



WEATHER BUREAU  
Western Region  
Salt Lake City, Utah  
January 1970

00 m

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

Richard P. Augulis



Technical Memorandum WBTM WR-45-4

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



#### WESTERN REGION TECHNICAL MEMORANDA

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- No. 3 Western Region Pre- and Post-FP-3 Program. Edward D. Diemer. March 1966.
- No. 4 Use of Meteorological Satellite Data. March 1966.
- No. 5\*\* Station Descriptions of Local Effects on Synoptic Weather Patterns. Philip Williams. April 1966.
- No. 6 Improvement of Forecast Wording and Format. C. L. Glenn. May 1966.
- No. 7 Final Report on Precipitation Probability Test Programs. Edward D. Diemer. May 1966.
- No. 8 Interpreting the RAREP. Herbert P. Benner. May 1966. (Revised Jan. 1967.)
- No. 9 A Collection of Papers Related to the 1966 NMC Primitive-Equation Model. June 1966.
- No. 10\* Sonic Boom. Loren Crow (6th Weather Wing, USAF, Pamphlet). June 1966.
- No. 11 Some Electrical Processes in the Atmosphere. J. Latham. June 1966.
- No. 12\* A Comparison of Fog Incidence at Missoula, Montana, with Surrounding Locations. Richard A. Dightman. August 1966.
- No. 13 A Collection of Technical Attachments on the 1966 NMC Primitive-Equation Model. Leonard W. Snellman. August 1966.
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- No. 16 Some Notes on Acclimatization in Man. Edited by Leonard W. Snellman. Nov. 1966.
- No. 17 A Digitalized Summary of Radar Echoes Within 100 Miles of Sacramento, California. J. A. Youngberg and L. B. Overaas. December 1966.
- No. 18 Limitations of Selected Meteorological Data. December 1966.
- No. 19 A Grid Method for Estimating Precipitation Amounts by Using the WSR-57 Radar. R. Granger. December 1966.
- No. 20 Transmitting Radar Echo Locations to Local Fire Control Agencies for Lightning Fire Detection. Robert R. Peterson. March 1967.
- No. 21 An Objective Aid for Forecasting the End of East Winds in the Columbia Gorge. D. John Coparanis. April 1967.
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- No. 23 "K" Chart Application to Thunderstorm Forecasts Over the Western United States. Richard E. Hambidge. May 1967.

\*Out of Print

\*\*Revised



A western Indian symbol for rain. It also symbolizes man's dependence on weather and environment in the West.

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

Weather Bureau Technical Memorandum WR-45/4

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

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TABLE OF CONTENTS

	<u>Page</u>
1. Introduction	1
Appendix A	2-52
Appendix B	53-65

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

1. INTRODUCTION

Precipitation probabilities associated with fall 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 fall season consisted of 1170 maps for 0000 and 1200GMT September 1962-1968, October 1962-1968, and November 1961-1967. Climatologies for 12-hour precipitation were calculated for the same station network in the Western Region.

Maps of fall 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:

Trough 130 - 150°W.--types 2, 5, 11, 14, 18, 23

Trough 120 - 125°W.--types 3, 16, 17, 20

Trough 110 - 115°W.--types 6, 7, 10, 13, 22, 25

Zonal flow--types 1, 9

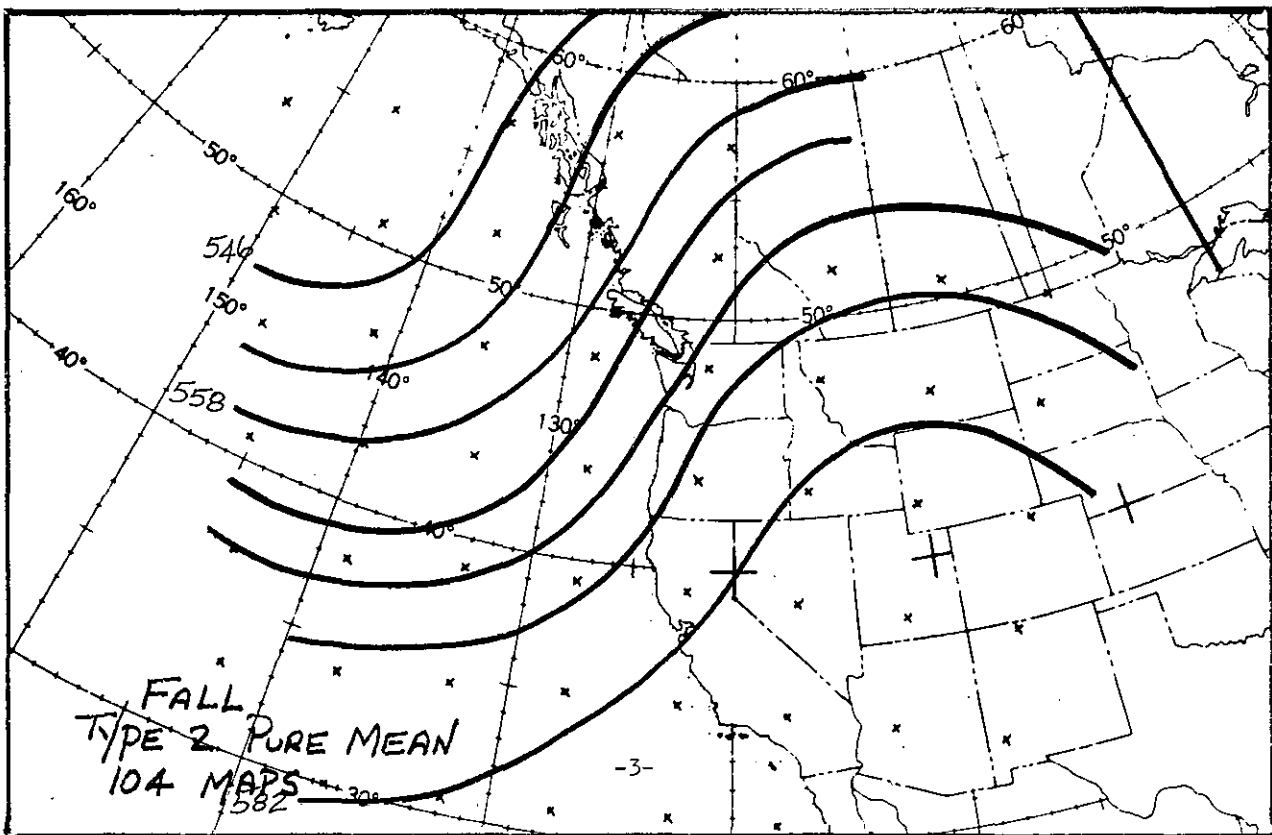
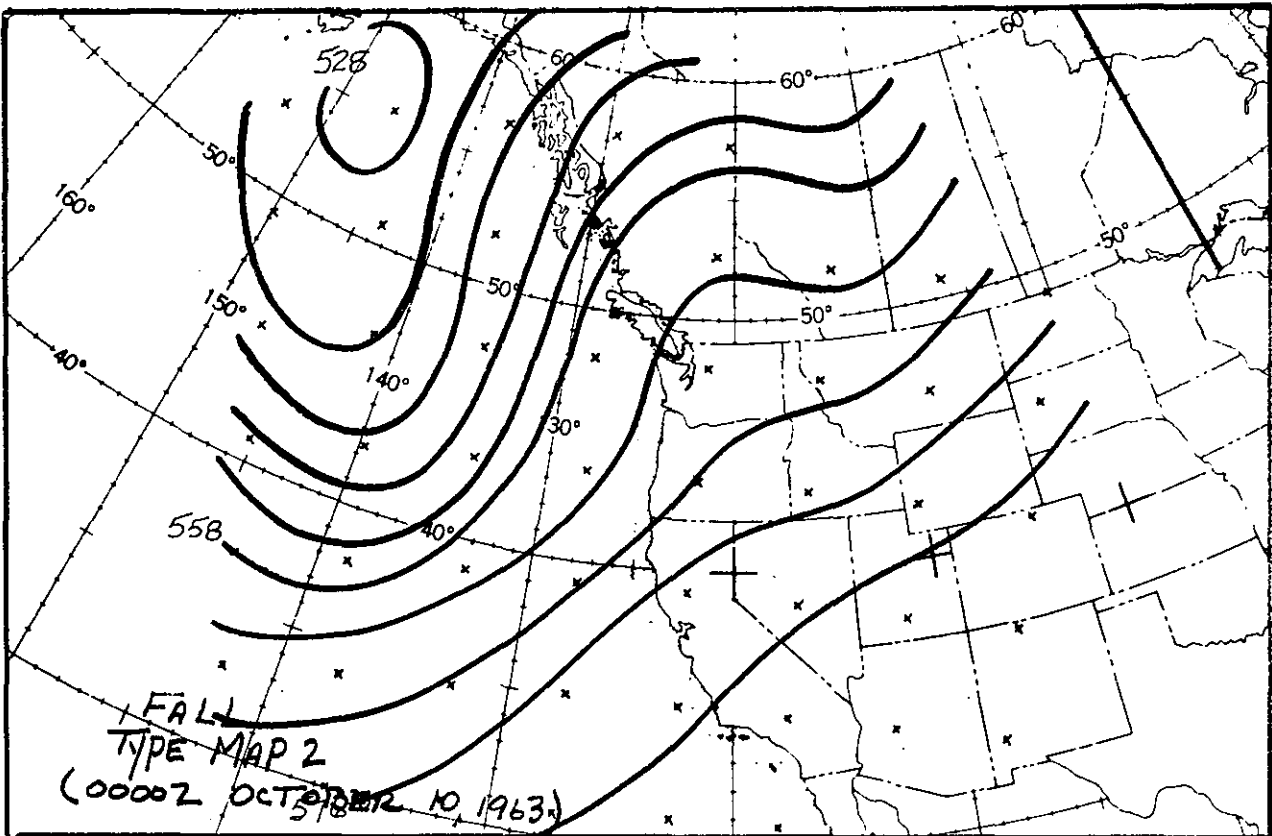
Ridge 120 -140°W.--types 4, 8, 12, 15, 19, 21, 24.

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

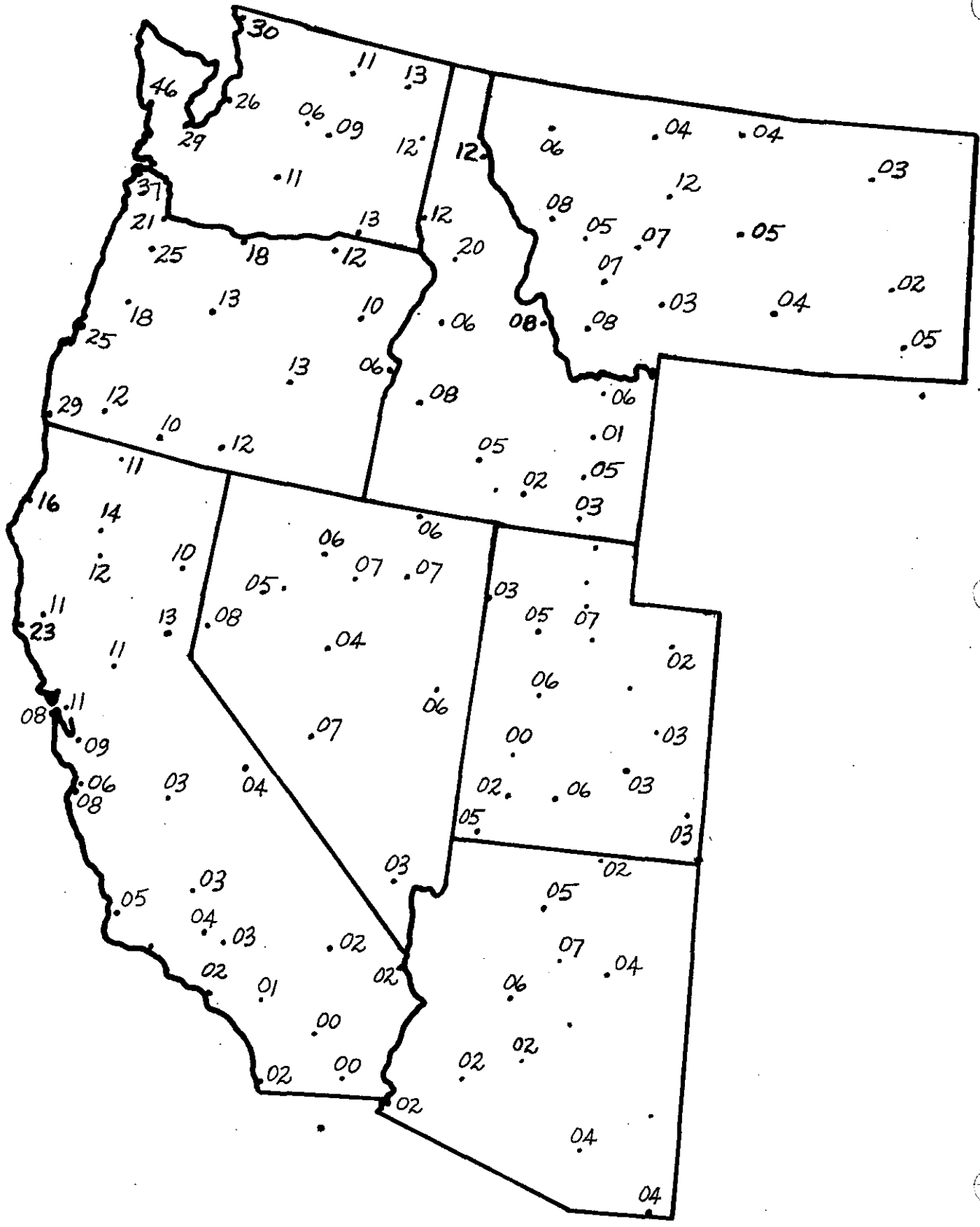
APPENDIX A

Fall Types and Associated Precipitation Climatologies

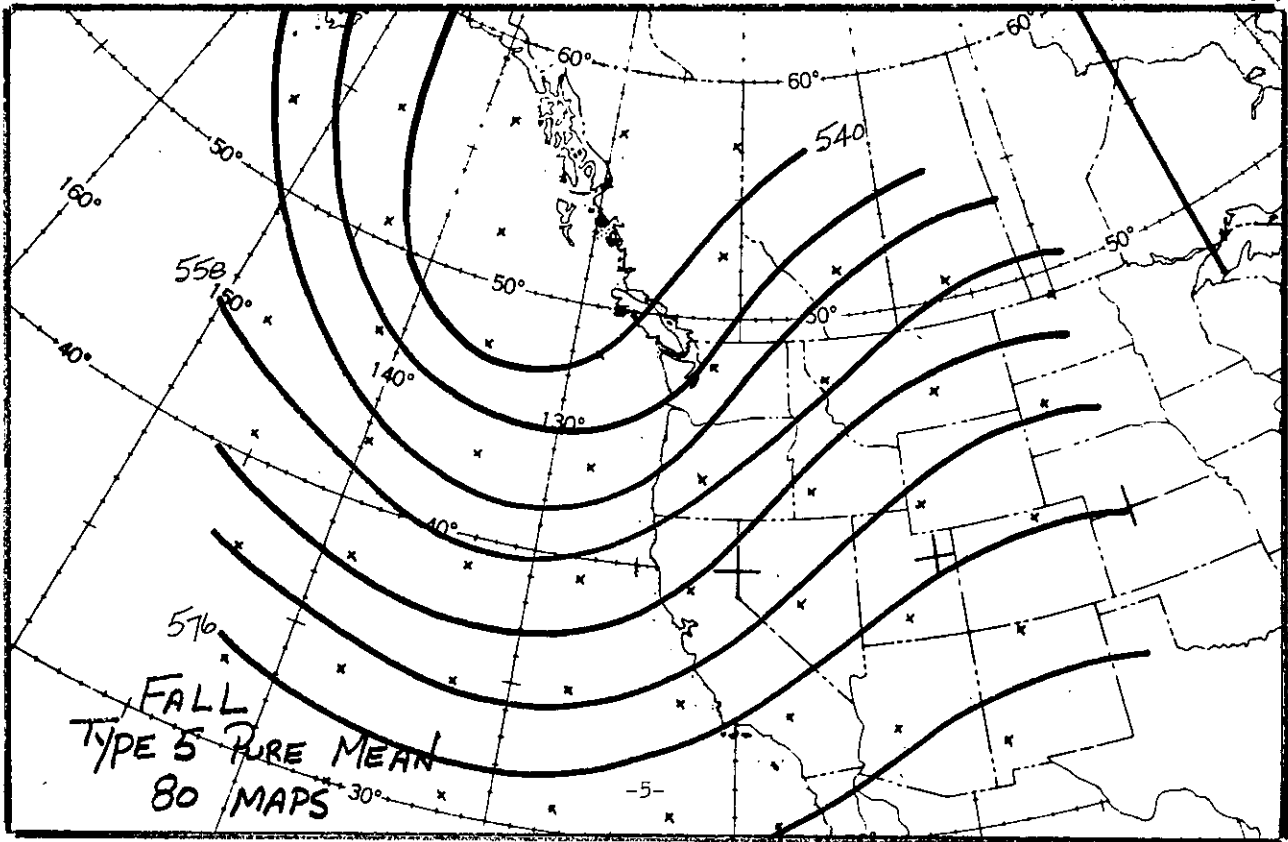
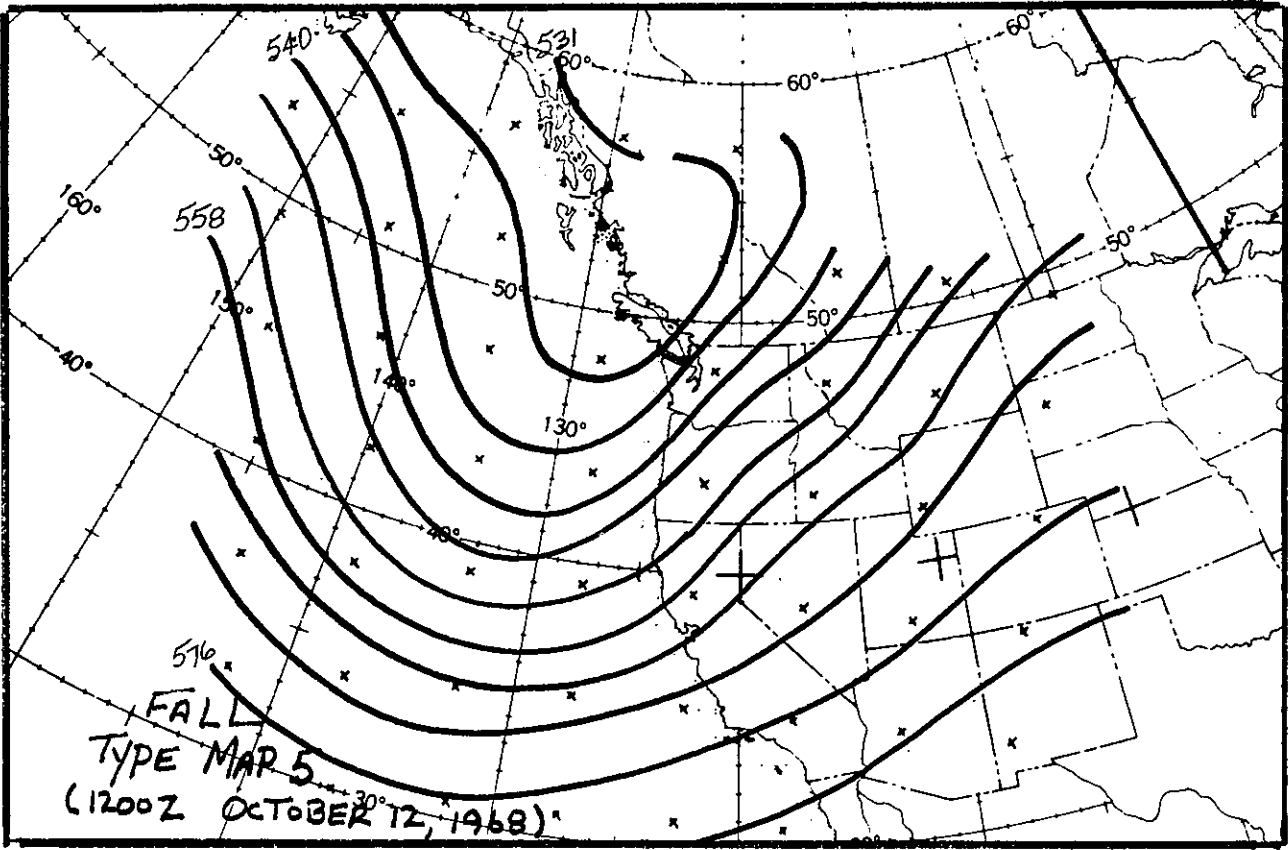
Types Arranged According to Similarity of  
Basic Flow Pattern



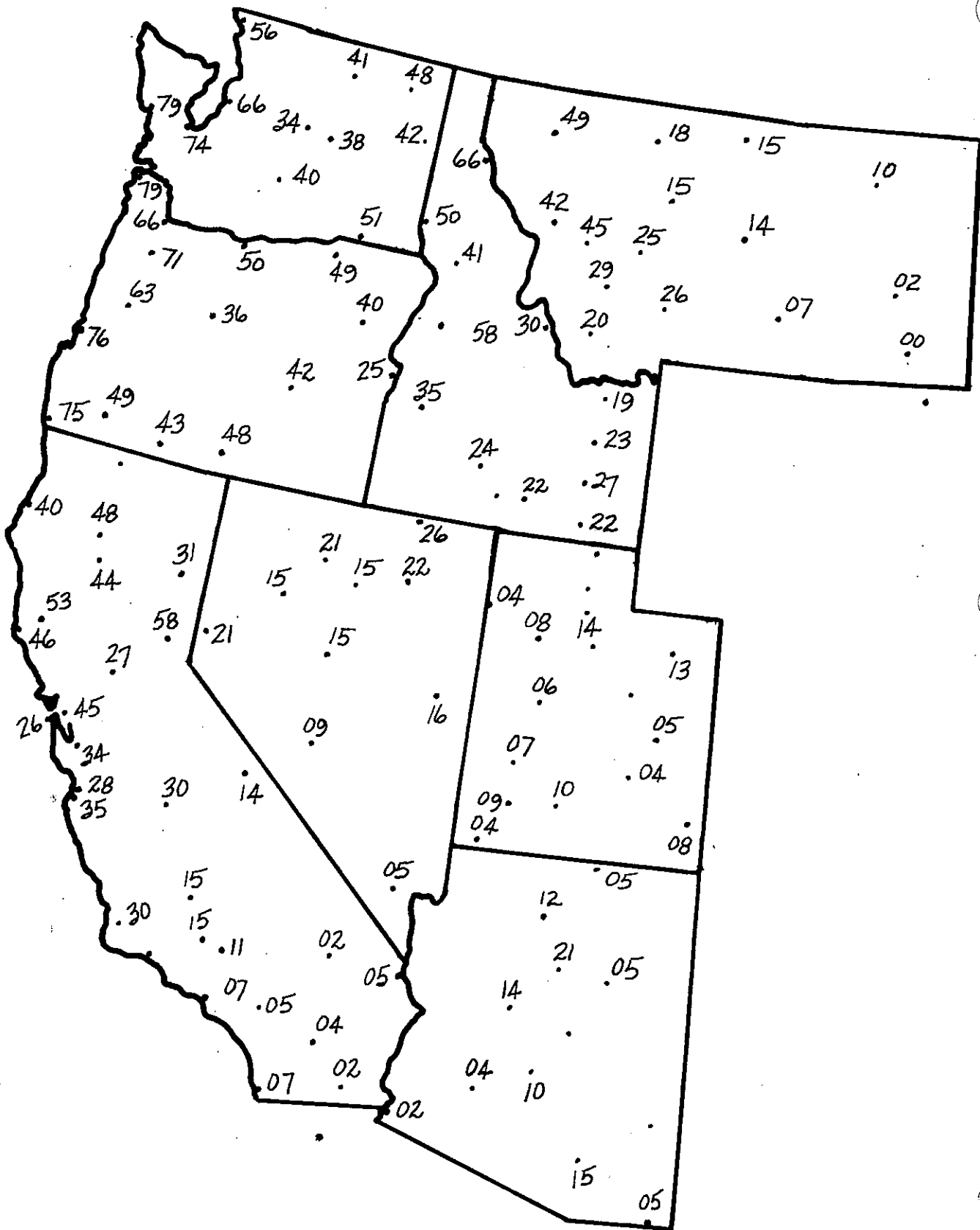
PERCENT FREQUENCY OF PRECIPITATION OCCURRENCE WITH  
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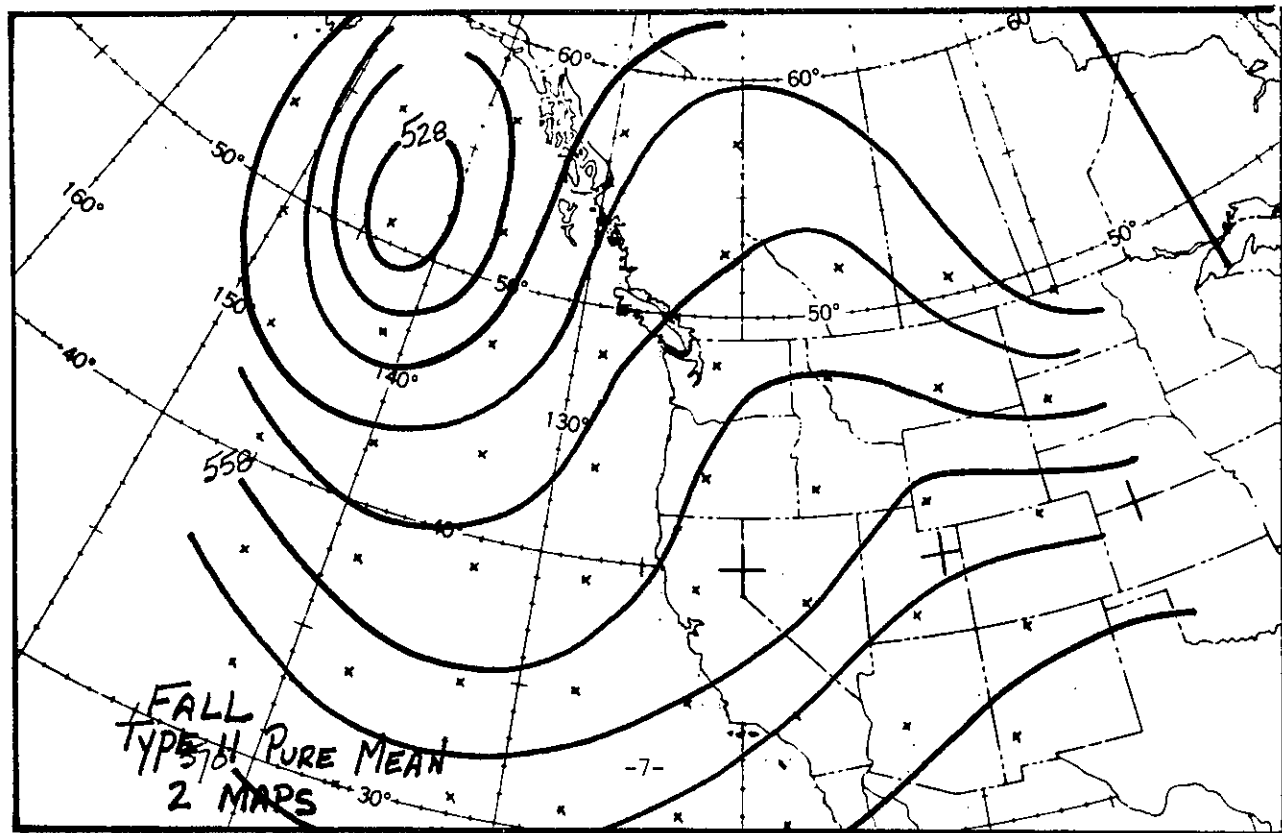
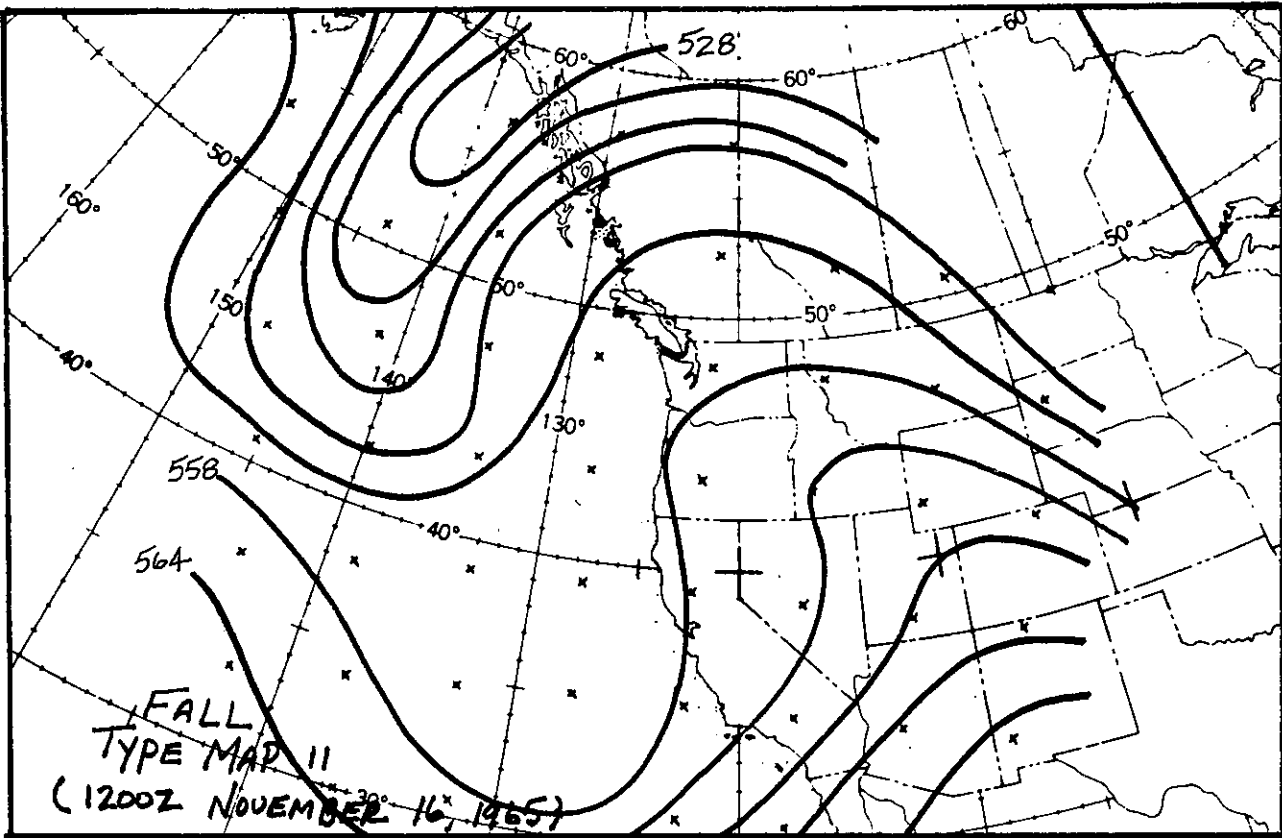




