UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

LOMA PRIETA, CALIFORNIA, EARTHQUAKE OCTOBER 18 (GMT), 1989

PROCESSED STRONG-MOTION RECORDS

VOLUME 1

By A. G. Brady and P. N. Mork

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PREFACE

This report contains the computer processed results of seventeen film records and a digital record from stations in the USGS Cooperative Network of permanent stations during the Loma Prieta, California, earthquake, M7.1, on October 18 (GMT), 1989. The 70 mm film records are from close-in stations (closest epicentral distance 27 km) or important San Francisco Bay Area stations. Central recorder film records at three of these stations (Anderson Dam, 600 Montgomery Street and Emeryville) are also due for processing. 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 the crest of the dam), 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, and Fourier amplitude spectra on linear axes) are available from the authors at USGS, 345 Middlefield Road MS 977, Menlo Park, California 94025, upon request. A companion tape containing all processed results (except FFT Fourier amplitude spectra ordinates) is available from the National Geophysical Data Center, 325 Broadway (Mail E/GC1), Boulder, Colorado 80303; phone (303) 497-6764.

Cover Picture. Aerial photo looking north at Pier E-9 on October 19, 1989, showing the collapsed upper and lower 50 foot deck spans. From "Performance of Structures During the Loma Prieta Earthquake of October 17, 1989," NIST Spec. Pub. 778 (ICCSSC TR11), H. S. Lew, Editor.

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USGS COOPERATIVE NETWORK STATIONS, VOLUME I

Station, recorder location, and component directions	Page no. for plots of four processing stages* 1	2	3	4
Anderson Dam				
Crest: 340, Up, 250	9	49	-	211
Left abutment: 340, Up, 250	11	55	167	214
Downstream: 340, Up, 250	13	61	170	217
Sunnyvale: Colton Avenue 360, Up, 270	15	67	173	220
Hollister Airport Differential Array 255, Up, 165	17	73	176	223
Palo Alto VA Hospital, Bldg. 1				
Basement: 302, Up, 212	19	79	179	226
Roof (7th level): 302, Up, 212	21	85	-	229
Hollister City Hall				
Basement: 180, Up, 090	23	91	182	232
Stanford University, SLAC				
Test Lab: 360, Up, 270	25	97	185	235
Stanford University; Parking Garage: 360, Up, 090	27	103	188	238
Menlo Park VA Hospital, Bldg. 37 110, Up, 020	29	109	191	241
Fremont, Emerson Court 180, Up, 090	31	115	194	244
APEEL Array Stn. 2, Redwood City 133, Up, 043	33	121	197	247
San Francisco: 600 Montgomery St. (Transamerica Building)				
Basement: 261, Up, 171	35	127	200	250
29th floor: 261, Up, 171	38	136	-	253
49th floor: 261, Up, 171	41	145	-	256
Emeryville: 6363 Christie Ave.				
Ground site, south: 350, Up, 260	44	154	203	259

TABLE OF CONTENTS FOR COMPUTER PLOTS - continued

LOMA PRIETA EARTHQUAKE OF OCTOBER 18, 1989
USGS COOPERATIVE NETWORK STATIONS, VOLUME I

Station, recorder location, and component directions	Page no. for plots of four processing stages* 1	2	3	4
San Francisco: Golden Gate Bridge 360, Up, 270	46	160	206	262

*Processing stages and plot format:

1. Uncorrected accelerogram (maximum, 40 seconds, except 60 seconds for San Francisco, 600 Montgomery St., Transamerica Building).
2. Corrected acceleration, velocity, displacement.
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, plots of response spectra are not provided for upper levels of buildings, or the dam crest.

LOMA PRIETA, CALIFORNIA, EARTHQUAKE, OCTOBER 18 (GMT), 1989

PROCESSED STRONG-MOTION RECORDS: VOLUME 1

INTRODUCTION

Instruments at 41 stations within the USGS Cooperative Strong-Motion Network were triggered by the M7.1 Loma Prieta earthquake on 18 October 1989, at 00:04 hr (GMT) (17 October, 1704 hr PST; Maley and others, 1989). Three of these 41 stations were not included in the above report: Bear Valley Fire Station, Rivera St., Milpitas, and a digital recorder at a parking garage at Stanford University. Epicentral distances range from 27 to 115 km. This report contains the results of processing seventeen 70-mm film records and the Stanford digital record, from thirteen stations, including the closest to the epicenter (at Anderson Dam) and important San Francisco Bay area stations, as shown in Figure 1. Computer plots of uncorrected acceleration, corrected acceleration, velocity and displacement, response spectra (except for upper levels), and Fourier amplitude spectra are included in the Appendices. A companion tape is available from the National Geophysical Data Center (NGDC), NOAA, 325 Broadway, Mail E/GC1, Boulder, Colorado 80303. Phone (303) 497-6764.

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 were 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 four successive 10-second frames, into 40 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 except for resonances in structures or in soft ground. Beyond these resonances, 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 play significant roles in the selection of the long-period limit for individual records in this report.

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 permits 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 1 lists the stations, with the instrumentation owner, epicentral distance, brief site geology, trigger time from a WWVB receiver, if available, and the long period filter. Station coordinates and peak values are available in Maley and others (1989) where peaks are scaled from the original film; corrected peaks may be obtained from the plots in Appendices I and II.

The following comments apply to specific stations whose processed records appear in this report. These comments are in addition to those found in Maley and others (1989).

1. Anderson Dam, the Transamerica building, and Emeryville are extensively instrumented with centrally recording accelerographs, in addition to the 70-mm film recorders described here.

2. Initial investigation of the Anderson Dam displacements and spectra, using a wide range of long-period filters, indicated an optimum choice of a 4-second filter. Calculated displacements after 6-second filtering were not sufficiently coherent across the station instrumentation, considering the longest period of vibration of the dam to be less than one second. Mostly as a result of this, all records in this report were filtered at 4 seconds. The one exception is the Transamerica Building whose longest fundamental resonant period is approximately 3 1/2 or 4 seconds (depending on the translational direction), as measured from the original film or the uncorrected data included here. The Fourier spectra over the entire record indicate that the peak spectral periods are 3.63 or 3.69 seconds. In order to capture this period, a long period filter of 6 seconds was used. There is no indication from the three records included here that the resulting motions are

contaminated with noise.

3. Anderson Dam. The crest, left abutment, and downstream recorders are not connected for simultaneous triggering or common timing marks. The left abutment recorder has a slight interference problem, presumed to be electromagnetic, between the time marks and the acceleration traces, as can be seen in the repeating half-second pattern in these traces. There is no significant peak in the Fourier spectra at 2, 4, 6, ... Hz. The low-amplitude spikes could be removed from the uncorrected data with further high-frequency filtering.

4. Hollister Airport Differential Array. The film recorder is in the recording building, which also contains the recorders for the inoperative digital array.

5. Palo Alto VA Hospital. The basement record suffers from film hesitations beyond 29 seconds, and thickening there of the traces results in the apparent spikes in the uncorrected data. The time marks ensure that the sections of the traces following the hesitations are timed correctly. The digitized version beyond 29 seconds should not be used before the spikes are removed.

The roof (7th level) record had traces crossing each other and needed careful work to separate them. High-frequency oscillations arrived simultaneously with both the highest peak (1097 cm/sec/sec) and the crossing traces.

6. Stanford University Parking Garage. This is a digital recorder at the lowest basement level. The record has a pre-event memory, of which approximately four seconds have been included in this report.

7. San Francisco, 600 Montgomery St., Transamerica Building. The three recorders are interconnected for simultaneous triggering and common time-code-generated time marks. Each record was digitized to nearly 60 seconds to capture the decaying long period oscillations (see note 2, above). The records ran for 80 seconds. The three recorders show various amounts of interference from the time marks (see note 3, above).

The 49th floor recorder shows a number of arrivals on all three traces of high-frequency excitation, particularly evident in the vertical trace, and lasting intermittently for the entire 60 seconds. Typical high amplitude characteristics are 30 Hz frequency, 50 cm/sec/sec acceleration amplitude, 0.0014 cm displacement amplitude. No evidence is known at this time regarding the cause.

ACKNOWLEDGMENTS

The Cooperative Strong-Motion Network operated by the U.S. Geological Survey includes instrumentation owned by both private industry as well as federal, state, and local agencies and organizations. The Veterans Administration and Stanford University contributed accelerographs that triggered during the main shock and are included in this report. We especially thank the many government agencies, private companies, and individuals that have permitted the U.S Geological Survey to operate

instrumentation on their property.

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

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Converse, April (1984). AGRAM, a series of computer programs for processing digitized strong-motion accelerograms, version 2.0: U.S. Geological Survey Open-File Report 84-525.

Fletcher, J. B., A. G. Brady, and T. C. Hanks (1980). Strong-motion accelerograms of the Oroville, California, aftershocks: data processing and the aftershock of 0350 August 6, 1975: Bull. Seis. Soc. Am., 70, 1, 243-267.

Hanks, T.C. (1975). Strong ground motion of the San Fernando, California, earthquake: ground displacements: Bull. Seis. Soc. Am. 65, 1, 193-225.

Maley, R., A. Acosta, F. Ellis, E. Etheredge, L. Foote, D. Johnson, R. Porcella, M. Salsman and J. Switzer (1989). USGS Strong-Motion Records from the Northern California (Loma Prieta) Earthquake of October 17, 1989: U.S. Geological Survey Open-File Report 89-568.

TABLE 1

LOMA PRIETA EARTHQUAKE, OCTOBER 18 (GMT) 1989
USGS COOPERATIVE STRONG MOTION NETWORK STATIONS, VOLUME 1

No.	Name (Instrumentation Owner)	Inst. Shelter	Epic. Dist. (km)	Site Geology	Trigger time (sec)	Long Period (sec)
1.	Anderson Dam (USGS)		27			
	Crest	5		Earthdam	--	4
	Left Abutment	1		Rock	--	4
	Downstream	1		Alluvium	04:22.9	4
4.	Sunnyvale: Colton Ave. (USGS)	2	43	Bay sediments -Alluvium	--	4
5.	Hollister Airport Diff. Array (USGS)	3	45	Alluvium	04:26.5	4
6.	Palo Alto VA Hospital (VA)	S6	47	Tertiary Sed. rock	--	4
7.	Hollister City Hall (USGS)	S1	47	Alluvium	04:27.1	4
10.	Stanford University (S.U.)					
	SLAC Test Lab		51	Tertiary Sed. rock	--	4
	Parking Garage		51	Alluvium	--	4
11.	Menlo Park VA (VA)	S3	54	Alluvium	--	4
12.	Fremont: Emerson Court (USGS)	2	56	Alluvium	--	4
15.	APEEL Stn 2: Redwood City (USGS)	4	63	Bay sediments /fill	--	4
29.	San Francisco: 600 Montgomery (USGS)	S49	97	Sediments over hard rock	--	6
30.	Emeryville: 6363 Christie Ave (USGS)	1	97	Bay sediment /fill	--	4
35.	San Francisco: Golden Gate Br. (USGS) Abutment/Toll Building	S2	100	Rock	--	4

Notes:
1. Station number is keyed to Figure 1.
2. Trigger time in minutes:sec after 00 hr, Oct. 18, 1989 (GMT).
3. Instrument Shelter code: 1, Small, fibreglass; 2, house garage floor; 3, small metal bldg on concrete slab; SN, N-story structure; 4, metal shelter on concrete slab; 5 small concrete block structure.

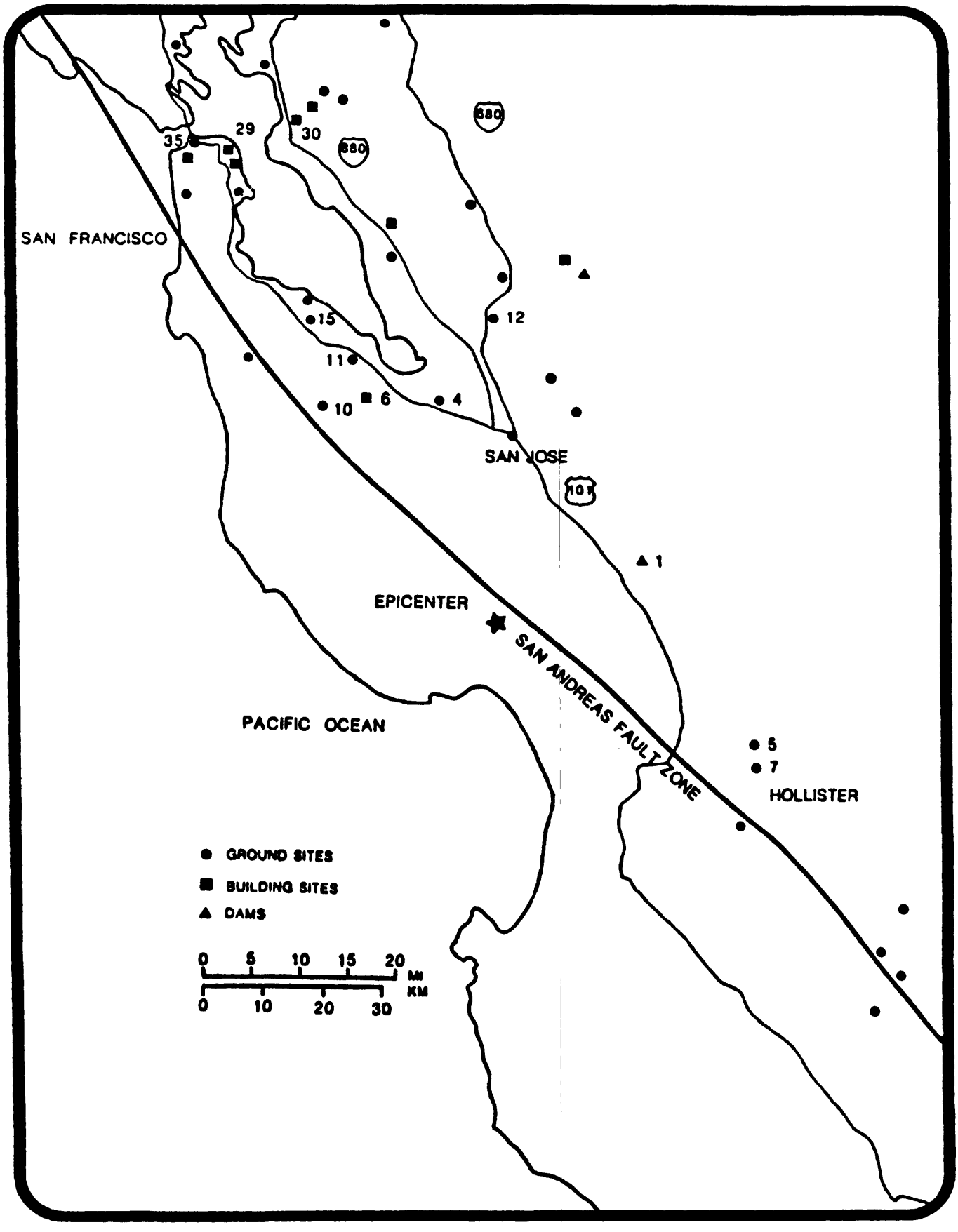
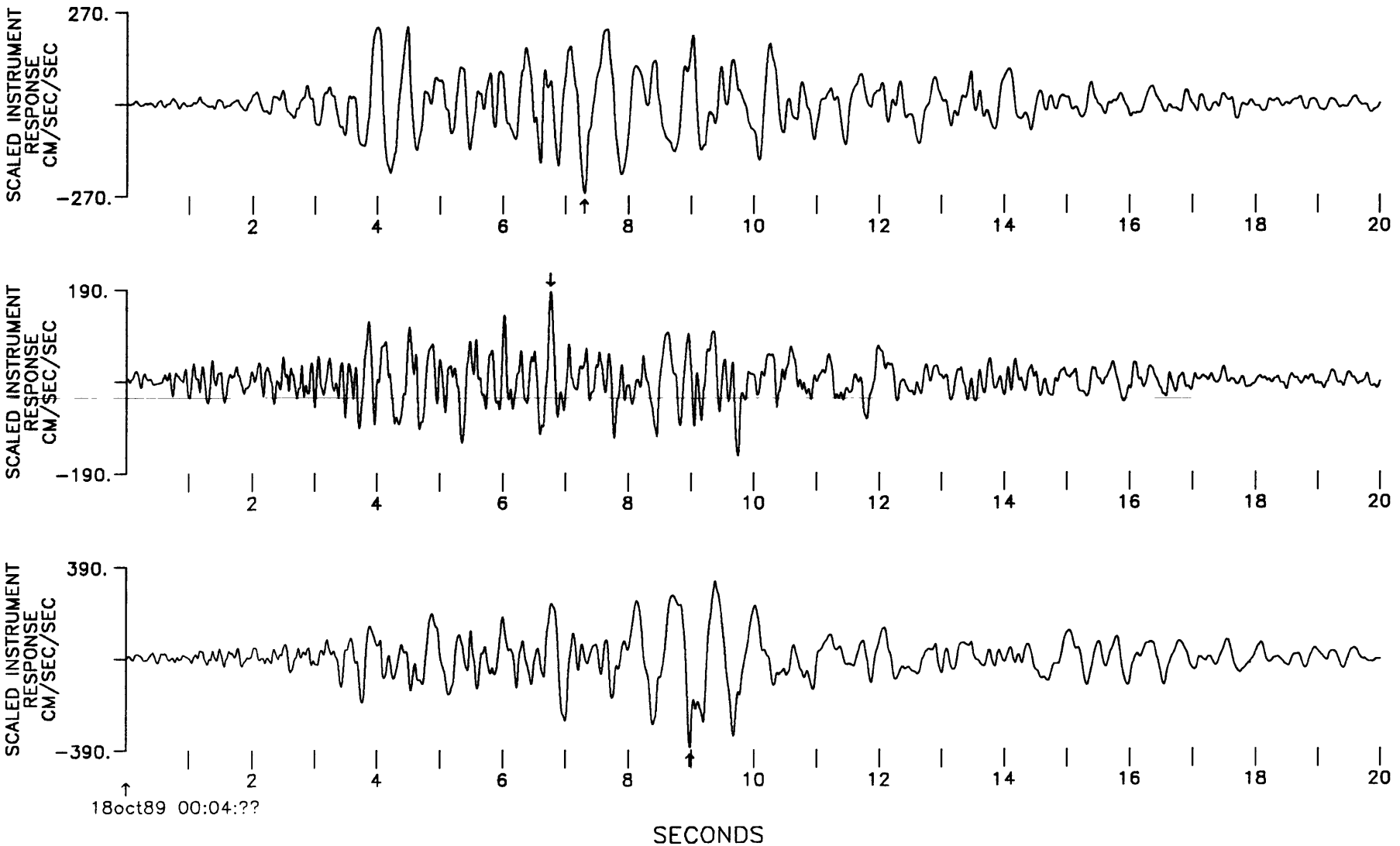


Figure 1. USGS Cooperative Network stations triggered during the October 18 mainshock (from Maley and others, 1989). 70-mm film records from the numbered stations, keyed to Table 1, are included in this report.

APPENDIX 1

UNCORRECTED ACCELEROGRAM

UNCORRECTED ACCELEROGRAM
ANDERSON DAM - CREST
340 DEGREES, UP, 250 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
PEAK VALUES (CM/SEC/SEC): -262.58, 184.53, -380.58



UNCORRECTED ACCELEROGRAM
ANDERSON DAM - CREST
340 DEGREES, UP, 250 DEGREES
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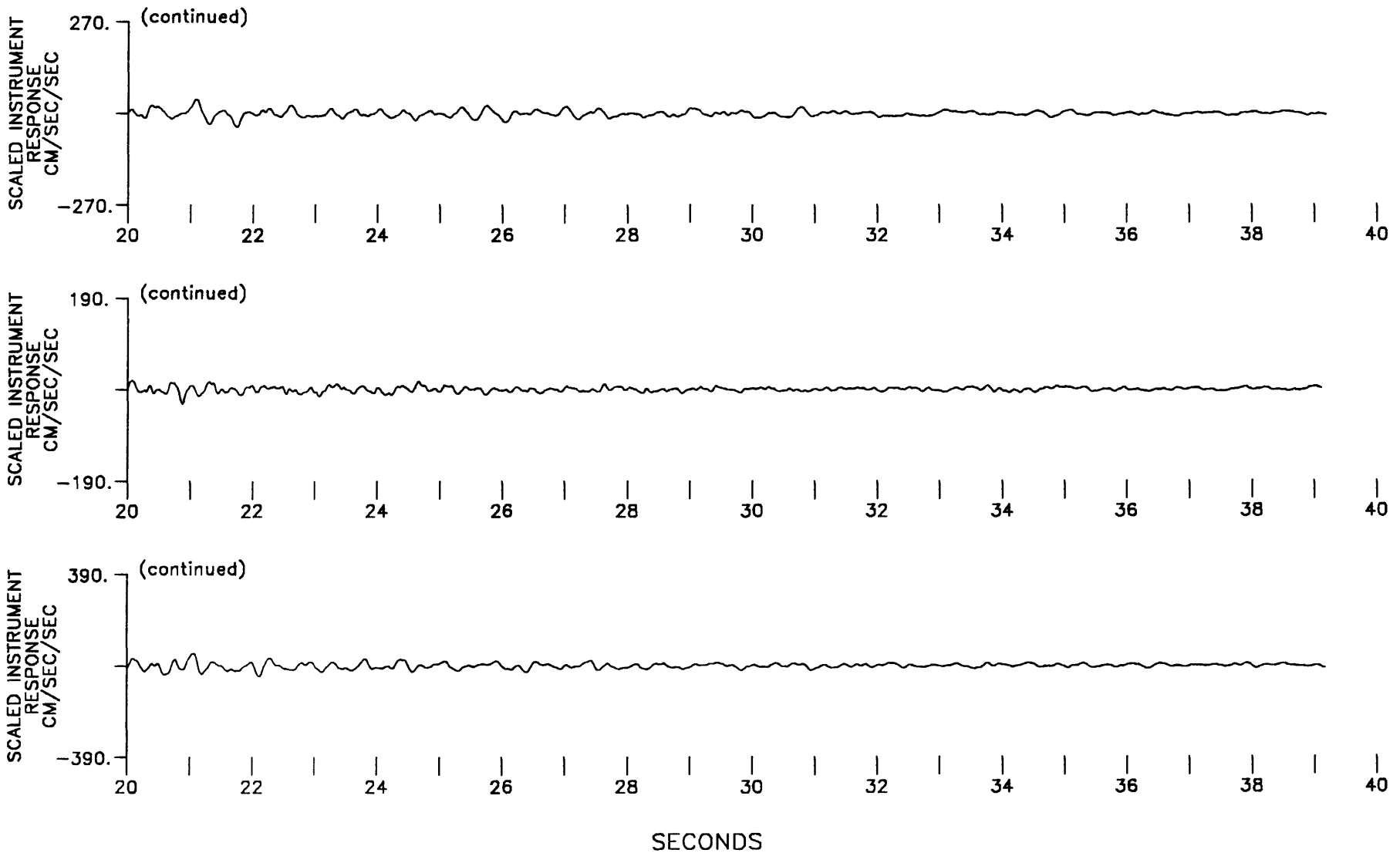
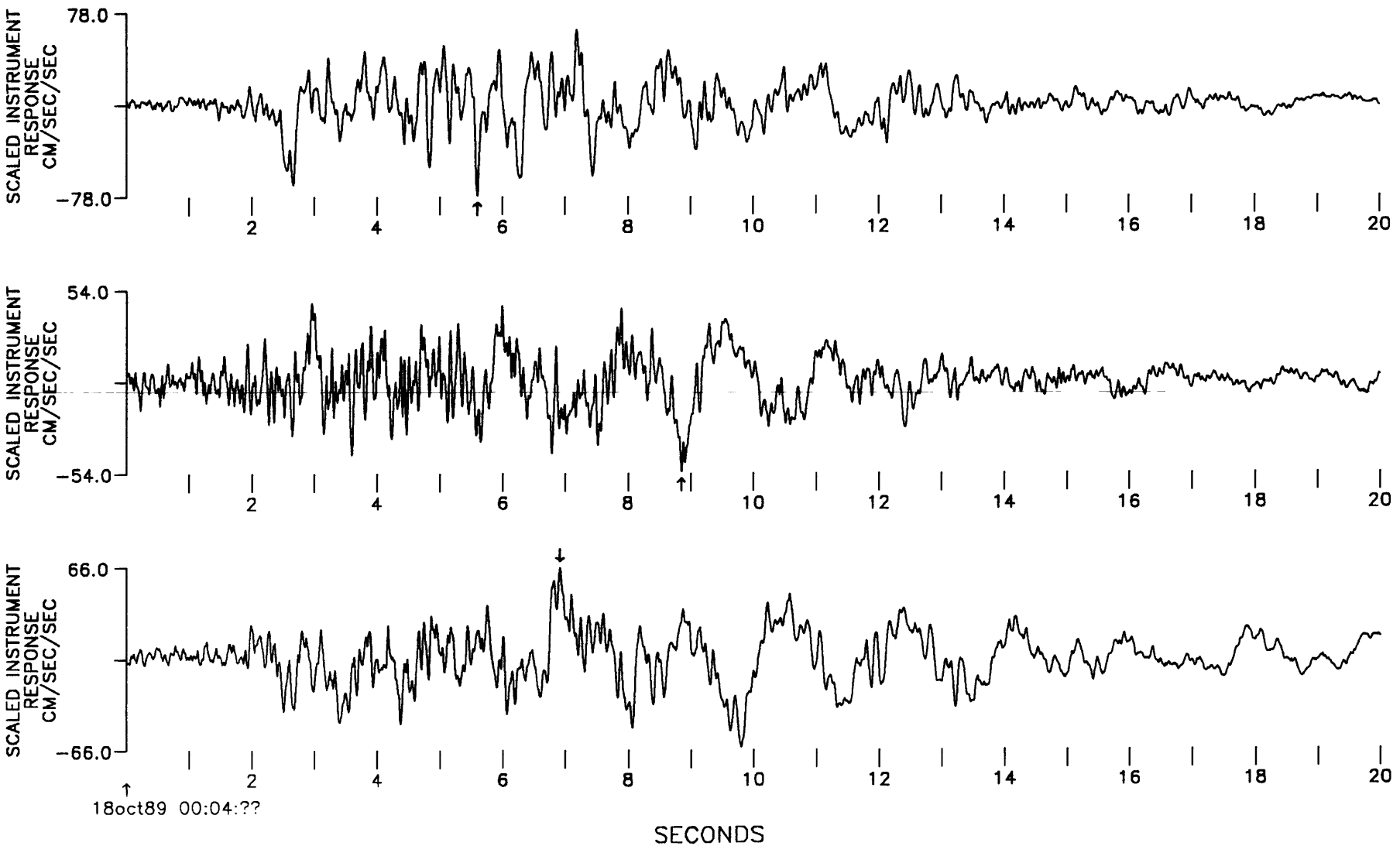


UNCORRECTED ACCELEROGRAM
ANDERSON DAM – LEFT ABUTMENT
340 DEGREES, UP, 250 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
PEAK VALUES (CM/SEC/SEC): −77.04, −53.36, 65.23



UNCORRECTED ACCELEROGRAM
ANDERSON DAM – LEFT ABUTMENT
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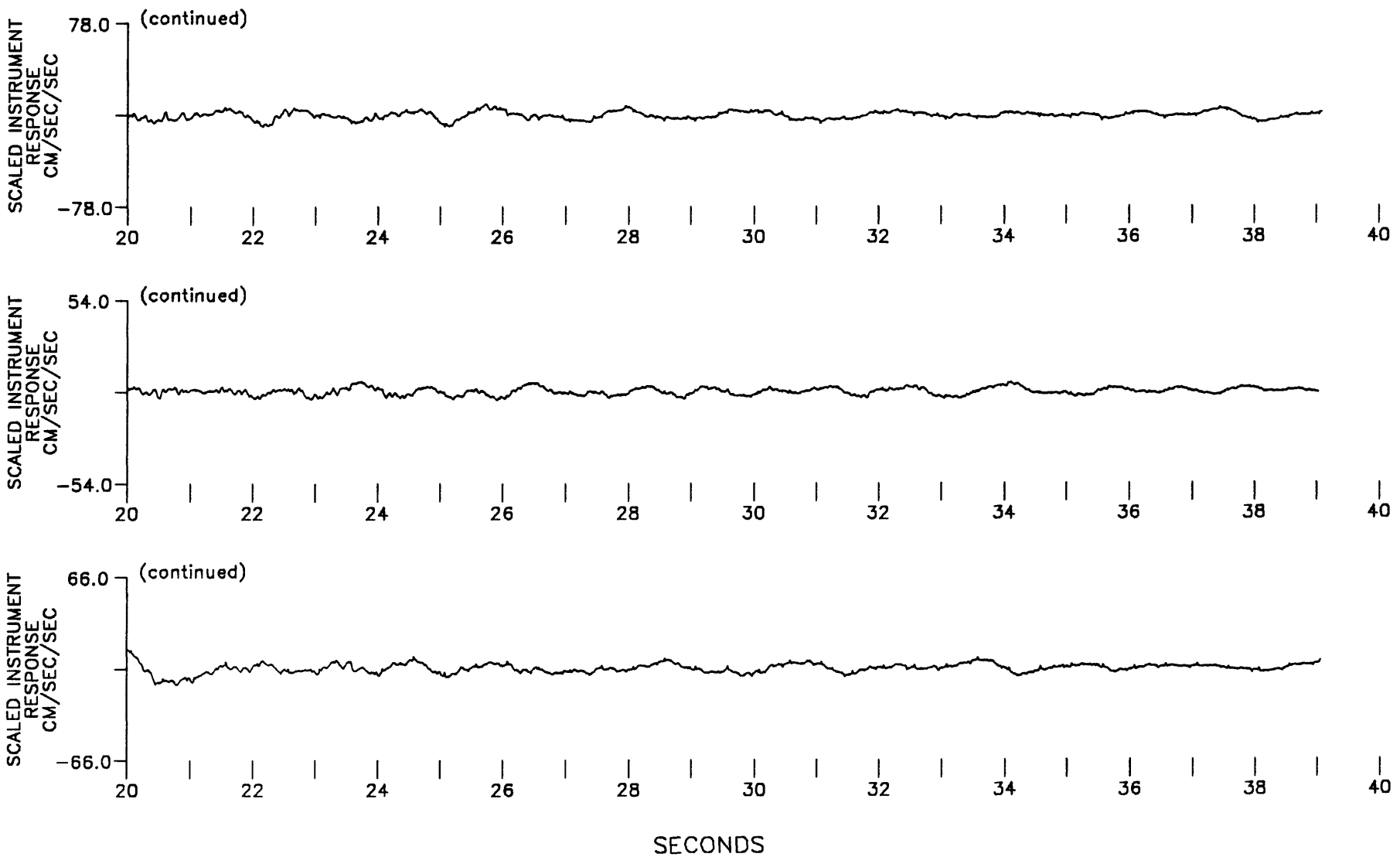
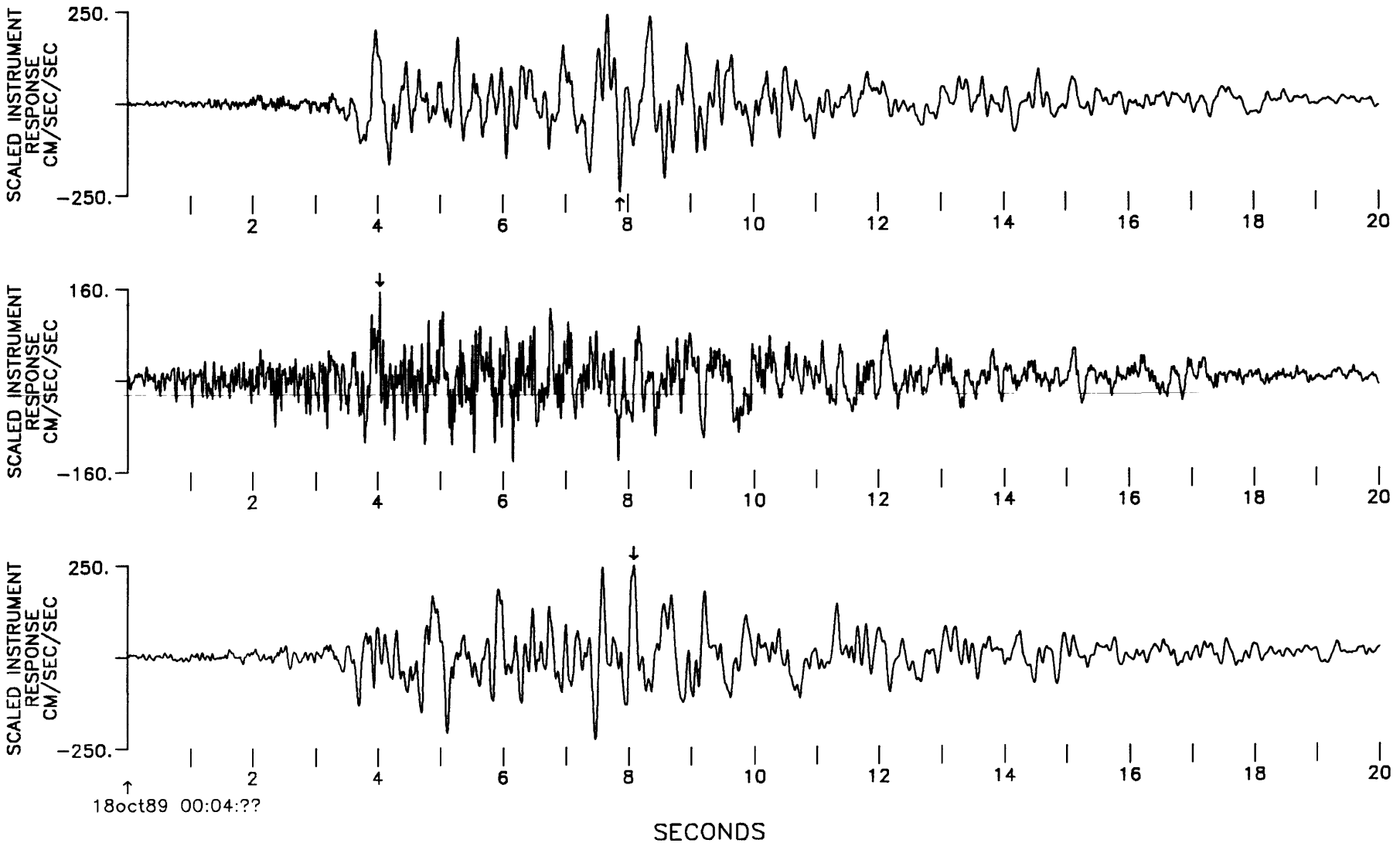
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
PEAK VALUES (CM/SEC/SEC): −77.04, −53.36, 65.23



UNCORRECTED ACCELEROGRAM
ANDERSON DAM - DOWNSTREAM
340 DEGREES, UP, 250 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
PEAK VALUES (CM/SEC/SEC): -243.00, 153.96, 245.86



UNCORRECTED ACCELEROGRAM
ANDERSON DAM - DOWNSTREAM
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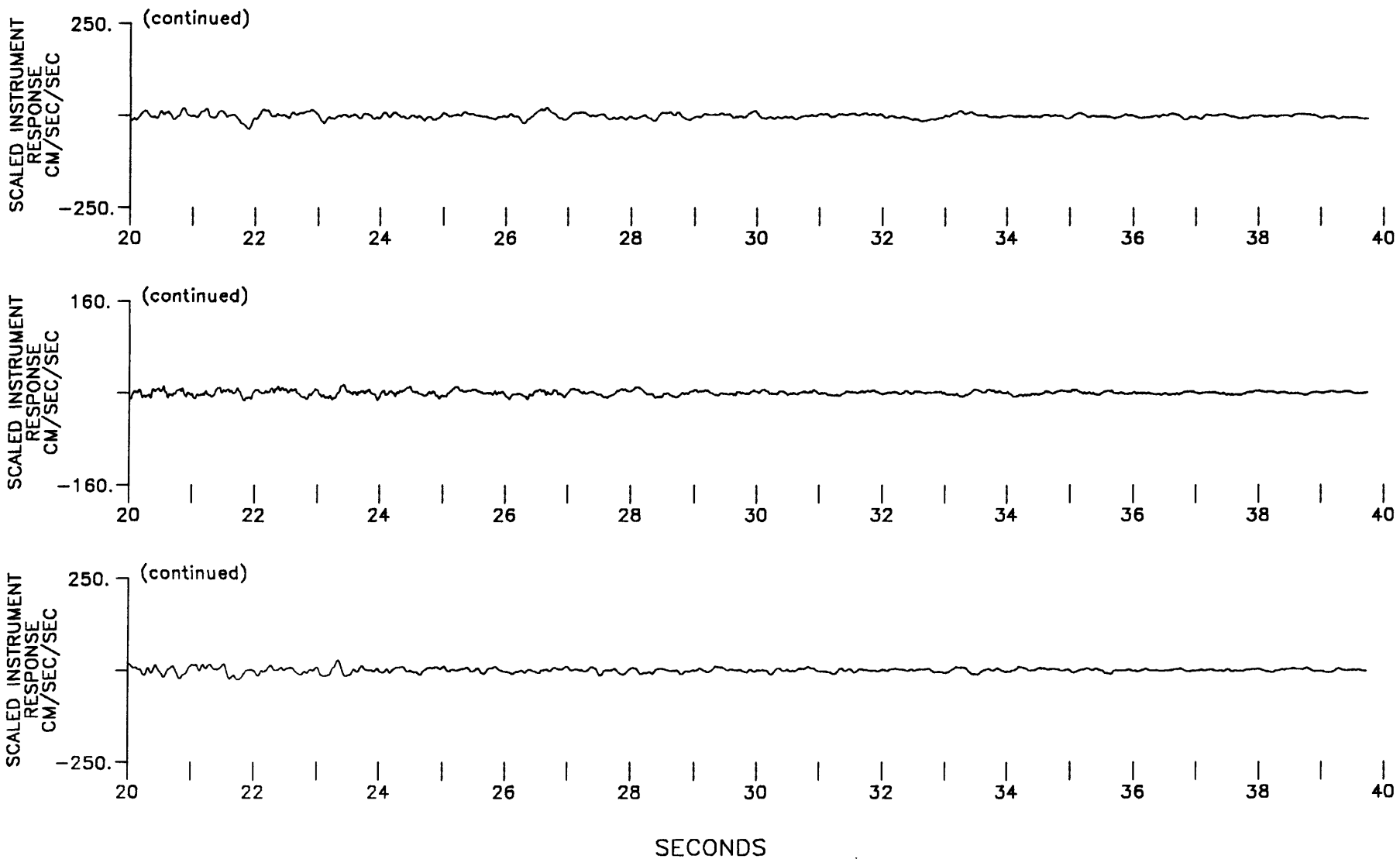
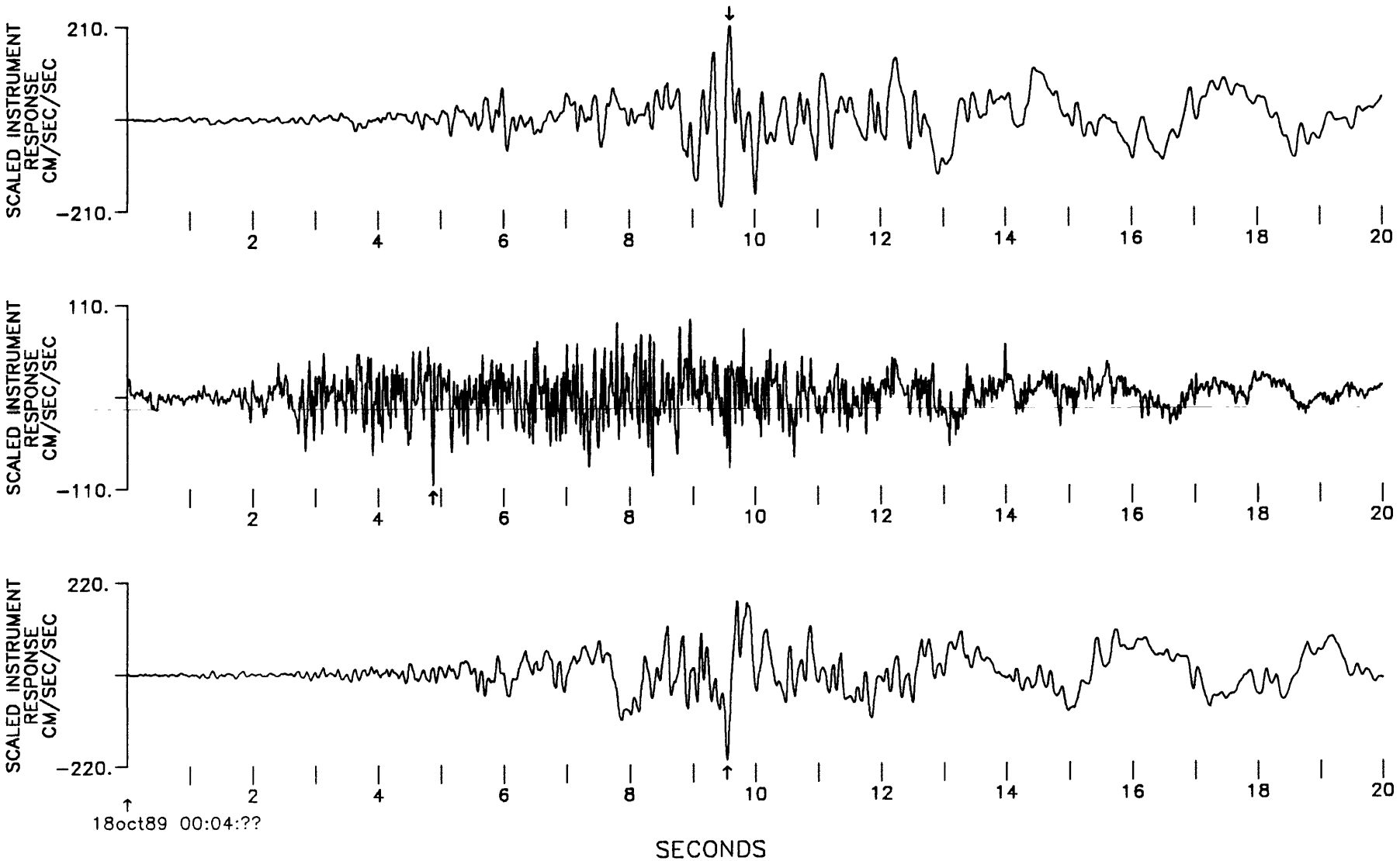
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
PEAK VALUES (CM/SEC/SEC): -243.00, 153.96, 245.86



UNCORRECTED ACCELEROGRAM
SUNNYVALE - COLTON AVENUE
360 DEGREES, UP, 270 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
PEAK VALUES (CM/SEC/SEC): 208.65, -106.89, -210.58



UNCORRECTED ACCELEROGRAM
SUNNYVALE - COLTON AVENUE
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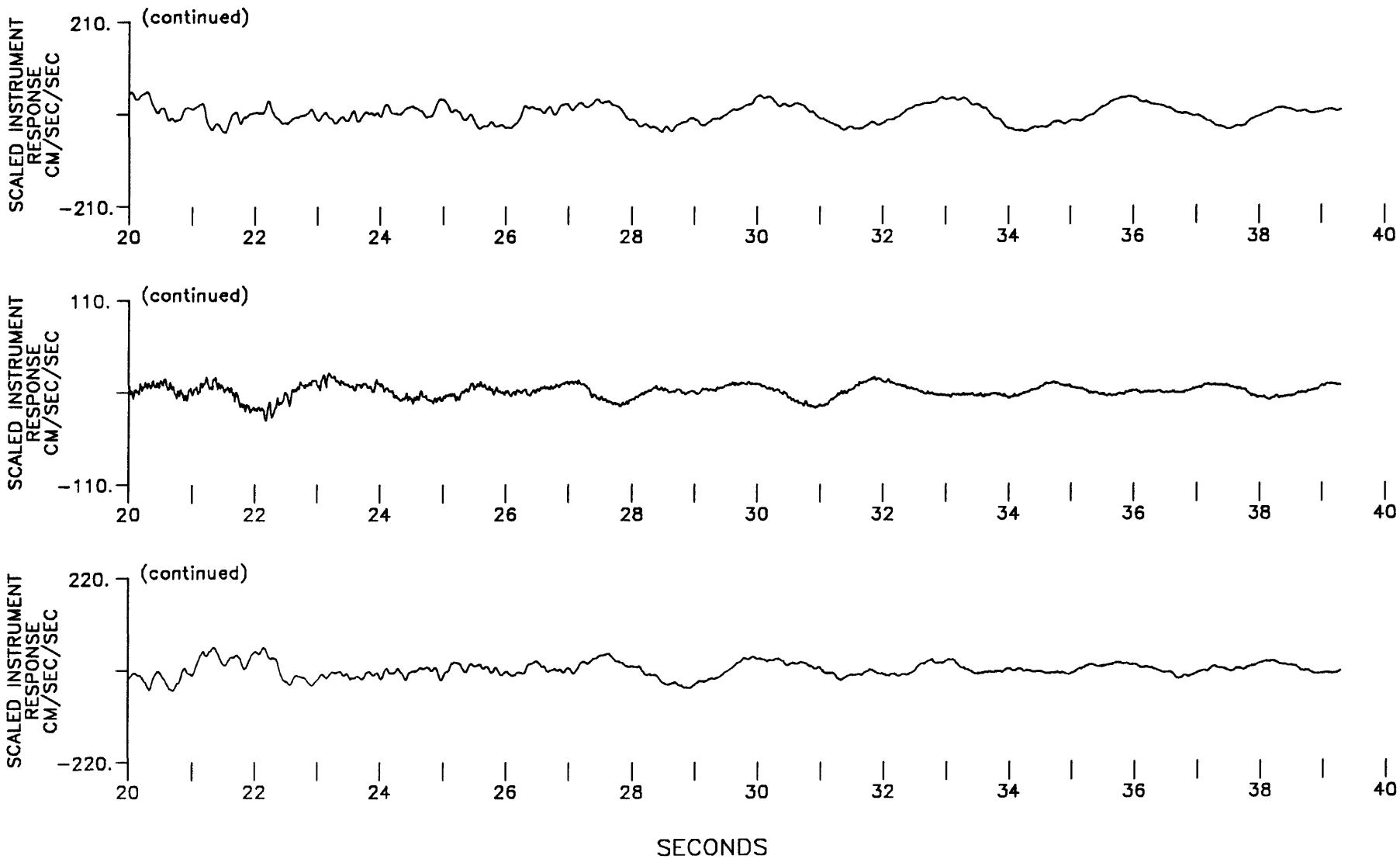
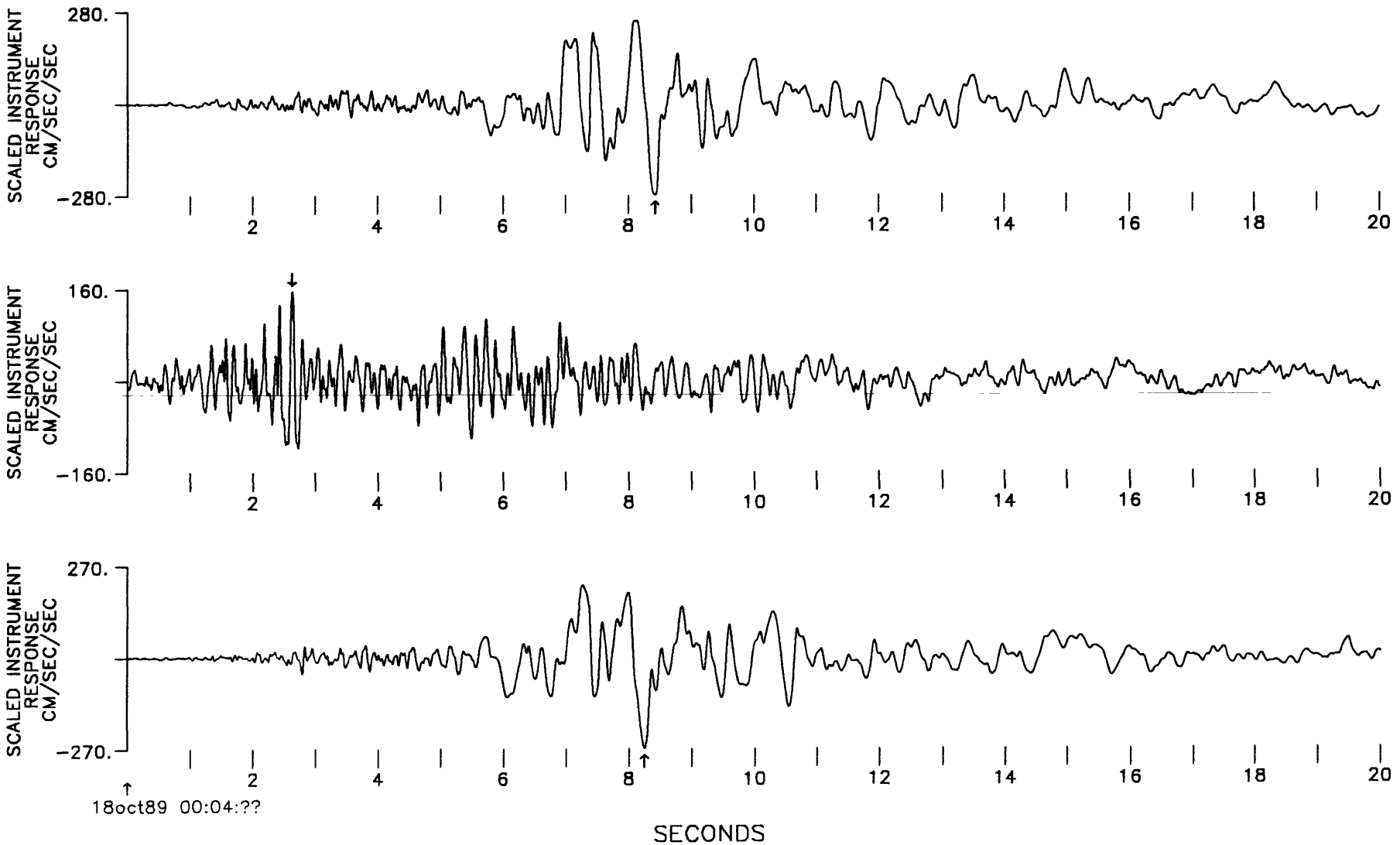


UNCORRECTED ACCELEROGRAM
HOLLISTER AIRPORT (DIFFERENTIAL ARRAY)
255 DEGREES, UP, 165 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
PEAK VALUES (CM/SEC/SEC): −278.36, 156.31, −269.12



UNCORRECTED ACCELEROGRAM
HOLLISTER AIRPORT (DIFFERENTIAL ARRAY)
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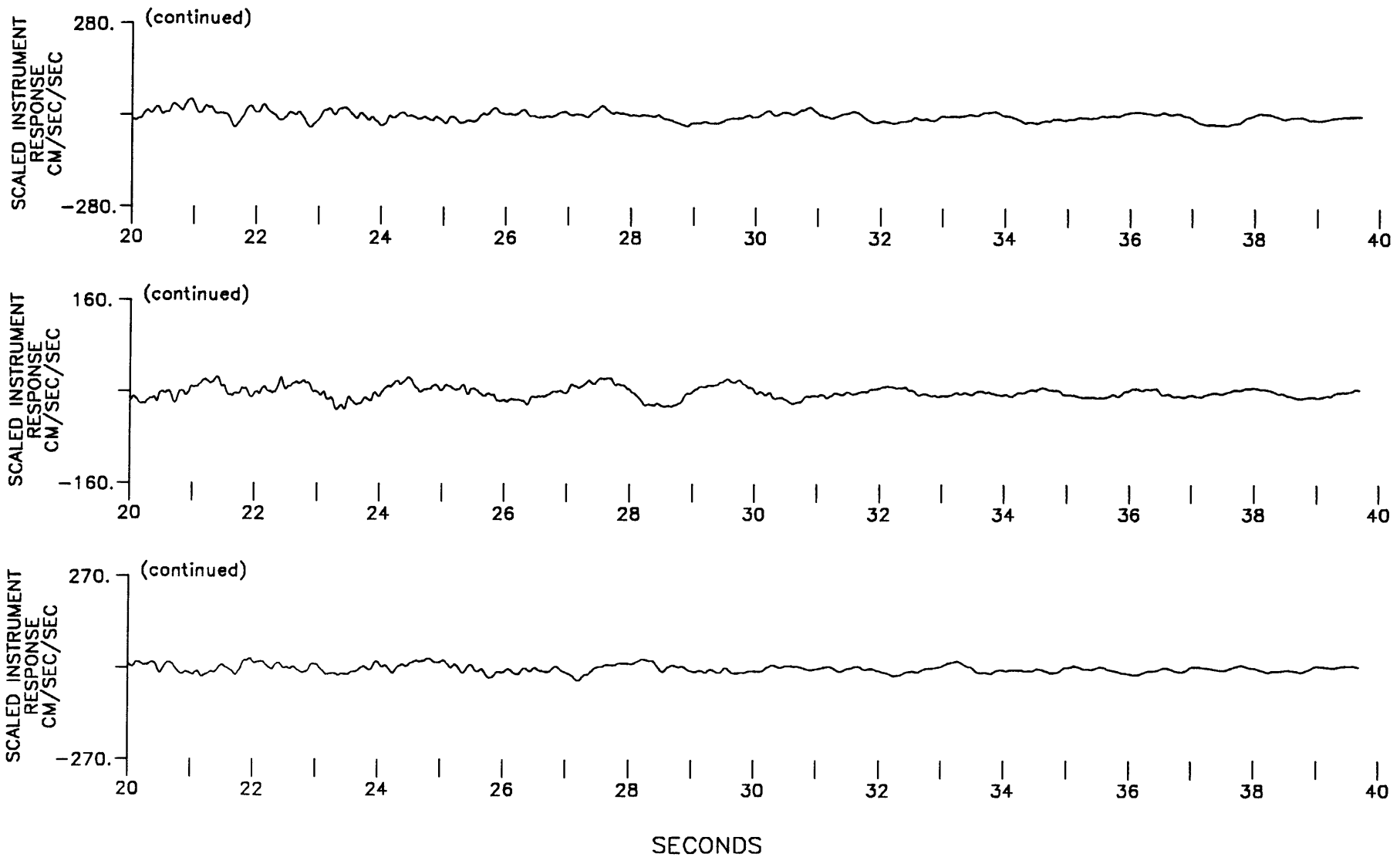
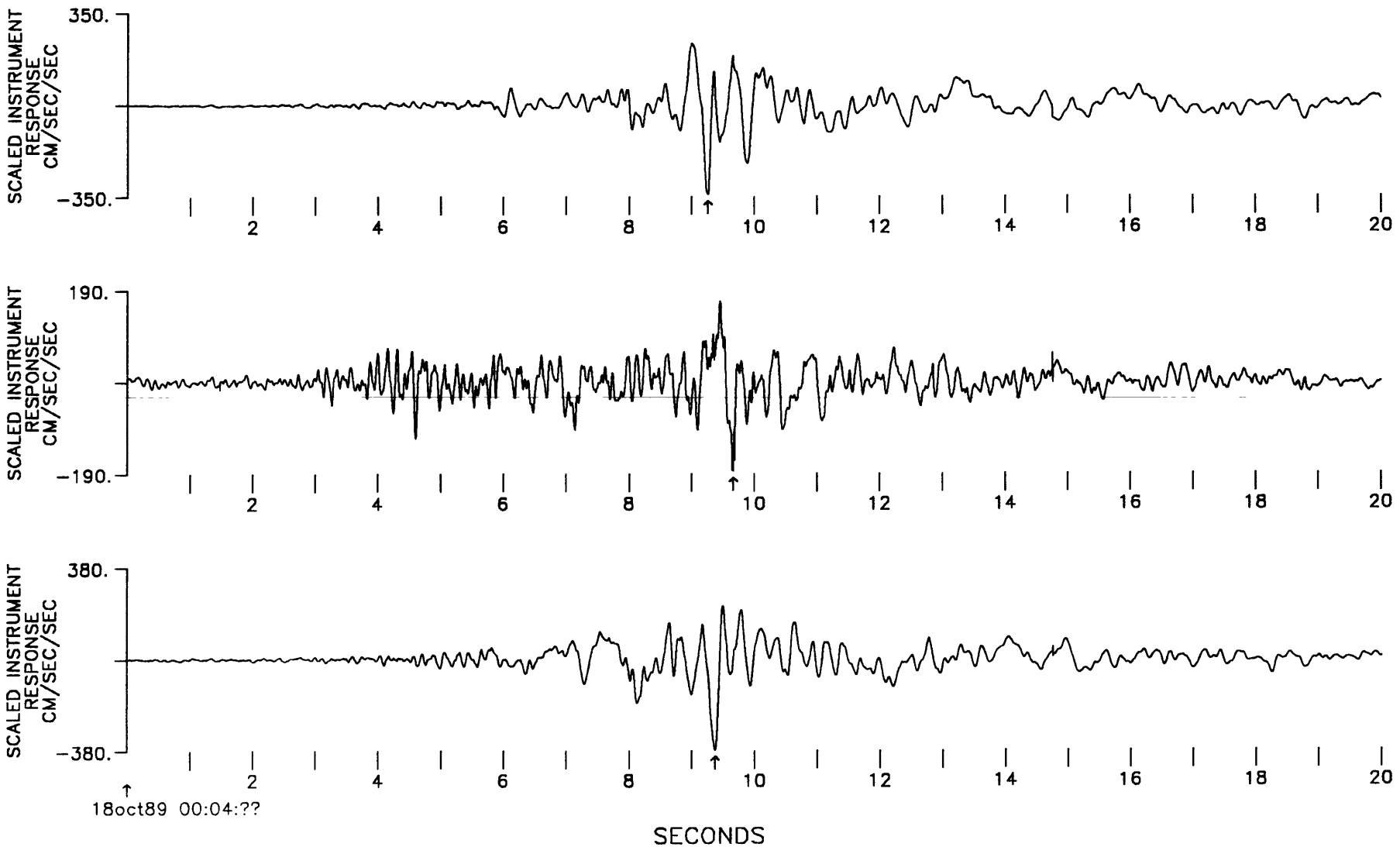


UNCORRECTED ACCELEROGRAM
PALO ALTO VA HOSPITAL - BLDG 1, BASEMENT
302 DEGREES, UP, 212 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
PEAK VALUES (CM/SEC/SEC): -341.47, -185.71, -378.12



UNCORRECTED ACCELEROGRAM
PALO ALTO VA HOSPITAL - BLDG 1, BASEMENT
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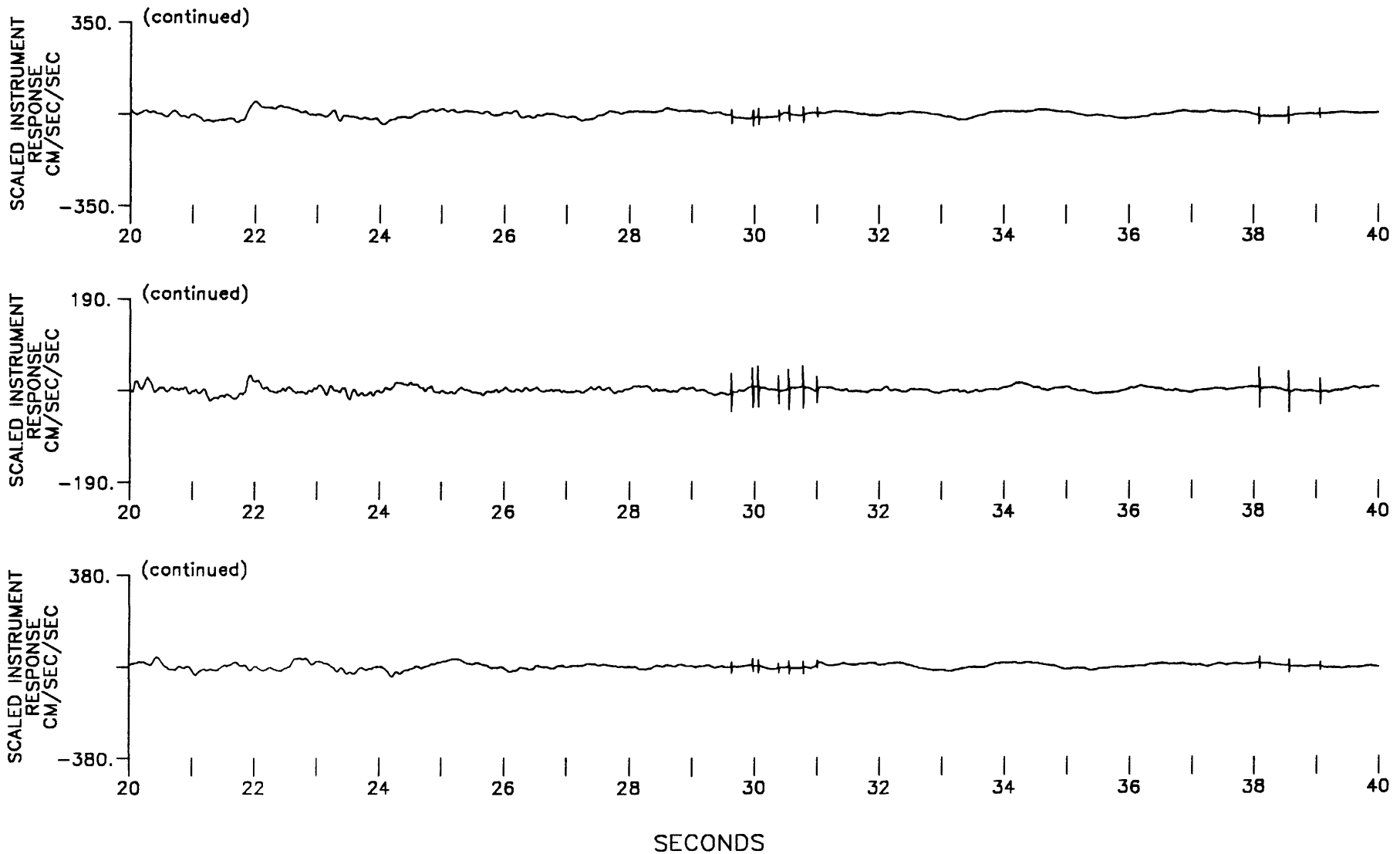

UNCORRECTED ACCELEROGRAM
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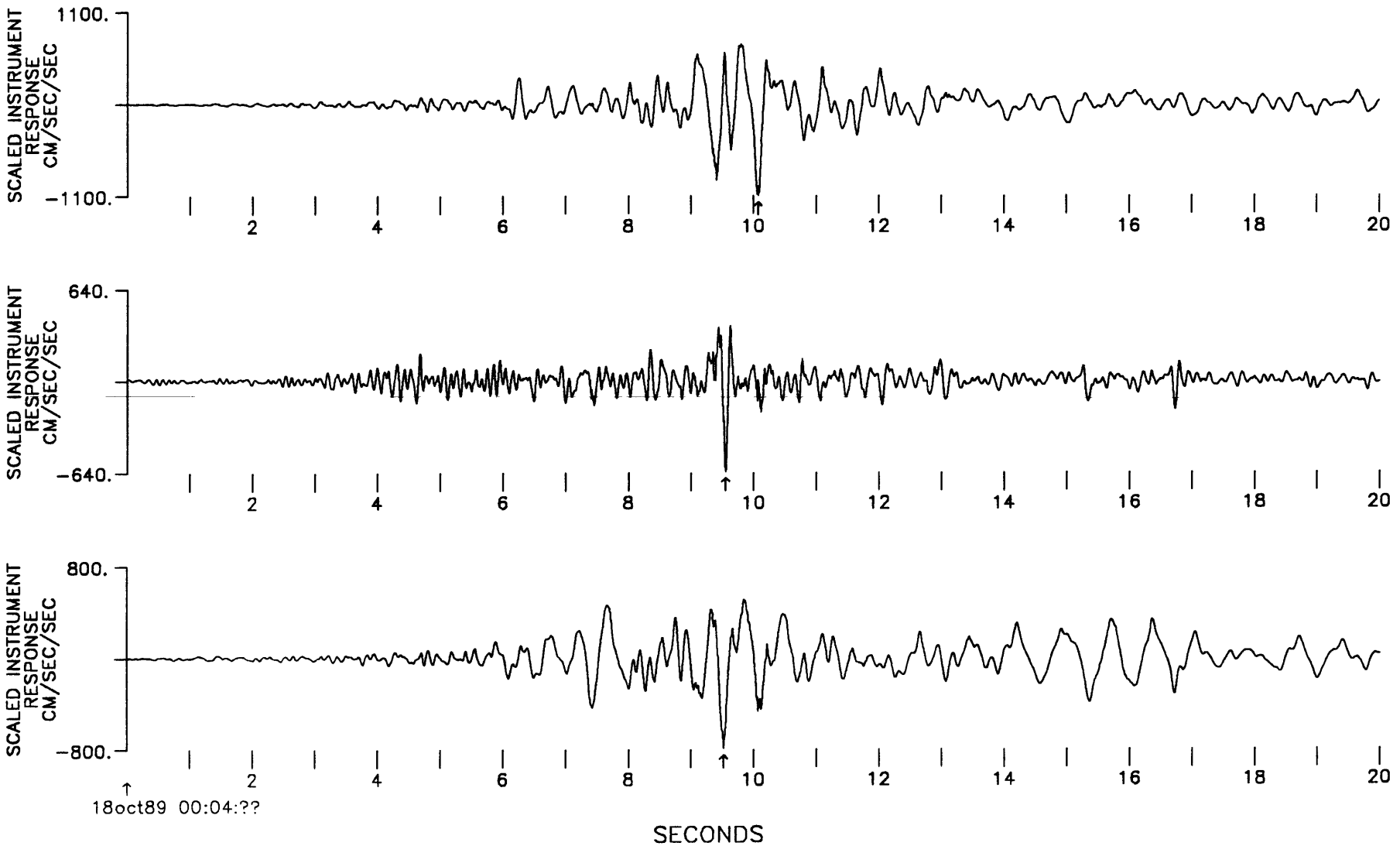
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
PEAK VALUES (CM/SEC/SEC): -1097.45, -634.22, -793.70



UNCORRECTED ACCELEROGRAM
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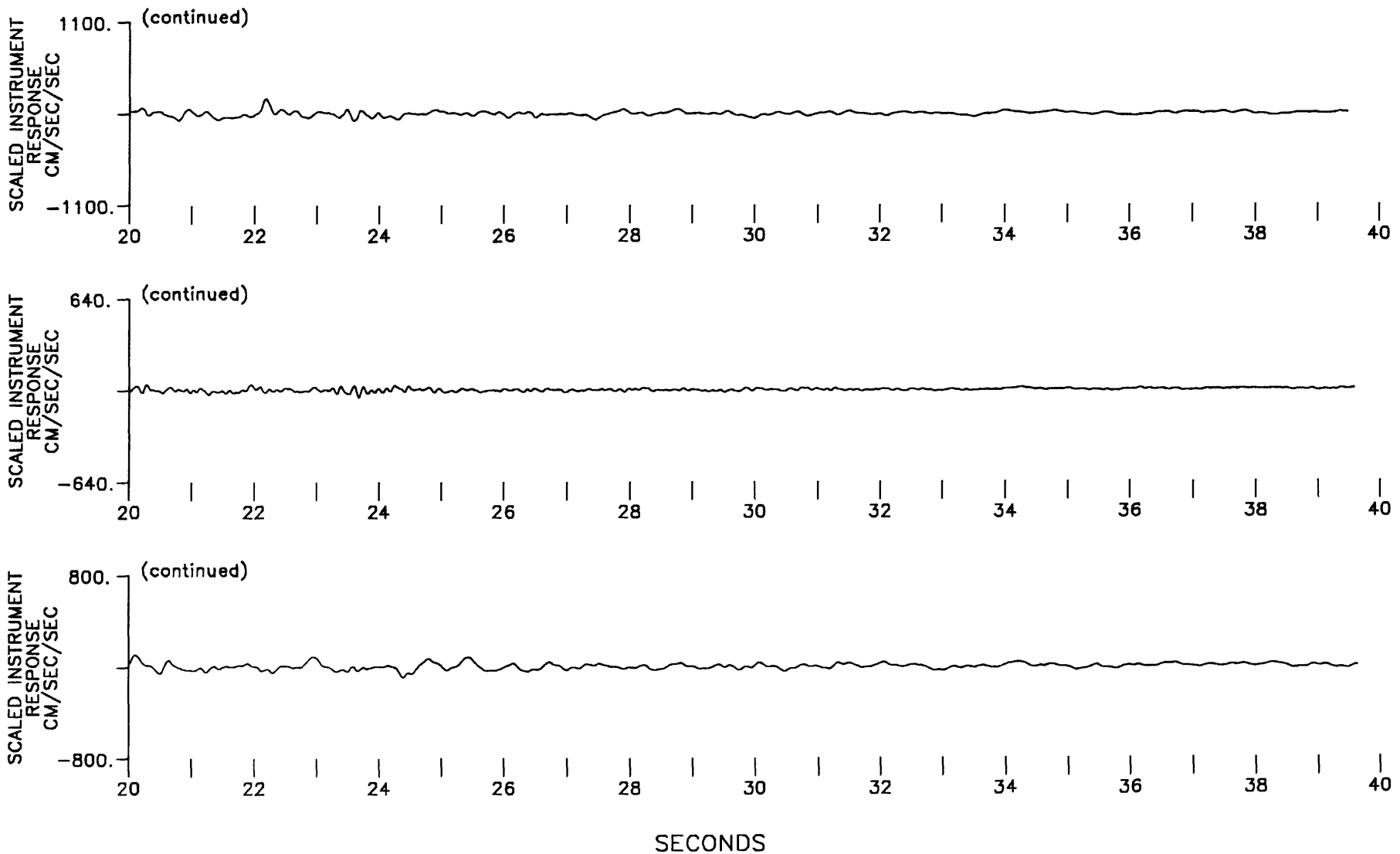
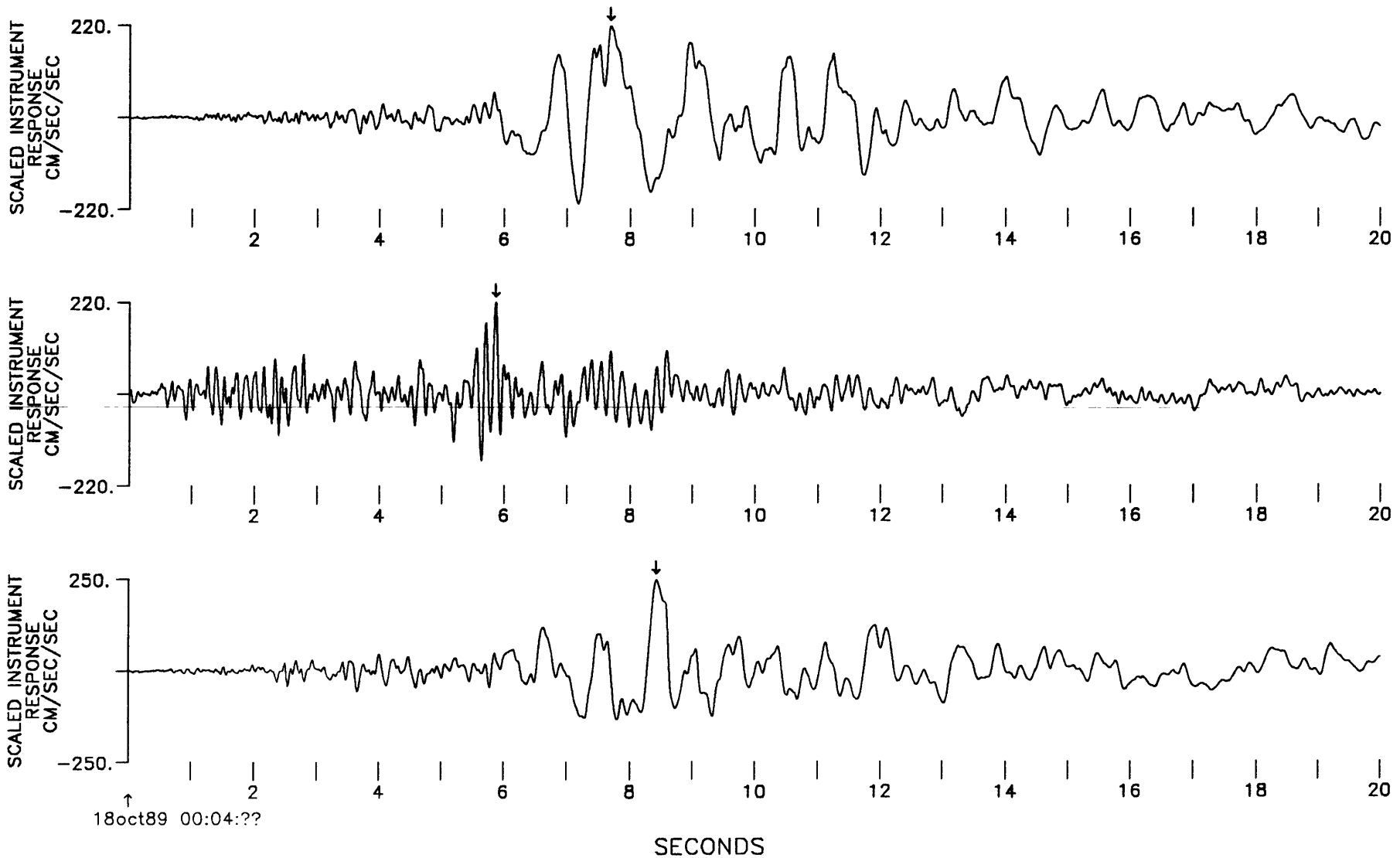
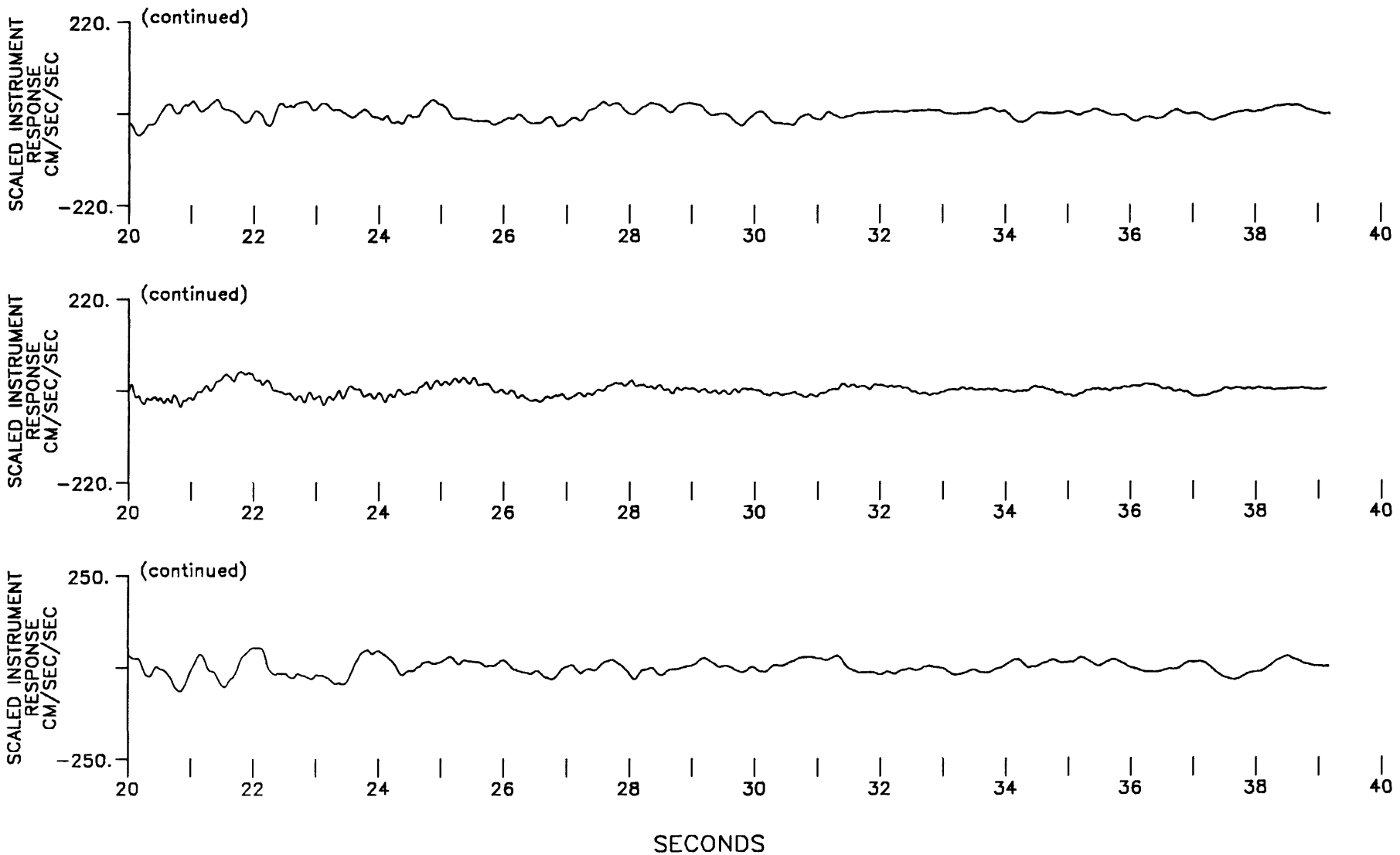


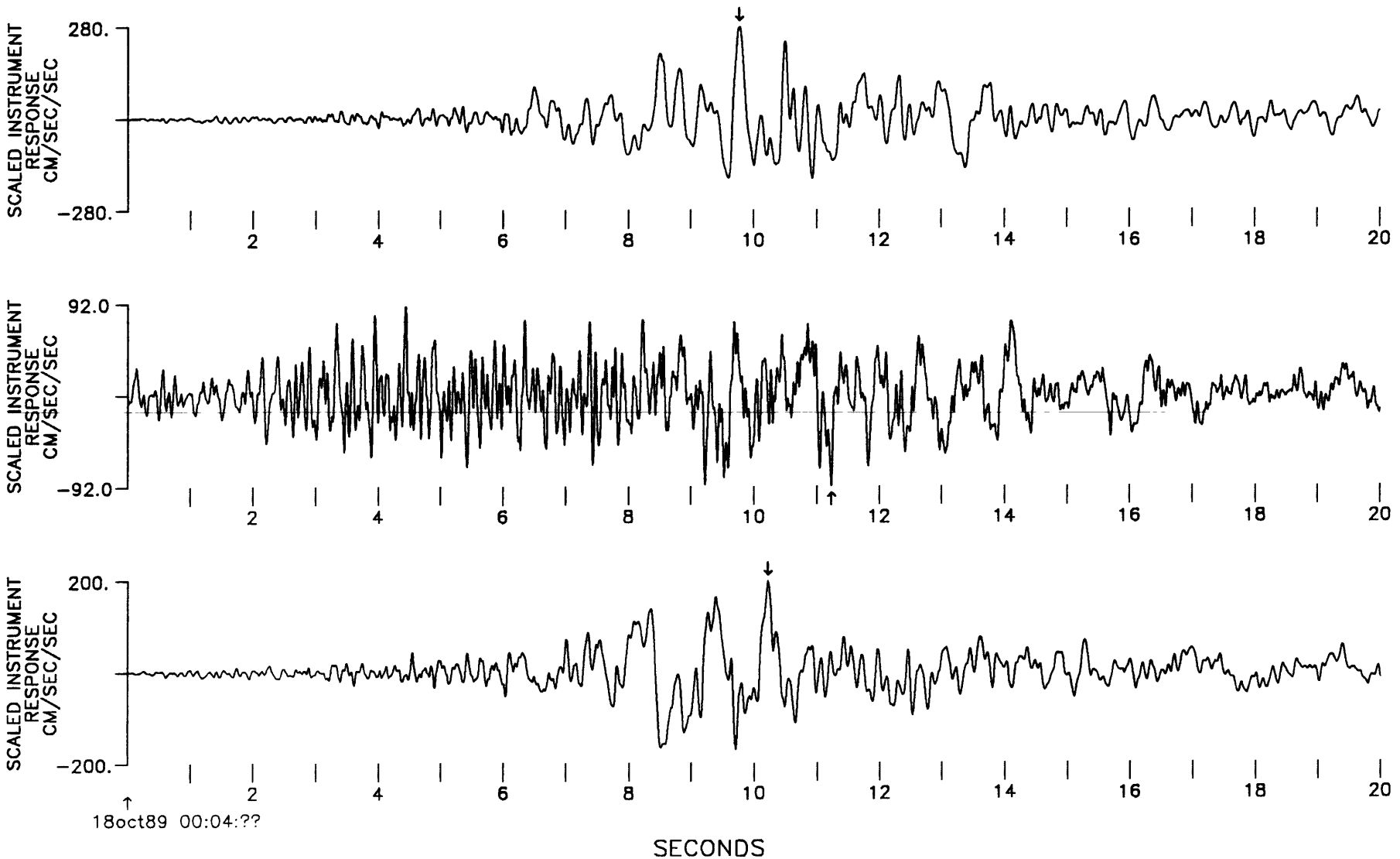
UNCORRECTED ACCELEROGRAM
HOLLISTER CITY HALL ANNEX - BASEMENT
180 DEGREES, UP, 090 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
PEAK VALUES (CM/SEC/SEC): 218.44, 219.51, 246.58



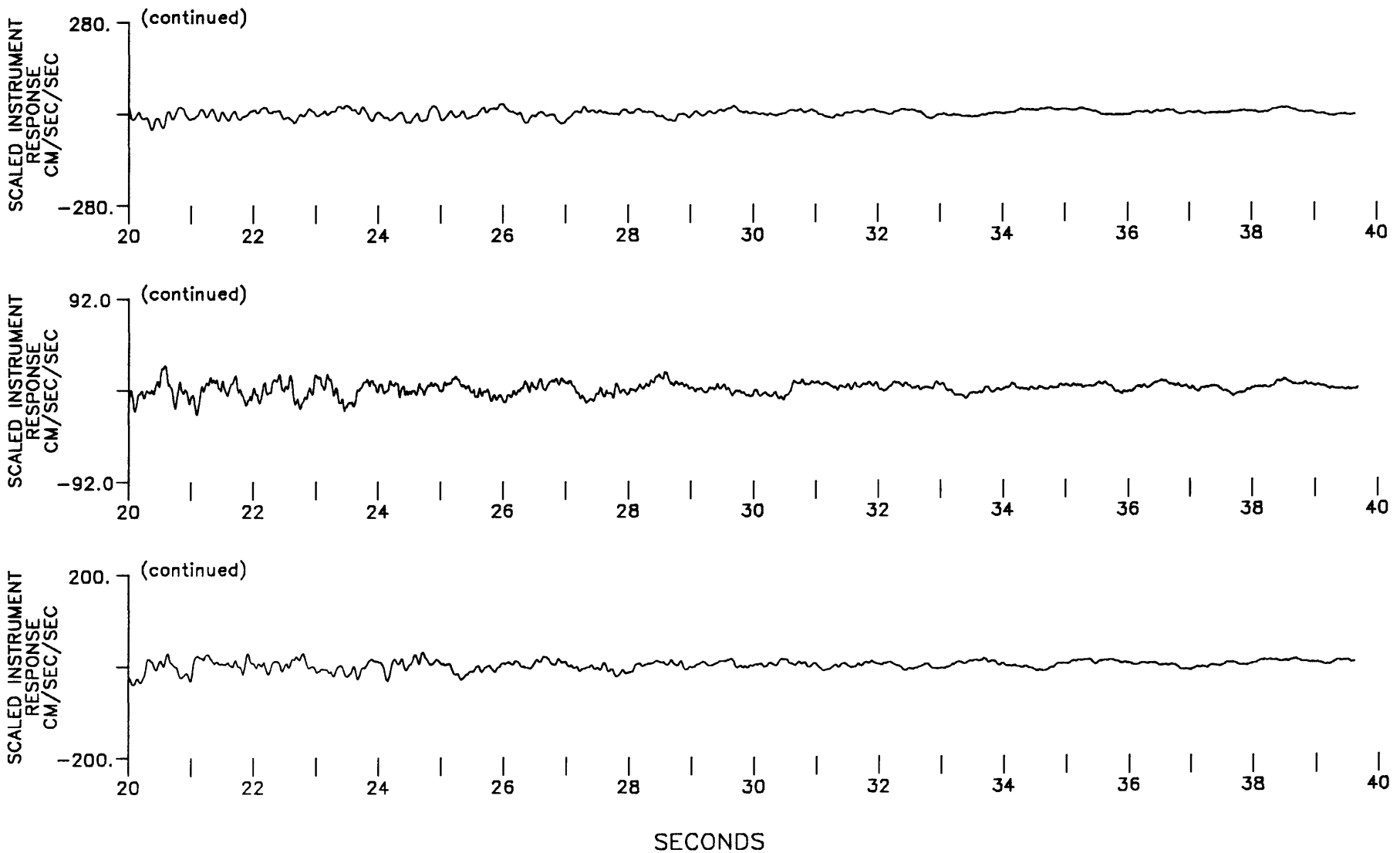
UNCORRECTED ACCELEROGRAM
HOLLISTER CITY HALL ANNEX - BASEMENT
180 DEGREES, UP, 090 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
PEAK VALUES (CM/SEC/SEC): 218.44, 219.51, 246.58



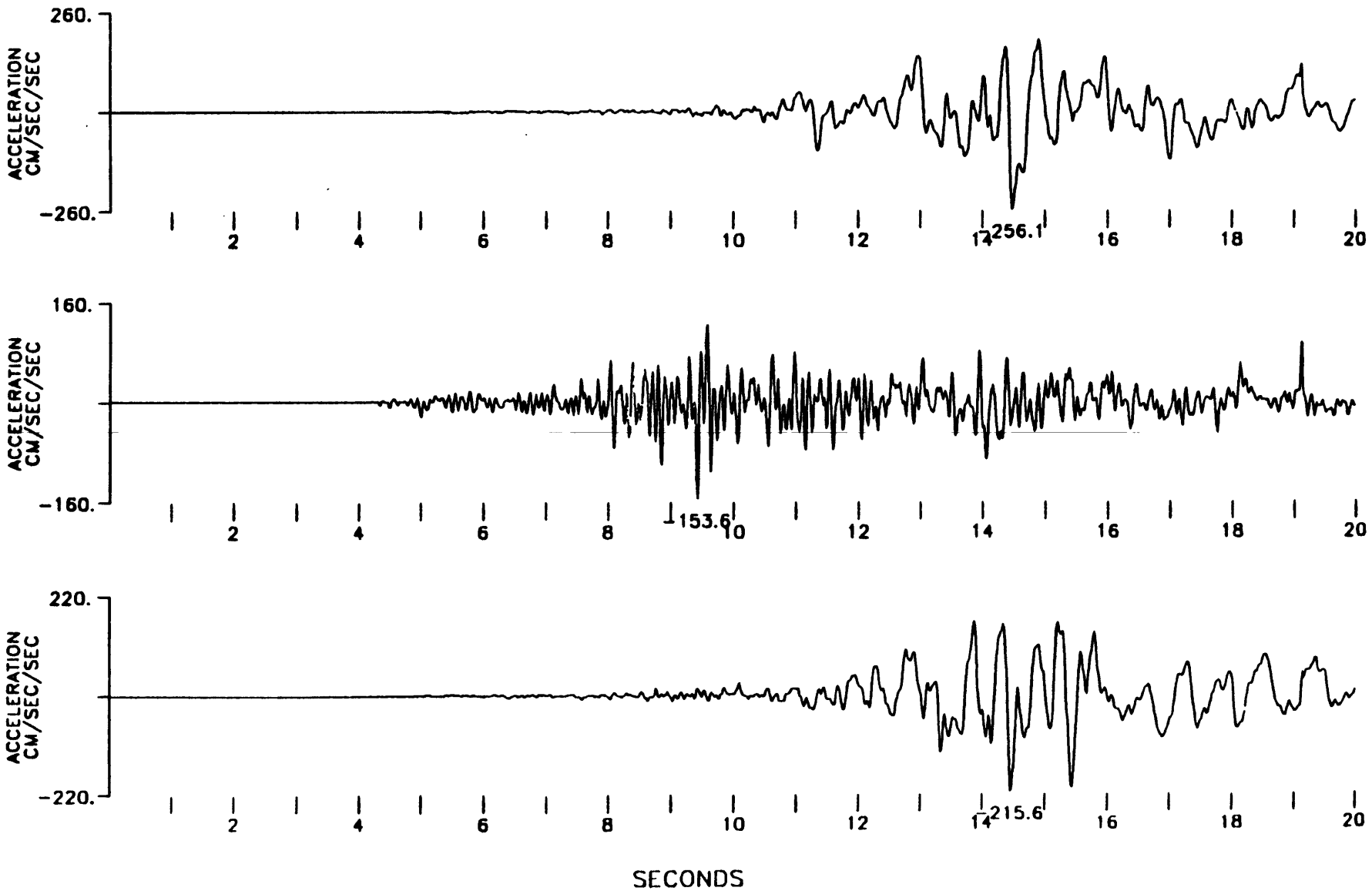
UNCORRECTED ACCELEROGRAM
STANFORD UNIVERSITY - SLAC TEST LAB
360 DEGREES, UP, 270 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
PEAK VALUES (CM/SEC/SEC): 278.84, -91.92, 197.28



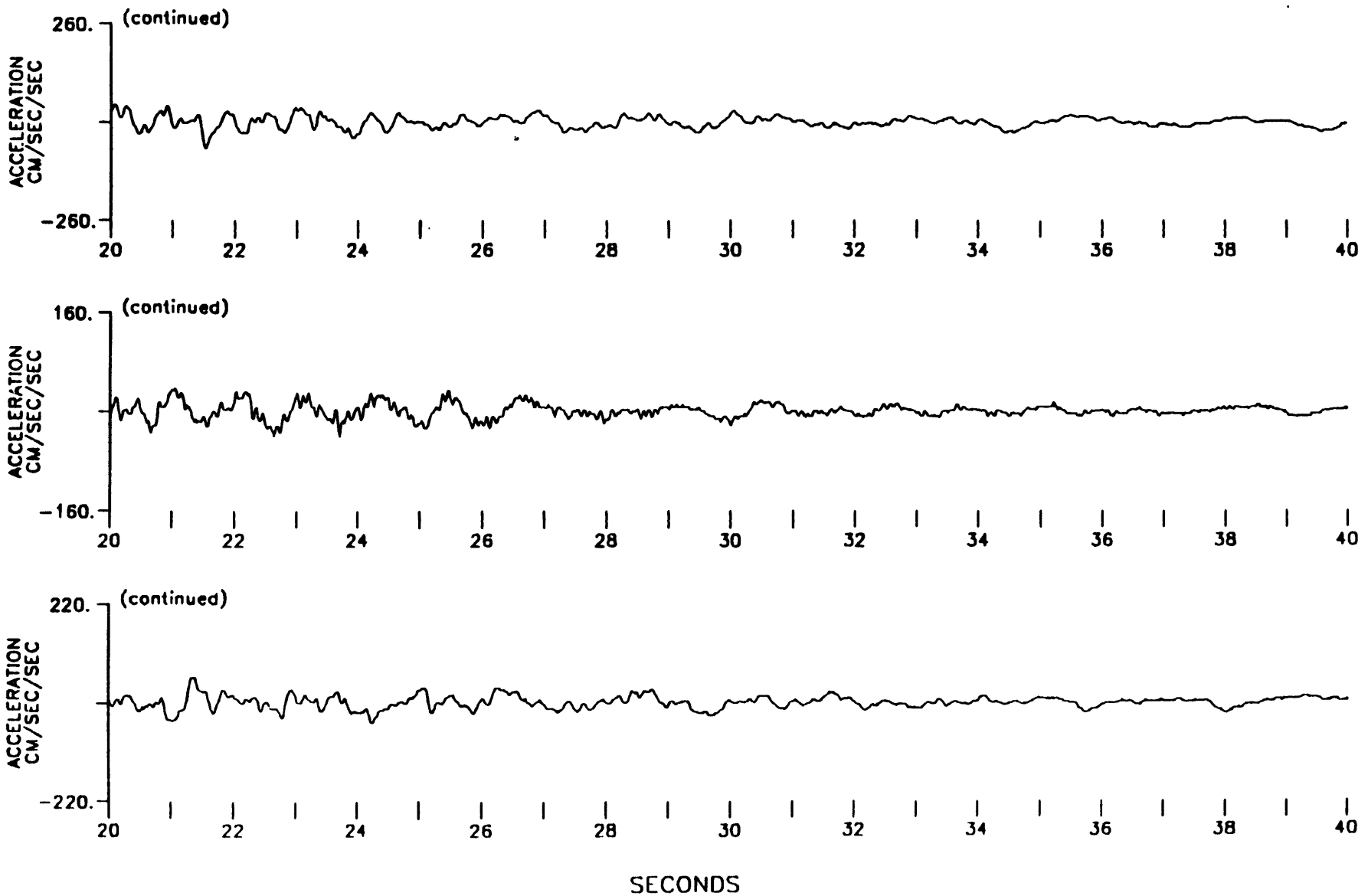
UNCORRECTED ACCELEROGRAM
STANFORD UNIVERSITY - SLAC TEST LAB
360 DEGREES, UP, 270 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
PEAK VALUES (CM/SEC/SEC): 278.84, -91.92, 197.28



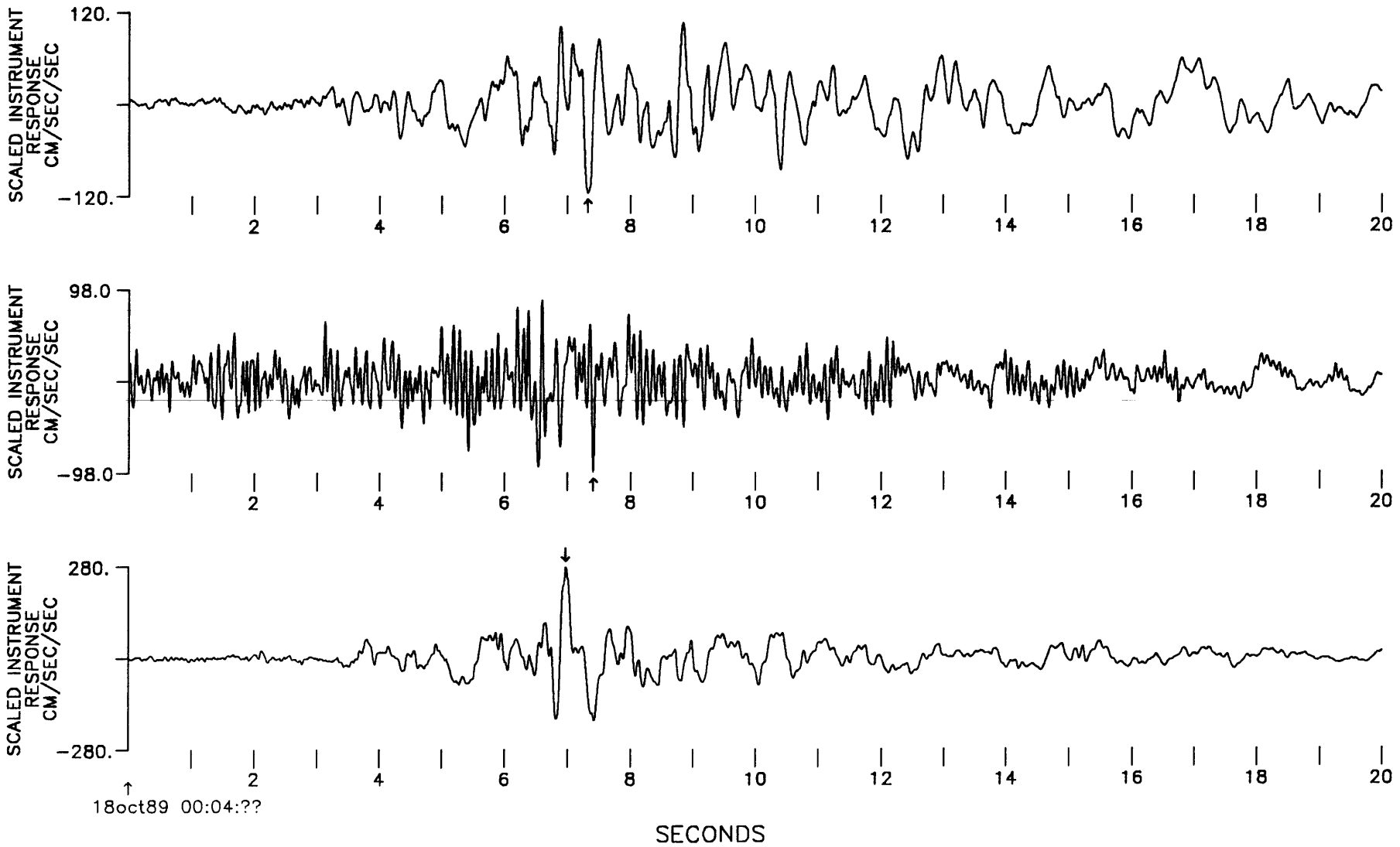
UNCORRECTED ACCELEROGRAM
STANFORD PARKING GARAGE, GRND LEVEL
360 DEGREES, UP, 90 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
PEAK VALUES (CM/SEC/SEC): -256.1, -153.6, -215.6



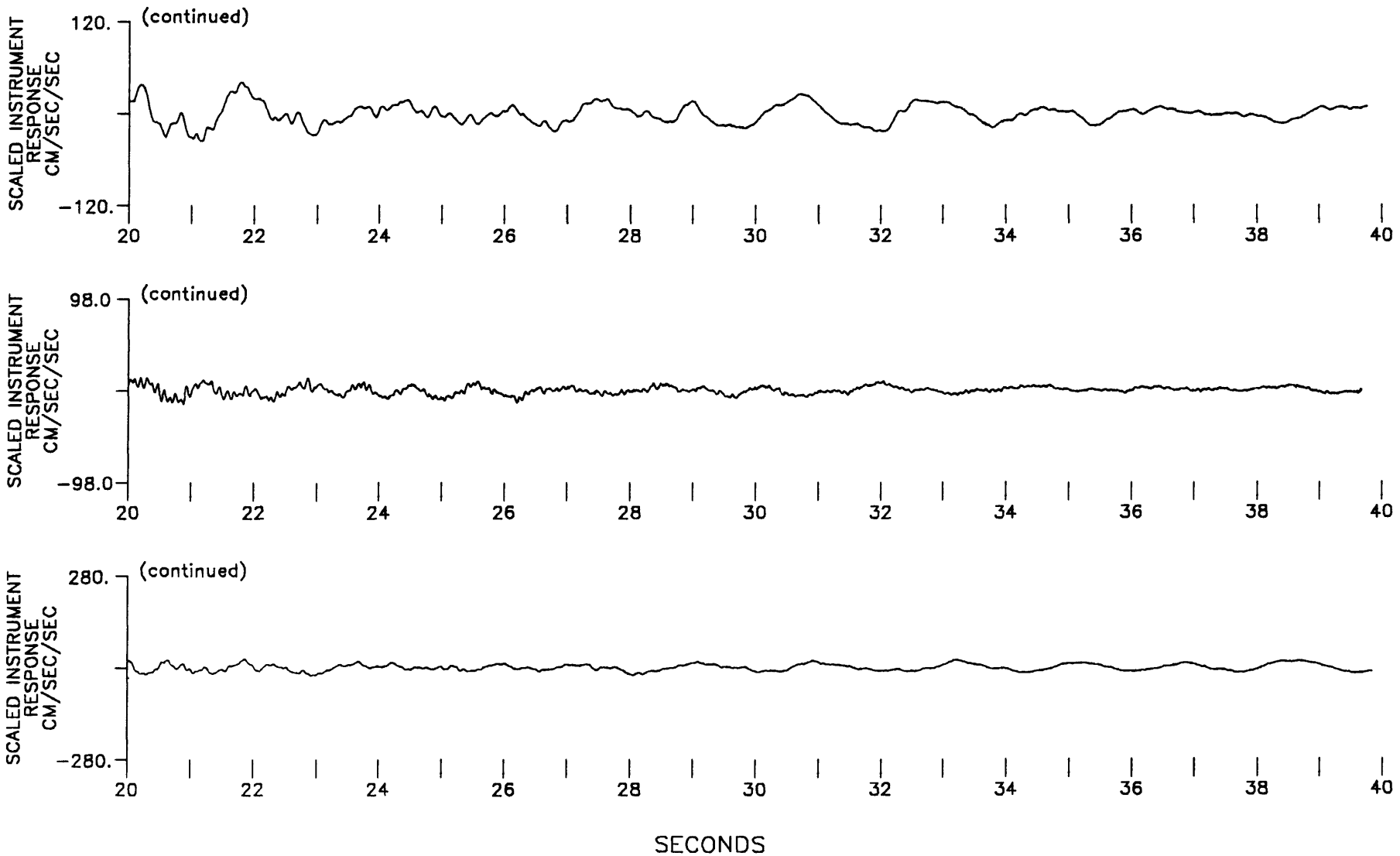
UNCORRECTED ACCELEROGRAM
STANFORD PARKING GARAGE, GRND LEVEL
360 DEGREES, UP, 90 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
PEAK VALUES (CM/SEC/SEC): -256.1, -153.6, -215.6



