	EUTECTIC	NDIP SILICONE	16/16	D-1	150	52	0.052	1
2533	PMOS	1024B	EUTECTIC	NDIP SILICONE	8/ 8	D-1	150	46	0.046	0
** MEMORY, TTL										
54164	TTL	8B	EUTECTIC	HDIP CERAMIC	16/14	D	150	77	0.077	0
5475	TTL	4B	EUTECTIC	HDIP CERAMIC	16/16	D	150	80	0.080	0
5477	TTL	0B	EUTECTIC	HDIP CERAMIC	14/12	D	150	80	0.080	0
5495	TTL	4B	EUTECTIC	HDIP CERAMIC	14/14	D	150	38	0.038	0
8201	TTL	10B	EUTECTIC	HDIP CERAMIC	24/24	D	150	90	0.090	0
8200	TTL	10B	EUTECTIC	HDIP METAL/CERAMIC	24/24	D	150	40	0.040	1
8202	TTL	10B	EUTECTIC	HDIP METAL/CERAMIC	24/24	D	150	40	0.040	0
5475	TTL	4B	EUTECTIC	HFPK CERAMIC	16/16	B-2	150	45	0.045	0
54198	TTL	8B	EUTECTIC	HFPK CERAMIC	24/24	D	150	45	0.045	0
8200	TTL	10B	EUTECTIC	HFPK CERAMIC	24/24	D	150	45	0.045	0
8202	TTL	10B	EUTECTIC	HFPK CERAMIC	24/24	D	150	85	0.085	0
8203	TTL	10B	EUTECTIC	HFPK CERAMIC	24/24	D	150	40	0.040	0

Microcircuit Storage
Life Test Data

Part Number	Circuit tech	Comp	Die Bond	Package Description		Pins/ Inter	Quality	Test Temp	Number Tested	Test Duration	Number failures
** MEMORY, DRAM NMOS											
2660	NMOS	4096B	EUTECTIC	HDIP	CERAMIC	16/16	D	150	45	0.090	2
2680	NMOS	4096B	EUTECTIC	HDIP	CERAMIC	22/21	D	150	49	0.369	1
4164	NMOS	65536B	EUTECTIC	HDIP	CERAMIC	16/15	D	150	40	0.040	0
8116	NMOS	16384B	EUTECTIC	HDIP	CERAMIC	16/16	D	250	100	0.101	1
8116	NMOS	16384B	EUTECTIC	HDIP	CERAMIC	16/16	D	200	200	0.214	0
8116	NMOS	16384B	EUTECTIC	HDIP	CERAMIC	16/16	D	150	200	0.254	0
4227	NMOS	4096B	EUTECTIC	HDIP	METAL/CERAMIC	16/16	D	125	32	0.032	1
2104A	NMOS	4096B	EUTECTIC	HDIP	N/R	16/16	D	250	597	0.597	0
2104A	NMOS	4096B	EUTECTIC	HDIP	N/R	16/16	D	150	105	0.105	0
2104A	NMOS	4096B	EUTECTIC	HDIP	N/R	16/16	D	250	40	0.038	2
4096	NMOS	4096B	EUTECTIC	NDIP	EPOXY	16/16	D-1	150	109	0.054	1
** MEMORY, DRAM PMOS											
1103	PMOS	1024B	EUTECTIC	HDIP	CERAMIC	18/18	D	150	150	0.099	1
1103	PMOS	1024B	EUTECTIC	HDIP	METAL/CERAMIC	18/18	D	150	150	0.100	0
1103	PMOS	1024B	EUTECTIC	NDIP	SILICONE	18/18	D-1	150	91	0.091	0
1103	PMOS	1024B	EUTECTIC	NDIP	SILICONE	18/18	D-1	150	46	0.012	0
1103	PMOS	1024B	EUTECTIC	NDIP	SILICONE	18/18	D-1	150	45	0.045	1
1103	PMOS	1024B	EUTECTIC	NDIP	SILICONE	18/18	D-1	150	48	0.186	3
1103	PMOS	1024B	EUTECTIC	NDIP	SILICONE	18/18	D-1	150	46	0.171	4
** MEMORY, EEPROM NMOS											
2816A	NMOS	16384B	EUTECTIC	HDIP	CERAMIC	24/24	D	250	37	0.006	0
** MEMORY, EPROM NMOS											
52B13	NMOS	16384B	EUTECTIC	HDIP	CERAMIC	24/24	D	250	150	0.148	4

Microcircuit Storage
Life Test Data

Part Number	Circuit tech	Comp	Die Bond	Package Description	Pins/ Inter	Quality	Test Temp	Number Tested	Test Duration	Number Failures
** MEMORY, PROM STTL										
82S126	STTL	1024B	EUTECTIC	HDIP CERAMIC	16/16	D	150	96	0.194	2
82S126	STTL	1024B	EUTECTIC	HDIP CERAMIC	16/16	D	150	46	0.046	0
82S126	STTL	1024B	EUTECTIC	HDIP CERAMIC	16/16	D	150	22	0.066	0
82S129	STTL	1024B	EUTECTIC	HDIP CERAMIC	16/16	D	150	24	0.072	0
82S130	STTL	2048B	EUTECTIC	HDIP CERAMIC	16/16	D	150	46	0.046	0
82S131	STTL	2048B	EUTECTIC	HDIP CERAMIC	16/16	D	150	46	0.046	1
82S136	STTL	4096B	EUTECTIC	HDIP CERAMIC	18/18	D	150	46	0.046	0
82S23	STTL	256B	EUTECTIC	HDIP CERAMIC	16/16	D	150	46	0.046	0
82S115	STTL	4096B	EUTECTIC	HDIP METAL/CERAMIC	24/24	D	150	45	0.045	0
82S126	STTL	1024B	EUTECTIC	HDIP METAL/CERAMIC	16/16	D	150	65	0.066	0
82S129	STTL	1024B	EUTECTIC	HDIP METAL/CERAMIC	16/16	D	150	43	0.043	0
** MEMORY, PROM TTL										
512	TTL	512B	EUTECTIC	HDIP CERAMIC	24/21	D	150	70	0.092	0
8256	TTL	256B	EUTECTIC	HDIP CERAMIC	16/16	D	150	22	0.022	0
8223	TTL	256B	EUTECTIC	NDIP EPOXY	16/16	D-1	150	40	0.040	0
** MEMORY, ROM NMOS										
52116	NMOS	16384B	EUTECTIC	NDIP EPOXY	24/24	D-1	150	50	0.050	0
** MEMORY, ROM PMOS										
2580	PMOS	8192B	EUTECTIC	HDIP METAL/CERAMIC	24/24	D	150	50	0.100	0
2580	PMOS	8192B	EUTECTIC	HDIP METAL/CERAMIC	24/24	D	150	46	0.046	0
2513	PMOS	2560B	EUTECTIC	NDIP SILICONE	24/19	D-1	150	40	0.040	0

Microcircuit Storage
Life Test Data

Part Number	Circuit tech	Comp	Die Bond	Package Description		Pins/ Inter	Quality	Test Temp	Number Tested	Test Duration	Number Failures
** MEMORY, ROM STTL											
82S226	STTL	1024B	EUTECTIC	HDIP	CERAMIC	16/16	D	150	46	0.046	0
82S215	STTL	4096B	EUTECTIC	HDIP	METAL/CERAMIC	24/22	D	150	46	0.046	0
82S280	STTL	8192B	EUTECTIC	HDIP	METAL/CERAMIC	24/24	D	150	46	0.046	0
** MEMORY, ROM TTL											
8205	TTL	4096B	EUTECTIC	HDIP	METAL/CERAMIC	24/22	D	150	91	0.091	0
** MEMORY, SRAM CMOS											
5501	CMOS	1024B	N/R	HDIP	CERAMIC	22/22	D	150	20	0.020	0
5504	CMOS	4096B	N/R	HDIP	CERAMIC	18/18	D	150	20	0.020	0
5514	CMOS	4096B	N/R	HDIP	CERAMIC	18/18	D	150	20	0.020	0
5516A	CMOS	16384B	N/R	NFPK	EPOXY	24/24	D-1	150	30	0.030	0
** MEMORY, SRAM ECL											
10145	ECL	64B	EUTECTIC	HDIP	METAL/CERAMIC	16/16	D	150	46	0.046	0
** MEMORY, SRAM LTTL											
93L415	LTTL	1024B	EUTECTIC	HDIP	METAL/CERAMIC	16/16	D	150	45	0.045	0
93L422	LTTL	1024B	EUTECTIC	HDIP	METAL/CERAMIC	22/22	D	150	50	0.108	0
93L422	LTTL	1024B	EUTECTIC	HDIP	METAL/CERAMIC	22/22	D	150	4	0.004	0
93L422	LTTL	1024B	EUTECTIC	HDIP	METAL/CERAMIC	22/22	D	150	30	0.065	0
** MEMORY, SRAM NMOS											
2102	NMOS	1024B	EUTECTIC	HDIP	CERAMIC	16/16	D	150	239	0.463	3
2102	NMOS	1024B	EUTECTIC	HDIP	CERAMIC	16/16	D	175	49	0.049	0
2102	NMOS	1024B	EUTECTIC	HDIP	CERAMIC	16/16	D	300	49	0.049	2
2102	NMOS	1024B	EUTECTIC	HDIP	CERAMIC	16/16	D	225	49	0.049	0
2102	NMOS	1024B	EUTECTIC	HDIP	CERAMIC	16/16	D	200	49	0.049	0

Microcircuit Storage
Life Test Data

Part Number	Circuit tech	Comp	Die Bond	Package Description		Pins/ Inter	Quality	Test Temp	Number Tested	Test Duration	Number Failures
2102	NMOS	1024B	EUTECTIC	HDIP	CERAMIC	16/16	D	250	49	0.049	0
2102	NMOS	1024B	EUTECTIC	HDIP	METAL/CERAMIC	16/16	D	150	52	0.256	1
2102	NMOS	1024B	EUTECTIC	NDIP	SILICONE	16/16	D-1	150	289	0.994	5
2102A	NMOS	1024B	EUTECTIC	NDIP	SILICONE	16/16	D-1	150	55	0.055	0
2112	NMOS	1024B	EUTECTIC	NDIP	SILICONE	16/16	D-1	150	46	0.046	0
2112	NMOS	1024B	EUTECTIC	NDIP	SILICONE	16/16	D-1	150	56	0.065	0
21L02	NMOS	1024B	EUTECTIC	NDIP	SILICONE	16/16	D-1	150	46	0.046	0
** MEMORY, SRAM PMOS											
2501	PMOS	256B	EUTECTIC	NDIP	SILICONE	16/16	D-1	150	46	0.046	0
** MEMORY, SRAM STTL											
82S06	STTL	256B	EUTECTIC	HDIP	CERAMIC	16/16	D	150	68	0.137	1
82S06	STTL	256B	EUTECTIC	HDIP	CERAMIC	16/16	D	150	68	0.137	1
82S16	STTL	256B	EUTECTIC	HDIP	CERAMIC	16/16	D	150	46	0.046	0
82S06	STTL	256B	EUTECTIC	HDIP	METAL/CERAMIC	16/16	D	150	90	0.090	0
82S09	STTL	576B	EUTECTIC	HDIP	METAL/CERAMIC	28/28	D	150	101	0.101	0
82S10	STTL	1024B	EUTECTIC	HDIP	METAL/CERAMIC	16/16	D	150	46	0.046	0
82S12	STTL	32B	EUTECTIC	HDIP	METAL/CERAMIC	24/24	D	150	45	0.045	0
** MEMORY, SRAM TTL											
93410	TTL	256B	EUTECTIC	HDIP	METAL/CERAMIC	16/16	D	150	76	0.076	0
93415	TTL	1024B	EUTECTIC	HDIP	METAL/CERAMIC	16/16	D	150	56	0.056	0
93415	TTL	1024B	EUTECTIC	HDIP	METAL/CERAMIC	16/16	D	150	77	0.077	0
93415	TTL	1024B	EUTECTIC	HDIP	METAL/CERAMIC	16/16	D	150	46	0.046	0
93415	TTL	1024B	EUTECTIC	HDIP	METAL/CERAMIC	16/16	D	150	46	0.046	0

Microcircuit Storage
Life Test Data

Part Number	Circuit tech	Comp	Die Bond	Package Description		Pins/ Inter	Quality	Test Temp	Number Tested	Test Duration	Number Failures
93421	TTL	256B	EUTECTIC	HDIP	METAL/CERAMIC	16/16	D	150	60	0.060	1
93421	TTL	256B	EUTECTIC	HDIP	METAL/CERAMIC	16/16	D	150	60	0.060	1
** MEMORY, UVEPROM NMOS											
68708	NMOS	8192B	EUTECTIC	HDIP	CER/MET WINDOW	24/24	D	250	121	0.444	6
27128	NMOS	*****B	EUTECTIC	HDIP	CERAMIC	28/28	D	250	3136	0.887	13
2764	NMOS	65536B	EUTECTIC	HDIP	CERAMIC	28/27	D	250	346	0.344	2
2716	NMOS	16384B	EUTECTIC	HDIP	CERAMIC WINDOW	24/24	D	150	1360	0.992	1
N/R	NMOS	8192B	N/R	HDIP	N/R	24/ 0	D	150	20	0.100	4
N/R	NMOS	8192B	N/R	HDIP	N/R	24/ 0	D	250	74	0.064	30
N/R	NMOS	8192B	N/R	HDIP	N/R	24/ 0	D	250	25	0.011	10
N/R	NMOS	8192B	N/R	HDIP	N/R	24/ 0	D	250	70	0.074	27
N/R	NMOS	16384B	N/R	HDIP	N/R	24/ 0	D	250	20	0.030	0
** MEMORY, UVEPROM PMOS											
N/R	PMOS	2048B	N/R	HDIP	N/R	24/ 0	D	150	25	0.060	1
** VLSI, CMOS											
10000	CMOS	1000G	N/R	HDIP	CERAMIC	40/ 0	D	150	33	0.033	0
5140	CMOS	1404G	N/R	HDIP	METAL/CERAMIC	40/ 0	D	125	8	0.008	0
10000	CMOS	1000G	N/R	NCC	EPOXY	68/ 0	D-1	150	30	0.030	0
10000	CMOS	1000G	N/R	NCC	EPOXY	68/ 0	D-1	150	30	0.030	0
17800	CMOS	1782G	N/R	NCC	EPOXY	68/ 0	D-1	150	25	0.025	0
17800	CMOS	1782G	N/R	NCC	EPOXY	68/ 0	D-1	150	25	0.025	0
5080	CMOS	880G	N/R	NCC	EPOXY	68/ 0	D-1	150	15	0.005	0
5140	CMOS	1404G	N/R	NCC	EPOXY	84/ 0	D-1	150	15	0.015	0

