

GEOLOGICAL SURVEY OPEN-FILE REPORT 90-311

STRONG-MOTION RECORDINGS FROM THE ML=5.5 UPLAND, CALIFORNIA EARTHQUAKE OF FEBRUARY 28, 1990

By

E. C. Etheredge,¹ A. V. Acosta,² L. J. Foote,³ D. A. Johnson,²
R. P. Maley,¹ R. L. Porcella,¹ and J. C. Switzer¹



1 Menlo Park, Calif.

2 Lawndale, Calif.

3 Las Vegas, Nev.

This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards. Any use of trade, product, or firm names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

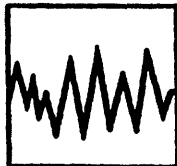
April 1990

**Department of the Interior
U. S. GEOLOGICAL SURVEY**

**STRONG-MOTION RECORDINGS FROM THE
ML 5.5 UPLAND, CALIFORNIA EARTHQUAKE
OF FEBRUARY 28, 1990**

The chief purpose of the work is for the benefit of engineers and architects. It has been felt that they should say what they want, and the general consensus obtained from them is that recording should start at the point where slight damage begins and that such records should have sufficient amplitude for interpretation. The upper limit should be the recording of acceleration for as wide a range as the design of the instrument permits, and the upper limit should exceed 0.2 the acceleration of gravity.

N. H. HECK, COAST & GEODETIC SURVEY, 1931



OPEN-FILE REPORT 90-311

CONTENTS

	Page
INTRODUCTION- - - - -	1
ACCELEROGRAPH DATA- - - - -	2

ILLUSTRATIONS

Figure 1. U.S. Geological Survey Cooperative Strong-Motion Instrumentation Network accelerograph stations that triggered during the Upland earthquake of February 28, 1990 - - - - -	4
2. Accelerograms from the USGS Cooperative S-M Instrumentation Network:	
San Antonio Dam- - - - -	14
Live Oak Reservoir - - - - -	17
Weymouth Filter Plant- - - - -	20
Morris Dam - - - - -	22
Lytle Creek- - - - -	23
Sycamore Forest Station- - - - -	24
Orange County Reservoir- - - - -	25
Diemer Filter Plant- - - - -	27
Carbon Canyon Dam- - - - -	28
Prado Dam- - - - -	30
Devore Water Dept. - - - - -	33
Paradise Springs Camp- - - - -	34
Santa Ana River Bridge - - - - -	35
Rialto Fire Station- - - - -	38
Whittier Narrows Dam - - - - -	39
Brea Dam - - - - -	41
Whittier, Bright Ave.- - - - -	44
Valyermo Forest Station- - - - -	46
San Bernardino Valley College- - - - -	47
Colton Interchange - - - - -	48
San Bernardino, 'F' Street - - - - -	50
San Bernardino, Government Center- - - - -	51
Lake Mathews - - - - -	55
Garvey Reservoir - - - - -	56
Pasadena, Wilson Avenue- - - - -	58
Norwalk, 12400 Imperial Hiway- - - - -	59
Norwalk, 12440 Imperial Hiway- - - - -	64
Loma Linda Medical Center- - - - -	71
Alhambra, Fremont Avenue - - - - -	72
Loma Linda VA Hospital - - - - -	74
Alhambra, Norwich Avenue - - - - -	78

ILLUSTRATIONS

	Page
Figure 2. Mills Filter Plant - - - - -	79
(con't) Los Angeles, Bulk Mail Facility - - - - -	80
Santa Ana, Orange County Engineering Bldg.- - - - -	81
Reche Canyon- - - - -	82
Littlerock Post Office- - - - -	83
Orange County, Wayne Airport- - - - -	84
Los Angeles, Griffith Park Observatory- - - - -	85
Long Beach, VA Hospital - - - - -	86
San Joaquin Reservoir - - - - -	90
Newport Beach, Newport Center Drive - - - - -	92
Palos Verdes Reservoir - - - - -	94
Sepulveda VA Hospital - - - - -	96
Jensen Filter Plant - - - - -	97
Leona Valley Fire Station - - - - -	100

TABLE

Table 1. Strong-motion stations triggered during the Upland earthquake of February 28, 1990 - - - - -	5
---	---

INTRODUCTION

The U.S. Geological Survey's Cooperative Strong-Motion Instrumentation Network consists of approximately 1000 stations located in 41 states and Puerto Rico. Station instrumentation is owned by numerous Federal, State, and local agencies and various private industries and property owners. Key objectives of the Network program are to record both strong ground motion and the response of various types of engineered structures during potentially damaging earthquakes and to disseminate resultant data to the international earthquake engineering research and design community. This report presents peak acceleration data and copies of accelerograms recorded at 46 strong-motion stations in the southern California region that triggered during the ML=5.5 Upland earthquake of February 28, 1990. Additional strong-motion recordings were made at stations operated by the University of Southern California and the California Division of Mines and Geology's Office of Strong-Motion Studies. Record information and data from those networks can be obtained by contacting the agencies' headquarters in Los Angeles and Sacramento, respectively.

The ML=5.5 Upland, California earthquake occurred at 23:43:36.0 (G.m.t.) on February 28, 1990. The epicenter was located at 34.140° N. lat. and 117.688° W. long., approximately 5 km northwest of downtown Upland and 40 km east of Pasadena; depth was about 10 km. The earthquake was reported felt from Santa Barbara, California to Ensenada, Mexico and east to Las Vegas, Nevada (U.S. Geological Survey, Preliminary Determination of Epicenters, March 22, 1990).

ACCELEROGRAPH DATA

The main shock triggered 82 accelerographs at 46 Cooperative Network stations at epicentral distances in the range 3-76 km (fig. 1 and table 1). Twelve of these stations are owned by the Metropolitan Water District of Southern California (MWD), six by the U.S. Army Corps of Engineers, three by the Veterans Administration, two shared by the U.S. Geological Survey and the Bechtel Corporation, one by the California Dept. of Transportation, and the remainder by the U.S. Geological Survey (see table 1). The analog records shown in figure 2 were recorded on triaxial accelerographs located at 16 ground sites, twelve dam/reservoir facilities, four filter plants, twelve large buildings, and two bridges. Other recordings were made on multi-channel (9-24) systems at one dam, one base-isolated bridge, and five buildings (see table 1). Ground accelerations from the $M_L=5.5$ main shock generally reached peak levels of 10 percent g out to distances of approximately 30 km. However, high amplitude ground motions were recorded at three close-in stations: San Antonio Dam (3 km), Live Oak Reservoir (5 km), and Weymouth Filter Plant (8 km; see figure 2 and table 1).

The closest station is San Antonio Dam, a flood and debris control reservoir operated by the U.S. Army Corps of Engineers to provide protection against flooding in the alluvial plain of the upper Santa Ana Valley. The reservoir, located about 7 km northeast of Claremont, was empty at the time of the earthquake. The crest of the earthfill embankment is approximately 1175 m long, 10 m wide, and 50 m above the original streambed. Both of the abutments rest directly on bedrock. Records were obtained from the crest station situated midway between the two abutments, at a station located midchannel, approximately 150 m downstream from the toe, and on the right abutment. The

crest recording contains 4-5 seconds of .2 g-.6 g, 2-Hz horizontal motion. The right abutment and downstream recordings are similar except for the somewhat higher frequencies at the abutment site, which also recorded higher vertical motions than either the crest or downstream stations. Peak accelerations greater than .1 g were recorded for 3-4 seconds at both the abutment and downstream sites.

The second closest recording station is located at Live Oak Reservoir, a water storage facility operated by the MWD. The reservoir, situated near the mouth of Live Oak Canyon, was empty at the time of the earthquake. The reservoir instrumentation consists of a triaxial accelerograph on the abutment and a 12-channel remote recording system on the earthfill embankment with 3 sensors at center crest, 2 at left crest, 1 at left slope, 3 at center slope, and 3 at center toe. Peak horizontal accelerations varied widely, from .18 g at center toe to .53 g at left crest (see figure 2).

Two accelerographs recorded the main shock at Weymouth Filter Plant, a water treatment facility operated by the MWD, just north of the city of LaVerne. The horizontal ground level accelerations were recorded in the range .2-.3 g at frequencies of 5-10 Hz. The second accelerograph, located on the roof of a large water storage tank produced peak horizontal motions of about 80 percent g, with very high-frequency (50-100 Hz) "spikes" in excess of 1 g. Vertical motions at the roof of the tank were of such high frequency during strong shaking that maximum trace amplitudes on the film recording could not be discerned; the maximum observable peak was measured at .87 g.

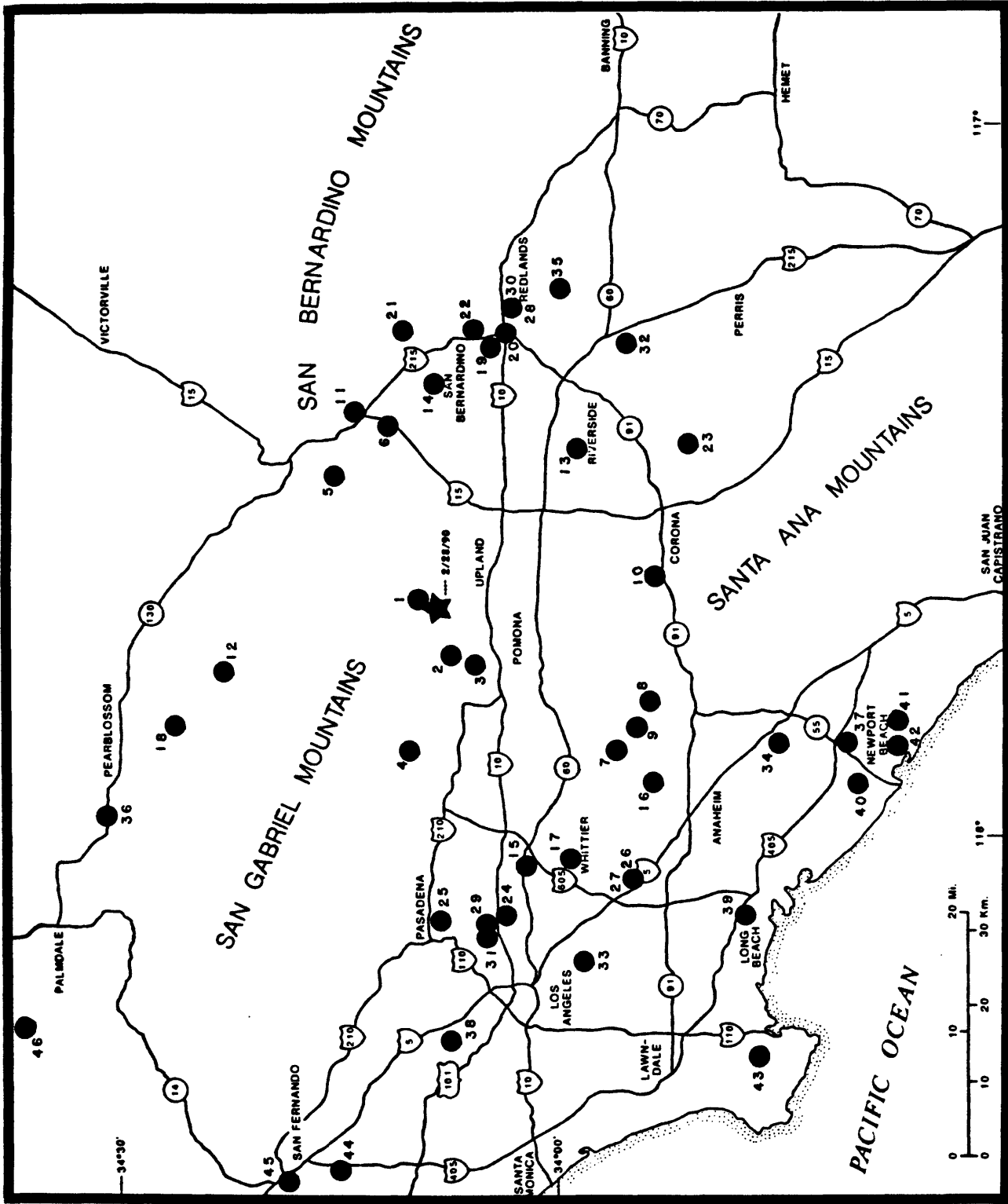


Figure 1. U.S. Geological Survey Cooperative Strong-Motion Instrumentation Network accelerometer stations (solid circles) that triggered during the ML=5.5 Upland earthquake (star) of February 28, 1990.

Table 1. Strong-motion stations triggered during the Upland earthquake of February 28, 1990 - Main shock

Map Index Number	USGS Number	Station Identification		Epicentral Distance ¹ (km)	Acceleration	
		Name [Owner]	Coordinates (Lat. °N, Long. °W)		Component Direction (degrees)	Maximum (g)
1	287	San Antonio Dam [ACOE]	34.157 117.676	3		
		Crest			090 Up 360	.46 .40 .58
		Right Abutment			090 Up 360	.40 .83 .48
		Downstream			090 Up 360	.47 .43 .43
2	656	Live Oak Reservoir [MWD]	34.137 117.753	5		
		Abutment			180 Up 090	.34 .24 .28
		Structure Array:				
		Ch. 1- Center Crest			155	.25
		Ch. 2- Center Crest			Up	.28
		Ch. 3- Center Crest			245	.44
		Ch. 4- Left Crest			155	.29
		Ch. 5- Left Crest			245	.53
		Ch. 6- Left Slope			245	.36
		Ch. 7- Center Slope			155	.22
		Ch. 8- Center Slope			Up	.13
		Ch. 9- Center Slope			245	.32
		Ch. 10- Center Toe			155	.18
		Ch. 11- Center Toe			Up	.18
		Ch. 12- Center Toe			245	.19
3	5164	Weymouth Filter Plant [MWD]	34.114 117.778	8		
		Bldg., Ground Level			015 Up 285	.31 .26 .23
		Water Tank, Top			015 Up 285	.83 .87 1.05

Note: Peak motions on water tank are approximate; record contains extremely high-frequency accelerations that are difficult to discern.

Table 1. Strong-motion stations triggered during the Upland earthquake of February 28, 1990 (continued)

Map Index Number	USGS Number	Station Identification		Epicentral Distance ¹ (km)	Acceleration			
		Name [Owner]	Coordinates (Lat. °N, Long. °W)		Component Direction (degrees)	Maximum (g)		
4	756	Morris Dam	34.173	17				
		[MWD]	117.879					
		Left abutment				245 Up 155	.05 * .08	
5	5035	Lytle Creek	34.26	23				
		Mann Residence	117.50					
		[USGS]				315 Up 225	.12 .07 .11	
6	5036	Sycamore	34.193	26				
		Forest Station	117.426					
		[USGS]				315 Up 225	.06 * *	
7	697	Orange County Reservoir	33.936	26				
		[MWD]	117.884					
		Abutment					090 Up 360	.09 .05 .10
		Crest					090 Up 360	.17 .08 .11
		Admin. Bldg. Basement					280 Up 190	Did not trigger
		Reservoir Roof					280 Up 190	.10 * .06
9	108	Carbon Canyon Dam	33.914	28				
		[ACOE]	117.839					
		Crest					130 Up 040	.11 .08 .14
		Left Abutment					130 Up 040	.06 .05 .05
		Right Abutment						instrument malfunctioned

Table 1. Strong-motion stations triggered during the Upland earthquake of February 28, 1990 (continued)

Map Index Number	USGS Number	Station Identification		Epicentral Distance ¹ (km)	Acceleration	
		Name [Owner]	Coordinates (Lat. °N, Long. °W)		Component Direction (degrees)	Maximum (g)
10	969	Prado Dam [ACOE]	33.890 117.641	28		
		Crest			090 Up 360	.08 .06 .07
		Left Abutment			090 Up 360	* * .05
		Downstream			090 Up 360	.20 .11 .11
11	5265	San Bernardino Array Devore Water Dept. [USGS]	34.235 117.407	29	360 Up 270	.06 .04 .07
12	5032	Paradise Springs Camp [USGS]	34.40 117.80	30	120 Up 030	* * .07
13	5235	Riverside Santa Ana River Bridge [MWD/USGS]	33.968 117.447	30		
		North Abutment Recorder Building			165 Up 075	.08 .05 .06
		Structure Array:				
		Ch. 1- North Abutment			345	*
		Ch. 2- North Abutment			Down	*
		Ch. 3- North Abutment			075	*
		Ch. 4- Mid Span			345	.07
		Ch. 5- Mid Span			Down	.05
		Ch. 6- Mid Span			075	.06
		Ch. 7- Below Bearing			345	.09
		Ch. 8- Below Bearing			Down	*
		Ch. 9- Below Bearing			075	*
		Ch. 10- Above Bearing			345	.07
		Ch. 11- Above Bearing			Down	*
		Ch. 12- Above Bearing			075	.08
14	5268	San Bernardino Array Rialto Fire Station [USGS]	34.134 117.368	31	360 Up 270	.07 .05 .06

Table 1. Strong-motion stations triggered during the Upland earthquake of February 28, 1990 (continued)

Map Index Number	USGS Number	Station Identification		Epicentral Distance ¹ (km)	Acceleration	
		Name [Owner]	Coordinates (Lat. °N, Long. °W)		Component Direction (degrees)	Maximum (g)
15	289	Whittier Narrows Dam [ACOE]	34.020 118.053	35		
		Crest			120 Up 030	.05 *.05 *
		Upstream				*
16	951	Brea Dam [ACOE]	33.890 117.925	35		
		Crest			130 Up 040	.08 *.09
		Left Abutment			130 Up 040	.06 *.06 *
		Downstream			130 Up 040	.06 *.06
17	804	Whittier 7215 Bright Ave. [USGS]	33.977 118.036	36		
		Basement				*
		5th Floor			failed	
		10th Floor				*
18	5031	Valyermo Forest Sta. Ground Level [USGS]	34.44 117.85	36	300 Up 210	.07 *.06
19	5269	San Bernardino Array Valley College [USGS]	34.086 117.309	37	360 Up 270	.05 *.05 *.05

Table 1. Strong-motion stations triggered during the Upland earthquake of February 28, 1990 (continued)

Map Index Number	USGS Number	Station Identification		Epicentral Distance ¹ (km)	Acceleration	
		Name [Owner]	Coordinates (Lat. °N, Long. °W)		Component Direction (degrees)	Maximum (g)
20	754	Colton Interchange I-10/215 [CDOT]	34.064 117.297	38		
		Ground Site			080 Up 350	.07 * .07
		Bridge Cell			080 Up 350	.25 .06 .07
21	5267	San Bernardino Array 5931 F Street [USGS]	34.183 117.295	38		*
22	5245	San Bernardino County Government Center (USGS)	34.106 117.287	38		
		Basement, SW				*
		Ground Site				*
		Structure Array:				
		Ch. 1- 2nd Floor Level, NW			360	*
		Ch. 2- 2nd Floor Level, NE			090	*
		Ch. 3- 2nd Floor Level, NE			360	*
		Ch. 4- 2nd Floor Level, SW			090	.05
		Ch. 5- 4th Floor Level, SW			090	.05
		Ch. 6- 4th Floor Level, NW			360	.07
		Ch. 7- 6th Floor Level, (Roof) NE			090	.09
		Ch. 8- 6th Floor Level, (Roof) NW			360	.09
		Ch. 9- 6th Floor Level, (Roof) SW			090	.08
		Ch. 10- 6th Floor Level, (Roof) NE			360	.07
		Ch. 11- 4th Floor Level, NE			090	.07
		Ch. 12- 4th Floor Level, NE			360	.05
23	707	Lake Mathews Dike Toe [MWD]	33.852 117.451	39	252 Up 162	.05 * .06
24	709	Garvey Reservoir [MWD]	34.050 118.114	39		
		Abutment Bldg.				*
		Crest				*
25	Temp	Pasadena (CIT) 525 S. Wilson Ave. [USGS]	34.137 118.127	40	360 Up 270	.05 * *

Table 1. Strong-motion stations triggered during the Upland earthquake of February 28, 1990 (continued)

Map Index Number	USGS Number	Station Identification		Epicentral Distance ¹ (km)	Acceleration		
		Name [Owner]	Coordinates (Lat. °N, Long. °W)		Component Direction (degrees)	Maximum (g)	
26	634	Norwalk 12400 Imperial Highway [USGS/BECHTEL]	33.916 118.067	42			
					North Ground Site	*	
					South Ground Site	*	
					Basement	*	
					4th Floor	*	
					8th Floor	090 Up 360	.06 * .06
27	5239	Norwalk 12440 Imperial Highway [USGS/BECHTEL]	33.917 118.066	42			
					North Ground Site	*	
					South Ground Site	*	
					Basement	*	
					Structure Array 1:		
					Ch. 1- 9th Level (Roof) Center	090	.05
					Ch. 2-12		*
					Structure Array 2:		
					Ch. 13- 9th Level (Roof), East end	180	.06
					Ch. 14-16		*
					Ch. 17- 9th Level (Roof), Center	180	.06
Ch. 18-20		*					
Ch. 21- 9th Level (Roof), West end	180	.06					
Ch. 22-24		*					
28	129	Loma Linda Medical Center Basement [USGS]	34.050 117.263	42		*	
29	482	Alhambra 900 S. Fremont Ave. [USGS]	34.085 118.149	42			
					Structure Array		
					Ch. 1-6		*
					Ch. 7, 2nd Floor, Center	090	.06
		Ch. 8-12		*			

Table 1. Strong-motion stations triggered during the Upland earthquake of February 28, 1990 (continued)

Map Index Number	USGS Number	Station Identification		Epicentral Distance ¹ (km)	Acceleration	
		Name [Owner]	Coordinates (Lat. °N, Long. °W)		Component Direction (degrees)	Maximum (g)
30	5229	Loma Linda VA Hospital [VA/USGS]	34.050 117.249	43		
		Building 1 Structure Array:				
		Ch. 1- Ground Floor, Center			Down	*
		Ch. 2- Ground Floor, Center			180	*
		Ch. 3- Ground Floor, Center			270	.06
		Ch. 4- 4th Floor, Center			270	.15
		Ch. 5- Ground Floor, North			270	.07
		Ch. 6- 4th Floor, Center			180	.11
		Ch. 7- 4th Floor, North			270	.12
		Ch. 8- Ground Floor, South			180	*
		Ch. 9- 4th Floor, South			270	.11
		North Ground Site			360	.05
					Up	*
					270	*
		South Ground Site			360	.06
					Up	*
					270	.06
31	5279	Alhambra 3213 Norwich Ave. [USGS]	34.084 118.159	43		*
32	5275	Mills Filter Plant [MWD]	33.920 117.320	43		*
33	5129	Los Angeles Bulk Mail Facility [USGS]	33.996 118.162	45	360	*
					Up	*
					270	.06
34	281	Santa Ana, Orange Cty. Engineering Bldg., Basement [USGS]	33.751 117.870	46		*
35	5037	Reche Canyon Olive Dell Ranch [USGS]	34.004 117.223	47		*
36	5030	Littlerock Post Office [USGS]	34.521 117.991	50	300	.09
					Up	*
					210	.10
37	5287	Orange County Wayne Airport [USGS]	33.677 117.869	54		*

Table 1. Strong-motion stations triggered during the Upland earthquake of February 28, 1990 (continued)

Map Index Number	USGS Number	Station Identification		Epicentral Distance ¹ (km)	Acceleration	
		Name [Owner]	Coordinates (Lat. °N, Long. °W)		Component Direction (degrees)	Maximum (g)
38	141	Los Angeles, Griffith Park Observatory [USGS]	34.118 118.299	55		*
39	5106	Long Beach VA Hospital [VA]	33.778 118.118	56		
		Ground Site				*
		Basement				*
		6th Floor				*
		11th Floor			360 Up 270	* * .07
40	5286	Costa Mesa Placentia Fire Station [USGS]	33.658 117.931	58		Did not trigger
41	5257	San Joaquin Reservoir [MWD]	33.620 117.842	59		
		Abutment				*
		Crest				*
42	5246	Newport Beach 840 Newport Center Dr. [USGS]	33.618 117.878	60		
		Structure Array:				
		Ch. 1- Tower 2, Level 1 (Garage), Center			360	.05
		Ch. 2- Tower 2, Level 1 (Garage), Center			Up	*
		Ch. 3- Tower 2, Level 1 (Garage), Center			090	*
		Ch. 4- Tower 2, Level 2 (Plaza), West End			360	Failed
		Ch. 5- Center Building, Level 2 (Plaza), Center			360	.07
		Ch. 6- Center Building, Level 2 (Plaza), Center			090	.07
		Ch. 7- Tower 2, Level 9 (Roof), South End			090	*
		Ch. 8- Tower 2, Level 10 (Penthouse), Center			360	Failed
		Ch. 9- Tower 2, Level 10 (Penthouse), Center			090	Failed
		Ch. 10- Tower 1, Level 9 (Roof), East End			360	*
		Ch. 11- Tower 1, Level 10 (Penthouse), Center			270	.05
		Ch. 12- Tower 1, Level 10 (Penthouse), Center			360	*

Table 1. Strong-motion stations triggered during the Upland earthquake of February 28, 1990 (continued)

Map Index Number	USGS Number	Station Identification		Epicentral Distance ¹ (km)	Acceleration	
		Name [Owner]	Coordinates (Lat. °N, Long. °W)		Component Direction (degrees)	Maximum (g)
43	710	Palos Verdes Reservoir [MWD]	33.772 118.319	70		
		Crest				*
		Abutment				*
44	637	Sepulveda VA Hospital [VA]	34.249 118.478	72		
		Ground				*
45	655	Jensen Filter Plant [MWD]	34.312 118.496	75		
		Administration Bldg. Basement				*
		Generator Room				*
		Reservoir Roof				*
46	5029	Leona Valley Fire Sta. [USGS]	34.62 118.29	76		*

¹Distance is from station to epicenter at 34.140° N. lat. and 117.702° W. long.

*Indicates peak recorded acceleration is less than 0.05 g.

U.S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 287 34.157 N, 117.676 W San Antonio Dam Crest SMA # 476 (ACOE)	L 090	Sens. = 1.80 cm/g Freq. = 25.6 Hz Damp. = 0.6 crit	0.46 g
Earthquake of 28 February 1990 2343 G.m.t.	V Up	Sens. = 1.80 cm/g Freq. = 25.5 Hz Damp. = 0.6 crit	0.40 g
	T 360	Sens. = 1.85 cm/g Freq. = 25.3 Hz Damp. = 0.6 crit	0.58 g
Epicentral distance = 3 km		Film speed = 1 cm/sec	

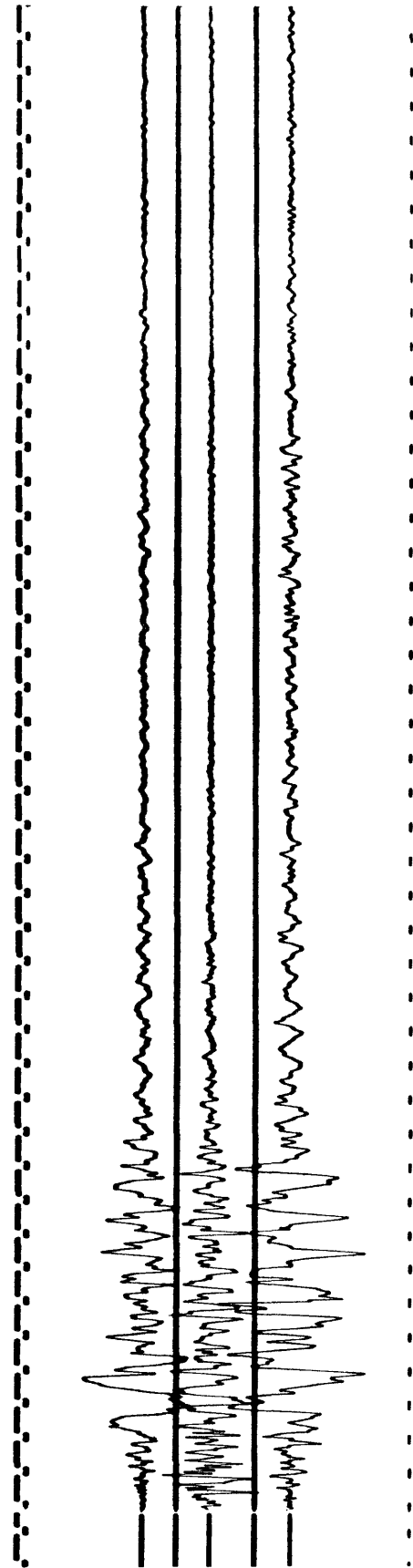
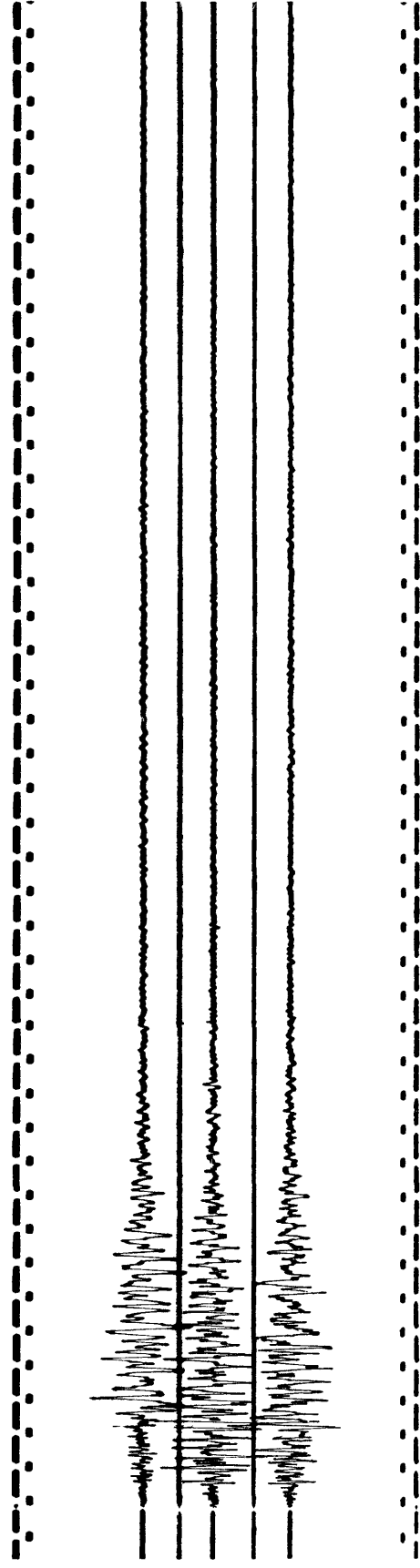


Figure 2. Accelerograms from USGS Cooperative Strong-Motion Instrumentation Network stations recorded during the Upland, California earthquake of February 28, 1990. See Contents (pages ii and iii) for specific stations.

