UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

PROCESSED STRONG-MOTION RECORDS
WHITTIER NARROWS, CALIFORNIA EARTHQUAKE
OCTOBER 1, 1987

VOLUME I
USGS-NSMIN STATIONS WITHIN 15 KM OF THE EPICENTER

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PREFACE

This report contains the computer processing results of records from the close-in stations of the U.S. Geological Survey's National Strong Motion Instrumentation Network during the Whittier Narrows, California, earthquake, ML=5.9, on October 1, 1987. This "Executive Summary" report contains computer plots of uncorrected acceleration (except relatively insignificant codas), corrected acceleration, velocity and displacements (except relatively insignificant codas), tripartite response spectra (except the upper stories of buildings), and Fourier amplitude spectra plotted on log axes. Subsets of plots excluded from the above list, and other familiar plots (velocity response spectra on linear axes, Fourier amplitude spectra on linear axes) are available from the authors at USGS, Menlo Park, California, on request. A companion tape containing all processing results (except Fourier amplitude spectra ordinates) is available from the National Geophysical Data Center, 325 Broadway (Mail E/GC11), Boulder, Colorado 80303.

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*Processing stages and plot format:
1. Uncorrected accelerogram (first 20 seconds).
2. Corrected acceleration, velocity, displacement (first 20 seconds).
3. Response spectrum; tripartite plot.
4. Fourier amplitude spectrum; log-log plot.

Note: In column 1, each plot contains all three components.
In columns 2 through 4, the indicated page number refers to the first of three components for this record.
In column 3, no plots of response spectra are provided for upper levels of buildings.

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VOLUME I

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INTRODUCTION

Fifty-two stations within the National Strong-Motion Instrumentation Network (NSMIN) operated by the U.S. Geological Survey (USGS) were triggered by the ML=5.9 Whittier Narrows earthquake on 1 October, 1987 (Etheredge & Porcella, 1987). Epicentral distances range from 3 to 79 km. This report contains the results of processing the film accelerograms obtained from instruments within 15 km of the epicenter. Computer plots of uncorrected acceleration, corrected acceleration, velocity, and displacement, response spectra (except for the upper levels in buildings) and Fourier amplitude spectra are included in the Appendices. A companion tape is available from the National Geophysical Data Center (NGDC), 325 Broadway, (Mail E/GC11), Boulder, Colorado 80303.

Processing of the Whittier Narrows data from stations farther from the epicenter is continuing. The stations included here, with epicentral distances between 3 and 15 km, are listed in Table 1 and plotted in Figure 1. Further division of the triggered stations from the earthquake includes a group of three buildings between 15 and 17 km epicentral distance together with the Santa Ana River Pipeline Bridge, stations out to 31 km, to 35 km, and to 47 km. The total number of digitized data channels is expected to be 248, selected from the 358 data channels at the 52 triggered stations.

PROCESSING PROCEDURES

The original film records, 70 mm wide, were contact printed onto direct positive mylar film. Exposure and developing times were selected to produce a contrast between black trace and clear background that was most satisfactory for subsequent digitizing, and to ensure that faint traces became digitizable.

Digitizing was performed on the contact prints by a commercial digitizer using a computer-controlled trace-following laser scanner. The machine has a least count of 1 micron (10^{-6} meter) and an accuracy in the RMS sense, while digitizing a straight line, of ±3 to ±15 micron depending on the clarity of the edges of the line (Fletcher and others, 1980). Overall accuracy of the optics is maintained by digitizing a square grid, and performing an appropriate optical correction on every digitized point.

The raw data is almost equispaced at approximately 600 samples per cm (that is, 600 samples per second of record time), although higher densities are required around the sharpest peaks.

The first processing steps are (Converse, 1984): 1, reassemble the data, digitized in three successive 10-second frames, into 30 sec (approximately)

time series; 2, adjust the time coordinates in accordance with the digitized time marks; 3, subtract an adjacent reference trace; 4, subtract the applicable mean value; and 5, scale for units of seconds and cm/sec/sec. The resulting data, having had no direct and specific alteration of their frequency content, have long been called uncorrected acceleration.

Corrections affecting particularly the high frequency end of the useful spectrum include: an instrument correction (applied across the entire spectrum but having most visible effects at frequencies higher than the natural frequency of the instrument); a high-frequency low-pass filter at 50 Hz with a cosine taper to zero at 100 Hz; and decimation to 200 samples per second.

Filtering out the low-frequency noise is performed with a bidirectional Butterworth filter placed at such a frequency as to retain as much as possible of the low-frequency content, but to exclude that part of the signal overly contaminated by noise. These are conflicting requirements, and vary from station to station, and possibly even from trace to trace on the same record. It is always desirable to retain periods as long as, or longer by a factor of two than, the rupture duration, insofar as this can be approximated by the strong-motion duration of the record (Basili and Brady, 1978). In structural records it is of course desirable to retain content with periods equal to or greater than the longest natural mode period of the structure.

Several opportunities exist for ascertaining the low frequency below which noise problems are present and must subsequently be removed.

1. Accelerations after two integrations must show displacements at the periods in question, and longer, that do not disagree substantially with those that might be expected, by the seismological community, from traditional displacement meters.

2. Displacements, at the periods in question, derived from stations sufficiently close to each other, will be coherent (for example, Hanks (1975)), that is, they will have similar shapes, although offset by applicable small time intervals.

3. Displacements from recorders within a structure, at periods longer than the natural periods of the fundamental resonant modes, will be coherent.

4. The Fourier amplitude spectrum and the tripartite response spectrum of a noise-free record will fall off smoothly at longer periods. Long period noise, if concentrated within a specific frequency range, will show clearly.

5. The Fourier amplitude spectrum of a true straight line, digitized as though it were an acceleration trace, is a basic measure of noise in the digitizing system at all frequencies. If this spectrum meets and coalesces with the calculated Fourier spectrum of a record at long periods, it is clear that in this period range noise is dominant.

6. The Fourier spectrum of a reference trace on the record, digitized in the normal course of digitization of all traces, is a basic measure of noise in the recording system and digitizing system at all frequencies. Some long-period noise sources, resident in the recorder itself, are

removed from the signal during the subtraction of the reference trace, followed by subtraction of the mean value. If, however, these recorder-resident noise sources are insignificant and the reference traces are close to truly straight, then the merging of the two Fourier spectra (of uncorrected accelerogram and reference trace) at long periods indicates a region where noise is dominant.

These conditions would normally play significant roles in the selection of the long-period limit for individual records in this report and for the remainder of the Whittier Narrows earthquake records. However, records from different elevations in the 12-story Alhambra building and the 10-story Whittier building introduce a new phenomenon concerning long-period content that must be investigated further.

Calculations of corrected displacements and velocities at different levels in the Alhambra building are shown in Appendix 2, using a 4-second filter. This filter was chosen to leave unaffected the response in the first mode with natural period of 2.0 seconds. During the first 2 seconds, between triggering and S-wave arrival, the displacements in the east direction (90°) and the north direction (360°) are surprisingly consistent over the three levels. The shape of the plotted displacement is dependent on the order of the processing (integrate the raw acceleration for velocity, filter the velocity allowing the initial value to be non-zero, and finally integrate velocity for displacement with initial displacement set to zero), but the implication is that the entire building is accelerating to the west during these first 2 seconds, reaching 3.1 cm/sec/sec at 2 seconds, or, possibly, tilting up to the west by 0.0032 radian in the same time period. To the north, the implied acceleration is 5.6 cm/sec/sec, or a tilt up to the north of 0.0057 radian.

The same phenomenon can be seen in the velocities and displacements at all levels in the Whittier building, where the implication is that the building is accelerating to the east (or tilting up to the east) and accelerating to the south (or tilting up to the south).

The consistency of the calculations for these early accelerations from the corrected velocity and displacement confirms that the behavior is not likely to be caused by noise, which would have affected the twelve applicable horizontal recordings in a more random fashion.

Such internal consistency of building displacements has not been seen at other locations for this earthquake, and the long-period limit has been dropped to 2 seconds at the Garvey Reservoir Abutment Building, the Whittier Narrows Dam, the Los Angeles Bulk Mail Center in Bell, 4814 Loma Vista Avenue in Vernon and 12400 Imperial Highway in Norwalk. The records from the Norwalk building basement produced velocity and displacement plots clearly contaminated by noise when a 4-second long-period filter was attempted.

A project is underway to carry on with this investigation of ground motion leading up to the arrival of the first shear waves.

In the corrected plots in Appendix 2, the bidirectional Butterworth filter is used for long-period removal, and is applied to the velocity data (obtained by integration from the uncorrected acceleration). This filter

allows the resulting initial velocity to be non-zero. Acceleration and displacement are calculated from this corrected velocity by differentiation and integration, respectively. The integration for displacement commences with zero displacement.

An option exists that assumes the recorded acceleration is preceded by zero acceleration. Processing of the record with leading zeros allows the displacement to have attained non-zero values by the time of actual record triggering. This displacement data, and their plots, are subsequently provided from this time of actual triggering, where in general the displacement is non-zero.

In either treatment, the displacement is not forced to have an average value close to zero by the end of the record. Particularly in the cases where routine processing is used, the final displacement is occasionally seen to be oscillating about a value that is different from zero. Insofar as this is directly attributable to the unknown initial displacement, and may be considered in the same way as an arbitrary integration constant is usually considered, it is not an important issue. Studies using peak displacements will need care in the measurement of peak displacements from such records.

Table 2 contains peak values of ground motion for all components included in this report. The scaled peak accelerations are from Etheredge and Porcella (1987) who scaled them from the original film records. The uncorrected peak accelerations are obtained from the digitized records, and the corrected peak acceleration, velocity, and displacement occur after filtering for high- and low-frequency noise. The low frequency cut is listed in the last column. The specific direction sense of the peak motions, in the component directions listed, is not of particular importance, although it is indicated for the digitized data.

FURTHER COMMENTS ON SOME INDIVIDUAL STATIONS.

Whittier Narrows Dam.

The crest and upstream instruments are not connected for simultaneous triggering or common timing, although an inspection of the vertical traces of uncorrected and corrected data indicates there are sufficient matches to be confident of near-simultaneous triggering (within 0.05 sec). A long-period limit of 2 sec was required to ensure the first 2 sec of displacement was free of unidentified noise.

Alhambra; 900 S. Fremont; Basement, 6th, and 12th floors.

These three recorders are wired for simultaneous triggering and common timing. Digitizing on all nine traces was commenced at the common trigger time. A fundamental first mode period of 2.0 sec scaled from the 12th floor 360° component indicated that a long period limit greater than 2 sec was required, in order that this 2 sec signal be retained with its full amplitude. A long-period limit of 4 sec has resulted in an interesting phenomenon that is visible in both horizontal directions at all three levels and is described in an earlier section.

Whittier; 7215 Bright Ave; Basement, 5th, and 10th floors.

These three instruments are wired for simultaneous triggering and common timing. A 4-second long-period limit has been chosen, even though it is well above the fundamental period of vibration of the building, to help in the above description of the ground motion during the first two seconds after triggering and before the shear wave arrival.

Vernon; 4814 Loma Vista Ave. (CMD Terminal).

The sharp spike at 5.3 sec on the 277° component of uncorrected acceleration is on the original film and digitized correctly; its high frequency catapults it to the highest peak during the instrument correction phase of the processing. There is no visible effect on velocity and displacement.

Norwalk; 12400 Imperial Highway.

The three recorders in the building (Basement, 4th, Roof) are triggered simultaneously; the South Ground Site has a separate trigger. Judging from the 0.5 sec and 0.8 sec pulses in displacement passing the ground level stations between 3 and 5 sec after their triggering, we calculate the South Ground Site actually triggered 0.35 sec before the Basement. The vertical components have a 4 Hz packet arriving at about 4 sec after triggering. Aligning these confirms this 0.35 sec delay in trigger times.

As mentioned in the earlier discussion, the Basement record produced velocity and displacement traces clearly contaminated by noise when a 4-second long-period filter was attempted.

ACKNOWLEDGMENTS

The authors wish to thank those who, over many years of instrument maintenance, and over hours of record keeping, photographic printing, digitization, typing, programming, and report preparation, have contributed to the quality of the basic recorded data from the Whittier Narrows earthquake and the subsequent usefulness of the data in this report.

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Fletcher, J. B., A. G. Brady, and T. C. Hanks (1980). Strong-motion accelero-

grams of the Oroville, California, aftershocks: data processing and the aftershock of 0350 August 6, 1975: Bull. Seis. Soc. Am., 70, 1, 243-267.

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Table 1

National Strong-Motion Instrumentation Network stations;
3-15 km Epicentral Distance

Coord. Name (Instrumentation Owner)	Epic. Dist. °N,°W	Site (km)	Geology
Garvey Reservoir Abutment Building (MWD) 118.11	34.05	3	Rock
Whittier Narrows Dam (ACOE) Crest, Upstream	34.03 118.05	4	Alluvium
Alhambra: 900 S. Fremont Blvd. (USGS) Basement, 6th, 12th floor	34.09 118.15	8	PNM (soft)
Whittier: 7215 Bright Ave. (USGS) Basement, 5th, 10th floor	33.977 118.036	10	Alluvium
Bell: Los Angeles Bulk Mail Center (USGS) 118.16	33.99	11	Alluvium
Vernon: 4814 Loma Vista Ave. (USGS) 118.20	34.00	13	Alluvium
Norwalk: 12400 Imperial Highway (USGS/BECH) Basement, 4th, Roof; South ground site	33.92 118.07	15	Alluvium

Station owners: MWD, Metropolitan Water District of S. Calif.
ACOE, U.S. Army Corps of Engineers.
BECH, Bechtel Power Corporation.
Site Geology: PNM, Pleistocene non-marine sand and terrace deposits.

Table 2. Records Data

Station and location	Component direction	Scaled peak accln (g)	Uncorrected peak accln (cm/s/s)	Corrected accln (cm/s/s)	Corrected vel. (cm/s)	Corrected displ. (cm)	Low freq. cut (Hz)
Garvey Reservoir Abutment Bldg.							
	060	.33	-367.7	-367.1	15.40	-1.42	.5
	Up	.38	-379.3	-373.5	7.56	0.96	.5
	330	.47	-469.4	-468.2	-19.78	-2.21	.5
Whittier Narrows Dam							
Crest	033	.31	295.9	294.0	19.63	-1.48	.5
	Up	.19	179.7	-177.0	4.39	0.27	.5
	303	.32	-317.0	-308.3	-17.46	1.18	.5
Upstream	152	.31	302.6	291.2	-14.14	1.30	.5
	Up	.46	465.5	521.0	7.94	-0.32	.5
	062	.24	231.7	225.4	14.19	-1.59	.5
Alhambra: 900 S. Fremont							
Basement	090	.30	-286.8	-284.2	11.26	-1.46	.25
	Up	.19	184.6	189.5	5.13	0.55	.25
	360	.26	252.9	249.8	20.82	-3.17	.25
6th floor	090	.47	-461.4	-462.7	21.94	-3.63	.25
	Up	.18	179.1	193.2	-6.53	-0.70	.25
	360	.37	-351.5	-355.9	26.75	5.12	.25
12th floor	090	.28	-266.1	-271.4	-22.97	-5.78	.25
	Up	.29	276.5	-335.1	-10.23	1.18	.25
	360	.23	226.5	230.7	37.64	-8.74	.25
Whittier: 7215 Bright Ave.							
Basement	180	.40	380.9	381.9	-26.59	-3.88	.25
	Up	.26	242.1	245.5	-7.60	0.84	.25
	090	.63	-611.9	-606.7	-27.70	-2.45	.25
5th floor	180	.61	545.6	539.5	-35.29	-5.84	.25
	Up	.34	309.4	345.0	10.31	-1.00	.25
	090	.60	580.4	-600.9	-24.23	-3.06	.25
10th floor	180	.41	395.8	417.9	-43.71	-7.27	.25
	Up	.54	510.3	549.4	-11.35	1.04	.25
	090	.54	517.8	514.0	-33.37	3.92	.25
Bell: Los Angeles Bulk Mail Center							
	010	.34	-320.2	-322.1	13.95	1.49	.5
	Up	.52	501.1	517.6	-8.57	0.67	.5
	280	.46	445.5	436.9	-35.79	-4.37	.5

Table 2. Records Data - Continued

Station and location	Component direction	Scaled peak accln (g)	Uncorrected peak accln (cm/s/s)	Corrected accln (cm/s/s)	Corrected vel. (cm/s)	Corrected displ. (cm)	Low freq. cut (Hz)
Vernon: 4814 Loma Vista Ave. (CMD Terminal)							
Basement	007	.29	-270.8	-267.3	18.57	-2.58	.5
	Up	.17	-150.0	-140.5	-3.42	0.42	.5
	277	.22	-210.6	-239.9	-20.31	2.19	.5
Norwalk: 12400 Imperial Highway							
Basement	090	.12	-108.6	-104.6	-7.00	0.92	.5
	Up	.07	62.6	62.9	2.79	0.27	.5
	360	.21	204.6	201.5	19.97	2.44	.5
4th floor	090	.17	-167.3	-164.3	10.13	1.35	.5
	Up	.12	-105.7	-102.2	4.37	0.34	.5
	360	.33	315.4	317.4	24.81	-2.83	.5
Roof	090	.21	-185.9	-187.0	-18.59	-2.91	.5
	Up	.18	-124.8	-121.5	-6.43	0.69	.5
	360	.40	413.9	436.6	42.02	5.45	.5
South Ground Site	090	.10	89.9	89.3	-9.31	-0.90	.5
	Up	.09	88.0	88.8	3.51	0.32	.5
	360	.29	-243.9	-234.9	21.61	2.84	.5

Note: The digitization of these records was done in three frames of approximately 10 s each, totalling 30 s. All peaks listed here occurred in the first 10 s. We include plots only to 20 s. The companion tape includes data to 30 s. See the note in the Preface.

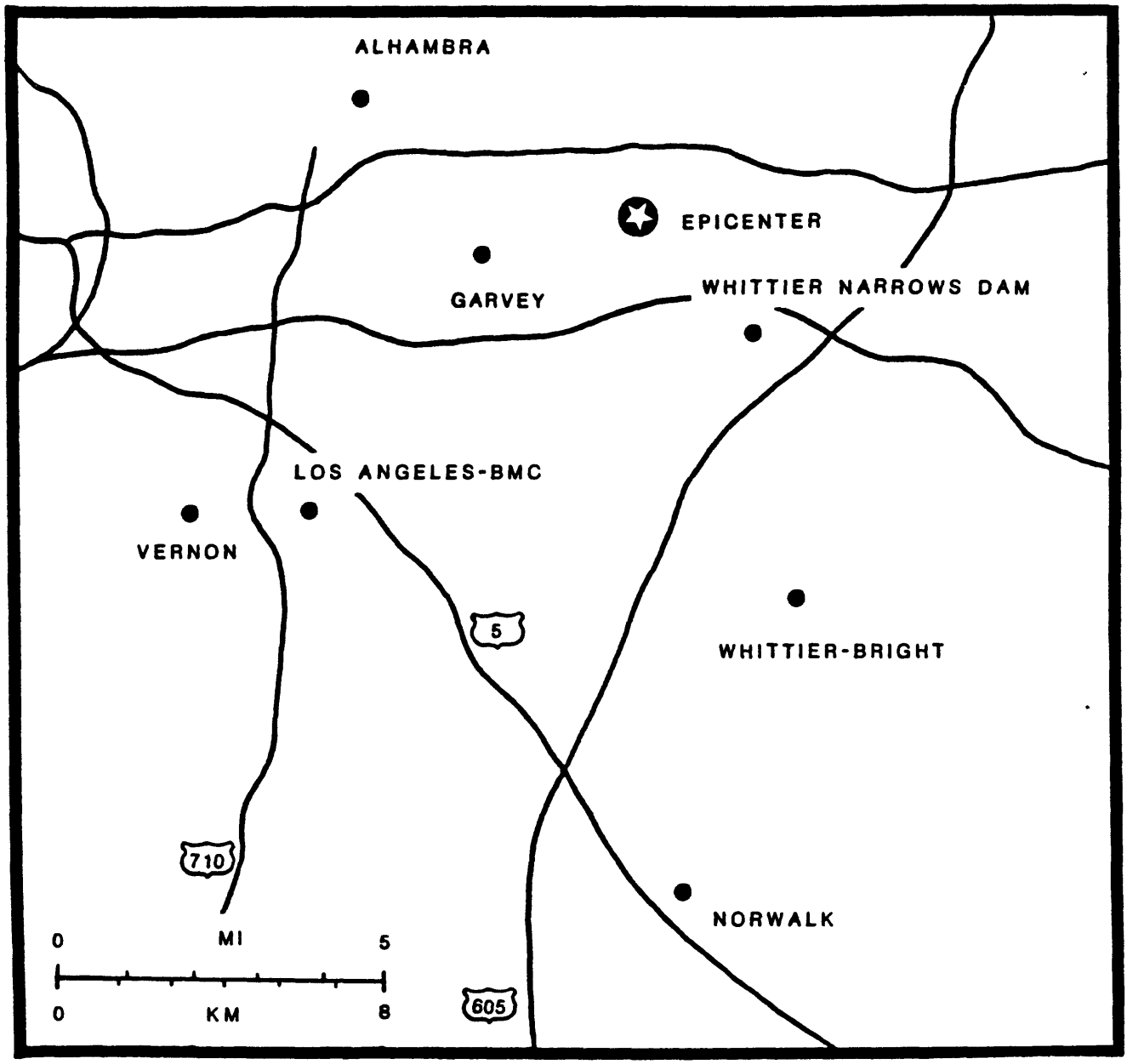

Figure 1. USGS-NSMIN stations with records in this report (adapted from Etheredge and Porcella, 1987).

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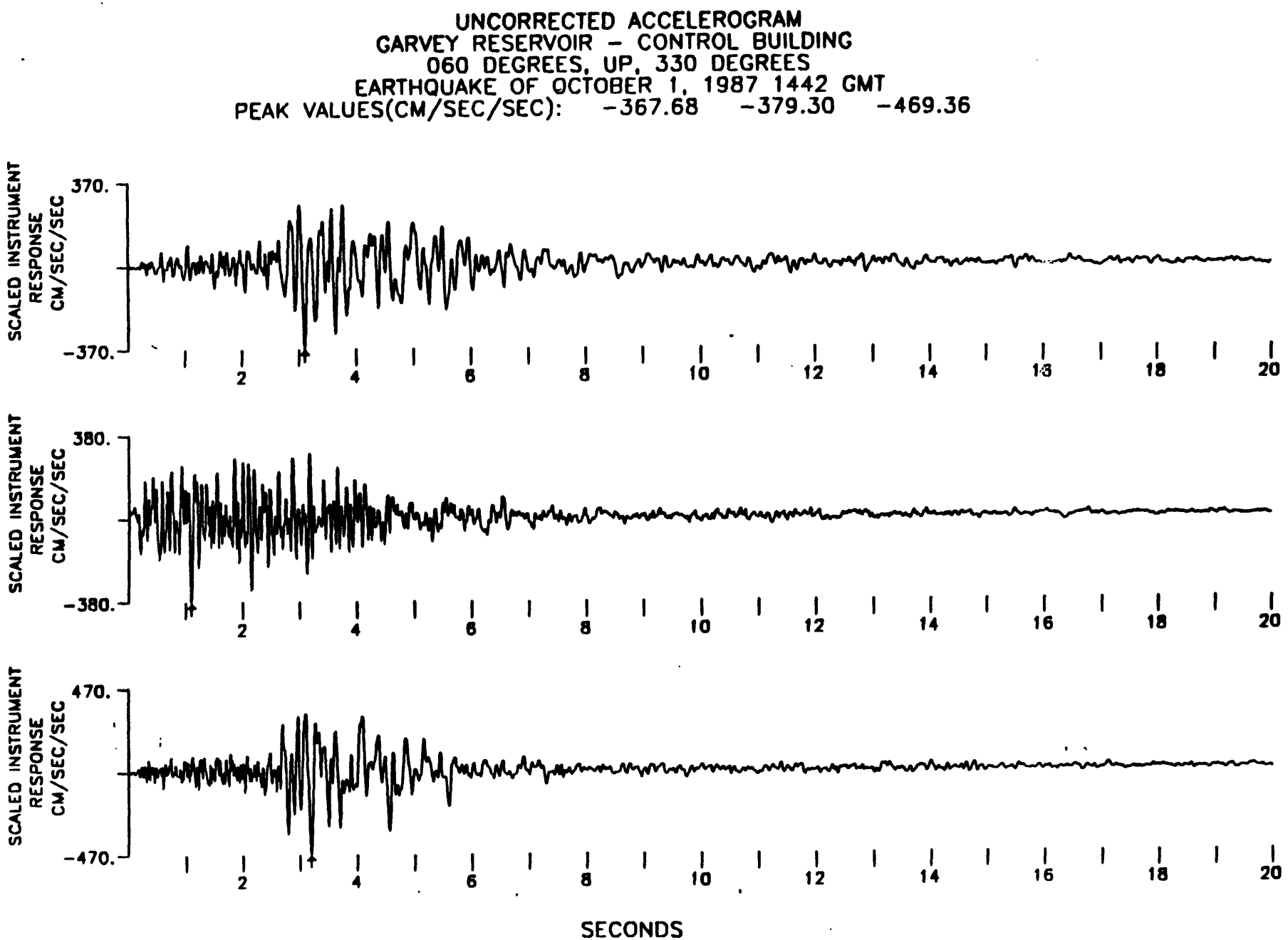
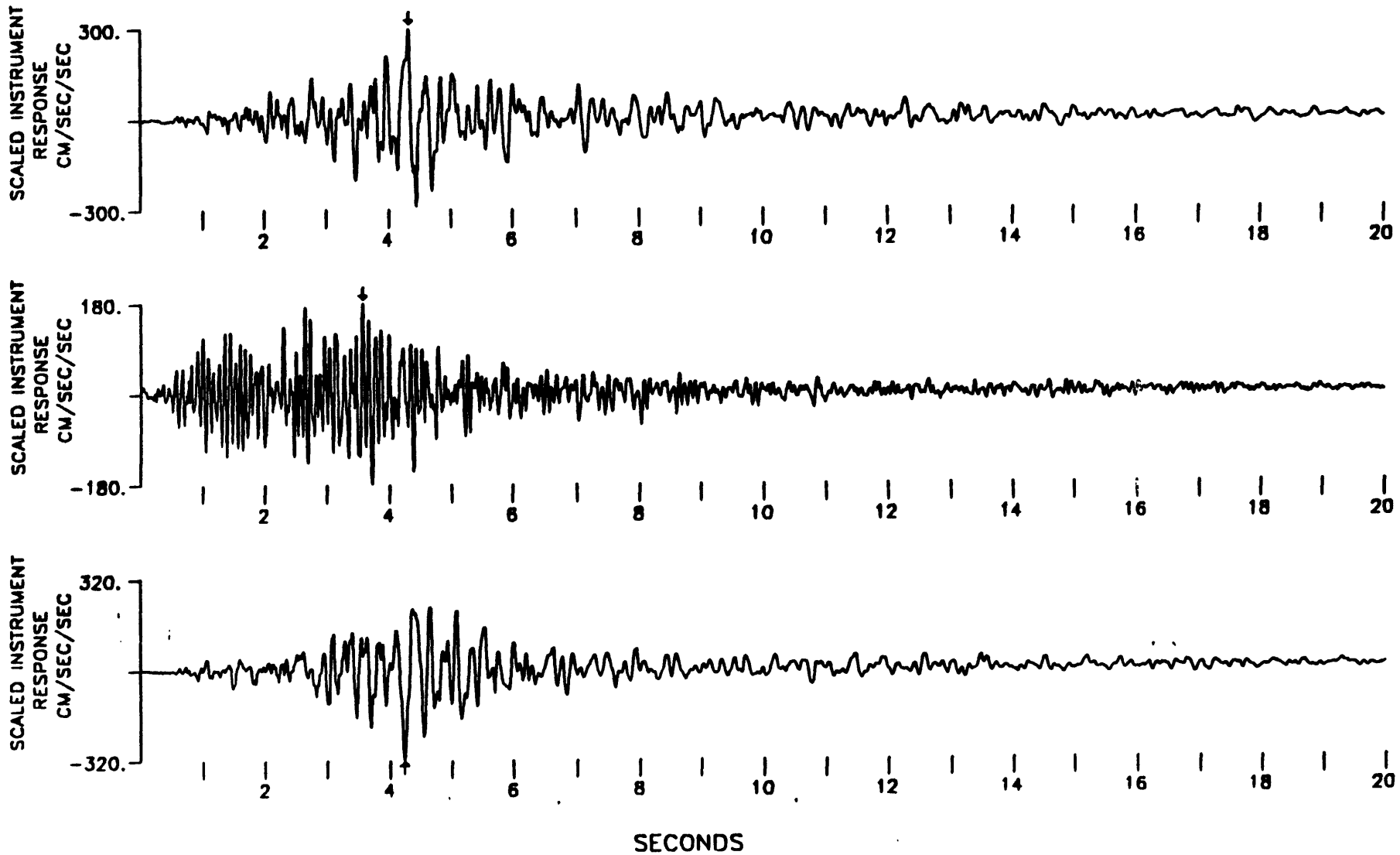
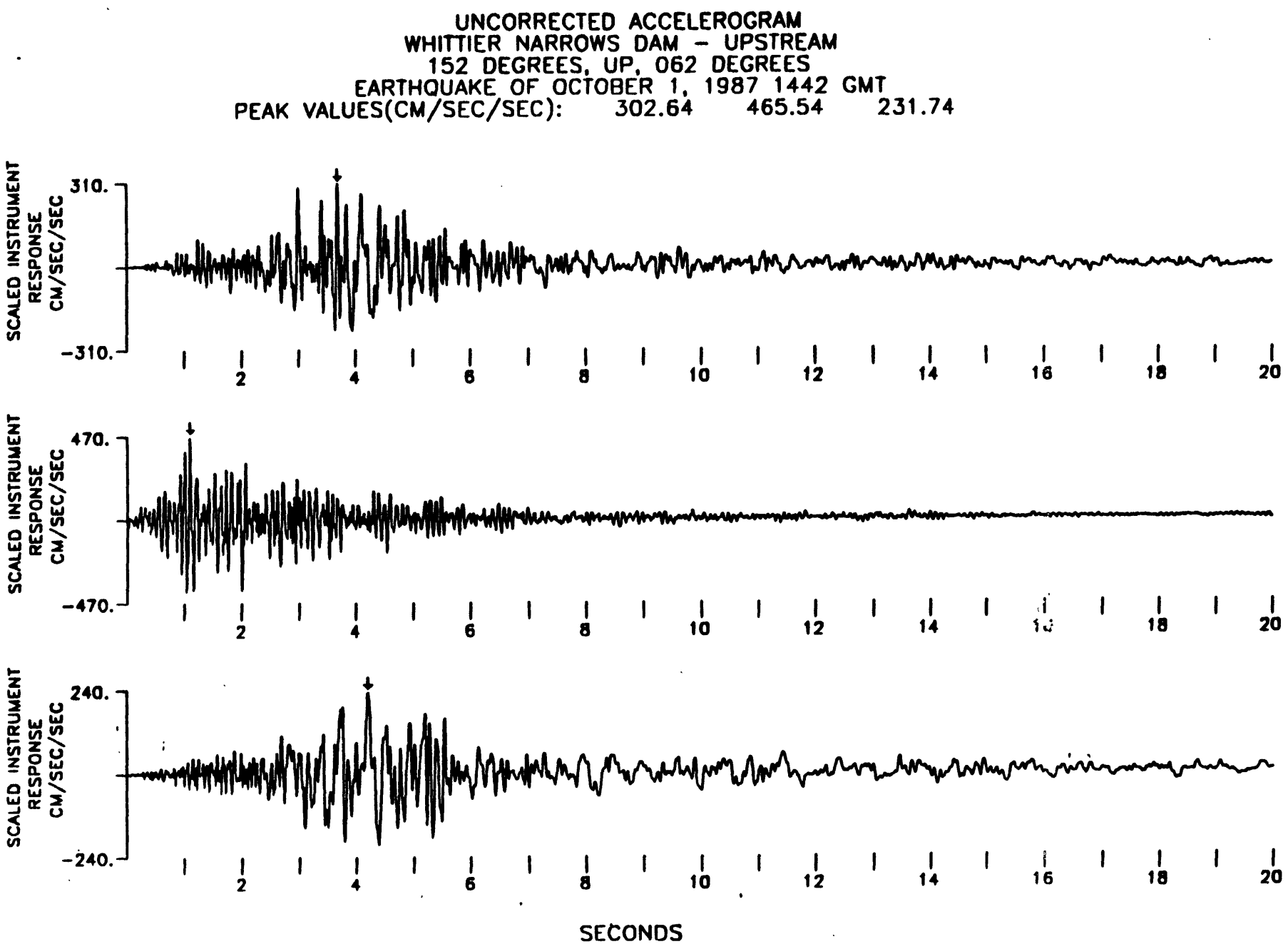
Appendix 1

Uncorrected accelerogram


UNCORRECTED ACCELEROGRAM
GARVEY RESERVOIR - CONTROL BUILDING
060 DEGREES, UP, 330 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
PEAK VALUES(CM/SEC/SEC): -367.68 -379.30 -469.36
SCALED INSTRUMENT RESPONSE CM/SEC/SEC
370.
-370.
380.
-380.
470.
-470.
2
4
6
8
10
12
14
16
18
20
SECONDS


UNCORRECTED ACCELEROGRAM
WHITTIER NARROWS DAM - CREST
033 DEGREES, UP, 303 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
PEAK VALUES(CM/SEC/SEC): 295.86 179.72 -316.98
SCALED INSTRUMENT RESPONSE CM/SEC/SEC
300.
-300.
180.
-180.
320.
-320.
2
4
6
8
10
12
14
16
18
20
SECONDS


UNCORRECTED ACCELEROGRAM
WHITTIER NARROWS DAM - UPSTREAM
152 DEGREES, UP, 062 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
PEAK VALUES(CM/SEC/SEC): 302.64 465.54 231.74
SCALED INSTRUMENT RESPONSE CM/SEC/SEC
310.
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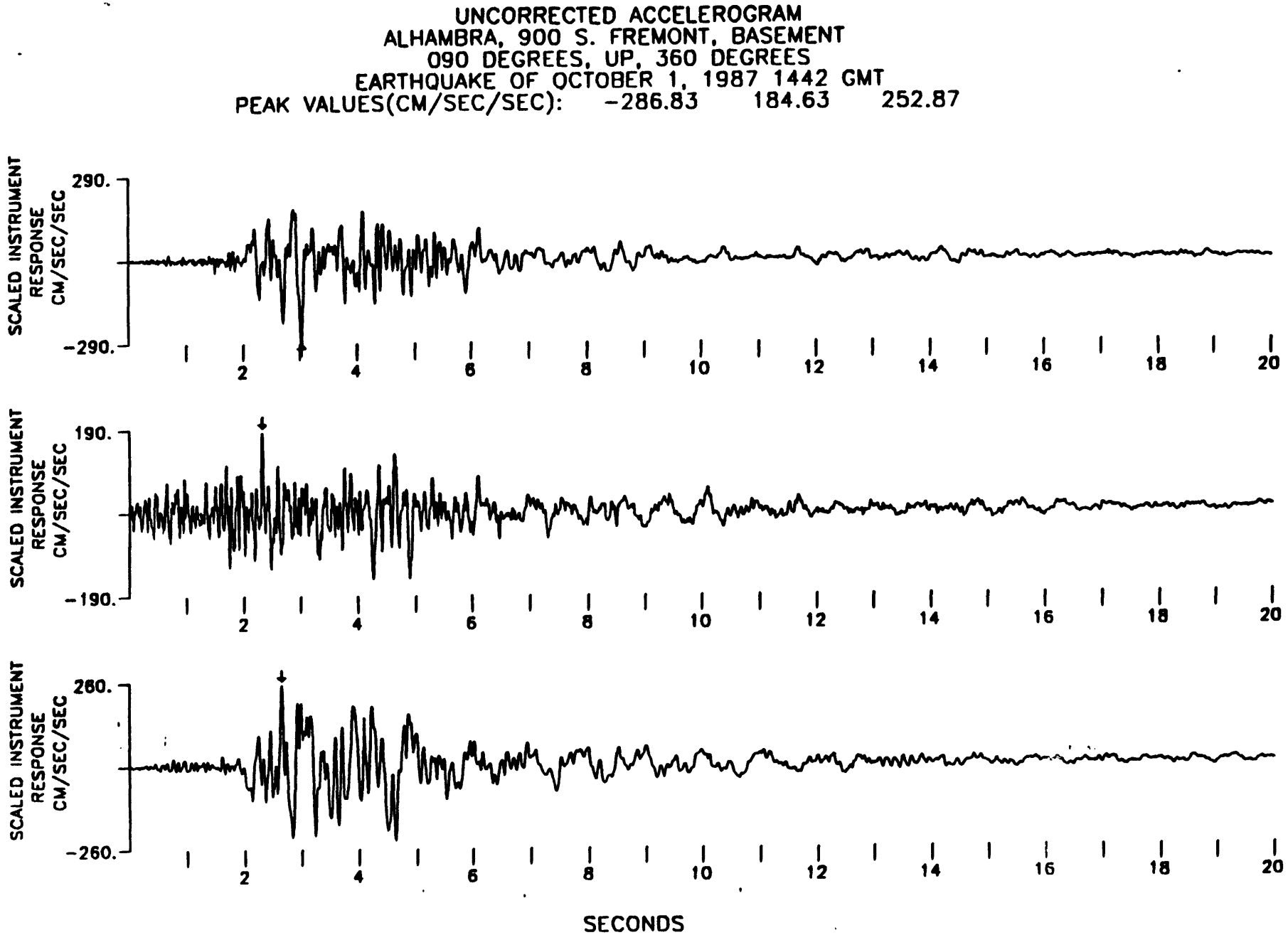
240.
-240.
2
4
6
8
10
12
14
16
18
20
SECONDS


UNCORRECTED ACCELEROGRAM
ALHAMBRA, 900 S. FREMONT, BASEMENT
090 DEGREES, UP, 360 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
PEAK VALUES(CM/SEC/SEC): -286.83 184.63 252.87
SCALED INSTRUMENT RESPONSE CM/SEC/SEC
290.
-290.
190.
-190.
260.
-260.
2
4
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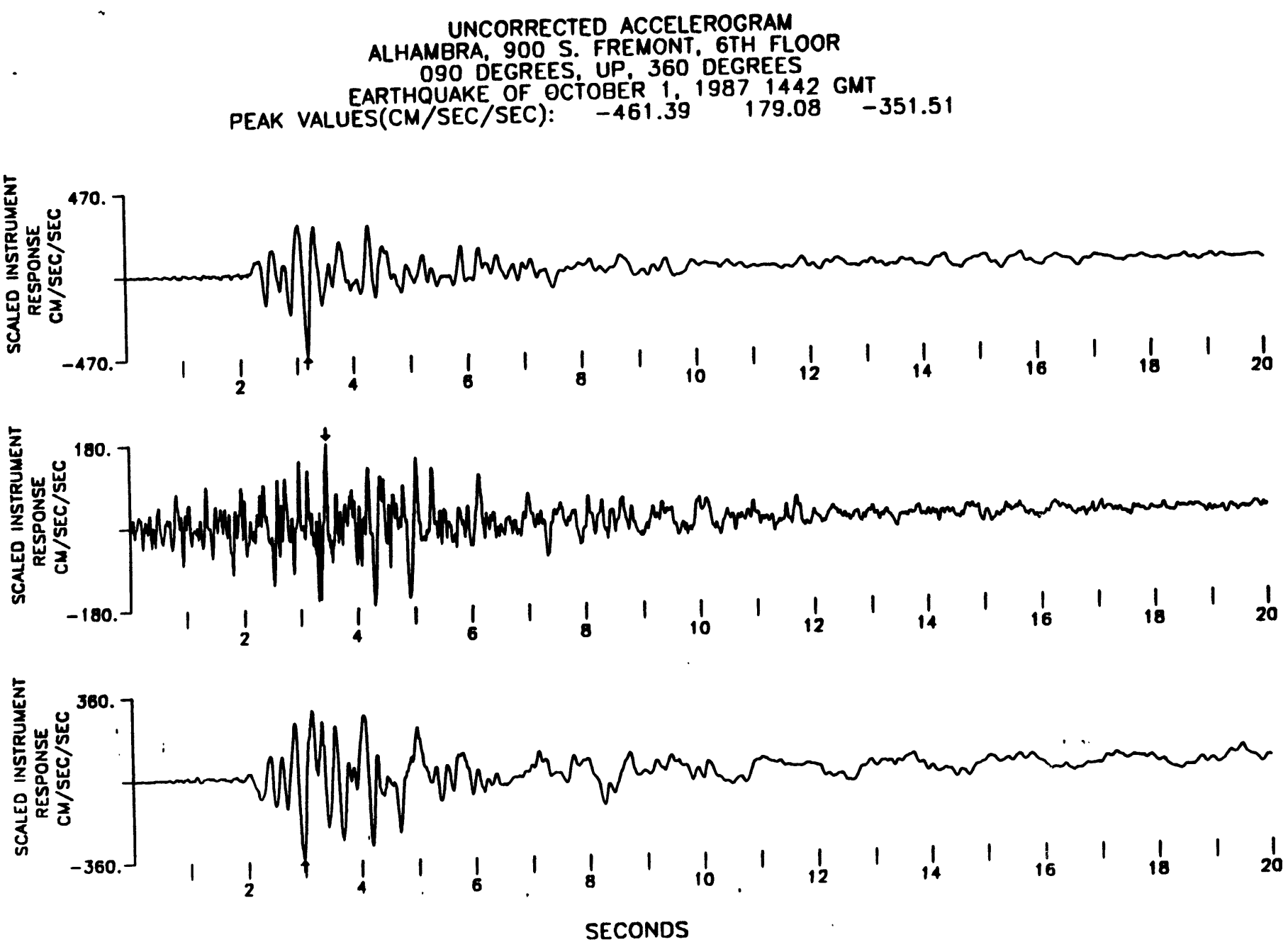
8
10
12
14
16
18
20
SECONDS


UNCORRECTED ACCELEROGRAM
ALHAMBRA, 900 S. FREMONT, 6TH FLOOR
090 DEGREES, UP, 360 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
PEAK VALUES(CM/SEC/SEC): -461.39 179.08 -351.51
SCALED INSTRUMENT RESPONSE CM/SEC/SEC
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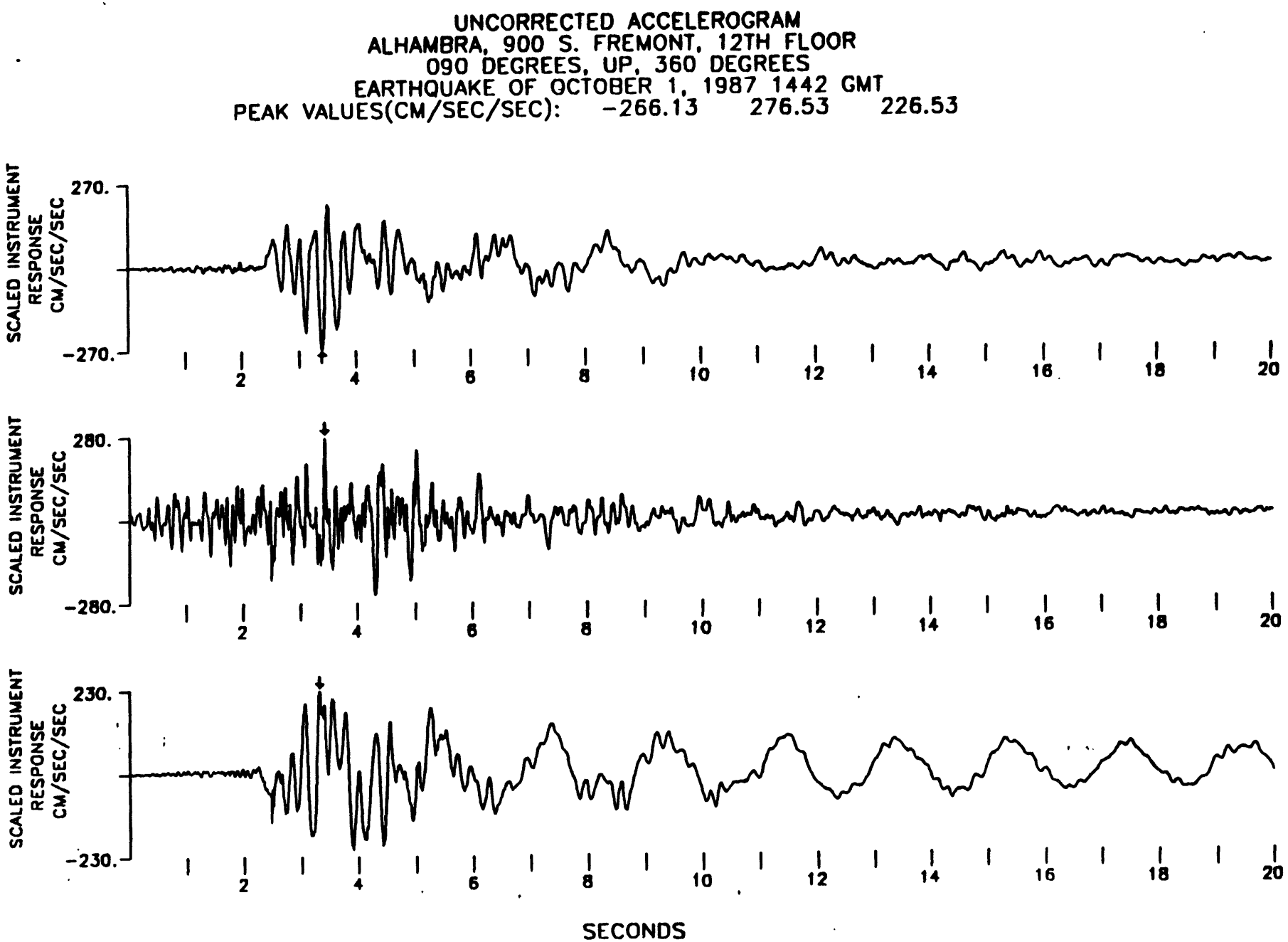
-180.
360.
-360.
2
4
6
8
10
12
14
16
18
20
SECONDS


UNCORRECTED ACCELEROGRAM
ALHAMBRA, 900 S. FREMONT, 12TH FLOOR
090 DEGREES, UP, 360 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
PEAK VALUES(CM/SEC/SEC): -266.13 276.53 226.53
SCALED INSTRUMENT RESPONSE CM/SEC/SEC
270.
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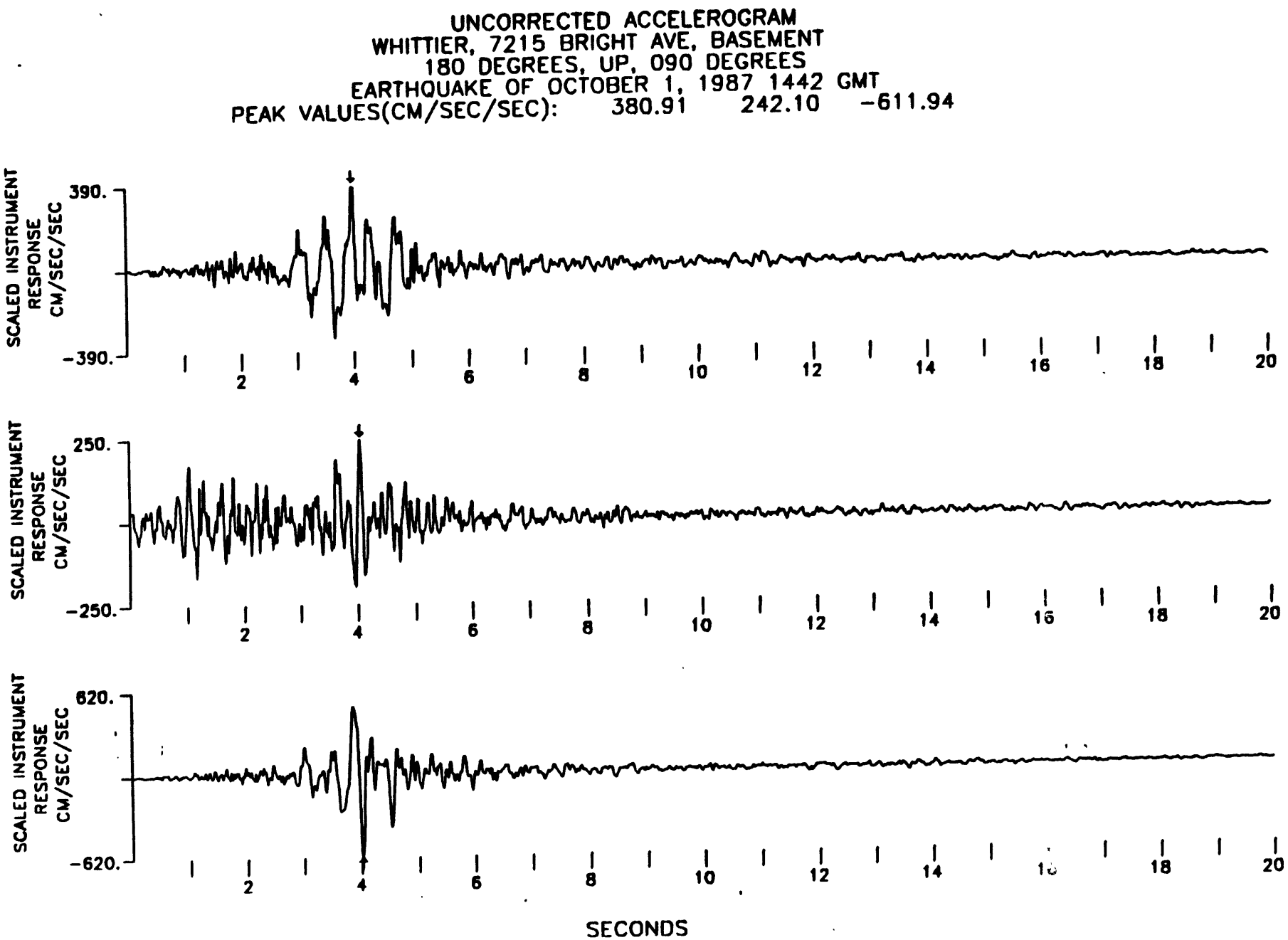
230.
-230.
2
4
6
8
10
12
14
16
18
20
SECONDS


UNCORRECTED ACCELEROGRAM
WHITTIER, 7215 BRIGHT AVE, BASEMENT
180 DEGREES, UP, 090 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
PEAK VALUES(CM/SEC/SEC): 380.91 242.10 -611.94
SCALED INSTRUMENT RESPONSE CM/SEC/SEC
390.
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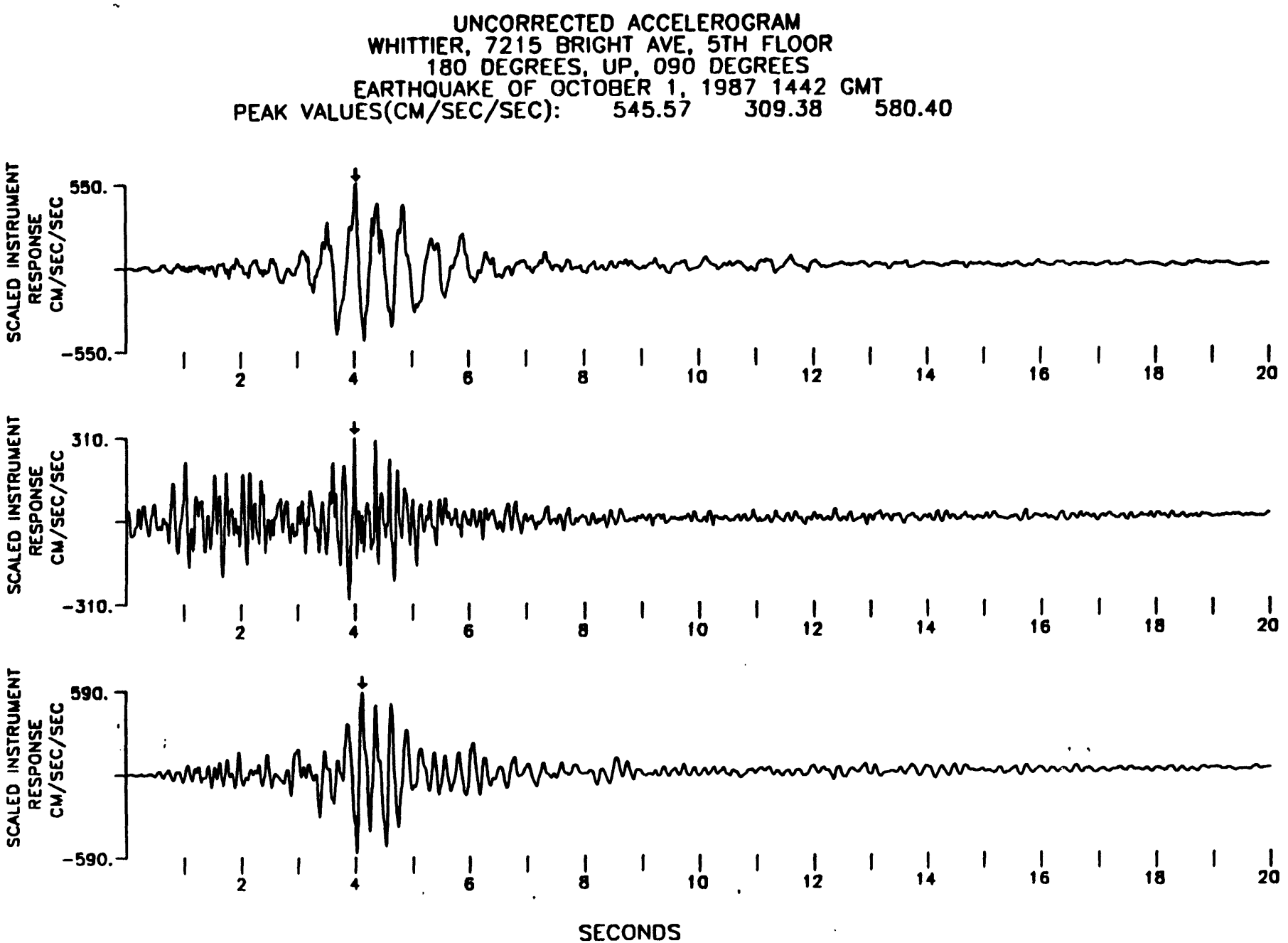
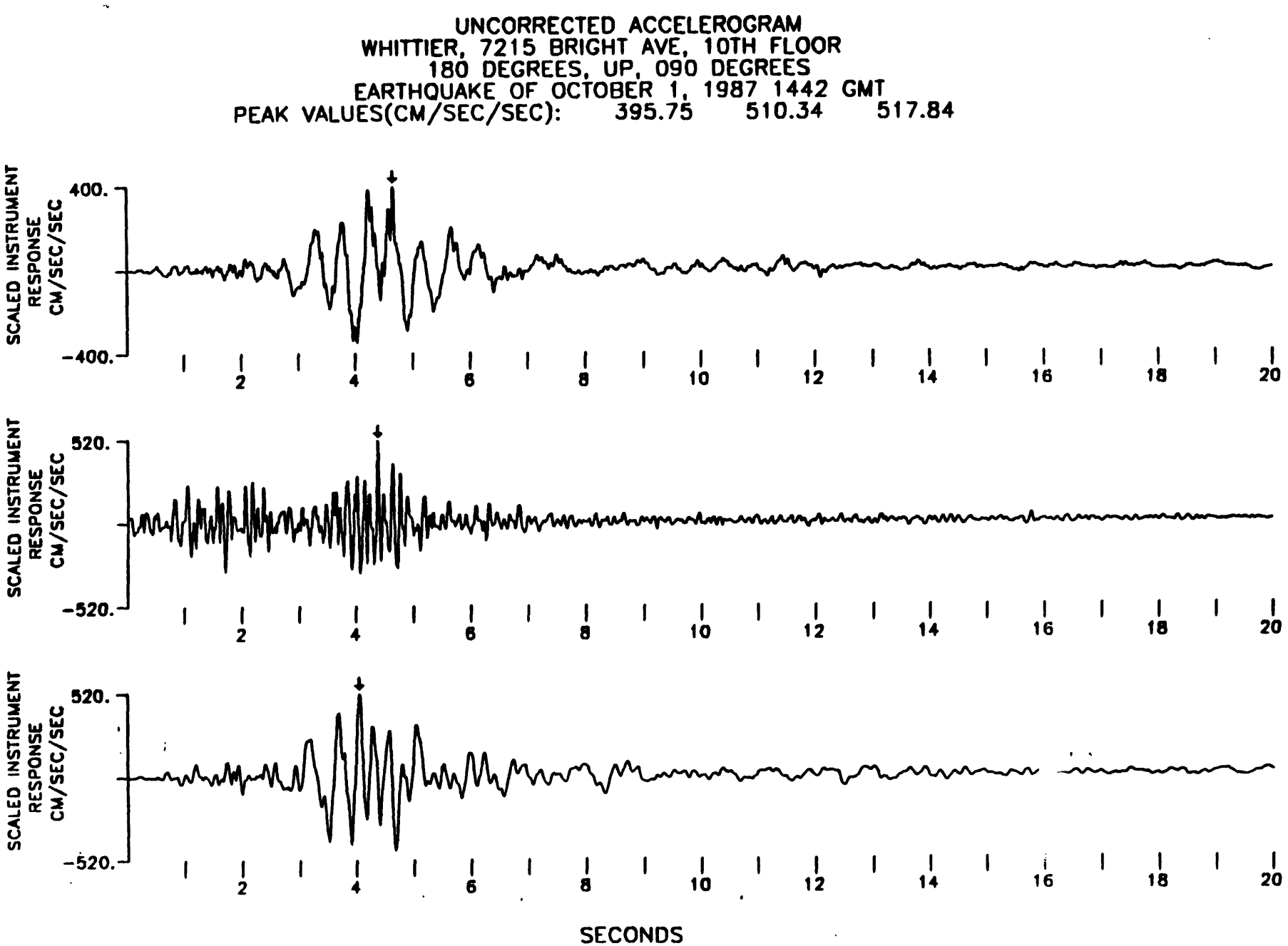
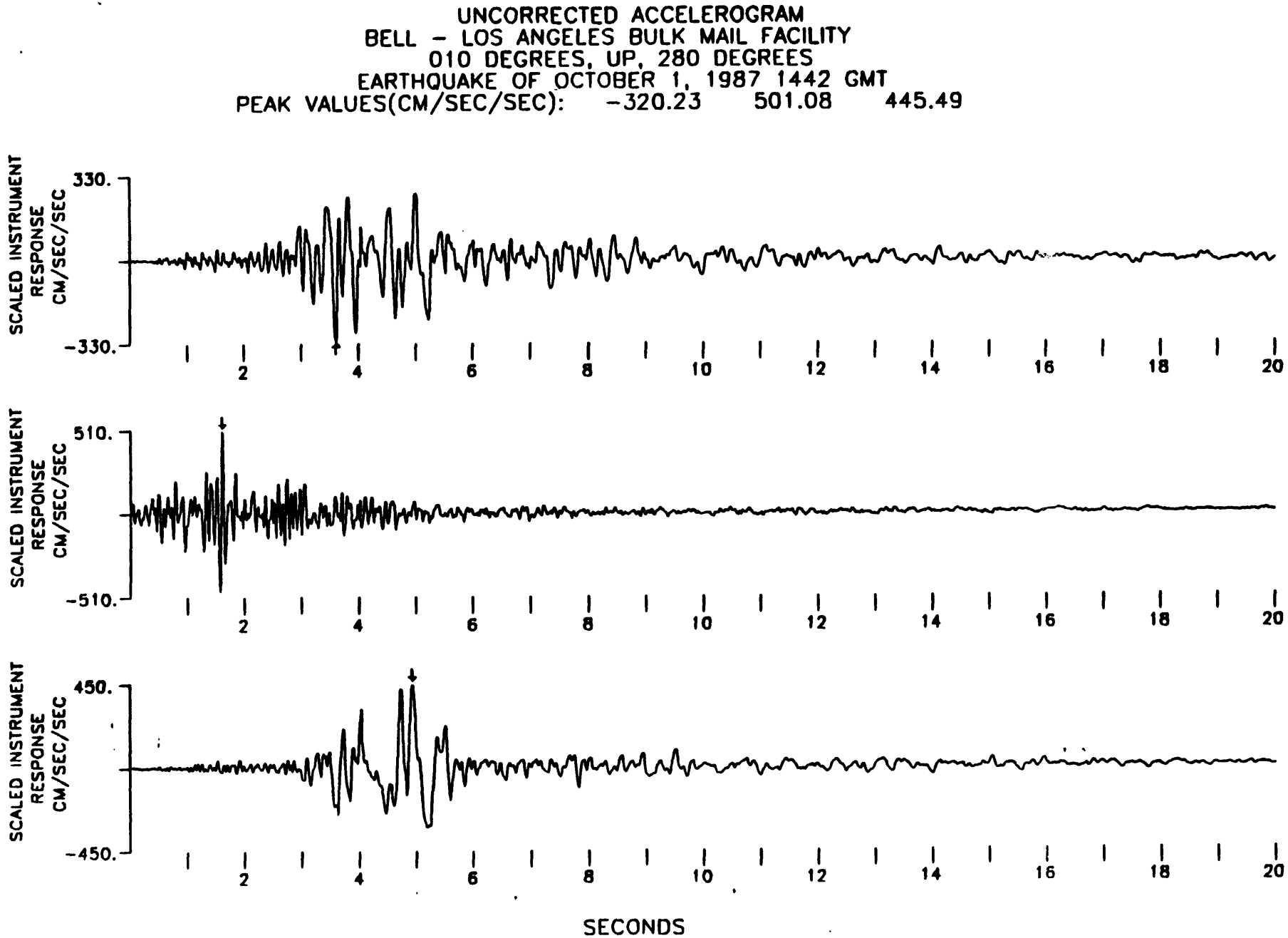
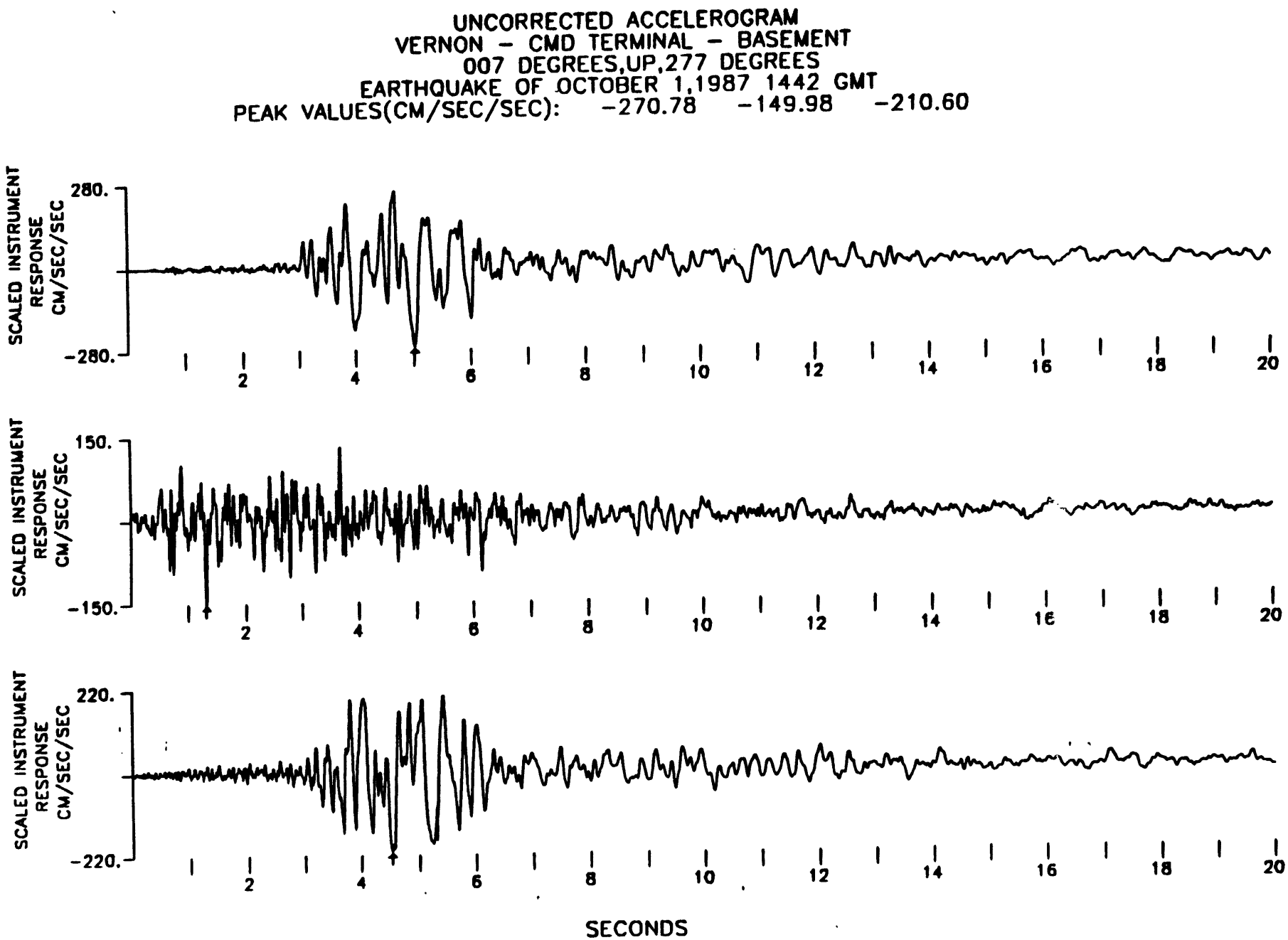
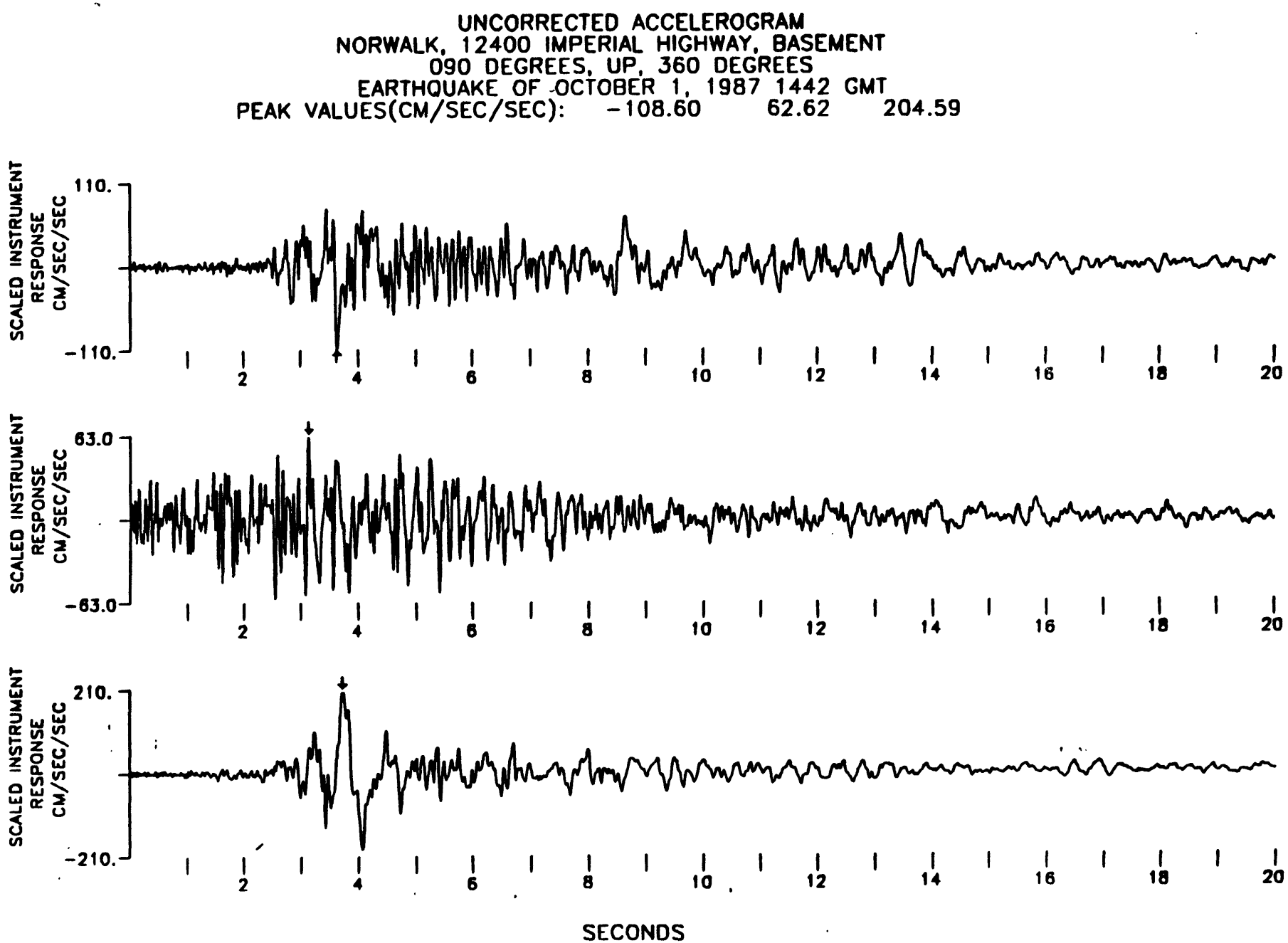
250.
-250.
620.
-620.
2
4
6
8
10
12
14
16
18
20
SECONDS

