



WEATHER BUREAU
Western Region
Salt Lake City, Utah
January 1970

Precipitation Probabilities in the Western Region Associated With Spring 500-mb. Map Types

Richard P. Augulis



Technical Memorandum WBTM WR 45-2

U.S. DEPARTMENT OF COMMERCE / ENVIRONMENTAL SCIENCE SERVICES ADMINISTRATION

M(05.5)
WB-WR
1970-J

U. S. DEPARTMENT OF COMMERCE
ENVIRONMENTAL SCIENCE SERVICES ADMINISTRATION
WEATHER BUREAU

Weather Bureau Technical Memorandum WR-45/2

PRECIPITATION PROBABILITIES IN THE WESTERN REGION ASSOCIATED
WITH SPRING 500-MB MAP TYPES

Richard P. Augulis
Meteorologist
Scientific Services Division
Western Region Headquarters, Salt Lake City, Utah



WESTERN REGION
TECHNICAL MEMORANDUM NO. 45/2

SALT LAKE CITY, UTAH
JANUARY 1970

TABLE OF CONTENTS

	<u>Page</u>
I. Introduction	I
Appendix A	2-64
Appendix B	63-75

PRECIPITATION PROBABILITIES IN THE WESTERN REGION
ASSOCIATED WITH SPRING 500-MB MAP TYPES

I. INTRODUCTION

Precipitation probabilities associated with spring 500-mb map types were generated employing the same typing technique presented in WBTM WR 45/1 "Precipitation Probabilities in the Western Region Associated with Winter 500-mb Map Types".

The spring season consisted of 947 maps for 0000 and 1200GMT March 1962-1966, April 1962-1967, and May 1962-1967. Climatologies for 12-hour precipitation were calculated for the same station network in the Western Region.

Maps of spring type climatologies along with associated type and pure mean map are given in Appendix A. The type maps have been arranged according to basic similarities in the large-scale flow over the typing area. The divisions are as follows:

Northwest flow over most of Western Region with ridge vicinity 130 - 140°W.--types 4, 15

Ridge vicinity 120 - 125°W.--types 10, 16, 24

Zonal flow--types 1, 14

Trough 135 - 145°W.--types 2, 12, 28

Trough 125 - 130°W.--negative tilt types 5, 7, 9, 11, 25

Trough 125°W.--types 20, 21, 30

Trough 110 - 120°W.--types 3, 8, 18, 22, 27, 29

Split flow trough vicinity 115 - 120°W.--types 6, 23, 26

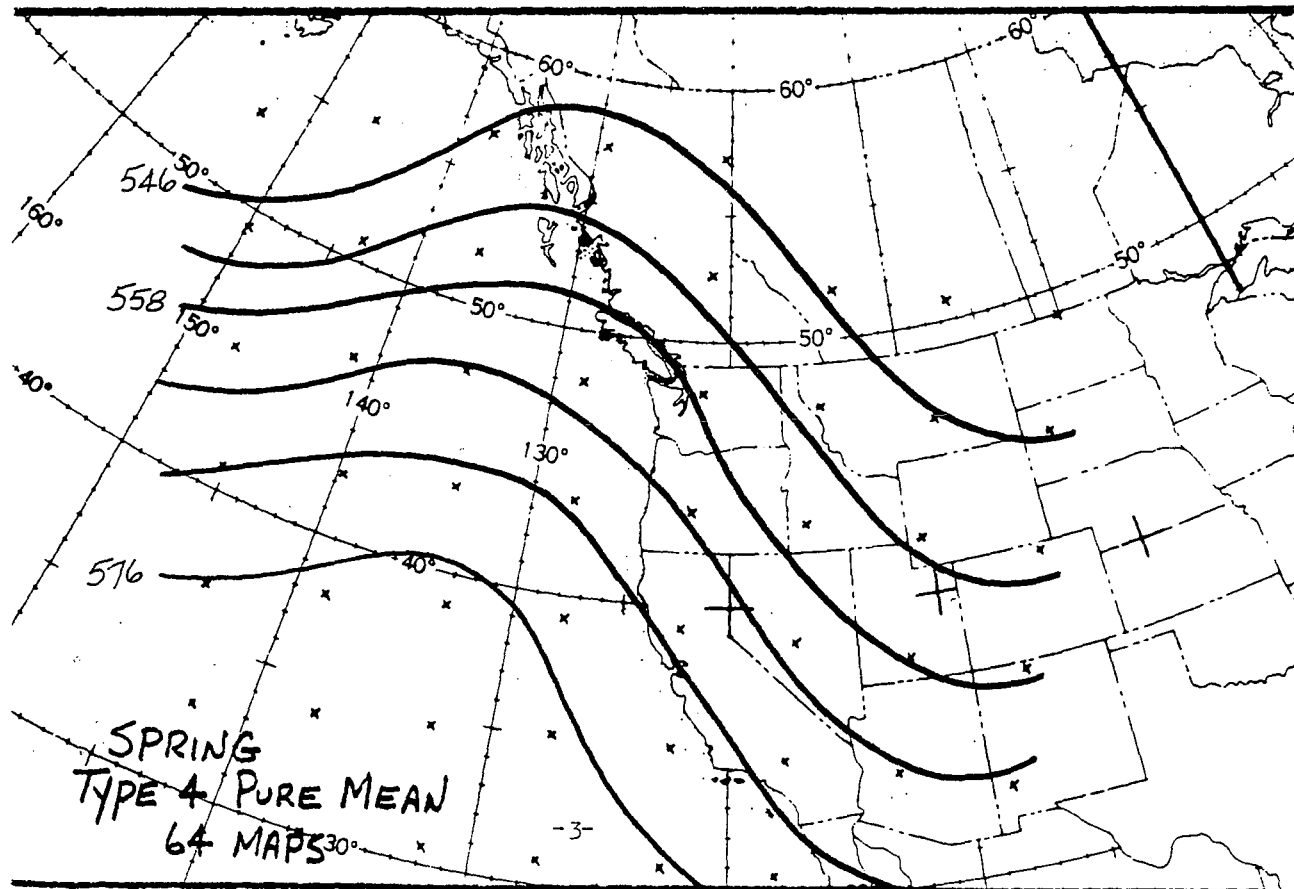
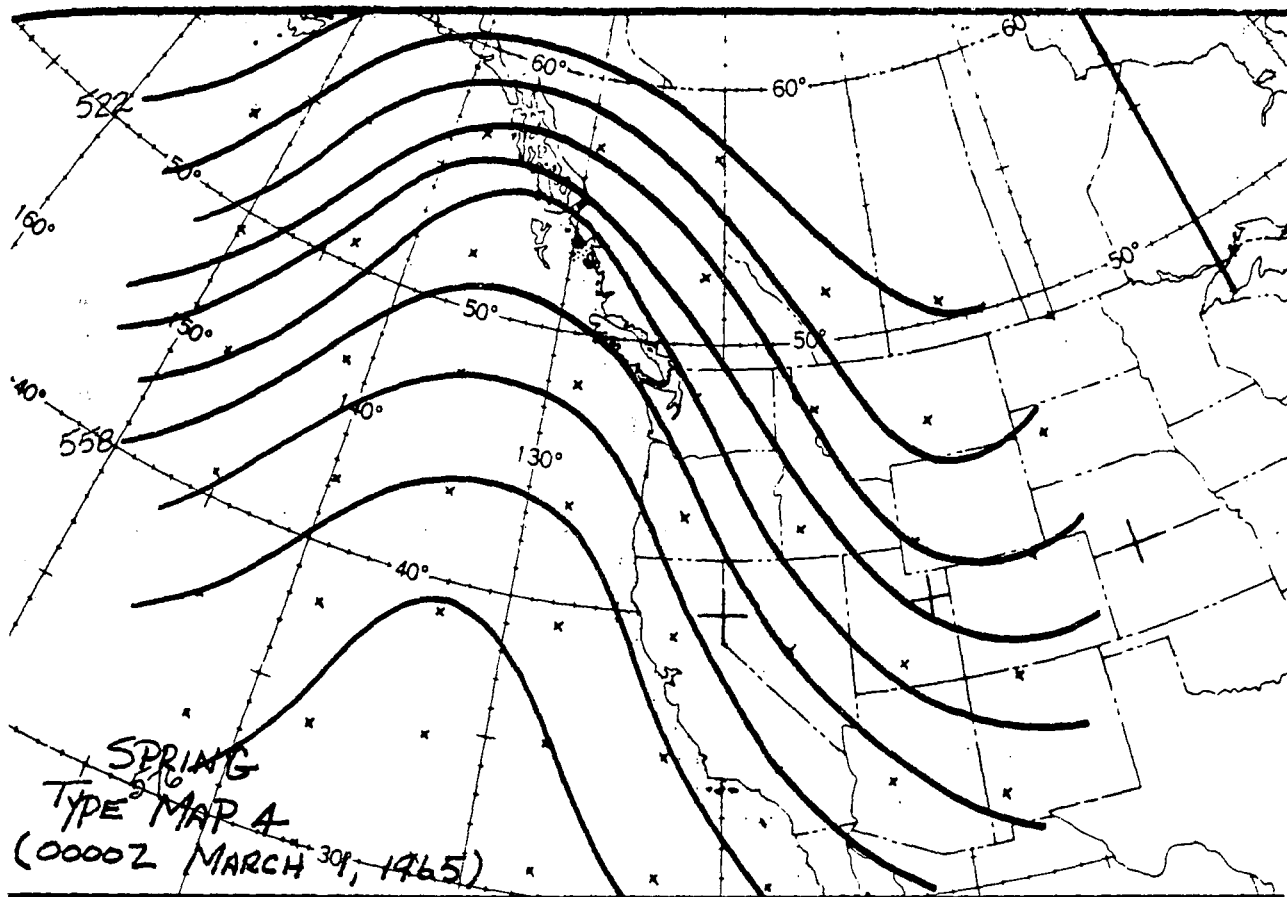
Closed low off California coast--types 13, 17, 19.

A listing of dates of occurrence of each spring type is given in Appendix B.

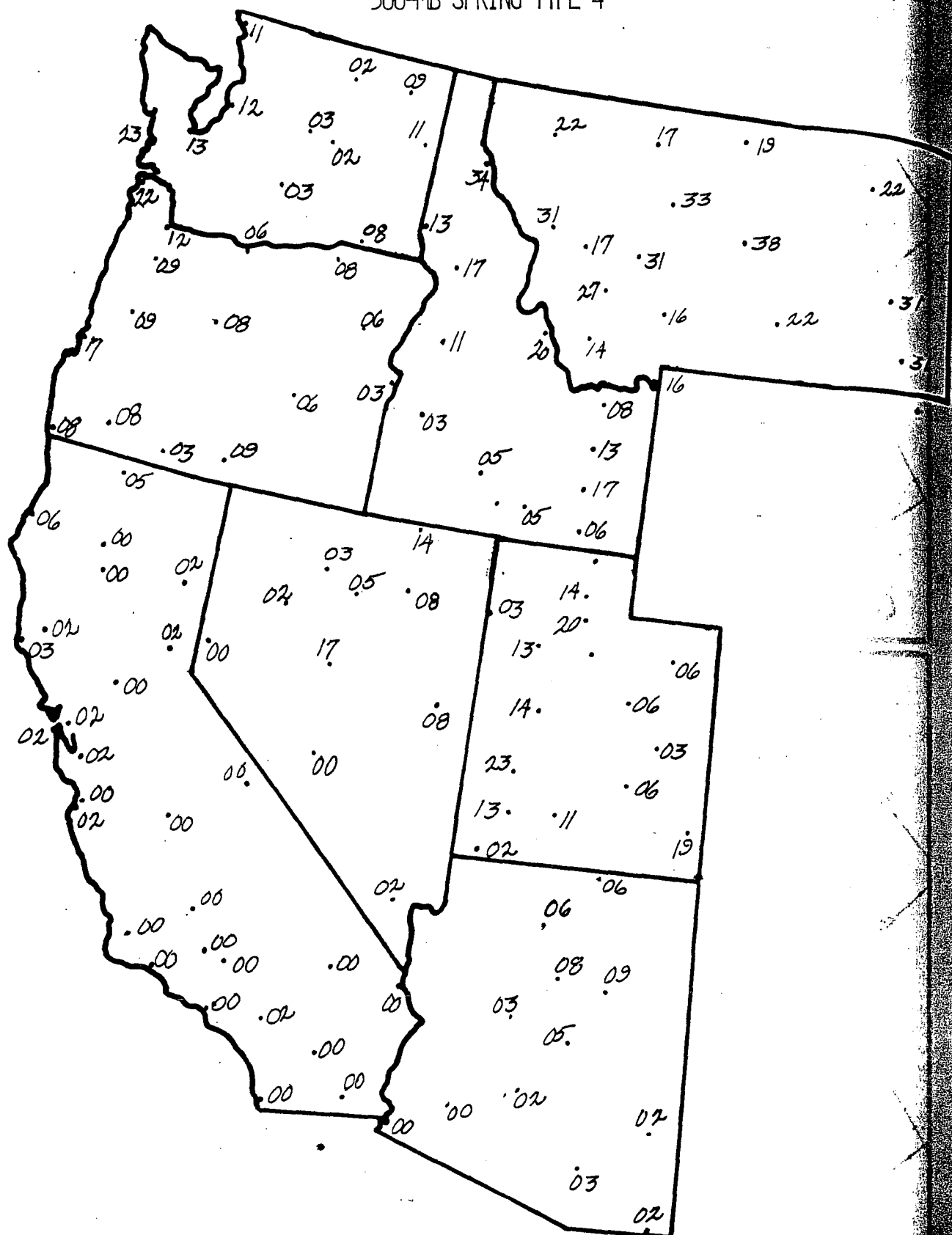
APPENDIX A

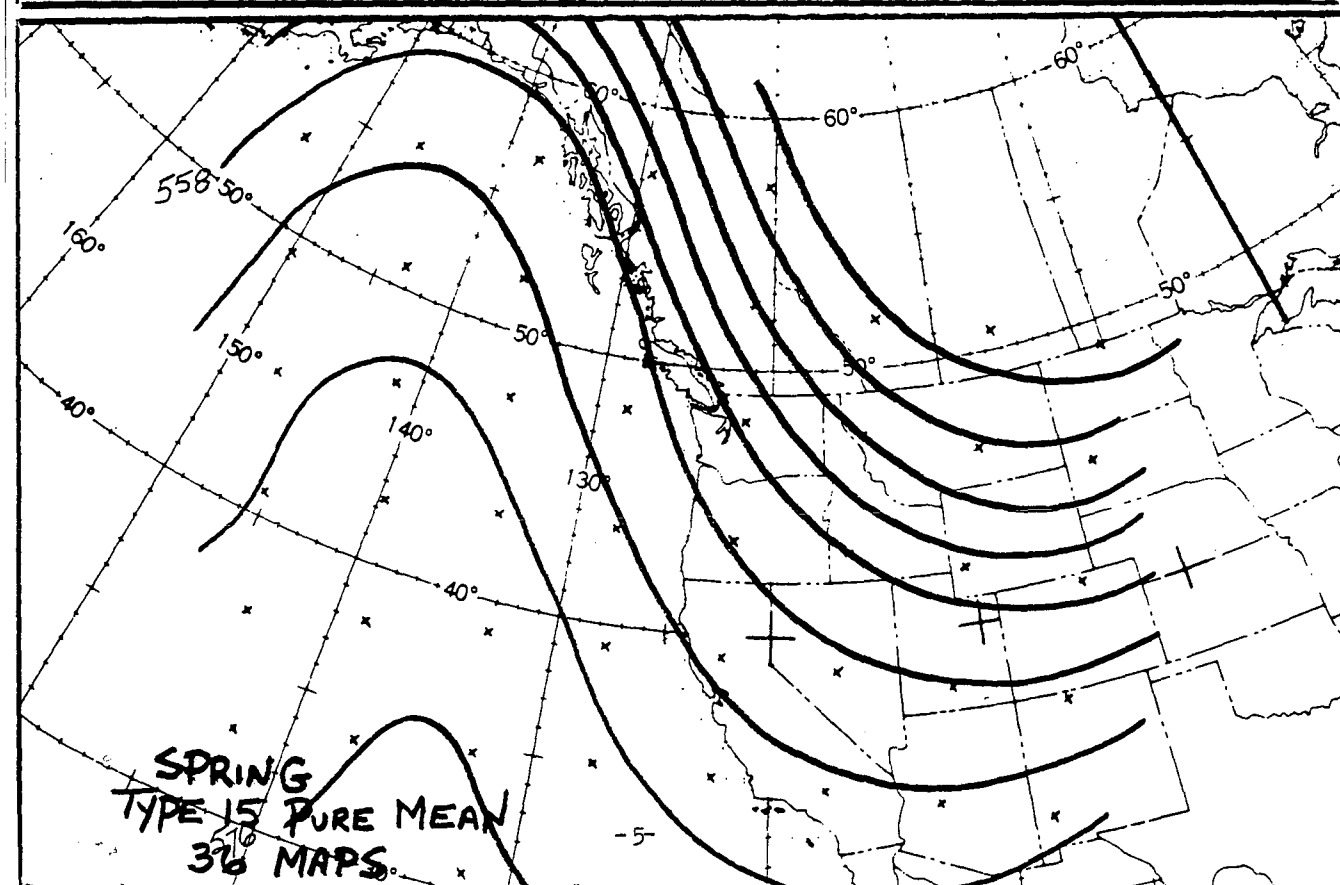
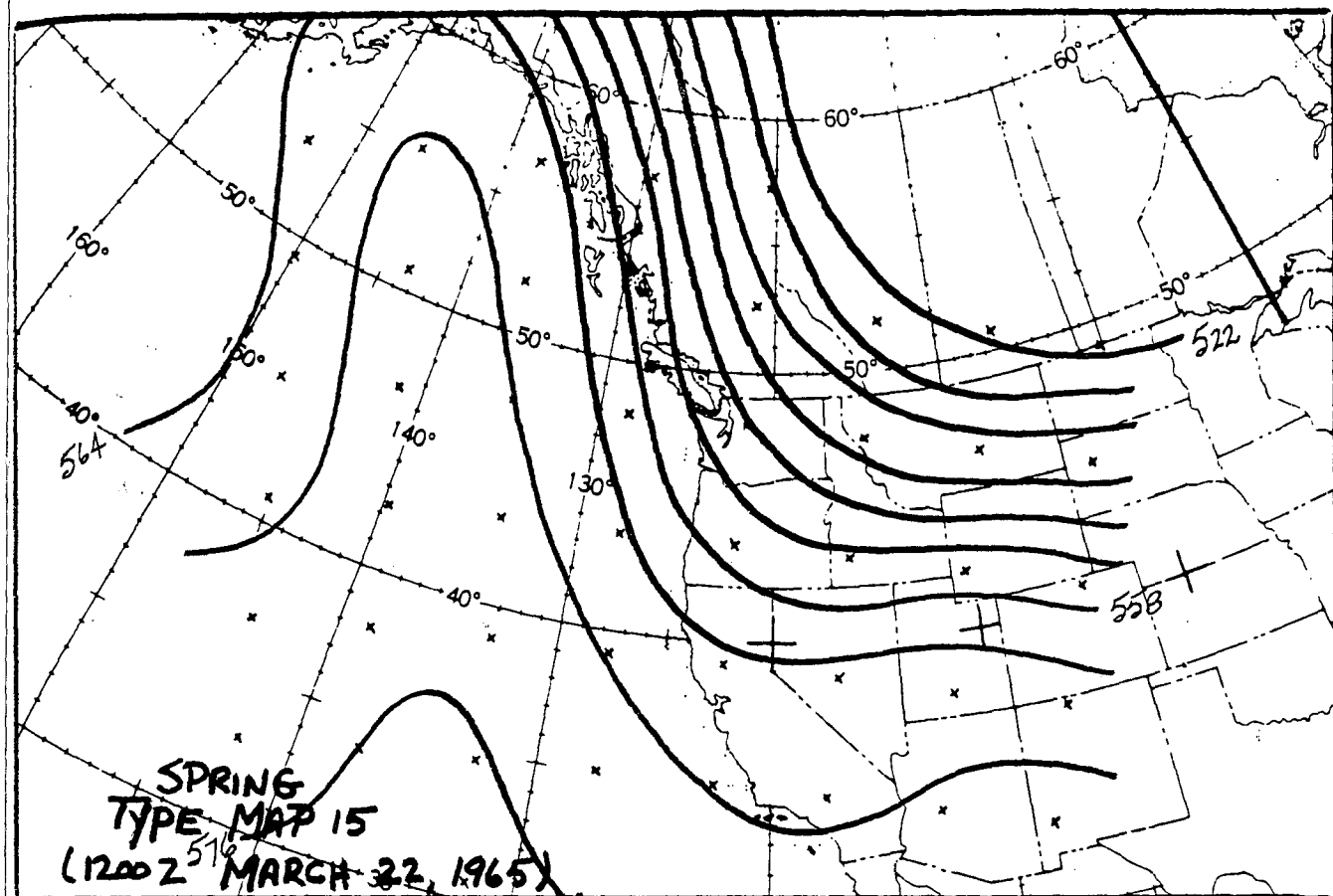
Spring Types and Associated Precipitation Climatologies

Types Arranged According to Similarity of
Basic Flow Pattern



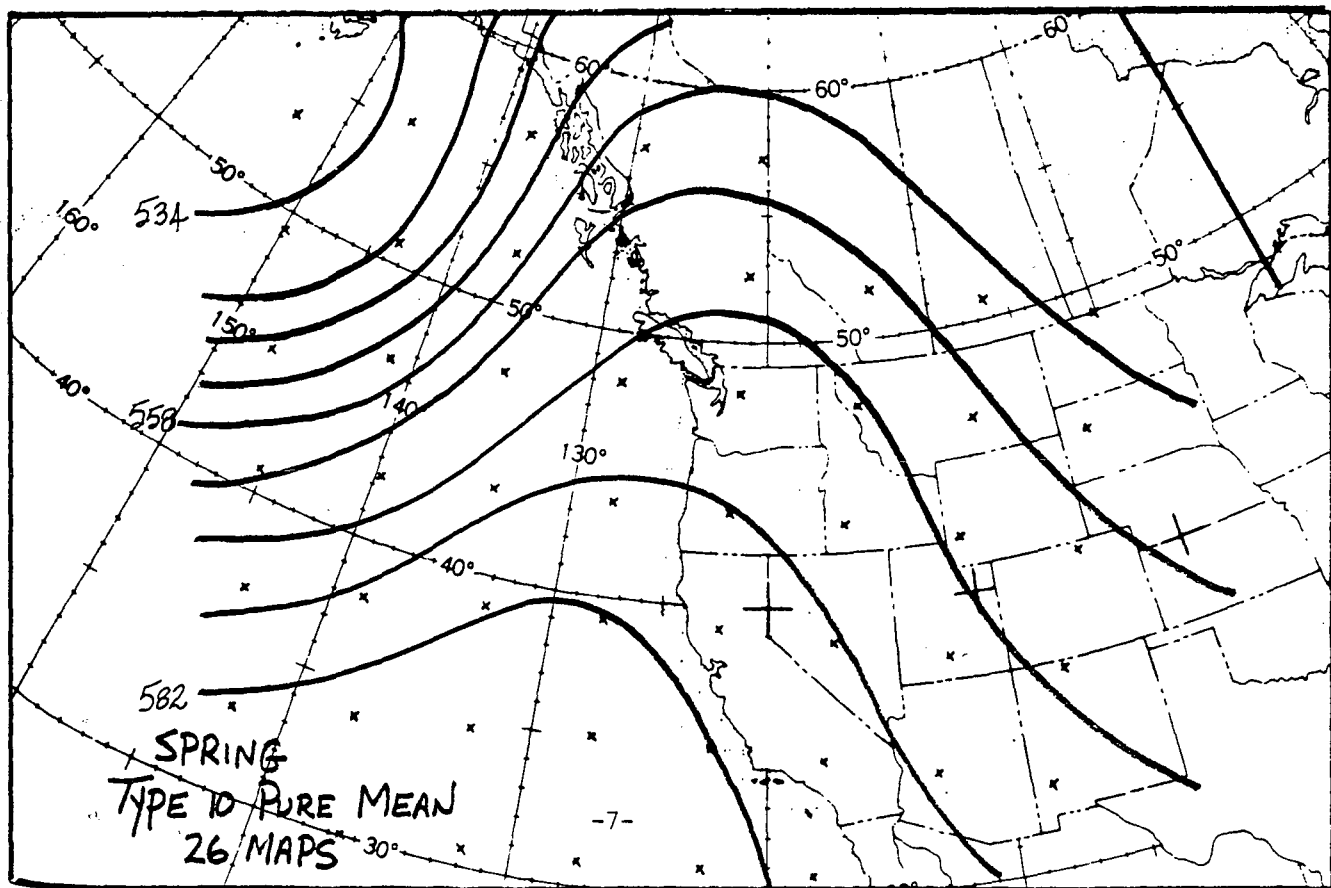
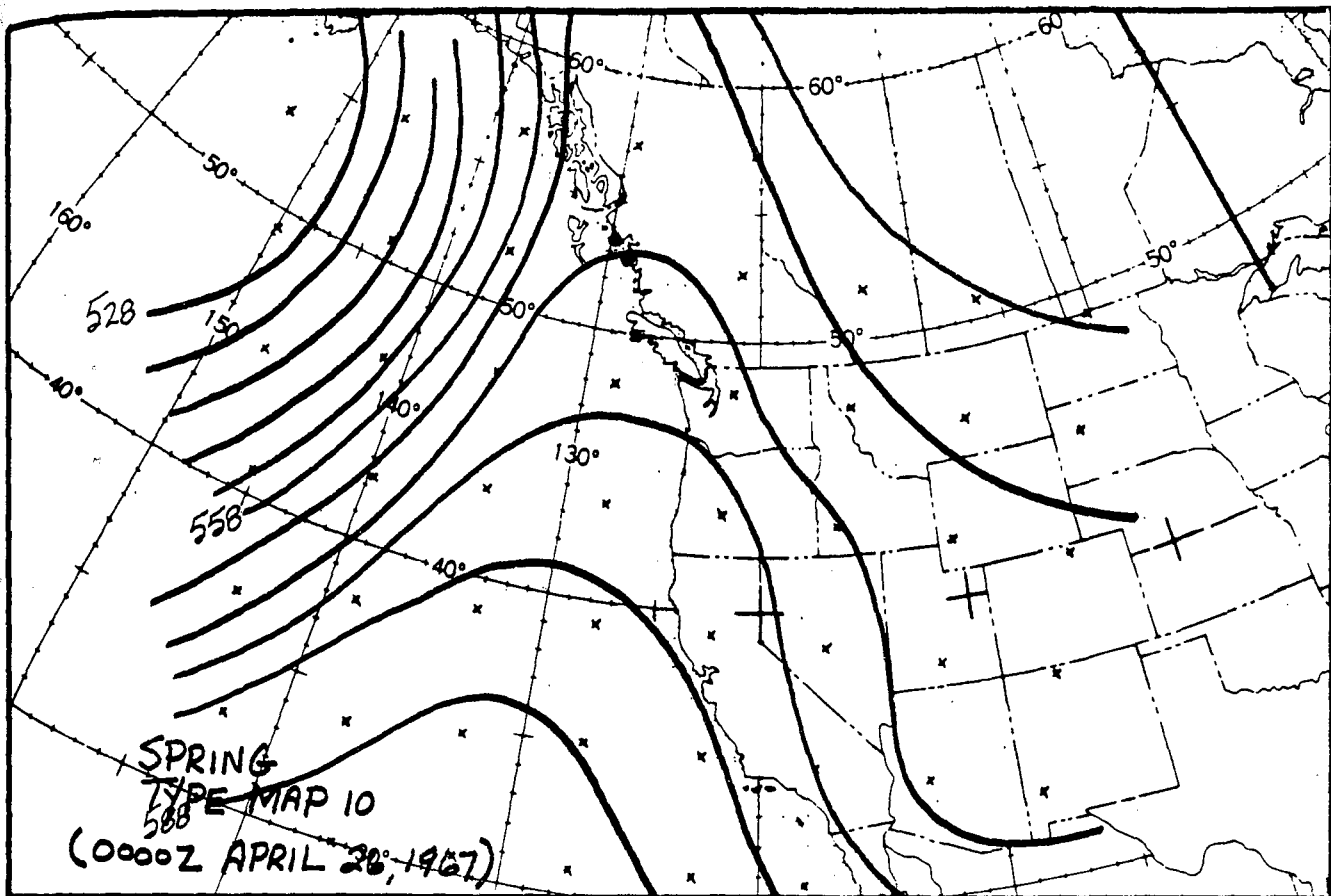
500-MB SPRING TYPE 4



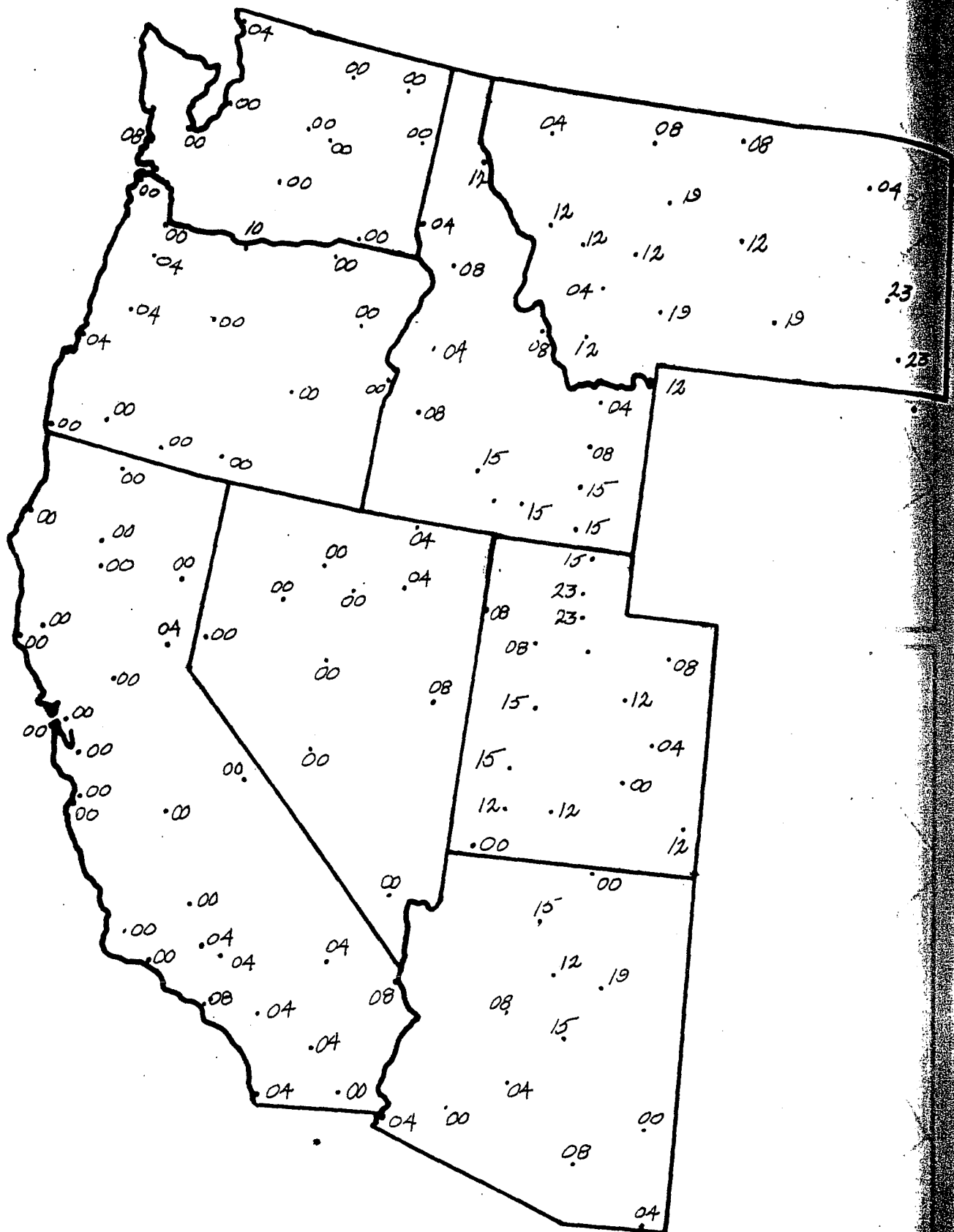


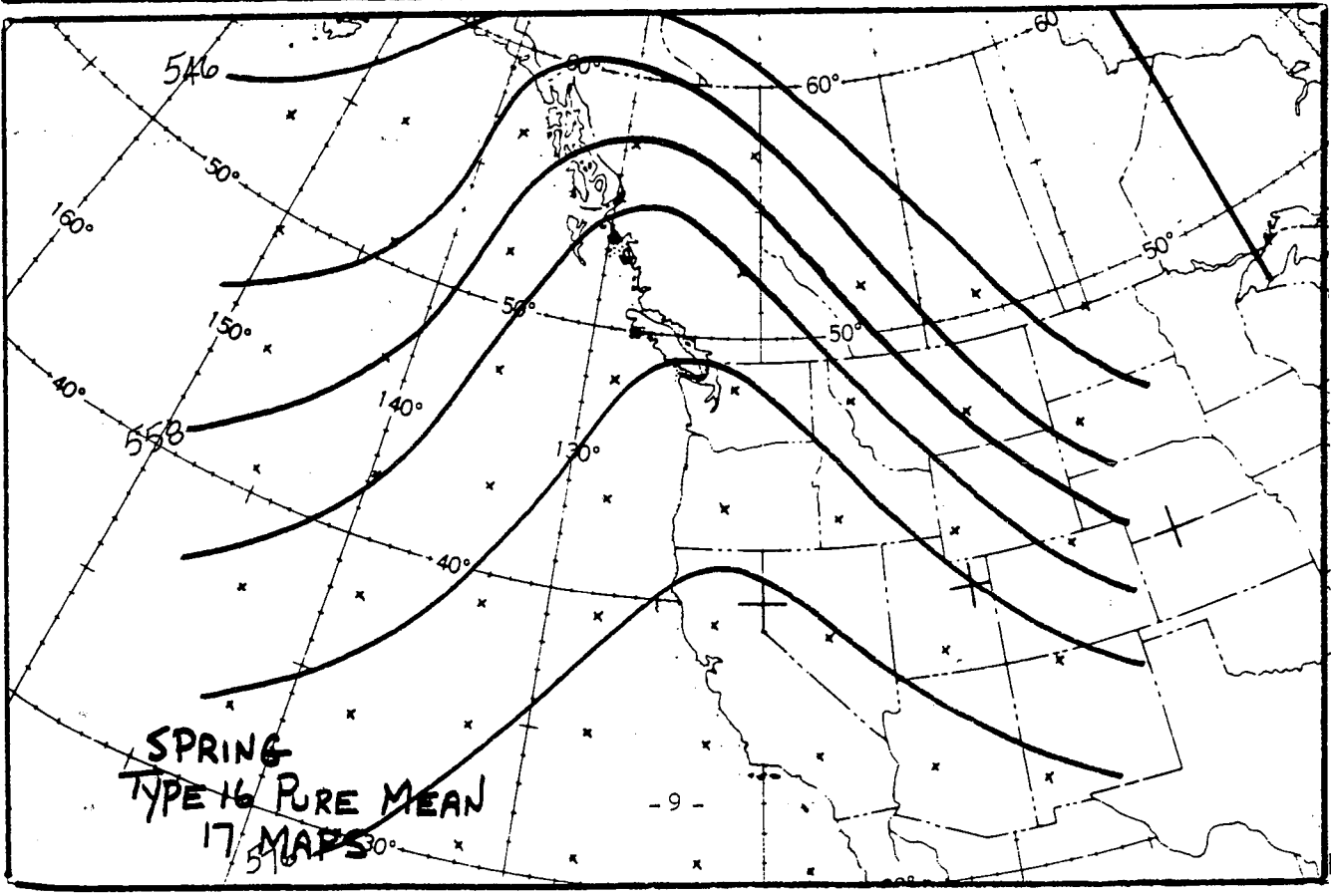
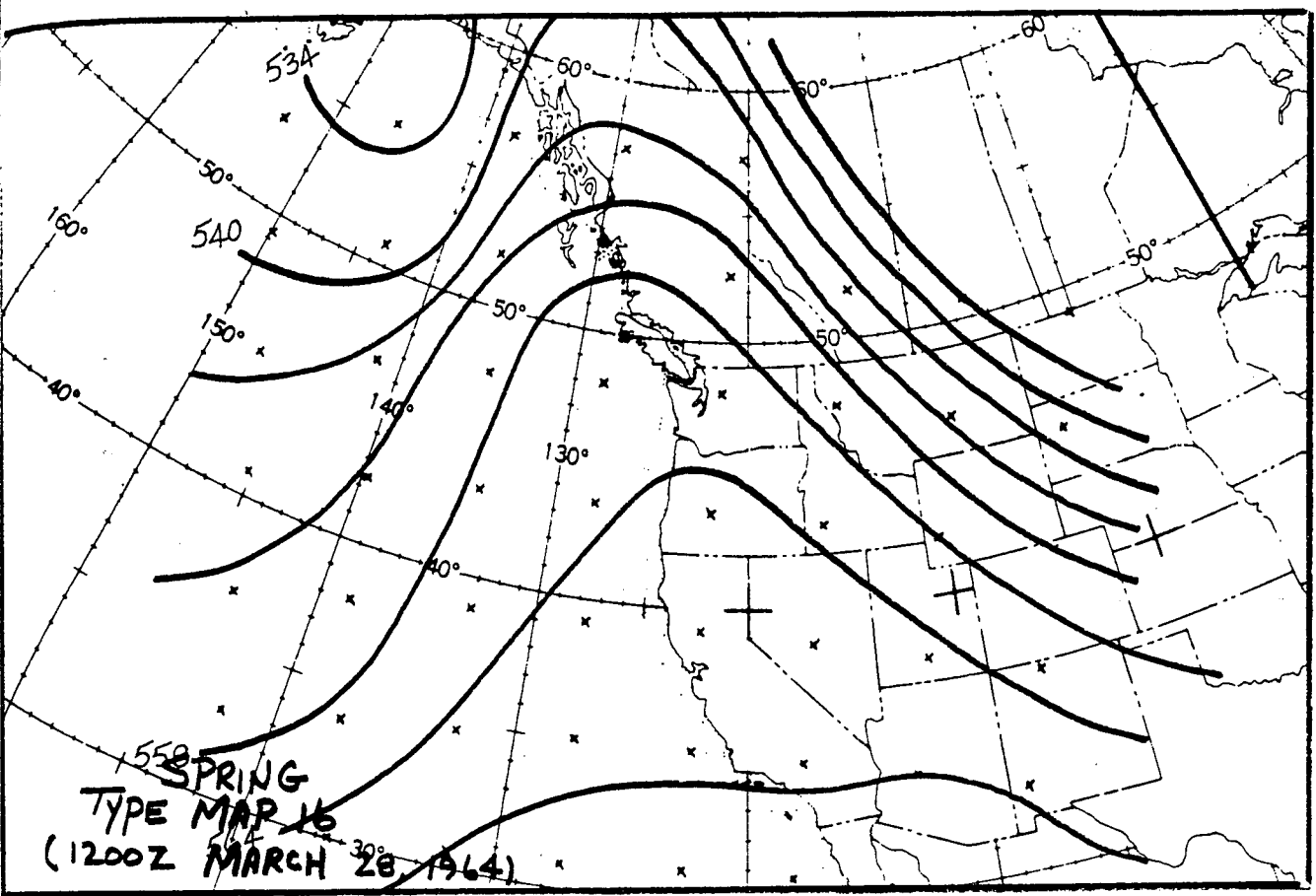
500-MB SPRING TYPE 15



