

EXTRA



WEATHER BUREAU
Western Region
Salt Lake City, Utah
January 1970

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

Richard P. Augulis

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Zimmerman			
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Williams			
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File			



Technical Memorandum WBTM WR 45-3 mo

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

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ENVIRONMENTAL SCIENCE SERVICES ADMINISTRATION
WEATHER BUREAU

Weather Bureau Technical Memorandum WR-45/3

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

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

1. INTRODUCTION

Precipitation probabilities associated with summer 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 summer season consisted of 1072 maps for 0000 and 1200GMT June 1963-1968, July 1963-1968, and August 1963-1968. Climatologies for 12-hour precipitation were calculated for the same station network in the Western Region.

Maps of the summer 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 125-140°W.--types 3, 5, 10, 24, 28, 29

Trough 115-125°W.--types 4, 12, 13, 15, 17, 25, 26

Ridge 130-140°W.--types 8, 19, 20, 21, 22, 23

Ridge 110-115°W.--types 2, 6, 9

Zonal flow--type 1

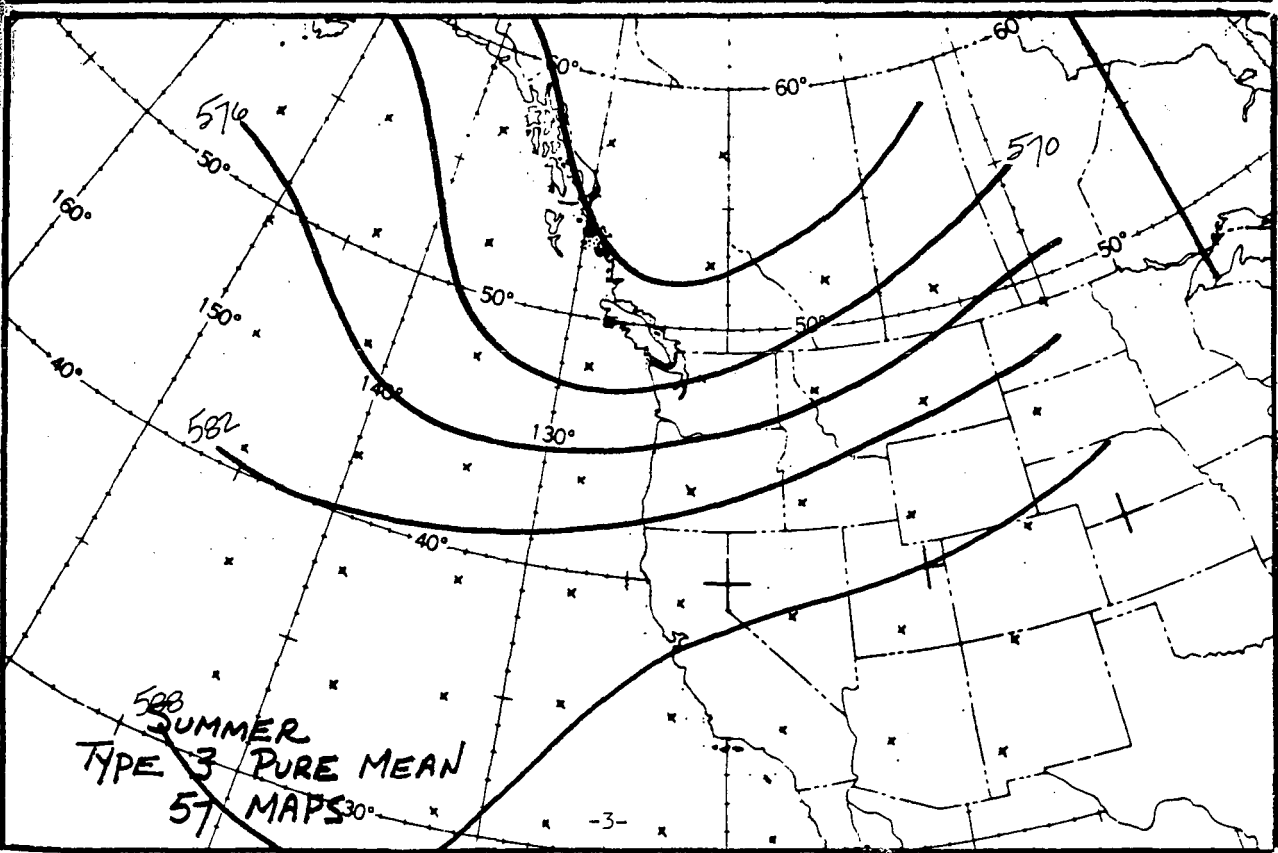
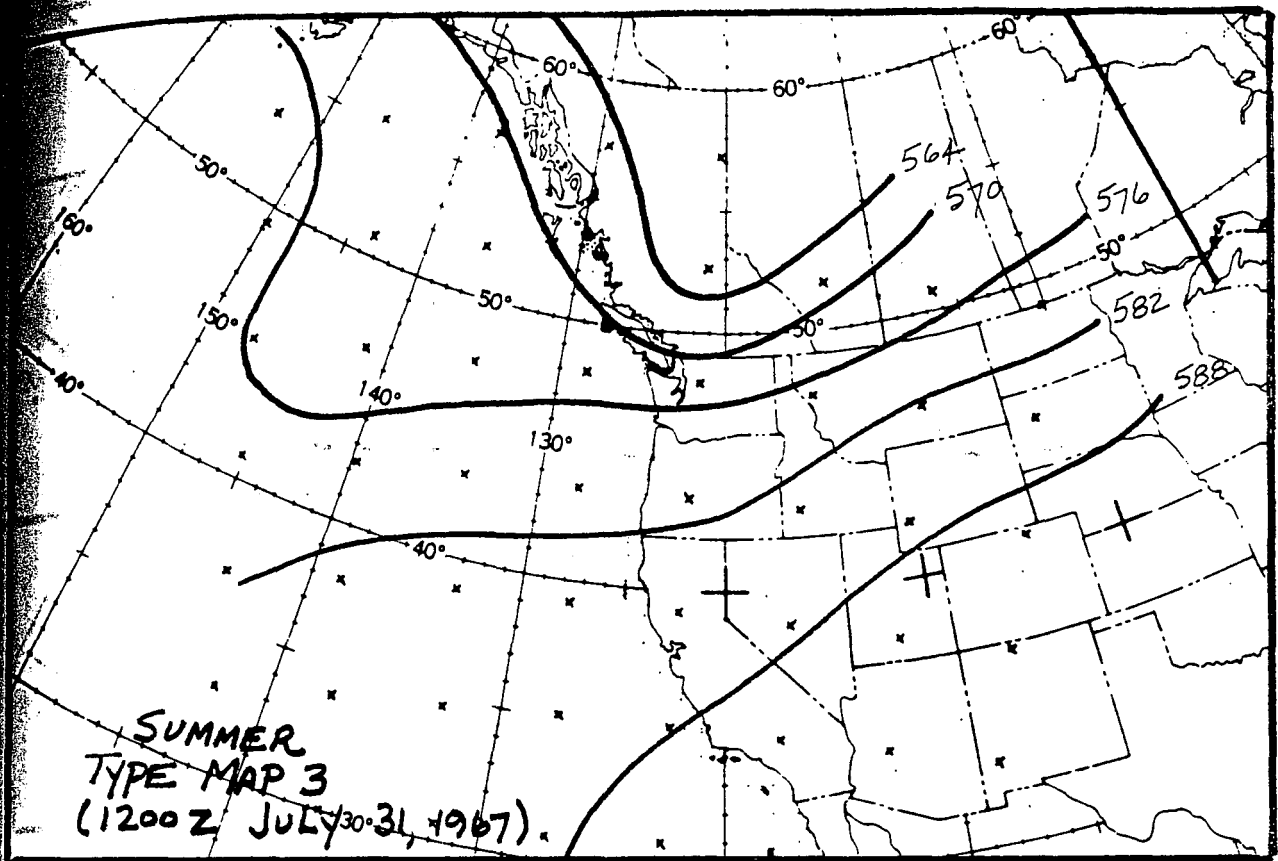
Split flows--types 7, 11, 14, 16, 18, 27.

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

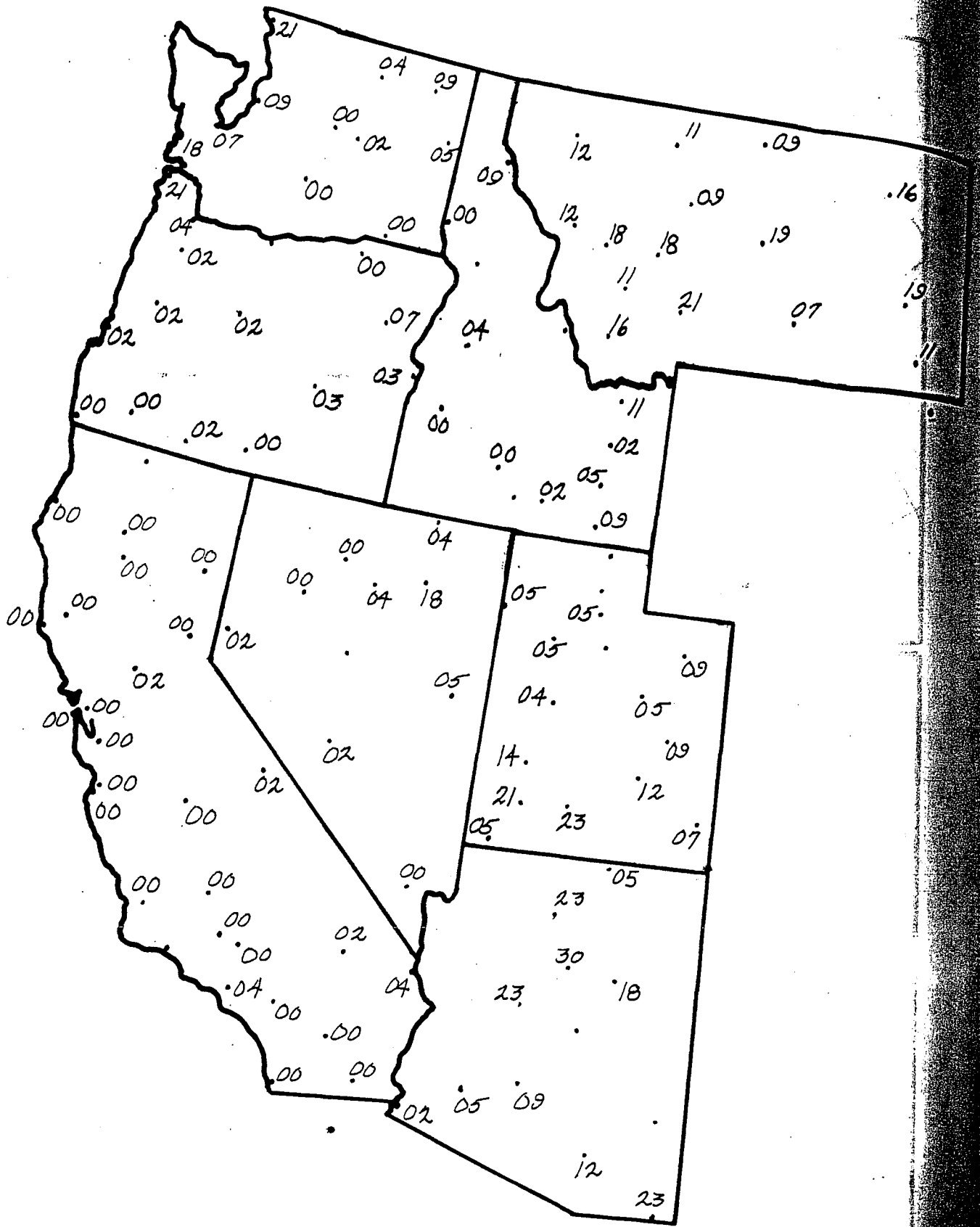
APPENDIX A

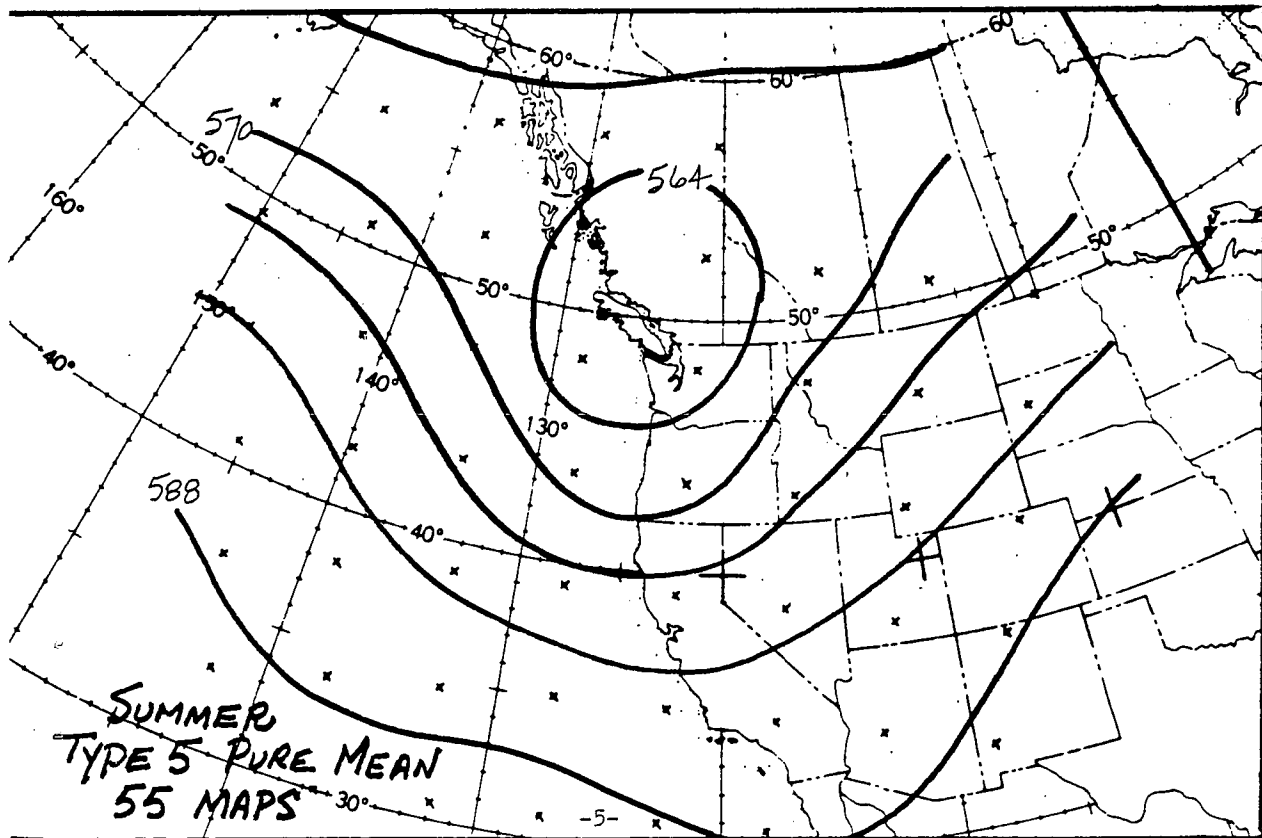
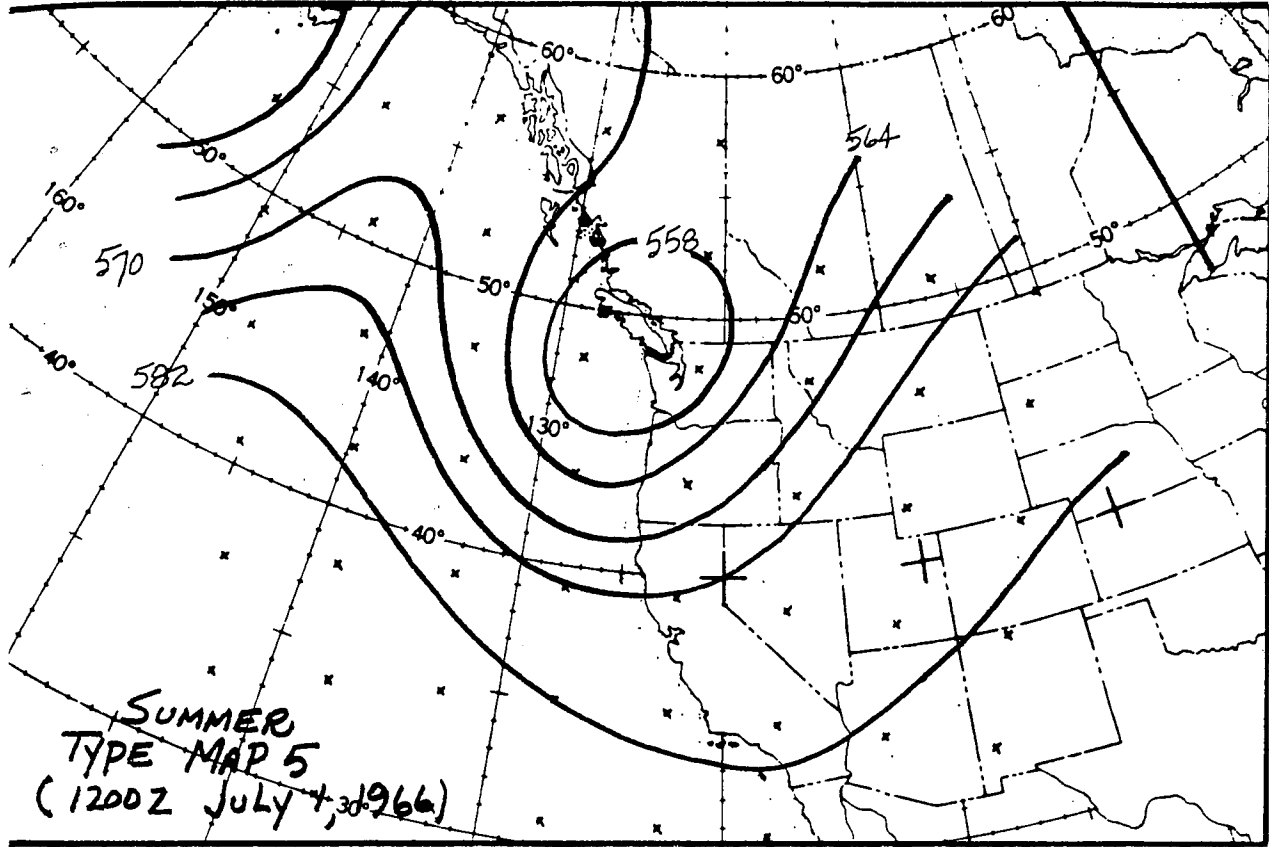
Summer Types and Associated Precipitation Climatologies

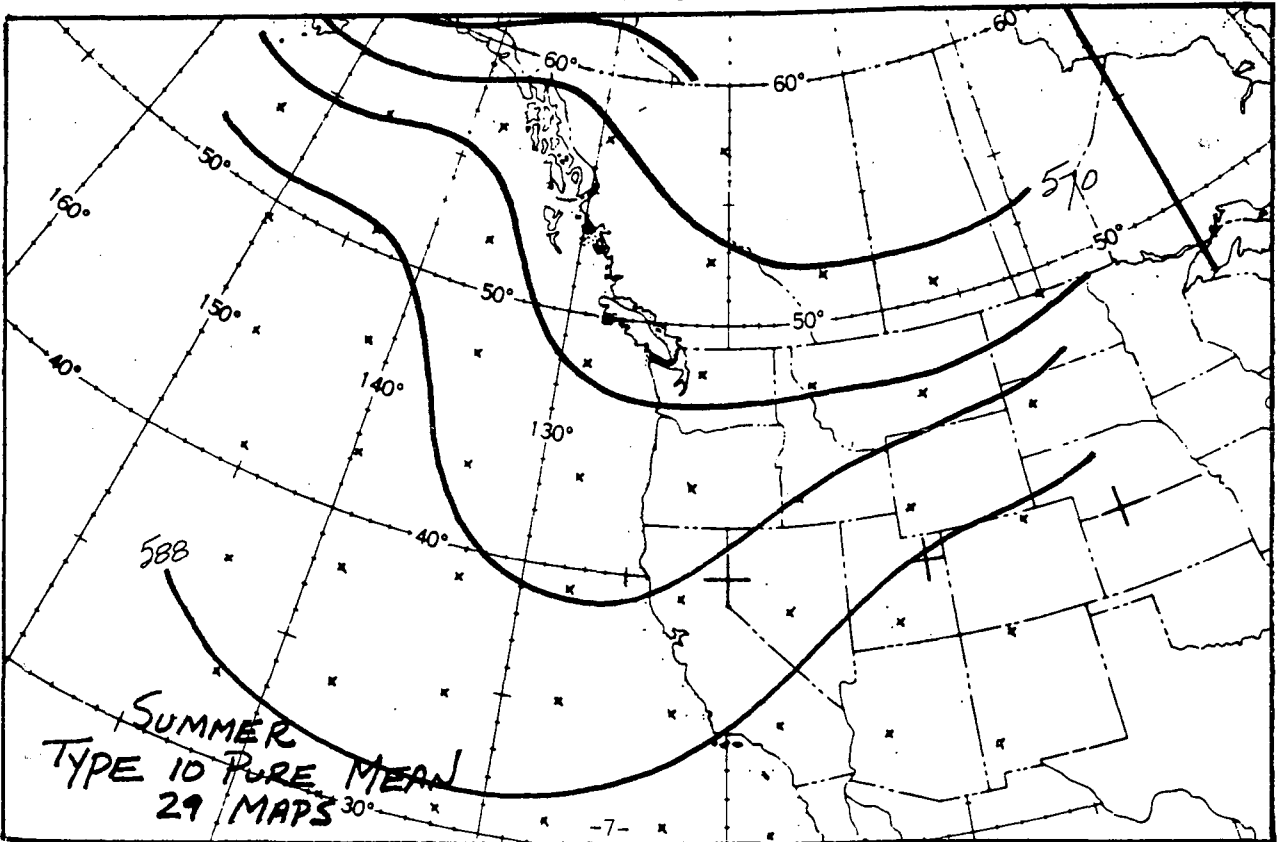
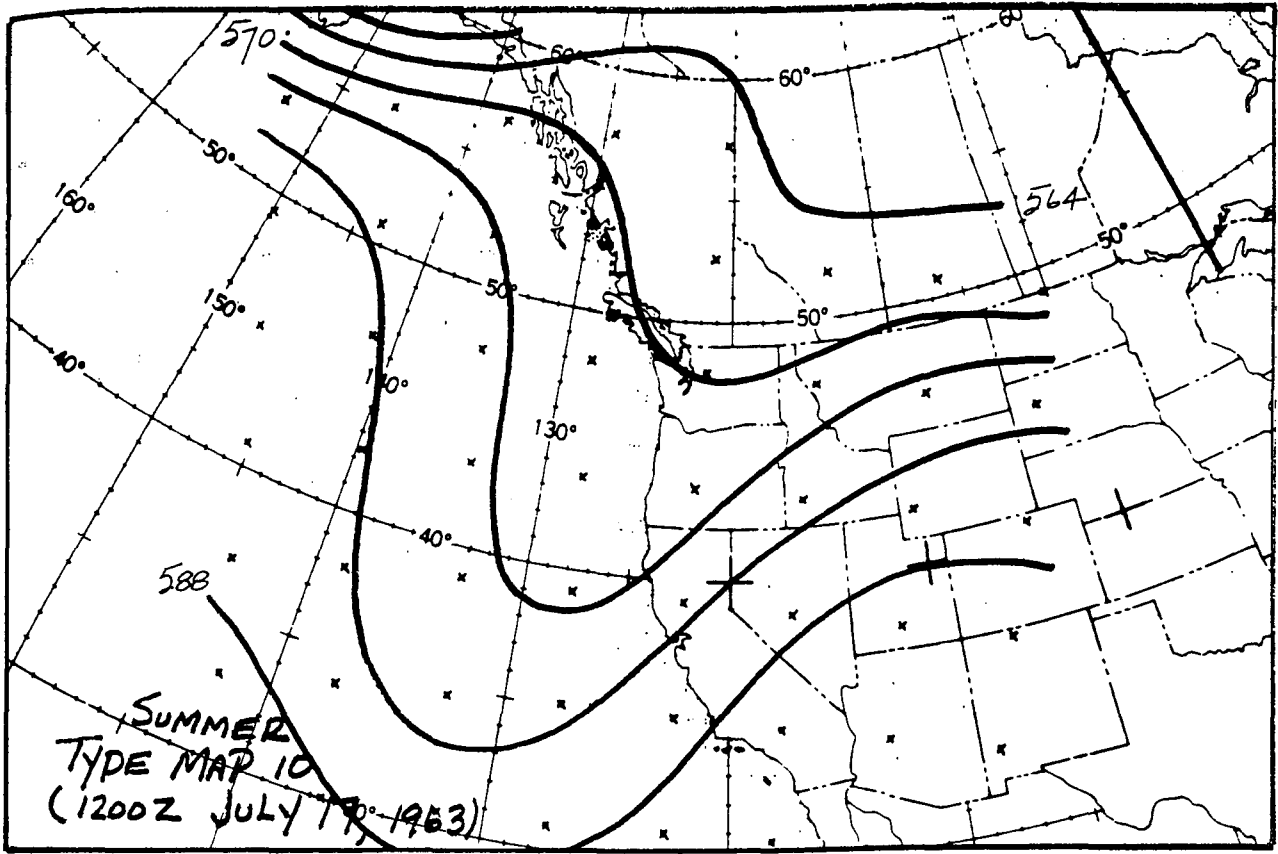
Types Arranged According to Similarity of
Basic Flow Pattern



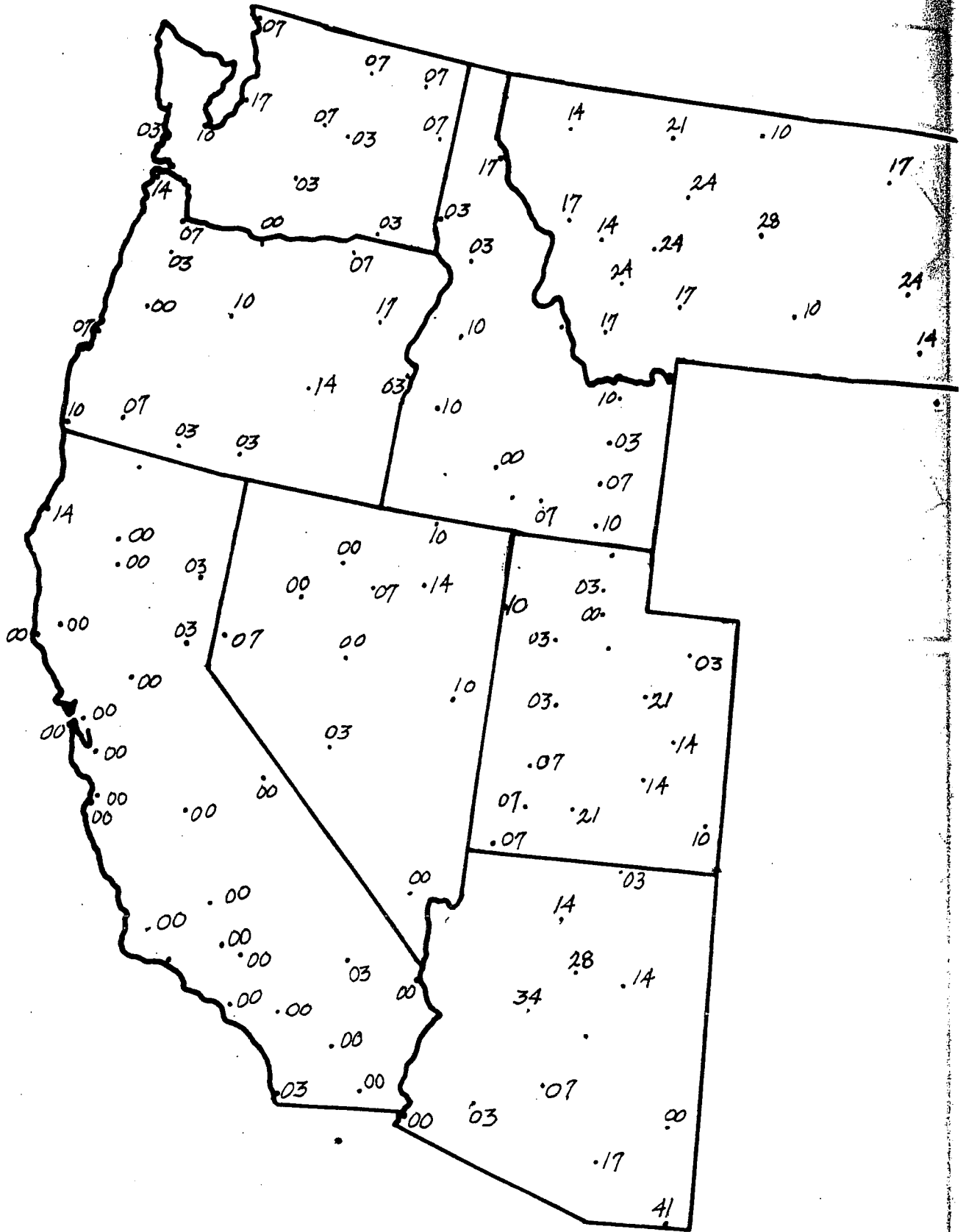
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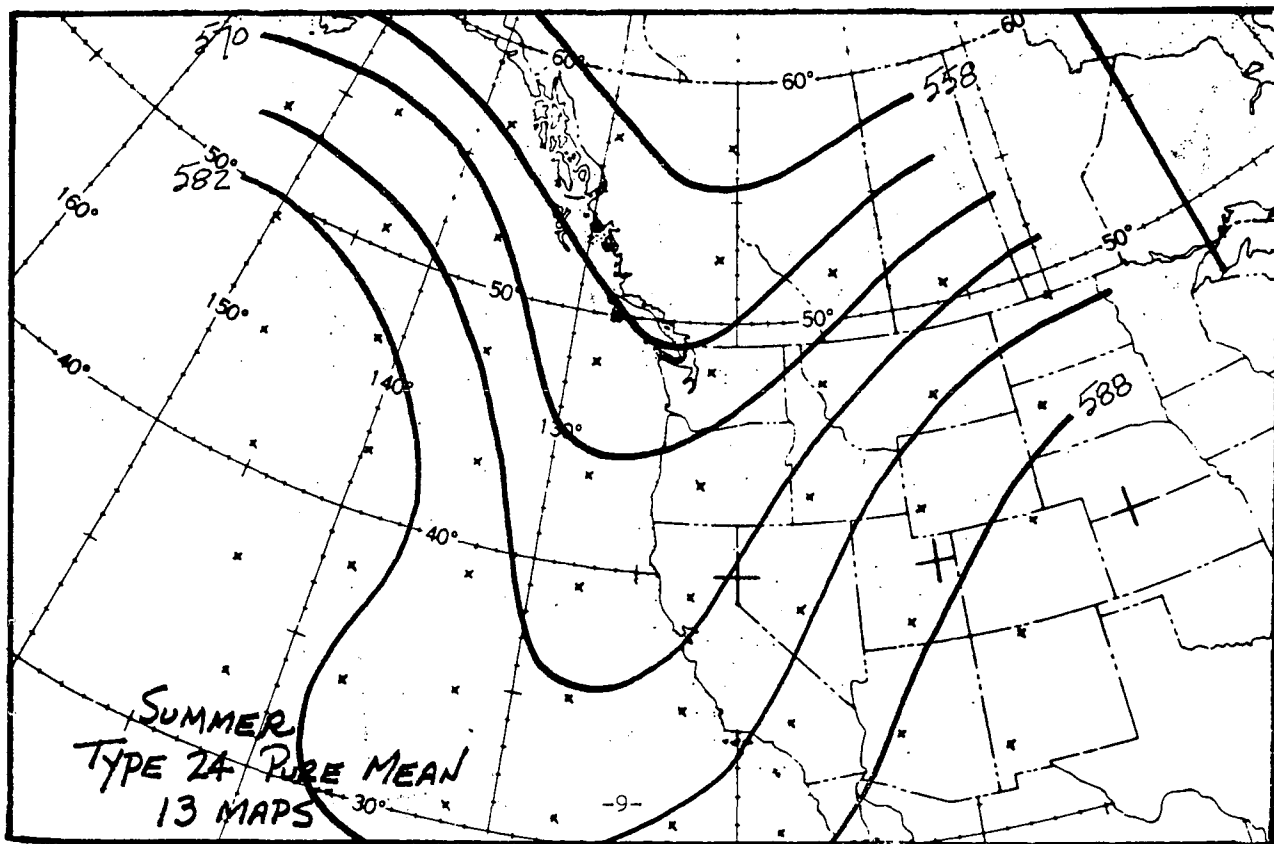
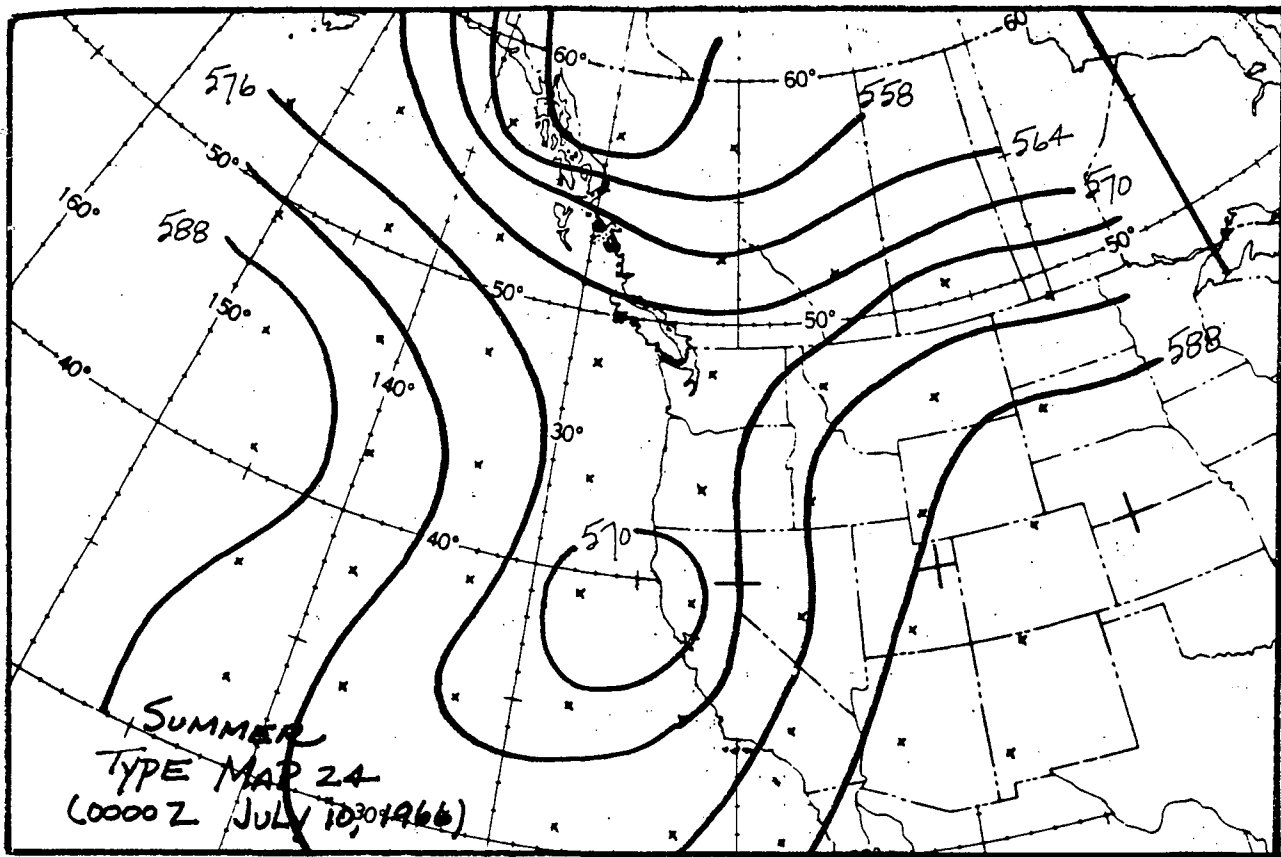




