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113

Outdoor Performance of Plastics X. Final Update of Weathering Data

Walter J. Rossiter, Jr.

Center for Building Technology
Institute for Applied Technology
National Bureau of Standards

March 1973

Final Report

Prepared for
Manufacturing Chemists Association
1825 Connecticut Avenue, N. W.
Washington, D. C. 20009



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OURDOOR PERFORMANCE OF PLASTICS
X. FINAL UPDATE OF WEATHERING DATA

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U. S. DEPARTMENT OF COMMERCE, Frederick B. Dent, Secretary
NATIONAL BUREAU OF STANDARDS, Richard W. Roberts, Director

for the
of the

Abstract

Twenty plastics samples have been weathered in Arizona, Florida, and Washington, D. C. for 72 months. The weathering of these samples has been followed by measuring changes in the specimen's color, tensile, flexure, gloss, and haze properties. Computer-generated graphs of these changes with time are presented.

This is the final updating of the Manufacturing Chemists' Association's (MCA) project which studied the outdoor performance of plastics. Since 1966, twenty plastics samples (Table I) have been exposed outdoors at three different exposure sites (Table II) which represent varying climatic conditions encountered in the United States. The MCA project and preliminary results have been described in a series of National Bureau of Standards Reports. These reports [1-9]*, all entitled Outdoor Performance of Plastics, have the following subtitles:

- I. Introduction and Color-Change [1].
- II. Tensile and Flexural Properties [2].
- III. Statistical Model for Predicting Weatherability [3].
- IV. Significance of Climate [4].
- V. Surface Roughness [5].
- VI. Electrical Properties [6].
- VII. Haze and Gloss [7].
- VIII. First Update of Weathering Data [8].
- IX. Second Update of Weathering Data [9].

Changes in those properties listed in the above subtitles were the means for determining the outdoor performance of the twenty samples. A computer was used for data storage and retrieval. Graphs of property vs. outdoor exposure time were generated by the computer. These graphs were reproduced in the various reports as the method of reporting property changes.

* Numbers in brackets refer to references which are found in the back of this report.

From the preliminary results, it was decided that color, tension, flexure, gloss, and haze would be the significant properties to follow for the remainder of the project. The samples remaining have now been exposed outdoors for 72 months. These five properties have been measured for each plastic. The physical testing was again performed by MCA member companies (Table III), and the test results sent here to the National Bureau of Standards for incorporation with the earlier data. Although these data were originally reported in three separate NBS reports [1, 2, 7], the data through 72 months for the five properties are all presented in this single report.

Experimental details are not given here; such details can be found in the earlier reports. Again, the data are presented as reproductions of the computer-generated graphs (Figures 1-81B). These graphs differ from the earlier ones in that the X-axis (time in months) has been expanded to 72 months. Thus, the data points are compressed when compared to those of the original graphs.

This report includes all previous data. Some plastics have failed in the field and obviously there are no additional data for these samples. Graphs with the expanded time have been reproduced for those samples for which there are no additional data. This report is meant to be a replacement for the two previous supplemental ones [8, 9]. The weathering of the plastics can be followed without reference to them. The graphs are identical except for the additional data.

The color data presented in the first report [1] were erroneous. These data were corrected in the first supplemental report [8]. No

comparisons can be made between the graphs for color change in the first report and any of the updates.

This report is only intended as a presentation of the new data. No discussion of the accumulated data is presented.

References

- [1] "Outdoor Performance of Plastics. I. Introduction and Color-Change", J. E. Clark, N. E. Green, and P. Giesecke, NBS Report #9912, Sept. 1968.
- [2] "Outdoor Performance of Plastics. II. Tensile and Flexural Properties", J. E. Clark, G. E. Gulmer, R. C. Neuman, and J. A. Slater, NBS Report #10014, March 1969.
- [3] "Outdoor Performance of Plastics. III. Statistical Model for Predicting Weatherability", J. E. Clark and J. A. Slater, NBS Report #10016, Oct. 1969.
- [4] "Outdoor Performance of Plastics. IV. Significance of Climate", J. E. Clark and C. Bal Krishna, NBS Report #10156, Jan. 1970.
- [5] "Outdoor Performance of Plastics. V. Surface Roughness", J. E. Clark, C. Bal Krishna, H. C. Gunst, and J. R. Dagon, NBS Report #10179, March 1970.
- [6] "Outdoor Performance of Plastics. VI. Electrical Properties", J. E. Clark, J. A. Slater, and V. L. Bergeron, NBS Report #10185, March 1970.
- [7] "Outdoor Performance of Plastics. VII. Haze and Gloss", J. E. Clark, C. Bal Krishna, G. C. Claver, and F. H. McTigue, NBS Report #10188, March 1970.
- [8] "Outdoor Performance of Plastics. VIII. First Update of Weathering Data", W. J. Rossiter, Jr. and W. D. Hayes, Jr., NBS Report #10479, September 1971.
- [9] "Outdoor Performance of Plastics. IX. Second Update of Weathering Data", W. J. Rossiter, Jr., NBS Report #10856, May 1972.

Table I

List of Twenty Plastics

<u>Base Polymer</u>	<u>Plastic</u>
Polyethylene	Translucent - 1 mil - 60 mil
Poly (methyl methacrylate)	Clear - 60 mil
Poly (vinyl fluoride)	Clear - 1 mil
Poly (ethylene terephthalate)	Clear - 5 mil
Polyester/x-linked	Clear - 60 mil
Poly (vinyl chloride)	Clear - 4 mil
	- 10 mil
	- 60 mil
	<u>Ba-Cd</u>
	Clear - 4 mil
	- 10 mil
	- 60 mil
	<u>Sn</u>
	Clear - 60 mil
	White - 4 mil
	- 10 mil
	- 60 mil
<u>Ba-Cd</u>	
White - 4 mil	
- 10 mil	
- 60 mil	
<u>Sn</u>	
White - 60 mil	

Table II

Exposure Sites

<u>Name and Location</u> *	<u>Letter Designation for Graphs</u>
Desert Sunshine Exposure Tests, Inc. Phoenix, Arizona	A
South Florida Test Service, Inc. Miami, Florida	F
Old NBS Site Connecticut & Van Ness Streets Washington, D. C.	W

* Samples were placed on the exposure racks facing south at 45° from the horizontal.

Table III

Plastics Evaluation

Property	Company & Location
Color	American Cyanamid Company Stamford, Connecticut
Tensile Flexure	W. R. Grace & Company Clarksville, Maryland
Haze	Monsanto Company Indian Orchard, Massachusetts
Gloss	Hercules Incorporated Wilmington, Delaware

List of Figures

Numbers

1 - 20	Color-change, ΔE (Delta E)
21 - 40	Ultimate Elongation (% of Initial Value)
41 - 48	5 Percent Stress (PSI)
49 - 68	Gloss (in percent)
69A - 81A	Haze at 421 nm (in percent)
69B - 81B	Haze at 550 nm (in percent)

FIGURE 1

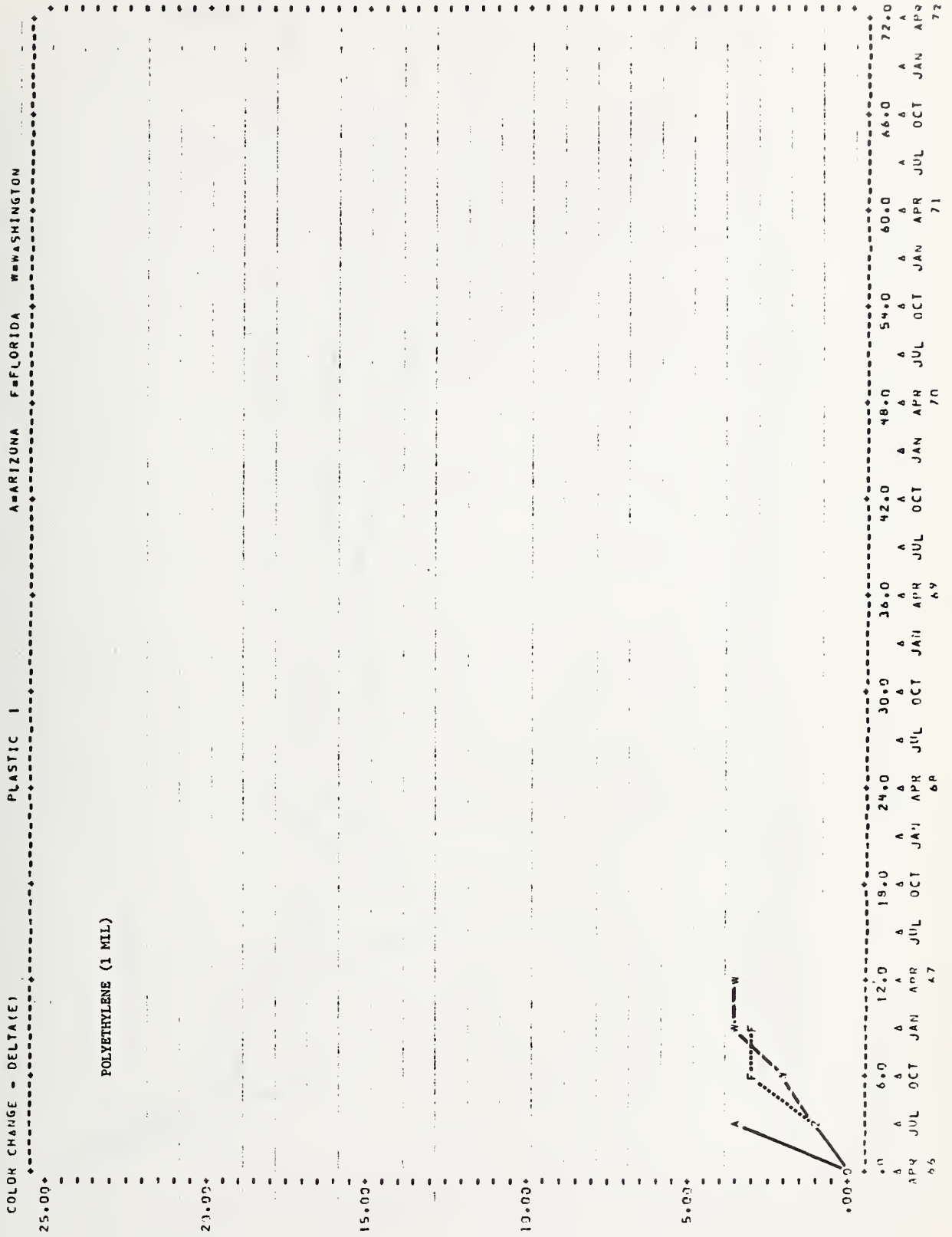


FIGURE 2

COLOR CHANGE - DELTA(E) PLASTIC 2 A=ARIZONA F=FLORIDA W=WASHINGTON

POLYETHYLENE (60 MIL)

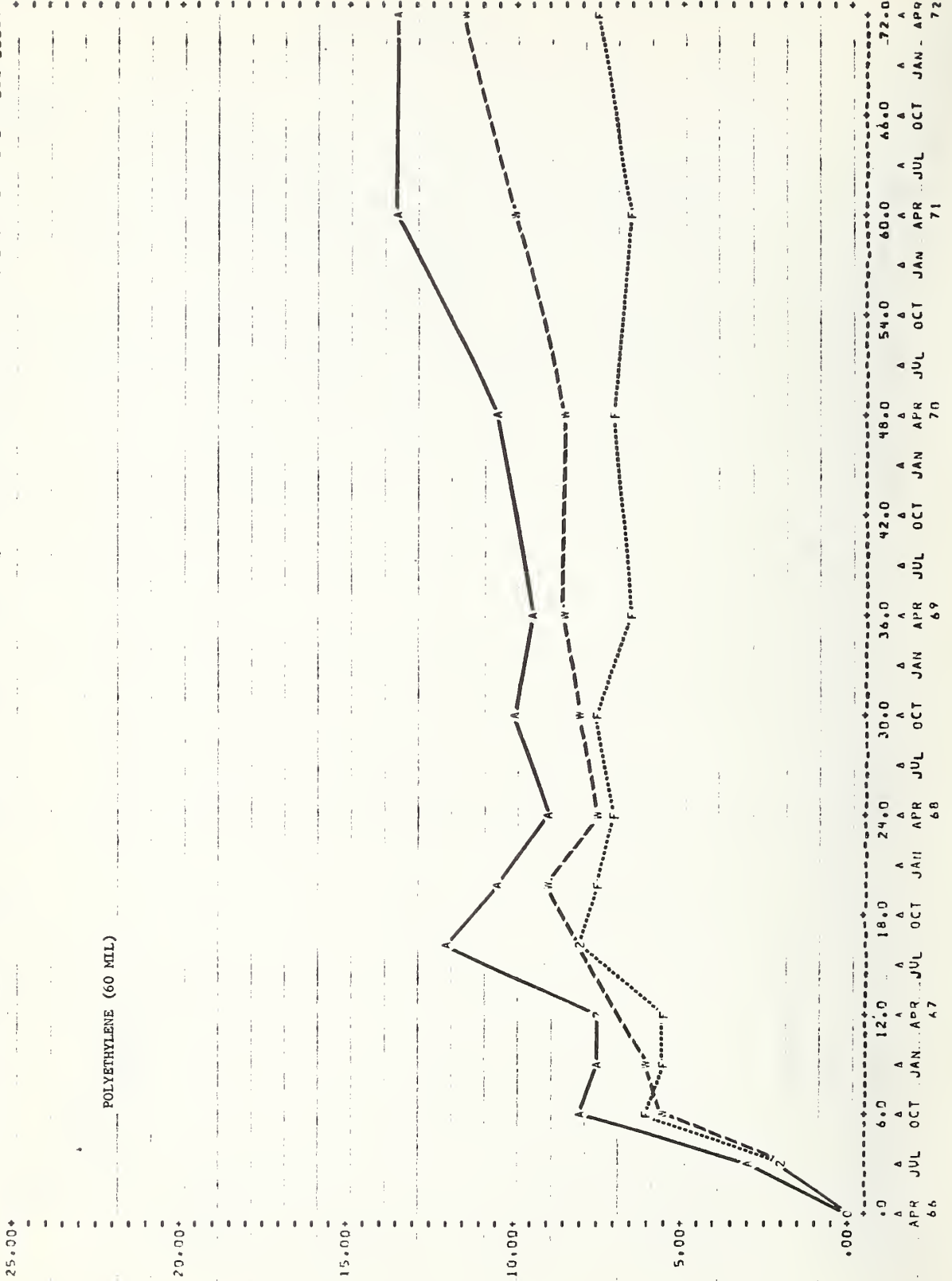


FIGURE 3

COLOR CHANGE - DELTAE) PLASTIC 3 A=ARIZONA F=FLORIDA W=WASHINGTON

POLYMETHYL METHACRYLATE (60 MIL)

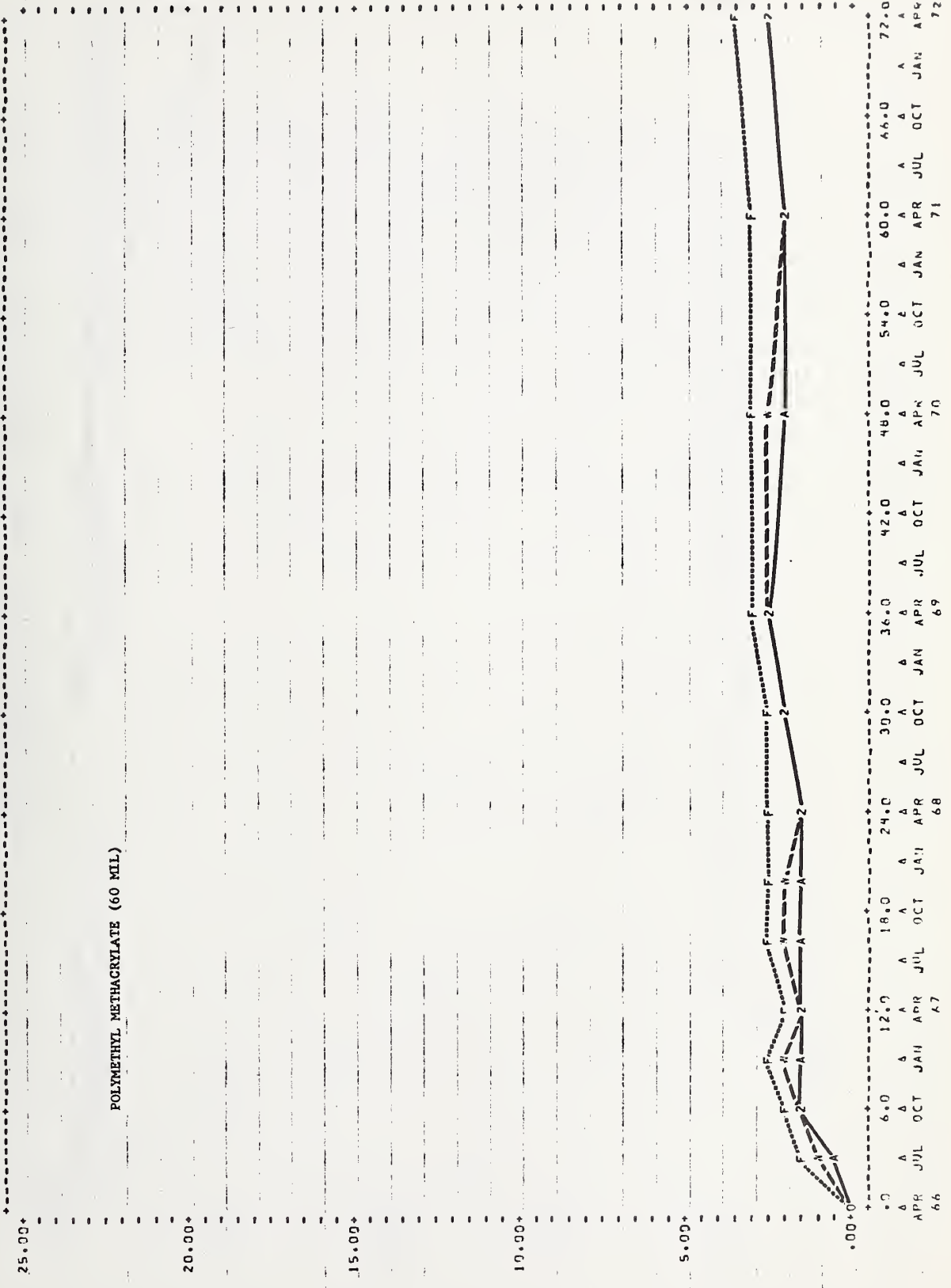


FIGURE 5

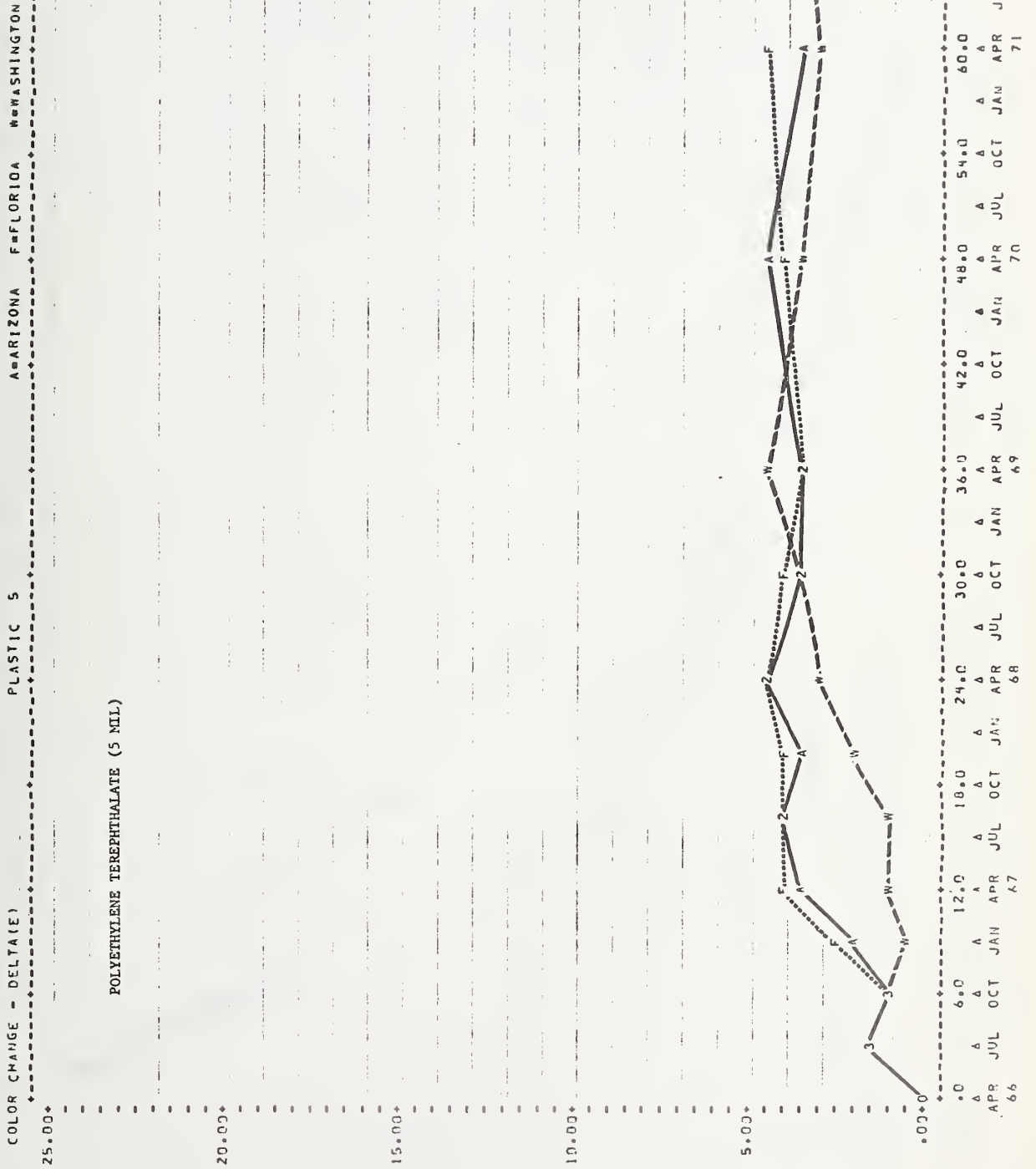
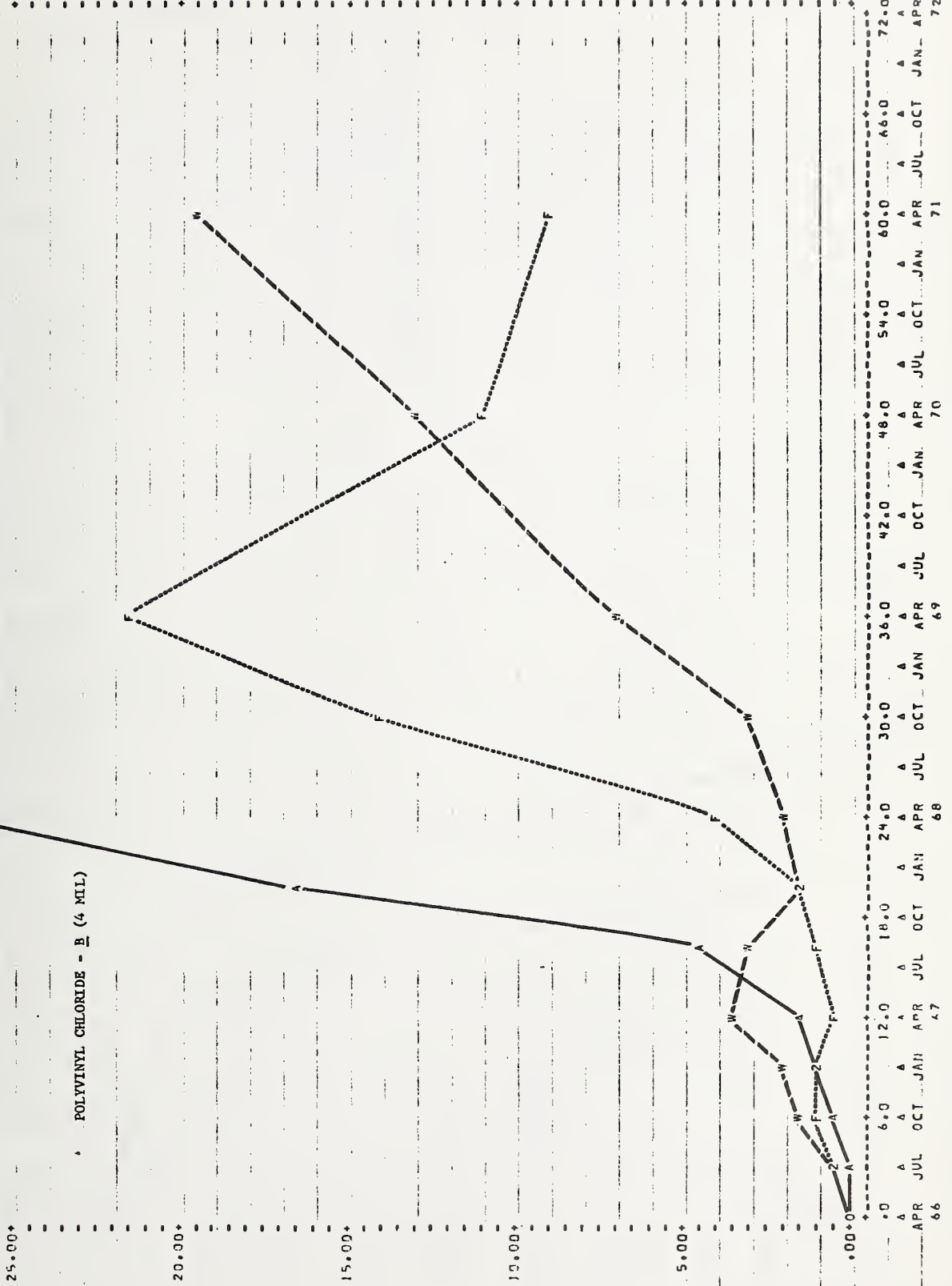


FIGURE 7

COLOR CHANGE - DELTA(E) PLASTIC 7 A=ARIZONA F=FLORIDA W=WASHINGTON

POLYVINYL CHLORIDE - B (4 MIL)



NOTE. 2 POINTS FELL OUTSIDE THE SPECIFIED LIMITS AND WERE OMITTED.

FIGURE 8

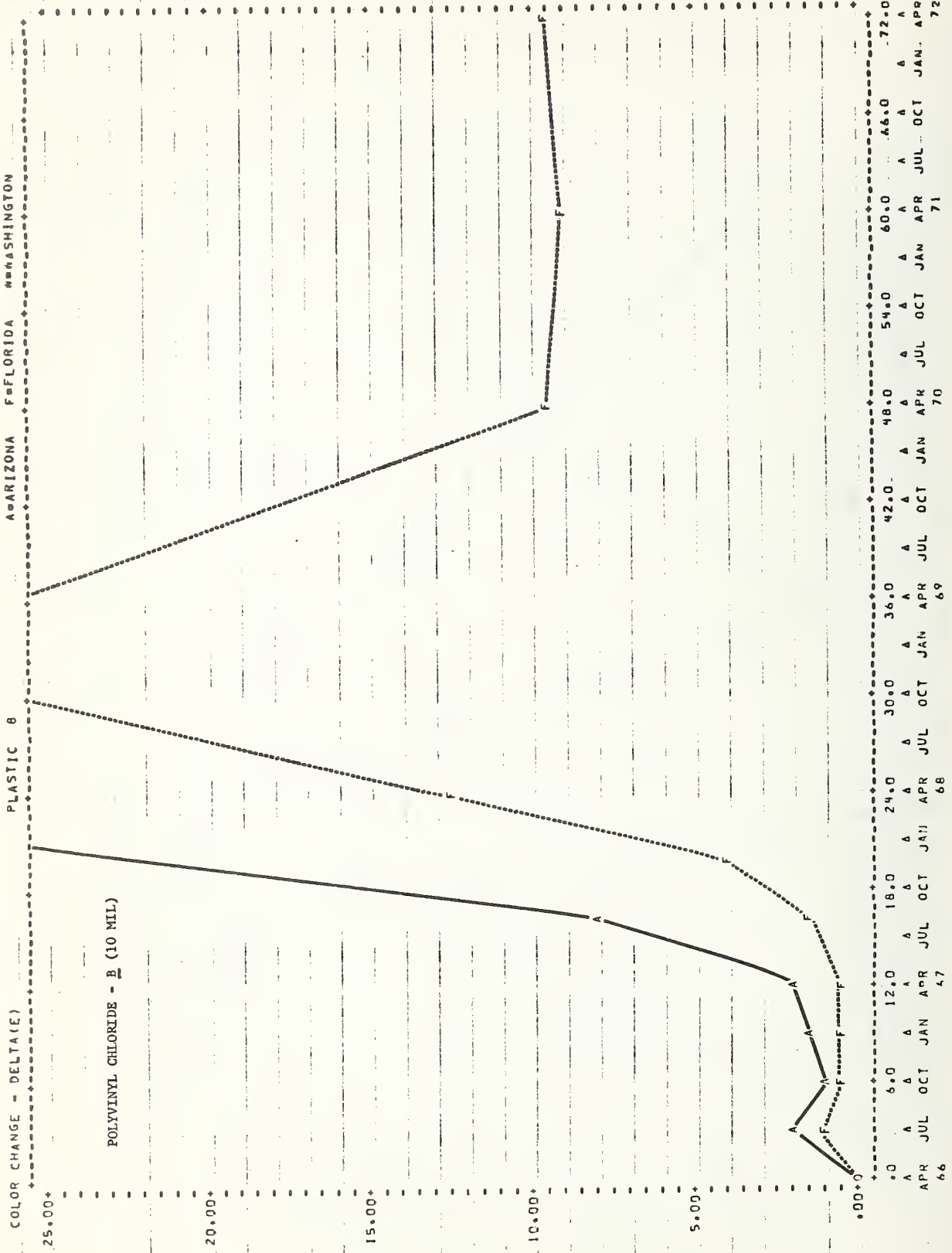


FIGURE 10

COLOR CHANGE - DELTA(E) PLASTIC 10 A=ARIZONA F=FLORIDA W=WASHINGTON

POLYVINYL CHLORIDE - C (4 MIL)

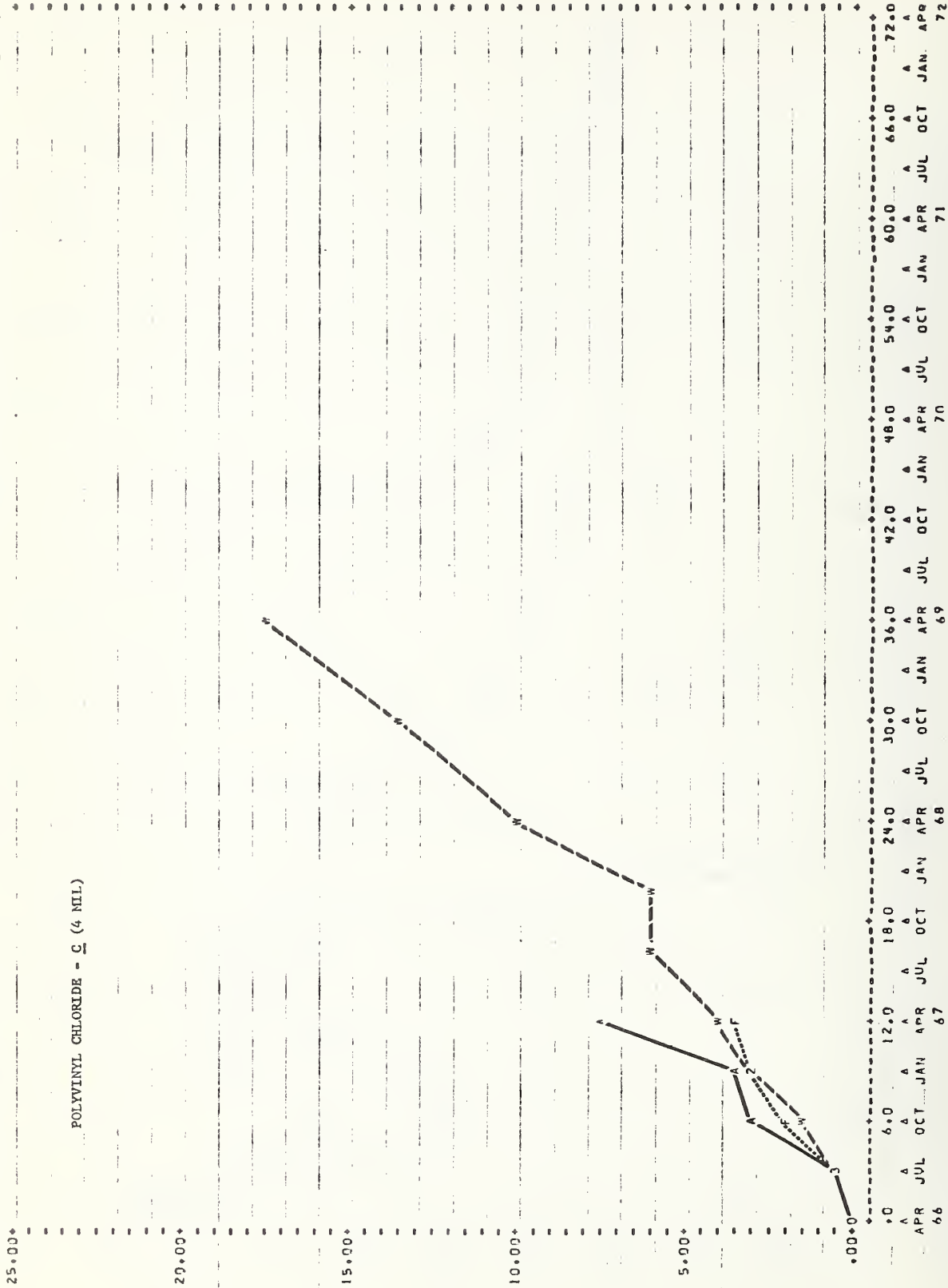
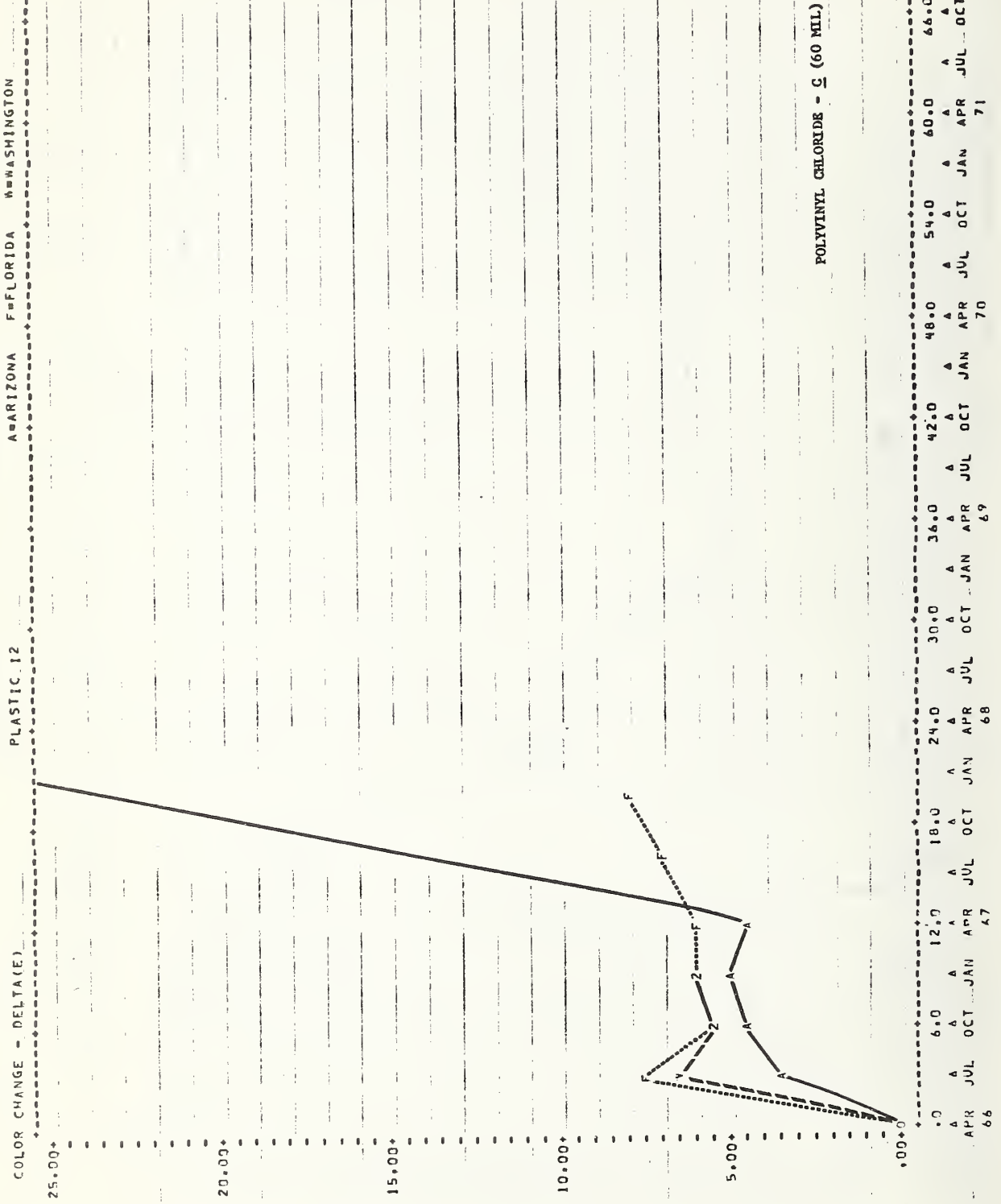


FIGURE 12



NOTE. 1 POINTS FELL OUTSIDE THE SPECIFIED LIMITS AND WERE OMITTED.