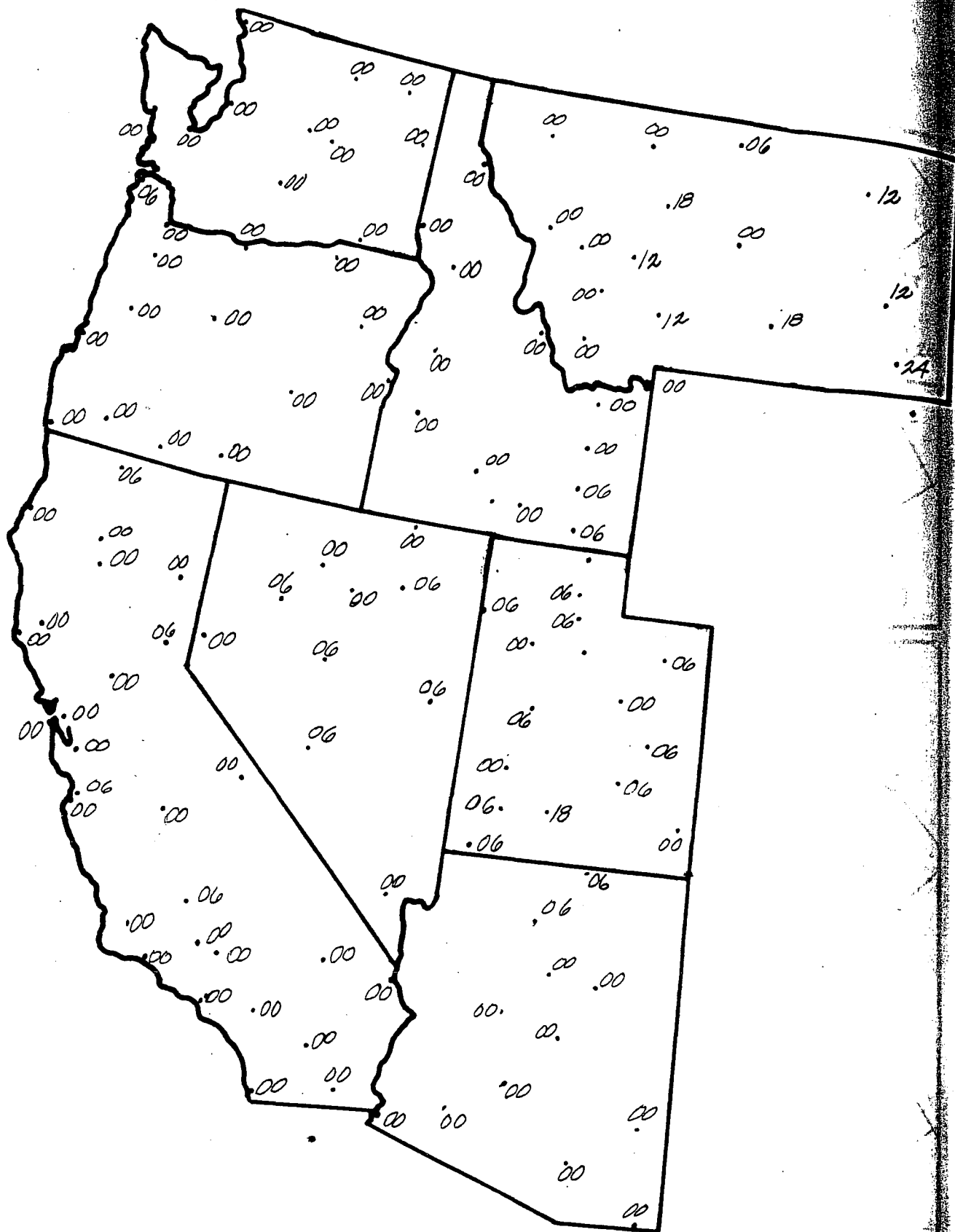


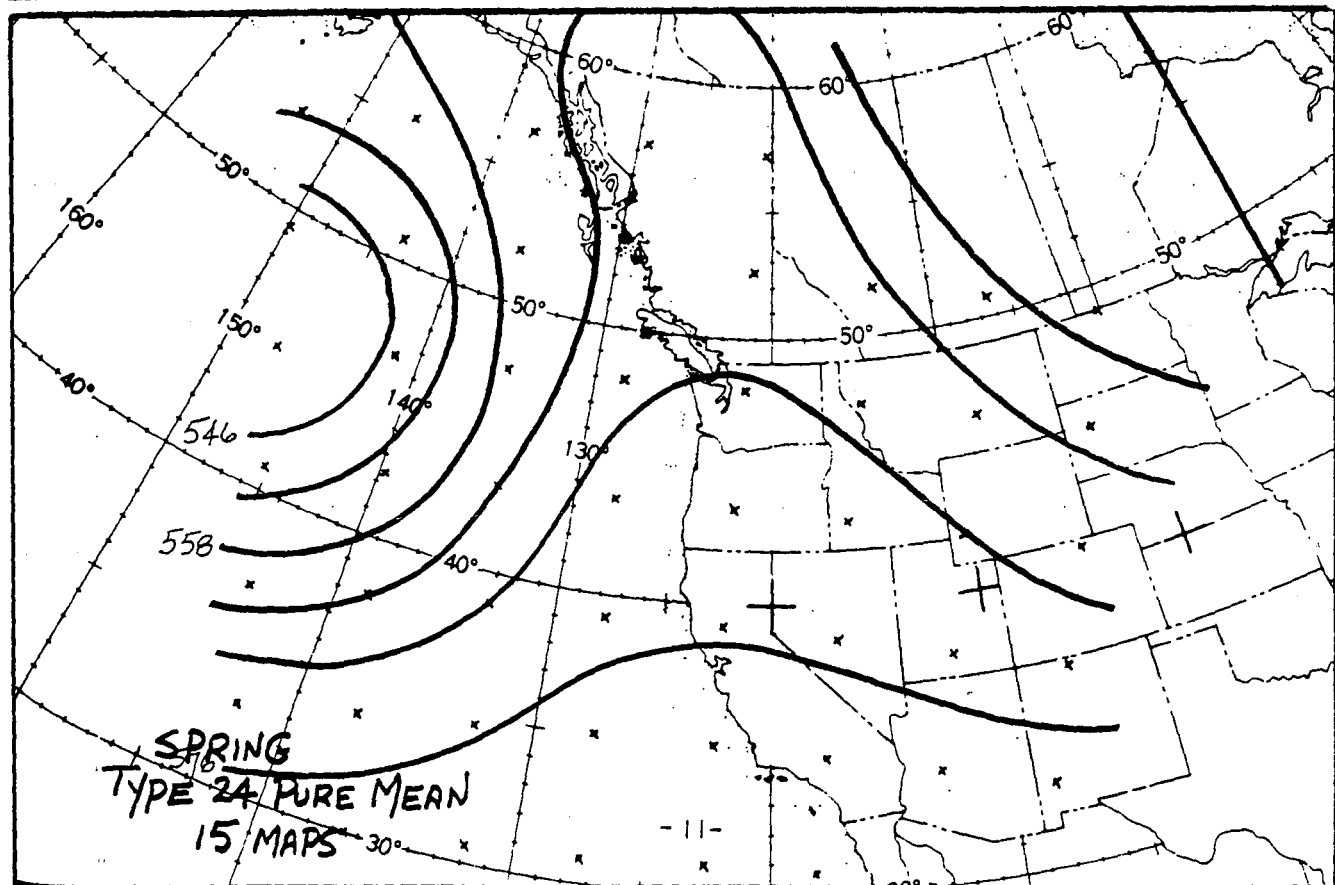
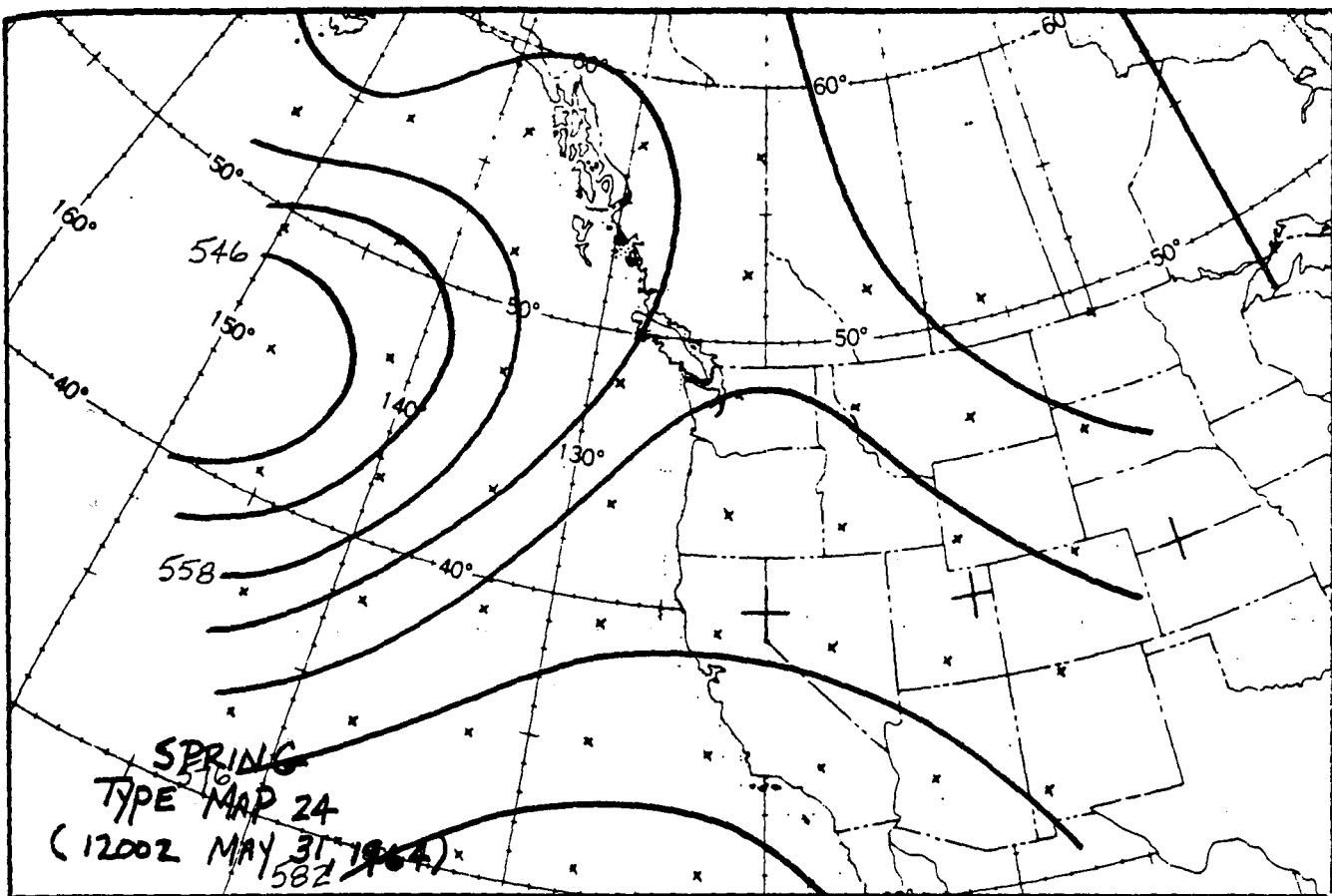
500-MB SPRING TYPE 10

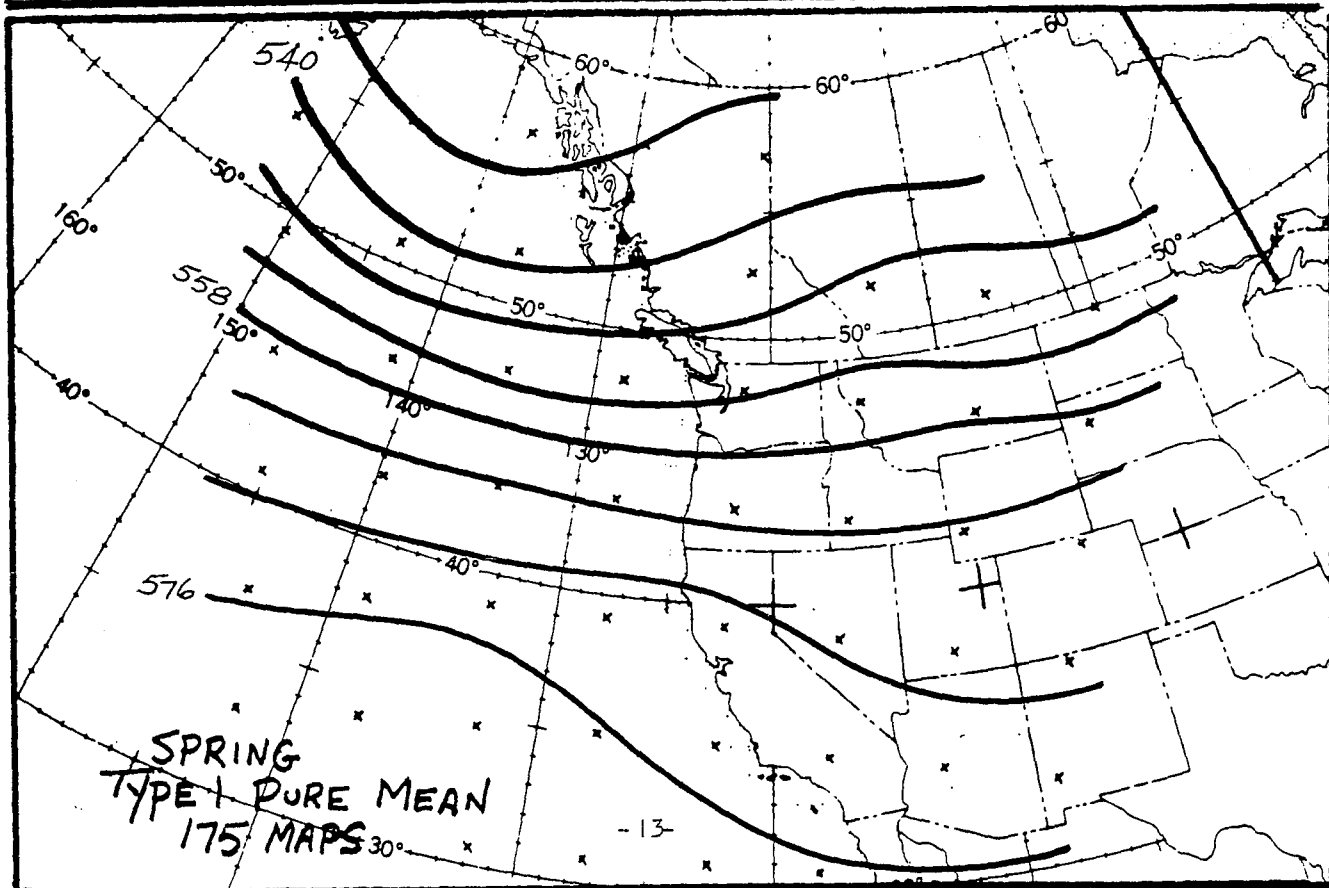
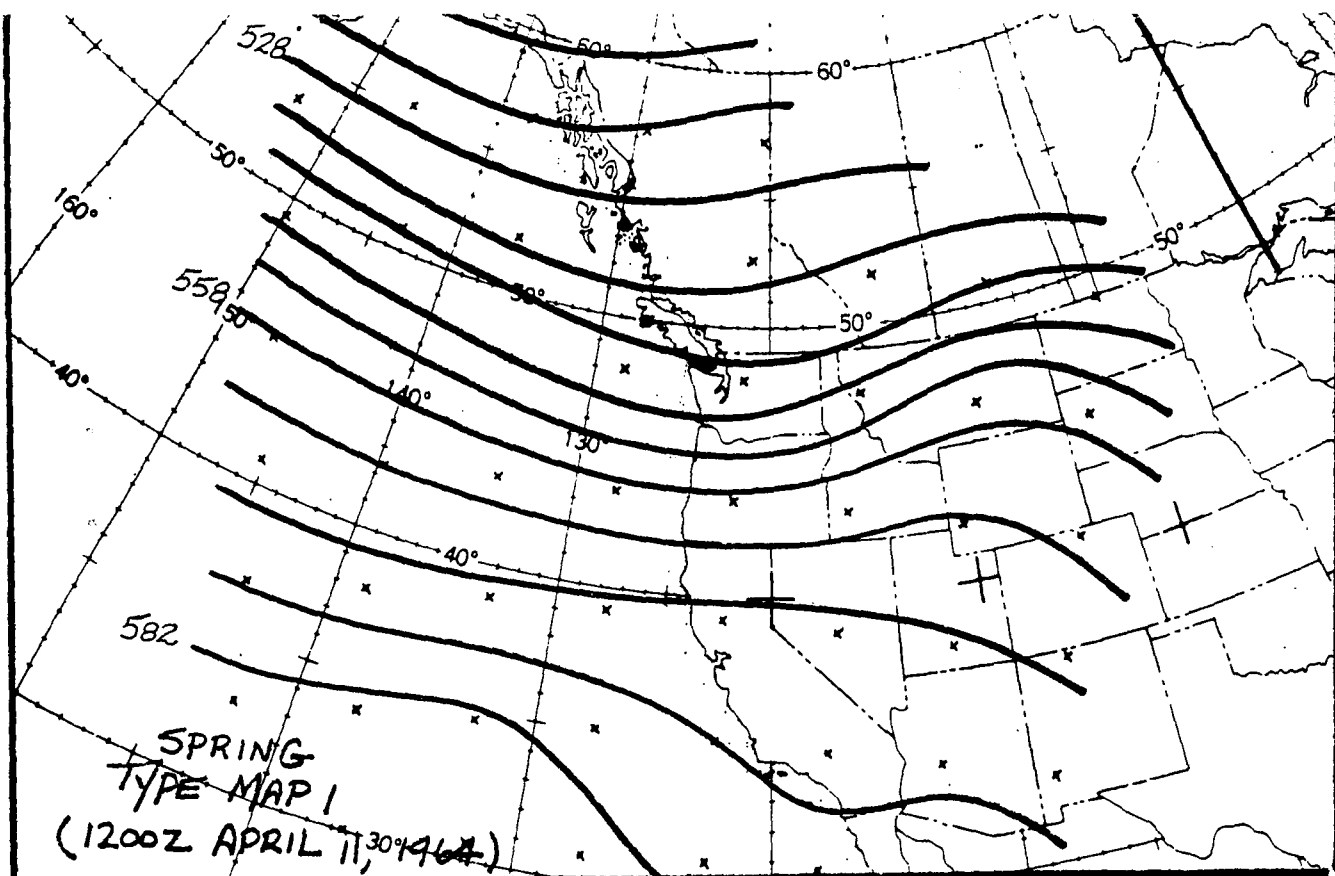




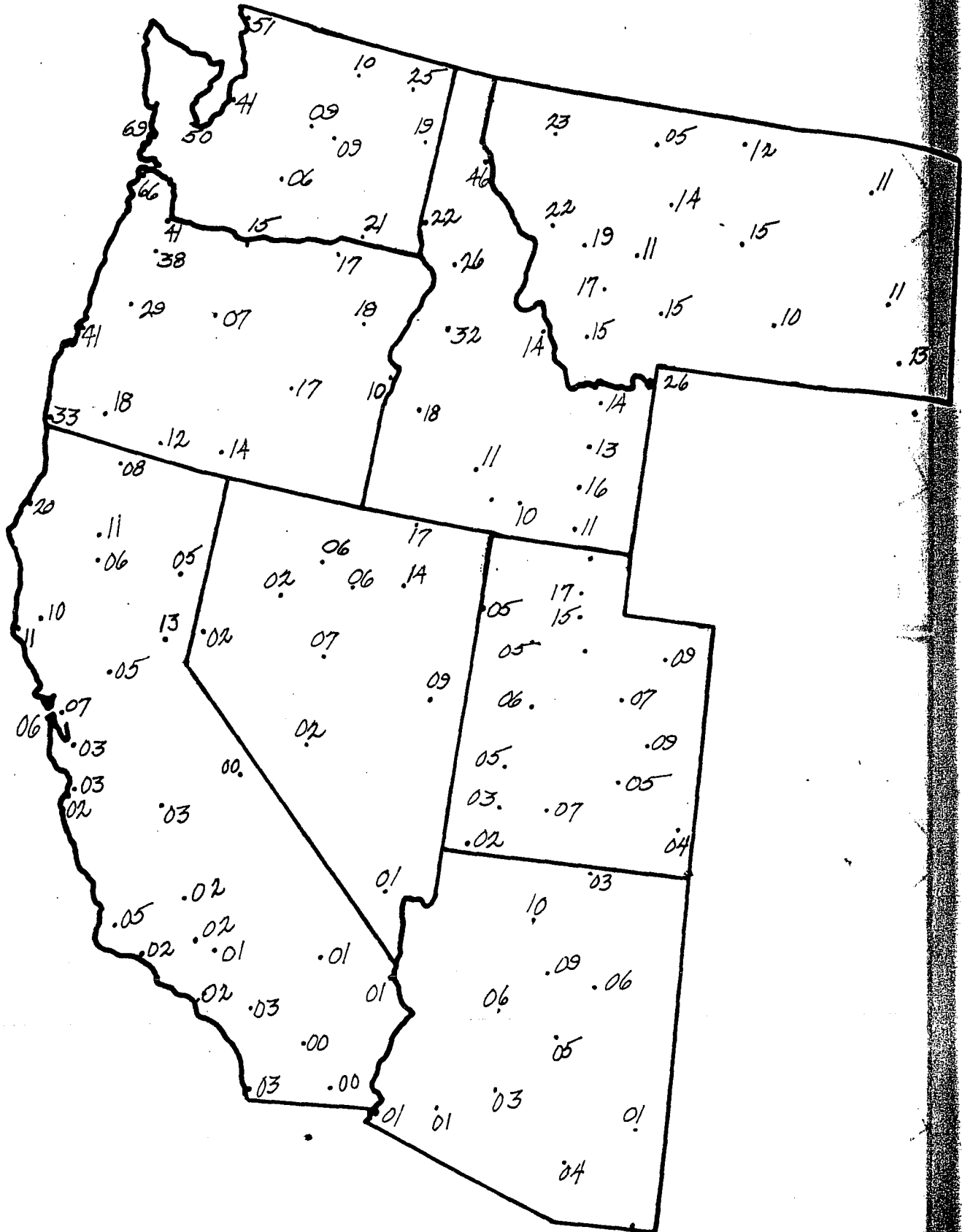
500-MB SPRING TYPE 16.



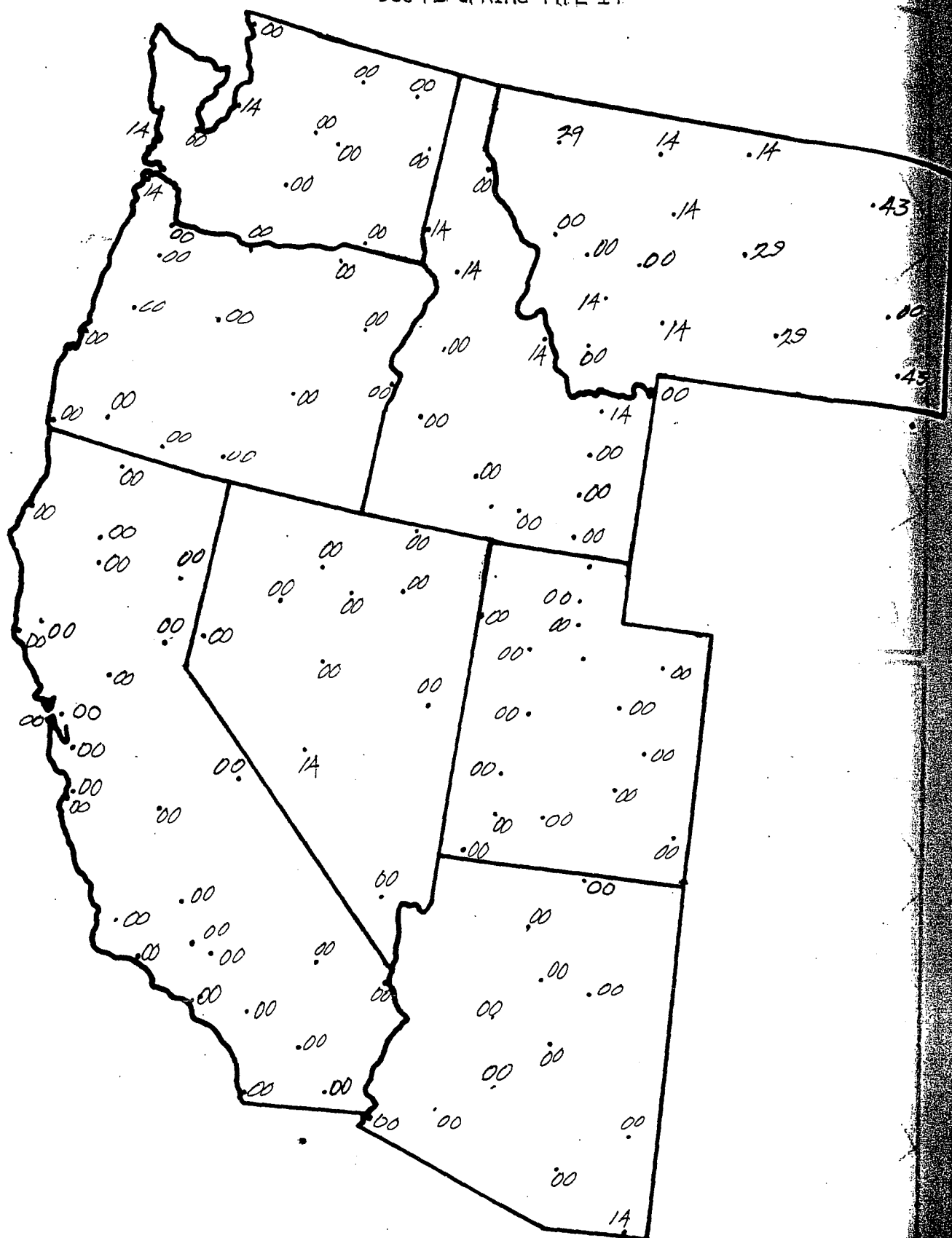


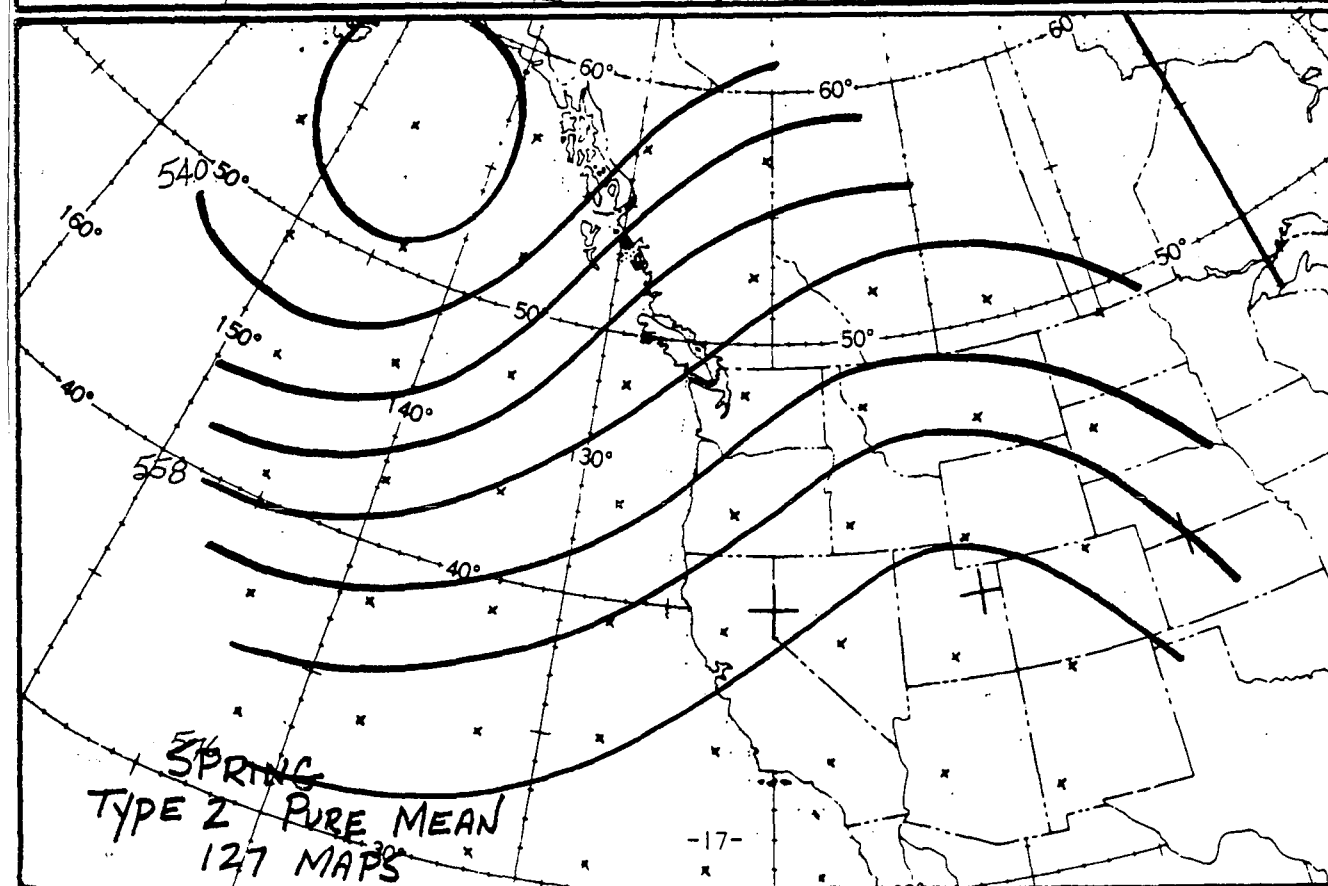
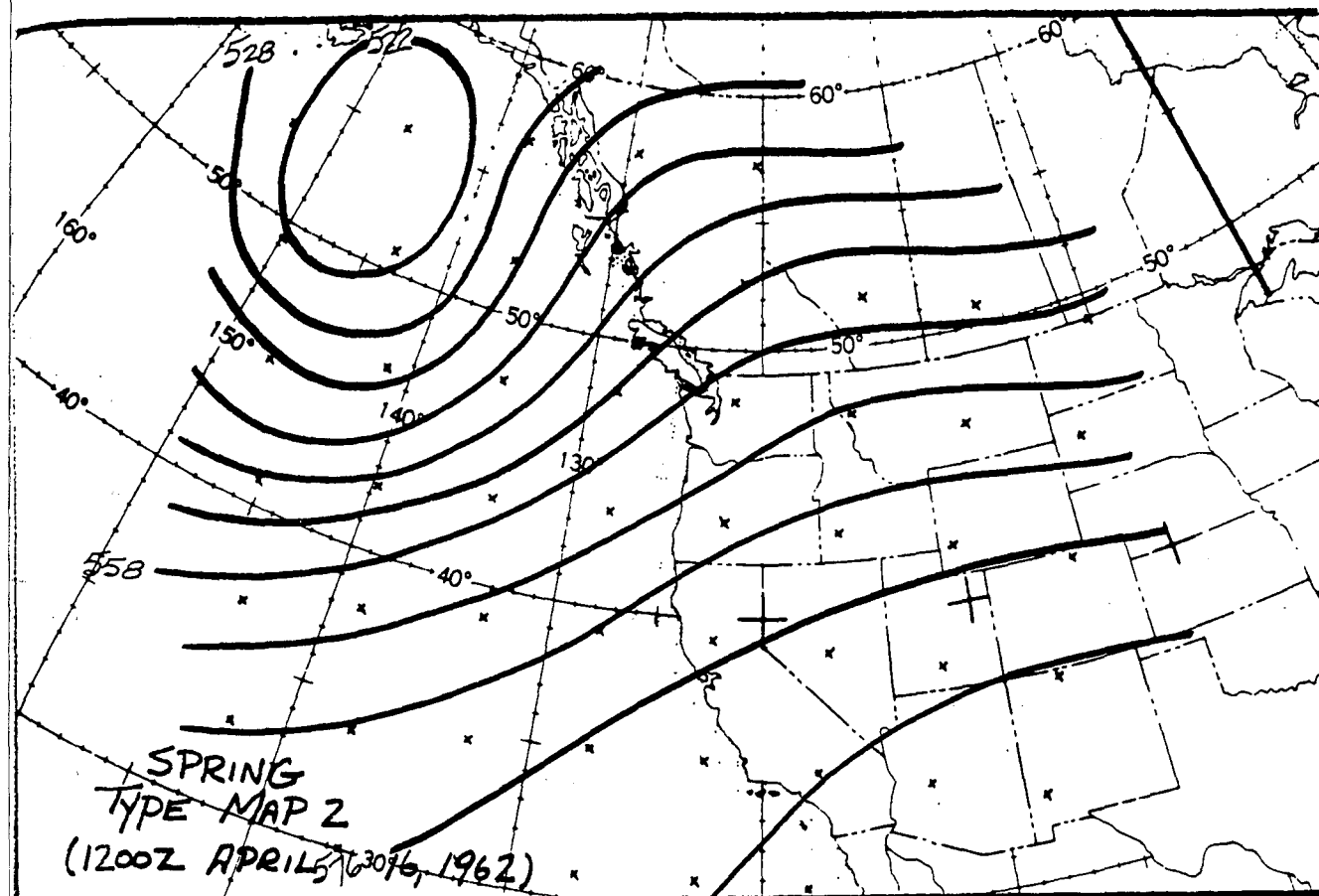