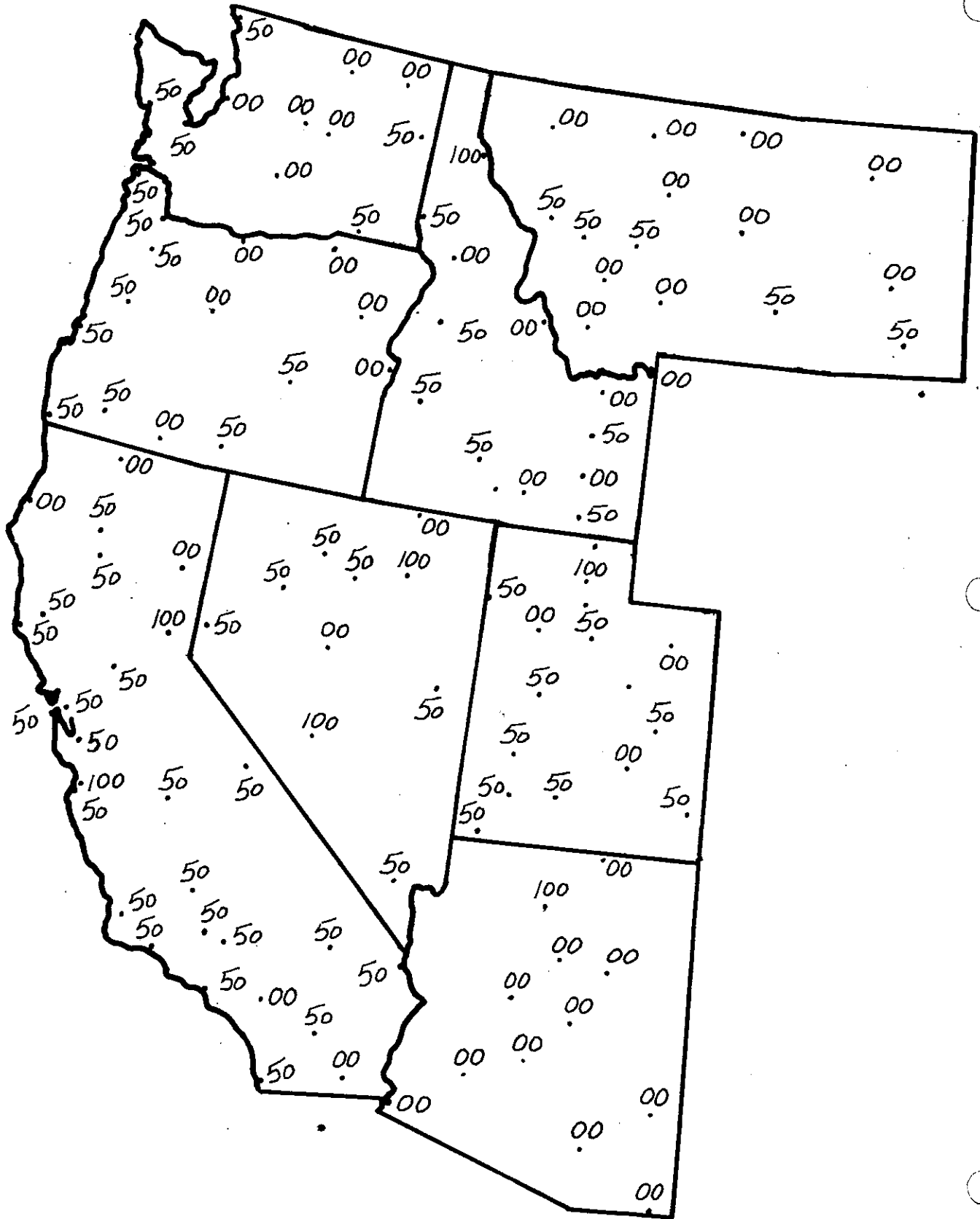


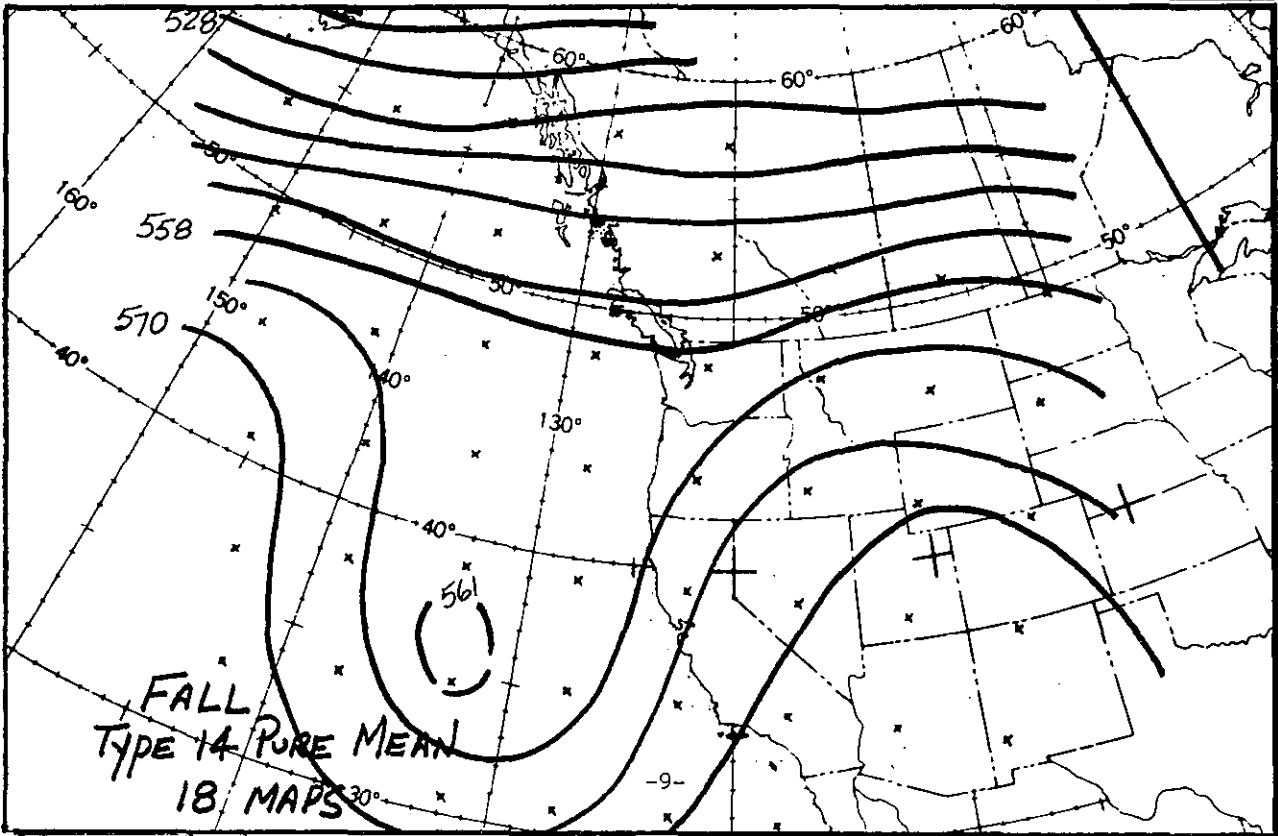
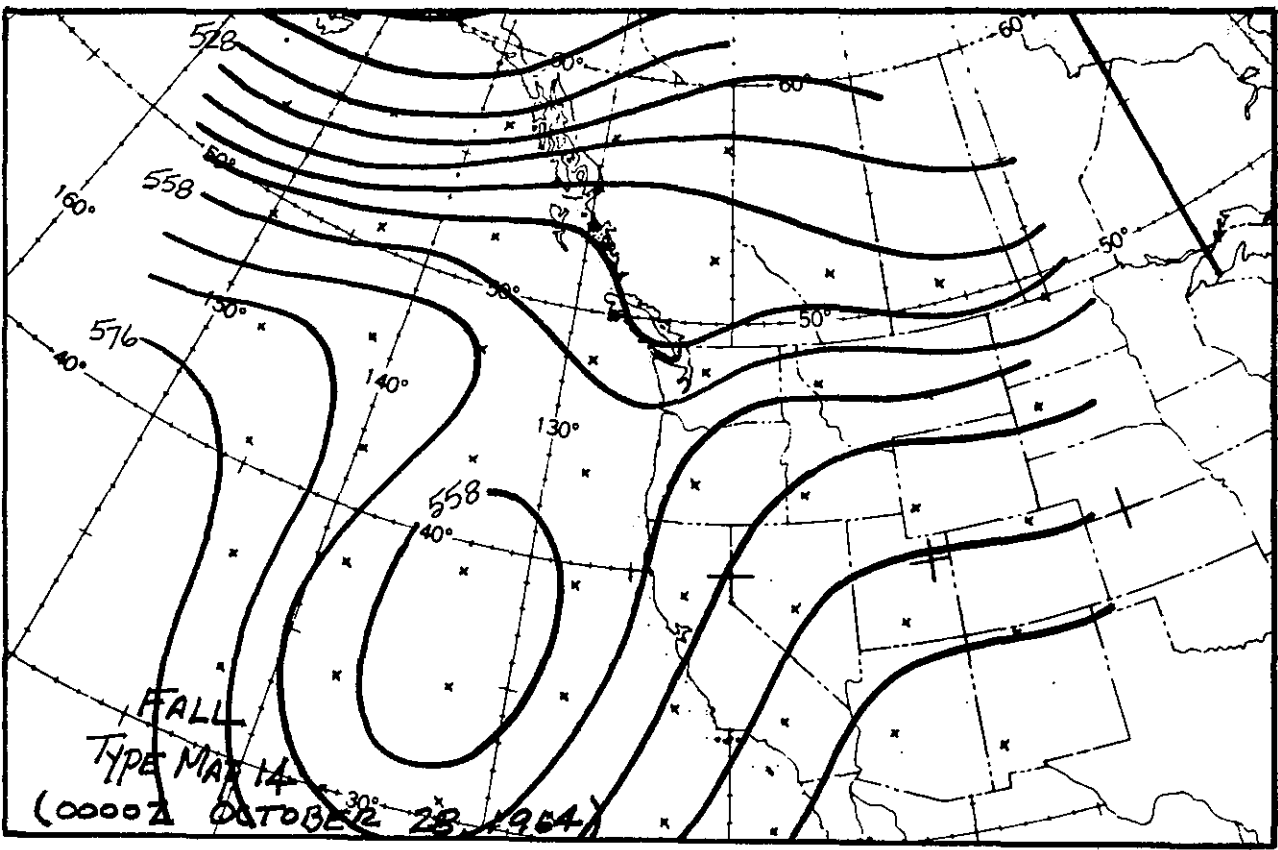
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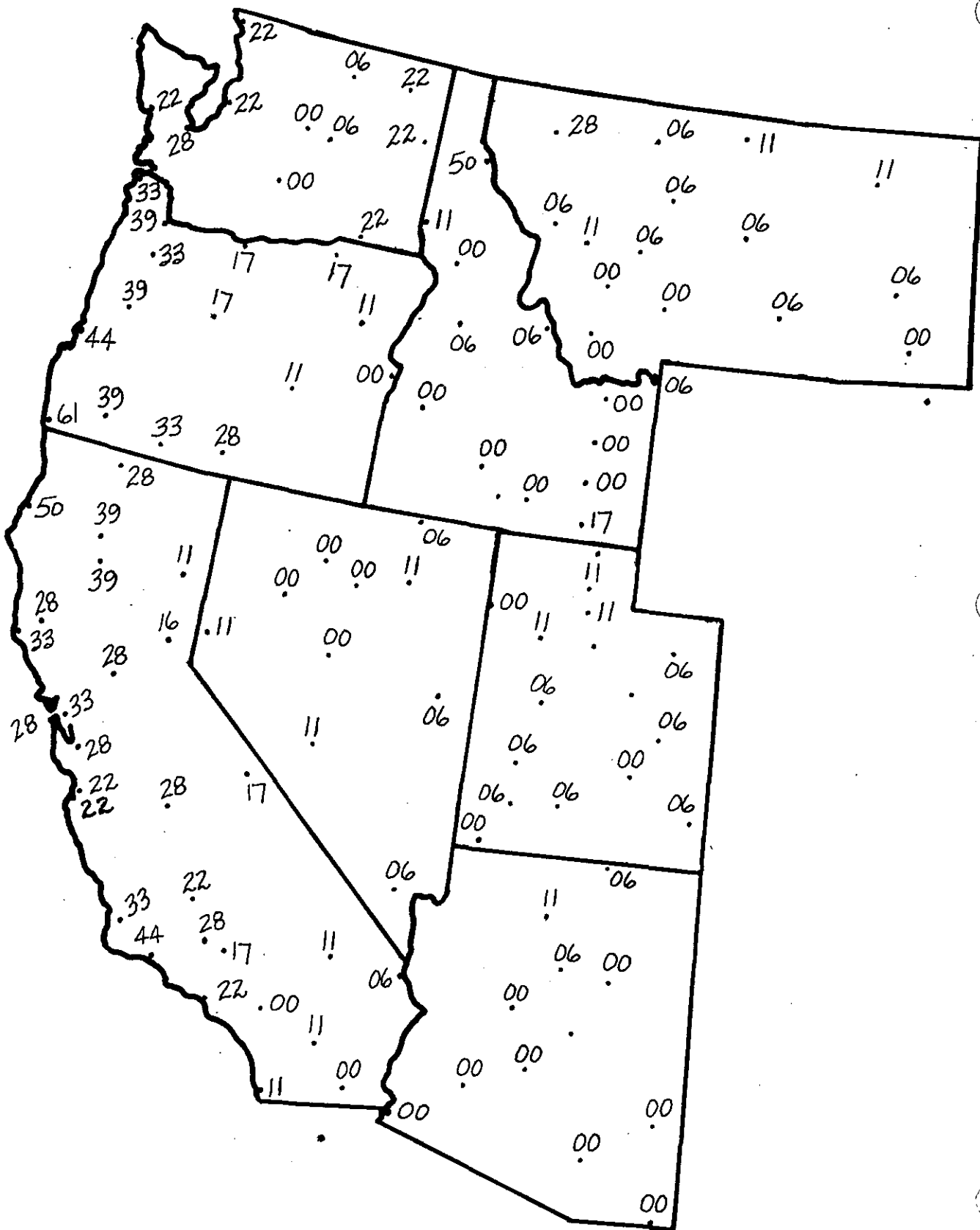


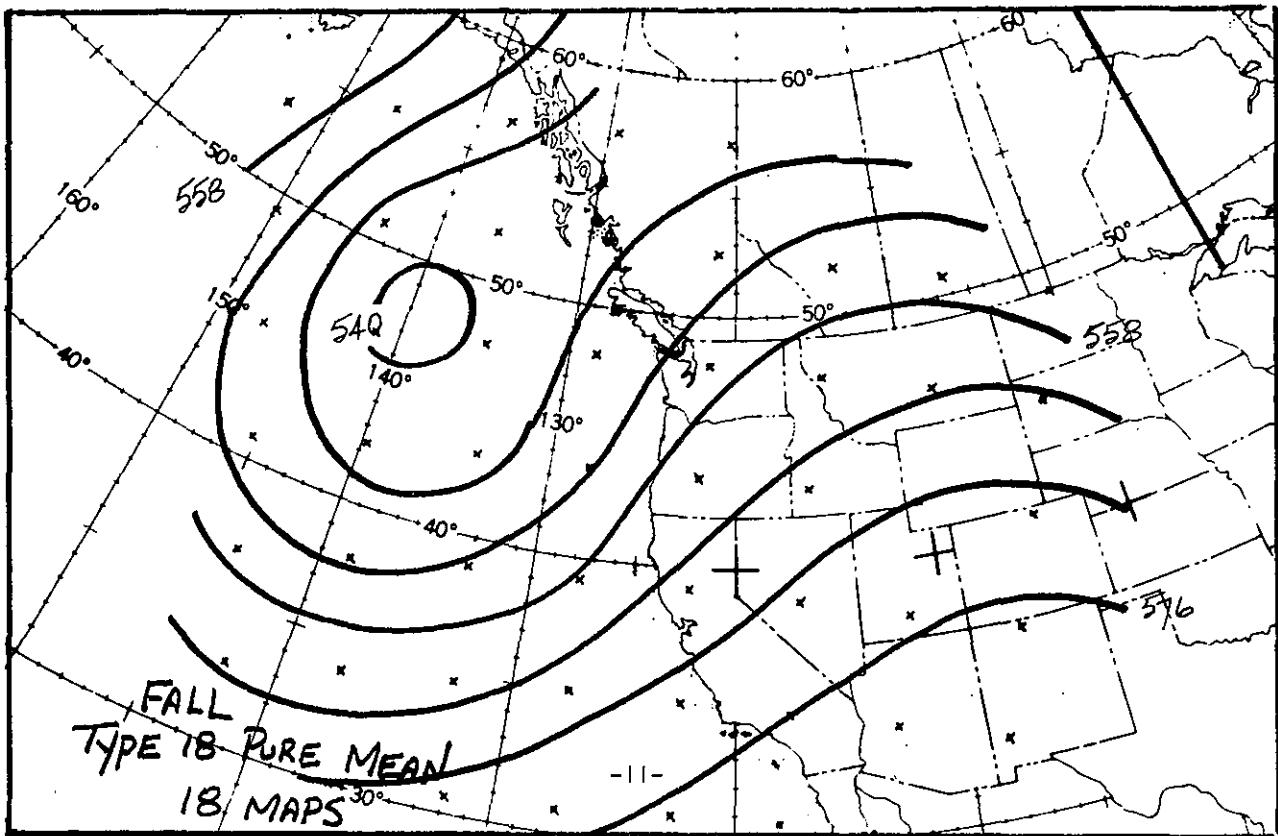
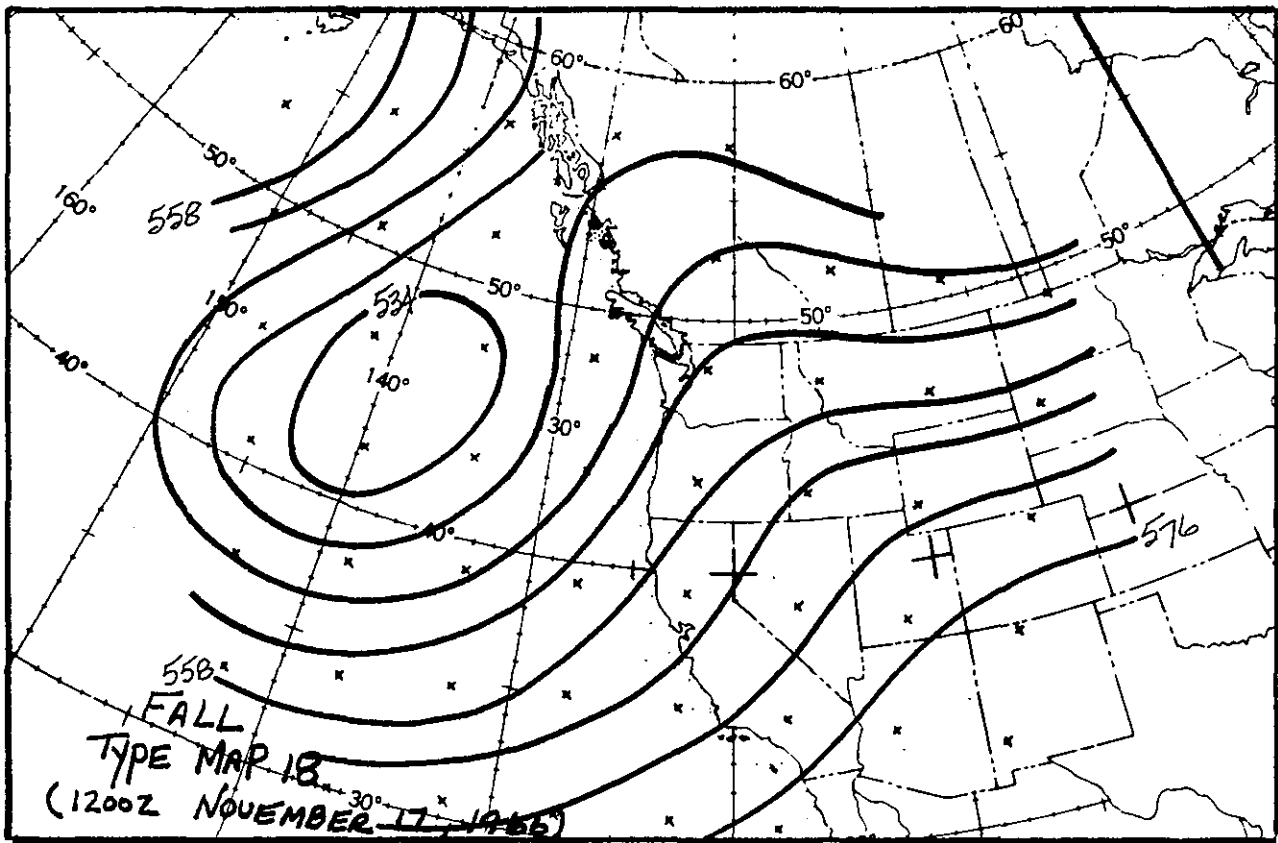
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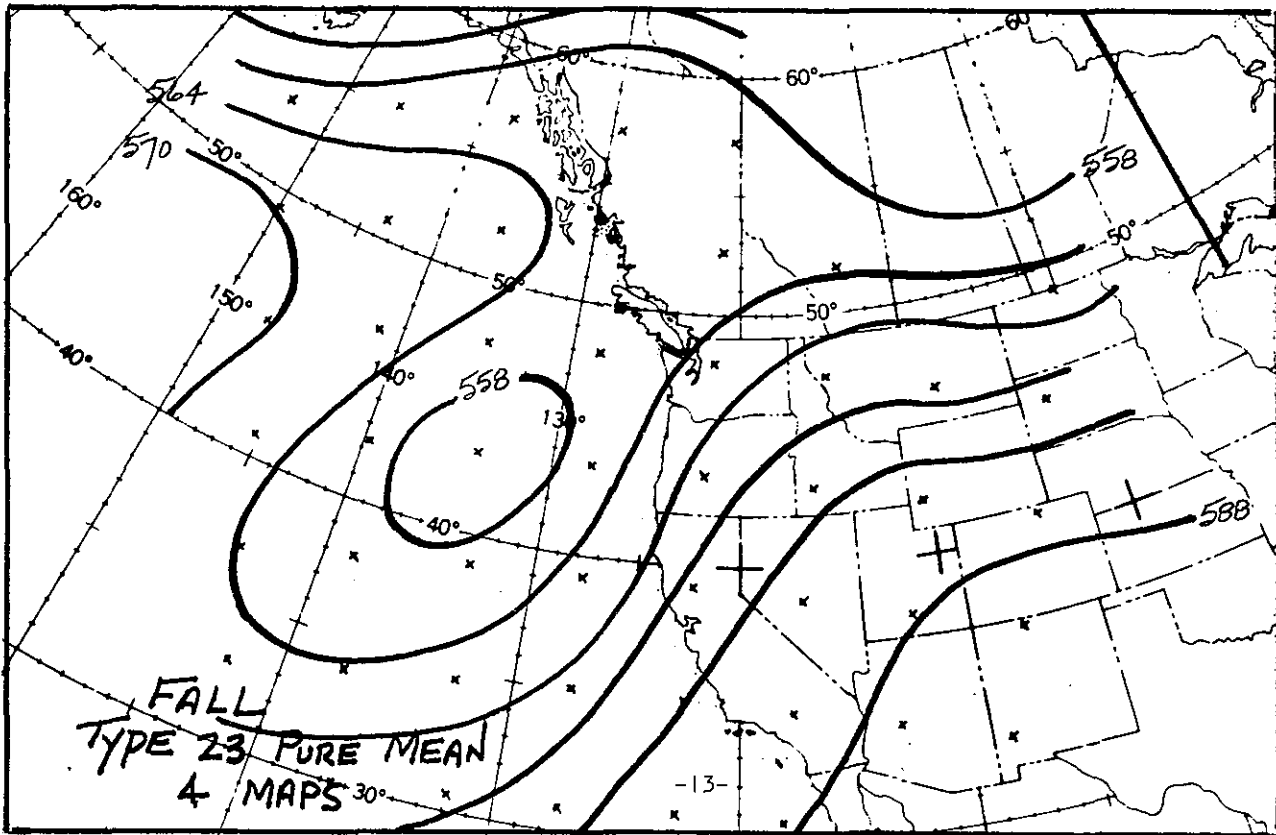
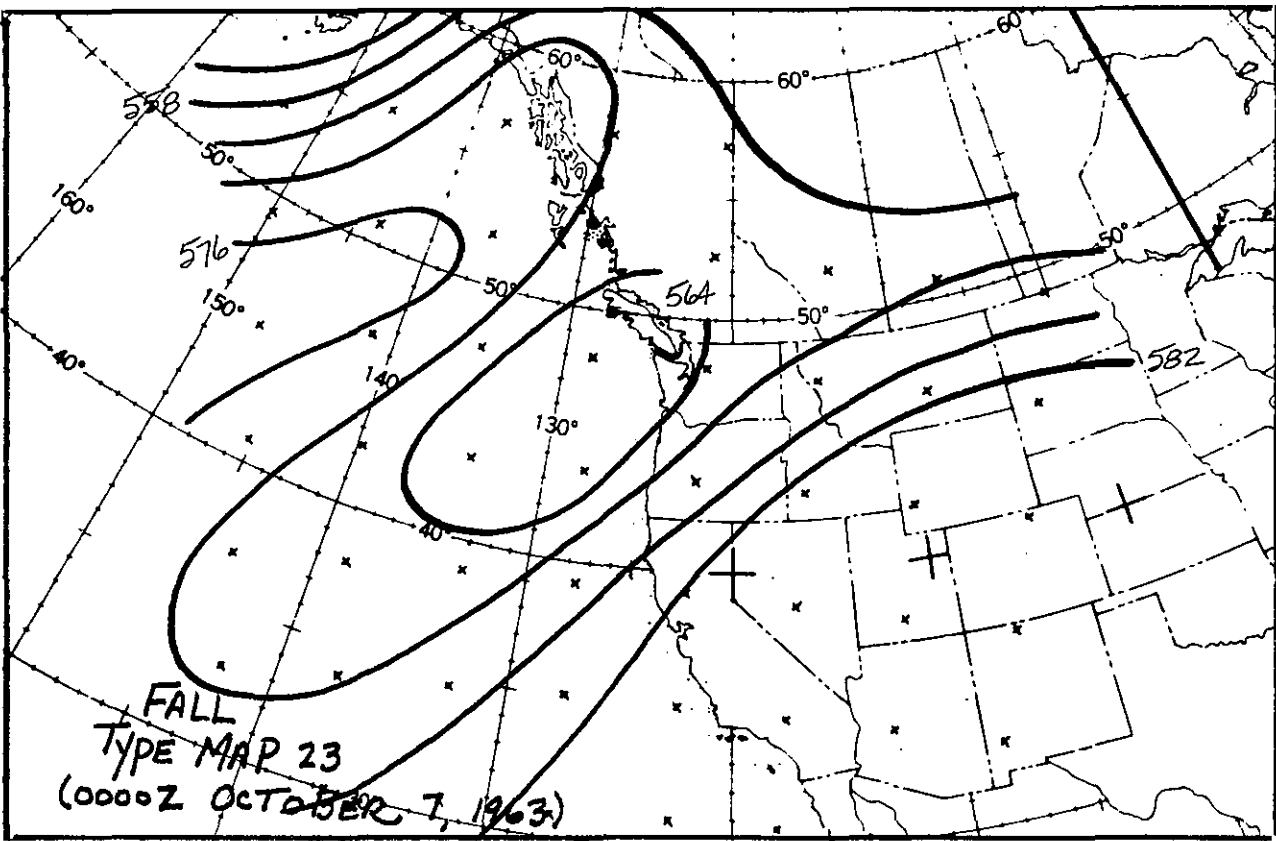
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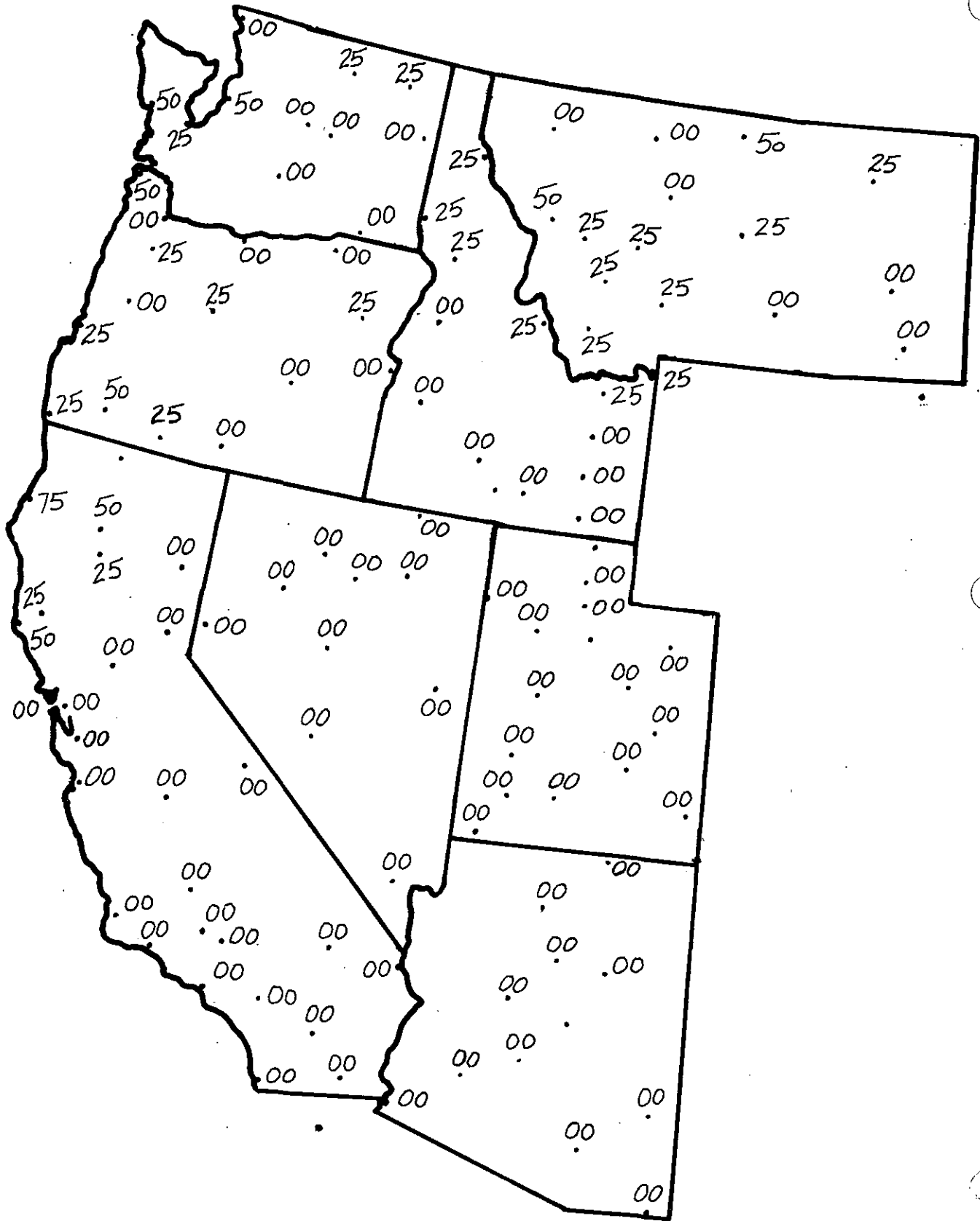