FIGURE 14

COLOR CHANGE - DELTA(E) PLASTIC 14 A=ARIZONA F=FLORIDA W=WASHINGTON

POLYVINYL CHLORIDE - A (4 MIL)

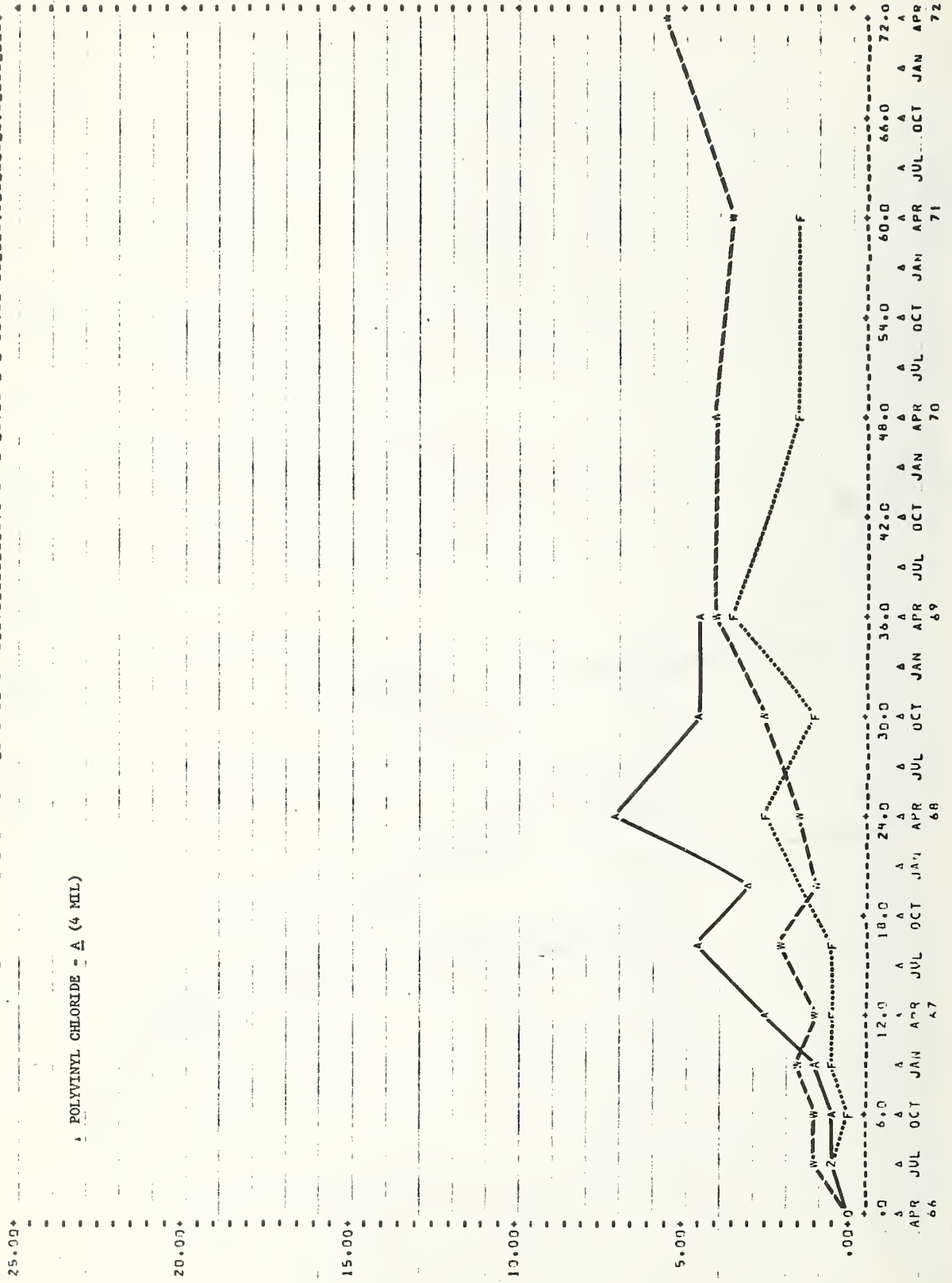


FIGURE 16

PLASTIC 16

A=ARIZONA F=FLORIDA W=WASHINGTON

COLOR CHANGE - DELTA(E)

25.00+

POLYVINYL CHLORIDE - A (60 MIL)

20.00+

15.00+

10.00+

5.00+

0.00+

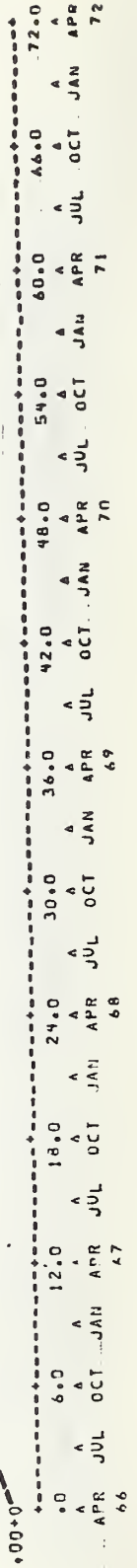
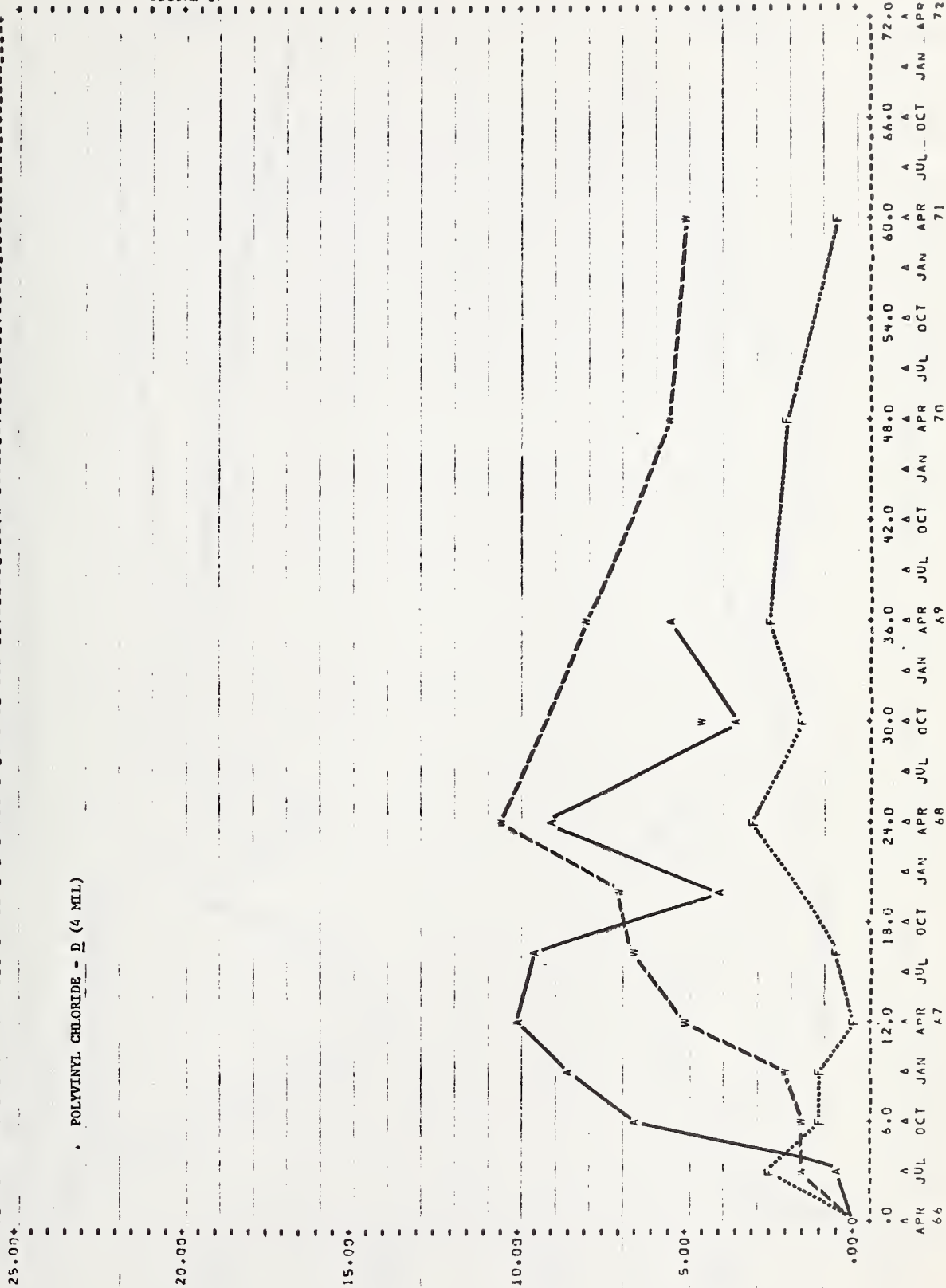


FIGURE 17

COLOR CHANGE - DELTA(E) PLASTIC 17 A=ARIZONA F=FLORIDA W=WASHINGTON

POLYVINYL CHLORIDE - D (4 MIL)



12
15
20
3
3
3
3
3
3

FIGURE 18

COLOR CHANGE - DELTA(E) PLASTIC 1B ARIZONA FLORIDA WASHINGTON

POLYVINYL CHLORIDE - D (10 ML)

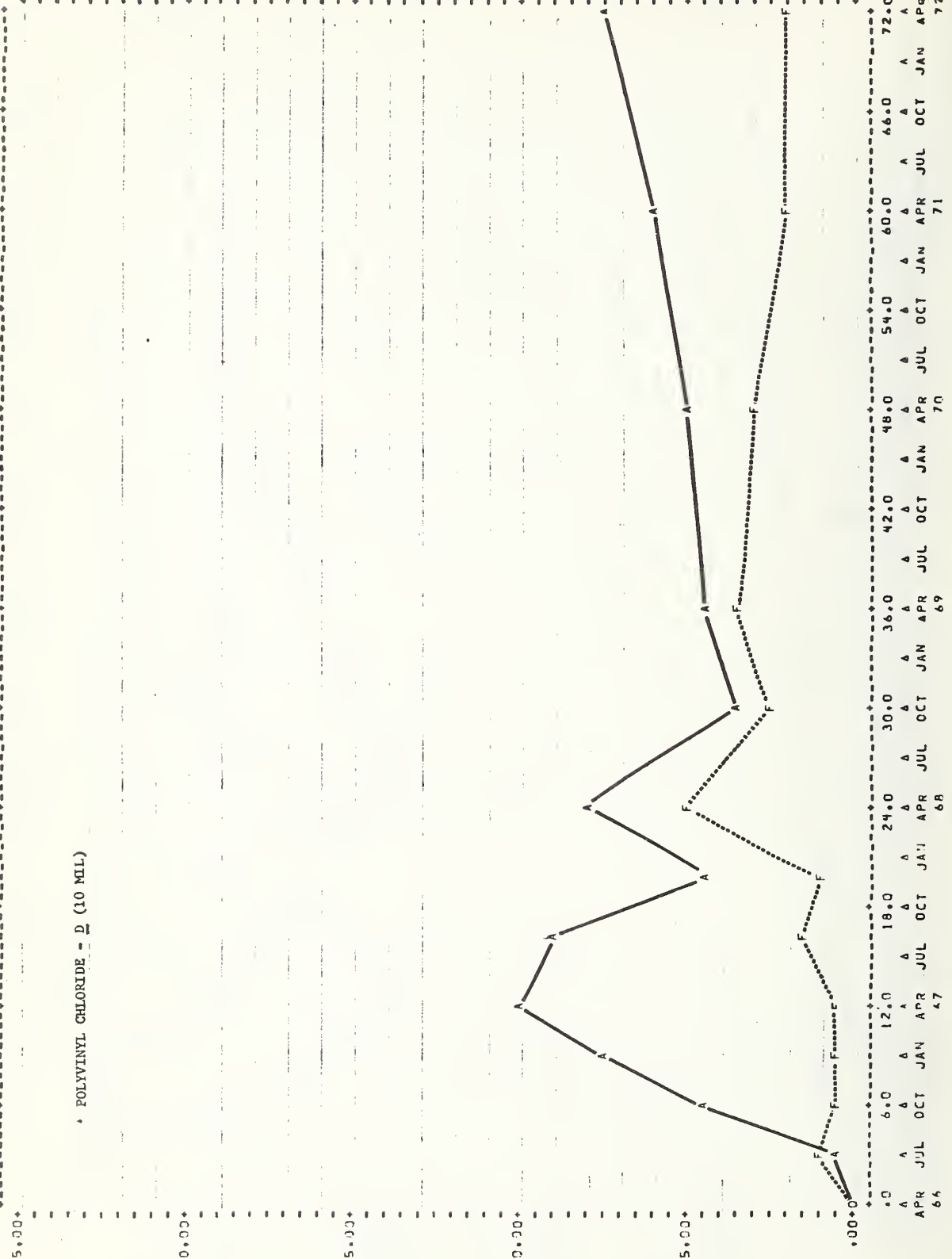


FIGURE 19

COLOR CHANGE - DELTA(E) PLASTIC 19 A=ARIZONA F=FLORIDA W=WASHINGTON

25.00+

POLYVINYL CHLORIDE - D (60 MIL)

20.00+

15.00+

10.00+

5.00+

0.00+

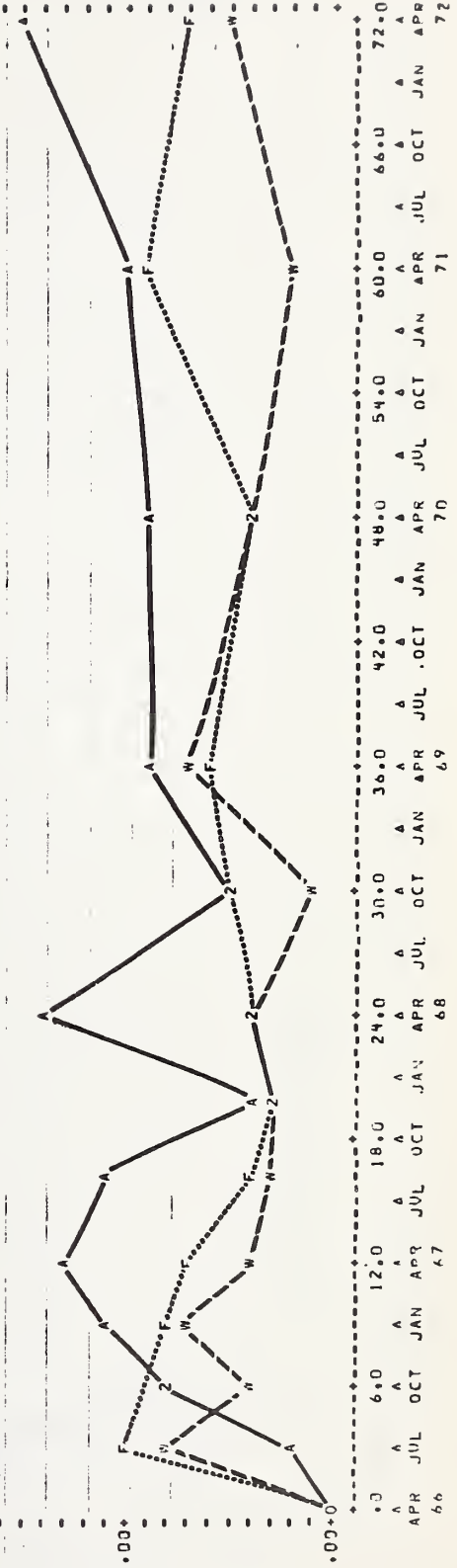


FIGURE 21

ULTIMATE FLOWGATION (PERCENT OF INITIAL VALUE) PLASTIC 1 A=ARIZONA F=FLORIDA W=WASHINGTON

POLYETHYLENE (1 MIL)

INITIAL VALUE = 504.0%

150.00+

120.00+

90.00+

60.00+

30.00+

0.00+

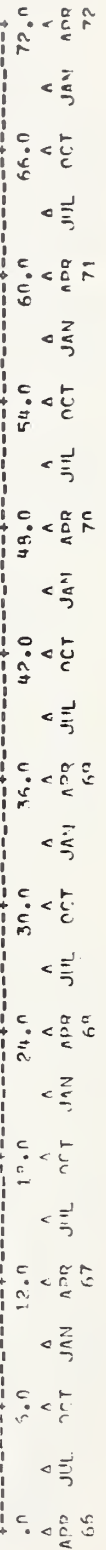


FIGURE 22

ULTIMATE FLOCCATION (PERCENT OF INITIAL VALUE) PLASTIC 2 ARIZONA FLOERINA MEMPHINGTON

POLYETHYLENE (60 MIL)
INITIAL VALUE = 814.0%

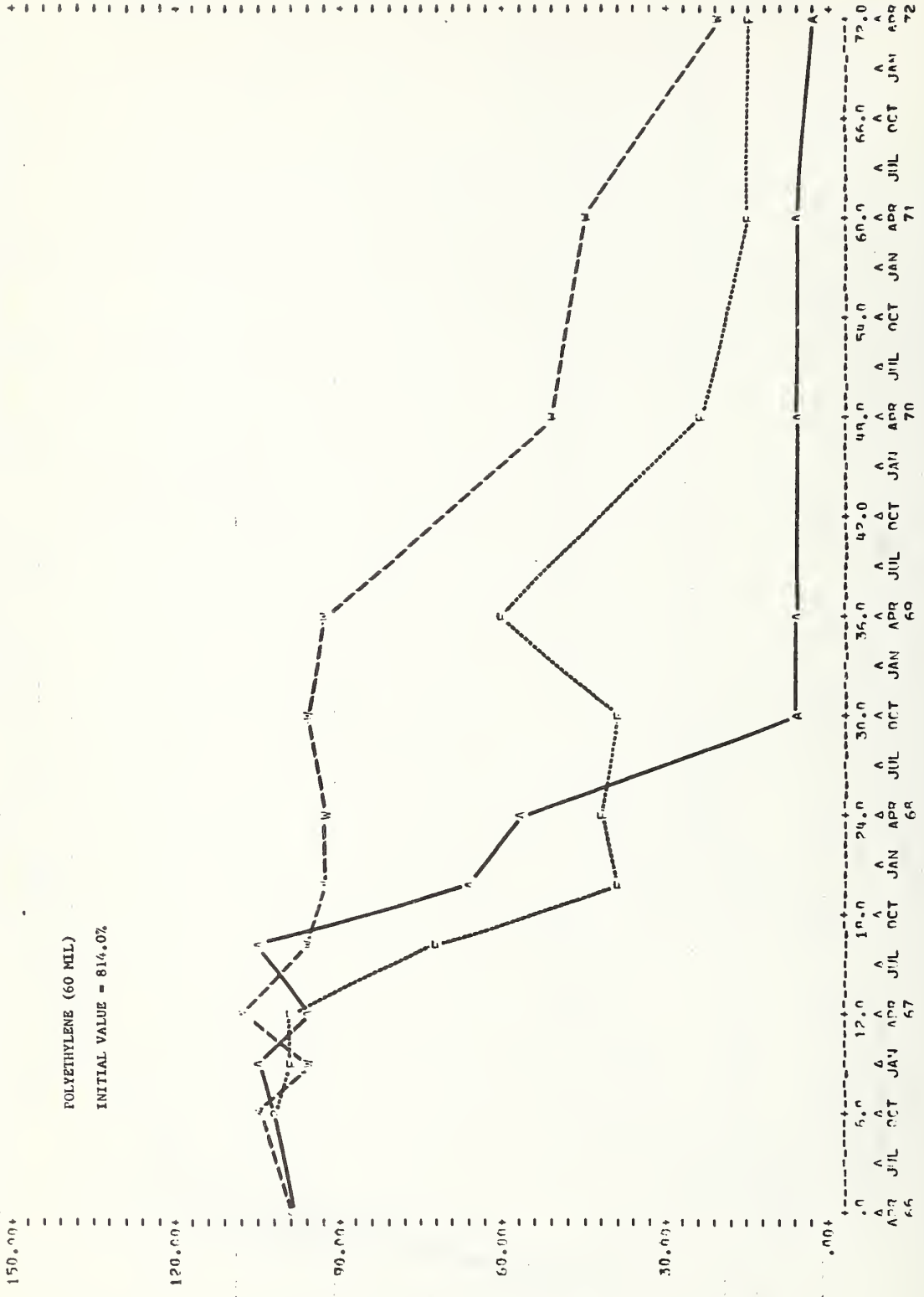


FIGURE 24

ULTIMATE ELONGATION (PERCENT OF INITIAL VALUE) PLASTIC 4

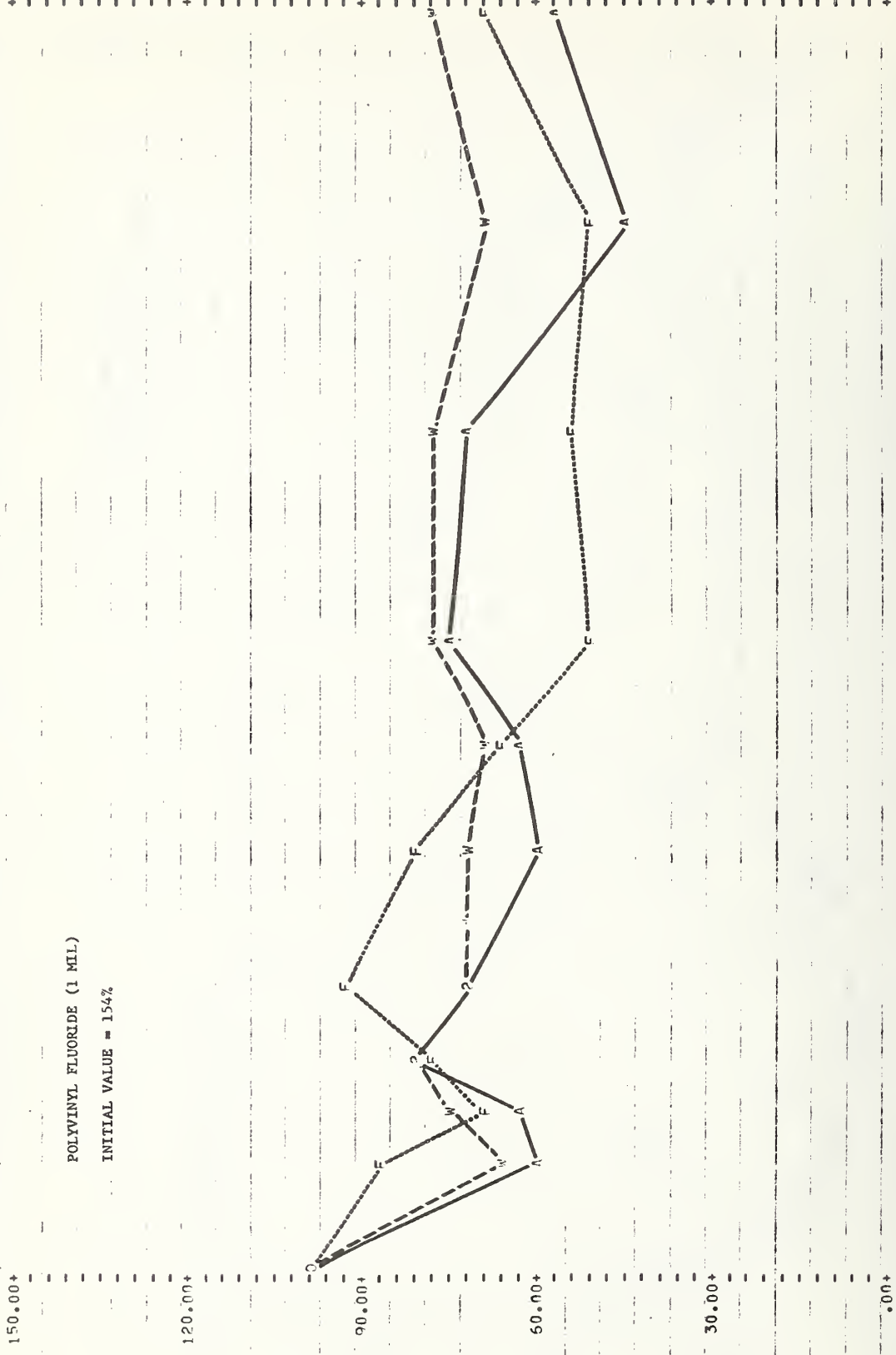
WASHINGTON

FLORIDA

ARIZONA

POLYVINYL FLUORIDE (1 MIL)

INITIAL VALUE = 154%



Year	Washington (Solid)	Florida (Dashed)	Arizona (Dotted)
56	50	50	50
57	55	55	55
58	60	60	60
59	65	65	65
60	70	70	70
61	75	75	75
62	80	80	80
63	85	85	85
64	90	90	90
65	95	95	95
66	100	100	100
67	105	105	105
68	110	110	110
69	115	115	115
70	120	120	120
71	125	125	125
72	130	130	130

FIGURE 25

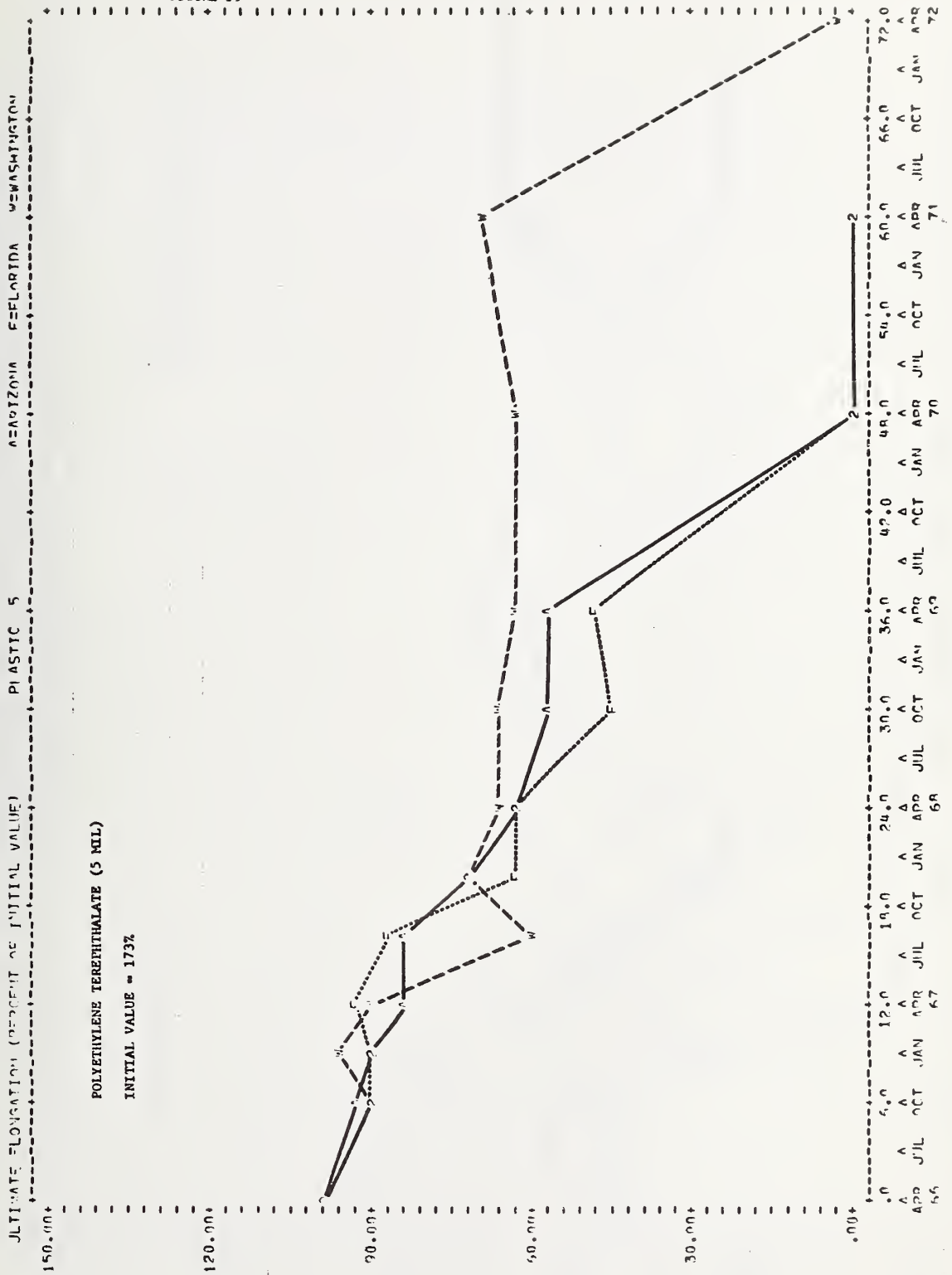


FIGURE 26

WASHINGTON

FLORIDA

ARIZONA

PLASTIC 6

ULTIMATE ELONGATION (PERCENT OF INITIAL VALUE)