500-MB SPRING TYPE 1

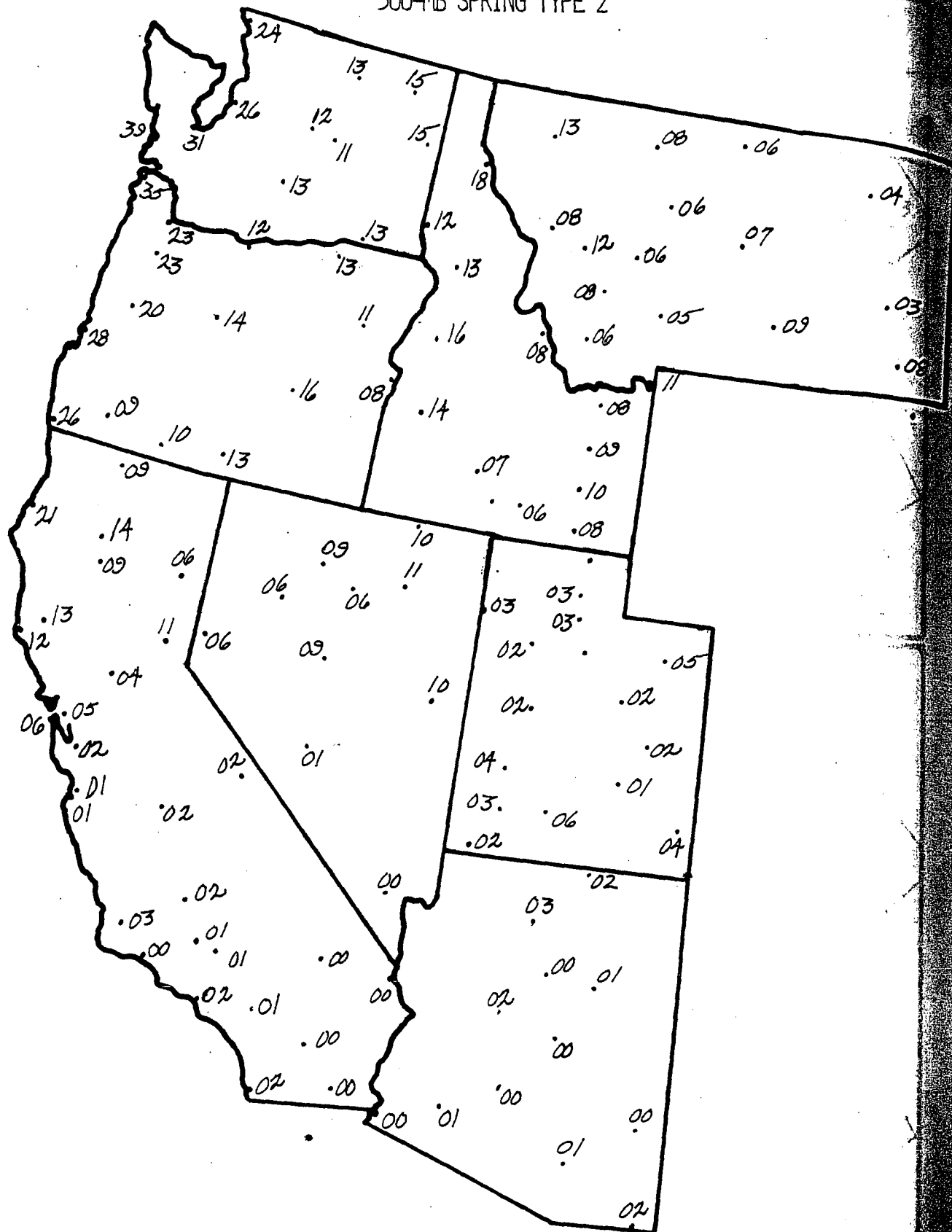


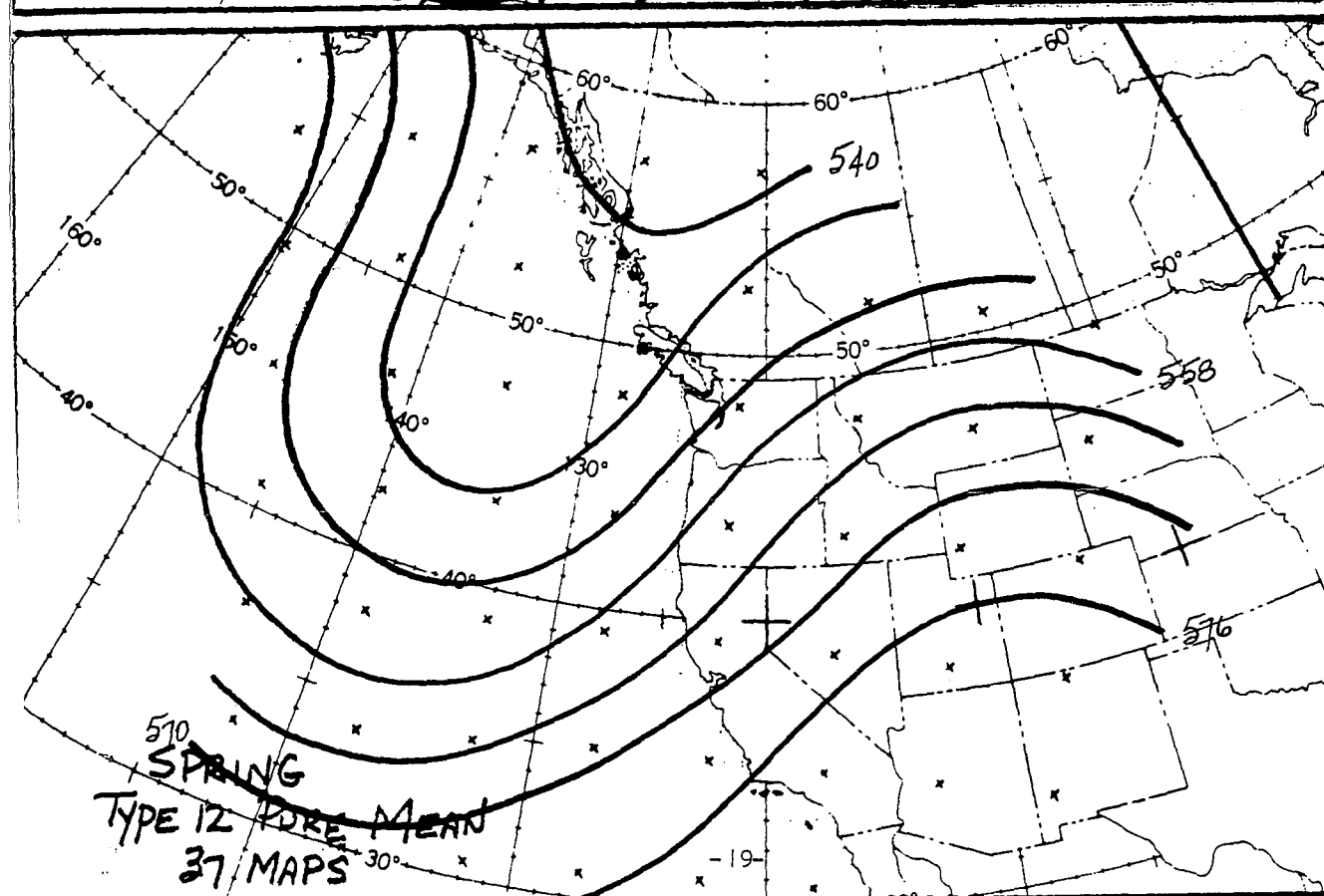
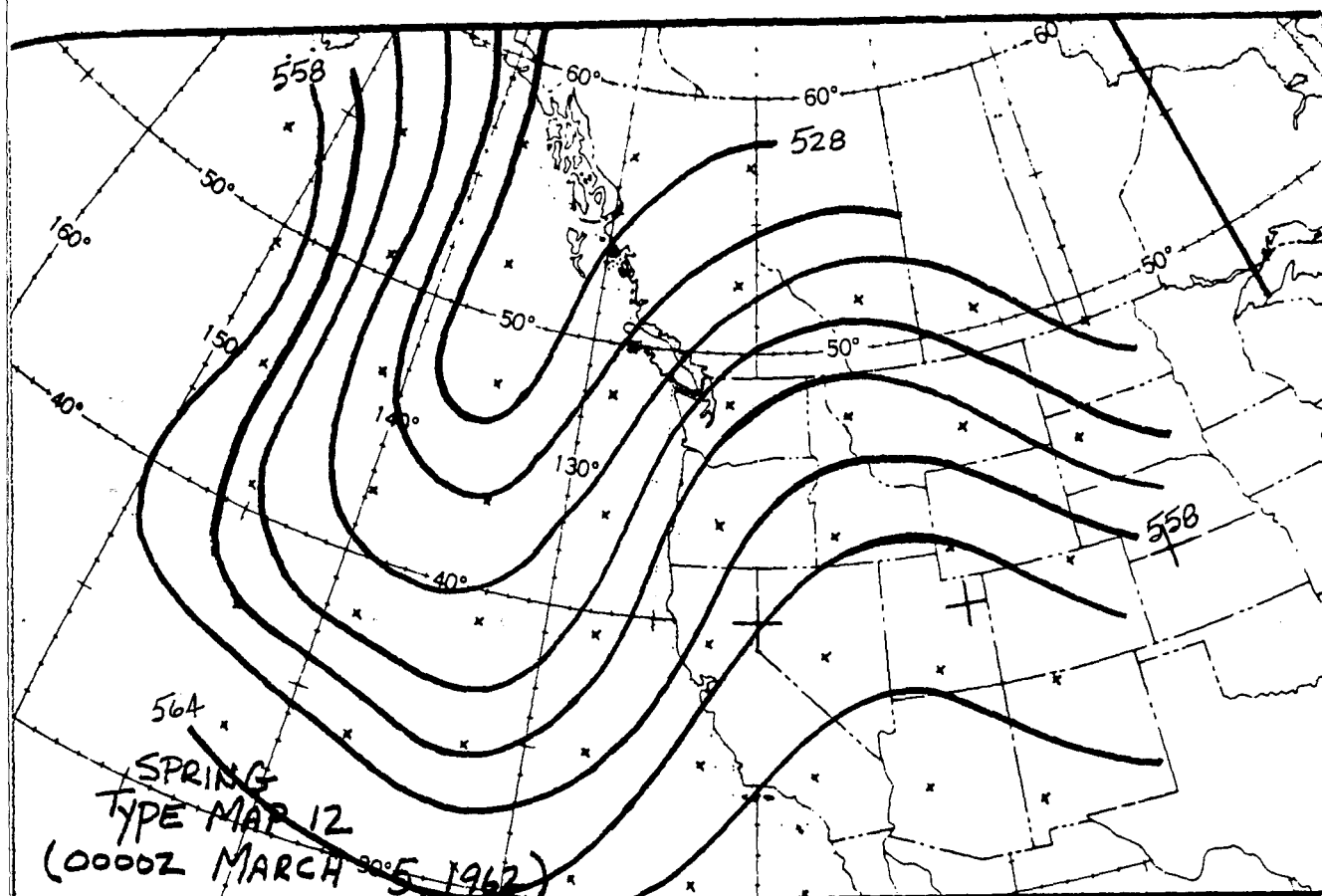
500-MB. SPRING TYPE 14.





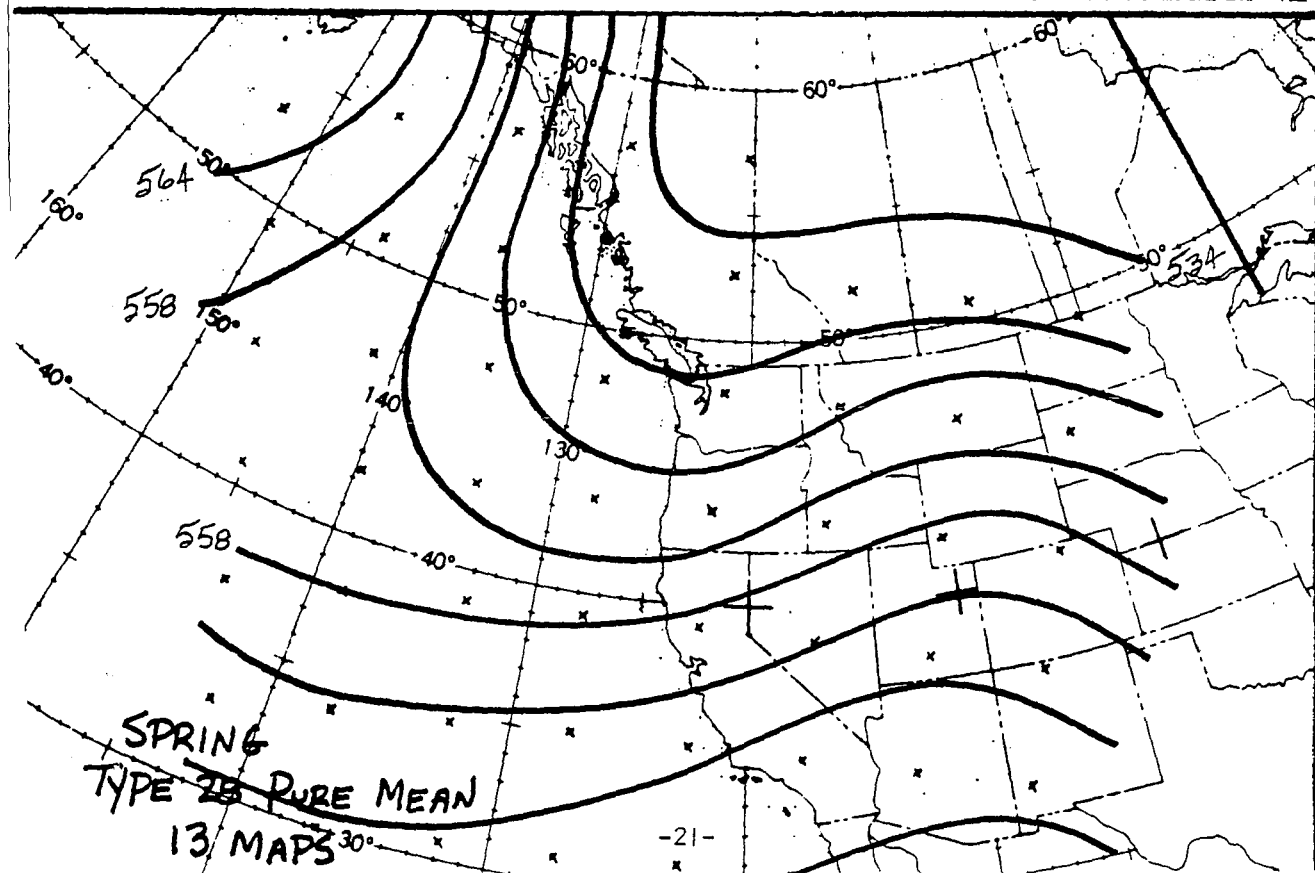
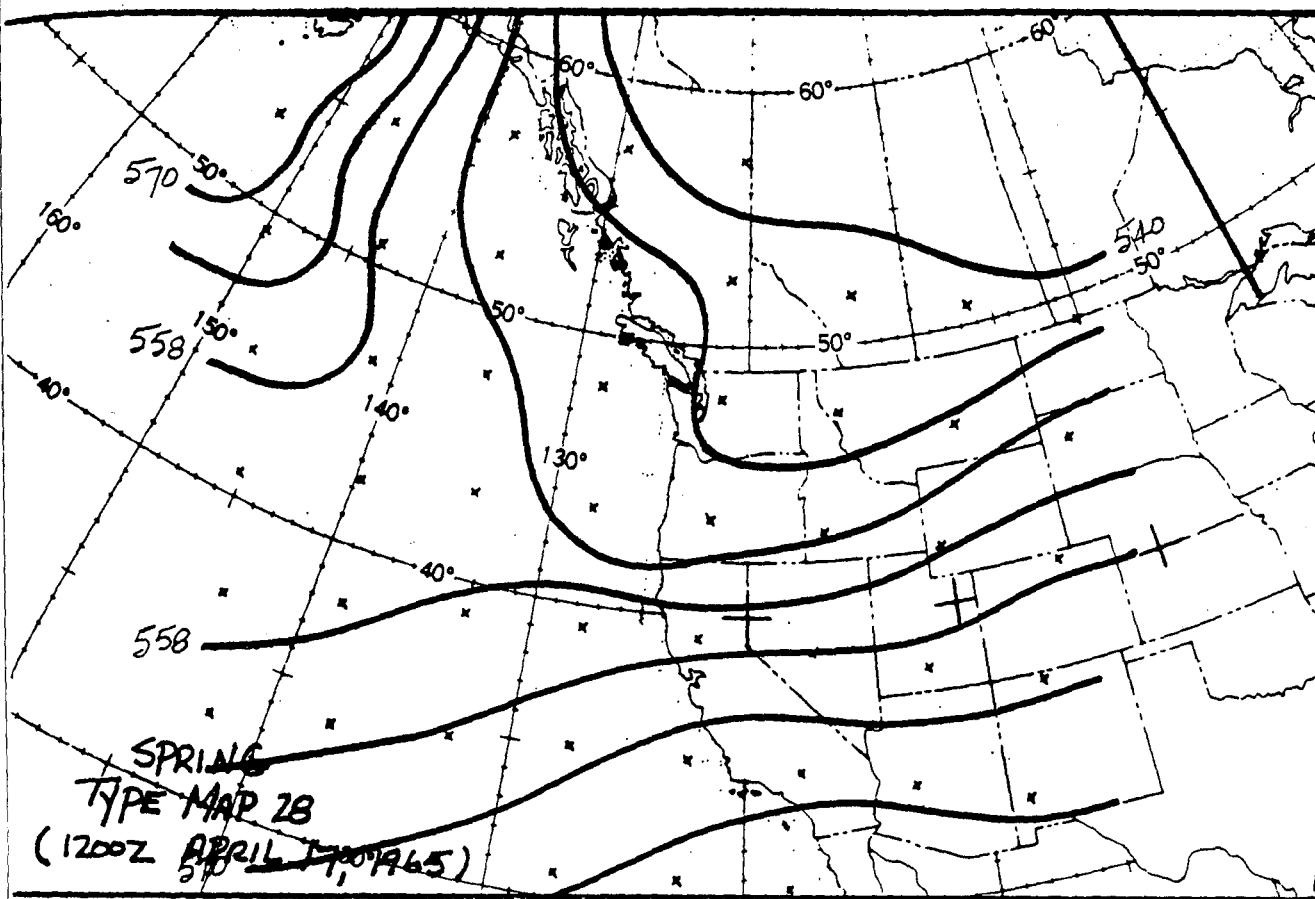
500-MB SPRING TYPE 2



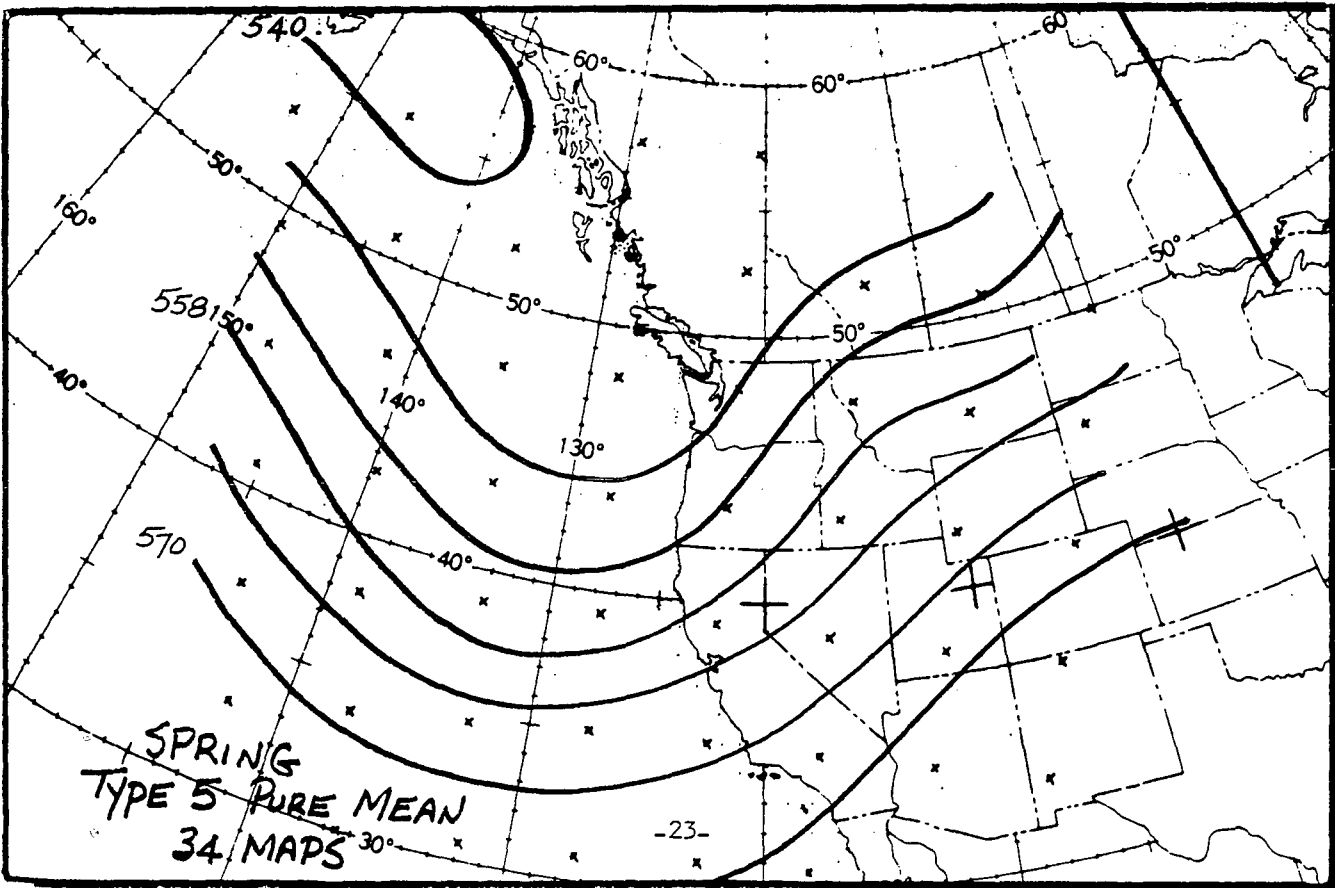
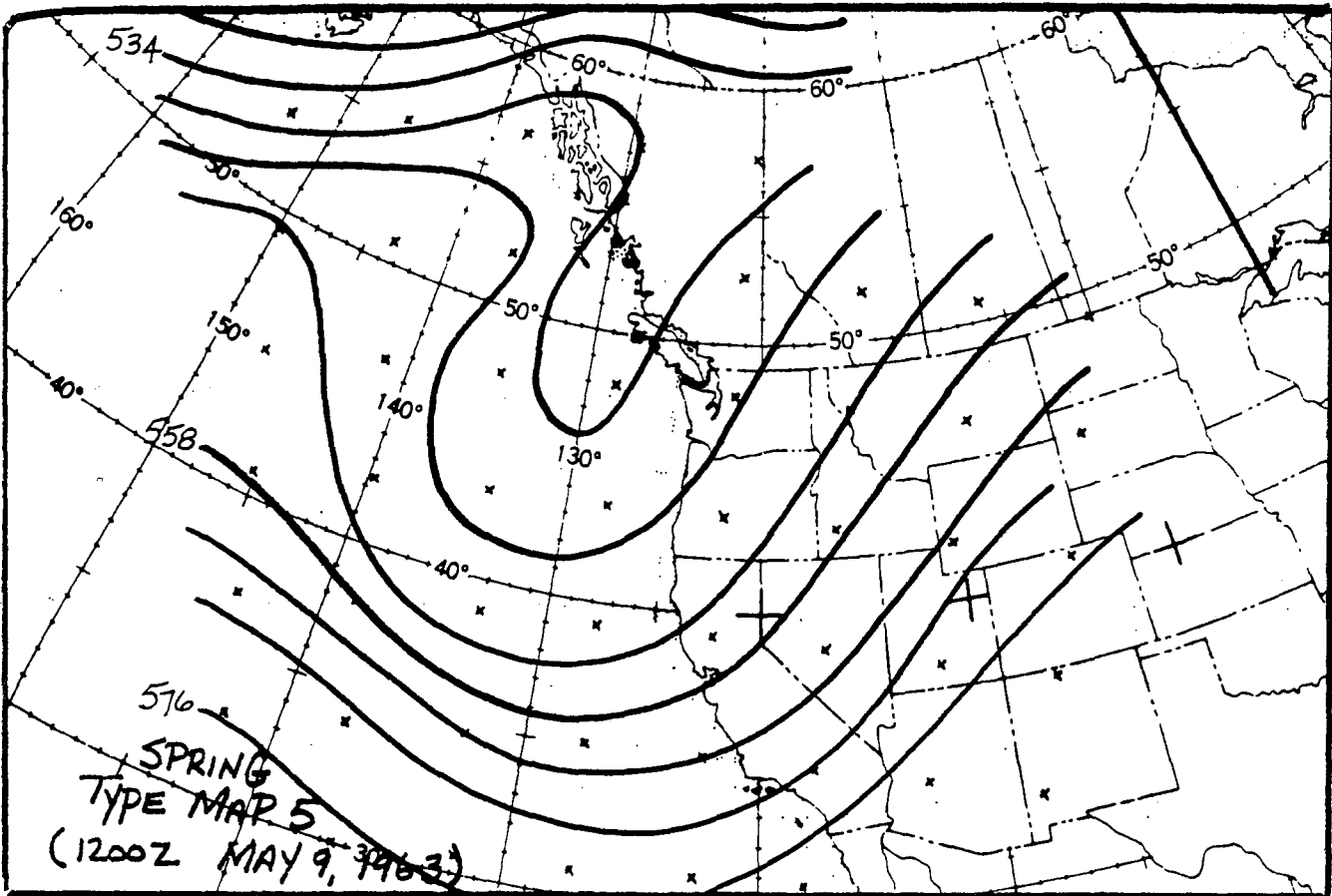


0220

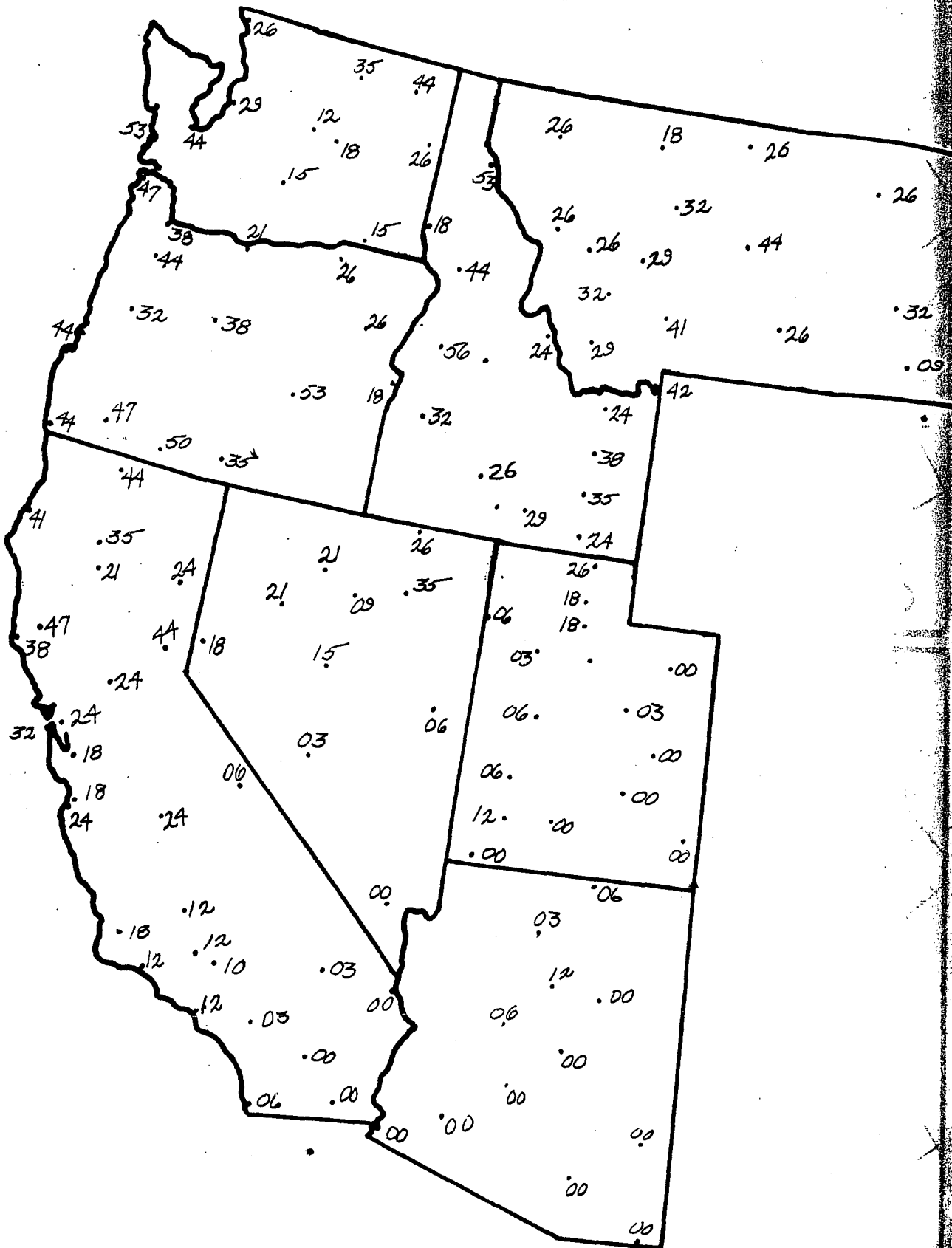


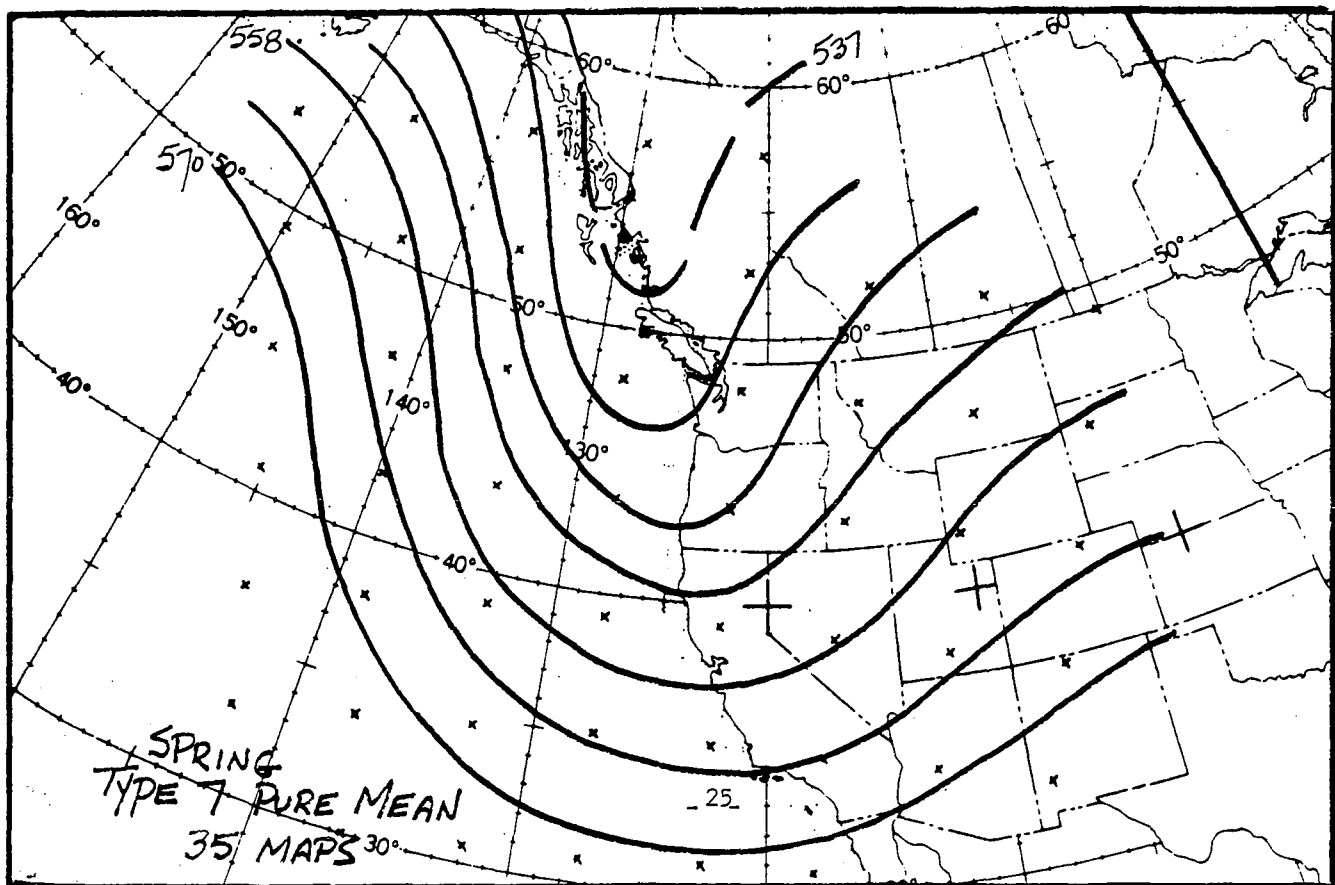
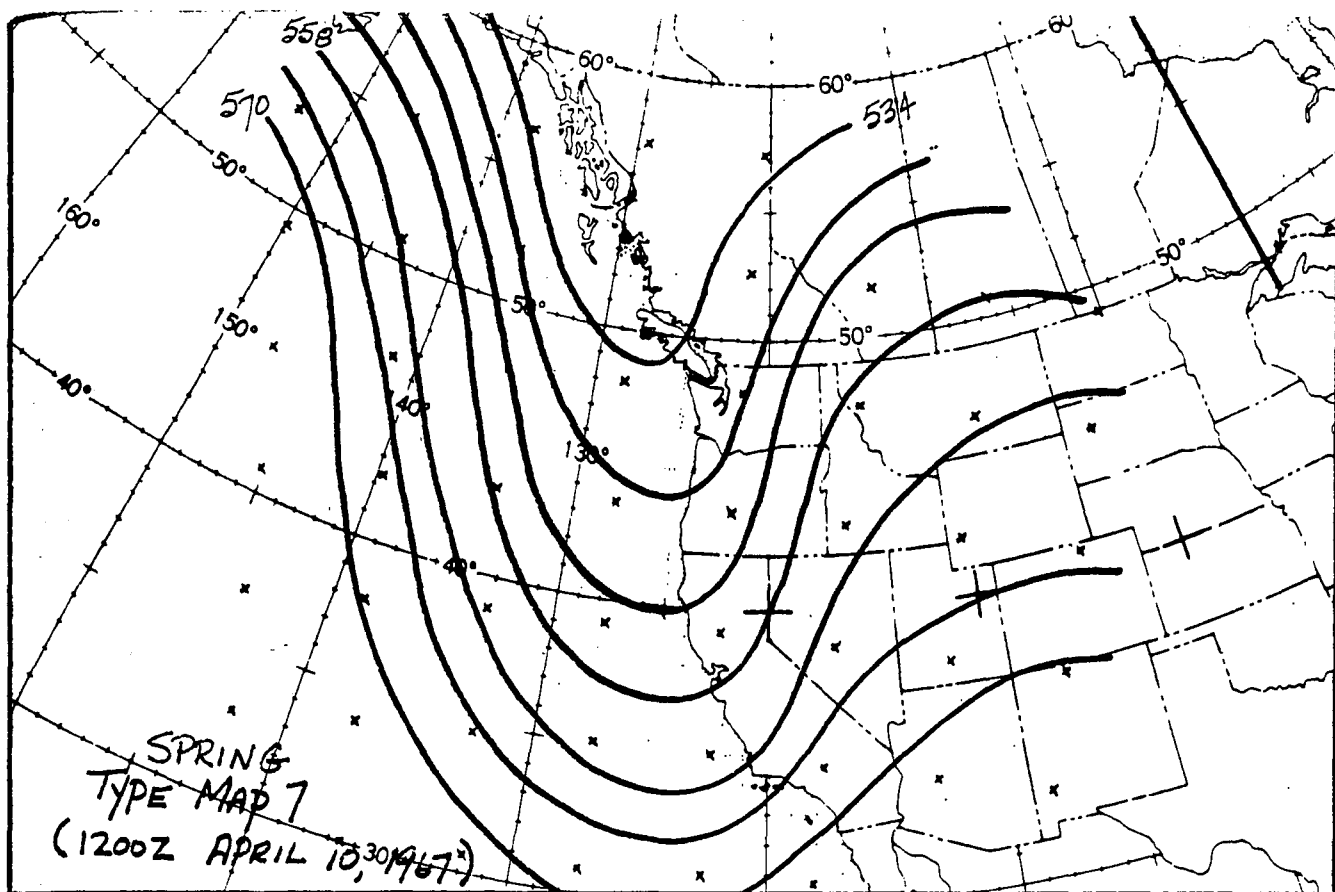


[illegible]