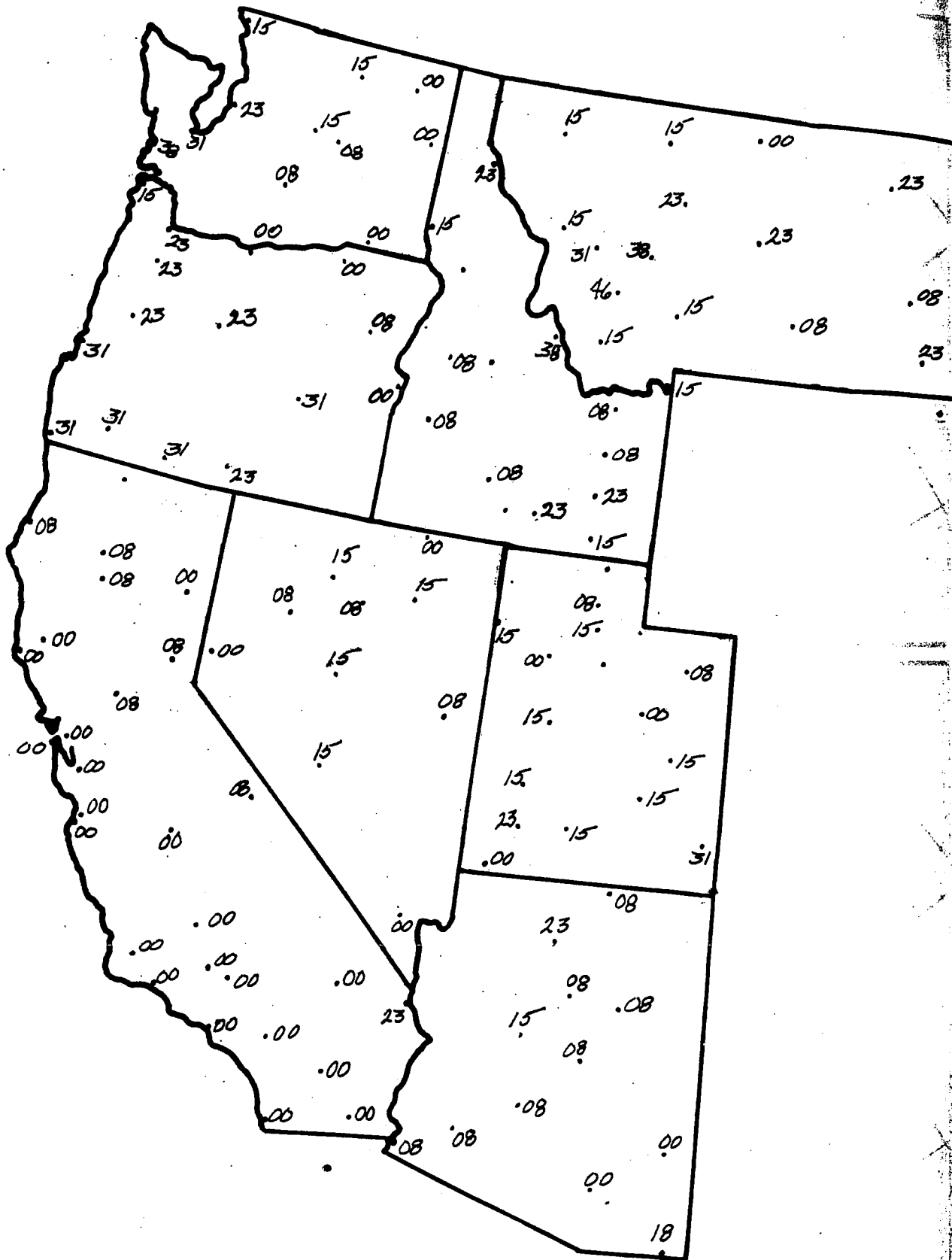


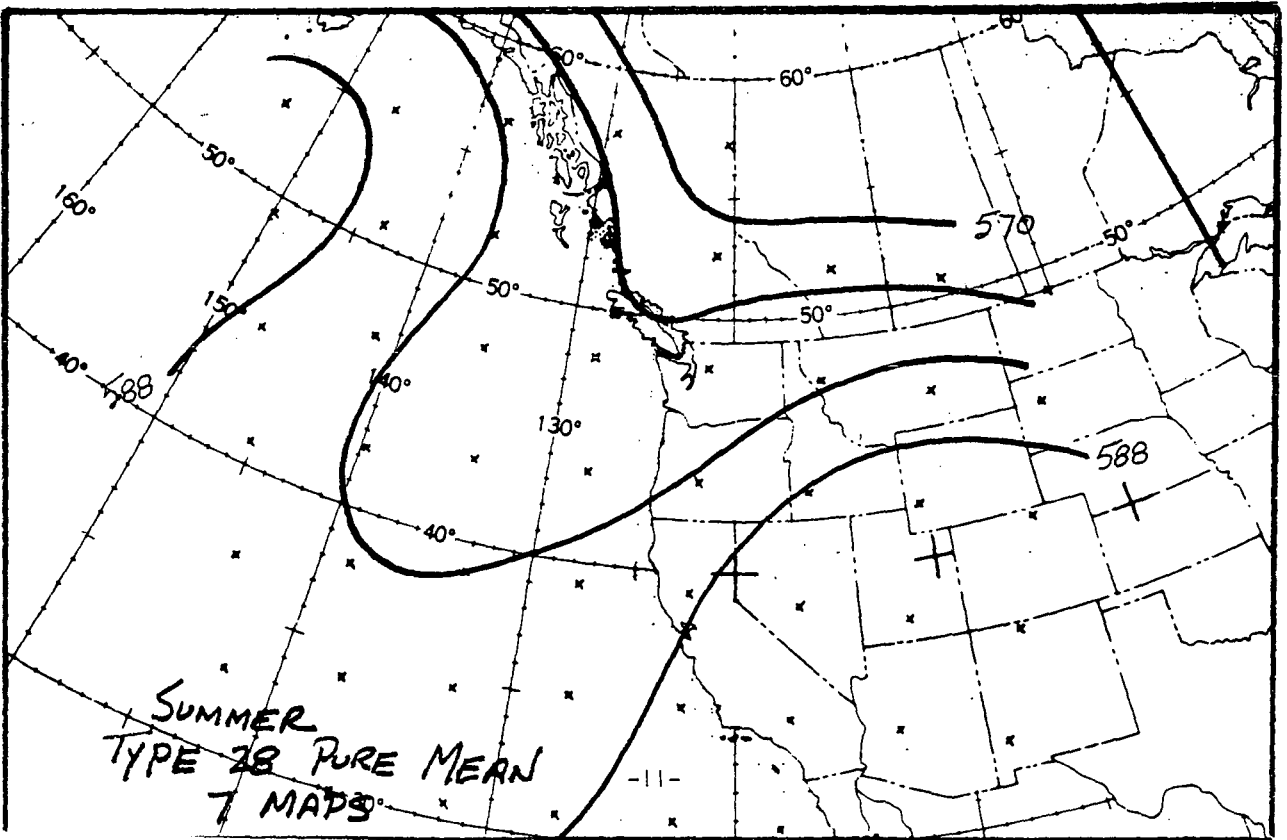
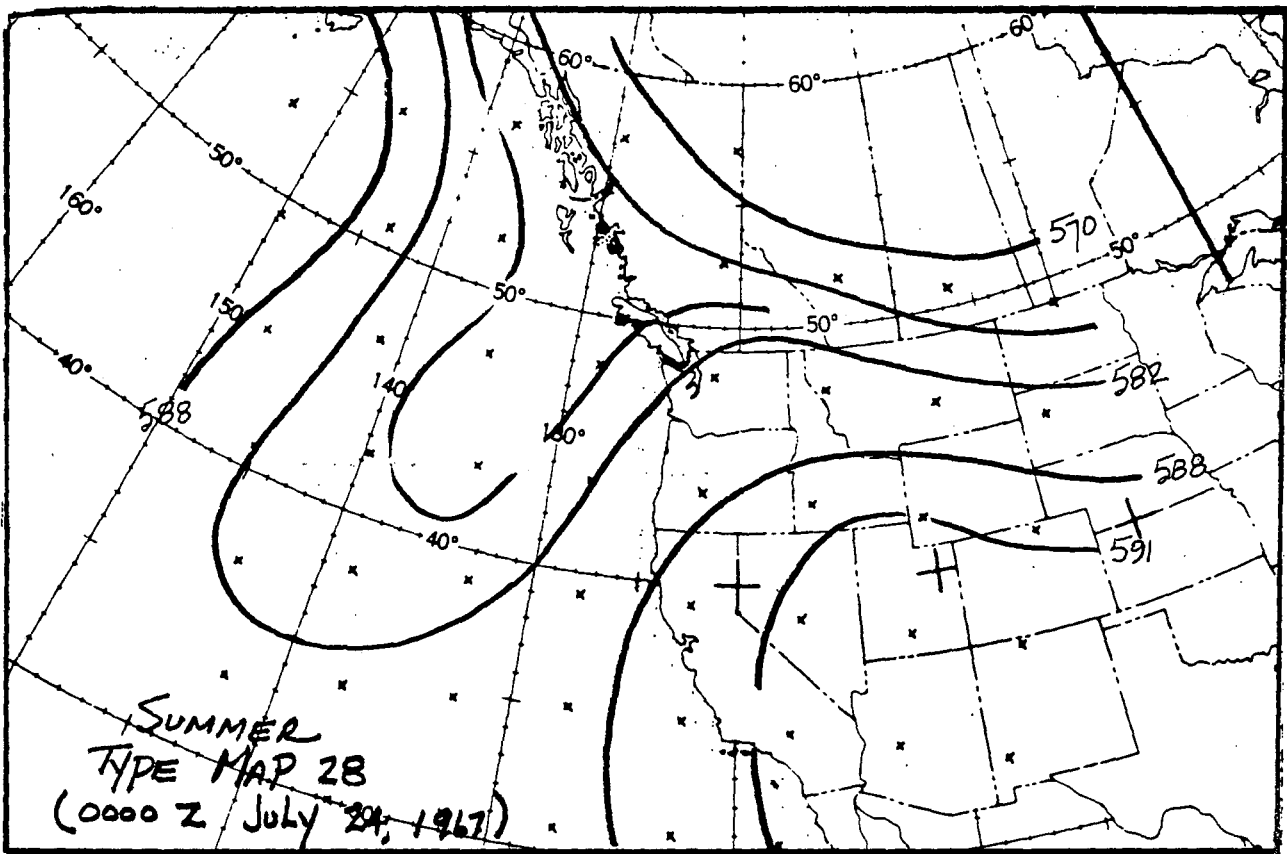
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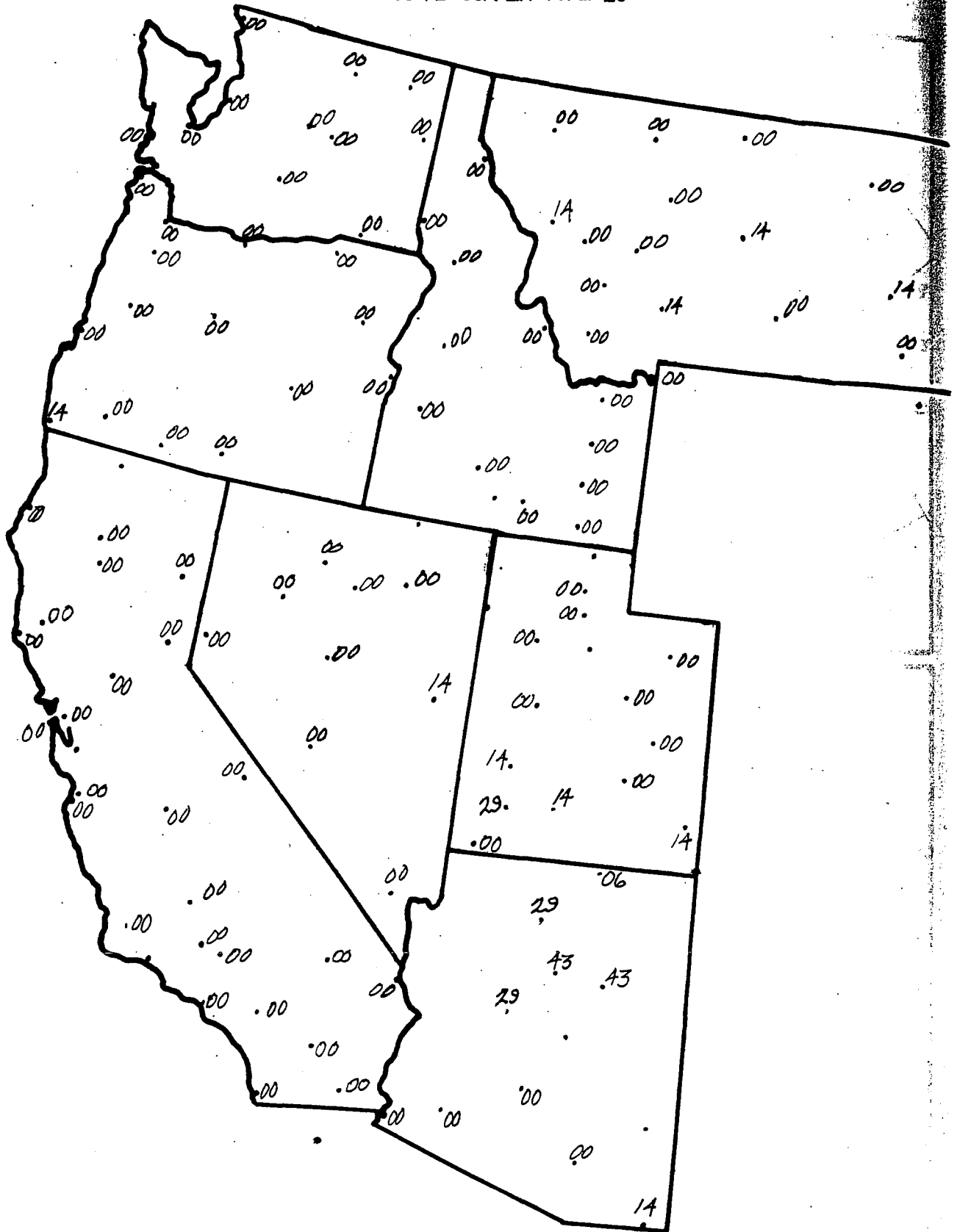


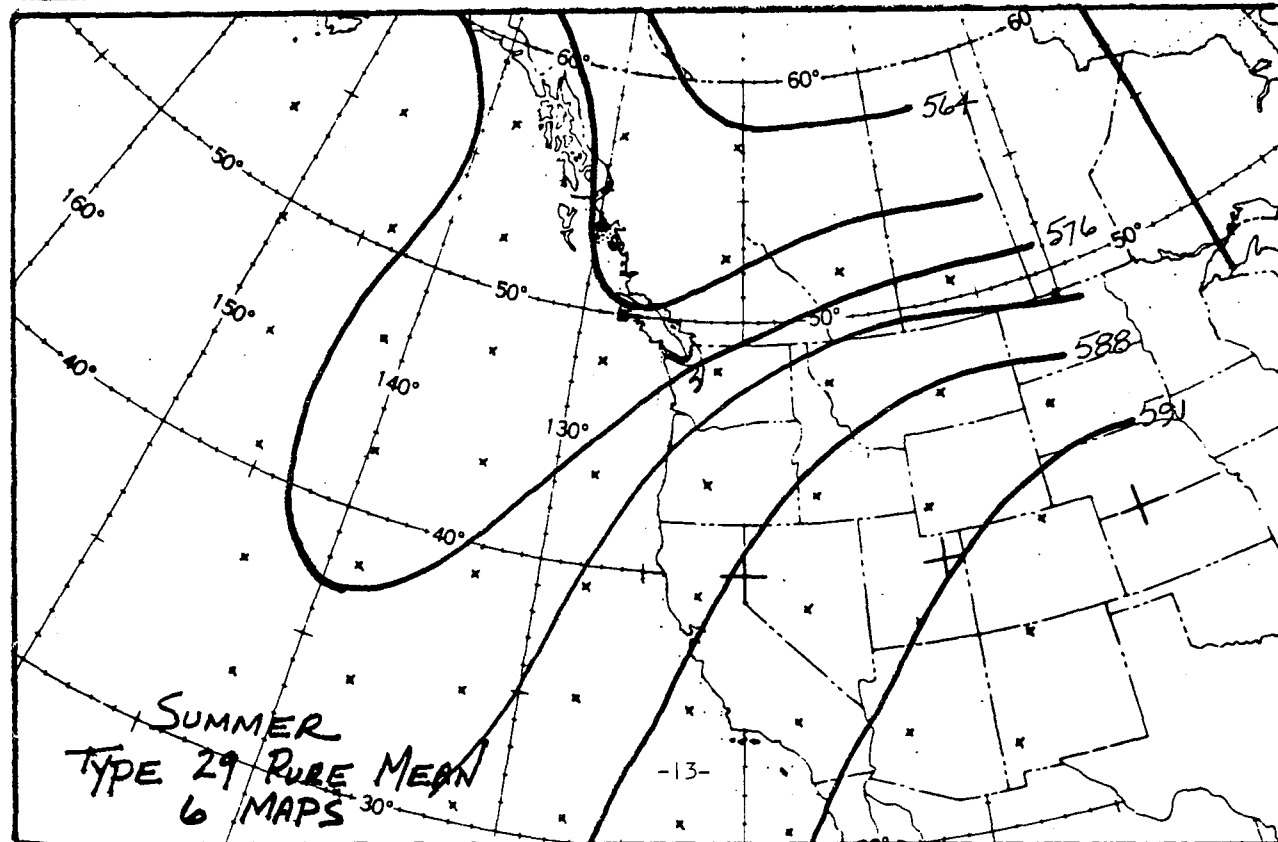
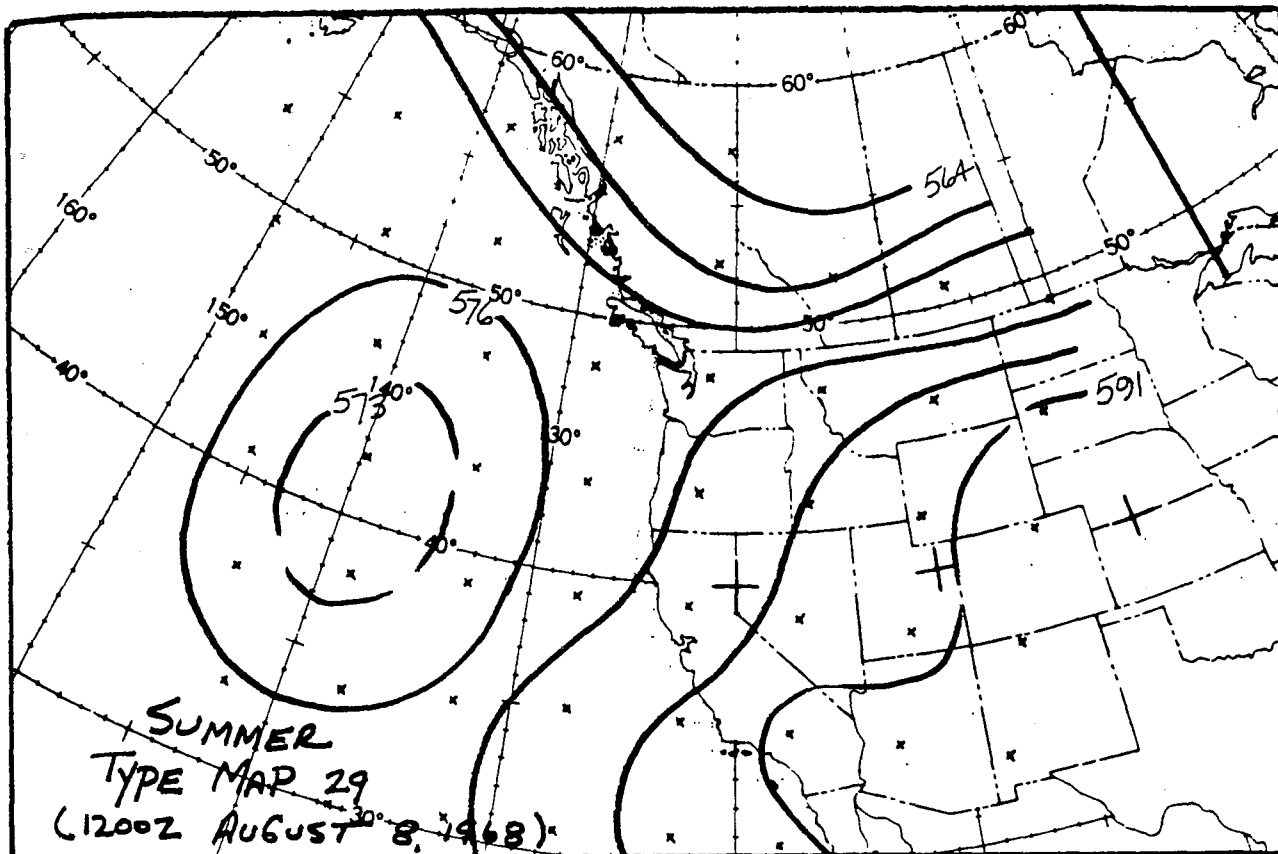
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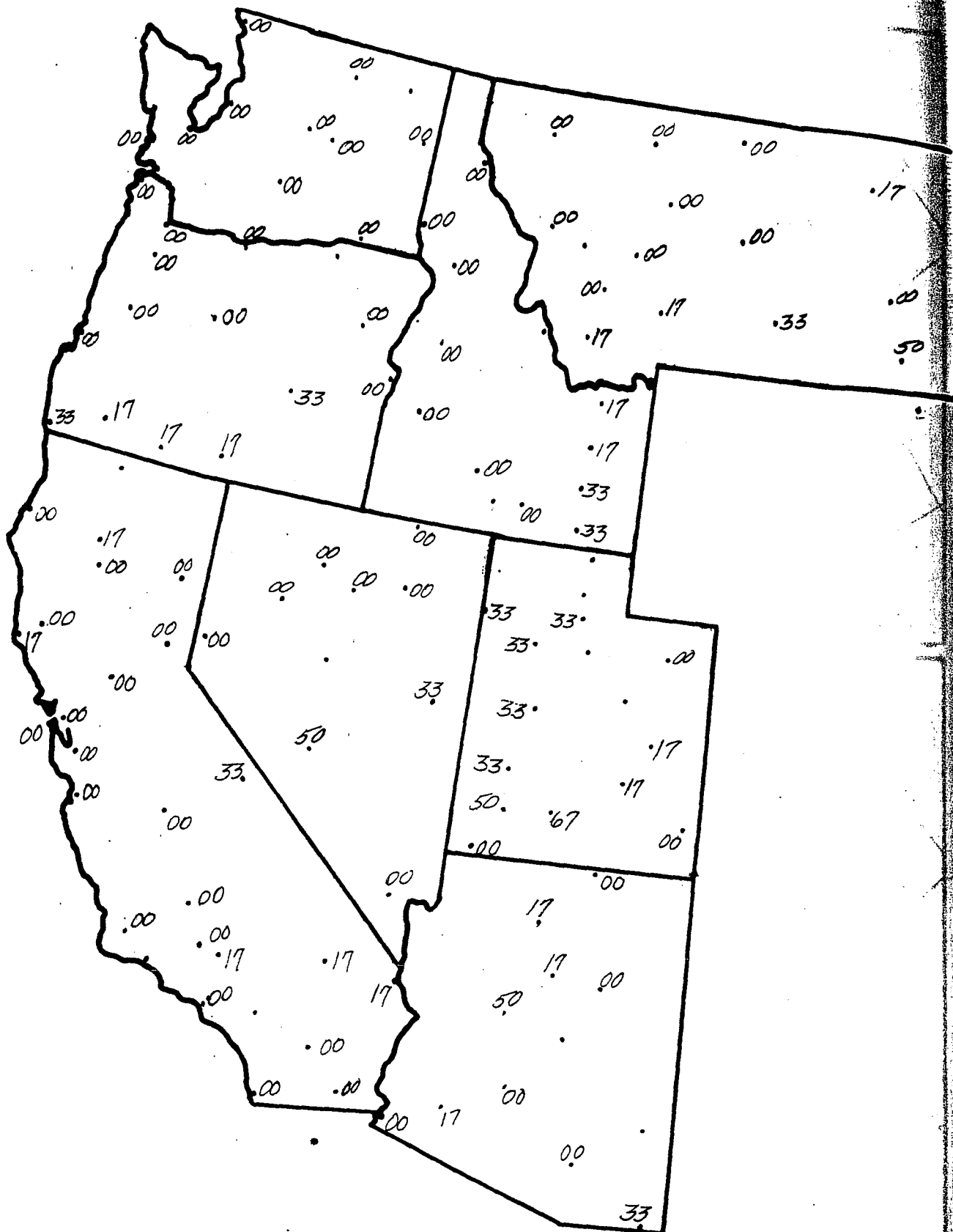


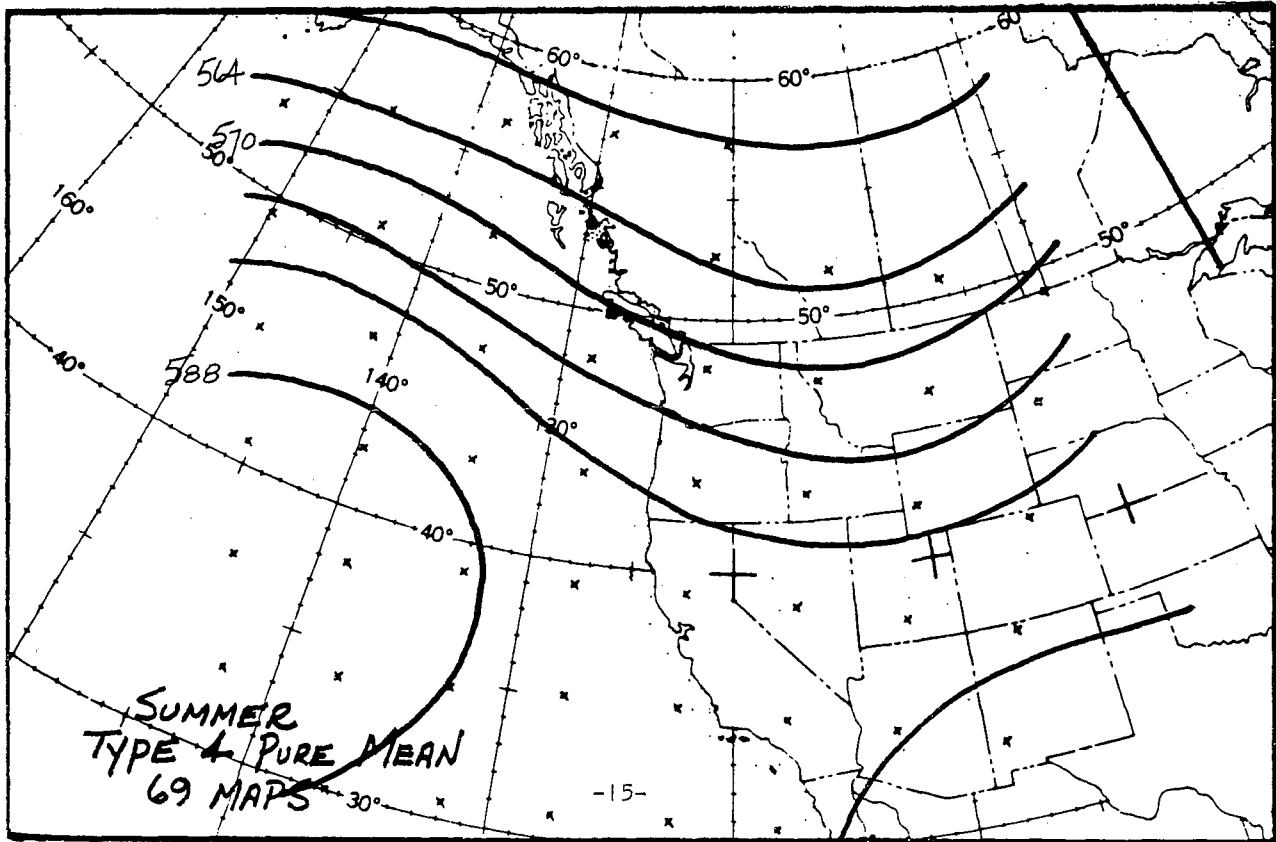
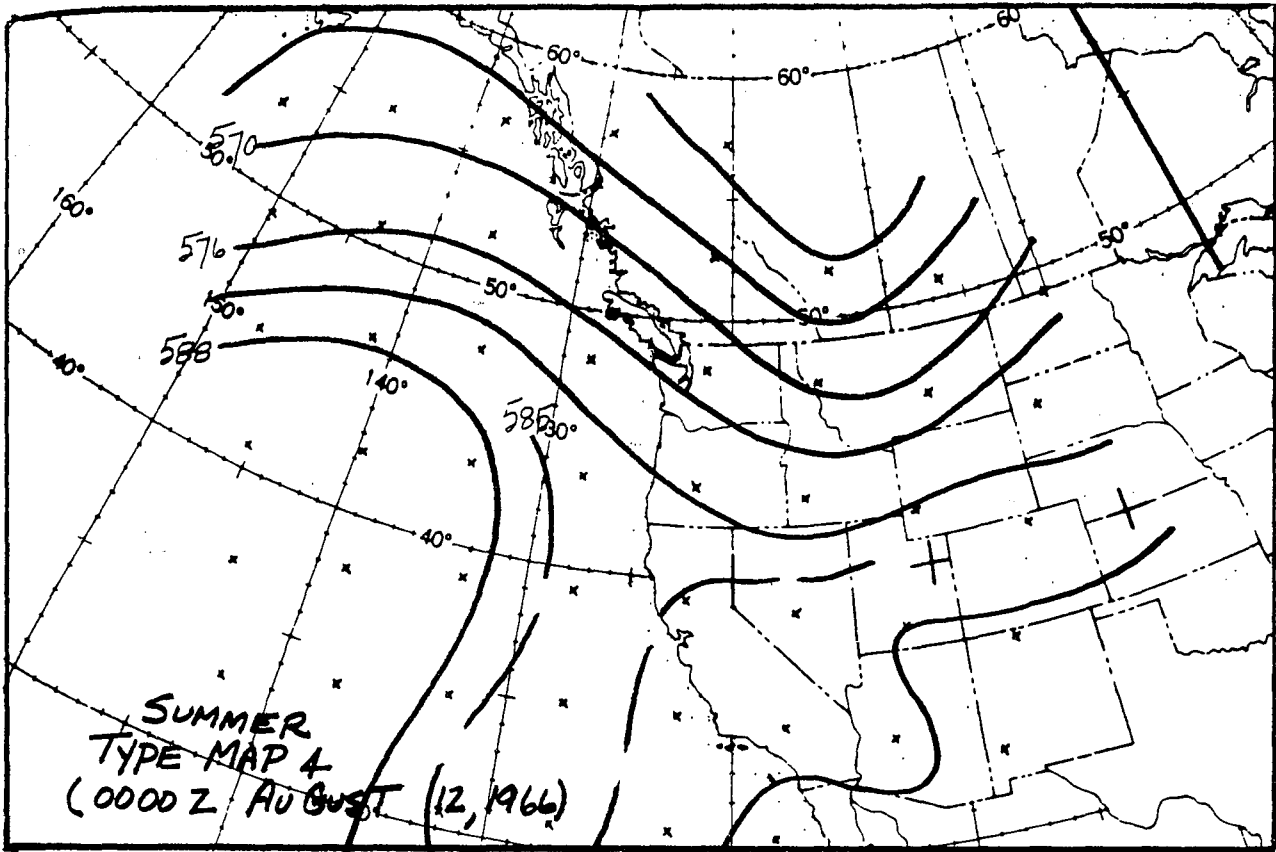
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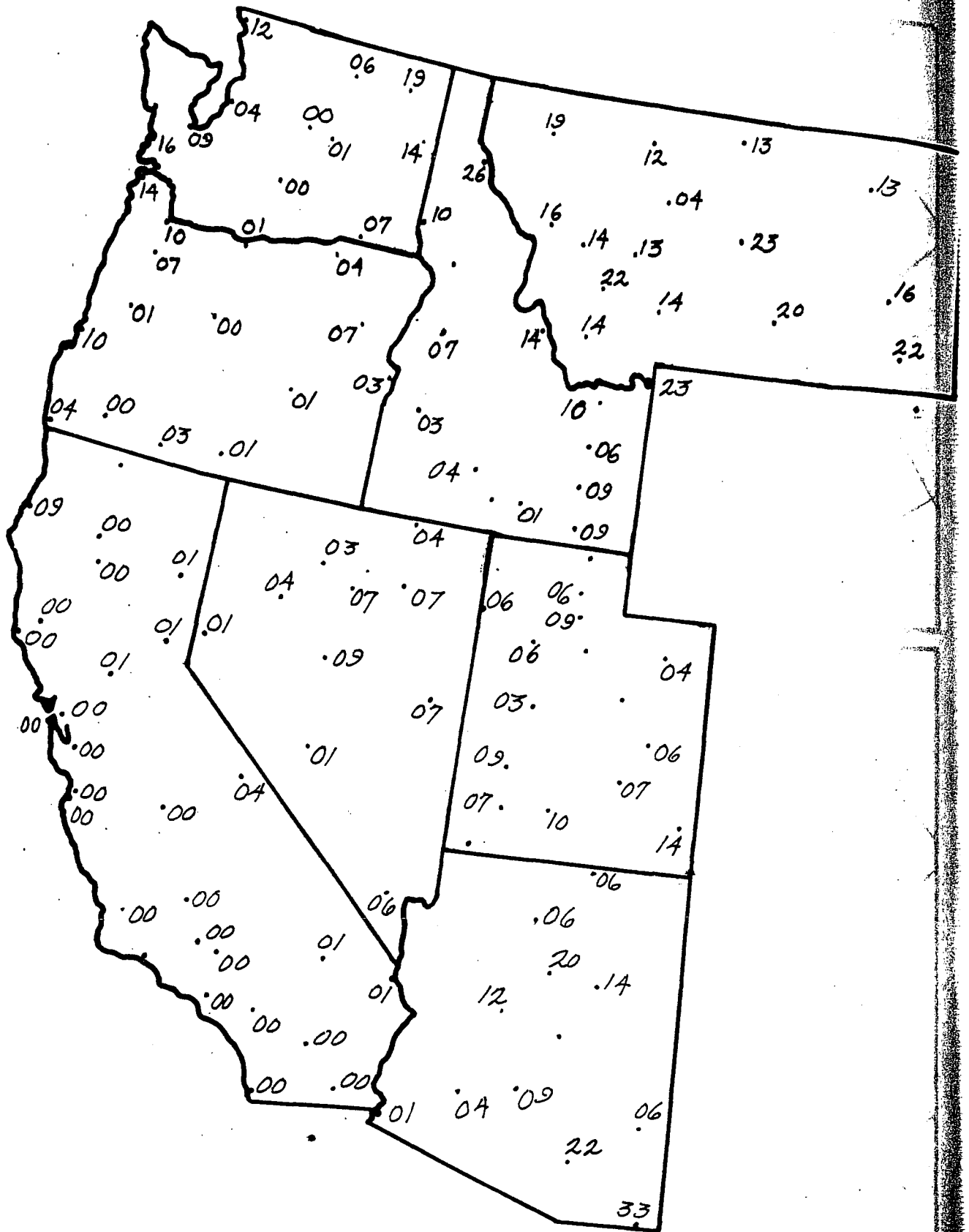