Microcircuit Storage
Life Test Data

Part Number	Circuit tech	Comp	Die Bond	Package Description		Pins/ Inter	Quality	Test Temp	Number Tested	Test Duration	Number Failures
5220	CMOS	2224G	N/R	NCC	EPOXY	44/ 0	D-1	150	15	0.015	0
5220	CMOS	2224G	N/R	NCC	EPOXY	44/ 0	D-1	150	15	0.015	0
5320	CMOS	3192G	N/R	NCC	EPOXY	68/ 0	D-1	150	20	0.020	0
5320	CMOS	3192G	N/R	NCC	EPOXY	68/ 0	D-1	150	20	0.020	0
5420	CMOS	4202G	N/R	NCC	EPOXY	68/ 0	D-1	150	15	0.015	0
10000	CMOS	1000G	N/R	NDIP	EPOXY	40/ 0	D-1	150	18	0.027	0
10000	CMOS	1000C	N/R	NDIP	EPOXY	40/ 0	D-1	150	30	0.060	0
10000	CMOS	1000G	N/R	NDIP	EPOXY	40/ 0	D-1	125	53	0.044	0
5080	CMOS	880G	N/R	NDIP	EPOXY	40/ 0	D-1	150	55	0.083	0
5220	CMOS	2224G	N/R	NDIP	EPOXY	40/ 0	D-1	150	15	0.015	0
5220	CMOS	2224G	N/R	NDIP	EPOXY	40/ 0	D-1	150	10	0.010	0
63L05	CMOS	0	EUTECTIC	NDIP	EPOXY	64/60	D-1	-55	22	0.022	0
63L05	CMOS	0	EUTECTIC	NDIP	EPOXY	64/60	D-1	150	22	0.022	0
80C48	CMOS	5667G	EUTECTIC	NDIP	EPOXY	40/40	D-1	150	20	0.020	0
** VLSI, IIL											
9900	IIL	3100G	EUTECTIC	HDIP	METAL/CERAMIC	64/59	D	150	44	0.088	2
9900	IIL	3100G	EUTECTIC	HDIP	METAL/CERAMIC	64/59	D	150	22	0.022	0
** VLSI, NMOS											
3870	NMOS	0	EUTECTIC	HDIP	METAL/CERAMIC	40/40	D	150	100	0.010	0
68000	NMOS	12667G	EUTECTIC	HDIP	METAL/CERAMIC	64/64	D	-55	42	0.042	0
68000	NMOS	12667G	EUTECTIC	HDIP	METAL/CERAMIC	64/64	D	295	42	0.042	0
402	NMOS	731G	EUTECTIC	NDIP	EPOXY	40/40	D-1	150	25	0.025	1

Microcircuit Test Data Summary

The following microcircuit test data summary table presents the results of the nonoperating microcircuit storage life test data base data merge. Data from this section were derived using the detailed data from the proceeding section. Data were merged when devices had identical functional groups, memory types (when applicable), technologies, complexity factors, life test temperatures and quality levels. Complexity factors are numbers assigned to group device complexities.

The values given in the summary table reflect the largest complexity within that group. Table MT-4 shows the complexity groupings. Data in the summary table are grouped according to their functional group, technology and memory type. Test durations and number failed were summed for microcircuits meeting this merge criteria. Life test failure rates were then derived for each merged record. It must be remembered that these failure rates are very high since they correspond to much higher ambient temperatures than would be encountered in actual storage conditions.

Predicted failure rates were not derived for the merged life test data records because current prediction models are only valid up to 200 degrees celsius.

TABLE MT-4:

COMPLEXITY FACTORS

Complexity Range	Complexity Factor
Not Applicable	N/A
1 - 20	20
21 - 40	40
41 - 60	60
61 - 80	80
81 - 100	100
101 - 200	200
201 - 400	400
401 - 600	600
601 - 800	800
801 - 1000	1000
1001 - 2000	2000
2001 - 3000	3000
3001 - 4000	4000
4001 - 5000	5000
6001 - 13000	13000

Microcircuit Test
Data Summary
Table

Functional Group	Technology	Memory Type	Complexity	Life Test Temperature	Quality Level	Cumulative Test Hours	Number Failed	Life Test Failure Rate
** DIGITAL, CMOS								
DIGITAL	CMOS		20G	150	B-1	0.050	0 <	18.3200000
DIGITAL	CMOS		20G	200	B-1	0.050	0 <	18.3200000
DIGITAL	CMOS		20G	250	B-1	0.049	2	40.8163265
DIGITAL	CMOS		20G	300	B-1	0.047	9	191.4893617
DIGITAL	CMOS		20G	125	D	0.028	0 <	32.7142857
DIGITAL	CMOS		20G	250	D	0.049	2	40.8163265
DIGITAL	CMOS		20G	300	D	0.038	26	684.2105263
** DIGITAL, DTL								
DIGITAL	DTL		20G	150	D	0.741	0 <	1.2361673
** DIGITAL, ECL								
DIGITAL	ECL		20G	150	D	0.659	0 <	1.3899848
DIGITAL	ECL		20G	250	D	0.490	3	6.1224490
DIGITAL	ECL		20G	300	D	0.392	3	7.6530612
DIGITAL	ECL		20G	325	D	0.003	0 <	305.3333333
DIGITAL	ECL		60G	150	D-1	0.046	0 <	19.9130435
** DIGITAL, HTTL								
DIGITAL	HTTL		20G	150	D	0.774	3	3.8759690
** DIGITAL, LSTTL								
DIGITAL	LSTTL		60G	275	B-1	0.080	0 <	11.4500000
DIGITAL	LSTTL		60G	300	B-1	0.080	0 <	11.4500000
DIGITAL	LSTTL		60G	325	B-1	0.074	6	81.0810811

Microcircuit Test
Data Summary
Table

Functional Group	Technology	Memory Type	Complexity	Life Test Temperature	Quality Level	Cumulative Test Hours	Number Failed	Life Test Failure Rate
DIGITAL	LSTTL		20G	150	D	0.149	1	6.7114094
DIGITAL	LSTTL		20G	250	D	0.123	0 <	7.4471545
DIGITAL	LSTTL		20G	300	D	0.095	1	10.5263158
DIGITAL	LSTTL		60G	150	D-1	0.046	0 <	19.9130435
DIGITAL	LSTTL		20G	150	D-1	0.741	1	1.3495277
** DIGITAL, NMOS								
DIGITAL	NMOS		N/A	150	D-1	0.646	3	4.6439628
** DIGITAL, STTL								
DIGITAL	STTL		20G	150	D	0.081	0 <	11.3086420
DIGITAL	STTL		80G	150	D	0.046	0 <	19.9130435
DIGITAL	STTL		20G	250	D	0.212	4	18.8679245
DIGITAL	STTL		20G	300	D	0.082	2	24.3902439
DIGITAL	STTL		20G	150	D-1	0.505	3	5.9405941
** DIGITAL, TTL								
DIGITAL	TTL		20G	150	B-2	0.130	0 <	7.0461538
DIGITAL	TTL		40G	150	B-2	0.045	0 <	20.3555556
DIGITAL	TTL		20G	150	D	1.653	0 <	0.5541440
DIGITAL	TTL		60G	150	D	0.128	0 <	7.1562500
DIGITAL	TTL		80G	150	D	0.045	0 <	20.3555556
DIGITAL	TTL		40G	150	D	0.398	1	2.5125628
DIGITAL	TTL		40G	150	D-1	0.091	0 <	10.0659341
DIGITAL	TTL		20G	150	D-1	2.636	9	3.4142640

Microcircuit Test
Data Summary
Table

Functional Group	Technology	Memory Type	Complexity	Life Test Temperature	Quality Level	Cumulative Test Hours	Number Failed	Life Test Failure Rate
DIGITAL	TTL		60G	150	D-1	0.193	0 <	4.7461140
DIGITAL	TTL		400G	150	D-1	0.046	0 <	19.9130435
** LINEAR, BIP JNCT								
LINEAR	BIP JNCT		20T	150	B-2	0.046	0 <	19.9130435
LINEAR	BIP JNCT		N/A	N/R	D	0.057	0 <	16.0701754
LINEAR	BIP JNCT		60T	150	D	0.046	0 <	19.9130435
LINEAR	BIP JNCT		80T	150	D	0.092	0 <	9.9565217
LINEAR	BIP JNCT		20T	150	D	0.443	0 <	2.0677201
LINEAR	BIP JNCT		40T	150	D	0.559	5	8.9445438
LINEAR	BIP JNCT		20G	175	D	1.020	0 <	0.8980392
LINEAR	BIP JNCT		N/A	175	D	0.539	0 <	1.6994434
LINEAR	BIP JNCT		80T	175	D	0.354	0 <	2.5875706
LINEAR	BIP JNCT		40T	175	D	1.212	0 <	0.7557756
LINEAR	BIP JNCT		60T	150	D-1	0.140	0 <	6.5428571
LINEAR	BIP JNCT		20T	150	D-1	0.836	2	2.3923445
LINEAR	BIP JNCT		40T	150	D-1	0.265	1	3.7735849
LINEAR	BIP JNCT		N/A	150	D-1	1.170	6	5.1282051
LINEAR	BIP JNCT		80T	150	D-1	0.045	0 <	20.3555556
LINEAR	BIP JNCT		40T	175	D-1	0.075	0 <	12.2133333
** LINEAR, ECL								
LINEAR	ECL		40T	150	D-1	0.046	0 <	19.9130435

Microcircuit Test
Data Summary
Table

Functional Group	Technology	Memory Type	Complexity	Life Test Temperature	Quality Level	Cumulative Test Hours	Number Failed	Life Test Failure Rate
** LINEAR, MOS								
LINEAR	MOS		20T	150	D	0.022	0 <	41.6363636
** LINEAR, STTL								
LINEAR	STTL		40T	150	D	0.045	0 <	20.3555556
** MEMORY, CMOS								
MEMORY	CMOS	SRAM	N/A	150	D	0.060	0 <	15.2666667
MEMORY	CMOS	SRAM	N/A	150	D-1	0.030	0 <	30.5333333
** MEMORY, ECL								
MEMORY	ECL		N/A	150	D	0.138	2	14.4927536
MEMORY	ECL		N/A	300	D	0.049	1	20.4081633
MEMORY	ECL	SRAM	N/A	150	D	0.046	0 <	19.9130435
** MEMORY, LTTL								
MEMORY	LTTL	SRAM	N/A	150	D	0.222	0 <	4.1261261
** MEMORY, NMOS								
MEMORY	NMOS		N/A	125	D	0.032	1	31.2500000
MEMORY	NMOS	DRAM	N/A	125	D	0.032	1	31.2500000
MEMORY	NMOS	DRAM	N/A	150	D	0.858	3	3.4965035
MEMORY	NMOS	DRAM	N/A	200	D	0.214	0 <	4.2803738
MEMORY	NMOS	DRAM	N/A	250	D	0.736	3	4.0760870
MEMORY	NMOS	DRAM	N/A	150	D-1	0.054	1	18.5185185
MEMORY	NMOS	EEPROM	N/A	250	D	0.006	0 <	152.6666667
MEMORY	NMOS	EPROM	N/A	250	D	0.148	4	27.0270270

Microcircuit Test
Data Summary
Table

Functional Group	Technology	Memory Type	Complexity	Life Test Temperature	Quality Level	Cumulative Test Hours	Number Failed	Life Test Failure Rate
MEMORY	NMOS	ROM	N/A	150	D-1	0.050	0 <	18.3200000
MEMORY	NMOS	SRAM	N/A	150	D	0.719	4	5.5632823
MEMORY	NMOS	SRAM	N/A	175	D	0.049	0 <	18.6938776
MEMORY	NMOS	SRAM	N/A	200	D	0.049	0 <	18.6938776
MEMORY	NMOS	SRAM	N/A	225	D	0.049	0 <	18.6938776
MEMORY	NMOS	SRAM	N/A	250	D	0.049	0 <	18.6938776
MEMORY	NMOS	SRAM	N/A	300	D	0.049	2	40.8163265
MEMORY	NMOS	SRAM	N/A	150	D-1	1.206	5	4.1459370
MEMORY	NMOS	UVEPROM	N/A	150	D	1.092	5	4.5787546
MEMORY	NMOS	UVEPROM	N/A	250	D	1.854	88	47.4649407
** MEMORY, PMOS								
MEMORY	PMOS		N/A	150	D	0.852	2	2.3474178
MEMORY	PMOS		N/A	150	D-1	0.942	4	4.2462845
MEMORY	PMOS	DRAM	N/A	150	D	0.199	1	5.0251256
MEMORY	PMOS	DRAM	N/A	150	D-1	0.505	8	15.8415842
MEMORY	PMOS	ROM	N/A	150	D	0.146	0 <	6.2739726
MEMORY	PMOS	ROM	N/A	150	D-1	0.040	0 <	22.9000000
MEMORY	PMOS	SRAM	N/A	150	D-1	0.046	0 <	19.9130435
MEMORY	PMOS	UVEPROM	N/A	150	D	0.060	1	16.6666667
** MEMORY, STTL								
MEMORY	STTL	PROM	N/A	150	D	0.716	3	4.1899441
MEMORY	STTL	ROM	N/A	150	D	0.138	0 <	6.6376812

Microcircuit Test
Data Summary
Table

Functional Group	Technology	Memory Type	Complexity	Life Test Temperature	Quality Level	Cumulative Test Hours	Number Failed	Life Test Failure Rate
MEMORY	STTL	SRAM	N/A	150	D	0.602	2	3.3222591
** MEMORY, TTL								
MEMORY	TTL		N/A	150	B-2	0.045	0 <	20.3555556
MEMORY	TTL		N/A	150	D	0.660	1	1.5151515
MEMORY	TTL	PROM	N/A	150	D	0.114	0 <	8.0350877
MEMORY	TTL	PROM	N/A	150	D-1	0.040	0 <	22.9000000
MEMORY	TTL	ROM	N/A	150	D	0.091	0 <	10.0659341
MEMORY	TTL	SRAM	N/A	150	D	0.421	2	4.7505938
** VLSI, CMOS								
VLSI	CMOS		2000G	125	D	0.008	0 <	114.5000000
VLSI	CMOS		2000G	150	D	0.033	0 <	27.7575758
VLSI	CMOS		N/A	-55	D-1	0.022	0 <	41.6363636
VLSI	CMOS		2000G	125	D-1	0.044	0 <	20.8181818
VLSI	CMOS		5000G	150	D-1	0.015	0 <	61.0666667
VLSI	CMOS		6000G	150	D-1	0.020	0 <	45.8000000
VLSI	CMOS		N/A	150	D-1	0.022	0 <	41.6363636
VLSI	CMOS		3000G	150	D-1	0.055	0 <	16.6545455
VLSI	CMOS		4000G	150	D-1	0.040	0 <	22.9000000
VLSI	CMOS		1000G	150	D-1	0.088	0 <	10.4090909
VLSI	CMOS		2000G	150	D-1	0.212	0 <	4.3207547
** VLSI, IIL								
VLSI	IIL		4000G	150	D	0.110	2	18.1818182