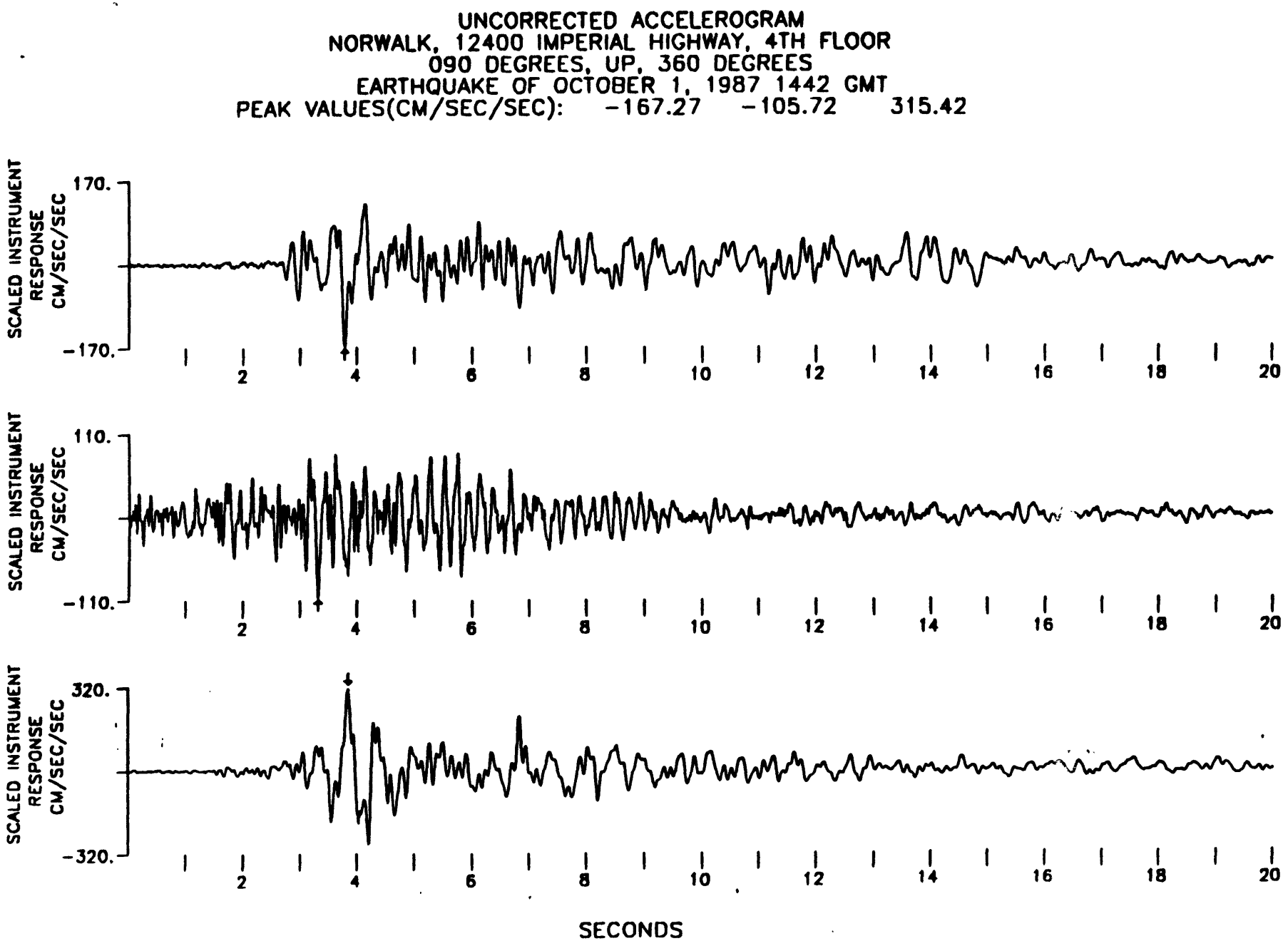

UNCORRECTED ACCELEROGRAM
WHITTIER, 7215 BRIGHT AVE, 5TH FLOOR
180 DEGREES, UP, 090 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
PEAK VALUES(CM/SEC/SEC): 545.57 309.38 580.40
SCALED INSTRUMENT RESPONSE CM/SEC/SEC
550.
-550.
310.
-310.
590.
-590.
2
4
6
8
10
12
14
16
18
20
SECONDS

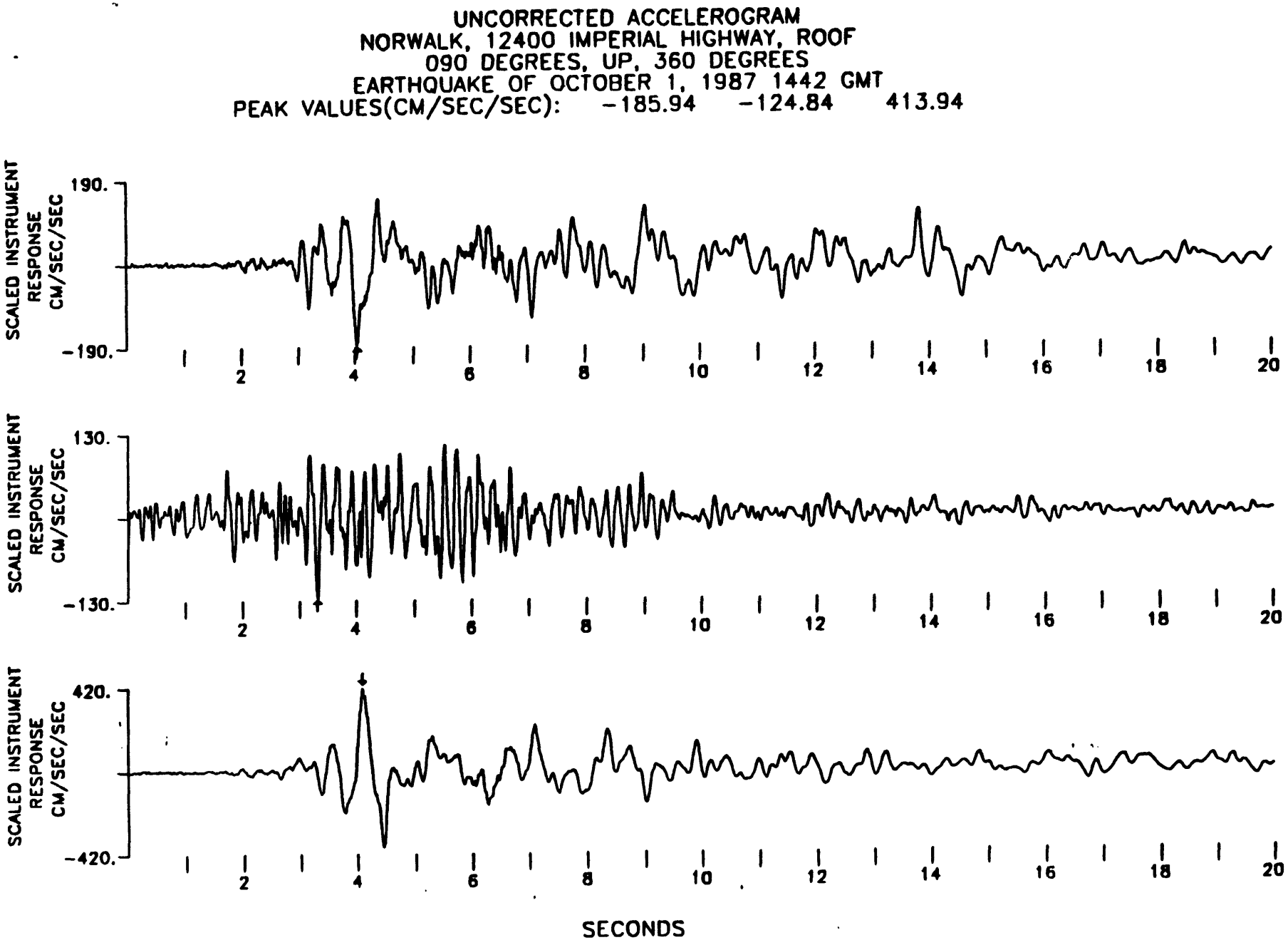

UNCORRECTED ACCELEROGRAM
WHITTIER, 7215 BRIGHT AVE, 10TH FLOOR
180 DEGREES, UP, 090 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
PEAK VALUES(CM/SEC/SEC): 395.75 510.34 517.84
SCALED INSTRUMENT RESPONSE CM/SEC/SEC
400.
-400.
520.
-520.
2
4
6
8
10
12
14
16
18
20
SECONDS

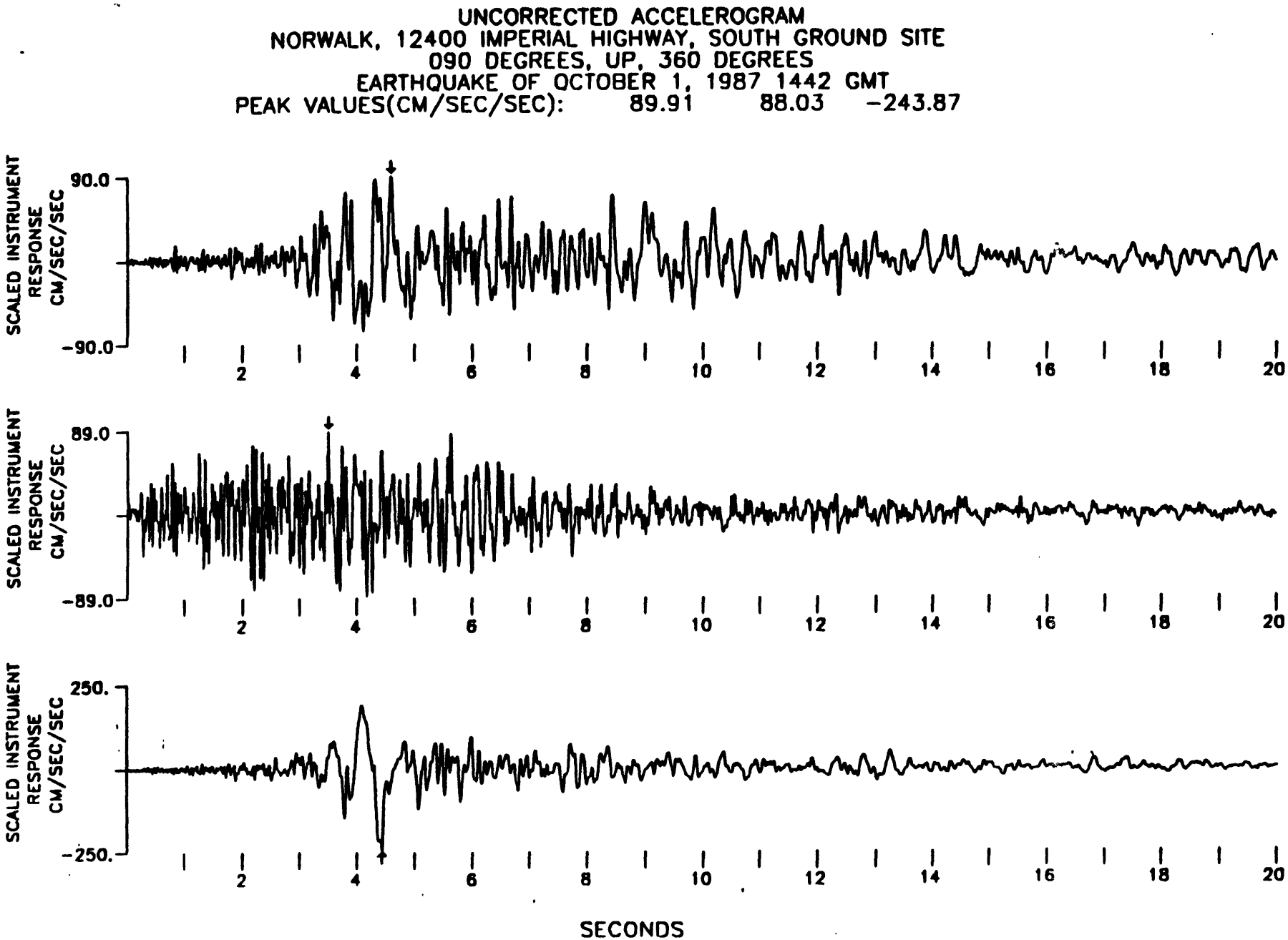

UNCORRECTED ACCELEROGRAM
BELL - LOS ANGELES BULK MAIL FACILITY
010 DEGREES, UP, 280 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
PEAK VALUES(CM/SEC/SEC): -320.23 501.08 445.49
SCALED INSTRUMENT RESPONSE CM/SEC/SEC
330.
-330.
510.
-510.
450.
-450.
2
4
6
8
10
12
14
16
18
20
SECONDS


UNCORRECTED ACCELEROGRAM
VERNON - CMD TERMINAL - BASEMENT
007 DEGREES,UP,277 DEGREES
EARTHQUAKE OF OCTOBER 1,1987 1442 GMT
PEAK VALUES(CM/SEC/SEC): -270.78 -149.98 -210.60
SCALED INSTRUMENT RESPONSE CM/SEC/SEC
280.
-280.
150.
-150.
220.
-220.
2
4
6
8
10
12
14
16
18
20
SECONDS


UNCORRECTED ACCELEROGRAM
NORWALK, 12400 IMPERIAL HIGHWAY, BASEMENT
090 DEGREES, UP, 360 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
PEAK VALUES(CM/SEC/SEC): -108.60 62.62 204.59
SCALED INSTRUMENT RESPONSE CM/SEC/SEC
110.
-110.
63.0
-63.0
210.
-210.
2
4
6
8
10
12
14
16
18
20
SECONDS


UNCORRECTED ACCELEROGRAM
NORWALK, 12400 IMPERIAL HIGHWAY, 4TH FLOOR
090 DEGREES, UP, 360 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
PEAK VALUES(CM/SEC/SEC): -167.27 -105.72 315.42
SCALED INSTRUMENT RESPONSE CM/SEC/SEC
170.
-170.
110.
-110.
320.
-320.
2
4
6
8
10
12
14
16
18
20
SECONDS

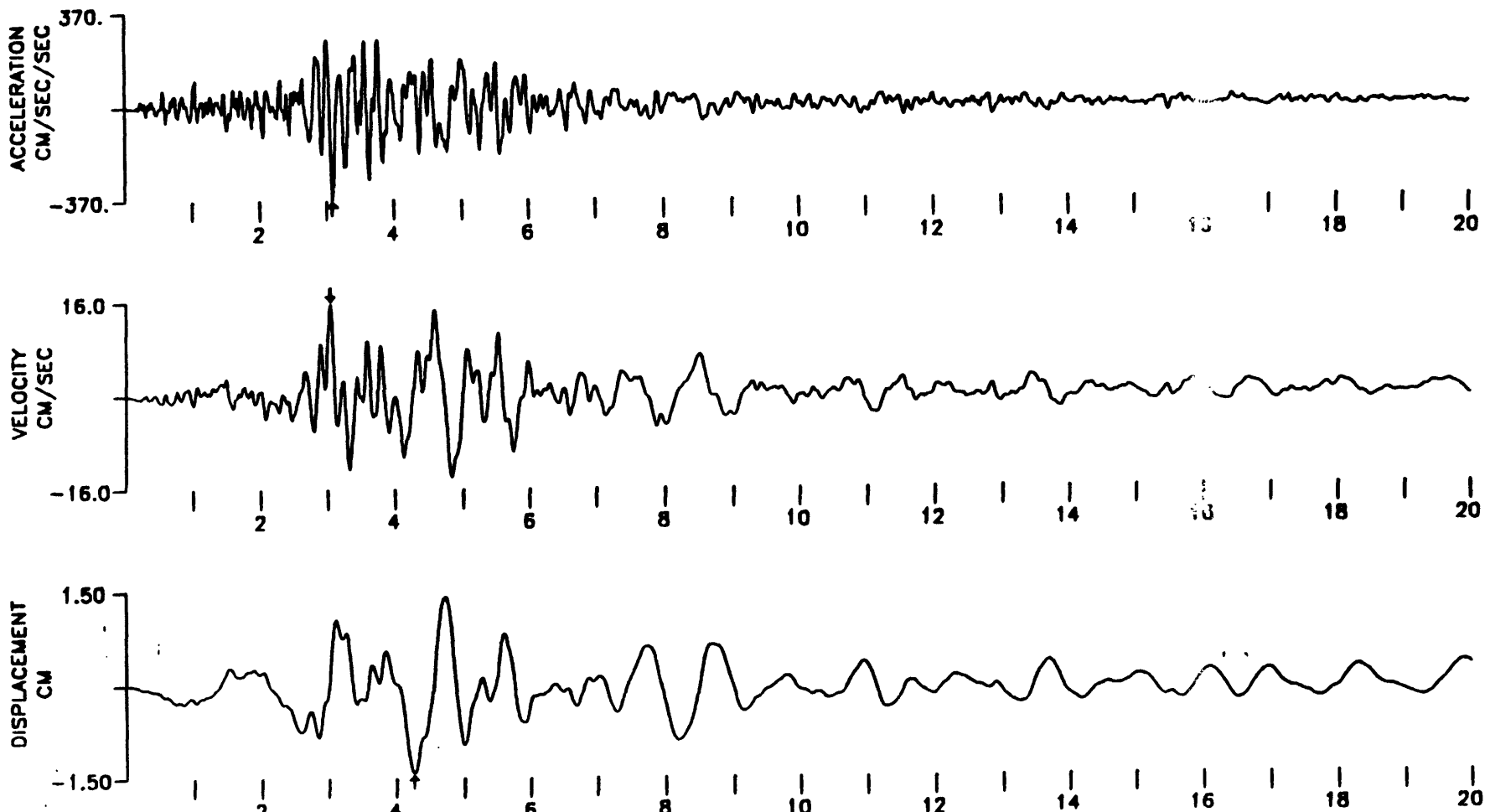

UNCORRECTED ACCELEROGRAM
NORWALK, 12400 IMPERIAL HIGHWAY, ROOF
090 DEGREES, UP, 360 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
PEAK VALUES(CM/SEC/SEC): -185.94 -124.84 413.94
SCALED INSTRUMENT RESPONSE CM/SEC/SEC
190.
-190.
130.
-130.
420.
-420.
2
4
6
8
10
12
14
16
18
20
SECONDS


UNCORRECTED ACCELEROGRAM
NORWALK, 12400 IMPERIAL HIGHWAY, SOUTH GROUND SITE
090 DEGREES, UP, 360 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
PEAK VALUES(CM/SEC/SEC): 89.91 88.03 -243.87
SCALED INSTRUMENT RESPONSE CM/SEC/SEC
90.0
-90.0
89.0
-89.0
250.
-250.
2
4
6
8
10
12
14
16
18
20
SECONDS

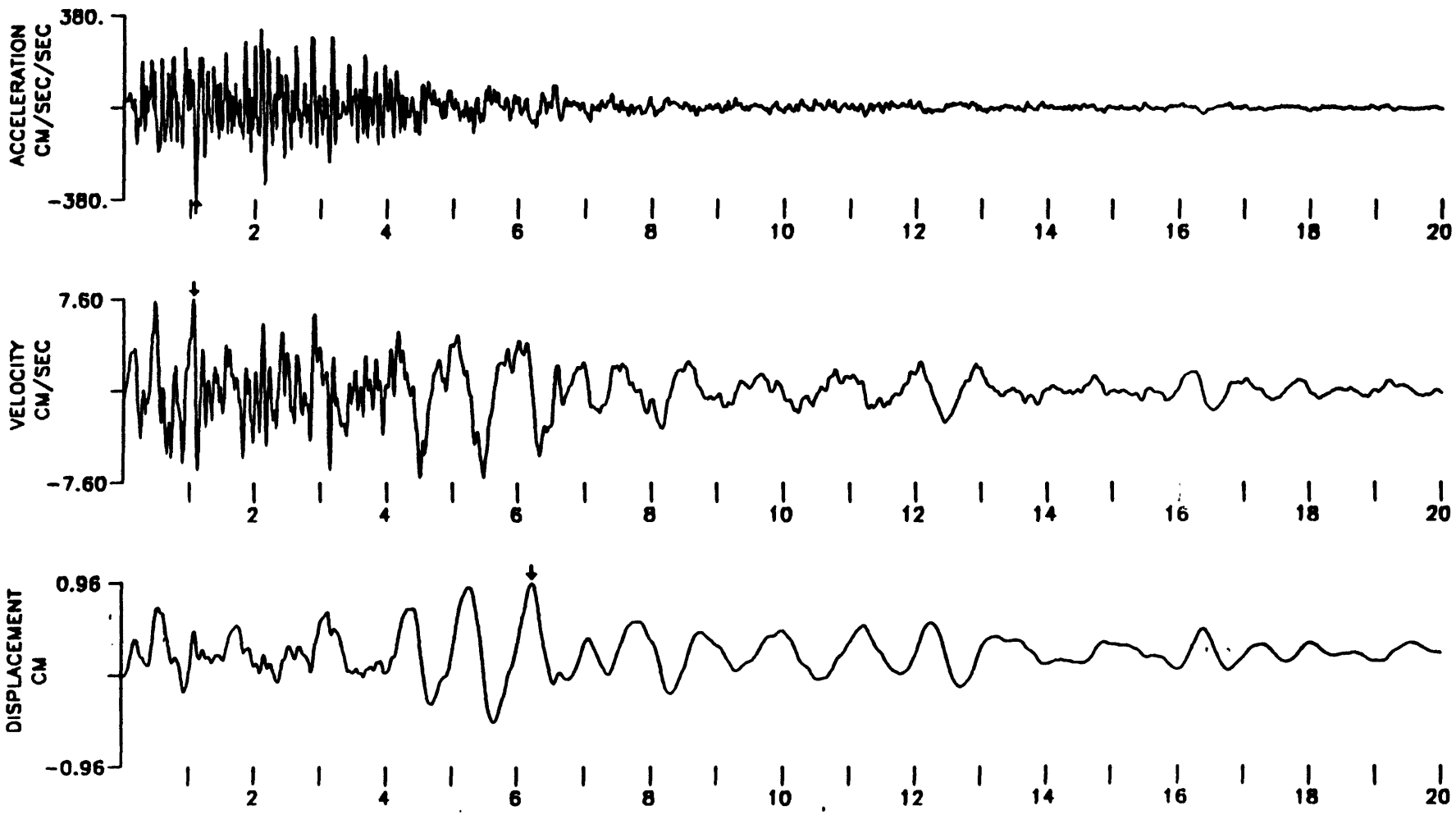
Appendix 2

Corrected acceleration, velocity, displacement

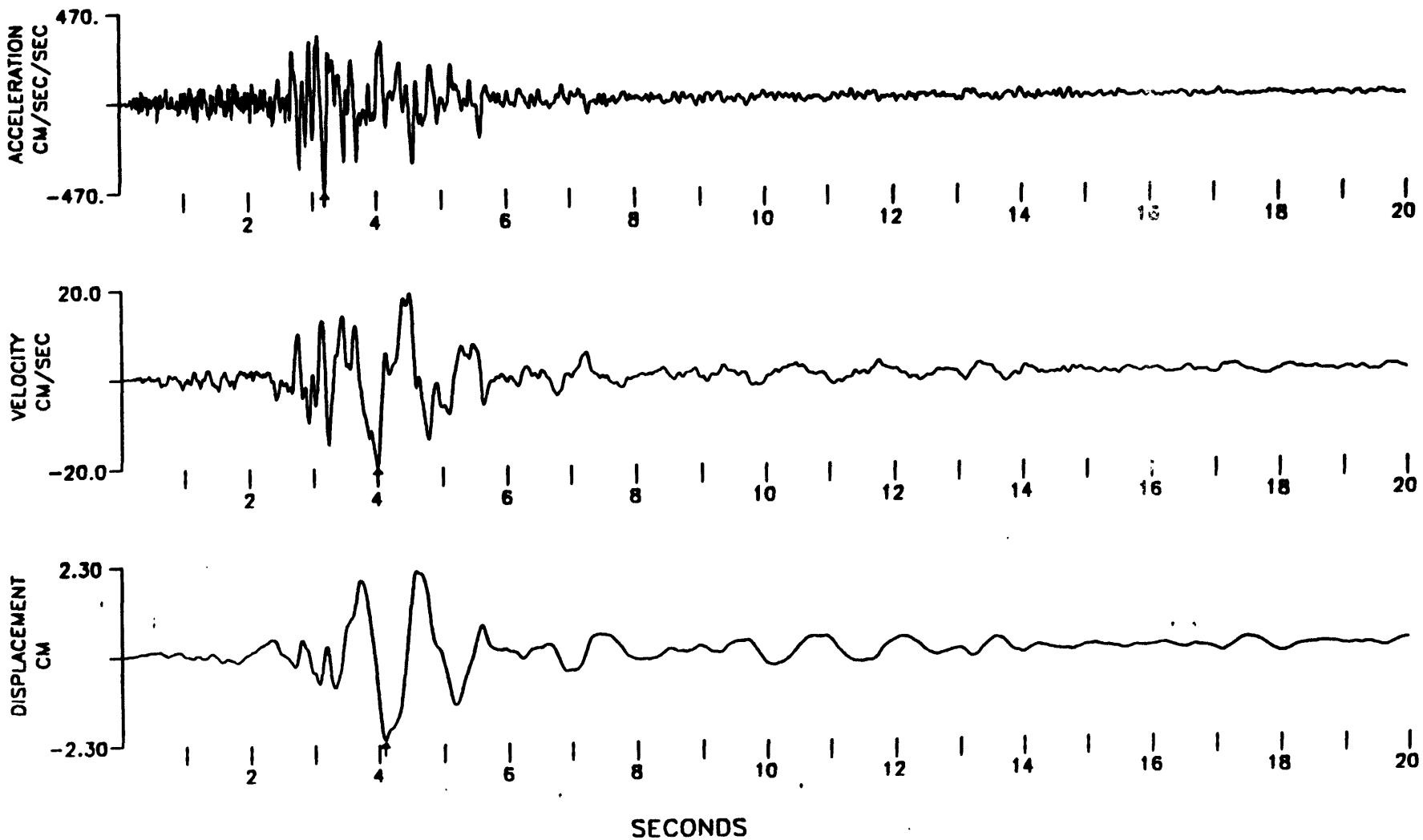
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
GARVEY RESERVOIR - CONTROL BUILDING
060 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT .5 HZ, ORDER 4
PEAK VALUES: ACCEL=-367.12 CM/SEC/SEC, VELOCITY=15.40 CM/SEC, DISPL=-1.42 CM

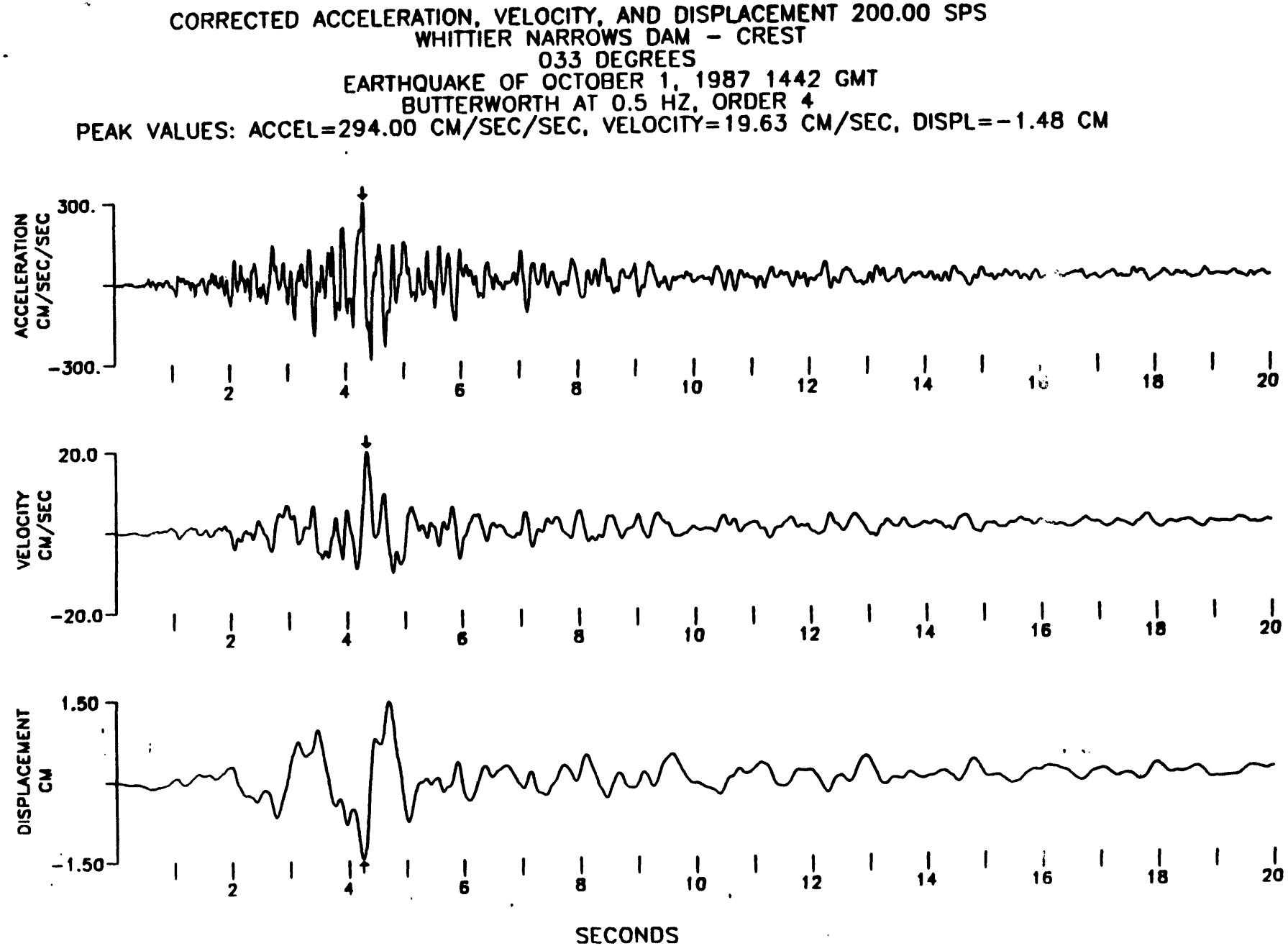


CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
GARVEY RESERVOIR - CONTROL BUILDING
UP
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT .5 HZ, ORDER 4
PEAK VALUES: ACCEL=-373.48 CM/SEC/SEC, VELOCITY=7.56 CM/SEC, DISPL=0.96 CM

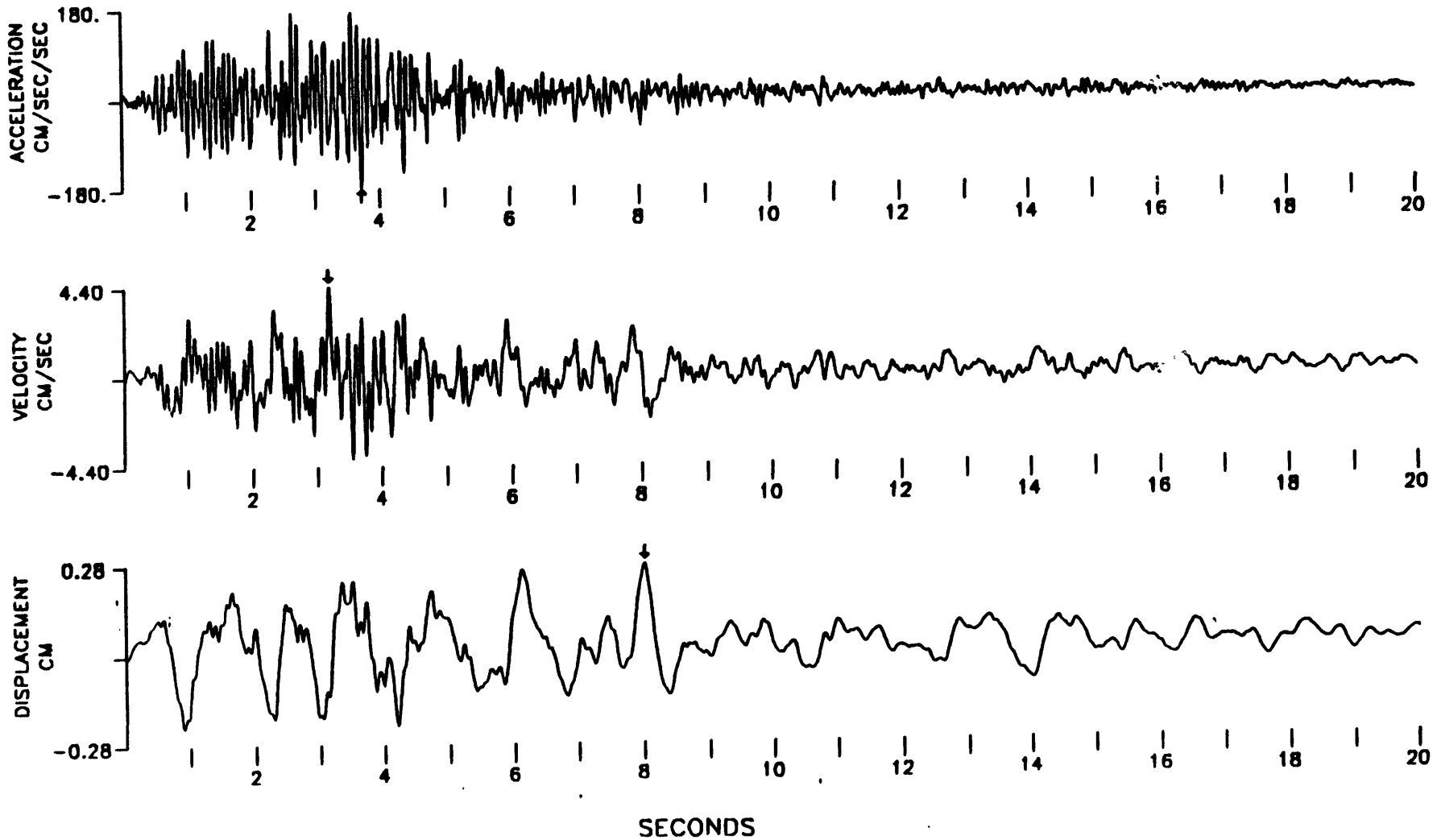


CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
GARVEY RESERVOIR – CONTROL BUILDING
330 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT .5 HZ, ORDER 4
PEAK VALUES: ACCEL=-468.19 CM/SEC/SEC, VELOCITY=-19.78 CM/SEC, DISPL=-2.21 CM

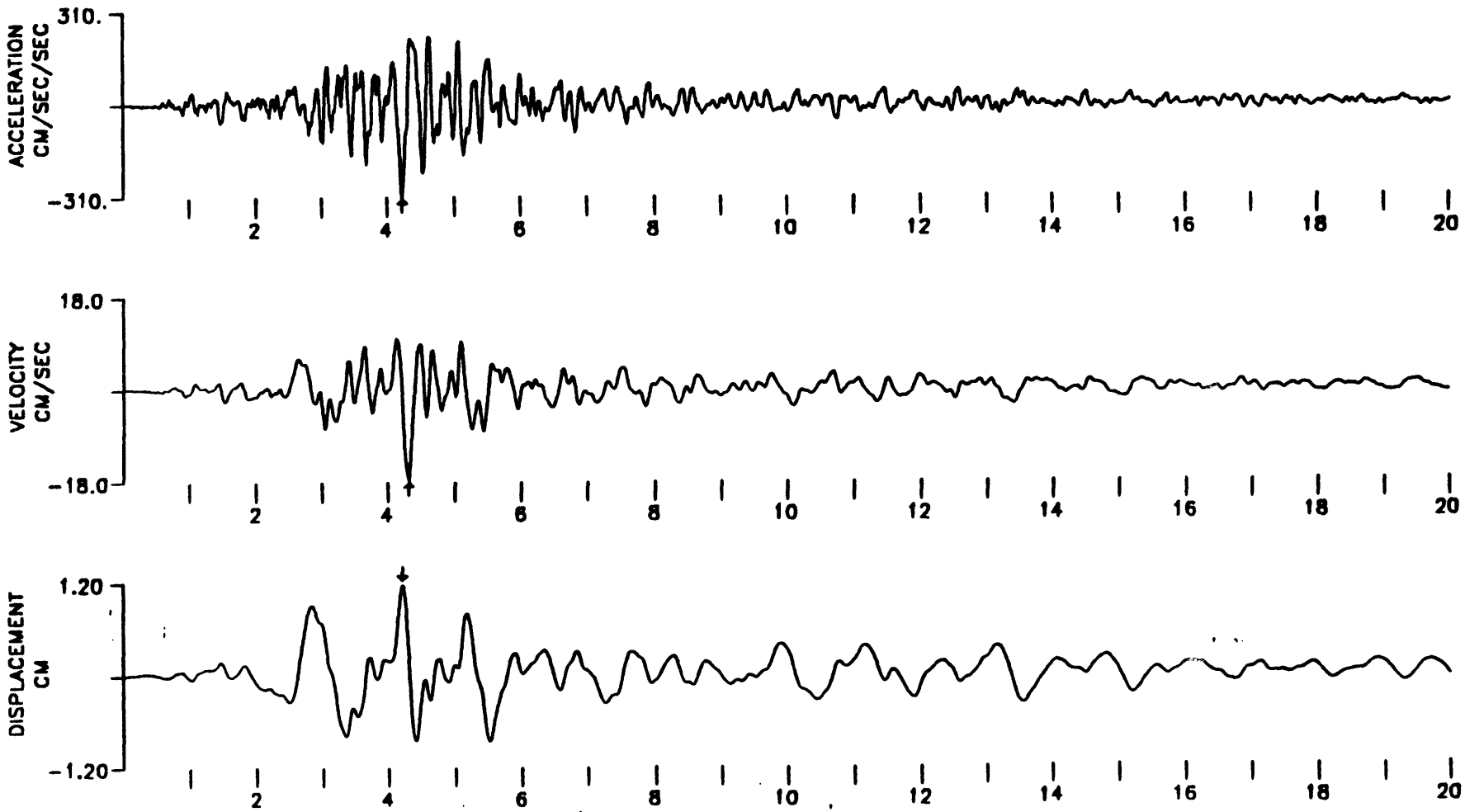



CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
WHITTIER NARROWS DAM - CREST
033 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT 0.5 HZ, ORDER 4
PEAK VALUES: ACCEL=294.00 CM/SEC/SEC, VELOCITY=19.63 CM/SEC, DISPL=-1.48 CM
ACCELERATION CM/SEC/SEC
300.
-300.
VELOCITY CM/SEC
20.0
-20.0
DISPLACEMENT CM
1.50
-1.50
2
4
6
8
10
12
14
16
18
20
SECONDS

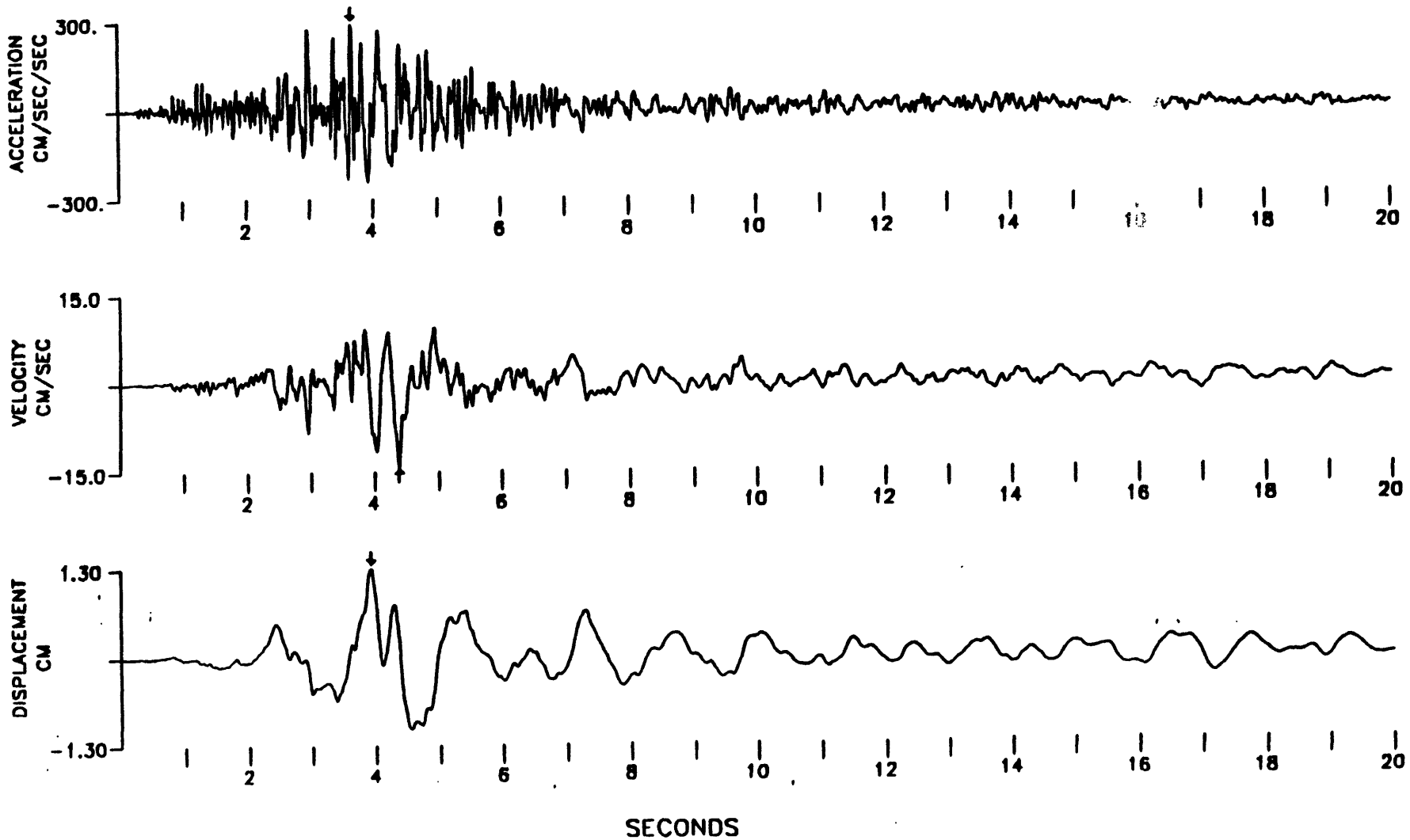
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
WHITTIER NARROWS DAM - CREST
UP
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT 0.5 HZ, ORDER 4
PEAK VALUES: ACCEL=-177.02 CM/SEC/SEC, VELOCITY=4.39 CM/SEC, DISPL=0.27 CM



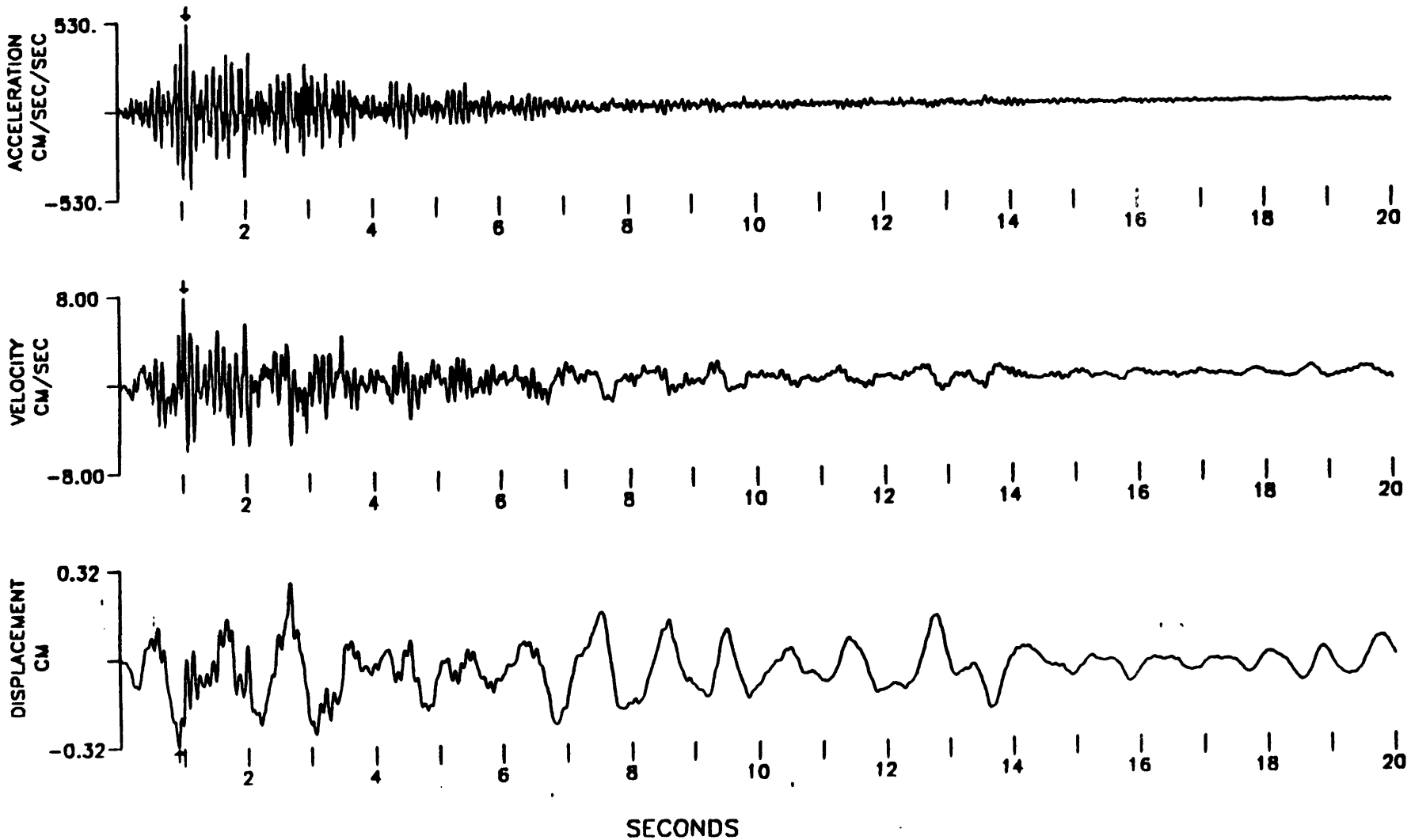
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
WHITTIER NARROWS DAM - CREST
303 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT 0.5 HZ, ORDER 4
PEAK VALUES: ACCEL=-308.33 CM/SEC/SEC, VELOCITY=-17.46 CM/SEC, DISPL=1.18 CM



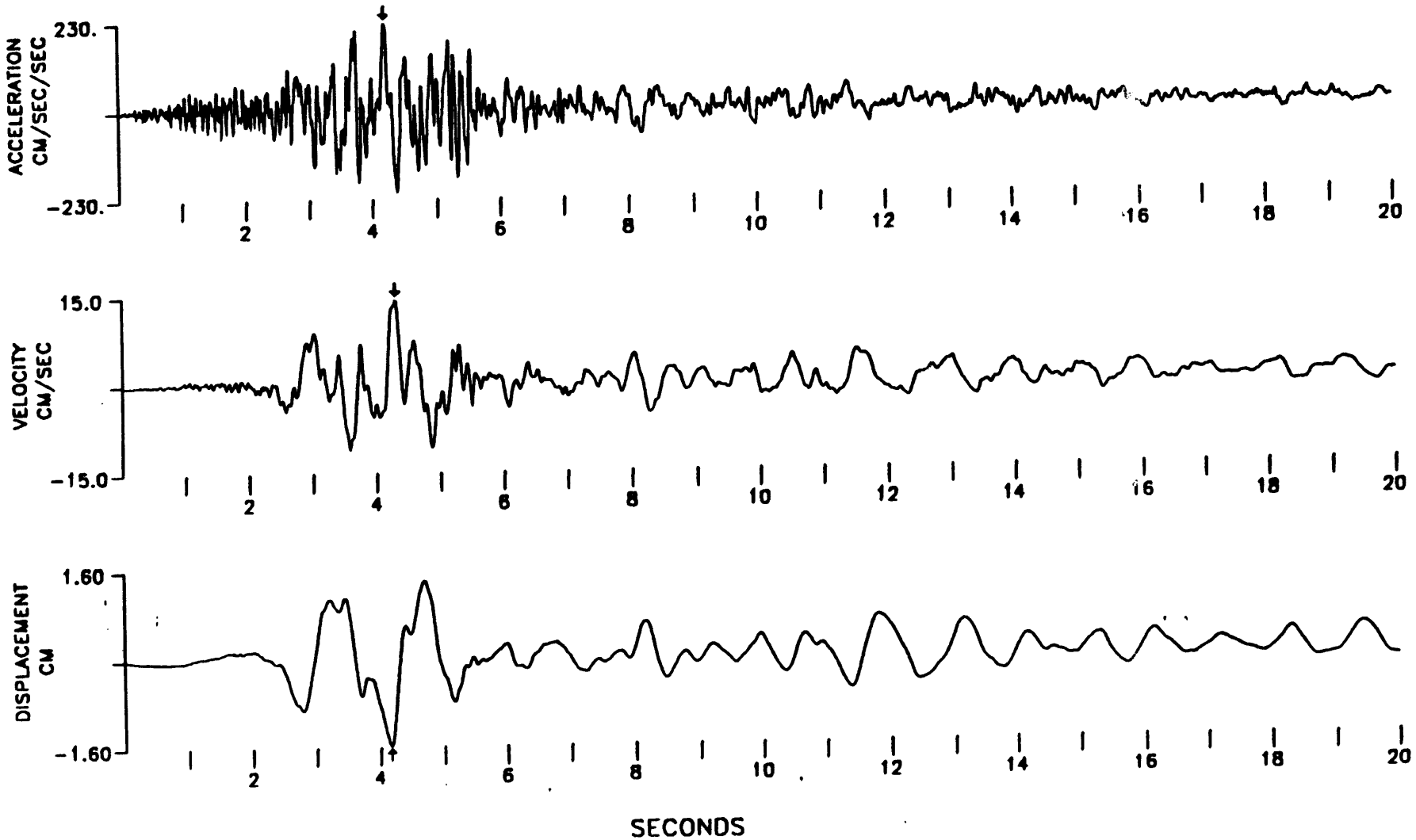
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
WHITTIER NARROWS DAM - UPSTREAM
152 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT 0.5 HZ, ORDER 4
PEAK VALUES: ACCEL=291.17 CM/SEC/SEC, VELOCITY=-14.14 CM/SEC, DISPL=1.30 CM



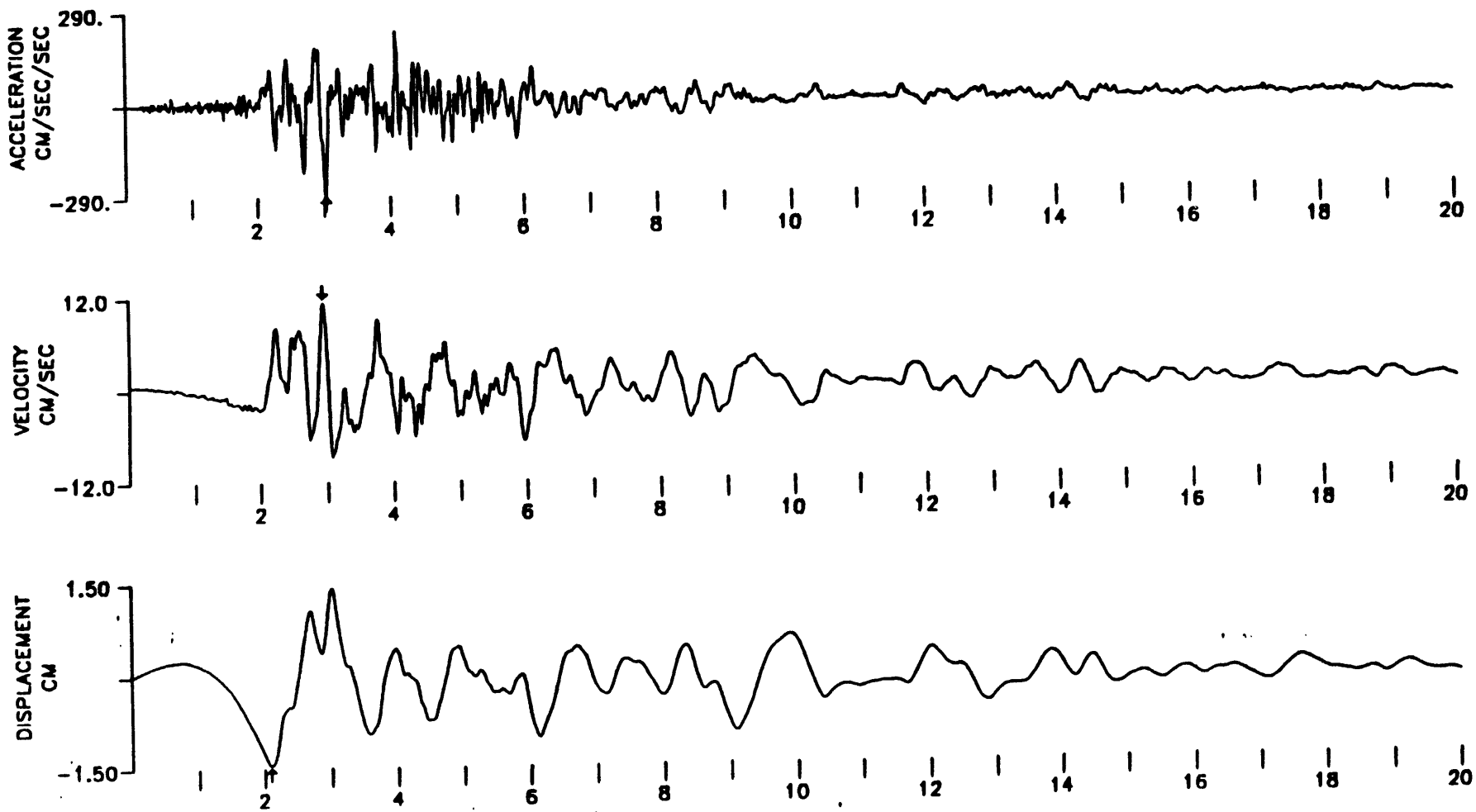
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
WHITTIER NARROWS DAM - UPSTREAM
UP
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT 0.5 HZ, ORDER 4
PEAK VALUES: ACCEL=521.03 CM/SEC/SEC, VELOCITY=7.94 CM/SEC, DISPL=-0.32 CM

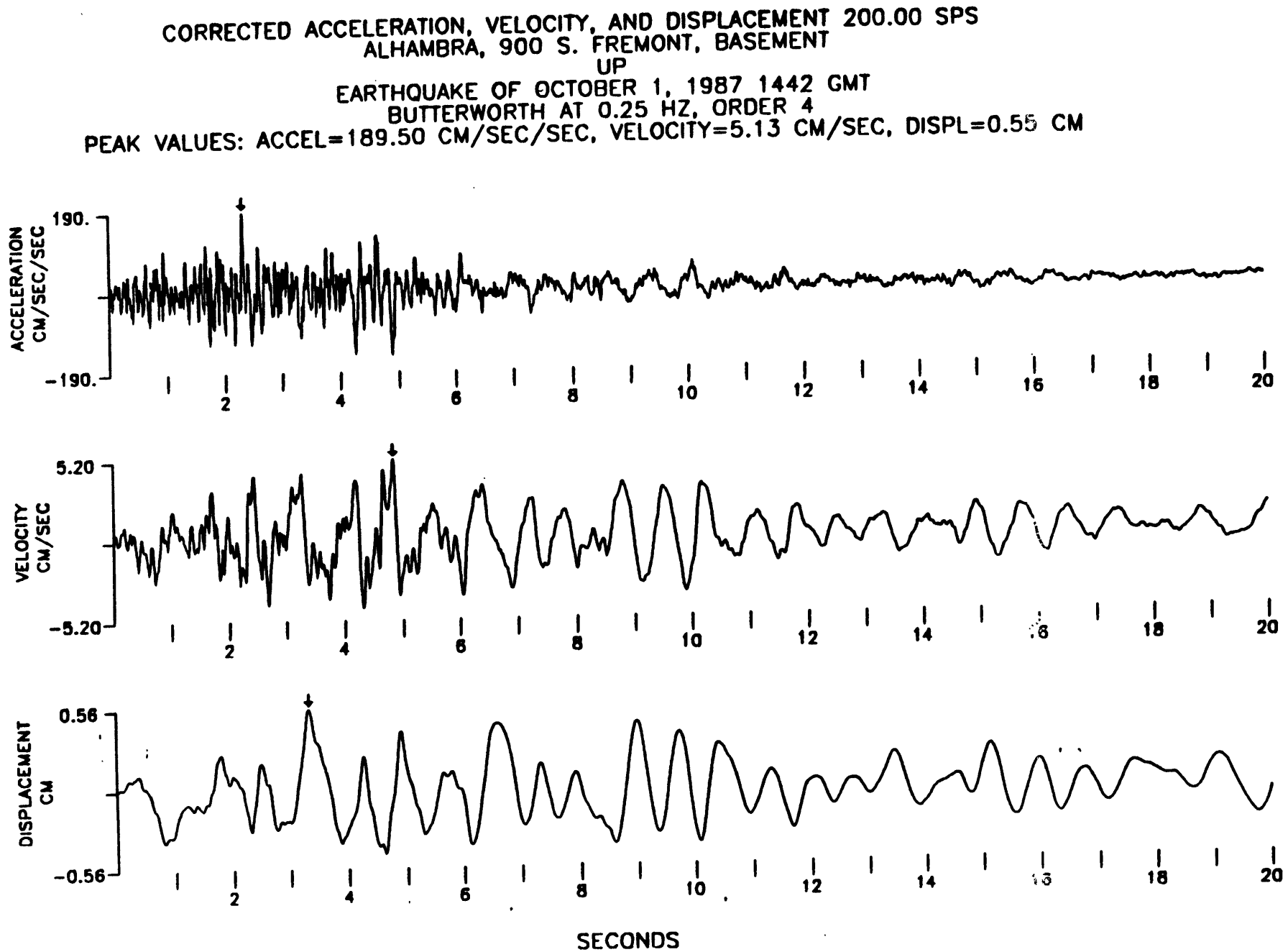


CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
WHITTIER NARROWS DAM - UPSTREAM
062 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT 0.5 HZ, ORDER 4
PEAK VALUES: ACCEL=225.36 CM/SEC/SEC, VELOCITY=14.19 CM/SEC, DISPL=-1.59 CM

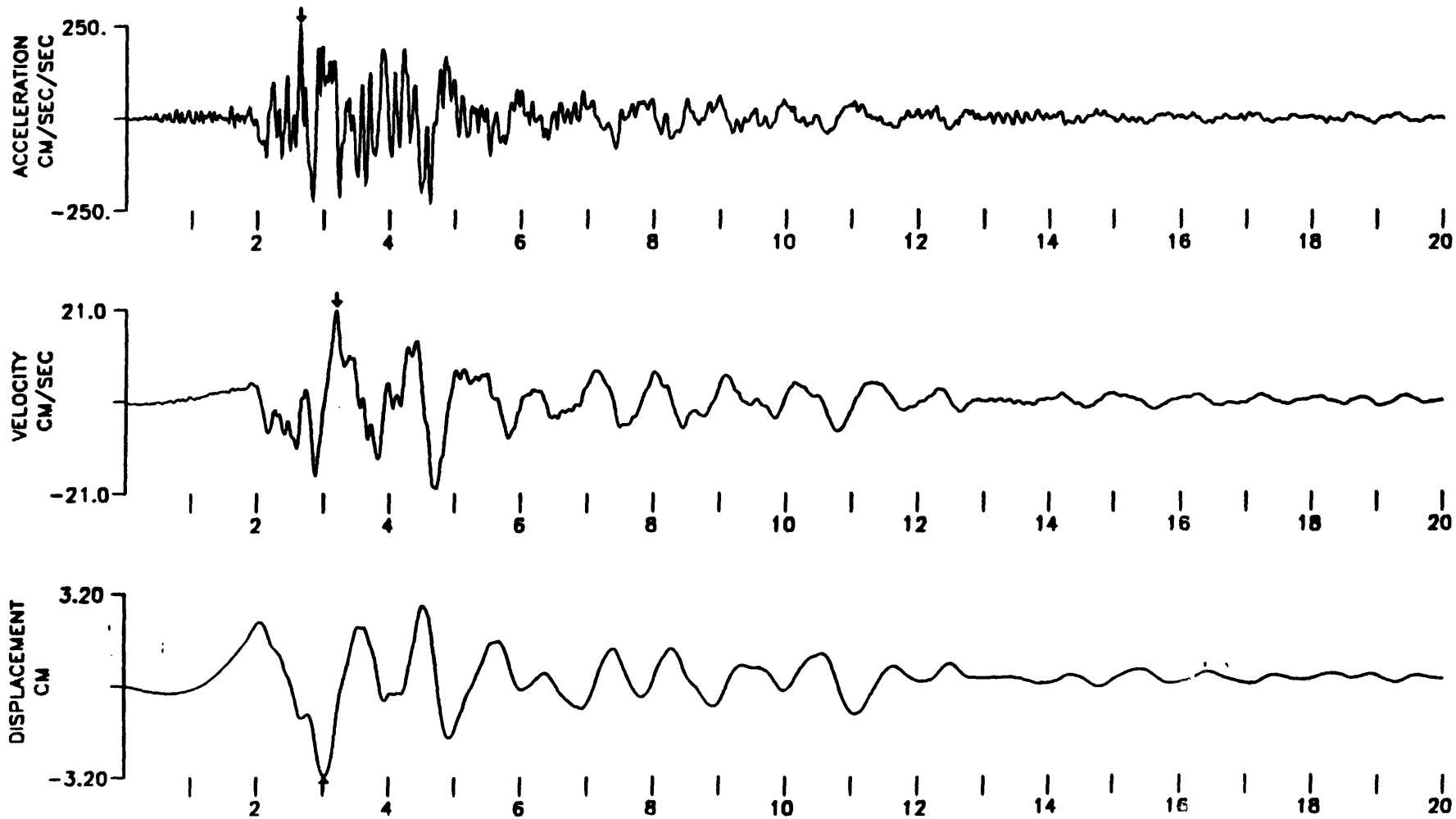


CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
ALHAMBRA, 900 S. FREMONT, BASEMENT
090 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
PEAK VALUES: ACCEL=-284.15 CM/SEC/SEC, VELOCITY=11.26 CM/SEC, DISPL=-1.46 CM

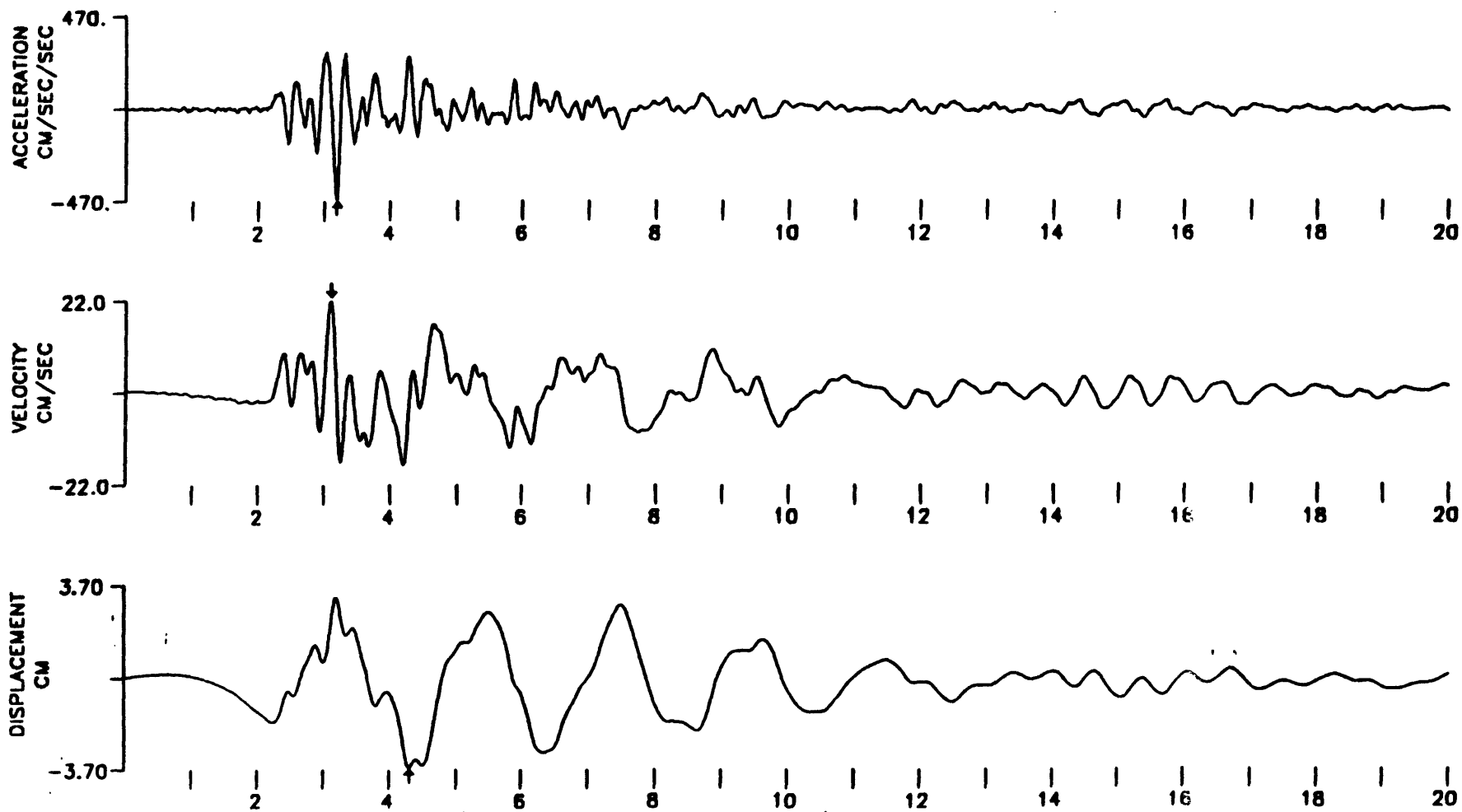



CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
ALHAMBRA, 900 S. FREMONT, BASEMENT
UP
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
PEAK VALUES: ACCEL=189.50 CM/SEC/SEC, VELOCITY=5.13 CM/SEC, DISPL=0.55 CM
ACCELERATION CM/SEC/SEC
190.
-190.
VELOCITY CM/SEC
5.20
-5.20
DISPLACEMENT CM
0.56
-0.56
2
4
6
8
10
12
14
16
18
20
SECONDS

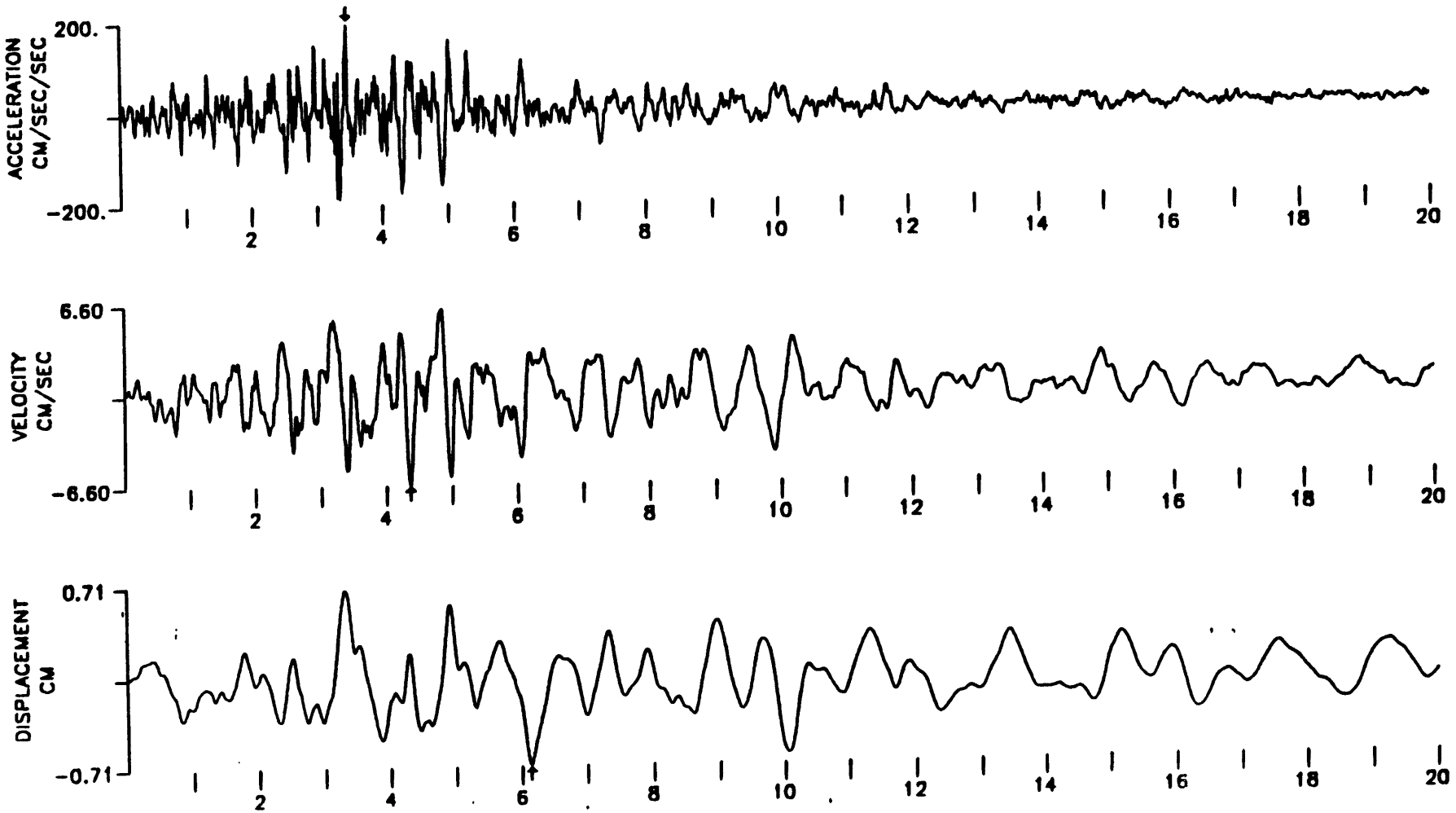
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
ALHAMBRA, 900 S. FREMONT, BASEMENT
360 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
PEAK VALUES: ACCEL=249.76 CM/SEC/SEC, VELOCITY=20.82 CM/SEC, DISPL=-3.17 CM