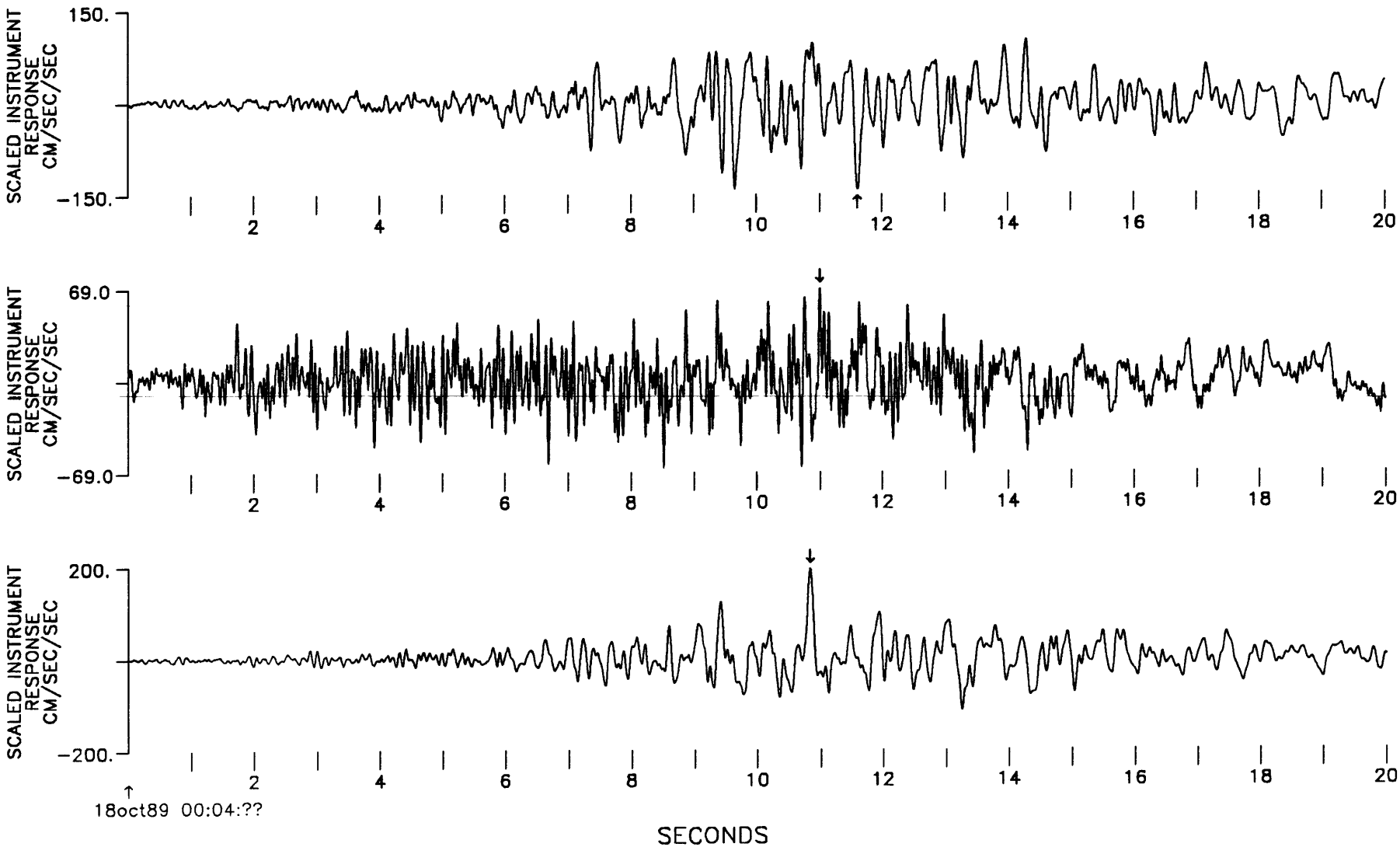
UNCORRECTED ACCELEROGRAM
MENLO PARK VA HOSPITAL – BLDG 137
110 DEGREES, UP, 20 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
PEAK VALUES (CM/SEC/SEC): −116.16, −97.48, 276.46



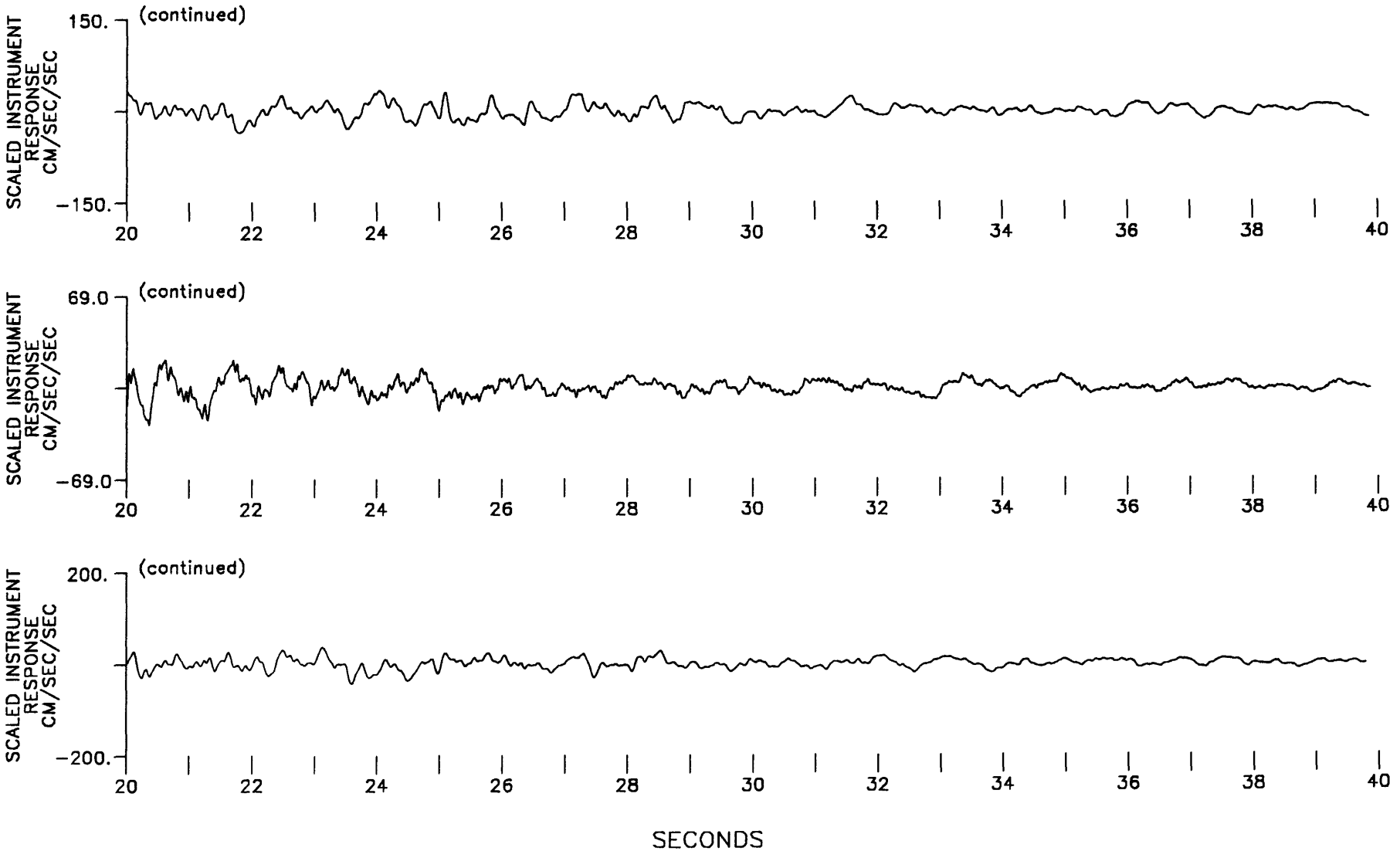
UNCORRECTED ACCELEROGRAM
MENLO PARK VA HOSPITAL - BLDG 137
110 DEGREES, UP, 20 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
PEAK VALUES (CM/SEC/SEC): -116.16, -97.48, 276.46



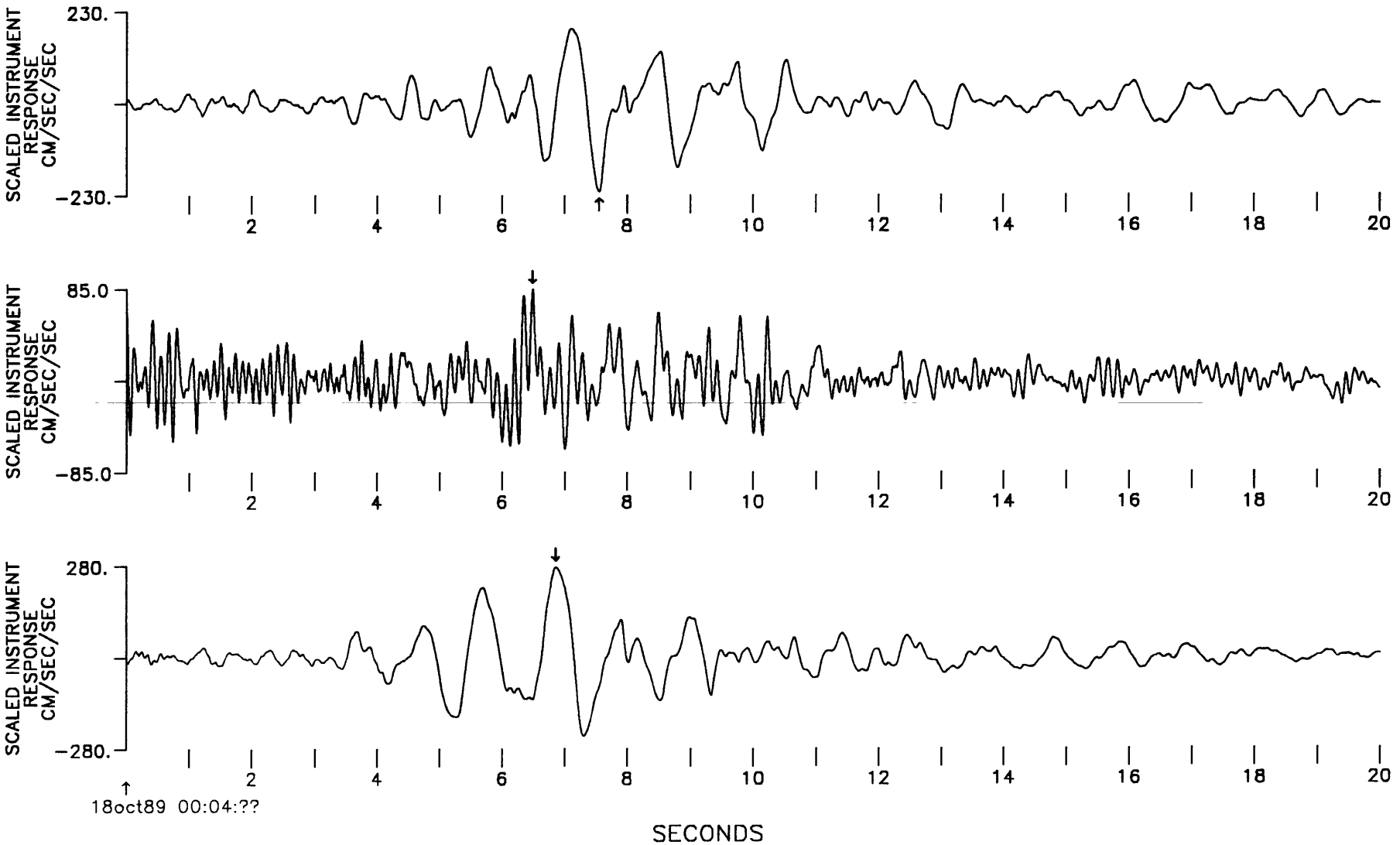
UNCORRECTED ACCELEROGRAM
CALAVERAS ARRAY - FREMONT, EMERSON CT.
180 DEGREES, UP, 090 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
PEAK VALUES (CM/SEC/SEC): -141.53, 68.65, 193.48



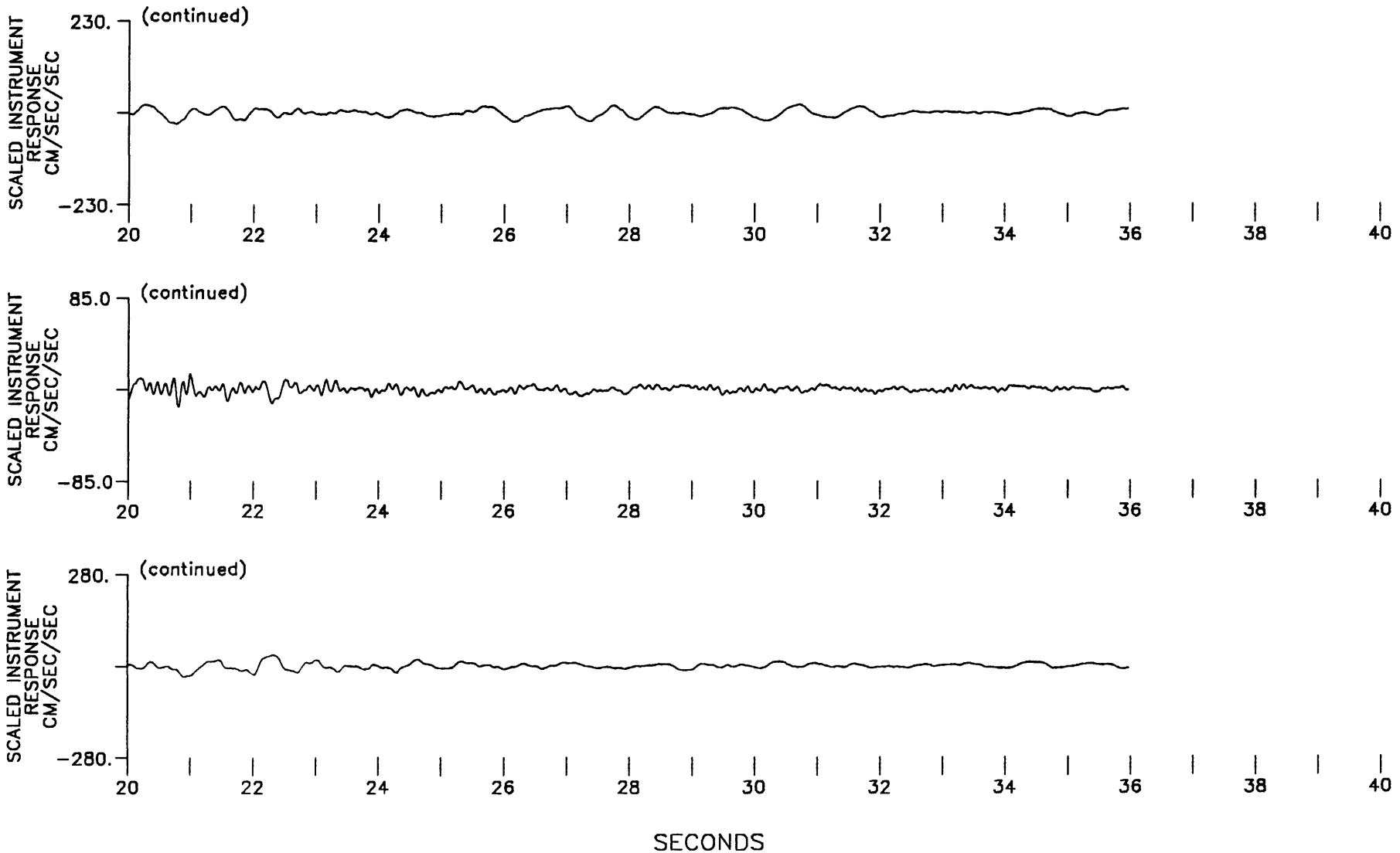
UNCORRECTED ACCELEROGRAM
CALAVERAS ARRAY - FREMONT, EMERSON CT.
180 DEGREES, UP, 090 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
PEAK VALUES (CM/SEC/SEC): -141.53, 68.65, 193.48



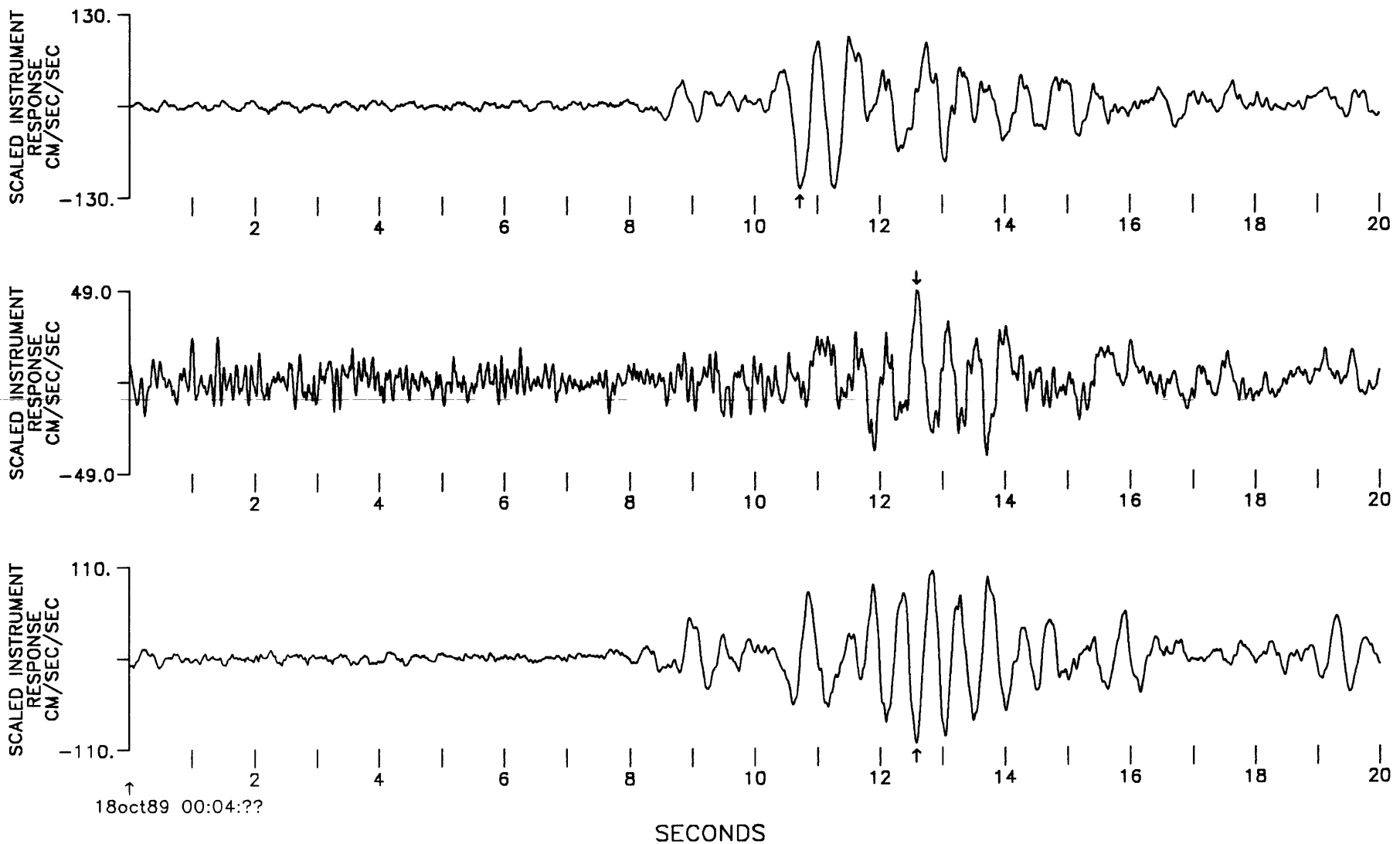
UNCORRECTED ACCELEROGRAM
APEEL ARRAY #2, REDWOOD CITY
133 DEGREES, UP, 043 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
PEAK VALUES (CM/SEC/SEC): -220.72, 84.34, 275.77



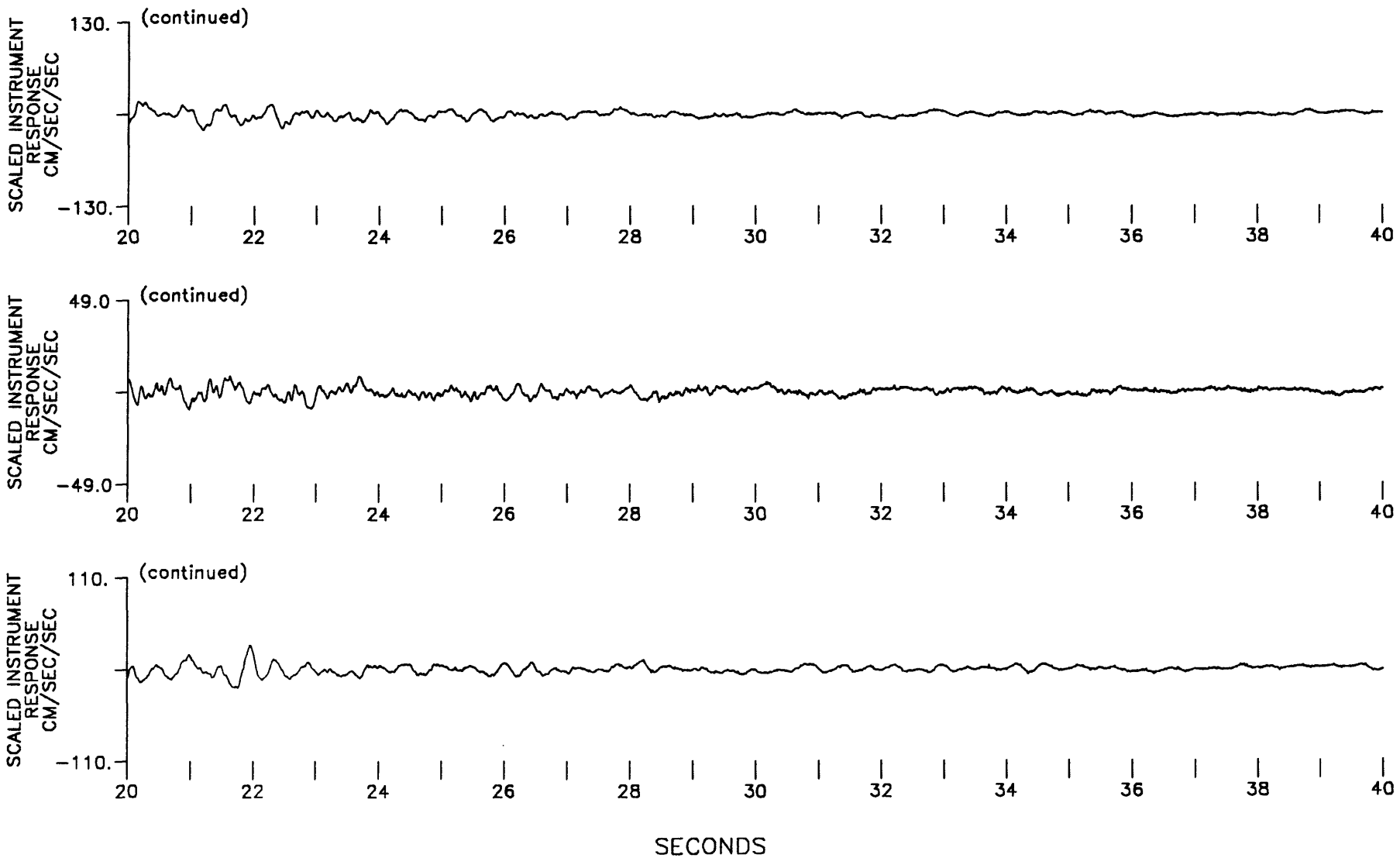
UNCORRECTED ACCELEROGRAM
APEEL ARRAY #2, REDWOOD CITY
133 DEGREES, UP, 043 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
PEAK VALUES (CM/SEC/SEC): -220.72, 84.34, 275.77



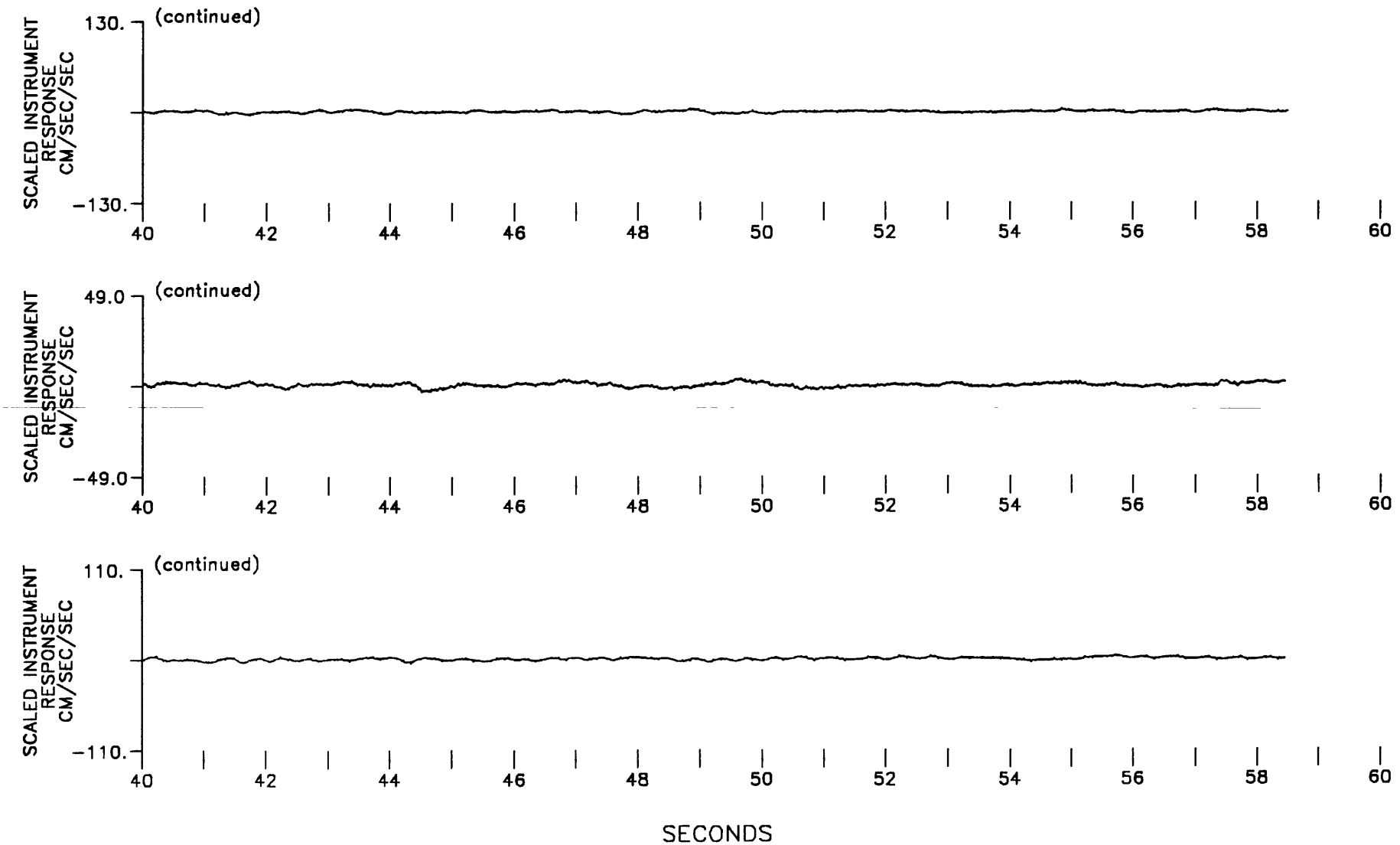
UNCORRECTED ACCELEROGRAM
SAN FRANCISCO, TRANSAMERICA BLDG - BASEMENT
261 DEGREES, UP, 171 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
PEAK VALUES (CM/SEC/SEC): -120.13, 48.02, -104.74



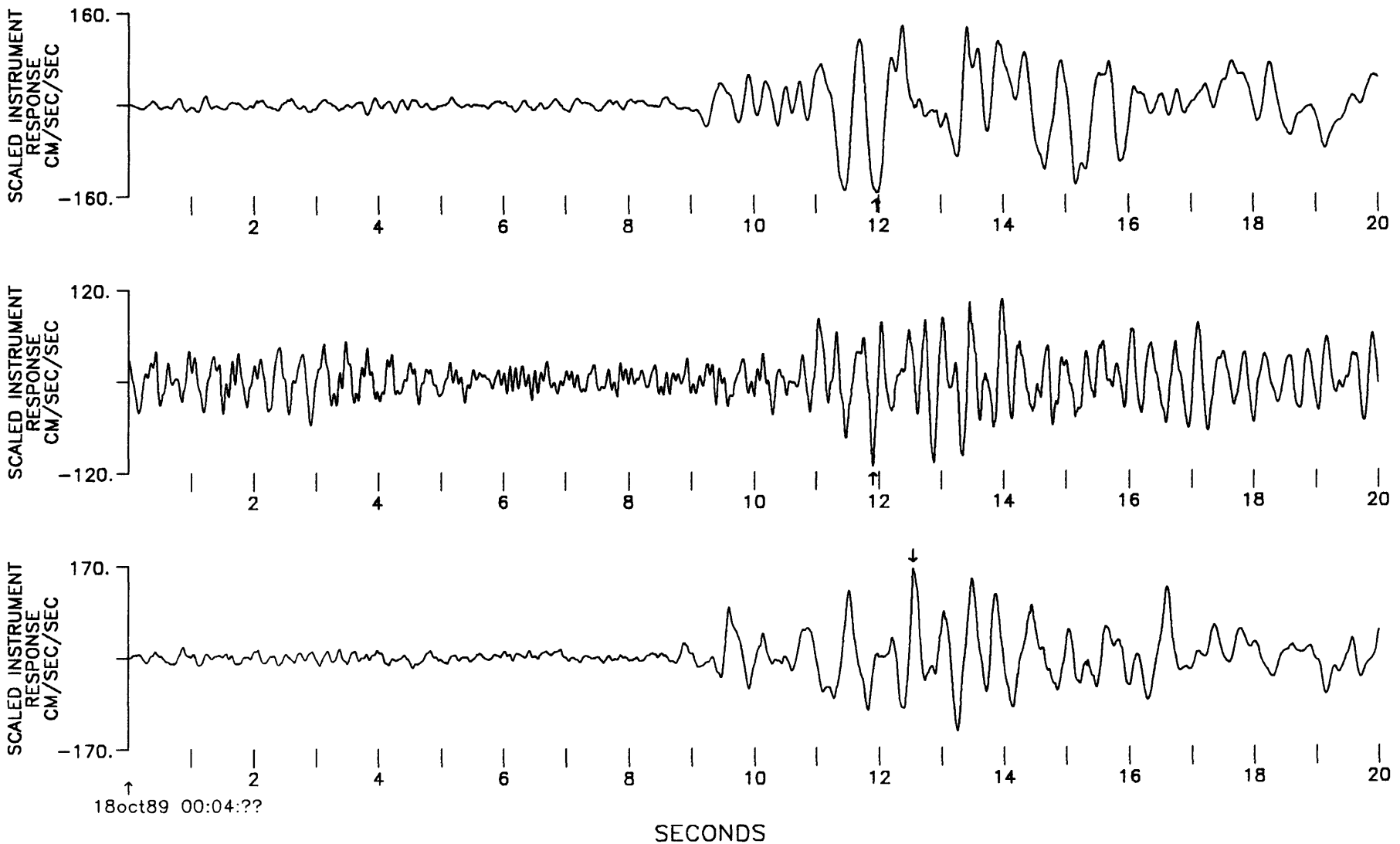
UNCORRECTED ACCELEROGRAM
SAN FRANCISCO, TRANSAMERICA BLDG - BASEMENT
261 DEGREES, UP, 171 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
PEAK VALUES (CM/SEC/SEC): -120.13, 48.02, -104.74



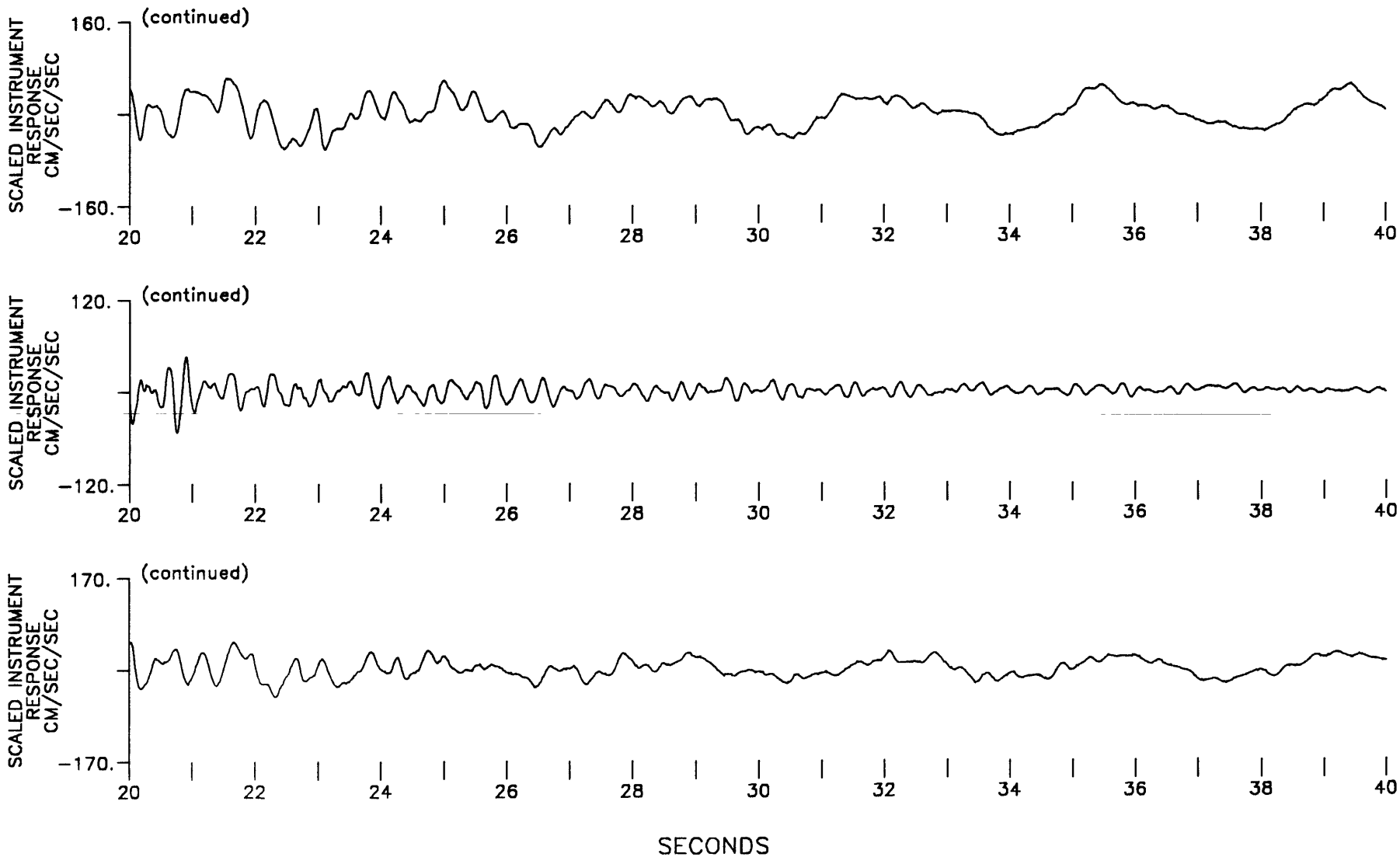
UNCORRECTED ACCELEROGRAM
SAN FRANCISCO, TRANSAMERICA BLDG – BASEMENT
261 DEGREES, UP, 171 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
PEAK VALUES (CM/SEC/SEC): –120.13, 48.02, –104.74



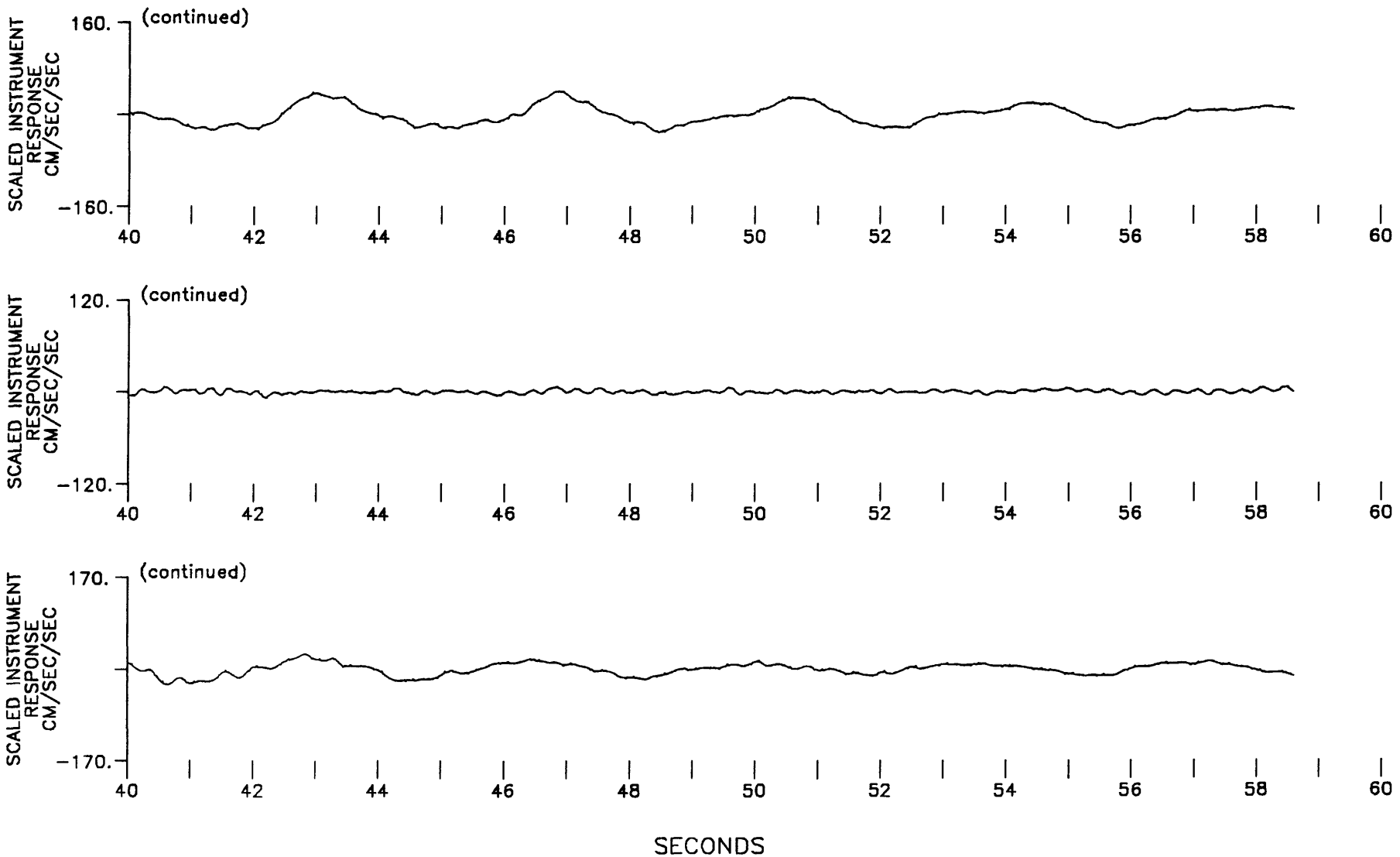
UNCORRECTED ACCELEROGRAM
SAN FRANCISCO, TRANSAMERICA BLDG – 29TH FLOOR
261 DEGREES, UP, 171 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
PEAK VALUES (CM/SEC/SEC): −155.45, −113.13, 162.72



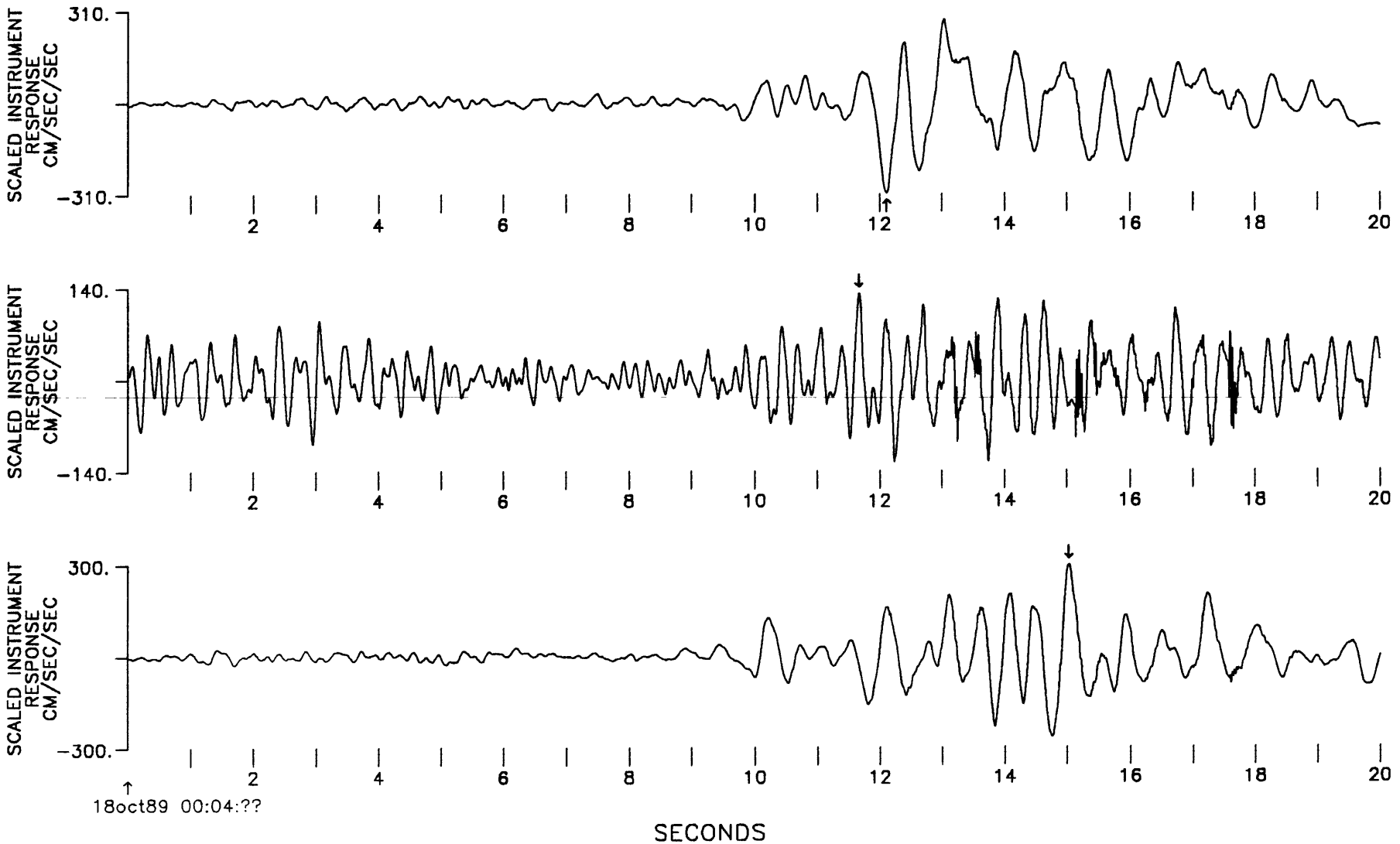
UNCORRECTED ACCELEROGRAM
SAN FRANCISCO, TRANSAMERICA BLDG – 29TH FLOOR
261 DEGREES, UP, 171 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
PEAK VALUES (CM/SEC/SEC): −155.45, −113.13, 162.72



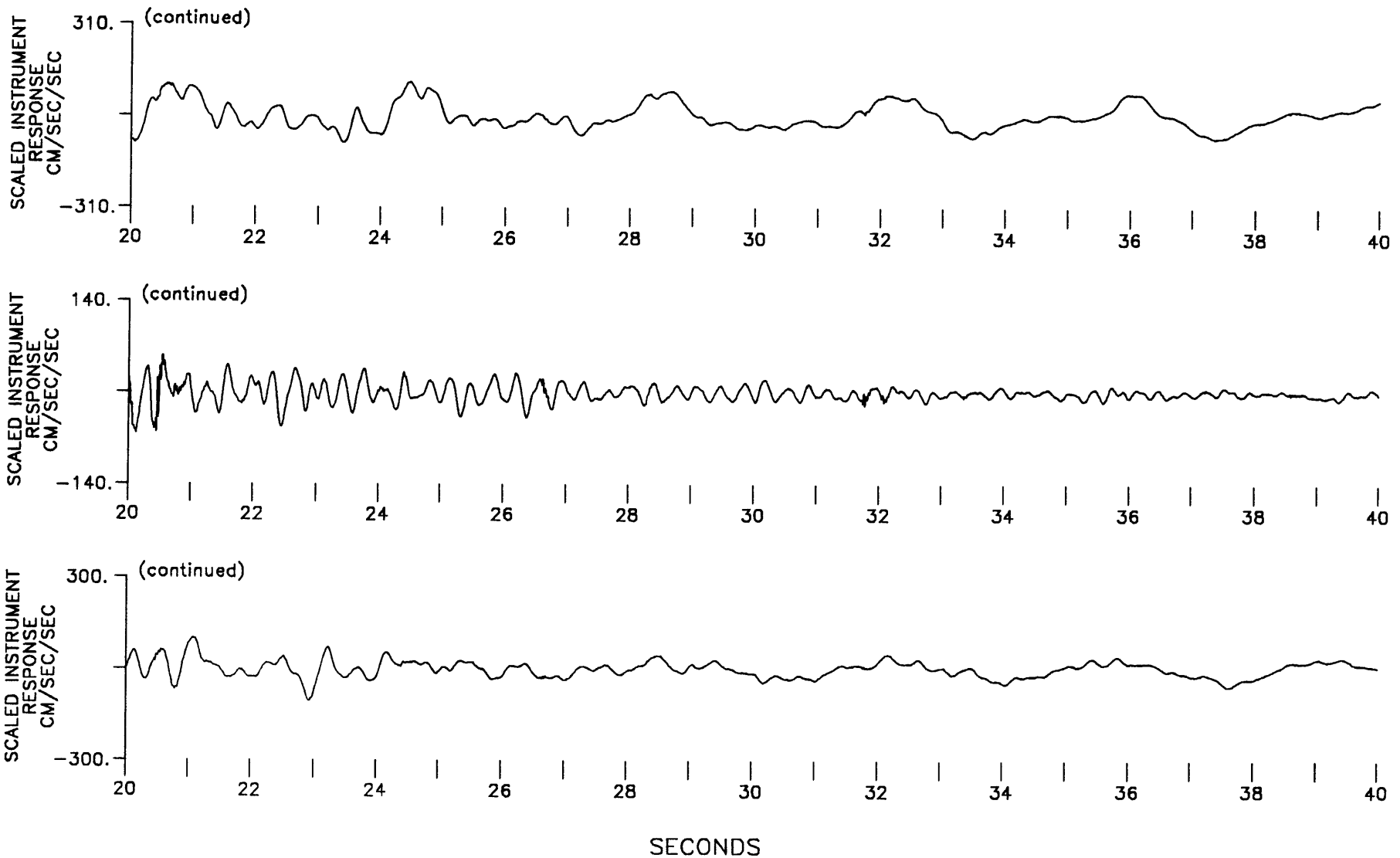
UNCORRECTED ACCELEROGRAM
SAN FRANCISCO, TRANSAMERICA BLDG - 29TH FLOOR
261 DEGREES, UP, 171 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
PEAK VALUES (CM/SEC/SEC): -155.45, -113.13, 162.72



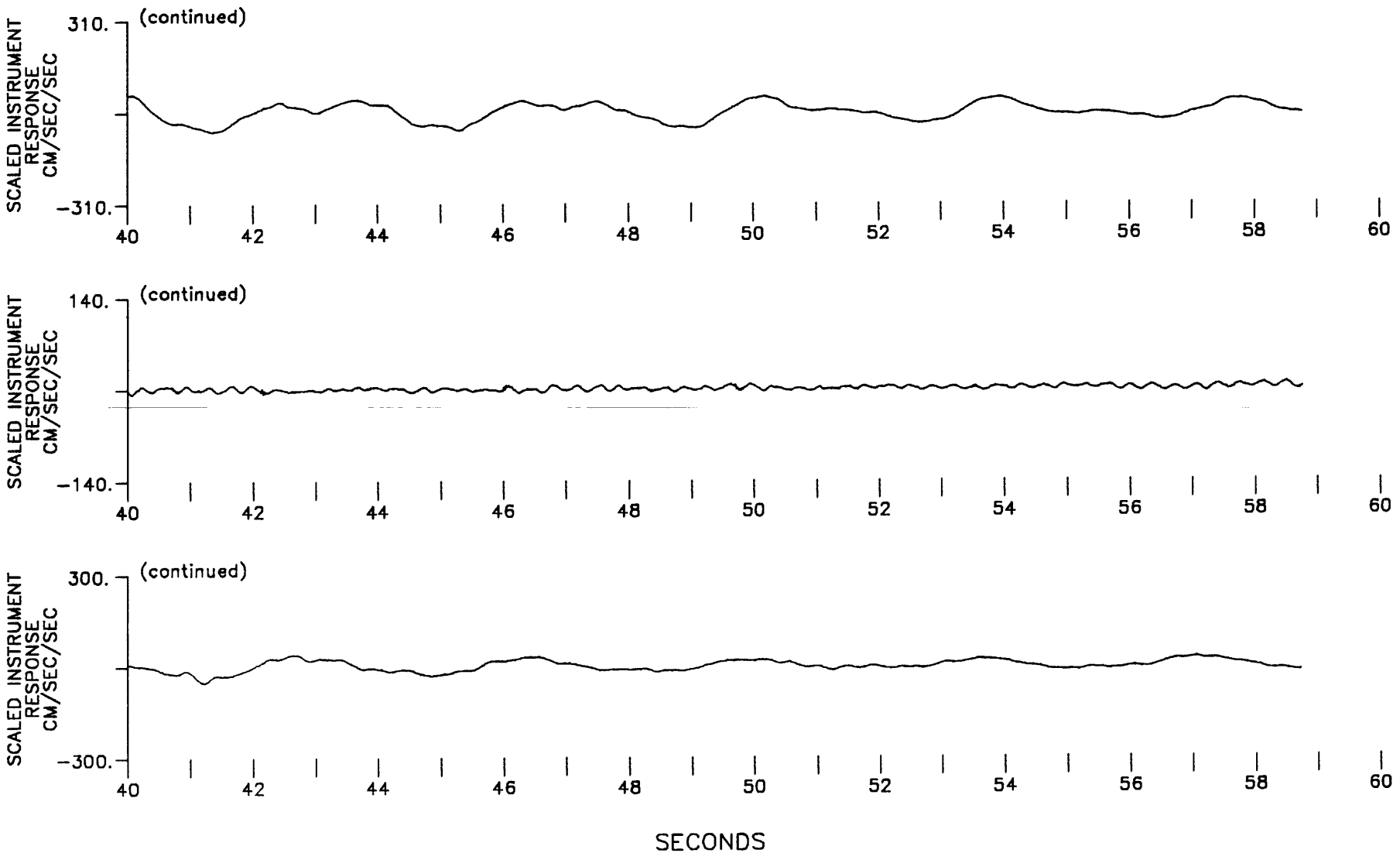
UNCORRECTED ACCELEROGRAM
SAN FRANCISCO, TRANSAMERICA BLDG – 49TH FLOOR
261 DEGREES, UP, 171 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
PEAK VALUES (CM/SEC/SEC): –306.63, 130.58, 296.26



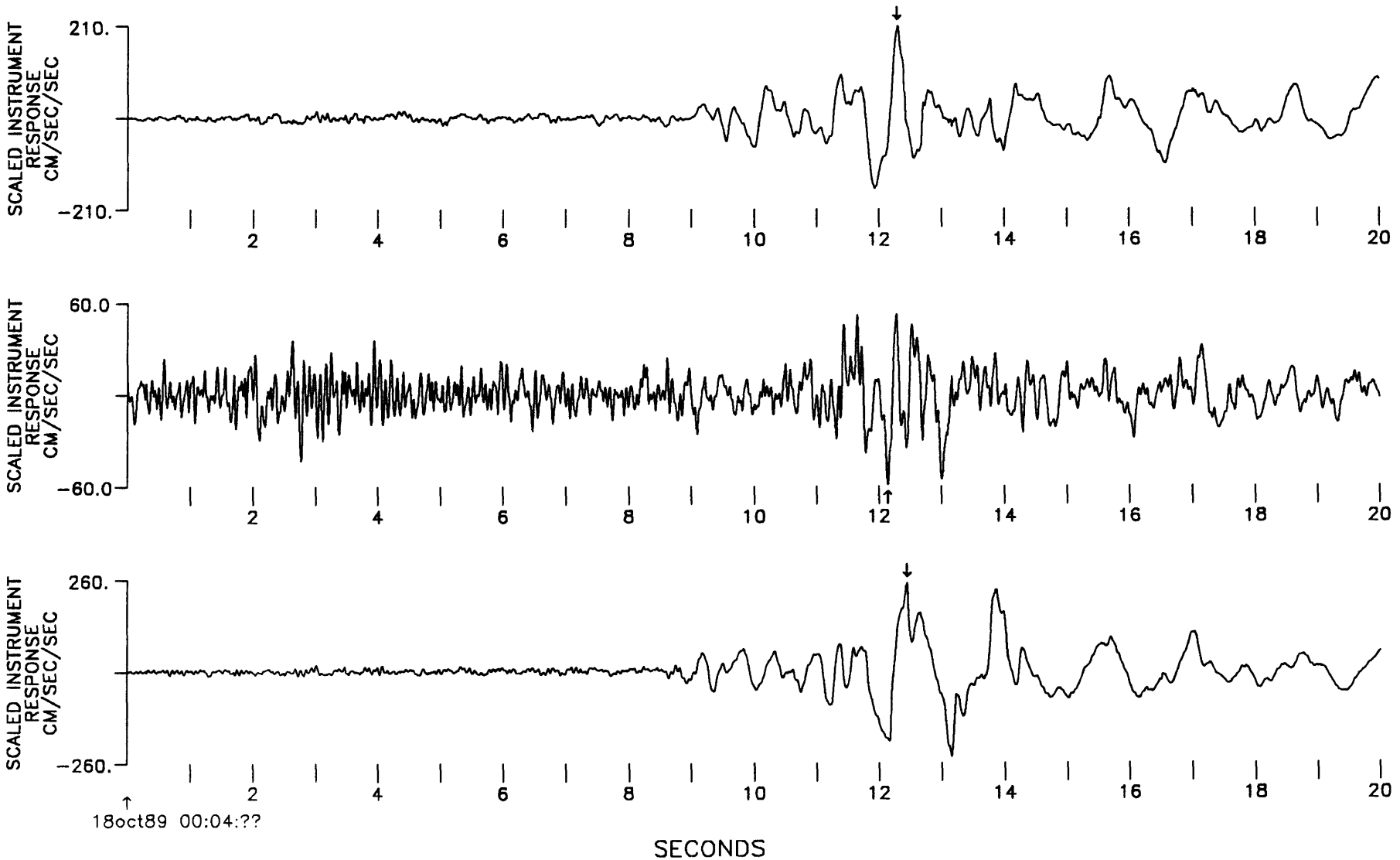
UNCORRECTED ACCELEROGRAM
SAN FRANCISCO, TRANSAMERICA BLDG – 49TH FLOOR
261 DEGREES, UP, 171 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
PEAK VALUES (CM/SEC/SEC): –306.63, 130.58, 296.26



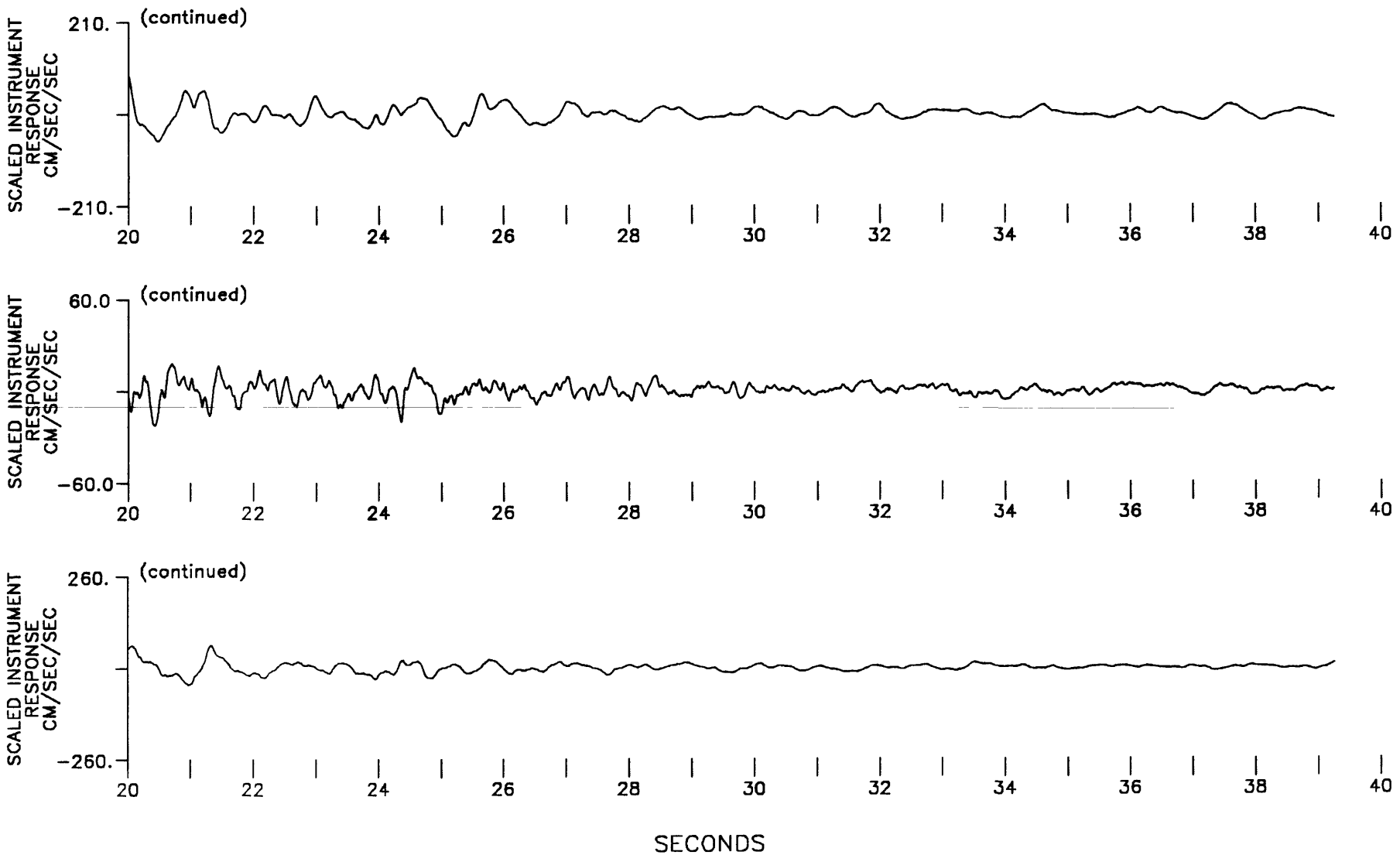
UNCORRECTED ACCELEROGRAM
SAN FRANCISCO, TRANSAMERICA BLDG – 49TH FLOOR
261 DEGREES, UP, 171 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
PEAK VALUES (CM/SEC/SEC): –306.63, 130.58, 296.26



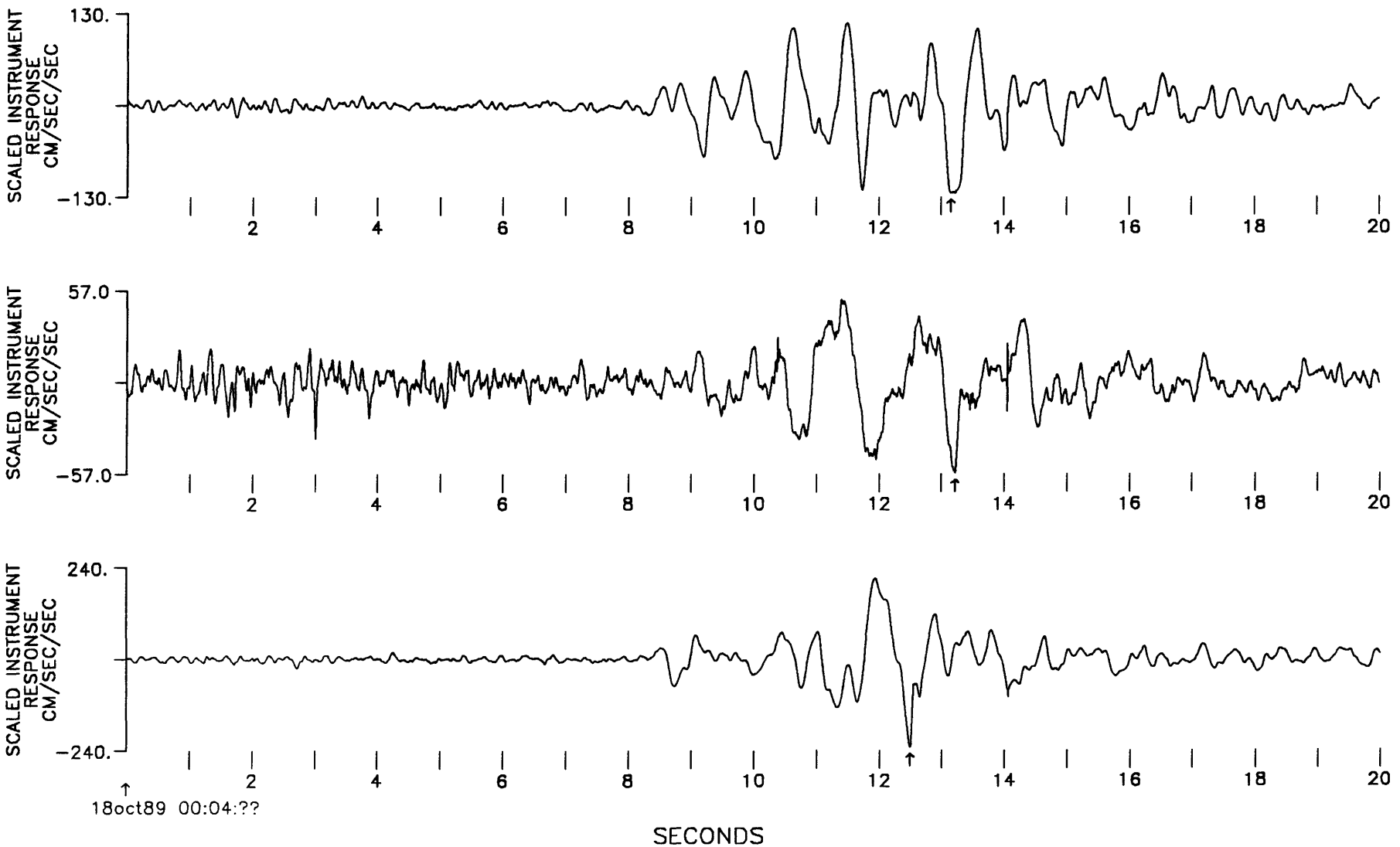
UNCORRECTED ACCELEROGRAM
EMERYVILLE – 6363 CHRISTIE AVE, S GROUND SITE
350 DEGREES, UP, 260 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
PEAK VALUES (CM/SEC/SEC): 209.84, –59.07, 250.42



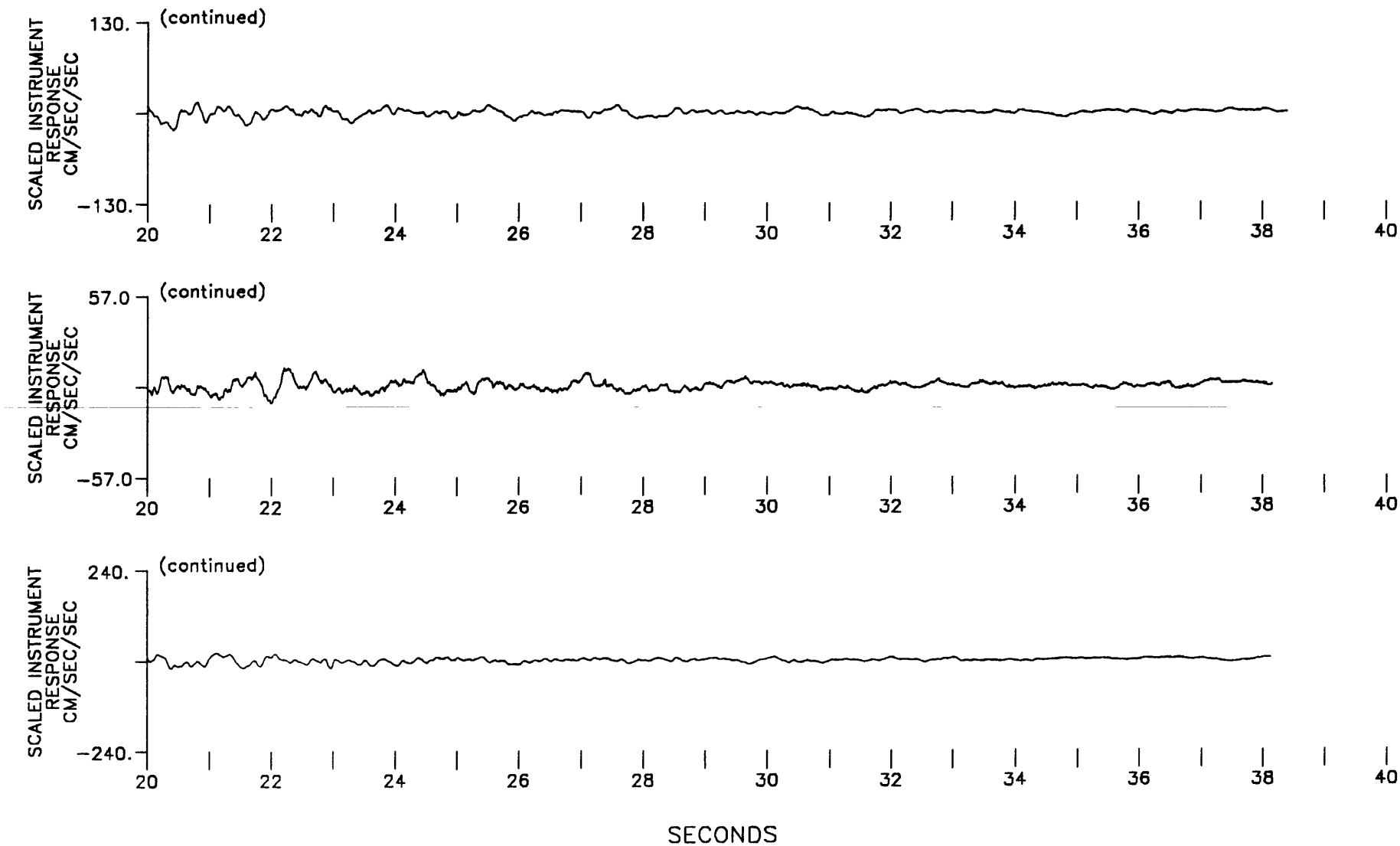
UNCORRECTED ACCELEROGRAM
EMERYVILLE - 6363 CHRISTIE AVE, S GROUND SITE
350 DEGREES, UP, 260 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
PEAK VALUES (CM/SEC/SEC): 209.84, -59.07, 250.42



UNCORRECTED ACCELEROGRAM
SAN FRANCISCO - GOLDEN GATE BRIDGE, ABUTMENT BLDG
360 DEGREES, UP, 270 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
PEAK VALUES (CM/SEC/SEC): -124.21, -56.59, -231.19



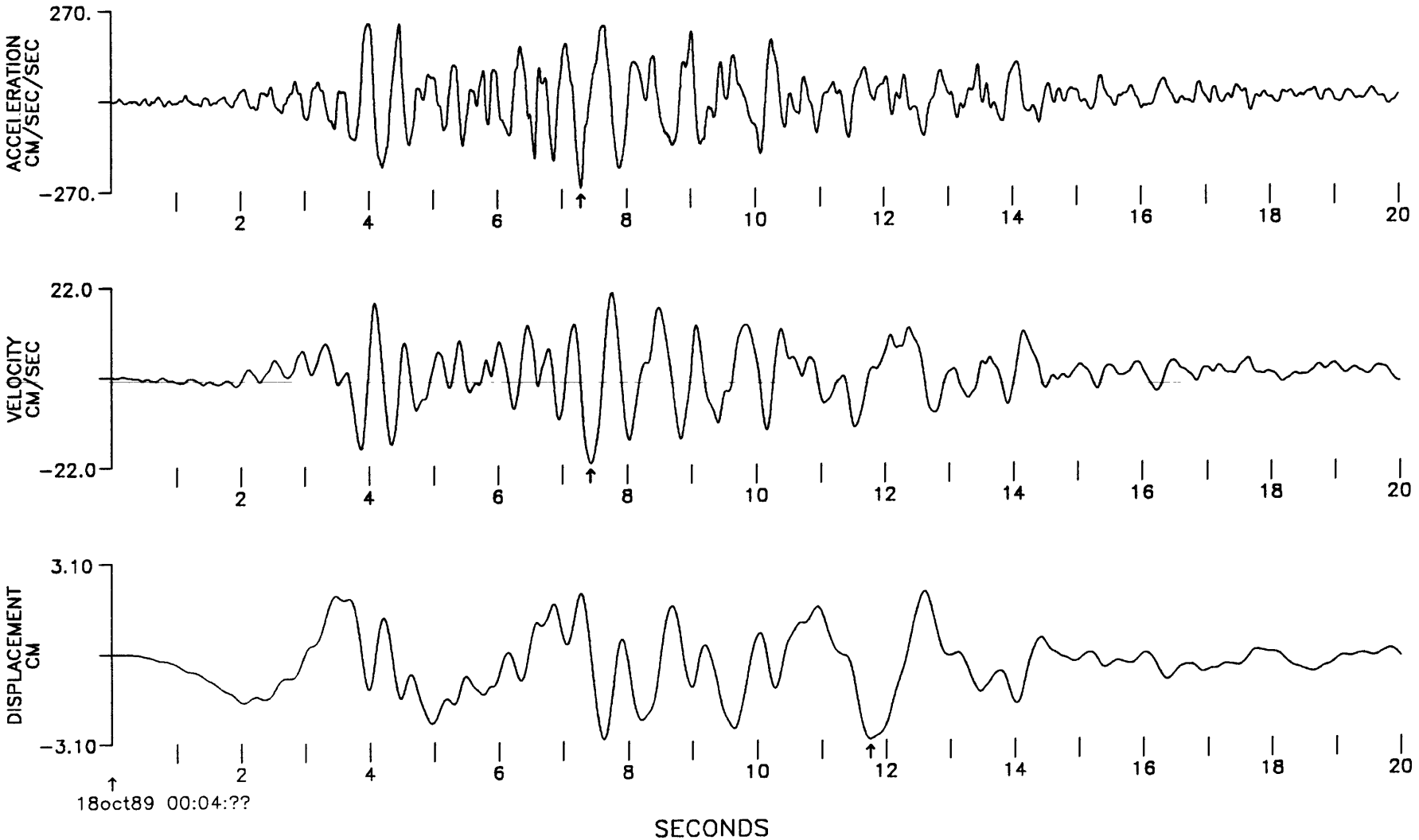
UNCORRECTED ACCELEROGRAM
SAN FRANCISCO – GOLDEN GATE BRIDGE, ABUTMENT BLDG
360 DEGREES, UP, 270 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
PEAK VALUES (CM/SEC/SEC): −124.21, −56.59, −231.19



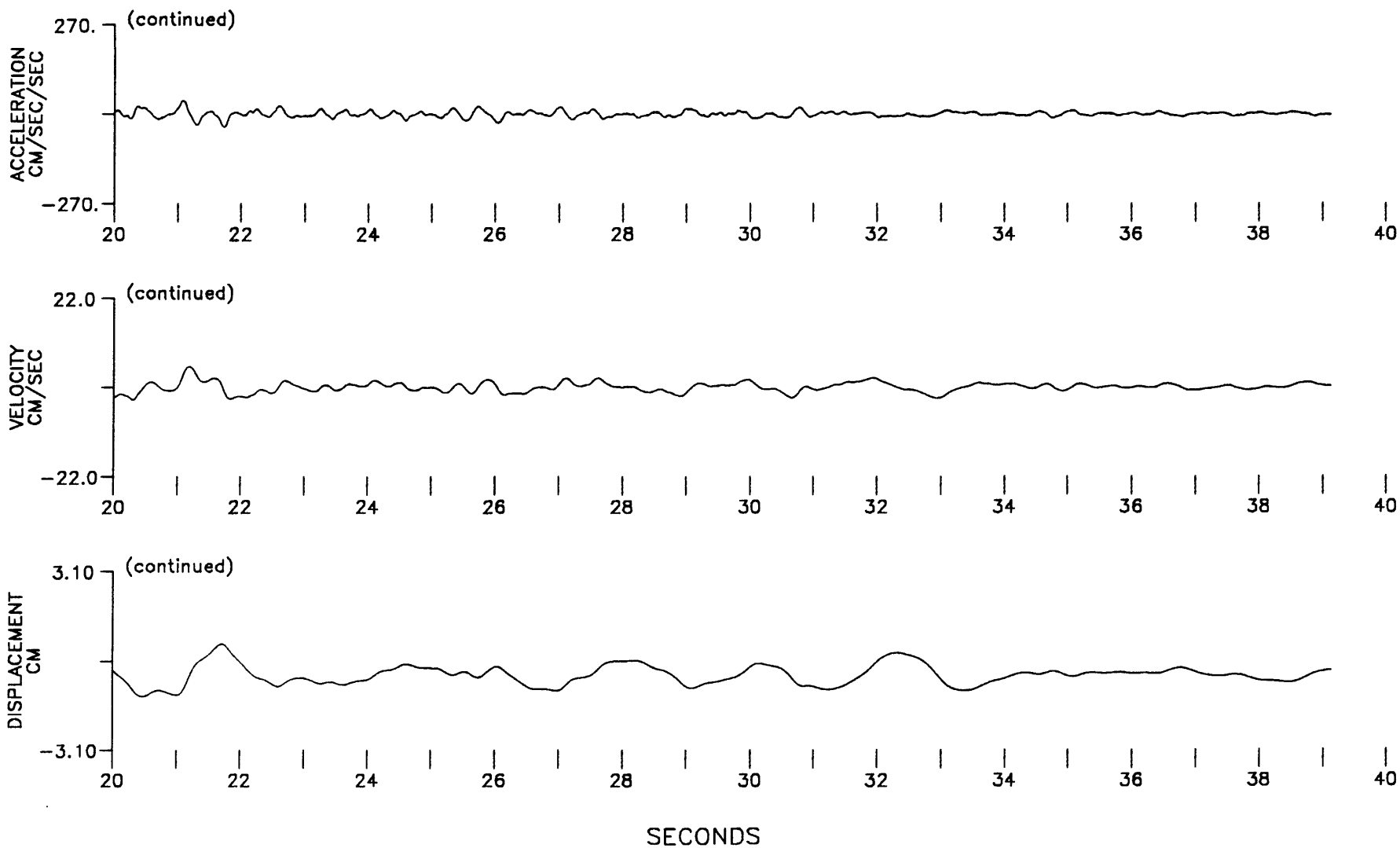
APPENDIX 2

CORRECTED ACCELERATION, VELOCITY, DISPLACEMENT

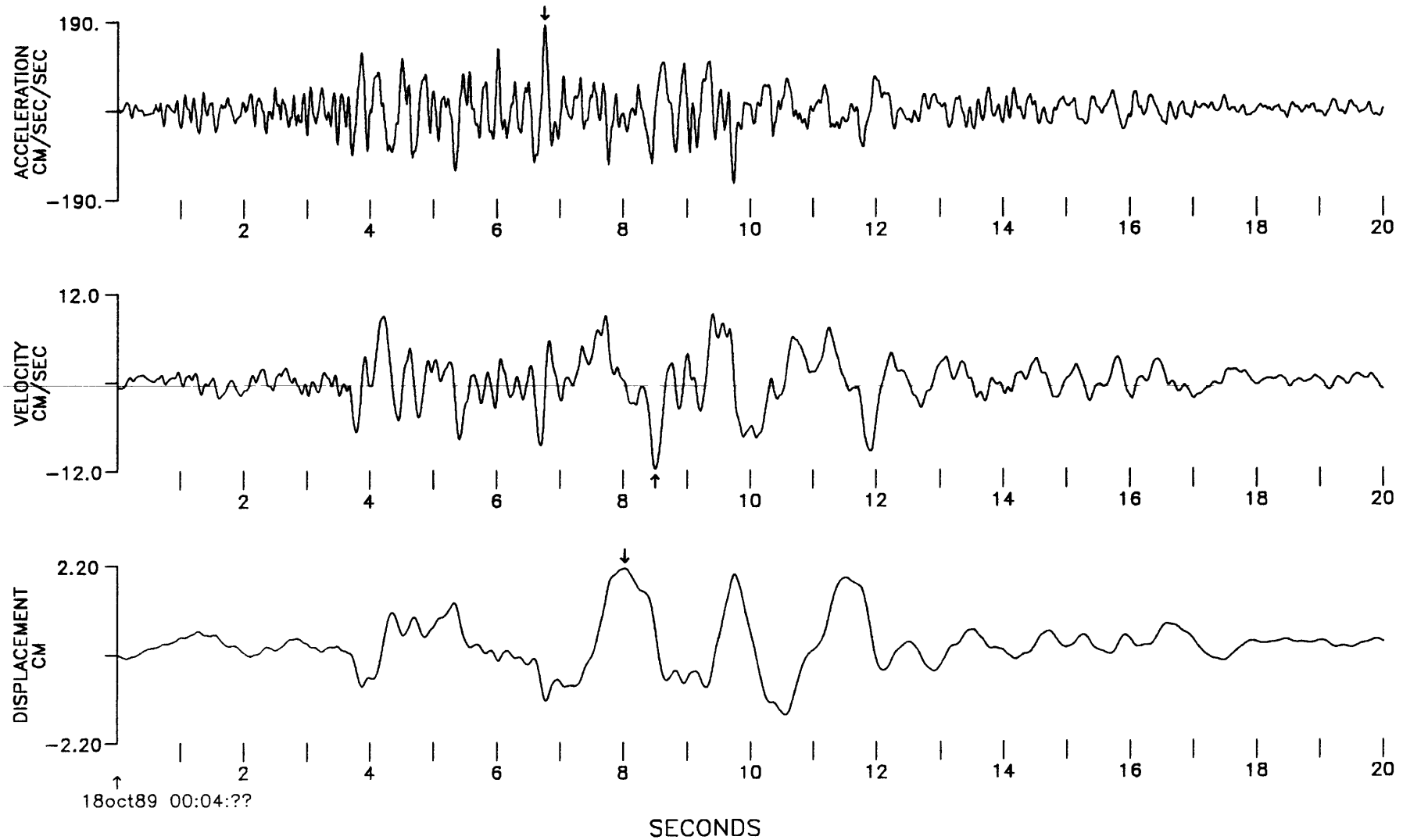
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
ANDERSON DAM – CREST
340 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= −265.44 CM/SEC/SEC, VELOCITY= −21.42 CM/SEC, DISPL= −3.06 CM



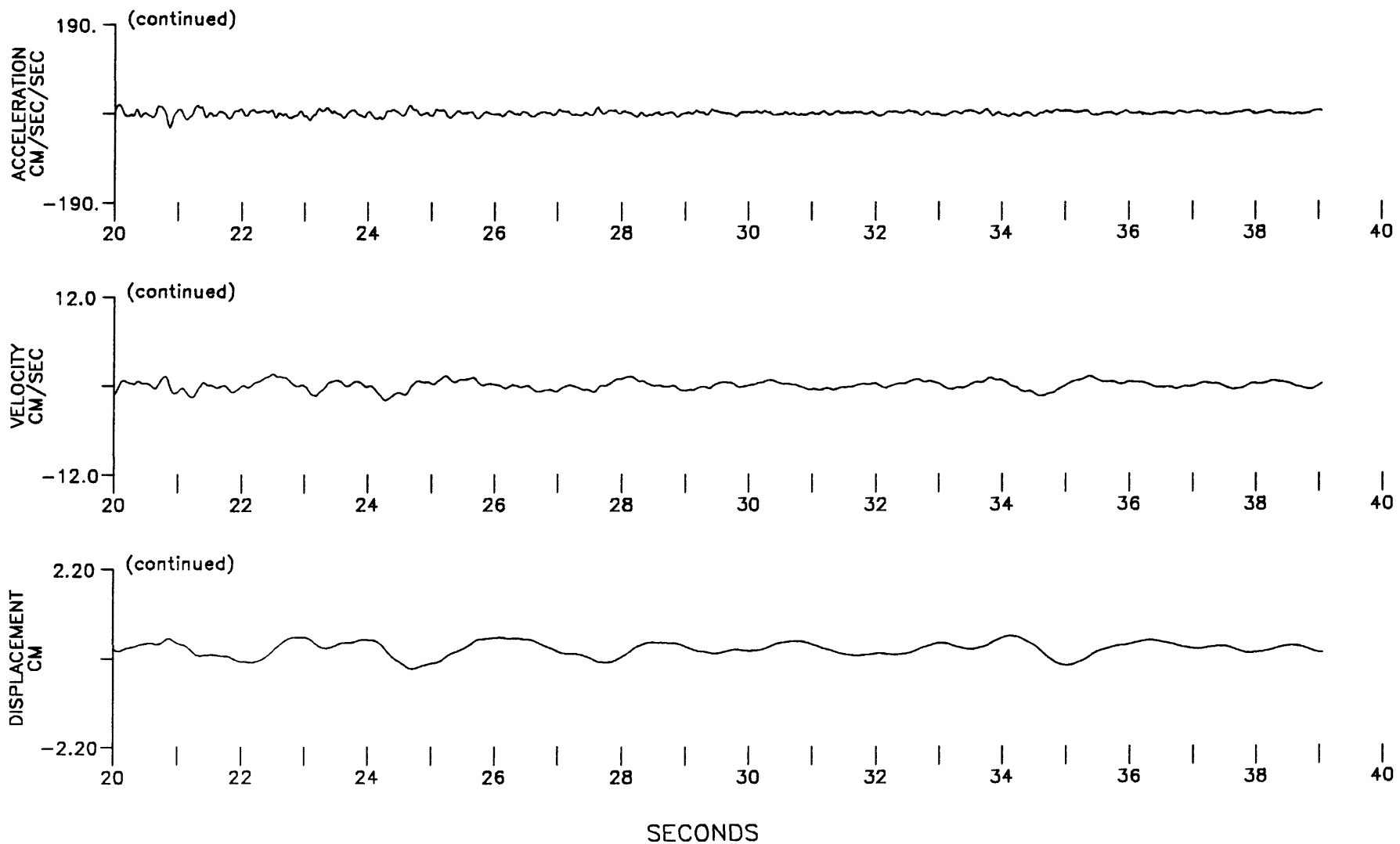
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
ANDERSON DAM – CREST
340 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= −265.44 CM/SEC/SEC, VELOCITY= −21.42 CM/SEC, DISPL= −3.06 CM



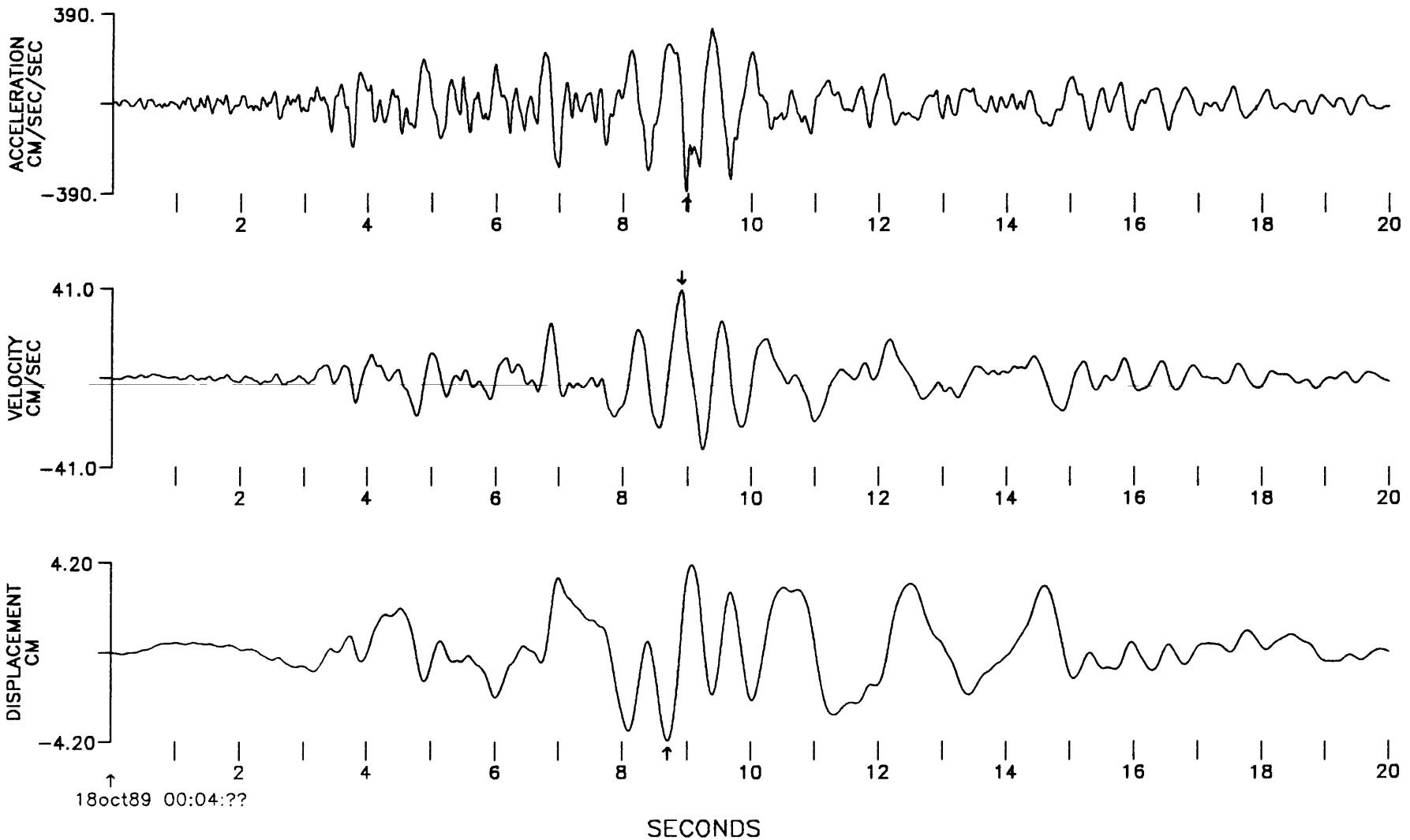
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
ANDERSON DAM – CREST
UP
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= 181.22 CM/SEC/SEC, VELOCITY= −11.77 CM/SEC, DISPL= 2.11 CM



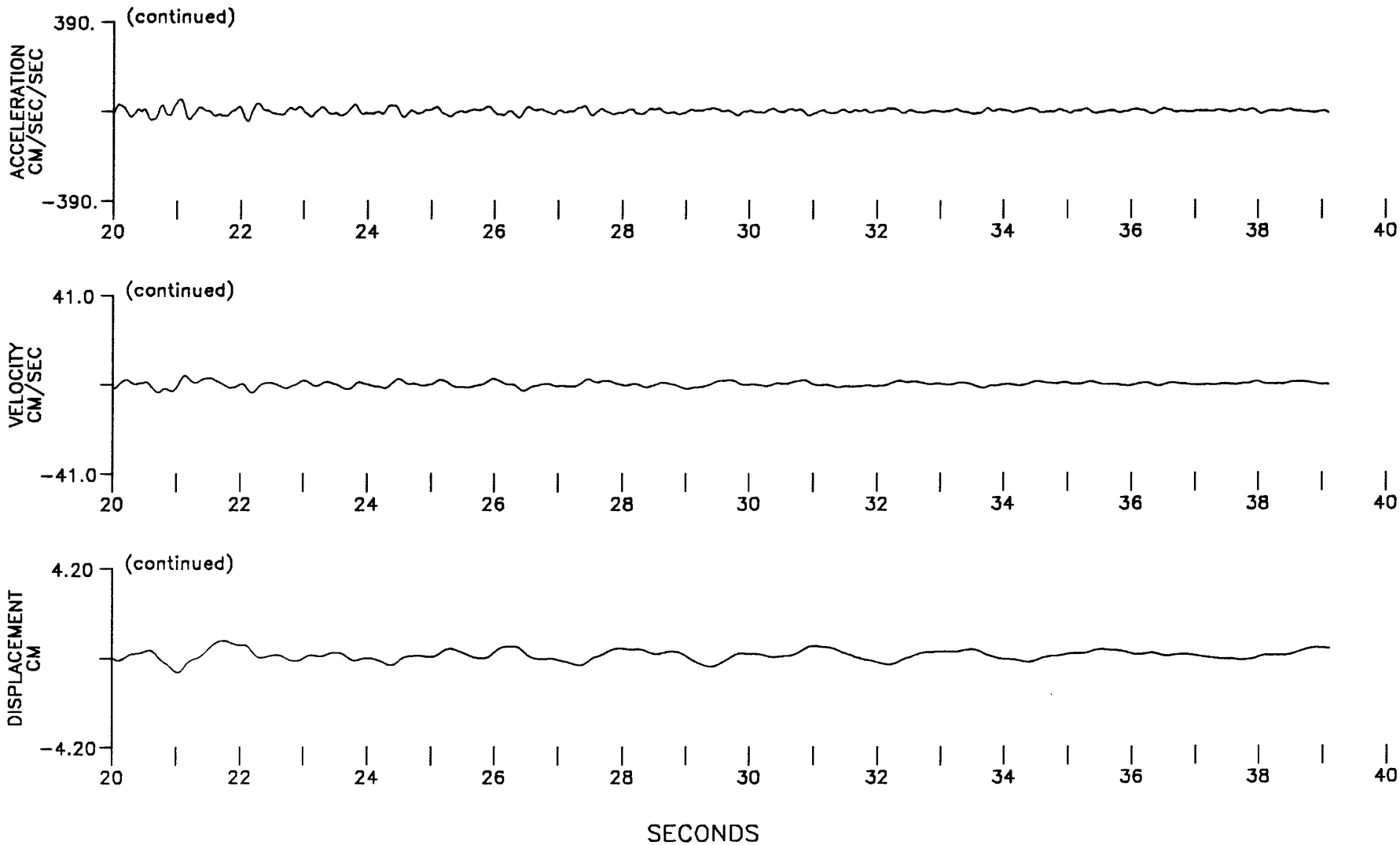
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
ANDERSON DAM - CREST
UP
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= 181.22 CM/SEC/SEC, VELOCITY= -11.77 CM/SEC, DISPL= 2.11 CM



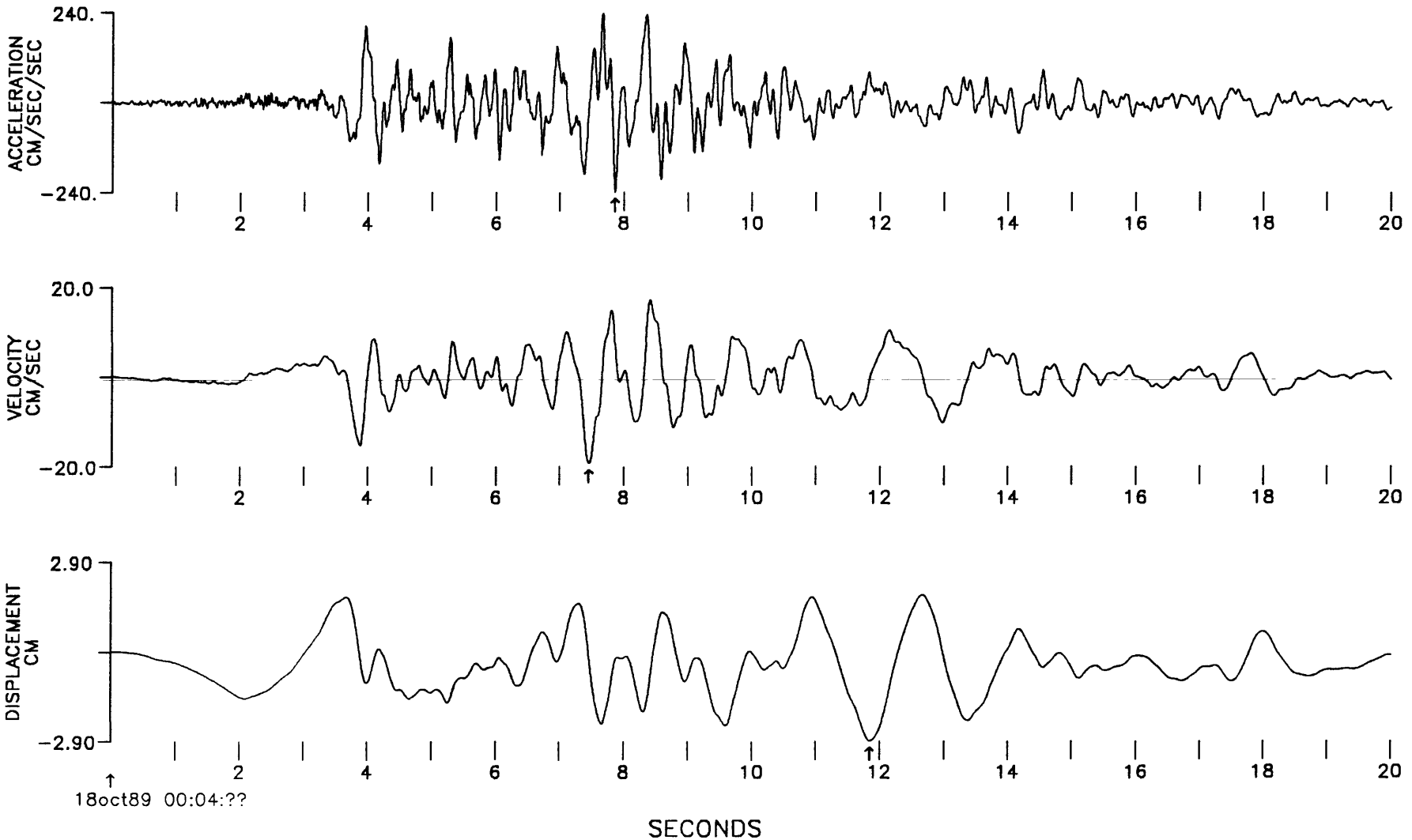
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
ANDERSON DAM – CREST
250 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= −381.57 CM/SEC/SEC, VELOCITY= 40.14 CM/SEC, DISPL= −4.17 CM



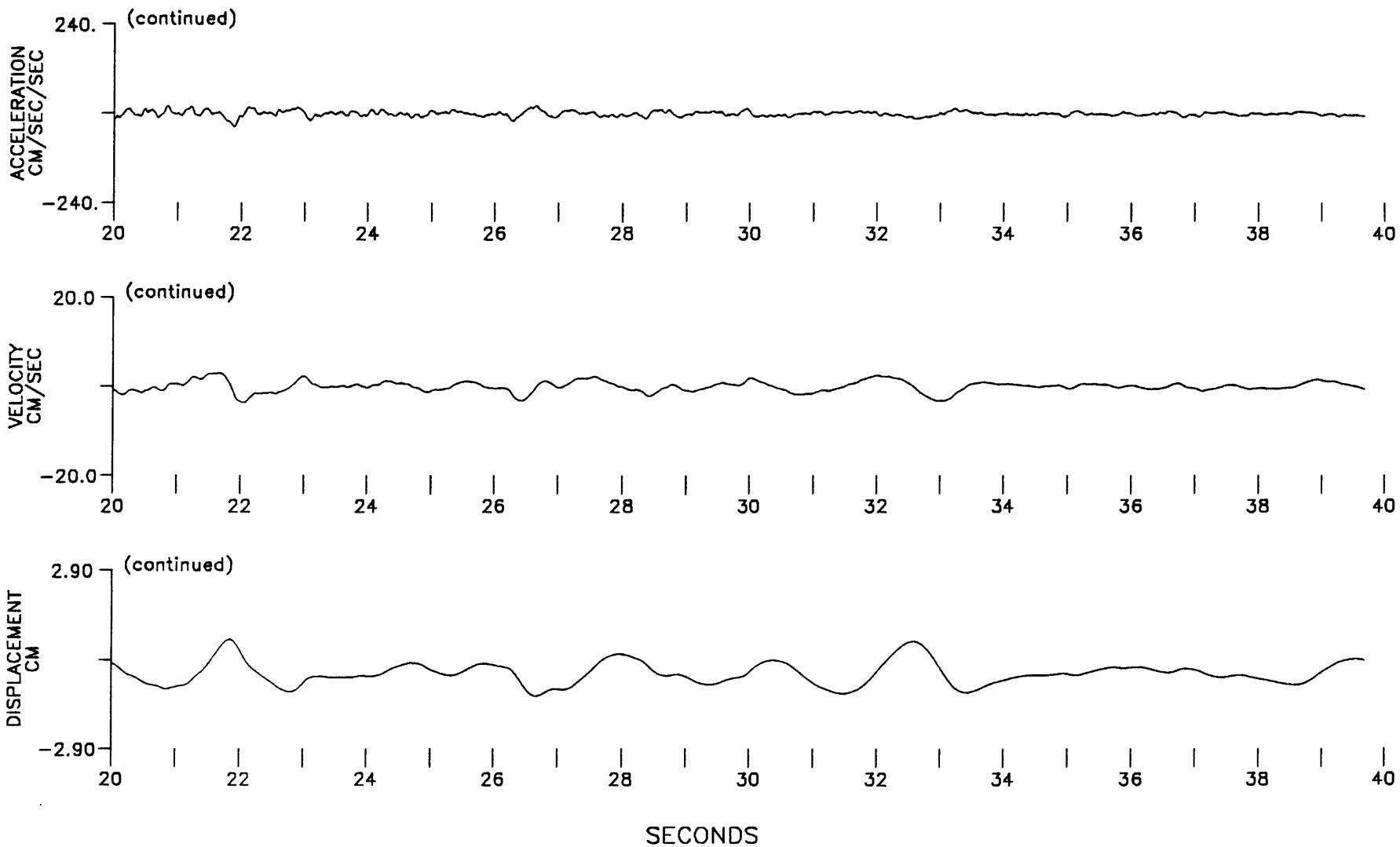
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
ANDERSON DAM - CREST
250 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= -381.57 CM/SEC/SEC, VELOCITY= 40.14 CM/SEC, DISPL= -4.17 CM