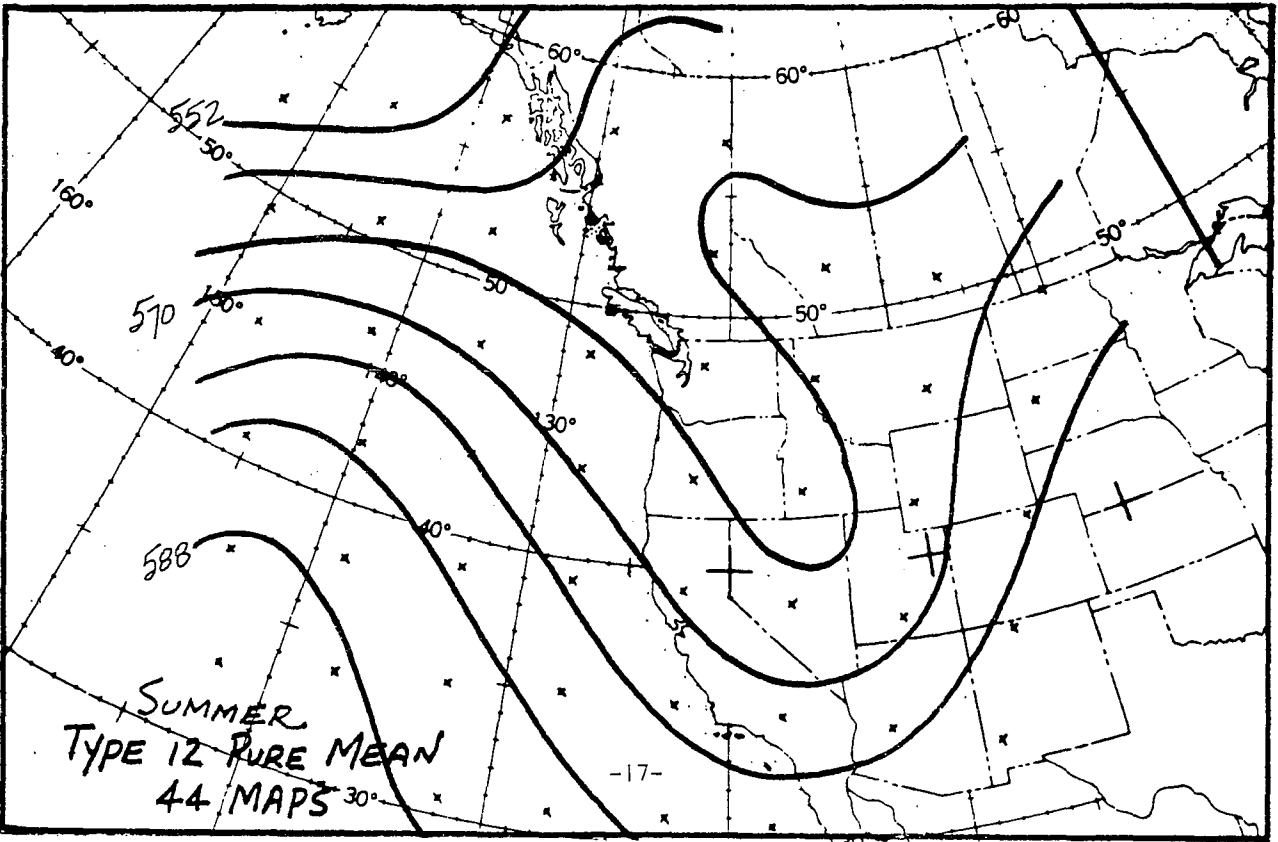
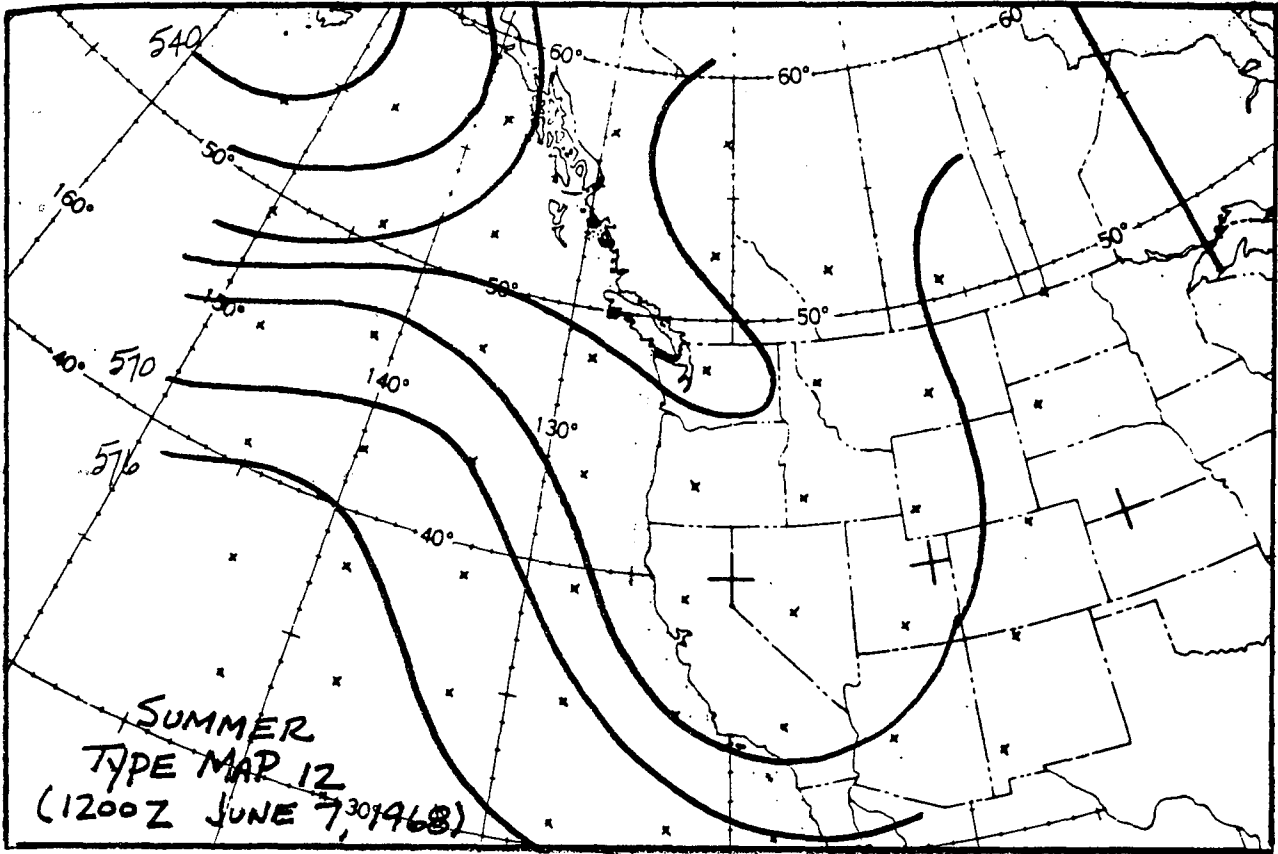
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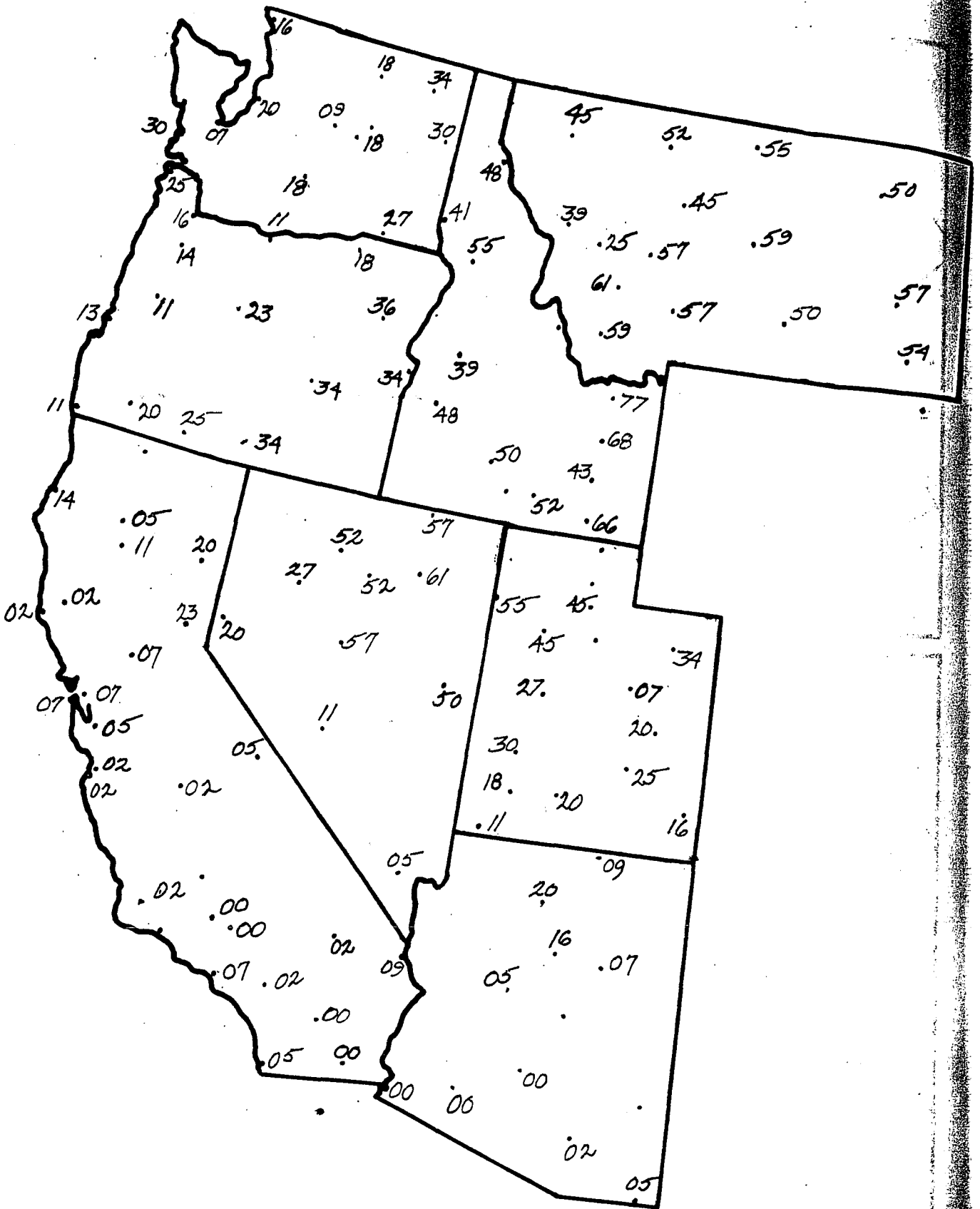


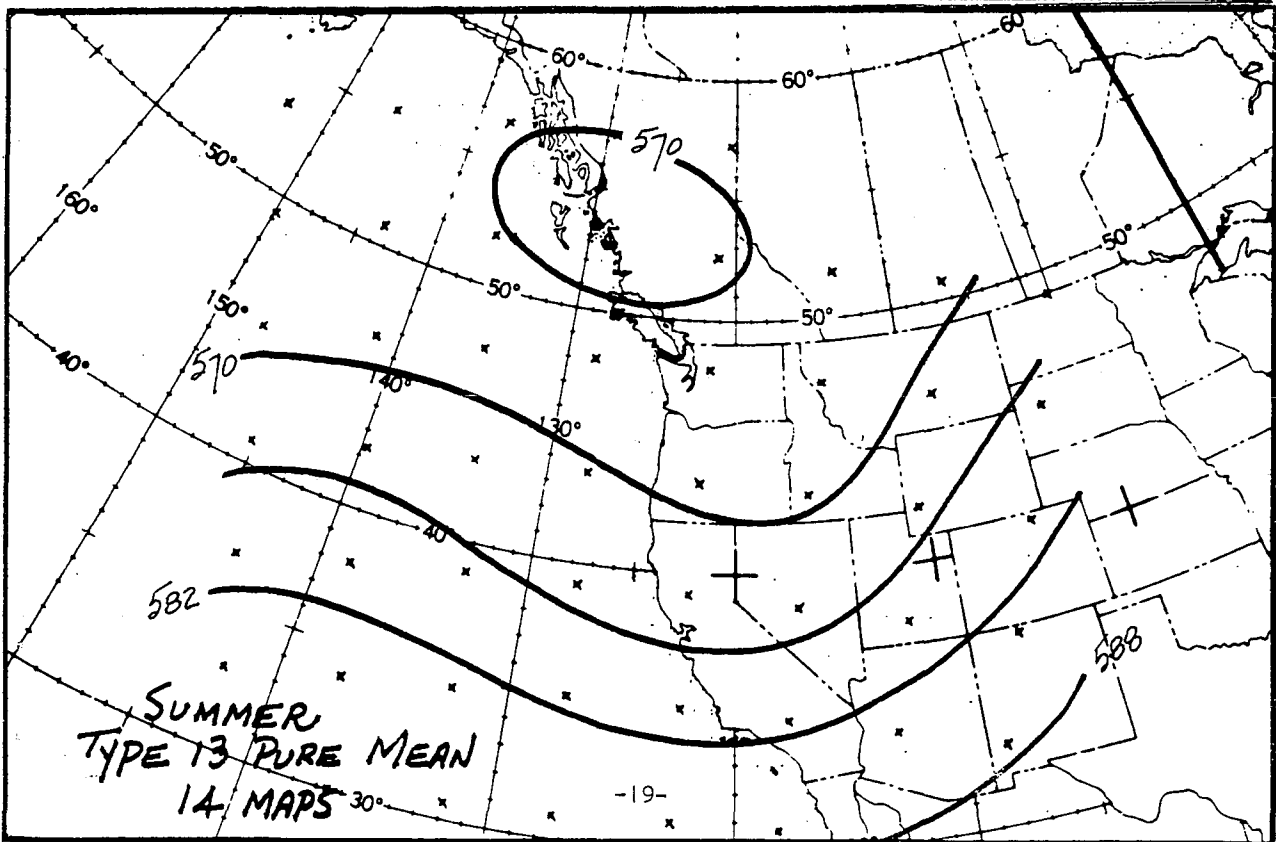
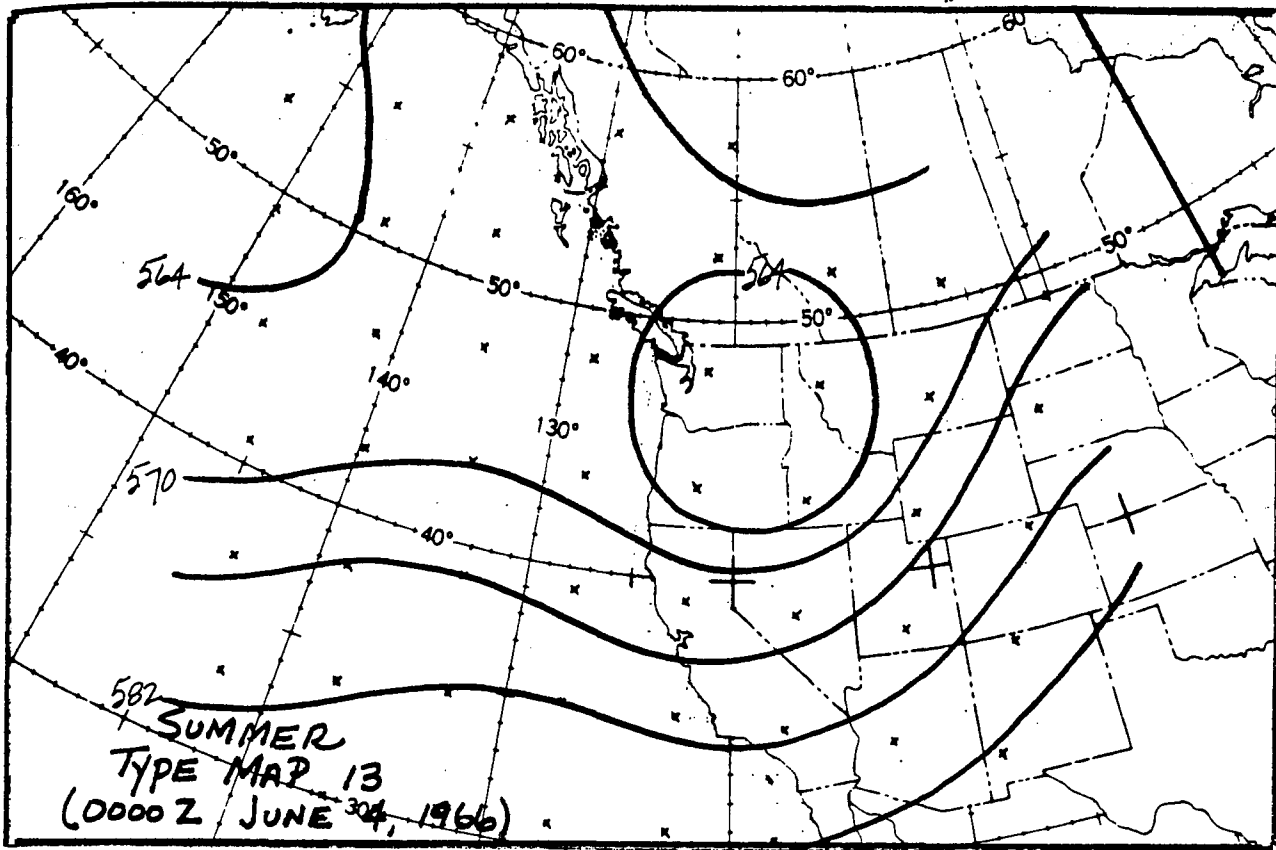
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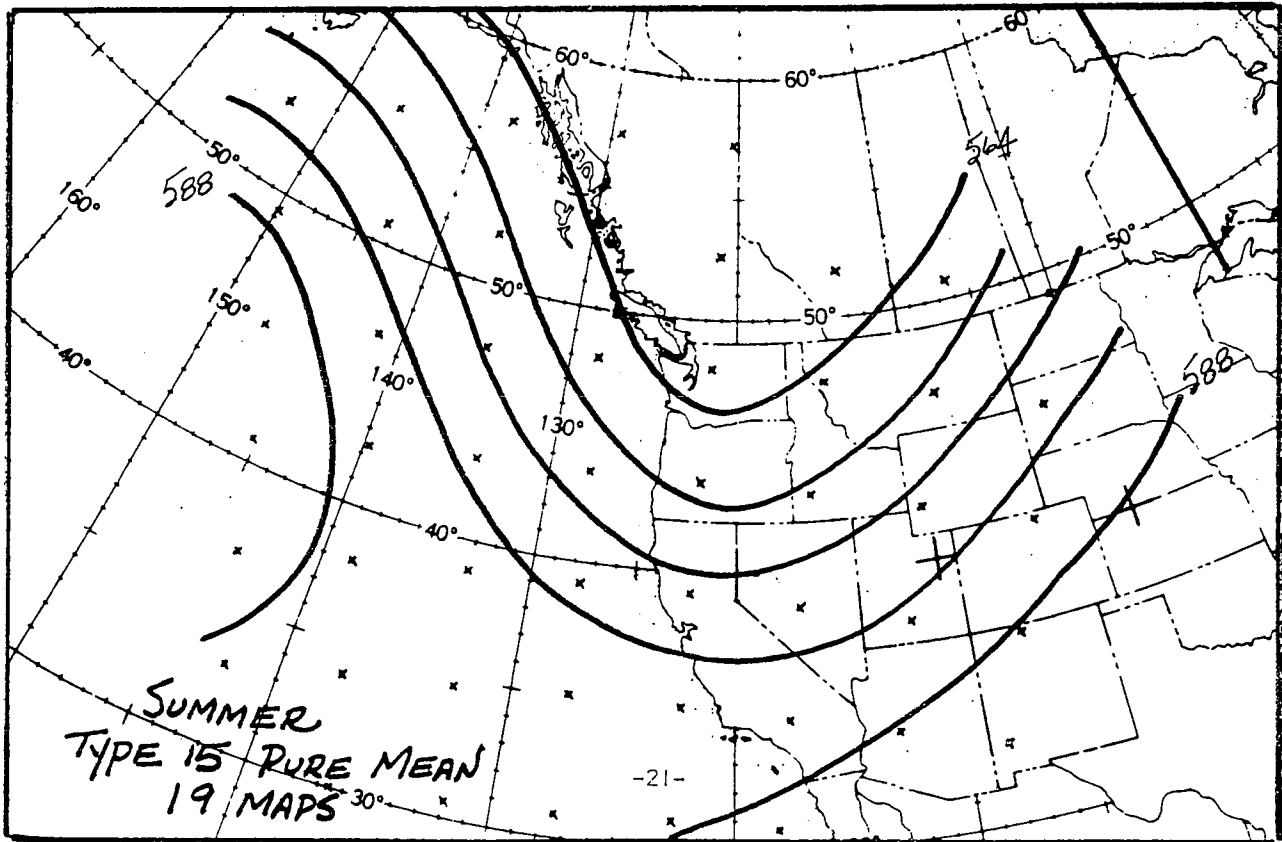
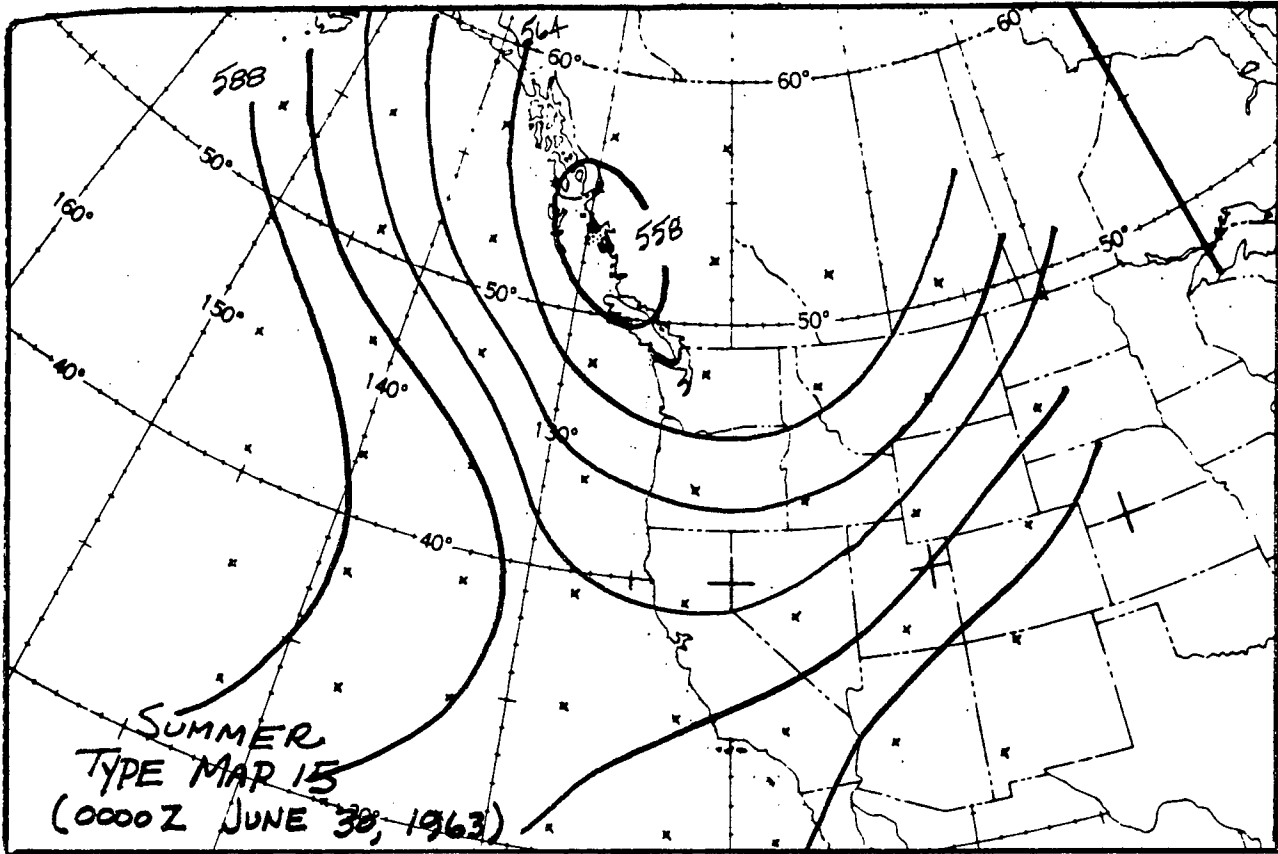


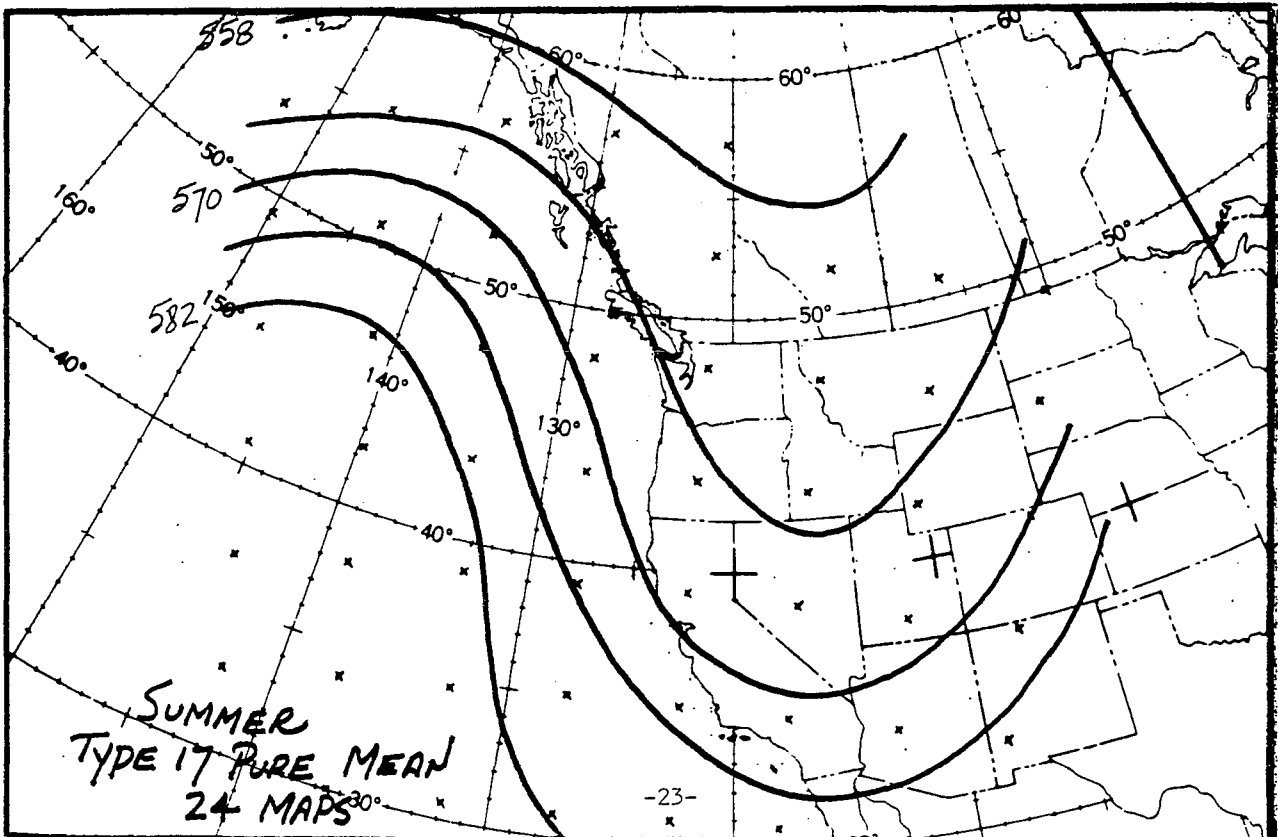
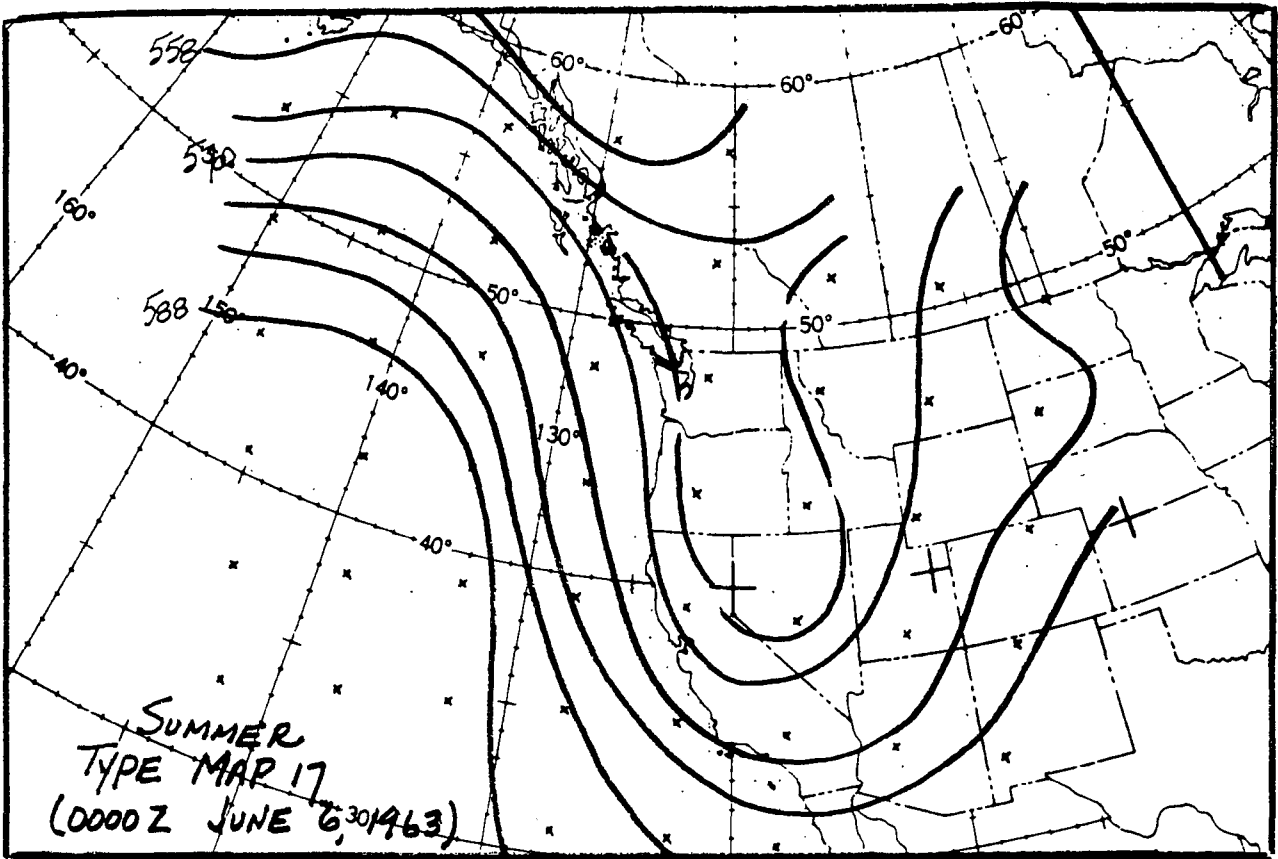


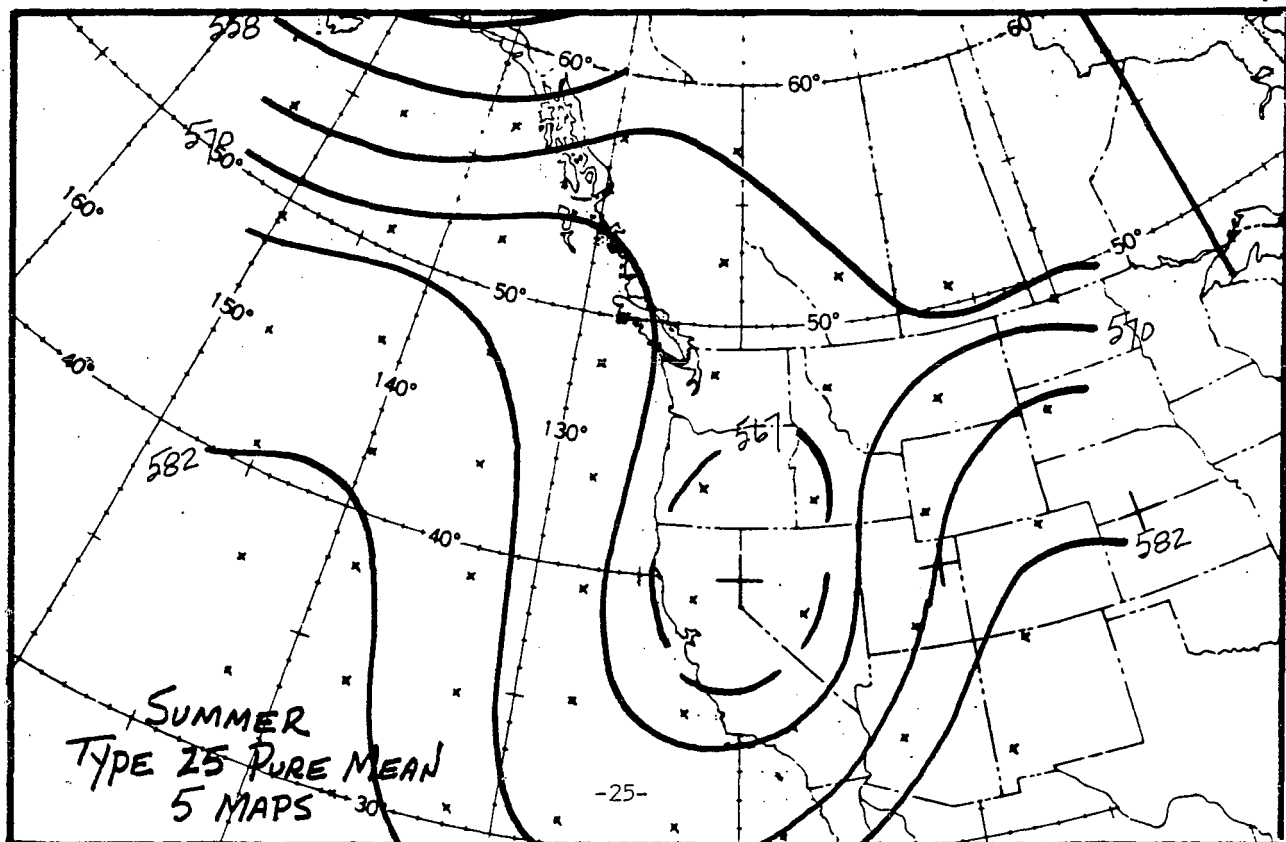
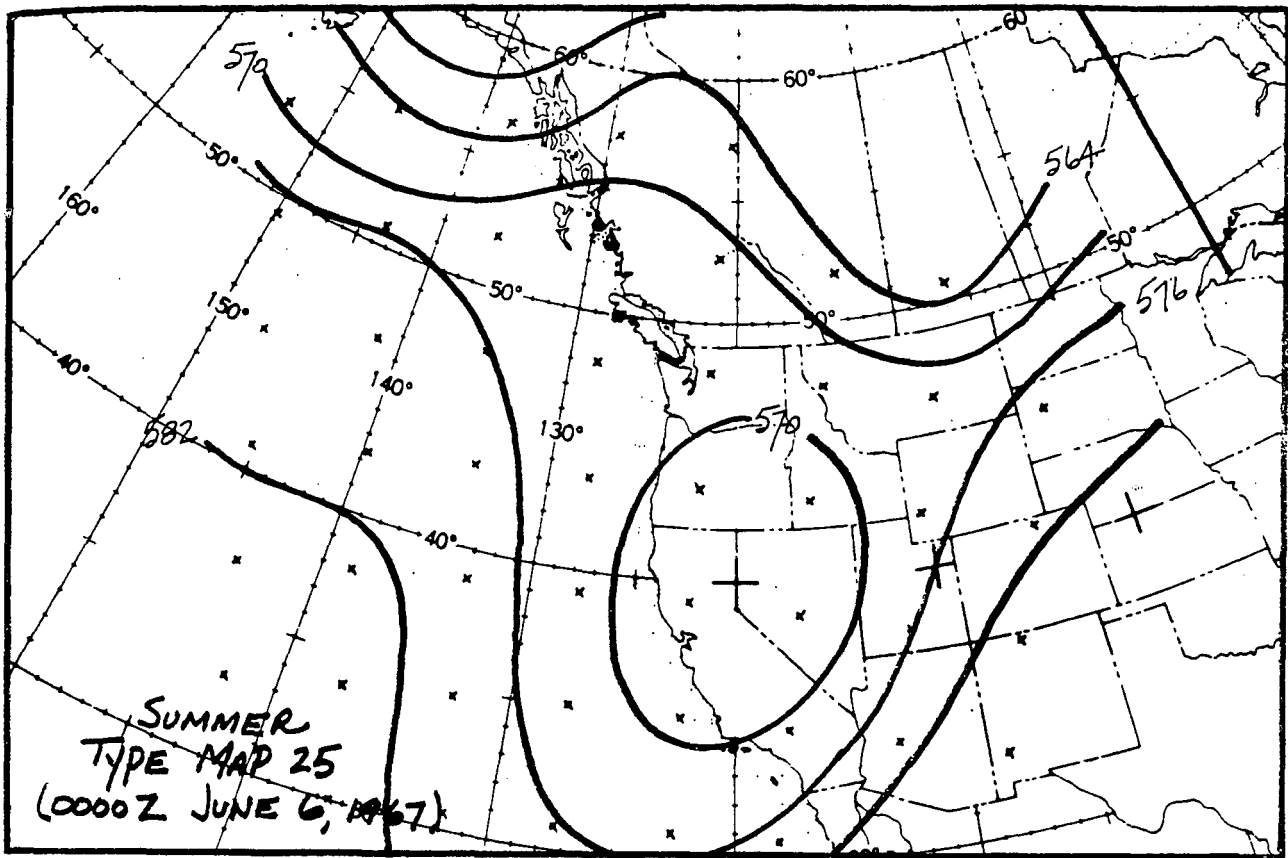
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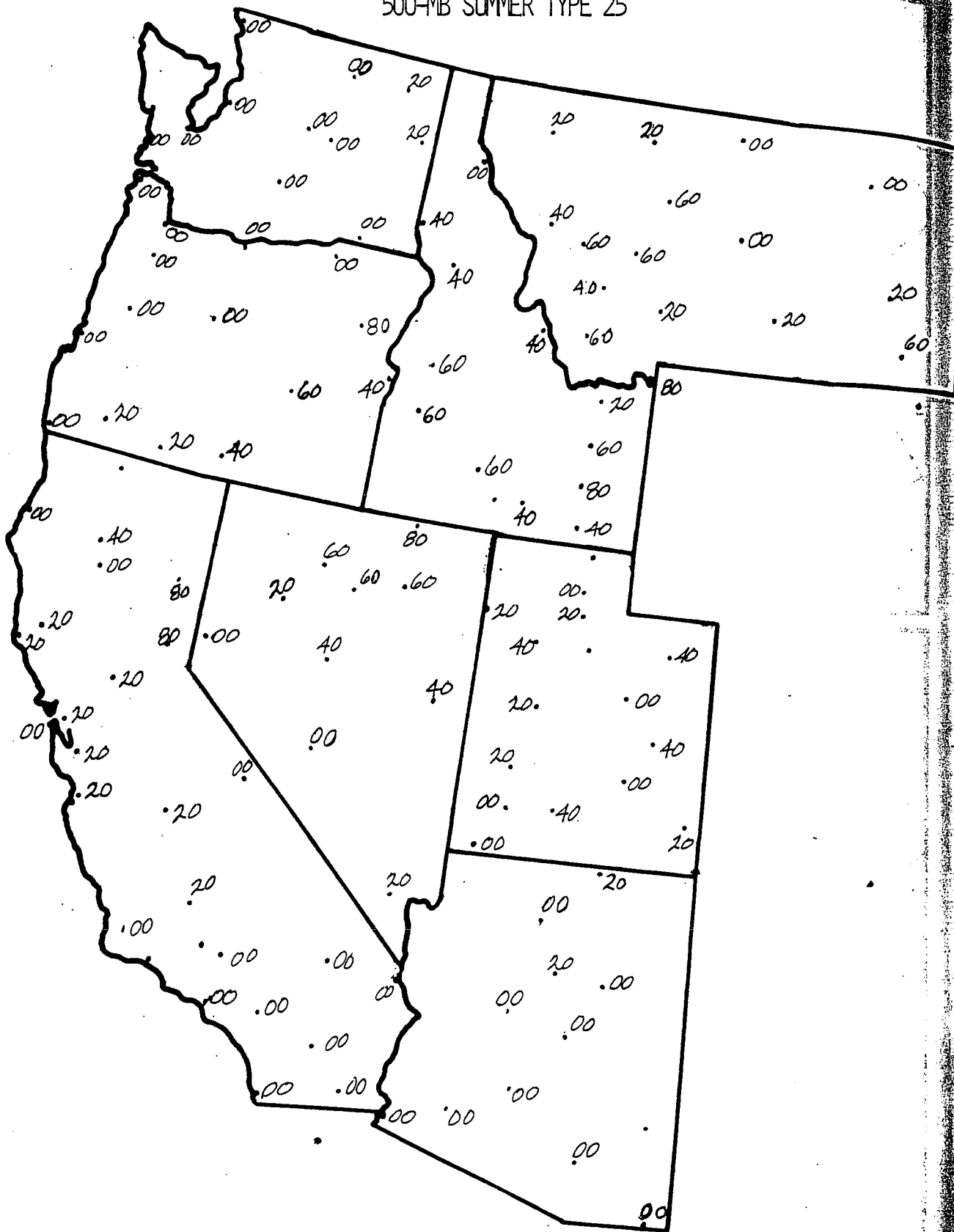