Microcircuit Test
Data Summary
Table

Functional Group	Technology	Memory Type	Complexity	Life Test Temperature	Quality Level	Cumulative Test Hours	Number Failed	Life Test Failure Rate
** VLSI, NMOS								
VLSI	NMOS		13000G	-55	D	0.042	0 <	21.8095238
VLSI	NMOS		N/A	150	D	0.010	0 <	91.6000000
VLSI	NMOS		13000G	295	D	0.042	0 <	21.8095238
VLSI	NMOS		800G	150	D-1	0.025	1	40.0000000

Hybrids

Hybrid Field Data File Description

Field experience data on hybrid devices are presented in this section. Data from the hybrid circuit nonoperating field experience data base have been sorted by the component quality level, application environment and part number. Once sorted, data were then grouped according to the devices quality level and application environment. Hybrid detail data records consist of the following characteristic data base fields:

- Function Group: The family for which the particular device belongs.
- Seal Perimeter: The perimeter of the hybrid circuit seal given in inches.
- Pkg Res: Number of packaged resistors.
- Pkg Cap: Number of packaged capacitors.
- Pkg Diode: Number of packaged diodes.
- Pkg Trans: Number of packaged transistors.
- Pkg IC's: Number of packaged microcircuits.
- Sub Res: Number of chip and substrate resistors.
- Int Con: Number of active interconnections.

o Quality: Codes used to indicate the level of quality control which a device has been subjected. These codes are based on the level of screening and testing that the device received prior to being installed into a system Table H-1 lists the various hybrid quality level.

TABLE H-1:
HYBRID QUALITY LEVELS

Quality Levels
S
B
C
D

Hybrid Circuit Storage
Field Experience

Part Number	Function Group	Seal Perimeter	Pkg Res	Pkg Cap	Pkg Diode	Pkg Trans	Pkg Ic's	Sub Res	Int Con	Quality	Env	Number Fielded	Part Hours	Number Failures
** B , AIF														
9421-00047	LINEAR	N/R	0	0	0	0	0	0	0	B	AIF	1004	25.950	0
9421-00047	LINEAR	N/R	20	2	2	0	7	0	85	B	AIF	1004	25.950	0
DAC 348	LINEAR	3.000	0	0	0	10	1	22	44	B	AIF	1004	25.950	0
DAC 348B12-883B	LINEAR	3.000	0	0	0	10	1	22	0	B	AIF	1004	25.950	0
LH0002H	LINEAR	1.100	4	0	0	4	0	0	10	B	AIF	1004	25.950	0
LH0053	LINEAR	1.900	0	0	0	1	2	2	18	B	AIF	1506	38.926	0
** B , GF														
N/R	N/R	1.005	0	0	1	2	0	0	8	B	GF	43962	2890.670	5
N/R	N/R	2.500	0	1	2	5	0	0	24	B	GF	51289	3372.450	1
N/R	N/R	2.500	0	2	2	5	0	0	24	B	GF	36635	2408.890	0
N/R	N/R	2.500	0	2	1	9	0	0	36	B	GF	21981	1445.330	1
N/R	N/R	2.500	0	1	1	9	0	0	38	B	GF	36635	2408.890	3
N/R	N/R	1.005	0	1	0	2	0	5	10	B	GF	183175	12044.460	98
N/R	N/R	2.000	0	1	2	5	0	0	24	B	GF	43962	2890.670	1
** C , GF														
N/R	N/R	5.000	8	1	4	6	1	0	48	C	GF	6800	416.980	140
N/R	N/R	5.000	9	1	4	6	1	0	48	C	GF	6800	416.980	15
N/R	N/R	5.000	9	1	4	6	1	0	48	C	GF	6800	416.980	10
N/R	N/R	5.000	9	1	4	6	1	0	48	C	GF	13200	810.060	9
N/R	N/R	2.000	9	1	4	6	1	0	48	C	GF	54400	3335.810	35
N/R	N/R	2.500	0	1	4	6	1	9	48	C	GF	52800	3240.230	39
N/R	N/R	5.000	9	1	4	6	1	0	48	C	GF	13200	810.060	22
N/R	N/R	2.000	9	1	4	6	1	0	48	C	GF	105600	6480.460	706

Hybrid Circuit Storage
Field Experience

Part Number	Function Group	Seal Perimeter	Pkg Res	Pkg Cap	Pkg Diode	Pkg Trans	Pkg Ic's	Sub Res	Int Con	Quality	Env	Number Fielded	Part Hours	Number Failures
N/R	N/R	5.000	9	1	4	6	1	0	48 C		GF	13200	810.060	30
N/R	N/R	5.000	0	1	4	6	1	9	48 C		GF	13200	810.060	45
N/R	N/R	2.000	9	1	4	6	1	0	48 C		GF	26400	1620.120	450
N/R	N/R	5.000	9	1	4	6	1	0	48 C		GF	6800	416.980	12
N/R	N/R	5.000	9	1	4	6	1	0	48 C		GF	6800	416.980	11
N/R	N/R	2.000	8	1	4	6	1	0	48 C		GF	6800	416.980	140
N/R	N/R	5.000	9	1	4	6	1	0	48 C		GF	13200	810.060	28
N/R	N/R	2.000	9	1	4	6	1	0	48 C		GF	13600	883.950	266
** C , N/R														
N/R	N/R	5.000	9	1	4	6	1	0	48 C		N/R	6800	416.980	11
** N/R, AIF														
7116-596	N/R	N/R	0	0	0	0	0	0	0 N/R		AIF	1004	25.950	0
9421-00032	LINEAR	2.890	30	0	10	0	1	0	0 N/R		AIF	1004	25.950	1
9421-00032	LINEAR	2.890	30	0	10	0	1	0	91 N/R		AIF	1004	25.950	1
9421-00048	N/R	N/R	16	0	2	0	5	0	67 N/R		AIF	502	12.975	0
9421-00048	N/R	N/R	0	0	0	0	0	0	0 N/R		AIF	502	12.975	0
LH0002H	LINEAR	0.350	4	0	0	4	0	0	10 N/R		AIF	1004	25.950	0
** S , AIF														
9412-00002-1/-2	N/R	N/R	3	0	0	0	6	1	101 S		AIF	2008	51.901	3
9412-00002-1/-2	LINEAR	N/R	3	0	0	0	6	1	0 S		AIF	2008	51.901	9

Hybrid Field Data Summary

The hybrid field data summary table presents field and predicted failure rates for the data records from the previous section. No data merge was performed for the hybrid devices due to the unique nature of these components and to the limited amount of data which had been collected. Data in this section have been grouped according to device quality level and application environment. In computing predicted failure rates, components with a quality level of C were upgraded to B because the current models only support S, B and D quality levels. These data points are denoted with a greater than sign before the predicted failure rate of all C quality components.

Hybrid Field
Data Summary
Table

Seal Perimeter	Pkg Res	Pkg Cap	Pkg Diode	Pkg Trans	Pkg Ic's	Sub Res	Int Con	Quality Level	App Env	Number Fielded	Cumulative Part Hours	Number Failed	Field Failure Rate	Predicted Failure Rate
** HYBRID, AIF, B														
1.900	0	0	0	1	2	2	18	B	AIF	1506	38.926	0 <<	0.0235318	0.0030431
1.100	4	0	0	4	0	0	10	B	AIF	1004	25.950	0 <<	0.0352987	0.0023230
3.000	0	0	0	10	1	22	0	B	AIF	1004	25.950	0 <<	0.0352987	0.0777005
3.000	0	0	0	10	1	22	44	B	AIF	1004	25.950	0 <<	0.0352987	0.0777005
N/R	20	2	2	0	7	0	85	B	AIF	1004	25.950	0 <<	0.0352987	0.0986435
** HYBRID, GF , B														
1.005	0	0	1	2	0	0	8	B	GF	43962	2890.670	5	0.0017297	0.0007564
2.500	0	1	2	5	0	0	24	B	GF	51289	3372.450	1	0.0002965	0.0045757
2.500	0	2	2	5	0	0	24	B	GF	36635	2408.890	0 <	0.0003803	0.0045757
2.500	0	2	1	9	0	0	36	B	GF	21981	1445.330	1	0.0006919	0.0176506
2.500	0	1	1	9	0	0	38	B	GF	36635	2408.890	3	0.0012454	0.0176506
1.005	0	1	0	2	0	5	10	B	GF	183175	12044.460	98	0.0081365	0.0004823
2.000	0	1	2	5	0	0	24	B	GF	43962	2890.670	1	0.0003459	0.0045757
** HYBRID, GF , C														
5.000	8	1	4	6	1	0	48	C	GF	∪800	416.980	140	0.3357475	> 0.0396768
5.000	9	1	4	6	1	0	48	C	GF	6800	416.980	15	0.0359729	0.0396768
5.000	9	1	4	6	1	0	48	C	GF	13200	810.060	22	0.0271585	> 0.0396768
5.000	9	1	4	6	1	0	48	C	GF	6800	416.980	12	0.0287784	> 0.0396768
5.000	9	1	4	6	1	0	48	C	GF	13200	810.060	9	0.0111103	> 0.0396768
2.500	0	1	4	6	1	9	48	C	GF	52800	3240.230	39	0.0120362	> 0.0396768
5.000	0	1	4	6	1	9	48	C	GF	13200	810.060	45	0.0555514	> 0.0396768

Hybrid Field
Data Summary
Table

Seal Perimeter	Pkg Res	Pkg Cap	Pkg Diode	Pkg Trans	Pkg Ic's	Sub Res	Int Con	Quality Level	App Env	Number Fielded	Cumulative Part Hours	Number Failed	Field Failure Rate	Predicted Failure Rate
2.000	9	1	4	6	1	0	48	C	GF	105600	6480.460	706	0.1089429	> 0.0396768
5.000	9	1	4	6	1	0	48	C	GF	6800	416.980	11	0.0263802	> 0.0396768
2.000	9	1	4	6	1	0	48	C	GF	13600	883.950	266	0.3009220	> 0.0396768
2.000	9	1	4	6	1	0	48	C	GF	54400	3335.810	35	0.0104922	> 0.0396768
2.000	9	1	4	6	1	0	48	C	GF	26400	1620.120	450	0.2777572	> 0.0396768
5.000	9	1	4	6	1	0	48	C	GF	6800	416.980	10	0.0239820	> 0.0396768
5.000	9	1	4	6	1	0	48	C	GF	13200	810.060	30	0.0370343	> 0.0396768
2.000	8	1	4	6	1	0	48	C	GF	6800	416.980	140	0.3357475	> 0.0396768
5.000	9	1	4	6	1	0	48	C	GF	13200	810.060	28	0.0345653	> 0.0396768
** HYBRID, AIF, S														
N/R	3	0	0	0	6	1	101	S	AIF	2008	51.901	3	0.0578024	0.0262583
N/R	3	0	0	0	6	1	0	S	AIF	2008	51.901	9	0.1734071	0.0262583

Tubes

Tube Data File Description

Field experience data on various tube types are presented in this section. Data from the tube nonoperating field experience detail data section are in order by tube type, operating mode, application environment and part number. The data from this section have been subgrouped according to the tube type. All tube data records contain the following characteristic data fields:

- o Tube Type: Description of the type or general application of the tube.
- o Operating Mode (Wave Type): Type of wave which the tube emits. Wave types would be either CW for continuous wave or pulsed for pulsed wave.

Tubes Storage
Field Experience

Tube Type	Component Part Number	Wave Type	App Env	Number Fielded	Number Failed	Part Hours
** KLYSTRON						
KLYSTRON	3K210000LQ	CW	GF	130	13	0.858
KLYSTRON	3K3000LQ	CW	GF	21	0	1.355
KLYSTRON	3K500LA	CW	GF	5	0	0.018
KLYSTRON	3KM30000LA	CW	GF	12	1	0.154
KLYSTRON	3KM50000PA	CW	GF	45	4	0.467
KLYSTRON	3KM50000PA	CW	GF	82	2	0.906
KLYSTRON	4K35K	CW	GF	16	2	0.288
KLYSTRON	4K3CC	CW	GF	18	2	0.261
KLYSTRON	4K500000LQ	CW	GF	71	0	1.341
KLYSTRON	4KM170000L	CW	GF	0	0	0.041
KLYSTRON	4KM300LR	CW	GF	54	0	0.724
KLYSTRON	4KM50-SK	CW	GF	0	3	0.465
KLYSTRON	4KM500000L	CW	GF	301	9	3.201
KLYSTRON	4KM50000LQ	CW	GF	0	0	0.196
KLYSTRON	4KM50LC	CW	GF	2	0	0.046
KLYSTRON	4KM50ST	CW	GF	0	0	0.064
KLYSTRON	N/R	CW	GF	0	28	9.605
KLYSTRON	N/R	CW	GF	58	6	0.280
KLYSTRON	N/R	CW	GF	0	2	1.416
KLYSTRON	N/R	CW	GF	0	1	0.152
KLYSTRON	N/R	CW	GF	0	1	0.134
KLYSTRON	N/R	CW	GF	0	6	2.138
KLYSTRON	VA800E	CW	GF	2	0	0.023