U. S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 287	L 090	Sens. = 1.87 cm/g	0.40 g
34.158 N, 117.682 W		Freq. = 25.6 Hz	
San Antonio Dam		Damp. = 0.6 crit	
Right abutment	V UP	Sens. = 1.75 cm/g	0.83 g
SMA # 477 (ACOE)		Freq. = 26.1 Hz	
		Damp. = 0.6 crit	
Earthquake of	T 360	Sens. = 1.85 cm/g	0.48 g
28 February 1990		Freq. = 25.7 Hz	
2343 G.m.t.		Damp. = 0.6 crit	

Epicentral distance = 3 km

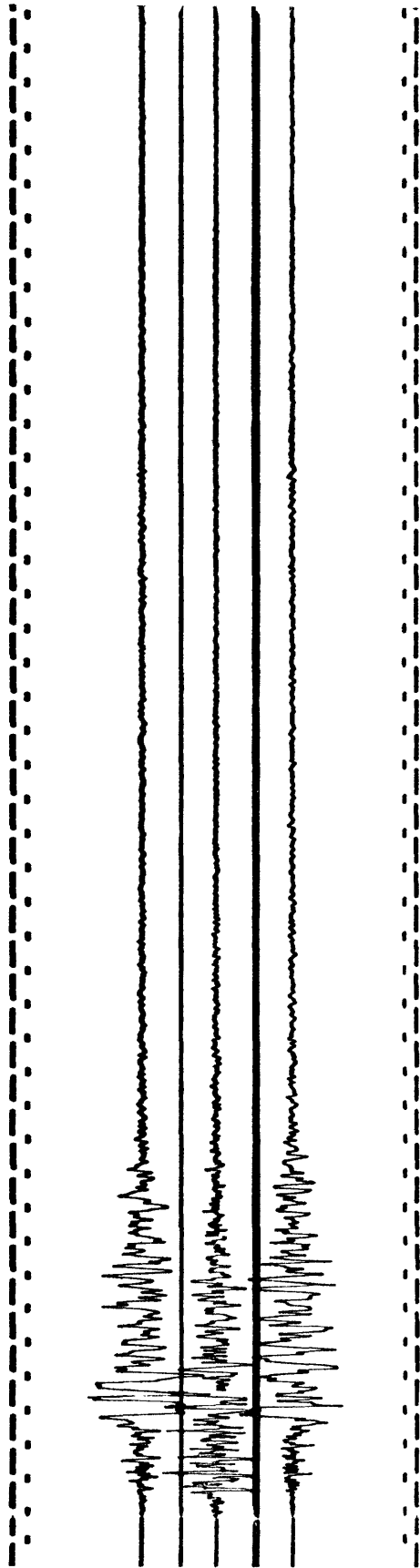
Film speed = 1 cm/sec



U.S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 287 34.156 N, 117.675 W San Antonio Dam Downstream SMA # 475 (ACOE)	L 090	Sens. = 1.90 cm/g Freq. = 25.4 Hz Damp. = 0.6 crit	0.47 g
Earthquake of 28 February 1990 2343 G.m.t.	V Up	Sens. = 1.80 cm/g Freq. = 26.0 Hz Damp. = 0.6 crit	0.43 g
	T 360	Sens. = 1.77 cm/g Freq. = 25.5 Hz Damp. = 0.6 crit	0.43 g

Epicentral distance = 3 km

Film speed = 1 cm/sec



U.S. STRONG-MOTION NETWORK

Station No. 656
34.140° North, 117.749° West
LIVE OAK RESERVOIR
Abutment
SMA-1 # 258 (MWD)

DIRECTION

L 180°

V Up

Earthquake of
28 February 1990
2343 G.m.t.

T 90°

Epicentral distance = 5 km

CONSTANTS

Sen. = 1.80 cm/g
Freq. = 25.8 Hz
Damp. = 0.6 crit

Sen. = 1.95 cm/g
Freq. = 26.1 Hz
Damp. = 0.6 crit

Sen. = 1.90 cm/g
Freq. = 26.2 Hz
Damp. = 0.6 crit

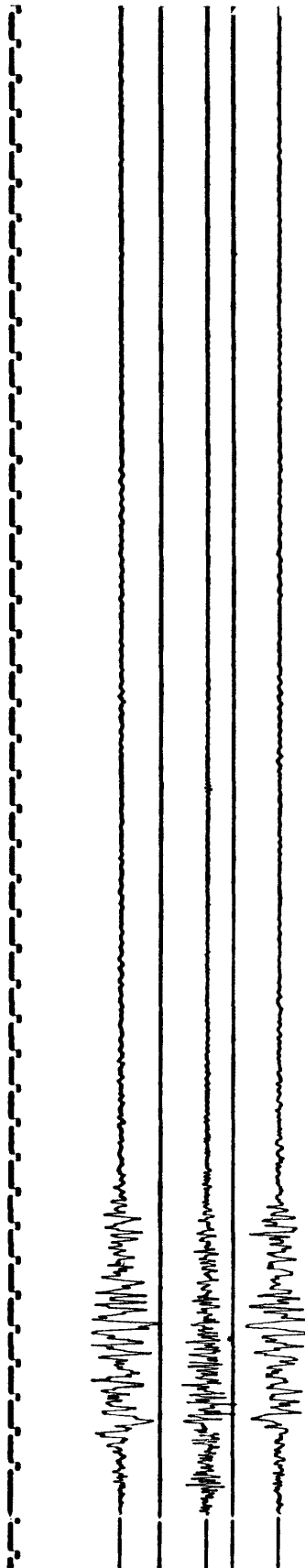
Film speed = 1 cm/sec

MAX. ACCELERATION

0.34 g

0.24 g

0.28 g

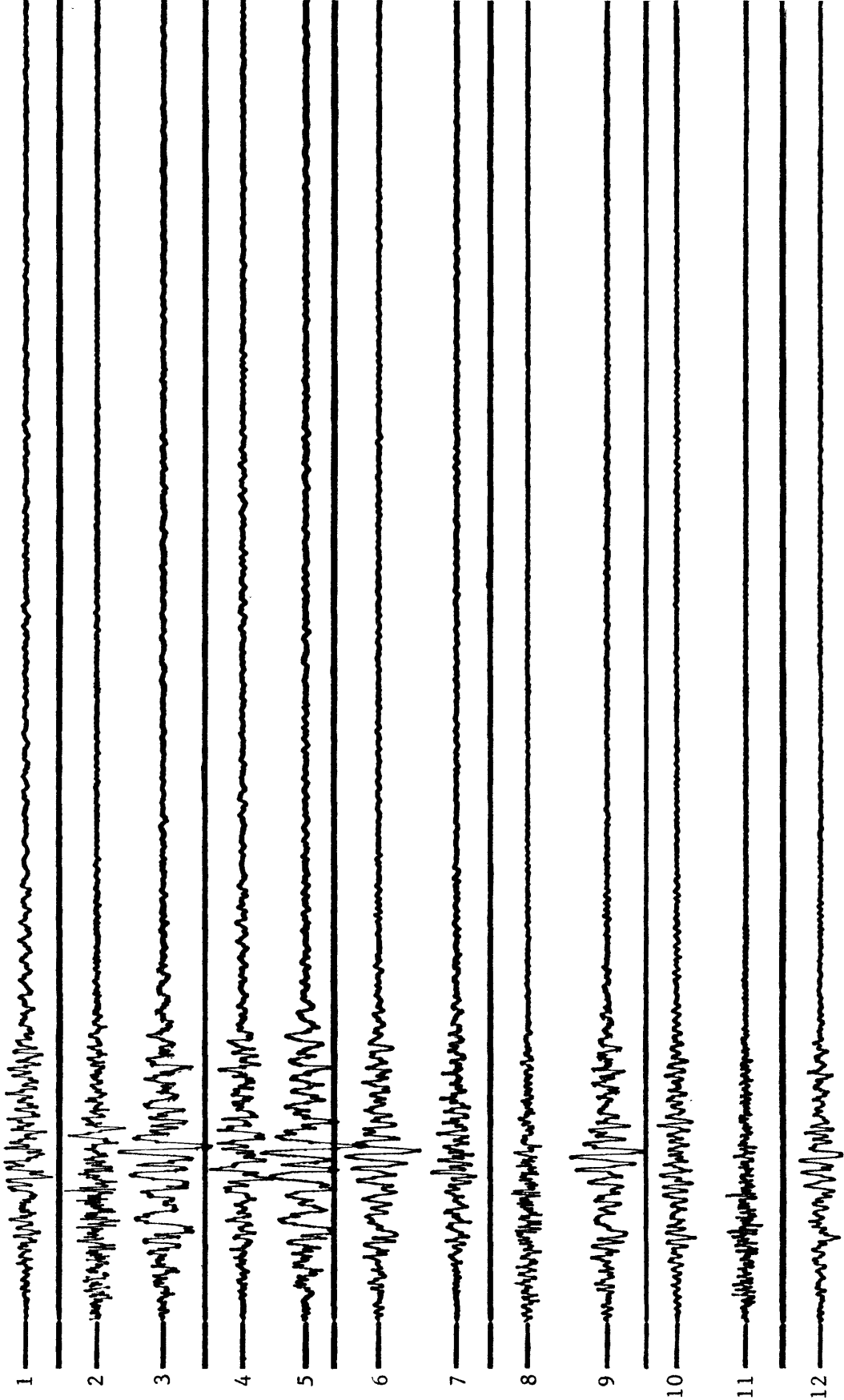
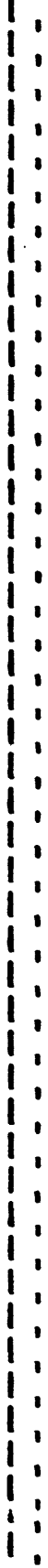


U. S. STRONG-MOTION NETWORK	CH.	DIRECTION	LOCATION	SENSITIVITY	MAX. ACCELERATION
Station No. 656	1	155	Center crest	1.83	0.25 g
34.137 N, 117.753 W	2	Up	Center crest	1.84	0.28 g
Live Oak Reservoir	3	245	Center crest	1.87	0.44 g
Structure array	4	155	Left crest	1.85	0.29 g
CRA # 225	5	245	Left crest	1.81	0.53 g
(MWD)	6	245	Left slope	1.87	0.36 g
Earthquake of	7	155	Center slope	1.85	0.22 g
28 February 1990	8	Up	Center slope	1.87	0.13 g
2343 G.m.t.	9	245	Center slope	1.85	0.32 g
	10	155	Center toe	1.83	0.18 g
	11	Up	Center toe	1.85	0.18 g
	12	245	Center toe	1.85	0.19 g

Epical distance = 5 km

Film speed = 1 cm/sec

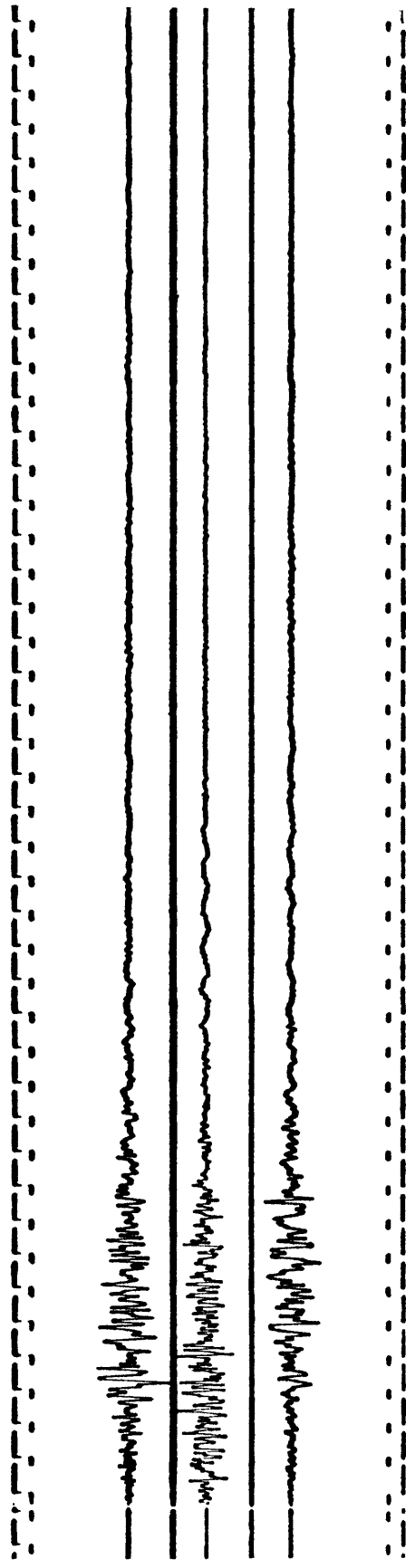
[See accelerogram on next page]



U.S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 5164	L 017	Sens. = 2.00 cm/g	0.31 g
34.114 N, 117.778 W		Freq. = 24.9 Hz	
Weymouth Filter Plant		Damp. = 0.6 crit	
Ground level			
SMA # 1053 (MWD)	V Up	Sens. = 1.83 cm/g	0.26 g
		Freq. = 25.9 Hz	
		Damp. = 0.6 crit	
Earthquake of	T 287	Sens. = 1.88 cm/g	0.23 g
28 February 1990		Freq. = 26.3 Hz	
2343 G.m.t.		Damp. = 0.6 crit	

Epicentral distance = 8 km

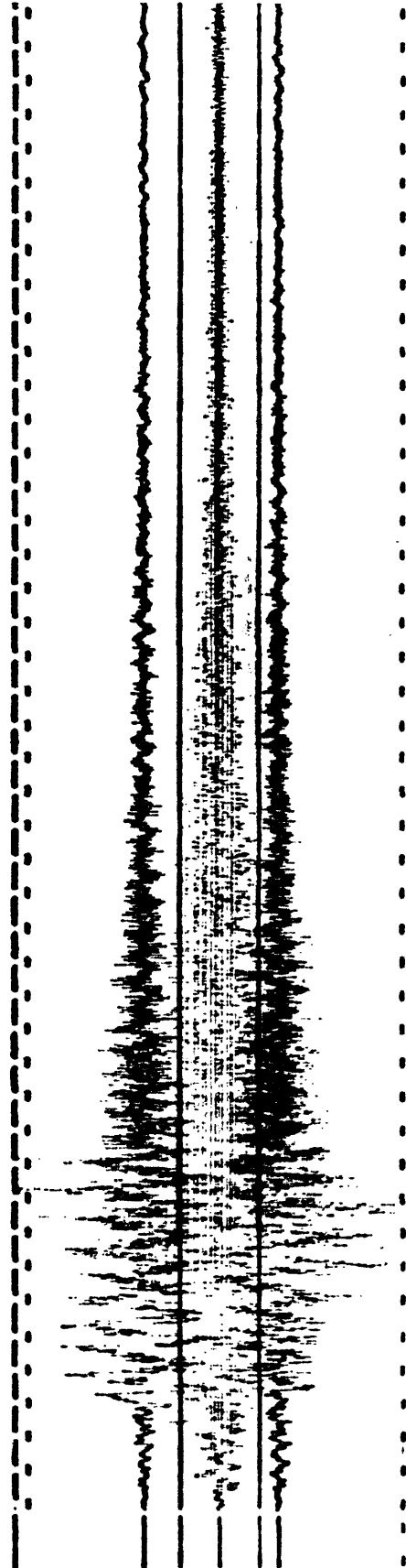
Film speed = 1 cm/sec



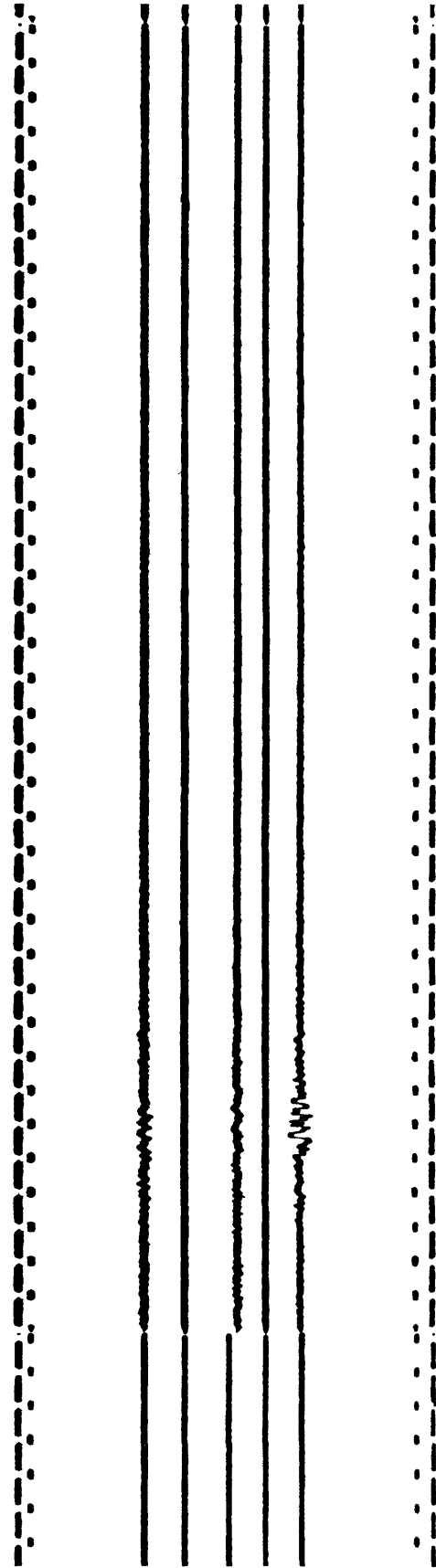
U. S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 5164	L 017	Sens. = 1.86 cm/g	0.83 g
34.115 N, 117.779 W		Freq. = 25.5 Hz	
Weymouth Filter Plant		Damp. = 0.6 crit	
Tank top			
SMA # 1052 (MWD)	V Up	Sens. = 1.85 cm/g	0.87 g
		Freq. = 25.9 Hz	
		Damp. = 0.6 crit	
Earthquake of	T 287	Sens. = 1.77 cm/g	1.05 g
28 February 1990		Freq. = 25.8 Hz	
2343 G.m.t.		Damp. = 0.6 crit	

Film speed = 1 cm/sec

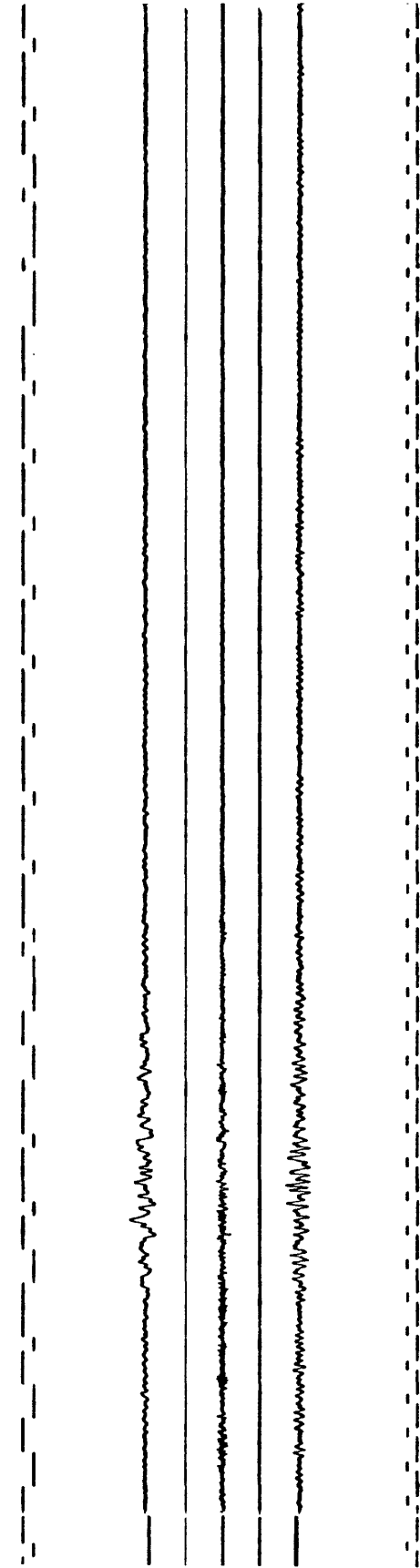
Epicentral distance = 8 km



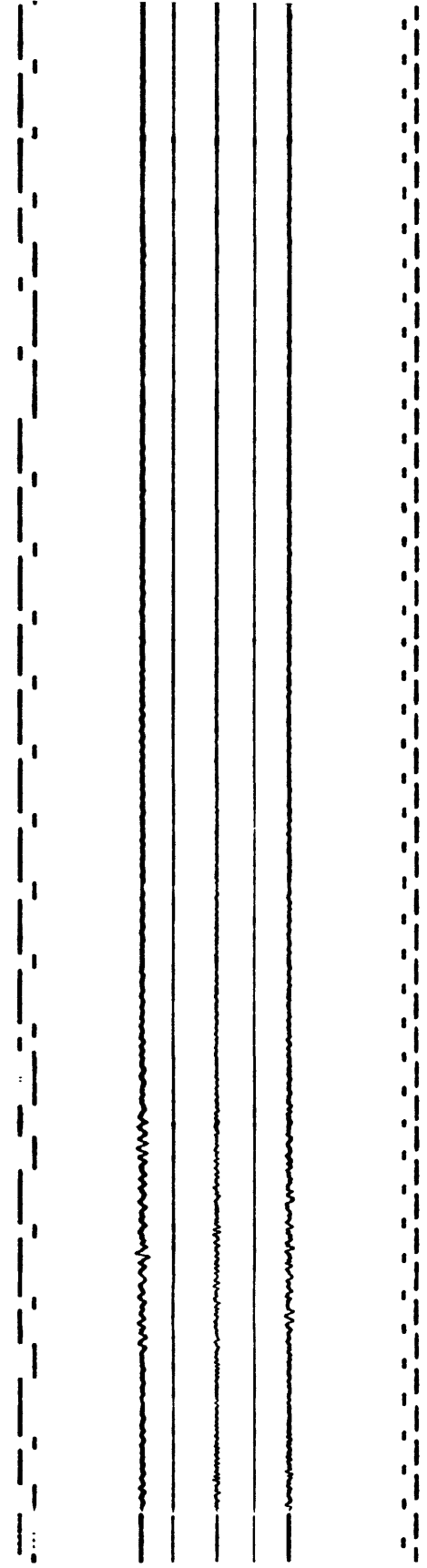
U.S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 756	L 246	Sens. = 1.90 cm/g	0.05 g
34.173 N, 117.879 W		Freq. = 25.4 Hz	
Morris Dam		Damp. = 0.6 crit	
Left abutment	V Up	Sens. = 1.91 cm/g	0.04 g
SMA # 1051 (MWD)		Freq. = 25.9 Hz	
		Damp. = 0.6 crit	
Earthquake of	T 156	Sens. = 1.90 cm/g	0.08 g
28 February 1990		Freq. = 27.1 Hz	
2343 G.m.t.		Damp. = 0.6 crit	
		Film speed = 1 cm/sec	
Epicentral distance = 17 km			



U.S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 5035	L 315	Sens. = 1.90 cm/g	0.12 g
34.26 N, 117.50 W		Freq. = 25.3 Hz	
Lytle Creek		Damp. = 0.6 crit	
Mann residence	V Up	Sens. = 1.93 cm/g	0.07 g
Ground		Freq. = 25.0 Hz	
SMA-1 # 1488 (USGS)		Damp. = 0.6 crit	
Earthquake of	T 225	Sens. = 1.78 cm/g	0.11 g
28 February 1950		Freq. = 26.1 Hz	
2343 G.m.t.		Damp. = 0.6 crit	
(WWVB trigger time)			
Epicentral distance = 23 km		Film speed = 1 cm/sec	



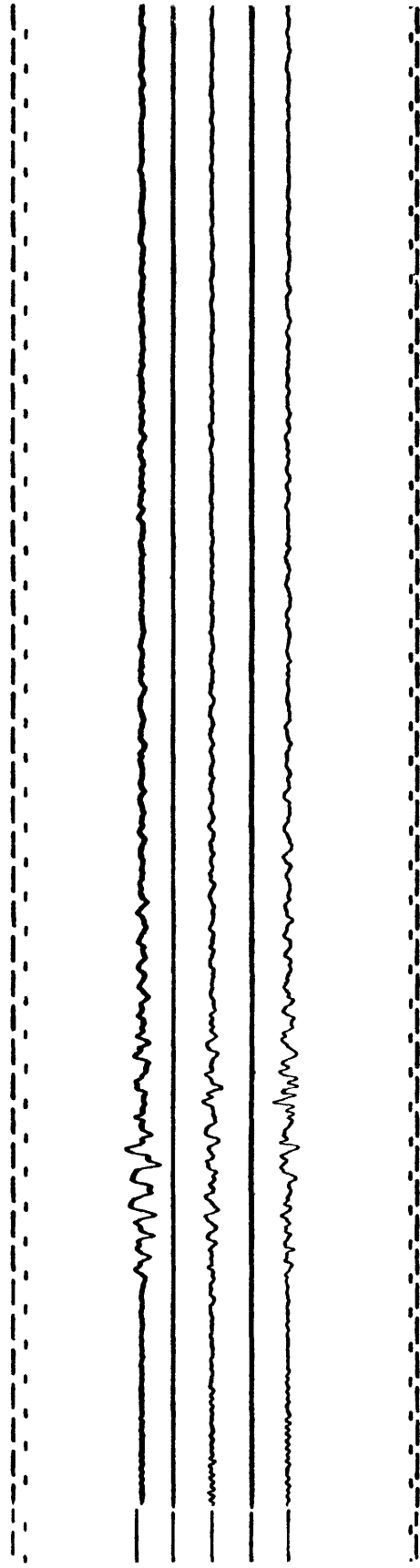
U. S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 5036 34.193 N, 117.426 W Sycamore Forest Station Ground	L 315	Sens. = 1.79 cm/g Freq. = 25.8 Hz Damp. = 0.6 crit	0.06 g
SMA-1 # 1505 (USGS) Earthquake of 28 February 1990 2343 G.m.t. (WWVB trigger time)	V Up T 225	Sens. = 1.86 cm/g Freq. = 25.8 Hz Damp. = 0.6 crit Sens. = 1.79 cm/g Freq. = 26.2 Hz Damp. = 0.6 crit	* *
Epical distance = 26 km		Film speed = 1 cm/sec	



U. S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 697 33.935 N, 117.883 W Orange County Reservoir Piezometer Building SMA # 1046 (MWD)	L 090	Sens. = 1.89 cm/g Freq. = 25.5 Hz Damp. = 0.6 crit	0.09 g
Earthquake of 28 February 1990 2343 G.m.t.	V Up	Sens. = 1.91 cm/g Freq. = 24.9 Hz Damp. = 0.6 crit	0.05 g
	T 360	Sens. = 1.92 cm/g Freq. = 25.2 Hz Damp. = 0.6 crit	0.10 g

Epicentral distance = 26 km

Film speed = 1 cm/sec



U. S. STRONG-MOTION NETWORK

Station No. 697
 33.936 N, 117.884 W
 Orange County Reservoir
 Crest
 SMA # 6696 (MWD)

DIRECTION

L 090
 V Up
 T 360

CONSTANTS

Sens. = 1.86 cm/g
 Freq. = 26.4 Hz
 Damp. = 0.62 crit

Sens. = 1.96 cm/g
 Freq. = 24.9 Hz
 Damp. = 0.61 crit

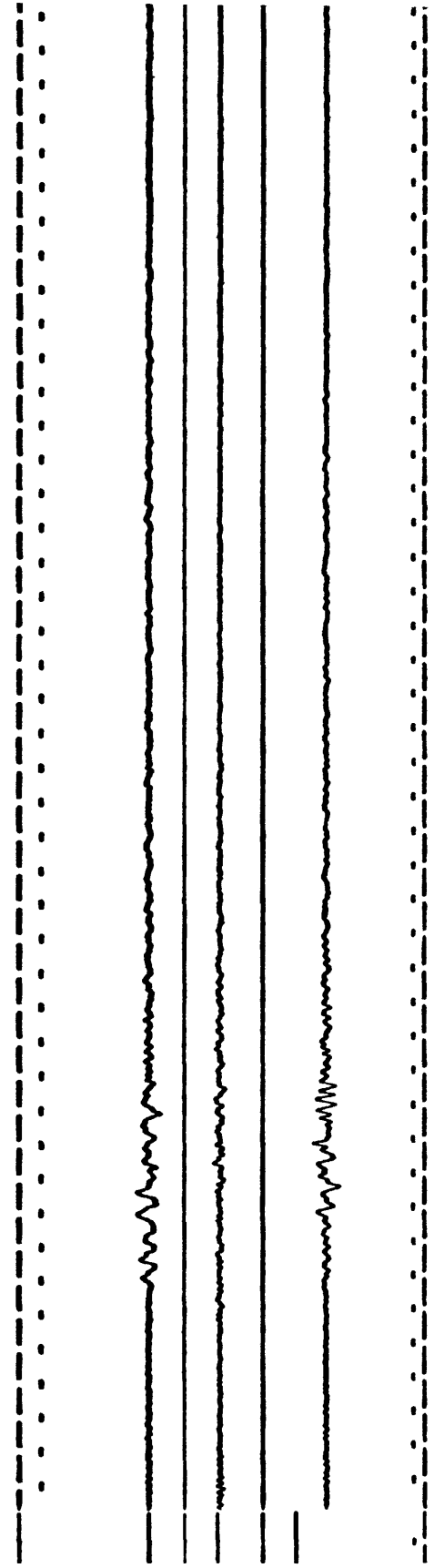
Sens. = 1.94 cm/g
 Freq. = 25.8 Hz
 Damp. = 0.64 crit