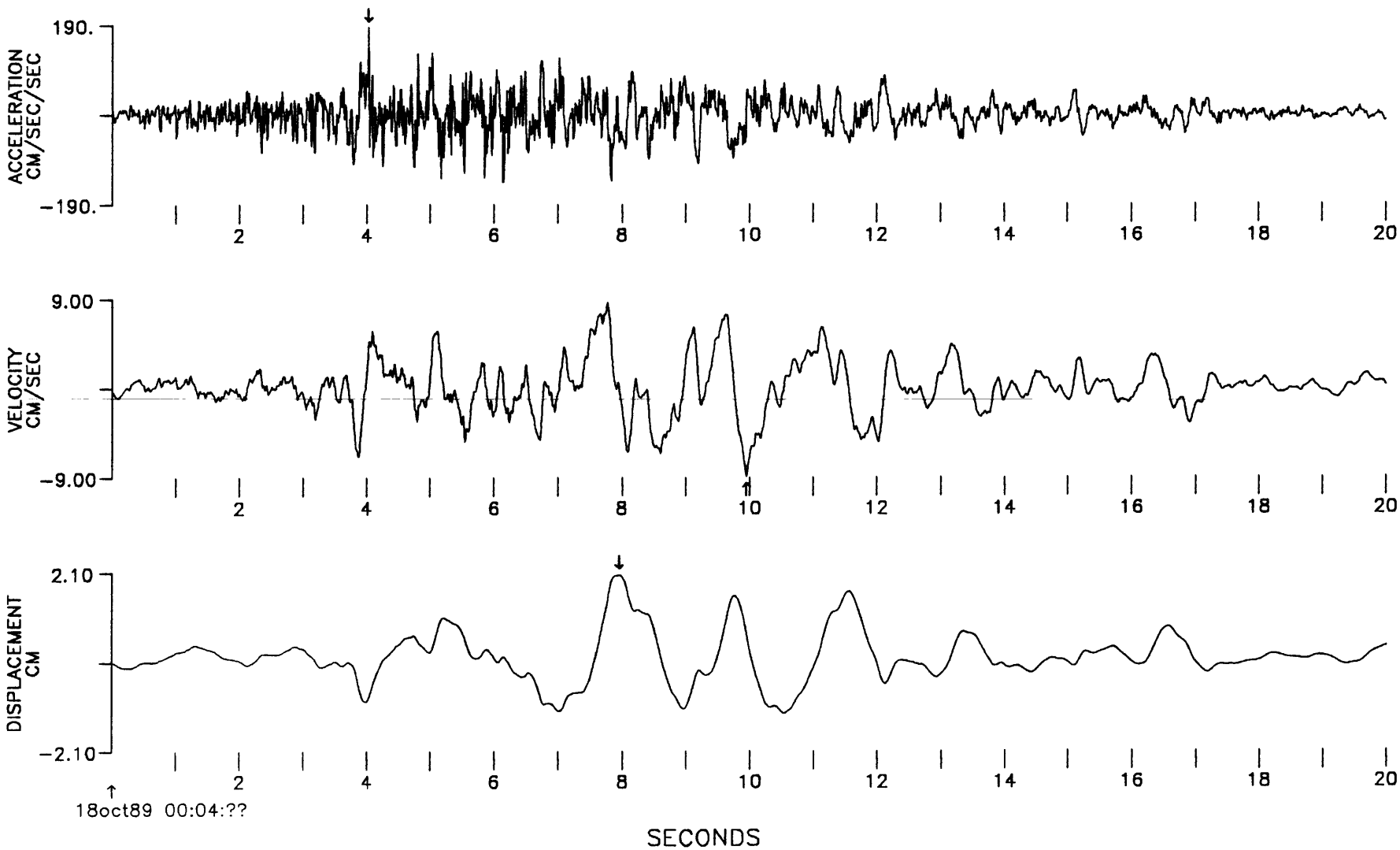
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
ANDERSON DAM - DOWNSTREAM
340 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= -238.79 CM/SEC/SEC, VELOCITY= -19.18 CM/SEC, DISPL= -2.89 CM



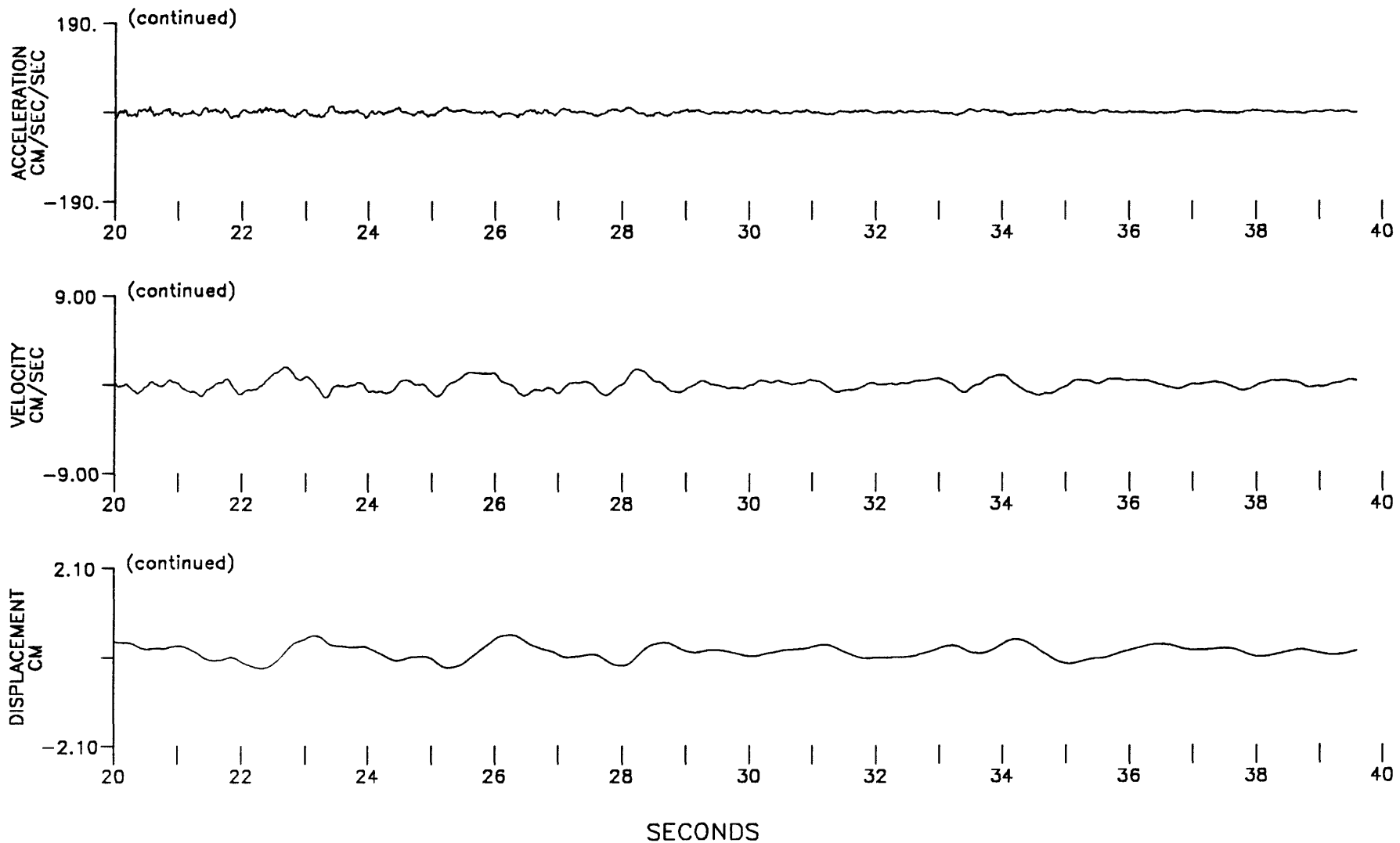
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
ANDERSON DAM - DOWNSTREAM
340 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= -238.79 CM/SEC/SEC, VELOCITY= -19.18 CM/SEC, DISPL= -2.89 CM



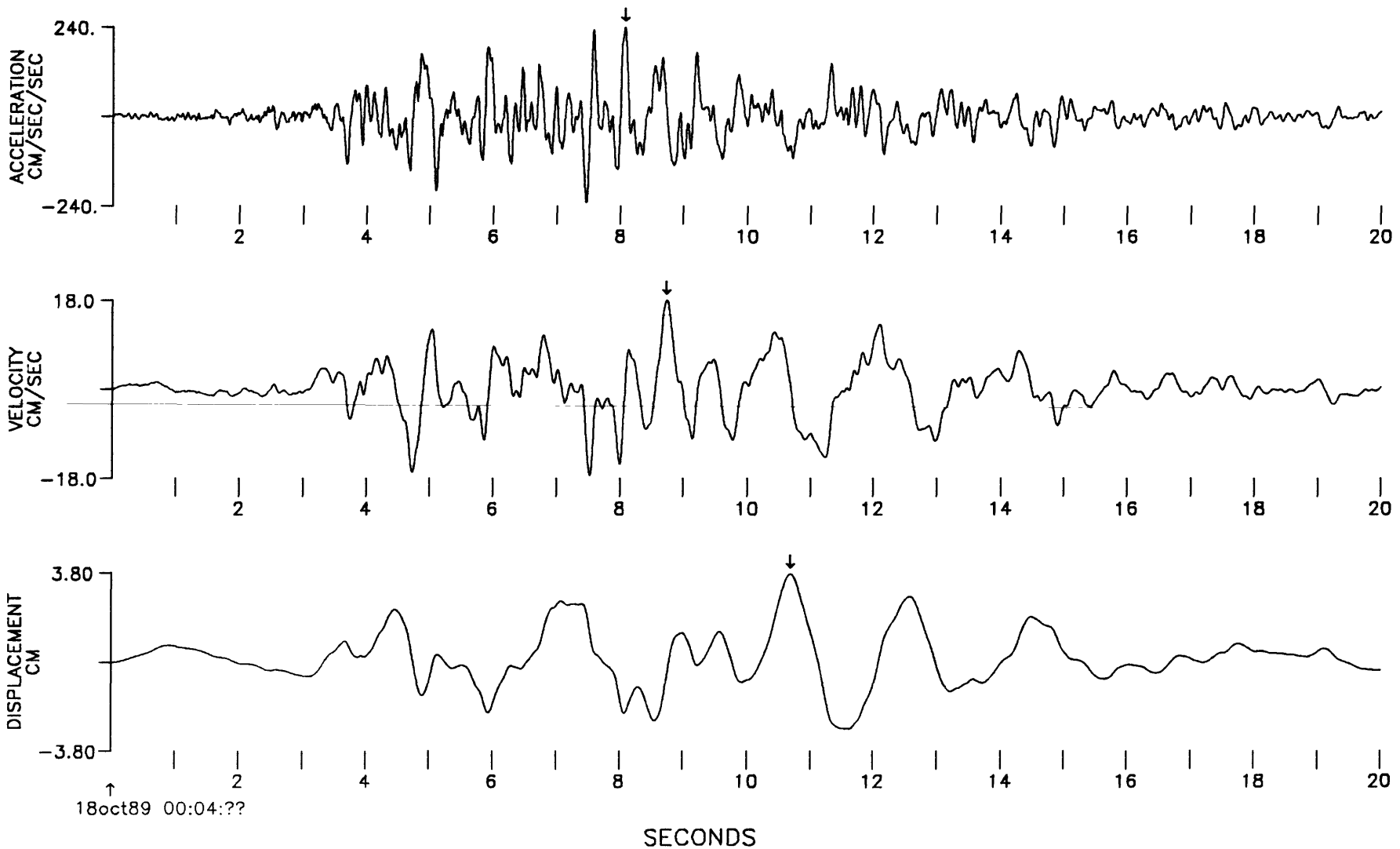
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
ANDERSON DAM – DOWNSTREAM
UP
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= 185.64 CM/SEC/SEC, VELOCITY= −8.91 CM/SEC, DISPL= 2.05 CM



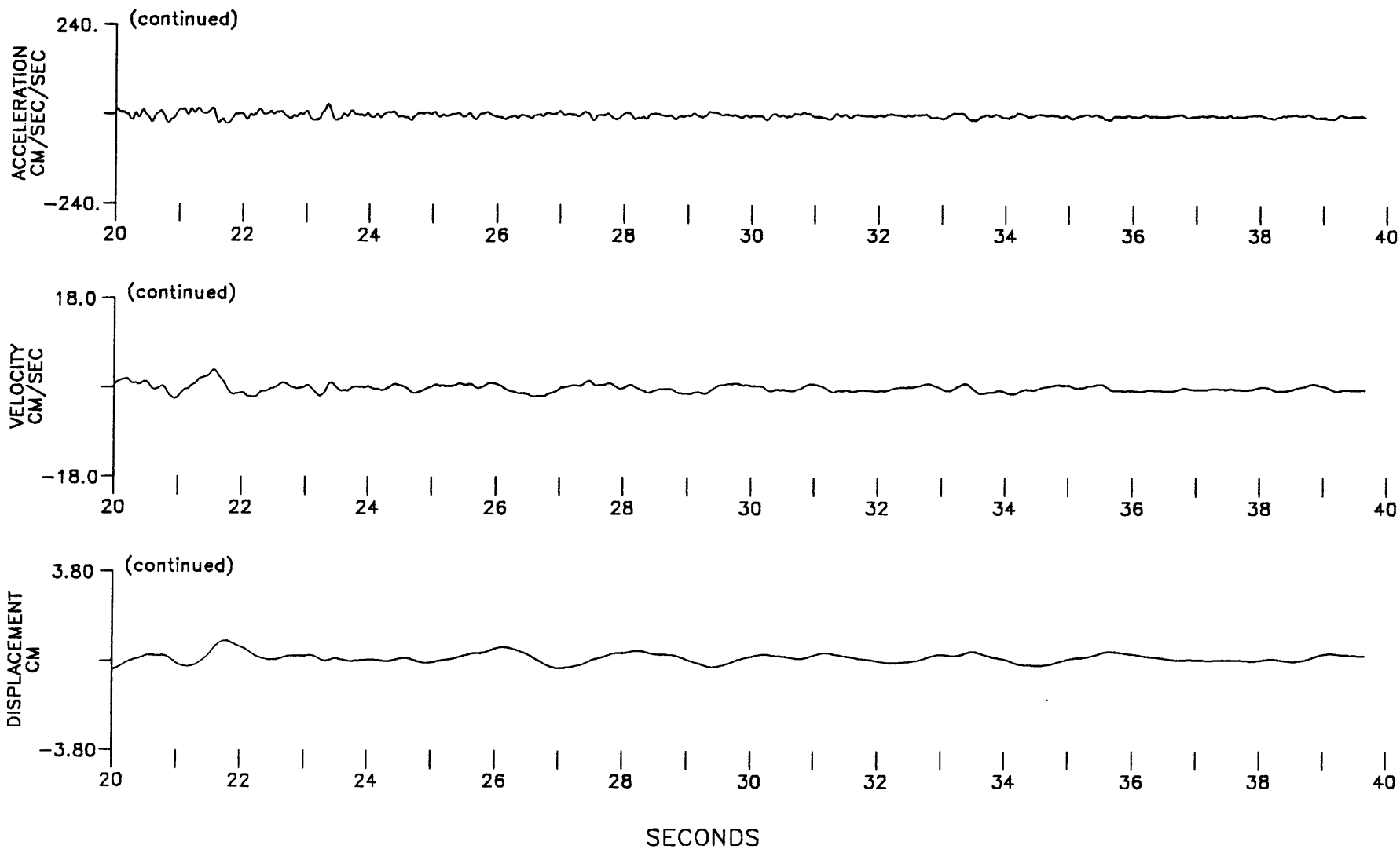
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
ANDERSON DAM - DOWNSTREAM
UP
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= 185.64 CM/SEC/SEC, VELOCITY= -8.91 CM/SEC, DISPL= 2.05 CM



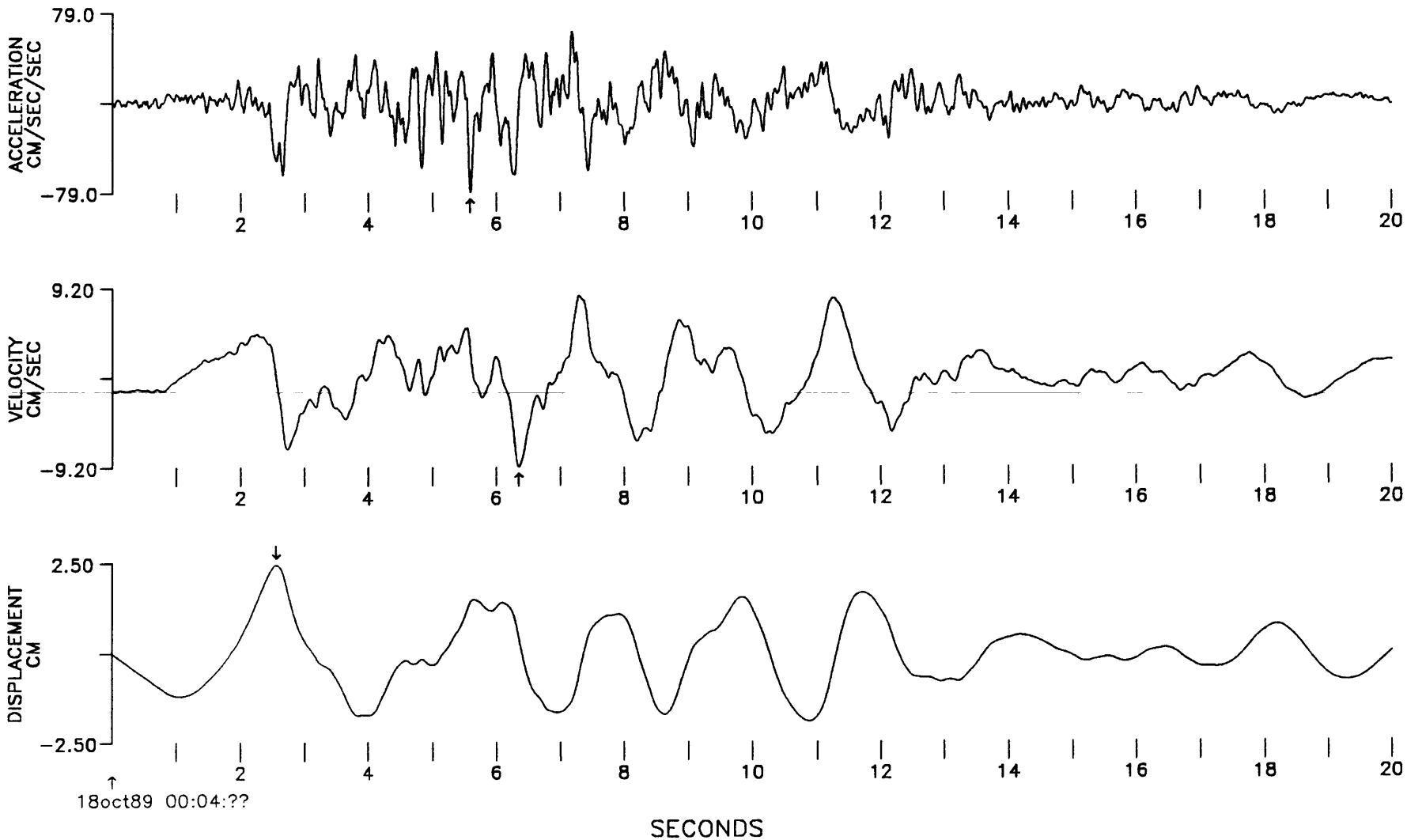
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
ANDERSON DAM – DOWNSTREAM
250 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= 238.84 CM/SEC/SEC, VELOCITY= 17.95 CM/SEC, DISPL= 3.76 CM



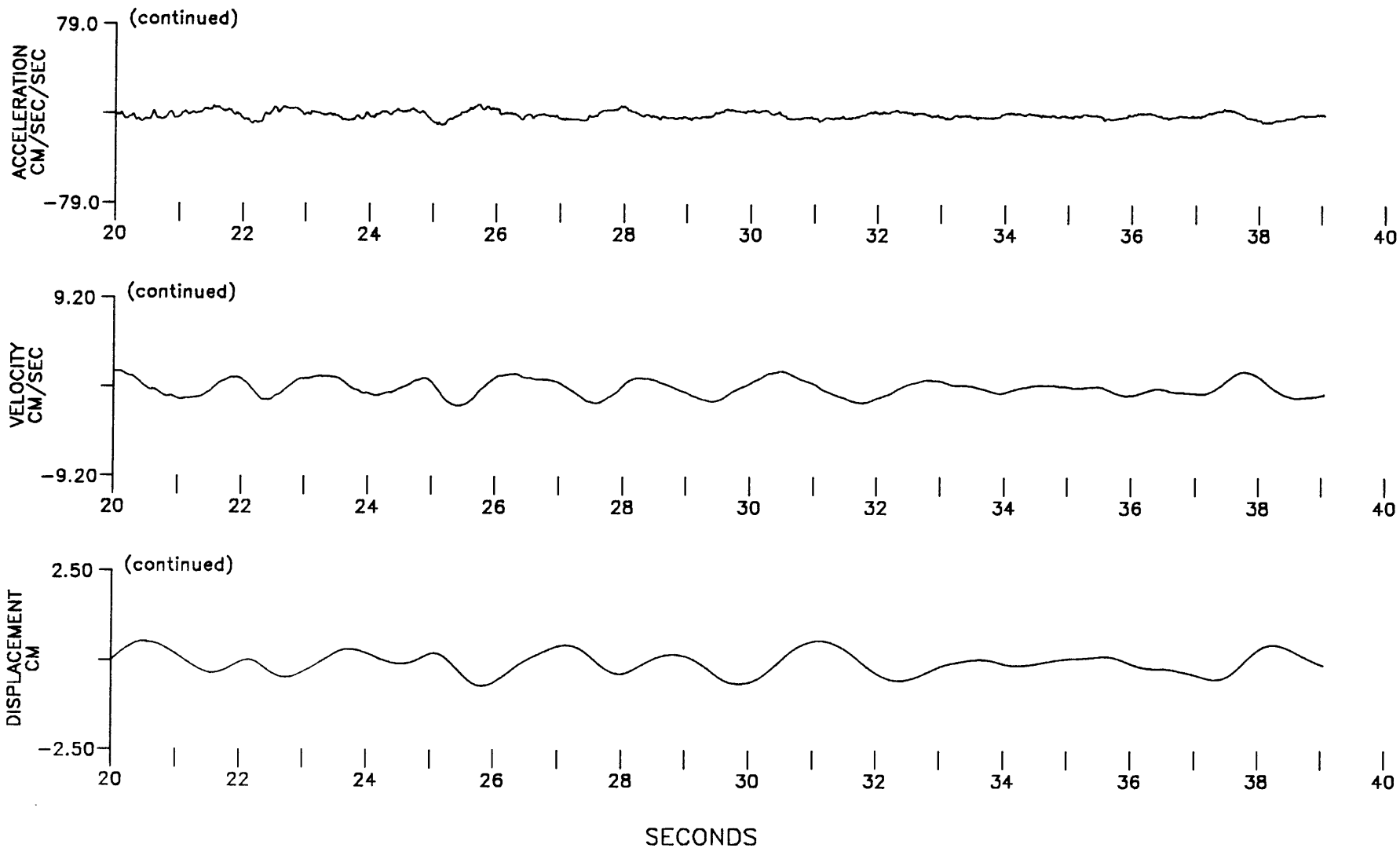
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
ANDERSON DAM – DOWNSTREAM
250 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= 238.84 CM/SEC/SEC, VELOCITY= 17.95 CM/SEC, DISPL= 3.76 CM



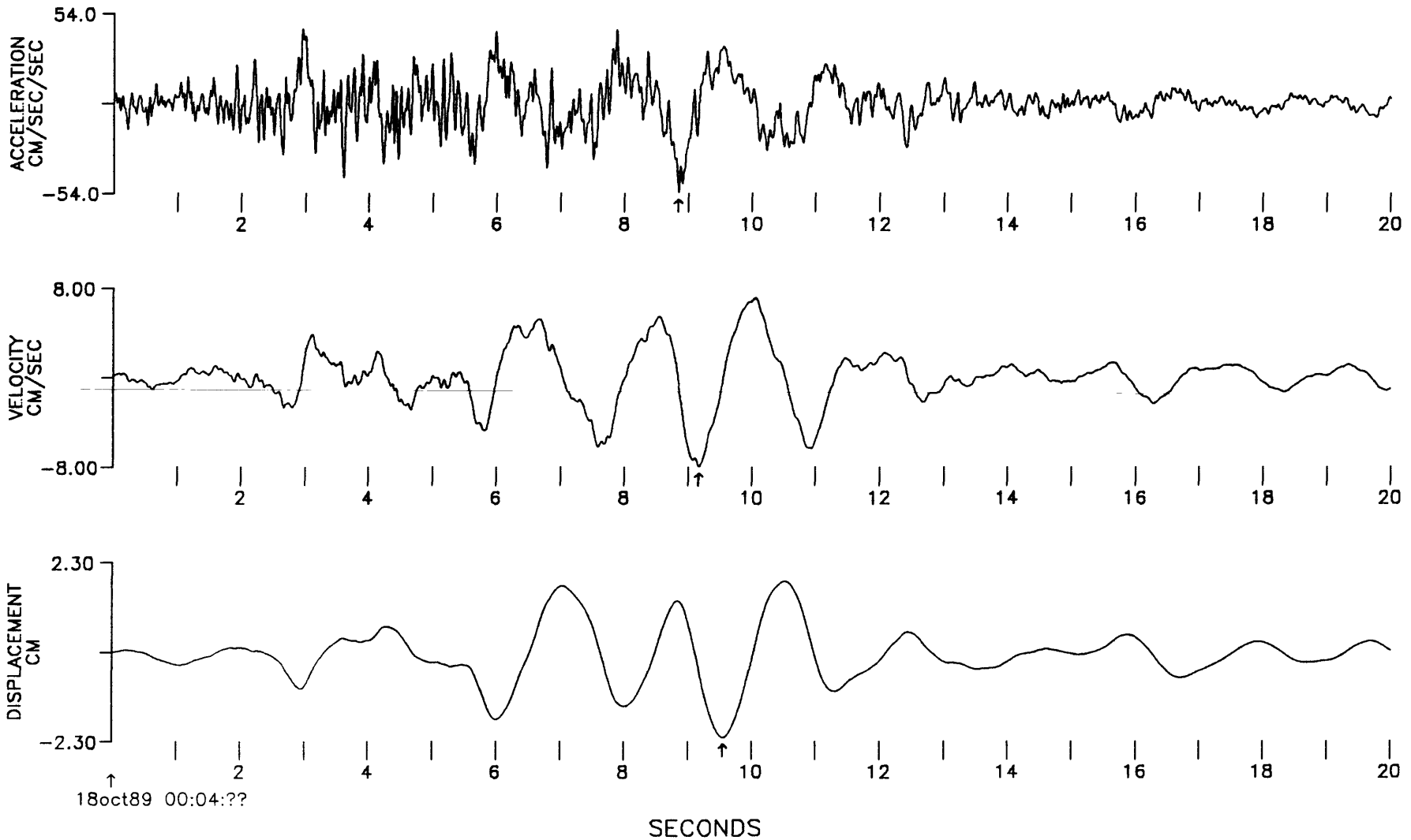
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
ANDERSON DAM - LEFT ABUTMENT
340 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
HI-PASS BUTTERWORTH AT .25 HZ, ORDER 4, LO-PAS FFT AT 25-30 HZ
PEAK VALUES: ACCEL= -78.88 CM/SEC/SEC, VELOCITY= -9.14 CM/SEC, DISPL= 2.45 CM



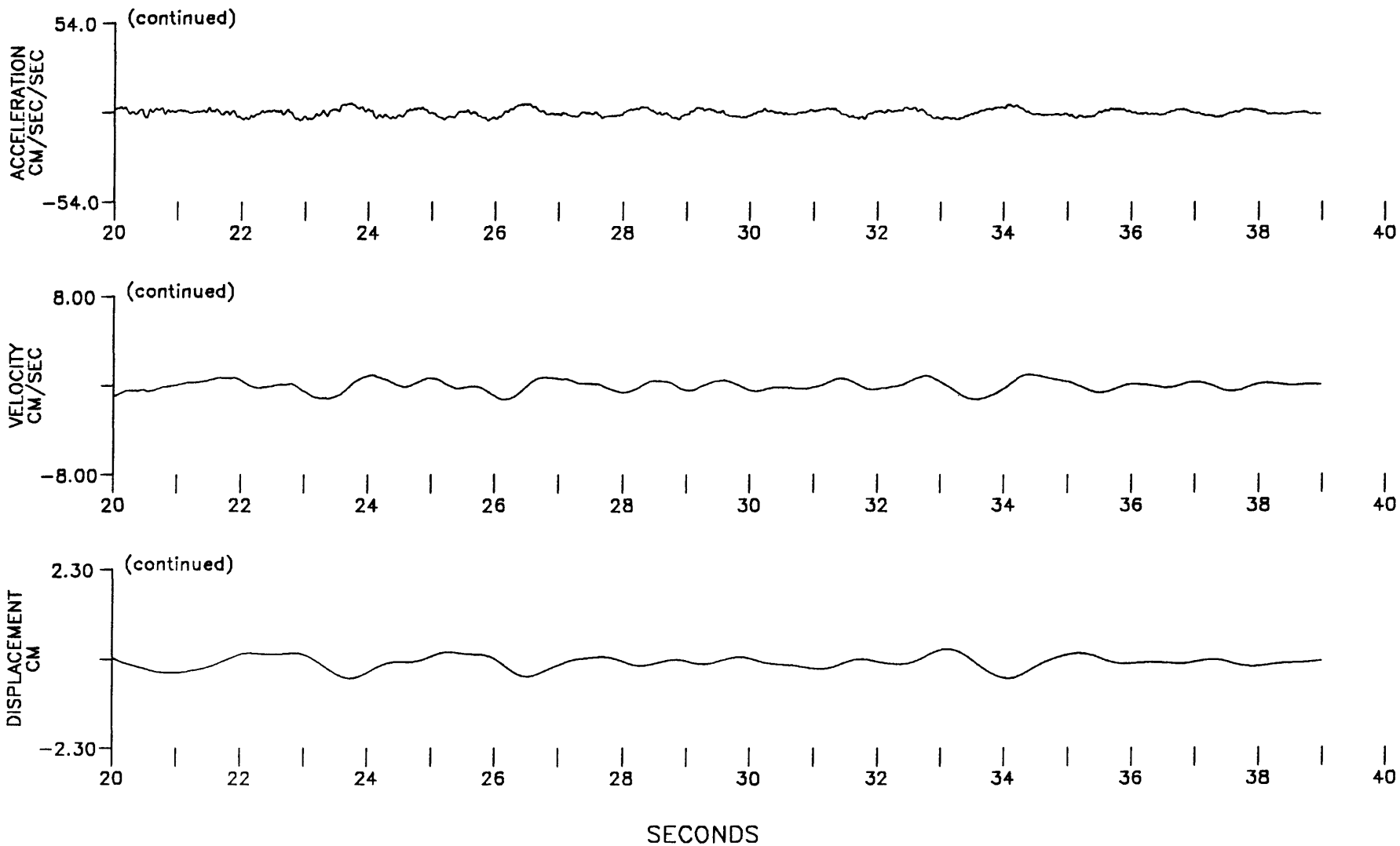
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
ANDERSON DAM - LEFT ABUTMENT
340 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
HI-PASS BUTTERWORTH AT .25 HZ, ORDER 4, LO-PAS FFT AT 25-30 HZ
PEAK VALUES: ACCEL= -78.88 CM/SEC/SEC, VELOCITY= -9.14 CM/SEC, DISPL= 2.45 CM



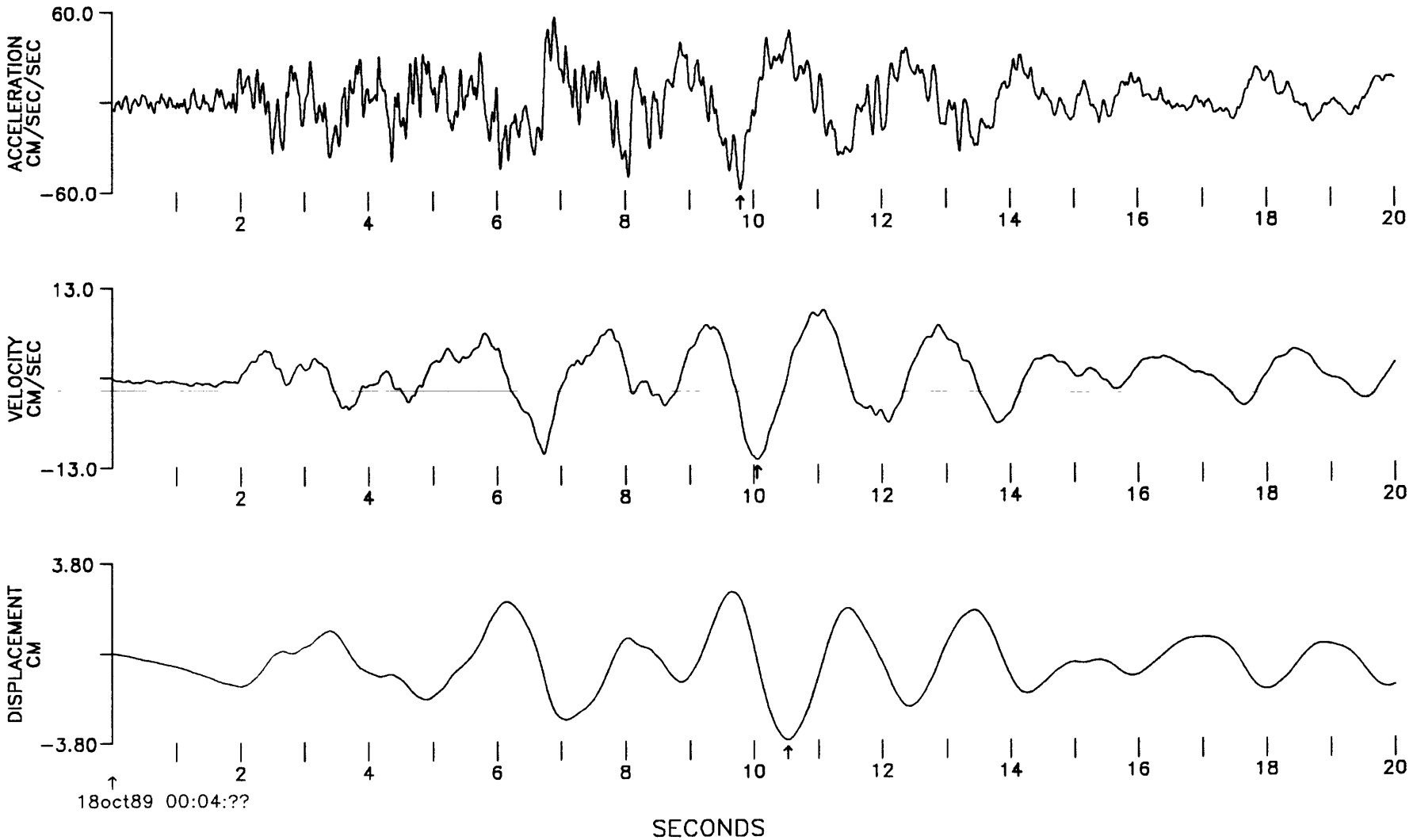
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
ANDERSON DAM – LEFT ABUTMENT
UP
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
HI-PASS BUTTERWORTH AT .25 HZ, ORDER 4, LO-PAS FFT AT 25-30 HZ
PEAK VALUES: ACCEL= -53.63 CM/SEC/SEC, VELOCITY= -7.96 CM/SEC, DISPL= -2.20 CM



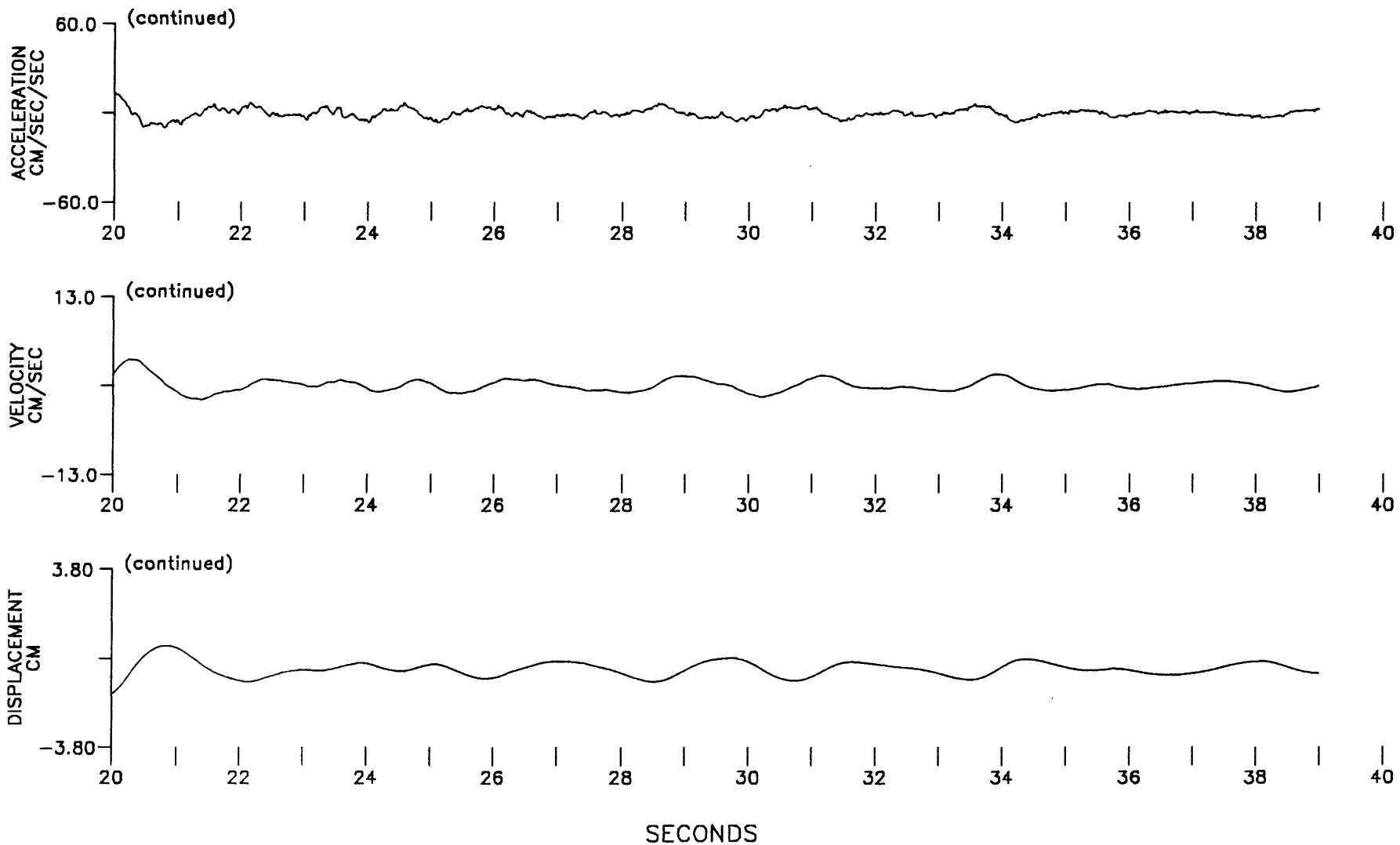
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
ANDERSON DAM - LEFT ABUTMENT
UP
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
HI-PASS BUTTERWORTH AT .25 HZ, ORDER 4, LO-PAS FFT AT 25-30 HZ
PEAK VALUES: ACCEL= -53.63 CM/SEC/SEC, VELOCITY= -7.96 CM/SEC, DISPL= -2.20 CM



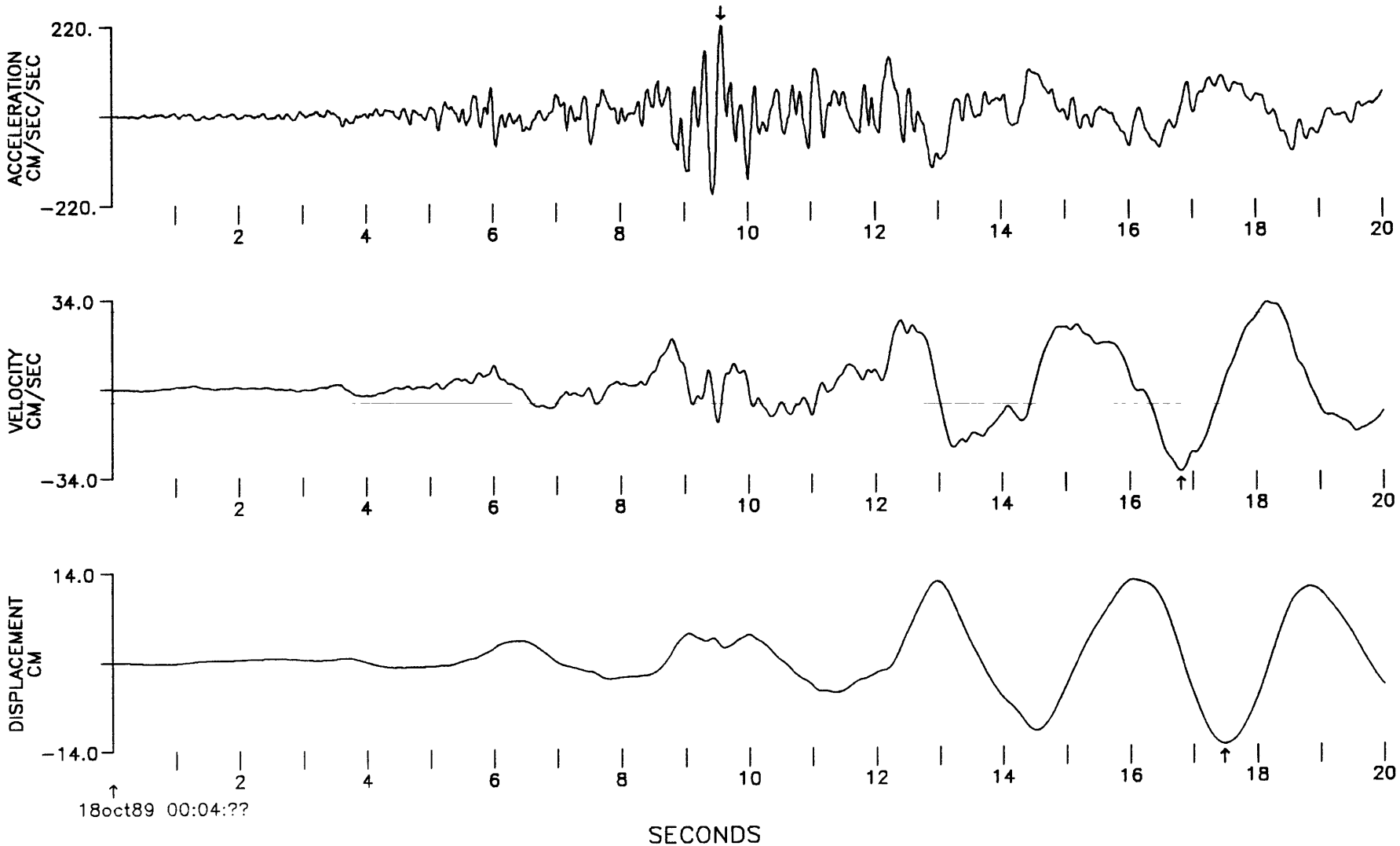
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
ANDERSON DAM - LEFT ABUTMENT
250 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
HI-PASS BUTTERWORTH AT .25 HZ, ORDER 4, LO-PAS FFT AT 25-30 HZ
PEAK VALUES: ACCEL= -59.71 CM/SEC/SEC, VELOCITY= -12.13 CM/SEC, DISPL= -3.77 CM



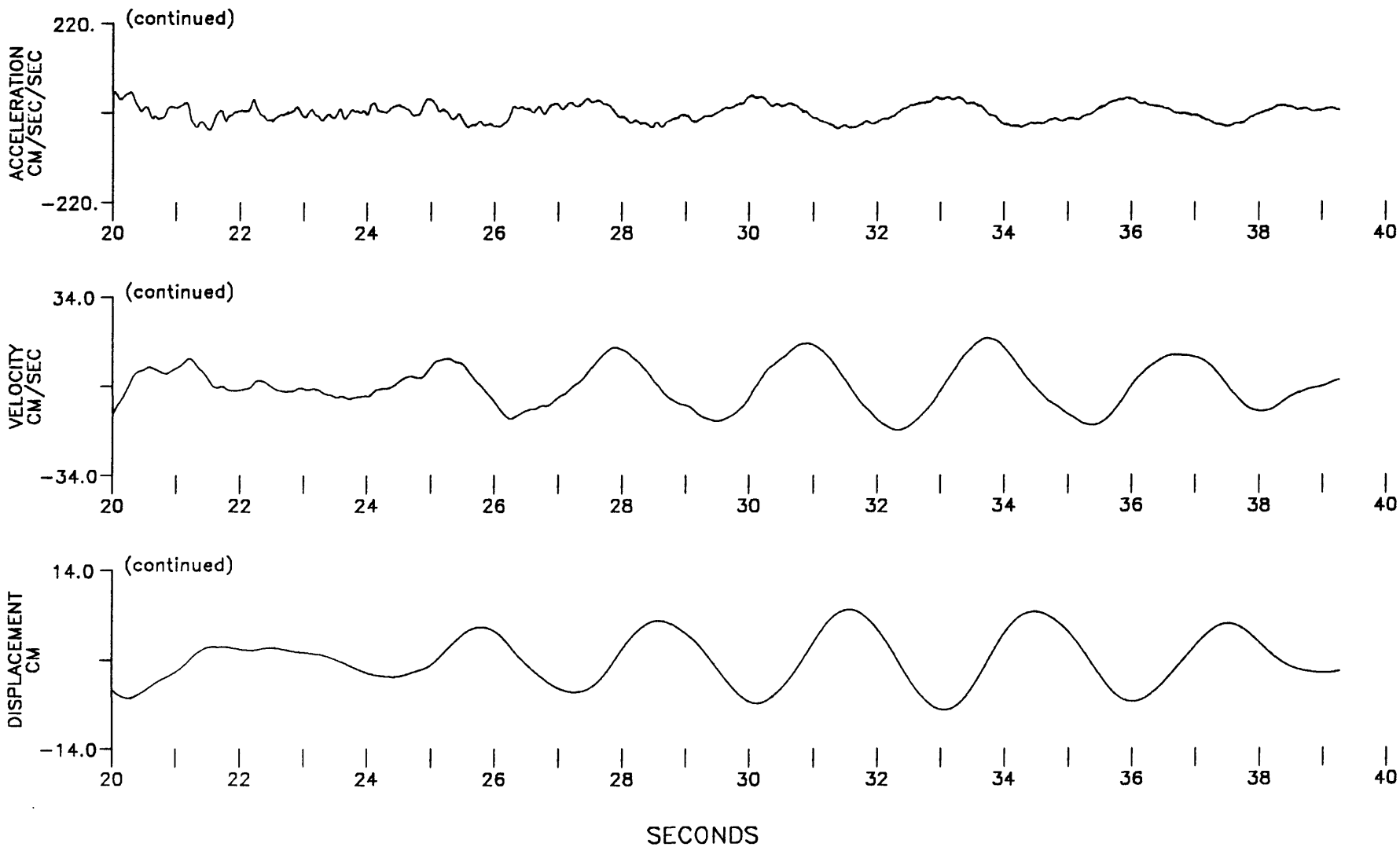
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
ANDERSON DAM - LEFT ABUTMENT
250 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
HI-PASS BUTTERWORTH AT .25 HZ, ORDER 4, LO-PAS FFT AT 25-30 HZ
PEAK VALUES: ACCEL= -59.71 CM/SEC/SEC, VELOCITY= -12.13 CM/SEC, DISPL= -3.77 CM



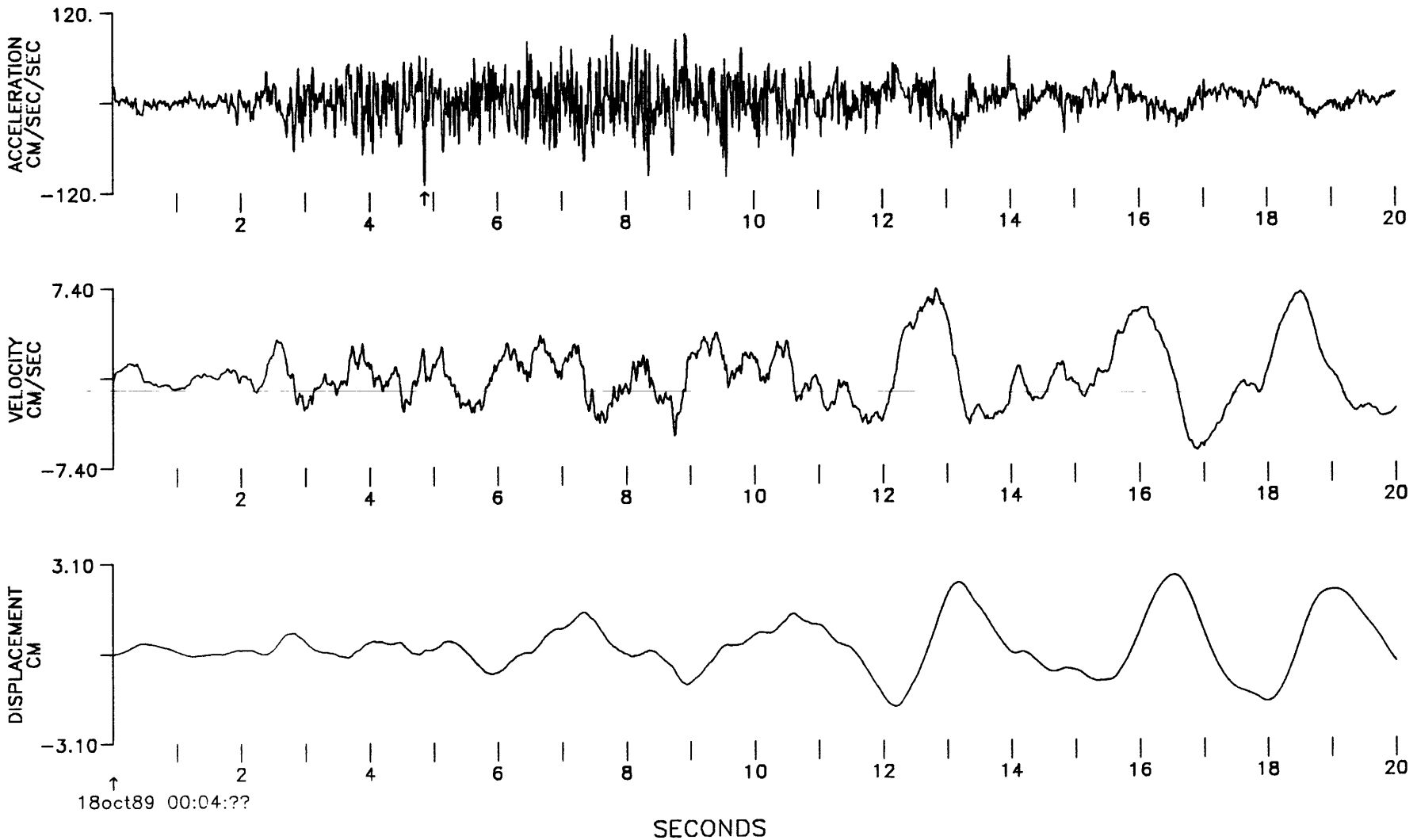
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SUNNYVALE - COLTON AVENUE
360 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
PEAK VALUES: ACCEL= 215.15 CM/SEC/SEC, VELOCITY= -33.43 CM/SEC, DISPL= -13.84 CM



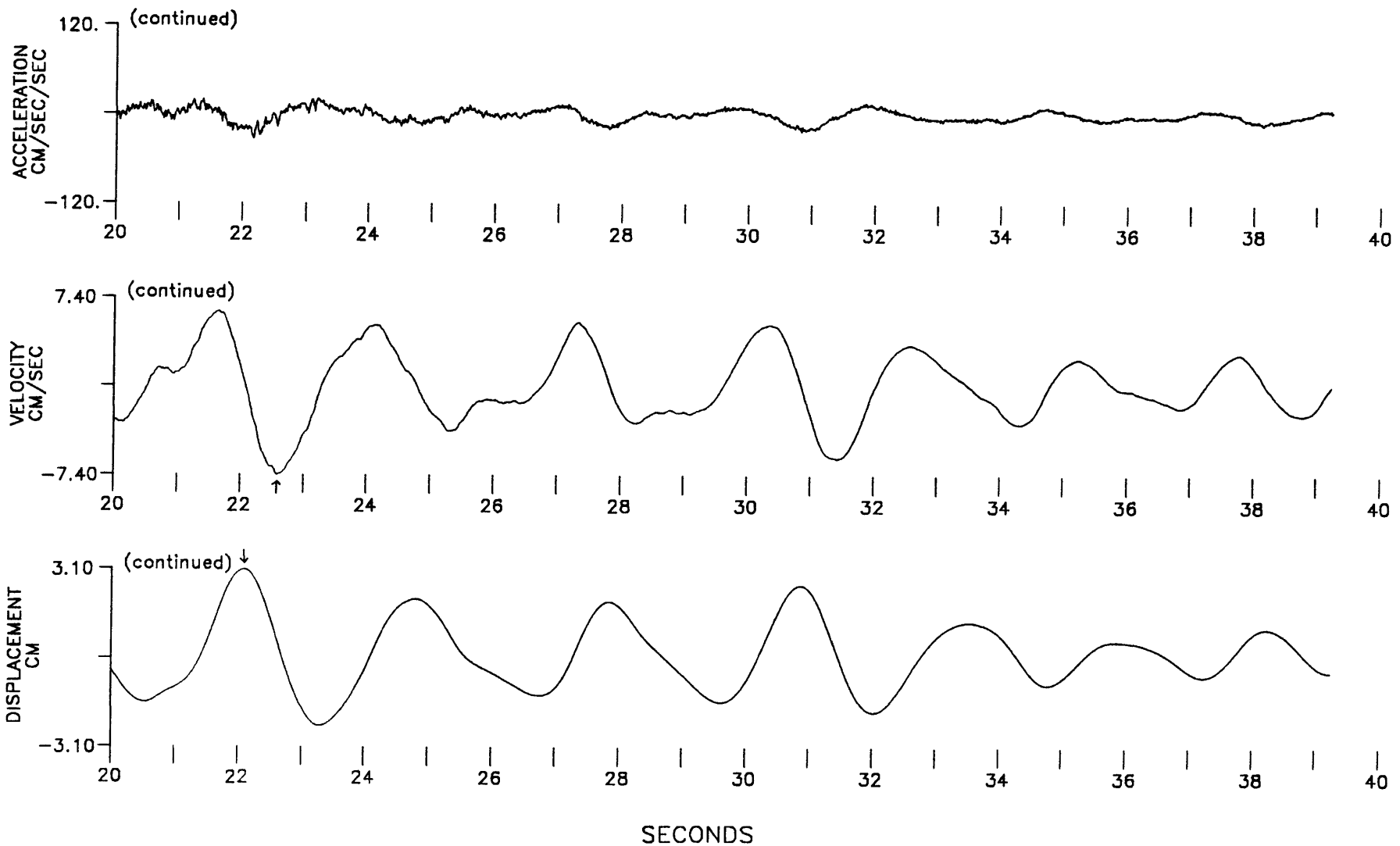
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SUNNYVALE - COLTON AVENUE
360 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
PEAK VALUES: ACCEL= 215.15 CM/SEC/SEC, VELOCITY= -33.43 CM/SEC, DISPL= -13.84 CM



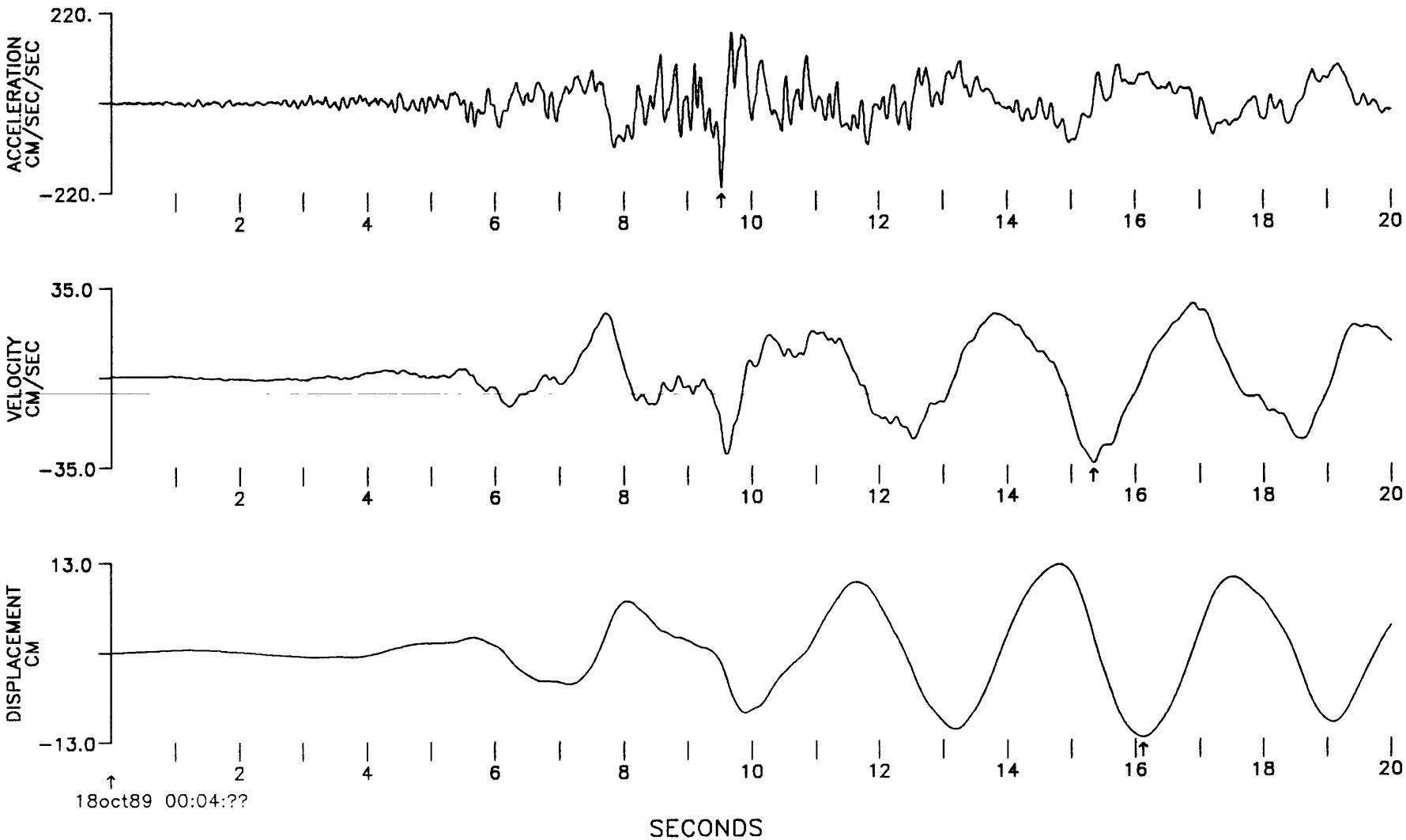
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SUNNYVALE - COLTON AVENUE
UP
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
PEAK VALUES: ACCEL= -110.83 CM/SEC/SEC, VELOCITY= -7.39 CM/SEC, DISPL= 3.08 CM



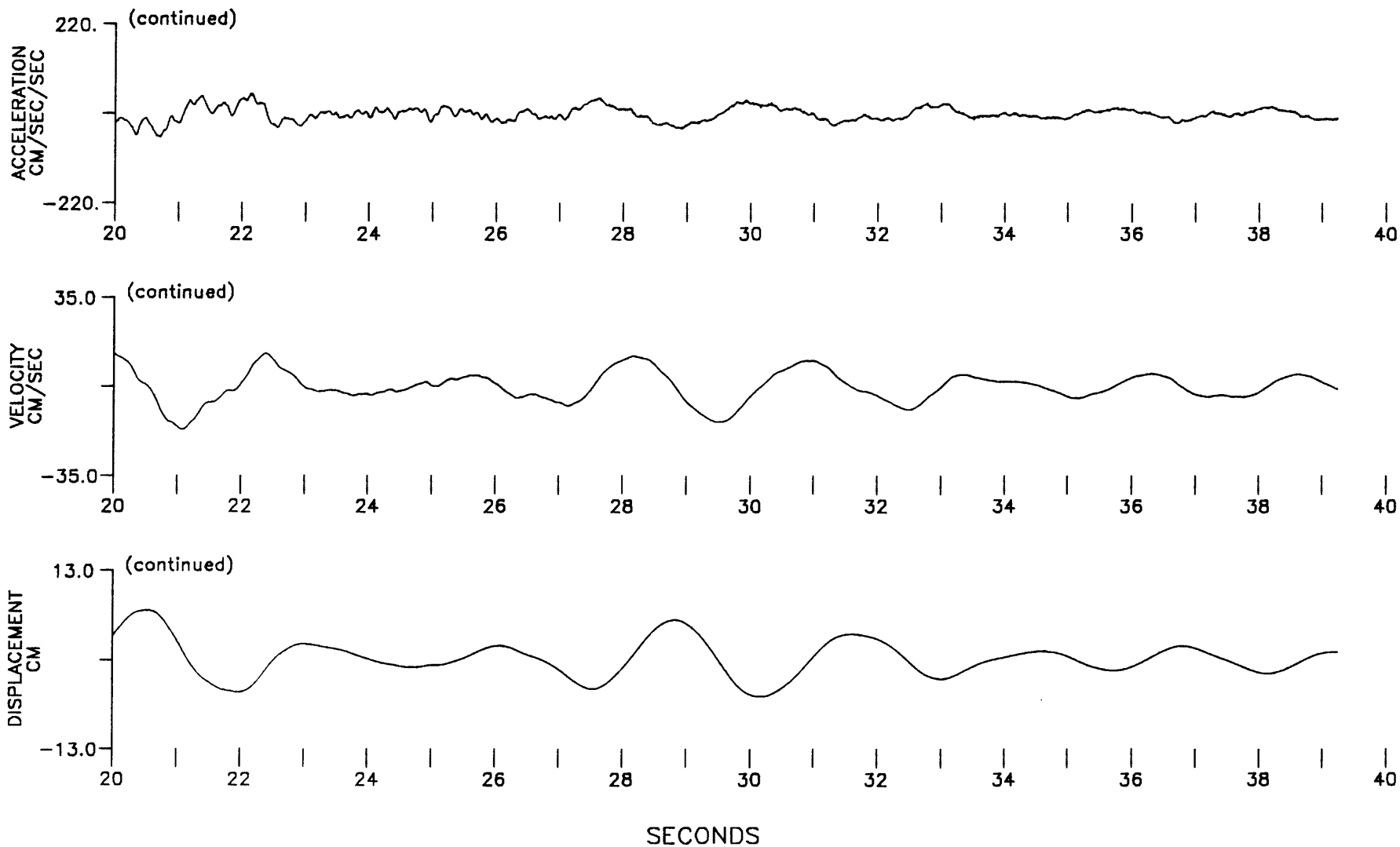
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SUNNYVALE - COLTON AVENUE
UP
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
PEAK VALUES: ACCEL= -110.83 CM/SEC/SEC, VELOCITY= -7.39 CM/SEC, DISPL= 3.08 CM



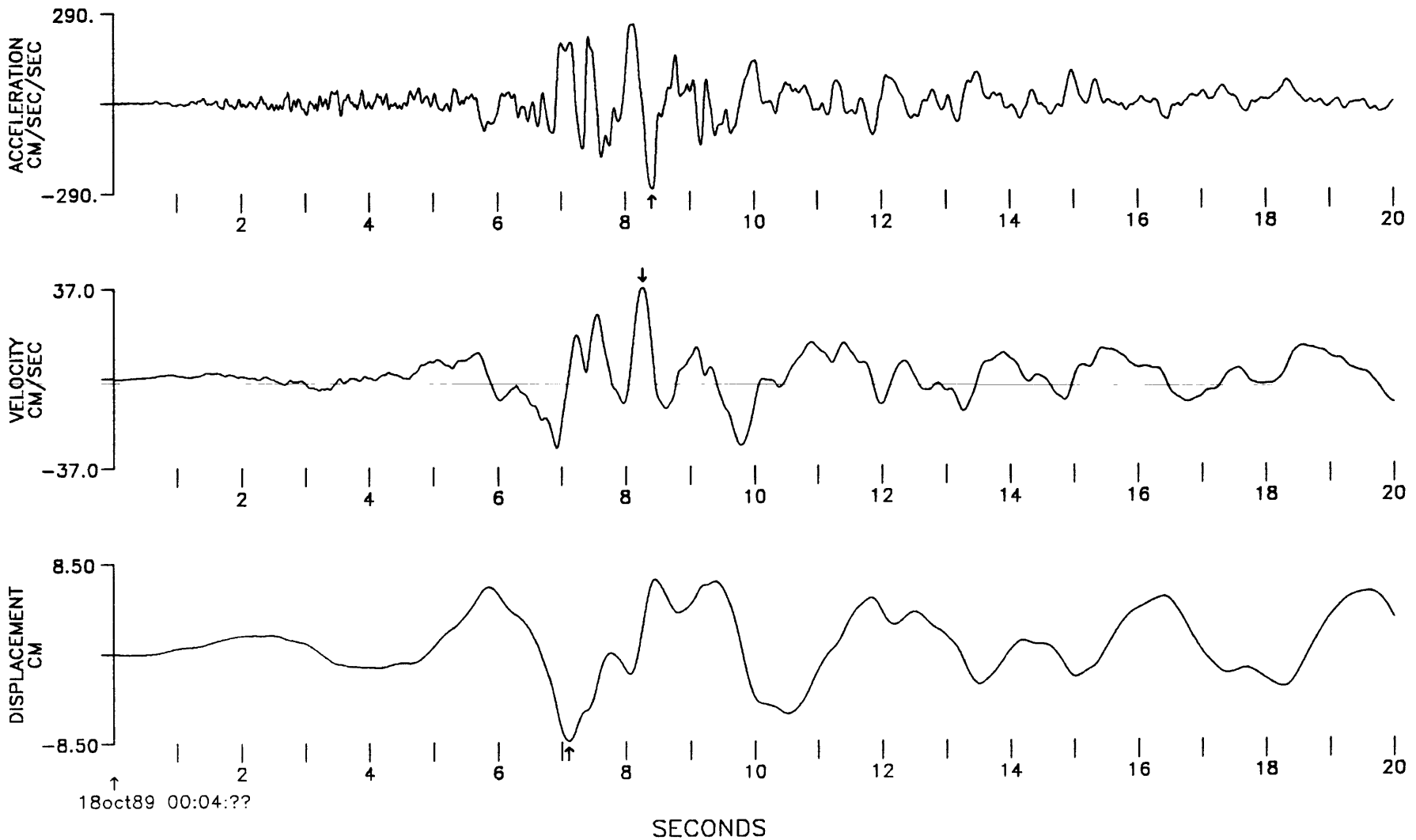
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SUNNYVALE - COLTON AVENUE
270 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
PEAK VALUES: ACCEL= -210.36 CM/SEC/SEC, VELOCITY= -34.08 CM/SEC, DISPL= -12.64 CM



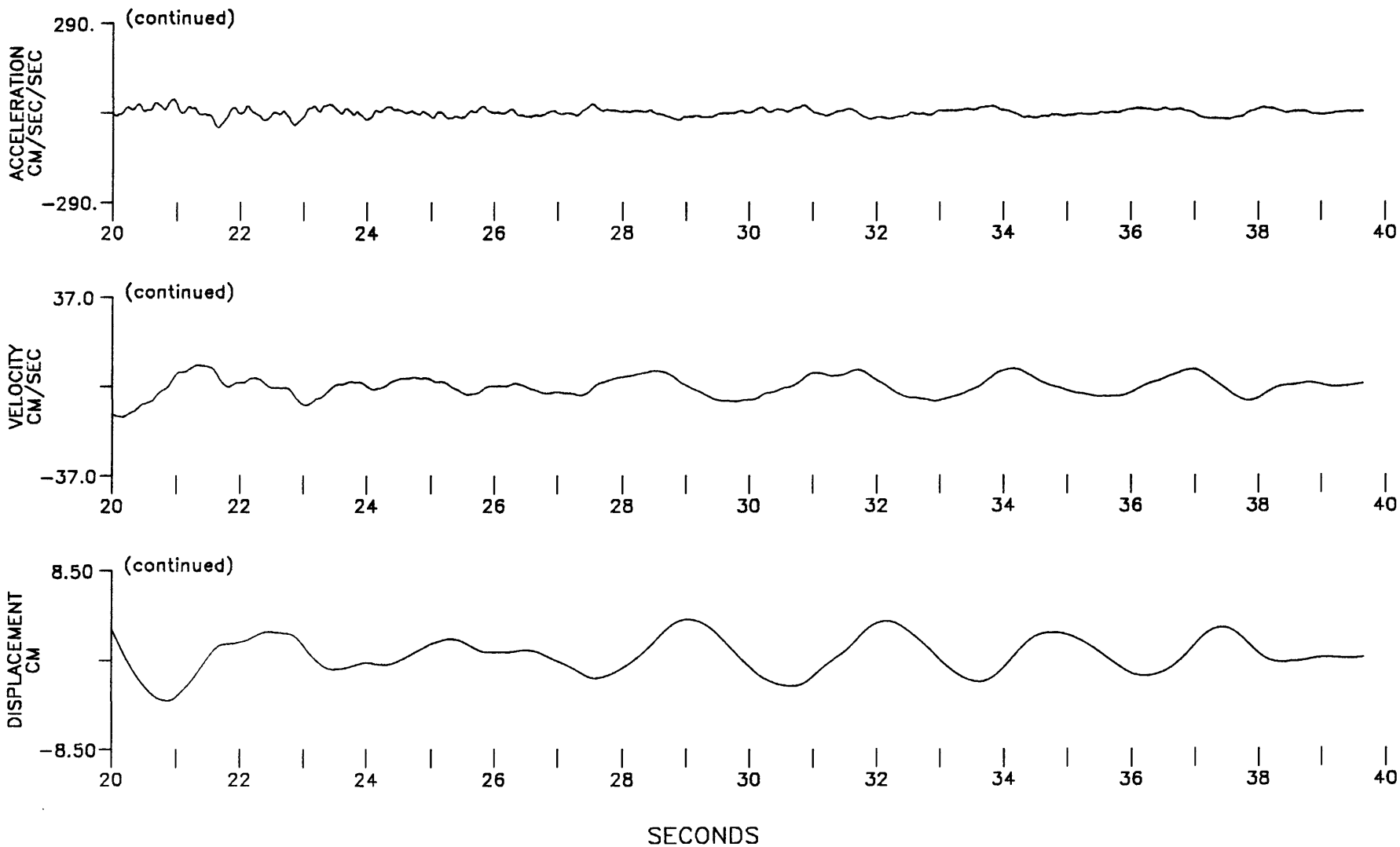
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SUNNYVALE - COLTON AVENUE
270 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
PEAK VALUES: ACCEL= -210.36 CM/SEC/SEC, VELOCITY= -34.08 CM/SEC, DISPL= -12.64 CM



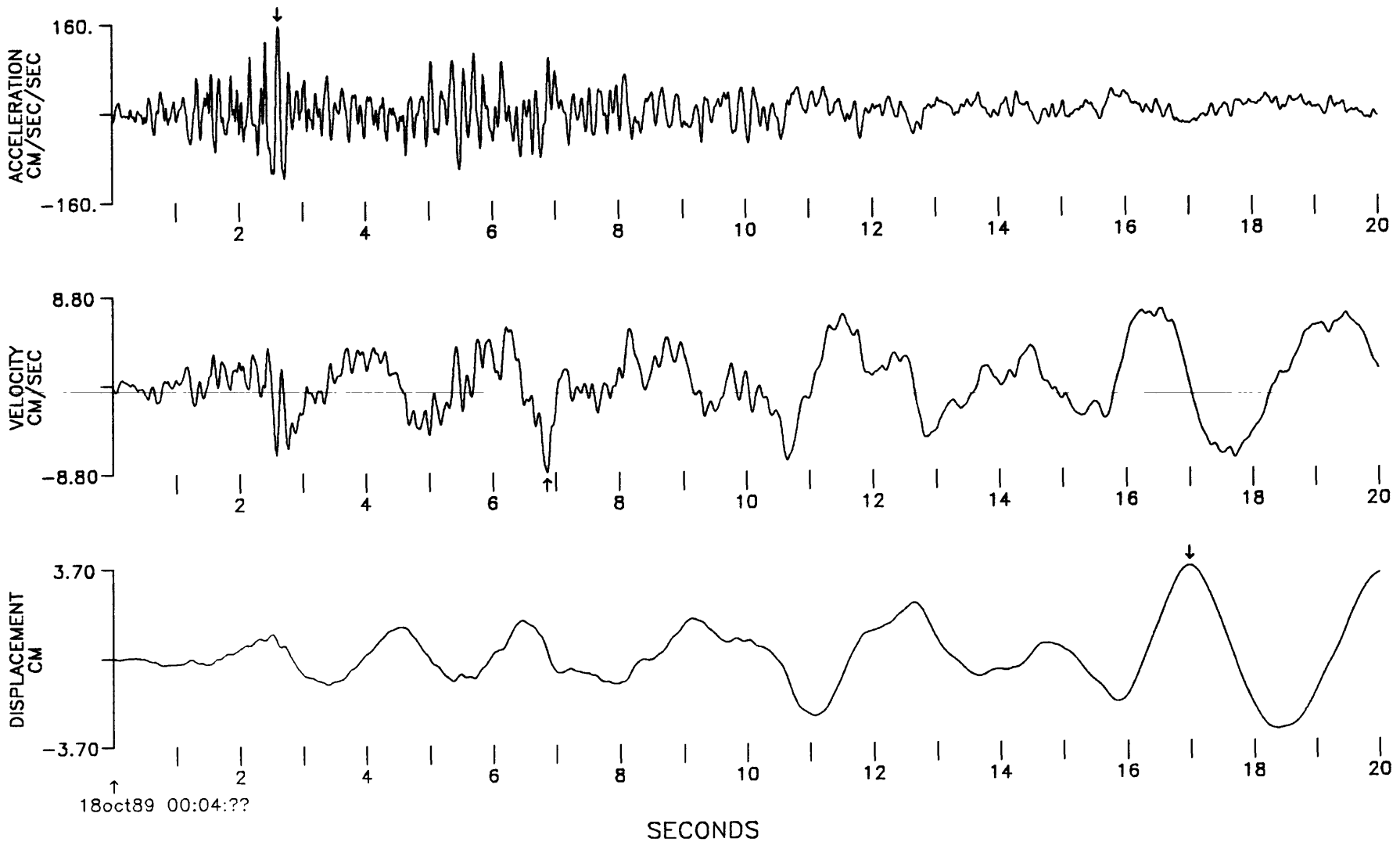
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
HOLLISTER AIRPORT (DIFFERENTIAL ARRAY)
255 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
PEAK VALUES: ACCEL= −281.42 CM/SEC/SEC, VELOCITY= 36.62 CM/SEC, DISPL= −8.42 CM



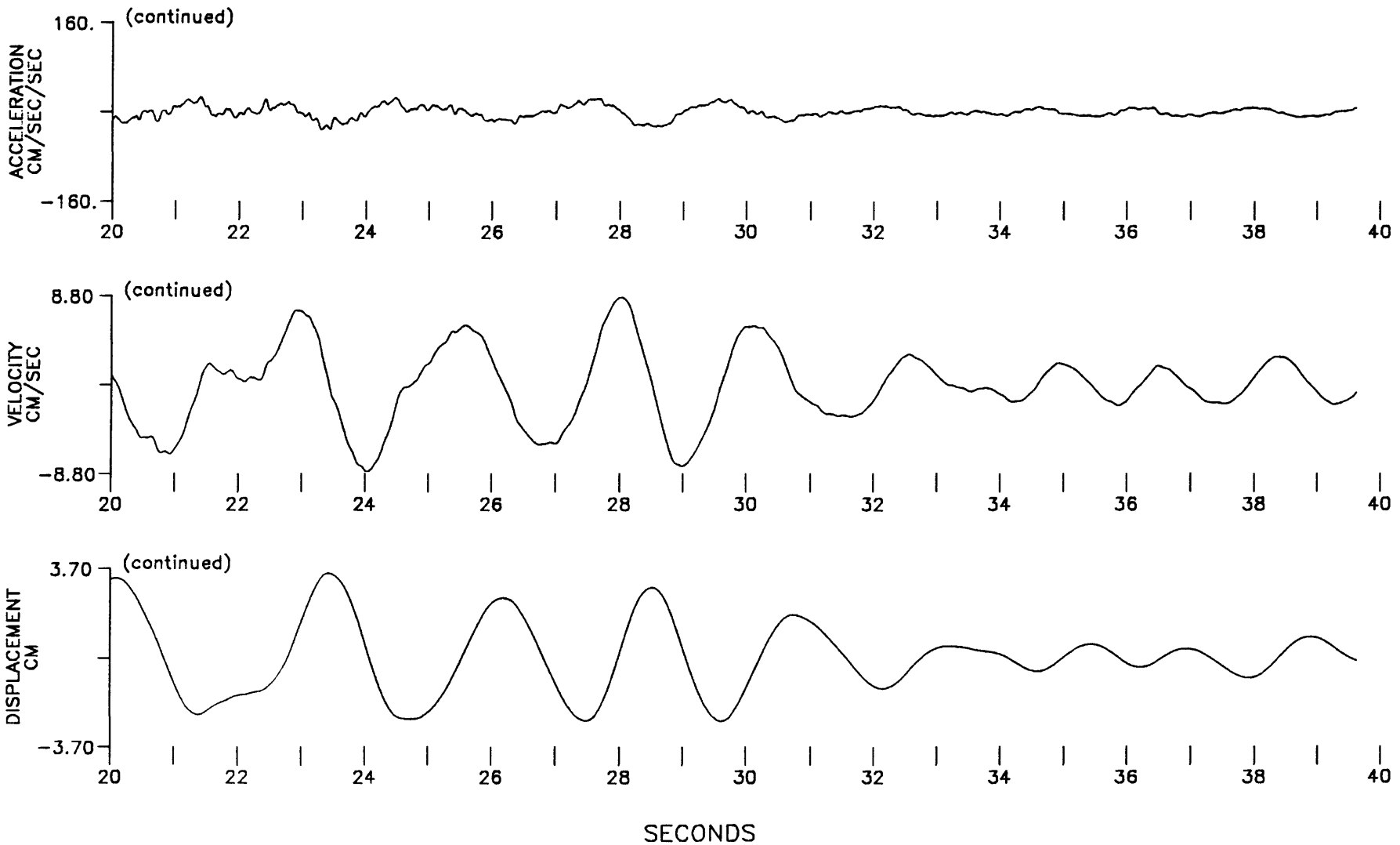
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
HOLLISTER AIRPORT (DIFFERENTIAL ARRAY)
255 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
PEAK VALUES: ACCEL= −281.42 CM/SEC/SEC, VELOCITY= 36.62 CM/SEC, DISPL= −8.42 CM



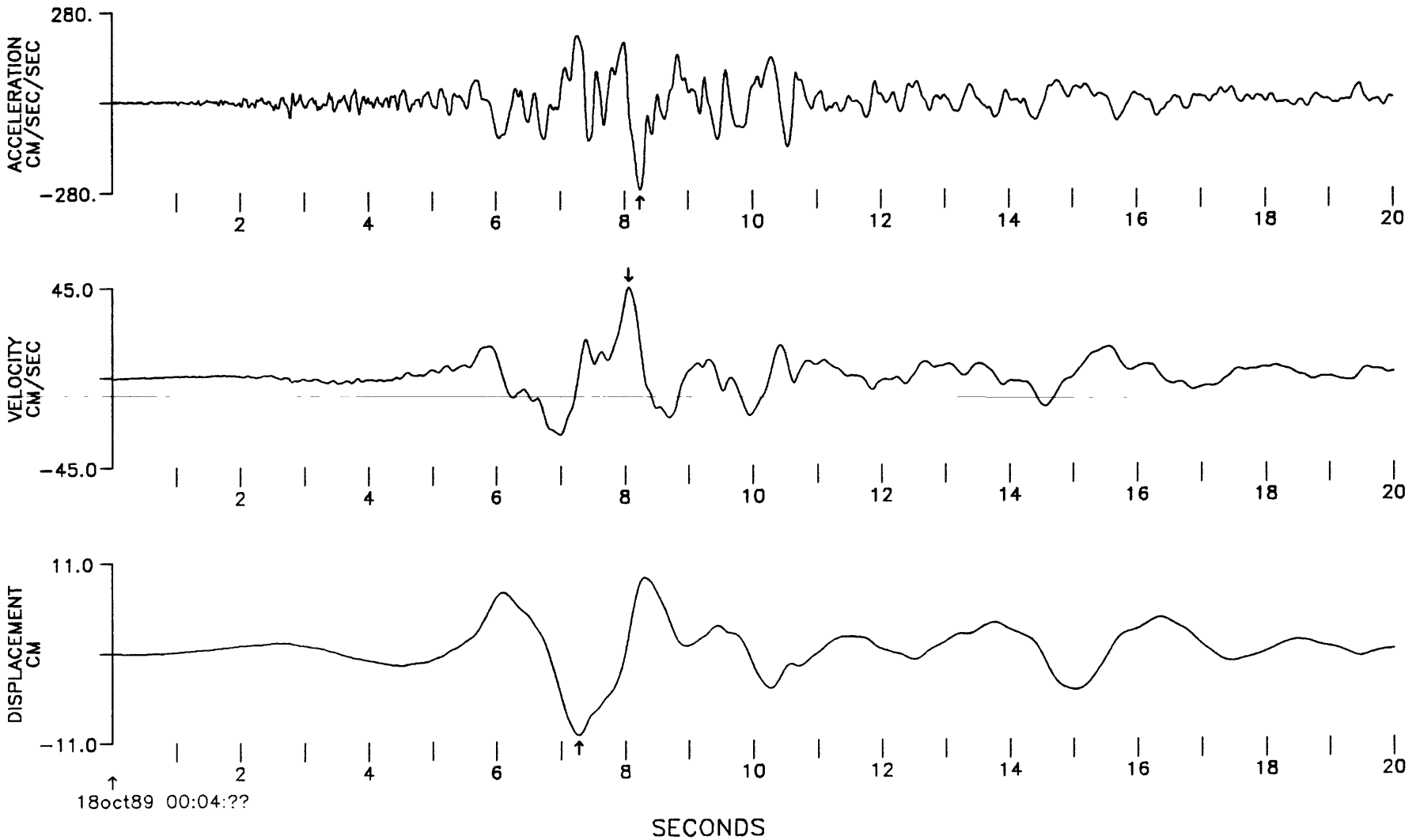
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
HOLLISTER AIRPORT (DIFFERENTIAL ARRAY)
UP
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
PEAK VALUES: ACCEL= 155.69 CM/SEC/SEC, VELOCITY= −8.74 CM/SEC, DISPL= 3.60 CM



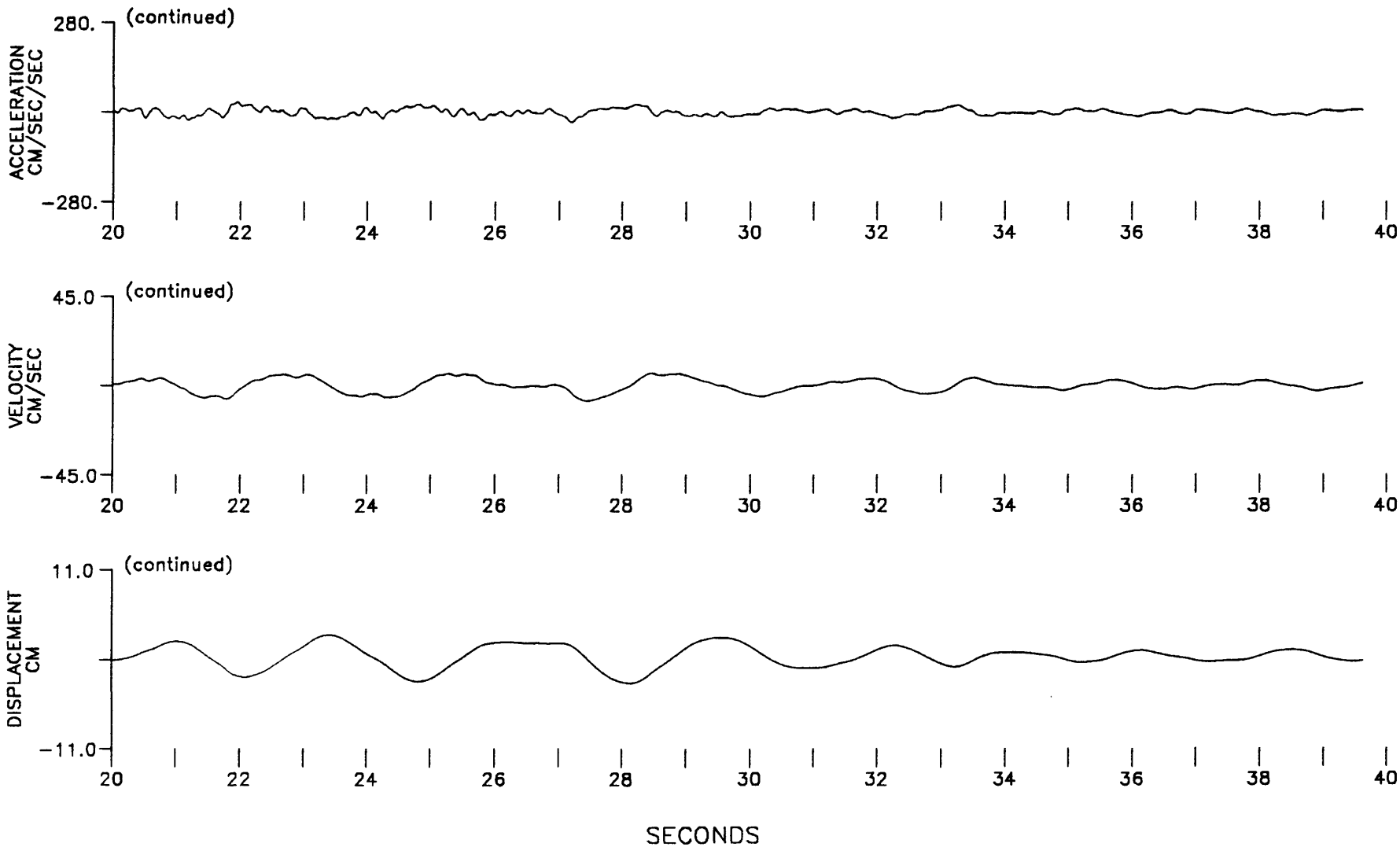
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
HOLLISTER AIRPORT (DIFFERENTIAL ARRAY)
UP
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
PEAK VALUES: ACCEL= 155.69 CM/SEC/SEC, VELOCITY= -8.74 CM/SEC, DISPL= 3.60 CM



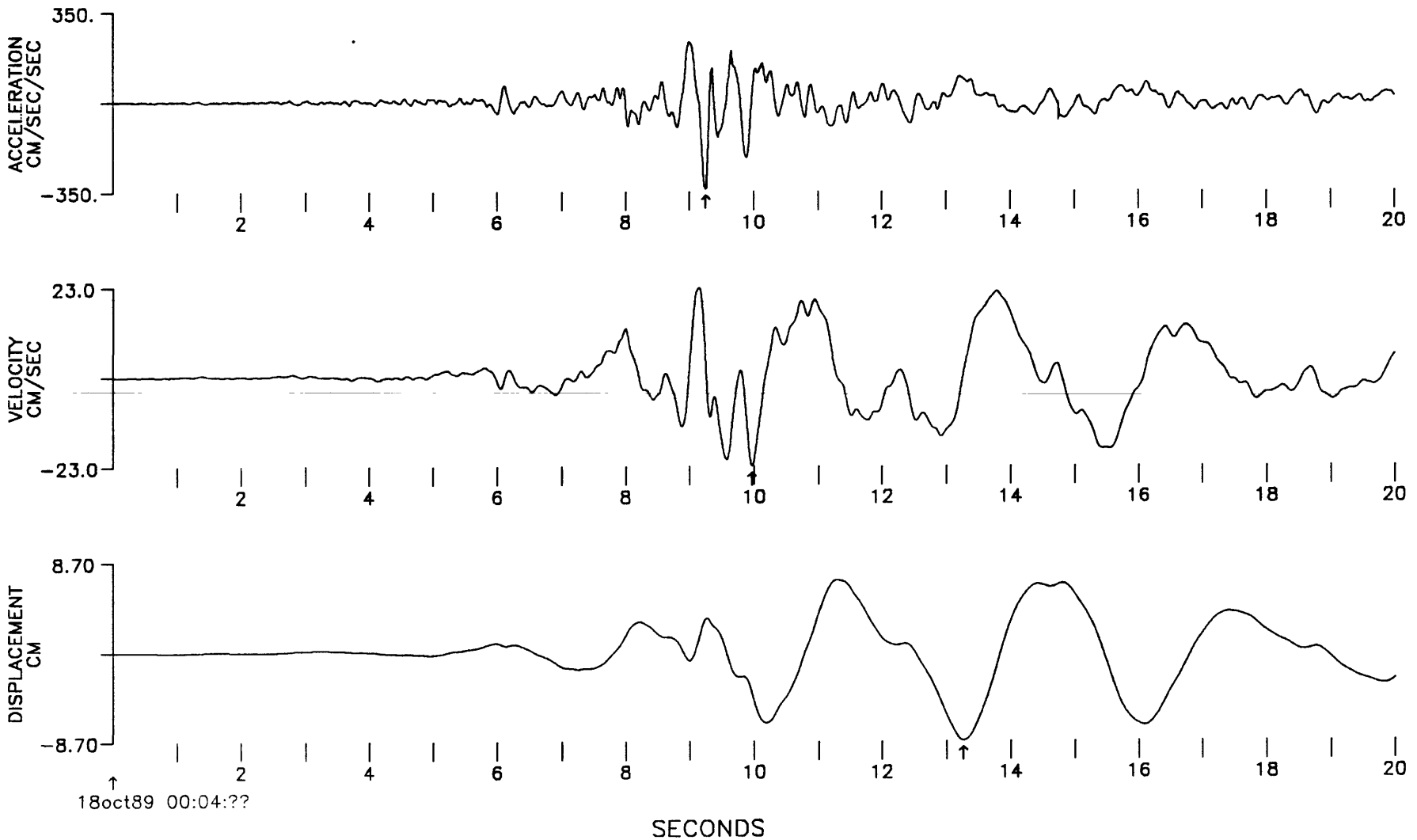
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
HOLLISTER AIRPORT (DIFFERENTIAL ARRAY)
165 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
PEAK VALUES: ACCEL= −276.98 CM/SEC/SEC, VELOCITY= 44.39 CM/SEC, DISPL= −10.23 CM



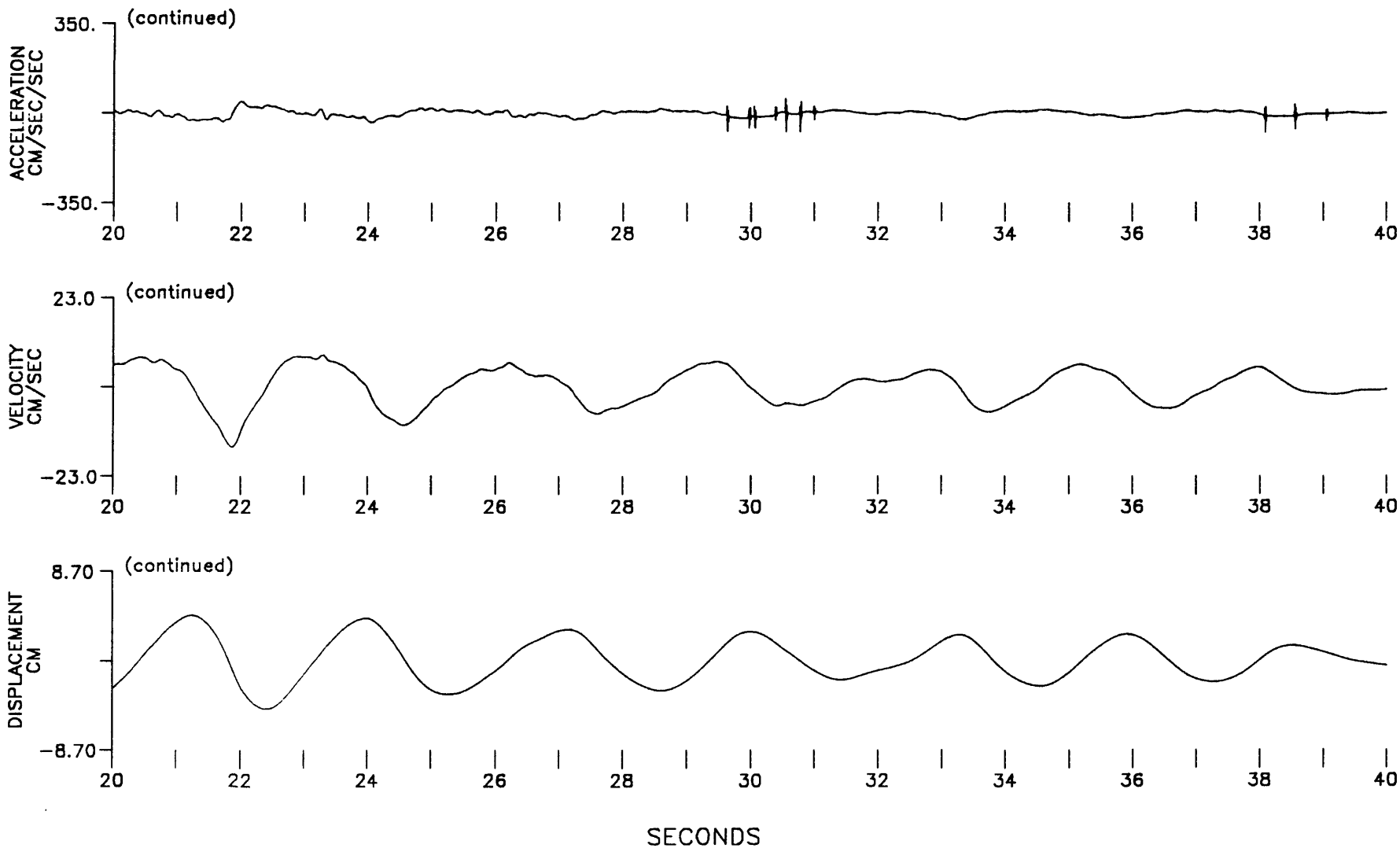
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
HOLLISTER AIRPORT (DIFFERENTIAL ARRAY)
165 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
PEAK VALUES: ACCEL= -276.98 CM/SEC/SEC, VELOCITY= 44.39 CM/SEC, DISPL= -10.23 CM



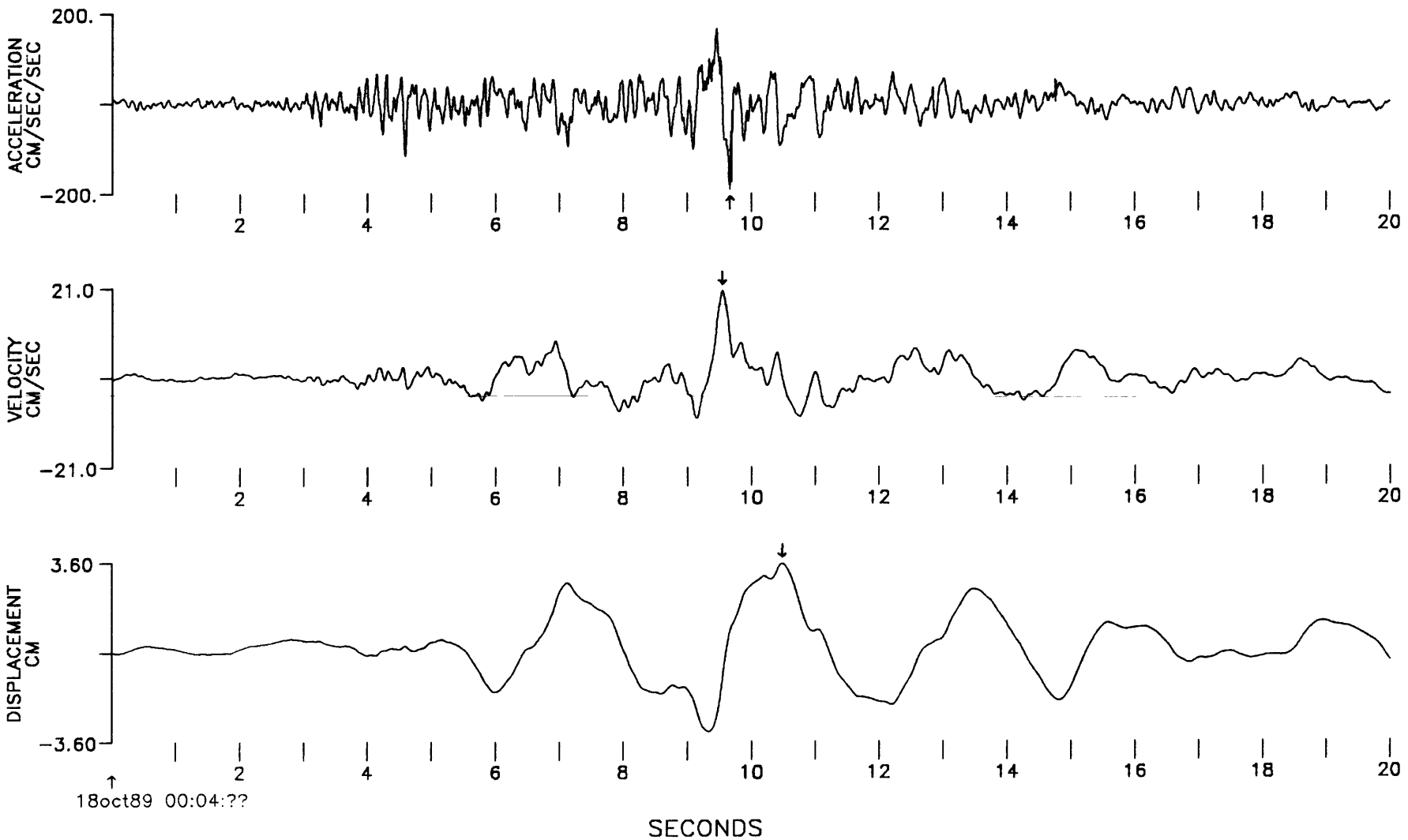
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
PALO ALTO VA HOSPITAL - BLDG 1, BASEMENT
302 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= -341.53 CM/SEC/SEC, VELOCITY= -22.96 CM/SEC, DISPL= -8.64 CM



