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Final Report

ACCELERATED TESTING OF HIGH RELIABILITY PARTS

T. Walsh
G. Bast

General Electric Company

TECHNICAL REPORT NO. RADC-TR- 67-71
June 1967

Rome Air Development Center
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ACCELERATED TESTING OF HIGH RELIABILITY PARTS

T. Walsh
G. Best

General Electric Company

SECTION 1

INTRODUCTION

This report is the final Technical Documentary Report of Contract AF30(602)-3968, Task 551902 and Project No. 5519.

The purpose of the program was to develop accelerated testing techniques for high reliability parts and to define long-term degradation mechanisms for these parts. The parts which were tested during the program are shown in Table 1-1 with the internal GE high reliability designation, the closest commercial designation, and the manufacturer.

Table 1-1. Description of Parts Tested

R NUMBER	DESCRIPTION	CLOSEST COMMERCIAL DESIGNATION
Resistors		
R2013	Ni Cr Metal Film, 1/8 Watt	XLT, IRC
R2048	Tin Oxide Film, 1/8 Watt	NF60, Corning
Capacitors		
R2045	Fixed Glass Dielectric	CYFR, Corning
Diodes		
R2008 P5, P10	Silicon, Regulator	IN751A, 752A, CDC
R2010 P1	Silicon, VHF	IN251, CDC
R2011 P1	Silicon, Computer	IN482A, CDC
Transistors		
R2004 P1	NPN, Silicon, 3 Watt	2N1613 FSC
R2005 P1	PNP, Silicon, 2 Watt	2N1132 FSC
R2026 P1	NPN, Silicon, 2 Watt	2N708 FSC
R2050 P1	NPN, Silicon, 4 Watt	2N657 FSC
R4041 P1	PNP, Silicon, 1 Watt	2N695 FSC

The parts under study were originally purchased for a reliability evaluation program during Project Advent (Contract AF04(647)-476). The reliability test and evaluation portion of the

project was initiated in 1960 to determine and specify procurement methods, screening techniques, and test and evaluation programs which would provide assurance that the hardware for the flyable satellites would meet the program objective of a 3-year life in a nonmaintainable space environment. Accelerated step-stress and constant stress tests were performed on electronic parts during the program to provide data and information which would lead to the formulation of design-life data, and screening tests. The test program continued until September, 1963 at which time the parts on life tests had accumulated 6000 to 10,000 hours each at various applied stresses and environmental conditions. The parts were then placed at storage conditions of 25° Celsius and zero power for ten months and were reactivated to the same prior test conditions for a 1 year period in June, 1964 as a requirement of contract AF 30(602)-3415. The step-stress tests which were completed during the Advent Program provided data which was analyzed during the initial period of the contract. The combination of the results of the step-stress tests and the constant stress tests formed the basis for the determination of the measurement techniques for controllable accelerated testing technique recommended as a result of the contract. The parts continued on Life Test during the period of June 65 to Dec 65 - the starting date for this one year contract (AF 30(602)-3968). The constant stress tests have accumulated 25,000 to 30,000 hours of test time and the step-stress tests were completed during the previous contracts. The tests were continued for a one year period to provide greater confidence in the test technique and to provide for further analysis of degradation trends.

The definition and establishment of accelerated testing methods and techniques for electronic parts must be based upon the actual failure mechanisms which exist in the part. Consequently this program consists of two distinct yet interrelated investigations. The first being the accelerated test program above and the second is the definition of the physical degradation mechanisms which the parts exhibit during the tests. Laboratory investigations were conducted on untested and on failed parts during the course of the program to identify the part failure mechanisms. In addition, a separate physics of failure investigation was instituted during this contract on inorganic dielectric capacitors.

The presentation of the accelerated testing concept, approach, and results are shown in Section 2. The results of the studies of the capacitor failure mechanisms are shown in Section 3 and the Summary and Conclusions are presented in Section 4. Appendix A provides a general description of the test and analysis activity. Volume II of this report contains the data from the constant stress tests together with charts of parameter trends.

NOTE

Unless otherwise indicated, C is an abbreviation for Celsius and not Centigrade.

SECTION 2

DESCRIPTION OF DATA FORMATS

The data in Section 3 contains information on the constant stress long life tests performed on resistors, capacitors, transistors, and diodes. Each page includes a graphic presentation of the average trend of the parts test data and a listing of any failures which occurred during test.

All charts reflect the accumulated test hours with the maximum, average, and minimum readings taken at each test time for the various parameters measured. Stress conditions, measurement conditions, and the parameters measured are noted on each figure. In addition to the accumulated test time, the time at which the parts were placed at storage conditions of 25 Celsius and zero power for ten months is shown.

The part type under test is shown at the bottom of each page.

All failures occurring during the test of each part type are indicated by the time of failure and frequency.

Additional information is available from the computer printout as follows:

a. Readings for each part at each test period by serial numbers.

b. Readings in ascending order of value (minimum to maximum) with serial numbers.

c. The change in reading between time periods for each serial number.

d. The change (percent) in reading from initial value.

e. The hours at which the change (percent) from initial value reaches the percentages indicated in the computer printout.

f. The natural logarithm of individual readings at each time period for each serial number.

Items a, c, d and f include a summary for each time period which gives the average value, standard deviation, minimum value, and maximum value. Items b, i and j were not included in previous computer printouts and have replaced the:

a. Sums of deltas for each part at each time period.

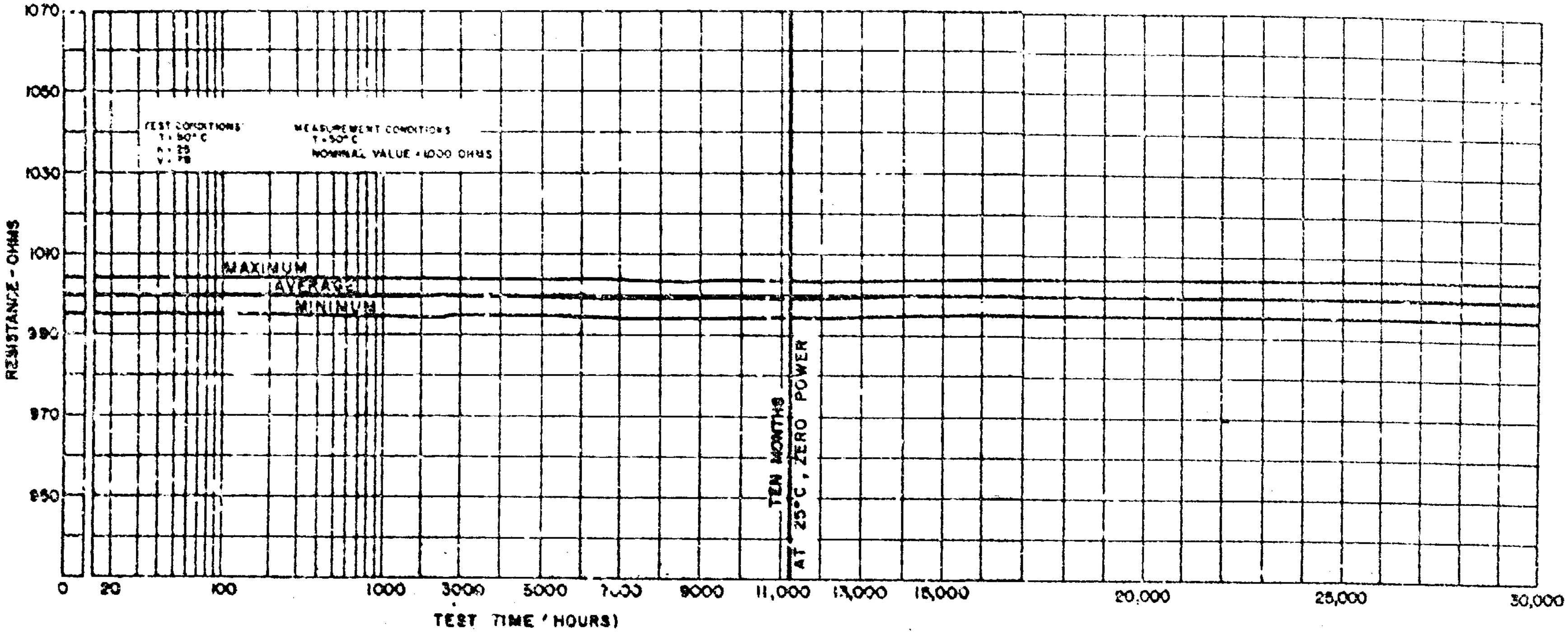
b. The absolute deltas for each part at each time period.

c. The absolute ratio for each part at each time period.

The raw data has been transferred to RADC for inclusion in the AF reliability central data system.

SECTION 3

DATA CHARTS



PH.6 R2016P1001

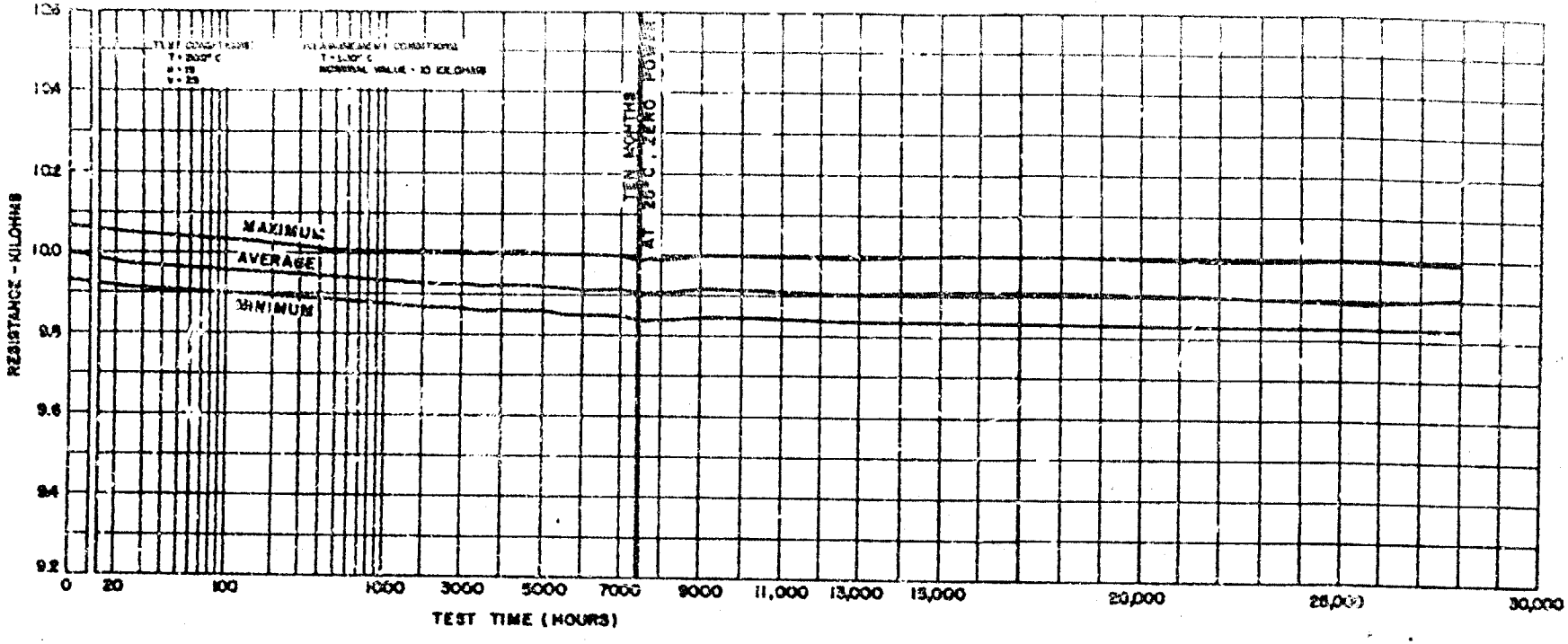
RESISTANCE VALUES IN OHMS

25 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	999.868	2.054	995.000	1004.100
96.	999.652	2.067	995.000	1004.130
168.	999.846	2.046	995.150	1004.100
504.	999.788	2.072	995.100	1004.200
1056.	999.844	2.102	995.000	1005.205
1680.	999.968	2.119	996.900	1004.400
1944.	999.768	2.034	996.100	1004.100
2472.	999.760	2.164	996.900	1004.109
2784.	999.848	2.004	995.000	1004.200
3408.	999.864	2.192	995.005	1004.200
3952.	999.888	2.002	995.000	1004.200
4656.	999.856	2.069	995.000	1004.100
5441.	999.864	2.030	996.000	1004.000
6431.	999.608	2.092	995.000	1004.200
7476.	999.560	1.992	996.590	1003.900
8387.	999.604	1.992	995.028	1003.500
9527.	999.612	2.129	994.920	1004.200
10557.	999.715	2.138	994.678	1004.800
11244.	999.740	1.955	995.100	1003.900
11487.	999.724	1.955	995.000	1003.900
12612.	999.648	1.963	994.930	1003.900
14424.	999.710	1.955	995.000	1003.700
16249.	999.636	1.947	995.000	1003.900
18619.	999.620	1.953	994.900	1003.900
22416.	999.616	1.953	994.985	1003.790
25584.	999.632	1.961	995.100	1003.910
29697.	995.764	1.928	995.107	1003.920
32377.	999.[illegible]	1.939	995.100	1003.919

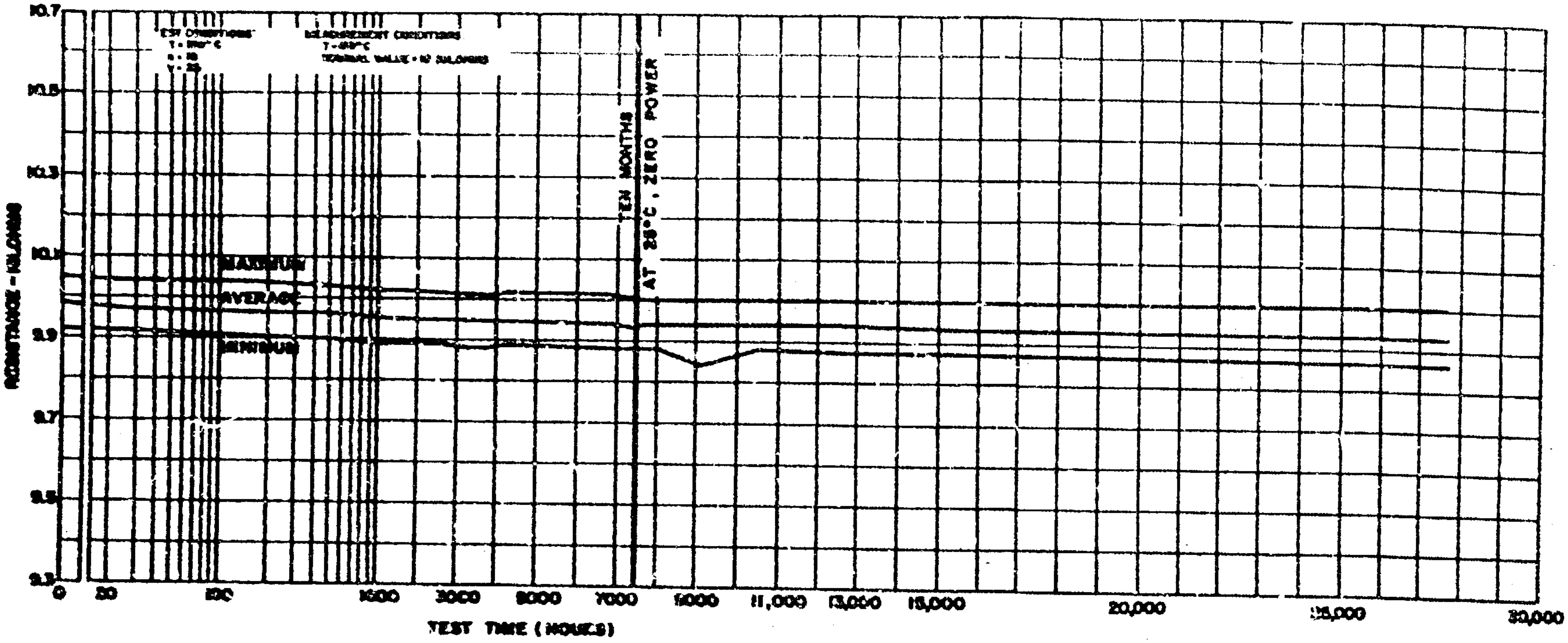
No Failures

Figure 3-1. R2016P1001 - Phase VI - Resistance Variation



No Failures

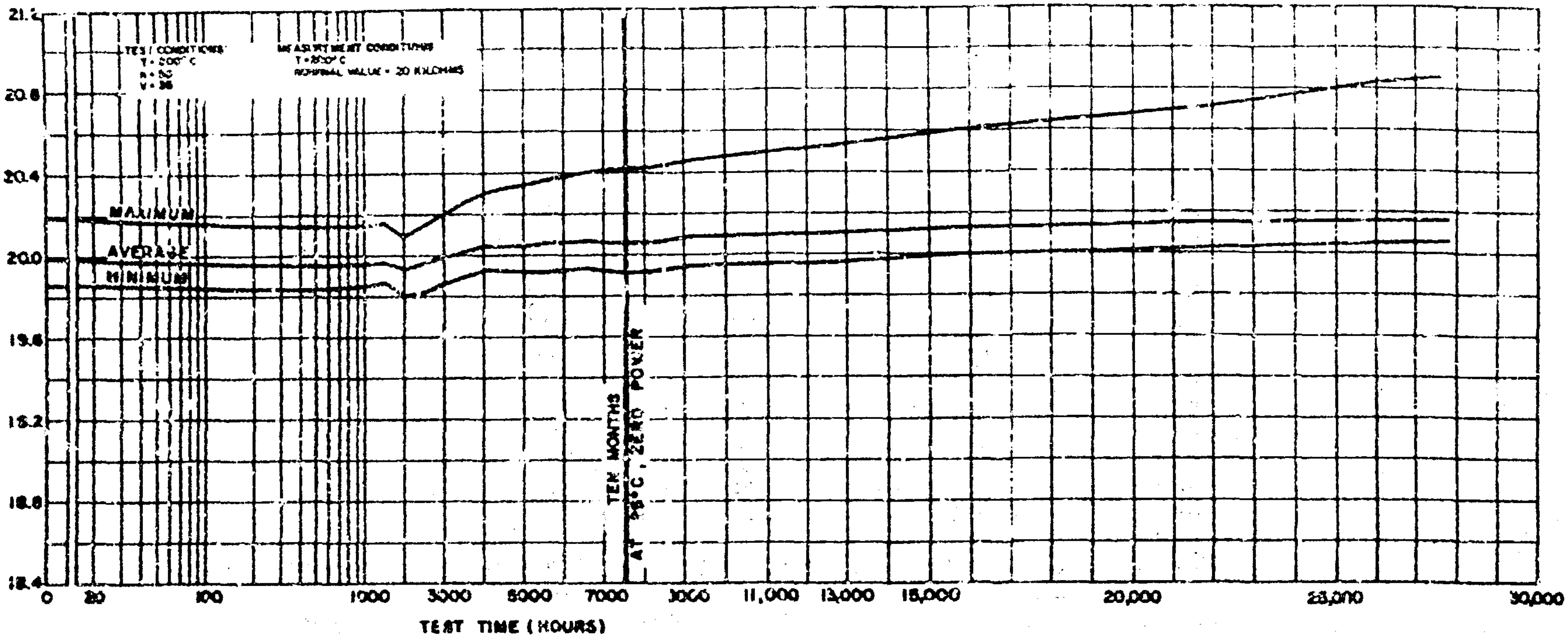
Figure 3-2. R2016P1002 - Phase IV - Resistance Variation



[illegible]	10 PARTS	RESISTANCE VALUES IN K OHMS		
TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	[illegible]	[illegible]	9.929	[illegible]
20.	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	9.915	10.039
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	10.017
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	10.014
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	9.877	10.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	9.879	10.002
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	9.872	10.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	9.871	10.000

No Failures

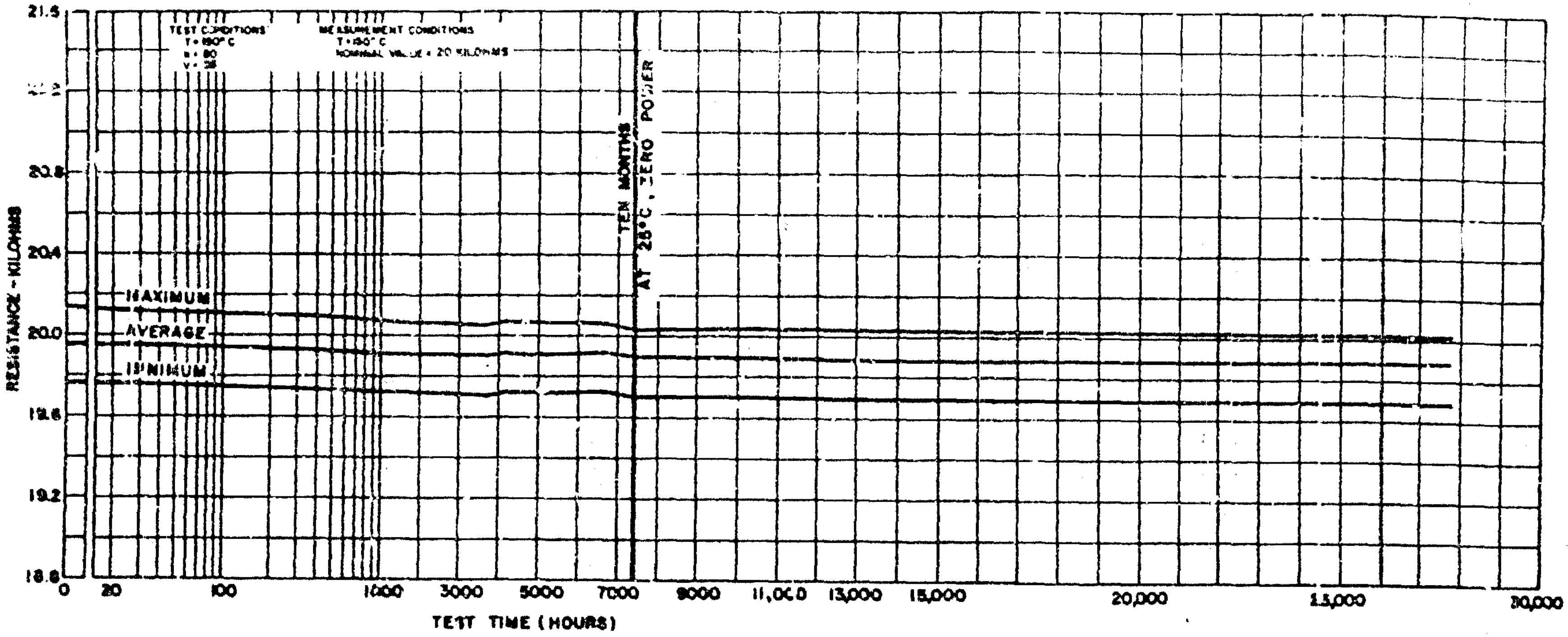
Figure 3-3. R2016P1002 - Phase V - Resistance Variation



PHA R2016P2002	RESISTANCE VALUES IN K OHMS			
	56 PARTS			
TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
2.	19.989	0.074	19.865	20.190
24.	19.989	0.088	19.858	[illegible]
168.	19.957	0.085	19.849	20.148
504.	19.957	0.109	19.8[illegible]	20.128
1008.	19.943	0.087	19.841	20.139
1509.	19.917	0.088	19.841	20.142
2511.	19.924	0.083	19.787	20.072
2520.	19.953	0.065	19.817	20.132
3370.	19.964	0.073	19.865	20.109
3501.	20.06[illegible]	0.081	19.875	20.254
4208.	20.062	0.069	19.928	20.299
4515.	20.032	0.088	19.911	20.306
5035.	20.070	0.092	19.987	20.350
5527.	20.07[illegible]	0.114	19.919	20.305
6312.	20.063	0.090	19.923	20.376
6812.	20.063	0.096	19.929	20.308
7522.	20.056	0.101	19.919	20.405
7548.	20.048	0.112	19.812	20.405
7716.	20.049	0.123	19.911	20.411
8848.	20.048	0.123	19.911	20.443
9154.	20.075	0.107	19.941	20.093
12035.	20.09[illegible]	0.132	19.934	20.4[illegible]
17922.	20.097	0.119	19.950	20.923
19540.	20.122	0.125	19.958	20.500
19998.	20.146	0.134	20.004	20.679
21793.	20.153	0.144	20.000	20.730
25087.	20.179	0.132	20.029	20.919
27005.	20.172	0.136	20.0[illegible]	20.8[illegible]

No Failures

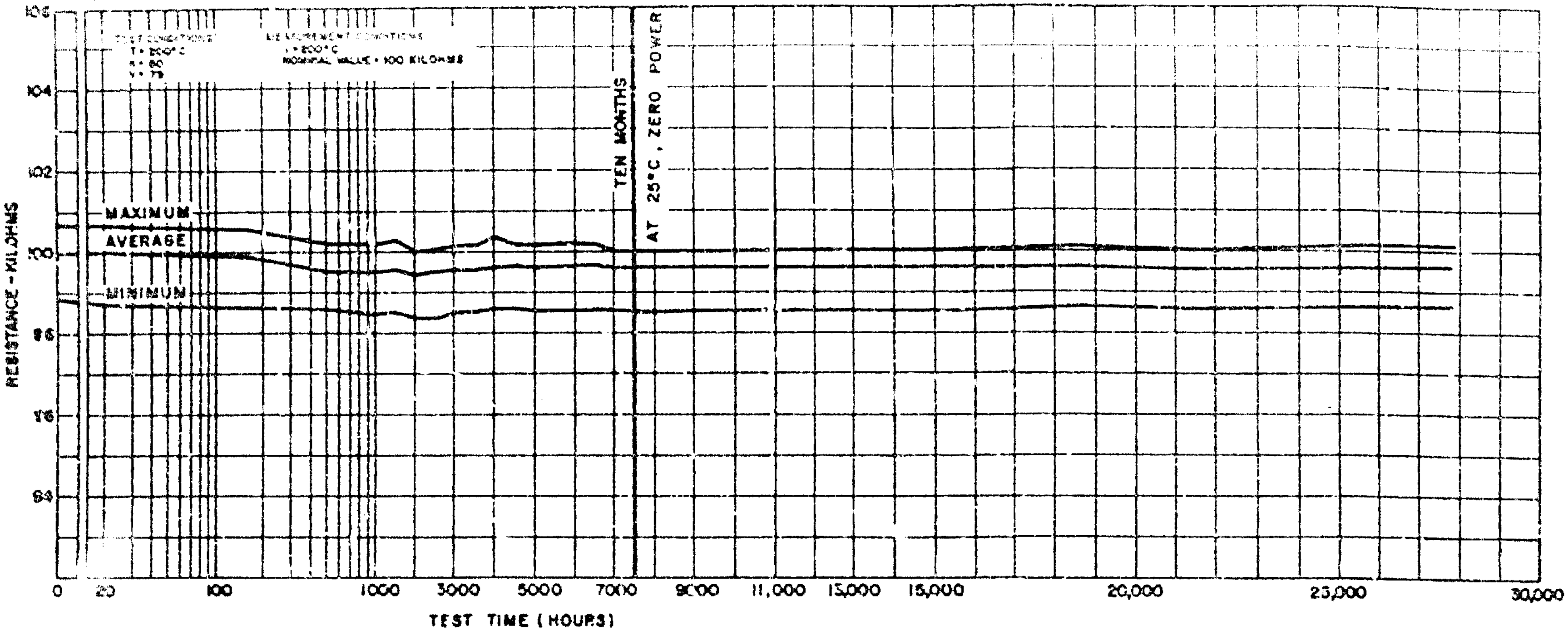
Figure 3-4. R2016P2002 - Phase IV - Resistance Variation



PN S R2016P2002		RESISTANCE VALUE · IN K OHMS		
	50 PARTS			
TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	19,958	0.075	19,772	20.133
24.	[illegible]	[illegible]	[illegible]	[illegible]
168.	19,937	0,073	19,749	20.136
504.	[illegible]	[illegible]	[illegible]	[illegible]
1272.	19,914	0,090	19,725	20.07[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2272.	19,909	0.089	19,719	20.095
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3108.	19,903	0,089	19,718	20.093
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4272.	19,918	0.089	19,729	20.047
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5276.	19,913	0.088	19,721	20,041
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6310.	19,918	0,089	19,724	20,044
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	19,893	0,085	19,707	20.030
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	19,894	0.086	19,707	20.039
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	19,890	0,087	19,700	20.041
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
19448.	19,897	0,087	19,704	20.039
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	19,700	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	19,700	[illegible]

No Failure

Figure 3-5. R2016P2002 - Phase V - Resistance Variation



R/N 2016P1003

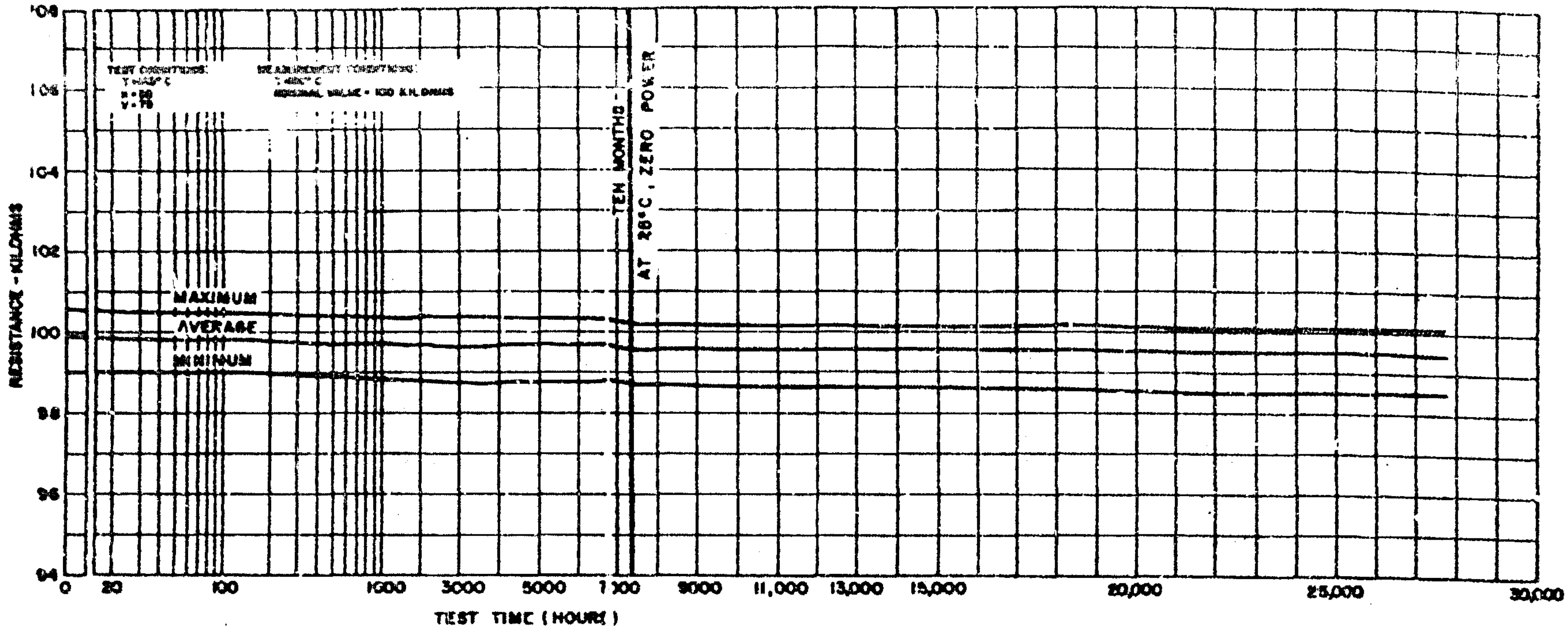
RESISTANCE VALUES IN K OHMS

99 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	100.042	0.372	98.890	100.710
74.	99.948	1.908	91.778	101.700
168.	99.837	0.389	98.690	100.990
264.	99.583	0.368	98.549	100.229
1008.	99.531	0.427	98.470	100.178
1596.	99.504	0.332	98.511	100.292
2011.	99.453	0.393	98.399	99.900
2508.	99.520	0.412	98.409	100.080
3000.	99.570	0.406	98.563	100.150
3591.	99.577	0.326	98.522	100.190
4008.	99.648	0.309	98.590	100.503
4515.	99.696	0.418	98.548	100.190
5042.	99.602	0.308	98.557	100.158
5512.	99.697	0.416	98.592	100.520
6012.	99.658	0.421	98.582	100.218
6512.	99.672	0.389	98.611	100.172
7022.	99.599	0.368	98.569	100.910
7550.	99.682	0.364	98.549	100.022
7714.	99.544	0.412	98.503	100.030
8070.	99.301	0.419	98.501	100.000
9153.	99.638	0.408	98.590	100.070
10598.	99.611	0.319	98.570	100.050
12575.	99.678	0.314	98.589	100.168
13548.	99.639	0.318	98.570	100.000
15578.	99.665	0.317	98.130	100.145
21752.	99.631	0.419	98.199	100.095
25587.	99.603	0.321	98.440	100.270
27905.	99.690	0.321	98.450	100.270

No Failures

Figure 3-6. R2016P1003 - Phase IV - Resistance Variation



RESISTANCE VALUES IN K OHMS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
5.	99.94-	[illegible]	99.000	100.640
24.	99.872	[illegible]	[illegible]	[illegible]
168.	99.833	0.361	99.200	100.510
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1772.	99.720	[illegible]	[illegible]	100.400
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2272.	99.785	[illegible]	[illegible]	102.400
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	100.250
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4222.	99.711	[illegible]	[illegible]	100.270
4721.	99.714	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	100.340
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	99.779	[illegible]	[illegible]	100.313
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	100.210
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[illegible]	99.641	[illegible]	[illegible]	100.200
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[illegible]	99.673	[illegible]	[illegible]	100.190
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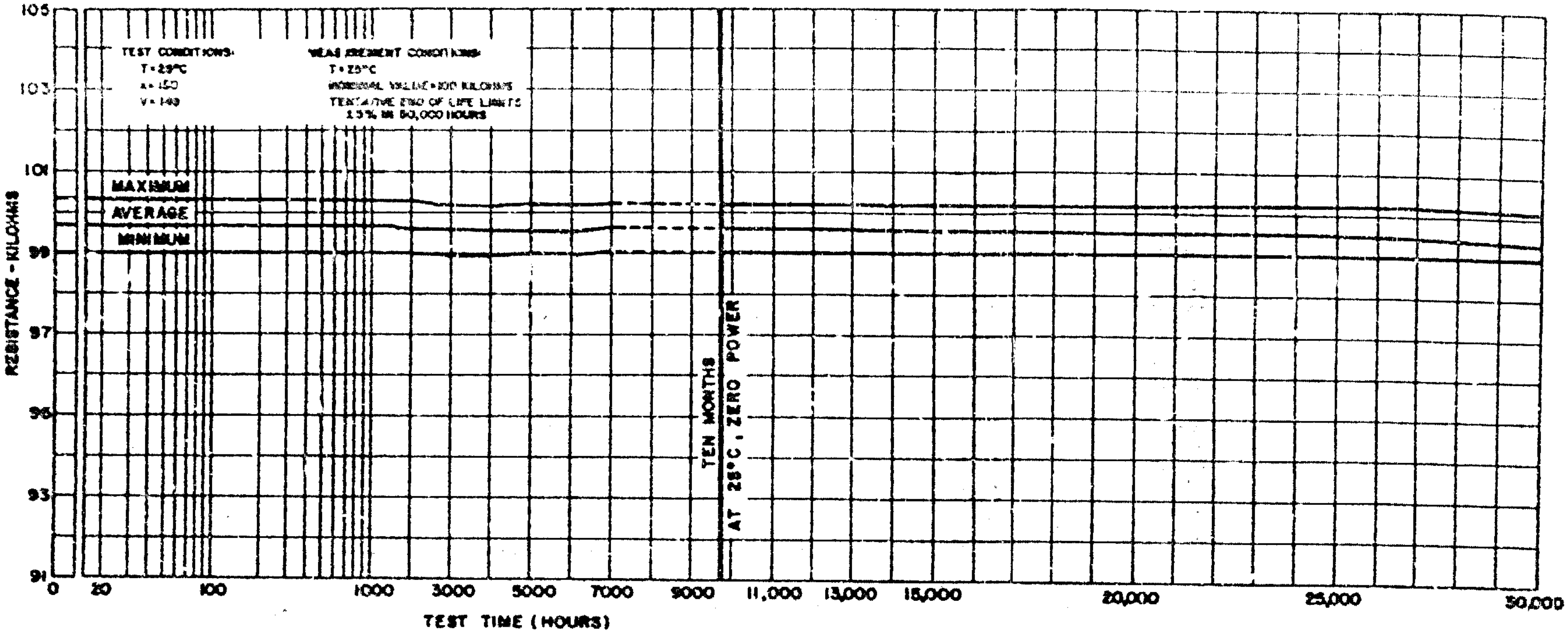
[illegible]	[illegible]	[illegible]	[illegible]	100.170
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	100.180

No Failures.

Figure 3-7. R2016P1003 - Phase V - Resistance Variation



AMBIENT LIFE R2016P1003

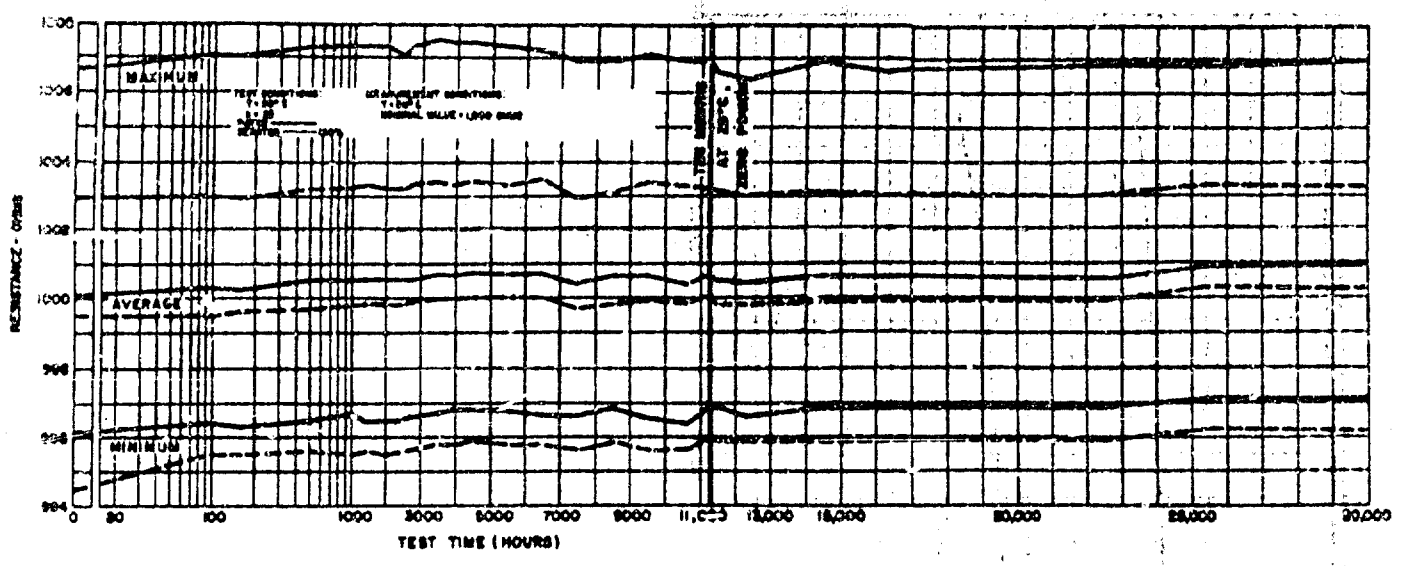
RESISTANCE VALUES IN K OHMS

140 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	99.606	0.269	99.038	100.290
24.	99.609	0.265	99.098	100.270
168.	99.638	0.261	99.039	100.290
352.	99.629	0.263	99.039	100.248
1000.	99.616	0.264	99.029	100.248
1536.	99.618	0.265	99.078	100.240
1384.	99.534	0.267	98.999	100.270
2016.	99.549	0.264	98.983	100.298
2735.	99.534	0.269	98.994	100.178
3624.	99.521	0.266	98.944	100.198
4631.	99.512	0.267	98.939	100.138
5620.	99.518	0.269	98.940	100.198
6035.	99.564	0.269	98.939	100.139
7036.	99.587	0.262	99.049	100.198
8777.	99.577	0.271	99.025	100.208
9974.	99.586	0.267	99.037	100.218
10007.	99.590	0.278	99.049	100.212
11609.	99.587	0.269	99.039	100.218
12797.	99.583	0.77	99.039	100.218
14936.	99.584	0.548	99.030	100.218
17493.	99.582	0.276	99.037	100.208
19831.	99.578	0.267	99.036	100.208
20007.	99.582	0.268	99.043	100.222
21619.	99.571	0.544	99.033	100.198
40001.	99.553	0.265	99.079	100.192

No Failures

Figure 3-8. R2016P1003 - Ambient Life - Resistance Variation



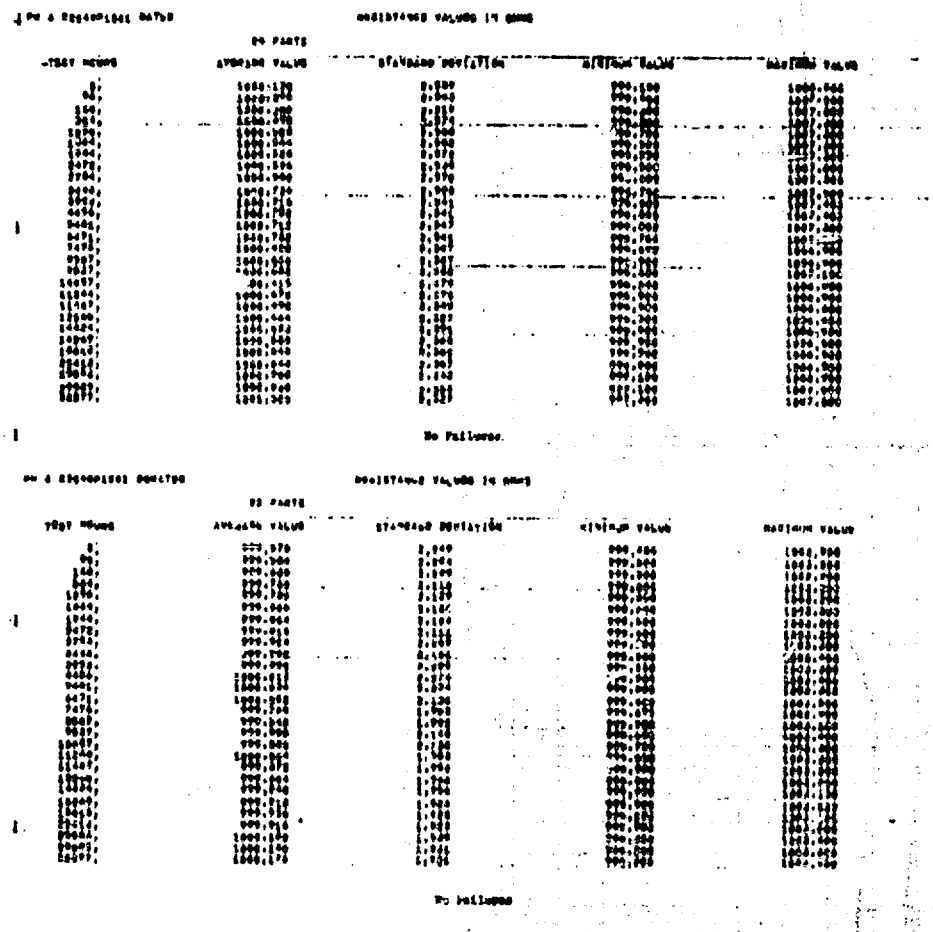
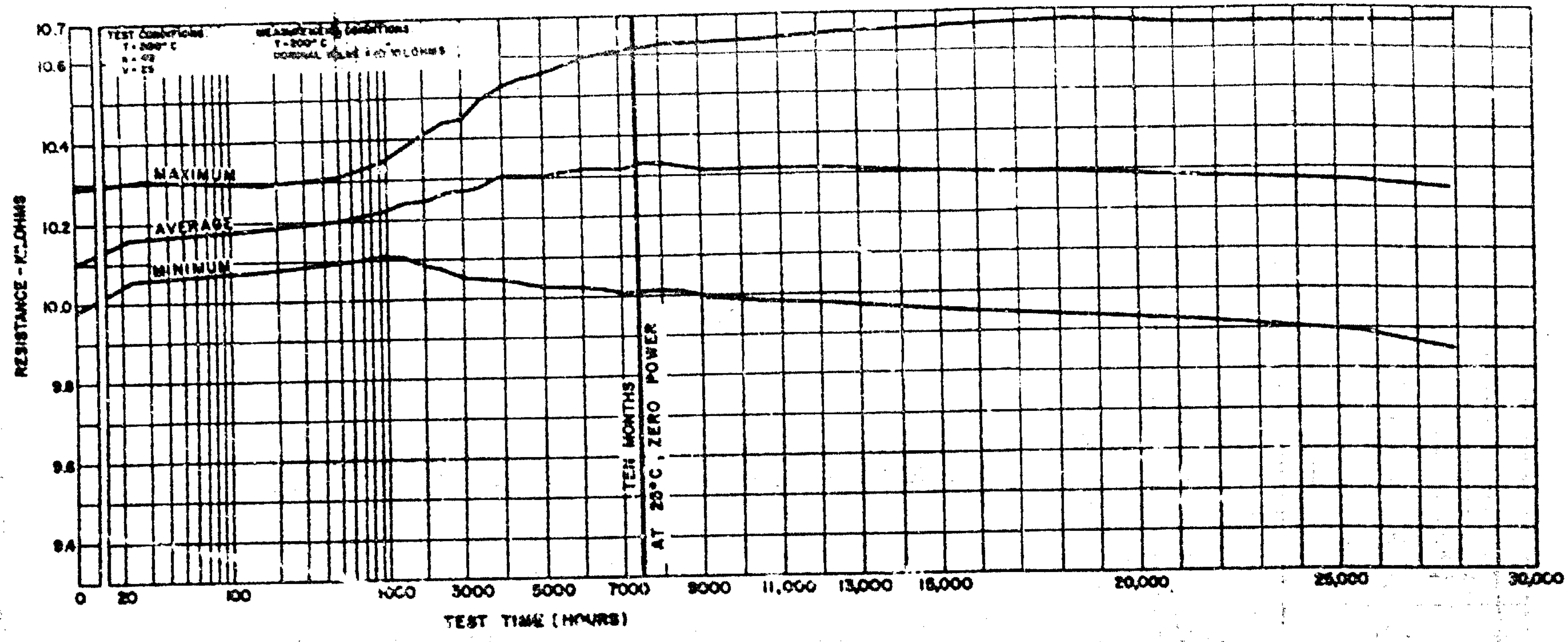


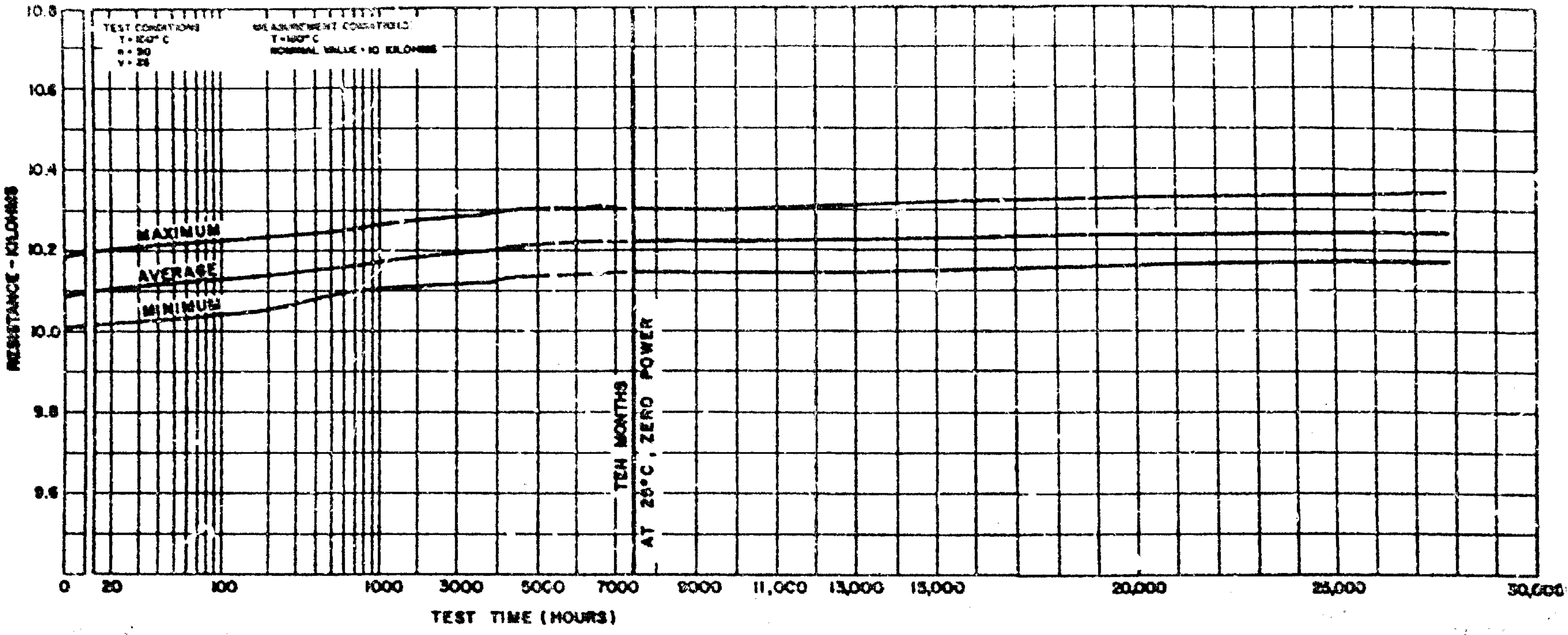
Figure 3-9. R2048P1001 - Phase VI - Resistance Variation



PHASE 4 R2048P1002	RESISTANCE VALUES IN K OHMS			
	49 PARTS			
TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	10.154	0.062	9.972	10.288
24.	10.155	0.058	[illegible]	[illegible]
140.	10.179	0.059	10.077	10.287
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1030.	10.219	0.063	10.107	10.344
1500.	[illegible]	[illegible]	[illegible]	[illegible]
2111.	10.243	0.077	10.090	10.402
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3040.	10.267	0.093	10.050	10.461
3501.	[illegible]	[illegible]	[illegible]	[illegible]
4004.	10.303	0.108	10.045	10.579
4515.	10.304	[illegible]	[illegible]	[illegible]
5017.	10.303	0.118	10.020	10.597
5512.	10.310	0.123	[illegible]	[illegible]
6312.	10.310	0.128	10.021	10.598
[illegible]	10.317	[illegible]	[illegible]	[illegible]
7022.	10.313	0.136	10.008	10.091
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7710.	10.329	0.149	10.018	10.017
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9153.	10.314	0.147	9.996	10.626
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12950.	10.315	0.157	9.976	10.640
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
17550.	10.296	0.194	9.941	10.672
[illegible]	10.276	0.204	[illegible]	[illegible]
25547.	10.273	0.214	9.896	10.662
[illegible]	[illegible]	[illegible]	[illegible]	10.663

No Failures

Figure 3-10. R2048P1002 - Phase IV - Resistance Variation



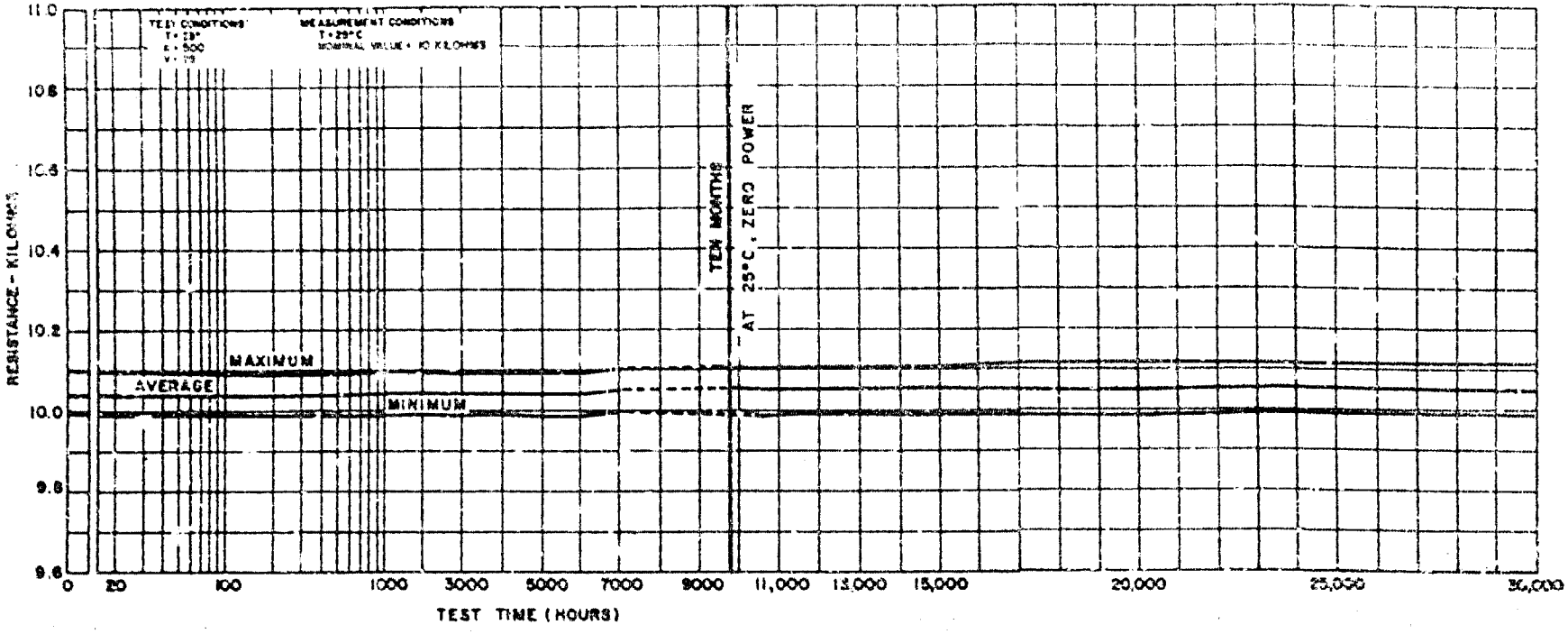
PHASE 5 R2048P1002 RESISTANCE VALUES IN K OHMS

50 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	10.087	[illegible]	10.012	10.182
94.	[illegible]	[illegible]	[illegible]	10.200
[illegible]	[illegible]	[illegible]	10.047	10.256
324.	[illegible]	[illegible]	[illegible]	10.256
1272.	[illegible]	[illegible]	[illegible]	10.262
1722.	10.170	[illegible]	10.188	10.264
2298.	[illegible]	[illegible]	10.111	10.273
2698.	10.188	[illegible]	10.114	10.236
3176.	10.191	[illegible]	10.117	10.288
[illegible]	10.174	[illegible]	10.118	10.281
4292.	10.190	[illegible]	10.122	10.294
4721.	10.266	[illegible]	[illegible]	10.292
5294.	10.227	[illegible]	10.149	10.297
5727.	10.214	[illegible]	[illegible]	10.300
6310.	10.219	[illegible]	10.141	10.308
[illegible]	[illegible]	[illegible]	[illegible]	10.310
7454.	10.219	[illegible]	10.142	10.299
7610.	10.219	[illegible]	[illegible]	10.302
7993.	[illegible]	[illegible]	10.145	10.303
9655.	10.228	[illegible]	10.143	10.305
[illegible]	[illegible]	[illegible]	10.144	10.307
[illegible]	[illegible]	[illegible]	10.148	10.314
15444.	[illegible]	[illegible]	10.151	10.370
[illegible]	10.234	[illegible]	10.150	10.321
21697.	10.245	[illegible]	10.152	10.326
24673.	10.243	[illegible]	10.162	10.333
[illegible]	[illegible]	[illegible]	10.167	10.329

No Failures

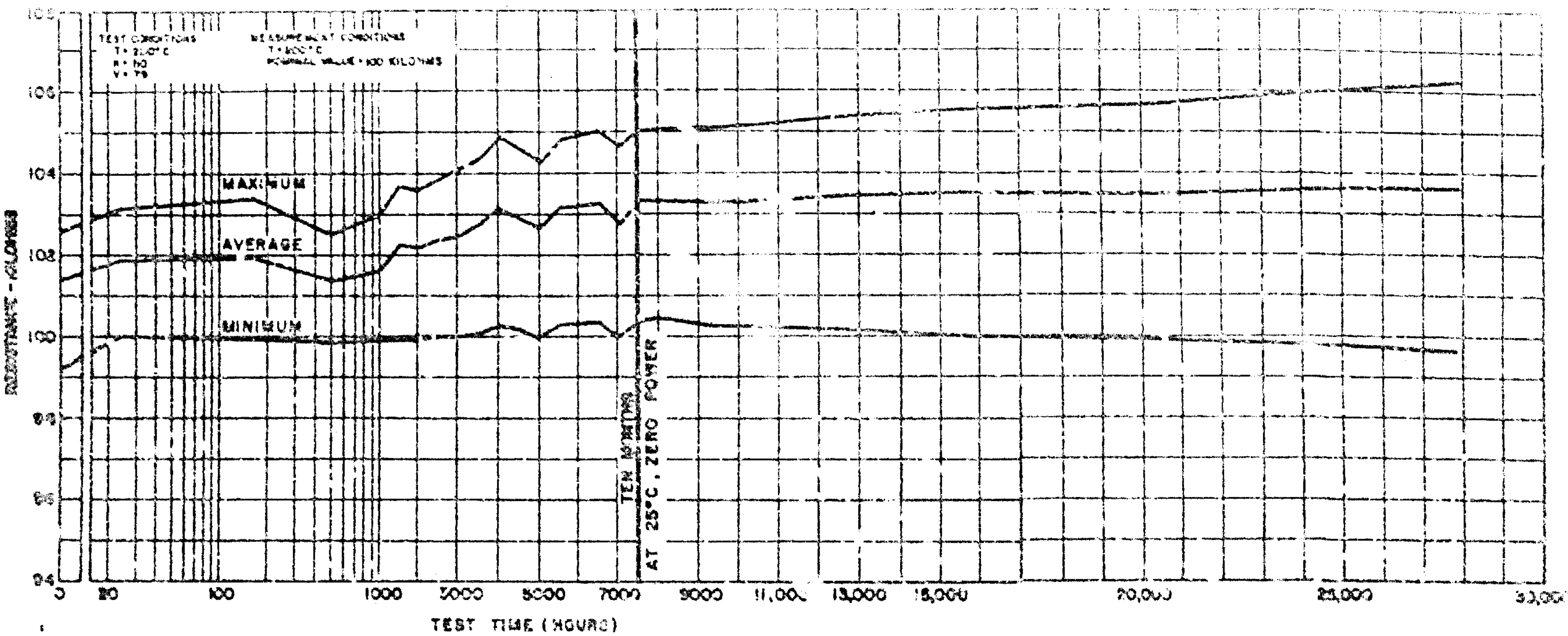
Figure 3-11. R2048P1002 - Phase V - Resistance Variation



Test Hours	Average	Maximum	Minimum
0	10.030	9.994	10.064
24	10.030	9.996	10.066
168	10.030	9.997	10.061
552	10.040	9.989	10.094
1004	10.041	9.987	10.096
1536	10.042	9.994	10.096
1584	10.042	9.994	10.098
2016	10.041	9.993	10.098
2520	10.038	9.995	10.091
3024	10.038	9.993	10.091
4032	10.039	9.994	10.093
5040	10.038	9.996	10.093
6936	10.038	9.994	10.092
7936	10.040	9.997	10.103
9797	10.052	9.992	10.109
9974	10.050	9.990	10.104
10307	10.050	9.989	10.106
11290	10.051	9.994	10.106
13797	10.053	9.998	10.108
14938	10.054	9.993	10.109
17493	10.054	9.993	10.113
20331	10.053	9.992	10.109
23097	10.054	9.991	10.109
26710	10.056	9.995	10.109
30031	10.052	9.994	10.109