MAX. ACCELERATION

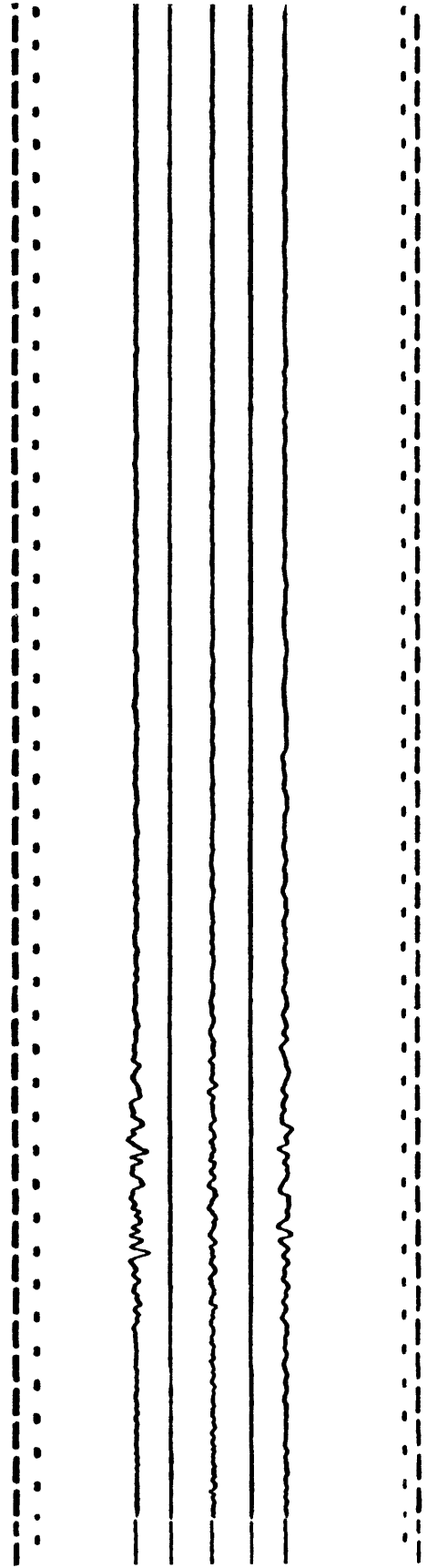
0.17g
 0.08g
 0.11g

Epicentral distance = 26 km

Film speed = 1 cm/sec



U. S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 698	L 280°	Sens. = 1.85 cm/g	0.10 g
33.911 N, 117.817 W		Freq. = 26.1 Hz	
Diemer Filter Plant		Damp. = 0.6 crit	
Reservoir roof	V Up	Sens. = 1.80 cm/g	0.04 g
SMA # 1045 (MWD)		Freq. = 25.4 Hz	
		Damp. = 0.6 crit	
Earthquake of	T 190°	Sens. = 1.78 cm/g	0.06 g
28 February 1990		Freq. = 25.2 Hz	
2343 G.m.t.		Damp. = 0.6 crit	
Film speed = 1 cm/sec			
Epicentral distance = 27 km			



U.S. STRONG-MOTION NETWORK

Station No. 108
33.914° North, 117.839° West
CARBON CANYON DAM
Crest
SMA-1 # 383 (ASOE)

DIRECTION

L 130°

V Up

T 040°

CONSTANTS

Sens. = 2.00 cm/g
Freq. = 25.5 Hz
Damp. = 0.6 crit

Sens. = 2.00 cm/g
Freq. = 25.9 Hz
Damp. = 0.6 crit

Sens. = 2.00 cm/g
Freq. = 25.8 Hz
Damp. = 0.6 crit

Epicentral distance = 28 km

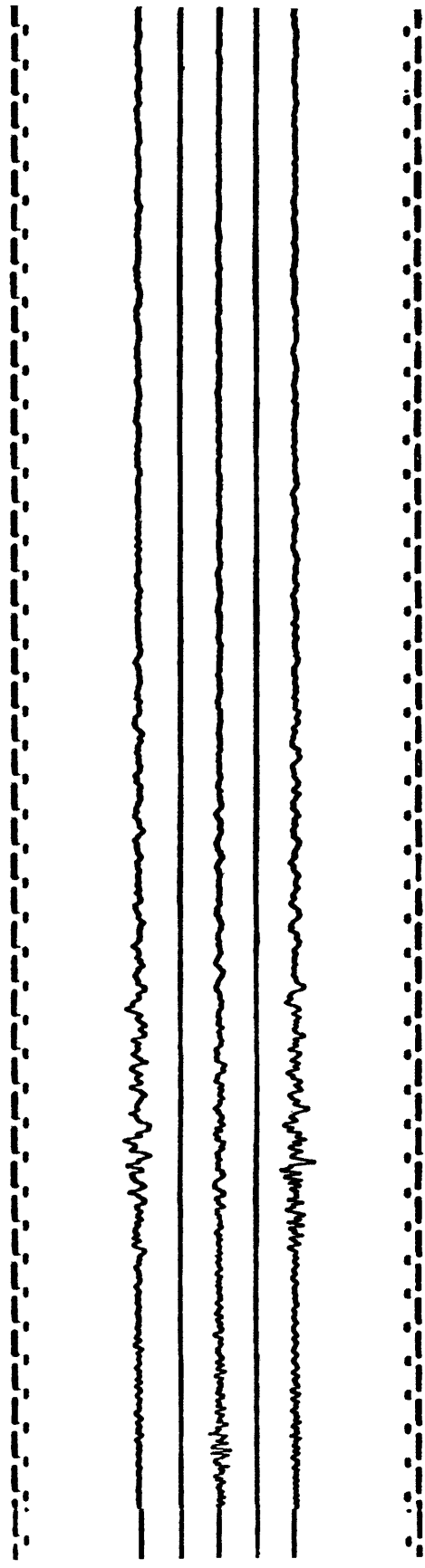
Film speed = 1 cm/sec

MAX. ACCELERATION

0.11 g

0.08 g

0.14 g



U.S. STRONG-MOTION NETWORK

Station No. 108
 33.913 N, 117.837 W
 Carbon Canyon Dam
 Left abutment
 SMA # 382 (ACOE)

DIRECTION

L 130°

V Up

T 40°

CONSTANTS

Sens. = 1.95 cm/g
 Freq. = 26.0 Hz
 Damp. = 0.6 crit

Sens. = 1.90 cm/g
 Freq. = 26.2 Hz
 Damp. = 0.6 crit

Sens. = 1.85 cm/g
 Freq. = 26.4 Hz
 Damp. = 0.6 crit

MAX. ACCELERATION

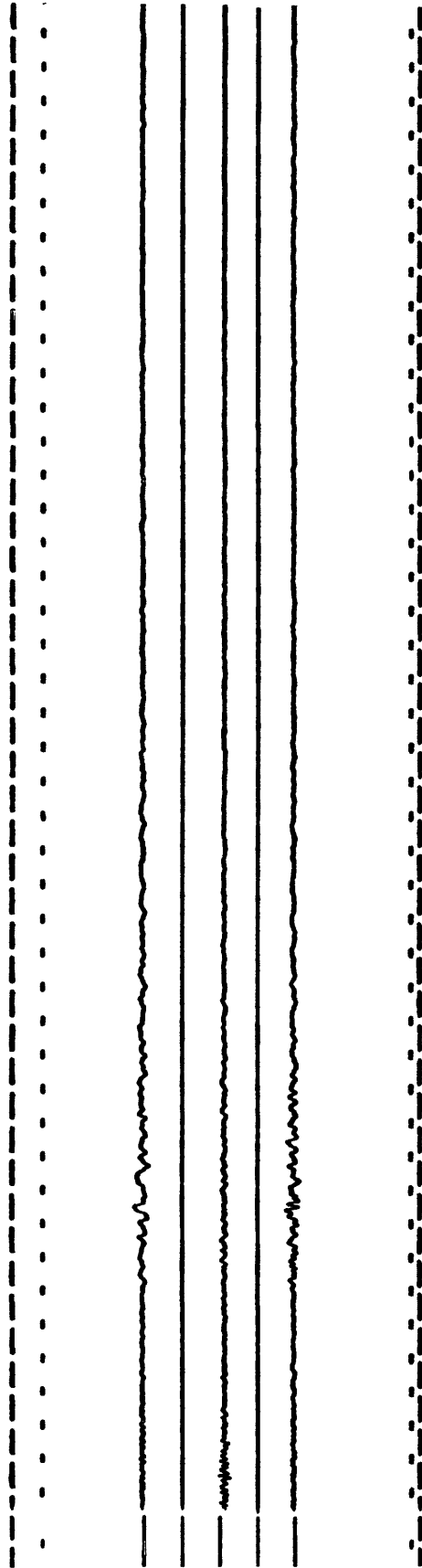
0.06 g

0.05 g

0.05 g

Epicentral distance = 28 km

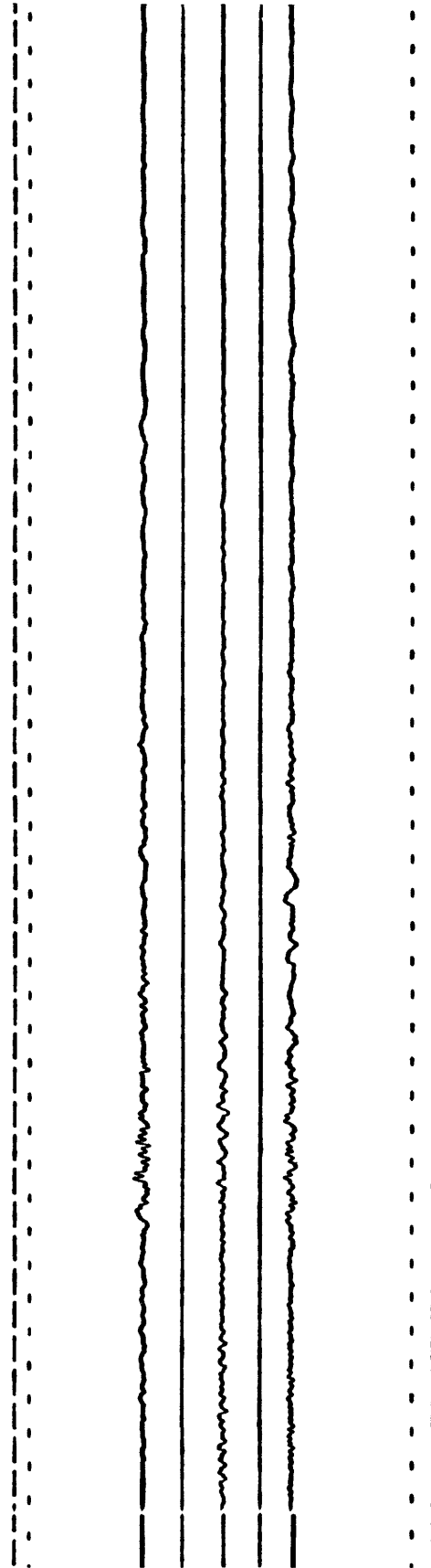
Film speed = 1 cm/sec



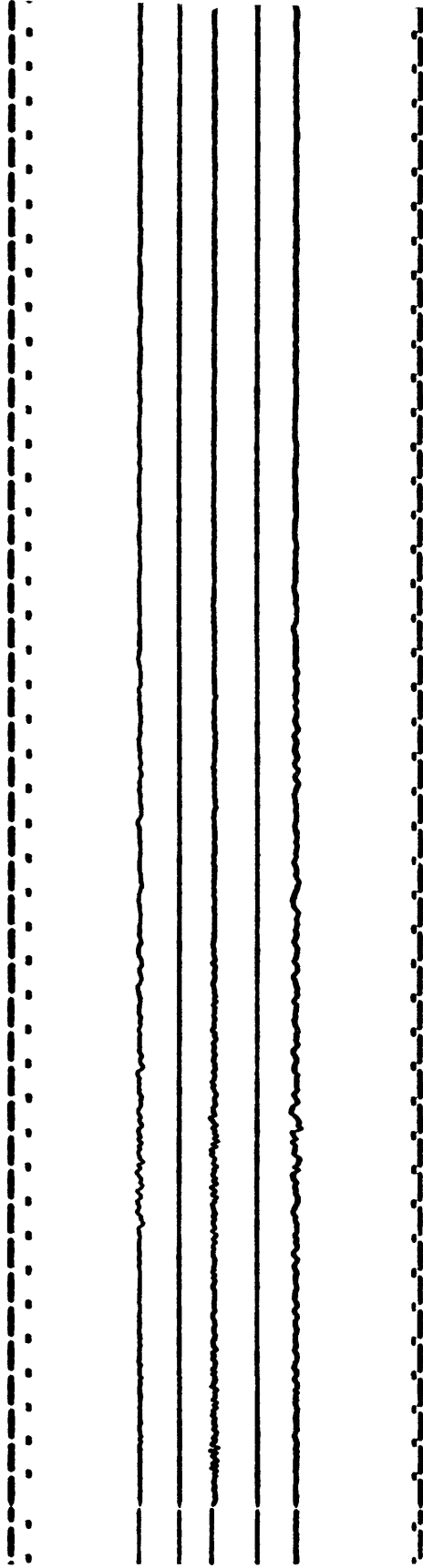
U. S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 969	L 090	Sens. = 2.00 cm/g	0.08 g
33.890 N, 117.641 W		Freq. = 25.1 Hz	
Prado Dam		Damp. = 0.6 crit	
Crest			
SMA # 389 (ACOE)	V Up	Sens. = 1.80 cm/g	0.06 g
		Freq. = 26.3 Hz	
		Damp. = 0.6 crit	
Earthquake of	T 360	Sens. = 1.80 cm/g	0.07 g
28 February 1990		Freq. = 26.1 Hz	
2343 G.m.t.		Damp. = 0.6 crit	

Epicentral distance = 28 km

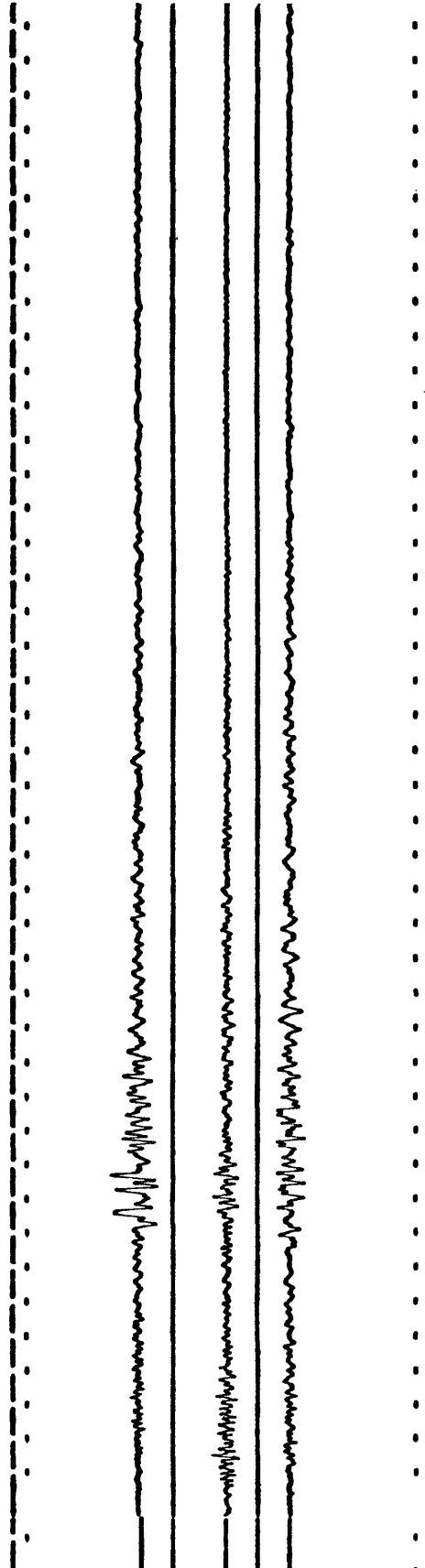
Film speed = 1 cm/sec



U.S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 969	L 090	Sens. = 1.80 cm/g	0.04 g
33.890 N, 117.637 W		Freq. = 26.8 Hz	
Prado Dam		Damp. = 0.6 crit	
Left Abutment	V Up	Sens. = 1.80 cm/g	0.03 g
SMA # 388 (ACOE)		Freq. = 24.9 Hz	
		Damp. = 0.6 crit	
Earthquake of	T 360	Sens. = 1.90 cm/g	0.05 g
28 February 1990		Freq. = 26.2 Hz	
2343 G.m.t.		Damp. = 0.6 crit	
Epical distance = 28 km		Film speed = 1 cm/sec	



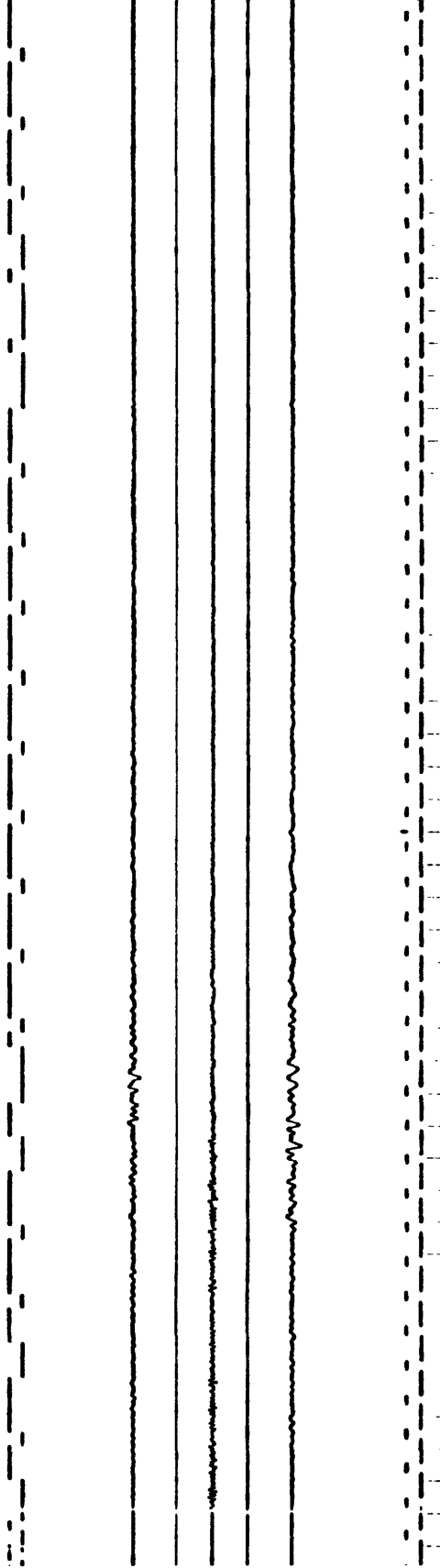
U.S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 969	L 090	Sens. = 1.90 cm/g	0.20 g
33.888 N, 117.640 W		Freq. = 26.3 Hz	
Prado Dam		Damp. = 0.6 crit	
Downstream			
SMA # 381 (ACOE)	V Up	Sens. = 1.80 cm/g	0.11 g
		Freq. = 26.2 Hz	
		Damp. = 0.6 crit	
Earthquake of	T 360	Sens. = 1.85 cm/g	0.11 g
28 February 1990		Freq. = 25.8 Hz	
2343 G.m.t.		Damp. = 0.6 crit	
Epicentral distance = 28 km		Film speed = 1 cm/sec	



U. S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 5265	L 360	Sens. = 1.74 cm/g	0.06 g
34.235 N, 117.407 W		Freq. = 26.6 Hz	
San Bernardino Array:		Damp. = 0.6 crit	
Devore Water Dept.	V Up	Sens. = 1.79 cm/g	0.04 g
Ground		Freq. = 26.4 Hz	
SMA-1 # 3560 (USGS)		Damp. = 0.6 crit	
Earthquake of	T 270	Sens. = 1.82 cm/g	0.07 g
28 February 1990		Freq. = 25.8 Hz	
2343 G.m.t.		Damp. = 0.6 crit	
(WWVB trigger time)			

Epicentral distance = 29 km

Film speed = 1 cm/sec



U. S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 5032 34.40 N, 117.80 W Paradise Springs Camp Ground	L 120	Sens. = 1.79 cm/g Freq. = 26.1 Hz Damp. = 0.6 crit	*
SMA-1 # 1469 (USGS)	V Up	Sens. = 1.86 cm/g Freq. = 25.4 Hz Damp. = 0.6 crit	*
Earthquake of 28 February 1990 2343 G.m.t. (WWVB trigger time)	T 030	Sens. = 1.83 cm/g Freq. = 25.2 Hz Damp. = 0.6 crit	0.07 g
Epicentral distance = 30 km		Film speed = 1 cm/sec	

U. S. STRONG-MOTION NETWORK

DIRECTION

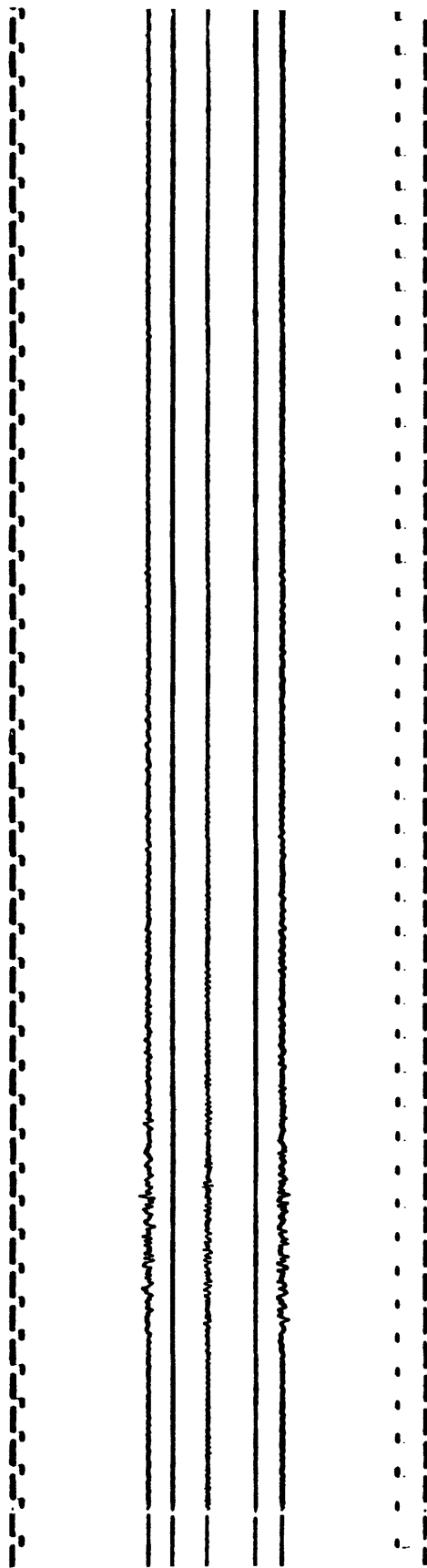
CONSTANTS

MAX. ACCELERATION

Station No. 5235	L 166	Sens. = 1.87 cm/g	0.08 g
33.968 N, 117.447 W		Freq. = 25.1 Hz	
Riverside,		Damp. = 0.62 crit	
Santa Ana River Bridge	V Up	Sens. = 1.73 cm/g	0.05 g
Abutment		Freq. = 26.5 Hz	
SMA-1 # 267 (USGS/MWD)		Damp. = 0.59 crit	
Earthquake of	T 076	Sens. = 1.79 cm/g	0.06 g
28 February 1990		Freq. = 25.8 Hz	
2343 G.m.t.		Damp. = 0.60 crit	

Film speed = 1 cm/sec

Epicentral distance = 30 km



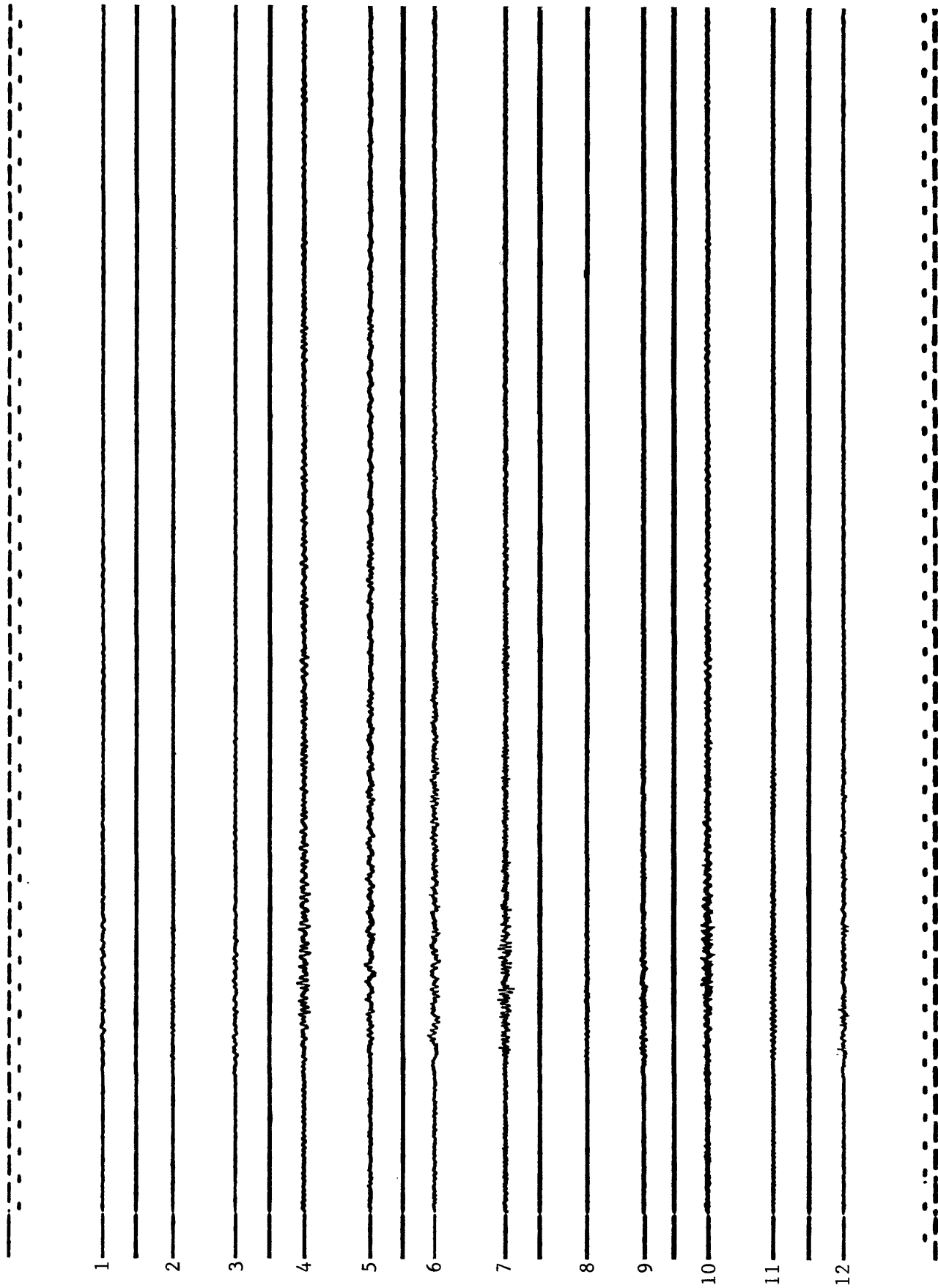
U. S. STRONG-MOTION NETWORK	CH. DIRECTION	LOCATION	SENSITIVITY	MAX. ACCELERATION
Station No. 5235	1 346	North abutment	0.91cm/g	0.03 g
33.968 N, 117.447 W	2 Down	North abutment	0.91	0.02 g
Riverside	3 076	North abutment	0.93	0.03 g
Santa Ana River Bridge	4 346	Mid-span	0.93	0.07 g
Structure Array	5 Down	Mid-span	0.94	0.05 g
CRA # 310 (MWD)	6 076	Mid-span	0.90	0.06 g
Earthquake of	7 346	Below bearing	0.92	0.09 g
28 February 1990	8 Down	Below bearing	0.91	0.02 g
2343 G.m.t.	9 076	Below bearing	0.90	0.03 g
(WWVB trigger time)	10 346	Above bearing	0.89	0.07 g
	11 Down	Above bearing	0.93	0.03 g
	12 076	Above bearing	0.89	0.08 g