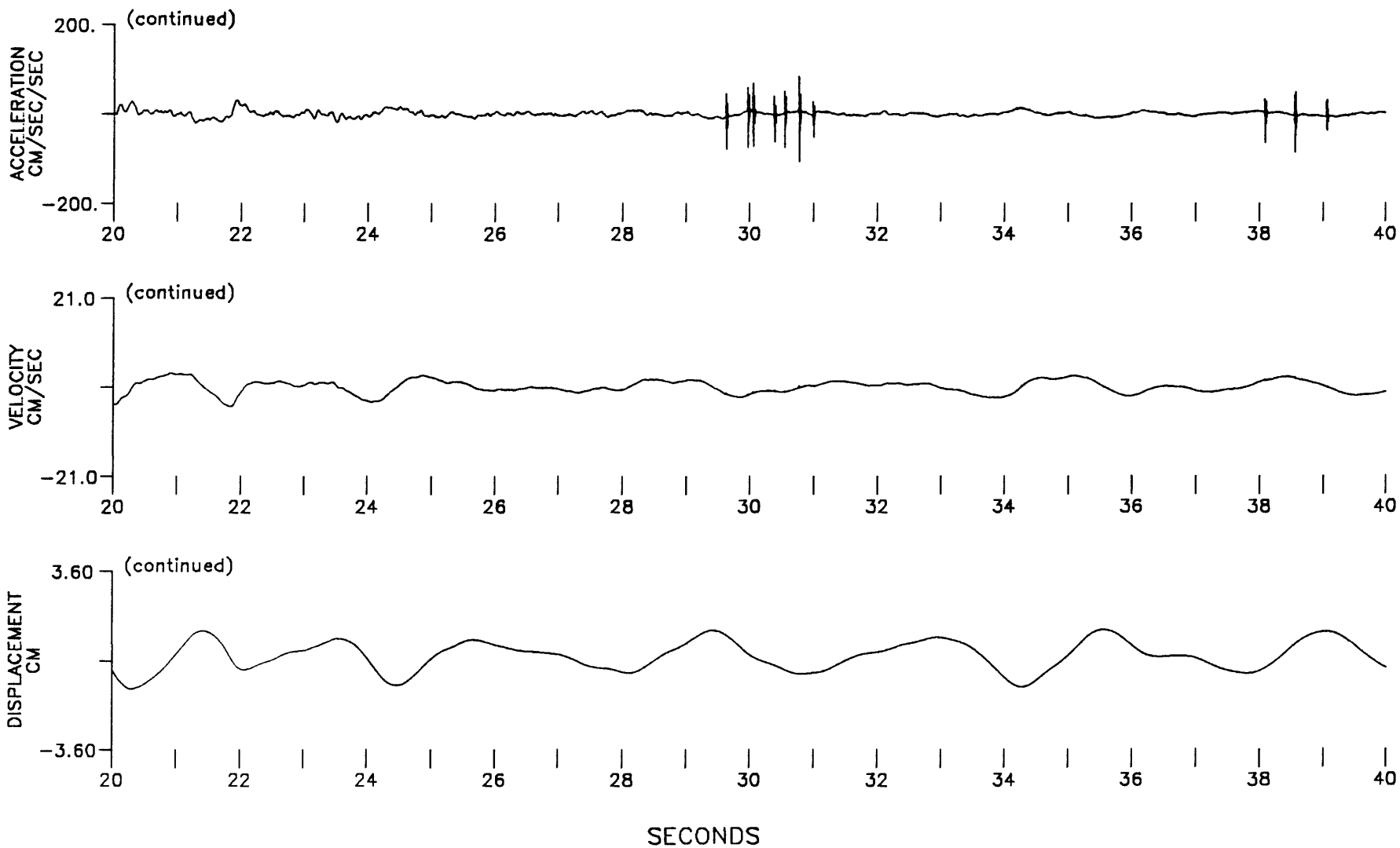
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
PALO ALTO VA HOSPITAL - BLDG 1, BASEMENT
302 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= -341.53 CM/SEC/SEC, VELOCITY= -22.96 CM/SEC, DISPL= -8.64 CM



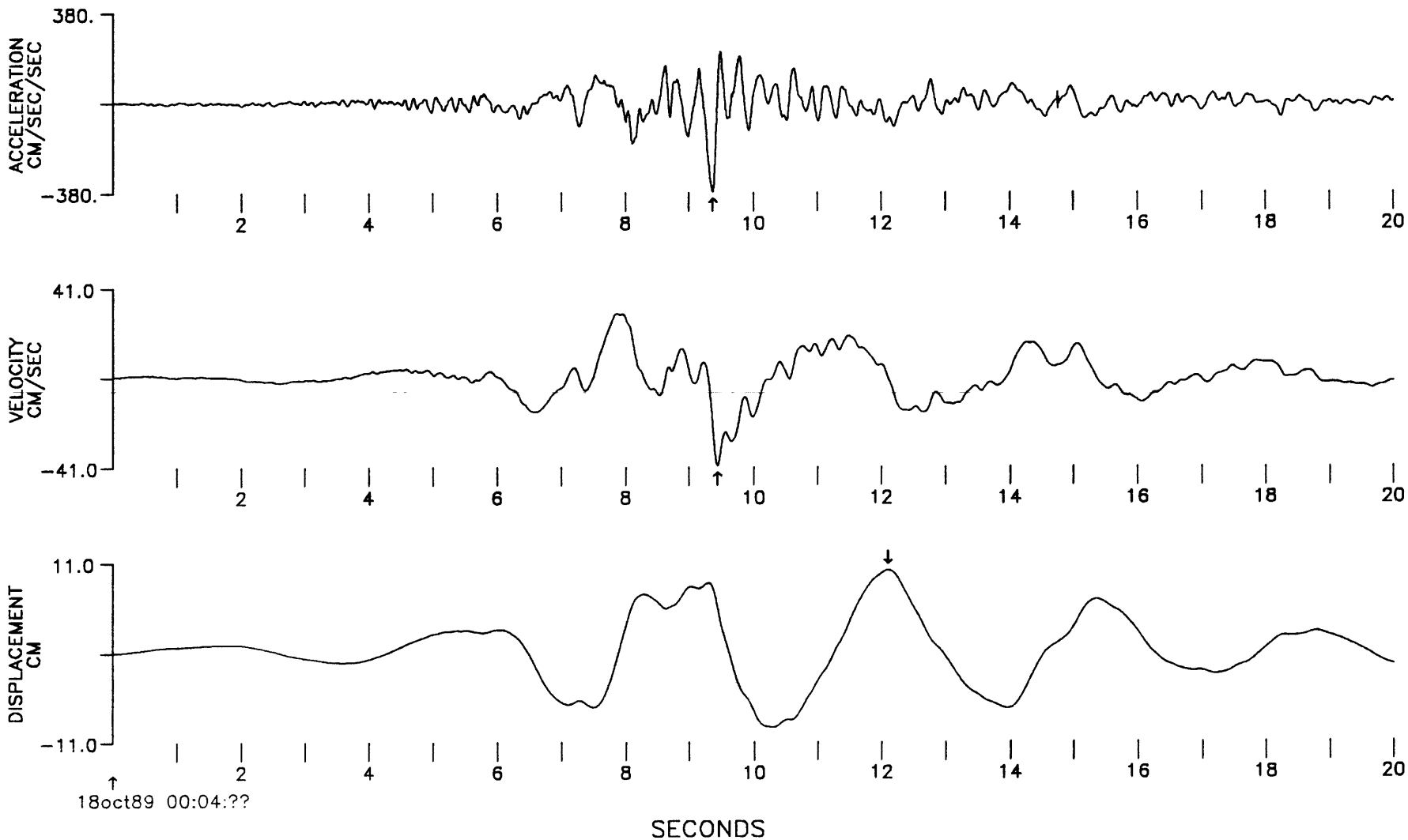
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
PALO ALTO VA HOSPITAL - BLDG 1, BASEMENT
UP
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= -192.99 CM/SEC/SEC, VELOCITY= 20.33 CM/SEC, DISPL= 3.55 CM



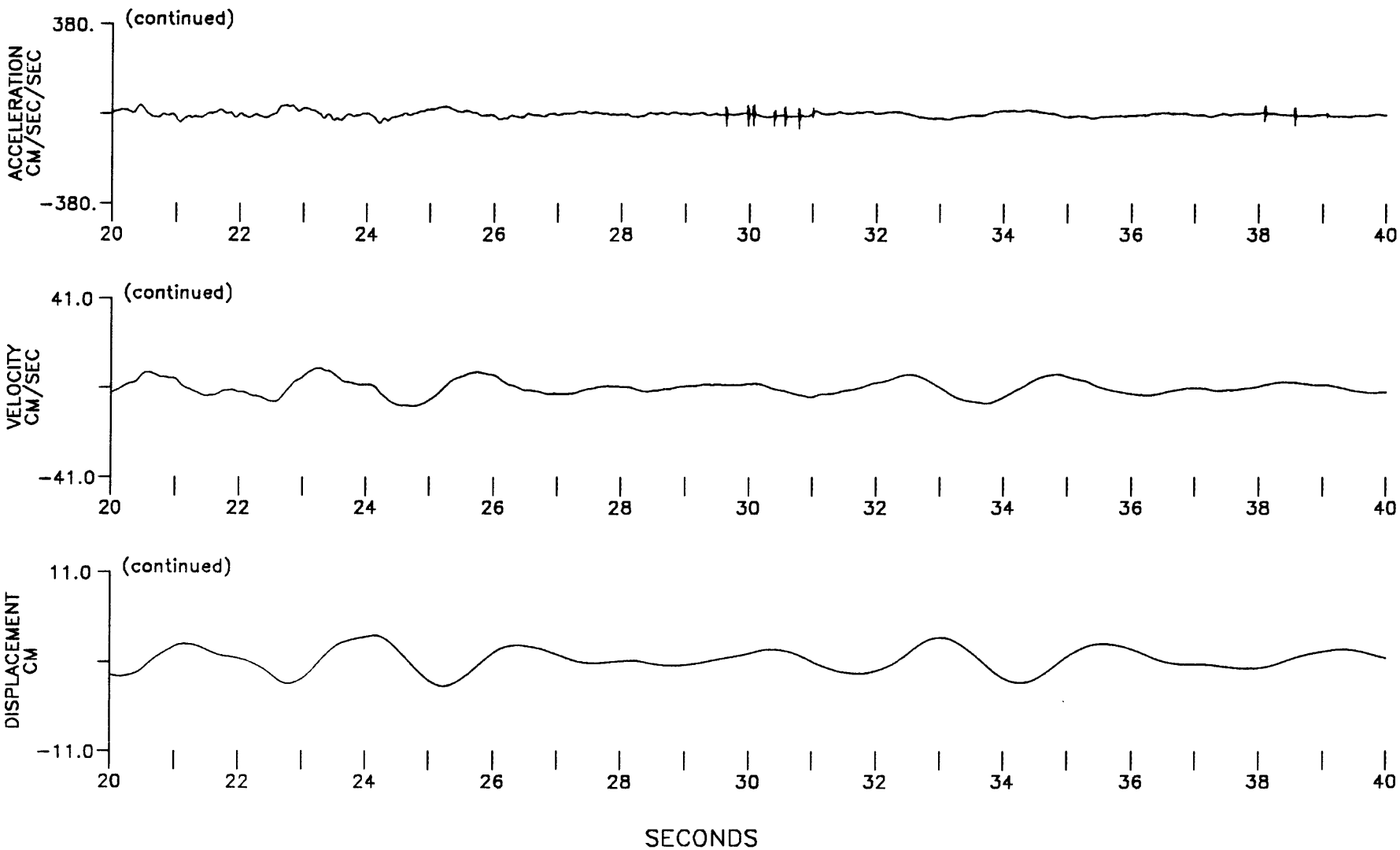
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
PALO ALTO VA HOSPITAL - BLDG 1, BASEMENT
UP
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= -192.99 CM/SEC/SEC, VELOCITY= 20.33 CM/SEC, DISPL= 3.55 CM



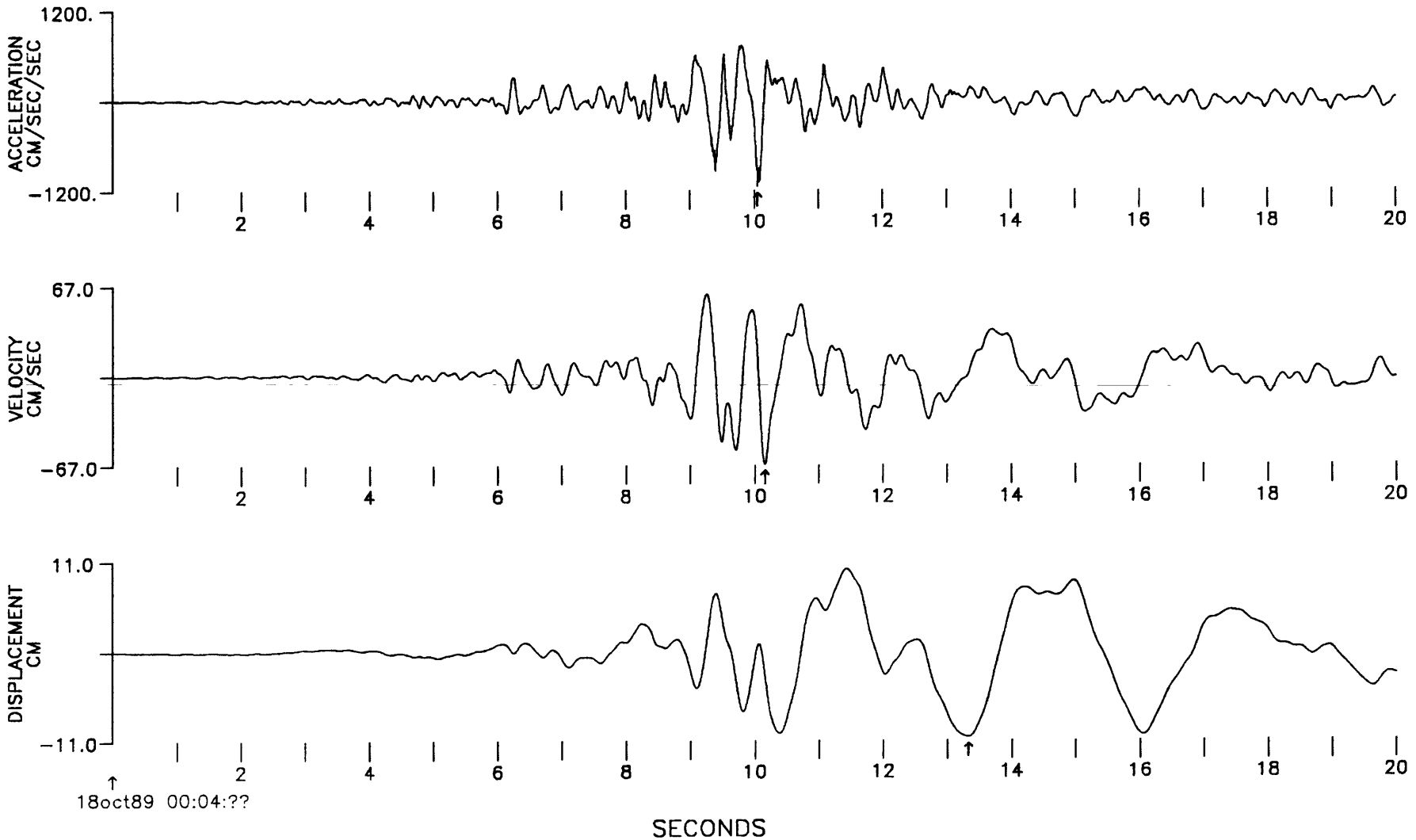
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
PALO ALTO VA HOSPITAL – BLDG 1, BASEMENT
212 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= −378.16 CM/SEC/SEC, VELOCITY= −40.46 CM/SEC, DISPL= 10.04 CM



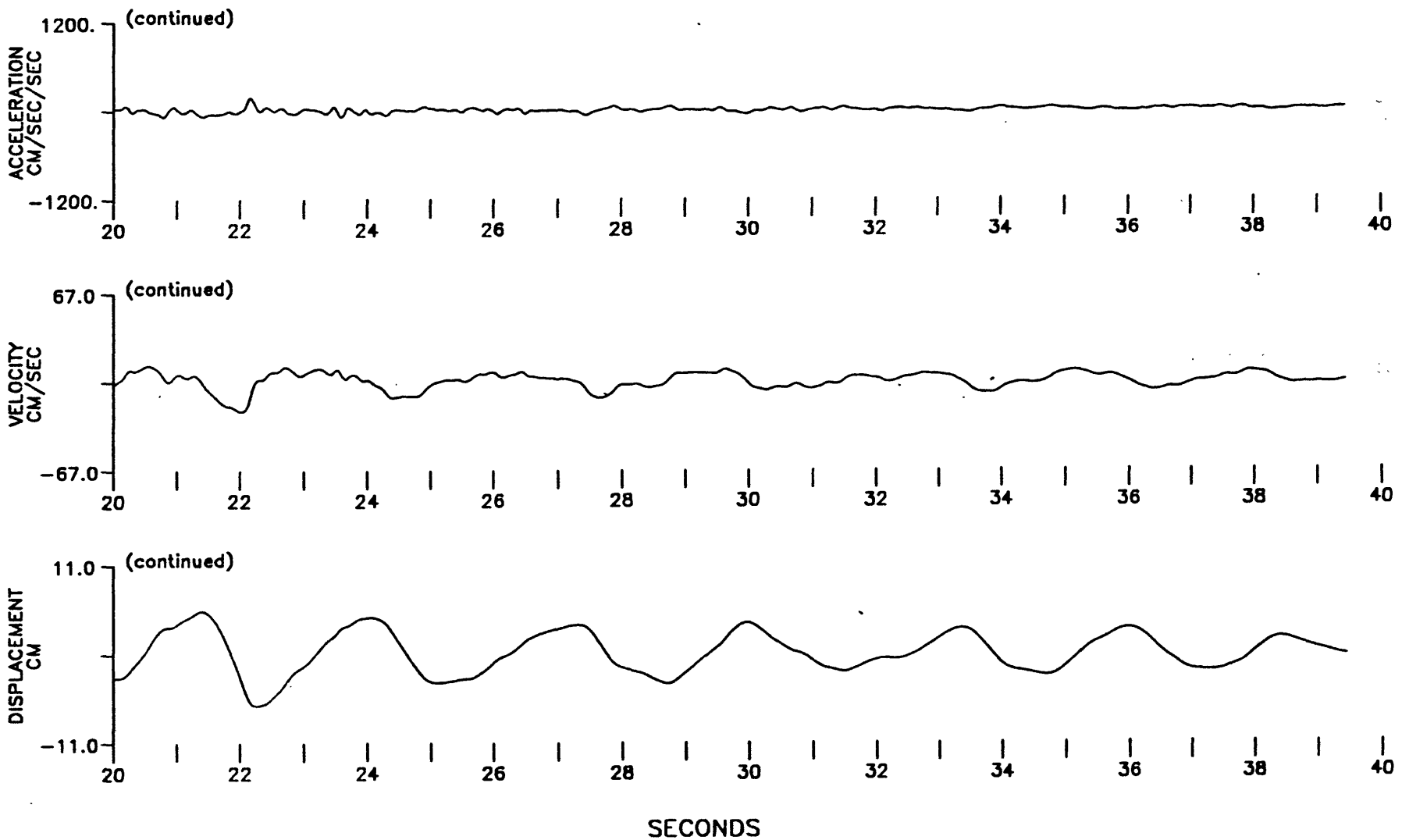
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
PALO ALTO VA HOSPITAL - BLDG 1, BASEMENT
212 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= -378.16 CM/SEC/SEC, VELOCITY= -40.46 CM/SEC, DISPL= 10.04 CM



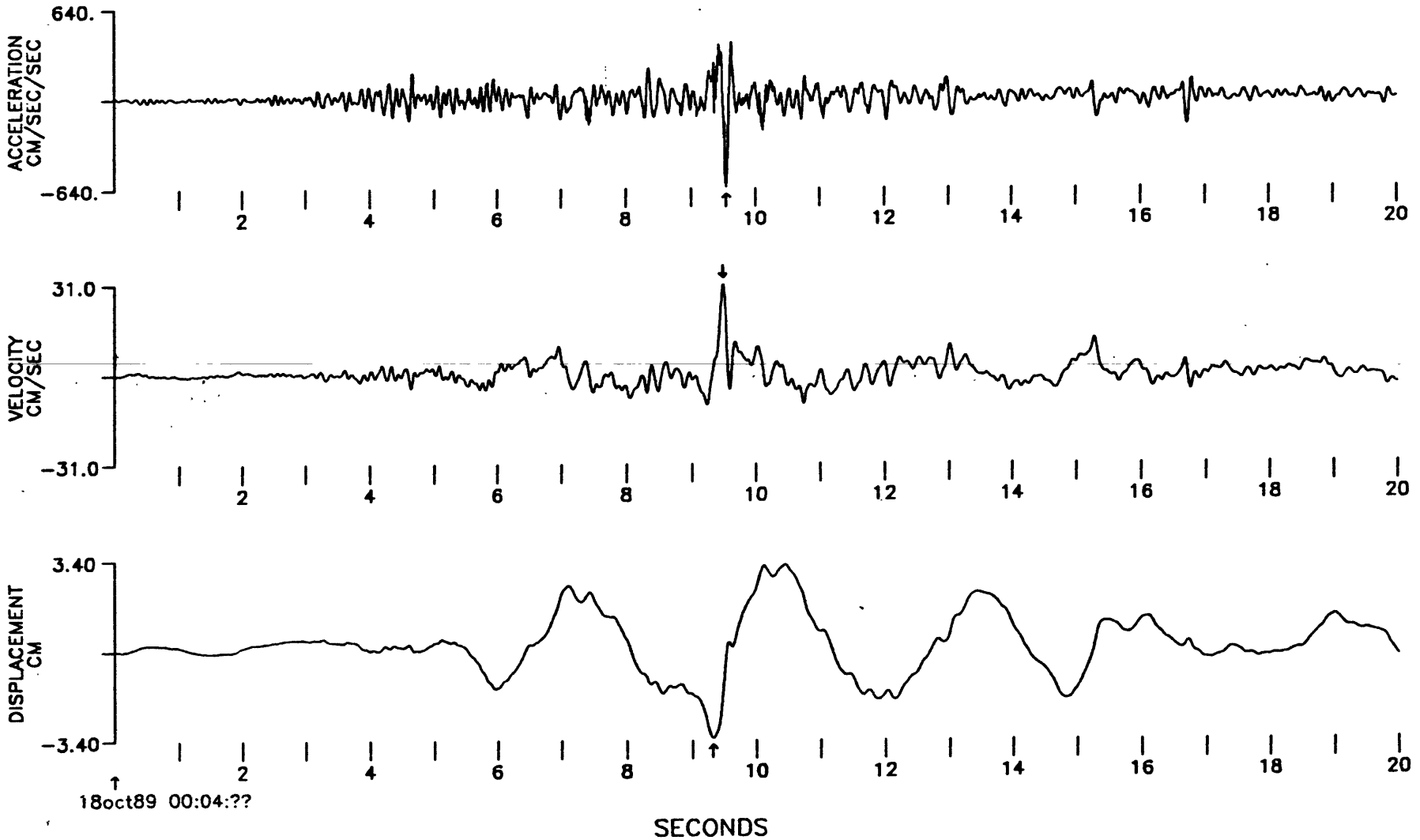
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
PALO ALTO VA HOSPITAL - BLDG 1, ROOF (7TH LEVEL)
302 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= -1151.03 CM/SEC/SEC, VELOCITY= -66.07 CM/SEC, DISPL= -10.59 CM



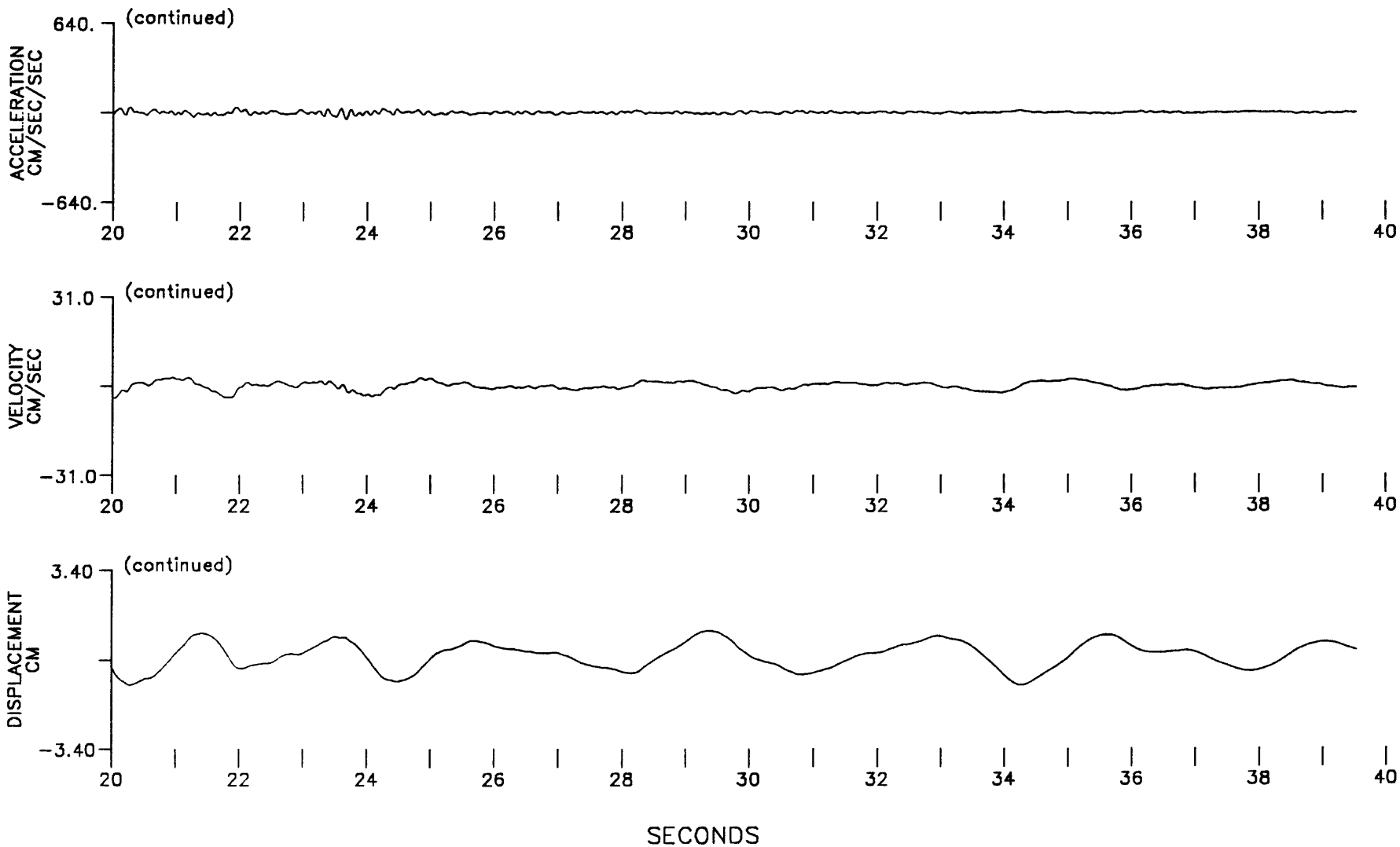
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
PALO ALTO VA HOSPITAL - BLDG 1, ROOF (7TH LEVEL)
302 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= -1151.03 CM/SEC/SEC, VELOCITY= -66.07 CM/SEC, DISPL= -10.59 CM



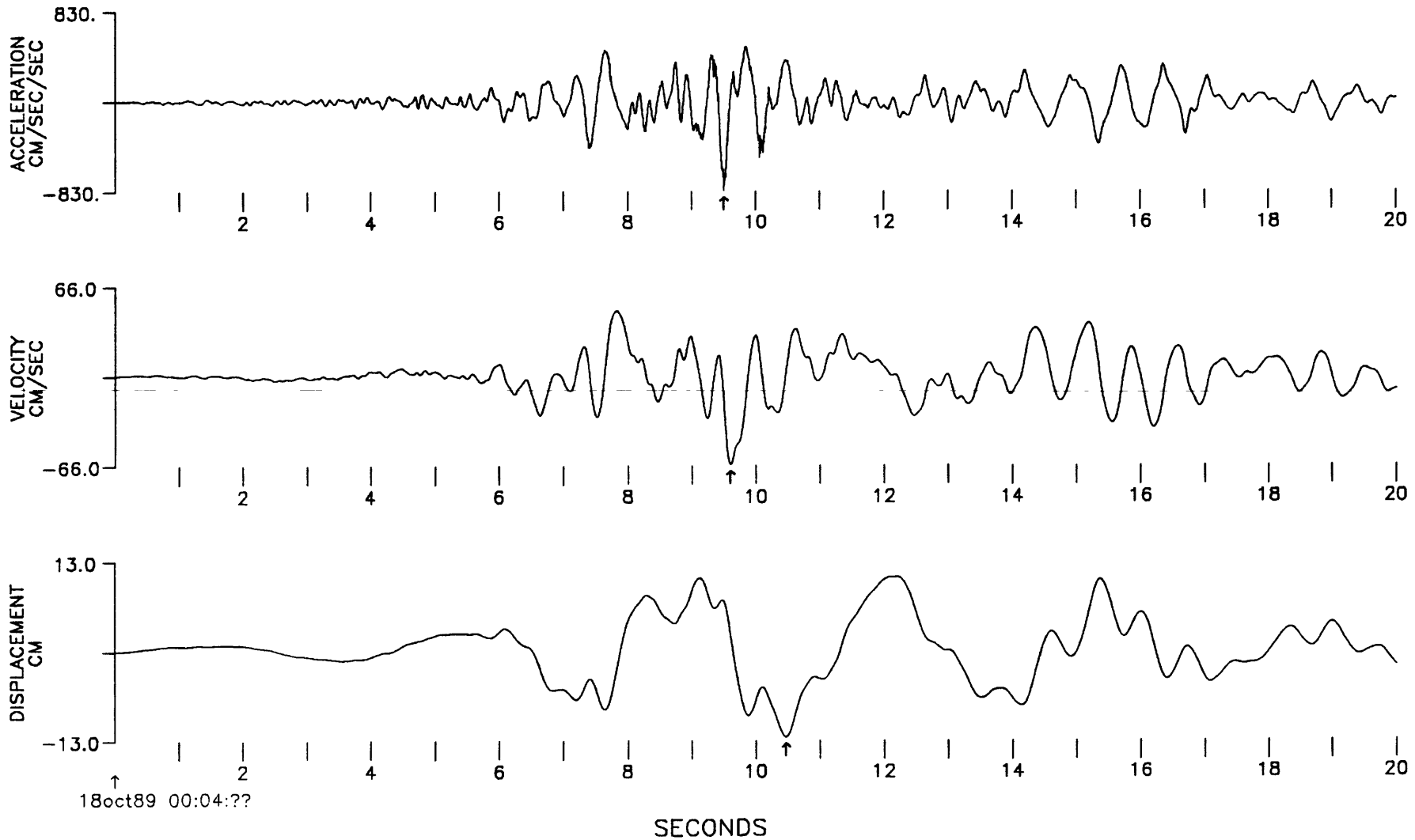
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
PALO ALTO VA HOSPITAL – BLDG 1, ROOF (7TH LEVEL)
UP
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= −635.32 CM/SEC/SEC, VELOCITY= 30.68 CM/SEC, DISPL= −3.32 CM



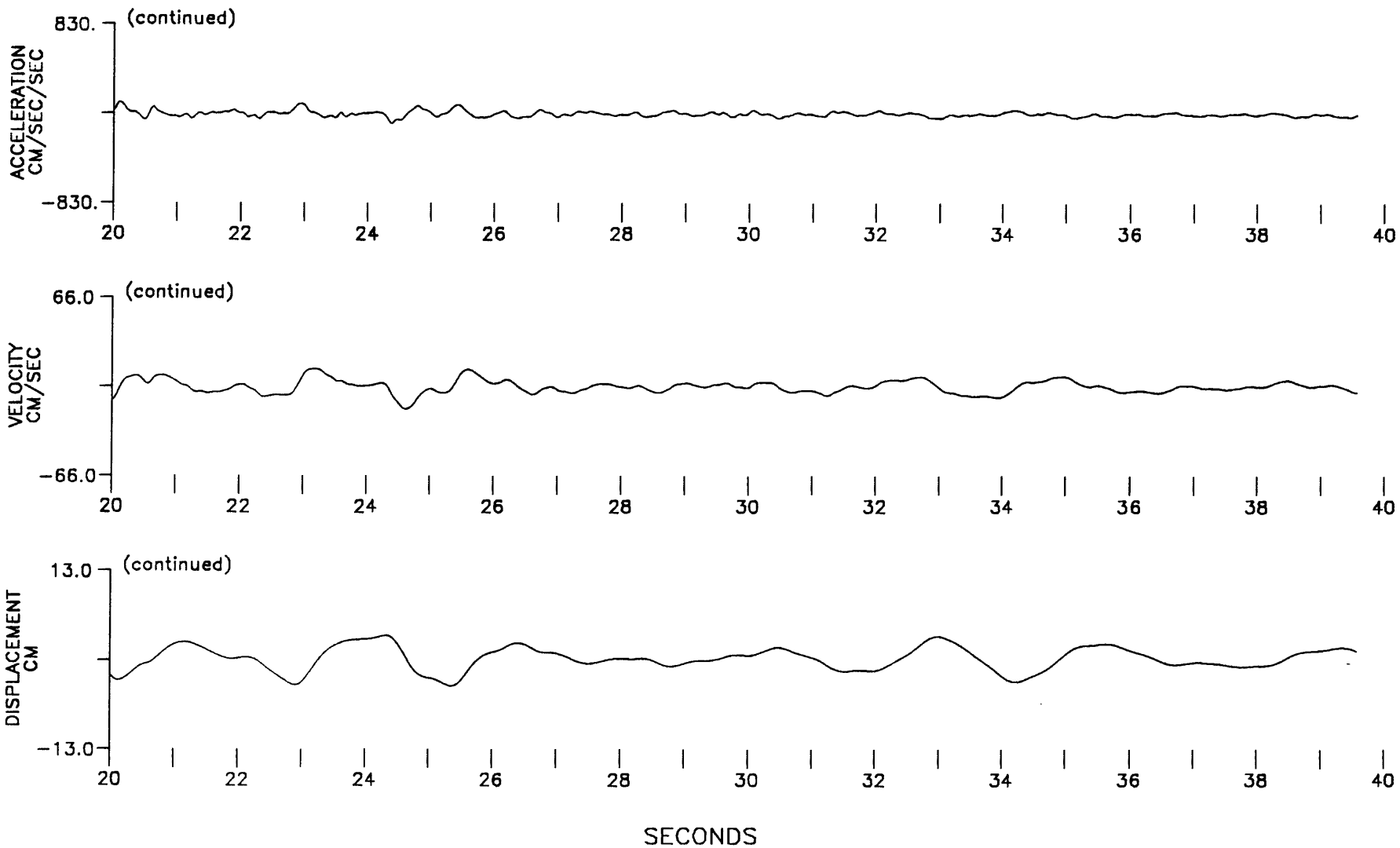
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
PALO ALTO VA HOSPITAL - BLDG 1, ROOF (7TH LEVEL)
UP
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= -635.32 CM/SEC/SEC, VELOCITY= 30.68 CM/SEC, DISPL= -3.32 CM



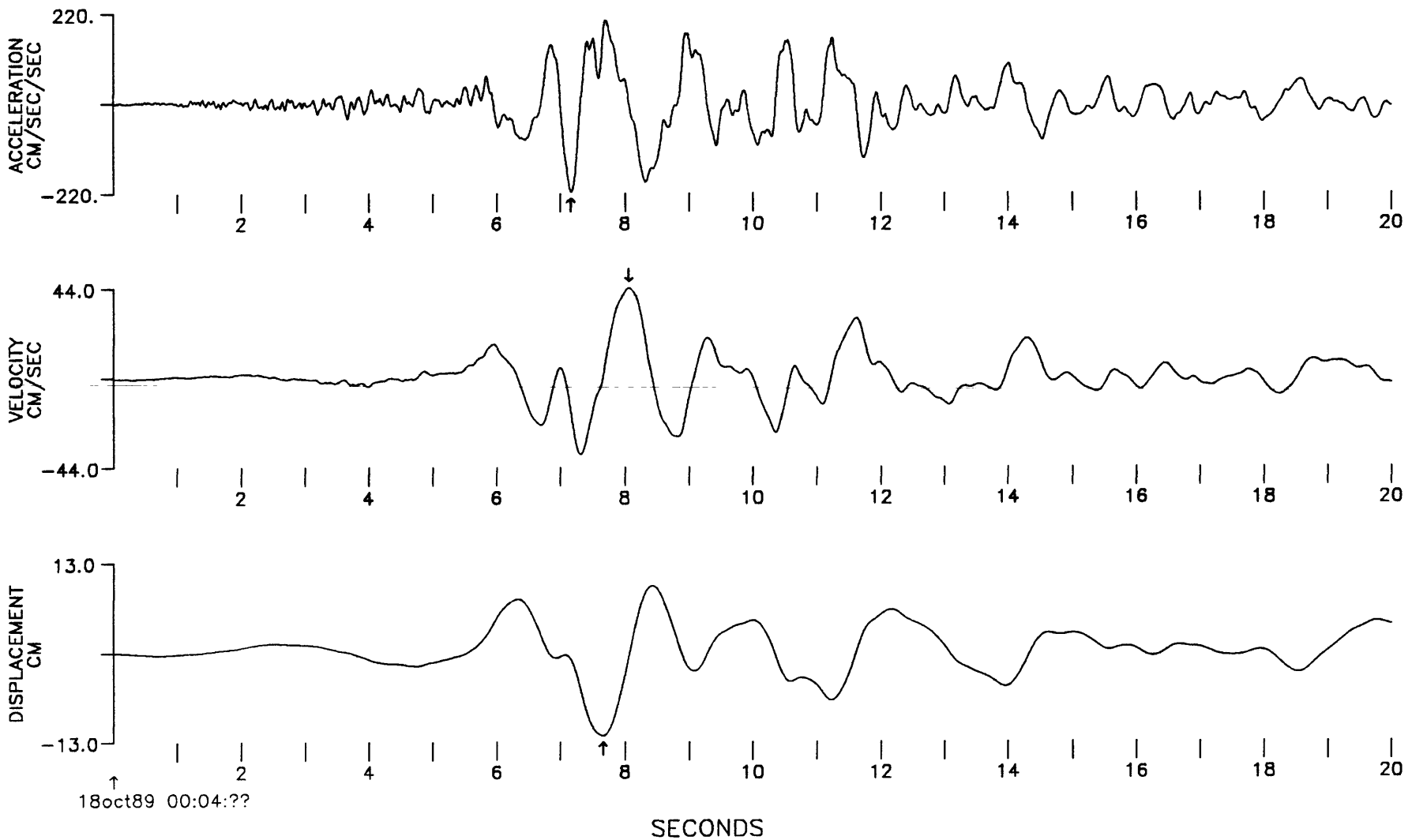
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
PALO ALTO VA HOSPITAL – BLDG 1, ROOF (7TH LEVEL)
212 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= −822.97 CM/SEC/SEC, VELOCITY= −65.08 CM/SEC, DISPL= −12.47 CM



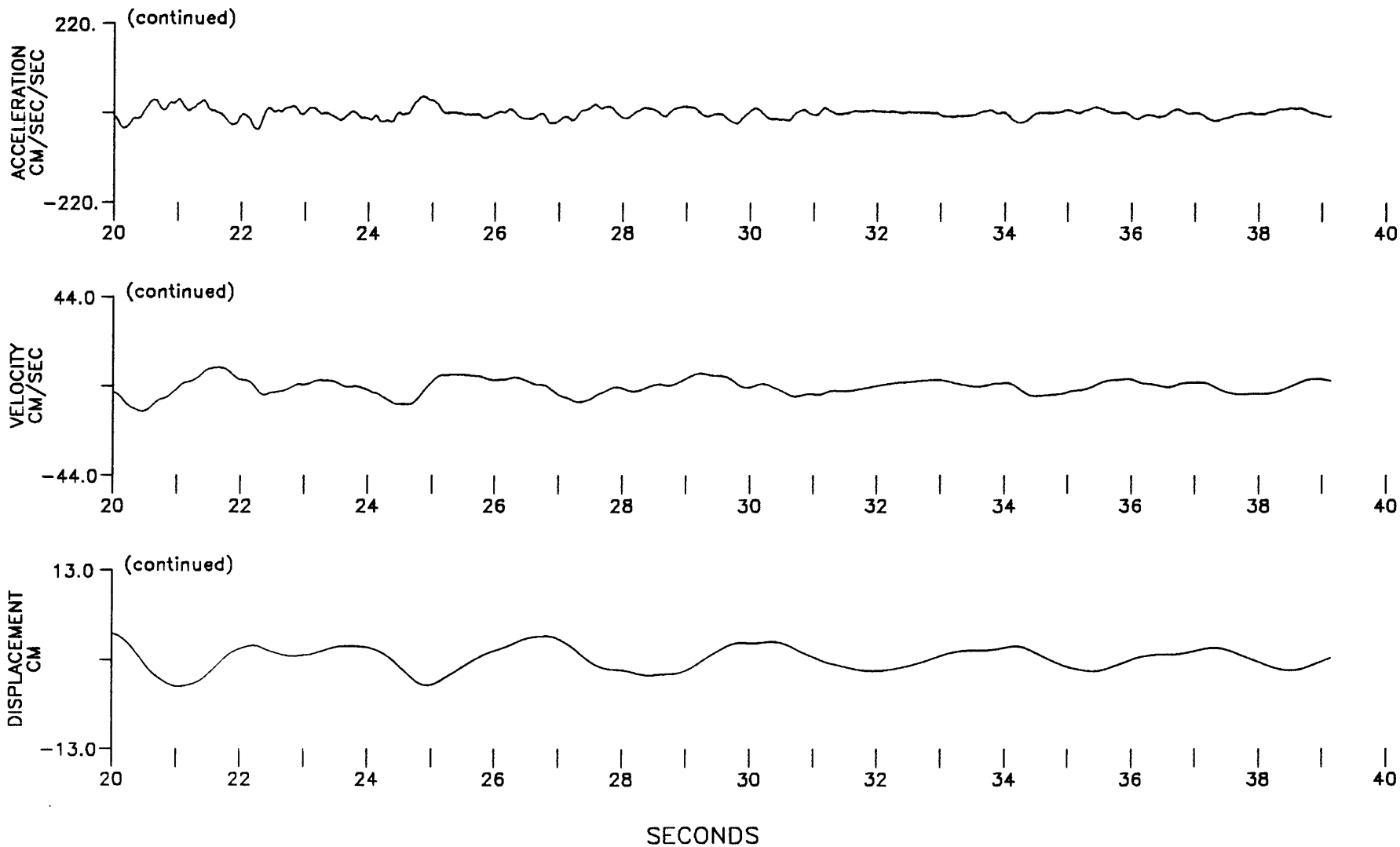
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
PALO ALTO VA HOSPITAL – BLDG 1, ROOF (7TH LEVEL)
212 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= −822.97 CM/SEC/SEC, VELOCITY= −65.08 CM/SEC, DISPL= −12.47 CM



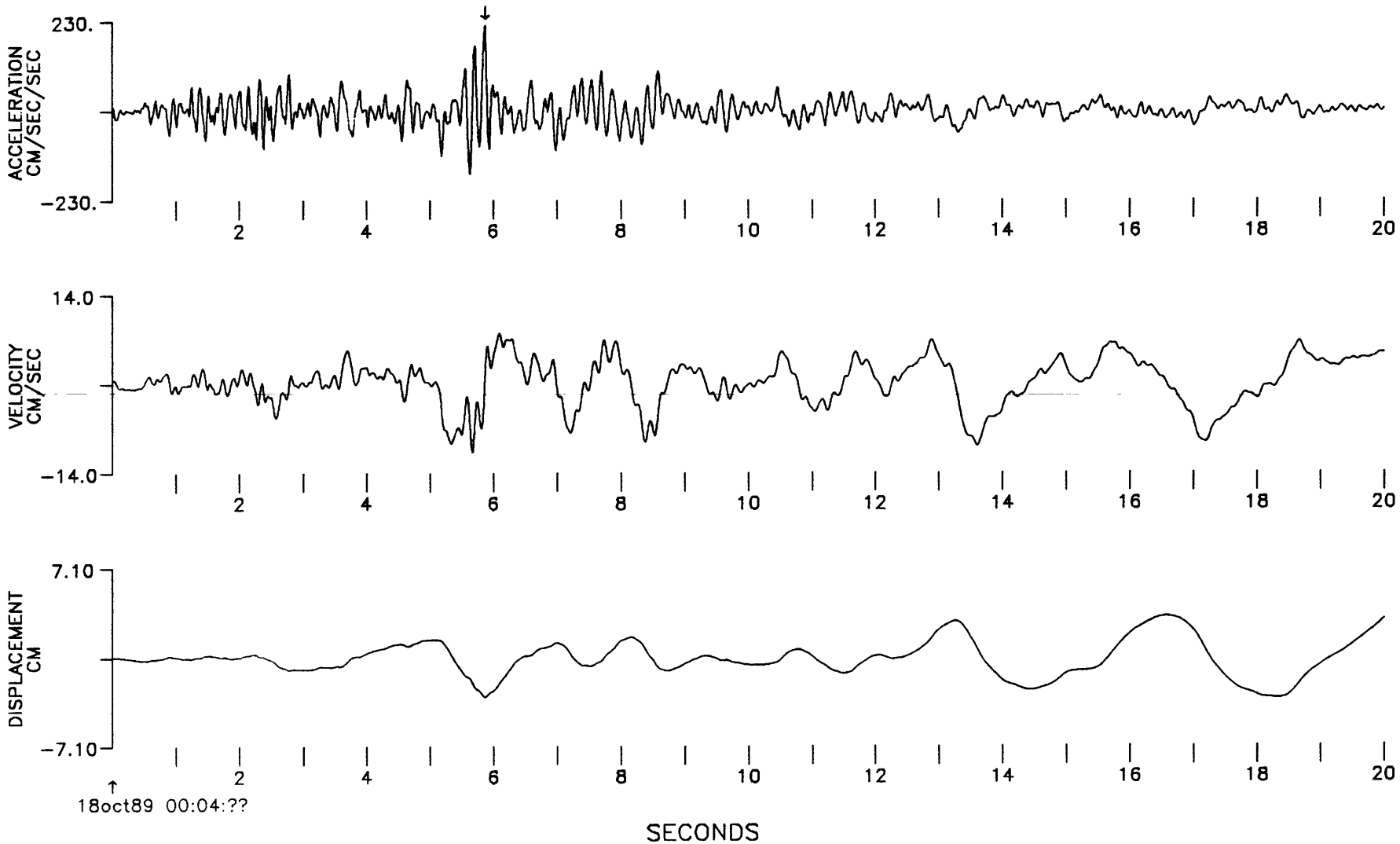
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
HOLLISTER CITY HALL ANNEX - BASEMENT
180 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= -217.07 CM/SEC/SEC, VELOCITY= 43.98 CM/SEC, DISPL= -12.16 CM



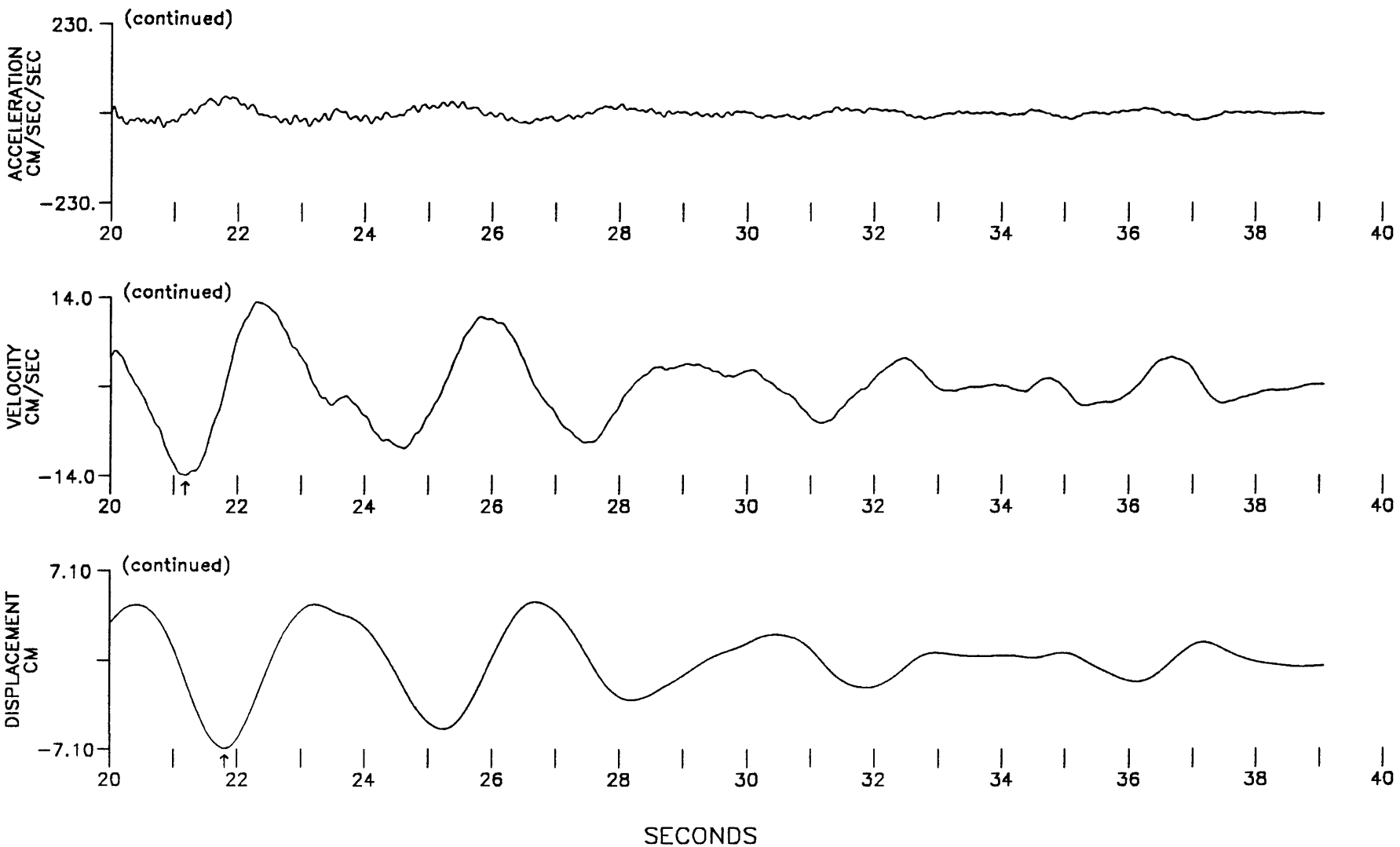
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
HOLLISTER CITY HALL ANNEX - BASEMENT
180 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= -217.07 CM/SEC/SEC, VELOCITY= 43.98 CM/SEC, DISPL= -12.16 CM



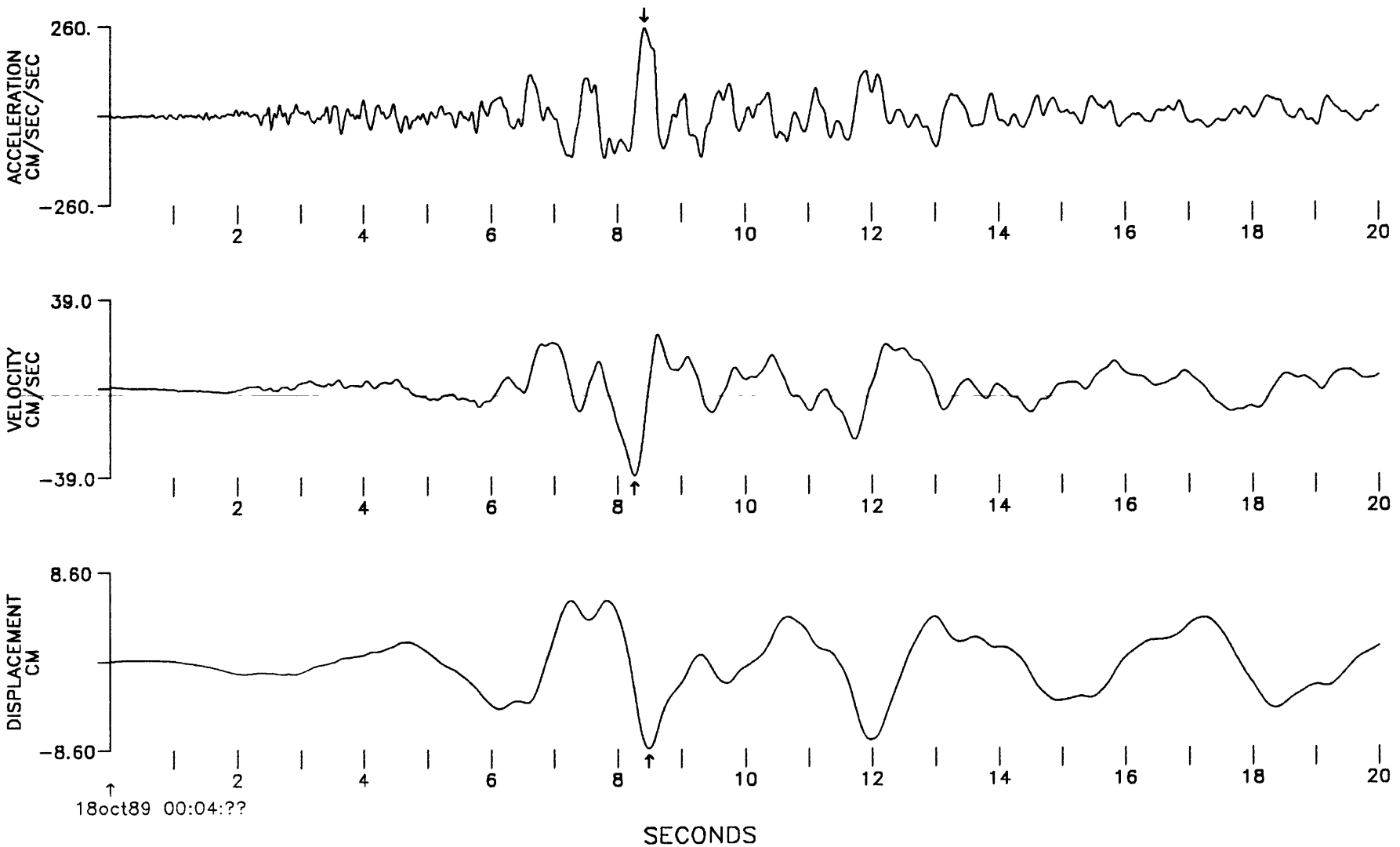
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
HOLLISTER CITY HALL ANNEX - BASEMENT
UP
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= 220.12 CM/SEC/SEC, VELOCITY= -13.90 CM/SEC, DISPL= -7.04 CM



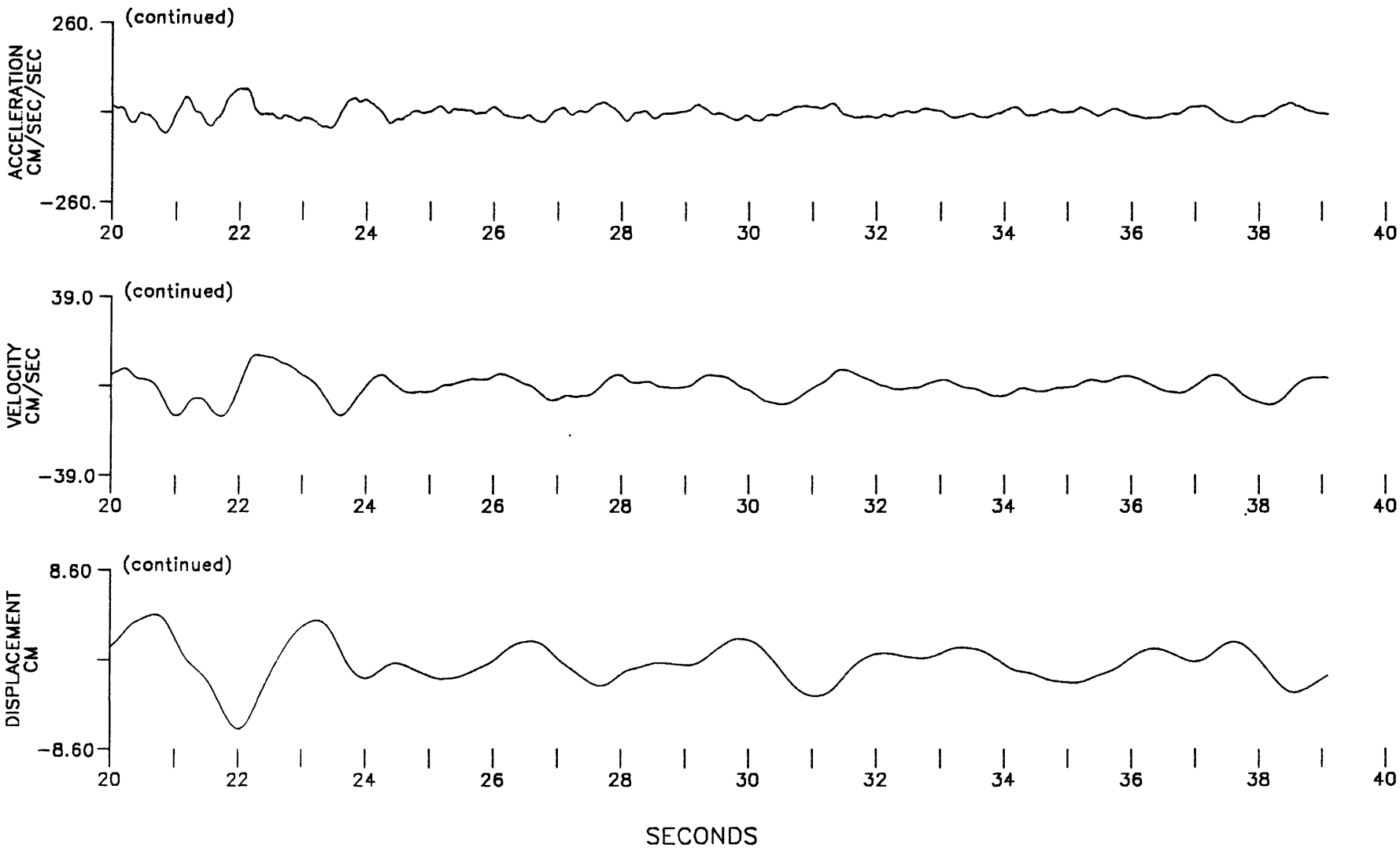
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
HOLLISTER CITY HALL ANNEX - BASEMENT
UP
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= 220.12 CM/SEC/SEC, VELOCITY= -13.90 CM/SEC, DISPL= -7.04 CM



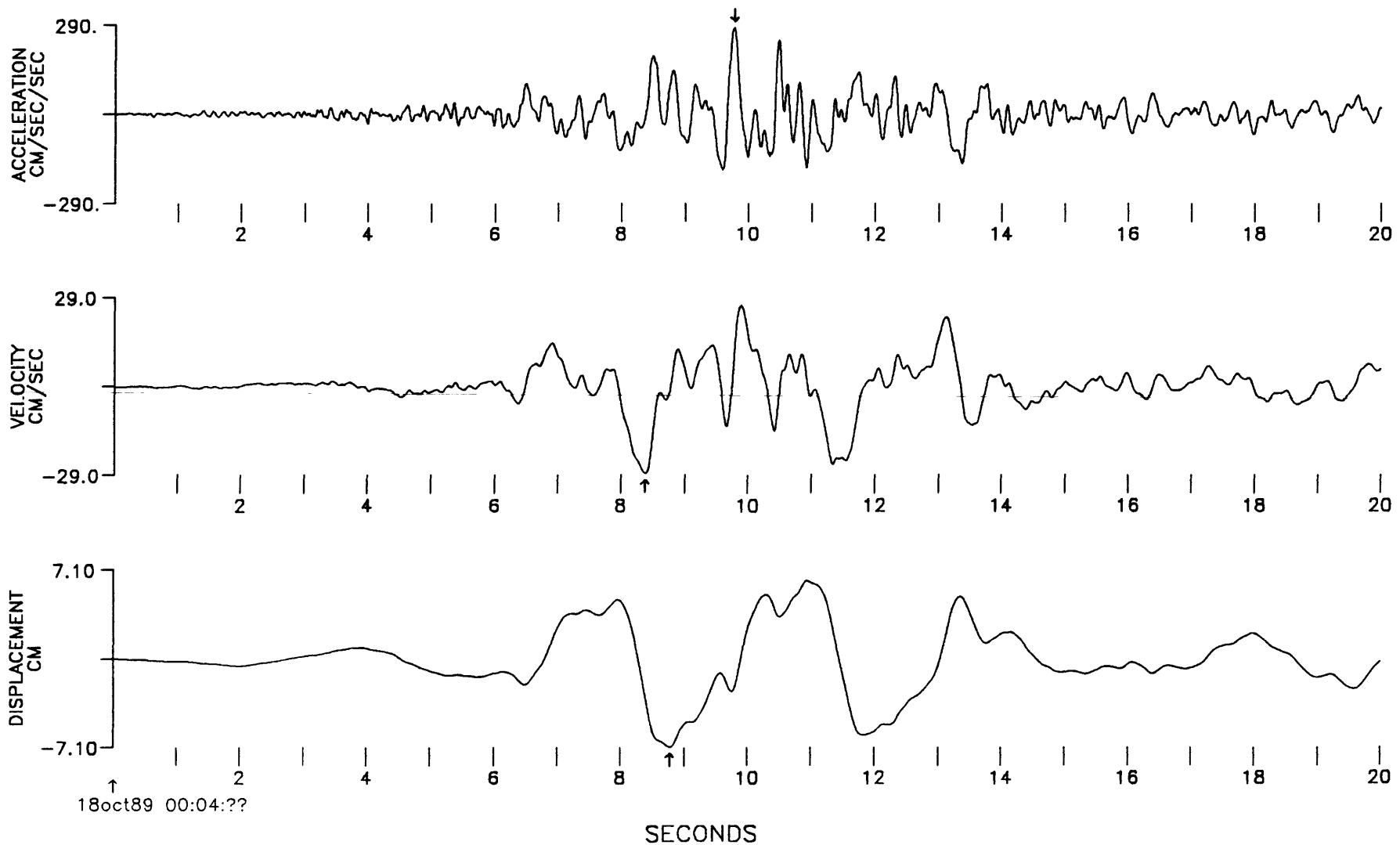
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
HOLLISTER CITY HALL ANNEX - BASEMENT
090 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= 252.11 CM/SEC/SEC, VELOCITY= -38.66 CM/SEC, DISPL= -8.53 CM



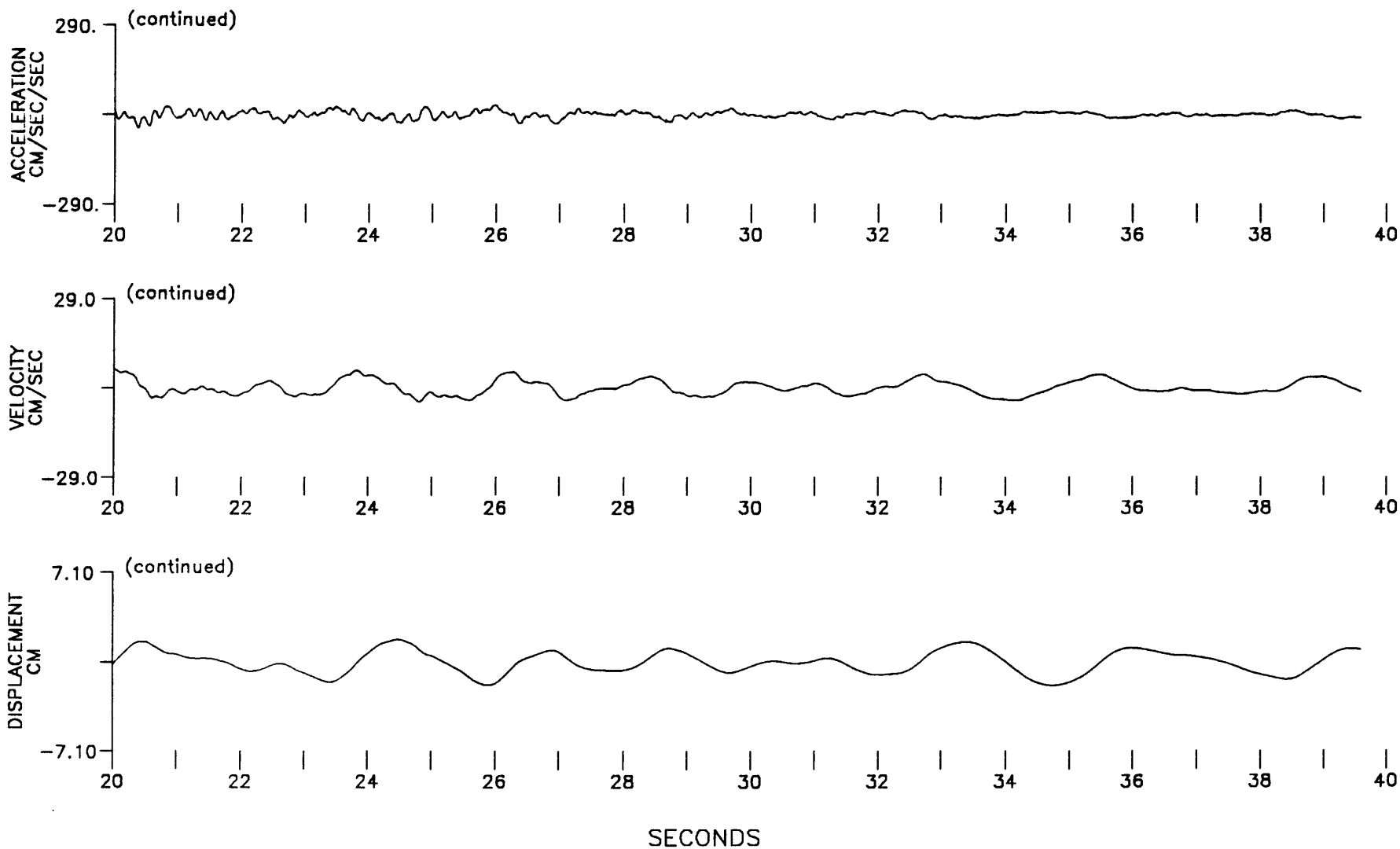
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
HOLLISTER CITY HALL ANNEX - BASEMENT
090 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= 252.11 CM/SEC/SEC, VELOCITY= -38.66 CM/SEC, DISPL= -8.53 CM



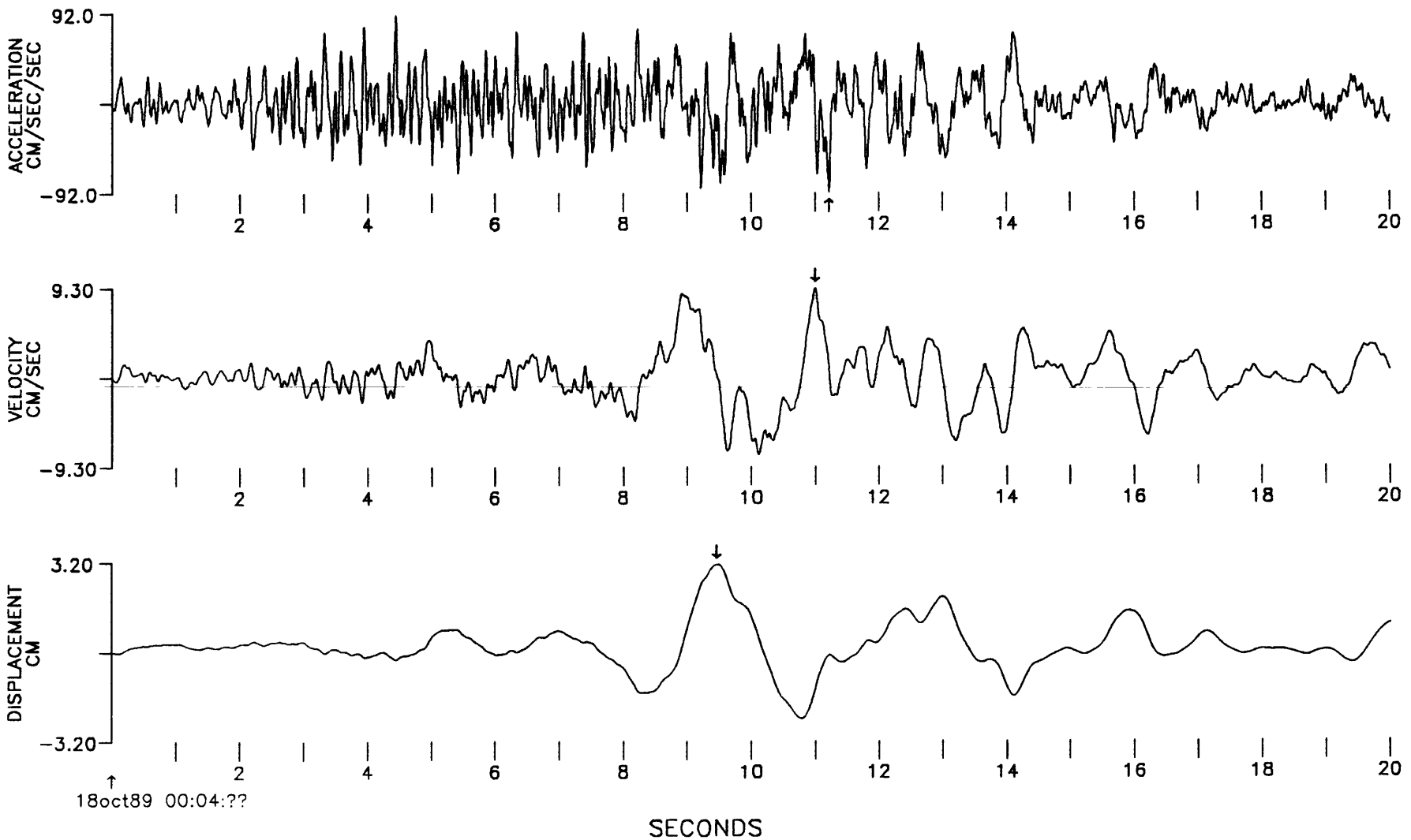
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
STANFORD UNIVERSITY - SLAC TEST LAB
360 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= 282.08 CM/SEC/SEC, VELOCITY= -28.37 CM/SEC, DISPL= -7.06 CM



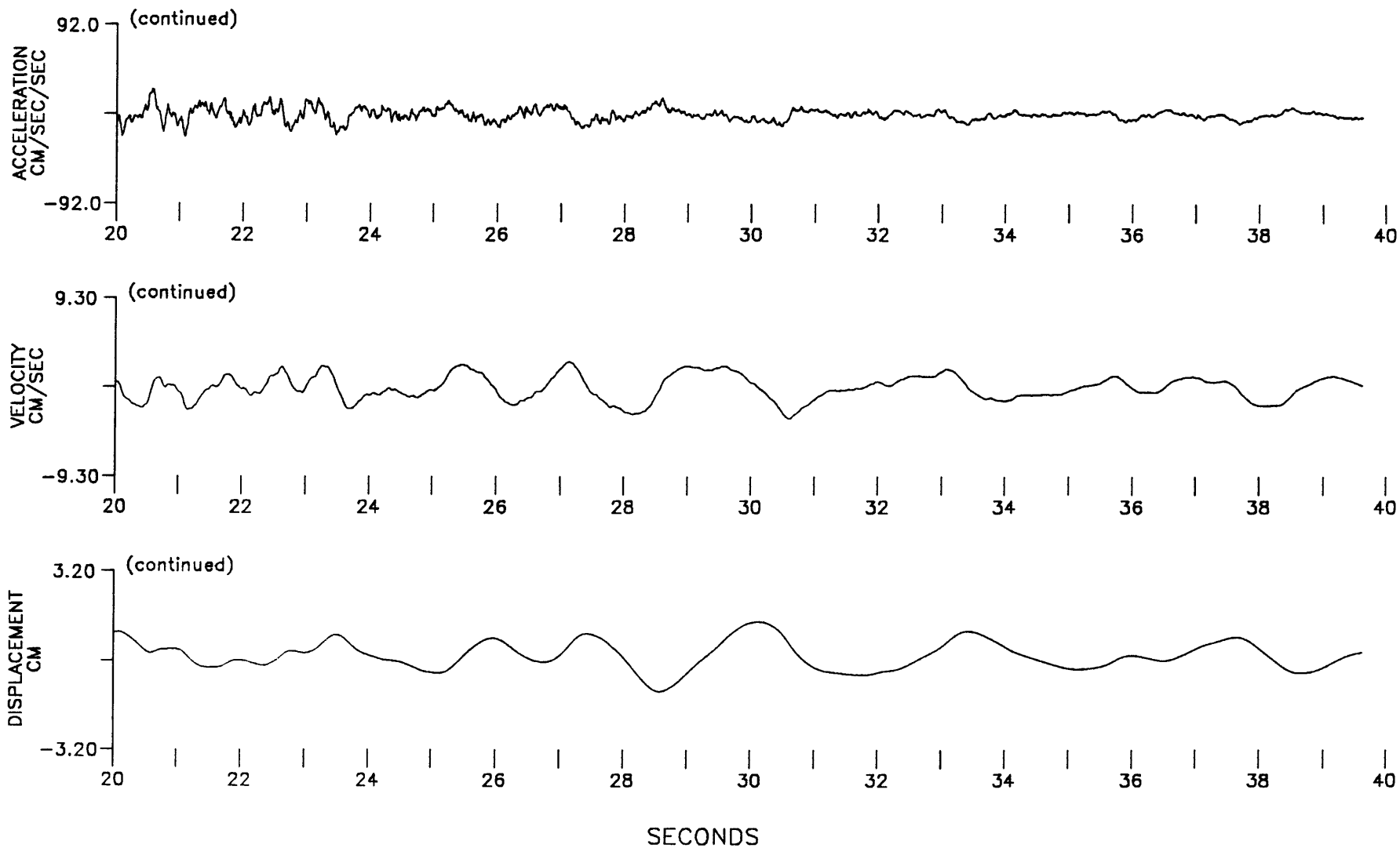
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
STANFORD UNIVERSITY - SLAC TEST LAB
360 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= 282.08 CM/SEC/SEC, VELOCITY= -28.37 CM/SEC, DISPL= -7.06 CM



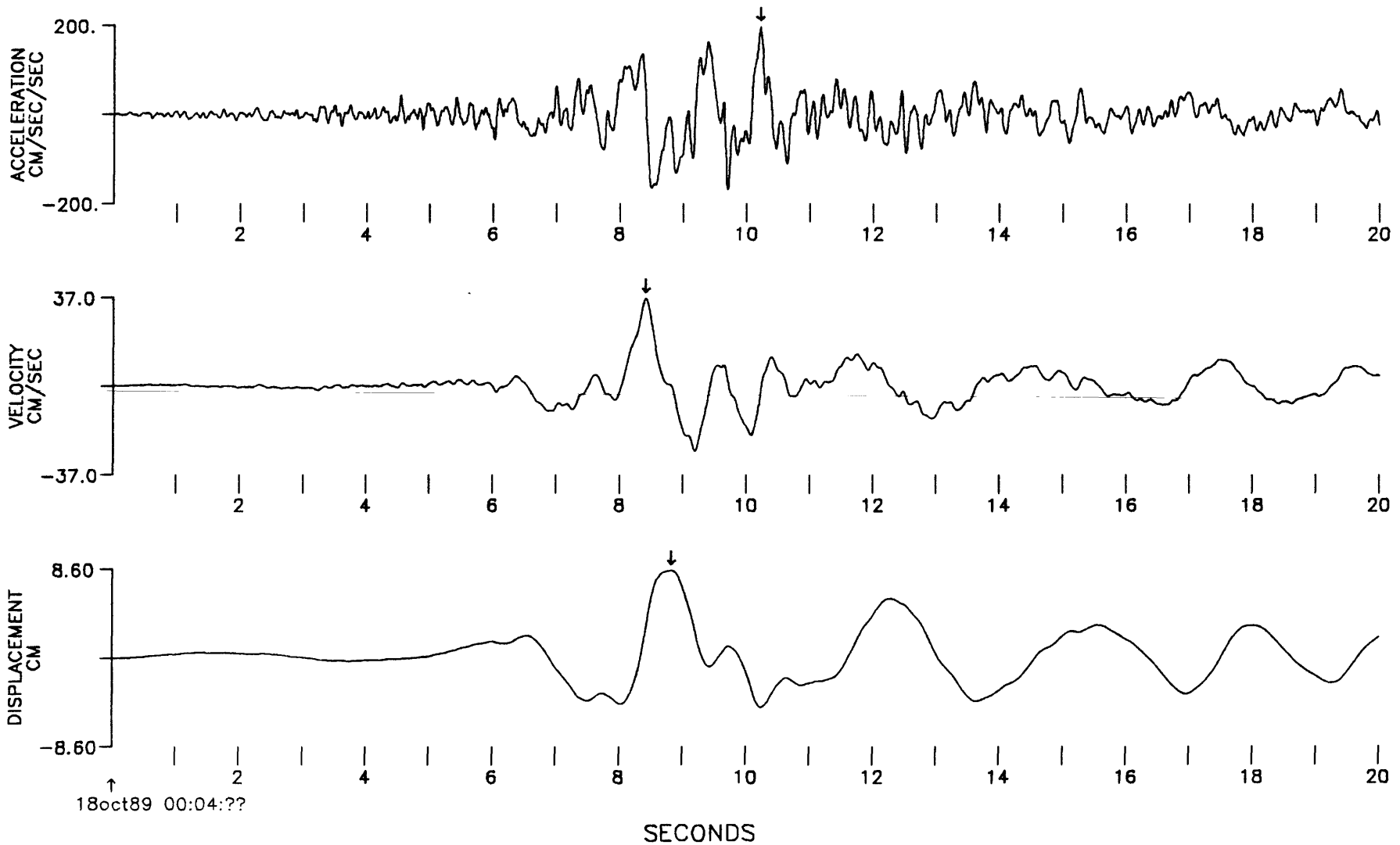
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
STANFORD UNIVERSITY - SLAC TEST LAB
UP
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= -91.82 CM/SEC/SEC, VELOCITY= 9.24 CM/SEC, DISPL= 3.12 CM



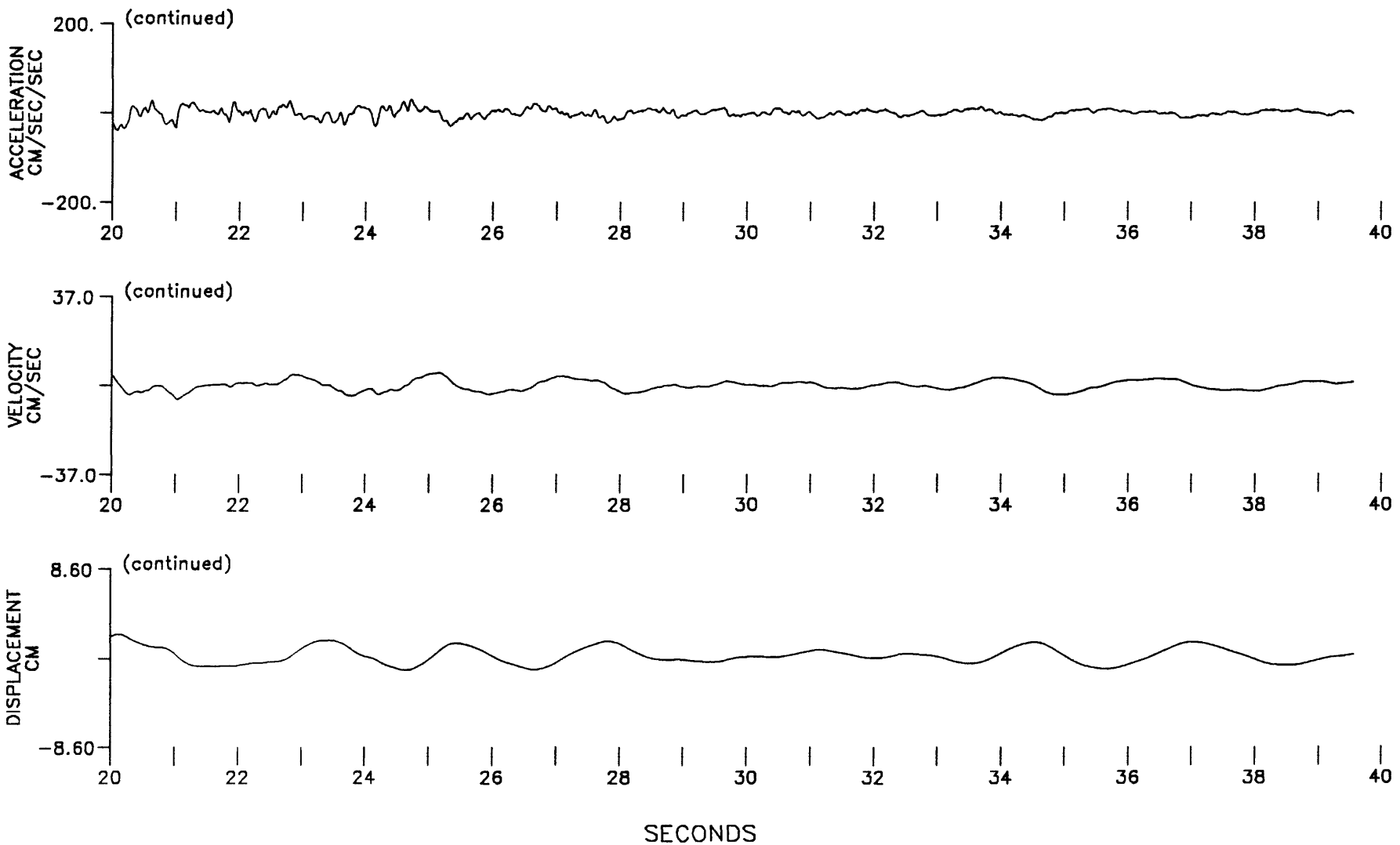
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
STANFORD UNIVERSITY - SLAC TEST LAB
UP
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= -91.82 CM/SEC/SEC, VELOCITY= 9.24 CM/SEC, DISPL= 3.12 CM



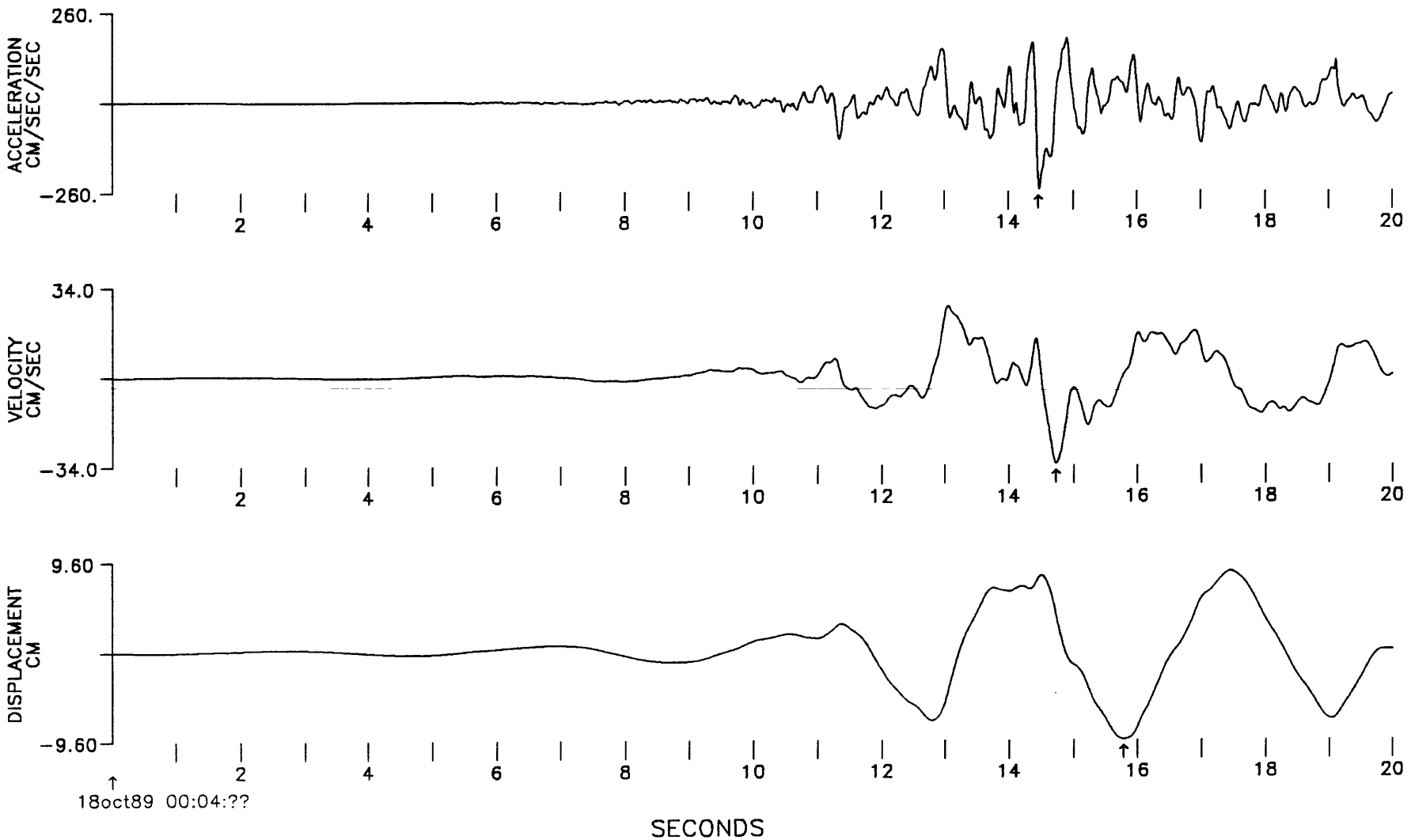
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
STANFORD UNIVERSITY – SLAC TEST LAB
270 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= 197.88 CM/SEC/SEC, VELOCITY= 36.73 CM/SEC, DISPL= 8.51 CM



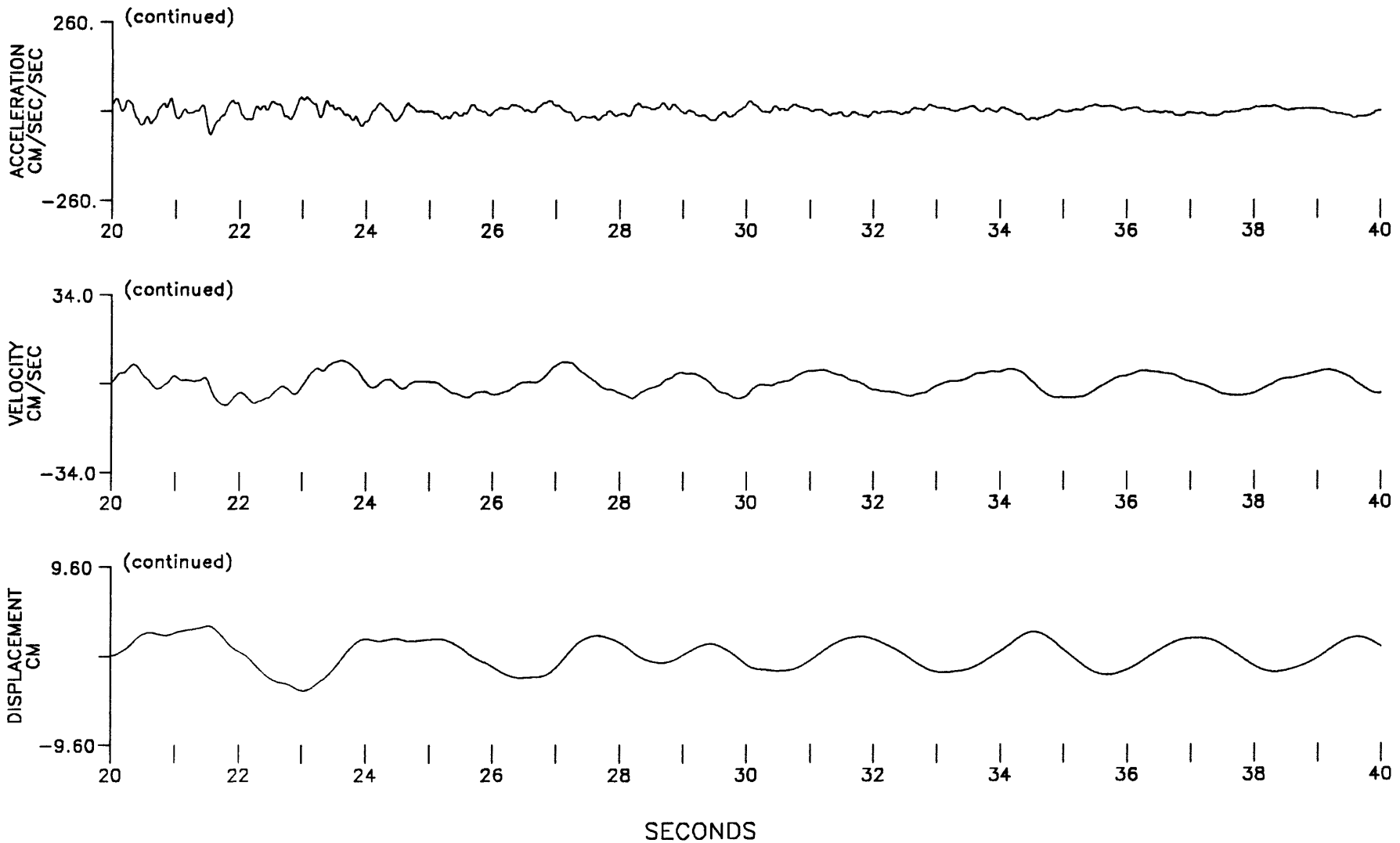
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
STANFORD UNIVERSITY - SLAC TEST LAB
270 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= 197.88 CM/SEC/SEC, VELOCITY= 36.73 CM/SEC, DISPL= 8.51 CM



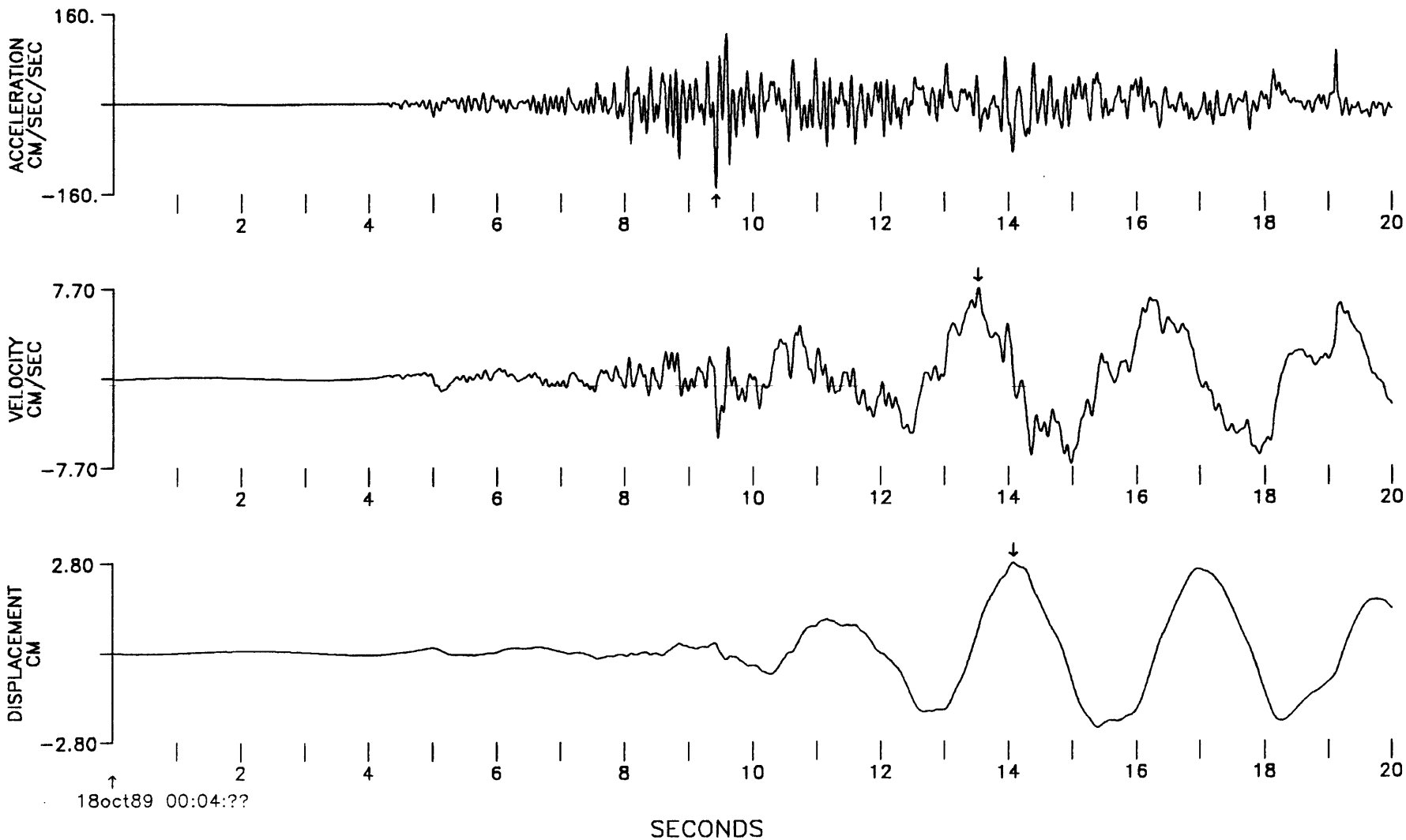
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 100. SPS
STANFORD PARKING GARAGE, GRND LEVEL
360 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= −255.02 CM/SEC/SEC, VELOCITY= −33.18 CM/SEC, DISPL= −9.51 CM



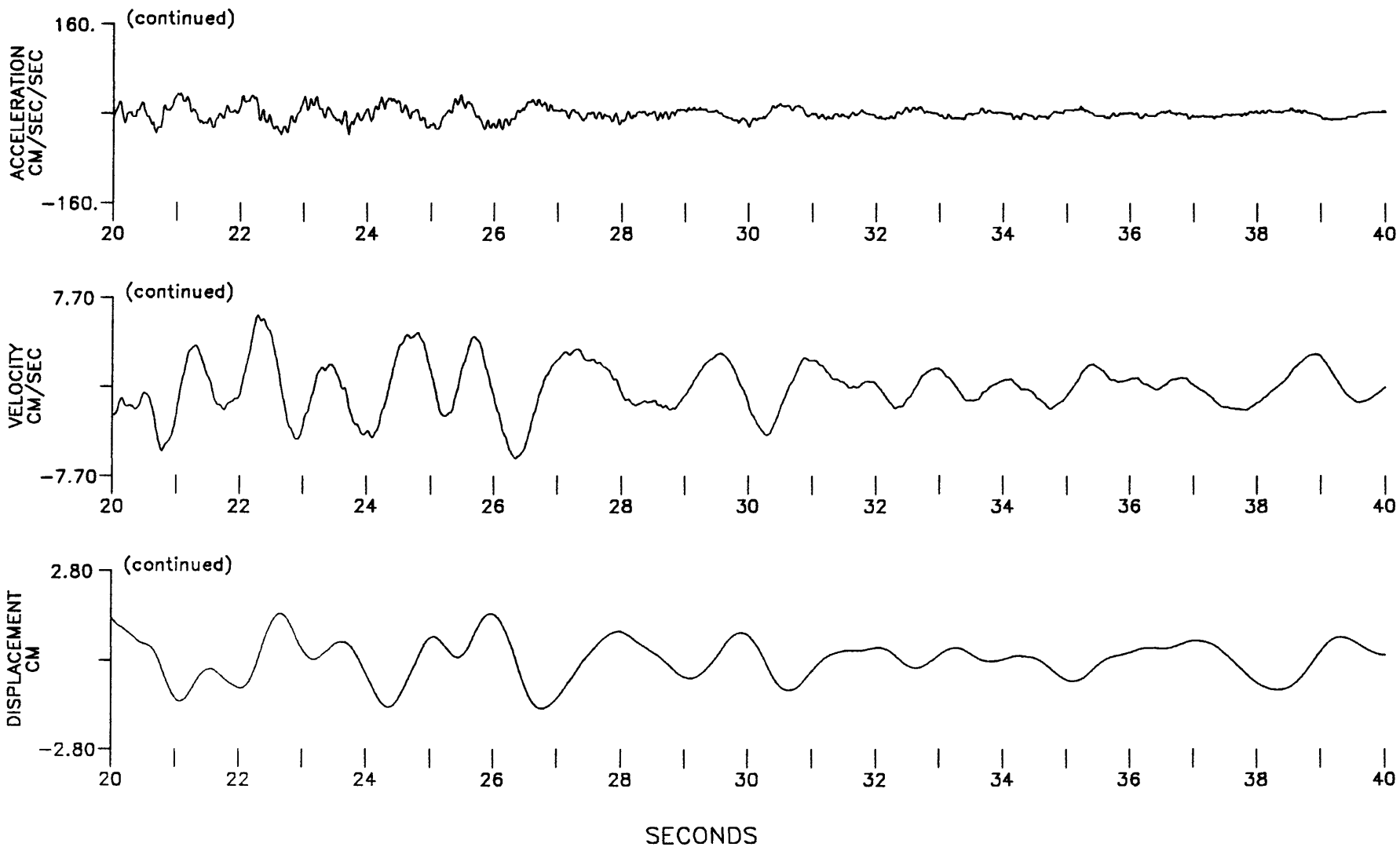
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 100. SPS
STANFORD PARKING GARAGE, GRND LEVEL
360 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= −255.02 CM/SEC/SEC, VELOCITY= −33.18 CM/SEC, DISPL= −9.51 CM



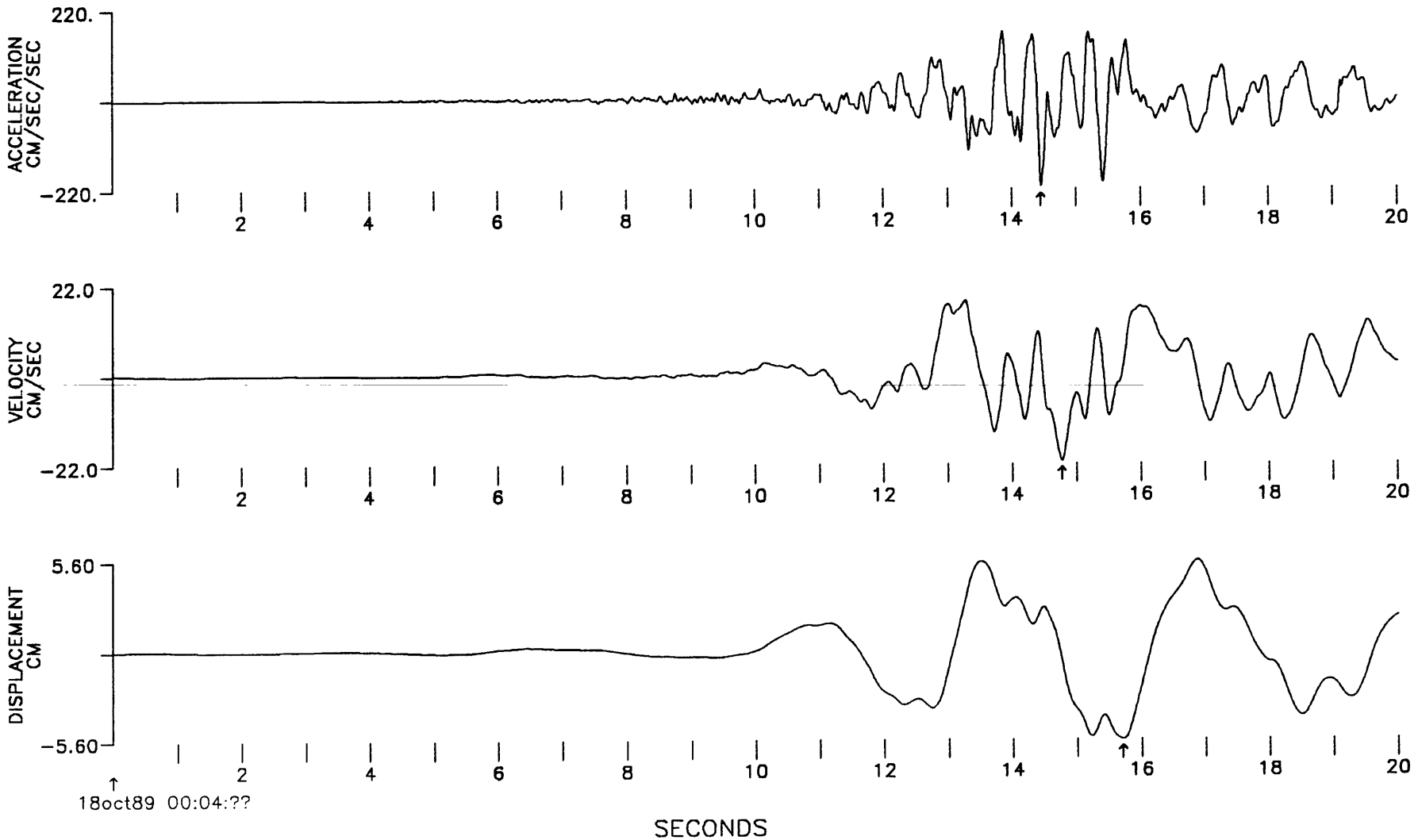
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 100. SPS
STANFORD PARKING GARAGE, GRND LEVEL
UP
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= -151.72 CM/SEC/SEC, VELOCITY= 7.66 CM/SEC, DISPL= 2.78 CM