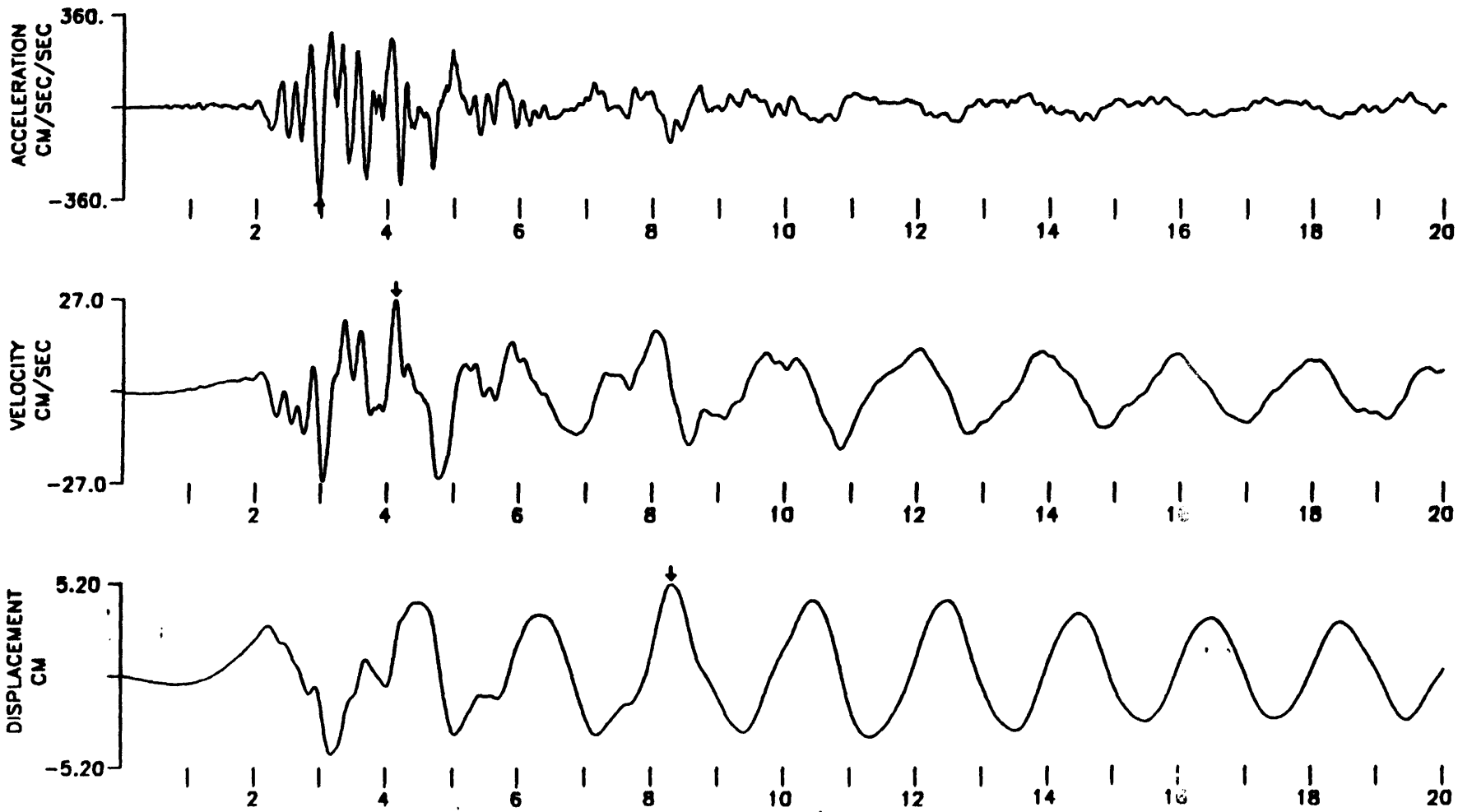
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
ALHAMBRA, 900 S. FREMONT, 6TH FLOOR
090 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
PEAK VALUES: ACCEL=-462.71 CM/SEC/SEC, VELOCITY=21.94 CM/SEC, DISPL=-3.63 CM



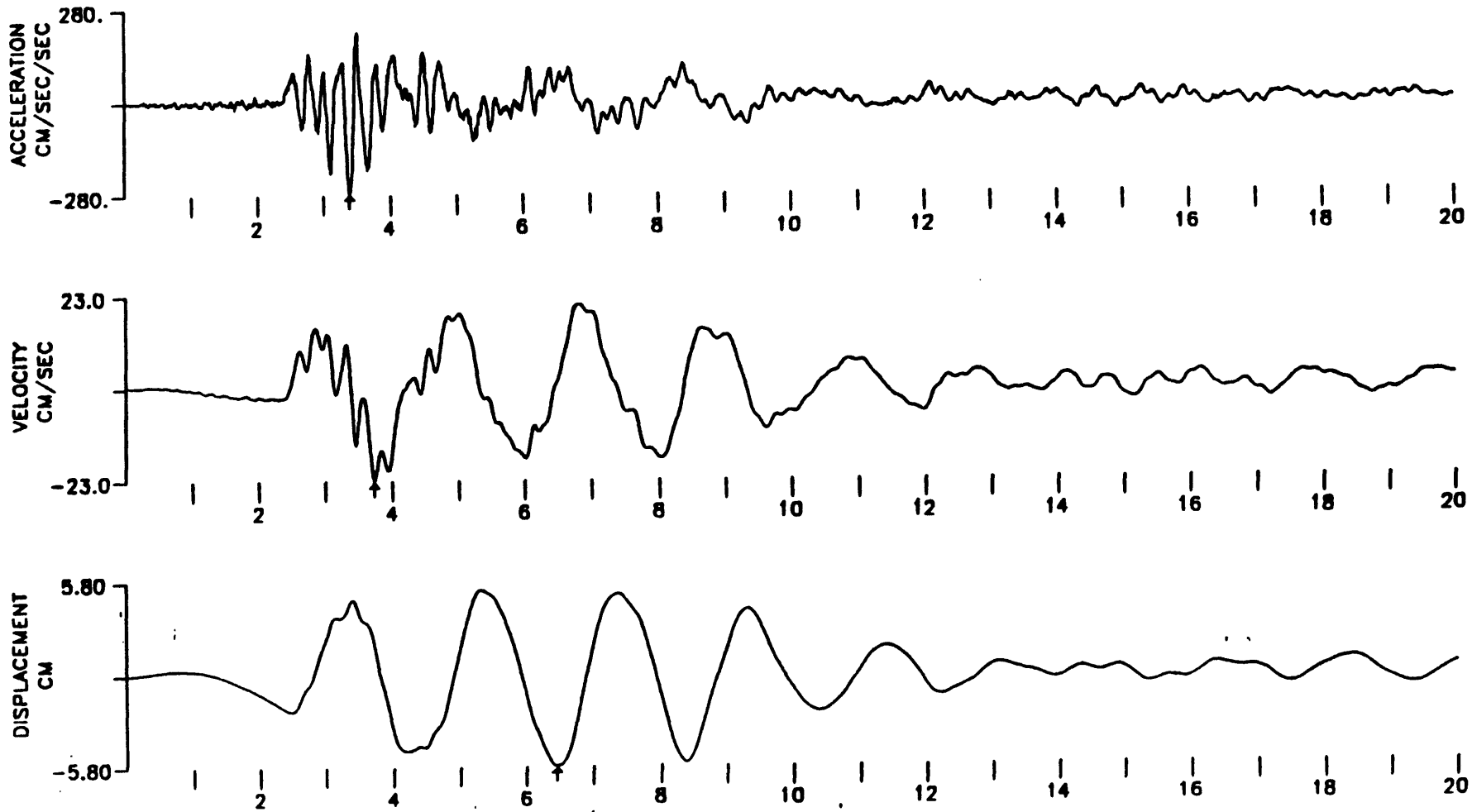
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
ALHAMBRA, 900 S. FREMONT, 6TH FLOOR
UP
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
PEAK VALUES: ACCEL=193.18 CM/SEC/SEC, VELOCITY=-6.53 CM/SEC, DISPL=-0.70 CM



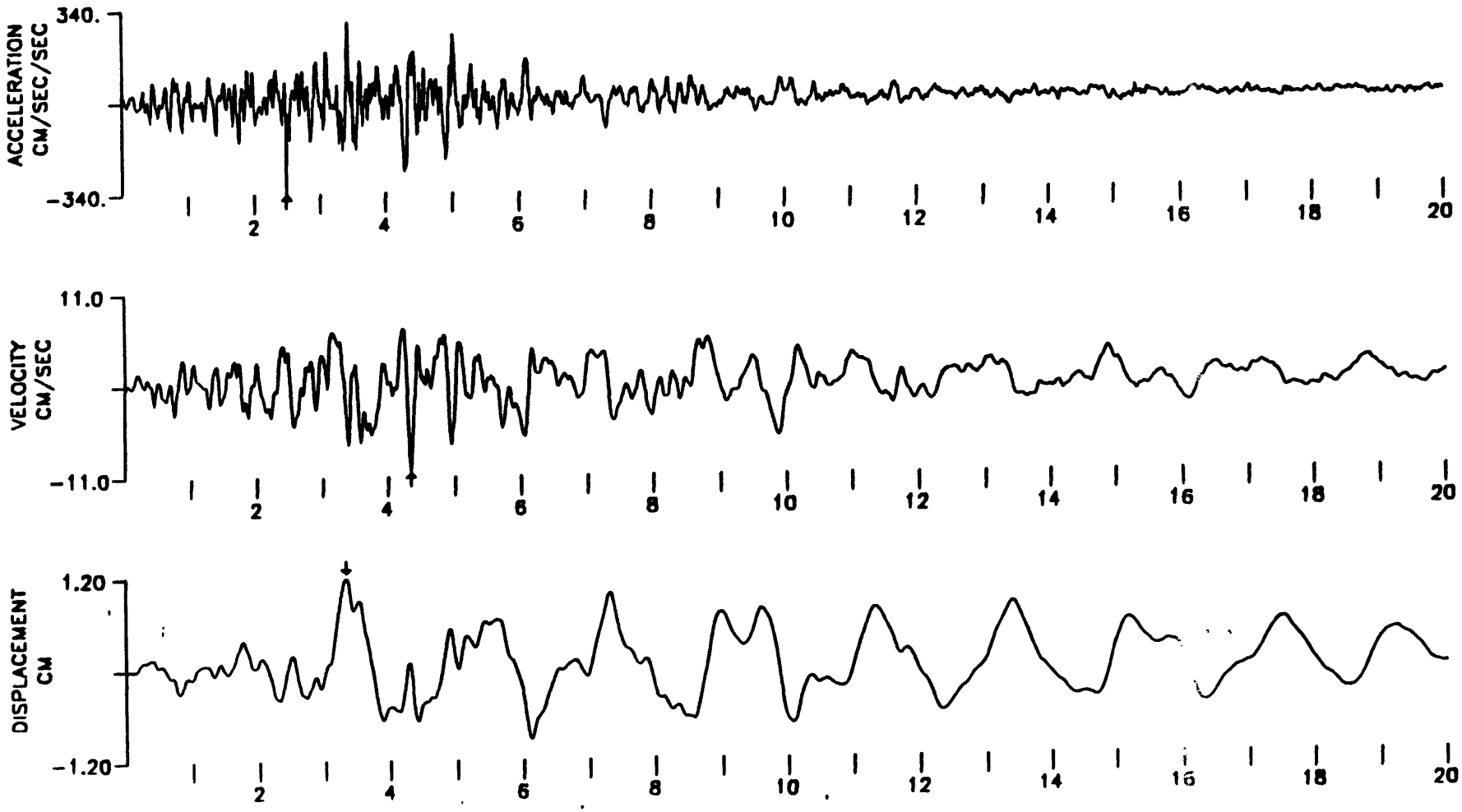
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
ALHAMBRA, 900 S. FREMONT, 6TH FLOOR
360 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
PEAK VALUES: ACCEL=-355.89 CM/SEC/SEC, VELOCITY=26.75 CM/SEC, DISPL=5.12 CM



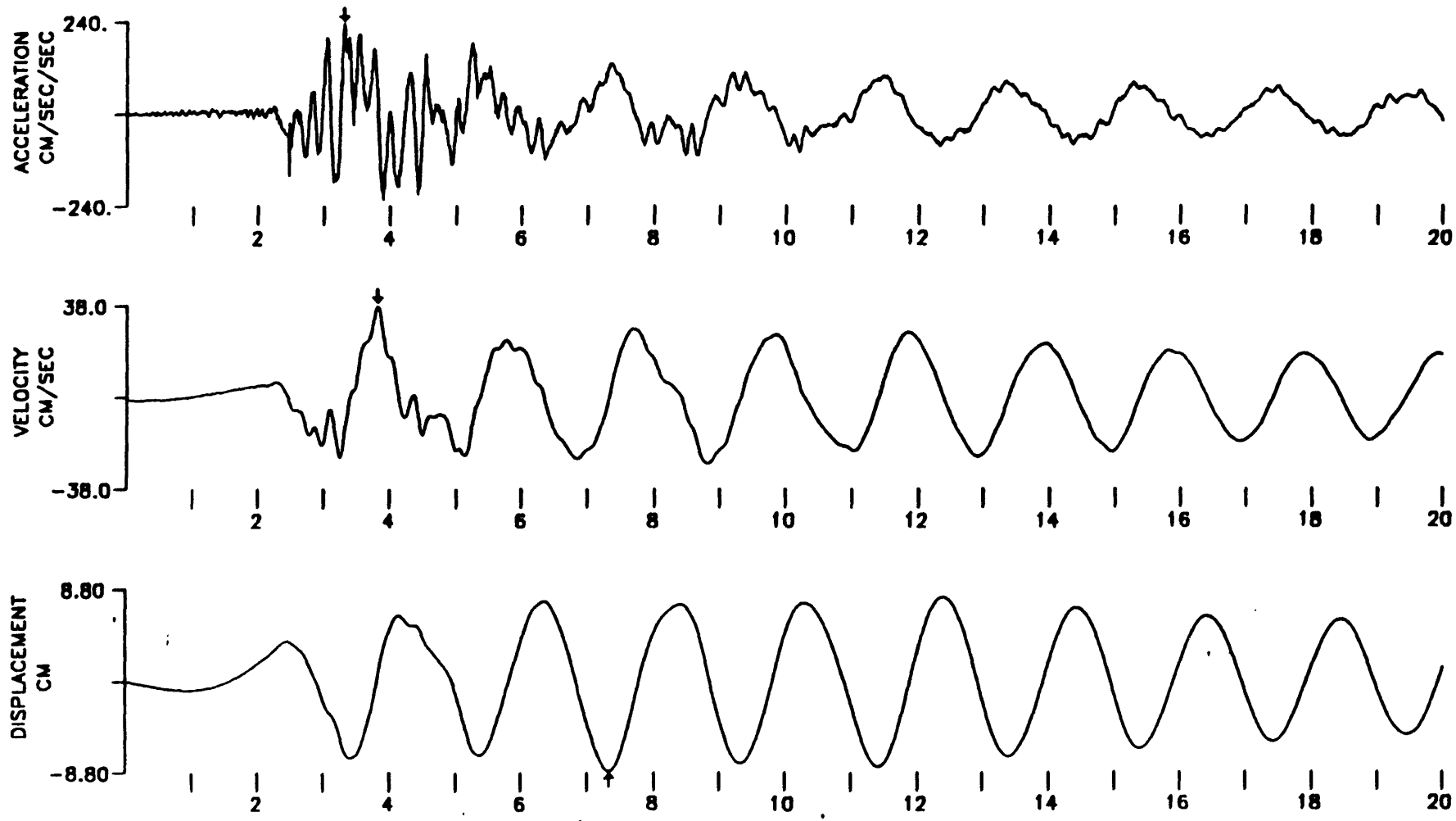
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
ALHAMBRA, 900 S. FREMONT, 12FLOOR
090 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
PEAK VALUES: ACCEL=-271.43 CM/SEC/SEC, VELOCITY=-22.97 CM/SEC, DISPL=-5.78 CM



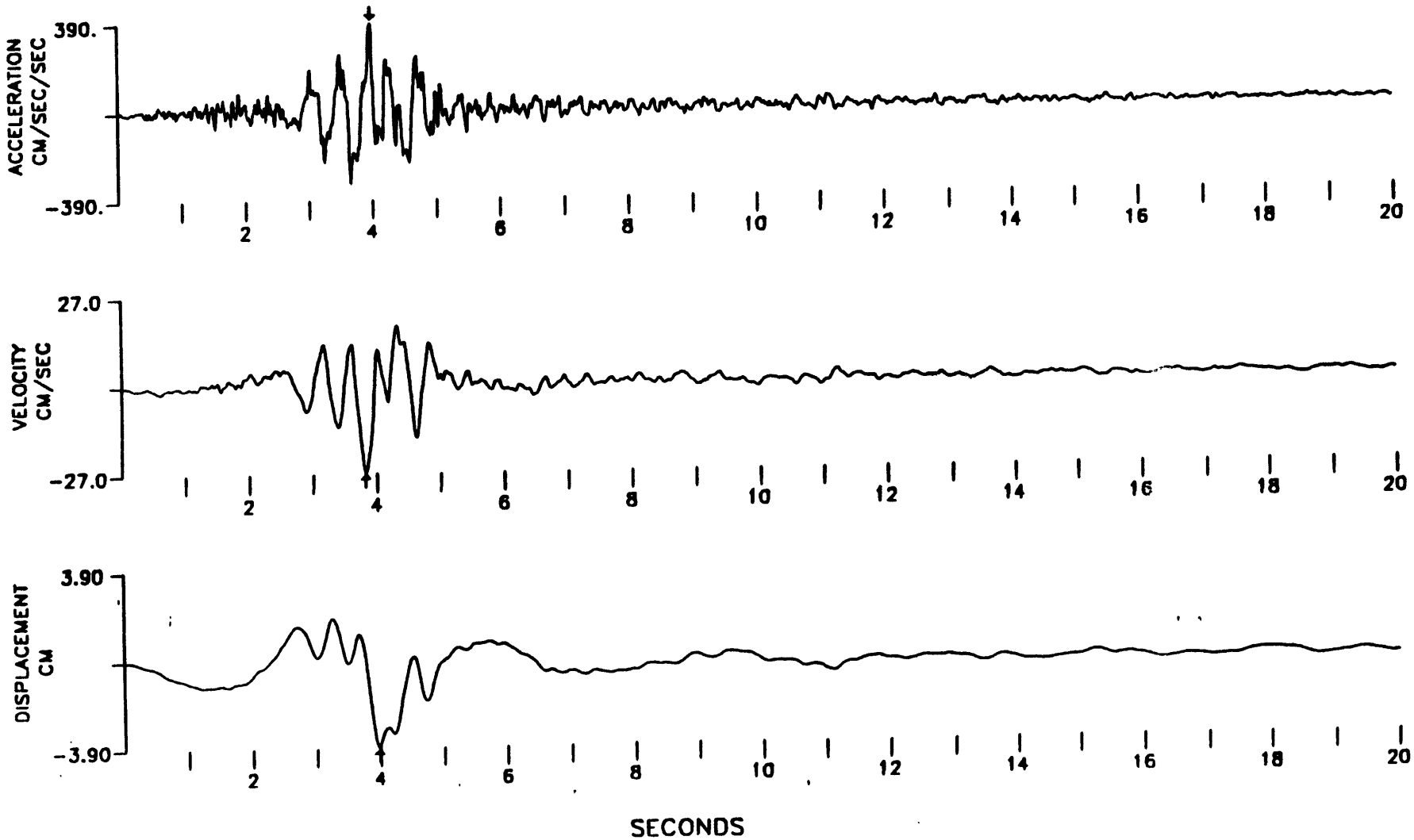
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
ALHAMBRA, 900 S. FREMONT, 12TH FLOOR
UP
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
PEAK VALUES: ACCEL=-335.06 CM/SEC/SEC, VELOCITY=-10.23 CM/SEC, DISPL=1.18 CM



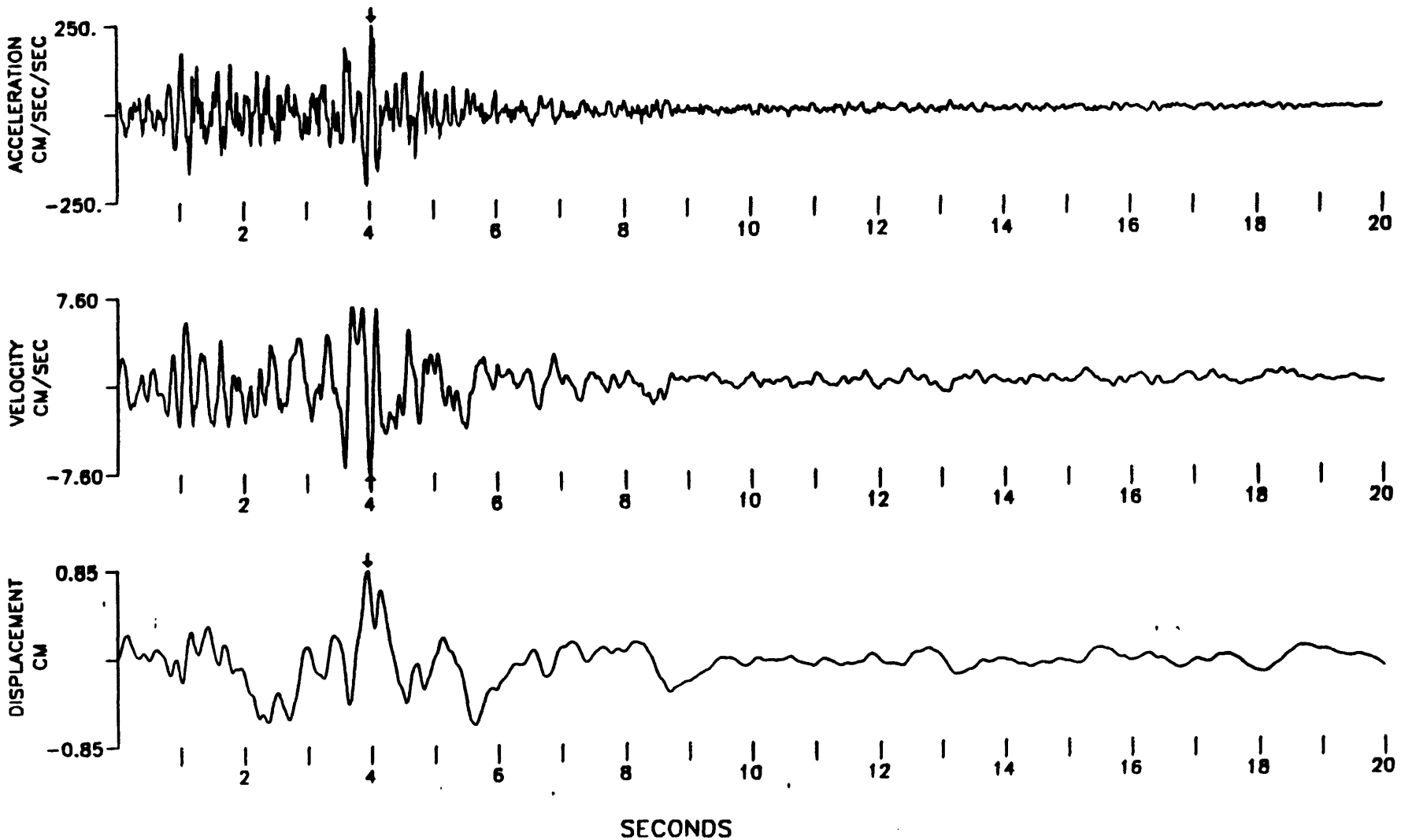
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
ALHAMBRA, 900 S. FREMONT, 12TH FLOOR
360 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
PEAK VALUES: ACCEL=230.68 CM/SEC/SEC, VELOCITY=37.64 CM/SEC, DISPL=-8.74 CM



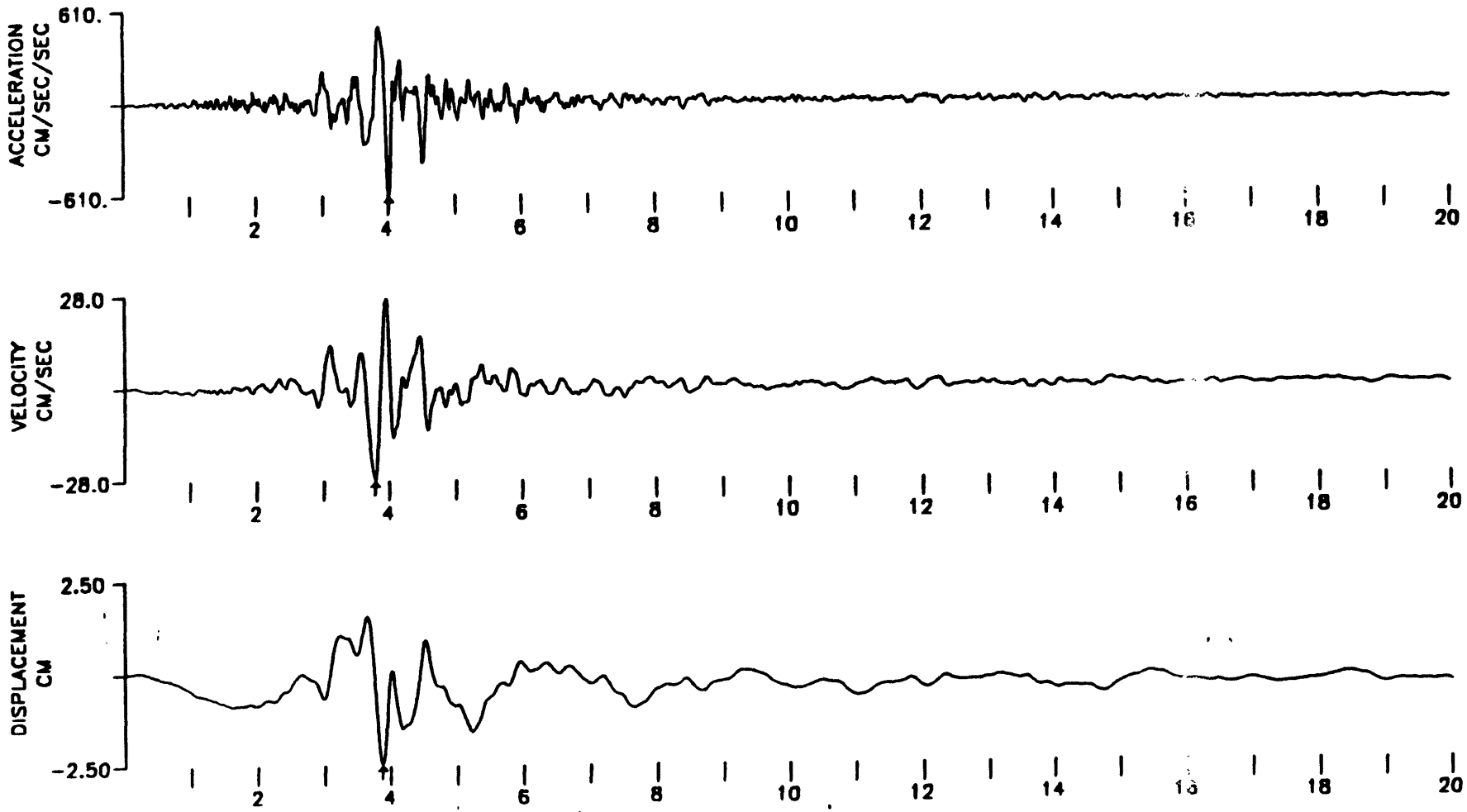
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
WHITTIER, 7215 BRIGHT AVE, BASEMENT
180 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
PEAK VALUES: ACCEL=381.87 CM/SEC/SEC, VELOCITY=-26.59 CM/SEC, DISPL=-3.88 CM



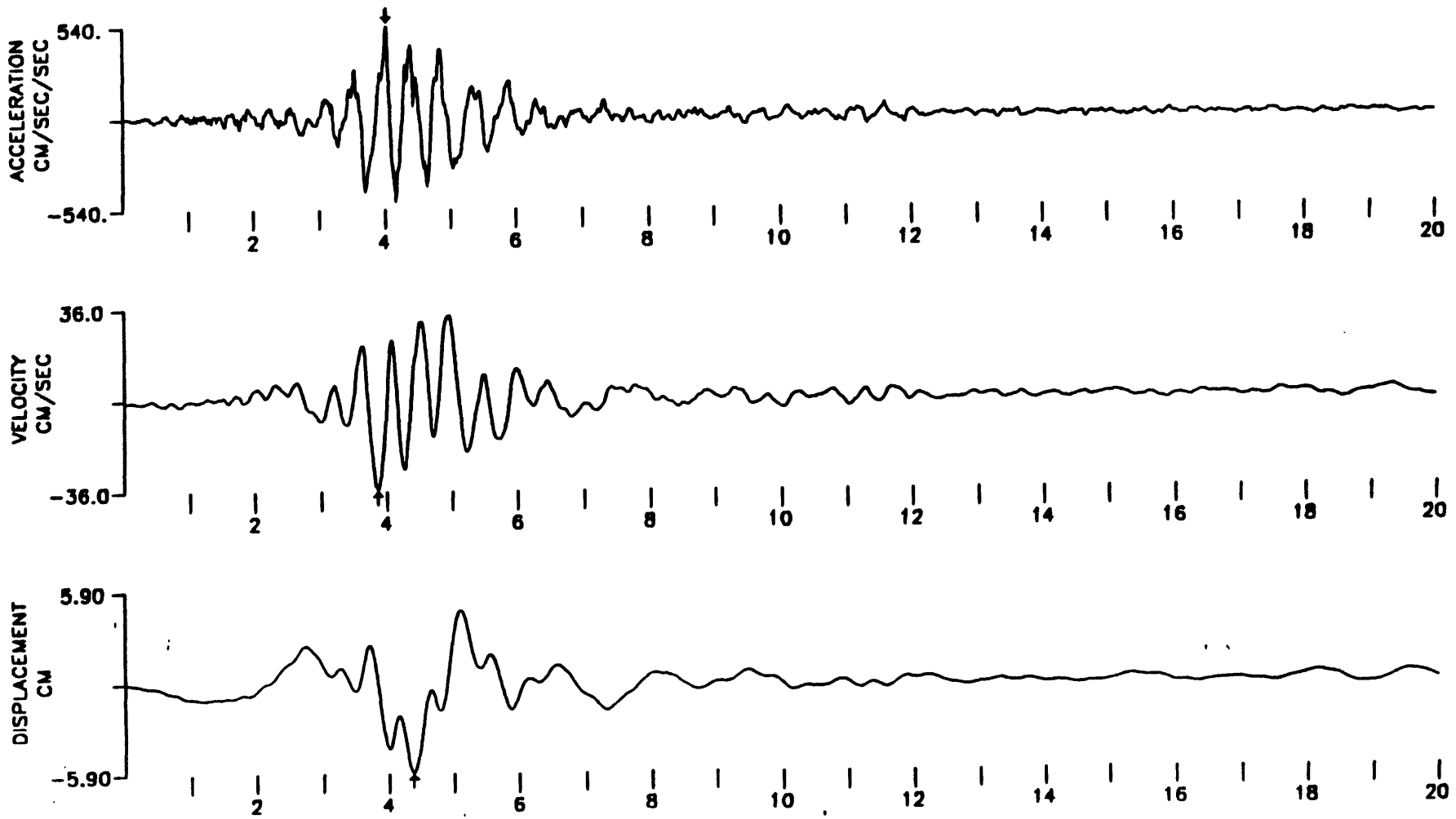
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
WHITTIER, 7215 BRIGHT AVE, BASEMENT
UP
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
PEAK VALUES: ACCEL=245.51 CM/SEC/SEC, VELOCITY=-7.60 CM/SEC, DISPL=0.84 CM



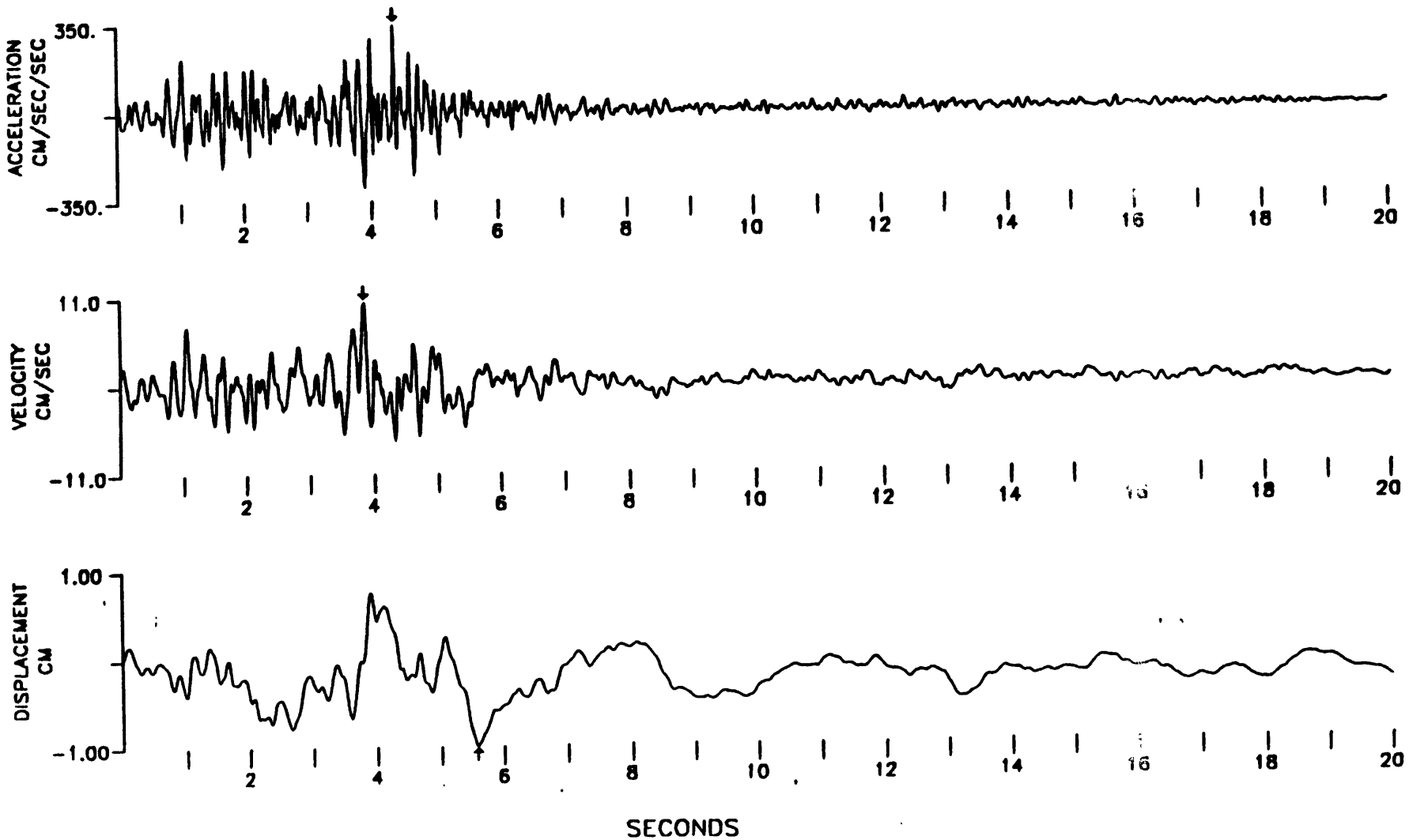
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
WHITTIER, 7215 BRIGHT AVE, BASEMENT
090 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
PEAK VALUES: ACCEL=-606.69 CM/SEC/SEC, VELOCITY=-27.70 CM/SEC, DISPL=-2.45 CM



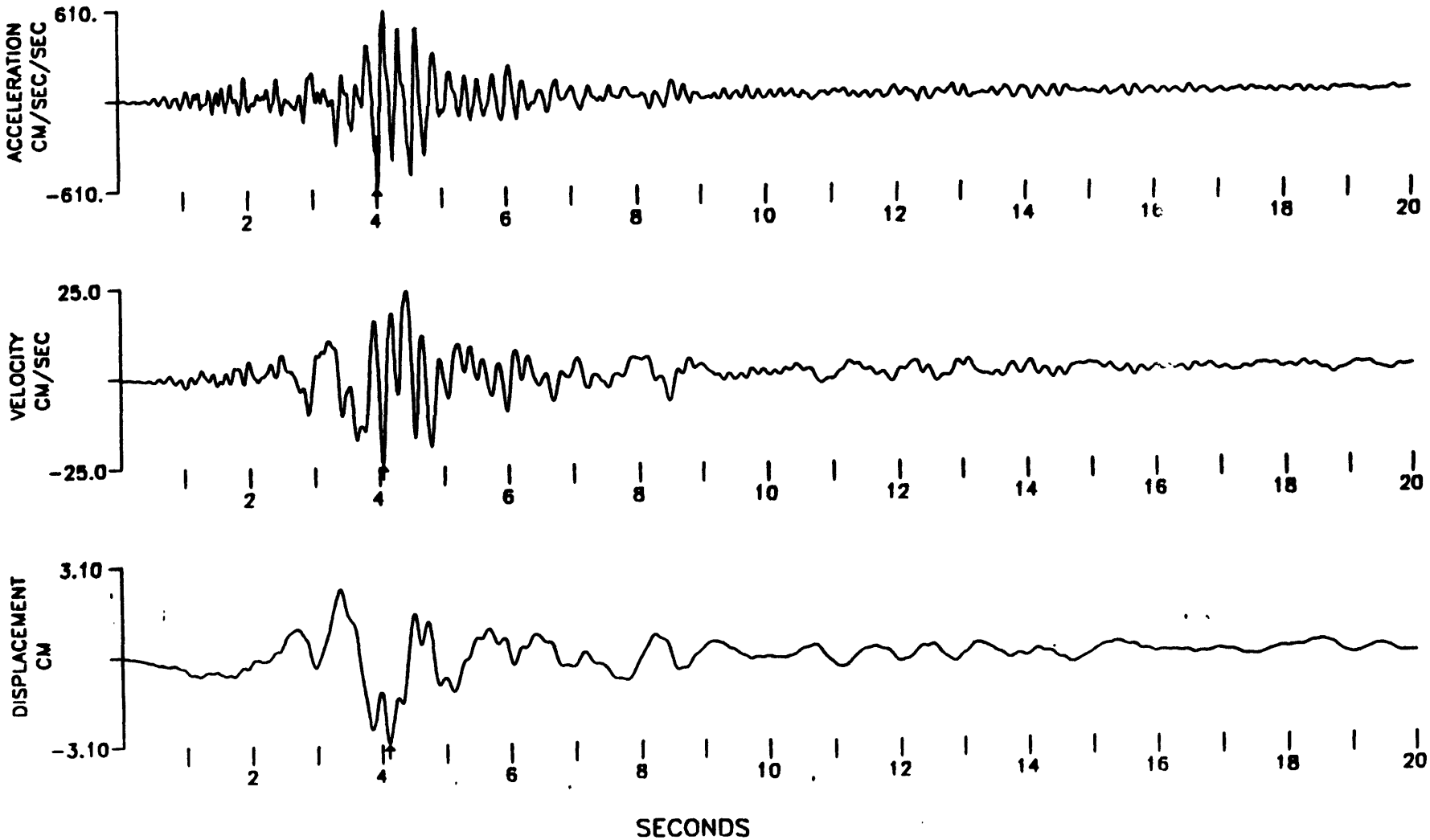
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
WHITTIER, 7215 BRIGHT AVE, 5TH FLOOR
180 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
PEAK VALUES: ACCEL=539.52 CM/SEC/SEC, VELOCITY=-35.29 CM/SEC, DISPL=-5.84 CM



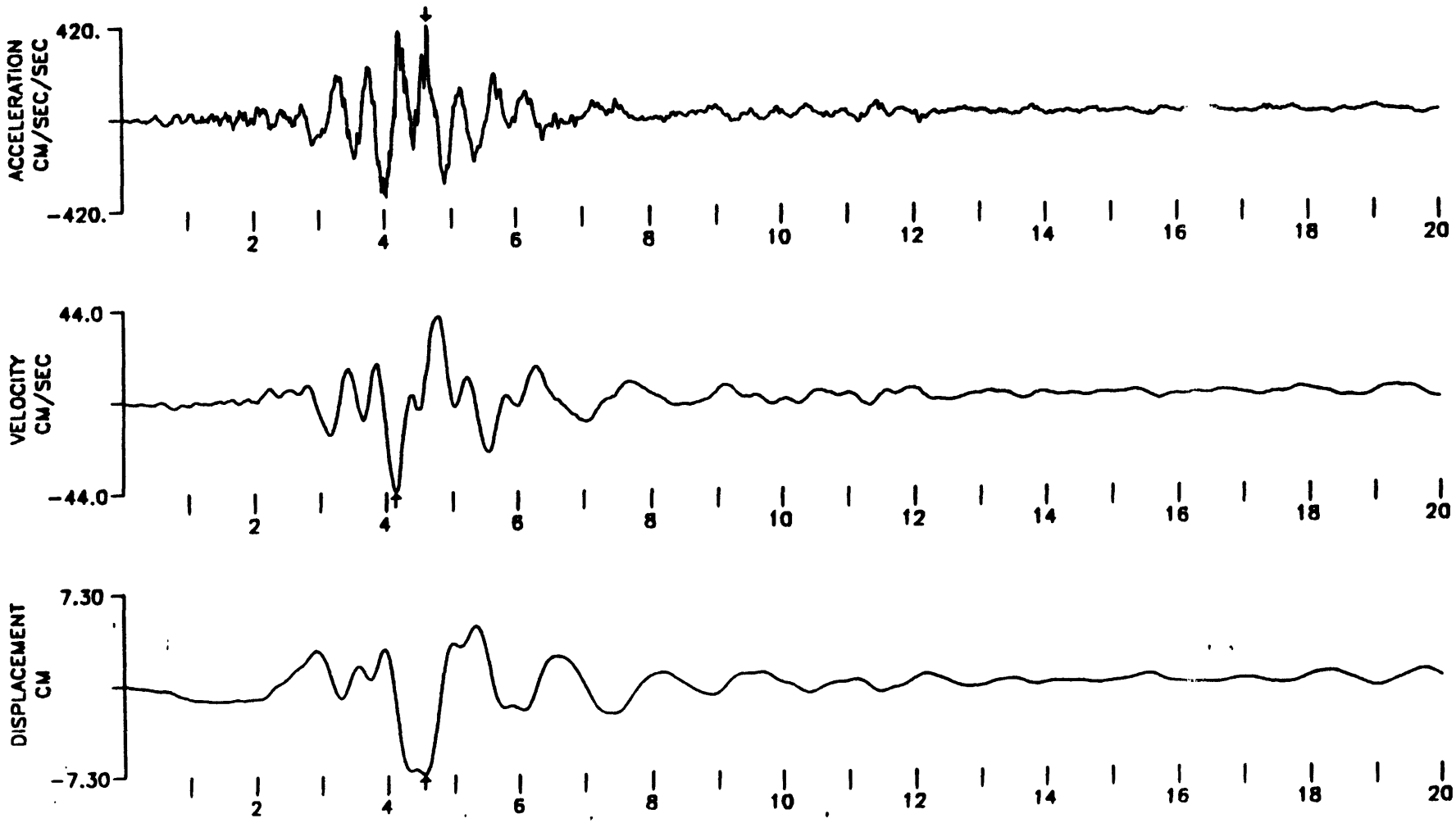
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
WHITTIER, 7215 BRIGHT AVE, 5TH FLOOR
UP
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
PEAK VALUES: ACCEL=345.01 CM/SEC/SEC, VELOCITY=10.31 CM/SEC, DISPL=-1.00 CM

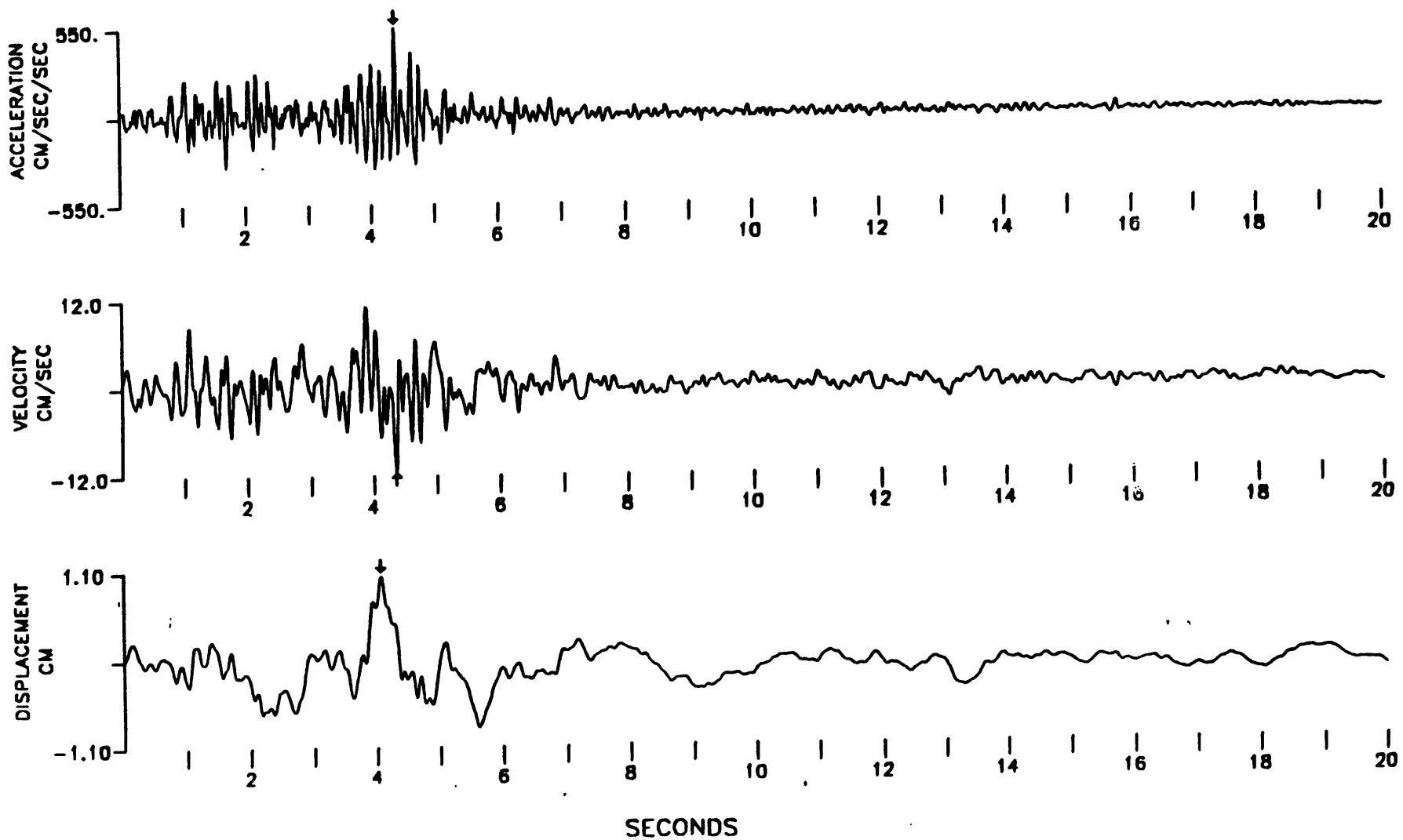


CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
WHITTIER, 7215 BRIGHT AVE, 5TH FLOOR
090 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
PEAK VALUES: ACCEL=-600.85 CM/SEC/SEC, VELOCITY=-24.23 CM/SEC, DISPL=-3.06 CM

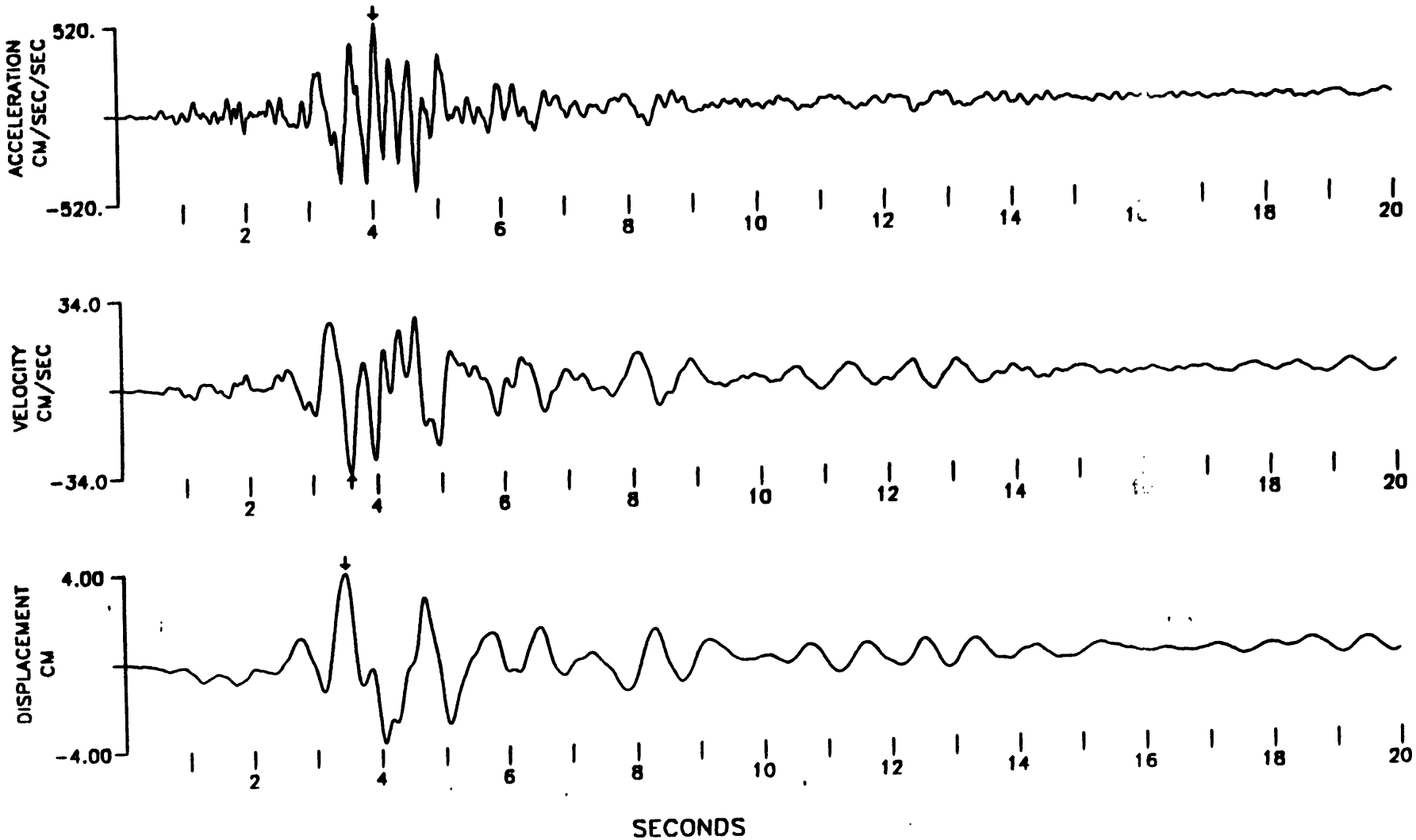


CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
WHITTIER, 7215 BRIGHT AVE, 10TH FLOOR
180 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL=417.91 CM/SEC/SEC, VELOCITY=-43.71 CM/SEC, DISPL=-7.27 CM

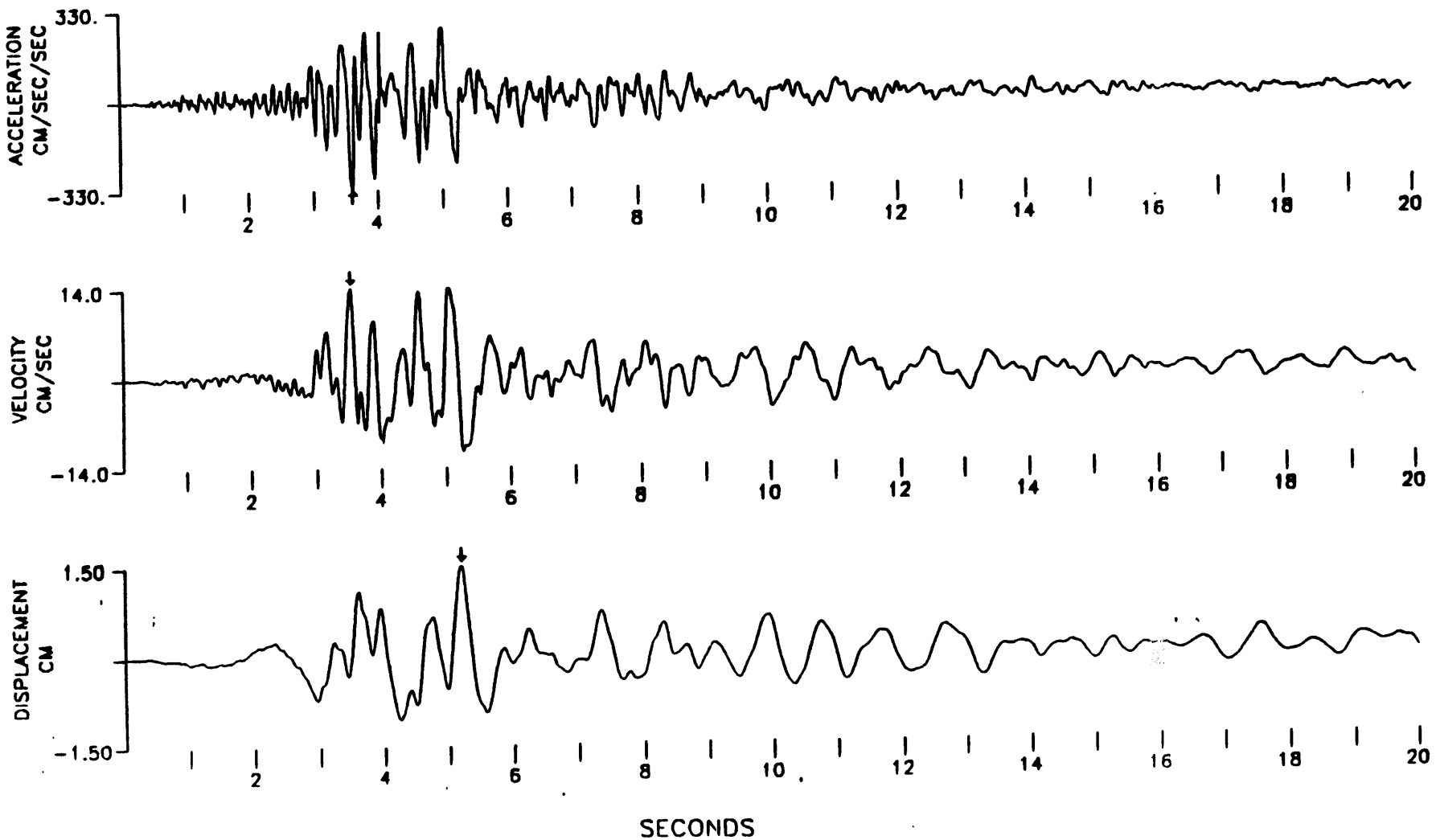


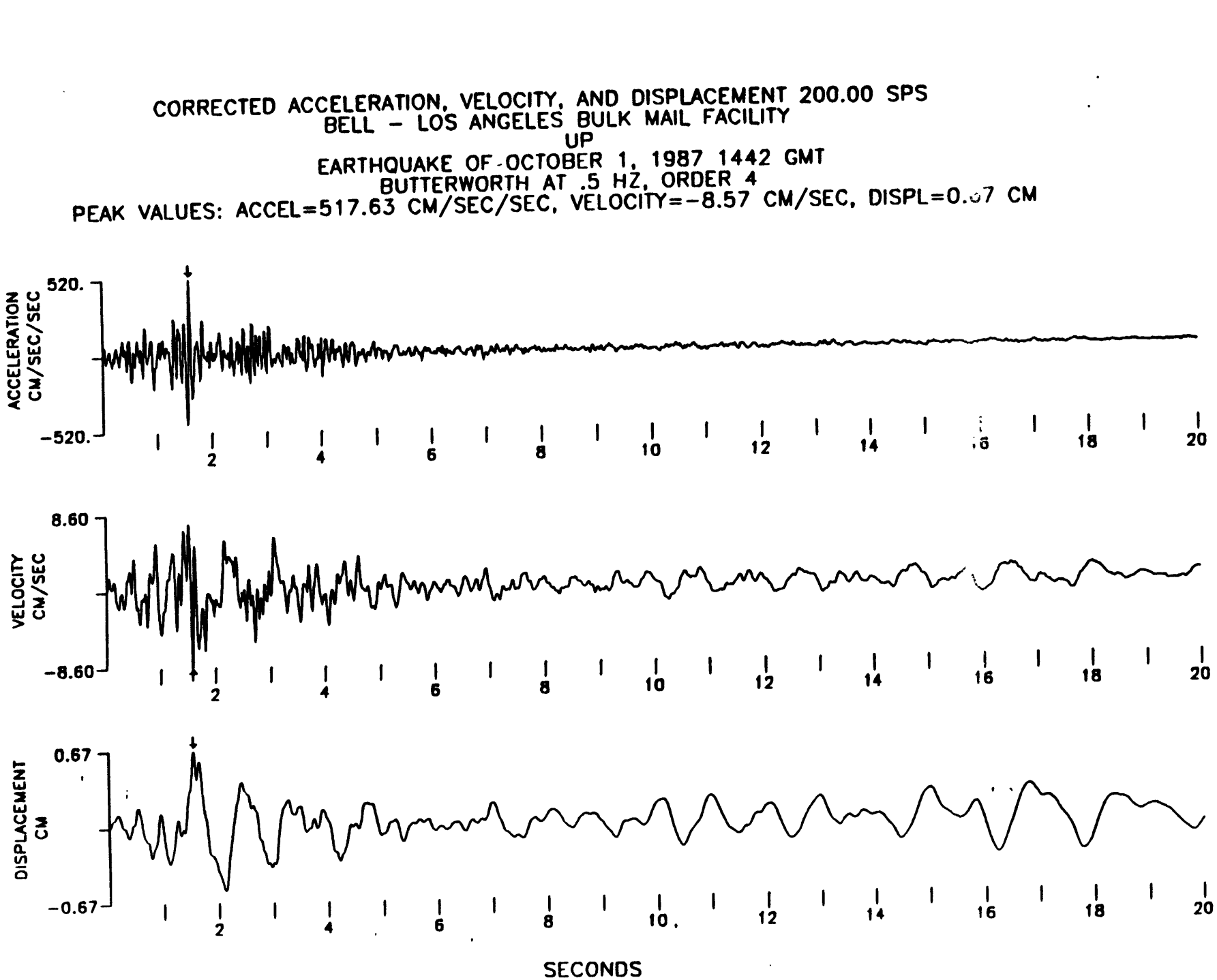

CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
WHITTIER, 7215 BRIGHT AVE, 10TH FLOOR
UP
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL=549.42 CM/SEC/SEC, VELOCITY=-11.35 CM/SEC, DISPL=1.0 CM
ACCELERATION CM/SEC/SEC
550.
-550.
VELOCITY CM/SEC
12.0
-12.0
DISPLACEMENT CM
1.10
-1.10
2
4
6
8
10
12
14
16
18
20
SECONDS

CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
WHITTIER, 7215 BRIGHT AVE, 10TH FLOOR
090 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL=514.03 CM/SEC/SEC, VELOCITY=-33.37 CM/SEC, DISPL=3.[illegible] CM

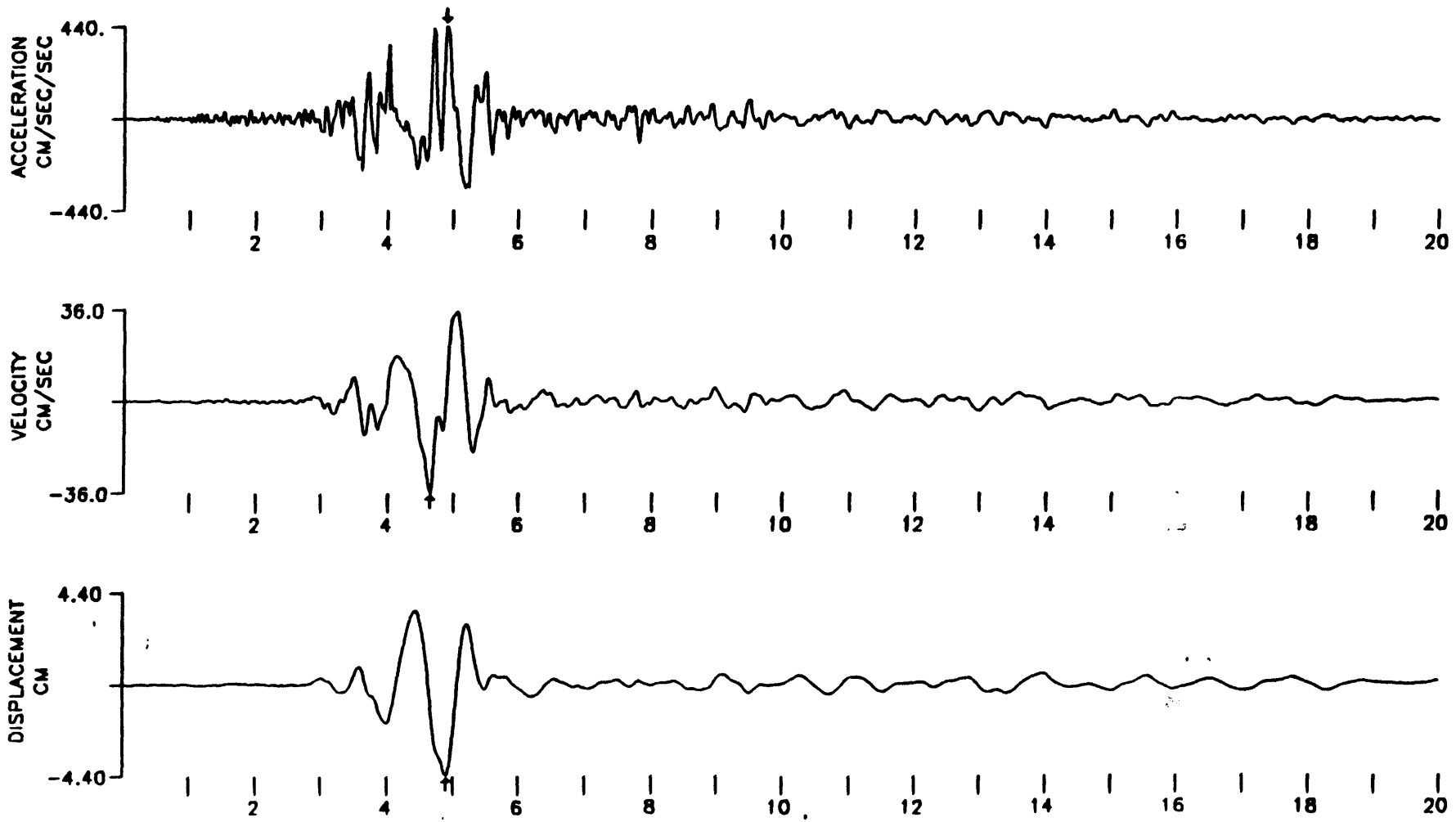


CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
BELL - LOS ANGELES BULK MAIL FACILITY
010 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT .5 HZ, ORDER 4
PEAK VALUES: ACCEL=-322.05 CM/SEC/SEC, VELOCITY=13.95 CM/SEC, DISPL=1.49 CM

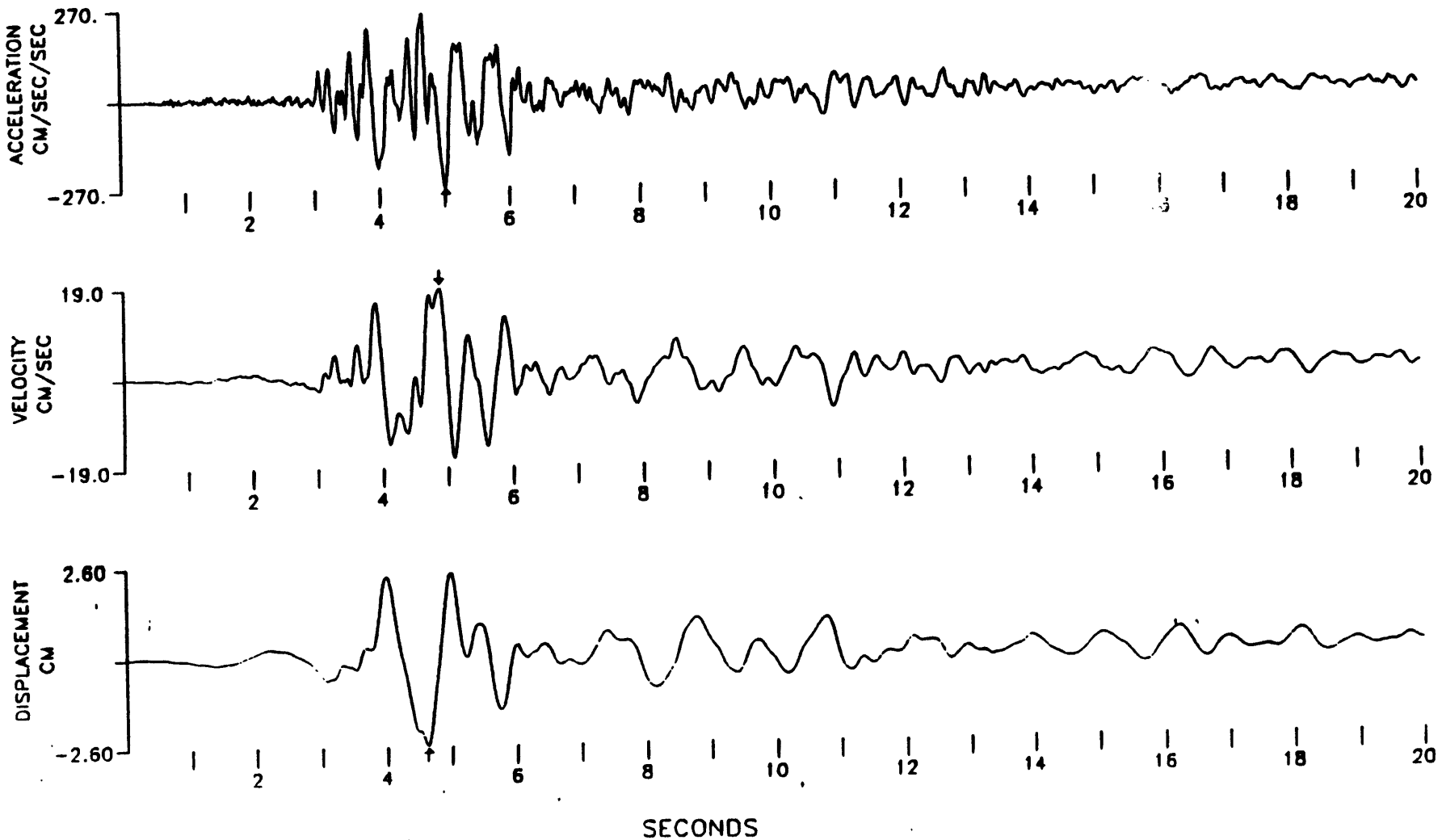



CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
BELL - LOS ANGELES BULK MAIL FACILITY
UP
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT .5 HZ, ORDER 4
PEAK VALUES: ACCEL=517.63 CM/SEC/SEC, VELOCITY=-8.57 CM/SEC, DISPL=0.67 CM
ACCELERATION CM/SEC/SEC
520.
-520.
VELOCITY CM/SEC
8.60
-8.60
DISPLACEMENT CM
0.67
-0.67
2
4
6
8
10
12
14
16
18
20
SECONDS

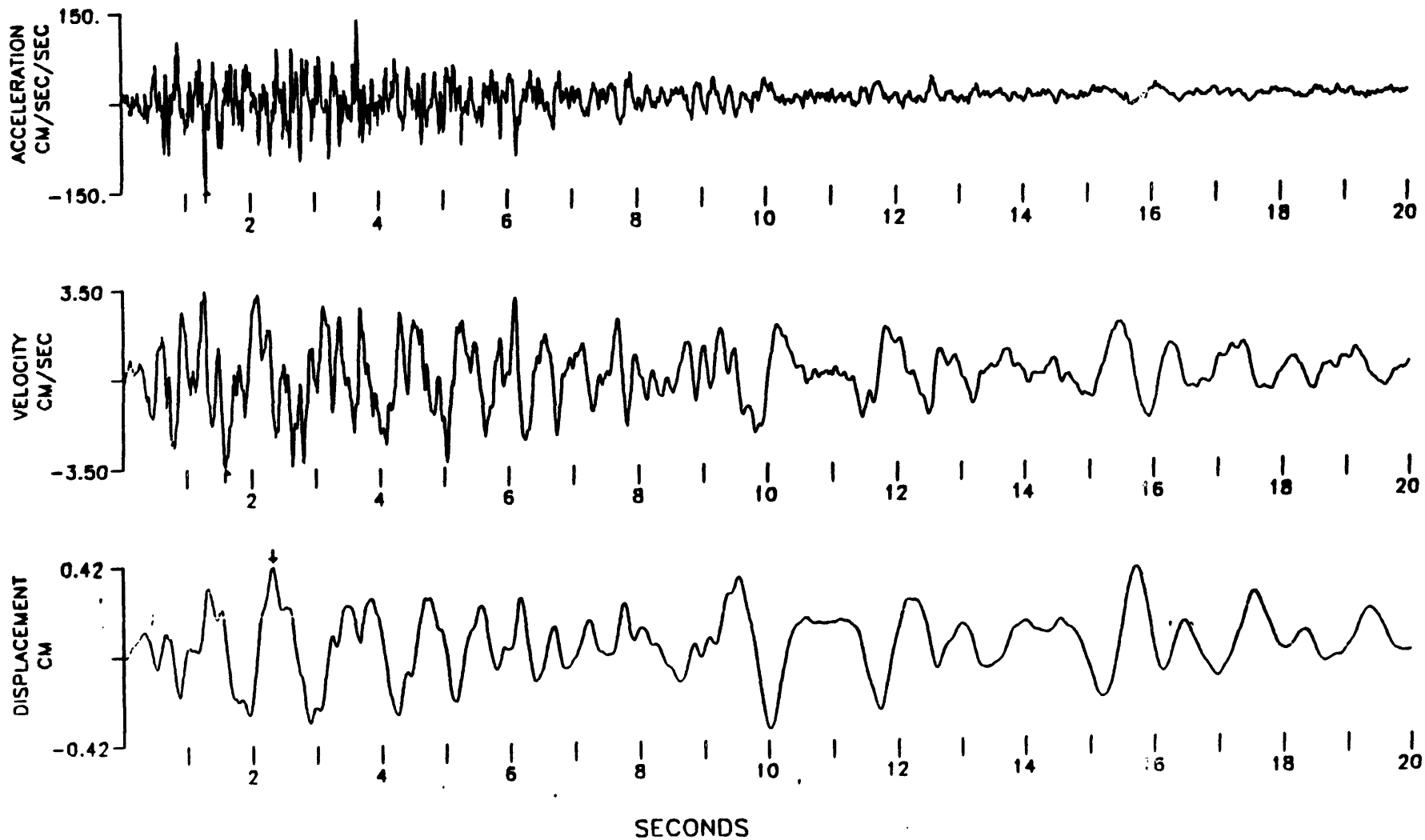
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
BELL - LOS ANGELES BULK MAIL FACILITY
280 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT .5 HZ, ORDER 4
PEAK VALUES: ACCEL=436.89 CM/SEC/SEC, VELOCITY=-35.79 CM/SEC, DISPL=-4.37 CM