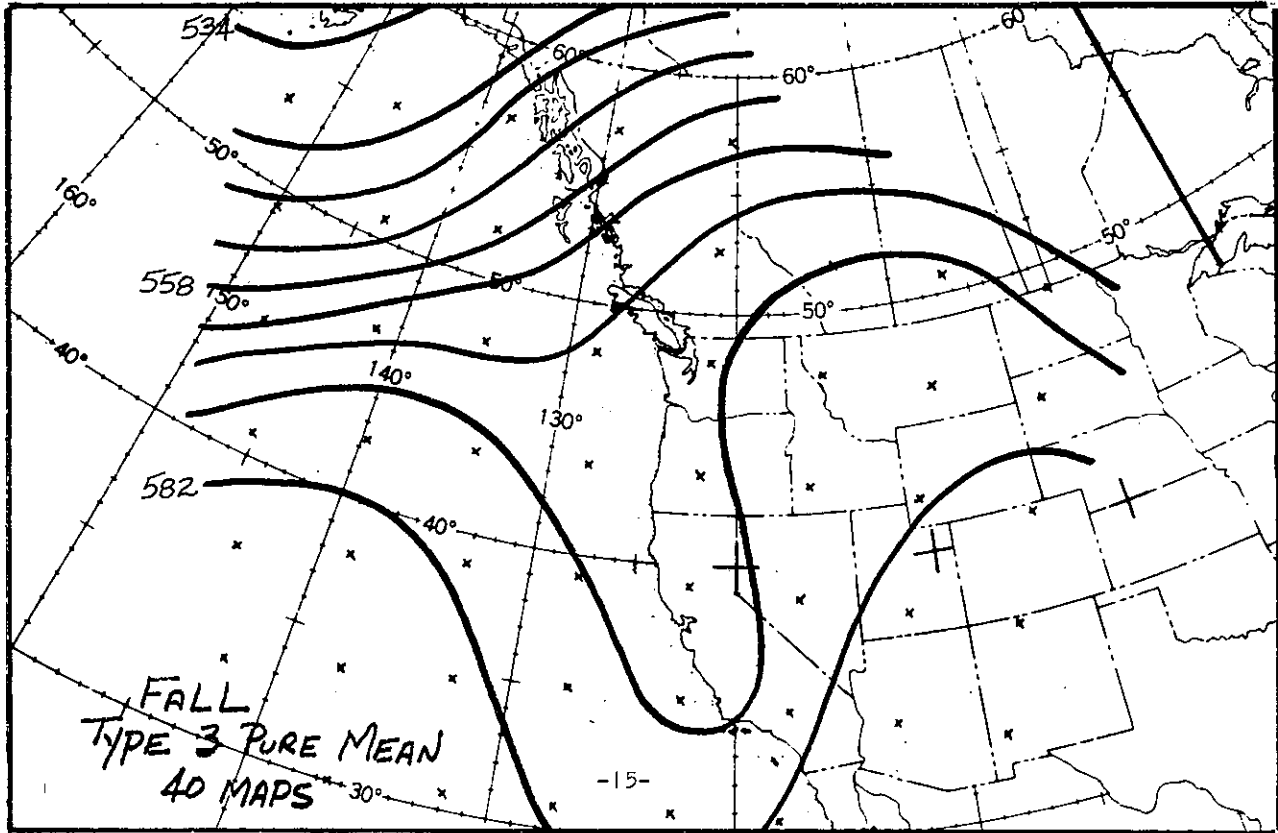
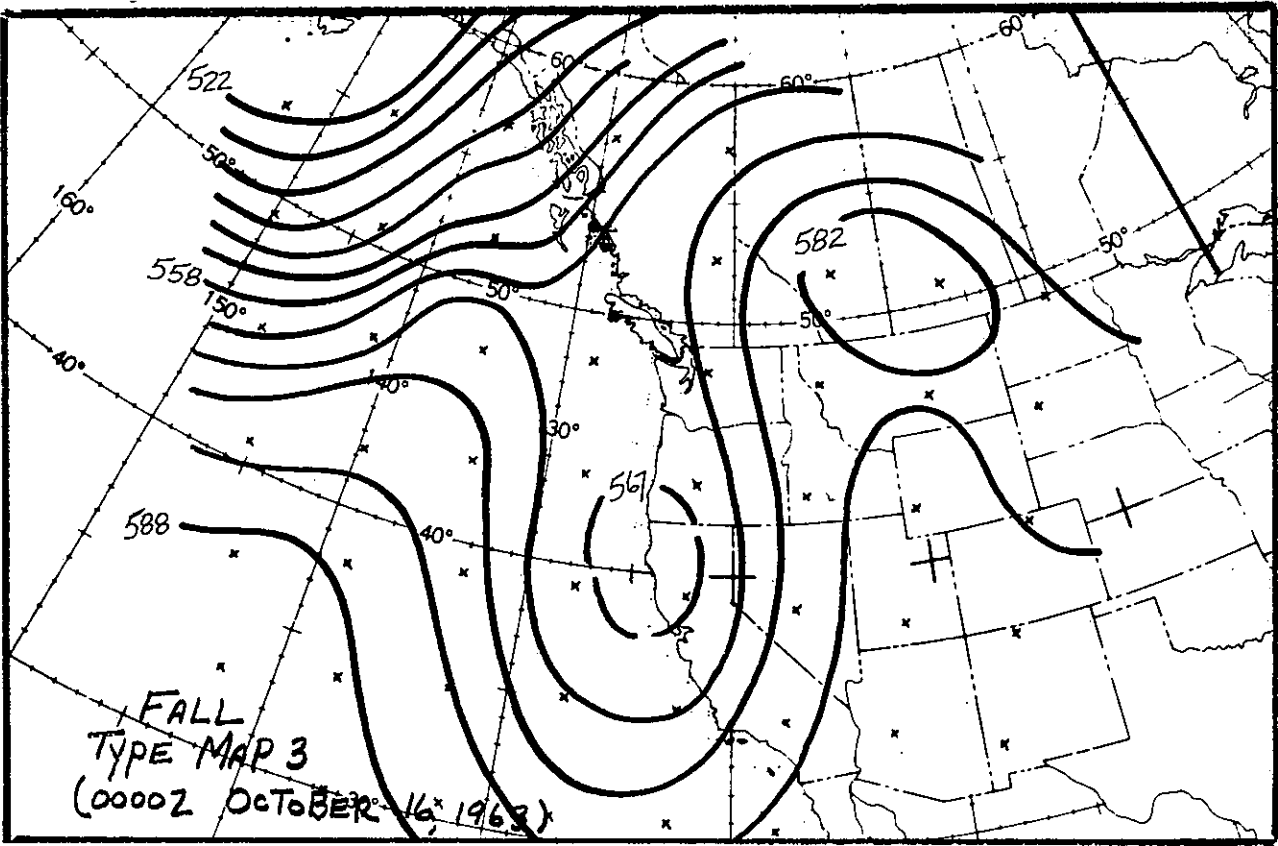




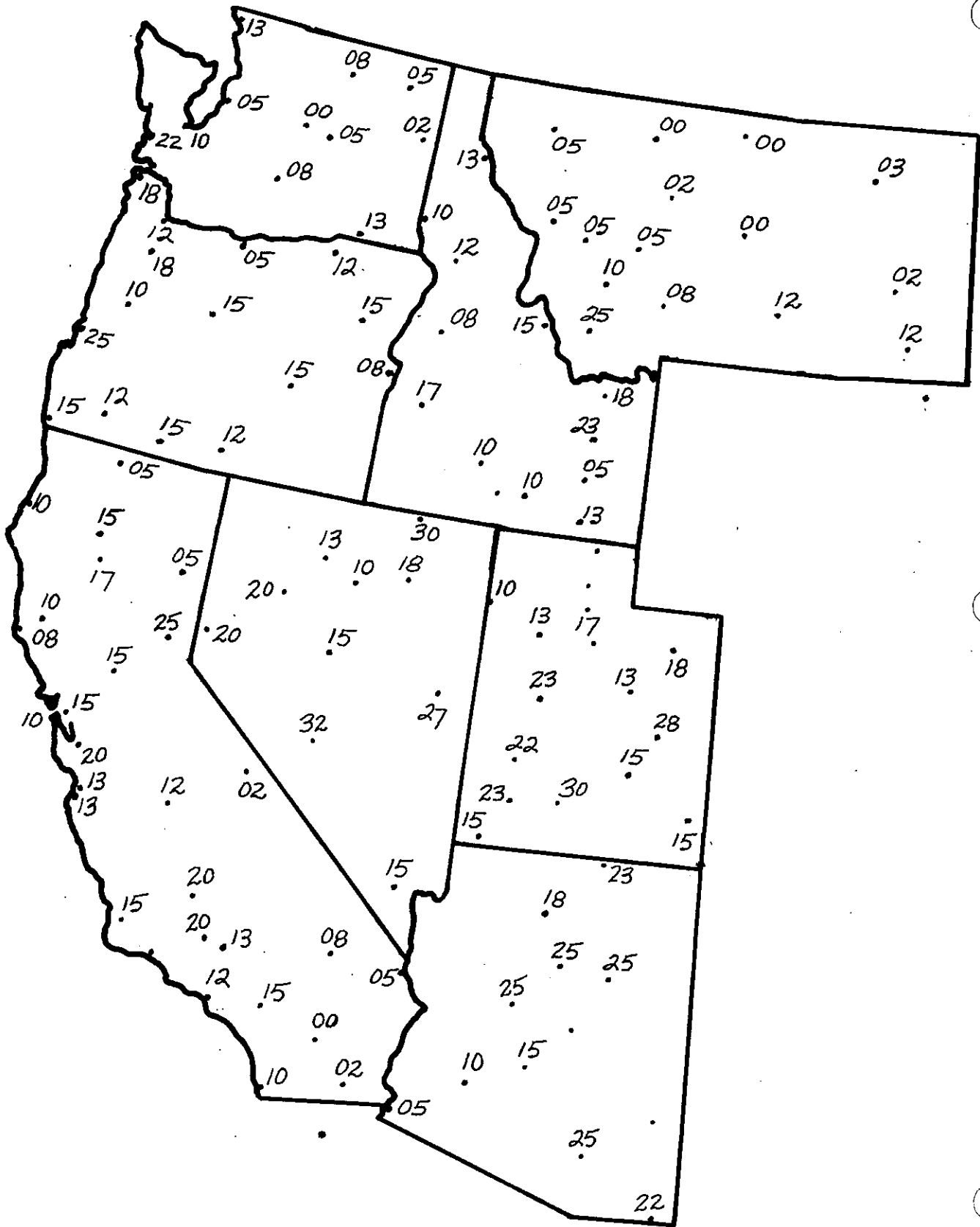


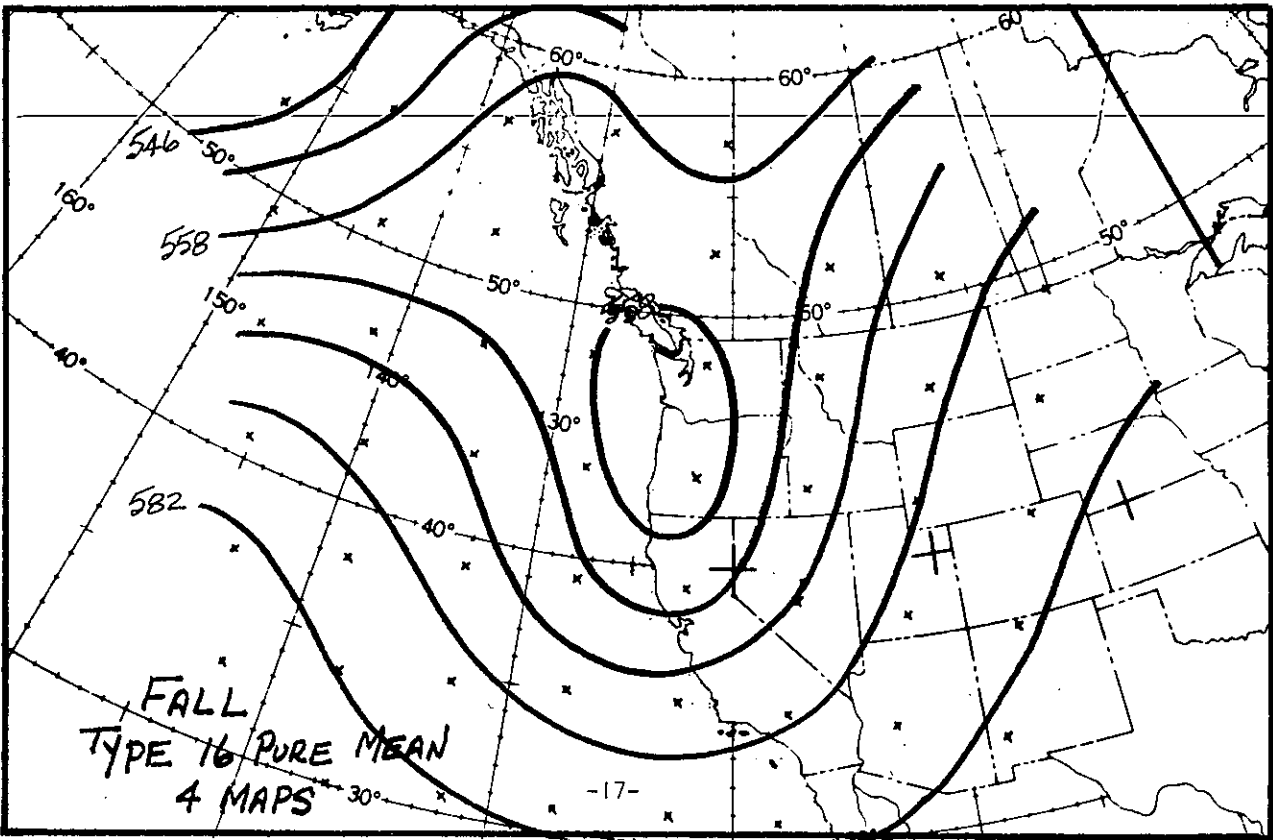
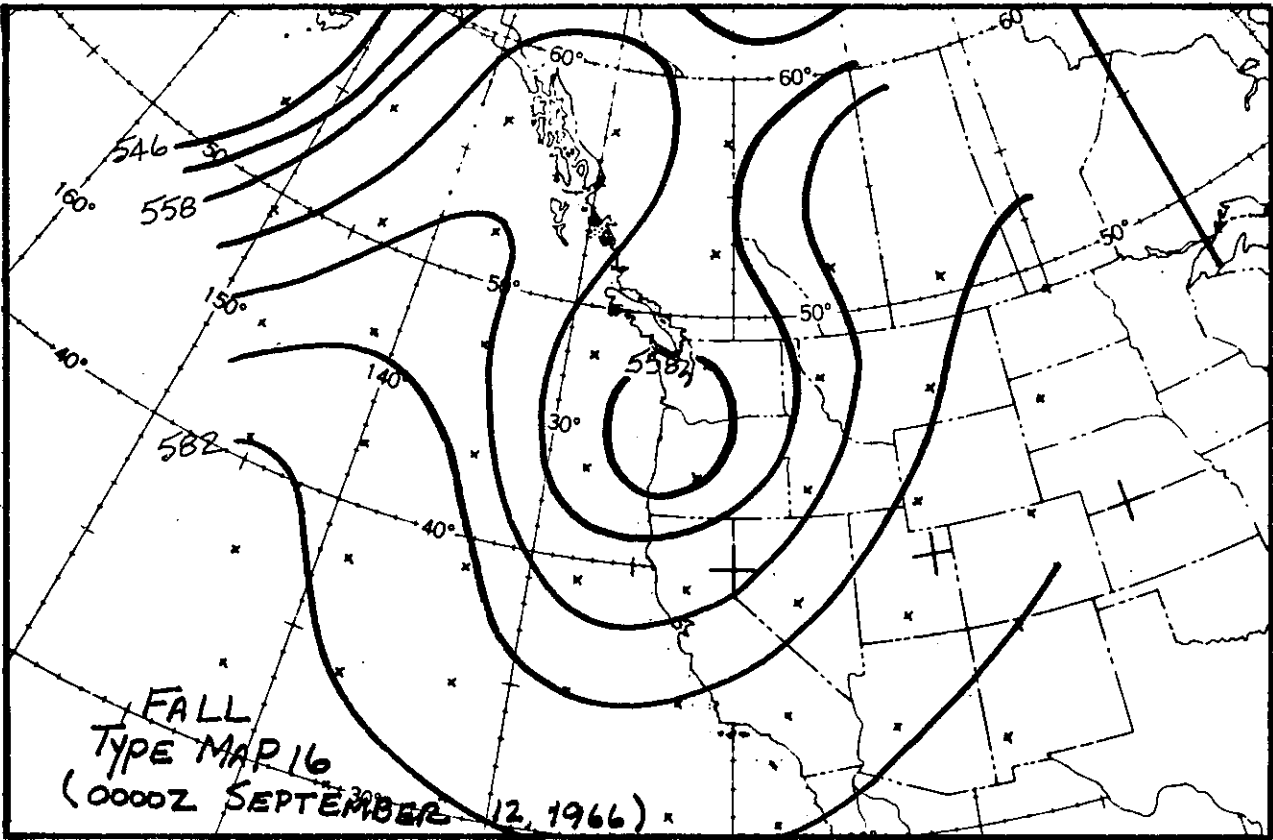
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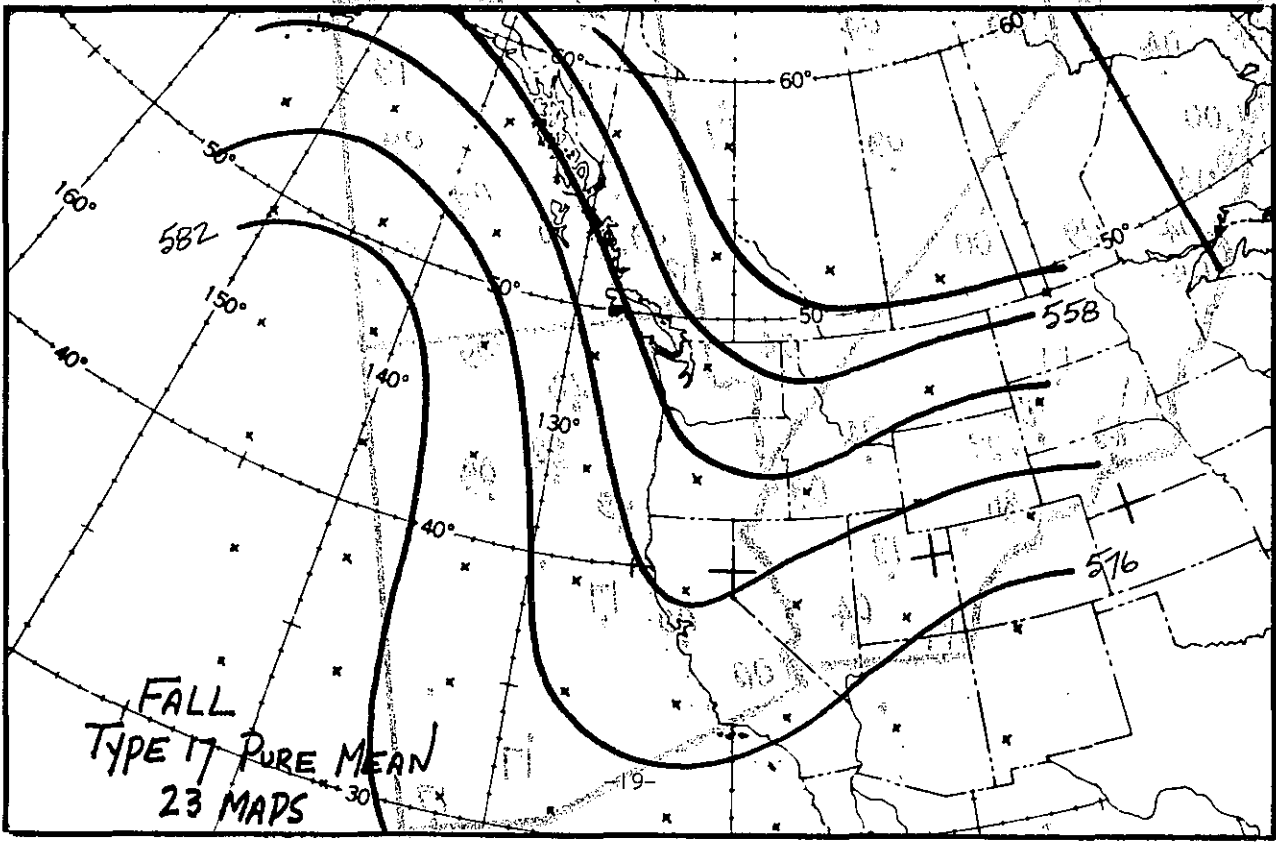
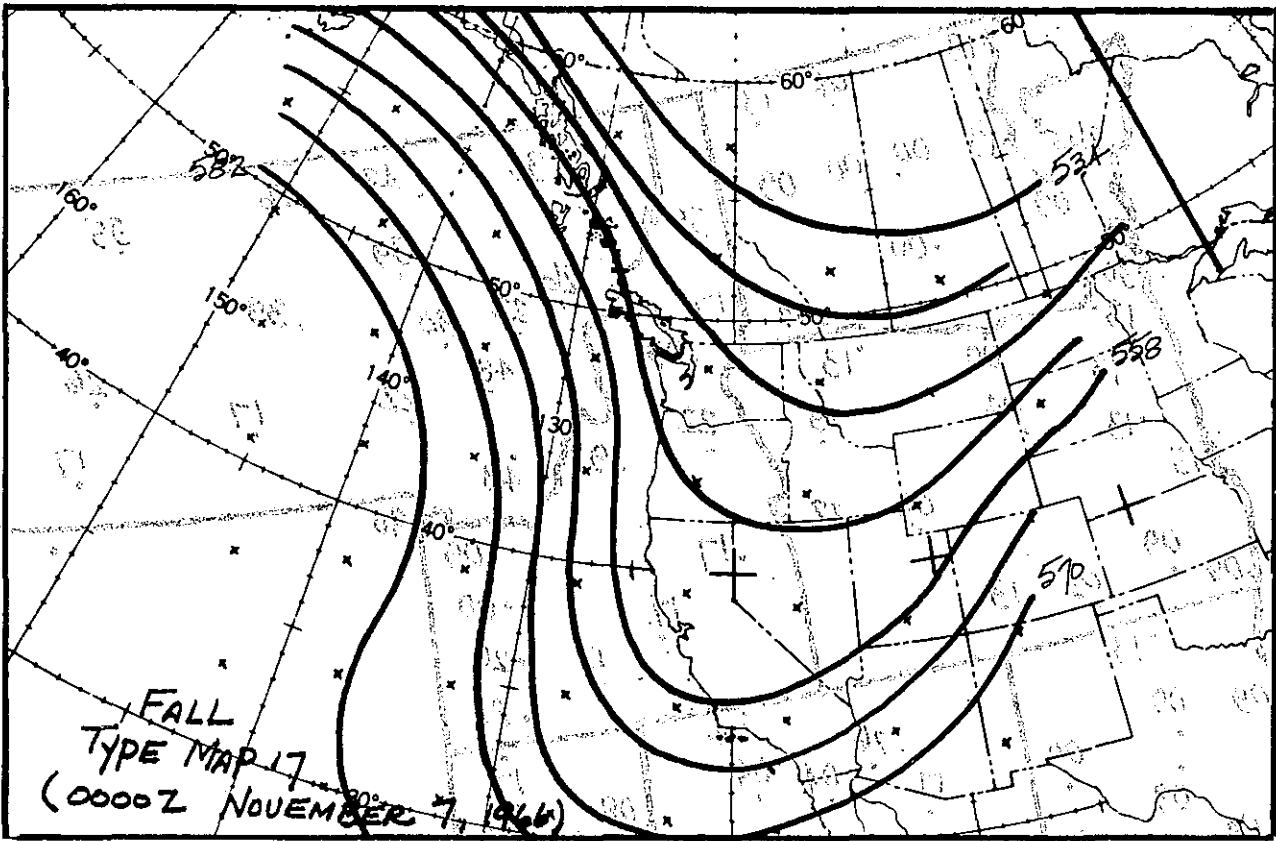


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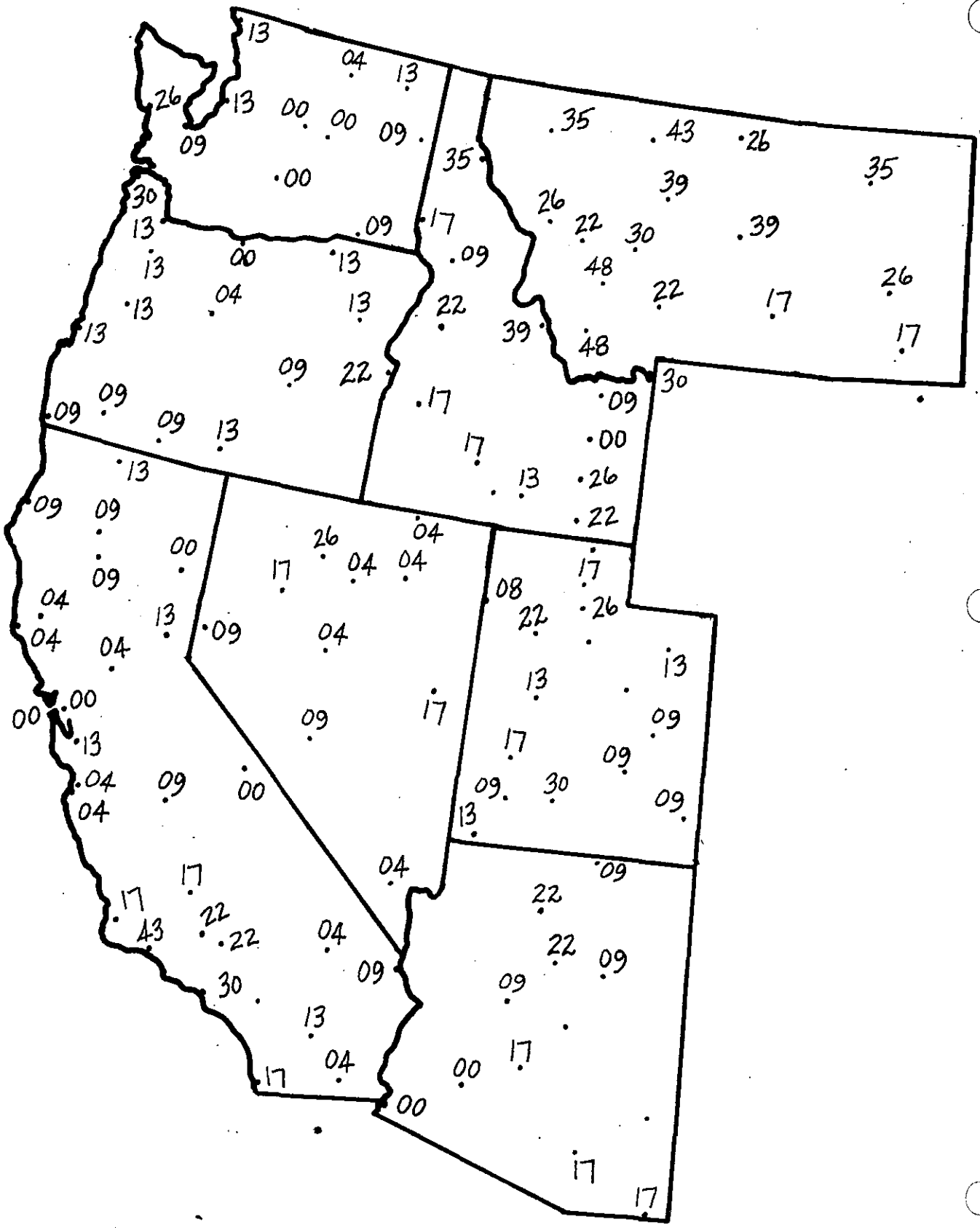