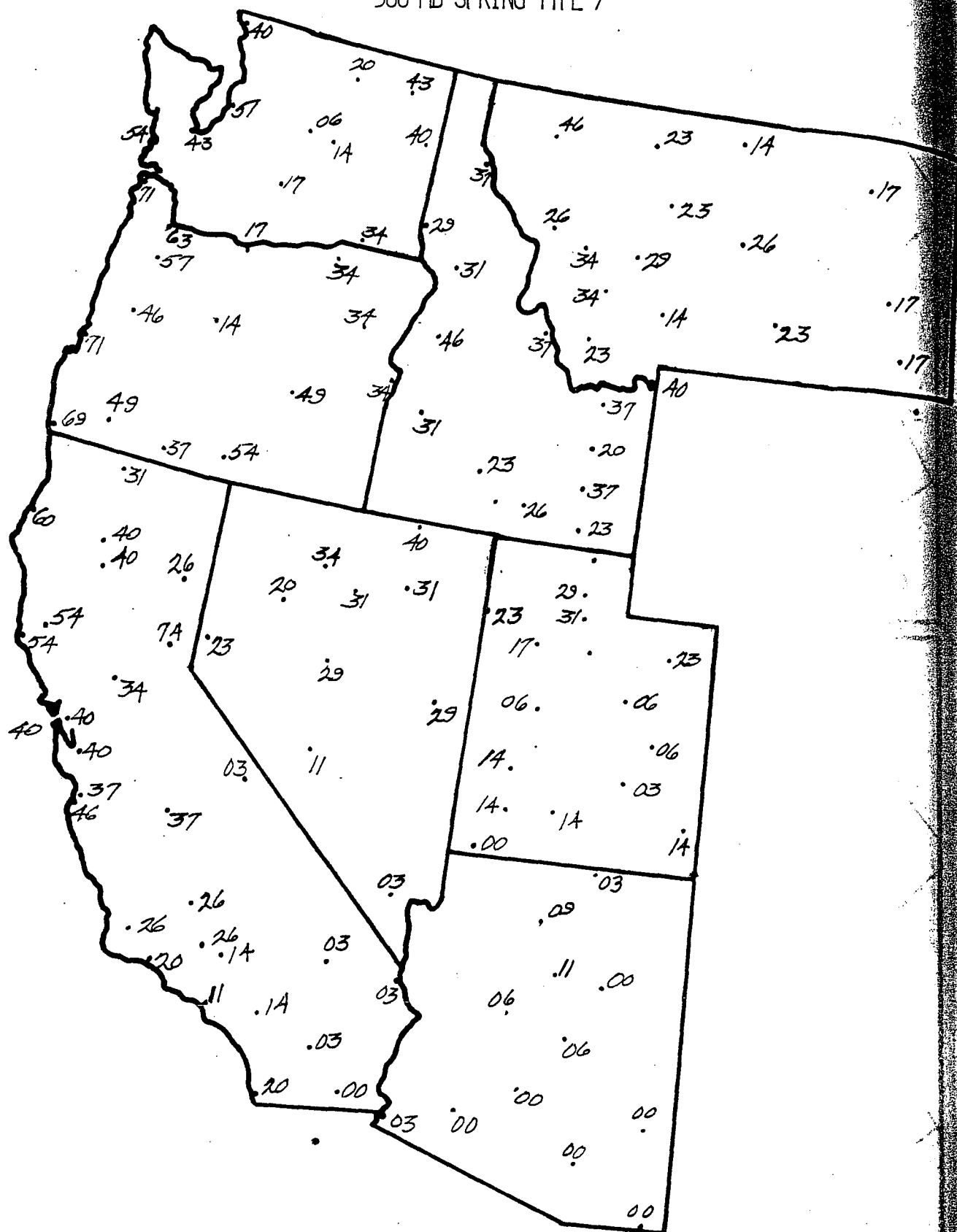


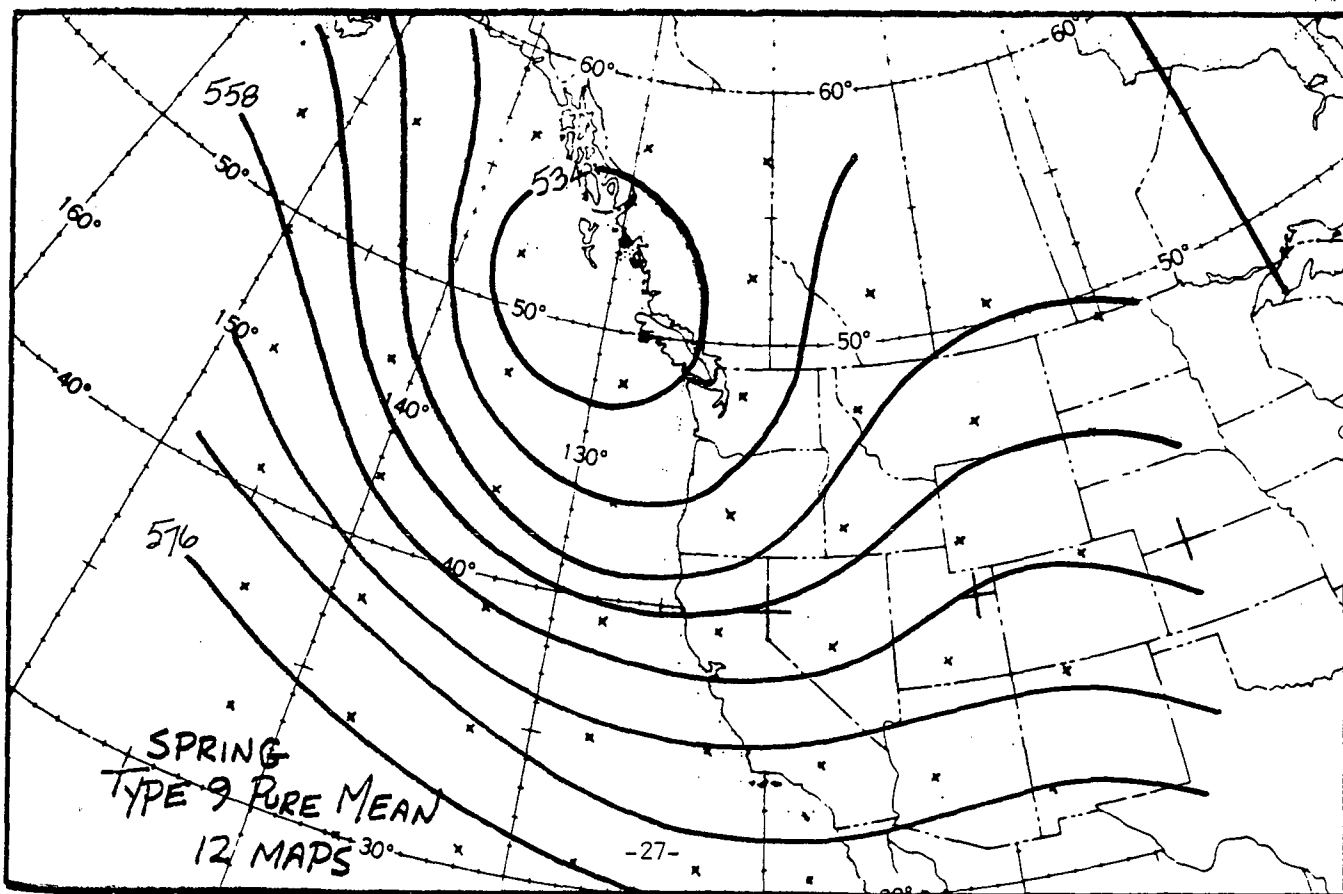
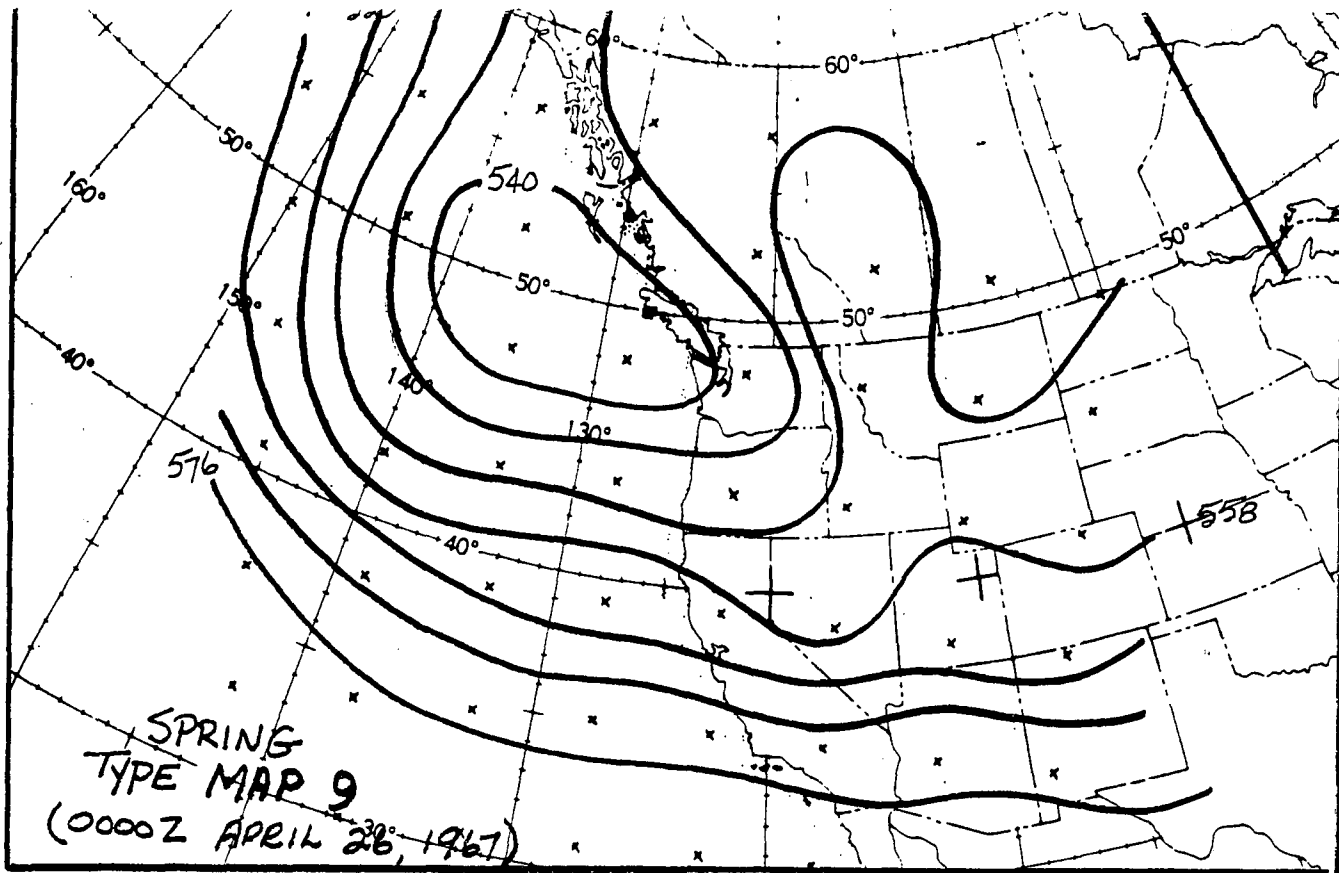
500-MB SPRING TYPE 5



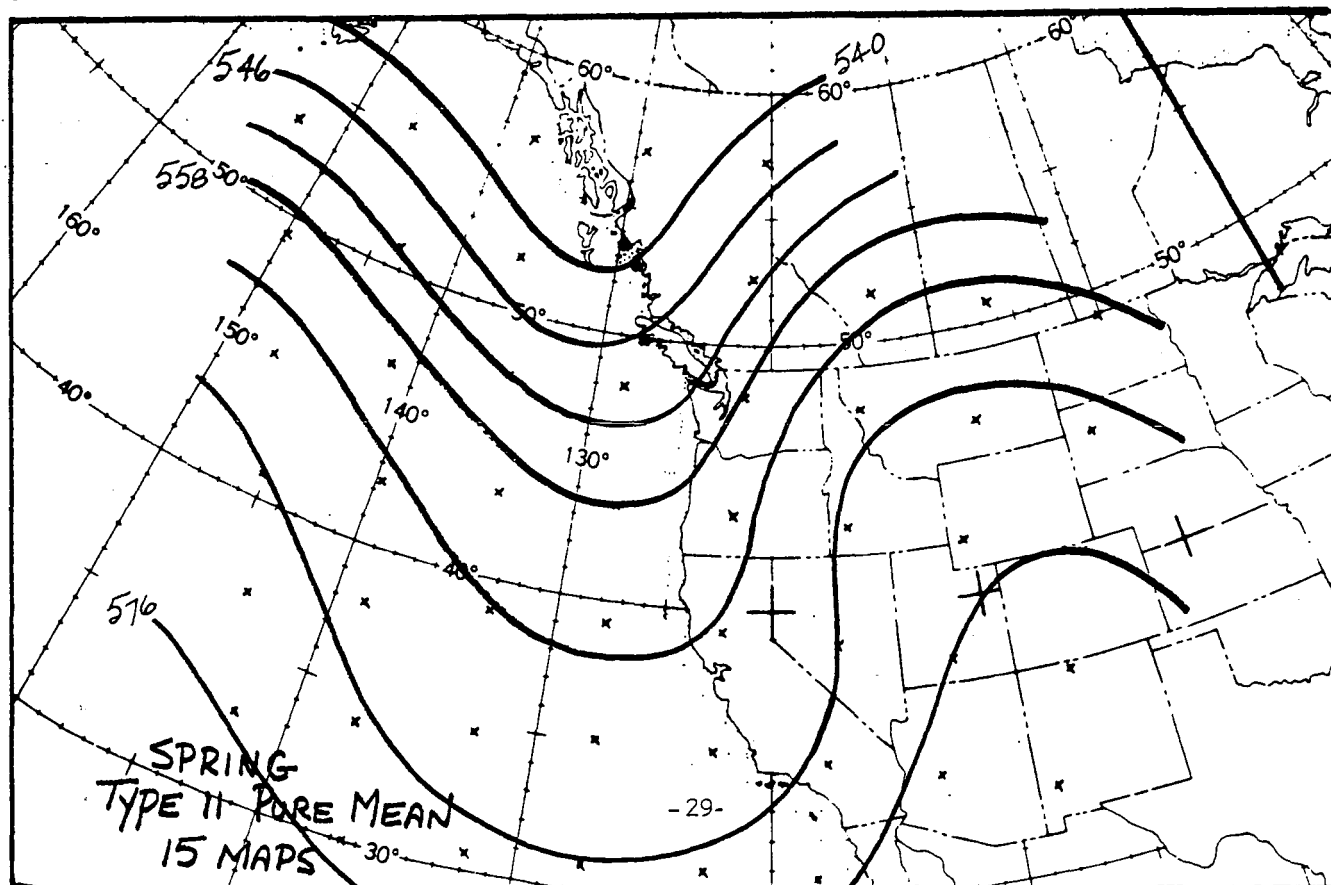
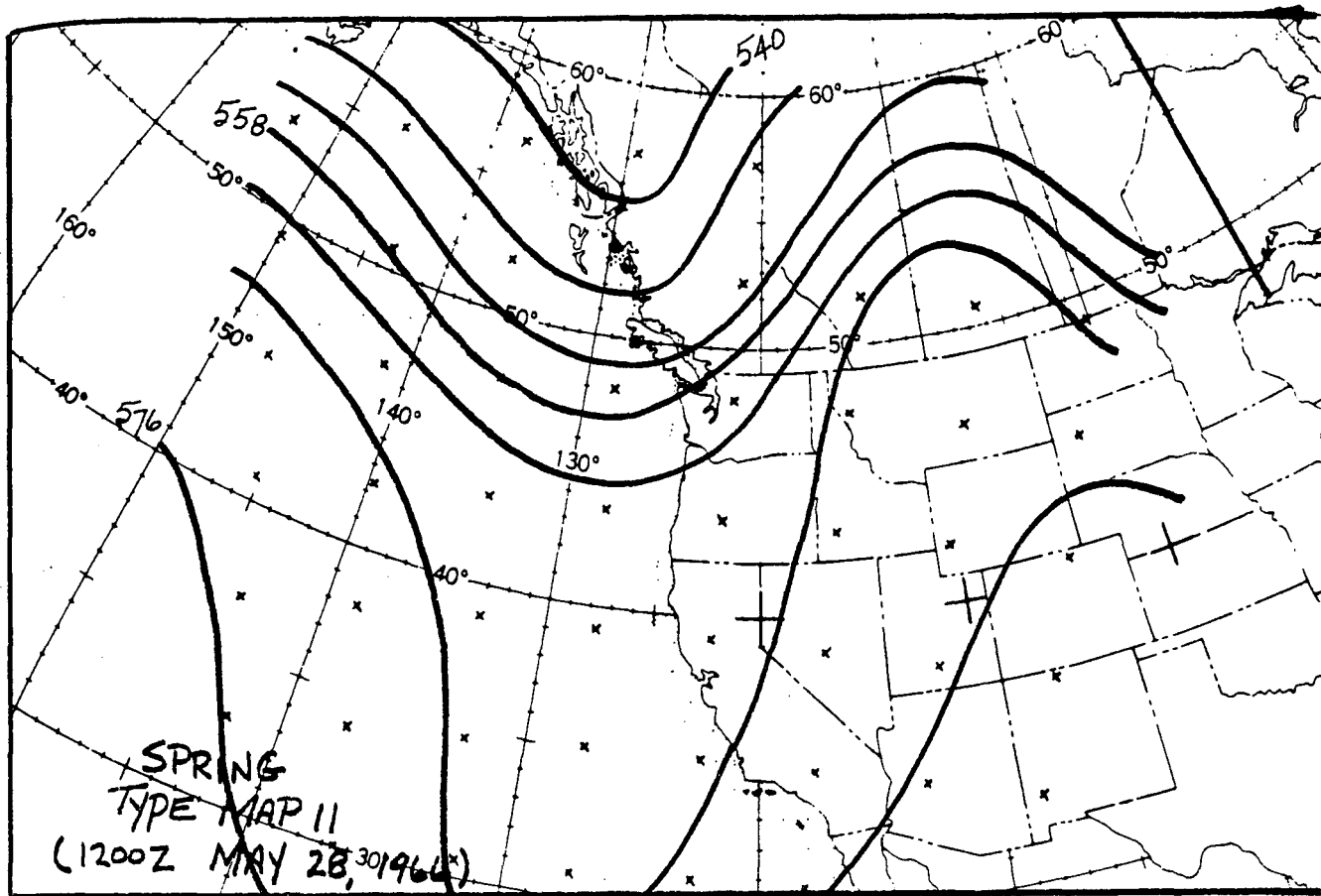


500-MB SPRING TYPE 7

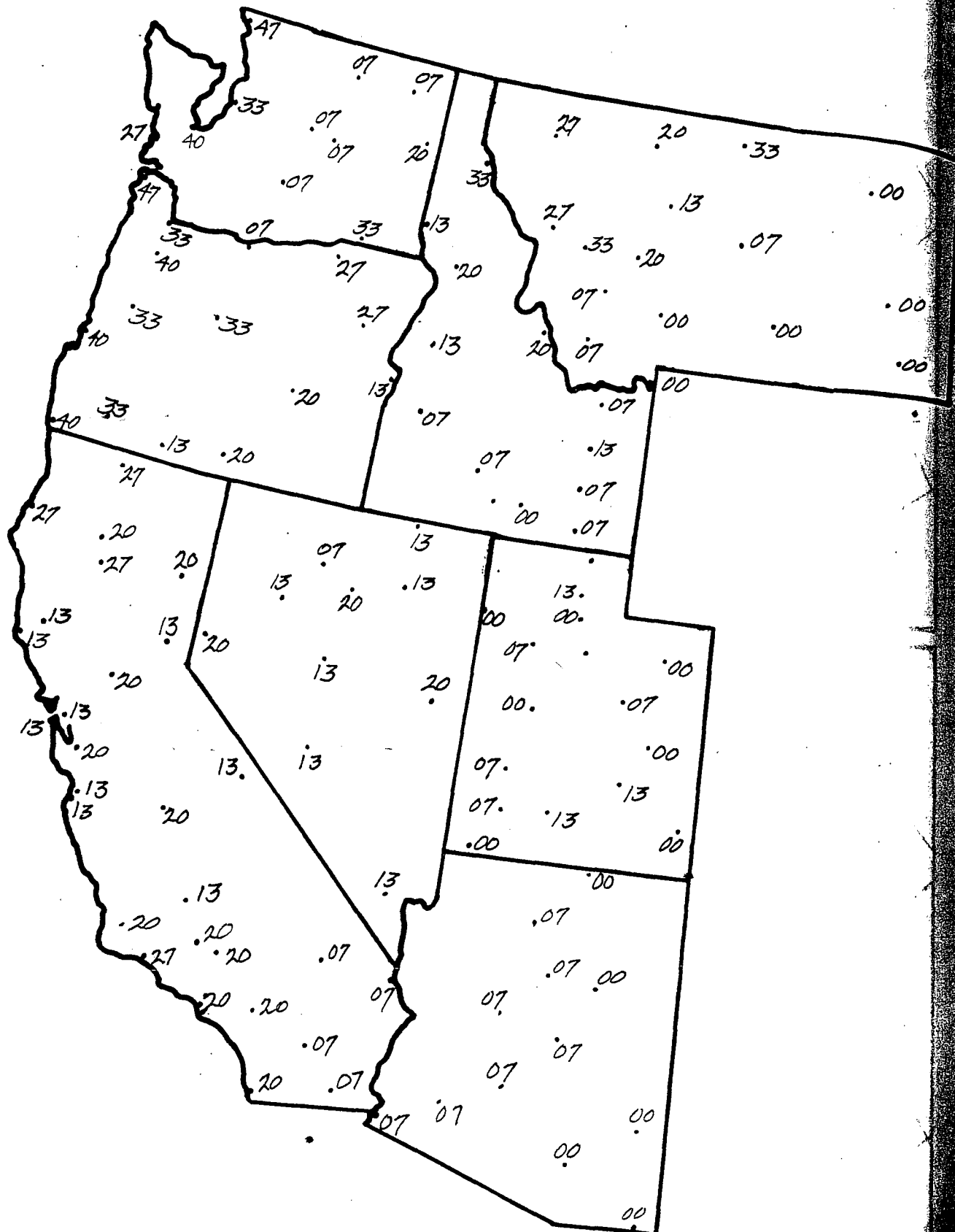


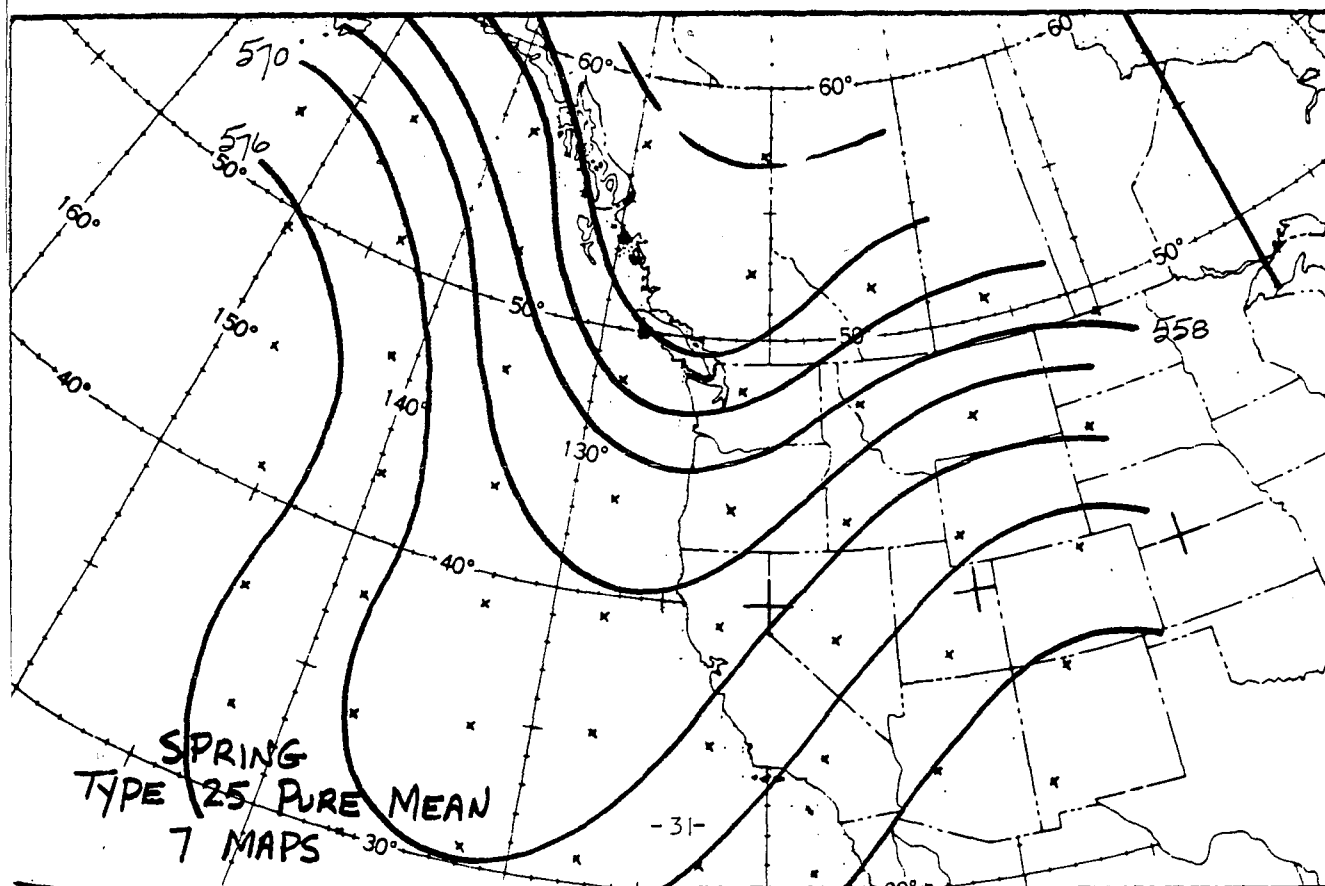
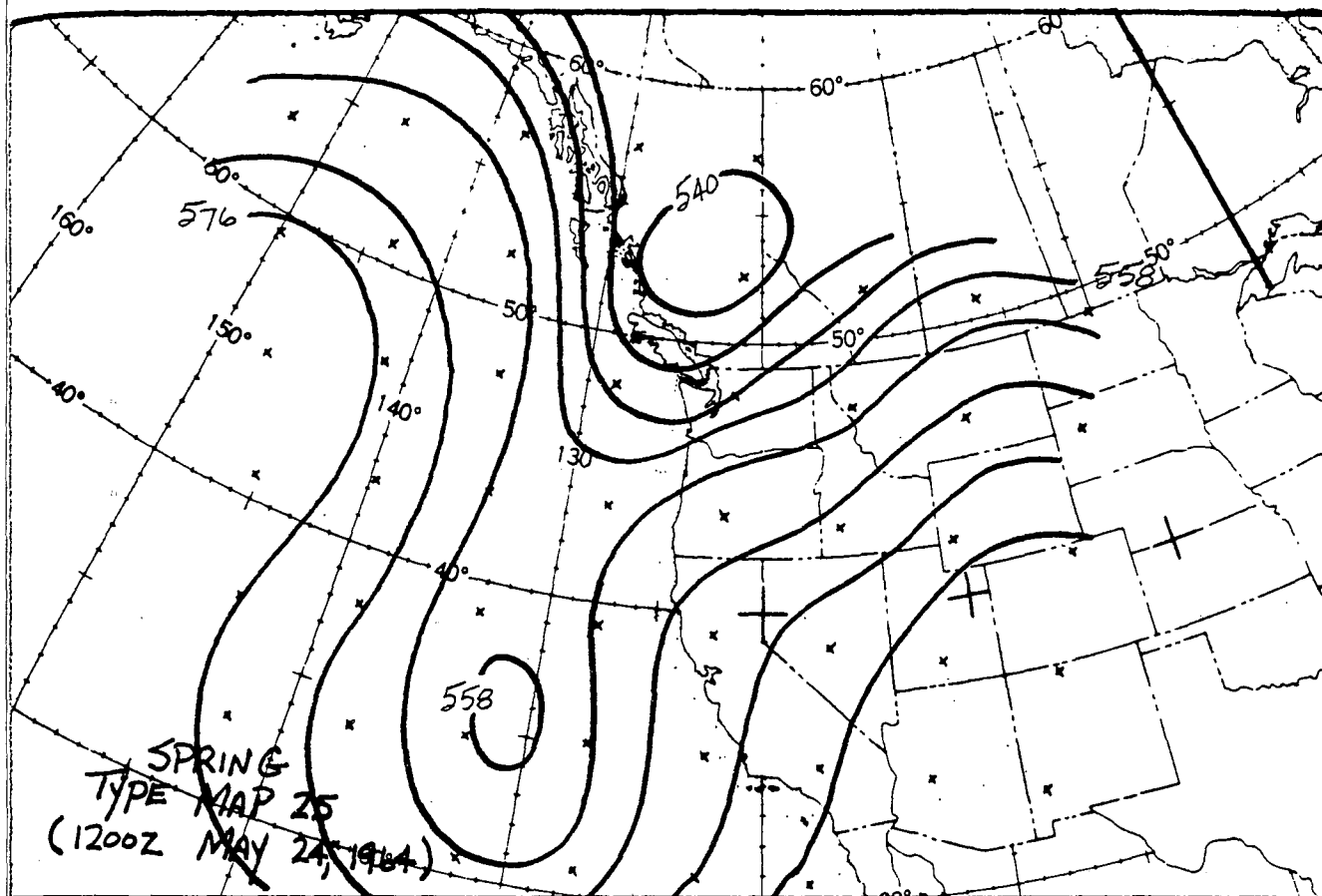


[illegible]

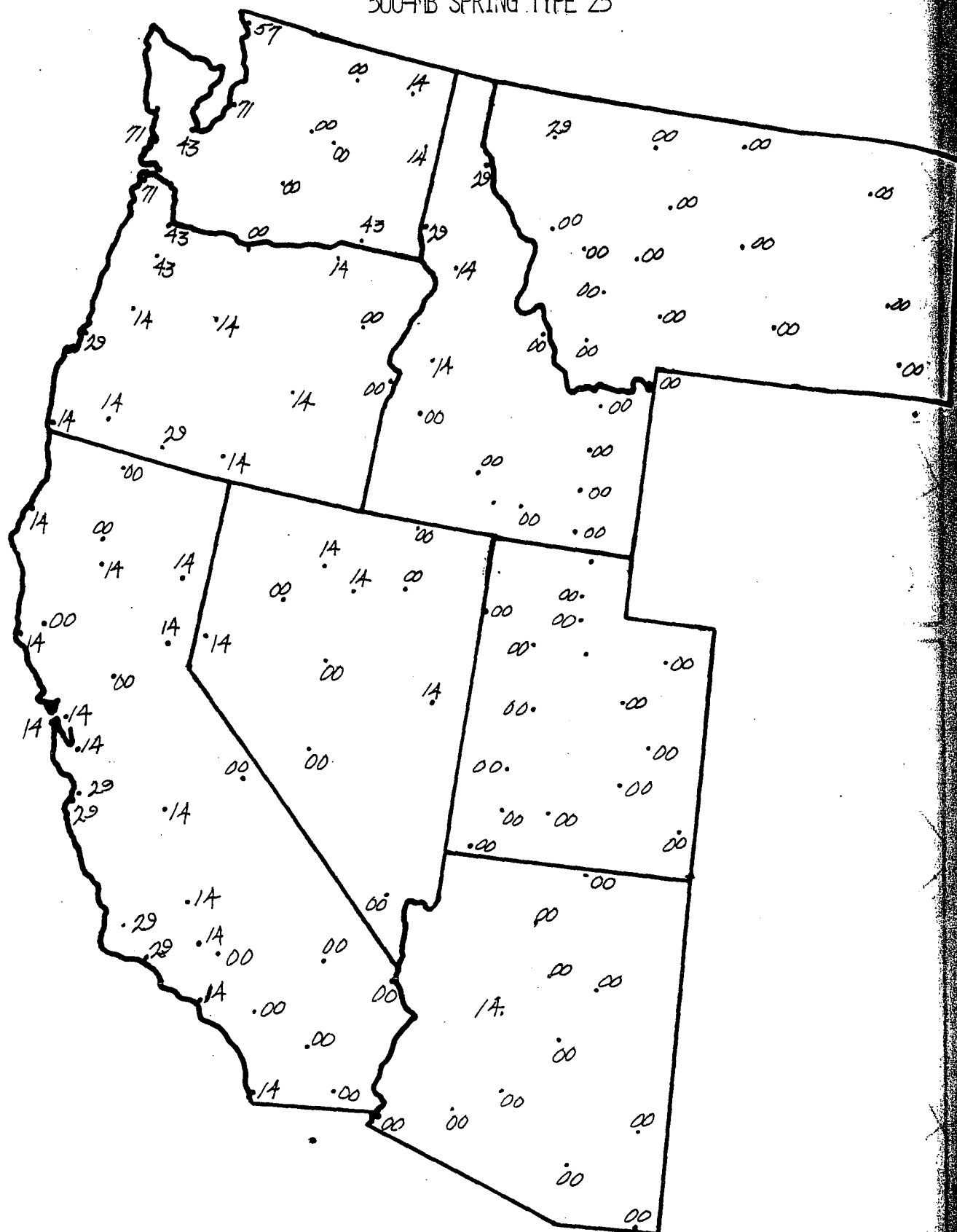


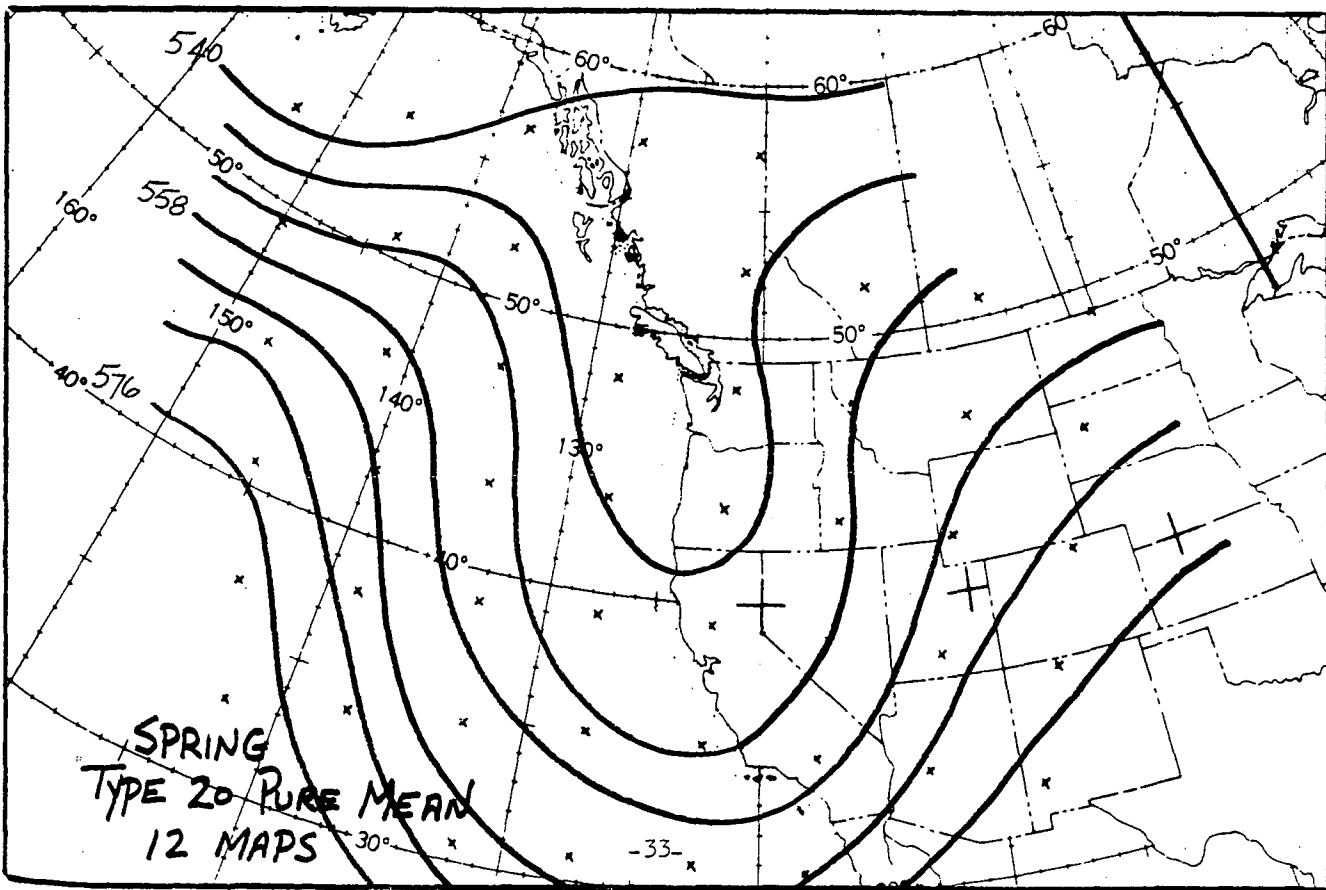
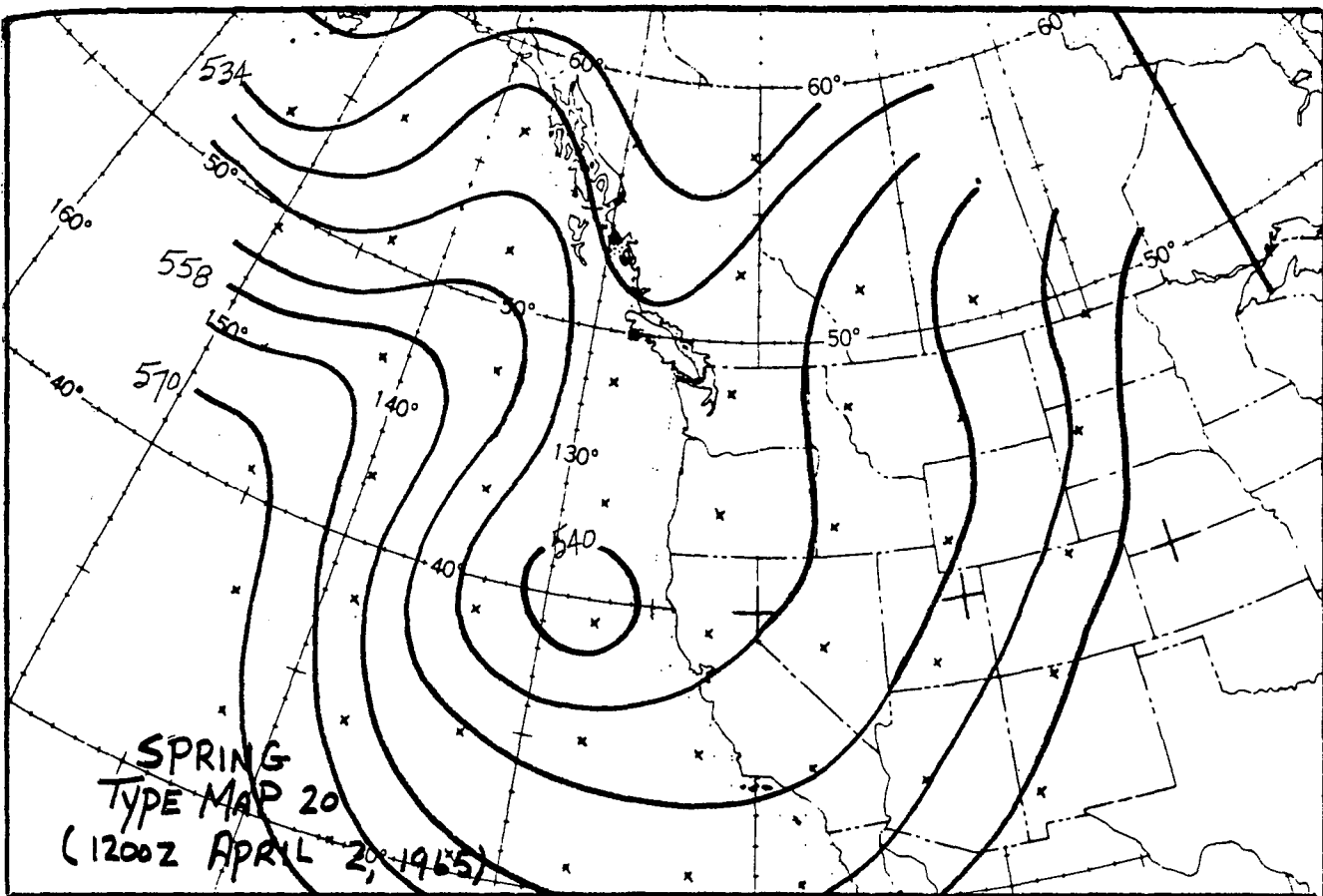
500-MB SPRING TYPE 11



