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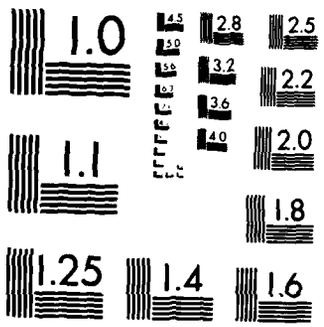

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HEADQUARTERS
OGDEN AIR LOGISTICS CENTER
UNITED STATES AIR FORCE
HILL AIR FORCE BASE, UTAH 84056

AD-A152 540

MM2 LRSLA TESTING

STAGE III PROPELLANT

PROPELLANT LAB SECTION

MANPA REPORT
NR 501(85)

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MANPA REPORT NR 501(85)

MM2 LRSLA TESTING

STAGE II PROPELLANT

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ABSTRACT

Data in this report is a continuation of LRSLA testing on Stage III Dissected Motors. Problems in testing C-7 bonds were not alleviated by changing specimen size as previously suggested.

The data variation that has been observed has prompted a closer analysis of testing for variance.

The plotted points used on the regression plots are a combined average of test results at a designated test period.

The data variance within test periods is now demonstrated with the addition of separating the test results into individual plotted points on the regressions for each test period.

Data variance between motors is demonstrated by the use of unique motor plot symbols in the multi-motor regressions. These unique symbols are data mean values and the number of samples per mean can be found with its minimum and maximum values in the sample size summary.

Statistically, these multi-motor regressions are inappropriate for analysis use and should be used for visual display only to show motor-to-motor relationship.

Additional Keywords:
Solid propellant [illegible]; regression analysis; stress relaxation; [illegible]; fracture toughness; [illegible] testers; Minuteman.

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TABLE OF CONTENTS

Section		Page
	Abstract	ii
	List of Figures	iv
I	Introduction	1-1
	Statistical Analysis	1-2
II	Stress Relaxation	2-1
III	Hardness	3-1
IV	Tensile Testing	4-1
V	Fracture Toughness	5-1
VI	Short Beam Shear Aft-Boot-to-Flap	6-1
VII	Summary and Recommendation	7-1
	Distribution List	8-1
	DD 1473	8-2

LIST OF FIGURES

Figure Nr		Page
	Regression Plot, Stress Relaxation, 2% Strain	
2-1	Modulus at 10 sec	2-2
2-2	Modulus at 50 sec	2-4
2-3	Modulus at 100 sec	2-6
2-4	Modulus at 1000 sec	2-8
	Regression Plot, Hardness, Shore A	
3-1	Multi-motor	3-2
3-2	Motor 0031064	3-4
3-3	Motor 0031134	3-6
3-4	Motor 0032434	3-8
3-5	Motor 0032831	3-10
3-6	Motor 0033174	3-12
	Regression Plot, Hardness, Shore C	
3-7	Multi-motor	3-14
3-8	Motor 0031064	3-16
3-9	Motor 0031134	3-18
3-10	Motor 0032434	3-20
3-11	Motor 0032831	3-22
3-12	Motor 0033174	3-24
	Regression Plot, Tensile, 2.0 in/min, Multi-motor	
4-1	Maximum Stress	4-3
4-2	Strain at Max Stress	4-4
4-3	Strain at Rupture	4-5
4-4	Stress at Rupture	4-6
4-5	Modulus	4-7

LIST OF FIGURES (cont)

Figure Nr		Page
	Regression Plot, Tensile, 2.0 in/min, Motor 0031064	
4-6	Maximum Stress, Mean Point Data	4-8
4-7	Strain at Max Stress, Mean Point Data	4-10
4-8	Strain at Rupture, Mean Point Data	4-12
4-9	Stress at Rupture, Mean Point Data	4-14
4-10	Modulus, Mean Point Data	4-16
4-11	Maximum Stress, Individual Data Point	4-18
4-12	Strain at Max Stress, Individual Data Point	4-19
4-13	Strain at Rupture, Individual Data Point	4-20
4-14	Stress at Rupture, Individual Data Point	4-21
4-15	Modulus, Individual Data Point	4-22
	Regression Plot, Tensile, 2.0 in/min, Motor 0031134	
4-16	Maximum Stress, Mean Point Data	4-23
4-17	Strain at Max Stress, Mean Data Point	4-25
4-18	Strain at Rupture, Mean Point Data	4-27
4-19	Stress at Rupture, Mean Point Data	4-29
4-20	Modulus, Mean Point Data	4-31
4-21	Maximum Stress, Individual Data Point	4-33
4-22	Strain at Max Stress, Individual Data Point	4-34
4-23	Strain at Rupture, Individual Data Point	4-35
4-24	Stress at Rupture, Individual Data Point	4-36
4-25	Modulus, Individual Data Point	4-37
	Regression Plot, Tensile, 2.0 in/min, Motor 0032434	
4-26	Maximum Stress, Mean Point Data	4-38
4-27	Strain at Max Stress, Mean Point Data	4-40
4-28	Strain at Rupture, Mean Point Data	4-42

LIST OF FIGURES (cont)

Figure Nr		Page
4-29	Stress at Rupture, Mean Point Data	4-44
4-30	Modulus, Mean Point Data	4-46
4-31	Maximum Stress, Individual Data Point	4-48
4-32	Strain at Max Stress, Individual Data Point	4-49
4-33	Strain at Rupture, Individual Data Point	4-50
4-34	Stress at Rupture, Individual Data Point	4-51
4-35	Modulus, Individual, Individual Data Point	4-52
	Regression Plot, Tensile, 2.0 in/min, Motor 0032831	
4-36	Maximum Stress, Mean Point Data	4-53
4-37	Strain at Max Stress, Mean Point Data	4-55
4-38	Strain at Rupture, Mean Point Data	4-57
4-39	Stress at Rupture, Mean Point Data	4-59
4-40	Modulus, Mean Point Data	4-61
4-41	Maximum Stress, Individual Data Point	4-63
4-42	Strain at Max Stress, Individual Data Point	4-64
4-43	Strain at Rupture, Individual Data Point	4-65
4-44	Stress at Rupture, Individual Data Point	4-66
4-45	Modulus, Individual Data Point	4-67
	Regression Plot, Tensile, 2.0 in/min, Motor 0033174	
4-46	Maximum Stress, Mean Point Data	4-68
4-47	Strain at Max Stress, Mean Point Data	4-70
4-48	Strain at Rupture, Mean Point Data	4-72
4-49	Stress at Rupture, Mean Point Data	4-74
4-50	Modulus, Mean Point Data	4-76
4-51	Maximum Stress, Individual Data Point	4-78
4-52	Strain at Max Stress, Individual Data Point	4-79

LIST OF FIGURES (cont)

Figure Nr		Page
4-53	Strain at Rupture, Individual Data Point	4-80
4-54	Stress at Rupture, Individual Data Point	4-81
4-55	Modulus, Individual Data Point	4-82
	Regression Plot, Biaxial Tensile, 0.2 in/min, Six Motors	
4-56	Maximum Stress	4-83
4-57	Strain at Max Stress	4-85
4-58	Strain at Rupture	4-87
4-59	Stress at Rupture	4-89
4-60	Modulus	4-91
	Regression Plot, Biaxial Tensile, 200 in/min, Six Motors	
4-61	Maximum Stress	4-92
4-62	Strain at Max Stress	4-93
4-63	Strain at Rupture	4-94
4-64	Stress at Rupture	4-95
4-65	Modulus	4-96

SECTION I

INTRODUCTION

In 1968, OO-ALC began testing dissected motors. Changes to the Aging and Surveillance program reduced the number of test motors to five per year. In 1983, one additional motor was added to the program.

In 1976, humidity conditioning at 50 $\pm$ 5 percent relative humidity for 48 hours was introduced into the program. Longer conditioning times, depending upon the thickness of the test specimen, began in 1981. At that same time changes were also made in several test parameters (GTD-30, Rev 2, 1 April 1981).

The motor serial numbers, lot numbers, cast dates and symbols used in the computer plots are shown below.

Motor S/N	Lot Number	Cast Date	Symbol
0031064	SR-56-62	62294	□
0031134	SR-65-62	63328	○
0032434	RAD-1-1-63	64021	△
0032619	RAD-1-4-64	64258	★
0032831	RAD-1-1-65	65176	+
0033174	RAD-1-10-66	67020	×

STATISTICAL APPROACH

Regression analysis has been selected as the method for projecting aging trends and demonstrating data variation in the propellant. The linear model $Y = a + bX$ was found to have the best fit throughout the data for this report.

A unique plot symbol is used for each motor tested. Analysis of covariance results indicate that the combined motor regression plots are to be used for visual display only.

Most points on the regression plots represent a data mean value at its particular age at test. The remaining points are single valued as shown in figures 4-11 thru 4-15, 4-21 thru 4-25, 4-31 thru 4-35, 4-41 thru 4-45, and 4-51 thru 4-55. The single valued points have multi-points per its particular age at test. Sample sizes per the mean values can be found in the Sample Size Summary. All regressions are calculated on single data values.

The data variance about each regression line was used to compute a tolerance interval such that at 90% confidence 90% of the sample distribution will fall within this interval. This tolerance interval is extrapolated 24 months beyond the age of the last test date.

The F value and student 't' values with their significance are recorded at the top of each regression. The significance gives an indication of the regression statistical significance of the trend line slope as compared to a line of zero slope.

SECTION II

STRESS RELAXATION

Stress relaxation specimens (0.5" x 0.5" x 4") were tested in the OO-ALC program at 3% strain and 77°F. In 1978, under the LRSLA program, an evaluation program tested two types of specimens at 2% strain, at 77°F. At the same time, specimens were tested at -30°F under 300 psi. The severe conditions could not be reproduced and testing was dropped.

Visual display for six motors and two test periods is shown in figures 2-1 thru 2-4. These combined data show a significant decrease in strain at rupture. The trend is not obvious for the two oldest motors for stress at rupture, but shows clearly for the RAD motors.

Individual regressions should be available for inclusion in the next report.

Y = ((+1.9404687E+03) + (-1.9472035E+00) * X)

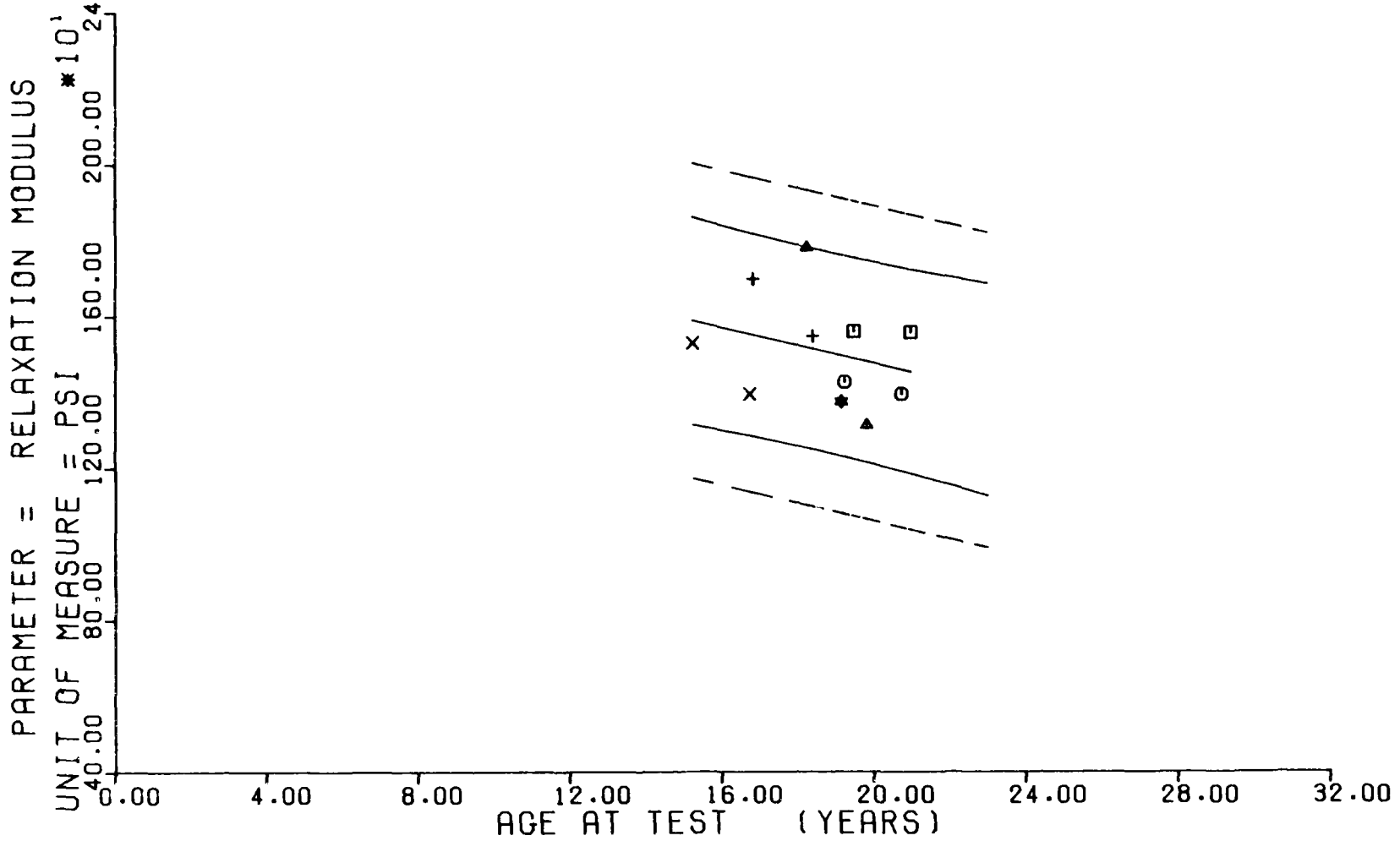
F = +4.5117037E+00 SIGNIFICANCE OF F = SIGNIFICANT σ_Y = +1.4242336E+02

R = -2.7768275E-01 SIGNIFICANCE OF R = SIGNIFICANT S_B = +9.1672919E-01

t = +2.1240771E+00 SIGNIFICANCE OF t = SIGNIFICANT S_E = +1.3808332E+02

N = 56 DEGREES OF FREEDOM = 54

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



STRESS RELAXATION MODULUS AT 10 SEC AND 2% STRAIN, SIX MOTOR VISUAL DISPLAY

Figure 2-

*** LINEAR REGRESSION ANALYSIS ***

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SAMPLING PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
27.0	1	+7.9599990E+01	+0.0000000E+07	+7.9599990E+01	+7.9599990E+01	+8.1823532E+01
30.0	1	+8.4399993E+01	+0.0000000E+07	+8.4399993E+01	+8.4399993E+01	+8.1574157E+01
55.0	5	+8.2000000E+01	+7.0710678E-01	+8.3000000E+01	+8.1000000E+01	+8.1280422E+01
105.0	10	+8.2799987E+01	+1.0327955E+00	+8.4000000E+01	+8.1000000E+01	+8.1094589E+01
110.0	5	+8.3000000E+01	+1.0000000E+00	+8.4000000E+01	+8.2000000E+01	+8.0883575E+01
140.0	5	+7.3399993E+01	+1.1401754E+00	+8.0000000E+01	+7.7000000E+01	+8.0815020E+01
145.0	5	+7.6199996E+01	+1.3033404E+00	+7.7000000E+01	+7.4000000E+01	+8.0365640E+01
150.0	5	+7.3199996E+01	+8.3666002E-01	+7.9000000E+01	+7.7000000E+01	+8.0192993E+01
200.0	6	+7.8666656E+01	+5.1639777E-01	+7.9000000E+01	+7.8000000E+01	+7.8696746E+01
240.0	5	+8.0399993E+01	+8.9442719E-01	+8.2000000E+01	+8.0000000E+01	+7.8351455E+01

MINUTEMAN II, STAGE III, DISSECTED MTR <0031134>

Y = ((+8.3108782E+01) + (-1.9182732E-02) * X)

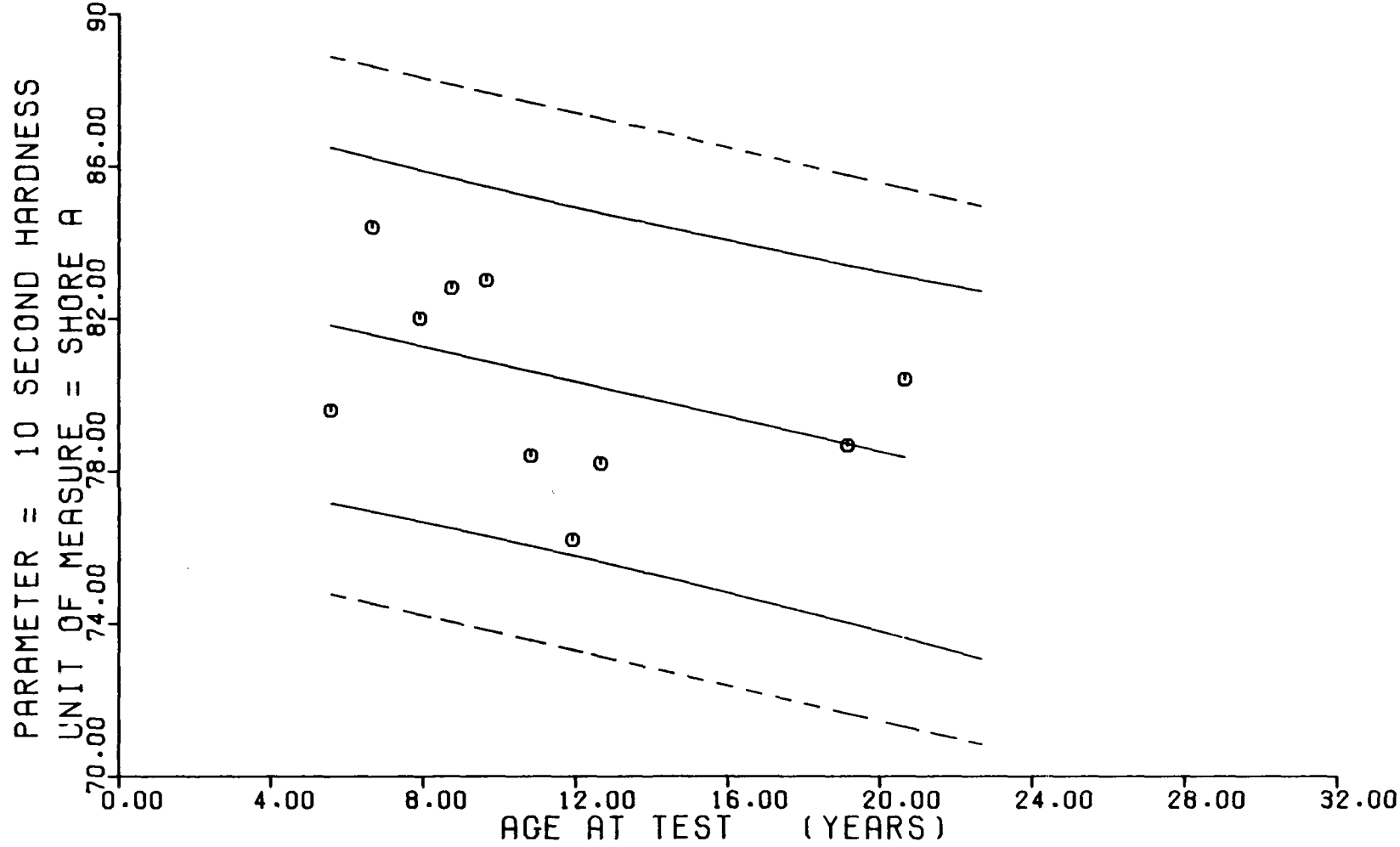
F = +9.3799746E+00 SIGNIFICANCE OF F = SIGNIFICANT σ_Y = +2.5508967E+00

R = -4.1155175E-01 SIGNIFICANCE OF R = SIGNIFICANT S_B = +6.2633927E-03

t = +3.0626744E+00 SIGNIFICANCE OF t = SIGNIFICANT S_E = +2.3499868E+00

N = 48 DEGREES OF FREEDOM = 46

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



MINUTEMAN II, STAGE III, DISSECTED MTR 0031134 , HARDNESS SHORE A

Figure 3-3

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
75.0	1	+8.0000000E+01	+0.0000000E+07	+8.0000000E+01	+8.0000000E+01	+8.3134124E+01
[illegible]	1	+8.1599990E+01	+0.0000000E+07	+8.1599990E+01	+8.1599990E+01	+8.2778694E+01
[illegible]	5	+8.1799987E+01	+1.0954451E+00	+8.3000000E+01	+8.0000000E+01	+8.2368392E+01
105.0	10	+8.5000000E+01	+1.0540925E+00	+8.7000000E+01	+8.4000000E+01	+8.2094924E+01
120.0	5	+8.3999993E+01	+8.9442719E-01	+8.4000000E+01	+8.2000000E+01	+8.1766754E+01
135.0	5	+7.9999990E+01	+1.1401754E+00	+8.1000000E+01	+7.8000000E+01	+8.1411239E+01
150.0	5	+7.8000000E+01	+1.0000000E+00	+7.9000000E+01	+7.7000000E+01	+8.1055709E+01
165.0	5	+7.7599990E+01	+1.3416407E+00	+7.9000000E+01	+7.6000000E+01	+8.0809585E+01
234.0	6	+8.0500000E+01	+1.3784048E+00	+8.2000000E+01	+7.9000000E+01	+7.8649139E+01
252.0	5	+7.8000000E+01	+2.3452078E+00	+8.1000000E+01	+7.6000000E+01	+7.8156890E+01

MINUTEMAN II, STAGE III, DISSECTED MTR <0031064>

Y = ((+8.5048443E+01) + (-2.7347393E-02) * X)

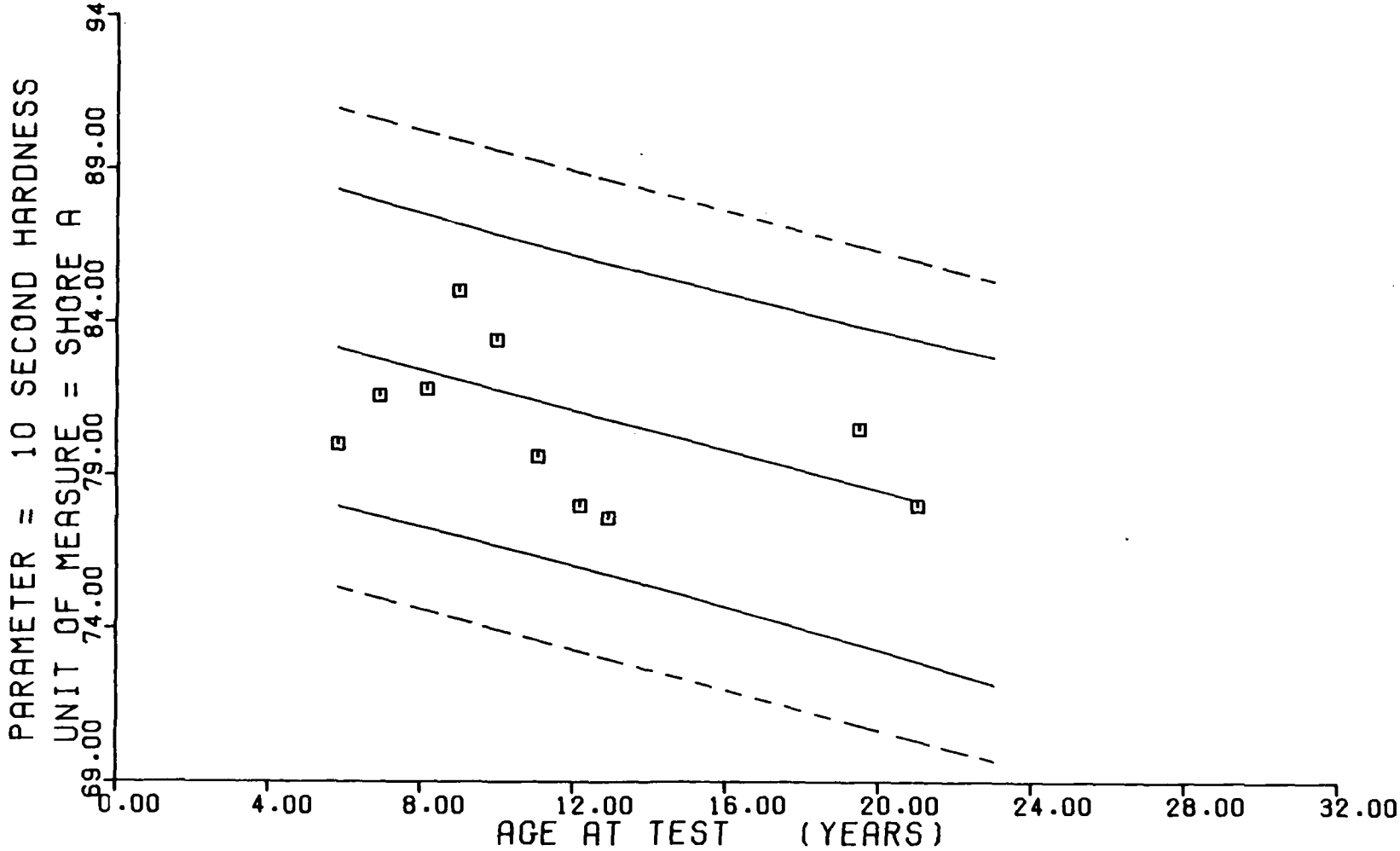
F = +1.5727897E+01 SIGNIFICANCE OF F = SIGNIFICANT σ_Y = +2.9833551E+00

R = -5.0477122E-01 SIGNIFICANCE OF R = SIGNIFICANT S_B = +6.8957355E-03

t = +3.9658413E+00 SIGNIFICANCE OF t = SIGNIFICANT S_E = +2.6032335E+00

N = 48 DEGREES OF FREEDOM = 46

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



MINUTEMAN II, STAGE III, DISSECTED MTR 0031064 , 10 sec HARDNESS , SHORE A

Figure 3-2

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
[illegible]	1	130.0	5
51.0	1	133.0	5
[illegible]	1	140.0	5
[illegible]	10	152.0	5
[illegible]	5	155.0	5
67.0	1	183.0	5
[illegible]	1	201.0	5
[illegible]	5	202.0	5
70.0	1	219.0	5
[illegible]	10	230.0	5
[illegible]	1	234.0	5
[illegible]	5	237.0	5
[illegible]	1	243.0	5
84.0	5	252.0	5
87.0	5		
[illegible]	5		
[illegible]	5		
[illegible]	5		
104.0	5		
105.0	20		
[illegible]	10		
116.0	5		
[illegible]	5		
[illegible]	5		
[illegible]	5		

[illegible] II, STAGE III, DISSECTED MTRS/00[illegible],0031[illegible],0032434,0032831,0033174

Y = ((+8.4953558E+01) + (-2.8989592E-02) ■ X)

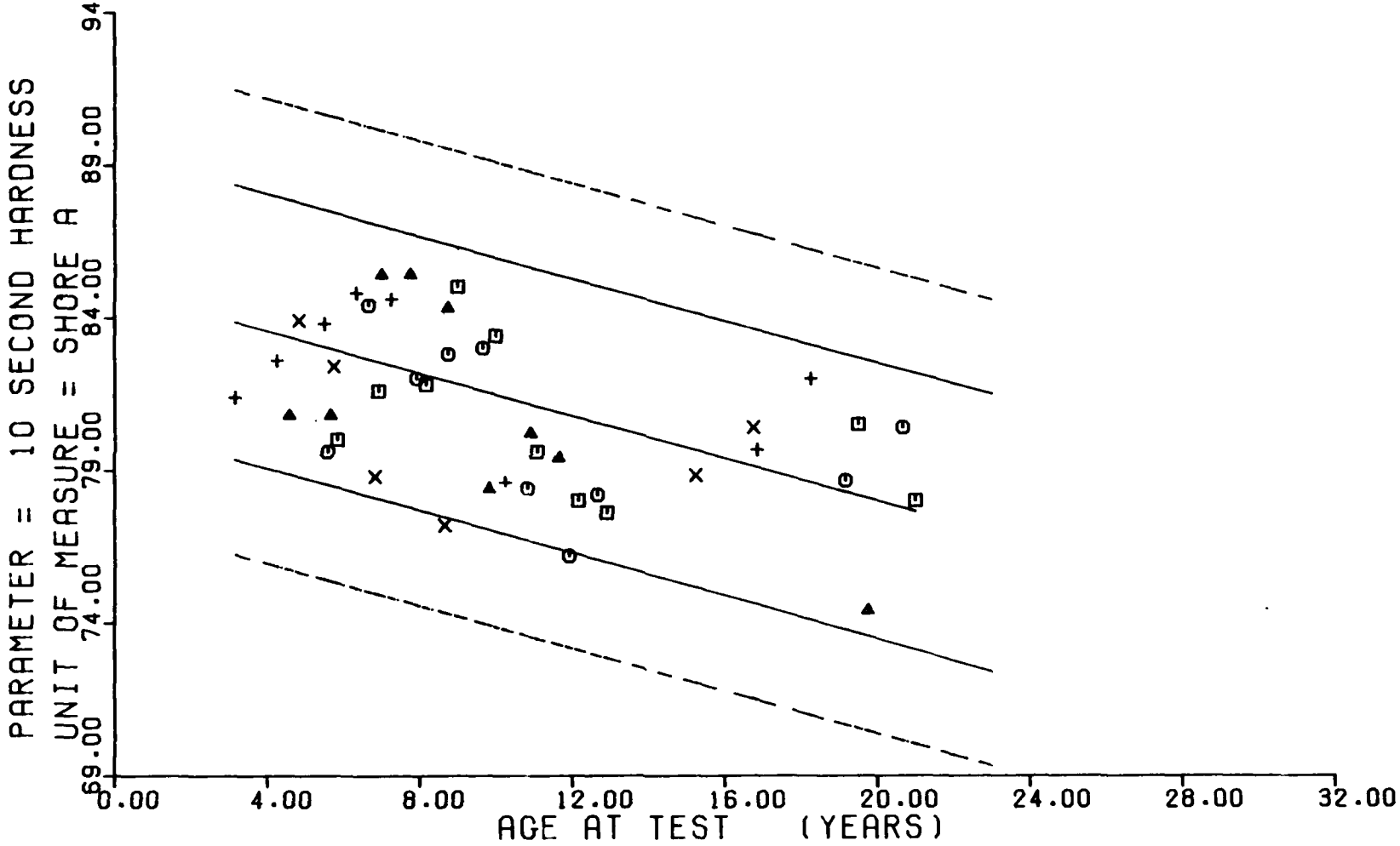
F = +8.829834CE+01 SIGNIFICANCE OF F = SIGNIFICANT σ_Y = +3.0158257E+00

R = -5.4406508E-01 SIGNIFICANCE OF R = SIGNIFICANT S_B = +3.0850758E-03

t = +9.3967196E+00 SIGNIFICANCE OF t = SIGNIFICANT S_E = +2.5364252E+00

N = 212 DEGREES OF FREEDOM = 210

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



MINUTEMAN II, STAGE III, DISSECTED MTRS/0031064,0031134,0032434,0032831,0033174

Figure 3-1

SECTION III

HARDNESS

The Shore A and Shore C hardness testing were performed on dogbone ends.

Figure 3-1 is a visual display of the 5 motor data. Figures 3-2 thru 3-6 show Shore A hardness on individual motors. All regressions show a significant decrease in hardness.

Shore C hardness is shown in figure 3-7 as a visual display. Figures 3-8 thru 3-12 show a significant decrease in each of the motors.