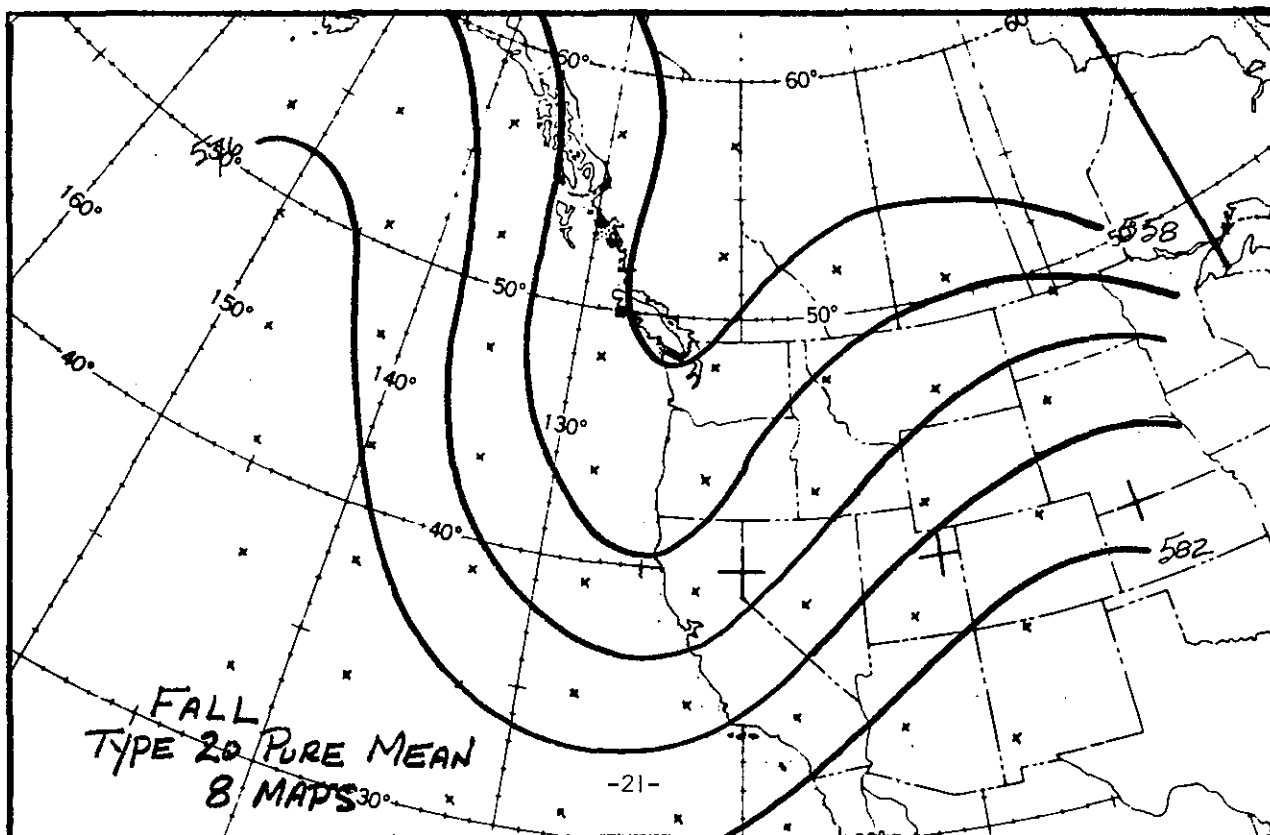
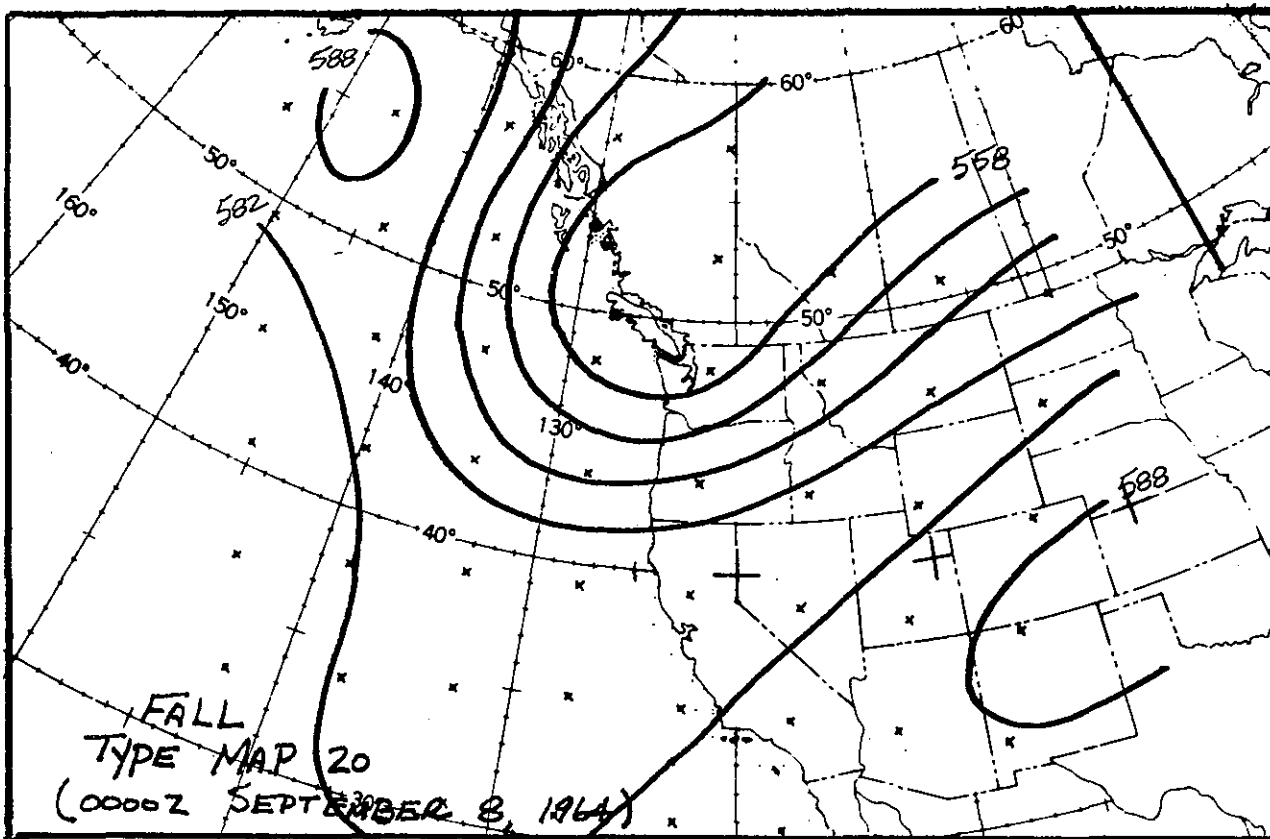




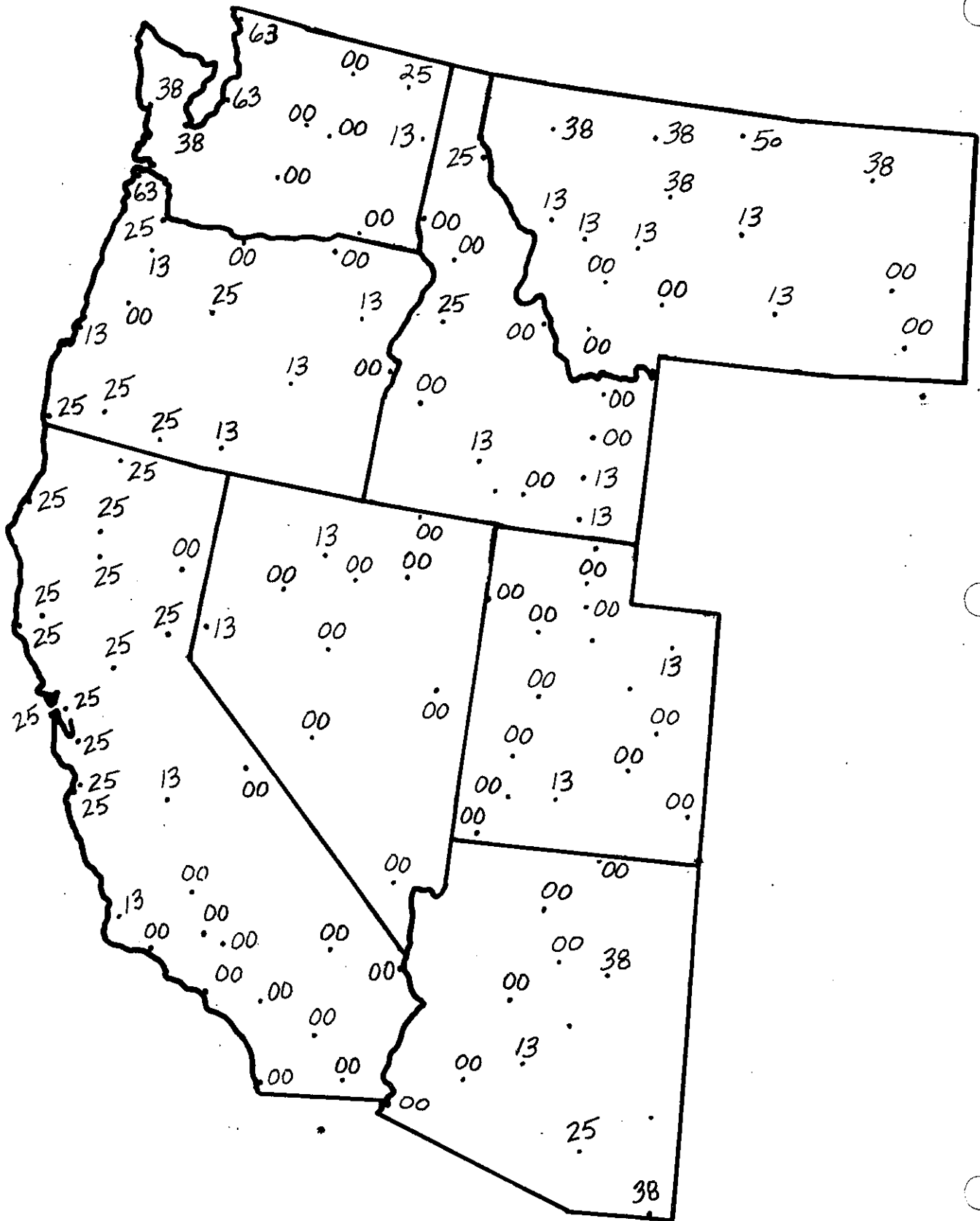
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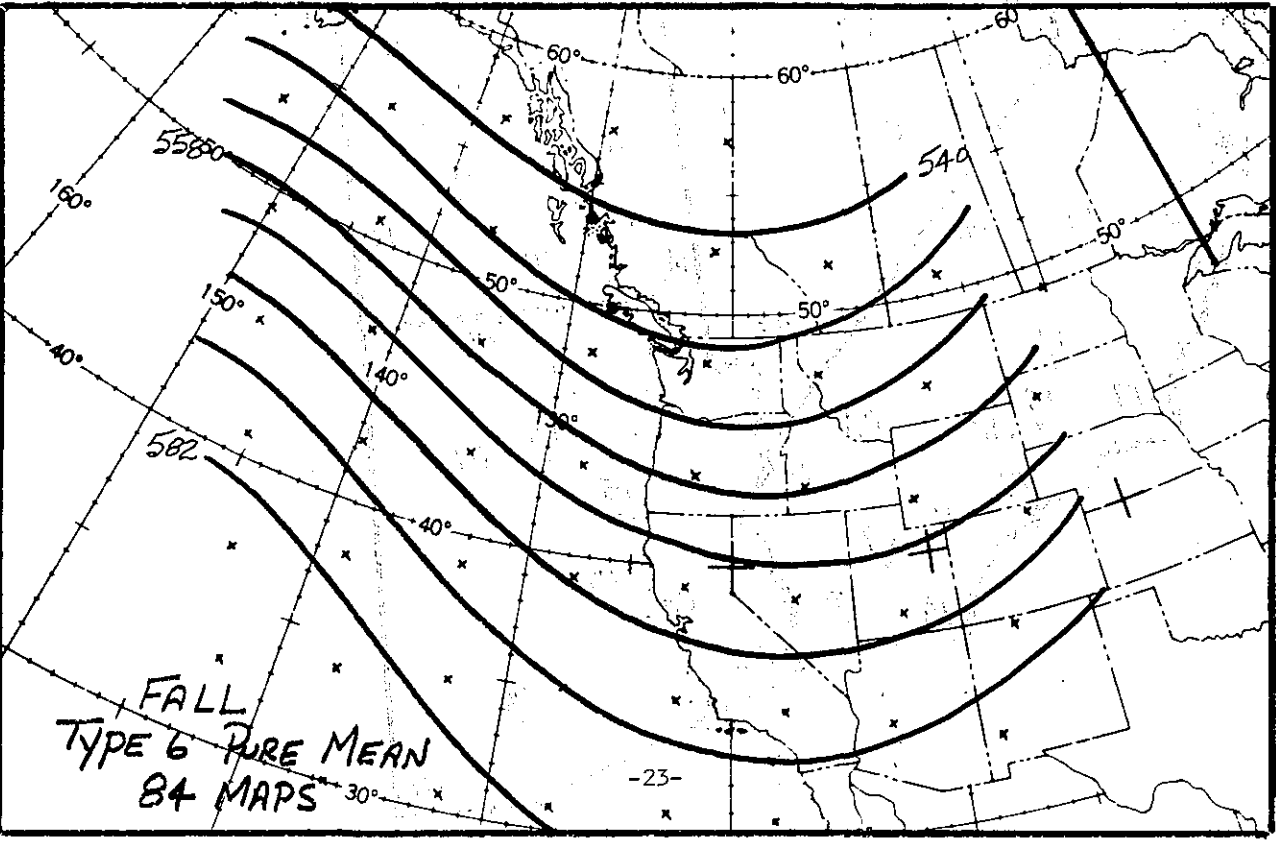
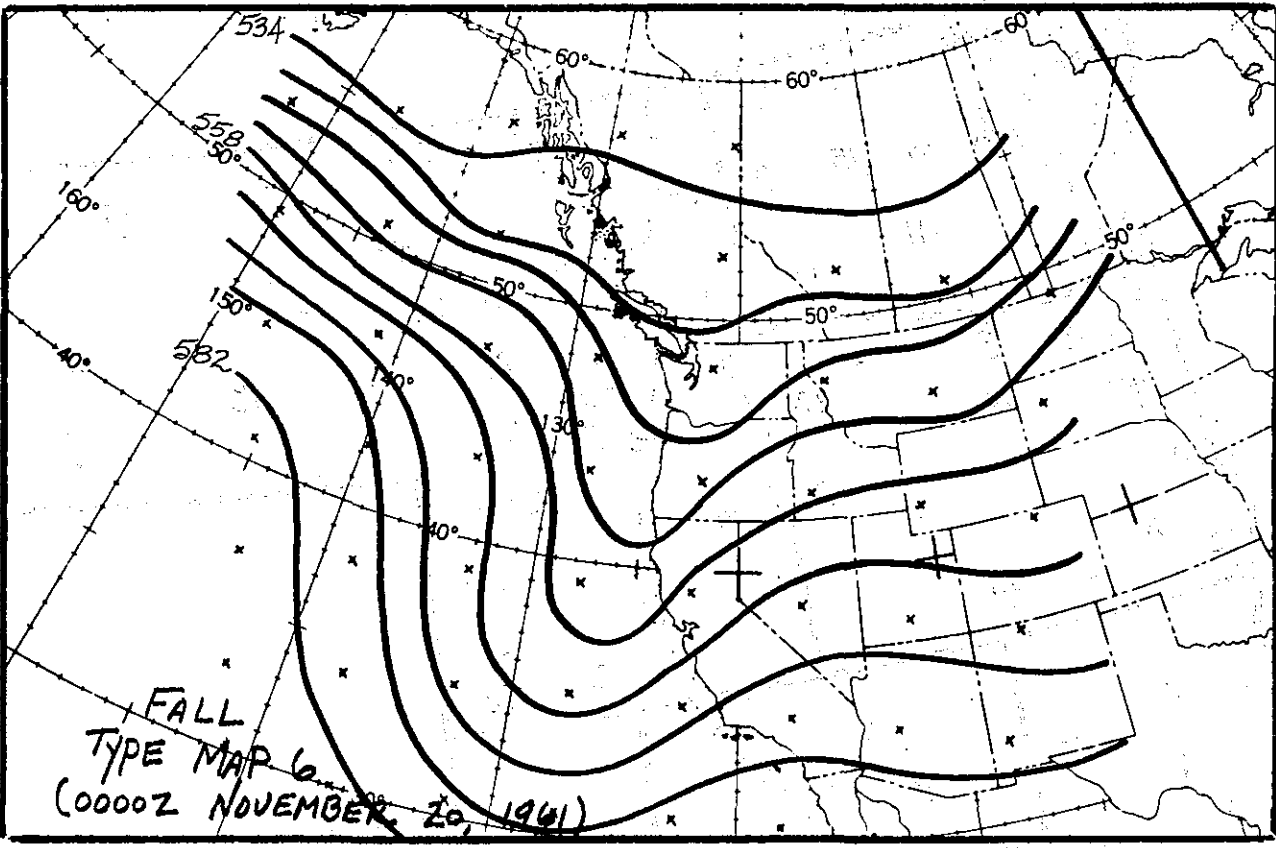




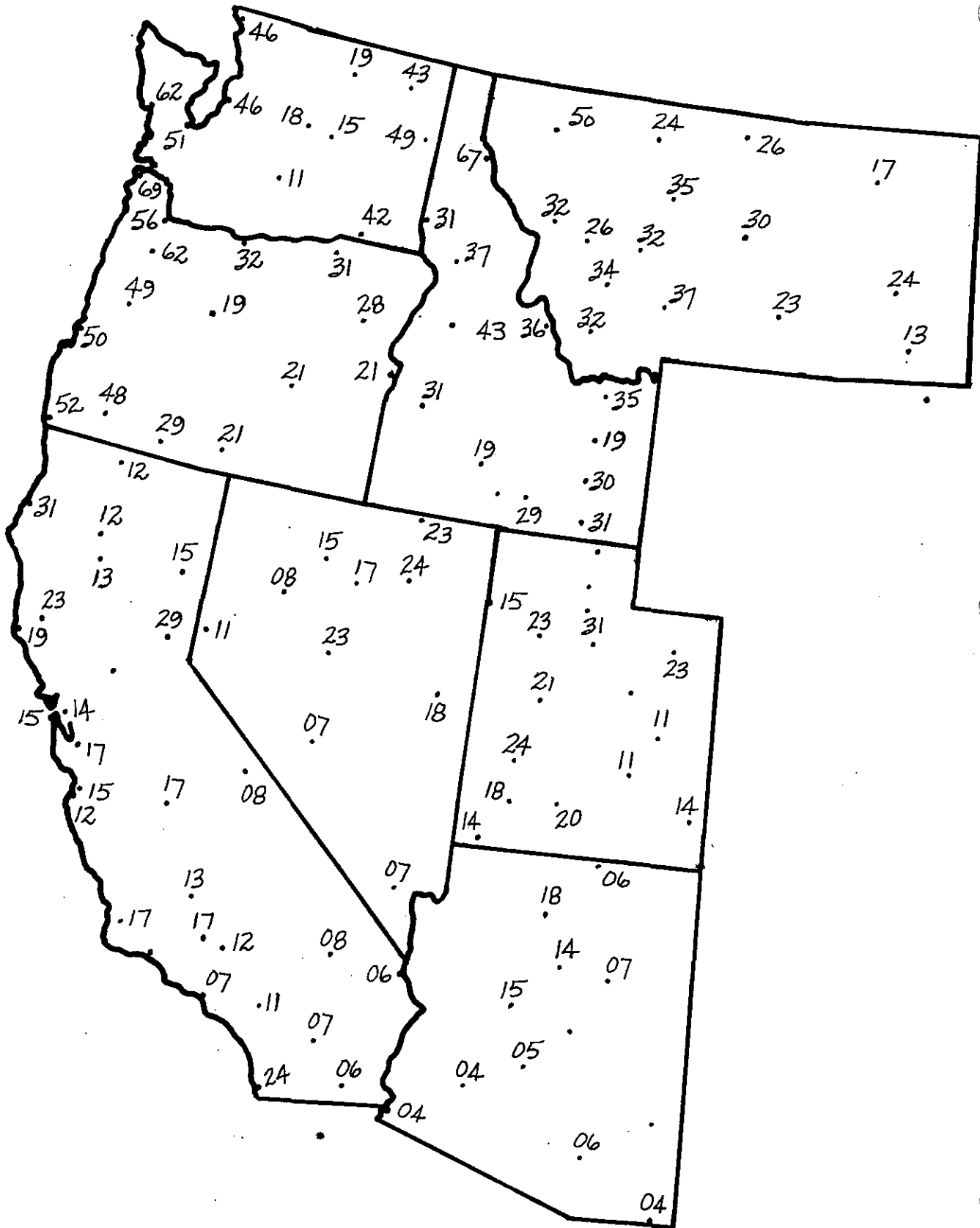


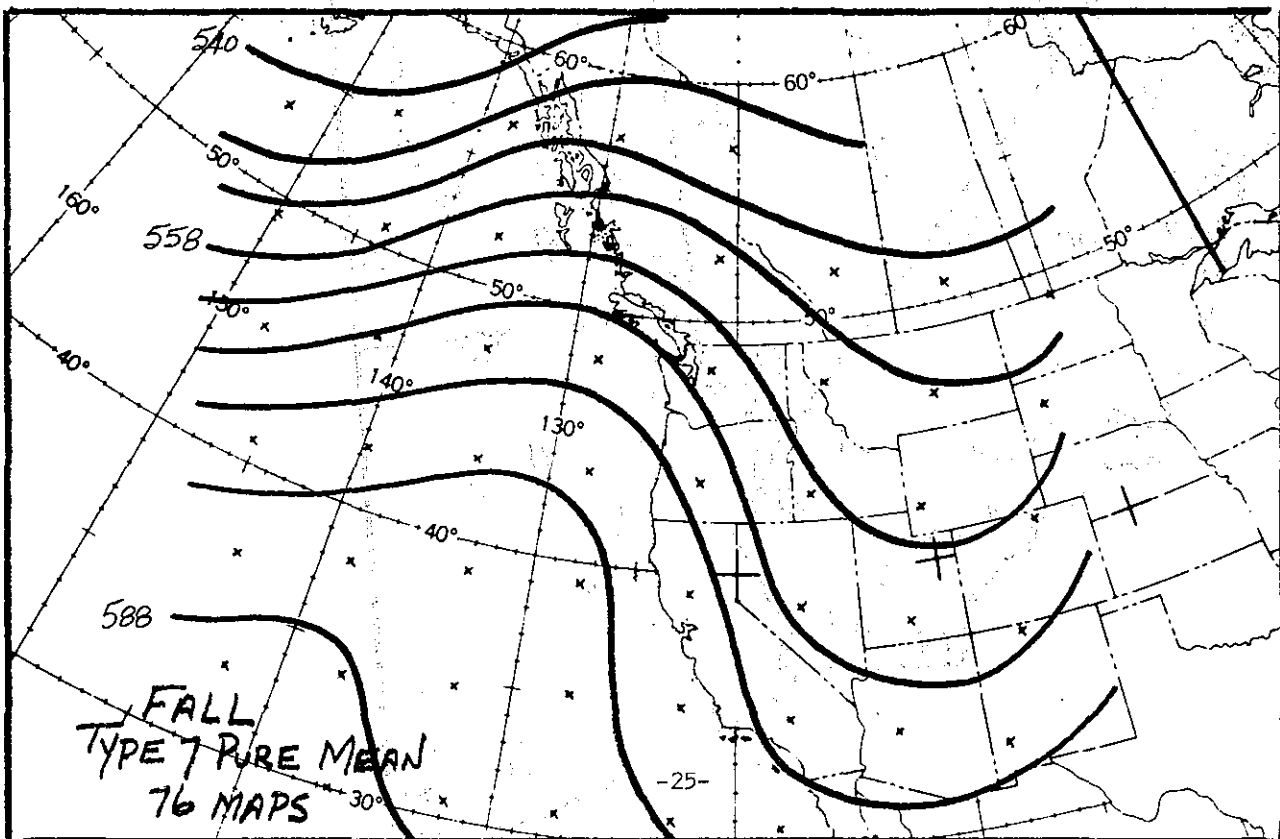
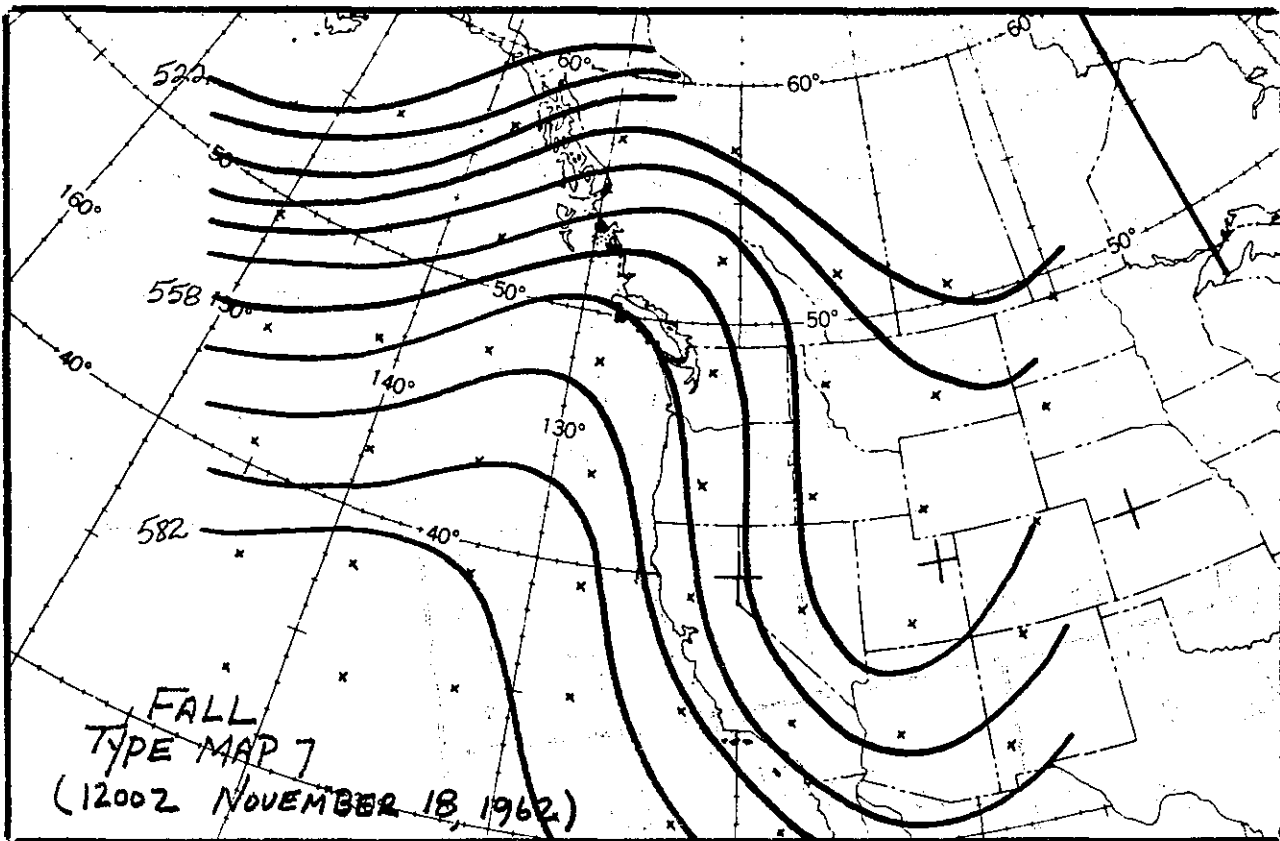
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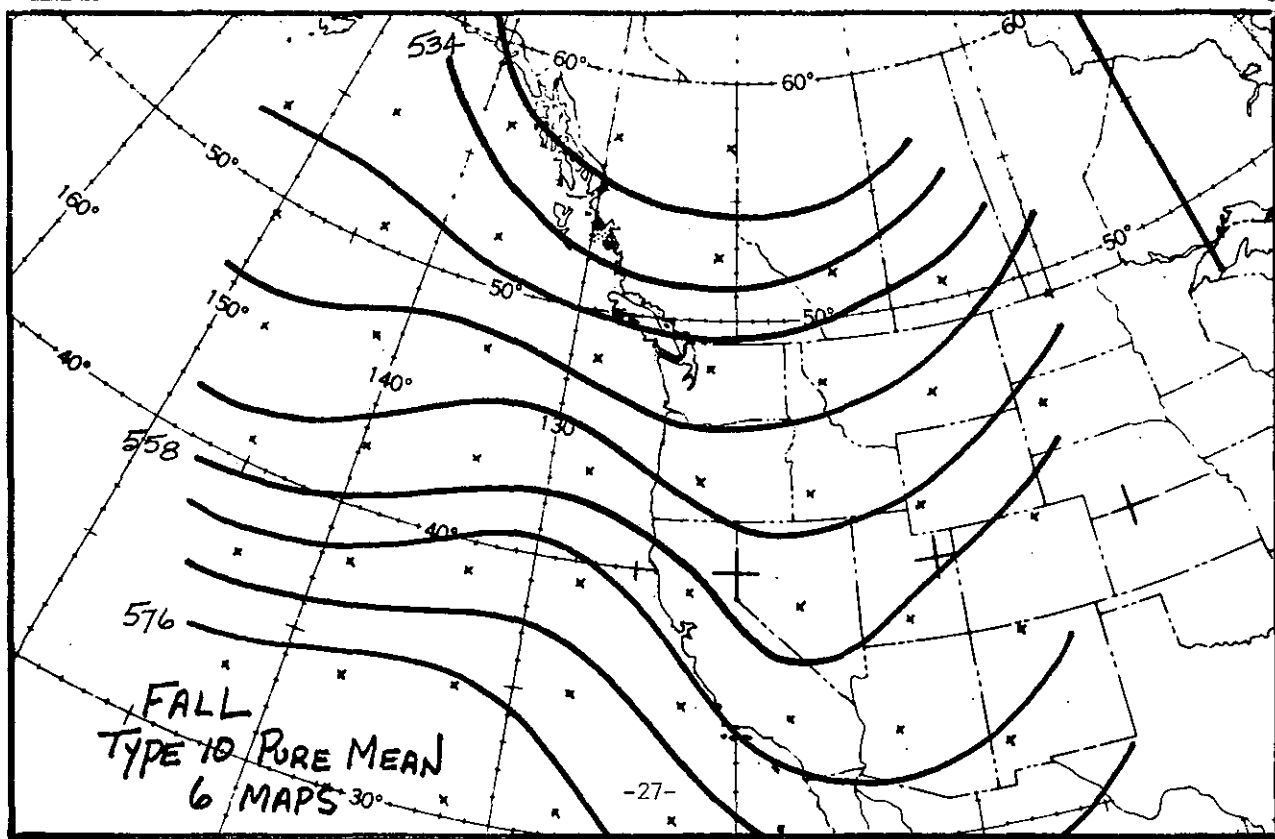
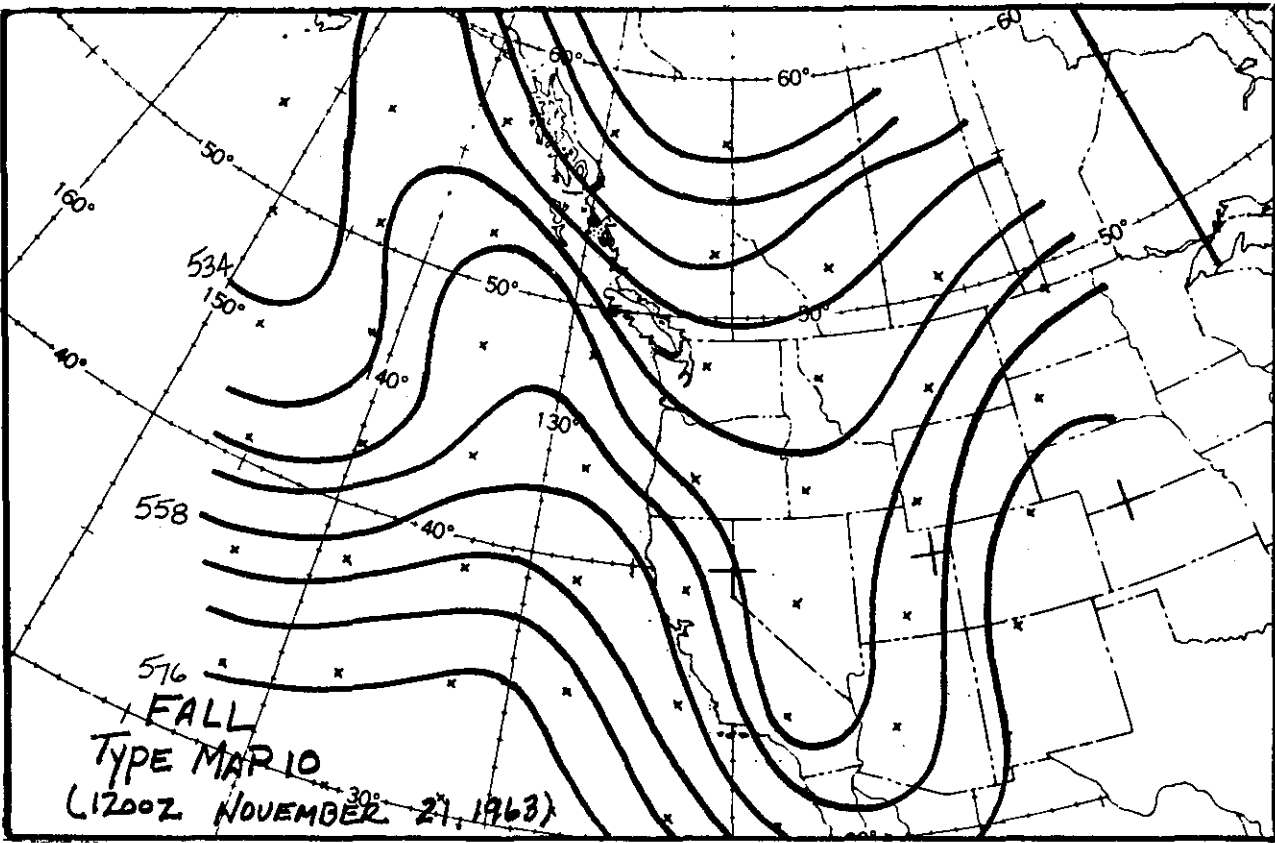