No Failures

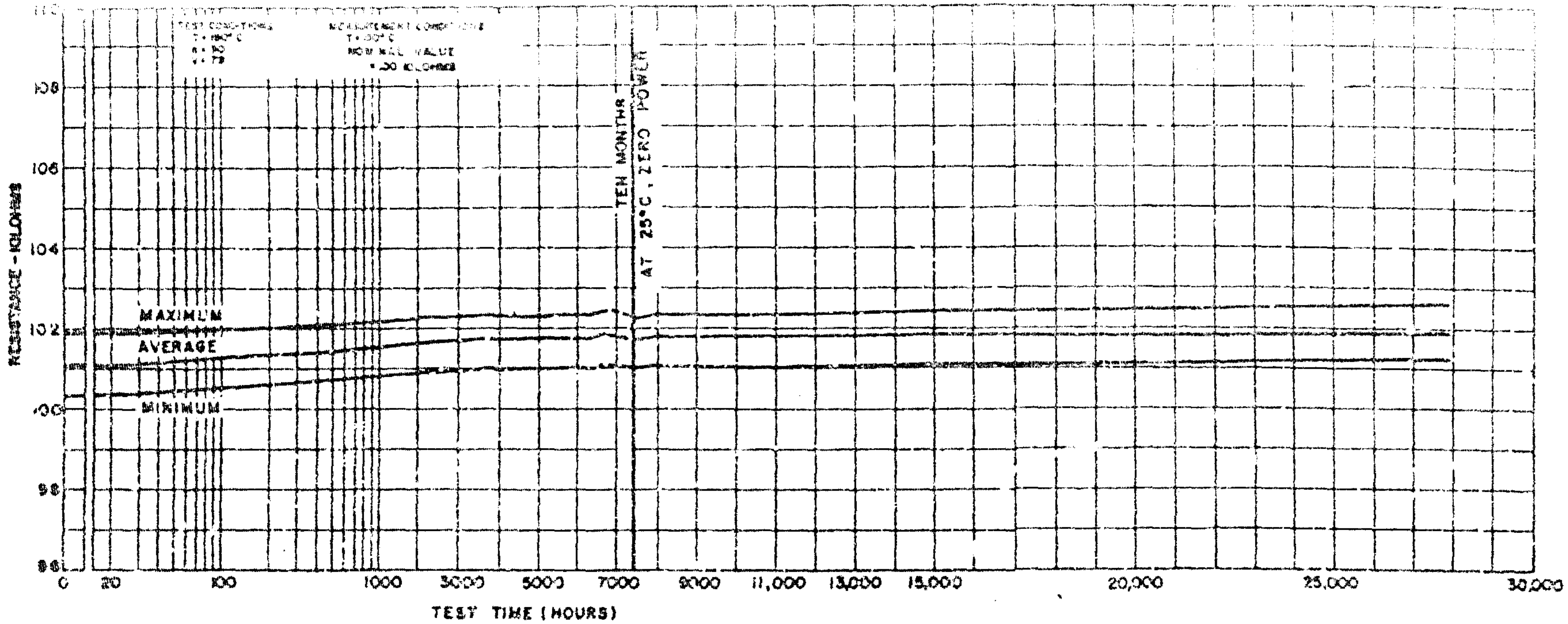
Figure 3-12. R2048P1002 - Ambient Life - Resistance Variation



PHASE 4 MEASUREMENTS — RESISTANCE VALUES IN K OHMS

49 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
1.	101.365	1.597	99.[illegible]	102.916
96.	101.449	2.143	[illegible]	[illegible]
144.	101.985	1.564	[illegible]	102.960
[illegible]	101.382	1.441	[illegible]	[illegible]
1368.	101.442	1.733	97.968	102.210
1506.	102.261	1.748	[illegible]	[illegible]
2011.	102.190	1.769	99.[illegible]	103.590
2584.	102.138	[illegible]	[illegible]	[illegible]
[illegible]	102.[illegible]	[illegible]	99.919	104.[illegible]
[illegible]	102.735	[illegible]	[illegible]	[illegible]
[illegible]	103.175	[illegible]	100.320	104.[illegible]
4519.	102.965	1.287	[illegible]	104.590
5952.	102.693	1.139	99.590	104.195
[illegible]	103.111	1.165	[illegible]	[illegible]
[illegible]	103.224	1.311	100.378	[illegible]
[illegible]	103.[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	102.770	1.334	100.[illegible]	103.590
[illegible]	103.[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	103.313	1.294	100.[illegible]	[illegible]
[illegible]	103.342	1.281	[illegible]	[illegible]
[illegible]	103.278	[illegible]	100.[illegible]	[illegible]
[illegible]	103.[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	103.487	[illegible]	100.[illegible]	[illegible]
[illegible]	103.315	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	100.493	[illegible]
[illegible]	[illegible]	1.726	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]



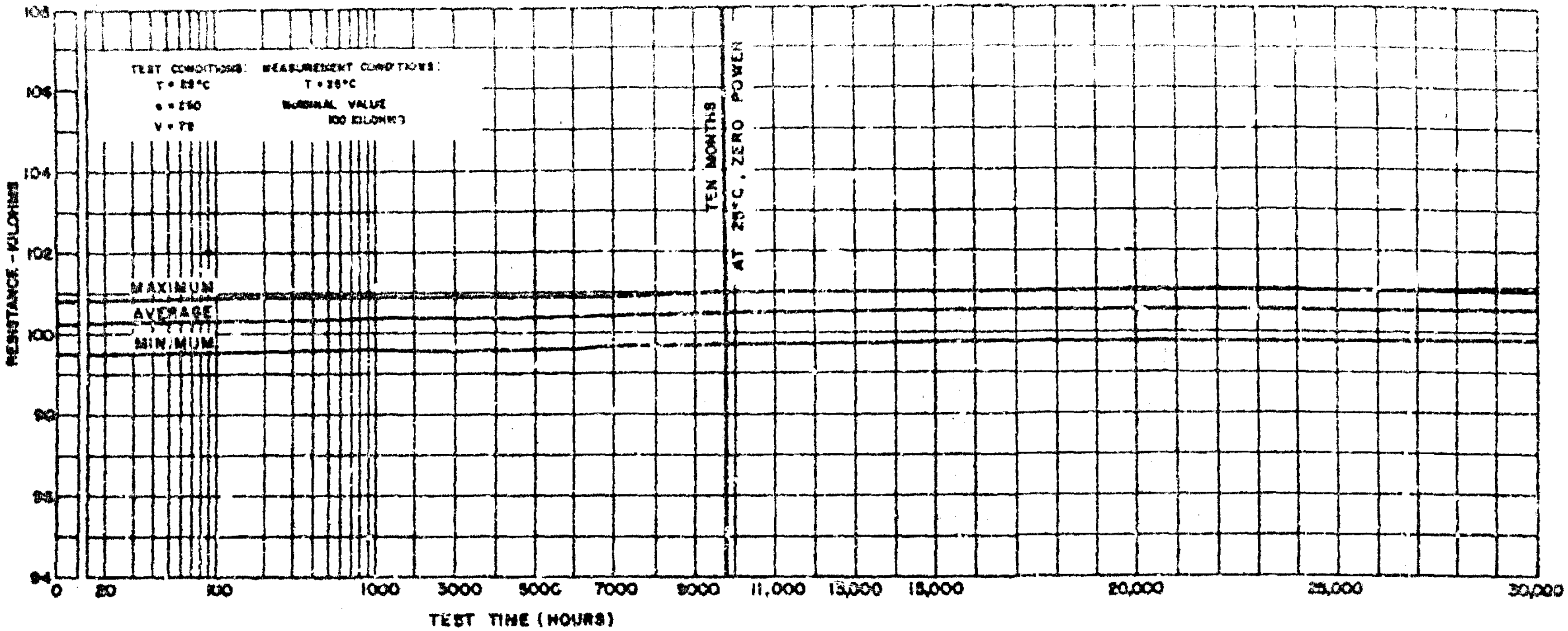
PHASE 5 R2048P1003 RESISTANCE VALUES IN K OHMS

50 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
4.	101.143	0.407	100.308	101.828
24.	101.171	0.414	100.376	101.850
148.	101.395	0.378	100.626	102.018
[illegible]	101.423	.365	100.780	102.126
1472.	101.558	0.355	100.958	102.189
[illegible]	101.662	0.355	100.896	102.226
2272.	101.688	0.366	100.970	102.270
2654.	101.672	0.361	100.826	102.296
[illegible]	101.736	0.355	100.995	102.330
[illegible]	101.75[illegible]	0.357	101.020	102.358
4274.	101.77[illegible]	0.354	100.990	102.370
[illegible]	101.751	0.355	101.048	102.345
5290.	101.764	0.355	101.020	102.348
[illegible]	101.798	0.351	101.030	102.378
6319.	101.765	0.351	101.048	102.368
[illegible]	101.474	0.356	101.130	102.452
7452.	101.786	0.321	101.070	102.320
[illegible]	101.741	0.322	101.078	102.292
7956.	101.746	0.321	101.069	102.309
[illegible]	101.782	0.330	101.030	102.330
13678.	[illegible]	0.341	101.048	102.390
[illegible]	101.837	0.338	101.188	102.428
14416.	101.946	0.348	101.190	102.430
[illegible]	101.816	0.342	101.178	102.488
21892.	101.896	0.342	101.196	102.488
[illegible]	101.896	0.344	101.300	102.558
27441.	101.974	0.353	101.240	102.588

No Failures

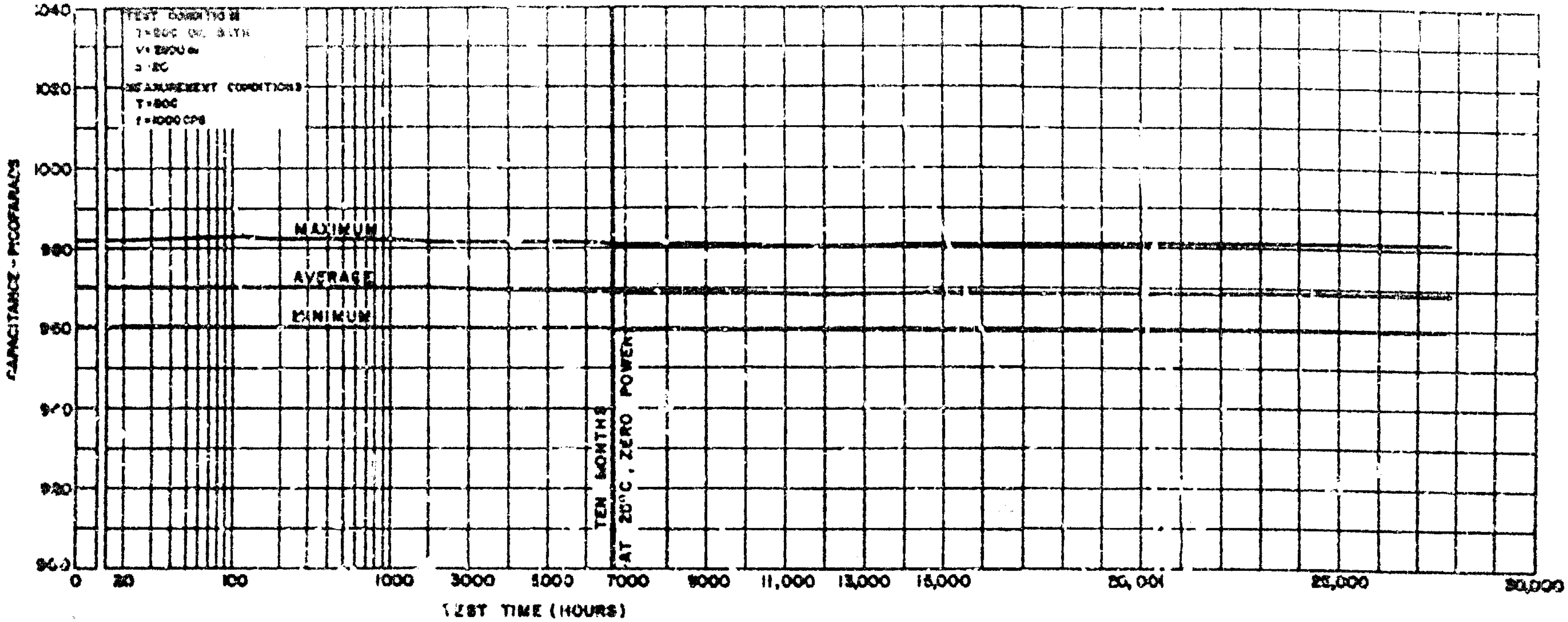
Figure 3-14. R2048P1003 - Phase V - Resistance Variation



Test Hours	Average	Minimum	Maximum
0	100.336	99.880	100.870
36	100.327	99.890	100.890
106	100.300	99.869	100.868
362	100.306	99.907	100.930
1064	100.301	99.619	100.920
1536	100.401	99.829	100.940
1884	100.441	99.824	100.920
2628	100.403	99.613	100.938
2820	100.307	99.863	100.910
3664	100.306	99.886	100.910
4021	100.307	99.648	100.810
5050	100.414	99.613	100.930
6033	100.485	99.608	100.930
7936	100.442	99.736	100.996
9717	100.502	99.180	101.000
9976	100.506	99.723	101.000
10367	100.506	99.721	101.030
11099	100.571	99.731	101.080
12797	100.544	99.782	101.080
13880	100.552	99.784	101.080
17468	100.548	99.700	101.060
20331	100.576	99.781	101.090
23697	100.567	99.769	101.092
26810	100.583	99.782	101.090
30341	100.583	99.787	101.100

No Failures

Figure 3-15. R2048P1003 - Ambient Life - Resistance Variation



CAPACITANCE VALUES IN MMF

11 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	[illegible]	[illegible]	[illegible]	[illegible]
24.	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
116.	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	7.179	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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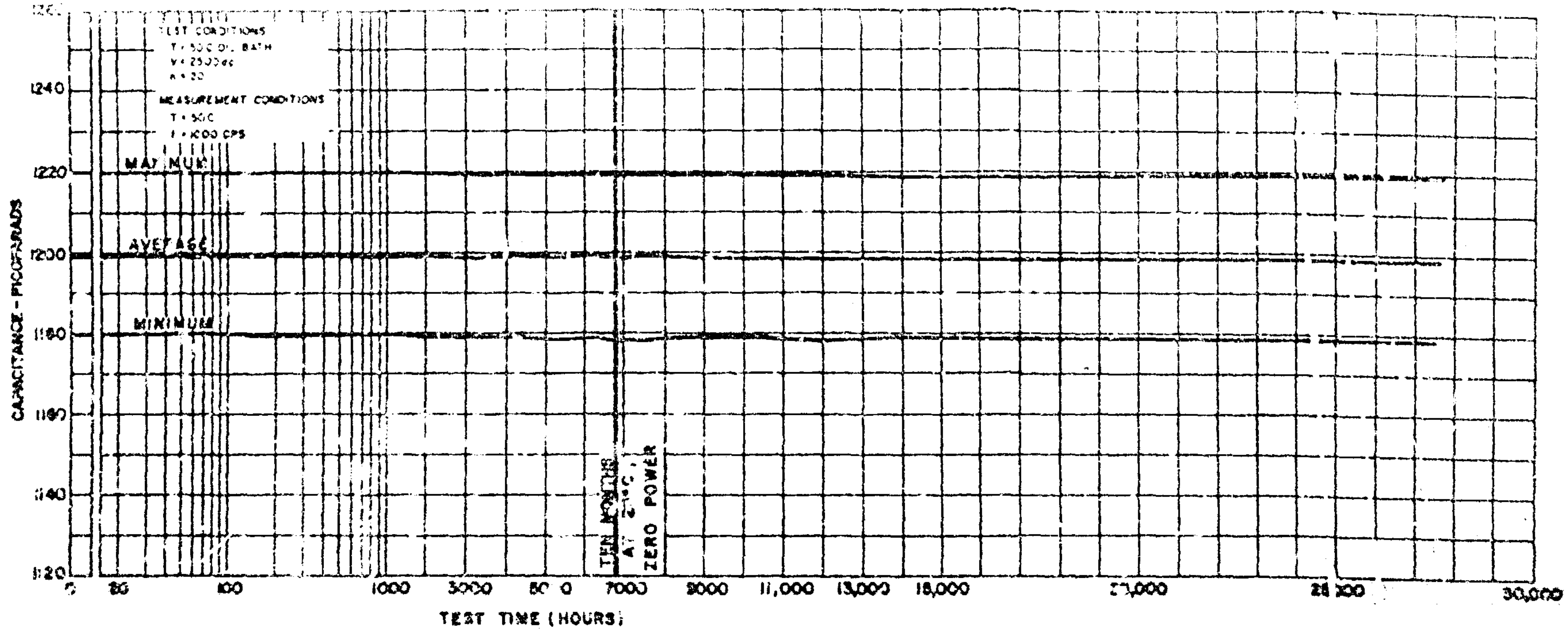
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TOTAL FAILURES	TIME TO FAILURE (HRS)	QUANTITY
[illegible]	116	1
	[illegible]	1
	[illegible]	[illegible]
	[illegible]	[illegible]

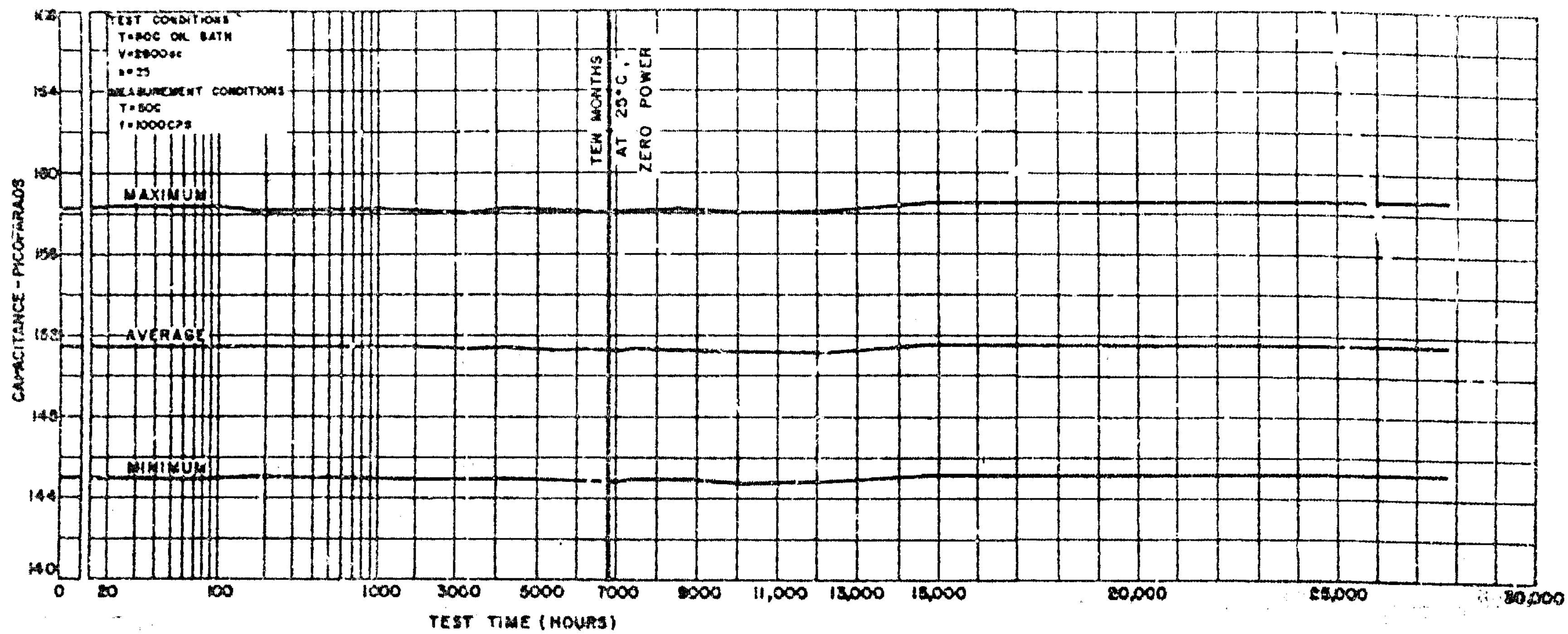
Figure 3-16. R2045P102 - Phase IV - Capacitance



PH 4 [illegible]		CAPACITANCE VALUES IN MMF		
	11 PARTS			
TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	[illegible]	[illegible]	[illegible]	[illegible]
24.	[illegible]	[illegible]	[illegible]	[illegible]
65.	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7610.	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TOTAL FAILURES	TIME TO FAILURE (HRS)	QUANTITY
[illegible]	[illegible]	[illegible]

Figure 3-17. R2045P122A, Phase IV - Capacitance



CAPACITANCE VALUES IN MMF

25 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	[illegible]	[illegible]	[illegible]	[illegible]
24.	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
114.	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
274.	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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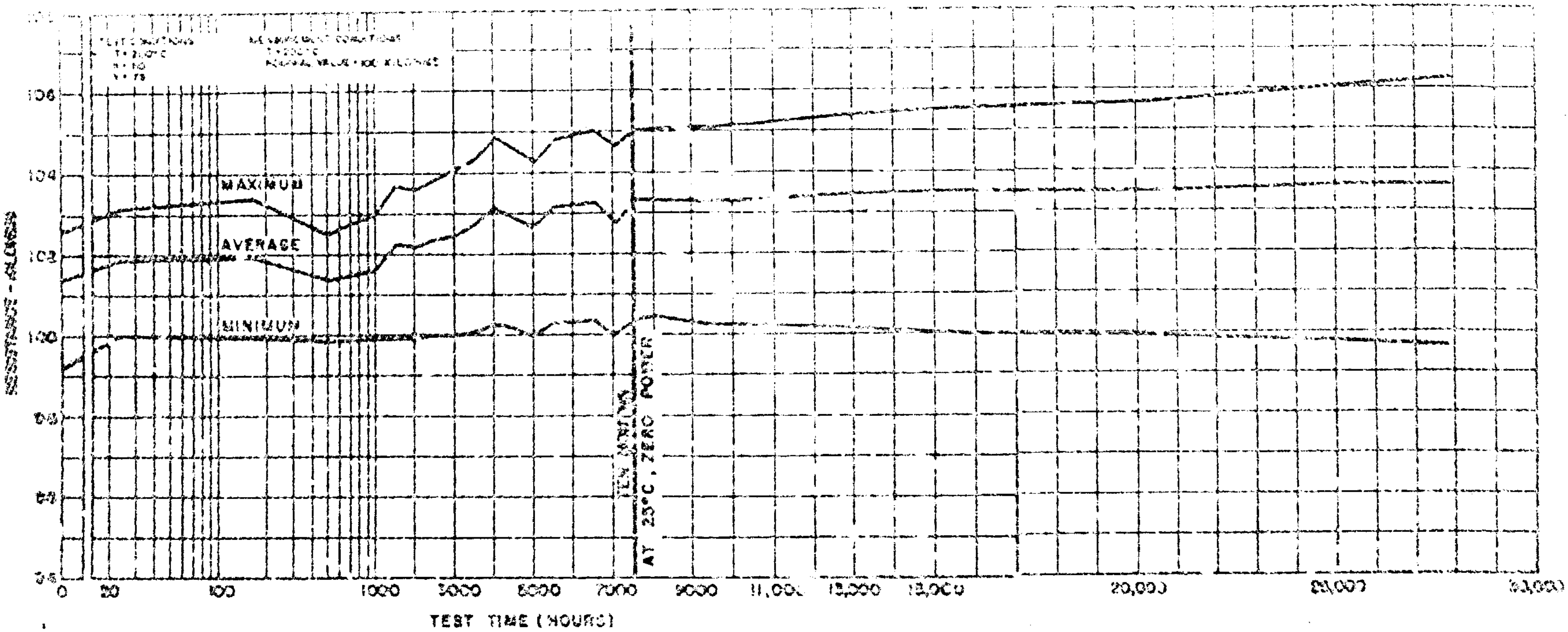
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

No Failures

Figure 3-18. R2045P151 - Phase IV - Capacitance



PHASE 4 [illegible]	RESISTANCE VALUES IN K OHMS			
	49 PARTS			
TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
1.	101.365	1.497	99.[illegible]	102.810
[illegible]	101.[illegible]	2.[illegible]	[illegible]	[illegible]
[illegible]	101.735	1.[illegible]	[illegible]	103.[illegible]
[illegible]	[illegible]	1.[illegible]	[illegible]	[illegible]
[illegible]	101.[illegible]	1.[illegible]	[illegible]	[illegible]
[illegible]	102.261	[illegible]	[illegible]	[illegible]
[illegible]	102.150	[illegible]	[illegible]	[illegible]
[illegible]	102.[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	102.[illegible]	[illegible]	99.[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	103.[illegible]	1.[illegible]	100.[illegible]	[illegible]
[illegible]	102.[illegible]	1.[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	1.[illegible]	99.[illegible]	104.[illegible]
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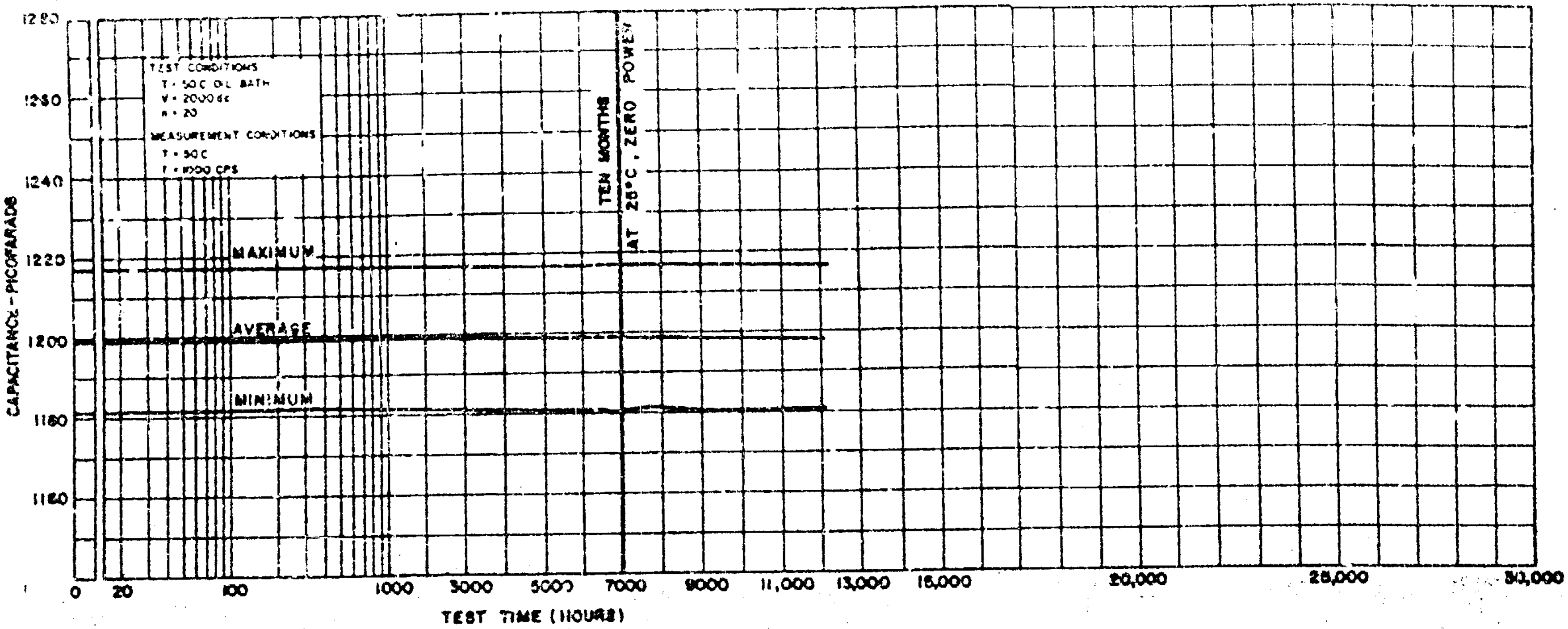
[illegible]	[illegible]	1.[illegible]	[illegible]	[illegible]
[illegible]	102.77[illegible]	1.[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	1.[illegible]	[illegible]	[illegible]
[illegible]	103.313	1.[illegible]	[illegible]	[illegible]
[illegible]	103.3[illegible]	1.[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	1.[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	103.[illegible]	1.[illegible]	[illegible]	105.[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	1.[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	1.[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	1.[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

0 Failures

Figure 3-18. RS048P1003 - Phase IV - Resistance Variation



P= 2 R2045P122A

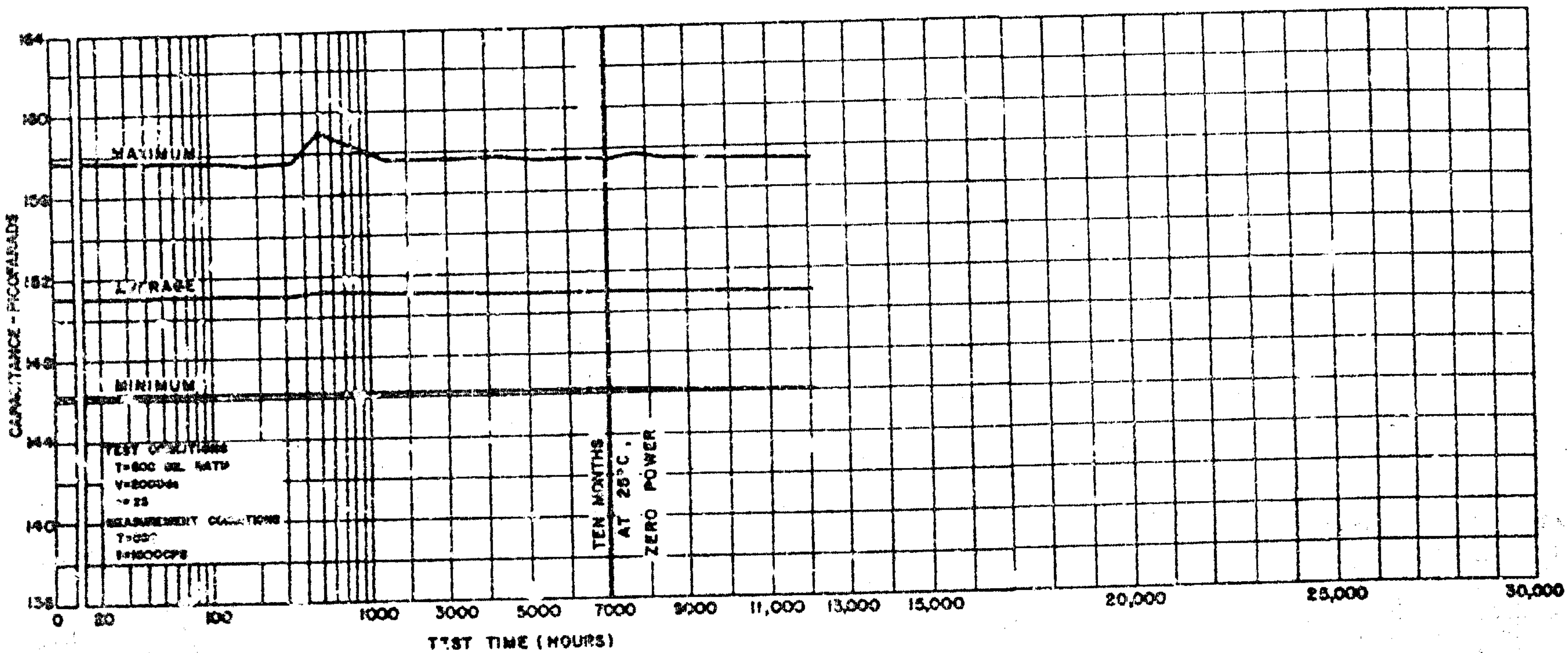
CAPACITANCE VALUES IN MMF

19 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	1199.953	10.728	1182.000	1217.330
25.	1199.924	10.681	[illegible]	[illegible]
114.	1199.632	10.717	1182.000	[illegible]
163.	[illegible]	10.689	[illegible]	1217.900
431.	1199.816	10.689	1182.000	1217.900
491.	1199.085	10.584	[illegible]	[illegible]
1497.	1199.421	10.674	1181.900	1217.900
2984.	1199.360	[illegible]	1181.200	[illegible]
3149.	1199.211	10.673	1181.900	1217.800
4271.	[illegible]	10.758	[illegible]	[illegible]
5293.	1199.979	10.734	[illegible]	[illegible]
6179.	1199.132	10.688	[illegible]	[illegible]
7071.	1198.700	10.747	1181.000	1217.000
7236.	1199.080	10.787	1181.200	[illegible]
7909.	1198.342	10.763	1182.030	1217.909
[illegible]	[illegible]	10.732	[illegible]	[illegible]
10170.	1198.947	10.755	1181.900	1217.000
12089.	1198.481	10.661	[illegible]	[illegible]

TOTAL FAILURES	TIME TO FAILURE (HRS)	QUANTITY
1	34	1

Figure 3-20. R2045P122A - Phase V - Capacitance



PN 9 R2045P151

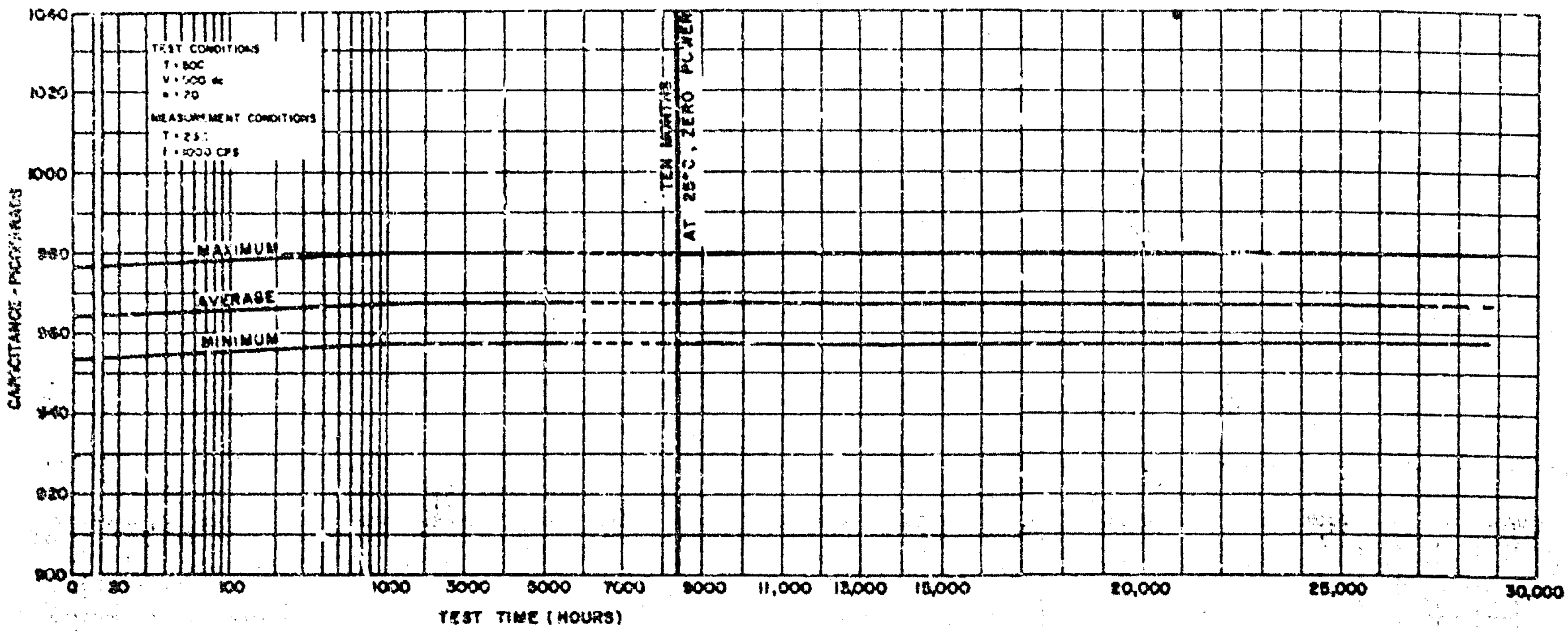
CAPACITANCE VALUES IN MMF

25 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	151.872	2.796	146.300	157.400
24.	151.832	2.784	146.200	157.500
114.	151.839	2.768	146.200	157.500
[illegible]	151.836	2.774	146.2[illegible]	157.400
231.	151.840	2.781	146.100	157.900
46[illegible].	151.844	2.813	146.100	158.900
1097.	151.892	2.777	146.200	157.200
2004.	151.[illegible]	2.784	146.200	157.500
3043.	151.334	2.784	146.200	157.900
4376.	150.[illegible]	2.784	146.2[illegible]	157.400
5590.	150.900	2.754	146.306	157.400
6379.	150.974	2.733	146.2[illegible]	157.900
7271.	150.944	2.791	144.156	157.400
7824.	[illegible]	2.777	146.200	157.400
7906.	151.032	2.783	146.200	157.900
[illegible]	150.[illegible]	[illegible]	146.100	157.400
10174.	151.948	2.799	146.100	157.400
[illegible]	150.902	2.773	139.152	157.306

No Failures

Figure 3-21. R2045P151 - Phase V - Capacitance



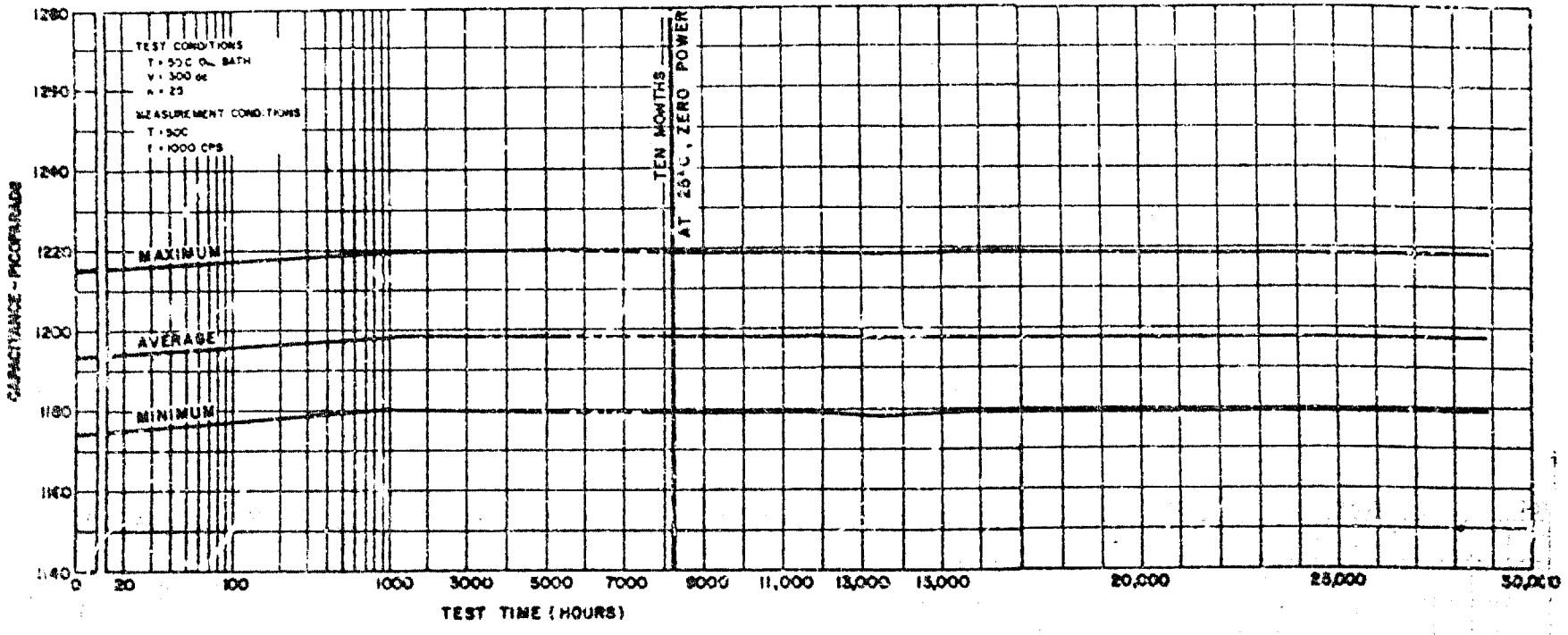
PN 6 R2045P102 CAPACITANCE VALUES IN MMF

25 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	967.792	6.605	957.500	980.100
1000.	967.788	6.627	957.000	979.900
1999.	967.843	6.626	957.500	980.000
4195.	967.823	6.621	957.700	979.900
5039.	967.648	6.611	957.400	979.800
6384.	967.444	6.727	957.100	979.100
6676.	967.204	6.653	957.100	979.300
7294.	967.408	6.619	957.100	979.400
11407.	967.224	6.696	957.800	979.650
[illegible]	967.112	6.628	956.910	979.200
13881.	967.312	6.647	957.300	979.300
17672.	966.828	6.630	956.200	978.963
22064.	966.852	6.636	956.600	978.800
24315.	966.720	6.627	956.720	979.000
28837.	966.472	6.638	955.200	978.600

No Failures

Figure 3-22. R2045P102 - Phase VI - Capacitance



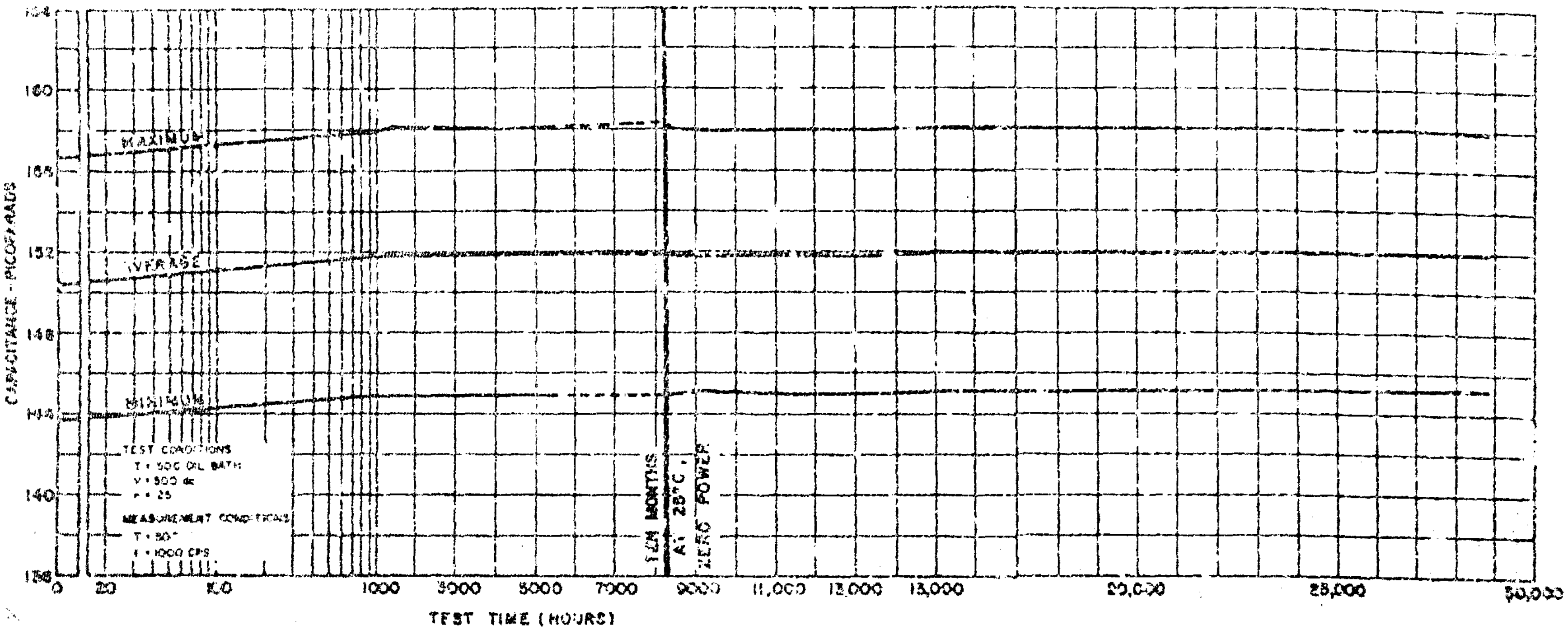
P/N & R2045P122A — CAPACITANCE VALUES IN [illegible]

25 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	1193.920	14.847	1170.000	1215.000
1058.	1198.880	14.195	1178.000	1219.000
1568.	1195.360	14.457	1180.000	1219.000
4152.	1196.120	14.339	1179.000	1218.000
5532.	1196.240	14.494	1179.000	1218.000
8316.	1197.920	14.434	1179.000	1218.000
6476.	1197.880	14.486	1179.000	1218.000
9394.	1197.960	14.490	1179.000	1218.000
11000.	1197.920	14.906	1179.000	1218.000
13321.	1197.880	14.419	1179.000	1218.000
15481.	1197.880	14.939	1179.000	1218.000
18473.	1197.440	14.664	1179.000	1218.000
20614.	1197.440	14.921	1179.000	1218.000
24513.	1197.640	14.949	1179.000	1218.000
26827.	1196.960	[illegible]	1178.000	1217.000

No Failures

Figure 3-23. R2045P122A - Phase VI - Capacitance



PH & P [illegible]151

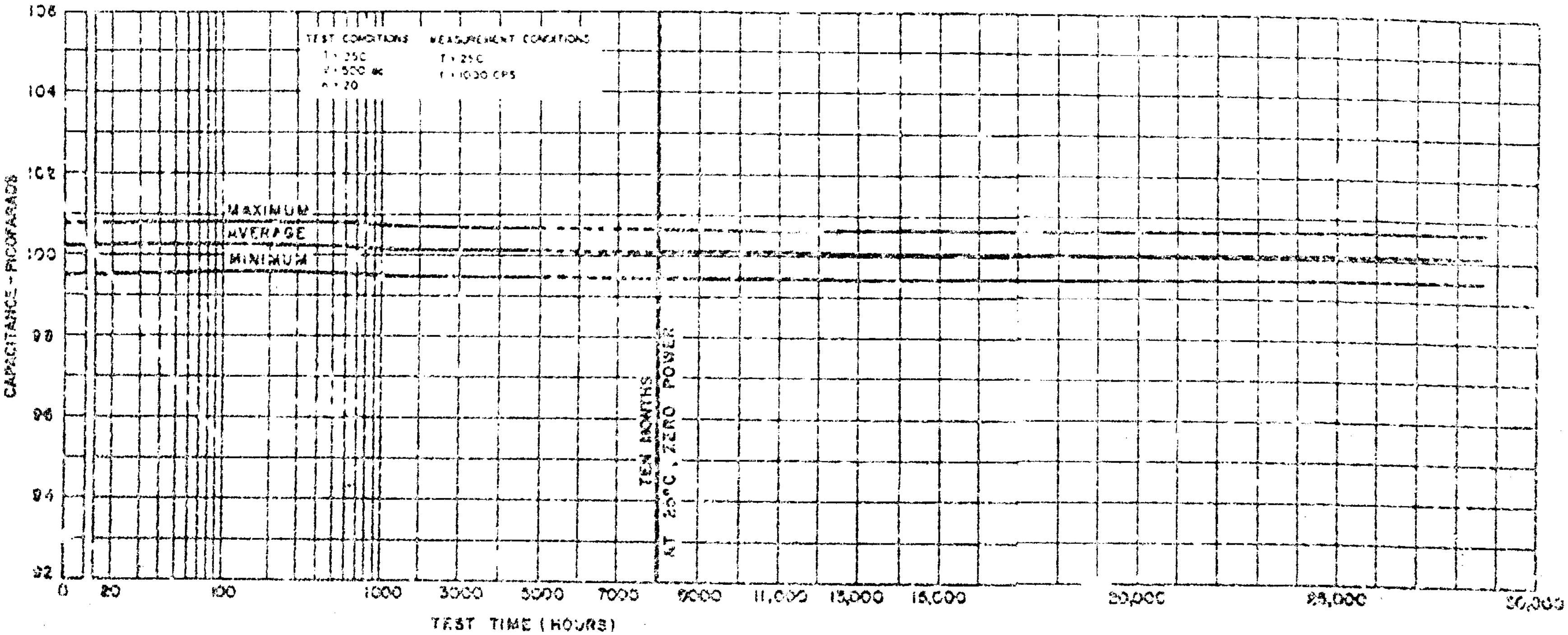
CAPACITANCE VALUES IN MMF

[illegible] PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	151.772	3.404	149.000	157.900
1008.	151.754	3.458	144.700	157.900
[illegible]	151.584	3.491	144.900	159.100
[illegible]	151.892	3.441	145.700	159.000
[illegible]	151.900	3.493	144.900	158.100
[illegible]	151.836	3.673	144.700	158.200
[illegible]	151.760	3.635	149.000	157.900
[illegible]	151.720	3.582	149.100	157.700
[illegible]	151.716	3.683	144.900	157.000
[illegible]	151.672	3.417	144.900	157.000
[illegible]	151.000	3.430	145.000	158.000
[illegible]	151.736	3.415	144.900	157.900
[illegible]	151.788	3.432	149.400	157.900
[illegible]	151.848	3.437	149.000	158.000
[illegible]	151.812	3.448	144.700	157.000

No Failures

Figure 3-24. R2045P151 - Phase VI - Capacitance



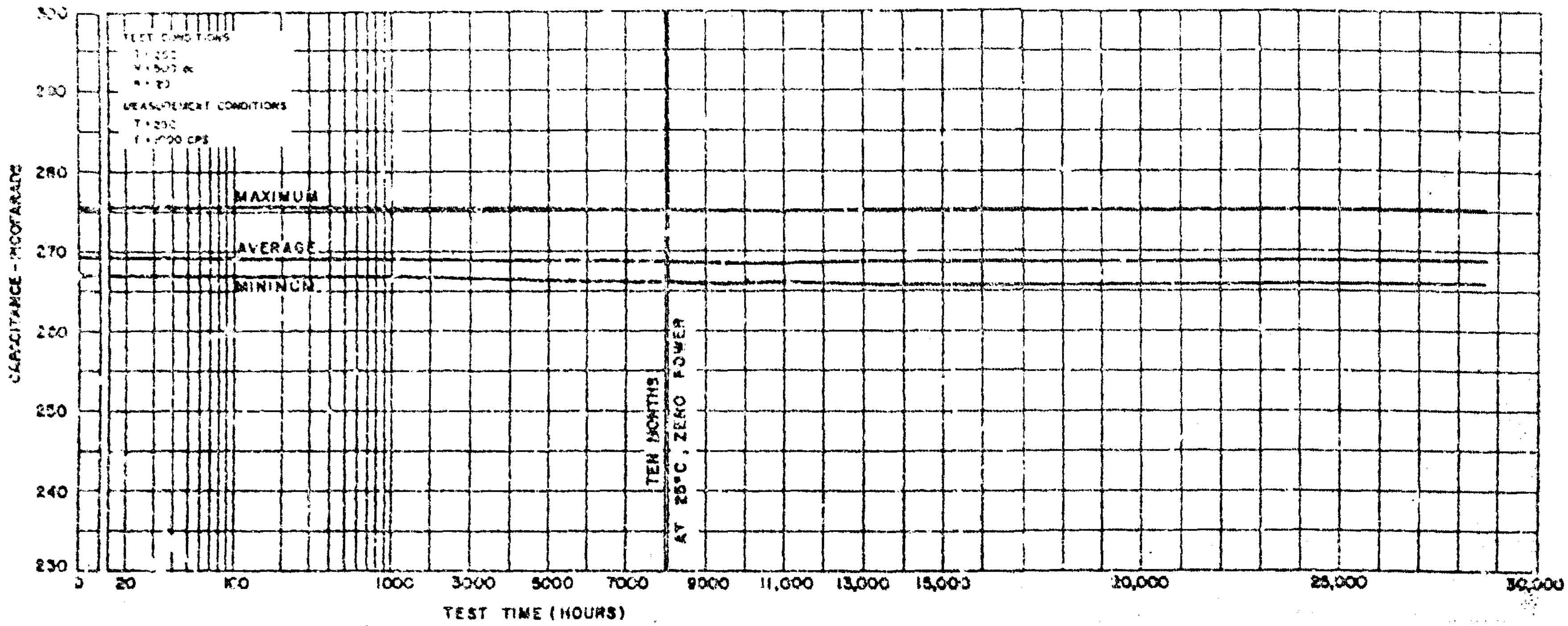
AMBIENT LIFE RS045P101 CAPACITANCE VALUES IN MMF

20 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	100.538	0.369	[illegible]	[illegible]
25.	[illegible]	0.377	[illegible]	[illegible]
[illegible]	[illegible]	0.377	[illegible]	[illegible]
676.	[illegible]	0.377	[illegible]	[illegible]
[illegible]	[illegible]	0.379	[illegible]	[illegible]
[illegible]	100.403	0.373	[illegible]	[illegible]
[illegible]	100.428	0.381	[illegible]	[illegible]
[illegible]	[illegible]	0.375	[illegible]	[illegible]
[illegible]	[illegible]	0.371	[illegible]	[illegible]
[illegible]	[illegible]	0.372	[illegible]	[illegible]
[illegible]	[illegible]	0.373	[illegible]	[illegible]
[illegible]	[illegible]	0.375	[illegible]	[illegible]
[illegible]	[illegible]	0.372	[illegible]	[illegible]
[illegible]	[illegible]	0.371	[illegible]	[illegible]
[illegible]	[illegible]	0.374	[illegible]	[illegible]
[illegible]	[illegible]	0.376	[illegible]	[illegible]
[illegible]	[illegible]	0.377	[illegible]	[illegible]
[illegible]	[illegible]	0.375	[illegible]	[illegible]

No Failures

Figure 3-25. RS045P101 - Ambient Life - Capacitance



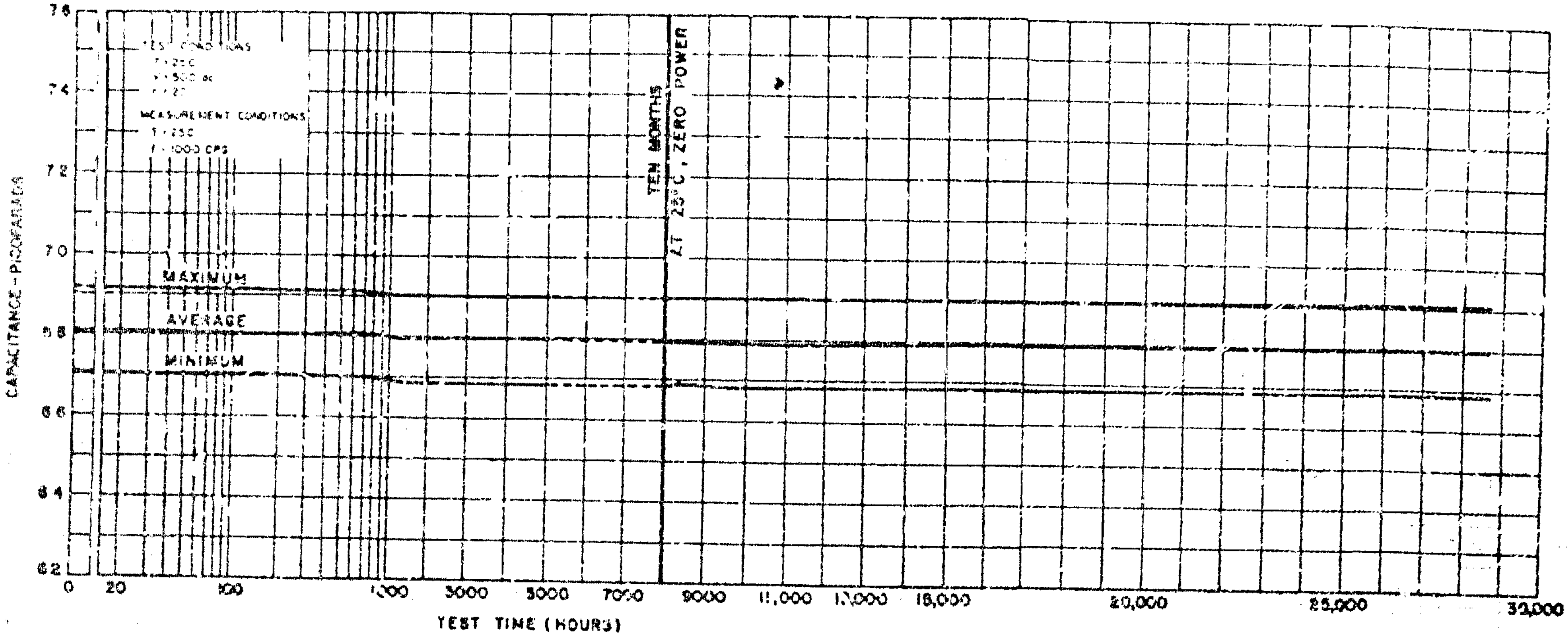
AMBIENT LIFE R2045P271 — CAPACITANCE VALUES IN MMF

25 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	269.267	2.390	266.706	275.030
39.	269.237	2.433	266.630	275.090
170.	269.202	2.433	264.606	275.040
476.	268.263	2.438	264.930	275.403
1134.	269.132	2.436	264.756	275.499
[illegible]	269.337	2.436	264.736	275.330
[illegible]	269.267	2.449	266.706	275.302
[illegible]	266.163	2.449	264.403	275.466
[illegible]	238.943	2.420	266.403	275.503
8367.	[illegible]	2.437	264.443	275.464
[illegible]	268.943	2.433	266.413	275.350
11261.	269.030	2.443	266.492	275.900
13215.	269.213	2.444	266.456	275.450
[illegible]	[illegible]	2.436	266.986	275.390
[illegible]	269.253	2.436	266.690	276.493
[illegible]	268.967	2.448	264.932	275.442
[illegible]	268.247	2.448	265.490	275.030
[illegible]	269.646	2.446	266.956	275.908

No Failures

Figure 3-26. R2045P271 - Ambient Life - Capacitance



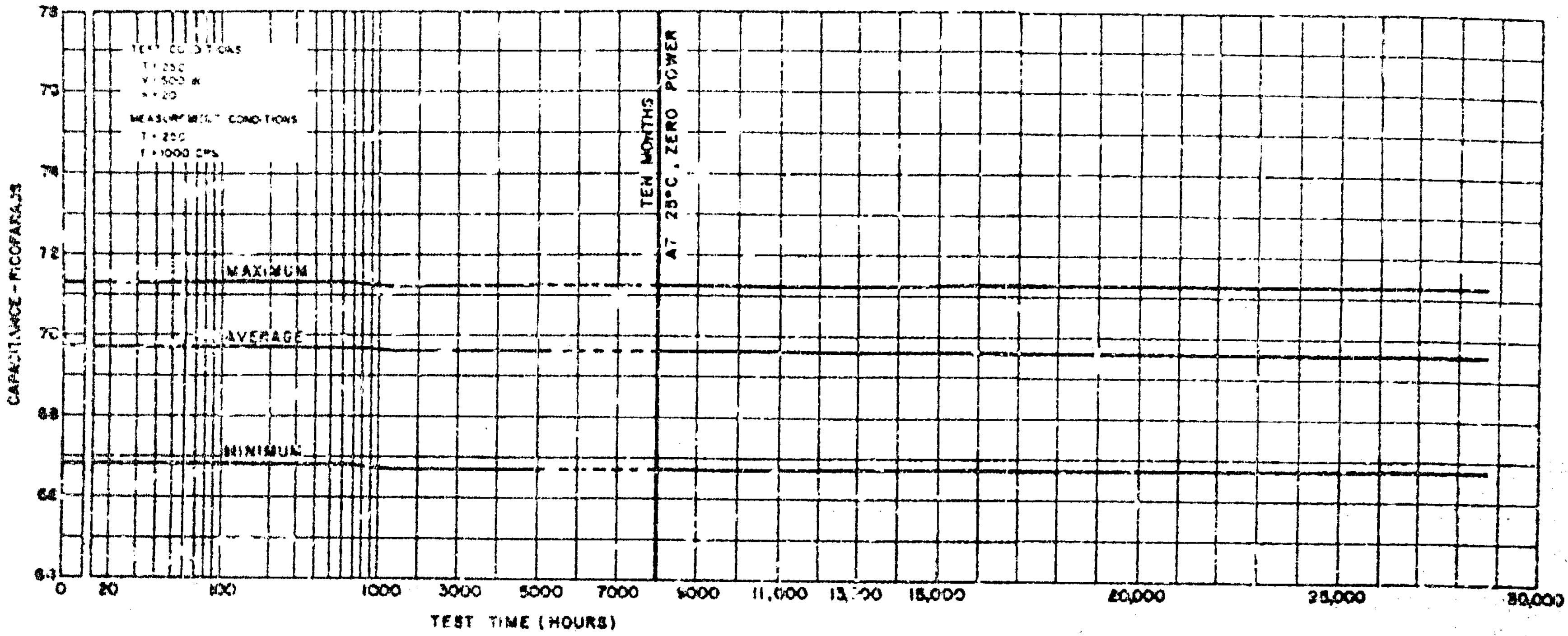
AMBIENT LIFE R2045P680 CAPACITANCE VALUES IN MMF

20 PART.

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	68.347	0.442	67.35[illegible]	69.473
29.	68.379	0.449	67.300	69.465
172.	68.354	0.445	67.319	69.479
476.	68.3[illegible]	0.446	67.3[illegible]	69.493
1352.	68.349	0.440	57.170	69.399
4043.	68.33[illegible]	0.444	67.179	69.338
5286.	68.296	0.445	67.275	69.358
8358.	68.263	0.440	67.100	69.255
8274.	68.273	0.446	67.278	69.349
[illegible]	68.275	0.448	67.[illegible]	69.379
9680.	68.290	0.447	67.170	69.349
11841.	68.288	0.460	67.190	69.389
13215.	68.276	0.469	67.148	69.328
15734.	68.271	0.440	67.170	69.349
[illegible]	68.294	0.447	67.319	69.495
21873.	68.288	0.444	67.319	69.398
25179.	68.[illegible]77	0.447	67.310	69.489
28400.	[illegible].289	0.445	67.315	69.405