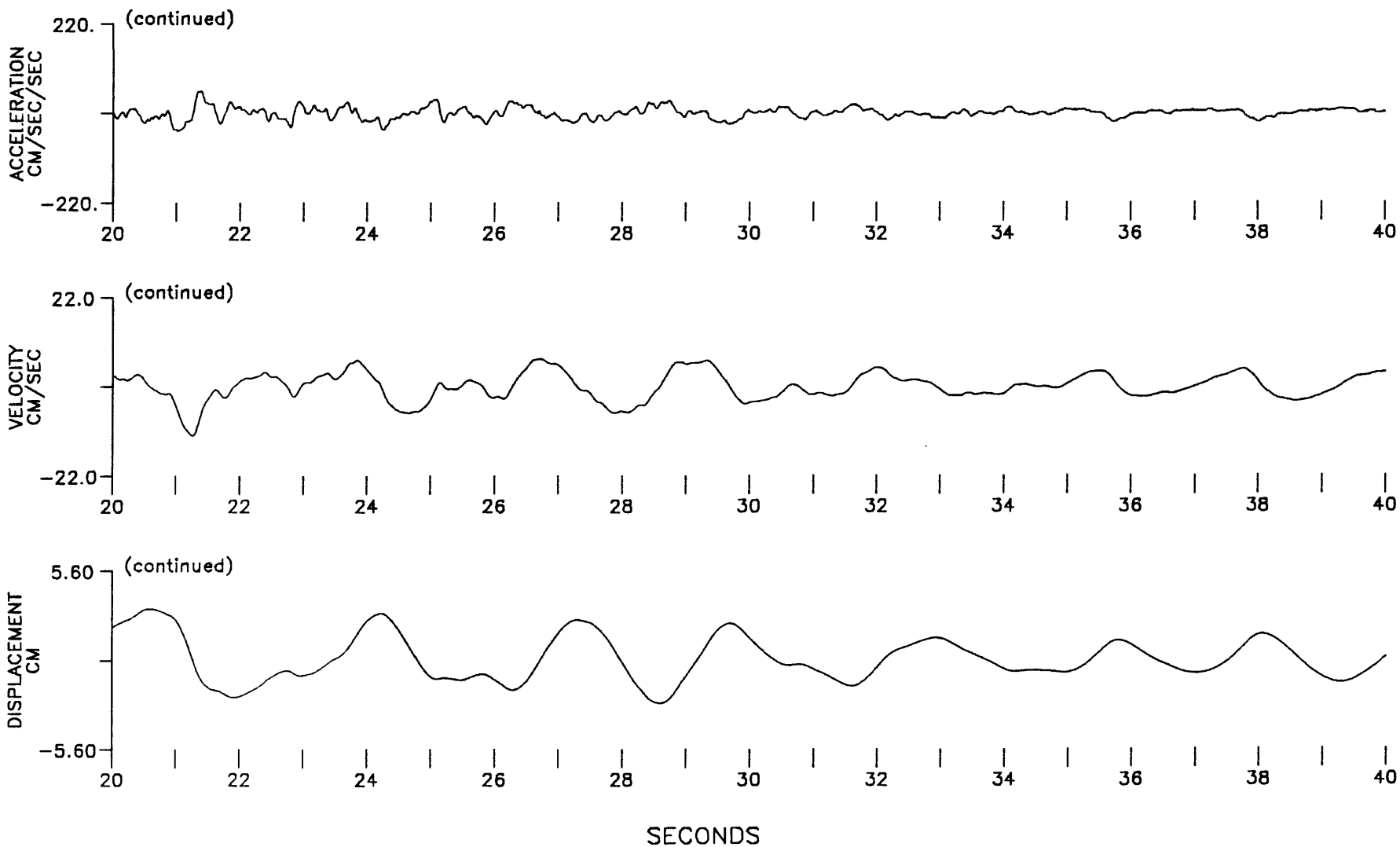
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 100. SPS
STANFORD PARKING GARAGE, GRND LEVEL
UP
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= −151.72 CM/SEC/SEC, VELOCITY= 7.66 CM/SEC, DISPL= 2.78 CM



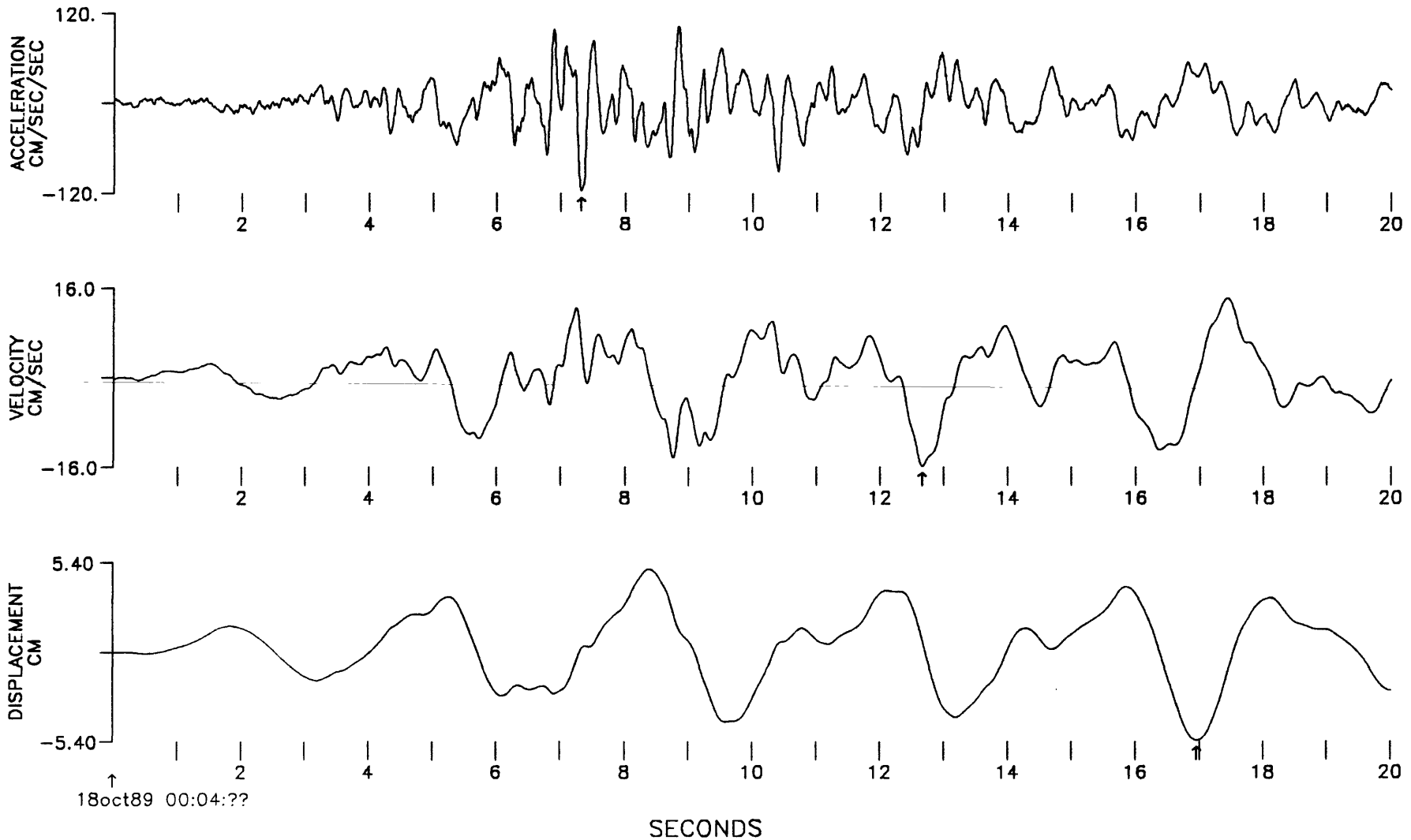
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 100. SPS
STANFORD PARKING GARAGE, GRND LEVEL
90 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= −215.99 CM/SEC/SEC, VELOCITY= −21.30 CM/SEC, DISPL= −5.60 CM



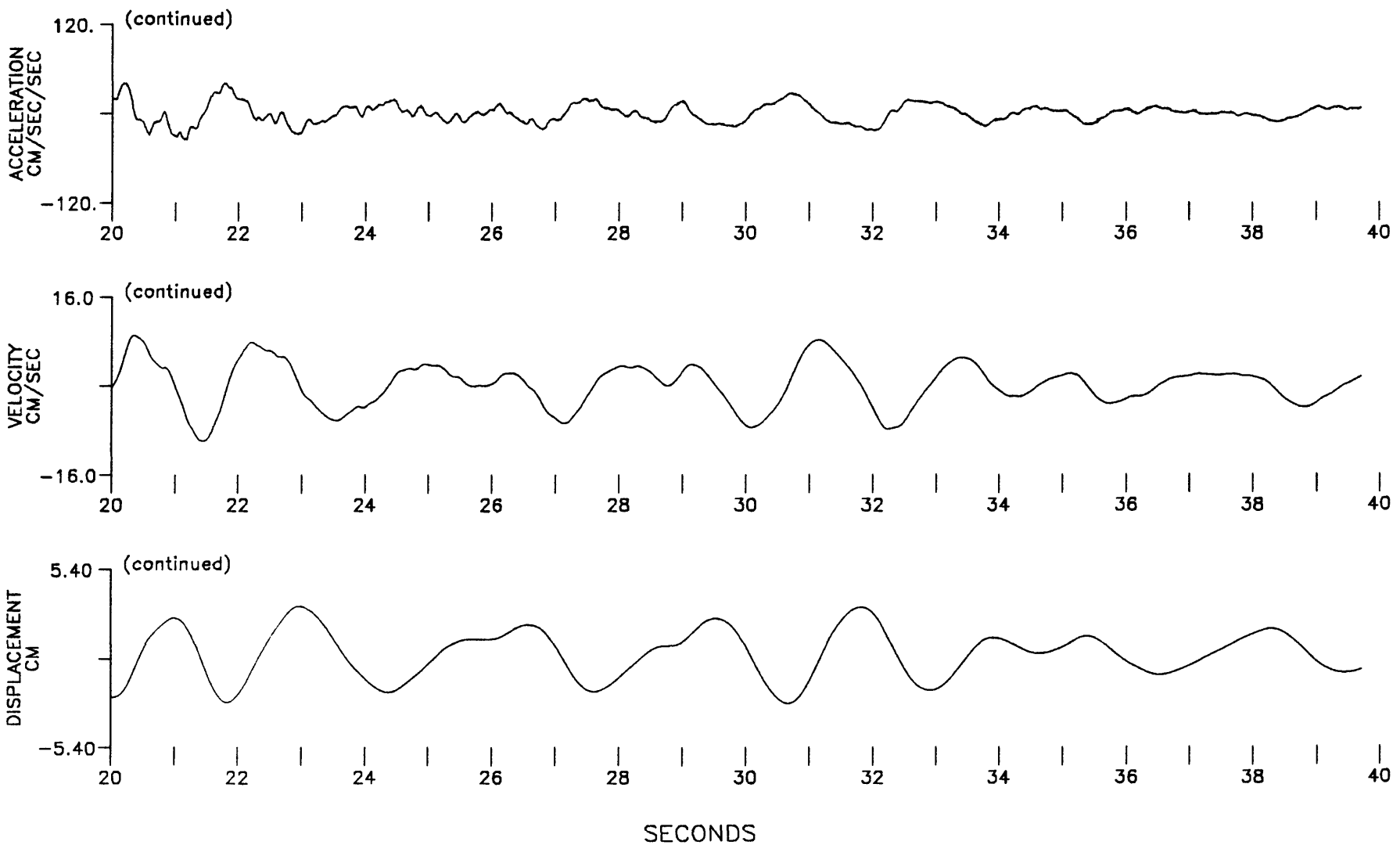
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 100. SPS
STANFORD PARKING GARAGE, GRND LEVEL
90 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= -215.99 CM/SEC/SEC, VELOCITY= -21.30 CM/SEC, DISPL= -5.60 CM



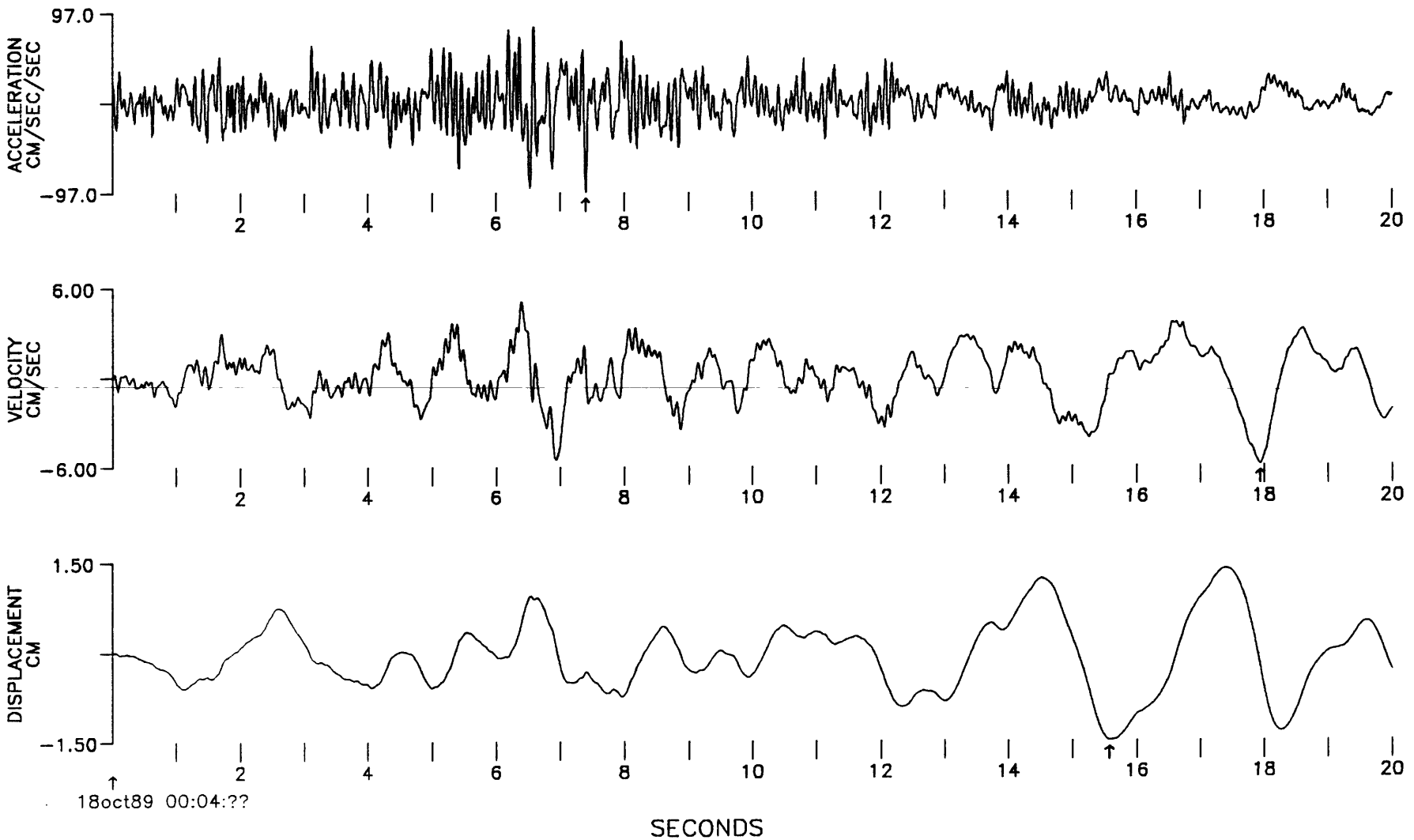
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
MENLO PARK VA HOSPITAL - BLDG 137
110 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= -117.10 CM/SEC/SEC, VELOCITY= -15.81 CM/SEC, DISPL= -5.31 CM



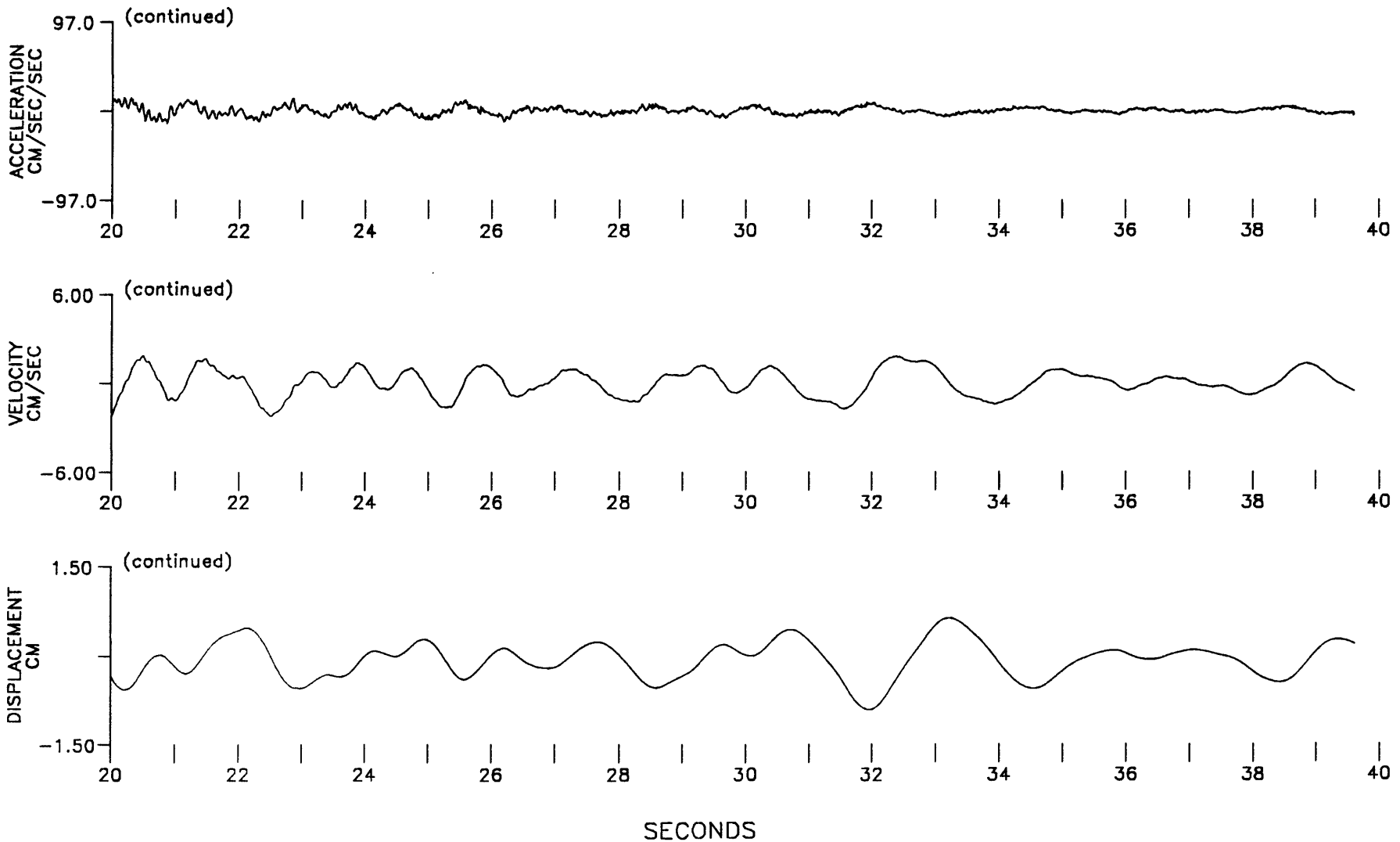
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
MENLO PARK VA HOSPITAL - BLDG 137
110 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= -117.10 CM/SEC/SEC, VELOCITY= -15.81 CM/SEC, DISPL= -5.31 CM



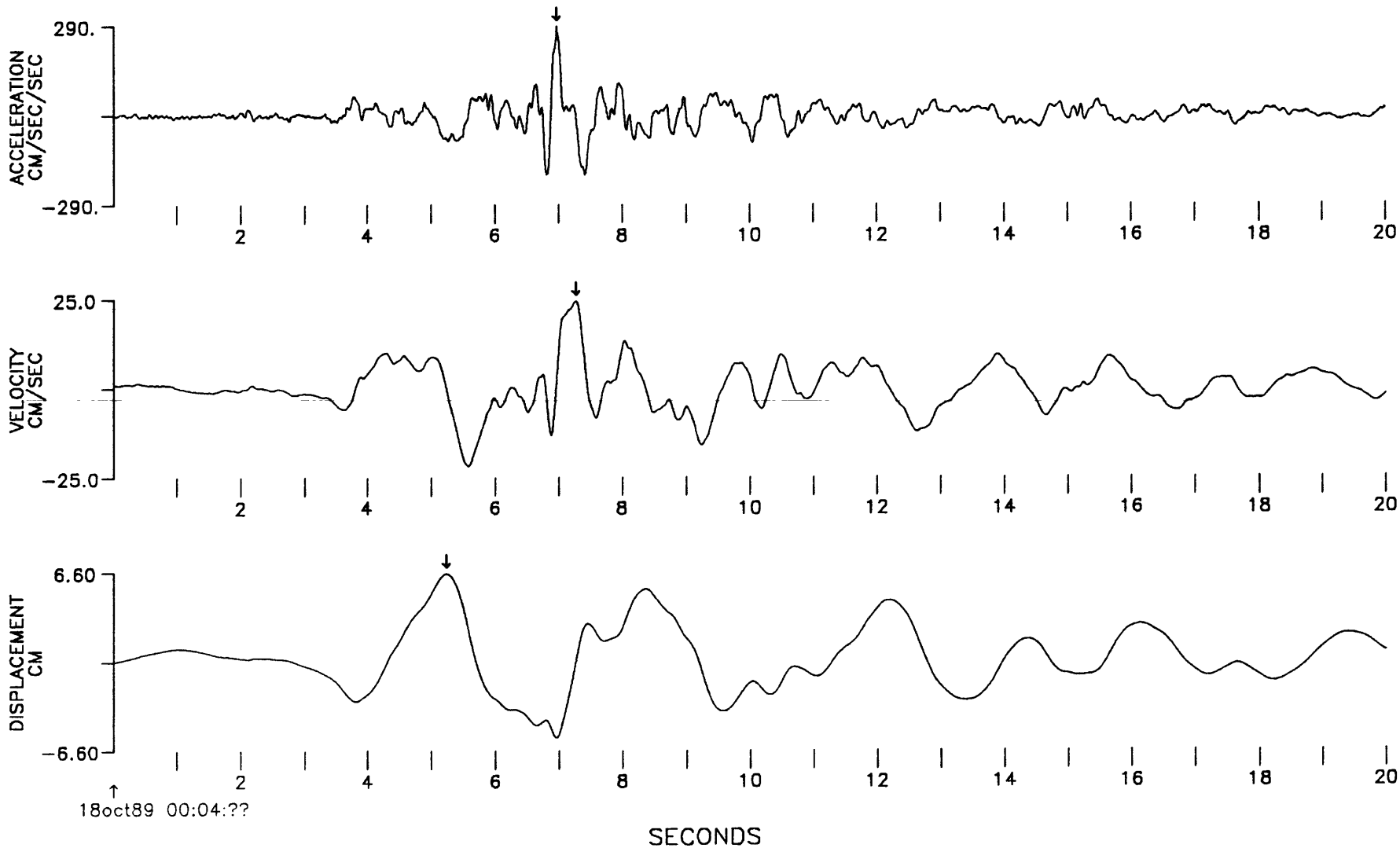
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
MENLO PARK VA HOSPITAL - BLDG 137
UP
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= -96.47 CM/SEC/SEC, VELOCITY= -5.91 CM/SEC, DISPL= -1.49 CM



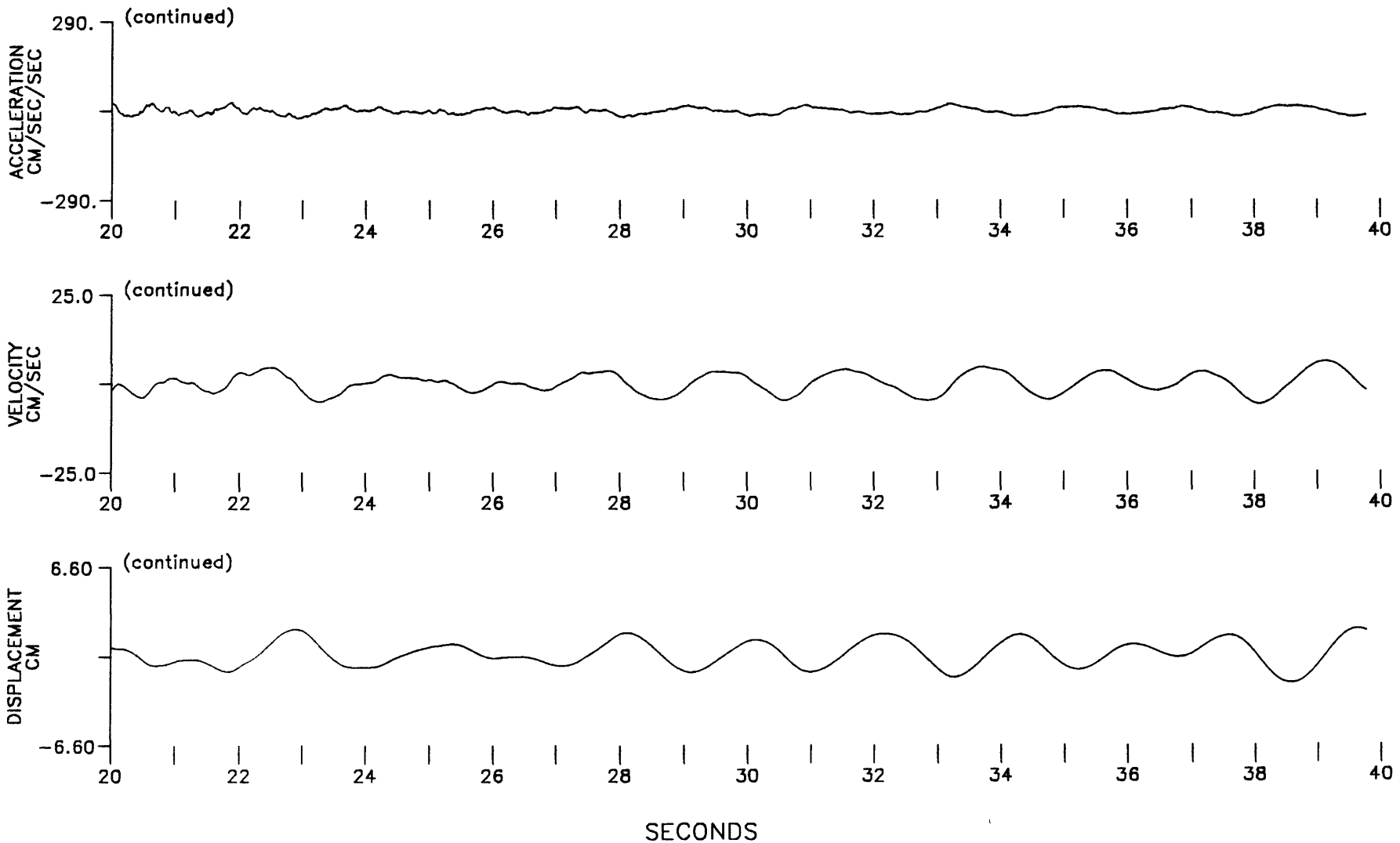
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
MENLO PARK VA HOSPITAL – BLDG 137
UP
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= −96.47 CM/SEC/SEC, VELOCITY= −5.91 CM/SEC, DISPL= −1.49 CM



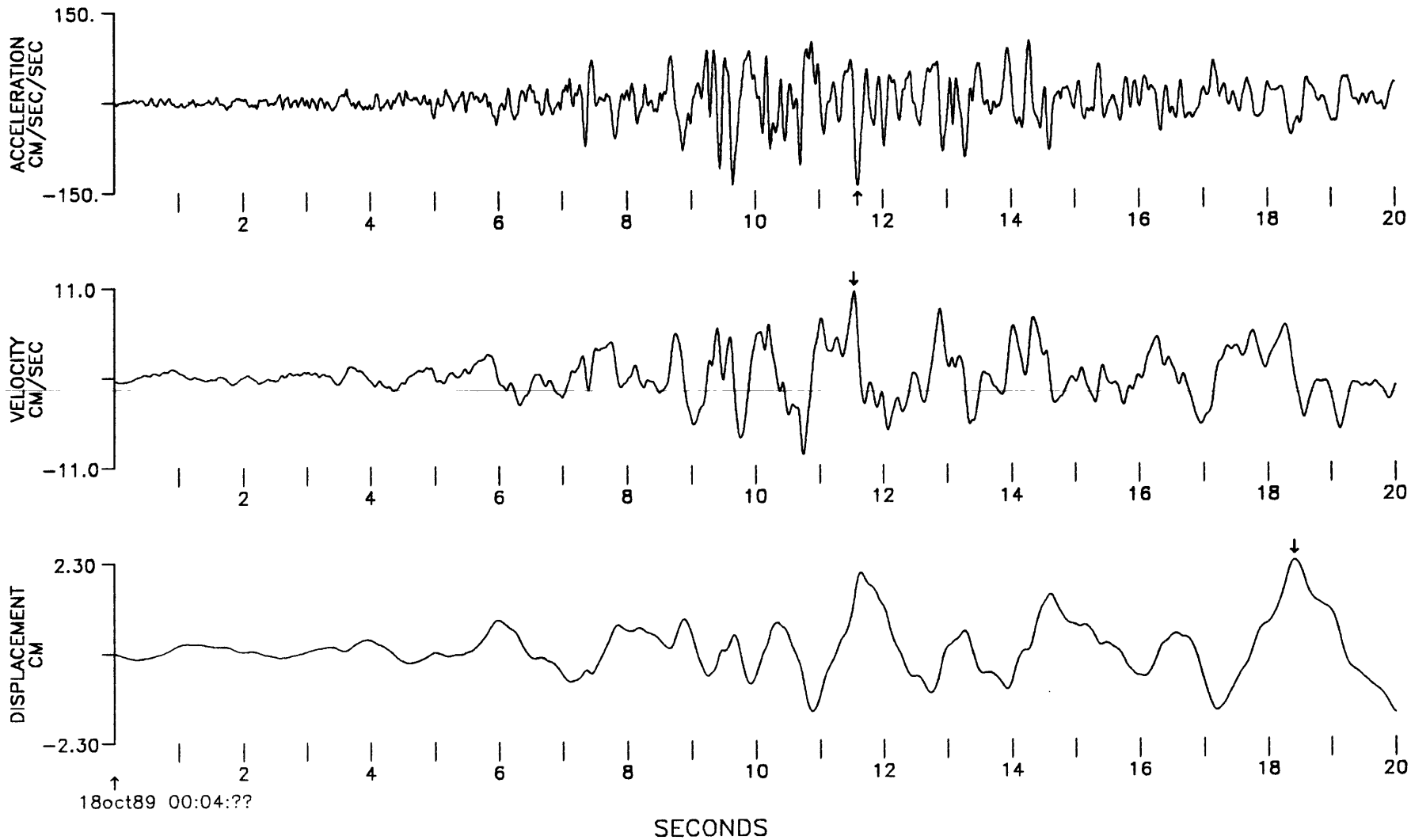
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
MENLO PARK VA HOSPITAL – BLDG 137
20 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= 287.90 CM/SEC/SEC, VELOCITY= 24.43 CM/SEC, DISPL= 6.53 CM



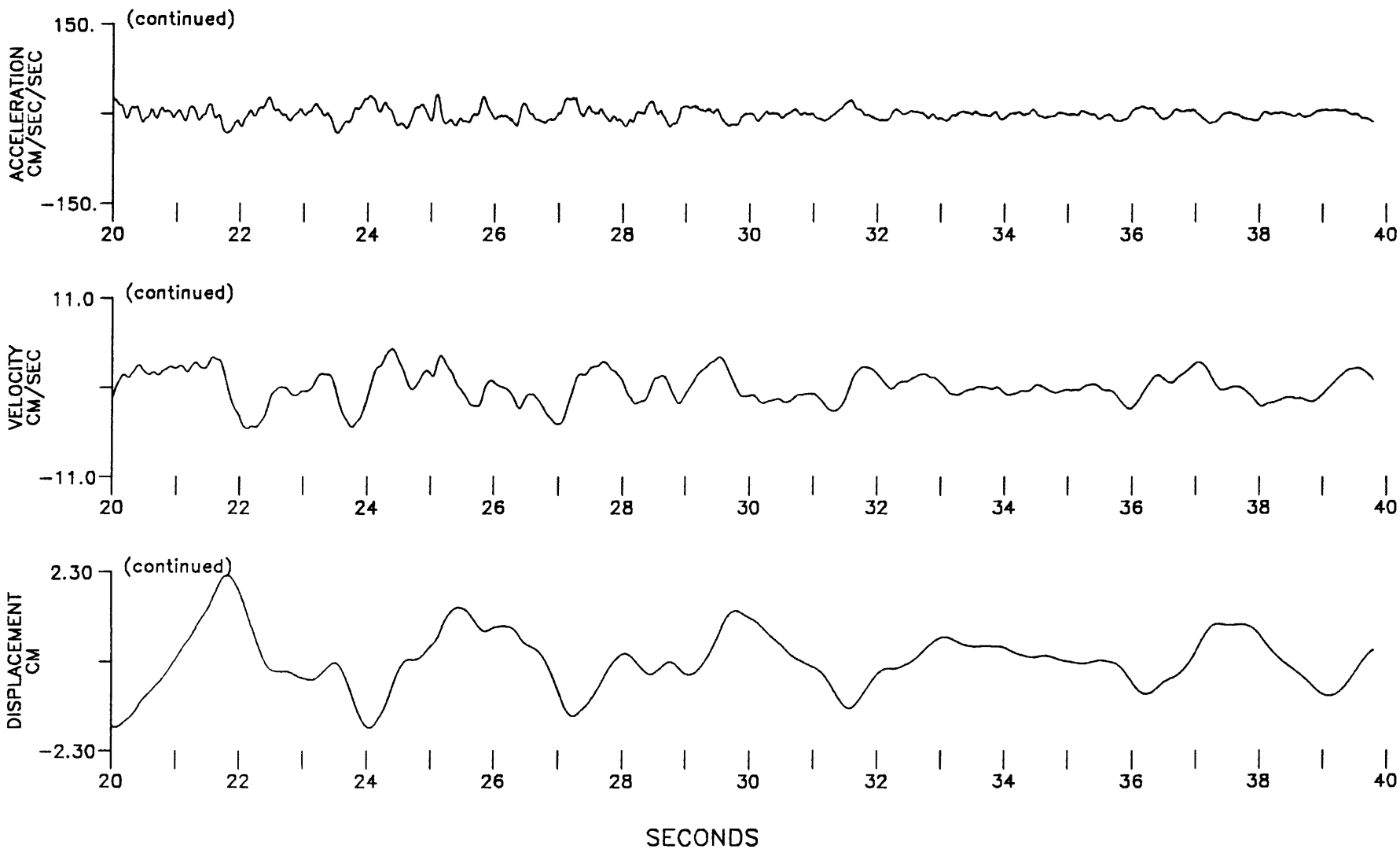
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
MENLO PARK VA HOSPITAL - BLDG 137
20 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= 287.90 CM/SEC/SEC, VELOCITY= 24.43 CM/SEC, DISPL= 6.53 CM



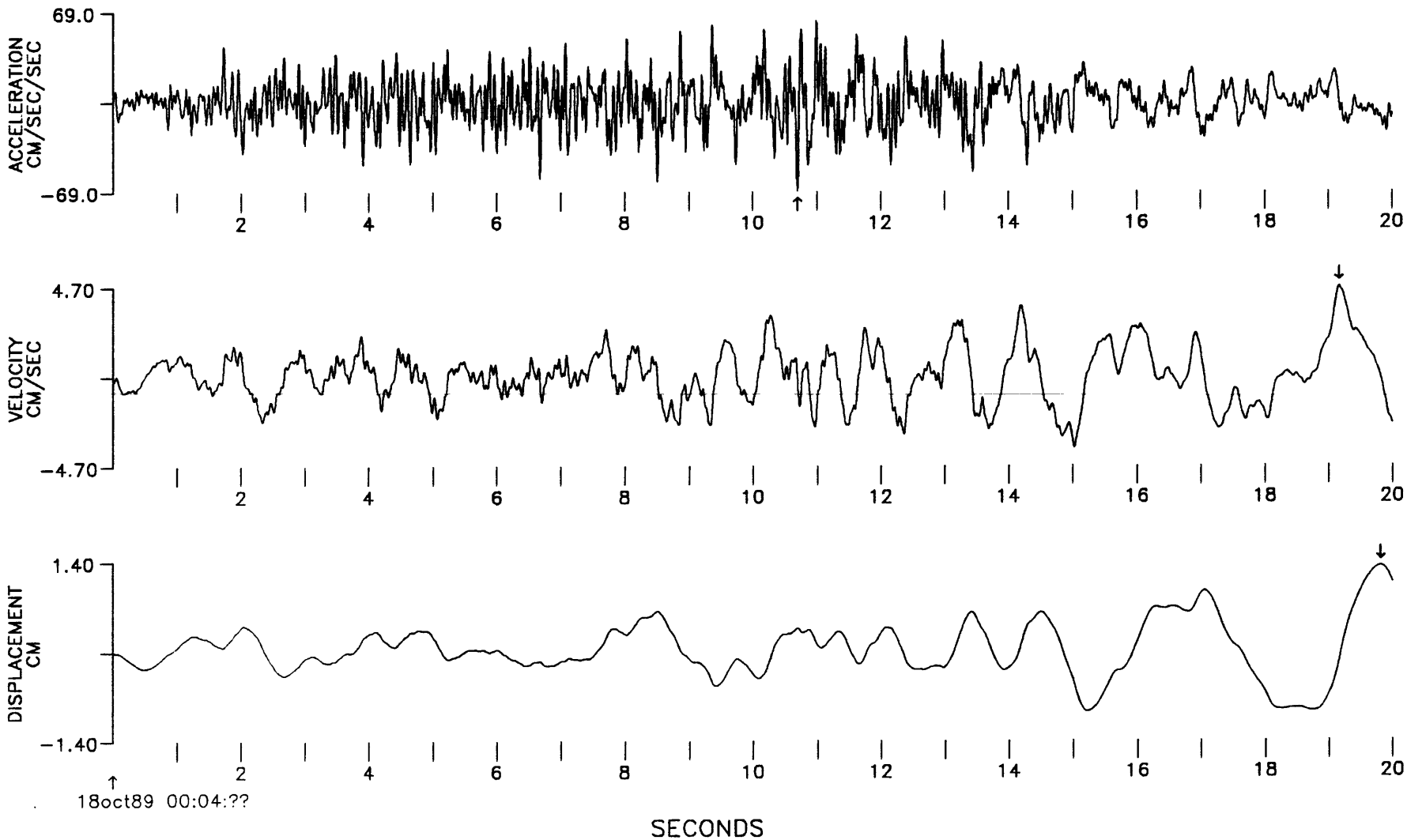
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
CALAVERAS ARRAY - FREMONT, EMERSON CT.
180 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= -142.56 CM/SEC/SEC, VELOCITY= 10.26 CM/SEC, DISPL= 2.27 CM



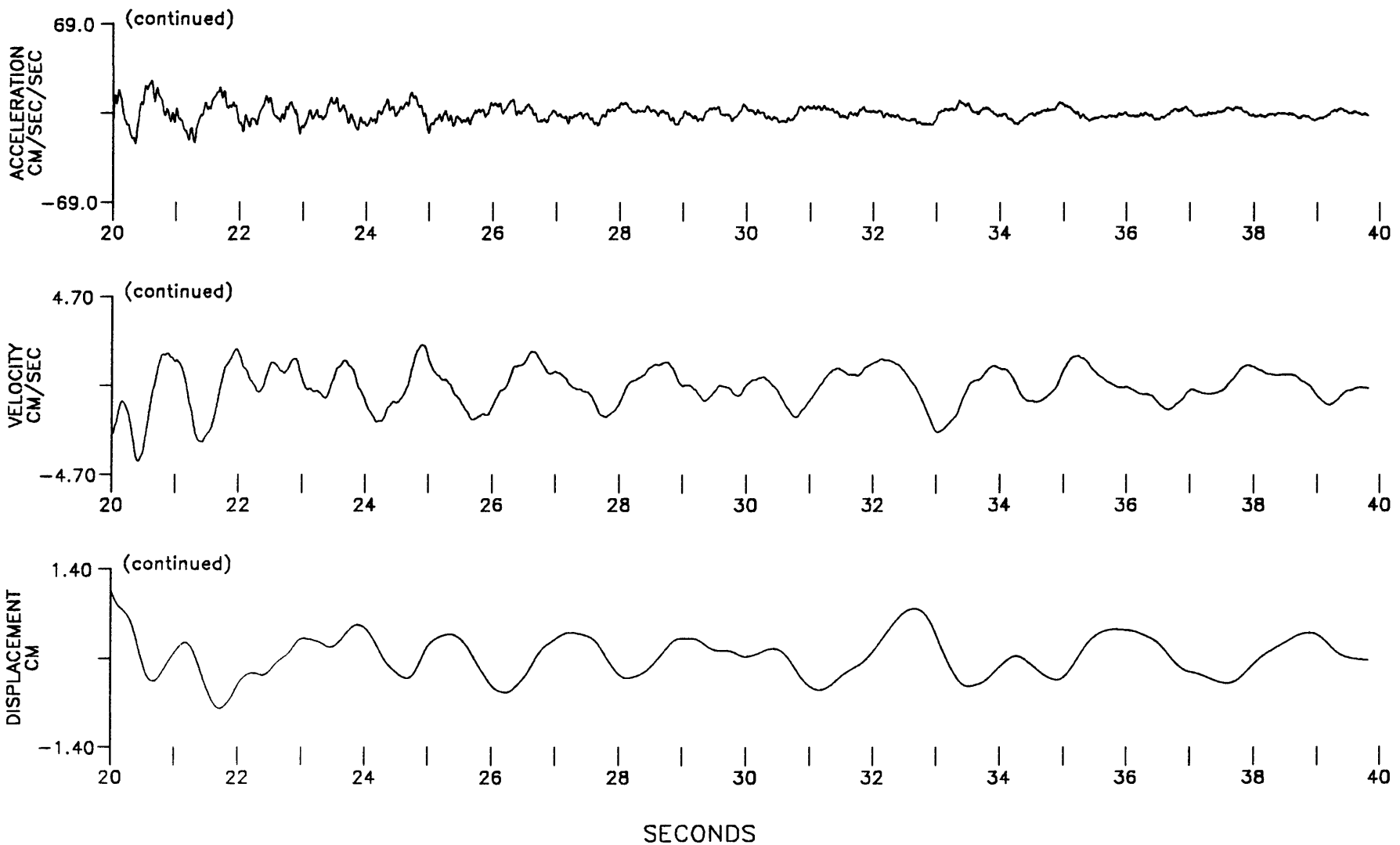
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
CALAVERAS ARRAY - FREMONT, EMERSON CT.
180 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= -142.56 CM/SEC/SEC, VELOCITY= 10.26 CM/SEC, DISPL= 2.27 CM



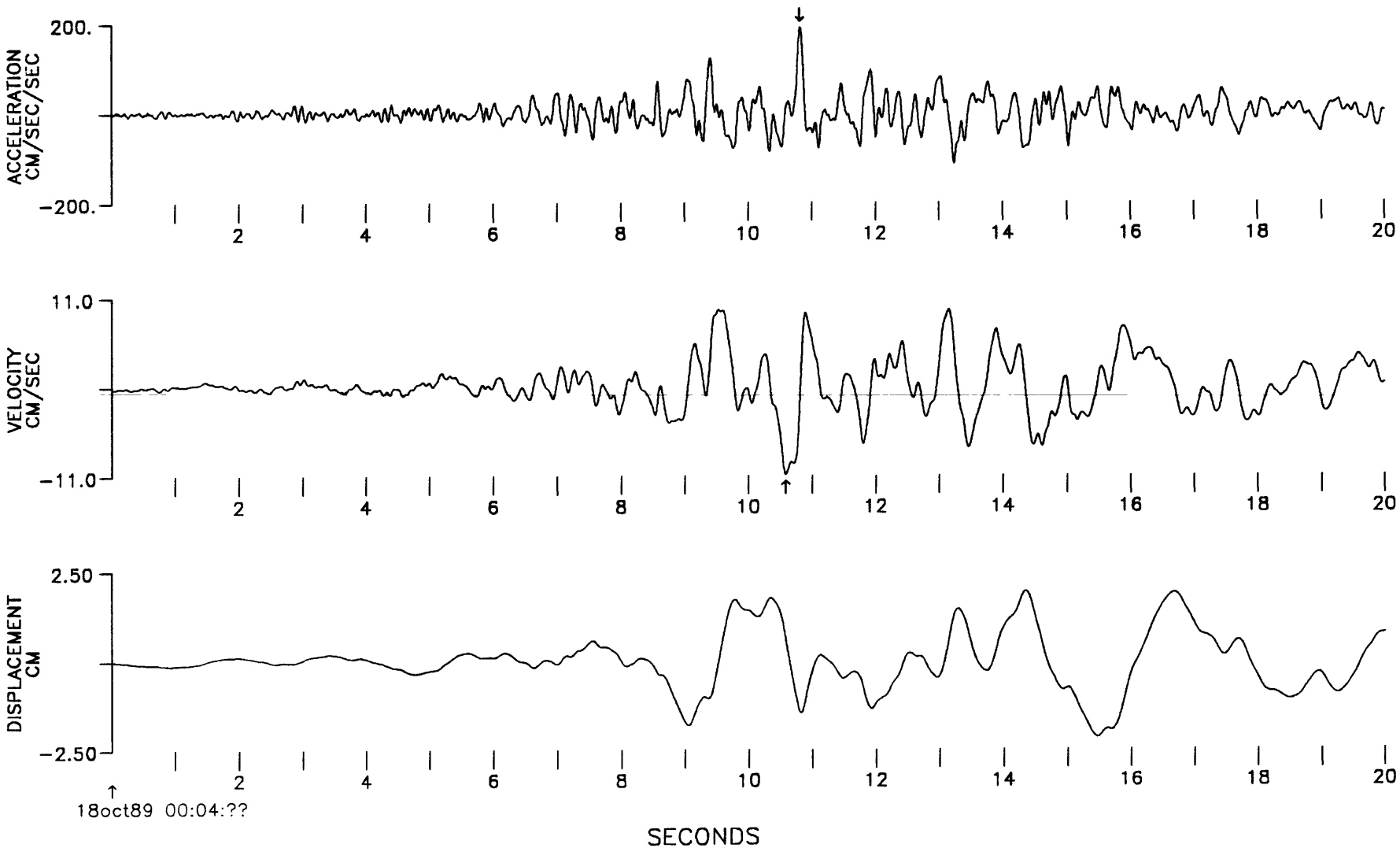
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
CALAVERAS ARRAY – FREMONT, EMERSON CT.
UP
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= −68.46 CM/SEC/SEC, VELOCITY= 4.69 CM/SEC, DISPL= 1.32 CM



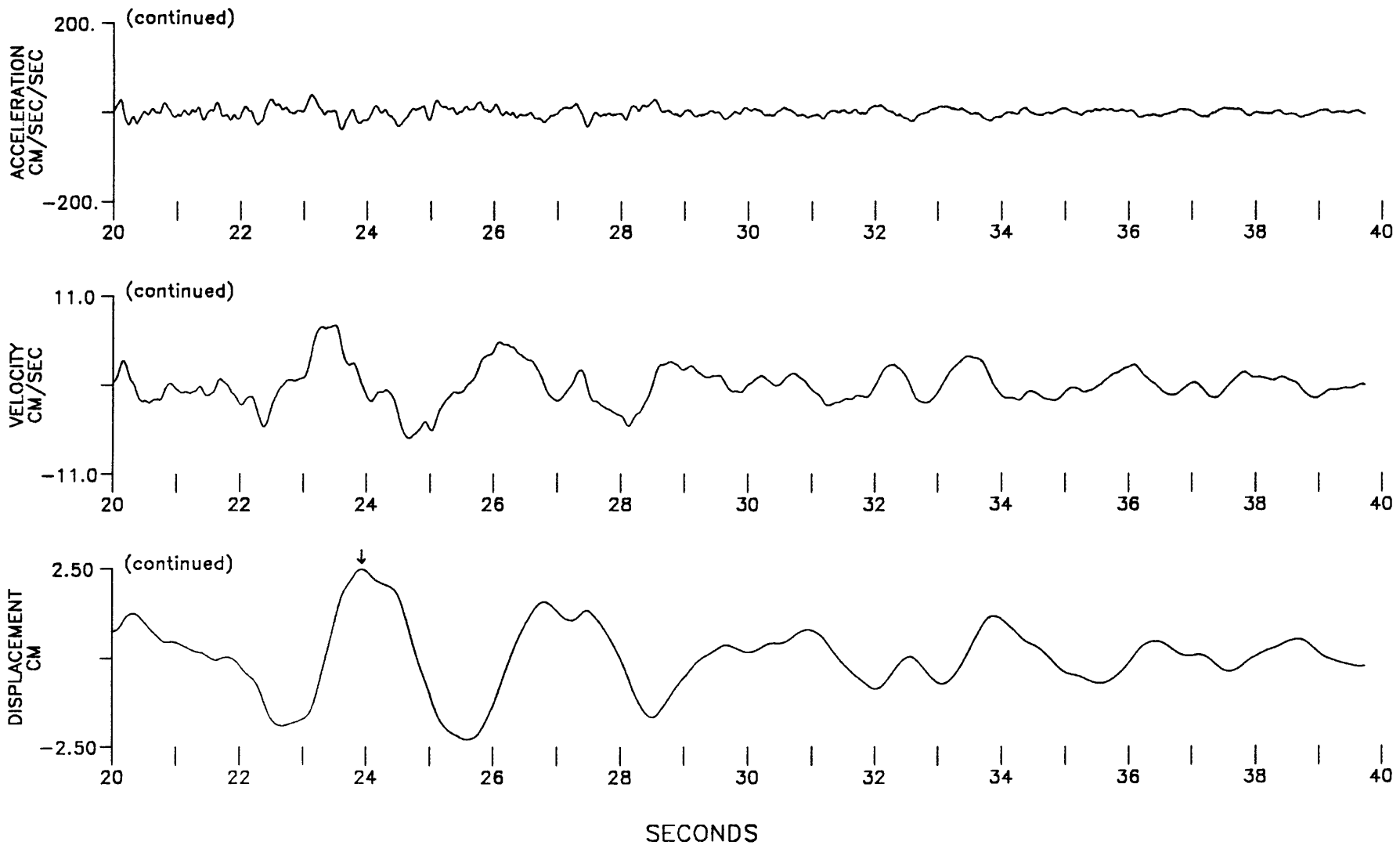
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
CALAVERAS ARRAY - FREMONT, EMERSON CT.
UP
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= -68.46 CM/SEC/SEC, VELOCITY= 4.69 CM/SEC, DISPL= 1.32 CM



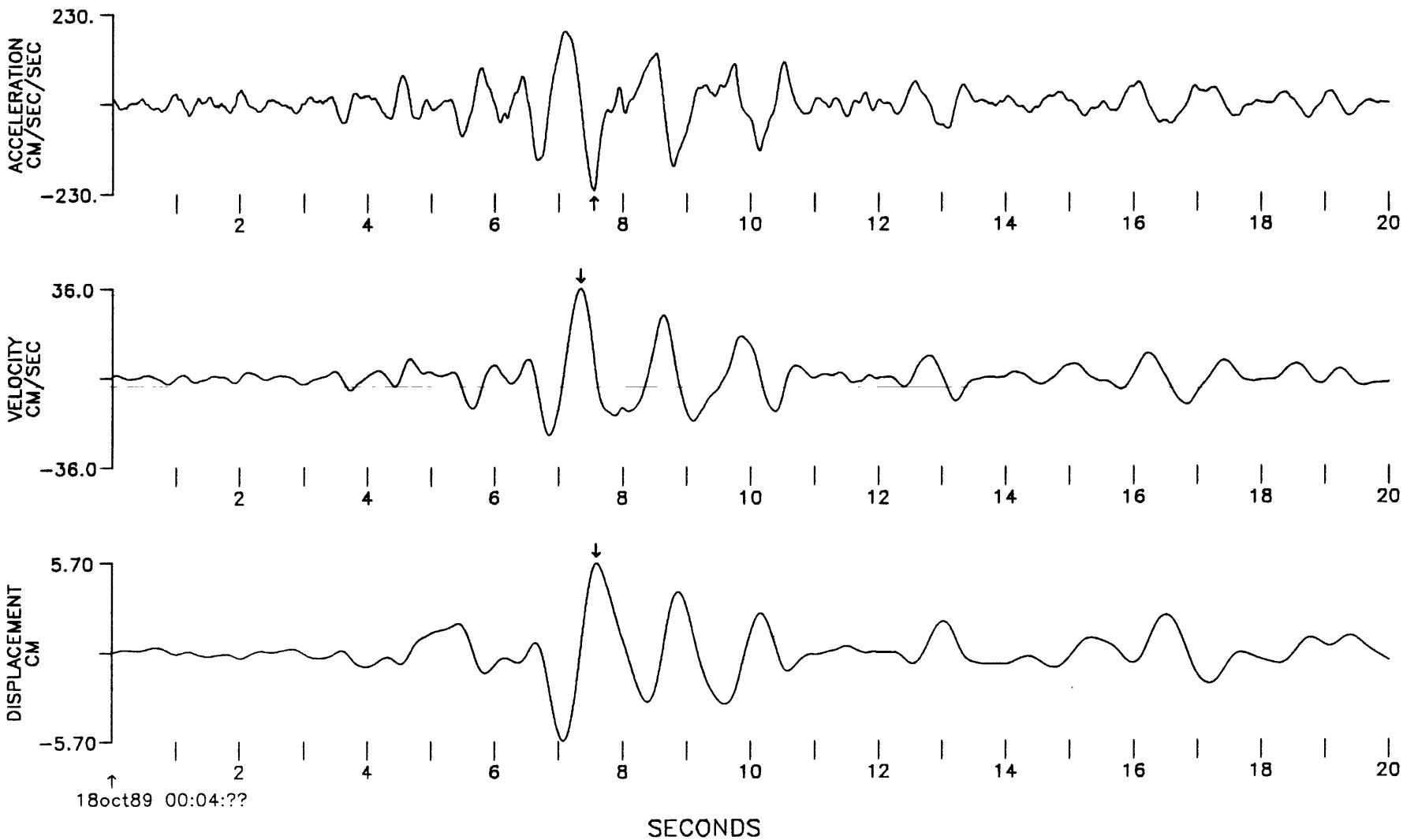
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
CALAVERAS ARRAY - FREMONT, EMERSON CT.
090 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= 190.68 CM/SEC/SEC, VELOCITY= -10.79 CM/SEC, DISPL= 2.49 CM



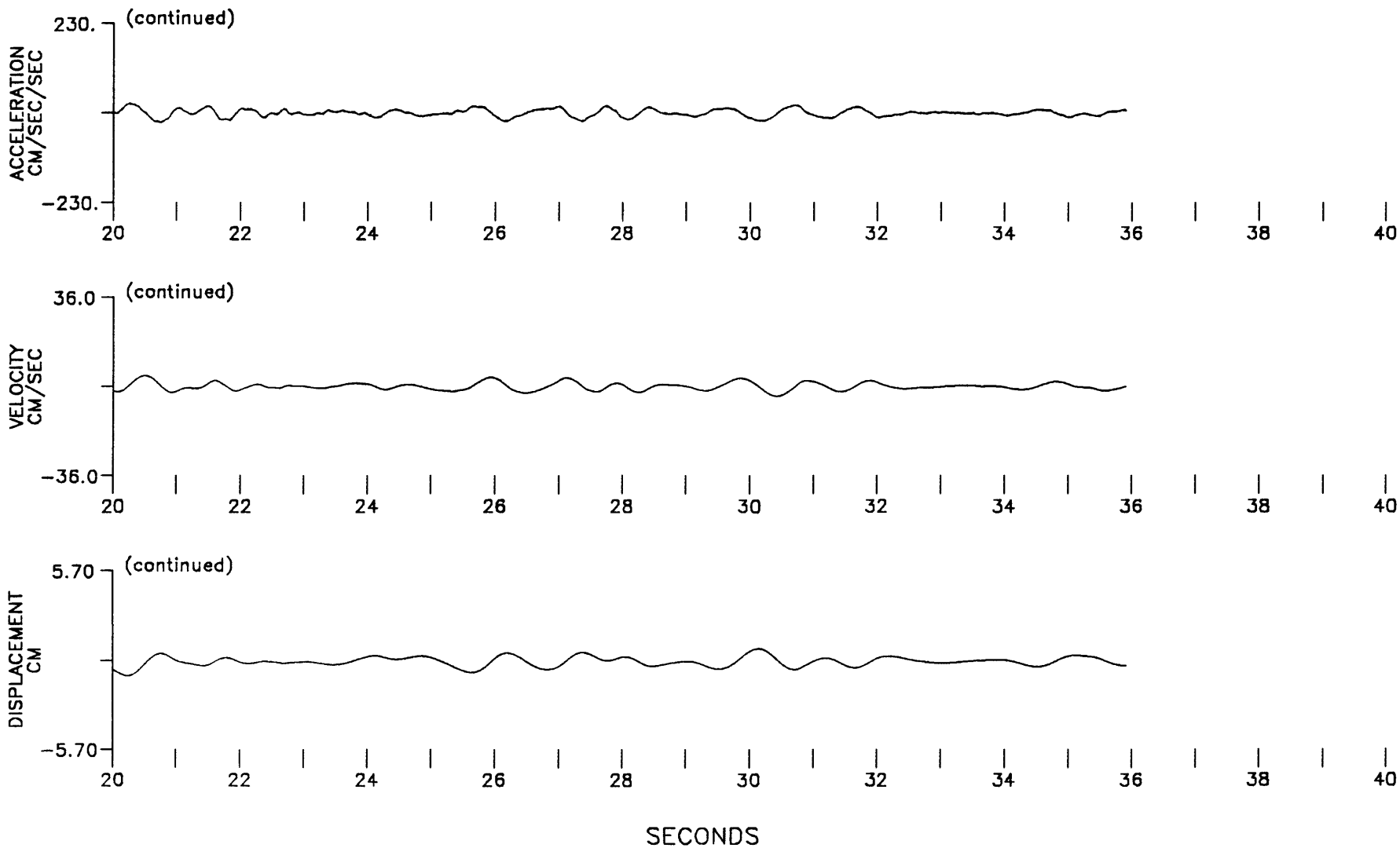
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
CALAVERAS ARRAY - FREMONT, EMERSON CT.
090 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= 190.68 CM/SEC/SEC, VELOCITY= -10.79 CM/SEC, DISPL= 2.49 CM



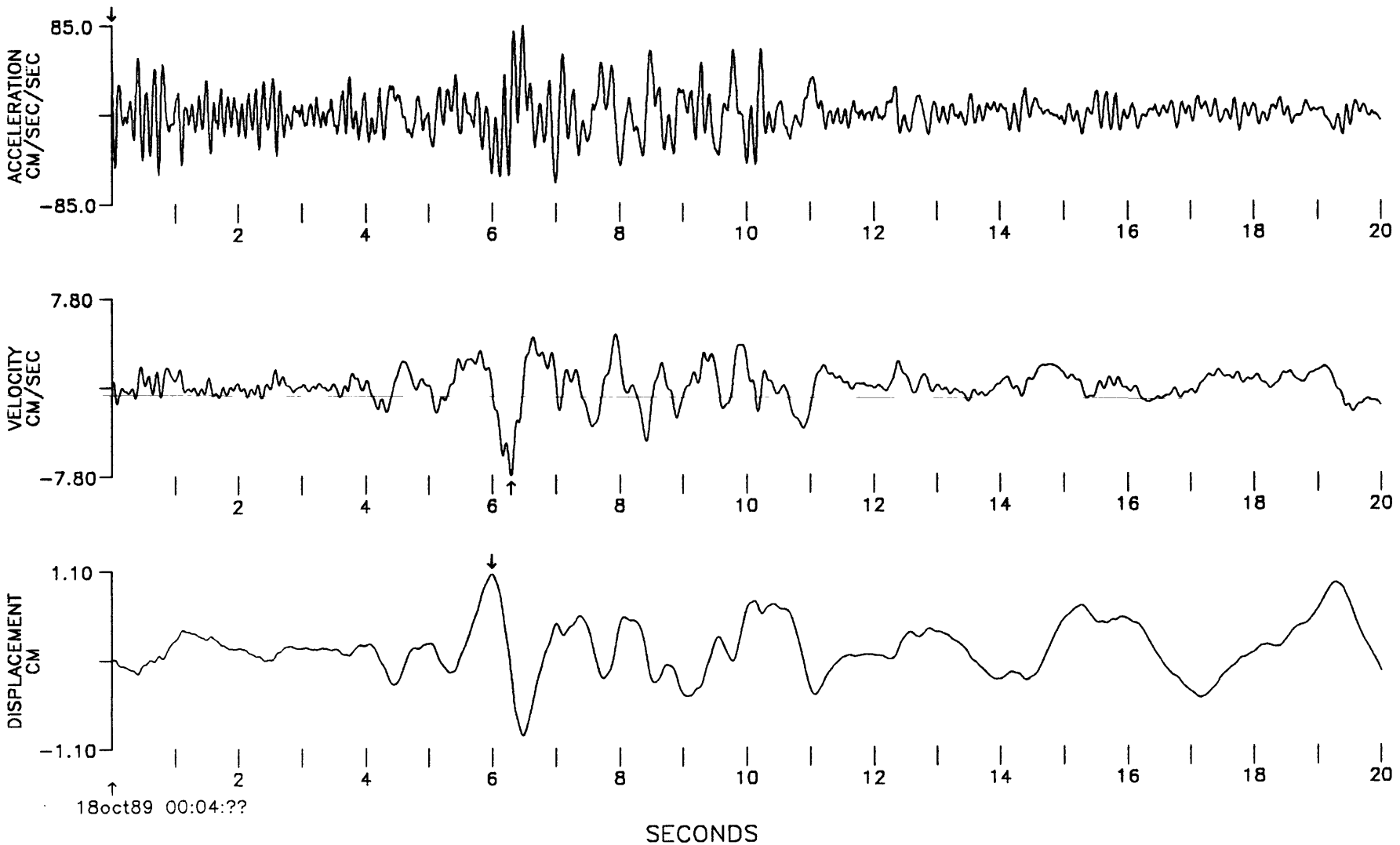
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
APEEL ARRAY #2, REDWOOD CITY
133 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
PEAK VALUES: ACCEL= -222.52 CM/SEC/SEC, VELOCITY= 35.88 CM/SEC, DISPL= 5.68 CM



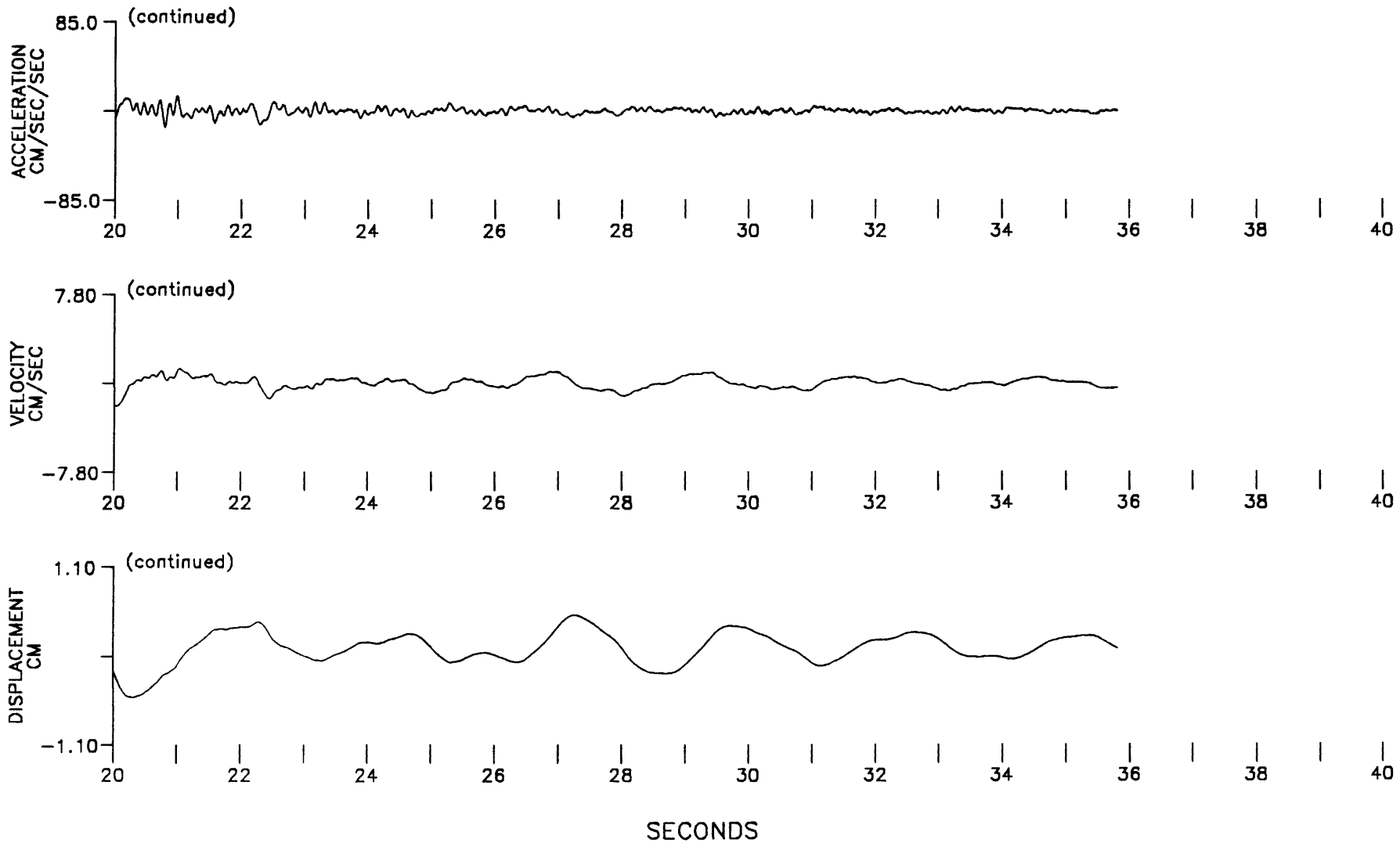
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
APEEL ARRAY #2, REDWOOD CITY
133 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
PEAK VALUES: ACCEL= -222.52 CM/SEC/SEC, VELOCITY= 35.88 CM/SEC, DISPL= 5.68 CM



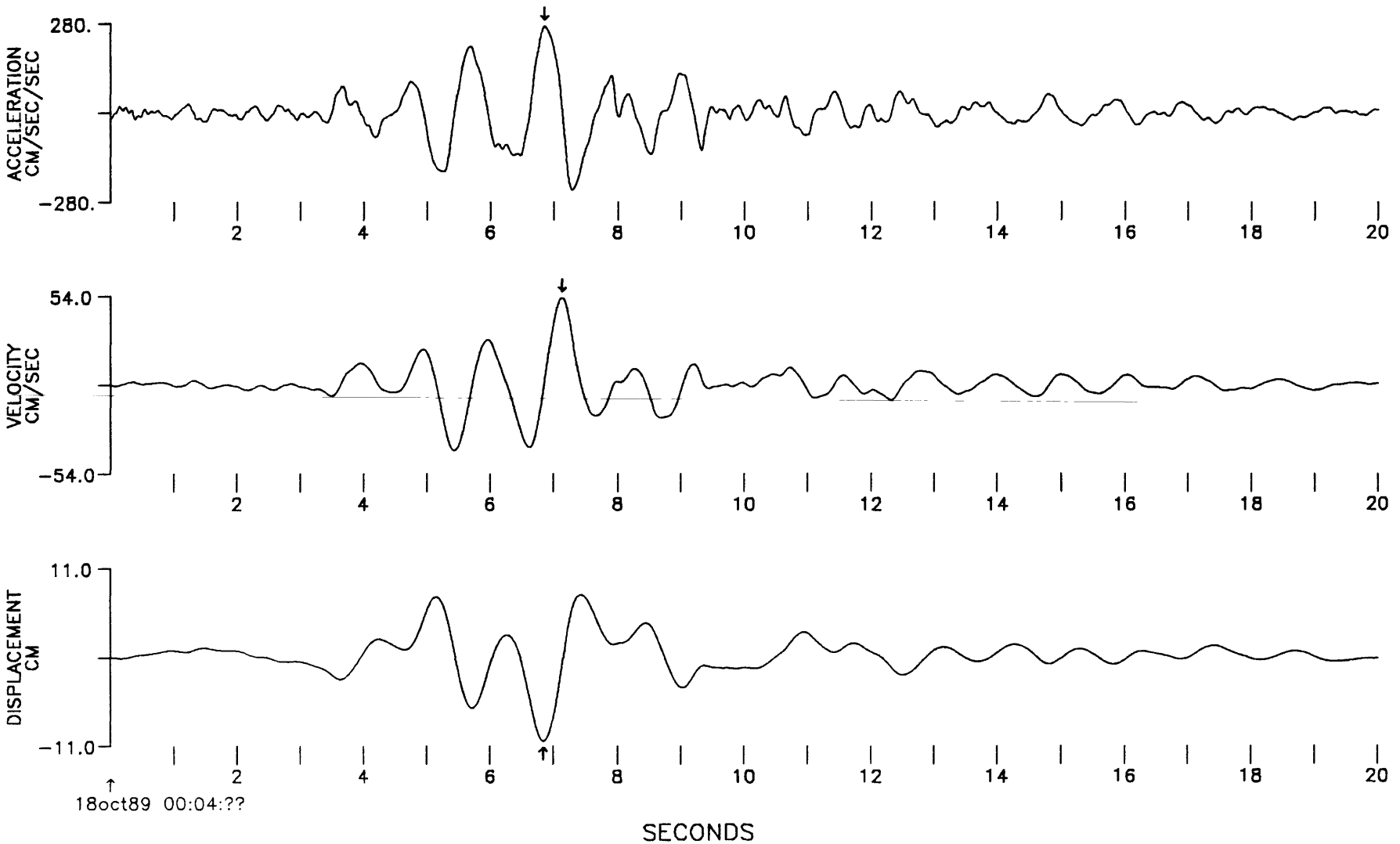
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
APEEL ARRAY #2, REDWOOD CITY
UP
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
PEAK VALUES: ACCEL= 84.52 CM/SEC/SEC, VELOCITY= −7.79 CM/SEC, DISPL= 1.06 CM



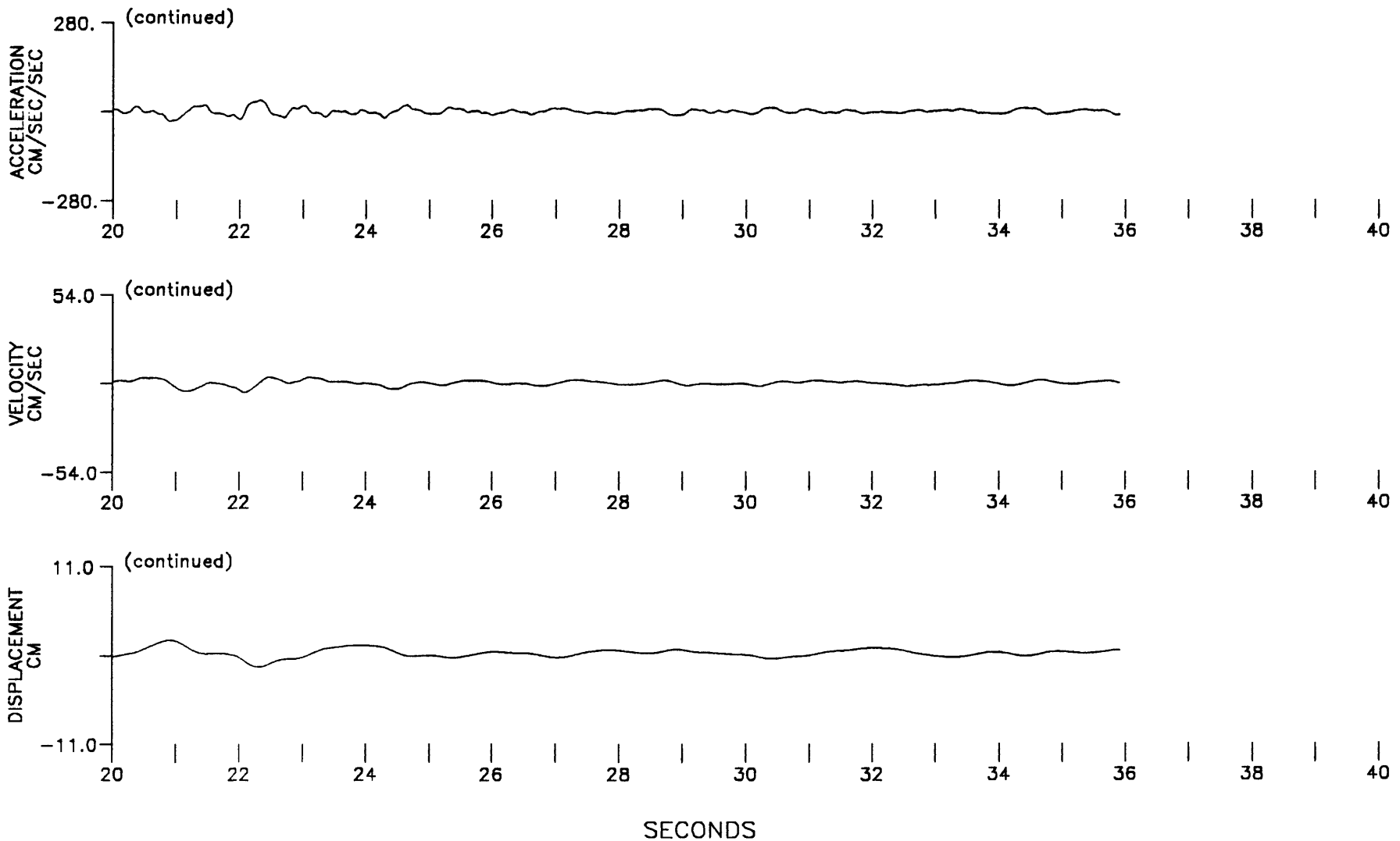
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
APEEL ARRAY #2, REDWOOD CITY
UP
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
PEAK VALUES: ACCEL= 84.52 CM/SEC/SEC, VELOCITY= -7.79 CM/SEC, DISPL= 1.06 CM



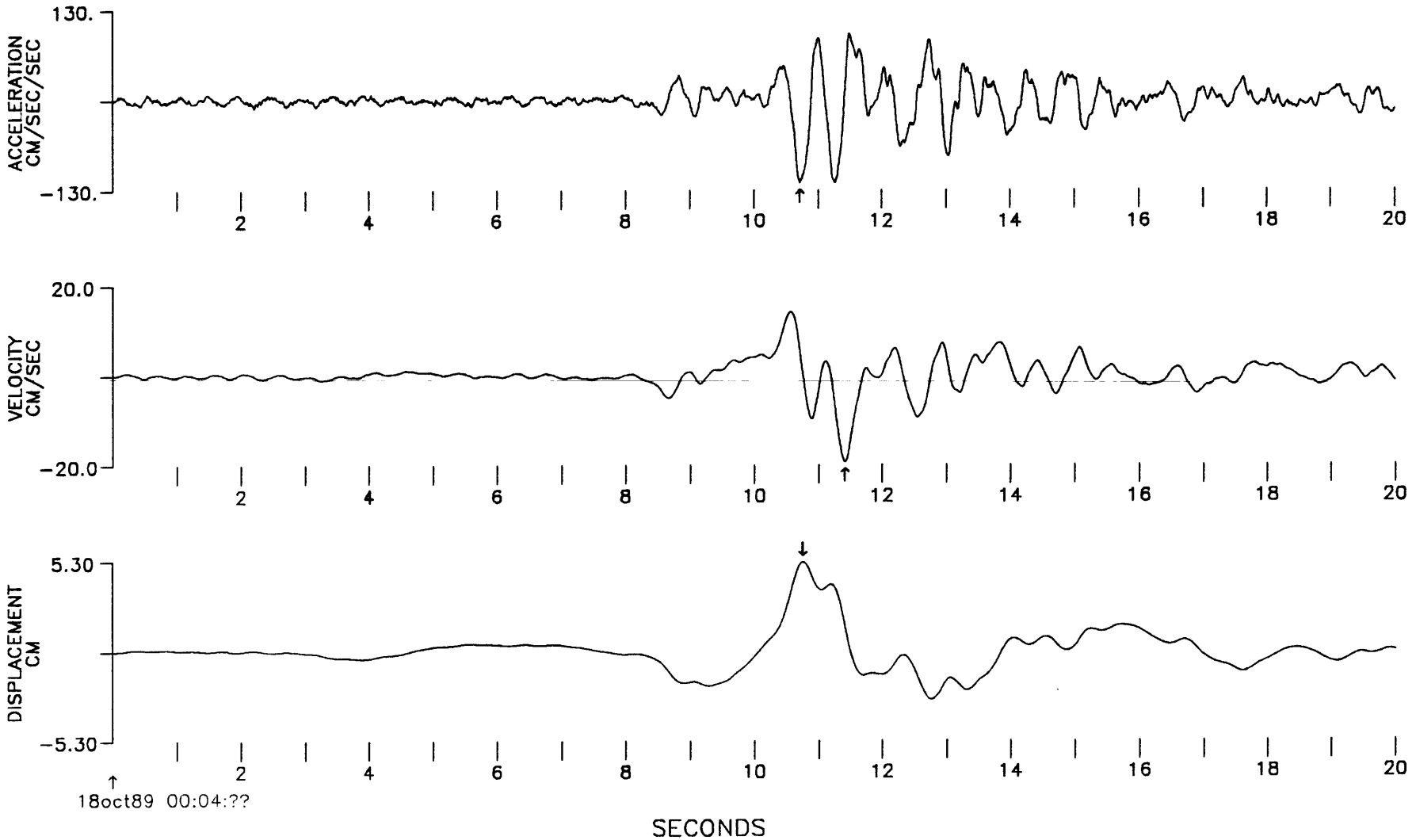
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
APEEL ARRAY #2, REDWOOD CITY
043 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
PEAK VALUES: ACCEL= 272.30 CM/SEC/SEC, VELOCITY= 53.13 CM/SEC, DISPL= -10.36 CM



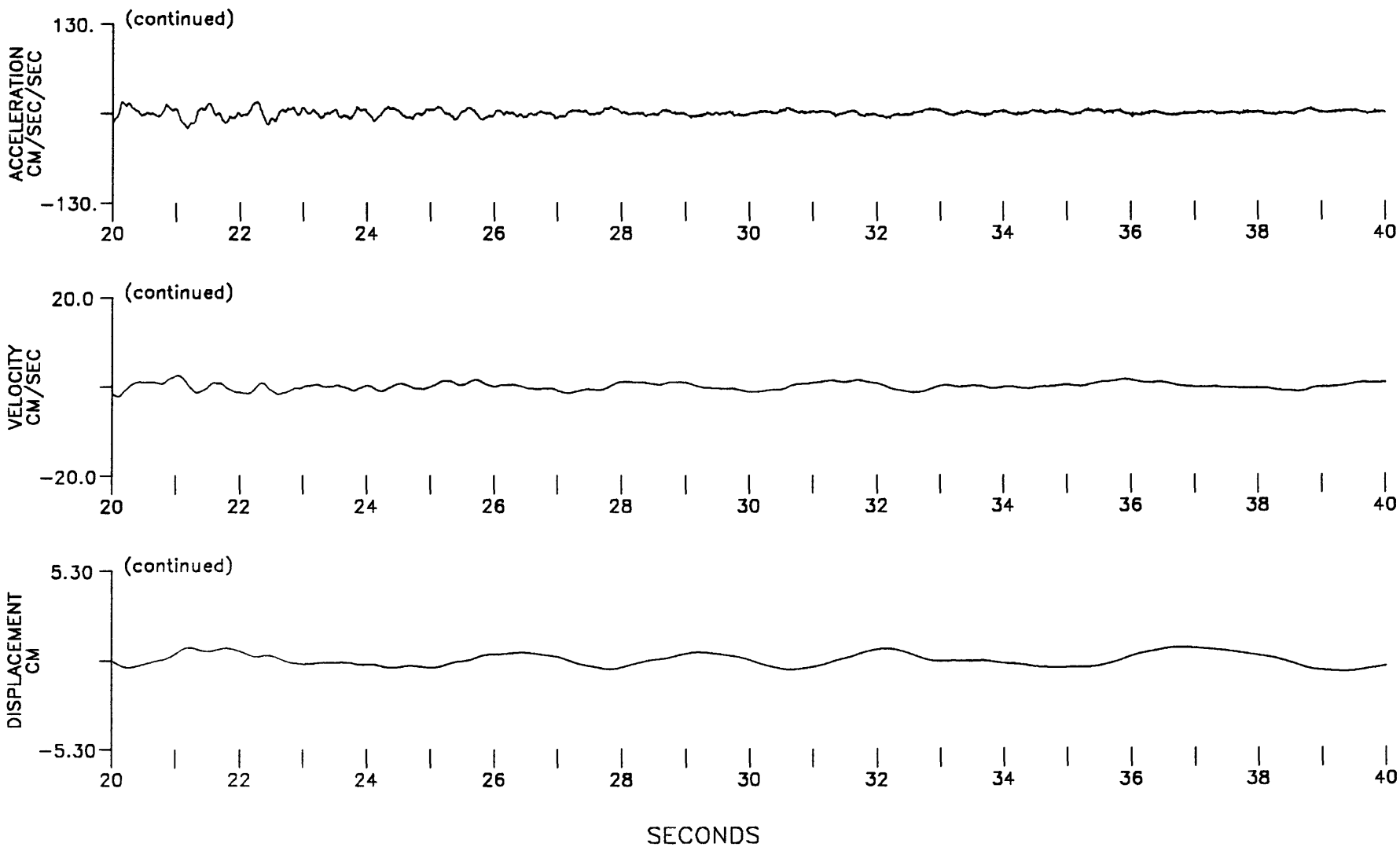
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
APEEL ARRAY #2, REDWOOD CITY
043 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
PEAK VALUES: ACCEL= 272.30 CM/SEC/SEC, VELOCITY= 53.13 CM/SEC, DISPL= −10.36 CM



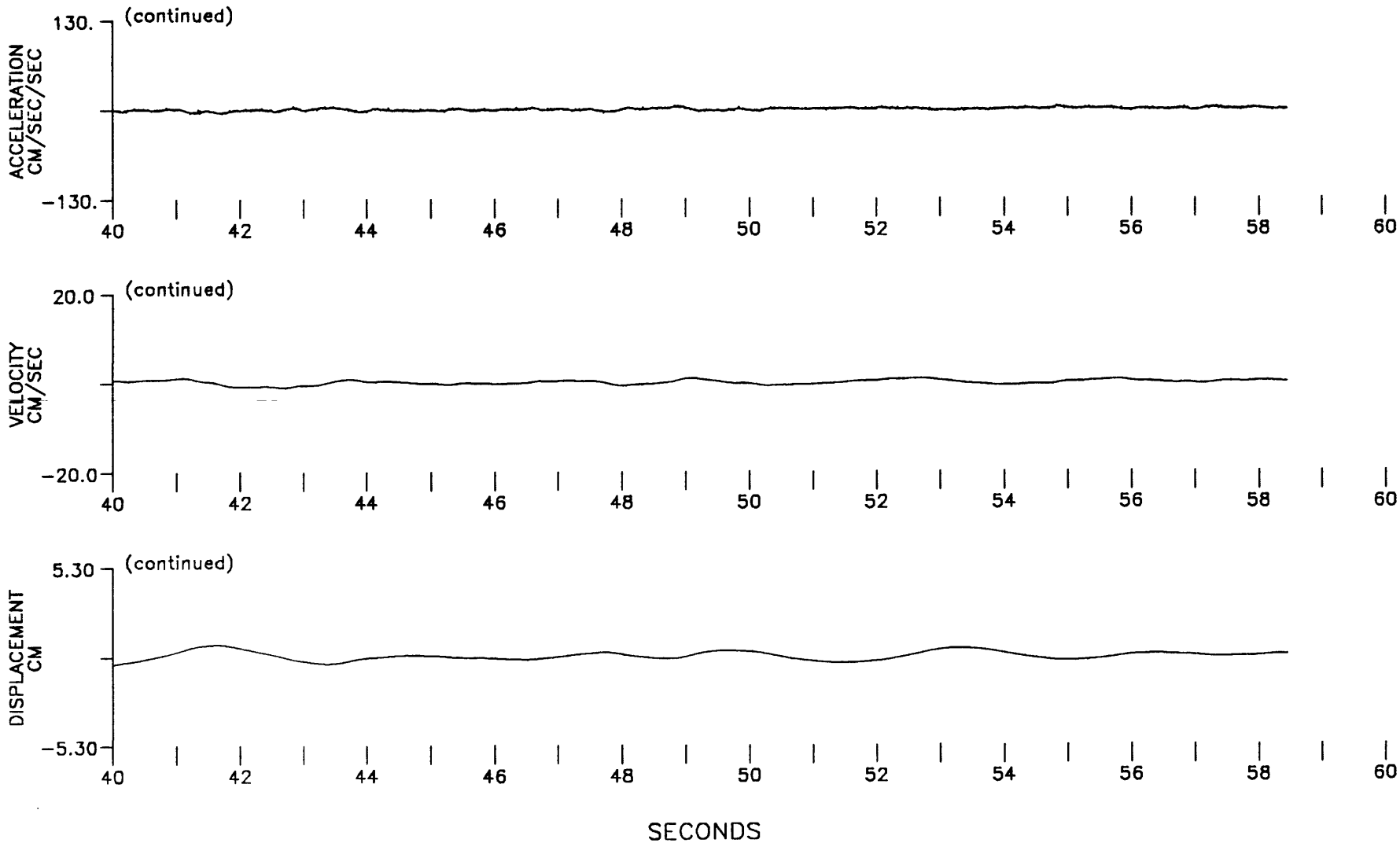
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SAN FRANCISCO, TRANSAMERICA BLDG - BASEMENT
261 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
PEAK VALUES: ACCEL= -120.23 CM/SEC/SEC, VELOCITY= -19.31 CM/SEC, DISPL= 5.22 CM



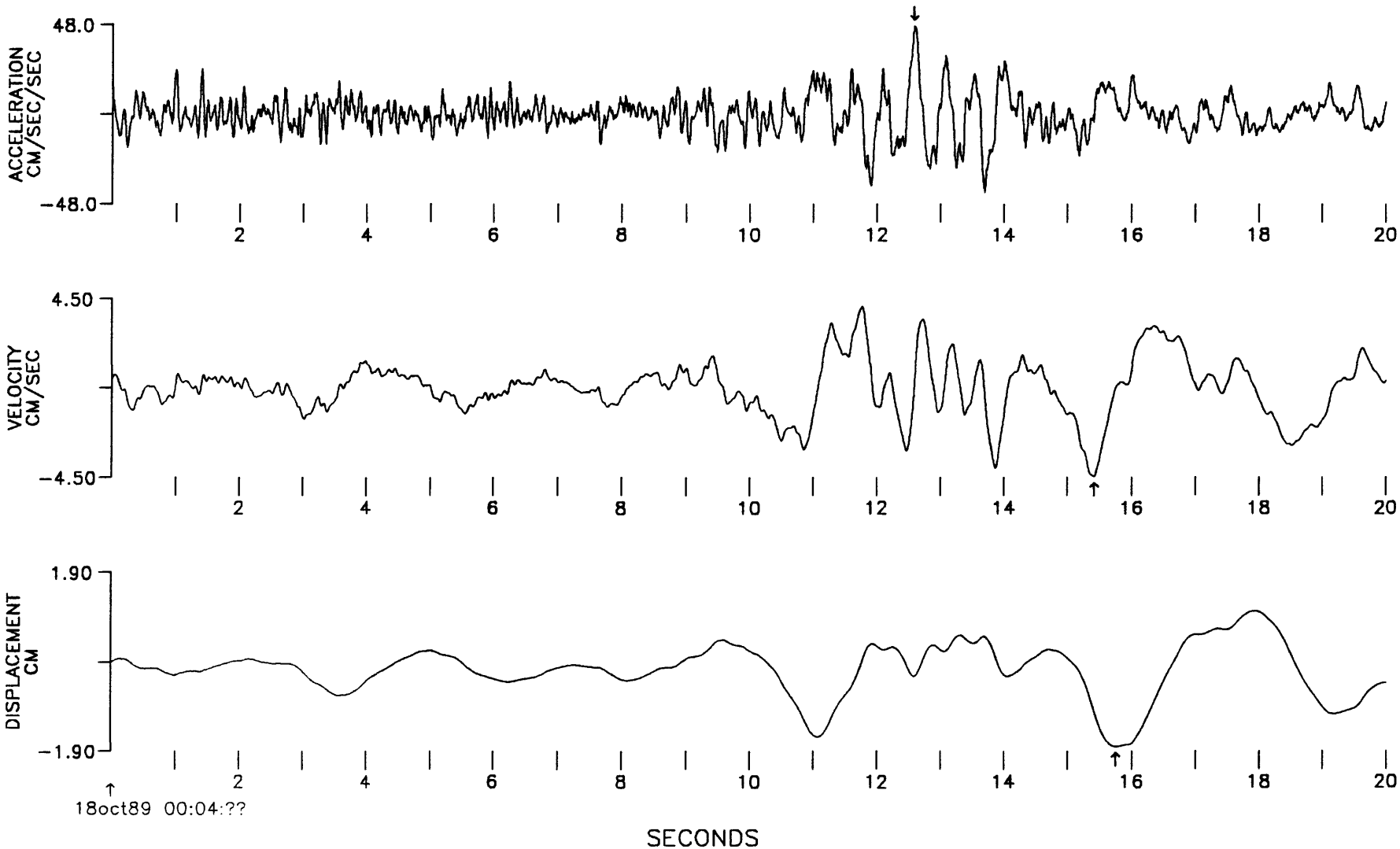
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SAN FRANCISCO, TRANSAMERICA BLDG - BASEMENT
261 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
PEAK VALUES: ACCEL= -120.23 CM/SEC/SEC, VELOCITY= -19.31 CM/SEC, DISPL= 5.22 CM



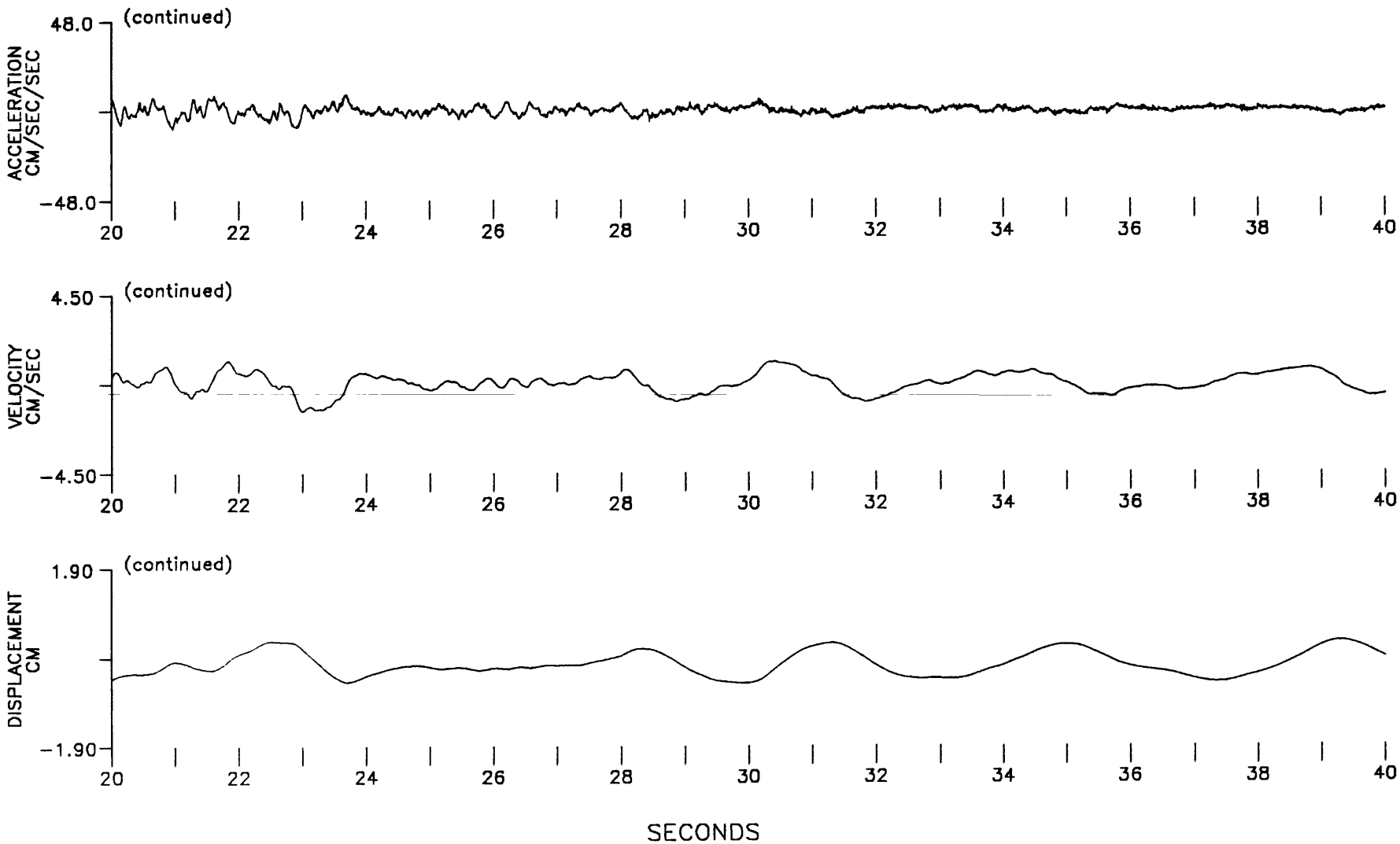
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SAN FRANCISCO, TRANSAMERICA BLDG - BASEMENT
261 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
PEAK VALUES: ACCEL= -120.23 CM/SEC/SEC, VELOCITY= -19.31 CM/SEC, DISPL= 5.22 CM



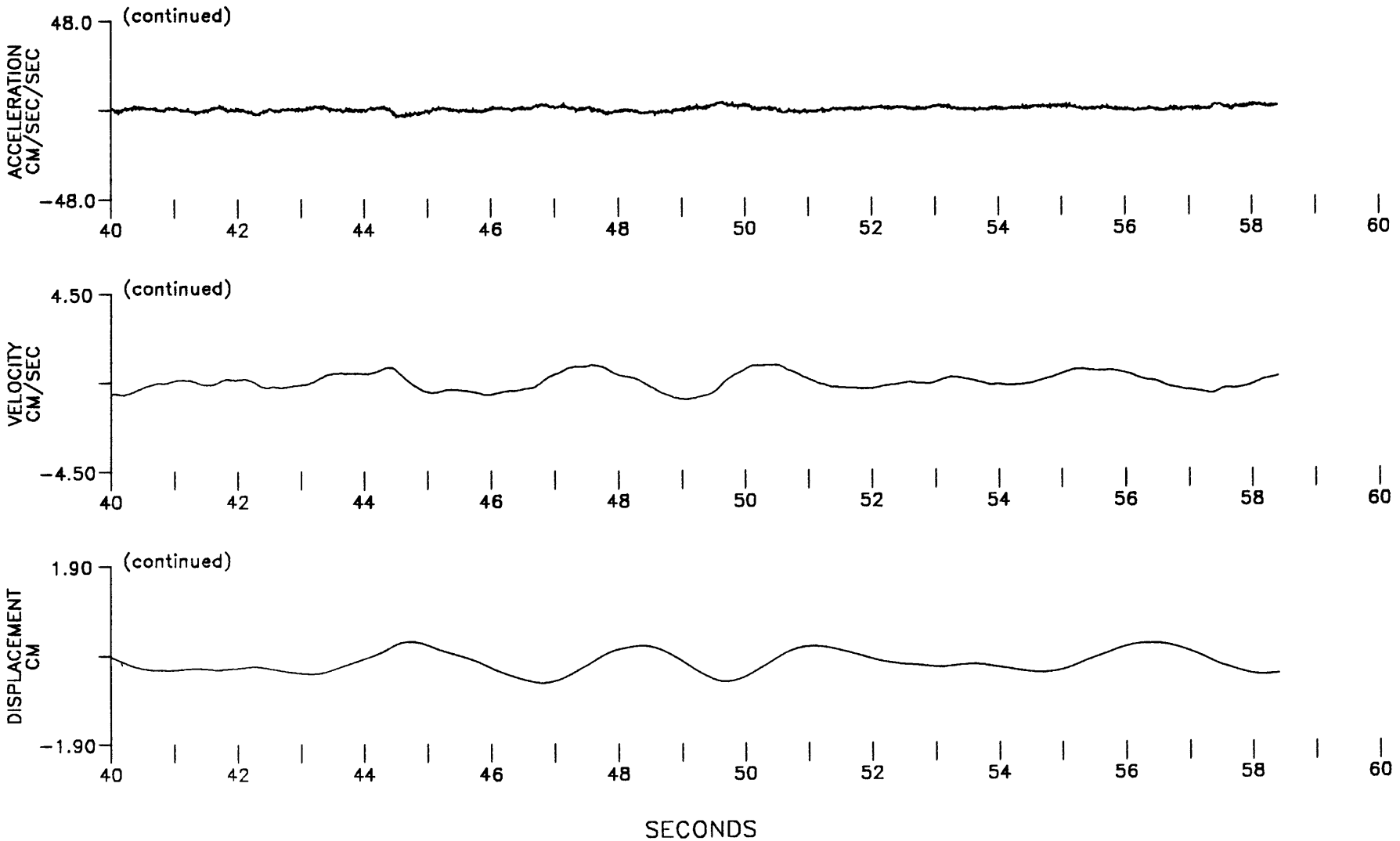
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SAN FRANCISCO, TRANSAMERICA BLDG - BASEMENT
UP
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
PEAK VALUES: ACCEL= 47.45 CM/SEC/SEC, VELOCITY= -4.45 CM/SEC, DISPL= -1.80 CM