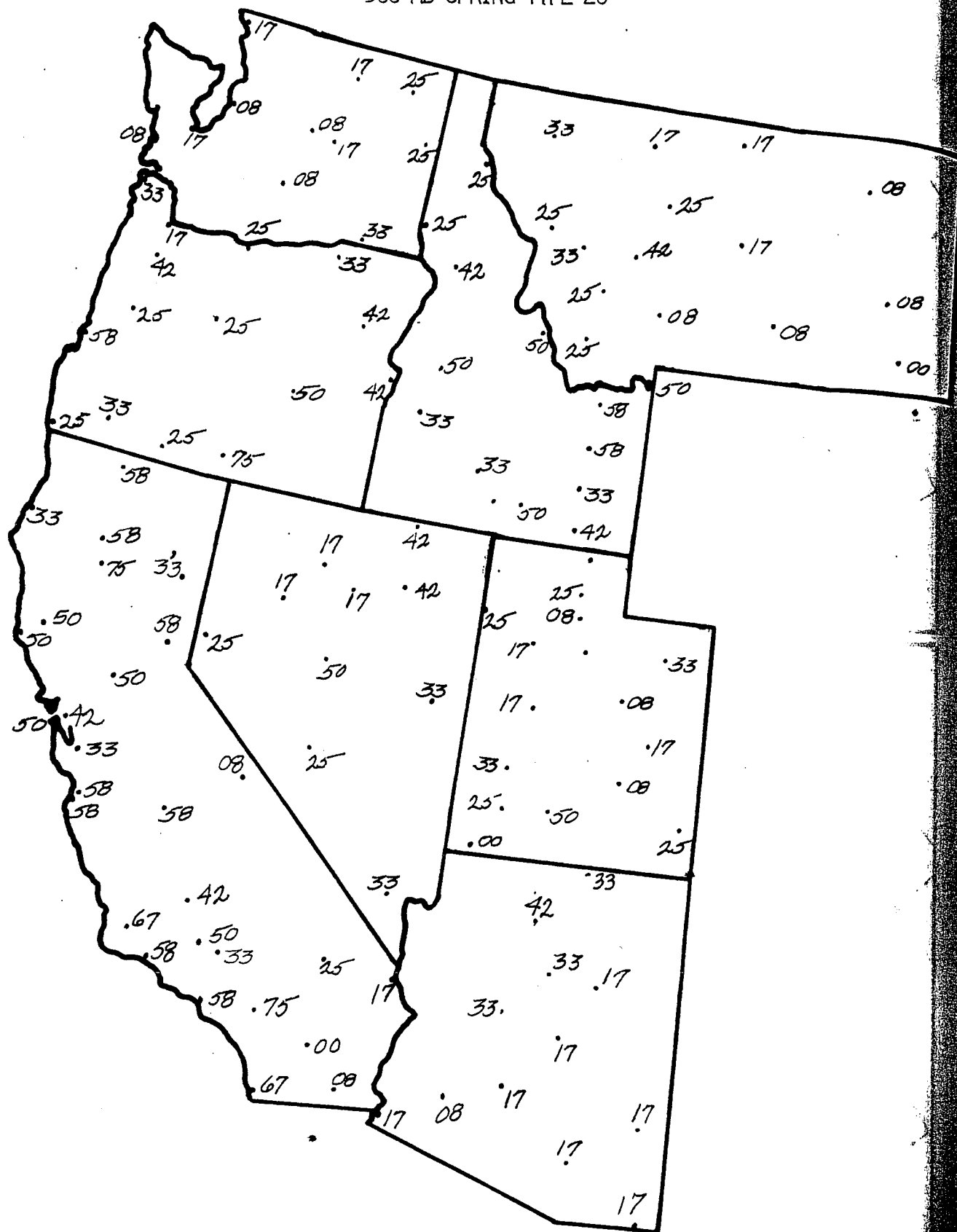


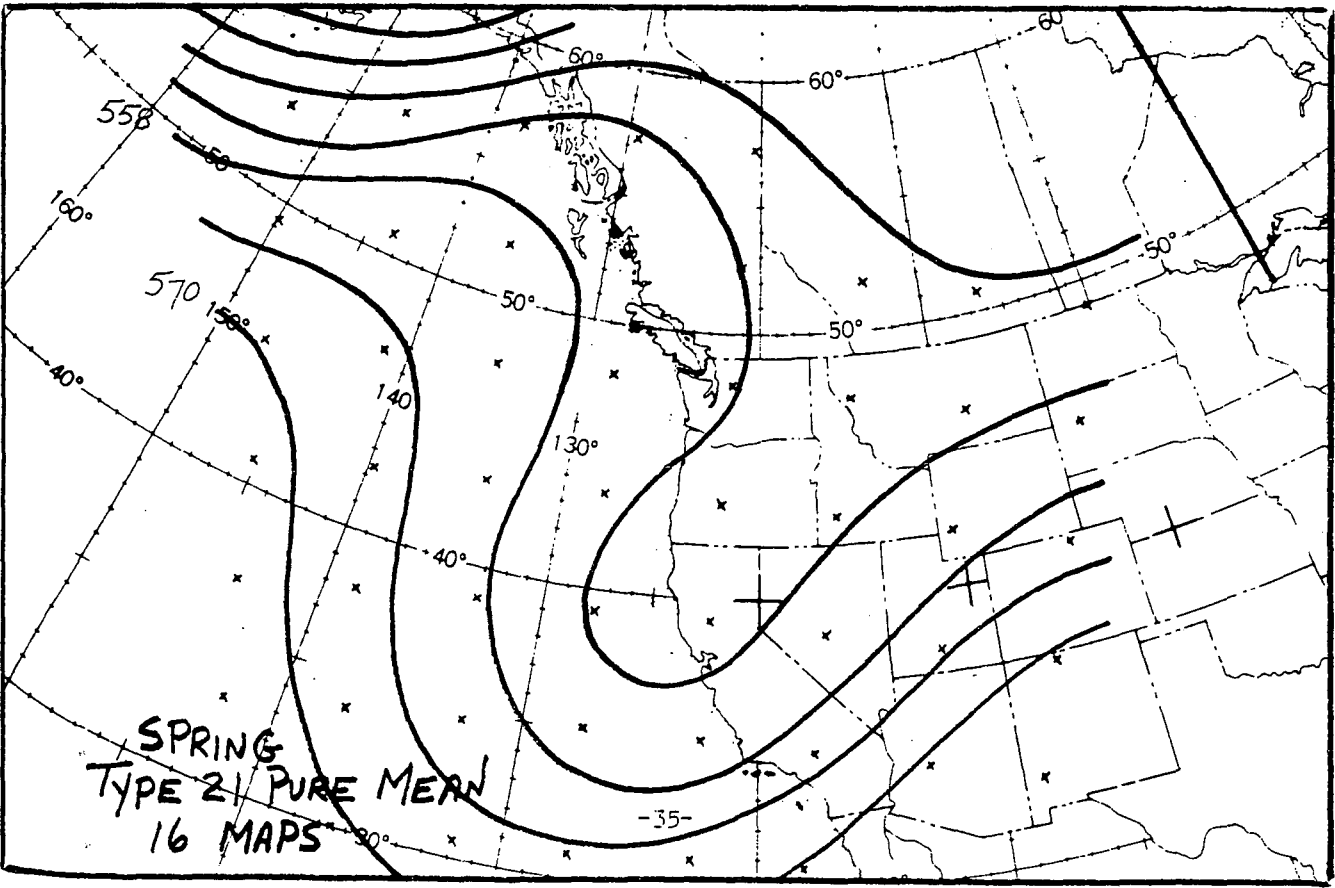
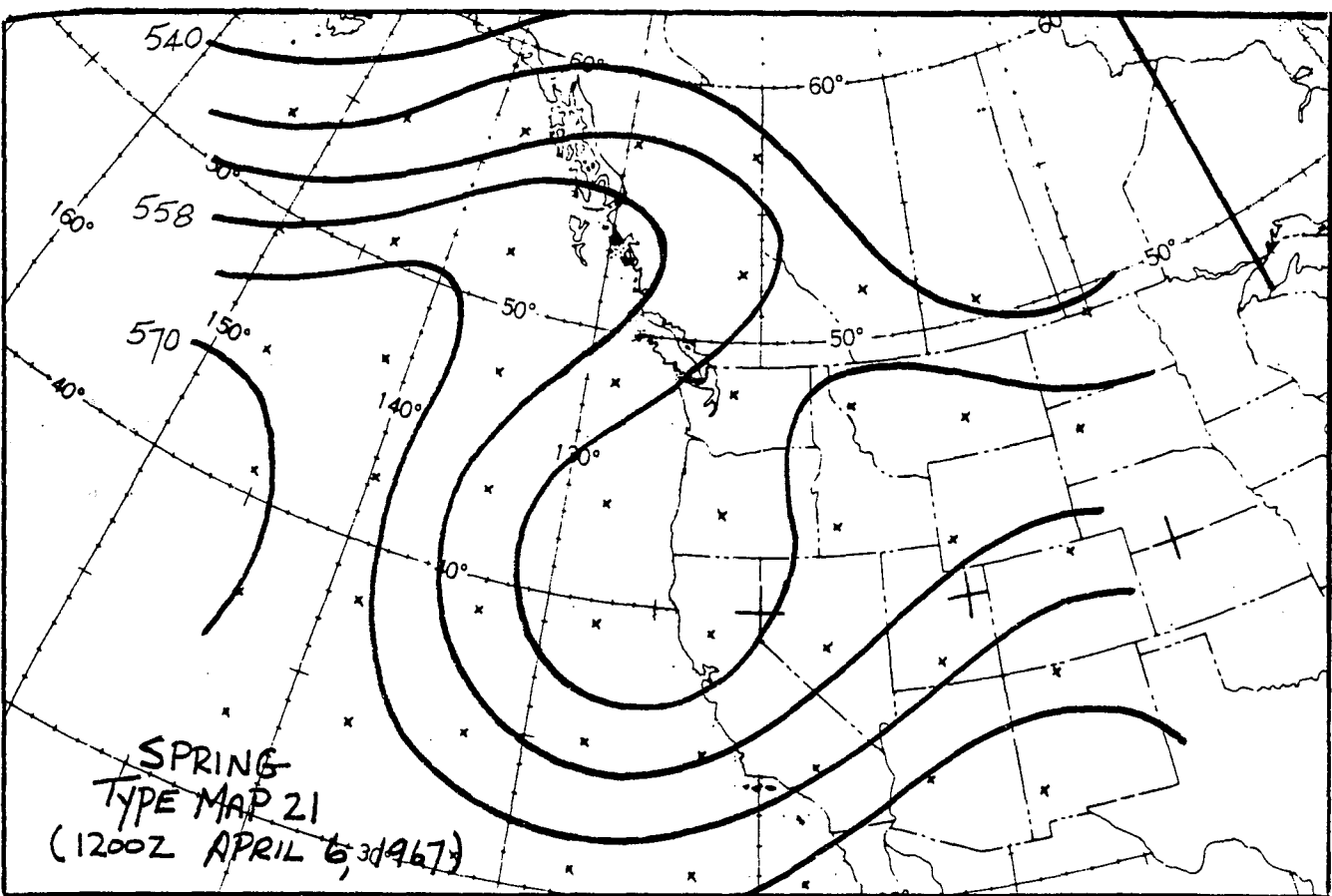
500-MB SPRING TYPE 25



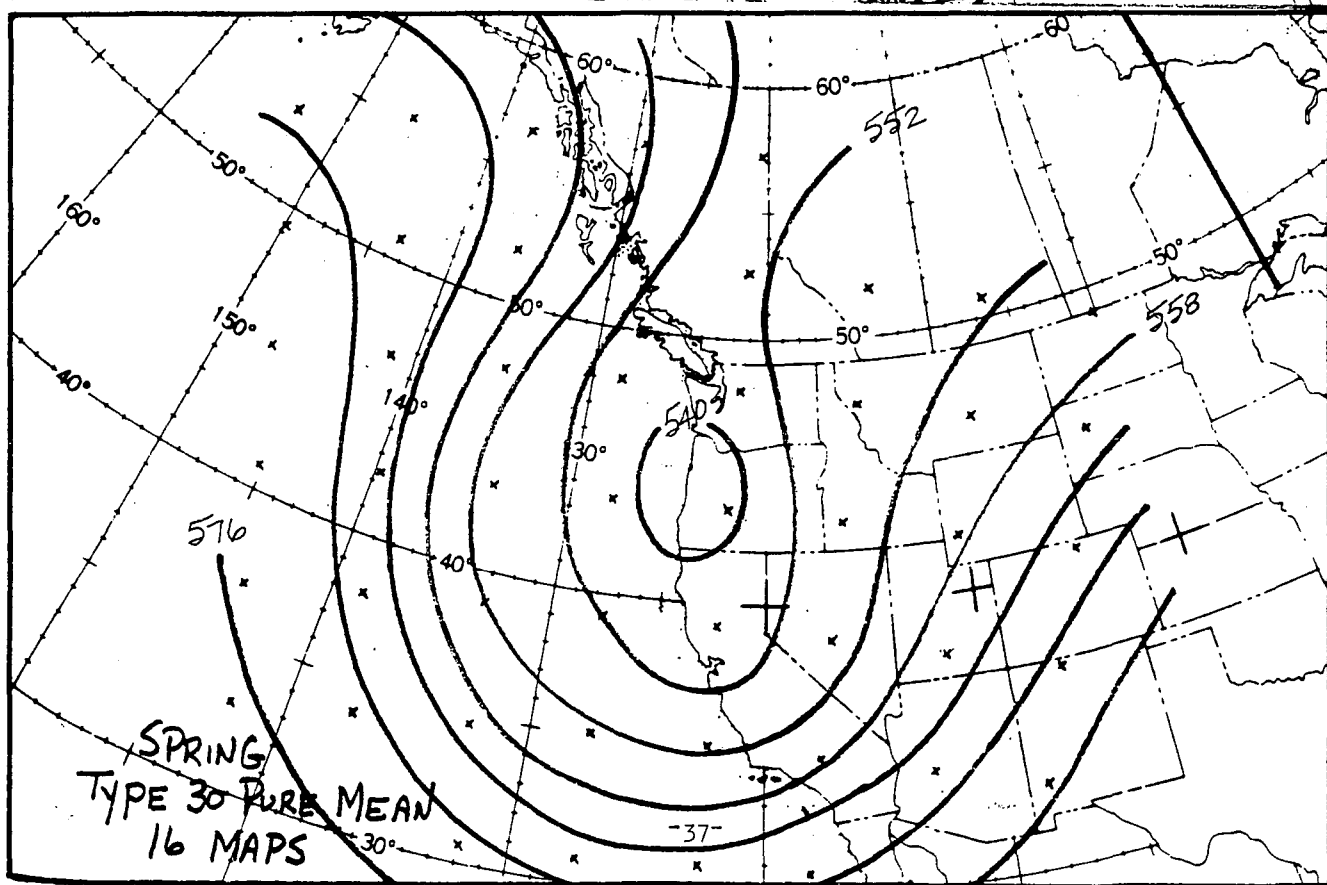
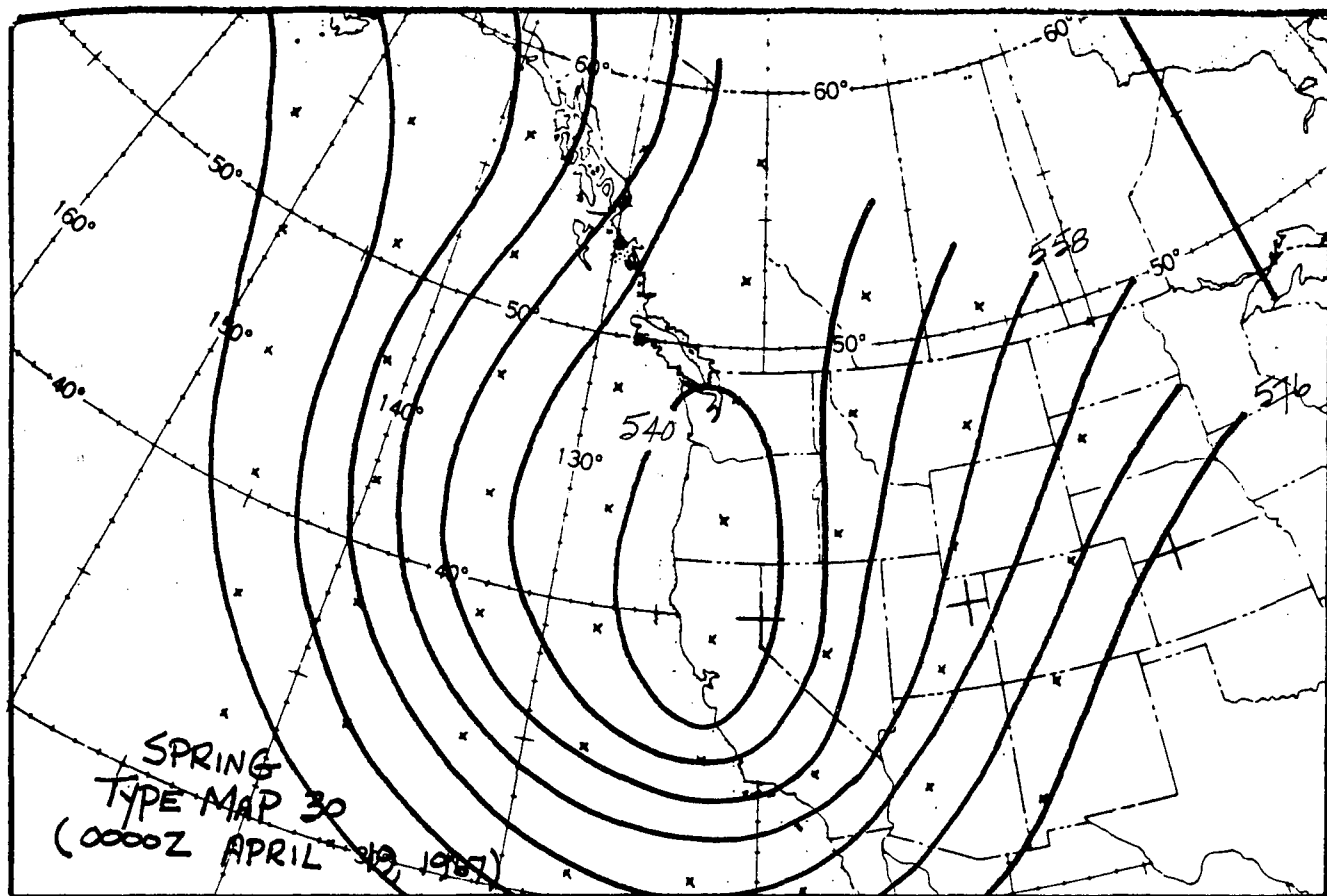


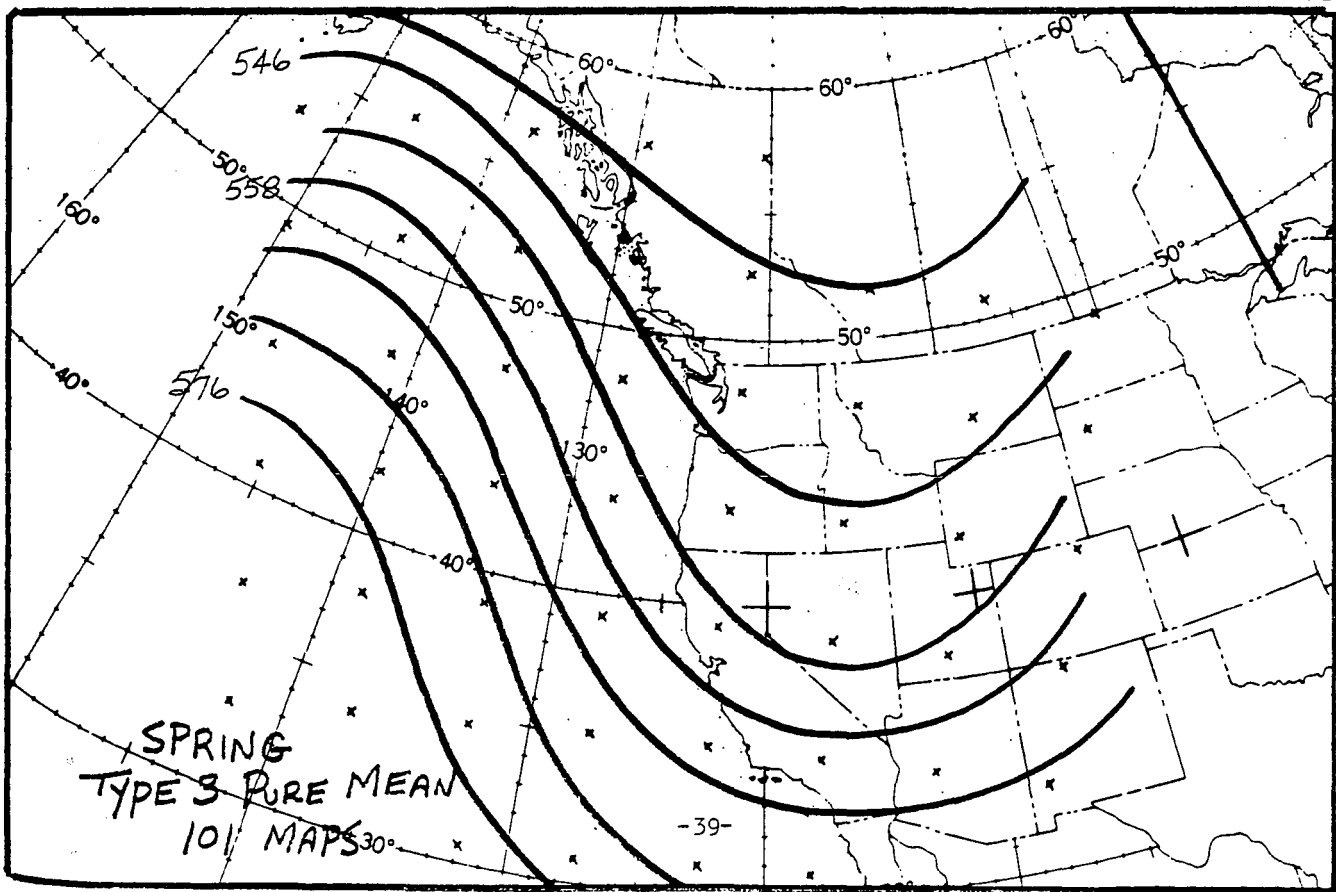
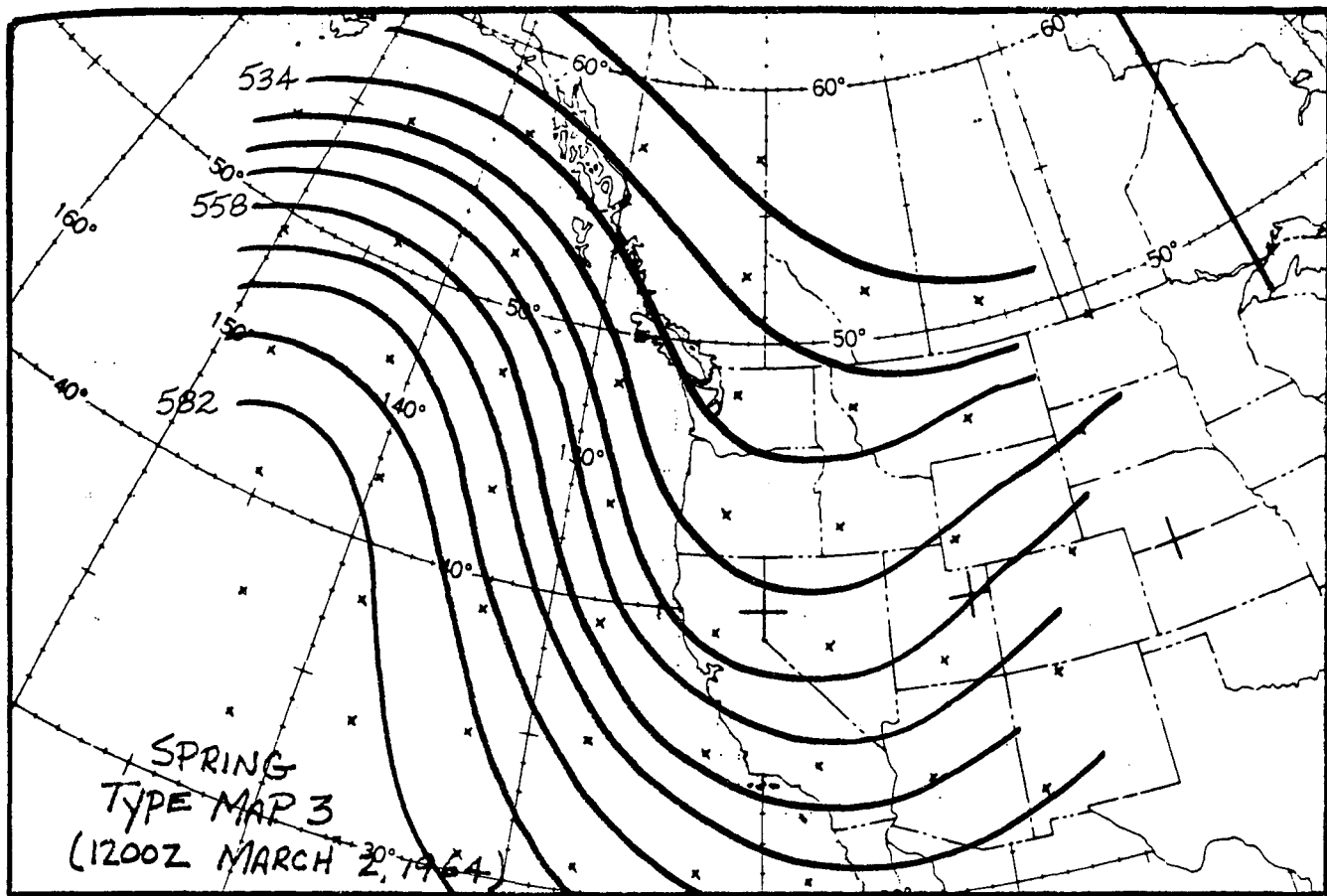
500-MB SPRING TYPE 20



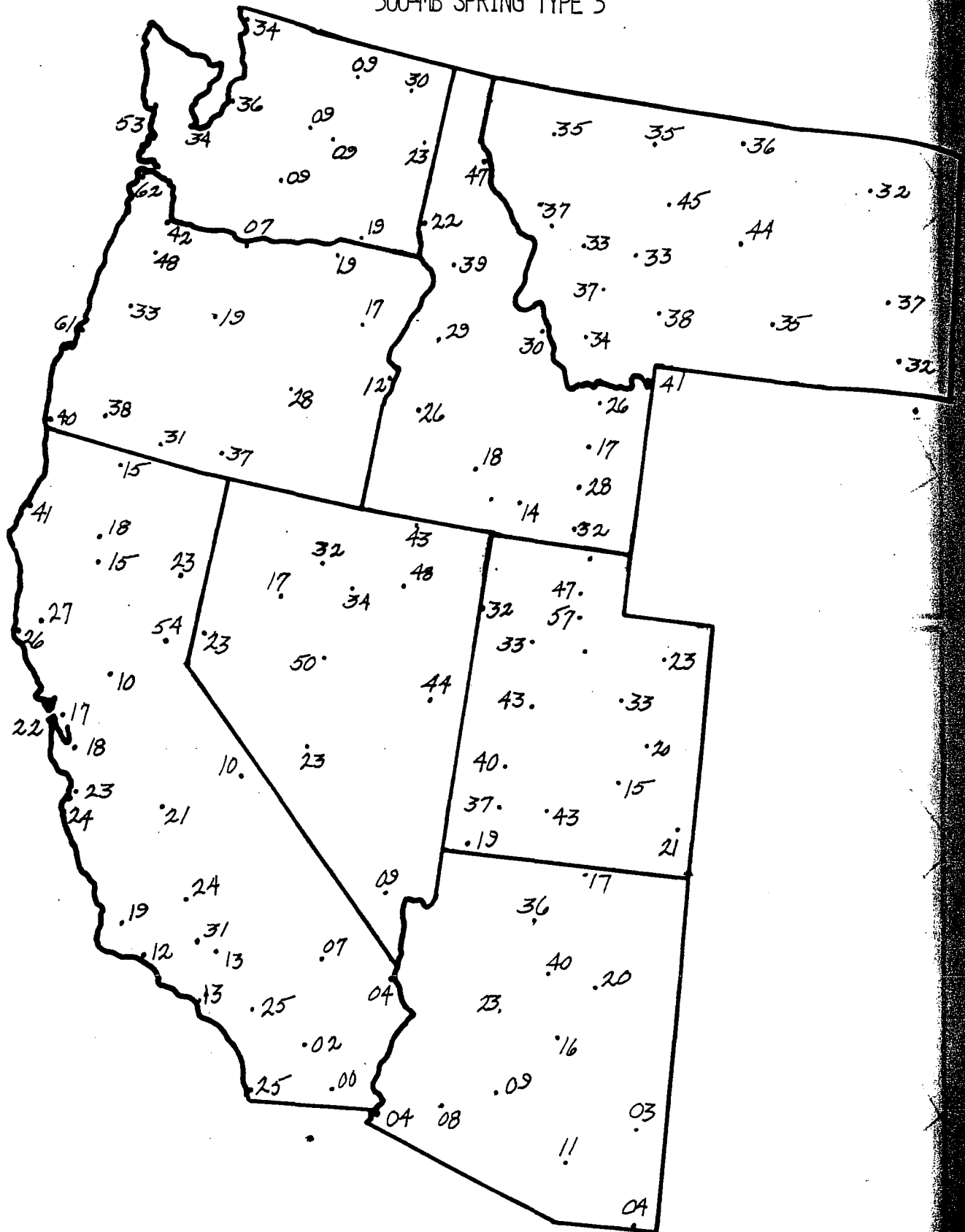


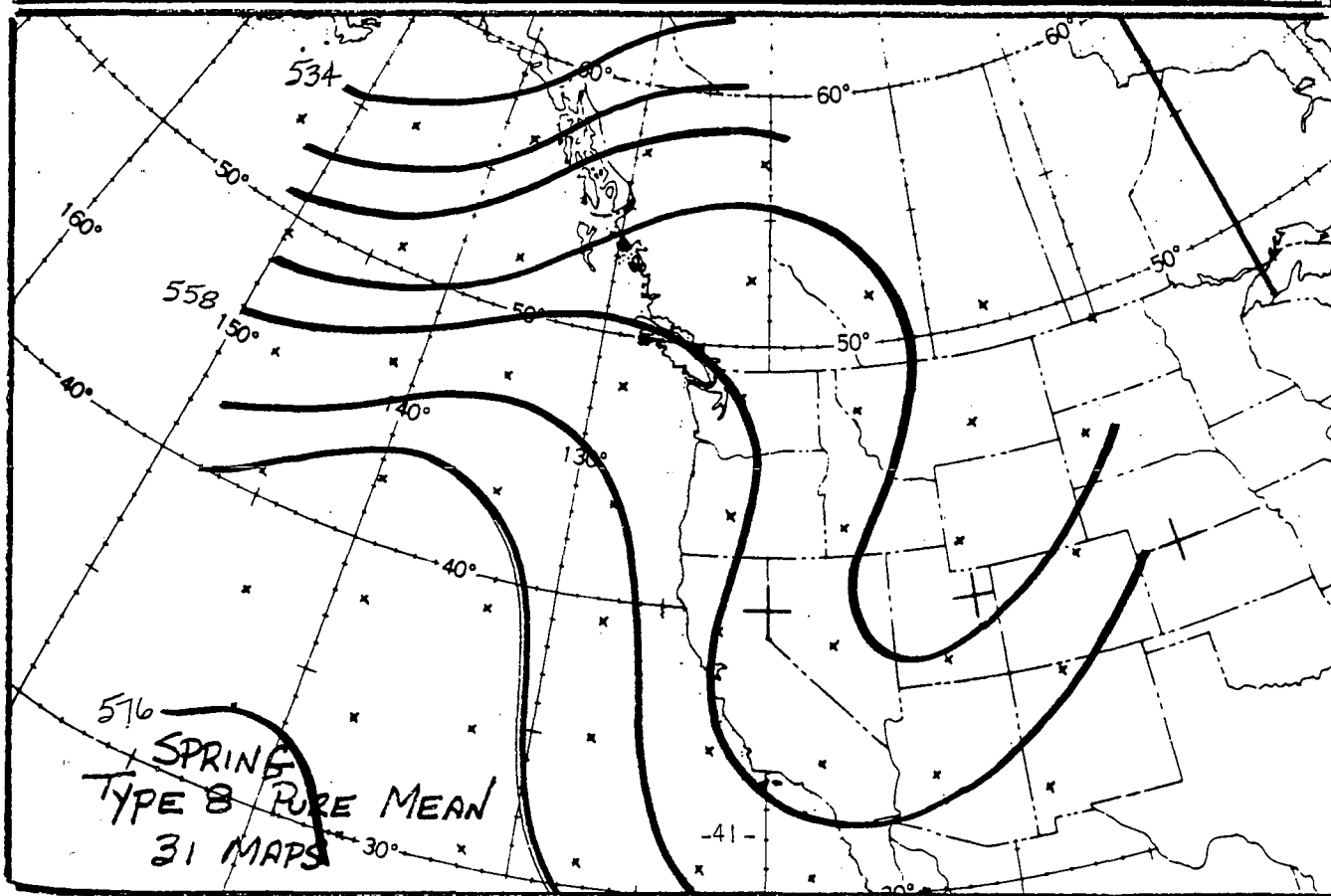
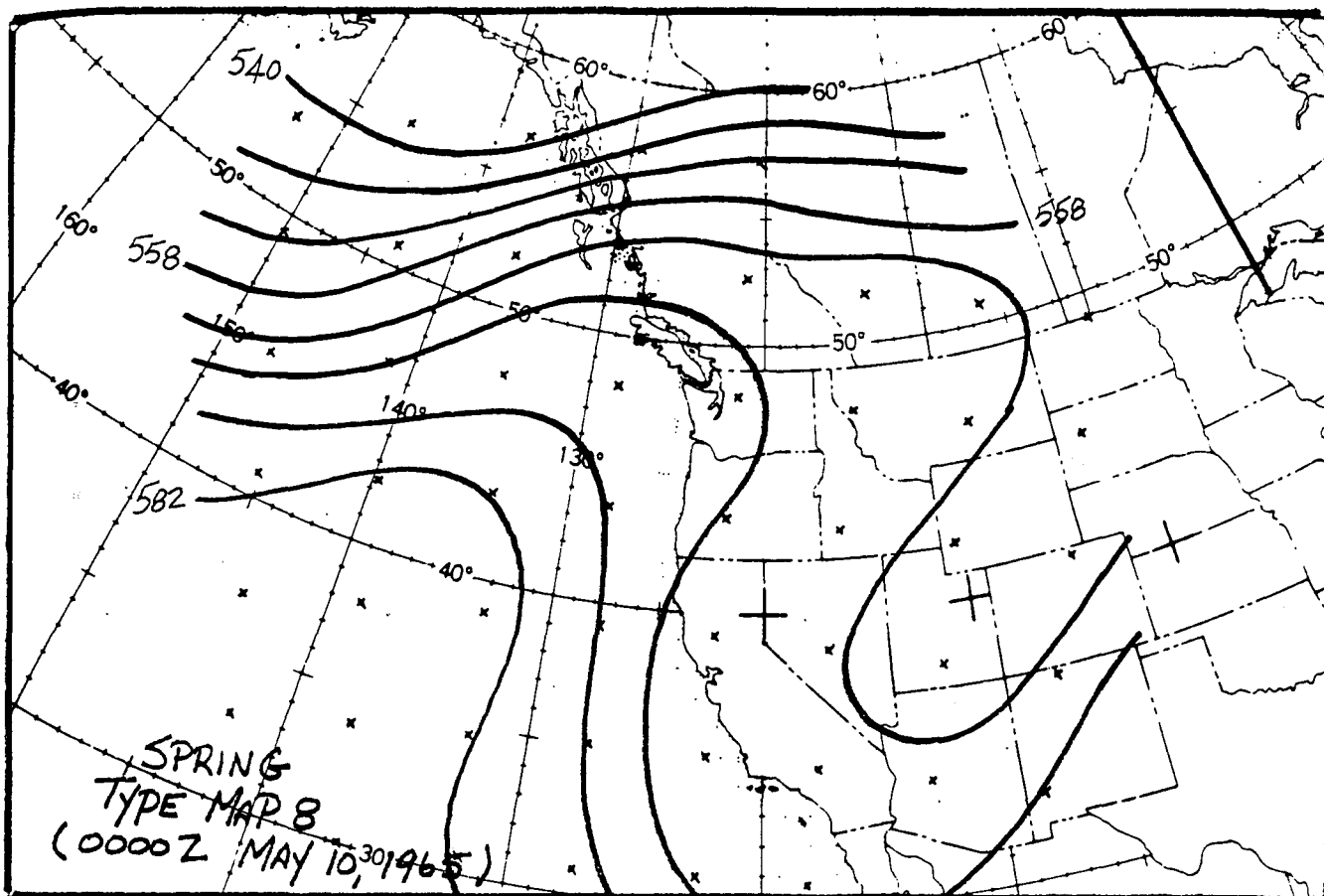
[illegible]