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
183.0	5	+8.9200000E+02	+1.4404860E+01	+9.0500000E+02	+8.7000000E+02	+9.1785058E+02
201.0	5	+7.5400000E+02	+1.5572411E+01	+7.7500000E+02	+7.4000000E+02	+8.8868017E+02
202.0	5	+9.8100000E+02	+4.3214580E+01	+1.0150000E+03	+9.1000000E+02	+8.8705957E+02
219.0	5	+1.0330000E+03	+4.7381430E+01	+1.0700000E+03	+9.5000000E+02	+8.5950976E+02
221.0	5	+8.4900000E+02	+3.7815340E+01	+8.9500000E+02	+8.1000000E+02	+8.5626855E+02
230.0	5	+7.7700000E+02	+2.4135036E+01	+8.0500000E+02	+7.4500000E+02	+8.4168334E+02
231.0	5	+8.4900000E+02	+7.4161984E+00	+8.6000000E+02	+8.4000000E+02	+8.4006298E+02
234.0	6	+8.8000000E+02	+2.6645825E+01	+9.3000000E+02	+8.6000000E+02	+8.3520117E+02
238.0	5	+7.4800000E+02	+2.5396850E+01	+7.8500000E+02	+7.2500000E+02	+8.2871875E+02
249.0	5	+7.6200000E+02	+3.8503246E+01	+8.3000000E+02	+7.4000000E+02	+8.1089233E+02
252.0	5	+8.3800000E+02	+2.3075961E+01	+8.7000000E+02	+8.0500000E+02	+8.0603076E+02

STRESS RELAXATION MODULUS AT 1000 SEC AND 2% STRAIN, SIX MOTOR VISUAL DISPLAY

Y = ((+1.2144166E+03) + (-1.6205786E+00) * X)

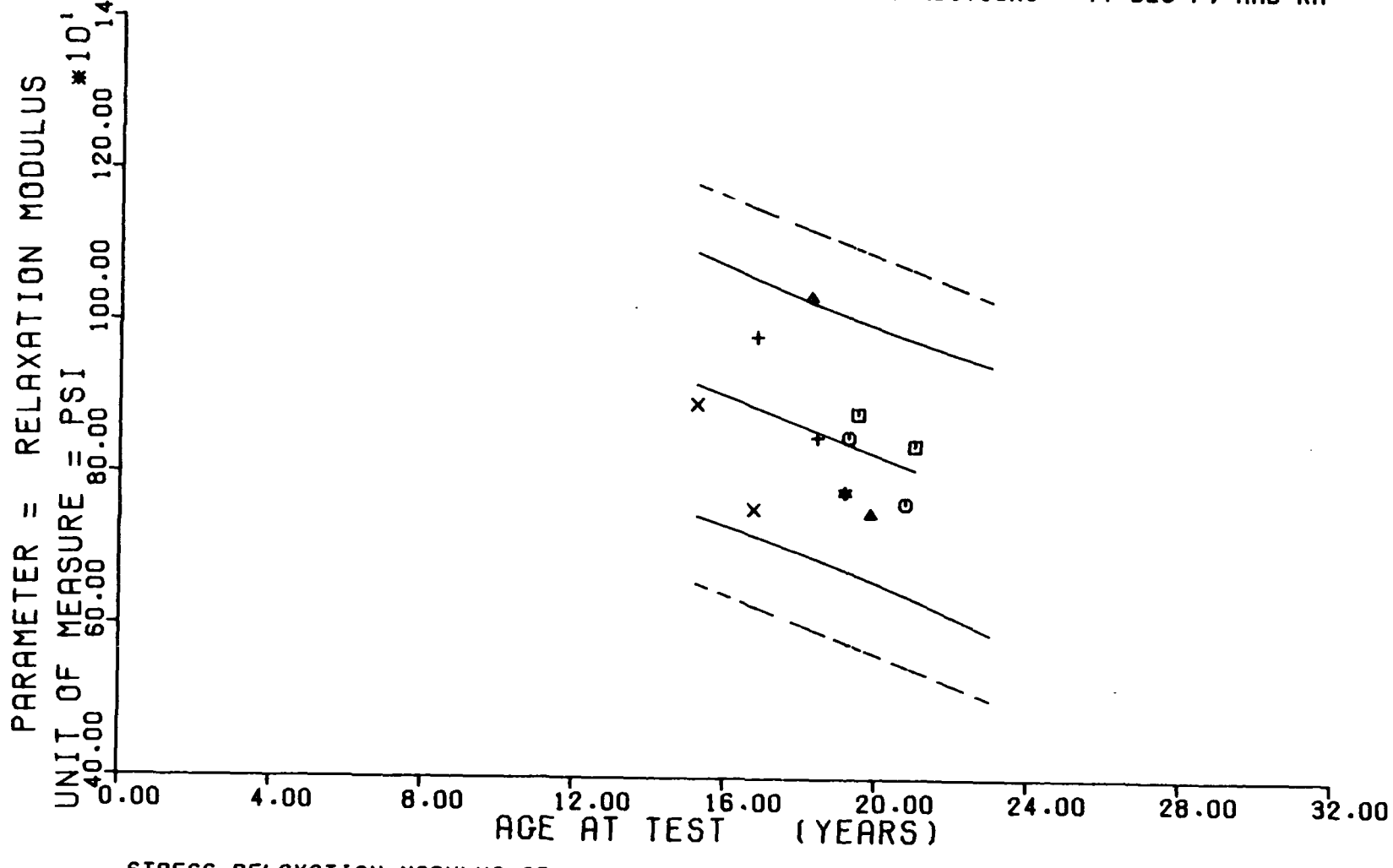
F = +7.7978565E+00 SIGNIFICANCE OF F = SIGNIFICANT σ_Y = +9.2659085E+01

R = -3.5522286E-01 SIGNIFICANCE OF R = SIGNIFICANT S_B = +5.8033998E-01

t = +2.7924642E+00 SIGNIFICANCE OF t = SIGNIFICANT S_E = +8.7414333E+01

N = 56 DEGREES OF FREEDOM = 54

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



STRESS RELAXATION MODULUS AT 1000 SEC AND 2% STRAIN, SIX MOTOR VISUAL DISPLAY

Figure 2-4

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
183.0	5	+1.1180000E+03	+1.6431676E+01	+1.1400000E+03	+1.0950000E+03	+1.1527011E+03
201.0	5	+9.8700000E+02	+1.5247950E+01	+1.0050000E+03	+9.7000000E+02	+1.1247778E+03
202.0	5	+1.2360000E+03	+5.8672821E+01	+1.2800000E+03	+1.1400000E+03	+1.1232265E+03
219.0	5	+1.2920000E+03	+5.3455589E+01	+1.3400000E+03	+1.2000000E+03	+1.0968542E+03
221.0	5	+1.1050000E+03	+3.0822070E+01	+1.1500000E+03	+1.0750000E+03	+1.0937517E+03
230.0	5	+9.9600000E+02	+2.5099800E+01	+1.0250000E+03	+9.6500000E+02	+1.0797900E+03
231.0	5	+1.0460000E+03	+1.0246950E+01	+1.0550000E+03	+1.0300000E+03	+1.0782387E+03
234.0	6	+1.1300000E+03	+3.6193922E+01	+1.1950000E+03	+1.1000000E+03	+1.0735849E+03
238.0	5	+9.5600000E+02	+1.9811612E+01	+9.9000000E+02	+9.4000000E+02	+1.0673796E+03
249.0	5	+1.0020000E+03	+3.5812009E+01	+1.0650000E+03	+9.8000000E+02	+1.0503154E+03
252.0	5	+1.1070000E+03	+2.1679483E+01	+1.1400000E+03	+1.0800000E+03	+1.0456613E+03

STRESS RELAXATION MODULUS AT 100 SEC AND 2% STRAIN, SIX MOTOR VISUAL DISPLAY

Y = ((+1.4365894E+03) + (-1.5513010E+00) * X)

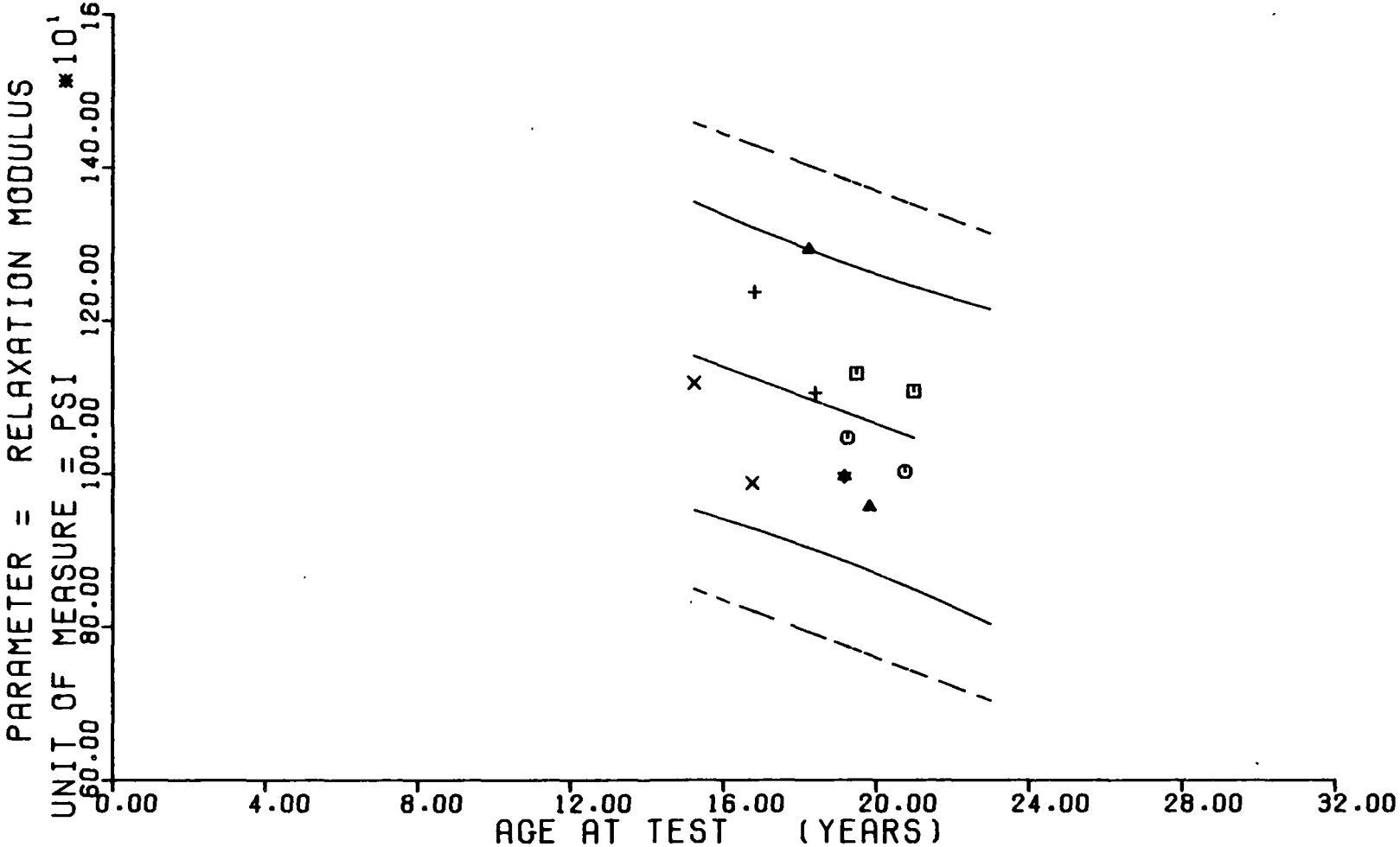
F = +5.2976052E+00 SIGNIFICANCE OF F = SIGNIFICANT σ_Y = +1.0541287E+02

R = -2.9889676E-01 SIGNIFICANCE OF R = SIGNIFICANT S_B = +6.7399439E-01

t = +2.3016527E+00 SIGNIFICANCE OF t = SIGNIFICANT S_E = +1.0152112E+02

N = 56 DEGREES OF FREEDOM = 54

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



STRESS RELAXATION MODULUS AT 100 SEC AND 2% STRAIN, SIX MOTOR VISUAL DISPLAY

Figure 2-3

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
183.0	5	+1.2100000E+03	+1.9999999E+01	+1.2350000E+03	+1.1800000E+03	+1.2480292E+03
201.0	5	+1.0750000E+03	+1.2247448E+01	+1.0900000E+03	+1.0600000E+03	+1.2201975E+03
202.0	5	+1.3400000E+03	+6.4710895E+01	+1.3900000E+03	+1.2350000E+03	+1.2186513E+03
219.0	5	+1.4050000E+03	+5.8630196E+01	+1.4600000E+03	+1.3050000E+03	+1.1923654E+03
221.0	5	+1.1970000E+03	+2.7064737E+01	+1.2350000E+03	+1.1700000E+03	+1.1892731E+03
230.0	5	+1.0870000E+03	+2.1965882E+01	+1.1150000E+03	+1.0600000E+03	+1.1753571E+03
231.0	5	+1.1360000E+03	+1.3416407E+01	+1.1500000E+03	+1.1150000E+03	+1.1738110E+03
234.0	6	+1.2275000E+03	+4.0712405E+01	+1.3000000E+03	+1.1900000E+03	+1.1691723E+03
238.0	5	+1.0450000E+03	+2.0310096E+01	+1.0800000E+03	+1.0300000E+03	+1.1629875E+03
249.0	5	+1.0910000E+03	+3.5951356E+01	+1.1550000E+03	+1.0700000E+03	+1.1459790E+03
252.0	5	+1.2120000E+03	+2.3611437E+01	+1.2450000E+03	+1.1800000E+03	+1.1413403E+03

STRESS RELAXATION MODULUS AT 50 SEC AND 2% STRAIN, SIX MOTOR VISUAL DISPLAY

Y = ((+1.5309871E+03) + (-1.5462165E+00) * X)

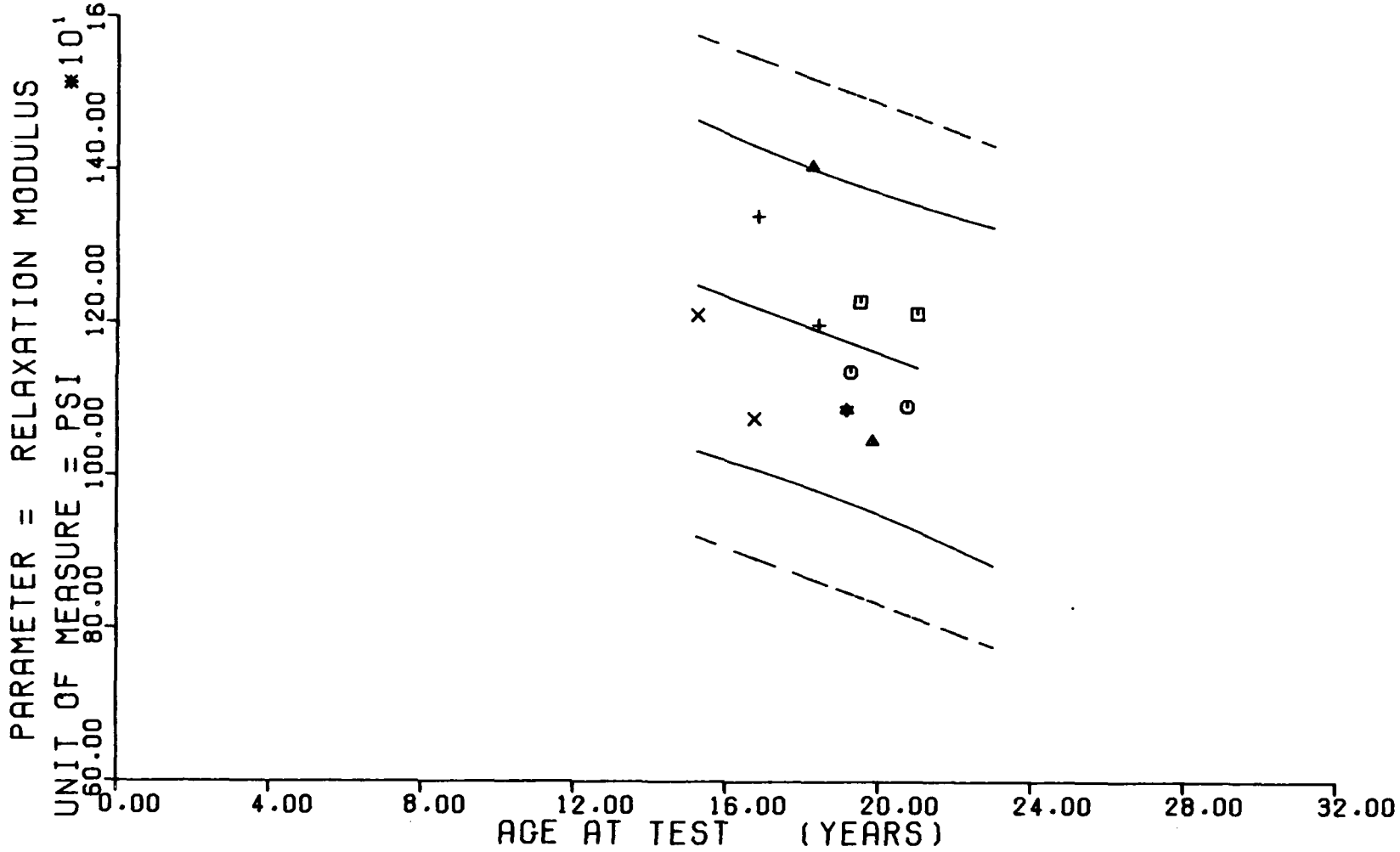
F = +4.5445439E+00 SIGNIFICANCE OF F = SIGNIFICANT σ_Y = +1.1271642E+02

R = -2.7861336E-01 SIGNIFICANCE OF R = SIGNIFICANT S_B = +7.2531251E-01

t = +2.1317935E+00 SIGNIFICANCE OF t = SIGNIFICANT S_E = +1.0925097E+02

N = 56 DEGREES OF FREEDOM = 54

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



STRESS RELAXATION MODULUS AT 50 SEC AND 2% STRAIN, SIX MOTOR VISUAL DISPLAY

Figure 2-2

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
153.0	5	+1.5260000E+03	+2.5592967E+01	+1.5650000E+03	+1.4950000E+03	+1.5841303E+03
201.0	5	+1.3920000E+03	+1.4832396E+01	+1.4100000E+03	+1.3750000E+03	+1.5490808E+03
202.0	5	+1.6940000E+03	+8.6631403E+01	+1.7650000E+03	+1.5550000E+03	+1.5471335E+03
219.0	5	+1.7770000E+03	+7.8549347E+01	+1.8550000E+03	+1.6450000E+03	+1.5140310E+03
221.0	5	+1.5440000E+03	+2.7477263E+01	+1.5850000E+03	+1.5150000E+03	+1.5101367E+03
230.0	5	+1.3720000E+03	+3.8013155E+01	+1.4350000E+03	+1.3400000E+03	+1.4926118E+03
231.0	5	+1.4240000E+03	+1.9170289E+01	+1.4400000E+03	+1.3950000E+03	+1.4906645E+03
234.0	6	+1.5558332E+03	+5.5354915E+01	+1.6550000E+03	+1.5050000E+03	+1.4848229E+03
238.0	5	+1.3100000E+03	+1.7677669E+01	+1.3400000E+03	+1.2950000E+03	+1.4770341E+03
249.0	5	+1.3920000E+03	+3.0331501E+01	+1.4450000E+03	+1.3750000E+03	+1.4556149E+03
252.0	5	+1.5540000E+03	+2.2472205E+01	+1.5850000E+03	+1.5250000E+03	+1.4497734E+03

STRESS RELAXATION MODULUS AT 10 SEC AND 2% STRAIN, SIX MOTOR VISUAL DISPLAY

Y = ((+8.9639254E+01) + (-6.6354797E-02) * X)

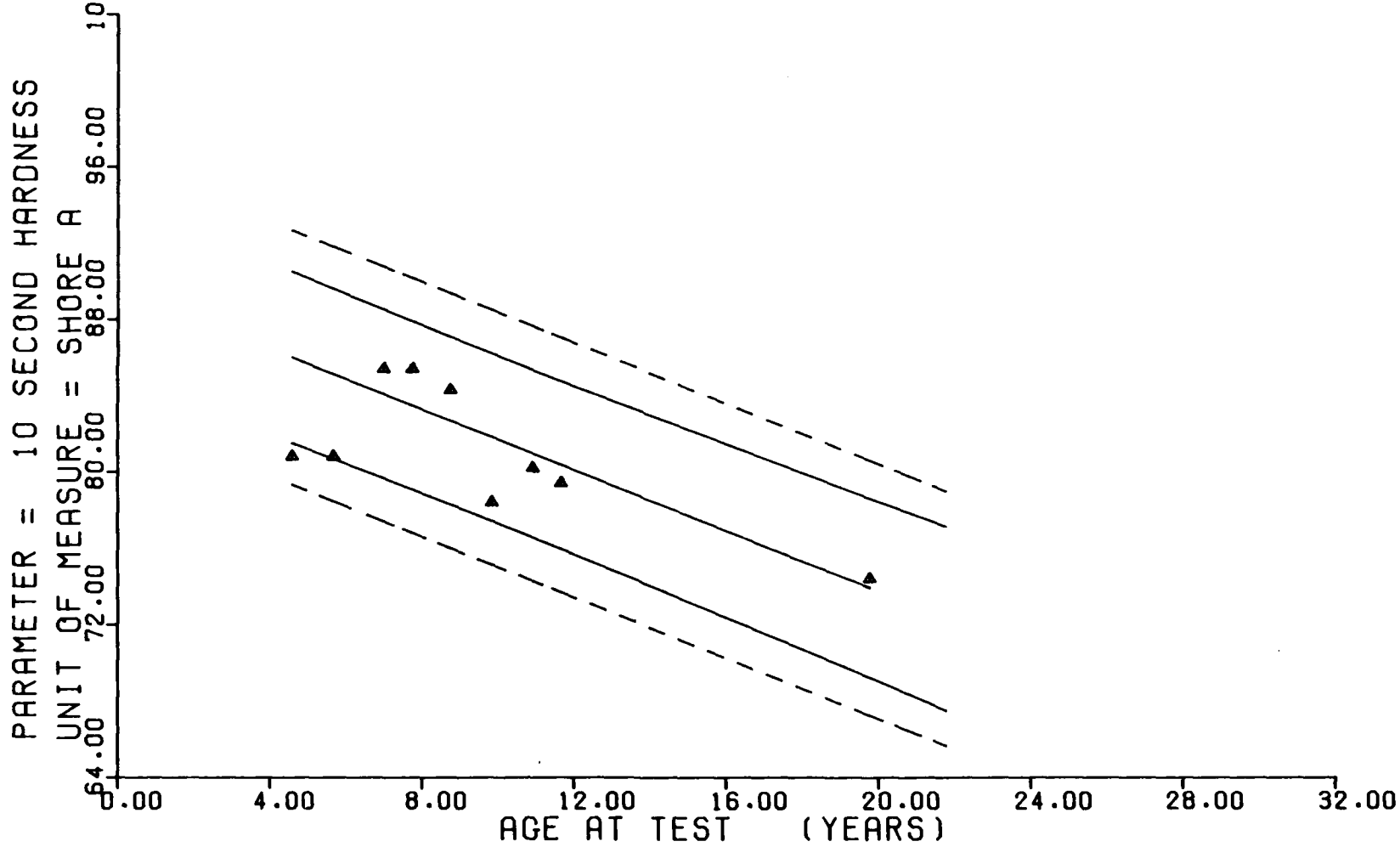
F = +8.0236202E+01 SIGNIFICANCE OF F = SIGNIFICANT σ_Y = +3.8025756E+00

R = -8.1689748E-01 SIGNIFICANCE OF R = SIGNIFICANT S_B = +7.4077641E-03

t = +8.9574662E+00 SIGNIFICANCE OF t = SIGNIFICANT S_E = +2.2205071E+00

N = 42 DEGREES OF FREEDOM = 40

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



MINUTEMAN II, STAGE III, DISSECTED MTR 0032434, HARDNESS SHORE A

Figure 3-4

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
55.0	1	+8.0799987E+01	+0.0000000E+07	+8.0799987E+01	+8.0799987E+01	+8.5989730E+01
68.0	1	+8.0799987E+01	+0.0000000E+07	+8.0799987E+01	+8.0799987E+01	+8.5127120E+01
84.0	5	+8.5399993E+01	+5.4772255E-01	+8.6000000E+01	+8.5000000E+01	+8.4065444E+01
95.0	5	+8.5399993E+01	+5.4772255E-01	+8.6000000E+01	+8.5000000E+01	+8.3468246E+01
105.0	10	+8.4299987E+01	+1.3374935E+00	+8.6000000E+01	+8.3000000E+01	+8.2671997E+01
118.0	5	+7.6399993E+01	+1.1401754E+00	+8.0000000E+01	+7.7000000E+01	+8.1809387E+01
131.0	5	+8.0199996E+01	+1.0954451E+00	+8.1000000E+01	+7.9000000E+01	+8.0946762E+01
140.0	5	+7.6399993E+01	+5.4772255E-01	+8.0000000E+01	+7.9000000E+01	+8.0349578E+01
237.0	5	+7.4399993E+01	+5.4772255E-01	+7.5000000E+01	+7.4000000E+01	+7.3913162E+01

MINUTEMAN II, STAGE III, DISSECTED MTR <0032434>

Y = ((+8.5330991E+01) + (-2.3716416E-02) * X)

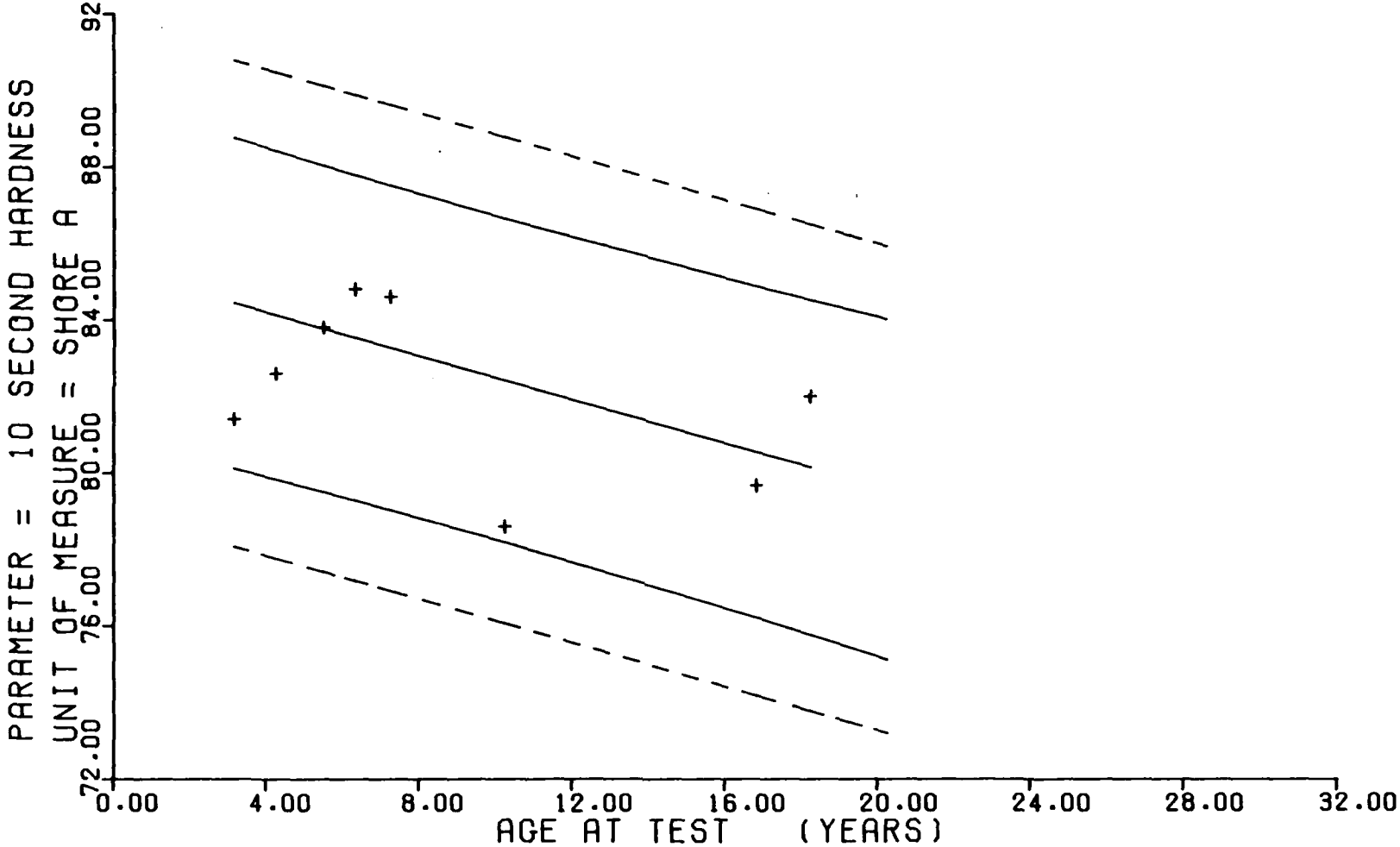
F = +1.7602437E+01 SIGNIFICANCE OF F = SIGNIFICANT σ_Y = +2.5480252E+00

R = -5.7305213E-01 SIGNIFICANCE OF R = SIGNIFICANT S_B = +5.6527876E-03

t = +4.1955258E+00 SIGNIFICANCE OF t = SIGNIFICANT S_E = +2.1169583E+00

N = 38 DEGREES OF FREEDOM = 36

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



MINUTEMAN II, STAGE III, DISSECTED MTR 0032831, HARDNESS SHORE A

Figure 3-5

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
[illegible]	1	+8.1399993E+01	+0.0000000E+07	+8.1399993E+01	+8.1399993E+01	+8.4429763E+01
31.0	1	+8.2599990E+01	+0.0000000E+07	+8.2599990E+01	+8.2599990E+01	+8.4121444E+01
[illegible]	5	+8.3799987E+01	+8.3666002E-01	+8.5000000E+01	+8.3000000E+01	+8.3765701E+01
76.0	10	+8.4799587E+01	+7.6881063E-01	+8.6000000E+01	+8.4000000E+01	+8.3528534E+01
97.0	5	+8.4599990E+01	+5.4772255E-01	+8.5000000E+01	+8.4000000E+01	+8.3267654E+01
125.0	5	+7.3599990E+01	+2.0735441E+00	+8.0000000E+01	+7.5000000E+01	+8.2413864E+01
202.0	6	+7.9666656E+01	+8.1643658E-01	+8.1000000E+01	+7.9000000E+01	+8.0540267E+01
219.0	5	+8.2000000E+01	+0.0000000E+07	+8.2000000E+01	+8.2000000E+01	+8.0137084E+01

MINUTEMAN II, STAGE III, DISSECTED MTR <0032831>

Y = ((+8.3249295E+01) + (-2.2984999E-02) * X)

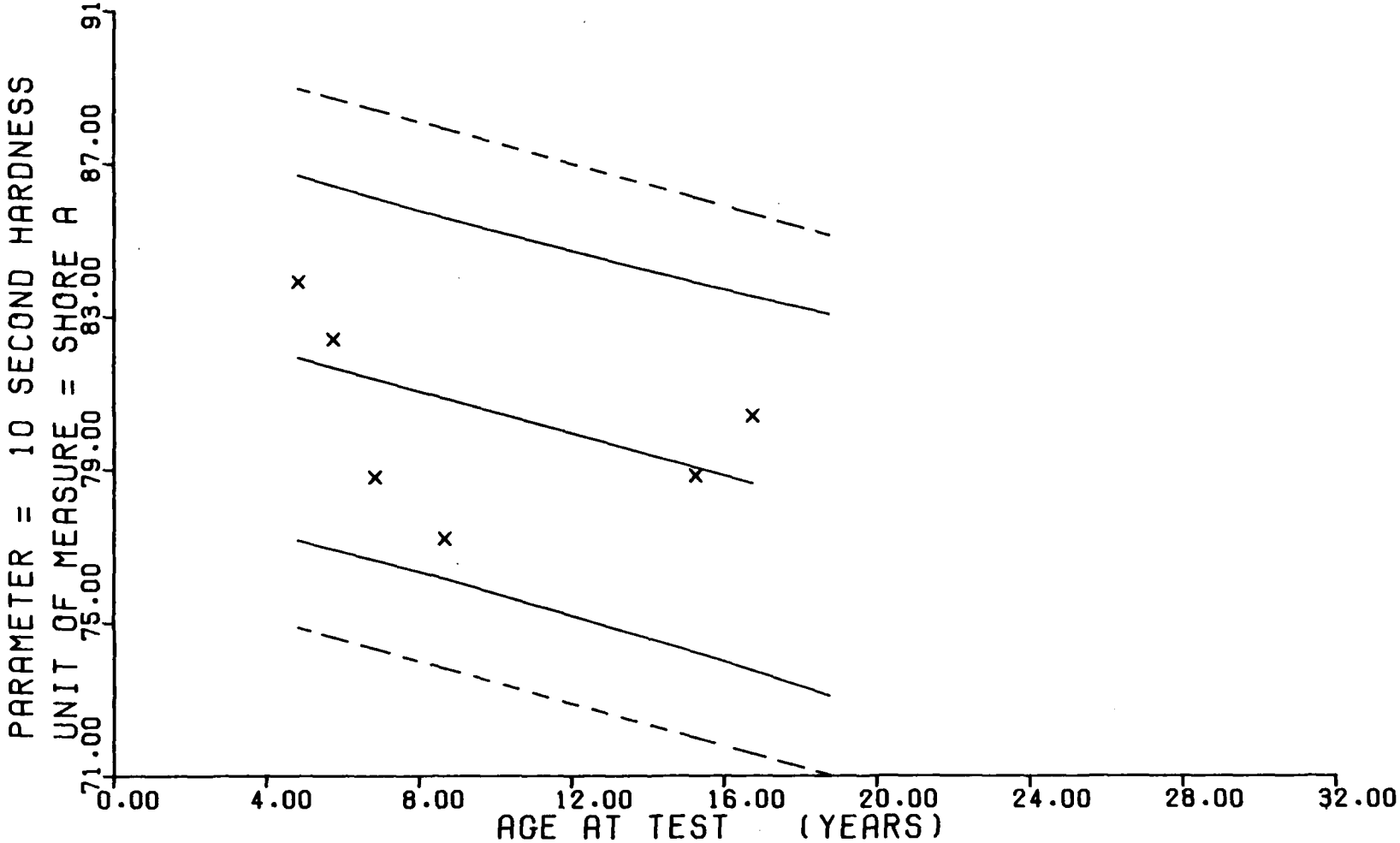
F = +1.0814481E+01 SIGNIFICANCE OF F = SIGNIFICANT σ_Y = +2.6577230E+00

R = -4.9123993E-01 SIGNIFICANCE OF R = SIGNIFICANT S_B = +6.9894282E-03

t = +3.2885378E+00 SIGNIFICANCE OF t = SIGNIFICANT S_E = +2.3487379E+00

N = 36 DEGREES OF FREEDOM = 34

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



MINUTEMAN II, STAGE III, DISSECTED MTR 0033174, HARDNESS SHORE A

Figure 3-6

*** LINEAR REGRESSION ANALYSIS ***

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
[illegible]	10	+8.3829993E+01	+1.1005049E+00	+8.0000000E+01	+3.2000000E+01	+8.1916152E+01
[illegible]	5	+8.2599993E+01	+5.4772255E-01	+8.3000000E+01	+8.2000000E+01	+8.1663330E+01
[illegible]	5	+7.8799987E+01	+4.4721359E-01	+7.9000000E+01	+7.8000000E+01	+8.1364517E+01
104.0	5	+7.7199996E+01	+1.3033404E+00	+7.9000000E+01	+7.6000000E+01	+8.0858840E+01
183.0	6	+7.6833326E+01	+1.1690451E+00	+8.0000000E+01	+7.7000000E+01	+7.9043029E+01
201.0	5	+8.0399993E+01	+3.9442719E-01	+8.1000000E+01	+7.9000000E+01	+7.8629302E+01

MINUTEMAN II, STAGE III, DISSECTED NTR <0033174>

Y = ((+5.4455382E+01) + (-2.0075474E-02) * X)

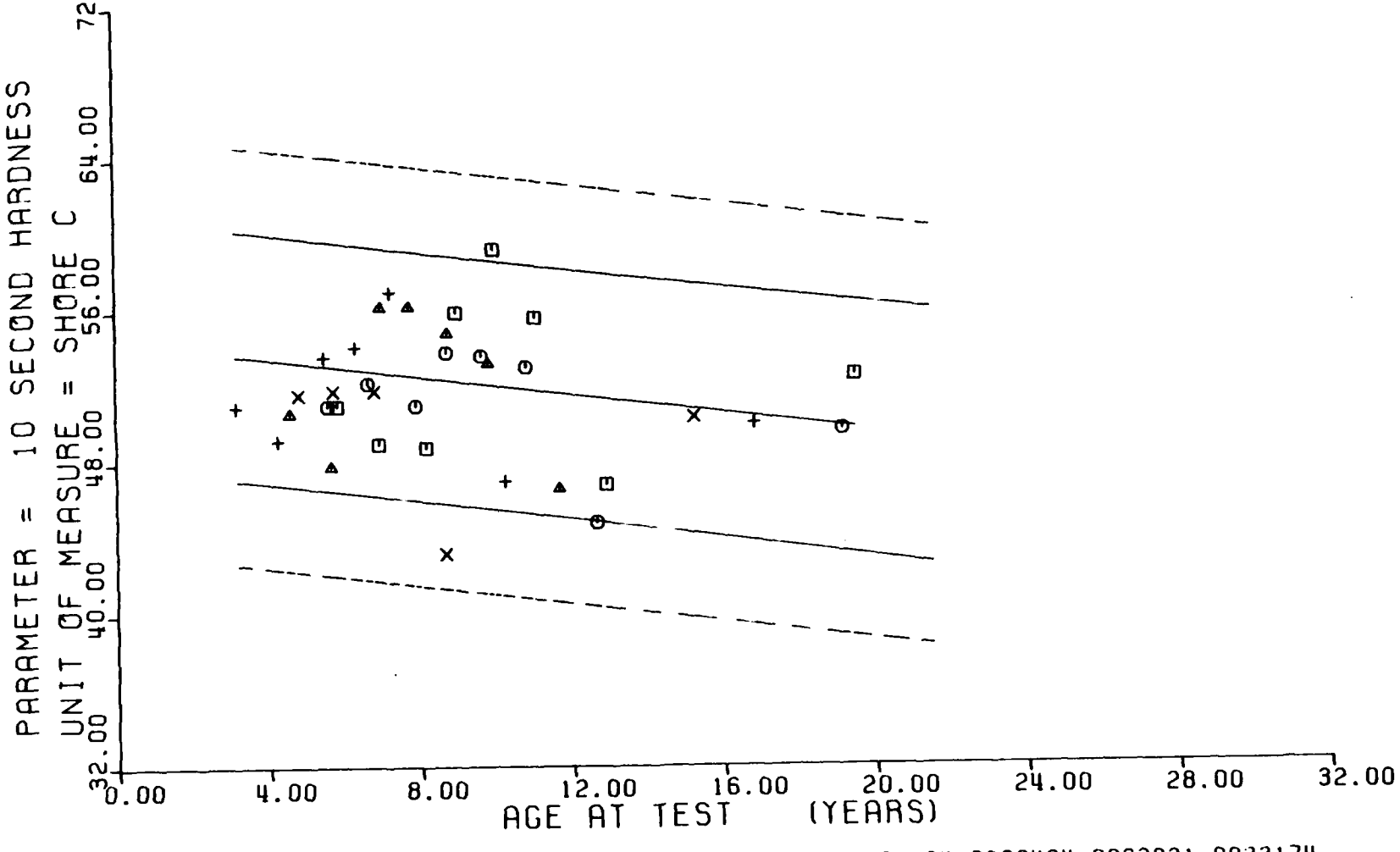
F = +1.1200599E+01 SIGNIFICANCE OF F = SIGNIFICANT σ_r = +3.7779887E+00