Tubes Storage
Field Experience

Tube Type	Component Part Number	Wave Type	App Env	Number Fielded	Number Failed	Part Hours
KLYSTRON	VA856B	CW	GF	5	0	0.219
KLYSTRON	N/R	N/R	GM	0	1	12.750
KLYSTRON	4KMP10000L	PULSED	GF	14	0	0.807
KLYSTRON	N/R	PULSED	GF	0	4	2.089
KLYSTRON	N/R	PULSED	GF	102	5	0.970
KLYSTRON	N/R	PULSED	GF	275	18	5.248
KLYSTRON	N/R	PULSED	GF	109	10	1.580
KLYSTRON	N/R	PULSED	GF	300	7	1.906
KLYSTRON	SAC42A	PULSED	GF	452	18	6.576
KLYSTRON	X780D	PULSED	GF	0	1	0.164
** MAGNETRON						
MAGNETRON	400615	N/R	GF	10	1	0.091
MAGNETRON	5586	N/R	GF	10	1	0.071
MAGNETRON	5586	N/R	GF	9	0	0.144
MAGNETRON	7256	N/R	GF	244	2	2.011
MAGNETRON	7256	N/R	GF	0	3	2.233
MAGNETRON	8798	N/R	GF	261	6	2.144
MAGNETRON	8798F	N/R	GF	49	3	0.431
MAGNETRON	8798M	N/R	GF	117	2	0.969
MAGNETRON	N/R	N/R	GF	0	4	0.729
MAGNETRON	QK327A	N/R	GF	0	13	7.746
MAGNETRON	QK338A	N/R	GF	2592	116	136.568
MAGNETRON	QK6410	N/R	GF	211	12	3.497

Tubes Storage
Field Experience

Tube Type	Component Part Number	Wave Type	App Env	Number Fielded	Number Failed	Part Hours
** PULSED GRIDDED						
PULSED GRIDDED	2041	N/R	GF	285	10	2.359
PULSED GRIDDED	6952	N/R	GF	356	17	3.119
PULSED GRIDDED	7835	N/R	GF	138	11	1.284
PULSED GRIDDED	N/R	N/R	GF	159	0	1.936
** RECEIVER						
RECEIVER	JAN5784WB	N/R	GM	0	0	12.760
RECEIVER	JAN578WA	N/R	GM	0	0	63.800
RECEIVER	JAN5829WA	N/R	GM	0	0	12.760
RECEIVER	N/R	N/R	GM	0	0	25.520
RECEIVER	N/R	N/R	GM	0	0	0.760
** RECEIVER, PENTODE						
RECEIVER, PENTODE	JAN5702WB	N/R	GM	0	10	370.050
** RECEIVER, TRIODE						
RECEIVER, TRIODE	JAN5703WB	N/R	GM	0	1	191.410
RECEIVER, TRIODE	JAN5744WB	N/R	GM	0	0	178.660
RECEIVER, TRIODE	JAN6021	N/R	GM	0	0	51.040
RECEIVER, TRIODE	JAN6112	N/R	GM	0	0	12.760
** TRANSMITTING						
TRANSMITTING	QK681	N/R	GF	145	13	1.970
** TRAVELING WAVE						
TRAVELING WAVE	N/R	N/R		0	0	0.266
TRAVELING WAVE	N/R	N/R	GF	0	1	0.729

Tubes Storage
Field Experience

Tube Type	Component Part Number	Wave Type	App Env	Number Fielded	Number Failed	Part Hours
TRAVELING WAVE	N/R	N/R	GF	0	0	0.320
TRAVELING WAVE	N/R	N/R	GF	0	0	0.090
TRAVELING WAVE	N/R	N/R	GF	0	9	2.889
** TWYSTRON						
TWYSTRON	N/R	N/R	GF	0	2	1.508
TWYSTRON	N/R	N/R	GF	0	6	0.134
** VACUUM TUBE						
VACUUM TUBE	N/R	N/R	GF	0	14	1.017
VACUUM TUBE	N/R	N/R	GF	0	0	0.410
** VIDICON						
VIDICON	253521-3-1	N/R	GF	2070	3	20.590

Tube Summary

The following table presents the results of the nonoperating tube data base data merge. Data in this section were obtained by merging records from the proceeding detail data section. Data were merged for records having identical tube types, operating mode and application environments. The tube data summary table presents the results in subgroupings by tube type. Number fielded, part hours and number failed were summed for tubes meeting this merge criteria. Field and predicted failure rates were then derived for each merged record. In cases where all prediction model parameters could not be determined, a N/R appears in the predicted failure rate column.

Tubes Field
Data Summary
Table

Tube Type	Wave Type	Application Environment	Number Fielded	Cumulative Part Hours	Number Failed	Field Failure Rate	Predicted Failure Rate
** KLYSTRON							
KLYSTRON	CW	GF	822	24.352	80	3.2851511	3.6000000
KLYSTRON	N/R	GM	N/R	12.750	1	0.0784314	N/R
KLYSTRON	PULSED	GF	1252	19.340	63	3.2574974	3.4500000
** MAGNETRON							
MAGNETRON	N/R	GF	3503	156.634	163	1.0406425	3.0600000
** PULSED GRIDDED							
PULSED GRIDDED	N/R	GF	938	8.698	38	4.3688204	3.0900000
** *RECEIVER, N/R*							
RECEIVER, N/R	N/R	GM	N/R	115.600	0 <	0.0079239	N/R
** RECEIVER, PENTODE							
RECEIVER, PENTODE	N/R	GM	N/R	370.050	10	0.0270234	0.1240000
** RECEIVER, TRIODE							
RECEIVER, TRIODE	N/R	GM	N/R	433.870	1	0.0023048	0.1240000
** TRANSMITTING, N/R							
TRANSMITTING, N/R	N/R	GF	145	1.970	13	6.5989848	N/R
** TRAVELING WAVE							
TRAVELING WAVE	N/R	N/R	N/R	0.266	0 <<	3.4436090	N/R
TRAVELING WAVE	N/R	GF	N/R	4.028	10	2.4826216	2.0700000
** TWYSTRON							
TWYSTRON	N/R	GF	N/R	1.642	8	4.8721072	7.8000000

Tubes Field
Data Summary
Table

Tube Type	Wave Type	Application Environment	Number Fielded	Cumulative Part Hours	Number Failed	Field Failure Rate	Predicted Failure Rate
** VACUUM TUBE							
VACUUM TUBE	N/R	GF	N/R	1.427	14	9.8107919	N/R
** VIDICON							
VIDICON	N/R	GF	2070	20.590	3	0.1457018	0.1470000

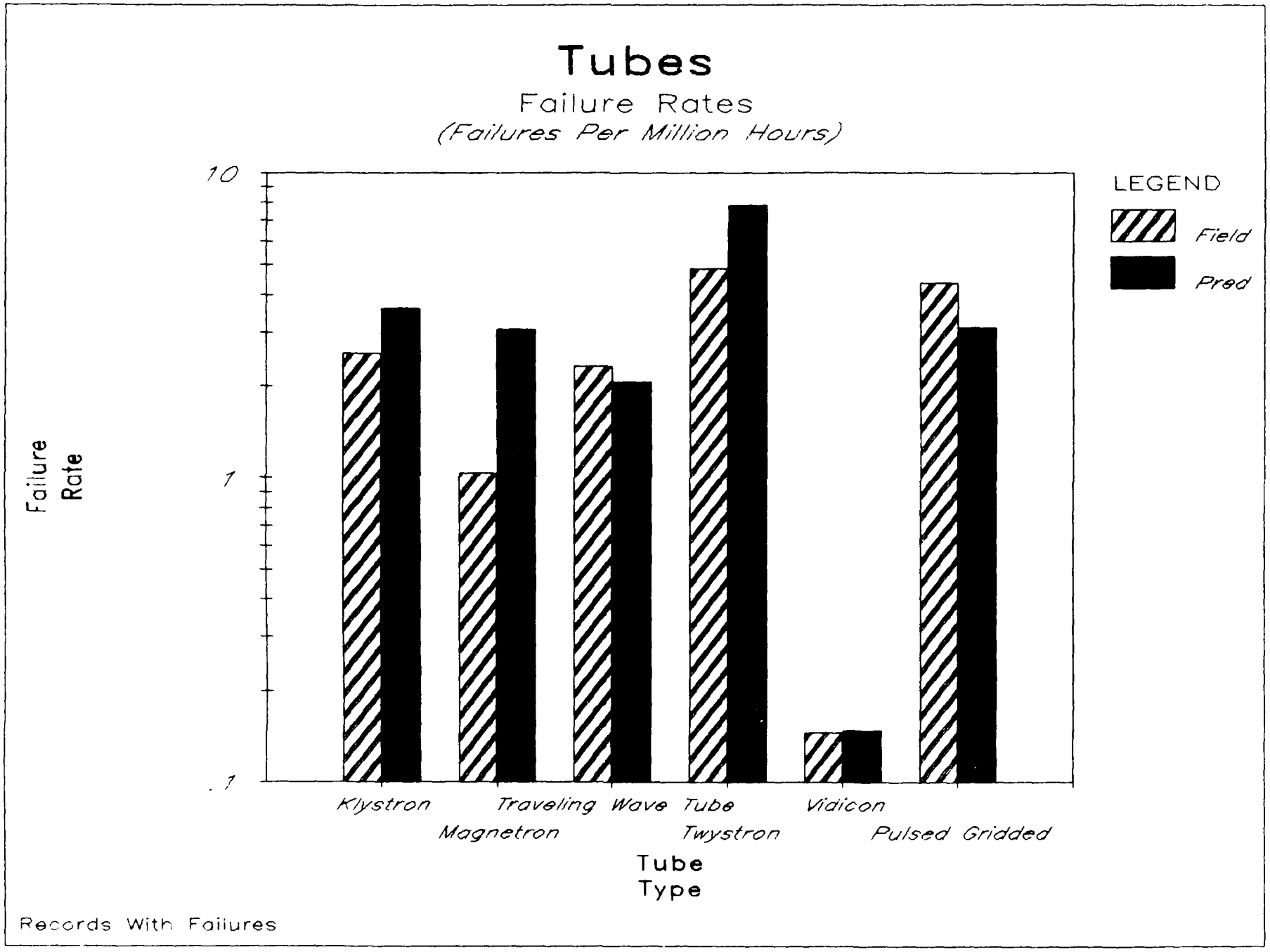

FIGURE TUB-1: TUBE FAILURE RATE VS. TUBE TYPE

Relays

Relay Data File Description

Field experience data on various relay types are presented in this section. Data from the relay nonoperating field experience detail data section are in order by relay type, relay construction, quality level, application environment and part number. The data from this section have been sub-grouped according to the relay type and construction. All relay data records contain the following characteristic data fields:

- o Relay Type: Description of the type or general application of the relay.
- o Relay Construction: Description of the physical characteristics of the relay.
- o Poles: Alpha-numeric field indicating the contact configuration of the relay. For example, 2PDT would represent a double pole double throw relay.
- o Quality: Codes which indicate the level of quality control a device has been subjected to. These codes are based on the level of testing the relay received before being installed into a system. Table REL-1 shows the various relay quality levels.

TABLE REL-1:

RELAY QUALITY LEVELS

Quality Levels
Established Reliability (R)
MIL-SPEC
Lower

Relay Storage
Field Experience

Component Part Number	Relay Type	Relay Construction	Poles	Quality	App Env	Number Fielded	Number Failed	Part Hours
** DRY CIRCUIT, ARMATURE								
N/R	DRY CIRCUIT	ARMATURE	N/R	MIL-SPEC	GF	156	0	4.500
N/R	DRY CIRCUIT	ARMATURE	SPDT	MIL-SPEC	N/R	0	0	2.658
N/R	DRY CIRCUIT	ARMATURE	SPDT	MIL-SPEC	N/R	0	0	27.872
N/R	DRY CIRCUIT	ARMATURE	SPDT	MIL-SPEC	N/R	0	0	1.017
** GENERAL PURPOSE, ARMATURE								
N/R	GENERAL PURPOSE	ARMATURE	N/R	MIL-SPEC	GF	6210	2	61.770
N/R	GENERAL PURPOSE	ARMATURE	N/R	MIL-SPEC	N/R	0	0	0.724
N/R	GENERAL PURPOSE	ARMATURE	N/R	MIL-SPEC	N/R	0	0	0.117
N/R	GENERAL PURPOSE	ARMATURE	N/R	MIL-SPEC	N/R	0	0	0.164
** GENERAL PURPOSE, N/R								
N/R	GENERAL PURPOSE	N/R	N/R	MIL-SPEC	N/R	0	19	587.400
N/R	GENERAL PURPOSE	N/R	N/R	MIL-SPEC	N/R	0	0	9.360
N/R	GENERAL PURPOSE	N/R	N/R	MIL-SPEC	NSB	0	0	144.100
** LATCHING, ARMATURE								
N/R	LATCHING	ARMATURE	N/R	MIL-SPEC	GF	39	1	1.570
N/R	LATCHING	ARMATURE	N/R	MIL-SPEC	GF	0	0	2.020
N/R	LATCHING	ARMATURE	SPDT	MIL-SPEC	N/R	0	0	43.460
** LATCHING, N/R								
N/R	LATCHING	N/R	N/R	MIL-SPEC	N/R	0	1	12.330
** N/R, ARMATURE								
5945-00-605-6578	N/R	ARMATURE	N/R	LOWER	N/R	69	0	0.981
5945-00-605-6578	N/R	ARMATURE	N/R	LOWER	N/R	76	1	1.078
5995-00-605-6578	N/R	ARMATURE	N/R	LOWER	N/R	21	0	0.299

Relay Storage
Field Experience

Component Part Number	Relay Type	Relay Construction	Poles	Quality	App Env	Number Fielded	Number Failed	Part Hours
5945-00-435-1833	N/R	ARMATURE	DPDT	R	N/R	296	0	4.227
5945-00-855-7478	N/R	ARMATURE	N/R	R	N/R	76	1	1.078
5945-00-855-7478	N/R	ARMATURE	N/R	R	N/R	21	0	0.299
5945-00-686-6877	N/R	ARMATURE	SPST	R	N/R	296	0	4.227
** N/R, N/R								
5945-00-922-0030	N/R	N/R	N/R	LOWER	N/R	16	0	0.232
5945-00-450-9136	N/R	N/R	N/R	LOWER	N/R	21	0	0.299
5945-00-450-9136	N/R	N/R	N/R	LOWER	N/R	16	0	0.232
5945-00-922-0030	N/R	N/R	N/R	LOWER	N/R	21	0	0.299
5945-00-420-4561	N/R	N/R	N/R	N/R	GM	21	0	0.299
5945-00-919-7749	N/R	N/R	N/R	N/R	N/R	69	0	0.981
5945-00-922-0031	N/R	N/R	N/R	N/R	N/R	16	0	0.232
5999-00-322-0010	N/R	N/R	N/R	N/R	N/R	21	0	0.299
5945-00-057-5655	N/R	N/R	N/R	N/R	N/R	69	0	0.981
5999-00-332-0010	N/R	N/R	N/R	N/R	N/R	76	0	1.078
5945-00-057-5655	N/R	N/R	N/R	N/R	N/R	21	0	0.299
5999-00-332-0010	N/R	N/R	N/R	N/R	N/R	69	0	0.981
5945-00-420-4561	N/R	N/R	N/R	N/R	N/R	69	0	0.981
5999-00-332-0012	N/R	N/R	N/R	N/R	N/R	16	0	0.232
5945-00-919-7748	N/R	N/R	N/R	N/R	N/R	16	0	0.232
SM15AWD-1	N/R	N/R	N/R	N/R	N/R	21	0	0.299
5945-00-919-7749	N/R	N/R	N/R	N/R	N/R	21	0	0.299
SM15AWD1	N/R	N/R	N/R	N/R	N/R	76	0	1.078