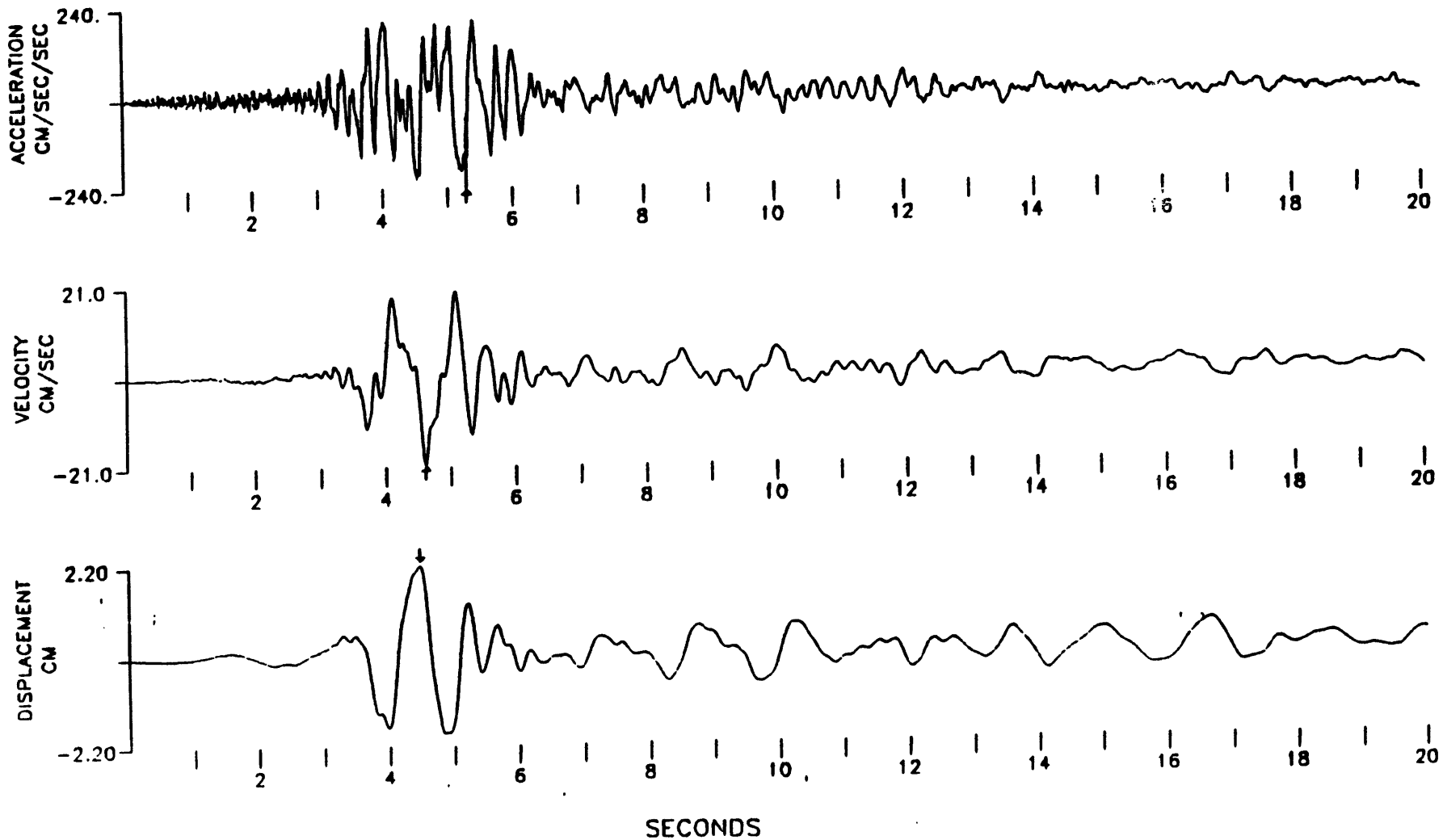
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
VERNON - CMD TERMINAL - BASEMENT
007 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT .5 HZ, ORDER 4
PEAK VALUES: ACCEL=-267.25 CM/SEC/SEC, VELOCITY=18.57 CM/SEC, DISPL=-2.58 CM



CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
VERNON - CMD TERMINAL - BASEMENT
UP
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT .5 HZ, ORDER 4
PEAK VALUES: ACCEL=-140.53 CM/SEC/SEC, VELOCITY=-3.42 CM/SEC, DISPL=0.42 CM

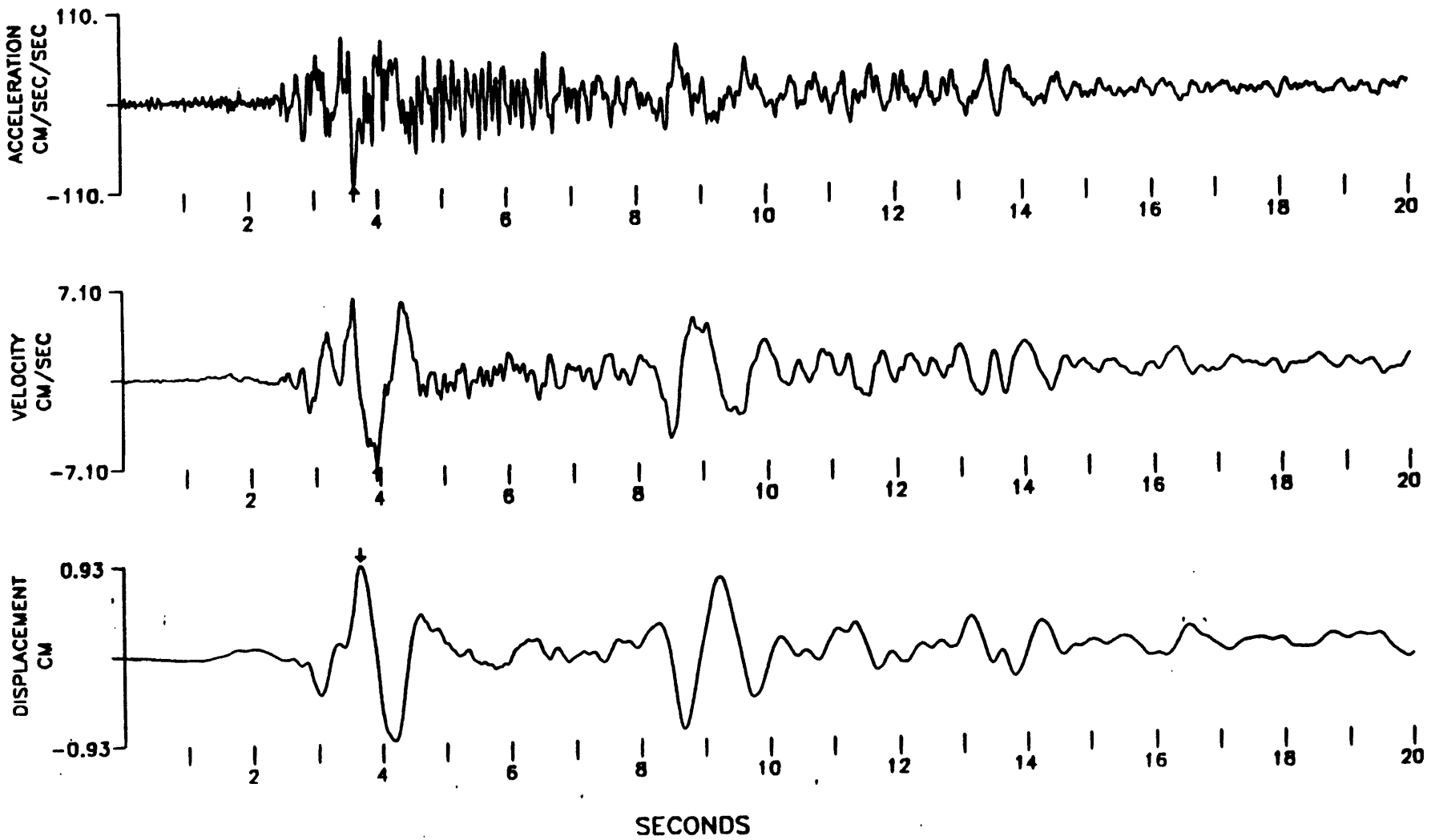


CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
VERNON - CMD TERMINAL - BASEMENT
277 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT .5 HZ, ORDER 4
PEAK VALUES: ACCEL=-239.88 CM/SEC/SEC, VELOCITY=-20.31 CM/SEC, DISPL=1.19 CM

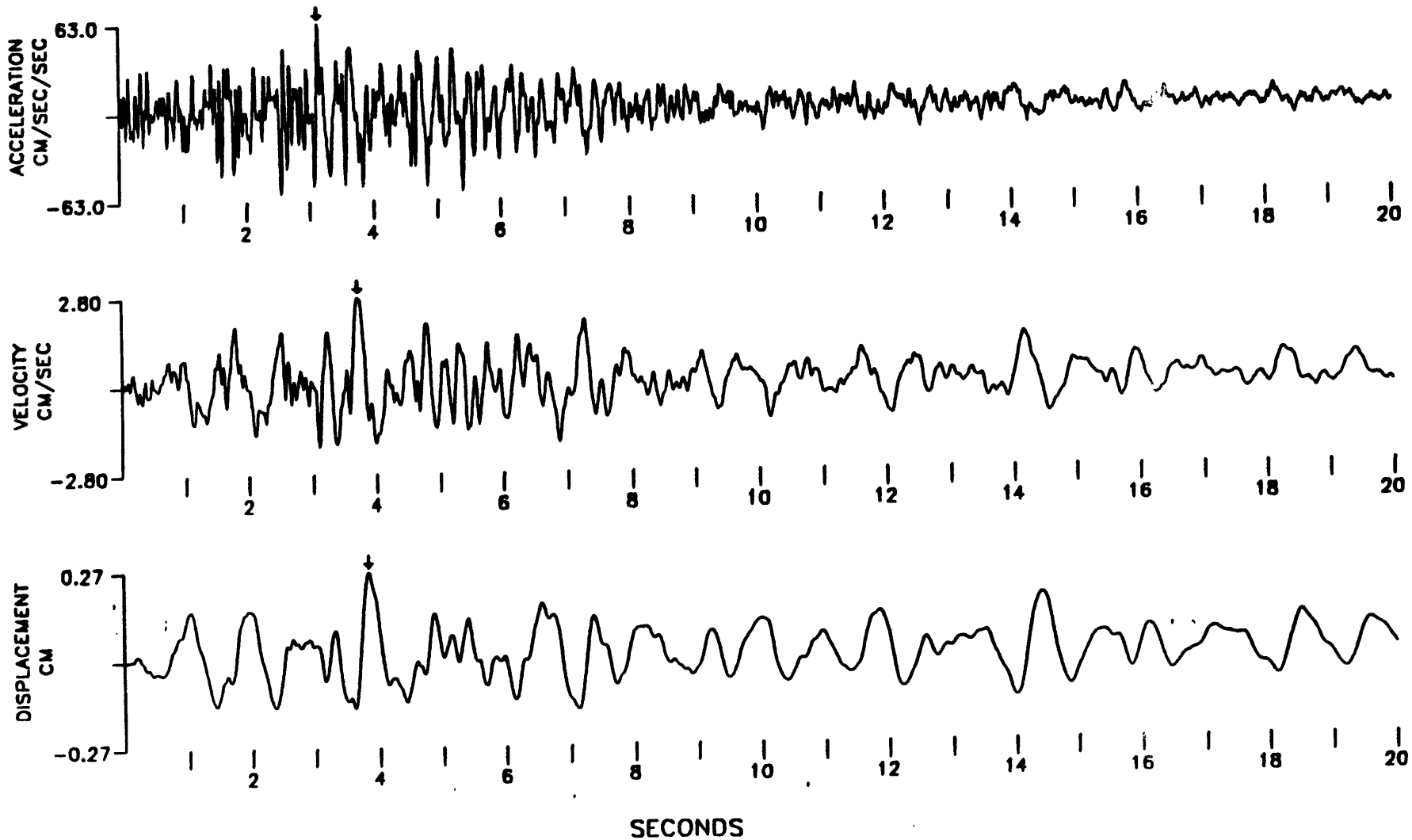


09

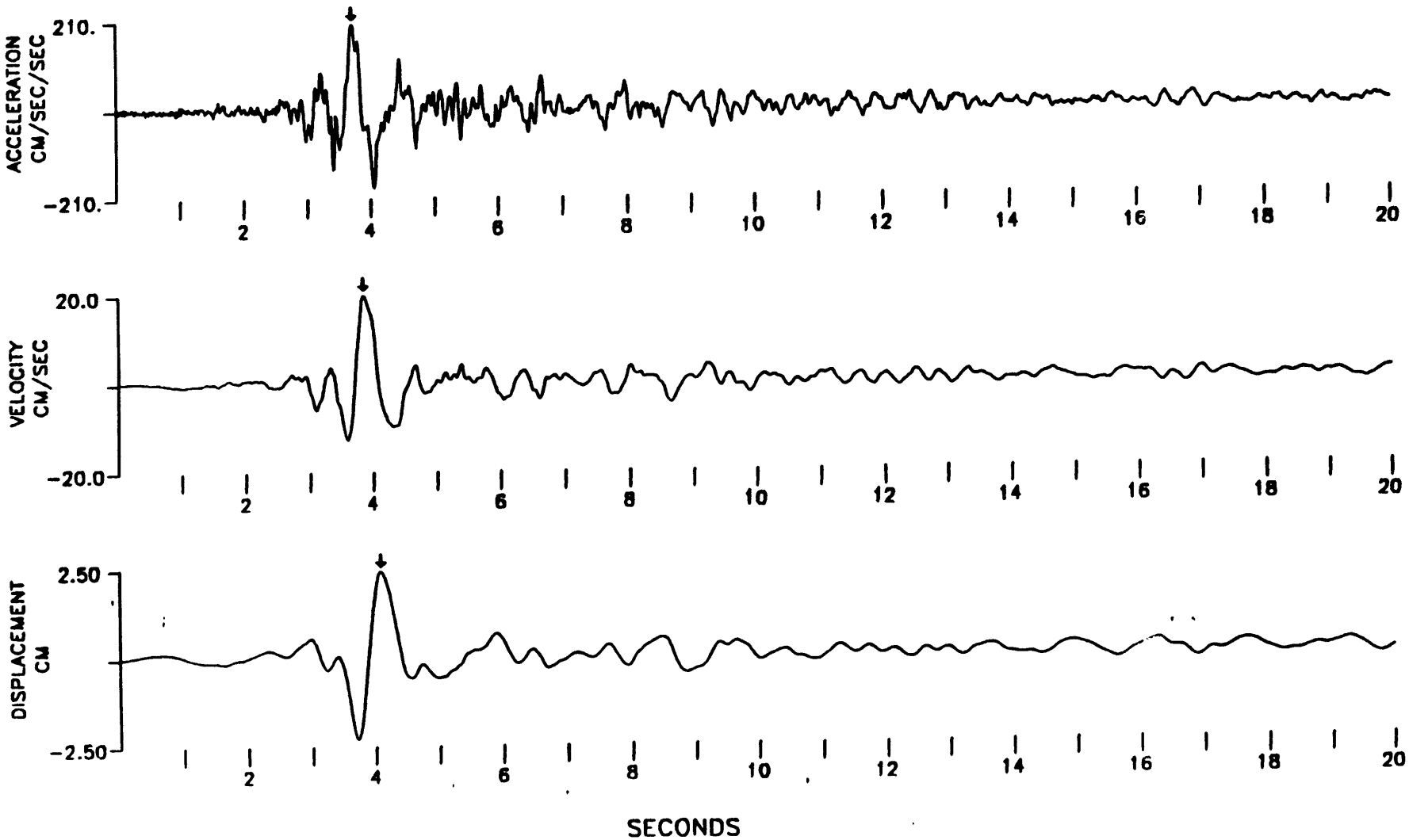
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
NORWALK, 12400 IMPERIAL HIGHWAY, BASEMENT
090 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT .5 HZ, ORDER 4
PEAK VALUES: ACCEL=-104.56 CM/SEC/SEC, VELOCITY=-7.00 CM/SEC, DISPL=0.92 CM



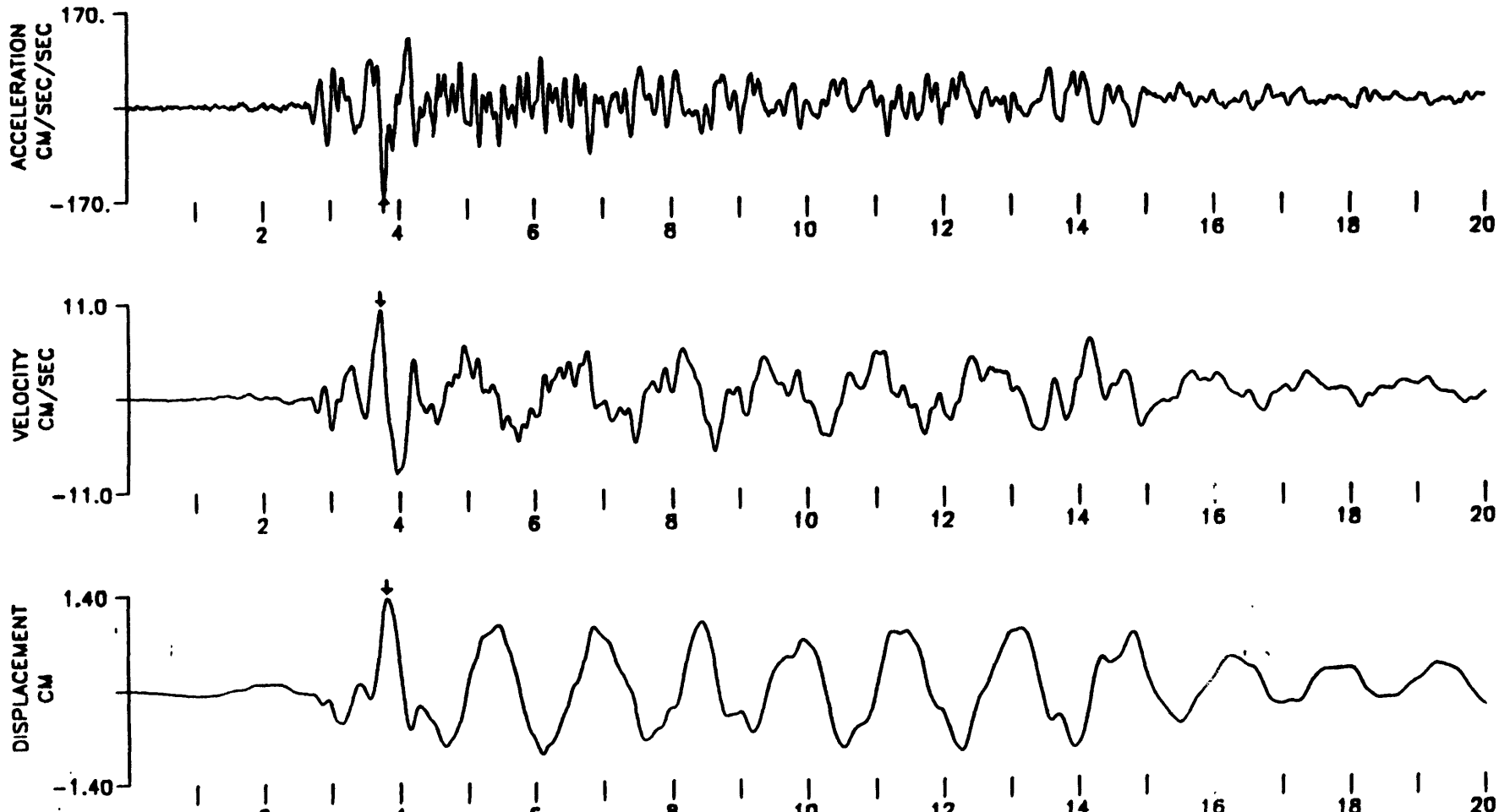
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
NORWALK, 12400 IMPERAL HIGHWAY, BASEMENT
UP
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT .5 HZ, ORDER 4
PEAK VALUES: ACCEL=62.86 CM/SEC/SEC, VELOCITY=2.79 CM/SEC, DISPL=0.27 CM



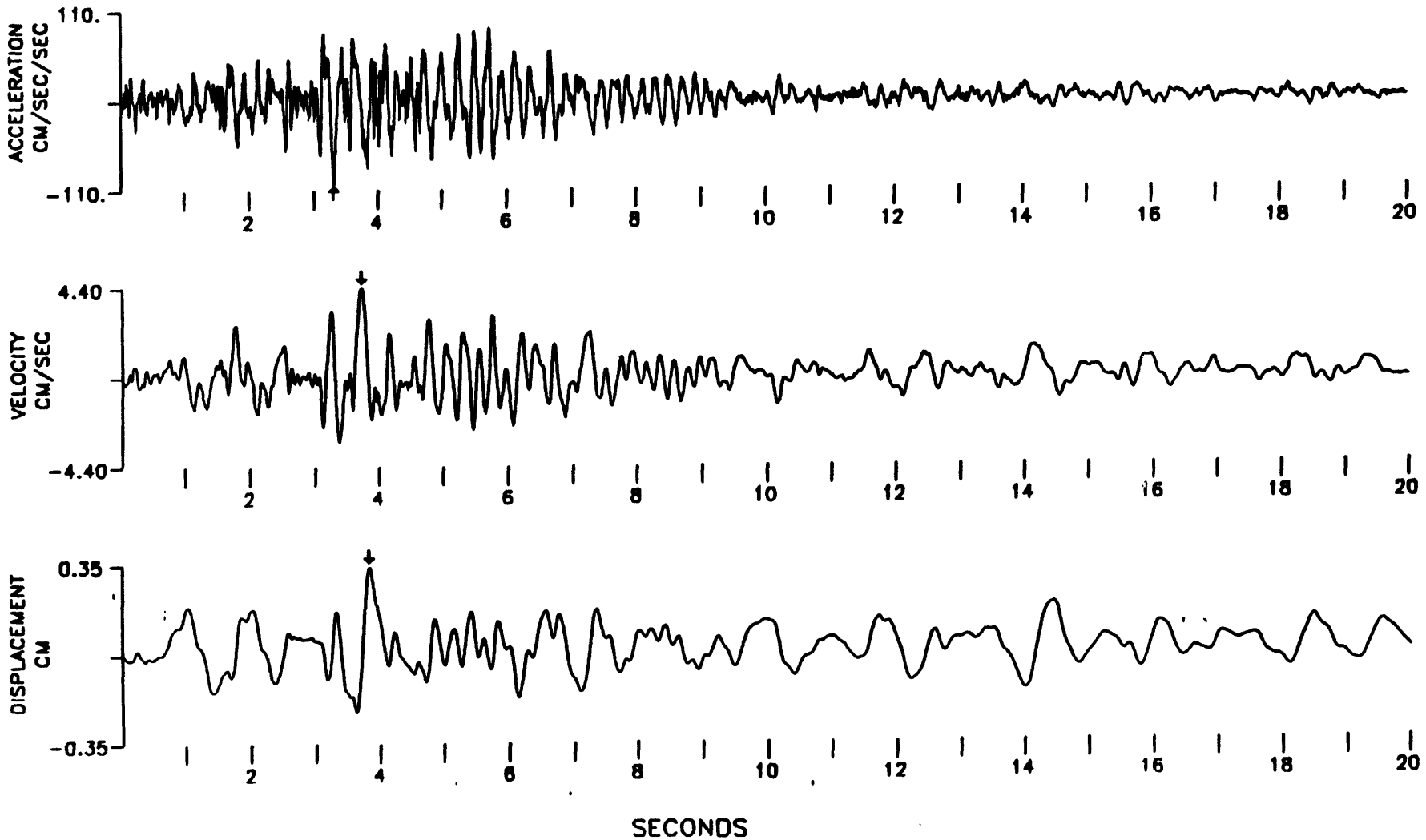
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
NORWALK, 12400 IMPERIAL HIGHWAY, BASEMENT
360 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT .5 HZ, ORDER 4
PEAK VALUES: ACCEL=201.54 CM/SEC/SEC, VELOCITY=19.97 CM/SEC, DISPL=2.44 CM



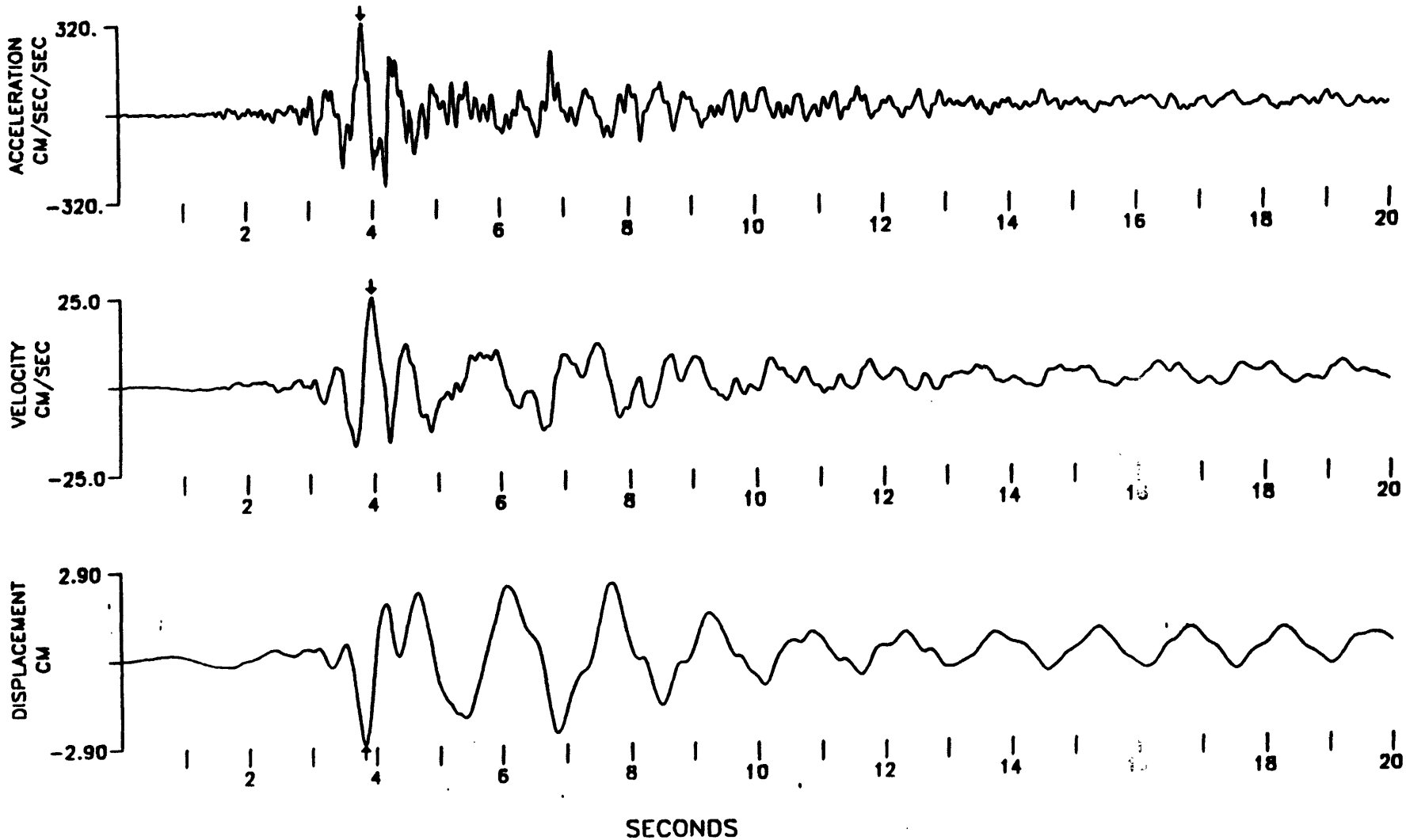
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
NORWALK, 12400 IMPERIAL HIGHWAY, 4TH FLOOR
090 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT .5 HZ, ORDER 4
PEAK VALUES: ACCEL=-164.31 CM/SEC/SEC, VELOCITY=10.13 CM/SEC, DISPL=1.35 CM



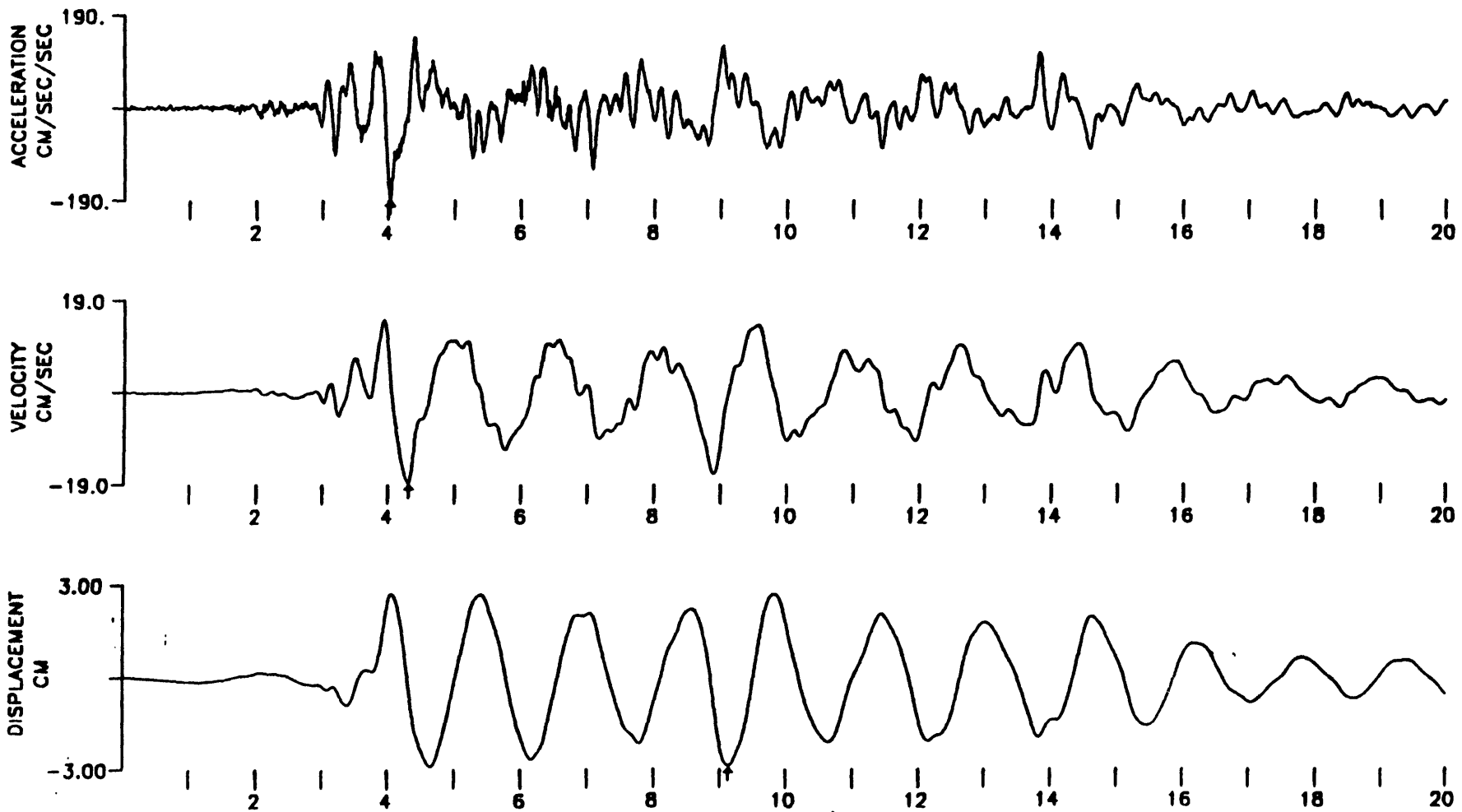
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
NORWALK, 12400 IMPERAL HIGHWAY, 4TH FLOOR
UP
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT .5 HZ, ORDER 4
PEAK VALUES: ACCEL=-102.18 CM/SEC/SEC, VELOCITY=4.37 CM/SEC, DISPL=0.34 CM



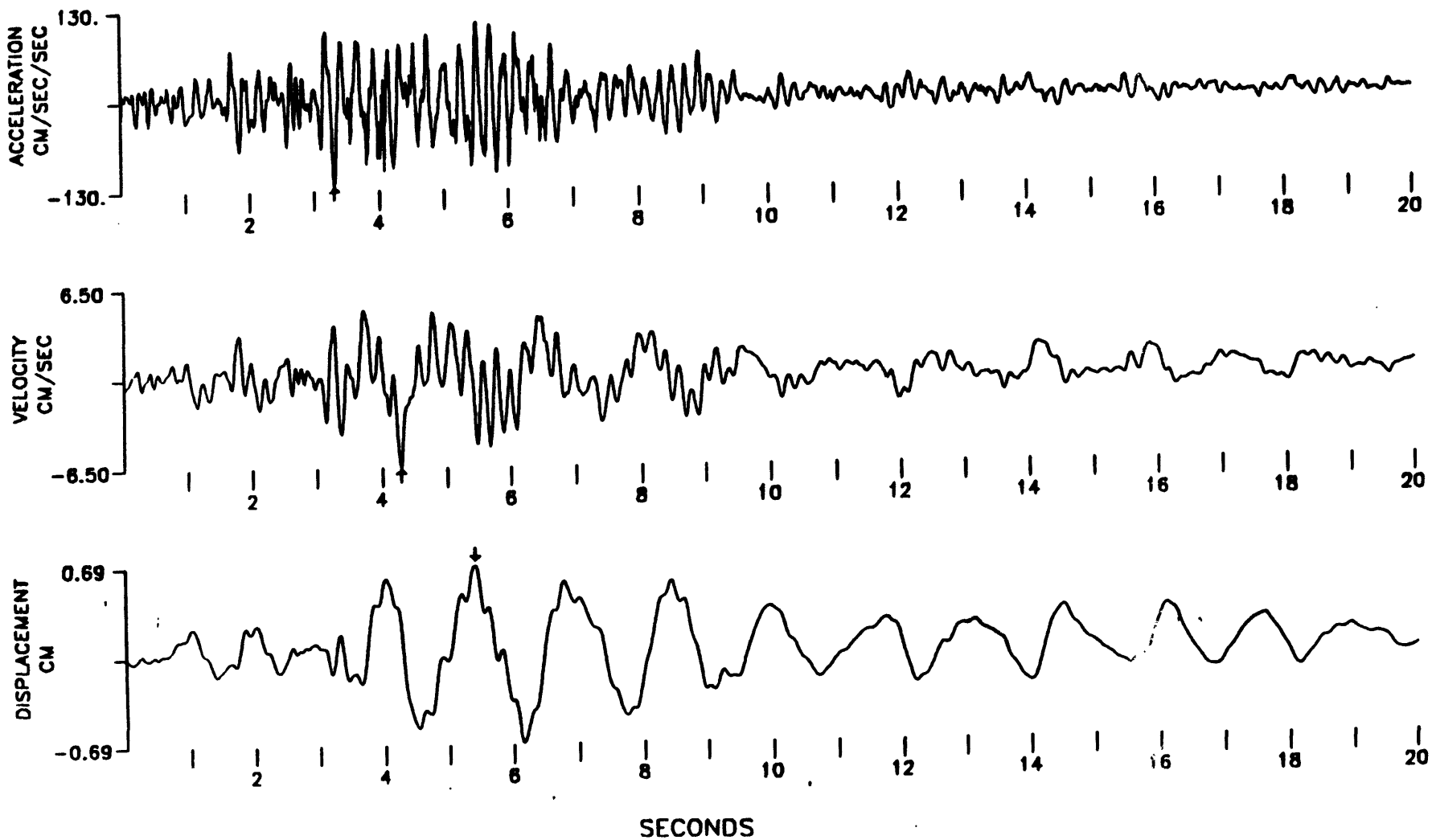
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
NORWALK, 12400 IMPERIAL HIGHWAY, 4TH FLOOR
360 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT .5 HZ, ORDER 4
PEAK VALUES: ACCEL=317.36 CM/SEC/SEC, VELOCITY=24.81 CM/SEC, DISPL=-2.83 CM



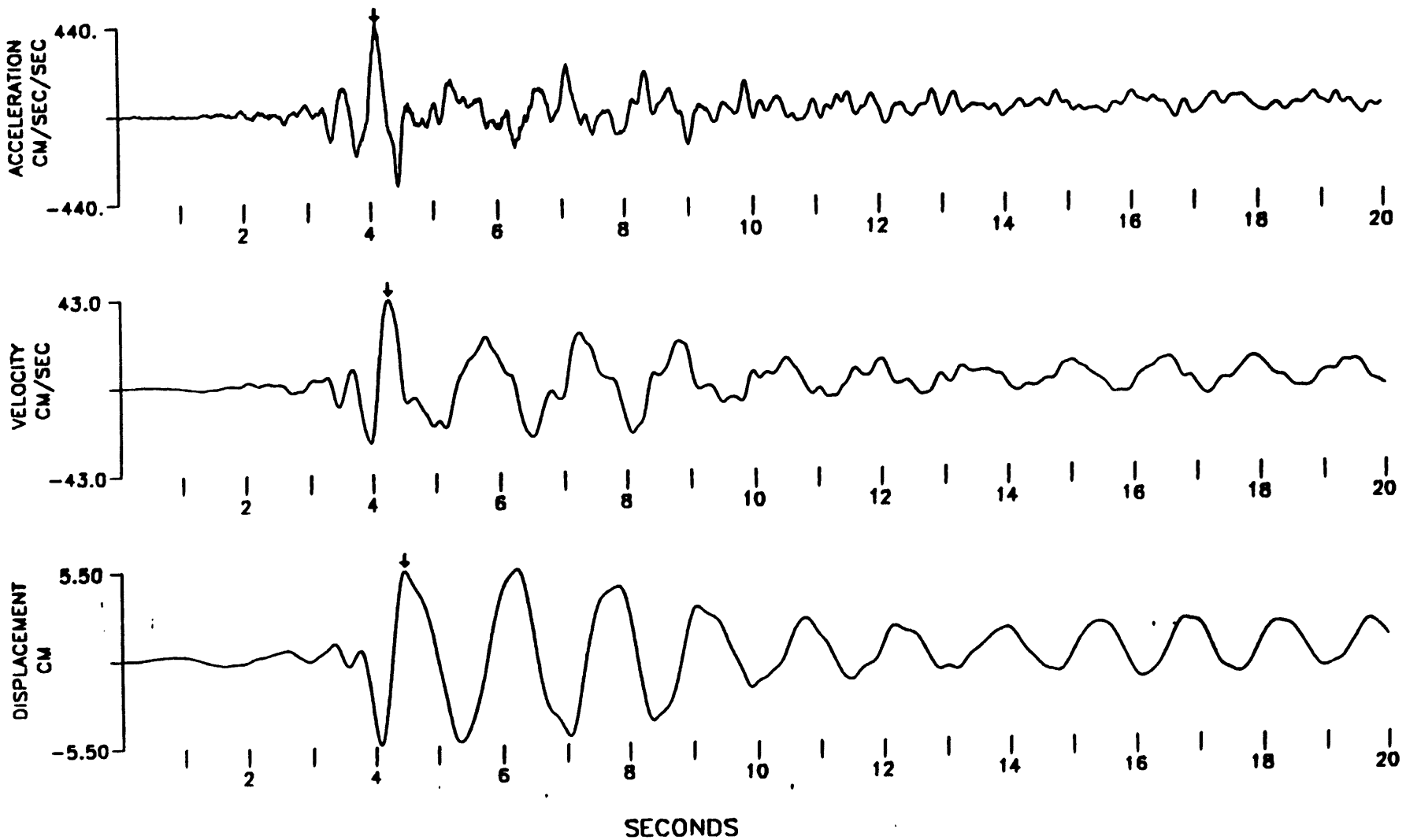
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
NORWALK, 12400 IMPERIAL HIGHWAY, ROOF
090 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT .5 HZ, ORDER 4
PEAK VALUES: ACCEL=-187.03 CM/SEC/SEC, VELOCITY=-18.59 CM/SEC, DISPL=-2.91 CM



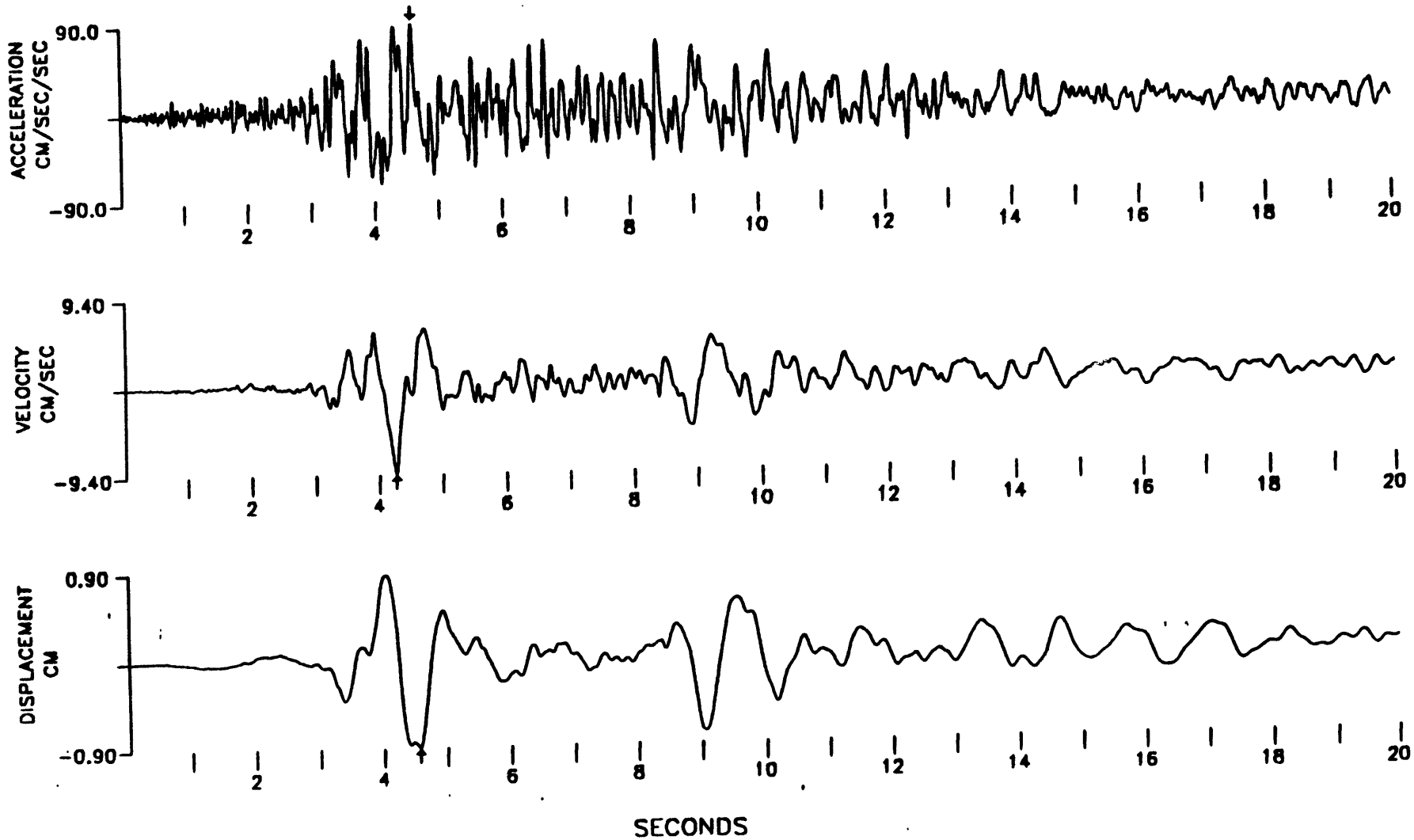
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
NORWALK, 12400 IMPERAL HIGHWAY, ROOF
UP
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT .5 HZ, ORDER 4
PEAK VALUES: ACCEL=-121.52 CM/SEC/SEC, VELOCITY=-6.43 CM/SEC, DISPL=0.69 CM



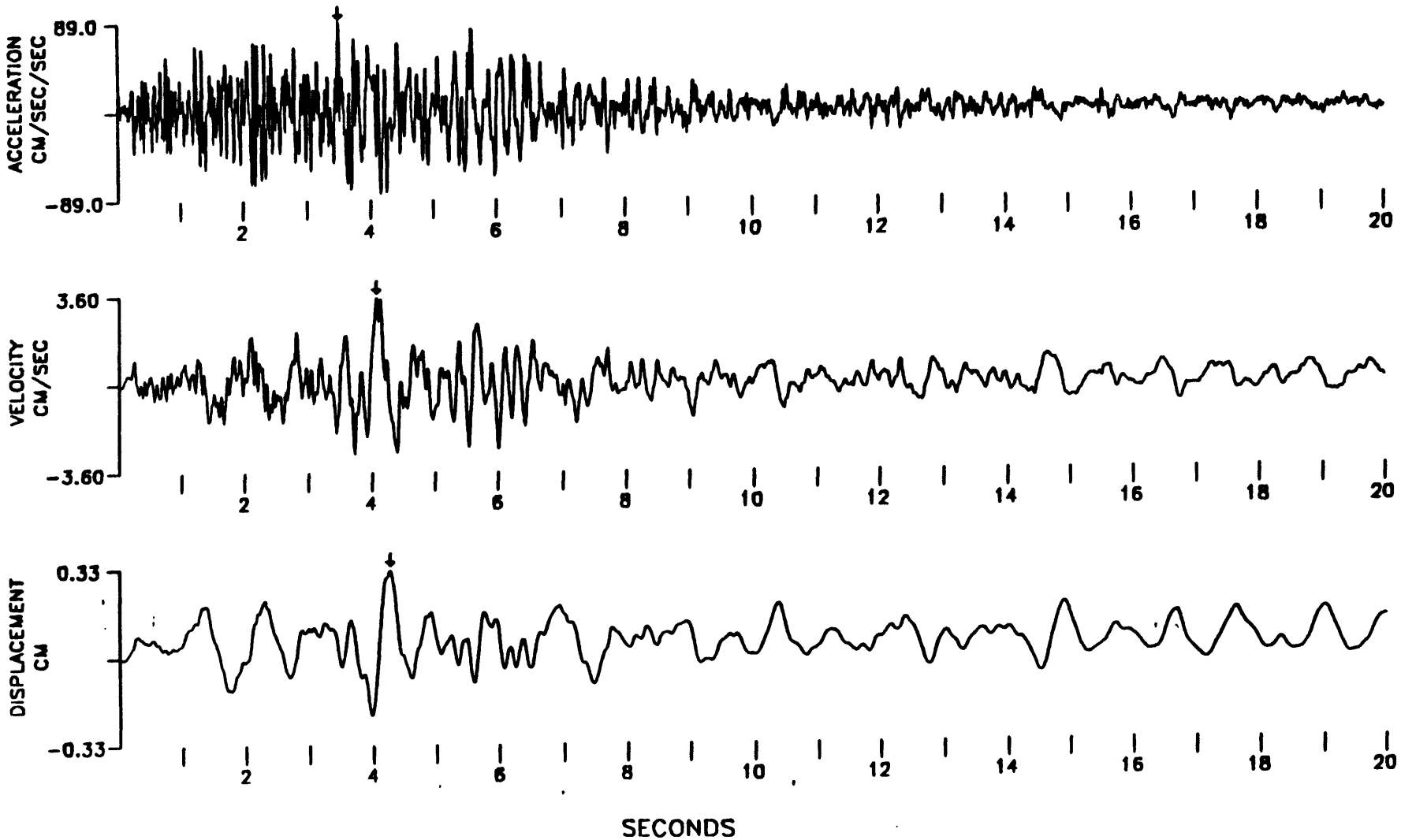
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
NORWALK, 12400 IMPERIAL HIGHWAY, ROOF
360 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT .5 HZ, ORDER 4
PEAK VALUES: ACCEL=436.55 CM/SEC/SEC, VELOCITY=42.02 CM/SEC, DISPL=5.45 CM



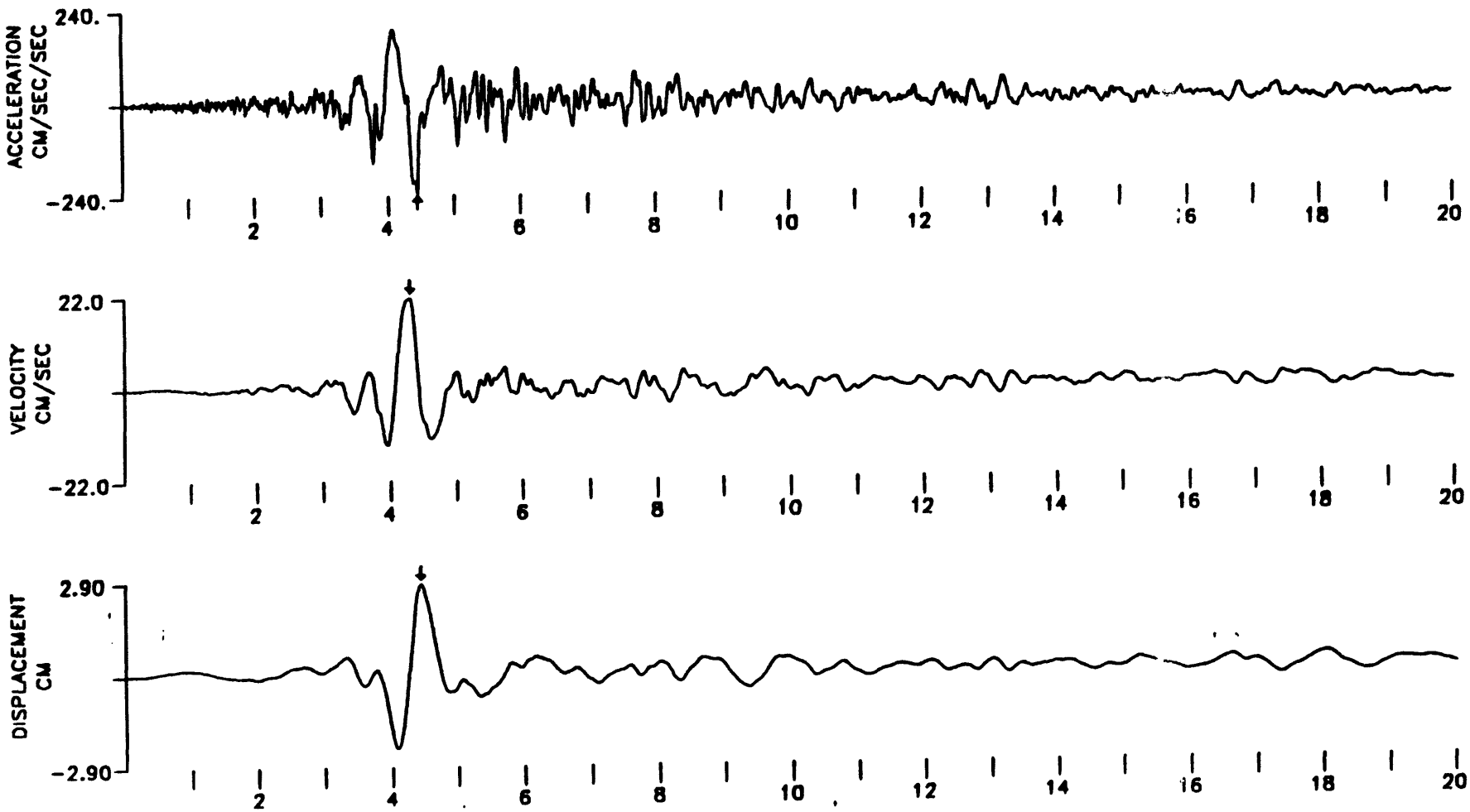
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
NORWALK, 12400 IMPERIAL HIGHWAY, SOUTH GROUND SITE
090 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT .5 HZ, ORDER 4
PEAK VALUES: ACCEL=89.33 CM/SEC/SEC, VELOCITY=-9.31 CM/SEC, DISPL=-0.90 CM



CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
NORWALK, 12400 IMPERAL HIGHWAY, SOUTH GROUND SITE
UP
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT .5 HZ, ORDER 4
PEAK VALUES: ACCEL=88.80 CM/SEC/SEC, VELOCITY=3.51 CM/SEC, DISPL=0.32 CM

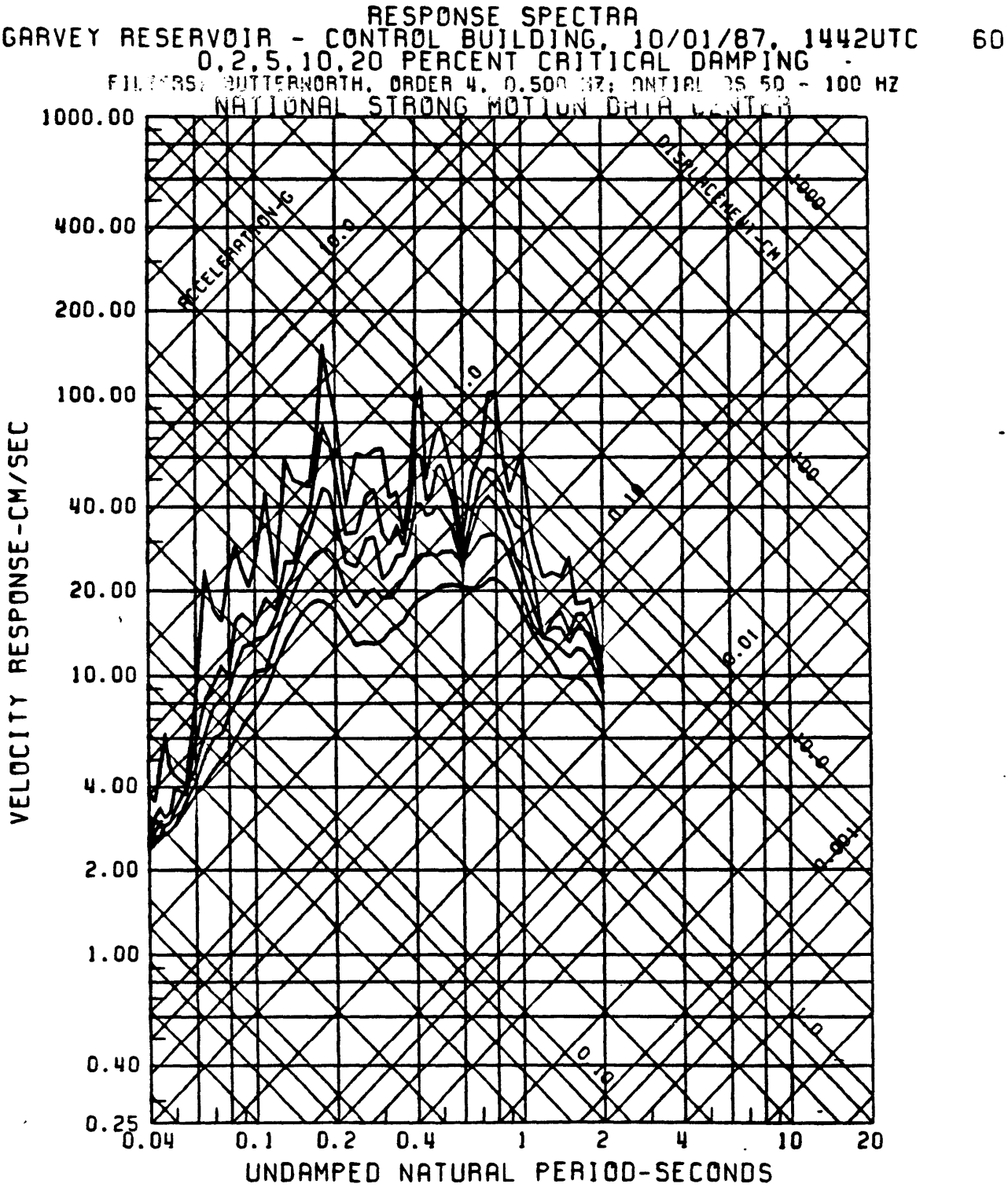


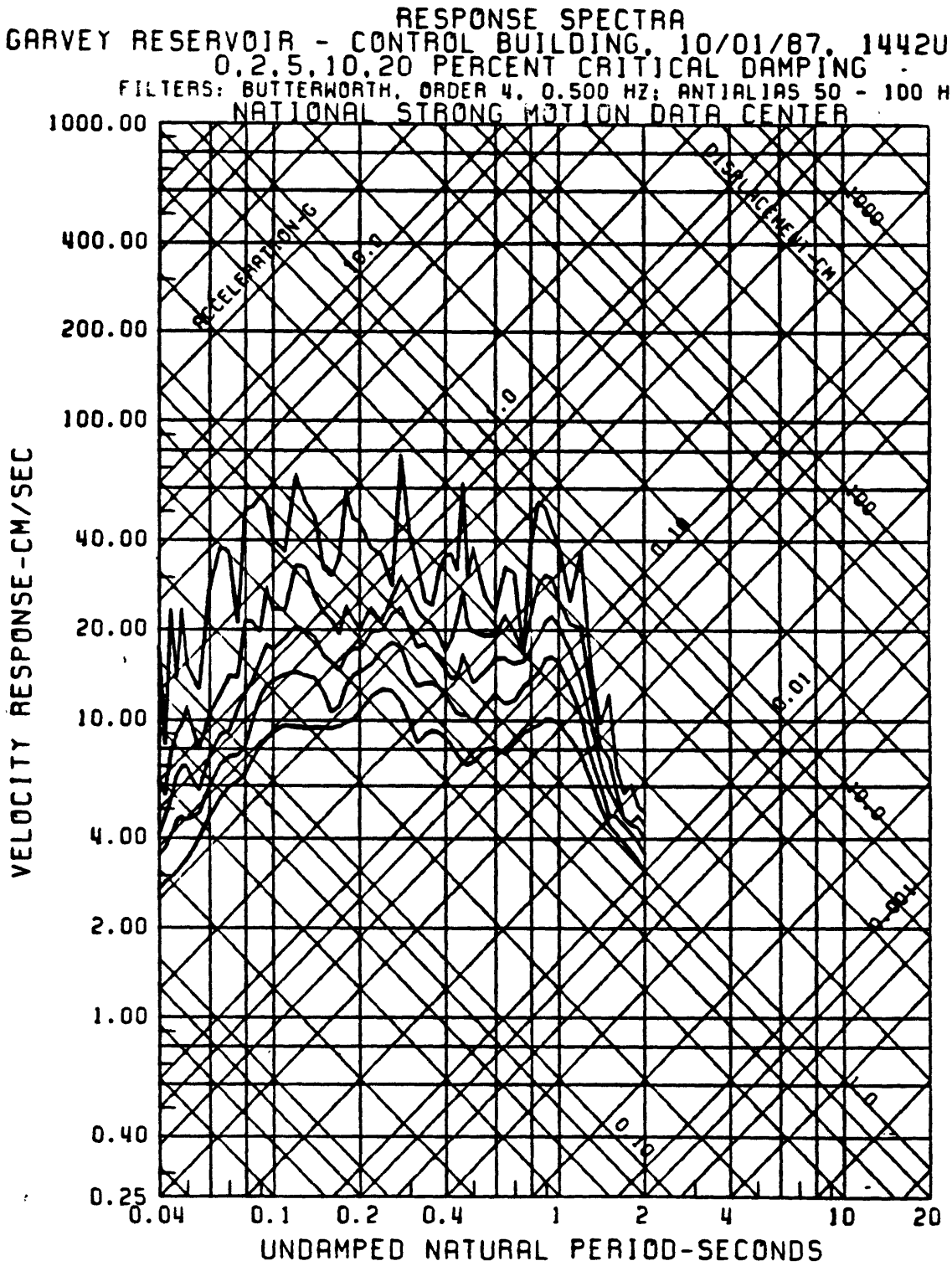
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT 200.00 SPS
NORWALK, 12400 IMPERIAL HIGHWAY, SOUTH GROUND SITE
360 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT .5 HZ, ORDER 4
PEAK VALUES: ACCEL=-234.90 CM/SEC/SEC, VELOCITY=21.61 CM/SEC, DISPL=2.84 CM

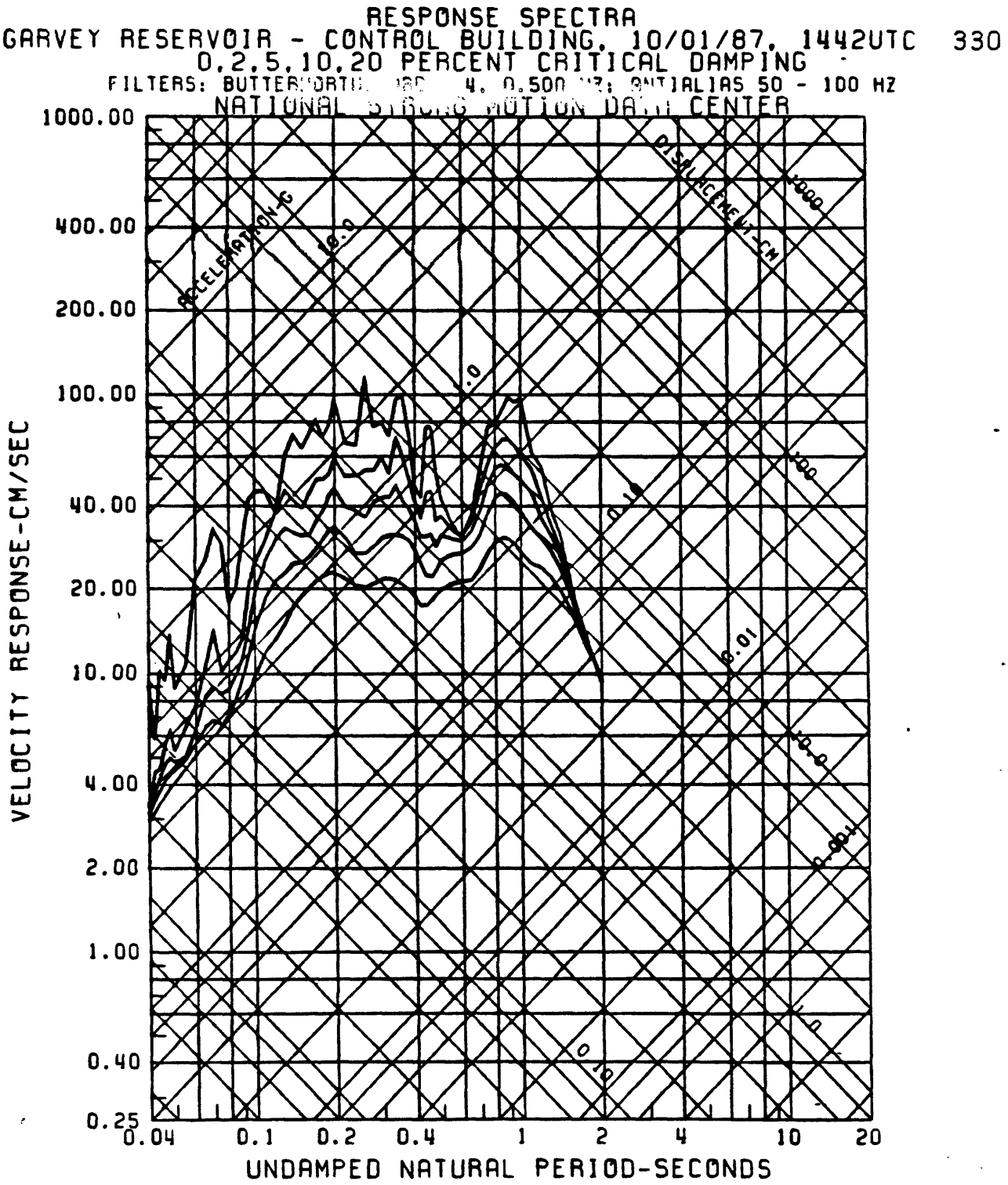


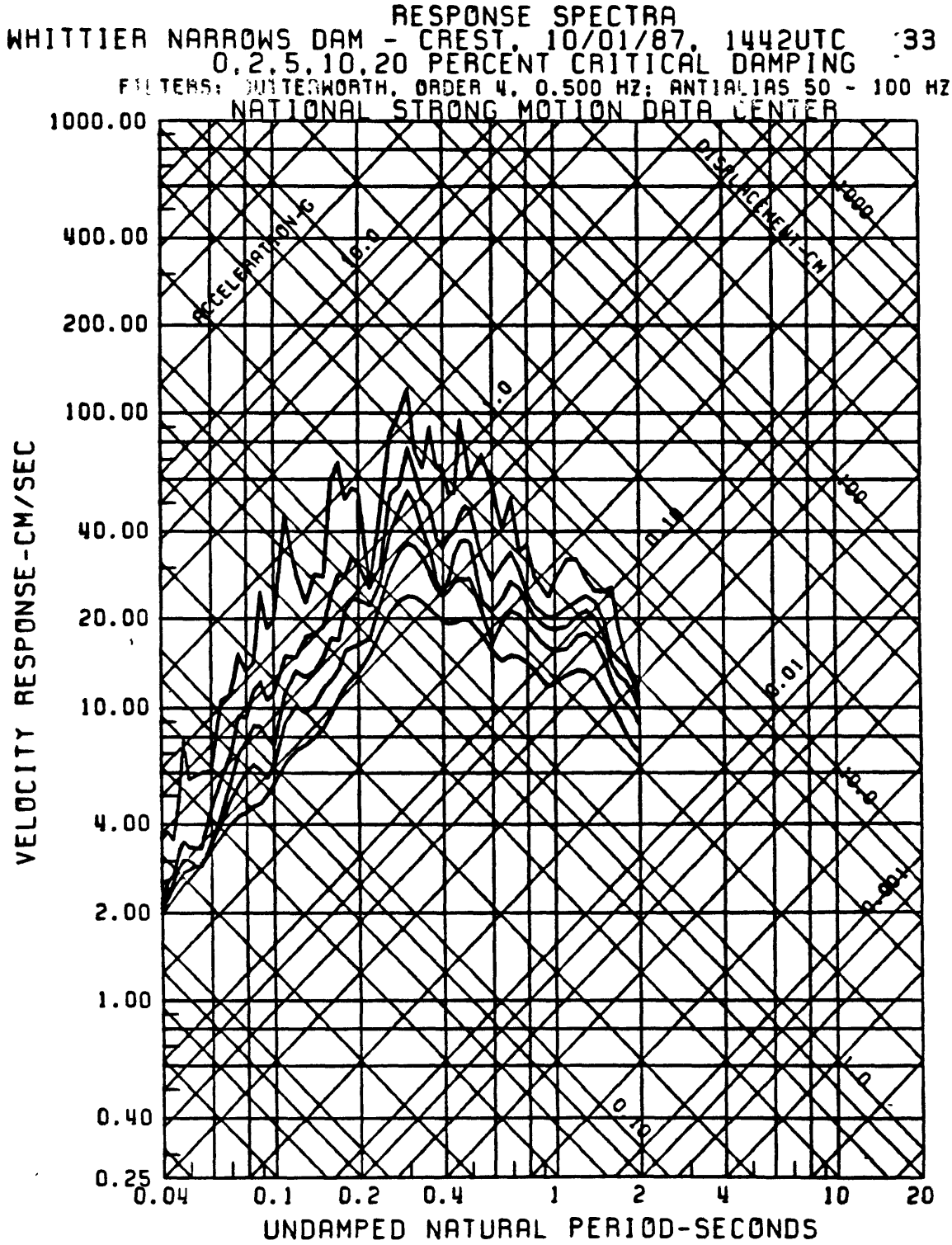
Appendix 3

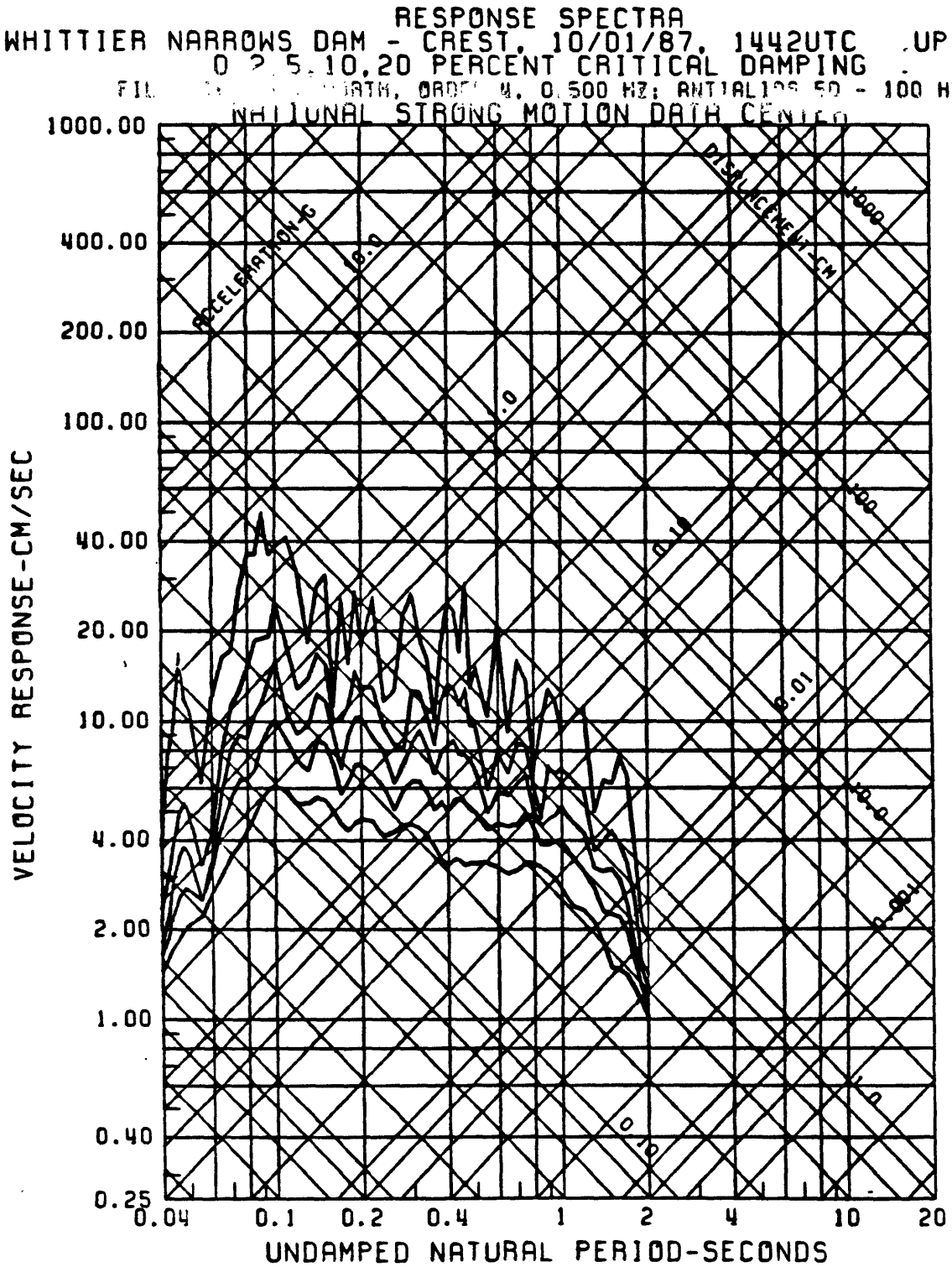
Response spectrum; tripartite plot

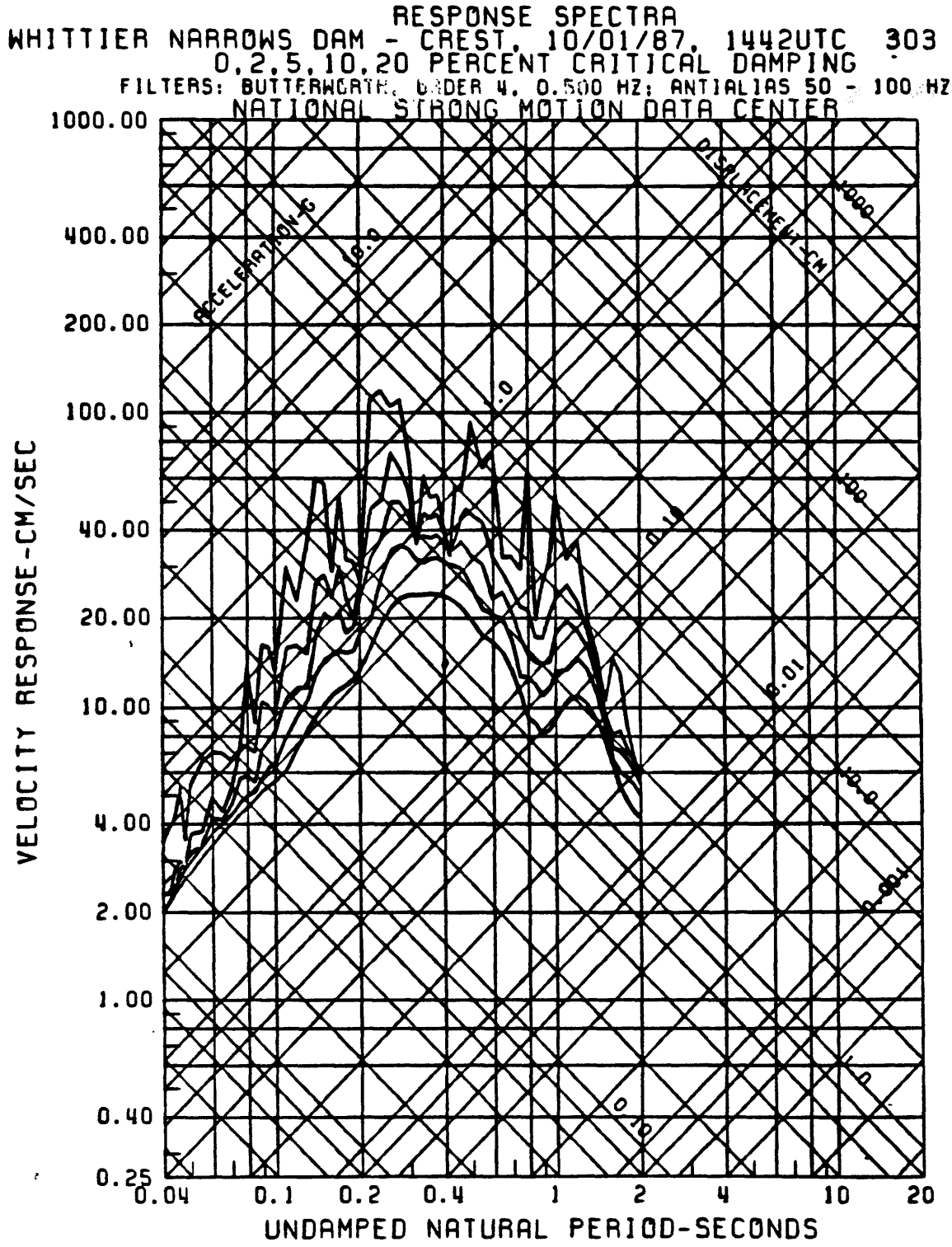

RESPONSE SPECTRA
GARVEY RESERVOIR - CONTROL BUILDING, 10/01/87, 1442UTC 60
0,2,5,10,20 PERCENT CRITICAL DAMPING
NATIONAL STRONG MOTION DATA CENTER
1000.00
400.00
200.00
100.00
40.00
20.00
10.00
4.00
2.00
1.00
0.40
0.25
VELOCITY RESPONSE-CM/SEC
0.04
0.1
0.2
0.4
1
2
4
10
20
UNDAMPED NATURAL PERIOD-SECONDS
ACCELERATION-G
10.0
1.0
0.1
0.01
DISPLACEMENT-CM
1000
100
10.0
1.0
0.10