R = -2.4862271E-01 SIGNIFICANCE OF R = SIGNIFICANT S_B = +5.9985350E-03

t = +3.3467296E+00 SIGNIFICANCE OF t = SIGNIFICANT S_E = +3.6701084E+00

N = 172 DEGREES OF FREEDOM = 170

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



MINUTEMAN II, STAGE III, DISSECTED MTRS/0031064,0031134,0032434,0032831,0033174

Figure 3-7

*** SAMPLE SIZE SUMMARY ***

AGE (MONTHS)	NR SAMPLES	AGE (MONTHS)	NR SAMPLES
38.0	1	130.0	5
51.0	1	133.0	5
55.0	1	140.0	5
58.0	10	152.0	5
66.0	5	155.0	5
67.0	1	183.0	6
68.0	1	201.0	5
69.0	5	202.0	6
70.0	1	219.0	5
76.0	10	230.0	6
80.0	1	234.0	6
82.0	5	237.0	5
83.0	1	248.0	5
84.0	5	252.0	5
87.0	5		
93.0	5		
95.0	5		
98.0	5		
104.0	5		
105.0	20		
108.0	10		
116.0	5		
118.0	5		
120.0	5		
125.0	5		

MINUTEMAN II, STAGE III, DISSECTED 4TRS/0031064,0031134,0032434,0032831,0033174

Y = ((+5.7709871E+01) + (-3.5401351E-02) * X)

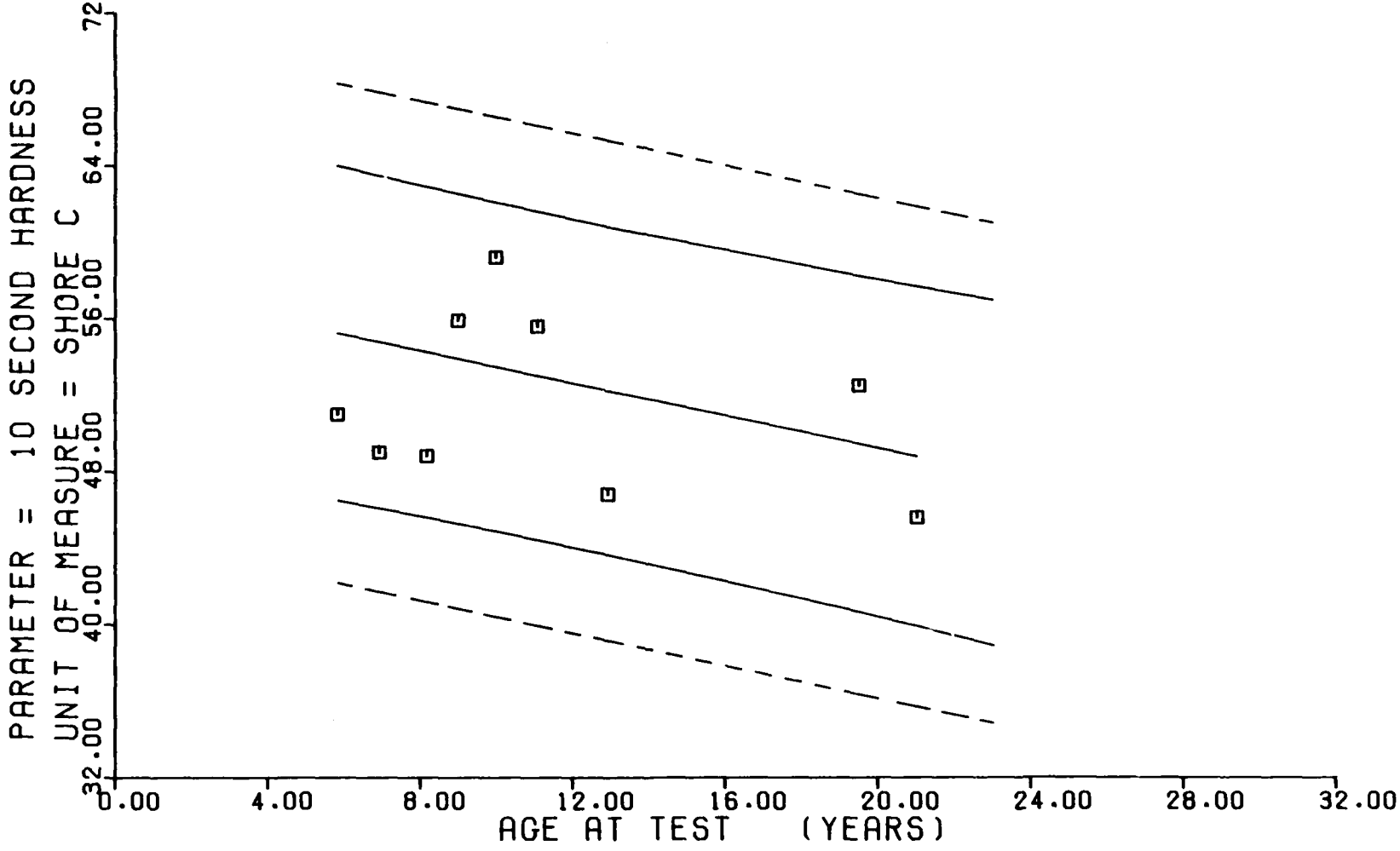
F = +9.4099679E+00 SIGNIFICANCE OF F = SIGNIFICANT σ_Y = +4.7721042E+00

R = -4.3205184E-01 SIGNIFICANCE OF R = SIGNIFICANT S_B = +1.1540530E-02

t = +3.0675671E+00 SIGNIFICANCE OF t = SIGNIFICANT S_E = +4.3558845E+00

N = 43 DEGREES OF FREEDOM = 41

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



MINUTEMAN II, STAGE III, DISSECTED MTR 0031064, 10 sec HARDNESS , SHORE C

Figure 3-8

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
70.0	1	+5.1000000E+01	+0.0000000E+07	+5.1000000E+01	+5.1000000E+01	+5.5231765E+01
[illegible]	1	+4.9000000E+01	+0.0000000E+07	+4.9000000E+01	+4.9000000E+01	+5.4771545E+01
[illegible]	5	+4.8799987E+01	+8.3666002E-01	+5.0000000E+01	+4.8000000E+01	+5.4240524E+01
108.0	10	+5.5899993E+01	+2.2827838E+00	+5.3000000E+01	+5.2000000E+01	+5.3886520E+01
120.0	5	+5.9199996E+01	+8.3666002E-01	+6.0000000E+01	+5.8000000E+01	+5.3461700E+01
133.0	5	+5.5599990E+01	+1.3416407E+00	+5.7000000E+01	+5.4000000E+01	+5.3001480E+01
155.0	5	+4.6799987E+01	+1.4832396E+00	+4.9000000E+01	+4.5000000E+01	+5.2222656E+01
234.0	6	+5.2500000E+01	+1.5165750E+00	+5.4000000E+01	+5.0000000E+01	+4.9425949E+01
252.0	5	+4.5599990E+01	+1.1401754E+00	+4.7000000E+01	+4.4000000E+01	+4.8788726E+01

MINUTEMAN II, STAGE III, DISSECTED MTR <J031064>

Y = ((+5.4456603E+01) + (-2.2354976E-02) * X)

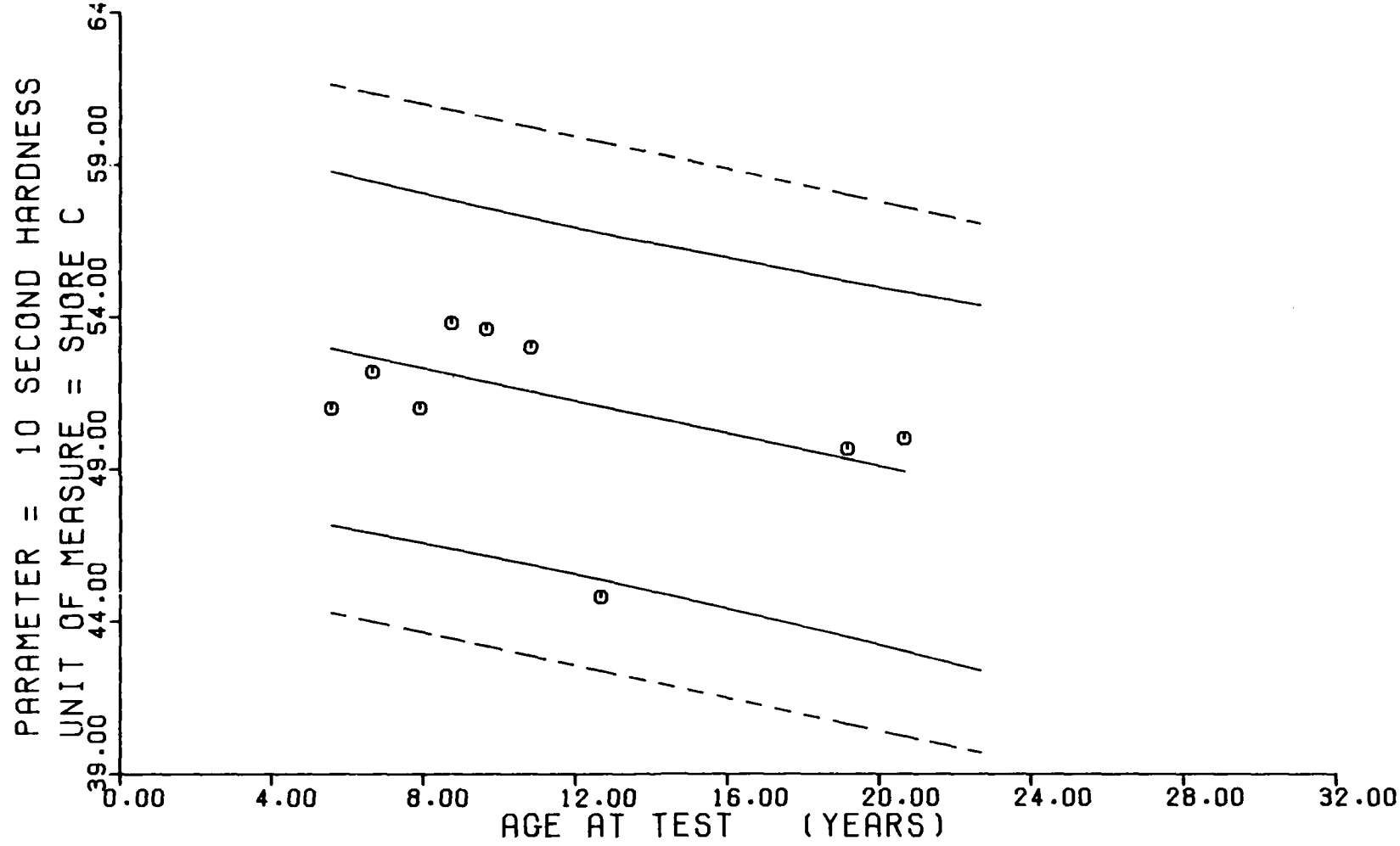
F = +8.4176287E+00 SIGNIFICANCE OF F = SIGNIFICANT σ_Y = +3.1353448E+00

R = -4.1271849E-01 SIGNIFICANCE OF R = SIGNIFICANT S_B = +7.7051186E-03

t = +2.9013149E+00 SIGNIFICANCE OF t = SIGNIFICANT S_E = +2.8904736E+00

N = 43 DEGREES OF FREEDOM = 41

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



MINUTEMAN II, STAGE III, DISSECTED MTR 0031134, 10 sec , HARDNESS, SHORE C

Figure 3-9

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

X (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
67.0	1	+5.1000000E+01	+0.0000000E+07	+5.1000000E+01	+5.1000000E+01	+5.2958816E+01
80.0	1	+5.2199996E+01	+0.0000000E+07	+5.2199996E+01	+5.2199996E+01	+5.2668197E+01
95.0	5	+5.1000000E+01	+7.0710678E-01	+5.2000000E+01	+5.0000000E+01	+5.2332870E+01
105.0	10	+5.3799987E+01	+1.3934117E+00	+5.6000000E+01	+5.2000000E+01	+5.2109329E+01
110.0	5	+5.3599990E+01	+1.5165750E+00	+5.5000000E+01	+5.2000000E+01	+5.1863418E+01
130.0	5	+5.2000000E+01	+1.4142135E+00	+5.5000000E+01	+5.2000000E+01	+5.1650445E+01
132.0	5	+4.7399987E+01	+2.7749873E+00	+4.7000000E+01	+4.0000000E+01	+5.1058639E+01
230.0	6	+4.9666656E+01	+5.1639777E-01	+5.0000000E+01	+4.9000000E+01	+4.9314956E+01
243.0	5	+5.0000000E+01	+1.0000000E+00	+5.1000000E+01	+4.9000000E+01	+4.8912567E+01

MINUTEMAN II, STAGE III, DISSECTED MTR <0031134>

Y = ((+6.4335378E+01) + (-1.0523031E-01) * X)

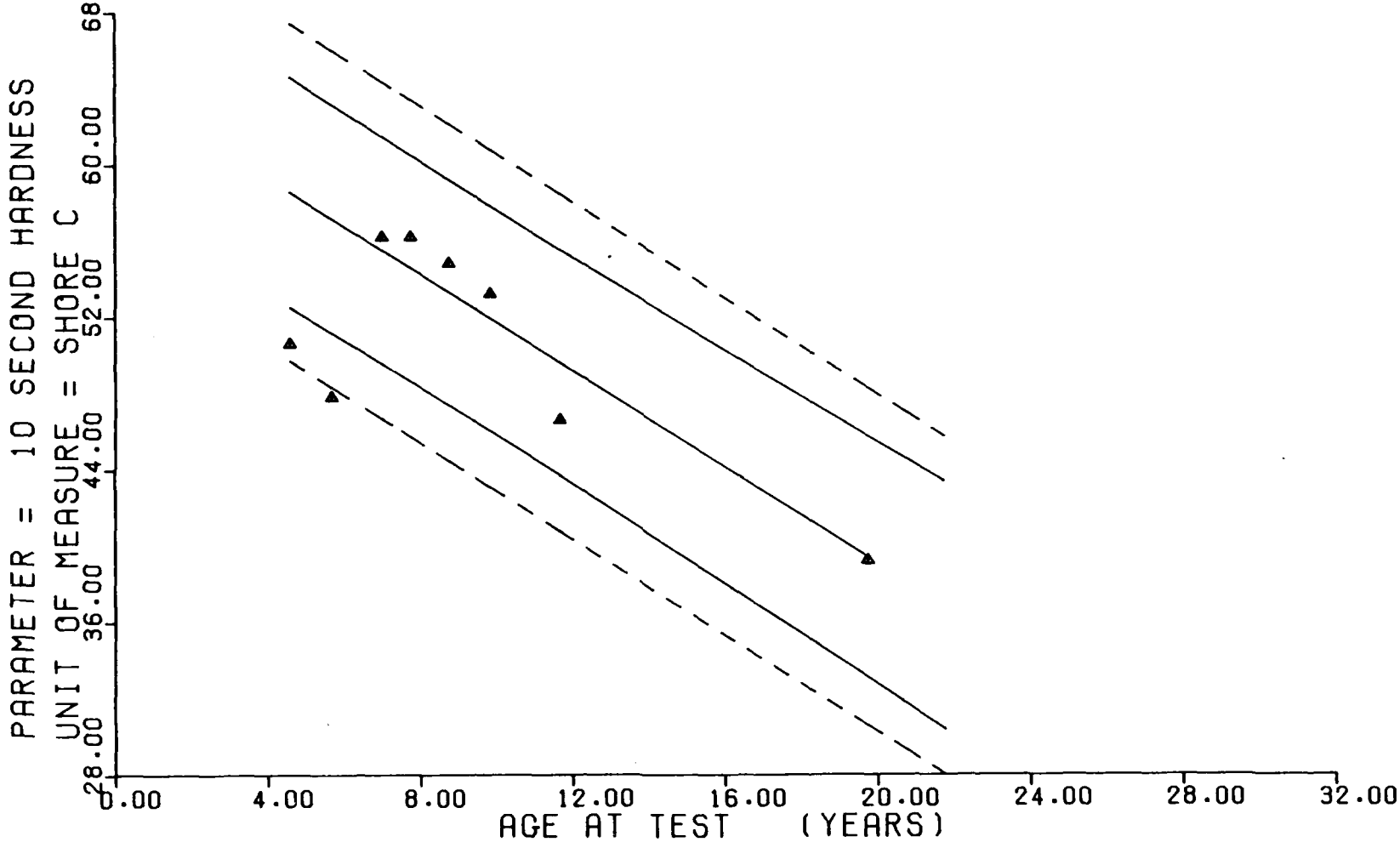
F = +1.1427270E+02 SIGNIFICANCE OF F = SIGNIFICANT σ_Y = +5.9979876E+00

R = -8.7494559E-01 SIGNIFICANCE OF R = SIGNIFICANT S_B = +9.8439548E-03

t = +1.0689841E+01 SIGNIFICANCE OF t = SIGNIFICANT S_E = +2.9455515E+00

N = 37 DEGREES OF FREEDOM = 35

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



MINUTEMAN II, STAGE III, DISSECTED MTR 0032434, 10 sec HARDNESS , SHORE C

Figure 3-10

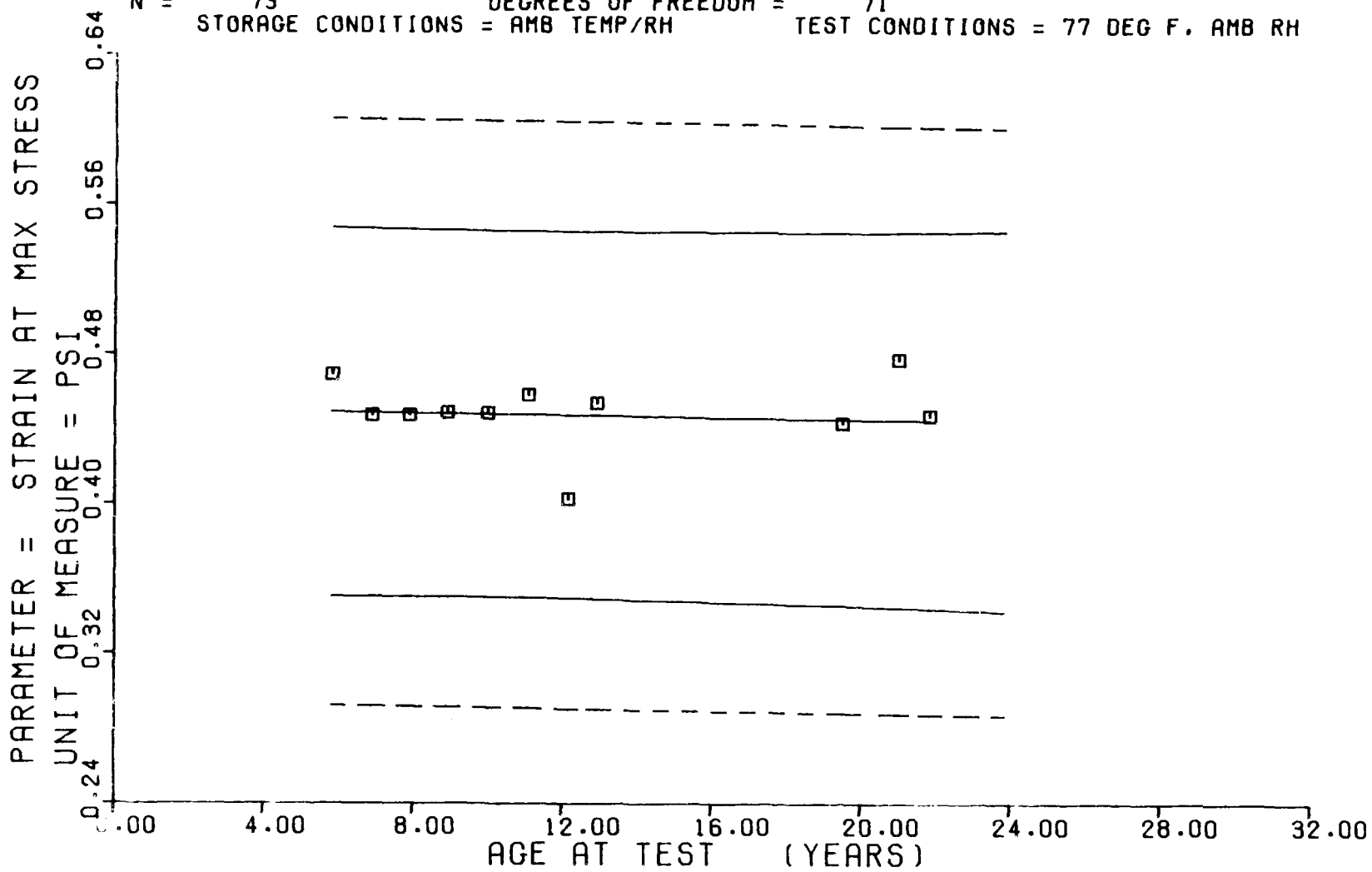
**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SAMPLES PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
[illegible]	1	+5.0599990E+01	+0.0000000E+07	+5.0599990E+01	+5.0599990E+01	+5.8547698E+01
[illegible]	1	+4.7799987E+01	+0.0000000E+07	+4.7799987E+01	+4.7799987E+01	+5.7179702E+01
[illegible]	5	+5.6199996E+01	+1.4632396E+00	+5.6000000E+01	+5.4000000E+01	+5.5498017E+01
[illegible]	5	+5.6199996E+01	+1.3954451E+00	+5.6000000E+01	+5.5000000E+01	+5.4542950E+01
100.0	10	+5.4799987E+01	+1.6173277E+00	+5.8000000E+01	+5.3000000E+01	+5.3286193E+01
110.0	5	+5.3199996E+01	+1.3333404E+00	+5.5000000E+01	+5.2000000E+01	+5.1918197E+01
140.0	5	+4.6599990E+01	+1.1401754E+00	+4.8000000E+01	+4.5000000E+01	+4.9603134E+01
157.0	5	+3.9199996E+01	+1.0431676E+00	+4.2000000E+01	+3.8000000E+01	+3.9395782E+01

MINUTEMAN II, STAGE III, DISSECTED MTR <0032434>

F = +6.2445213E-02 SIGNIFICANCE OF F = NOT SIGNIFICANT σ_Y = +5.1910318E-02
R = -2.9643501E-02 SIGNIFICANCE OF R = NOT SIGNIFICANT S_B = +9.7014115E-05
t = +2.4989040E-01 SIGNIFICANCE OF t = NOT SIGNIFICANT S_E = +5.2251633E-02
N = 73 DEGREES OF FREEDOM = 71
STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



UNIAXIAL TENSILE, STRAIN AT MAX, 2.0 IN/MIN AT 77 DEG F, MOTOR=0031064.

Figure 4-7

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
70.0	10	+4.2519995E+02	+1.0726913E+01	+4.4500000E+02	+4.1200000E+02	+4.5247583E+02
83.0	10	+4.0100000E+02	+5.6754621E+00	+4.1000000E+02	+3.9000000E+02	+4.4789990E+02
95.0	10	+4.6500000E+02	+6.2360956E+00	+4.8000000E+02	+4.6000000E+02	+4.4367553E+02
107.0	10	+4.3079980E+02	+1.3554826E+01	+4.5300000E+02	+4.1300000E+02	+4.3945141E+02
120.0	5	+3.8395971E+02	+7.2799715E+00	+3.9459985E+02	+3.7539990E+02	+4.3487524E+02
133.0	3	+5.1666650E+02	+1.9731531E+01	+5.3000000E+02	+4.9400000E+02	+4.3029931E+02
146.0	8	+5.5602978E+02	+2.6587161E+02	+1.2130998E+03	+4.4400000E+02	+4.2572314E+02
155.0	2	+4.1587475E+02	+3.1991114E+00	+4.1811987E+02	+4.1362988E+02	+4.2255493E+02
234.0	6	+4.0242651E+02	+6.8941651E+00	+4.1176977E+02	+3.9221997E+02	+3.9474609E+02
252.0	4	+2.8990234E+02	+2.8445475E+00	+2.9300976E+02	+2.8615991E+02	+3.8840991E+02
262.0	5	+3.7076171E+02	+8.3824962E+00	+3.8378979E+02	+3.6450976E+02	+3.8488964E+02

UNIAXIAL TENSILE, MAXIMUM STRESS, 2.0 IN/MIN AT 77 DEG F, MOTOR=0031064.

Y = ((+4.7711687E+02) + (-3.5201169E-01) * X)

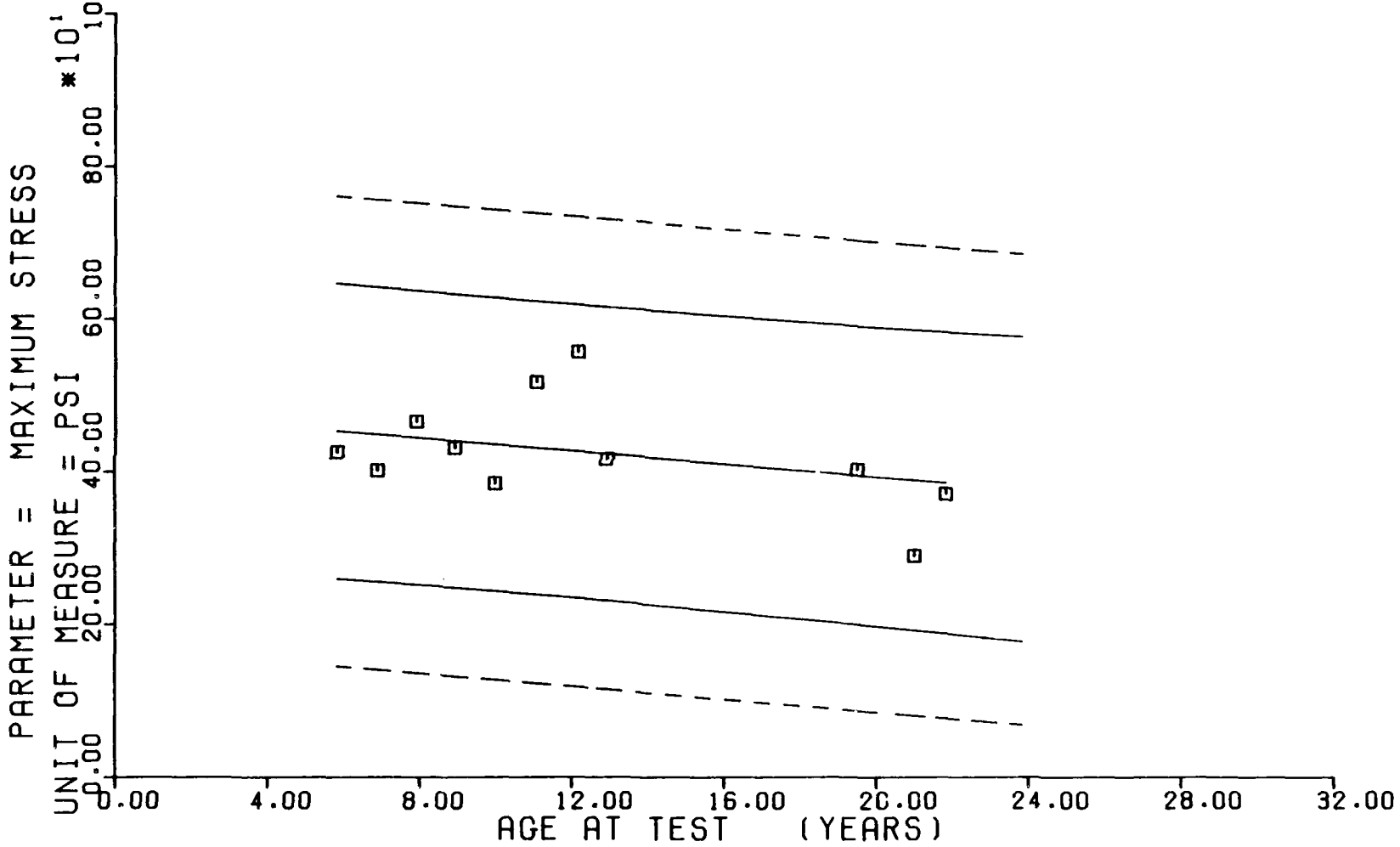
F = +3.4217615E+00 SIGNIFICANCE OF F = NOT SIGNIFICANT σ_Y = +1.0420315E+02

R = -2.1442474E-01 SIGNIFICANCE OF R = NOT SIGNIFICANT S_B = +1.9029712E-01

t = +1.8498004E+00 SIGNIFICANCE OF t = NOT SIGNIFICANT S_E = +1.0249369E+02

N = 73 DEGREES OF FREEDOM = 71

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



UNIAXIAL TENSILE, MAXIMUM STRESS, 2.0 IN/MIN AT 77 DEG F, MOTOR=0031064.