Relay Storage
Field Experience

Component Part Number	Relay Type	Relay Construction	Poles	Quality	App Env	Number Fielded	Number Failed	Part Hours
5945-00-922-0031	N/R	N/R	N/R	N/R	N/R	21	0	0.299
5945-00-057-5655	N/R	N/R	N/R	N/R	N/R	76	0	1.078
5945-00-420-4511	N/R	N/R	N/R	N/R	N/R	76	0	1.078
5945-00-420-4561	N/R	N/R	N/R	N/R	N/R	16	0	0.232
5945-00-919-7749	N/R	N/R	N/R	N/R	N/R	76	0	1.078
5945-00-057-5655	N/R	N/R	N/R	N/R	N/R	16	0	0.232
5945-00-435-1833	N/R	N/R	DPDT	R	N/R	105	0	1.493
5945-00-686-6877	N/R	N/R	N/R	R	N/R	16	0	0.232
5945-00-686-6877	N/R	N/R	N/R	R	N/R	69	0	0.981
** N/R, VACUUM								
5945-00-435-1833	N/R	VACUUM	N/R	R	N/R	207	0	2.944
5945-00-435-1833	N/R	VACUUM	N/R	R	N/R	380	0	5.389
5945-00-435-1833	N/R	VACUUM	N/R	R	N/R	48	0	0.695
** TIME DELAY, ARMATURE								
N/R	TIME DELAY	ARMATURE	N/R	MIL-SPEC	GM	4370	0	63.802
** TIME DELAY, DRY REED								
N/R	TIME DELAY	DRY REED	N/R	MIL-SPEC	N/R	0	0	0.458

Relay Summary

The following table presents the results of the nonoperating relay data base data merge. Data in this section were derived from the relay detail data section. A merged data record was computed for all records having identical relay types, relay constructions, quality levels and application environments. Part hours, number fielded and number failed were cumulated for relays meeting these merge criteria. Field and predicted failure rates were derived for each merged data record. When it was not possible to compute a predicted failure rate a N/R appears in the predicted failure rate column.

Relay Field
Data Summary
Table

Relay Type	Relay Construction	Quality Level	Application Environment	Number Fielded	Cumulative Part Hours	Number Failed	Field Failure Rate	Predicted Failure Rate
** DRY CIRCUIT, ARMATURE								
DRY CIRCUIT	ARMATURE	MIL-SPEC	GF	156	4.500	0 <<	0.2035556	0.0009200
DRY CIRCUIT	ARMATURE	MIL-SPEC	N/R	N/R	31.547	0 <<	0.0290360	N/R
** GENERAL PURPOSE, ARMATURE								
GENERAL PURPOSE	ARMATURE	MIL-SPEC	GF	6210	61.770	2	0.0323782	0.0009200
GENERAL PURPOSE	ARMATURE	MIL-SPEC	N/R	N/R	1.005	0 <<	0.9114428	N/R
** GENERAL PURPOSE, N/R								
GENERAL PURPOSE	N/R	MIL-SPEC	N/R	N/R	596.760	19	0.0318386	N/R
GENERAL PURPOSE	N/R	MIL-SPEC	NSB	N/R	144.100	0 <	0.0063567	0.0032000
** LATCHING, ARMATURE								
LATCHING	ARMATURE	MIL-SPEC	GF	39	3.590	1	0.2785515	0.0009200
LATCHING	ARMATURE	MIL-SPEC	N/R	N/R	43.460	0 <<	0.0210769	N/R
** TIME DELAY, ARMATURE								
TIME DELAY	ARMATURE	MIL-SPEC	GM	4370	63.802	0 <	0.0143569	0.0032800
** TIME DELAY, DRY REED								
TIME DELAY	DRY REED	MIL-SPEC	N/R	N/R	0.458	0 <<	2.0000000	N/R

Switches

Switch Data File Description

Field experience data on various switch types are presented in this section. Data from the switch nonoperating field experience detail data section have been sorted by switch classification, actuation style, quality level, application environment and component part number. The data records are grouped together when they have similar switch classifications and actuation styles. All switch data records have the following characteristic data fields:

- o Switch Classification: The family from which this switch belongs. Switch families included are sensitive, general, push button, rotary and toggle switches.
- o Actuation Style: Actuation style indicates the way in which a switch actuates. This will be either snap action, non-snap action or N/R in our data base.
- o Conf: Configuration: Alpha-numeric field indicating the contact configuration of the switch.
- o Pos: Positions: Number of positions the switch has.
- o Quality: Codes which indicate the level of quality control a device has been subjected to. Table S-1 shows the various switch quality levels.

TABLE S-1:
SWITCH QUALITY LEVELS

Quality Levels
Established Reliability (R)
MIL-SPEC
Lower

- Actual Temp: Average temperature which the switch is exposed to during periods of nonoperation. The actual temperature is given in degrees centigrade.

Switch Storage
Field Experience

Switch Classification	Actuation Style	Conf	Pos	Component Part Number	Quality	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
** BASIC SENSITIVE, N/R										
BASIC SENSITIVE	N/R	N/R	2	N/R	MIL-SPEC	N/R	N/R	0	0	0.370
BASIC SENSITIVE	N/R	N/R	2	N/R	MIL-SPEC	N/R	N/R	0	0	1.644
BASIC SENSITIVE	N/R	N/R	N/R	2910-00-405-6153	N/R	N/R	N/R	21	0	0.299
BASIC SENSITIVE	N/R	N/R	N/R	5930-00-430-3522	N/R	N/R	N/R	21	0	0.299
BASIC SENSITIVE	N/R	N/R	N/R	5930-00-430-3532	N/R	N/R	N/R	76	0	1.078
BASIC SENSITIVE	N/R	N/R	N/R	5930-01-039-3140	N/R	N/R	N/R	148	0	2.113
BASIC SENSITIVE	N/R	N/R	N/R	M1450351-282	N/R	N/R	N/R	21	0	0.299
BASIC SENSITIVE	N/R	N/R	N/R	M1450351-282	N/R	N/R	N/R	76	0	1.078
BASIC SENSITIVE	N/R	N/R	N/R	MI 450351-282	N/R	N/R	N/R	69	0	0.981
** GENERAL, N/R										
GENERAL	N/R	N/R	2	N/R	MIL-SPEC	N/R	GF	40	0	1.870
GENERAL	N/R	N/R	2	N/R	MIL-SPEC	N/R	GF	40	2	1.770
GENERAL	N/R	N/R	2	N/R	MIL-SPEC	20	GF	1748	0	25.520
GENERAL	N/R	N/R	2	N/R	MIL-SPEC	N/R	GF	23	0	0.540
GENERAL	N/R	N/R	2	N/R	MIL-SPEC	N/R	GF	2070	0	20.590
GENERAL	N/R	N/R	N/R	N/R	MIL-SPEC	18	GM	2142	1	34.029
GENERAL	N/R	N/R	2	N/R	MIL-SPEC	N/R	N/R	0	10	31.001
GENERAL	N/R	N/R	2	N/R	MIL-SPEC	N/R	N/R	2070	0	20.590
GENERAL	N/R	N/R	2	N/R	MIL-SPEC	N/R	N/R	0	0	0.111
GENERAL	N/R	N/R	2	N/R	MIL-SPEC	N/R	N/R	0	4	48.300
GENERAL	N/R	N/R	2	N/R	MIL-SPEC	N/R	N/R	0	0	0.066
GENERAL	N/R	N/R	N/R	N/R	MIL-SPEC	N/R	N/R	0	0	3.699
GENERAL	N/R	N/R	N/R	MS 24655	N/R	N/R	AIF	2510	6	64.876

Switch Storage
Field Experience

Switch Classification	Actuation Style	Conf	Pos	Component Part Number	Quality	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
GENERAL	N/R	N/R	N/R	MS 24656	N/R	N/R	AIF	1004	1	25.950
GENERAL	N/R	N/R	N/R	5930-01-021-2378	N/R	N/R	GM	21	0	0.299
GENERAL	N/R	N/R	N/R	2910-00-405-6153	N/R	N/R	N/R	76	0	1.078
GENERAL	N/R	N/R	N/R	2910-00-405-6153	N/R	N/R	N/R	16	0	0.232
GENERAL	N/R	N/R	N/R	2910-00-405-6153	N/R	N/R	N/R	69	0	0.981
GENERAL	N/R	N/R	N/R	5930-00-044-3518	N/R	N/R	N/R	16	0	0.232
GENERAL	N/R	N/R	N/R	5930-00-214-0431	N/R	N/R	N/R	16	0	0.232
GENERAL	N/R	N/R	N/R	5930-00-214-0431	N/R	N/R	N/R	21	0	0.299
GENERAL	N/R	N/R	N/R	5930-00-219-4350	N/R	N/R	N/R	69	0	0.981
GENERAL	N/R	N/R	N/R	5930-00-219-4350	N/R	N/R	N/R	16	0	0.232
GENERAL	N/R	N/R	N/R	5930-00-375-0139	N/R	N/R	N/R	16	0	0.232
GENERAL	N/R	N/R	N/R	5930-00-375-0139	N/R	N/R	N/R	69	0	0.981
GENERAL	N/R	N/R	N/R	5930-00-375-0139	N/R	N/R	N/R	76	0	1.078
GENERAL	N/R	N/R	N/R	5930-00-375-0139	N/R	N/R	N/R	21	0	0.299
GENERAL	N/R	N/R	N/R	5930-00-430-3532	N/R	N/R	N/R	16	0	0.232
GENERAL	N/R	N/R	N/R	5930-00-430-3532	N/R	N/R	N/R	69	0	0.981
GENERAL	N/R	N/R	N/R	5930-00-584-8344	N/R	N/R	N/R	21	0	0.299
GENERAL	N/R	N/R	N/R	5930-00-601-6342	N/R	N/R	N/R	16	0	0.232
GENERAL	N/R	N/R	N/R	5930-00-601-6342	N/R	N/R	N/R	69	0	0.981
GENERAL	N/R	N/R	N/R	5930-00-615-7880	N/R	N/R	N/R	16	0	0.232
GENERAL	N/R	N/R	N/R	5930-00-615-7880	N/R	N/R	N/R	69	0	0.981
GENERAL	N/R	N/R	N/R	5930-00-621-7133	N/R	N/R	N/R	76	2	1.078
GENERAL	N/R	N/R	N/R	5930-00-621-7133	N/R	N/R	N/R	69	0	0.981

Switch Storage
Field Experience

Switch Classification	Actuation Style	Conf	Pos	Component Part Number	Quality	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
GENERAL	N/R	N/R	N/R	5930-00-621-7133	N/R	N/R	N/R	21	0	0.299
GENERAL	N/R	N/R	N/R	5930-00-621-7133	N/R	N/R	N/R	16	0	0.232
GENERAL	N/R	N/R	N/R	5930-00-655-1514	N/R	N/R	N/R	32	0	0.463
GENERAL	N/R	N/R	N/R	5930-00-655-1522	N/R	N/R	N/R	16	0	0.232
GENERAL	N/R	N/R	N/R	5930-00-655-1575	N/R	N/R	N/R	16	0	0.232
GENERAL	N/R	N/R	N/R	5930-00-655-1575	N/R	N/R	N/R	69	0	0.981
GENERAL	N/R	N/R	N/R	5930-00-655-1581	N/R	N/R	N/R	32	0	0.463
GENERAL	N/R	N/R	N/R	5930-00-655-1582	N/R	N/R	N/R	16	0	0.232
GENERAL	N/R	N/R	N/R	5930-00-708-3588	N/R	N/R	N/R	76	0	1.078
GENERAL	N/R	N/R	N/R	5930-00-782-8590	N/R	N/R	N/R	16	0	0.232
GENERAL	N/R	N/R	N/R	5930-00-854-8344	N/R	N/R	N/R	76	0	1.078
GENERAL	N/R	N/R	N/R	5930-00-993-4654	N/R	N/R	N/R	69	0	0.981
GENERAL	N/R	N/R	N/R	5930-00-993-4654	N/R	N/R	N/R	76	0	1.078
GENERAL	N/R	N/R	N/R	5930-00-993-4654	N/R	N/R	N/R	21	0	0.299
GENERAL	N/R	N/R	N/R	5930-00-993-4654	N/R	N/R	N/R	16	0	0.232
GENERAL	N/R	N/R	N/R	5930-01-017-5940	N/R	N/R	N/R	69	0	0.981
GENERAL	N/R	N/R	N/R	5930-01-017-5940	N/R	N/R	N/R	21	0	0.299
GENERAL	N/R	N/R	N/R	5930-01-017-5940	N/R	N/R	N/R	76	0	1.078
GENERAL	N/R	N/R	N/R	5930-01-017-5940	N/R	N/R	N/R	16	0	0.232
GENERAL	N/R	N/R	N/R	5930-01-039-6721	N/R	N/R	N/R	148	1	2.113
GENERAL	N/R	N/R	N/R	5930-01-062-0690	N/R	220	N/R	148	0	2.113
GENERAL	N/R	N/R	N/R	5945-00-016-0798	N/R	N/R	N/R	21	0	0.299
GENERAL	N/R	N/R	N/R	5945-01-016-0797	N/R	N/R	N/R	21	0	0.299