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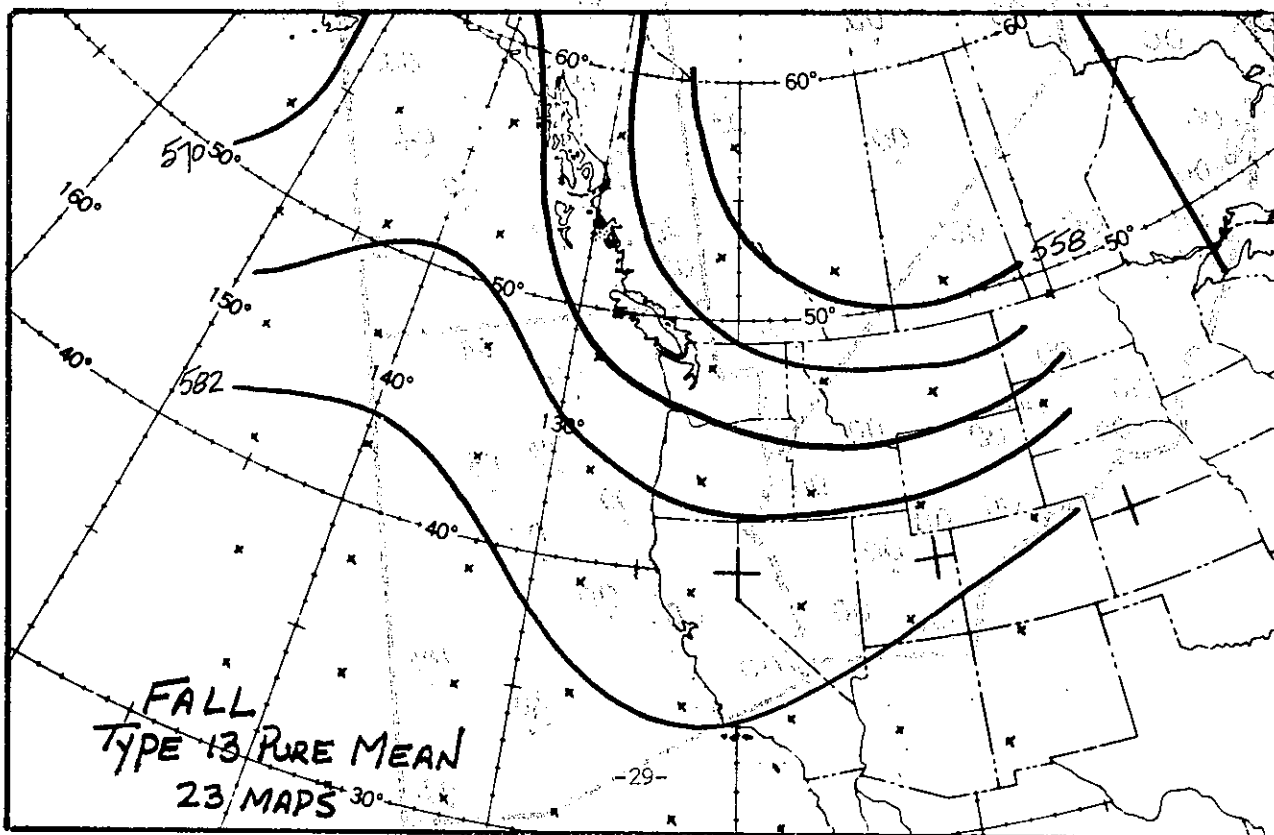
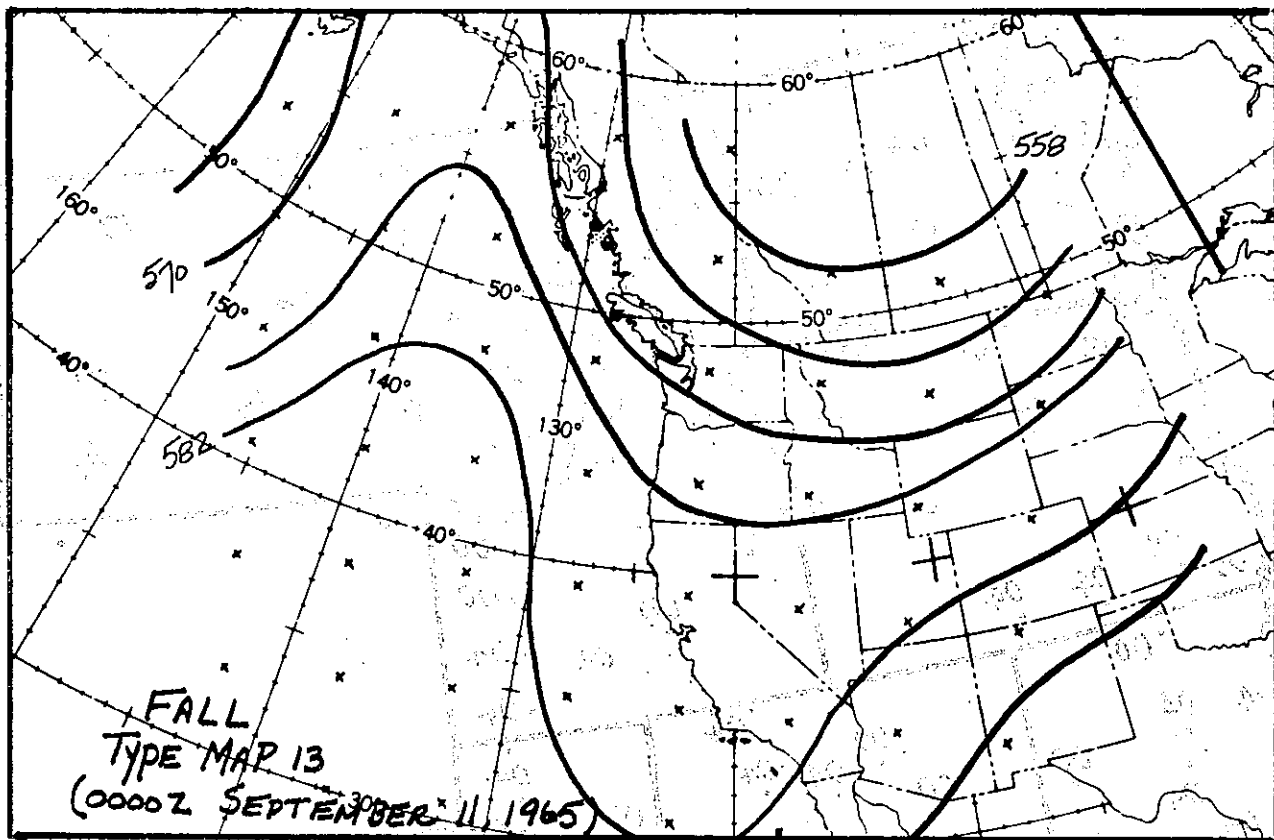




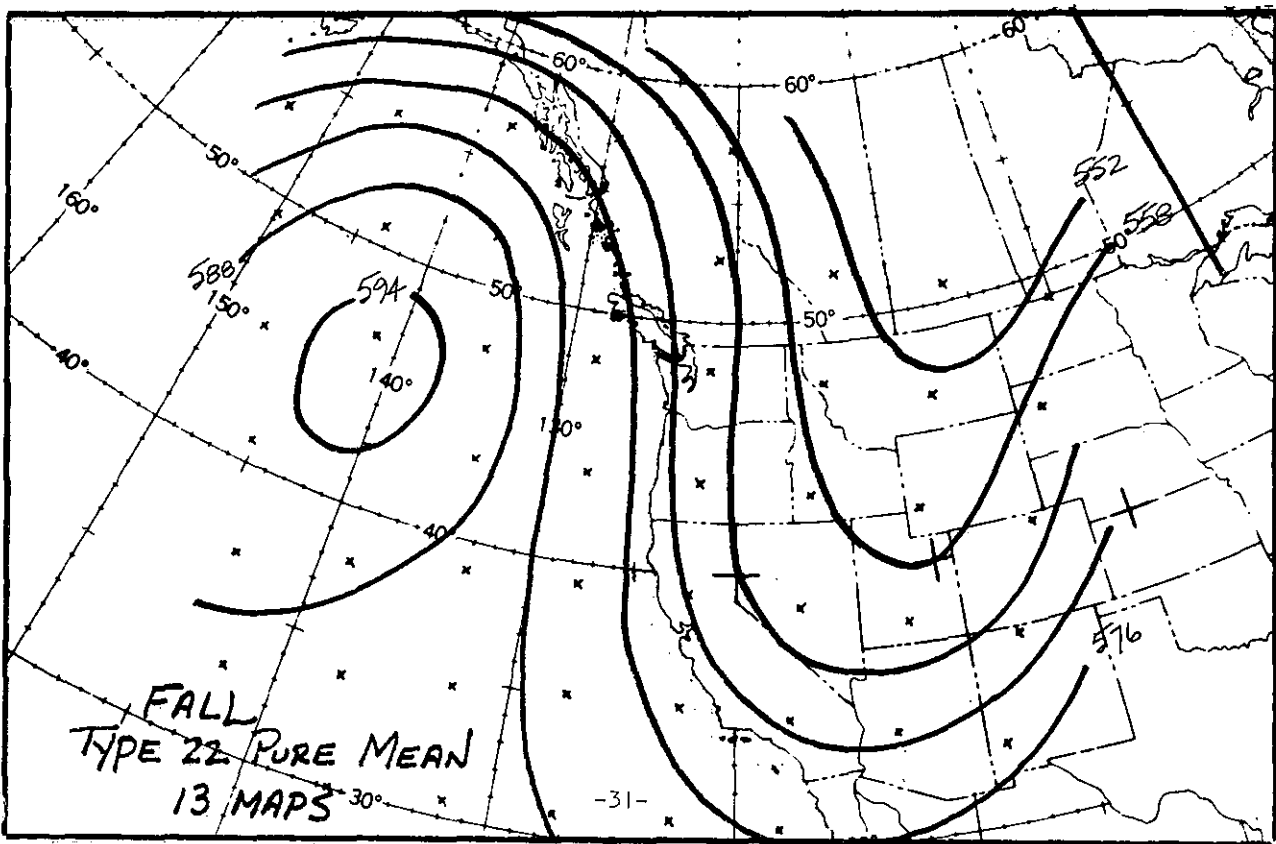
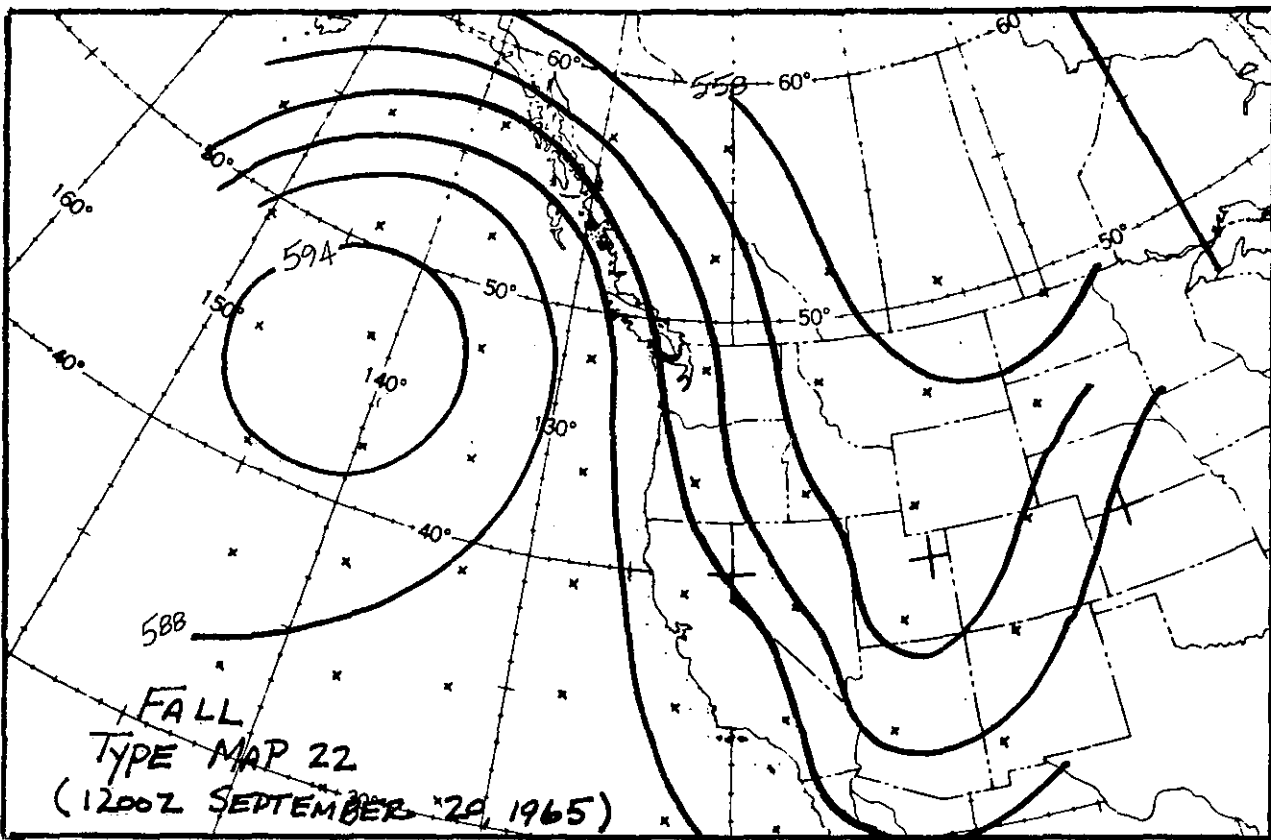




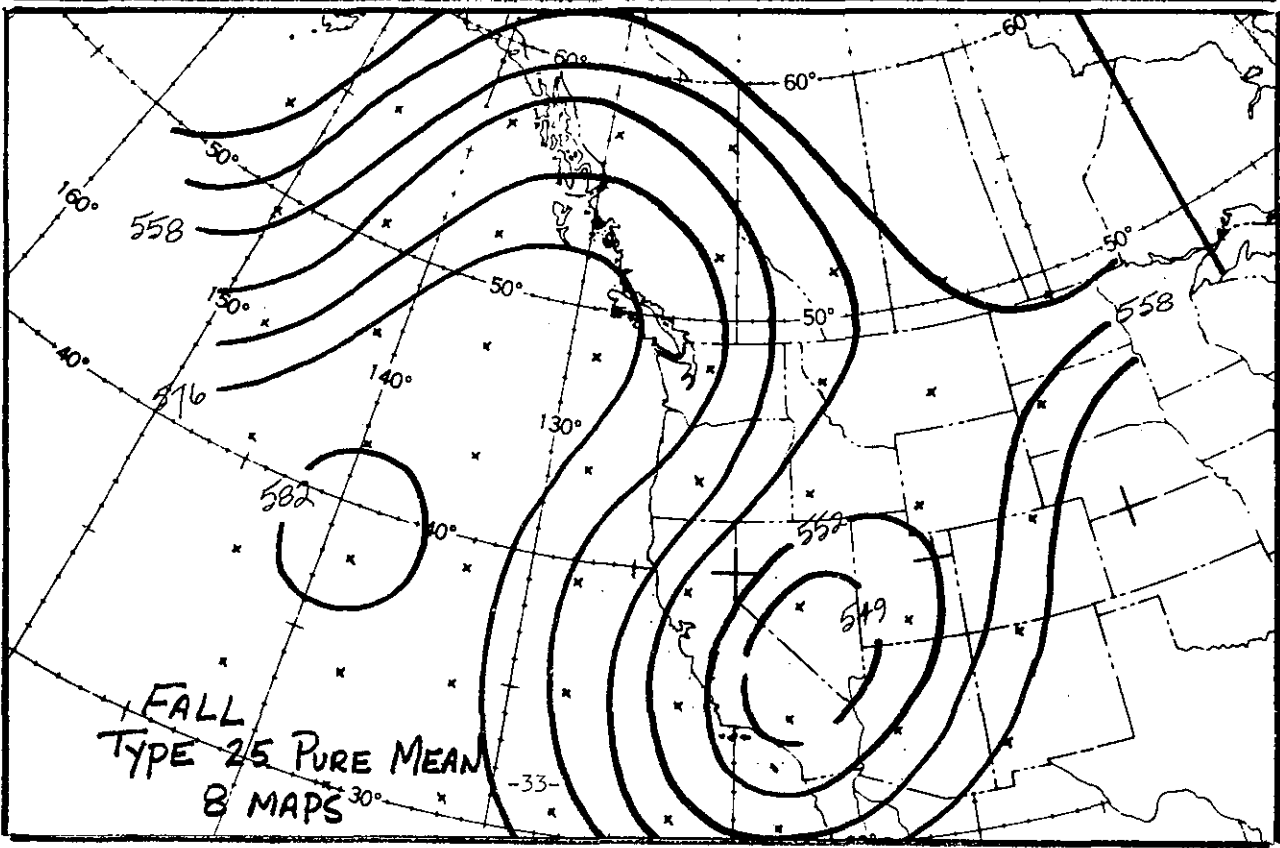
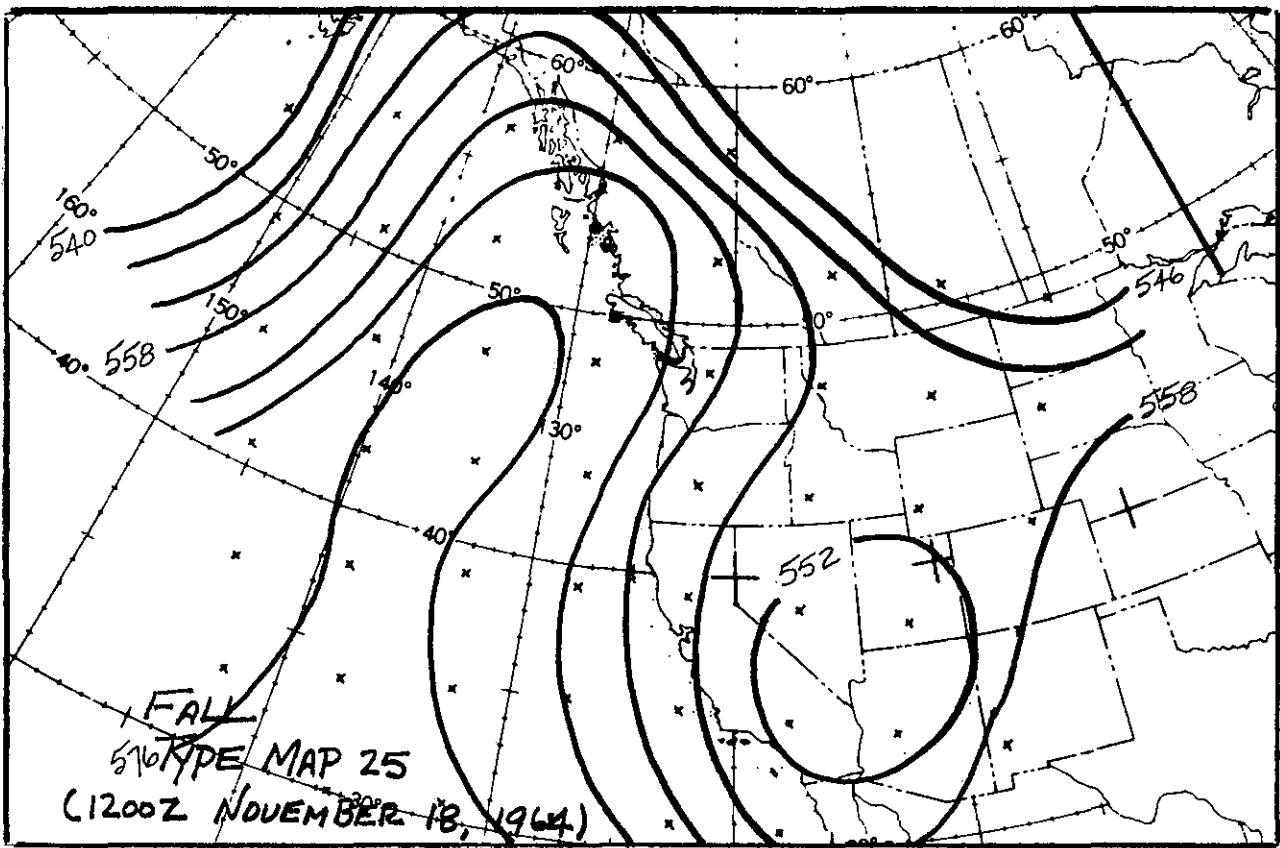




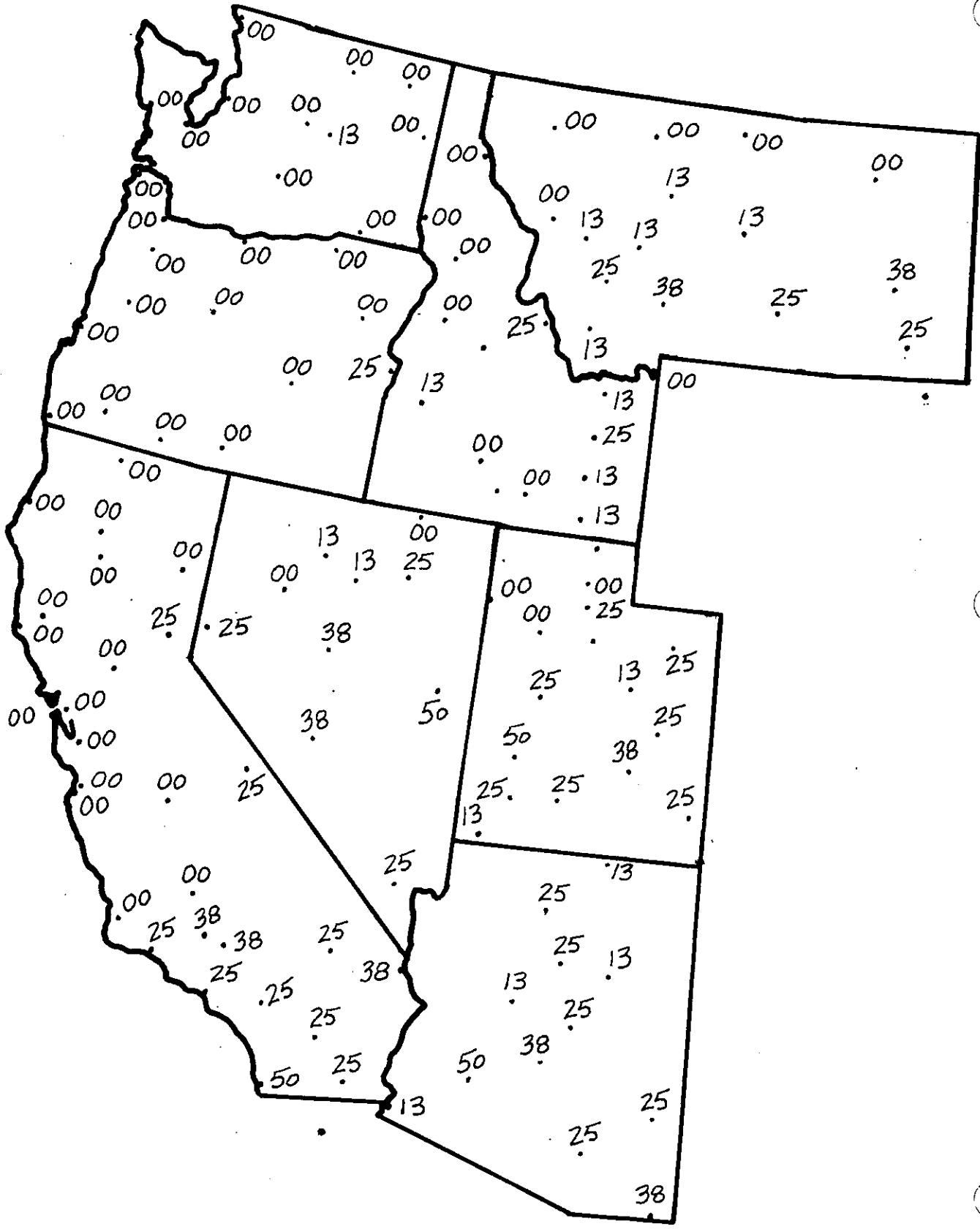


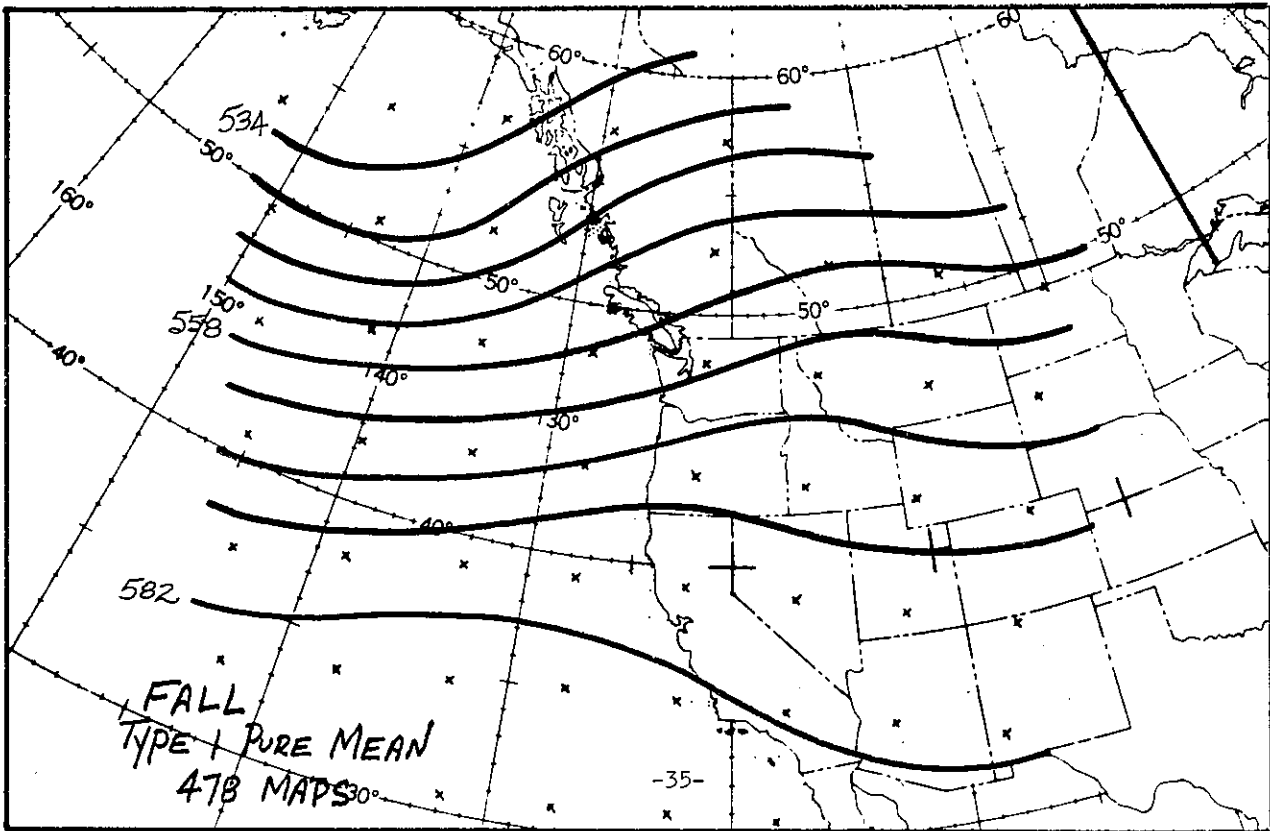
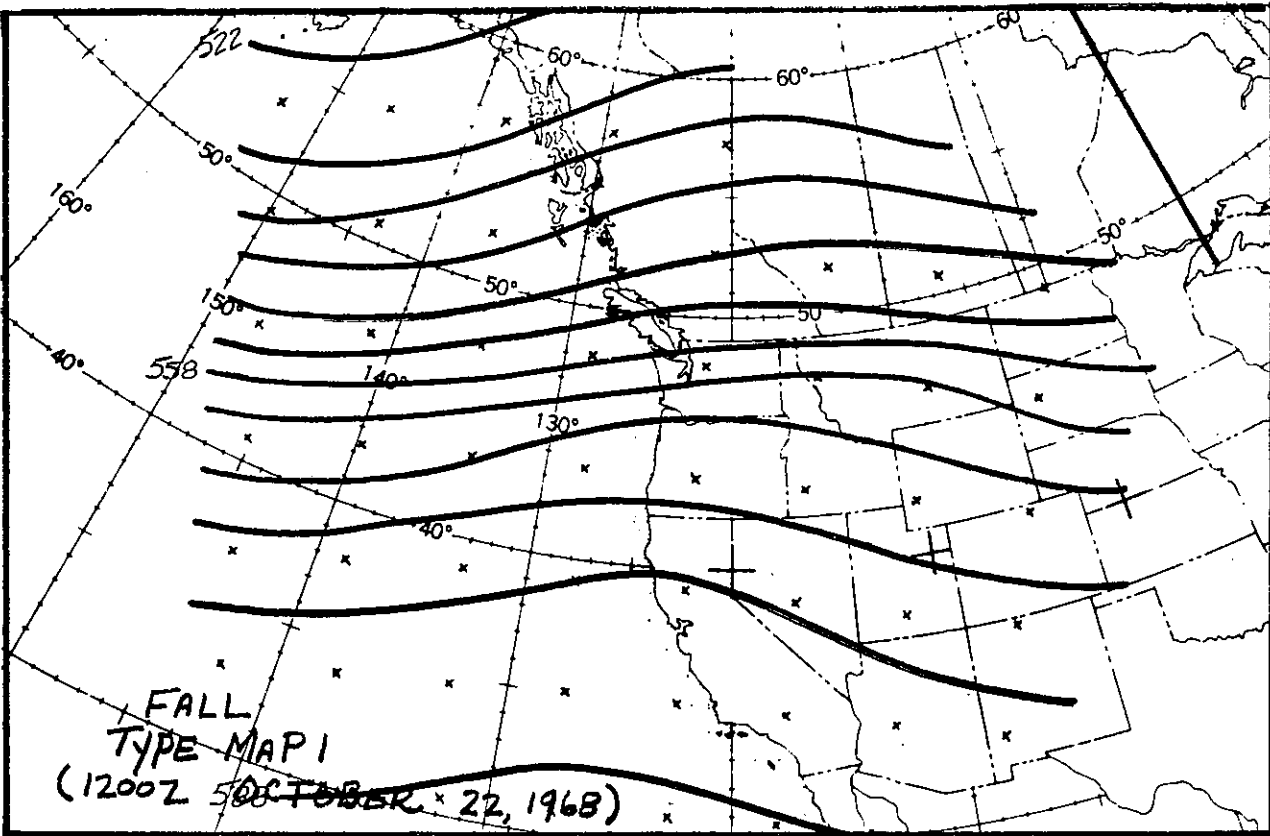