150.00+

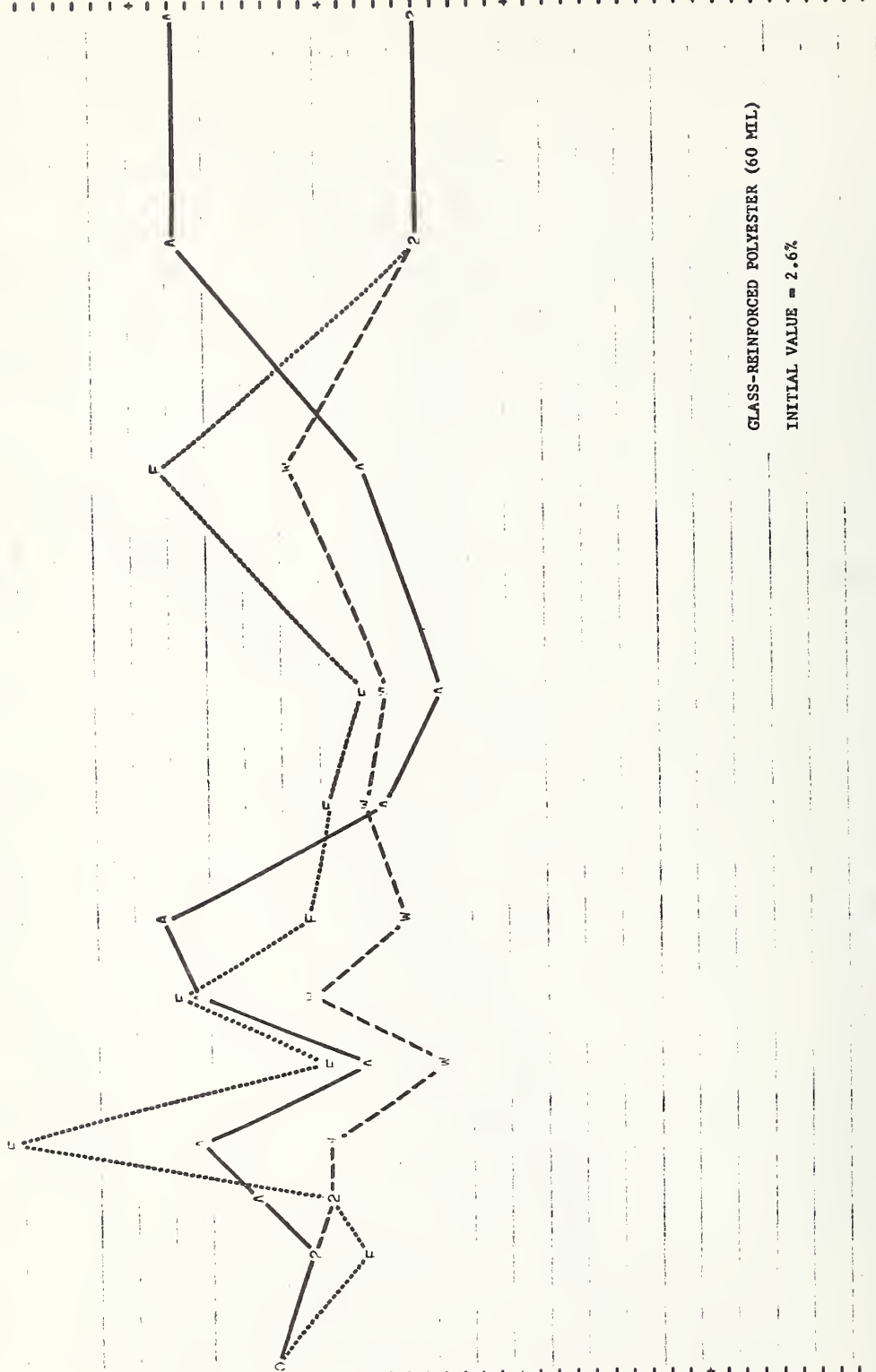
120.00+

90.00+

60.00+

30.00+

.00+



GLASS-REINFORCED POLYESTER (60 MIL)

INITIAL VALUE = 2.6%

Date	Washington (%)	Florida (%)	Arizona (%)
APR 65	0	0	0
JUL 65	10	10	10
OCT 65	12	12	12
JAN 66	14	14	14
APR 66	16	16	16
JUL 66	18	18	18
OCT 66	20	20	20
JAN 67	22	22	22
APR 67	24	24	24
JUL 67	26	26	26
OCT 67	28	28	28
JAN 68	30	30	30
APR 68	32	32	32
JUL 68	34	34	34
OCT 68	36	36	36
JAN 69	38	38	38
APR 69	40	40	40
JUL 69	42	42	42
OCT 69	44	44	44
JAN 70	46	46	46
APR 70	48	48	48
JUL 70	50	50	50
OCT 70	52	52	52
JAN 71	54	54	54
APR 71	56	56	56
JUL 71	58	58	58
OCT 71	60	60	60
JAN 72	62	62	62
APR 72	64	64	64
JUL 72	66	66	66
OCT 72	68	68	68
JAN 73	70	70	70

FIGURE 27

ULTIMATE FLOWGATION (PERCENT OF INITIAL VALUE) PLASTIC 7 ARIZONA FLORIDA WASHINGTON

POLYVINYL CHLORIDE - B (4 MIL)

INITIAL VALUE = 198.0%

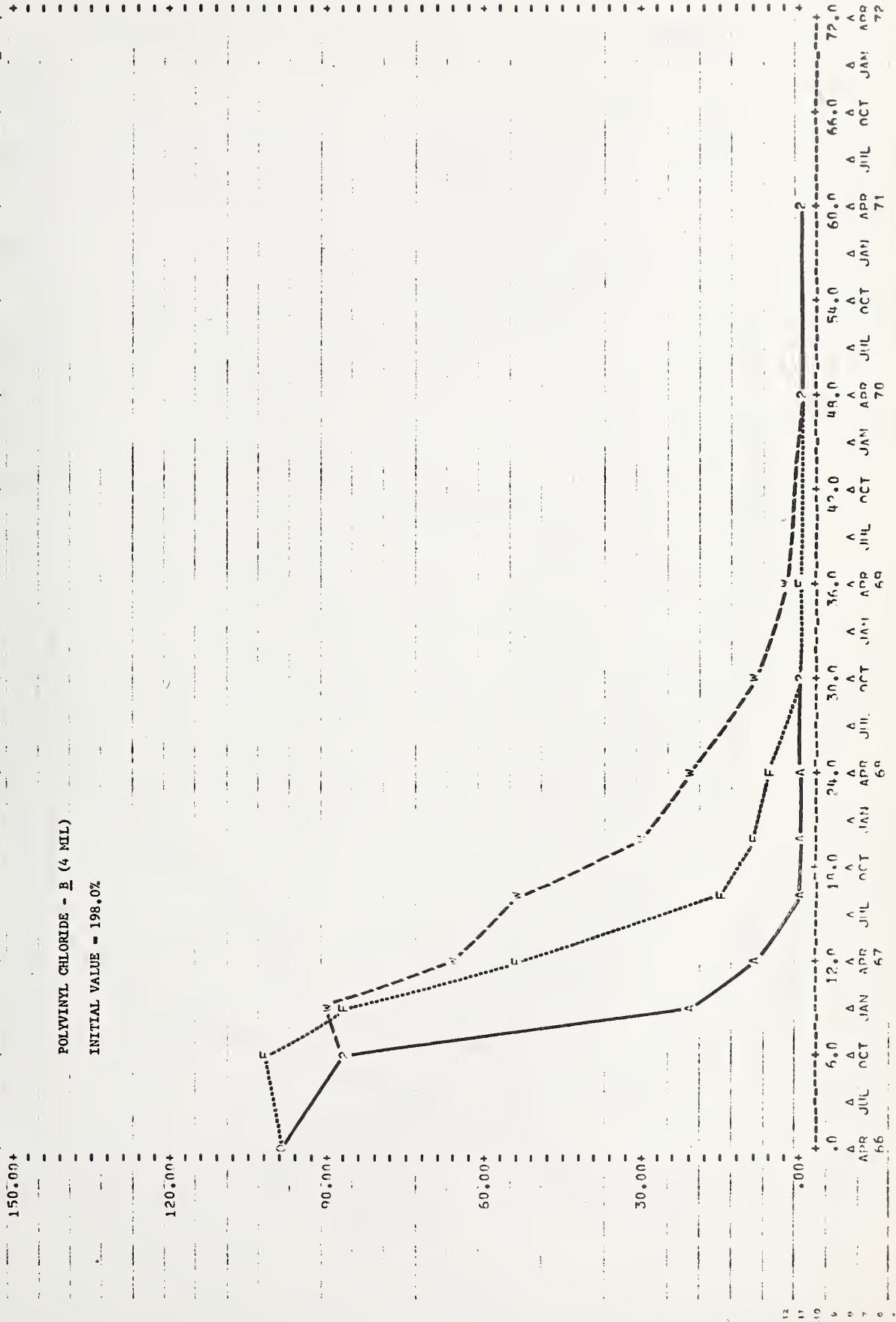


FIGURE 28

ULTIMATE ELONGATION (PERCENT OF INITIAL VALUE) PLASTIC REGION WASHINGTON

POLYVINYL CHLORIDE - B (10 MIL)

INITIAL VALUE = 203.0%

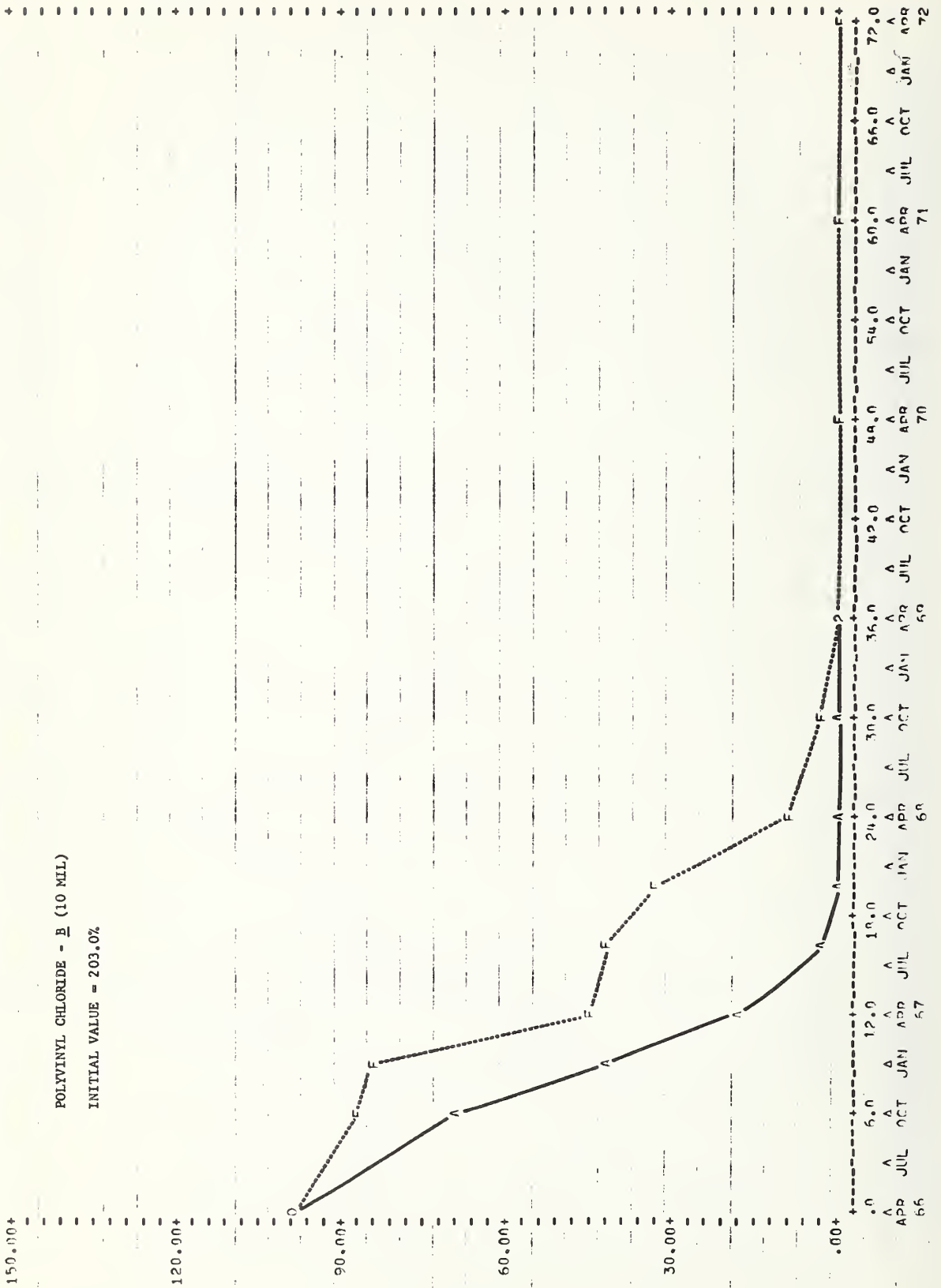


FIGURE 29

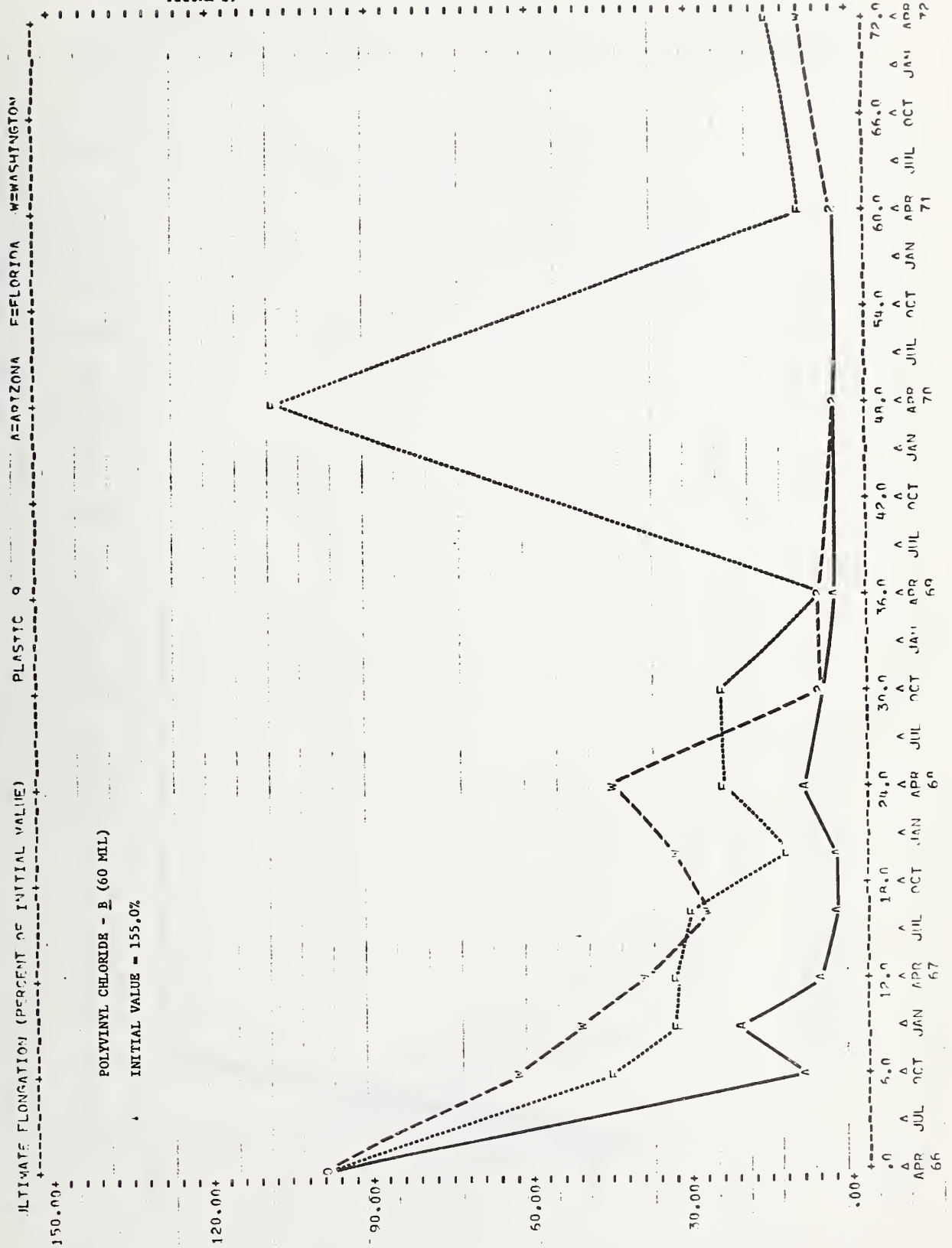


FIGURE 30

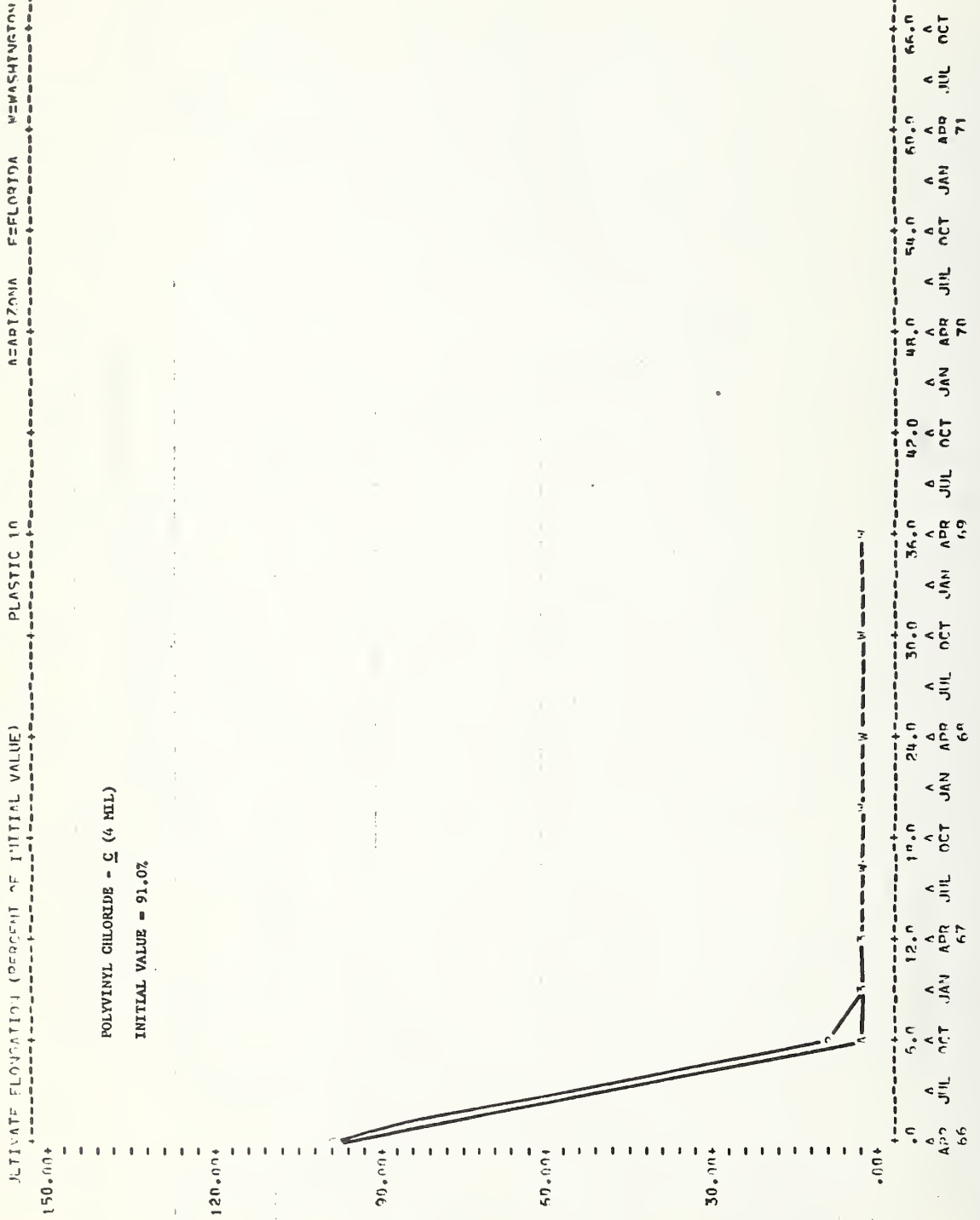


FIGURE 32

ULTIMATE ELONGATION (PERCENT OF INITIAL VALUE) PLASTIC 12

A=ARIZONA F=FLORIDA M=WASHINGTON

POLYVINYL CHLORIDE - C (60 MIL)

INITIAL VALUE = 32.1%

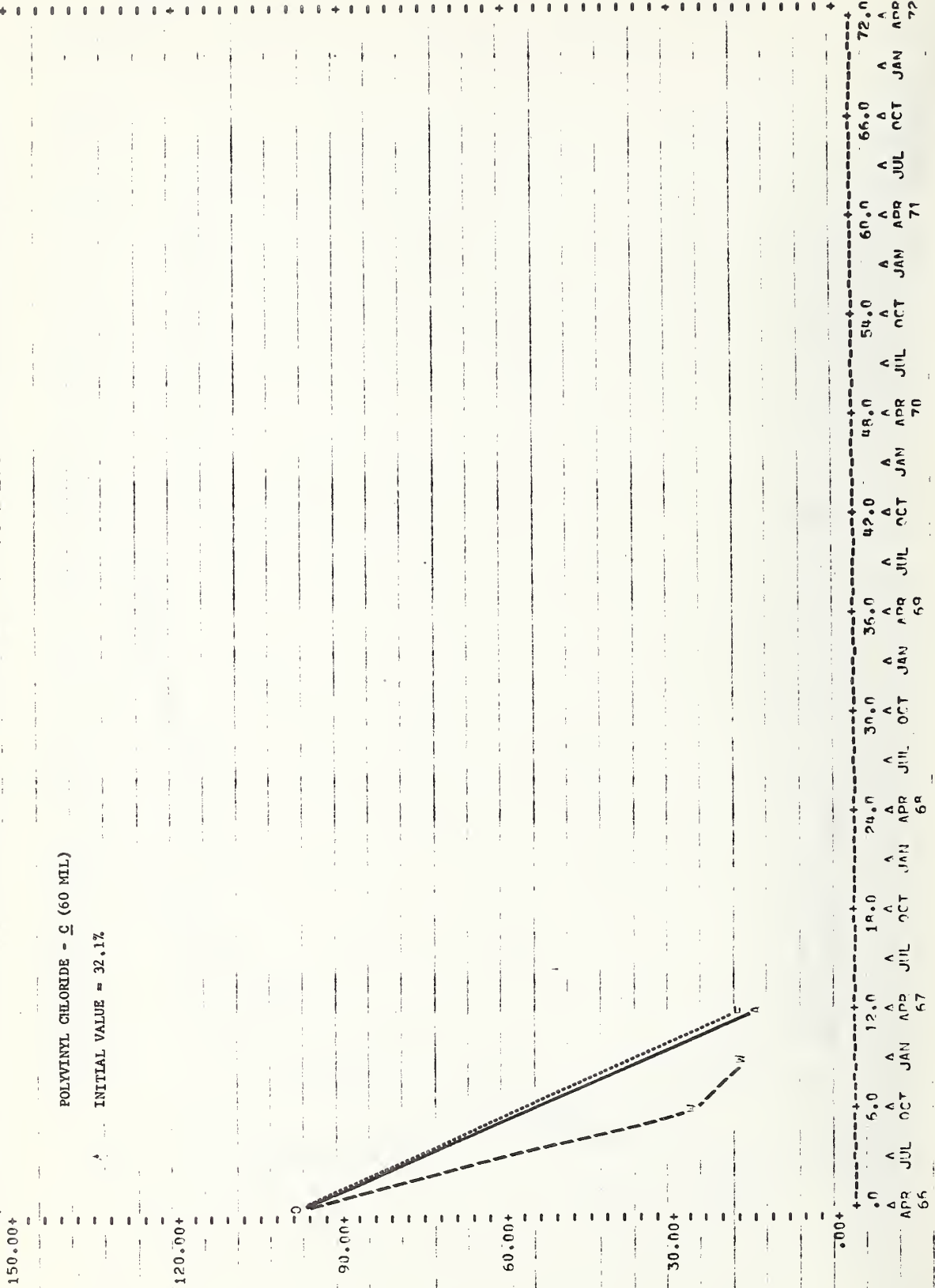


FIGURE 33

ULTIMATE ELONGATION (PERCENT OF INITIAL VALUE) PLASTIC 13

A=ARIZONA F=FLORIDA W=WASHINGTON

POLYVINYL CHLORIDE - N (60 MIL)

INITIAL VALUE = 85.5%

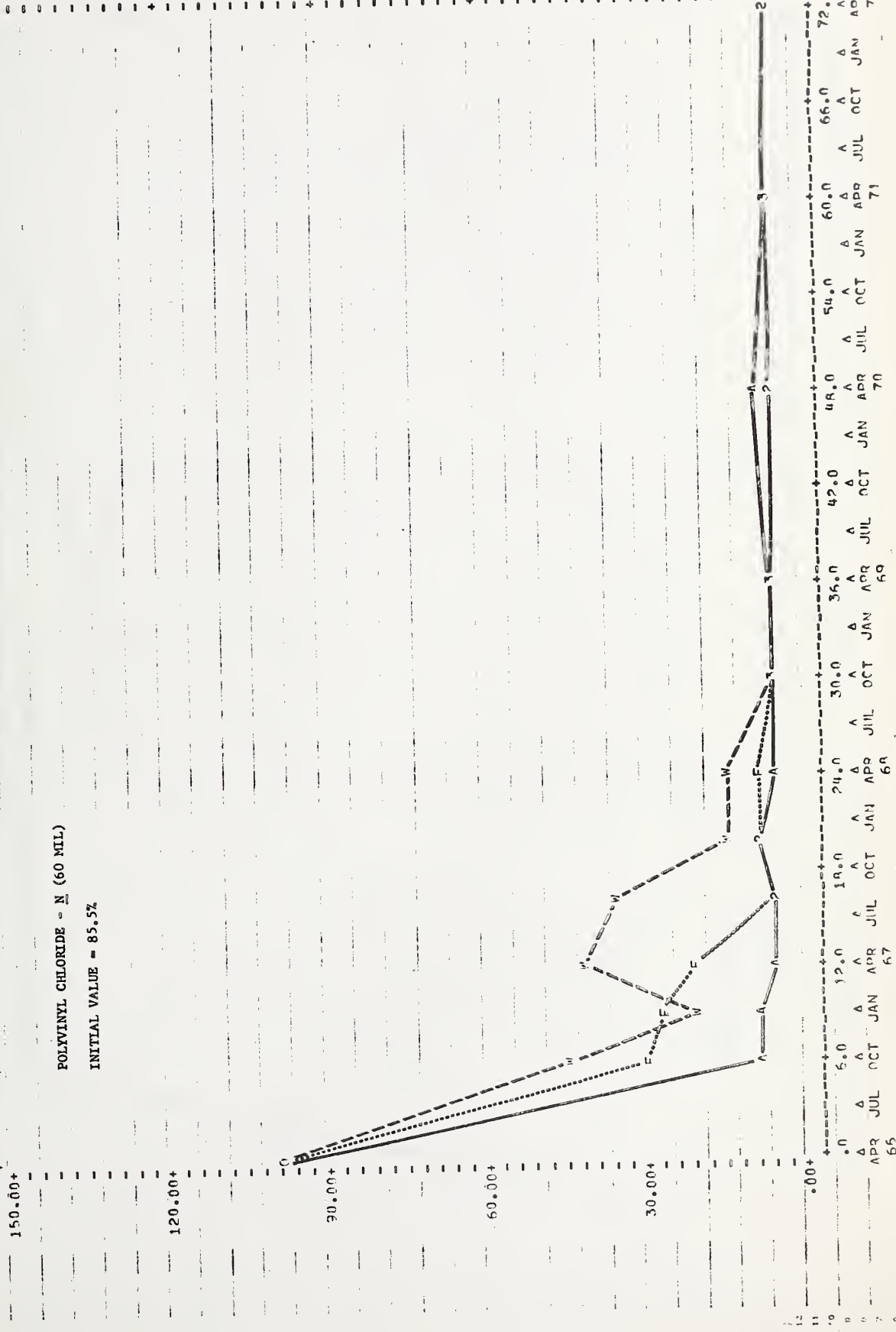
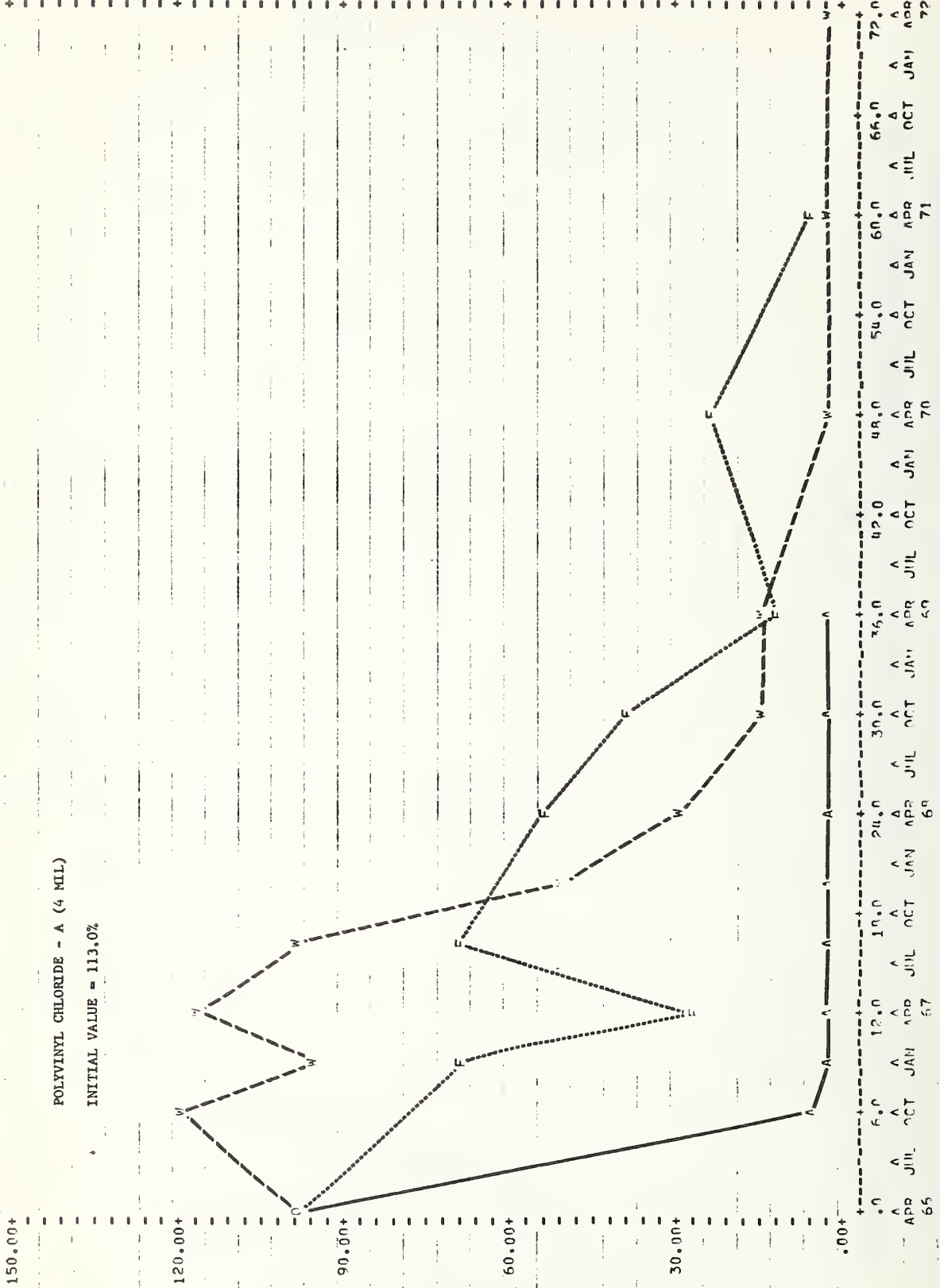


FIGURE 34

ULTIMATE ELONGATION (PERCENT OF INITIAL VALUE) PLASTIC 14 A=ARIZONA F=FLORIDA W=WASHINGTON

POLYVINYL CHLORIDE - A (4 MIL)

INITIAL VALUE = 113.0%



**NOTE. 1 POINTS FELL OUTSIDE THE SPECIFIED LIMITS AND WERE OMITTED.

FIGURE 35

ULTIMATE ELONGATION (PERCENT OF INITIAL VALUE) PLASTIC 15 A=ARIZONA F=FLORIDA W=WASHINGTON

POLYVINYL CHLORIDE - A (10 MIL)