Switch Storage
Field Experience

Switch Classification	Actuation Style	Conf	Pos	Component Part Number	Quality	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
GENERAL	N/R	N/R	N/R	5945-01-016-0797	N/R	N/R	N/R	76	0	1.078
GENERAL	N/R	N/R	N/R	5945-01-016-0797	N/R	N/R	N/R	76	0	1.078
GENERAL	N/R	N/R	N/R	8930-00-708-358	N/R	N/R	N/R	21	0	0.299
GENERAL	N/R	N/R	N/R	MI450351-282	N/R	N/R	N/R	16	0	0.232
** GENERAL, NON-SNAP ACTION										
GENERAL	NON-SNAP ACTION	N/R	2	N/R	MIL-SPEC	N/R	GF	874	0	12.760
GENERAL	NON-SNAP ACTION	N/R	2	N/R	MIL-SPEC	N/R	N/R	0	6	25.340
GENERAL	NON-SNAP ACTION	N/R	2	N/R	MIL-SPEC	N/R	N/R	0	9	137.100
GENERAL	NON-SNAP ACTION	SPST	2	N/R	MIL-SPEC	N/R	N/R	8280	9	82.360
** GENERAL, SNAP ACTION										
GENERAL	SNAP ACTION	N/R	N/R	N/R	MIL-SPEC	N/R	N/R	0	2	5.000
** PUSHBUTTON, SNAP ACTION										
PUSHBUTTON	SNAP ACTION	N/R	N/R	N/R	MIL-SPEC	18	GM	1071	1	17.015
PUSHBUTTON	SNAP ACTION	N/R	2	N/R	MIL-SPEC	N/R	N/R	0	0	0.603
** ROTARY, N/R										
ROTARY	N/R	N/R	N/R	5930-00-214-0431	N/R	N/R	N/R	69	0	0.981
ROTARY	N/R	6PDT	6	5930-01-046-6949	N/R	N/R	N/R	148	0	2.113
ROTARY	N/R	N/R	N/R	5930-01-055-9251	N/R	N/R	N/R	148	2	2.113
ROTARY	N/R	N/R	N/R	72-5322	N/R	N/R	N/R	148	0	2.113
** TOGGLE, N/R										
TOGGLE	N/R	N/R	N/R	5930-00-044-3518	N/R	N/R	N/R	69	0	0.981
TOGGLE	N/R	N/R	N/R	5930-00-044-3518	N/R	N/R	N/R	76	0	1.078
TOGGLE	N/R	N/R	N/R	5930-00-044-3518	N/R	N/R	N/R	21	0	0.299

Switch Storage
Field Experience

Switch Classification	Actuation Style	Conf	Pos	Component Part Number	Quality	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
TOGGLE	N/R	N/R	N/R	5930-00-214-0431	N/R	N/R	N/R	76	0	1.078
TOGGLE	N/R	N/R	N/R	5930-00-601-6342	N/R	N/R	N/R	76	0	1.078
TOGGLE	N/R	N/R	N/R	5930-00-601-6392	N/R	N/R	N/R	21	0	0.299
TOGGLE	N/R	N/R	N/R	5930-00-615-7880	N/R	N/R	N/R	76	0	1.078
TOGGLE	N/R	N/R	N/R	5930-00-615-7880	N/R	N/R	N/R	21	0	0.299
TOGGLE	N/R	N/R	N/R	5930-00-655-1514	N/R	N/R	N/R	138	0	1.963
TOGGLE	N/R	N/R	N/R	5930-00-655-1514	N/R	N/R	N/R	21	0	0.299
TOGGLE	N/R	SPST	2	5930-00-655-1514	N/R	N/R	N/R	148	0	2.113
TOGGLE	N/R	N/R	N/R	5930-00-655-1522	N/R	N/R	N/R	69	0	0.981
TOGGLE	N/R	N/R	N/R	5930-00-655-1522	N/R	N/R	N/R	76	0	1.078
TOGGLE	N/R	N/R	N/R	5930-00-655-1522	N/R	N/R	N/R	21	0	0.299
TOGGLE	N/R	N/R	N/R	5930-00-655-1544	N/R	N/R	N/R	76	0	1.078
TOGGLE	N/R	N/R	N/R	5930-00-655-1544	N/R	N/R	N/R	76	0	1.078
TOGGLE	N/R	N/R	N/R	5930-00-655-1581	N/R	N/R	N/R	138	0	1.963
TOGGLE	N/R	N/R	N/R	5930-00-655-1581	N/R	N/R	N/R	152	0	2.156
TOGGLE	N/R	N/R	N/R	5930-00-655-1581	N/R	N/R	N/R	42	0	0.597
TOGGLE	N/R	N/R	N/R	5930-00-655-1582	N/R	N/R	N/R	69	0	0.981
TOGGLE	N/R	N/R	N/R	5930-00-655-1582	N/R	N/R	N/R	76	0	1.078
TOGGLE	N/R	N/R	N/R	5930-00-655-1582	N/R	N/R	N/R	21	0	0.299
TOGGLE	N/R	N/R	N/R	5930-00-655-1584	N/R	N/R	N/R	21	0	0.299
TOGGLE	N/R	N/R	N/R	5930-00-782-8590	N/R	N/R	N/R	69	2	0.981
TOGGLE	N/R	N/R	N/R	5930-00-782-8590	N/R	N/R	N/R	76	0	1.078
TOGGLE	N/R	N/R	N/R	5930-00-782-8590	N/R	N/R	N/R	21	0	0.299

Switch Storage
Field Experience

Switch Classification	Actuation Style	Conf	Pos	Component Part Number	Quality	Actual Temp	App Env	Number Fielded	Number Failed	Part Hours
TOGGLE	N/R	N/R	N/R	5930-00-945-1592	N/R	N/R	N/R	21	0	0.299
TOGGLE	N/R	N/R	N/R	5930-00-945-1592	N/R	N/R	N/R	76	0	1.078
** TOGGLE, SNAP ACTION										
TOGGLE	SNAP ACTION	SPDT	3	N/R	MIL-SPEC	20	GF	874	0	12.760
TOGGLE	SNAP ACTION	N/R	N/R	N/R	MIL-SPEC	N/R	GM	240	0	5.256
TOGGLE	SNAP ACTION	N/R	N/R	N/R	MIL-SPEC	N/R	N/R	0	0	1.274
TOGGLE	SNAP ACTION	N/R	N/R	N/R	MIL-SPEC	N/R	N/R	0	0	0.056
TOGGLE	SNAP ACTION	N/R	N/R	N/R	MIL-SPEC	N/R	N/R	0	0	0.178
TOGGLE	SNAP ACTION	N/R	N/R	N/R	MIL-SPEC	N/R	N/R	0	0	0.167
TOGGLE	SNAP ACTION	N/R	N/R	N/R	MIL-SPEC	N/R	N/R	0	0	1.010
TOGGLE	SNAP ACTION	N/R	N/R	N/R	MIL-SPEC	N/R	N/R	0	4	38.688
TOGGLE	SNAP ACTION	N/R	N/R	N/R	MIL-SPEC	N/R	N/R	0	0	0.242
TOGGLE	SNAP ACTION	N/R	N/R	N/R	MIL-SPEC	N/R	N/R	0	0	0.370
TOGGLE	SNAP ACTION	N/R	N/R	N/R	MIL-SPEC	N/R	N/R	0	1	3.442
TOGGLE	SNAP ACTION	N/R	N/R	N/R	MIL-SPEC	N/R	N/R	0	6	37.200
TOGGLE	SNAP ACTION	N/R	N/R	N/R	MIL-SPEC	N/R	N/R	0	0	6.658
TOGGLE	SNAP ACTION	N/R	N/R	N/R	MIL-SPEC	N/R	N/R	0	0	3.095
TOGGLE	SNAP ACTION	N/R	2	N/R	MIL-SPEC	N/R	N/R	0	0	43.328

Switch Summary

The following table presents the results of the nonoperating switch data base merge. Data in this section were derived from the switch detail data section. A merged data record was computed for all records having identical switch classifications, application environments and quality levels. Part hours and failures were cumulated for switches meeting these criteria. Field and predicted failure rates were derived for each merged data record. When it was not possible to compute a predicted failure rate a N/R appears in the predicted failure rate column.

Switch Field
Data Summary
Table

Switch Classification	Quality Level	Application Environment	Number Fielded	Cumulative Part Hours	Number Failed	Field Failure Rate	Predicted Failure Rate
** BASIC SENSITIVE							
BASIC SENSITIVE	MIL-SPEC	N/R	N/R	2.014	0	<< 0.4548163	N/R
BASIC SENSITIVE	N/R	N/R	432	6.147	0	<< 0.1490158	N/R
** GENERAL							
GENERAL	MIL-SPEC	GF	4795	63.050	2	0.0317209	0.0870000
GENERAL	MIL-SPEC	GM	2142	34.029	1	0.0293867	0.3900000
GENERAL	MIL-SPEC	N/R	10350	353.567	40	0.1131327	N/R
GENERAL	N/R	AIF	3514	90.826	7	0.0770704	N/R
GENERAL	N/R	GM	21	0.299	0	<< 3.0635452	N/R
GENERAL	N/R	N/R	2179	31.067	3	0.0965655	N/R
** PUSHBUTTON							
PUSHBUTTON	MIL-SPEC	GM	1071	17.015	1	0.0587717	0.3900000
PUSHBUTTON	MIL-SPEC	N/R	N/R	0.603	0	<< 1.5190713	N/R
** ROTARY							
ROTARY	N/R	N/R	513	7.320	2	0.2732240	N/R
** TOGGLE							
TOGGLE	MIL-SPEC	GF	874	12.760	0	<< 0.0717868	0.0870000
TOGGLE	MIL-SPEC	GM	240	5.256	0	<< 0.1742770	0.3900000
TOGGLE	MIL-SPEC	N/R	N/R	135.708	11	0.0810564	N/R
TOGGLE	N/R	N/R	1843	26.187	2	0.0763738	N/R

Meters

Meter Data File Description

Field experience on a variety of meter types are predicted in this section. Data from the meter nonoperating field experience detail data section are sorted by part type, application environment and part number and are grouped according to the part type. The following describe the characteristic data fields for meters.

o Part Type:	Description of the type of meter. Data is presented for ammeters, Elapsed Time Indictors, voltmeters and wattmeters.

Meter Storage
Field Experience

Part Type	Component Part Number	Application Environment	Number Fielded	Part Hours	Qty Fail
** AMMETER					
AMMETER	6625-00-004-8060	GM	69	0.981	1
AMMETER	6625-00-004-8066	GM	76	1.078	2
AMMETER	6625-00-081-5840	GM	21	0.299	0
AMMETER	6625-00-869-3141	GM	69	0.981	2
AMMETER	6625-00-869-3141	GM	76	1.078	0
AMMETER	6625-00-869-3141	GM	21	0.299	0
AMMETER	6625-01-038-6829	GM	148	0.211	4
** ELAPSED TIME					
ELAPSED TIME	6645-00-089-8842	GM	21	0.299	0
ELAPSED TIME	6645-00-089-8842	GM	293	0.423	14
ELAPSED TIME	6645-00-089-8842	GM	76	1.078	0
ELAPSED TIME	6645-00-089-8842	GM	69	0.981	0
** N/R					
N/R	6625-00-003-0971	GM	76	1.078	0
N/R	6625-00-003-0972	GM	21	0.299	0
N/R	6625-00-003-0975	GM	16	0.232	0
N/R	6625-00-004-8066	GM	16	0.232	0
N/R	6625-00-869-3141	GM	16	1.078	0
N/R	6625-00-869-3144	GM	16	0.232	0
N/R	6625-00-869-3144	GM	76	1.078	0
N/R	6625-01-038-6869	GM	148	0.211	7
N/R	6625-01-046-5767	GM	148	0.211	0
N/R	6645-00-089-8842	GM	16	1.078	0

Meter Storage
Field Experience

Part Type	Component Part Number	Application Environment	Number Fielded	Part Hours	Qty Fail
** VOLTMETER					
VOLTMETER	6625-00-038-6826	GM	148	0.211	0
VOLTMETER	6625-00-321-6365	GM	148	0.211	4
VOLTMETER	6625-00-869-3144	GM	69	0.981	2
VOLTMETER	6625-00-869-3144	GM	21	0.299	0
** WATTMETER					
WATTMETER	6625-00-003-0975	GM	76	1.078	0
WATTMETER	6625-00-003-0975	GM	69	0.981	4
WATTMETER	6625-00-003-0975	GM	21	0.299	0

Meter Summary

The following table presents the results of the nonoperating meter data base data merge. Data in this section were derived from the meter detail data section. A merged data record was computed for all records having identical part types and classifications application environments. Part hours, number fielded and number of failure were cumulated for meters meeting these criteria. Field and predicted failure rates were derived for each merged data record.