Film speed = 1 cm/sec

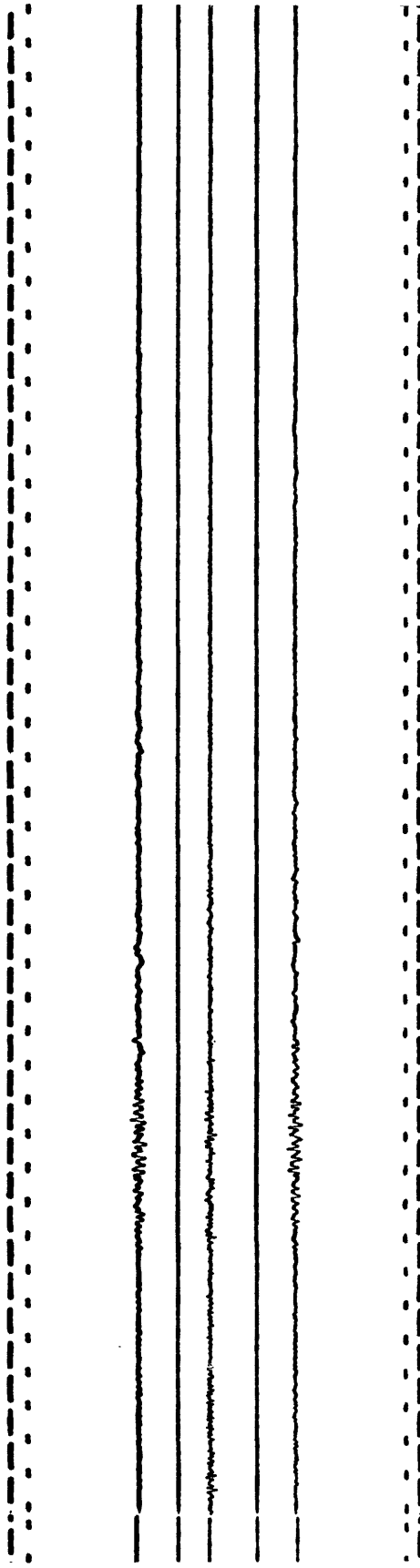
Epicentral distance = 30 km

[See accelerogram on next page]

SANTA ANA RIVER BRIDGE CRA-1 #310 (MWD)



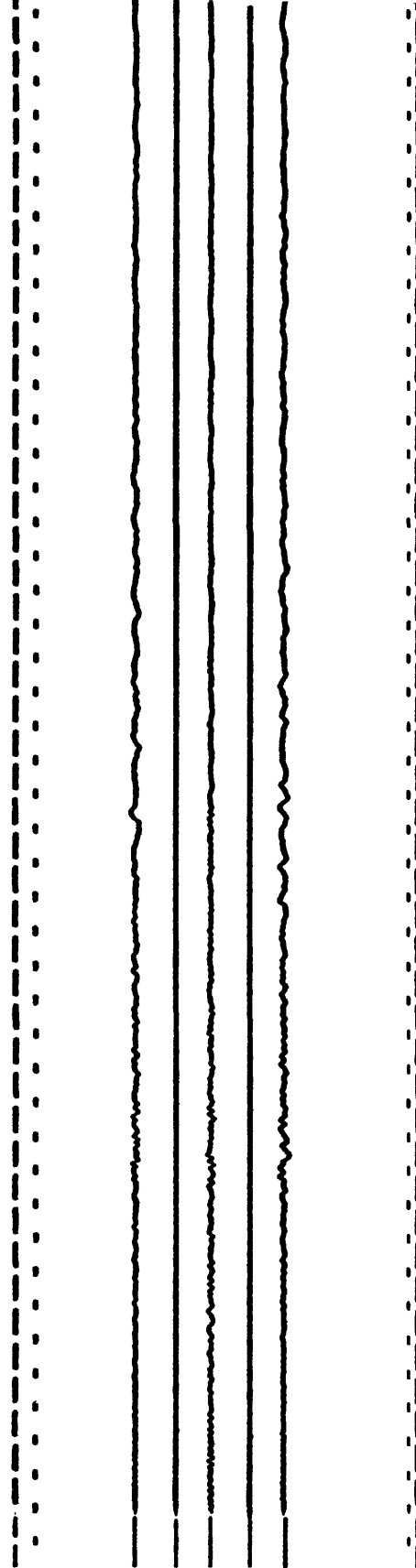
U. S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 5268	L 360	Sens. = 1.82 cm/g	0.07 g
34.134 N, 117.368 W		Freq. = 25.7 Hz	
San Bernardino Array:		Damp. = 0.6 crit	
Rialto Fire Station	V Up	Sens. = 1.90 cm/g	0.05 g
Ground		Freq. = 24.8 Hz	
SMA-1 # 1082 (USGS)		Damp. = 0.6 crit	
Earthquake of	T 270	Sens. = 1.97 cm/g	0.06 g
28 February 1990		Freq. = 25.0 Hz	
2343 G.m.t.		Damp. = 0.6 crit	
Epicentral distance = 31 km		Film speed = 1 cm/sec	



U. S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 289	L 118	Sens. = 1.80 cm/g	0.05 g
34.020 N, 118.053 W		Freq. = 26.1 Hz	
Whittier Narrows Dam		Damp. = 0.61 crit	
Crest			
SMA # 478 (ACOE)	V Up	Sens. = 1.79 cm/g	0.05 g
		Freq. = 25.7 Hz	
		Damp. = 0.57 crit	
Earthquake of			
28 February 1990	T 028	Sens. = 1.79 cm/g	0.04 g
2343 G.m.t.		Freq. = 26.1 Hz	
		Damp. = 0.59 crit	

Epicentral distance = 35 km

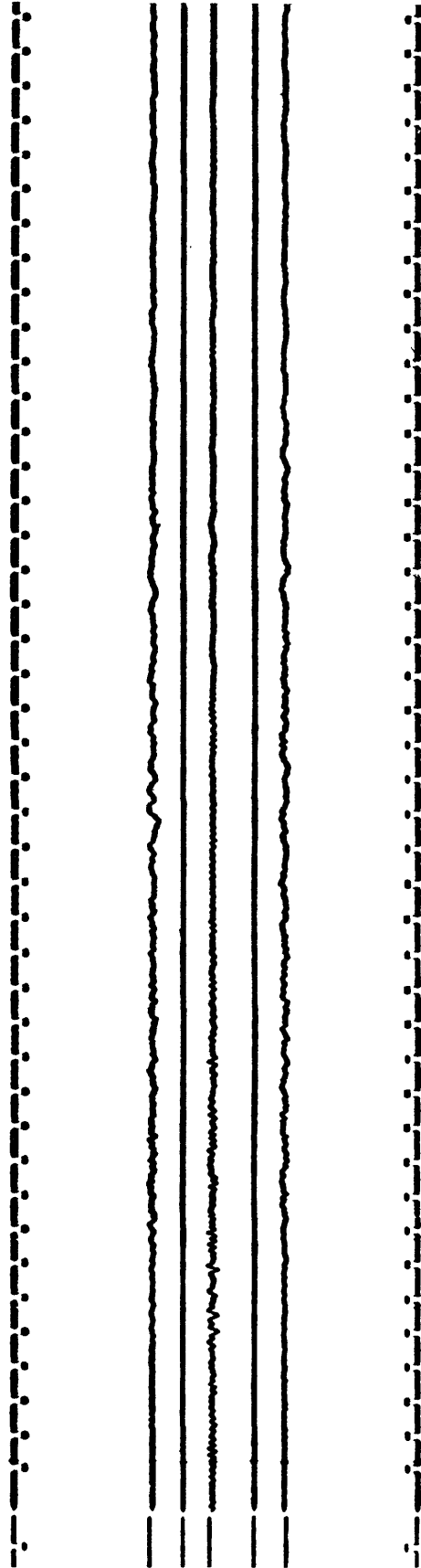
Film speed = 1 cm/sec



U. S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 289	L 118	Sens. = 2.00 cm/g	0.04 g
34.031 N, 118.054 W		Freq. = 25.1 Hz	
Whittier Narrows Dam		Damp. = 0.59 crit	
Upstream			
SMA # 376 (ACOE)	V Up	Sens. = 2.00 cm/g	0.04 g
		Freq. = 25.4 Hz	
		Damp. = 0.61 crit	
Earthquake of			
28 February 1990	T 028	Sens. = 2.00 cm/g	0.03 g
2343 G.m.t.		Freq. = 25.2 Hz	
		Damp. = 0.59 crit	

Epicentral distance = 35 km

Film speed = 1 cm/sec



U. S. STRONG-MOTION NETWORK

Station No. 951
 33.890 N, 117.925 W
 Brea Dam
 Crest
 SMA # 386 (ACOE)

DIRECTION

L 130°

V Up

CONSTANTS

Sens. = 2.00 cm/g
 Freq. = 25.3 Hz
 Damp. = 0.6 crit

Sens. = 1.96 cm/g
 Freq. = 25.8 Hz
 Damp. = 0.6 crit

Sens. = 1.90 cm/g
 Freq. = 25.7 Hz
 Damp. = 0.6 crit

MAX. ACCELERATION

0.08 g

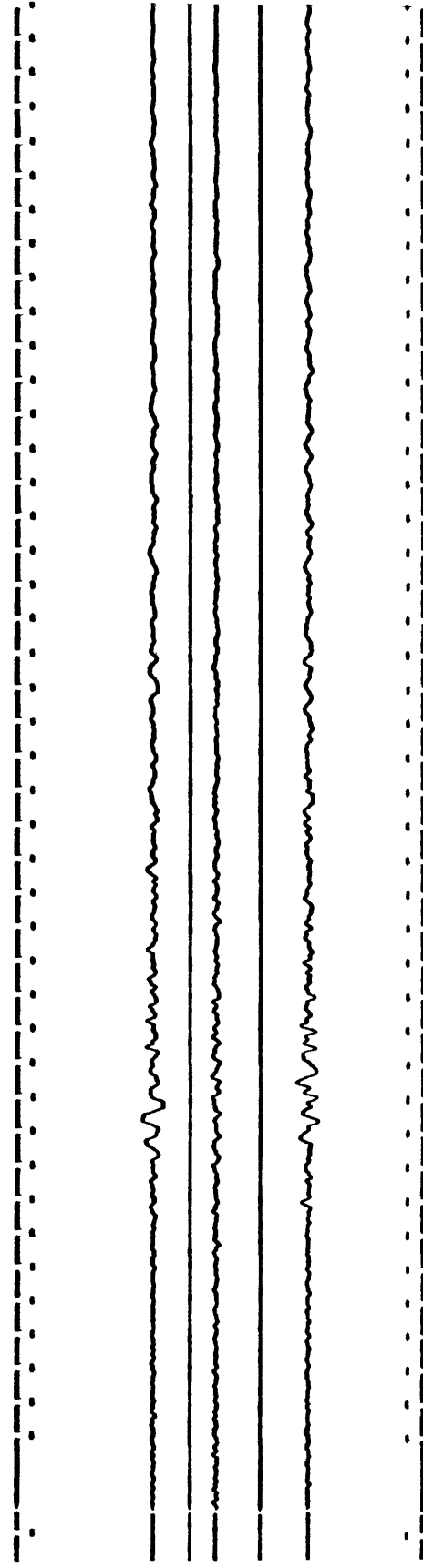
0.04 g

0.09 g

Earthquake of
 28 February 1990
 2343 G.m.t.

Epicentral distance = 35 km

Film speed = 1 cm/sec

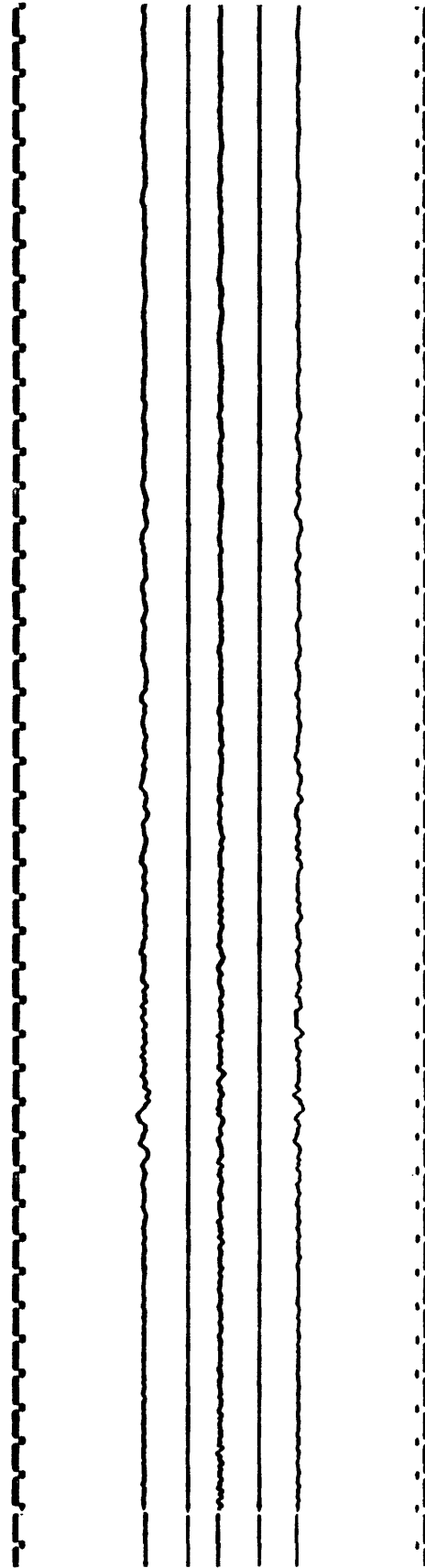


U.S. STRONG-MOTION NETWORK

Station No. 951 33.890 N, 117.924 W Brea Dam Left abutment SMA # 385 (ACOE)	DIRECTION <hr/> L 130° V Up	CONSTANTS <hr/> Sens. = 1.90 cm/g Freq. = 25.9 Hz Damp. = 0.6 crit Sens. = 2.02 cm/g Freq. = 24.8 Hz Damp. = 0.6 crit Sens. = 1.95 cm/g Freq. = 25.2 Hz Damp. = 0.6 crit	MAX. ACCELERATION <hr/> 0.06 g 0.02 g 0.04 g
---	---------------------------------------	---	---

Epicentral distance = 35 km Film speed = 1 cm/sec

Earthquake of
 28 February 1990
 2343 G.m.t.



U.S. STRONG-MOTION NETWORK

Station No. 951
 33.889 N, 117.926 W
 Brea Dam
 Downstream
 SMA # 387 (ACOE)

DIRECTION

L 130°
 V Up

CONSTANTS

Sens. = 1.95 cm/g
 Freq. = 26.2 Hz
 Damp. = 0.6 crit
 Sens. = 2.00 cm/g
 Freq. = 25.7 Hz
 Damp. = 0.6 crit
 Sens. = 1.85 cm/g
 Freq. = 26.0 Hz
 Damp. = 0.6 crit

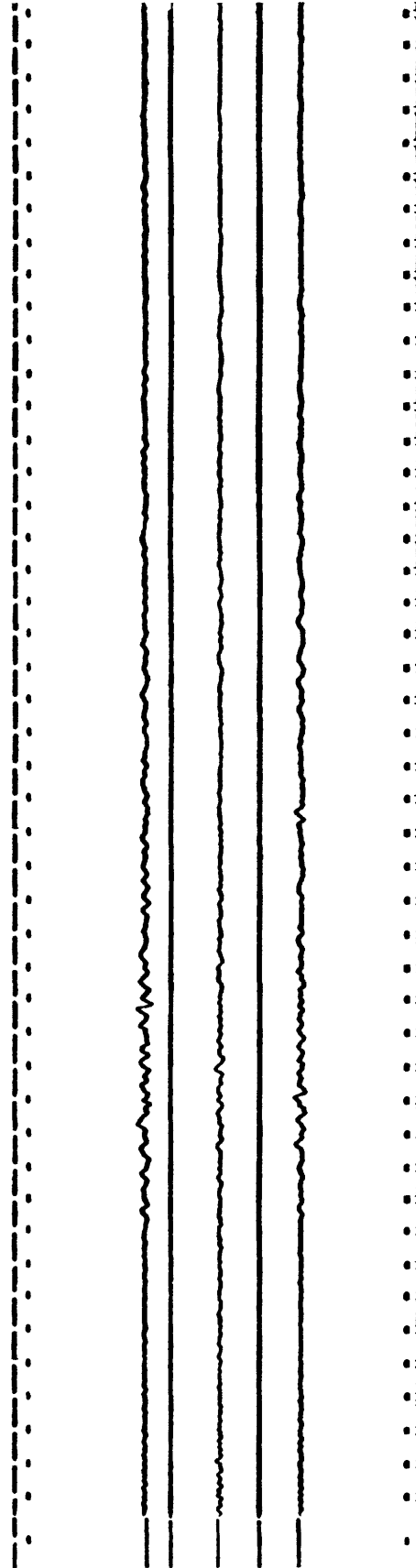
MAX. ACCELERATION

0.06 g
 0.04 g
 0.06 g

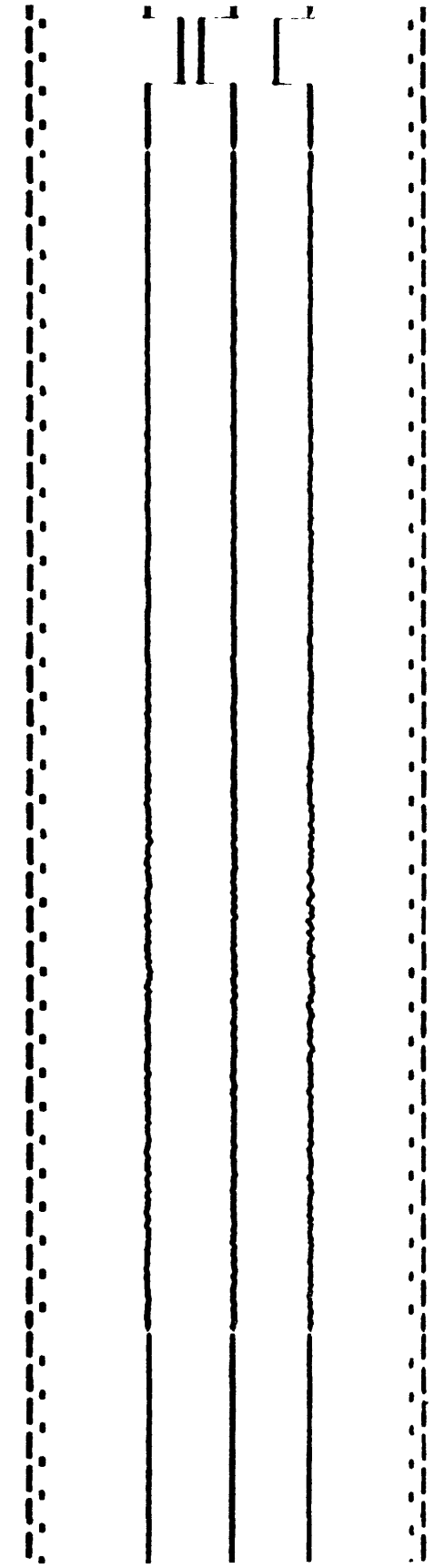
Earthquake of
 28 February 1990
 2343 G.m.t.

Epicentral distance = 35 km

Film speed = 1 cm/sec



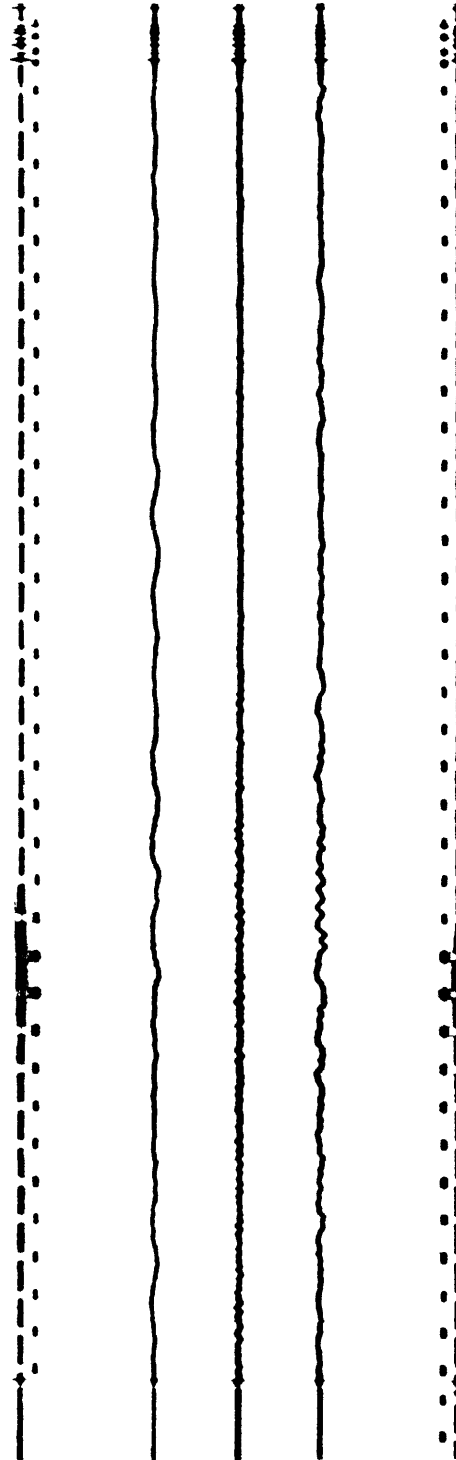
U.S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 804 33.977 N, 118.036 W Whittier, 7215 Bright Ave. Basement SMA # 1069 (Code/USGS)	L 180	Sens. = 1.78 cm/g Freq. = 25.9 Hz Damp. = 0.6 crit	*
Earthquake of 28 February 1990 2343 G.m.t.	V Up	Sens. = 1.89 cm/g Freq. = 25.1 Hz Damp. = 0.6 crit	*
Epical distance = 36 km	T 090	Sens. = 1.90 cm/g Freq. = 25.1 Hz Damp. = 0.6 crit	*
		Film speed = 1 cm/sec	



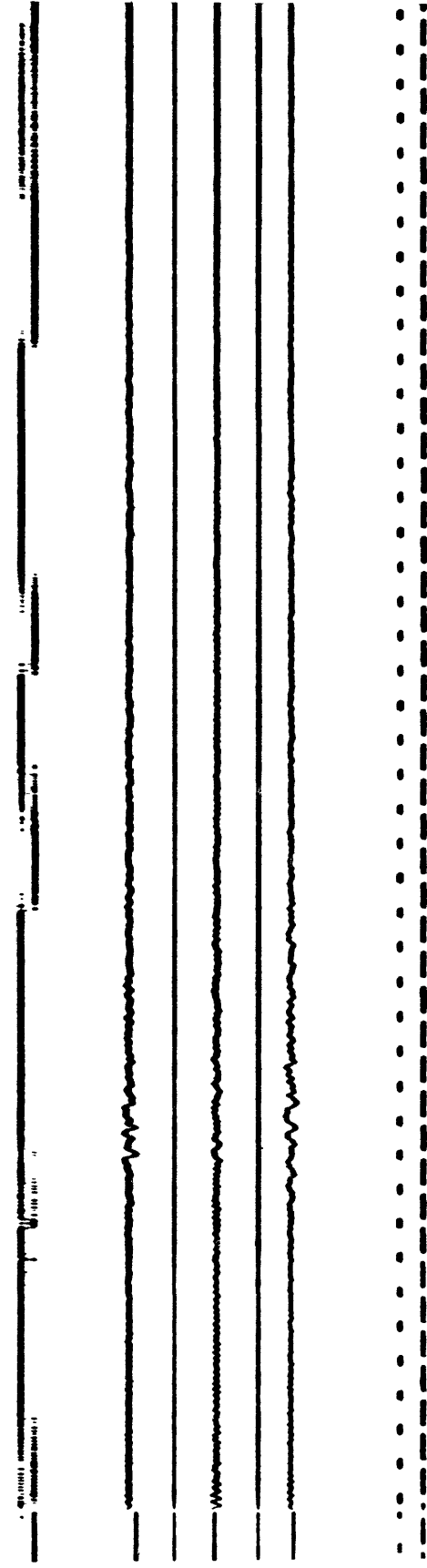
U. S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 804 33.977 N, 118.036 W Whittier, 7215 Bright Ave. 10th floor SMA # 1071 (Code/USGS)	L 180	Sens. = 1.84 cm/g Freq. = 26.1 Hz Damp. = 0.6 crit	*
Earthquake of 28 February 1990 2343 G.m.t.	V Up	Sens. = 1.85 cm/g Freq. = 25.5 Hz Damp. = 0.6 crit	*
	T 090	Sens. = 1.89 cm/g Freq. = 25.1 Hz Damp. = 0.6 crit	*

Epical distance = 36 km

Film speed = 1 cm/sec



U.S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 5031 34.44 N, 117.85 W Valyermo Forest Station Ground	L 300	Sens. = 1.84 cm/g Freq. = 26.1 Hz Damp. = 0.6 crit	0.07 g
SMA-1 # 1512 (USGS)	V Up	Sens. = 1.85 cm/g Freq. = 25.6 Hz Damp. = 0.6 crit	0.04 g
Earthquake of 28 February 1990 2343 G.m.t. (WWVB trigger time)	T 210	Sens. = 1.90 cm/g Freq. = 25.4 Hz Damp. = 0.6 crit	0.06 g
Epical distance = 36 km		Film speed = 1 cm/sec	

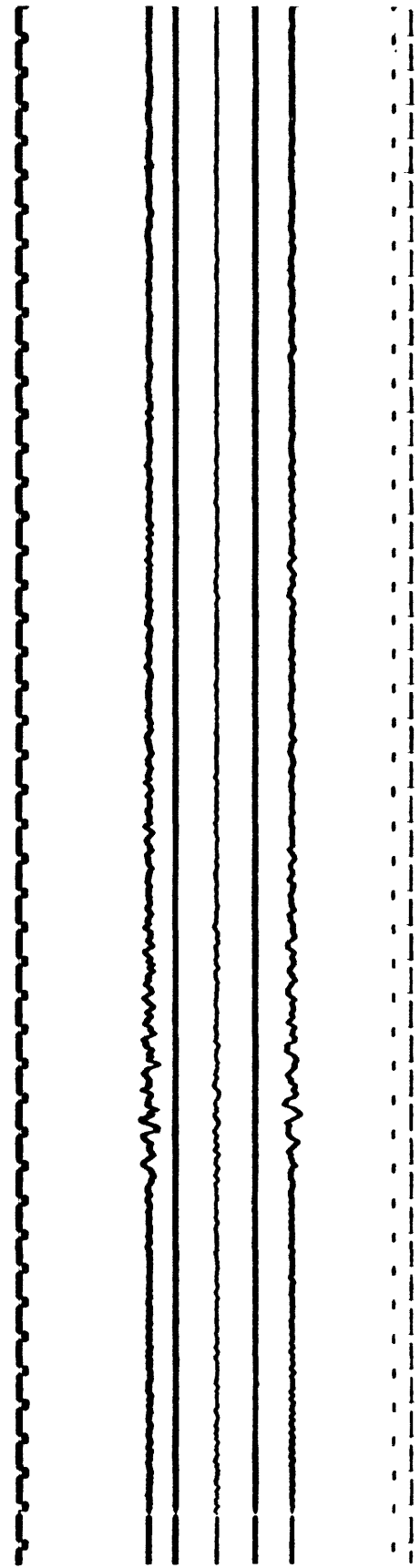


U.S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 5269	L 360	Sens. = 1.84 cm/g	0.05 g
34.086 N, 117.309 W		Freq. = 25.5 Hz	
San Bernardino Array:		Damp. = 0.6 crit	
San Bernardino Valley College	V Up	Sens. = 1.91 cm/g	0.05 g
Ground		Freq. = 25.2 Hz	
SMA-1 #1080 (USGS)	T 270	Damp. = 0.6 crit	
Earthquake of		Sens. = 1.77 cm/g	0.05 g
28 February 1990		Freq. = 25.6 Hz	
2343 G.m.t.		Damp. = 0.6 crit	
Epicentral distance = 37 km		Film speed = 1 cm/sec	

U. S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 754	L 082	Sens. = 1.90 cm/g	0.07 g
34.064 N, 117.297 W		Freq. = 25.9 Hz	
Colton Interchange		Damp. = 0.6 crit	
I-10/215			
Ground	V Up	Sens. = 1.80 cm/g	0.03 g
SMA-1 # 414 (CDOT)		Freq. = 26.5 Hz	
		Damp. = 0.6 crit	
Earthquake of	T 352	Sens. = 1.80 cm/g	0.07 g
28 February 1990		Freq. = 26.0 Hz	
2343 G.m.t.		Damp. = 0.6 crit	