No Failures

Figure 3-27. R2045P680 - Ambient Life - Capacitance



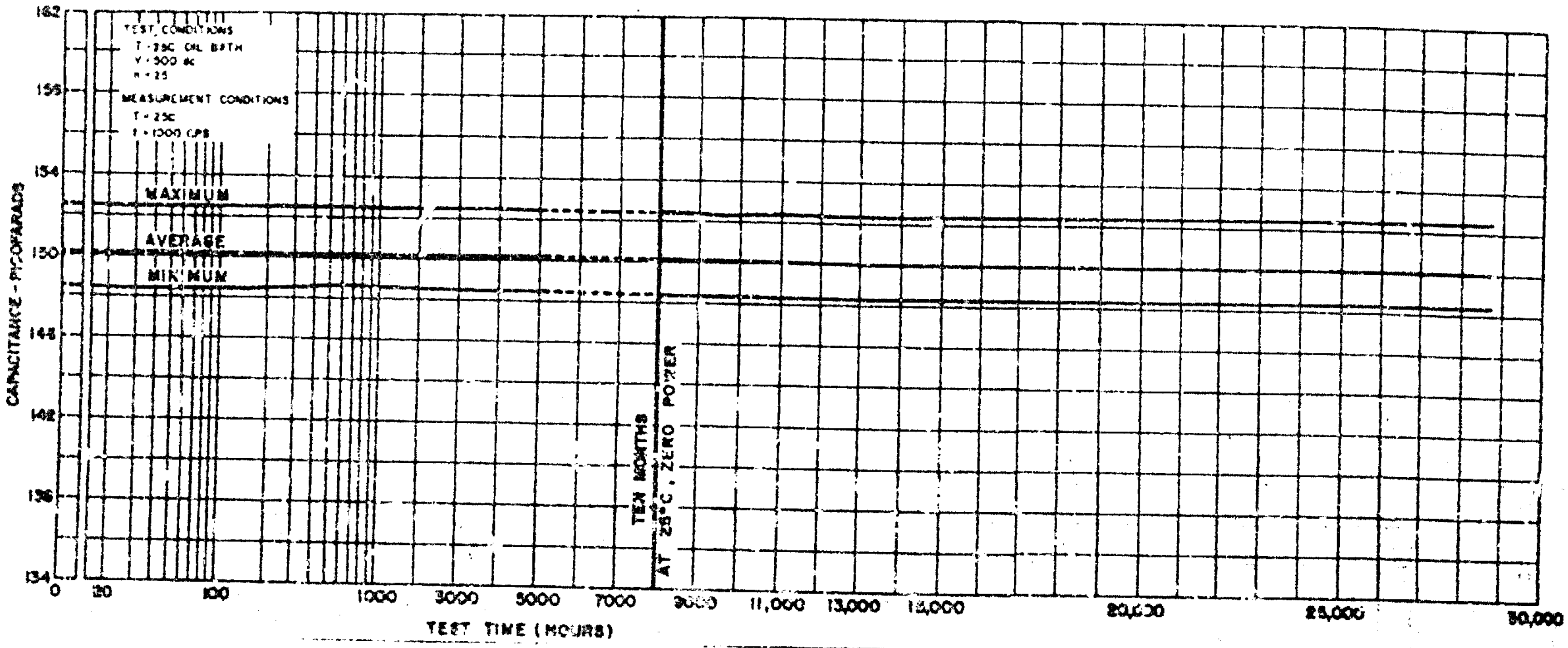
AMBIENT LIFE R2045P880A

CAPACITANCE VALUES IN MMF

	20 PARTS			
TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	70.014	1.498	67.118	71.621
20.	70.014	1.495	67.129	71.629
172.	70.020	1.497	67.105	72.646
[illegible]	70.016	1.475	67.125	71.629
1354.	69.912	1.507	[illegible]	71.915
[illegible]	69.891	1.496	67.089	71.911
[illegible]	69.906	1.496	67.010	71.944
[illegible]	69.912	1.493	67.030	71.920
[illegible]	[illegible]	[illegible]	67.019	71.919
[illegible]	69.919	[illegible]	67.124	71.936
[illegible]	69.910	[illegible]	67.036	71.958
11541.	69.929	1.490	67.038	71.948
13215.	69.896	1.490	67.034	71.908
15734.	69.912	1.496	67.022	[illegible]
18990.	70.043	1.493	67.168	71.645
21872.	69.813	1.476	[illegible]	71.650
23170.	70.029	1.495	67.140	71.680
28588.	70.042	1.490	67.108	71.650

No Failures

Figure 3-28. R2045P880 Rev. A Ambient Life - Capacitance



AMBIENT LIFE [illegible]

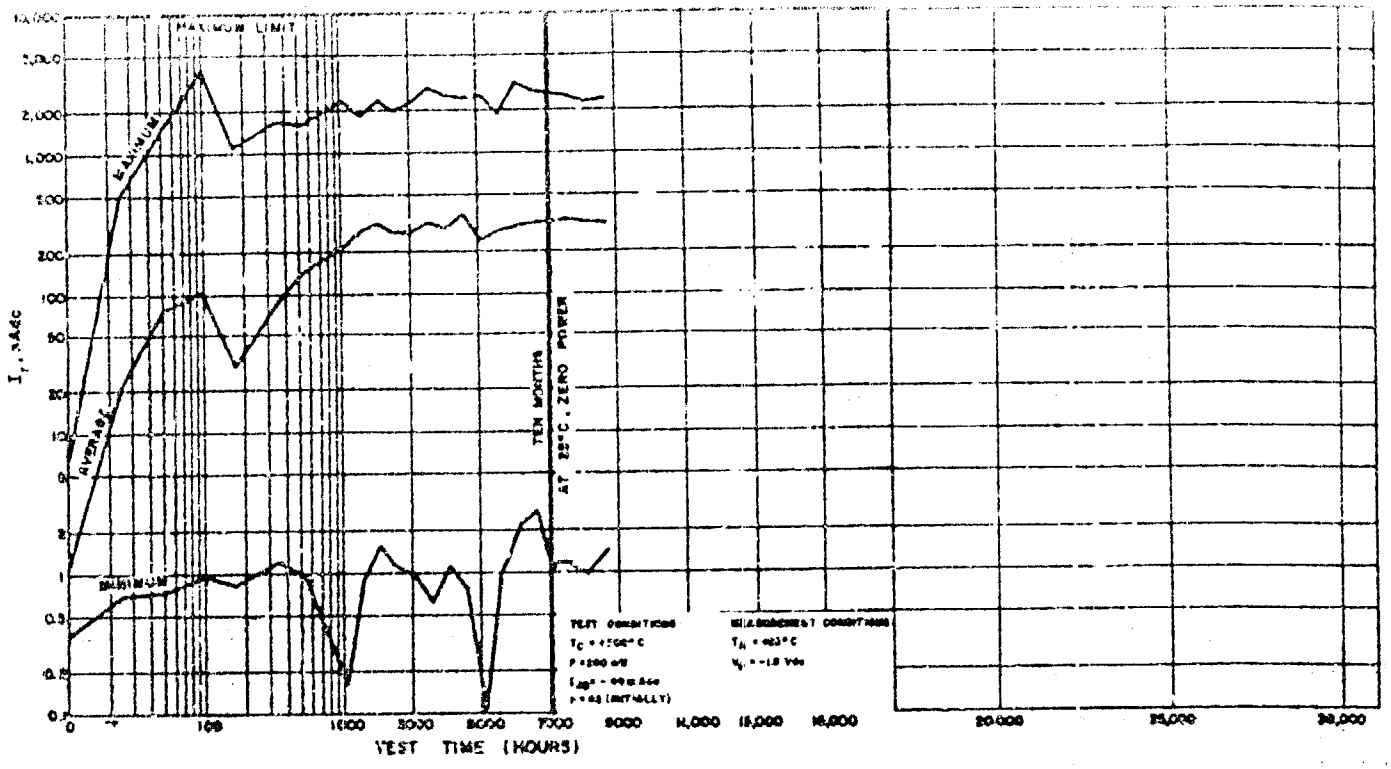
CAPACITANCE VALUES IN [illegible]

25 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	150.452	1.255	147.730	152.790
29.	150.412	1.236	148.699	152.900
172.	150.457	1.236	148.752	152.760
476.	150.455	1.216	148.632	152.710
1376.	150.355	1.216	148.790	152.640
4243.	150.337	1.219	148.090	152.600
7256.	150.335	1.223	148.650	152.600
8258.	150.323	1.224	148.420	152.600
8224.	150.310	1.224	148.600	152.600
2567.	150.145	1.224	148.490	152.410
9602.	150.000	1.212	148.390	151.900
11001.	150.332	1.222	148.422	152.900
12215.	150.297	1.238	148.470	152.400
15734.	150.287	1.237	148.650	152.992
16640.	150.400	1.255	148.770	152.690
21823.	150.27	1.207	148.775	152.900
25170.	150.412	1.202	148.[illegible]	152.700
28806.	150.478	1.183	148.750	152.702

No Failures

Figure 3-29. R2045P151 - Ambient Life - Capacitance



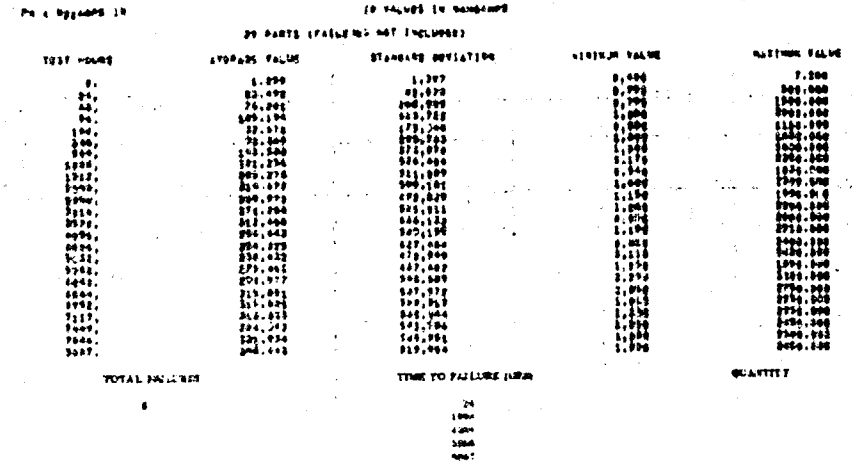
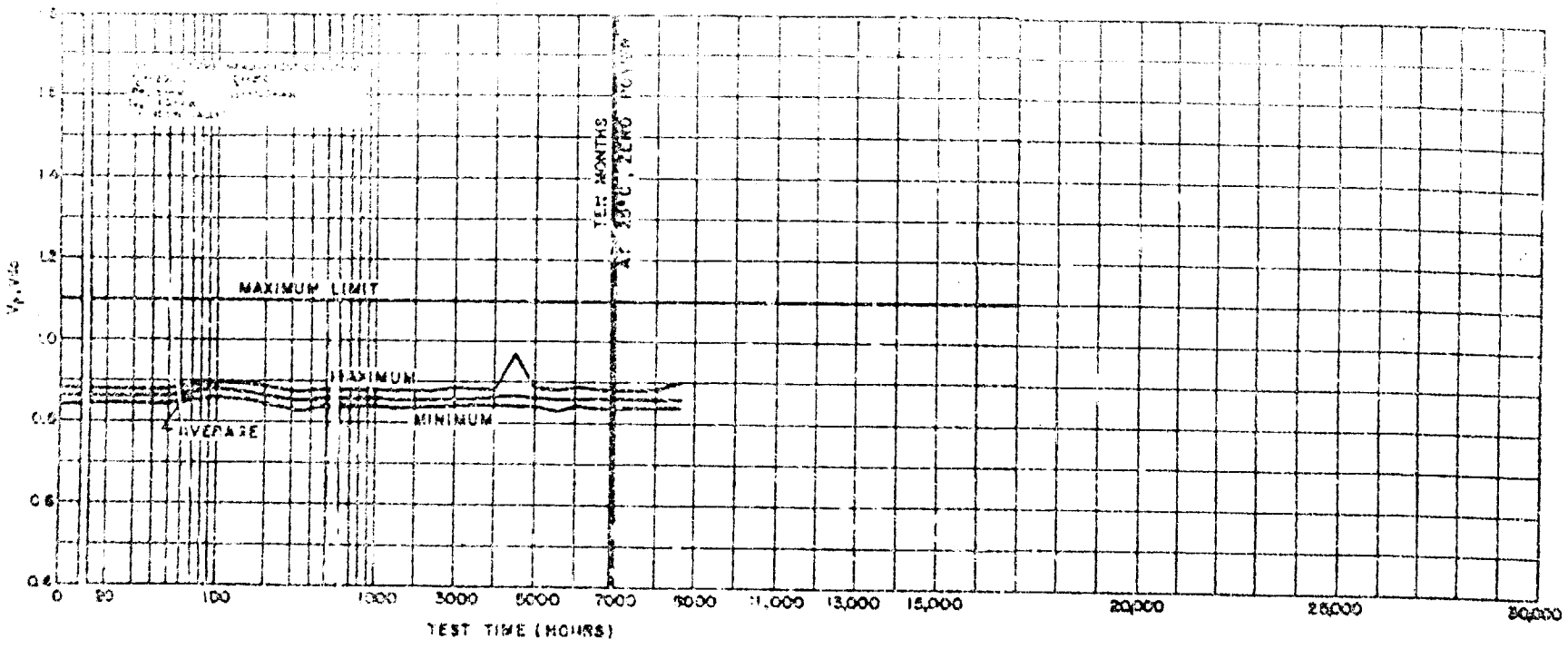


Figure 3-30. R2008P5, Phase IV, I_R

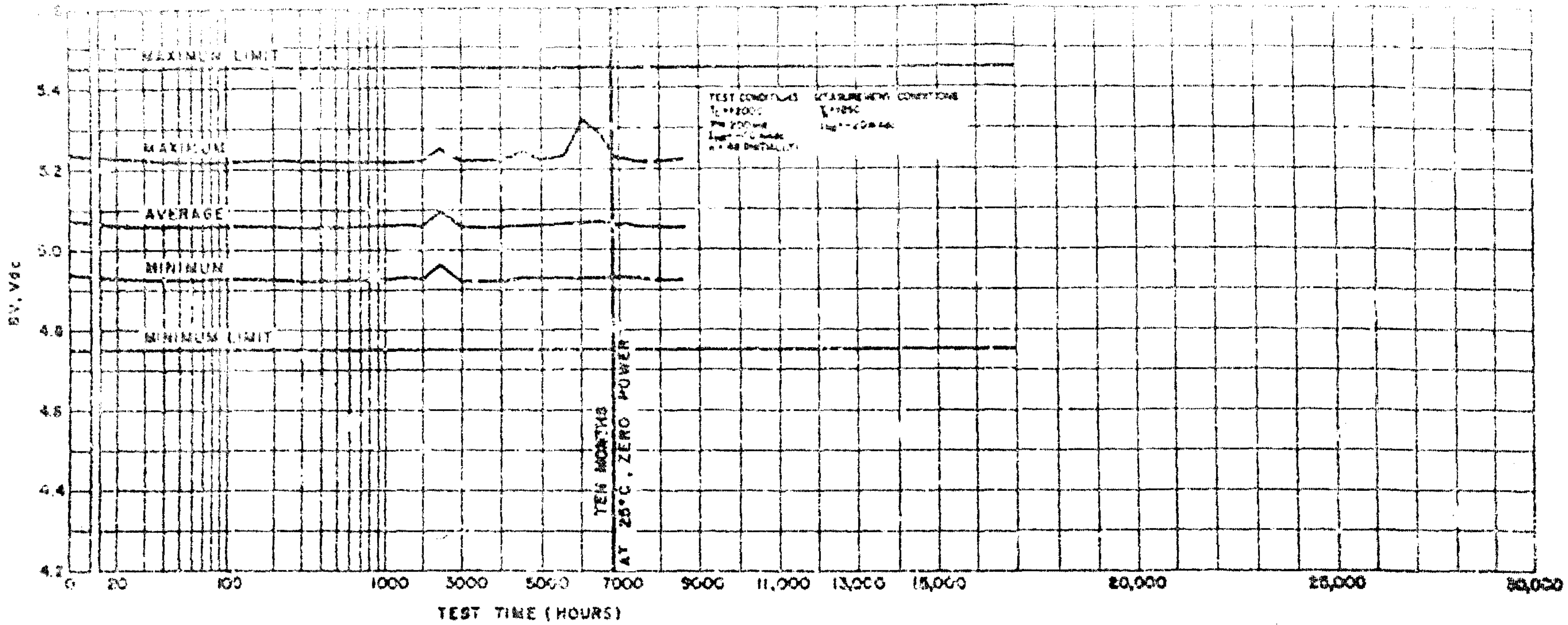


TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0	0.842	0.009	0.844	0.881
20	0.841	0.009	0.843	0.879
48	0.842	0.010	0.843	0.881
96	0.842	0.010	0.844	0.880
168	0.874	0.009	0.891	0.898
340	0.857	0.009	0.859	0.878
504	0.856	0.008	0.842	0.870
1008	0.862	0.009	0.845	0.882
1512	0.858	0.009	0.836	0.879
2184	0.855	0.009	0.837	0.878
3528	0.858	0.009	0.840	0.879
4816	0.862	0.010	0.837	0.897
5784	0.864	0.009	0.849	0.884
7095	0.862	0.010	0.843	0.883
8328	0.864	0.010	0.847	0.878
9240	0.864	0.011	0.846	0.889
9408	0.858	0.010	0.831	0.882
9576	0.861	0.011	0.840	0.889
9744	0.860	0.010	0.838	0.883
9912	0.860	0.010	0.842	0.881
10080	0.860	0.010	0.842	0.882
10248	0.863	0.010	0.843	0.882
10416	0.859	0.010	0.841	0.882
10584	0.860	0.011	0.838	0.884
10752	0.862	0.013	0.843	0.884

TOTAL FAILURES
0

TIME TO FAILURE (HRS)	QUANTITY
24	1
1968	1
4584	1
5760	1
6672	1

Figure 3-31. R2008P5, Phase IV, V_F



PH 4 R200SP5 BV

BV VALUES IN VOLTS

39 PARTS (FAILURES NOT INCLUDED)

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
5.	5.073	0.032	4.941	5.214
23.	5.076	0.043	4.996	5.219
48.	[illegible]	0.064	4.932	5.215
99.	5.039	0.083	4.919	5.219
150.	5.057	0.055	4.929	5.228
300.	5.093	0.059	4.933	5.219
510.	5.057	0.097	4.934	5.210
1077.	5.078	0.043	4.935	5.219
1518.	5.056	0.047	4.939	5.218
2158.	5.064	0.053	4.933	[illegible]
2480.	5.078	0.051	4.997	5.232
3111.	5.093	0.043	4.923	5.219
3588.	5.085	0.043	4.921	5.219
4078.	5.092	0.053	4.919	5.231
4516.	5.058	0.053	4.939	5.239
5532.	5.079	0.062	4.929	5.232
5939.	5.061	0.061	4.929	5.219
6048.	5.065	0.051	4.929	5.319
6514.	5.059	0.049	4.926	5.279
6852.	5.057	0.053	4.929	5.222
7110.	5.062	0.055	4.920	5.232
7440.	5.095	0.057	4.924	5.459
7833.	5.056	0.063	4.921	5.215
8437.	5.095	0.053	4.921	5.229

TOTAL FAILURES	TIME TO FAILURE (HRS)	QUANTITY
6	24	1
	1008	1
	[illegible]	1
	[illegible]	1
	8607	2

Figure 3-32. R200SP5, Phase IV, BV

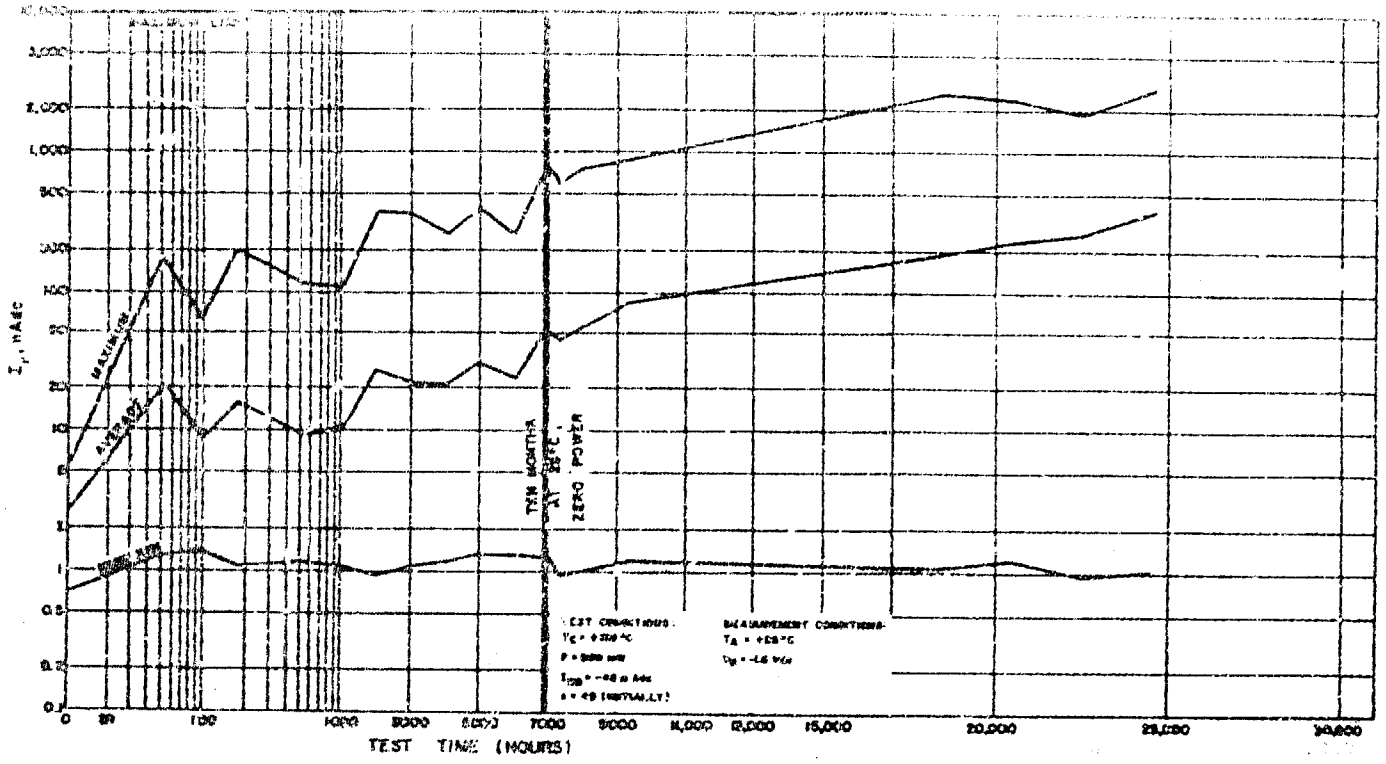
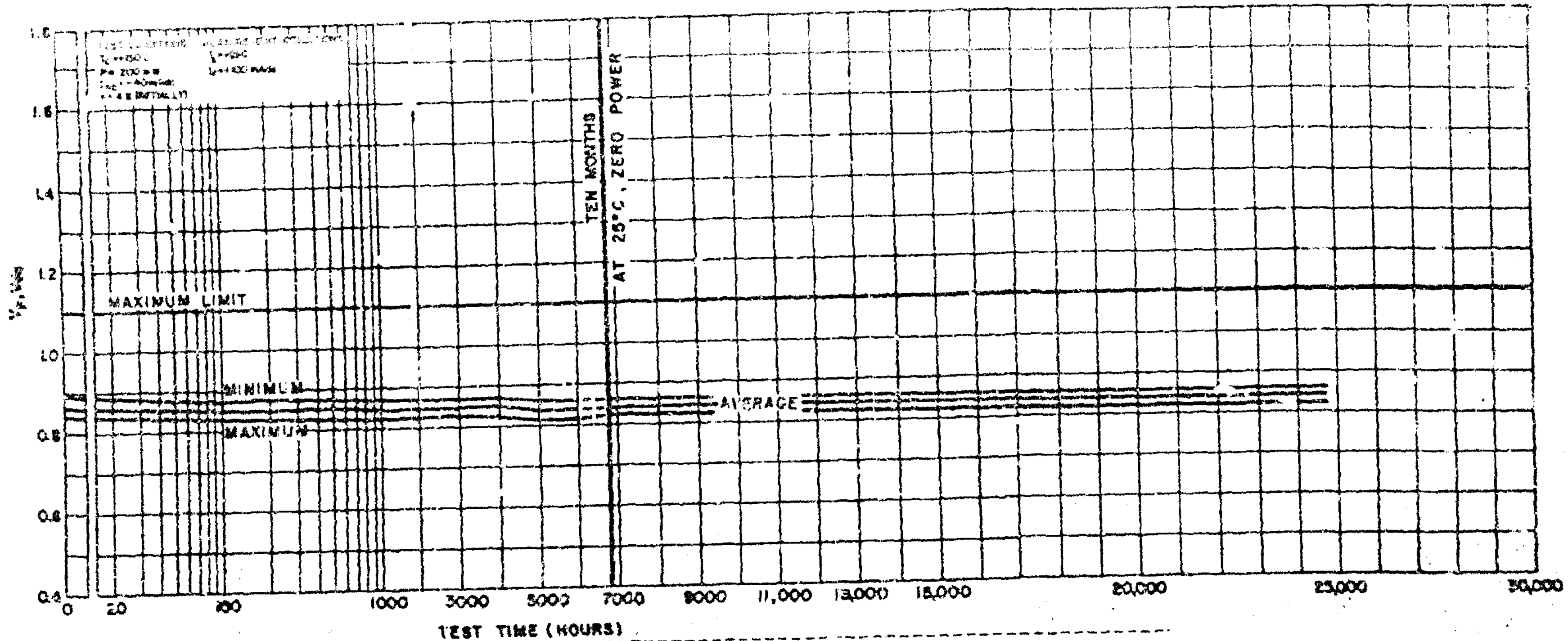


Figure 3-33. R2008P5, Phase V, I_R



PHASE 5 R2008P5 VF

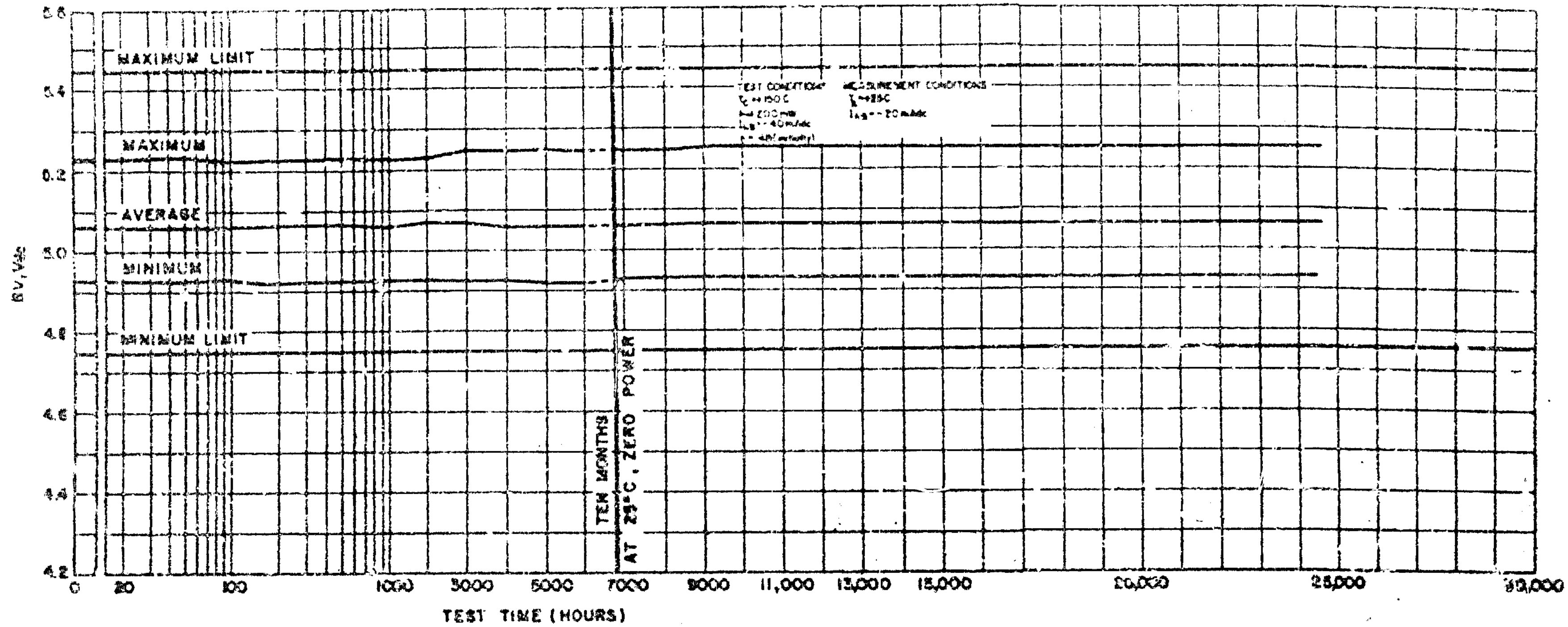
VF VALUES IN VOLTS

34 PARTS (FAILURES NOT INCLUDED)

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	0.844	0.010	0.849	0.883
48.	0.897	0.039	0.839	0.872
[illegible]	0.870	0.118	0.828	0.869
168.	0.852	0.089	0.839	0.872
504.	0.858	0.100	0.845	0.874
1010.	0.848	0.010	[illegible]	0.866
2208.	0.849	0.010	0.831	0.866
[illegible]	0.849	0.010	0.841	0.856
[illegible]	0.852	0.010	0.848	0.868
4993.	0.838	0.011	0.818	0.859
[illegible]	0.829	0.010	0.828	0.859
[illegible]	0.844	0.010	[illegible]	0.862
7310.	0.848	0.010	0.831	0.856
7348.	0.841	0.014	0.824	0.855
7947.	0.841	0.099	0.823	0.859
[illegible]	0.847	0.010	0.825	0.859
[illegible]	0.841	0.010	0.824	0.859
[illegible]	0.839	0.010	0.822	0.856
[illegible]	0.846	0.010	0.822	0.859
14471.	0.839	0.010	0.821	0.859
[illegible]	0.847	0.010	0.819	[illegible]
[illegible]	0.876	0.010	0.829	0.855
22647.	0.834	0.010	0.815	0.856
[illegible]	0.830	0.010	0.871	0.855

TOTAL FAILURES	TIME TO FAILURE (HRS)	QUANTITY
2	1010	1
	12808	1

Figure 3-34. R2008P5, Phase V, V_F



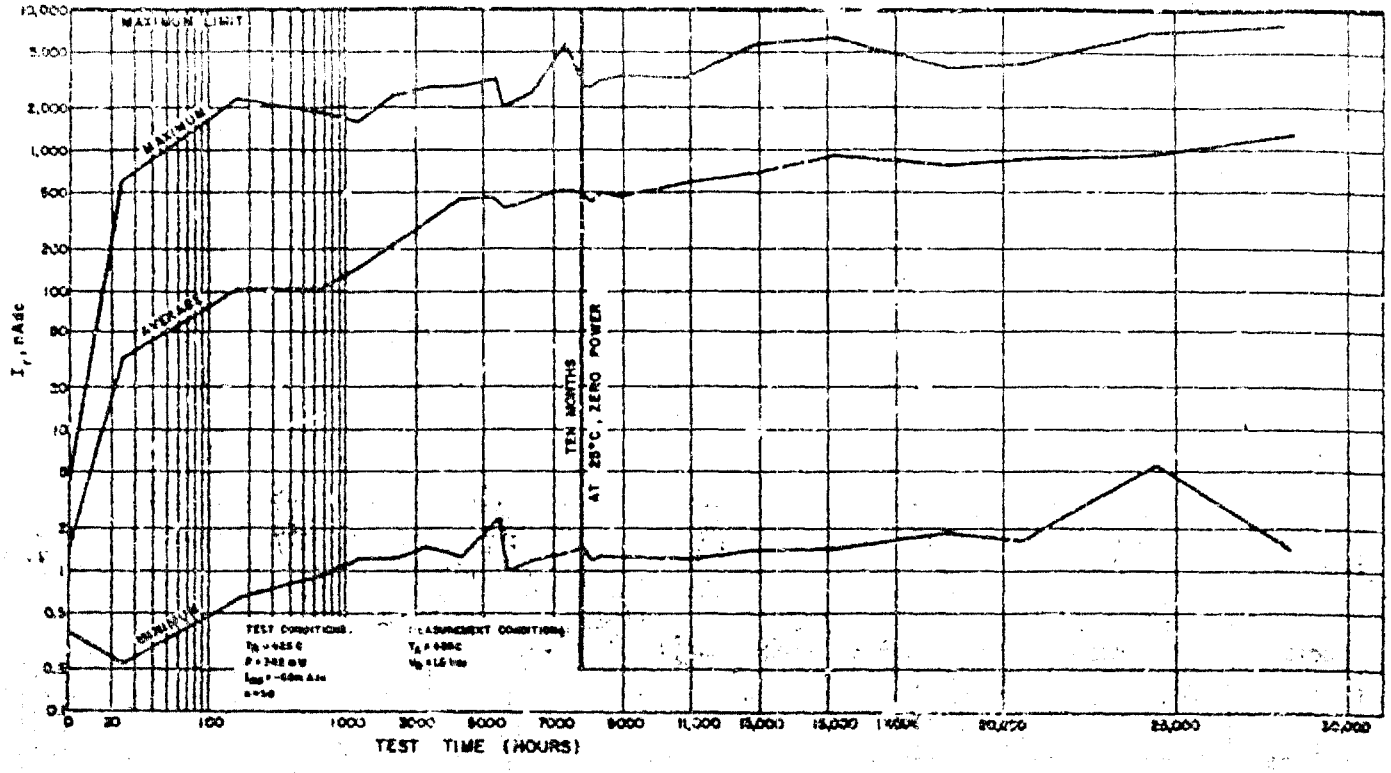
PHASE 5 R2008P5 BY — BV VALUES IN VOLTS

24 PARTS (FAILURES NOT INCLUDED)

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	5.054	0.070	4.922	5.236
48.	5.050	0.100	4.919	5.239
93.	5.055	0.108	4.933	5.230
169.	5.054	0.079	4.941	5.236
504.	5.047	0.088	4.935	5.232
1016.	5.046	0.100	4.940	5.241
2001.	5.060	0.079	4.941	5.268
3000.	5.061	0.079	4.940	5.265
4034.	5.057	0.108	4.909	5.239
4991.	5.070	0.091	4.949	5.240
6043.	5.073	0.138	4.938	5.238
6896.	5.067	0.105	4.940	5.254
7014.	5.063	0.094	4.923	5.249
7240.	5.063	0.104	4.933	5.249
7947.	5.065	0.106	4.932	5.240
9326.	5.058	0.087	4.947	5.234
10001.	5.071	0.102	4.948	5.256
11950.	5.070	0.105	4.948	5.292
14340.	5.062	0.103	4.940	5.234
14671.	5.058	0.105	4.936	5.292
15336.	5.078	0.095	4.939	5.294
20470.	5.069	0.086	4.935	5.291
22167.	5.076	0.096	4.941	5.252
24030.	5.073	0.097	4.937	5.256

TOTAL FAILURES	TIME TO FAILURE (HRS)	QUANTITY
2	1016	1
	1800	1

Figure 3-35. R2008P5, Phase V, BV



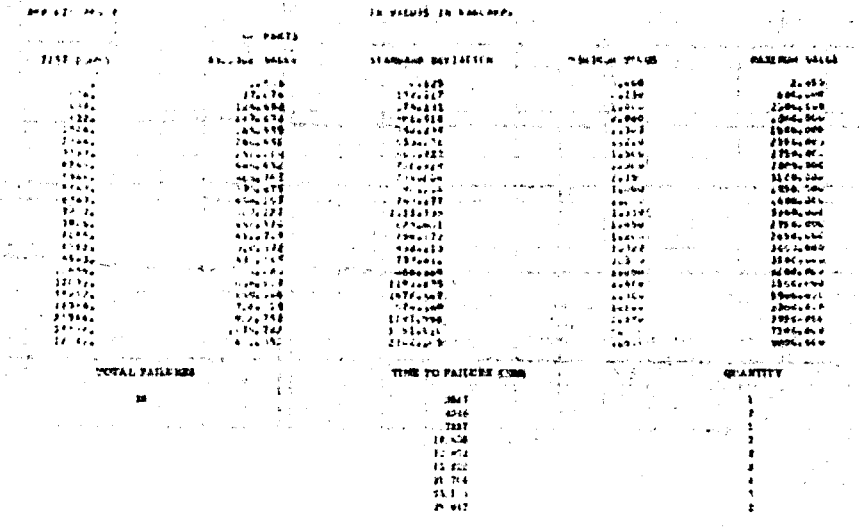
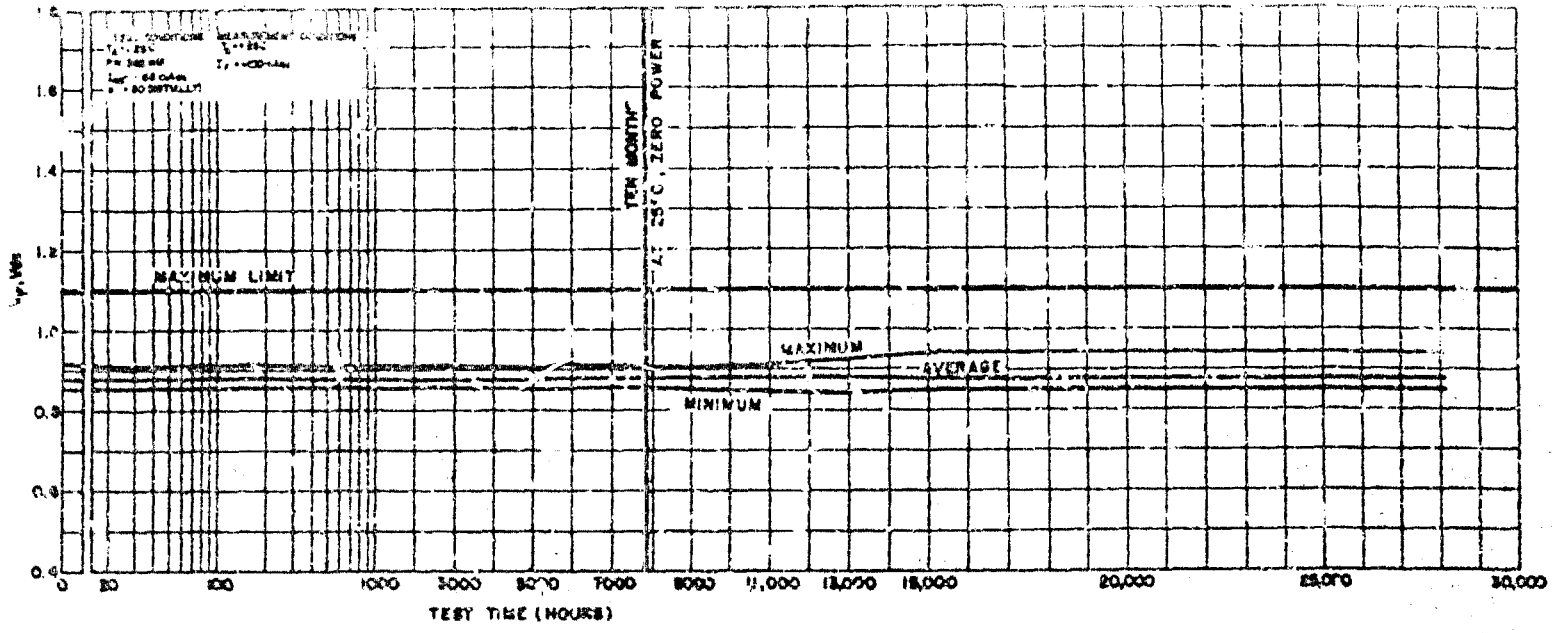
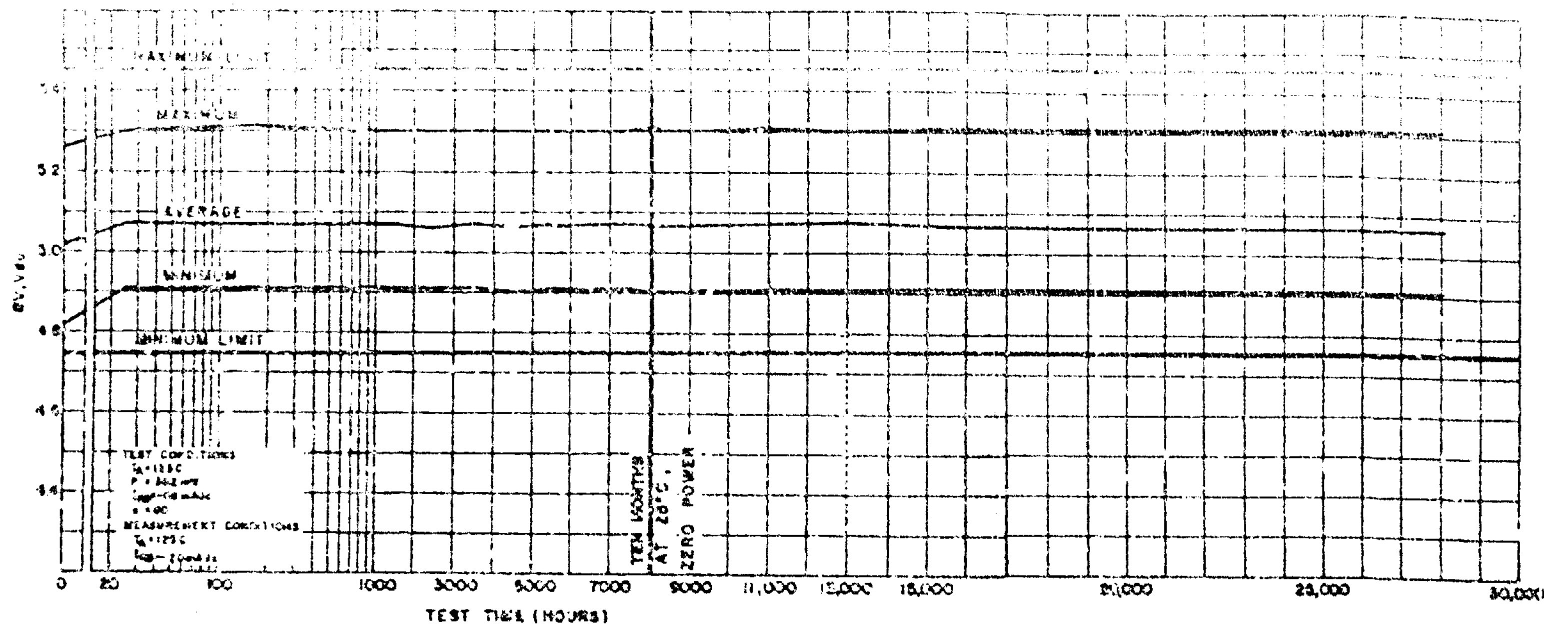


Figure 3-36. R2008P5, Ambient Life L_R



TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TOTAL FAILURES	TIME TO FAILURE (HRS)	QUANTITY
36	[illegible]	[illegible]



BV VALUES IN VOLTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
[illegible]	[illegible]	[illegible]	4.823	5.239
24.	[illegible]	[illegible]	4.913	5.191
168.	[illegible]	[illegible]	[illegible]	5.190
472.	5.059	0.111	[illegible]	5.290
1344.	5.059	0.111	4.909	5.189
[illegible]	5.055	0.111	4.905	5.284
[illegible]	5.052	[illegible]	[illegible]	5.250
[illegible]	5.056	[illegible]	4.912	5.284
[illegible]	5.058	0.112	[illegible]	5.281
[illegible]	5.057	0.111	4.942	5.209
[illegible]	5.058	0.111	4.919	5.289
[illegible]	5.058	[illegible]	[illegible]	5.290
[illegible]	5.054	0.112	4.904	5.287
[illegible]	5.054	0.111	4.945	5.287
[illegible]	[illegible]	0.111	4.903	5.286
[illegible]	[illegible]	0.112	4.908	5.290
[illegible]	[illegible]	0.112	4.912	5.291
[illegible]	[illegible]	0.112	4.910	5.293
[illegible]	[illegible]	0.112	4.912	5.293
[illegible]	[illegible]	0.112	4.911	5.290
21504.	[illegible]	0.112	4.911	5.297
[illegible]	[illegible]	0.112	4.914	5.301
[illegible]	[illegible]	0.112	4.913	5.304

TOTAL FAILURES	TIME TO FAILURE (HRS)	QUANTITY
30	7047	1
	6344	3
	7317	1
	10,850	3
	14,372	2
	16,330	3
	21,756	4
	26,130	3
	34,542	2

Figure 3-38. R2008P5, Ambient Life, BV

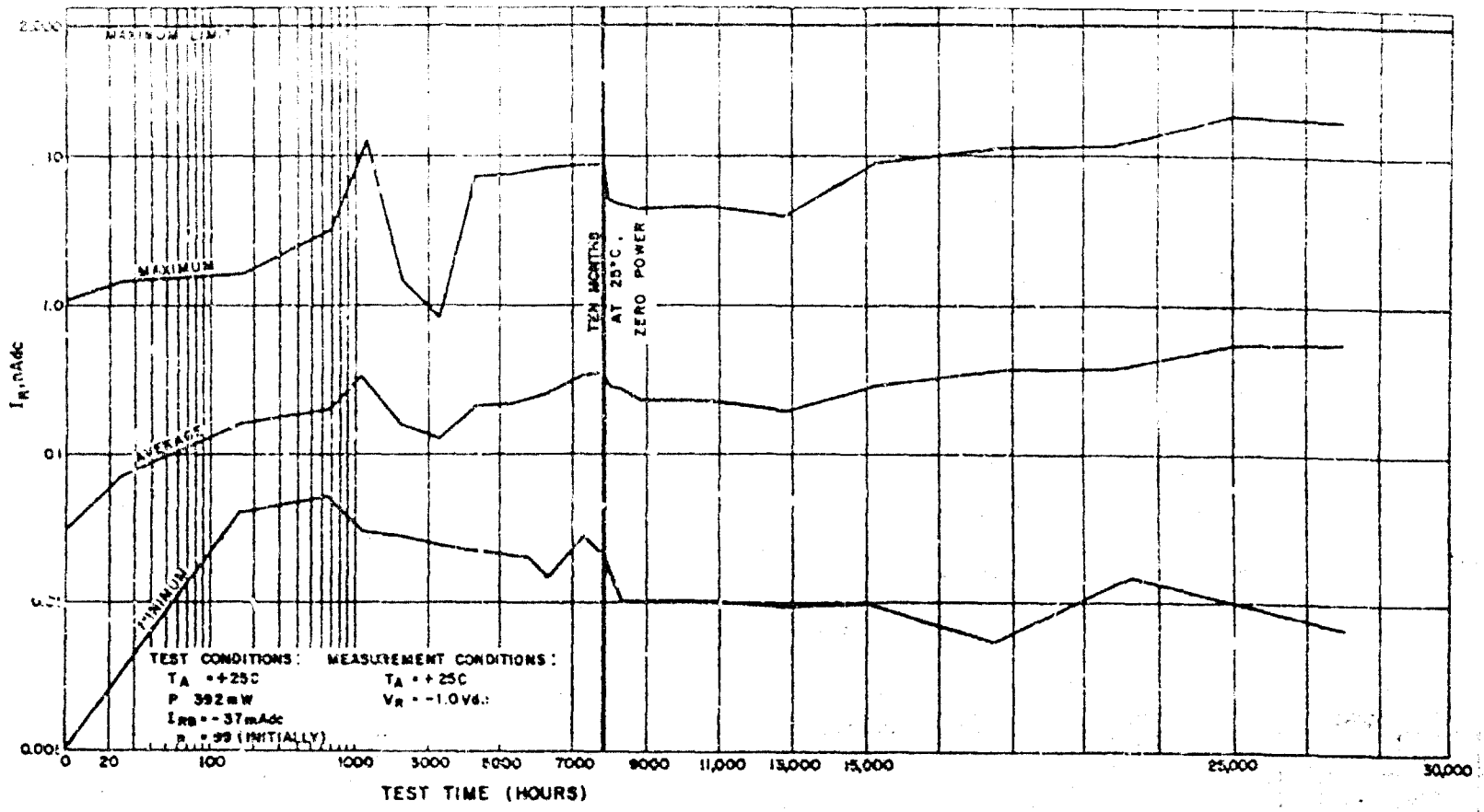
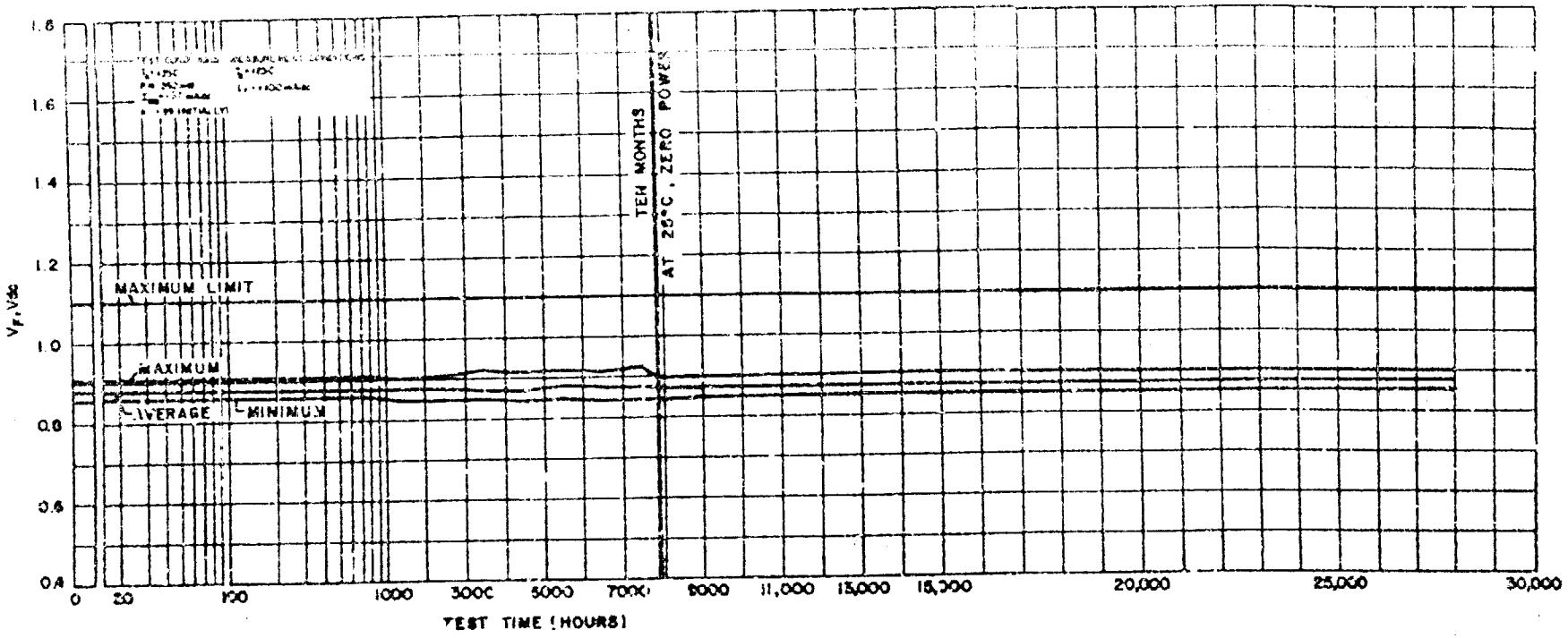


Figure 3-39. Parameter Trend Chart, R2008P10, Ambient Life, I_R



AMBLIFE R2008P10 VF

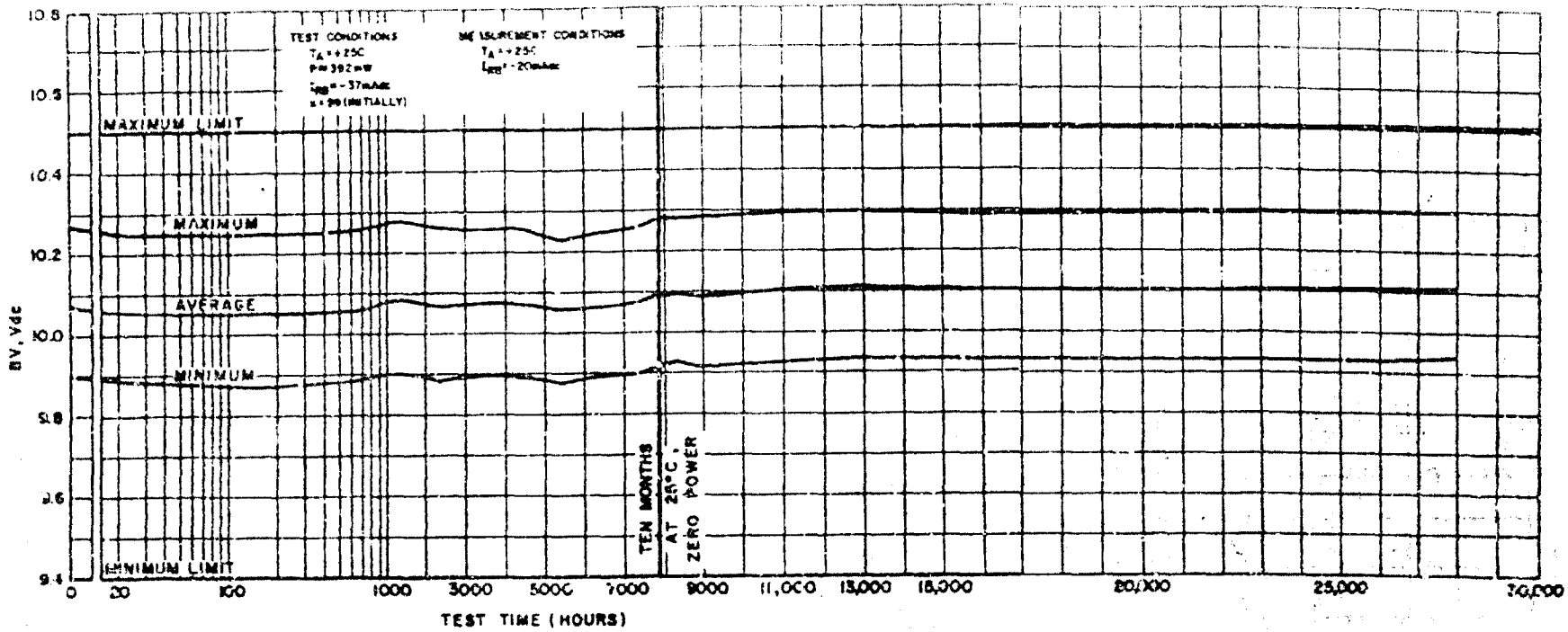
VF VALUES IN VOLTS

60 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	0.886	0.011	0.863	0.913
24.	0.885	0.011	0.863	0.912
168.	0.889	0.012	0.862	0.912
672.	0.884	0.012	0.868	0.910
1336.	0.879	0.012	0.859	0.908
2344.	0.881	0.013	0.859	0.903
3344.	0.878	0.013	0.853	0.910
4344.	0.877	0.012	0.849	0.915
5344.	0.888	0.013	0.851	0.920
6344.	0.879	0.014	0.849	0.919
7344.	0.878	0.014	0.849	0.920
7548.	0.876	0.012	0.858	0.904
8614.	0.876	0.012	0.858	0.904
8341.	0.874	0.012	0.851	0.903
8932.	0.874	0.012	0.851	0.904
10014.	0.875	0.012	0.851	0.904
12631.	0.874	0.013	0.852	0.909
15101.	0.873	0.012	0.848	0.902
18718.	0.874	0.013	0.849	0.903
21743.	0.874	0.012	0.852	0.902
23899.	0.874	0.012	0.850	0.905
25861.	0.878	0.013	0.852	0.906

TOTAL FAILURES	TIME TO FAILURE (HRS)	QUANTITY
1	15,131	1

Figure 3-40. Parameter Trend Chart, R2008P10, Ambient Life, V_F



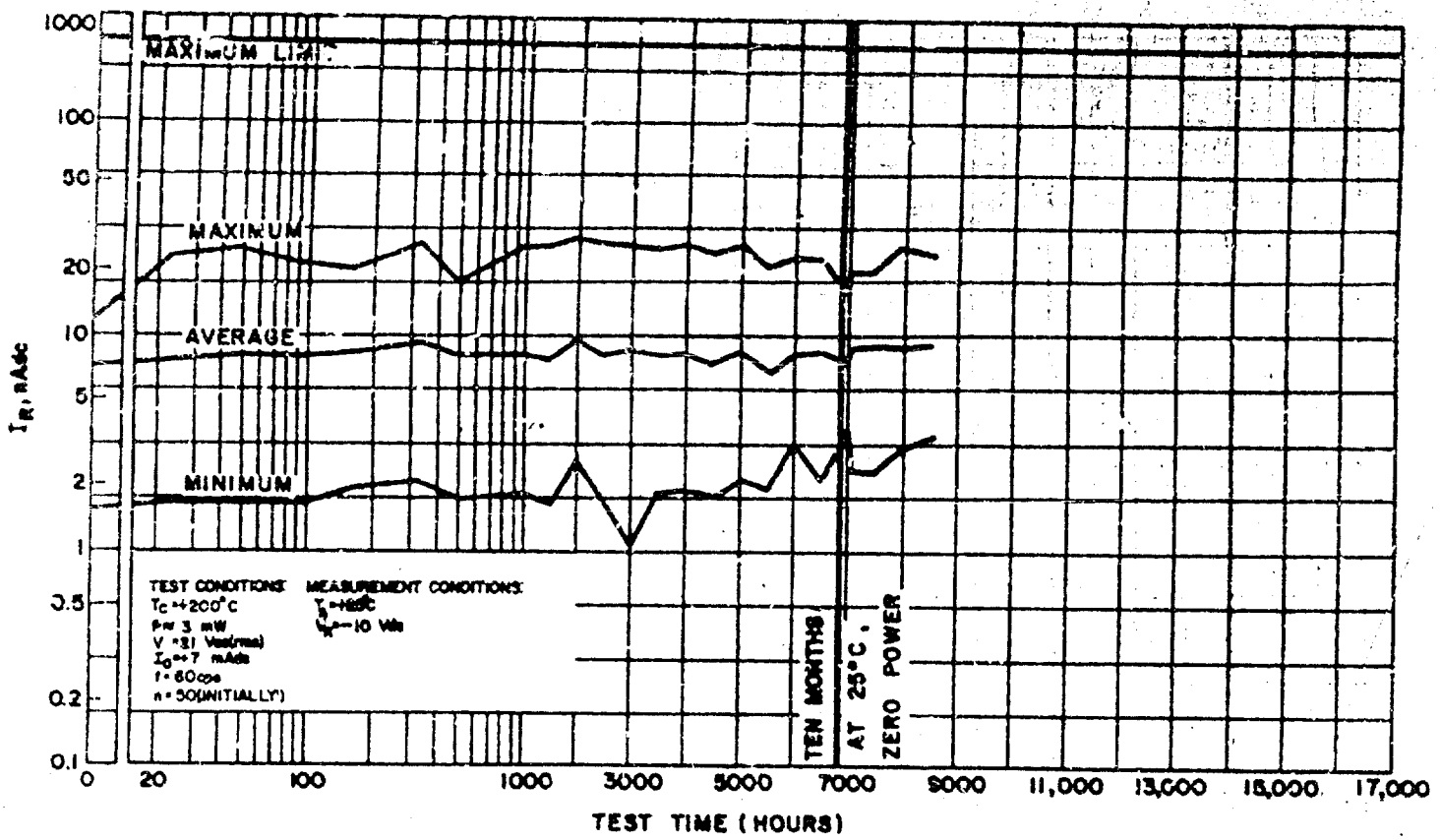
BV VALUES IN VOLTS

89 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	10.073	0.086	9.924	10.269
24.	10.056	0.091	9.889	10.249
144.	10.056	0.092	9.879	10.249
672.	10.062	0.093	9.889	10.259
1344.	10.086	0.093	9.919	10.279
2344.	10.065	0.091	9.888	10.259
3344.	10.071	0.090	9.899	10.259
4344.	10.073	0.091	9.899	10.259
5344.	10.071	0.091	9.879	10.229
6344.	10.069	0.090	9.899	10.249
7344.	10.067	0.089	9.899	10.259
7848.	10.076	0.091	9.922	10.284
8614.	10.089	0.091	9.921	10.282
8341.	10.094	0.091	9.939	10.284
8822.	10.087	0.091	9.916	10.286
10814.	10.102	0.091	9.931	10.294
12631.	10.109	0.090	9.937	10.297
15102.	10.106	0.091	9.937	10.292
18713.	10.105	0.090	9.928	10.284
21743.	10.101	0.091	9.925	10.282
25095.	10.108	0.090	9.926	10.288
28031.	10.093	0.090	9.919	10.268