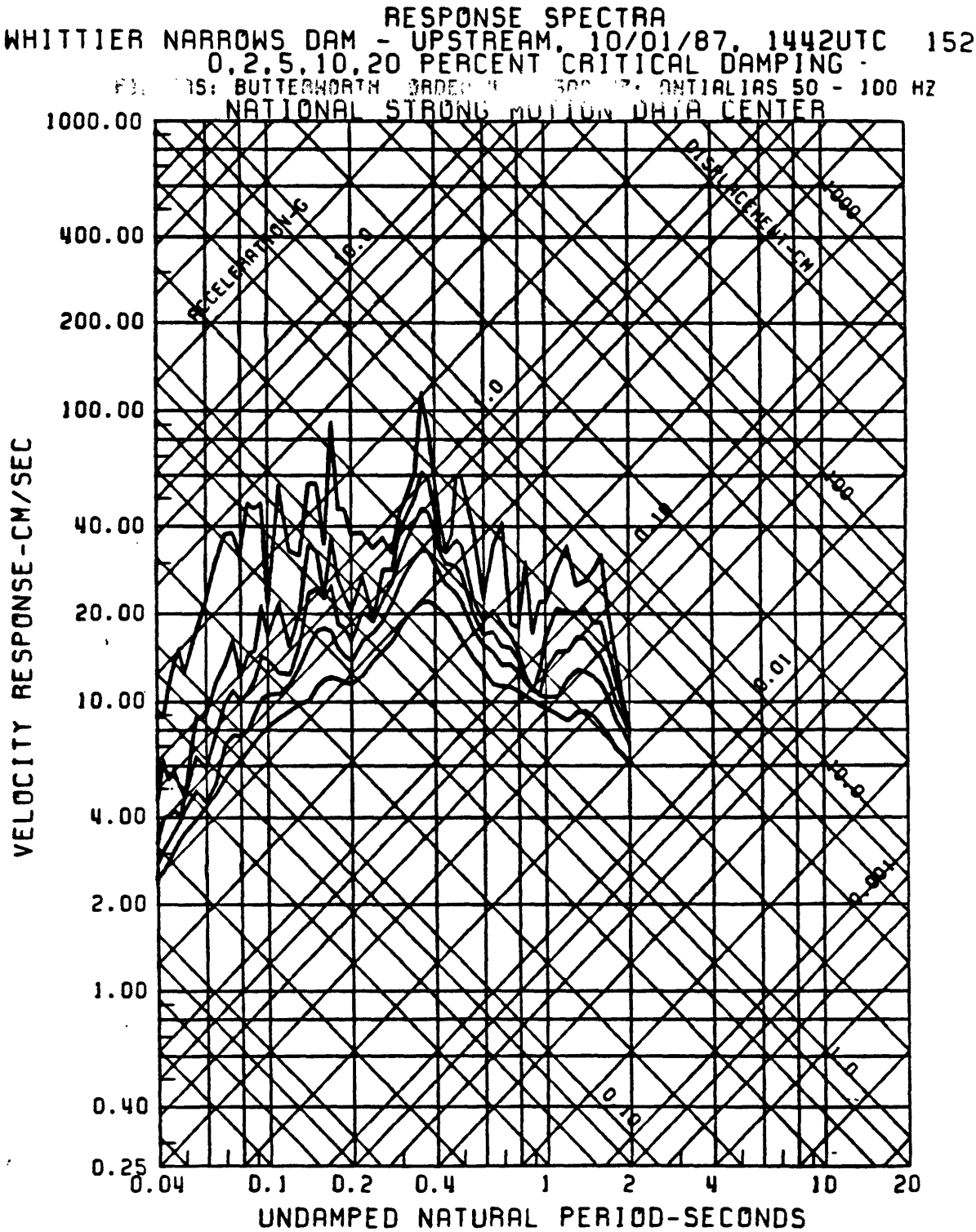

RESPONSE SPECTRA
GARVEY RESERVOIR - CONTROL BUILDING, 10/01/87, 1442UTC UP
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.500 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER
VELOCITY RESPONSE-CM/SEC
1000.00
400.00
200.00
100.00
40.00
20.00
10.00
4.00
2.00
1.00
0.40
0.25
0.04
0.1
0.2
0.4
1
2
4
10
20
UNDAMPED NATURAL PERIOD-SECONDS
ACCELERATION-G
10.0
1.0
0.1
0.01
DISPLACEMENT-CM
1000
100
10.0
1.0
0.10

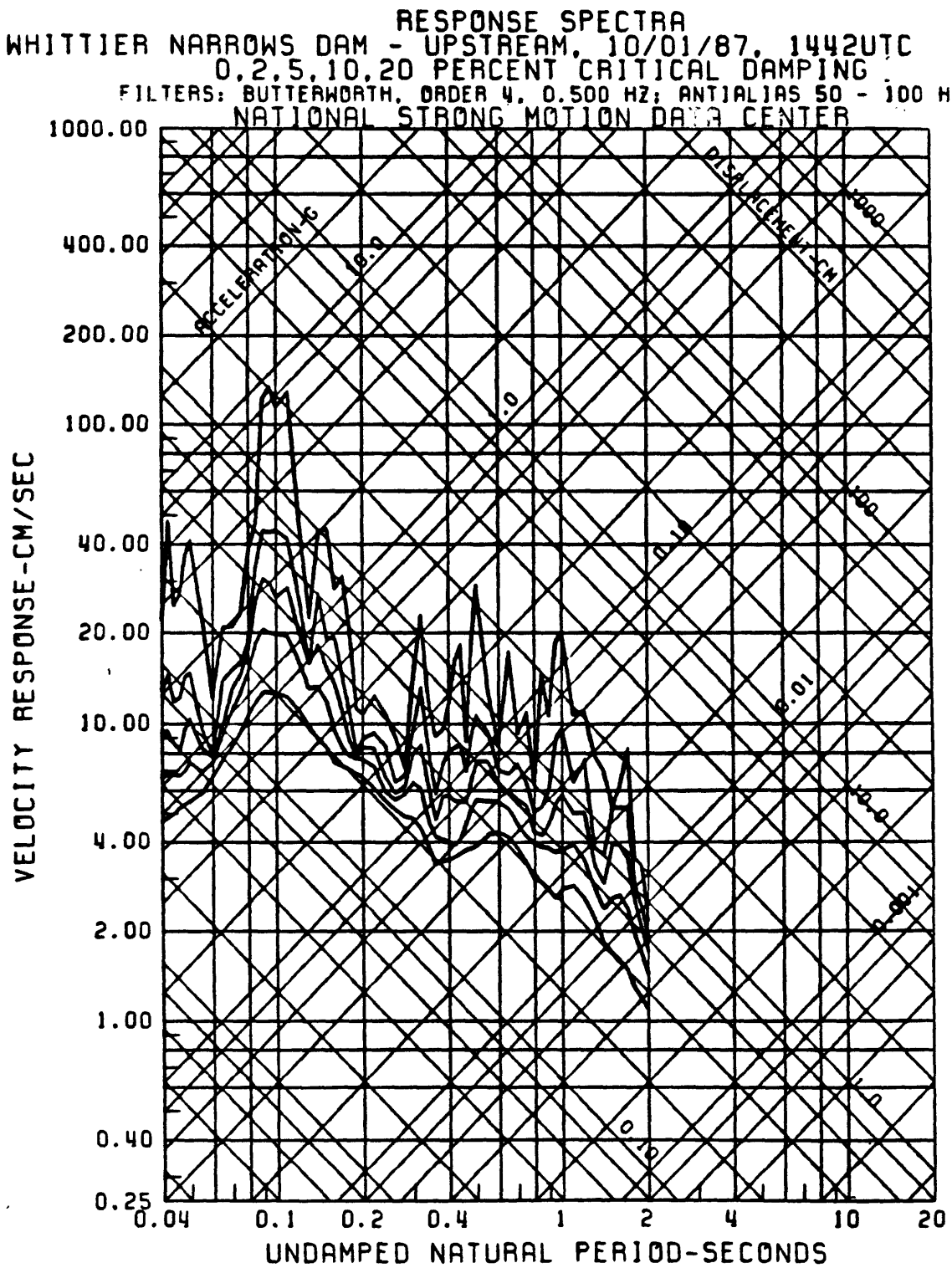

RESPONSE SPECTRA
GARVEY RESERVOIR - CONTROL BUILDING, 10/01/87, 1442UTC 330
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTER
NATIONAL
1000.00
400.00
200.00
100.00
40.00
20.00
10.00
4.00
2.00
1.00
0.40
0.25
ACCELERATION-G
10.0
1.0
0.1
0.01
DISPLACEMENT-CM
1000
100
10.0
1.0
0.01
0.04
0.0
VELOCITY RESPONSE-CM/SEC
0.04
0.1
0.2
0.4
1
2
4
10
20
UNDAMPED NATURAL PERIOD-SECONDS

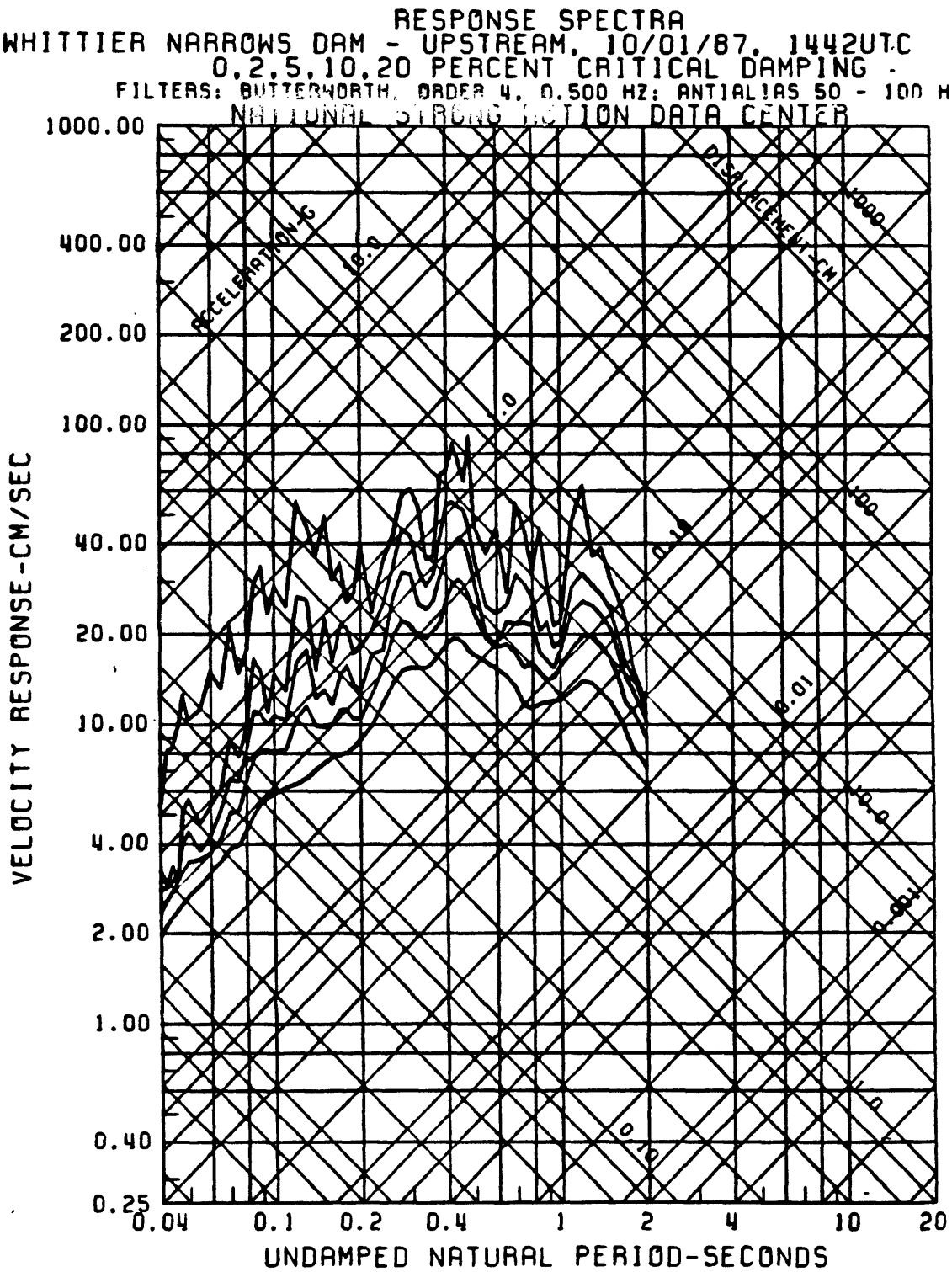

RESPONSE SPECTRA
WHITTIER NARROWS DAM - CREST, 10/01/87, 1442UTC 33
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.500 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER
VELOCITY RESPONSE-CM/SEC
1000.00
400.00
200.00
100.00
40.00
20.00
10.00
4.00
2.00
1.00
0.40
0.25
0.04
0.1
0.2
0.4
1
2
4
10
20
UNDAMPED NATURAL PERIOD-SECONDS
ACCELERATION-G
DISPLACEMENT-CM
10.0
1.0
0.1
0.01
0.10
1000
100
10.0
1.00
0.01
1.0

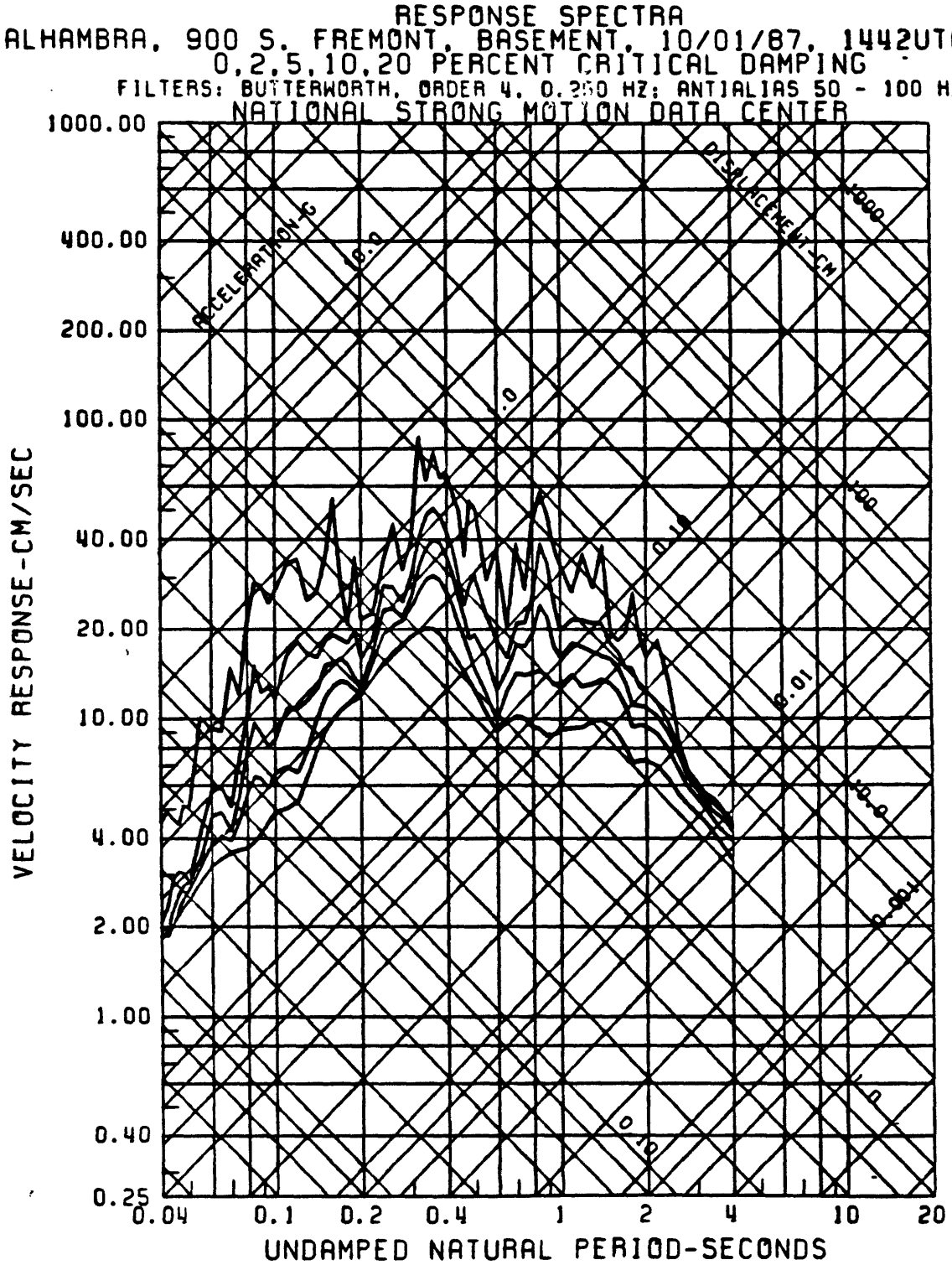

RESPONSE SPECTRA
WHITTIER NARROWS DAM - CREST, 10/01/87, 1442UTC UP
0 2 5 10 20 PERCENT CRITICAL DAMPING
NATIONAL STRONG MOTION DATA CENTER
ACCELERATION-G
10.0
1.0
0.1
0.01
DISPLACEMENT-CM
1000
100
10.0
1.0
0.10
1000.00
400.00
200.00
100.00
40.00
20.00
10.00
4.00
2.00
1.00
0.40
0.25
0.04
0.1
0.2
0.4
1
2
4
10
20
VELOCITY RESPONSE-CM/SEC
UNDAMPED NATURAL PERIOD-SECONDS

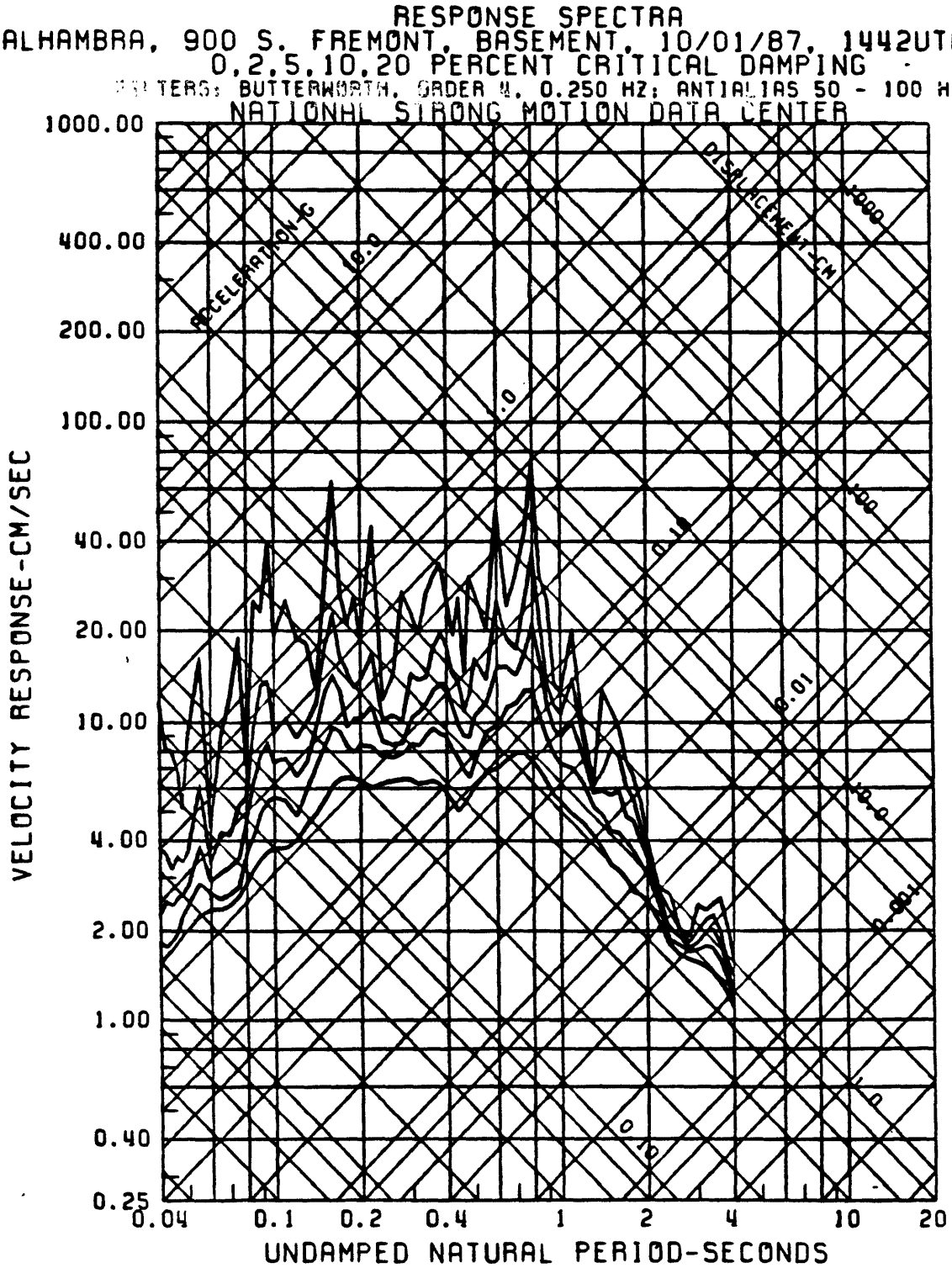

RESPONSE SPECTRA
WHITTIER NARROWS DAM - CREST, 10/01/87, 1442UTC 303
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.500 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER
VELOCITY RESPONSE-CM/SEC
UNDAMPED NATURAL PERIOD-SECONDS
1000.00
400.00
200.00
100.00
40.00
20.00
10.00
4.00
2.00
1.00
0.40
0.25
0.04
0.1
0.2
0.4
1
2
4
10
20
ACCELERATION-G
DISPLACEMENT-CM
0.0
0.1
0.01
0.10

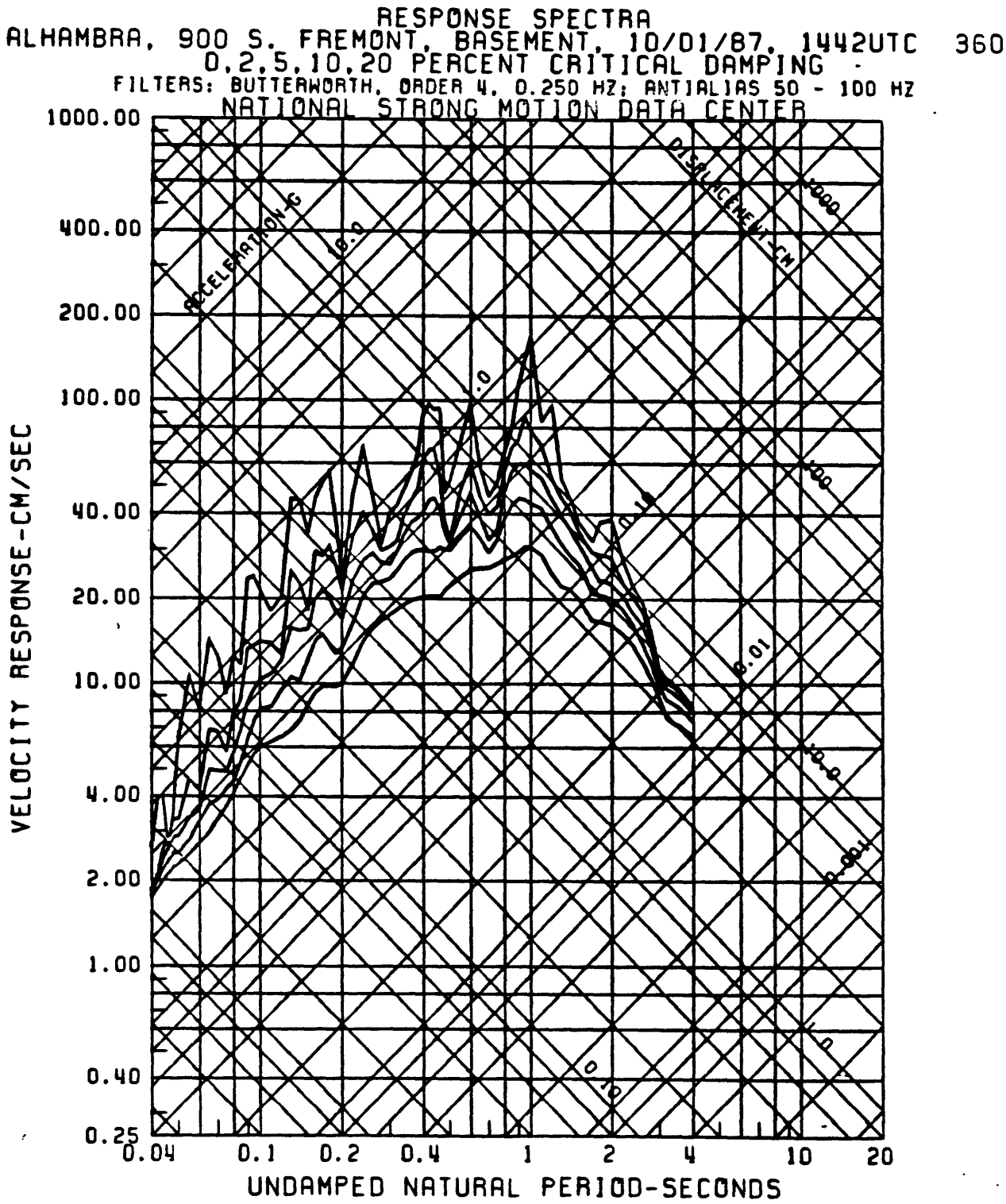

RESPONSE SPECTRA
WHITTIER NARROWS DAM - UPSTREAM, 10/01/87, 1442UTC 152
0,2,5,10,20 PERCENT CRITICAL DAMPING
NATIONAL STRONG MOTION DATA CENTER
1000.00
400.00
200.00
100.00
40.00
20.00
10.00
4.00
2.00
1.00
0.40
0.25
VELOCITY RESPONSE-CM/SEC
0.04
0.1
0.2
0.4
1
2
4
10
20
UNDAMPED NATURAL PERIOD-SECONDS
ACCELERATION-G
DISPLACEMENT-CM


RESPONSE SPECTRA
WHITTIER NARROWS DAM - UPSTREAM, 10/01/87, 1442UTC UP
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.500 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER
VELOCITY RESPONSE-CM/SEC
1000.00
400.00
200.00
100.00
40.00
20.00
10.00
4.00
2.00
1.00
0.40
0.25
0.04
0.1
0.2
0.4
1
2
4
10
20
UNDAMPED NATURAL PERIOD-SECONDS
ACCELERATION-G
DISPLACEMENT-CM

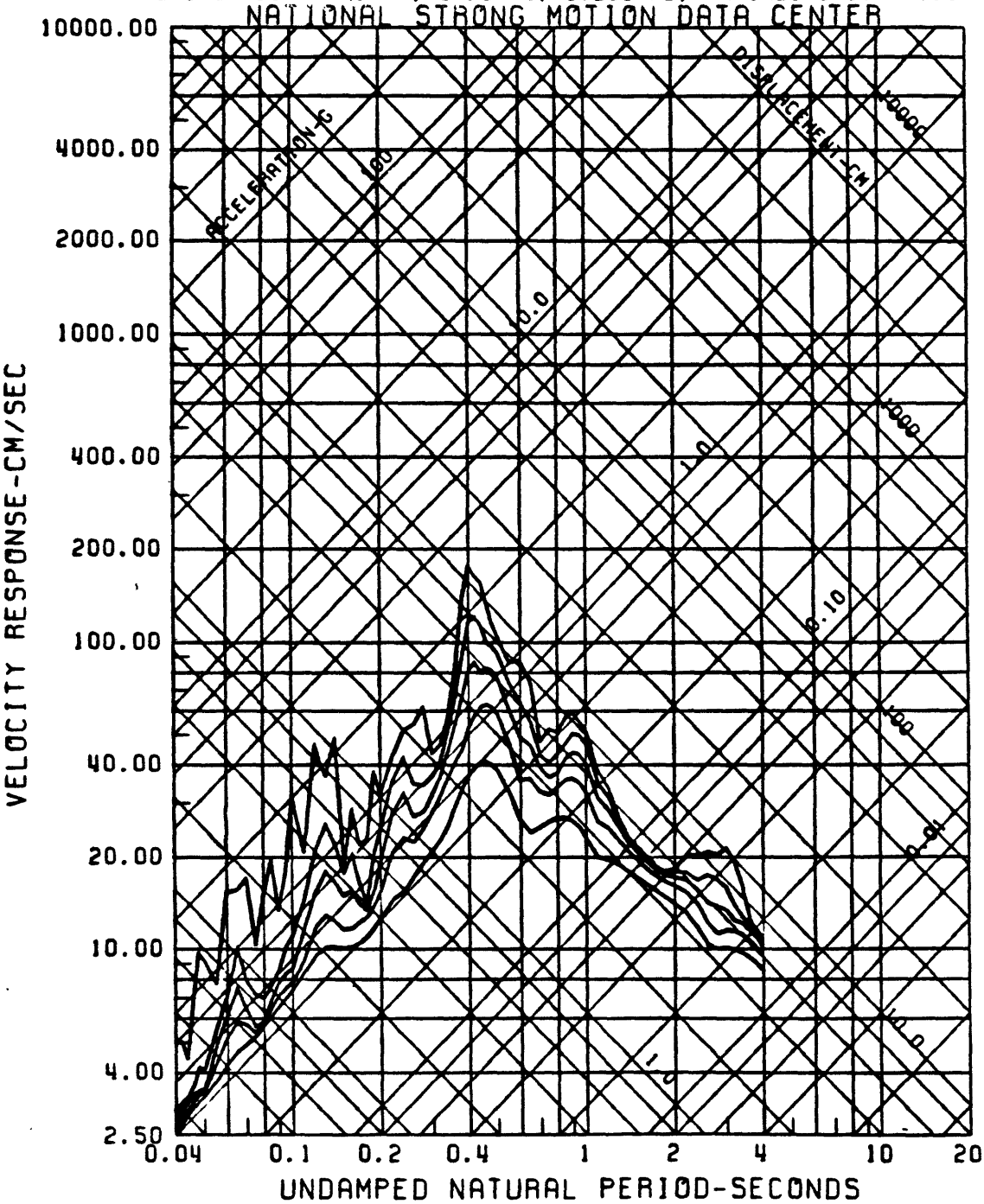

RESPONSE SPECTRA
WHITTIER NARROWS DAM - UPSTREAM, 10/01/87, 1442UTC 62
0,2,5,10,20 PERCENT CRITICAL DAMPING -
FILTERS: BUTTERWORTH, ORDER 4, 0.500 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER
VELOCITY RESPONSE-CM/SEC
UNDAMPED NATURAL PERIOD-SECONDS
1000.00
400.00
200.00
100.00
40.00
20.00
10.00
4.00
2.00
1.00
0.40
0.25
0.04
0.1
0.2
0.4
1
2
4
10
20
ACCELERATION-G
DISPLACEMENT-CM
0.0
0.01
0.10


RESPONSE SPECTRA
ALHAMBRA, 900 S. FREMONT, BASEMENT, 10/01/87, 1442UTC 90
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.250 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER
ACCELERATION-G
DISPLACEMENT-CM
VELOCITY RESPONSE-CM/SEC
UNDAMPED NATURAL PERIOD-SECONDS
1000.00
400.00
200.00
100.00
40.00
20.00
10.00
4.00
2.00
1.00
0.40
0.25
0.04
0.1
0.2
0.4
1
2
4
10
20

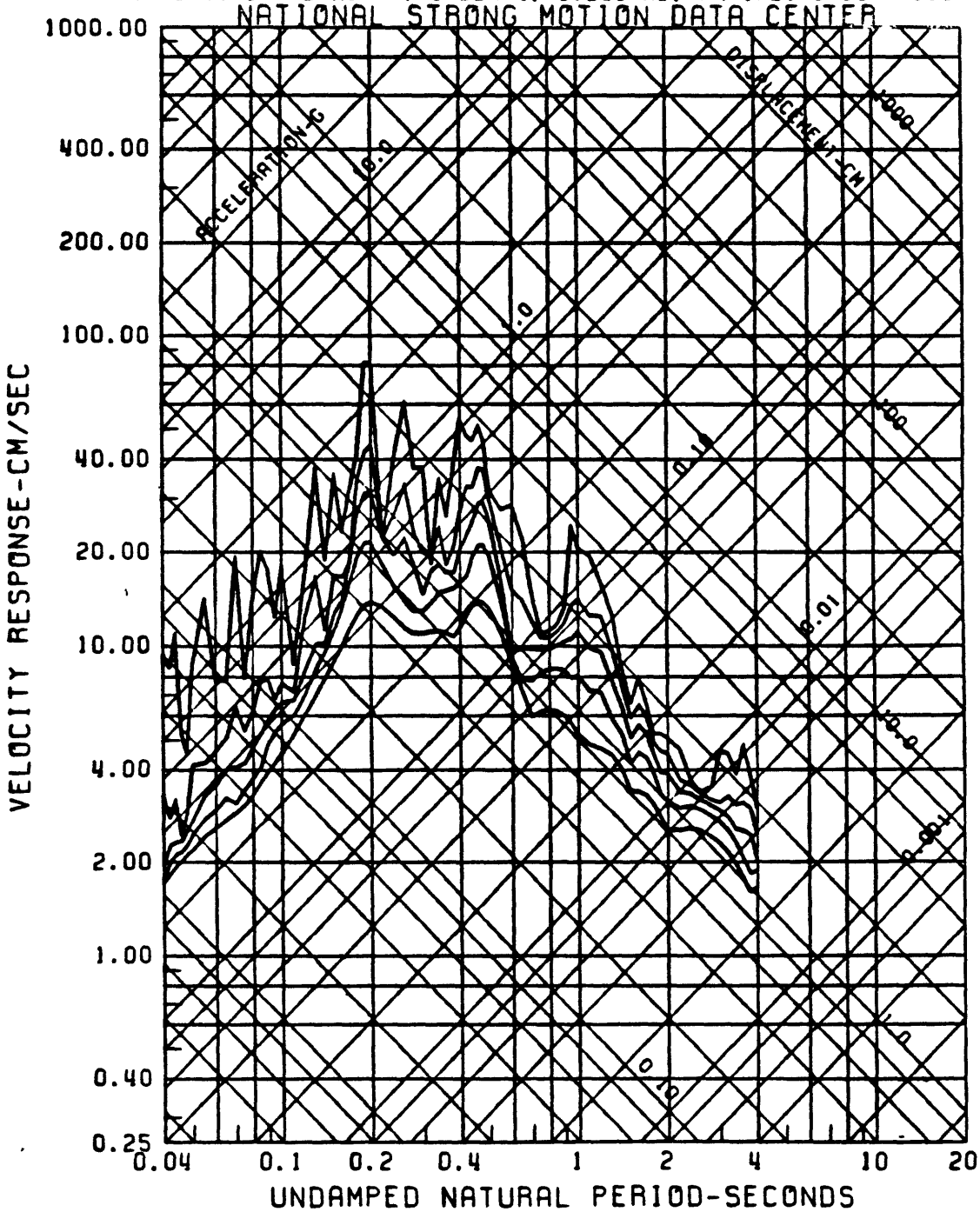

RESPONSE SPECTRA
ALHAMBRA, 900 S. FREMONT, BASEMENT, 10/01/87, 1442UTC UP
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.250 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER
VELOCITY RESPONSE-CM/SEC
1000.00
400.00
200.00
100.00
40.00
20.00
10.00
4.00
2.00
1.00
0.40
0.25
0.04
0.1
0.2
0.4
1
2
4
10
20
UNDAMPED NATURAL PERIOD-SECONDS
ACCELERATION-G
10.0
1.0
0.1
0.01
0.001
DISPLACEMENT-CM
1000
100
10.0
1.0
0.10

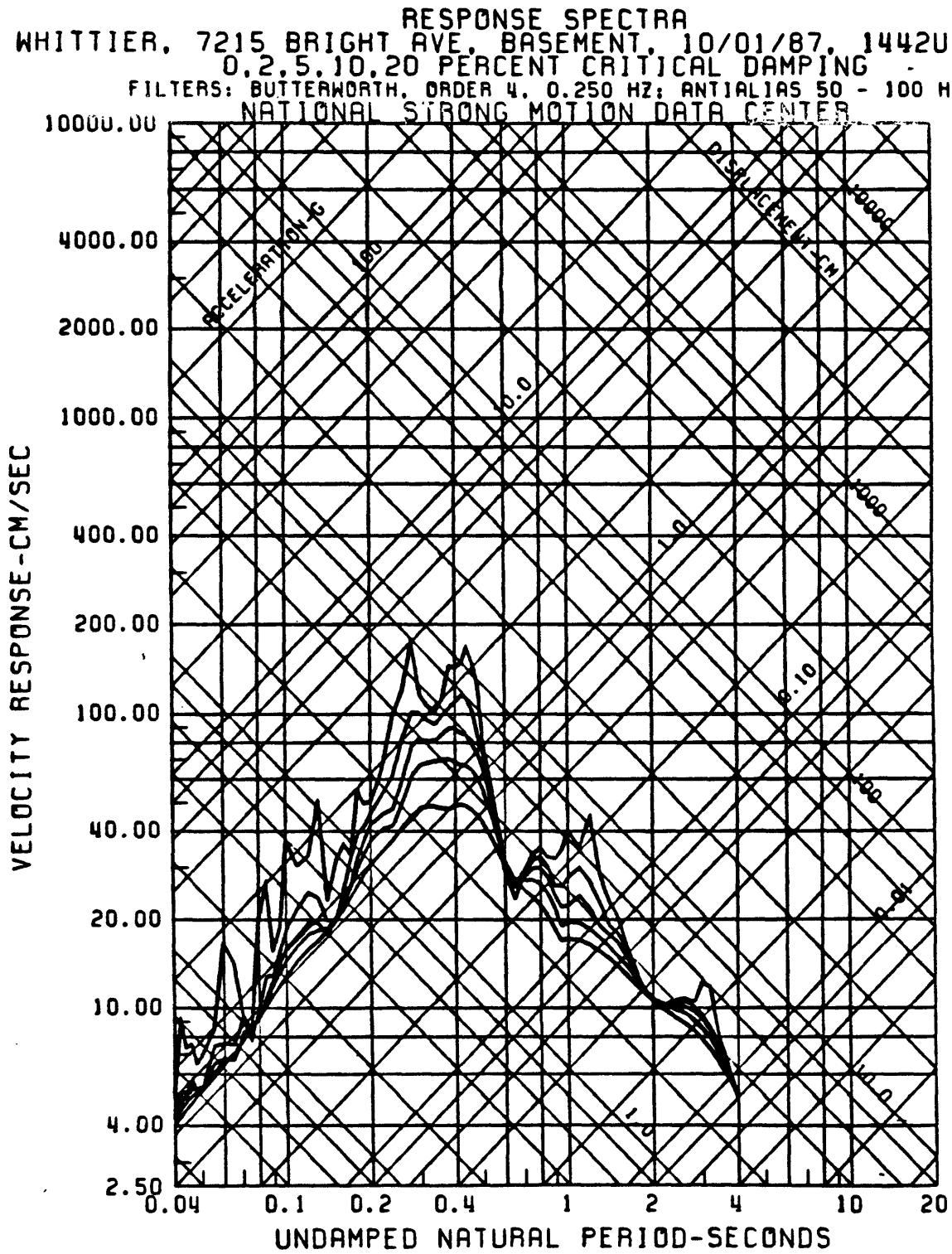

RESPONSE SPECTRA
ALHAMBRA, 900 S. FREMONT, BASEMENT, 10/01/87, 1442UTC 360
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.250 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER
VELOCITY RESPONSE-CM/SEC
1000.00
400.00
200.00
100.00
40.00
20.00
10.00
4.00
2.00
1.00
0.40
0.25
0.04
0.1
0.2
0.4
1
2
4
10
20
UNDAMPED NATURAL PERIOD-SECONDS
ACCELERATION-G
DISPLACEMENT-CM
10.0
1.0
0.10
0.01

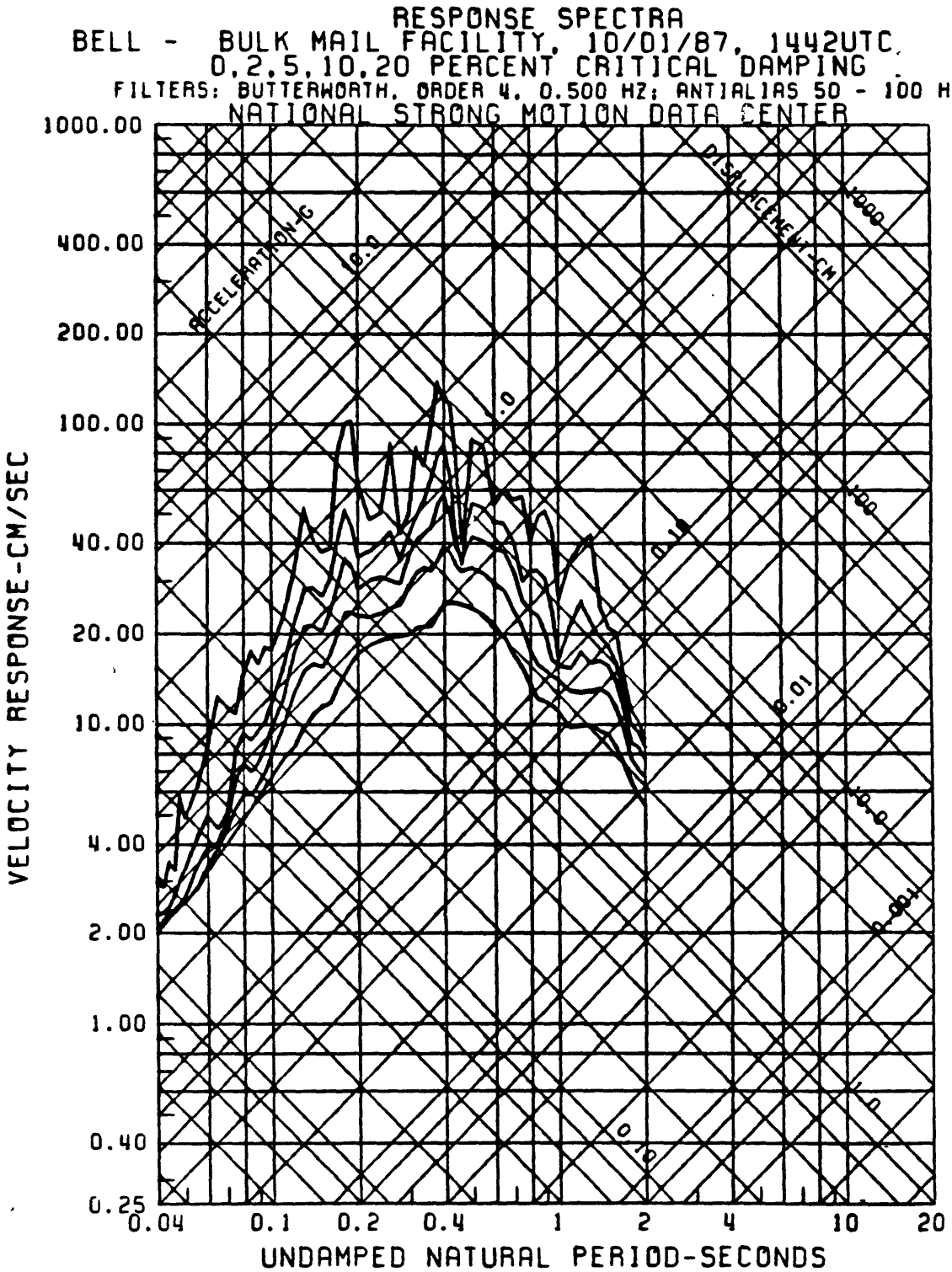
RESPONSE SPECTRA
WHITTIER, 7215 BRIGHT AVE, BASEMENT, 10/01/87, 1442UTC 180
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.250 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER

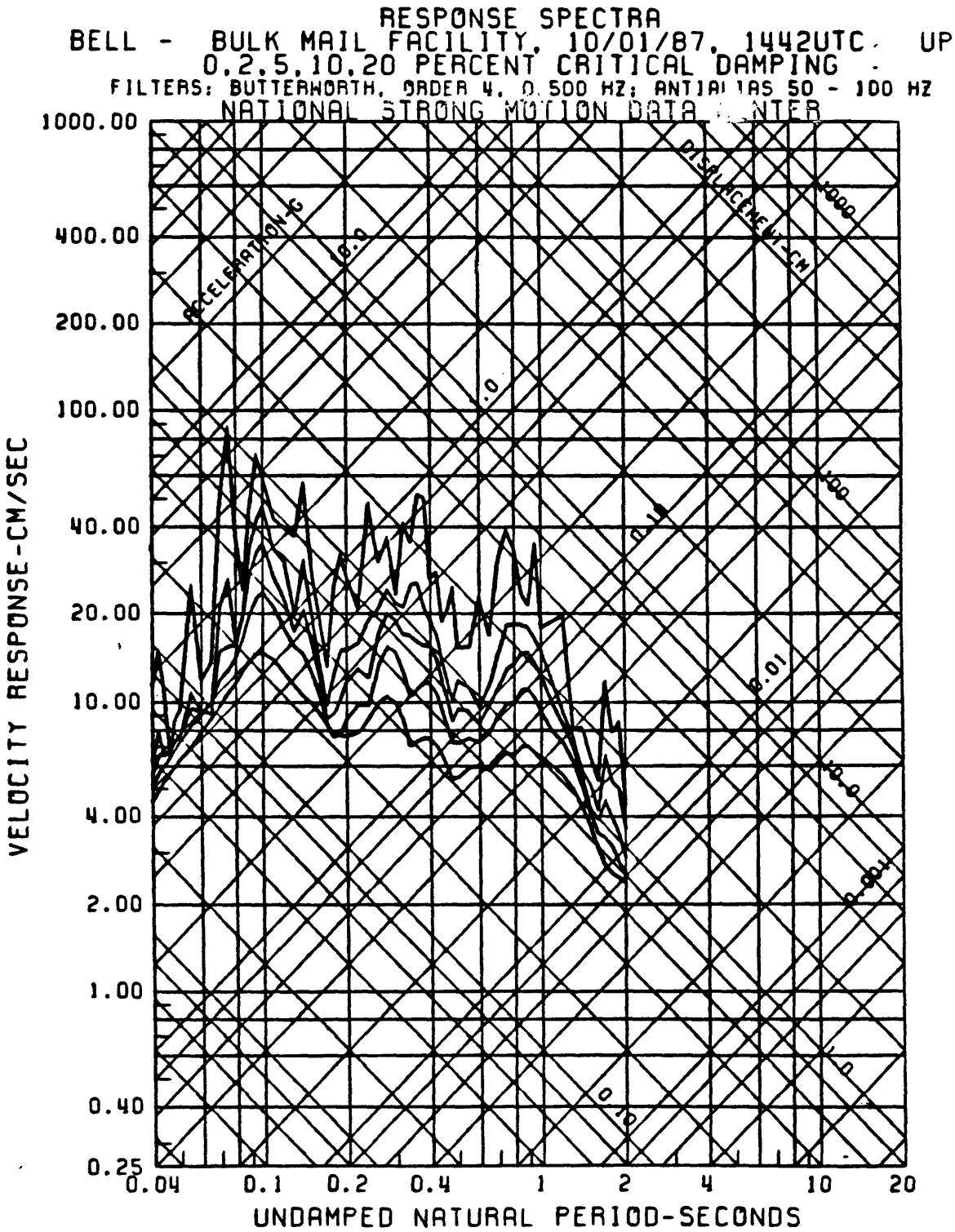


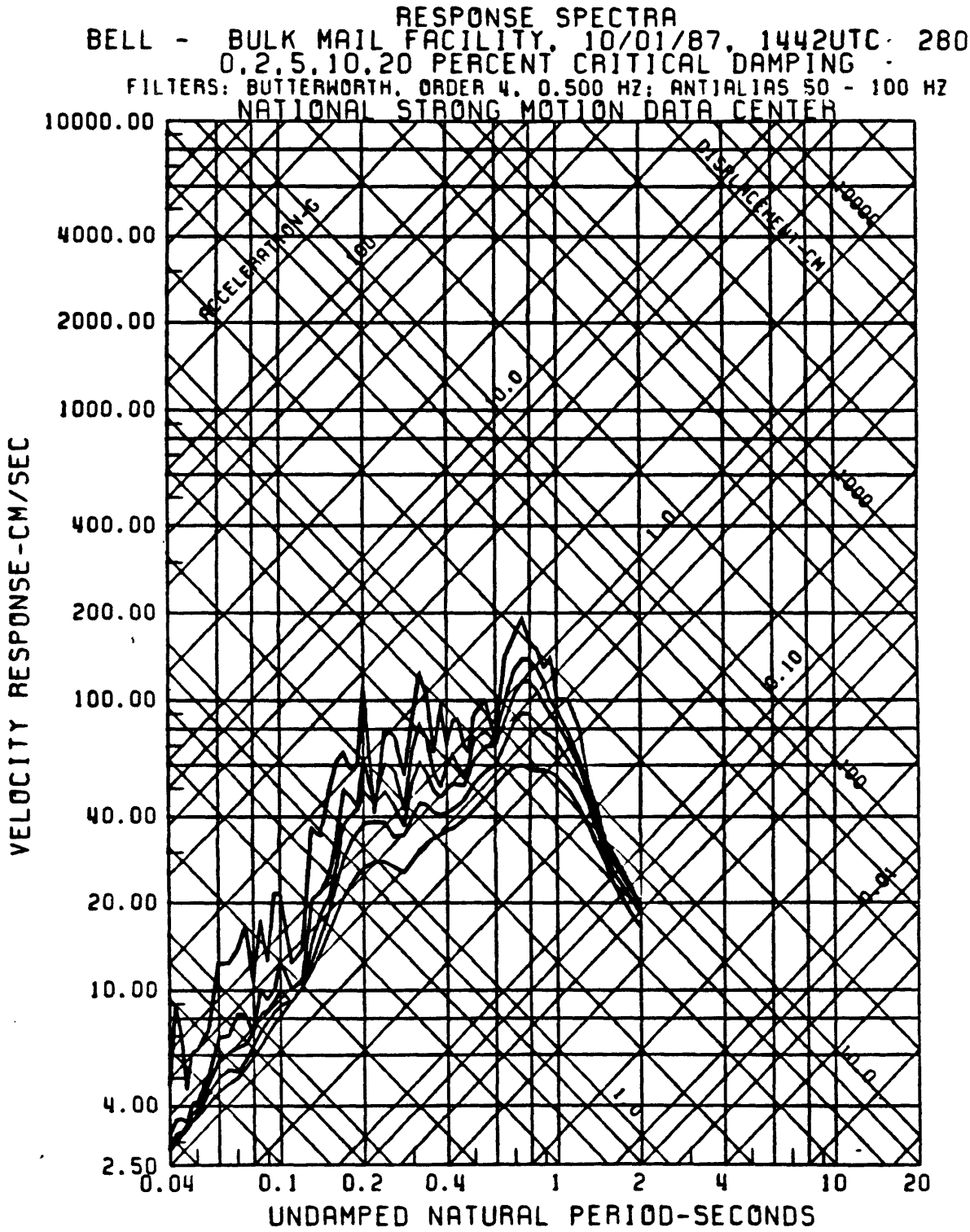
RESPONSE SPECTRA
WHITTIER, 7215 BRIGHT AVE, BASEMENT, 10/01/87, 1442UTC UP
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.250 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER

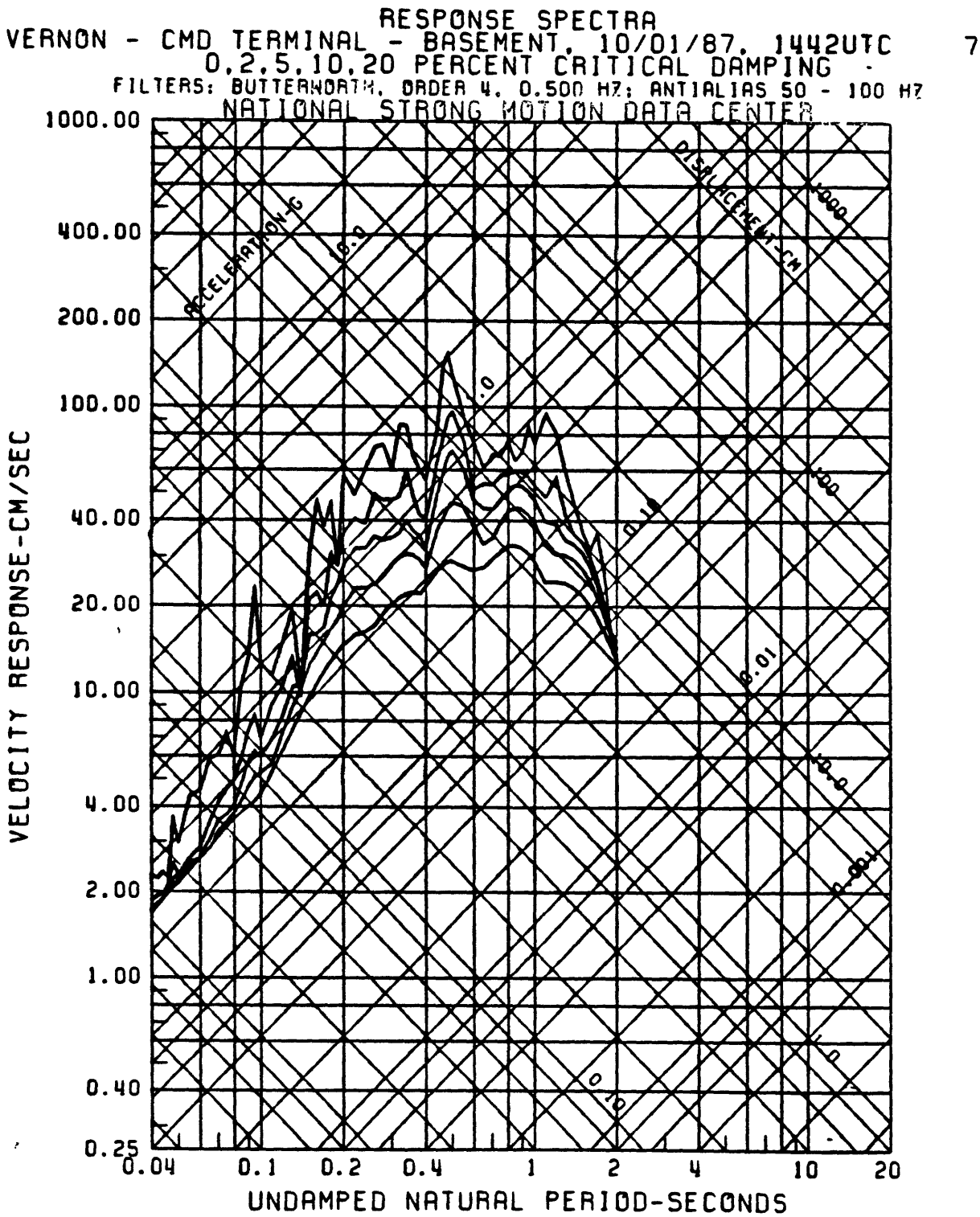


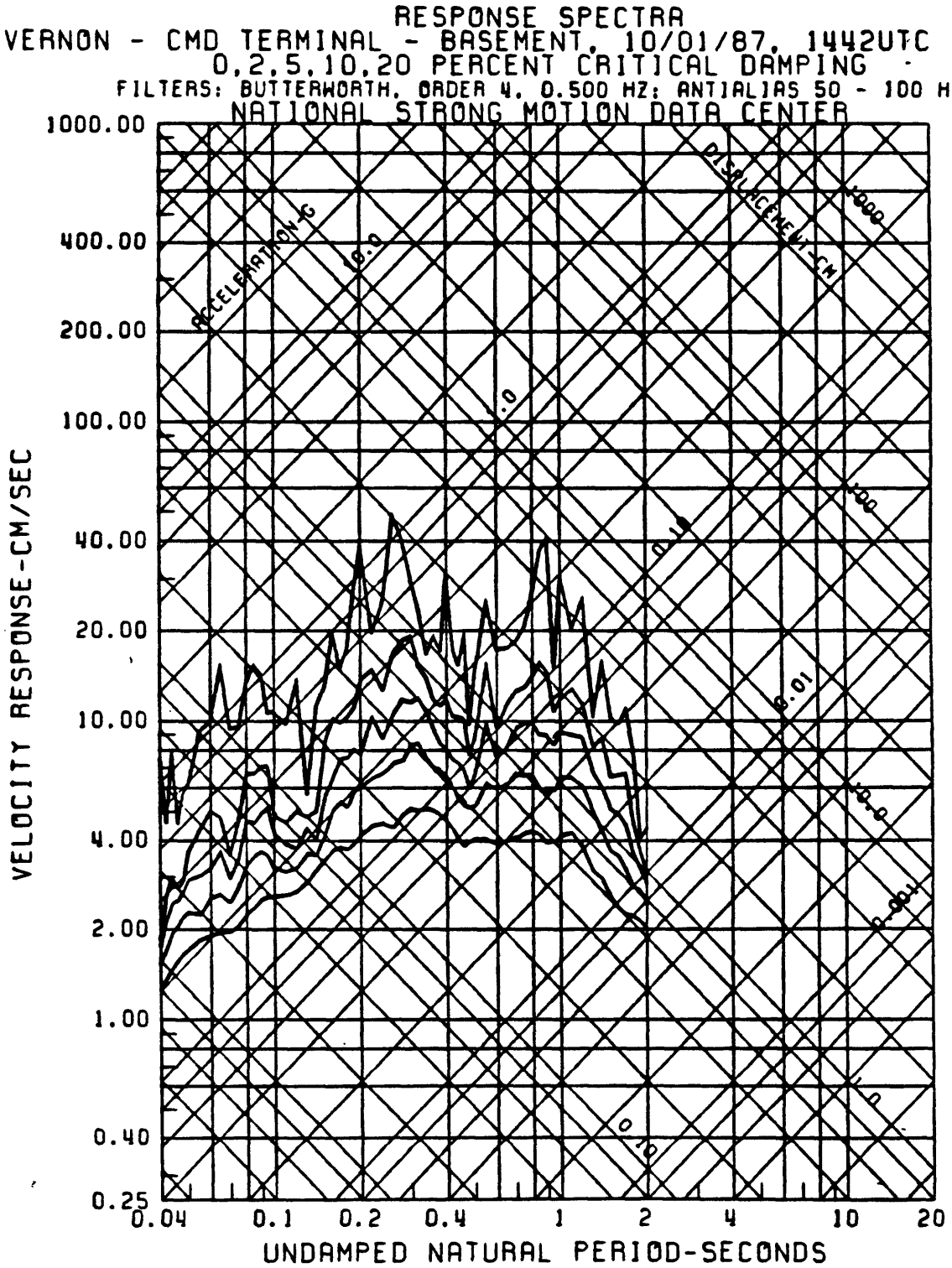

RESPONSE SPECTRA
WHITTIER, 7215 BRIGHT AVE, BASEMENT, 10/01/87, 1442UTC 90
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.250 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER
VELOCITY RESPONSE-CM/SEC
10000.00
4000.00
2000.00
1000.00
400.00
200.00
100.00
40.00
20.00
10.00
4.00
2.50
0.04
0.1
0.2
0.4
1
2
4
10
20
UNDAMPED NATURAL PERIOD-SECONDS
ACCELERATION-G
DISPLACEMENT-CM

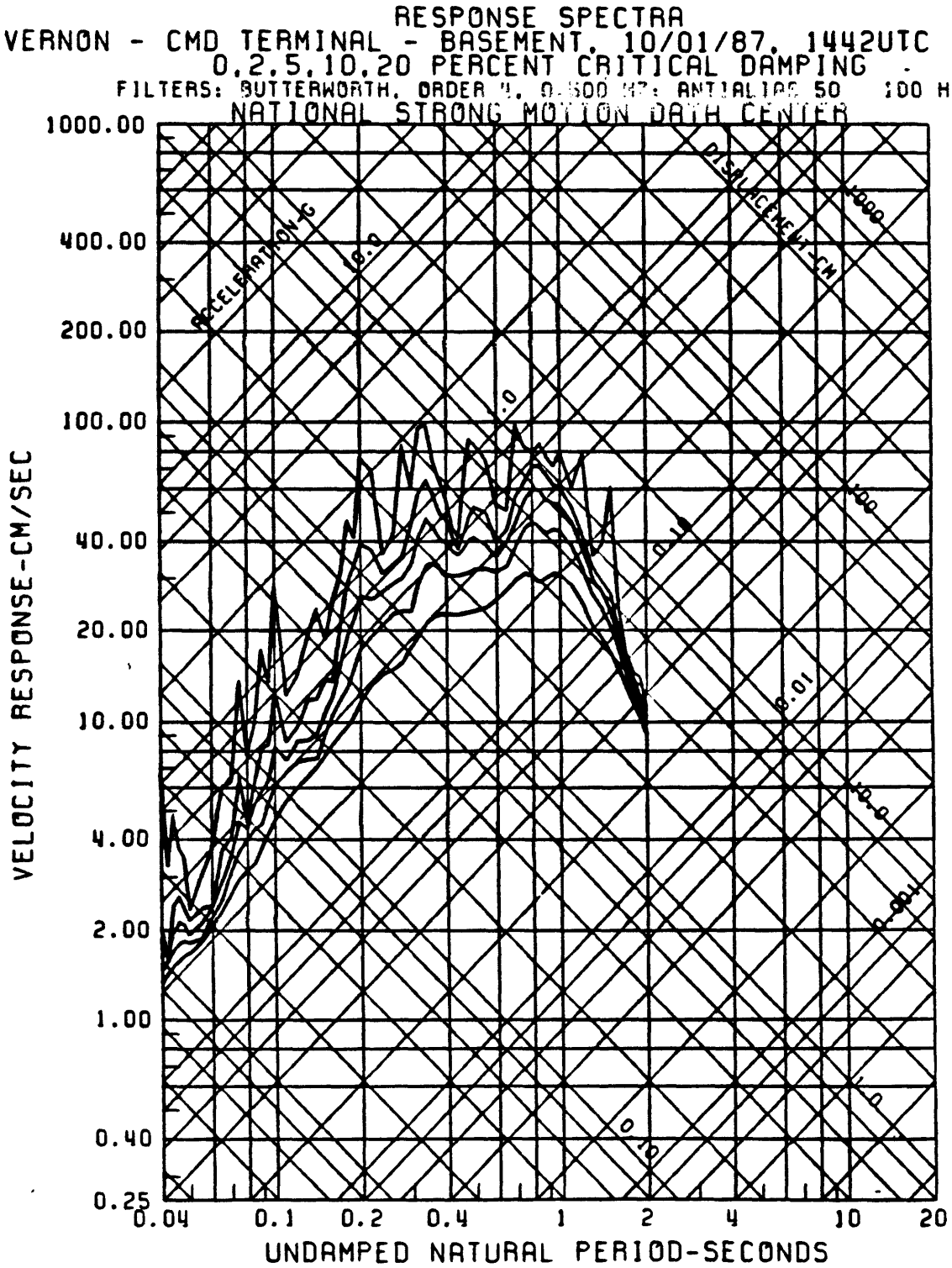

RESPONSE SPECTRA
BELL - BULK MAIL FACILITY, 10/01/87, 1442UTC, 10
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.500 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER
VELOCITY RESPONSE-CM/SEC
1000.00
400.00
200.00
100.00
40.00
20.00
10.00
4.00
2.00
1.00
0.40
0.25
0.04
0.1
0.2
0.4
1
2
4
10
20
UNDAMPED NATURAL PERIOD-SECONDS
ACCELERATION-G
10.0
1.0
0.1
0.01
DISPLACEMENT-CM
1000
100
10.0
1.0
0.10
0.0
0.10