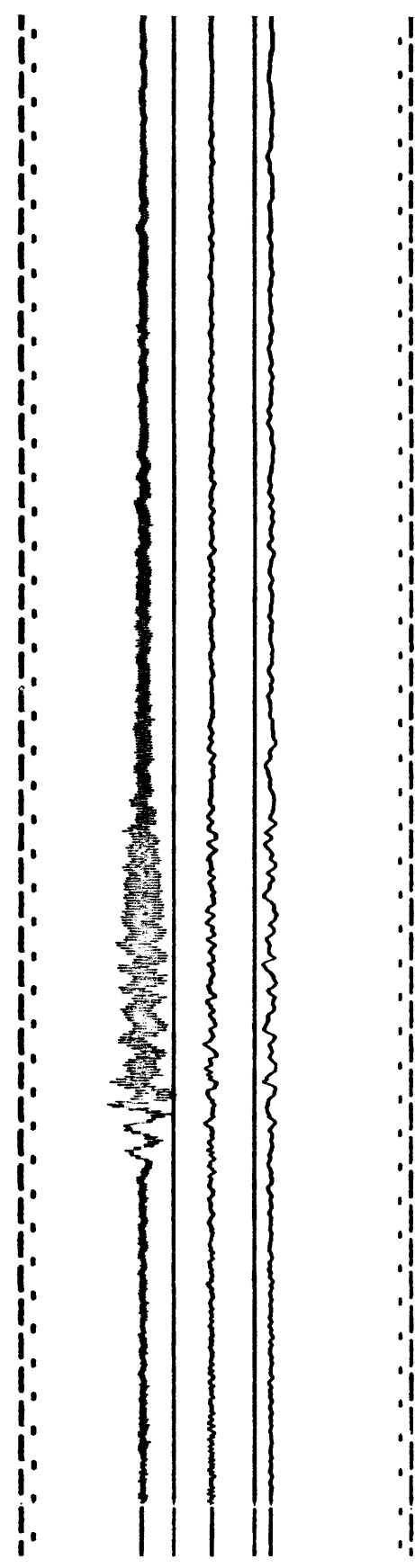
Epicentral distance = 38 km

Film speed = 1 cm/sec

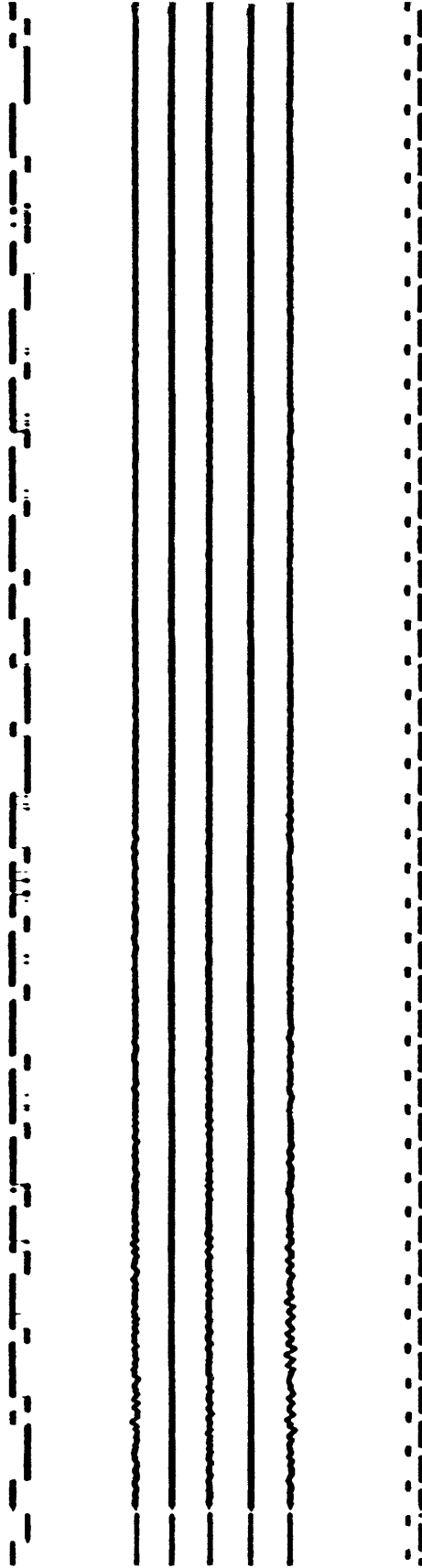


U.S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 754	L 082	Sens. = 2.05 cm/g	0.25 g
34.064 N, 117.297 W		Freq. = 24.7 Hz	
Colton Interchange		Damp. = 0.6 crit	
I-10/215			
Bridge cell	V Up	Sens. = 1.75 cm/g	0.06 g
SMA-1 # 415 (CDOT)		Freq. = 26.3 Hz	
		Damp. = 0.6 crit	
Earthquake of	T 352	Sens. = 1.80 cm/g	0.07 g
28 February 1990		Freq. = 26.3 Hz	
2343 G.m.t.		Damp. = 0.6 crit	

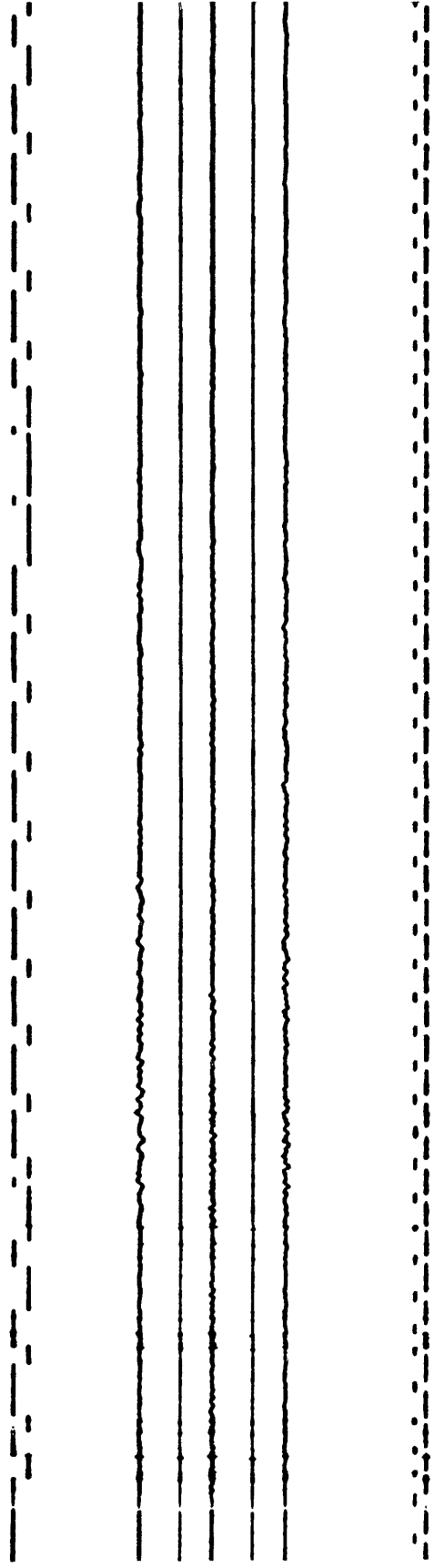
Epicentral distance = 38 km Film speed = 1 cm/sec



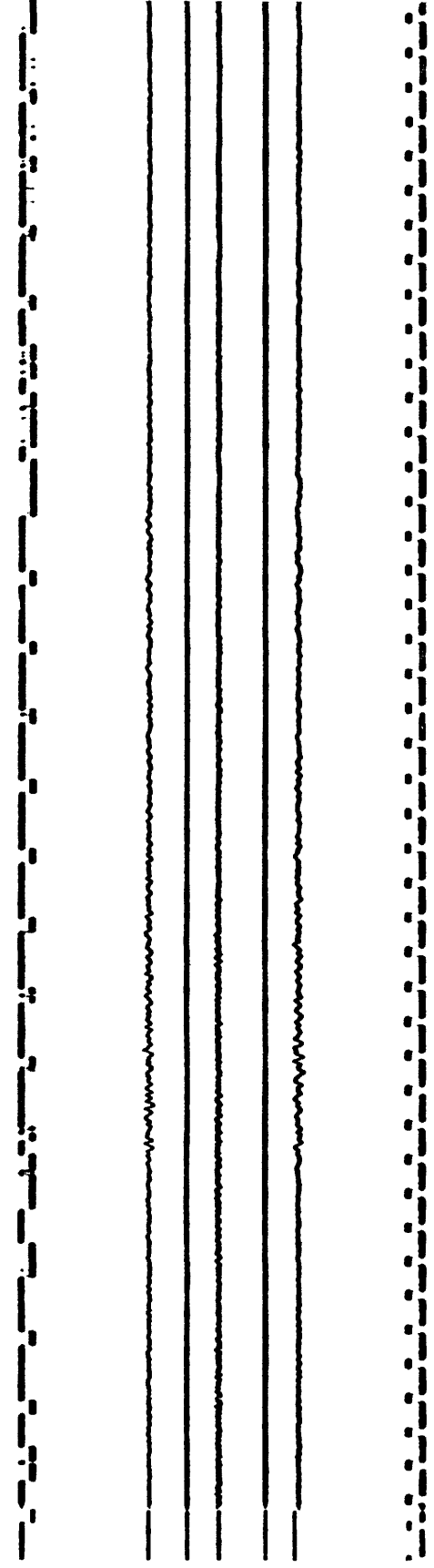
U. S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 5267	L 360	Sens. = 1.67 cm/g	*
34.183 N, 117.295 W		Freq. = 27.0 Hz	
San Bernardino Array, 5931 F St. Ground		Damp. = 0.6 crit	
SMA # 4905 (USGS)	V Up	Sens. = 1.87 cm/g	*
		Freq. = 26.2 Hz	
		Damp. = 0.6 crit	
Earthquake of	T 270	Sens. = 1.71 cm/g	*
28 February 1990		Freq. = 26.9 Hz	
2343 G.m.t.		Damp. = 0.6 crit	
(WWVB trigger time)			
Epicentral distance = 38 km		Film speed = 1 cm/sec	



U.S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 5245 34.106 N, 117.287 W San Bernardino County Government Center Basement SW SMA-1 # 1462 (USGS)	L 090	Sens. = 1.80 cm/g Freq. = 25.5 Hz Damp. = 0.6 crit	*
Earthquake of 28 February 1990 2343 G.m.t.	V Up	Sens. = 1.96 cm/g Freq. = 24.7 Hz Damp. = 0.6 crit	*
Epicentral distance = 38 km	T 360	Sens. = 1.76 cm/g Freq. = 26.4 Hz Damp. = 0.6 crit	*
		Film speed = 1 cm/sec	



U.S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 5245	L 360	Sens. = 1.88 cm/g	*
34.106 N, 117.287 W		Freq. = 25.9 Hz	
San Bernardino County		Damp. = 0.6 crit	
Government Center			
Ground site	V Up	Sens. = 1.88 cm/g	*
SMA-1 #4904 (USGS)		Freq. = 26.0 Hz	
		Damp. = 0.6 crit	
Earthquake of			
28 February 1990	T 270	Sens. = 1.77 cm/g	*
2343 G.m.t.		Freq. = 26.3 Hz	
(WWVB trigger time)		Damp. = 0.6 crit	
Epicentral distance = 38 km		Film speed = 1 cm/sec	

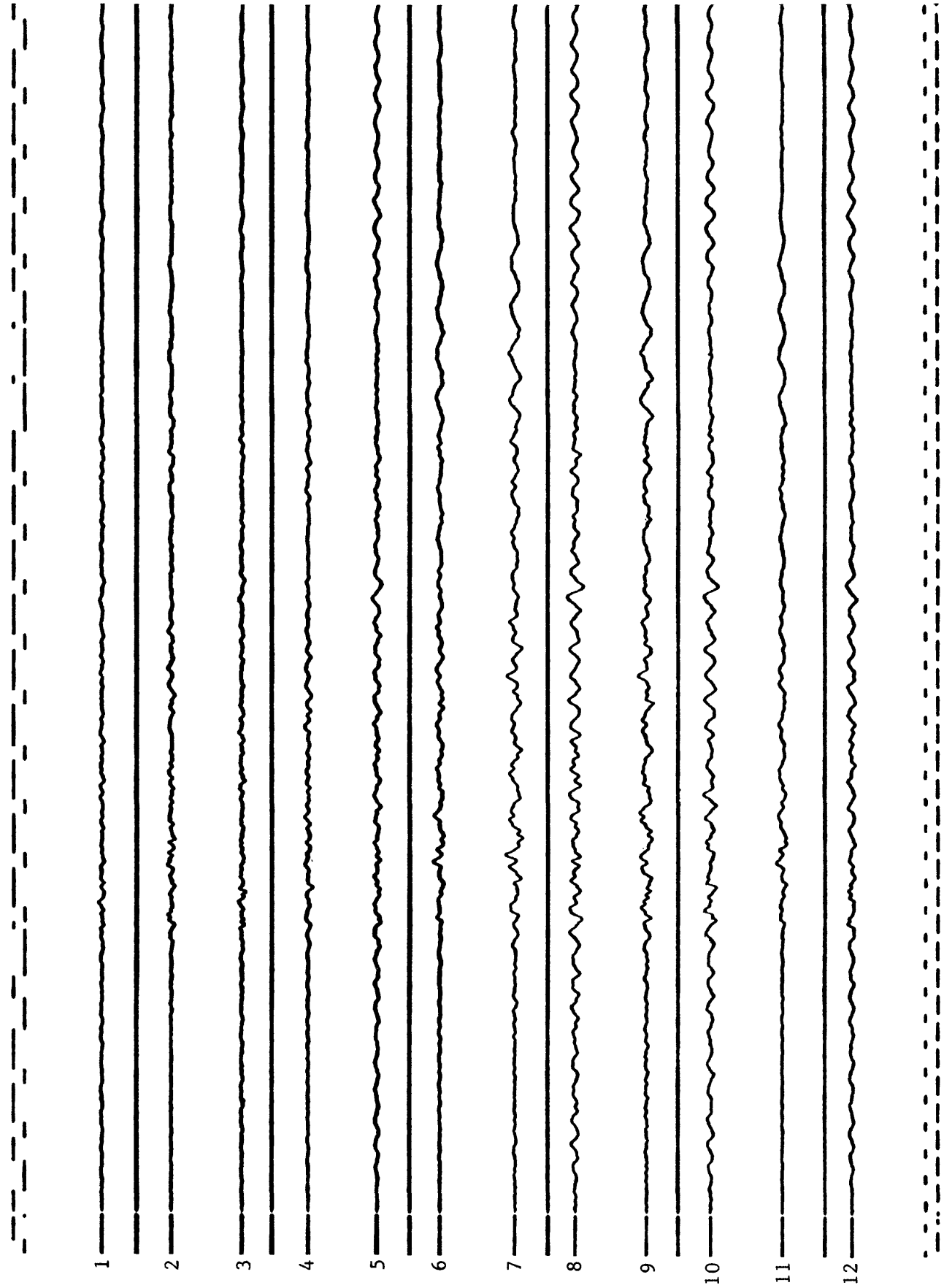


U.S. STRONG-MOTION NETWORK	CH.	DIRECTION	LOCATION	SENSITIVITY	MAX. ACCELERATION
Station No. 5245	1	360	2nd floor NW	1.82 cm/g	*
34.106 N, 117.287 W	2	090	2nd floor NE	1.97	*
San Bernardino	3	360	2nd floor NE	1.83	*
County Government Center	4	090	2nd floor SW	1.89	0.05 g
Structure Array	5	090	4th floor SW	1.88	0.05 g
CRA # 302 (USGS)	6	360	4th floor NW	1.80	0.07 g
Earthquake of	7	090	Roof (6th) NE	1.90	0.09 g
28 February 1990	8	360	Roof (6th) NW	1.91	0.08 g
2343 G.m.t.	9	090	Roof (6th) SW	1.90	0.08 g
(WWVB trigger time)	10	360	Roof (6th) NE	1.90	0.07 g
	11	090	4th floor NE	1.81	0.07 g
	12	360	4th floor NE	1.94	0.05 g

Epicentral distance = 38 km

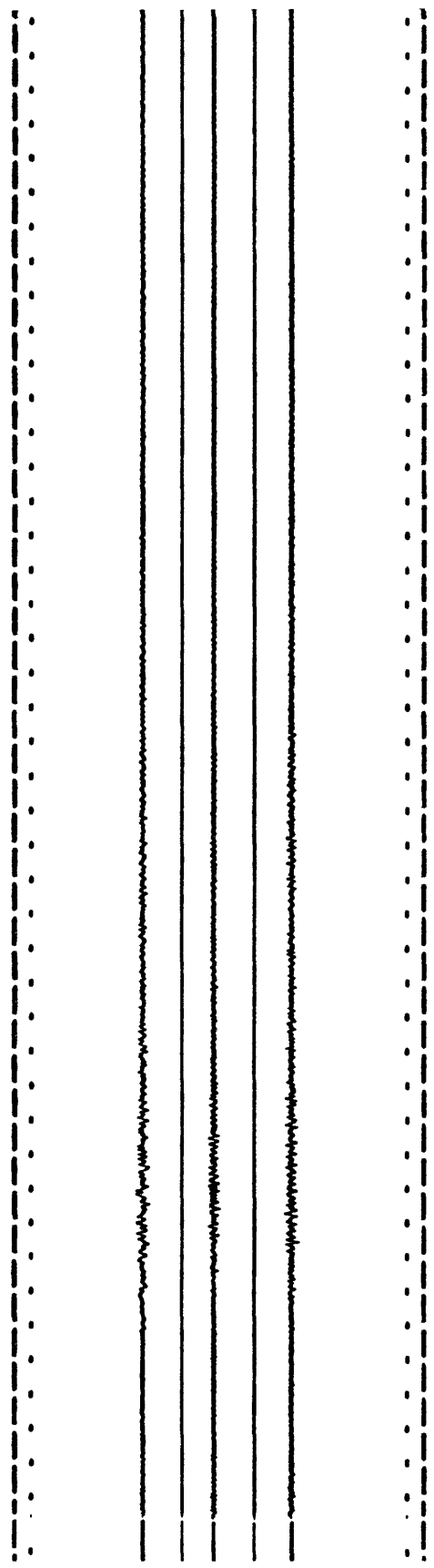
Film speed = 1 cm/sec

[See accelerogram on next page]

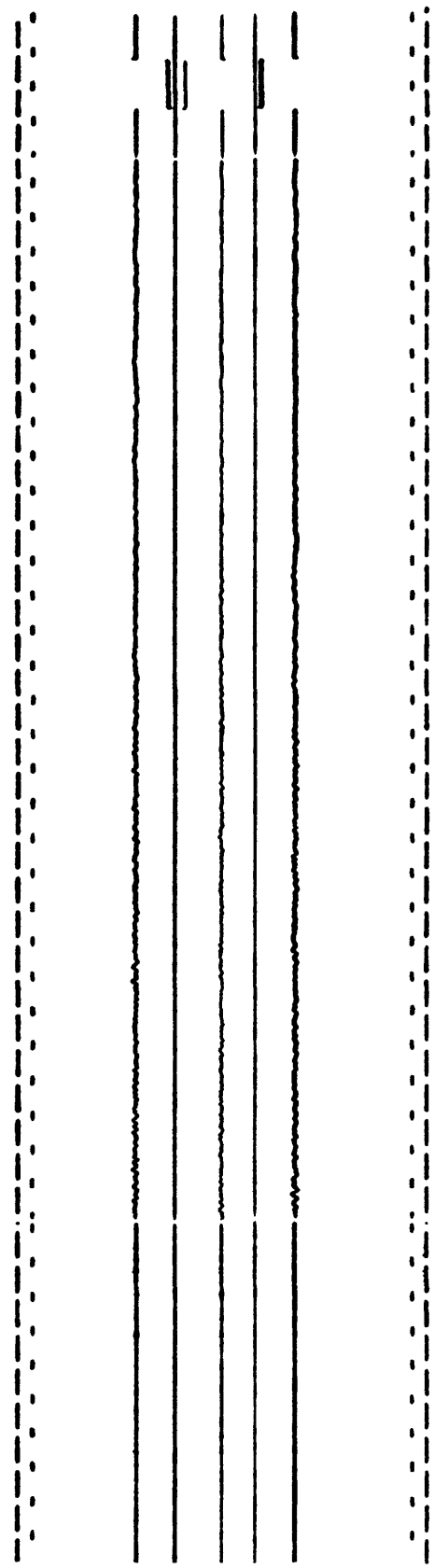


U.S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 707	L 252	Sens. = 1.95 cm/g	0.05 g
33.852 N, 117.451 W		Freq. = 24.9 Hz	
Lake Mathews		Damp. = 0.6 crit	
Dike toe			
SMA # 1050 (MWD)	V Up	Sens. = 1.95 cm/g	0.04 g
		Freq. = 25.4 Hz	
		Damp. = 0.6 crit	
Earthquake of			
28 February 1990	T 162	Sens. = 1.82 cm/g	0.06 g
2343 G.m.t.		Freq. = 26.0 Hz	
		Damp. = 0.6 crit	

Epical distance = 39 km Film speed = 1 cm/sec



U.S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 709 34.048 N, 118.111 W Garvey Reservoir Abutment Building SMA # 1055 (MWD)	L 114	Sens. = 1.84 cm/g Freq. = 25.5 Hz Damp. = 0.6 crit	*
Earthquake of 28 February 1990 2343 G.m.t.	V Up	Sens. = 1.90 cm/g Freq. = 25.1 Hz Damp. = 0.6 crit	*
Epicentral distance = 39 km	T 024	Sens. = 1.90 cm/g Freq. = 25.8 Hz Damp. = 0.6 crit	*
		Film speed = 1 cm/sec	



U.S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 709	L 114	Sens. = 2.00 cm/g	*
34.050 N, 118.114 W		Freq. = 25.6 Hz	
Garvey Reservoir		Damp. = 0.62 crit	
Crest			
SMA # 6698 (MWD)	V Up	Sens. = 2.00 cm/g	*
		Freq. = 25.2 Hz	
		Damp. = 0.62 crit	
Earthquake of			
28 February 1950	T 024	Sens. = 1.76 cm/g	*
2343 G.m.t.		Freq. = 26.2 Hz	
		Damp. = 0.55 crit	

Epicentral distance = 39 km Film speed = 1 cm/sec

U.S. STRONG-MOTION NETWORK

Station No. Temp.
34.137° North, 118.127° West
Pasadena (CIT)
525 South Wilson Ave.
SMA-1 #4791 (USGS)

DIRECTION

L 360°

V Up

T 270°

CONSTANTS

Sens. = 1.71 cm/g
Freq. =
Damp. = 0.6 crit

Sens. = 1.79 cm/g
Freq. =
Damp. = 0.6 crit

Sens. = 1.86 cm/g
Freq. =
Damp. = 0.6 crit

MAX. ACCELERATION

0.05 g

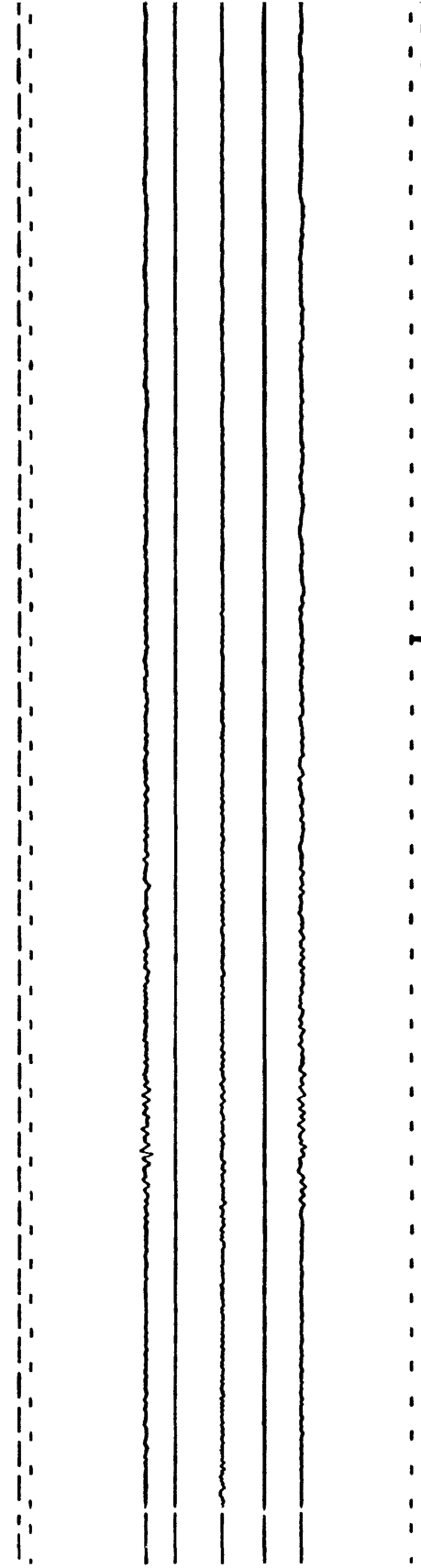
*

*

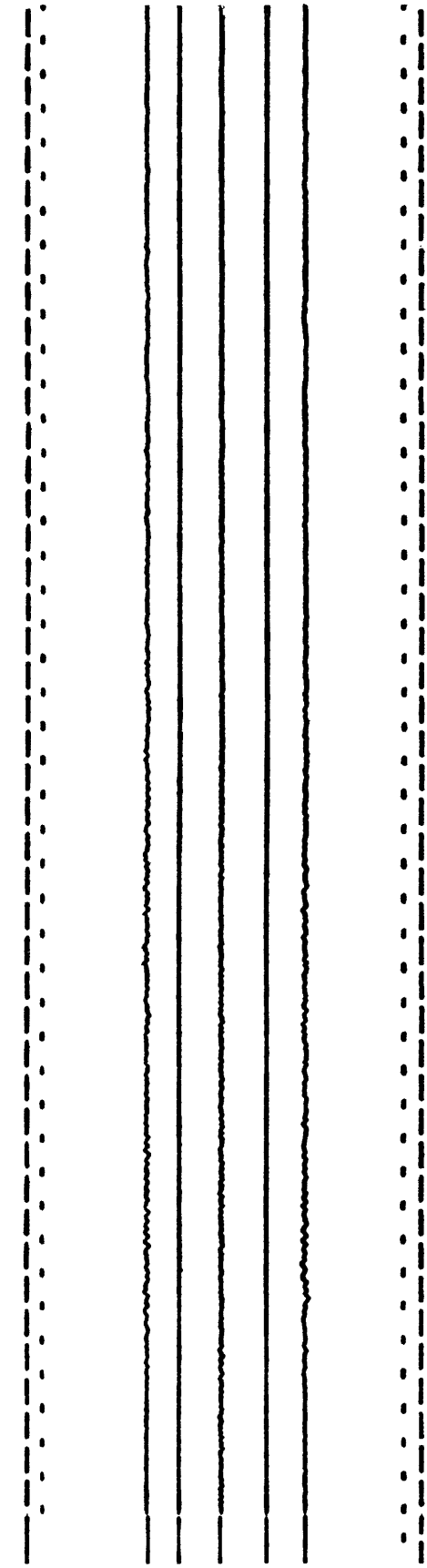
Earthquake of
28 February 1990
2343 G.m.t.