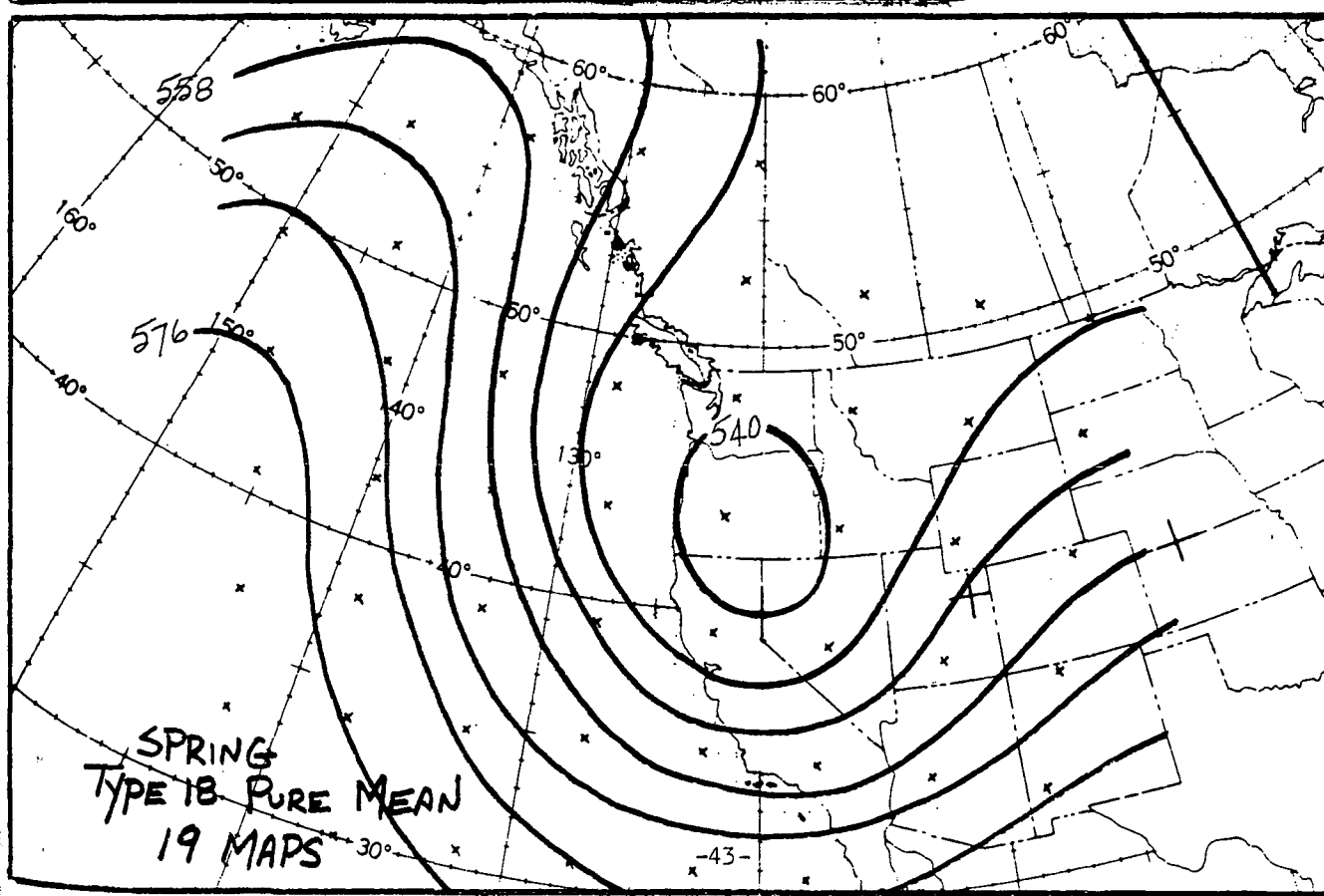
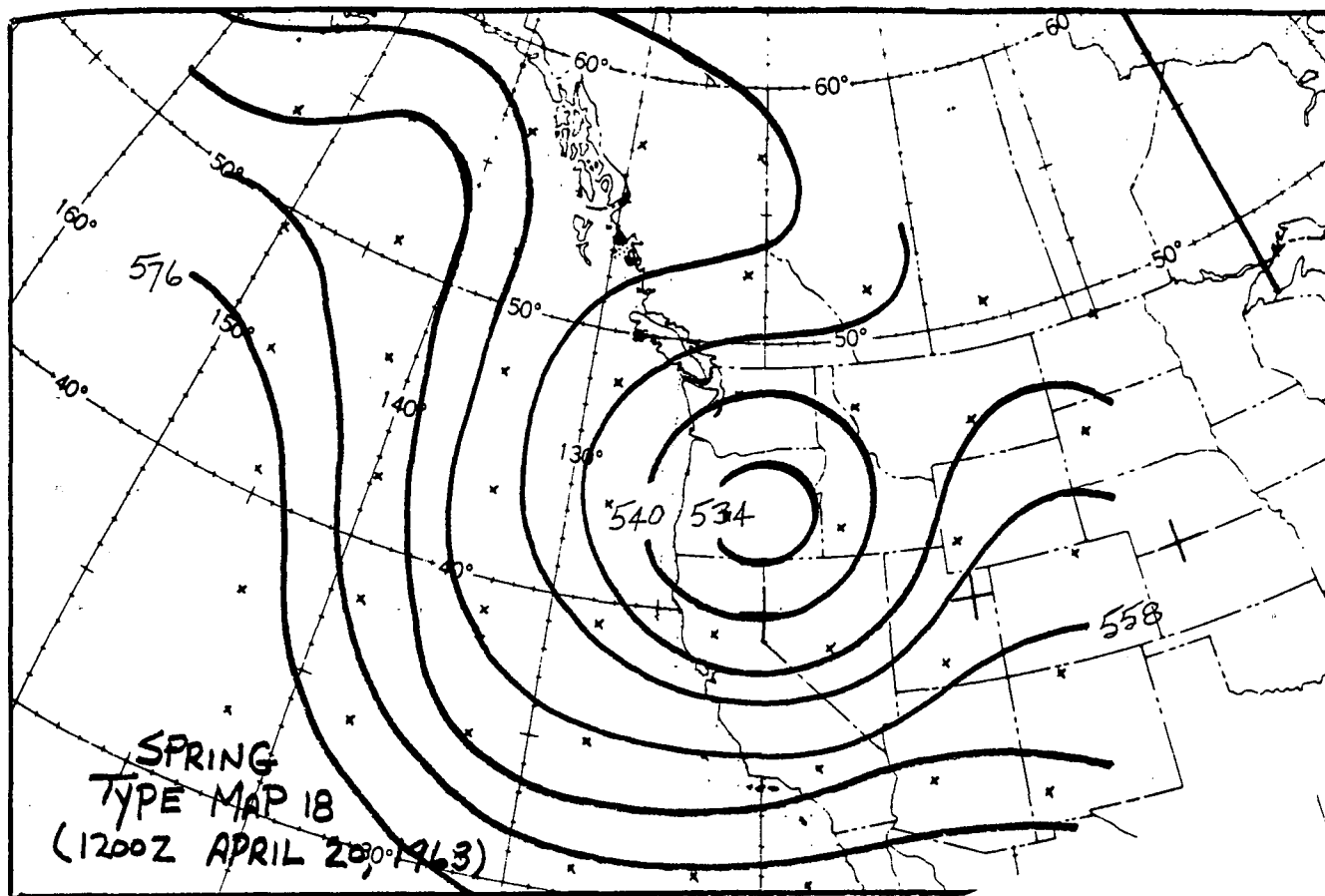
PERCENT FREQUENCY OF PRECIPITATION OCCURRENCE WITH
500-MB SPRING TYPE 3



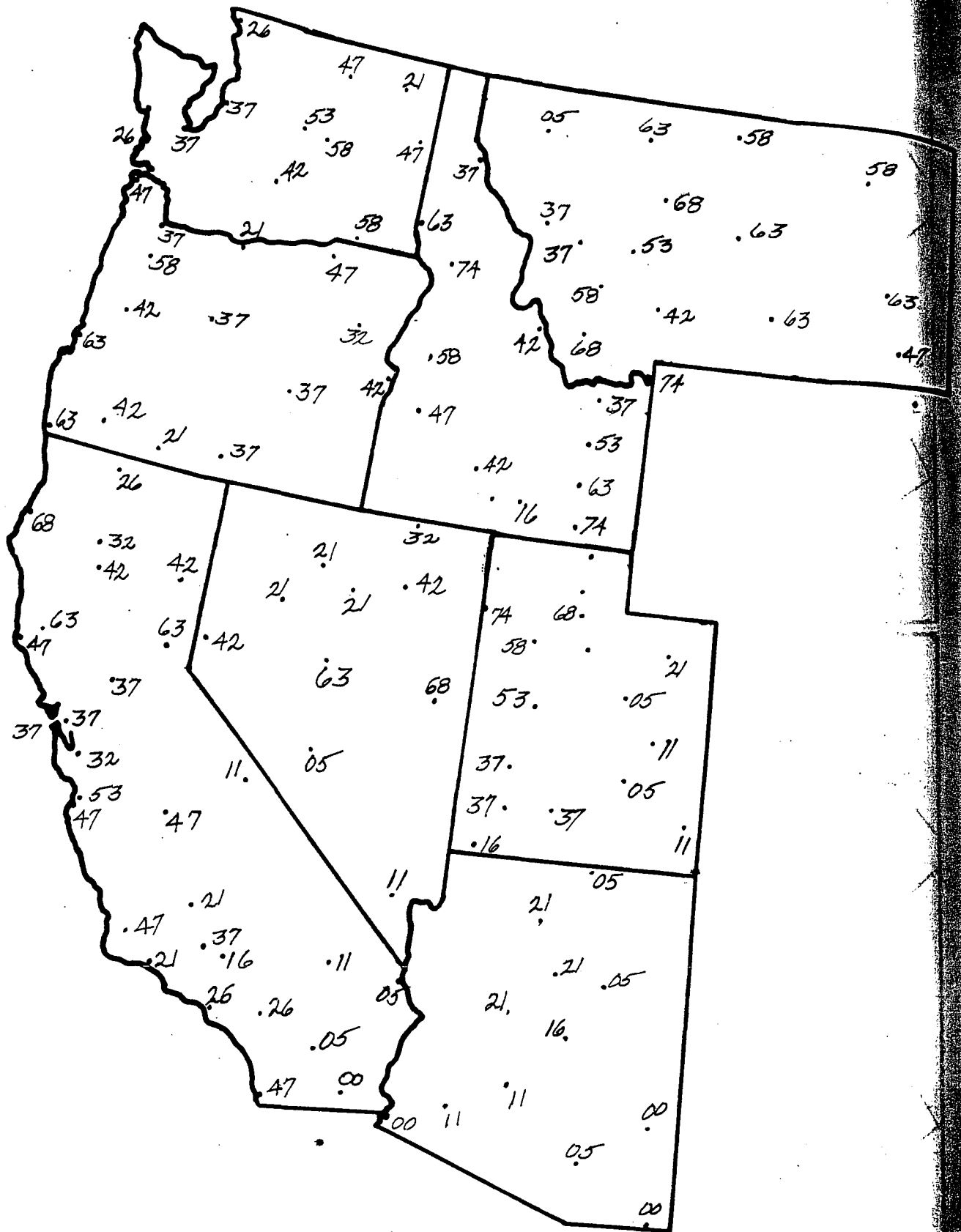


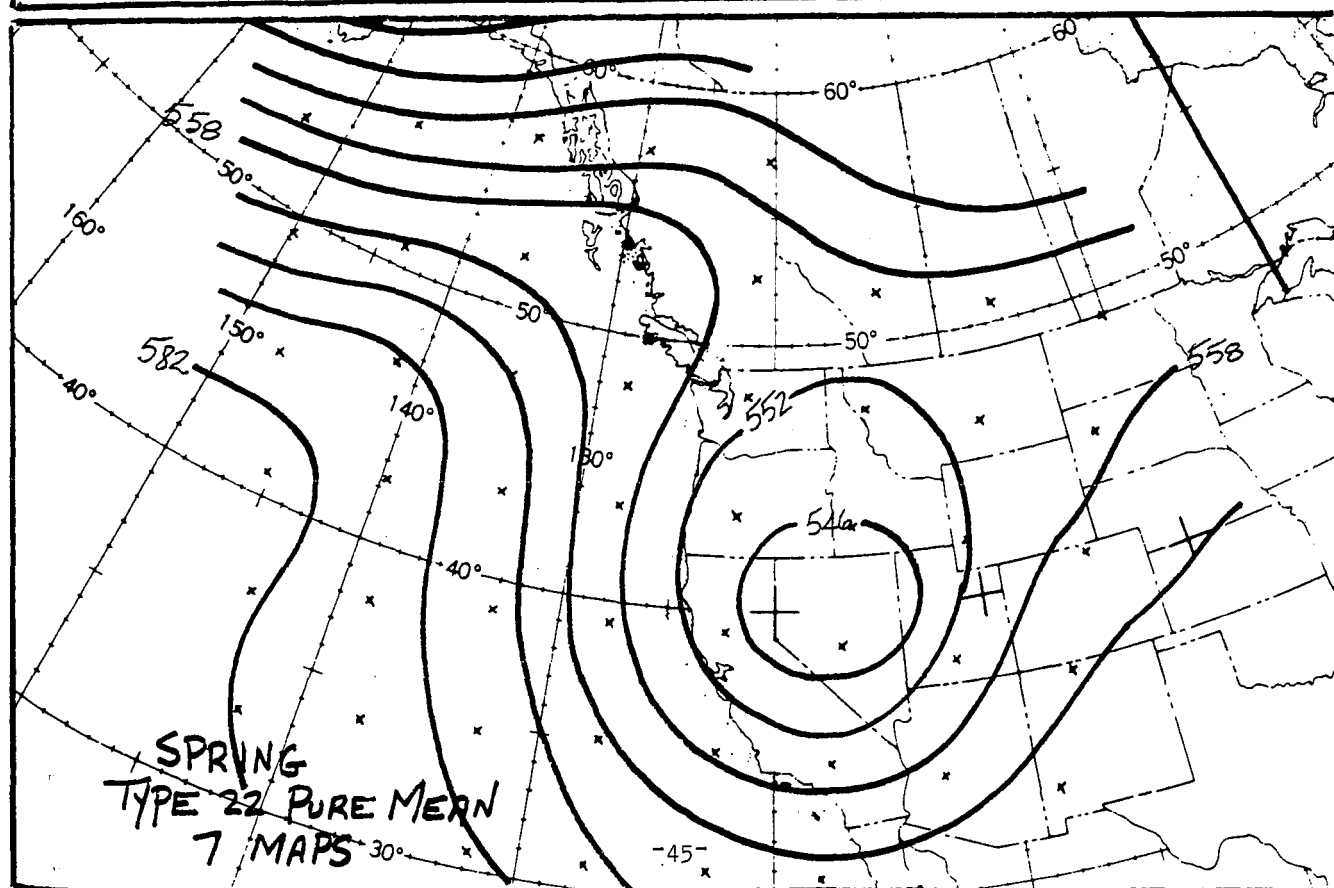
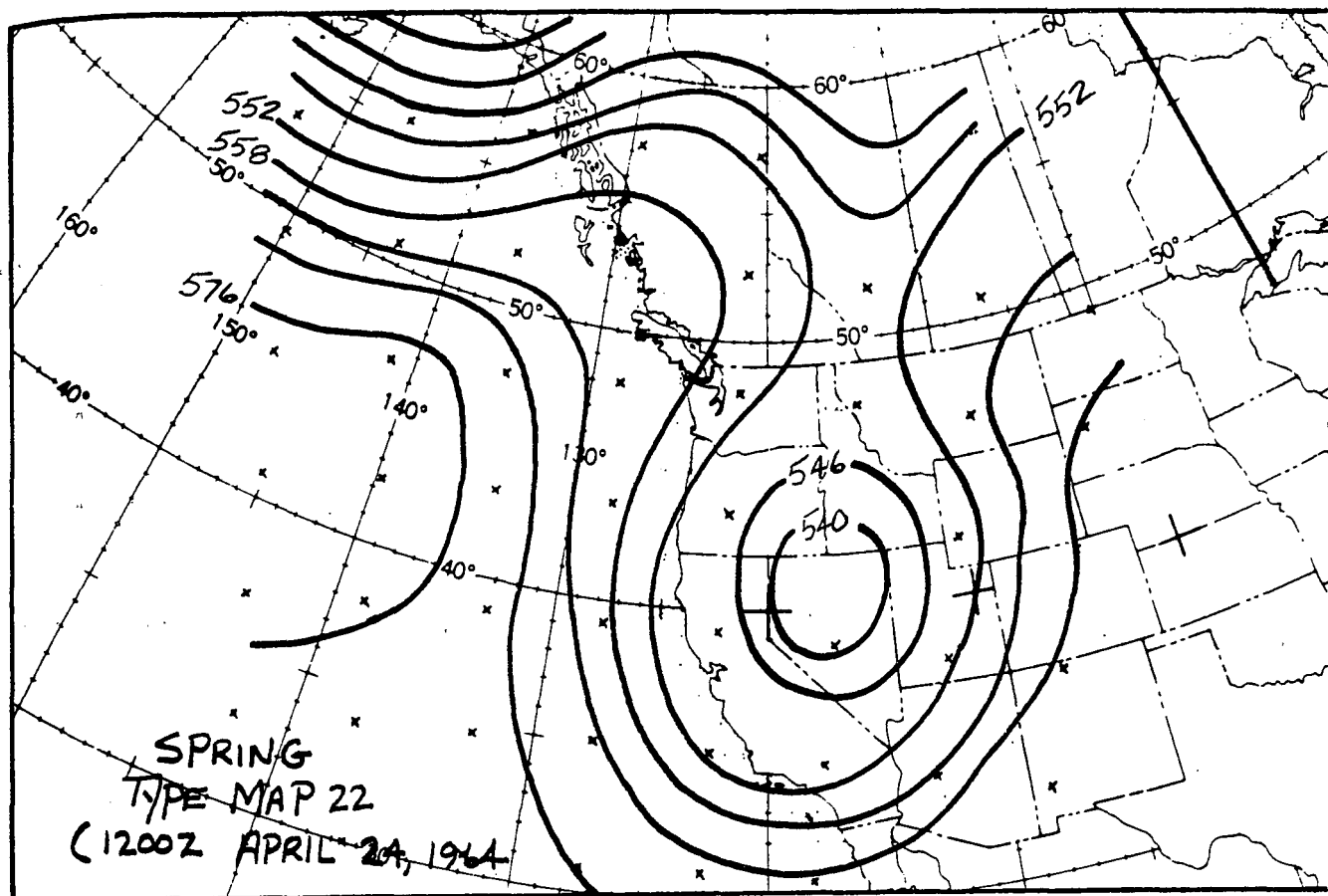
500-MB SPRING TYPE 8



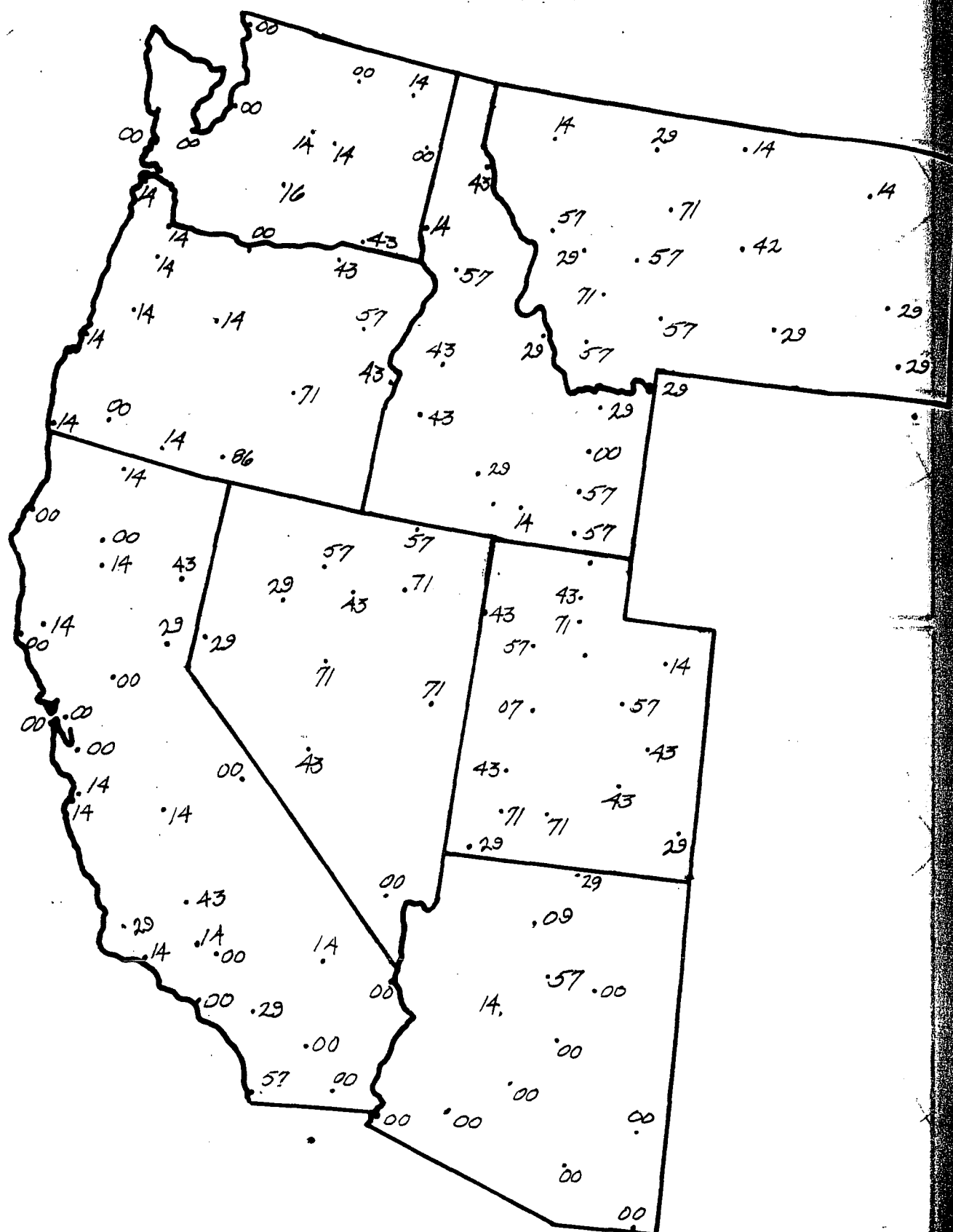


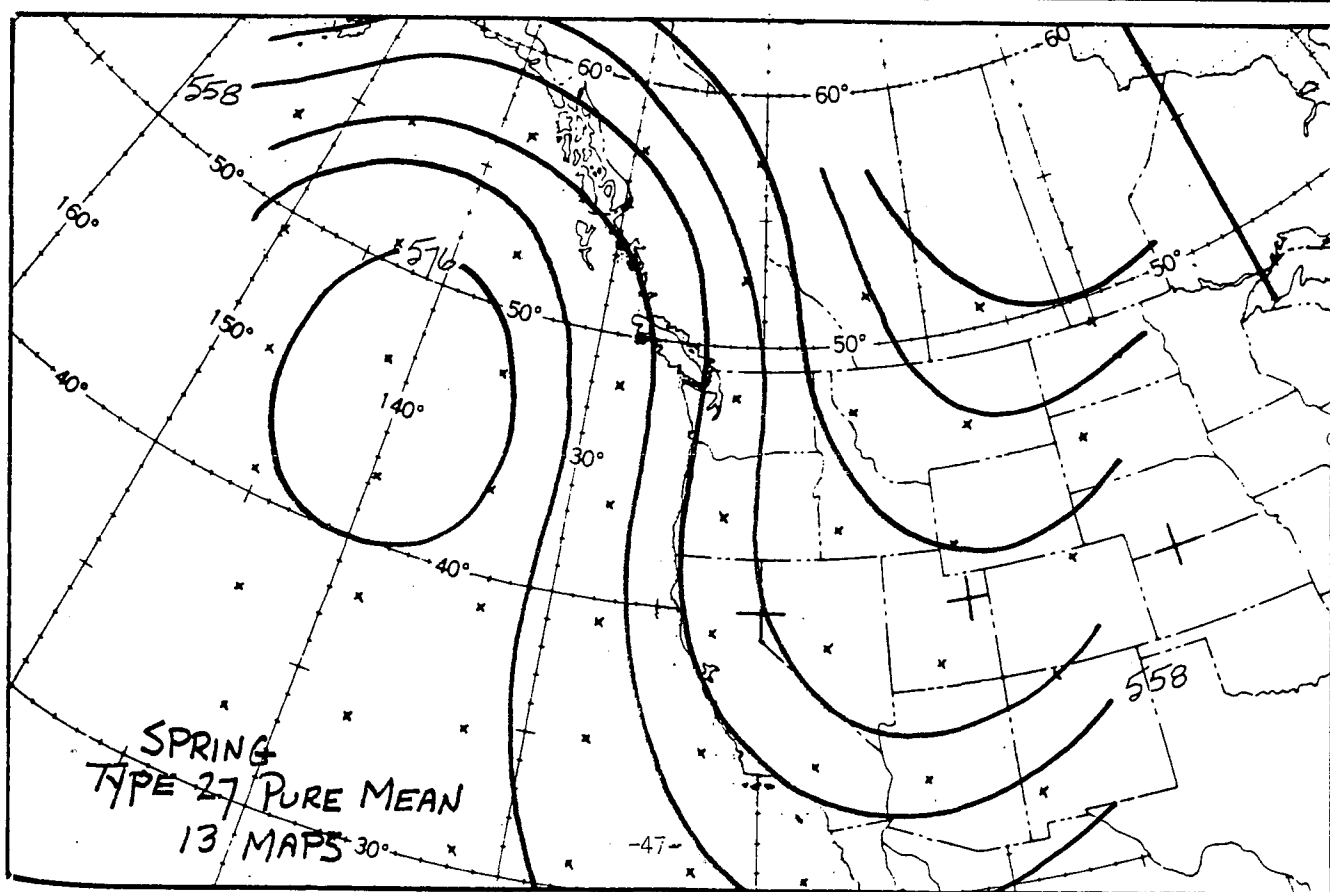
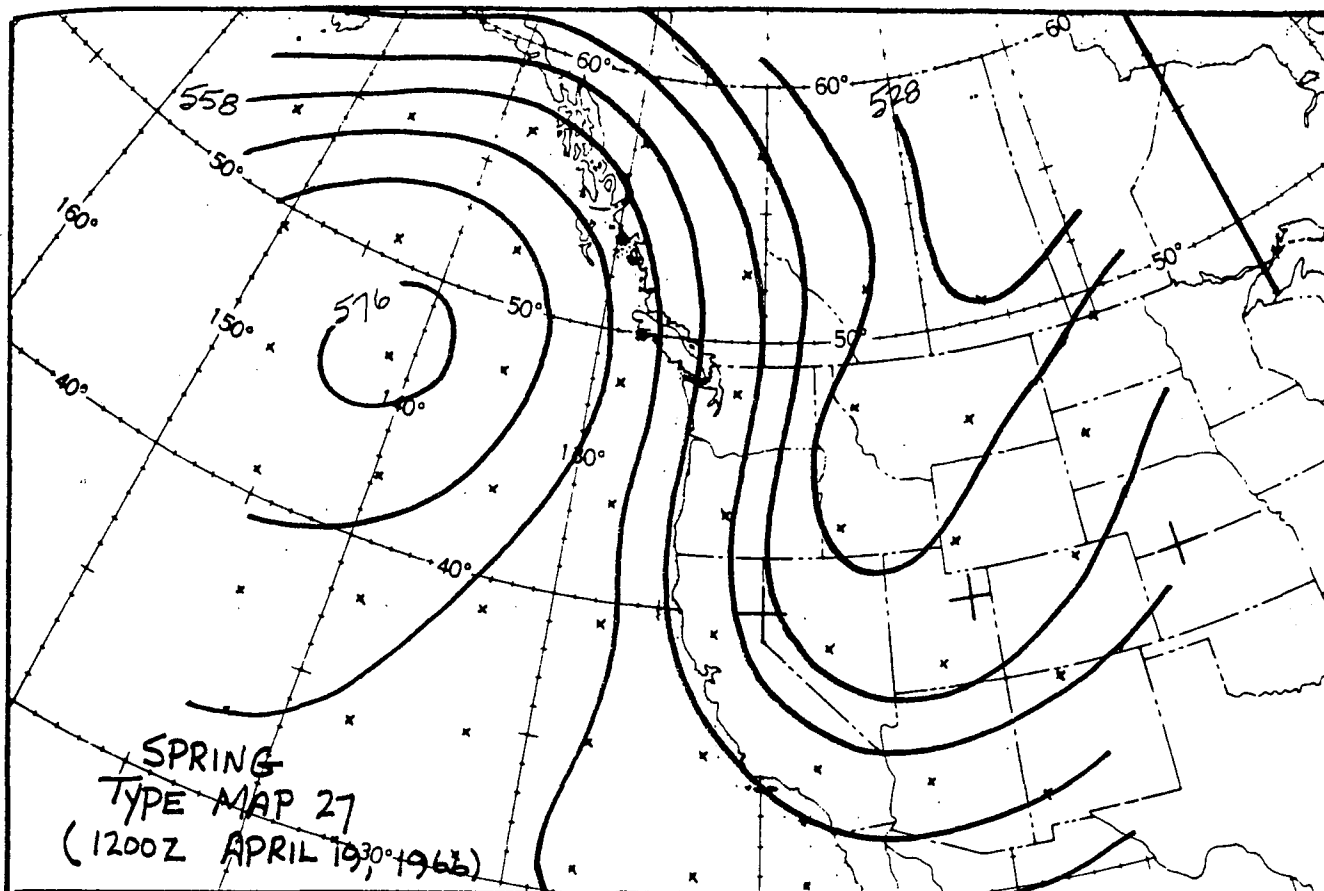
500-MB SPRING TYPE 18.



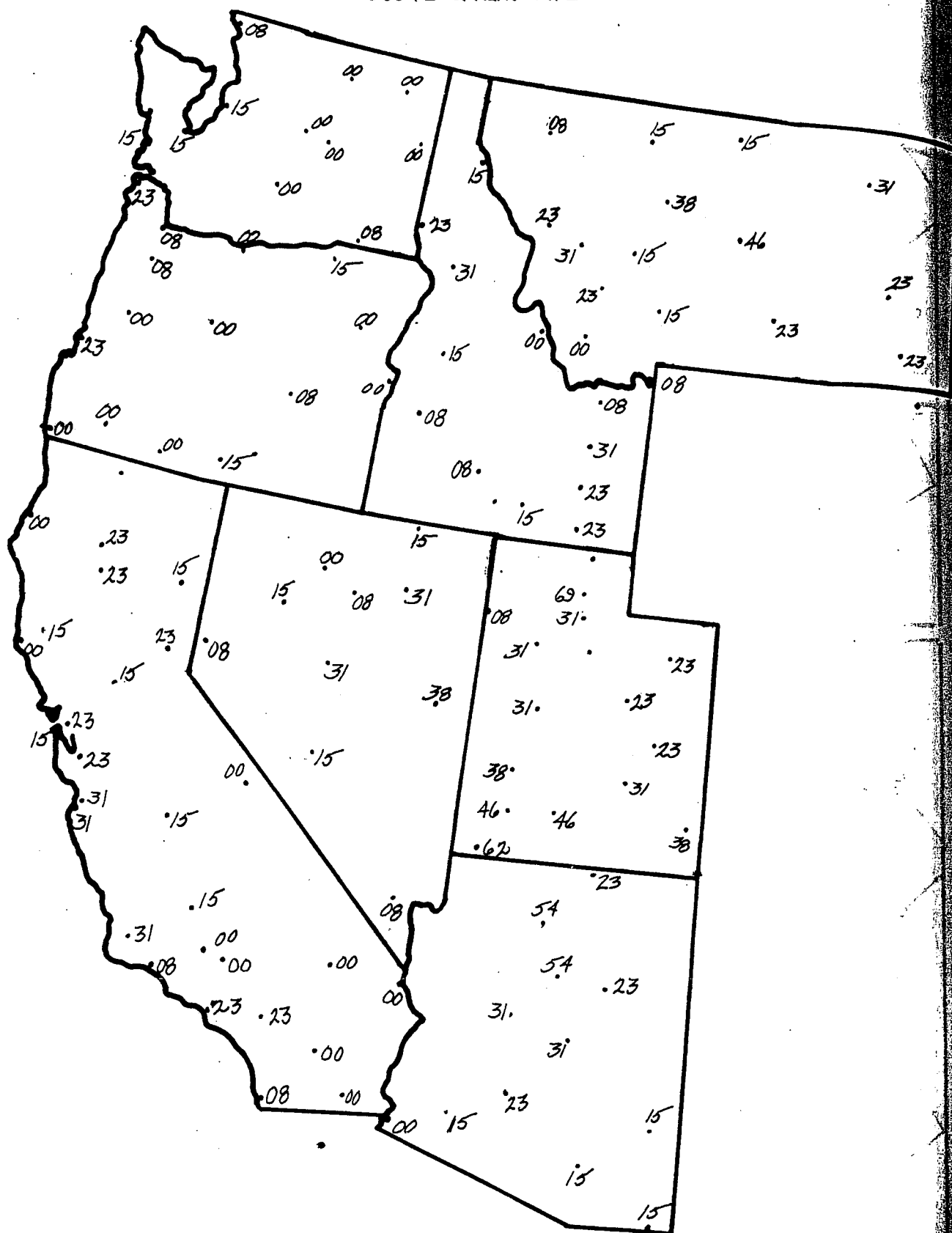


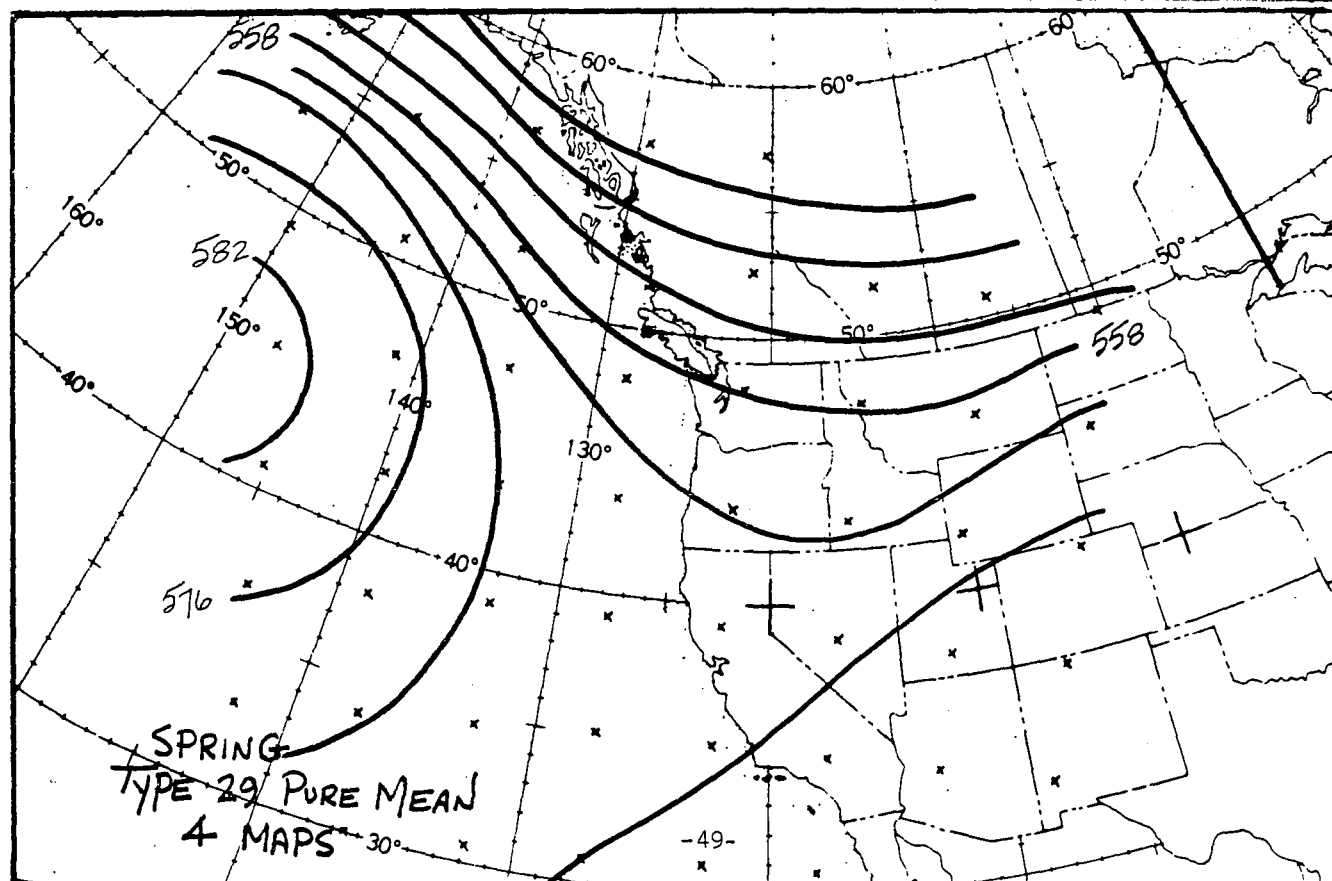
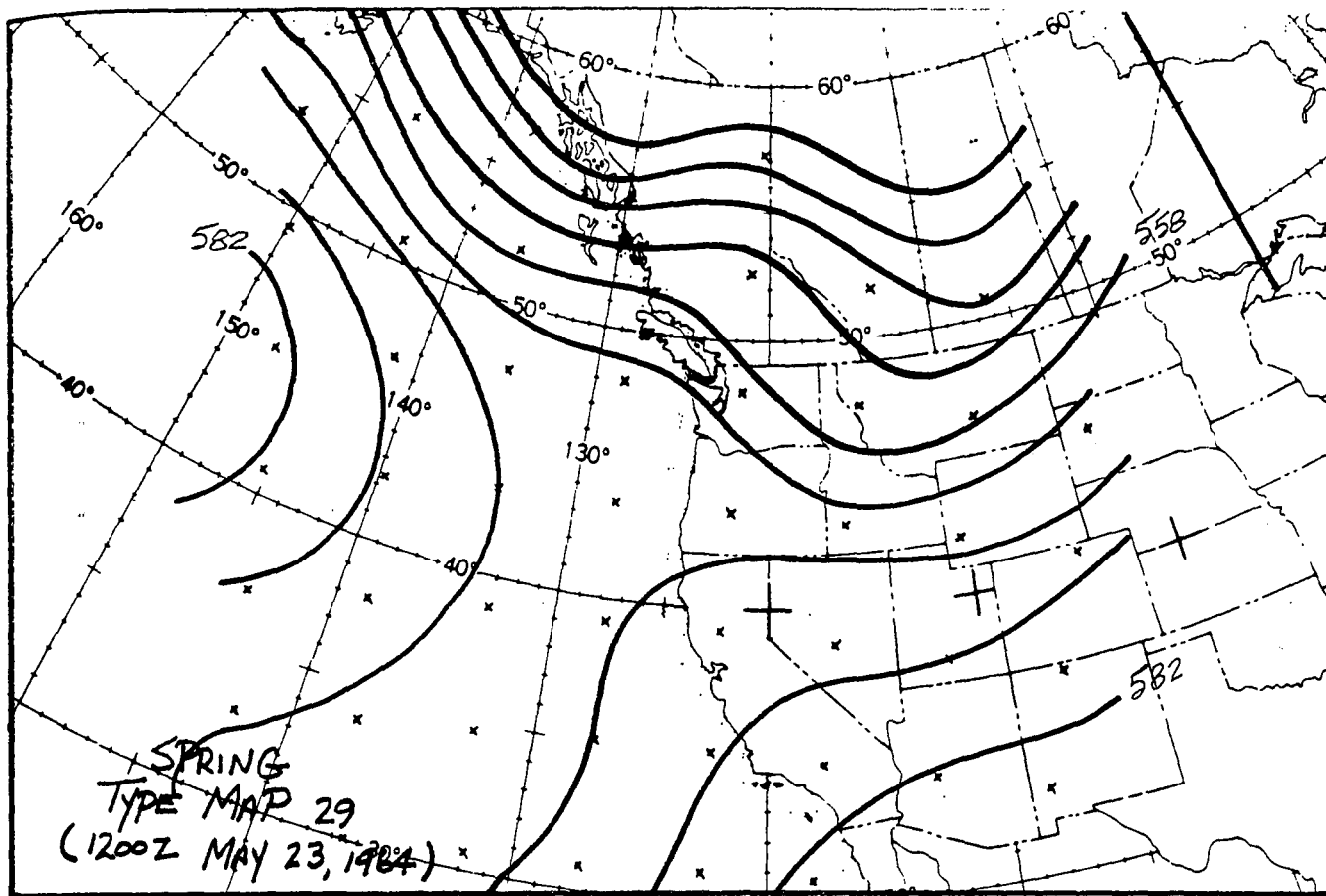
500-MB SPRING TYPE 22