INITIAL VALUE = 155.0%

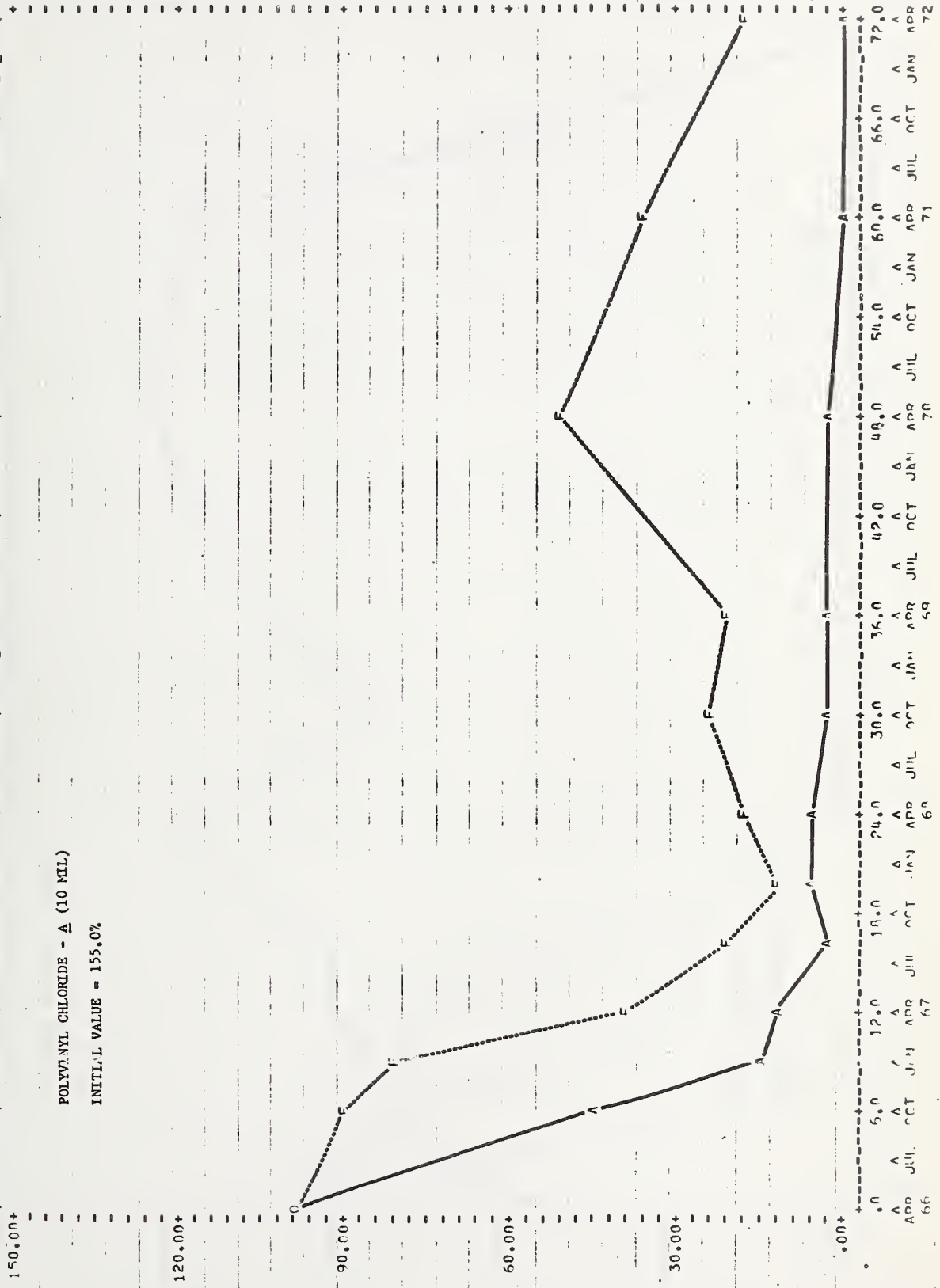


FIGURE 36

ULTIMATE FLOWATION (PERCENT OF INITIAL VALUE) PLASTIC 14

ARIZONA

FLORIDA

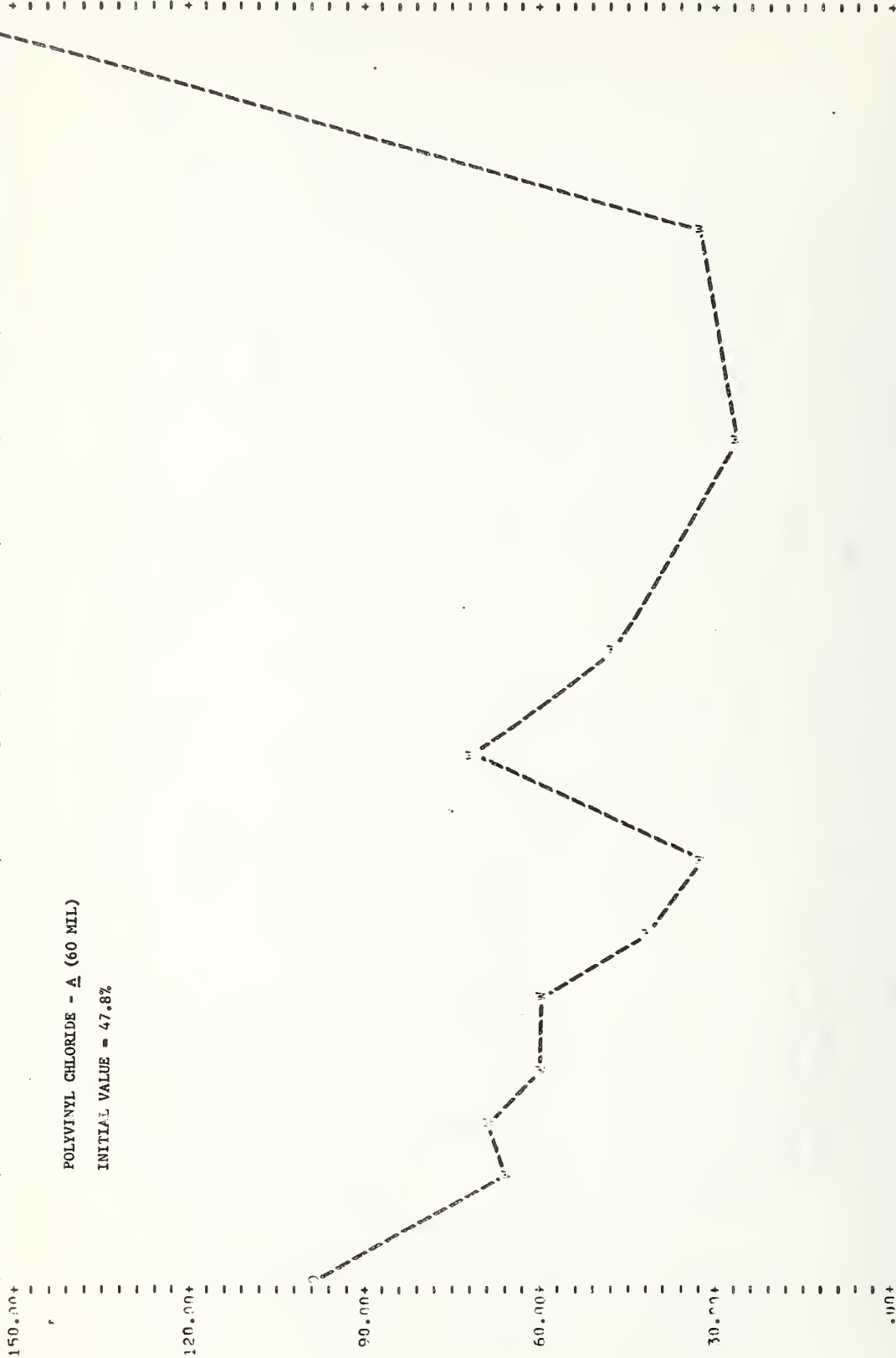
MISSISSIPPI

NEW YORK

WASHINGTON

POLYVINYL CHLORIDE - A (60 MIL)

INITIAL VALUE = 47.8%



5.0
12.0
19.0
28.0
30.0
36.0
47.0
48.0
48.0
54.0
54.0
60.0
60.0
65.0
65.0
72.0

APR 55
JUL 55
OCT 55
JAN 56
APR 56
JUL 56
OCT 56
JAN 57
APR 57
JUL 57
OCT 57
JAN 58
APR 58
JUL 58
OCT 58
JAN 59

56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72

FIGURE 37

ULTIMATE ELONGATION (PERCENT OF INITIAL VALUE) PLASTIC 17 ARIZONA FLORIDA WASHINGTON

150.00+

POLY VINYL CHLORIDE - D (4 MIL)

INITIAL VALUE = 191.0%

120.00+

90.00+

60.00+

30.00+

0.00+

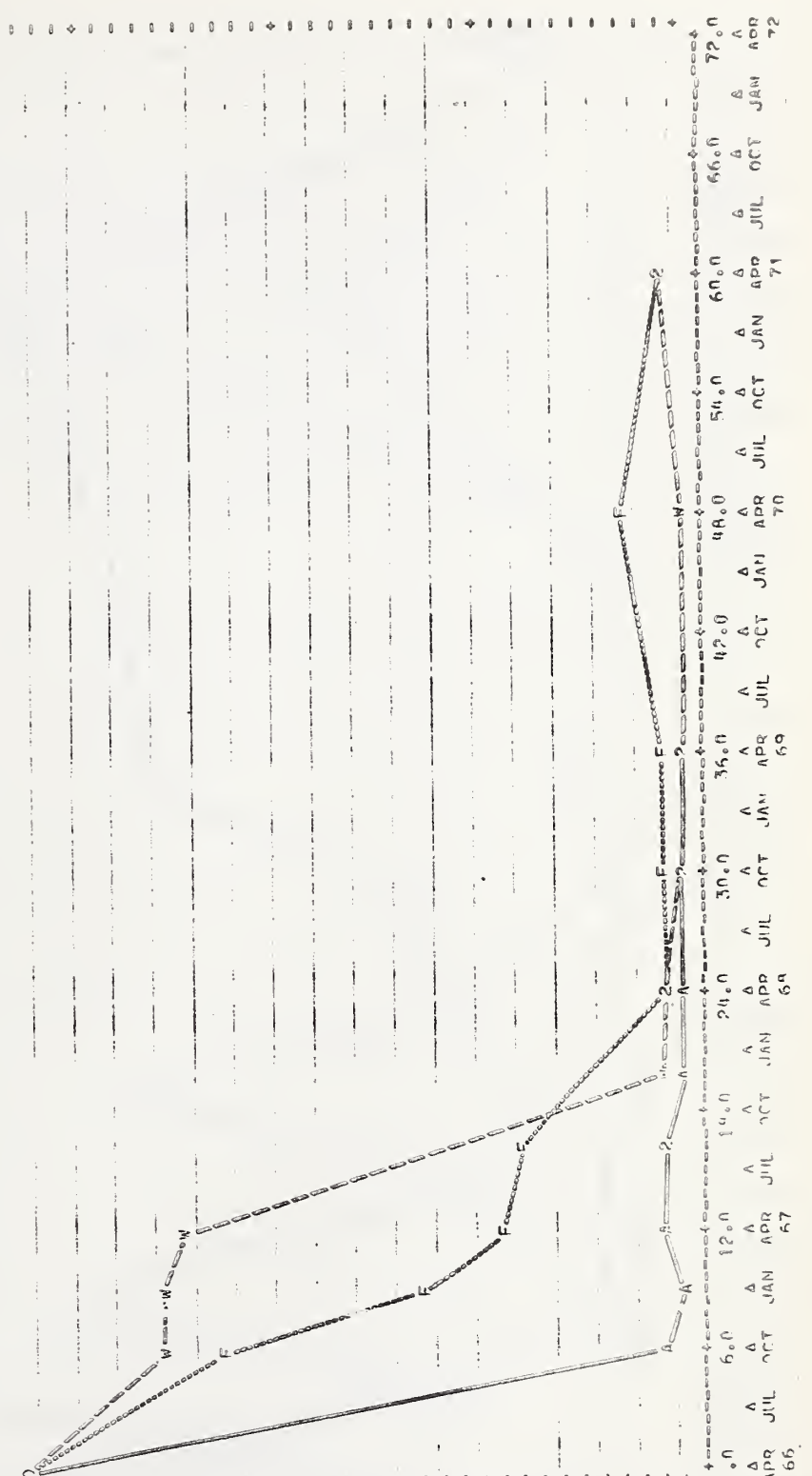


FIGURE 38

ULTIMATE ELONGATION (PERCENT OF INITIAL VALUE) PLASTIC 1A ARIZONA FLORIDA WASHINGTON

POLYVINYL CHLORIDE - D (10 MIL)

INITIAL VALUE = 142.0%

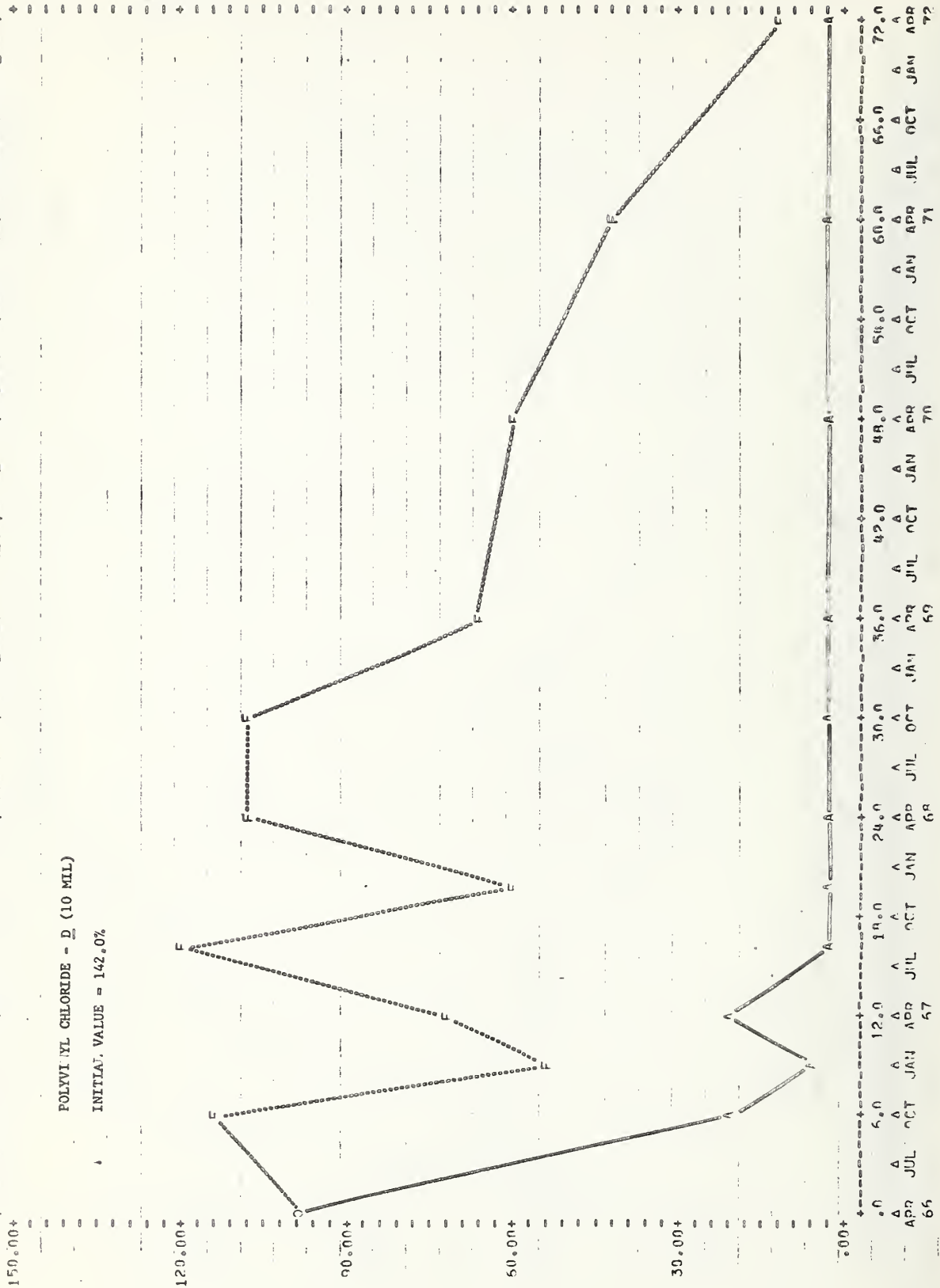


FIGURE 39

ULTIMATE FLOURATION PERCENT OF INITIAL VALUE) PLASTIC 19 ARIZONA FLORIDA WASHINGTON

150.00+

POLYVINYL CHLORIDE - D (60 MIL)

INITIAL VALUE = 50.7%

120.00+

90.00+

60.00+

30.00+

0.00+

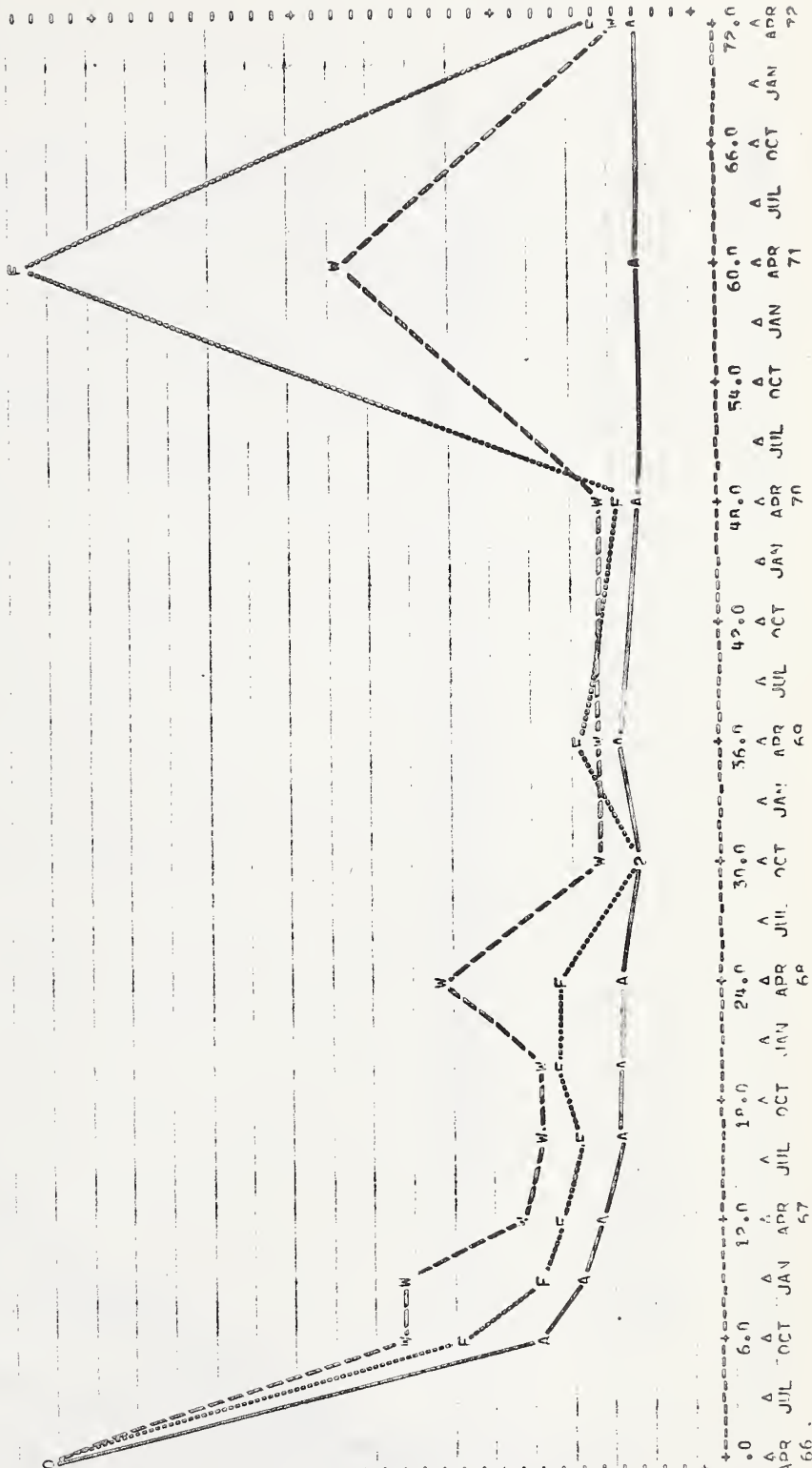


FIGURE 40

ULTIMATE FLOWBATION (PERCENT OF INITIAL VALUE) PLASTIC 20

ARIZONA FLORIDA

WASHINGTON

POLYVINYL CHLORIDE - M (60 MIL)

INITIAL VALUE = 178.0%

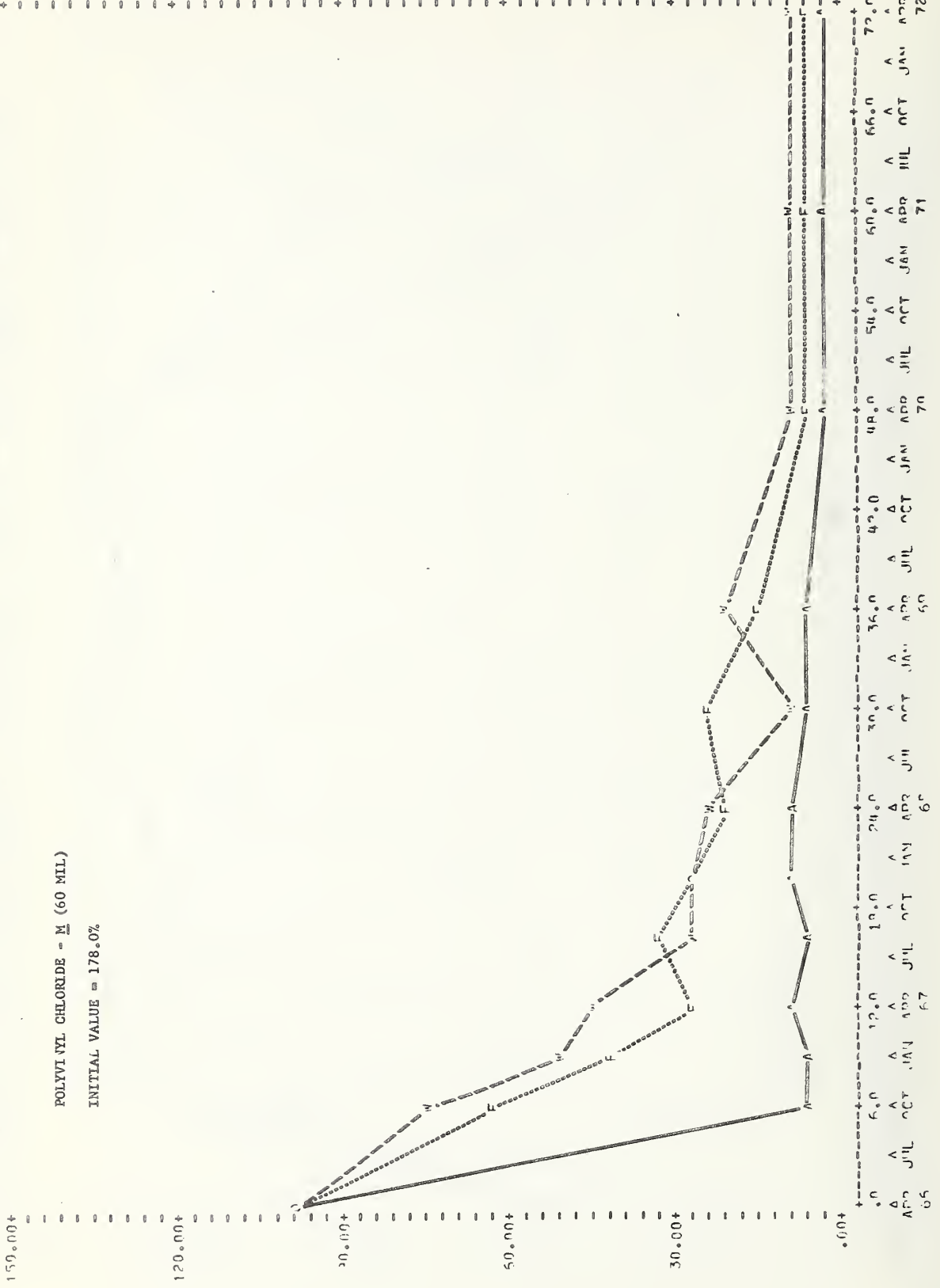


FIGURE 41

5 PERCENT STRESS (PSI) PLASTIC 2 ARIZONA FLORIDA WASHINGTON

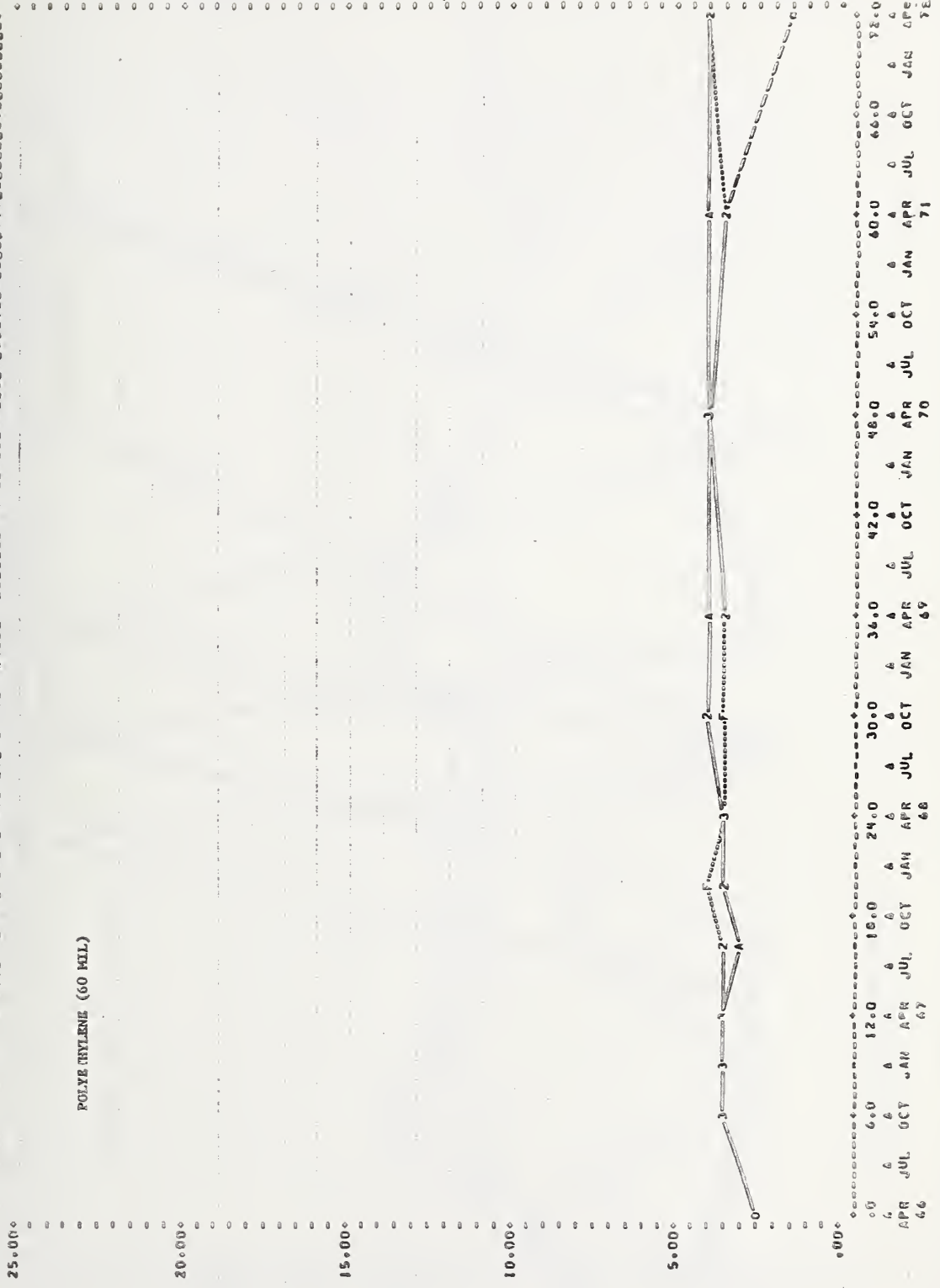


FIGURE 42

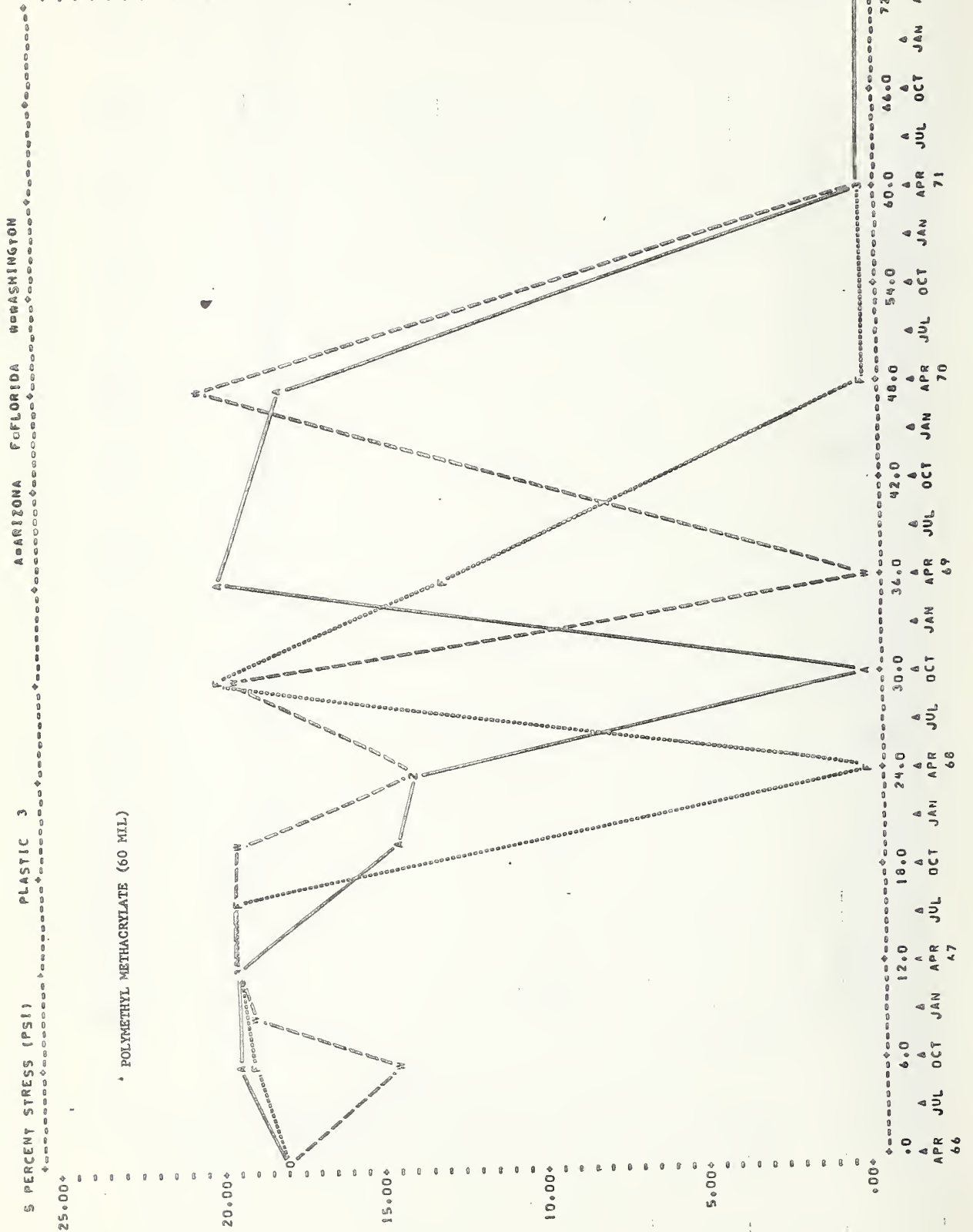
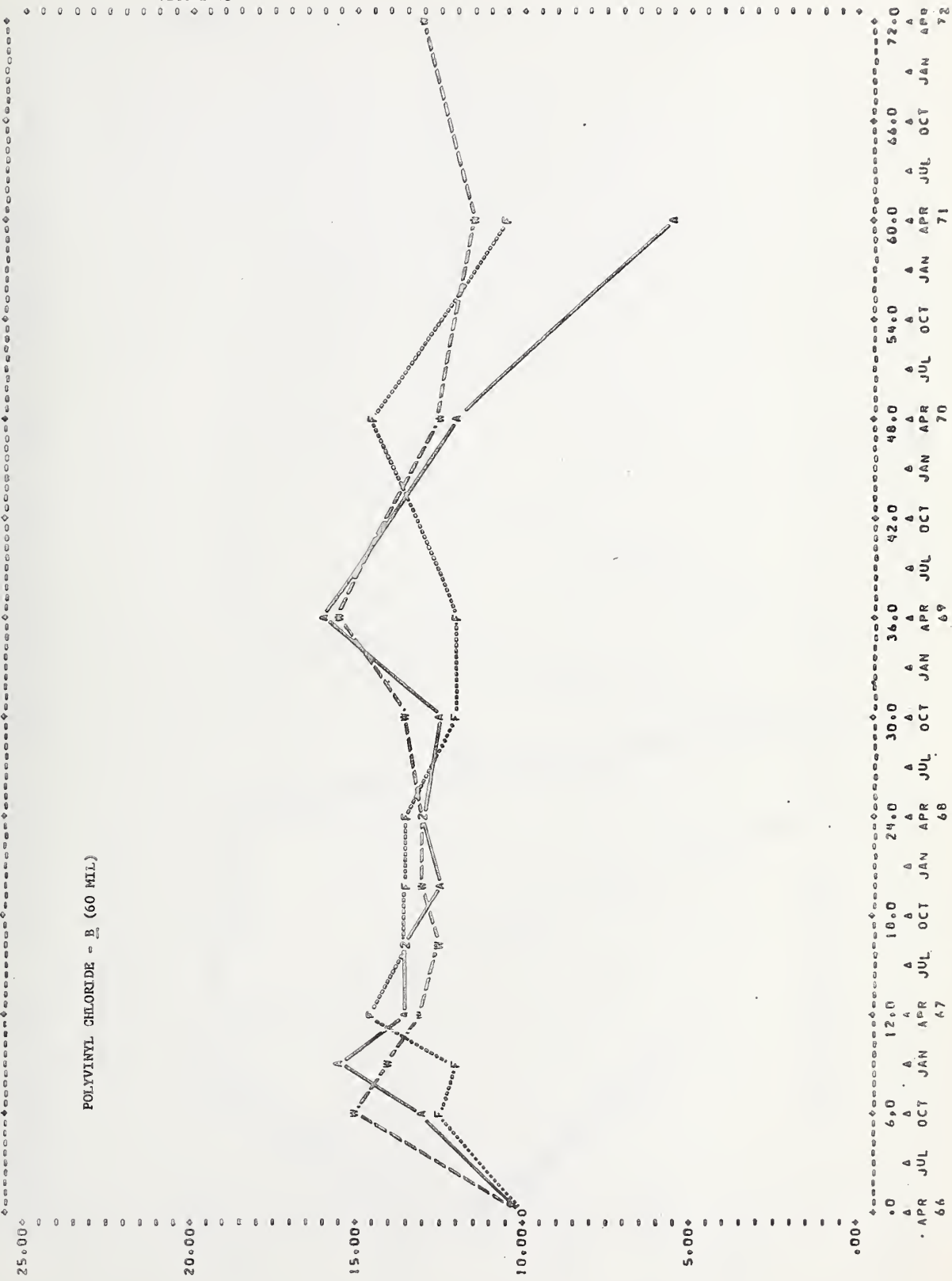