Epical distance = 40 km

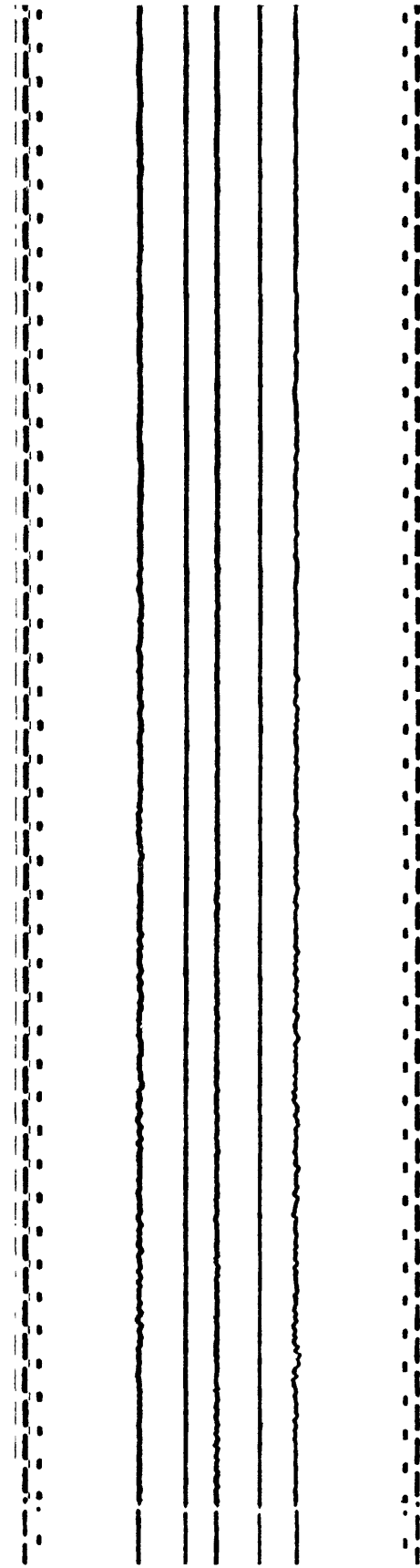
Film speed = 1 cm/sec



U. S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 634	L 090	Sens. = 1.95 cm/g	*
33.917 N, 118.067 W		Freq. = 25.0 Hz	
Norwalk, 12400 Imperial Highway		Damp. = 0.55 crit	
North ground site			
SMA # 419 (USGS/BECH)	V Up	Sens. = 1.68 cm/g	*
		Freq. = 26.3 Hz	
		Damp. = 0.57 crit	
Earthquake of			
28 February 1990	T 360	Sens. = 1.87 cm/g	*
2343 G.m.t.		Freq. = 25.6 Hz	
		Damp. = 0.57 crit	
Epical distance = 42 km		Film speed = 1 cm/sec	



U. S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 634	L 090	Sens. = 1.83 cm/g	*
33.915 N, 118.067 W		Freq. = 26.0 Hz	
Norwalk, 12400 Imperial Highway		Damp. = 0.6 crit	
South ground site			
SMA # 823 (USGS/BECH)	V Up	Sens. = 1.76 cm/g	*
		Freq. = 25.9 Hz	
		Damp. = 0.6 crit	
Earthquake of			
28 February 1990	T 360	Sens. = 1.88 cm/g	*
2343 G.m.t.		Freq. = 25.9 Hz	
		Damp. = 0.6 crit	
Epicentral distance = 42 km		Film speed = 1 cm/sec	

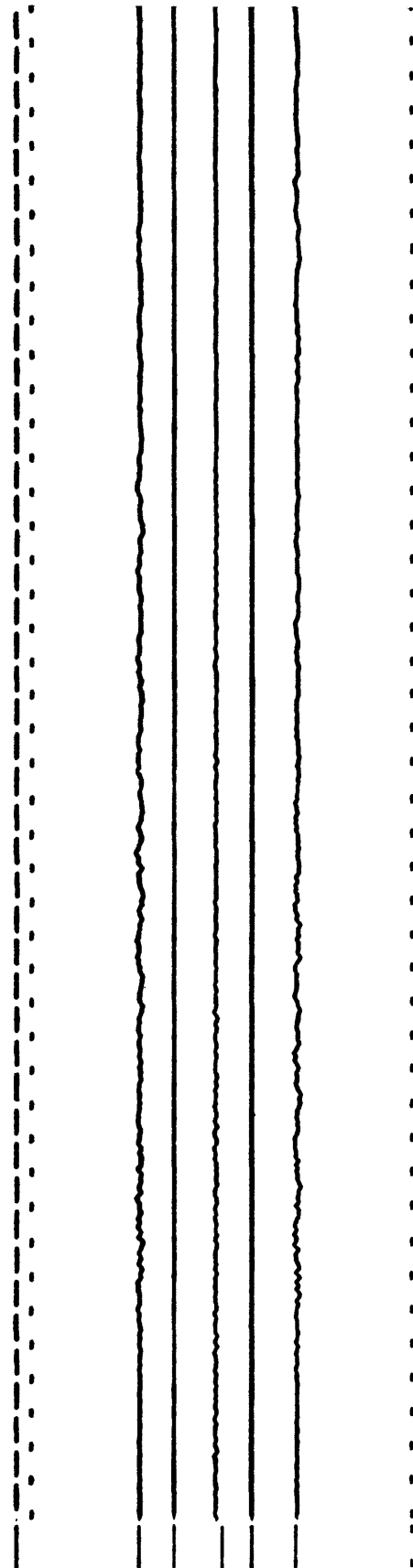


U.S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 634	L 090	Sens. = 1.75 cm/g	*
33.916 N, 118.067 W		Freq. = 27.1 Hz	
Norwalk, 12400 Imperial Highway		Damp. = 0.6 crit	
Basement			
SMA # 424 (USGS/BECH)	V Up	Sens. = 1.95 cm/g	*
		Freq. = 25.3 Hz	
		Damp. = 0.6 crit	
Earthquake of			
28 February 1990	T 360	Sens. = 1.80 cm/g	*
2343 G.m.t.		Freq. = 25.3 Hz	
		Damp. = 0.6 crit	
Epical distance = 42 km		Film speed = 1 cm/sec	

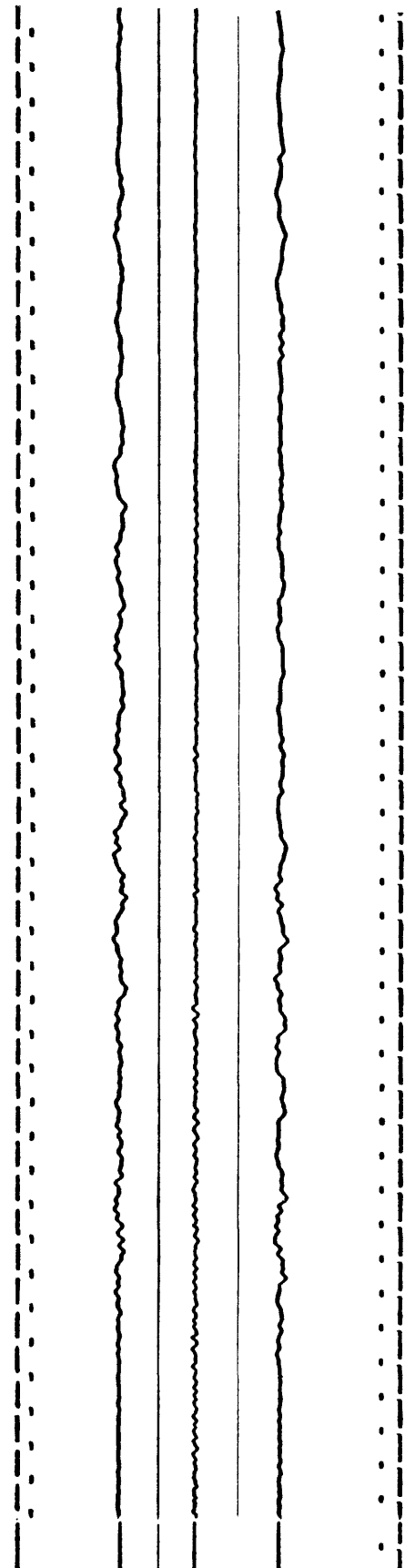
U. S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 634 33.916 N, 118.067 W Norwalk, 12400 Imperial Highway 4th floor SMA # 425 (USGS/BECH)	L 090	Sens. = 1.80 cm/g Freq. = 26.3 Hz Damp. = 0.6 crit	*
Earthquake of 28 February 1990 2343 G.m.t.	V Up	Sens. = 1.95 cm/g Freq. = 25.0 Hz Damp. = 0.6 crit	*
	T 360	Sens. = 1.82 cm/g Freq. = 26.6 Hz Damp. = 0.6 crit	*

Epicentral distance = 42 km

Film speed = 1 cm/sec



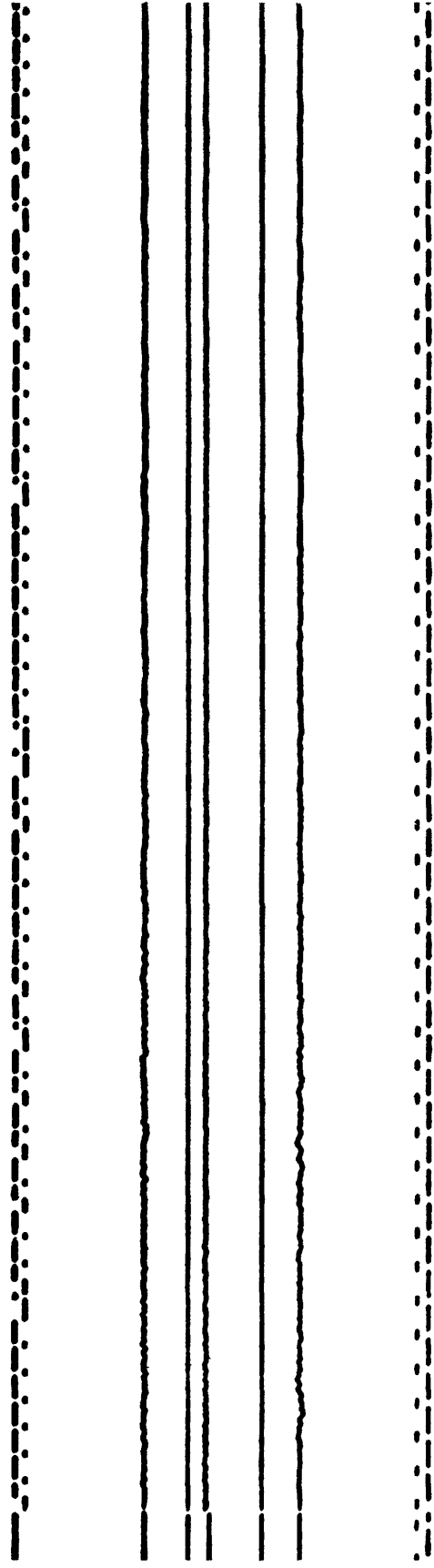
U. S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 634	L 090	Sens. = 1.90 cm/g	0.06 g
33.916 N, 118.067 W		Freq. = 25.7 Hz	
Norwalk, 12400 Imperial Highway		Damp. = 0.6 crit	
Roof (8)			
SMA # 418 (USGS/BECH)	V Up	Sens. = 2.00 cm/g	*
		Freq. = 24.8 Hz	
		Damp. = 0.6 crit	
Earthquake of			
28 February 1990	T 360	Sens. = 1.90 cm/g	0.06 g
2343 G.m.t.		Freq. = 26.1 Hz	
		Damp. = 0.6 crit	
Epicentral distance = 42 km		Film speed = 1 cm/sec	



U. S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 5239 33.917 N, 118.065 W Norwalk, 12440 Imperial Highway North ground site SMA # 824 (USGS/BECH)	L 090	Sens. = 1.80 cm/g Freq. = 26.1 Hz Damp. = 0.59 crit	*
Earthquake of 28 February 1990 2343 G.m.t.	V Up T 360	Sens. = 1.82 cm/g Freq. = 25.4 Hz Damp. = 0.61 crit Sens. = 1.80 cm/g Freq. = 26.0 Hz Damp. = 0.59 crit	* *

Epicentral distance = 42 km

Film speed = 1 cm/sec



U. S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 5239 33.915 N, 118.066 W Norwalk, 12440 Imperial Highway South ground site SMA # 922 (USGS/BECH)	L 090	Sens. = 1.85 cm/g Freq. = 25.3 Hz Damp. = 0.55 crit	*
Earthquake of 28 February 1990 2343 G.m.t.	V Up	Sens. = 1.83 cm/g Freq. = 26.4 Hz Damp. = 0.55 crit	*
Epical distance = 42 km	T 360	Sens. = 1.93 cm/g Freq. = 25.4 Hz Damp. = 0.53 crit	*
		Film speed = 1 cm/sec	

U. S. STRONG-MOTION NETWORK

DIRECTION

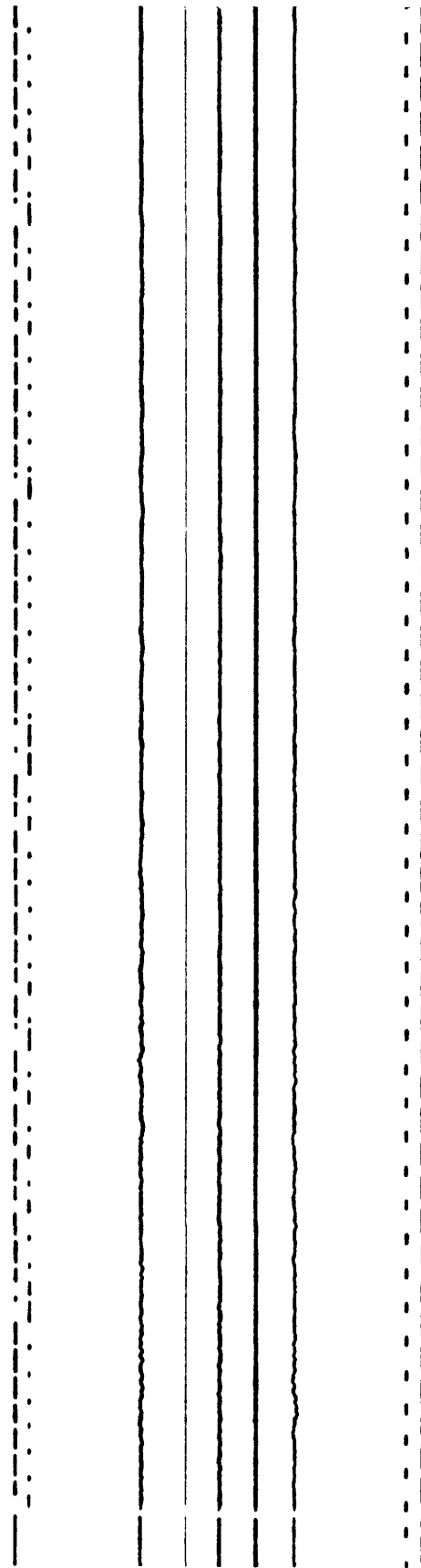
CONSTANTS

MAX. ACCELERATION

Station No. 5239	L 090	Sens. = 1.76 cm/g	*
33.917 N, 118.066 W		Freq. = 26.3 Hz	
Norwalk, 12440 Imperial Highway		Damp. = 0.63 crit	
Basement			
SMA # 2218 (USGS/BECH)	V Up	Sens. = 1.88 cm/g	*
		Freq. = 25.8 Hz	
		Damp. = 0.62 crit	
Earthquake of	T 360	Sens. = 1.71 cm/g	*
28 February 1990		Freq. = 26.4 Hz	
2343 G.m.t.		Damp. = 0.60 crit	

Film speed = 1 cm/sec

Epicentral distance = 42 km

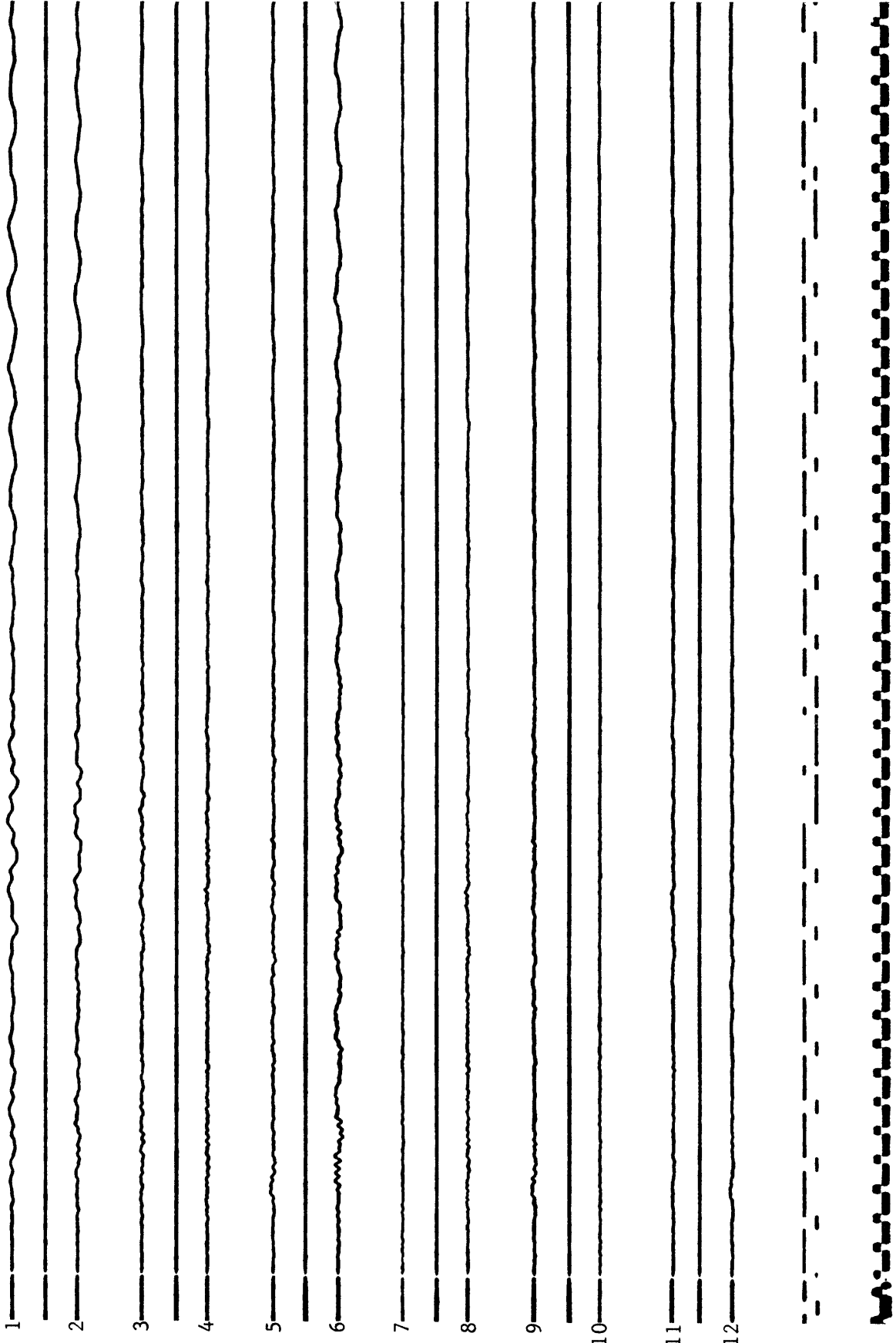


U.S. STRONG-MOTION NETWORK	CH.	DIRECTION	LOCATION	SENSITIVITY	MAX. ACCELERATION
Station No. 5239	1	90°	9th Level (Roof), Bldg. Center	1.75	0.05 g
33.917° North, 118.066° West	2	90°	6th Level, Bldg. Center	1.83	*
NORWALK	3	90°	3rd Level, Bldg. Center	1.80	*
12440 Imperial Highway	4	90°	2nd Level, Bldg. Center	1.72	*
Structure Array #1	5	180°	1st Level (Basement), East end	1.94	*
CRA-1 #127 (USGS/BECHTEL)	6	180°	6th Level, Bldg. West-Center	1.77	*
Earthquake of 28 February 1990	7	Up	1st Level (Basement), Bldg. Center	1.92	*
2343 G.m.t.	8	90°	1st Level (Basement), Bldg. Center	1.88	*
	9	180°	1st Level (Basement), Bldg. Center	1.93	*
	10	Up	Downhole (30'), Bldg. Center	1.85	*
	11	90°	Downhole (30'), Bldg. Center	1.91	*
	12	180°	Downhole (30'), Bldg. Center	1.90	*

Epicentral distance = 42 km

Film speed = 1 cm/sec

[See accelerometer on next page]

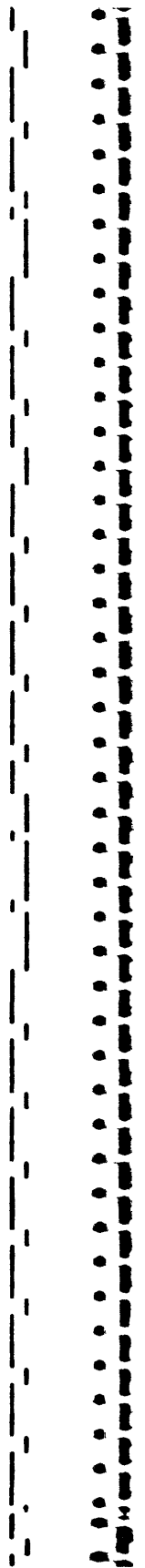
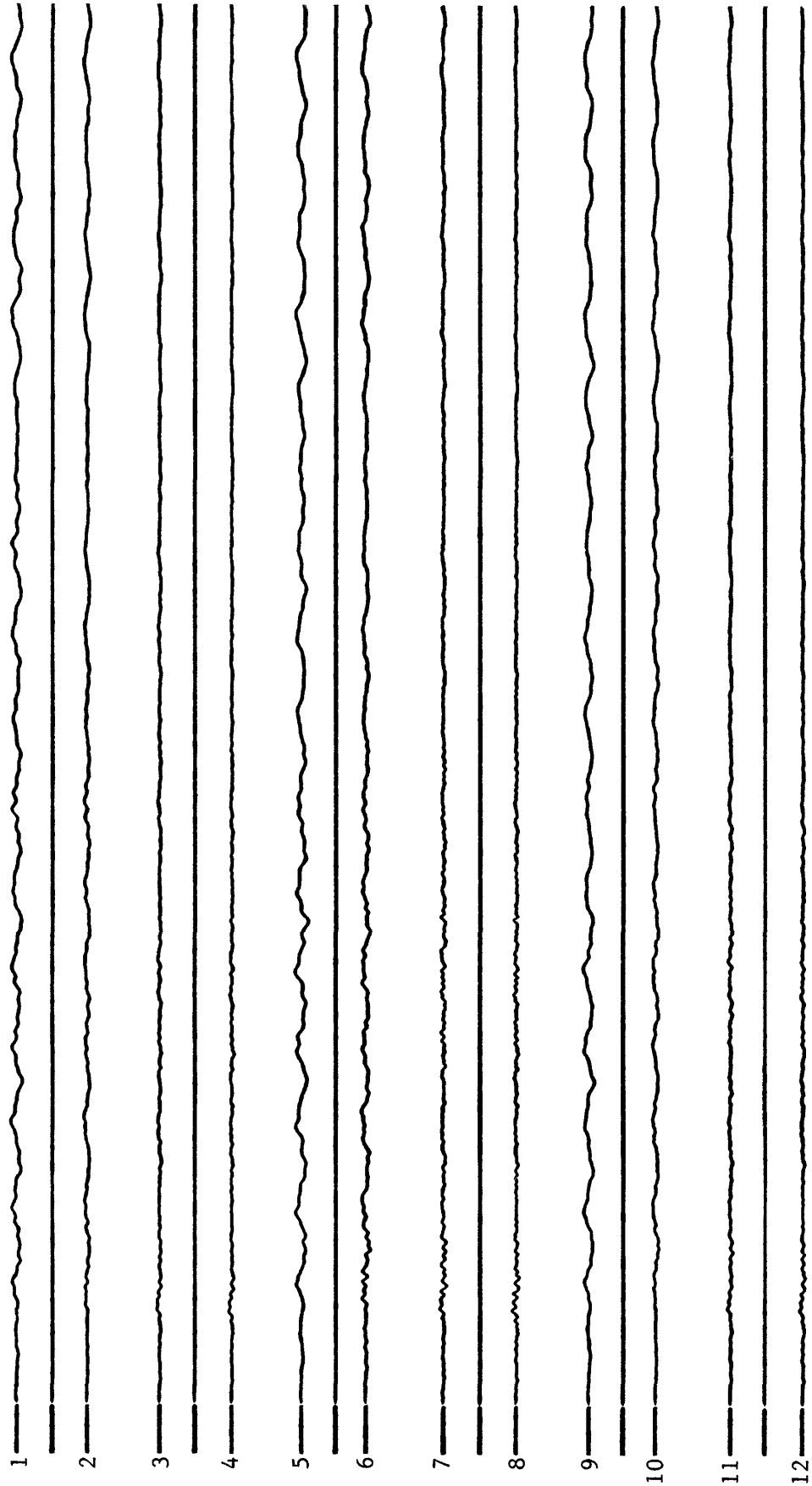


U. S. STRONG-MOTION NETWORK	CH.	DIRECTION	LOCATION	SENSITIVITY	MAX. ACCELERATION
Station No. 5239	13	180°	9th Level (Roof), East end	1.95	0.06 g
33.917° North, 118.066° West	14	180°	6th Level, East end	1.87	*
Norwalk	15	180°	3rd Level, East end	1.98	*
12440 Imperial Highway	16	180°	2nd Level, East end	1.87	*
Structure Array #2	17	180°	9th Level, (Roof) Bldg. Center	1.88	0.06 g
CRA-1 #128 (USGS/BECHTEL)	18	180°	6th Level, Bldg. Center	1.92	*
Earthquake of	19	180°	3rd Level, Bldg. Center	1.91	*
28 February 1990	20	180°	2nd Level, Bldg. Center	1.85	*
2343 G.m.t.	21	180°	9th Level, (Roof) West end	1.86	0.06 g
	22	180°	6th Level, West end	1.84	*
	23	180°	3rd Level, West end	1.91	*
	24	180°	2nd Level, West end	1.85	*

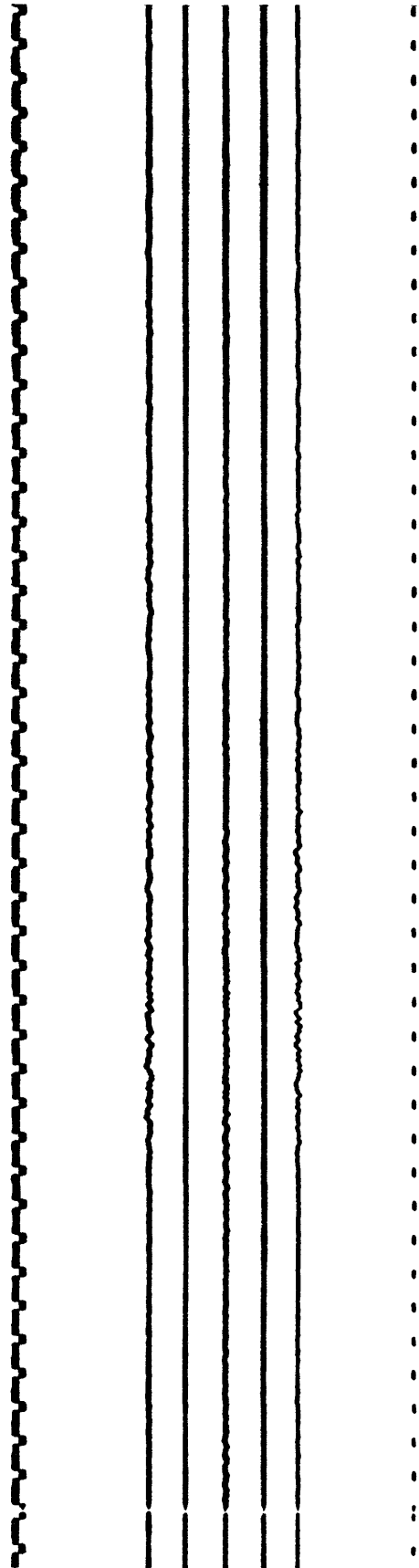
Epical distance = 42 km

Film speed = 1 cm/sec

[See accelerogram on next page]



U. S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 129	L 360	Sens. = 1.85 cm/g	*
34.050 N, 117.263 W		Freq. = 25.8 Hz	
Loma Linda		Damp. = 0.6 crit	
Medical Center			
Ground	V Up	Sens. = 1.85 cm/g	*
SMA-1 #813 (USGS)		Freq. = 25.8 Hz	
		Damp. = 0.6 crit	
Earthquake of	T 270	Sens. = 1.85 cm/g	*
28 February 1990		Freq. = 24.9 Hz	
2343 G.m.t.		Damp. = 0.6 crit	
Epicentral distance = 42 km.			
Film speed = 1 cm/sec			

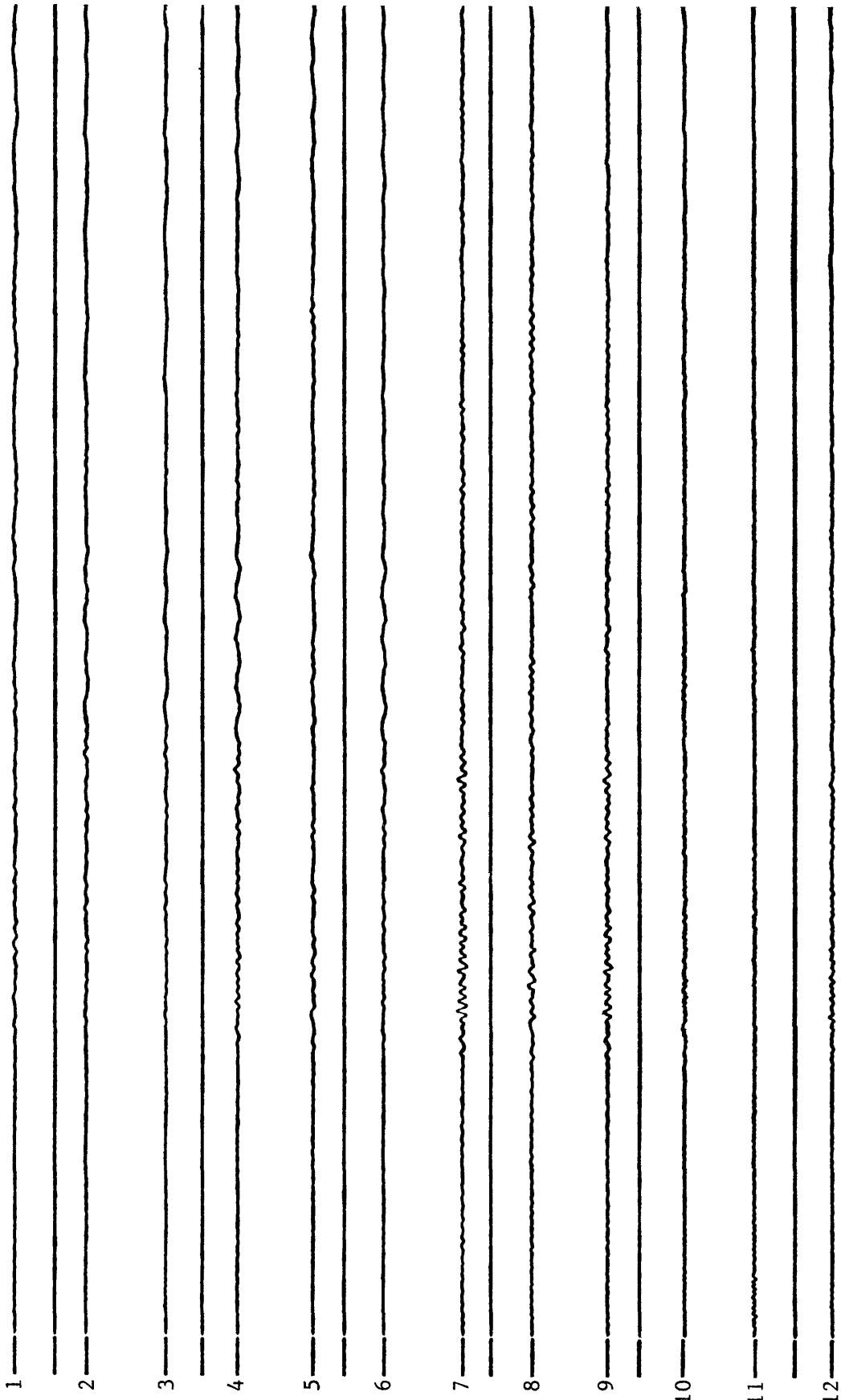


U.S. STRONG-MOTION NETWORK	CH.	DIRECTION	LOCATION	SENSITIVITY	MAX. ACCELERATION
Station No. 482	1	360	12th flr, cntr	1.79 cm/g	*
34.085 N, 118.149 W	2	090	12th flr, cntr	1.88 cm/g	*
Alhambra	3	090	12th flr, No. end	1.76 cm/g	*
900 South Fremont Avenue	4	090	6th flr, cntr	1.81 cm/g	*
Structure Array	5	360	6th flr, cntr	1.72 cm/g	*
CRA # 316 (USGS)	6	090	6th flr, No. end	1.84 cm/g	*
Earthquake of	7	090	2nd flr, cntr	1.76 cm/g	0.06 g
28 February 1990	8	360	2nd flr, cntr	1.77 cm/g	*
2343 G.m.t.	9	090	2nd flr, No. end	1.73 cm/g	*
(WWVB trigger time)	10	360	Bsmt, cntr	1.83 cm/g	*
	11	UP	Bsmt, cntr	1.84 cm/g	*
	12	090	Bsmt, cntr	1.83 cm/g	*