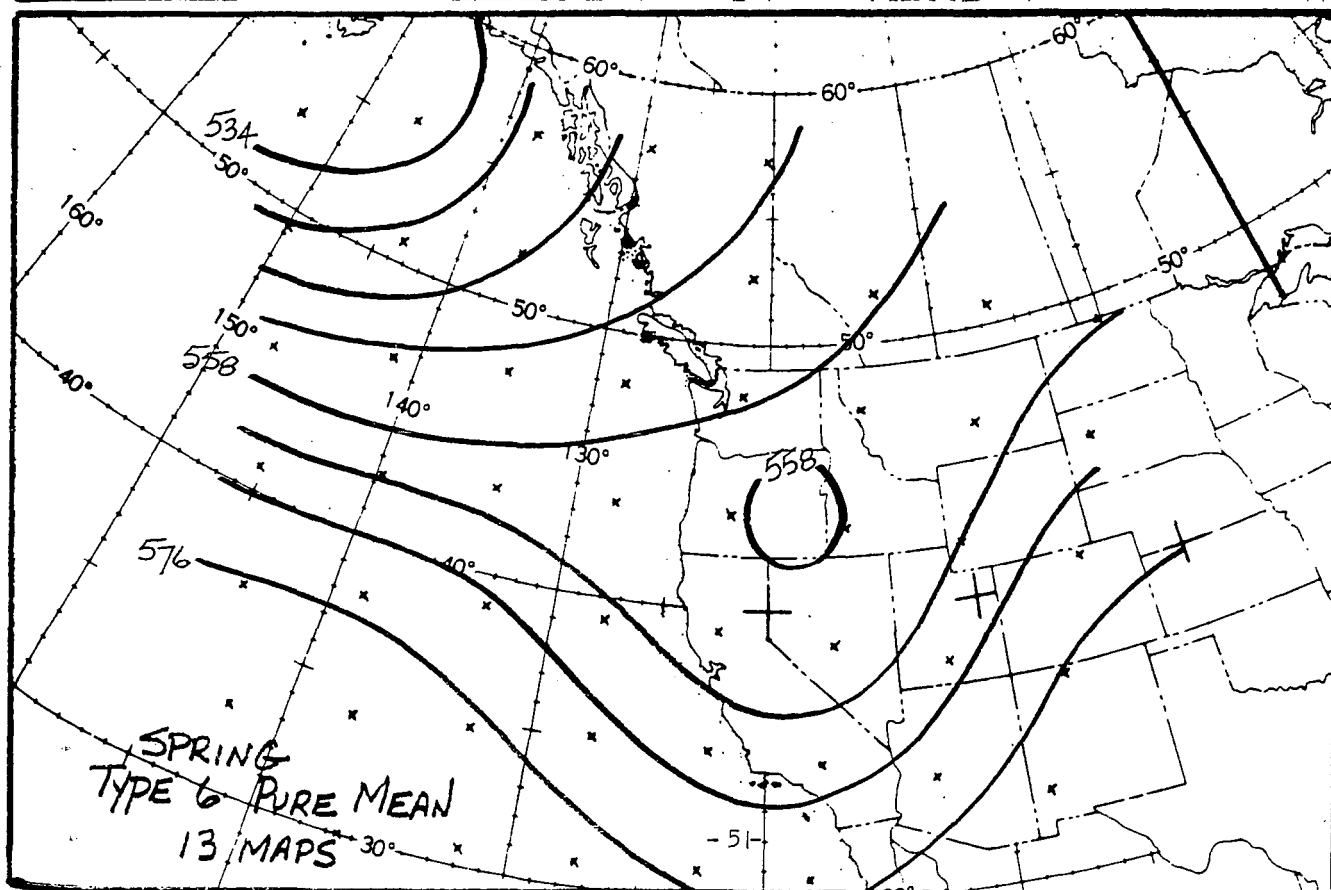
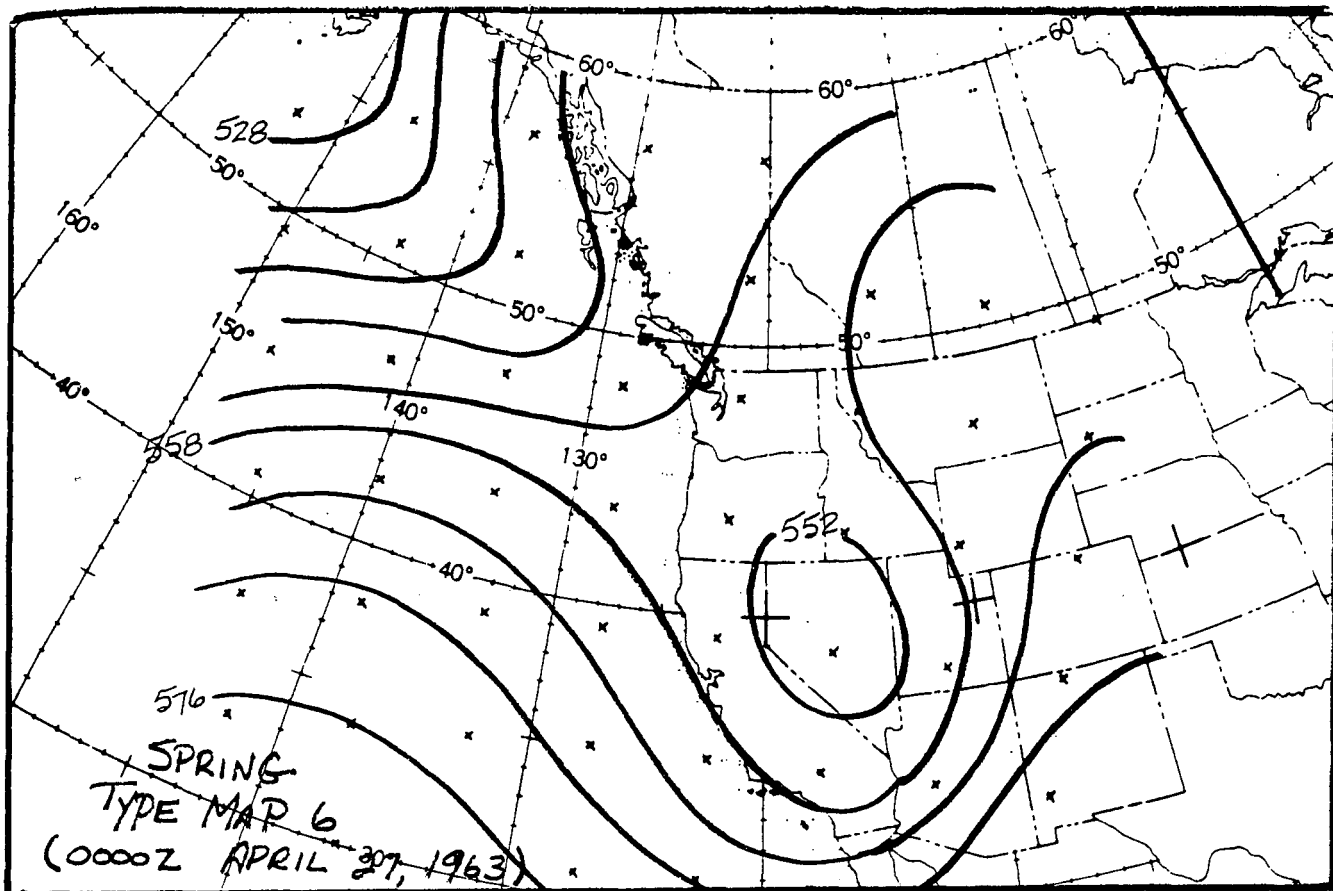


500-MB SPRING TYPE 27



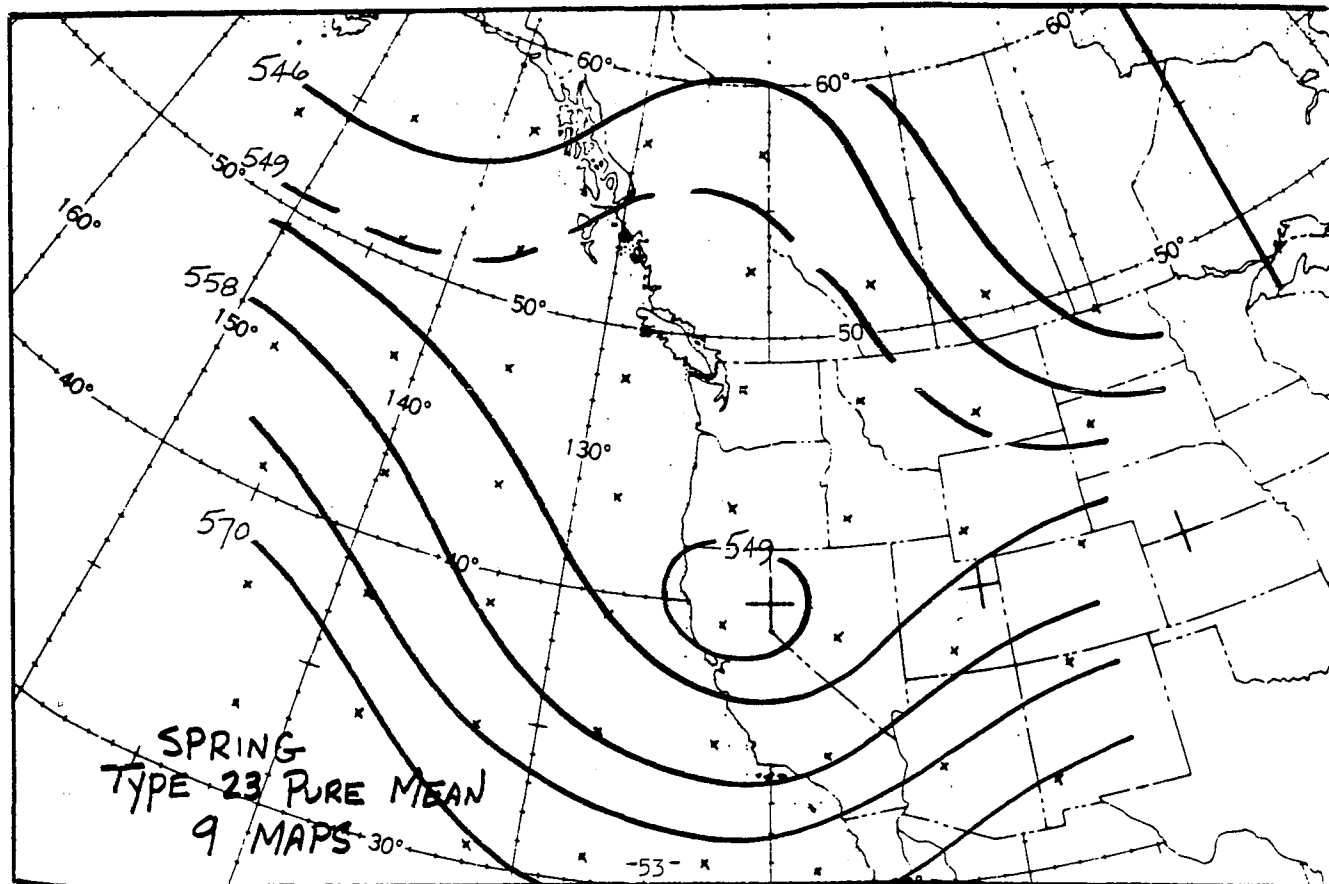
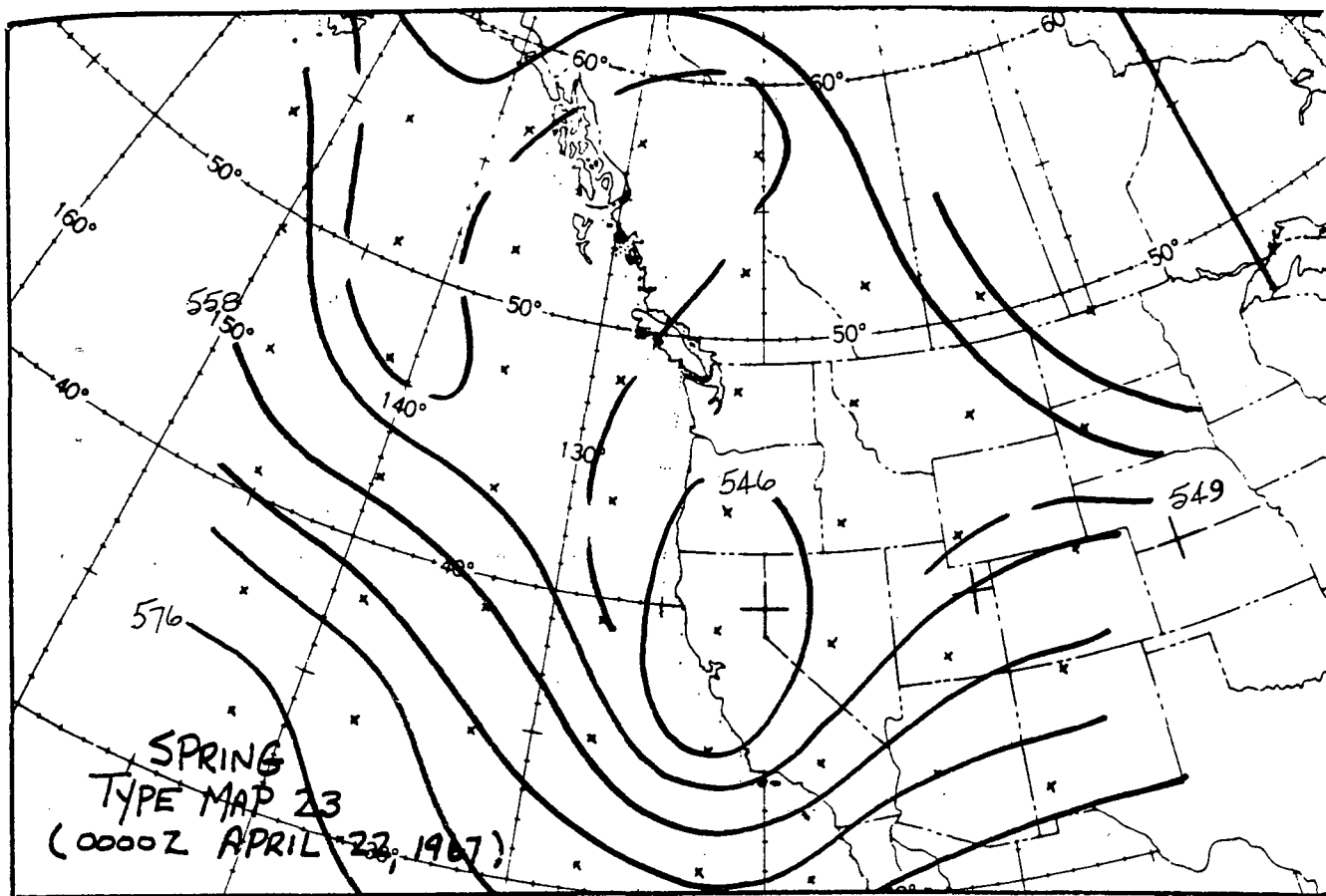


[illegible]

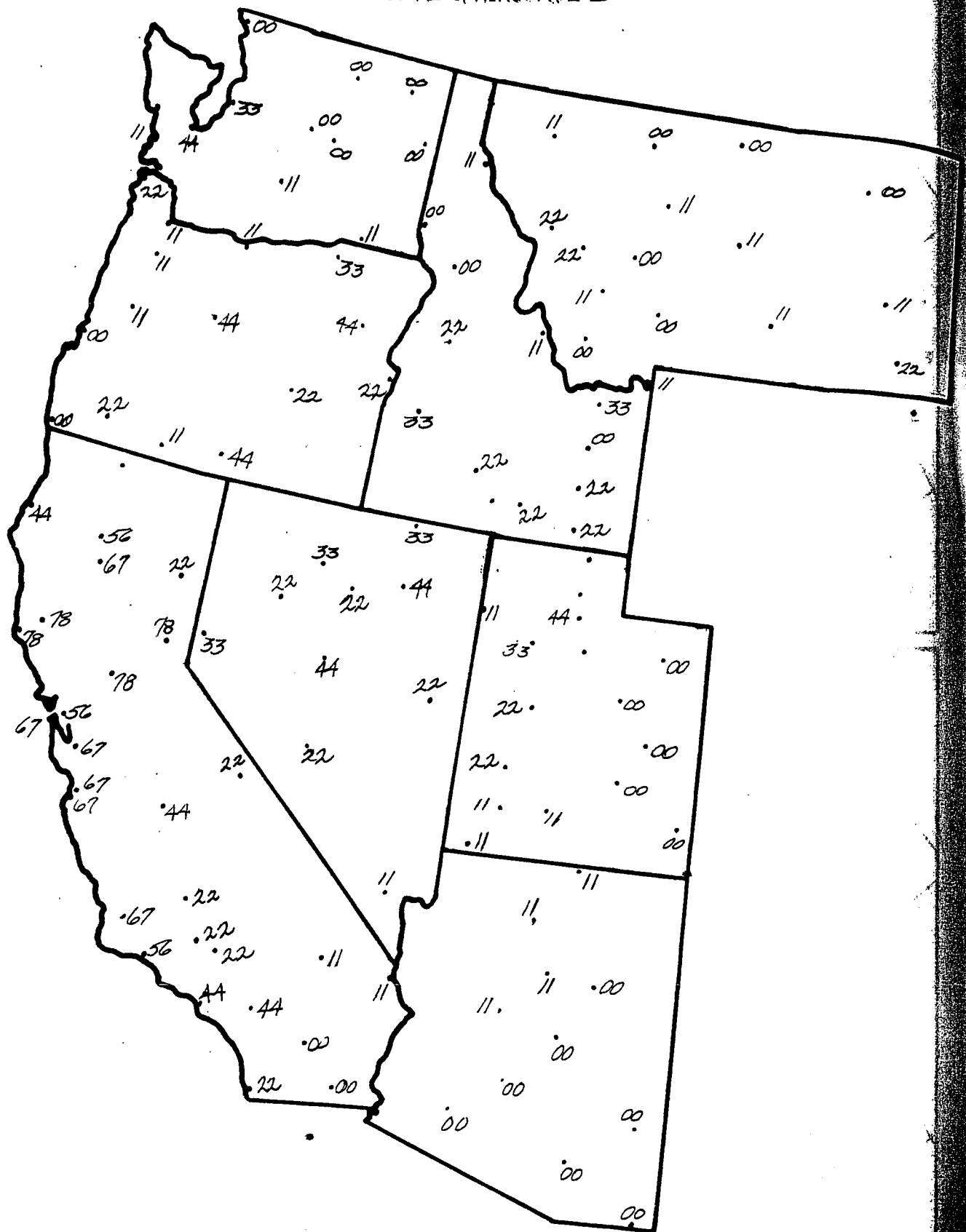


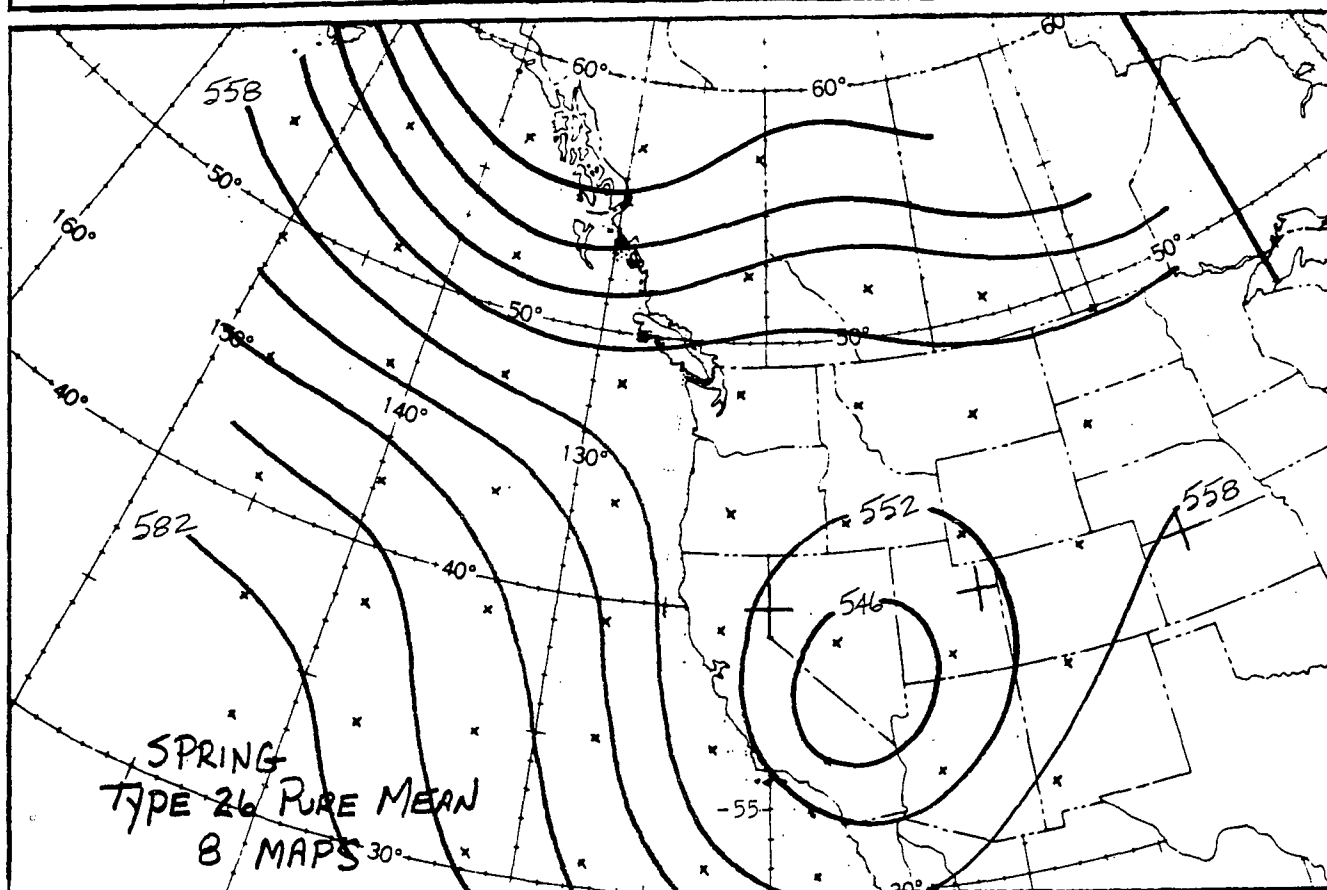
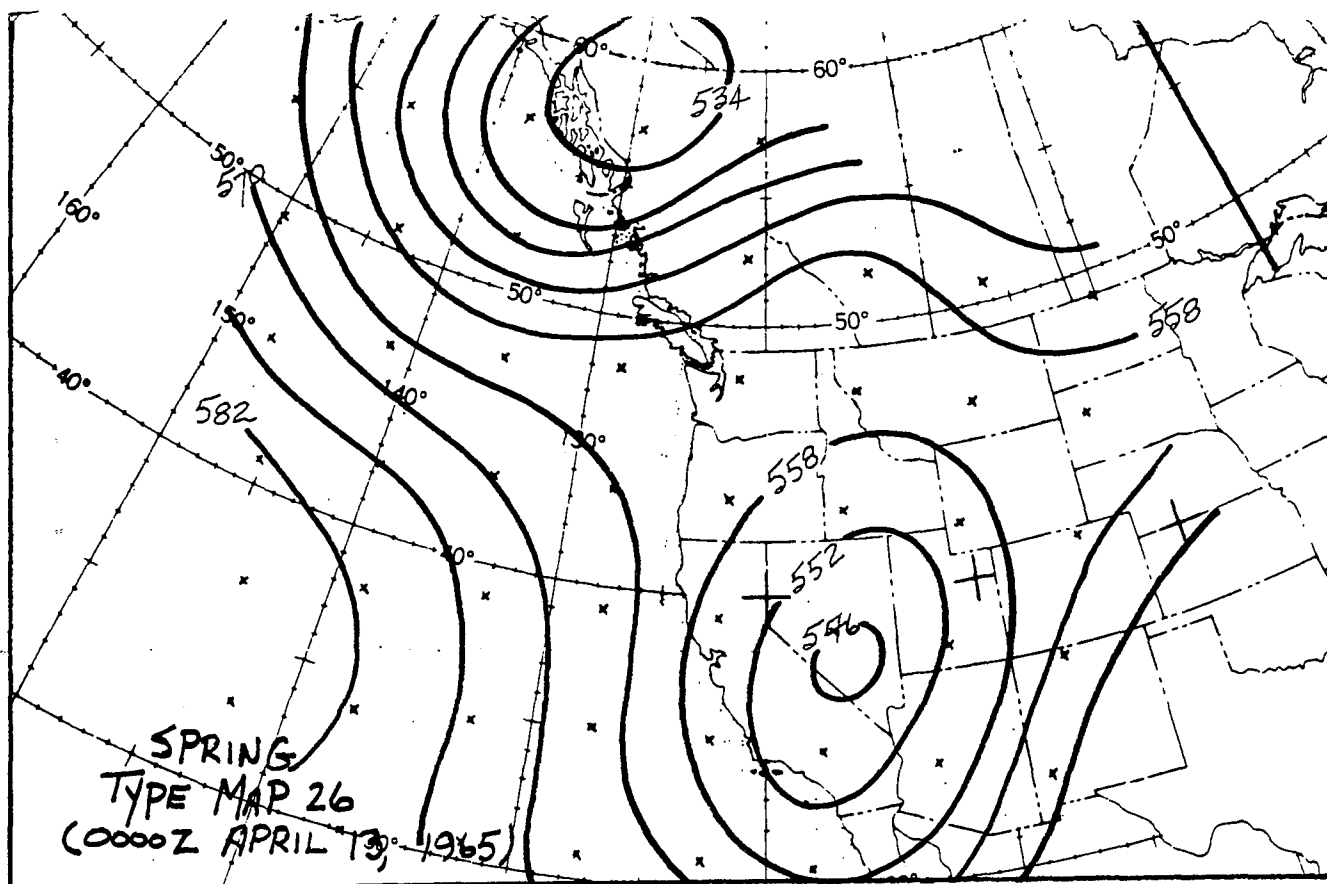
500-MB SPRING TYPE 6

Map showing the state of Washington divided into counties, with handwritten numerical data points (likely precipitation or temperature) scattered across the map. The data points are small numbers, some with decimal points, representing various measurements or values for each county.



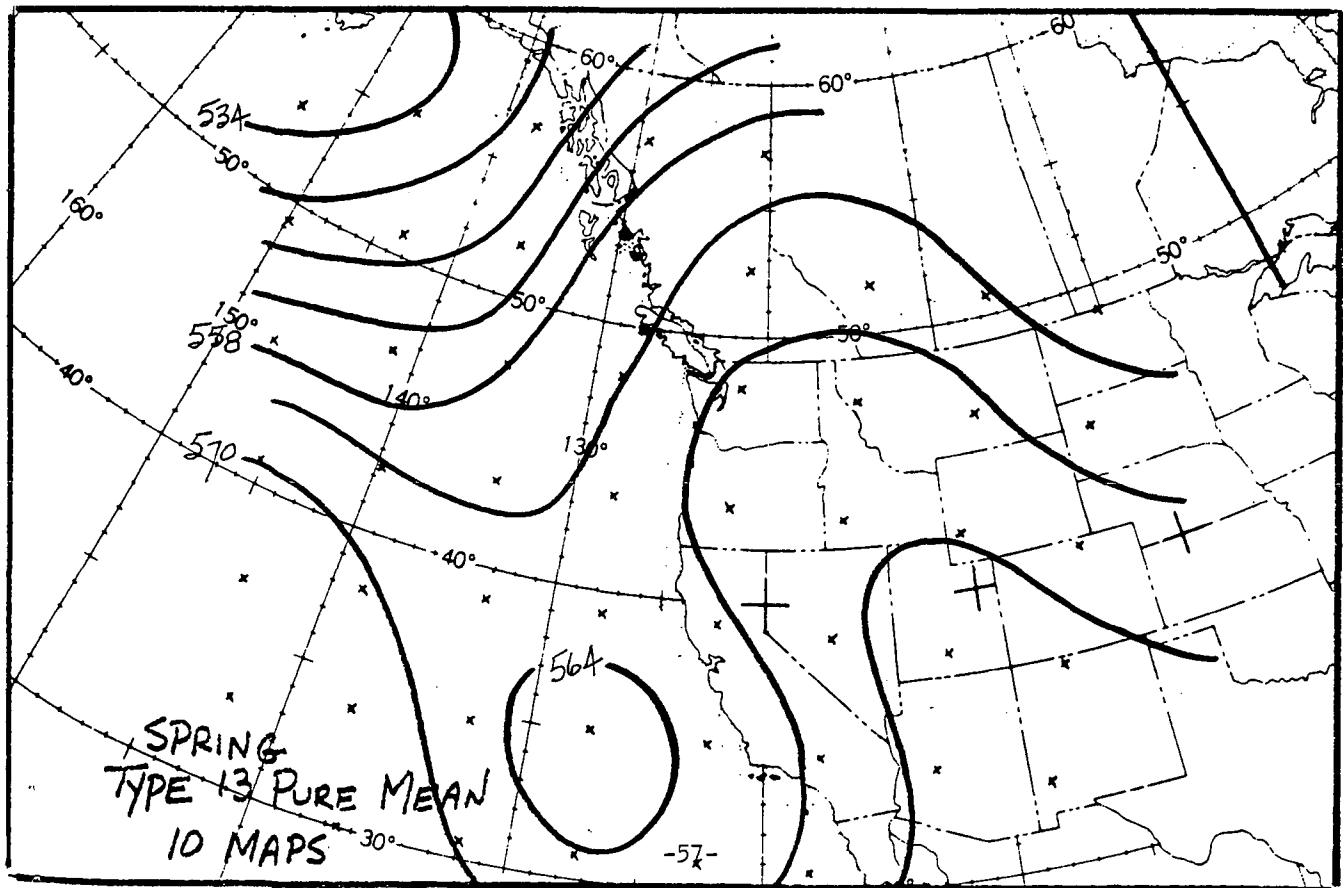
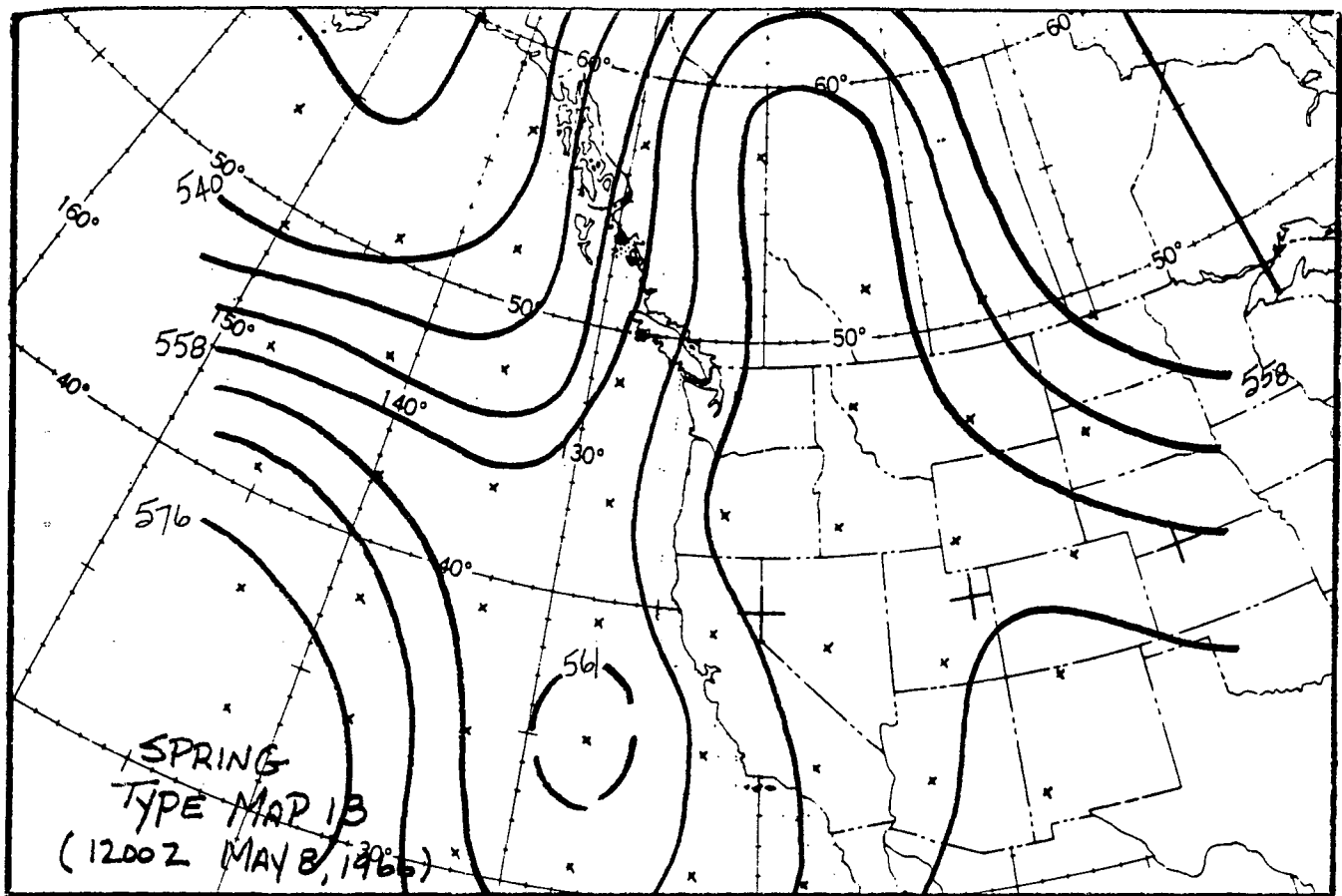
504MB SPRING TYPE 25