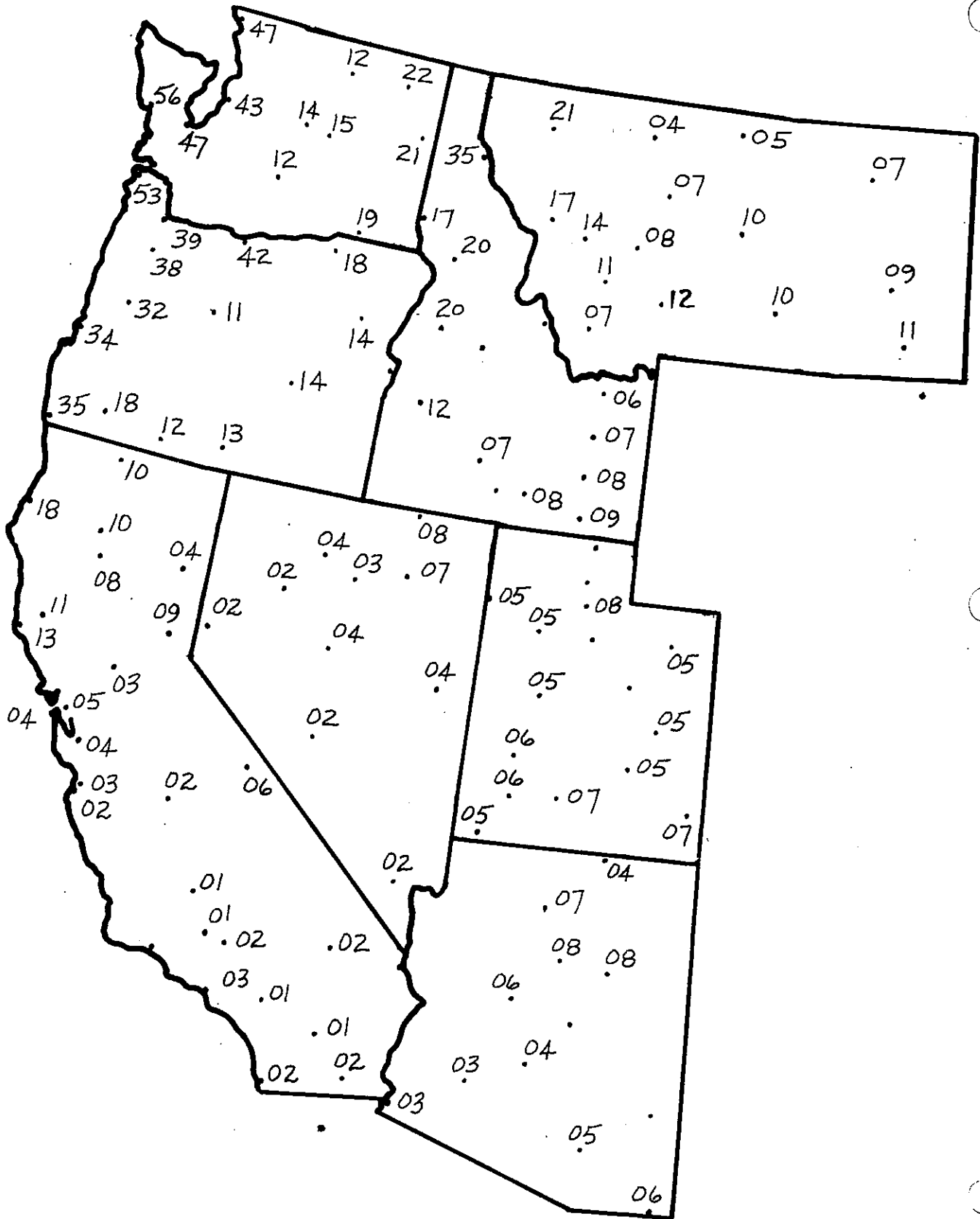


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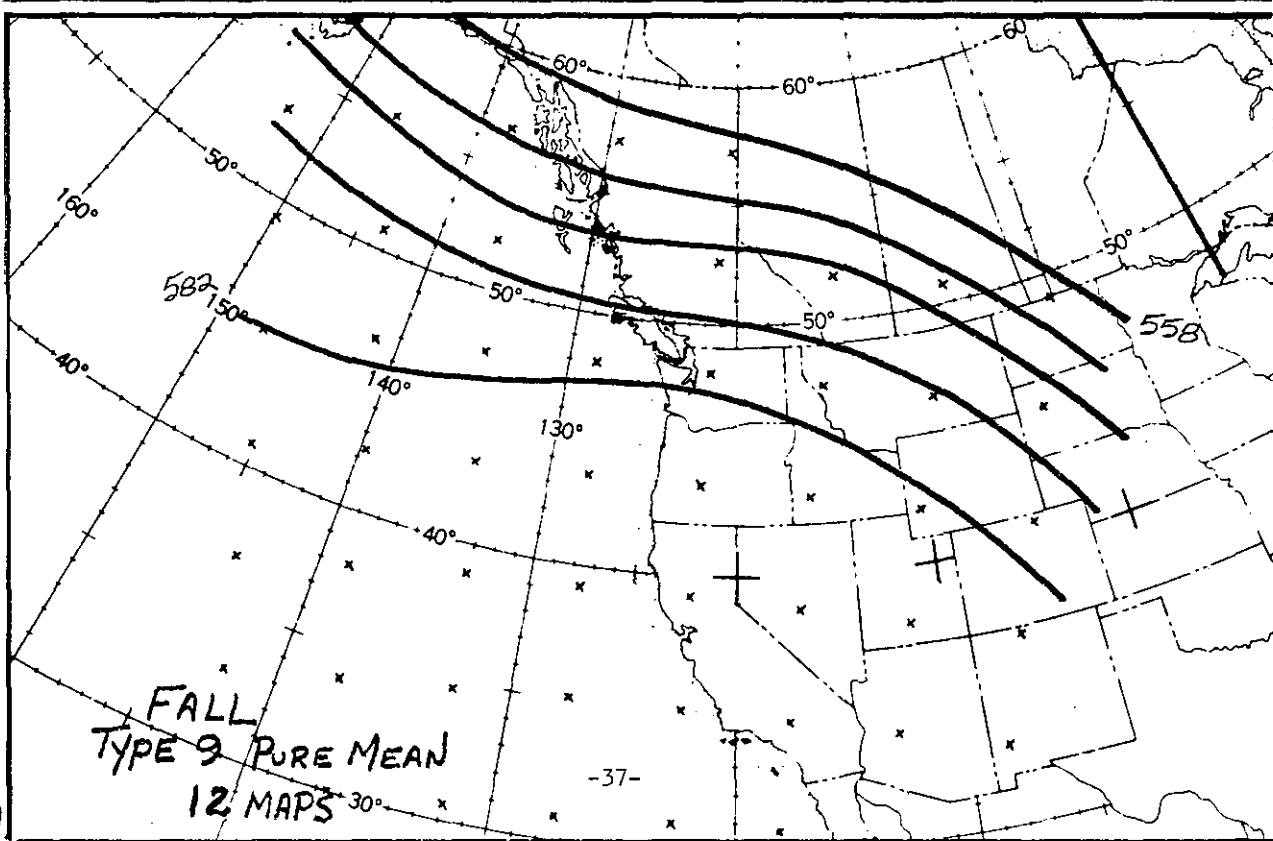
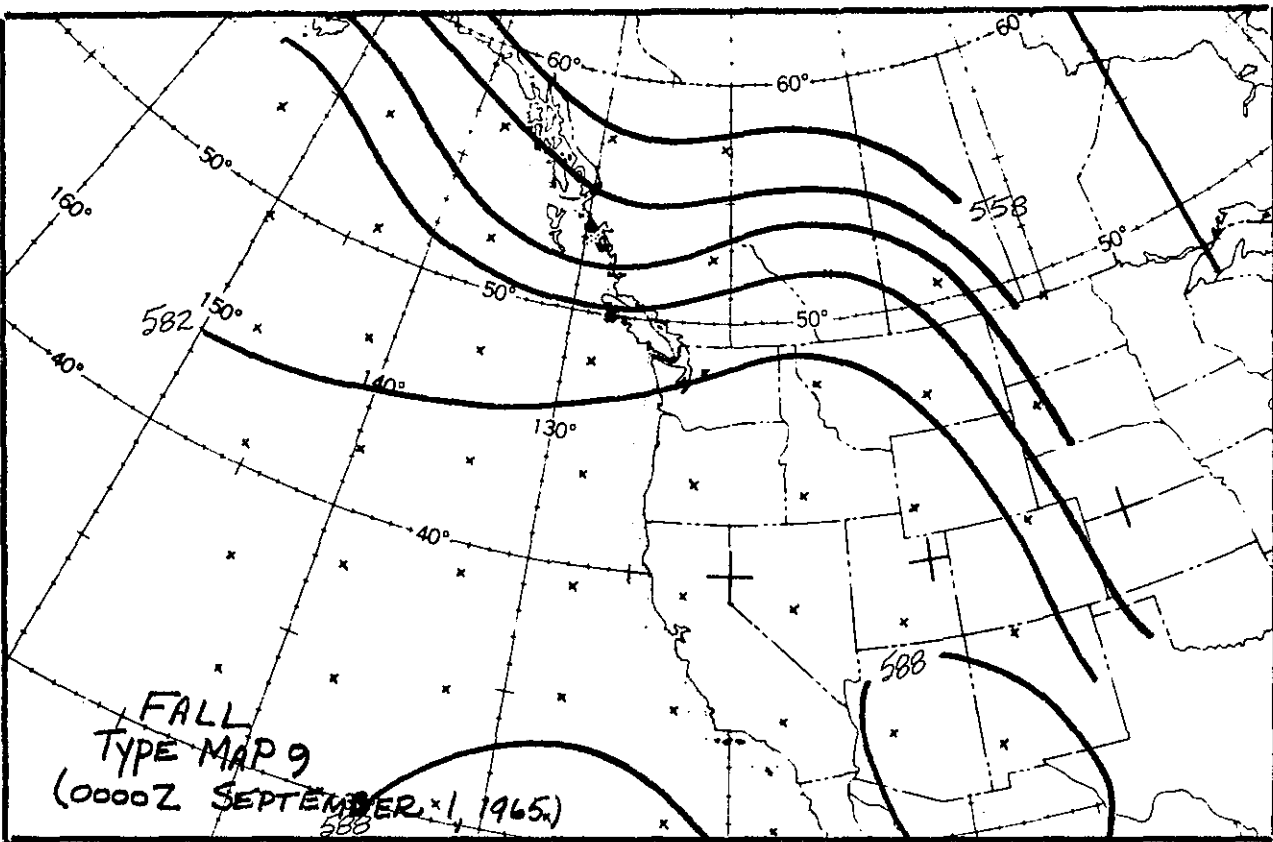




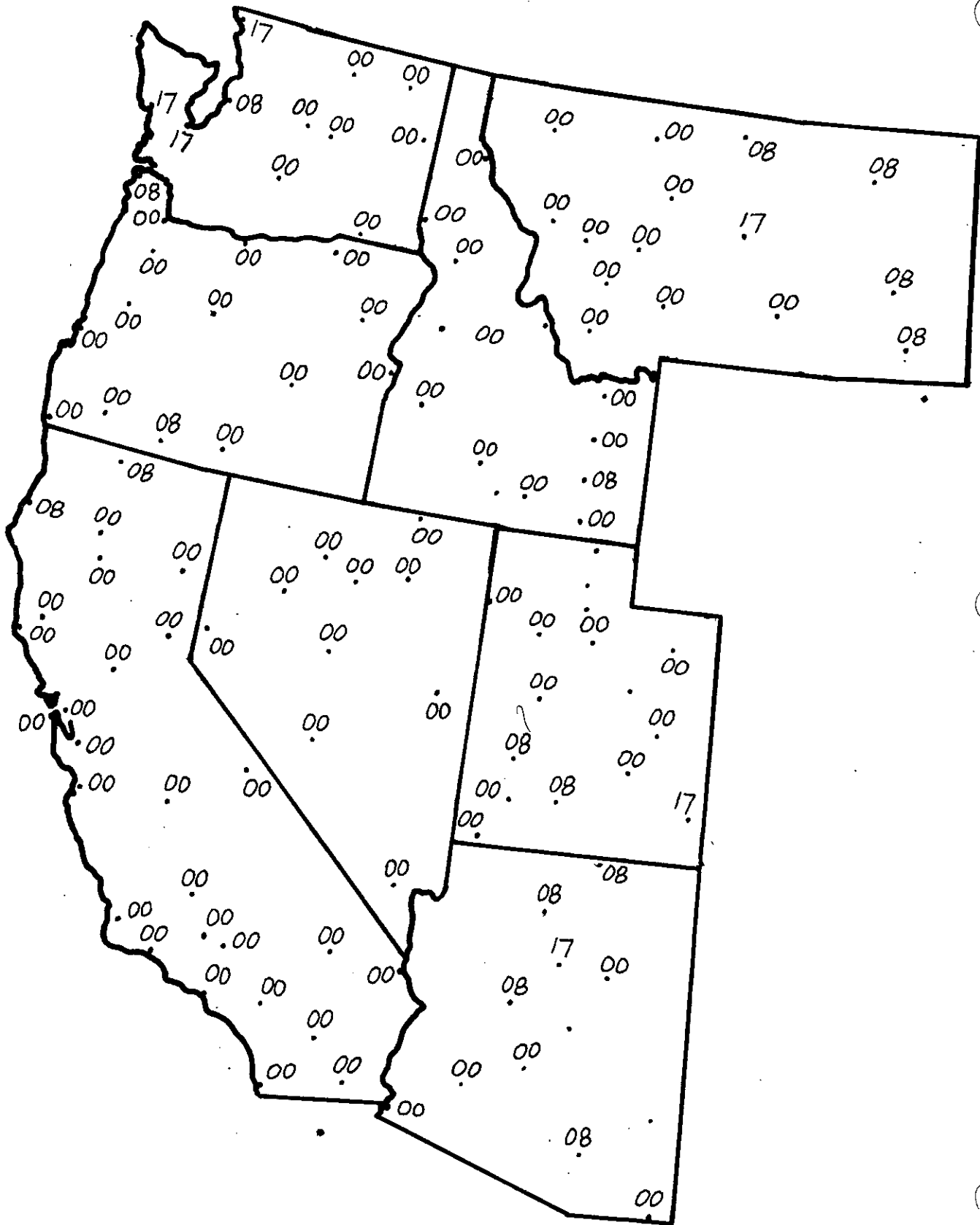
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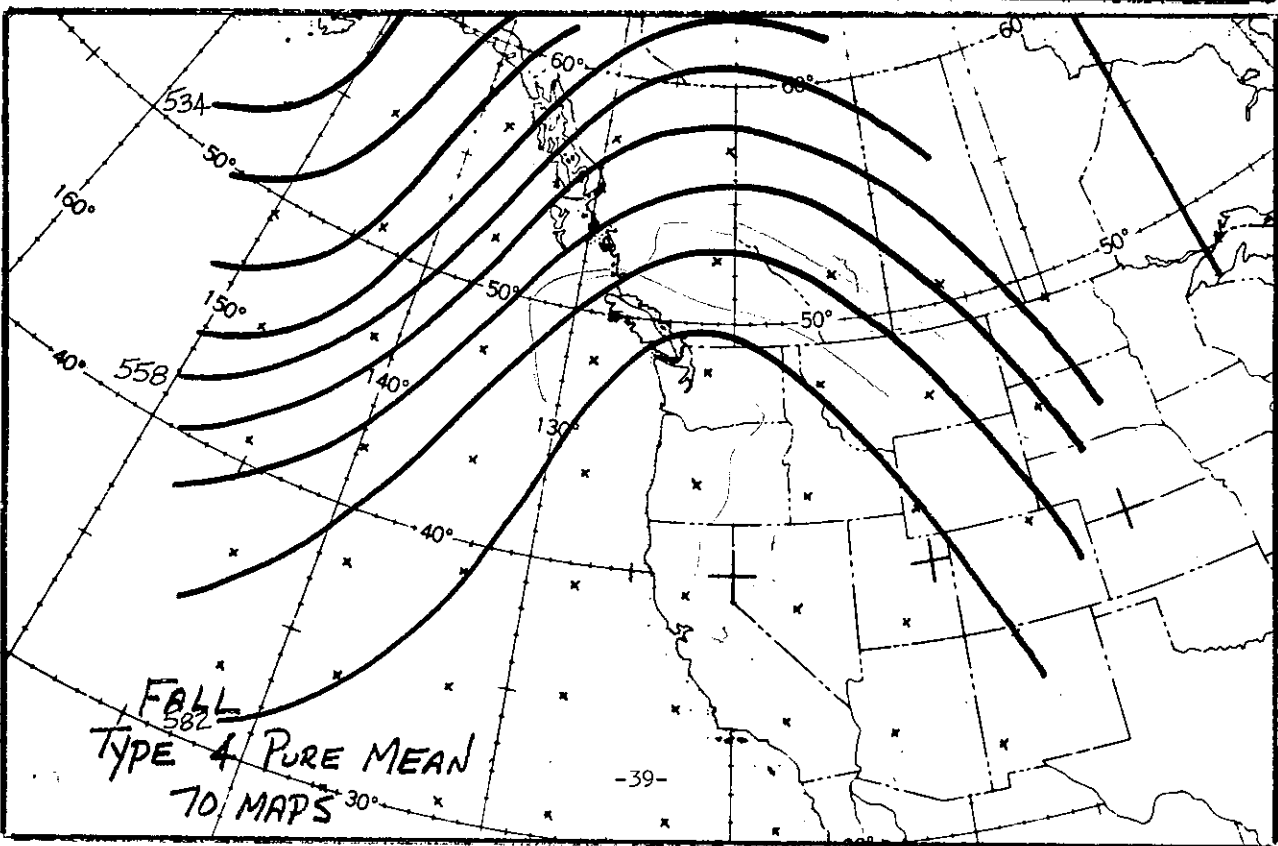
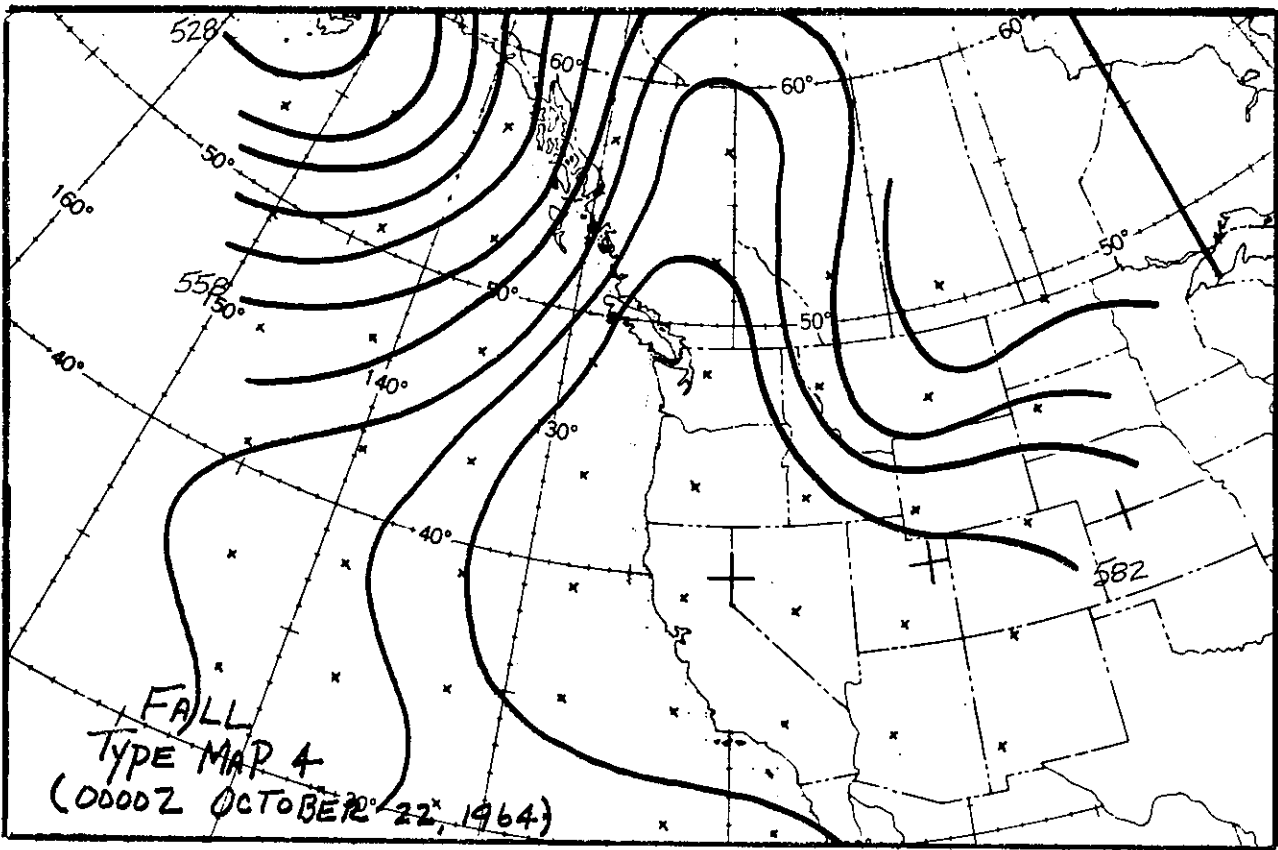