Film speed = 1 cm/sec

Epicentral distance = 42 km

[See accelerogram on next page]

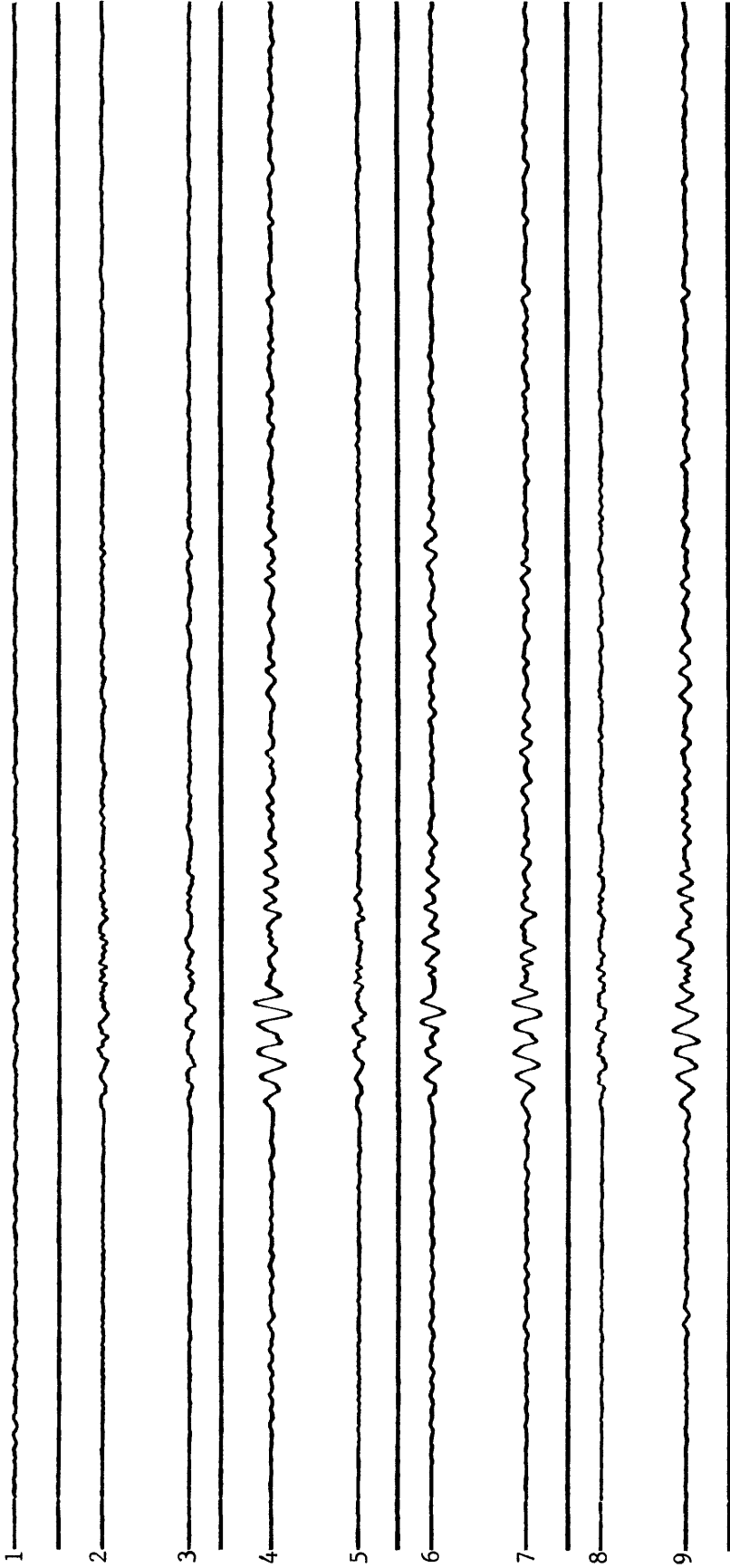
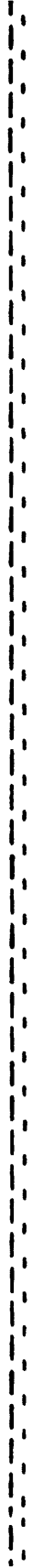


U. S. STRONG-MOTION NETWORK	CH.	DIRECTION	LOCATION	SENSITIVITY	MAX. ACCELERATION
Station No. 5229	1	Down	Ground floor ctr	1.80 cm/g	*
34.050 N, 117.249 W	2	180	Ground floor ctr	1.83	*
Loma Linda	3	270	Ground floor ctr	1.80	0.06 g
VA Hospital	4	270	4th floor center	1.85	0.15 g
Structure Array	5	270	Ground floor north	1.83	0.07 g
CRA # 230 (VA)	6	180	4th floor center	1.83	0.11 g
Earthquake of	7	270	4th floor north	1.85	0.12 g
28 February 1990	8	180	Ground floor south	1.83	*
2343 G.m.t.	9	270	4th floor south	1.85	0.11 g

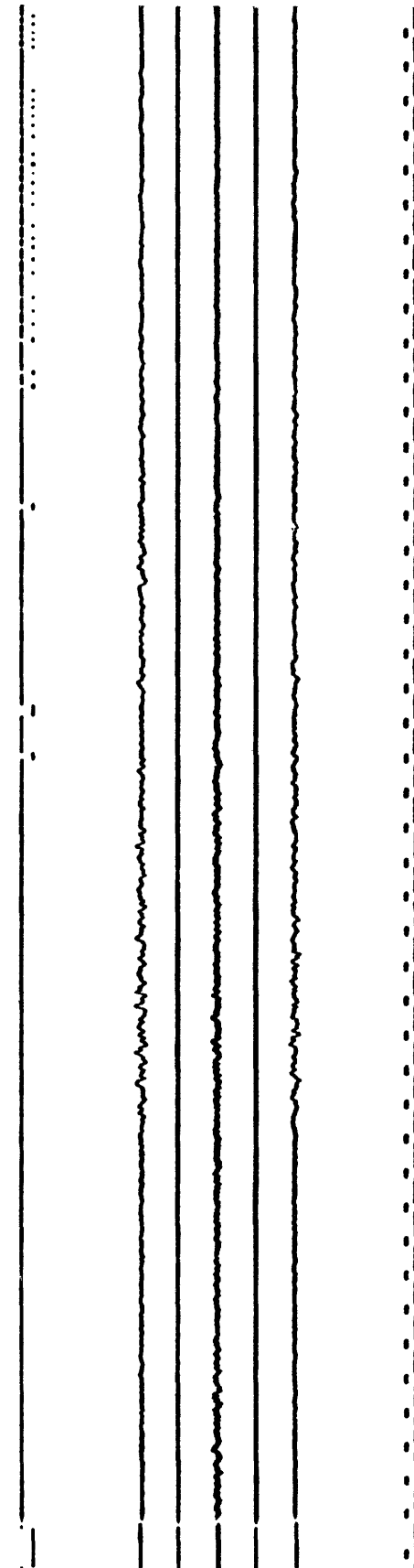
Epicentral distance = 43 km

Film speed = 1 cm/sec

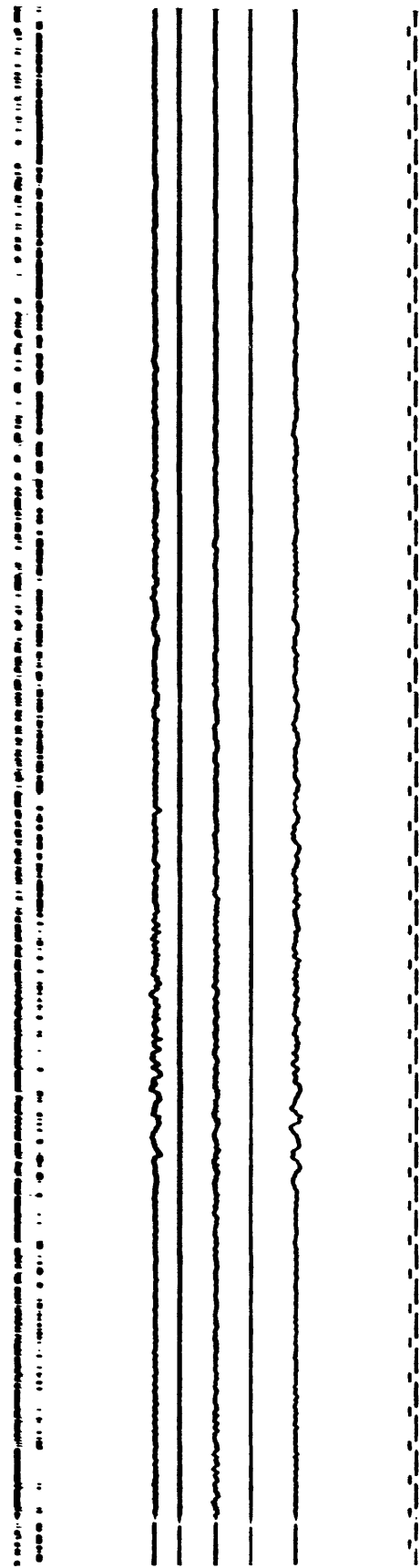
[See accelerogram on next page]



U. S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 5229	L 360	Sens. = 1.92 cm/g	0.05 g
34.051 N, 117.248 W		Freq. = 25.2 Hz	
Loma Linda		Damp. = 0.6 crit	
Veterans Administration Hospital	V Up	Sens. = 2.03 cm/g	0.04 g
Ground site north		Freq. = 25.0 Hz	
SMA-1 # 4233 (USGS)		Damp. = 0.6 crit	
Earthquake of	T 270	Sens. = 1.83 cm/g	0.04 g
28 February 1990		Freq. = 26.2 Hz	
2343 G.m.t.		Damp. = 0.6 crit	
(WWVB trigger time)			
Epicentral distance = 43 km		Film speed = 1 cm/sec	



U. S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 5229	L 360	Sens. = 1.81 cm/g	0.06 g
34.049 N, 117.250 W		Freq. = 26.4 Hz	
Loma Linda		Damp. = 0.6 crit	
Veterans Administration Hospital	V Up	Sens. = 1.86 cm/g	0.03 g
Ground site south		Freq. = 25.2 Hz	
SMA-1 # 4234 (USGS)		Damp. = 0.6 crit	
Earthquake of	T 270	Sens. = 1.82 cm/g	0.06 g
28 February 1990		Freq. = 25.5 Hz	
2343 G.m.t.		Damp. = 0.6 crit	
(WWVB trigger time)			
Epicentral distance = 43 km		Film speed = 1 cm/sec	



U. S. STRONG-MOTION NETWORK

Station No. 5279
 34.084 N, 118.159 W
 Alhambra, 3213 Norwich Ave.
 Ground

SMA # 1418 (USGS)

Earthquake of
 28 February 1990
 2343 G.m.t.

Epicentral distance = 43 km

DIRECTION

L 360

V Up

T 270

CONSTANTS

Sens. = 1.78 cm/g
 Freq. = 25.8 Hz
 Damp. = 0.6 crit

Sens. = 1.76 cm/g
 Freq. = 26.0 Hz
 Damp. = 0.6 crit

Sens. = 1.79 cm/g
 Freq. = 26.2 Hz
 Damp. = 0.6 crit

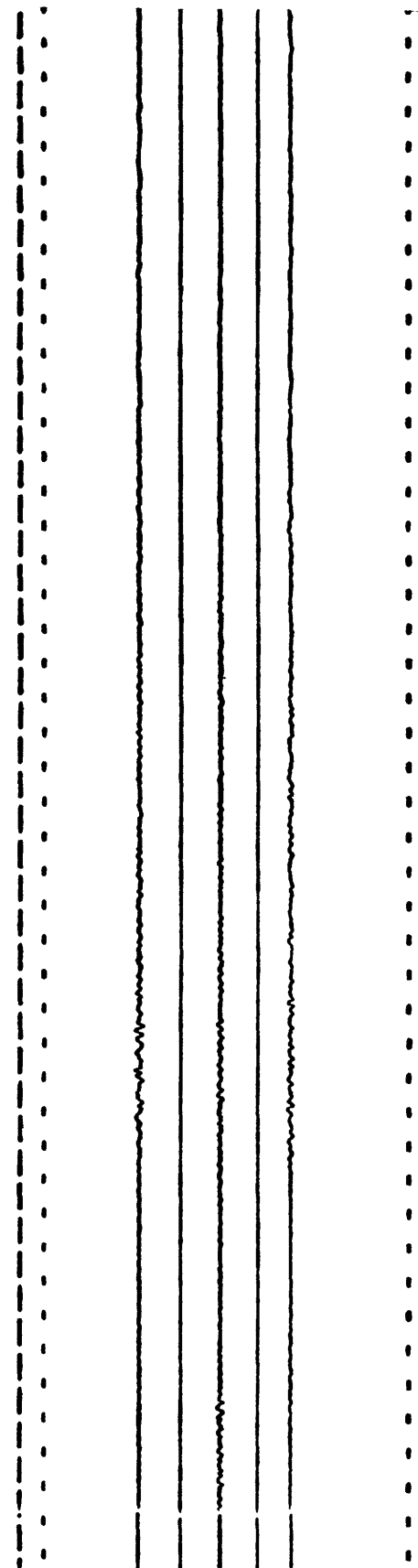
Film speed = 1 cm/sec

MAX. ACCELERATION

*

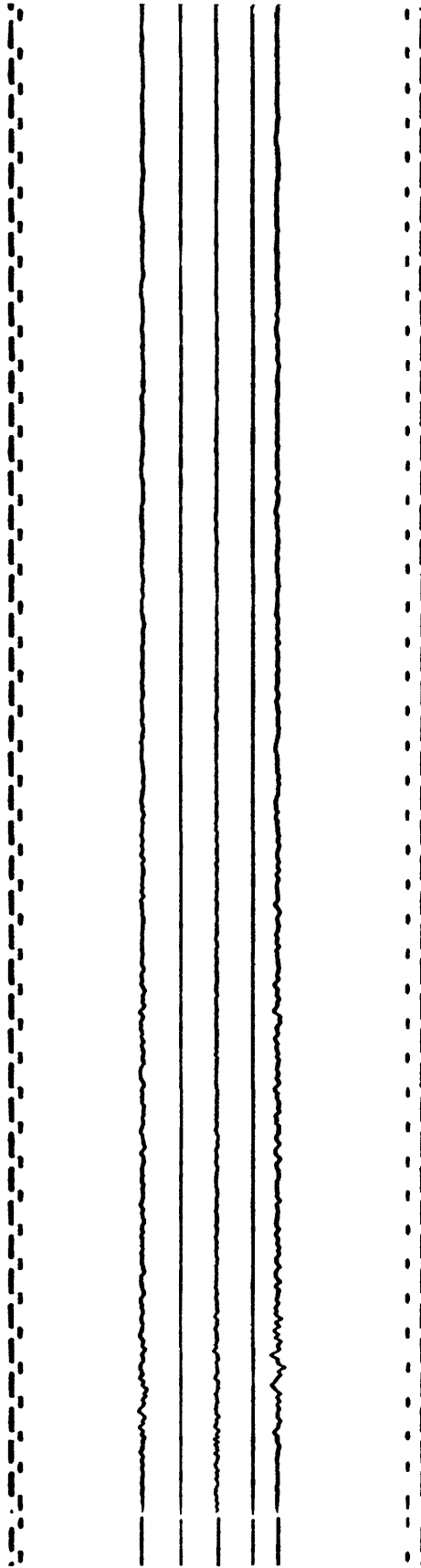
*

*



U. S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 5275 33.920 N, 117.320 W Mills Filter Plant Ground	L 360	Sens. = 1.93 cm/g Freq. = 25.6 Hz Damp. = 0.6 crit	*
SMA # 6695 (MWD)	V Up	Sens. = 1.98 cm/g Freq. = 25.0 Hz Damp. = 0.6 crit	*
Earthquake of 28 February 1990 2343 G.m.t.	T 270	Sens. = 1.94 cm/g Freq. = 25.5 Hz Damp. = 0.6 crit	*
Epical distance = 43 km Film speed = 1 cm/sec			

U.S. STRONG-MOTION NETWORK	DIRECTIONS	CONSTANTS	MAX. ACCELERATION
Station No. 5129 33.996° North, 118.162° West LOS ANGELES BULK MAIL FACILITY Ground SMA-1 #1295 (USGS)	L 360°	Sens. = 1.80 cm/g Freq. = 25.6 Hz Damp. = 0.6 crit	*
Earthquake of 28 February 1990 2343 G.m.t.	V Up	Sens. = 1.86 cm/g Freq. = 25.6 Hz Damp. = 0.6 crit	*
Epicentral distance = 45 km	T 270°	Sens. = 1.88 cm/g Freq. = 26.3 Hz Damp. = 0.6 crit	0.06 g
		Film speed = 1 cm/sec	

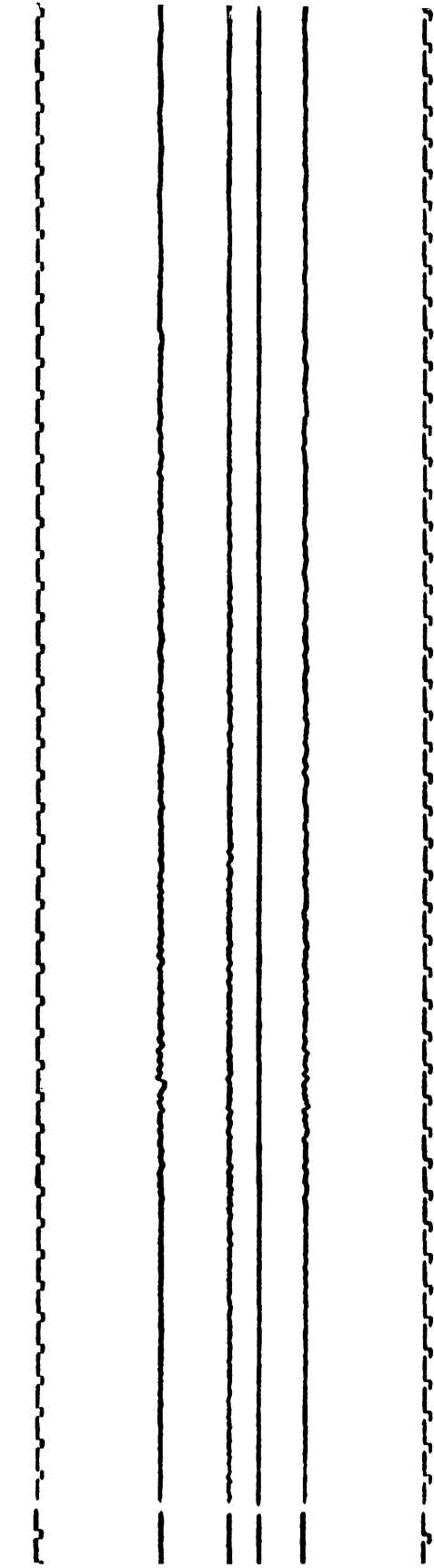


U. S. STRONG-MOTION NETWORK

Station No. 281 33.751 N, 117.870 W Santa Ana Orange County Engineering Bldg. Basement RFT-250 # 510 (USGS)	DIRECTION <hr/> L 360 V Up T 270	CONSTANTS <hr/> Sens. = 1.74 cm/g Freq. = 21.6 Hz Damp. = 0.63 crit Sens. = 1.80 cm/g Freq. = 22.1 Hz Damp. = 0.60 crit Sens. = 1.80 cm/g Freq. = 21.7 Hz Damp. = 0.60 crit	MAX. ACCELERATION <hr/> * * *
--	---	--	--

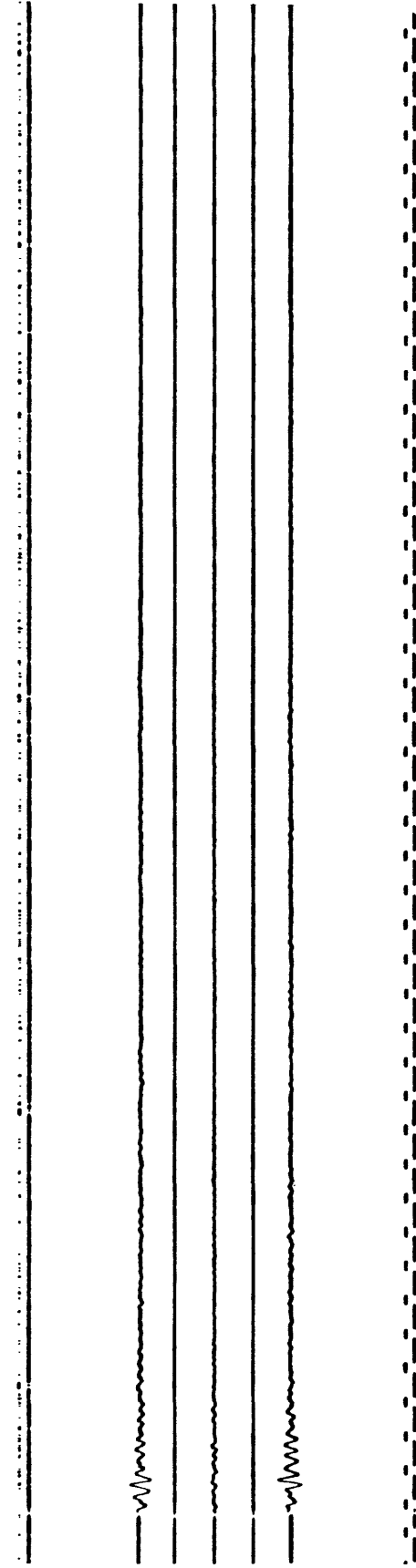
Epical distance = 46 km

Film speed = 1 cm/sec



U. S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 5037	L 360	Sens. = 1.78 cm/g	*
34.004 N, 117.223 W		Freq. = 25.9 Hz	
Reche Canyon		Damp. = 0.6 crit	
Olive Dell Ranch	V Up	Sens. = 1.80 cm/g	*
Ground		Freq. = 25.9 Hz	
SMA-1 # 1514 (USGS)		Damp. = 0.6 crit	
Earthquake of	T 270	Sens. = 1.82 cm/g	*
28 February 1990		Freq. = 26.1 Hz	
2343 G.m.t.		Damp. = 0.6 crit	
(WWVB trigger time)			
Epical distance = 47 km		Film speed = 1 cm/sec	

U. S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 5030	L 300	Sens. = 1.82 cm/g	0.09 g
34.52 N, 117.99 W		Freq. = 26.1 Hz	
Littlerock Post Office		Damp. = 0.6 crit	
Ground			
SMA-1 # 1521 (USGS)	V Up	Sens. = 1.78 cm/g	0.02 g
Earthquake of		Freq. = 26.0 Hz	
28 February 1990	T 210	Damp. = 0.6 crit	
2343 G.m.t.		Sens. = 1.83 cm/g	0.10 g
(WVVB trigger time)		Freq. = 25.6 Hz	
		Damp. = 0.6 crit	
Epicentral distance = 50 km		Film speed = 1 cm/sec	



U.S. STRONG-MOTION NETWORK

DIRECTION

CONSTANTS

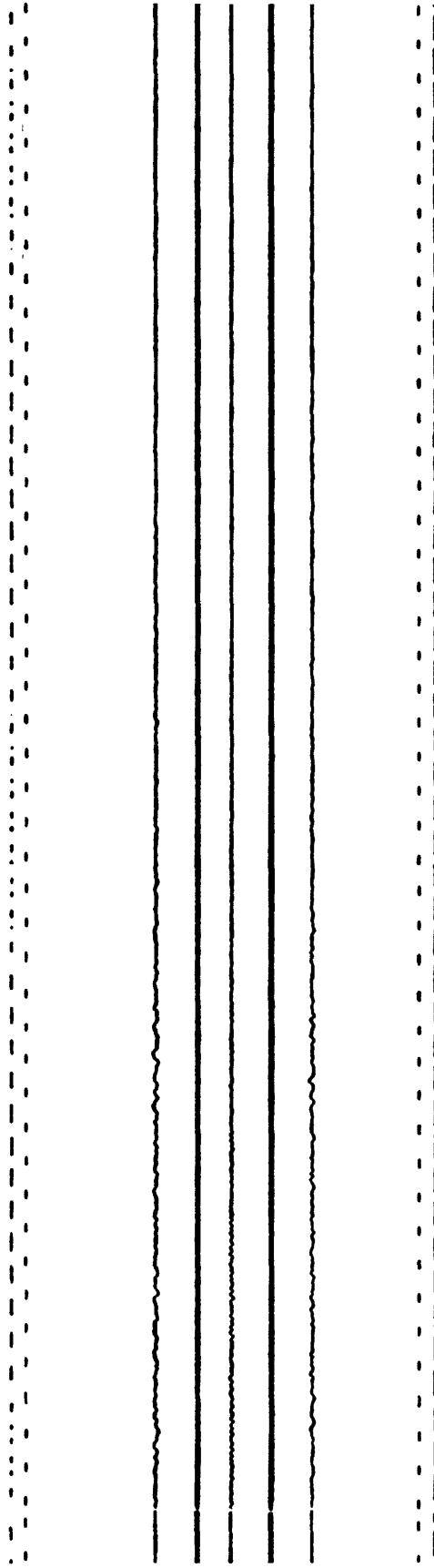
MAX. ACCELERATION

Station No. 5287	L 360	Sens. = 1.82 cm/g	*
33.677 N, 117.869 W		Freq. = 25.3 Hz	
Orange County		Damp. = 0.6 crit	
John Wayne Airport	V Up	Sens. = 1.69 cm/g	*
SMA # 2017 (USGS)		Freq. = 27.0 Hz	
EARTHQUAKE OF		Damp. = 0.6 crit	

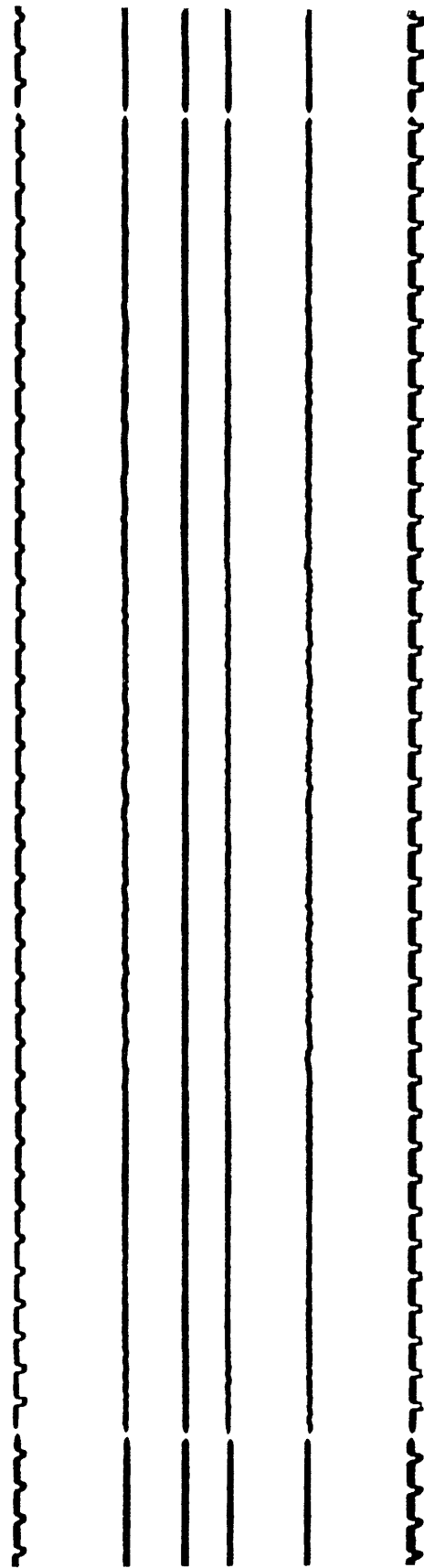
28 February 1990	T 270	Sens. = 1.91 cm/g	*
2343 G.m.t.		Freq. = 25.6 Hz	
		Damp. = 0.6 crit	