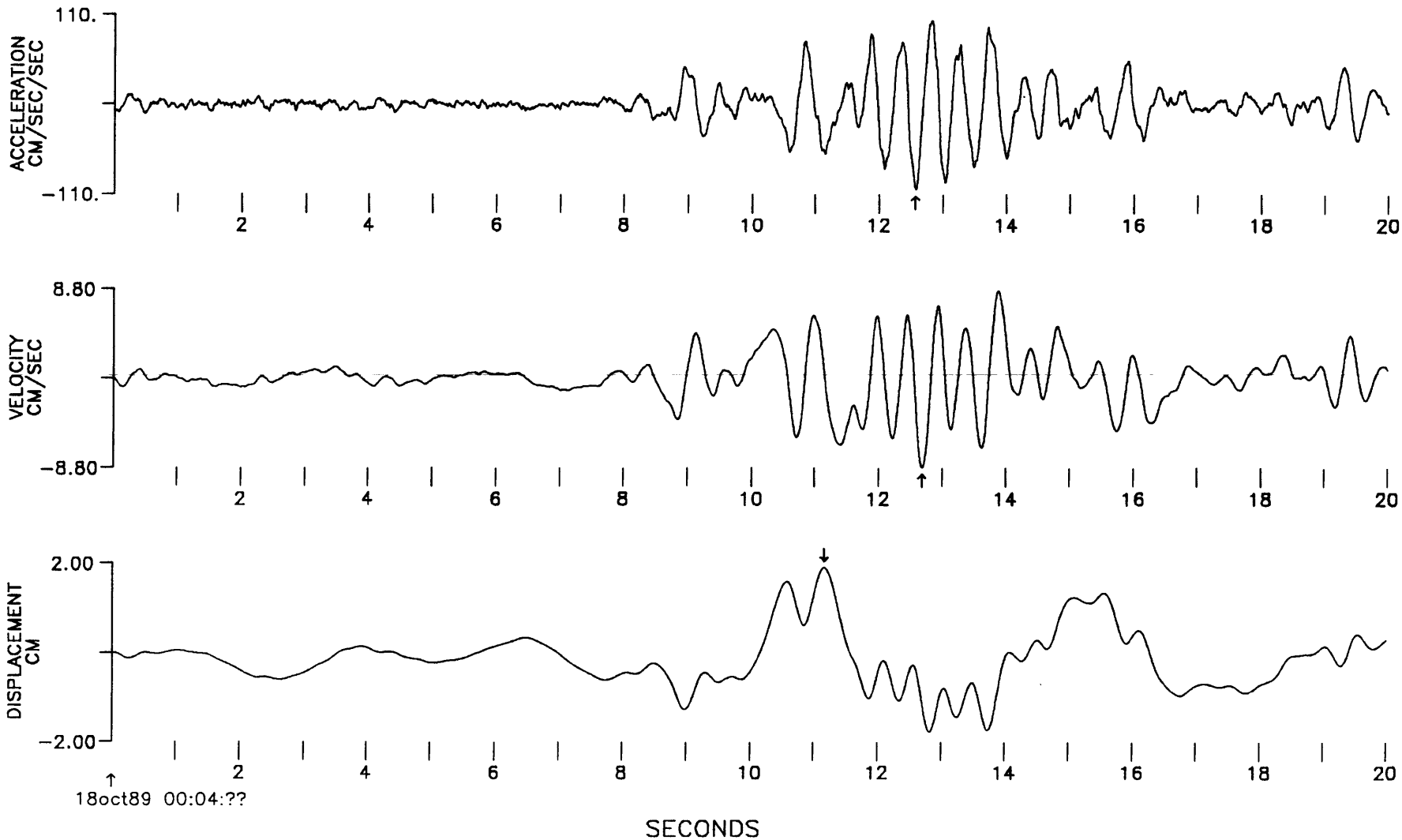
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SAN FRANCISCO, TRANSAMERICA BLDG - BASEMENT
UP
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
PEAK VALUES: ACCEL= 47.45 CM/SEC/SEC, VELOCITY= -4.45 CM/SEC, DISPL= -1.80 CM



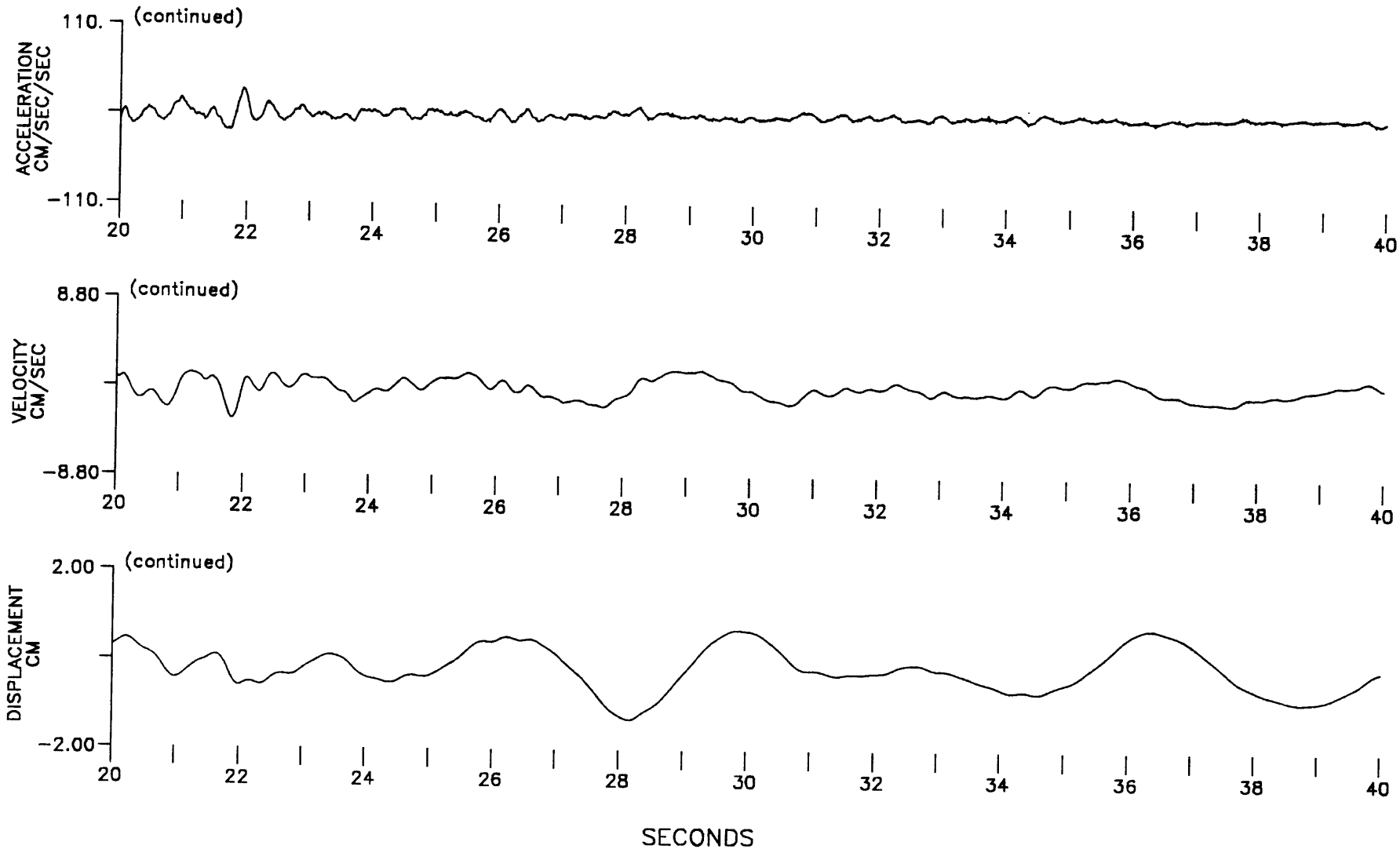
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SAN FRANCISCO, TRANSAMERICA BLDG - BASEMENT
UP
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
PEAK VALUES: ACCEL= 47.45 CM/SEC/SEC, VELOCITY= -4.45 CM/SEC, DISPL= -1.80 CM



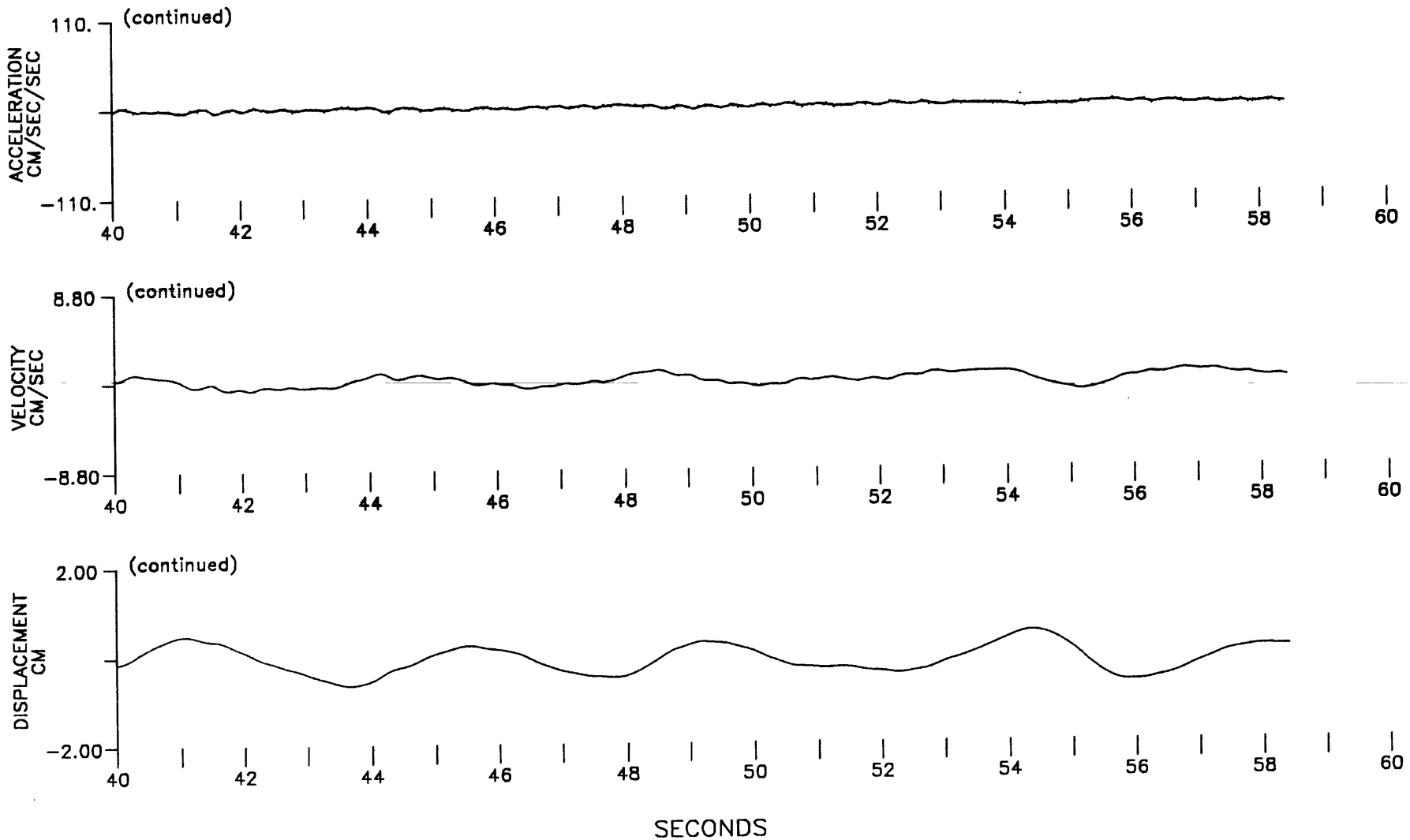
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SAN FRANCISCO, TRANSAMERICA BLDG - BASEMENT
171 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
PEAK VALUES: ACCEL= -104.18 CM/SEC/SEC, VELOCITY= -8.76 CM/SEC, DISPL= 1.91 CM



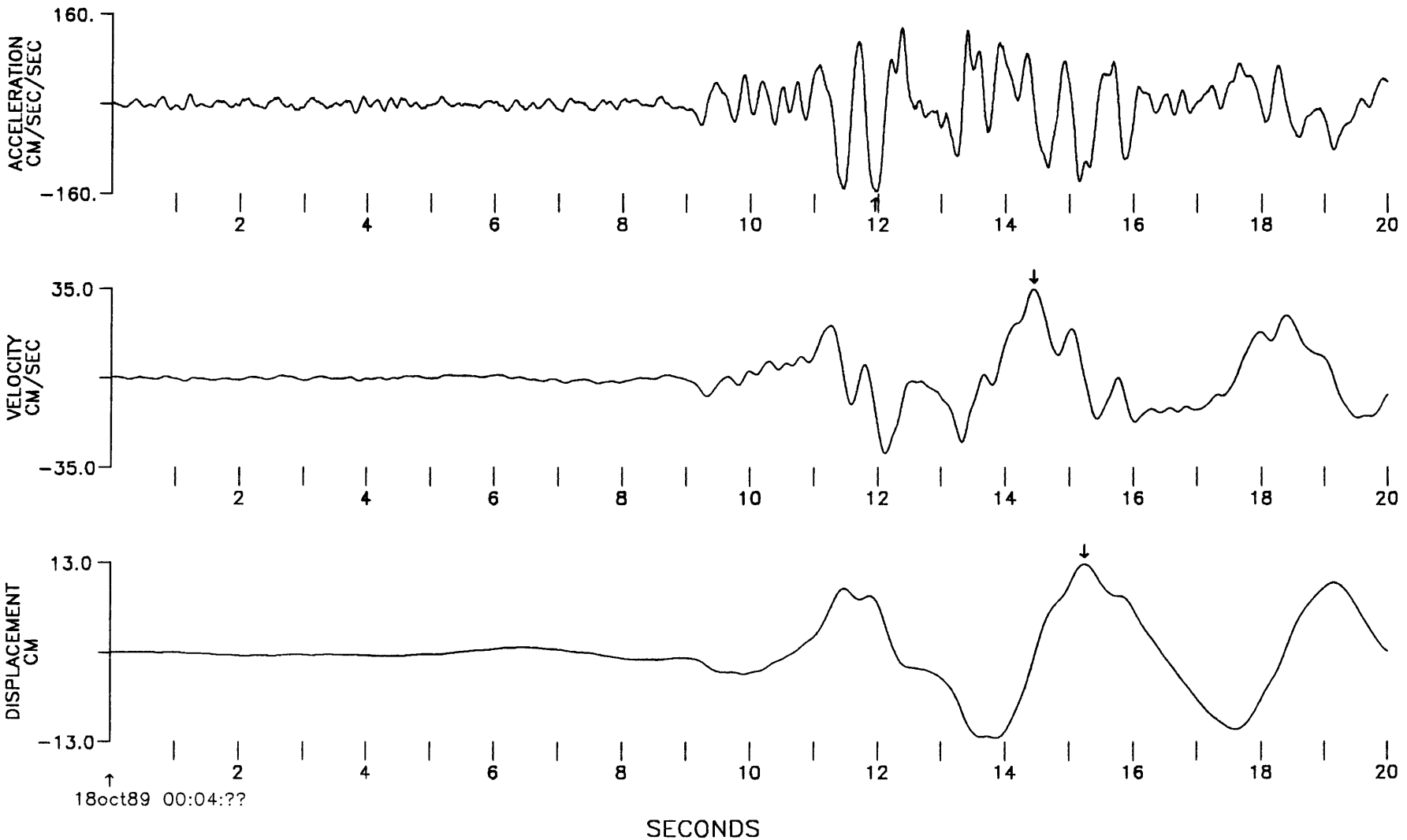
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SAN FRANCISCO, TRANSAMERICA BLDG - BASEMENT
171 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
PEAK VALUES: ACCEL= -104.18 CM/SEC/SEC, VELOCITY= -8.76 CM/SEC, DISPL= 1.91 CM



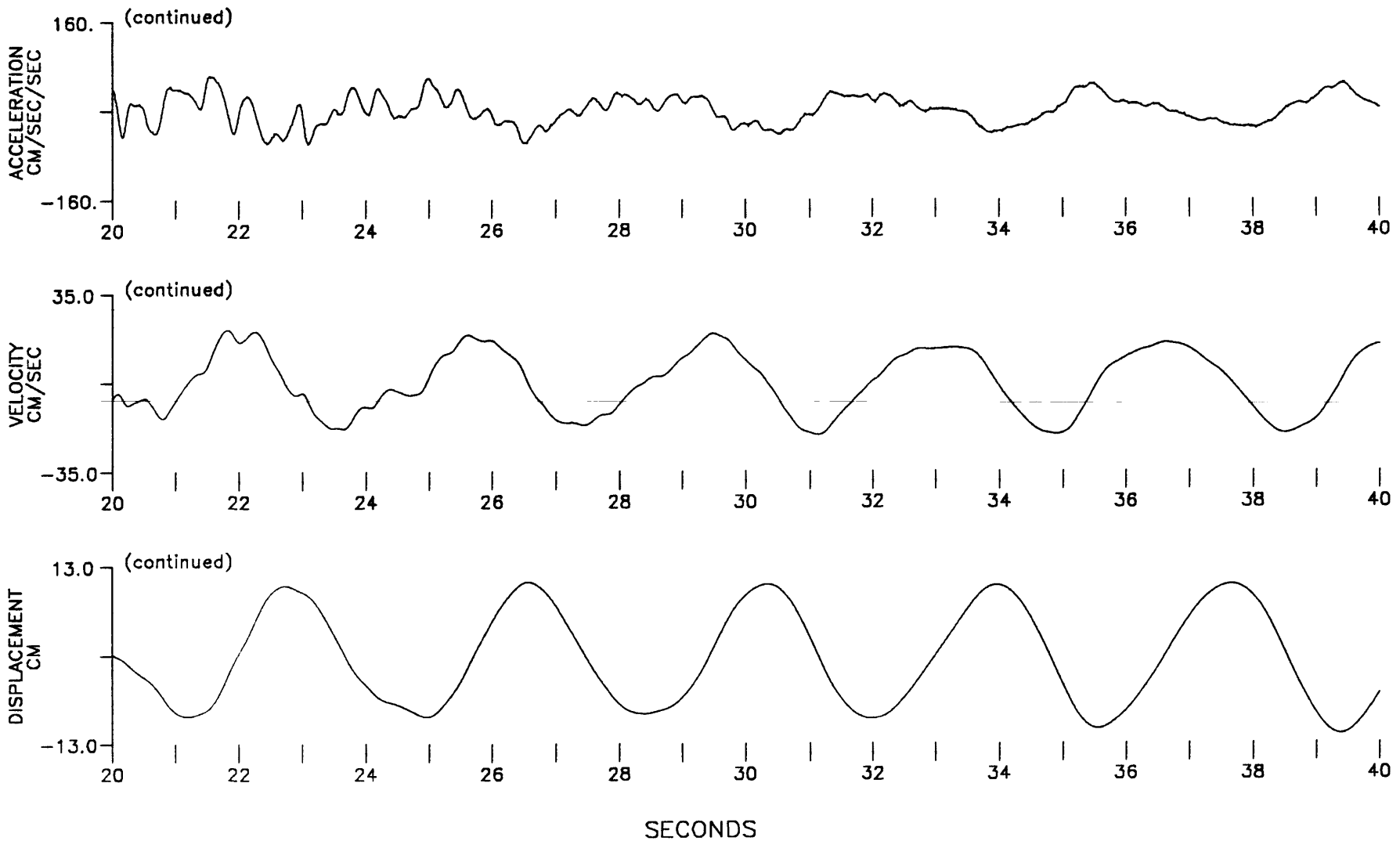
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SAN FRANCISCO, TRANSAMERICA BLDG - BASEMENT
171 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
PEAK VALUES: ACCEL= -104.18 CM/SEC/SEC, VELOCITY= -8.76 CM/SEC, DISPL= 1.91 CM



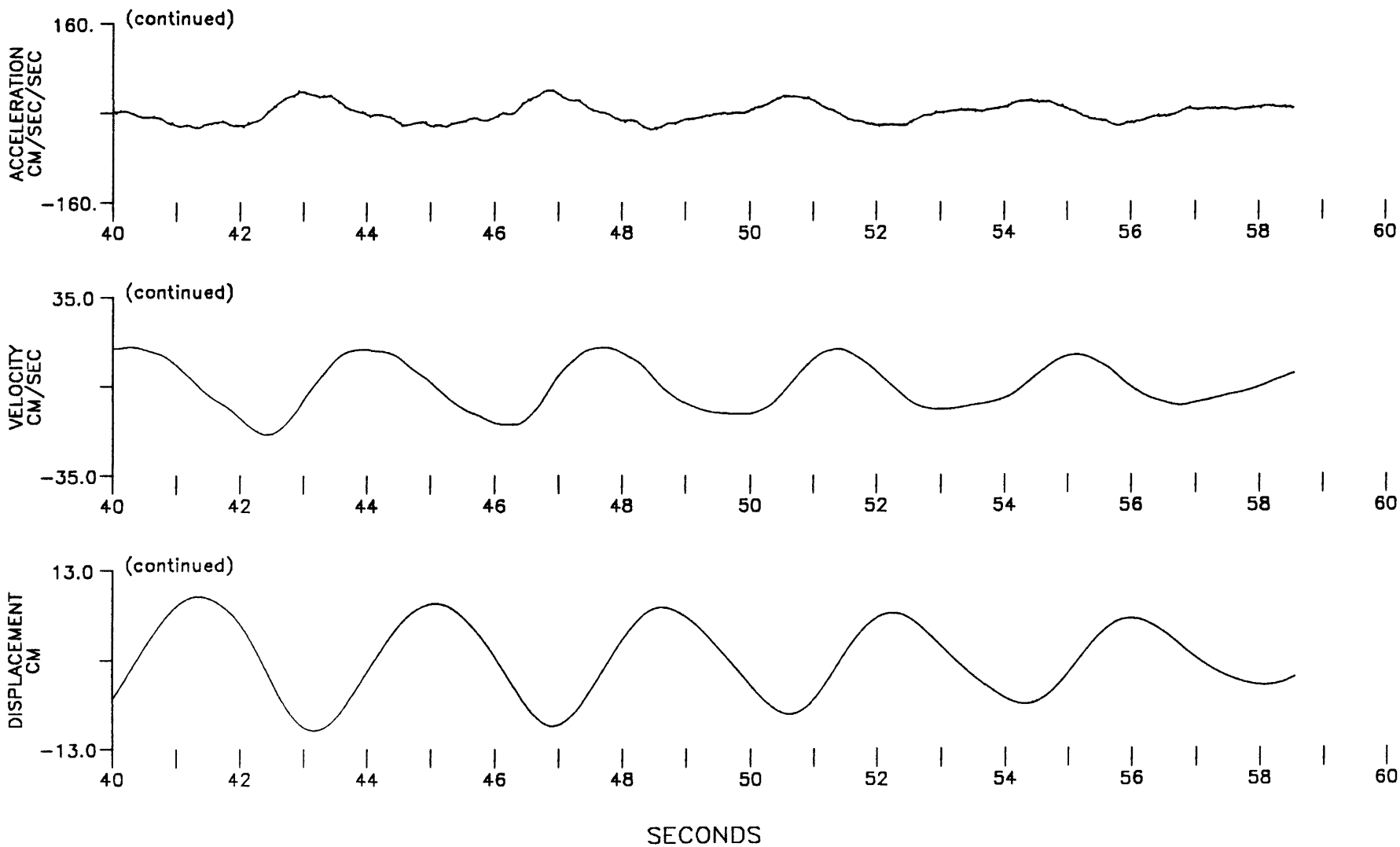
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SAN FRANCISCO, TRANSAMERICA BLDG - 29TH FLOOR
261 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
PEAK VALUES: ACCEL= -156.05 CM/SEC/SEC, VELOCITY= 34.83 CM/SEC, DISPL= 12.79 CM



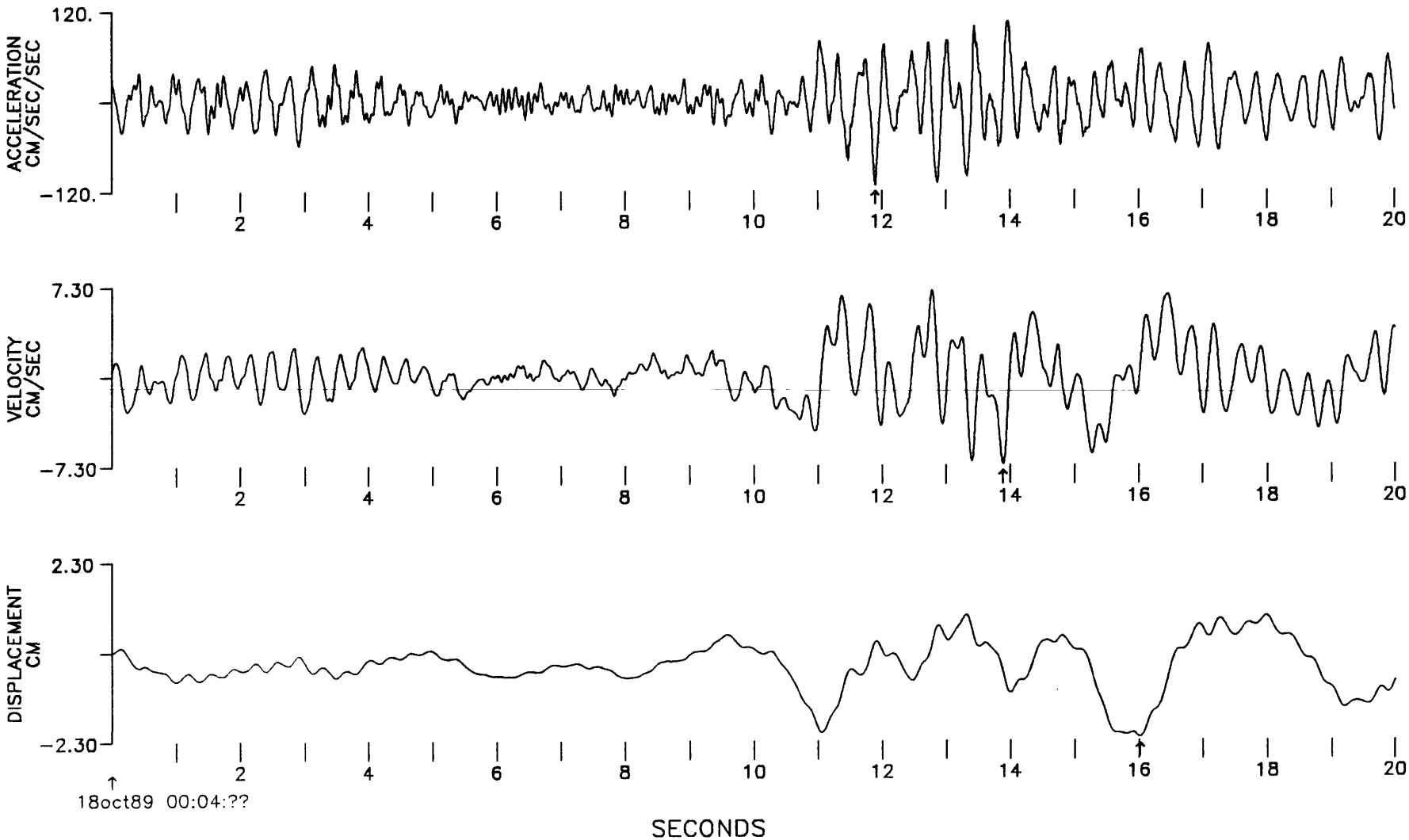
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SAN FRANCISCO, TRANSAMERICA BLDG - 29TH FLOOR
261 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
PEAK VALUES: ACCEL= -156.05 CM/SEC/SEC, VELOCITY= 34.83 CM/SEC, DISPL= 12.79 CM



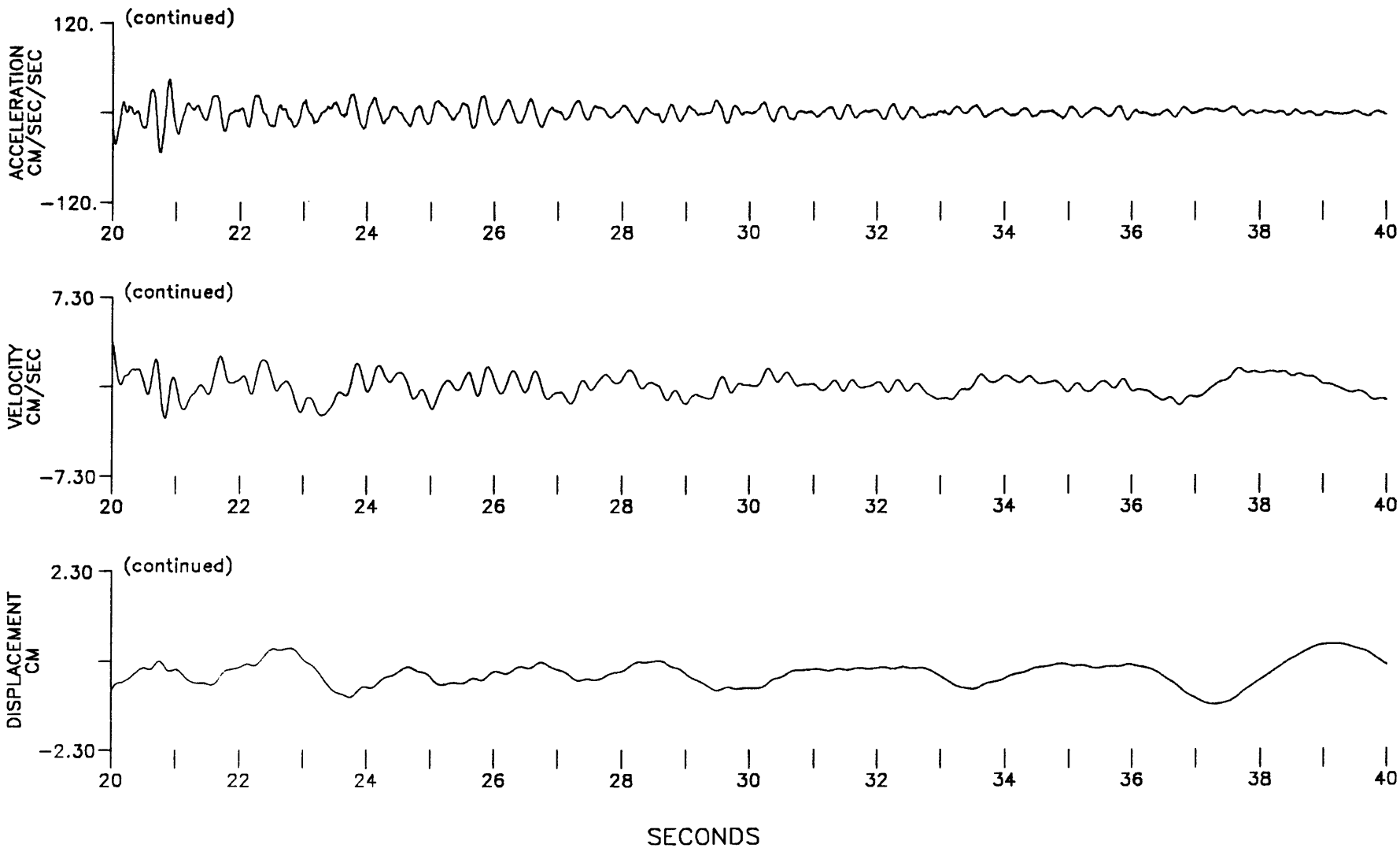
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SAN FRANCISCO, TRANSAMERICA BLDG - 29TH FLOOR
261 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
PEAK VALUES: ACCEL= -156.05 CM/SEC/SEC, VELOCITY= 34.83 CM/SEC, DISPL= 12.79 CM



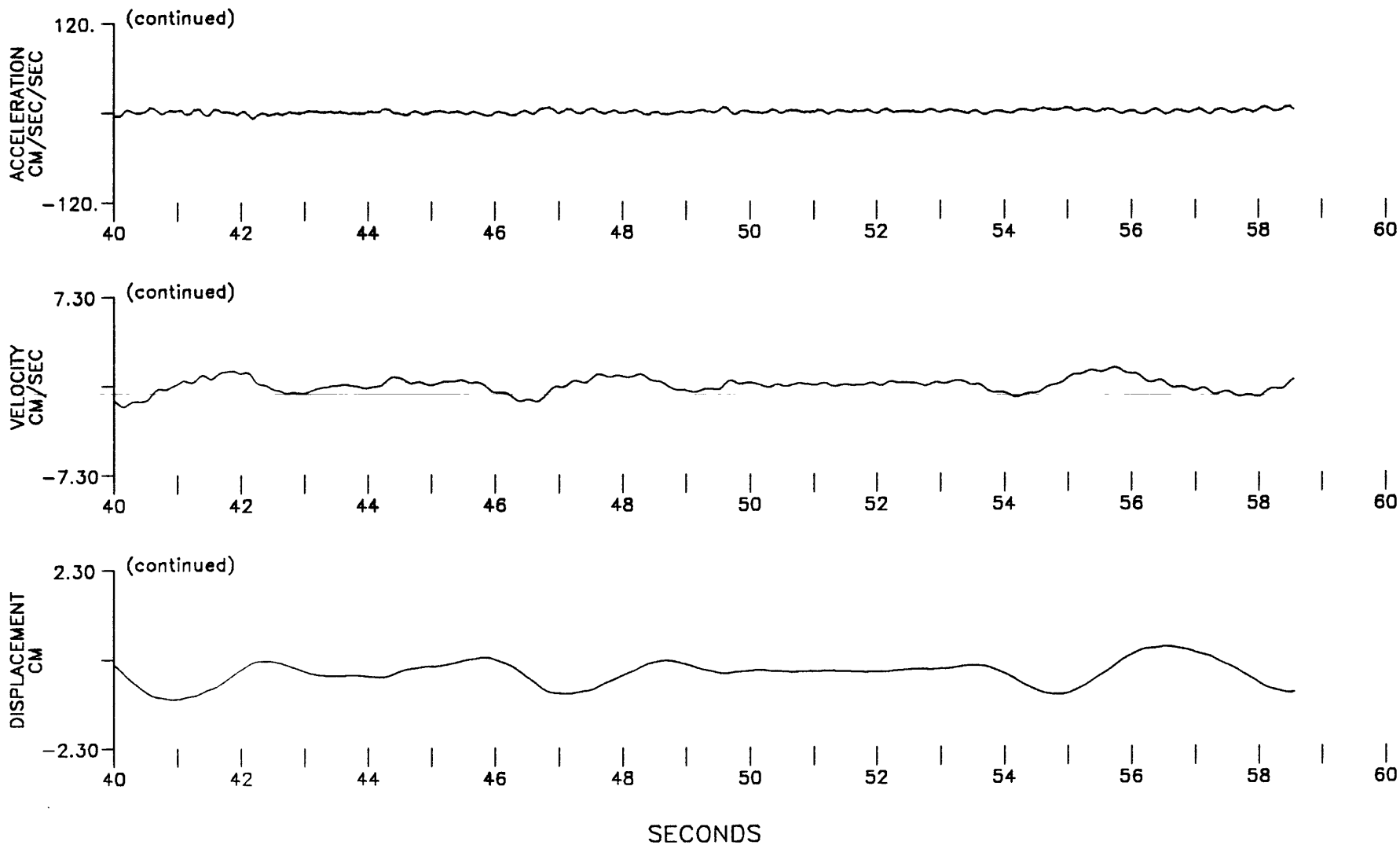
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SAN FRANCISCO, TRANSAMERICA BLDG – 29TH FLOOR
UP
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
PEAK VALUES: ACCEL= −112.56 CM/SEC/SEC, VELOCITY= −7.20 CM/SEC, DISPL= −2.22 CM



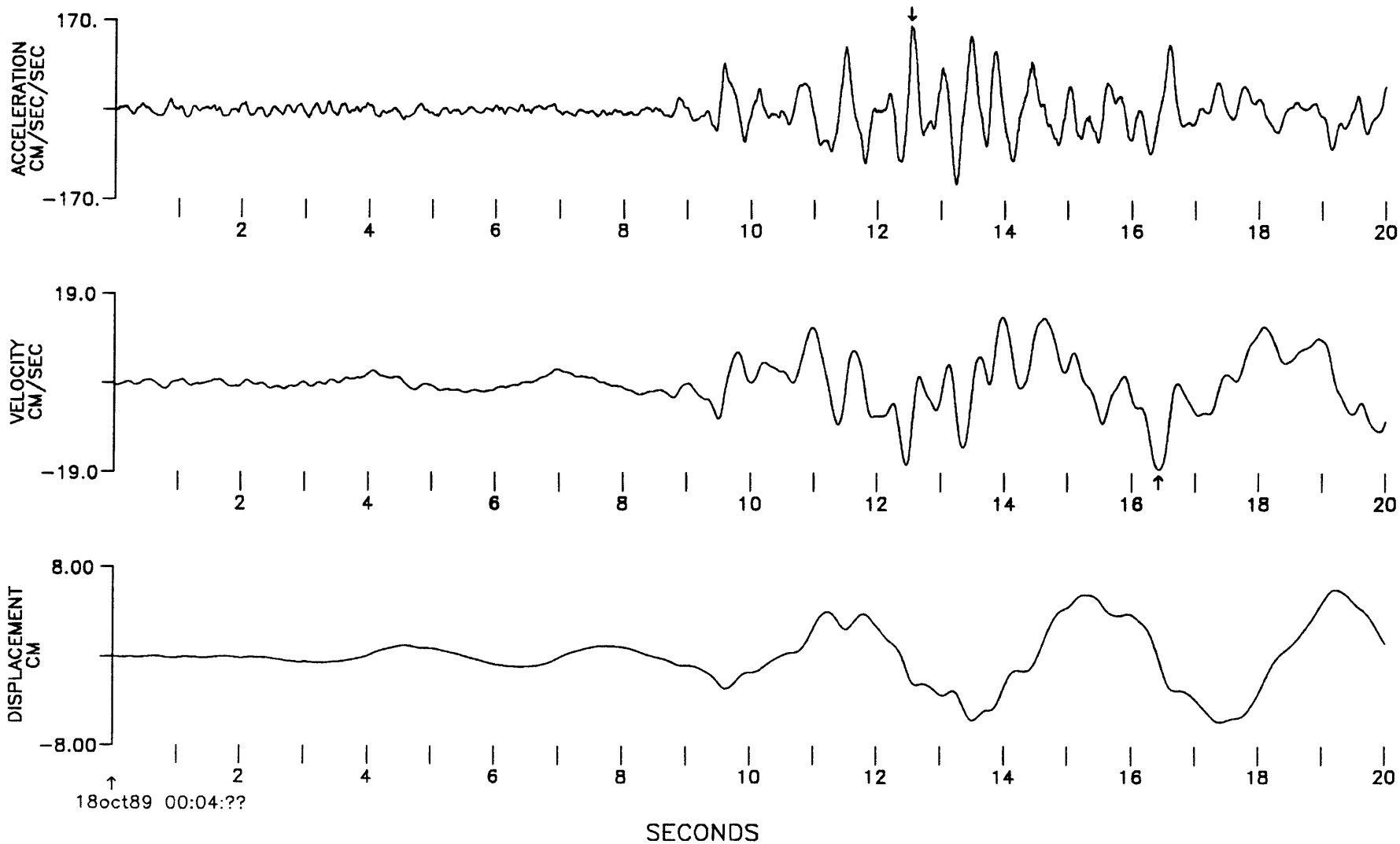
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SAN FRANCISCO, TRANSAMERICA BLDG - 29TH FLOOR
UP
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
PEAK VALUES: ACCEL= -112.56 CM/SEC/SEC, VELOCITY= -7.20 CM/SEC, DISPL= -2.22 CM



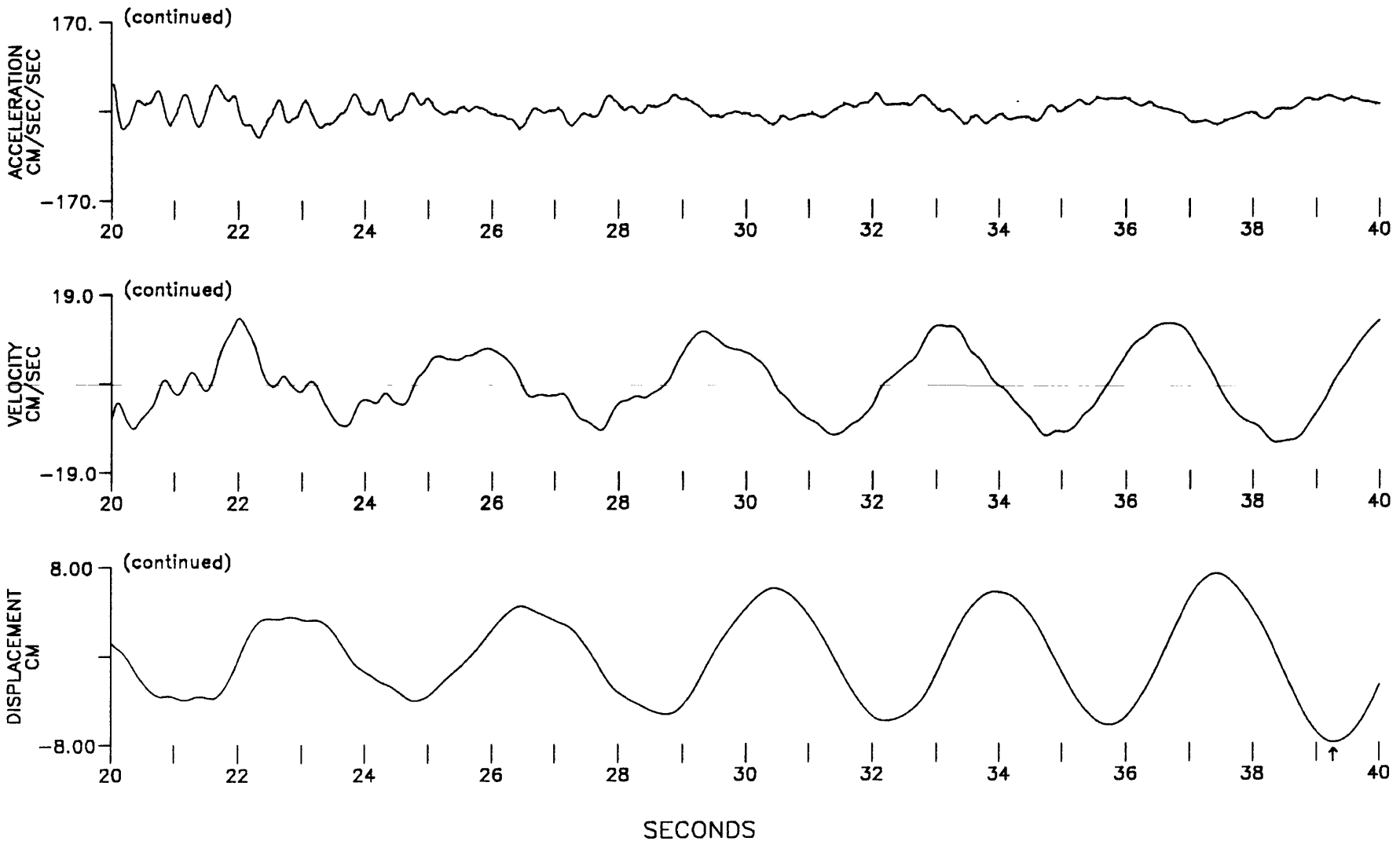
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SAN FRANCISCO, TRANSAMERICA BLDG – 29TH FLOOR
UP
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
PEAK VALUES: ACCEL= −112.56 CM/SEC/SEC, VELOCITY= −7.20 CM/SEC, DISPL= −2.22 CM



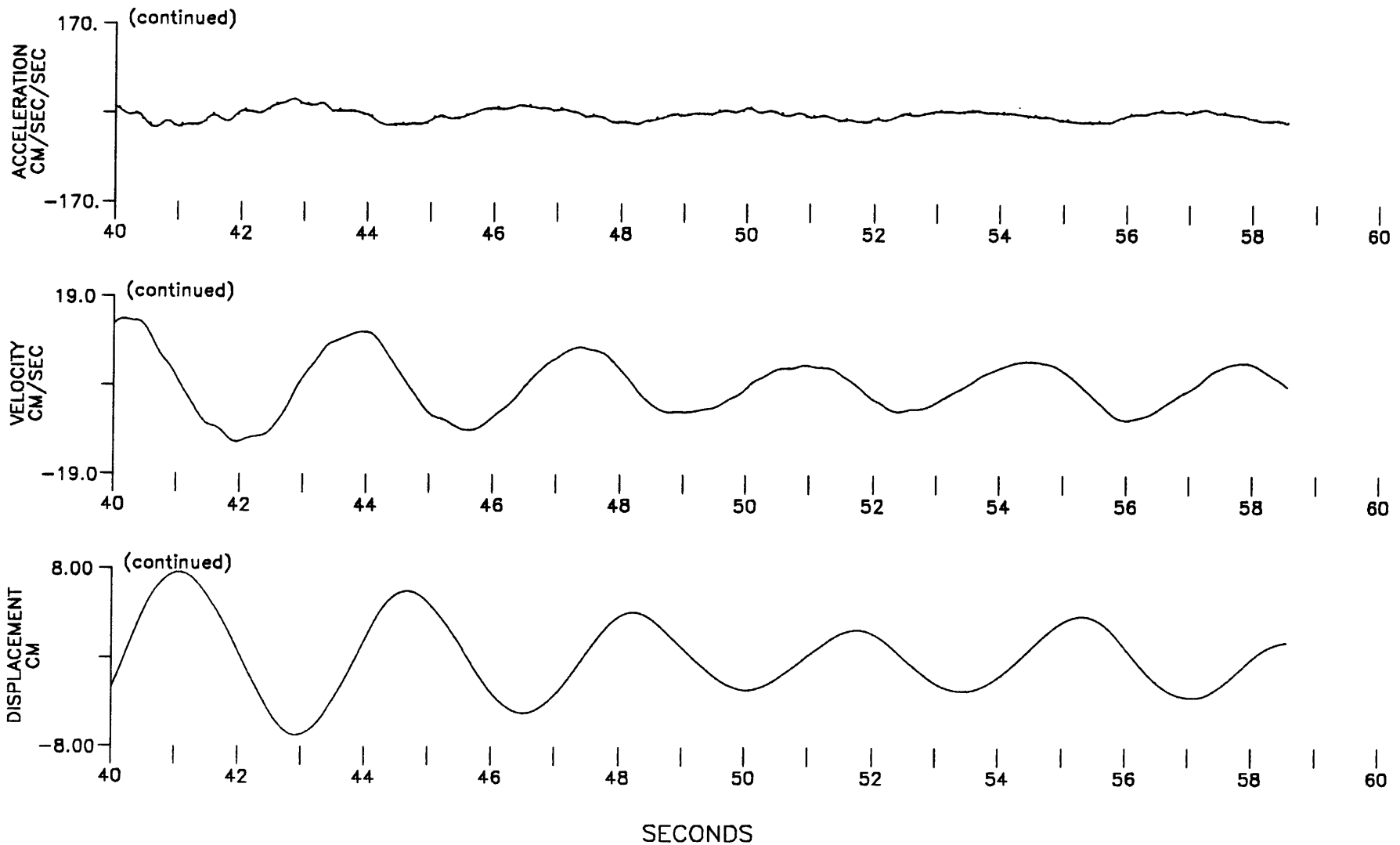
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SAN FRANCISCO, TRANSAMERICA BLDG - 29TH FLOOR
171 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
PEAK VALUES: ACCEL= 162.20 CM/SEC/SEC, VELOCITY= -18.19 CM/SEC, DISPL= -7.94 CM



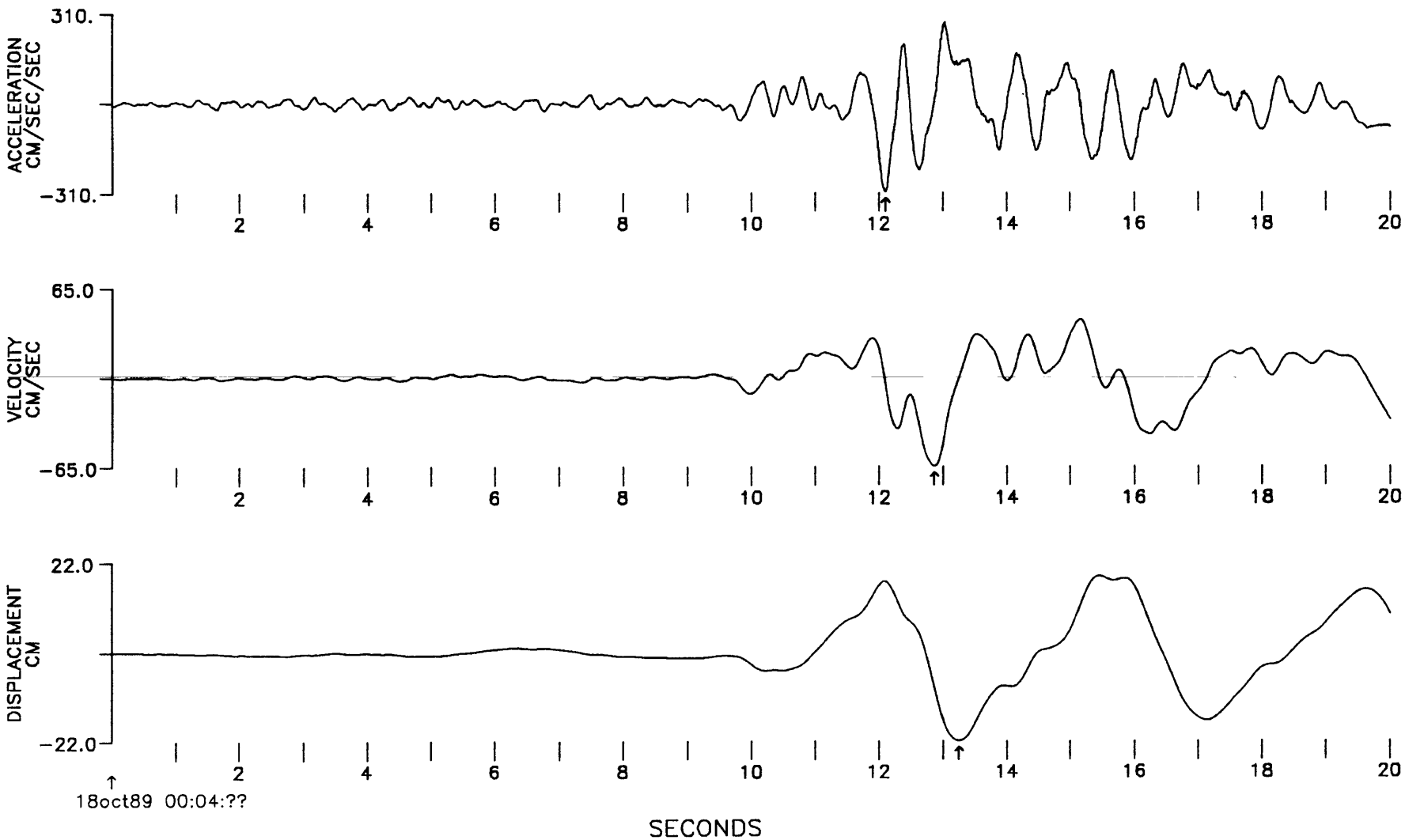
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SAN FRANCISCO, TRANSAMERICA BLDG - 29TH FLOOR
171 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
PEAK VALUES: ACCEL= 162.20 CM/SEC/SEC, VELOCITY= -18.19 CM/SEC, DISPL= -7.94 CM



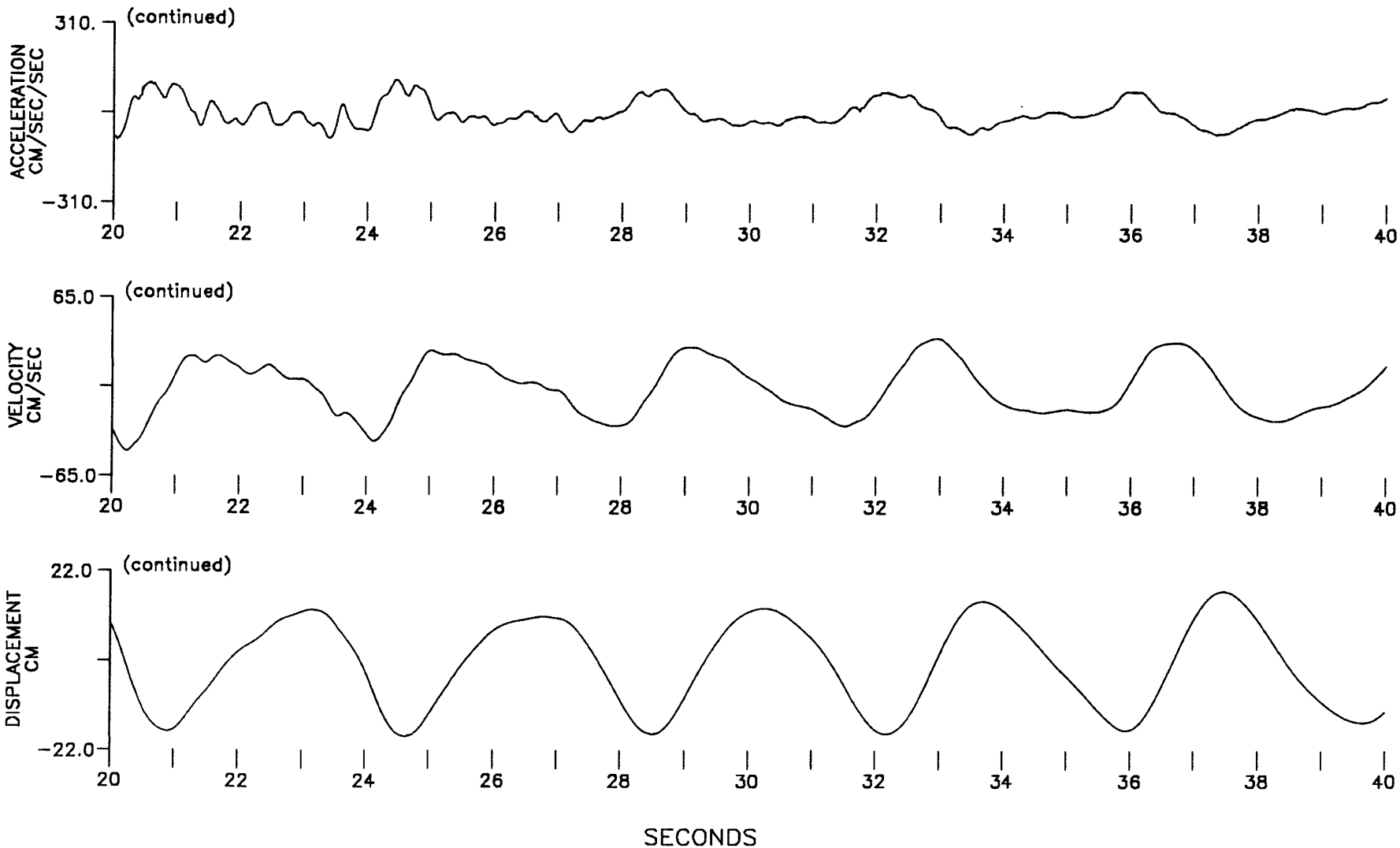
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SAN FRANCISCO, TRANSAMERICA BLDG – 29TH FLOOR
171 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
PEAK VALUES: ACCEL= 162.20 CM/SEC/SEC, VELOCITY= −18.19 CM/SEC, DISPL= −7.94 CM



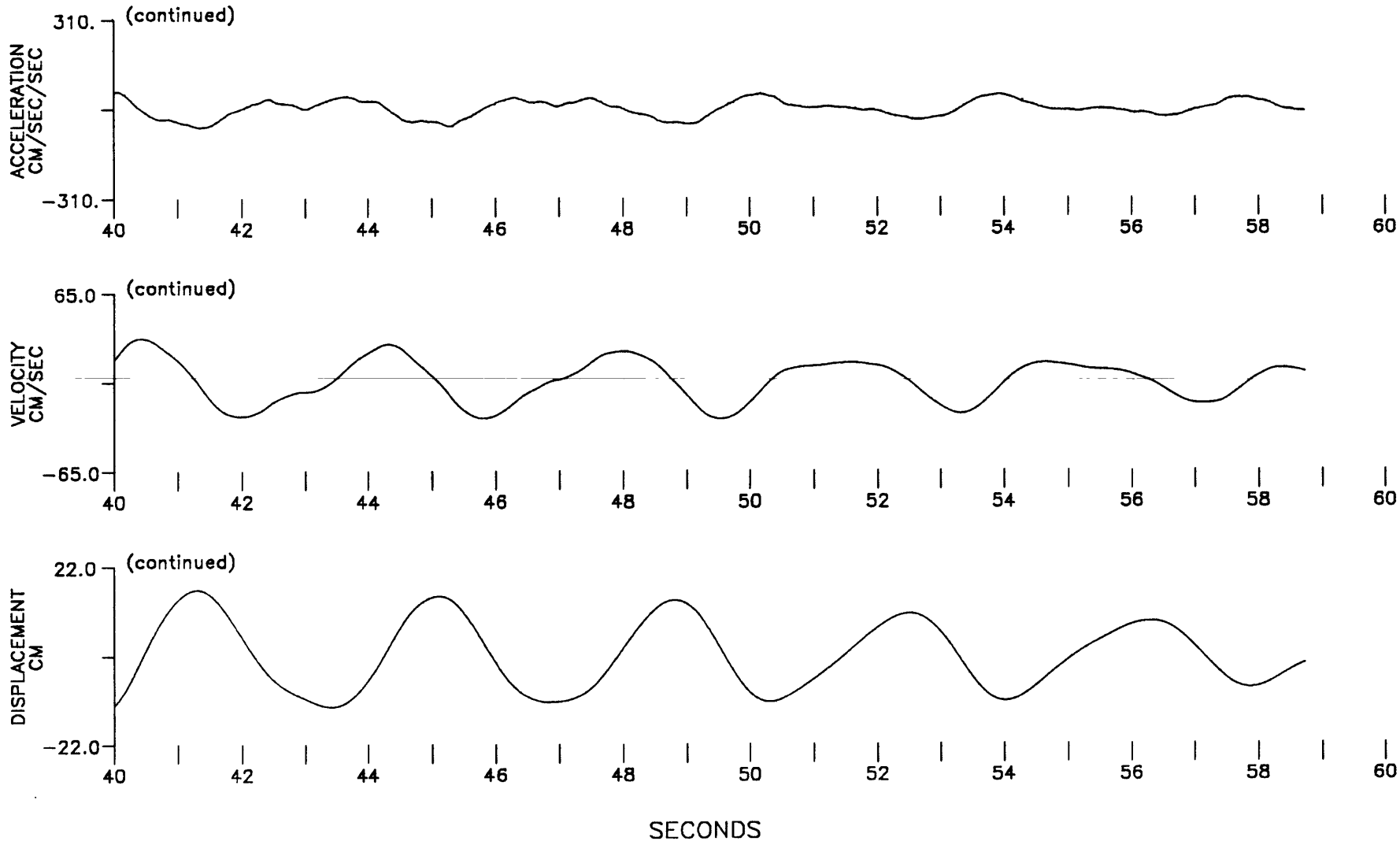
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SAN FRANCISCO, TRANSAMERICA BLDG - 49TH FLOOR
261 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
PEAK VALUES: ACCEL= -306.43 CM/SEC/SEC, VELOCITY= -64.52 CM/SEC, DISPL= -21.87 CM



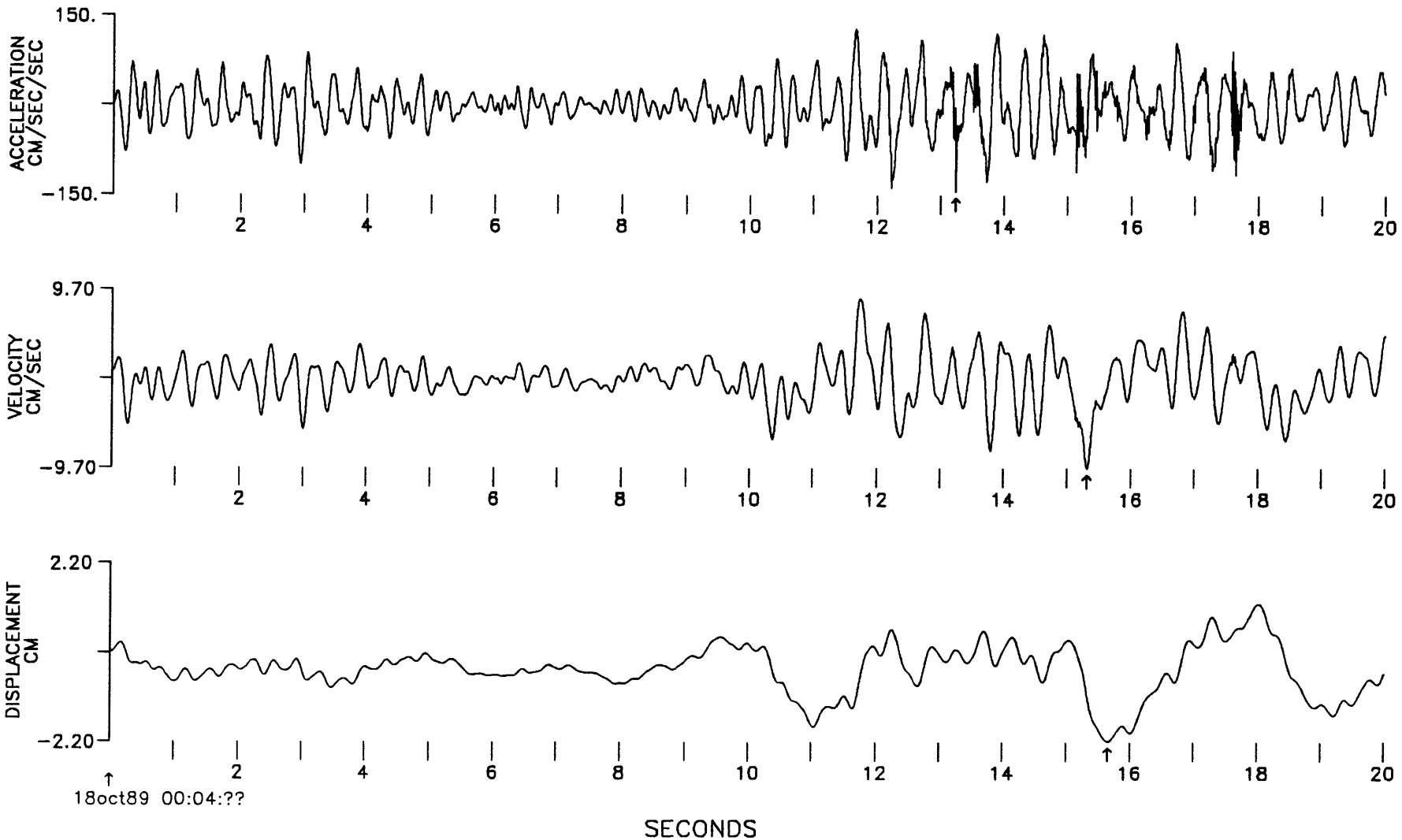
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SAN FRANCISCO, TRANSAMERICA BLDG - 49TH FLOOR
261 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
PEAK VALUES: ACCEL= -306.43 CM/SEC/SEC, VELOCITY= -64.52 CM/SEC, DISPL= -21.87 CM



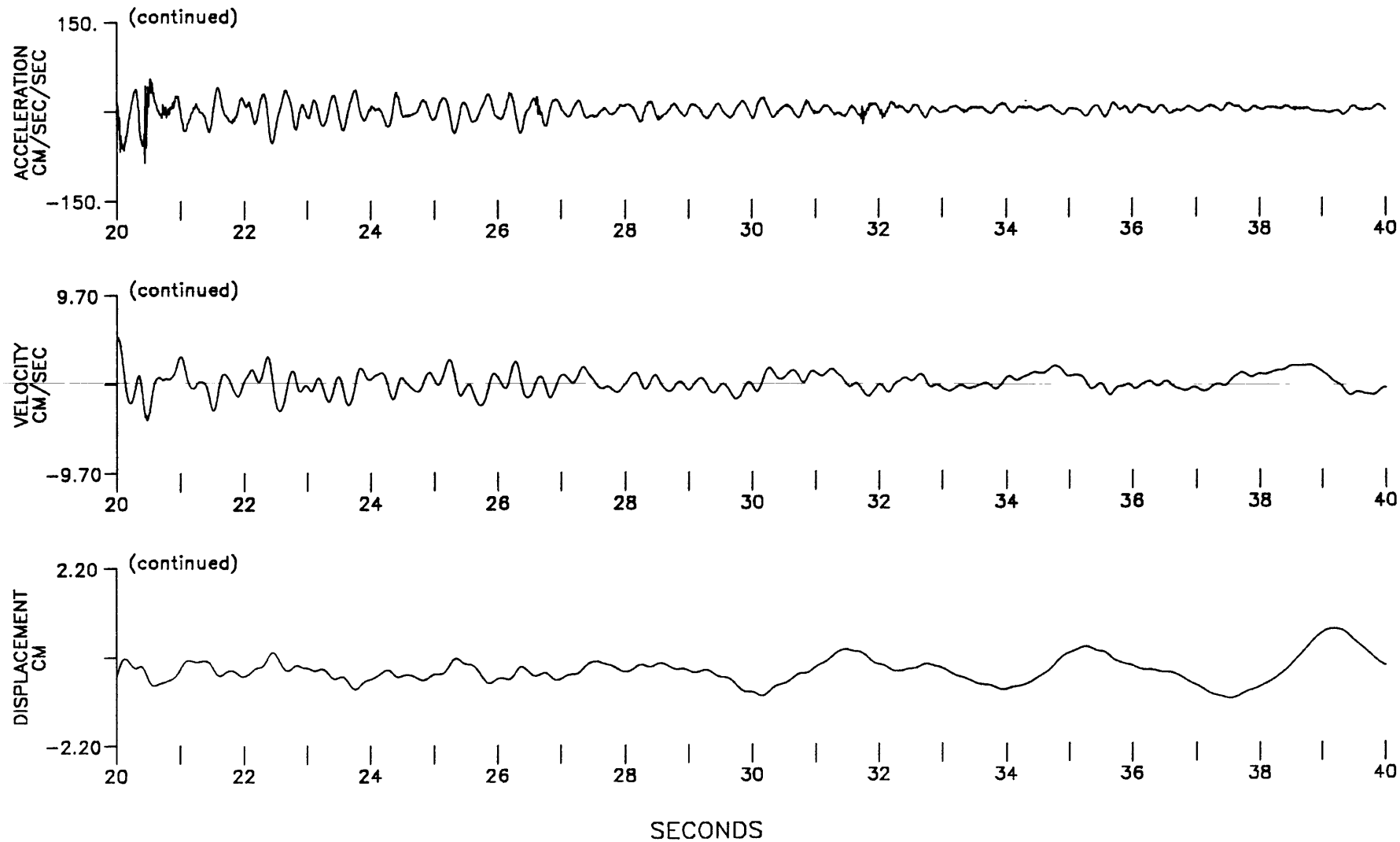
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SAN FRANCISCO, TRANSAMERICA BLDG - 49TH FLOOR
261 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
PEAK VALUES: ACCEL= -306.43 CM/SEC/SEC, VELOCITY= -64.52 CM/SEC, DISPL= -21.87 CM



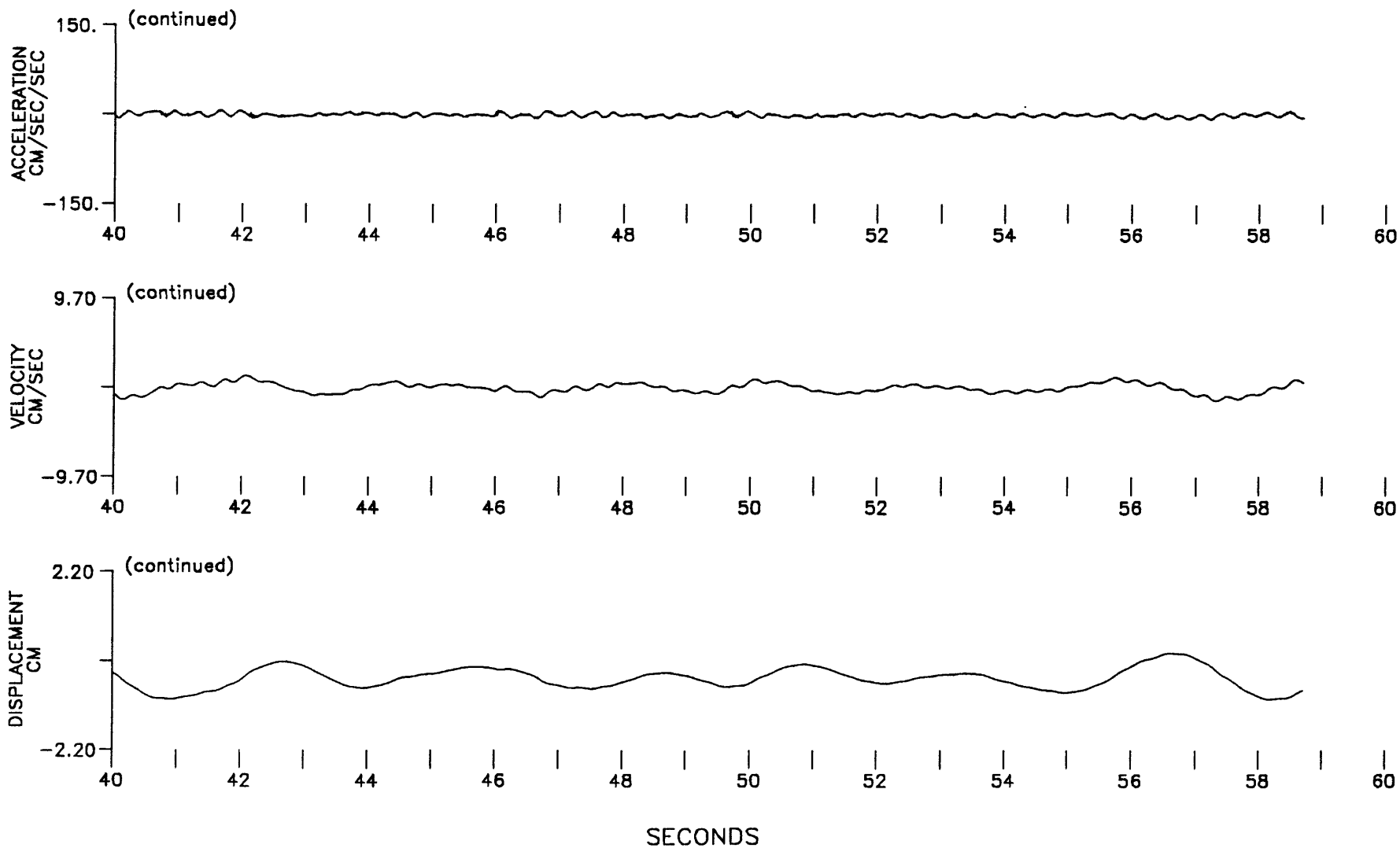
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SAN FRANCISCO, TRANSAMERICA BLDG - 49TH FLOOR
UP
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
PEAK VALUES: ACCEL= -143.48 CM/SEC/SEC, VELOCITY= -9.68 CM/SEC, DISPL= -2.17 CM



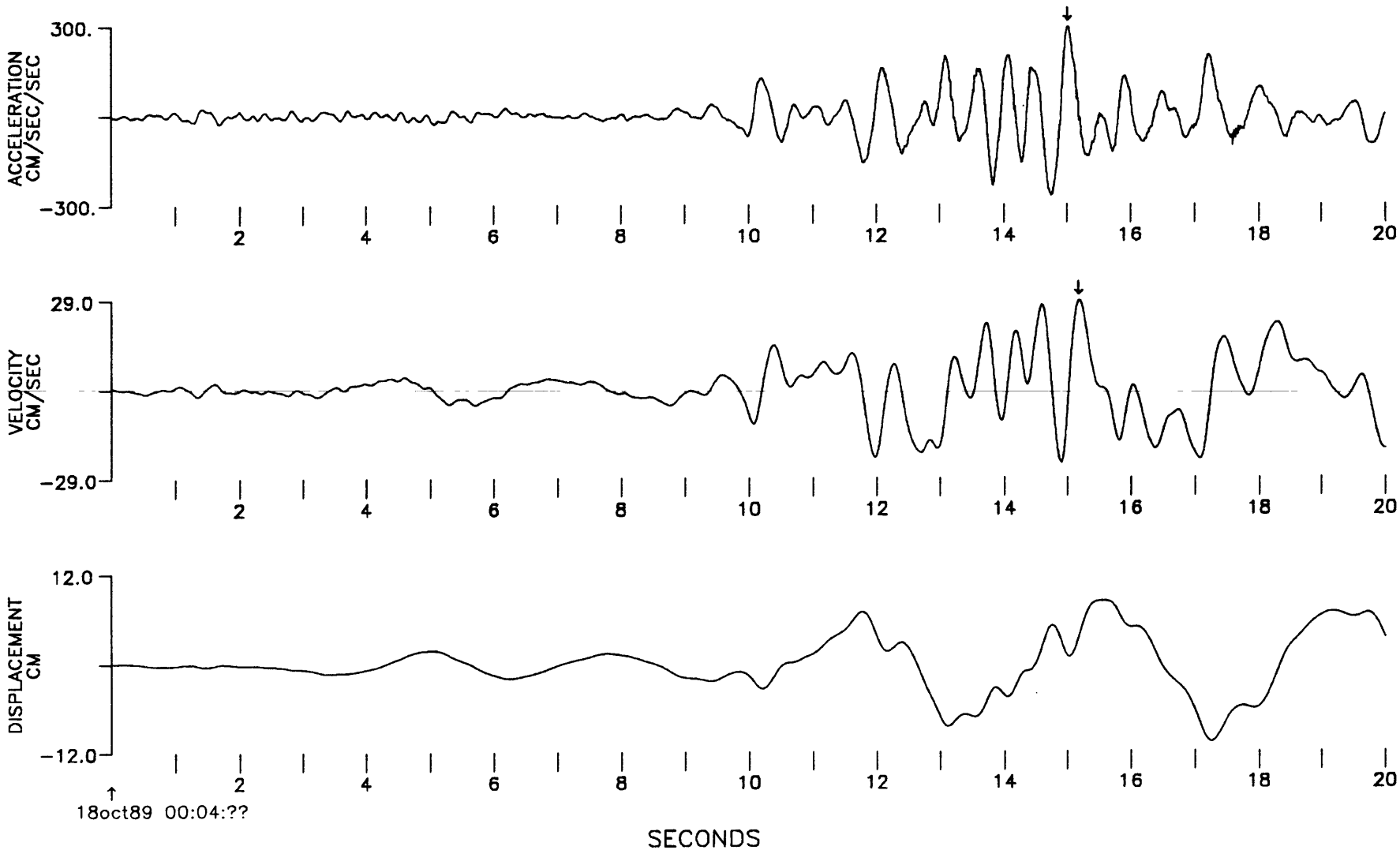
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SAN FRANCISCO, TRANSAMERICA BLDG – 49TH FLOOR
UP
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
PEAK VALUES: ACCEL= −143.48 CM/SEC/SEC, VELOCITY= −9.68 CM/SEC, DISPL= −2.17 CM



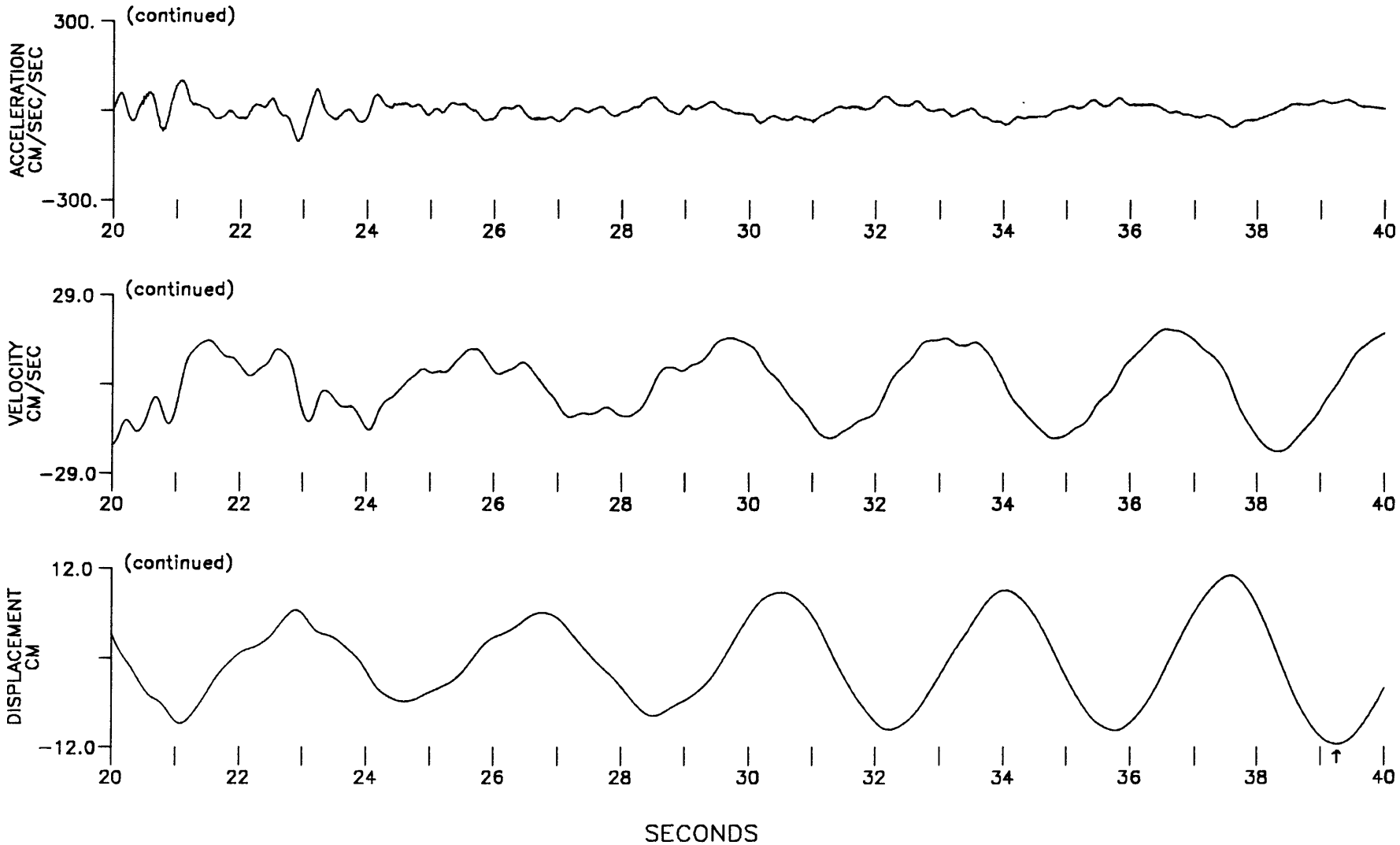
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SAN FRANCISCO, TRANSAMERICA BLDG - 49TH FLOOR
UP
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
PEAK VALUES: ACCEL= -143.48 CM/SEC/SEC, VELOCITY= -9.68 CM/SEC, DISPL= -2.17 CM



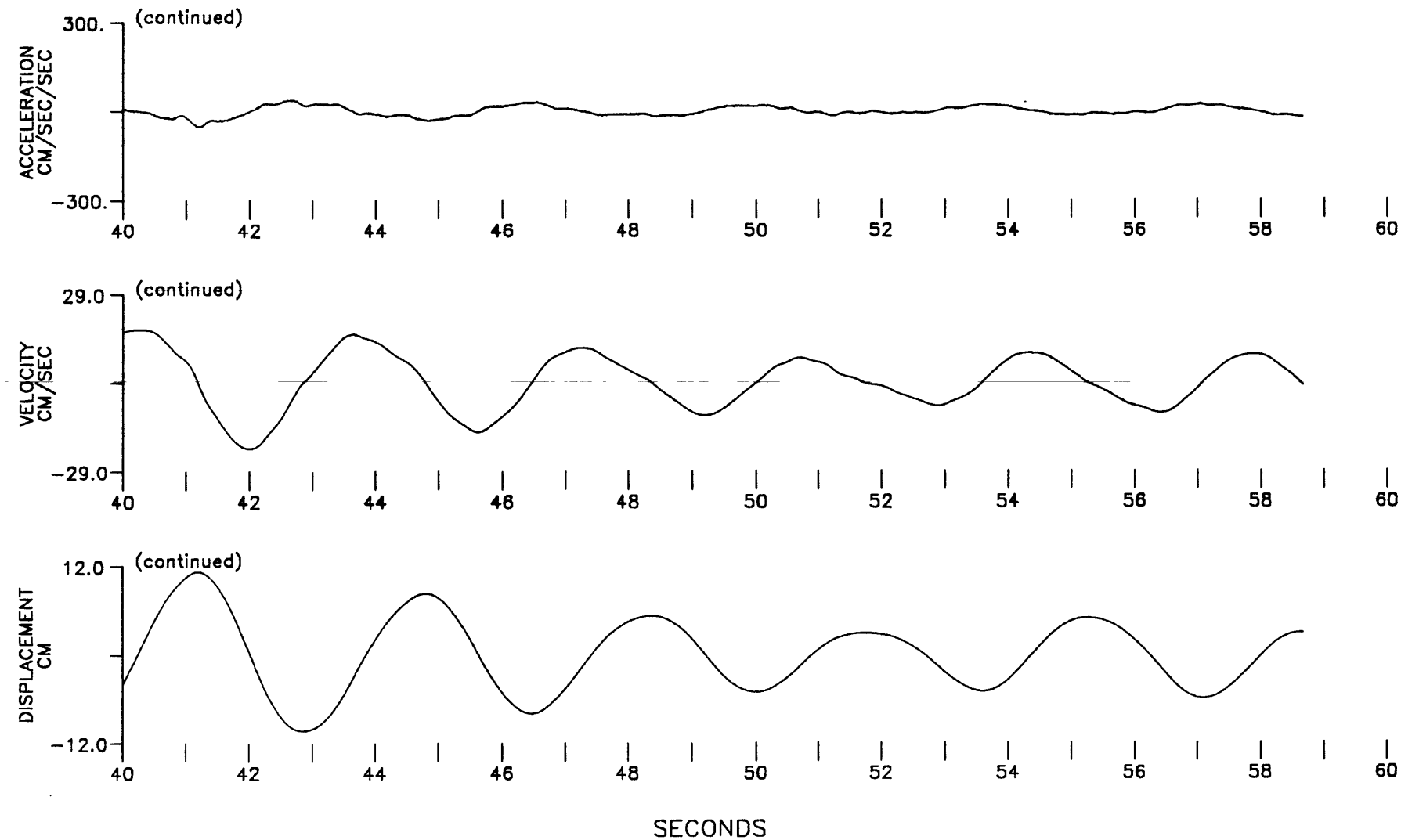
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SAN FRANCISCO, TRANSAMERICA BLDG - 49TH FLOOR
171 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
PEAK VALUES: ACCEL= 294.29 CM/SEC/SEC, VELOCITY= 28.47 CM/SEC, DISPL= -11.60 CM



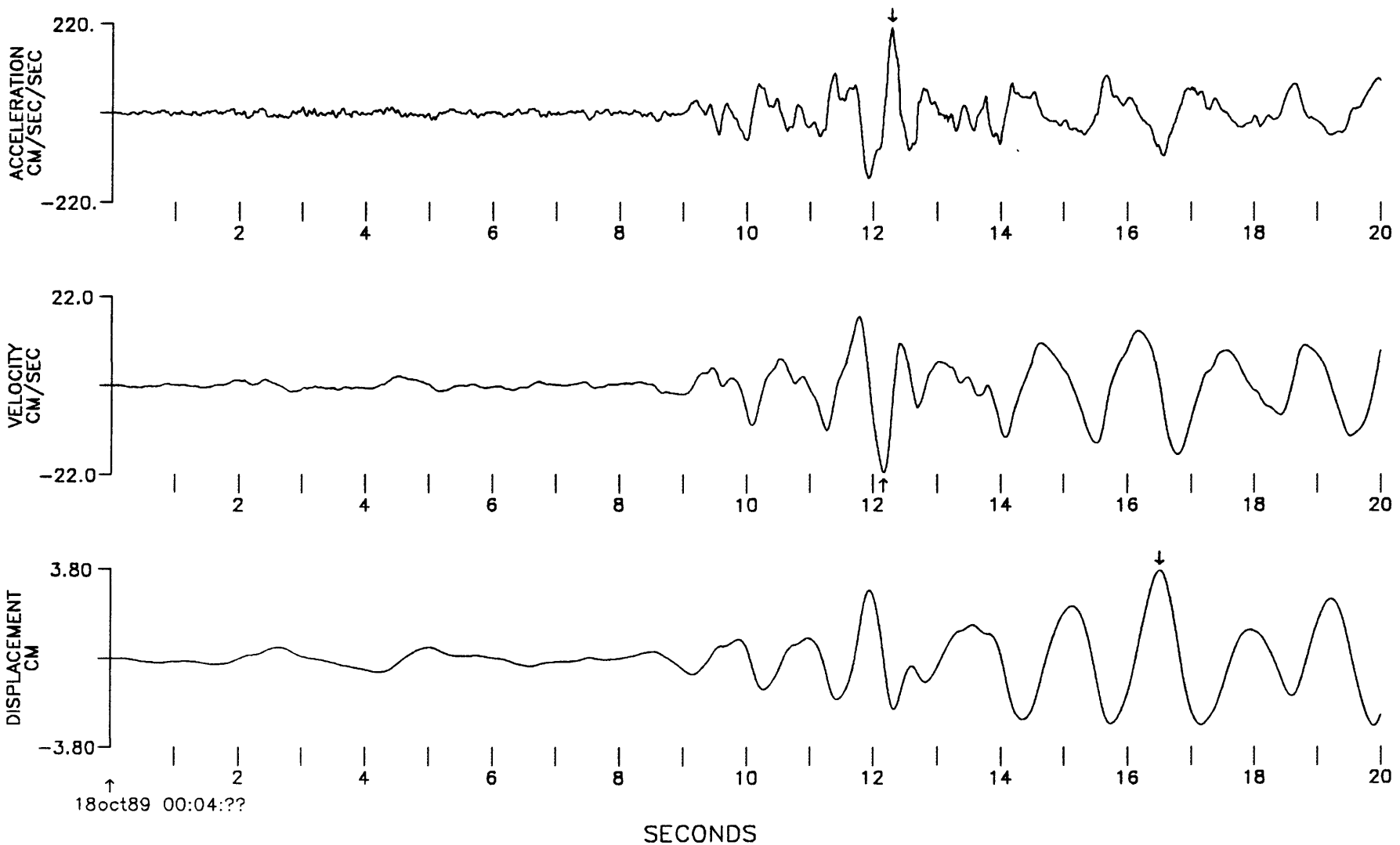
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SAN FRANCISCO, TRANSAMERICA BLDG - 49TH FLOOR
171 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
PEAK VALUES: ACCEL= 294.29 CM/SEC/SEC, VELOCITY= 28.47 CM/SEC, DISPL= -11.60 CM



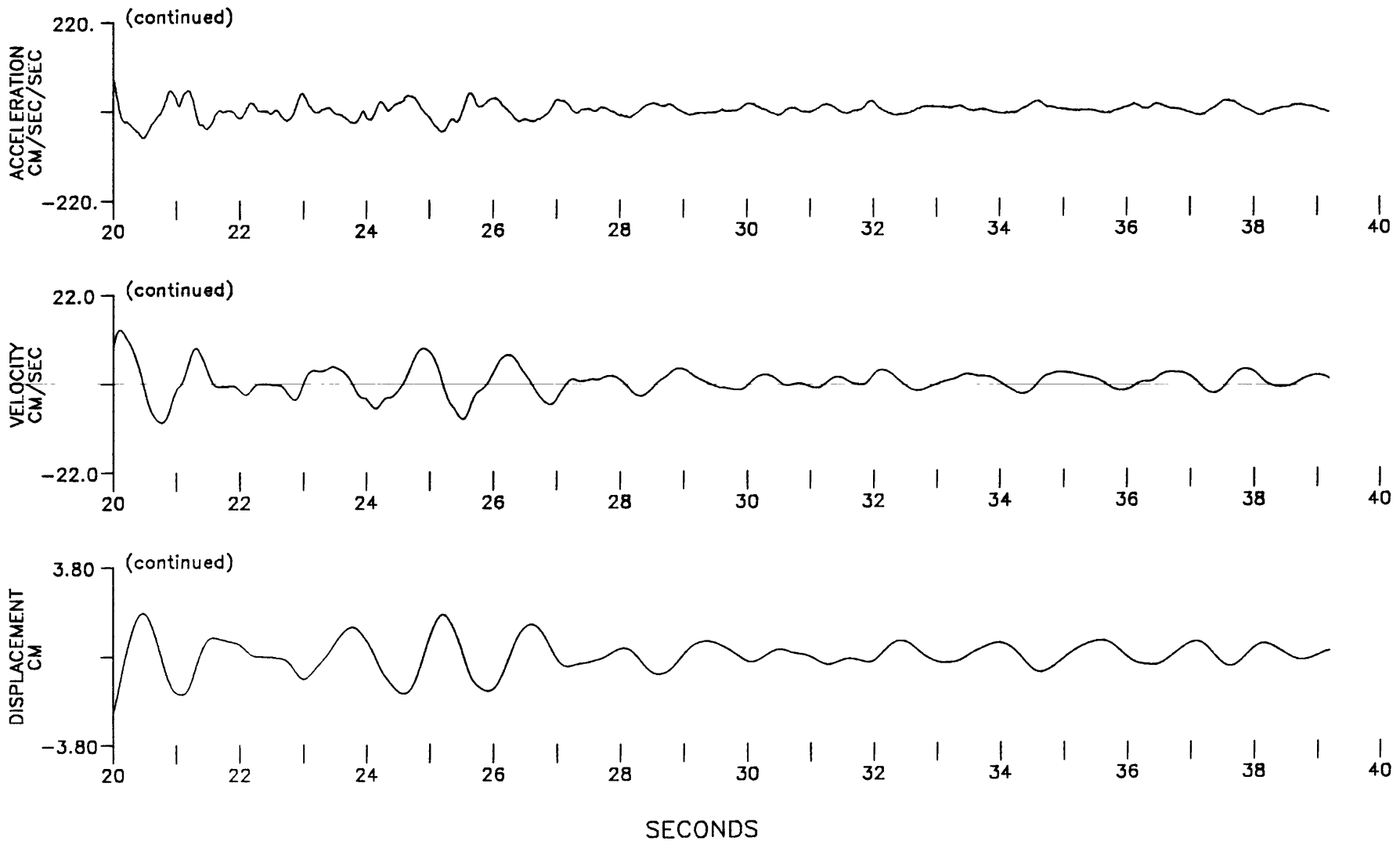
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SAN FRANCISCO, TRANSAMERICA BLDG - 49TH FLOOR
171 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
PEAK VALUES: ACCEL= 294.29 CM/SEC/SEC, VELOCITY= 28.47 CM/SEC, DISPL= -11.60 CM



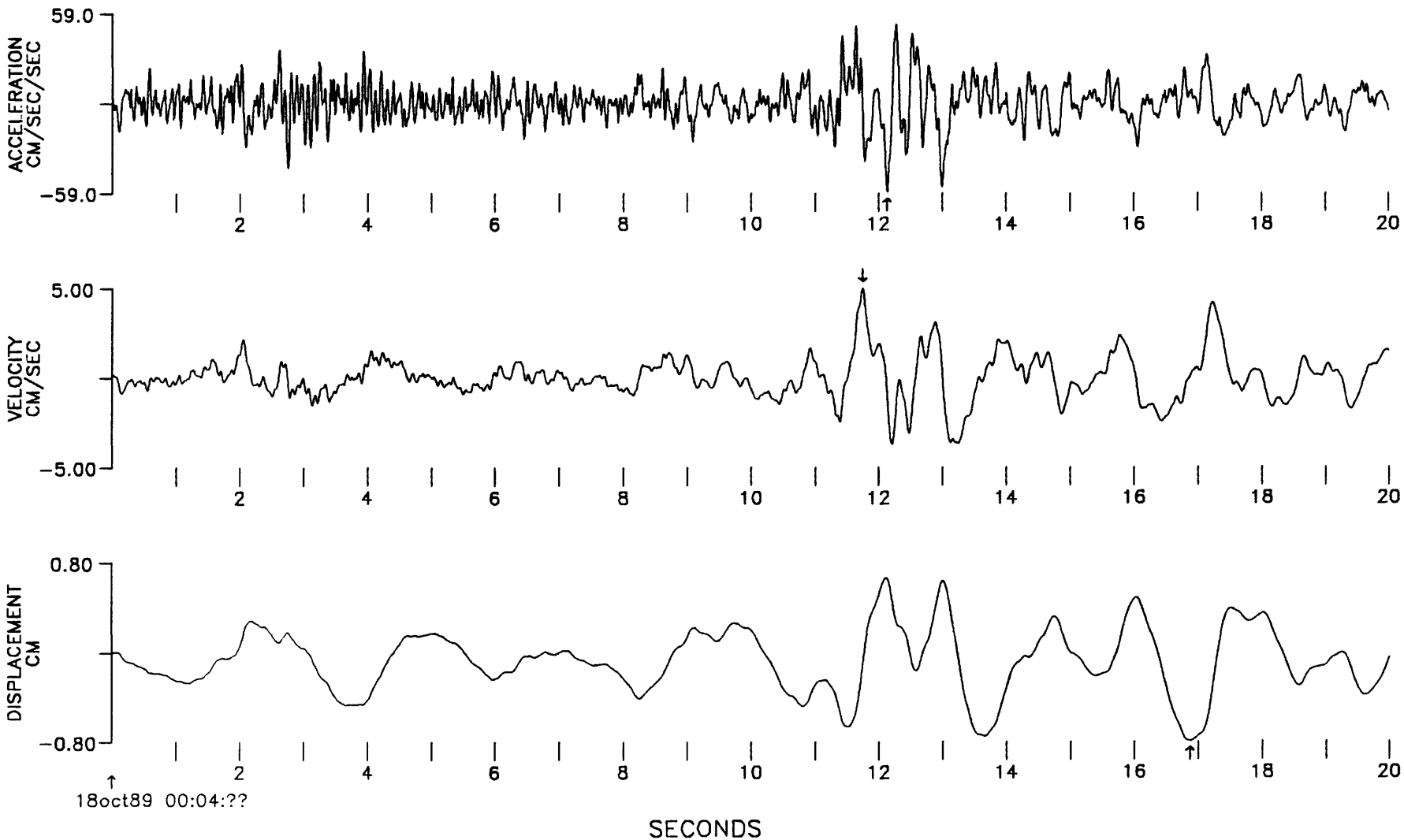
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
EMERYVILLE – 6363 CHRISTIE AVE, S GROUND SITE
350 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= 210.33 CM/SEC/SEC, VELOCITY= −21.50 CM/SEC, DISPL= 3.75 CM



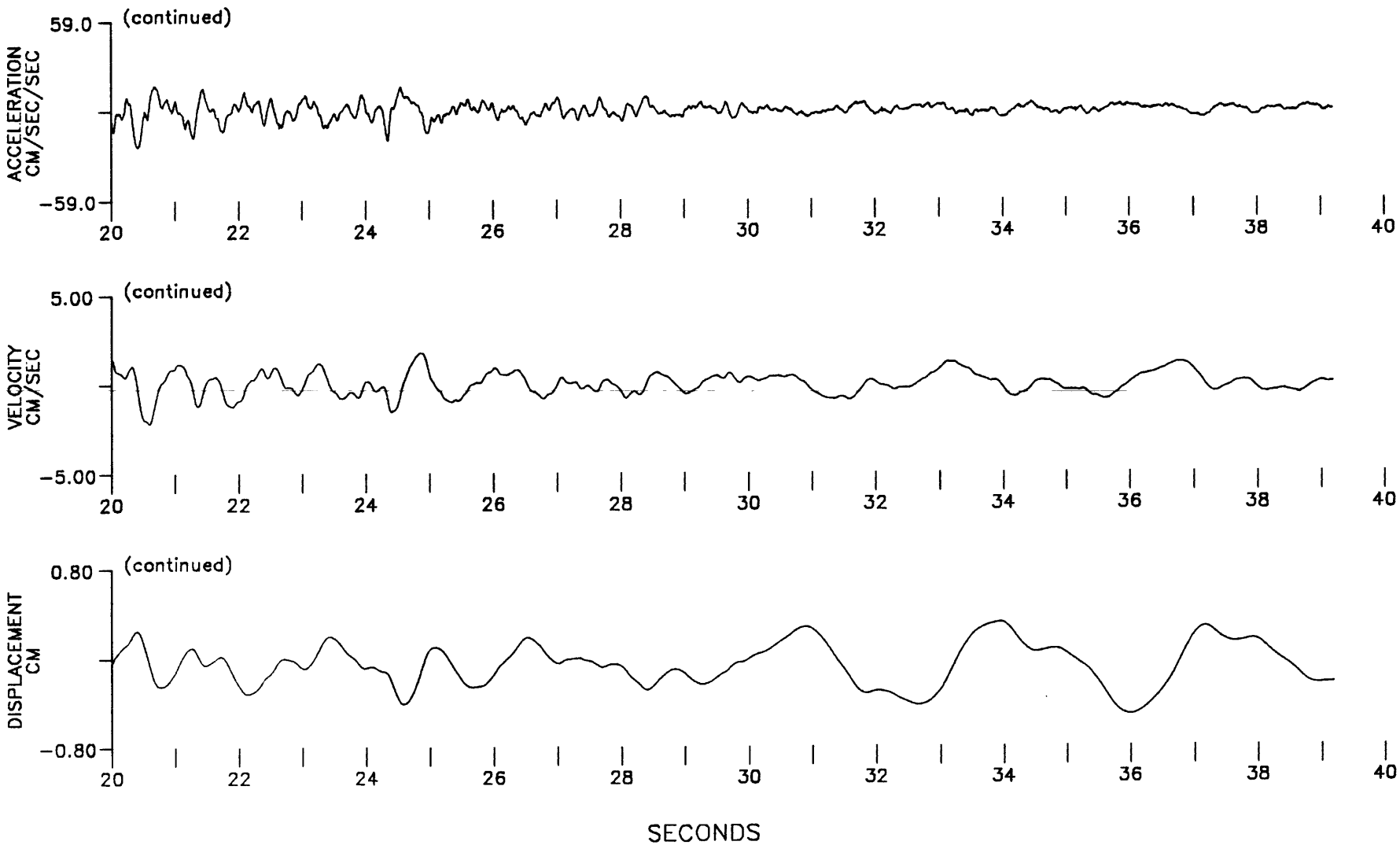
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
EMERYVILLE - 6363 CHRISTIE AVE, S GROUND SITE
350 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= 210.33 CM/SEC/SEC, VELOCITY= -21.50 CM/SEC, DISPL= 3.75 CM