Figure 4-6

Y = ((+1.7355000E+03) + (+7.0385281E-02) * X)

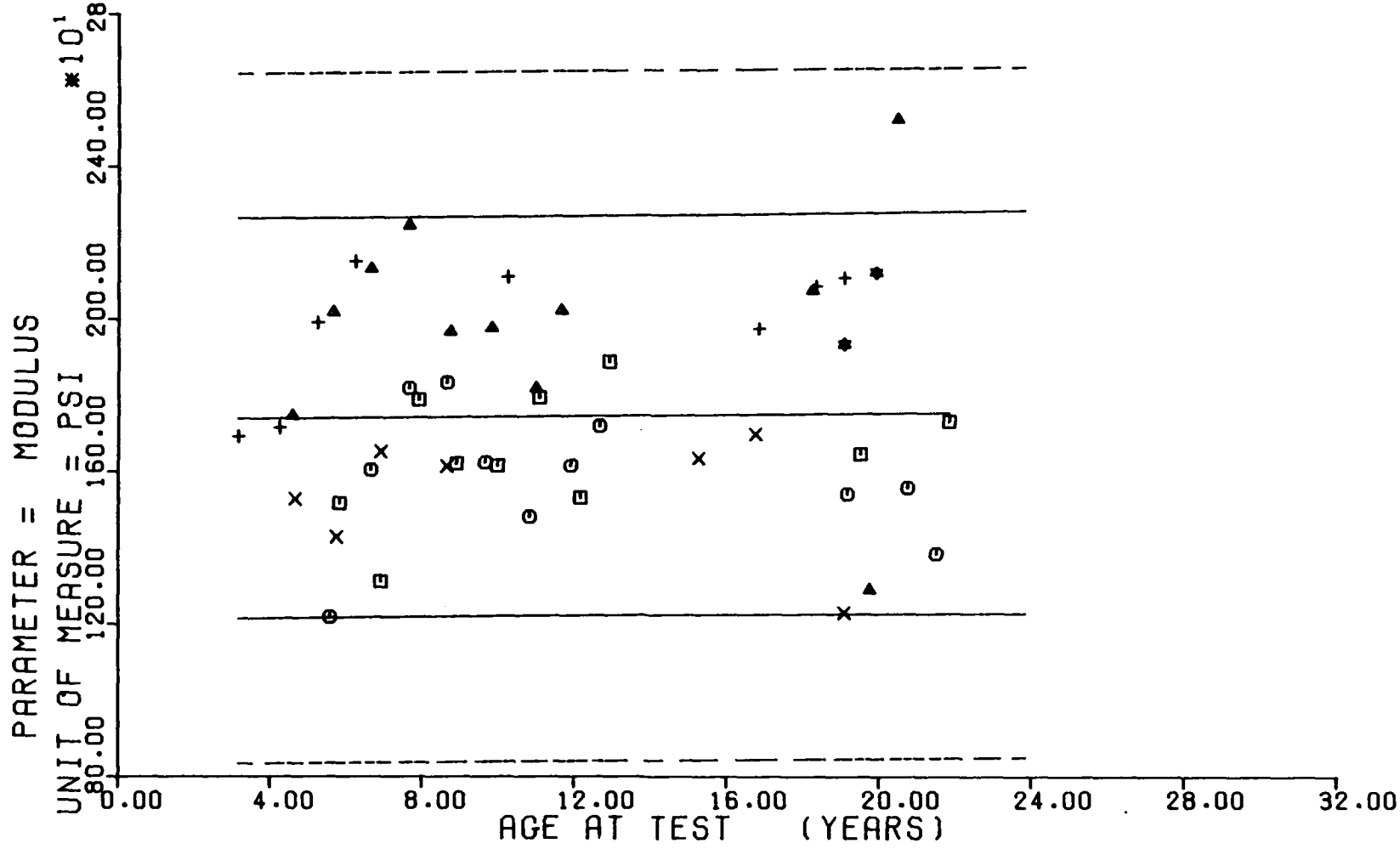
F = +8.2685131E-02 SIGNIFICANCE OF F = NOT SIGNIFICANT σ_Y = +3.0120423E+02

R = +1.5948387E-02 SIGNIFICANCE OF R = NOT SIGNIFICANT S_B = +2.4477560E-01

t = +2.8755022E-01 SIGNIFICANCE OF t = NOT SIGNIFICANT S_E = +3.0162890E+02

N = 327 DEGREES OF FREEDOM = 325

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



UNIAXIAL TENSILE, MODULUS, 2.0 IN/MIN AT 77 DEG F, SIX MOTOR DISPLAY

Figure 4-5

Y = ((+4.0312417E+02) + (-2.5460750E-01) * X)

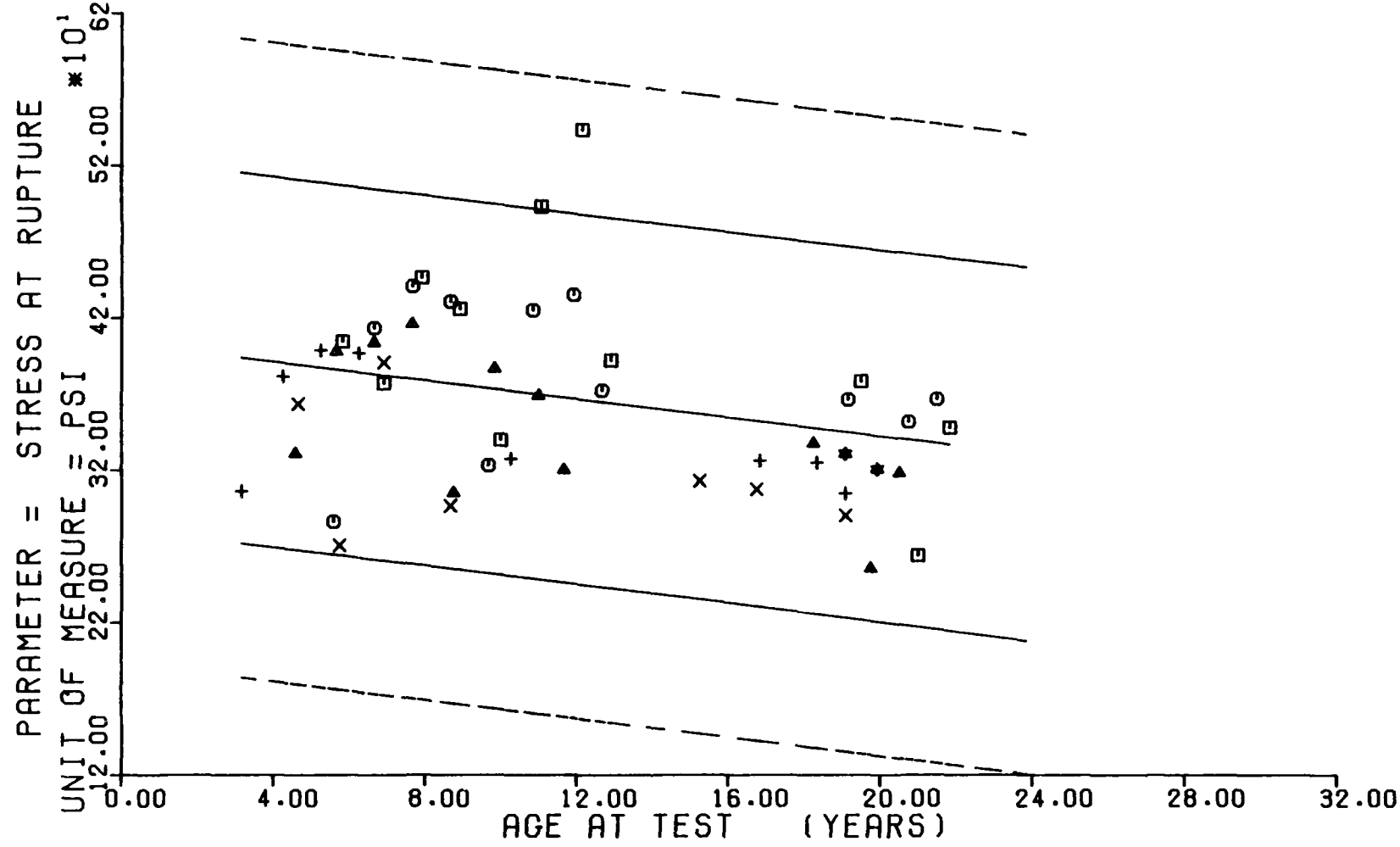
F = +2.0179775E+01 SIGNIFICANCE OF F = SIGNIFICANT σ_Y = +7.1867365E+01

R = -2.4178842E-01 SIGNIFICANCE OF R = SIGNIFICANT S_B = +5.6677806E-02

t = +4.4921905E+00 SIGNIFICANCE OF t = SIGNIFICANT S_E = +6.9842190E+01

N = 327 DEGREES OF FREEDOM = 325

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



UNIAXIAL TENSILE, STRESS AT RUP, 2.0 IN/MIN AT 77 DEG F, SIX MOTOR DISPLAY

Figure 4-4

Y = ((+4.7608374E-01) + (+1.0554419E-05) * X)

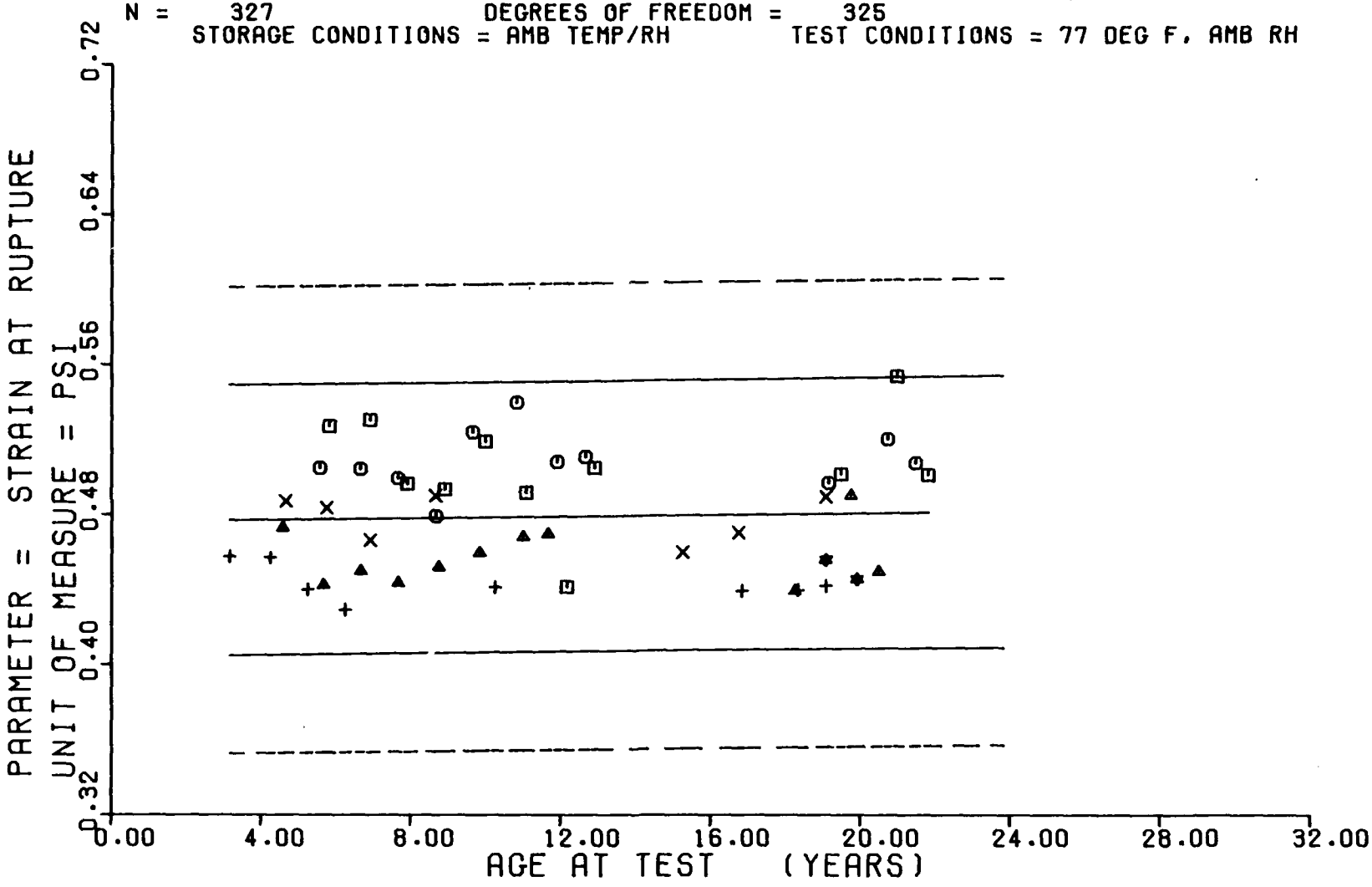
F = +3.3777246E-01 SIGNIFICANCE OF F = NOT SIGNIFICANT σ_Y = +4.1418663E-02

R = +3.2221434E-02 SIGNIFICANCE OF R = NOT SIGNIFICANT S_B = +3.3645951E-05

t = +5.8118195E-01 SIGNIFICANCE OF t = NOT SIGNIFICANT S_E = +4.1460795E-02

N = 327 DEGREES OF FREEDOM = 325

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



UNIAXIAL TENSILE, STRAIN AT RUP, 2.0 IN/MIN AT 77 DEG F, SIX MOTOR DISPLAY

Figure 4-3

Y = ((+4.0905708E-01) + (+2.9110279E-05) * X)

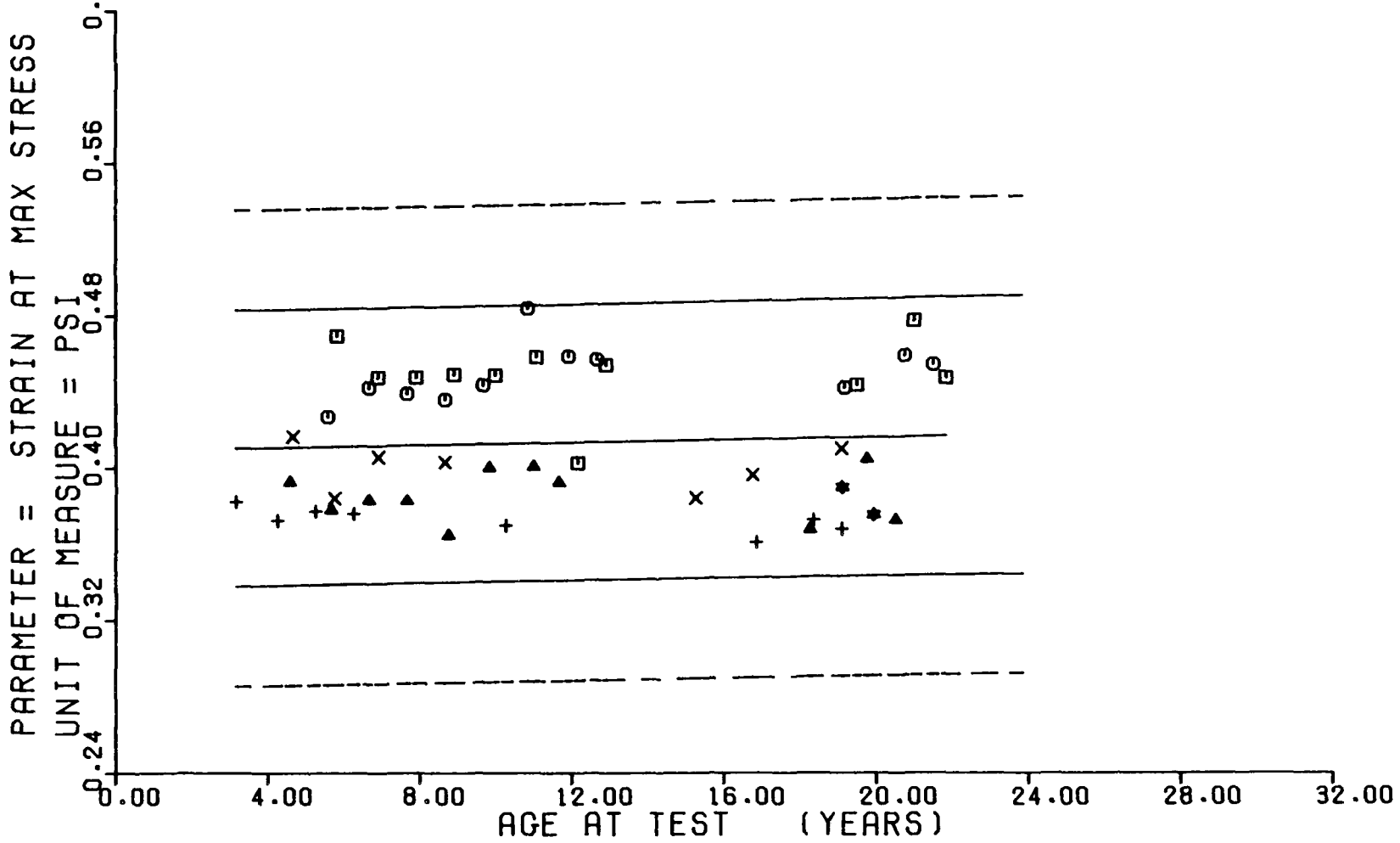
F = +7.4214385E-01 SIGNIFICANCE OF F = NOT SIGNIFICANT σ_Y = +4.1623185E-02

R = +4.7731718E-02 SIGNIFICANCE OF R = NOT SIGNIFICANT S_B = +3.3791099E-05

t = +8.6147771E-01 SIGNIFICANCE OF t = NOT SIGNIFICANT S_E = +4.1639656E-02

N = 327 DEGREES OF FREEDOM = 325

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



UNIAXIAL TENSILE, STRAIN AT MAX, 2.0 IN/MIN AT 77 DEG F, SIX MOTOR DISPLAY

Figure 4-2

Y = ((+4.2375278E+02) + (-2.1027210E-01) * X)

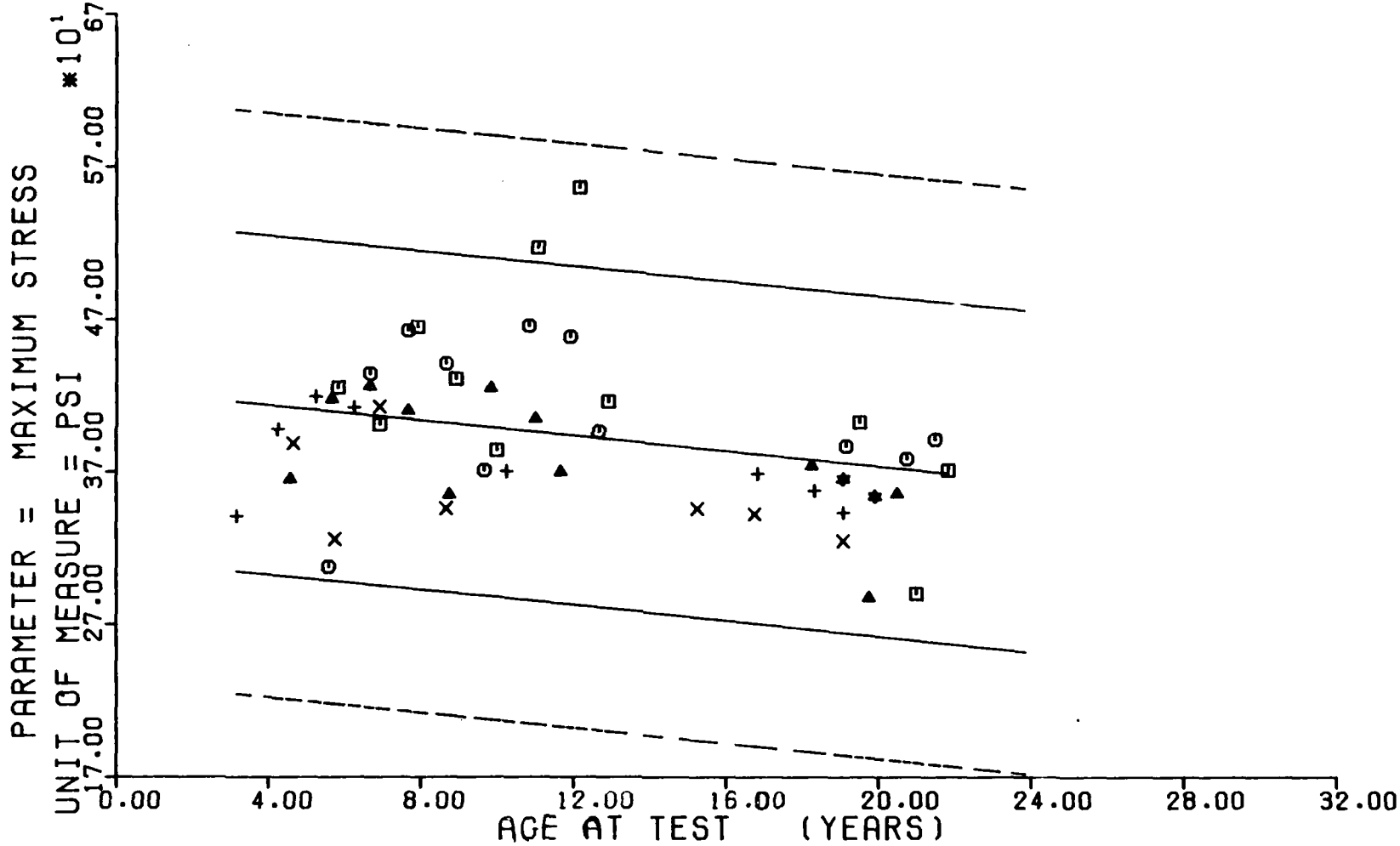
F = +1.6491886E+01 SIGNIFICANCE OF F = SIGNIFICANT σ_Y = +6.5302937E+01

R = -2.1975814E-01 SIGNIFICANCE OF R = SIGNIFICANT S_B = +5.1778146E-02

t = +4.0610203E+00 SIGNIFICANCE OF t = SIGNIFICANT S_E = +6.3804501E+01

N = 327 DEGREES OF FREEDOM = 325

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



UNIAXIAL TENSILE, MAXIMUM STRESS, 2.0 IN/MIN AT 77 DEG F, SIX MOTOR DISPLAY

Figure 4-1

from the test program's inception should be available for regressions.

C. A change in testing rails under pressure was made in GTD-30, REV 2, April 1981. This required rails to be tested at 200 in/min under 300 psi pressure. These data are shown as a visual display in figures 4-61 thru 4-65. Strains show a significant increase and there appears to be a significant decrease in modulus.

SECTION IV

TENSILE TESTING

A. Uniaxial JANNAF dogbones were tested at 77°F and 2.0 in/min. The data are show in three sets of figures. Figures 4-1 thru 4-5 represent the visual display of data from six motors. The next set of figures represent averages of data on the individual motors and a third set represent individual data points for each test period.

Figures 4-1 and 4-5 show a significant decrease in maximum stress and stress at rupture. These figures depict a visual display of six motors.

Figures 4-6 thru 4-15 represent motor S/N 0031064. The average values show a non-significant trend in any parameter. The maximum stress shows a significant decrease when individual specimen values are used.

Figures 4-16 thru 4-25 represent motor S/N 0031134. The strain at maximum stress shows a significant increase (figures 4-17 and 4-22).

Figures 4-26 thru 4-35 represent motor S/N 0032434. The maximum stress and stress at rupture show a significant decrease. The modulus for individual points also shows a significant decrease (figure 4-35).

Figures 4-36 thru 4-45 represent motor S/N 0032831. Only strain at rupture (figure 4-38) shows a non-significant trend. With one less time point, the individual data plots show a significant decrease in strain at maximum stress, stress at rupture (figures 4-42 and 4-44) and a significant increase in modulus (figure 4-45).

Figures 4-46 thru 4-55 represent motor S/N 0033174. Only strain at rupture and modulus shows a non-significant trend (figures 4-48 and 4-50).

B. Biaxial rails at low rate, 0.2 in/min, are shown in figures 4-56 thru 4-60. Strains show a significant increase. This data represents the data from the last three test periods. In the next report, data acquired

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
[illegible].0	10	+5.1599990E+01	+1.0749676E+00	+5.3000000E+01	+5.0000000E+01	+5.0732162E+01
[illegible].0	5	+5.1799987E+01	+8.3653062E-01	+5.3000000E+01	+5.1000000E+01	+5.0518295E+01
[illegible].0	5	+5.1799987E+01	+4.4721359E-01	+5.2000000E+01	+5.1000000E+01	+5.0265533E+01
104.0	5	+4.5199990E+01	+1.3038404E+00	+4.5000000E+01	+4.2000000E+01	+4.9837783E+01
153.0	5	+5.0333328E+01	+8.1649658E-01	+5.2000000E+01	+5.0000000E+01	+4.8301803E+01
201.0	5	+4.7599990E+01	+5.4772255E-01	+4.8000000E+01	+4.7000000E+01	+4.7951843E+01

MINUTEMAN II, STAGE III, DISSECTED MTR <0033174>

Y = ((+5.1859849E+01) + (-1.9442790E-02) * X)

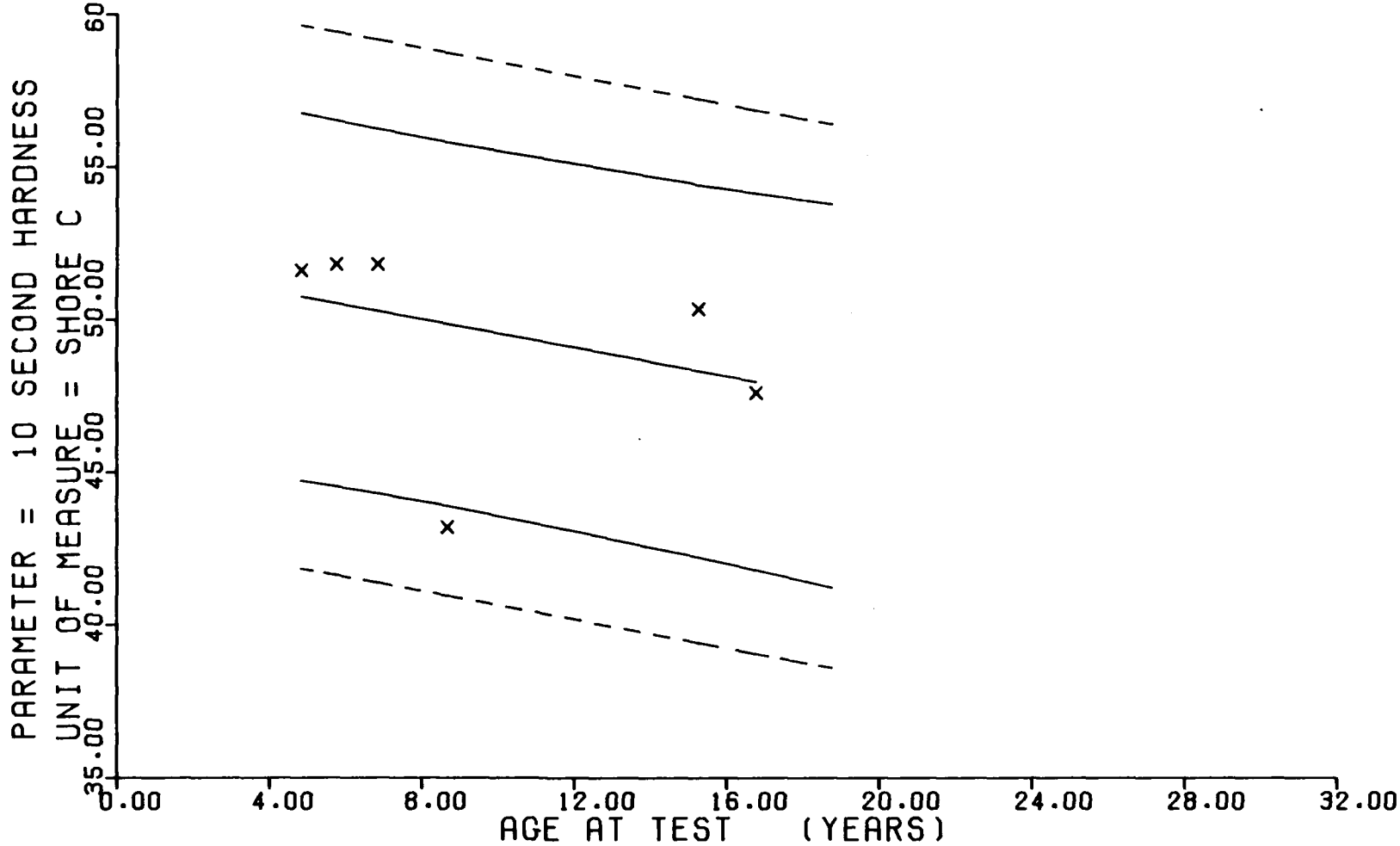
F = +4.8616919E+00 SIGNIFICANCE OF F = SIGNIFICANT σ_Y = +3.1223719E+00

R = -3.5369821E-01 SIGNIFICANCE OF R = SIGNIFICANT S_B = +8.8178942E-03

t = +2.2049244E+00 SIGNIFICANCE OF t = SIGNIFICANT S_E = +2.9631784E+00

N = 36 DEGREES OF FREEDOM = 34

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



MINUTEMAN II, STAGE III, DISSECTED MTR 0033174, 10 sec HARDNESS , SHORE C

Figure 3-12

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
30.0	1	+5.1000000E+01	+0.0000000E+07	+5.1000000E+01	+5.1000000E+01	+5.3905181E+01
51.0	1	+4.9199996E+01	+0.0000000E+07	+4.9199996E+01	+4.9199996E+01	+5.3677307E+01
60.0	5	+5.3599990E+01	+3.9442719E-01	+5.5000000E+01	+5.3000000E+01	+5.3414382E+01
75.0	10	+5.4099990E+01	+1.2806839E+00	+5.6000000E+01	+5.2000000E+01	+5.3239105E+01
87.0	5	+5.7000000E+01	+1.0000000E+00	+5.8000000E+01	+5.6000000E+01	+5.3046205E+01
123.0	5	+4.7000000E+01	+1.0000000E+00	+4.8000000E+01	+4.6000000E+01	+5.2415283E+01
204.0	5	+5.0000000E+01	+0.0000000E+07	+5.0000000E+01	+5.0000000E+01	+5.1030563E+01
217.0	5	+5.0000000E+01	+1.8703280E+00	+5.5000000E+01	+5.0000000E+01	+5.0732574E+01

MINUTEMAN II, STAGE III, DISSECTED MTR <0032831>

Y = ((+5.4571257E+01) + (-1.7528167E-02) * X)

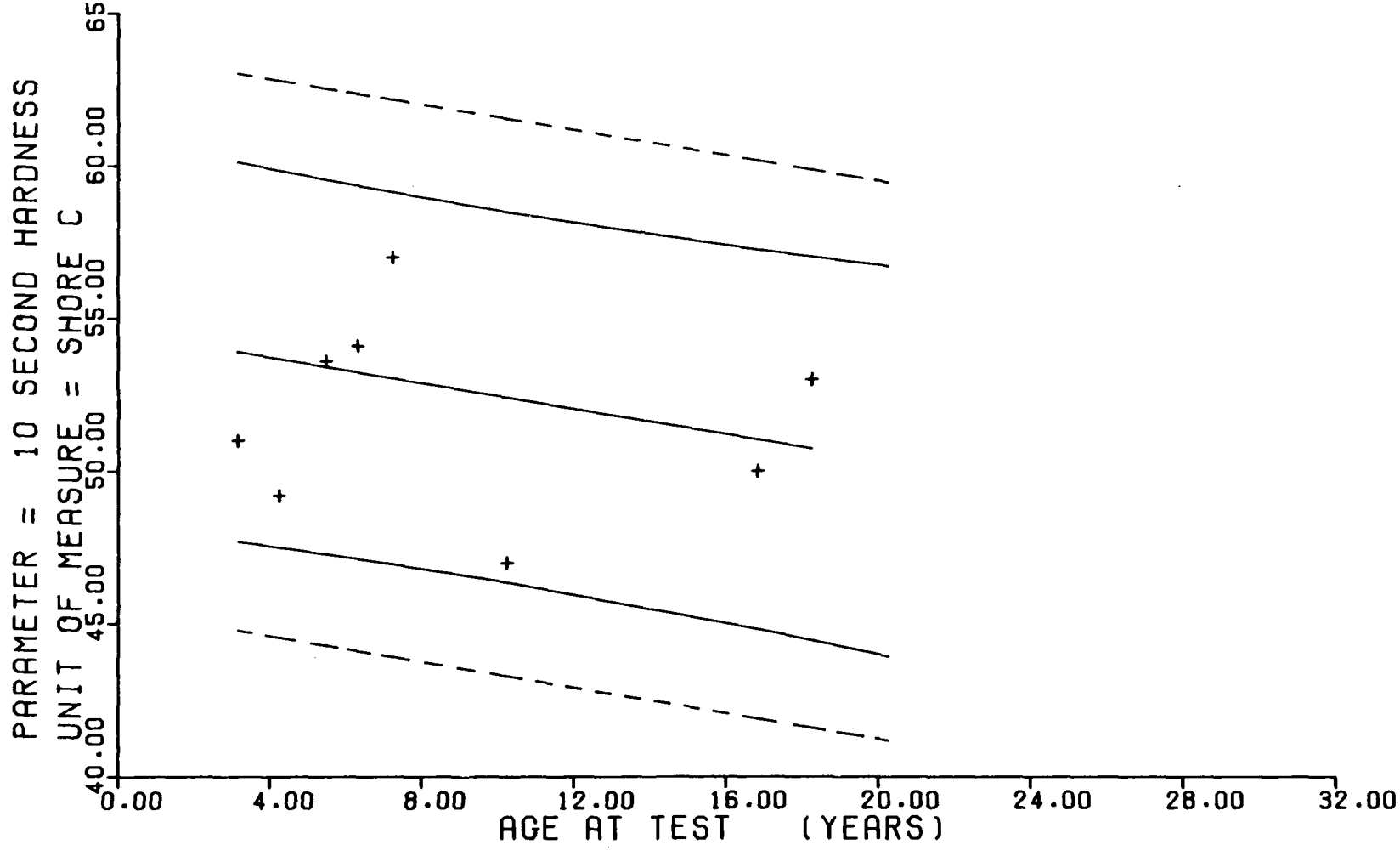
F = +4.6578642E+00 SIGNIFICANCE OF F = SIGNIFICANT σ_Y = +3.1883366E+00

R = -3.3847074E-01 SIGNIFICANCE OF R = SIGNIFICANT S_B = +8.1216283E-03

t = +2.1582085E+00 SIGNIFICANCE OF t = SIGNIFICANT S_E = +3.0415345E+00

N = 38 DEGREES OF FREEDOM = 36

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = AMB TEMP/RH



MINUTEMAN II, STAGE III, DISSECTED MTR 0032831 , 10 sec HARDNESS , SHORE C

Figure 3-11

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
70.0	10	+4.6909952E-01	+6.6136148E-03	+4.7999995E-01	+4.5799994E-01	+4.4910496E-01
83.0	10	+4.4739967E-01	+6.6640446E-03	+4.6199995E-01	+4.3999999E-01	+4.4878977E-01
95.0	10	+4.4729971E-01	+9.3880207E-03	+4.6199995E-01	+4.2999994E-01	+4.4849884E-01
107.0	10	+4.4879966E-01	+9.0731777E-03	+4.6399998E-01	+4.2999994E-01	+4.4820797E-01
120.0	5	+4.4839972E-01	+5.7021084E-03	+4.5399999E-01	+4.3999999E-01	+4.4789278E-01
133.0	3	+4.5799982E-01	+8.0091578E-03	+4.6599996E-01	+4.4999998E-01	+4.4757765E-01
146.0	8	+4.0242469E-01	+1.5406605E-01	+4.6899998E-01	+2.1999999E-02	+4.4726246E-01
155.0	2	+4.5369994E-01	+1.8371599E-03	+4.5499998E-01	+4.5239996E-01	+4.4704431E-01
234.0	6	+4.4319963E-01	+5.5927591E-03	+4.5079994E-01	+4.3829995E-01	+4.4512909E-01
252.0	4	+4.7712469E-01	+2.2210520E-03	+4.7869998E-01	+4.7399997E-01	+4.4469273E-01
262.0	5	+4.4713973E-01	+5.8580023E-03	+4.5469999E-01	+4.4019997E-01	+4.4445031E-01

UNIAXIAL TENSILE, STRAIN AT MAX, 2.0 IN/MIN AT 77 DEG F, MOTOR=0031064.

Y = ((+5.0854254E-01) + (-3.1562812E-05) ■ X)

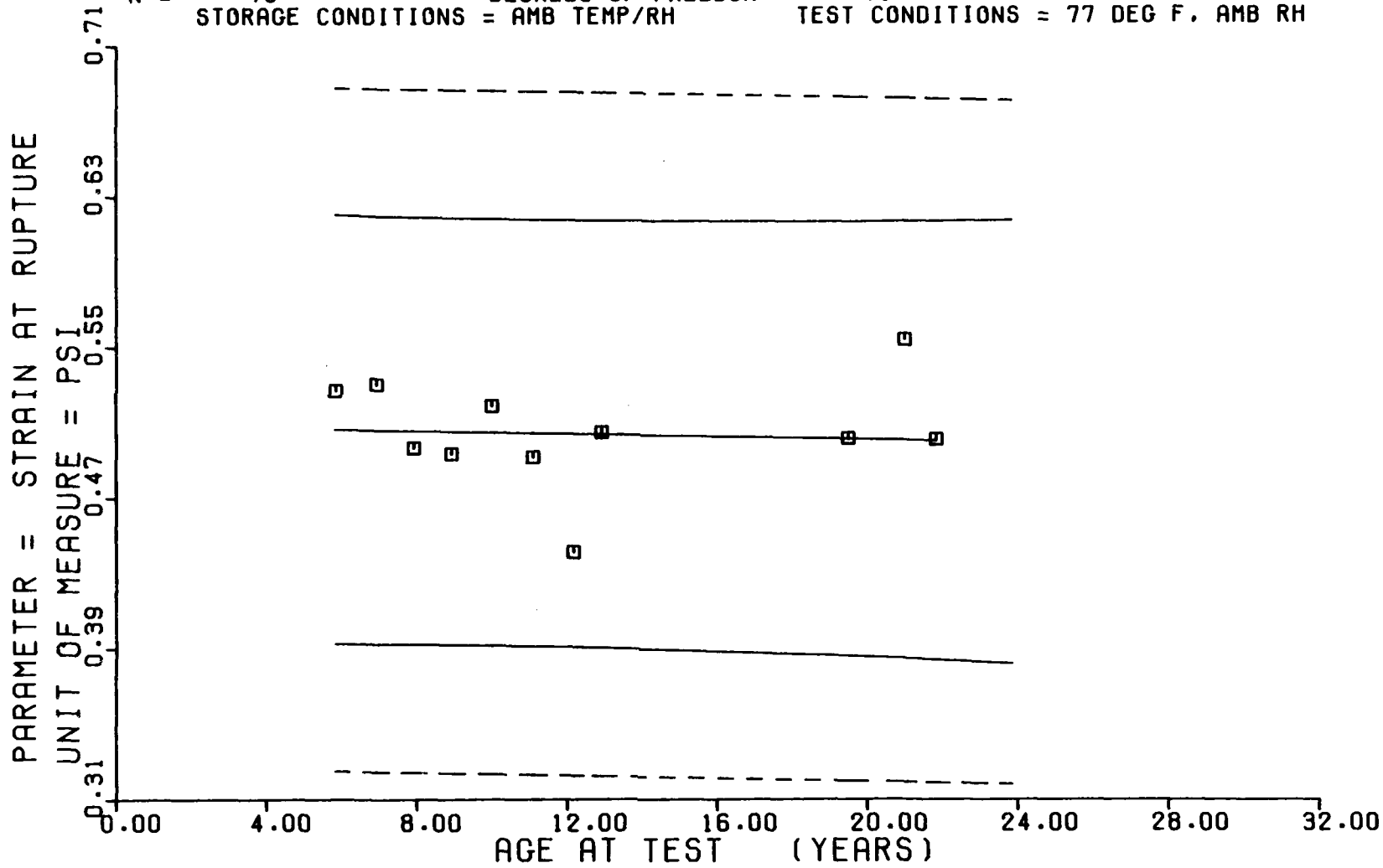
F = +7.9124522E-02 SIGNIFICANCE OF F = NOT SIGNIFICANT σ_Y = +6.0046801E-02

R = -3.3364491E-02 SIGNIFICANCE OF R = NOT SIGNIFICANT S_B = +1.1220705E-04

t = +2.8129081E-01 SIGNIFICANCE OF t = NOT SIGNIFICANT S_E = +6.0434522E-02

N = 73 DEGREES OF FREEDOM = 71

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



UNIAXIAL TENSILE, STRAIN AT RUP, 2.0 IN/MIN AT 77 DEG F, MOTOR=0031064.