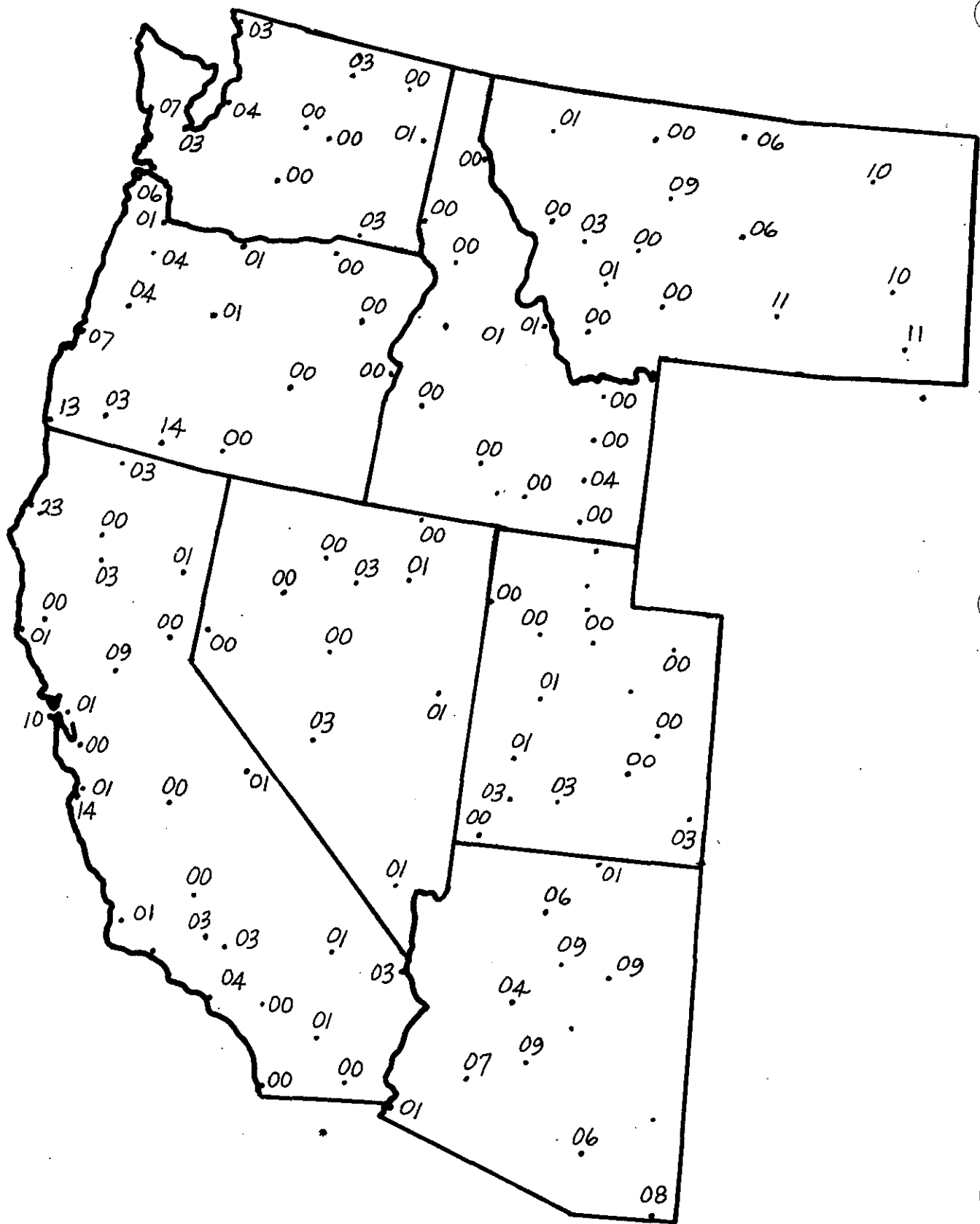


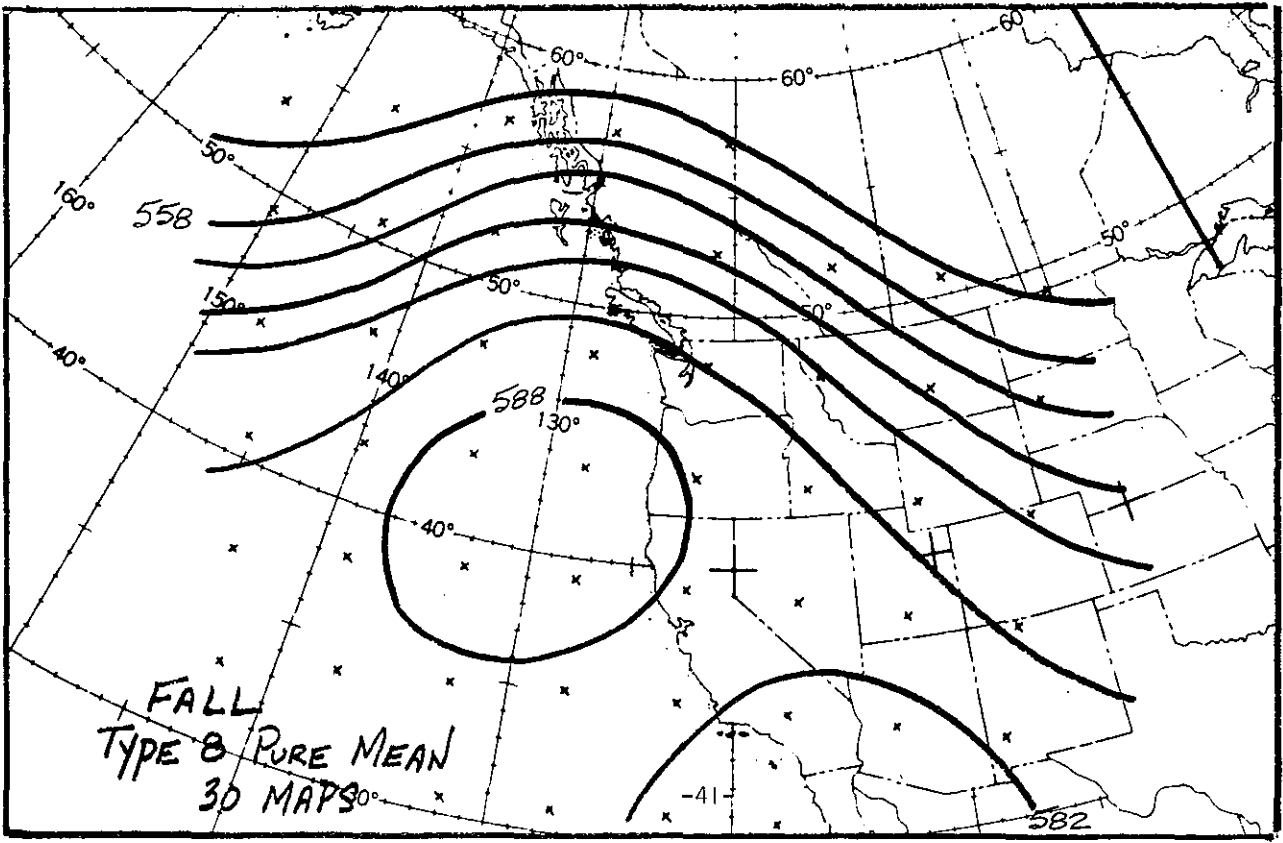
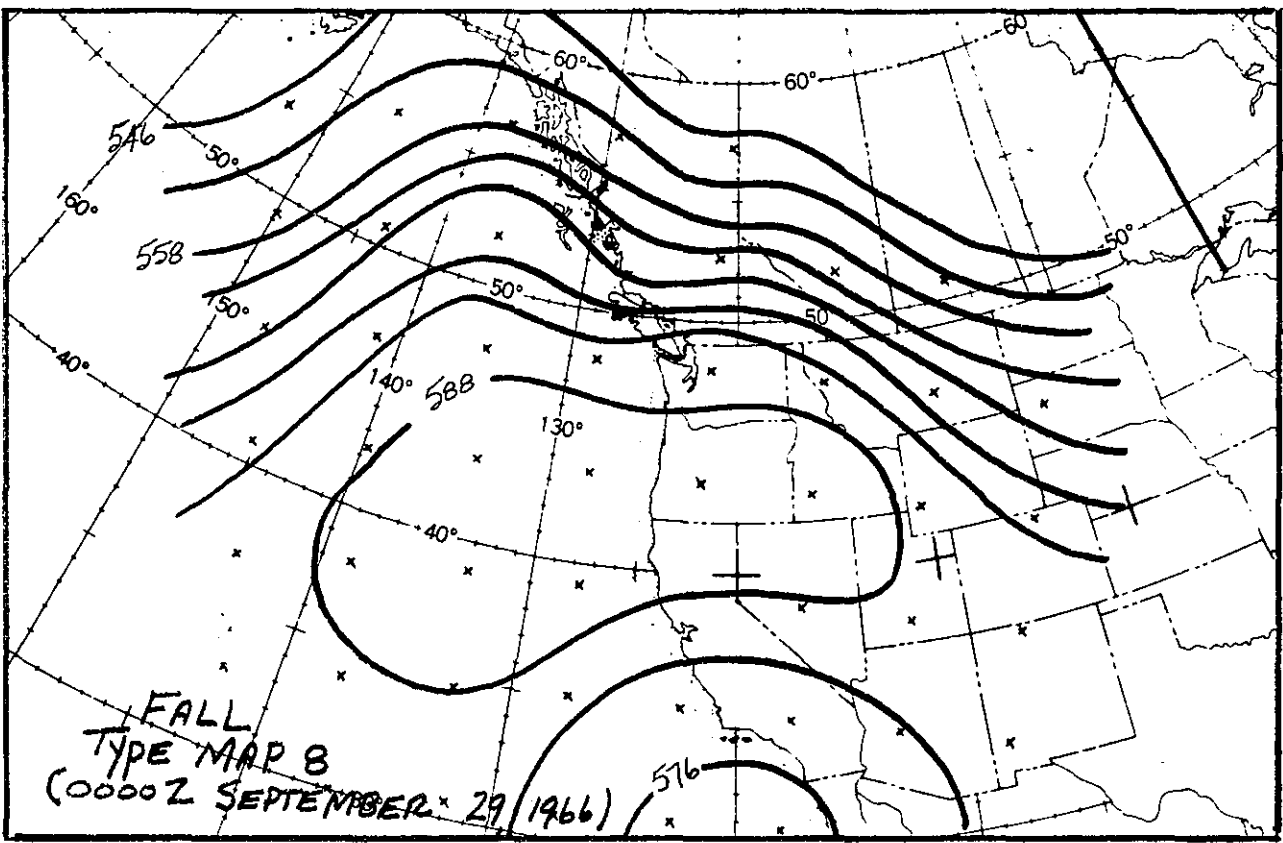
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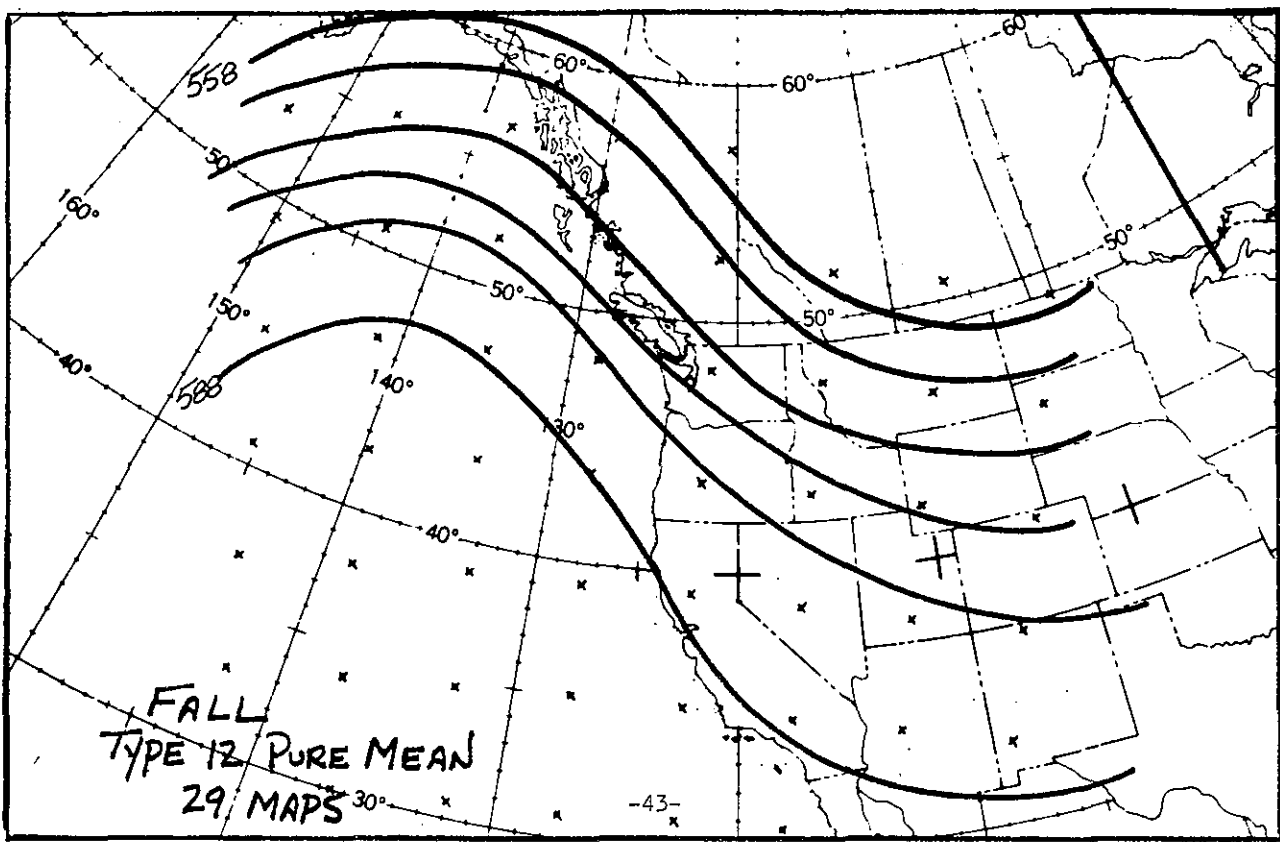
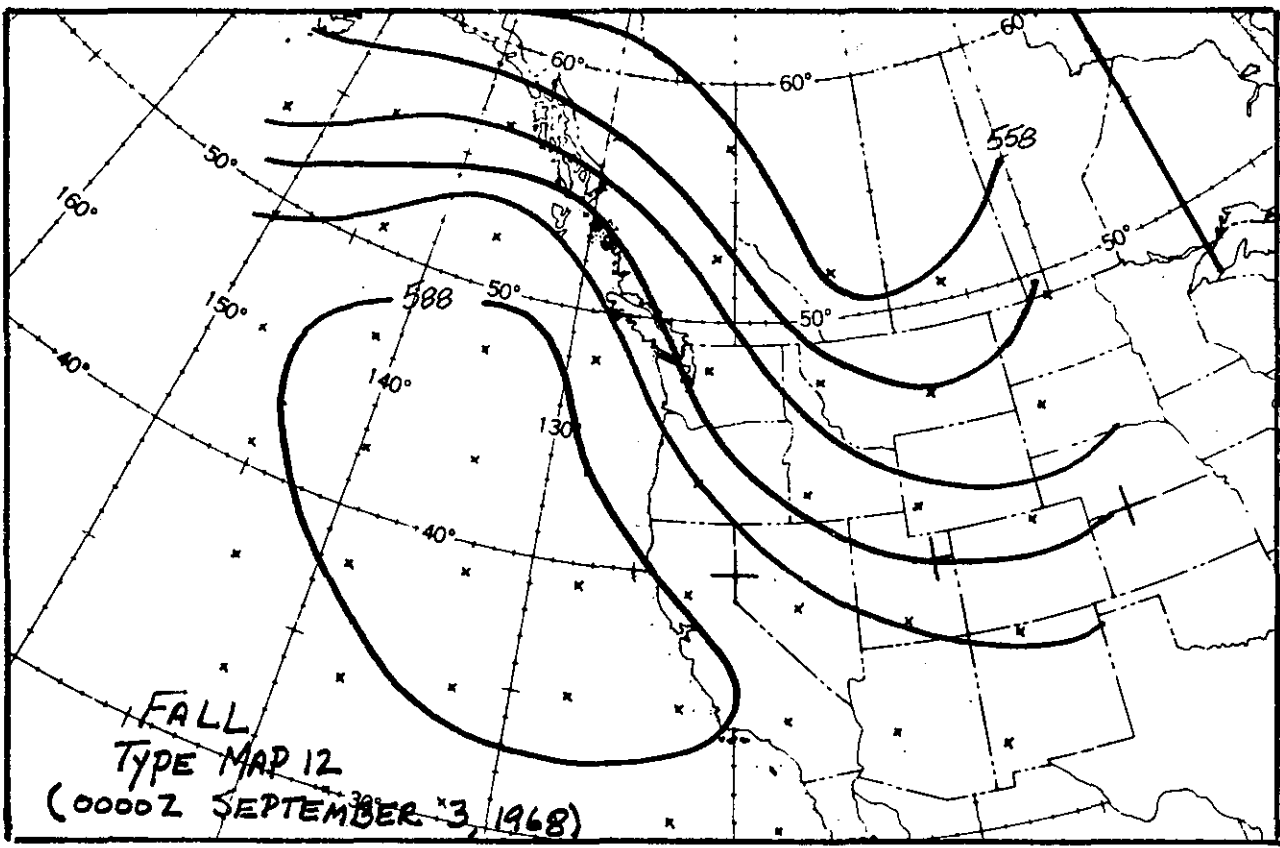


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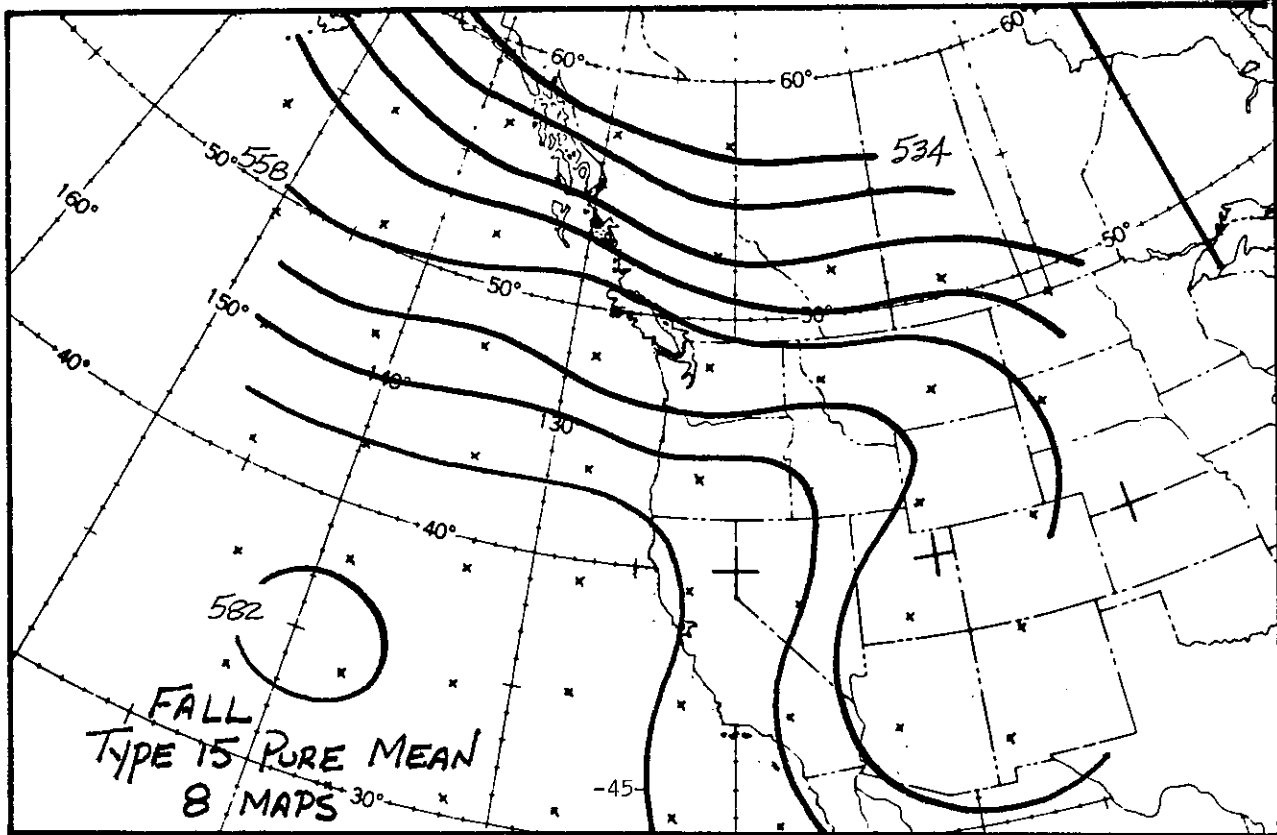
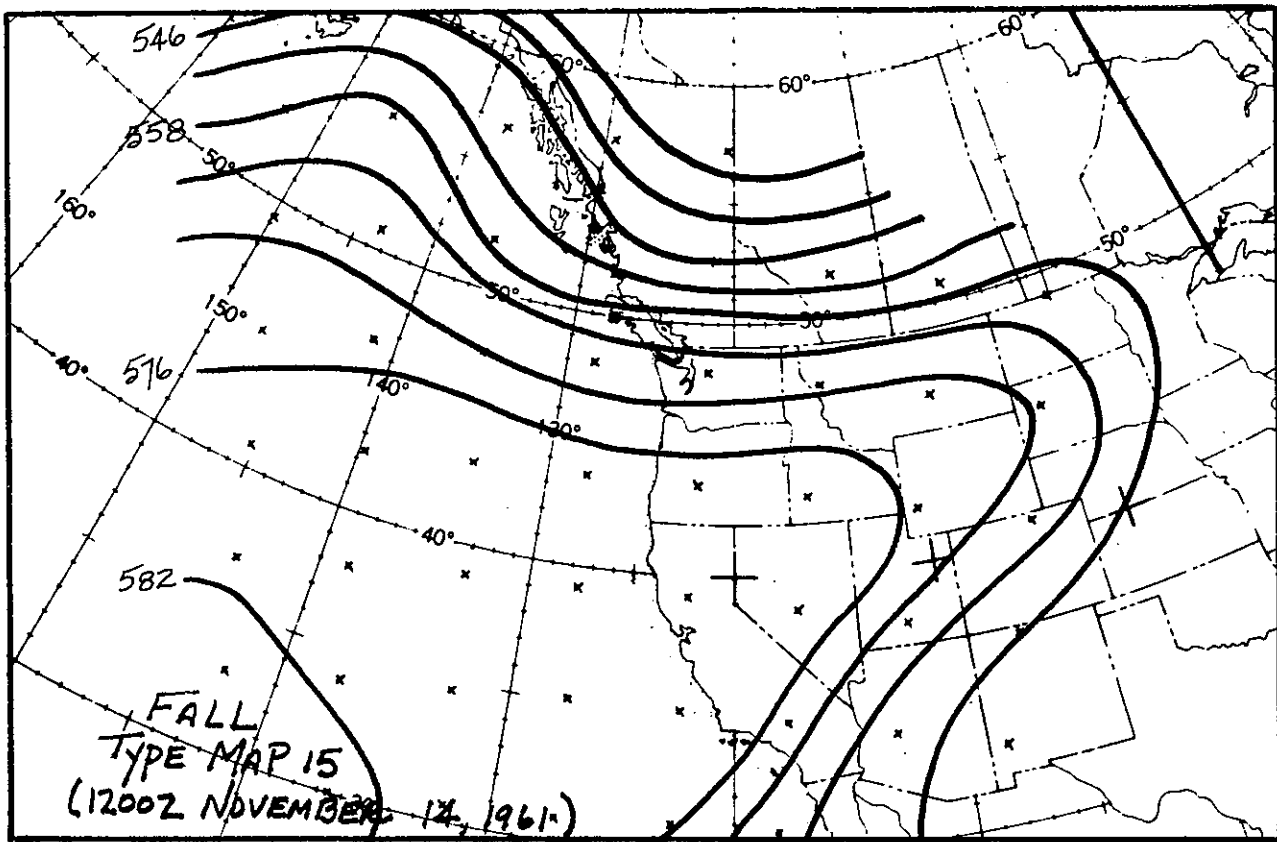




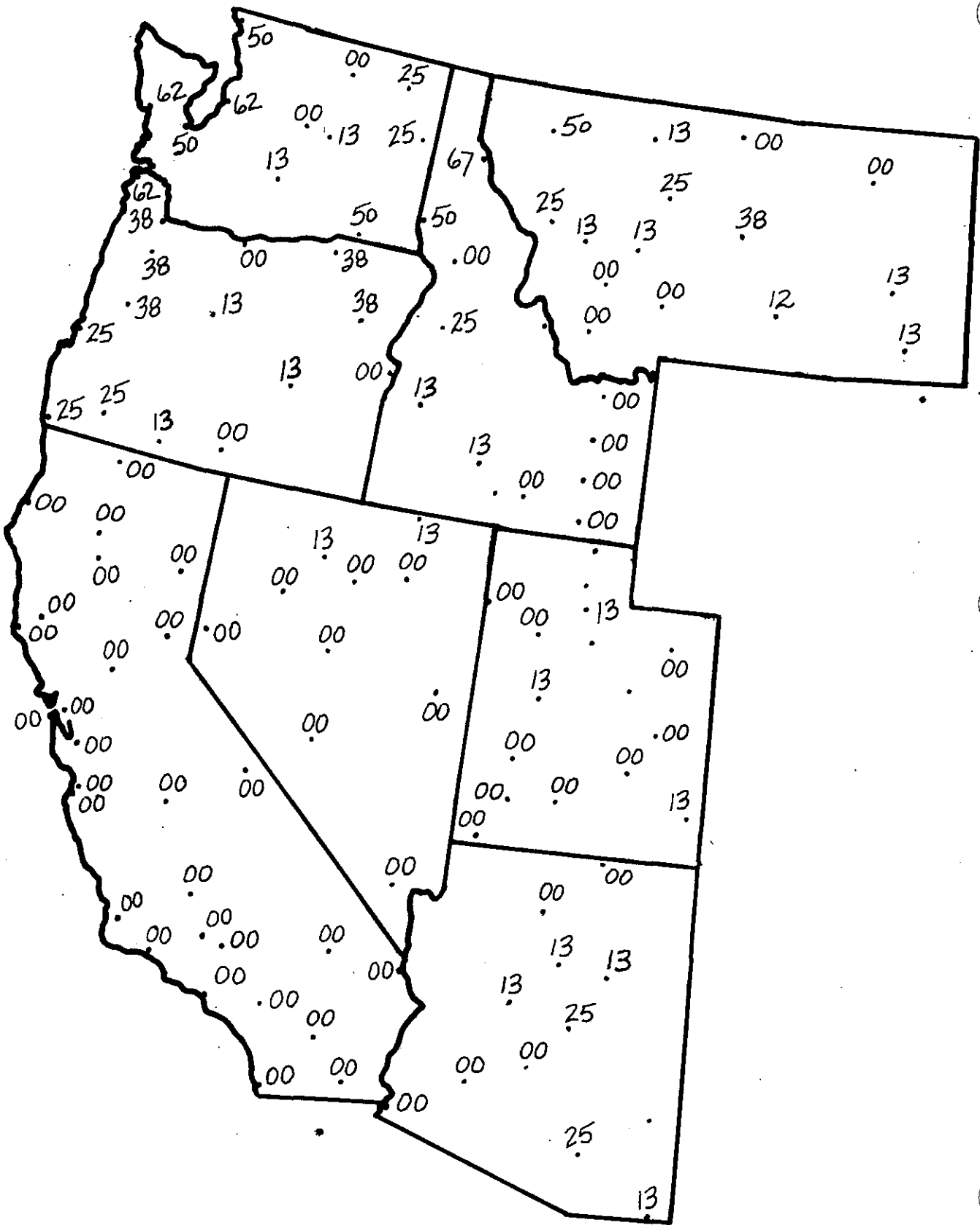


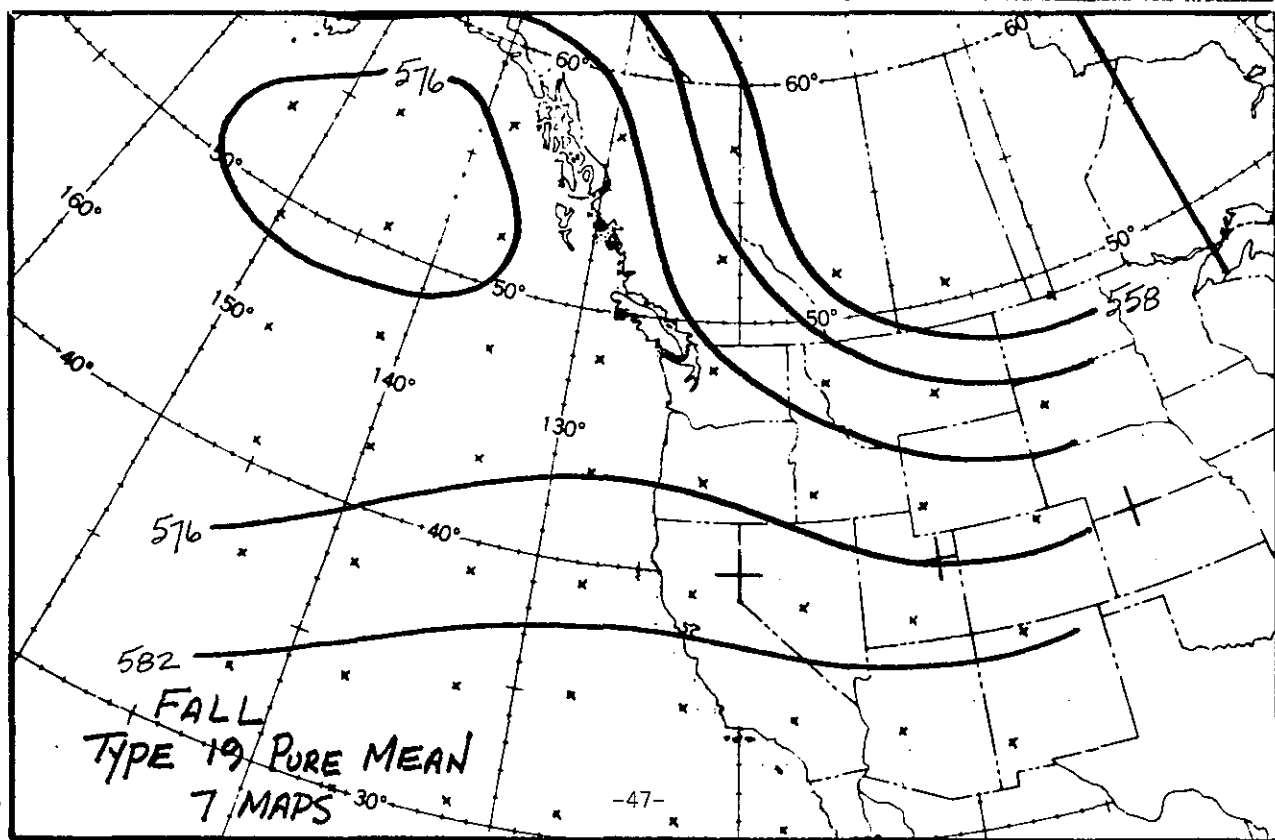
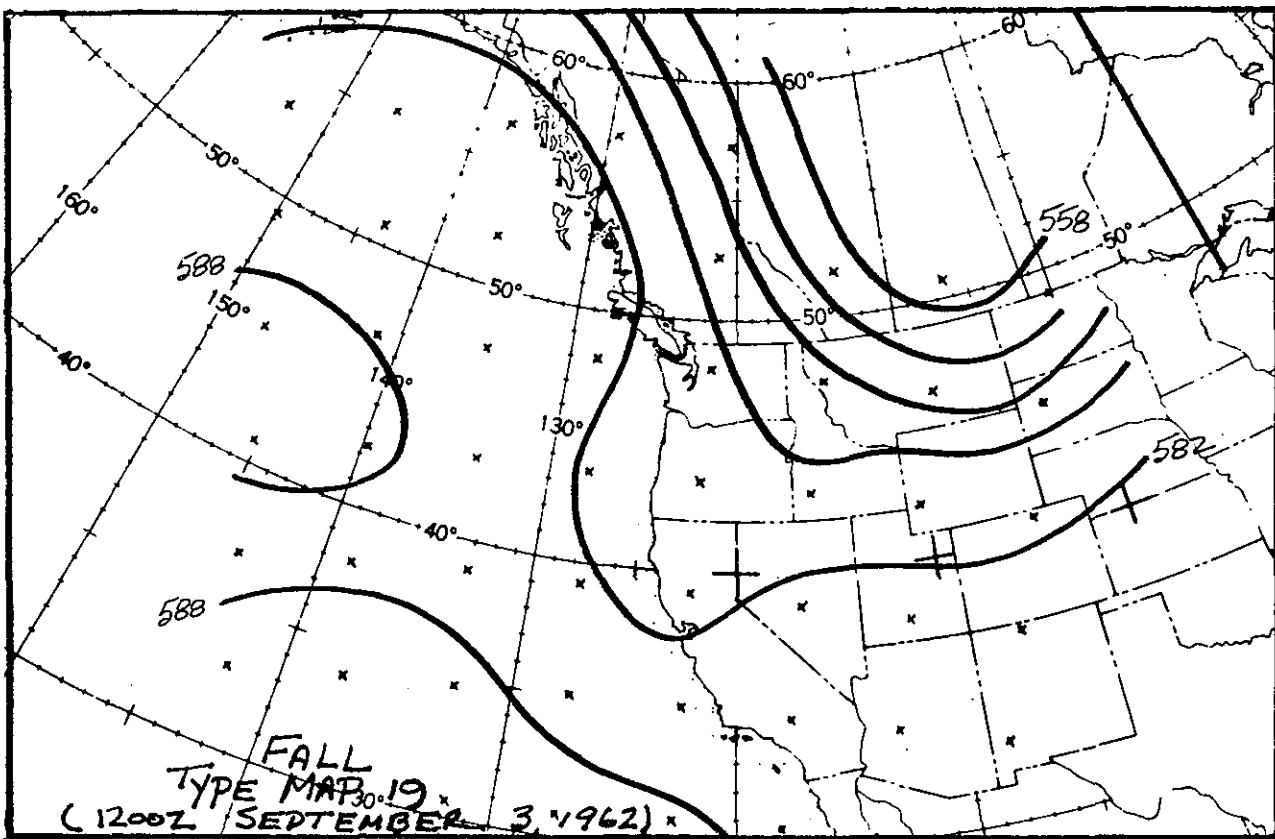




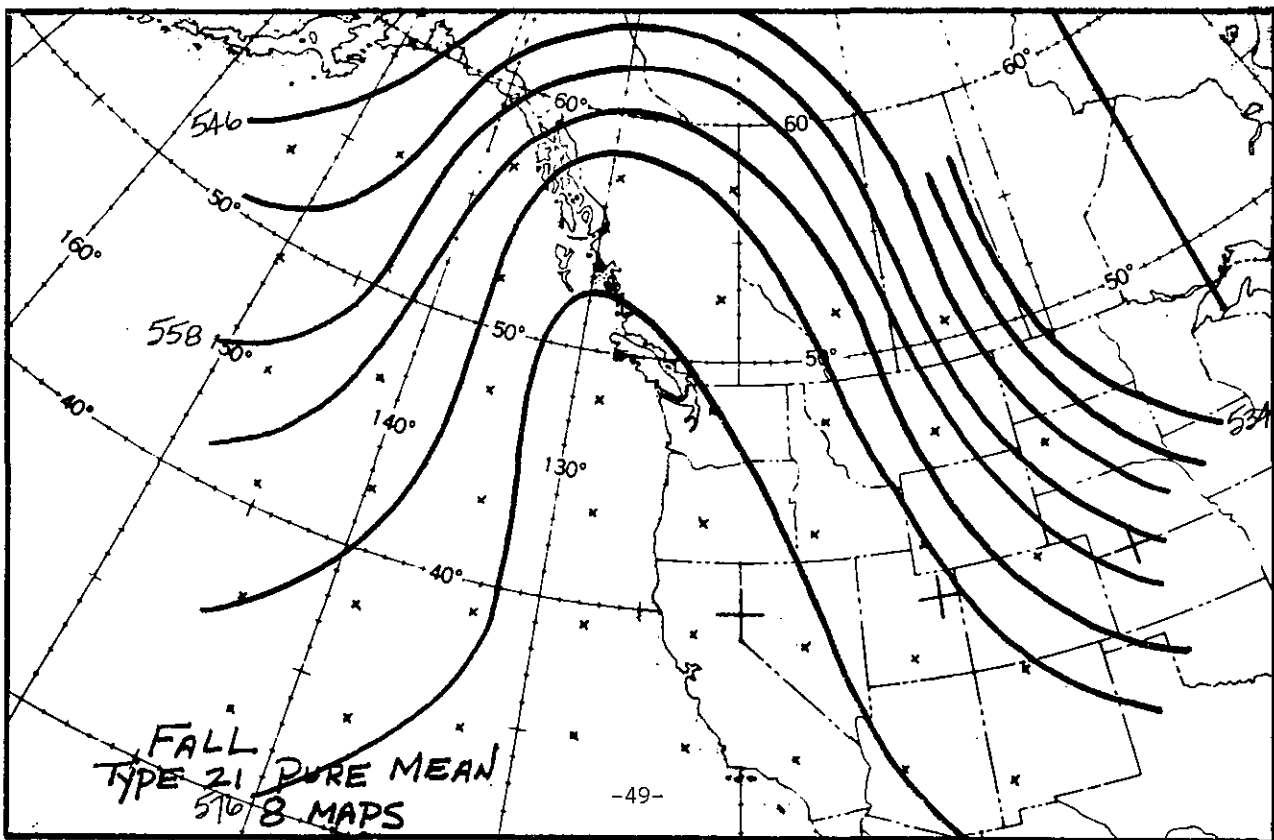
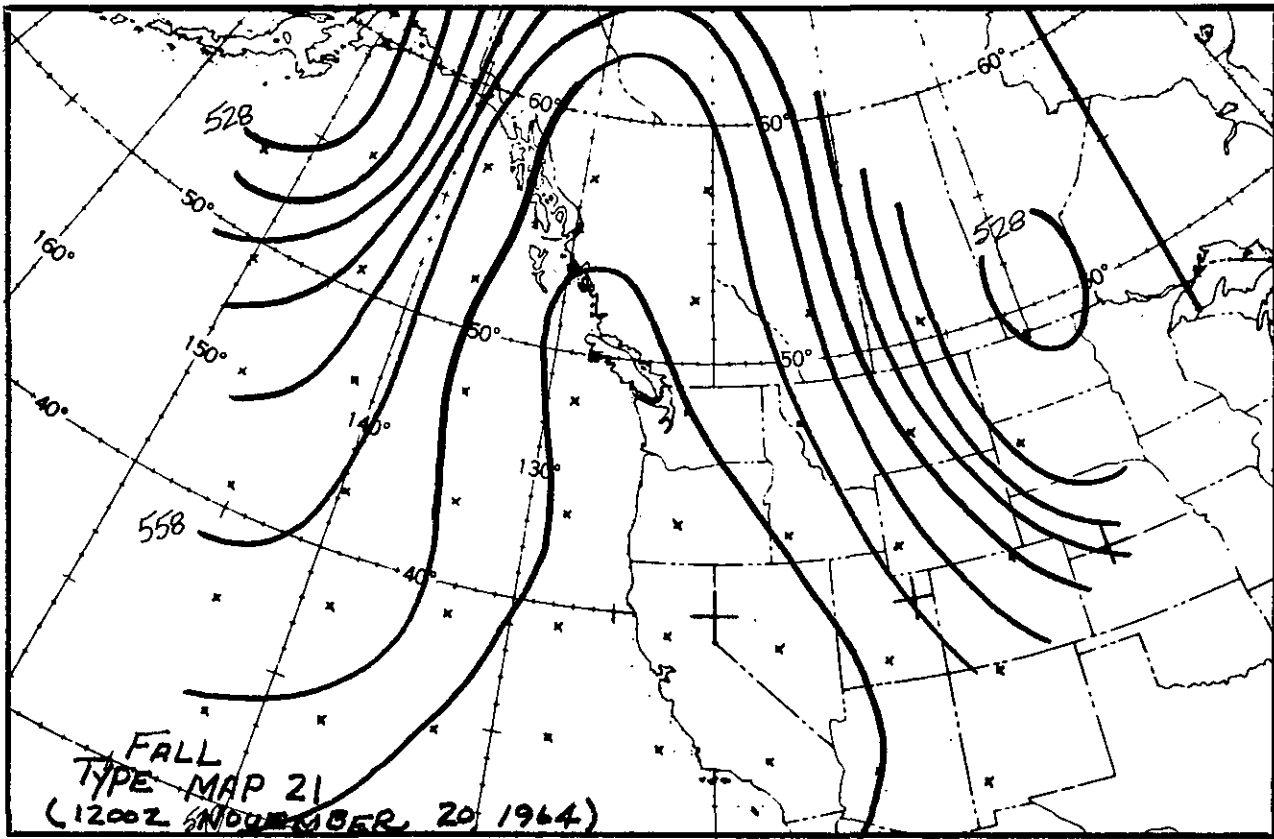