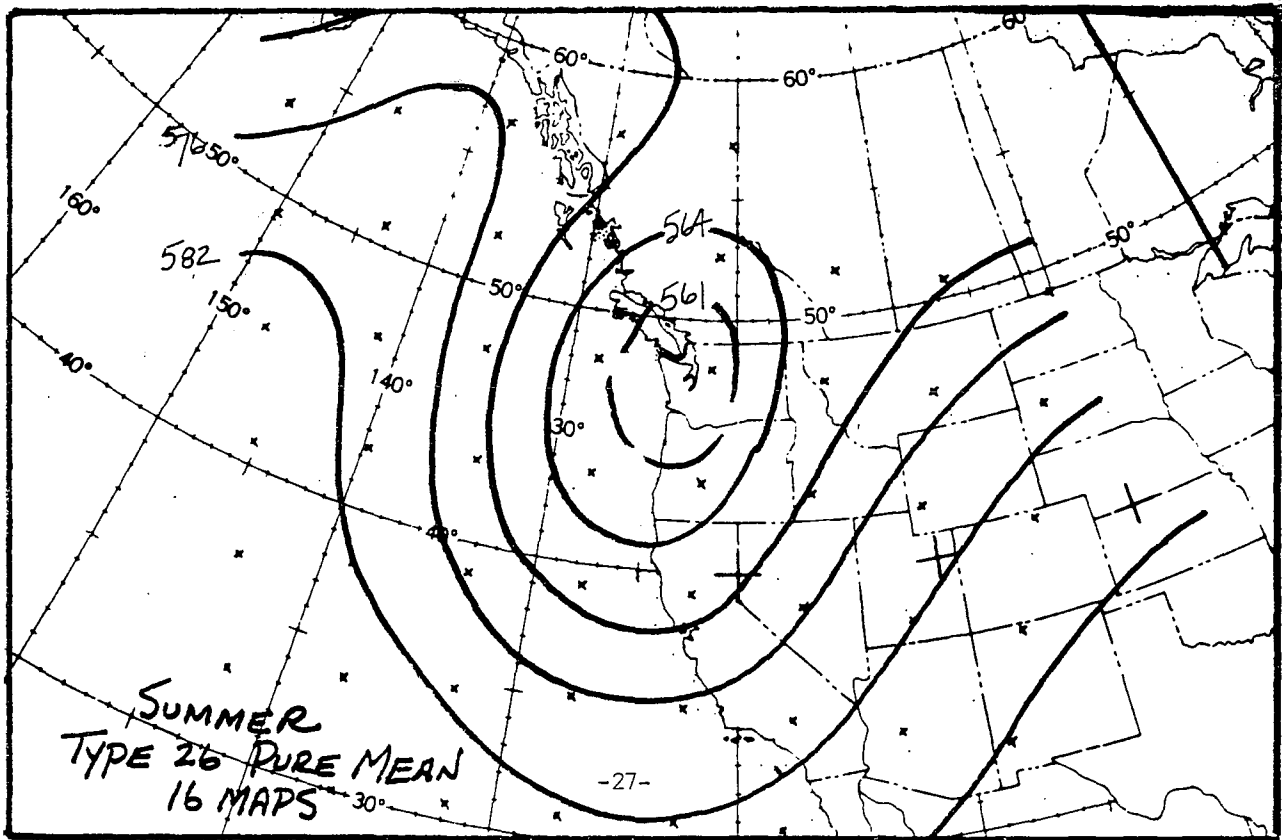
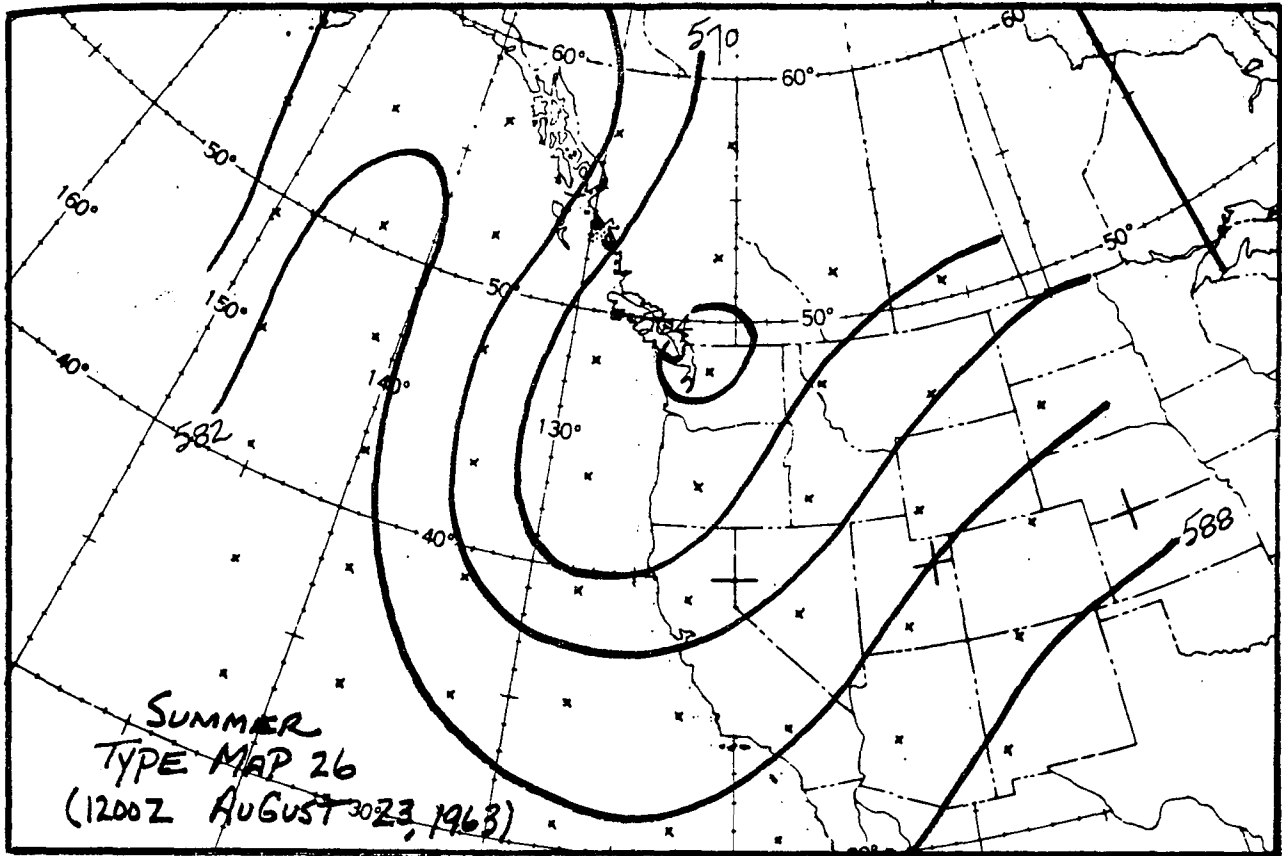


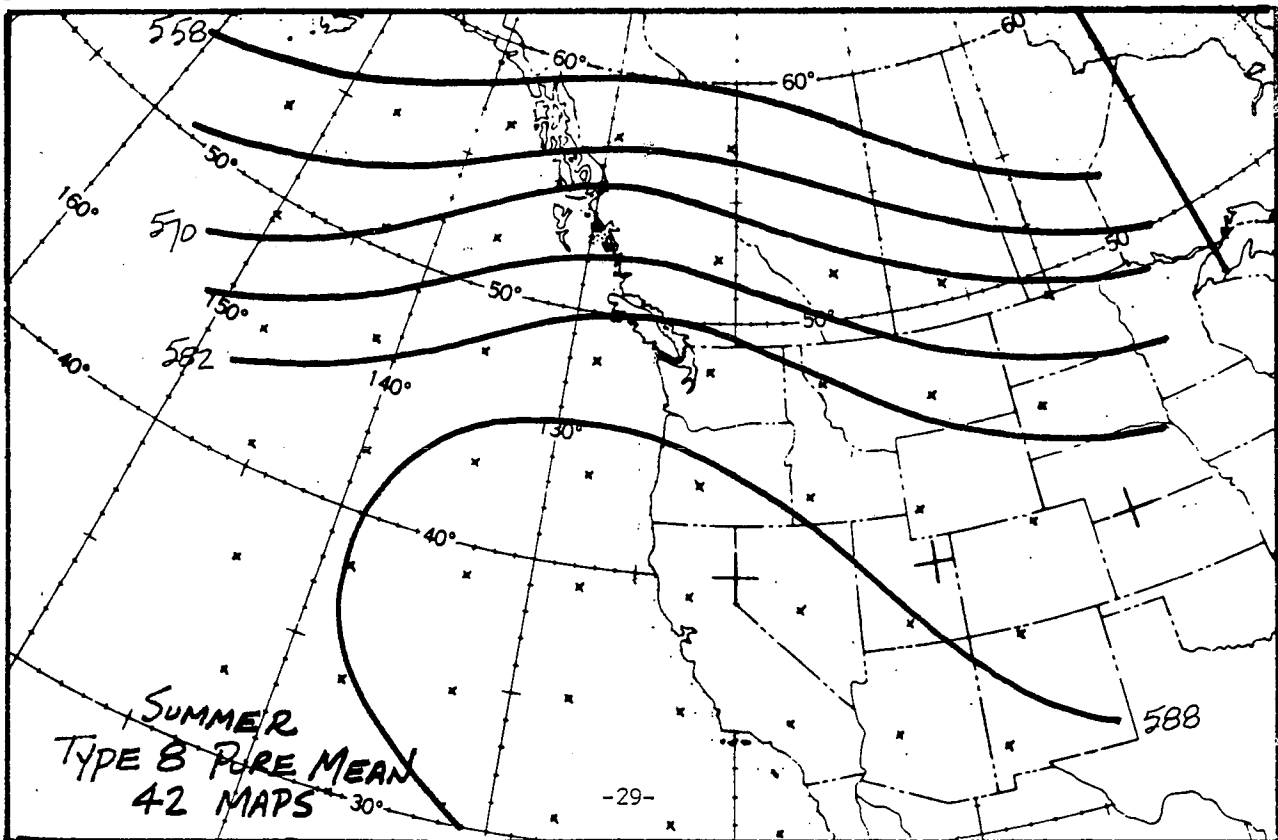
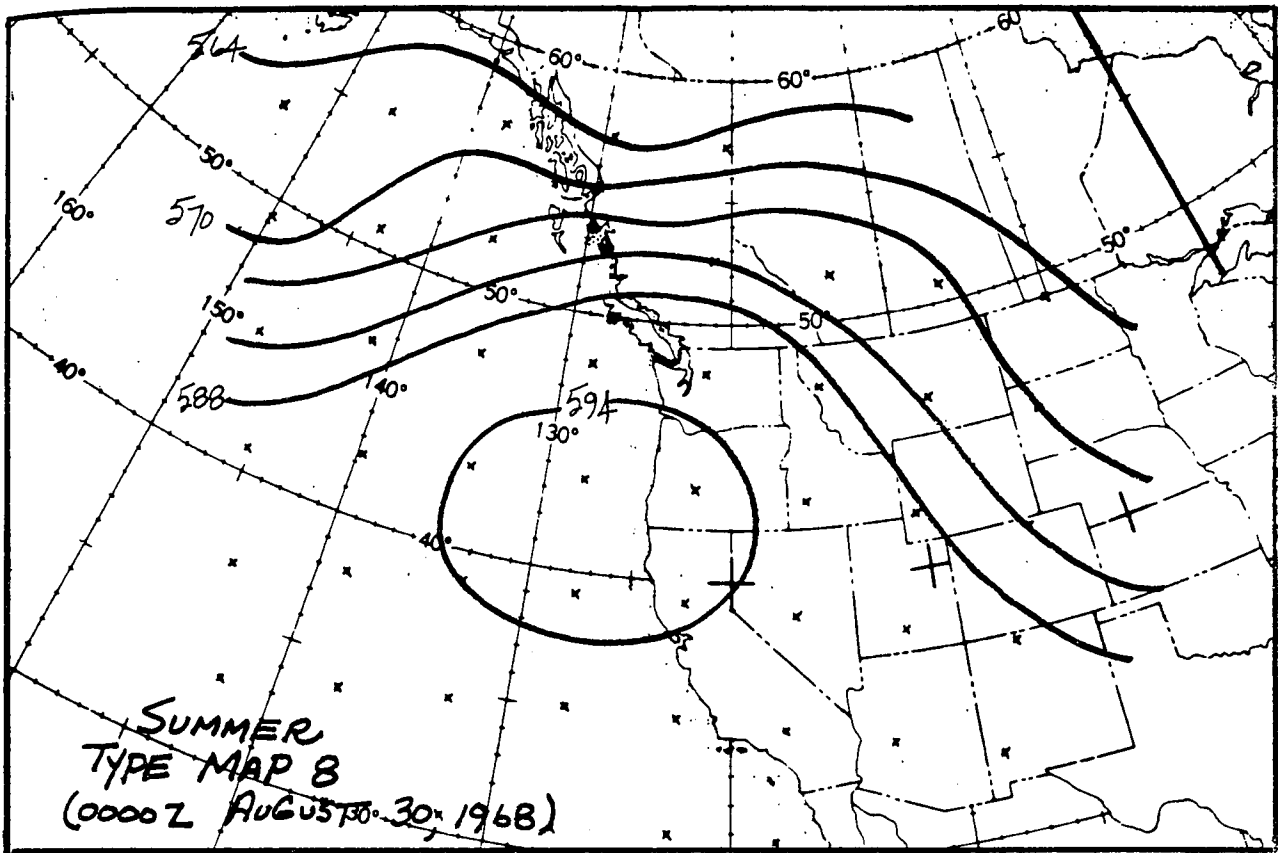




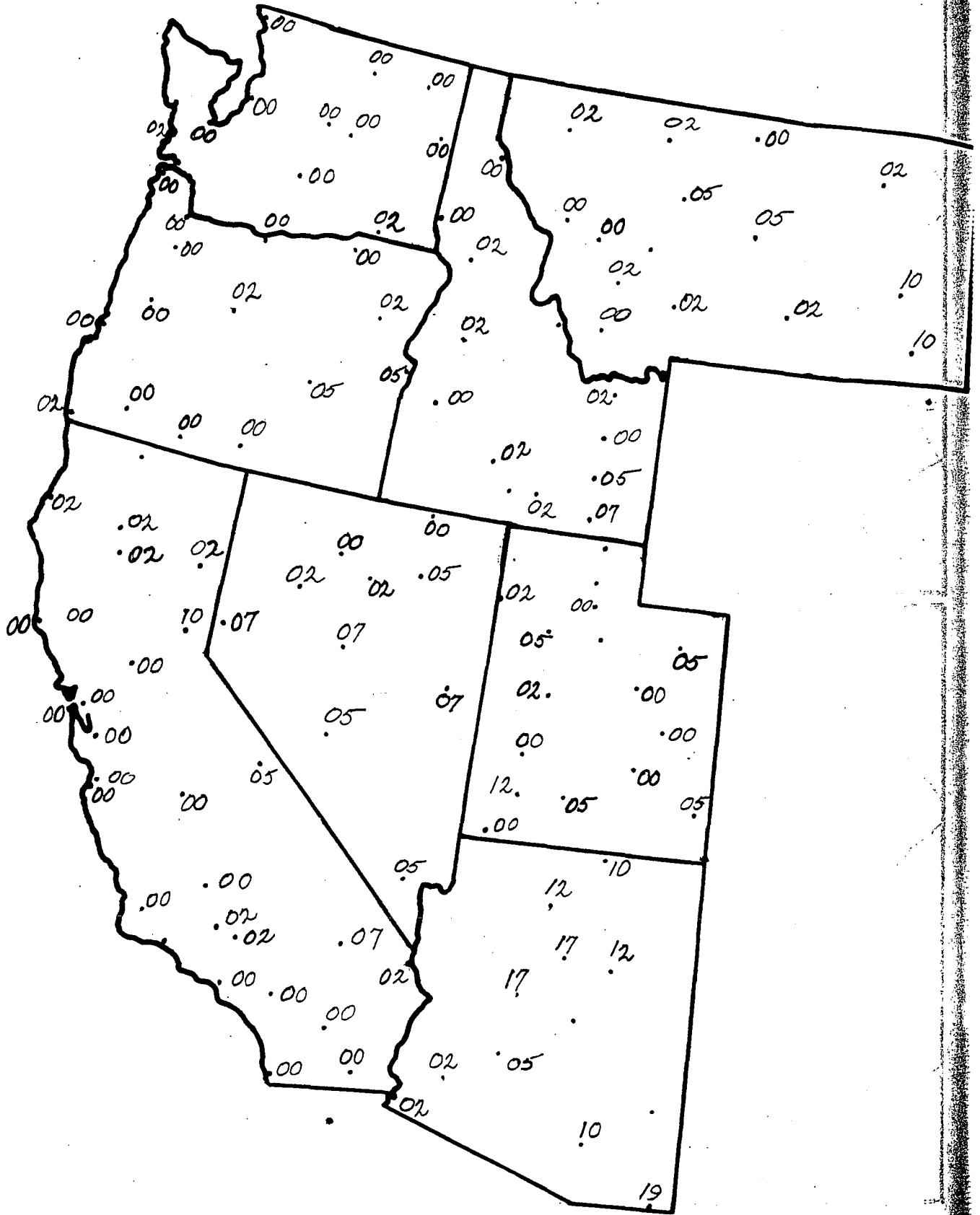
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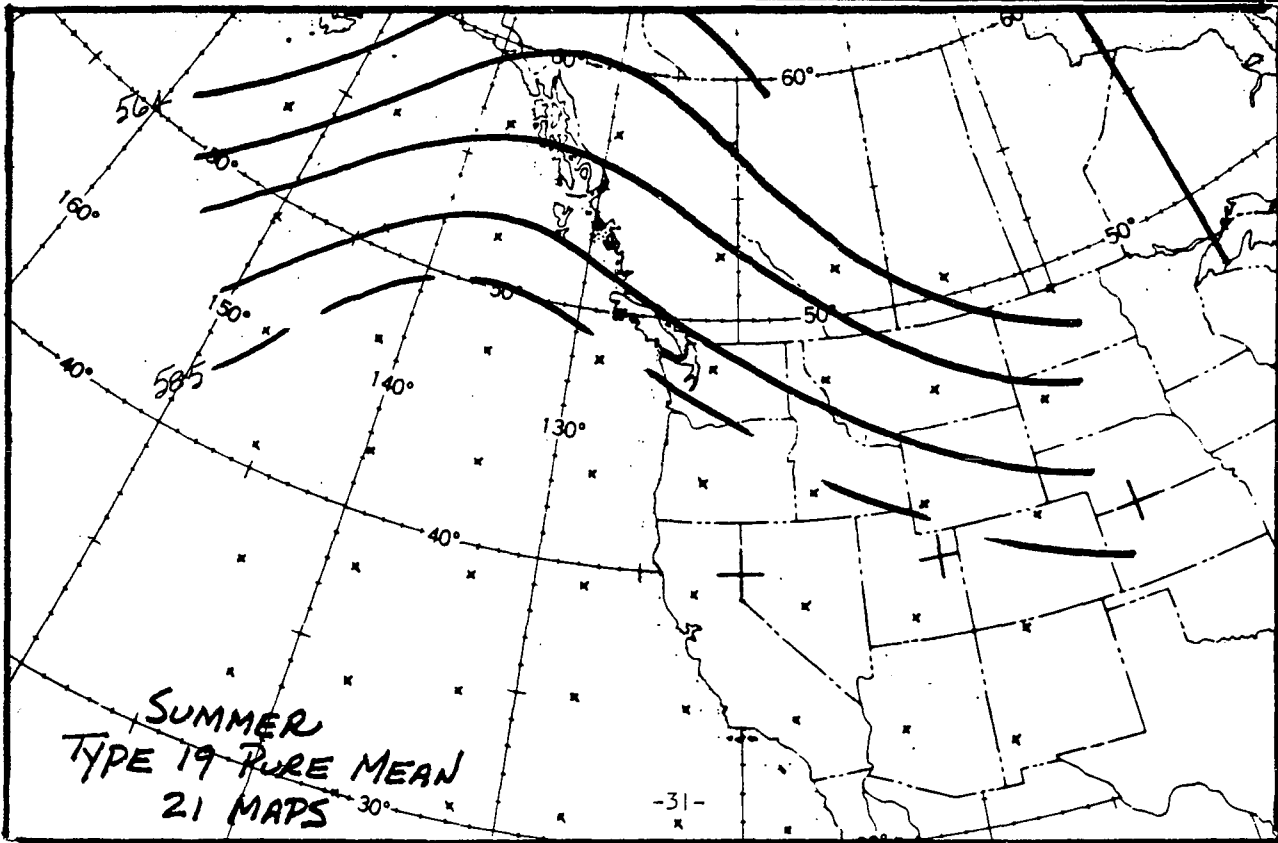
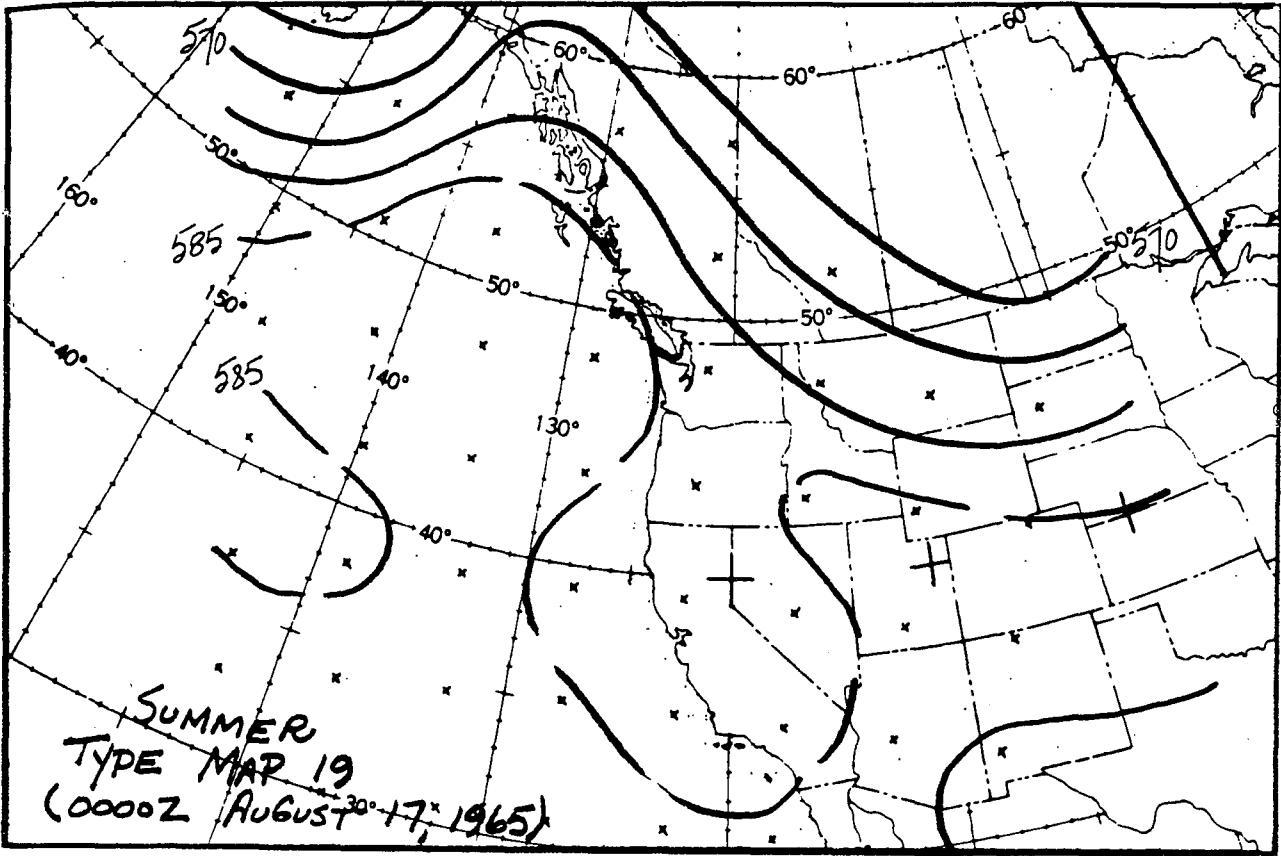




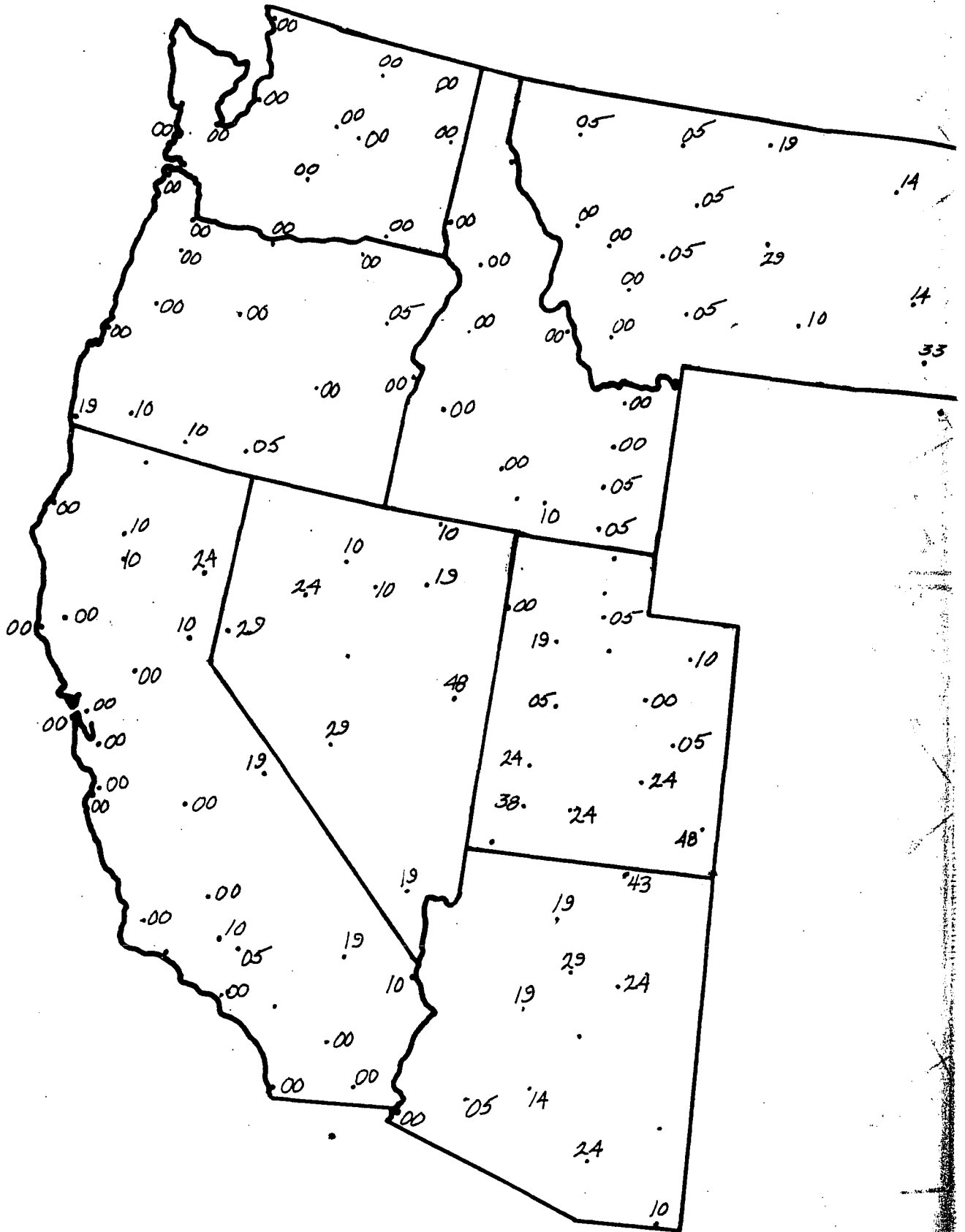


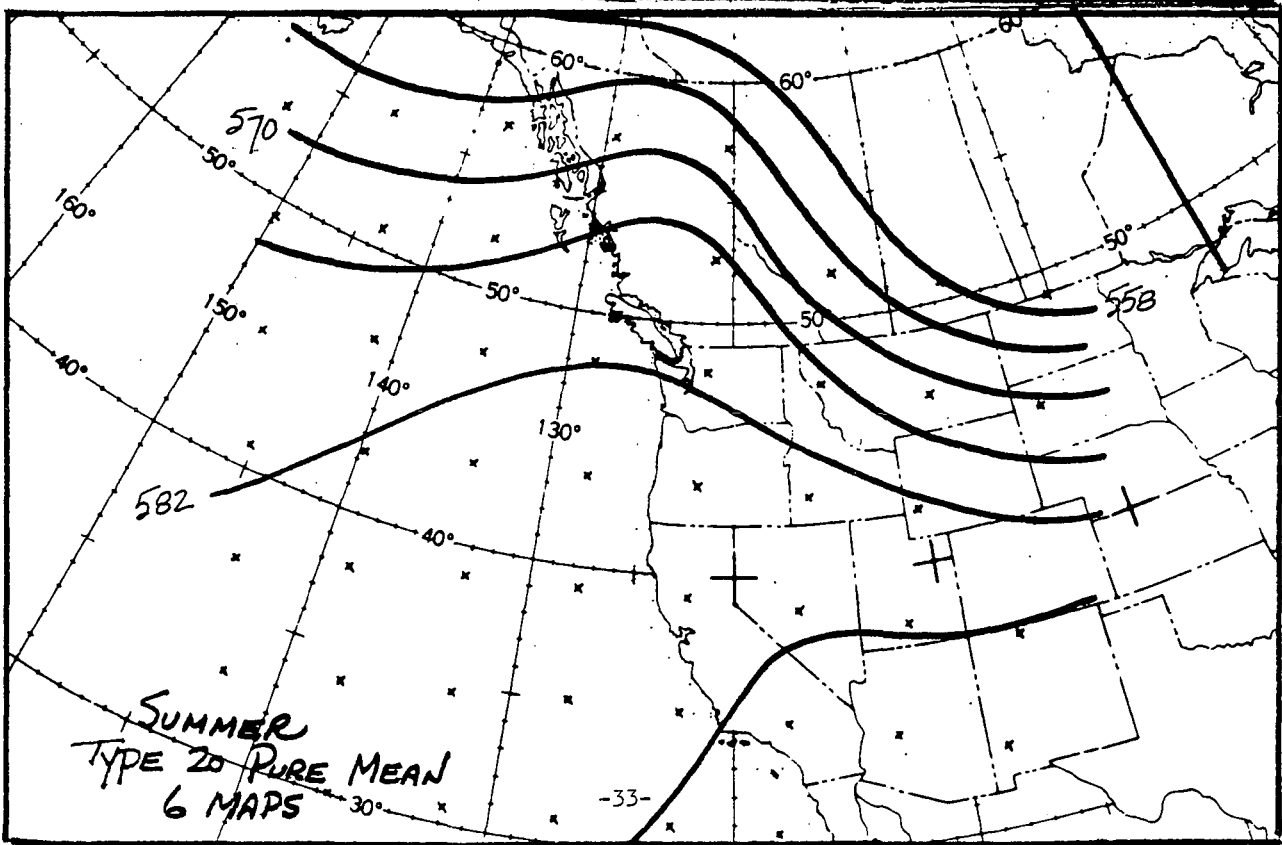
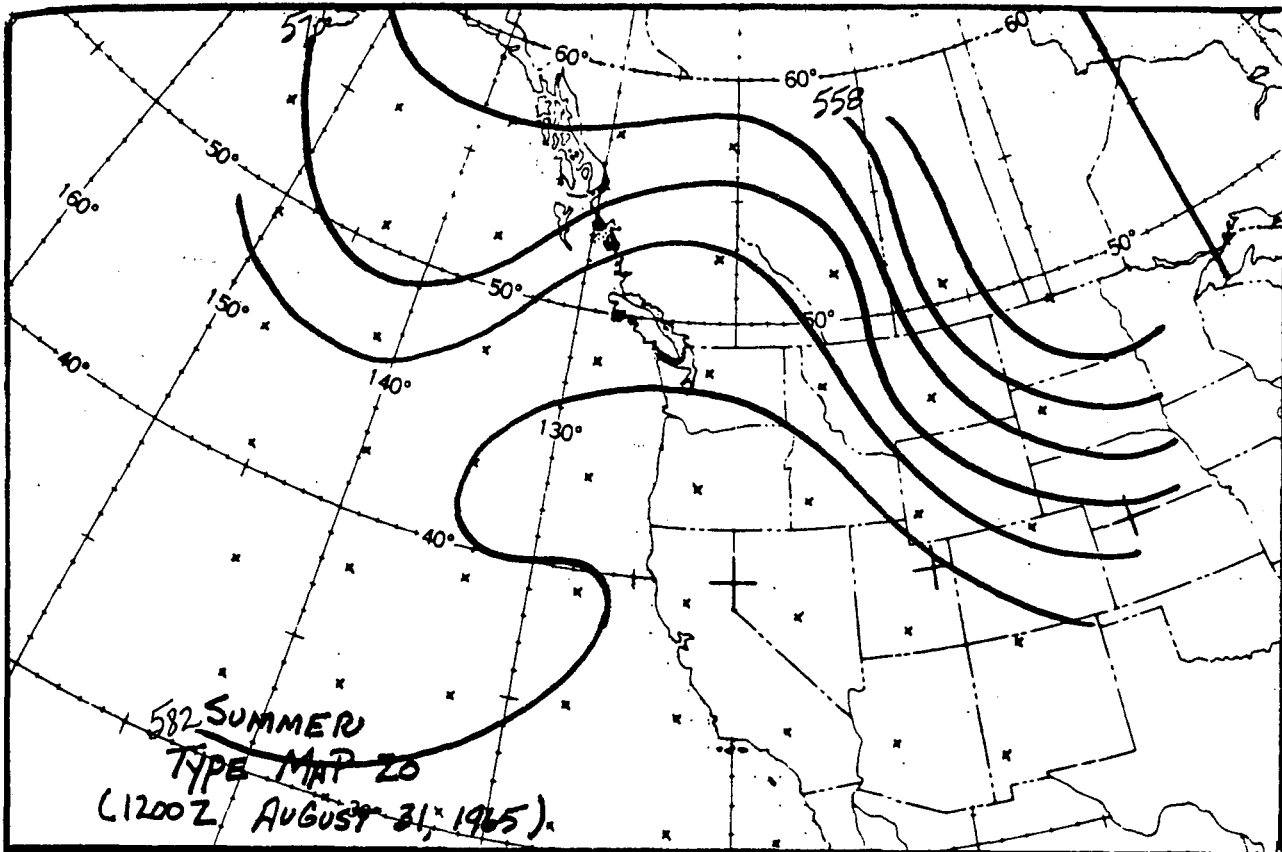
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500-MB. SUMMER TYPE 8