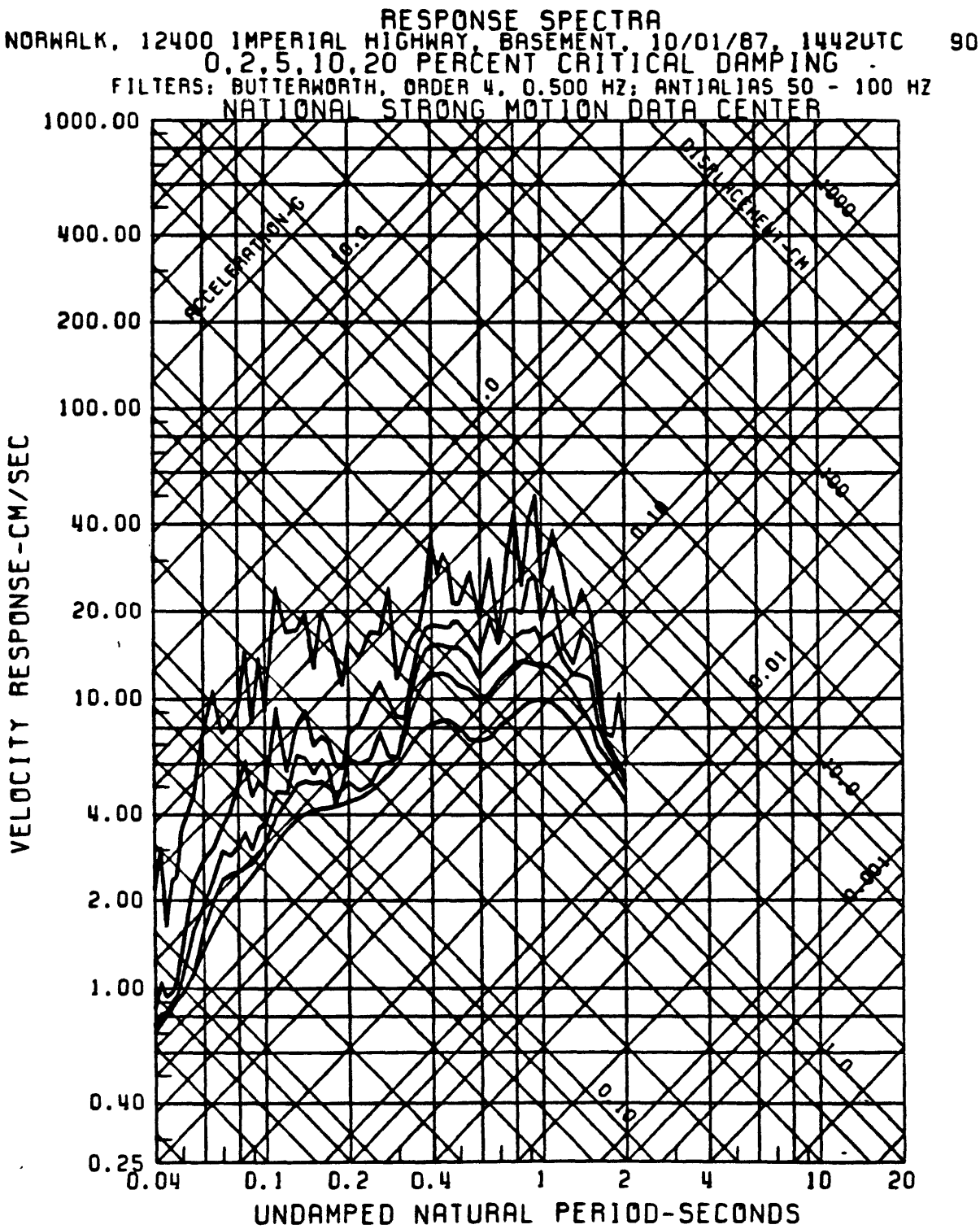

RESPONSE SPECTRA
BELL - BULK MAIL FACILITY, 10/01/87, 1442UTC, UP
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.500 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER
VELOCITY RESPONSE-CM/SEC
1000.00
400.00
200.00
100.00
40.00
20.00
10.00
4.00
2.00
1.00
0.40
0.25
0.04
0.1
0.2
0.4
1
2
4
10
20
UNDAMPED NATURAL PERIOD-SECONDS
ACCELERATION-G
10.0
1.0
0.1
0.01
DISPLACEMENT-CM
1000
100
10.0
1.0
0.10
0.0

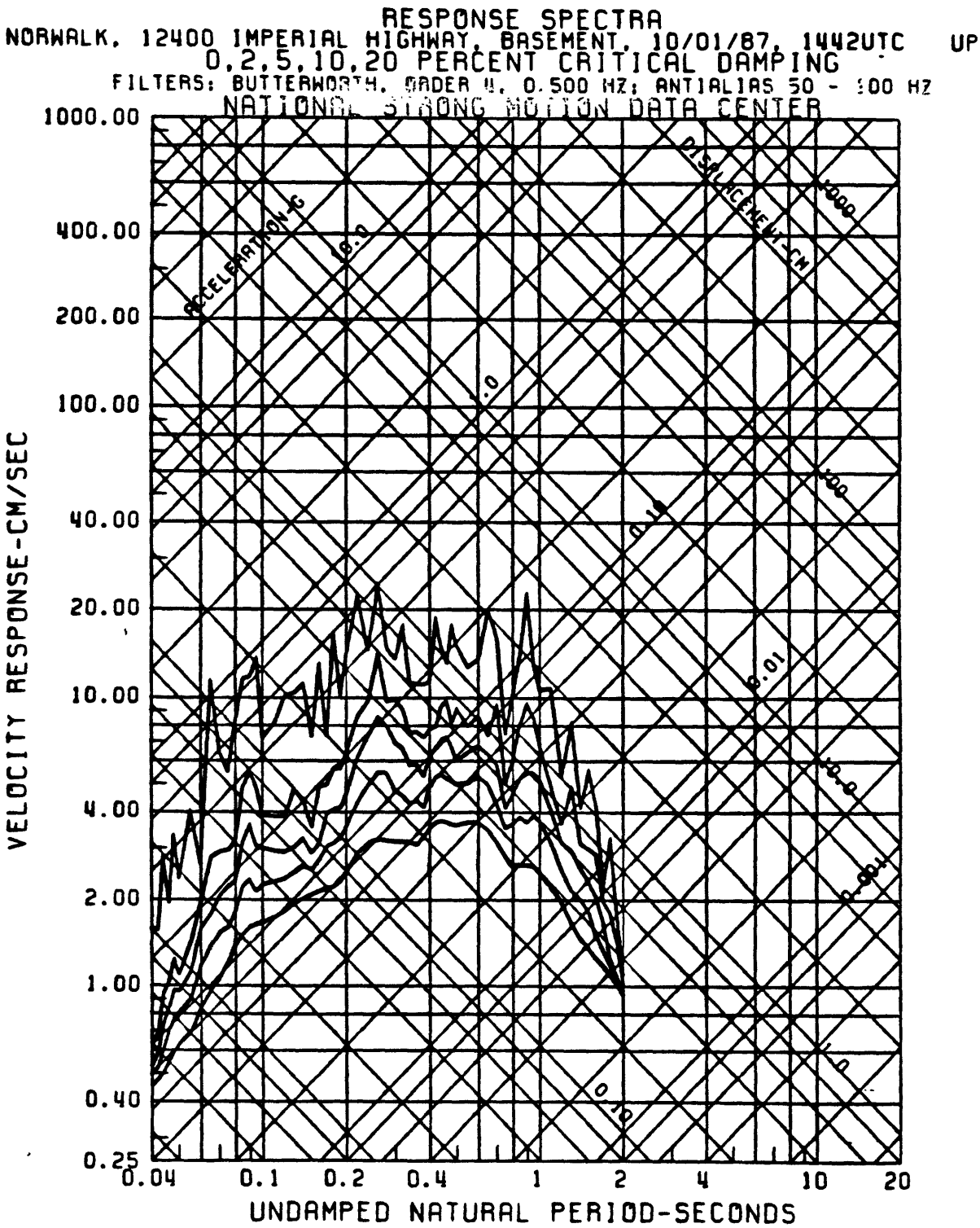

RESPONSE SPECTRA
BELL - BULK MAIL FACILITY, 10/01/87, 1442UTC, 280
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.500 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER
VELOCITY RESPONSE-CM/SEC
UNDAMPED NATURAL PERIOD-SECONDS
ACCELERATION-G
DISPLACEMENT-CM
10000.00
4000.00
2000.00
1000.00
400.00
200.00
100.00
40.00
20.00
10.00
4.00
2.50
0.04
0.1
0.2
0.4
1
2
4
10
20

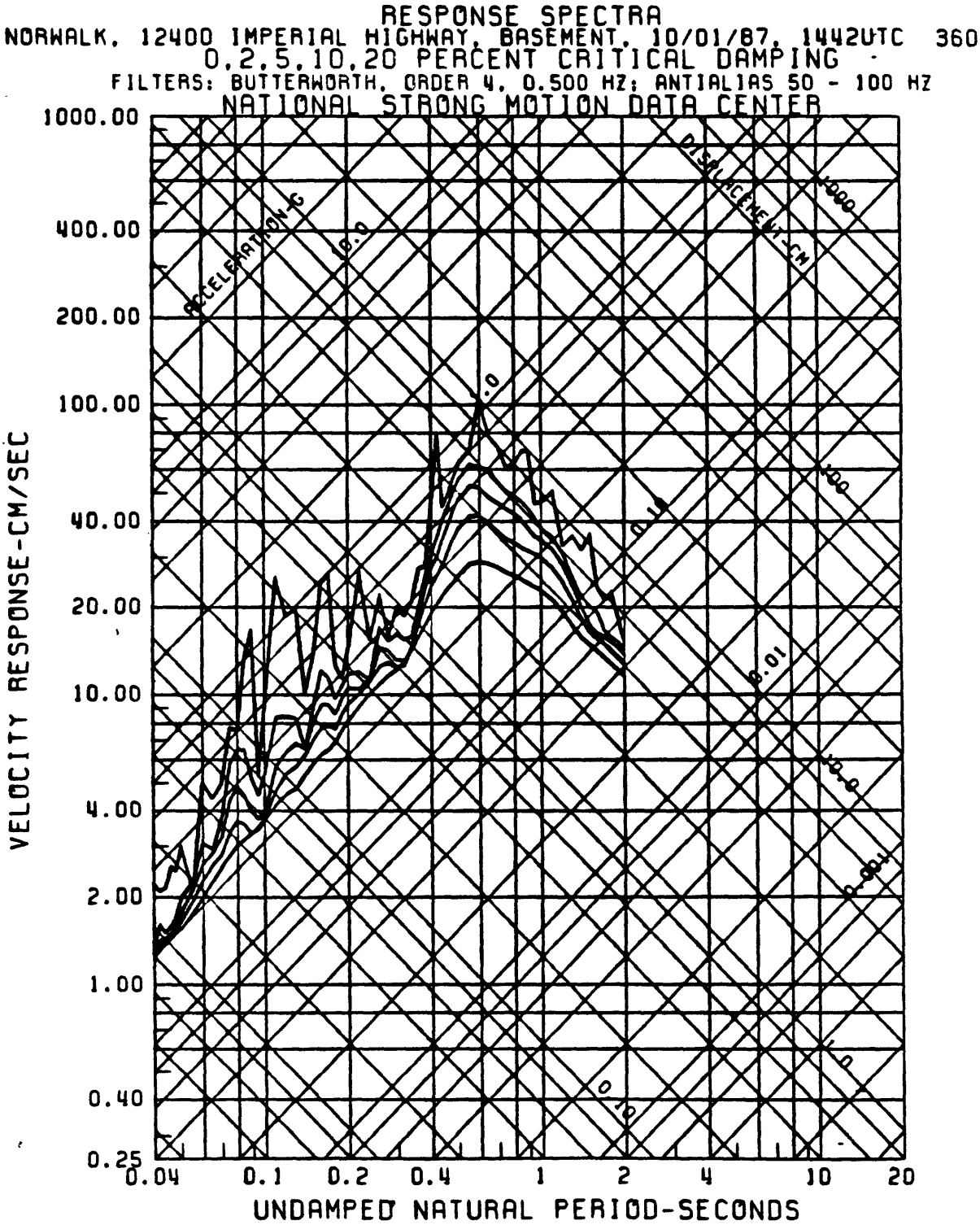

RESPONSE SPECTRA
VERNON - CMD TERMINAL - BASEMENT, 10/01/87, 1442UTC 7
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.500 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER
VELOCITY RESPONSE-CM/SEC
1000.00
400.00
200.00
100.00
40.00
20.00
10.00
4.00
2.00
1.00
0.40
0.25
0.04
0.1
0.2
0.4
1
2
4
10
20
UNDAMPED NATURAL PERIOD-SECONDS
ACCELERATION-G
DISPLACEMENT-CM
.0
0.1
0.01
0.10


RESPONSE SPECTRA
VERNON - CMD TERMINAL - BASEMENT, 10/01/87, 1442UTC UP
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.500 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER
VELOCITY RESPONSE-CM/SEC
1000.00
400.00
200.00
100.00
40.00
20.00
10.00
4.00
2.00
1.00
0.40
0.25
0.04
0.1
0.2
0.4
1
2
4
10
20
UNDAMPED NATURAL PERIOD-SECONDS
ACCELERATION-G
10.0
1.0
0.1
0.01
DISPLACEMENT-CM
1000
100
10.0
1.0
0.10


RESPONSE SPECTRA
VERNON - CMD TERMINAL - BASEMENT, 10/01/87, 1442UTC 277
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.500 HZ; ANTIALIAS 50 100 HZ
NATIONAL STRONG MOTION DATA CENTER
VELOCITY RESPONSE-CM/SEC
1000.00
400.00
200.00
100.00
40.00
20.00
10.00
4.00
2.00
1.00
0.40
0.25
0.04
0.1
0.2
0.4
1
2
4
10
20
UNDAMPED NATURAL PERIOD-SECONDS
ACCELERATION-G
10.0
1.0
0.1
0.01
DISPLACEMENT-CM
1000
100
10.0
1.0
0.10


RESPONSE SPECTRA
NORWALK, 12400 IMPERIAL HIGHWAY, BASEMENT, 10/01/87, 1442UTC 90
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.500 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER
VELOCITY RESPONSE-CM/SEC
1000.00
400.00
200.00
100.00
40.00
20.00
10.00
4.00
2.00
1.00
0.40
0.25
0.04
0.1
0.2
0.4
1
2
4
10
20
UNDAMPED NATURAL PERIOD-SECONDS
ACCELERATION-G
DISPLACEMENT-CM
1000
100
10.0
1.0
0.1
0.01
0.001
0.0001
0.10


RESPONSE SPECTRA
NORWALK, 12400 IMPERIAL HIGHWAY, BASEMENT, 10/01/87, 1442UTC UP
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.500 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER
VELOCITY RESPONSE-CM/SEC
1000.00
400.00
200.00
100.00
40.00
20.00
10.00
4.00
2.00
1.00
0.40
0.25
ACCELERATION-G
16.0
1.0
0.10
0.01
DISPLACEMENT-CM
1000
100
10.0
1.0
0.01
0.04
0.1
0.2
0.4
1
2
4
10
20
UNDAMPED NATURAL PERIOD-SECONDS


RESPONSE SPECTRA
NORWALK, 12400 IMPERIAL HIGHWAY, BASEMENT, 10/01/87, 1442UTC 360
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.500 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER
VELOCITY RESPONSE-CM/SEC
1000.00
400.00
200.00
100.00
40.00
20.00
10.00
4.00
2.00
1.00
0.40
0.25
0.04
0.1
0.2
0.4
1
2
4
10
20
UNDAMPED NATURAL PERIOD-SECONDS
ACCELERATION-G
10.0
1.0
0.1
0.01
DISPLACEMENT-CM
1000
100
10.0
1.0
0.10
0.01

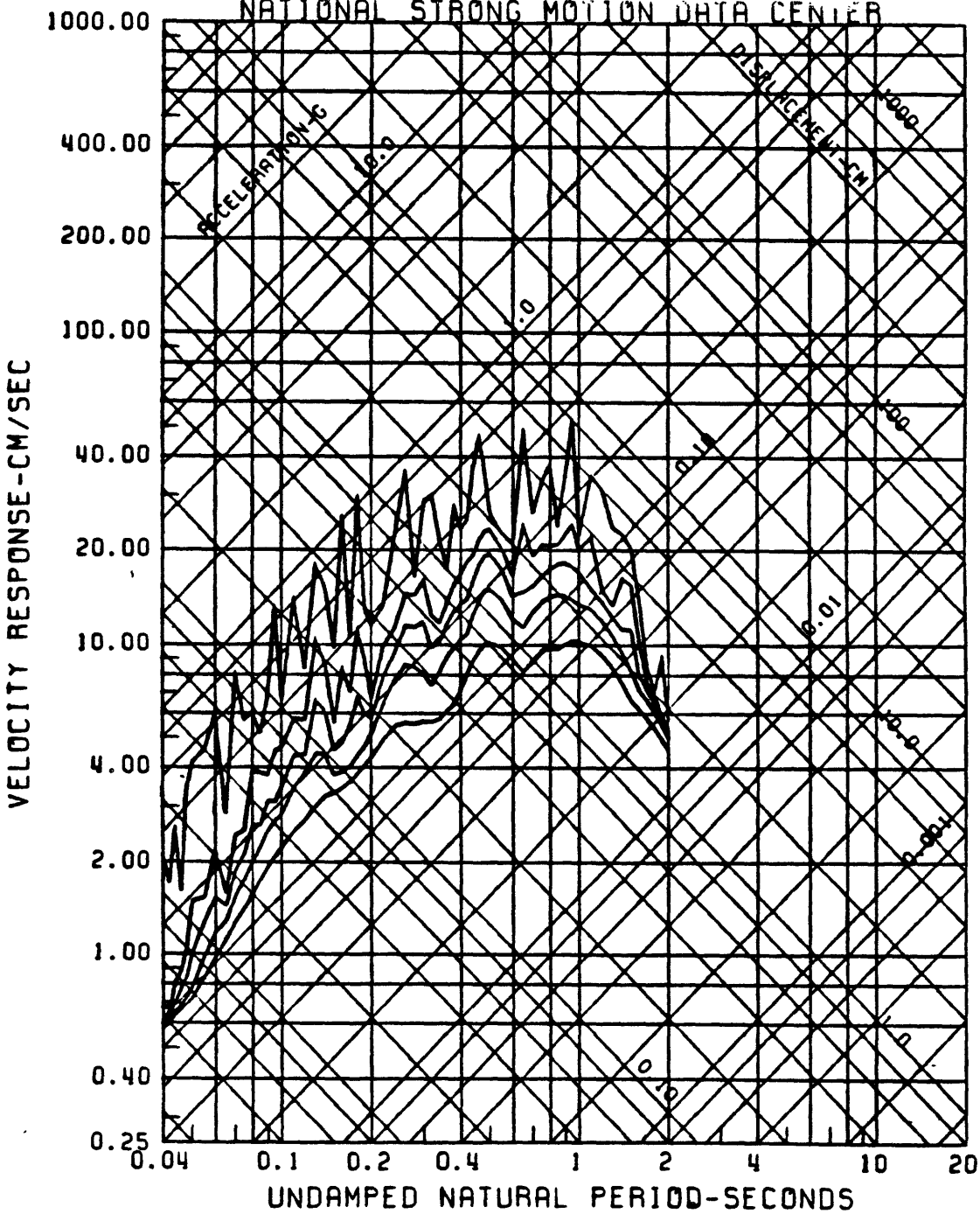
RESPONSE SPECTRA

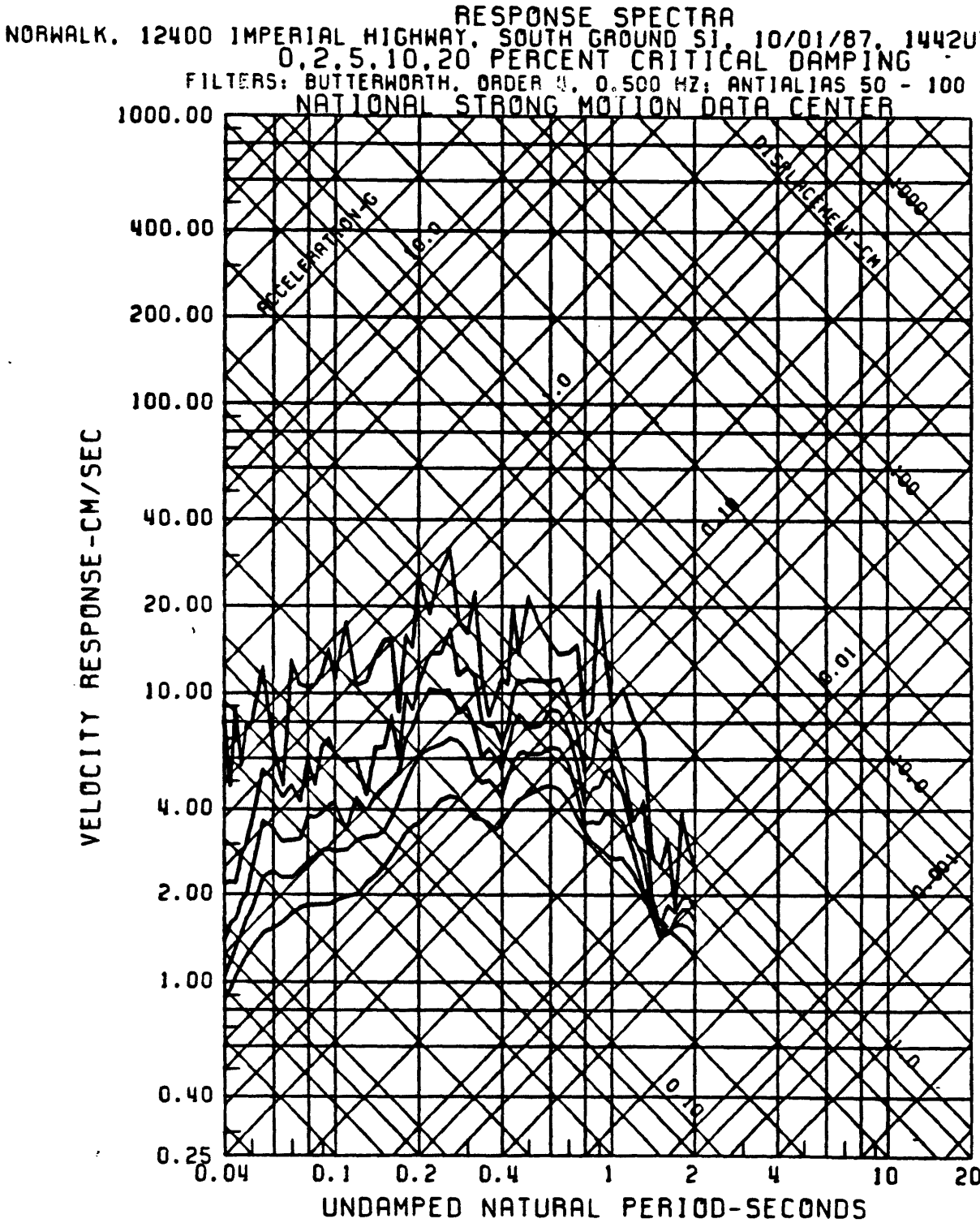
NORWALK, 12400 IMPERIAL HIGHWAY, SOUTH GROUND SI, 10/01/87, 1442UTC 90

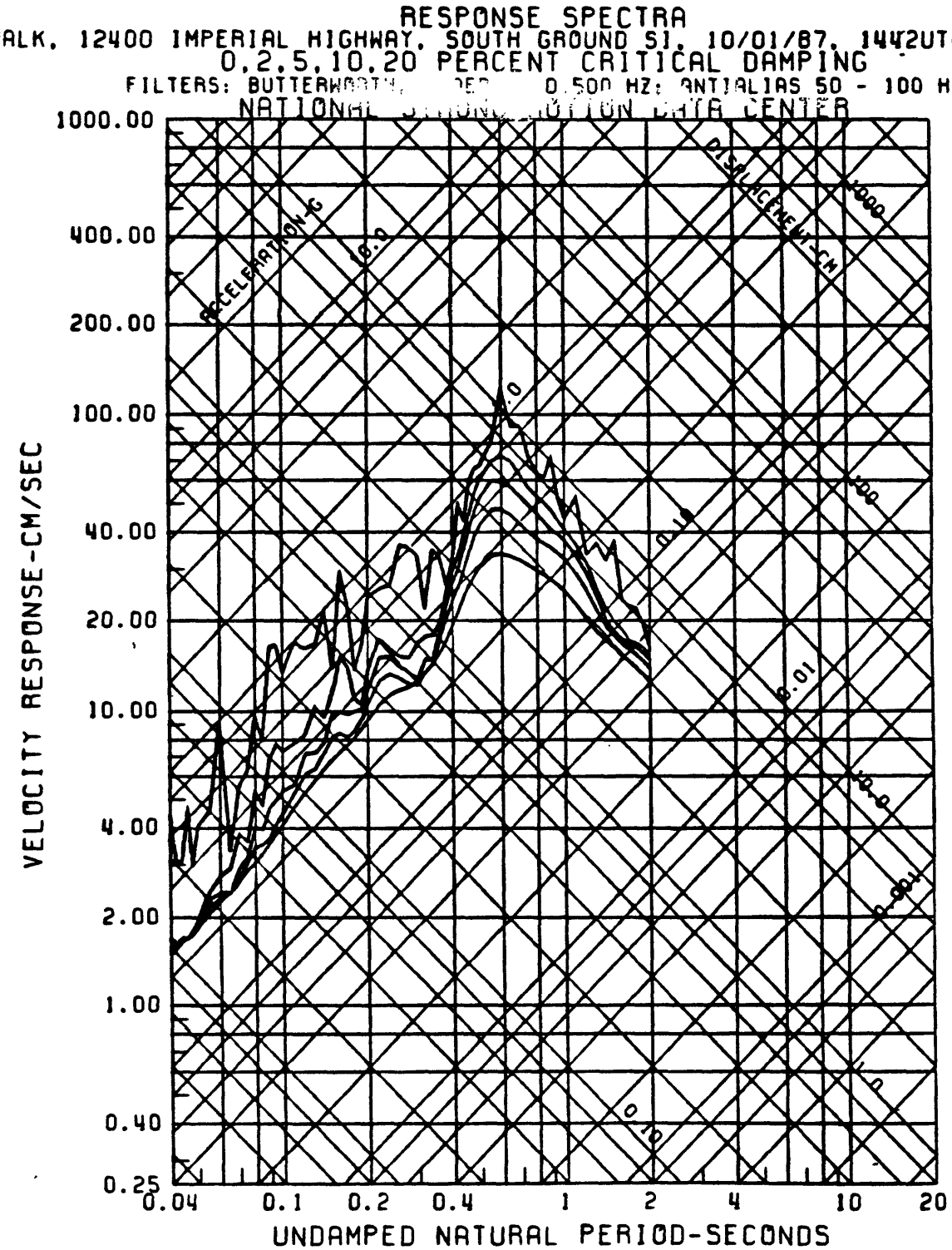
0,2,5,10,20 PERCENT CRITICAL DAMPING

FILTERS: BUTTERWORTH, ORDER 4, 0.500 HZ, ANTIALIAS 2.0 - 100 HZ

NATIONAL STRONG MOTION DATA CENTER

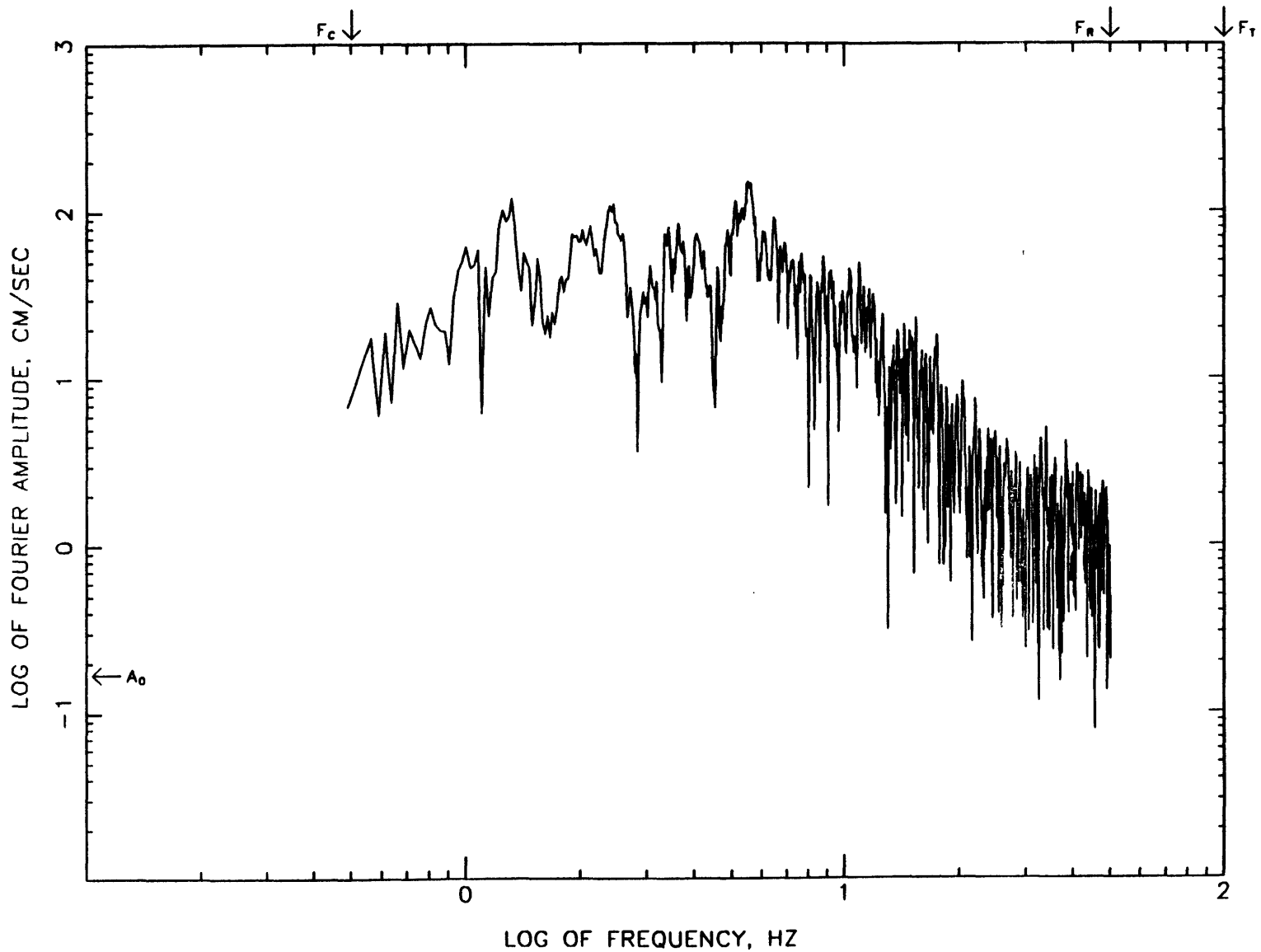


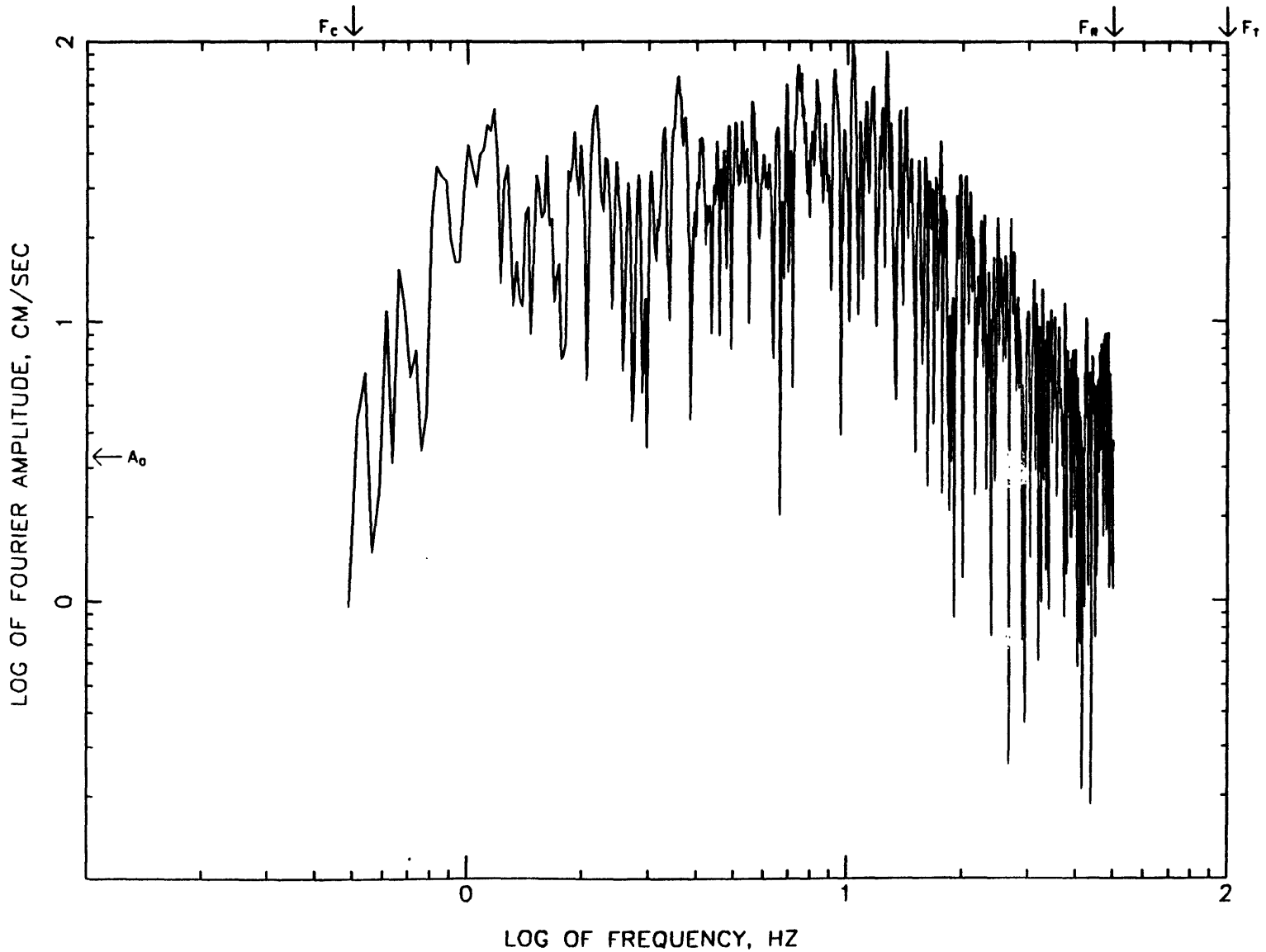

RESPONSE SPECTRA
NORWALK, 12400 IMPERIAL HIGHWAY, SOUTH GROUND SI, 10/01/87, 1442UTC UP
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.500 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER
VELOCITY RESPONSE-CM/SEC
1000.00
400.00
200.00
100.00
40.00
20.00
10.00
4.00
2.00
1.00
0.40
0.25
0.04
0.1
0.2
0.4
1
2
4
10
20
UNDAMPED NATURAL PERIOD-SECONDS
ACCELERATION-G
10.0
1.0
0.10
0.01
DISPLACEMENT-CM
1000
100
10.0
1.0
0.10

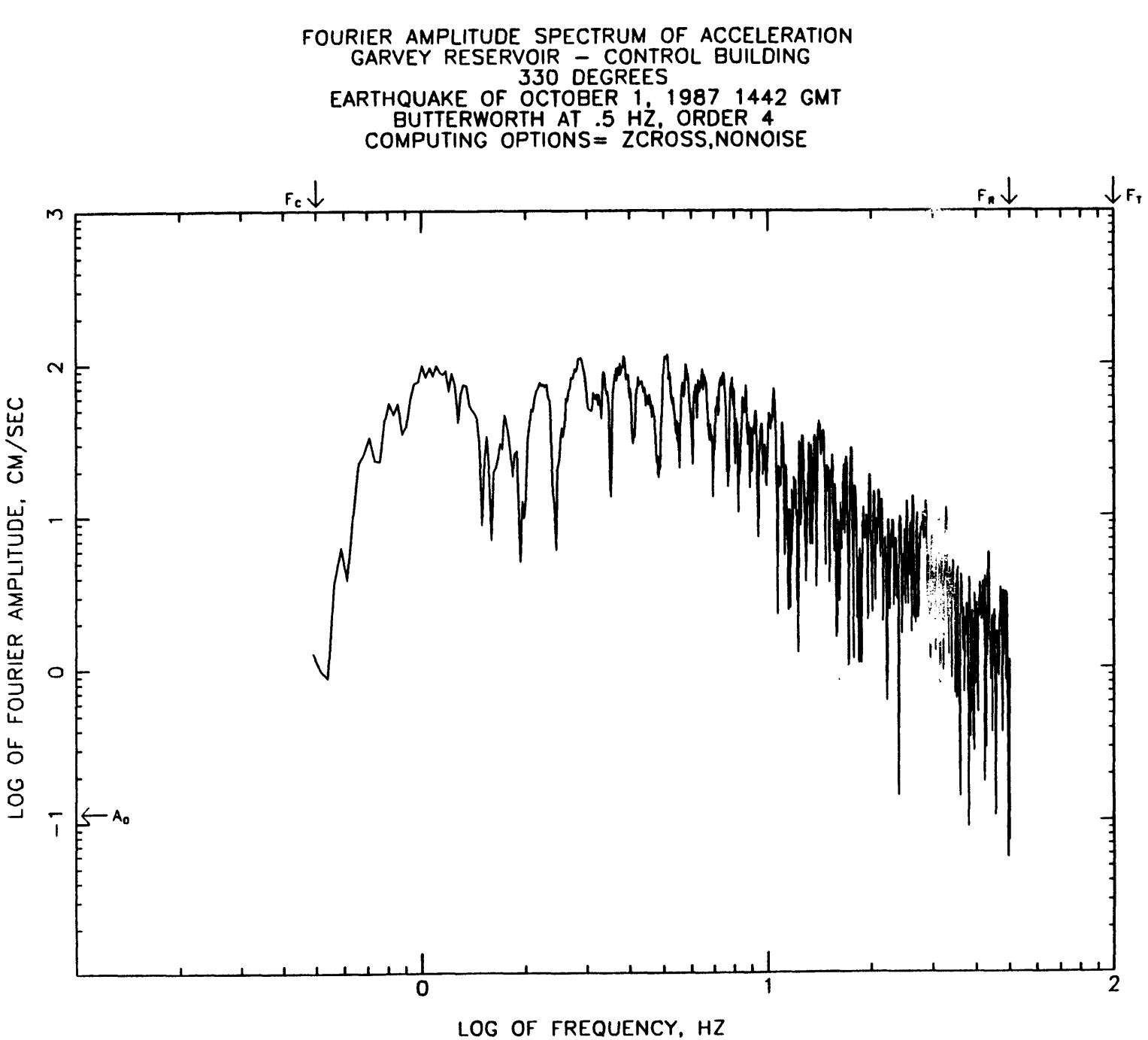

RESPONSE SPECTRA
NORWALK, 12400 IMPERIAL HIGHWAY, SOUTH GROUND SI, 10/01/87, 1442UTC 360
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, 2ER 0.500 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER
1000.00
400.00
200.00
100.00
40.00
20.00
10.00
4.00
2.00
1.00
0.40
0.25
VELOCITY RESPONSE-CM/SEC
0.04
0.1
0.2
0.4
1
2
4
10
20
UNDAMPED NATURAL PERIOD-SECONDS
ACCELERATION-G
16.0
DISPLACEMENT-CM
1000
100
10.0
1.0
0.1
0.01
0.001
0.0
0.10

Appendix 4

Fourier amplitude spectrum; log-log plot


FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
GARVEY RESERVOIR - CONTROL BUILDING
060 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT .5 HZ, ORDER 4
COMPUTING OPTIONS= ZCROSS,NONOISE
F_C
F_R
F_T
A_0
LOG OF FOURIER AMPLITUDE, CM/SEC
LOG OF FREQUENCY, HZ
3
2
1
0
-1
0
1
2


FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
GARVEY RESERVOIR – CONTROL BUILDING
UP
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT .5 HZ, ORDER 4
COMPUTING OPTIONS= ZCROSS,NONOISE
Fc
FR
FT
A0
LOG OF FOURIER AMPLITUDE, CM/SEC
LOG OF FREQUENCY, HZ
2
1
0
0
1
2


FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
GARVEY RESERVOIR – CONTROL BUILDING
330 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT .5 HZ, ORDER 4
COMPUTING OPTIONS= ZCROSS,NONOISE
Fc
FR
FT
A0
LOG OF FOURIER AMPLITUDE, CM/SEC
LOG OF FREQUENCY, HZ
3
2
1
0
-1
0
1
2

FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
WHITTIER NARROWS DAM - CREST
033 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT 0.5 HZ, ORDER 4
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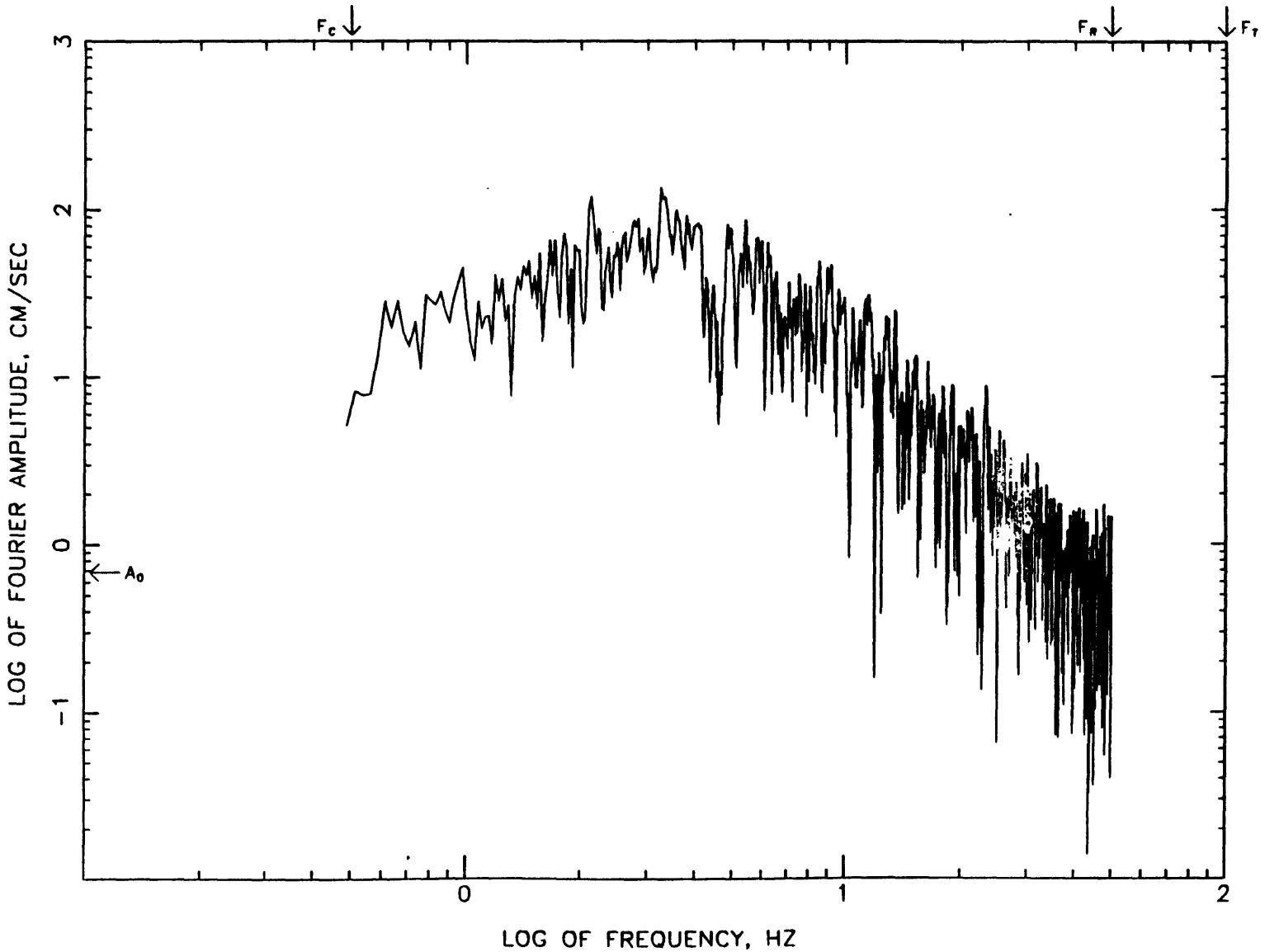

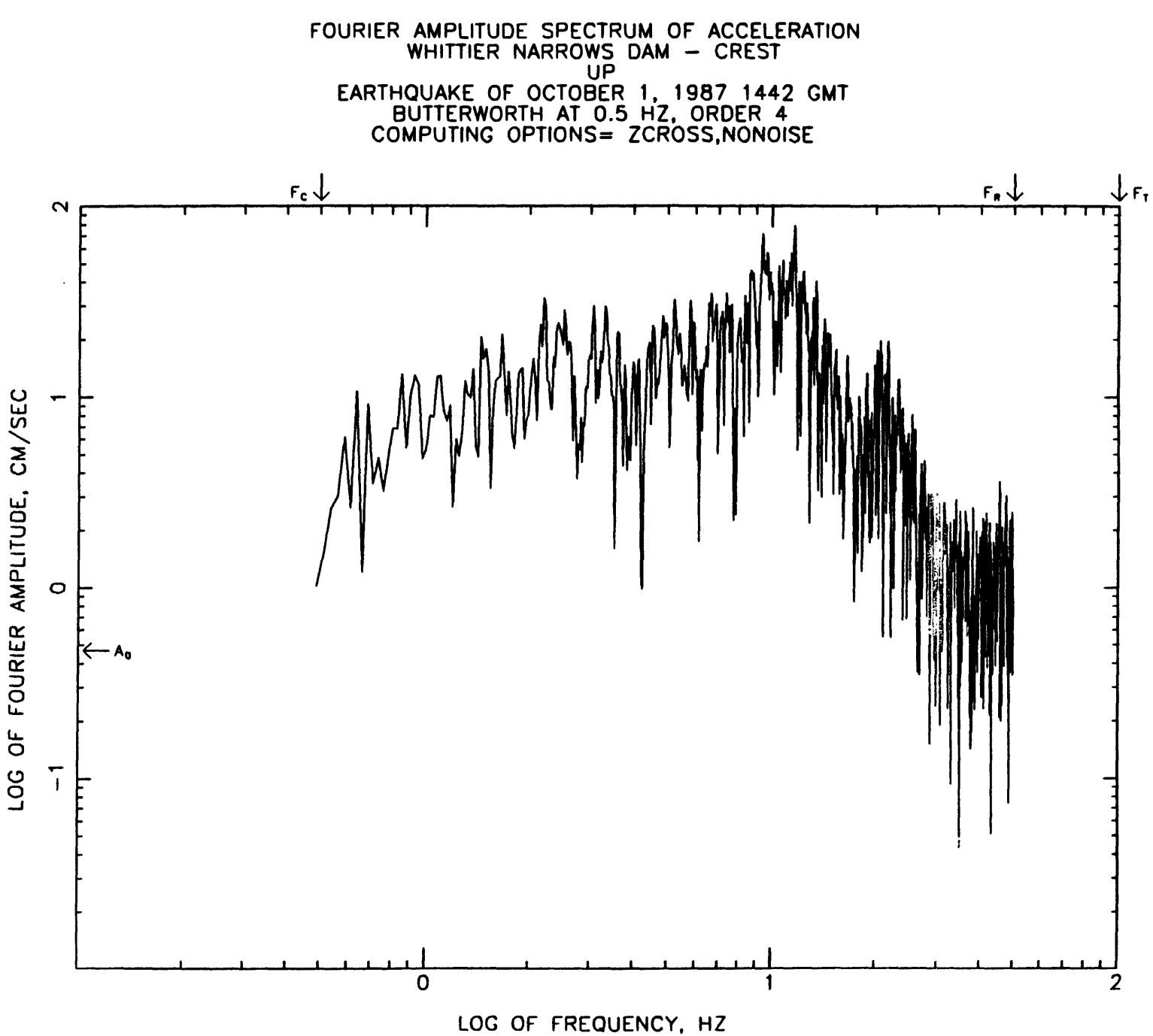
FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
WHITTIER NARROWS DAM – CREST
UP
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT 0.5 HZ, ORDER 4
COMPUTING OPTIONS= ZCROSS,NONOISE
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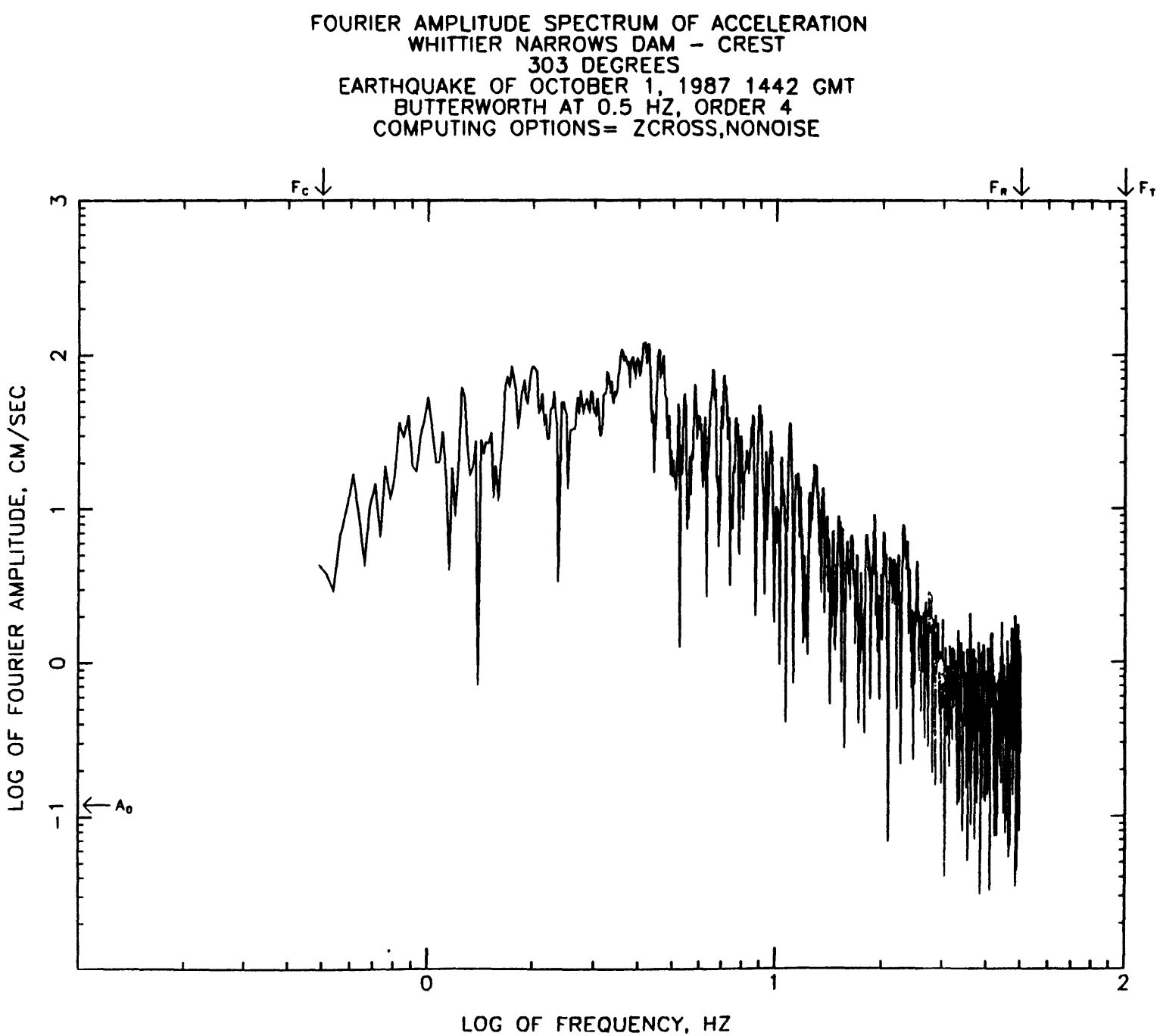
FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
WHITTIER NARROWS DAM - CREST
303 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT 0.5 HZ, ORDER 4
COMPUTING OPTIONS= ZCROSS,NONOISE
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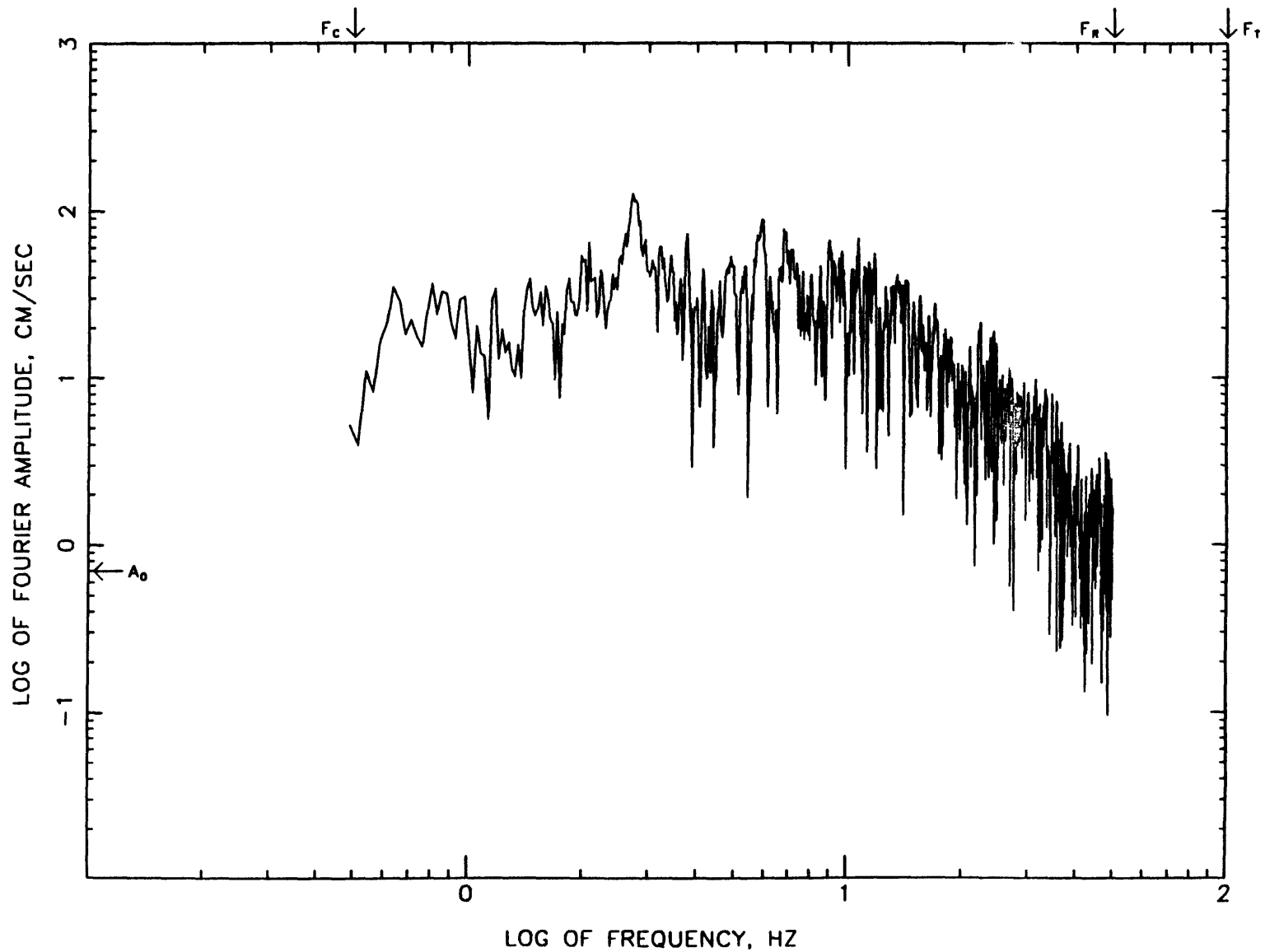
FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
WHITTIER NARROWS DAM - UPSTREAM
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EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
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COMPUTING OPTIONS= ZCROSS,NONOISE
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LOG OF FOURIER AMPLITUDE, CM/SEC
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FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
WHITTIER NARROWS DAM - UPSTREAM
UP
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
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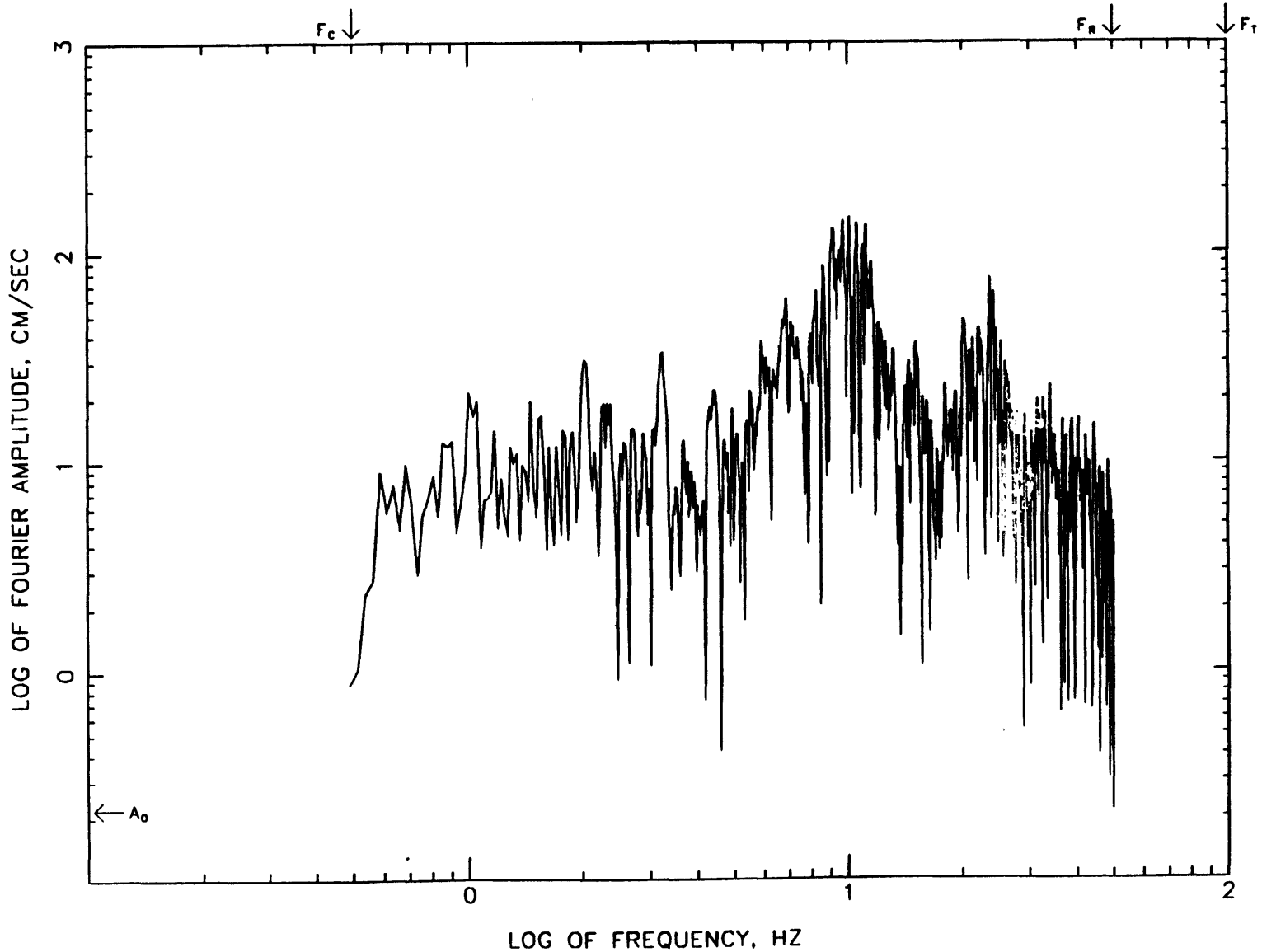

FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
WHITTIER NARROWS DAM - UPSTREAM
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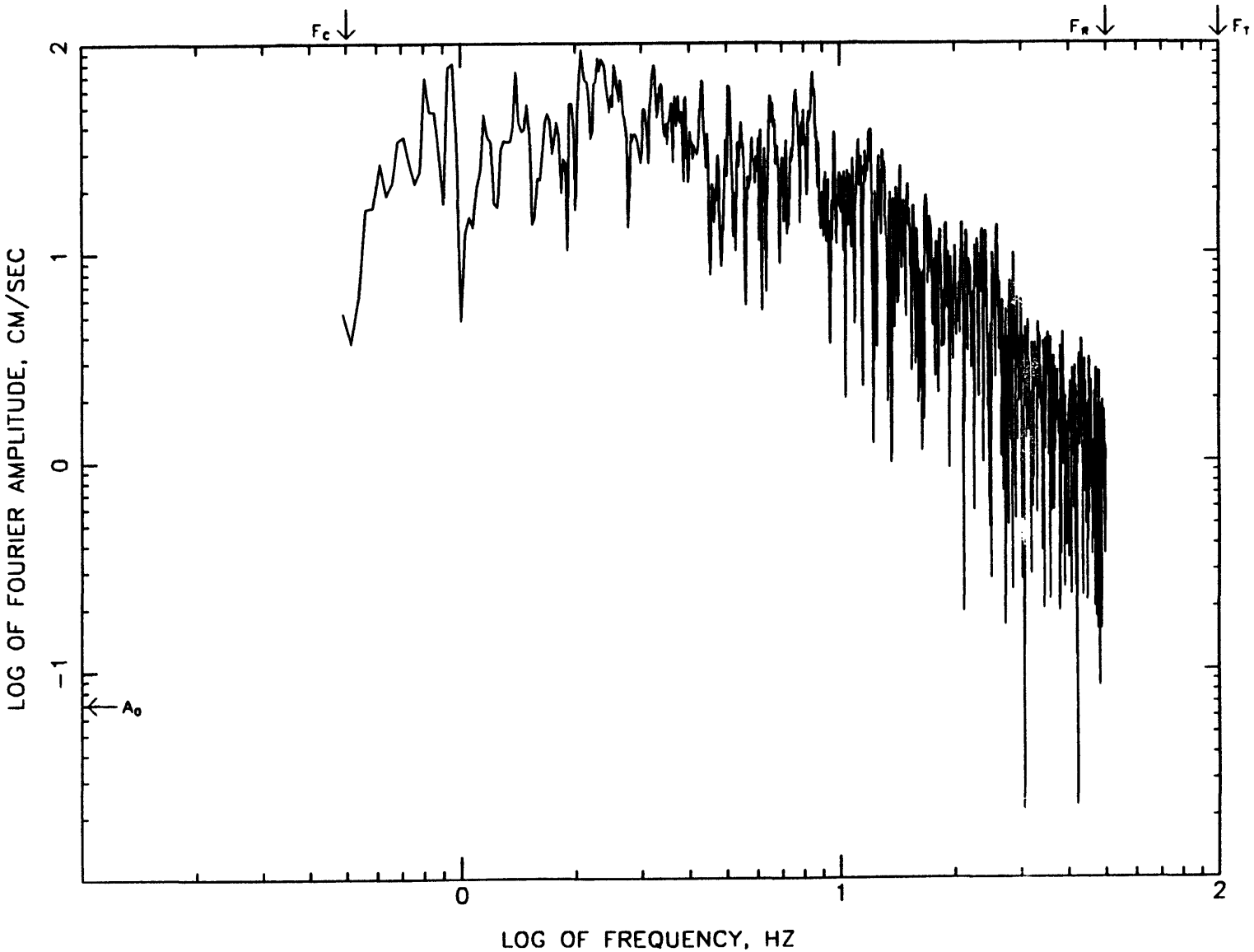