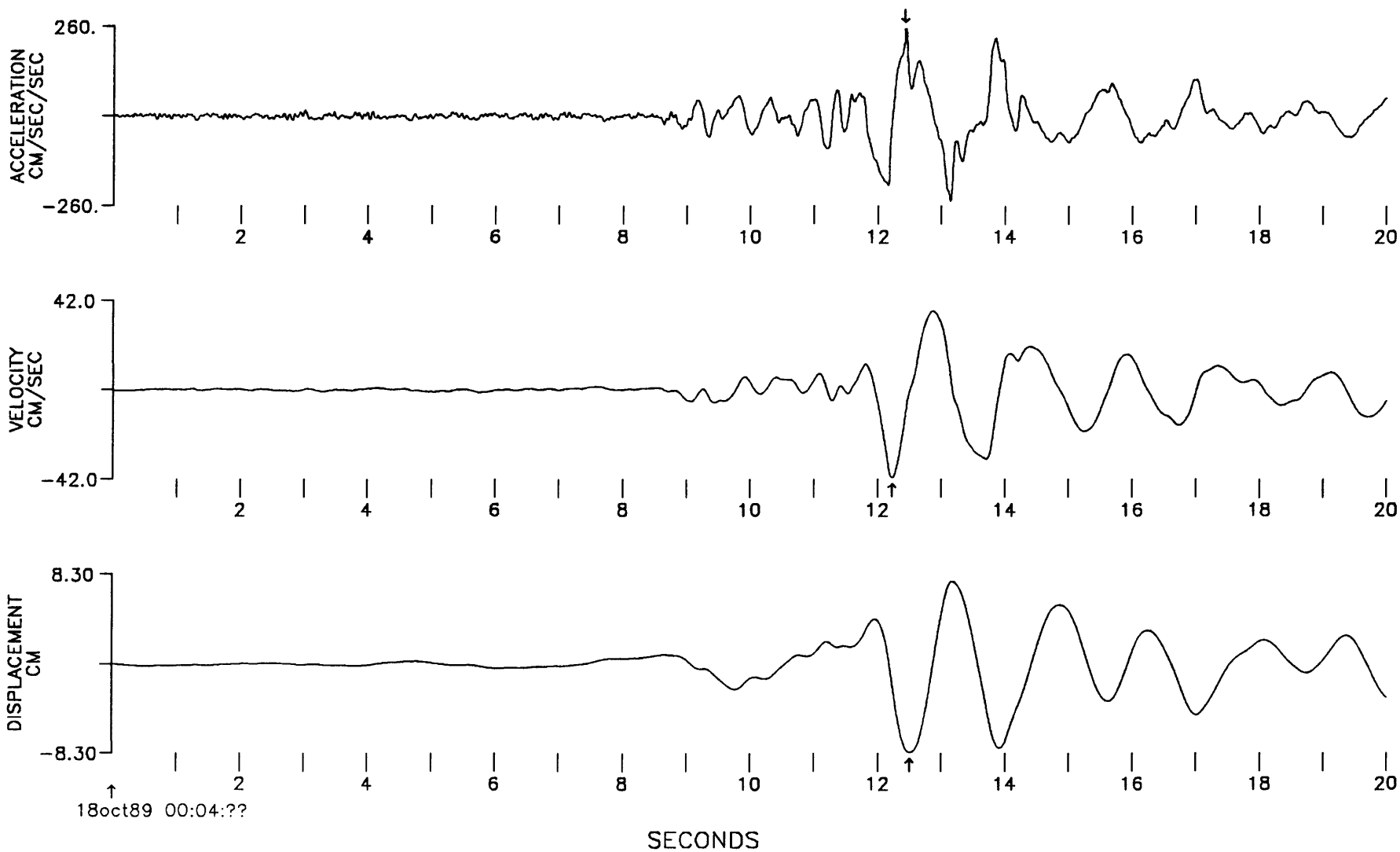
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
EMERYVILLE – 6363 CHRISTIE AVE, S GROUND SITE
UP
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= −58.52 CM/SEC/SEC, VELOCITY= 5.00 CM/SEC, DISPL= −0.80 CM



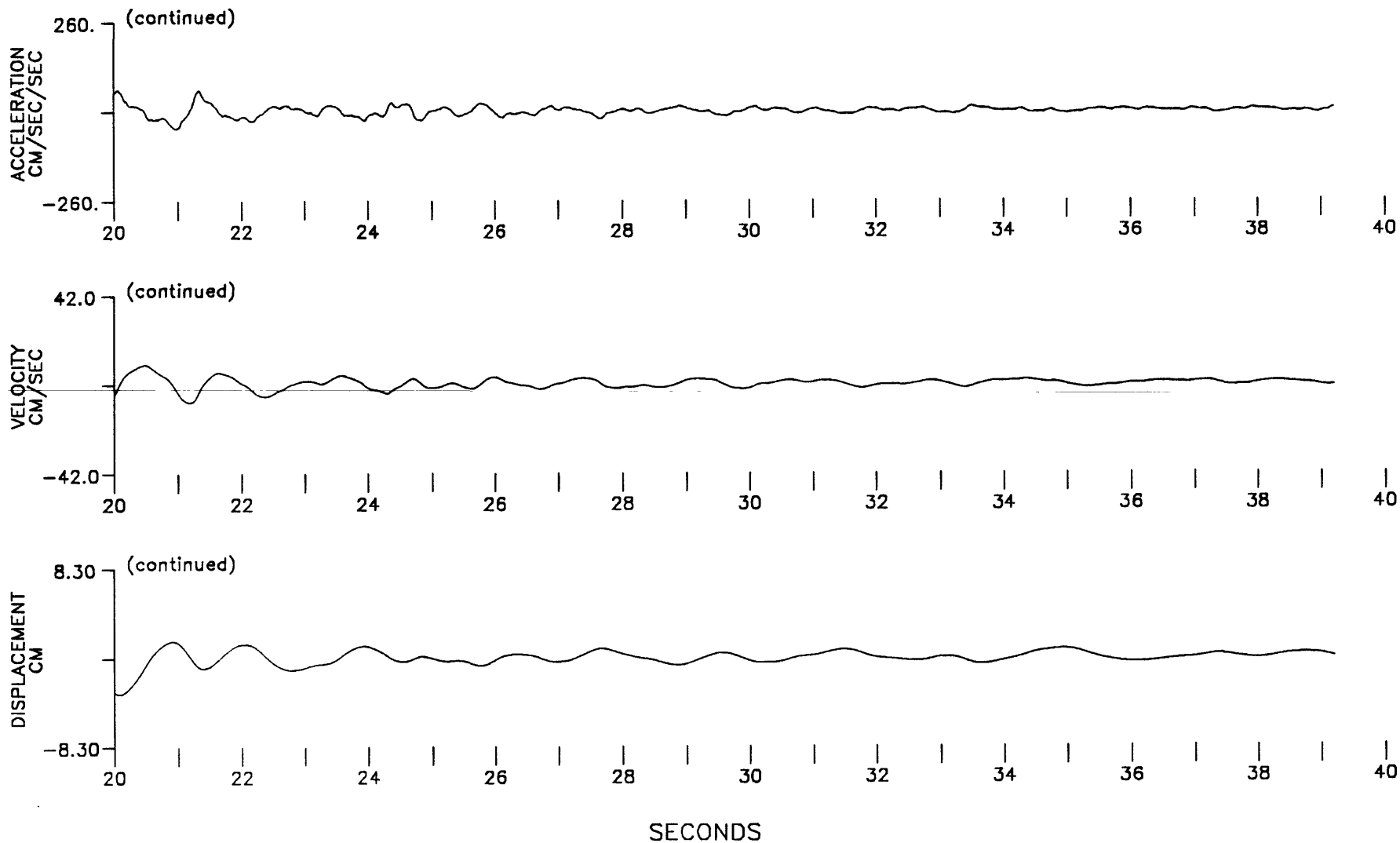
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
EMERYVILLE - 6363 CHRISTIE AVE, S GROUND SITE
UP
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= -58.52 CM/SEC/SEC, VELOCITY= 5.00 CM/SEC, DISPL= -0.80 CM



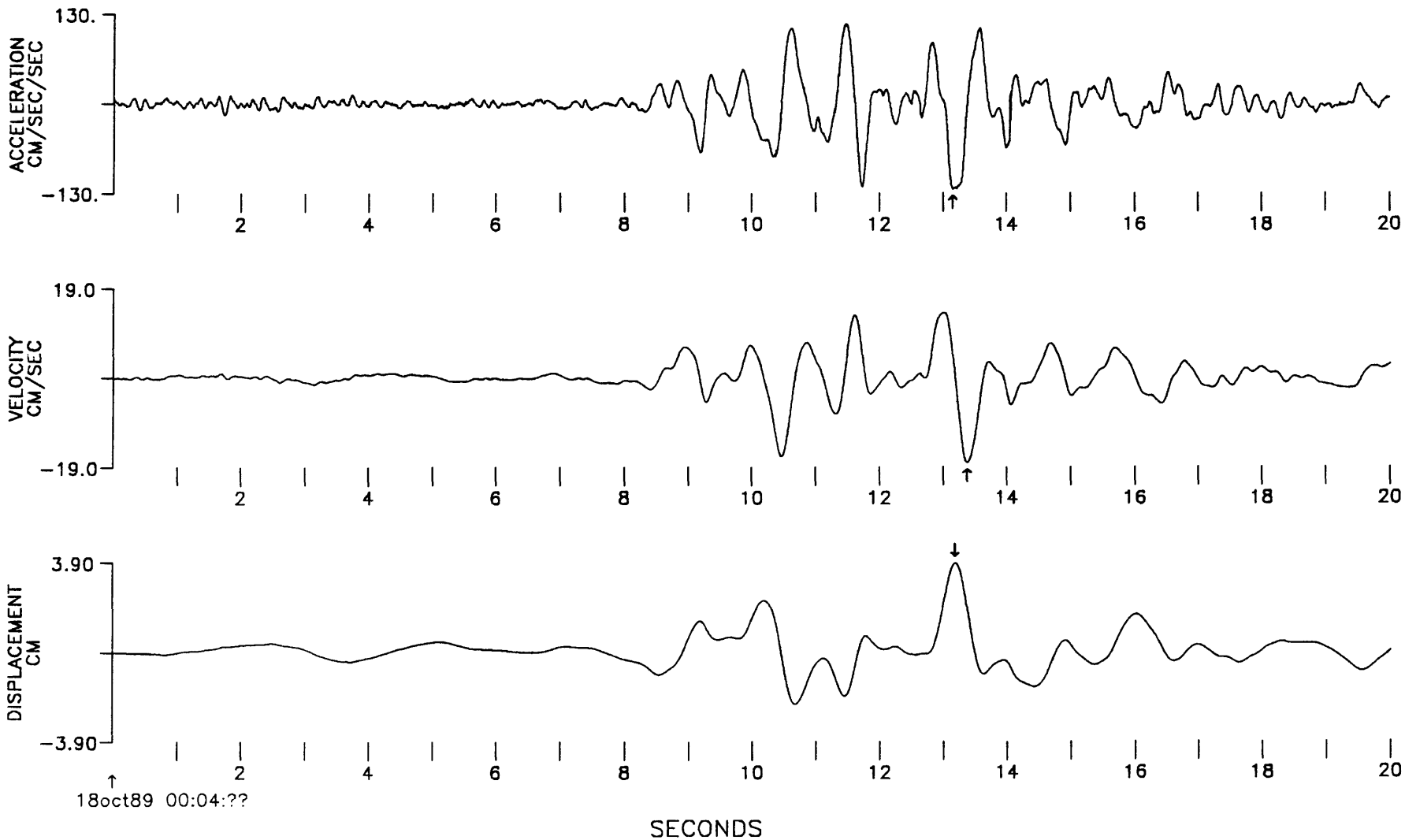
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
EMERYVILLE – 6363 CHRISTIE AVE, S GROUND SITE
260 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= 254.69 CM/SEC/SEC, VELOCITY= −41.06 CM/SEC, DISPL= −8.21 CM



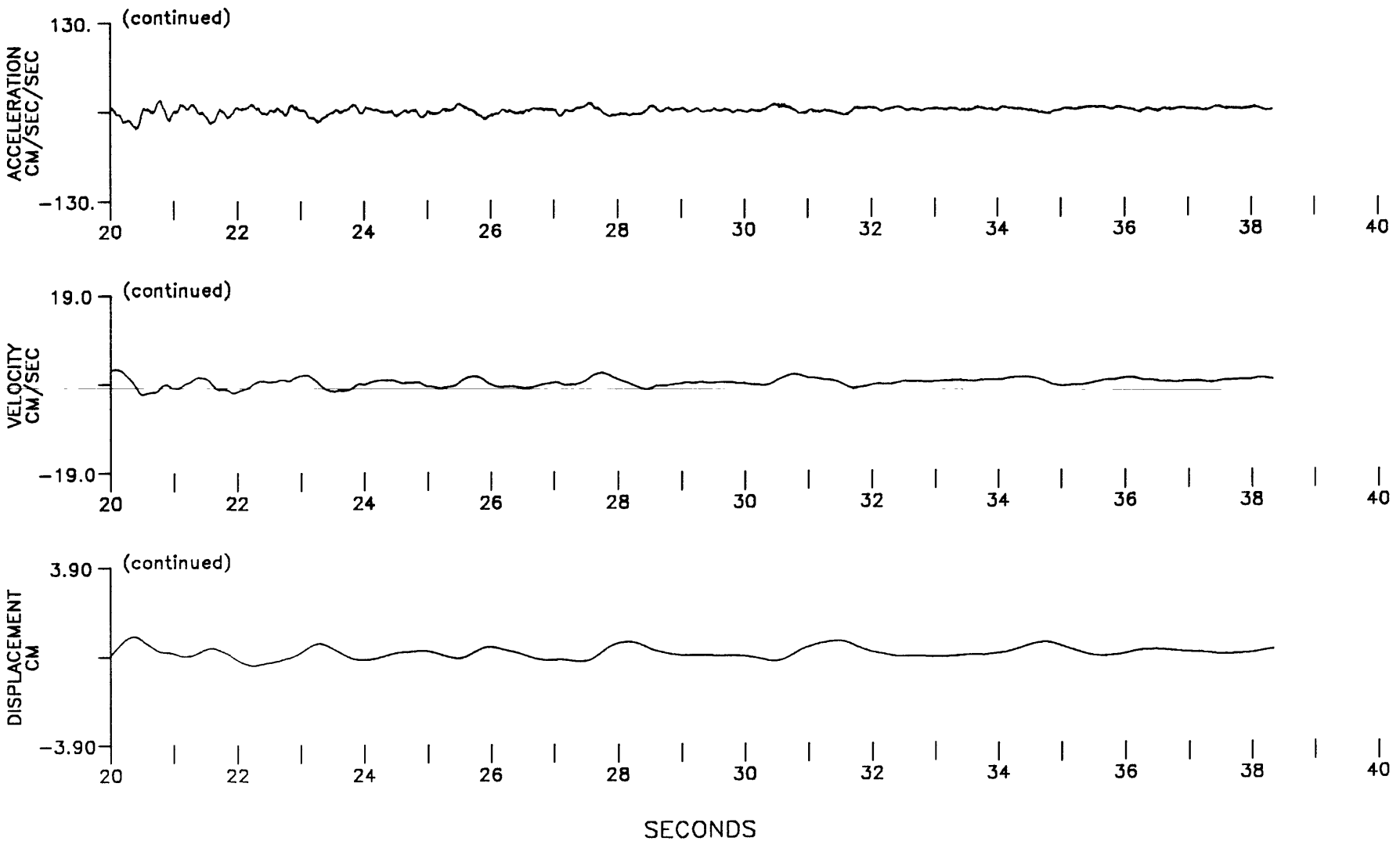
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
EMERYVILLE – 6363 CHRISTIE AVE, S GROUND SITE
260 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= 254.69 CM/SEC/SEC, VELOCITY= −41.06 CM/SEC, DISPL= −8.21 CM



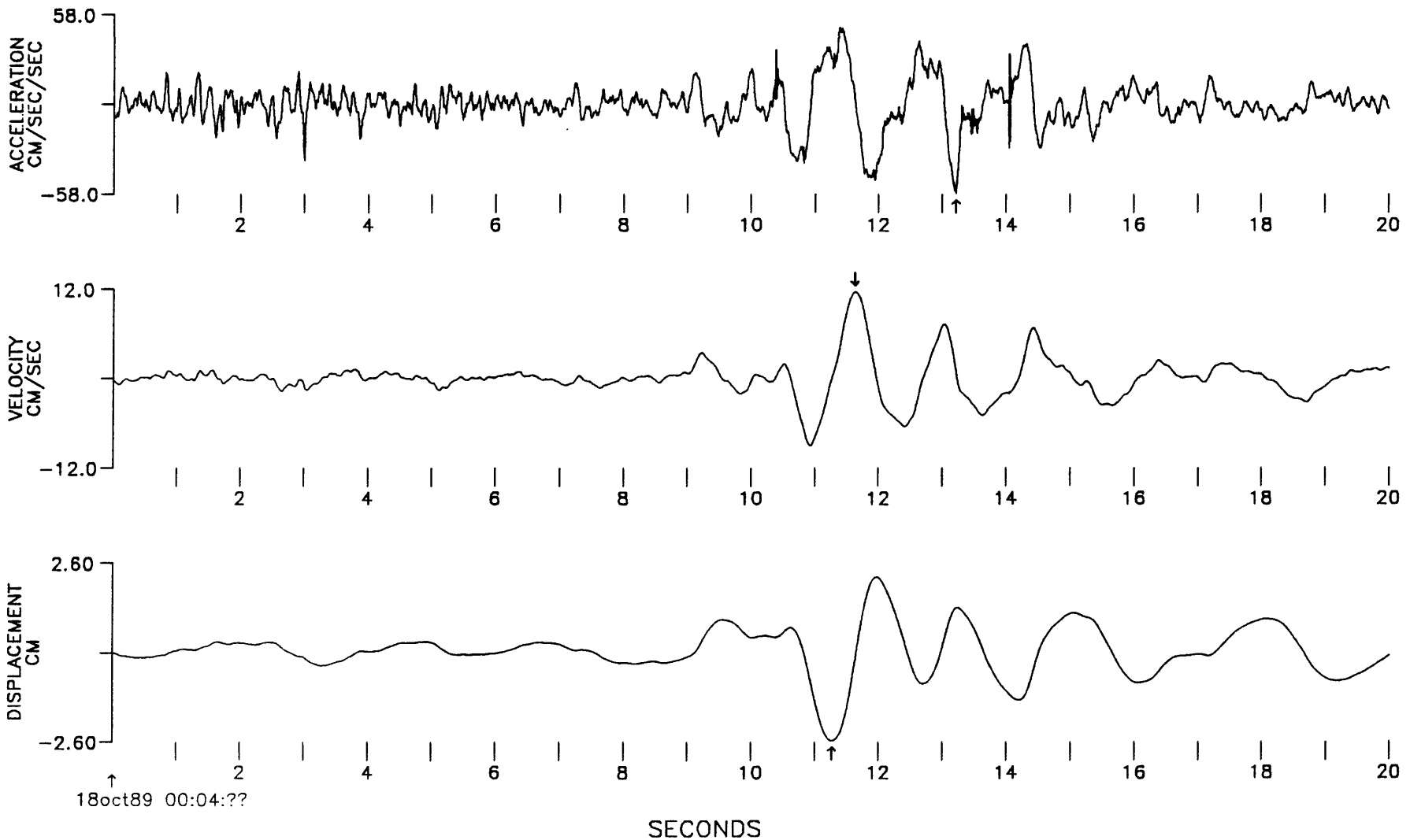
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SAN FRANCISCO - GOLDEN GATE BRIDGE, ABUTMENT BLDG
360 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= -124.17 CM/SEC/SEC, VELOCITY= -18.02 CM/SEC, DISPL= 3.86 CM



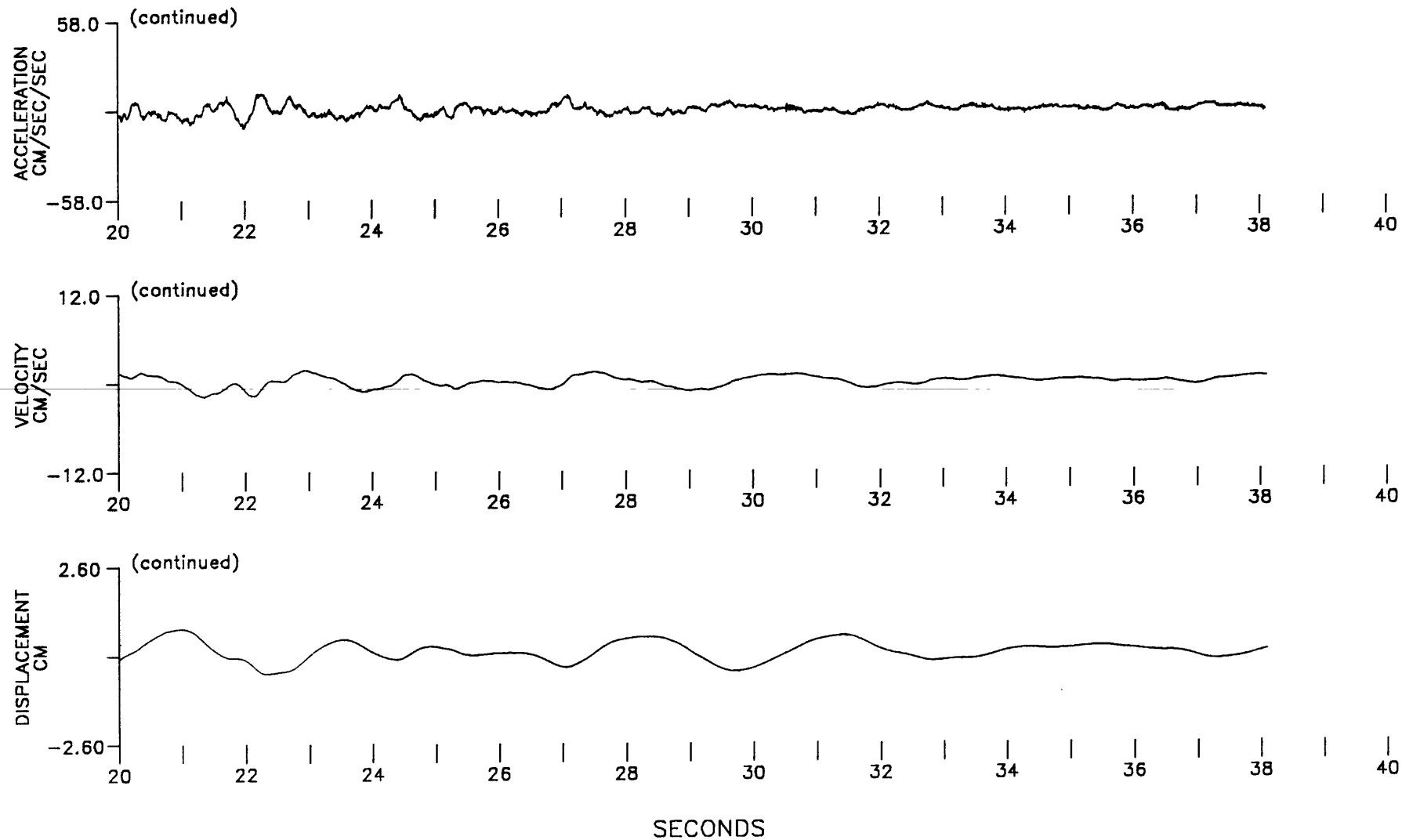
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SAN FRANCISCO - GOLDEN GATE BRIDGE, ABUTMENT BLDG
360 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= -124.17 CM/SEC/SEC, VELOCITY= -18.02 CM/SEC, DISPL= 3.86 CM



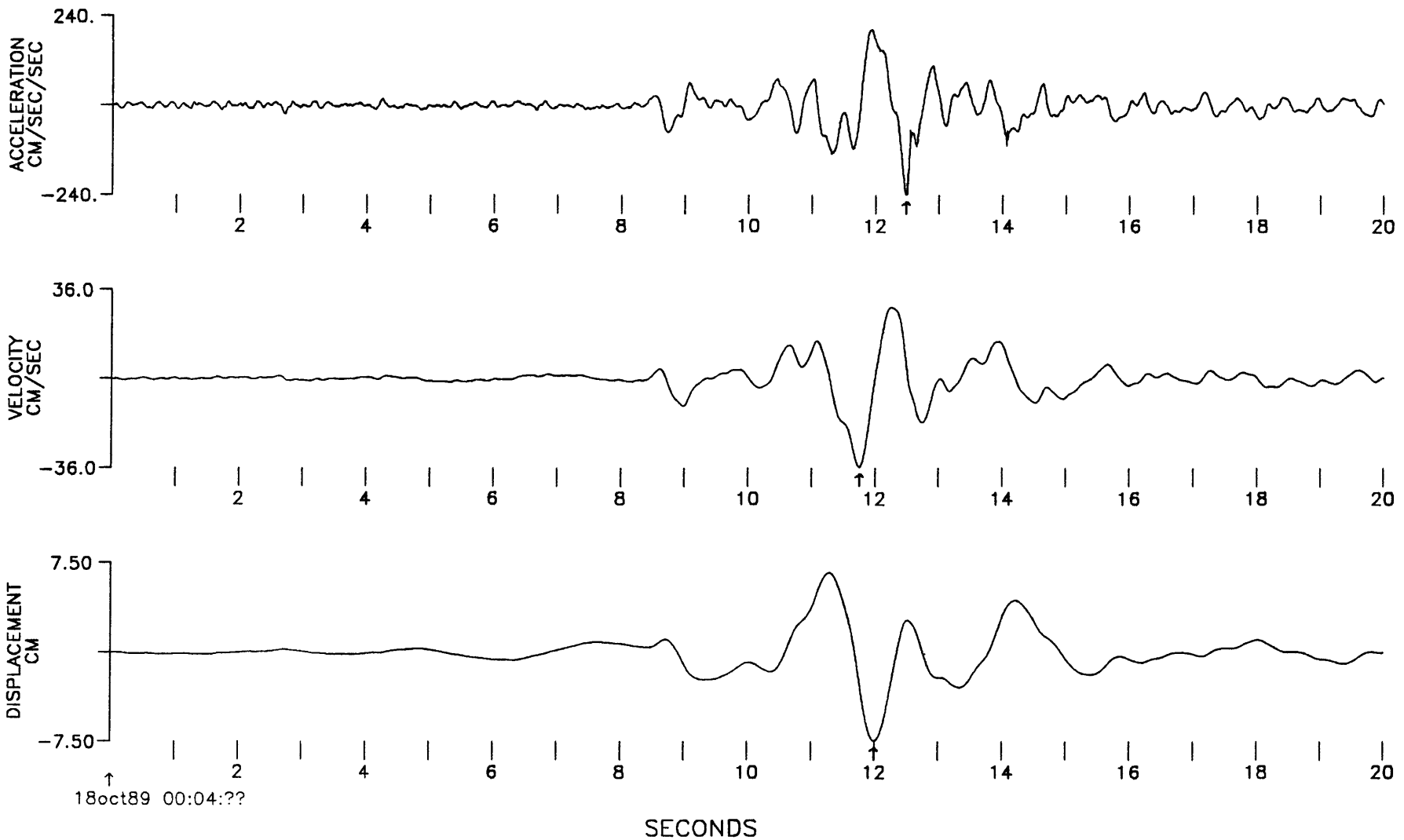
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SAN FRANCISCO – GOLDEN GATE BRIDGE, ABUTMENT BLDG
UP
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= −57.48 CM/SEC/SEC, VELOCITY= 11.62 CM/SEC, DISPL= −2.56 CM



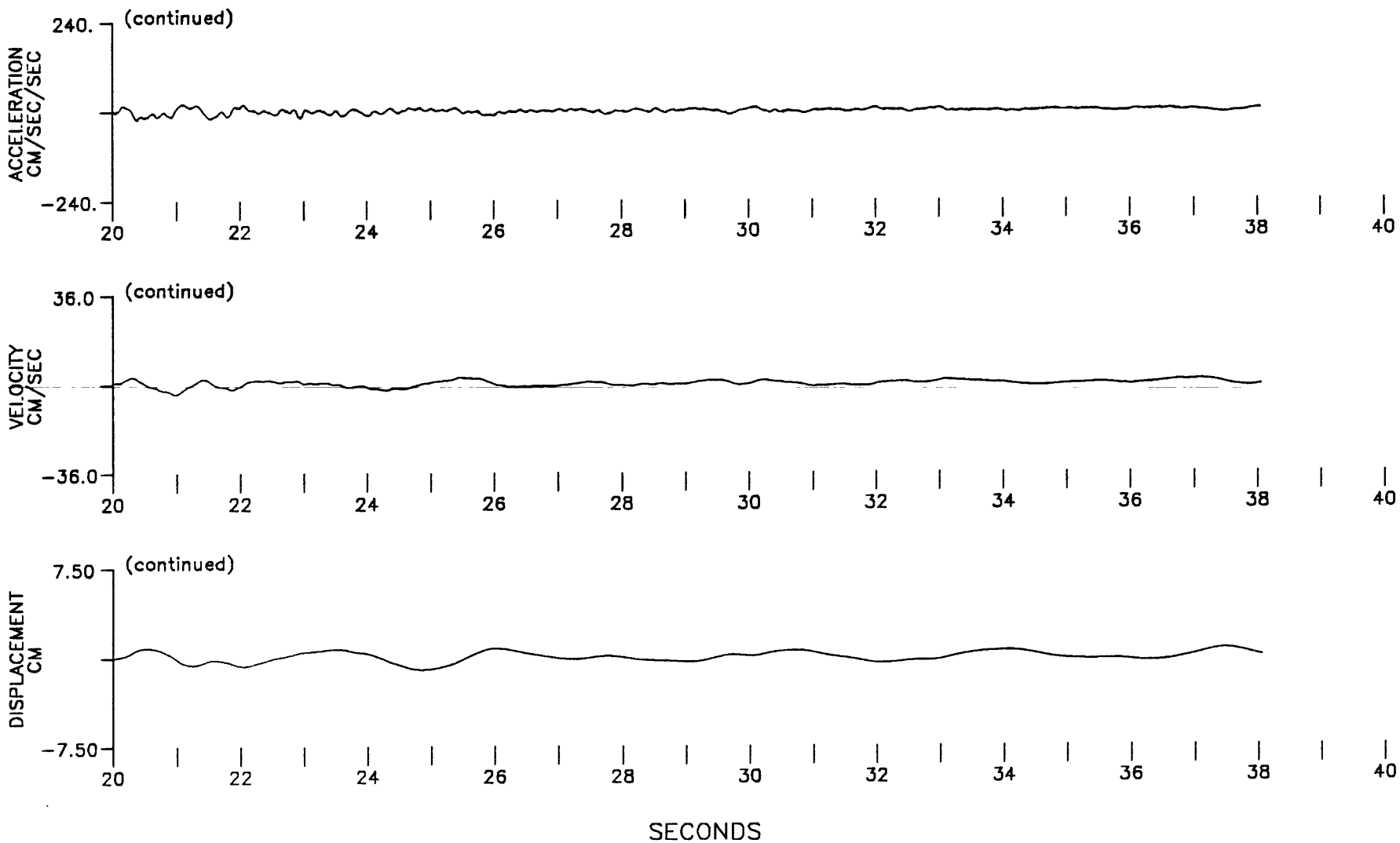
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SAN FRANCISCO - GOLDEN GATE BRIDGE, ABUTMENT BLDG
UP
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= -57.48 CM/SEC/SEC, VELOCITY= 11.62 CM/SEC, DISPL= -2.56 CM



CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SAN FRANCISCO - GOLDEN GATE BRIDGE, ABUTMENT BLDG
270 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= -238.75 CM/SEC/SEC, VELOCITY= -35.49 CM/SEC, DISPL= -7.42 CM

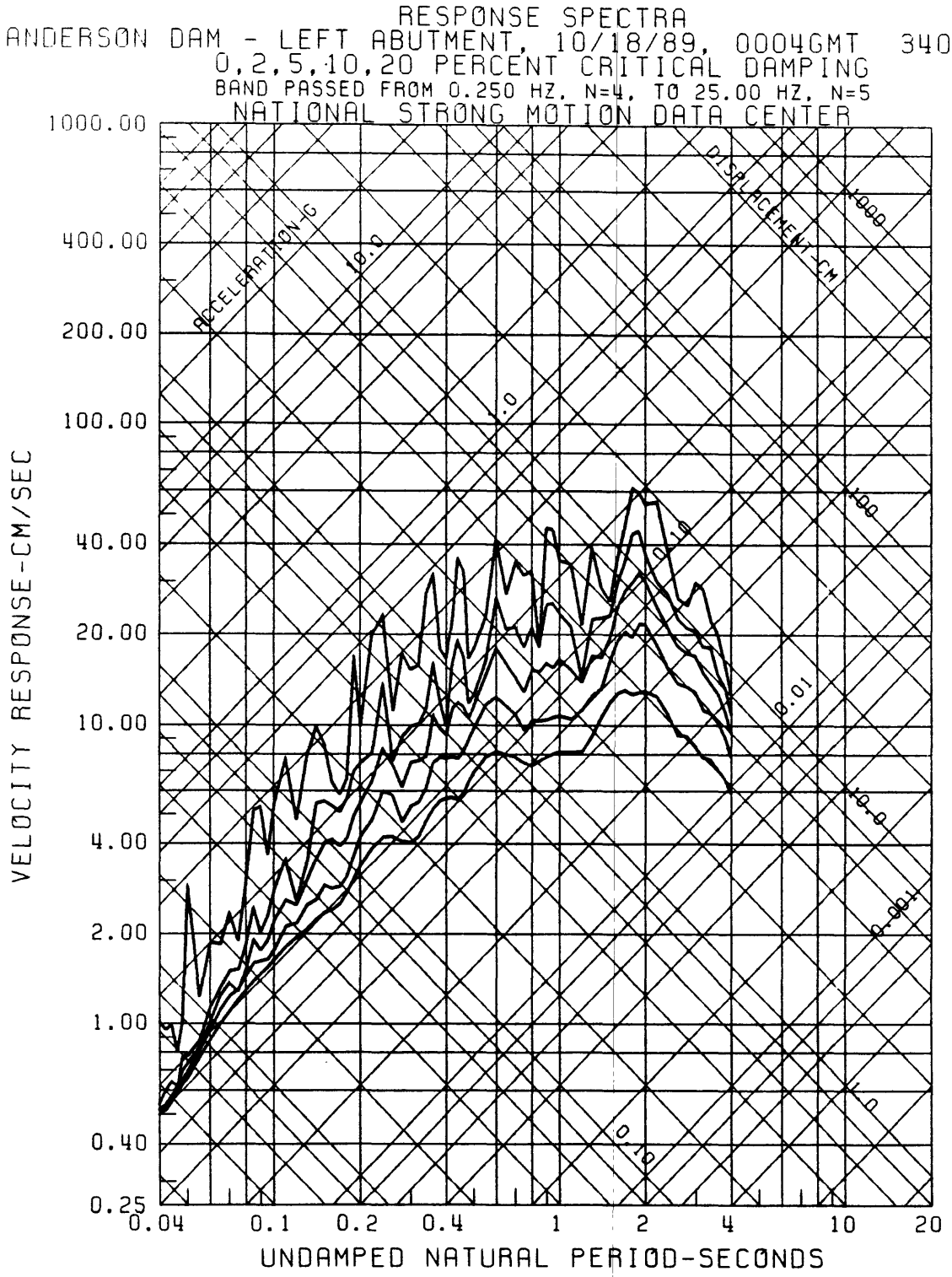


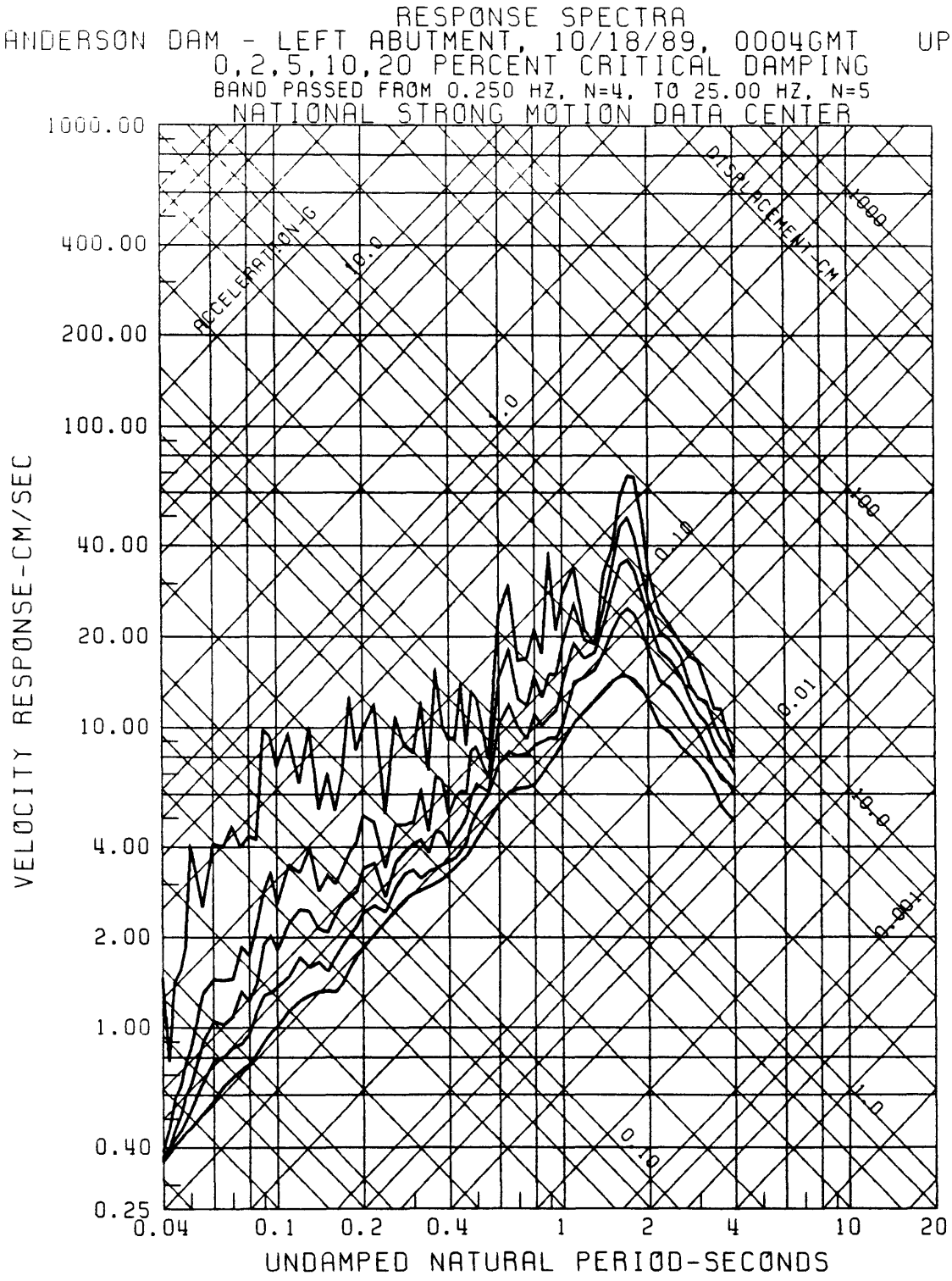
CORRECTED ACCELERATION, VELOCITY, AND DISPLACEMENT AT 200. SPS
SAN FRANCISCO – GOLDEN GATE BRIDGE, ABUTMENT BLDG
270 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
PEAK VALUES: ACCEL= −238.75 CM/SEC/SEC, VELOCITY= −35.49 CM/SEC, DISPL= −7.42 CM

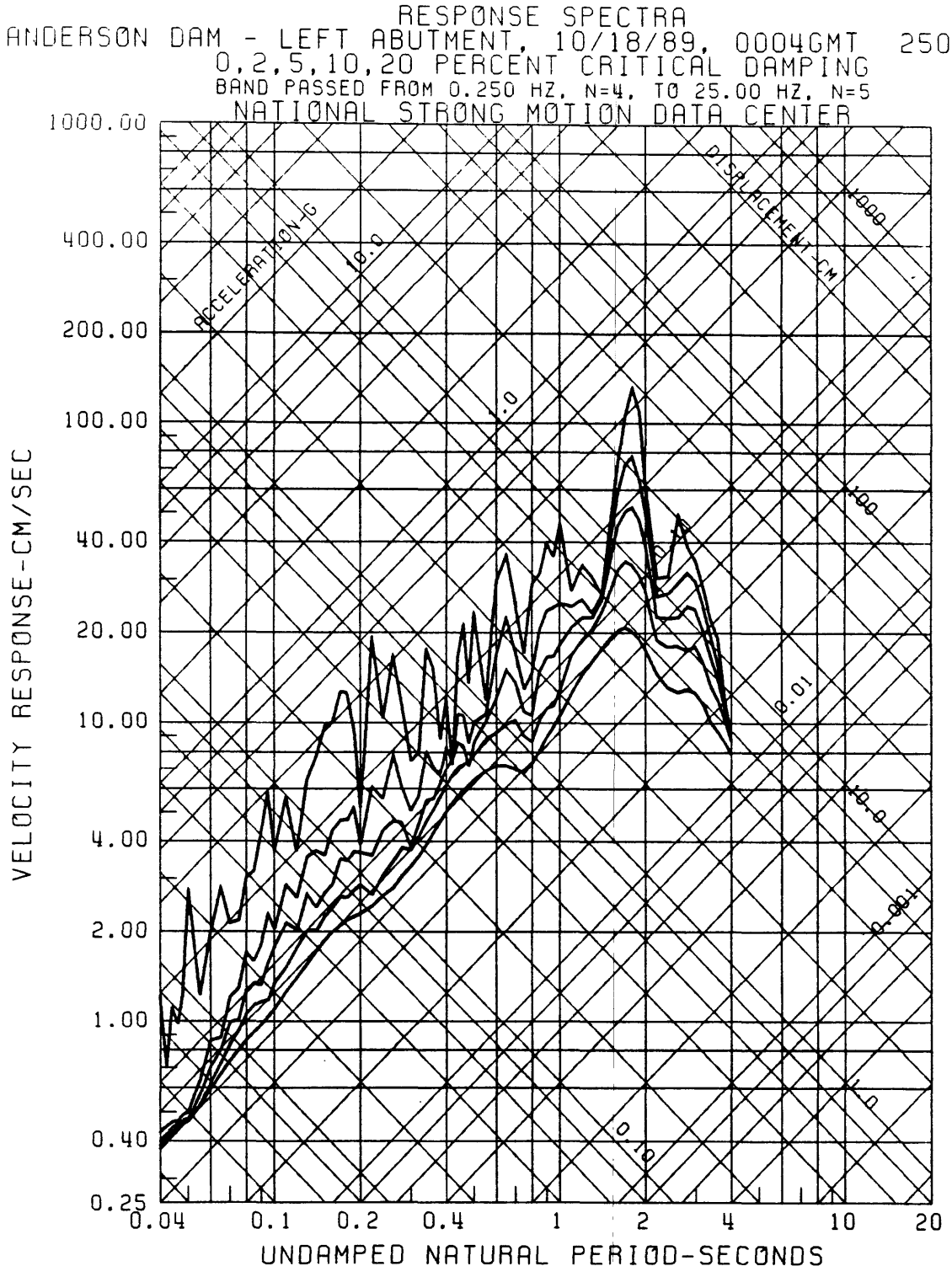


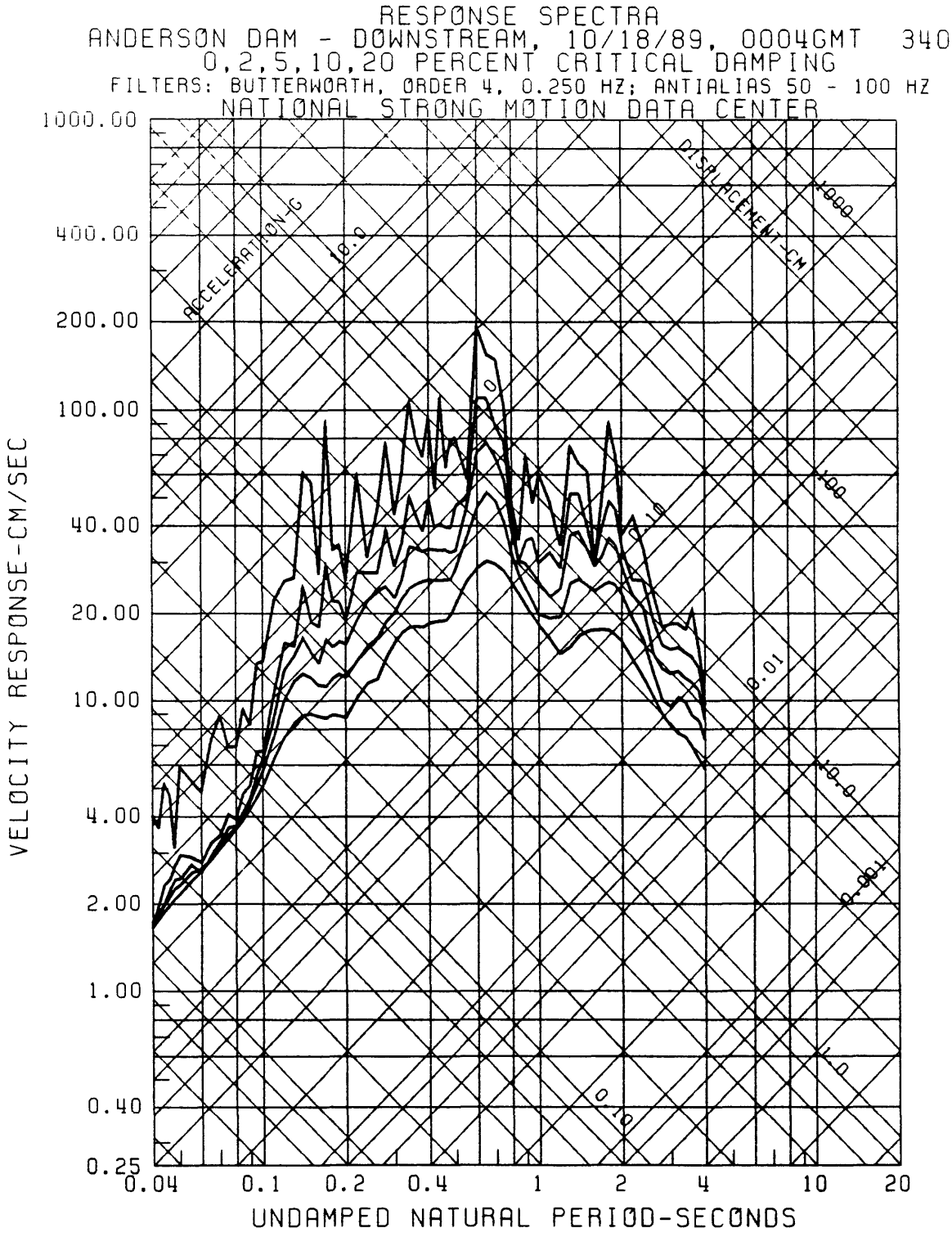
APPENDIX 3

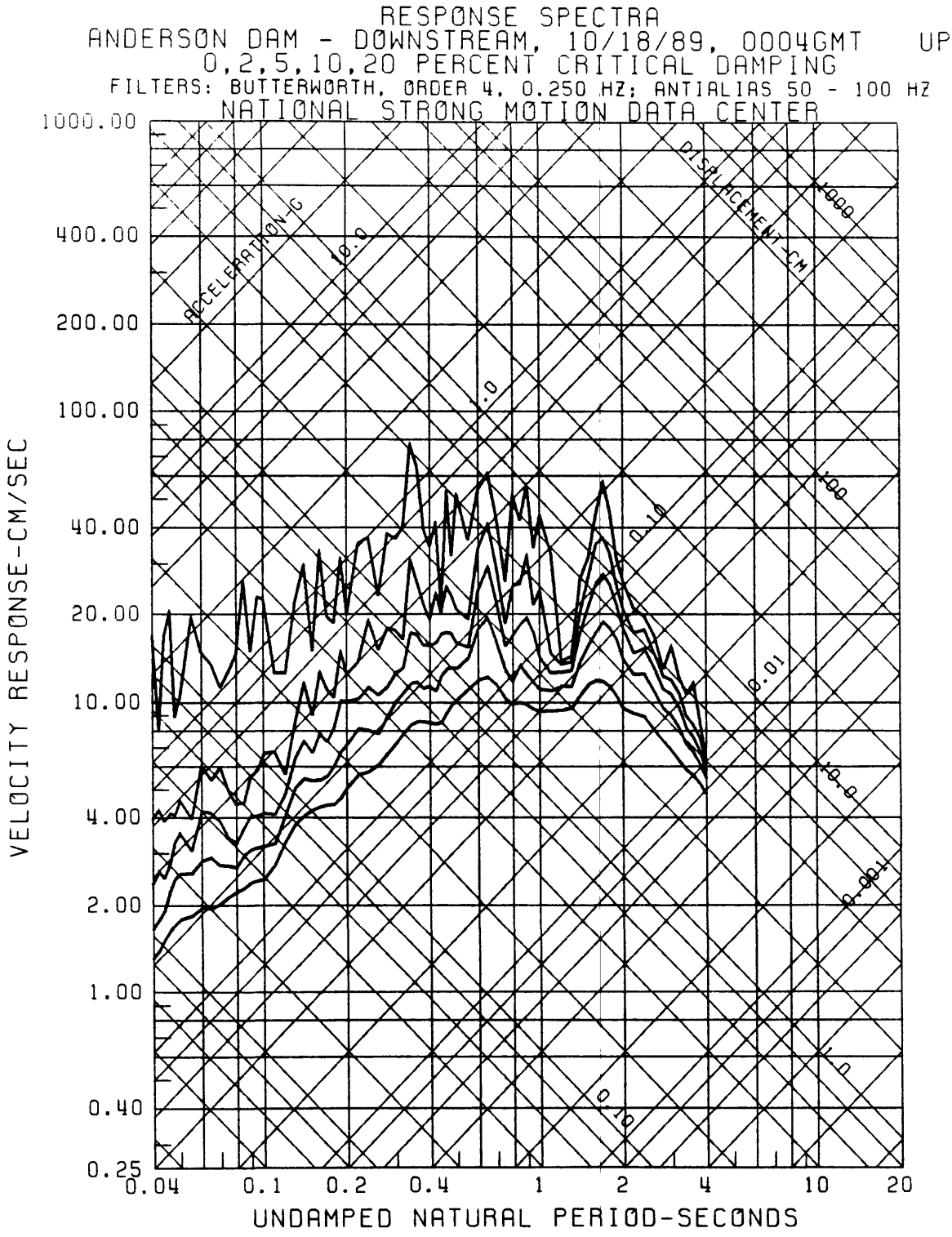
RESPONSE SPECTRUM; TRIPARTITE PLOT

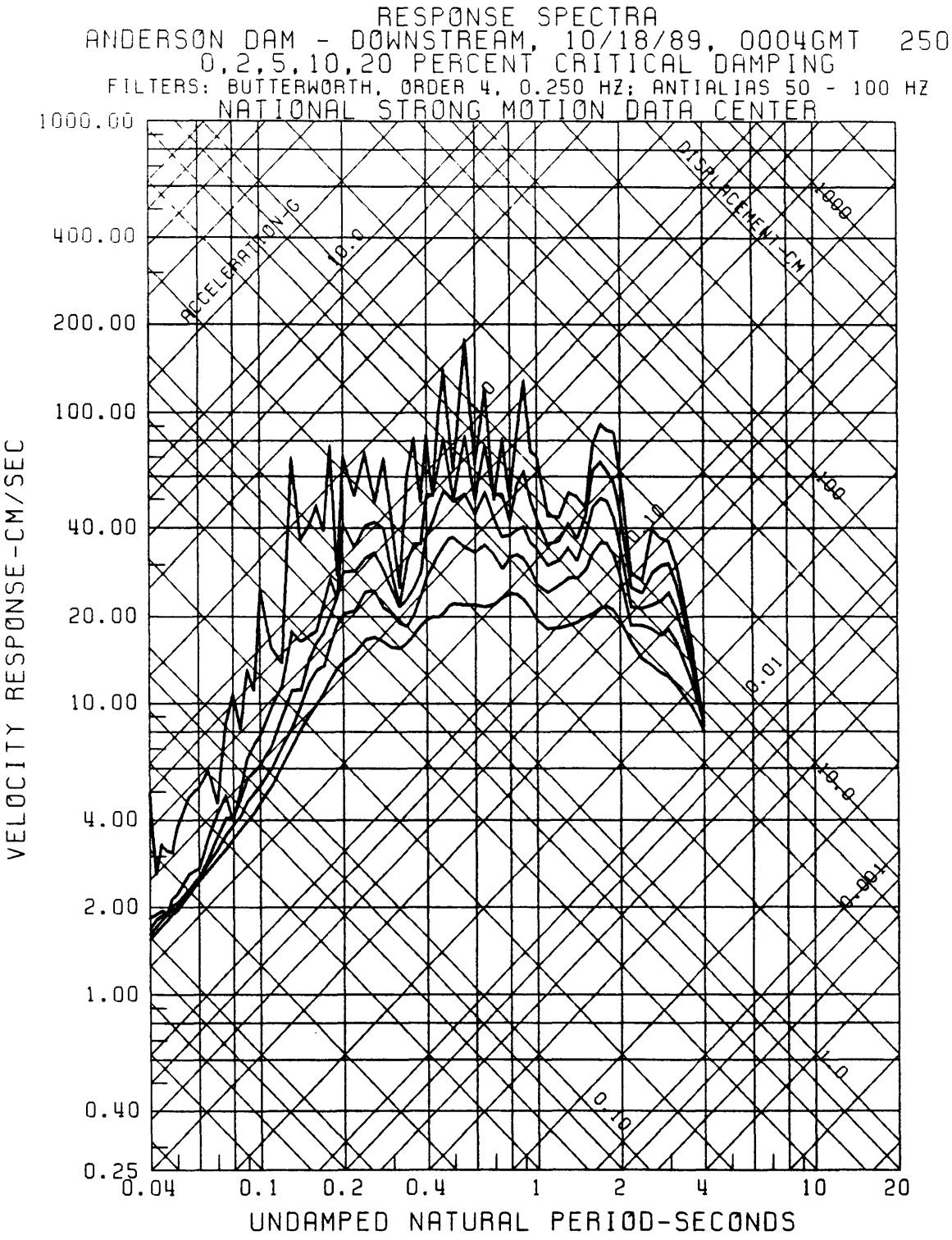

RESPONSE SPECTRA
ANDERSON DAM - LEFT ABUTMENT, 10/18/89, 0004GMT 340
0,2,5,10,20 PERCENT CRITICAL DAMPING
BAND PASSED FROM 0.250 HZ, N=4, TO 25.00 HZ, N=5
NATIONAL STRONG MOTION DATA CENTER
VELOCITY RESPONSE-CM/SEC
UNDAMPED NATURAL PERIOD-SECONDS
ACCELERATION-G
DISPLACEMENT-CM
1000.00
400.00
200.00
100.00
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

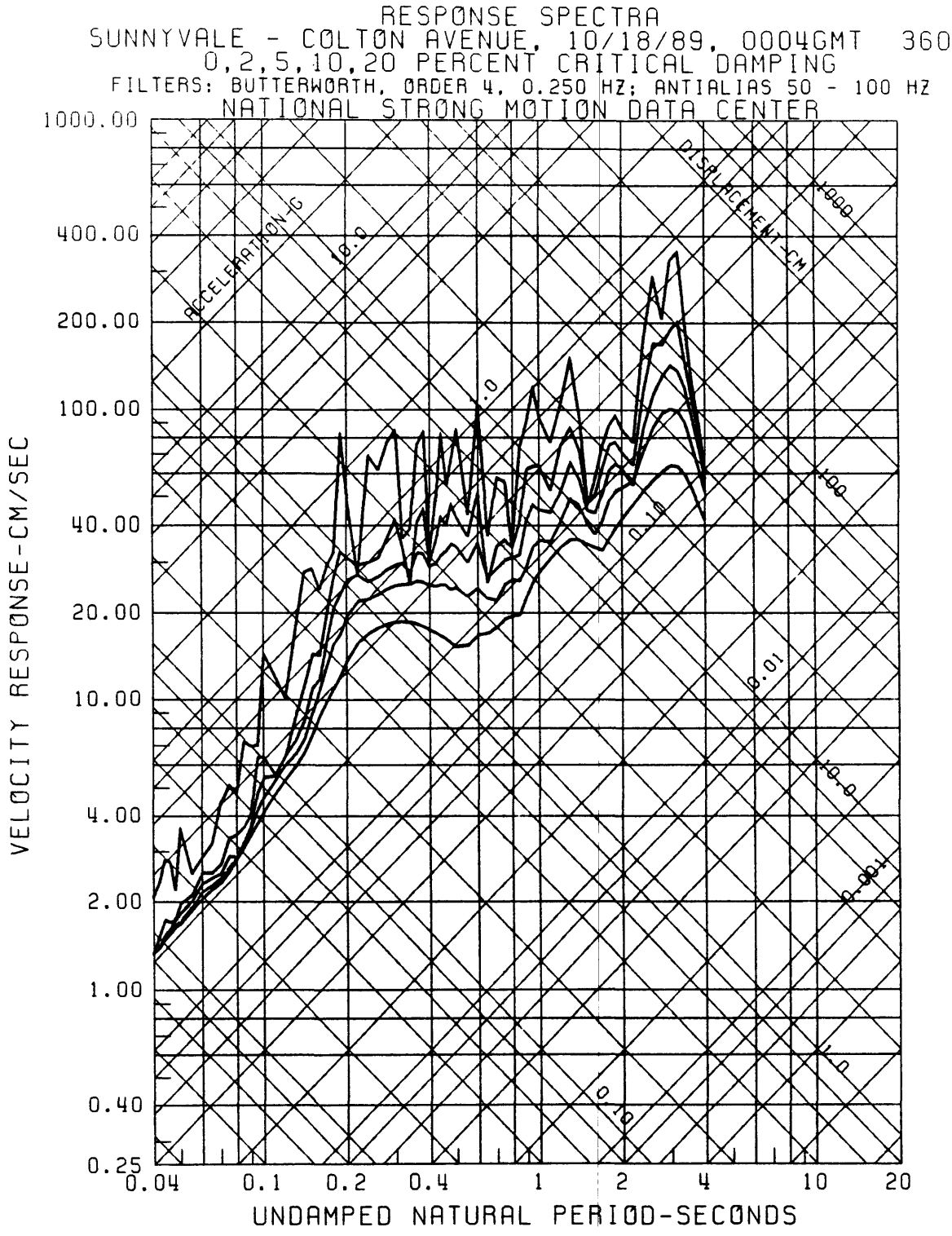

RESPONSE SPECTRA
ANDERSON DAM - LEFT ABUTMENT, 10/18/89, 0004GMT UP
0,2,5,10,20 PERCENT CRITICAL DAMPING
BAND PASSED FROM 0.250 HZ, N=4, TO 25.00 HZ, N=5
NATIONAL STRONG MOTION DATA CENTER
VELOCITY RESPONSE-CM/SEC
UNDAMPED NATURAL PERIOD-SECONDS
ACCELERATION-G
DISPLACEMENT-CM
1000.00
400.00
200.00
100.00
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
10.0
1.0
0.10
0.01
1000
100
10.0
1.0
0.10
0.01

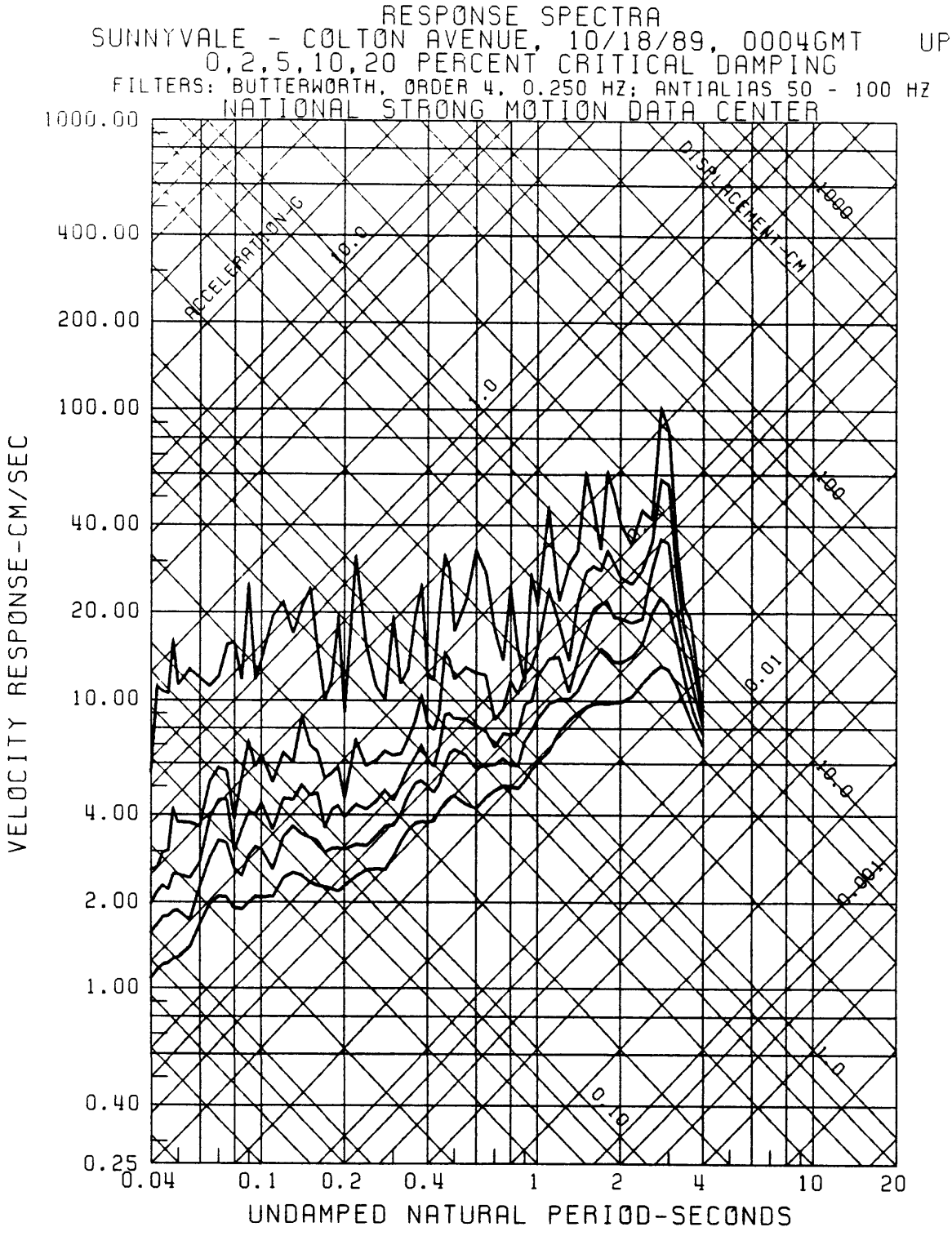

RESPONSE SPECTRA
ANDERSON DAM - LEFT ABUTMENT, 10/18/89, 0004GMT 250
0,2,5,10,20 PERCENT CRITICAL DAMPING
BAND PASSED FROM 0.250 HZ, N=4, TO 25.00 HZ, N=5
NATIONAL STRONG MOTION DATA CENTER
ACCELERATION-G
DISPLACEMENT-CM
10.0
1.0
0.01
0.10
1000
100
10.0
0.001
1.0
1000.00
400.00
200.00
100.00
40.00
20.00
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

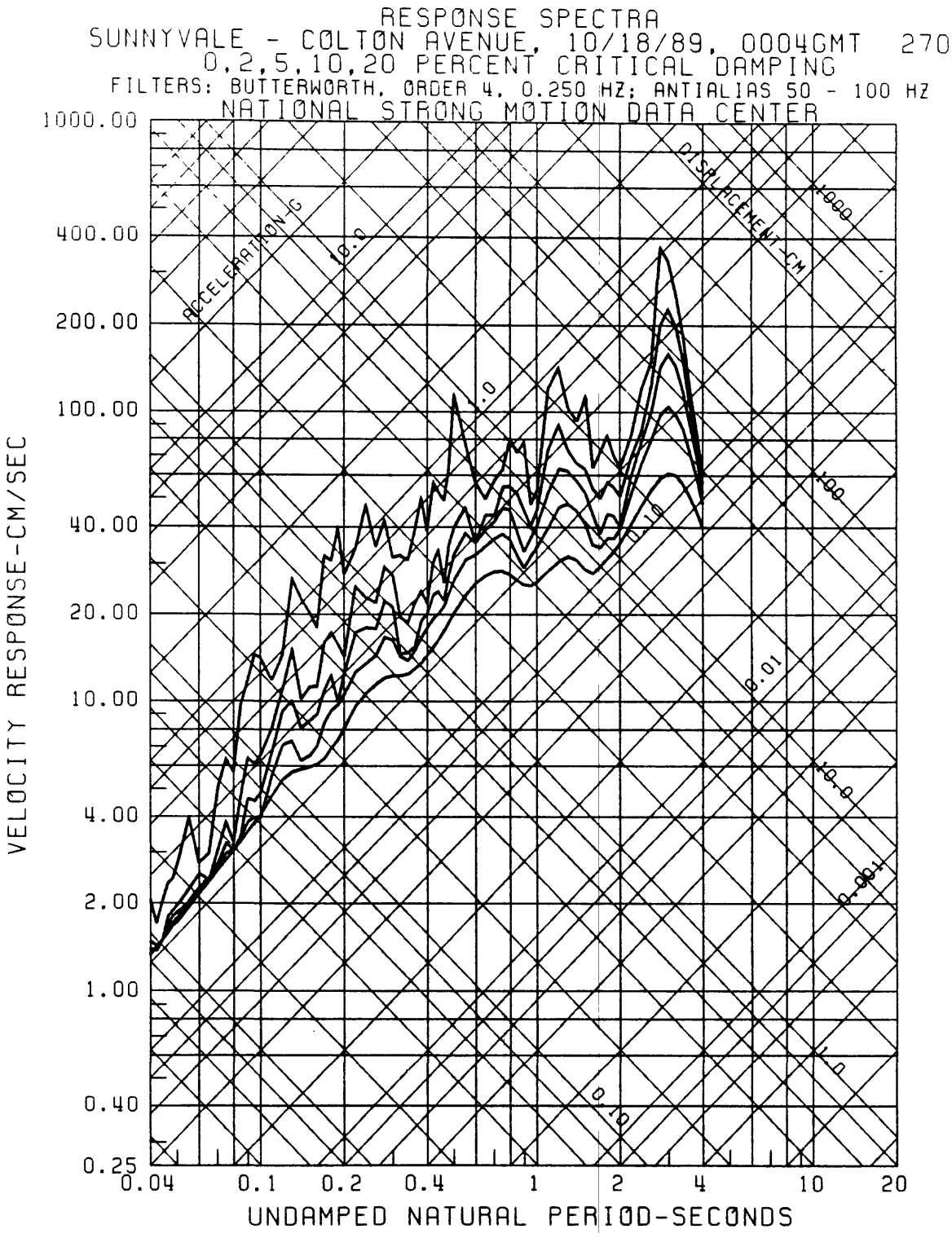

RESPONSE SPECTRA
ANDERSON DAM - DOWNSTREAM, 10/18/89, 0004GMT 340
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.250 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER
ACCELERATION-G
10.0
DISPLACEMENT-CM
1000
100
10.0
1.0
0.01
0.001
0
0.10
0.10
VELOCITY RESPONSE-CM/SEC
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

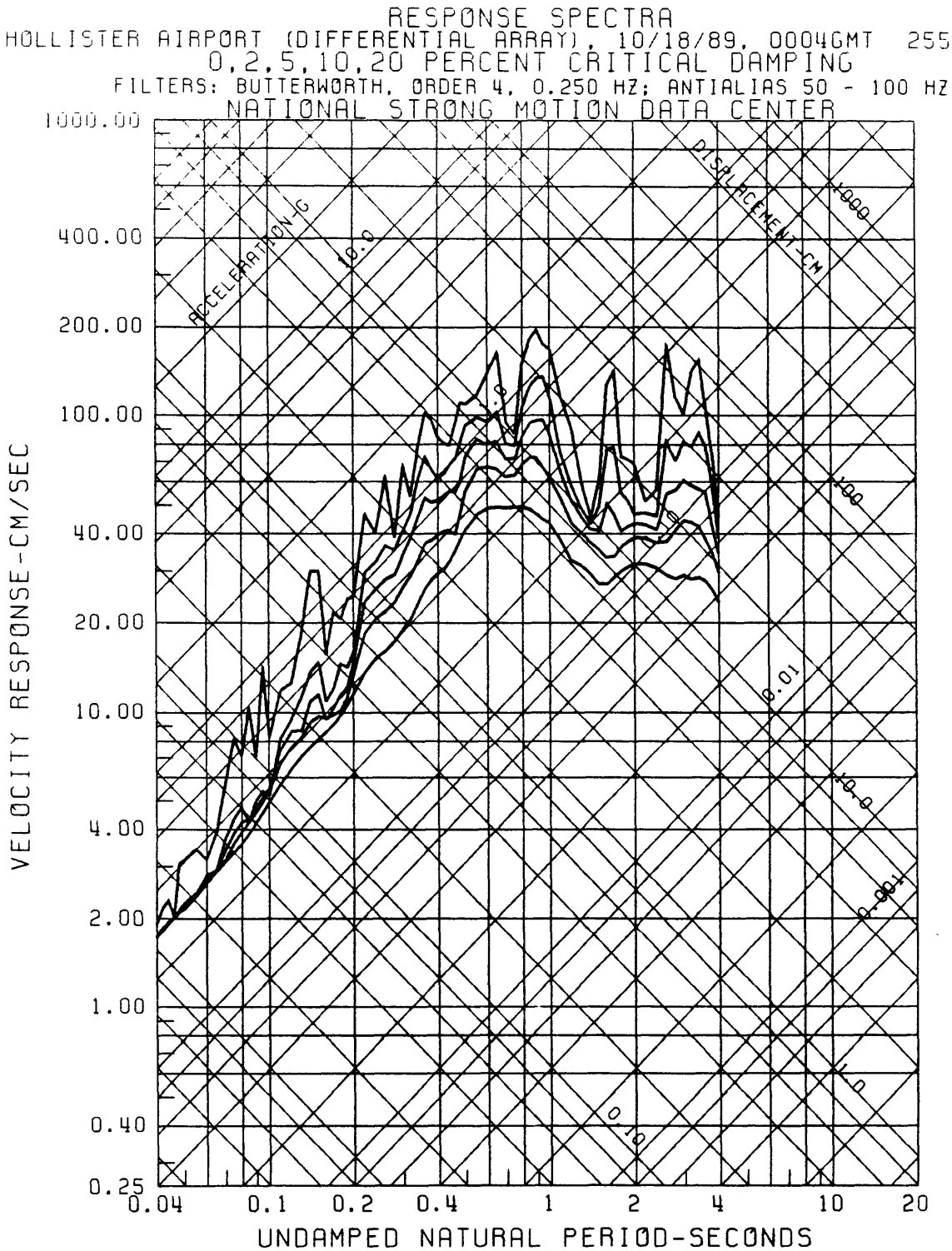

RESPONSE SPECTRA
ANDERSON DAM - DOWNSTREAM, 10/18/89, 0004GMT UP
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.250 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER
ACCELERATION-G
DISPLACEMENT-CM
VELOCITY RESPONSE-CM/SEC
UNDAMPED NATURAL PERIOD-SECONDS
1000.00
400.00
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
ANDERSON DAM - DOWNSTREAM, 10/18/89, 0004GMT 250
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
UNDAMPED NATURAL PERIOD-SECONDS
ACCELERATION-G
DISPLACEMENT-CM
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

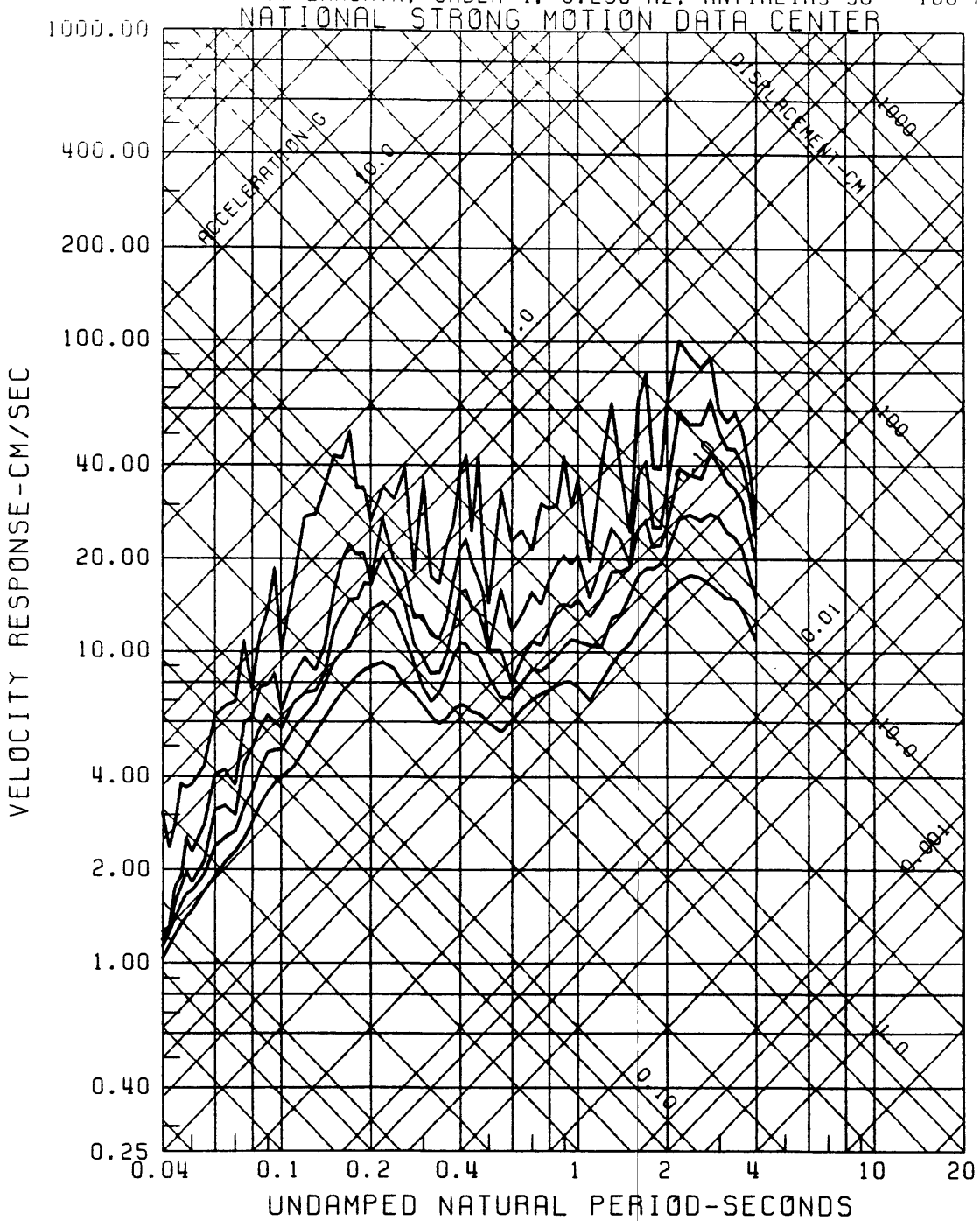

RESPONSE SPECTRA
SUNNYVALE - COLTON AVENUE, 10/18/89, 0004GMT 360
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.250 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER
VELOCITY RESPONSE-CM/SEC
UNDAMPED NATURAL PERIOD-SECONDS
1000.00
400.00
200.00
100.00
40.00
20.00
10.00
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
10.0
1.0
0.10
0.01
1000
100
10.0
1.0
0.10
0.01

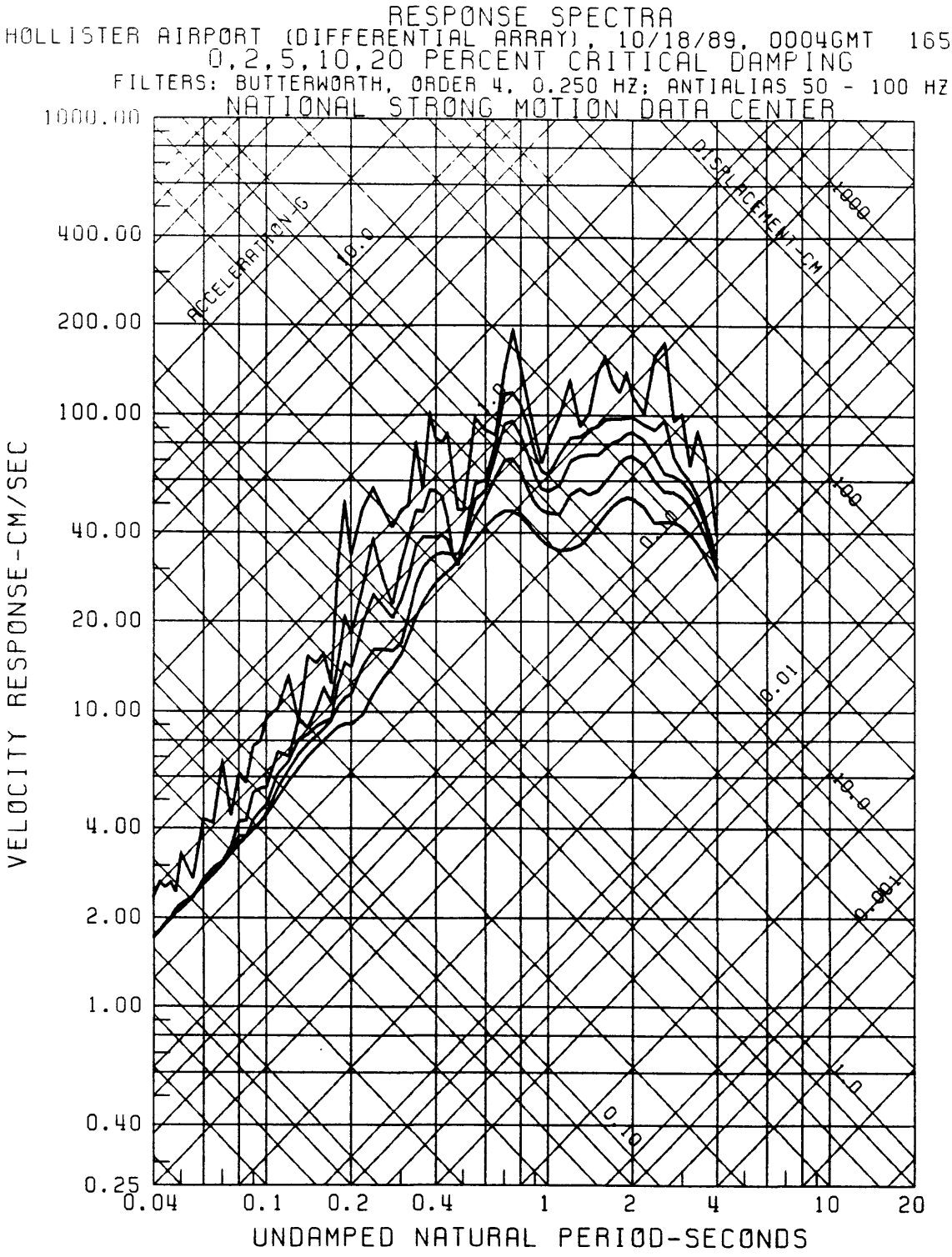

RESPONSE SPECTRA
SUNNYVALE - COLTON AVENUE, 10/18/89, 0004GMT UP
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.250 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER
ACCELERATION-G
DISPLACEMENT-CM
VELOCITY RESPONSE-CM/SEC
UNDAMPED NATURAL PERIOD-SECONDS
1000.00
400.00
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
10.0
1.0
0.10
0.01
1000
100
10.0
1.0
0.01


RESPONSE SPECTRA
SUNNYVALE - COLTON AVENUE, 10/18/89, 0004GMT 270
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
10.0
.0
0.10
0.01
0.001
1000
100
10.0
1.0

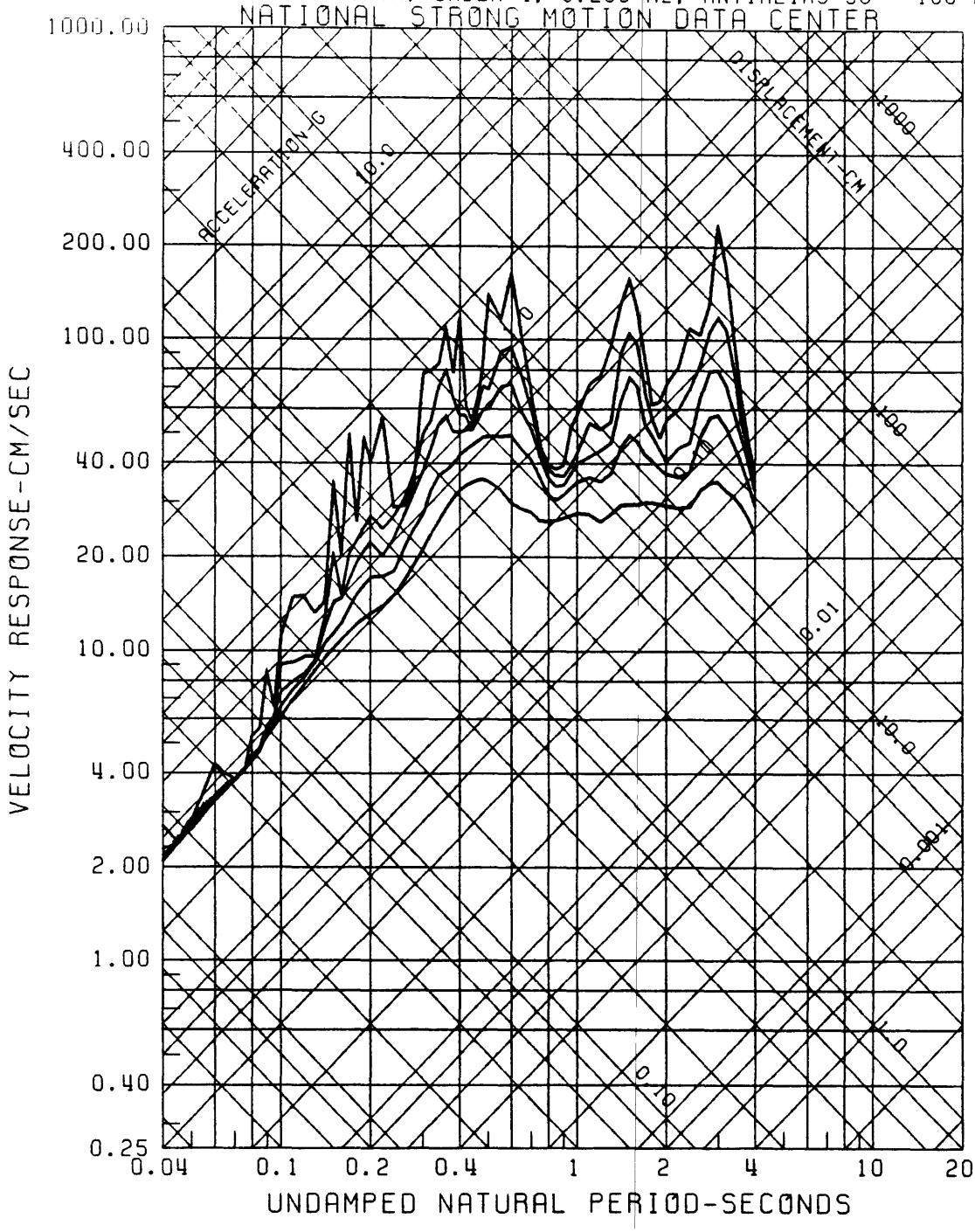

RESPONSE SPECTRA
HOLLISTER AIRPORT (DIFFERENTIAL ARRAY), 10/18/89, 0004GMT 255
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.250 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER
ACCELERATION-G
DISPLACEMENT-CM
VELOCITY RESPONSE-CM/SEC
UNDAMPED NATURAL PERIOD-SECONDS
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
10.0
1000
100
0.01
10.0
0.001
1.0
0.10

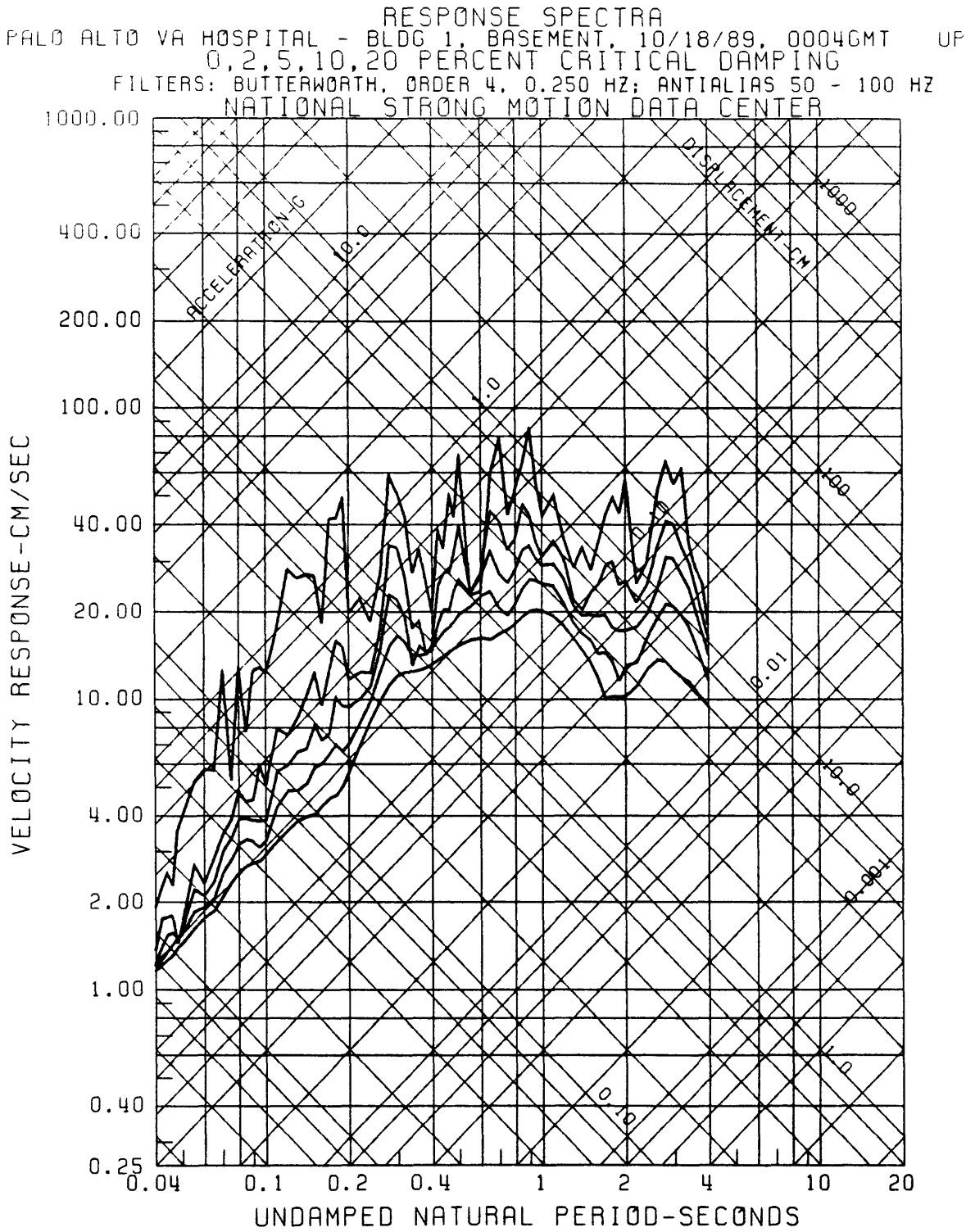
RESPONSE SPECTRA
HOLLISTER AIRPORT (DIFFERENTIAL ARRAY), 10/18/89, 0004GMT UP
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.250 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER



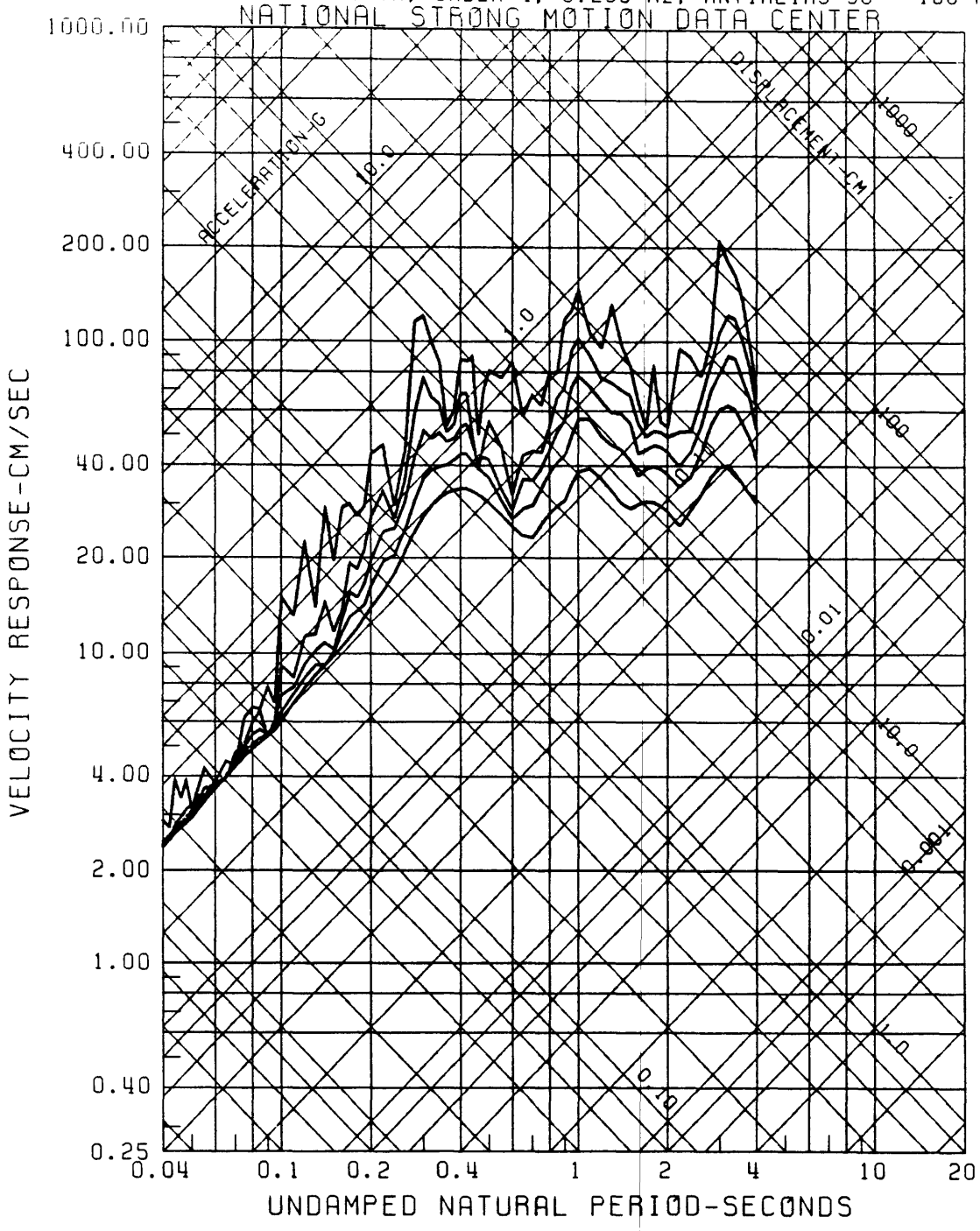

RESPONSE SPECTRA
HOLLISTER AIRPORT (DIFFERENTIAL ARRAY), 10/18/89, 0004GMT 165
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.250 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER
ACCELERATION-G
DISPLACEMENT-CM
VELOCITY RESPONSE-CM/SEC
UNDAMPED NATURAL PERIOD-SECONDS
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
10.0
1.0
0.10
0.01
0.001
1000
100
10.0
1.0
0.10

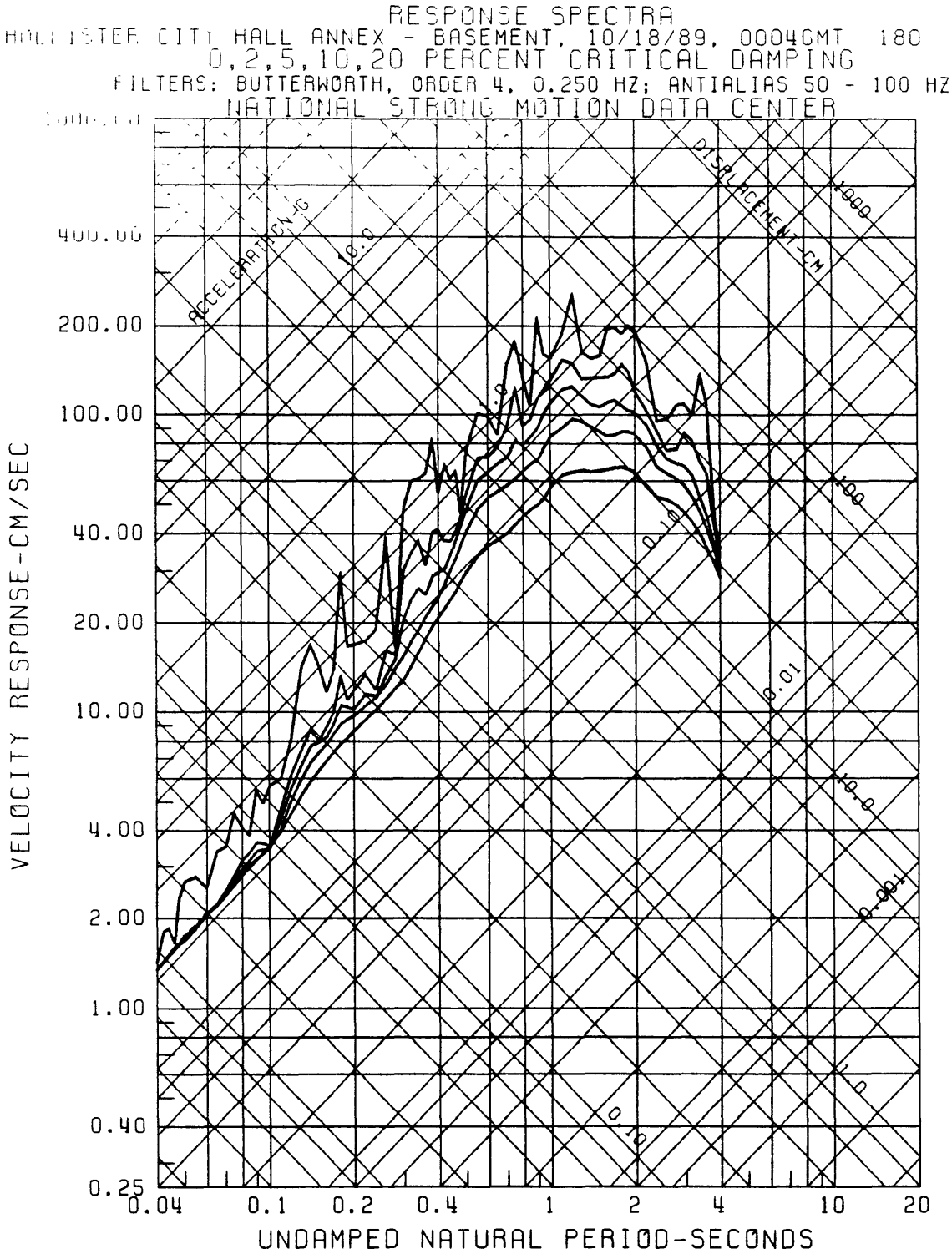
RESPONSE SPECTRA
PALO ALTO VA HOSPITAL - BLDG 1, BASEMENT, 10/18/89, 0004GMT 302
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.250 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER

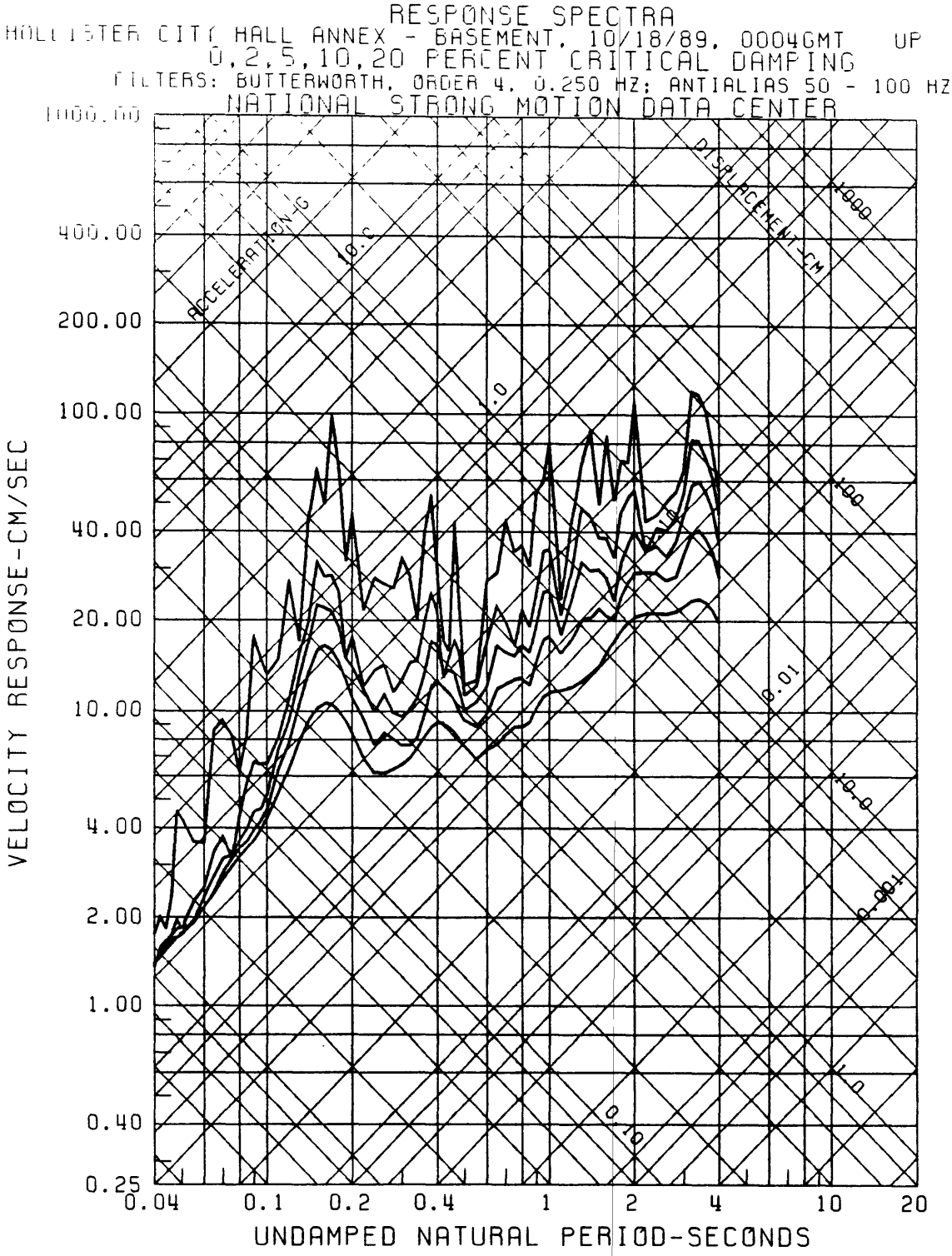


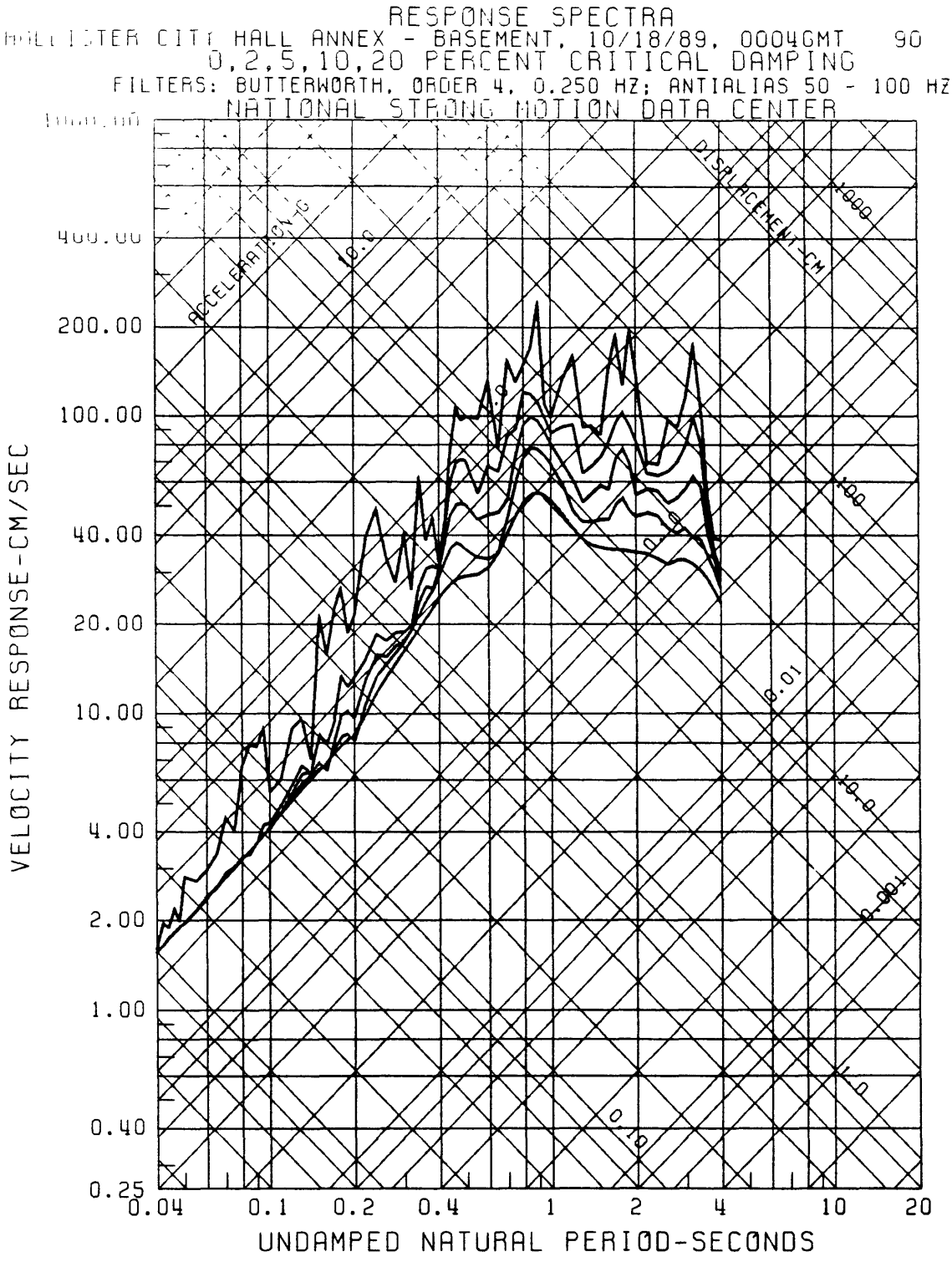

RESPONSE SPECTRA
PALO ALTO VA HOSPITAL - BLDG 1, BASEMENT, 10/18/89, 0004GMT UP
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.250 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER
ACCELERATION-G
DISPLACEMENT-CM
10.0
1.0
0.01
0.10
1000
100
10.0
0.001
1.0
VELOCITY RESPONSE-CM/SEC
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