Meter Field
Data Summary
Table

Meter Type	Application Environment	Number Fielded	Cumulative Part Hours	Number Failed	Field Failure Rate	Predicted Failure Rate
** AMMETER						
AMMETER	GM	480	4.927	9	1.8266694	1.4000000
** ELAPSED TIME						
ELAPSED TIME	GM	459	2.781	14	5.0341604	1.4000000
** N/R						
N/R	GM	549	5.729	7	1.2218537	1.4000000
** VOLTMETER						
VOLTMETER	GM	386	1.702	6	3.5252644	1.4000000
** WATTMETER						
WATTMETER	GM	166	2.358	4	1.6963528	1.4000000

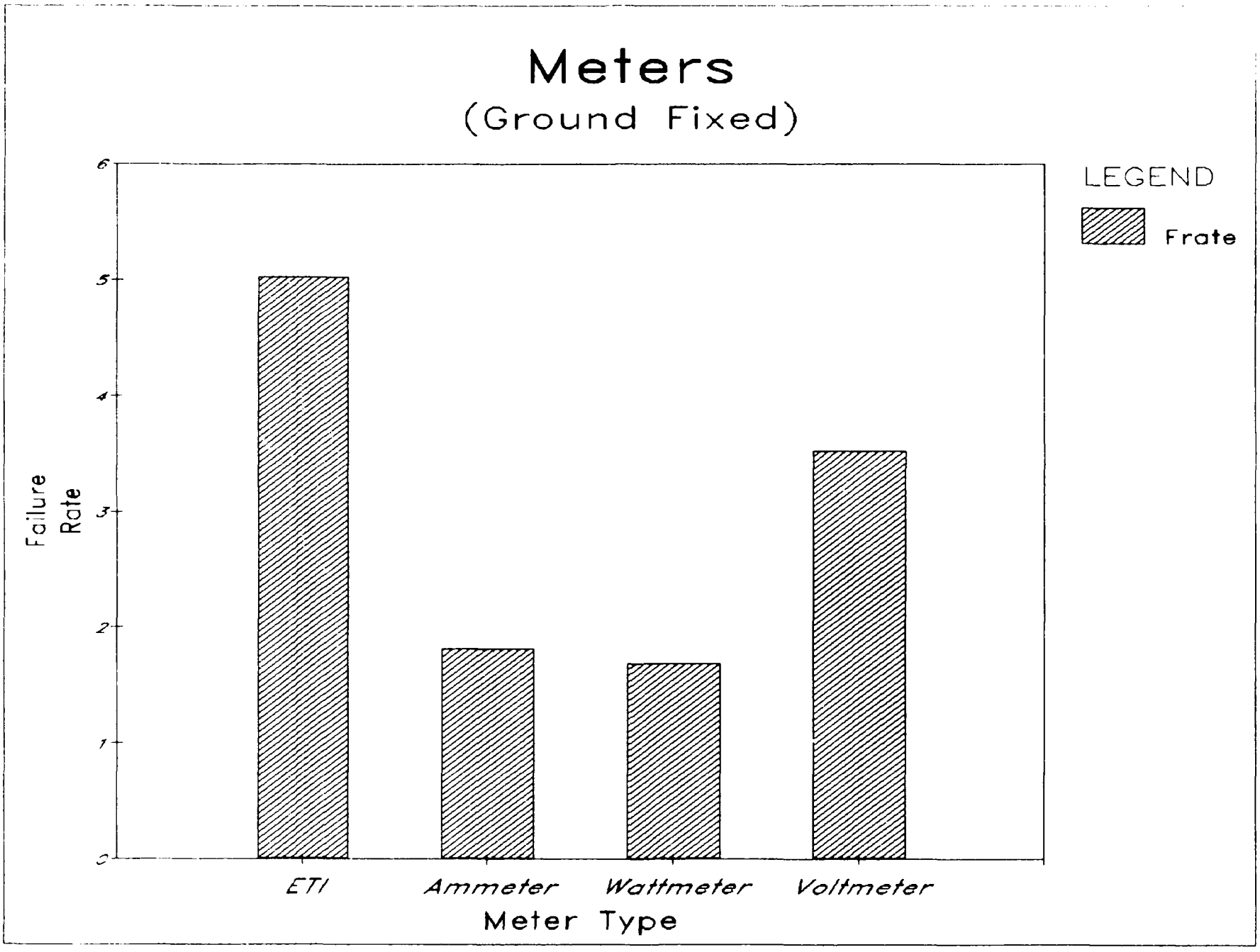

FIGURE MET-1: METER FAILURE RATE VS. METER TYPE

Connectors

Connector Data File Description

Field experience data on various connectors are outlined in this section. Data from the connector nonoperating field experience detail data section have been sorted by application environment and part number and are grouped by application environment.

Connector Storage
Field Experience

Part Number	Application Environment	Number Fielded	Part Hours	Number Failed
** AIF				
220GB-0515	AIF	6024	155.700	0
2DB-52P	AIF	502	12.975	0
2DBF-52P	AIF	502	12.975	0
4-174058-01	AIF	502	12.975	0
7009-5507-001	AIF	502	12.975	0
7009-5527-001	AIF	502	12.975	0
7025-9826-001	AIF	8534	220.580	0
7026-9824-001	AIF	12048	311.400	0
DCMM27W2P	AIF	502	12.975	0
DCMMF-27W2S	AIF	502	12.975	0
DEMM-5WIS	AIF	502	12.975	0
M83723/15N	AIF	502	12.975	0
M83723/73R	AIF	1004	25.950	0
M83733106RB101	AIF	502	12.975	0
MS2430814-306	AIF	502	12.975	0
MS274G8T23F355	AIF	502	12.975	0
MS55302	AIF	4016	103.800	0
MS90335-1	AIF	502	12.975	1
** GM				
10250226-3	GM	21	0.299	0
10250226-3	GM	76	1.078	0
13222E9727	GM	21	0.299	0
13222E9727	GM	76	1.078	0

Connector Storage
Field Experience

Part Number	Application Environment	Number Fielded	Part Hours	Number Failed
5035-00-024-1050	GM	21	0.299	0
5035-00-024-1050	GM	76	1.078	0
5835-00-367-7625	GM	76	1.078	0
5935-00-007-2179	GM	42	0.597	0
5935-00-007-2179	GM	76	1.078	0
5935-00-007-2179	GM	76	1.078	0
5935-00-007-2179	GM	69	0.981	0
5935-00-007-2179	GM	16	0.232	0
5935-00-024-1038	GM	16	0.232	0
5935-00-024-1038	GM	69	0.981	0
5935-00-024-1050	GM	16	0.232	0
5935-00-024-1050	GM	69	0.981	0
5935-00-115-2307	GM	63	0.896	0
5935-00-167-7775	GM	42	0.597	0
5935-00-295-640	GM	21	0.299	0
5935-00-295-6403	GM	76	1.078	0
5935-00-295-6403	GM	16	0.232	0
5935-00-295-6403	GM	69	0.981	0
5935-00-367-725	GM	21	0.299	0
5935-00-367-7625	GM	16	0.232	0
5935-00-367-7625	GM	69	0.981	0
5935-00-546-135	GM	21	0.299	0
5935-00-546-1355	GM	76	1.078	0

Connector Storage
Field Experience

Part Number	Application Environment	Number Fielded	Part Hours	Number Failed
5935-00-557-2054	GM	21	0.299	0
5935-00-564-1355	GM	16	0.232	0
5935-00-564-1355	GM	69	0.981	0
5935-00-564-1355	GM	142	2.113	0
5935-00-601-6372	GM	69	0.981	0
5935-00-601-6375	GM	16	0.232	0
5935-00-608-1876	GM	42	0.597	0
5935-00-608-1876	GM	16	0.232	0
5935-00-608-1876	GM	76	1.078	0
5935-00-608-1876	GM	16	0.232	0
5935-00-608-1876	GM	76	1.078	0
5935-00-608-1876	GM	69	0.981	0
5935-00-608-1876	GM	69	0.981	0
5935-00-702-4199	GM	128	1.852	0
5935-00-721-049	GM	42	0.597	0
5935-00-721-0496	GM	16	0.232	0
5935-00-755-2892	GM	69	0.981	0
5935-00-755-2892	GM	16	0.232	0
5935-00-800-282	GM	42	0.597	0
5935-00-800-2824	GM	16	0.232	0
5935-00-806-3564	GM	21	0.299	0
5935-00-806-4588	GM	16	0.232	0
5935-00-806-4588	GM	69	0.981	0

Connector Storage
Field Experience

Part Number	Application Environment	Number Fielded	Part Hours	Number Failed
5935-00-813-472	GM	21	0.299	0
5935-00-813-4722	GM	16	0.232	0
5935-00-827-9045	GM	21	0.299	0
5935-00-827-9045	GM	16	0.232	0
5935-00-839-9681	GM	69	0.981	0
5935-00-839-9681	GM	16	0.232	0
5935-00-938-7841	GM	69	0.981	0
5935-00-938-7841	GM	16	0.232	0
5935-01-015-209	GM	21	0.299	0
5935-01-015-2098	GM	69	0.981	0
5935-01-015-2098	GM	76	1.078	0
5935-01-015-2098	GM	16	0.232	0
5935-01-049-3181	GM	492	8.453	0
MS25251-12	GM	64	0.926	0
MS25251-12	GM	276	3.925	0
MS27144-1	GM	138	1.963	0
MS27144-1	GM	32	0.463	0
MS27144-1	GM	380	5.389	0
MS3100RXX-XX	GM	1184	16.907	0
MS3101RXX-XX	GM	228	3.234	0
MS3101RXX-XX	GM	63	0.896	0
MS3102RXX-XX	GM	2128	30.180	0
MS3102RXX-XX	GM	588	8.360	0

Connector Storage
Field Experience

Part Number	Application Environment	Number Fielded	Part Hours	Number Failed
MS3102RXX-XX	GM	448	6.483	0
MS3102RXX-XX	GM	1725	24.532	0
MS3106RXX-XX	GM	987	14.033	0
MS3106RXX-XX	GM	1480	21.134	0
MS3106RXX-XX	GM	592	8.566	0
MS3106RXX-XX	GM	2888	40.959	0
MS3106RXX-XX	GM	2208	31.401	0
MS3108RXX-XX	GM	32	0.463	0
MS3108RXX-XX	GM	138	1.963	0
MS3108RXX-XX	GM	152	2.100	0
MS3108RXX-XX	GM	148	2.113	0
MS75058-1	GM	148	2.113	0
N/R	GM	127449	2024.700	0
N/R	GM	23598	344.541	1

Connector Summary

The following table presents the results of the nonoperating connector data base data merge. Data in this section were derived from the connector detail data section. A merged data record was computed for all records having identical application environments. Part hours, number fielded and number failed were cumulated for connectors meeting these criteria. Field and predicted failure rates were derived for each merged data record.

Connector Field
Data Summary
Table

Application Environment	Number Fielded	Cumulative Part Hours	Number Failed	Field Failure Rate	Predicted Failure Rate
** CONNECTOR, AIF					
AIF	38152	986.105	1	0.0010141	0.0048400
** CONNECTOR, GM					
GM	170430	2646.700	1	0.0003778	0.0036520

Miscellaneous

Miscellaneous Component Data File Descriptions

Field experience on numerous miscellaneous part types are reported in this data section. Data from this section have been collected from numerous data sources. These data points may consist of many merged detail data records but unfortunately many of them can not be traced back to their original source. The data points have been assembled here to present as much information on component nonoperating reliability as possible. Several of these data points are from the Reliability Analysis Center's nonelectronic parts reliability data base and have previously been published in NPRD-3, "Nonelectronic Parts Reliability Data". The data presented in this table are sorted by component classification, and component description and have been grouped by component classification. Because of the nature of several of these component types, an MTBF was derived and is presented in the data tables. The following characteristic data fields make up each data record:

- o Component Classification: General family for which this component belongs.
- o Component Description: Field used to further describe the component.
- o MTBF: Mean-Time-Between-Failure. The MTBF was computed by dividing the total hours and failures. In the case of zero failure items .916 failures is assumed (see Section 1 for explanation). MTBF is presented in these tables because many of the part types may be considered small systems.

Miscellaneous Component
Data Summary
Table

Component Classification	Component Description	Field Failure Rate	Cumulative Part Hours	Number Failed	MTBF
** ACCELEROMETER					
ACCELEROMETER	ANGULAR	<< 0.1767657	5.182	0	5657206
ACCELEROMETER	GENERAL	0.4191471	329.240	138	2385797
ACCELEROMETER	LINEAR	<< 0.3241331	2.826	0	3085152
ACCELEROMETER	PENDULUM	1.9233852	6.239	12	519917
** ACCUMULATOR					
ACCUMULATOR	HYDRAULIC	0.2056321	179.933	37	4863054
** ACTUATOR					
ACTUATOR	EXPLOSIVE	0.0627716	207.100	13	15930771
ACTUATOR	LINEAR	0.3544069	36.681	13	2821615
ACTUATOR	LINEAR, PNEUMATIC	0.2461084	32.506	8	4063250
** BATTERY					
BATTERY	GENERAL	0.0049377	405.049	2	202523442
BATTERY	LITHIUM	< 12.2750000	N/R	0	81466
BATTERY	MERCURY	1.4984079	5.339	8	667375
BATTERY	RECHARGEABLE	0.0163808	732.564	12	61047080
** BEARING					
BEARING	BALL	0.0099663	903.040	9	100338140
** BELLOWS					
BELLOWS	DIAPHRAGM BURST	<< 1.3836858	0.662	0	722707
BELLOWS	EXPLOSIVE	< 0.0139634	65.600	0	71615796
BELLOWS	GENERAL	< 0.0677515	13.520	0	14759821

Miscellaneous Component
Data Summary
Table

Component Classification	Component Description	Field Failure Rate	Cumulative Part Hours	Number Failed	MTBF
** CAPACITOR					
CAPACITOR	VARIABLE	0.0202143	49.470	1	49469930
** CIRCUIT BOARD					
CIRCUIT BOARD	PLATED THROUGH HOLES	< 0.0001119	8183.538	0	8936550492
CIRCUIT BOARD	SINGLE SIDED	0.8264463	1.210	1	1210000
** CIRCUIT BREAKERS					
CIRCUIT BREAKERS	GENERAL	< 0.2900000	N/R	0	3448276
CIRCUIT BREAKERS	THERMAL	0.0558316	17.911	1	17911000
** COMPRESSOR					
COMPRESSOR	GENERAL	<< 3.7540984	0.244	0	266376
** CONNECTIONS					
CONNECTIONS	SOLDER, GENERAL	< 0.0001501	6101.826	0	6662225183
CONNECTIONS	SOLDER, HAND LAP	0.0001901	52594.180	10	5260389269
** CONNECTOR PINS					
CONNECTOR PINS	GENERAL	< 0.0003273	2798.310	0	3055300947
** CONNECTORS					
CONNECTORS	CYLINDRICAL	< 0.0132269	69.253	0	75603505
CONNECTORS	GENERAL	<< 3.5095785	0.261	0	284935
CONNECTORS	PIN	< 0.0003273	2798.310	0	3055300947
CONNECTORS	PRINTED WIRING BOARD	<< 0.0647808	14.140	0	15436673
** DUMMY LOADS					
DUMMY LOADS	N/R	< 0.0110000	N/R	0	90909091

Miscellaneous Component
Data Summary
Table

Component Classification	Component Description	Field Failure Rate	Cumulative Part Hours	Number Failed	MTBF
** ELECTRIC MOTORS					
ELECTRIC MOTORS	AC	< 0.0450000	N/R	0	22222222
ELECTRIC MOTORS	DC	< 0.0450000	N/R	0	22222222
ELECTRIC MOTORS	FULL H.P.	0.4990020	2.004	1	2004000
ELECTRIC MOTORS	SENSOR	0.5452563	18.340	10	1834000
ELECTRIC MOTORS	SOLENOID	<< 2.3792208	0.385	0	420306
ELECTRIC MOTORS	TORQUE	<< 0.2202982	4.158	0	4539302
** ENGINE					
ENGINE	DIESEL	0.8983573	7.792	7	1113143
** FAN					
FAN	AXIAL	<< 0.1355030	6.760	0	7379910
FAN	CENTRIFUGAL	<< 1.6745887	0.547	0	597162
FAN	GENERAL	<< 0.4163636	2.200	0	2401747
** FIBER OPTIC CABLES					
FIBER OPTIC CABLES	SINGLE (PER FIBER KM)	< 0.0140000	N/R	0	71428571
** FILTER					
FILTER	FLUID	<< 0.0341028	26.860	0	29323105
** FITTINGS, HYDRAULIC					
FITTINGS, HYDRAULIC	QUICK DISCONNECT	0.4611483	8.674	4	2168500
** FUSES					
FUSES	GENERAL	< 0.0014000	N/R	0	714285714