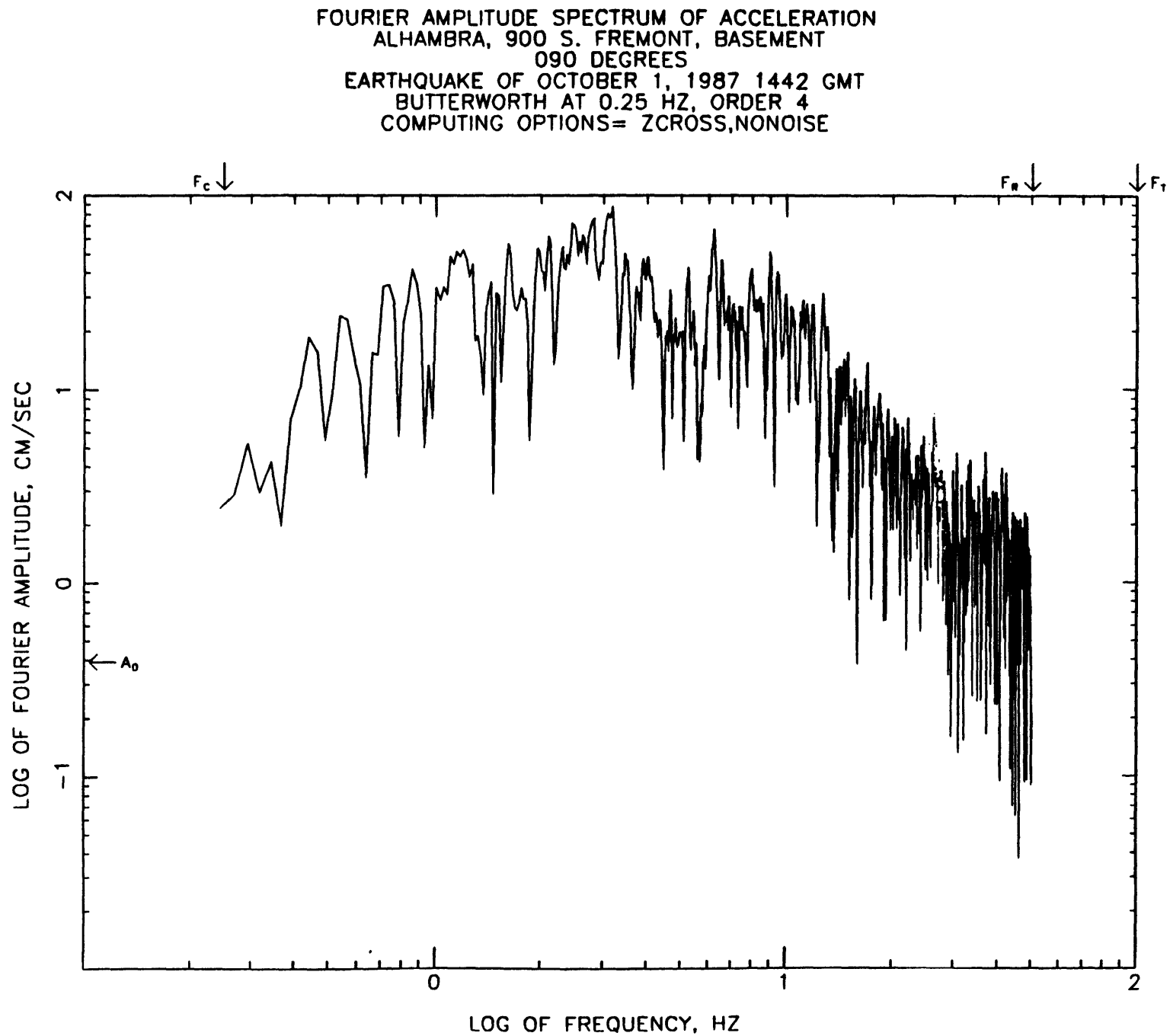
FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
ALHAMBRA, 900 S. FREMONT, BASEMENT
090 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
COMPUTING OPTIONS= ZCROSS,NONOISE
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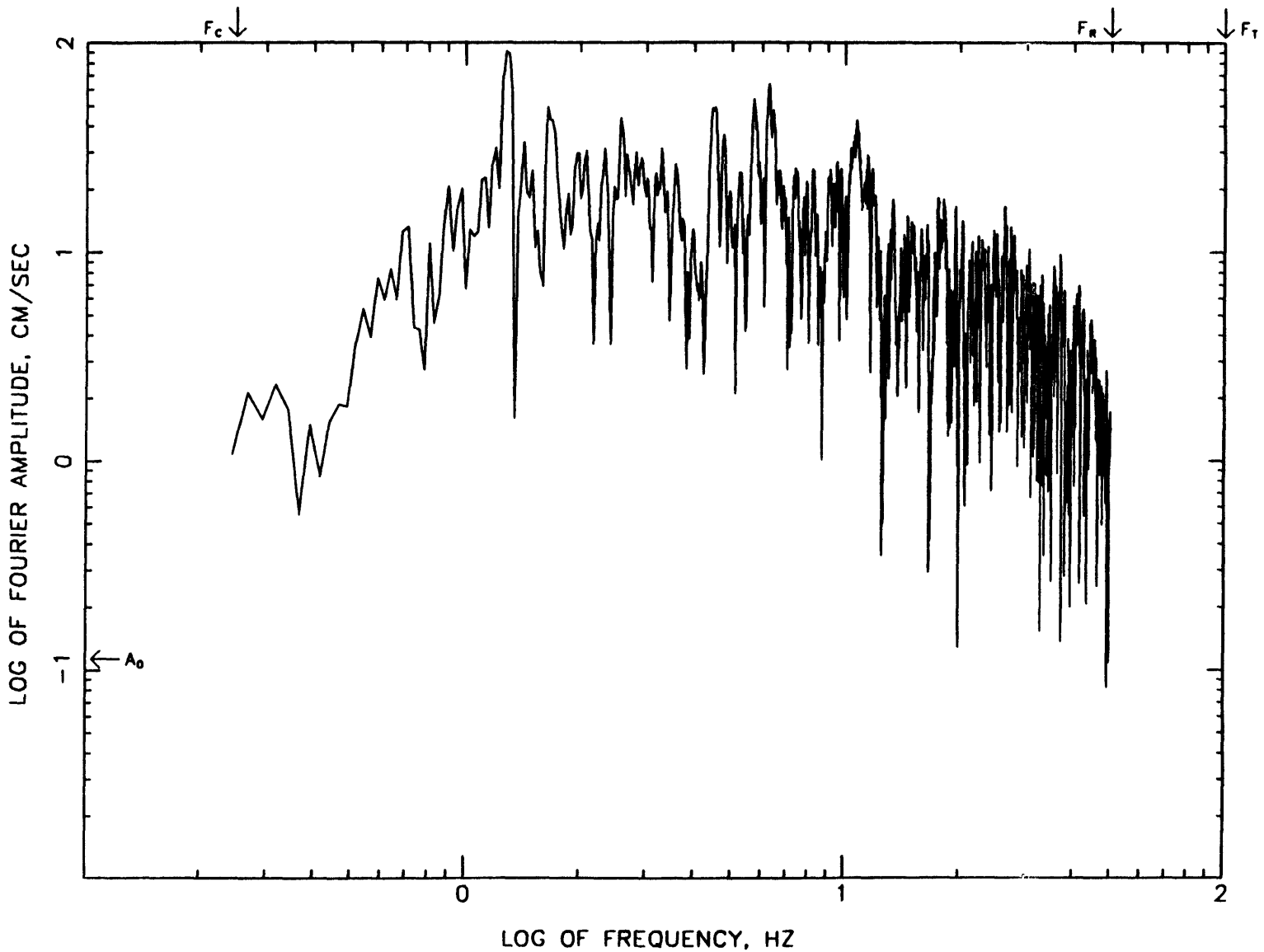
FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
ALHAMBRA, 900 S. FREMONT, BASEMENT
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EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
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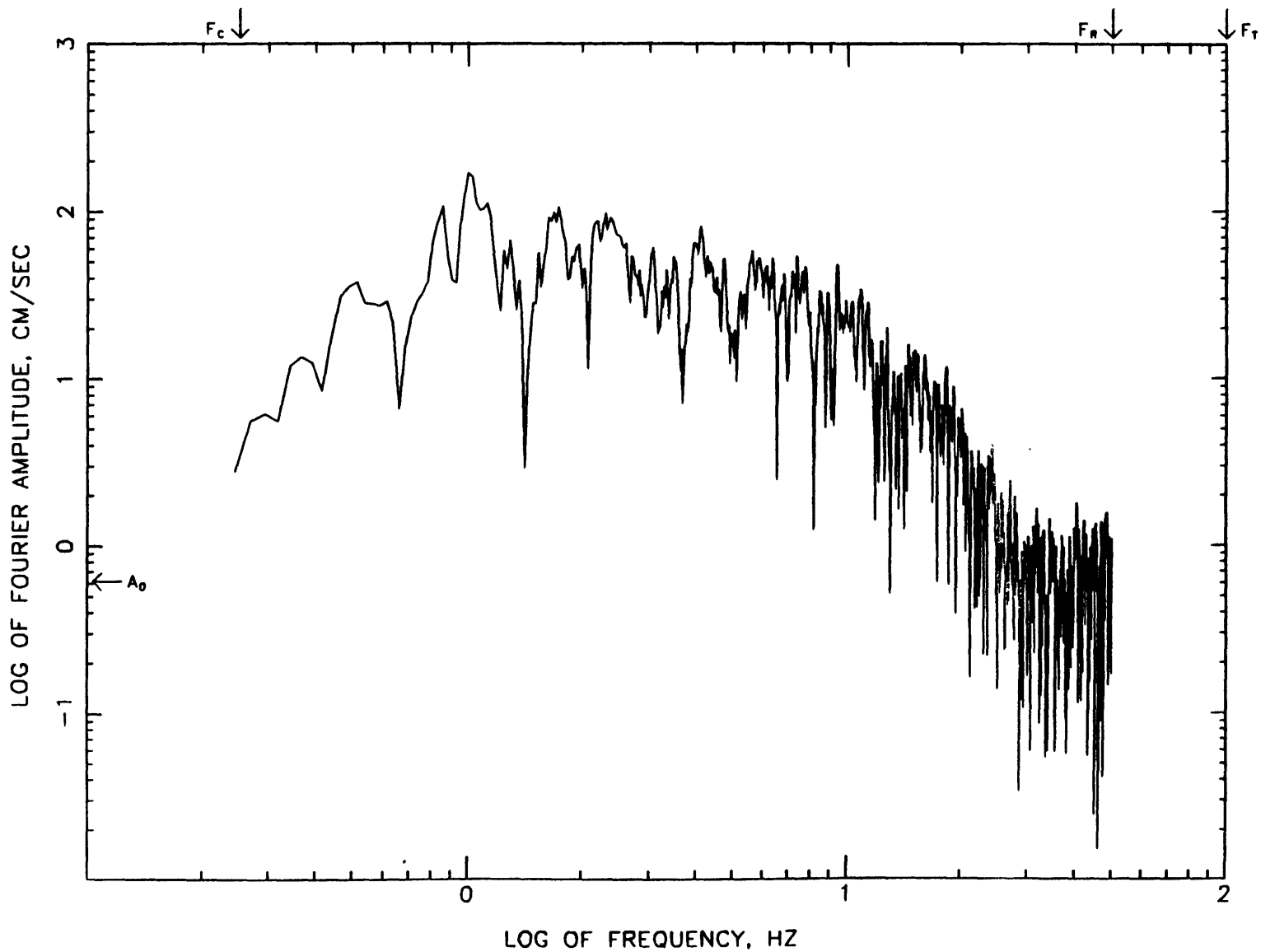
FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
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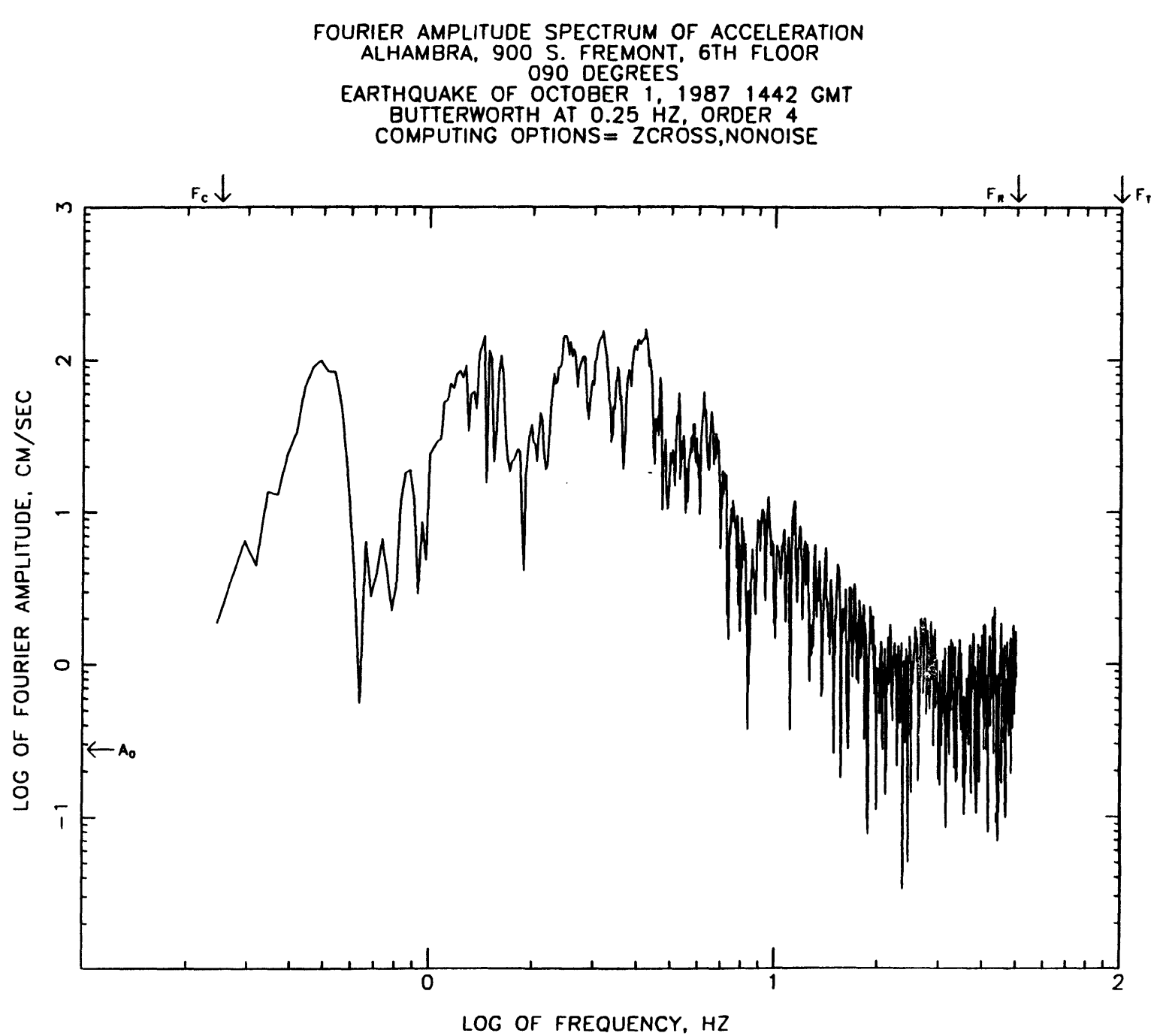
FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
ALHAMBRA, 900 S. FREMONT, 6TH FLOOR
090 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
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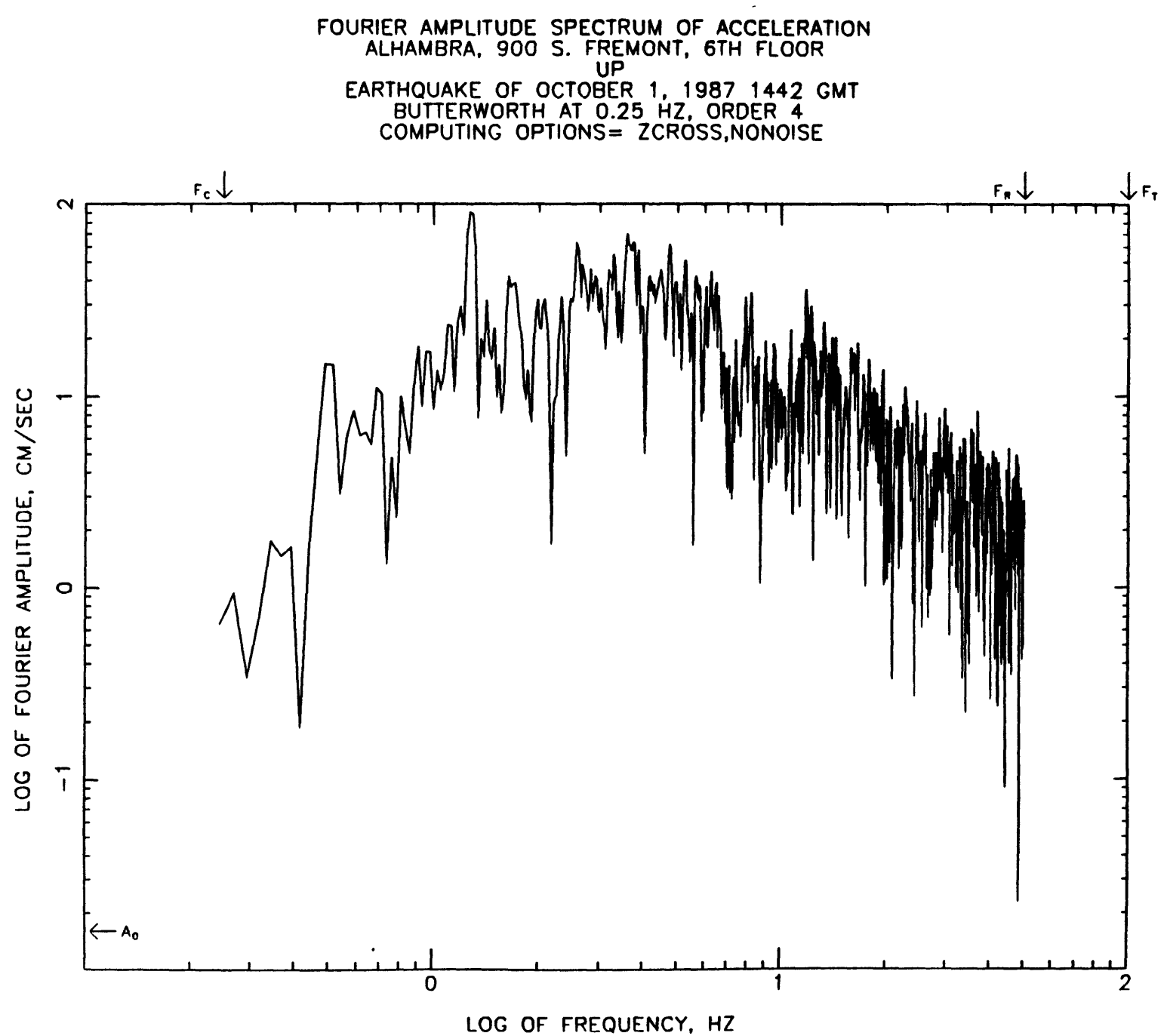
FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
ALHAMBRA, 900 S. FREMONT, 6TH FLOOR
UP
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
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FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
ALHAMBRA, 900 S. FREMONT, 6TH FLOOR
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EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
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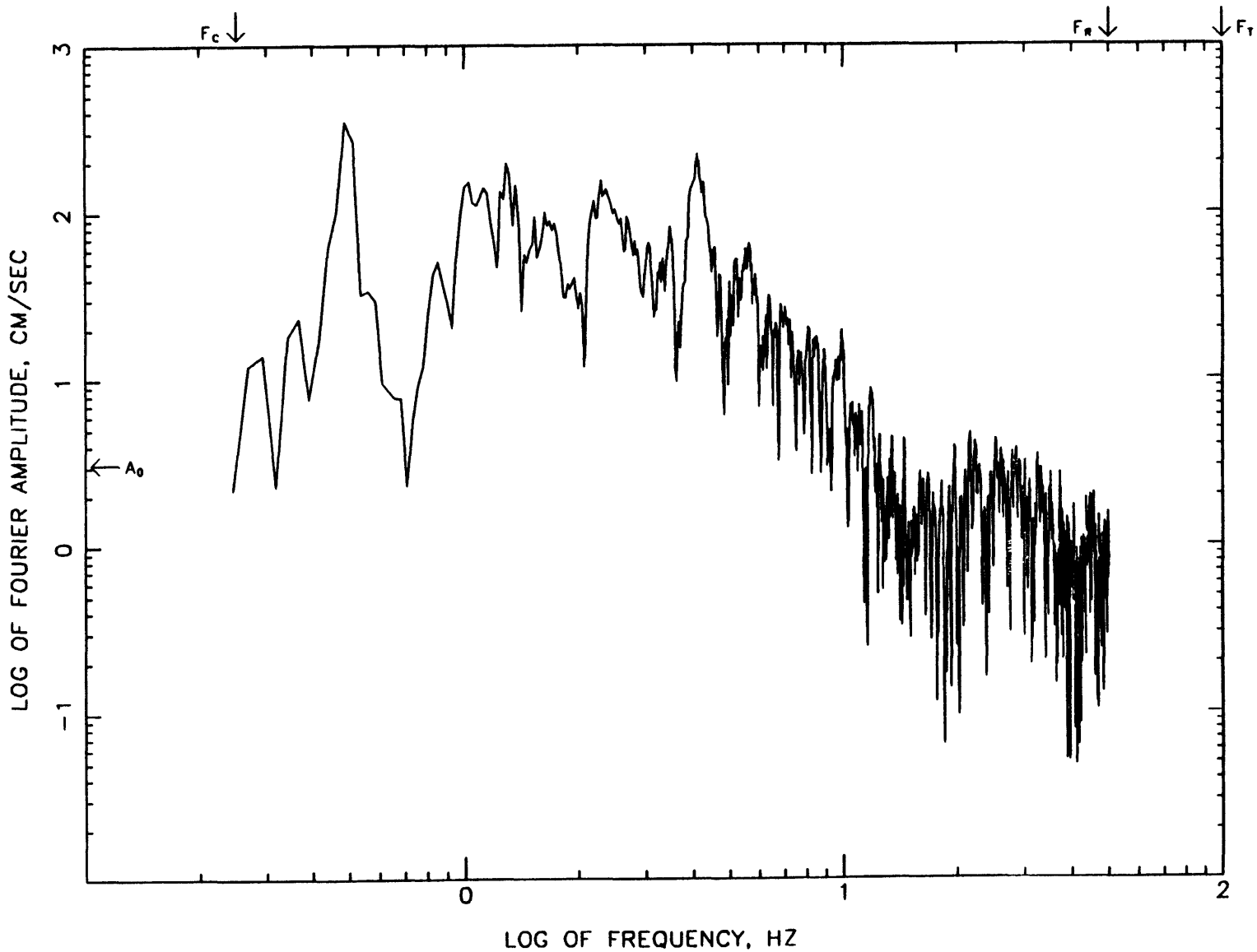

FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
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EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
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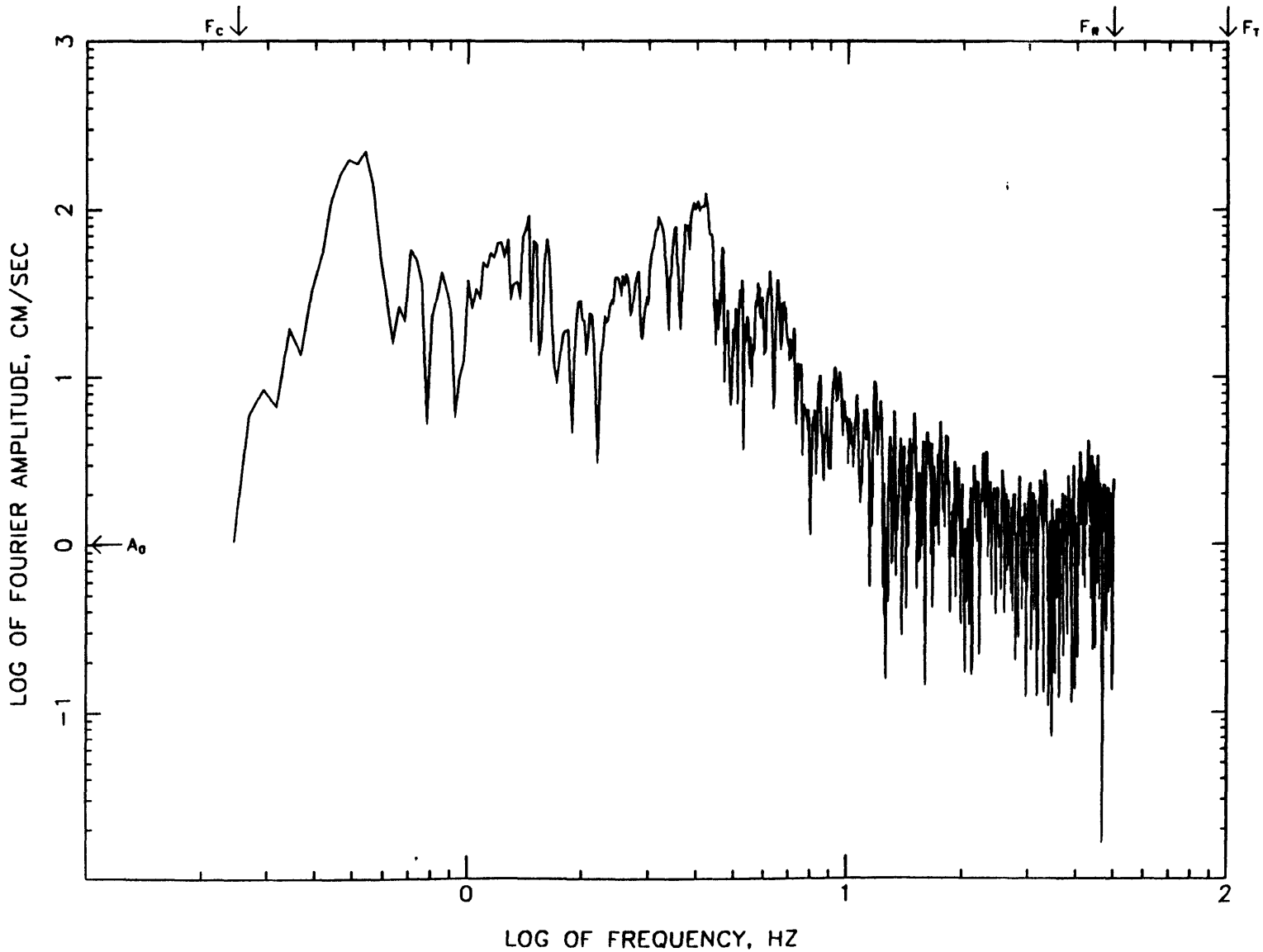

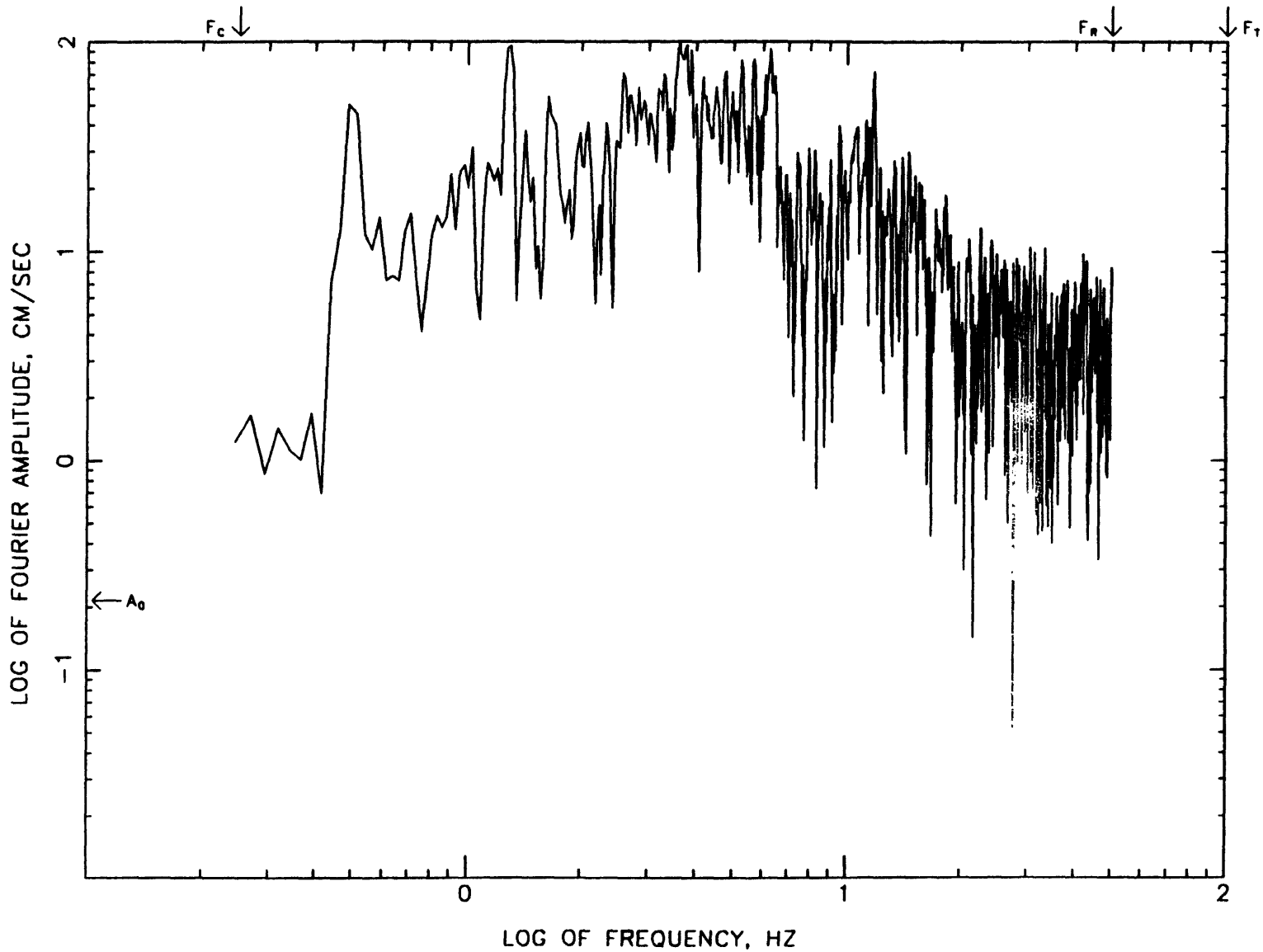
FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
ALHAMBRA, 900 S. FREMONT, 12TH FLOOR
UP
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
COMPUTING OPTIONS= ZCROSS,NONOISE
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ALHAMBRA, 900 S. FREMONT, 12TH FLOOR
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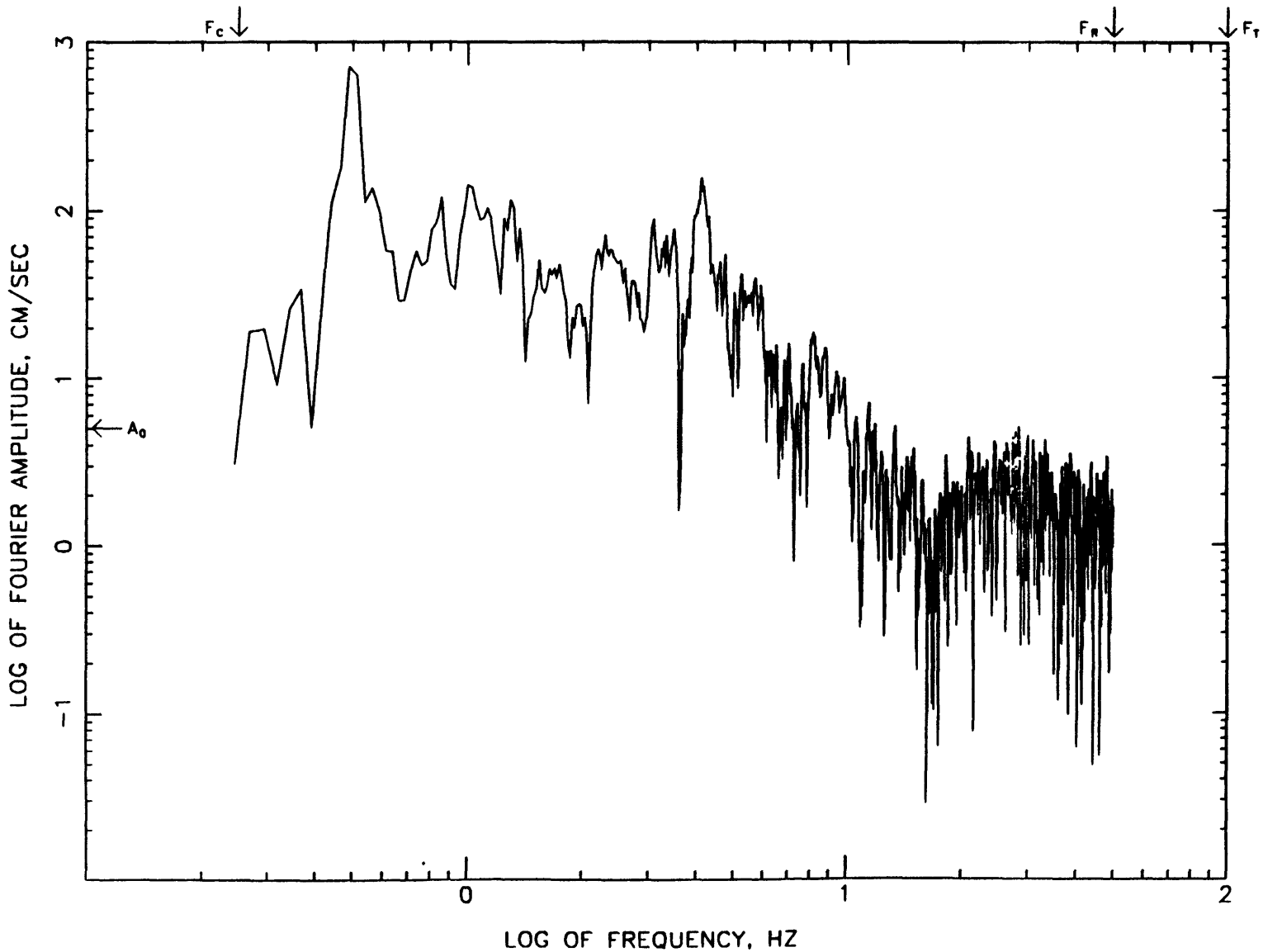

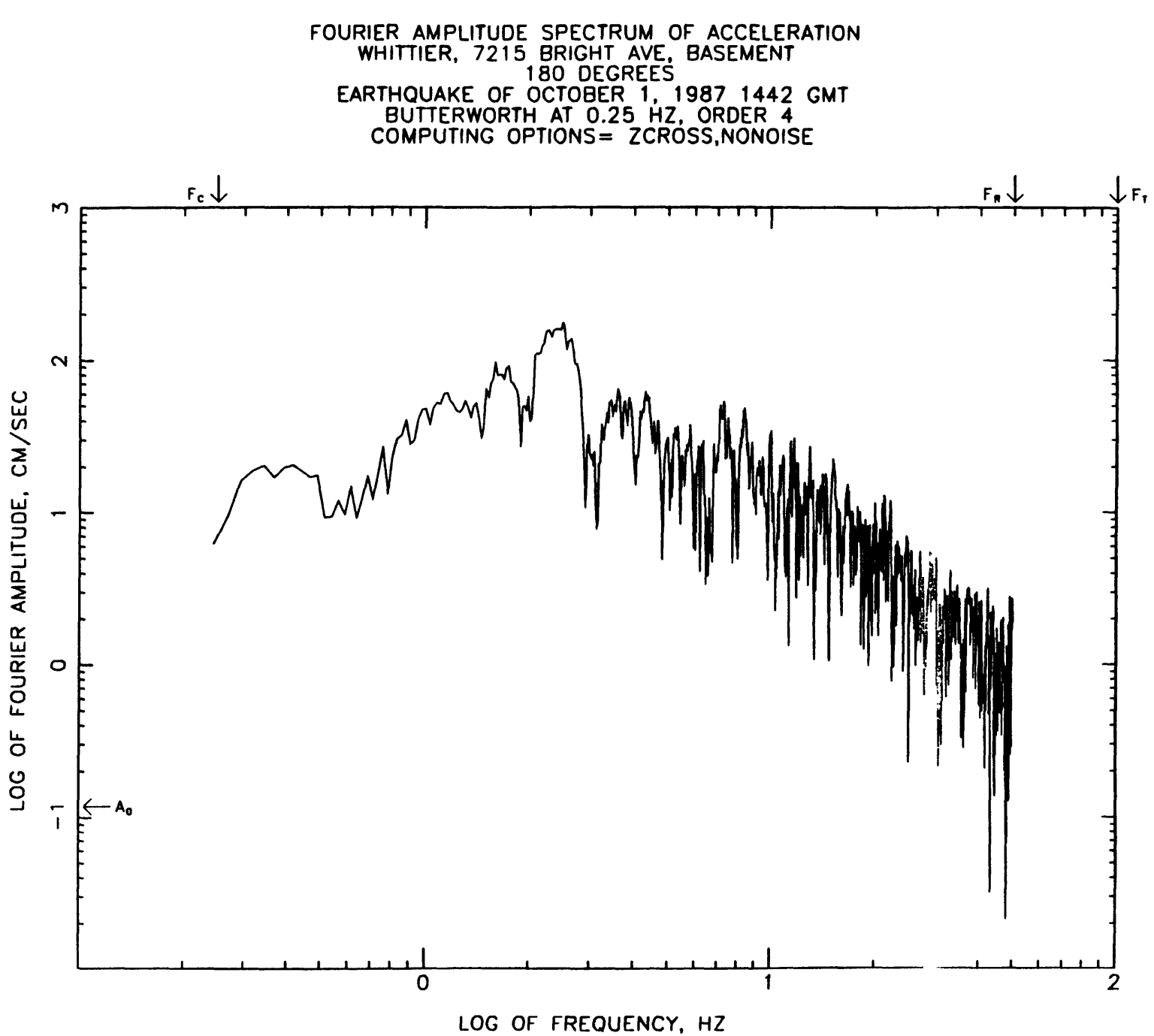
FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
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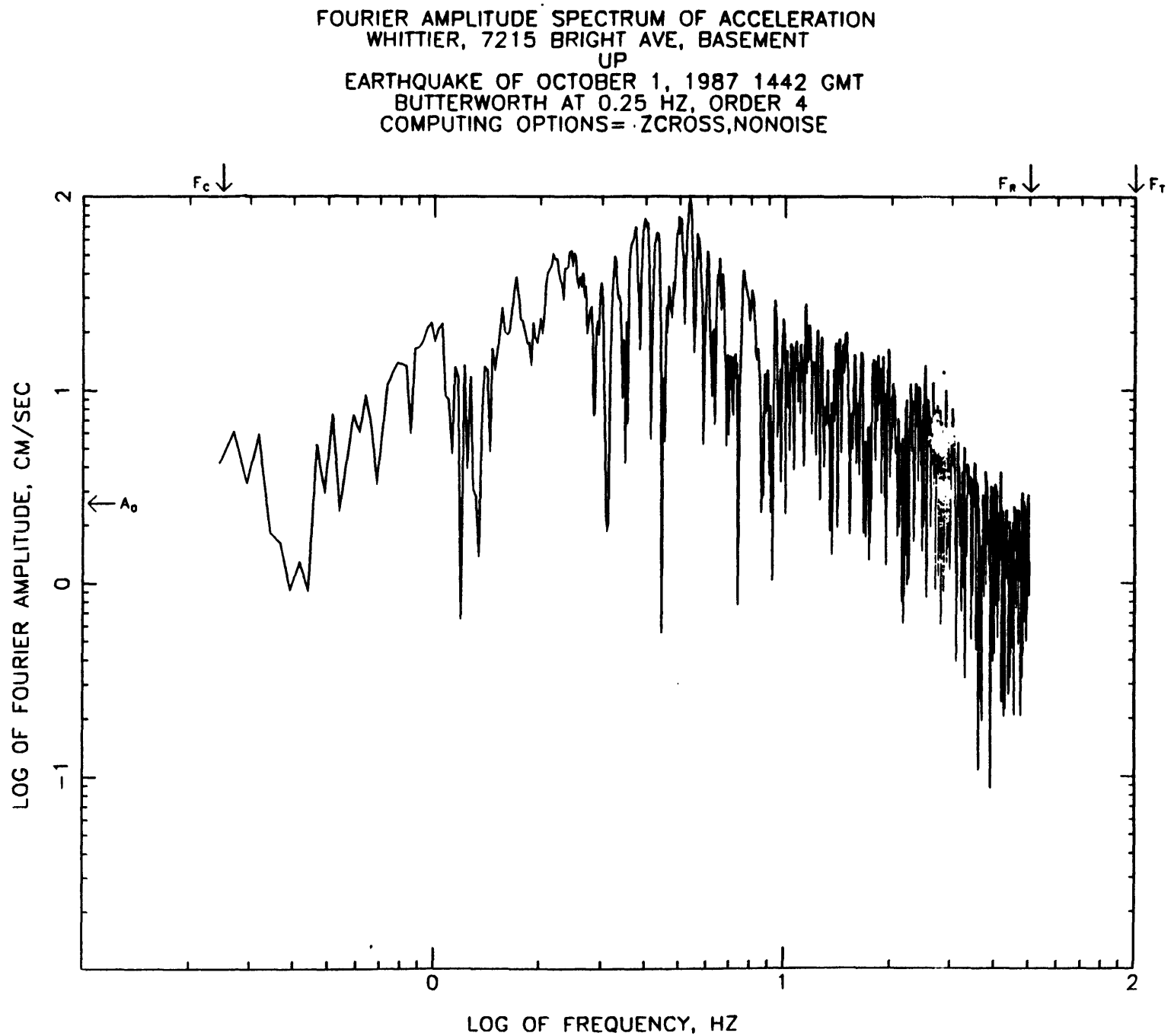
FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
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UP
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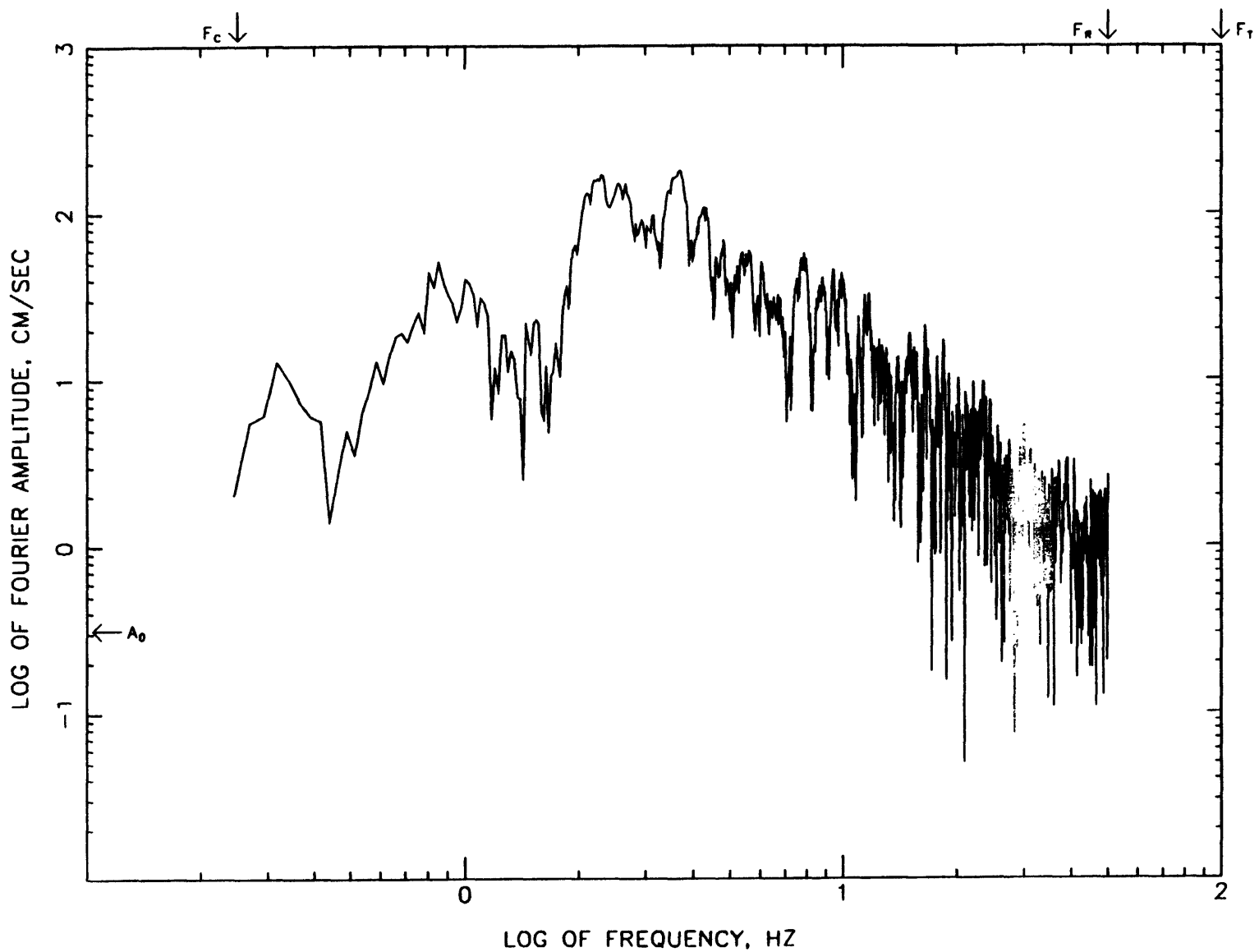
FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
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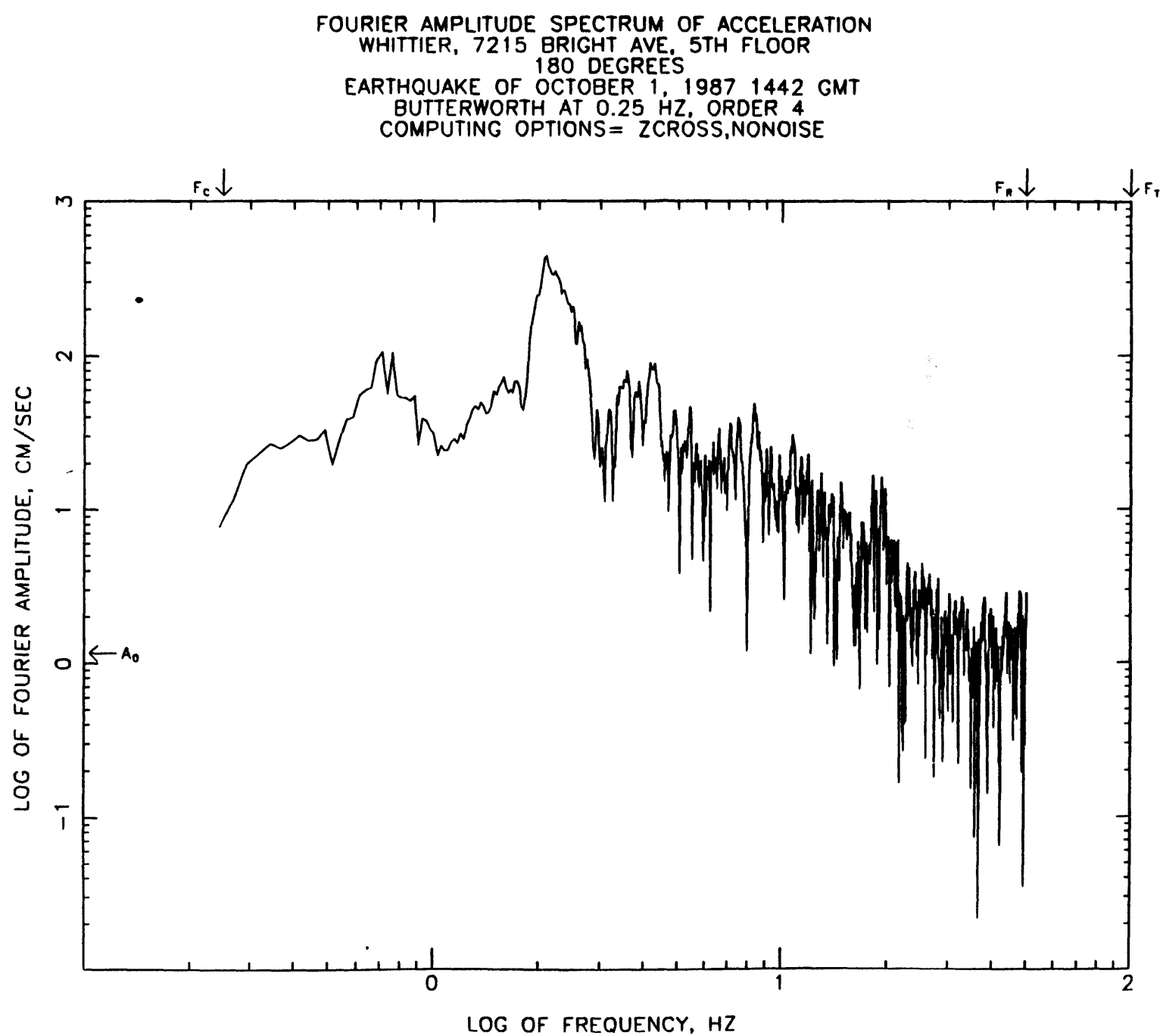
FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
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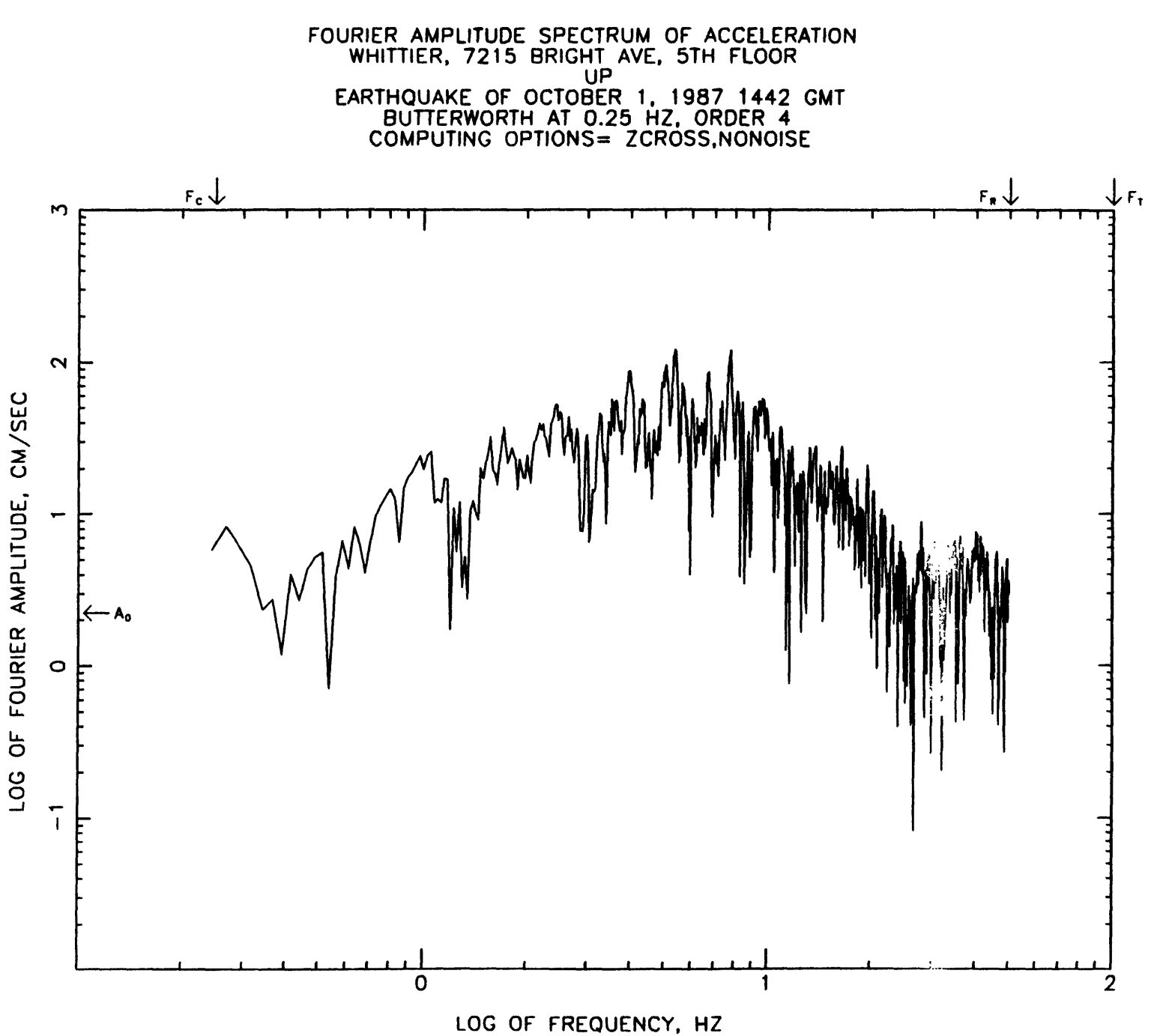
FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
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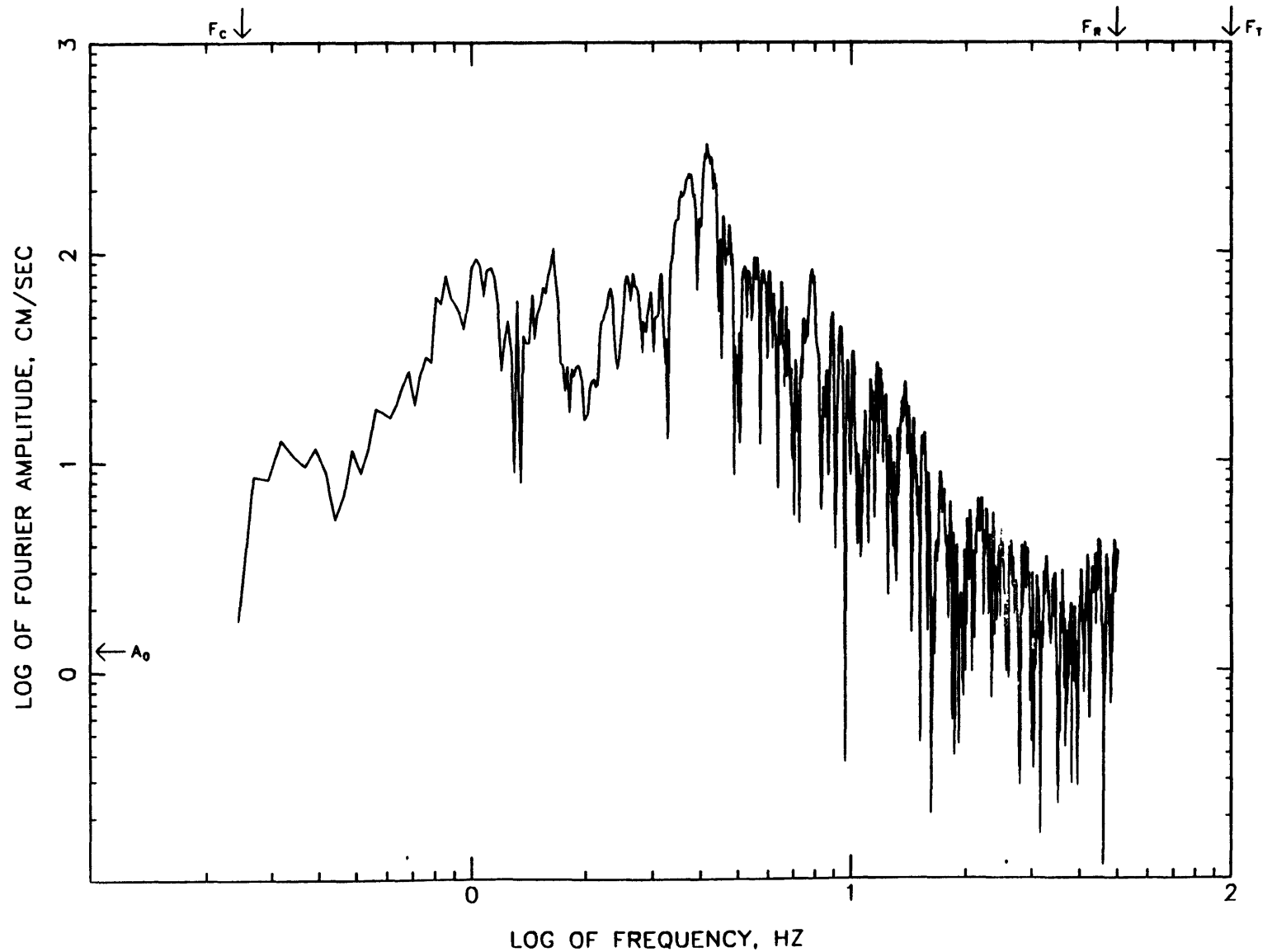
FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
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EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
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FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
WHITTIER, 7215 BRIGHT AVE, 10TH FLOOR
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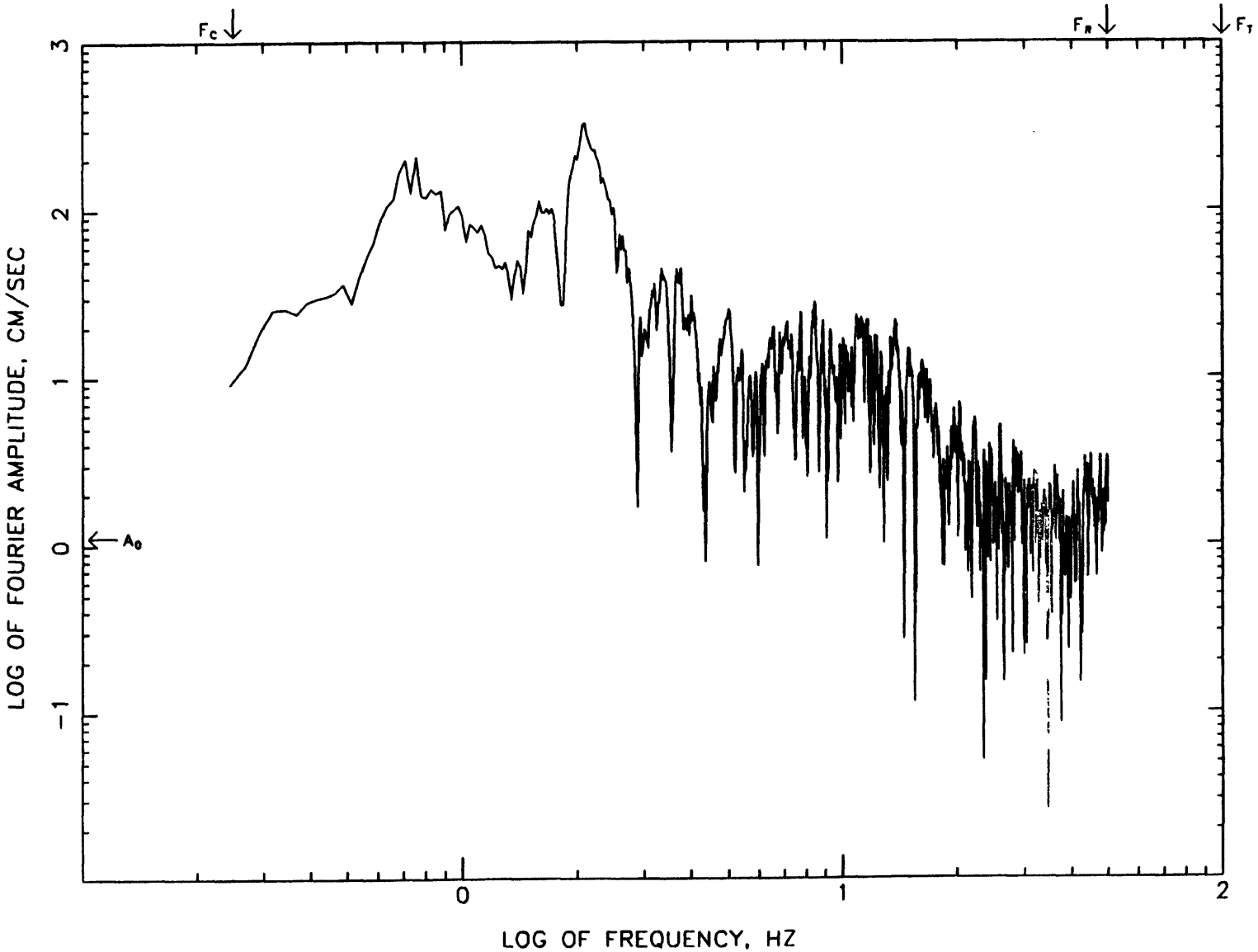