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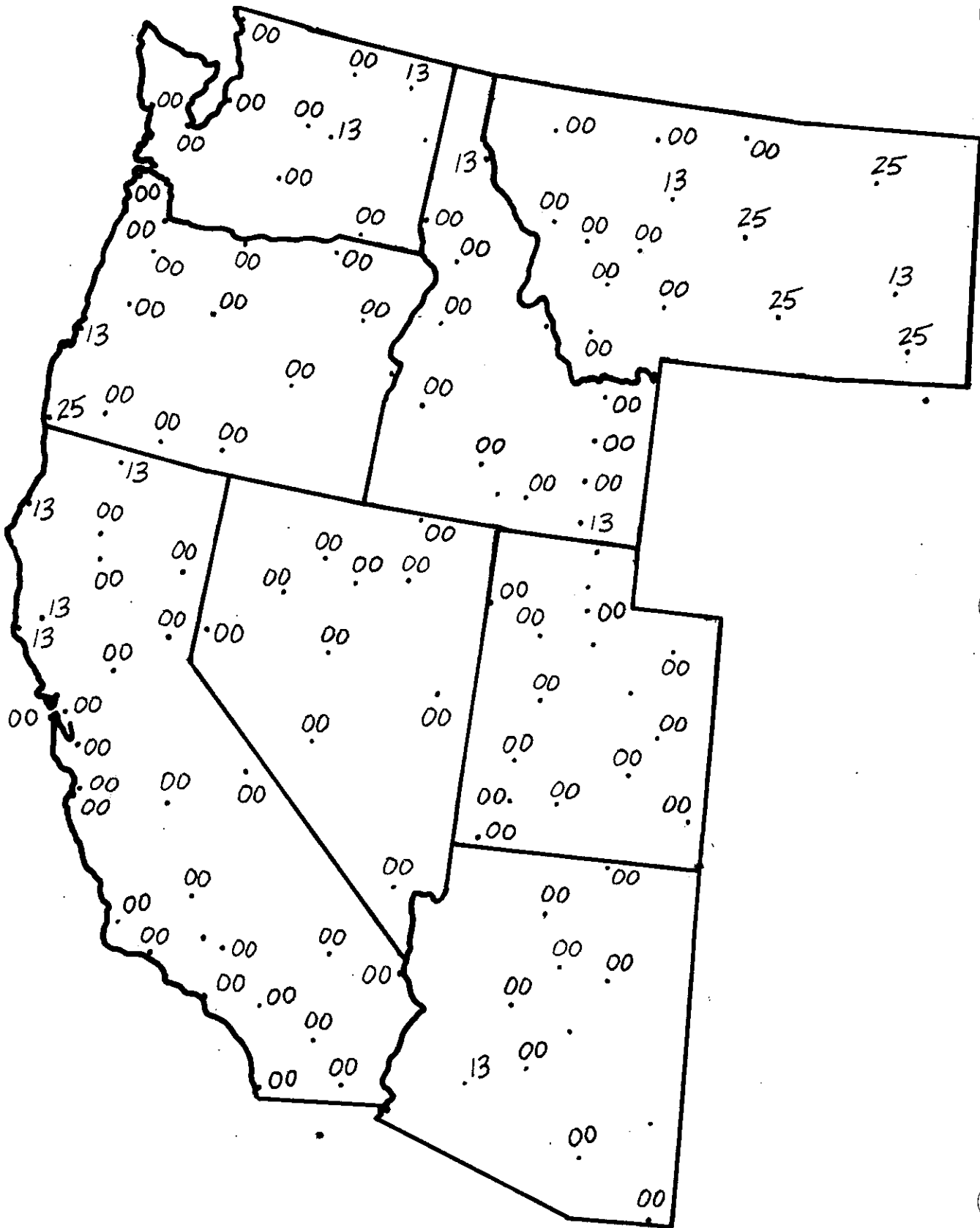


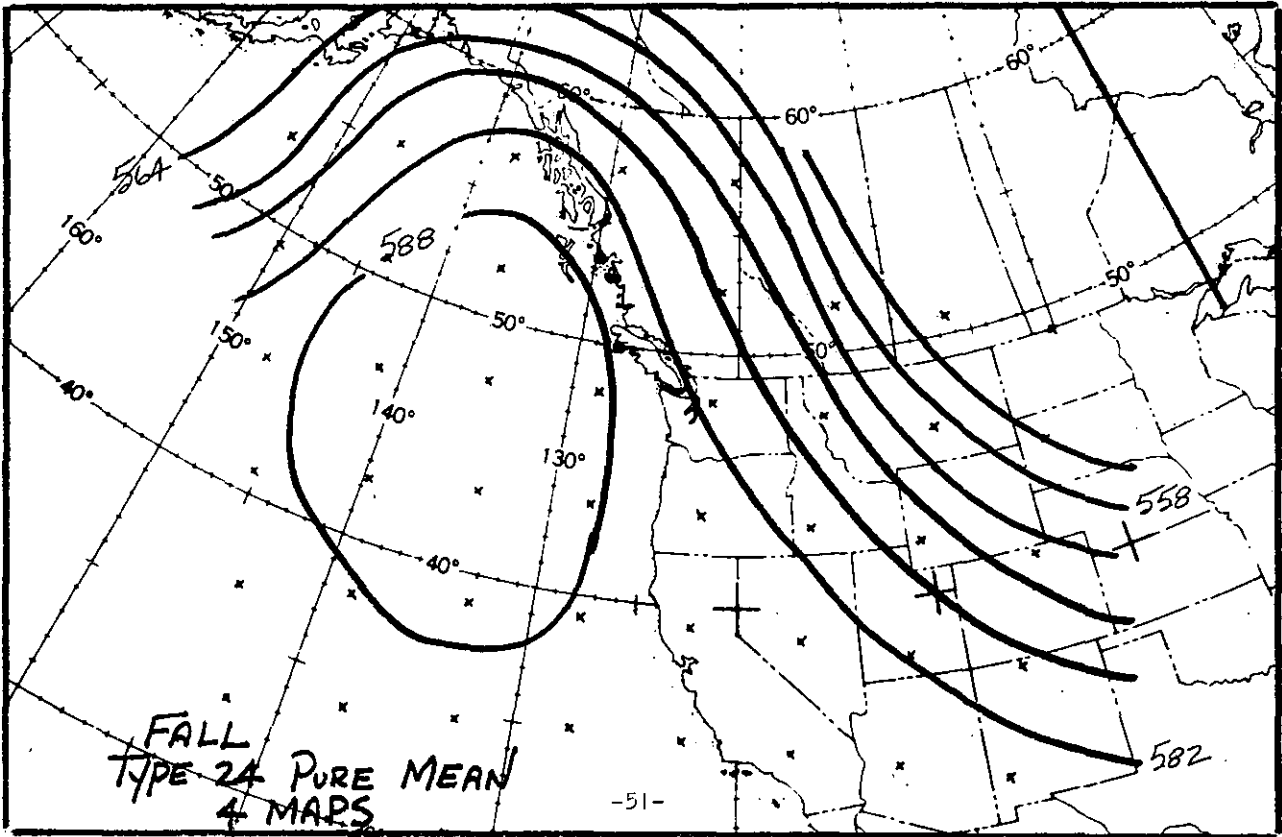
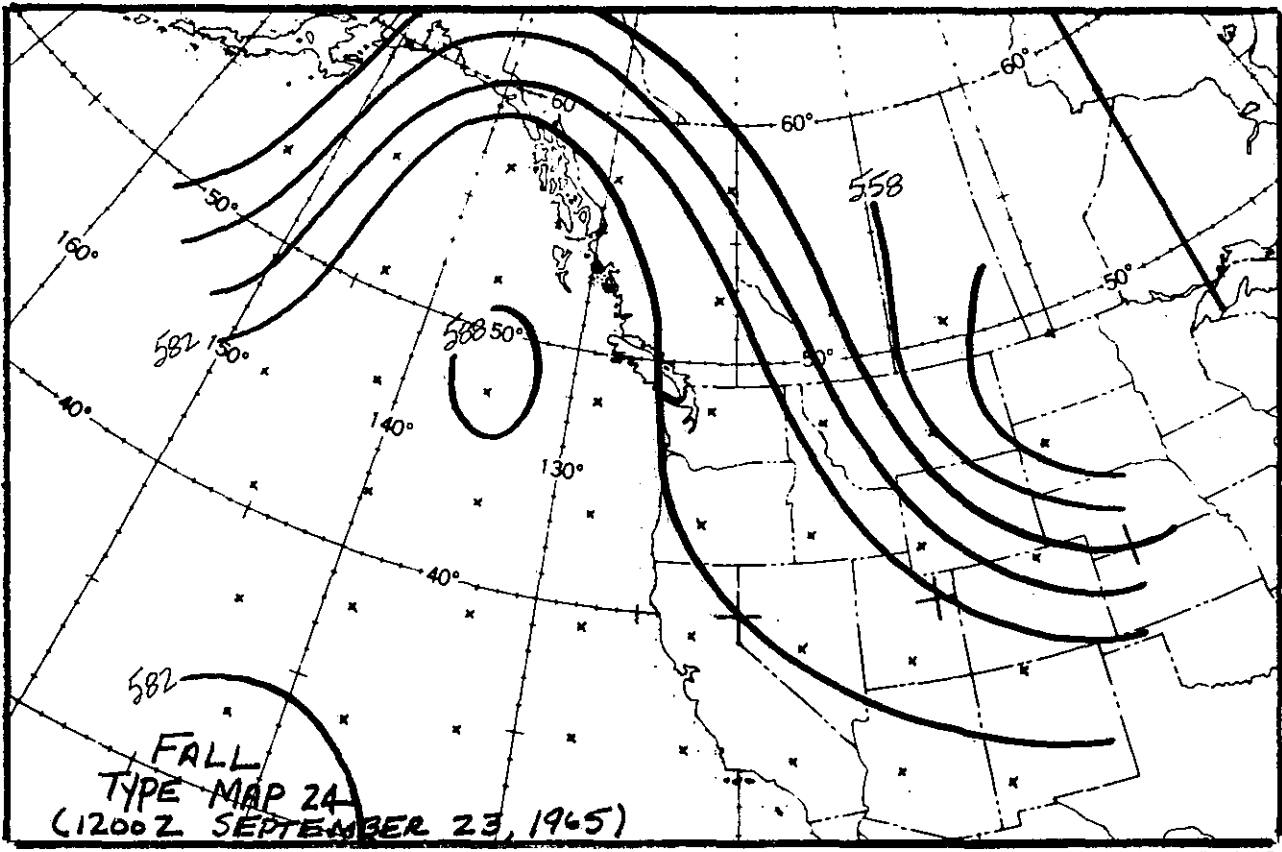




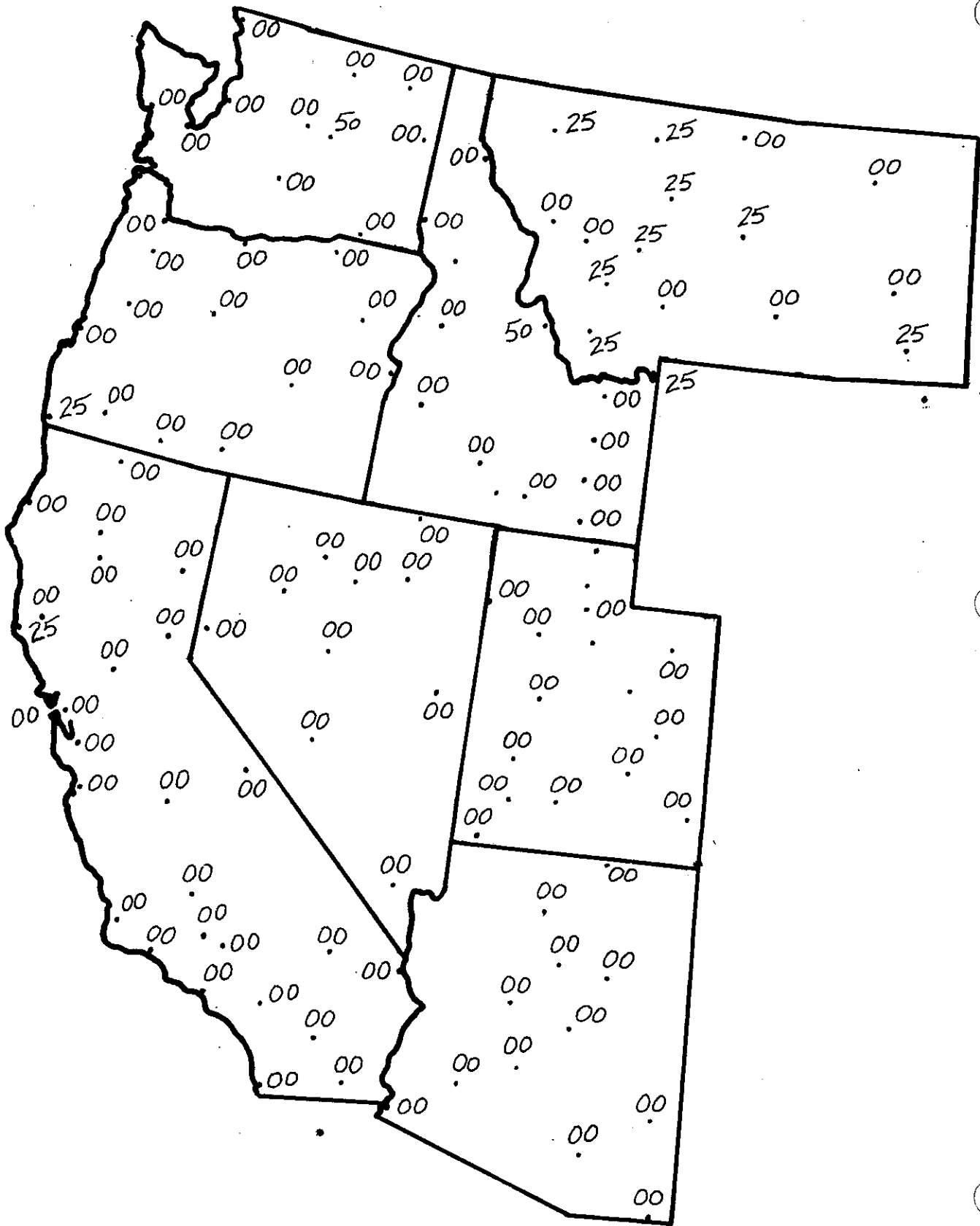


PERCENT FREQUENCY OF PRECIPITATION OCCURRENCE WITH  
500-MB FALL TYPE 21





PERCENT FREQUENCY OF PRECIPITATION OCCURRENCE WITH  
500-MB FALL TYPE 24





APPENDIX B

Listing of Maps Within Each Type

TYPE I

Sep 1961	Sep 1963	Sep 1964	Sep 1965	Sep 1966	Sep 1967	Sep 1968
9-12	1-0	11-12	30-12	3-12	1-12	7-0
12-12	1-12	12-12		4-0	2-0	7-12
13-0	2-0	13-0		5-0	2-12	8-0
13-12	2-12	13-12		5-12	3-0	8-12
14-0	13-12	14-0		6-0	3-12	9-0
14-12	14-0	14-12		15-12	4-0	9-12
15-0	21-0	15-0		16-0	7-0	11-12
15-12	21-12	15-12		16-12	7-12	12-0
16-12	22-0	16-0		17-0	8-0	12-12
17-12	23-0	16-12		17-12	8-12	13-0
19-12	23-12	17-0		18-0	9-0	13-12
21-12	24-12	28-0		25-12	9-12	14-0
22-0		28-12		26-0	10-0	14-12
22-12		29-0		26-12	10-12	15-0
27-0		29-12			11-0	18-0
27-12		30-0			12-0	23-12
28-0		30-12			12-12	24-0
28-12					21-0	24-12
29-0					21-12	25-0
29-12					22-0	25-12
30-0					22-12	26-0
30-12					23-0	26-12
					23-12	27-0
					24-12	
					25-0	
					25-12	
					28-12	
					29-12	
					30-0	

Type I (Continued)

Oct 1962	Oct 1963	Oct 1964	Oct 1965	Oct 1966	Oct 1967	Oct 1968
5-0	1-0	1-0	1-0	5-0	6-0	1-0
5-12	2-12	1-12	1-12	5-12	6-12	1-12
6-0	3-0	2-0	2-0	6-0	7-0	4-0
7-0	3-12	2-12	4-12	6-12	7-12	4-12
7-12	4-0	3-0	5-0	7-0	8-0	5-0
8-0	12-12	3-12	5-12	7-12	8-12	5-12
8-12	18-0	8-12	6-0	8-0	9-0	6-0
9-0	18-12	9-0	6-12	10-0	9-12	8-12
9-12	20-12	9-12	7-0	10-12	10-0	9-0
10-12	21-0	10-0	7-12	11-0	10-12	9-12
21-12	21-12	10-12	8-0	18-0	11-0	10-0
26-12	22-0	11-0	8-12	18-12	11-12	10-12
	22-12	11-12	9-0	19-0	12-0	11-0
	23-0	14-12	9-12	19-12	12-12	16-12
	23-12	15-0	10-0	20-0	13-0	17-0
	24-0	16-0	10-12	22-0	13-12	17-12
	24-12	16-12	11-12	22-12	14-0	18-0
	25-0	17-0	12-0	23-0	14-12	18-12
	25-12	17-12	12-12	23-12	15-0	19-0
	26-12	18-0	13-0	24-0	15-12	19-12
	27-0	23-12	13-12	24-12	16-0	20-0
	27-12	24-0	14-0	25-0	16-12	20-12
	28-0	24-12	14-12	25-12	17-0	21-0
	28-12	25-0	17-0	26-0	17-12	21-12
	29-0	25-12	17-12	26-12	18-0	22-0
	29-12	30-12	18-0	27-0	18-12	22-12
	30-0	31-0	18-12	27-12	19-0	23-0
	30-12	31-12	19-0	28-0	19-12	23-12
	31-0		19-12	28-12	20-0	24-0
	31-12		20-0	29-0	20-12	24-12
			20-12	29-12	21-0	25-0
			21-0	30-0	21-12	25-12
			28-12	30-12	22-0	26-0
			29-0	31-0	22-12	26-12
			29-12		23-0	27-0
			30-0		23-12	27-12
			30-12		24-0	30-12
			31-0		24-12	31-0
			31-12		25-0	31-12
					25-12	
					26-0	
					26-12	
					27-0	
					27-12	
					28-0	
					28-12	
					30-12	
					31-0	
					31-12	

Type 1 (Continued)

Nov 1961	Nov 1962	Nov 1963	Nov 1964	Nov 1965	Nov 1966
3-12	4-12	1-0	1-0	1-0	2-0
5-12	5-0	1-12	1-12	1-12	2-12
6-0	5-12	2-0	2-0	2-0	11-12
8-12	6-0	2-12	2-12	2-12	12-0
9-0	7-12	3-0	3-0	3-0	12-12
9-12	8-0	3-12	3-12	3-12	13-0
10-0	8-12	4-0	4-0	4-0	13-12
10-12	9-0	4-12	4-12	4-12	26-12
11-0	10-12	5-0	9-12	5-0	27-0
11-12	11-0	5-12	11-12	5-12	27-12
17-12	11-12	7-0	12-0	21-12	
18-0	12-0	7-12	22-12	27-0	
18-12	14-12	8-12	23-0	27-12	
22-12	15-0	9-0	23-12	28-0	
23-0	20-0	9-12	24-0	28-12	
23-12	20-12	10-0	24-12	29-0	
	21-0	10-12	28-12	29-12	
	21-12	22-12	29-0	30-0	
	22-0	23-0	29-12	30-12	
	22-12	23-12	30-0		
	23-0	26-0	30-12		
	23-12	26-12			
	24-0	27-0			
	24-12	27-12			
	25-0	28-0			
	25-12	28-12			
	26-0	29-0			
	26-12	30-0			
	27-0	30-12			
	28-0				
	28-12				
	29-0				
	29-12				
	30-0				
	30-12				

TYPE 2

Sep 1962    Sep 1963    Sep 1966    Sep 1967    Sep 1968

18-0	3-0	8-0	4-12	10-0
18-12	8-12	8-12	5-0	10-12
19-0	9-0	9-0	5-12	11-0
26-12	9-12	9-12	6-0	
	10-0	22-0	6-12	
	10-12	22-12	29-0	
	11-0	23-0		
	11-12	23-12		
	12-0	24-0		
	12-12	24-12		
	13-0	25-0		
	22-12			
	24-0			
	25-0			
	25-12			
	26-0			
	26-12			
	27-0			
	27-12			
	28-0			
	28-12			
	29-12			
	30-0			

Oct 1962    Oct 1963    Oct 1964    Oct 1965    Oct 1968

1-0	8-0	8-0	3-0	28-0
1-12	8-12	12-0	3-12	28-12
2-0	9-0	12-12	4-0	29-0
2-12	9-12	13-0	24-0	
29-0	10-0		26-12	
29-12	10-12		27-0	
30-0	11-0		28-0	
	11-12			
	13-0			
	13-12			
	14-0			
	14-12			
	15-0			
	19-12			
	20-0			

Nov 1962    Nov 1963    Nov 1964    Nov 1965    Nov 1966

3-12	11-0	22-0	4-0	14-0
4-0	11-12		8-0	14-12
12-12	12-0		8-12	28-0
	12-12		9-0	28-12
	13-0		9-12	29-0
	13-12		18-0	

TYPE 3

Sep 1962    Sep 1963    Sep 1966    Sep 1967    Sep 1968

20-0	8-0	13-0	1-0	29-12
20-12	19-0	13-12	18-0	30-0
21-0	19-12	14-0	18-12	30-12
26-0	20-0	14-12	24-0	
	20-12	15-0	28-0	
	30-12	18-12		
		19-0		
		19-12		
		20-0		
		20-12		
		21-0		
		21-12		

Oct 1963    Oct 1964

12-0	13-12
15-12	14-0
16-0	29-12
16-12	30-0
17-0	
17-12	

TYPE 4

Sep 1962    Sep 1966    Sep 1967    Sep 1968

23-12	4-12	13-0	29-0
24-0		13-12	
24-12		14-0	
25-0		14-12	
25-12		15-0	
		15-12	
		16-0	
		16-12	
		17-0	
		17-12	
		26-0	
		26-12	
		27-0	
		27-12	

Oct 1962    Oct 1963    Oct 1964    Oct 1965    Oct 1968

24-0	1-12	4-12	11-0	3-0
24-12	2-0	5-0	21-12	3-12
25-0		5-12	22-0	
25-12		6-12	22-12	
26-0		7-0	23-0	
27-0		7-12	23-12	
27-12		18-12	24-12	
28-0		19-0	25-0	
28-12		19-12	25-12	
30-12		20-12	26-0	
31-0		21-0	27-12	
31-12		21-12		
		22-0		
		22-12		
		23-0		

Nov 1961    Nov 1962    Nov 1963    Nov 1966

7-0	1-12	29-12	1-0
7-12			1-12
8-0			

TYPE 5

Sep 1964	Sep 1966	Sep 1967
17-12	6-12	30-12
	7-0	
	7-12	
	10-0	
	10-12	
	11-0	

Oct 1962	Oct 1963	Oct 1964	Oct 1965	Oct 1966	Oct 1967	Oct 1968
3-0	4-12	26-0	15-0	20-12	1-0	11-12
3-12	5-0	26-12			1-12	12-0
4-0	5-12	27-0			2-0	12-12
10-0					2-12	13-0
11-0					3-0	13-12
11-12					3-12	14-0
12-12					4-0	29-12
13-0					4-12	30-0
13-12					5-0	
14-0					5-12	
14-12						

Nov 1961	Nov 1962	Nov 1963	Nov 1964	Nov 1965	Nov 1966
24-0	13-0	6-0	8-0	6-0	15-0
24-12	13-12	6-12	10-0	10-0	15-12
27-0	14-0	14-0		10-12	16-0
27-12	27-12	14-12		17-12	16-12
29-12		15-0		19-12	20-0
30-0		15-12		23-0	20-12
30-12				23-12	21-0
				24-0	
				24-12	

TYPE 6

Sep 1962	Sep 1963	Sep 1964	Sep 1965	Sep 1967	Sep 1968
10-0	14-12	18-0	27-12	11-12	15-12
10-12	15-0	20-12	28-0		18-12
11-0	15-12				19-0
11-12	16-0				19-12
12-0	16-12				20-0
	17-12				20-12
	18-0				21-0
	18-12				21-12

Oct 1962	Oct 1965	Oct 1966	Oct 1968
15-0	15-12	11-12	6-12
	16-0	12-0	7-0
		12-12	7-12
		13-0	8-0
		14-12	14-12
		15-0	15-0
		15-12	15-12
		17-12	
		21-0	
		21-12	

Nov 1961	Nov 1962	Nov 1963	Nov 1964	Nov 1965	Nov 1966
19-12	15-12	16-0	11-0	21-0	10-0
20-0	16-0	16-12	12-12	22-0	23-12
20-12	16-12	17-0	13-0	22-12	24-0
21-0		17-12	13-12	25-0	25-12
21-12		18-0	25-0	25-12	26-0
		19-0	25-12		
		19-12	26-0		
		20-0	26-12		
		20-12	27-0		
			27-12		
			28-0		



TYPE 7

Sep 1962	Sep 1964	Sep 1965	Sep 1966	Sep 1967	Sep 1968
8-12	18-12	28-12	1-0	19-0	16-0
9-0	19-0	29-0	1-12	19-12	16-12
23-0	19-12	30-0	2-0	20-0	17-0
	21-12		2-12		22-0
	22-0		3-0		22-12
	22-12		27-0		23-0
			27-12		27-12
					28-0
					28-12

Oct 1962	Oct 1965	Oct 1966	Oct 1967	Oct 1968
15-12	16-12	3-12	29-0	16-0
16-0		4-0	29-12	
18-12		4-12	30-0	
19-0		13-12		
19-12		14-0		
20-0		16-0		
		16-12		

Nov 1961	Nov 1962	Nov 1963	Nov 1965	Nov 1966
2-12	17-0	24-12	26-0	4-0
4-12	17-12	25-0	26-12	4-12
5-0	18-0	25-12		9-0
12-0	18-12			24-12
12-12	19-0			25-0
13-0	19-12			
13-12				
16-0				
16-12				
17-0				
22-0				

TYPE 8

Sep 1964	Sep 1966	Sep 1967	
23-0	28-0	20-12	
23-12	28-12		
24-0	29-0		
24-12	29-12		
25-0	30-0		
	30-12		

Oct 1962	Oct 1964	Oct 1966	Oct 1968
18-0	4-0	1-0	2-0
20-12		1-12	2-12
21-0		9-0	
22-0		9-12	
22-12		31-12	
23-0			
23-12			

Nov 1961	Nov 1962	Nov 1966
6-12	1-0	3-0

TYPE 9

Sep 1962	Sep 1964	Sep 1965	Sep 1968	Nov 1966
1-0	27-12	1-0	1-0	5-0
1-12		1-12	6-0	
5-0			6-12	
6-0				
6-12				

TYPE 10

Nov 1961	Nov 1963	Nov 1965
19-0	18-12	11-0
	21-0	
	21-12	
	22-0	

TYPE 11

Nov 1961	Nov 1965
26-12	16-12

TYPE 12

Sep 1962	Sep 1964	Sep 1965	Sep 1968	Oct 1966	Nov 1961	Nov 1966
7-0	25-12	2-0	2-0	2-0	2-0	3-1
8-0	26-0	14-12	2-12	2-12	3-0	6-12
	26-12	15-0	3-0	3-0	4-0	11-0
	27-0	15-12	3-12		15-0	
		16-0	4-0			
		24-12	4-12			
		25-0				

TYPE 13

Sep 1962	Sep 1964	Sep 1965	Nov 1965	Nov 1966
2-0	2-12	3-0	11-12	10-12
	3-0	9-0		
	4-0	9-12		
	5-0	10-0		
	10-0	10-12		
	10-12	11-0		
	11-0	11-12		
		12-0		
		12-12		
		13-0		
		13-12		
		14-0		
		27-0		

TYPE 14

Sep 1962	Oct 1964	Nov 1964	Nov 1965
16-0	27-12	5-0	15-12
17-0	28-0	5-12	16-0
	28-12	6-0	20-0
	29-0	6-12	20-12
		7-0	
		7-12	
		8-12	
		9-0	

TYPE 15

Sep 1968	Oct 1966	Nov 1961	Nov 1966
1-12	8-12	1-12	9-12
17-12	17-0	14-0	
		14-12	

TYPE 16

Sep 1966	Oct 1962
11-12	4-12
12-0	
12-12	

TYPE 17

Sep 1964	Sep 1965	Nov 1966
2-0	2-12	5-12
5-12	3-12	6-0
6-0	4-0	7-0
7-0	4-12	7-12
	5-0	8-0
	5-12	22-12
	6-0	23-0
	6-12	
	8-0	
	8-12	
	25-12	
	26-0	

TYPE 18

Nov 1961	Nov 1965	Nov 1966
28-0	6-12	17-0
28-12	7-0	17-12
29-0	7-12	18-0
	13-12	18-12
	17-0	19-12
	18-12	29-12
	19-0	30-0
		30-12

TYPE 19

Sep 1962	Nov 1965
2-12	12-0
3-0	12-12
3-2	
4-0	
4-12	

TYPE 20

Sep 1964	Sep 1965	Nov 1966
4-12	26-12	21-12
7-12		22-0
8-0		
8-12		
9-0		

TYPE 21

Sep 1968	Oct 1964	Nov 1964
5-0	6-0	19-12
5-12		20-0
		20-12
		21-0
		21-12

TYPE 22

Sep 1965	Nov 1964	Nov 1966
16-12	14-12	8-12
17-0		
17-12		
18-0		
18-12		
19-0		
19-12		
20-0		
21-0		
21-12		
22-0		

TYPE 23

Oct 1963	Nov 1966
6-12	19-0
7-0	
7-12	

TYPE 24

Sep 1965
22-12
23-0
23-12
24-0

TYPE 25

Nov 1964
15-0
16-0
16-12
17-0
17-12
18-0
18-12
19-0

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