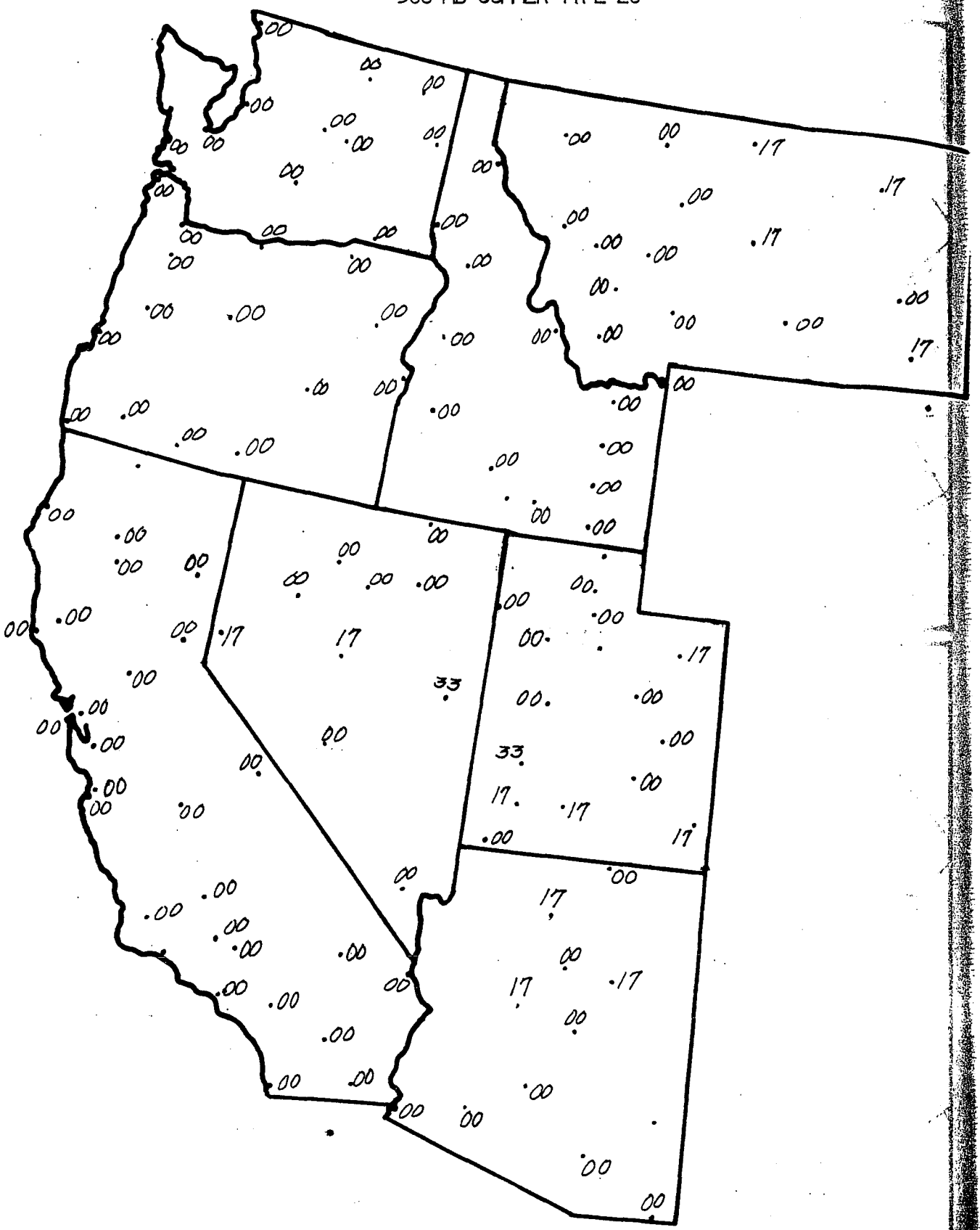


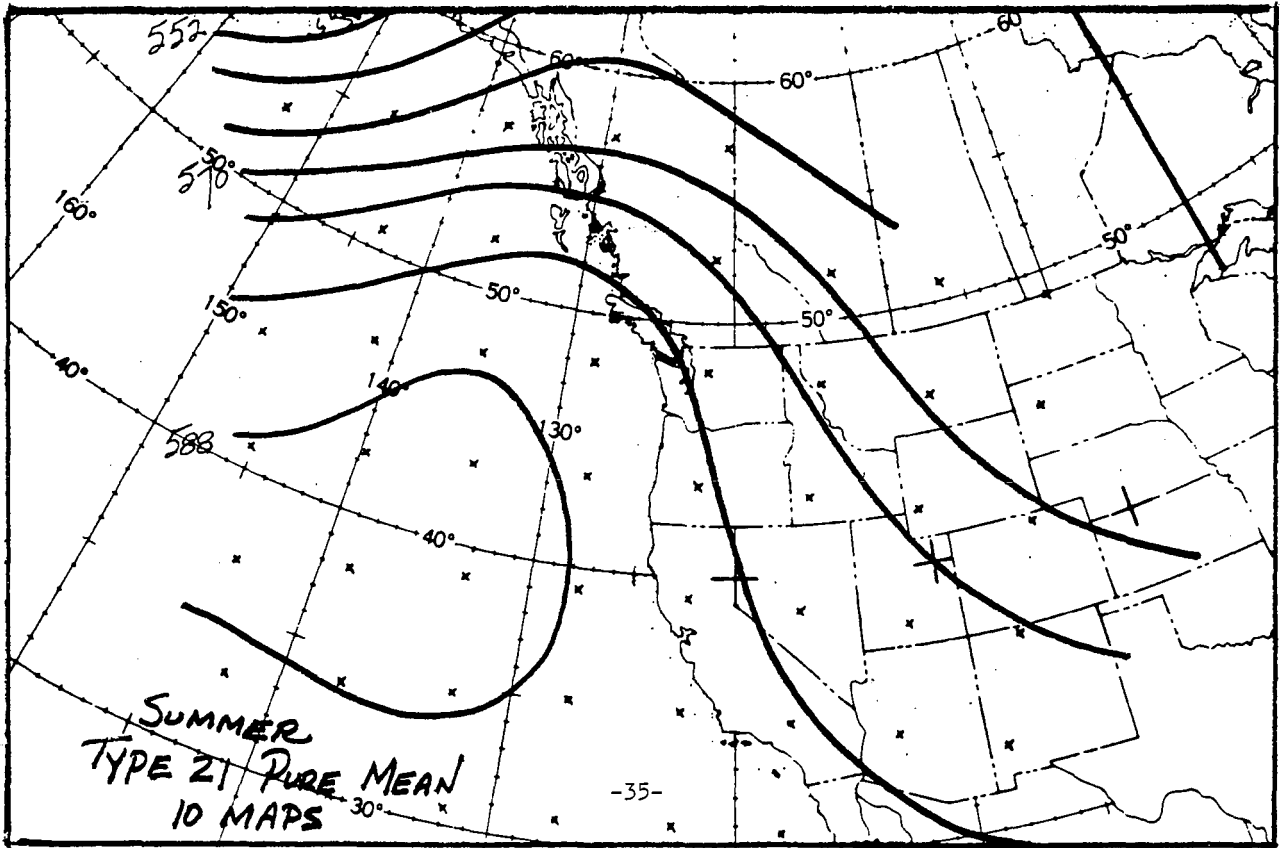
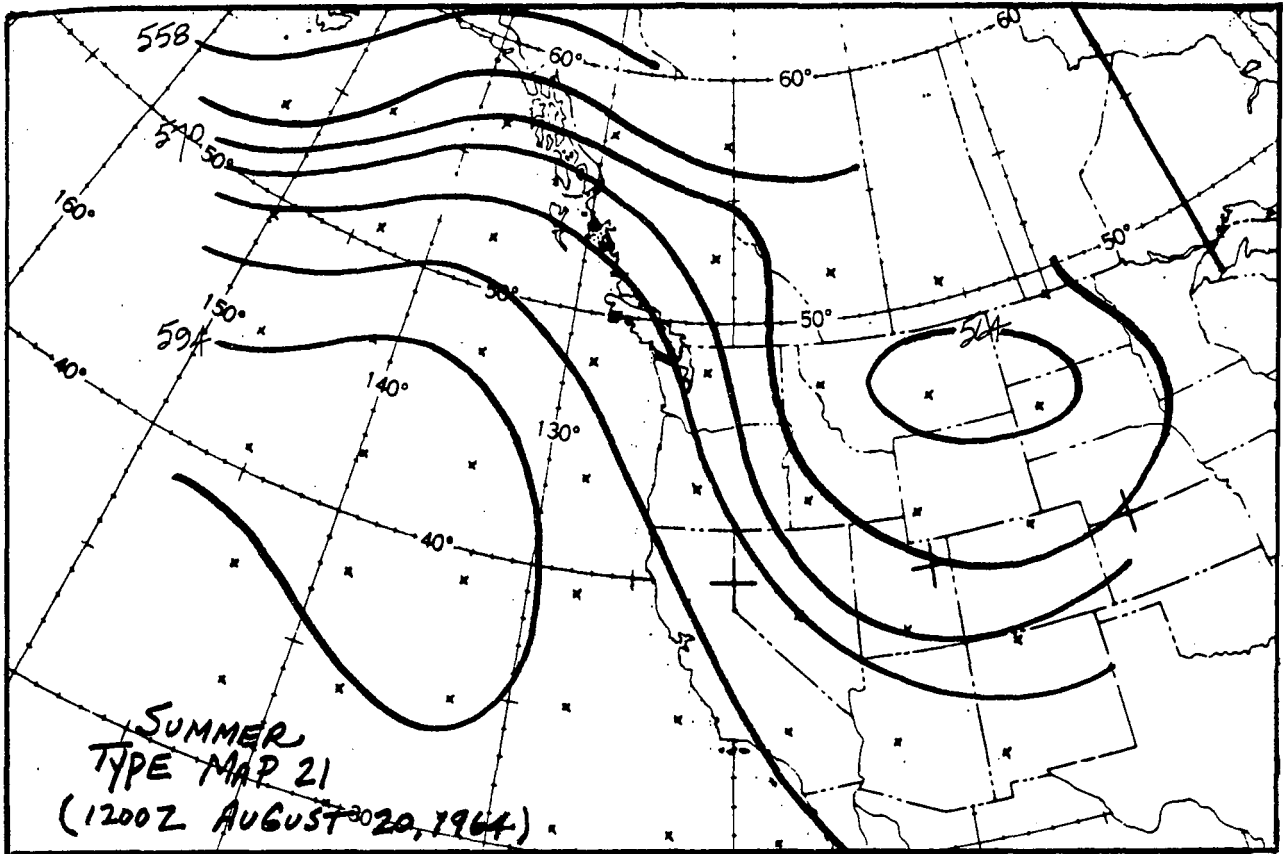
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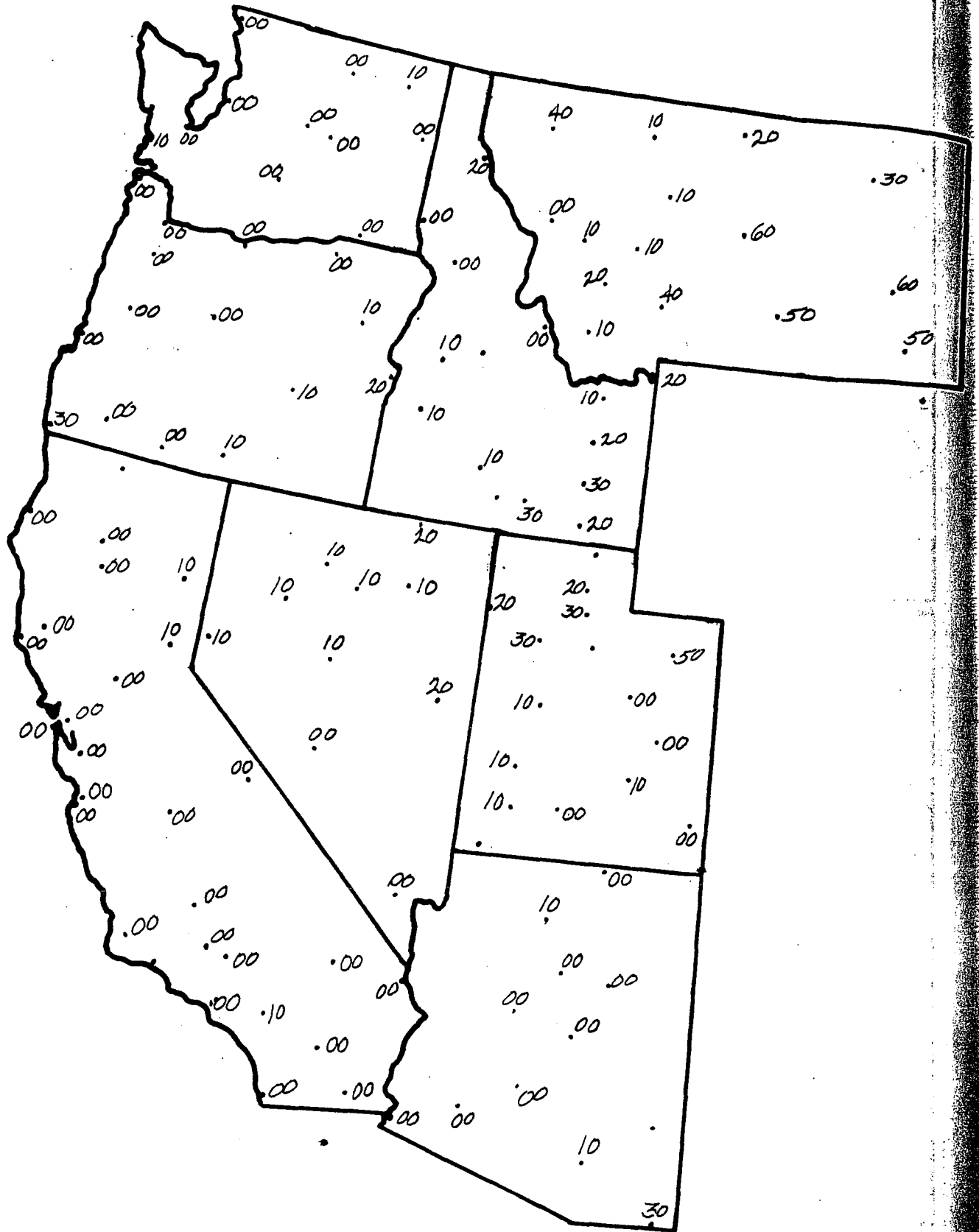


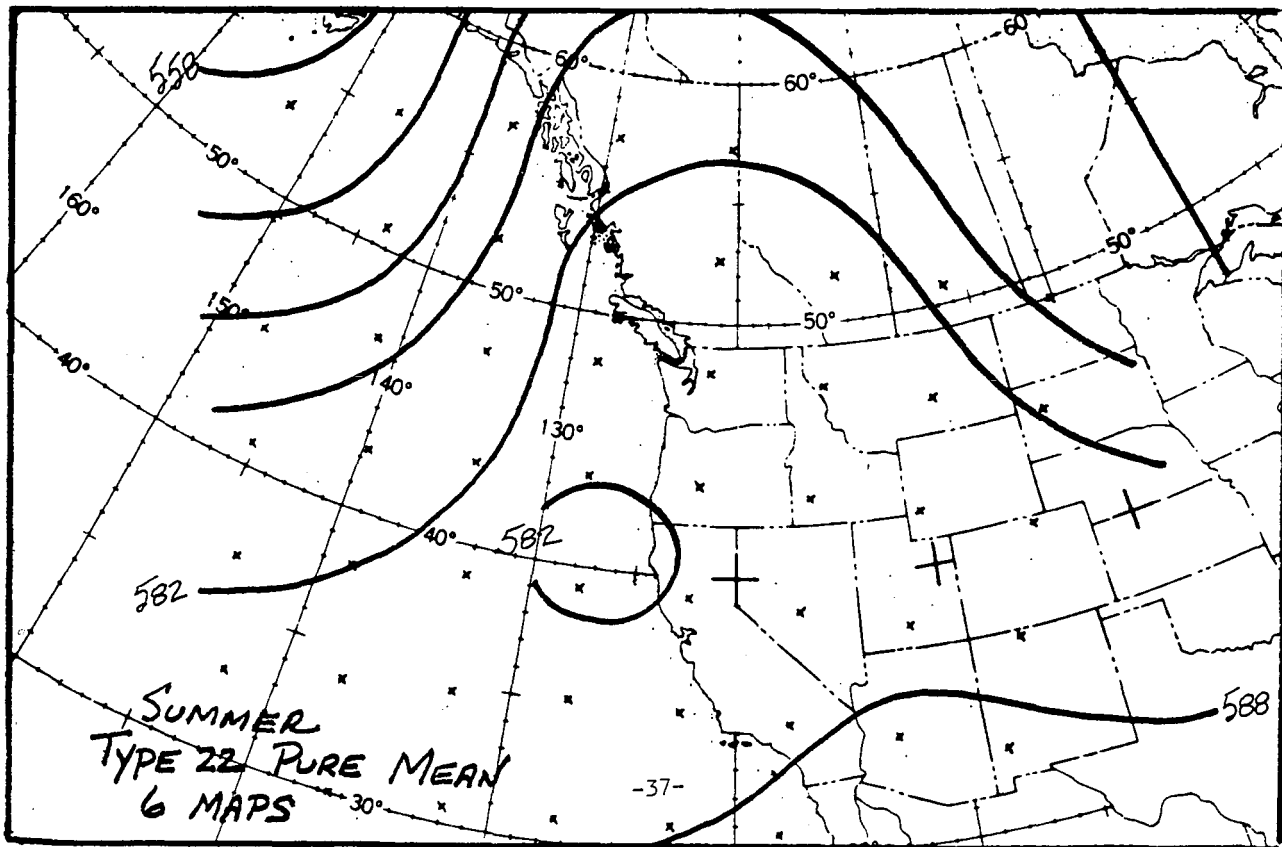
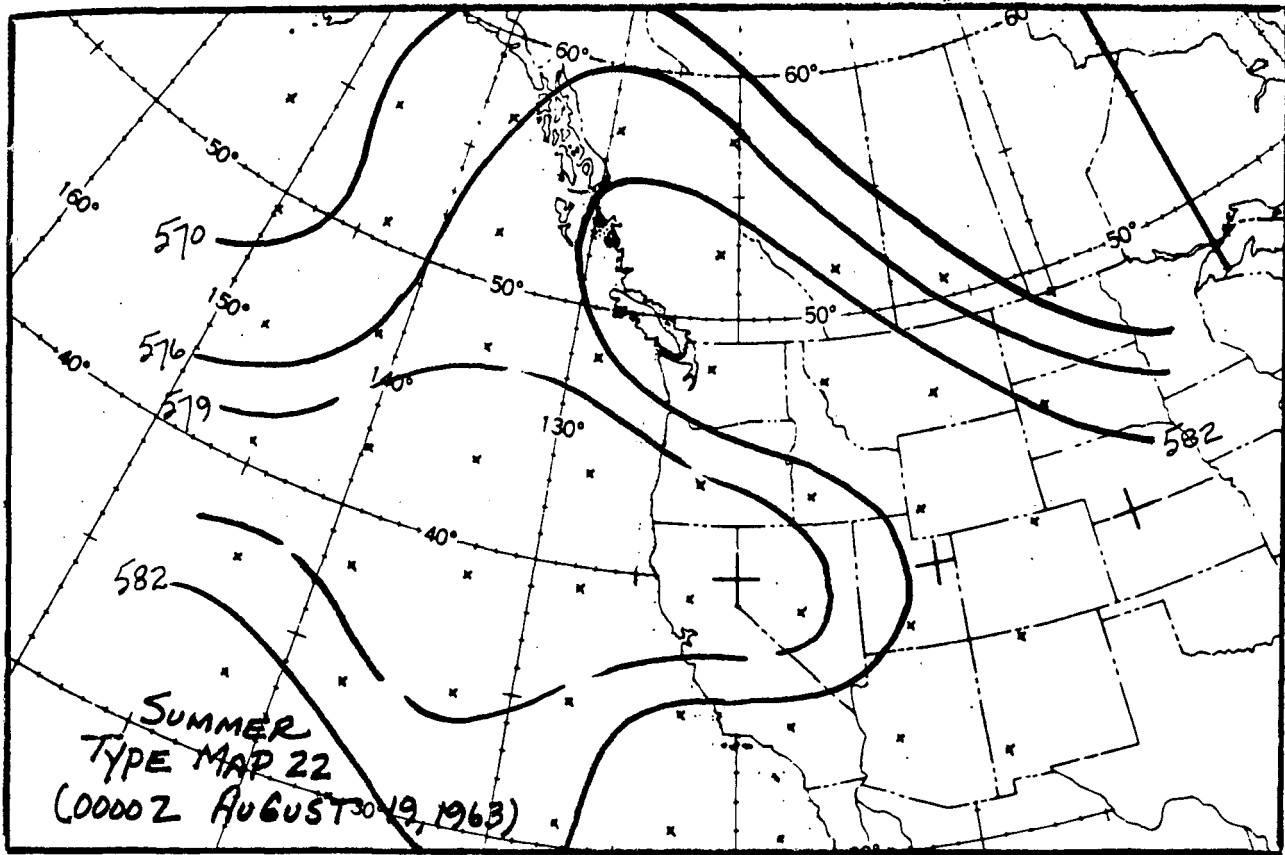
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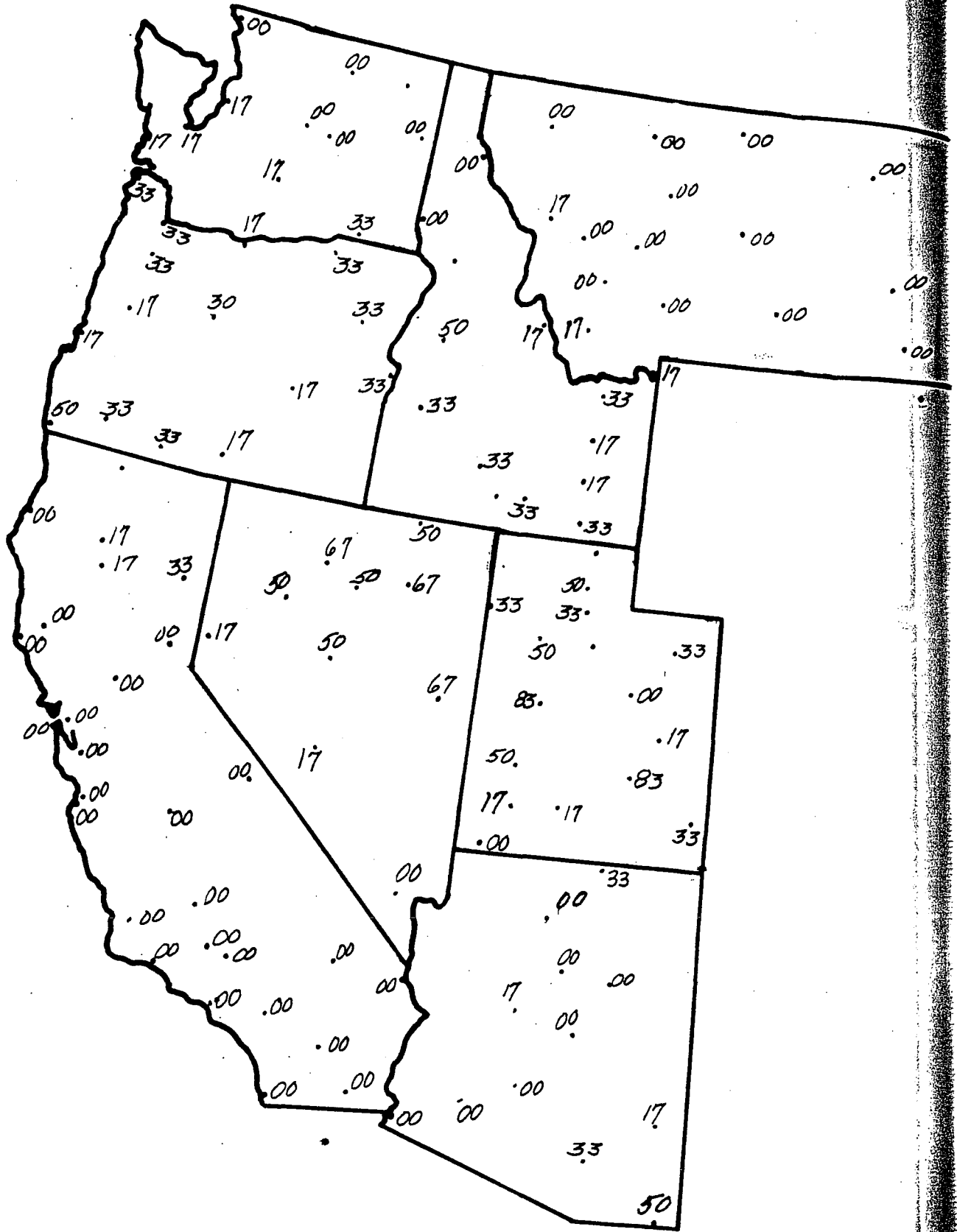


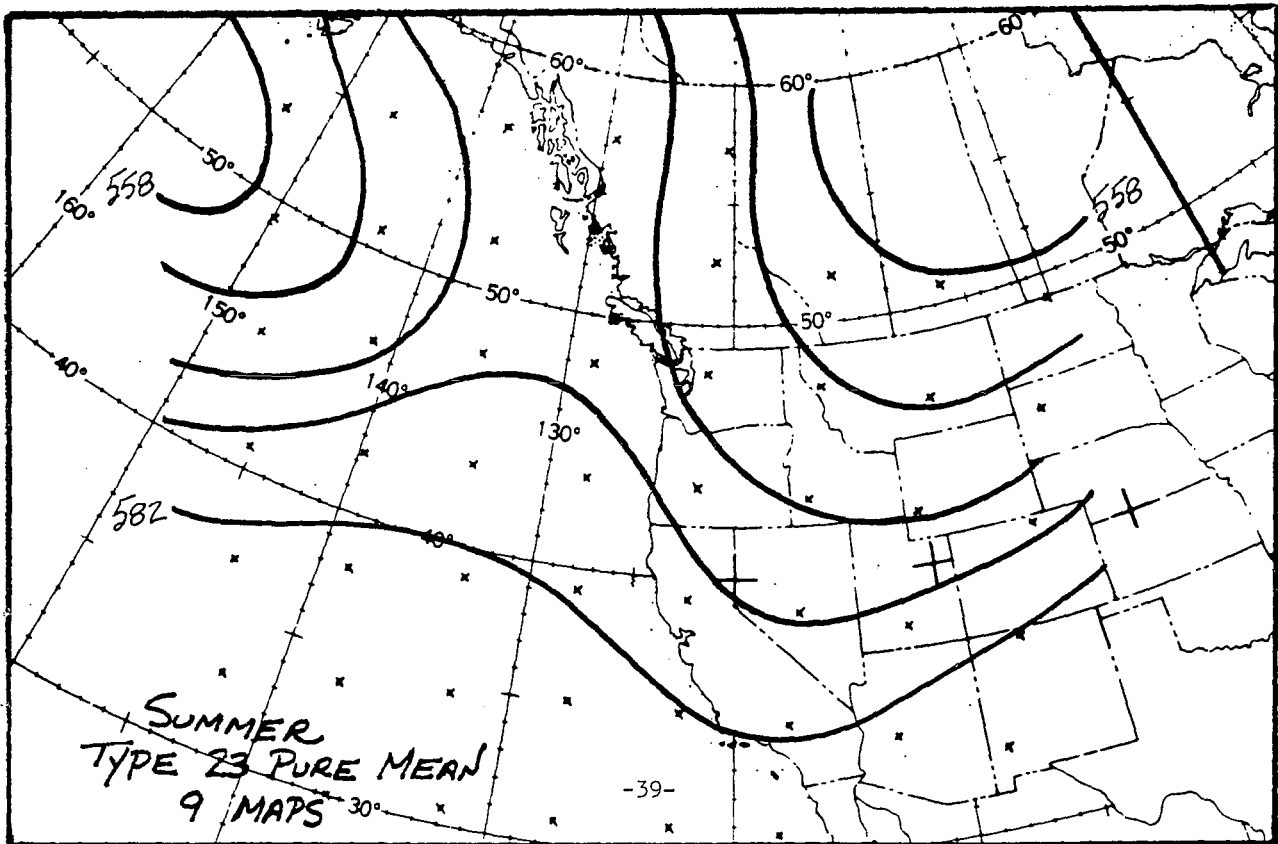
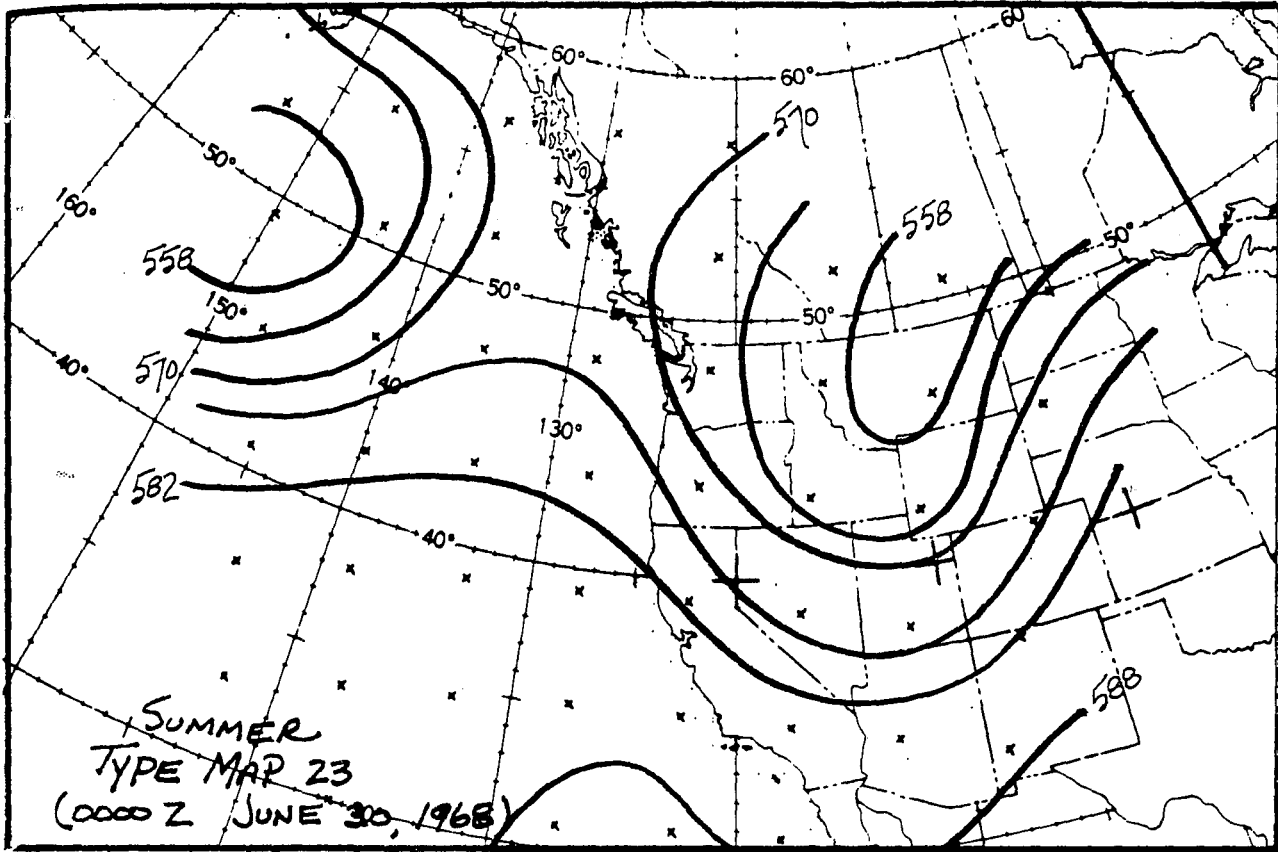
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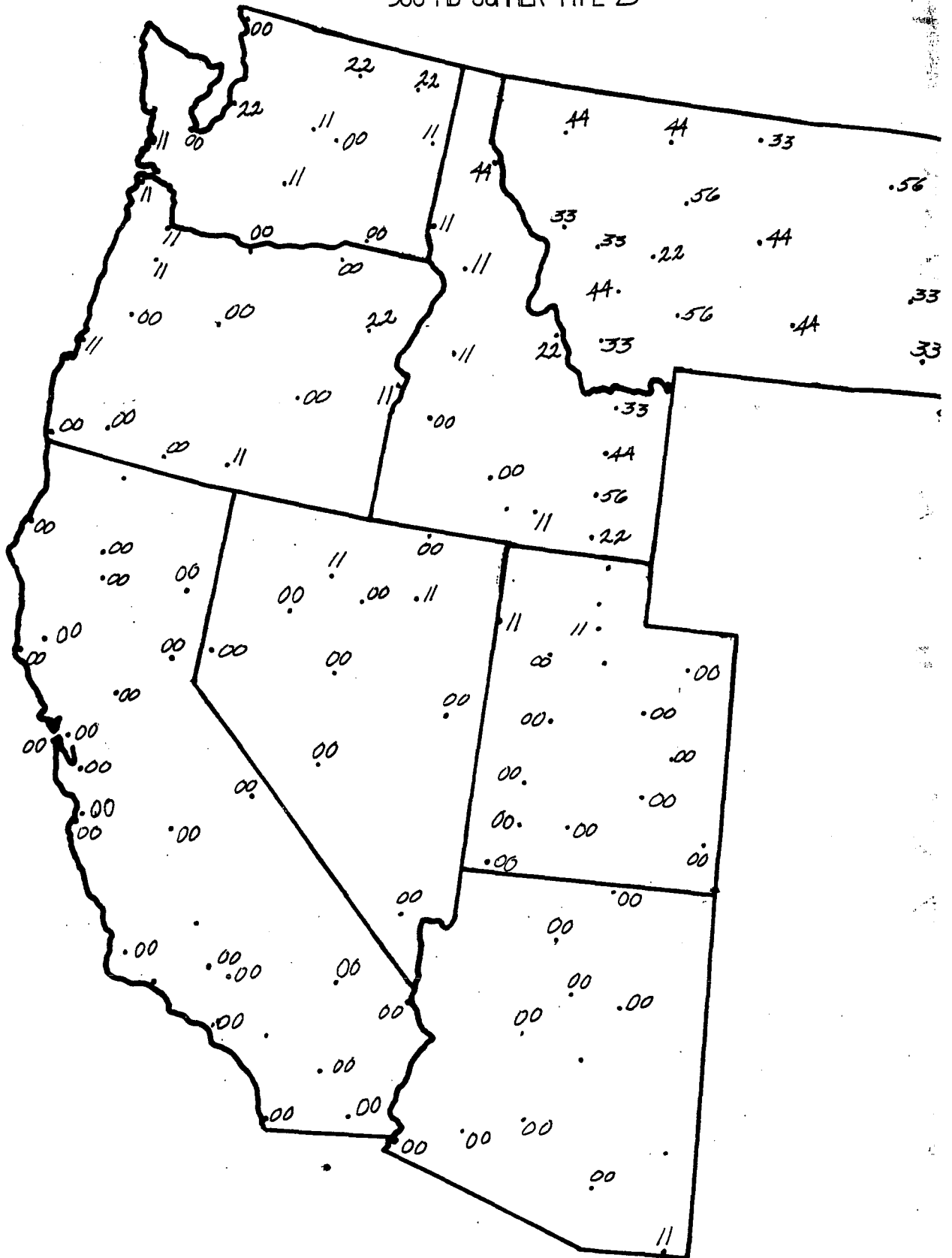