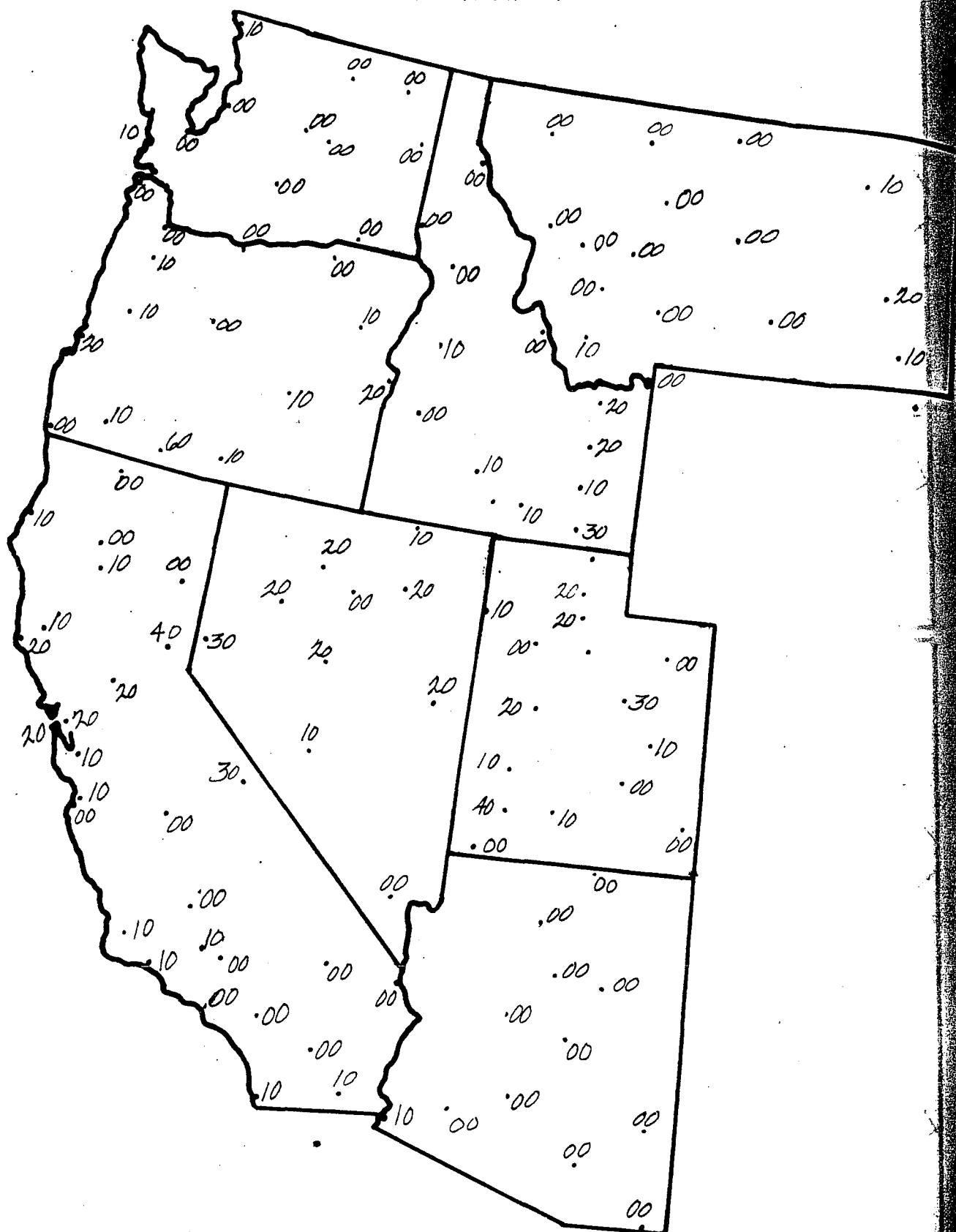


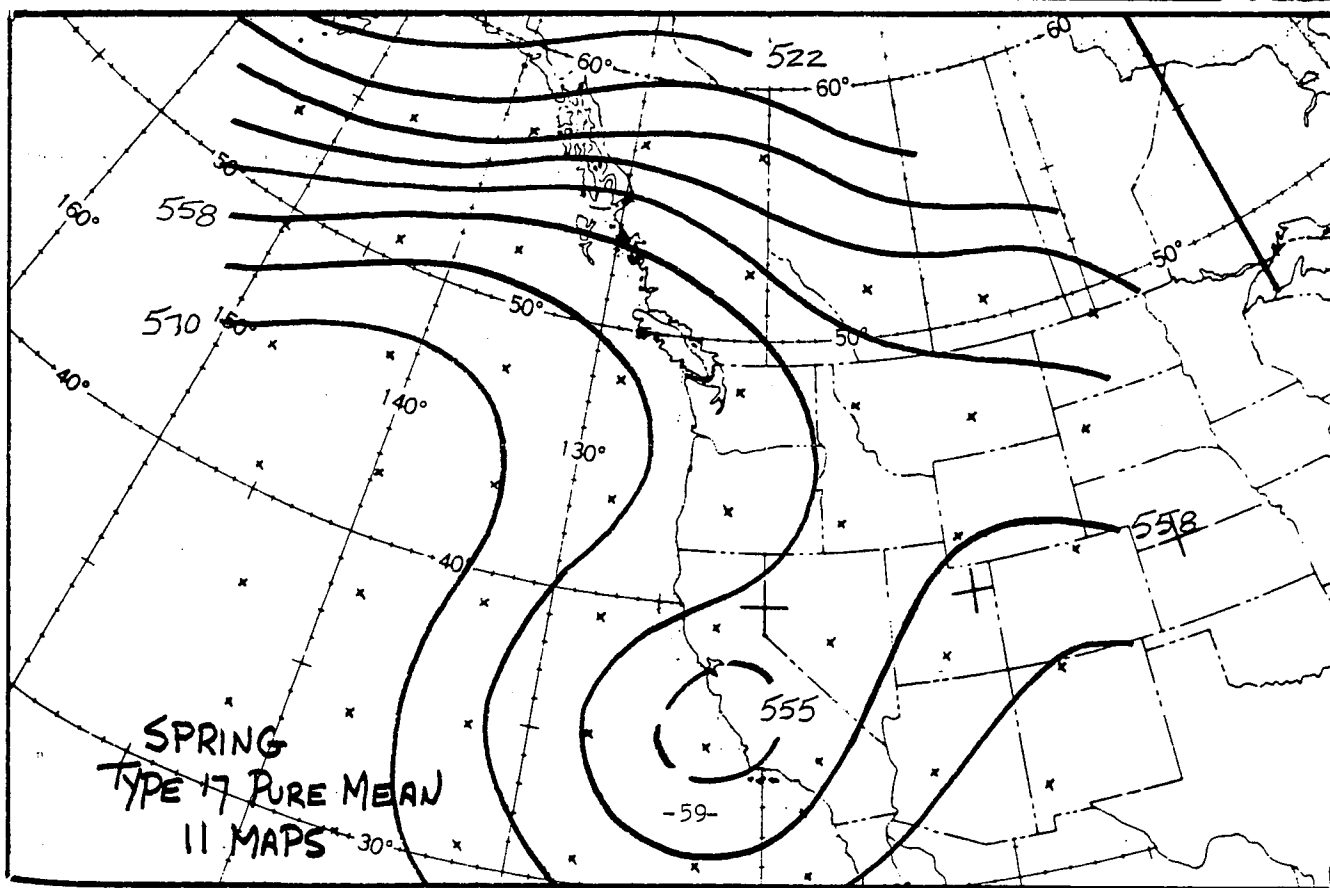
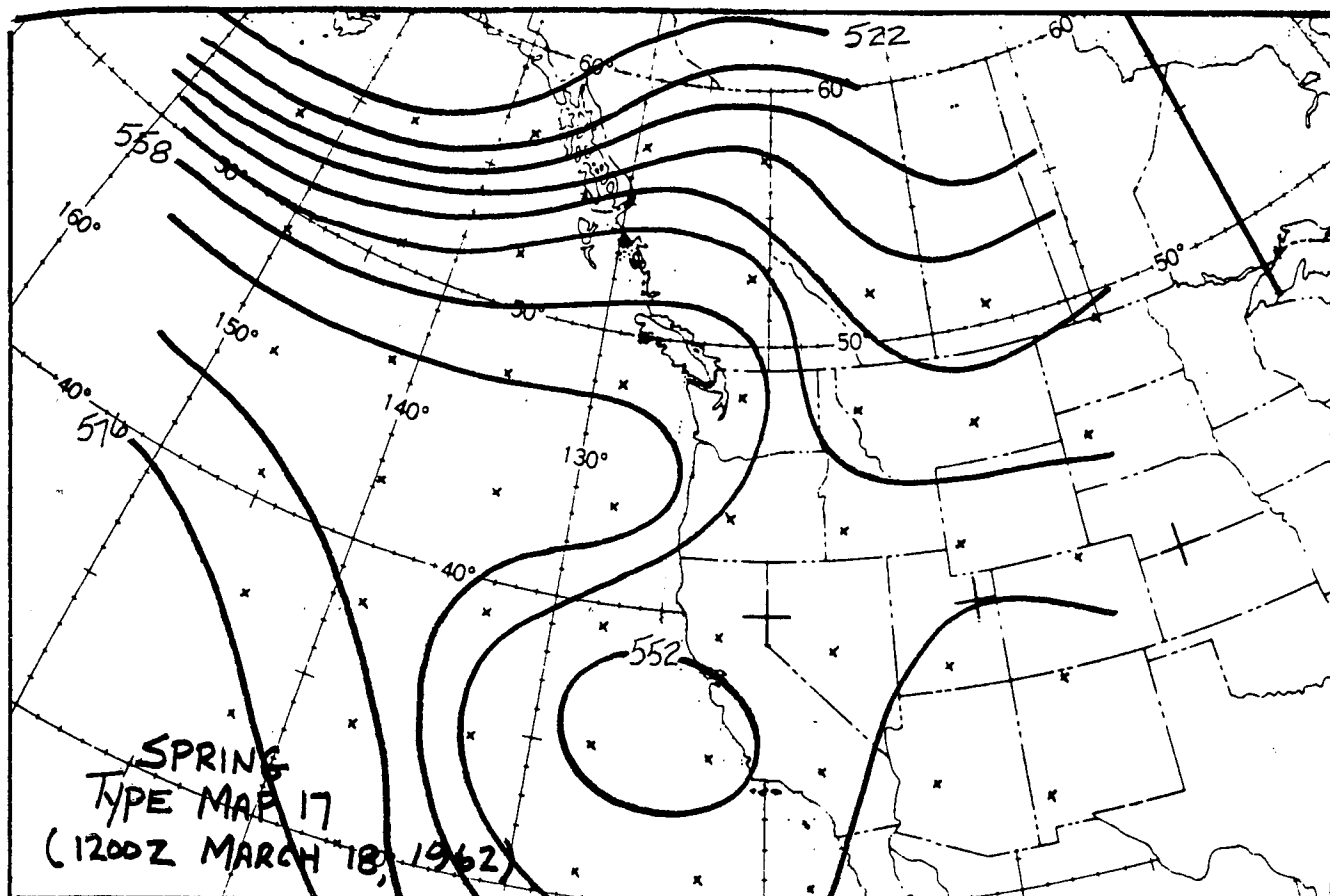
1. The first group of people who are interested in the study of the history of the United States are the people who are interested in the history of the United States.





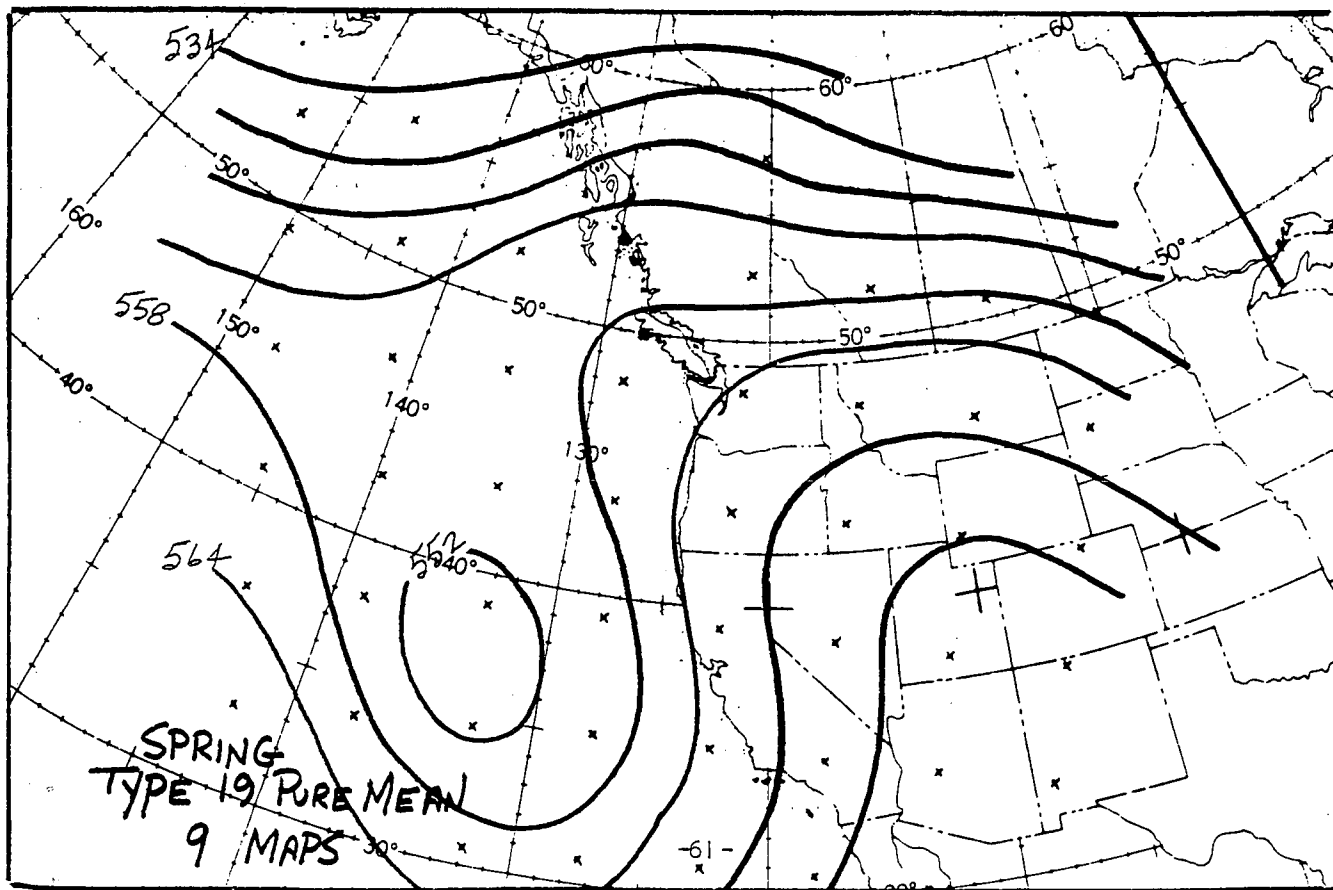
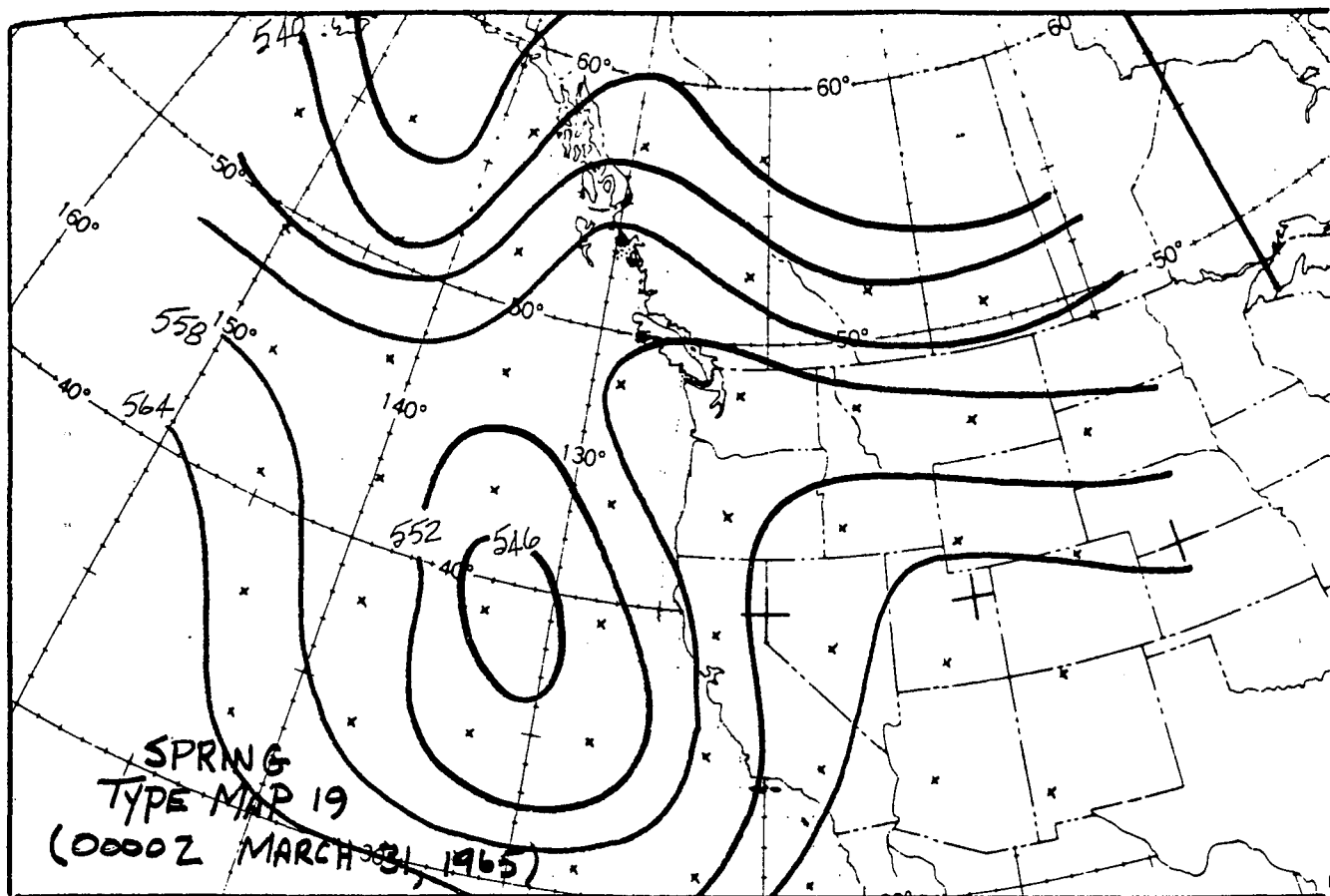
500-MB SPRING TYPE 13



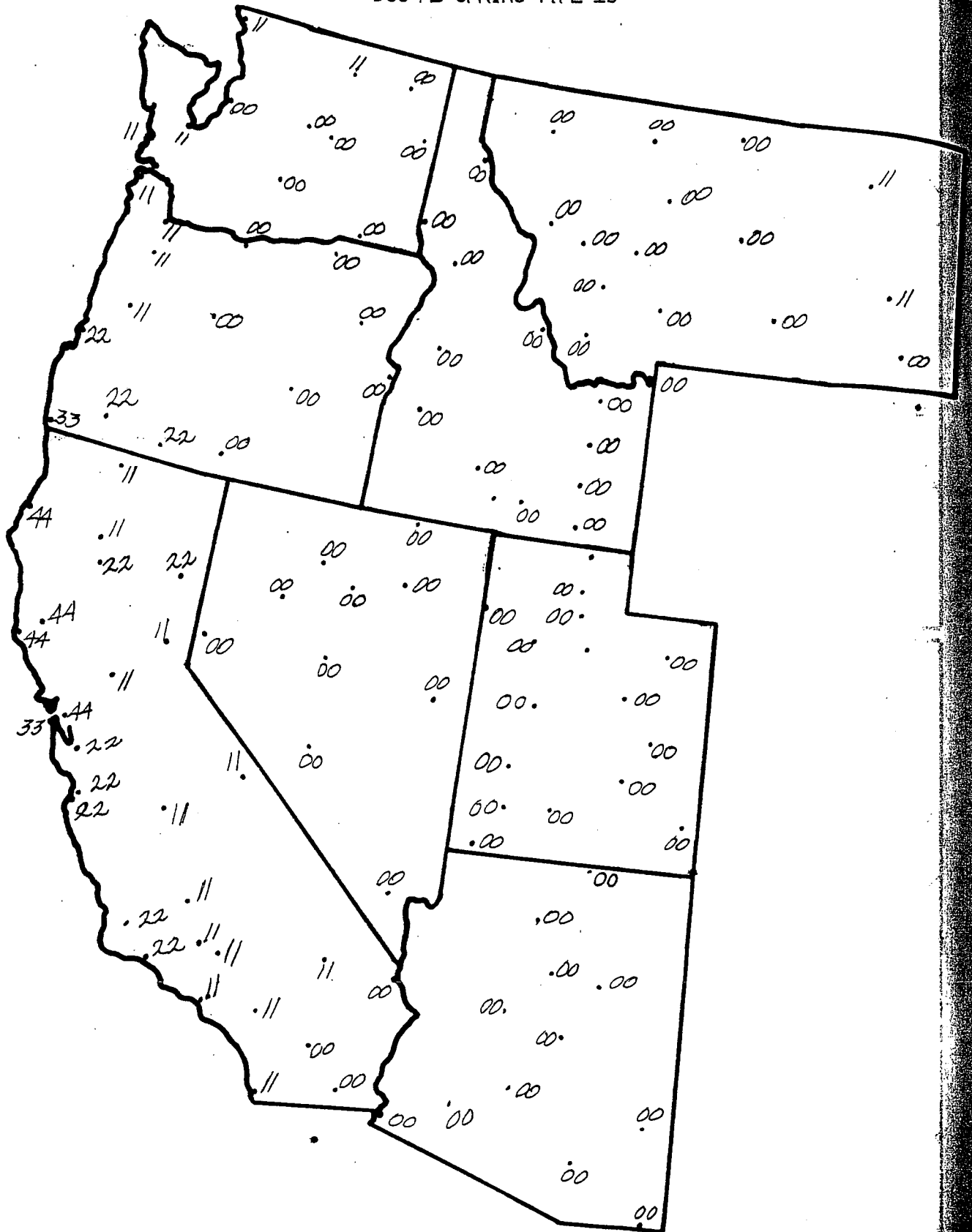


1. SUBJECT MATTER OF INVESTIGATION CONCERNING THE FBI





500-MB SPRING TYPE 19



APPENDIX B

Listing of Maps Within Each Type

TYPE I

Mar 1962	Mar 1963	Mar 1964	Mar 1965	Mar 1966
4-0	1-00	1-0	28-12	10-12
4-12	1-12	1-12	29-0	11-0
15-0	19-0	5-0		11-12
15-12	19-12	10-12		17-12
22-0	20-0	11-0		20-0
23-12		11-12		20-12
24-0		12-0		21-0
25-0		12-12		21-12
25-12		14-12		
26-0		15-0		
26-12		17-12		
27-12		18-0		
		20-0		
		20-12		

Apr 1962	Apr 1963	Apr 1964	Apr 1965	Apr 1967	Apr 1966
6-0	2-12	1-12	7-0	8-12	2-0
6-12	3-0	9-12	24-12	9-0	11-12
7-0	3-12	10-0		9-12	12-0
21-12	4-0	10-12		13-0	12-12
25-12	4-12	11-0			13-0
26-0	5-0	11-12			13-12
26-12	5-12	12-0			15-0
27-0	23-12	12-12			15-12
27-12	24-0	14-0			24-12
28-0	24-12	14-12			25-0
29-12		15-12			25-12
30-0		16-0			26-0
30-12		26-12			29-0
		27-0			29-12
		27-12			30-0
		28-0			30-12
		28-12			
		29-0			
		29-12			
		30-12			

Type I (Continued)

May 1962	May 1963	May 1964	May 1965	May 1966	May 1967
1-12	13-12	1-0	1-0	13-12	23-12
2-0	15-0	9-12	1-12	14-0	24-0
3-0	15-12	10-0	4-0	14-12	24-12
4-0	24-12	10-12	5-0	15-0	29-0
4-12	31-12	11-0	12-0	15-12	29-12
5-0		11-12	12-12	16-0	
6-12		12-0	13-0	16-12	
17-12		12-12	13-12	17-0	
18-0			14-0	17-12	
29-12			15-12	20-12	
30-0			16-0	21-0	
30-12			16-12	21-12	
31-0			17-0	22-0	
			17-12	23-0	
			18-0	23-12	
			18-12	24-0	
			28-12	24-12	
			29-0		
			29-12		
			30-0		
			31-0		

TYPE 2

Mar 1963 Mar 1964 Mar 1966

20-12	30-12	5-12
21-0	31-0	6-0
22-0	31-12	6-12
		7-0
		7-12
		8-0
		8-12
		9-0
		12-0
		12-12
		13-0
		13-12
		14-0
		14-12
		15-0
		15-12
		18-0
		18-12
		19-0
		30-0
		30-12
		31-0
		31-12

Apr 1962 Apr 1963 Apr 1964 Apr 1965 Apr 1966

5-0	11-12	9-0	21-0	1-0
12-12			21-12	1-12
13-0			22-0	14-0
13-12			22-12	14-12
14-0			24-0	
14-12			28-12	
15-0			29-0	
15-12			29-12	
16-0			30-0	
16-12				
17-0				
17-12				
18-0				
18-12				
19-0				
20-0				
22-0				
22-12				
23-12				
24-0				
24-12				

Type 2 (Continued)

May 1962	May 1963	May 1964	May 1966	May 1967
31-12	4-12	16-0	1-0	16-12
	14-12	16-12	1-12	17-0
	16-0	17-0	2-0	17-12
	16-12	17-12	2-12	18-0
	17-0	18-0	3-0	18-12
	22-0	18-12	6-0	21-0
	22-12	19-0	6-12	21-12
	24-0	19-12	7-0	22-0
	25-0	28-0	7-12	22-12
	25-12	28-12	25-0	23-0
	26-0		25-12	25-0
	26-12		26-0	25-12
	27-0		26-12	26-0
	27-12			26-12
	28-0			27-0
	28-12			27-12
	29-0			28-0
	29-12			
	30-0			
	30-12			
	31-0			

TYPE 3

Mar 1962	Mar 1963	Mar 1964	Mar 1965	Mar 1966
----------	----------	----------	----------	----------

3-0	10-0	2-0	27-12	2-0
3-12	12-12	2-12	28-0	2-12
9-0	13-12	3-0		
9-12	15-0	5-12		
10-12	15-12	6-0		
11-0	16-0	6-12		
20-0	16-12	7-0		
20-12	17-0	7-12		
21-0	17-12	8-0		
21-12	18-0	9-0		
23-0	18-12	9-12		
		10-0		
		13-0		
		13-12		
		21-12		
		22-0		
		24-0		
		24-12		
		25-0		

Apr 1962	Apr 1963	Apr 1964	Apr 1965	Apr 1966	Apr 1967
----------	----------	----------	----------	----------	----------

29-0	1-12	2-0	6-0	20-12	8-0
	2-0	2-12	10-12	21-12	
	16-12	5-0	11-0	26-12	
	17-0	5-12			
	18-0	6-0			
	19-0	20-0			
		20-12			
		21-0			
		21-12			
		22-12			

May 1962	May 1964	May 1965	May 1966	May 1967
----------	----------	----------	----------	----------

13-12	2-12	5-12	12-12	4-12
14-0	3-0	6-0	13-0	5-0
14-12	4-12	23-0		12-0
15-0	5-0	23-12		12-12
15-12	5-12	24-0		30-0
20-12	6-0	31-12		30-12
21-0	6-12			31-0
21-12	7-0			
	8-0			

Mar 1962	Mar 1963	Mar 1964	Mar 1965	Mar 1966
12-0	2-0	3-12	1-0	3-0
12-12	4-12	4-0	1-12	3-12
13-0	5-0	4-12		22-0
13-12	5-12	8-12		22-12
14-0	6-0	14-0		
14-12	6-12	15-12		
	13-0	16-0		
		18-12		
		19-0		
		19-12		
		27-12		

Apr 1962	Apr 1964	Apr 1966	May 1965	May 1966	May 1967
8-0	6-12	2-12	24-12	11-0	3-12
8-12	7-0	3-0	25-12		4-0
9-0	7-12	3-12	26-0		13-12
9-12	8-0	22-0	26-12		14-0
10-12	13-0	22-12	27-0		14-12
11-12	13-12	23-0			
		24-0			
		27-0			
		27-12			
		28-0			
		28-12			

TYPE 5

Mar 1962	Mar 1963	Mar 1966	Apr 1962	Apr 1963
16-12	23-0	16-0	25-0	8-0
	23-12	16-12		
	27-0	17-0		
	28-0	17-12		
	28-12			
	29-0			

May 1962	May 1963	May 1964	May 1965
10-0	3-12	15-0	19-12
10-12	4-0		20-0
11-0	8-0		20-12
11-12	8-12		21-0
12-0	9-0		
	9-12		
	10-0		
	10-12		
	11-0		
	12-12		
	13-0		

TYPE 6

Apr 1962	Apr 1963	Apr 1965	May 1963	May 1965	May 1967
20-12	10-12	23-0	11-12	22-0	28-12
21-0	26-12	23-12	12-0	22-12	
	27-0		14-0		

TYPE 7

Mar 1962	Mar 1963	Mar 1964	Apr 1962	Apr 1963	Apr 1965	Apr 1967
2-12	14-0	21-0	28-12	1-0	2-0	7-12
	14-12			8-12	5-12	10-0
	31-12			9-0	6-12	10-12
				25-0	7-12	11-0
					10-0	14-0
					13-12	14-12
						15-0
						15-12
						16-0
						16-12
						17-0

May 1962	May 1964	May 1966	May 1967
13-0	1-12	30-12	9-12
18-12	2-0	31-0	
19-0			

TYPE 8

Mar 1964	Mar 1966	Apr 1964	Apr 1965
16-12	24-12	3-0	4-0
17-0	25-0	3-12	4-12
		4-0	12-0
		25-12	
		26-0	

May 1962	May 1964	May 1965	May 1966
16-0	8-12	3-0	10-0
16-12	9-0	3-12	10-12
		7-0	11-12
		7-12	12-0
		8-0	
		8-12	
		9-0	
		9-12	
		10-0	
		10-12	
		11-12	

TYPE 9

Mar 1962	Mar 1966	Apr 1963	Apr 1966	Apr 1967
22-12	1-0 1-12	15-12 16-0	11-0	13-12 25-0 25-12 26-0 26-12 27-0

TYPE 10

Mar 1965	Mar 1966	Apr 1962	Apr 1963	Apr 1965
2-0 2-12 3-0	4-0 23-0 23-12 25-12 26-12 27-0 27-12 28-12 29-0	5-12	27-12 28-0	25-0 25-12 26-0 26-12 27-0

May 1963	May 1965	May 1967
19-12	15-0	15-0 19-12 20-0 20-12

TYPE 11

Mar 1962	Mar 1963	Apr 1964	Apr 1965	May 1964	May 1966
27-0	22-12	1-0 30-0	1-0 1-12	21-0 21-12	27-0 27-12 28-0 28-12 29-0 29-12 30-0

TYPE 12

Mar 1962	Mar 1963	Mar 1965	Apr 1963	Apr 1965
5-10	21-12	29-12	6-0	19-12
5-12	25-0	30-0	6-12	20-0
	25-12		7-0	20-12
	26-0		12-0	30-12
	26-12		12-12	
	27-12			

May 1962	May 1963	May 1964
6-0	5-0	13-0
7-0	5-12	13-12
7-12	6-0	14-0
8-0	6-12	14-12
8-12	7-0	20-0
9-0	7-12	20-12

TYPE 13

Mar 1965	Mar 1966	May 1963	May 1966
5-0	24-0	23-0	3-12
		23-12	5-12
			8-0
			8-12
			9-0
			9-12

TYPE 14

Apr 1966	May 1966	May 1967
16-0	19-0	7-0
	19-12	7-12
		8-0
		8-12

TYPE 15

Mar 1963	Mar 1964	Mar 1965	Apr 1964	Apr 1966
7-12	25-12	14-12	18-0	16-12
8-0	26-0	15-0		17-0
8-12	26-12	15-12		17-12
9-0		16-0		18-0
9-12		16-12		
12-0		17-0		
		17-12		
		18-0		
		18-12		
		19-0		
		20-0		
		21-0		
		22-12		
		23-0		
		23-12		
		24-0		
		24-12		
		25-0		
		25-12		
		26-0		
		26-12		
		27-0		

TYPE 16

Mar 1964	Apr 1962	Apr 1966	May 1965	May 1966	May 1967
28-0	12-0	4-0	27-12	18-0	5-12
28-12		4-12	28-0	18-12	16-0
29-0		6-0			19-0
29-12		6-12			
		7-12			

TYPE 17

Mar 1962	Apr 1964	Apr 1965	May 1966	May 1967
7-12	9-12	3-0	20-0	6-0
8-0		3-12		6-12
18-0				
18-12				
19-12				

TYPE 18

Mar 1962	Mar 1964	Apr 1963	Apr 1964	Apr 1967
10-0	22-12	19-12	23-0	20-12
	23-0	20-0	23-12	21-0
	23-12	20-12		29-12
		21-0		
		21-12		
		22-0		

May 1964	May 1967
3-12	10-12
	11-0
	11-12

TYPE 19

Mar 1964	Mar 1965	Apr 1963	May 1964	May 1966
30-0	30-12	13-0	15-12	4-0
	31-0			4-12
	31-12			5-0

TYPE 20

Mar 1962	Apr 1963	Apr 1965	Apr 1967	May 1962
17-0	26-0	2-12	11-12	12-12
17-12		8-0		19-12
		8-12		20-0
		9-0		
		9-12		

TYPE 21

Mar 1962	Apr 1963	Apr 1964	Apr 1967	May 1964	May 1965
6-12	9-12	18-12	2-12	4-0	2-12
7-0	10-0	19-0	3-0		
	22-12		6-0		
	23-0		6-12		
	25-12		7-0		

TYPE 22

Apr 1963	Apr 1964	Apr 1965	May 1967
17-12	24-0	11-12	5-12
	24-12		31-12
	25-0		

TYPE 23

Mar 1963	Apr 1967	May 1967
7-0	21-12	13-0
	22-0	
	22-12	
	23-0	
	23-12	
	24-0	
	24-12	

TYPE 24

Mar 1966	May 1963	May 1964
4-12	17-12	29-0
5-0	18-0	29-12
	18-12	30-0
	19-0	30-12
	20-0	31-0
	20-12	31-12
	21-12	

TYPE 25

Apr 1967	May 1964	May 1967
4-0	22-0	9-0
4-12	22-12	
	24-0	
	24-12	

TYPE 26

Mar 1962	Apr 1963	Apr 1964	Apr 1965	Apr 1967
8-12	18-12	4-12	5-0	12-0
			12-12	12-12
			13-0	

TYPE 27

Mar 1963	Mar 1965	Apr 1966
10-12	10-12	18-12
11-0	12-0	19-0
11-12	12-12	19-12
	13-0	20-0
	13-12	
	14-0	

TYPE 28

Mar 1962	Apr 1964	Apr 1965	Apr 1966
1-0	16-12	16-12	9-0
1-12		17-0	10-0
2-0		17-12	10-12
		18-0	
		18-12	
		19-0	

TYPE 29

Apr 1964	Apr 1967	May 1964
22-0	3-12	23-0
		23-12

TYPE 30

Apr 1967	May 1966	May 1967
1-0	31-12	10-0
1-12		
5-0		
5-12		
17-12		
18-0		
18-12		
19-0		
19-12		
20-0		
27-12		
28-0		
28-12		
29-0		