FIGURE 43

5 PERCENT STRESS (PSI) PLASTIC 9 ARIZONA FLORIDA WASHINGTON

POLYVINYL CHLORIDE - B (60 MIL)

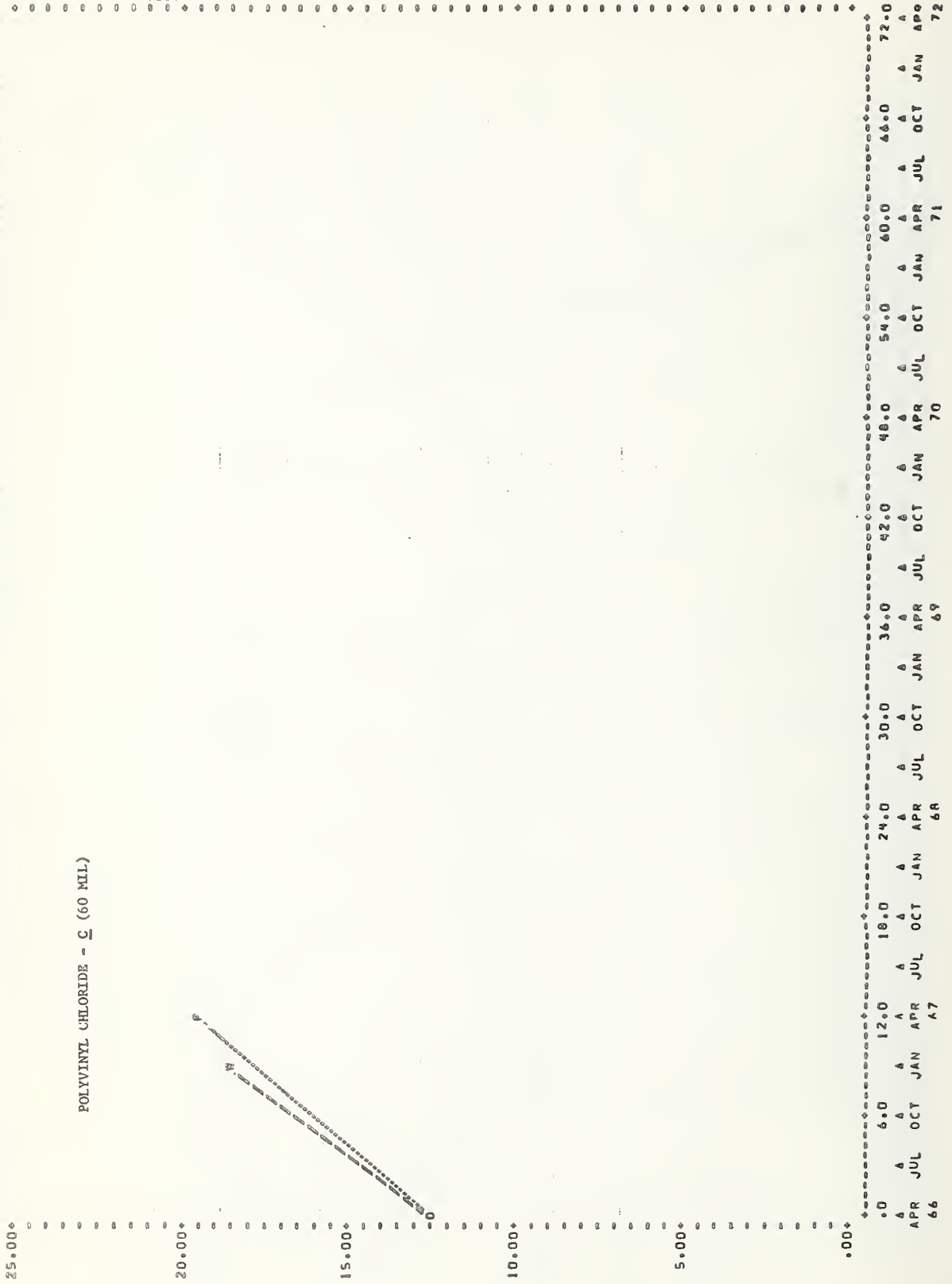


NOTE: 1 POINTS FELL OUTSIDE THE SPECIFIED LIMITS AND WERE OMITTED.

FIGURE 44

5 PERCENT STRESS (PSI) PLASTIC 12 ARIZONA FLORIDA WASHINGTON

POLYVINYL CHLORIDE - C (60 MIL)

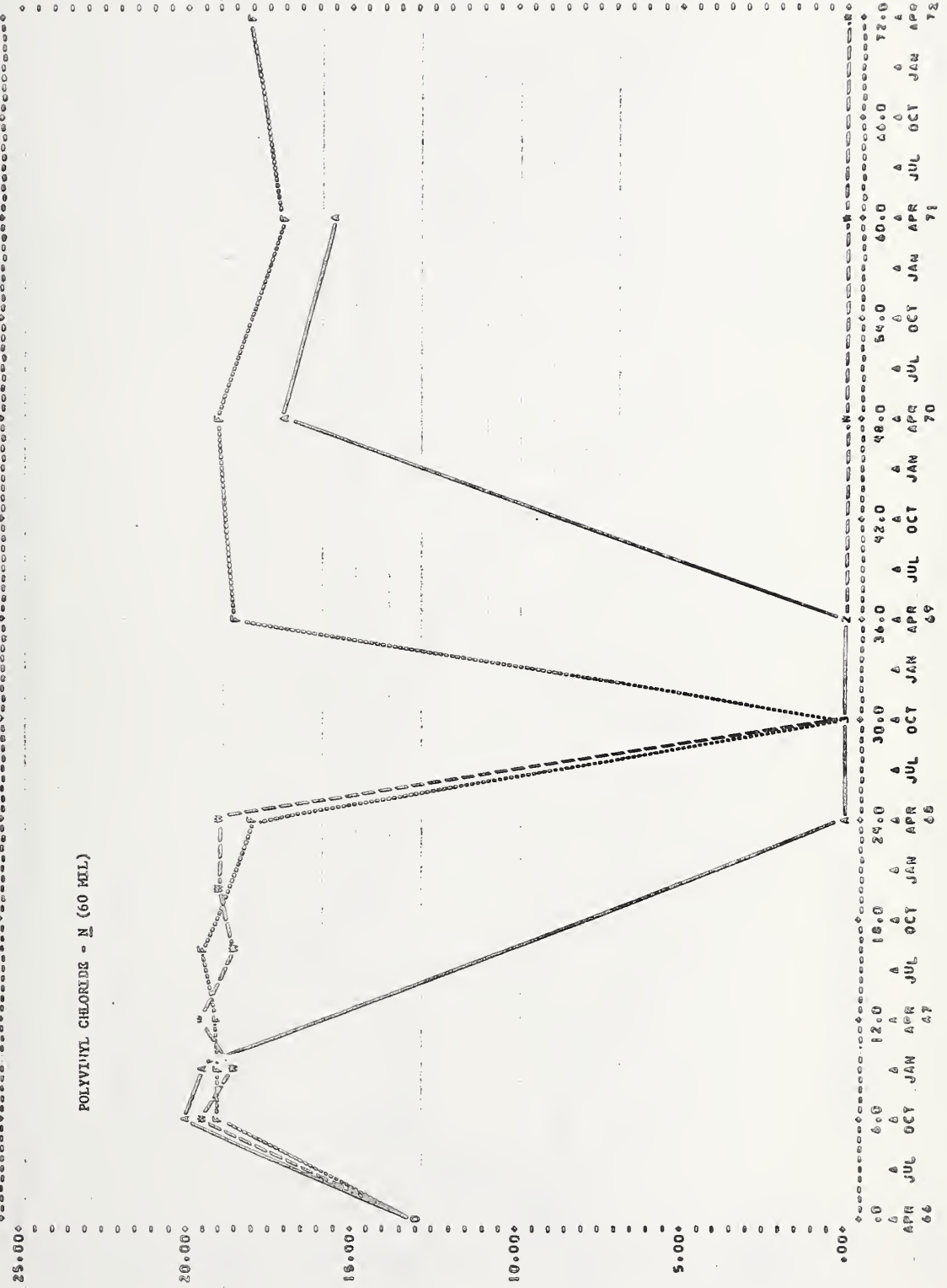


5 PERCENT STRESS (PSI) PLASTIC 13

ARIZONA FLORIDA WASHINGTON

POLYVINYL CHLORIDE - N (60 HLL)

FIGURE 45



5 PERCENT STRESS (PSI) PLASTIC 16 ARIZONA FLORIDA WASHINGTON

POLYVINYL CHLORIDE - A (60 MIL)

FIGURE 46

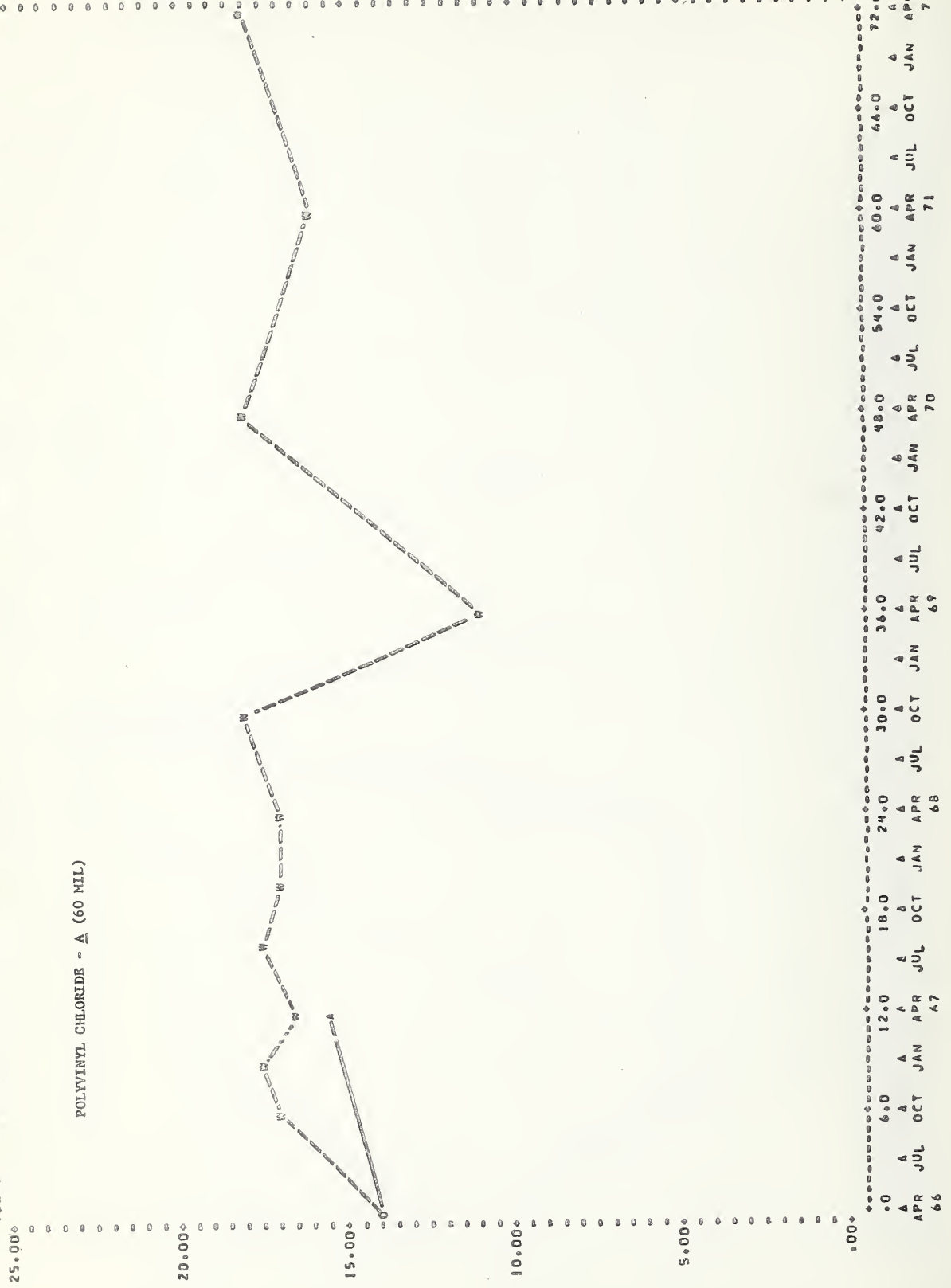
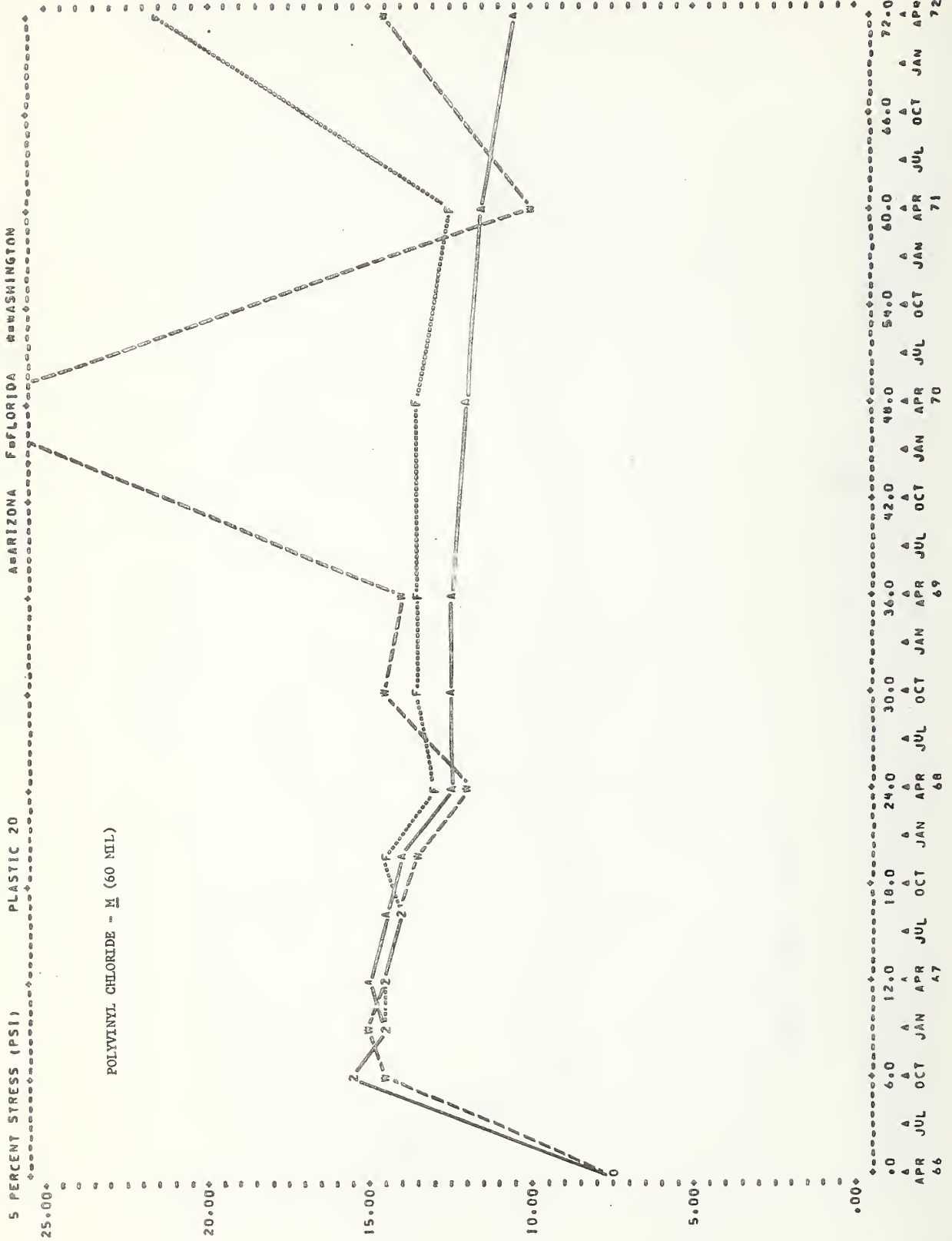


FIGURE 48



NOTE. 1 POINTS FELL OUTSIDE THE SPECIFIED LIMITS AND WERE OMITTED.

FIGURE 49

GLASS (IN PERCENT) PLASTIC 1 ARIZONA FELORDINA WASHINGTON

POLYETHYLENE (1 MIL)

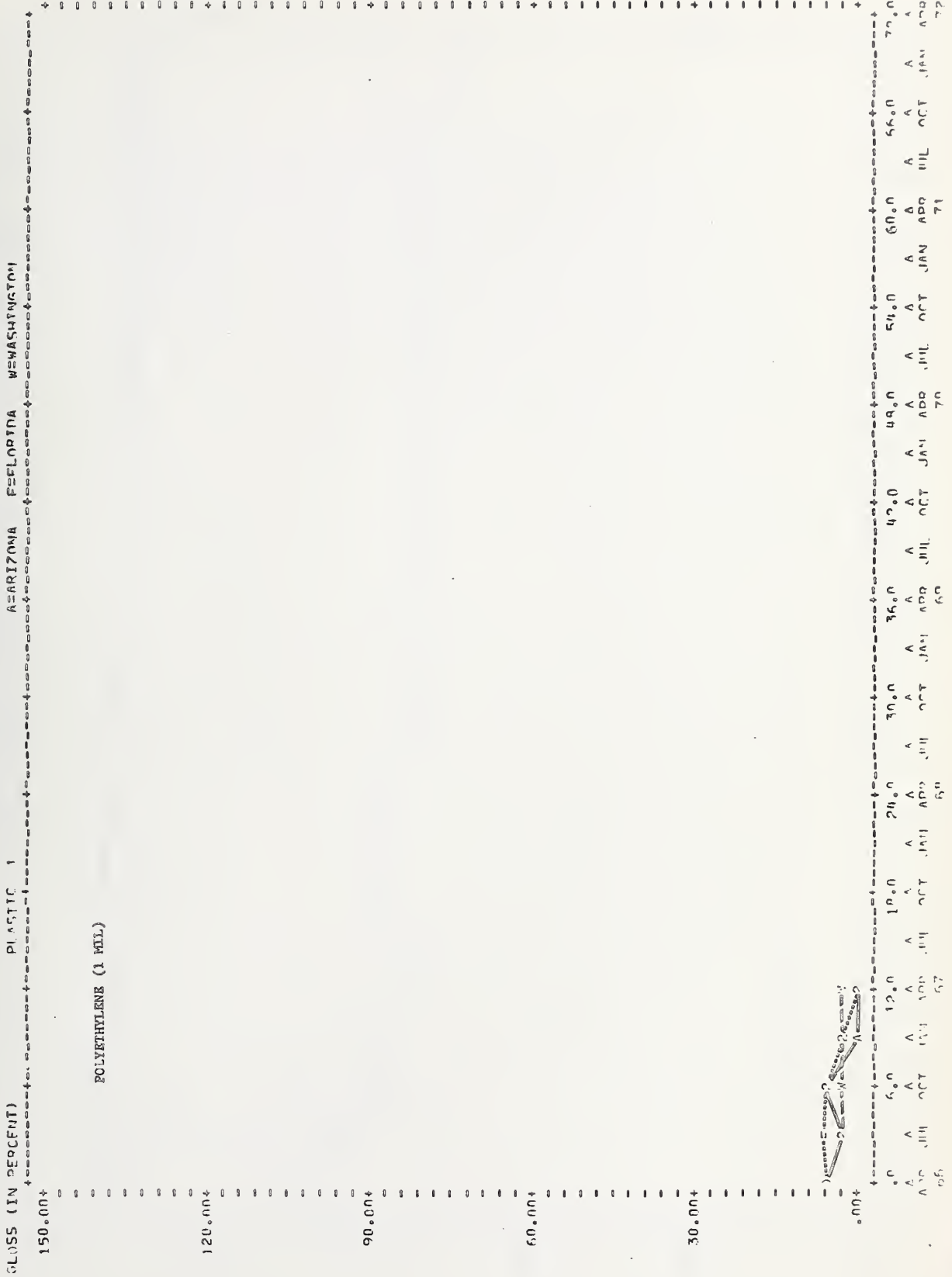


FIGURE 50

GLASS (IN PERCENT)

PLASTIC

ARIZONA FLOPINA WASHINGTON

150.00+

120.00+

90.00+

60.00+

30.00+

0.00+

POLYETHYLENE (60 MIL)

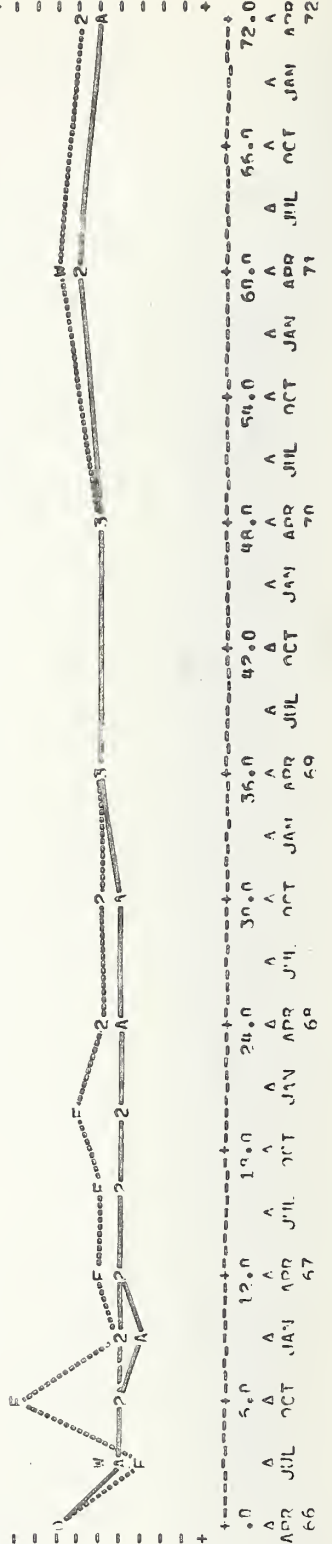
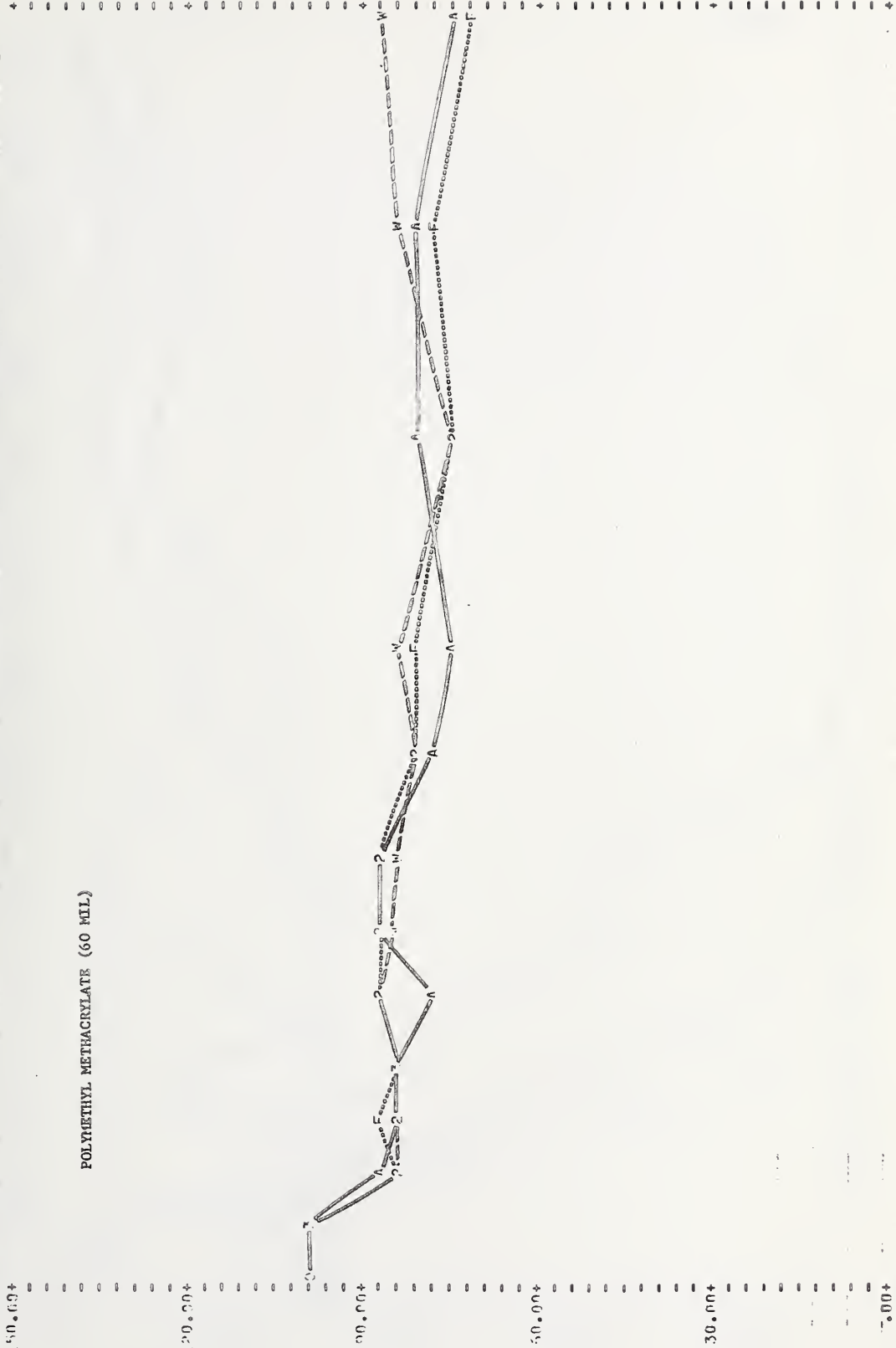


FIGURE 51

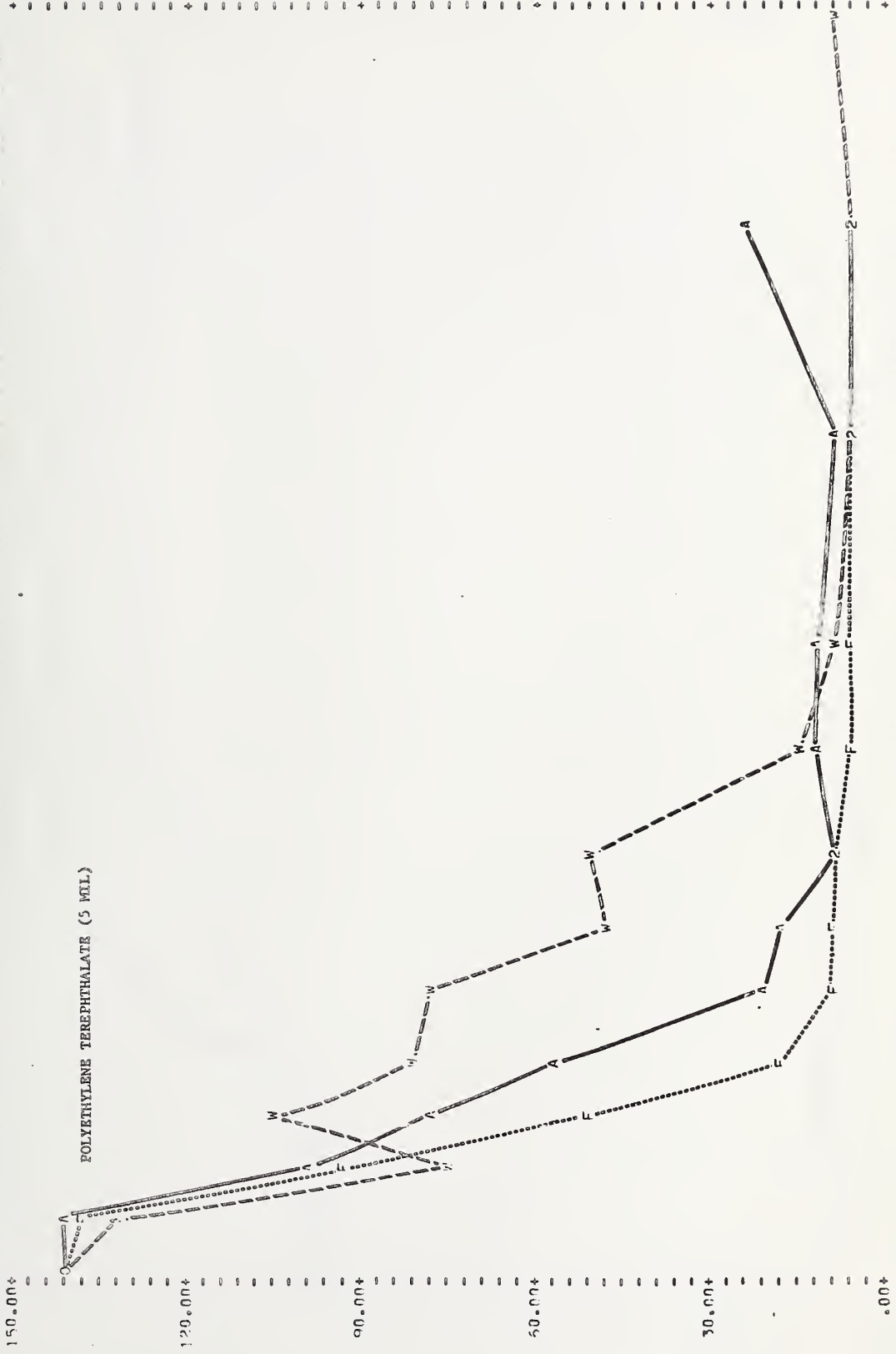
GLASS (IN PERCENT) PLASTIC ARIZONA FLORIDA WASHINGTON



POLYMETHYL METHACRYLATE (60 MIL)

FIGURE 53

GLASS (IN PERCENT) PLASTIC ARIZONA FLORIDA WASHINGTON



150.00+
120.00+
90.00+
60.00+
30.00+
0.00+

65
64
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1

FIGURE 54

WASHINGTON

FLORIDA

ARIZONA

PLASTIC

GLASS (IMPERFECT)

GLASS-REINFORCED POLYESTER (60 MIL)