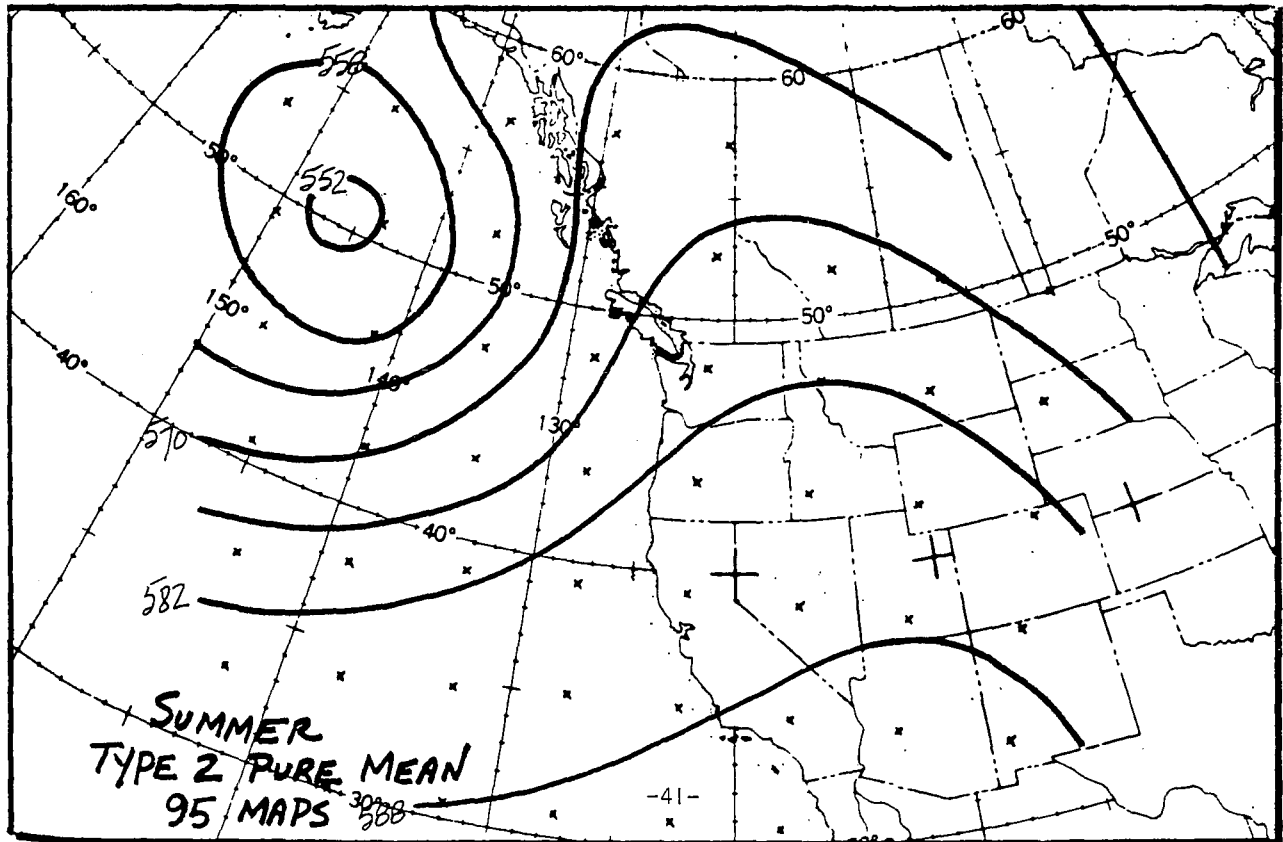
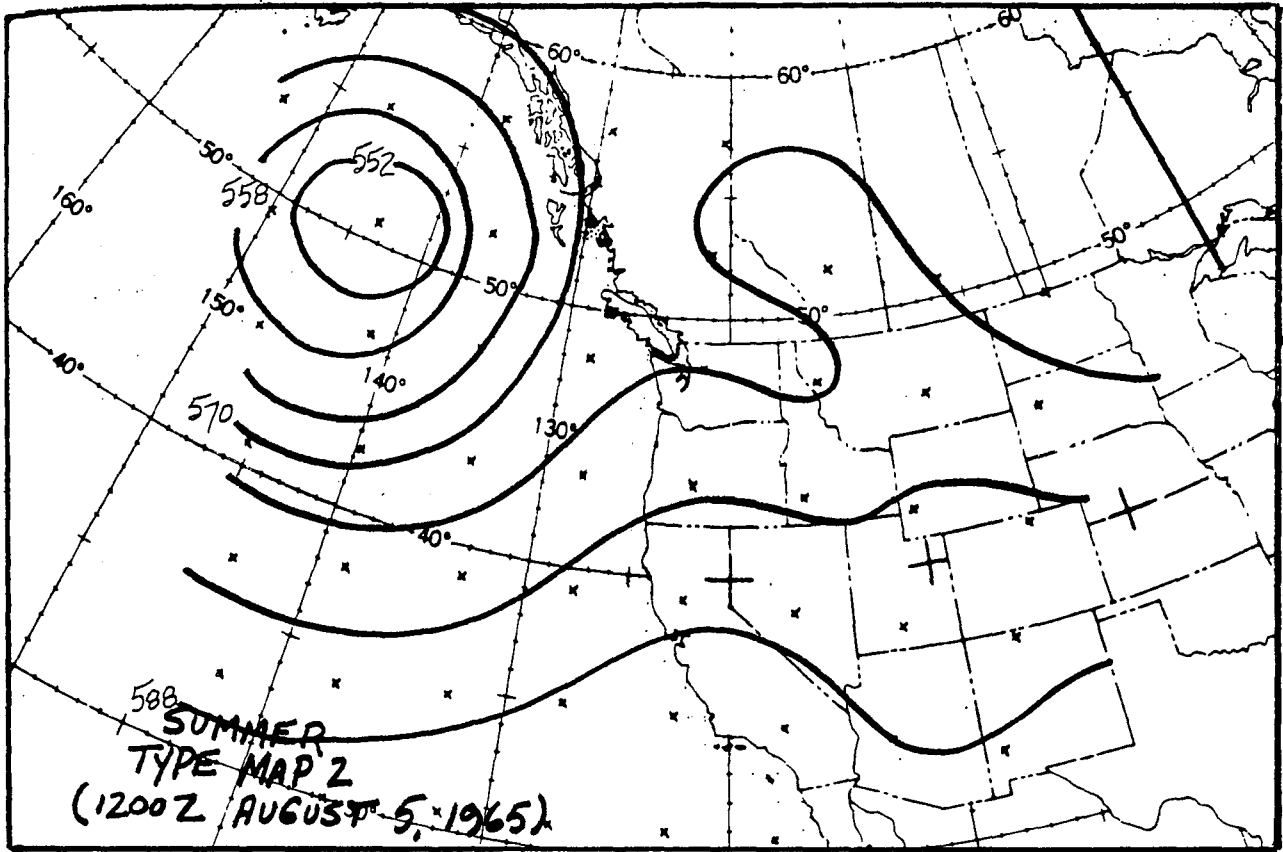
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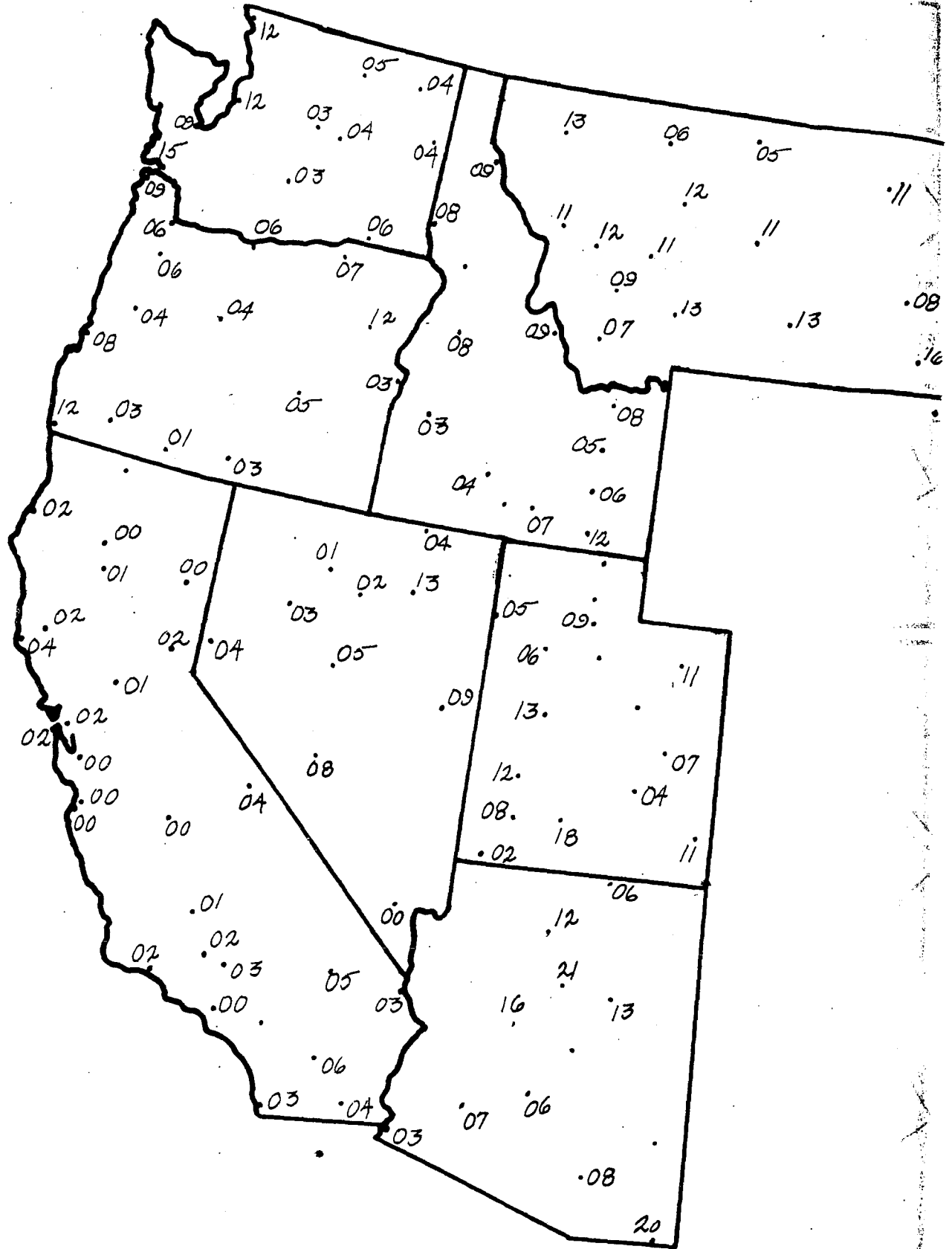


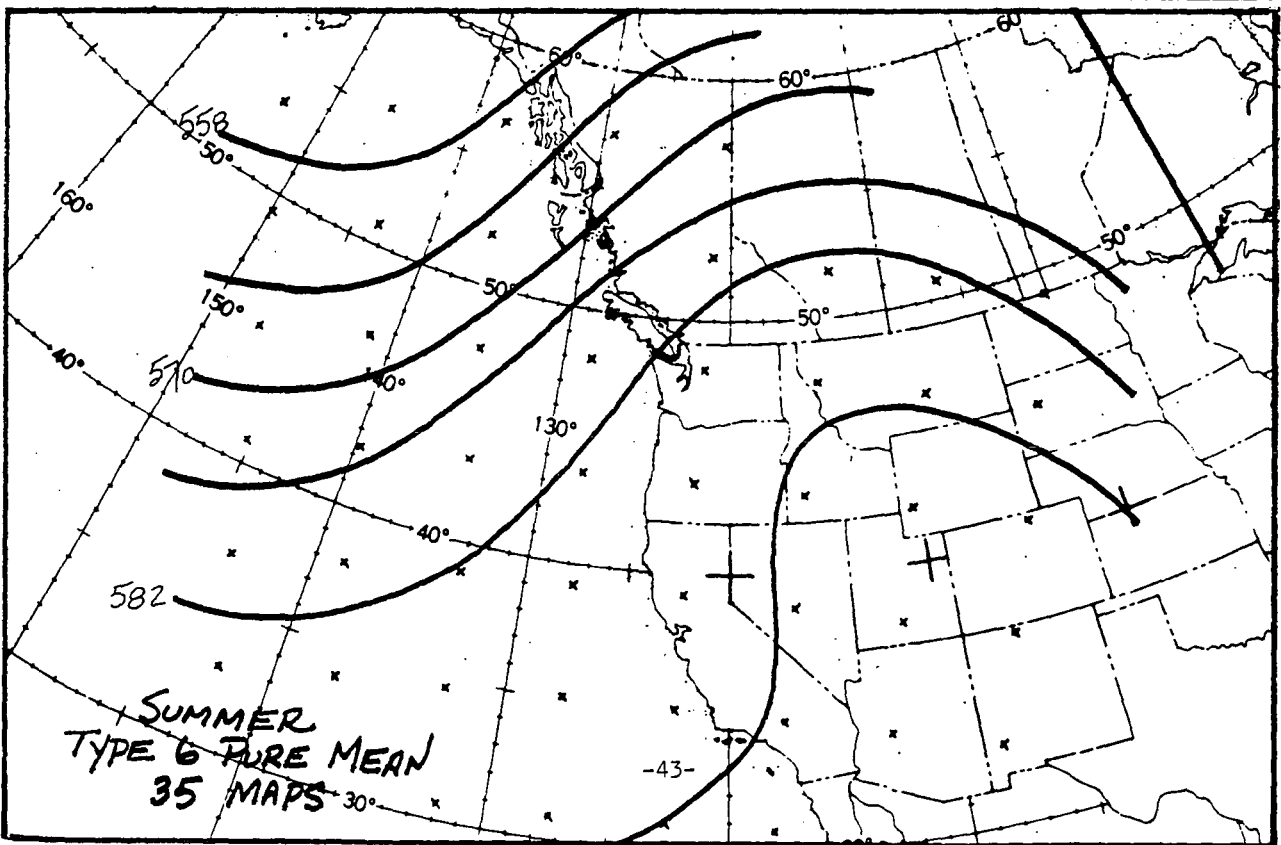
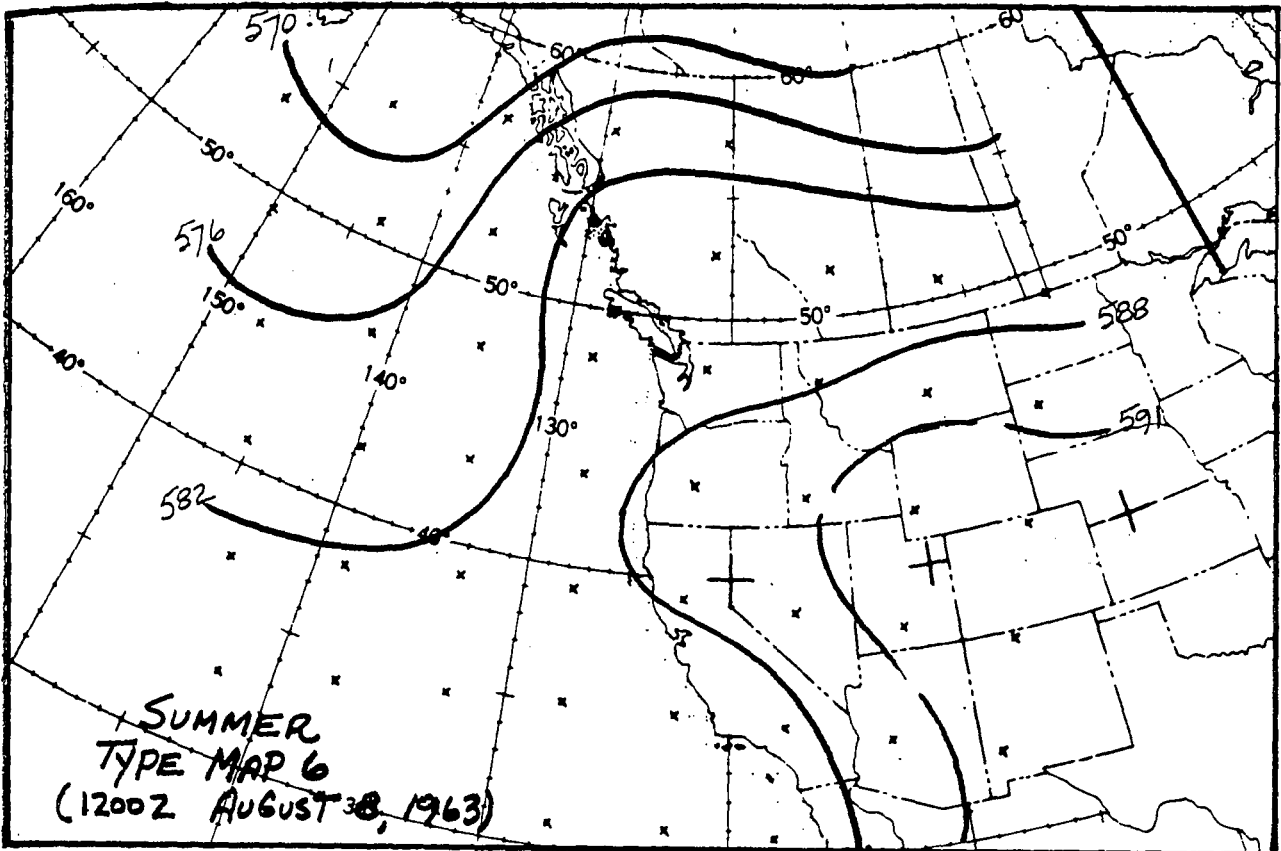
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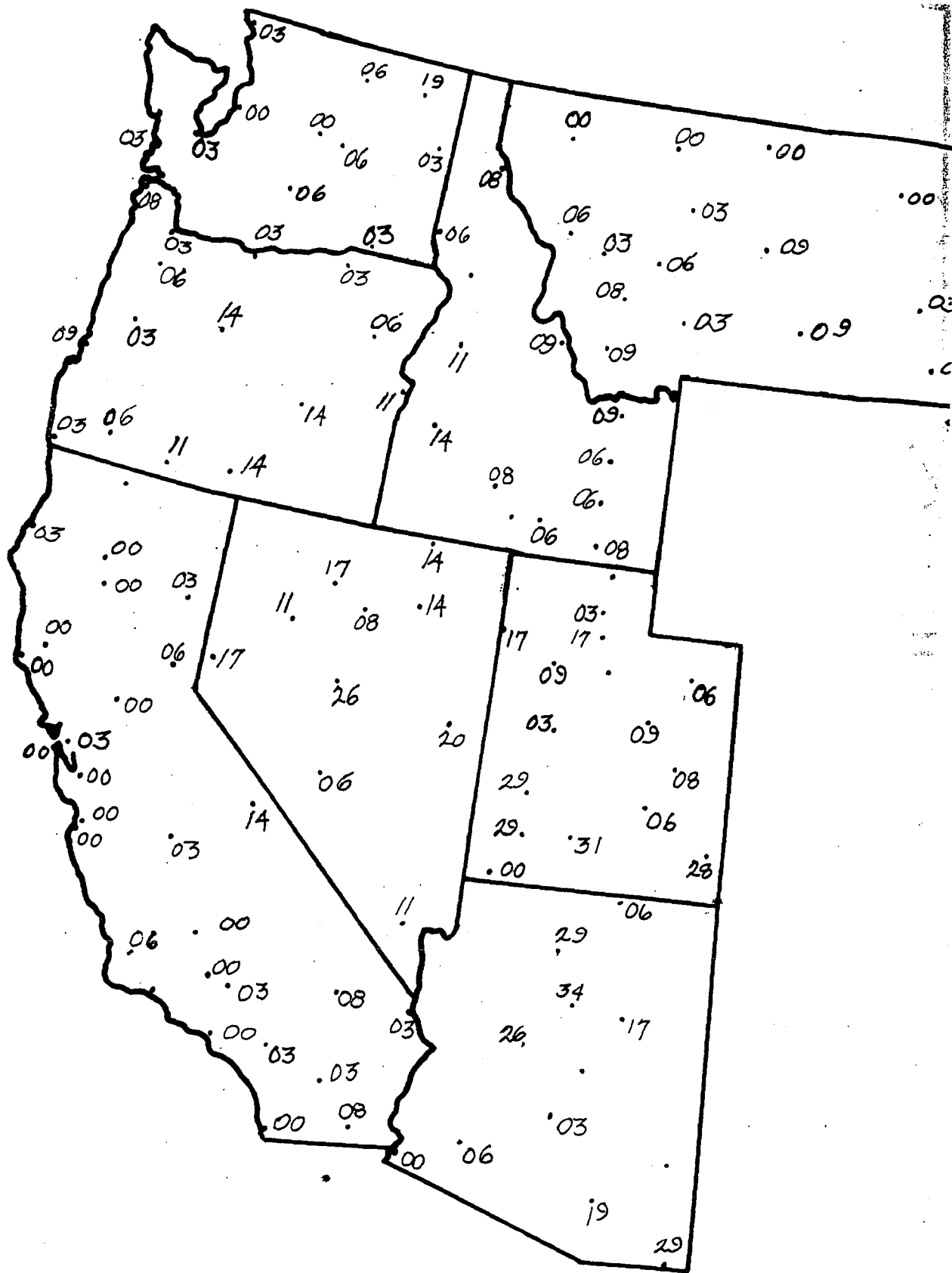


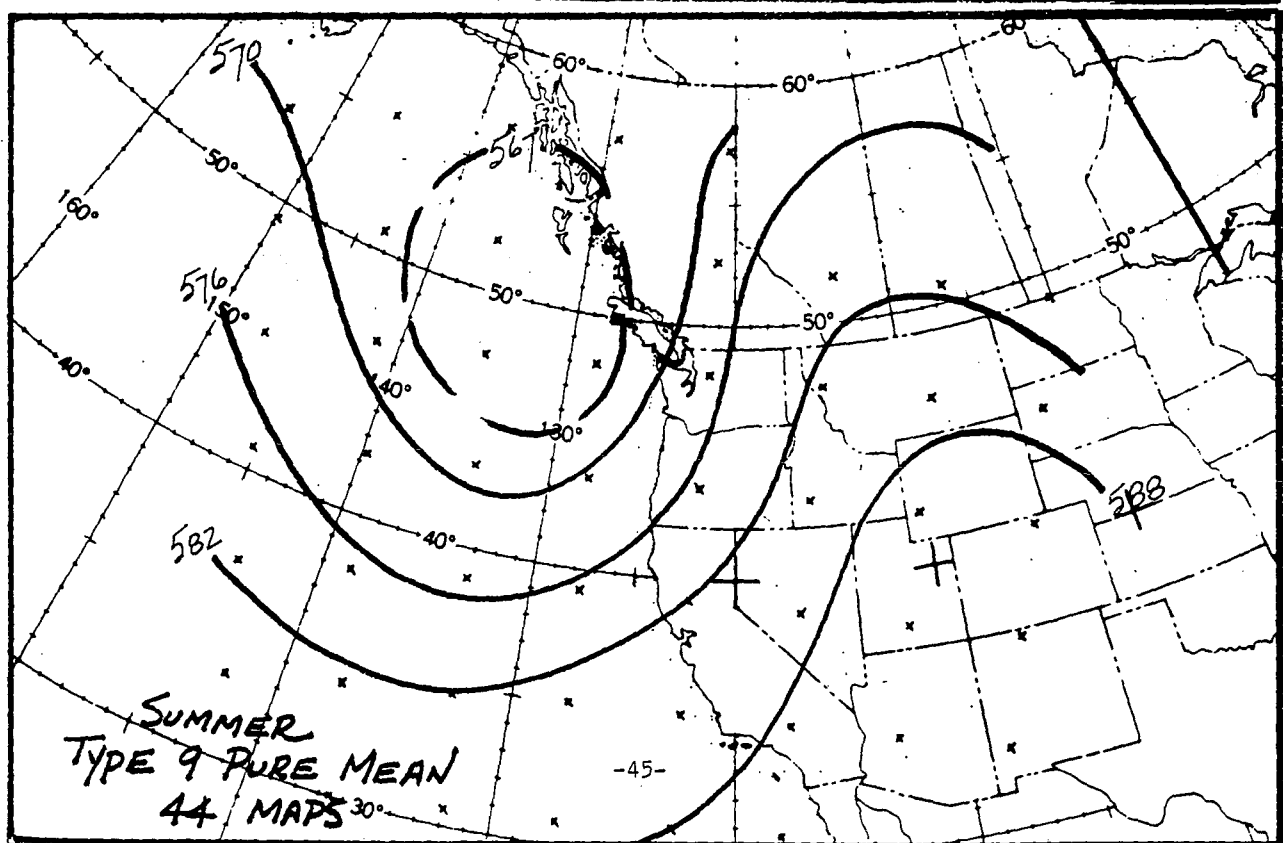
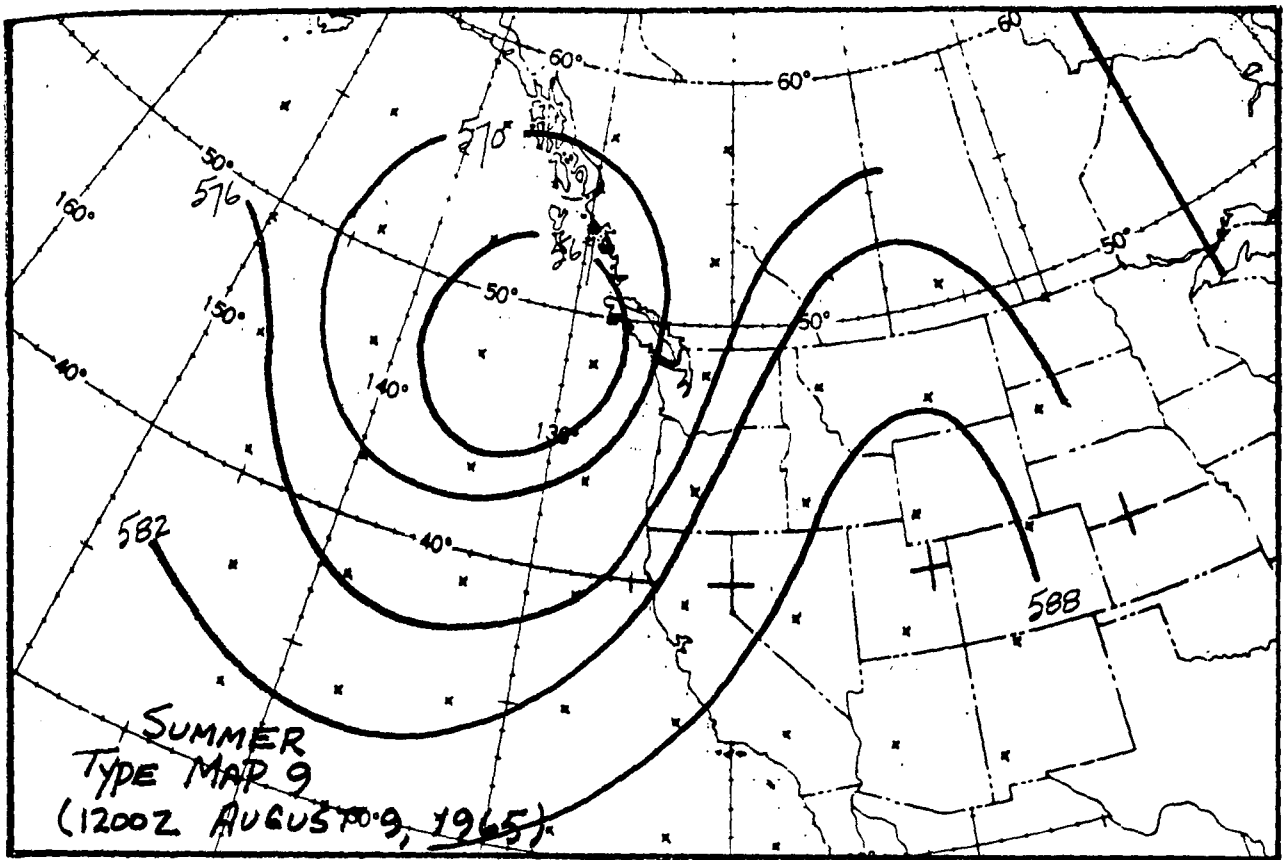
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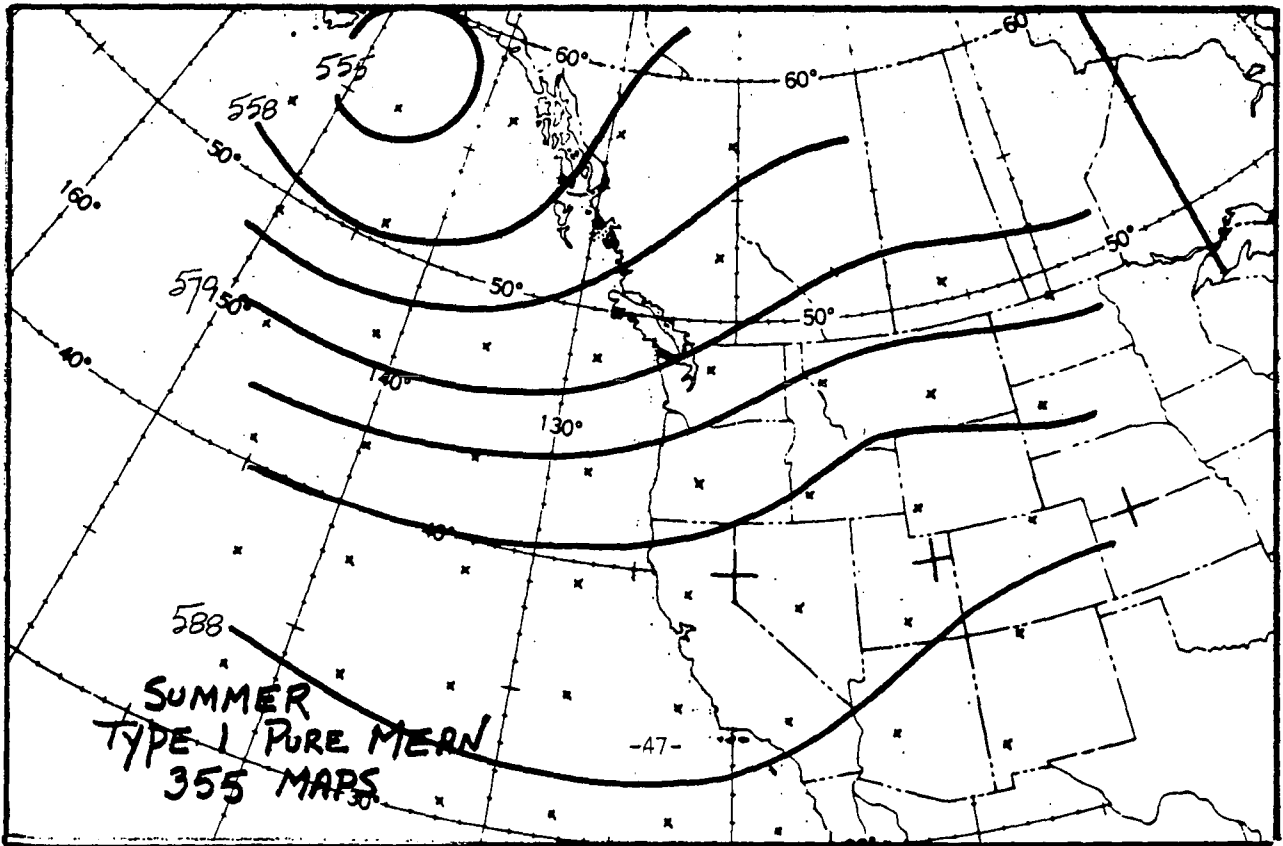
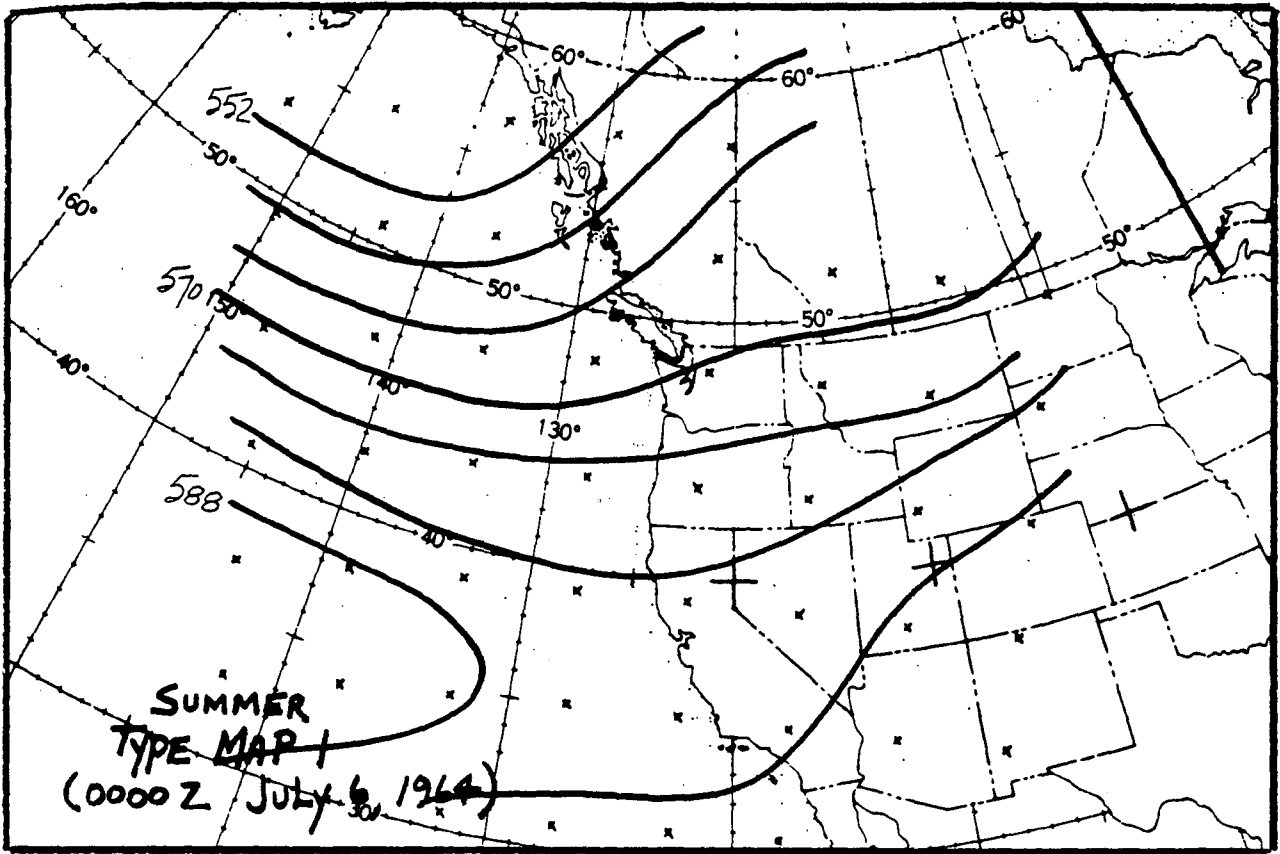