TOTAL FAILURES	TIME TO FAILURE (HRS)	QUANTITY
1	15,141	1

Figure 3-41. Parameter Trend Chart, R2008P10, Ambient Life, BV



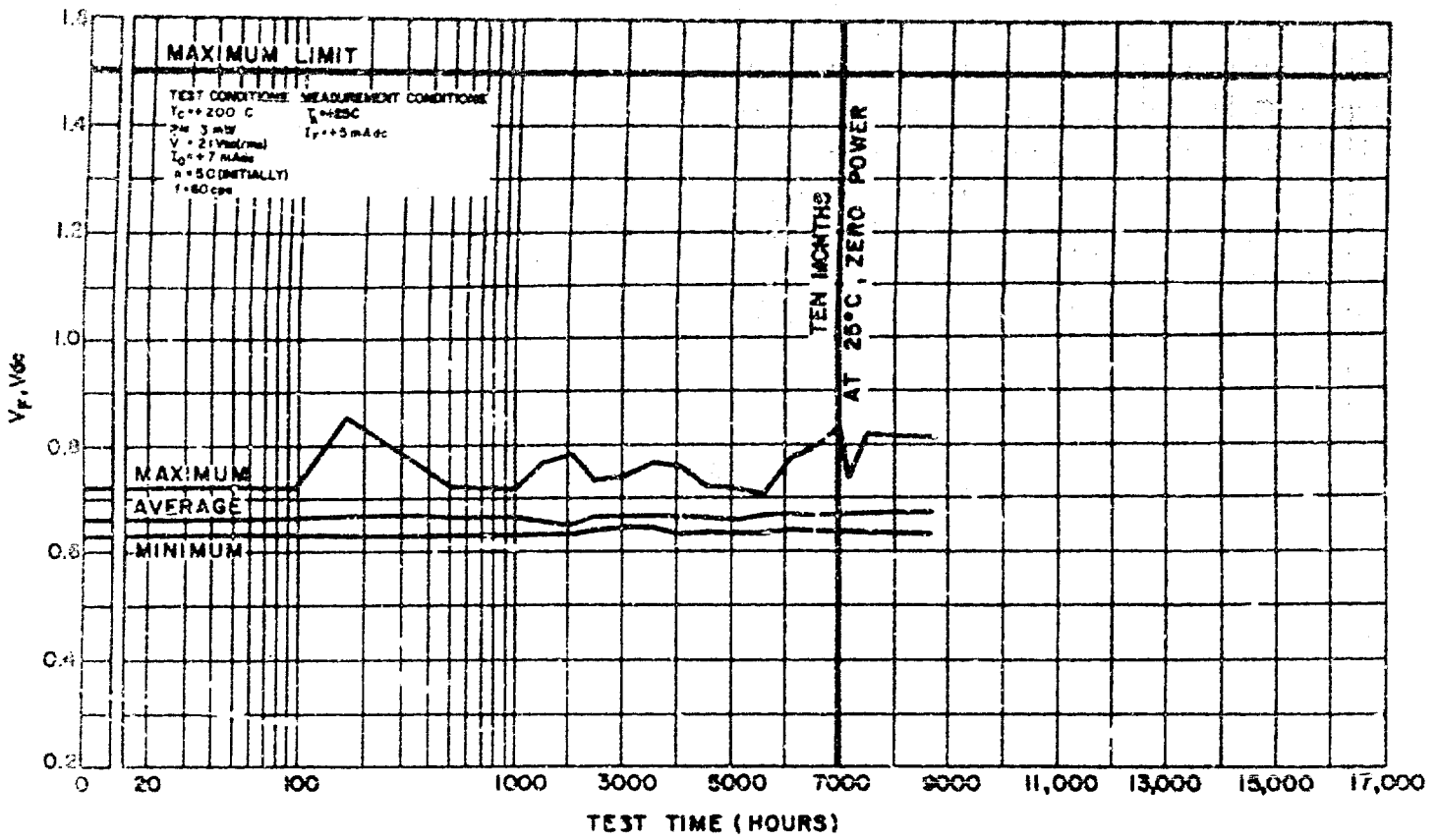
PH 4 R2010P1 1A — IR VALUES IN NANOAMPS

49 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	7.152	2.923	1.650	11.500
24.	7.944	3.087	1.720	24.500
48.	8.132	3.127	1.730	25.000
96.	8.165	3.022	1.700	24.000
168.	8.670	2.933	1.950	20.000
340.	9.353	3.457	2.150	26.800
504.	8.084	3.224	1.800	24.500
1000.	8.567	3.469	1.950	26.500
1512.	7.768	3.308	1.700	25.100
2000.	8.099	3.769	2.070	28.000
2496.	8.094	3.502	1.800	26.500
3000.	8.417	3.583	1.930	25.500
3520.	7.908	3.322	1.900	25.000
4000.	8.010	3.585	1.990	26.800
4520.	7.824	3.297	1.850	24.500
5032.	8.241	3.516	2.250	26.000
5536.	8.798	4.978	1.900	21.500
6040.	8.618	3.151	3.100	23.000
6544.	8.638	3.407	2.200	23.000
6992.	7.742	4.749	3.600	18.000
7119.	8.049	3.197	2.400	19.500
7449.	8.410	3.532	2.400	19.800
7992.	8.653	3.804	3.000	20.500
8603.	9.280	4.121	3.500	23.500

TOTAL FAILURES: 1 — TIME TO FAILURE (HRS): 4884 — QUANTITY: 1

Figure 3-42. Parameter Trend Chart, R2010P1 Phase IV, I_R



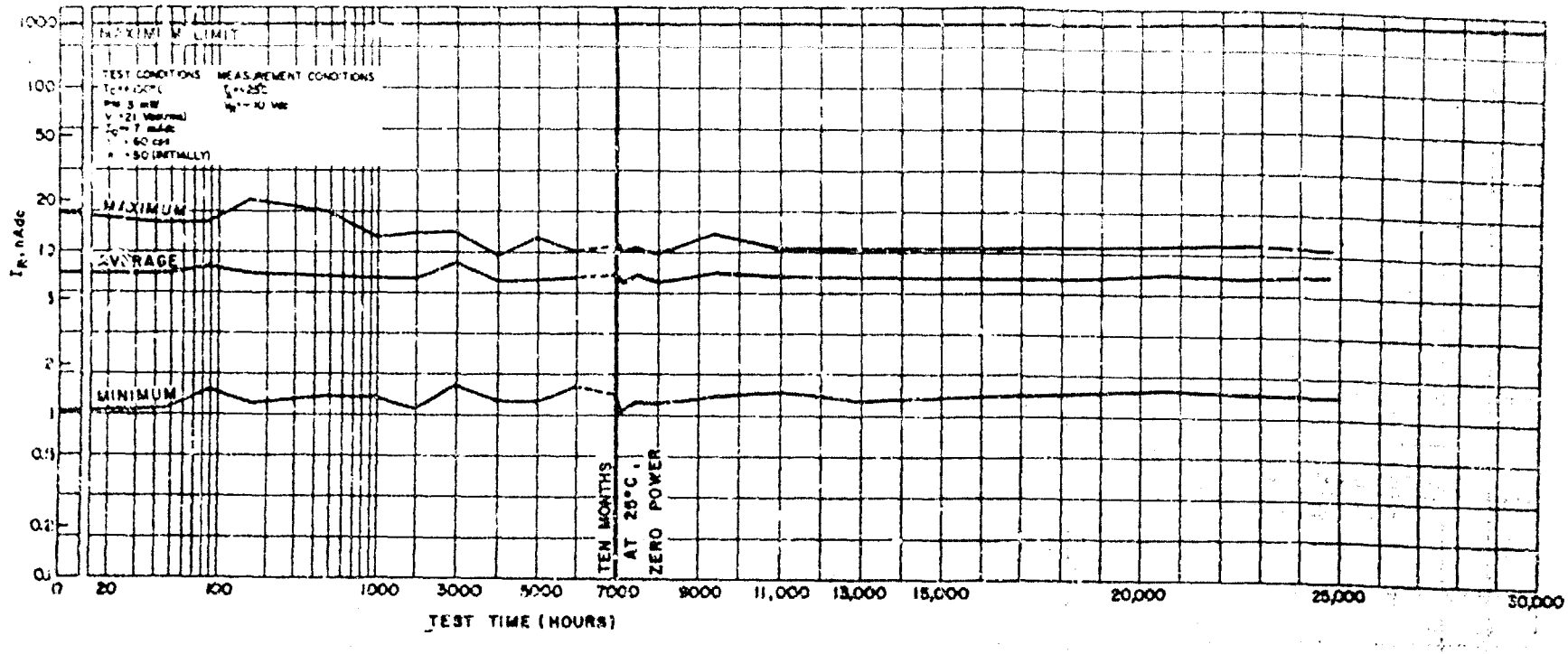
PH 4 R2010P1 VF MATRIX OF VF VALUES IN VOLTS

49 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	0.660	0.016	0.633	0.720
24.	0.660	0.016	0.636	0.721
48.	0.659	0.017	0.634	0.720
96.	0.662	0.016	0.636	0.721
168.	0.667	0.022	0.635	0.853
360.	0.665	0.029	0.632	0.769
504.	0.661	0.016	0.635	0.722
1008.	0.660	0.019	0.634	0.719
1512.	0.661	0.023	0.633	0.706
2008.	0.659	0.024	0.636	0.770
2488.	0.662	0.022	0.638	0.732
3016.	0.666	0.029	0.643	0.743
3520.	0.664	0.025	0.642	0.765
4050.	0.664	0.025	0.631	0.758
4528.	0.662	0.018	0.635	0.720
5032.	0.659	0.018	0.636	0.719
5536.	0.658	0.017	0.633	0.707
6040.	0.667	0.025	0.639	0.773
6544.	0.667	0.026	0.639	0.762
6952.	0.670	0.032	0.639	0.833
7119.	0.655	0.026	0.636	0.739
7449.	0.669	0.035	0.635	0.816
7946.	0.664	0.027	0.634	0.813
8007.	0.663	0.030	0.633	0.813

TOTAL FAILURES	TIME TO FAILURE (HRS)	QUANTITY
1	4050	1

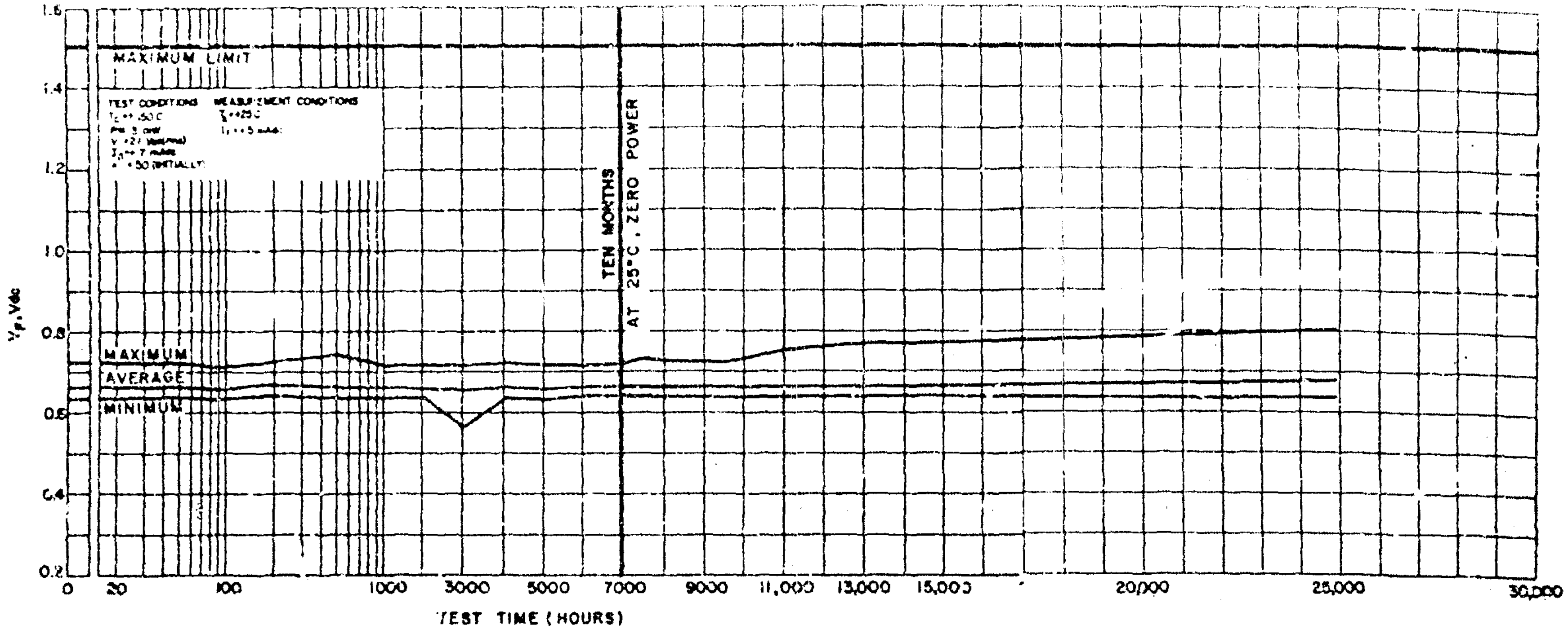
Figure 3-43. Parameter Trend Chart, R2010P1 Phase JV, V_F



TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	7.498	2.465	1.050	16.400
48.	7.191	1.919	1.100	11.900
96.	7.058	2.362	1.450	13.500
168.	6.998	1.636	1.200	10.033
504.	6.967	1.718	1.350	9.350
1010.	6.962	1.806	1.200	10.000
1993.	6.904	1.647	1.100	9.000
2998.	6.857	2.263	1.500	13.200
3998.	6.463	1.726	1.200	9.400
4998.	6.429	1.711	1.200	9.200
5998.	6.749	1.824	1.500	9.800
7048.	7.034	1.702	1.200	10.000
7198.	6.546	1.659	1.050	8.900
7492.	7.043	1.757	1.200	9.700
8871.	6.589	1.618	1.200	9.500
9497.	7.215	1.808	1.300	9.900
11883.	7.282	1.779	1.400	9.700
12994.	7.413	1.953	1.200	10.200
14934.	7.259	1.847	1.300	10.000
16519.	7.147	1.792	1.400	10.000
17[illegible].	7.038	1.811	1.000	11.200
20549.	6.998	1.787	1.300	10.500
22741.	7.111	1.879	1.500	12.000
24784.	7.092	1.876	1.400	11.900

No Failures

Figure 3-44. Parameter Trend Chart, R2010P1 Phase V, I_R, Group I



PHASE 5 R2010P1 VF

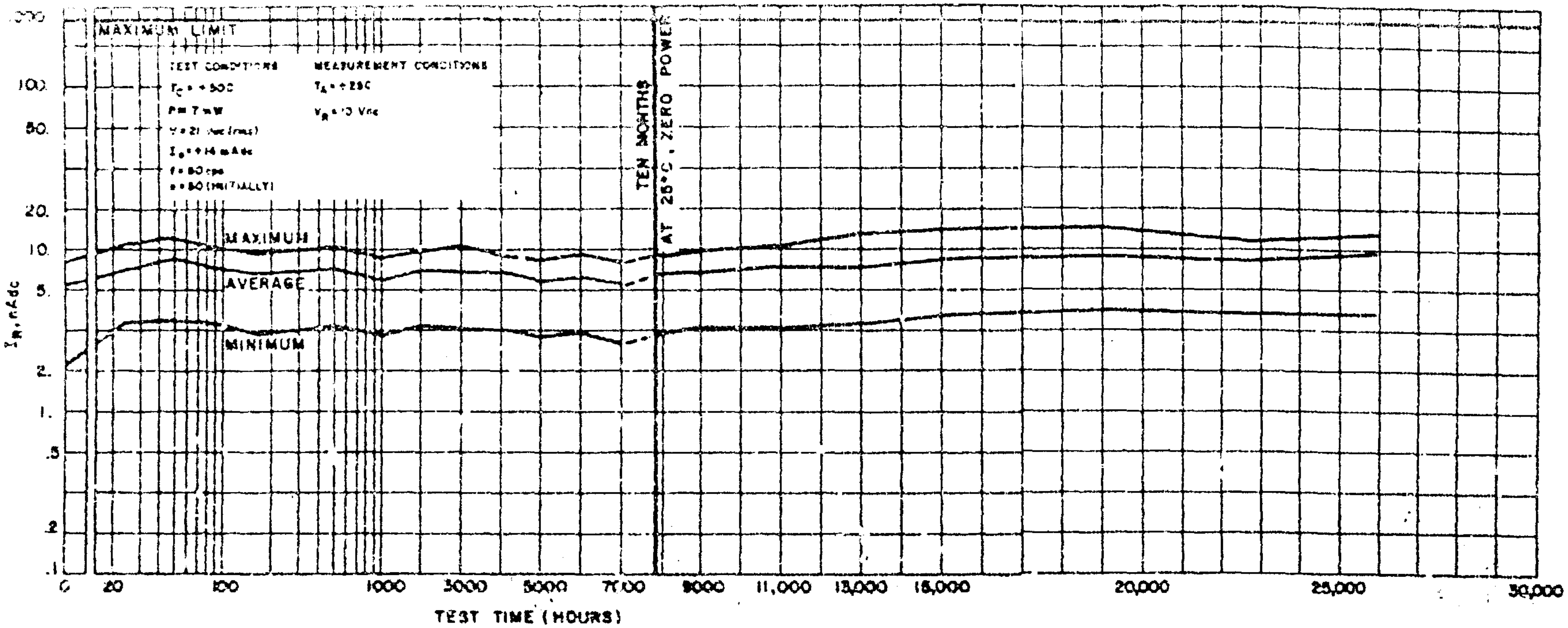
VF VALUES IN VOLTS

47 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	0.663	0.014	0.637	0.726
48.	0.666	0.017	0.641	0.729
96.	0.659	0.015	0.646	0.718
168.	0.661	0.017	0.648	0.771
344.	0.666	0.019	0.637	0.742
1000.	0.662	0.017	0.639	0.718
1992.	0.662	0.016	0.646	0.710
2998.	0.659	0.020	0.567	0.716
3996.	0.661	0.014	0.638	0.720
4998.	0.659	0.015	0.642	0.719
5996.	0.665	0.016	0.642	0.719
7000.	0.668	0.014	0.645	0.722
7168.	0.665	0.017	0.642	0.723
[illegible]	0.6[illegible]6	0.020	0.642	0.733
[illegible]	0.659	0.018	0.641	0.724
[illegible]	0.656	0.016	0.643	0.721
[illegible]	[illegible]	0.021	0.64[illegible]	0.757
12994.	0.666	0.023	0.642	0.774
14438.	0.66[illegible]	0.024	0.642	0.773
[illegible]	0.667	0.024	0.641	0.790
[illegible]	0.674	0.044	0.646	0.804
23549.	0.672	0.042	0.642	0.917
22141.	0.674	0.043	0.643	0.972
[illegible]	0.681	0.036	0.642	0.930

No Failures

Figure 3-45. Parameter Trend Chart R2010P1 Phase V, V_F, Group I



PN & RESISTL IR

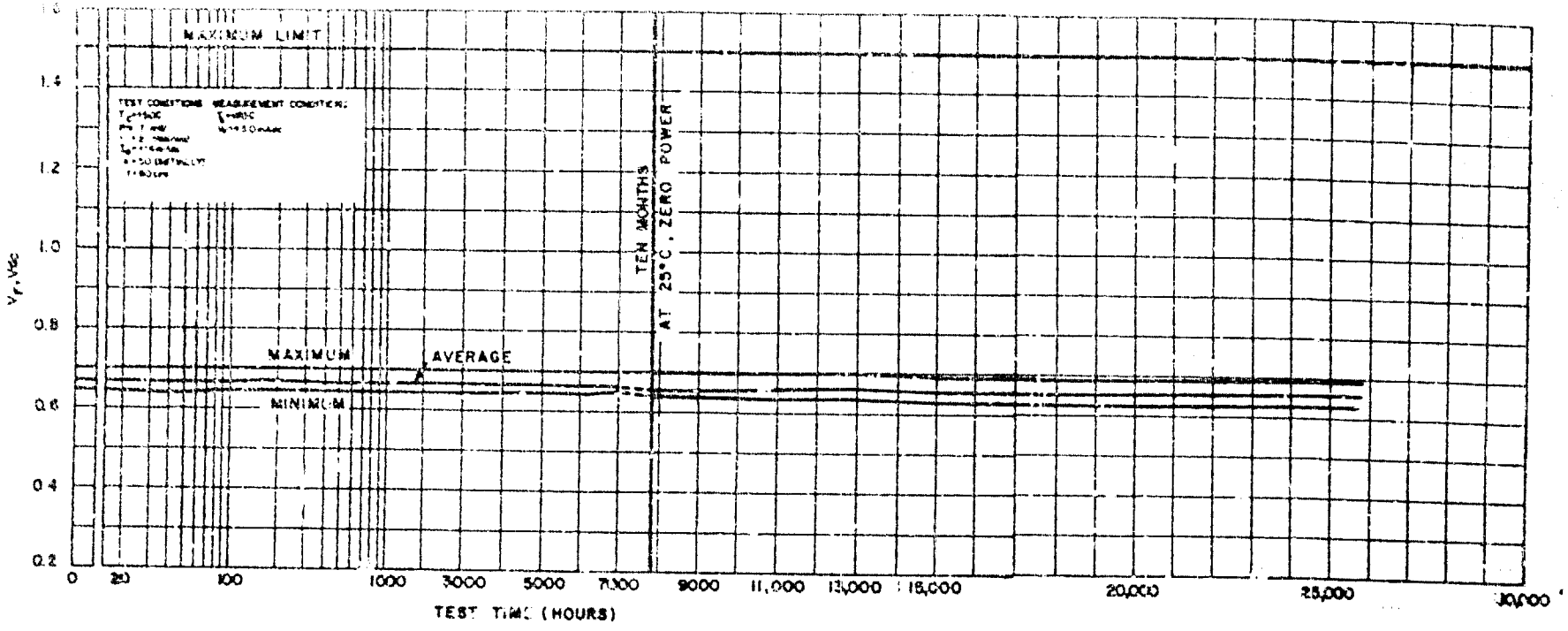
IR VALUES IN NANOAMPS

58 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0,	6,280	1,600	2,000	8,000
24,	7,412	1,626	3,600	11,999
48,	6,847	2,140	2,801	12,900
96,	7,015	1,640	3,600	10,100
144,	7,184	1,967	[illegible]	6,500
264,	8,038	1,717	3,801	10,260
1054,	6,766	1,483	3,801	9,800
2088,	7,949	1,801	3,401	9,900
3088,	7,437	1,506	3,301	10,800
4088,	7,386	1,937	3,301	9,900
5628,	6,783	1,419	3,001	4,800
6625,	6,914	1,412	3,101	9,700
7070,	6,264	1,584	3,700	8,400
7894,	7,252	1,513	4,100	9,500
9892,	7,176	1,526	3,820	9,800
11850,	7,664	1,314	3,410	10,300
12933,	8,960	1,840	3,400	11,300
13925.	8,292	1,912	3,400	13,900
15145,	8,732	1,999	2,900	12,930
18778,	9,234	2,280	4,100	14,900
22471,	8,464	1,867	4,000	11,200
25594.	8,934	1,832	3,800	11,400

No Failures

Figure 3-46. Parameter Trend Chart R2010P1 Phase VI, I_R



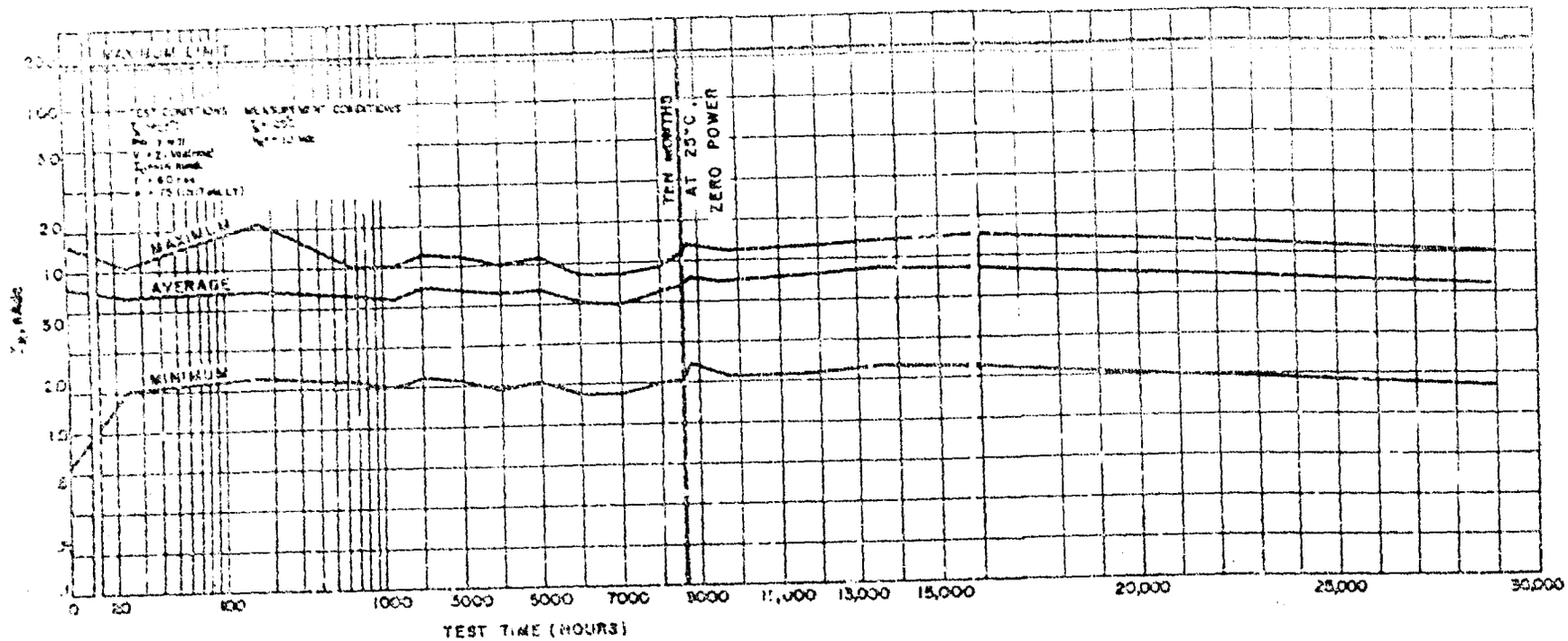
PW 6 R2010P1 VF

V_F VALUES IN VOLTS

TEST HOURS	96 PARTS AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0	0.663	0.015	0.641	0.696
24	0.662	0.013	0.639	0.693
48	0.663	0.012	0.639	0.699
96	0.664	0.012	0.641	0.702
168	0.666	0.013	0.642	0.699
504	0.665	0.012	0.642	0.699
1008	0.664	0.012	0.640	0.699
1680	0.663	0.013	0.641	0.701
3000	0.663	0.013	0.640	0.695
4008	0.664	0.012	0.641	2.696
5016	0.664	0.012	0.641	0.696
6120	0.663	0.012	0.639	0.699
7320	0.667	0.012	0.640	0.700
7864	0.667	0.012	0.636	0.694
8592	0.669	0.012	0.638	0.693
8690	0.666	0.013	0.633	0.691
10023	0.668	0.013	0.638	0.693
12023	0.669	0.013	0.636	0.693
14344	0.668	0.013	0.638	0.699
16776	0.667	0.013	0.636	0.692
22473	0.667	0.012	0.636	0.696
25596	0.665	0.013	0.638	0.695

No Failures

Figure 3-47. Parameter Trend Chart R2010P1 Phase VI, V_F



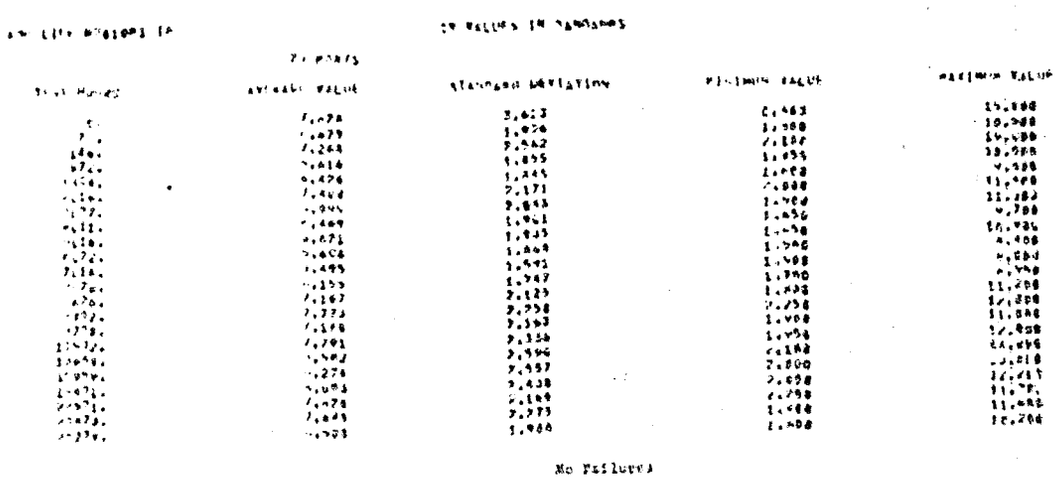
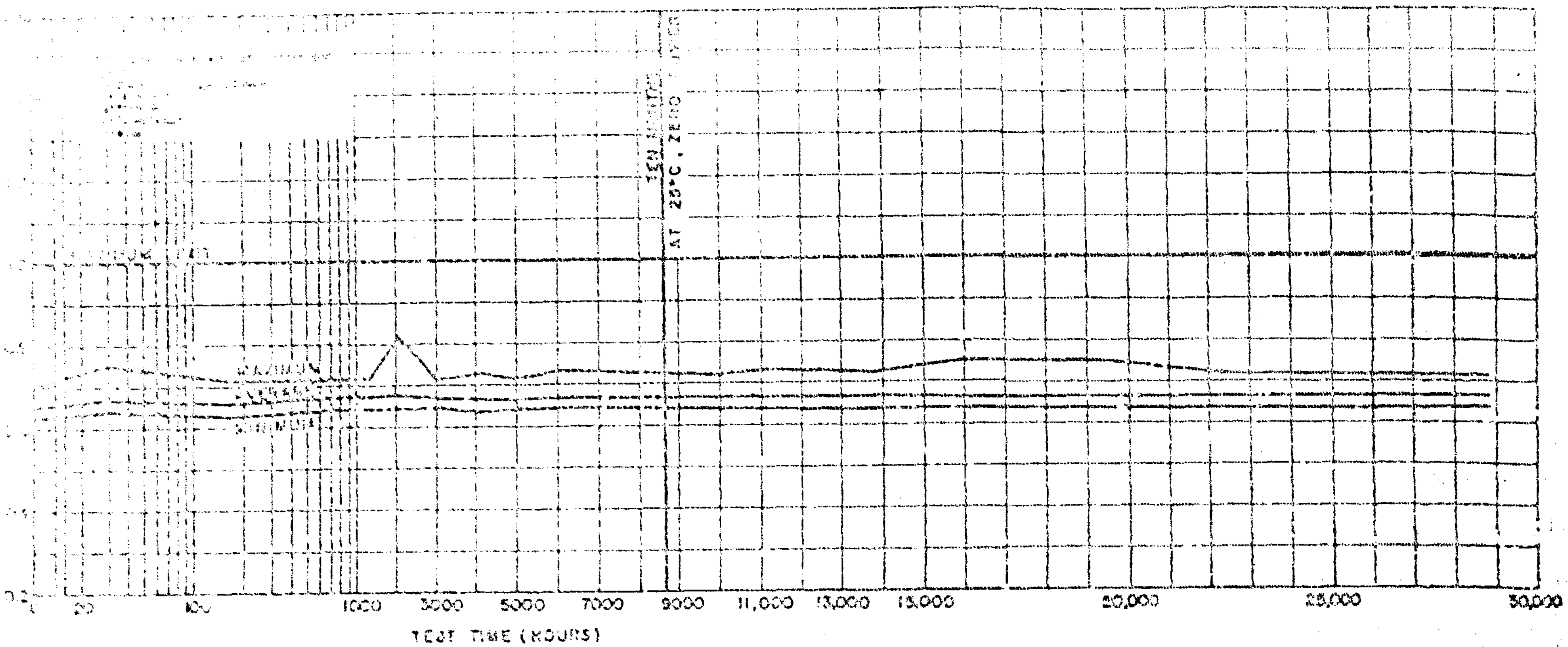


Figure 3-48. Parameter Trend Chart R2010P1 Ambient Life, I_R

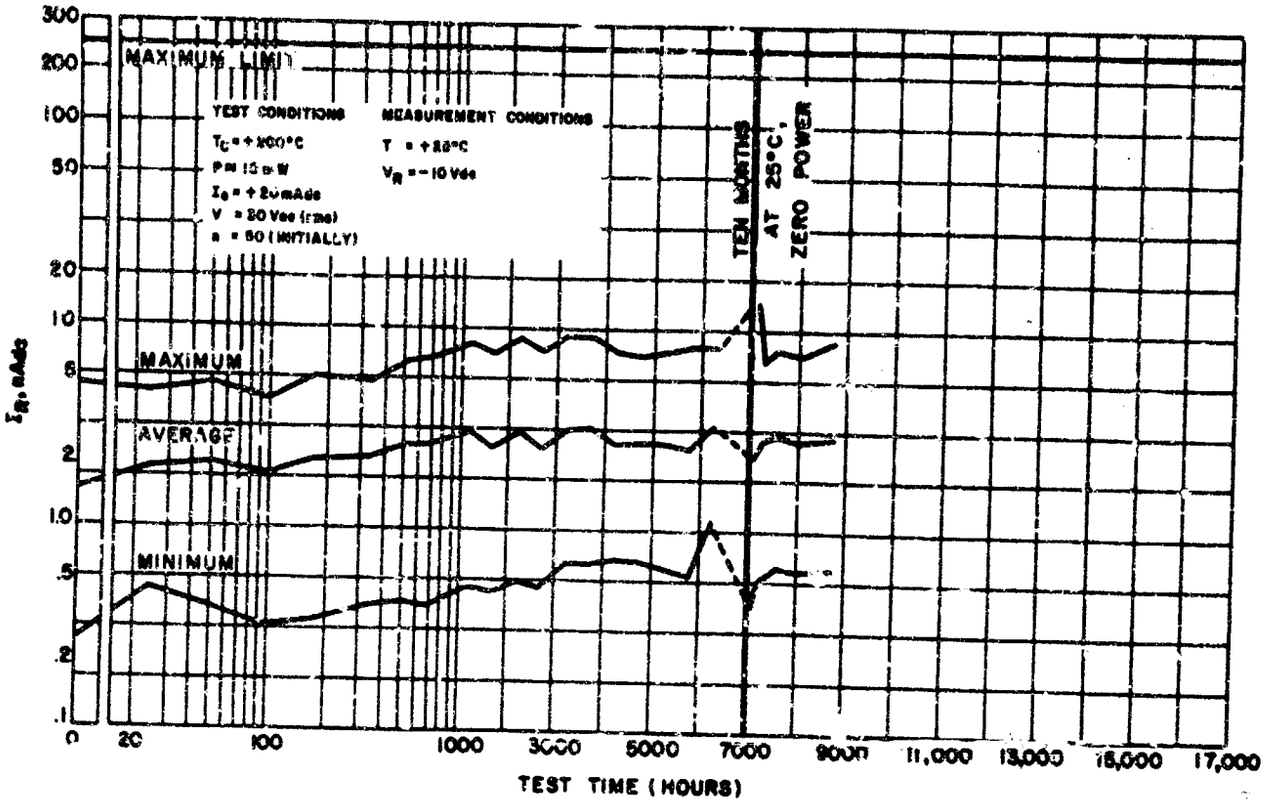


VF VALUES IN VOLTS

72 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	[illegible]	[illegible]	[illegible]	0.704
24.	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	0.710
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	0.720

Figure [illegible]. Parameter Trend Chart [illegible] Ambient Life, V_F



PH 4 R2011P1 IR

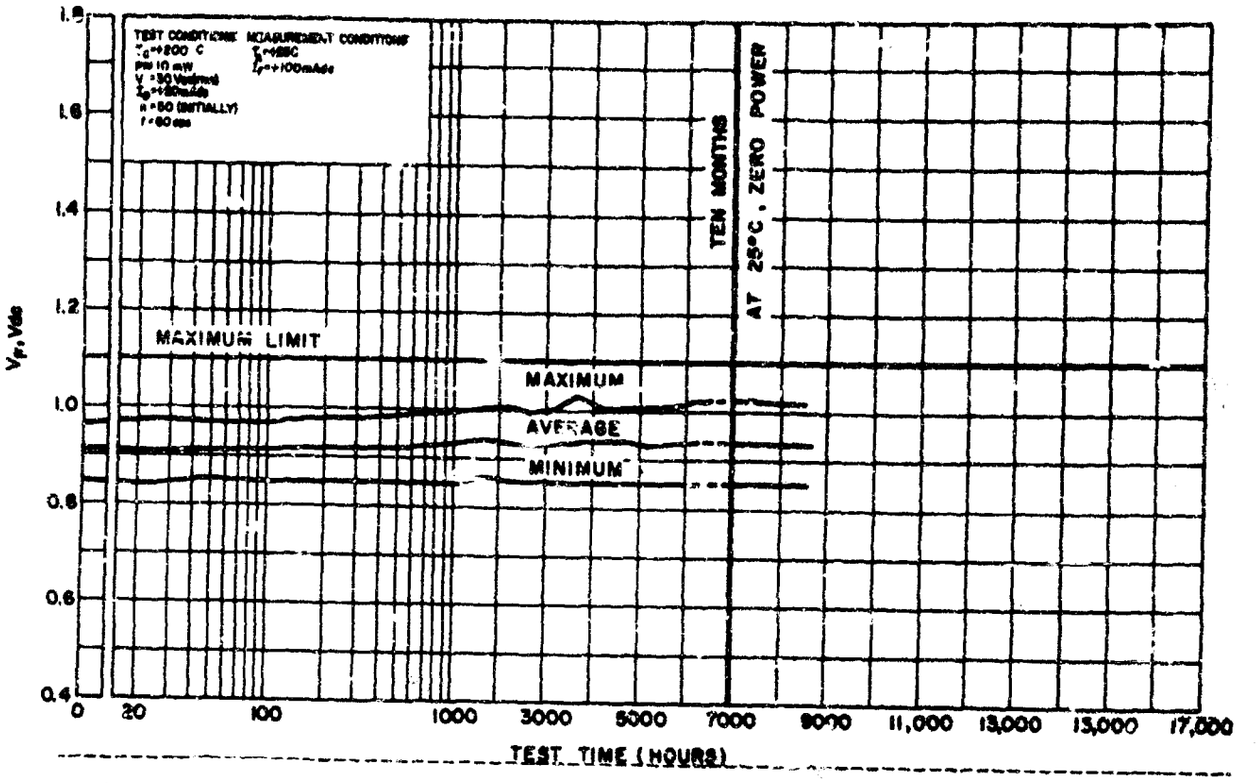
IR VALUES IN NANOAMPS

44 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	1.488	0.900	0.260	4.820
24.	1.962	0.954	0.490	4.720
48.	2.143	1.083	0.400	5.000
96.	1.882	0.948	0.320	4.430
168.	2.287	1.229	0.390	5.800
336.	2.345	1.261	0.420	5.800
504.	2.602	1.436	0.430	6.600
672.	2.700	1.395	0.430	7.200
1176.	2.655	1.789	0.310	8.300
1596.	2.717	1.623	0.480	7.000
2184.	3.118	1.830	0.550	8.900
2688.	2.637	1.579	0.520	7.800
3192.	3.310	1.909	0.490	9.600
3696.	3.416	1.926	0.700	9.300
4198.	2.629	1.500	0.700	7.700
4702.	2.932	1.617	0.710	7.650
5217.	2.910	1.527	0.650	7.700
5710.	2.717	1.598	0.600	8.200
6214.	3.406	1.972	1.150	8.400
7020.	2.436	1.453	0.450	14.200
7167.	2.925	1.581	0.580	7.600
7527.	3.077	1.699	0.680	8.300
8624.	2.905	1.562	0.650	7.900
8685.	3.096	1.668	0.670	9.000

TOTAL FAILURES	TIME TO FAILURE (HRS)	QUANTITY
4	1176	1
	7020	1
	7587	1
	8624	1

Figure 3-50. Parameter Trend Chart R2011P1, Phase IV, I_R



PH 4 R2011P1 VF — MATRIX OF VF VALUES IN VOLTS — 44 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	0.913	0.038	0.850	0.960
24.	0.916	0.038	0.845	0.971
48.	0.917	0.037	0.853	0.974
96.	0.916	0.038	0.852	0.975
168.	0.922	0.037	0.857	0.980
336.	0.924	0.037	0.859	0.981
504.	0.928	0.038	0.859	0.989
672.	0.927	0.039	0.857	0.989
1176.	0.927	0.039	0.857	0.990
1680.	0.931	0.043	0.860	0.998
2184.	0.929	0.043	0.853	1.000
2688.	0.932	0.041	0.858	1.010
3192.	0.931	0.042	0.856	0.999
3697.	0.933	0.044	0.853	1.000
4196.	0.934	0.043	0.858	1.010
4702.	0.935	0.044	0.858	1.009
5217.	0.932	0.045	0.854	1.007
5716.	0.934	0.048	0.849	1.009
6214.	0.938	0.047	0.849	1.010
7030.	0.936	0.046	0.853	1.023
7197.	0.937	0.044	0.859	1.021
7527.	0.934	0.047	0.850	1.020
8024.	0.936	0.047	0.853	1.020
8685.	0.937	0.046	0.849	1.015

TOTAL FAILURES	TIME TO FAILURE (HRS)	QUANTITY
4	1176	1
	7680	1
	7527	1
	8024	1

Figure 3-51. Parameter Trend Chart R2011P1, Phase IV, V_F

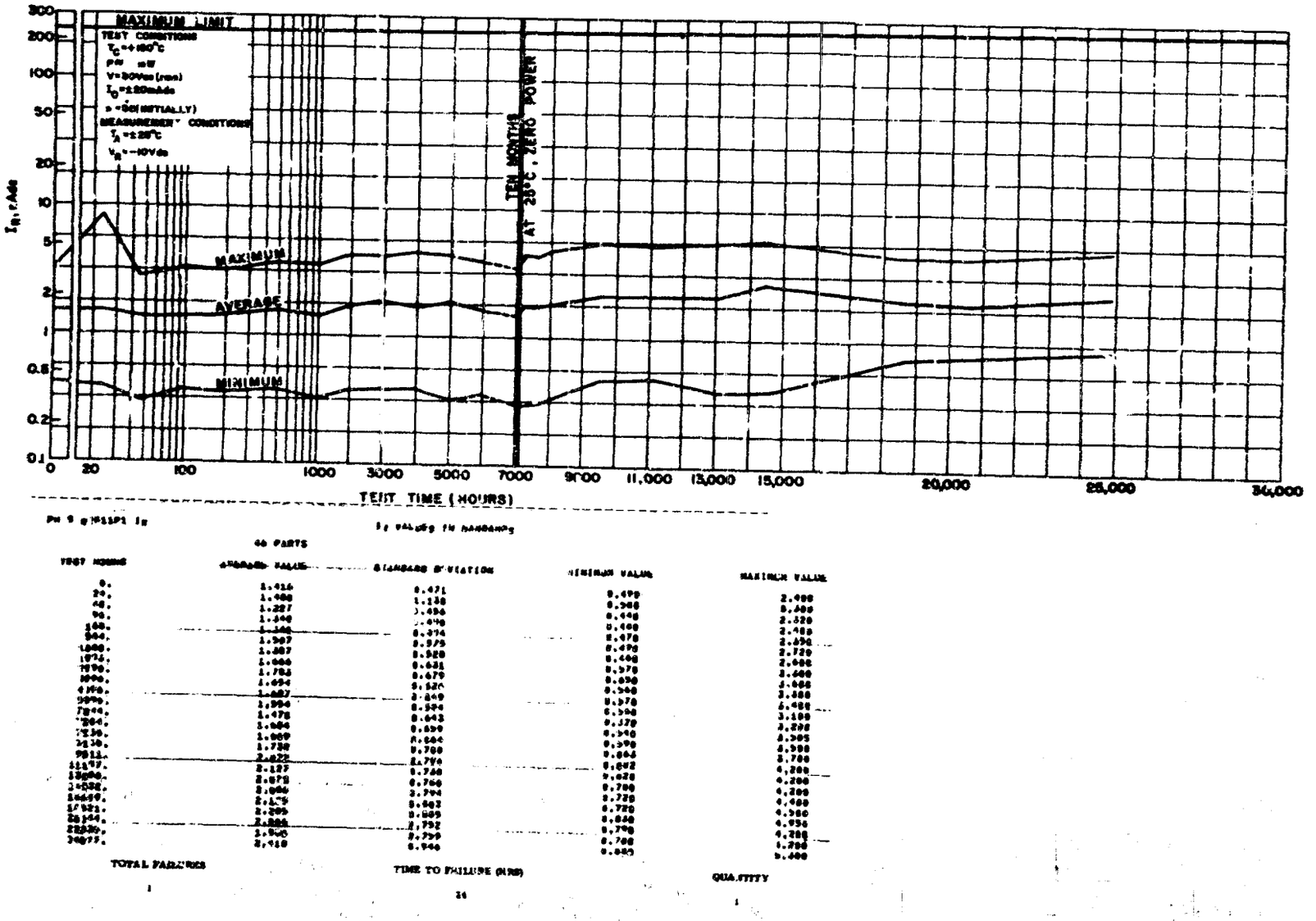
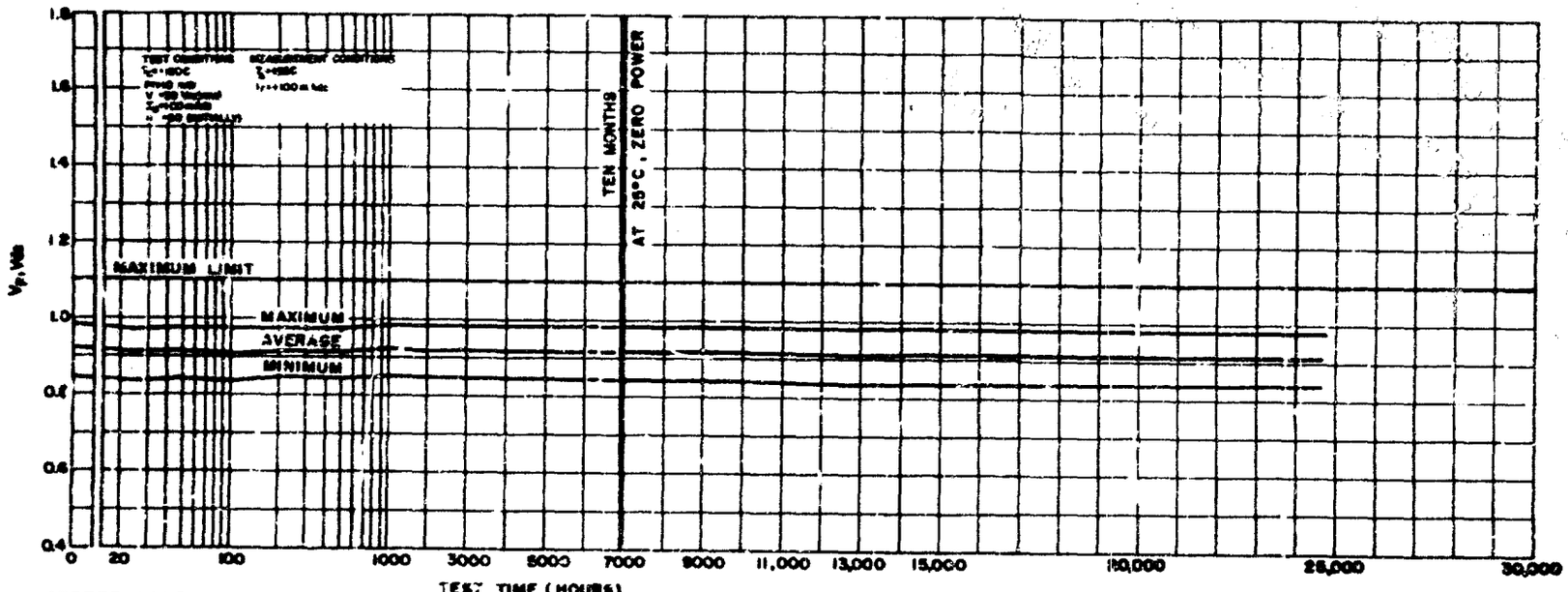
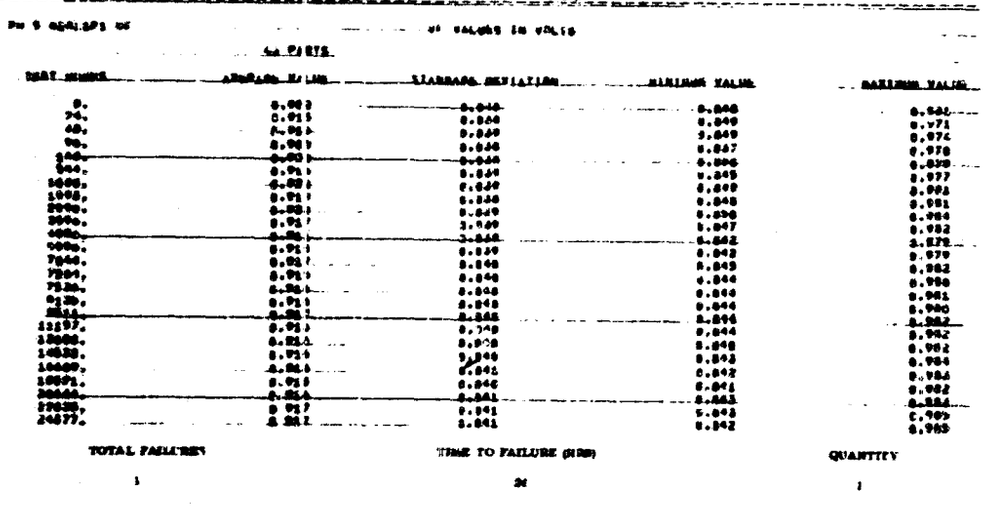


Figure 3-52. Parameter Trend Chart R2011P1, Phase V, I_R

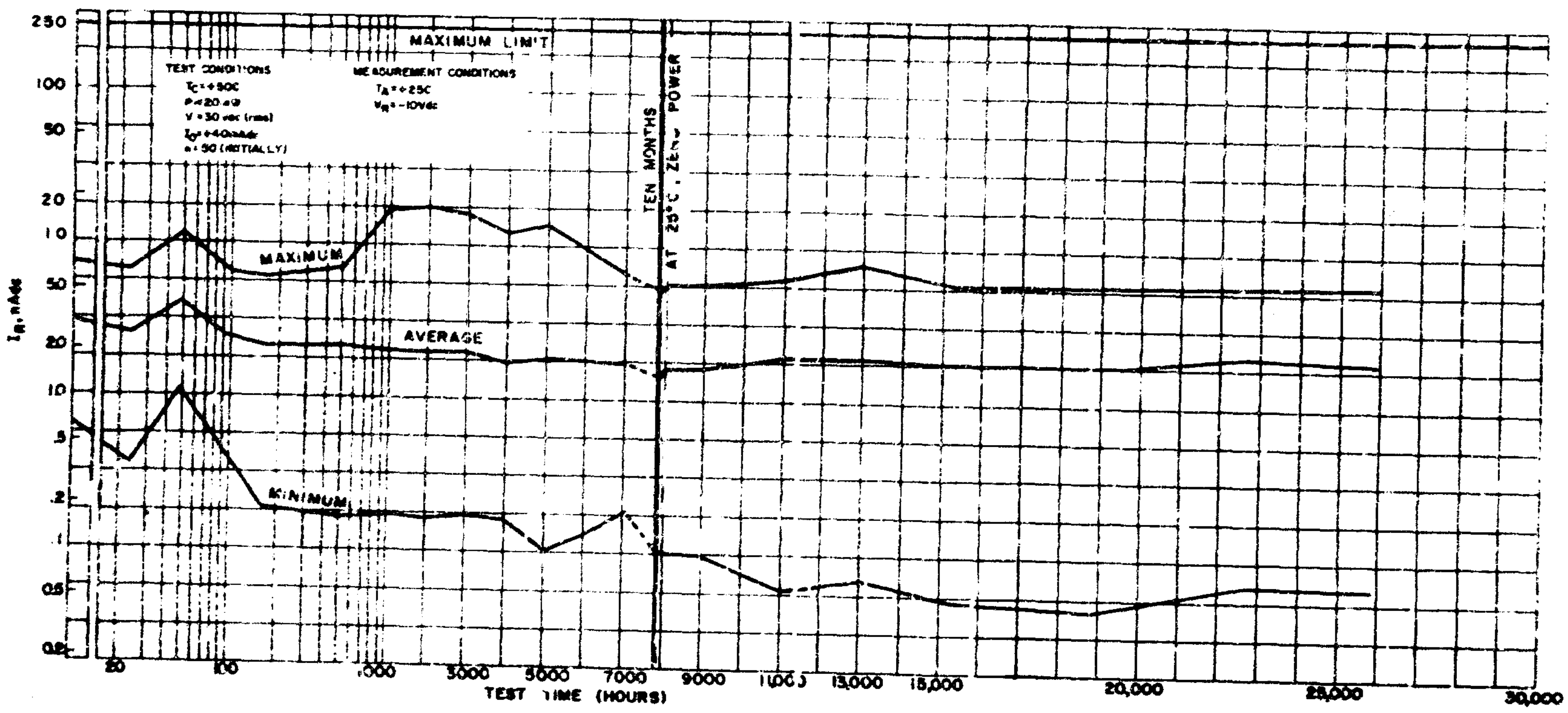




TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	0.983	0.040	0.868	0.941
24.	0.915	0.050	0.849	0.971
48.	0.913	0.049	0.849	0.974
96.	0.913	0.048	0.847	0.978
168.	0.913	0.048	0.846	0.979
344.	0.911	0.049	0.845	0.977
1000.	0.913	0.049	0.849	0.981
1848.	0.911	0.048	0.848	0.981
2520.	0.913	0.049	0.850	0.984
3000.	0.911	0.049	0.847	0.982
4000.	0.914	0.048	0.852	0.979
5000.	0.911	0.049	0.842	0.979
7040.	0.913	0.048	0.843	0.982
7304.	0.911	0.048	0.844	0.980
7520.	0.914	0.048	0.844	0.981
8230.	0.911	0.048	0.844	0.980
8544.	0.913	0.048	0.844	0.982
11157.	0.911	0.049	0.844	0.982
13000.	0.914	0.048	0.843	0.982
14520.	0.911	0.049	0.843	0.984
16000.	0.914	0.048	0.842	0.984
18001.	0.913	0.048	0.841	0.982
20000.	0.914	0.048	0.843	0.984
21520.	0.913	0.048	0.843	0.985
24077.	0.912	0.048	0.842	0.985

TOTAL FAILURES: 1 — TIME TO FAILURE (HRS): 24 — QUANTITY: 1

Figure 3-53. Parameter Trend Chart R2011P1, Phase V, V_F



R2011P1 IR

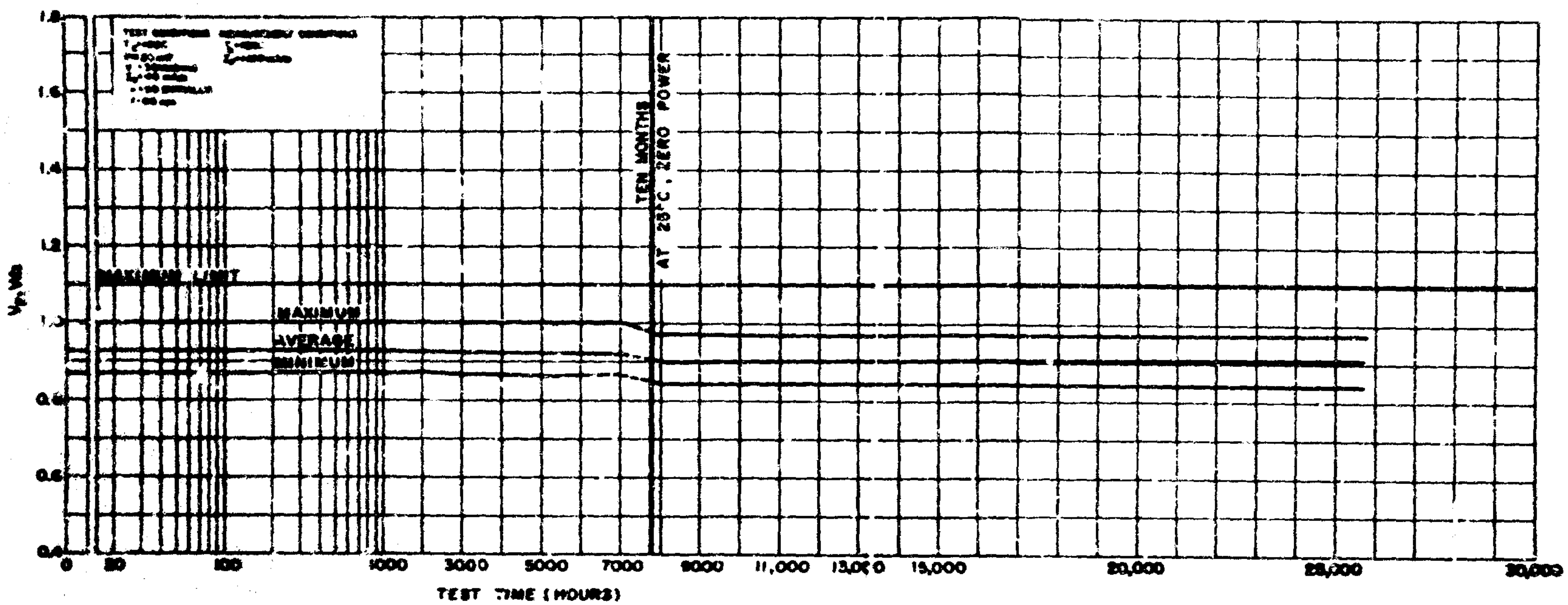
IR VALUES IN NANOAMPS

50 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0,	3,320	1,909	0,720	7,100
24,	2,506	1,594	0,300	6,200
48,	4,050	1,902	1,400	11,530
96,	2,108	1,470	0,401	6,500
168,	2,040	1,462	0,180	4,000
504,	2,194	1,575	0,100	6,800
1250,	2,030	2,466	0,172	16,900
2000,	2,002	2,946	0,190	17,200
3000,	2,030	3,340	0,170	15,900
4000,	1,704	1,684	0,108	20,200
[illegible]	1,606	2,044	0,100	13,700
[illegible]	1,750	1,986	0,130	9,400
7000,	1,700	1,312	0,140	6,700
[illegible]	1,410	1,250	0,105	5,300
[illegible]	1,540	1,303	0,100	5,700
[illegible]	1,674	1,372	0,100	5,300
[illegible]	1,602	1,909	0,080	6,300
[illegible]	1,534	1,730	0,070	7,000
[illegible]	1,914	1,413	0,030	[illegible]
[illegible]	1,931	1,944	0,070	[illegible]
[illegible]	3,150	1,381	0,400	[illegible]
[illegible]	1,709	1,909	0,040	[illegible]

No Failures

Figure 3-54. Parameter Trend Chart R2011P1, Phase VI, I_R



[illegible]

V_F VALUES IN VOLTS

50 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	[illegible]	[illegible]	0.873	1.002
24.	[illegible]	[illegible]	0.873	[illegible]
48.	[illegible]	[illegible]	[illegible]	[illegible]
96.	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	0.871	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	1.002
[illegible]	[illegible]	[illegible]	[illegible]	1.000
[illegible]	[illegible]	[illegible]	0.875	1.002
[illegible]	[illegible]	[illegible]	0.874	1.003
[illegible]	[illegible]	[illegible]	0.871	1.002
[illegible]	[illegible]	[illegible]	[illegible]	0.999
[illegible]	[illegible]	[illegible]	0.873	[illegible]
[illegible]	[illegible]	[illegible]	0.849	[illegible]
[illegible]	[illegible]	[illegible]	0.849	0.974
[illegible]	[illegible]	[illegible]	0.849	0.974
[illegible]	[illegible]	[illegible]	0.849	0.974
[illegible]	[illegible]	[illegible]	0.846	0.974
[illegible]	[illegible]	[illegible]	0.846	0.975
[illegible]	[illegible]	[illegible]	0.846	0.974
[illegible]	[illegible]	[illegible]	0.849	0.976
[illegible]	[illegible]	[illegible]	0.852	0.977
[illegible]	[illegible]	[illegible]	[illegible]	0.975