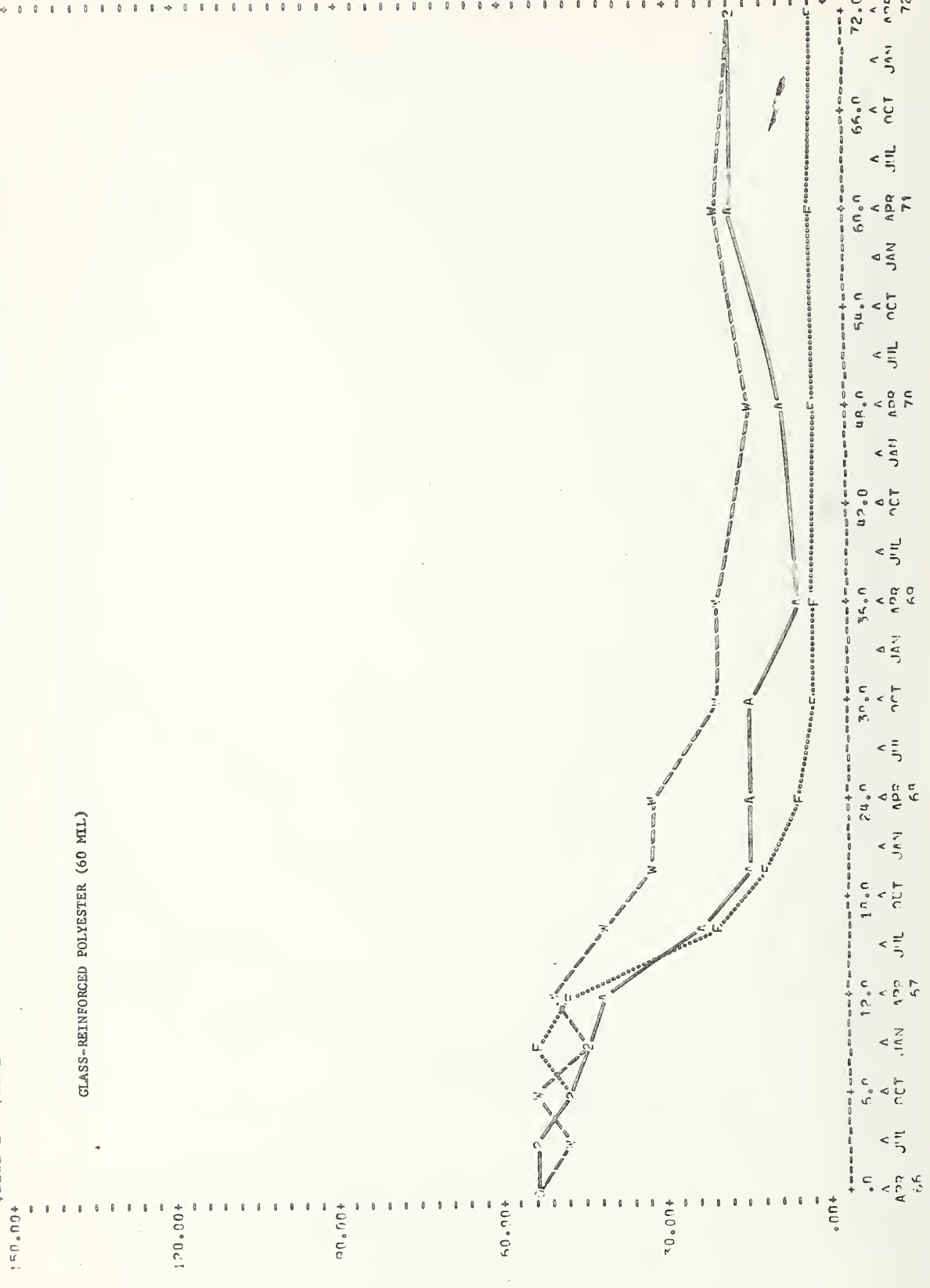


FIGURE 55

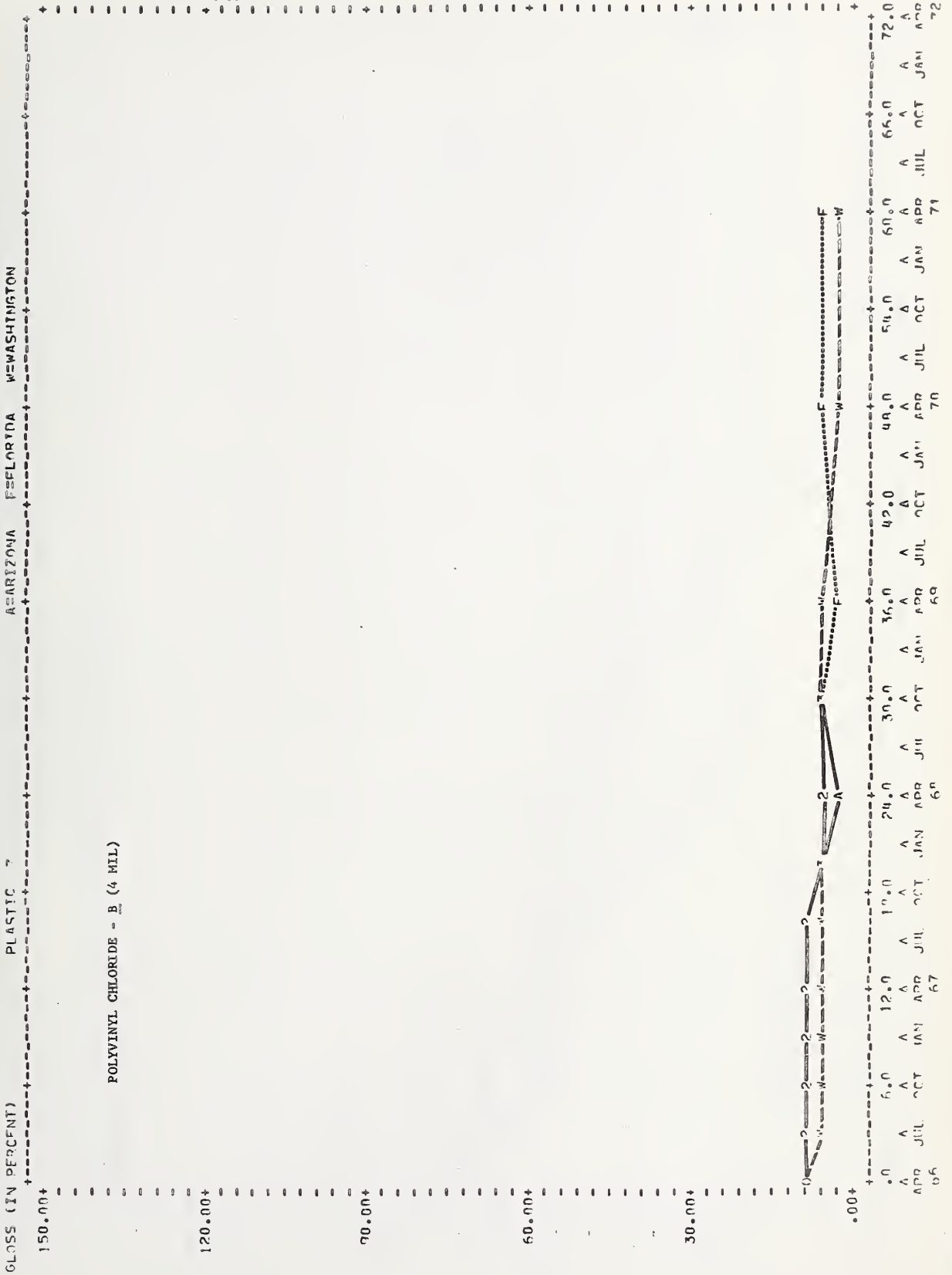
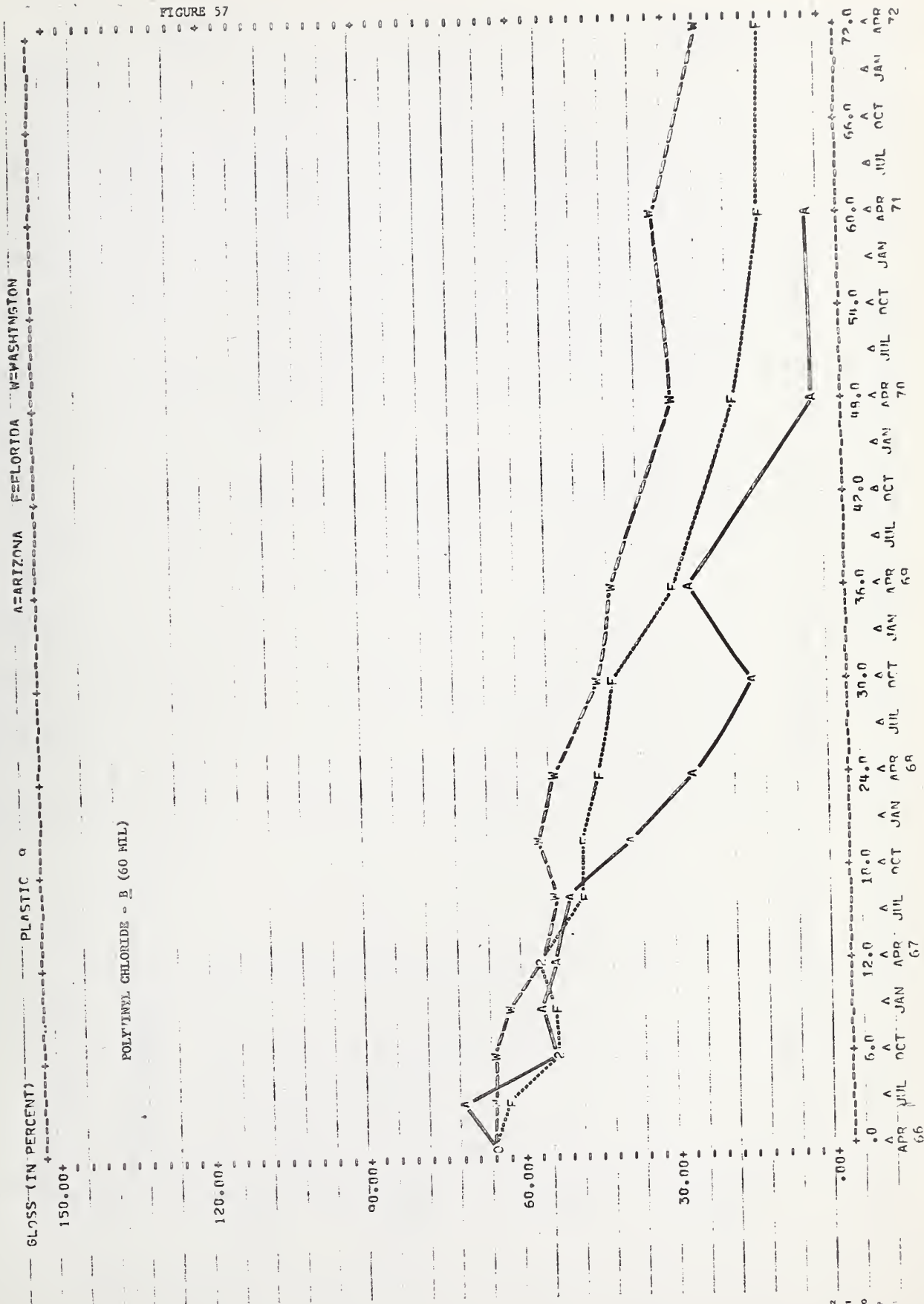


FIGURE 57



ARIZONA FLORIDA WASHINGTON

PLASTIC

GLOSS (IN PERCENT)

FIGURE 60

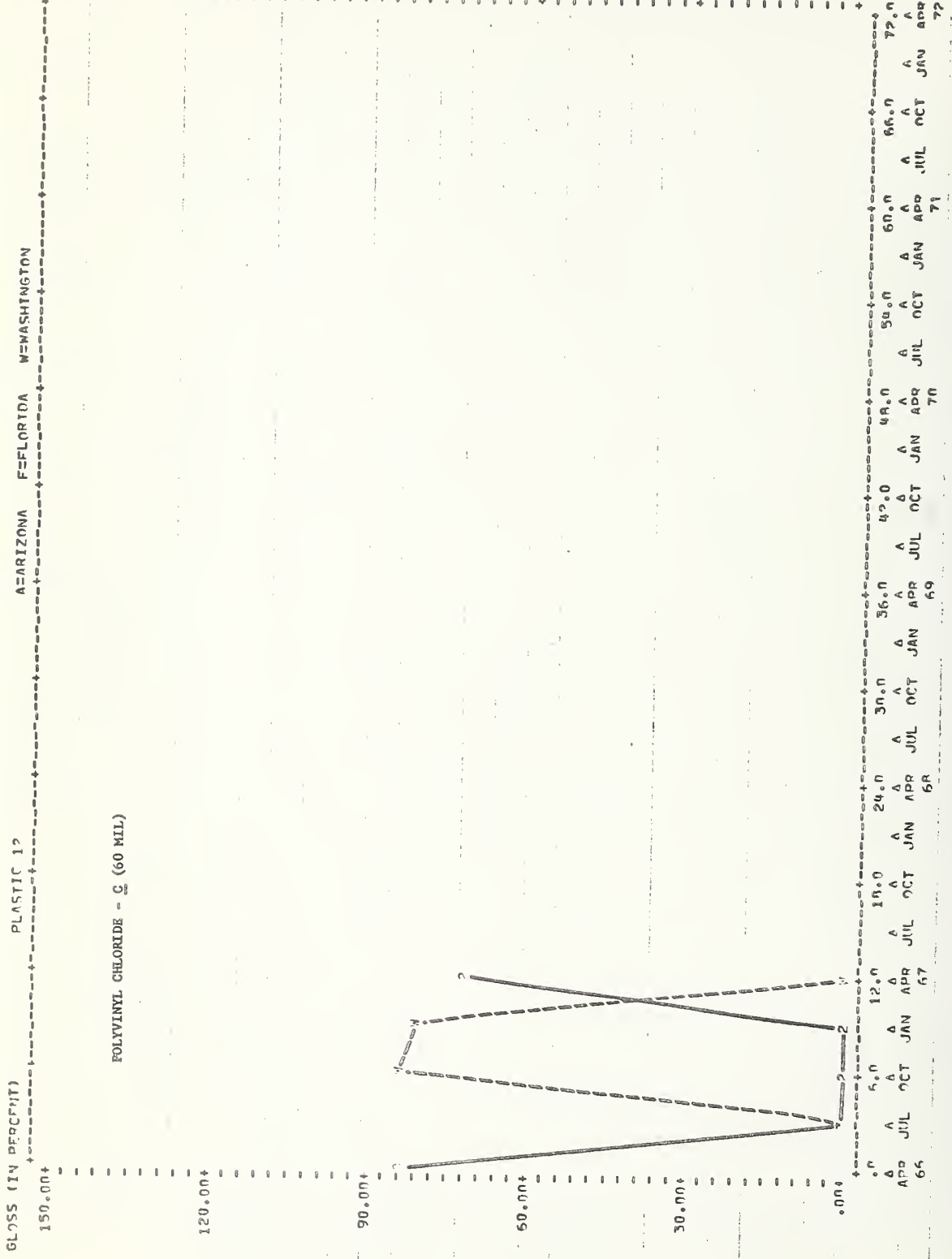


FIGURE 62

GLOSS (IN PERCENT) PLASTIC 14 ARIZONA FLORIDA WASHINGTON

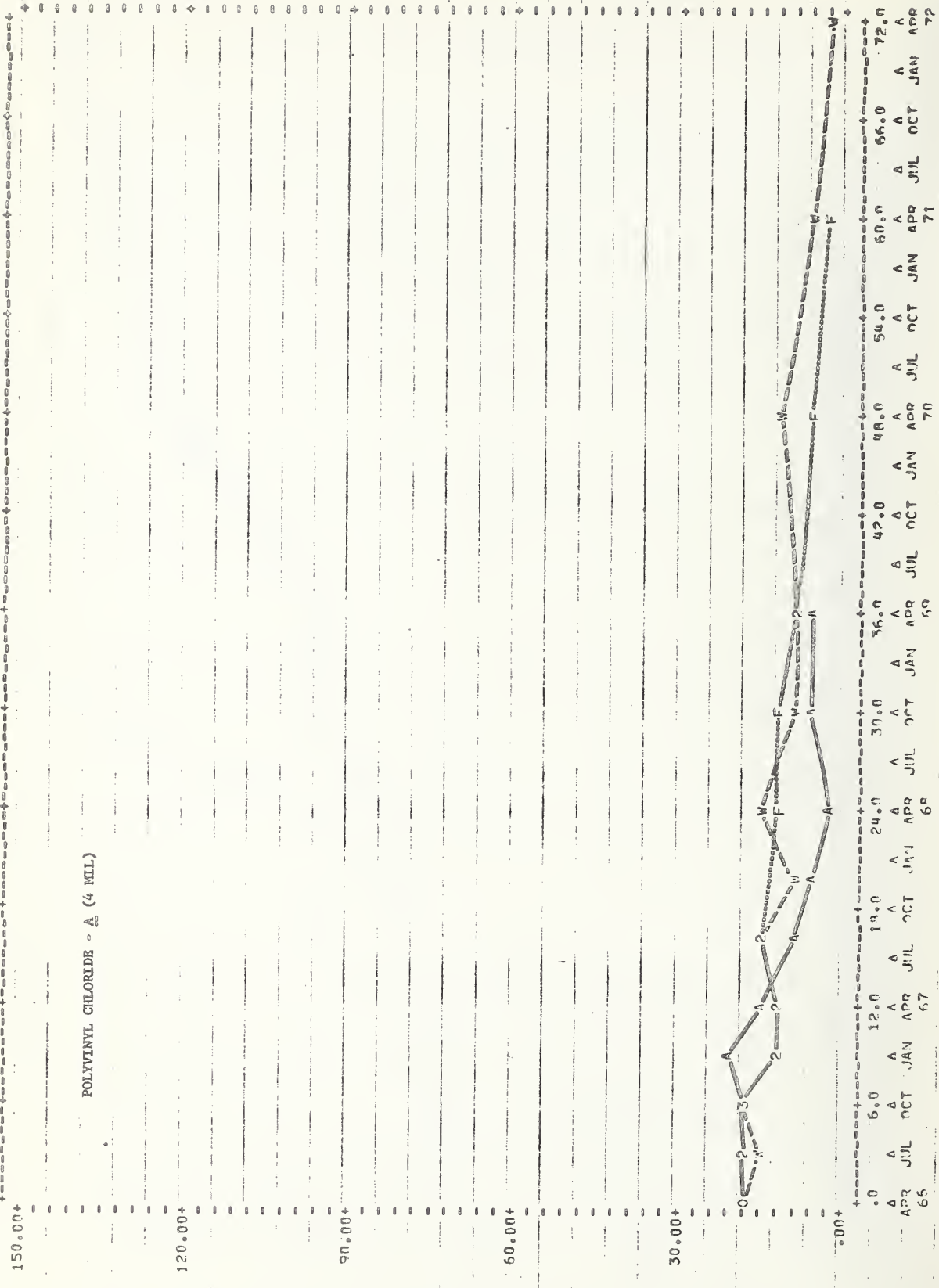


FIGURE 64

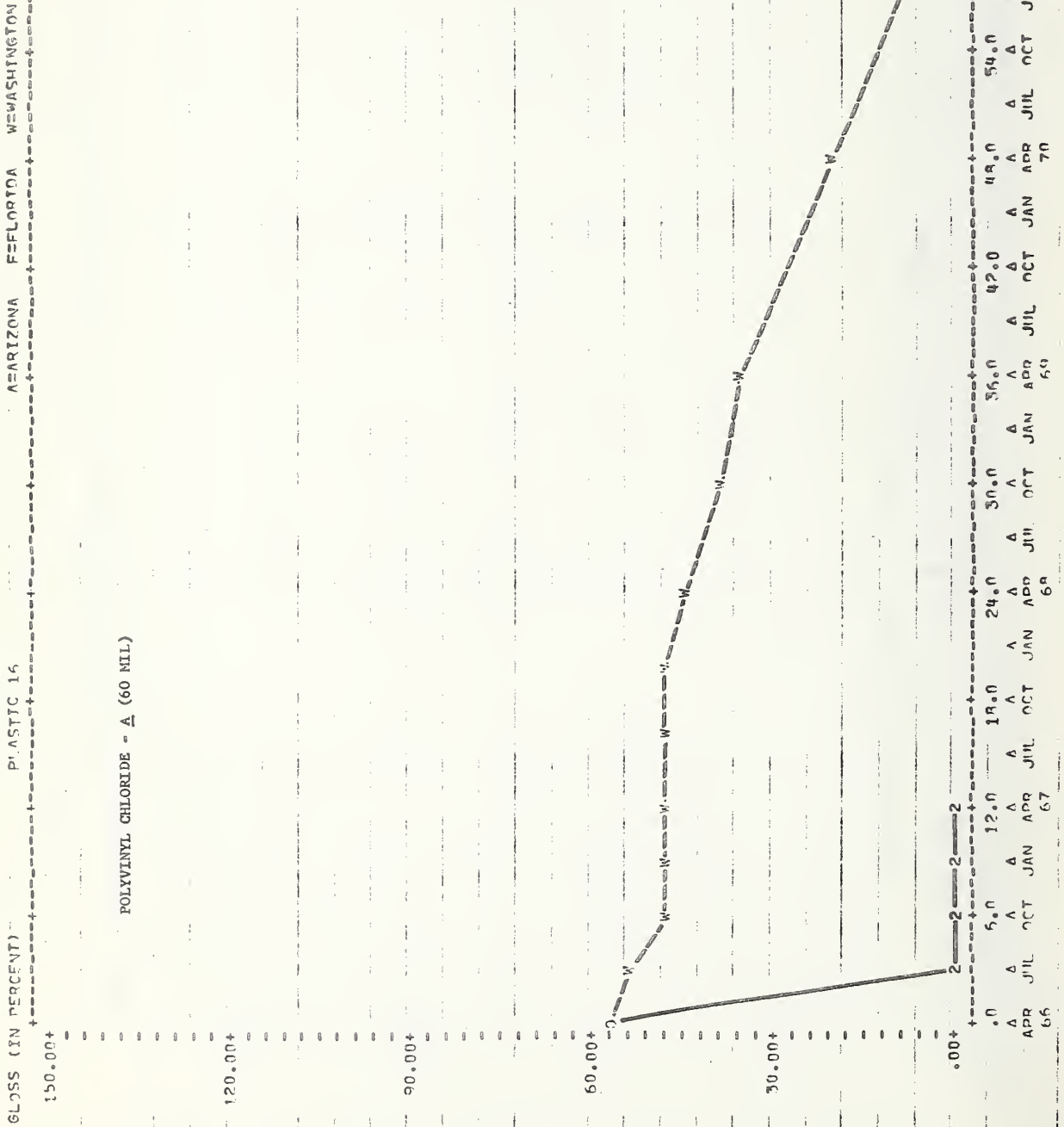
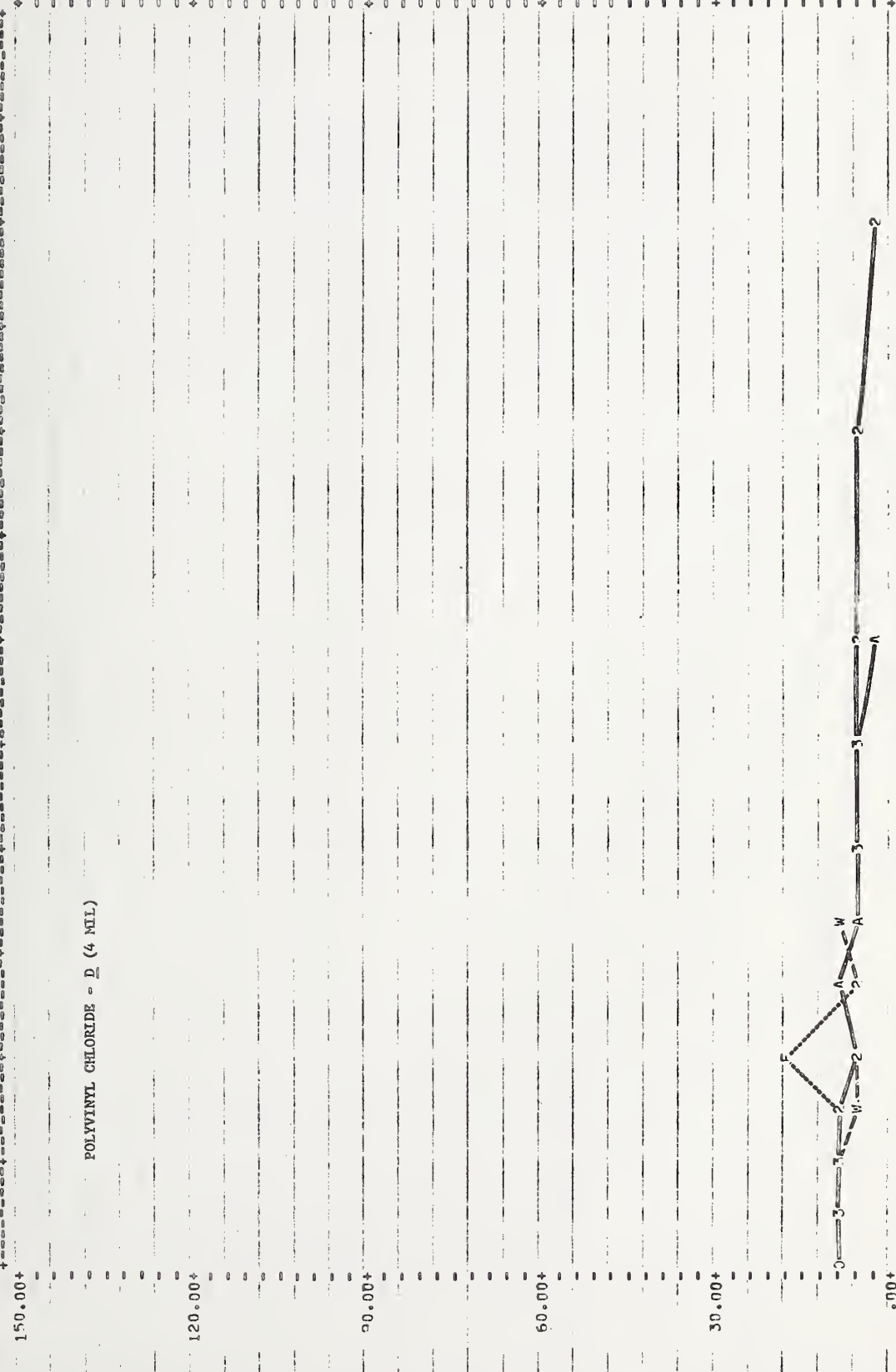


FIGURE 65

PLASTIC 17 ARIZONA FLORIDA WASHINGTON

POLYVINYL CHLORIDE - D (4 MIL)



150.00+
120.00+
90.00+
60.00+
30.00+
0.00+

55
67
68
69
70
71
72

FIGURE 66

ARIZONA FLORIDA WASHINGTON

PLASTIC 10

GLOSS (IN PERCENT)

POLYVINYL CHLORIDE - D (10 MLL)

150.00+

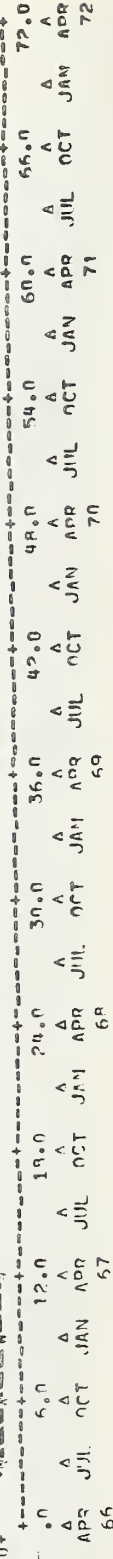
120.00+

90.00+

60.00+

30.00+

0.00+



65

66

67

68

69

70

71

72

FIGURE 68

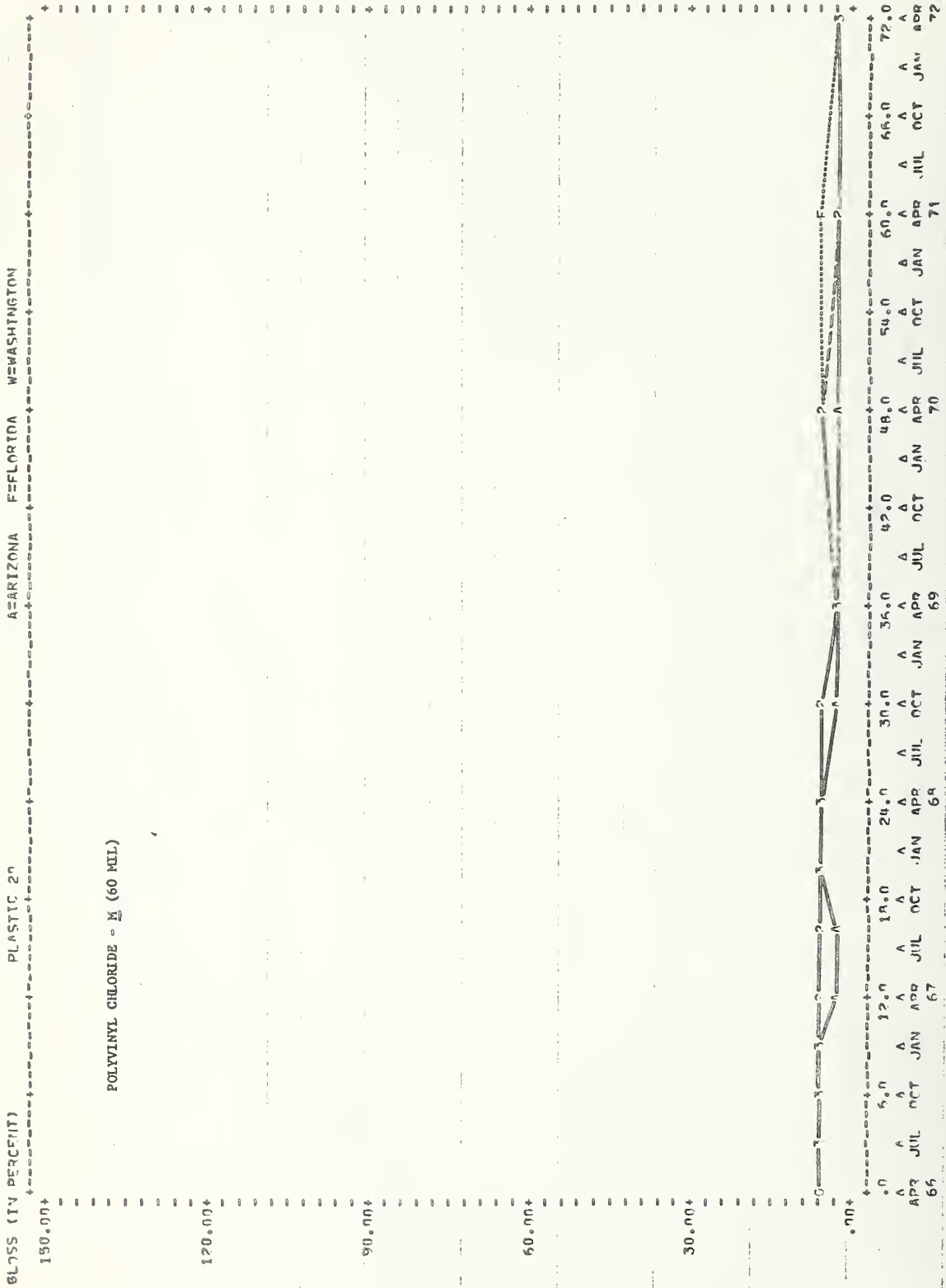


FIGURE 69B

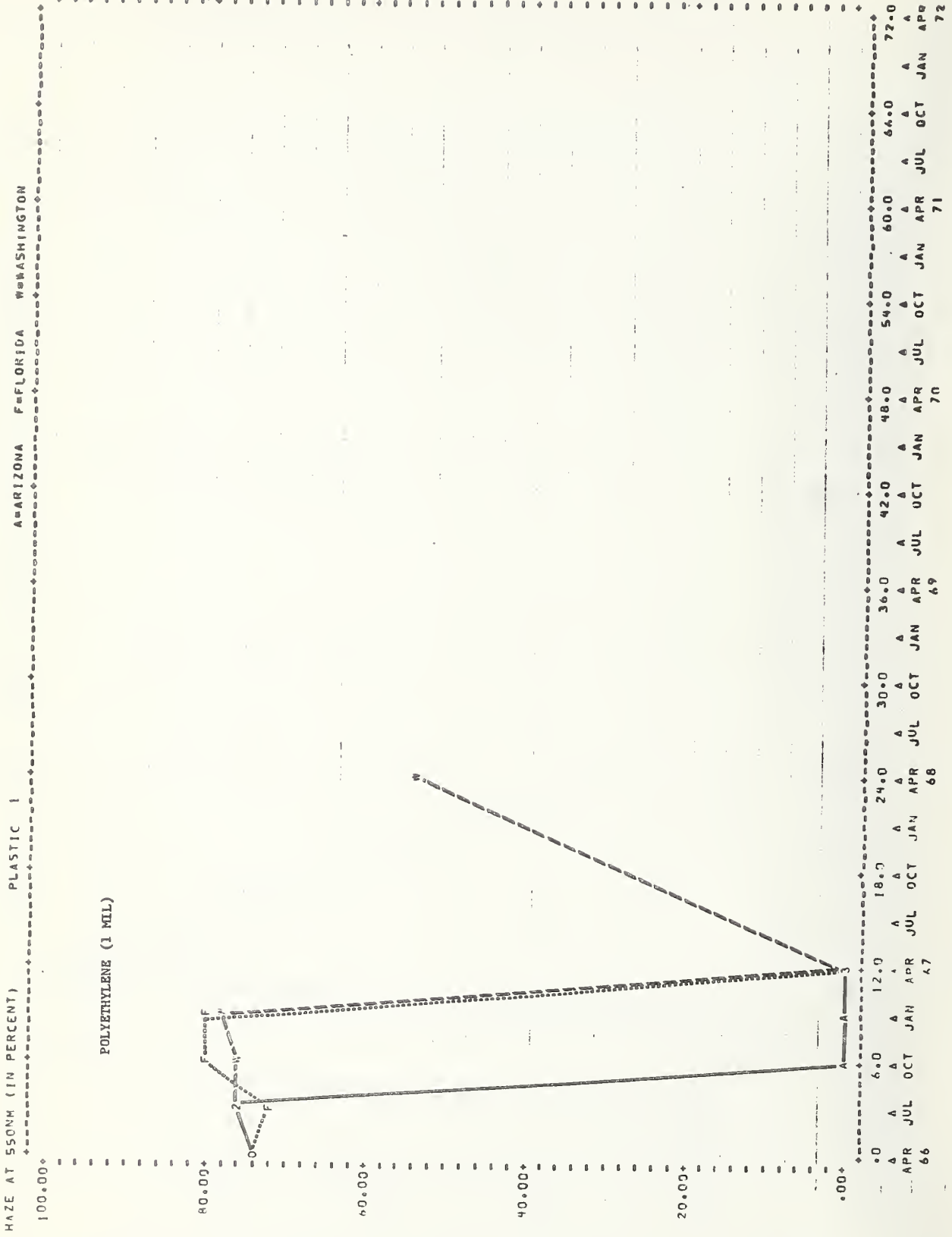
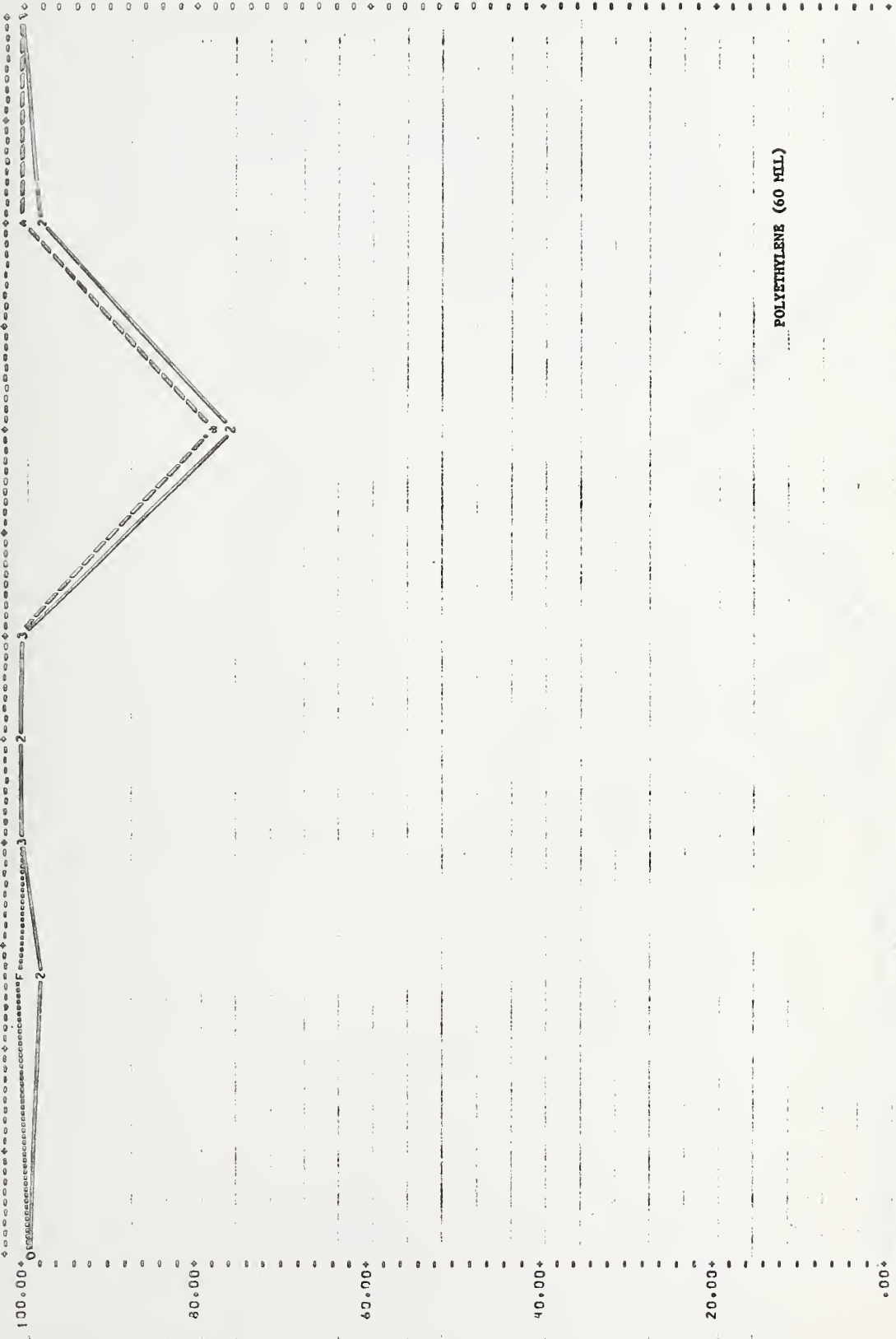