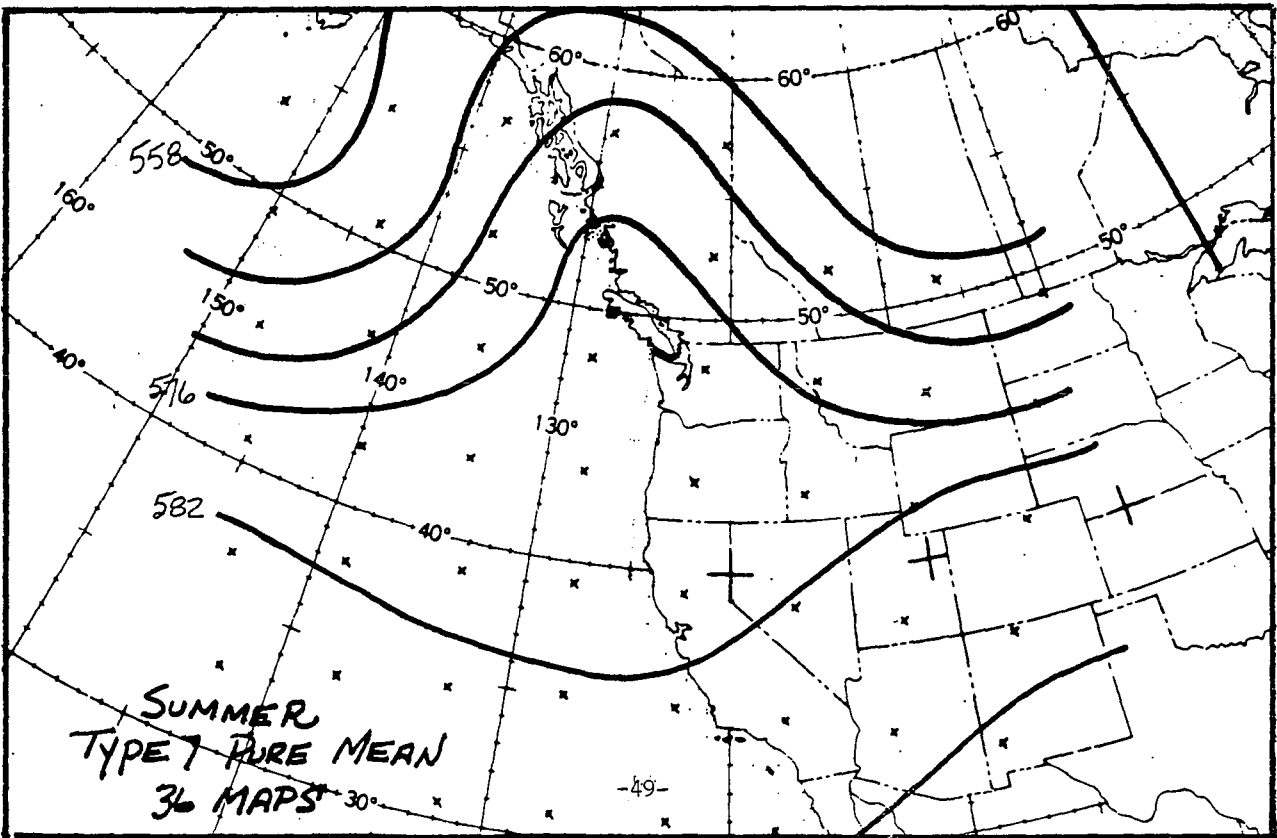
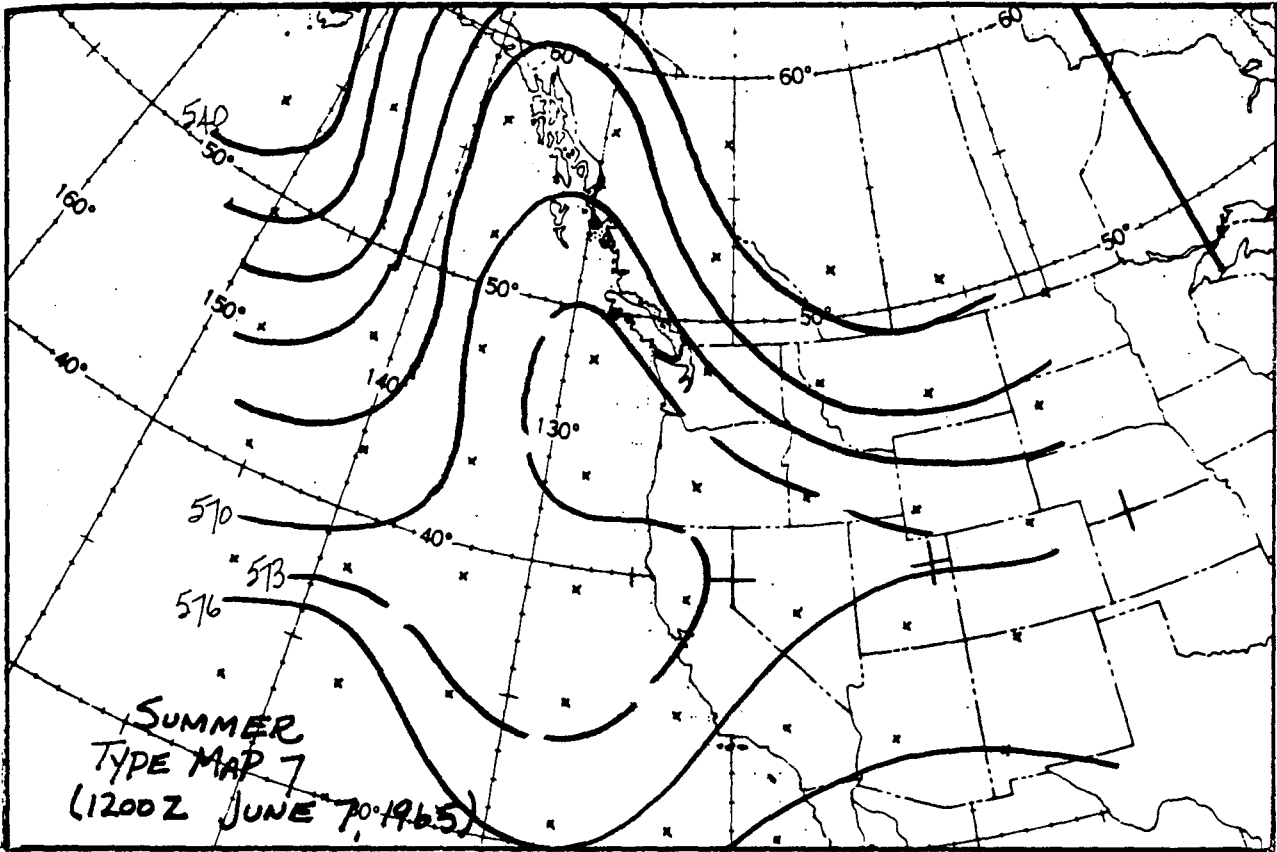


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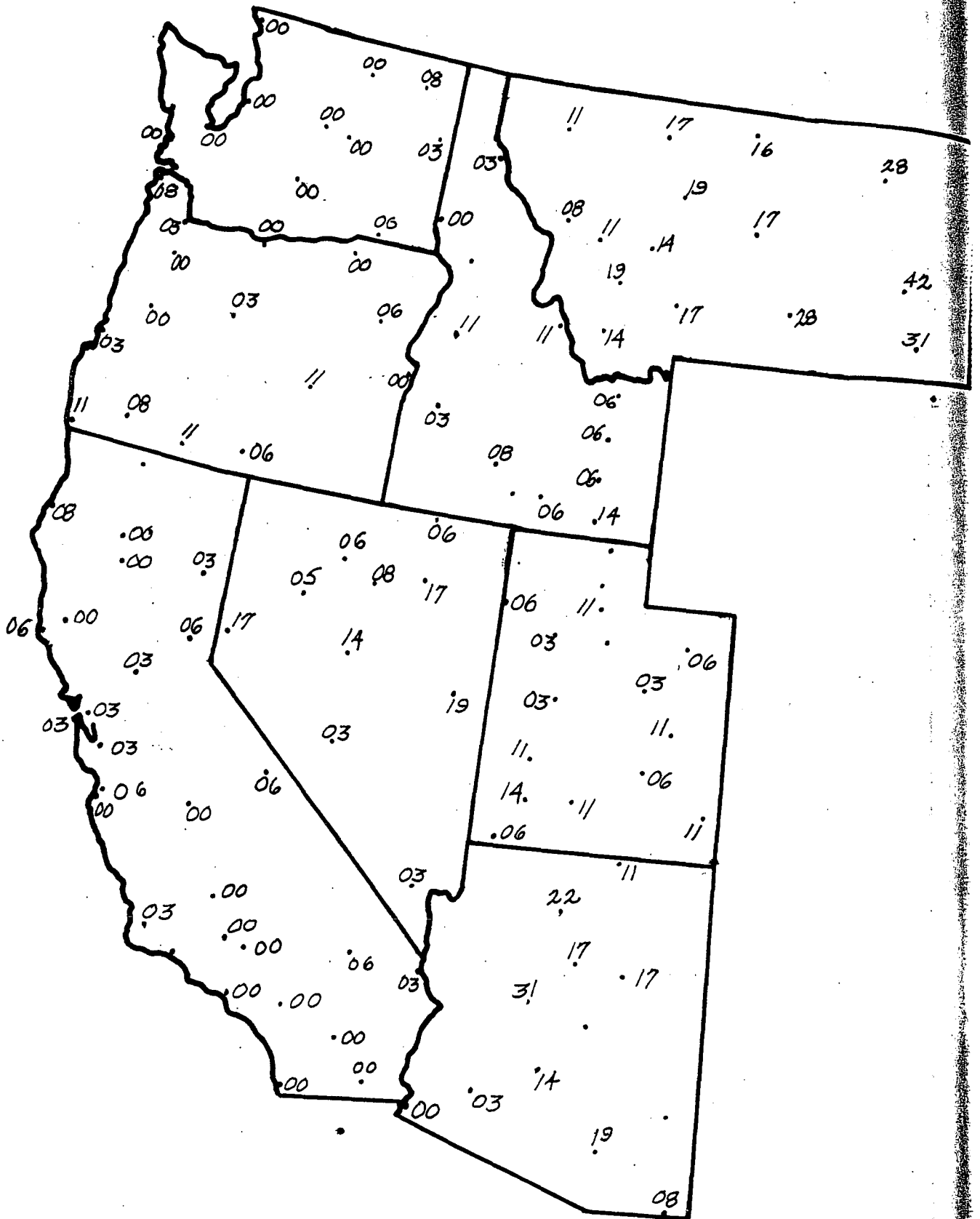


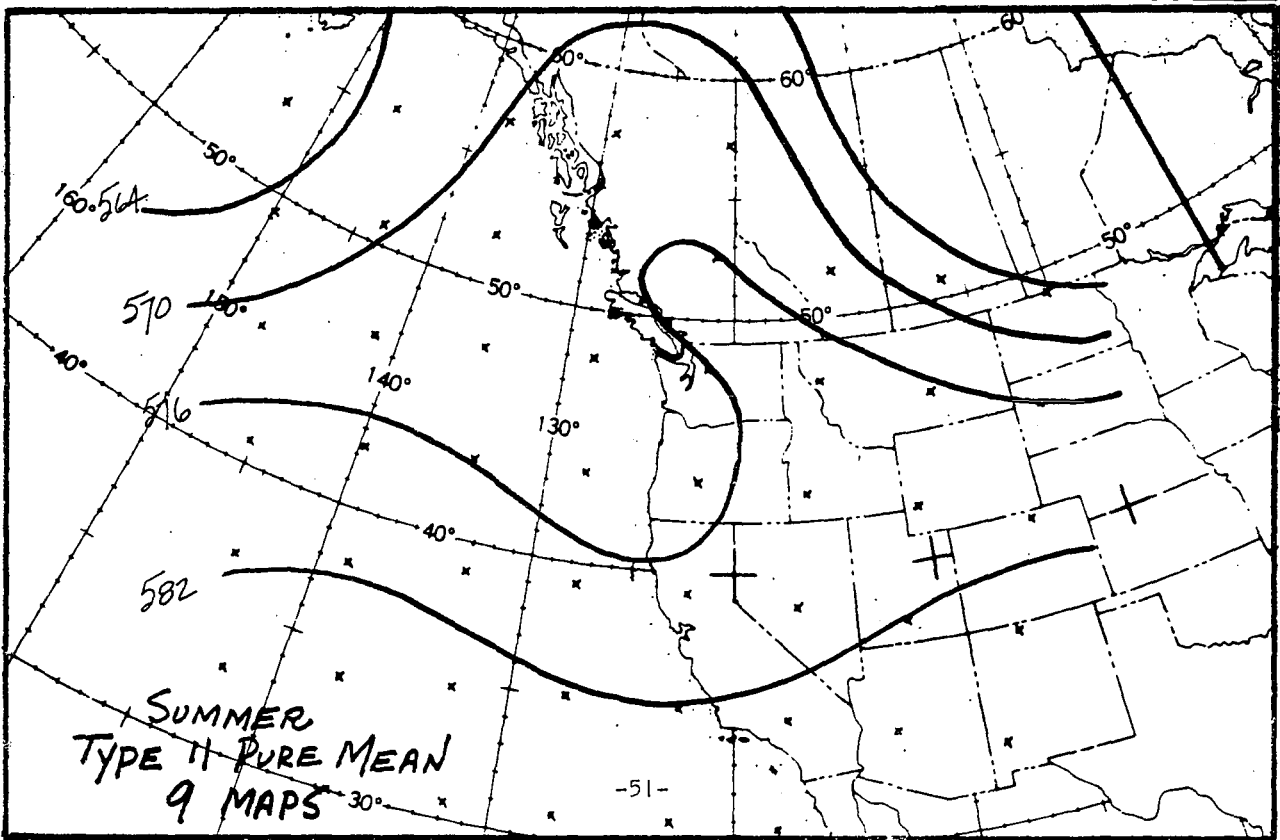
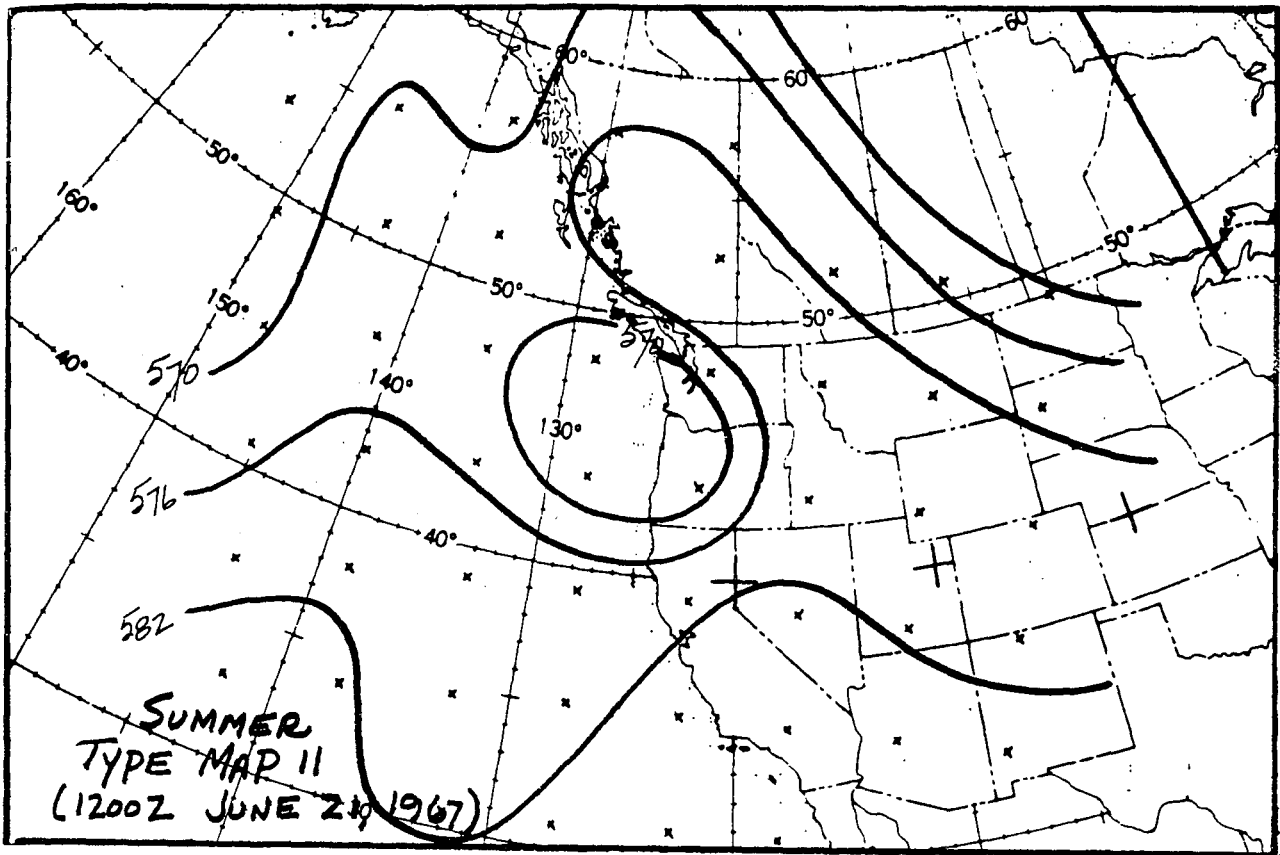




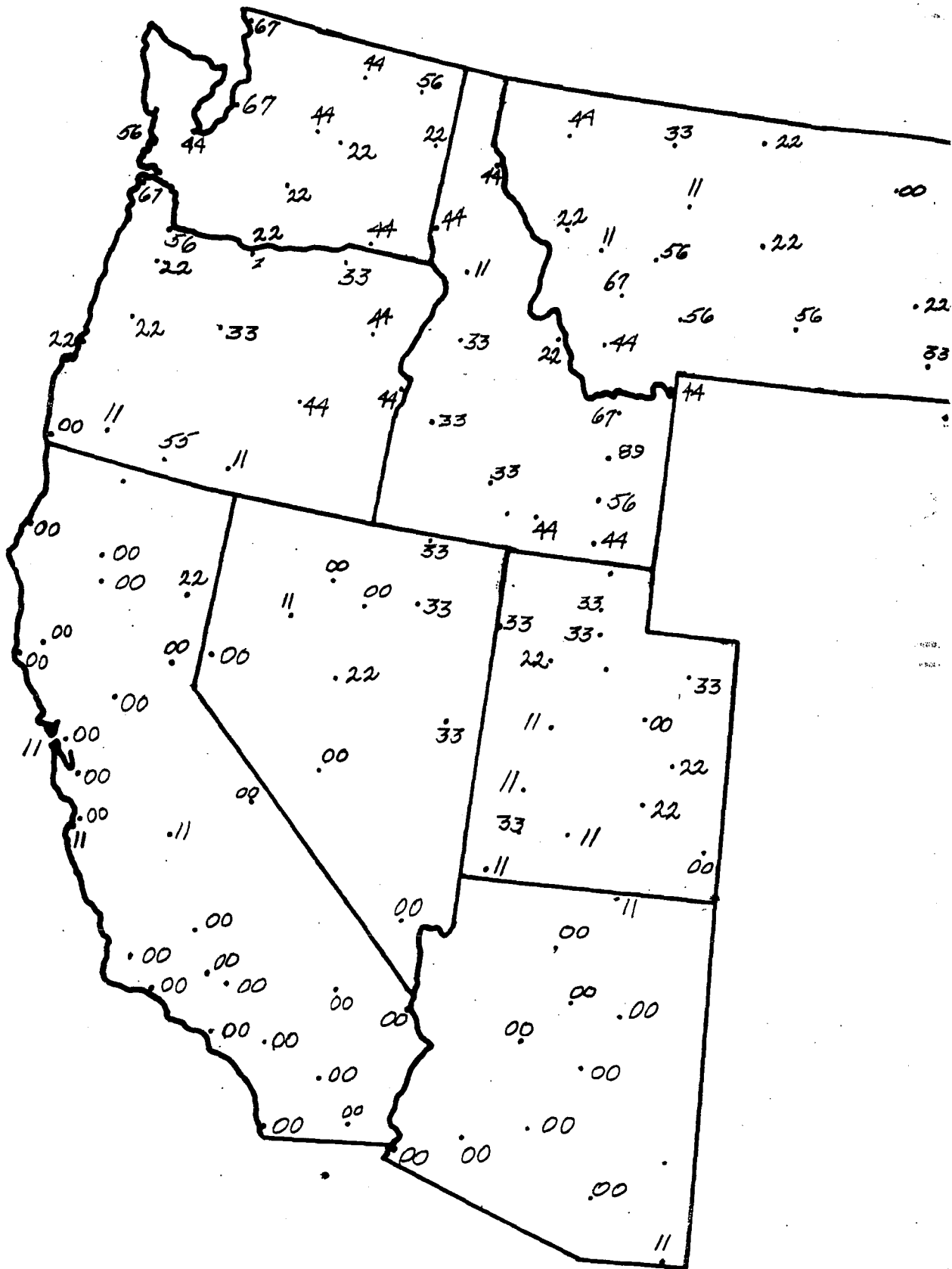


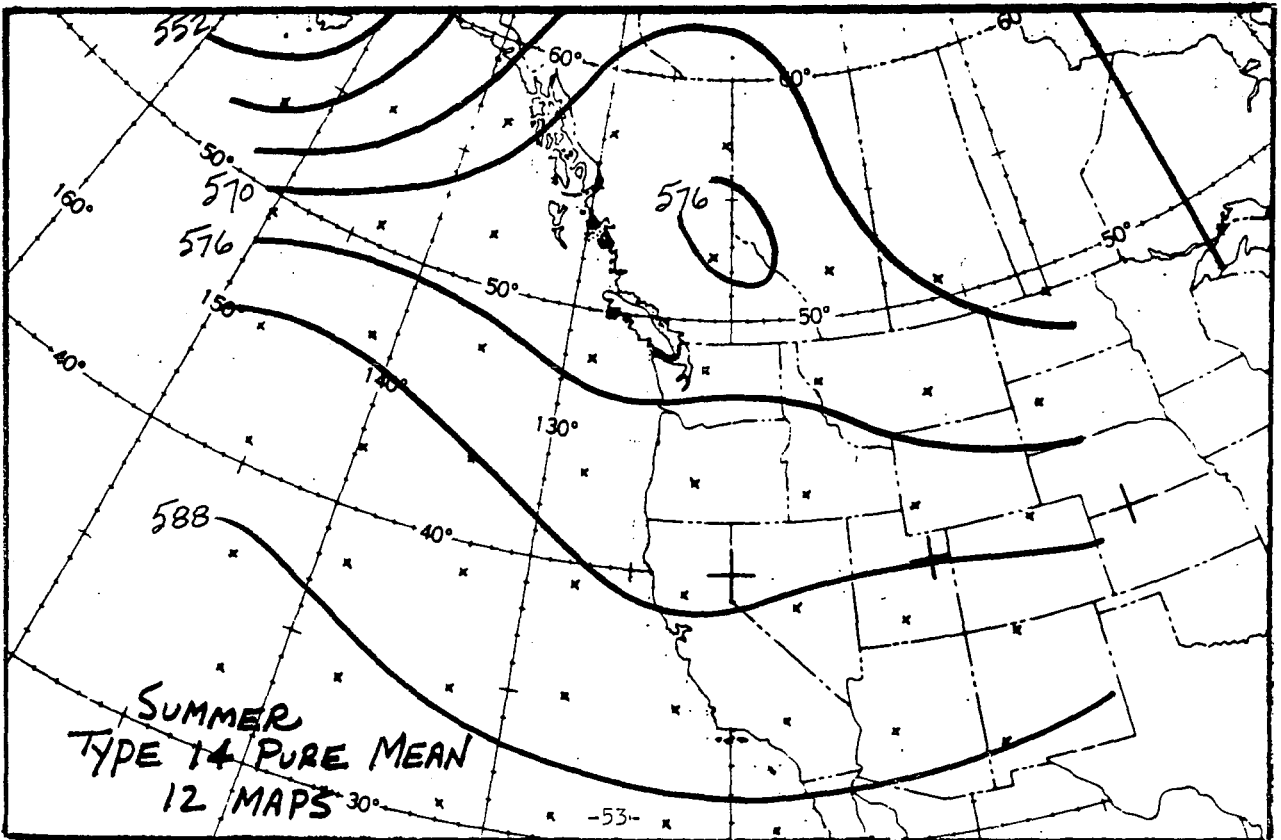
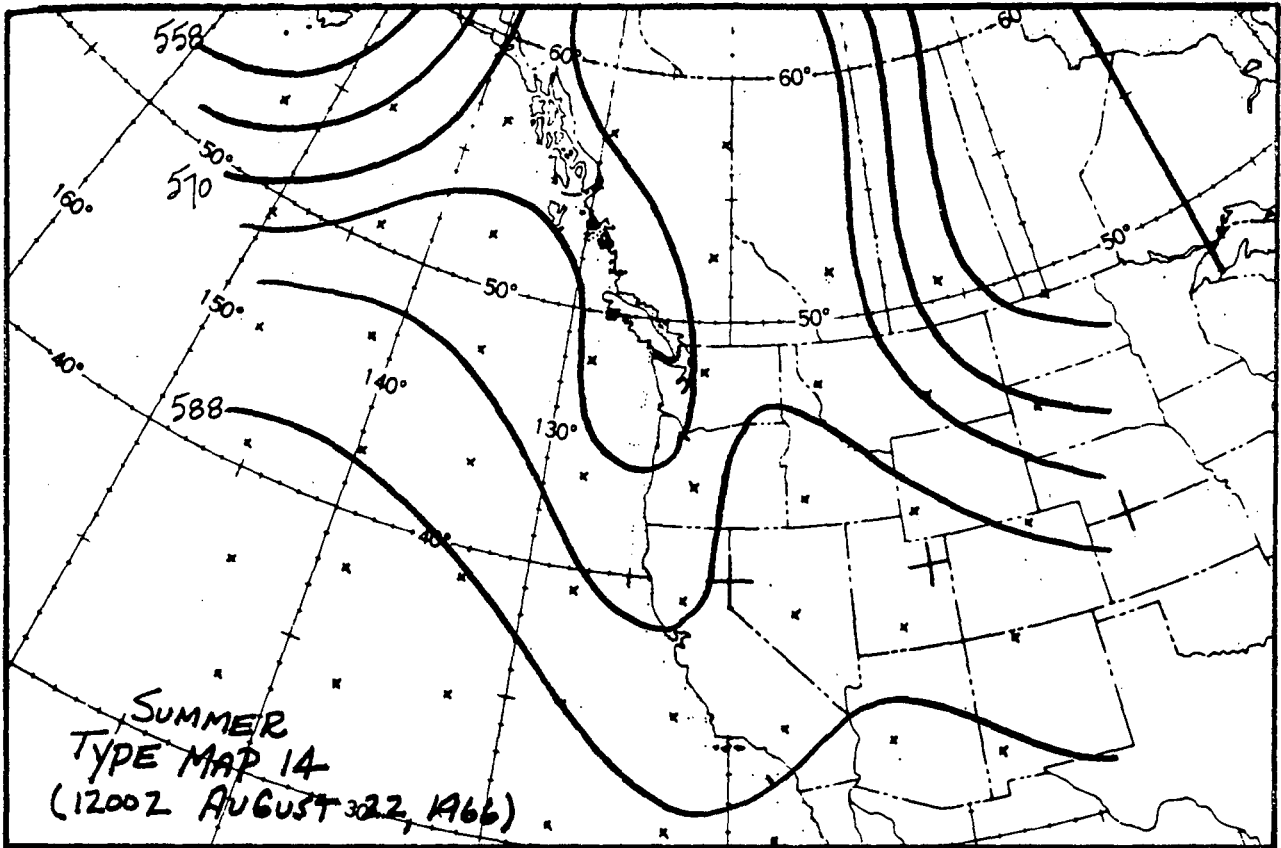
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500-MB. SUMMER TYPE 7

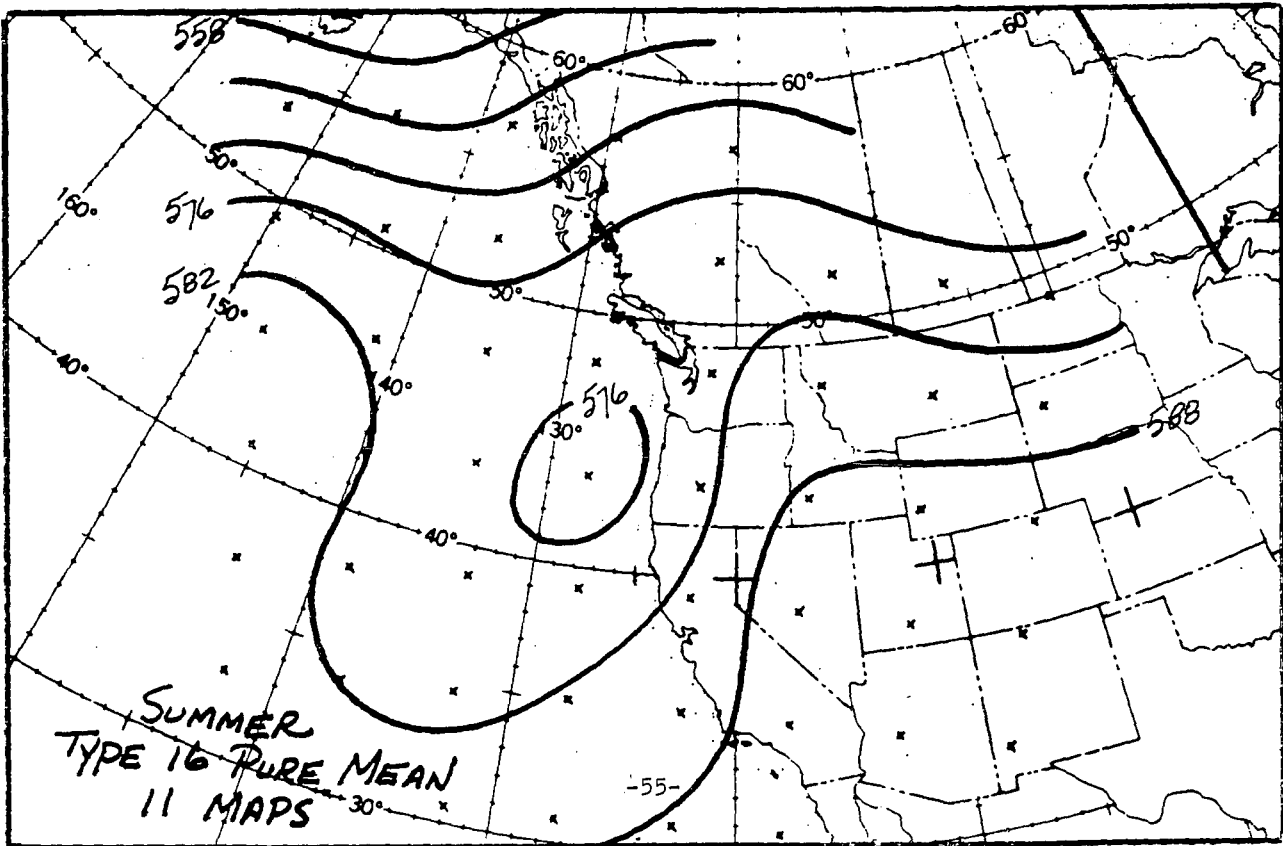
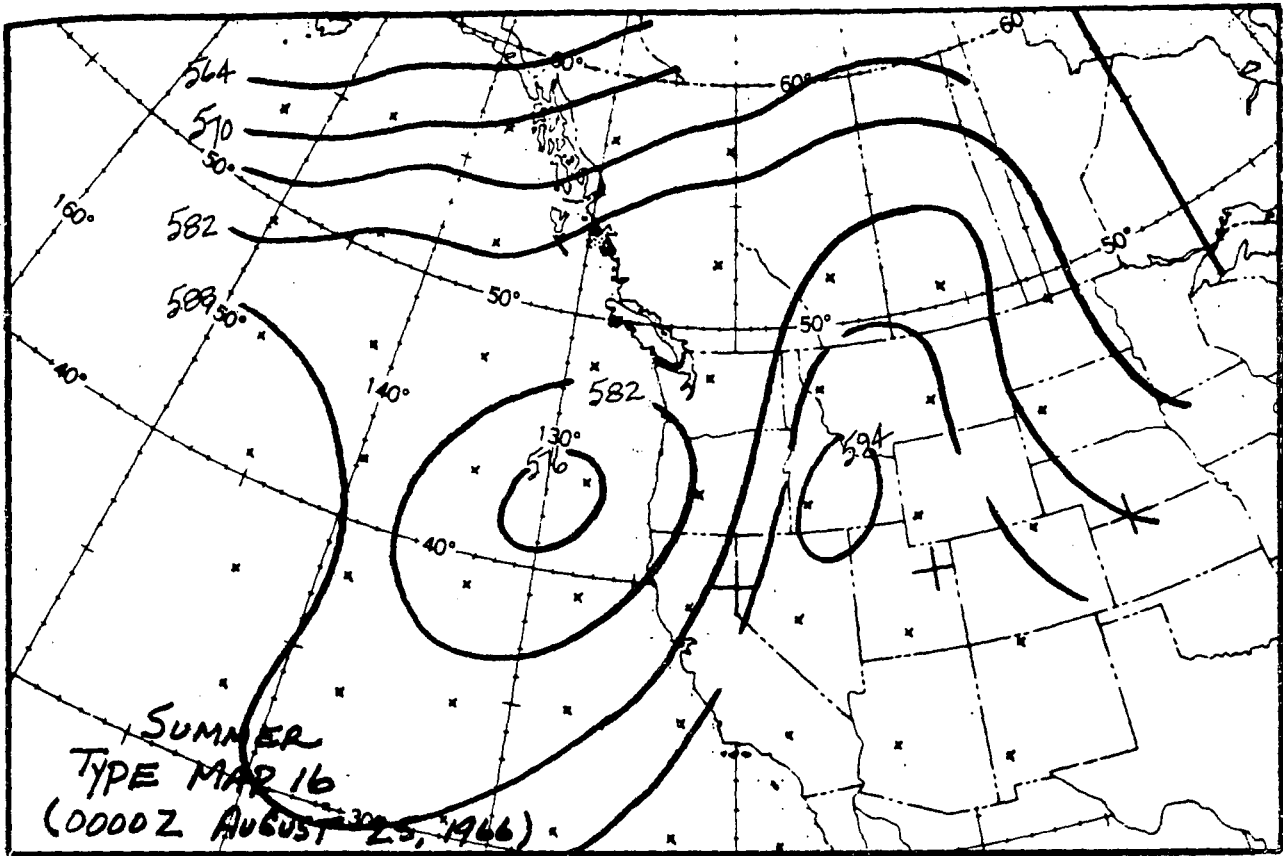