Figure 4-8

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
70.0	10	+5.2699953E-01	+8.2680051E-03	+5.3899997E-01	+5.1699995E-01	+5.0633311E-01
83.0	10	+5.3039968E-01	+7.8170340E-03	+5.4199999E-01	+5.1599997E-01	+5.0592279E-01
95.0	10	+4.9649953E-01	+1.7798327E-02	+5.1999998E-01	+4.5999997E-01	+5.0554406E-01
107.0	10	+4.9349951E-01	+8.0655454E-03	+5.1099997E-01	+4.7999995E-01	+5.0516527E-01
120.0	5	+5.1899963E-01	+1.4716522E-02	+5.3999996E-01	+5.0099998E-01	+5.0475496E-01
133.0	3	+4.9166643E-01	+1.4648017E-02	+5.0499999E-01	+4.7599995E-01	+5.0434464E-01
146.0	8	+4.4144952E-01	+1.6671396E-01	+5.2499997E-01	+3.0999999E-02	+5.0393432E-01
155.0	2	+5.0489997E-01	+8.2045966E-03	+5.1069998E-01	+4.9909996E-01	+5.0365030E-01
234.0	6	+5.0159960E-01	+1.2672013E-02	+5.2109998E-01	+4.8769998E-01	+5.0115680E-01
252.0	4	+5.5374956E-01	+7.0328638E-03	+5.6199997E-01	+5.4519999E-01	+5.0058871E-01
262.0	5	+5.0117945E-01	+1.8494879E-02	+5.2499997E-01	+4.8459994E-01	+5.0027304E-01

UNIAXIAL TENSILE, STRAIN AT RUP, 2.0 IN/MIN AT 77 DEG F, MOTOR=0031064.

Y = ((+4.5973759E+02) + (-3.7641649E-01) * X)

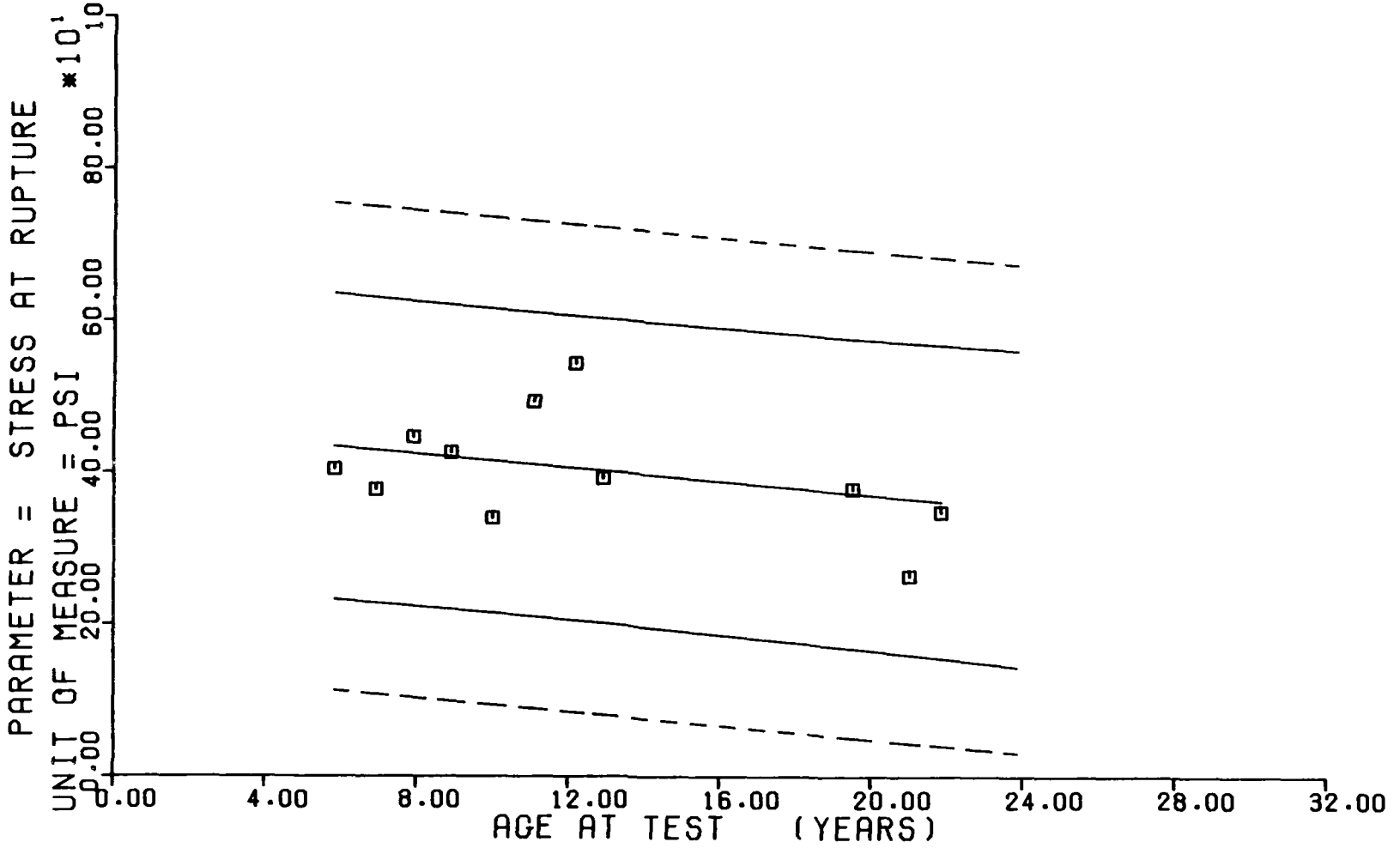
F = +3.6011305E+00 SIGNIFICANCE OF F = NOT SIGNIFICANT σ_Y = +1.0874783E+02

R = -2.1970843E-01 SIGNIFICANCE OF R = NOT SIGNIFICANT S_B = +1.9835776E-01

t = +1.8976645E+00 SIGNIFICANCE OF t = NOT SIGNIFICANT S_E = +1.0683514E+02

N = 73 DEGREES OF FREEDOM = 71

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



UNIAXIAL TENSILE, STRESS AT RUP, 2.0 IN/MIN AT 77 DEG F, MOTOR=0031064.

Figure 4-9

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
70.0	10	+4.0419995E+02	+1.0443498E+01	+4.1700000E+02	+3.9200000E+02	+4.3138042E+02
80.0	10	+3.7689990E+02	+1.2323870E+01	+3.9200000E+02	+3.5000000E+02	+4.2849487E+02
95.0	10	+4.4600000E+02	+9.6609178E+00	+4.6000000E+02	+4.3000000E+02	+4.2397802E+02
107.0	10	+4.2559985E+02	+2.5325437E+01	+4.9000000E+02	+4.0300000E+02	+4.1946093E+02
120.0	5	+3.9659991E+02	+1.1853823E+01	+5.5200000E+02	+3.2000000E+02	+4.1456738E+02
133.0	3	+4.9266650E+02	+1.7925772E+01	+5.0400000E+02	+4.7200000E+02	+4.0967407E+02
146.0	8	+5.4293457E+02	+2.7117295E+02	+1.2130000E+03	+4.2862988E+02	+4.0478076E+02
155.0	2	+3.9172973E+02	+5.7117053E+00	+3.9575976E+02	+3.8769995E+02	+4.0139232E+02
234.0	6	+3.7807812E+02	+1.0121482E+01	+3.9221997E+02	+3.6432935E+02	+3.7165600E+02
[illegible]	4	+2.6370483E+02	+4.3171507E+00	+2.6795994E+02	+2.5911987E+02	+3.6488061E+02
262.0	5	+3.4732565E+02	+1.4013345E+01	+3.6450976E+02	+3.2989990E+02	+3.6111645E+02

UNIAXIAL TENSILE, STRESS AT ROP, 2.0 IN/MIN AT 77 DEG F, MUTOR=0031064.

Y = ((+1.5790956E+03) + (-6.9748583E-02) * X)

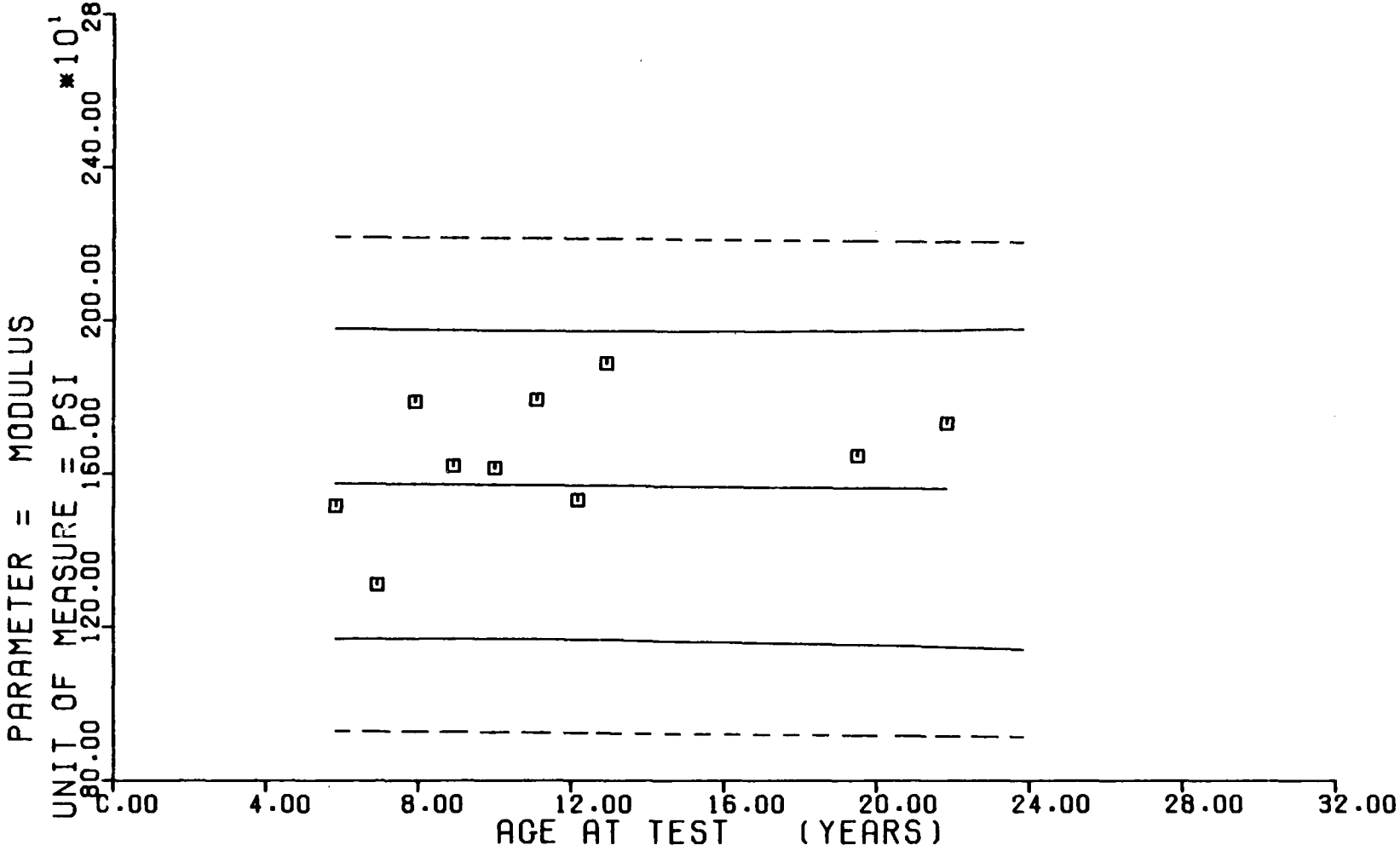
F = +3.0571794E-02 SIGNIFICANCE OF F = NOT SIGNIFICANT σ_Y = +2.1340091E+02

R = -2.0746164E-02 SIGNIFICANCE OF R = NOT SIGNIFICANT S_B = +3.9891000E-01

t = +1.7484791E-01 SIGNIFICANCE OF t = NOT SIGNIFICANT S_E = +2.1485223E+02

N = 73 DEGREES OF FREEDOM = 71

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



UNIAXIAL TENSILE, MODULUS, 2.0 IN/MIN AT 77 DEG F, MOTOR=0031064.

Figure 4-10

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

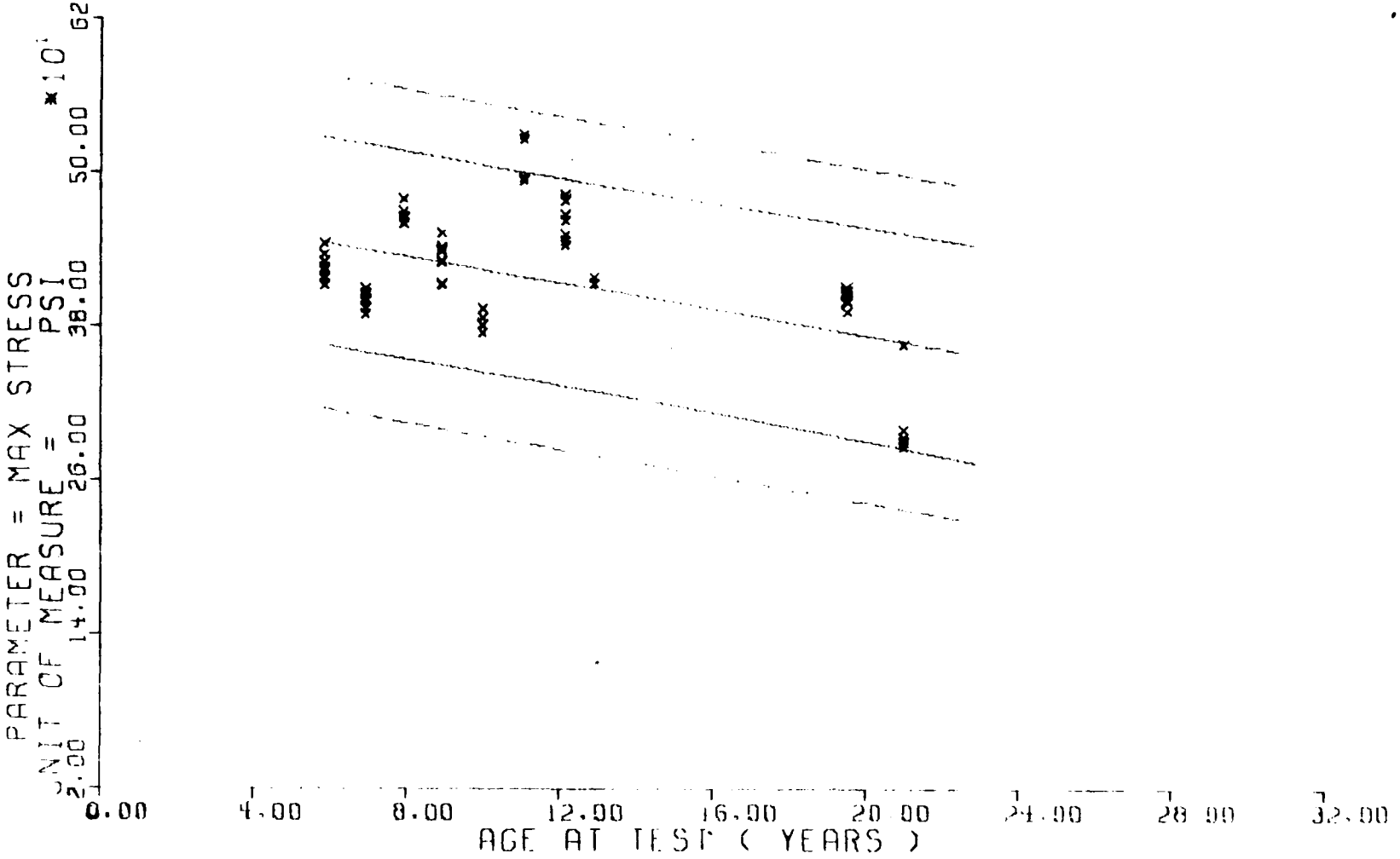
AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
70.0	10	+1.5165000E+03	+6.0491964E+01	+1.6050000E+03	+1.4140000E+03	+1.5742131E+03
83.0	10	+1.3110000E+03	+3.3476359E+01	+1.3900000E+03	+1.2700000E+03	+1.5733063E+03
95.0	10	+1.7880000E+03	+7.2541176E+01	+1.8800000E+03	+1.6800000E+03	+1.5724694E+03
107.0	10	+1.6205000E+03	+8.4929709E+01	+1.7300000E+03	+1.4500000E+03	+1.5716323E+03
120.0	5	+1.6143999E+03	+5.8624227E+01	+1.6720000E+03	+1.5200000E+03	+1.5707255E+03
135.0	3	+1.7933332E+03	+9.8657657E+01	+1.8600000E+03	+1.6800000E+03	+1.5698188E+03
146.0	8	+1.5312500E+03	+1.6699508E+02	+1.6840000E+03	+1.1760000E+03	+1.5689121E+03
155.0	2	+1.8875000E+03	+1.9445436E+02	+2.0250000E+03	+1.7500000E+03	+1.5682844E+03
234.0	6	+1.6463332E+03	+5.9948867E+01	+1.7510000E+03	+1.5740000E+03	+1.5627744E+03
252.0	4	+1.0552500E+03	+3.1573987E+01	+1.0900000E+03	+1.0280000E+03	+1.5615187E+03
262.0	5	+1.7315998E+03	+9.7022162E+01	+1.8890000E+03	+1.6560000E+03	+1.5608212E+03

UNIAXIAL TENSILE, MODULUS, 2.0 IN/MIN AT 77 DEG F, MOTOR=0031064.

Y = (476.341430) + (-0.431264) * X

F = 23.106483	SIGNIFICANCE OF F	SIGNIFICANT	σ_Y = 49.762252
R = -0.503608	SIGNIFICANCE OF R	SIGNIFICANT	S_B = 0.089717
C = 4.806919	SIGNIFICANCE OF C	SIGNIFICANT	S_E = 43.306182
N = 70	DEGREES OF FREEDOM = 68		

STORAGE COND = AMB TEMP/RH TEST COND = 77 DEG F MOTOR #0031064



STAGE III. MAX STRESS. LOW RATE TENSILE TEST. CHS 2.0

Figure 4-11

Y = (0.450438) + (0.000023) * X

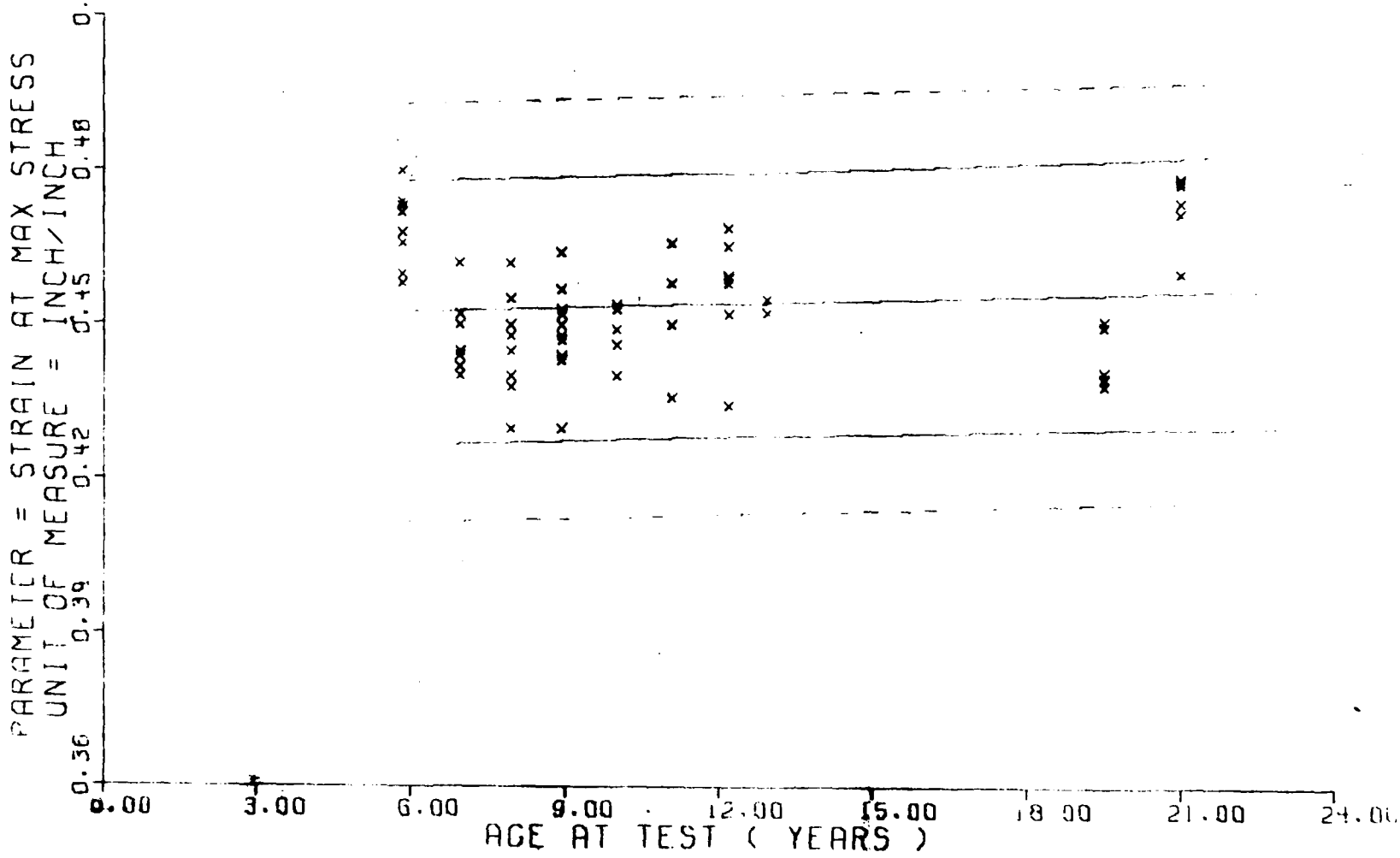
F = 0.576815 SIGNIFICANCE OF F - NOT SIGNIFICANT σ_Y = 0.013532

R = 0.098558 SIGNIFICANCE OF R - NOT SIGNIFICANT S_b = 0.000029

L = 0.822687 SIGNIFICANCE OF L - NOT SIGNIFICANT S_E = 0.013563

N = 71 DEGREES OF FREEDOM= 69

STORAGE COND AMB TEMP/RH TEST COND 77 DEG F MOTOR = [illegible]



STAGE III. STRAIN AT MAX STRESS. LOW RATE TENSILE TEST. CHS=2.0

Figure 4-12

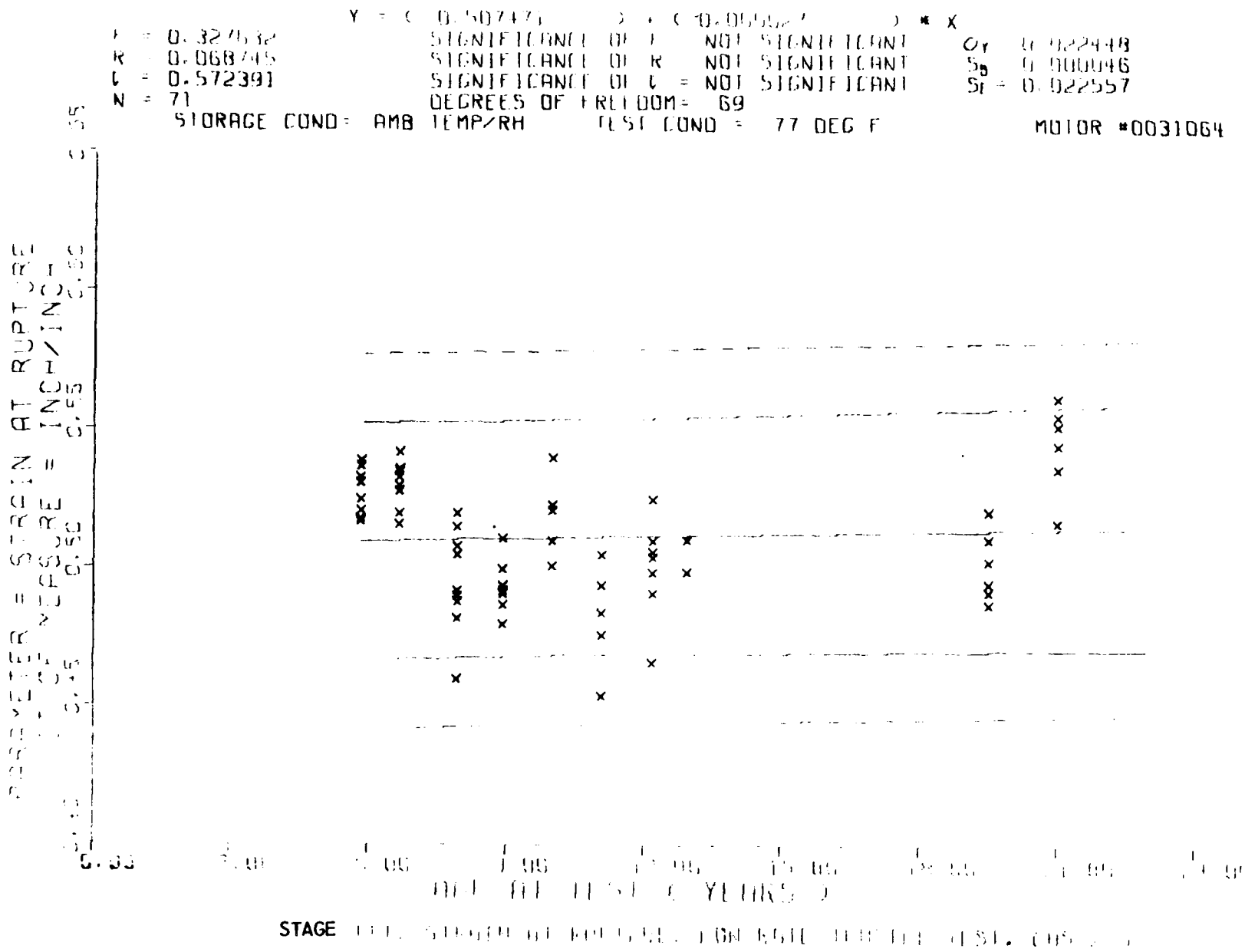

Y = (0.507471) + (0.065527) * X
F = 0.327632
R = 0.068745
C = 0.572391
N = 71
SIGNIFICANCE OF F NOT SIGNIFICANT
SIGNIFICANCE OF R NOT SIGNIFICANT
SIGNIFICANCE OF C = NOT SIGNIFICANT
DEGREES OF FREEDOM= 69
σ_Y 0.022448
S_B 0.000046
S_E = 0.022557
STORAGE COND= AMB TEMP/RH
TEST COND = 77 DEG F
MOTOR #0031064
PARAMETER = STRAIN AT RUPTURE
TIME OF MEASURE = INCH/INCH
0.55
0.50
0.45
0.40
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
AGE AT TEST (YEARS)
STAGE

Figure 4-13

Y = (458.653442) + (-0.456093) * X

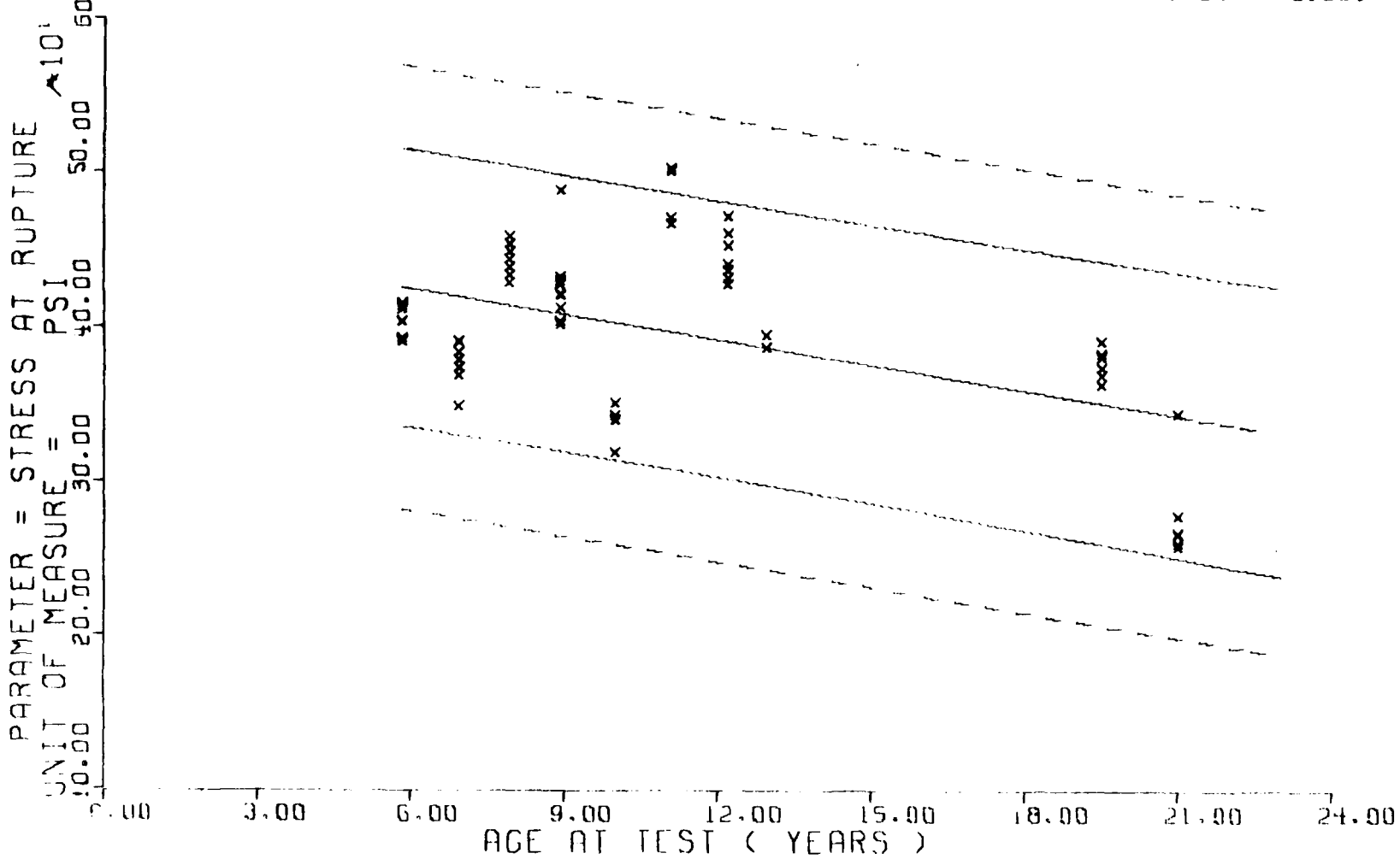
F = 21.089523 SIGNIFICANCE OF F = SIGNIFICANT σ_Y = 54.473052

R = -0.486542 SIGNIFICANCE OF R = SIGNIFICANT S_B = 0.099316

t = 4.592332 SIGNIFICANCE OF t = SIGNIFICANT S_E = 47.939437

N = 70 DEGREES OF FREEDOM= 68

STORAGE COND= AMB TEMP/RH TEST COND = 77 DEG F MOTOR #0031064



STAGE III. STRESS AT RUPTURE. LOW RATE TENSILE TEST. CHS-2.0

Figure 4-14

Y = (1662.997070) + (-0.741012) * X

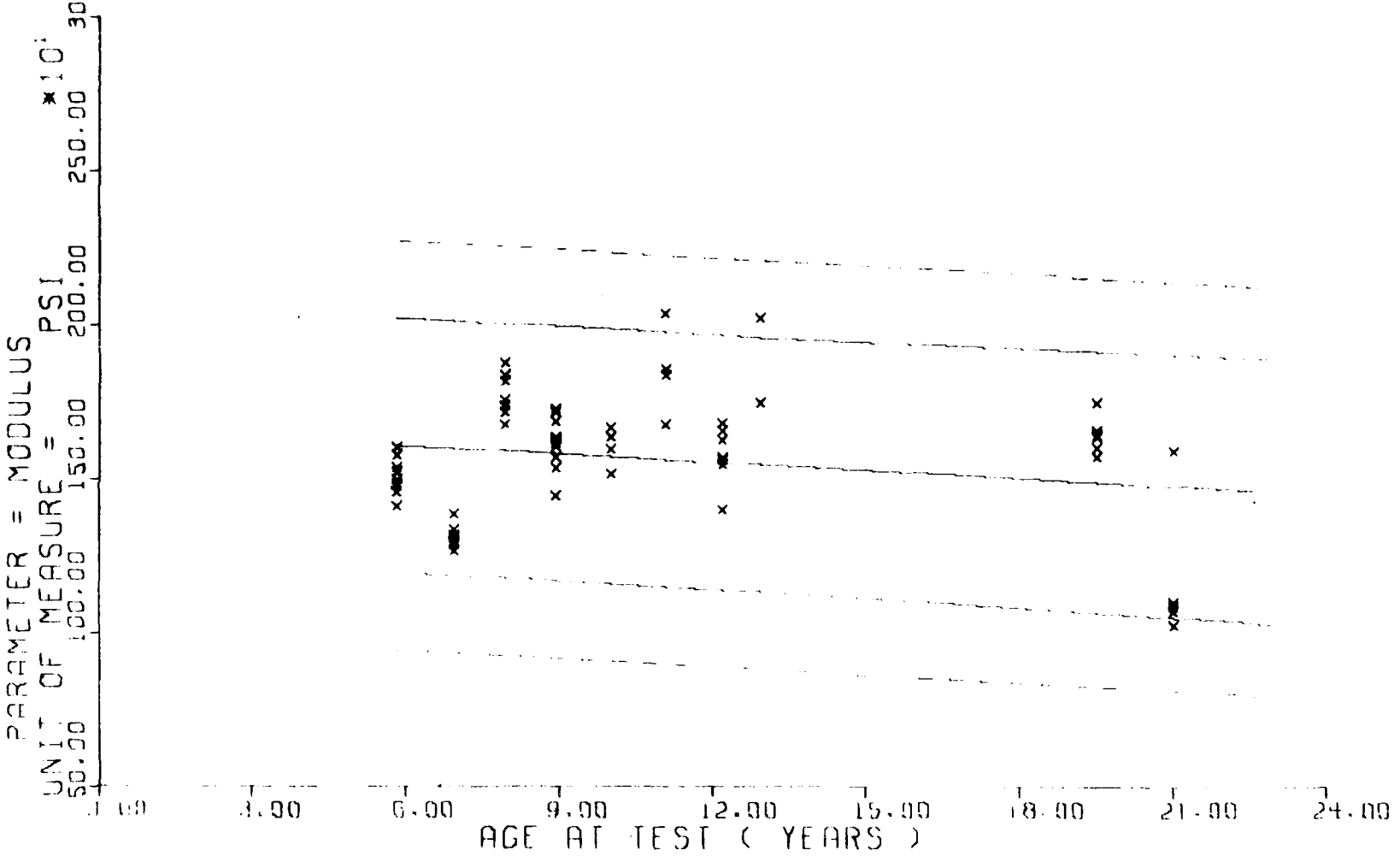
F = 2.634711 SIGNIFICANCE OF F = NOT SIGNIFICANT σ_Y = 222.931823