No Failures

Figure 3-55. Parameter Trend Chart R2011P1, Phase VI, V_F

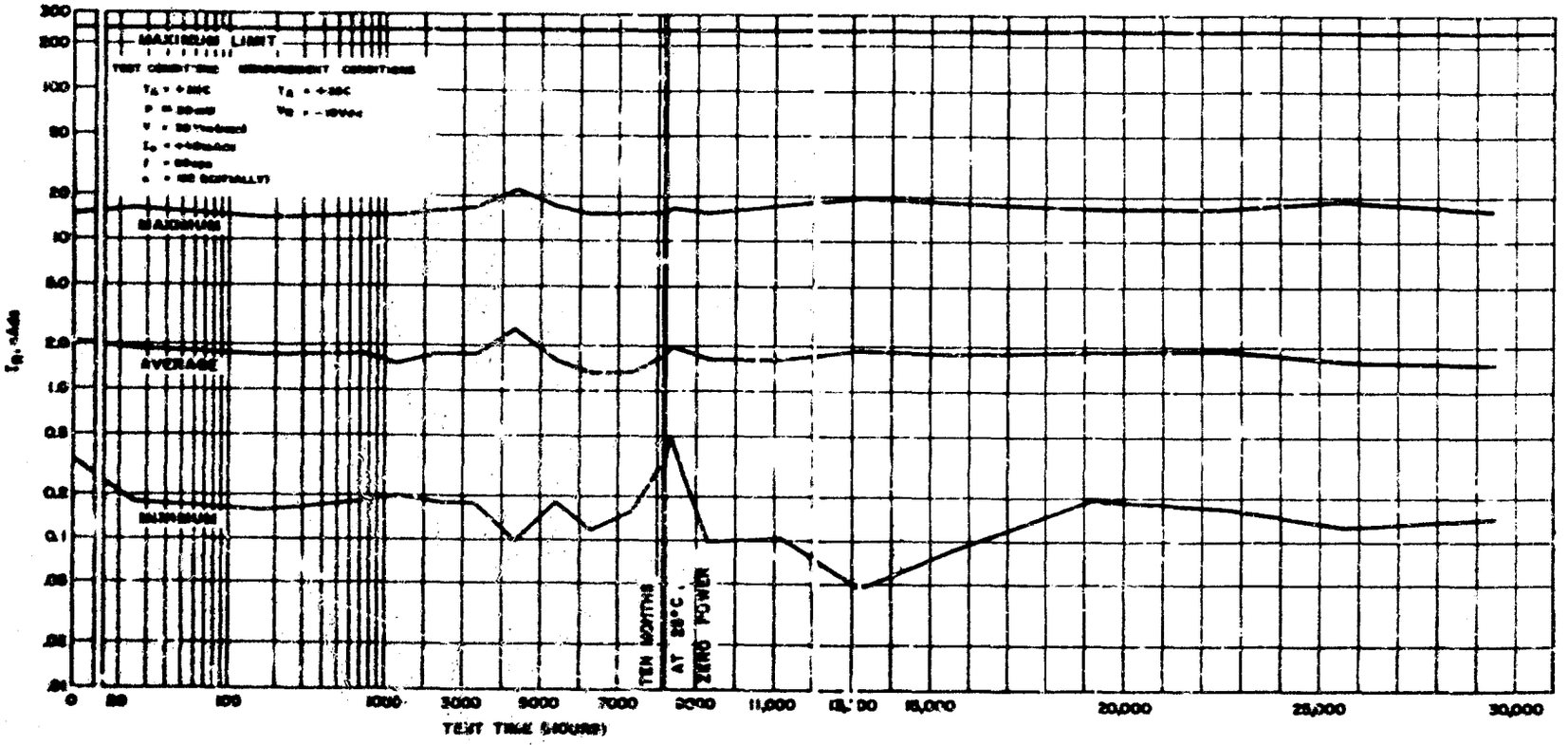


Figure 3-56. Parameter Trend Chart A2011P1, Ambient Life, I_R, Group I

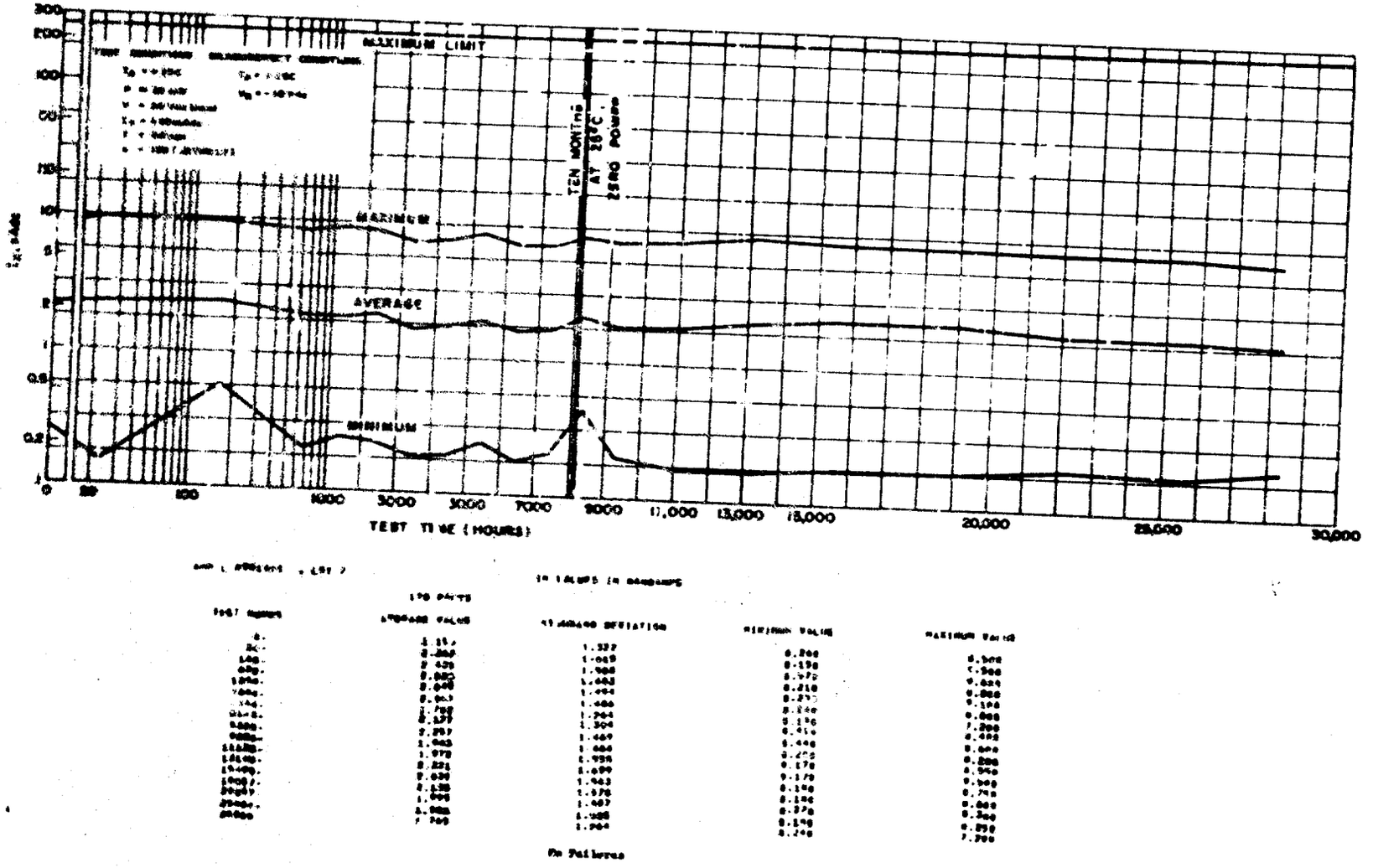


Figure 3-57. Parameter Trend Chart R2011F1, Ambient Life, I_R, Group II

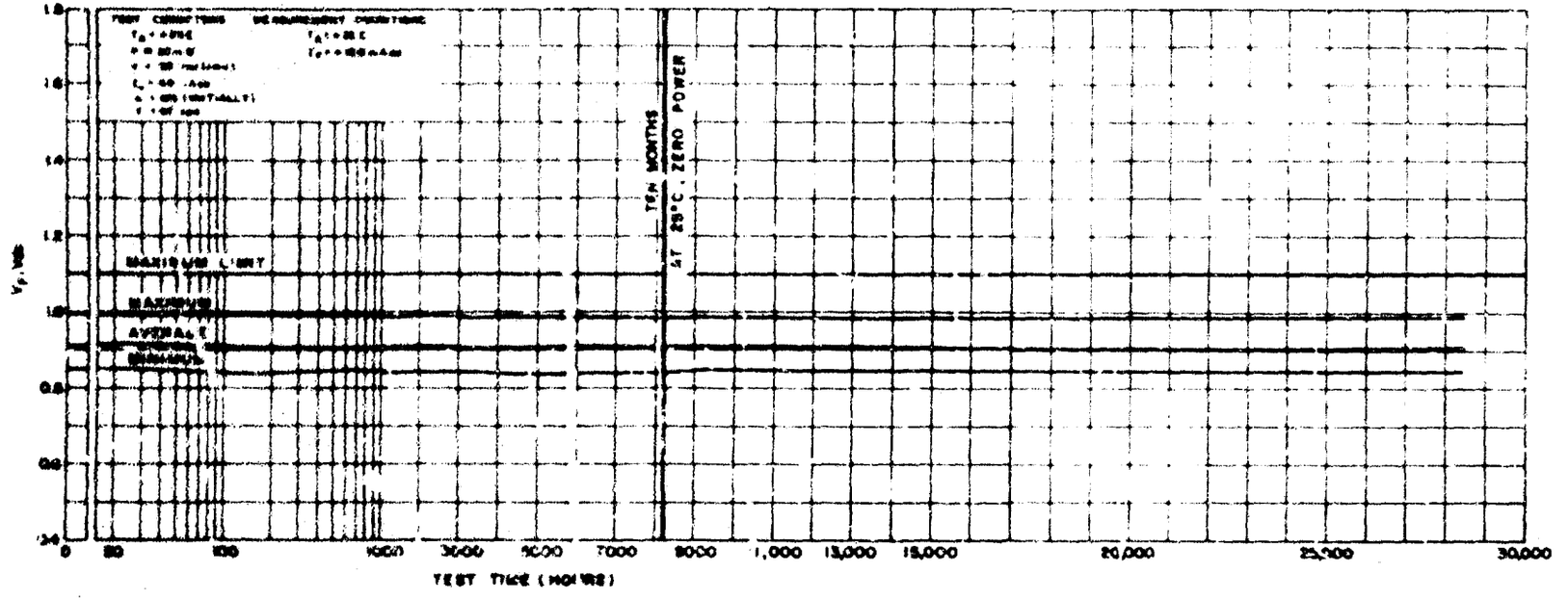


Figure 3-58. Parameter Trend Chart R2011P1, Ambient Life, V_F, Group I

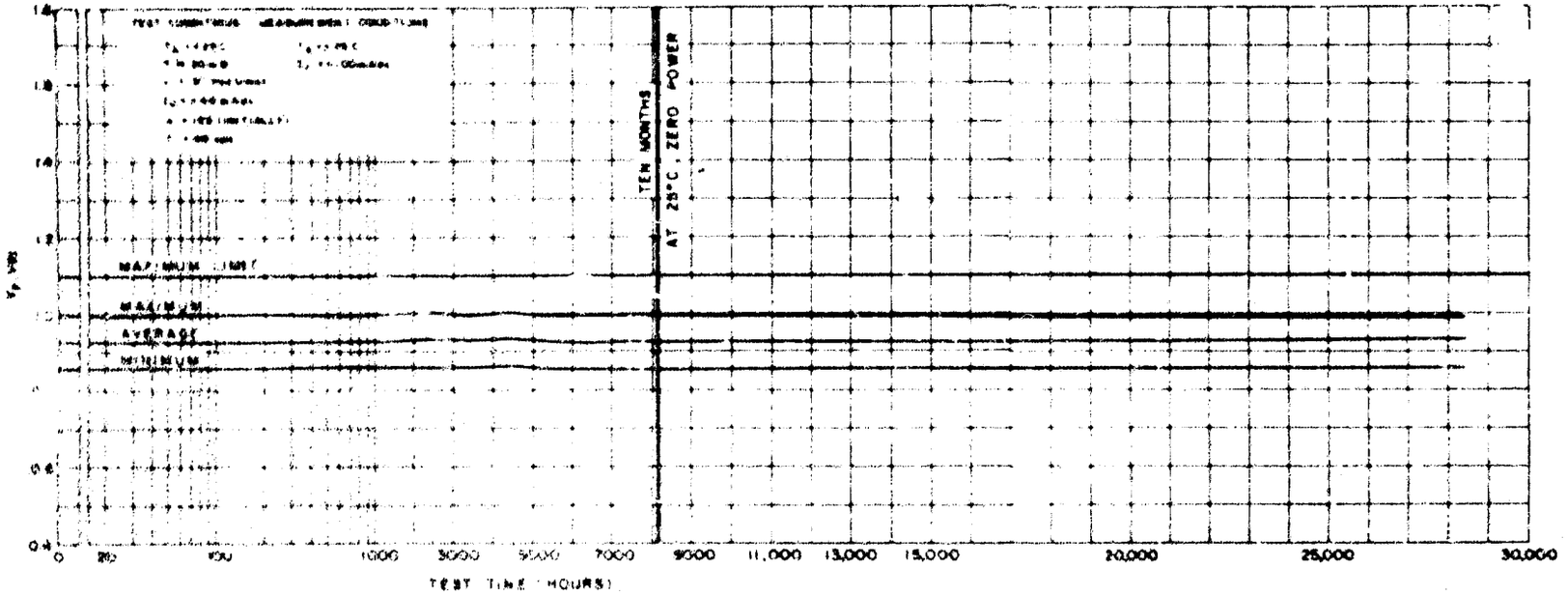
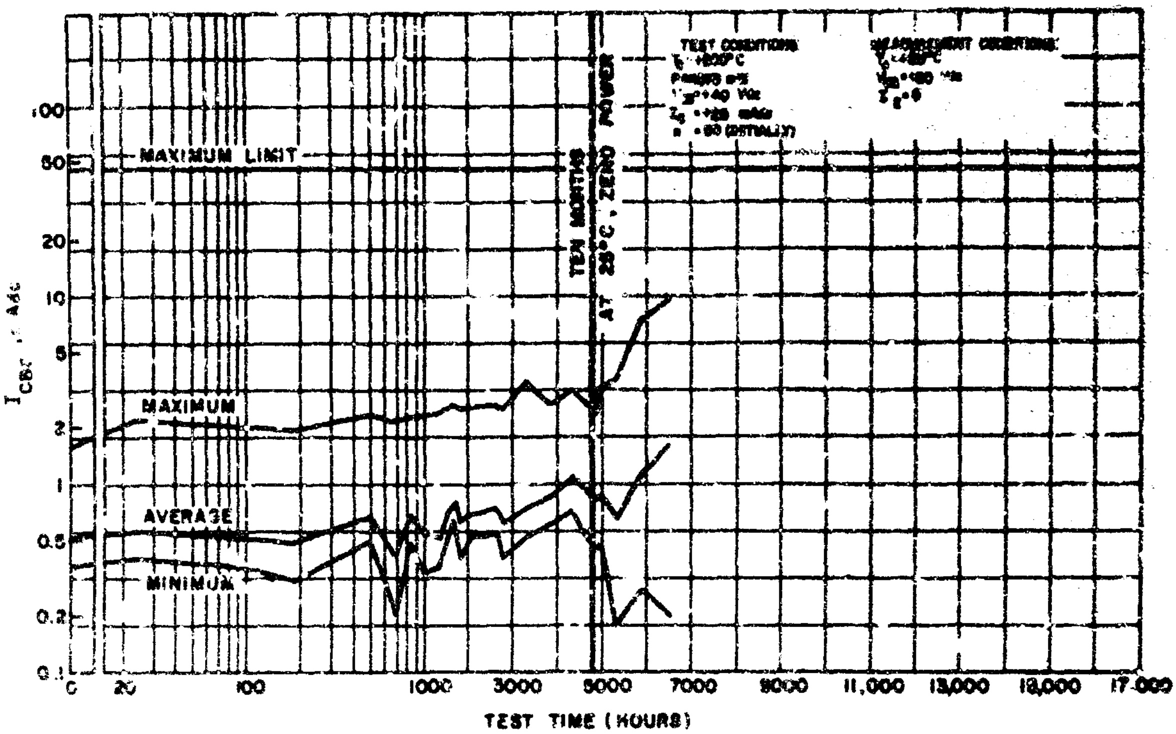


Figure 3-59. Parameter Trend Chart R2011P1, Ambient Life V_F, Group II



PH 4 R2004P1 ICHC

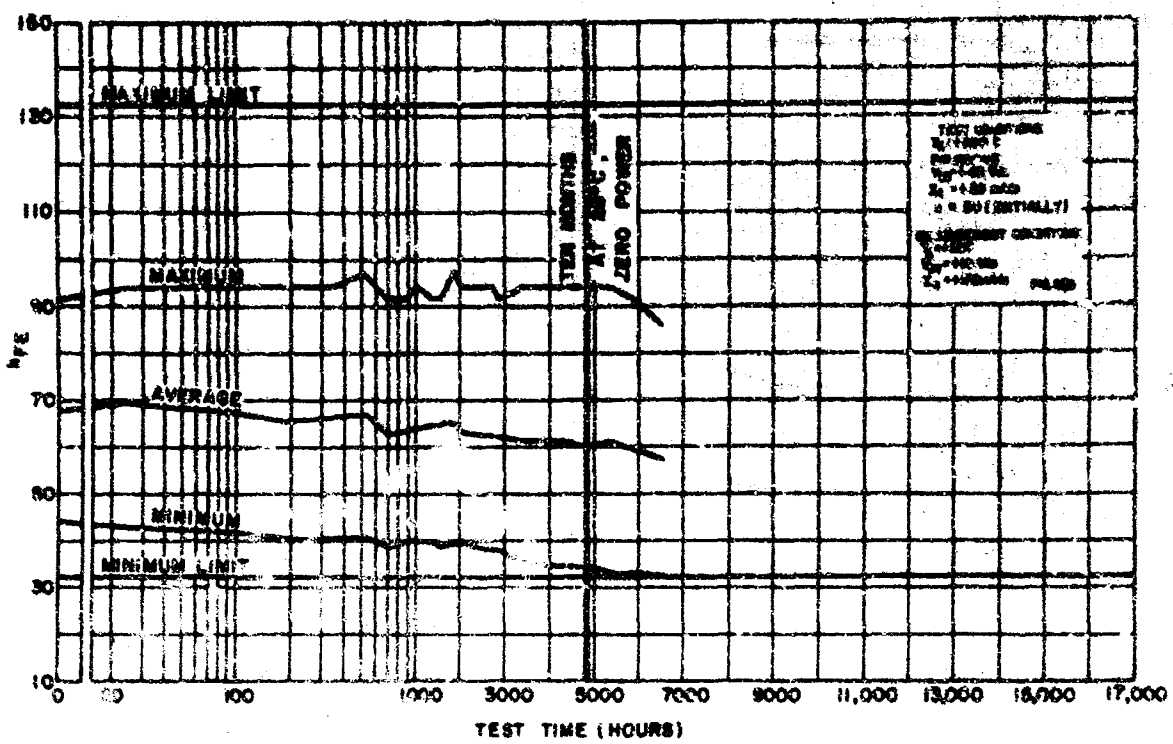
ICHO VALUES IN NANOAMPS

78 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	0.536	0.225	0.370	1.000
24.	0.549	0.330	0.400	2.300
96.	0.515	0.316	0.370	2.090
168.	0.490	0.300	0.310	1.990
337	0.481	0.356	[illegible]	2.000
504.	0.685	0.346	0.510	2.400
672	0.427	0.367	0.310	2.260
840.	0.595	.347	0.490	2.350
1008.	0.549	0.372	0.340	2.300
1344.	0.56[illegible]	0.574	0.300	2.400
1512.	[illegible]	0.373	0.470	2.900
1656.	0.833	0.370	0.630	2.350
1849.	0.541	0.300	0.620	2.400
2317.	0.720	0.376	0.570	2.350
2448.	0.771	0.393	0.590	2.090
2790.	0.610	0.367	0.489	2.400
3408.	0.753	0.352	0.543	2.420
3667.	0.649	.614	0.600	2.690
4553.	1.103	0.682	0.730	3.200
4877.	0.842	0.767	0.440	2.400
4954.	0.684	0.600	0.460	3.200
5334.	0.943	0.776	0.170	3.600
5891.	1.001	1.535	0.270	7.200
6462	1.697	2.054	0.200	9.800

TOTAL FAILURES	TIME TO FAILURE (HRS)	QUANTITY
21	504	1
	1000	1
	1848	1
	2187	2
	2520	1
	2640	2
	2700	1
	2908	2
	3507	2
	4004	3
	4004	1
	5857	1
	6462	1

Figure 3-60. Parameter Trend Chart, R2004P1, Phase IV, I_{CBO}



PH 4 87 9992

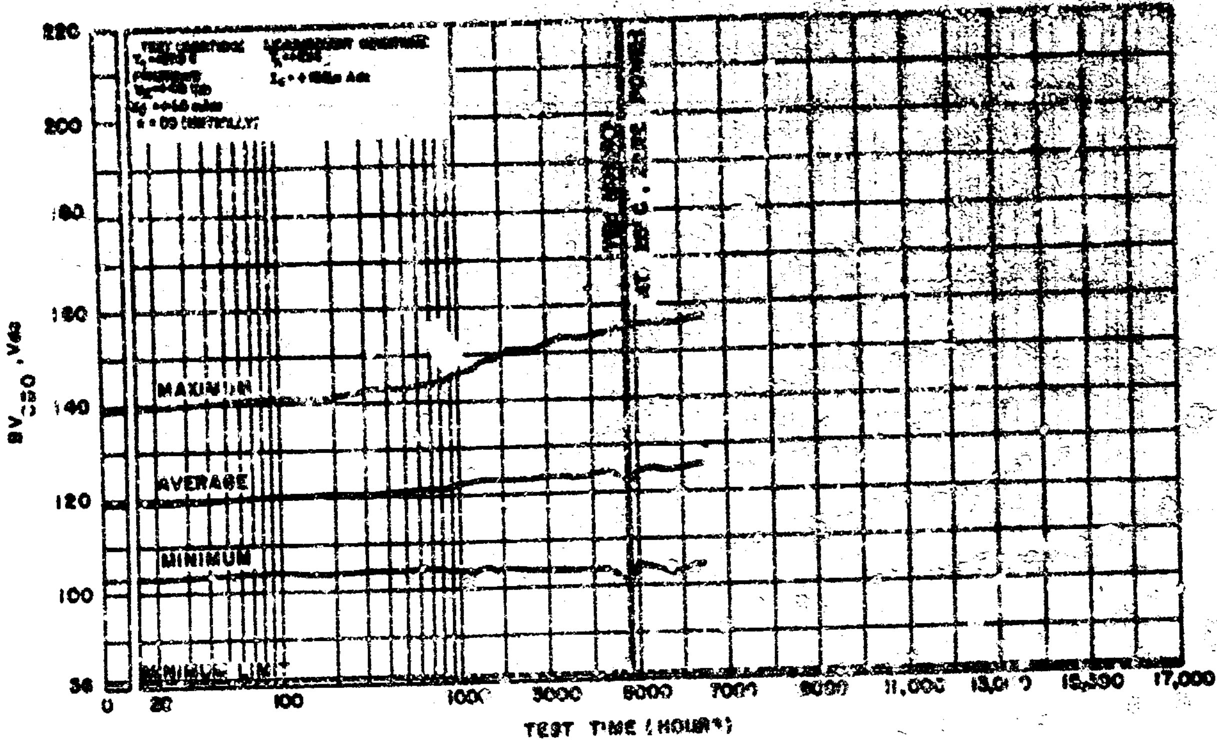
HFE VALUES

20 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
9.	66.875	14.667	44.100	91.000
24.	69.182	14.743	42.900	95.800
50.	67.457	14.844	41.700	92.800
100.	65.318	14.692	40.000	93.886
337.	66.446	14.730	46.580	92.808
504.	66.664	14.997	46.580	96.070
672.	63.475	14.751	40.900	91.850
840.	65.679	14.726	39.500	91.000
1200.	64.464	14.499	39.500	93.805
1344.	64.943	14.403	39.500	91.800
1512.	64.875	14.536	38.590	91.086
1680.	65.080	14.459	39.800	93.802
1849.	66.789	15.011	39.800	96.860
2017.	63.393	13.554	39.000	93.409
2640.	62.929	13.507	37.985	93.648
2790.	61.743	13.086	37.560	90.900
3363.	61.490	14.483	35.390	93.800
3807.	61.857	14.222	34.989	94.800
4264.	61.179	14.172	34.950	94.008
4032.	59.006	14.135	34.100	93.700
4994.	58.608	13.973	34.900	93.780
5324.	60.093	15.675	32.300	93.760
5371.	59.296	14.961	32.800	91.680
6482.	7.146	10.850	31.306	85.748

TOTAL FAILURES	TIME TO FAILURE (HRS)	QUANTITY
31	504	1
	1680	1
	1849	1
	2187	3
	3660	1
	2019	3
	2790	1
	3360	3
	3807	3
	4304	3
	4994	1
	5671	1
	6480	1

Figure 3-61. Parameter Trend Chart, R2004P1, Phase IV, h_{FE}



FN 4 R2004P1 BVC40

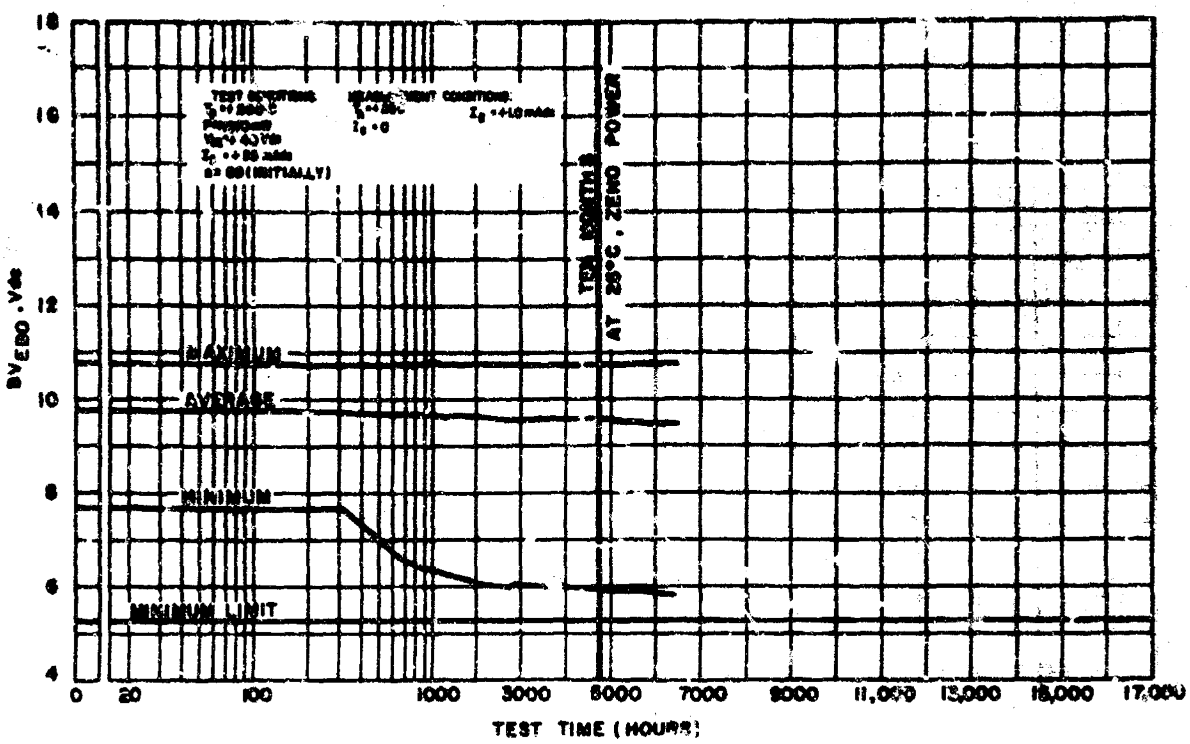
BVCBO VALUES IN VOLTS

28 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	119.806	8.757	103.800	139.100
24.	119.264	9.242	104.100	139.900
96.	120.111	[illegible] 37	104.100	141.300
186.	120.079	[illegible].678	103.700	140.700
337.	120.593	9.186	104.400	142.700
504.	121.394	10.187	10[illegible] 800	142.900
672.	121.875	10.397	104.900	142.900
840.	121.744	10.476	104.800	144.000
1008.	122.71[illegible]	10.692	[illegible]04.900	145.900
1344.	122.697	10.895	104.900	144.903
1512.	124.114	11.219	104.300	140.100
1680.	125.303	11.155	104.400	140.705
1849.	123.848	11.176	103.900	140.[illegible]0
2617.	123.119	11.286	104.300	140.300
2648.	123.384	11.397	103.900	150.960
2799.	123.0[illegible]9	11.[illegible]14	103.970	150.900
3303.	123.762	11.758	103.[illegible]03	153.100
3807.	124.480	11.447	103.700	153.300
4304.	124.311	11.098	103.900	154.400
4827.	122.797	12.732	101.100	155.306
4994.	124.740	13.019	104.000	155.900
5314.	125.20[illegible]	11.953	104.000	156.305
5671.	124.879	12.278	103.000	156.560
6482.	125.080	11.811	104.900	157.19[illegible]

TOTAL FAILURES	TIME TO FAILURE (HRS)	QUANTITY
21	504	1
	1008	1
	1848	1
	2197	[illegible]
	2648	1
	2849	3
	2799	1
	3308	3
	3807	3
	4304	[illegible]
	4994	1
	5681	1
	6482	1

Figure 3-62. Parameter Trend Chart, R2004P1, Phase IV, BV_{CBO}



PH 4 R2004P1 BVEBO

BVEBO VALUES IN VOLTS

20 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	9.717	0.761	7.639	10.718
24.	9.736	0.748	7.639	10.721
96.	9.720	0.745	7.639	10.713
168.	9.718	0.749	7.639	10.7[illegible]
337.	9.714	0.777	7.649	10.720
504.	9.667	0.884	7.071	10.720
672.	9.690	0.933	6.594	10.775
840.	9.694	0.962	6.454	10.724
1008.	9.671	0.963	6.359	10.744
1344.	9.639	0.973	6.299	10.71[illegible]
1512.	9.649	0.982	6.224	10.733
1680.	9.651	0.987	6.176	10.720
1849.	9.627	0.995	6.129	10.711
2017.	9.617	1.027	6.064	10.710
2640.	9.593	1.092	5.999	10.711
2799.	9.584	1.102	6.071	10.709
3303.	9.574	1.120	6.002	10.710
3607	9.572	1.129	6.000	10.709
4304.	9.581	1.138	5.994	10.719
4827.	9.582	1.133	5.924	10.702
4994.	9.562	1.143	5.940	10.719
5324.	9.518	1.197	5.984	10.714
5572.	9.497	1.267	5.870	10.722
6482.	9.481	1.298	5.874	10.719

TOTAL FAILURES	TIME TO FAILURE (HRS)	QUANTITY
21	504	1
	1680	1
	1849	1
	2187	2
	2400	1
	2640	2
	2799	1
	3303	3
	3607	5
	4304	2
	4994	1
	5651	1
	6482	1

Figure 3-63. Parameter Trend Chart, R2004P1, Phase IV, BV_{EBO}

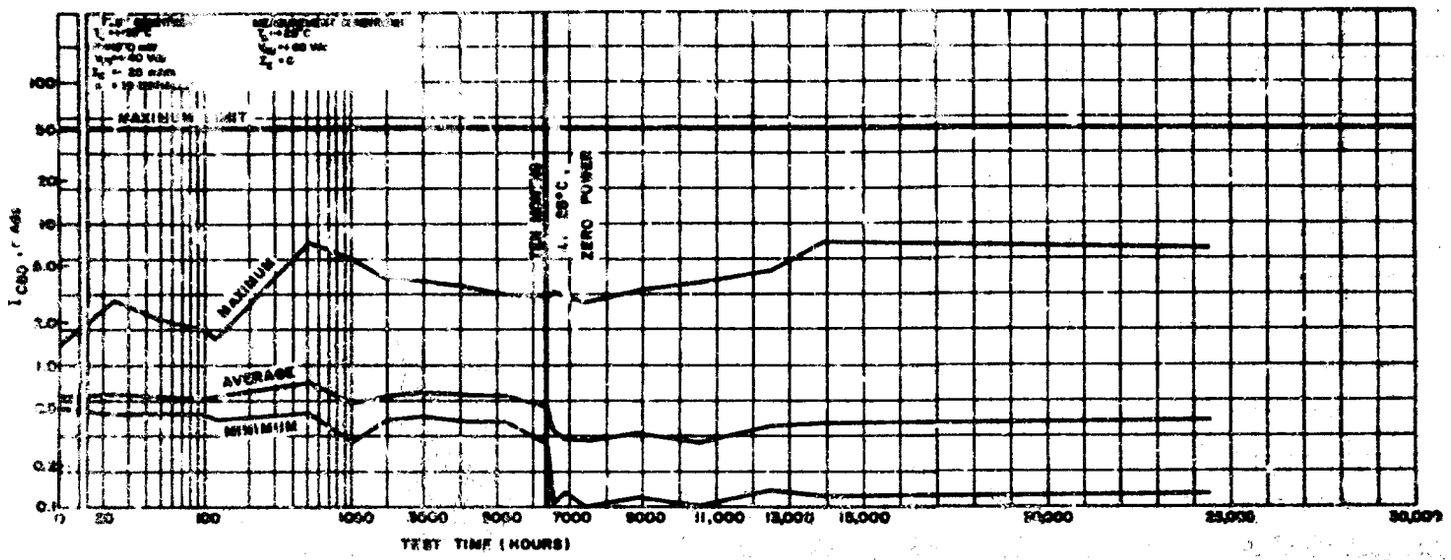
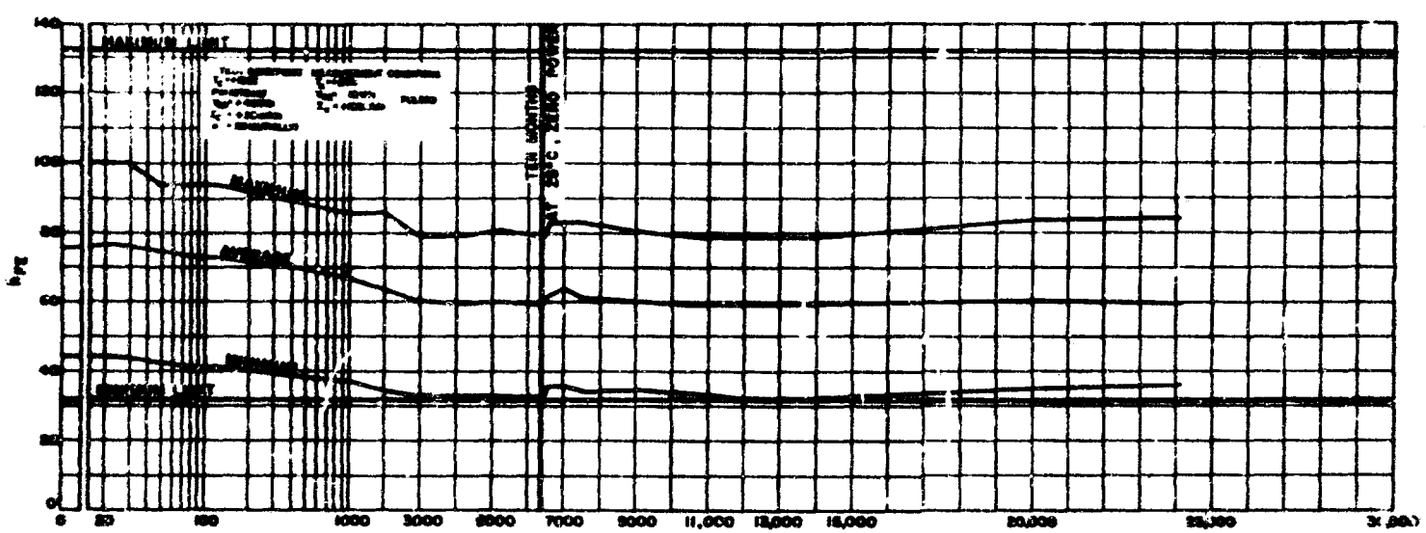


Figure 3-64. Parameter Trend Chart, R2004P1, Phase V, I_{CBO}



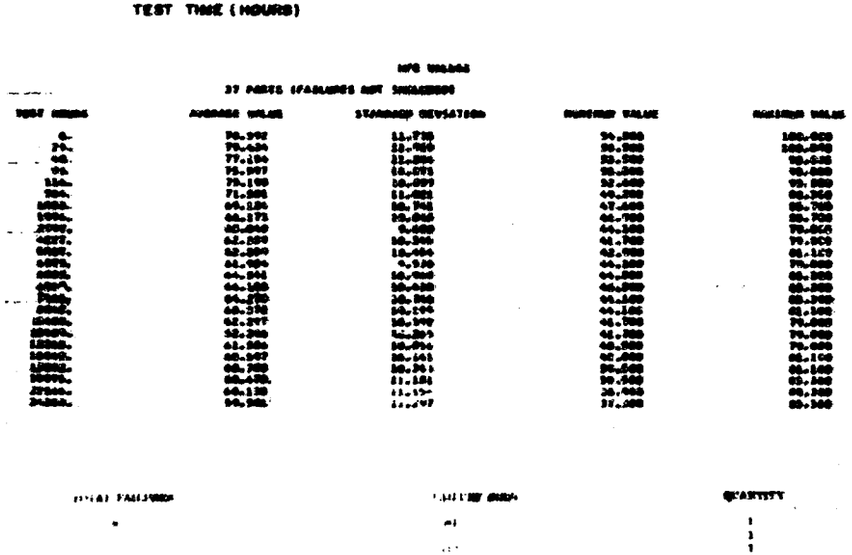
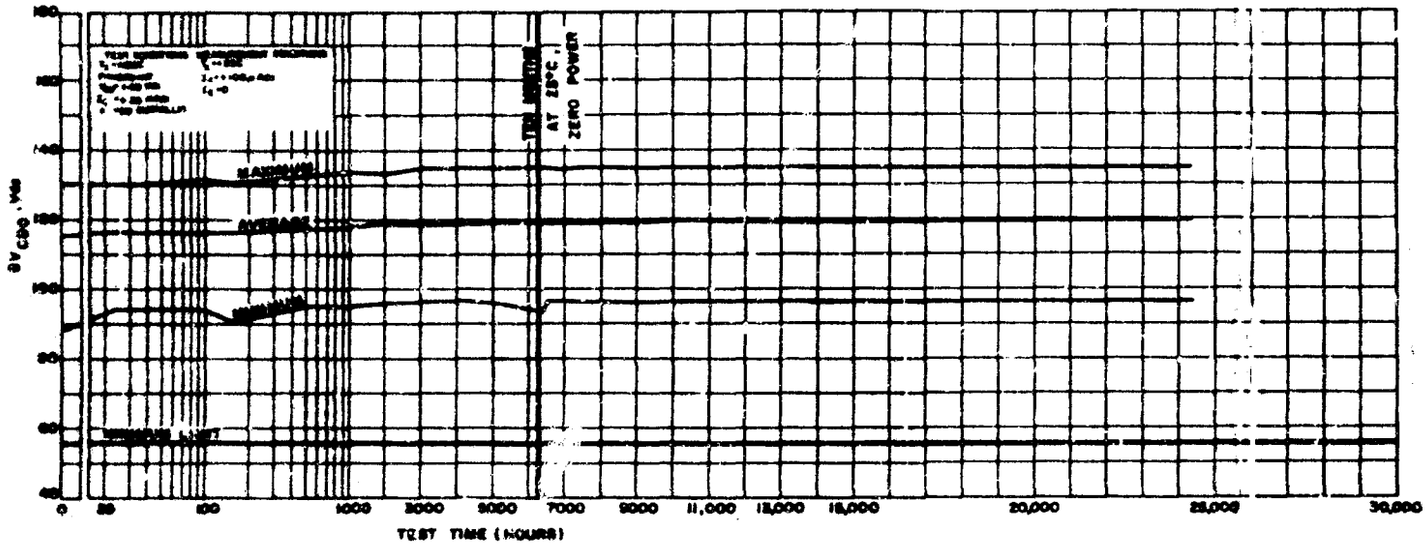


Figure 3-65. Parameter Trend Chart, R2004P1, Phase V, h_{FE}



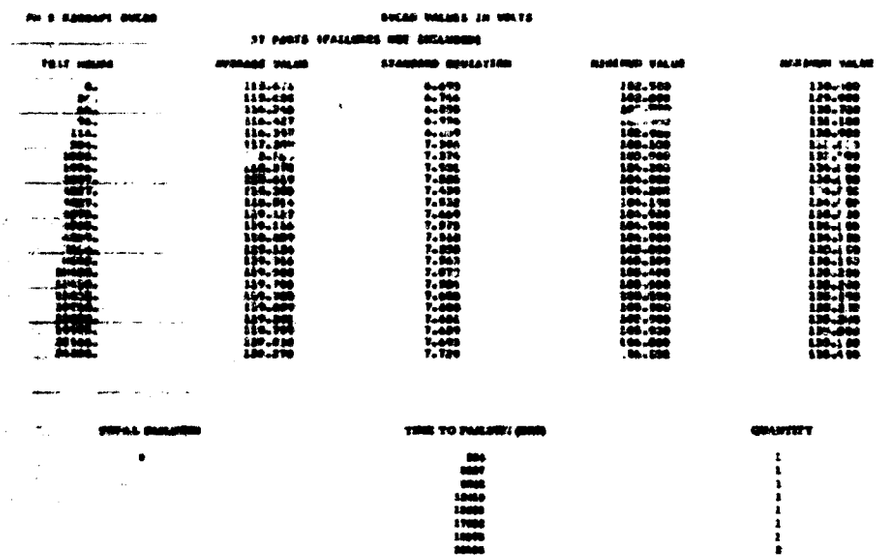
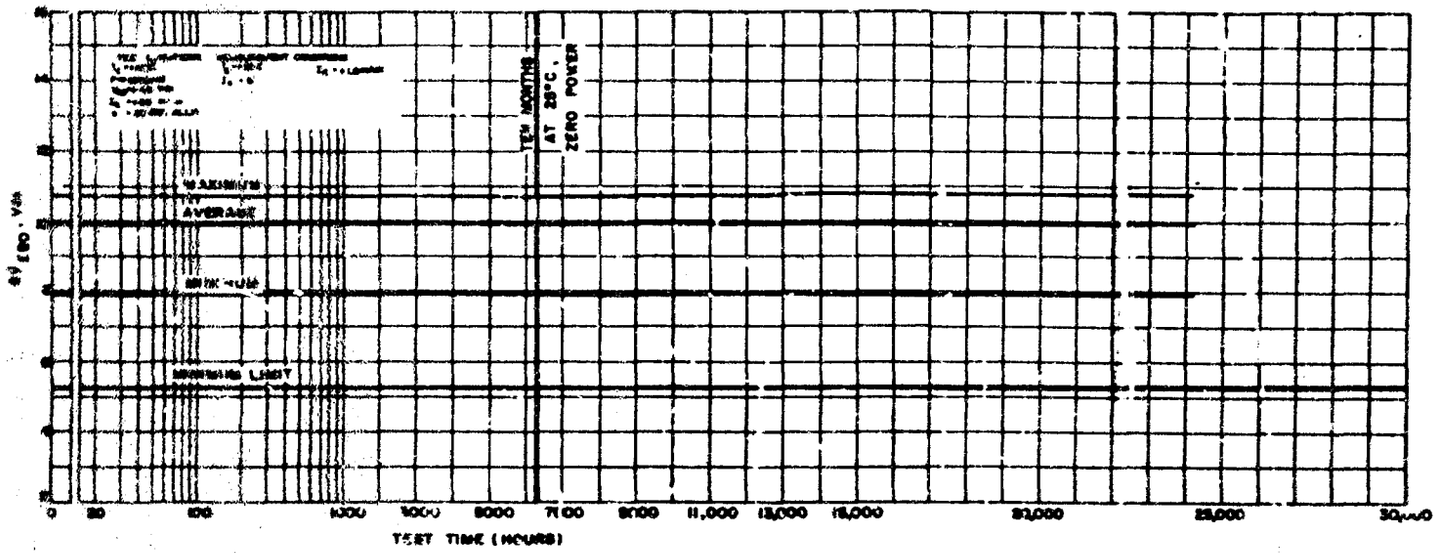


Figure 3-66. Parameter Trend Chart, R2004P1, Phase V, BV_{CBO}



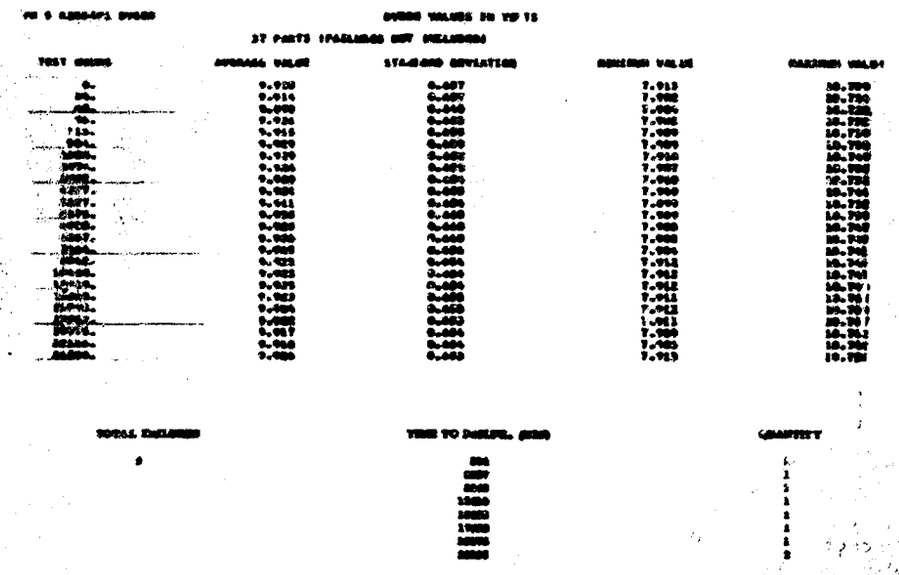
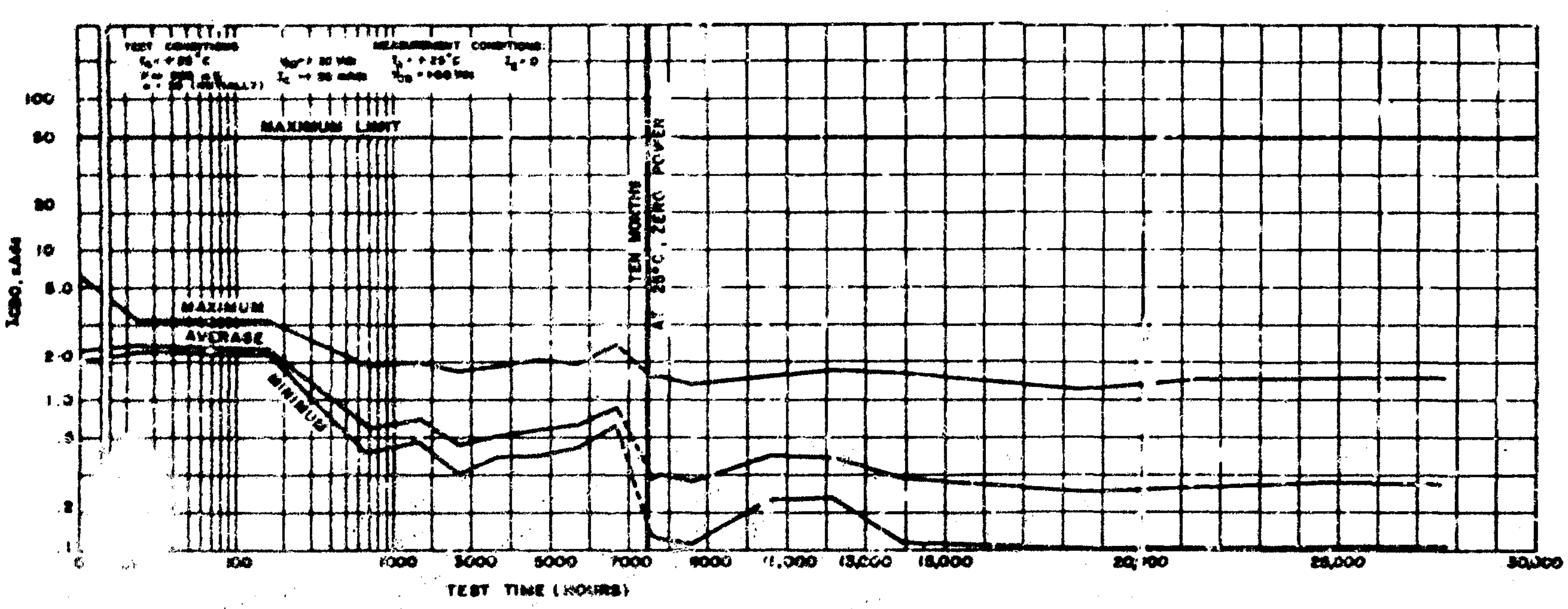


Figure 3-67. Parameter Trend Chart, R2004P1, Phase V, EV_{EB4}



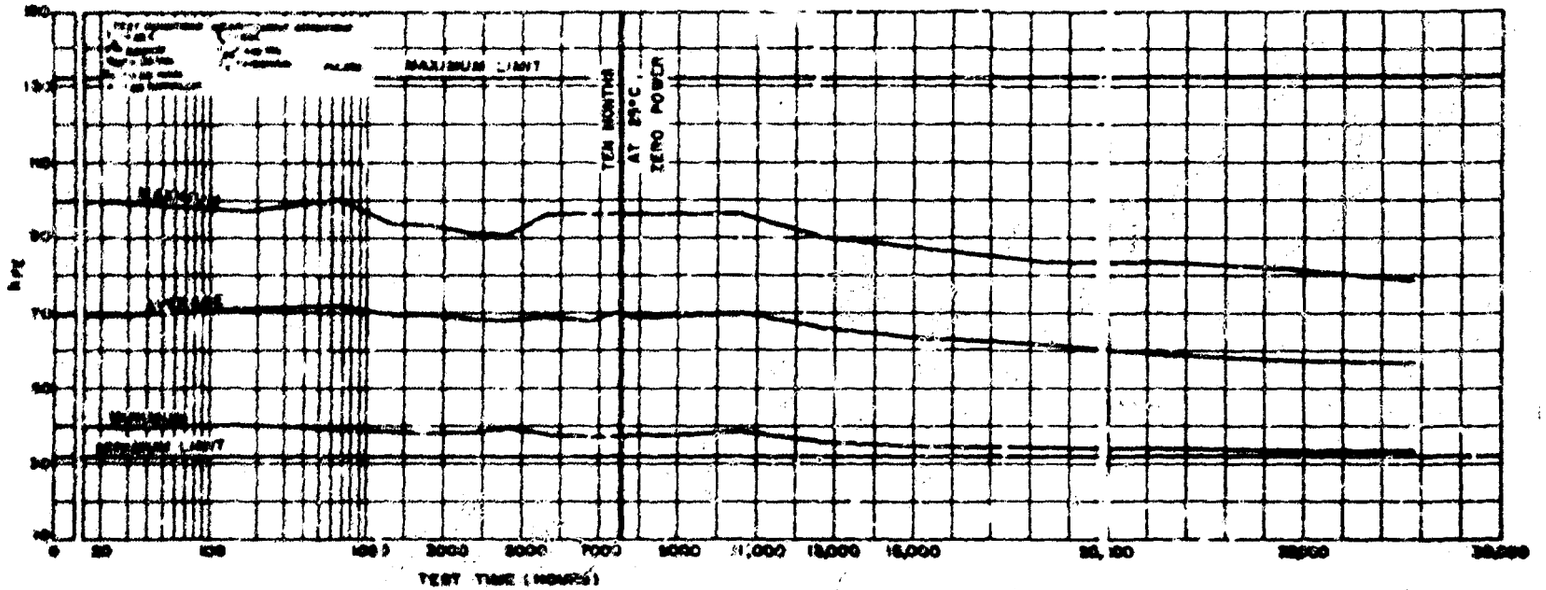
[illegible] ICBO VALUES [illegible]

[illegible] (FAILURES NOT INCLUDED)

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	[illegible] VALUE	[illegible] VALUE
0.	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TOTAL FAILURES	TIME TO FAILURE [illegible]	[illegible]
[illegible]	[illegible]	1

Figure 3-68. Parameter Trend Chart, R2004P[illegible], Ambient Life, I_{CBO}



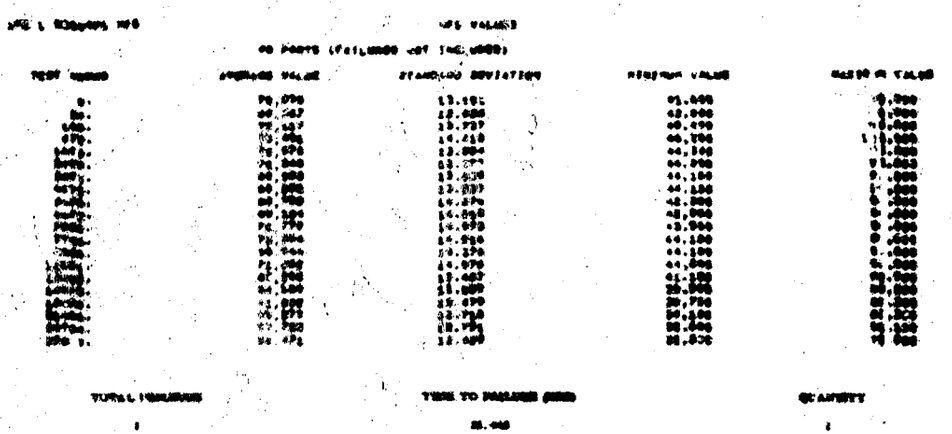
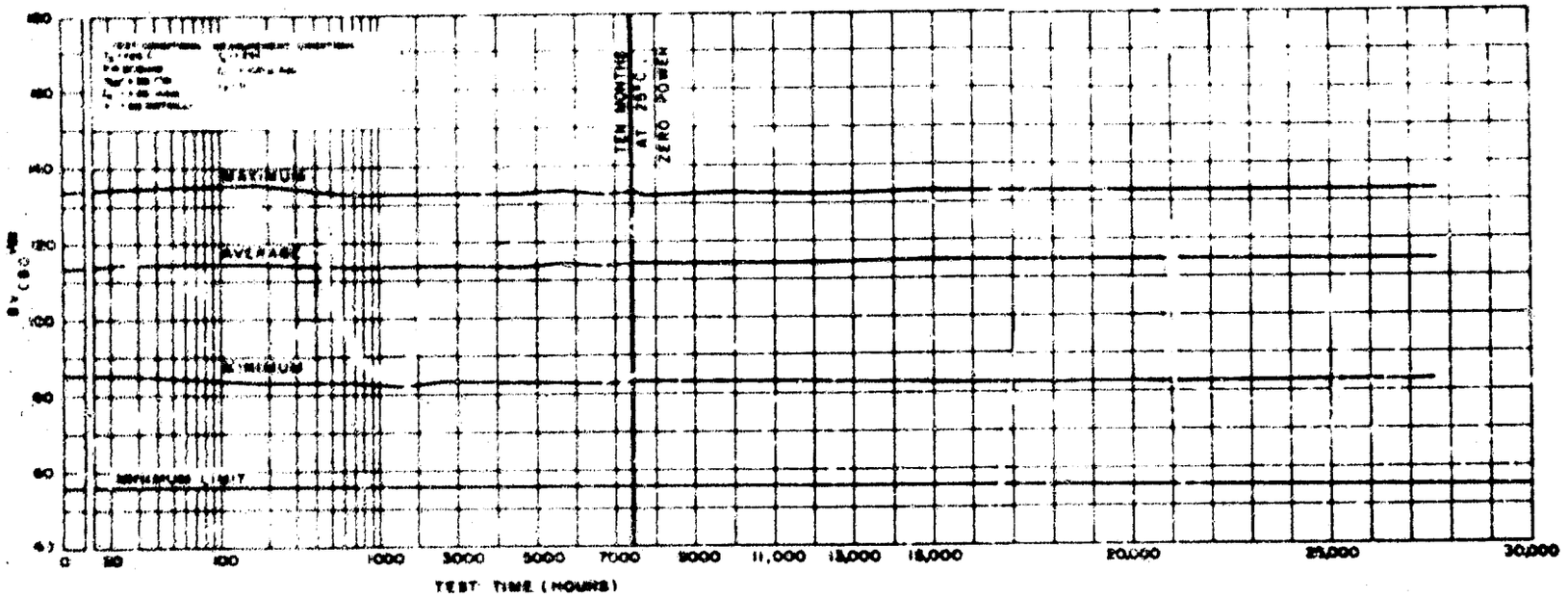


Figure 3-69. Parameter Trend Chart, R2004P1, Ambient Life, h_{FE}



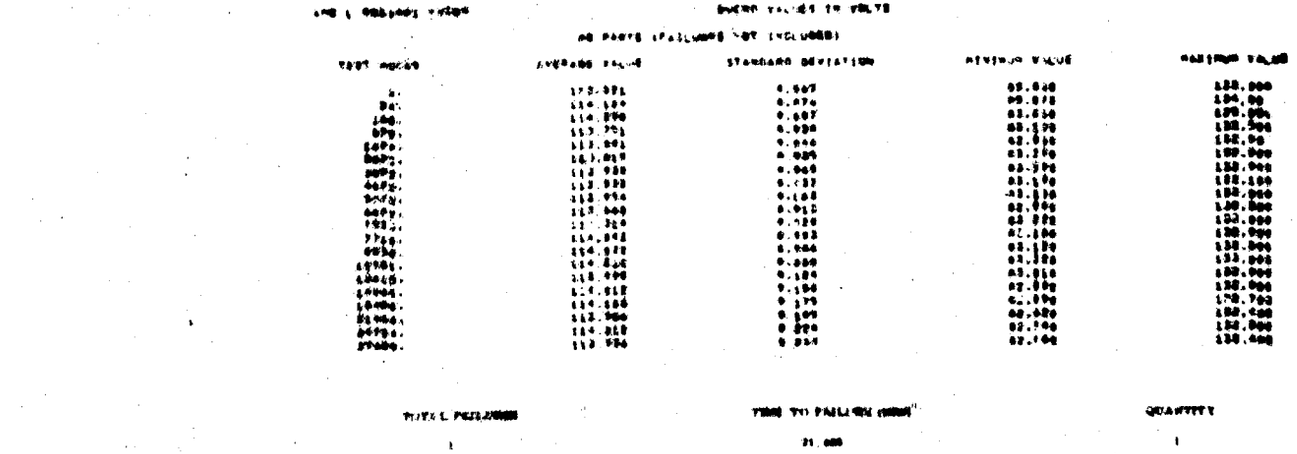
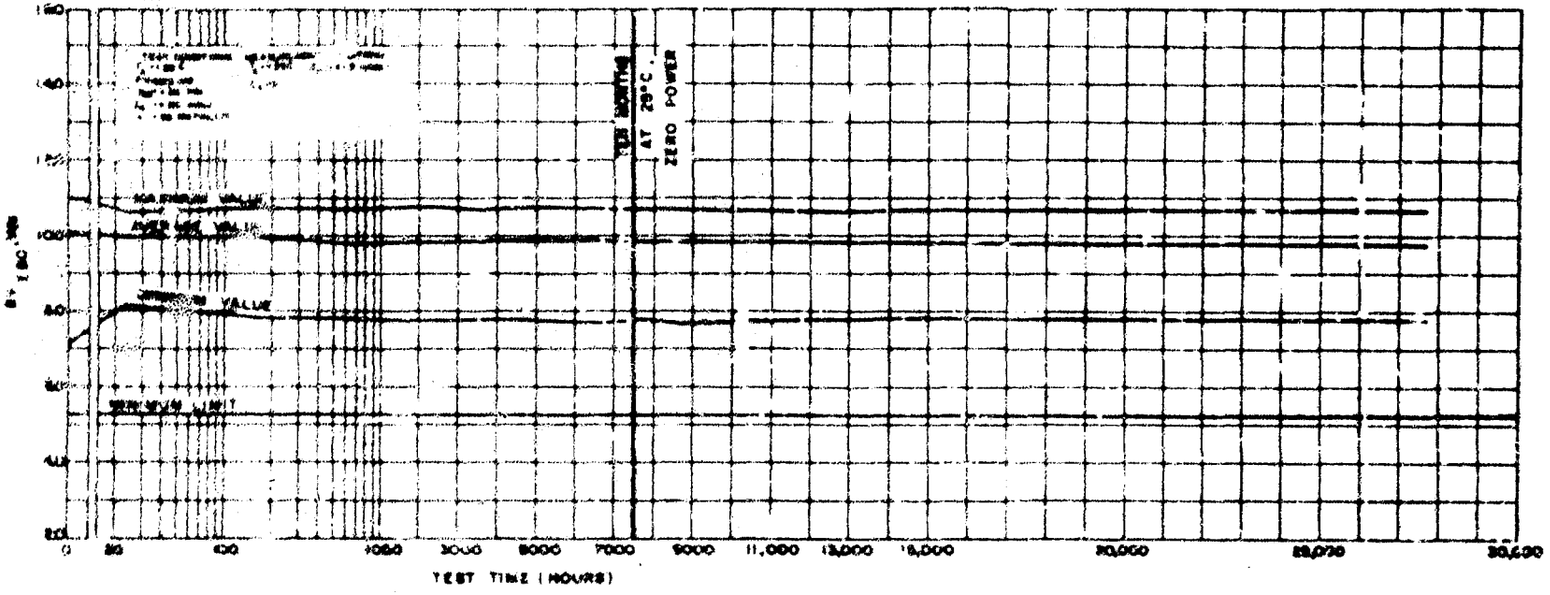