FIGURE 70A

HAZE AT 420NM (IN PERCENT) PLASTIC 2 ARIZONA FLORIDA WASHINGTON



POLYETHYLENE (60 MIL)

100.00
80.00
60.00
40.00
20.00
0.00

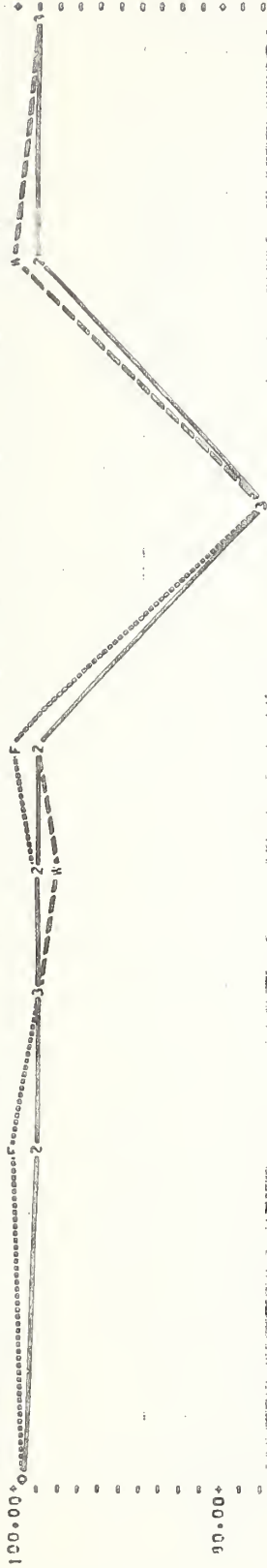
0.0 6.0 12.0 18.0 24.0 30.0 36.0 42.0 48.0 54.0 60.0 66.0 72.0

APR JUL OCT JAN APR JUL OCT JAN APR JUL OCT JAN APR JUL OCT JAN APR

66 67 68 69 70 71 72

FIGURE 70B

HAZE AT 550NM (IN PERCENT) PLASTIC 2 ARIZONA FLORIDA WASHINGTON



POLYETHYLENE (60 MIL)

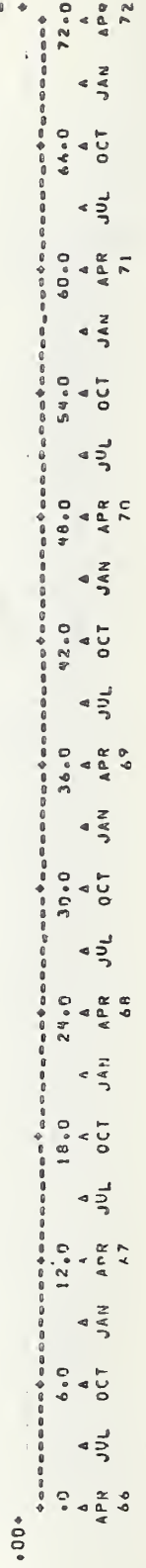


FIGURE 71A

HAZE AT 420NM (IN PERCENT) PLASTIC 3

A=ARIZONA F=FLORIDA W=WASHINGTON

POLYMETHYL METHACRYLATE (60 MIL)

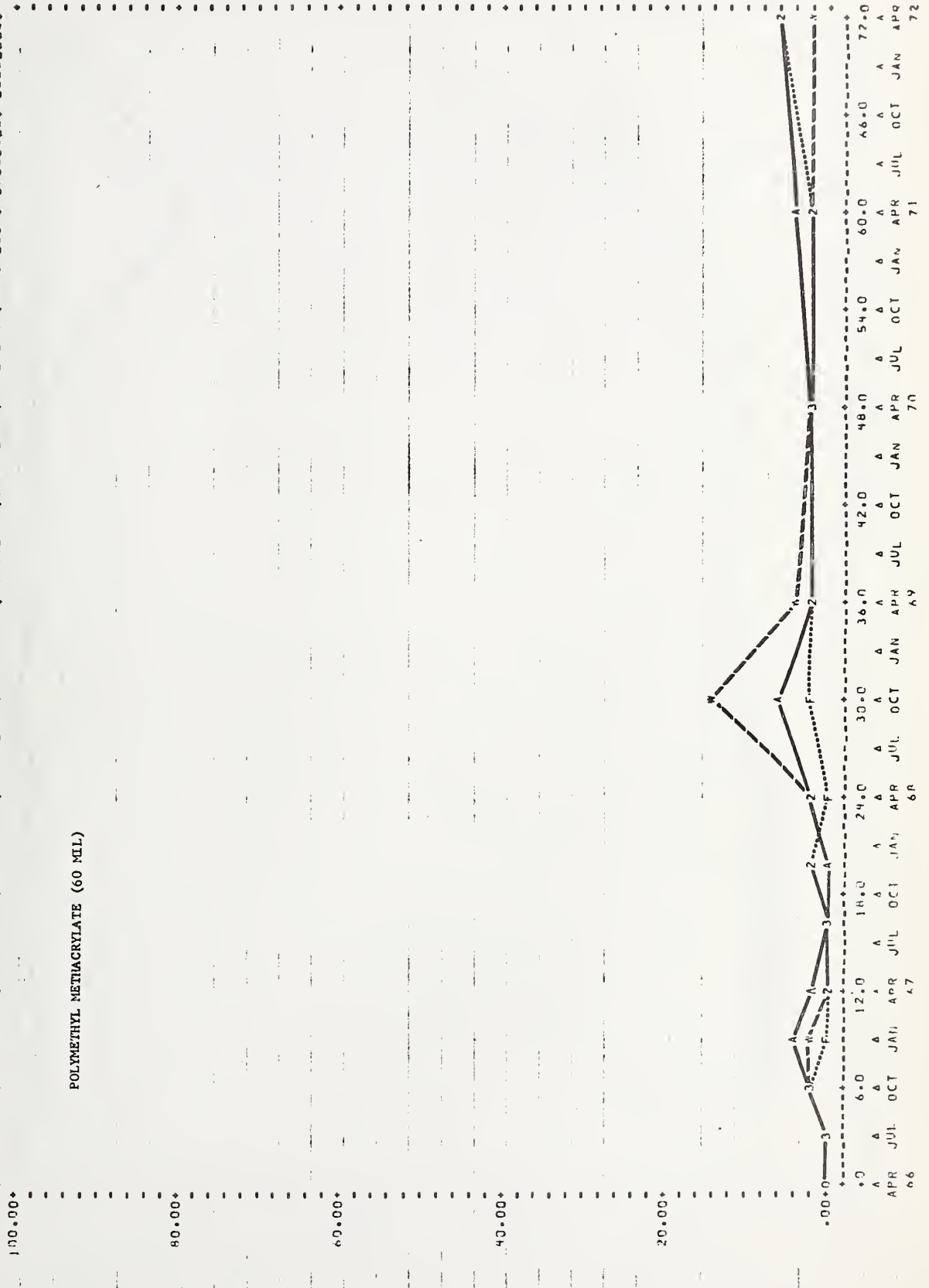


FIGURE 72A

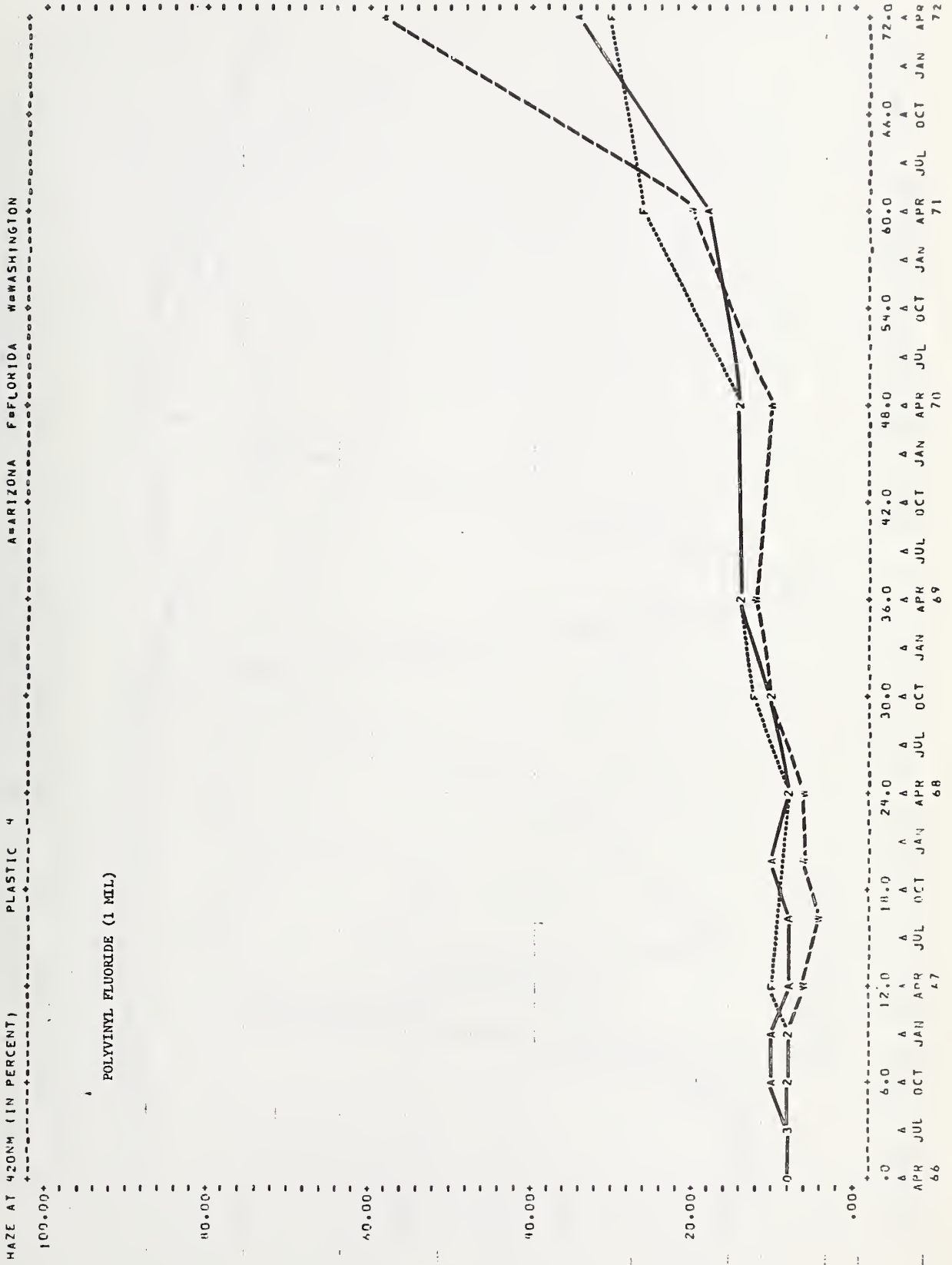
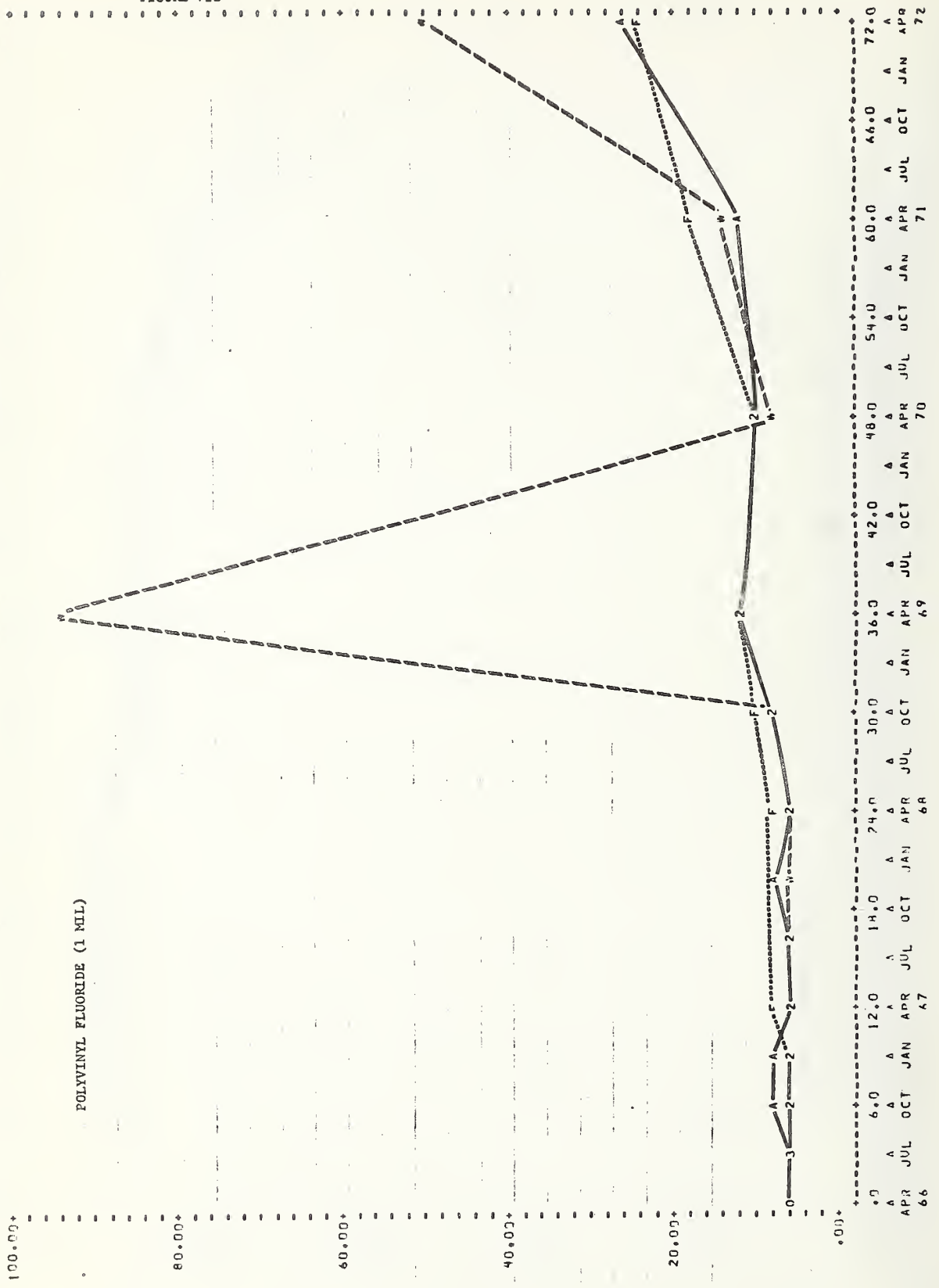


FIGURE 72B

HAZE AT 550NM (IN PERCENT) PLASTIC # ARIZONA FLORIDA WASHINGTON

POLYVINYL FLUORIDE (1 MIL)



HAZE AT 550NM (IN PERCENT) PLASTIC 5 ARIZONA F=FLORIDA W=WASHINGTON

POLYETHYLENE TEREPHTHALATE (5 MIL)

FIGURE 73B

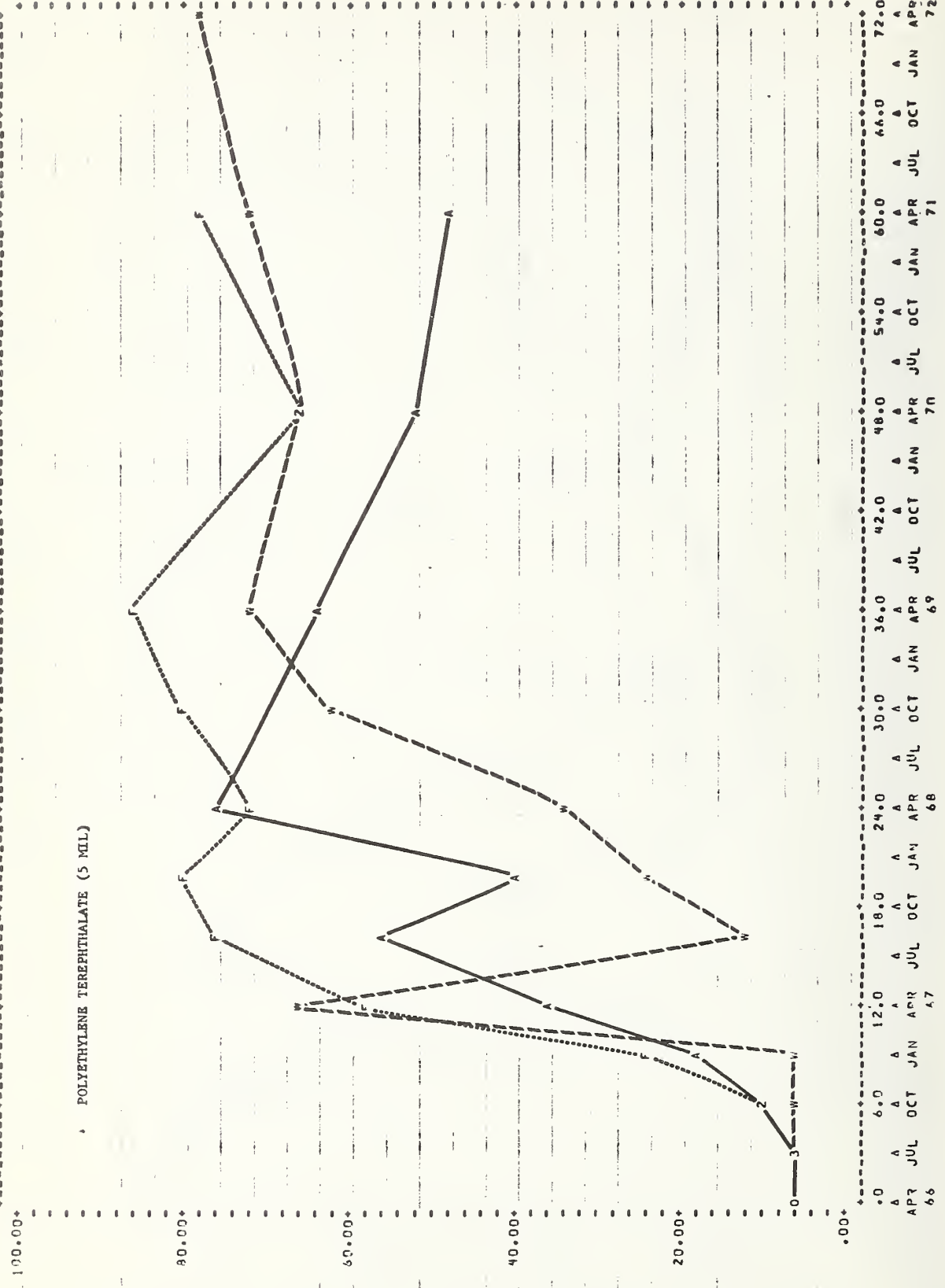
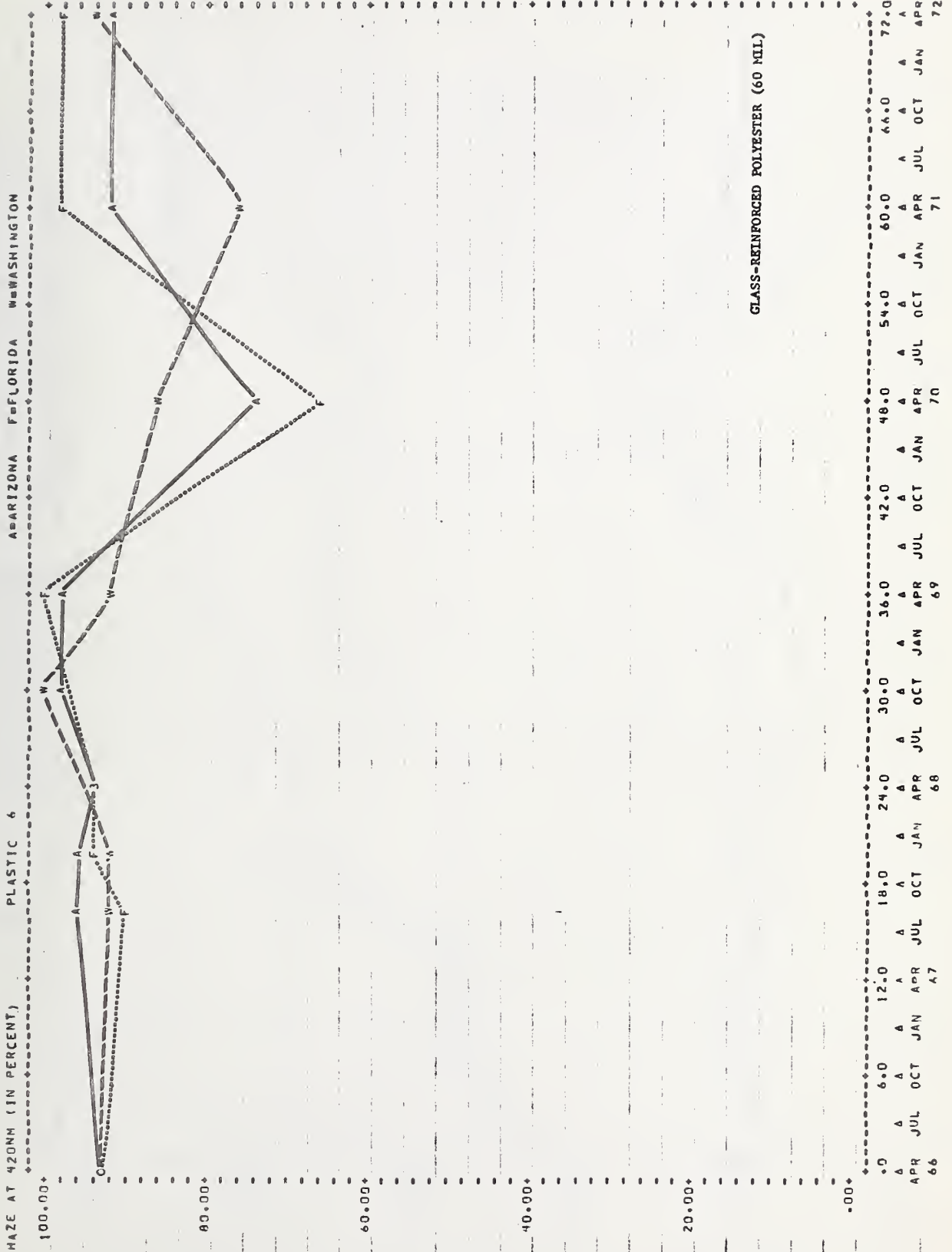


FIGURE 74A



HAZE AT 550NM (IN PERCENT)

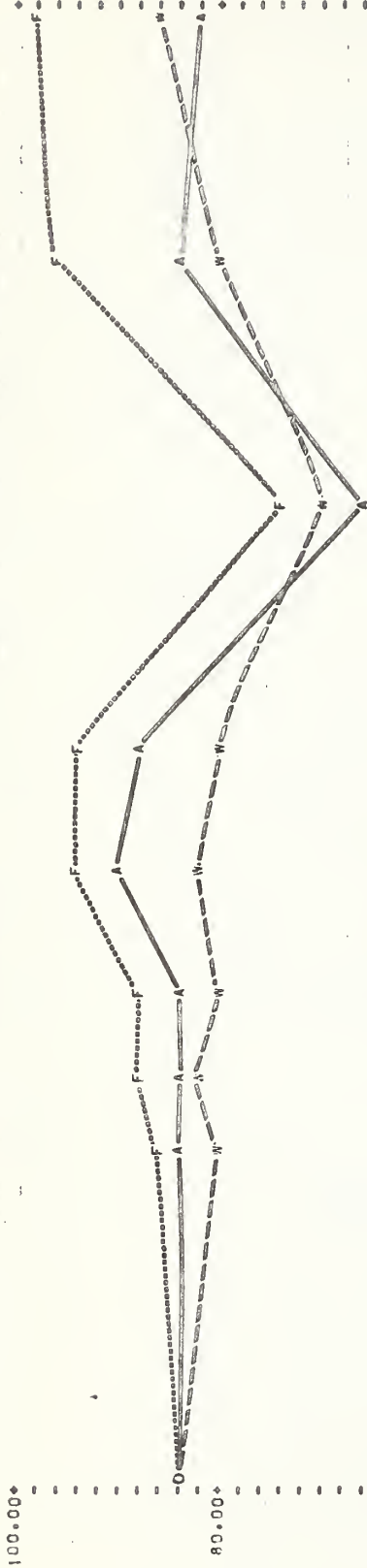
PLASTIC 6

ARIZONA

F=FLORIDA

W=WASHINGTON

FIGURE 74B



GLASS-REINFORCED POLYESTER (60 MIL)

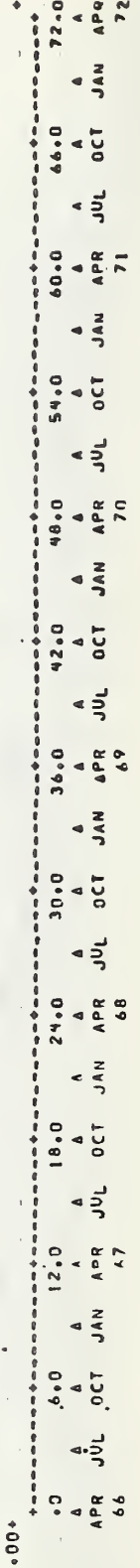
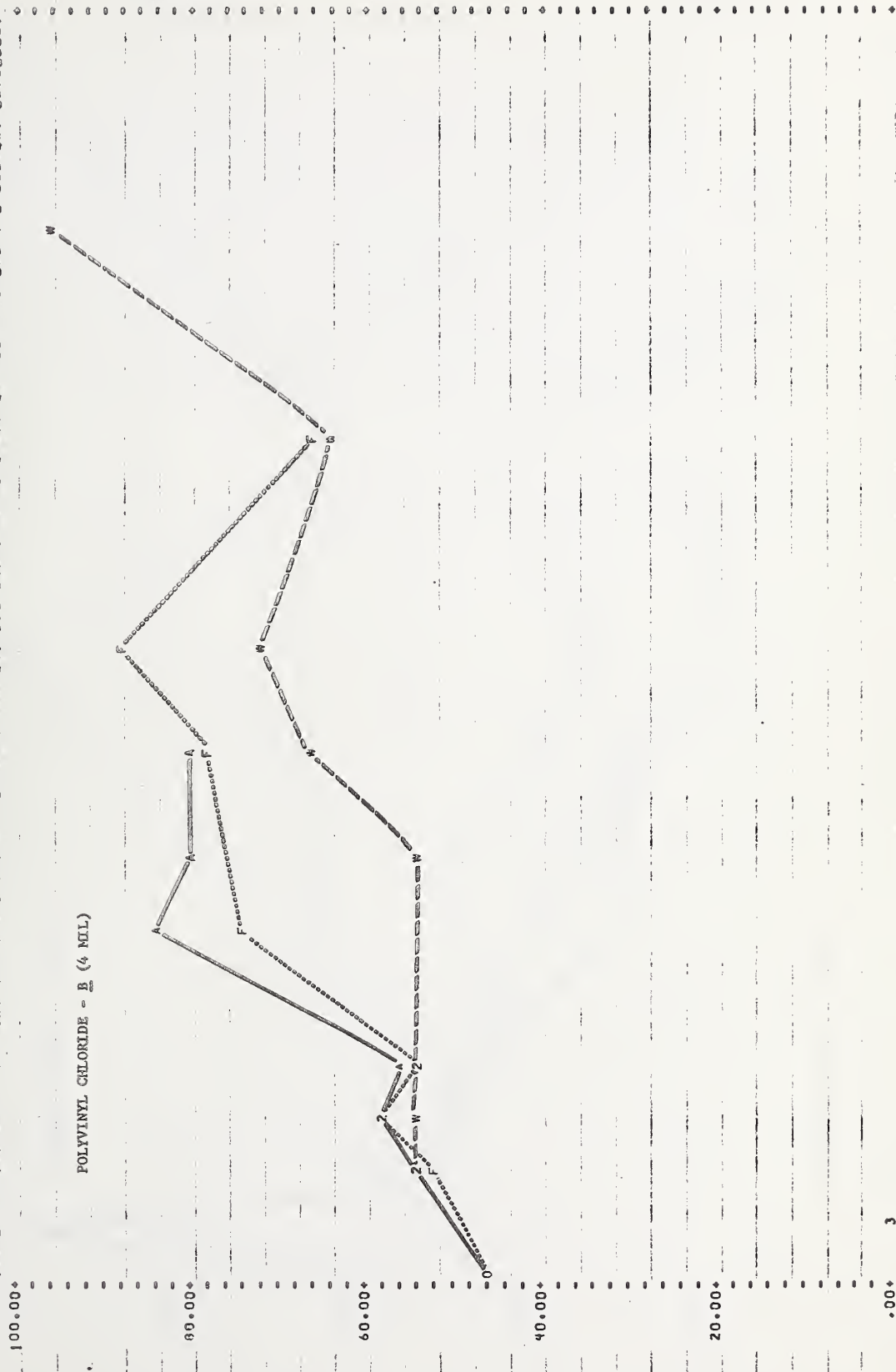


FIGURE 75A

HAZE AT 420NM (IN PERCENT) PLASTIC 7 ARIZONA FLORIDA WASHINGTON



00+ 3
 0 6.0 12.0 18.0 24.0 30.0 36.0 42.0 48.0 54.0 60.0 66.0 72.0
 APR JUL OCT JAN APR JUL OCT JAN APR JUL OCT JAN APR JUL OCT JAN APR
 66 67 68 69 70 71 72

FIGURE 75B

HAZE AT 550NM (IN PERCENT) PLASTIC 7 ARIZONA FLORIDA WASHINGTON

POLYVINYL CHLORIDE - B (4 MIL)