R = -0.191781 SIGNIFICANCE OF R = NOT SIGNIFICANT S_B = 0.456519

t = 1.623179 SIGNIFICANCE OF t = NOT SIGNIFICANT S_E = 220.373474

N = 71 DEGREES OF FREEDOM= 69

STORAGE COND= AMB TEMP/RH . TEST COND = 77 DEG F MOTOR #: 0031064



STAGE III, MODULUS, LOW RATE TENSILE TEST, CHS-2.0

Figure 4-15

Y = ((+4.1611572E+02) + (-4.4680375E-02) * X)

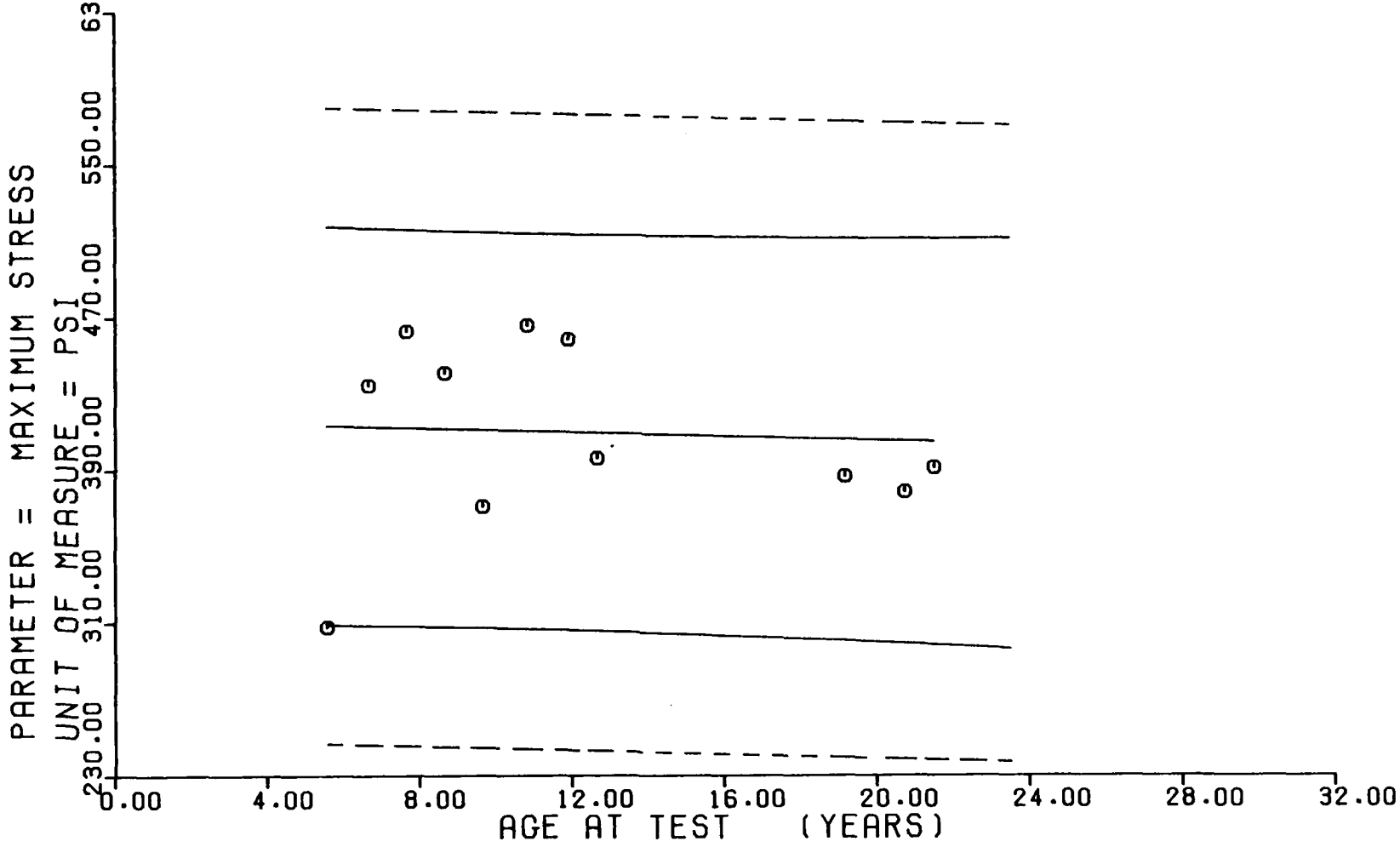
F = +1.9428884E-01 SIGNIFICANCE OF F = NOT SIGNIFICANT σ_Y = +5.5142470E+01

R = -5.1521124E-02 SIGNIFICANCE OF R = NOT SIGNIFICANT S_B = +1.0136613E-01

t = +4.4078208E-01 SIGNIFICANCE OF t = NOT SIGNIFICANT S_E = +5.5445139E+01

N = 75 DEGREES OF FREEDOM = 73

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



UNIAXIAL TENSILE, MAXIMUM STRESS, 2.0 IN/MIN AT 77 DEG F, MOTOR=0031134.

Figure 4-16

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
67.0	10	+3.0769995E+02	+1.5434809E+01	+3.3000000E+02	+2.8700000E+02	+4.1312207E+02
80.0	9	+4.3433325E+02	+1.8881207E+01	+4.6000000E+02	+4.1500000E+02	+4.1254125E+02
92.0	10	+4.6250000E+02	+5.8925565E+00	+4.7500000E+02	+4.5500000E+02	+4.1200488E+02
104.0	10	+4.4089990E+02	+2.8602447E+01	+4.7300000E+02	+4.0000000E+02	+4.1146875E+02
116.0	5	+3.7087988E+02	+9.1243210E+00	+3.8319995E+02	+3.6000000E+02	+4.1093261E+02
130.0	5	+4.6559985E+02	+7.7974354E+00	+4.7200000E+02	+4.5200000E+02	+4.1030712E+02
143.0	7	+4.5821118E+02	+4.8467680E+01	+5.2289990E+02	+4.0447998E+02	+4.0972631E+02
152.0	3	+3.9598315E+02	+4.7279058E+00	+3.9975000E+02	+3.9068994E+02	+4.0932421E+02
230.0	6	+3.8656152E+02	+5.6911173E+00	+3.9211987E+02	+3.7658984E+02	+4.0583911E+02
249.0	5	+3.7834375E+02	+7.5887701E+00	+3.8920996E+02	+3.6993994E+02	+4.0499023E+02
258.0	5	+3.9101977E+02	+4.0537609E+00	+3.9761987E+02	+3.8692993E+02	+4.0458813E+02

UNIAXIAL TENSILE, MAXIMUM STRESS, 2.0 IN/MIN AT 77 DEG F, MOTOR=0031134.

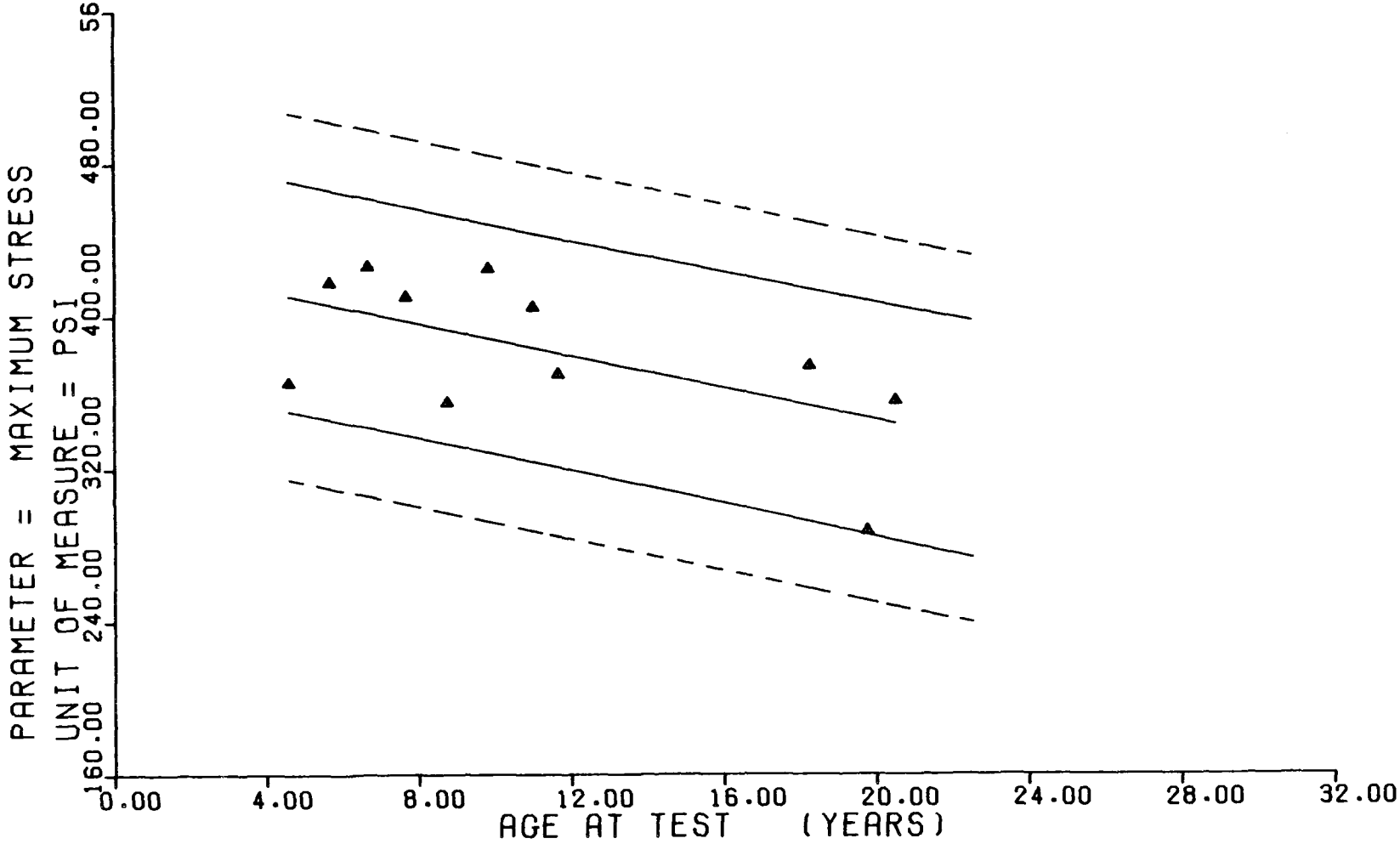
F = +5.6136169E+01 SIGNIFICANCE OF F = SIGNIFICANT

R = -5.7807683E-01 SIGNIFICANCE OF R = SIGNIFICANT S_B = +5.8410592E-02

t = +6.0113367E+00 SIGNIFICANCE OF t = SIGNIFICANT S_E = +3.1965925E+01

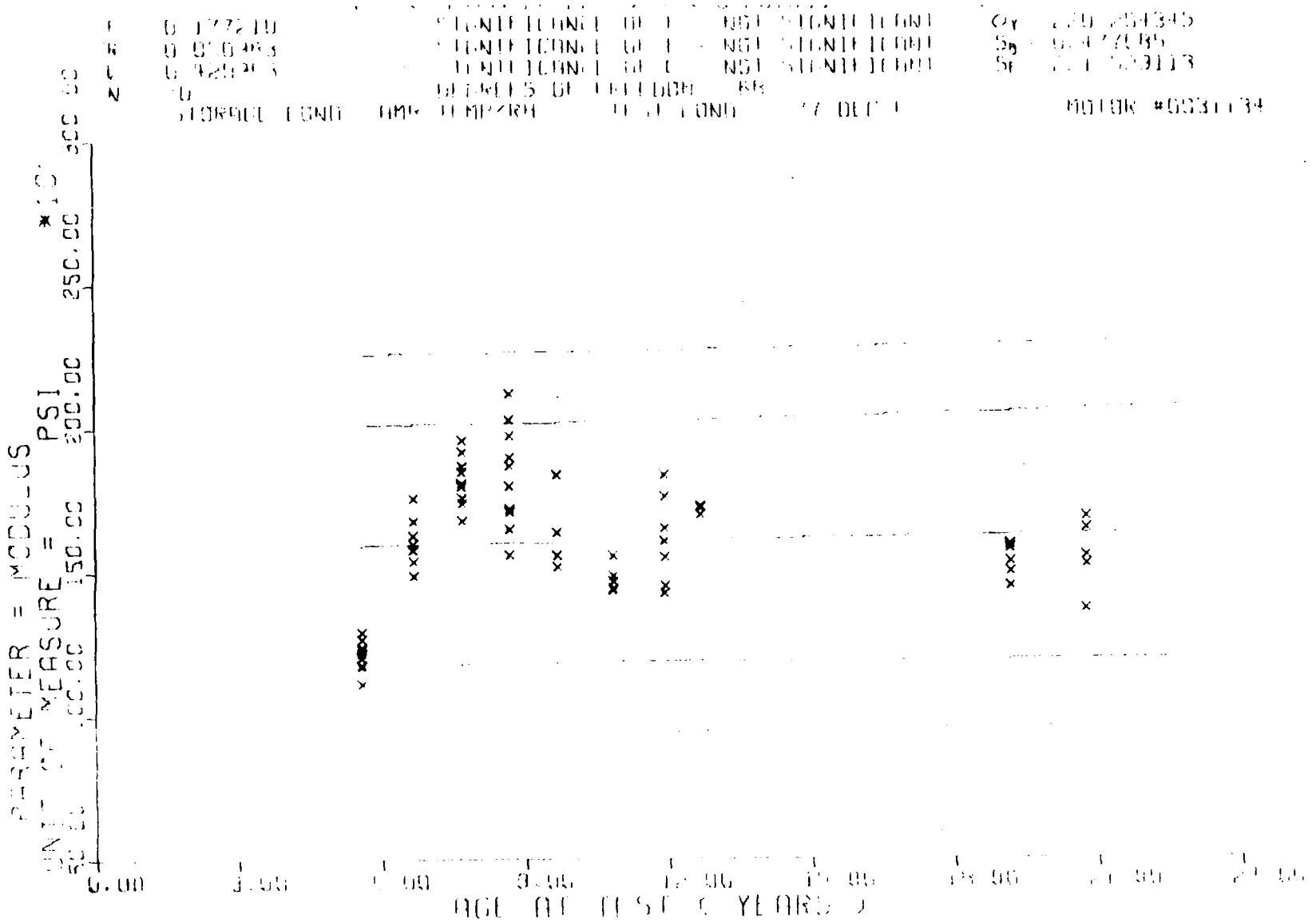
N = 74 DEGREES OF FREEDOM = 72

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



UNIAXIAL TENSILE, MAXIMUM STRESS, 2.0 IN/MIN AT 77 DEG F, MOTOR=0032434.

Figure 4-26



STAGE [illegible]

Figure 4-25

Y = (390.808349) + (-0.024805) * X

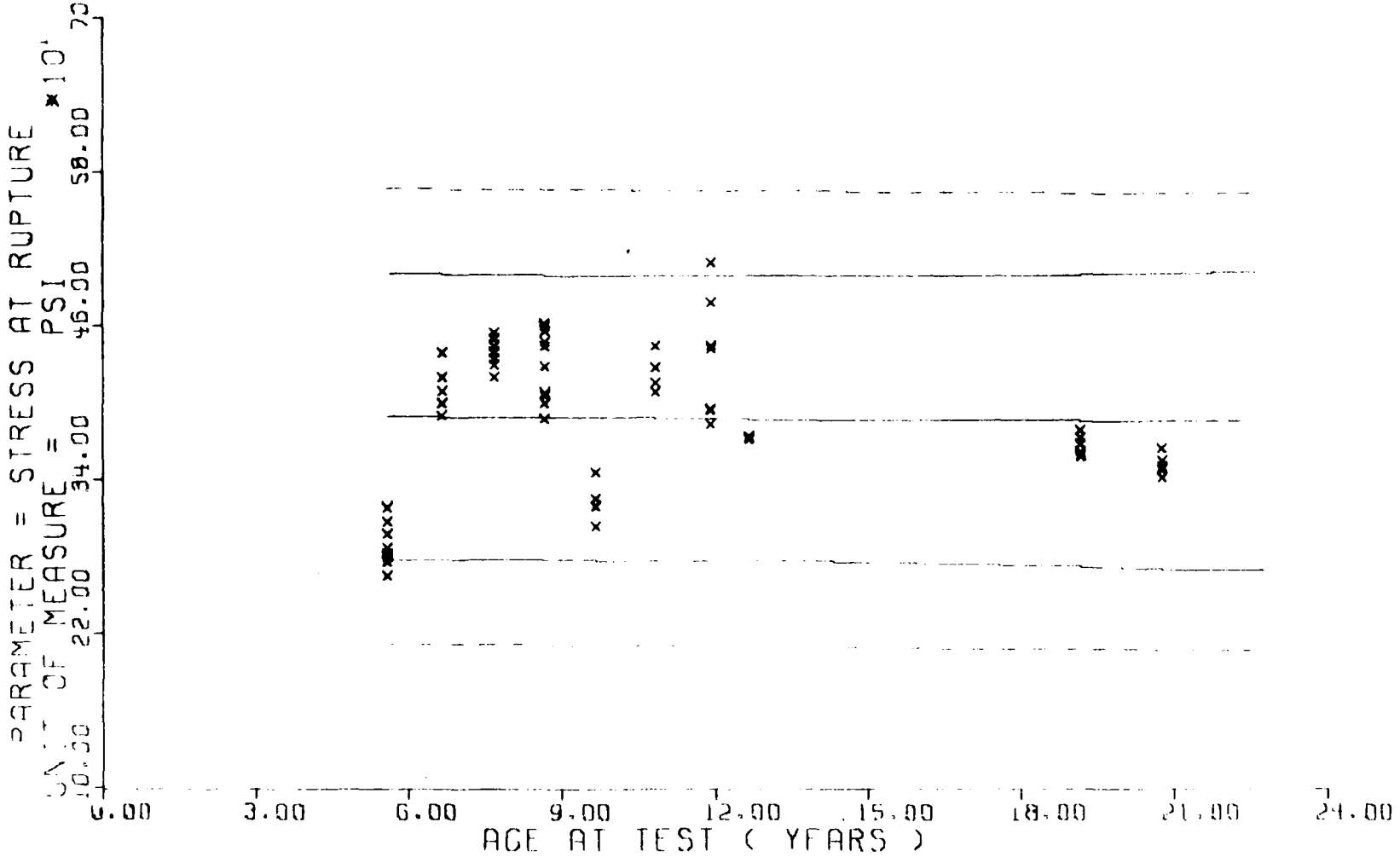
F = 0.037868 SIGNIFICANCE OF F = NOT SIGNIFICANT σ_Y = 58.700622

R = 0.023592 SIGNIFICANCE OF R = NOT SIGNIFICANT S_B = 0.127468

t = 0.194597 SIGNIFICANCE OF t = NOT SIGNIFICANT S_F = 59.114212

N = 70 DEGREES OF FREEDOM = 68

STORAGE COND = AMB TEMP/RH TEST COND = 77 DEG F MOTOR #0031134



STAGE III. STRESS AT RUPTURE. LOW RATE TENSILE TEST. CHS=2.0

Figure 4-24

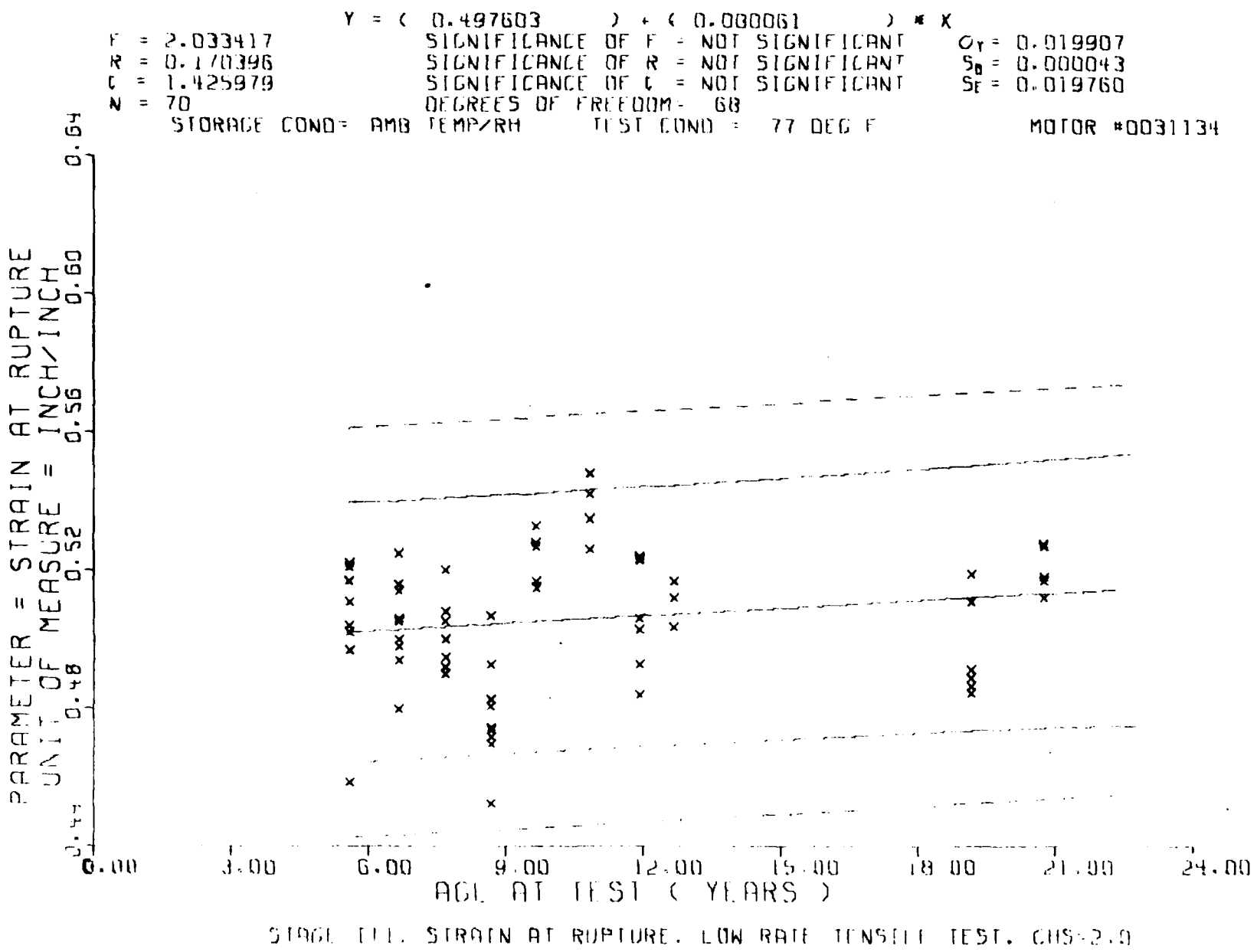

Y = (0.497603) + (0.000061) * X
F = 2.033417
R = 0.170396
C = 1.425979
N = 70
SIGNIFICANCE OF F = NOT SIGNIFICANT
SIGNIFICANCE OF R = NOT SIGNIFICANT
SIGNIFICANCE OF C = NOT SIGNIFICANT
DEGREES OF FREEDOM- 68
σY = 0.019907
SB = 0.000043
SE = 0.019760
STORAGE COND= AMB TEMP/RH
TEST COND = 77 DEG F
MOTOR #0031134
PARAMETER = STRAIN AT RUPTURE
UNIT OF MEASURE = INCH/INCH
0.64
0.60
0.56
0.52
0.48
0.00
3.00
6.00
9.00
12.00
15.00
18.00
21.00
24.00
AGE AT TEST (YEARS)
STAGE III. STRAIN AT RUPTURE. LOW RATE TENSILE TEST. CHS-2.0

Figure 4-23

Y = (0.429968) + (0.000121) * X

F = 14.210792 SIGNIFICANCE OF F = SIGNIFICANT σ_Y = 0.016301

R = 0.415762 SIGNIFICANCE OF R = SIGNIFICANT S_B = 0.000032

t = 3.769721 SIGNIFICANCE OF t = SIGNIFICANT S_E = 0.014934

N = 70 DEGREES OF FREEDOM= 68

STORAGE COND= AMB TEMP/RH TEST COND = 77 DEG F MOTOR #0031134

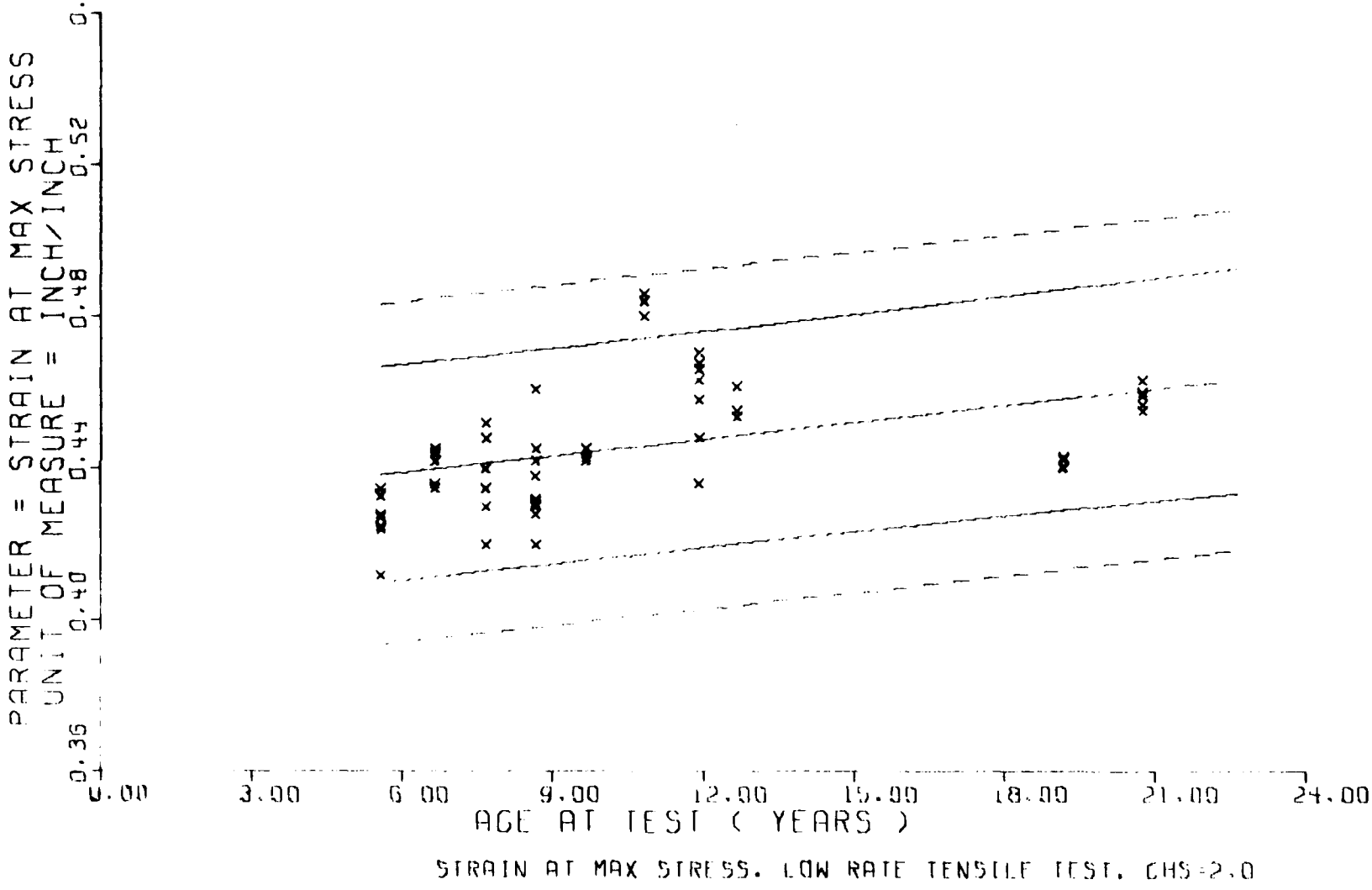


Figure 4-22

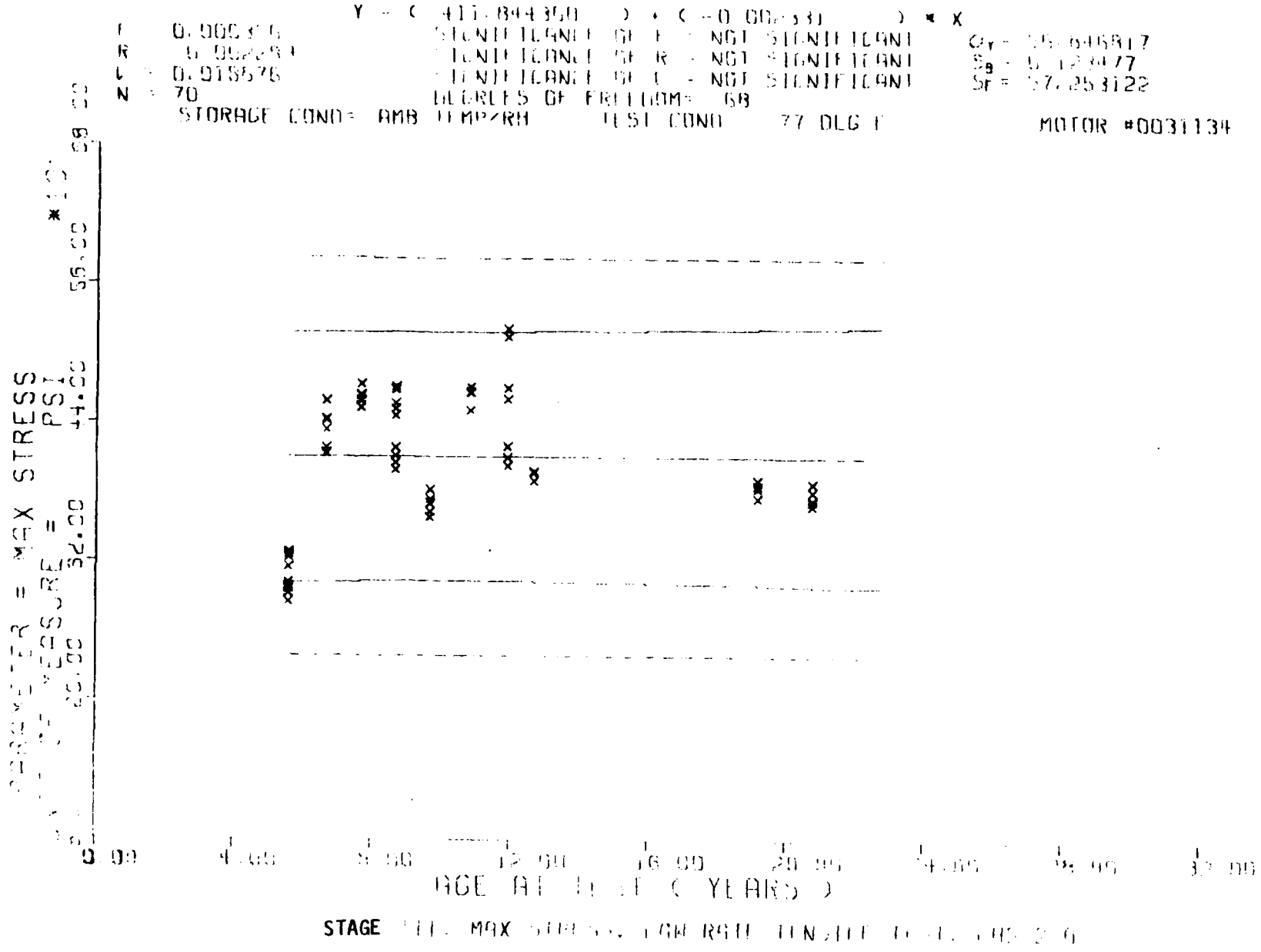

Y = (411.844360) + (-0.002331) * X
F = 0.000376
R = 0.002294
V = 0.015676
N = 70
SIGNIFICANCE OF F - NOT SIGNIFICANT
SIGNIFICANCE OF R - NOT SIGNIFICANT
SIGNIFICANCE OF V - NOT SIGNIFICANT
DEGREES OF FREEDOM= 68
STORAGE COND= AMB TEMP/RH
TEST COND 77 DEG F
MOTOR #0031134
PARAMETER = MAX STRESS
MEASURE = PSI
*10
68.00
56.00
44.00
32.00
20.00
0.00
4.00
8.00
12.00
16.00
20.00
24.00
28.00
32.00
AGE AT TEST (YEARS)
STAGE

Figure 4-21

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
67.0	10	+1.2180000E+03	+5.1415518E+01	+1.2960000E+03	+1.1170000E+03	+1.6084995E+03
80.0	9	+1.6044443E+03	+7.8751366E+01	+1.7600000E+03	+1.4900000E+03	+1.6044455E+03
92.0	10	+1.8190000E+03	+8.3982802E+01	+1.9600000E+03	+1.6800000E+03	+1.6007033E+03
104.0	10	+1.8335000E+03	+1.7769683E+02	+2.1200000E+03	+1.5600000E+03	+1.5969611E+03
116.0	5	+1.6240000E+03	+1.2837445E+02	+1.8400000E+03	+1.5200000E+03	+1.5932189E+03
130.0	5	+1.4815998E+03	+4.8236915E+01	+1.5600000E+03	+1.4400000E+03	+1.5888530E+03
143.0	7	+1.6155712E+03	+1.5194665E+02	+1.8380000E+03	+1.4280000E+03	+1.5847990E+03
152.0	3	+1.7193332E+03	+1.5947831E+01	+1.7300000E+03	+1.7010000E+03	+1.5819924E+03
230.0	6	+1.5415000E+03	+5.8776696E+01	+1.5950000E+03	+1.4490000E+03	+1.5576682E+03
249.0	5	+1.5577998E+03	+1.2503079E+02	+1.6900000E+03	+1.3700000E+03	+1.5517431E+03
258.0	5	+1.3845998E+03	+3.1141612E+01	+1.4340000E+03	+1.3540000E+03	+1.5489365E+03

UNIAXIAL TENSILE, MODULUS, 2.0 IN/MIN AT 77 DEG F, MOTOR=0031134.