Figure 3-70. Parameter Trend Chart, R2004P1, Ambient Life, BV_{CBO}



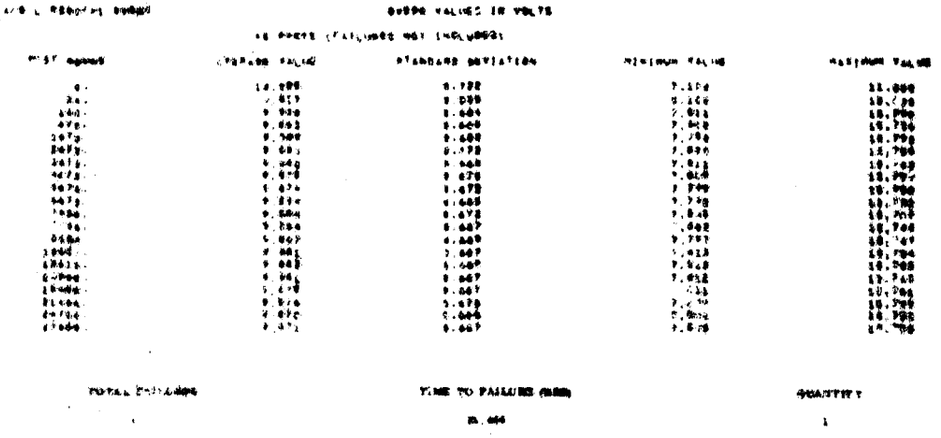


Figure 3-71. Parameter Trend Chart, R2004P1, Ambient Life, BV_{EBO}

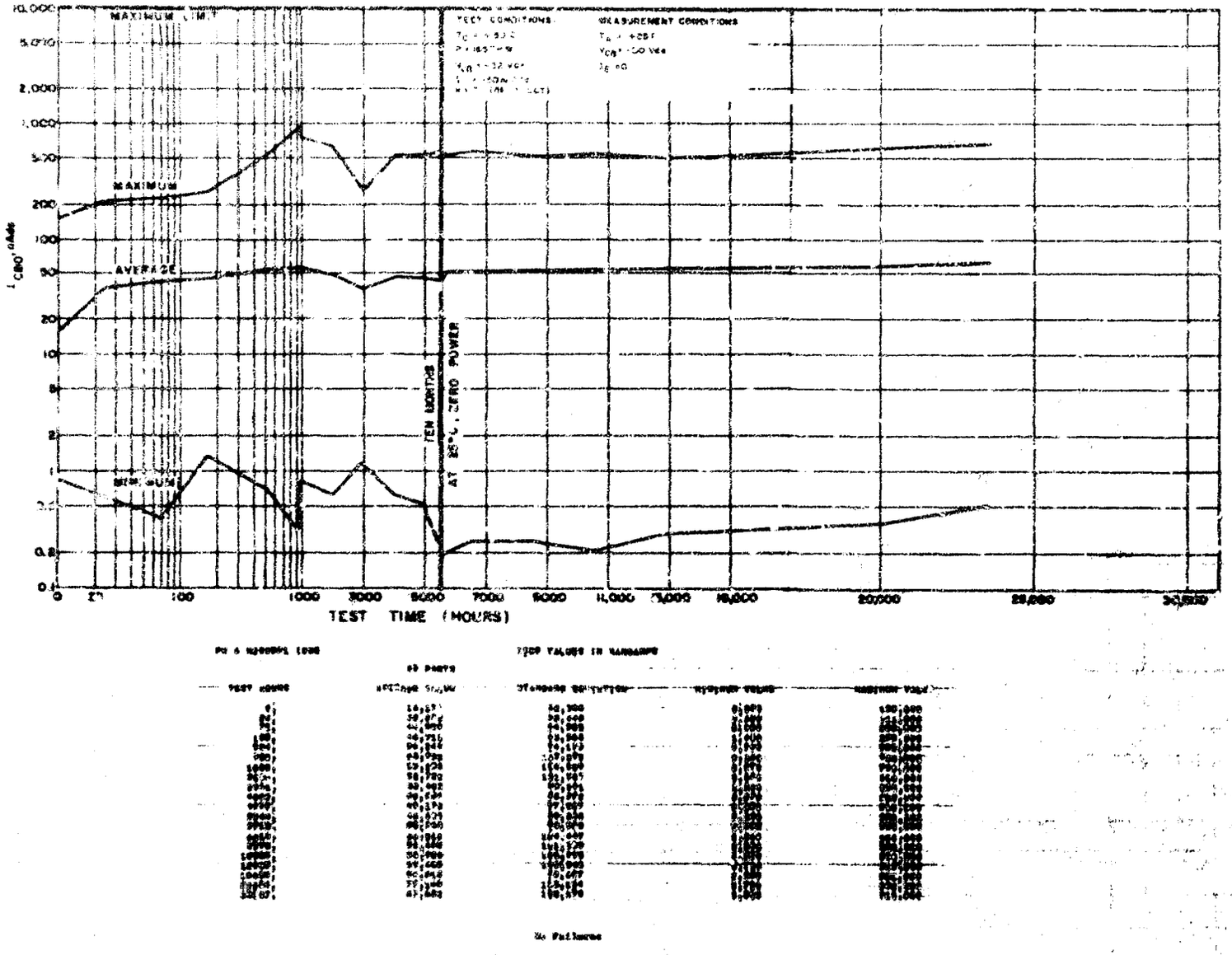
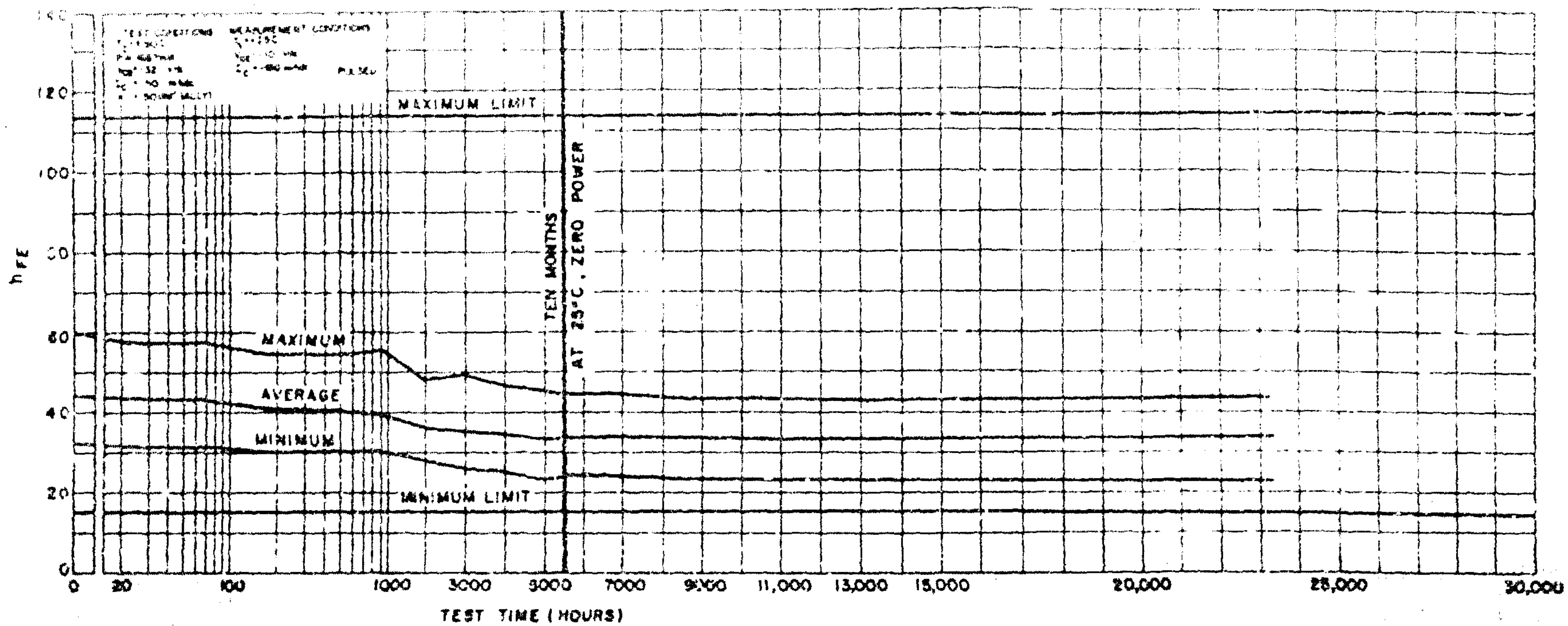


Figure 3-72. Parameter Trend Chart, R2005F1, Phase VI, I_{CBO}



PW 6 R2005P1 HFE

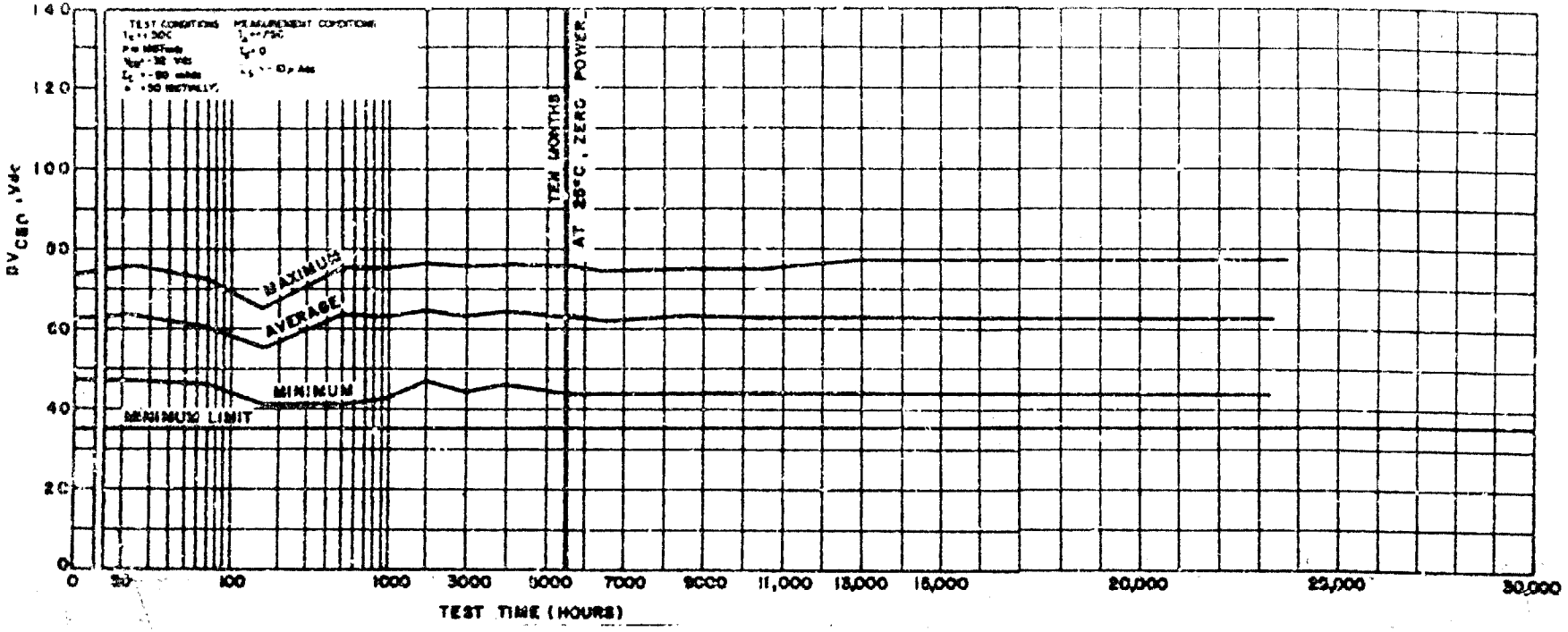
HFE VALUES

40 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	44,000	6,320	32,500	66,000
24.	45,699	6,181	31,500	57,000
72.	43,179	6,270	31,100	57,300
168.	41,208	5,527	30,650	54,600
304.	41,112	5,567	30,000	54,600
629.	39,431	5,901	30,000	55,500
1008.	39,931	5,773	30,000	54,500
2016.	39,207	5,232	27,000	45,400
2001.	37,418	5,753	25,000	49,235
4285.	34,837	4,063	23,400	46,900
4992.	33,700	4,736	23,300	45,900
5840.	33,816	4,699	24,000	44,100
5712.	33,765	4,671	24,200	44,195
8316.	34,171	4,717	24,200	44,000
8593.	32,714	4,305	23,400	43,900
10080.	33,571	4,753	23,100	43,320
12095.	33,332	4,781	23,190	48,950
16638.	33,433	4,825	22,960	43,590
22460.	32,329	4,080	22,100	44,900
23317.	32,292	4,736	21,400	43,200

No Failures

Figure 3-73. Parameter Trend Chart, R2005P1, Phase VI, h_{FE}



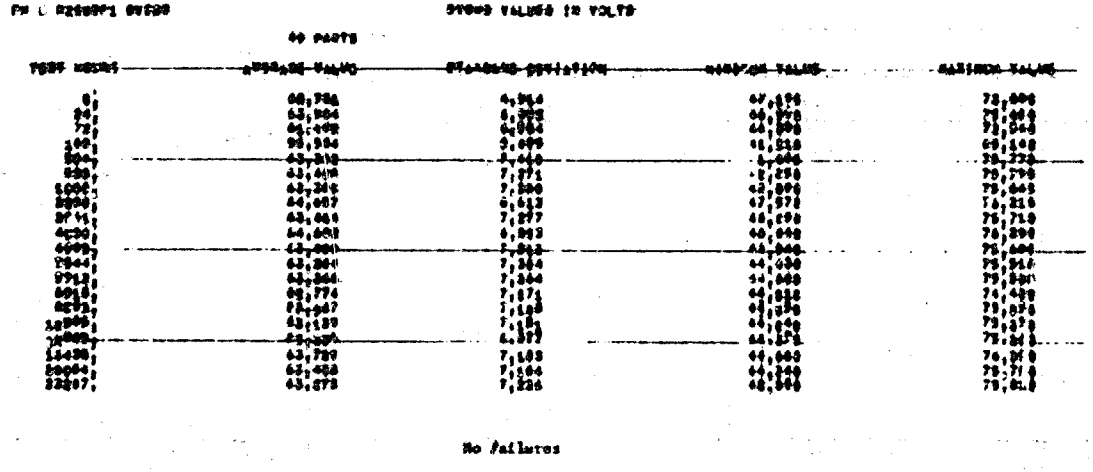


Figure 3-74. Parameter Trend Chart, R2005P1, Phase VI, BV_{CBO}

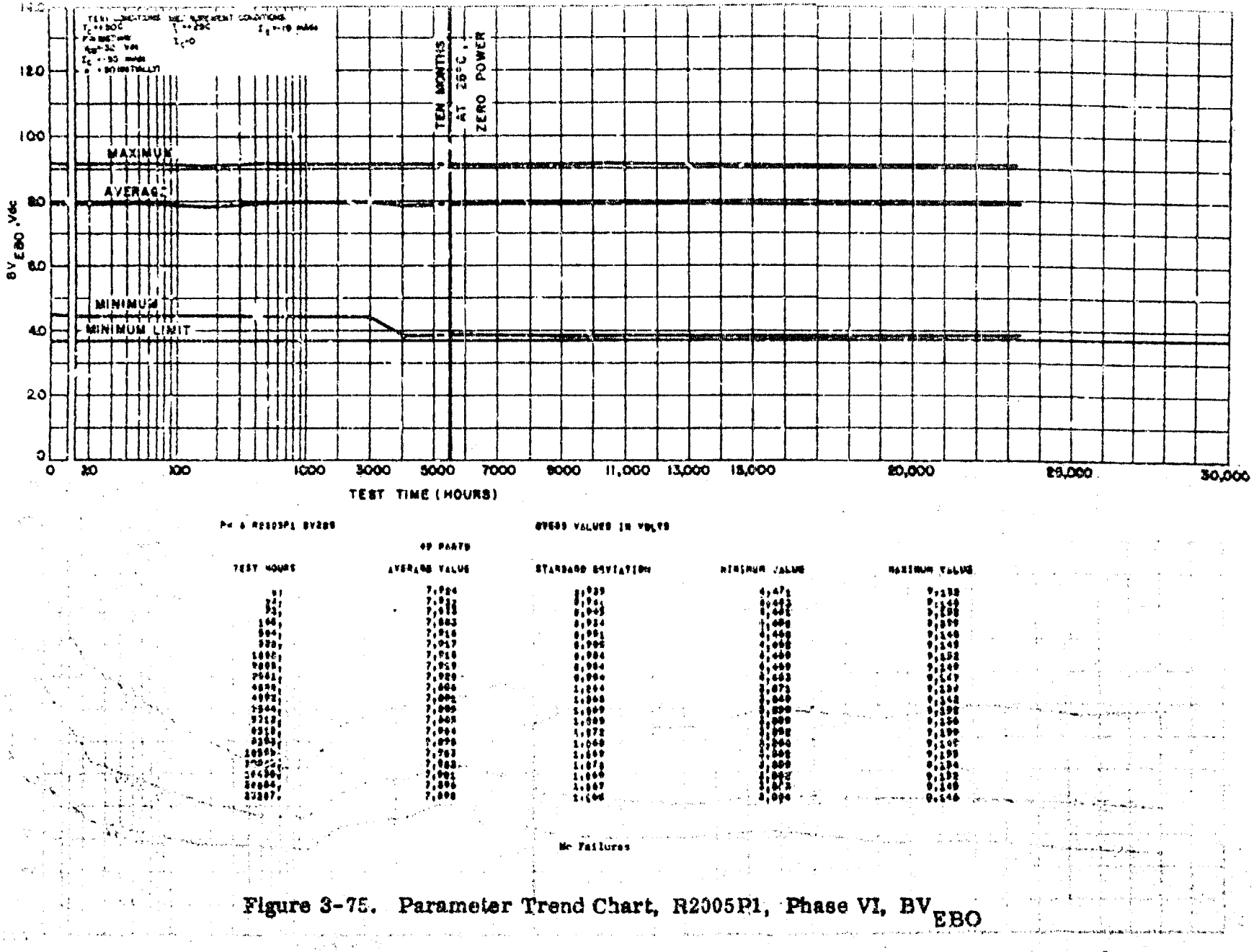
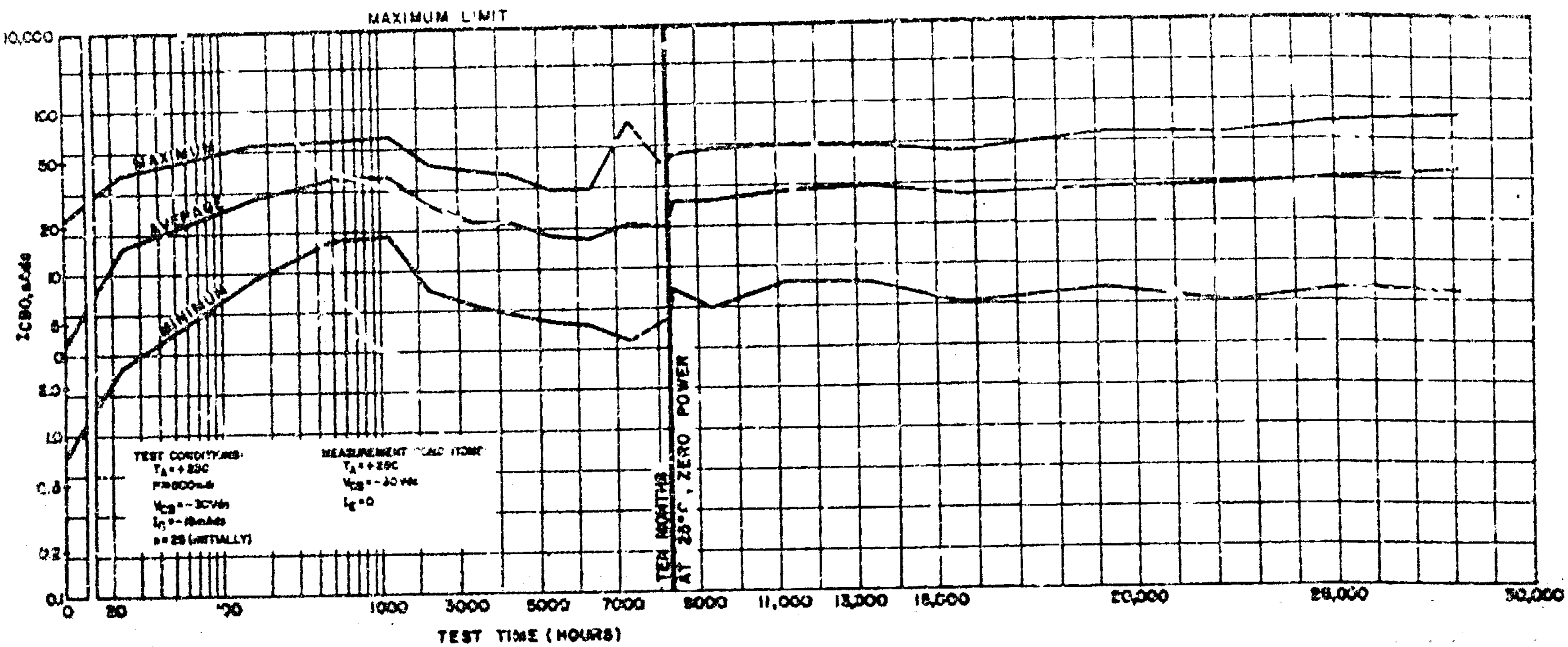


Figure 3-75. Parameter Trend Chart, R2005P1, Phase VI, BV_{EBO}



AMB L ?20-500 ICBO

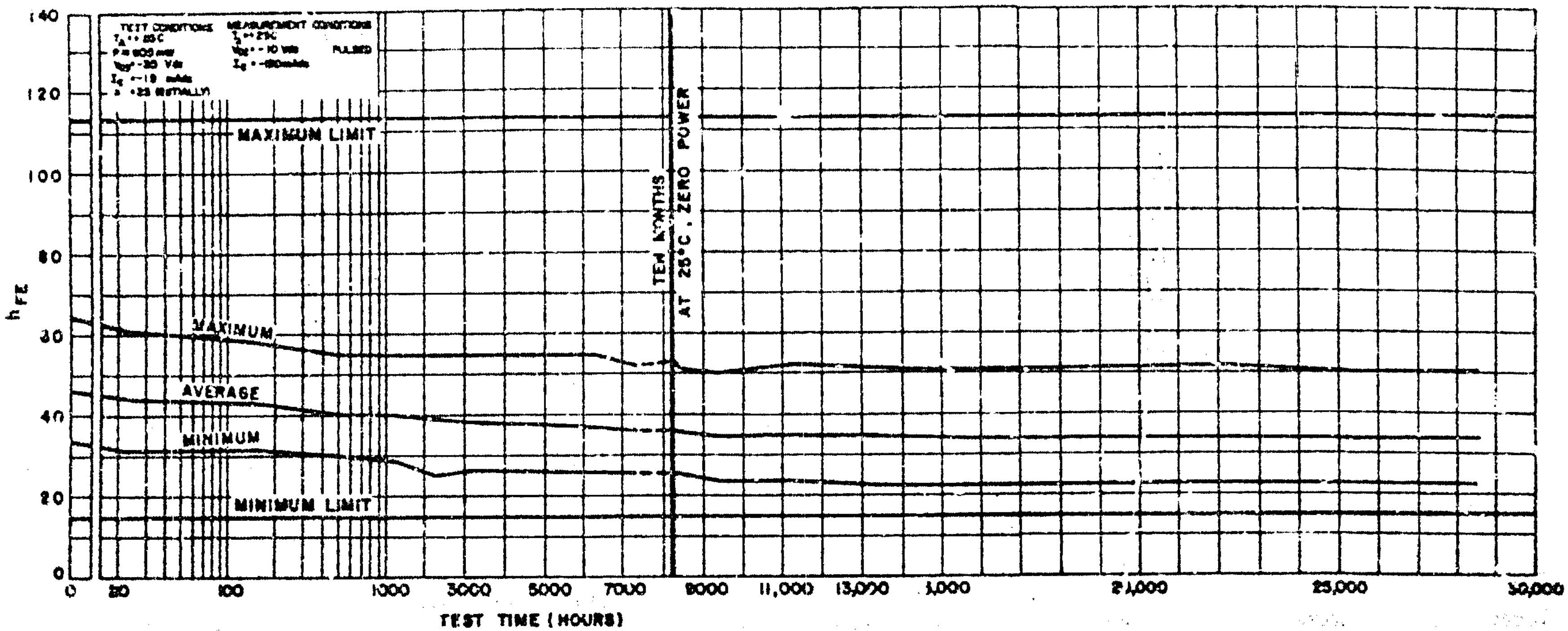
ICBO VALUES IN NANOAMPS

24 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	3.977	9.302	0.728	21.500
24.	15.744	10.657	2.770	44.000
168.	30.750	13.062	9.400	62.011
504.	39.072	12.794	16.500	44.001
1344.	39.937	12.980	17.700	68.443
2344.	25.779	10.327	7.720	45.000
3344.	21.279	9.644	6.300	42.005
4344.	28.837	9.190	9.500	39.400
5344.	16.146	7.406	4.750	37.000
6344.	15.925	7.471	4.585	32.300
7344.	19.450	19.080	3.709	28.845
8304.	18.979	9.969	5.800	48.100
8479.	27.312	10.950	7.850	53.085
9204.	26.797	11.037	5.887	54.018
11287.	38.695	12.793	6.200	57.008
14241.	32.151	11.671	8.008	50.050
15731.	29.920	11.296	6.000	55.610
17224.	38.129	12.440	7.000	60.982
22237.	31.084	13.919	9.700	61.494
25276.	32.934	15.830	6.600	78.654
28456.	34.546	18.496	6.283	78.893

No Failures

Figure 3-76. Parameter Trend Chart, R2005P1, Ambient Life, I_{CBO}



ARB I, R2005PI HFE

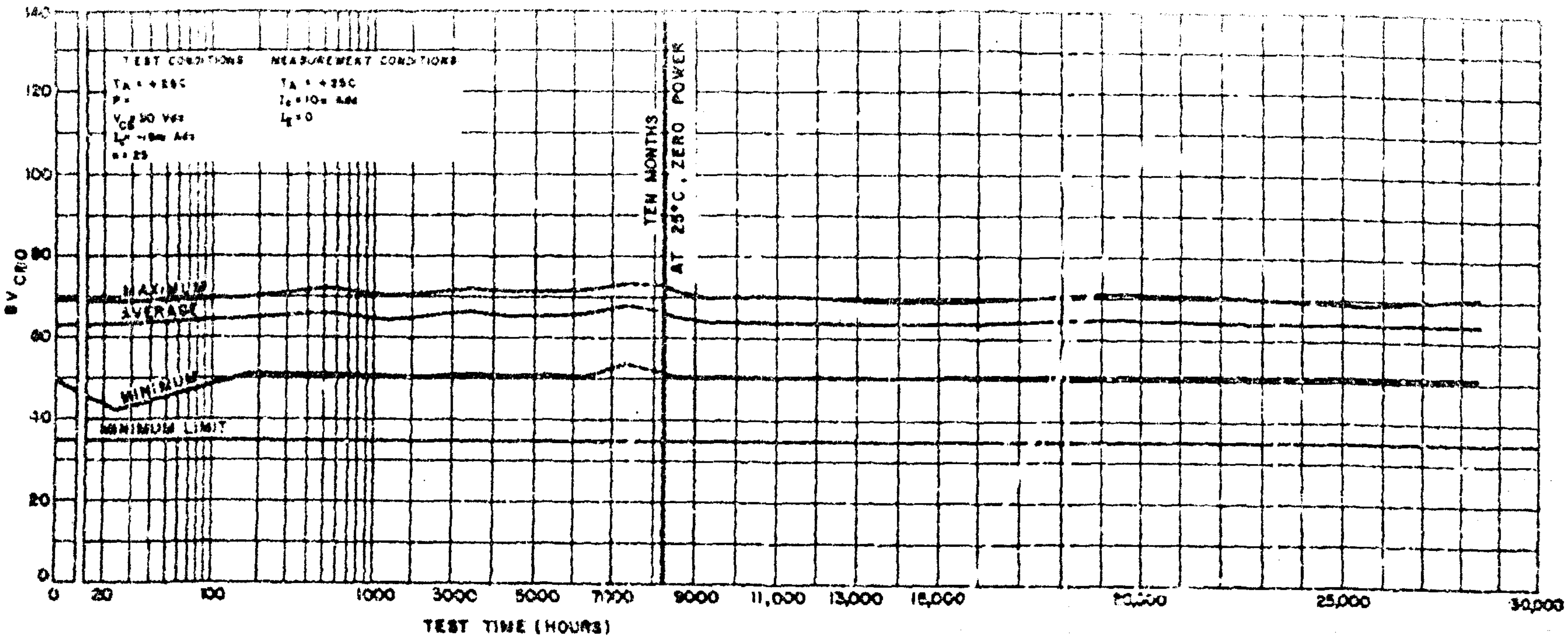
HFE VALUES

24 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	45.844	8.587	34.100	65.288
24.	44.708	8.411	31.600	61.298
168.	43.069	7.869	31.900	58.800
504.	42.581	7.831	30.000	55.600
1344.	41.377	7.496	28.000	55.665
2344.	39.848	8.891	25.300	55.038
3344.	38.979	7.806	26.900	53.600
4344.	38.210	7.595	26.330	55.910
5344.	37.662	7.973	26.100	55.580
6344.	37.318	7.576	25.900	55.900
7344.	36.697	6.868	25.900	52.048
8304.	36.796	7.463	23.906	53.600
8472.	36.252	7.836	25.200	51.708
9204.	35.596	7.185	24.200	53.000
11207.	35.788	7.438	24.200	52.600
13381.	35.242	7.328	23.400	51.708
15733.	34.956	7.376	23.350	51.706
19224.	34.867	7.414	22.700	51.700
22237.	34.371	7.473	22.200	51.706
25471.	33.594	7.346	21.400	50.095
29459.	33.943	7.406	21.400	50.000

No Failures

Figure 3-77. Parameter Trend Chart, R2005Pl, Amblknt Life, h_{FE}



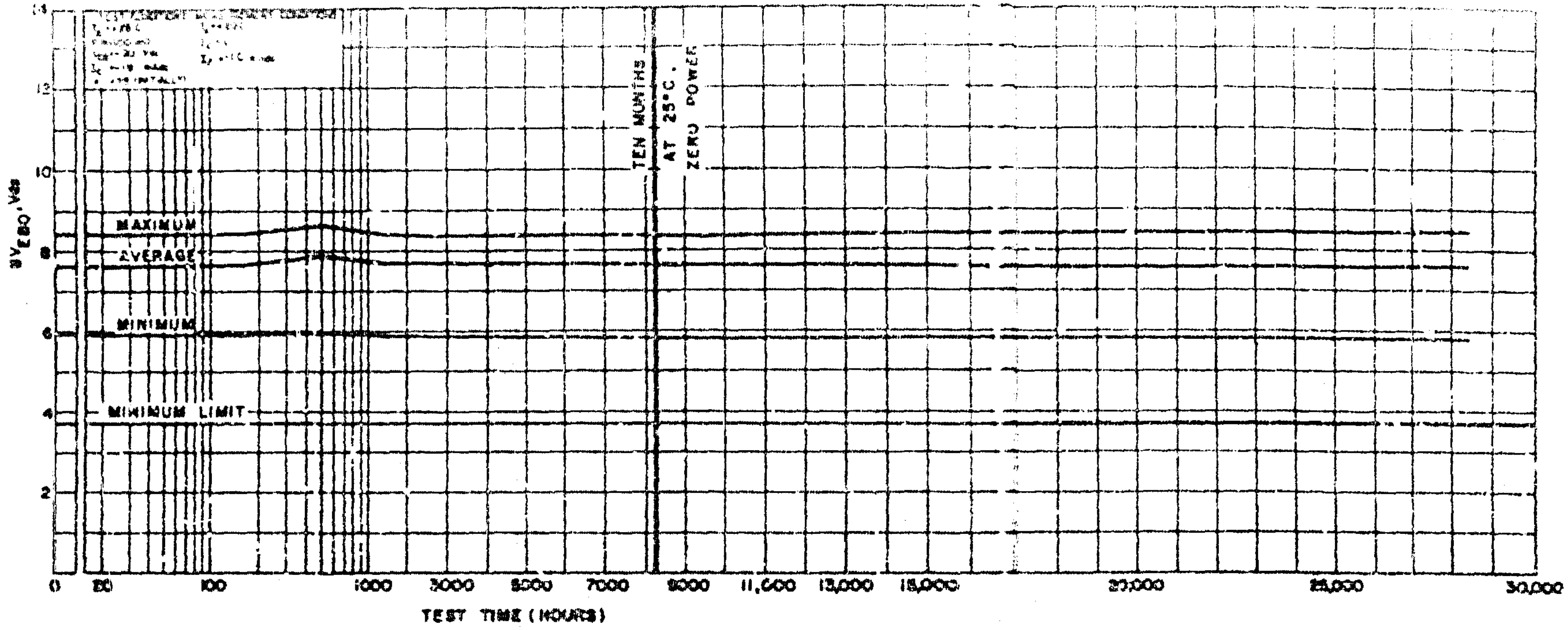
AMB L R2005P1 BVCBO . BVCBO VALUES IN VOLTS

74 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	63.8[illegible]4	4.368	49.640	69.790
24.	63.878	5.048	48.007	69.180
168.	64.895	5.130	51.090	70.098
504.	64.558	5.394	51.880	72.688
2344.	64.517	5.301	50.920	78.630
3344.	65.809	5.227	51.180	71.290
1844.	66.947	5.314	51.790	72.010
4344.	65.875	5.315	5[illegible].116	71.748
5344.	65.924	5.3[illegible]3	51.060	71.790
6344.	66.876	5.434	51.193	72.598
7344.	66.389	4.923	54.148	73.940
8384.	64.842	5.363	51.710	73.049
8472.	65.922	5.215	51.348	71.099
9384.	64.717	5.097	51.090	78.490
11257.	64.542	5.072	51.129	73.998
13321.	64.349	4.877	51.048	65.990
15734.	64.181	4.833	51.029	59.605
19224.	65.873	5.148	51.179	71.130
22232.	64.396	4.053	[illegible]	79.430
25874.	64.218	4.932	50.499	69.790
28456.	64.927	5.025	51.049	70.370

No Failures

Figure 3-78. Parameter Trend Chart, R2005P1, Ambient Life, BV_{CBO}



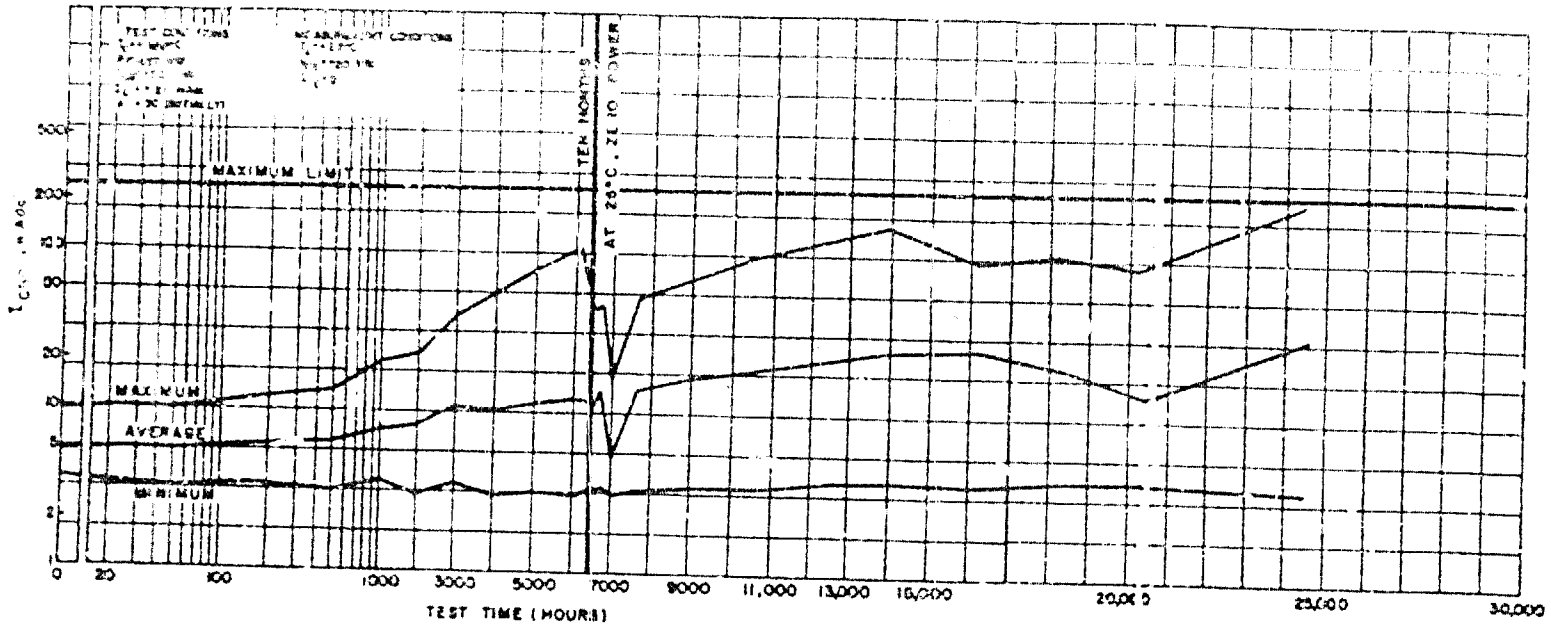
TREND VALUES IN VOLTS

24 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	7.648	0.526	5.881	8.393
24.	7.555	0.538	5.844	8.394
168.	7.644	0.529	5.871	8.395
504.	7.875	0.598	5.888	8.440
1008.	7.675	0.531	5.879	8.499
2344.	7.642	0.529	5.879	8.392
3264.	7.647	0.429	5.872	8.389
4344.	7.654	0.528	5.863	8.380
5344.	7.656	0.526	5.882	8.387
6344.	7.653	0.527	5.842	8.491
7344.	7.643	0.526	5.885	8.378
8861.	7.611	0.517	5.885	8.340
8677.	7.656	0.529	5.844	8.380
9384.	7.644	0.528	5.882	8.350
11297.	7.643	0.529	5.872	8.081
13381.	7.666	0.530	5.872	8.404
15731.	7.642	0.529	5.872	8.431
19226.	7.664	0.530	5.872	8.442
22229.	7.656	0.529	5.869	8.395
25479.	7.649	0.528	5.866	8.392
28454.	7.641	0.529	5.872	8.394

No Failures

Figure 3-79. Parameter Trend Chart, R2005P1, Ambient Life, BV_{EBO}



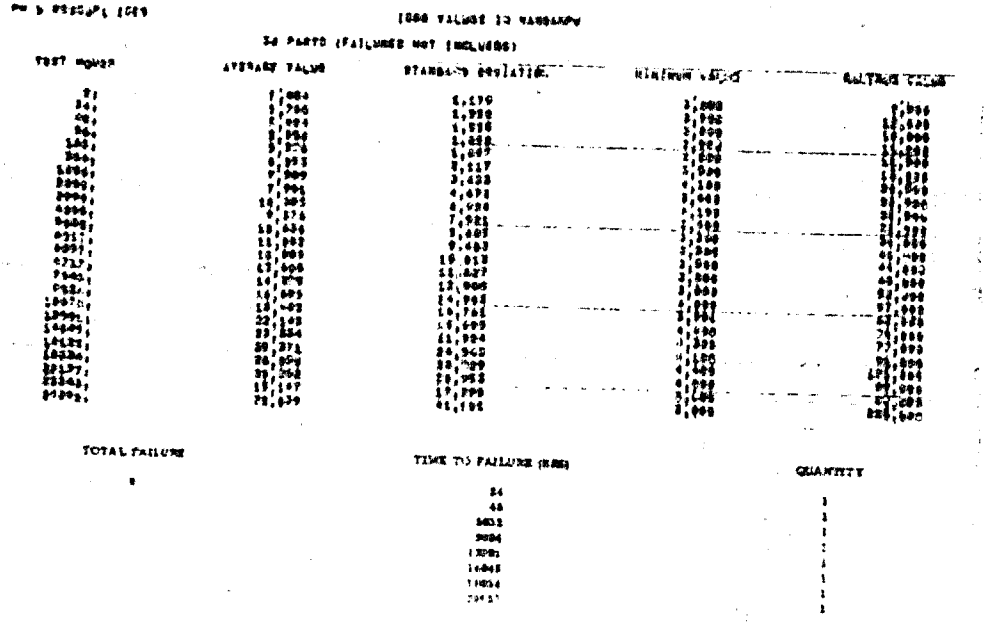
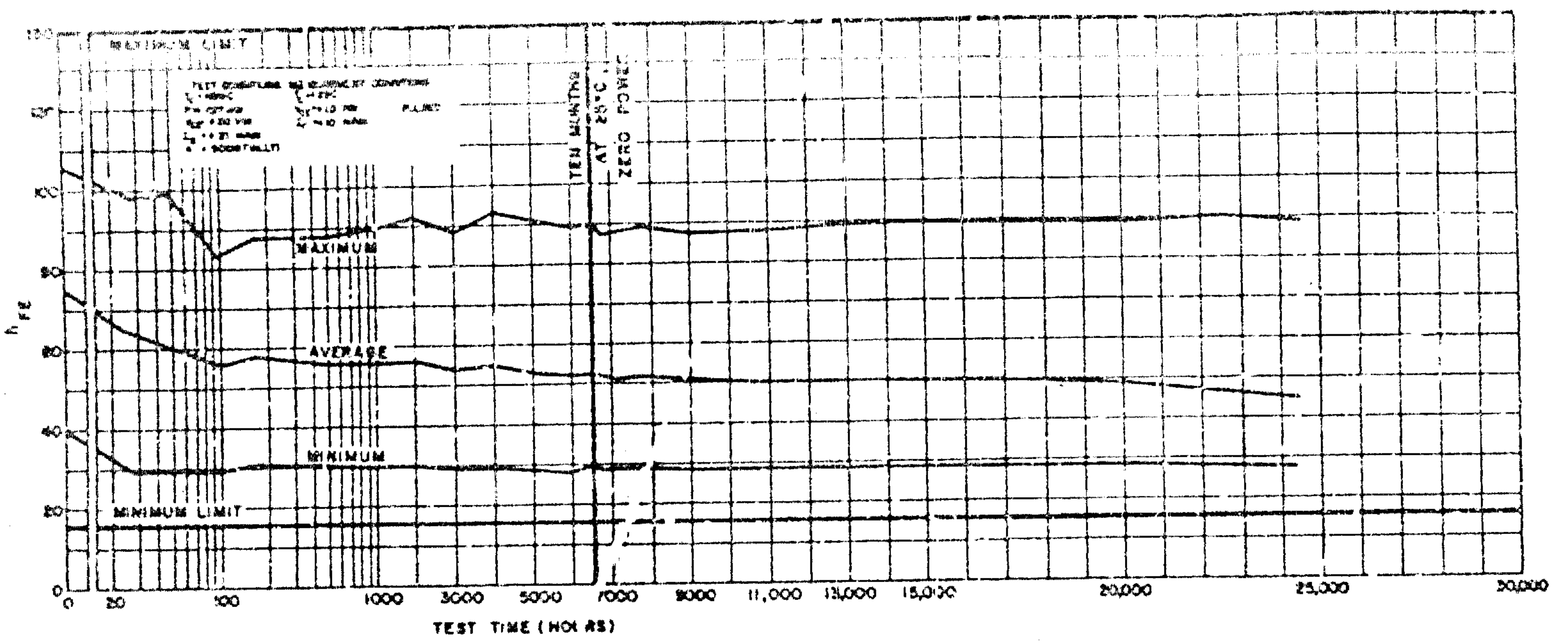


Figure 3-80. Parameter Trend Chart, R2023Pi, Phase V, I_{CBO}



PN 5 R2026P1 HFE

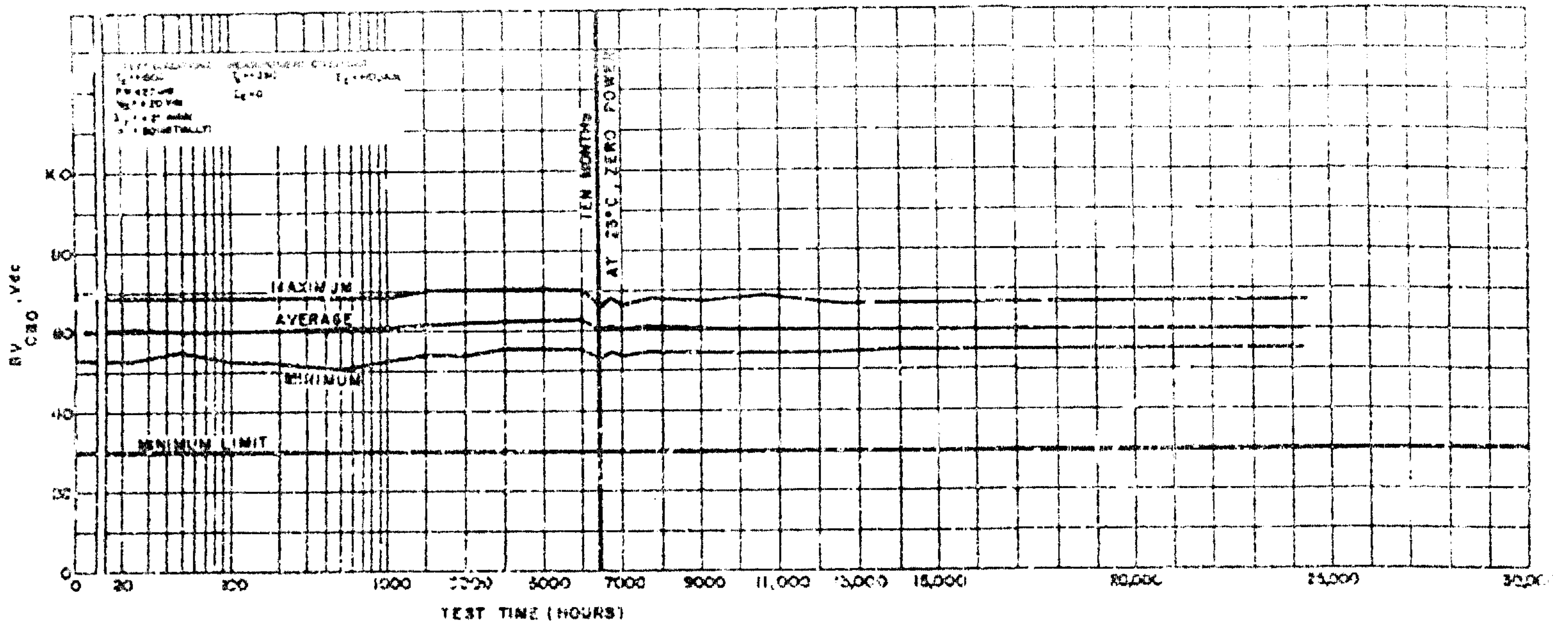
HFE VALUES

12 PARTS (FAILURES NOT INCLUDED)

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	77.234	17.696	39.100	105.803
24.	69.471	18.647	36.200	100.300
48.	62.786	16.190	28.100	98.600
96.	57.539	14.518	33.000	97.600
168.	58.648	15.282	35.600	97.803
504.	57.114	15.364	32.900	97.900
1008.	56.991	16.157	33.200	98.200
2000.	56.613	16.006	32.263	97.300
2999.	54.532	16.08	33.600	97.800
4073.	55.526	17.530	34.100	98.590
5032.	53.187	16.423	30.500	96.200
6013.	51.903	16.210	29.400	96.250
6867.	53.132	14.473	32.720	96.300
6717.	52.421	16.235	32.700	97.500
7000.	52.176	16.257	30.000	97.790
7668.	52.618	16.353	32.440	96.560
8894.	53.055	16.040	32.160	97.900
10470.	50.983	15.977	31.300	97.600
12061.	50.921	15.972	31.900	97.700
14344.	50.608	15.759	31.300	99.300
16112.	49.295	15.364	31.000	98.900
18036.	49.197	15.340	30.900	99.300
20157.	48.018	13.723	28.700	97.800
22346.	46.405	12.891	28.200	94.100
24090.	45.963	12.475	27.900	90.100

TOTAL FAILURE	TIME TO FAILURE (HRS)	QUANTITY
8	96	1
	4	1
	3002	1
	6004	1
	12061	1
	14045	1
	18094	1
	20317	1

Figure 3-81. Parameter Trend Chart, R2026P1, Phase V, h_{FE}



RN 5 R2026P1 BVCBO

BVCBO VALUES IN VOLTS

30 PARTS (FAILURES NOT INCLUDED)

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	60.730	2.678	52.540	66.050
24.	60.969	2.901	52.890	66.490
48.	62.961	2.714	54.770	66.490
96.	60.575	3.055	52.590	66.890
168.	60.773	2.196	53.640	66.700
504.	60.937	3.192	50.810	66.830
1000.	61.073	3.012	52.600	66.900
2000.	62.150	3.248	54.000	68.160
3000.	62.229	3.239	54.810	68.100
4003.	62.277	3.121	55.510	68.444
5012.	62.323	2.967	55.690	67.862
6013.	62.667	2.991	55.490	69.244
6097.	60.320	2.711	54.210	66.100
6717.	61.010	2.720	54.060	66.720
7059.	60.094	2.703	53.090	68.320
7603.	61.024	2.701	54.790	66.730
8944.	60.972	2.722	54.900	66.000
10270.	60.882	2.796	54.440	69.009
12001.	60.777	2.626	55.013	67.000
14065.	63.796	1.579	55.010	66.190
16122.	62.787	2.561	52.040	66.190
18034.	60.830	1.609	55.100	66.690
20157.	60.903	2.069	54.720	60.490
22248.	60.214	2.641	54.330	65.550
24795.	60.753	1.743	55.050	66.120

TOTAL FAILURE	TIME TO FAILURE (HRS)	QUANTITY
8	54	1
	68	1
	5022	1
	9094	1
	13001	1
	13361	1
	16484	1
	18187	1

Figure 3-82. Parameter Trend Chart, R2026P1, Phase V, BV_{CBO}

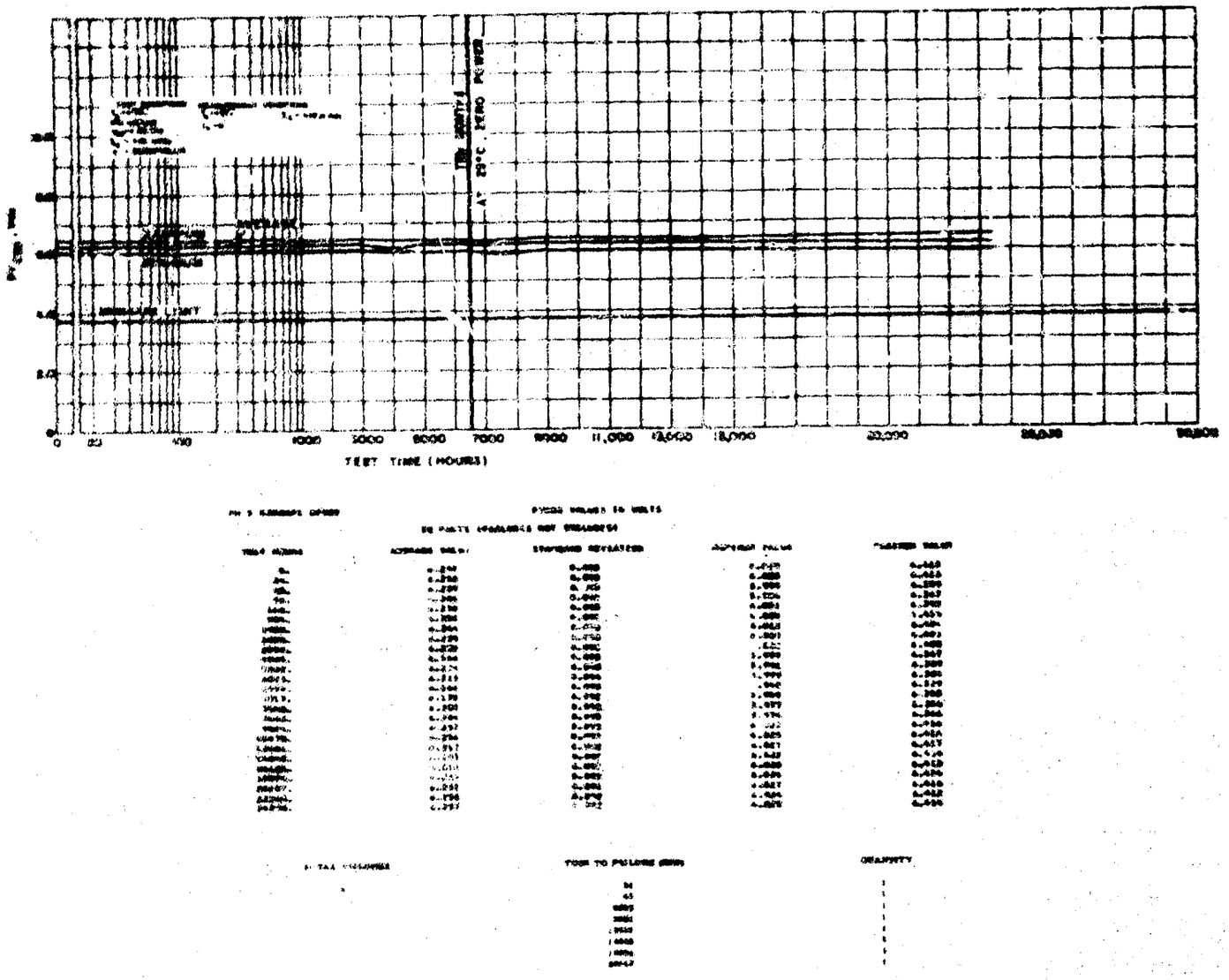
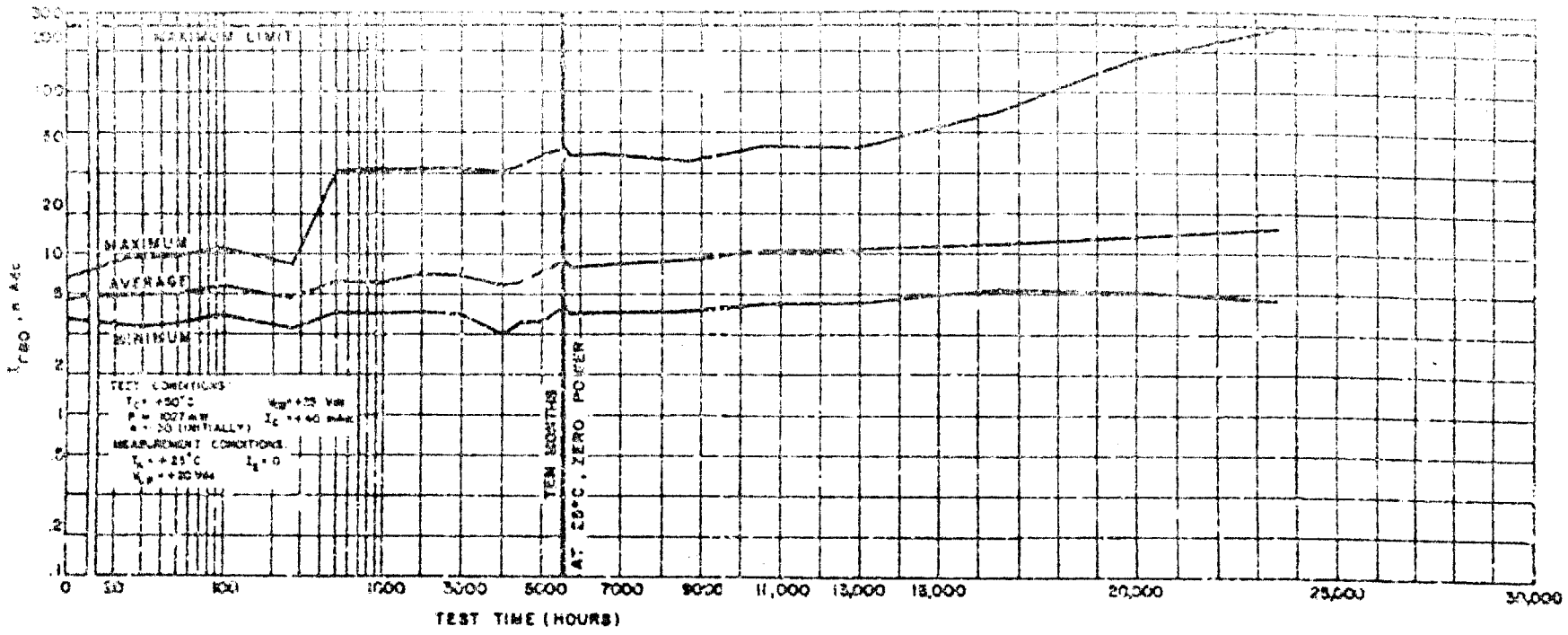


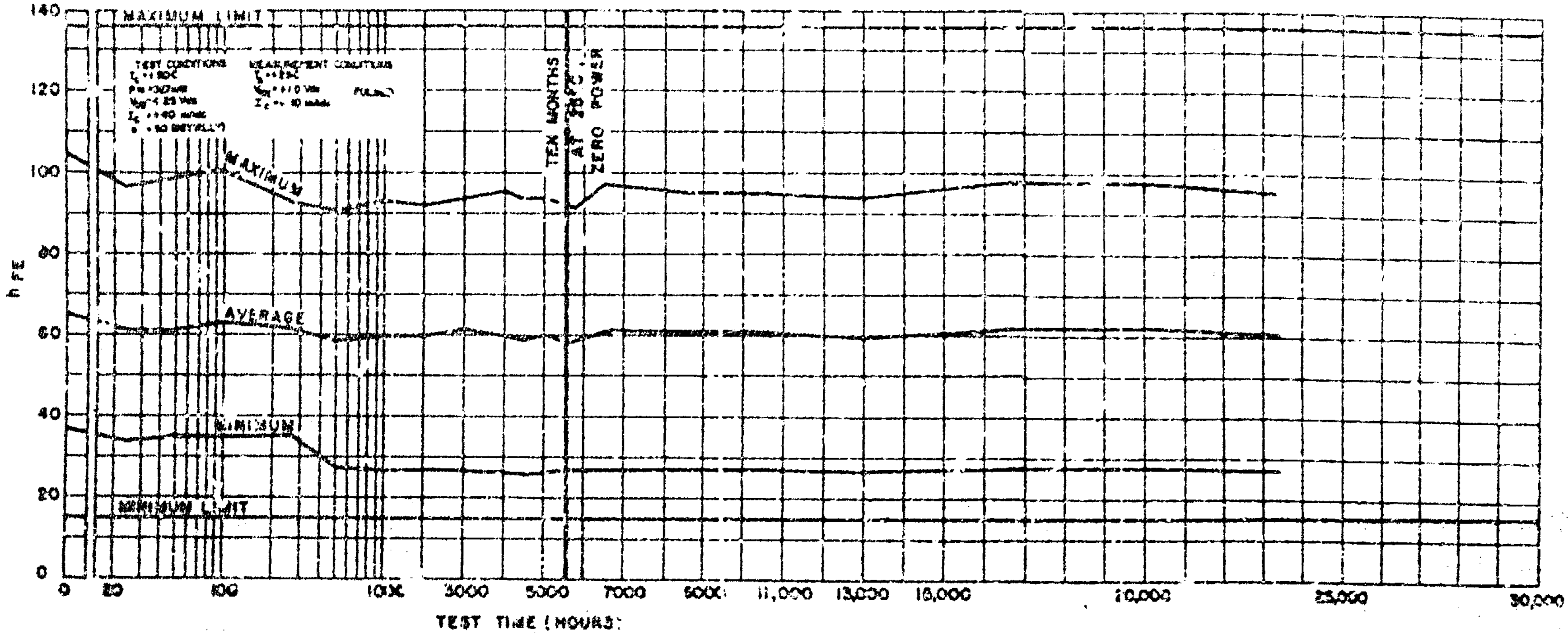
Figure 3-83. Parameter Trend Chart, R2036P1, Phase V, BV_{EBO}