Miscellaneous Component
Data Summary
Table

Component Classification	Component Description	Field Failure Rate	Cumulative Part Hours	Number Failed	MTBF
** GASKETS					
GASKETS	GENERAL	< 0.0112919	81.120	0	88559056
** GENERATOR					
GENERATOR	AC	1.2234457	8.991	11	817364
GENERATOR	GENERAL	<< 1.0663562	0.859	0	937773
GENERATOR	HOT GAS	<< 0.7809037	1.173	0	1280568
GENERATOR	TURBINE	38.4615385	0.078	3	26000
** GYROSCOPE					
GYROSCOPE	GENERAL	0.2471042	518.000	128	4046876
GYROSCOPE	RATE INTEGRATING	0.4086111	178.654	73	2447315
** HEATER					
HEATER	ELECTRIC, GENERAL	<< 0.2681499	3.416	0	3729257
** HOSE					
HOSE	HYDRAULIC	<< 2.7757576	0.330	0	360262
HOSE	HYDRAULIC, FLEXIBLE	1.7460713	4.009	7	572714
** IGNITERS					
IGNITERS	ELECTRIC	0.0193611	516.500	10	51649958
IGNITERS	EXPLOSIVE BOLTS	<< 0.0561963	16.300	0	17794766
IGNITERS	EXPLOSIVE MOTOR	<< 0.0383264	23.900	0	26091676
IGNITERS	EXPLOSIVE SWITCH	0.0048193	415.000	2	207499014
IGNITERS	EXPLOSIVE, GENERAL	<< 0.3259786	2.810	0	3067686
IGNITERS	GAS GENERATOR	<< 0.0275133	33.293	0	36346058

Miscellaneous Component
Data Summary
Table

Component Classification	Component Description	Field Failure Rate	Cumulative Part Hours	Number Failed	MTBF
IGNITERS	PYROGEN	<< 0.0366444	24.997	0	27289299
IGNITERS	PYROTEC	0.3035362	13.178	4	3294500
IGNITERS	ROCKET, JET MOTOR	0.1034501	38.666	4	9666496
IGNITERS	SOLID PROPELLENT	<< 0.5344224	1.714	0	1871179
IGNITERS	SQUIB EXPLOSIVE	<< 0.5328679	1.719	0	1876638
** LAMPS					
LAMPS	INCANDESCENT	< 0.1100000	N/R	0	9090909
LAMPS	NEON	< 0.0290000	N/R	0	34482759
** MAGNETIC CORES					
MAGNETIC CORES	N/R	< 0.000025	35799.142	0	
** MANIFOLD					
MANIFOLD	GENERAL	0.6129329	3.263	2	1631500
** MECHANICAL DEVICE					
MECHANICAL DEVICE	POWER TRANSMITTER	0.1119946	8.929	1	8929002
MECHANICAL DEVICE	SPRING	<< 5.5515152	0.165	0	180131
** MEMORY DISK					
MEMORY DISK	N/R	0.1480000	6.760	1	6756757
** METERS					
METERS	ELAPSED TIME	< 1.2000000	N/R	0	833333
METERS	GENERAL	< 1.4000000	N/R	0	714286
** MICROWAVE ELEMENTS					
MICROWAVE ELEMENTS	ATTENUATORS AND FIXED	< 0.0000001	N/R	0	.100 E+14

Miscellaneous Component
Data Summary
Table

Component Classification	Component Description	Field Failure Rate	Cumulative Part Hours	Number Failed	MTBF
MICROWAVE ELEMENTS	VARIABLE	< 0.0140000	N/R	0	71428571
** MICROWAVE FERRITE DEVICE					
MICROWAVE FERRITE DEVICE	N/R	< 0.0430000	N/R	0	23255814
** MOTOR GENERATOR SET					
MOTOR GENERATOR SET	DIESEL	9.5435685	2.410	23	104783
MOTOR GENERATOR SET	GASOLINE	2.7027027	0.740	2	370000
MOTOR GENERATOR SET	GENERAL	56.1122244	0.499	28	17821
** PUMP					
PUMP	CENTRIFUGAL	0.2000000	160.000	32	5000000
PUMP	FIXED DISPLACEMENT	0.2500000	540.000	135	4000000
PUMP	FUEL	<< 0.0378356	24.210	0	26430135
PUMP	HYDRAULIC	0.1266384	142.137	18	7896499
PUMP	PISTON	0.5814815	270.000	157	1719745
PUMP	VANE	0.2761905	210.000	58	3620689
PUMP	VARIABLE DISPLACEMENT	0.2000000	100.000	20	5000000
** QUARTZ CRYSTALS					
QUARTZ CRYSTALS	GENERAL	< 0.0390000	N/R	0	25641026
** REGULATOR					
REGULATOR	PRESSURE	<< 0.9060336	1.011	0	1103712
REGULATOR	TEMPERATURE	<< 0.1820000	5.024	0	6756756
** RELAY					
RELAY	CRYSTAL CAN	<< 0.0210725	43.469	0	47455214

Miscellaneous Component
Data Summary
Table

Component Classification	Component Description	Field Failure Rate	Cumulative Part Hours	Number Failed	MTBF
RELAY	GENERAL	0.0238183	797.705	19	41984525
RELAY	LATCHING	0.0810833	12.333	1	12332996
RELAY	THERMAL	<< 2.0000000	0.458	0	500000
** SAFE AND ARM DEVICE					
SAFE AND ARM DEVICE	N/R	0.4818890	74.706	36	2075167
** SEALS					
SEALS	GENERAL	<< 0.0225838	40.560	0	44279528
SEALS	O-RING	<< 0.0782973	11.699	0	12771832
SEALS	PACKING	< 0.0015756	581.360	0	634678853
SEALS	STATIC SEAL	< 0.0091600	100.000	0	109170306
** SENSORS					
SENSORS	GENERAL	0.5452563	18.340	10	1834000
** SLIP RING ASSEMBLY					
SLIP RING ASSEMBLY	GENERAL	<< 0.1101491	8.316	0	9078603
** SOLENOID					
SOLENOID	GENERAL	<< 0.2996402	3.057	0	3337336
** SPARK GAP					
SPARK GAP	SURGE PROTECTION	0.0117938	84.790	1	84790314
** SWITCH					
SWITCH	GENERAL	0.4205130	249.695	105	2378048
SWITCH	INERTIAL	0.0656455	137.100	9	15233337
SWITCH	PRESSURE	0.0828157	48.300	4	12075005

Miscellaneous Component
Data Summary
Table

Component Classification	Component Description	Field Failure Rate	Cumulative Part Hours	Number Failed	MTBF
SWITCH	PUSH BUTTON	<< 1.5190713	0.603	0	658297
SWITCH	REED	<< 0.9502075	0.964	0	1052402
SWITCH	SENSITIVE	<< 0.4094770	2.237	0	2442140
SWITCH	STEPPING	0.4000000	5.000	2	2500000
SWITCH	THERMOSTAT	<< 0.1701970	5.382	0	5875544
SWITCH	TOGGLE	<< 0.9069307	1.010	0	1102620
** SYNCHROS					
SYNCHROS	RESOLVER	0.1346076	14.858	2	7429001
** TANK					
TANK	STORAGE	0.2374733	4.211	1	4211000
** TERMINATIONS					
TERMINATIONS	FILM LOADS	< 0.0100000	N/R	0	100000000
** TRANSDUCERS					
TRANSDUCERS	PRESSURE	1.9980020	2.002	4	500500
** TURBINE					
TURBINE	GAS	37.9746835	0.079	3	26333
TURBINE	GENERAL	<< 0.2489130	3.680	0	4017468
** VALVE, HYDRAULIC					
VALVE, HYDRAULIC	BALL	<< 0.1871680	4.894	0	5342794
VALVE, HYDRAULIC	CHECK	0.0572541	52.398	3	17465998
VALVE, HYDRAULIC	FUEL	<< 0.1268698	7.220	0	7882096
VALVE, HYDRAULIC	GENERAL	0.0017484	571.949	1	571951499

Miscellaneous Component
Data Summary
Table

Component Classification	Component Description	Field Failure Rate	Cumulative Part Hours	Number Failed	MTBF
VALVE, HYDRAULIC	RELIEF	0.3145643	3.179	1	3179000
VALVE, HYDRAULIC	SERVO	0.1826713	87.589	16	5474314
VALVE, HYDRAULIC	SOLENOID	0.0086701	807.376	7	115338923
** VALVE, PNEUMATIC					
VALVE, PNEUMATIC	CHECK	<< 0.1106280	8.280	0	9039303
VALVE, PNEUMATIC	PNEUMATIC ACTIVATED	0.0189007	52.908	1	52908093
VALVE, PNEUMATIC	RELIEF	<< 1.3836858	0.662	0	722707
** VIBRATORS					
VIBRATORS	N/R	< 3.3000000	N/R	0	303030

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Appendix A:
Periodic Test Model Derivation

Derivation of the periodic test model is described in the following paragraphs.

Initially the electrical equipment/system is thoroughly checked-out as part of the equipment acquisition process and is assumed to have a reliability of 1.0 when storage is initiated (i.e., at time zero). As time progresses, the electronic components begin to degrade and the predicted reliability falls. Before the first test occurs, the reliability is given by the following equation (assuming an exponential time-to-failure distribution).

$$R(t) = \exp(-\lambda t);\ t<T_T$$

where

$R(t)$ = nonoperating reliability
t = time
λ = nonoperating failure rate
T_T = test interval

For the purposes of model development, the periodic test process is assumed to be performed instantaneously at T_T. Just prior to the test the reliability is given by the following equation where T_T^* represents a point in time just prior to T_T.

$$R(T_T^*) = \exp(-\lambda T_T)$$

The expected number of failures identified in the testing process is $\alpha\lambda T_T$. Therefore the remaining number of undetected failures is $(1-\alpha)\lambda T_T$ and the reliability just after the test is given by,

$$R(T_T) = \exp(-(1-\alpha)\lambda T_T)$$

This post-test reliability is somewhat less than the initial reliability depending largely on α, the test effectiveness. It should be noted that the above equation indicates that if a test is 100% effective ($\alpha = 1$), the reliability returns to unity. Similarly, if the test process is 0% effective, the reliability would be the same as if no testing occurred (In practice, the reliability will be even less due to some degradation introduced by the test). Actual test effectiveness data tends to vary between 50 and 90%.

After the first test, the degradation process begins again. The time from the first test (designated t' where $t' = t - NT_T$) impacts the reliability as follows:

$$\begin{aligned} R(t) &= R(t' + T_T),\ T_T < t < 2T_T \\ &= R(t')R(T_T) \\ &= \exp(-\lambda t')\exp(-(1-\alpha)\lambda T_T) \\ &= \exp(-\lambda(t-T_T))\exp(-(1-\alpha)\lambda T_T) \end{aligned}$$

The effect of the second test creates an interesting problem. If the test failure detection process is strictly probabilistic in nature, then the second test will detect 100 $(1-\alpha)$ percent of the failures which have occurred since the original test plus a similar percentage of failures which were missed in the first test sequence. The expected number of failures before (i.e., F_b) and after (i.e., F_a) the second test for the probabilistic failure detection scenario is given by,

$$\begin{aligned} F_{b1}(N=2) &= \lambda T_T + (1-\alpha)\lambda T_T \\ F_{a1}(N=2) &= (1-\alpha)[\lambda T_T + (1-\alpha)\lambda T_T] \\ &= [(1-\alpha) + (1-\alpha)^2]\lambda T_T \end{aligned}$$

In the general case (i.e., N tests), the expected number of failures before and after the periodic test is given by the following equations for the probabilistic failure detection scenario,

$$F_{b1}(N) = \lambda T_T + \left[\sum_{i=1}^{N-1} (1-\alpha)^{N-1}\right] \lambda T_T$$

$$F_{a1}(N) = \left[\sum_{i=1}^{N} (1-\alpha)^{N}\right] \lambda T_T$$

On the other hand, it is necessary to recognize the reasons which are responsible for the first test to not detect the failed items. It is highly likely that once failed devices are missed by a test, a significant number of these items will remain undetected during subsequent testing. Generally the first test (or any subsequent test) will miss detection of a failed item because,

- o the part fails in a manner which is not apparent at the system level
- o inability of the testing process to properly simulate actual operating conditions
- o inability of the test hardware to detect 100% of all malfunctions
- o test operator error

For the first three of these items, it is doubtful that the second test sequence will be any more effective than the first in detecting the failed components. This contradicts with the probabilistic argument which indicates that 100 $(1-\alpha)$% of the failures missed in the first test sequence will be detected in the second. For this second case, where failures missed in the first test remained undetected, the number of expected failures before and after application of the second test is given by,

$$F_{b2}(N=2) = \lambda T_T + (1-\alpha)\lambda T_T$$

$$F_{a2}(N=2) = (1-\alpha)\lambda T_T + (1-\alpha)\lambda T_T$$

$$= 2(1-\alpha)\lambda T_T$$

In the general case (i.e., N test), the expected number of failures before and after application of the test given the hidden failure scenario is,

$$F_{b2}(N) = \lambda T_T + (N-1)(1-\alpha)\lambda T_T$$
$$F_{a2}(N) = N(1-\alpha)\lambda T_T$$

In practice actual test fall-out would likely be somewhere between the two cases previously described. However, the second scenario more closely resembles actual conditions. Additionally, the second scenario is a "worst-case" assumption and was adopted for this model development process.

Given the assumptions previously stated, the reliability of an item in storage with periodic test at any test number is,

$$R(N) = \exp(-N(1-\alpha)\lambda T_T)$$

Expansion of this equation to include periods in between tests is accomplished by considering the incremental time accrued since the last test. Reliability degradation since the last test is given by $R(t')$. Therefore the most general reliability equation is given by,

$$\begin{aligned} R(N,t) &= R(t')R(N) \\ &= \exp(-\lambda t')\exp(-N(1-\alpha)\lambda T_T) \\ &= \exp(-\lambda(t-NT_T))\exp(-N(1-\alpha)\lambda T_T) \end{aligned}$$

Appendix B:

Additional RAC Services

ADDITIONAL RAC SERVICES

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March 1987

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