Y = ((+1.6293935E+03) + (-3.1184851E-01) * X)

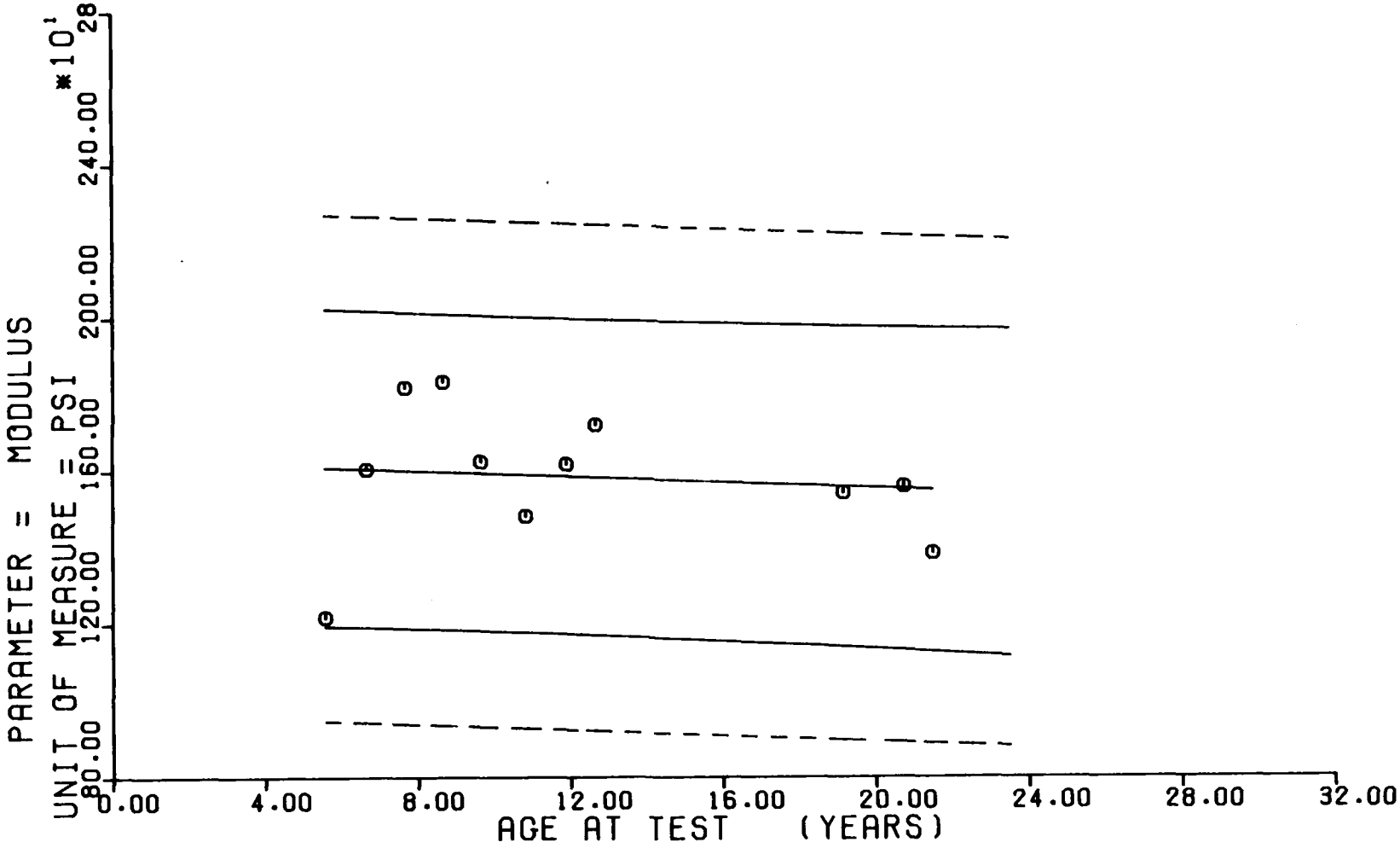
F = +5.9961404E-01 SIGNIFICANCE OF F = NOT SIGNIFICANT σ_Y = +2.1968493E+02

R = -9.0260582E-02 SIGNIFICANCE OF R = NOT SIGNIFICANT S_B = +4.0272425E-01

t = +7.7434749E-01 SIGNIFICANCE OF t = NOT SIGNIFICANT S_E = +2.2028167E+02

N = 75 DEGREES OF FREEDOM = 73

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



UNIAXIAL TENSILE, MODULUS, 2.0 IN/MIN AT 77 DEG F, MOTOR=0031134.

Figure 4-20

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
17.0	10	+2.5600000E+02	+1.7422845E+01	+3.1900000E+02	+2.6600000E+02	+3.9042700E+02
50.0	9	+4.1333325E+02	+1.8027756E+01	+4.4000000E+02	+3.9000000E+02	+3.8961279E+02
92.0	10	+4.4050000E+02	+1.0394977E+01	+4.5000000E+02	+4.2000000E+02	+3.8886132E+02
104.0	10	+4.3029980E+02	+2.7596497E+01	+4.6200000E+02	+3.8800000E+02	+3.8810986E+02
116.0	5	+3.2305981E+02	+1.5111311E+01	+3.4600000E+02	+3.0400000E+02	+3.8735815E+02
130.0	5	+4.2479980E+02	+1.3682105E+01	+4.4400000E+02	+4.0800000E+02	+3.8648144E+02
143.0	7	+4.3486549E+02	+4.7433711E+01	+5.0000000E+02	+3.8279980E+02	+3.8566723E+02
157.0	3	+3.7214648E+02	+1.0870349E+00	+3.7329980E+02	+3.7123999E+02	+3.8510375E+02
230.0	8	+3.6613647E+02	+7.8439047E+00	+3.7302978E+02	+3.5789990E+02	+3.8021875E+02
249.0	5	+3.5139379E+02	+3.5397609E+00	+3.6400000E+02	+3.4150976E+02	+3.7902880E+02
256.0	5	+3.5634790E+02	+2.9591179E+00	+3.7019995E+02	+3.6195996E+02	+3.7846533E+02

UNIAXIAL TENSILE, STRESS AT ROP, 2.0 IN/MIN AT 77 DEG F, MOTOR=0031134.

Y = ((+3.9462305E+02) + (-6.2626546E-02) * X)

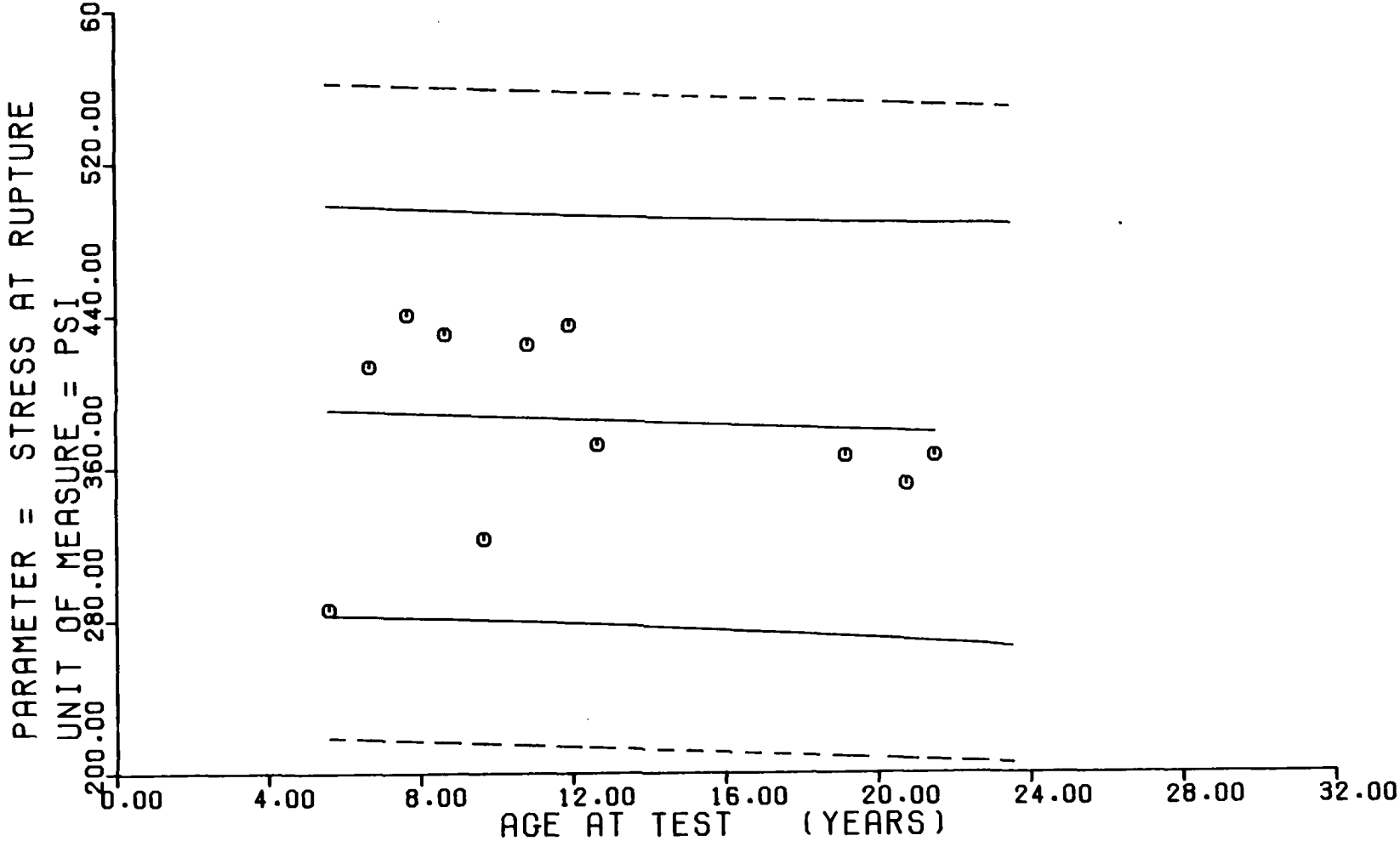
F = +3.5878084E-01 SIGNIFICANCE OF F = NOT SIGNIFICANT σ_Y= +5.6940938E+01

R = -6.9934032E-02 SIGNIFICANCE OF R = NOT SIGNIFICANT S_B= +1.0455476E-01

t = +5.9898317E-01 SIGNIFICANCE OF t = NOT SIGNIFICANT S_E= +5.7189253E+01

N = 75 DEGREES OF FREEDOM = 73

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



UNIAXIAL TENSILE, STRESS AT RUP, 2.0 IN/MIN AT 77 DEG F, MOTOR=0031134.

Figure 4-19

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
67.0	10	+5.0469958E-01	+1.8627096E-02	+5.2199995E-01	+4.5899999E-01	+5.0207930E-01
80.0	9	+5.0422191E-01	+1.3313103E-02	+5.2499997E-01	+4.7999995E-01	+5.0271344E-01
92.0	10	+4.9919962E-01	+9.6415934E-03	+5.1999998E-01	+4.8999994E-01	+5.0329881E-01
104.0	10	+4.7909963E-01	+1.4387741E-02	+5.0699996E-01	+4.5299994E-01	+5.0388425E-01
116.0	5	+5.2399957E-01	+7.6926053E-03	+5.3299999E-01	+5.1499998E-01	+5.0446963E-01
130.0	5	+5.3979969E-01	+9.3947854E-03	+5.4799997E-01	+5.2599996E-01	+5.0515258E-01
143.0	7	+5.0805664E-01	+1.6074084E-02	+5.2399998E-01	+4.8399996E-01	+5.0578677E-01
152.0	3	+5.1086616E-01	+6.8253874E-03	+5.1699995E-01	+5.0359994E-01	+5.0622582E-01
230.0	6	+4.9684953E-01	+1.4488414E-02	+5.1899999E-01	+4.8429995E-01	+5.1003080E-01
249.0	5	+5.2027946E-01	+6.8153711E-03	+5.2759999E-01	+5.1199996E-01	+5.1095771E-01
258.0	5	+5.0755977E-01	+1.2365844E-02	+5.2339994E-01	+4.8999994E-01	+5.1139676E-01

UNIAXIAL TENSILE, STRAIN AT RUP, 2.0 IN/MIN AT 77 DEG F, MOTOR=0031134.

Y = ((+4.9881089E-01) + (+4.8782478E-05) * X)

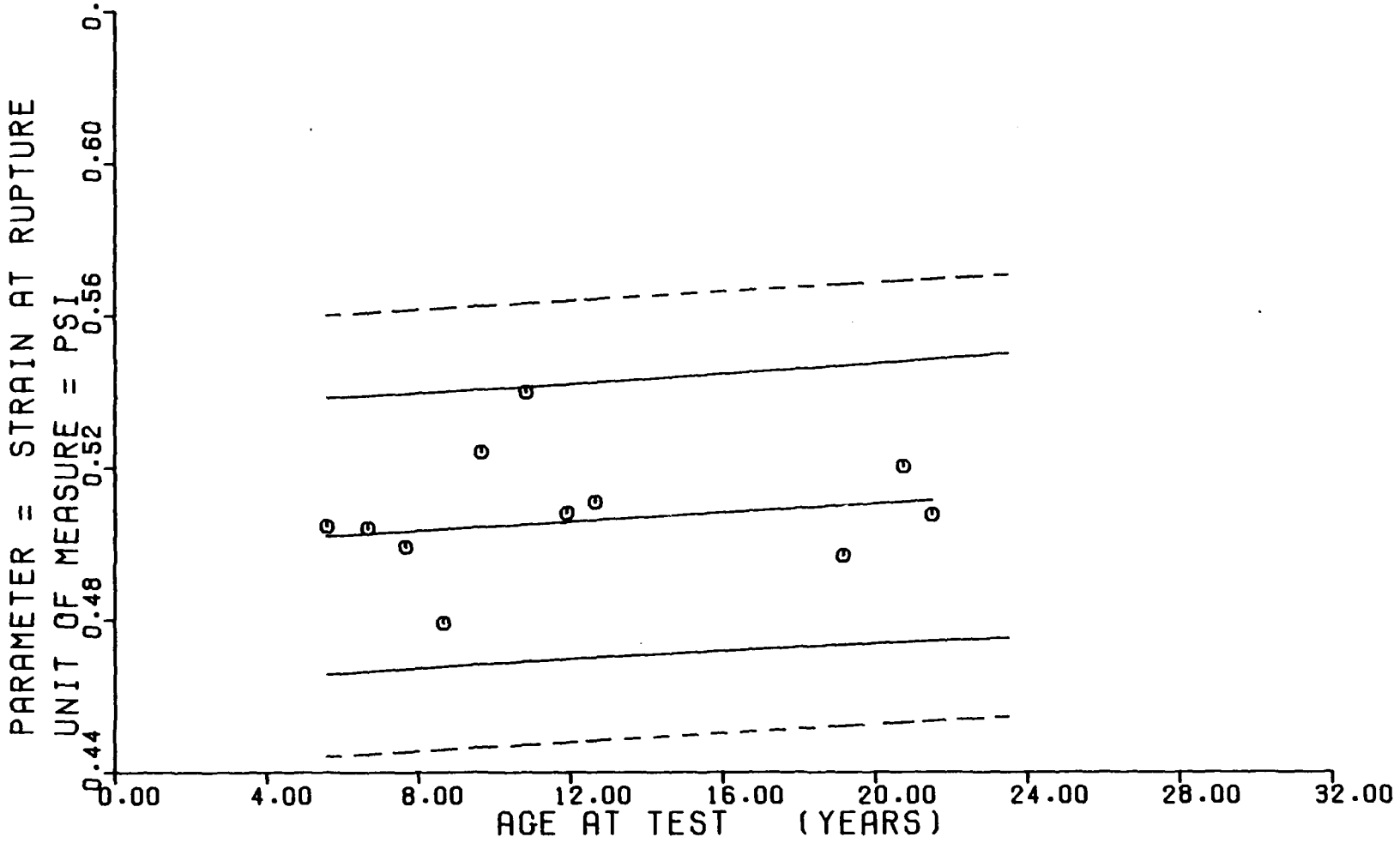
F = +1.9058392E+00 SIGNIFICANCE OF F = NOT SIGNIFICANT σ_Y = +1.9446135E-02

R = +1.5950903E-01 SIGNIFICANCE OF R = NOT SIGNIFICANT S_B = +3.5336271E-05

t = +1.3805213E+00 SIGNIFICANCE OF t = NOT SIGNIFICANT S_E = +1.9328196E-02

N = 75 DEGREES OF FREEDOM = 73

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



UNIAXIAL TENSILE, STRAIN AT RUP, 2.0 IN/MIN AT 77 DEG F, MOTOR=0031134.

Figure 4-18

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
67.0	10	+4.2669951E-01	+6.5385333E-03	+4.3499994E-01	+4.1199994E-01	+4.3861281E-01
80.0	9	+4.4199961E-01	+3.8898424E-03	+4.4499999E-01	+4.3499994E-01	+4.3999475E-01
92.0	10	+4.3879956E-01	+9.4774412E-03	+4.5199996E-01	+4.1999995E-01	+4.4127029E-01
104.0	10	+4.3569952E-01	+1.1444890E-02	+4.6099996E-01	+4.1999995E-01	+4.4254589E-01
116.0	5	+4.4339978E-01	+1.5780289E-03	+4.4499999E-01	+4.4199997E-01	+4.4382148E-01
130.0	5	+4.8359966E-01	+2.2278151E-03	+4.8599994E-01	+4.7999995E-01	+4.4530969E-01
143.0	7	+4.5838546E-01	+1.2331770E-02	+4.7029995E-01	+4.3599998E-01	+4.4669157E-01
152.0	3	+4.5673304E-01	+4.2207913E-03	+4.6149998E-01	+4.5369994E-01	+4.4764822E-01
230.0	6	+4.4186639E-01	+1.4435750E-03	+4.4299995E-01	+4.3989998E-01	+4.5593953E-01
249.0	5	+4.5883959E-01	+3.0737838E-03	+4.6309995E-01	+4.5529997E-01	+4.5795923E-01
258.0	5	+4.5407980E-01	+8.4506896E-03	+4.5969998E-01	+4.3939995E-01	+4.5891588E-01

UNIAXIAL TENSILE, STRAIN AT MAX, 2.0 IN/MIN AT 77 DEG F, MOTOR=0031134.

Y = ((+4.3149085E-01) + (+1.0629880E-04) * X)

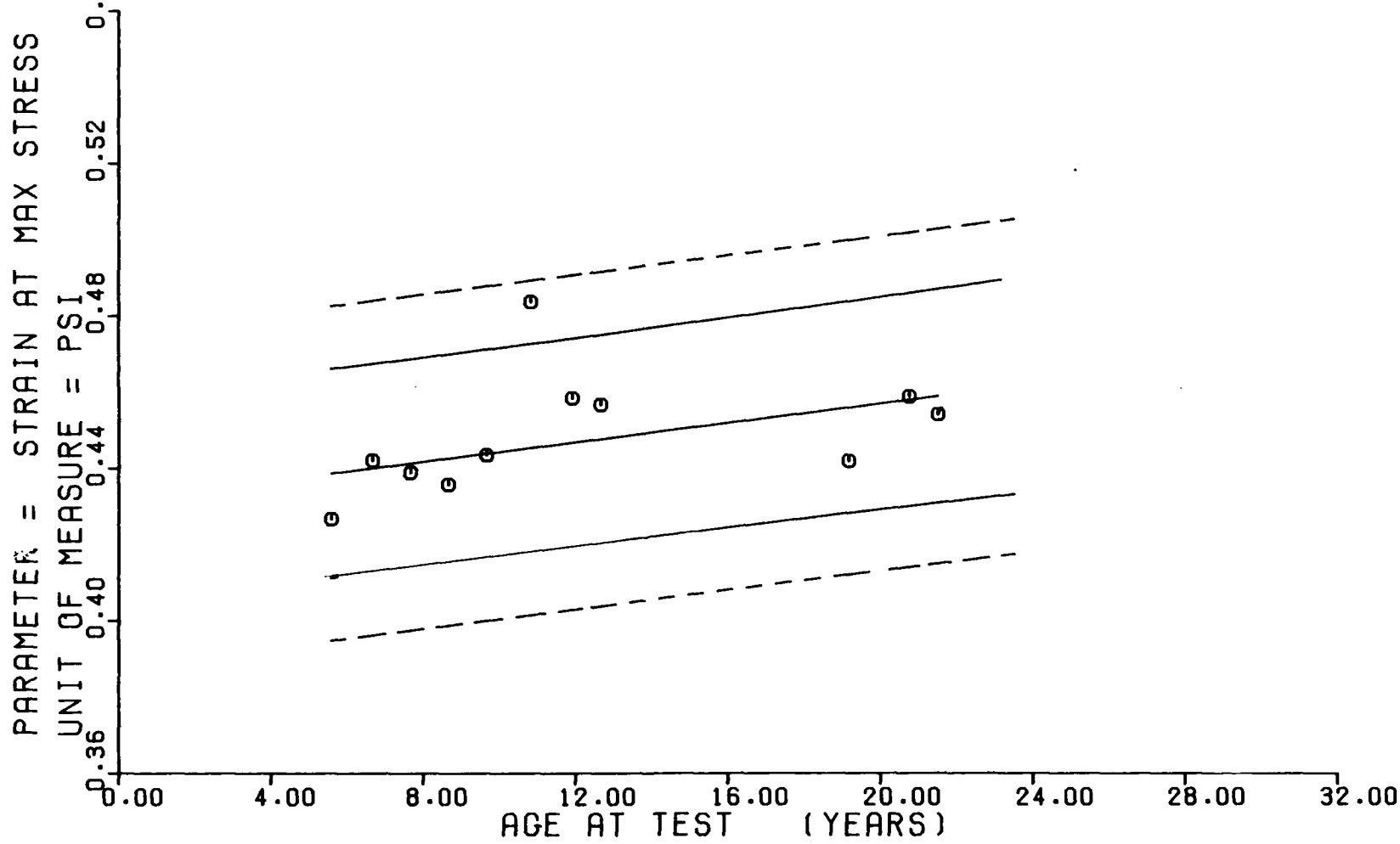
F = +1.5793670E+01 SIGNIFICANCE OF F = SIGNIFICANT σ_Y = +1.6026274E-02

R = +4.2174557E-01 SIGNIFICANCE OF R = SIGNIFICANT S_B = +2.6747724E-05

t = +3.9741251E+00 SIGNIFICANCE OF t = SIGNIFICANT S_E = +1.4630441E-02

N = 75 DEGREES OF FREEDOM = 73

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



UNIAXIAL TENSILE, STRAIN AT MAX, 2.0 IN/MIN AT 77 DEG F, MOTOR=0031134.

Figure 4-17

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
55.0	10	+3.6519995E+02	+7.4206917E+00	+3.7800000E+02	+3.5300000E+02	+4.1057177E+02
68.0	9	+4.1766650E+02	+4.3588989E+00	+4.2500000E+02	+4.1200000E+02	+4.0600732E+02
80.0	10	+4.2600000E+02	+5.6764621E+00	+4.3500000E+02	+4.1500000E+02	+4.0179370E+02
92.0	9	+4.1011108E+02	+9.6234666E+00	+4.2600000E+02	+4.0000000E+02	+3.9758007E+02
105.0	5	+3.5493994E+02	+7.6270894E+00	+3.6769995E+02	+3.4859985E+02	+3.9301562E+02
118.0	5	+4.2479980E+02	+1.6828547E+01	+4.4400000E+02	+4.0000000E+02	+3.8845092E+02
132.0	7	+4.0461132E+02	+7.6758767E+00	+4.1407983E+02	+3.9369995E+02	+3.8353515E+02
140.0	3	+3.6965991E+02	+5.6246394E+00	+3.7547998E+02	+3.6425976E+02	+3.8072607E+02
219.0	6	+3.7386474E+02	+5.1658409E+00	+3.7870996E+02	+3.6489990E+02	+3.5298730E+02
237.0	5	+2.8734179E+02	+2.5263873E+01	+3.3164990E+02	+2.7060986E+02	+3.4666699E+02
246.0	5	+3.5542773E+02	+4.6699180E+00	+3.6206982E+02	+3.5150000E+02	+3.4350683E+02

UNIAXIAL TENSILE, MAXIMUM STRESS, 2.0 IN/MIN AT 77 DEG F, MOTOR=0032434.

Y = ((+3.8666957E-01) + (-1.2937058E-05) * X)

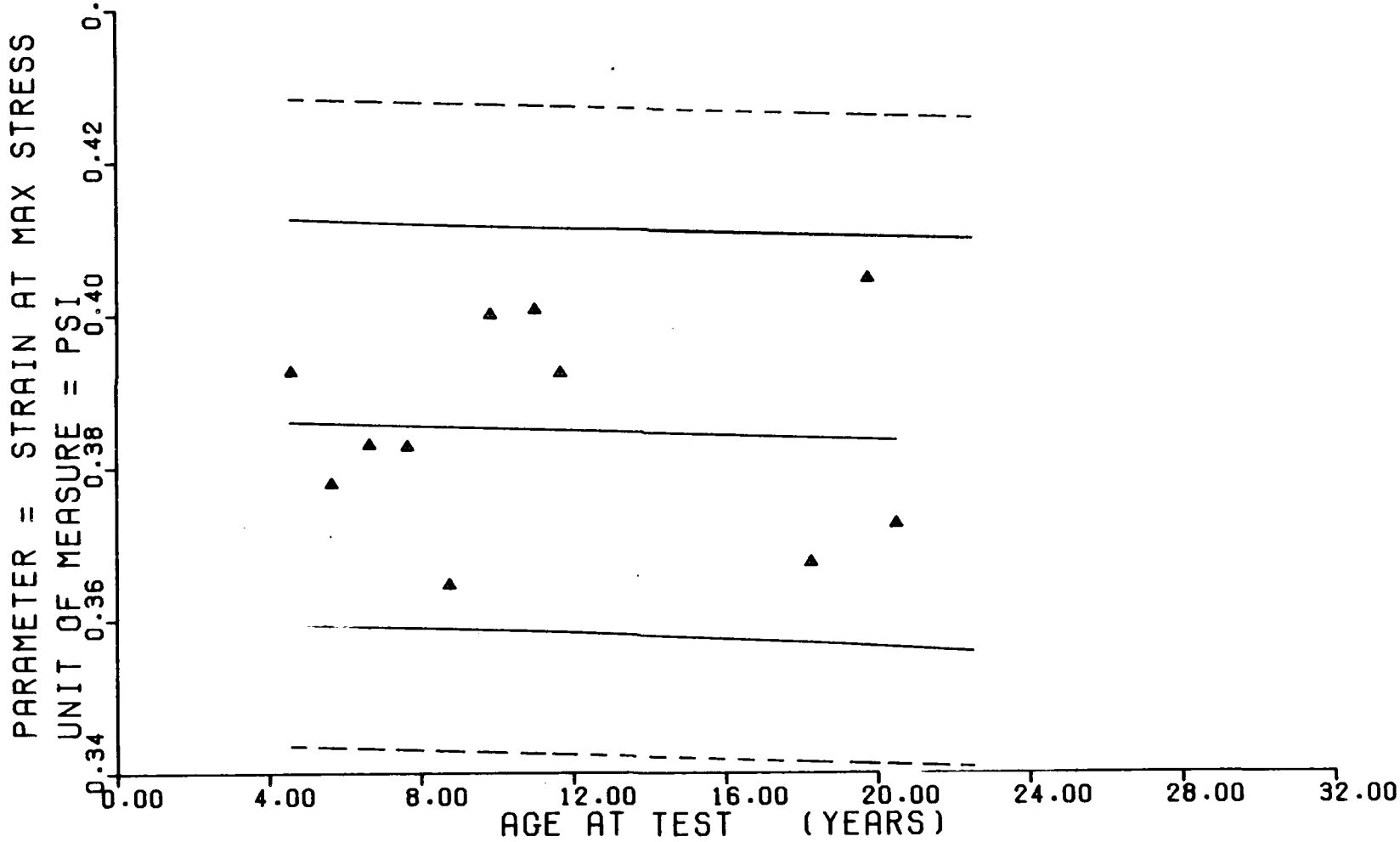
F = +2.5147601E-01 SIGNIFICANCE OF F = NOT SIGNIFICANT σ_Y = +1.4045747E-02

R = -5.8996320E-02 SIGNIFICANCE OF R = NOT SIGNIFICANT S_B = +2.5798071E-05

t = +5.0147384E-01 SIGNIFICANCE OF t = NOT SIGNIFICANT S_E = +1.4118316E-02

N = 74 DEGREES OF FREEDOM = 72

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



UNIAXIAL TENSILE, STRAIN AT MAX, 2.0 IN/MIN AT 77 DEG F, MOTOR=0032434.

Figure 4-27

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
55.0	10	+3.9259964E-01	+9.2447333E-03	+4.1199994E-01	+3.8199996E-01	+3.8595801E-01
68.0	9	+3.7788856E-01	+6.3218515E-03	+3.8599997E-01	+3.6799997E-01	+3.8578981E-01
80.0	10	+3.8299947E-01	+5.9690495E-03	+3.9499998E-01	+3.7500000E-01	+3.8563460E-01
92.0	9	+3.8277751E-01	+1.0257653E-02	+3.9799994E-01	+3.6299997E-01	+3.8547933E-01
105.0	5	+3.6459976E-01	+3.5242881E-03	+3.6999994E-01	+3.6099994E-01	+3.8531118E-01
118.0	5	+3.9999979E-01	+1.2089275E-02	+4.1199994E-01	+3.7999999E-01	+3.8514298E-01
132.0	7	+4.0061390E-01	+9.1882850E-03	+4.0899997E-01	+3.8249999E-01	+3.8496184E-01
140.0	3	+3.9236640E-01	+9.0313813E-04	+3.9279997E-01	+3.9149999E-01	+3.8485836E-01
219.0	6	+3.6753284E-01	+3.0124252E-03	+3.7199997E-01	+3.6409997E-01	+3.8383632E-01
237.0	5	+4.0459972E-01	+7.8216063E-03	+4.0989995E-01	+3.9089995E-01	+3.8360345E-01
246.0	5	+3.7255972E-01	+1.7066662E-03	+3.7409996E-01	+3.7019997E-01	+3.8348704E-01

UNIAXIAL TENSILE, STRAIN AT MAX, 2.0 IN/MIN AT 77 DEG F, MOTOR=0032434.

Y = ((+4.5263761E-01) + (+3.1734931E-05) * X)

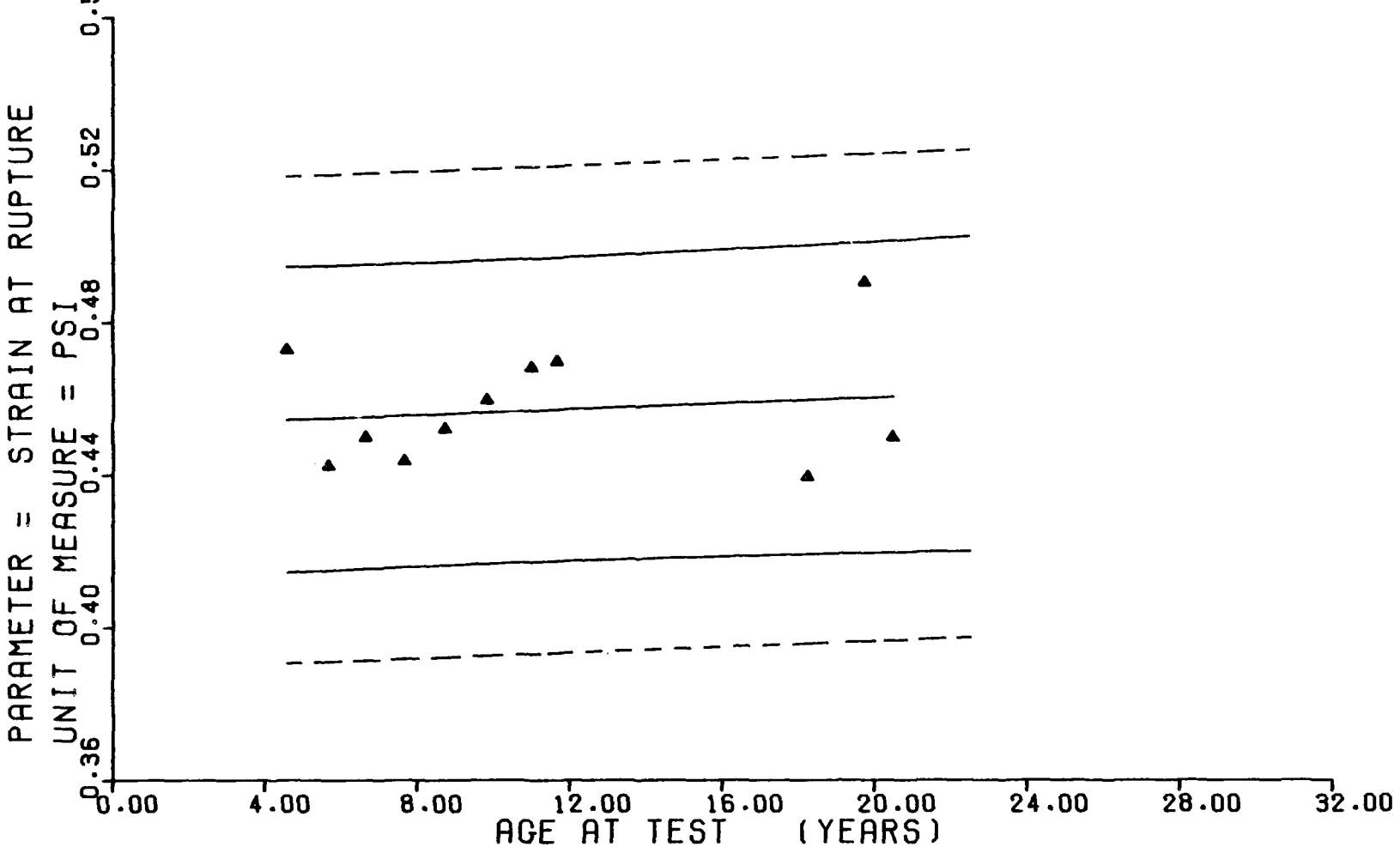
F = +6.6628501E-01 SIGNIFICANCE OF F = NOT SIGNIFICANT σ_Y = +2.1227960E-02

R = +9.5755459E-02 SIGNIFICANCE OF R = NOT SIGNIFICANT S_B = +3.8878324E-05

t = +8.1626283E-01 SIGNIFICANCE OF t = NOT SIGNIFICANT S_E = +2.1276648E-02

N = 74 DEGREES OF FREEDOM = 72

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



UNIAXIAL TENSILE, STRAIN AT RUP, 2.0 IN/MIN AT 77 DEG F, MOTOR=0032434.