43 PARTS

No Failures

Figure 3-84. Parameter Trend Chart, R2026P1, Phase VI, I_{CBO}



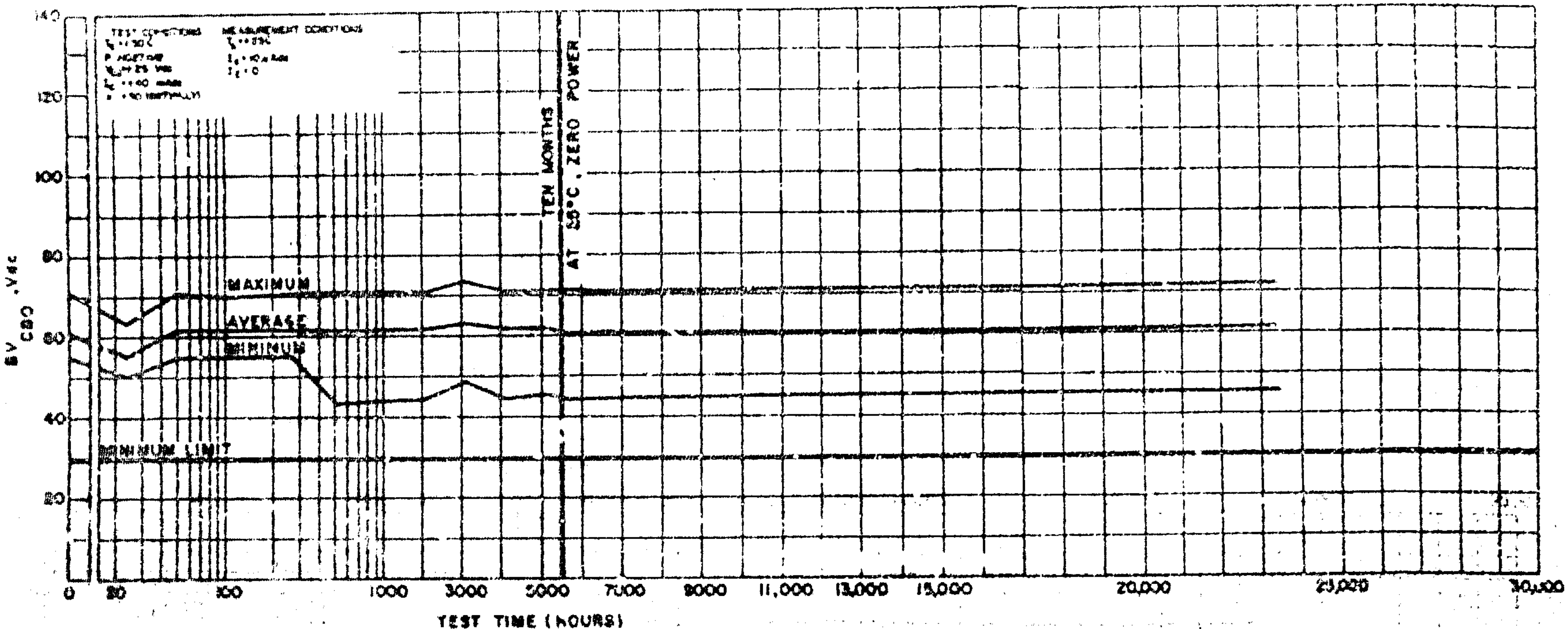
HFE VALUES

48 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0,	65,140	16,920	35,720	104,180
24,	[illegible]	[illegible]	[illegible]	[illegible]
48,	[illegible]	[illegible]	[illegible]	[illegible]
96,	[illegible]	[illegible]	[illegible]	[illegible]
264,	[illegible]	[illegible]	[illegible]	[illegible]
504,	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

No Failures

Figure 3-85. Parameter Trend Chart, R2028P1, Phase VI, h_{FE}



PH 6 R2028P1 BVCBO

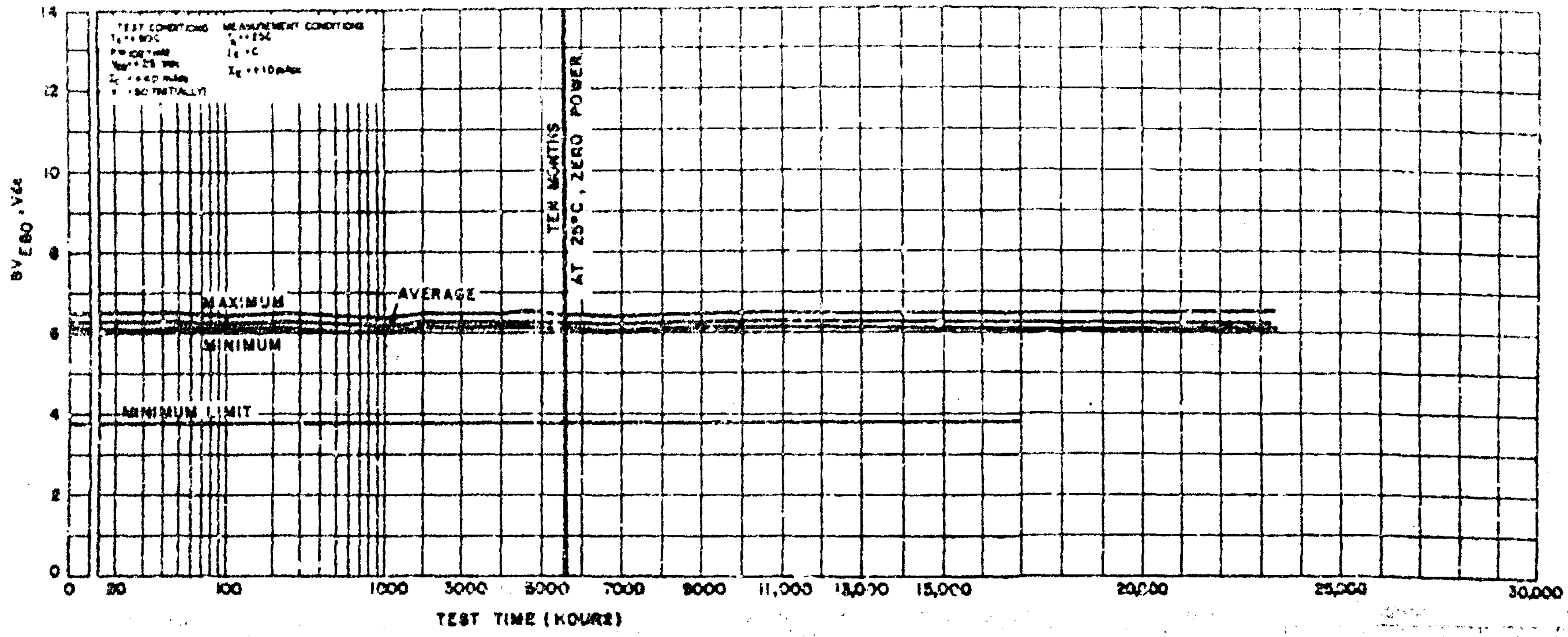
BVCBO VALUES IN VOLTS

43 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0,	61,807	2,944	55,848	71,018
48,	59,322	2,364	56,268	63,248
48,	61,894	2,578	53,088	70,668
96,	61,904	2,794	55,048	69,398
264,	61,986	2,882	55,280	70,778
504,	61,651	3,544	43,698	71,098
1008,	61,735	3,949	44,488	71,898
2016,	62,069	3,578	44,738	71,136
3000,	62,254	4,081	45,448	73,536
4013,	62,063	3,647	44,998	71,253
4443,	62,946	3,098	46,198	71,358
5000,	62,132	3,853	48,898	71,438
5992,	61,672	3,887	44,778	71,138
5750,	61,834	3,510	44,478	71,398
6570,	61,882	3,832	46,698	71,218
8001,	61,883	3,955	45,518	71,888
10943,	61,857	3,776	45,378	74,198
12914,	61,886	3,781	45,888	70,338
16446,	61,914	3,810	45,128	71,998
21188,	61,950	3,761	45,498	76,448
23150,	61,907	3,794	45,348	71,502

No Failures

Figure 3-88. Parameter Trend Chart, R2028P1, Phase VI, BV_{CBO}



[illegible] BVEBO

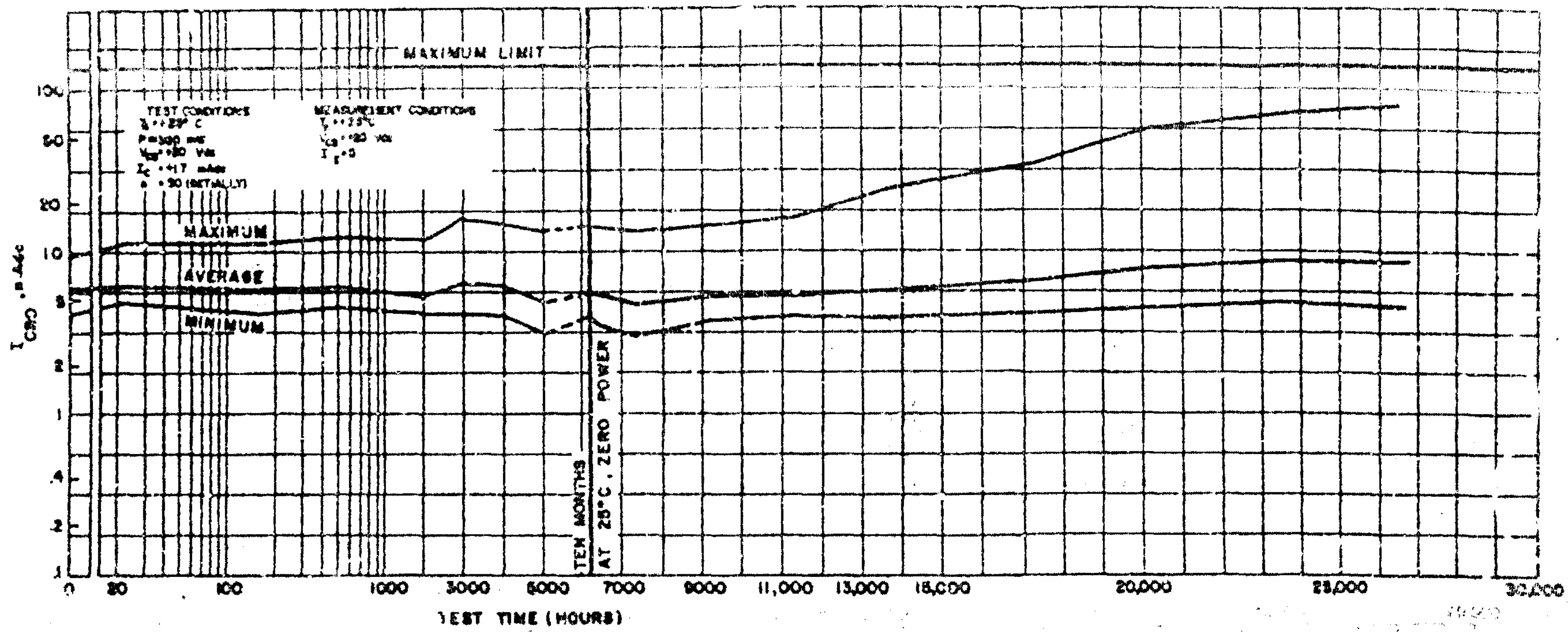
BVEBO VALUES IN VOLTS

45 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0,	6,276	[illegible]	6,132	6,479
23,	6,212	[illegible]	[illegible]	[illegible]
48,	6,275	[illegible]	[illegible]	[illegible]
96,	6,219	[illegible]	6,072	6,410
[illegible]	6,244	[illegible]	[illegible]	6,471
[illegible]	6,231	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	6,250	[illegible]	[illegible]	[illegible]
[illegible]	6,248	[illegible]	[illegible]	[illegible]
[illegible]	6,267	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	6,248	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	6,257	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	6,278	[illegible]	[illegible]	6,484
[illegible]	6,275	[illegible]	[illegible]	6,484

No Failures

Figure 3-87. Parameter Trend Chart, R2026P1, Phase VI, BV_{EBO}



[illegible] R2028P1 ICBO

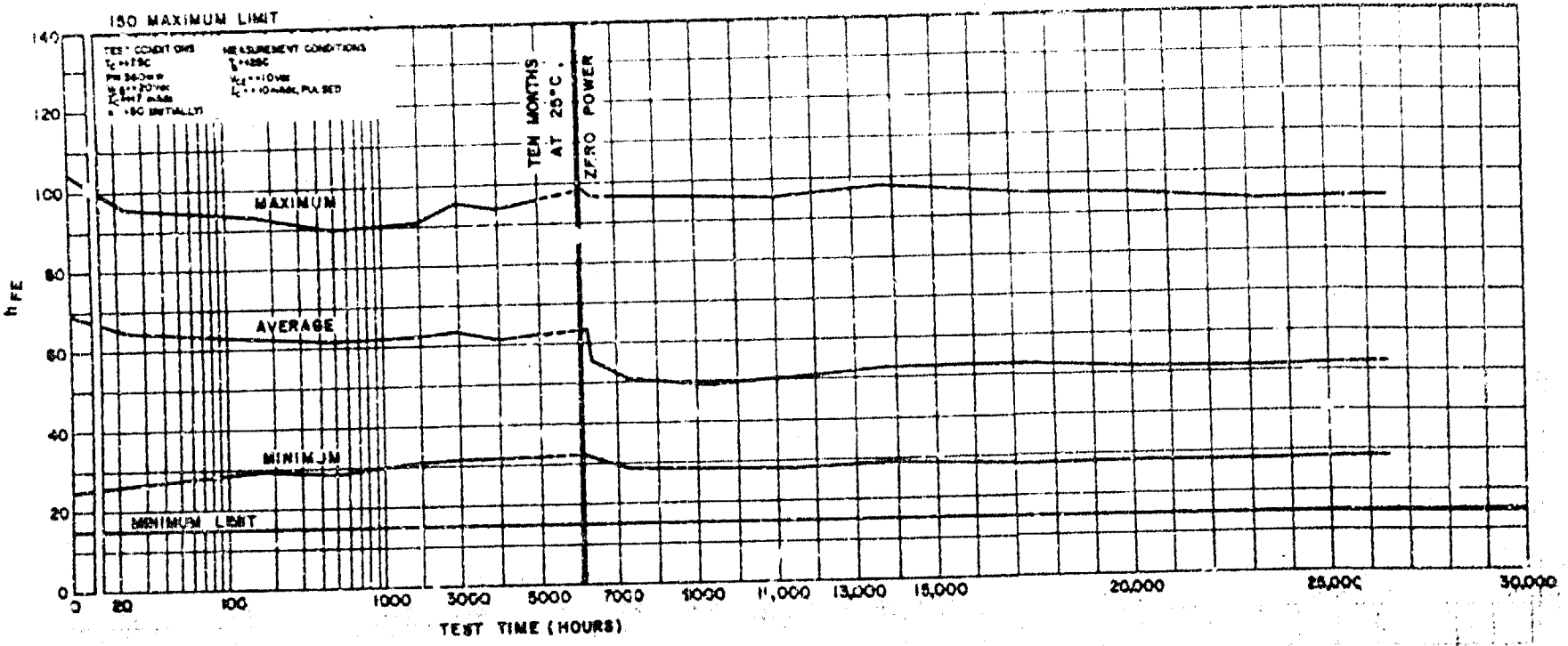
ICBO VALUES IN NANOAMPS

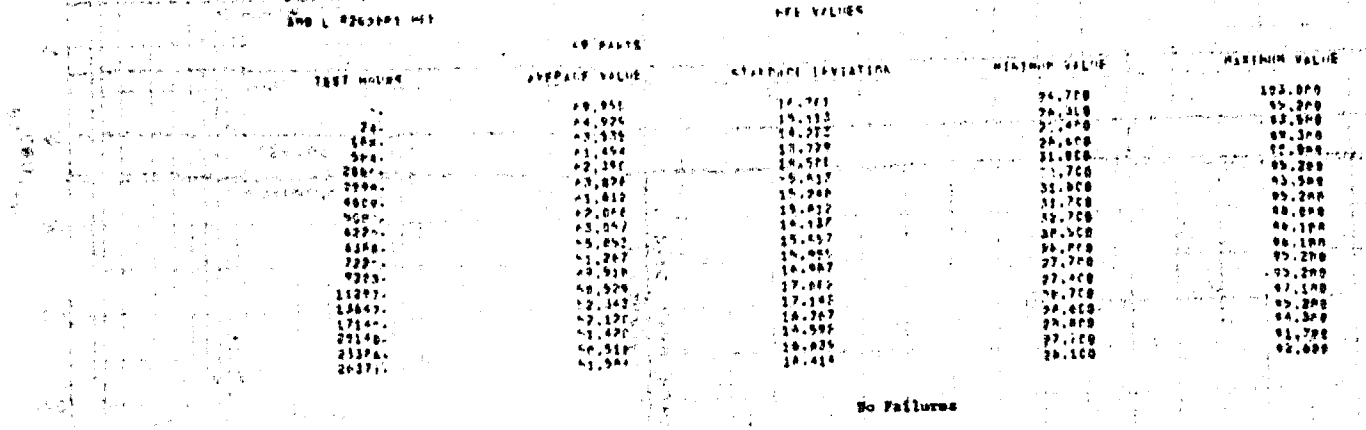
49 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
4.	6.039	1.670	4.200	7.983
24.	6.218	1.178	4.300	11.009
168.	5.433	1.726	4.400	11.009
504.	6.210	1.325	4.700	12.000
2664.	5.415	1.557	4.200	12.055
2992.	6.551	1.867	4.300	16.040
4000.	6.331	1.454	4.800	10.031
5000.	4.801	1.437	3.400	13.508
6274.	5.636	1.424	3.220	14.549
6888.	5.310	1.744	3.400	14.998
7274.	4.830	1.555	3.400	13.908
9213.	5.474	1.736	3.900	15.001
11897.	5.794	1.873	4.100	17.008
14647.	6.116	1.154	4.200	26.943
17144.	6.378	4.124	4.100	34.896
20146.	7.745	7.197	4.557	55.008
23184.	8.354	9.033	4.003	66.888
24371.	8.151	9.719	4.400	73.804

No Failures

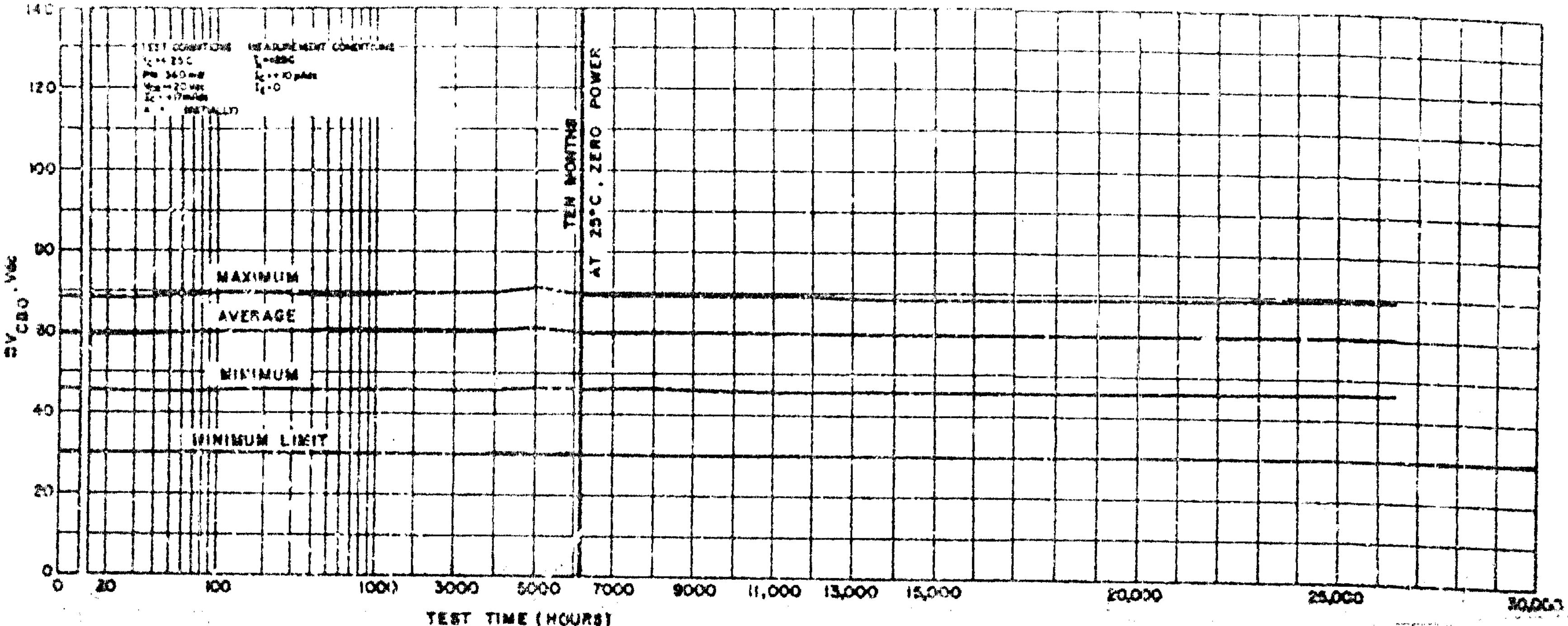
Figure 3-88. Parameter Trend Chart, R2028P1, Ambient Life, I_{CBO}





No Failures

Figure 3-89. Parameter Trend Chart, R2026P1, Ambient Life, h_{FE}

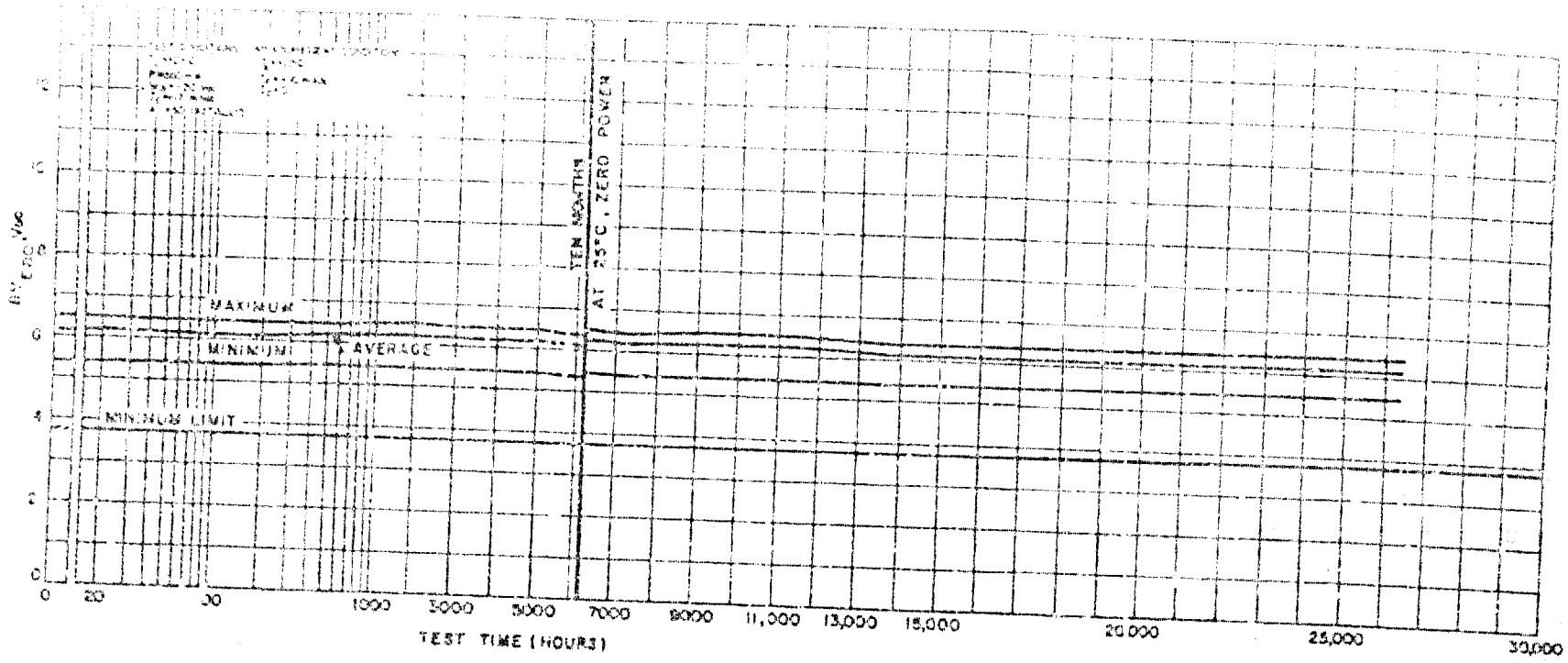


BVCBO VALUES IN VOLTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	[illegible]	[illegible]	[illegible]	[illegible]
24.	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11797.	[illegible]	[illegible]	[illegible]	[illegible]
13047.	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

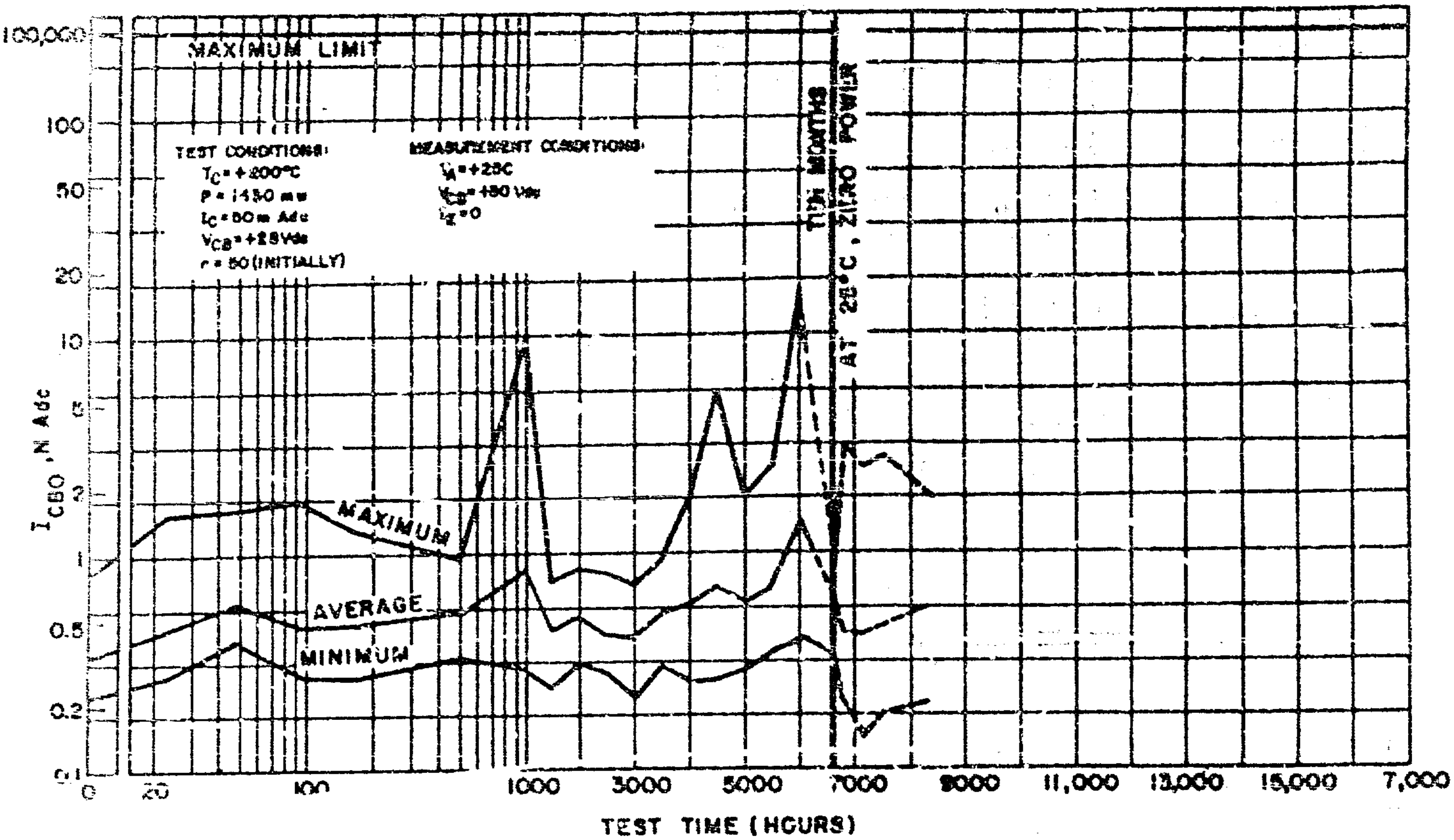
No Failures

Figure 3-90. Parameter Trend Chart, R2026P1, Ambient Life, BV_{CBO}



No Failures

Figure 3-91. Parameter Trend Chart, R2023P1, Ambient Life, BV_{EBO}



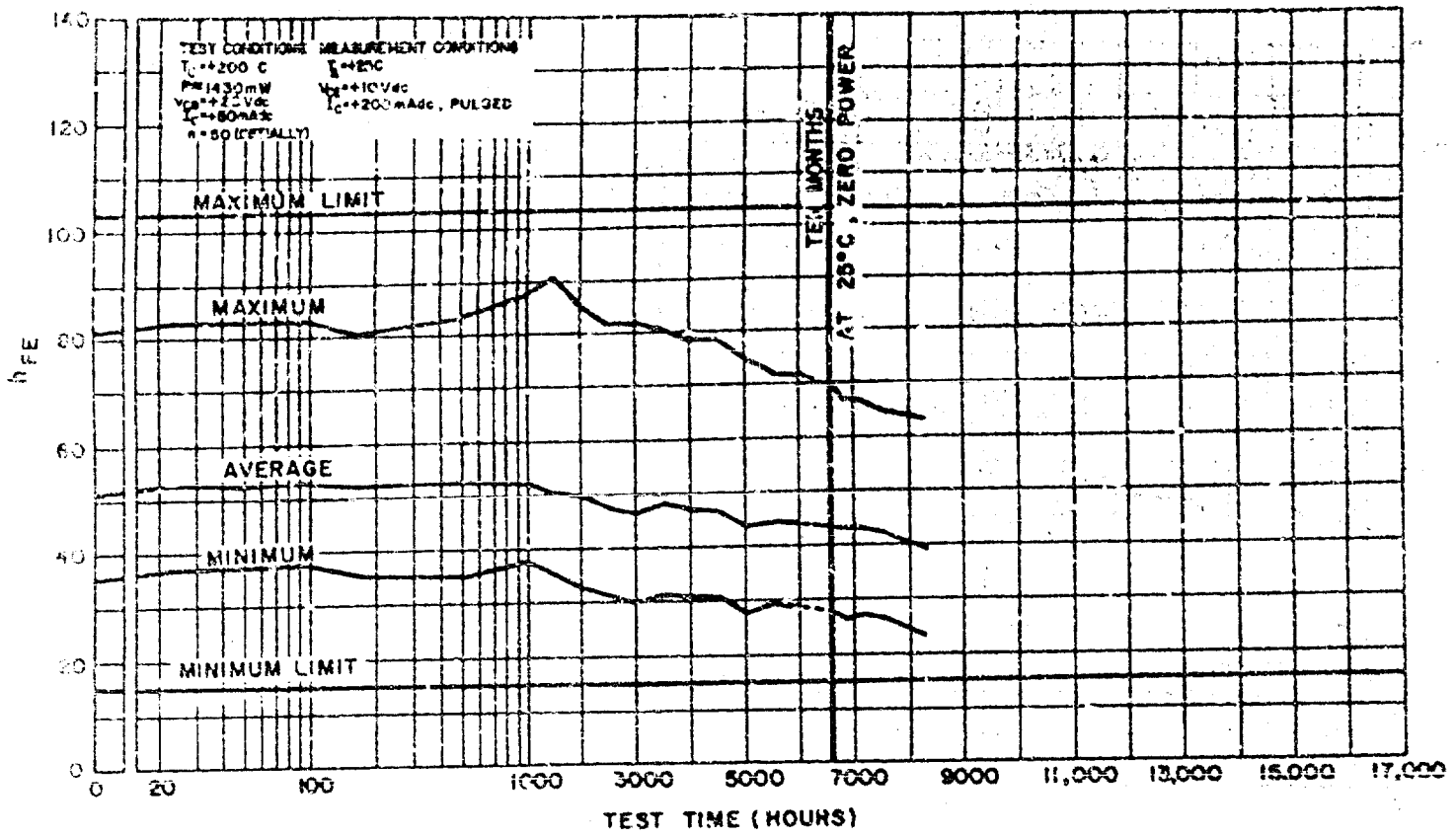
2N 4 R2050P1 1980 MATRIX OF ICBO VALUES IN NANOAMPS

30 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	0.388	0.110	0.230	0.700
24.	0.448	0.222	0.250	1.550
48.	0.610	0.217	0.400	1.400
96.	0.462	0.268	0.200	1.700
168.	0.447	0.100	0.200	1.600
504.	0.328	0.137	0.230	0.640
1008.	0.840	1.677	0.270	9.750
1512.	0.442	0.133	0.340	0.700
2008.	0.564	0.114	0.360	0.640
2520.	0.446	0.128	0.260	0.630
3024.	0.413	0.130	0.280	0.700
3528.	0.587	0.149	0.300	0.980
4032.	0.504	0.904	0.270	1.807
4536.	0.490	0.964	0.300	0.760
5074.	0.505	0.914	[illegible]	1.000
5578.	0.490	0.418	0.340	2.250
6082.	0.558	1.000	[illegible]	[illegible]
6591.	0.469	0.137	0.350	0.850
6813.	0.448	0.505	0.200	0.908
7140.	1.432	0.415	0.170	2.400
7599.	0.406	0.470	0.158	2.305
8304.	0.550	0.371	0.200	1.700

TOTAL FAILURES	TIME TO FAILURE (HRS)	QUANTITY
14	504	2
	1008	1
	1512	6
	3342	1
	3528	1
	3849	2
	3708	1

Figure 3-92. Parameter Trend Chart, R2050P1, Phase IV, I_{CBO}

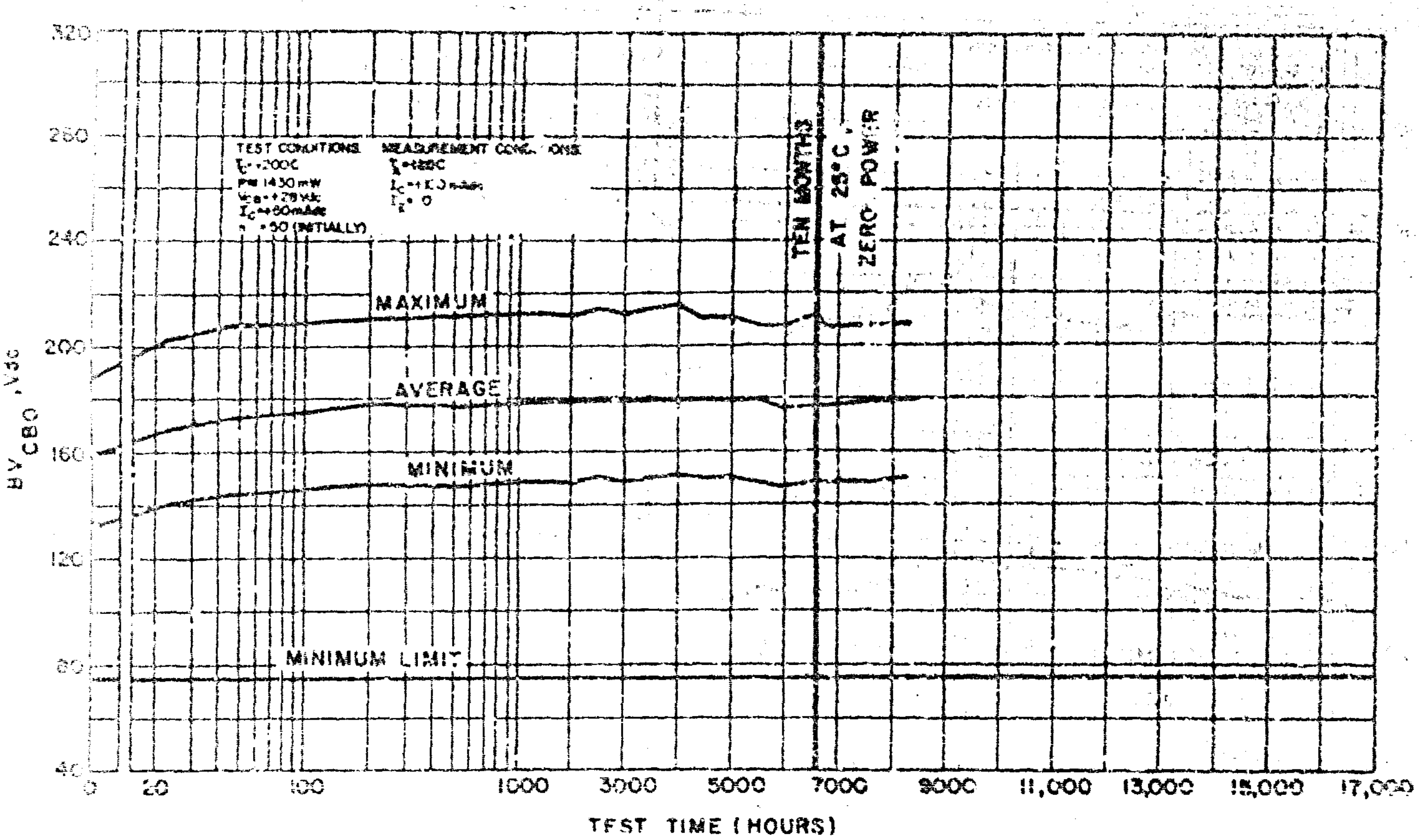


PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
[illegible]				

TOTAL FAILURES	TIME TO FAILURE (HRS)	QUANTITY
14	504	2
	1008	1
	1512	8
	2548	1
	3528	1
	3549	2
	3708	1

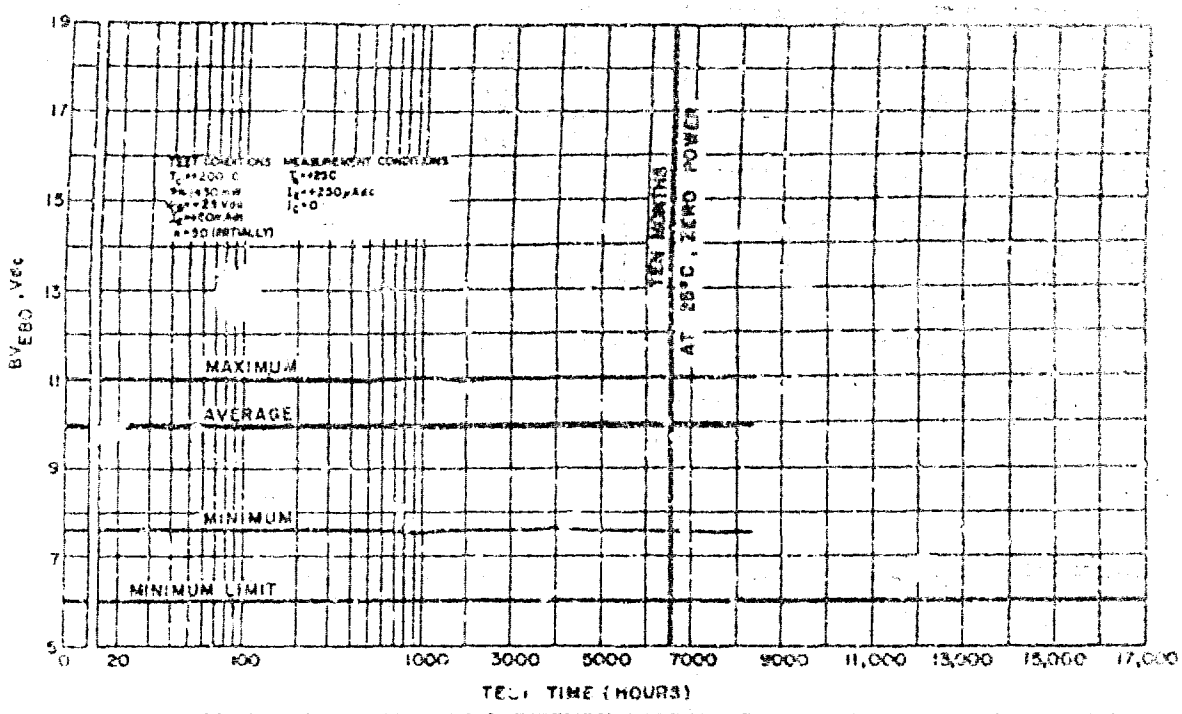
Figure 3-93. Parameter Trend Chart, H2050P1, Phase IV, h_{FE}



TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
24.	[illegible]	[illegible]	141.7[illegible]	[illegible]
48.	171.[illegible]	[illegible]	[illegible]	207.9[illegible]
[illegible]	[illegible]	[illegible]	145.9[illegible]	208.2[illegible]
108.	[illegible]	[illegible]	143.1[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	147.[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	207.2[illegible]
1512.	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	151.[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

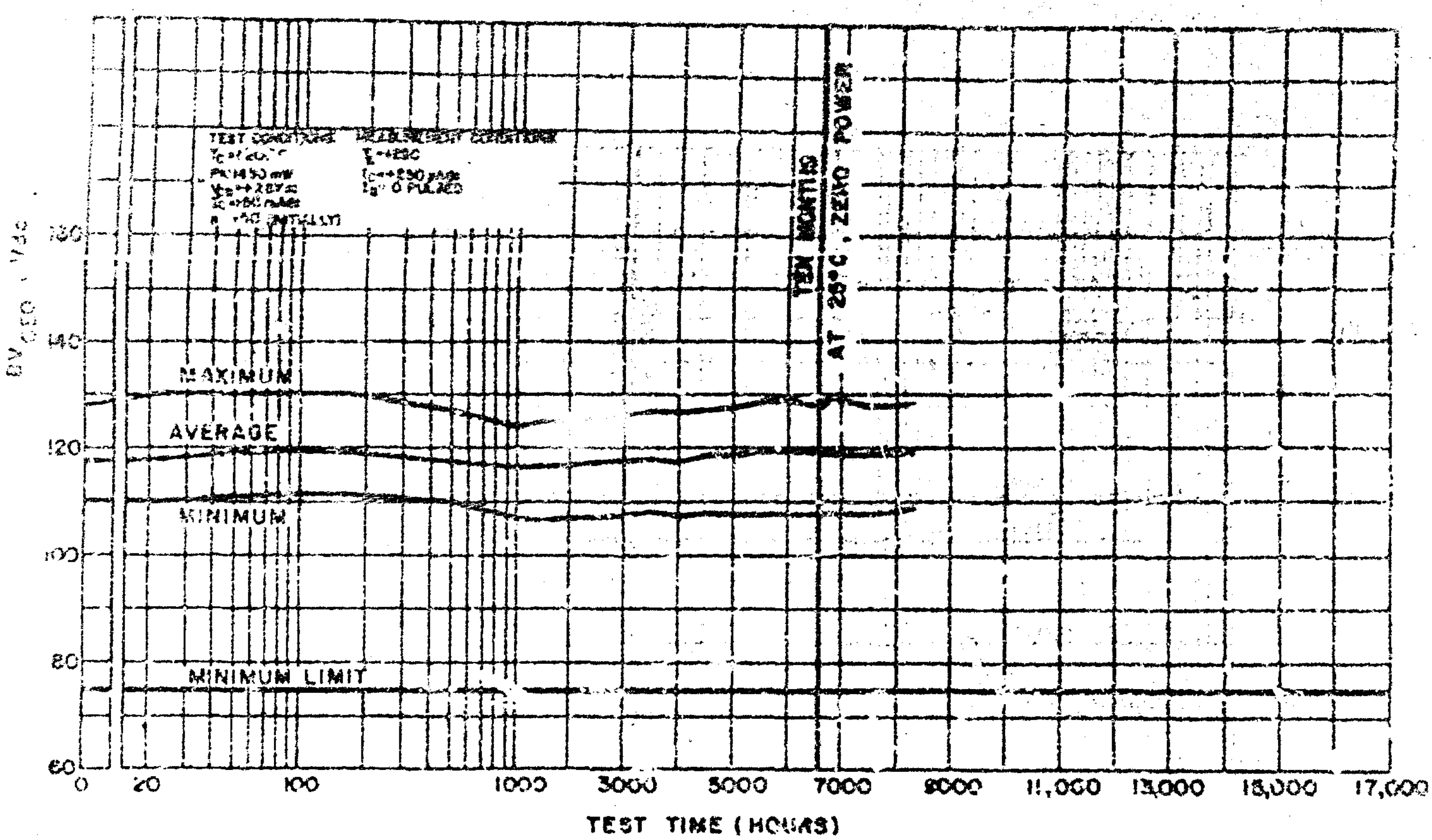
TOTAL FAILURES	TIME TO FAILURE (HRS)	QUANTITY
14	504	2
	1066	1
	1512	6
	3343	1
	3528	1
	3549	2
	3709	1

Figure 3-94. Parameter Trend Chart, R2050P1, Phase IV, BV_{CBO}



TOTAL FAILURES	TIME TO FAILURE (HRS)	QUANTITY
11	754	2
	1904	
	[illegible]2	8
	[illegible]3	1
	7520	1
	8543	2
	9700	1

Figure 3-95. Parameter Trend Chart, R2050P1, Phase IV, BV_{EBO}



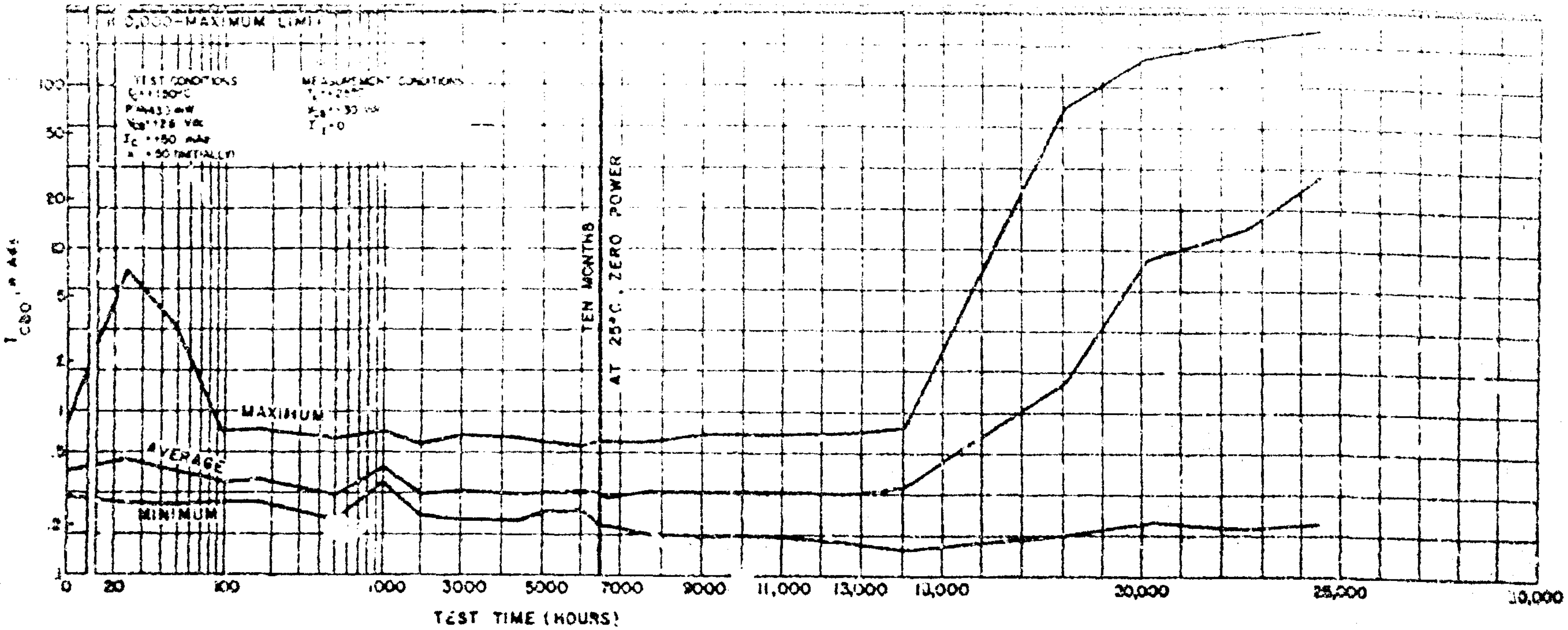
[illegible] MATRIX OF [illegible] VALUES IN VOLTS

50 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	118.7[illegible]	5.139	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	119.27[illegible]	4.277	[illegible]	[illegible]
[illegible]	[illegible]	3.842	[illegible]	[illegible]
1008.	[illegible]	[illegible]	[illegible]	[illegible]
1512.	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	116.477	4.212	[illegible]	[illegible]
2520.	117.1[illegible]7	[illegible]	[illegible]	[illegible]
[illegible]	117.523	[illegible]	[illegible]	[illegible]
3528.	117.[illegible]37	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	4.453	[illegible]	[illegible]
[illegible]	[illegible]	4.267	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TOTAL FAILURES	TIME TO FAILURE (HRS)	QUANTITY
14	504	2
	1008	1
	1512	6
	3343	1
	3528	1
	3549	2
	3780	1

Figure 3-98. Parameter Trend Chart, R2050P1, Phase IV, BV_{CEO}



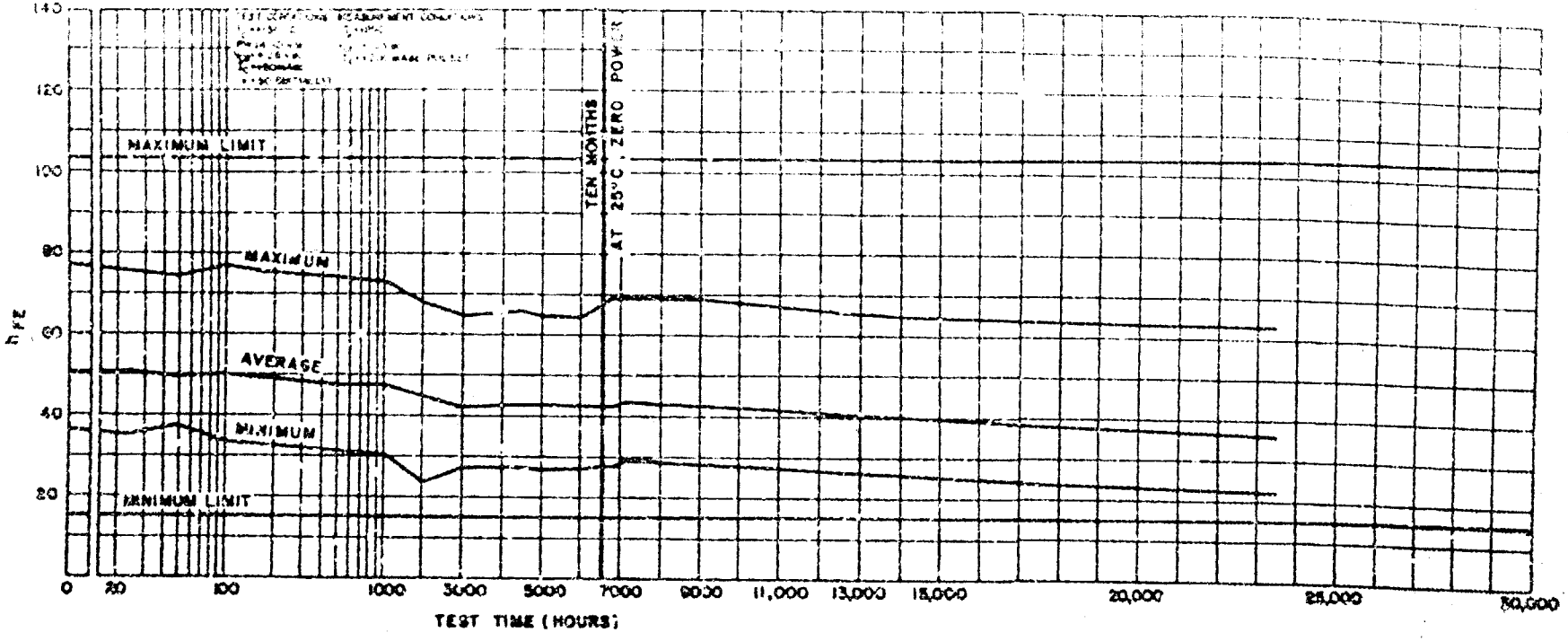
ICBO VALUES IN NANOAMPS

45 PARTS (FAILURES NOT INCLUDED)

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	0.449	0.184	0.330	1.040
25.	0.539	1.049	0.270	7.568
43.	0.437	0.406	0.278	4.448
96.	0.373	0.092	0.280	0.798
192.	0.394	0.200	0.298	0.783
384.	0.325	0.075	0.220	0.658
1100.	0.455	0.076	0.280	0.790
2485.	0.310	0.075	0.234	0.530
2999.	0.336	0.097	0.229	0.773
4405.	0.320	0.082	0.228	0.664
5069.	0.320	0.073	0.240	0.678
6415.	0.337	0.075	0.250	0.696
6350.	0.337	0.095	0.189	0.660
6716.	0.264	0.094	0.188	0.664
7491.	0.457	4.024	0.285	0.560
7696.	0.359	1.675	0.212	0.660
9036.	0.317	0.128	0.176	0.700
10612.	0.339	0.117	0.179	0.740
12403.	0.232	0.129	0.166	0.798
14047.	0.364	0.141	0.158	0.846
16174.	0.831	2.509	0.240	17.272
18434.	2.353	11.883	0.266	82.888
20176.	9.371	51.835	0.276	348.000
22435.	13.477	70.987	0.220	568.048
24392.	37.35	330.948	0.224	1478.838

TOTAL FAILURES	TIME TO FAILURE (HRS)	QUANTITY
	72	1
	20156	2

Figure 3-97. Parameter Trend Chart, R2050P1, Phase V, I_{CBO}



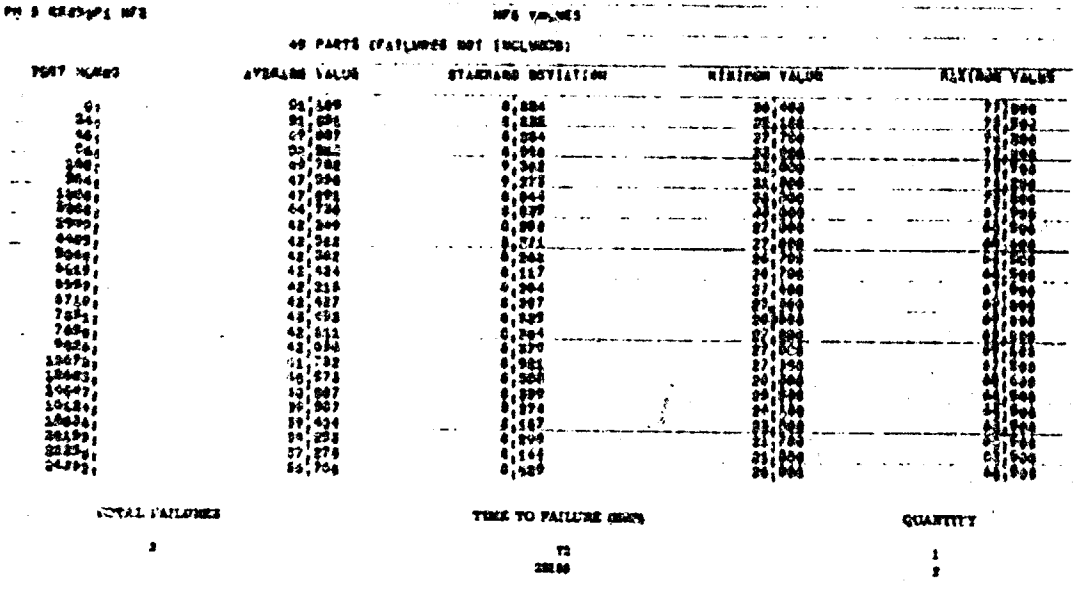
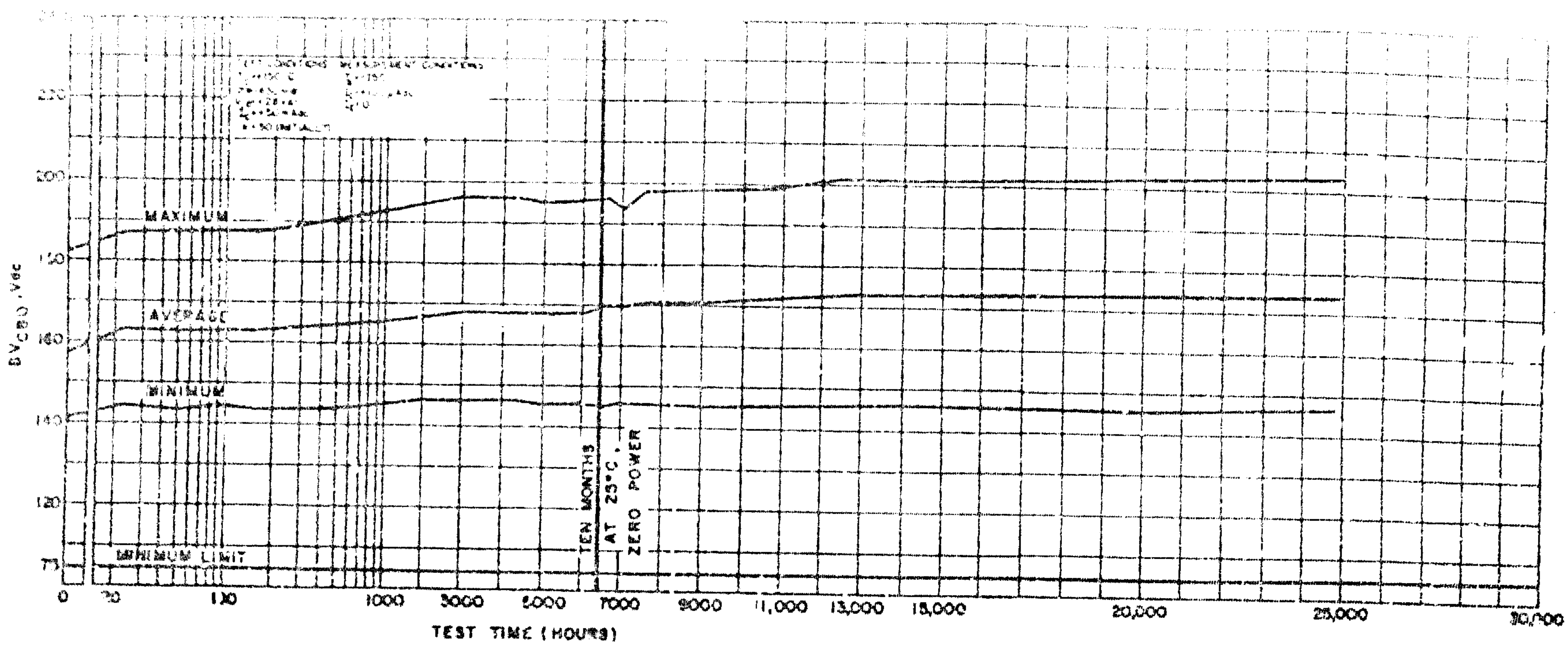