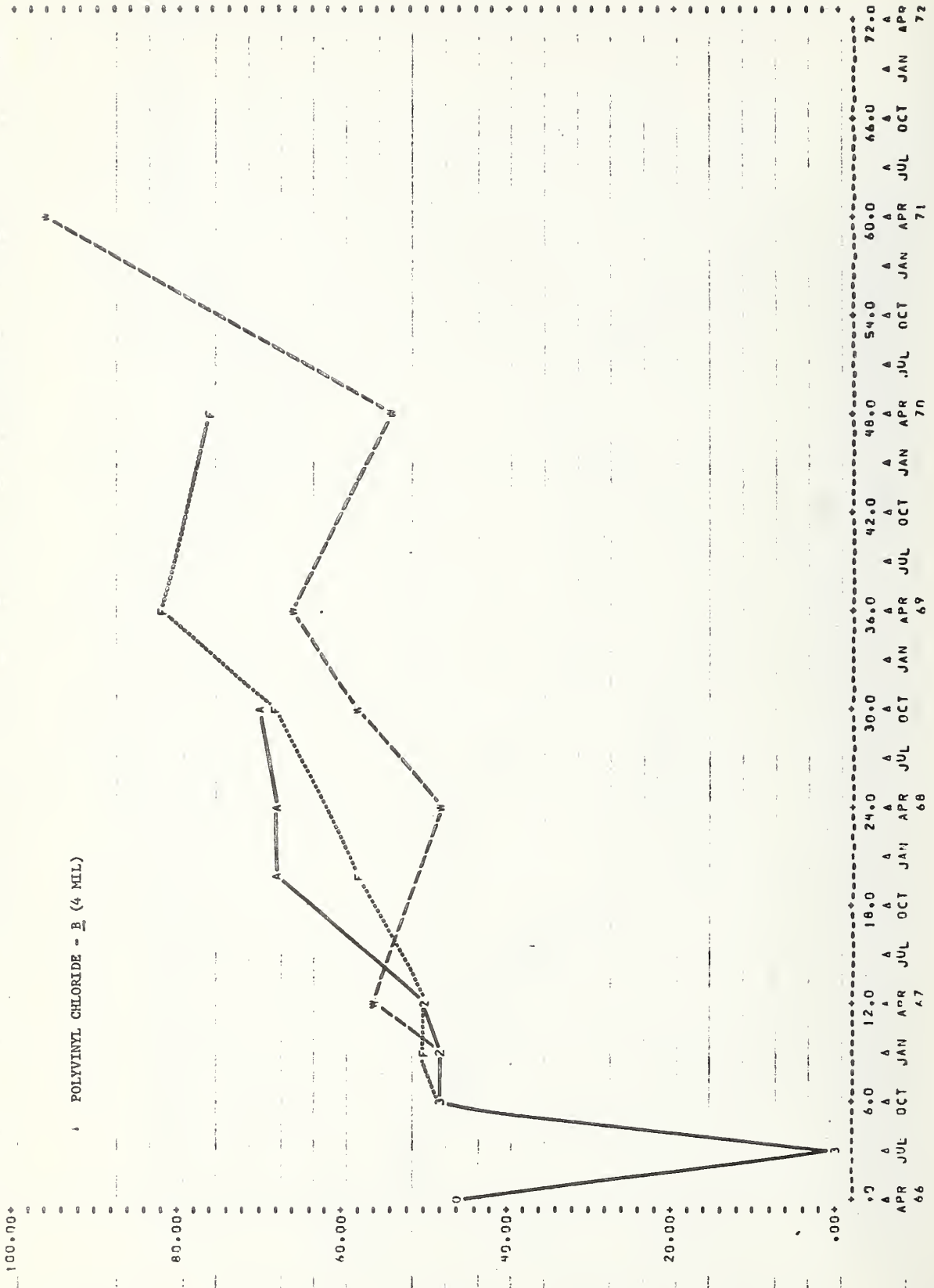
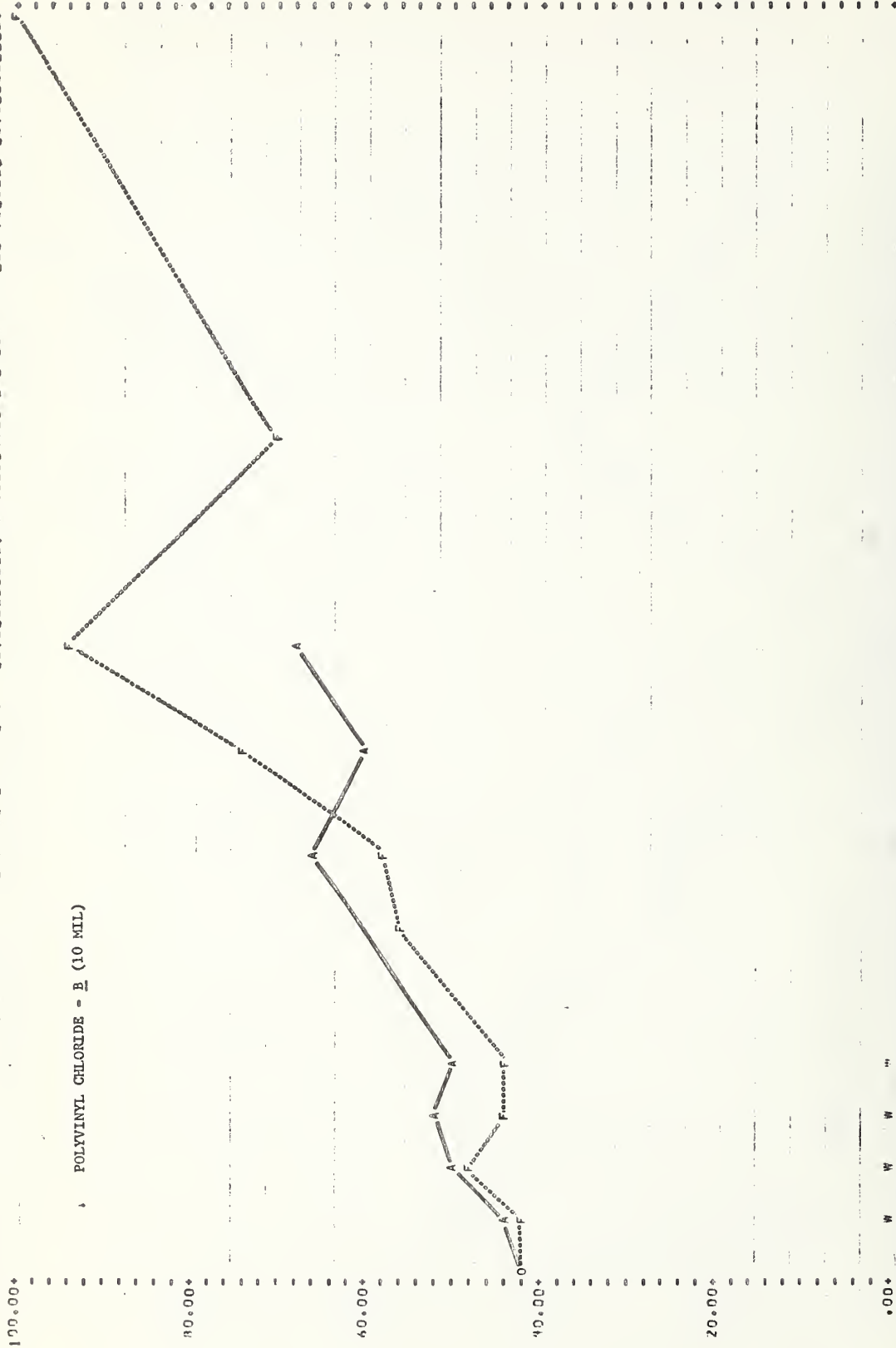


FIGURE 76B

HAZE AT 550NM (IN PERCENT) PLASTIC B ARIZONA FLORIDA WASHINGTON

POLYVINYL CHLORIDE - B (10 MIL)

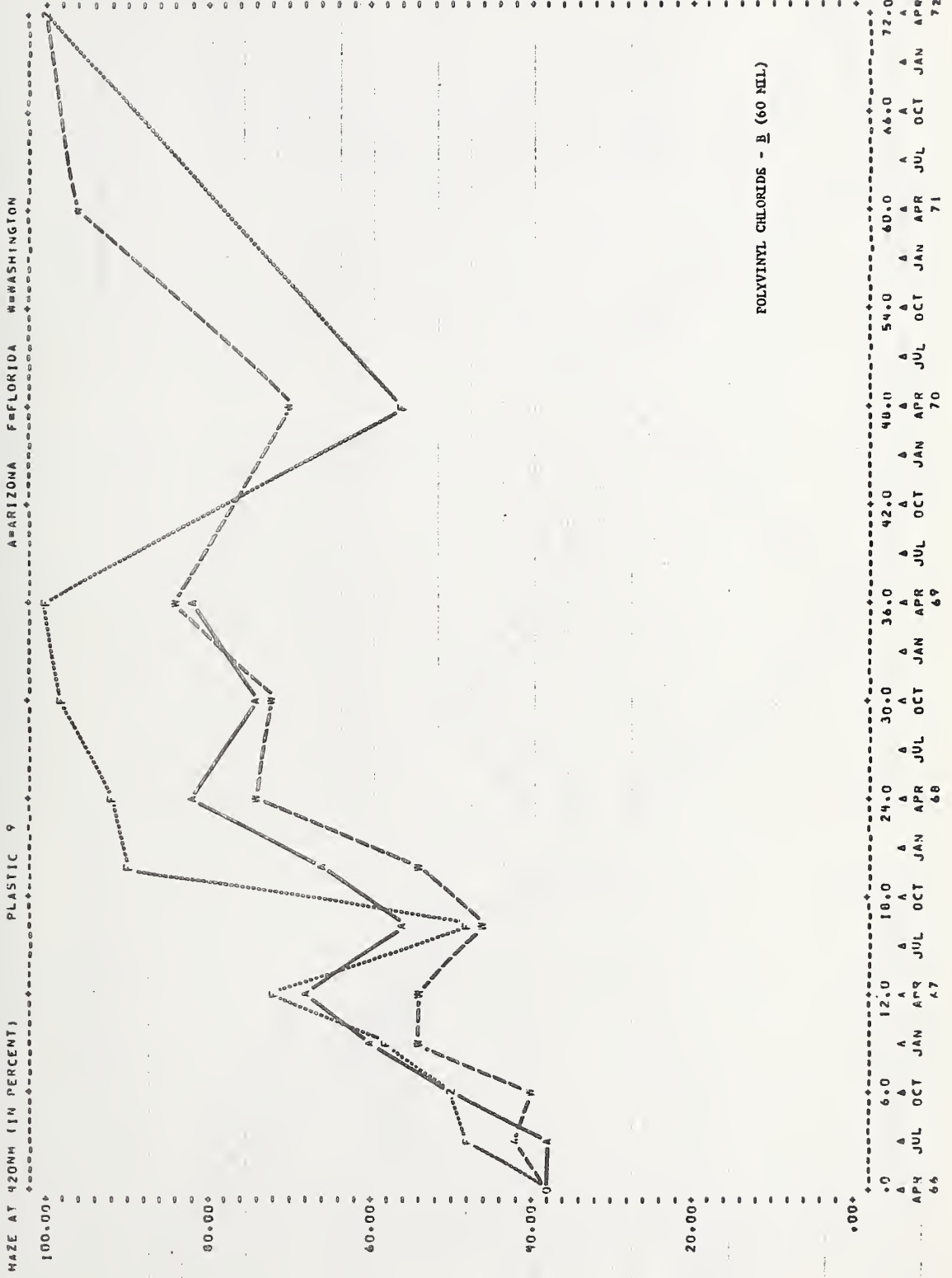


0.00 10.00 20.00 30.00 40.00 50.00 60.00 70.00 80.00 90.00 100.00

APR JUL OCT APR JUL OCT APR JUL OCT APR JUL OCT APR JUL OCT APR JUL OCT APR JUL OCT

66 67 68 69 70 71 72

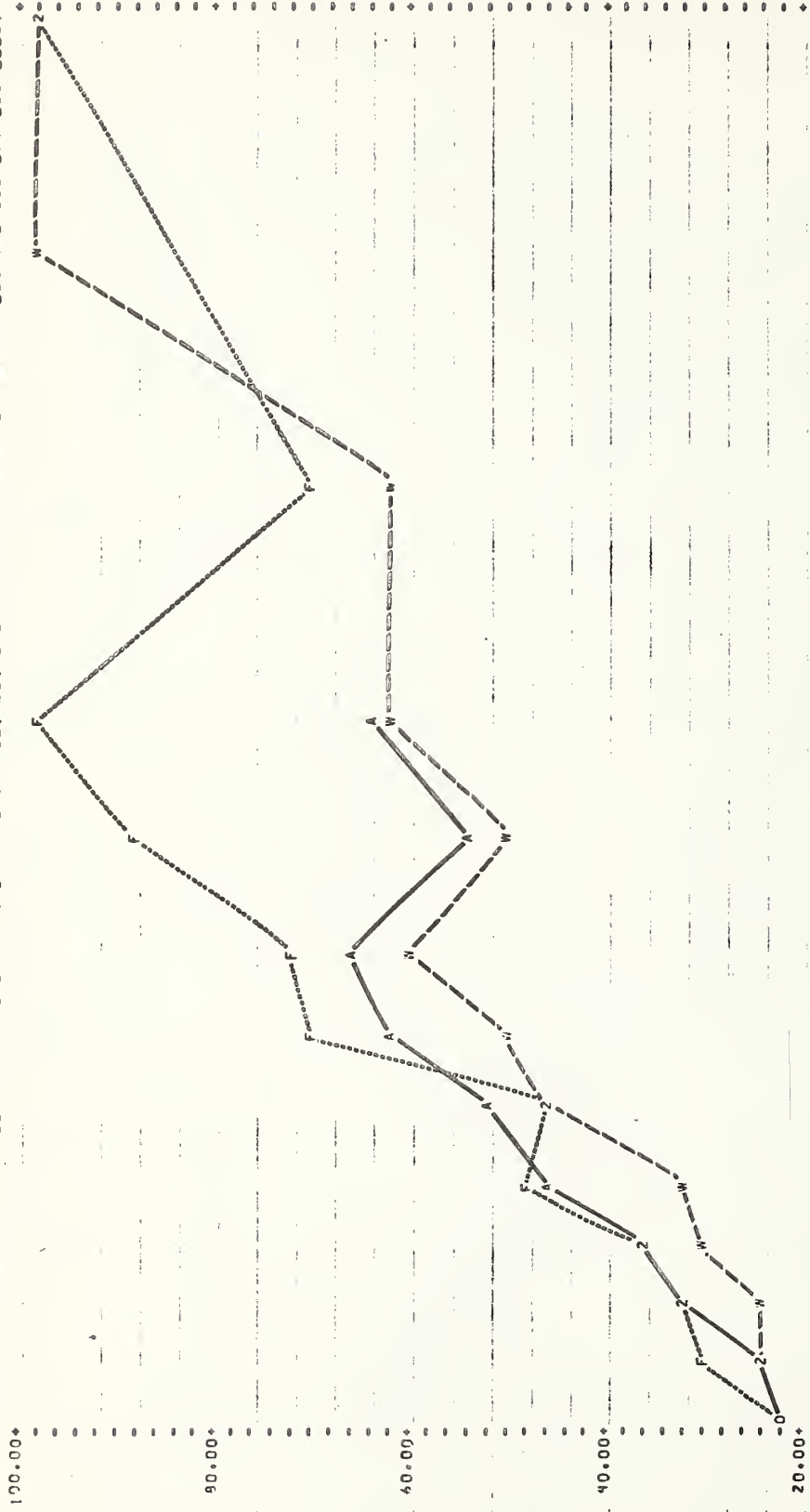
FIGURE 77A



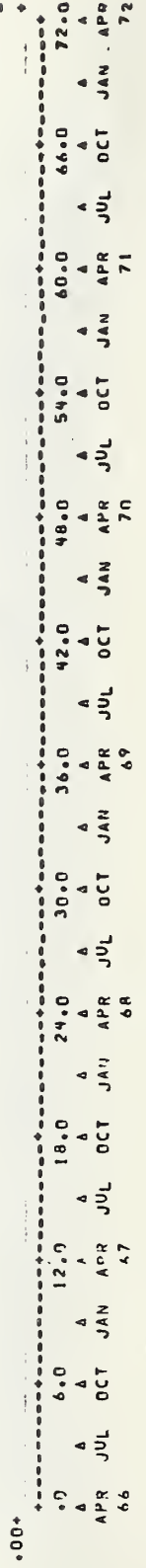
HAZE AT 550NM (IN PERCENT) PLASTIC 9

A=ARIZONA F=FLORIDA W=WASHINGTON

FIGURE 77B



POLYVINYL CHLORIDE - B (60 MIL)



HAZE AT 550MM (IN PERCENT)

PLASTIC 10

ARIZONA FLORIDA WASHINGTON

POLYVINYL CHLORIDE - C (4 MLL)

FIGURE 78B

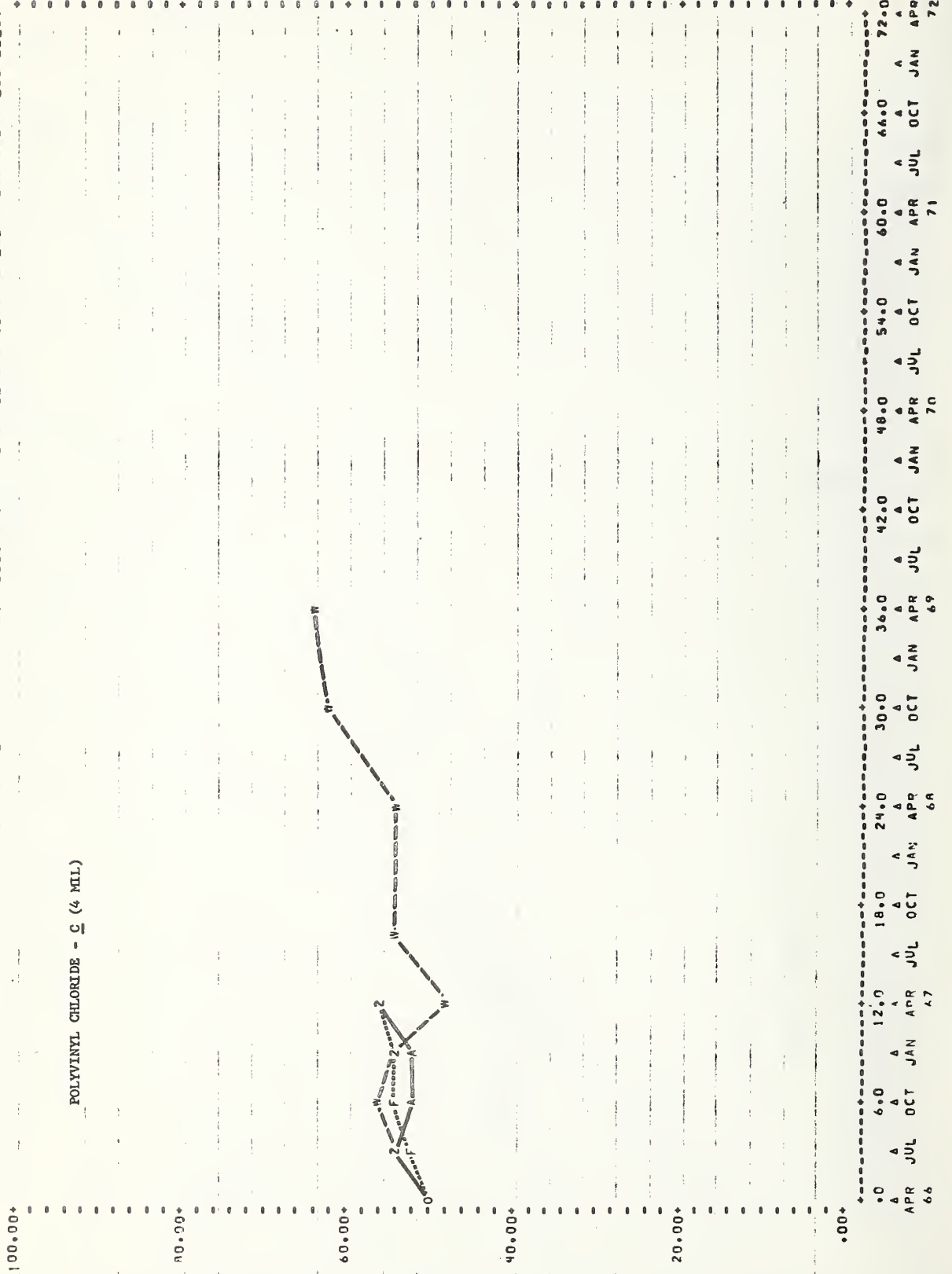


FIGURE 79A

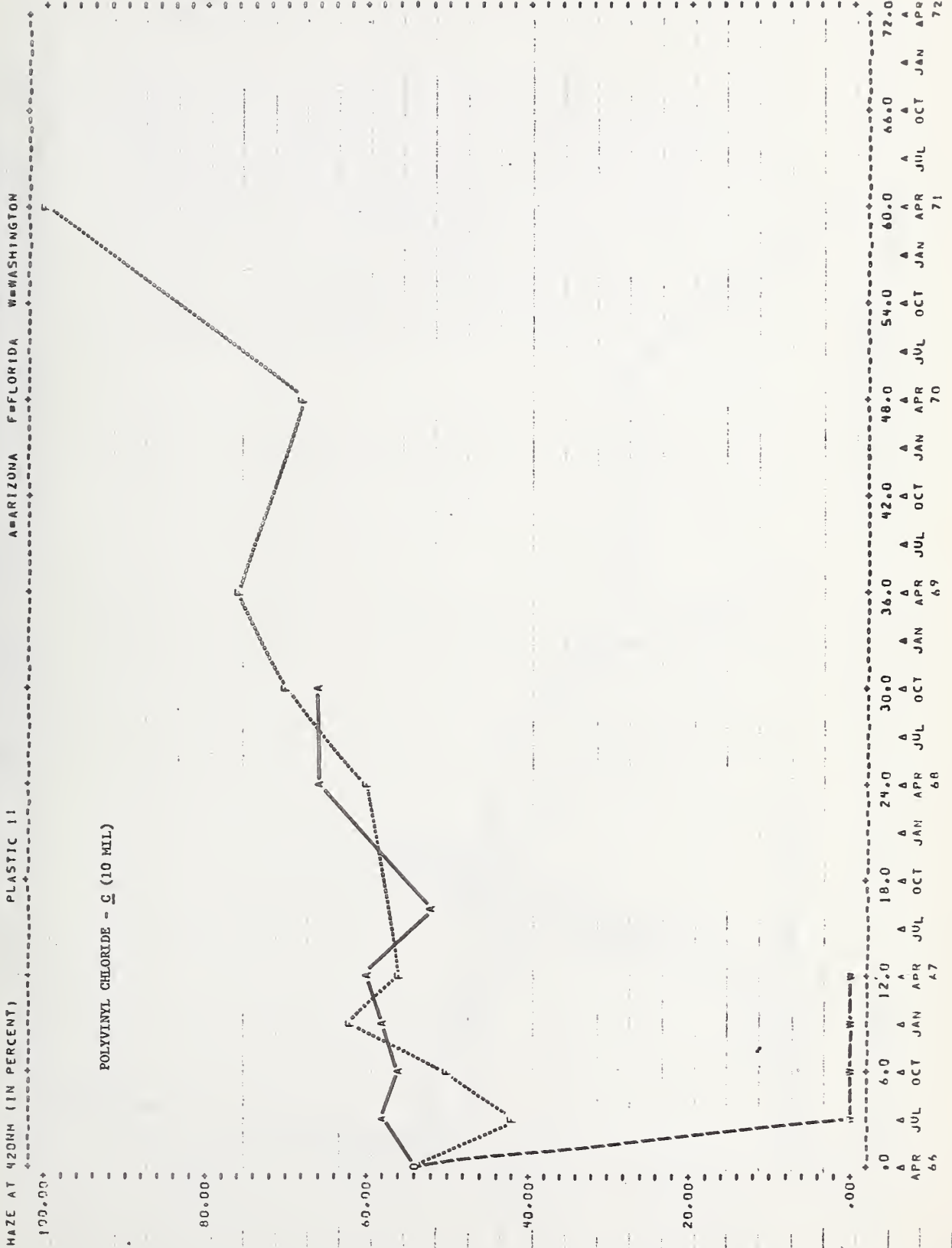
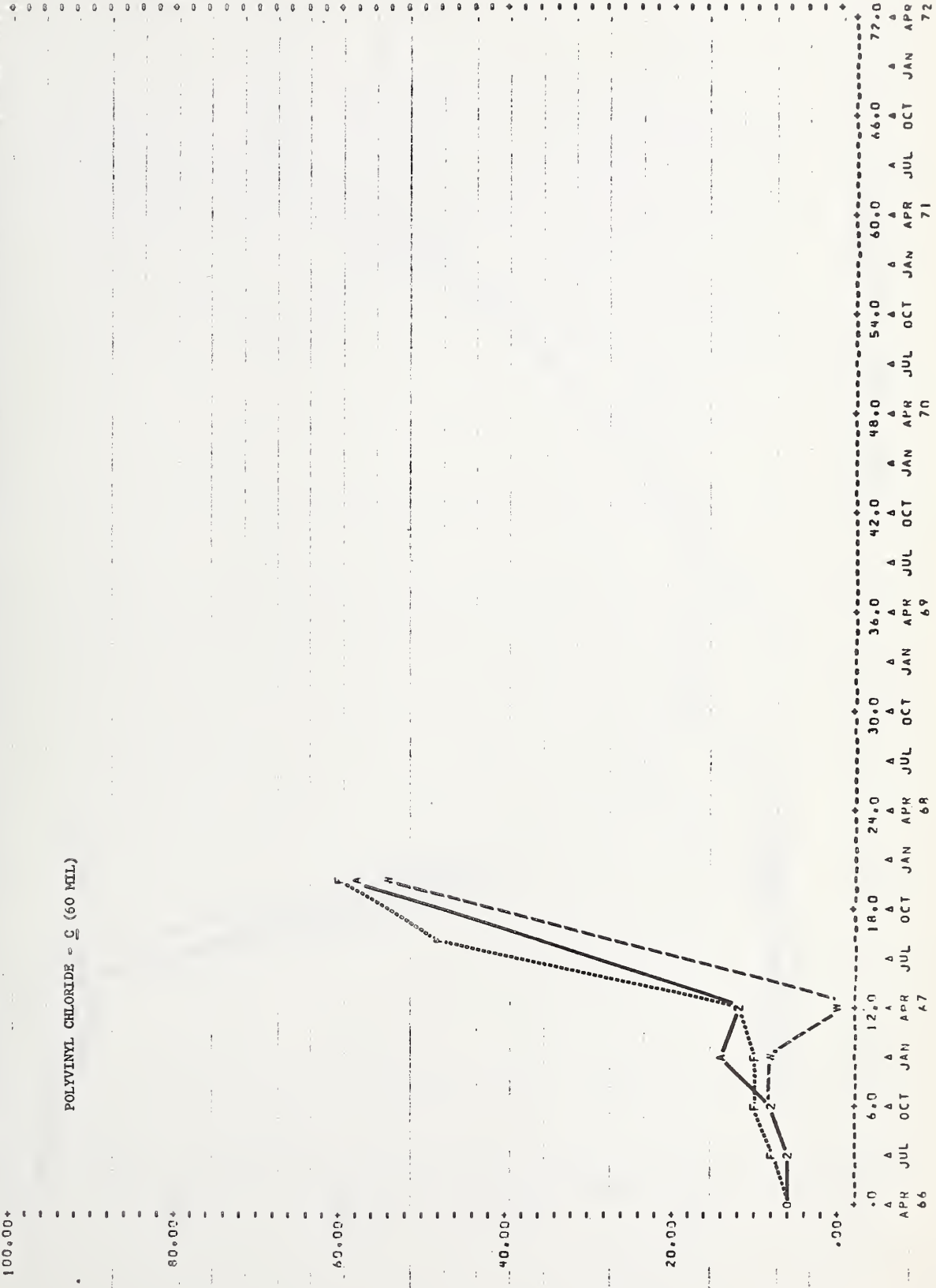


FIGURE 80A

HAZE AT 420NH (IN PERCENT) PLASTIC 12 ARIZONA FLORIDA WASHINGTON



POLYVINYL CHLORIDE - C (60 MIL)

FIGURE 80B

WASHINGTON

FLORIDA

ARIZONA

PLASTIC 12

HAZE AT 550NM (IN PERCENT)

POLYVINYL CHLORIDE - C (60 ML)

100.00

80.00

60.00

40.00

20.00

0.00

APR JUL OCT JAN APR JUL OCT JAN APR JUL OCT JAN APR JUL OCT JAN APR JUL OCT JAN APR
 64 67 68 69 70 71 72

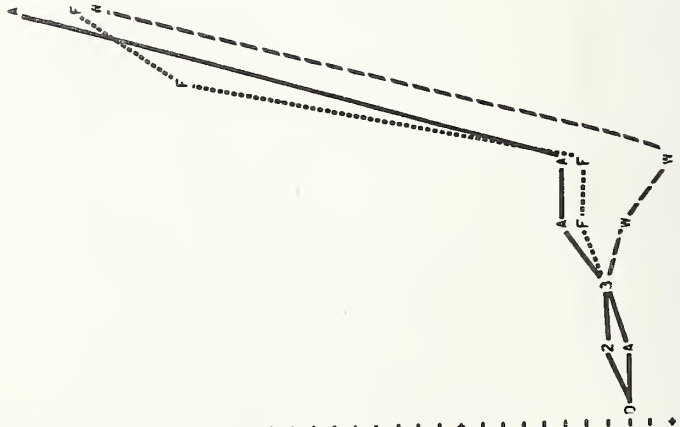


FIGURE 81A

HAZE AT 420NM (IN PERCENT) PLASTIC 13 A=ARIZONA F=FLORIDA W=WASHINGTON

POLYVINYL CHLORIDE - N (60 MIL)



100.00
80.00
60.00
40.00
20.00
0.00

0.0 6.0 12.0 18.0 24.0 30.0 36.0 42.0 48.0 54.0 60.0 66.0 72.0

APR JUL OCT JAN APR JUL OCT JAN APR JUL OCT JAN APR JUL OCT JAN APR JUL OCT JAN APR

66 67 68 69 70 71 72

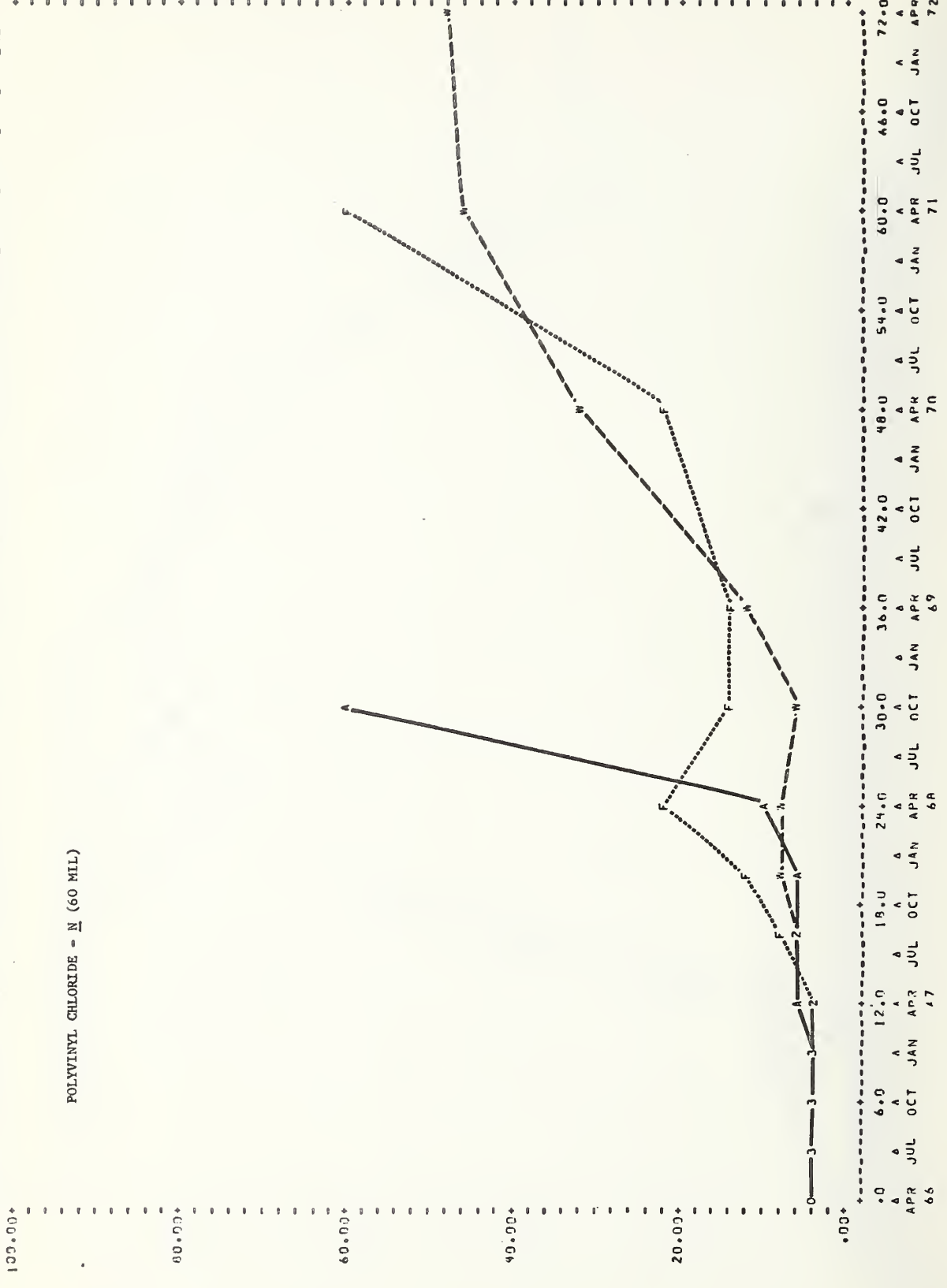
FIGURE 81B

HAZE AT 550NM (IN PERCENT)

PLASTIC 13

ARIZONA FLORIDA WASHINGTON

POLYVINYL CHLORIDE - N (60 MIL)



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<p>16. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.)</p> <p>Twenty plastics samples have been weathered in Arizona, Florida, and Washington, D. C. for 72 months. The weathering of these samples has been followed by measuring changes in the specimen's color, tensile, flexure, gloss, and haze properties. Computer-generated graphs of these changes with time are presented.</p>			
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