Figure 4-28

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
55.0	10	+4.7279953E-01	+1.0355348E-02	+4.8299998E-01	+4.5099997E-01	+4.5438301E-01
68.0	9	+4.4233310E-01	+2.3943043E-02	+4.5499998E-01	+3.7999999E-01	+4.5479553E-01
80.0	10	+4.4979971E-01	+8.8202296E-03	+4.6499997E-01	+4.3499994E-01	+4.5517641E-01
92.0	9	+4.4355517E-01	+1.7345953E-02	+4.8199999E-01	+4.2299997E-01	+4.5555722E-01
105.0	5	+4.5199966E-01	+1.0942681E-02	+4.6599996E-01	+4.3599998E-01	+4.5596975E-01
118.0	5	+4.5959967E-01	+2.6514381E-02	+4.7999995E-01	+4.1399997E-01	+4.5638233E-01
132.0	7	+4.6807098E-01	+2.1198064E-02	+4.9199998E-01	+4.4549995E-01	+4.5682662E-01
140.0	3	+4.6969985E-01	+5.2236655E-03	+4.7439998E-01	+4.6409994E-01	+4.5708048E-01
219.0	6	+4.3948298E-01	+9.4050625E-03	+4.5309996E-01	+4.2699998E-01	+4.5958751E-01
237.0	5	+4.9031943E-01	+2.1911117E-02	+5.0709998E-01	+4.5309996E-01	+4.6015876E-01
246.0	5	+4.4979971E-01	+5.7274727E-03	+4.5969998E-01	+4.4489997E-01	+4.6044439E-01

UNIAXIAL TENSILE, STRAIN AT RUP, 2.0 IN/MIN AT 77 DEG F, MOTOR=0032434.

Y = ((+4.1105007E+02) + (-4.3049291E-01) * X)

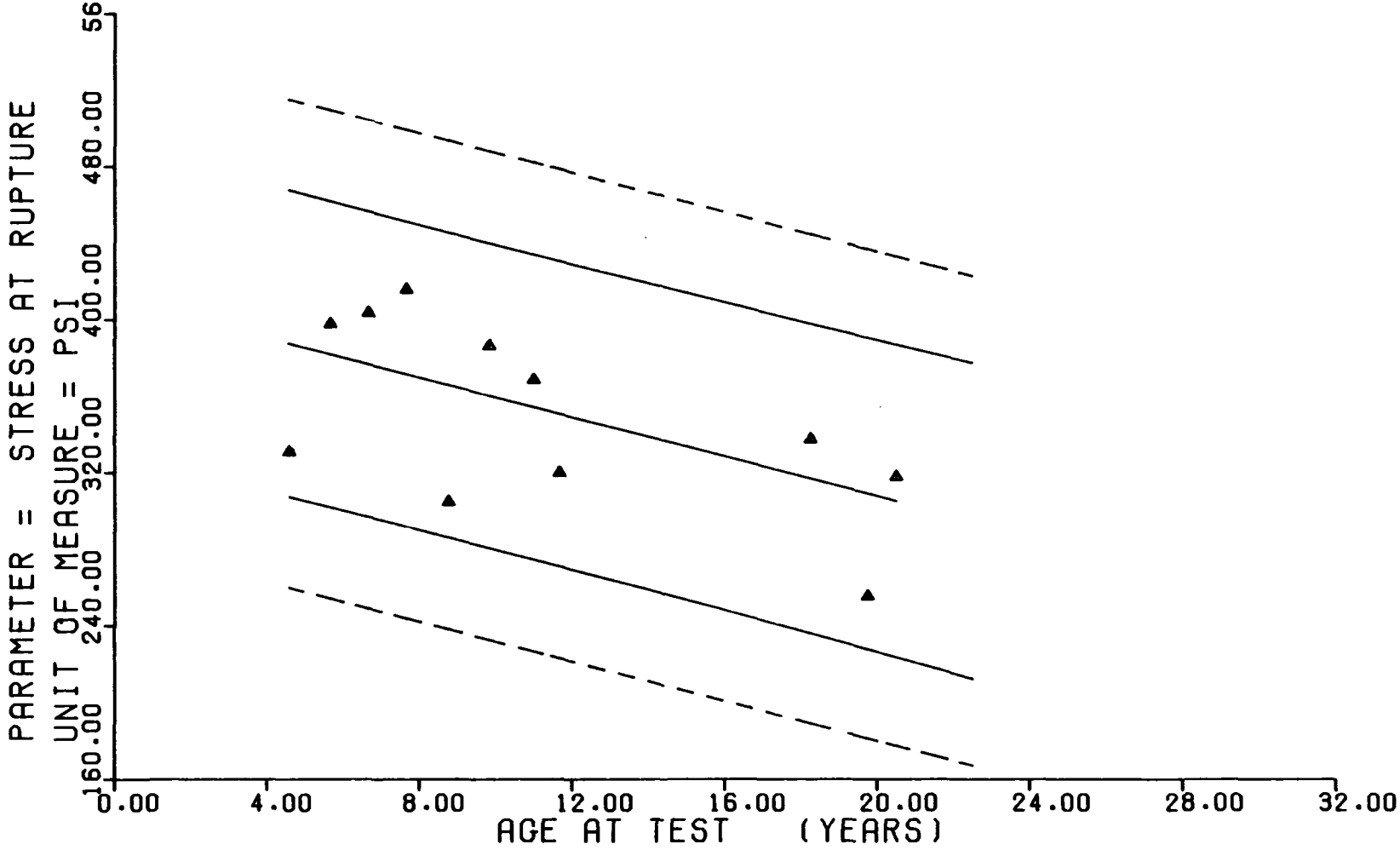
F = +3.0713179E+01 SIGNIFICANCE OF F = SIGNIFICANT σ_Y = +5.0425585E+01

R = -5.4682618E-01 SIGNIFICANCE OF R = SIGNIFICANT S_B = +7.7678998E-02

t = +5.5419472E+00 SIGNIFICANCE OF t = SIGNIFICANT S_E = +4.2510801E+01

N = 74 DEGREES OF FREEDOM = 72

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



UNIAXIAL TENSILE, STRESS AT RUP, 2.0 IN/MIN AT 77 DEG F, MOTOR=0032434.

Figure 4-29

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
55.0	10	+3.3079980E+02	+1.2025897E+01	+3.6200000E+02	+3.1900000E+02	+3.8737280E+02
68.0	9	+3.9766650E+02	+7.8421935E+00	+4.1000000E+02	+3.8500000E+02	+3.8177636E+02
80.0	10	+4.0350000E+02	+1.3550317E+01	+4.2000000E+02	+3.8000000E+02	+3.7661059E+02
92.0	9	+4.1577758E+02	+4.1321234E+01	+4.3900000E+02	+3.7800000E+02	+3.7144458E+02
105.0	5	+3.0491992E+02	+1.6209525E+01	+3.2400000E+02	+2.8700000E+02	+3.6584814E+02
118.0	5	+3.3639990E+02	+1.3445189E+01	+4.0800000E+02	+3.7200000E+02	+3.6025170E+02
132.0	7	+3.6873415E+02	+2.3699068E+01	+3.9200000E+02	+3.3700000E+02	+3.5422485E+02
146.0	3	+3.2003320E+02	+1.4503175E+01	+3.3507983E+02	+3.0614990E+02	+3.5078100E+02
219.0	6	+3.3743310E+02	+1.0050763E+01	+3.4821997E+02	+3.2377978E+02	+3.1677197E+02
237.0	5	+2.5543193E+02	+3.0092872E+01	+3.0797998E+02	+2.3602999E+02	+3.0902319E+02
246.0	5	+3.1782788E+02	+5.1864740E+00	+3.2650000E+02	+3.1362988E+02	+3.0514868E+02

UNIAXIAL TENSILE, STRESS AT RUP, 2.0 IN/MIN AT 77 DEG F, MUTOR=0032434.

Y = ((+1.9918492E+03) + (-2.6491964E-02) * X)

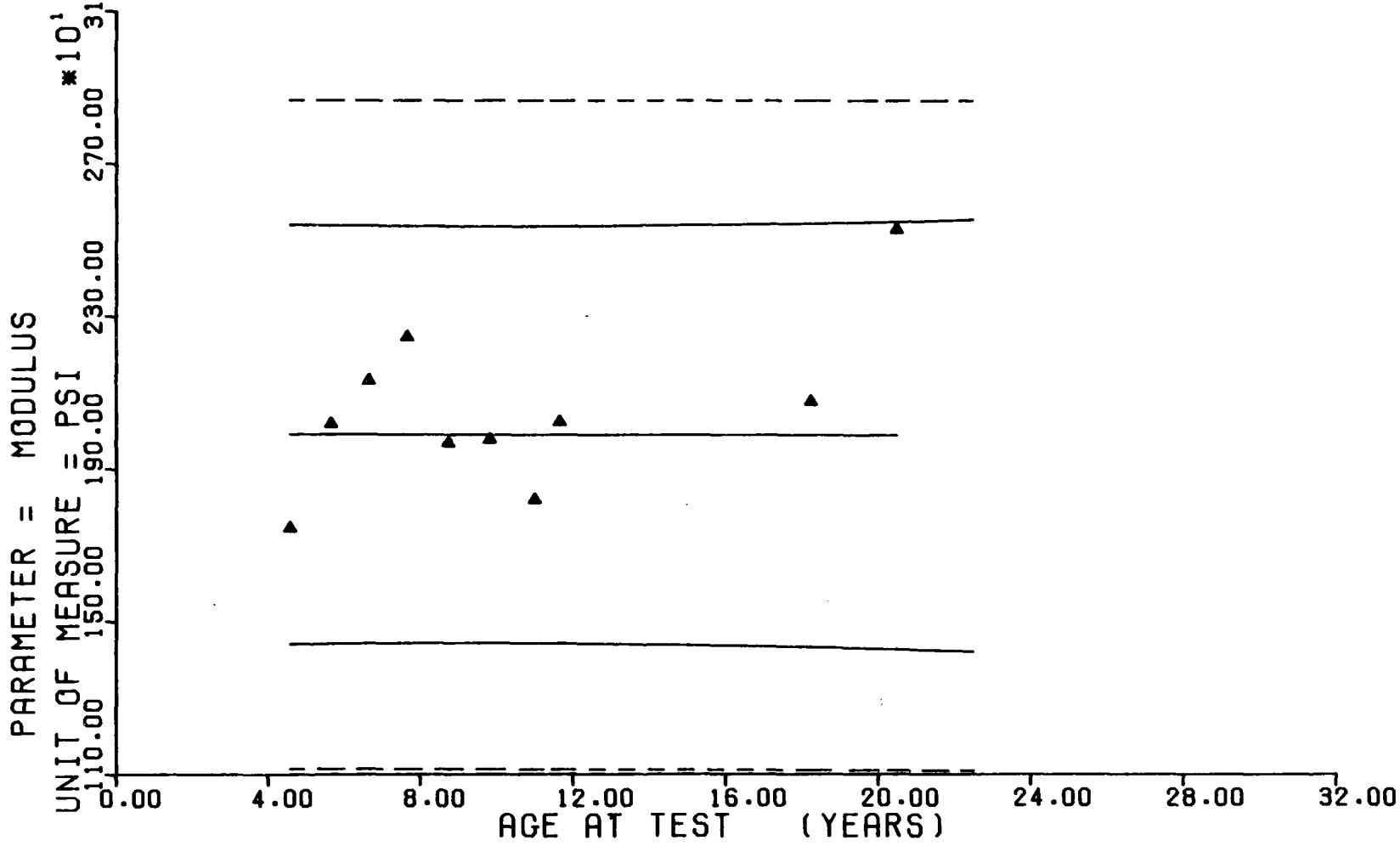
F = +2.4691717E-03 SIGNIFICANCE OF F = NOT SIGNIFICANT σ_Y = +2.8976535E+02

R = -5.8560119E-03 SIGNIFICANCE OF R = NOT SIGNIFICANT S_B = +5.3313663E-01

t = +4.9690760E-02 SIGNIFICANCE OF t = NOT SIGNIFICANT S_E = +2.9176567E+02

N = 74 DEGREES OF FREEDOM = 72

STORAGE CONDITIONS = AMB TEMP/RH TEST CONDITIONS = 77 DEG F, AMB RH



UNIAXIAL TENSILE, MODULUS, 2.0 IN/MIN AT 77 DEG F, MOTOR=0032434.

Figure 4-30

**** LINEAR REGRESSION ANALYSIS ****

*** ANALYSIS OF TIME SERIES ***

AGE (MONTHS)	SPECIMENS PER GROUP	MEAN Y	STANDARD DEVIATION	MAXIMUM Y	MINIMUM Y	REGRESSION Y
55.0	10	+1.7457998E+03	+1.0883606E+02	+1.9130000E+03	+1.6120000E+03	+1.9903920E+03
68.0	9	+2.0177775E+03	+9.5751994E+01	+2.2200000E+03	+1.9000000E+03	+1.9900476E+03
80.0	10	+2.1310000E+03	+5.8581377E+01	+2.2000000E+03	+2.0400000E+03	+1.9897297E+03
92.0	9	+2.2450000E+03	+7.5920188E+01	+2.3500000E+03	+2.1550000E+03	+1.9894118E+03
105.0	5	+1.9663999E+03	+3.4129166E+01	+2.0000000E+03	+1.9200000E+03	+1.9890673E+03
118.0	5	+1.9760000E+03	+8.7338422E+01	+2.1100000E+03	+1.9100000E+03	+1.9887231E+03
132.0	7	+1.8184284E+03	+9.6931861E+01	+1.9460000E+03	+1.7130000E+03	+1.9883522E+03
140.0	3	+2.0216665E+03	+2.6274195E+01	+2.0420000E+03	+1.9920000E+03	+1.9881401E+03
219.0	6	+2.0746665E+03	+7.6217233E+01	+2.2190000E+03	+1.9980000E+03	+1.9860473E+03
237.0	5	+1.2900000E+03	+1.8377567E+02	+1.5980000E+03	+1.1140000E+03	+1.9855705E+03
246.0	5	+2.5243999E+03	+1.5353110E+02	+2.7300000E+03	+2.3880000E+03	+1.9853320E+03

UNIAXIAL TENSILE, MODULUS, 2.0 IN/MIN AT 77 DEG F, MOTOR=0032434.

Y = (434.107299) + (-0.392357) * X

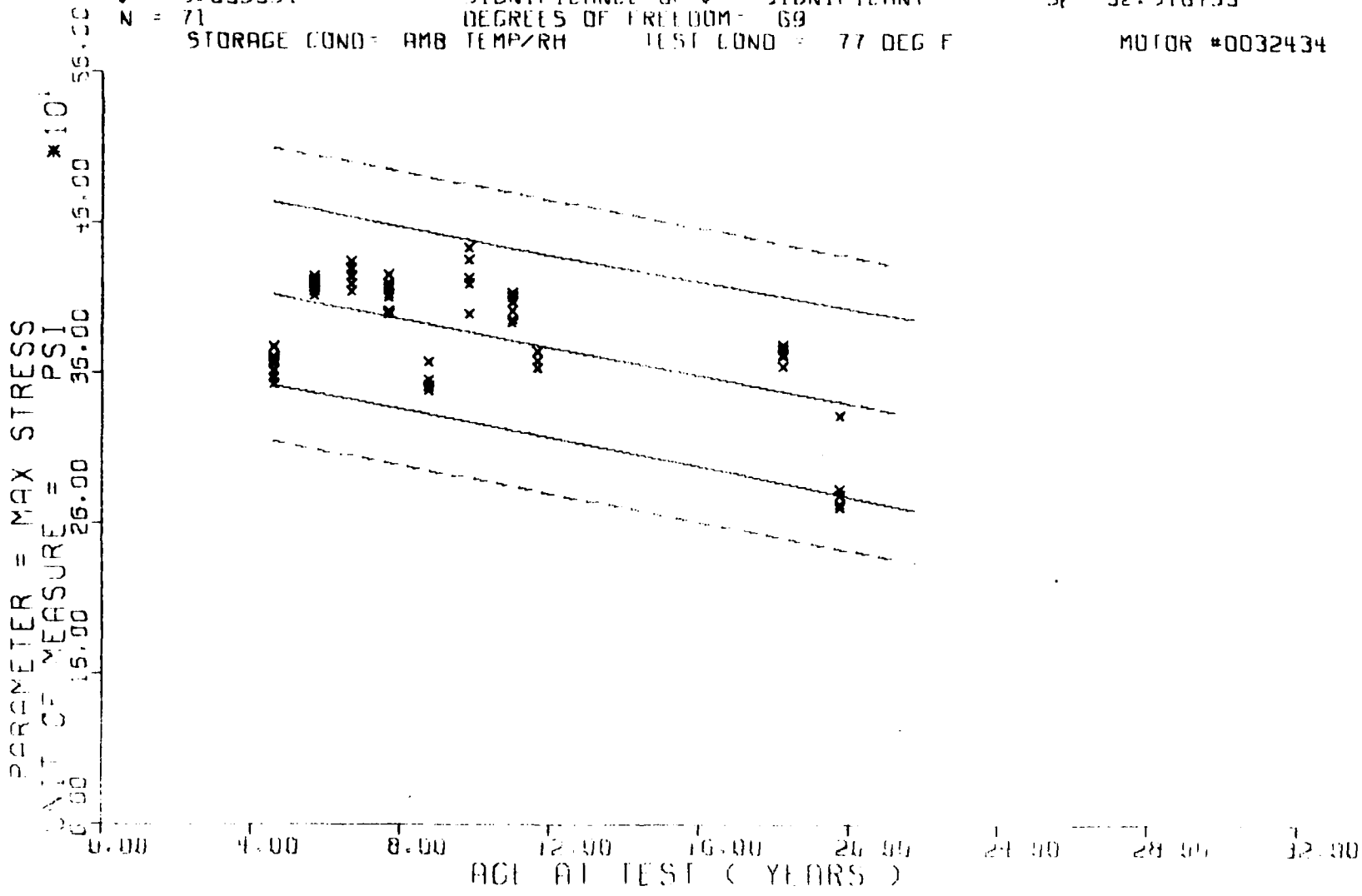
F = 31.802787 SIGNIFICANCE OF F - SIGNIFICANT σ_Y = 39.023040

R = 0.561690 SIGNIFICANCE OF R - SIGNIFICANT S_B = 0.069574

C = 5.639394 SIGNIFICANCE OF C SIGNIFICANT S_E = 32.518753

N = 71 DEGREES OF FREEDOM = 69

STORAGE COND = AMB TEMP/RH TEST COND = 77 DEG F MOTOR #0032434



STORE III. MAX STRESS. LOW RATE TENSILE TEST. PAS 2.6

Figure 4-31

Y = (0.383260) + (0.000023) * X

F = 0.581984
R = 0.092119
t = 0.762879
N = 70

SIGNIFICANCE OF F = NOT SIGNIFICANT
SIGNIFICANCE OF R = NOT SIGNIFICANT
SIGNIFICANCE OF t = NOT SIGNIFICANT
DEGREES OF FREEDOM= 68

σ_Y = 0.014085
S_B = 0.000030
S_F = 0.014128

STORAGE COND= AMB TEMP/RH TEST COND = 77 DEG F MOTOR #0032434

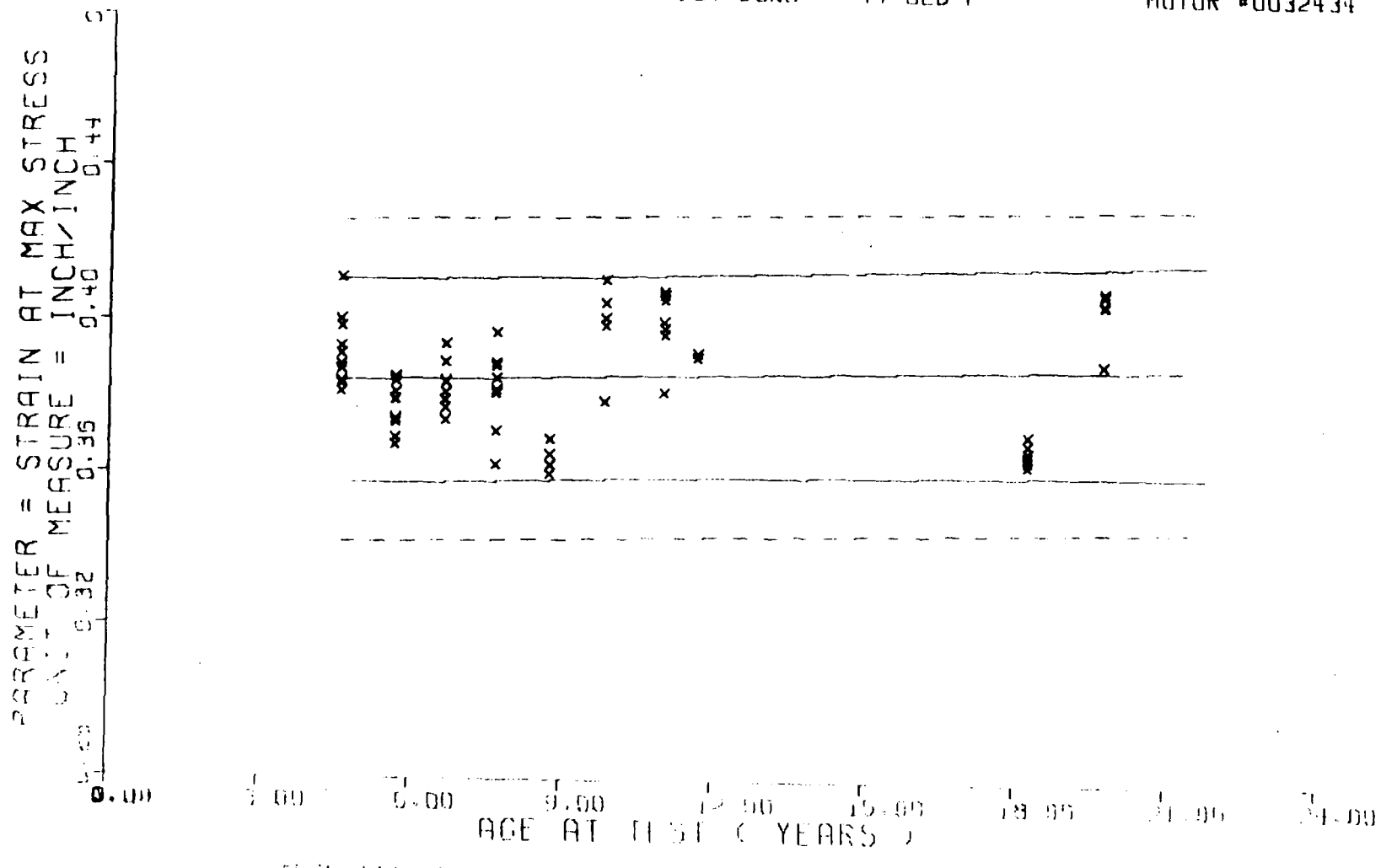
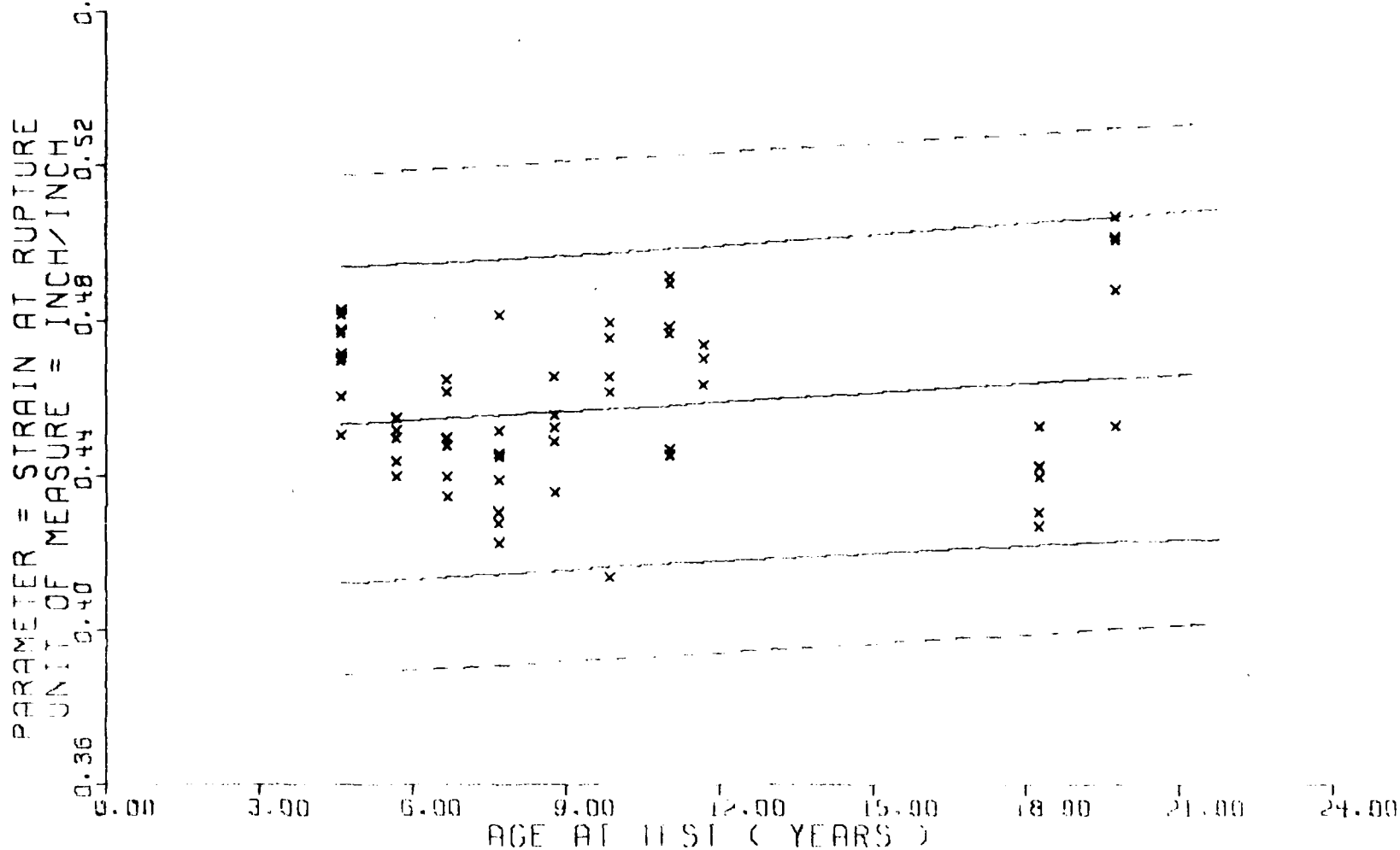


FIGURE 4-32 STRAIN AT MAX STRESS, LOW RATE TENSILE TEST, [illegible]

Figure 4-32

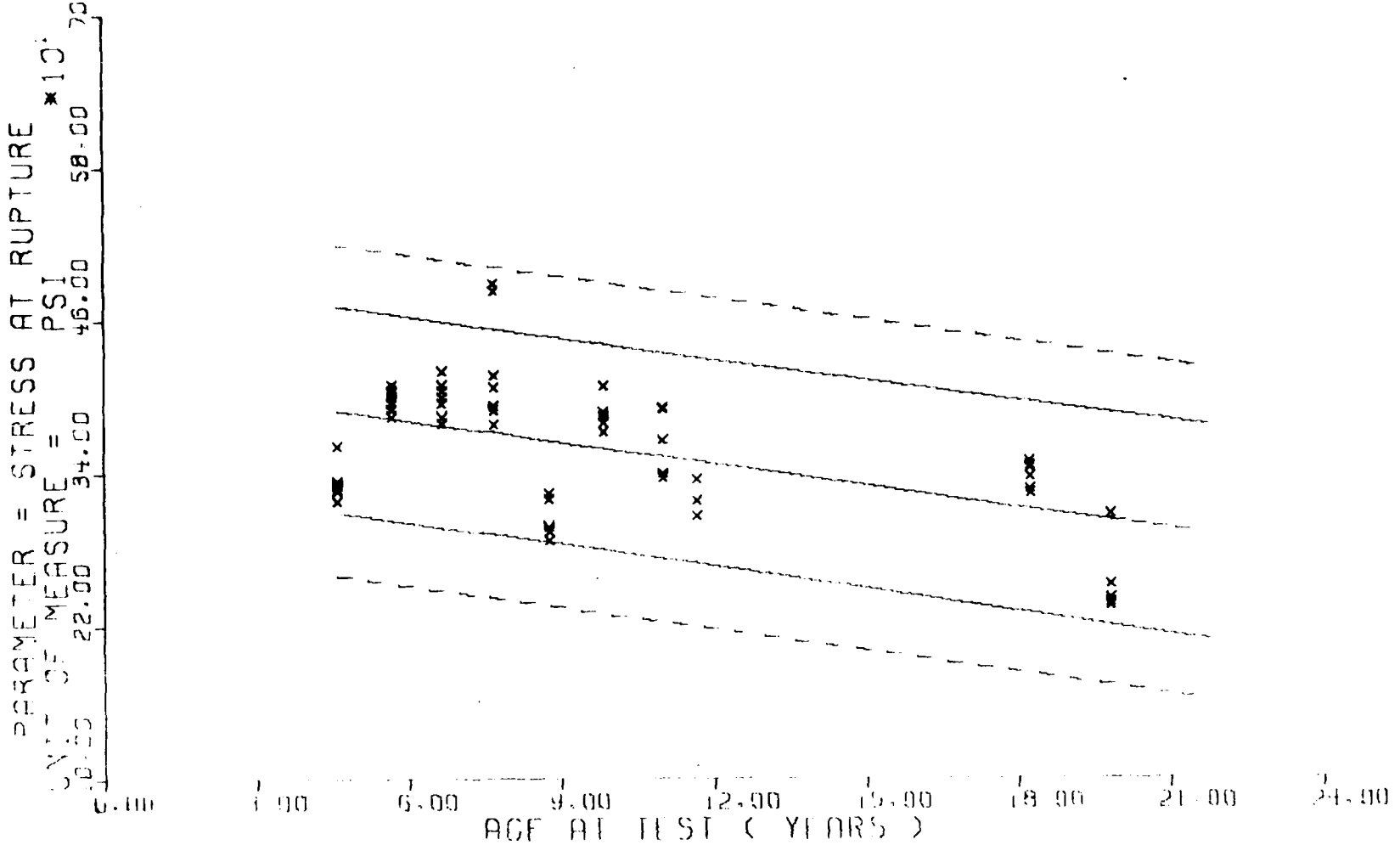
F = 1.995180 SIGNIFICANCE OF F = NOT SIGNIFICANT σ_Y = 0.021751
R = 0.168833 SIGNIFICANCE OF R = NOT SIGNIFICANT S_B = 0.000046
t = 1.412508 SIGNIFICANCE OF t = NOT SIGNIFICANT S_F = 0.021596
N = 70 DEGREES OF FREEDOM = 68
STORAGE COND= AMB TEMP/RH TEST COND = 77 DEG F MOTOR #0032434



STAGE III. STRAIN AT RUPTURE, LOW RATE TENSILE TEST, CUS-2 0

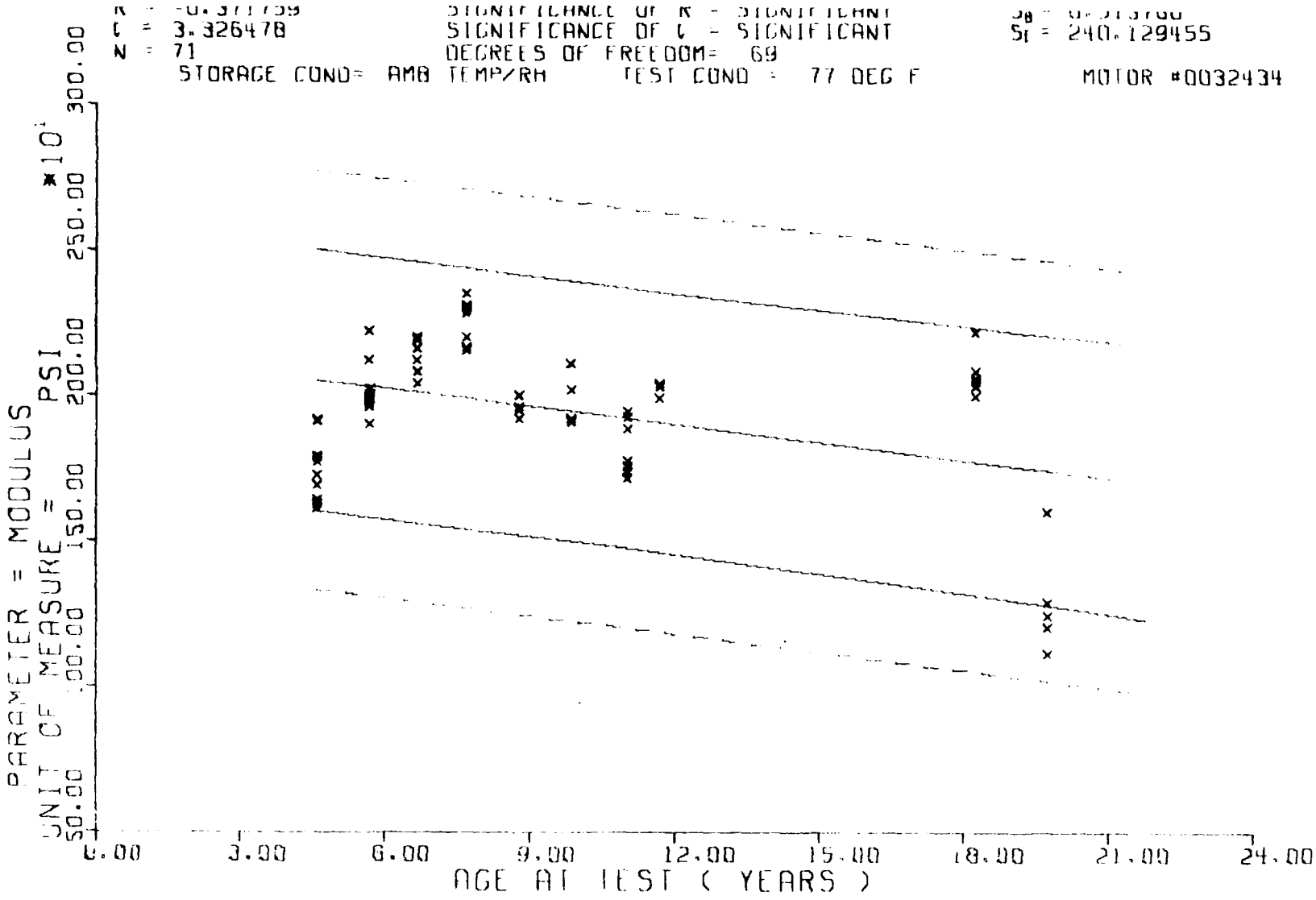
Figure 4-33

F = 26.274162 SIGNIFICANCE OF F = SIGNIFICANT σ_Y = 50.458129
R = -0.525142 SIGNIFICANCE OF R = SIGNIFICANT S_B = 0.092238
C = 5.125831 SIGNIFICANCE OF C = SIGNIFICANT S_E = 43.250640
N = 71 DEGREES OF FREEDOM= 69
STORAGE COND= AMB TEMP/RH TEST COND = 77 DEG F MOTOR #0032434



STAGE III. STRESS AT RUPTURE, LOW RATE TENSILE TEST, CHS 2.0

Figure 4-34



STAGE III. MODULUS. LOW RATE TENSILE TEST. CHS-2.0

Figure 4-35