Figure 3-98. Parameter Trend Chart, R2050P1, Phase V, h_{FE}



PH 5 R2050P1 BVCBO

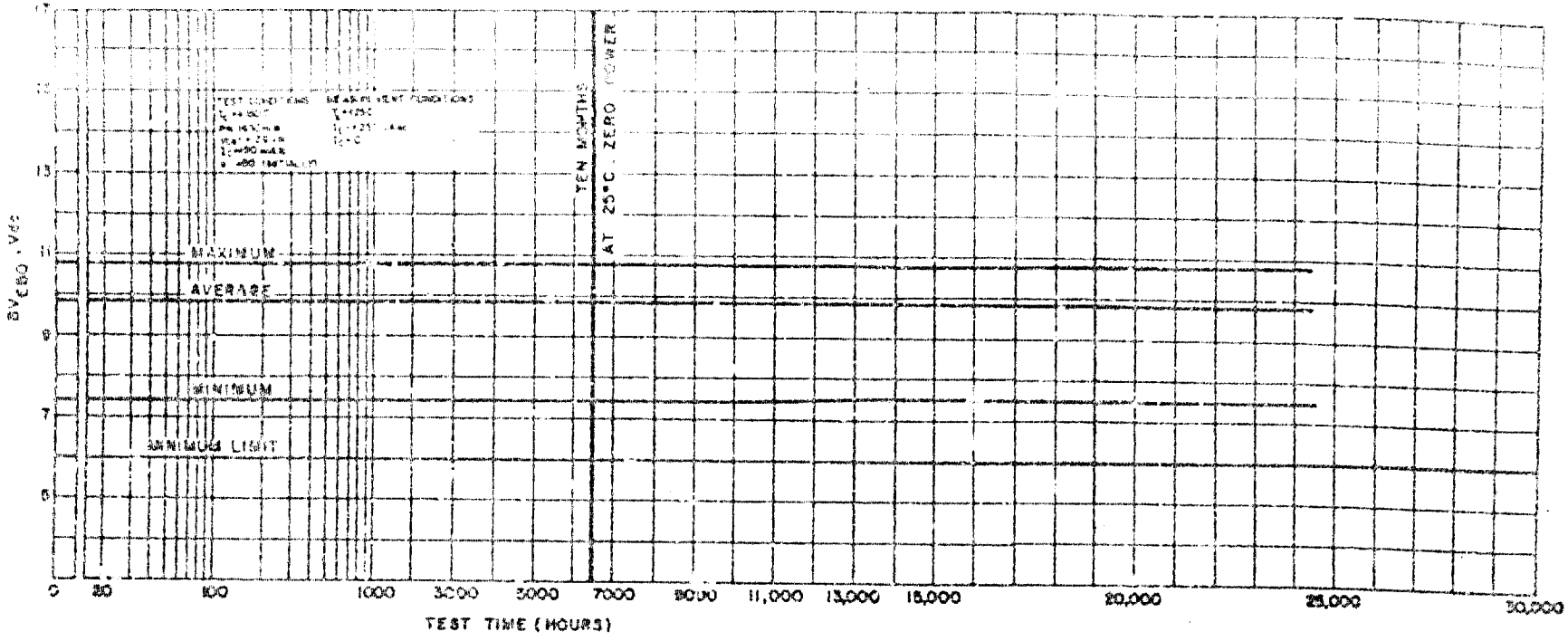
BVCBO VALUES IN VOLTS

45 PARTS (FAILURES NOT INCLUDED)

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
8,	158,462	10,089	145,996	[illegible]
24,	163,731	11,276	144,856	[illegible]
48,	163,496	11,326	143,366	[illegible]
96,	161,359	11,617	143,865	[illegible]
168,	163,138	11,867	143,456	[illegible]
334,	163,947	11,746	143,998	[illegible]
1010,	165,891	12,115	143,119	[illegible]
2,60,	166,693	13,993	146,000	[illegible]
[illegible]	167,304	13,833	144,282	[illegible]
4455,	167,367	12,539	136,309	[illegible]
5083,	167,854	12,955	143,488	[illegible]
[illegible]	167,956	13,840	145,692	[illegible]
6590,	168,544	13,384	147,288	[illegible]
8710,	169,672	13,462	144,900	[illegible]
[illegible]	169,763	[illegible]	144,508	[illegible]
7693,	170,056	13,615	144,906	[illegible]
9224,	170,960	13,952	145,902	[illegible]
10471,	171,598	14,089	145,606	[illegible]
12602,	172,433	14,448	145,568	[illegible]
14047,	172,742	14,959	145,908	[illegible]
18114,	173,476	14,087	143,688	[illegible]
18534,	173,976	14,288	153,500	[illegible]
21150,	173,934	15,029	145,682	[illegible]
22356,	173,349	15,281	144,929	[illegible]
24307	174,004	15,329	133,188	[illegible]

TOTAL FAILURES	TIME TO FAILURE (HRS)	QUANTITY
3	72	1
	20155	2

Figure 3-59. Parameter Trend Chart, R2050P1, Phase V, BV_{CBO}



TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0	9.995	0.046	9.928	10.069
24	9.858	0.042	9.819	10.001
48	9.914	0.041	9.859	10.019
96	9.842	0.042	9.809	10.000
168	9.787	0.039	9.718	10.003
264	9.788	0.036	9.728	10.000
336	9.773	0.051	9.683	10.000
504	9.804	0.043	9.723	10.000
672	9.818	0.033	9.736	10.000
840	9.804	0.038	9.736	10.000
1008	9.809	0.033	9.723	10.000
1176	9.819	0.042	9.736	10.000
1344	9.797	0.038	9.736	10.000
1512	9.794	0.036	9.736	10.000
1680	9.806	0.032	9.736	10.000
1848	9.813	0.034	9.736	10.000
2016	9.808	0.034	9.736	10.000
2184	9.808	0.028	9.736	10.000
2352	9.805	0.028	9.736	10.000
2520	9.799	0.028	9.736	10.000
2688	9.796	0.028	9.736	10.000
2856	9.797	0.028	9.736	10.000
3024	9.779	0.028	9.736	10.000
3192	9.791	0.028	9.736	10.000
3360	9.798	0.028	9.736	10.000

TOTAL FAILURES: 0

TIME TO FAILURE (HRS): 72, 2619

QUANTITY: 1, 1

Figure 3-100. Parameter Trend Chart, R2050P1, Phase V, BV_{EBO}

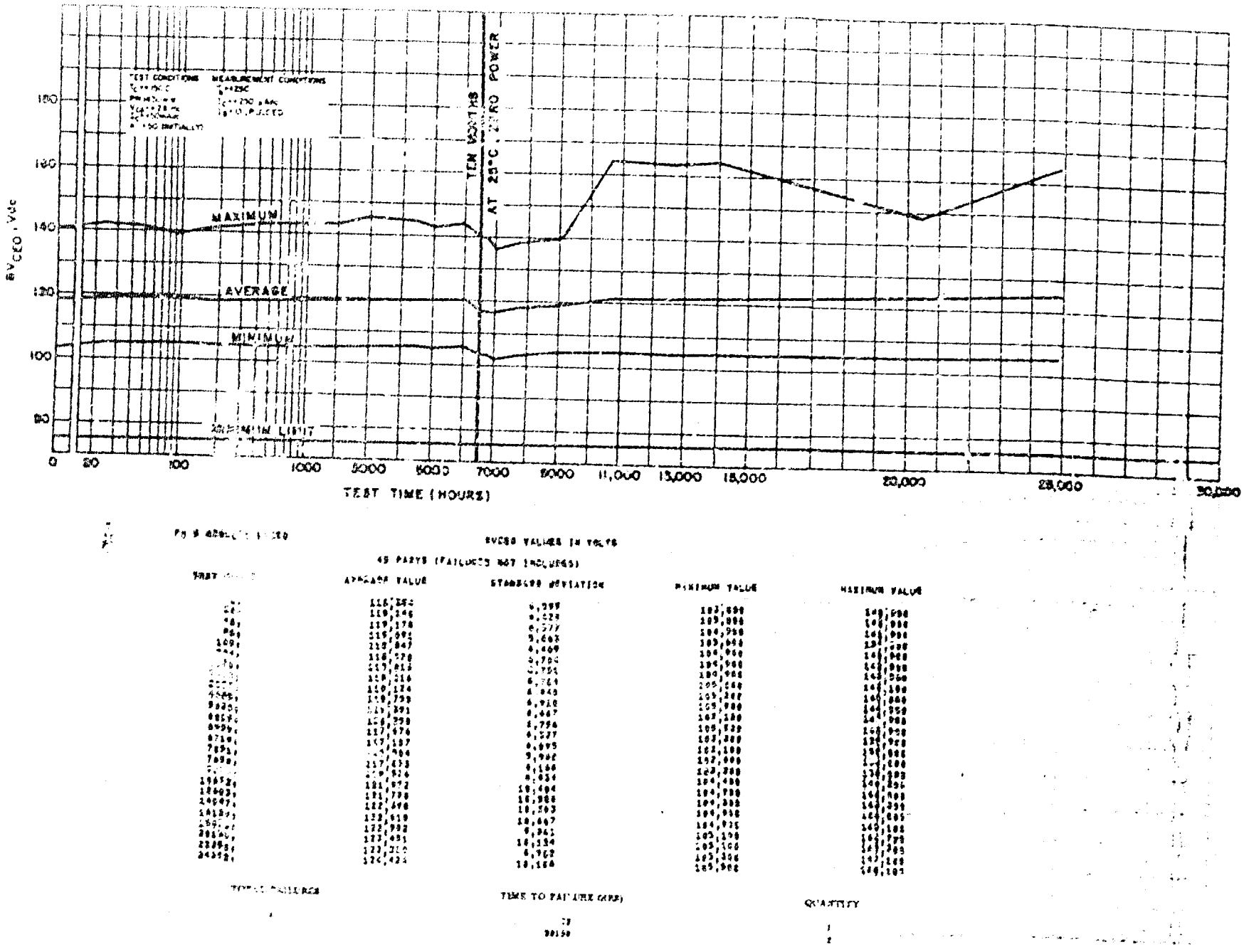
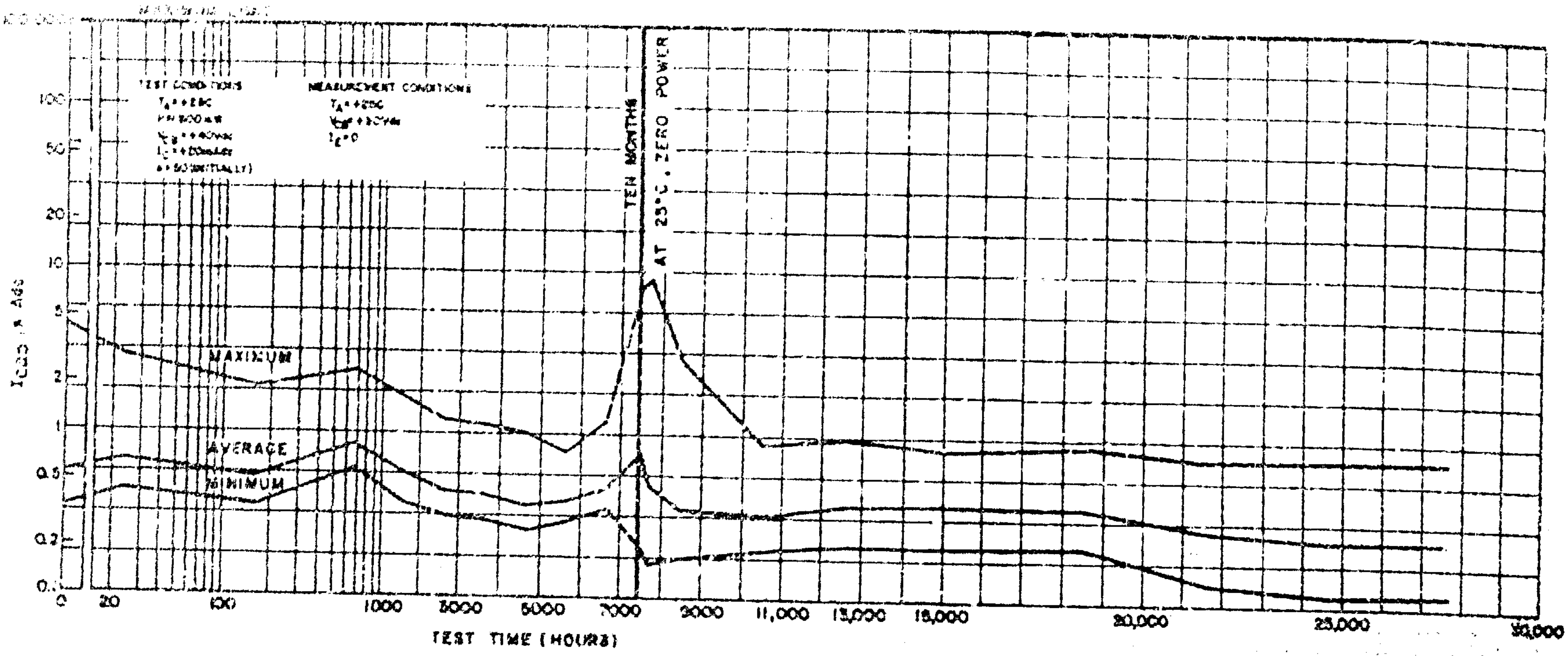


Figure 3-101. Parameter Trend Chart, R2050P1, Phase V, BV_{CEO}

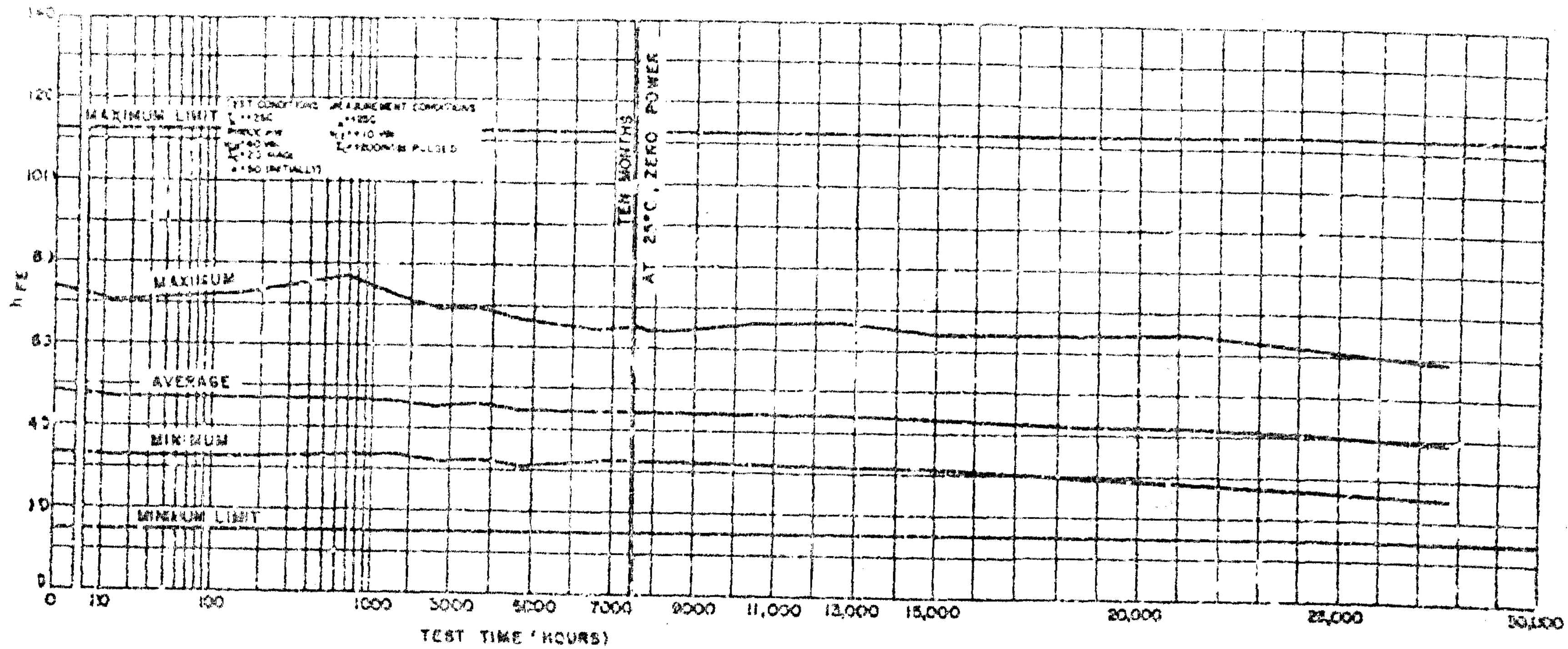


ICBO VALUES IN NANOAMPS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
[illegible]	0.574	0.611	0.240	4.600
[illegible]	0.641	0.348	0.450	3.800
[illegible]	0.539	0.237	0.343	1.000
[illegible]	0.870	0.255	0.625	7.390
[illegible]	0.585	0.337	0.370	1.600
[illegible]	0.427	0.151	0.388	1.200
[illegible]	0.436	0.160	0.290	1.190
[illegible]	0.420	0.131	0.240	1.030
[illegible]	0.398	0.106	0.295	0.770
[illegible]	0.413	0.144	0.390	1.370
[illegible]	0.874	1.073	0.280	0.870
[illegible]	[illegible]	0.933	0.160	0.804
[illegible]	0.362	0.388	0.180	2.930
[illegible]	0.334	0.167	0.200	3.900
[illegible]	0.304	0.144	0.270	0.960
[illegible]	0.353	0.127	0.220	6.600
[illegible]	0.277	0.138	0.220	0.995
[illegible]	0.273	0.132	0.130	0.730
[illegible]	0.257	0.144	0.112	0.730
[illegible]	0.274	0.125	0.190	0.770

TOTAL FAILURES	TIME TO FAILURE (HRS)	QUANTITY
2	1600	1
	2007	1

Figure 3-102. Parameter Trend Chart, R2050P1, Ambient Life, I_{CBO}



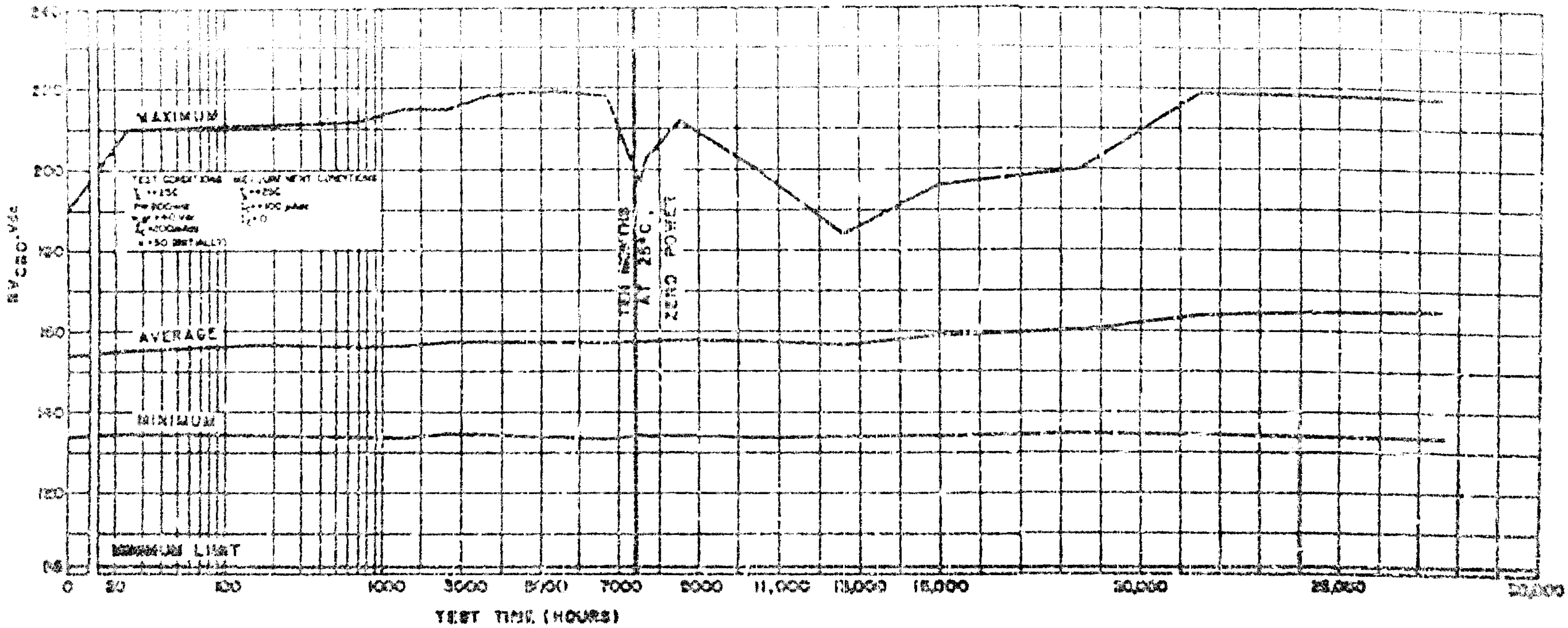
[illegible] hFE VALUES

48 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
[illegible]	48.154	8.144	33.005	74.670
24.	47.304	7.882	33.331	75.670
69.	47.295	7.781	33.472	72.748
[illegible]	47.293	7.938	33.900	73.678
668.	47.219	7.436	33.900	71.228
[illegible]	46.048	7.492	32.385	69.878
[illegible]	46.207	7.547	32.800	60.058
4674.	44.925	7.426	31.876	60.778
5952.	44.673	7.253	31.820	63.878
[illegible]	45.144	6.297	32.000	64.500
7538.	44.960	7.878	33.350	65.600
[illegible]	44.652	6.987	32.300	64.548
8538.	44.442	6.923	32.300	64.500
[illegible]	44.884	7.505	32.200	64.788
[illegible]	44.716	7.395	32.300	64.788
[illegible]	44.046	7.113	31.780	64.548
19924.	41.649	7.174	29.992	62.900
21456.	42.262	7.367	28.000	64.926
[illegible]	42.137	5.878	27.000	65.408
27598.	39.158	6.752	25.650	58.013

TOTAL FAILURES	TIME TO FAILURE (HRS)	QUANTITY
1	1688	1
	20976	1

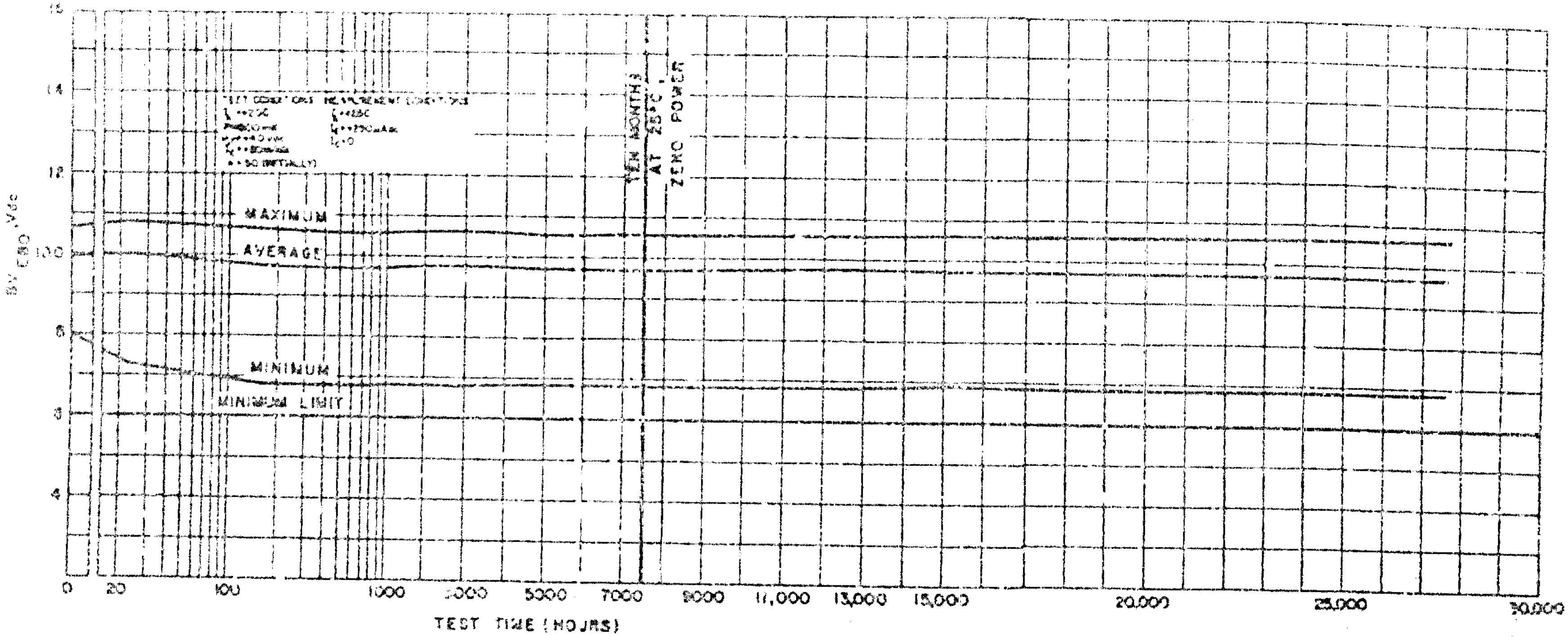
Figure 3-103. Parameter Trend Chart, R2050P1, Ambient Life, h_{FE}



TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	[illegible]	[illegible]	[illegible]	[illegible]
24.	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TOTAL FAILURES	TIME TO FAILURE (HRS)	QUANTITY
[illegible]	[illegible]	1
	[illegible]	1

Figure 3-104. Parameter Trend Chart, R2050P1, Ambient Life, BV_{CBO}



AMB. L. R2050P1 HVEBO

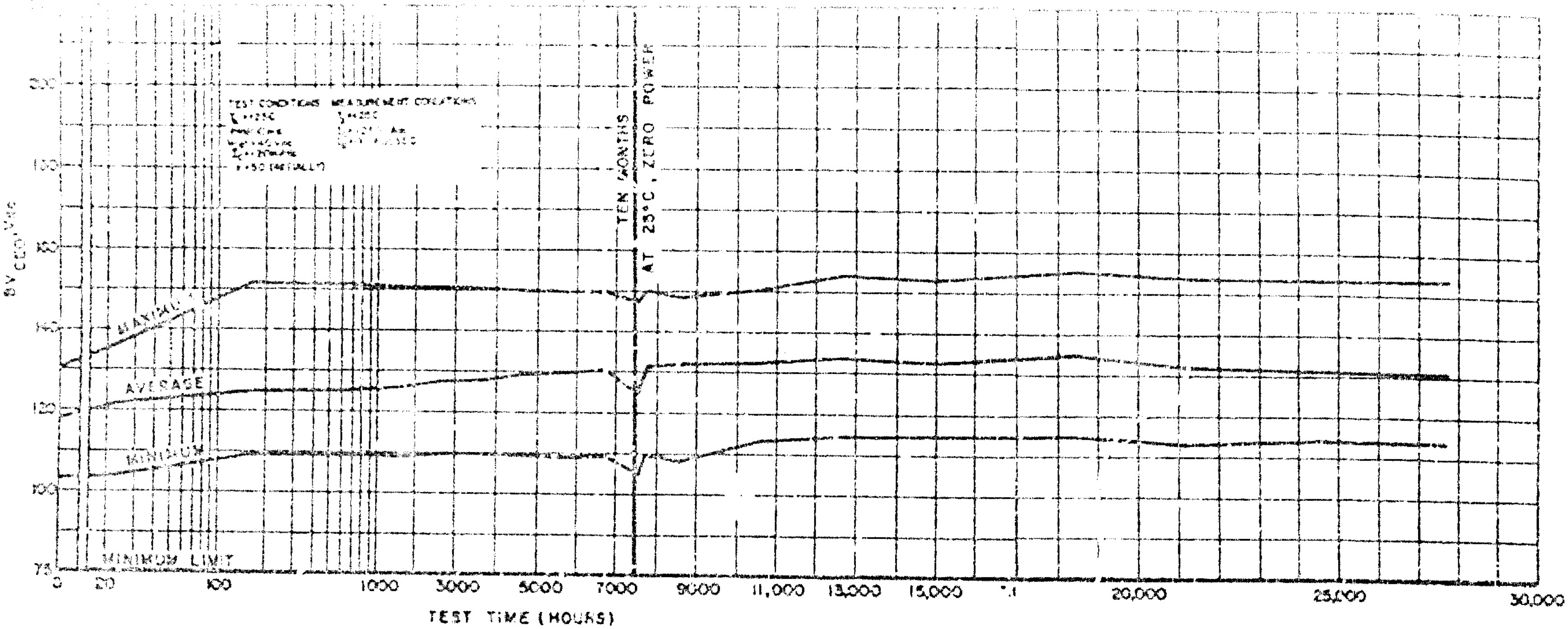
HVEBO VALUES IN VOLTS

46 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	9.815	0.519	8.033	10.400
24.	10.047	0.475	7.300	10.699
168.	9.759	0.721	6.642	10.485
672.	9.729	0.717	6.632	10.372
1446.	9.741	0.727	6.690	10.508
[illegible]	9.741	0.729	6.630	10.475
3872.	9.712	0.722	6.651	10.630
4874.	9.739	0.719	6.639	10.551
5858.	9.744	0.717	6.653	10.591
6674.	9.731	0.713	6.672	10.572
7538.	9.723	0.720	6.634	10.569
[illegible]	9.730	0.721	6.669	10.599
9540.	9.736	0.713	6.676	10.527
[illegible]	9.751	0.712	6.687	10.593
[illegible]	9.754	0.713	6.686	10.596
14165.	9.750	0.709	6.711	10.591
16456.	9.751	0.710	6.731	10.593
21866.	9.744	0.710	6.701	10.509
[illegible]	9.739	0.711	6.695	10.563
27687.	9.737	0.711	6.596	10.530

TOTAL FAILURES	TIME TO FAILURE (HRS)	QUANTITY
2	1446	1
	20076	1

Figure 3-105. Parameter Trend Chart, R2050P1, Ambient Life, BV_{EBO}



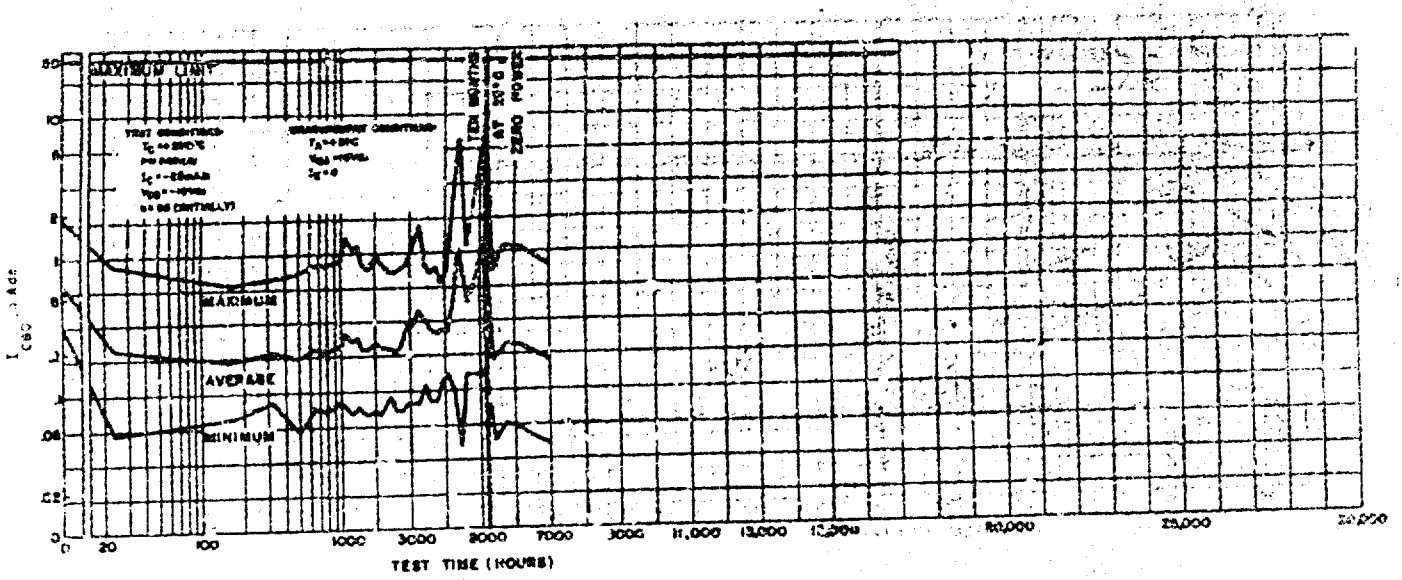
BV_{CEO} VALUES IN VOLTS

46 PARTS

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
[illegible]	117.634	9.235	103.000	145.200
24.	121.937	9.518	104.000	135.600
168.	124.69[illegible]	9.939	109.000	131.300
672.	125.051	6.276	109.000	13[illegible].900
1066.	126.274	6.252	108.900	[illegible]
2576.	127.296	6.765	109.300	[illegible]
3072.	128.[illegible]	7.265	109.300	13[illegible]
4074.	129.545	7.761	109.400	149.[illegible]
5580.	130.[illegible]	8.138	108.900	[illegible]
6574.	130.698	8.437	109.100	149.500
7534.	134.719	7.837	105.300	147.900
7708.	131.347	8.472	109.900	145.900
9535.	127.233	7.596	108.400	146.200
11522.	132.631	8.467	112.000	152.1[illegible]
12015.	133.567	8.744	114.500	154.100
14065.	132.39[illegible]	8.292	114.900	155.800
14456.	134.971	9.133	115.400	156.335
21482.	131.[illegible]	10.235	112.900	153.600
24494.	133.867	10.290	112.500	153.300
27689.	13[illegible]	10.328	113.400	153.100

TOTAL FAILURES	TIME TO FAILURE (HRS)	QUANTITY
2	1996	1
	20876	1

Figure 3-106. Parameter Trend Chart, R2050P1, Ambient Life, BV_{CEO}



R4041
Phase 4
ICBO

Item	Average	Minimum	Maximum	Std. Dev.
0	.094	.340	1.980	0.339
24	.209	.052	.880	0.290
168	.171	.068	.620	0.201
329	.196	.086	.640	0.208
497	.172	.052	.738	0.242
664	.209	.078	.865	0.280
784	.199	.072	.810	0.271
1008	.215	.085	.990	0.298
1182	.244	.078	1.380	0.436
1350	.251	.074	1.070	0.365
1518	.262	.077	1.18	0.378
1694	.193	.058	.810	0.274
1856	.200	.069	.[illegible]	0.252
2022	.228	.073	.[illegible]	0.330
2190	.207	.068	.895	0.288
2413	.203	.098	.763	0.239
2581	.186	.074	.780	0.229
2749	.226	.070	.795	0.267
2921	.299	.080	.84	0.341
3089	.301	.082	1.18	0.376
3253	.383	.084	1.57	0.539
3416	.312	.110	.[illegible]	0.[illegible]
3589	.276	.085	.72	0.268
3757	.252	.063	.76	0.285
3925	.276	.110	.62	0.[illegible]
4093	.267	.130	.705	0.215
4261	.436	.108	2.16	0.738
4429	1.039	.048	6.6	2.374
4687	.410	.130	1.100	0.417
5213	1.735	0.138	8.108	2.784
5388	0.165	0.062	0.720	0.251
5710	0.316	0.036	1.160	0.358
6207	0.301	0.032	1.050	0.344
6864	0.168	0.060	0.848	0.273

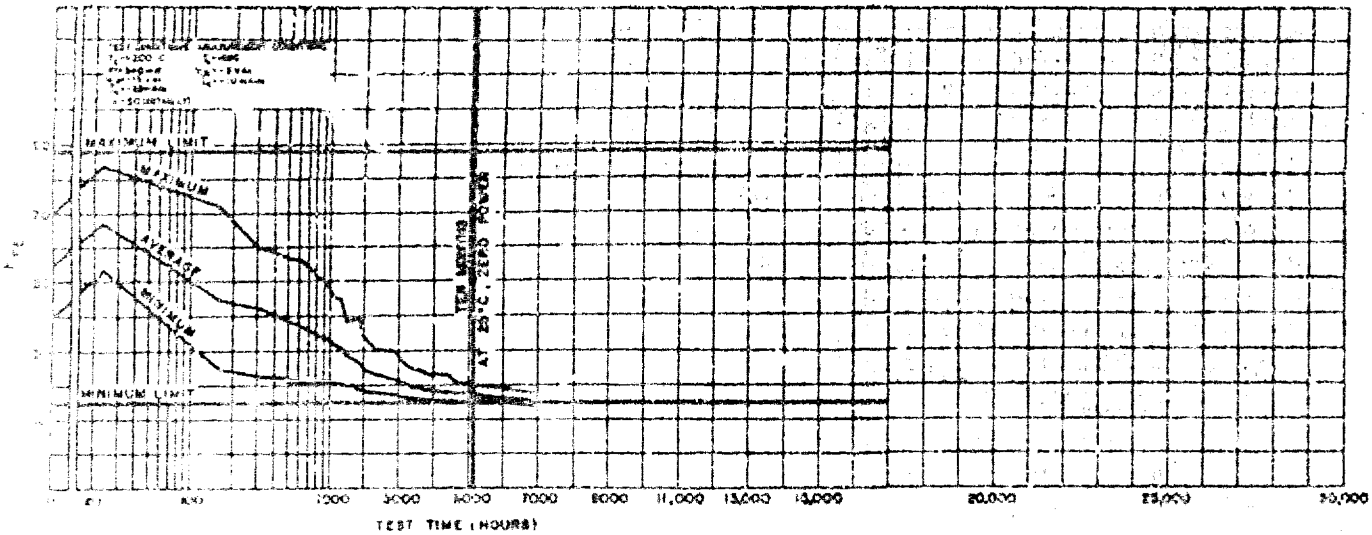
TOTAL FAILURES

46

TIME TO FAILURE (hrs)

QUANTITY

Figure 3-107. Parameter Trend Chart, R4041P1, Phase IV. I_{CBO}

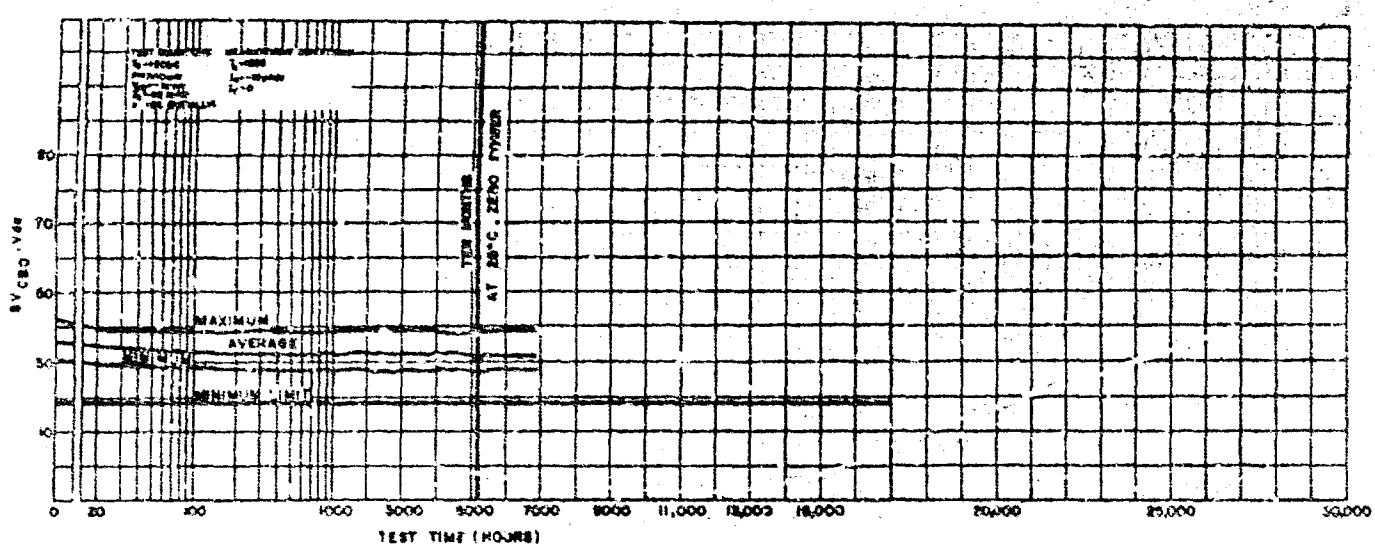


R4041 P1
Phase 4
hFE

Test Hours	Average	Minimum	Maximum
0	54.214	[illegible]	[illegible]
66	[illegible]	[illegible]	[illegible]
130	[illegible]	[illegible]	71.000
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
1161	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
2415	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
2740	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
6419	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

TOTAL FAILURES	TIME TO FAILURE (HRS)	QUANTITY
45	66	1
	[illegible]	1
	[illegible]	1
	[illegible]	1
	[illegible]	[illegible]
	[illegible]	1
	[illegible]	[illegible]
	[illegible]	[illegible]
	[illegible]	[illegible]
	[illegible]	1
	[illegible]	1
	[illegible]	[illegible]
	[illegible]	1
	[illegible]	1
	[illegible]	1
	[illegible]	[illegible]
	[illegible]	[illegible]
	[illegible]	1
	[illegible]	[illegible]
	[illegible]	1
	[illegible]	1
	[illegible]	1
	[illegible]	1
	[illegible]	[illegible]

Figure 3-108. Parameter Trend Chart, R4041P1, Phase IV, h_{FE}



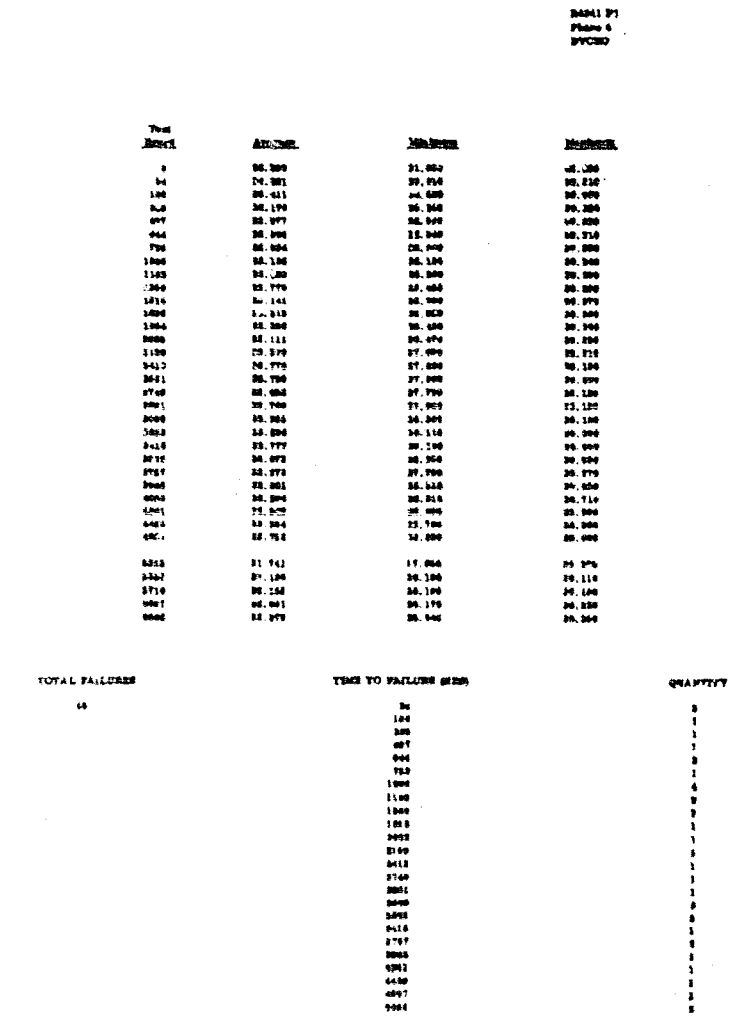


Figure 3-109. Parameter Trend Chart, R4041P1, Phase IV, BV_{CBO}

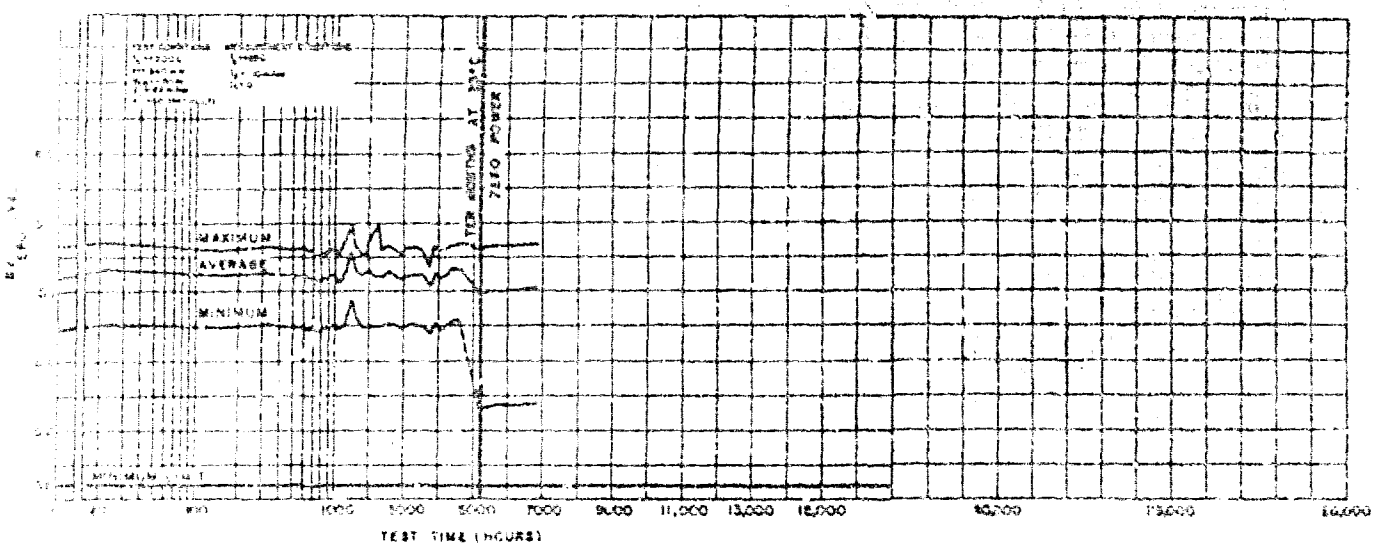


Figure 3-110. Parameter Trend Chart, R4040 P1, Mean IV, BV$_{EBO}$

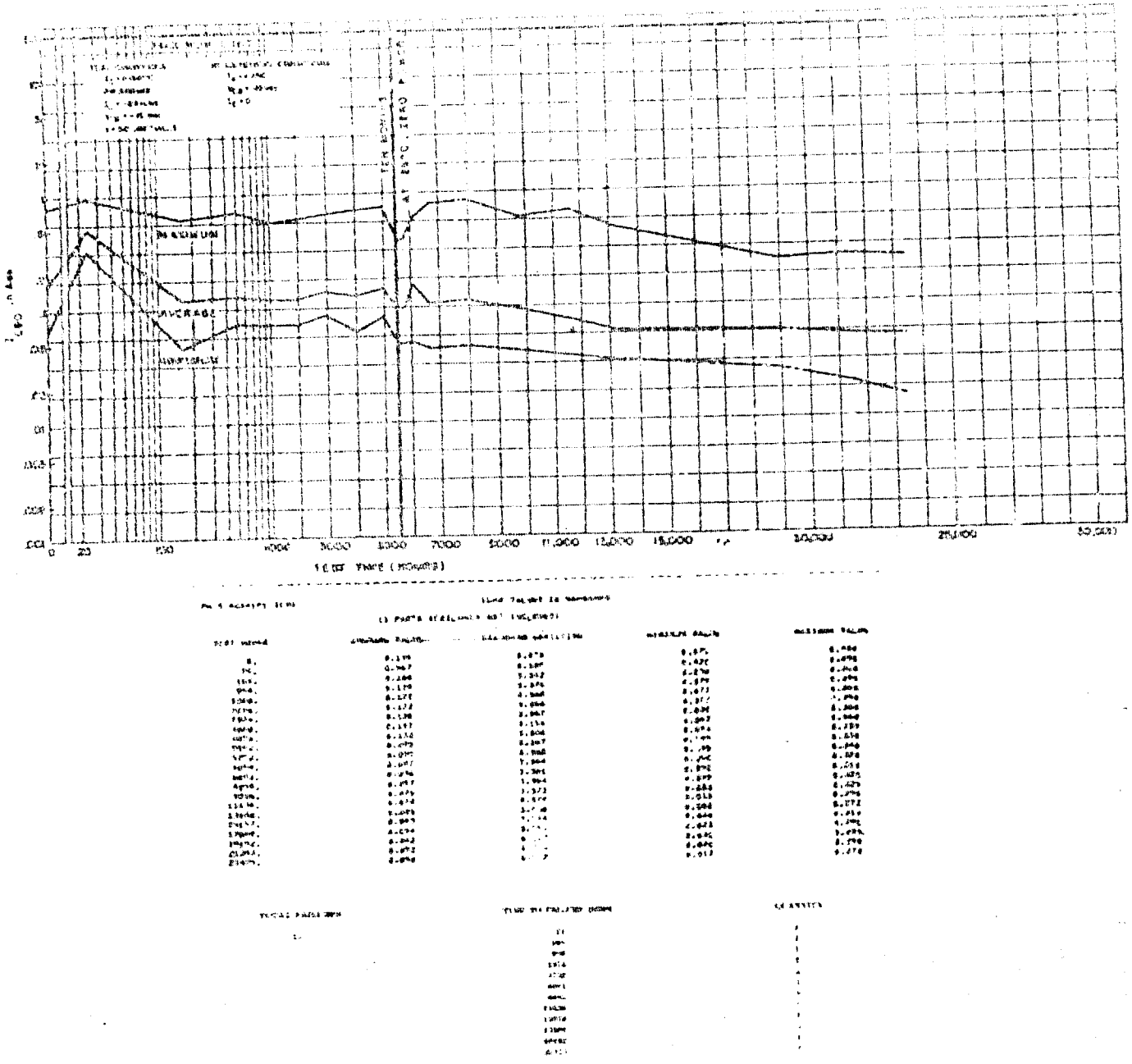
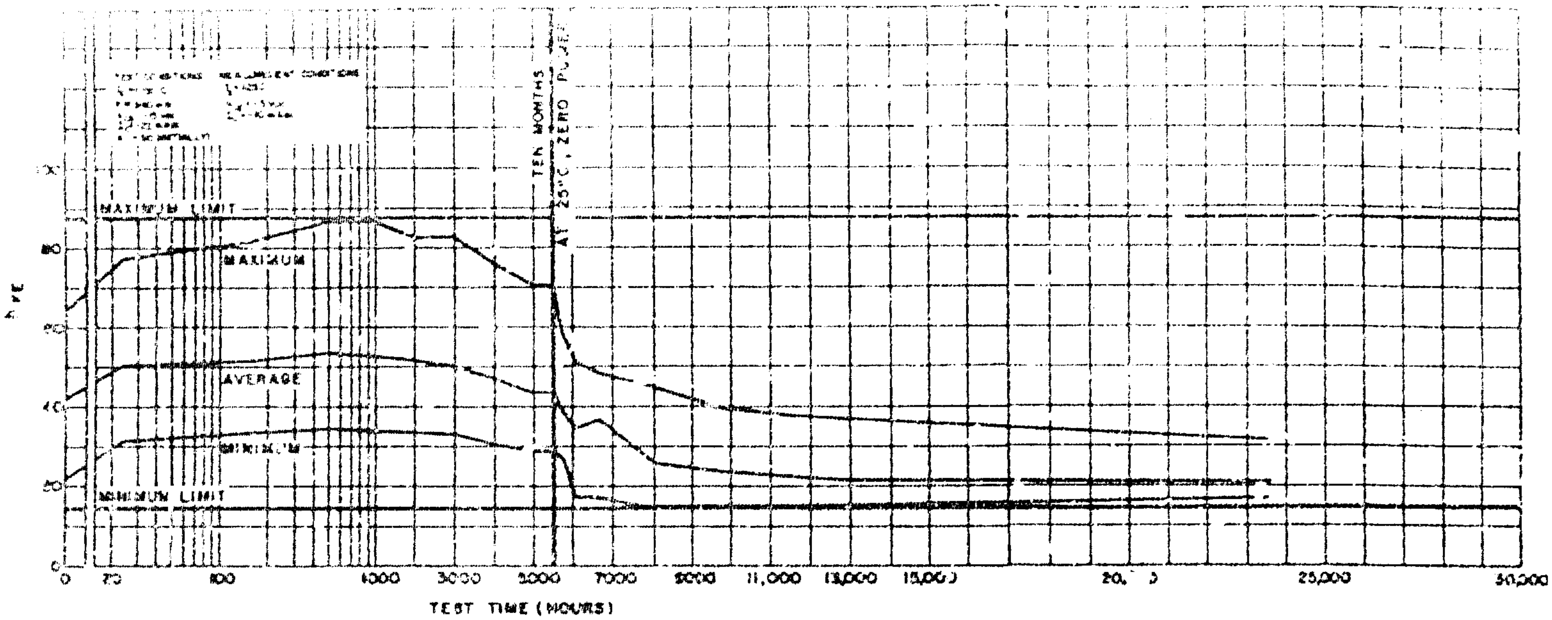


Figure 3-111. Parameter Trend Chart, R4041P1, Phase V, I_{CBO}

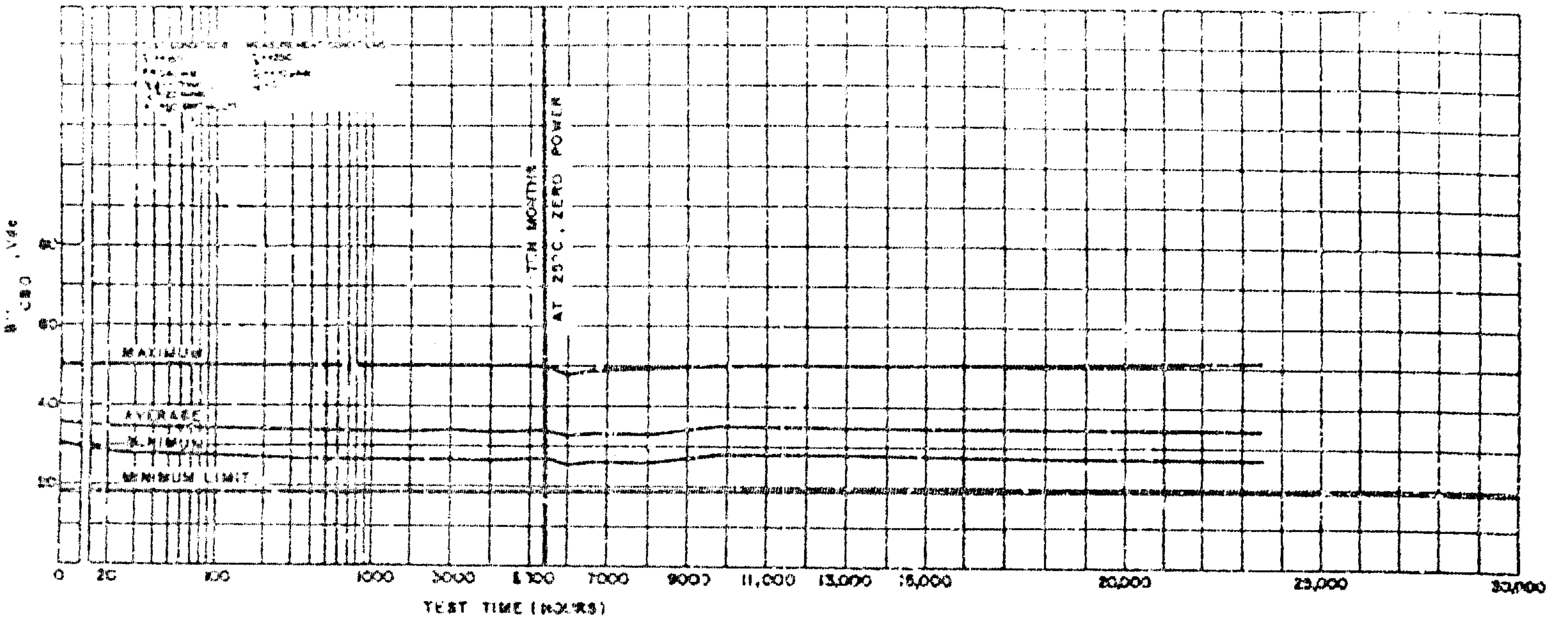


[illegible]

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	42.544	[illegible]	29.043	64.190
24.	[illegible]	11.343	[illegible]	77.944
168.	[illegible]	12.468	[illegible]	[illegible]
504.	[illegible]	[illegible]	[illegible]	87.000
[illegible]	[illegible]	[illegible]	[illegible]	87.000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	56.456	12.731	[illegible]	76.378
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	51.003
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	17.444	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	17.000	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	17.000	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	37.700
[illegible]	[illegible]	[illegible]	19.000	[illegible]
[illegible]	[illegible]	[illegible]	19.400	[illegible]

TOTAL FAILURES	TIME TO FAILURE (HRS)	QUANTITY
25	24	1
	168	1
	[illegible]	1
	[illegible]	1
	[illegible]	[illegible]
	[illegible]	[illegible]
	[illegible]	[illegible]
	[illegible]	[illegible]
	[illegible]	1
	[illegible]	[illegible]
	[illegible]	[illegible]
	[illegible]	[illegible]

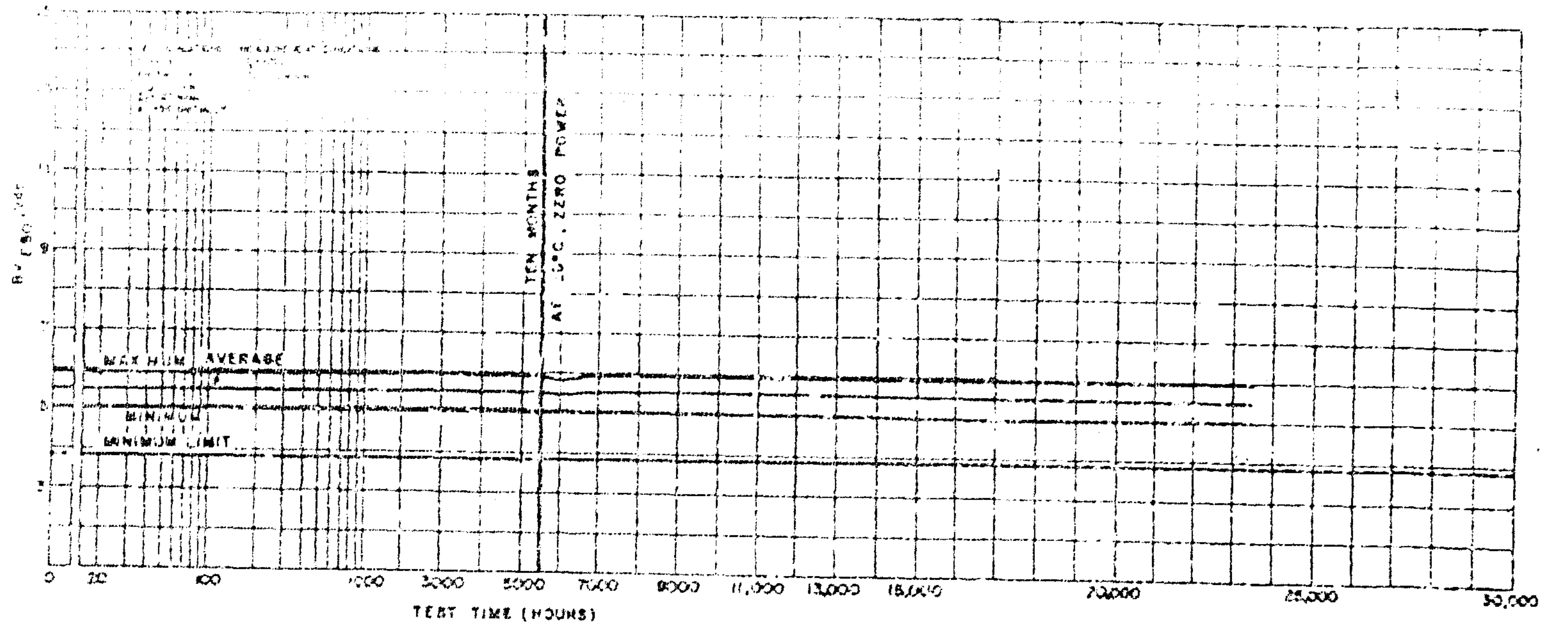
Figure 3-112. Parameter Trend Chart, R4041P1, Phase V, h_{FE}



TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
0.	34.481	4.736	32.316	51.132
24.	25.647	9.144	31.176	51.130
168.	34.163	6.272	29.708	56.796
504.	34.505	5.790	29.579	56.646
1008.	34.464	5.314	28.568	54.314
[illegible]	34.648	[illegible]	[illegible]	[illegible]
[illegible]	34.781	[illegible]	[illegible]	[illegible]
[illegible]	34.175	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	33.646	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	33.741	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	33.490	9.708	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	33.999	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	33.741	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	33.796	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	34.113	[illegible]	[illegible]	[illegible]

TOTAL FAILURES	TIME TO FAILURE (HRS)	QUANTITY
[illegible]	24	1
	168	1
	504	1
	2076	1
	3152	1
	4464	1
	9083	[illegible]
	11616	[illegible]
	13070	1
	17990	[illegible]
	19192	1
	23435	1

Figure 3-113. Parameter Trend Chart, R4041P1, Phase V, BV_{CBO}



[illegible]

TEST HOURS	AVERAGE VALUE	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TOTAL FAILURES	TIME TO FAILURE (HRS)	QUANTITY
[illegible]	24	1
	[illegible]	1
	[illegible]	[illegible]
	[illegible]	1
	[illegible]	[illegible]
	[illegible]	[illegible]
	[illegible]	[illegible]
	[illegible]	[illegible]
	[illegible]	1
	[illegible]	[illegible]
	[illegible]	1
	[illegible]	1

Figure 3-114. Parameter Trend Chart, R4041P1, Phase V, BV_{EBO}

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Security Classification

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Mario L. Rocci, Project Engineer	Rome Air Development Center (EMERR) Griffiss AFB NY 13440

13. ABSTRACT
This is the final report on Contract AF30(602)-3968. Long term tests to 30,000 hours were continued to provide correlation data for accelerated test results. A theory of life governing processes for electronic parts is given. The data is analyzed and presented to provide estimates of the life governing processes for each part type. A physics of failure study of mica, ceramic, porcelain, and glass capacitors was also performed and the results are included.

DD FORM 1473

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Security Classification

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	ROLE	WT	ROLE	WT	ROLE	WT
Accelerated Testing Step-Stress Failure Mechanisms Degradation Models						

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