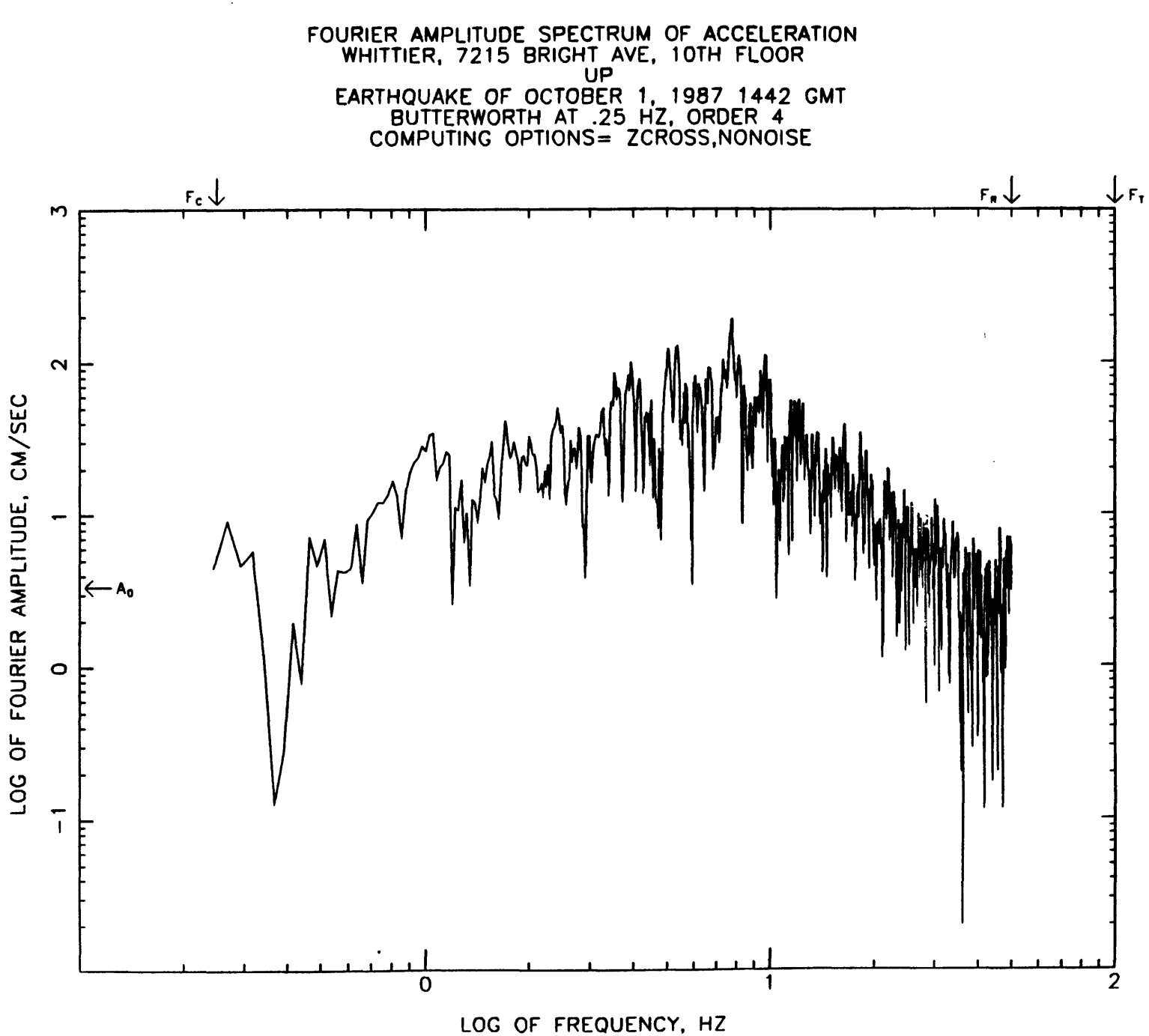
FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
WHITTIER, 7215 BRIGHT AVE, 10TH FLOOR
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EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
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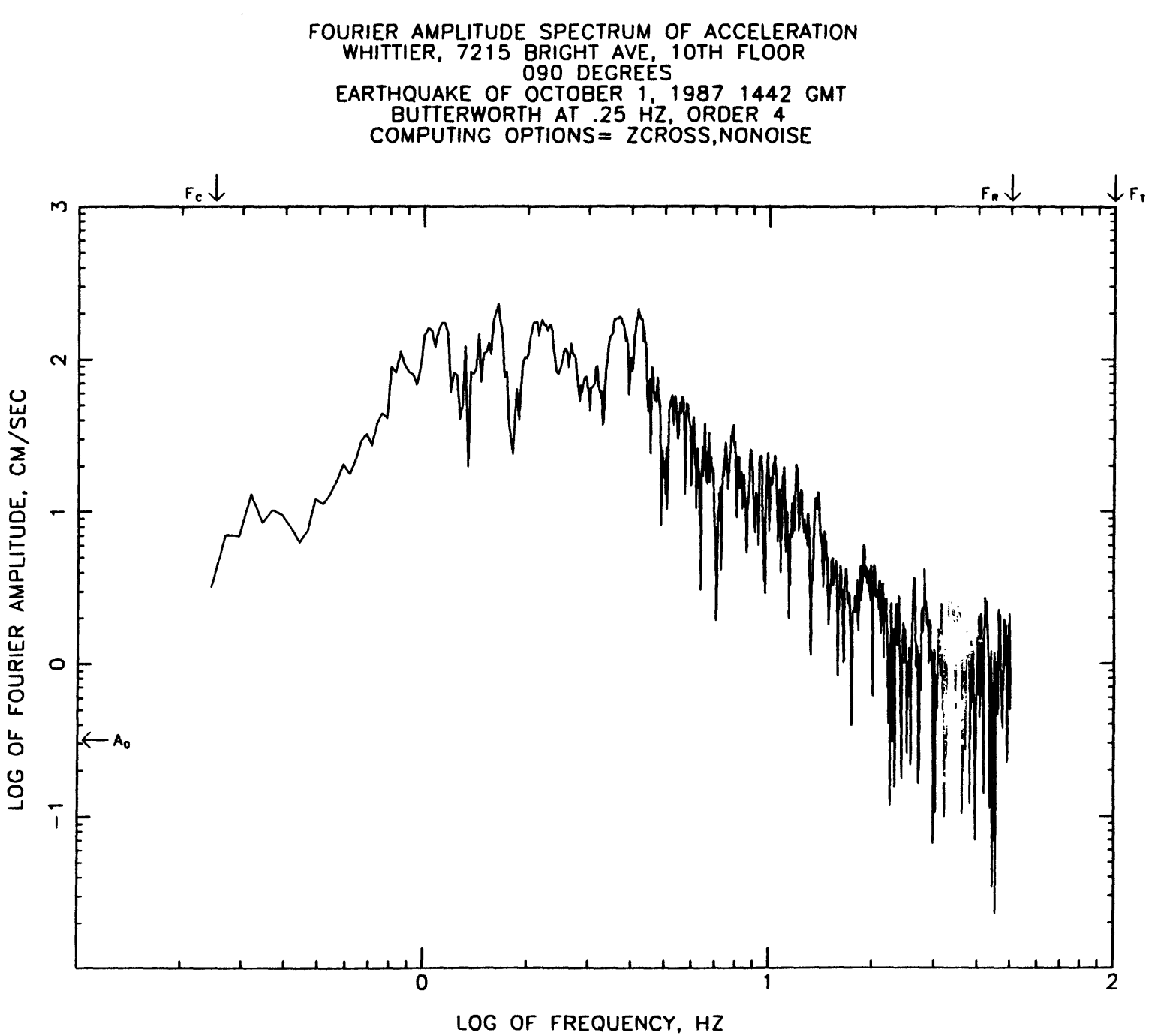
FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
WHITTIER, 7215 BRIGHT AVE, 10TH FLOOR
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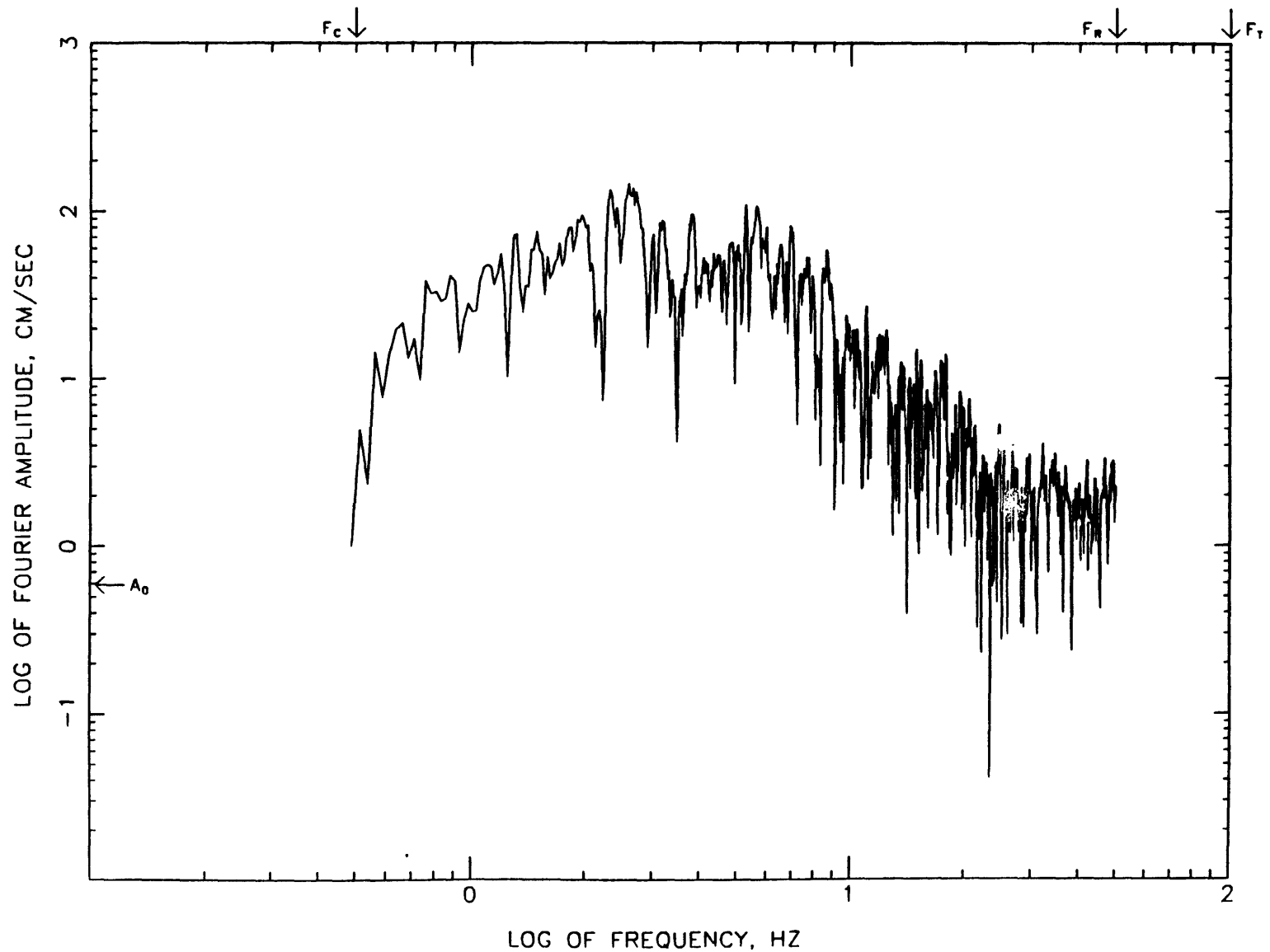
FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
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EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
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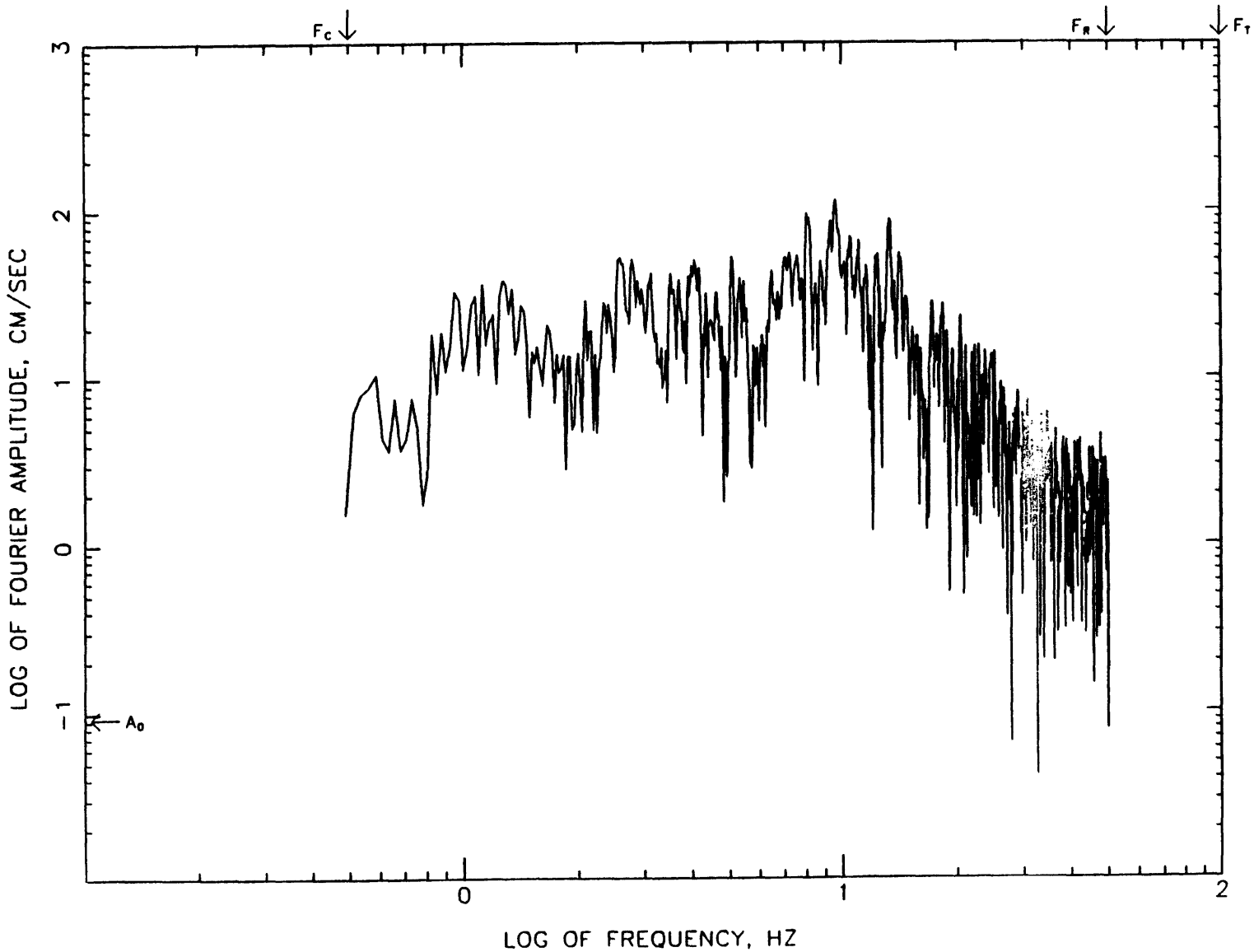
FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
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UP
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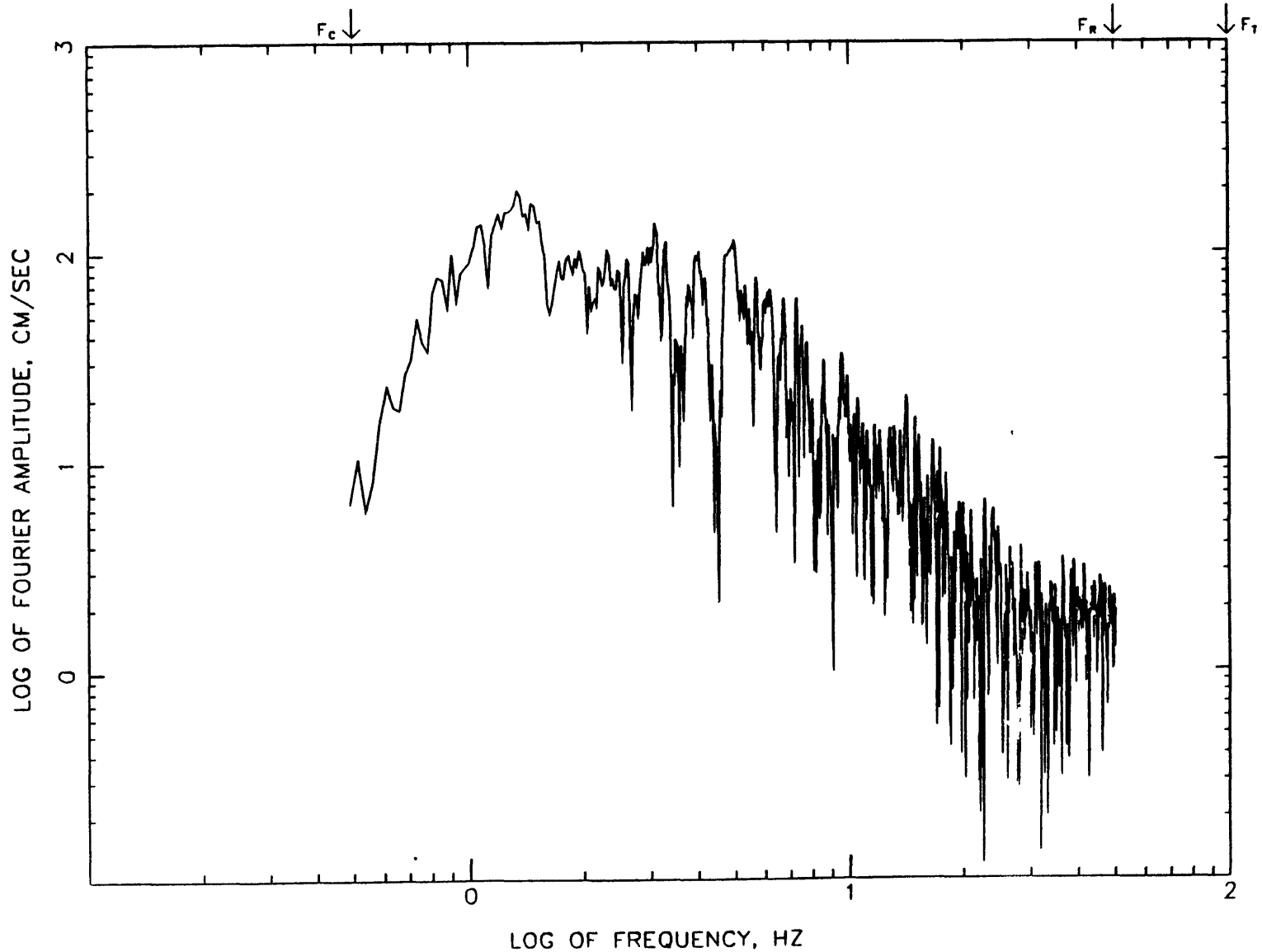
FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
BELL - LOS ANGELES BULK MAIL FACILITY
280 DEGREES
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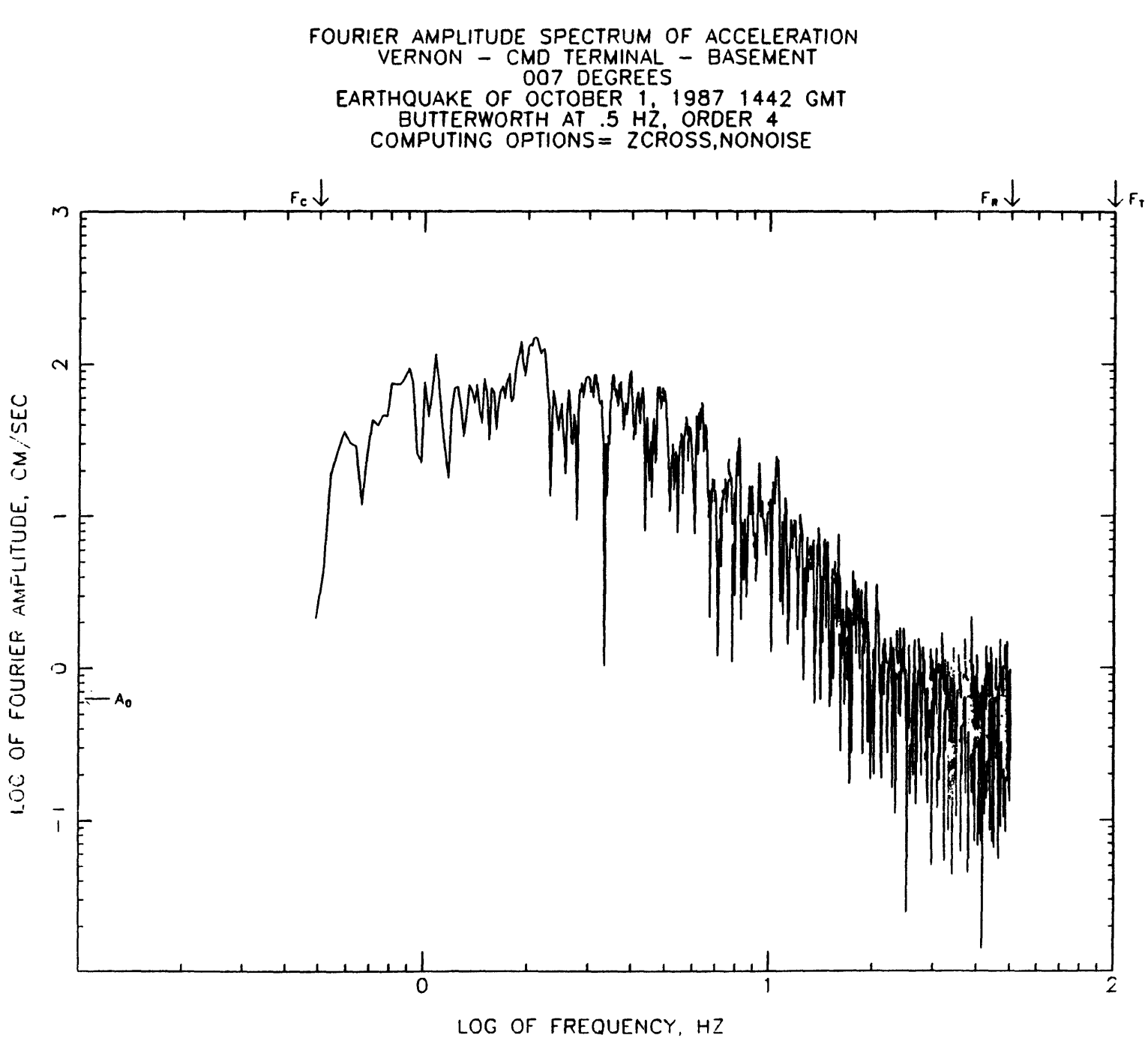
FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
VERNON - CMD TERMINAL - BASEMENT
007 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
BUTTERWORTH AT .5 HZ, ORDER 4
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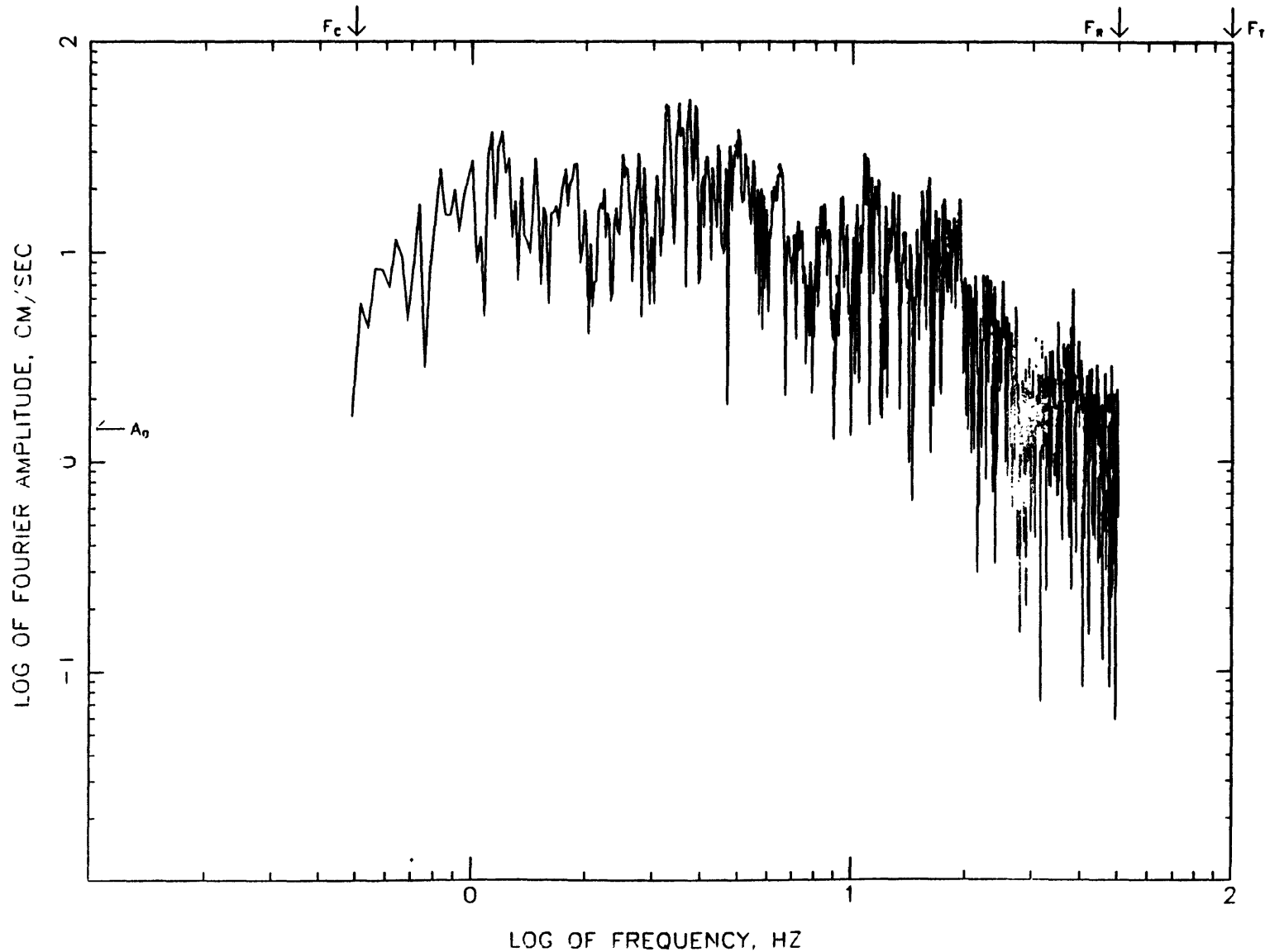
FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
VERNON - CMD TERMINAL - BASEMENT
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EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
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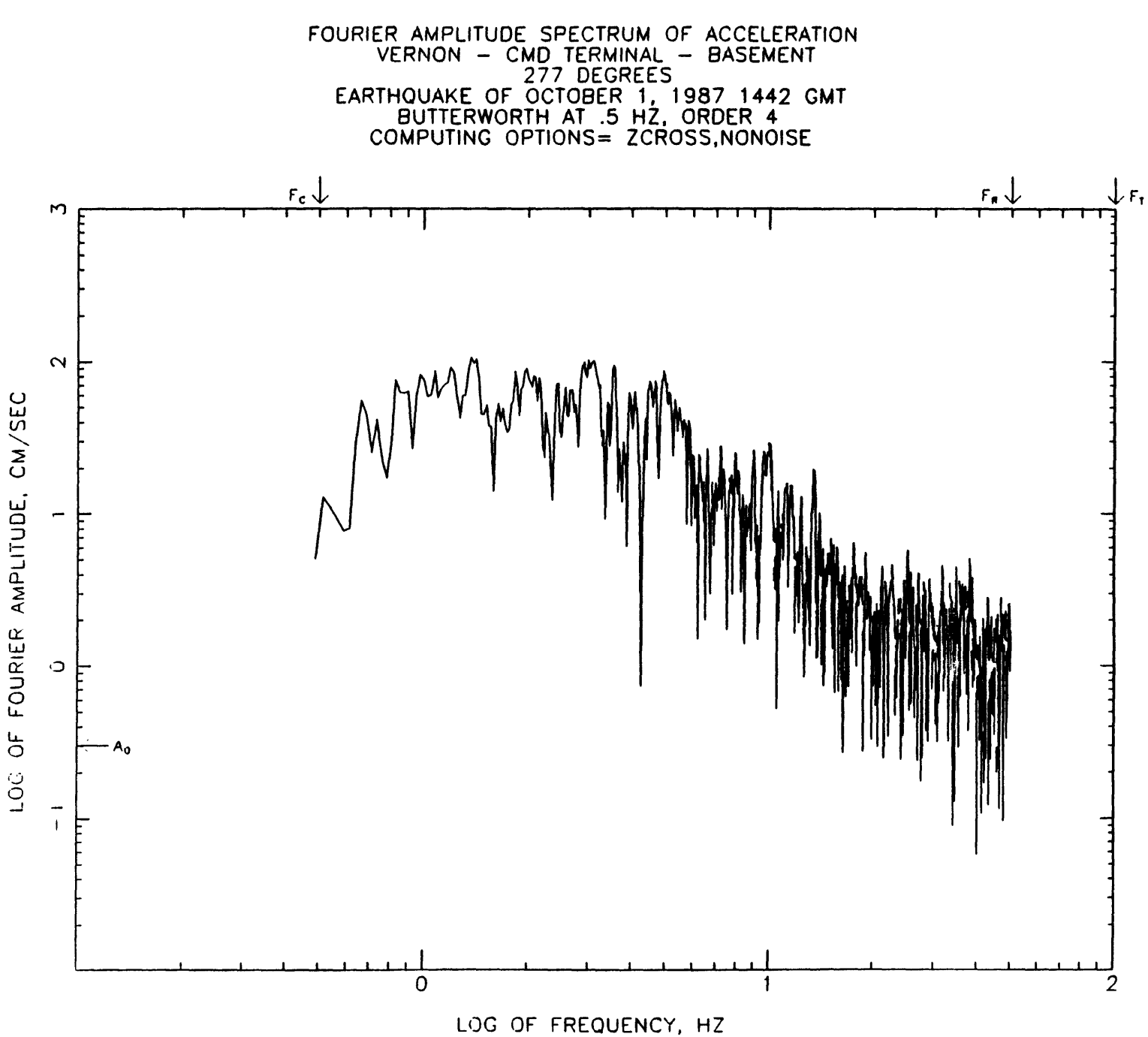
FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
VERNON - CMD TERMINAL - BASEMENT
277 DEGREES
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
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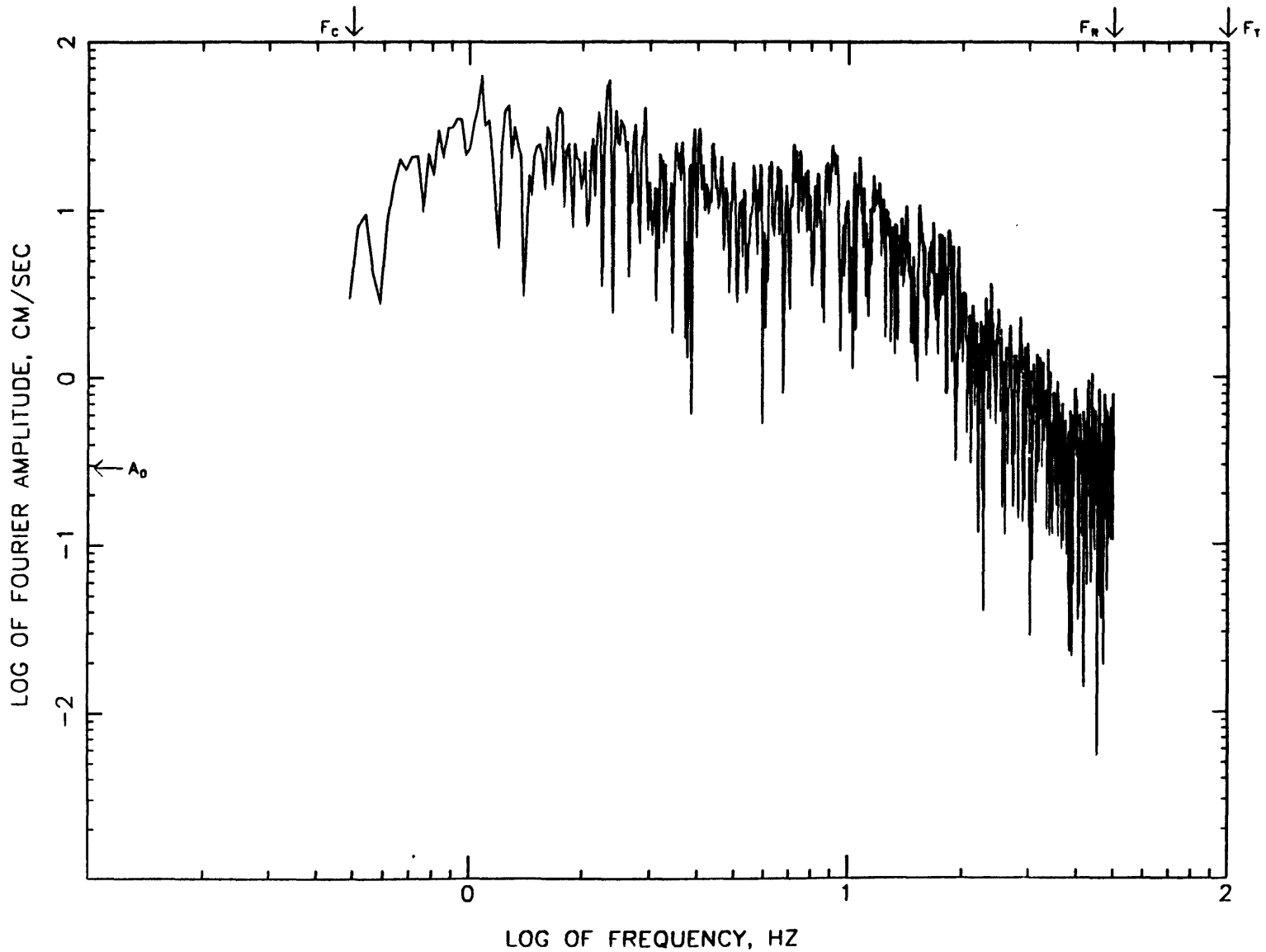
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COMPUTING OPTIONS= ZCROSS,NONOISE
F_C
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F_T
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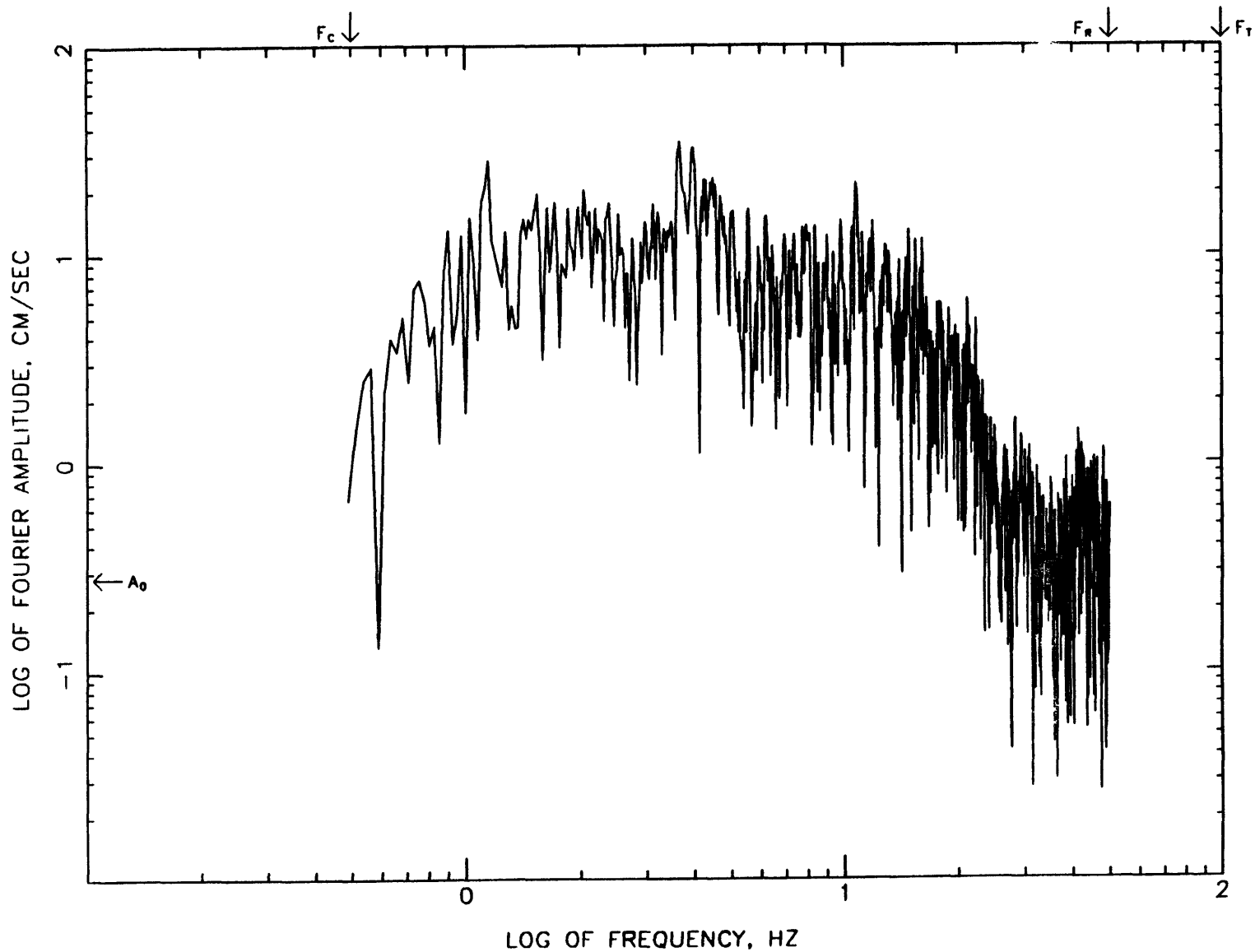
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UP
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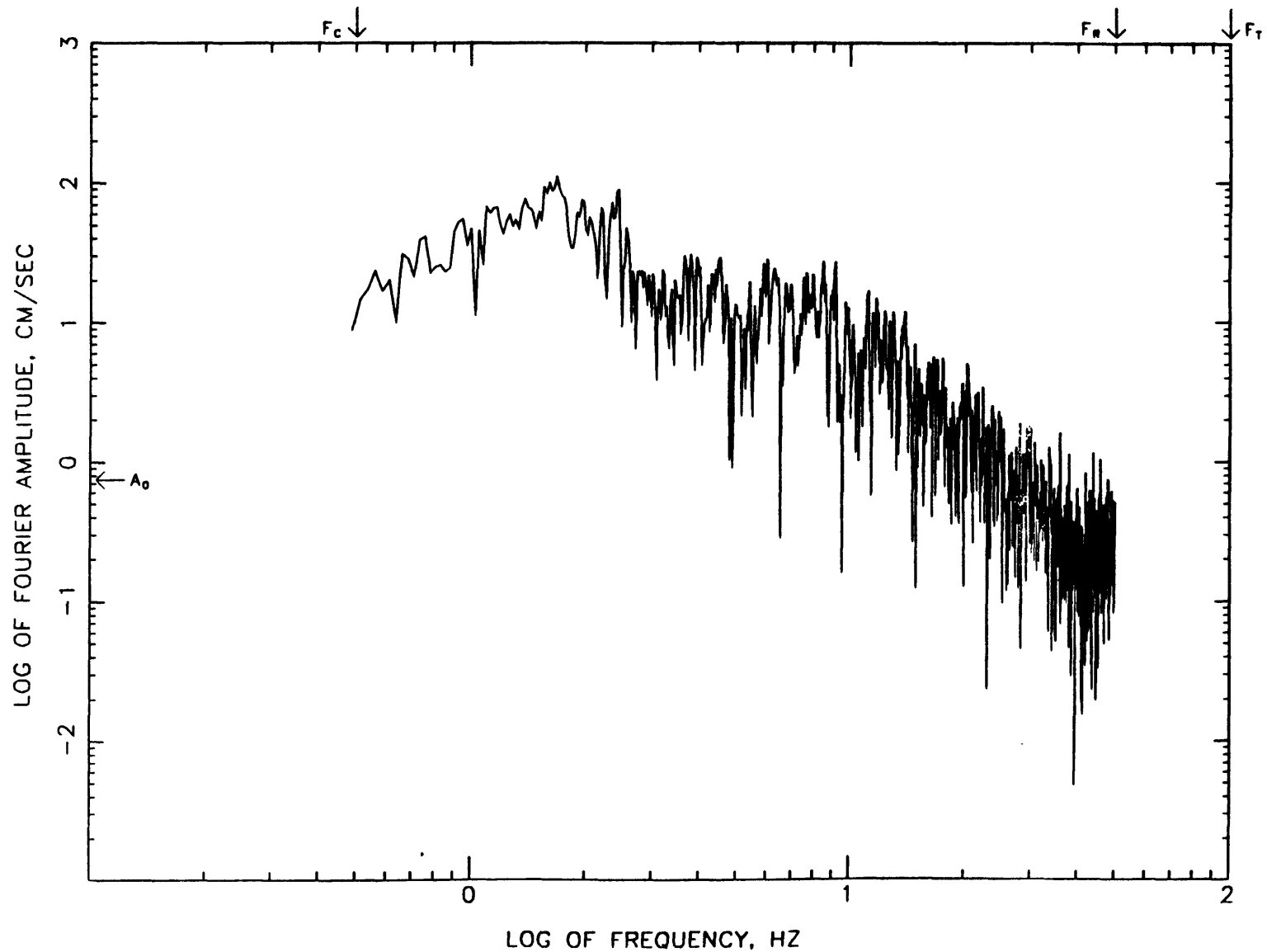
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BUTTERWORTH AT .5 HZ, ORDER 4
COMPUTING OPTIONS= ZCROSS,NONOISE
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FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
NORWALK, 12400 IMPERIAL HIGHWAY, 4TH FLOOR
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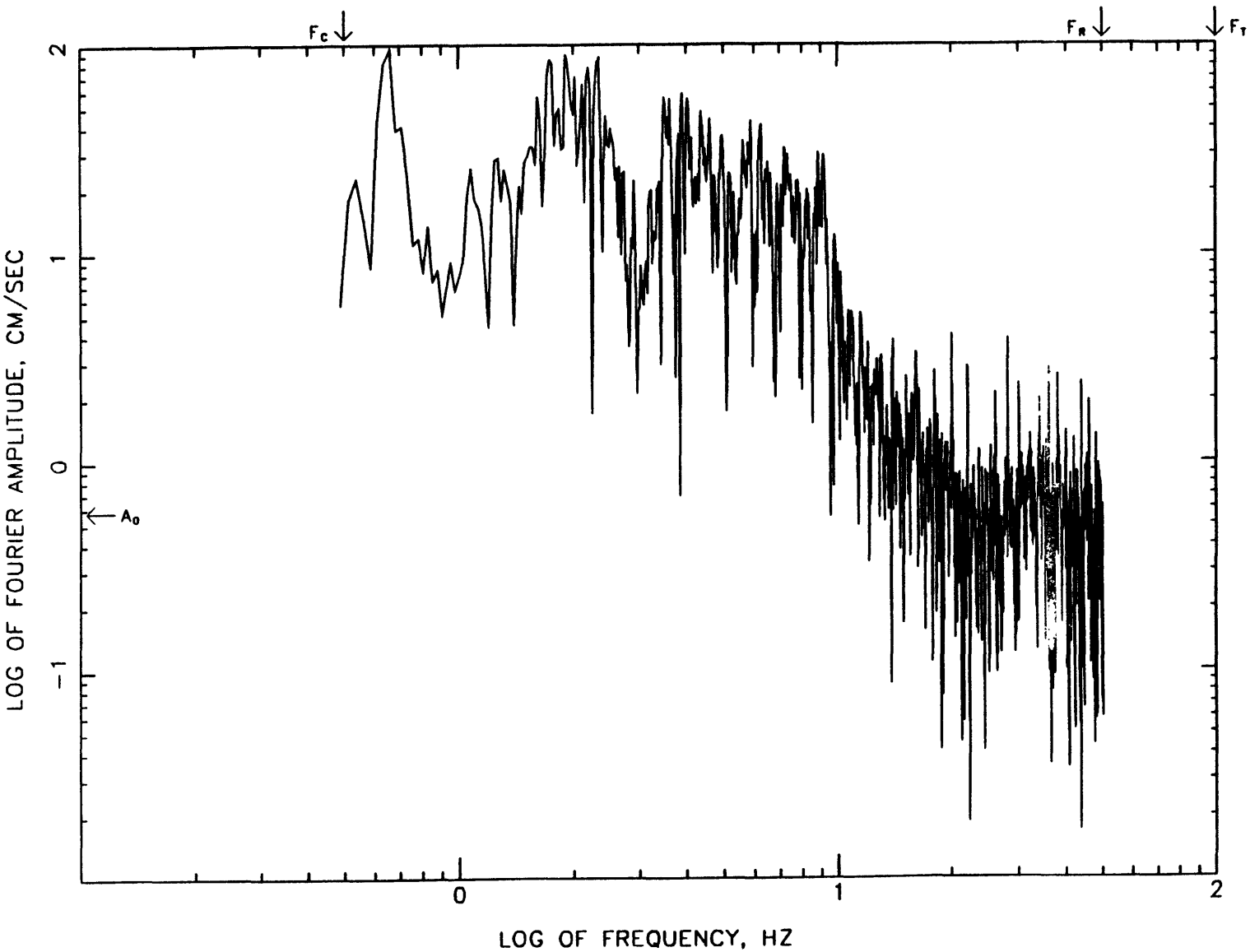

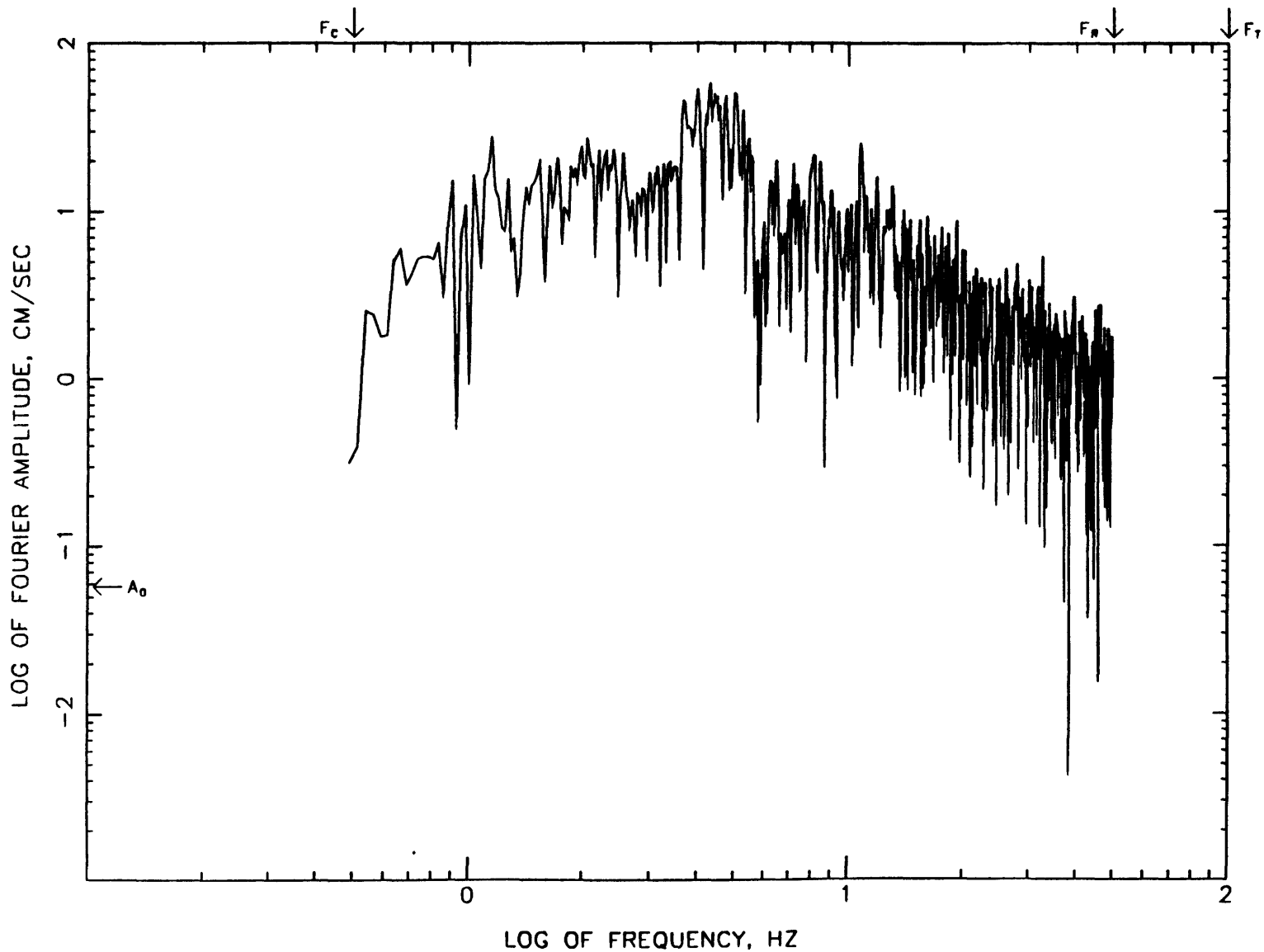
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UP
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COMPUTING OPTIONS= ZCROSS,NONOISE
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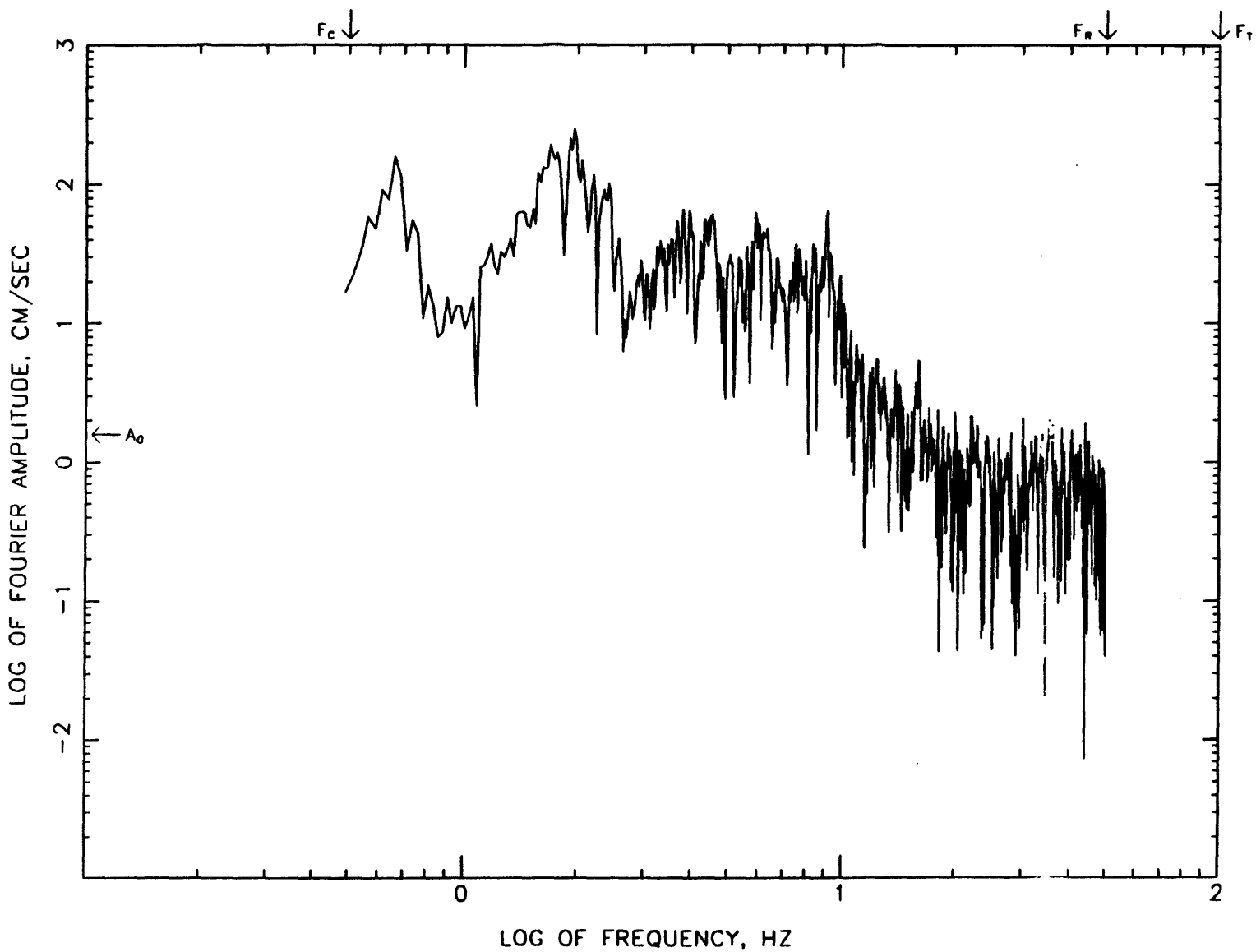
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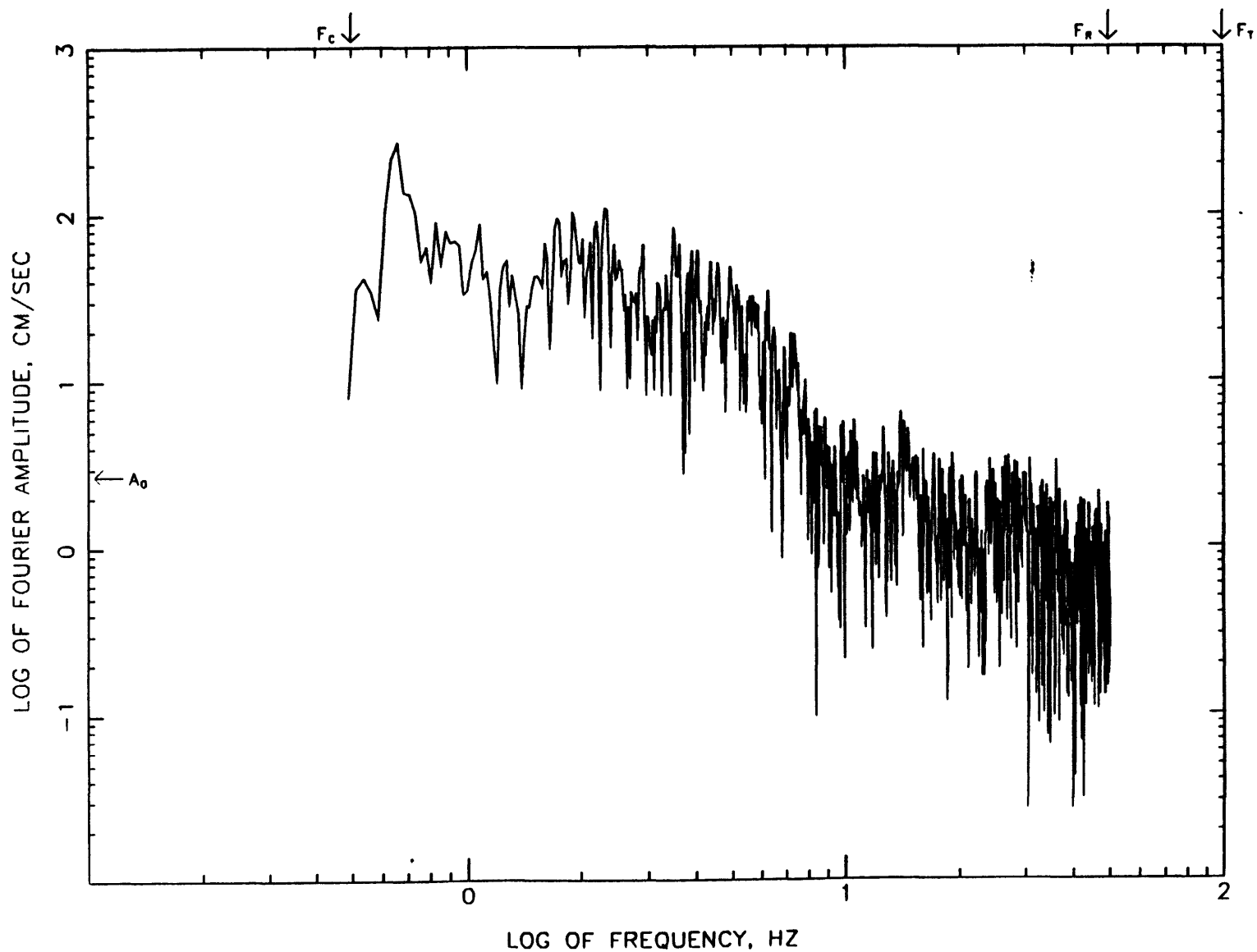
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EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
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COMPUTING OPTIONS= ZCROSS,NONOISE
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LOG OF FREQUENCY, HZ
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FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
NORWALK, 12400 IMPERAL HIGHWAY, ROOF
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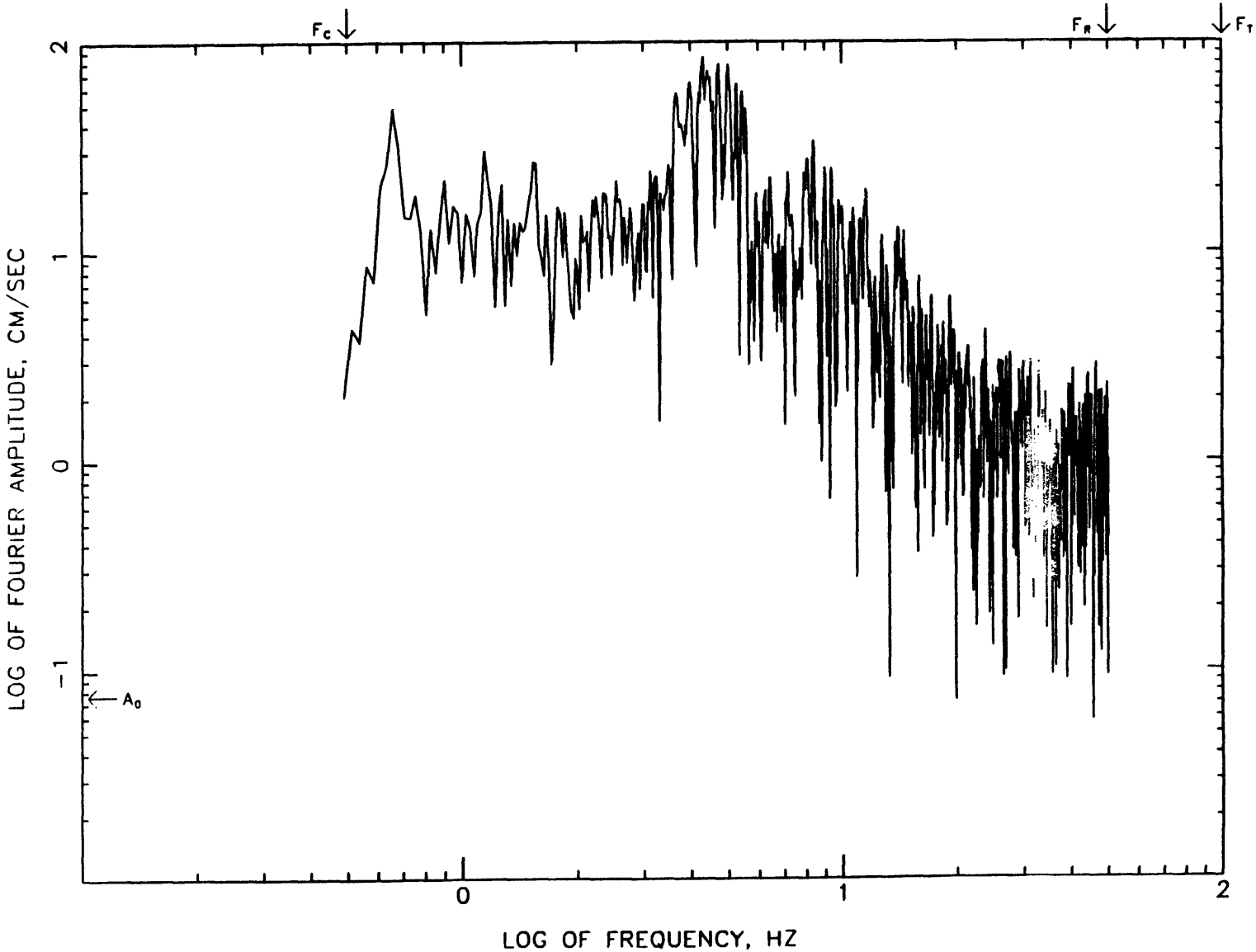

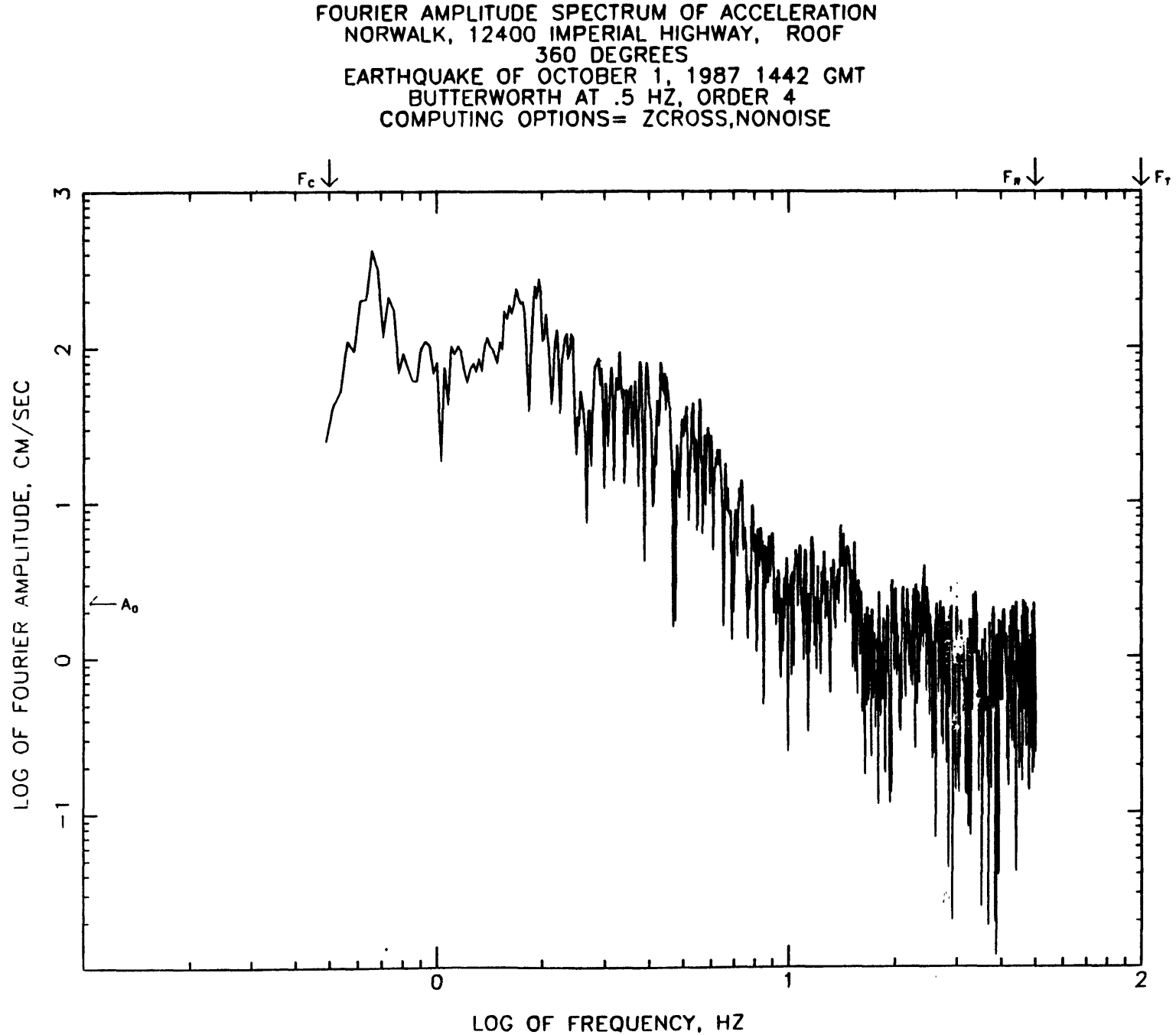
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EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
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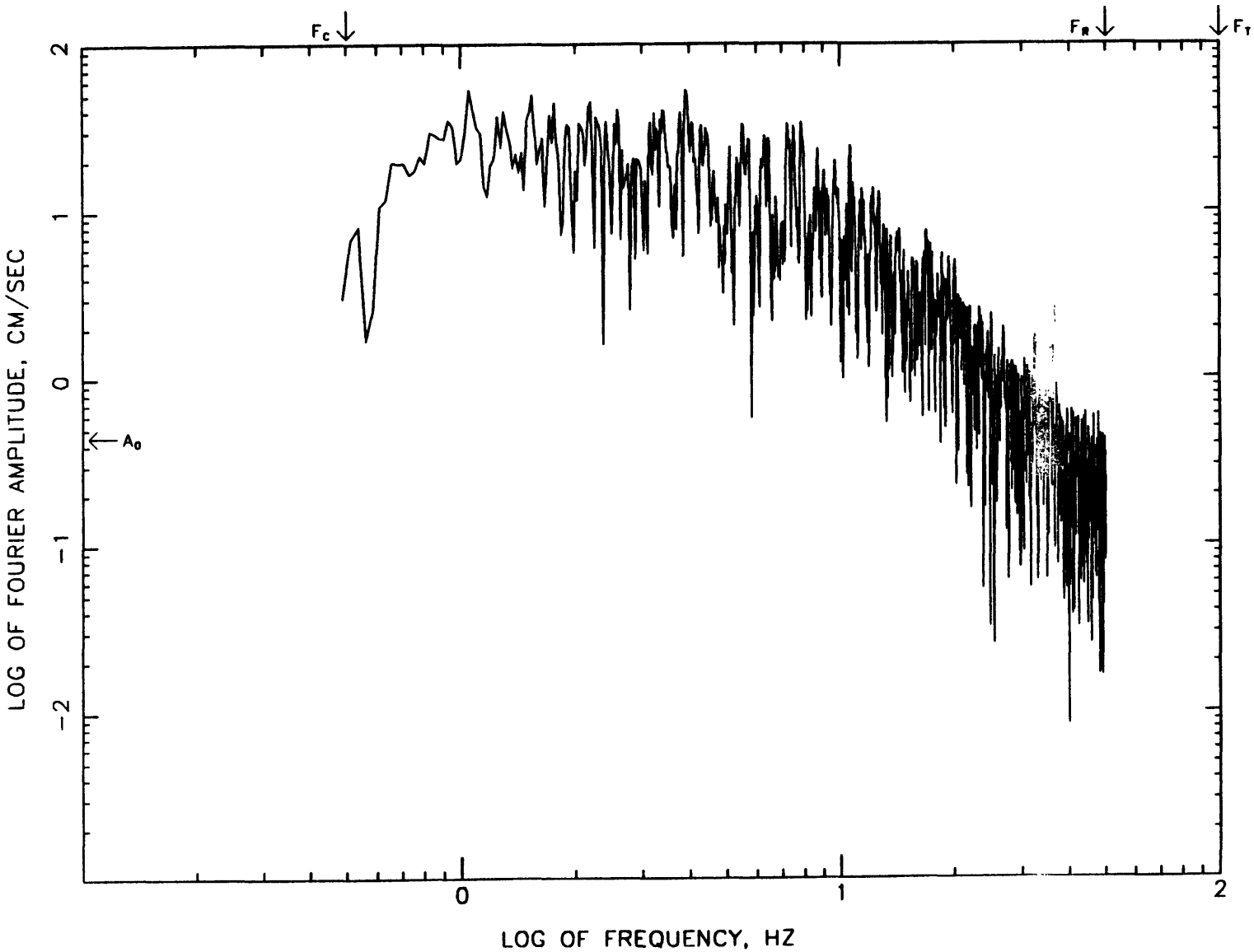
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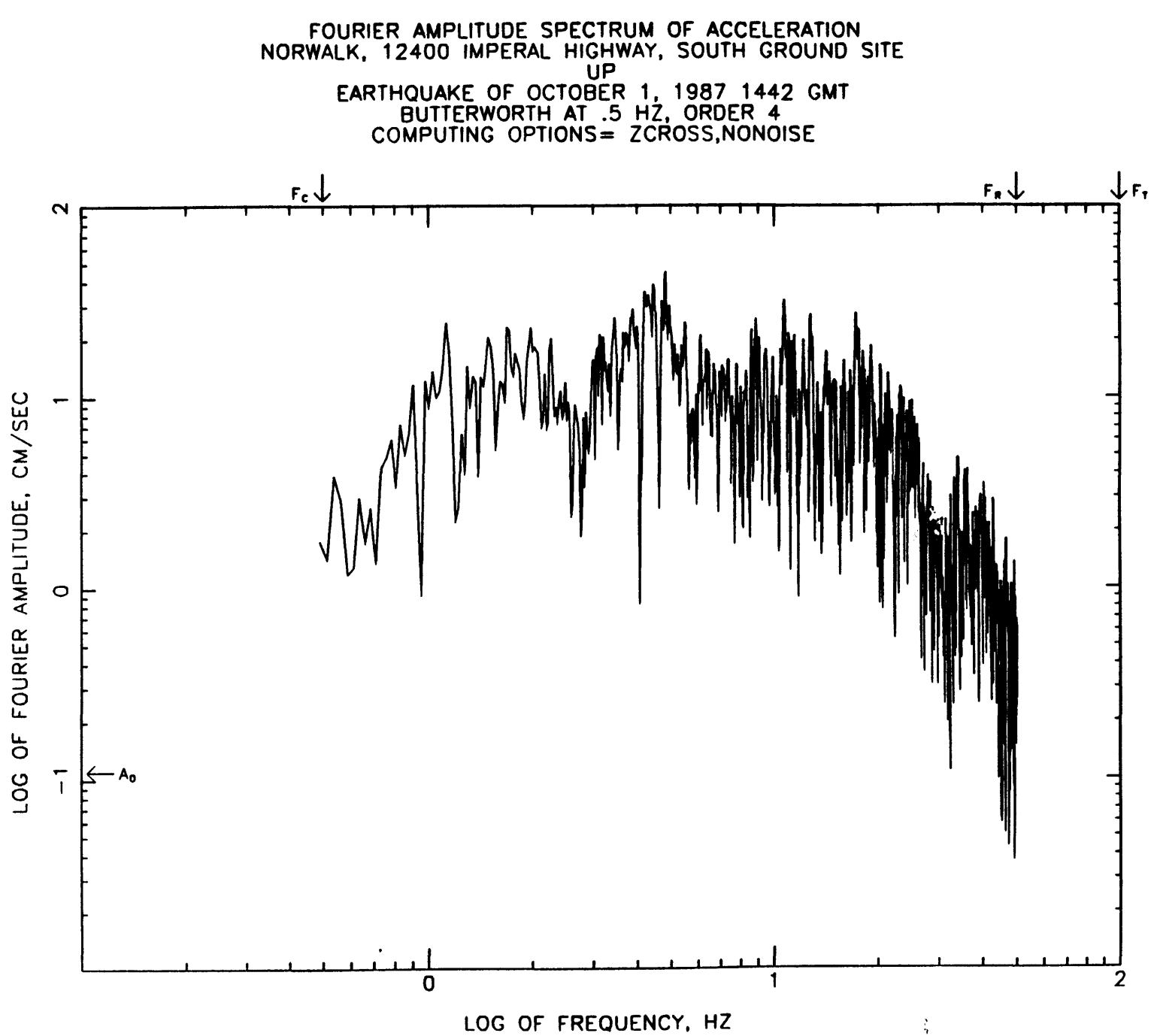
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UP
EARTHQUAKE OF OCTOBER 1, 1987 1442 GMT
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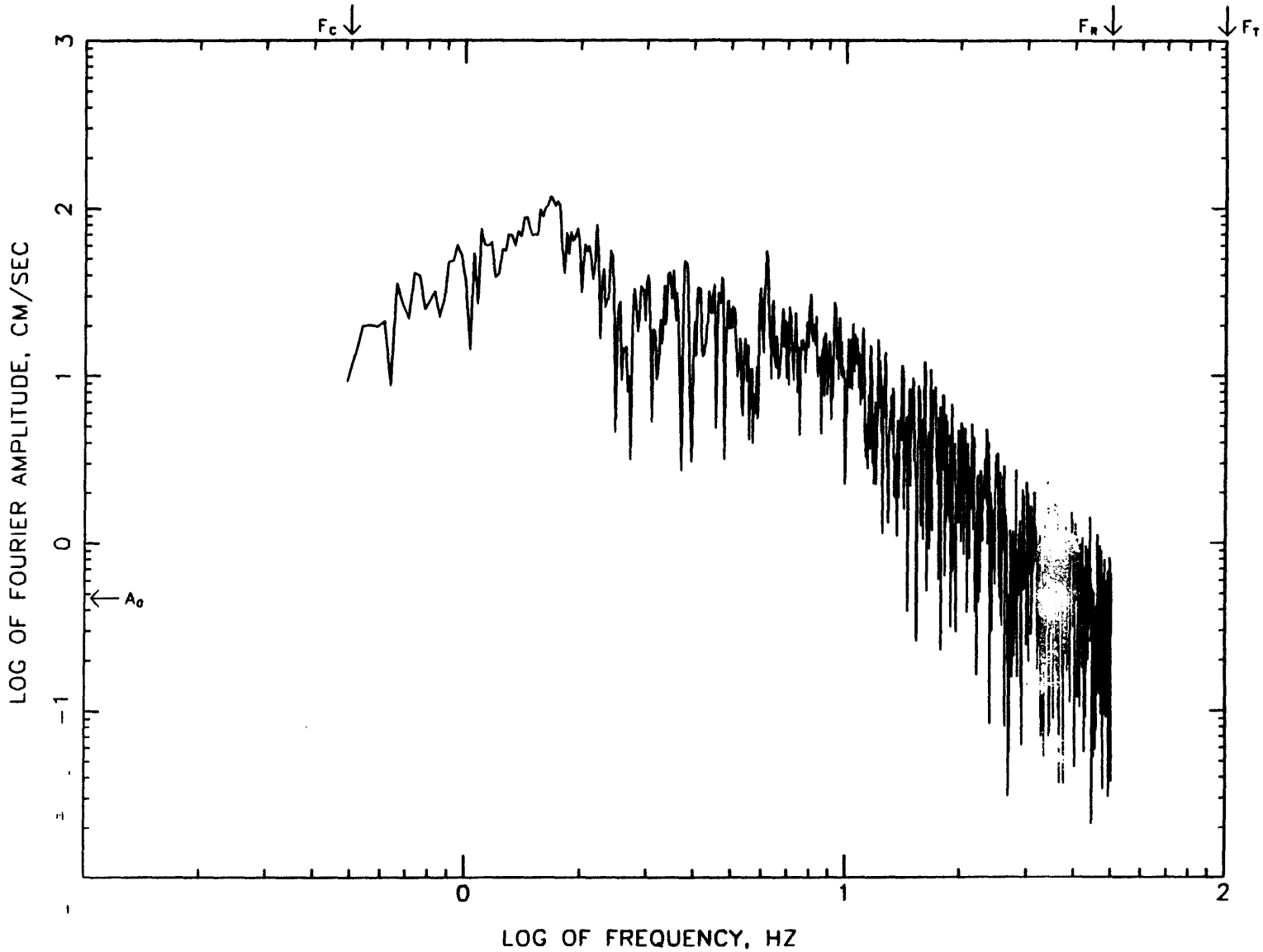
FOURIER AMPLITUDE SPECTRUM OF ACCELERATION
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BUTTERWORTH AT .5 HZ, ORDER 4
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LOG OF FOURIER AMPLITUDE, CM/SEC
LOG OF FREQUENCY, HZ
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Appendix 5

Current list of processed records

CURRENT LIST OF PROCESSED RECORDS

USGS processing of records from the USGS permanent network of strong-motion accelerographs and associated networks

Strong motion data from earthquakes 1978* and later.

TABLE 1. Chronological list of events and associated reports describing the existence/processing/analysis/availability of digital data on tape from NOAA, or from the National Strong Motion Data Center in Menlo Park.

Date & Time (Gmt)	Earthquake	Reference (see attached list)
January 1, 1975; 0355	Southern Alaska	OFR 86-191 (Silverstein, Brady, Mork, 1986b)
March 25, 1978	Coyote Dam, California	OFR 83-166 (Brady & Perez, 1983)
August 27, 1978 and two later shocks	Monticello Dam, Jenkinsville, South Carolina	OFR 81-0448 (Brady & others, 1981)
August 6, 1979	Coyote Lake, California	OFR 81-42 (Brady & others, 1980)
October 15, 1979	Imperial Valley, California	OFR 80-703 (Brady, Perez & Mork, 1980)
October 15, 1979	Imperial Valley, California	OFR 82-183 (Perez, 1982)
October 15, 1979; 2317:41, 2318:20, 2318:40	Imperial Valley California aftershock	OFR 86-441 (Brady, Mork, Silverstein)
October 16, 1979, 0706	Monticello Dam, Jenkinsville, South Carolina	OFR 81-1241 (Mork & Brady, 1981)
December 13, 1981 and March 18, 1983	Solomon Islands	OFR 86-264 (Silverstein, Brady, Mork, 1986a)
February 13, 14, and 23, 1983	Monasavu Dam, Fiji	OFR 85-375 (Silverstein, 1985a)
May 2 and May 9, 1983	Coalinga, California	OFR 84-626 (Maley & others, 1984)
July 9, 1983; 0740	Coalinga, California	OFR 85-584 (Silverstein, 1985b)

*With inclusion of isolated earlier events recently processed.

TABLE 1. Chronological list of events and associated reports (continued)

Date & Time (Gmt)	Earthquake	Reference (see attached list)
July 22, 1983; 0239	Coalinga, California	OFR 85-250 (Silverstein and Brady, 1985)
April 24, 1984	Morgan Hill, California	OFR 84-498, Vol I and II (Compiled by Seena Hoose)
December 23, 1985; 0516 Nov. 9, Dec. 23, Dec 25	Nahanni, Northwest Territories, Canada	Geol. Survey of Canada Open File Report 86-1-PGC, (Weichert and others, 1986)
January 26, 1986; 1920	Hollister, California	OFR 86-156, (Brady and others, 1986)
October 1, 1987; 1442	Whittier Narrows, California	OFR 88-354, (Brady and others, 1988)

TABLE 2. Processed records in each report

January 1, 1975; 0355; southern Alaska; OFR 86-191.
Records (4): Anchorage, 500 W. Third St., Basement
Anchorage, Alaskan Methodist University
Anchorage, Government Hospital
Talkeetna, FAA-VOR Building

March 25, 1978; Coyote Dam, California; OFR 83-166.
Records (3): Coyote Dam, Ukiah, California: abutment, toe, crest

August 27, 1978, 1023 and 2 later shocks; Monticello Dam, South Carolina, OFR 81-0448.
Records (3): Jenkinsville, Monticello Dam
Shared abutment (center crest)

August 6, 1979, Coyote Lake, California; OFR 81-42.
Records (6): Coyote Creek, San Martin, California
Gilroy Array: Station 6, San Ysidro
Gilroy Array: Station 4, San Ysidro School
Gilroy Array: Station 3, Sewage Treatment Plant
Gilroy Array: Station 2, Mission Trails Motel
Gilroy Array: Station 1, Gavilan College

October 15, 1979, 2317; The Imperial Valley Earthquake; OFR 80-703.
Records (22): El Centro Array 7, Imperial Valley College
El Centro Array 6, Huston Road
El Centro, Bonds Corner, Hiways 98 & 115
El Centro Array 8, Cruickshank Road
El Centro Array 5, James Road
El Centro Differential Array
El Centro Array 4, Anderson Road
Brawley, Brawley Municipal Airport
Holtville, California, Holtville Post Office
El Centro Array 10, Keystone Road
Calexico, California, Calexico Fire Station
El Centro Array 11, McCabe School
El Centro Array 3, Pine Union School
Parachute Test Facility
El Centro Array 2, Keystone Road
El Centro Array 12, Brockman Road
Calipatria, California, Calipatria Fire Station
El Centro Array 13, Strobel Residence
El Centro Array 1, Borchard Ranch
Superstition Mountain, California
Plaster City, California, Storehouse
Coachella Canal Number 4, California

October 15, 1979, 2317:41; Imperial Valley Aftershocks; OFR 86-441
Records (6) El Centro Array 5, James Road
El Centro Array 6, Huston Road
El Centro Array 7, Imperial Valley College
El Centro Array 8, Cruickshank Road
El Centro Array 9, Commercial Ave.
El Centro Differential Array

TABLE 2. Processed records in each report (continued)

October 15, 1979, 2318:21; Imperial Valley Aftershocks; OFR 86-441
Records (6) El Centro Array 5, James Road
El Centro Array 6, Huston Road
El Centro Array 7, Imperial Valley College
El Centro Array 8, Cruickshank Road
El Centro Array 9, Commercial Ave.
El Centro Differential Array

October 15, 1979, 2318:42; Imperial Valley Aftershock; OFR 86-441
Records (7) El Centro Array 6, Huston Road
El Centro Array 7, Imperial Valley College
El Centro Array 8, Cruickshank Road
El Centro Array 9, Commercial Ave.
El Centro Differential Array
Bonds Corner, Highways 115 & 98
Holtville Post Office

October 15, 1979; The Imperial Valley, California; OFR 82-183;
Records (22): This report contains the time-dependent response spectrum plots for the same records in OFR 80-703, above.

October 16, 1979, 0706 Gmt, Monticello Dam, South Carolina, OFR 81-1214.
Records (1): Jenkinsville, South Carolina, Monticello Dam shared abutment (center crest)

December 13, 1981 and March 18, 1983; Solomon Islands, OFR 86-264
Records (5): Dec. 13, 1981, 0129 Gmt: 460 Beach, Panguna Mine, Bougainville Island.
Dec. 13, 1981, 1324 Gmt: "
March 18, 1983: Arawa Town
Bato Bridge
BVE80, Panguna Mine.

February 13, 14, and 23, 1983; Monasavu Dam, Fiji; OFR 85-375
Records (3): Feb 13, 14, 23, 1983: Monasavu Dam.

May 2 and May 9, 1983; Coalinga, California; OFR 84-625.
Records (13): May 2, 1983, 2342 Gmt:

Pleasant Valley Pump Plant: switchyard, basement

May 9, 1983, 0249 Gmt

Anticline Ridge: freefield and pad
Burnett Construction
Oil City
Oil Fields Fire Station
Palmer Avenue
Skunk Hollow
Pleasant Valley Pump Plant: switchyard, basement, 1st floor, roof

TABLE 2. Processed records in each report. (continued)

July 9, 1983; 0740; Coalinga, California; OFR 85-584
Records (9): Anticline Ridge: freefield and pad
Burnett Construction
Oil City
Oil Fields Fire Station: freefield and pad
Palmer Avenue
Skunk Hollow
Transmitter Hill

July 22, 1983; 0239; Coalinga, California; OFR 85-250
Records (13): Anticline Ridge: pad site
Burnett Construction
Oil City
Oil Fields Fire Station: freefield and pad
Palmer Avenue
Pleasant Valley Pump Plant: 1st floor, basement, roof, switchyard, freefield
Skunk Hollow
Transmitter Hill

April 24, 1984; Morgan Hill, California; OFR 84-498B, Vol. II.
Records (11): Anderson Dam: downstream, crest
Hollister City Hall Annex
Hollister Differential Array
San Justo Damsite: right abutment, left abutment
San Jose 101/280/680 bridge
Hollister Differential Array No. 1, 3, 4, 5

December 23, 1985; with foreshock and aftershocks; Northwest Territories, Canada; OFR in press.
Records (6): Nov. 9, 1985; 0446 Gmt: Nahanni Site 2
Dec. 23, 1985; 0516 Gmt: Nahanni Sites 1, 2, 3
Dec. 23, 1985; 0548 Gmt: Nahanni Site 1
Dec. 25, 1985; 1543 Gmt: Nahanni Site 3

January 26, 1986; Hollister, California; OFR 86-156
Records (5): Hollister Digital Differential Array, Stations 1, 3, 4,

October 1, 1987; Whittier Narrows, California; OFR 88-354
Records (15): Garvey Reservoir Abutment Building
Whittier Narrows Dam: crest, upstream
Alhambra; 900 S. Fremont: Basement, 6, 12
Whittier; 7215 Bright: Basement, 5, 10
Bell; L. A. Bulk Mail Center
Vernon; 4814 Loma Vista Avenue
Norwalk; 12400 Imperial: Basement, 4, Roof, South ground level

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