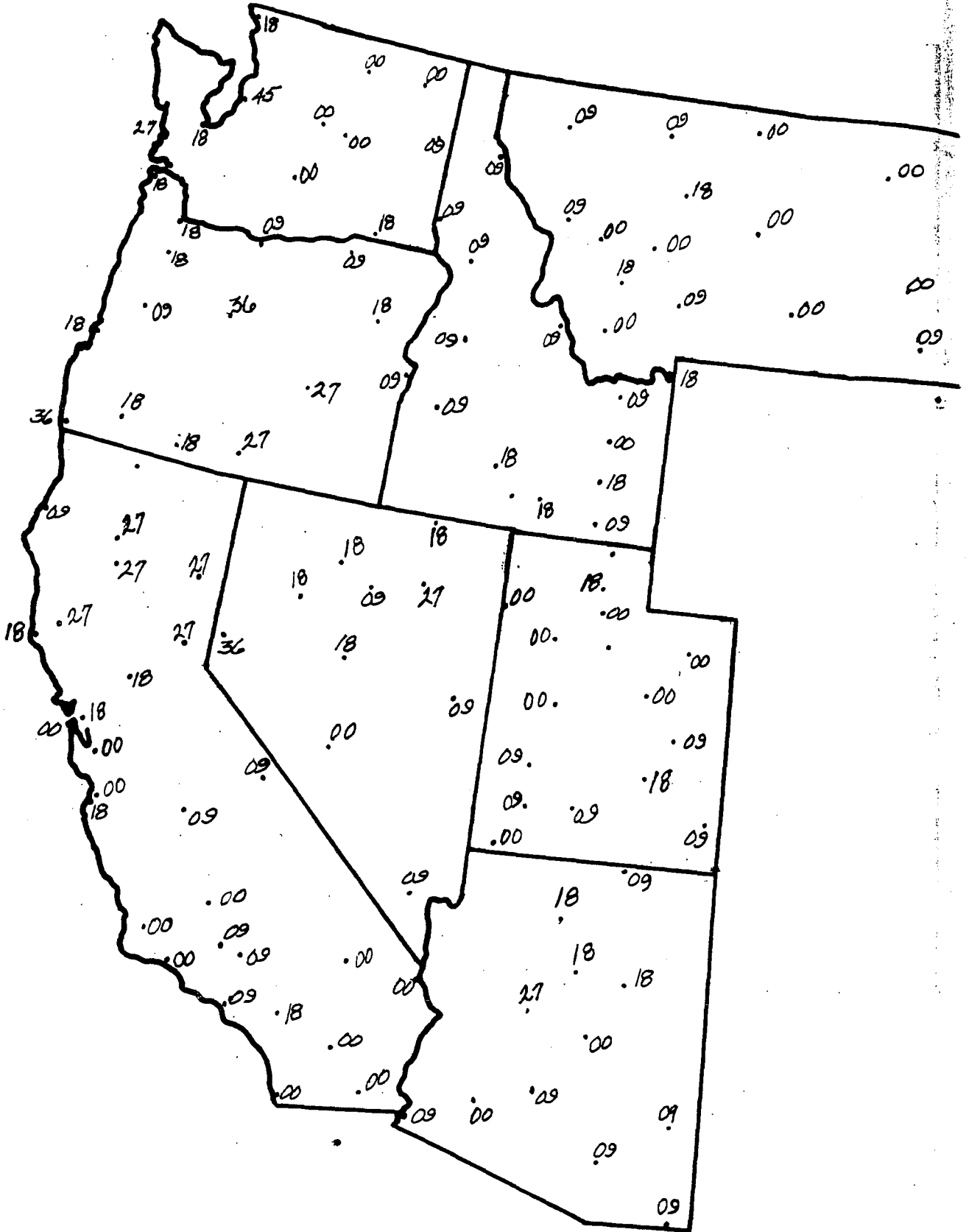


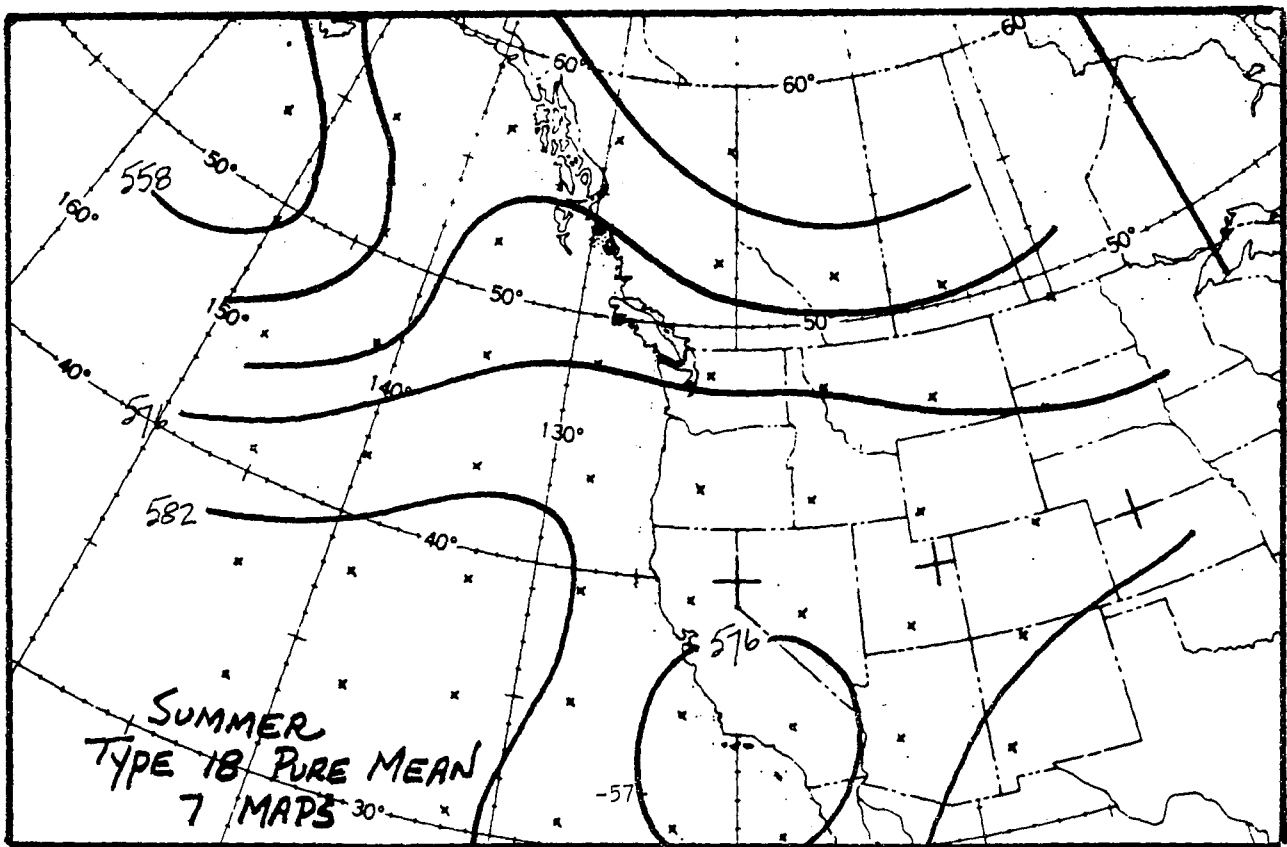
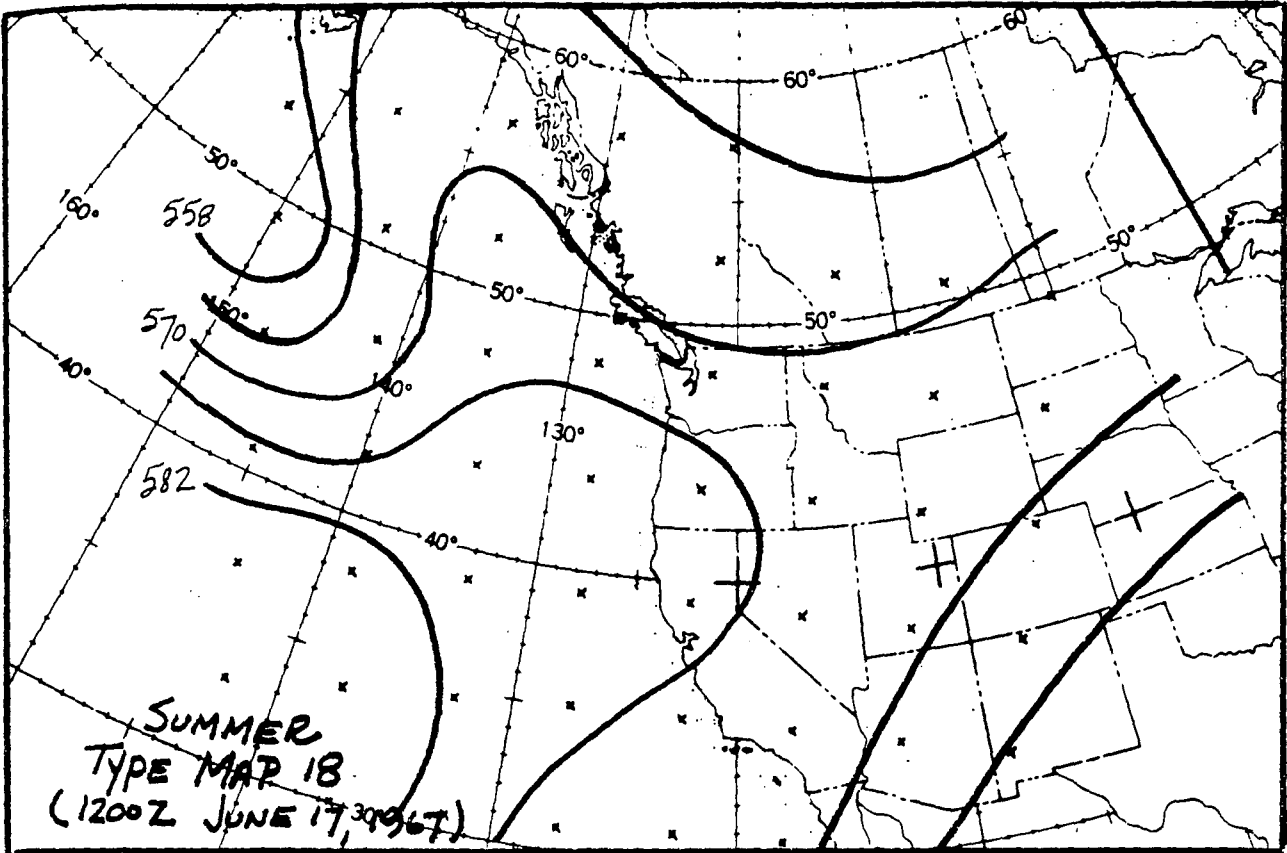
PERCENT FREQUENCY OF PRECIPITATION OCCURRENCE WITH
500-MB SUMMER TYPE 11



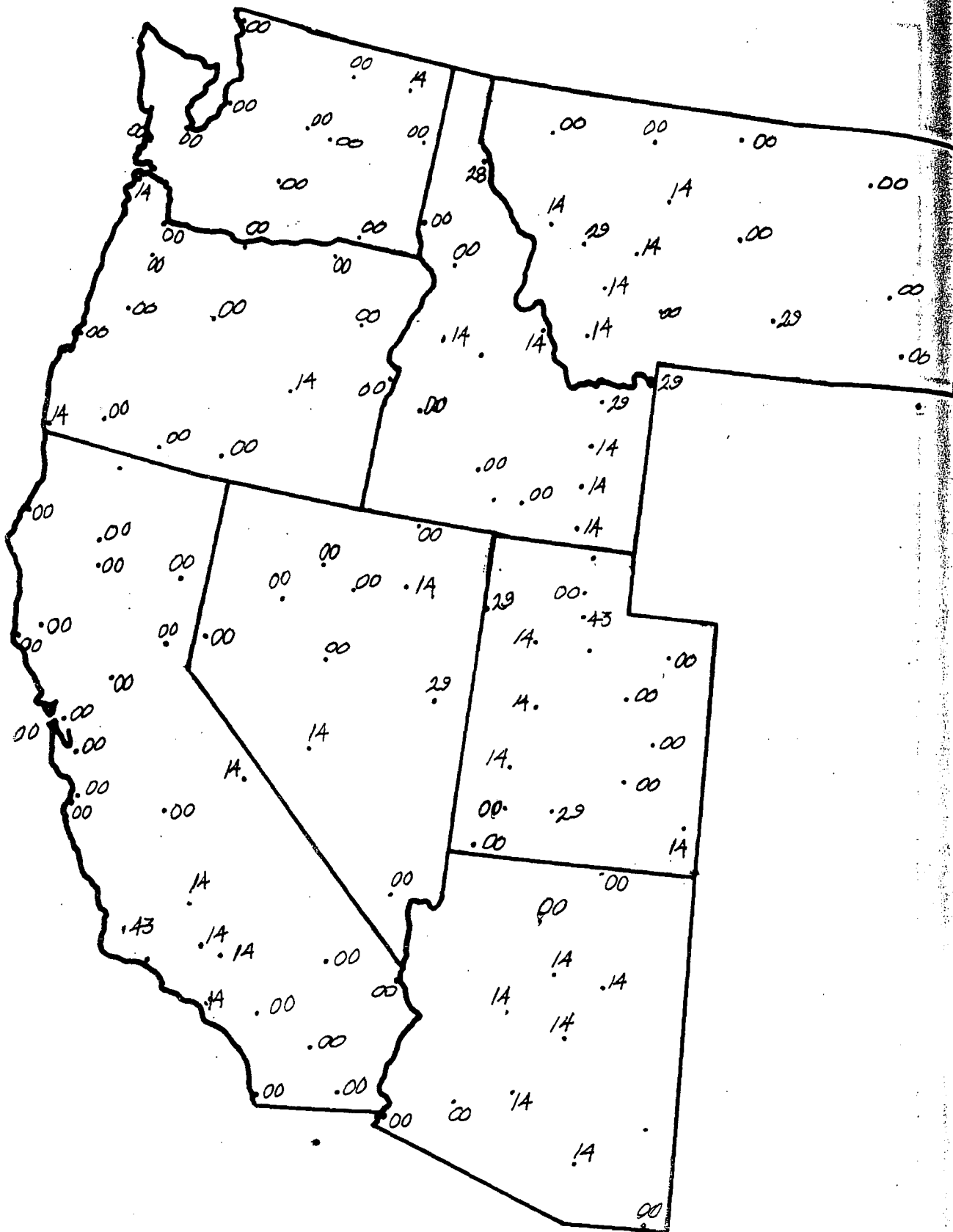


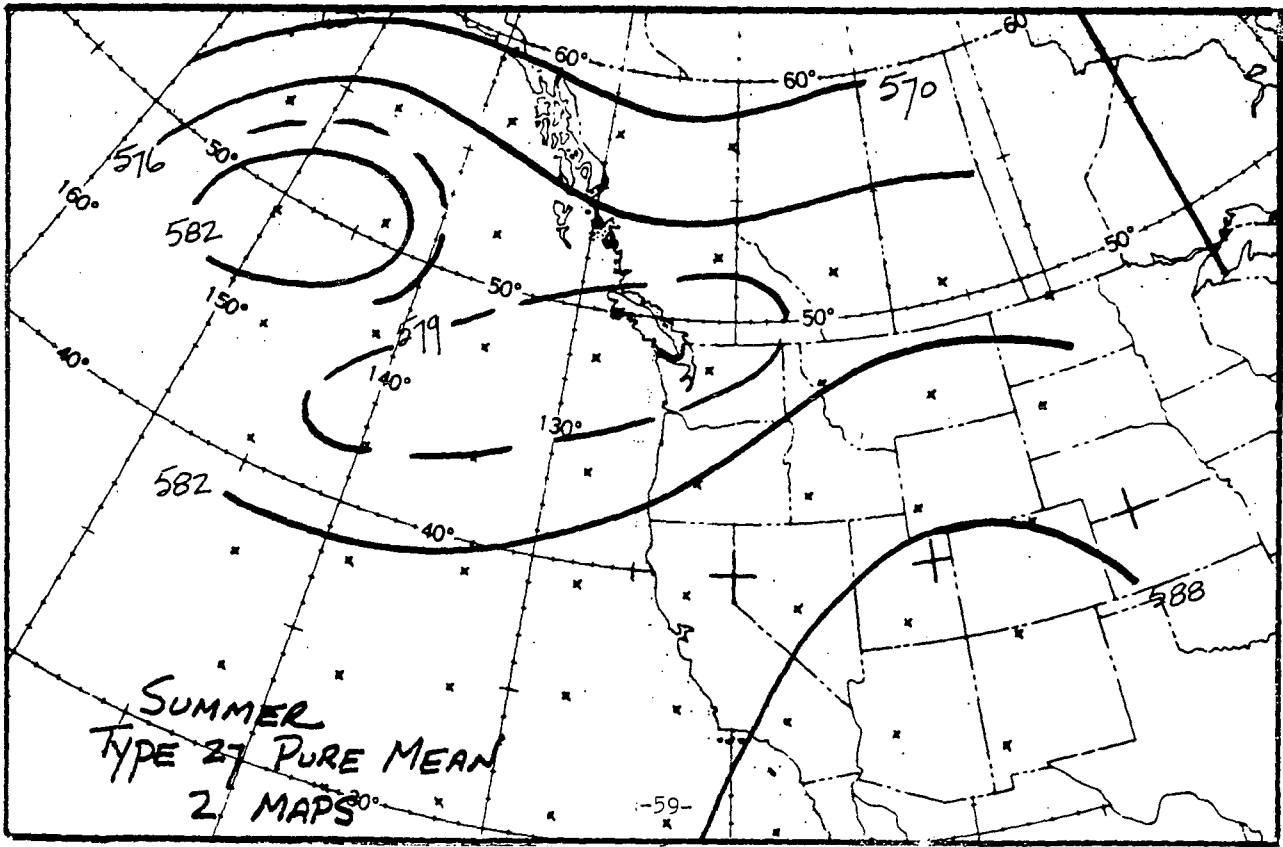
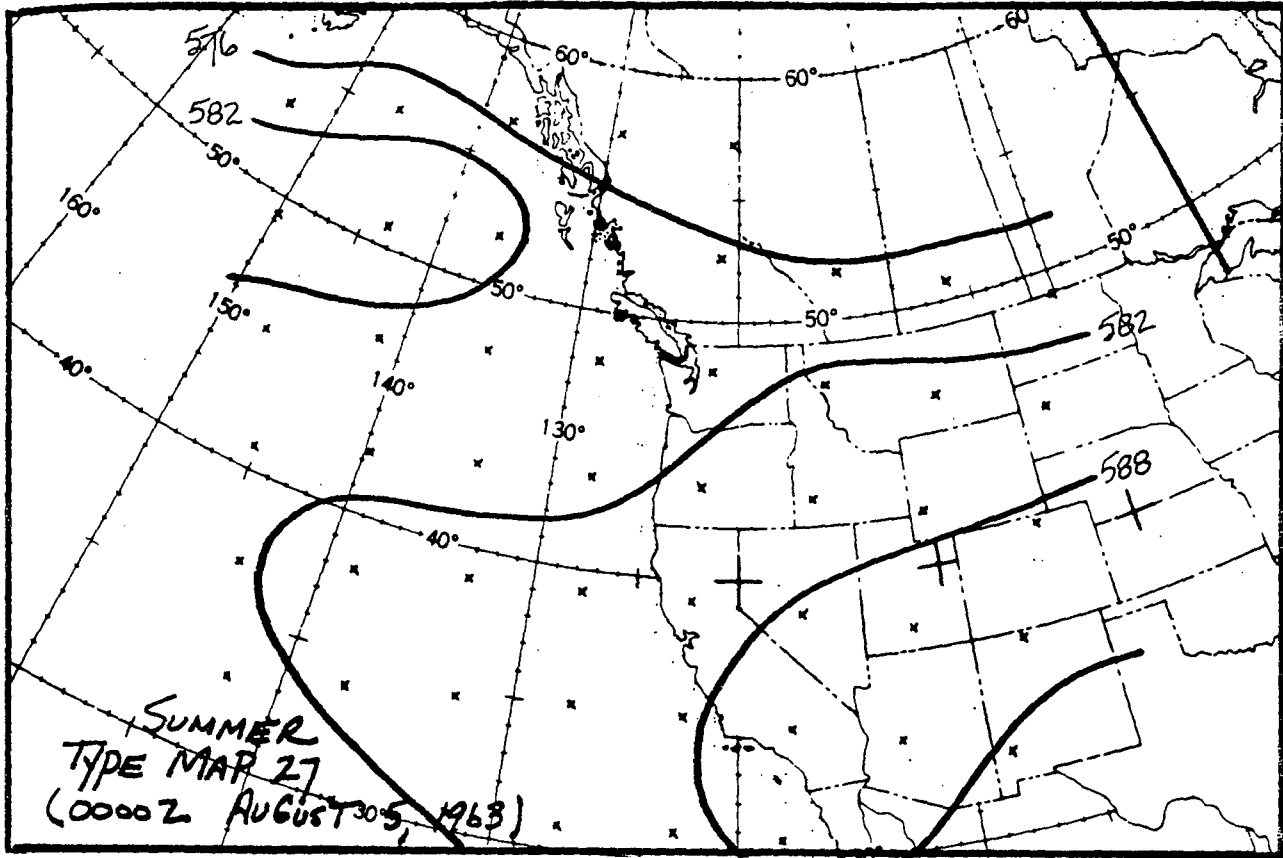




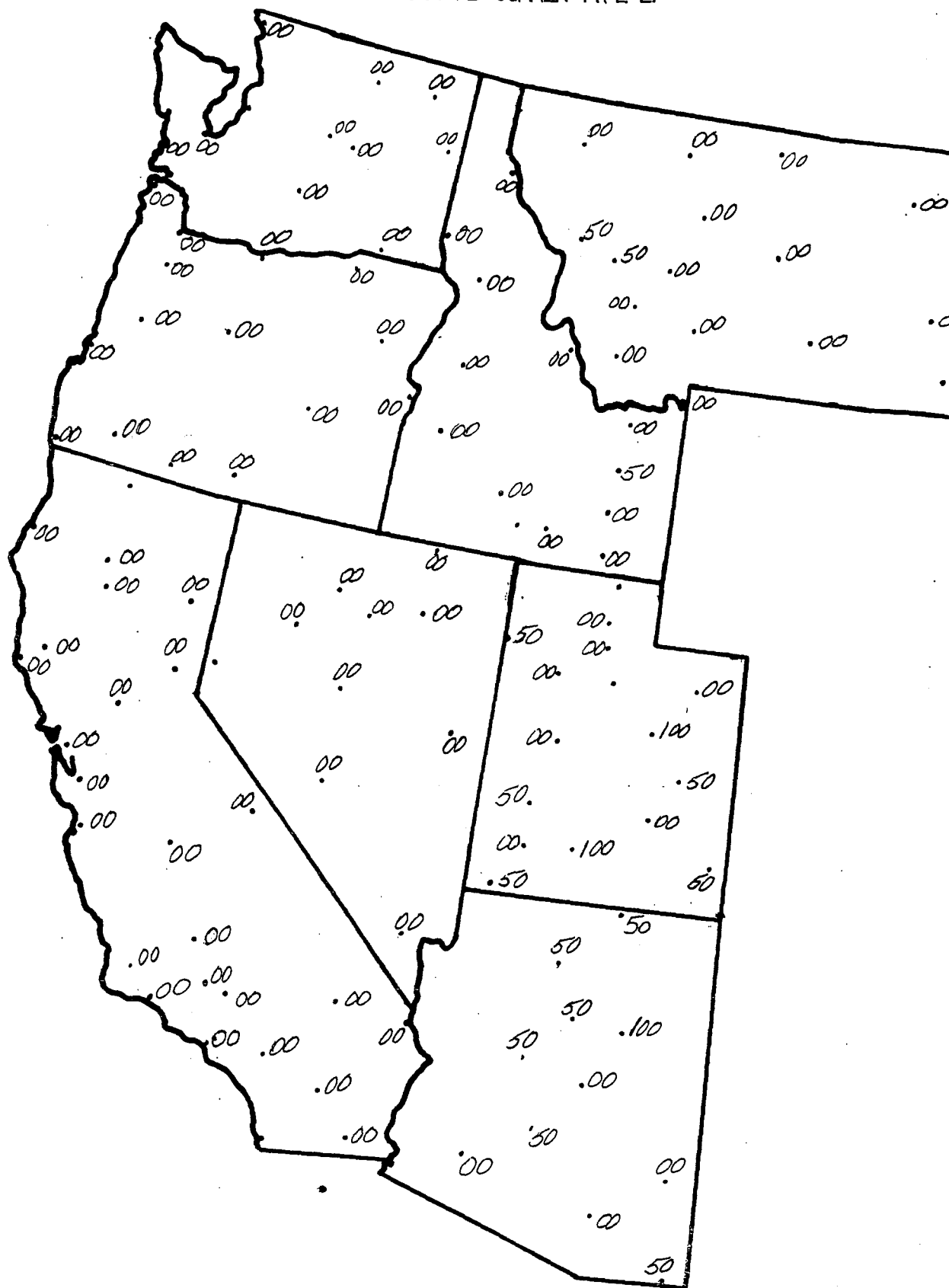


500-MB SUMMER TYPE 18.





500-MB SUMMER TYPE 27



APPENDIX B

Listing of Maps Within Each Type

TYPE 1

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

Type I (Continued)

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

Type I (Continued)

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

TYPE 2

Jun 1963	Jun 1964	Jun 1965	Jun 1966	Jun 1968
18-0	1-0	10-0	8-12	1-0
	1-12	10-12	16-0	11-0
	2-0	11-0		12-0
	2-12			
	3-0			
	3-12			
	4-0			
	4-12			
	5-0			
	5-12			
	13-0			
	13-12			
	14-0			
Jul 1964	Jul 1965	Jul 1966	Jul 1967	Jul 1968
7-12	27-12	17-0	11-0	1-0
8-0	28-0	17-12	11-12	1-12
	28-12	18-0	12-0	2-12
	29-12	21-12	12-12	3-0
	30-0		13-12	3-12
	30-12			4-0
	31-0			4-12
				5-0
				6-0
				6-12
				7-0
				7-12
				8-0
				9-12
				10-0
				18-0
				25-0
				25-12
				26-0

Type 2 (Continued)

Aug 1964	Aug 1965	Aug 1966	Aug 1967
6-12	2-12	5-0	13-0
	3-0	5-12	13-12
	3-12	6-0	14-0
	4-12	6-12	14-12
	5-0	7-0	15-0
	5-12	7-12	15-12
	6-0		16-0
	6-12		16-12
	7-0		17-0
	7-12		17-12
	8-0		18-0
			28-0
			28-12
			29-0
			29-12
			30-0
			30-12
			31-0

TYPE 3

Jun 1963	Jun 1964	Jun 1968
26-12	25-0	28-0
27-0	25-12	28-12
	28-0	
	28-12	
	29-0	

Jul 1963	Jul 1964	Jul 1965	Jul 1966	Jul 1967
14-12	22-0	7-12	20-0	5-0
15-0	22-12	8-0	20-12	5-12
15-12		8-12	23-12	8-12
29-12				20-0
30-0				20-12
30-12				21-0
31-0				30-12
31-12				31-0
				31-12

Aug 1963	Aug 1964	Aug 1965	Aug 1967	Aug 1968
1-0	2-0	13-12	1-0	4-0
15-12		27-12	1-12	4-12
16-0		28-0	2-0	5-0
16-12		28-12		5-12
17-0				6-0
17-12				6-12
18-0				
27-0				
27-12				

TYPE 4

Jun 1964	Jun 1965	Jul 1963	Jul 1964	Jul 1965	Jul 1966
20-12	1-0	10-0	23-12	18-12	27-12
21-0	6-12	10-12		19-0	
21-12	18-12	11-0		19-12	
22-0	19-0	11-12		22-12	
	19-12	12-0		23-0	
	21-0	12-12			
	21-12	13-0			
	22-0	26-0			Jul 1967
	27-12	26-12			4-12
		27-0			9-0
		27-12			9-12
		28-0			
		28-12			
		29-0			

Aug 1963	Aug 1964	Aug 1965	Aug 1966	Aug 1967
2-0	10-0	29-0	10-12	24-12
21-12	19-0	29-12	11-0	25-0
	19-12	30-0	11-12	
	25-12		12-0	
	26-0		12-12	
	26-12		13-0	
	27-0		13-12	
	26-12		14-0	
	28-0		14-12	
	28-12		17-0	
	29-0		17-12	
	29-12		18-0	
			18-12	

TYPE 5

Jun 1964	Jun 1965	Jun 1966
7-12	14-12	22-12
18-0		23-0
		23-12
		24-0

Jul 1963	Jul 1964	Jul 1965	Jul 1966
8-0	30-12	9-0	1-0
8-12	31-0	10-0	1-12
9-0	31-12	10-12	2-0
		11-0	2-12
		11-12	3-0
		20-12	13-0
		21-0	13-12
		21-12	14-0
		22-0	14-12
			15-0
			24-0
			25-0

Aug 1963	Aug 1964	Aug 1966	Aug 1967	Aug 1968
18-12	1-0	27-12	5-12	14-0
19-12	1-12	28-0	6-0	19-0
20-12	18-12	28-12		19-12
25-0		29-12		21-0
25-12		30-0		
26-0		30-12		

TYPE 6

Jun 1963	Jun 1965	Jul 1964	Jul 1965	Jul 1967
14-0	9-12	11-12	26-12	13-0
14-12	11-12	12-0	27-0	
15-0			29-0	
			31-12	

Aug 1963	Aug 1966	Aug 1967	Aug 1968
6-12	2-12	9-0	11-0
7-0	3-0	9-12	
7-12		10-0	
8-0		10-12	
8-12		11-0	
9-0		11-12	
9-12		12-0	
		18-12	
		19-0	
		19-12	
		26-12	
		27-0	
		27-12	

TYPE 7

Jun 1965	Jun 1966	Jun 1967	Jun 1968	Jul 1965	Jul 1968
2-0	6-0	18-12	23-12	1-0	24-0
7-0	6-12	19-0	24-0	1-12	24-12
7-12	15-12	19-12	24-12	3-0	26-12
8-0		20-0	25-0		
8-12		25-0			
30-0					
30-12					

Aug 1963	Aug 1964	Aug 1966	Aug 1967
28-0	10-12	19-0	8-0
28-12	11-0	20-12	8-12
29-0			
30-0			
30-12			

TYPE 8

Jun 1963	Jun 1965	Jun 1967	Jul 1964	Jul 1965	Jul 1966	Jul 1967
15-12	2-12	29-0	24-0	5-12	29-0	1-0
16-0	3-0	29-12	24-12	6-0		1-12
16-12	5-12	30-0	25-0	6-12		2-0
17-0	6-0	30-12	25-12			2-12
17-12	20-0		26-0			3-0
	20-12		26-12			

July 1968

						29-0
Aug 1966	Aug 1967	Aug 1968				29-12
9-12	25-12	29-0				
10-0	26-0	29-12				
		30-0				
		30-12				
		31-0				
		31-12				

TYPE 9

Jun 1964	Jul 1963	Jul 1964	Jul 1966	Aug 1963	Aug 1964	Aug 1965
26-0	2-12	8-12	18-12	10-0	3-0	8-12
26-12	3-0		19-0	10-12	3-12	9-0
27-0	3-12		19-12	11-0	4-0	9-12
	4-0			11-12	4-12	10-0
	4-12			12-0		10-12
	5-0			12-12		12-12
	5-12			13-0		
	6-0			13-12		
	6-12			14-0	Aug 1967	Aug 1968
	7-12			14-12	12-12	10-0
				15-0		10-12
						24-12
						25-0
						25-12

TYPE 10

Jun 1963	Jul 1963	Jul 1964	Jul 1966	Jul 1967	Aug 1963	Aug 1965
20-12	16-0	30-0	5-0	21-12	1-12	15-0
23-0	17-0		5-12	22-0	3-0	15-12
	17-12		7-12	26-0	3-12	24-0
	18-0		27-0	26-12	4-0	24-12
				27-0	4-12	
					26-12	
					Aug 1966	Aug 1968
					29-0	3-0
						3-12

TYPE 11

Jun 1966	Jun 1967	Aug 1965
7-0	20-12	20-0
	21-0	20-12
	21-12	21-0
	22-0	
	22-12	

TYPE 12

Jun 1963	Jun 1964	Jun 1965	Jun 1967	Jun 1968	Aug 1965	Aug 1966
2-12	10-0	1-12	14-0	5-12	21-12	31-0
3-0	10-12	15-0	14-12	6-0		31-12
3-12	11-0	15-12		6-12		
4-0	11-12	16-0		7-0	Aug 1968	
4-12	17-12	16-12		7-12	14-12	
5-0	18-12	17-0		8-0	15-0	
11-0	19-12	17-12		8-12	21-12	
24-0		18-0		9-0		
		25-12		9-12		
		26-0				
		26-12				
		27-0				

TYPE 13

Jun 1965	Jun 1966	Jul 1965	Aug 1965
29-12	3-0	12-0	22-0
	3-12	12-12	22-12
	4-0		23-0
	4-12		23-12
	5-0		
	5-12		
	7-12		

TYPE 14

Jul 1965	Aug 1966	Aug 1968
2-0	19-12	15-12
	20-0	16-0
	21-0	16-12
	21-12	
	22-0	
	22-12	
	23-0	
	23-12	

TYPE 15

Jun 1963	Jun 1968	Jul 1966	Aug 1963	Aug 1964
21-0	29-0	3-12	2-12	30-0
21-12		4-0	22-0	30-12
22-0		4-12		
22-12		24-12		
29-0		25-12		
29-12		26-0		
30-0		26-12		

TYPE 16

Jul 1964	Jul 1965	Aug 1965	Aug 1966
1-0	24-0	11-0	24-0
2-0	26-0	11-12	24-12
		12-0	25-0
			25-12

TYPE 17

Jun 1963	Jun 1964	Jun 1967
6-0	8-0	7-0
6-12		7-12
7-0		8-0
7-12		8-12
8-0		9-0
8-12		9-12
9-0		10-0
9-12		10-12
10-12		11-0
		11-12
		12-0
		12-12
		13-0
		13-12

TYPE 18

Jun 1963	Jun 1967	Jul 1966
12-12	16-0	22-0
	16-12	
	17-0	
	17-12	
	18-0	

TYPE 19

Jun 1965	Jul 1965	Jul 1968	Aug 1964	Aug 1965	Aug 1968
3-12	23-12	30-0	22-12	16-0	1-0
4-0		30-12	23-0	16-12	1-12
		31-0	23-12	17-0	2-0
		31-12	24-0	17-12	2-12
			24-12	18-0	

TYPE 20

Aug 1964	Aug 1965	Aug 1967
25-0	30-12	2-12
	31-0	3-0
	31-12	

TYPE 21

Jun 1963	Jun 1965	Jun 1967	Aug 1964
10-0	4-12	15-0	20-0
	5-0	15-12	20-12
			21-0
			21-12
			22-0

TYPE 22

Aug 1965
1-0
1-12
2-0
18-12
19-0
19-12

TYPE 23

Jun 1964	Jun 1967	Jun 1968
12-0	23-0	29-12
12-12	23-12	30-0
	24-0	30-12
	24-12	

TYPE 24

Jun 1963	Jul 1963	Jul 1965	Jul 1966
27-12	9-12	18-0	8-0
28-0		20-0	8-12
28-12			9-0
			9-12
			10-0
			10-12
			11-0

TYPE 25

Jun 1963	Jun 1967
23-12	5-0
	5-12
	6-0
	6-12

TYPE 26

Jun 1966	Jul 1965	Jul 1966	Aug 1963	Aug 1964	Aug 1968
1-0	9-12	11-12	22-12	31-0	20-0
1-12		12-0	23-12	31-12	20-12
2-0		12-12	24-0		
2-12			24-12		

TYPE 27

Aug 1963

5-0

5-12

TYPE 28

Jul 1967

22-12

23-0

23-12

24-0

24-12

25-0

25-12

TYPE 29

Aug 1968

7-0

7-12

8-0

8-12

9-0

9-12