Film speed = 1 cm/sec

Epicentral distance = 54 km



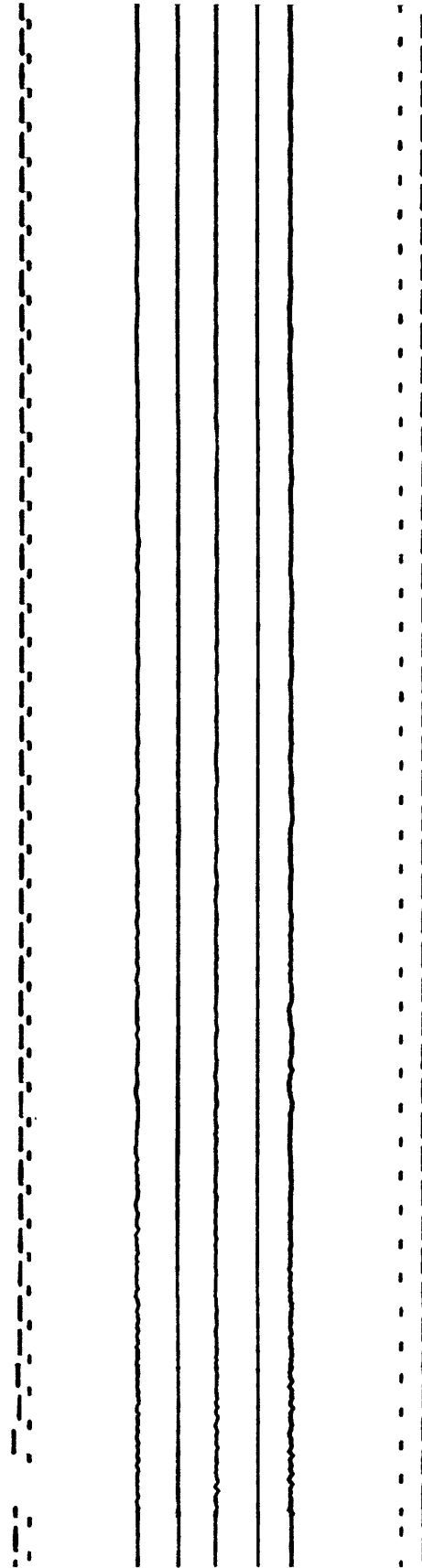
U.S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 141 34.118° North, 118.299° West LOS ANGELES, GRIFFITH PARK Ground	L 360°	Sen. = 1.88 cm/g Freq = 20.6 Hz Damp = 0.6 crit	*
RFT-250 s/n 351 (USGS)	V Up	Sen. = 1.89 cm/g Freq = 21.5 Hz Damp = 0.6 crit	*
Earthquake of 28 February 1990 2343 G.m.t.	T 270°	Sen. = 1.90 cm/g Freq = 21.7 Hz Damp = 0.6 crit	*
Epicentral distance = 55 km		Film speed = 1 cm/sec	



U.S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 5106 33.777 N, 118.115 W Long Beach VA Hospital Ground site SMA # 1731 (USGS)	L 360	Sens. = 1.90 cm/g Freq. = 25.4 Hz Damp. = 0.6 crit	*
Earthquake of 28 February 1990 2343 G.m.t.	V Up	Sens. = 1.77 cm/g Freq. = 25.9 Hz Damp. = 0.6 crit	*
Epicentral distance = 56 km	T 270	Sens. = 1.76 cm/g Freq. = 26.2 Hz Damp. = 0.6 crit	*

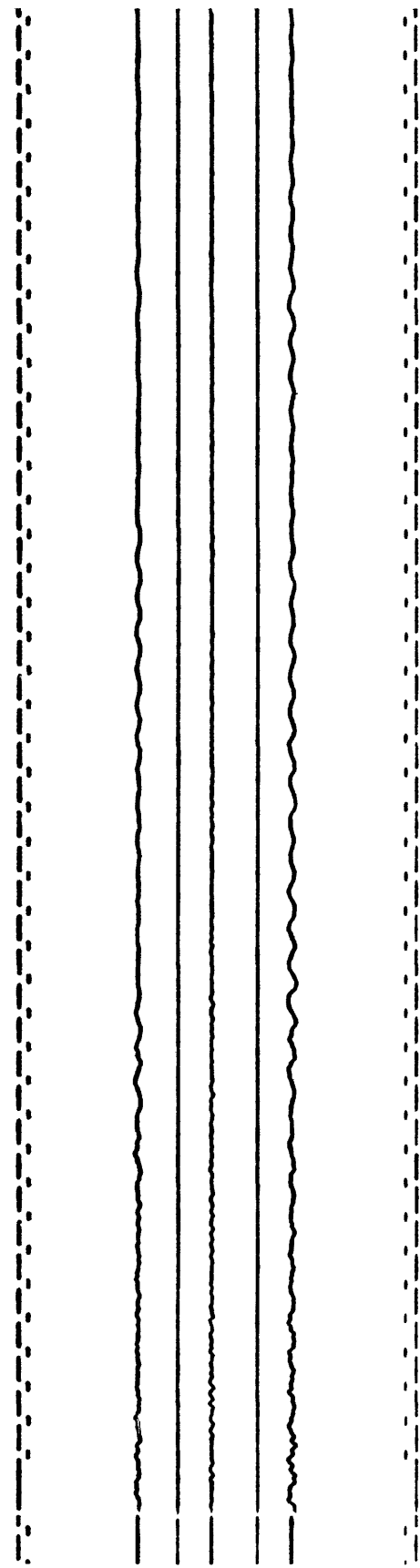
Film speed = 1 cm/sec

U. S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 5106	L 360	Sens. = 1.83 cm/g	0.02 g
33.778 N, 118.118 W		Freq. = 25.6 Hz	
Long Beach VA Hospital Basement		Damp. = 0.55 crit	
SMA # 845 (VA)	V Up	Sens. = 1.95 cm/g	0.02 g
		Freq. = 26.3 Hz	
		Damp. = 0.57 crit	
Earthquake of	T 270	Sens. = 2.00 cm/g	0.02 g
28 February 1990		Freq. = 25.0 Hz	
2343 G.m.t.		Damp. = 0.59 crit	
Epicentral distance = 56 km		Film speed = 1 cm/sec	



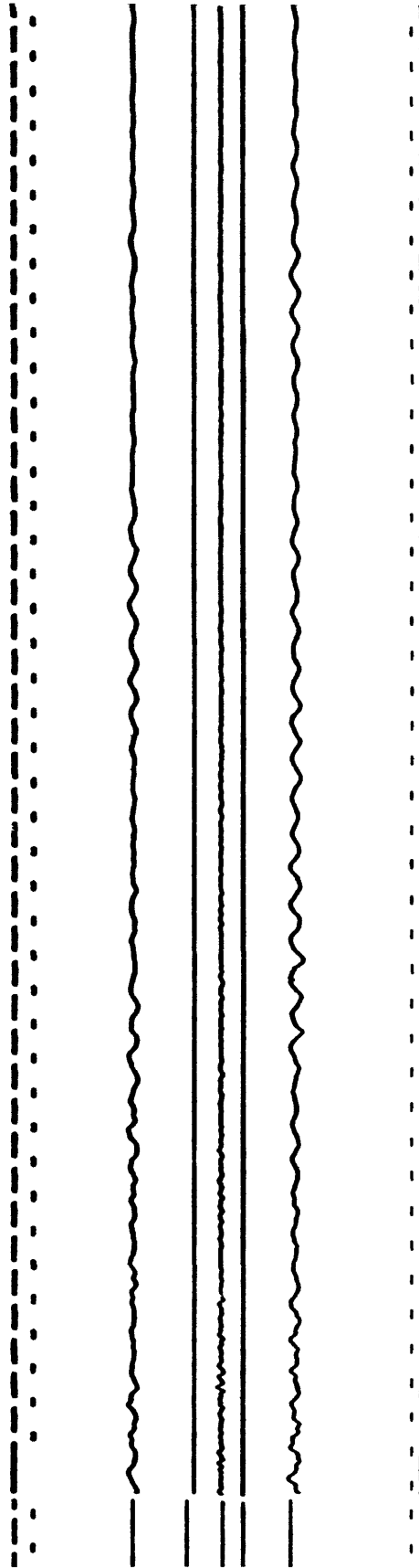
U. S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 5106 33.778 N, 118.118 W Long Beach VA Hospital 6th floor SMA # 809 (VA)	L 360	Sens. = 1.78 cm/g Freq. = 26.3 Hz Damp. = 0.57 crit	0.03 g
Earthquake of 28 February 1950 2343 G.m.t.	V Up T 270	Sens. = 1.95 cm/g Freq. = 25.6 Hz Damp. = 0.57 crit Sens. = 1.85 cm/g Freq. = 25.6 Hz Damp. = 0.59 crit	0.02 g 0.04 g

Epicentral distance = 56 km Film speed = 1 cm/sec



U. S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 5106 33.778 N, 118.118 W Long Beach VA Hospital 11th floor SMA # 749 (VA)	L 360	Sens. = 1.88 cm/g Freq. = 25.6 Hz Damp. = 0.50 crit	0.04 g
	V Up	Sens. = 1.81 cm/g Freq. = 26.3 Hz Damp. = 0.53 crit	0.04 g
Earthquake of 28 February 1990 2343 G.m.t.	T 270	Sens. = 1.77 cm/g Freq. = 27.0 Hz Damp. = 0.50 crit	0.07 g

Epicentral distance = 56 km Film speed = 1 cm/sec



U. S. STRONG-MOTION NETWORK

Station No. 5257
33.620 N, 117.844 W
San Joaquin Reservoir
Left abutment
SMA # 4222 (USGS)

DIRECTION

L 087

V Up

T 357

CONSTANTS

Sens. = 1.82 cm/g
Freq. = 25.5 Hz
Damp. = 0.6 crit

Sens. = 1.74 cm/g
Freq. = 26.0 Hz
Damp. = 0.6 crit

Sens. = 1.89 cm/g
Freq. = 25.5 Hz
Damp. = 0.6 crit

MAX. ACCELERATION

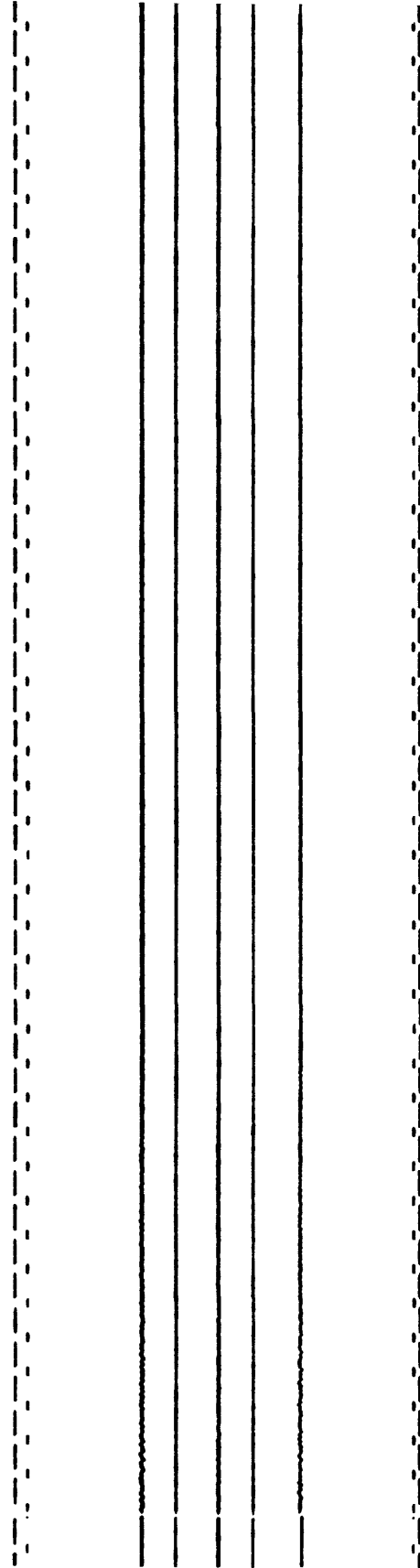
*

*

*

Epicentral distance = 59 km

Film speed = 1 cm/sec



U. S. STRONG-MOTION NETWORK

Station No. 5257
 33.620 N, 117.842 W
 San Joaquin Reservoir
 Crest
 SMA # 6697 (MWD)

DIRECTION

L 087

CONSTANTS

Sens. = 1.82 cm/g
 Freq. = 26.2 Hz
 Damp. = 0.57 crit

Sens. = 2.04 cm/g
 Freq. = 25.2 Hz
 Damp. = 0.57 crit

V Up

Earthquake of
 28 February 1990
 2343 G.m.t.

T 357

Sens. = 1.86 cm/g
 Freq. = 25.7 Hz
 Damp. = 0.61 crit

Epicentral distance = 59 km

Film speed = 1 cm/sec

MAX. ACCELERATION

*

*

*

U. S. STRONG-MOTION NETWORK	CH.	DIRECTION	LOCATION	SENSITIVITY	MAX. ACCELERATION
Station No. 5246	1	360°	Tower 2, Level 1 Center, Garage	1.71 cm/g	0.05 g
33.618° North, 117.878° West	2	Up	Tower 2, Level 1 Center, Garage	1.77 cm/g	*
Newport Beach 840 Newport Center Drive	3	090°	Tower 2, Level 1 Center, Garage	1.80 cm/g	*
Structure array	4	360°	Tower 2, Level 2 West end, Plaza	1.81 cm/g	Failed
CRA-1 #231	5	360°	Tower 2, Level 2 Center, Plaza	1.78 cm/g	0.07 g
Earthquake of 28 February 1990	6	090°	Tower 2, Level 2 Center, Plaza	1.81 cm/g	0.07 g
2343 G.m.t.	7	090°	Tower 2, Level 9 South end, roof	1.78 cm/g	*
	8	090°	Tower 2, Level 10 Center, P.H.	1.82 cm/g	Failed
	9	090°	Tower 2, Level 10 Center, P.H.	1.84 cm/g	Failed
	10	360°	Tower 1, Level 9 East end, roof	1.78 cm/g	*
	11	270°	Tower 1, Level 10 Center, P.H.	1.81 cm/g	0.05 g
	12	360°	Tower 1, Level 10 Center, P.H.	1.80 cm/g	*

Epical distance = 60 km

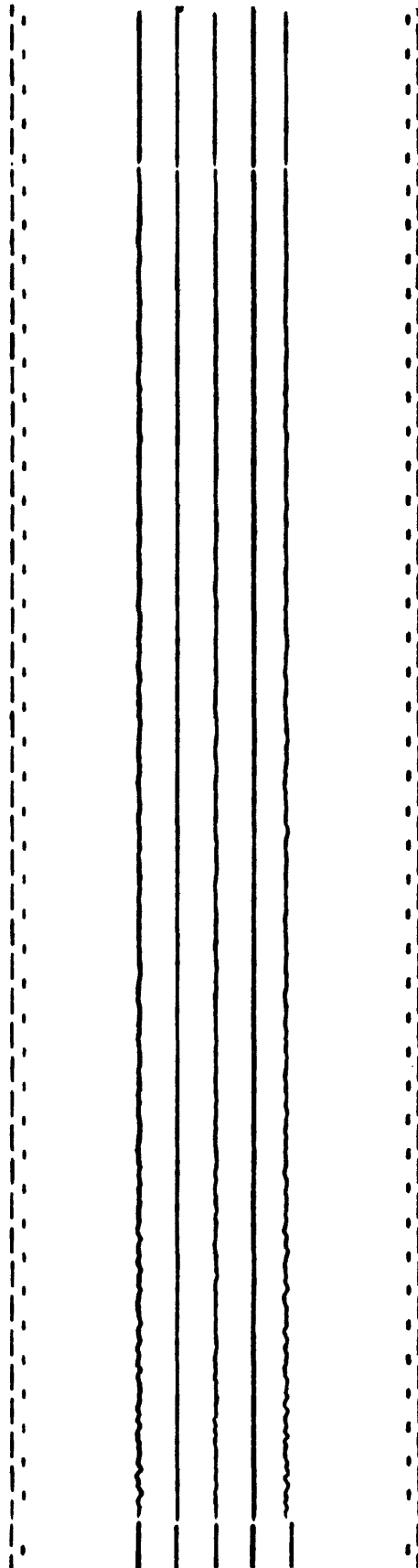
Film speed = 1 cm/sec

[See accelerometer on next page]

- 1 _____
- 2 _____
- 3 _____
- 4 _____
- 5 _____
- 6 _____
- 7 _____
- 8 _____
- 9 _____
- 10 _____
- 11 _____
- 12 _____

U.S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 710 33.772 N, 118.319 W Palos Verdes Reservoir Crest SMA # 6699 (MWD)	L 210 V Up	Sens. = 1.97 cm/g Freq. = 25.9 Hz Damp. = 0.59 crit Sens. = 2.07 cm/g Freq. = 25.5 Hz Damp. = 0.60 crit	 *
Earthquake of 28 February 1990 2343 G.m.t.	T 120	Sens. = 1.76 cm/g Freq. = 26.4 Hz Damp. = 0.60 crit	*

Epical distance = 70 km Film speed = 1 cm/sec



U.S. STRONG-MOTION NETWORK

Station No. 710
 33.774 N, 118.321 W
 Palos Verdes Reservoir
 Abutment Building
 SMA # 1056 (MWD)

DIRECTION

L 210
 V Up

CONSTANTS

Sens. = 1.94 cm/g
 Freq. = 26.7 Hz
 Damp. = 0.6 crit
 Sens. = 1.89 cm/g
 Freq. = 27.2 Hz
 Damp. = 0.6 crit
 Sens. = 1.87 cm/g
 Freq. = 26.1 Hz
 Damp. = 0.6 crit

MAX. ACCELERATION

*

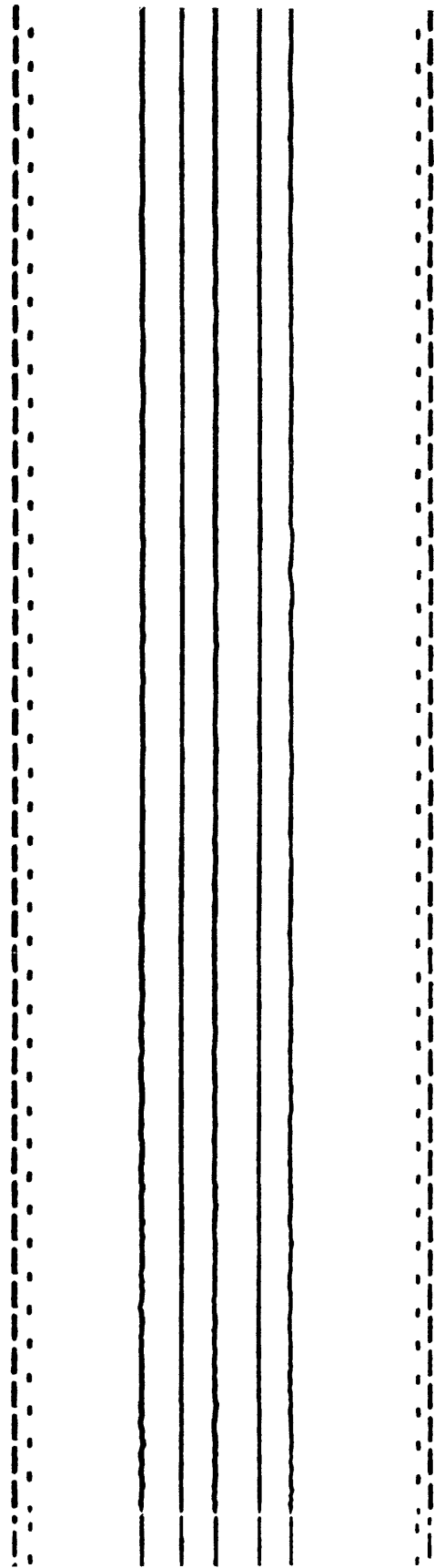
*

*

Earthquake of
 28 February 1990
 2343 G.m.t.

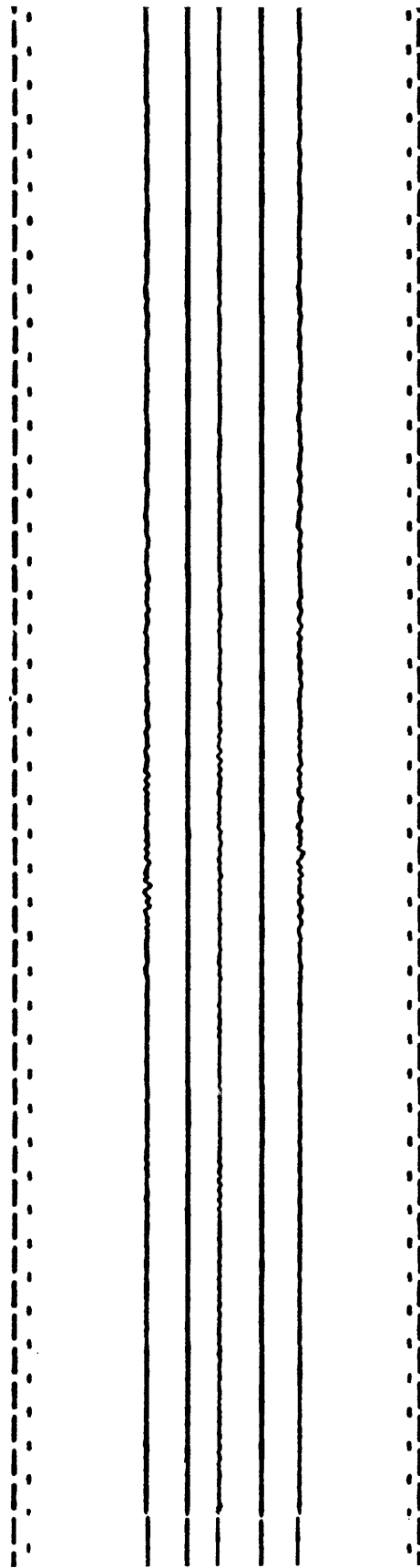
Epicentral distance = 70 km

Film speed = 1 cm/sec

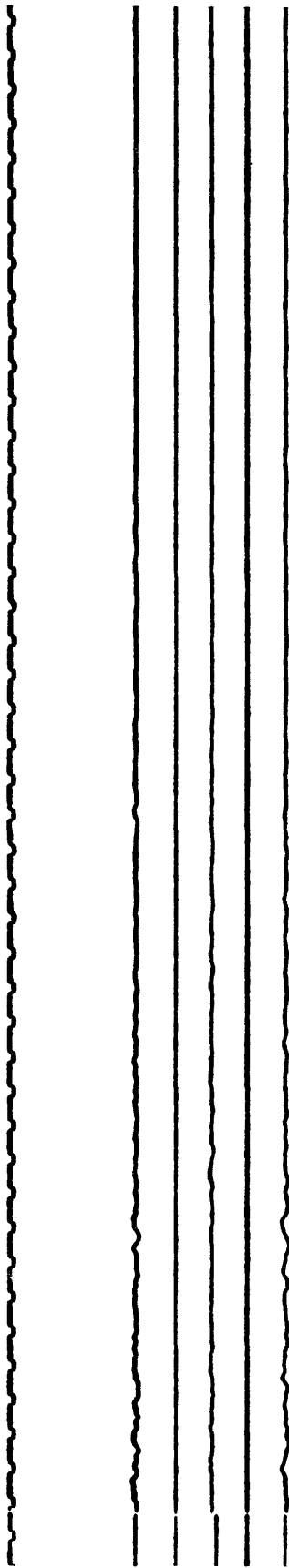


U. S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 637 34.249 N, 118.478 W Sepulveda VA Hospital Ground	L 360	Sens. = 1.84 cm/g Freq. = 26.3 Hz Damp. = 0.55 crit	*
SMA # 751 (VA)	V Up	Sens. = 1.81 cm/g Freq. = 25.6 Hz Damp. = 0.55 crit	*
Earthquake of 28 February 1990 2343 G.m.t.	T 270	Sens. = 1.80 cm/g Freq. = 25.0 Hz Damp. = 0.55 crit	*

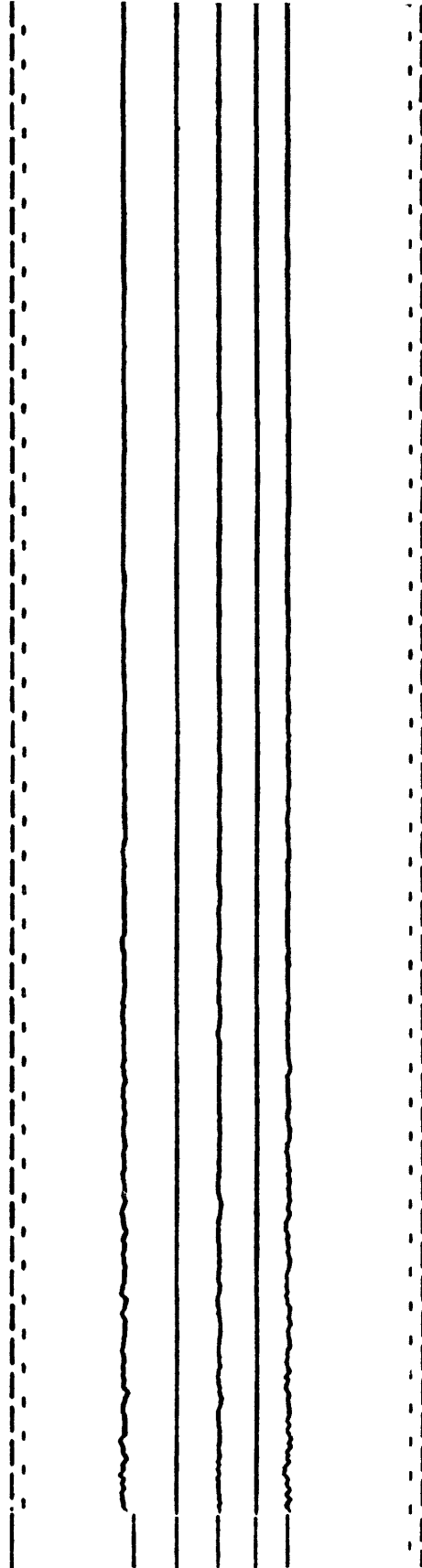
Epicentral distance = 72 km Film speed = 1 cm/sec



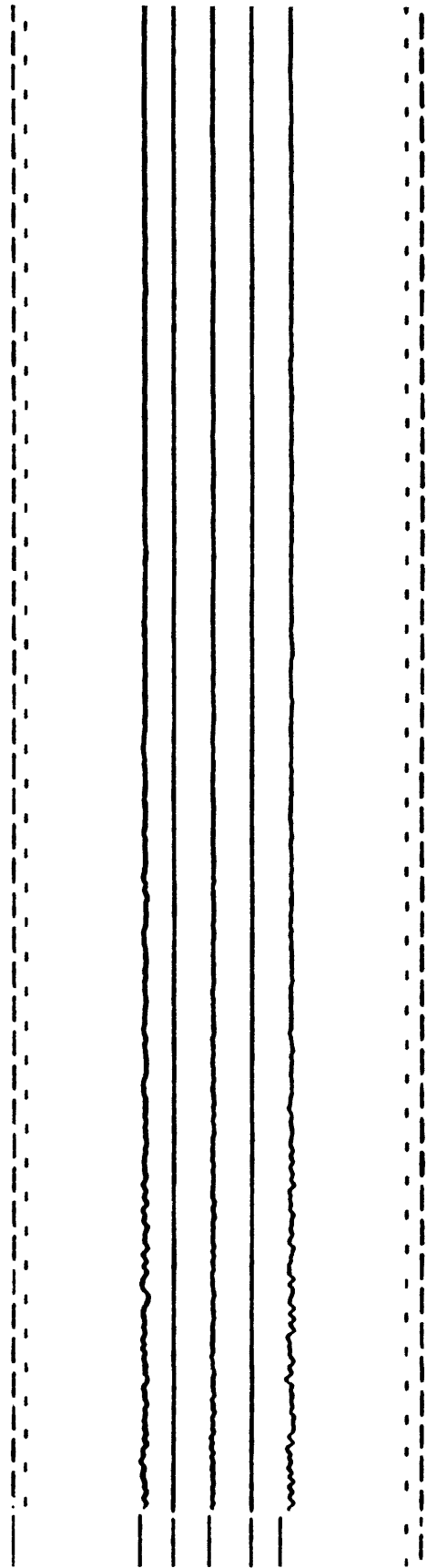
U.S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 655 34.312 N, 118.496 W Jensen Filter Plant Administration Bldg., basement SMA # 259 (MWD)	L 022	Sens. = 1.78 cm/g Freq. = 26.3 Hz Damp. = 0.57 crit	0.03 g
Earthquake of 28 February 1990 2343 G.m.t.	V Up	Sens. = 1.74 cm/g Freq. = 27.0 Hz Damp. = 0.55 crit	0.01 g
Epical distance = 75 km	T 292	Sens. = 1.63 cm/g Freq. = 27.7 Hz Damp. = 0.50 crit	0.04 g
		Film speed = 1 cm/sec	



U.S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 655 34.313 N, 118.498 W Jensen Filter Plant Generator building, ground SMA # 6757 (MWD)	L 022	Sens. = 1.96 cm/g Freq. = 25.6 Hz Damp. = 0.63 crit	0.04 g
Earthquake of 28 February 1990 2343 G.m.t.	V Up	Sens. = 1.99 cm/g Freq. = 25.5 Hz Damp. = 0.55 crit	0.02 g
Epicentral distance = 75 km	T 292	Sens. = 1.90 cm/g Freq. = 25.7 Hz Damp. = 0.63 crit	0.03 g
		Film speed = 1 cm/sec	



U.S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 655	L 022	Sens. = 1.77 cm/g	0.03 g
34.309 N, 118.499 W		Freq. = 26.6 Hz	
Jensen Filter Plant		Damp. = 0.60 crit	
Reservoir roof	V Up	Sens. = 1.97 cm/g	0.02 g
SMA # 6756 (MWD)		Freq. = 25.3 Hz	
		Damp. = 0.63 crit	
Earthquake of	T 292	Sens. = 1.82 cm/g	0.05 g
28 February 1990		Freq. = 26.5 Hz	
2343 G.m.t.		Damp. = 0.63 crit	
Epicentral distance = 75 km		Film speed = 1 cm/sec	



U.S. STRONG-MOTION NETWORK	DIRECTION	CONSTANTS	MAX. ACCELERATION
Station No. 5029 34.62 N, 118.29 W Leona Valley Fire Station Ground	L 120	Sens. = 1.88 cm/g Freq. = 25.8 Hz Damp. = 0.6 crit	*
SMA-1 # 1499 (USGS) Earthquake of 28 February 1990 2343 G.m.t. (WWVB trigger time)	V Up	Sens. = 1.87 cm/g Freq. = 26.1 Hz Damp. = 0.6 crit	*
Epicentral distance = 76 km	T 030	Sens. = 1.83 cm/g Freq. = 26.4 Hz Damp. = 0.6 crit	*
		Film speed = 1 cm/sec	