RESPONSE SPECTRA
PALO ALTO VA HOSPITAL - BLDG 1, BASEMENT, 10/18/89, 0004GMT 212
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.250 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER

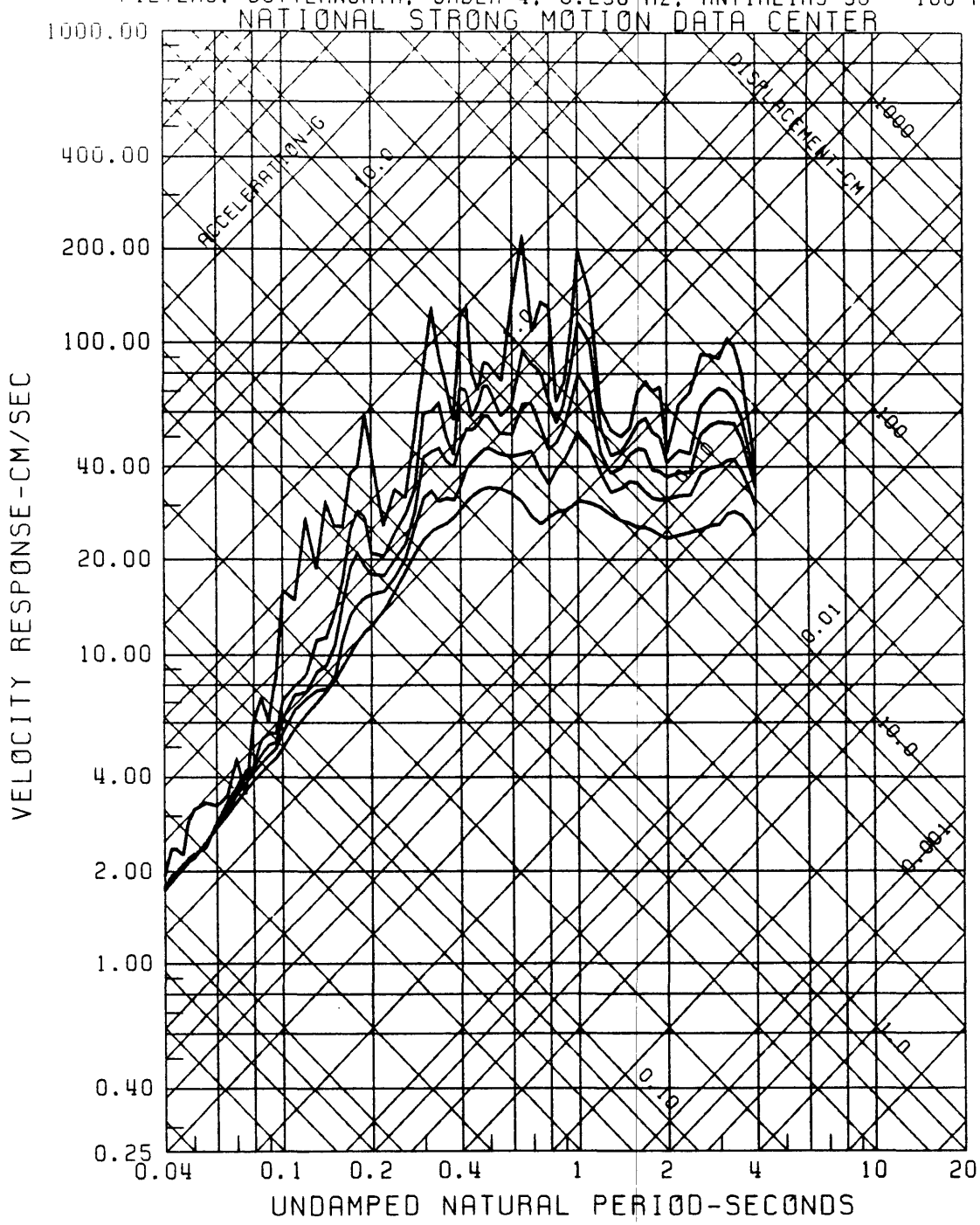



RESPONSE SPECTRA
HOLLISTER CITY HALL ANNEX - BASEMENT, 10/18/89, 0004GMT 180
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.250 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER
ACCELERATION-G
DISPLACEMENT-CM
VELOCITY RESPONSE-CM/SEC
UNDAMPED NATURAL PERIOD-SECONDS
400.00
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

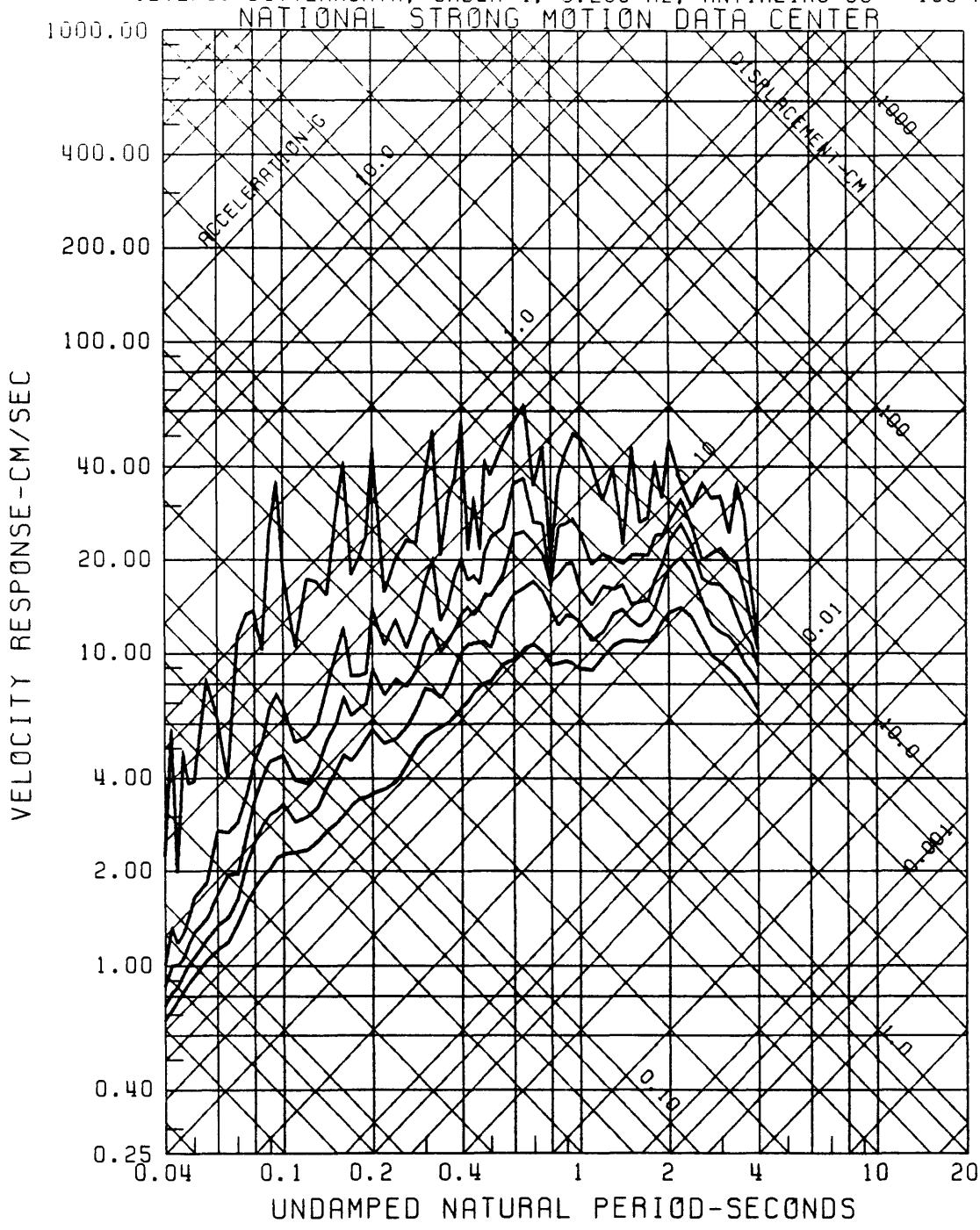

RESPONSE SPECTRA
HOLLISTER CITY HALL ANNEX - BASEMENT, 10/18/89, 0004GMT UP
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.250 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER
ACCELERATION-G
DISPLACEMENT-CM
VELOCITY RESPONSE-CM/SEC
UNDAMPED NATURAL PERIOD-SECONDS
1000.00
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
1000
100
10.0
1.0
0.01
0.001
0.10


RESPONSE SPECTRA
HOLLISTER CITY HALL ANNEX - BASEMENT, 10/18/89, 0004GMT 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
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

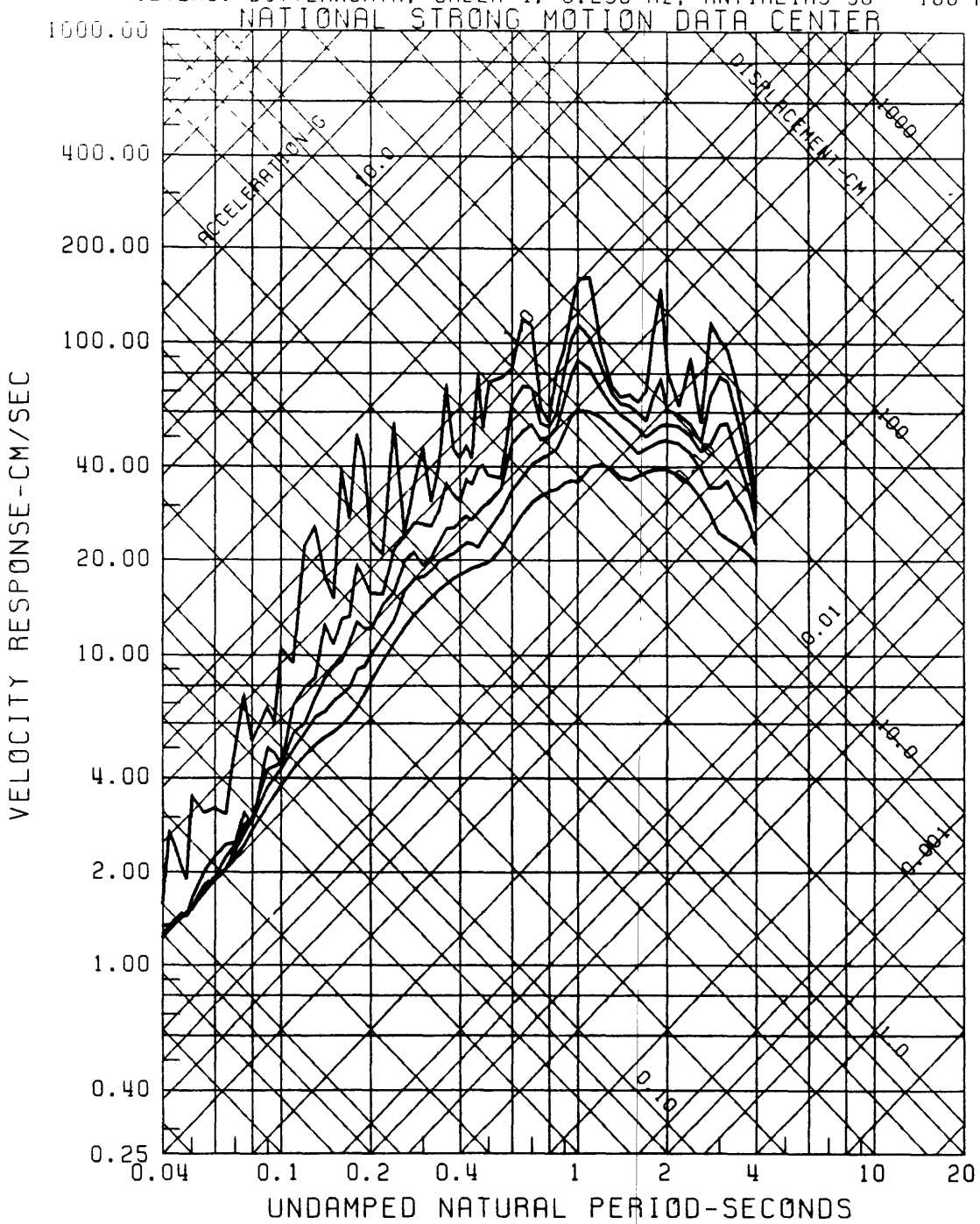
RESPONSE SPECTRA
STANFORD UNIVERSITY - SLAC TEST LAB, 10/18/89, 0004GMT 360
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.250 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER

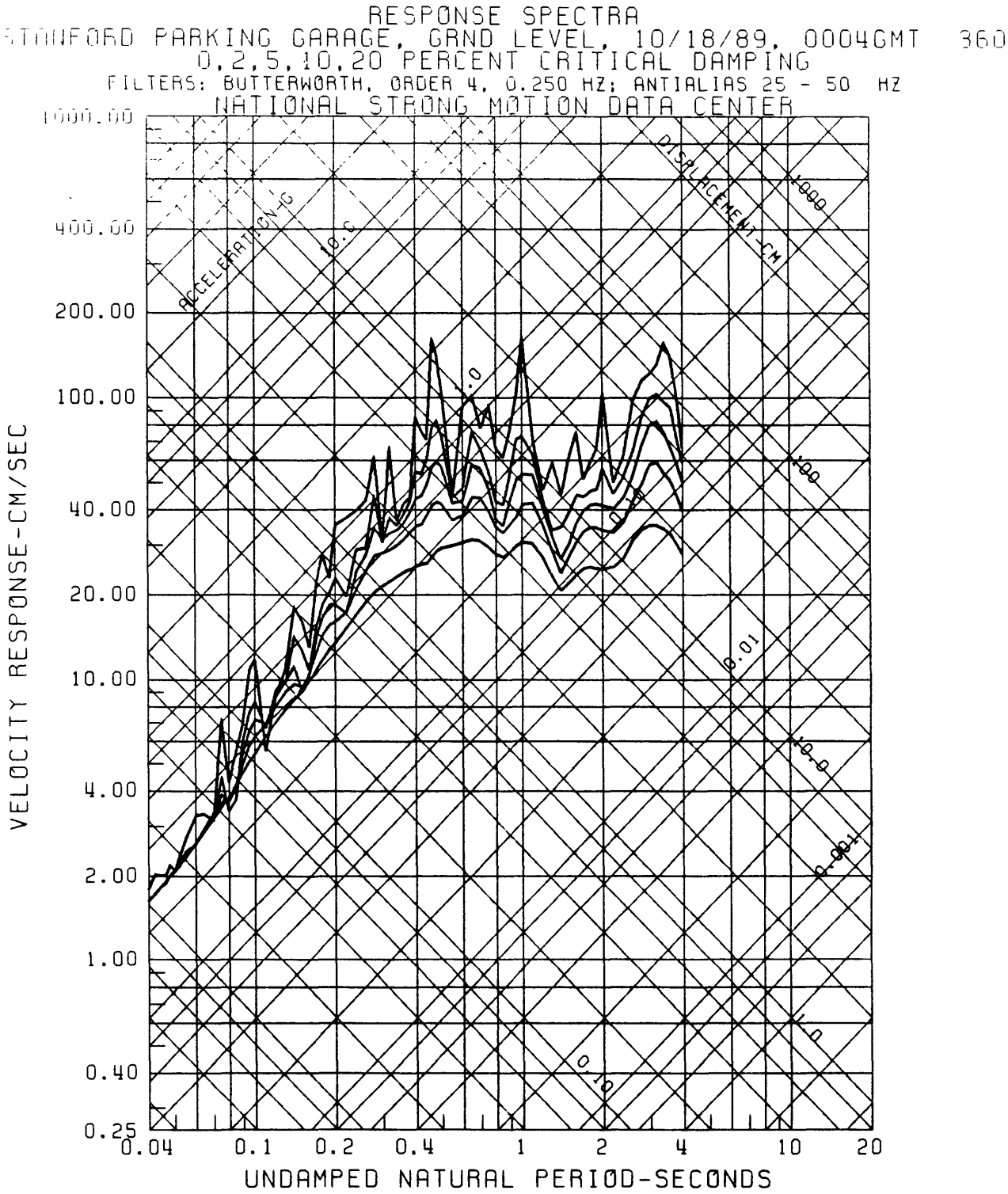


RESPONSE SPECTRA
STANFORD UNIVERSITY - SLAC TEST LAB, 10/18/89, 0004GMT UP
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.250 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER

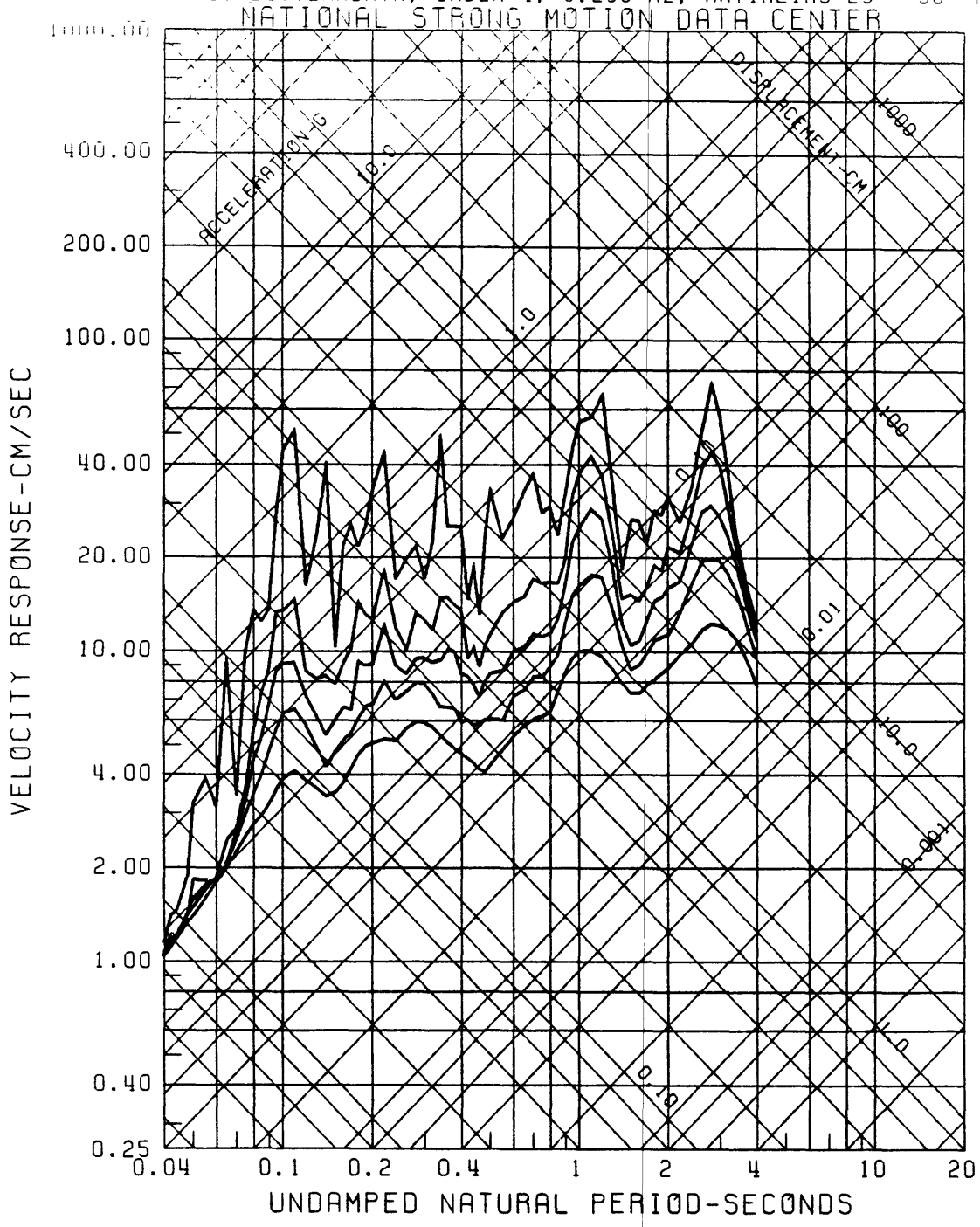


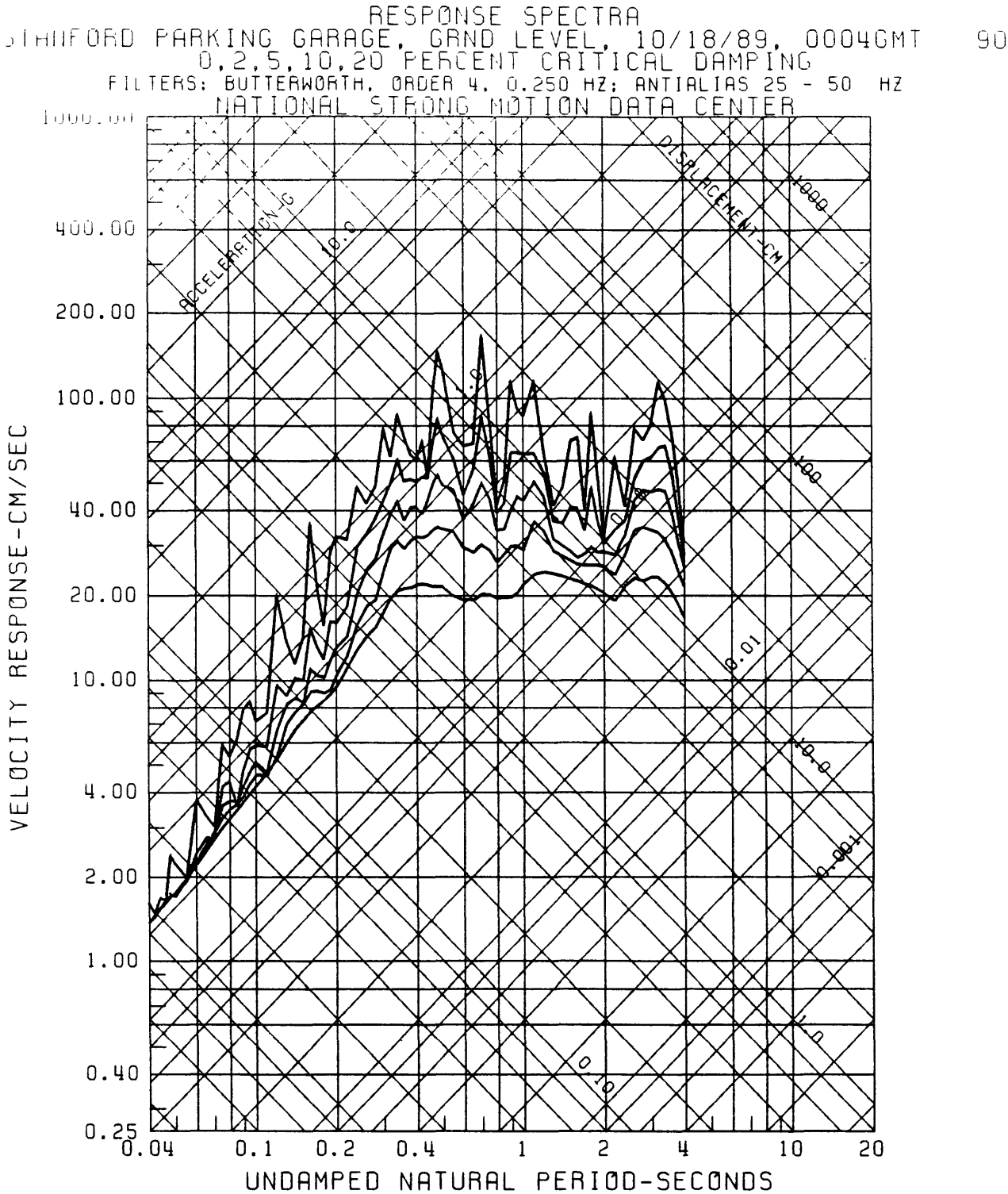
RESPONSE SPECTRA
STANFORD UNIVERSITY - SLAC TEST LAB, 10/18/89, 0004GMT 270
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.250 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER



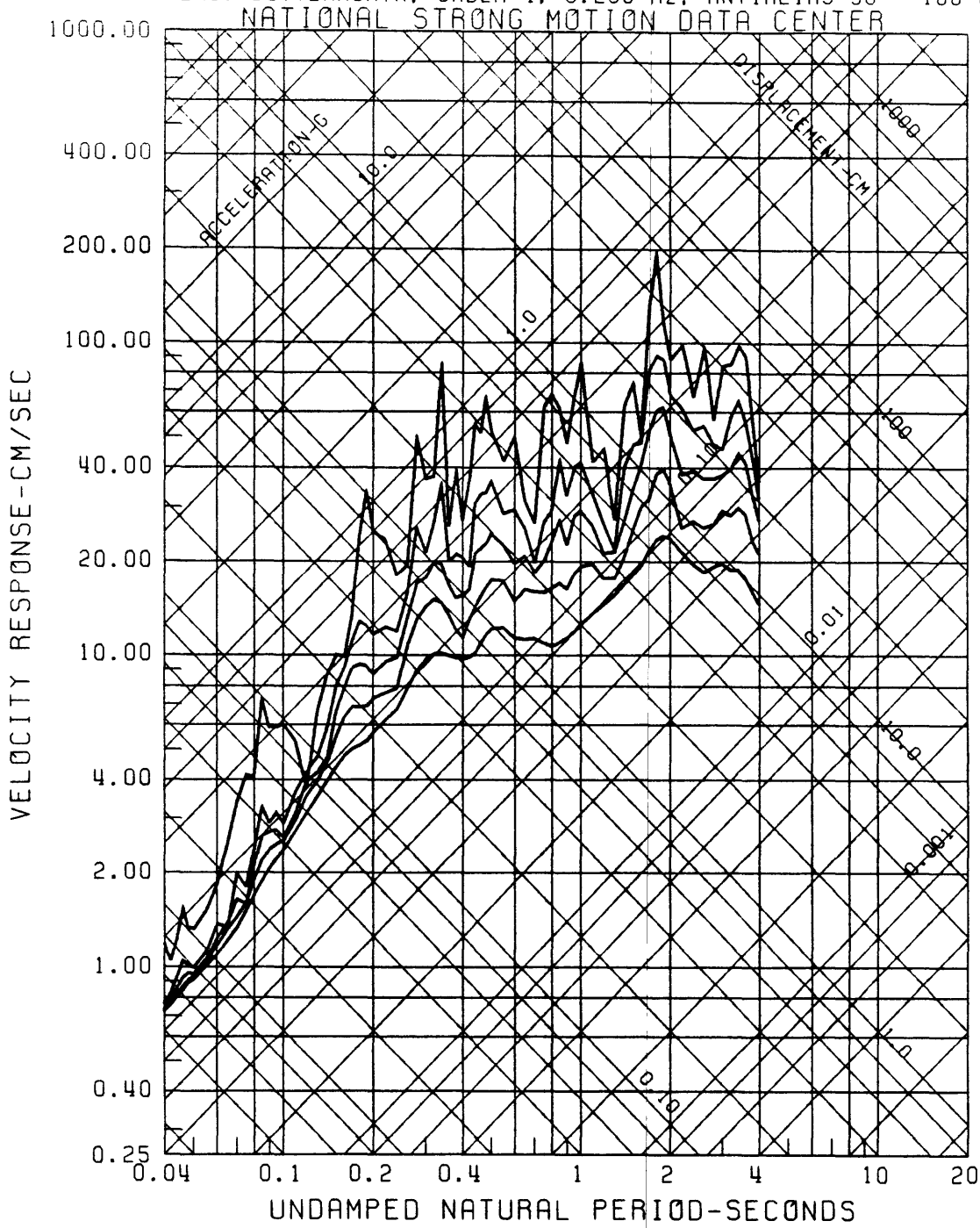

RESPONSE SPECTRA
STANFORD PARKING GARAGE, GRND LEVEL, 10/18/89, 0004GMT 360
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.250 HZ; ANTIALIAS 25 - 50 HZ
NATIONAL STRONG MOTION DATA CENTER
ACCELERATION-G
DISPLACEMENT-CM
VELOCITY RESPONSE-CM/SEC
UNDAMPED NATURAL PERIOD-SECONDS
1000.00
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
STANFORD PARKING GARAGE, GRND LEVEL, 10/18/89, 0004GMT UP
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.250 HZ; ANTIALIAS 25 - 50 HZ
NATIONAL STRONG MOTION DATA CENTER

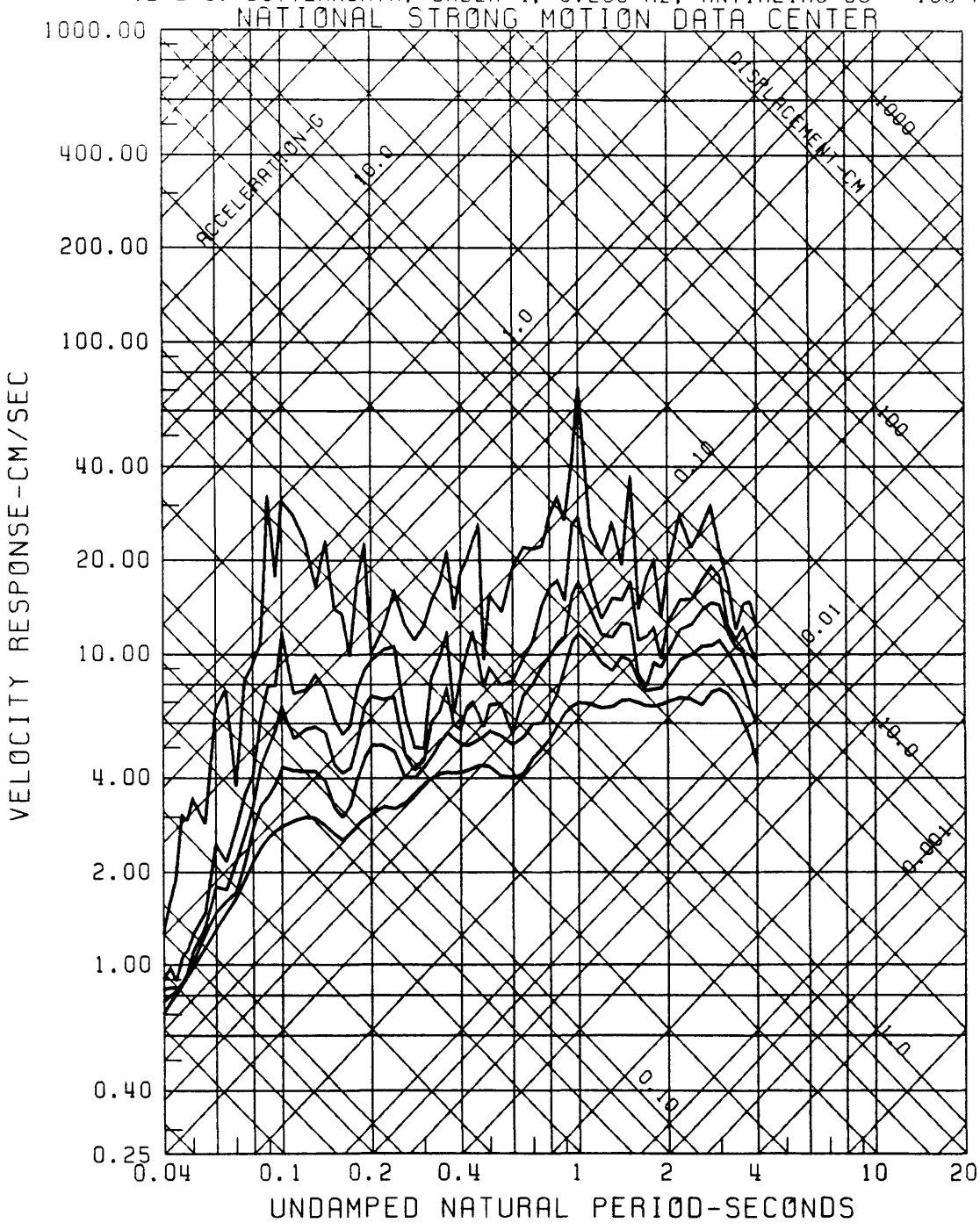



RESPONSE SPECTRA
STANFORD PARKING GARAGE, GRND LEVEL, 10/18/89, 0004GMT 90
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.250 HZ; ANTIALIAS 25 - 50 HZ
NATIONAL STRONG MOTION DATA CENTER
ACCELERATION-G
DISPLACEMENT-CM
VELOCITY RESPONSE-CM/SEC
UNDAMPED NATURAL PERIOD-SECONDS
400.00
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

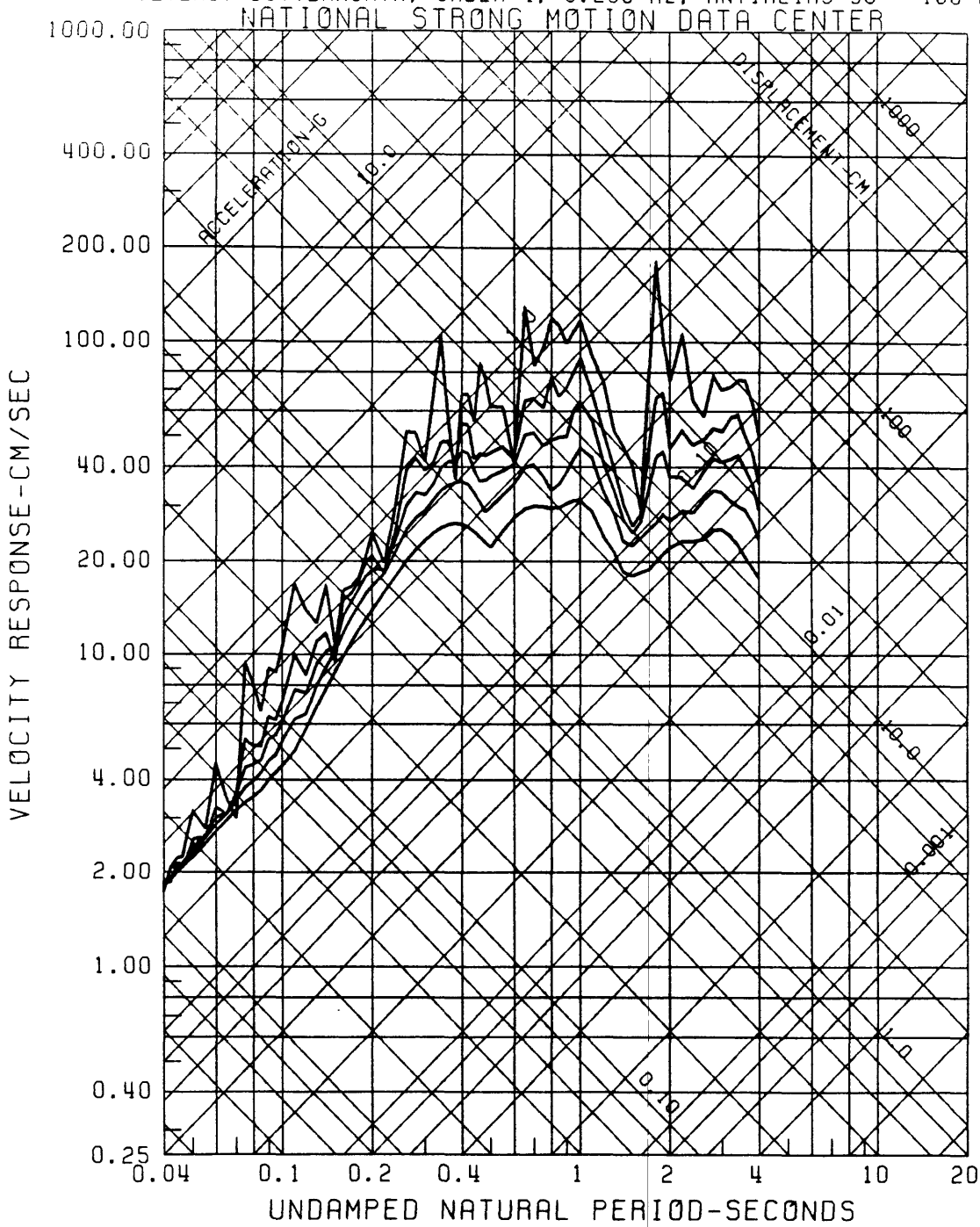
RESPONSE SPECTRA
MENLO PARK VA HOSPITAL - BLDG 137, 10/18/89, 0004GMT 110
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.250 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER

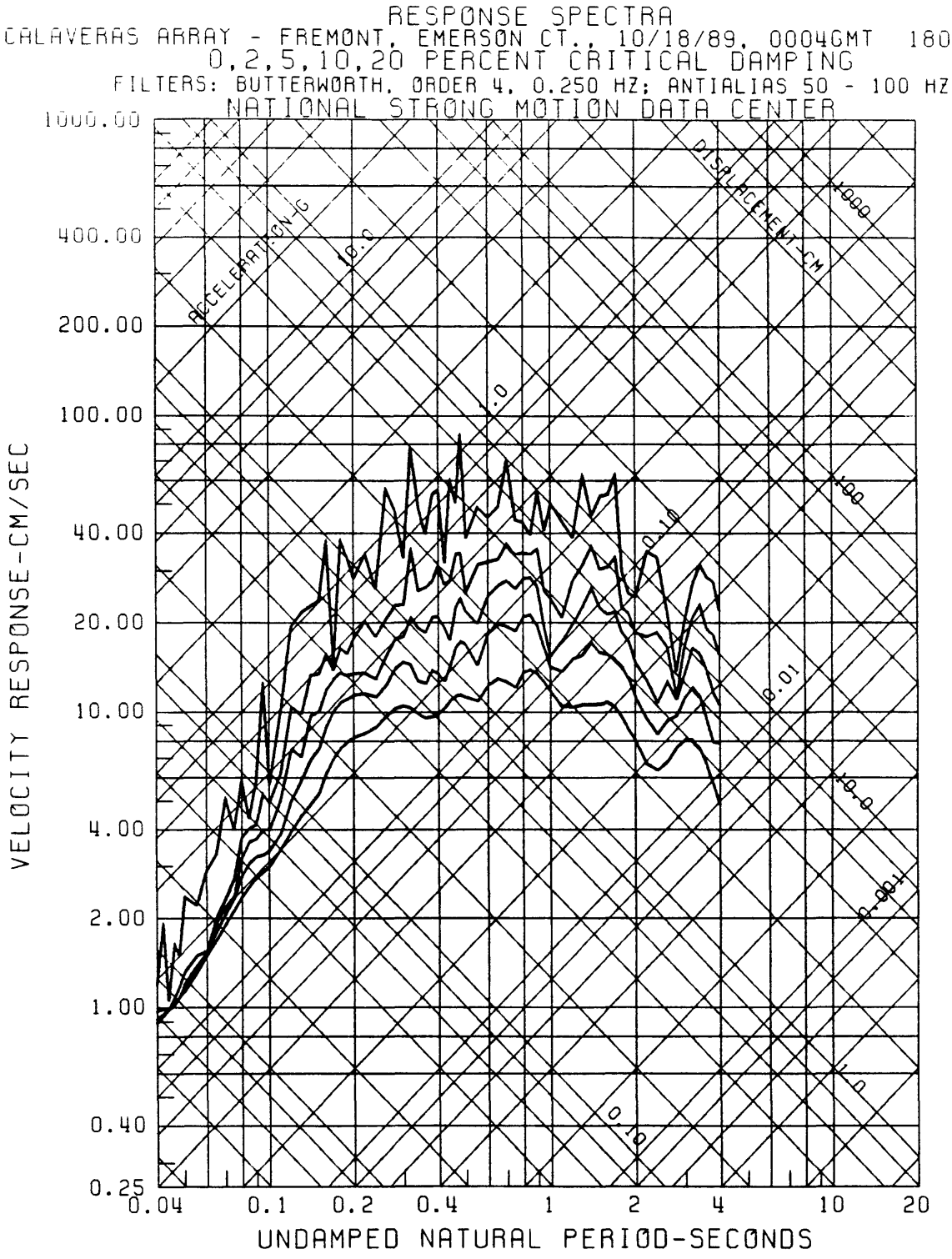


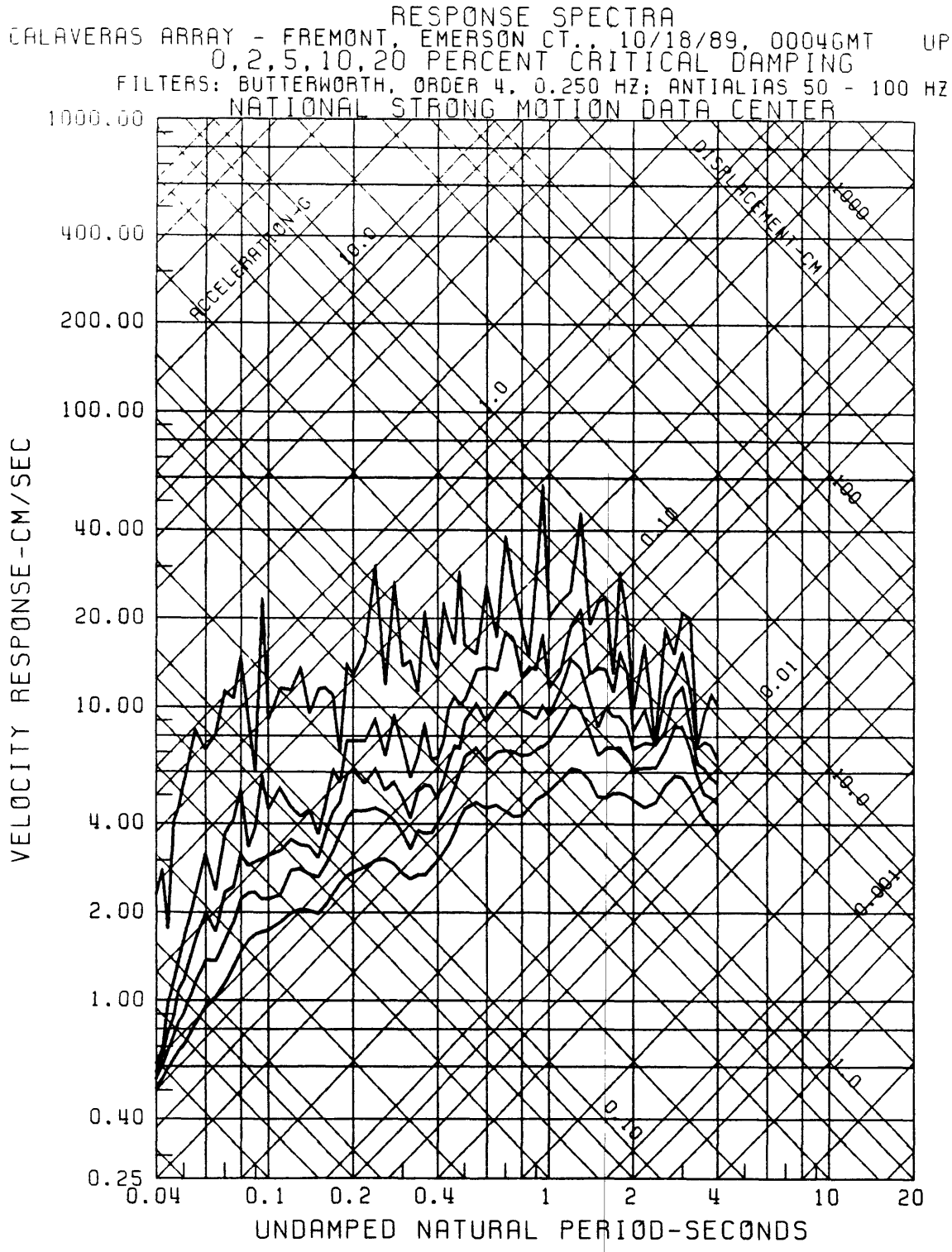
RESPONSE SPECTRA
MENLO PARK VA HOSPITAL - BLDG 137, 10/18/89, 0004GMT UP
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.250 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER

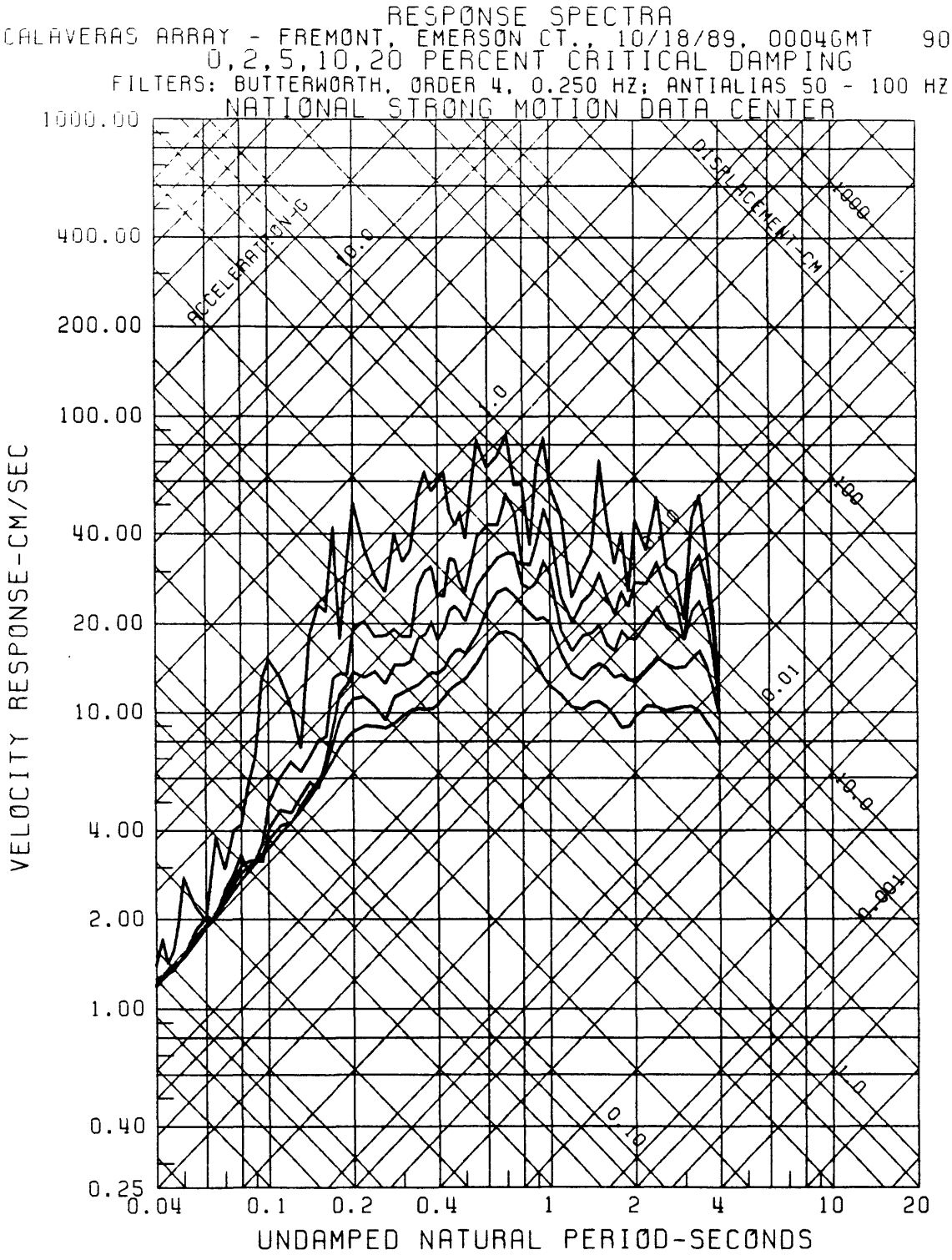


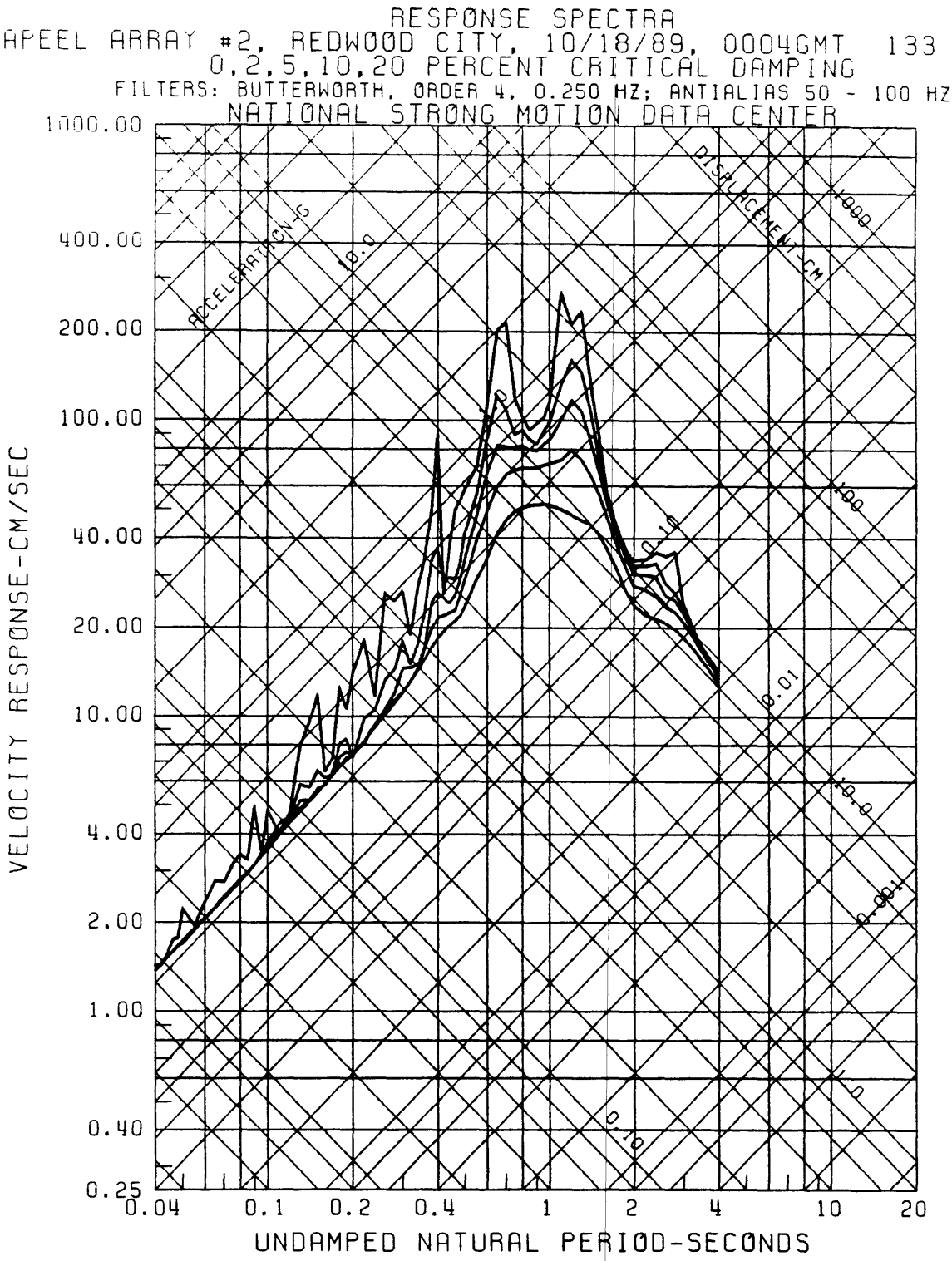
RESPONSE SPECTRA
MENLO PARK VA HOSPITAL - BLDG 137, 10/18/89, 0004GMT 20
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.250 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER

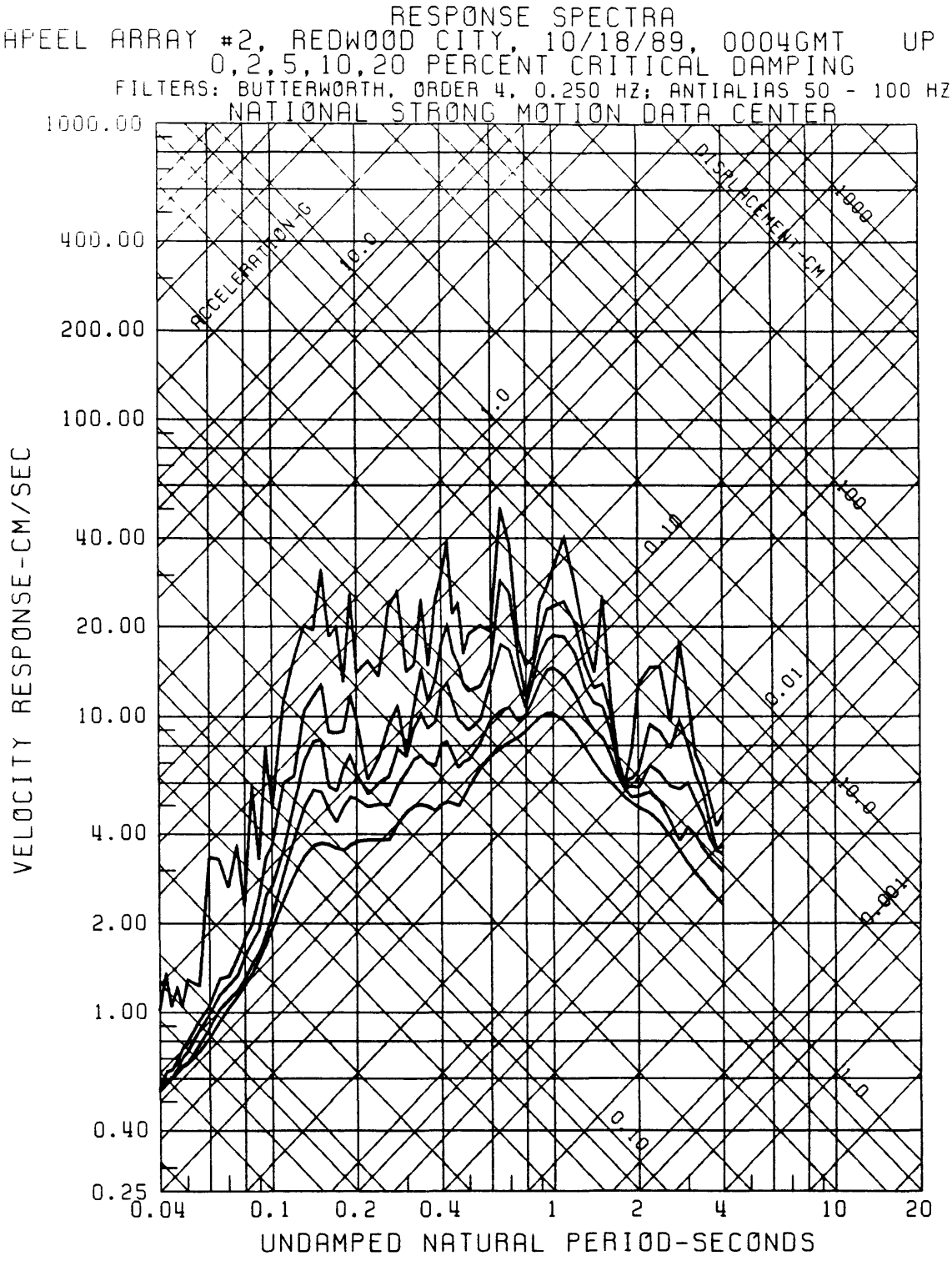


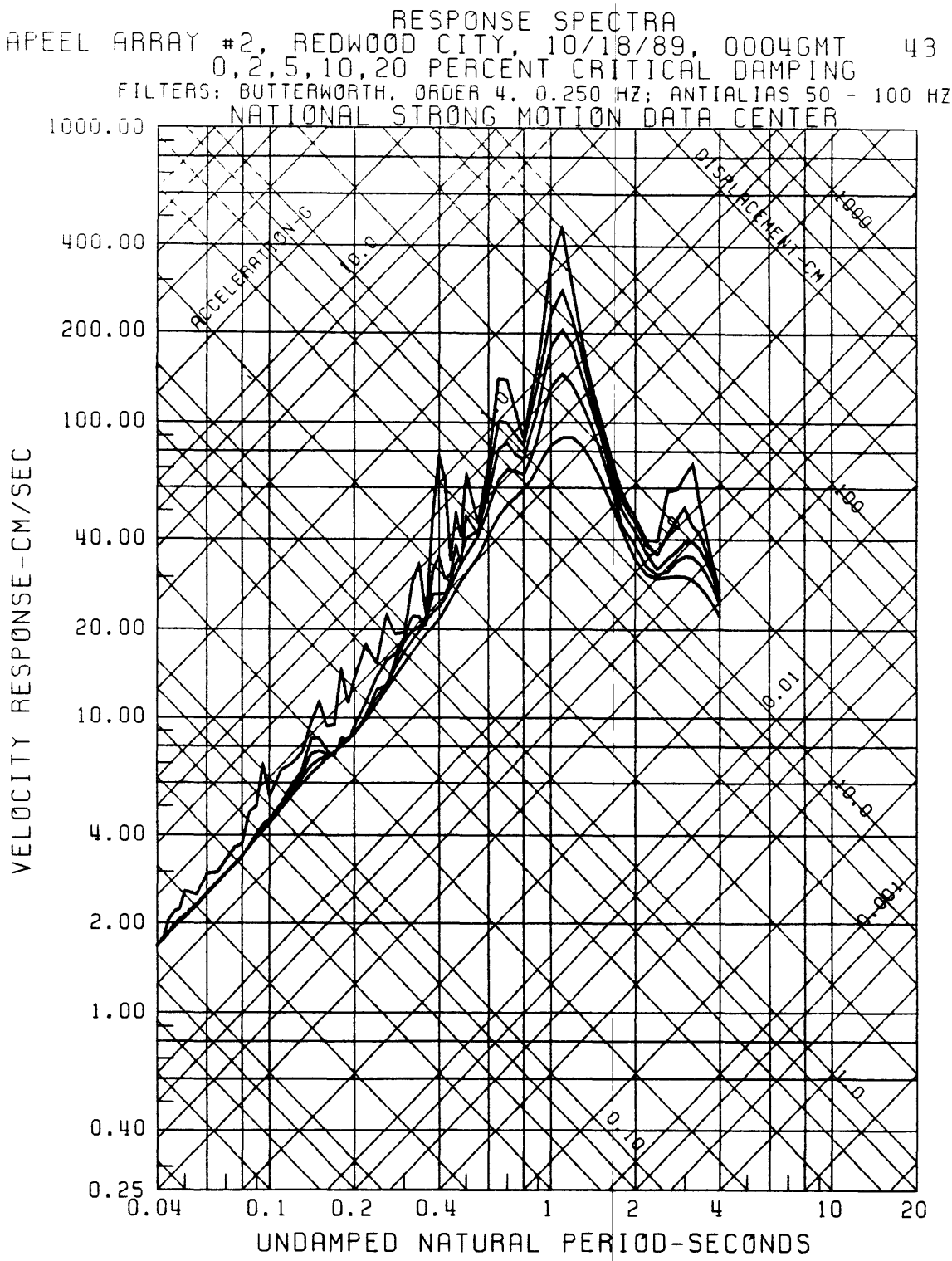

RESPONSE SPECTRA
CALAVERAS ARRAY - FREMONT, EMERSON CT., 10/18/89, 0004GMT 180
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.250 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER
ACCELERATION-G
DISPLACEMENT-CM
10.0
1.0
0.10
0.01
0.10
1000
100
10.0
0.001
1.0
1000.00
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


RESPONSE SPECTRA
CALAVERAS ARRAY - FREMONT, EMERSON CT., 10/18/89, 0004GMT 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
ACCELERATION-G
DISPLACEMENT-CM
10.0
1.0
0.10
0.01
1000
100
10.0
1.0
0.001
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

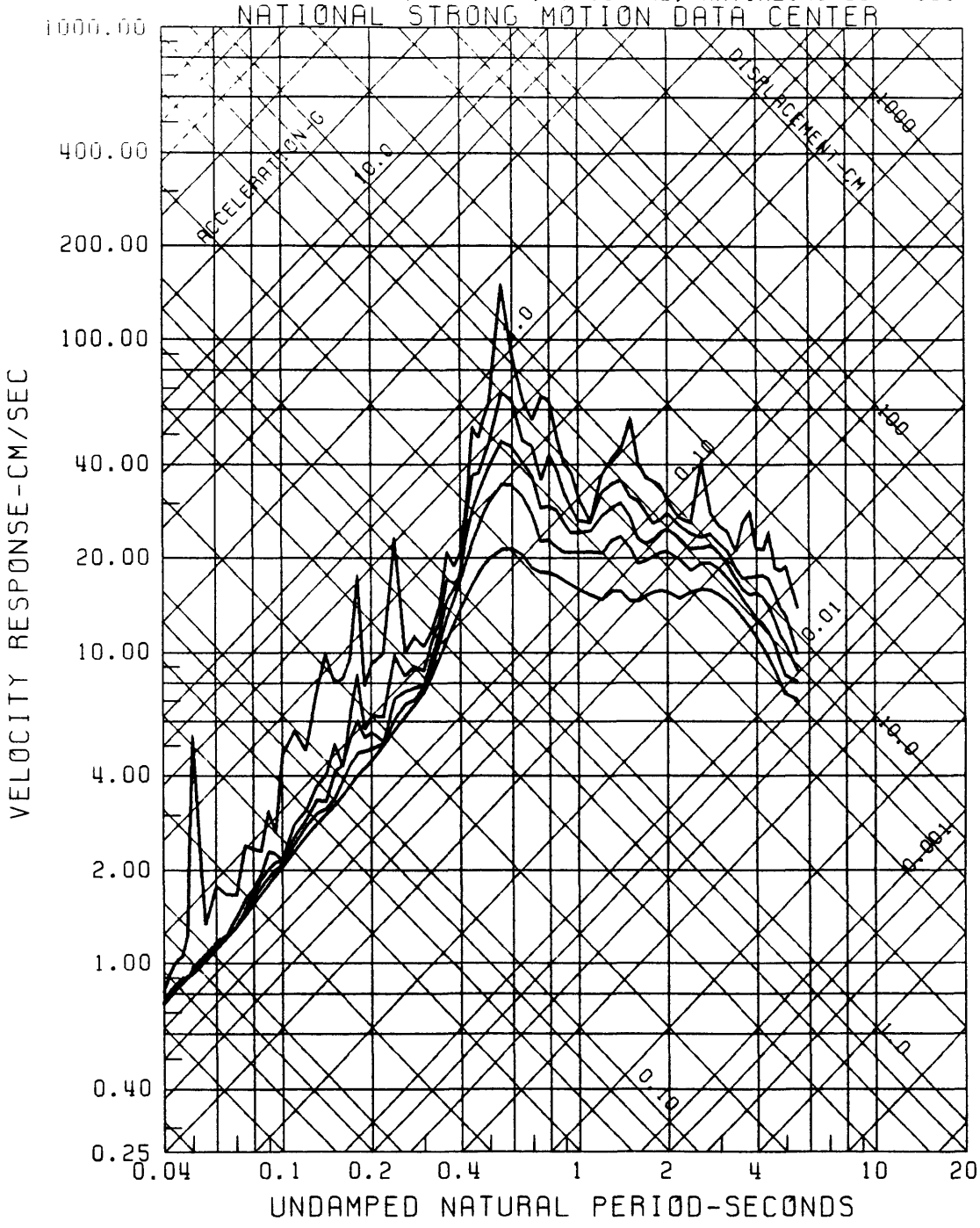

RESPONSE SPECTRA
CALAVERAS ARRAY - FREMONT, EMERSON CT., 10/18/89, 0004GMT 90
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.250 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER
VELOCITY RESPONSE-CM/SEC
UNDAMPED NATURAL PERIOD-SECONDS
ACCELERATION-G
DISPLACEMENT-CM
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
APEEL ARRAY #2, REDWOOD CITY, 10/18/89, 0004GMT 133
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
UNDAMPED NATURAL PERIOD-SECONDS
ACCELERATION-G
DISPLACEMENT-CM
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

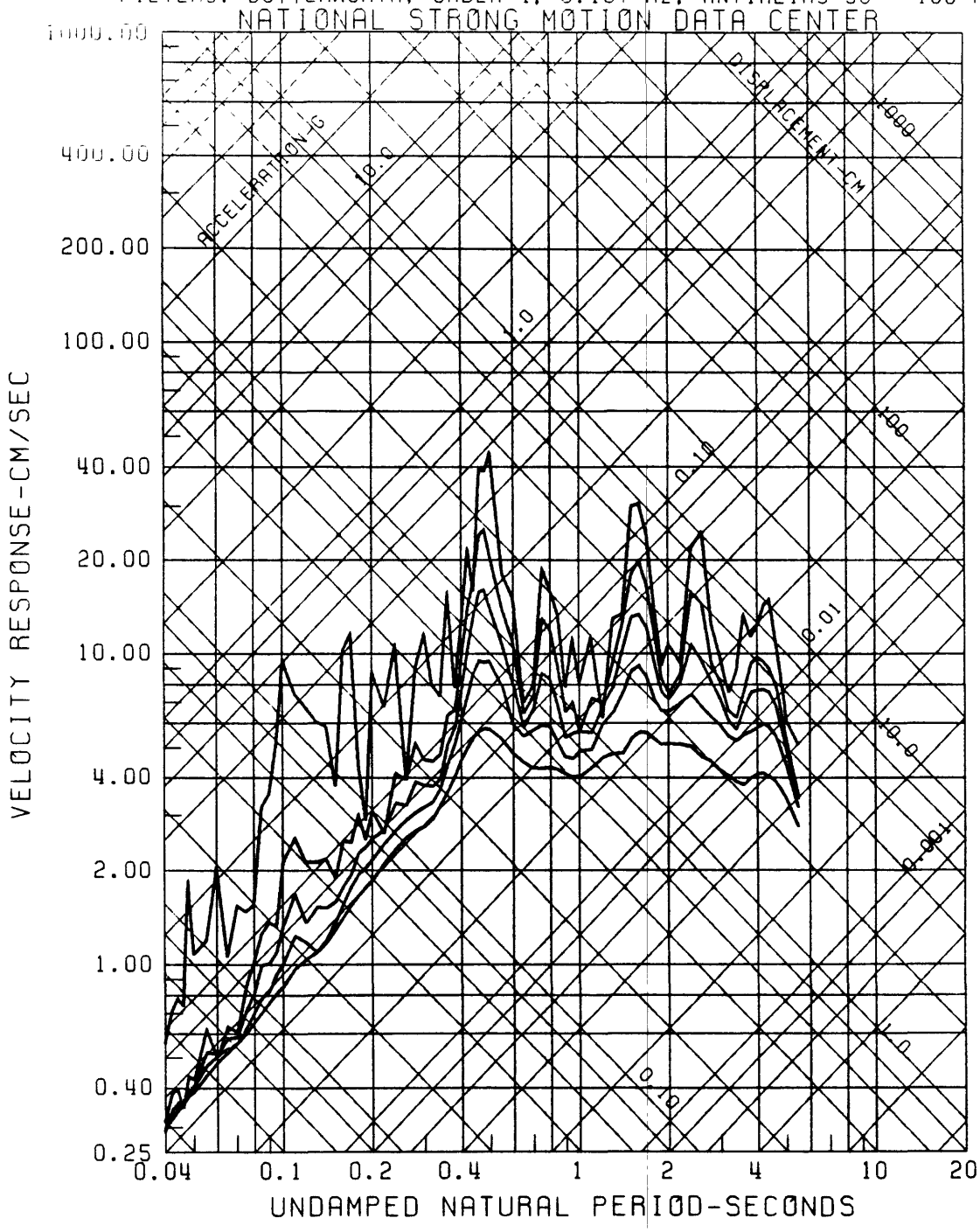

RESPONSE SPECTRA
APEEL ARRAY #2, REDWOOD CITY, 10/18/89, 0004GMT UP
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.250 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER
VELOCITY RESPONSE-CM/SEC
UNDAMPED NATURAL PERIOD-SECONDS
ACCELERATION-G
DISPLACEMENT-CM
1000.00
400.00
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
APEEL ARRAY #2, REDWOOD CITY, 10/18/89, 0004GMT 43
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
UNDAMPED NATURAL PERIOD-SECONDS
ACCELERATION-G
DISPLACEMENT-CM
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
10.0
1.0
0.10
0.01
1000
100
10.0
1.0
0.001

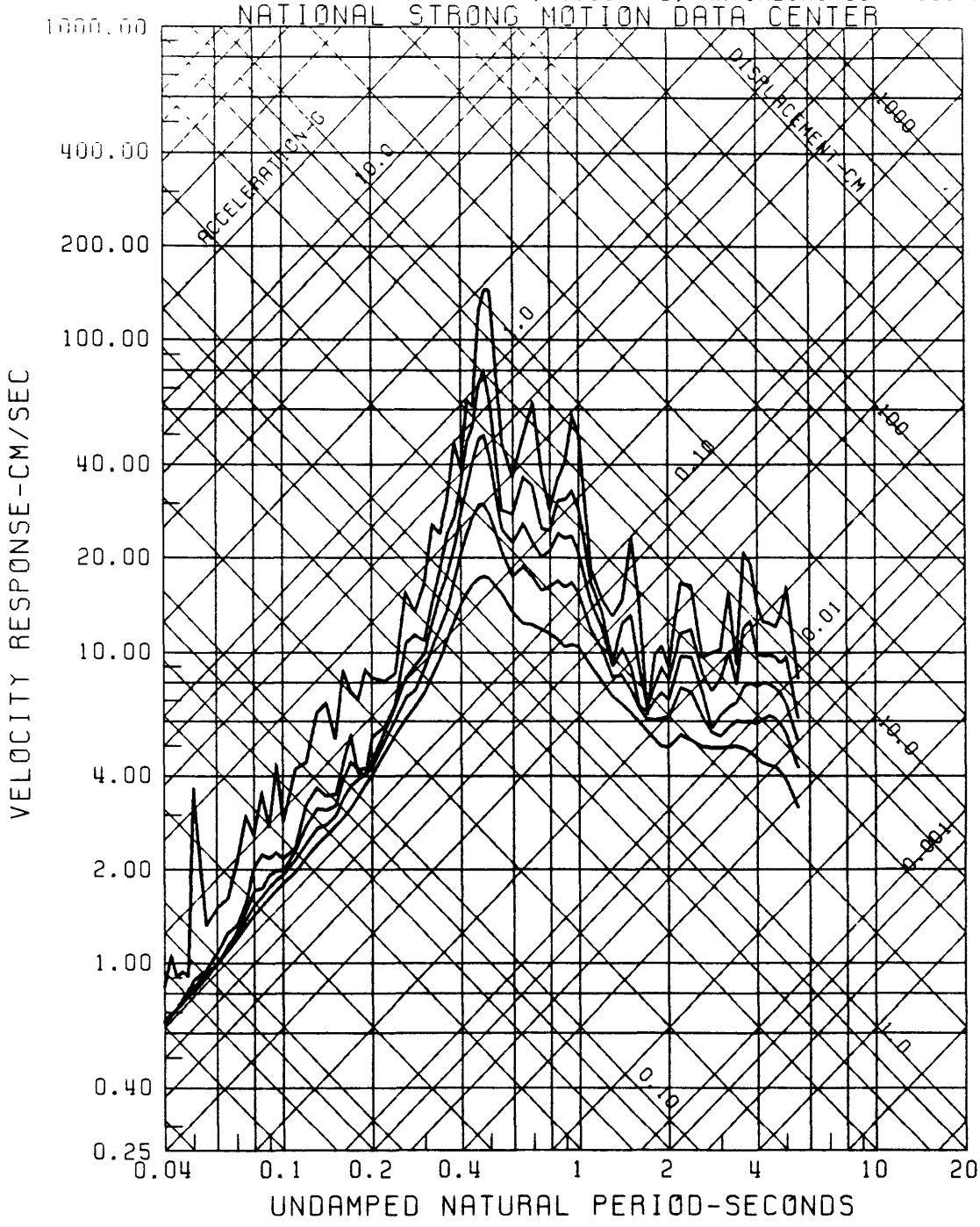
RESPONSE SPECTRA
SAN FRANCISCO, TRANSAMERICA BLDG - BASEMENT, 10/18/89, 0004GMT 261
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.167 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER



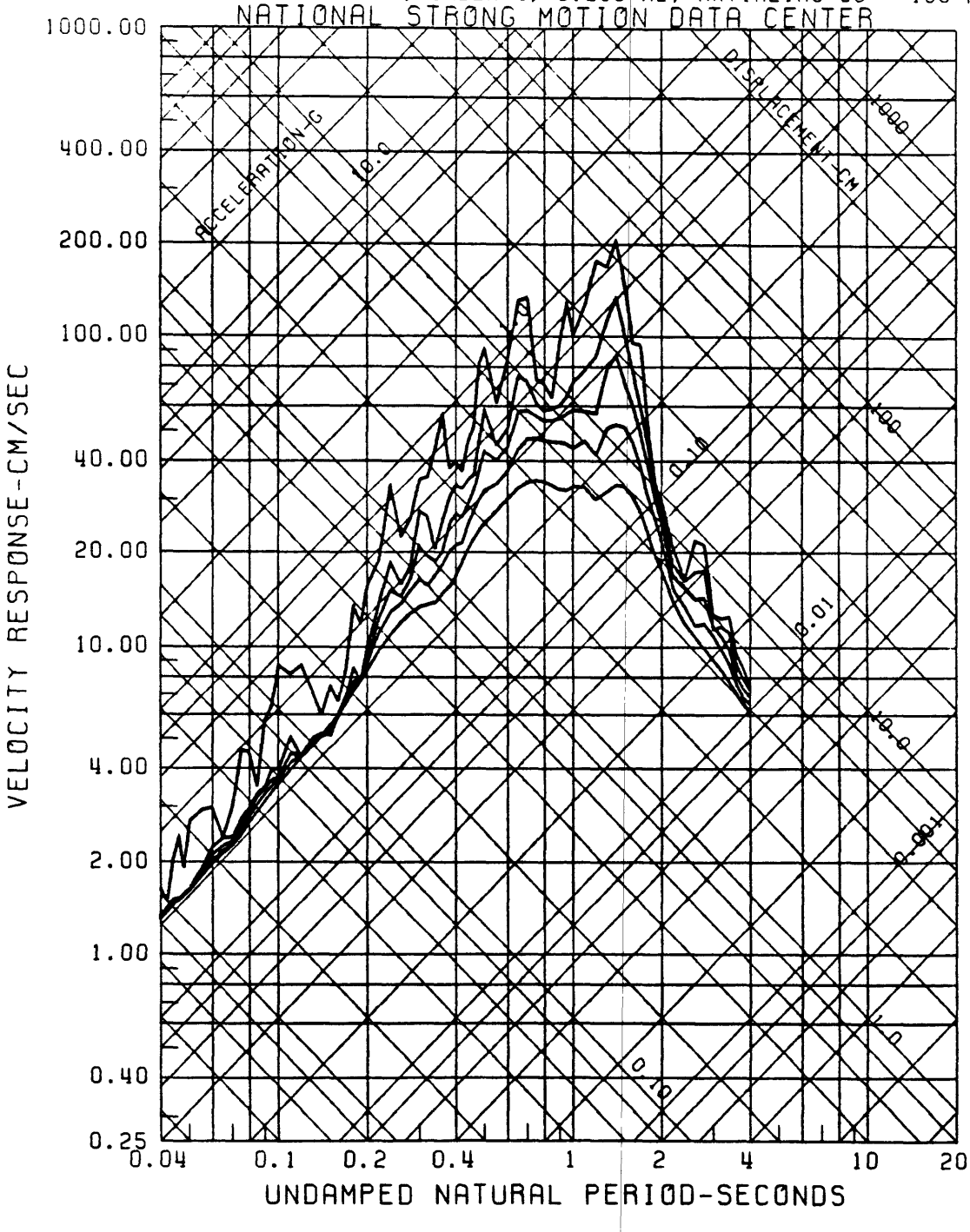
RESPONSE SPECTRA
SAN FRANCISCO, TRANSAMERICA BLDG - BASEMENT, 10/18/89, 0004GMT UP
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.167 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER



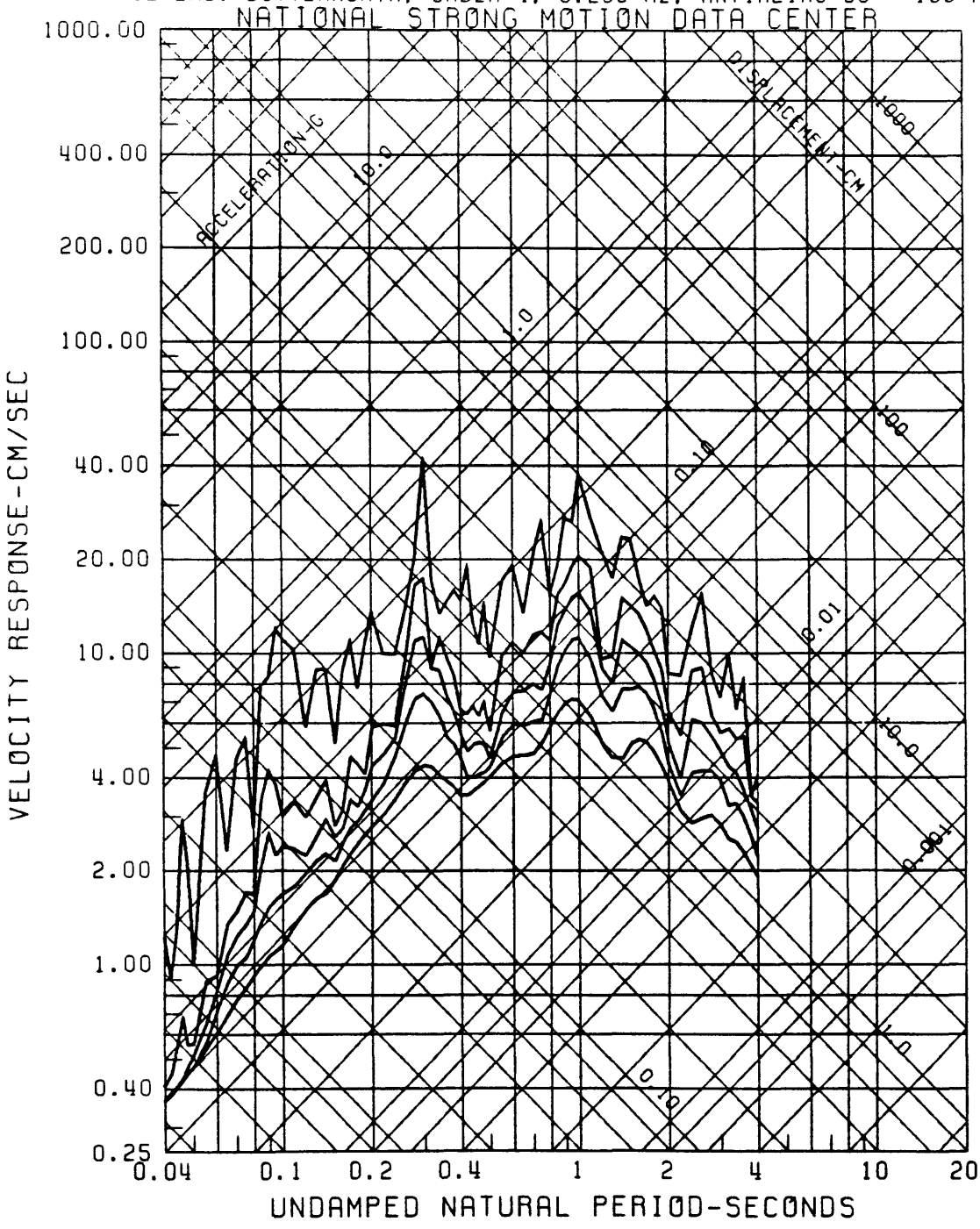
RESPONSE SPECTRA
SAN FRANCISCO, TRANSAMERICA BLDG - BASEMENT, 10/18/89, 0004GMT 171
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.167 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER



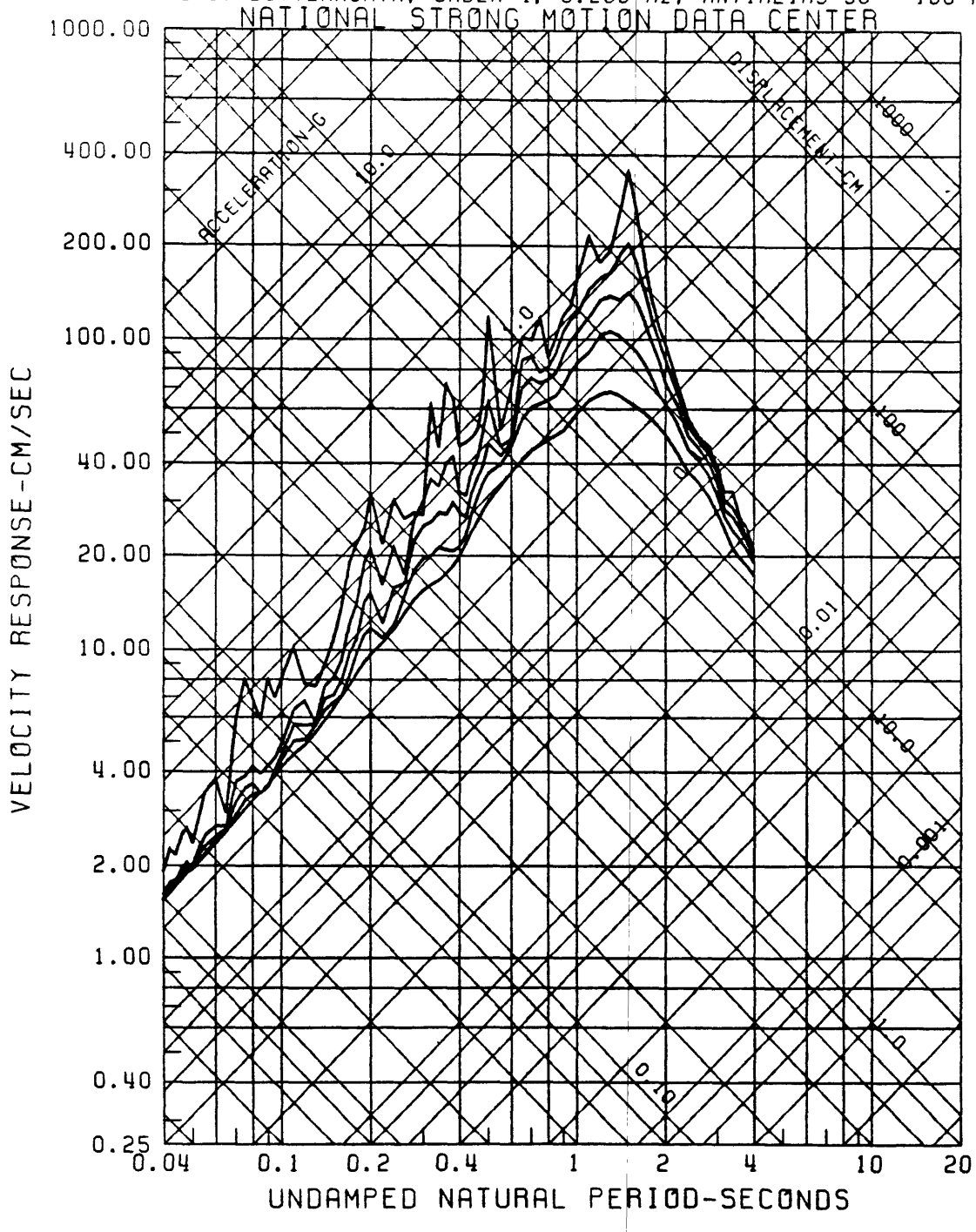
RESPONSE SPECTRA
EMERYVILLE - 6363 CHRISTIE AVE, S GROUND SITE, 10/18/89, 0004GMT 350
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.250 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER

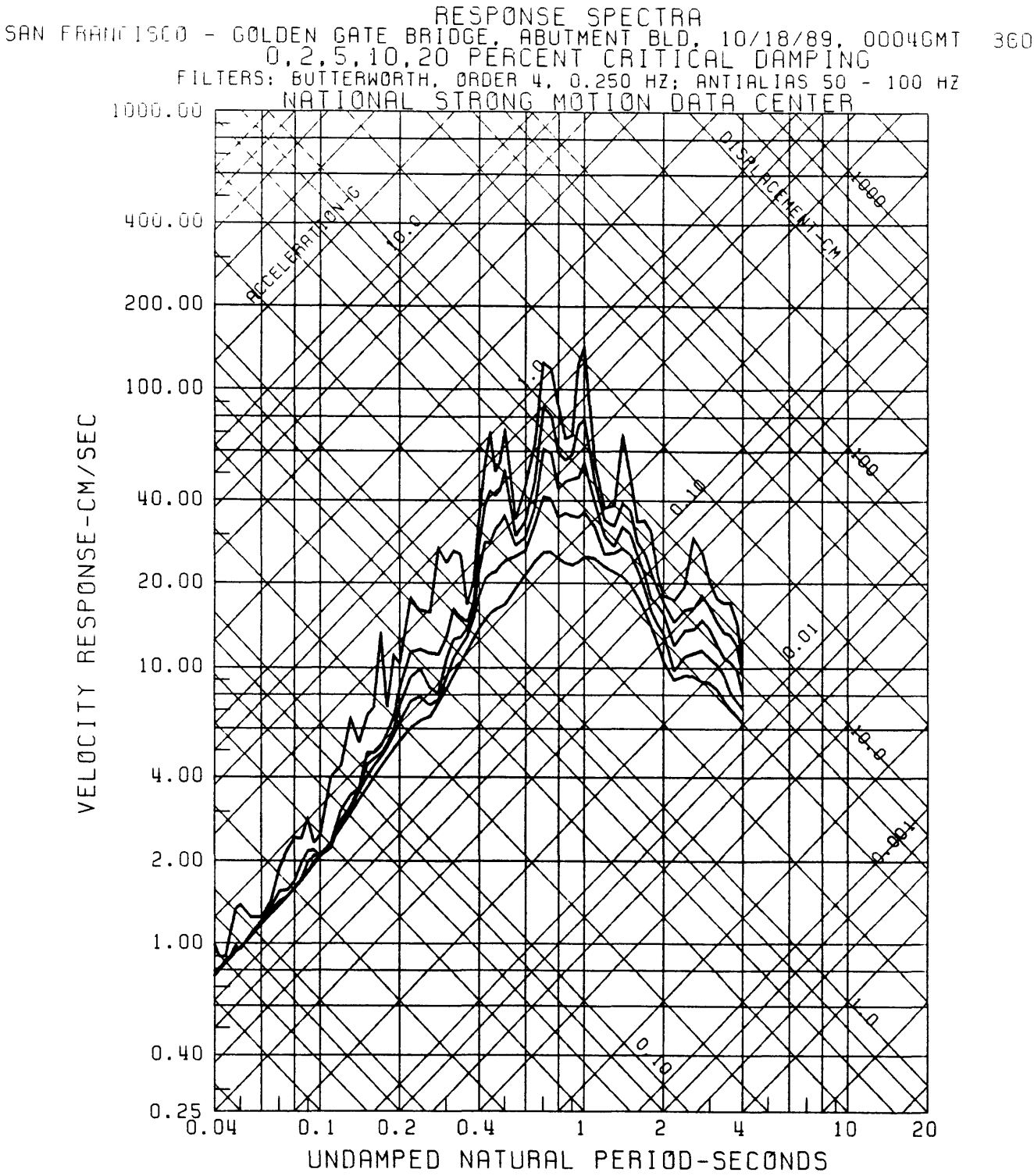


RESPONSE SPECTRA
EMERIVILLE - 6363 CHRISTIE AVE, S GROUND SITE, 10/18/89, 0004GMT UP
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.250 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER



RESPONSE SPECTRA
EMERYVILLE - 6363 CHRISTIE AVE, S GROUND SITE, 10/18/89, 0004GMT 260
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
SAN FRANCISCO - GOLDEN GATE BRIDGE, ABUTMENT BLD, 10/18/89, 0004GMT 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
UNDAMPED NATURAL PERIOD-SECONDS
ACCELERATION-G
DISPLACEMENT-CM
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
10.0
1.0
0.10
0.01
0.001
1000
100
10.0
1.0
0.10

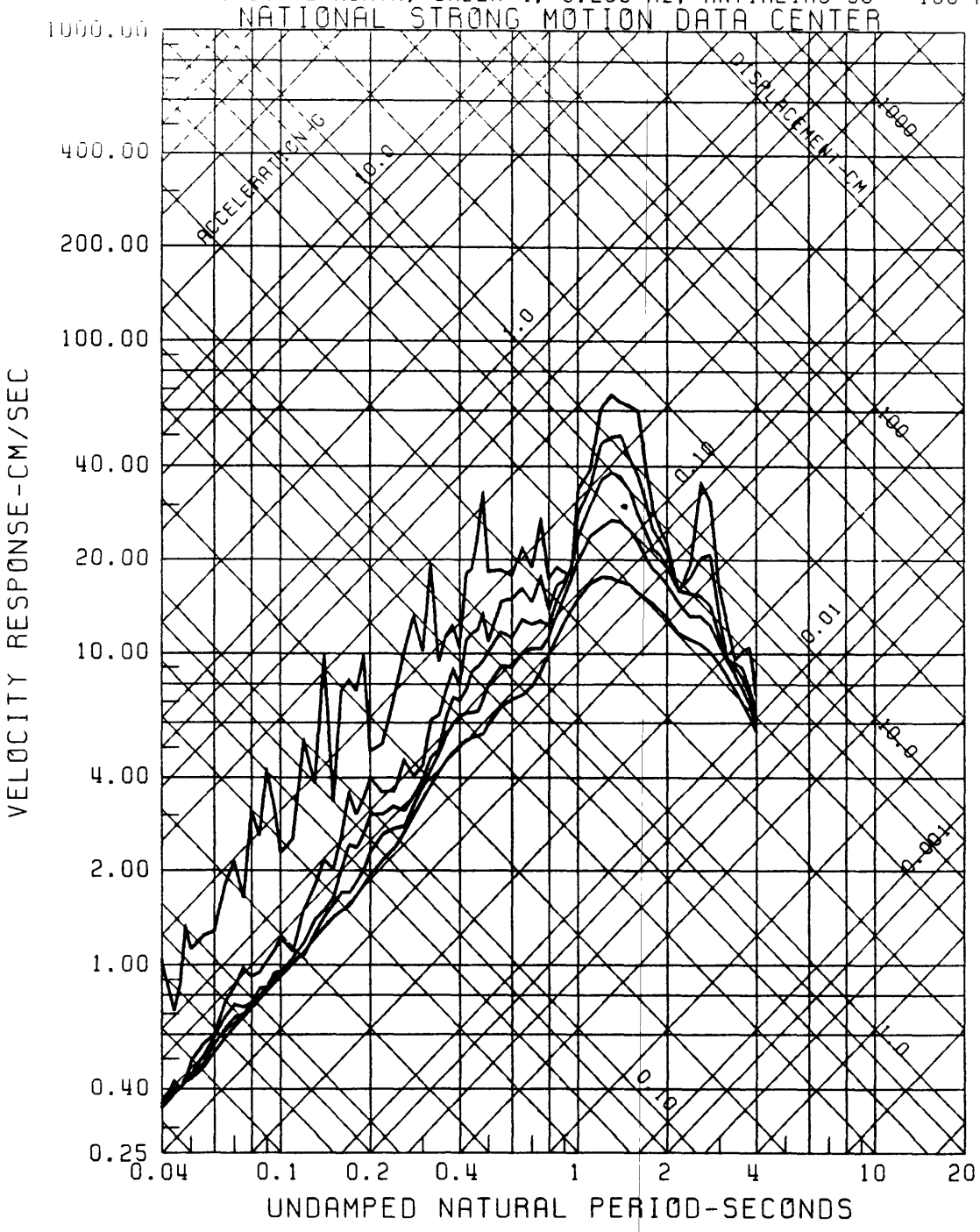
RESPONSE SPECTRA

SAN FRANCISCO - GOLDEN GATE BRIDGE, ABUTMENT BLD, 10/18/89, 0004GMT UP

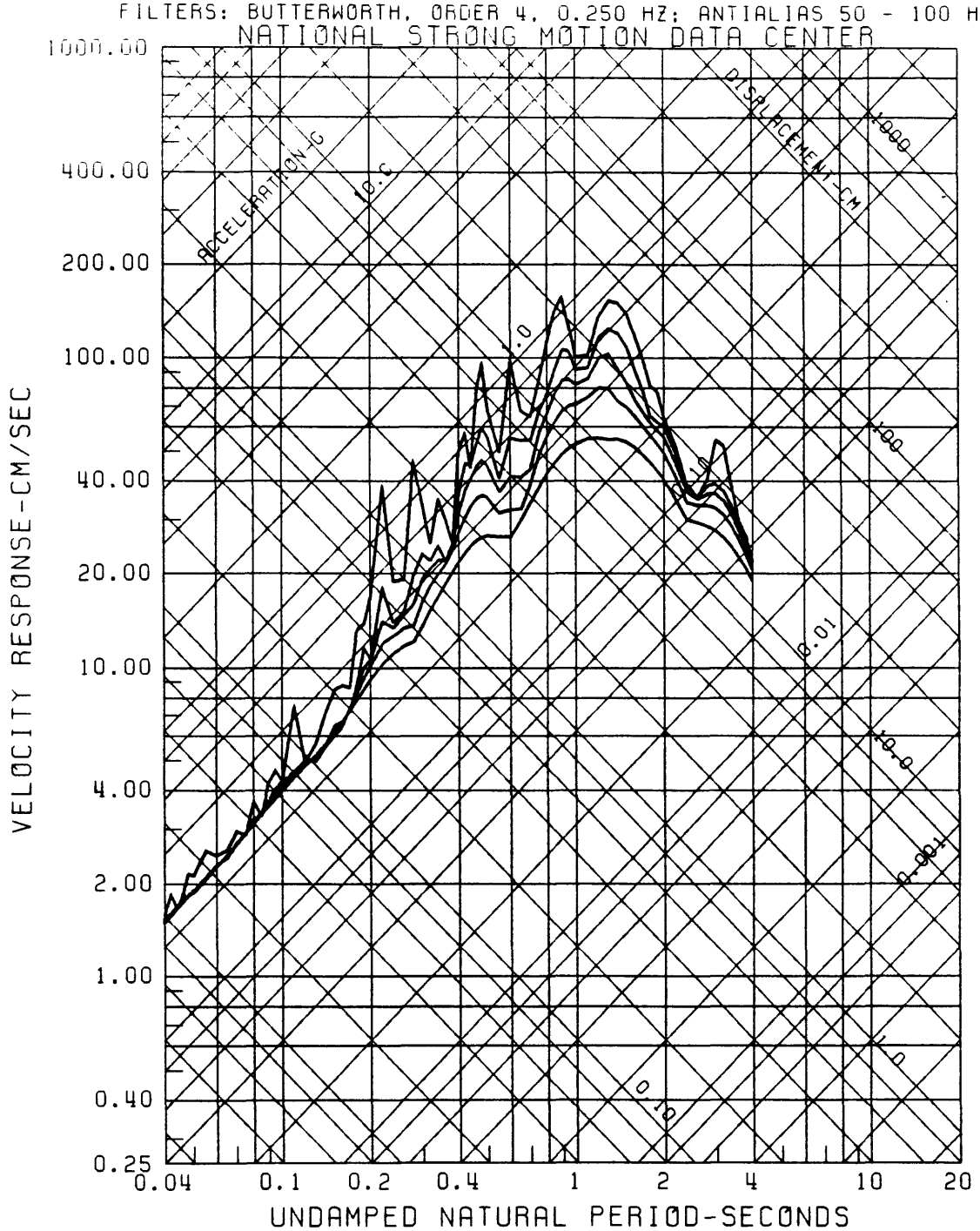
0,2,5,10,20 PERCENT CRITICAL DAMPING

FILTERS: BUTTERWORTH, ORDER 4, 0.250 HZ; ANTIALIAS 50 - 100 HZ

NATIONAL STRONG MOTION DATA CENTER



RESPONSE SPECTRA
SAN FRANCISCO - GOLDEN GATE BRIDGE, ABUTMENT BLD, 10/18/89, 0004GMT 270
0,2,5,10,20 PERCENT CRITICAL DAMPING
FILTERS: BUTTERWORTH, ORDER 4, 0.250 HZ; ANTIALIAS 50 - 100 HZ
NATIONAL STRONG MOTION DATA CENTER

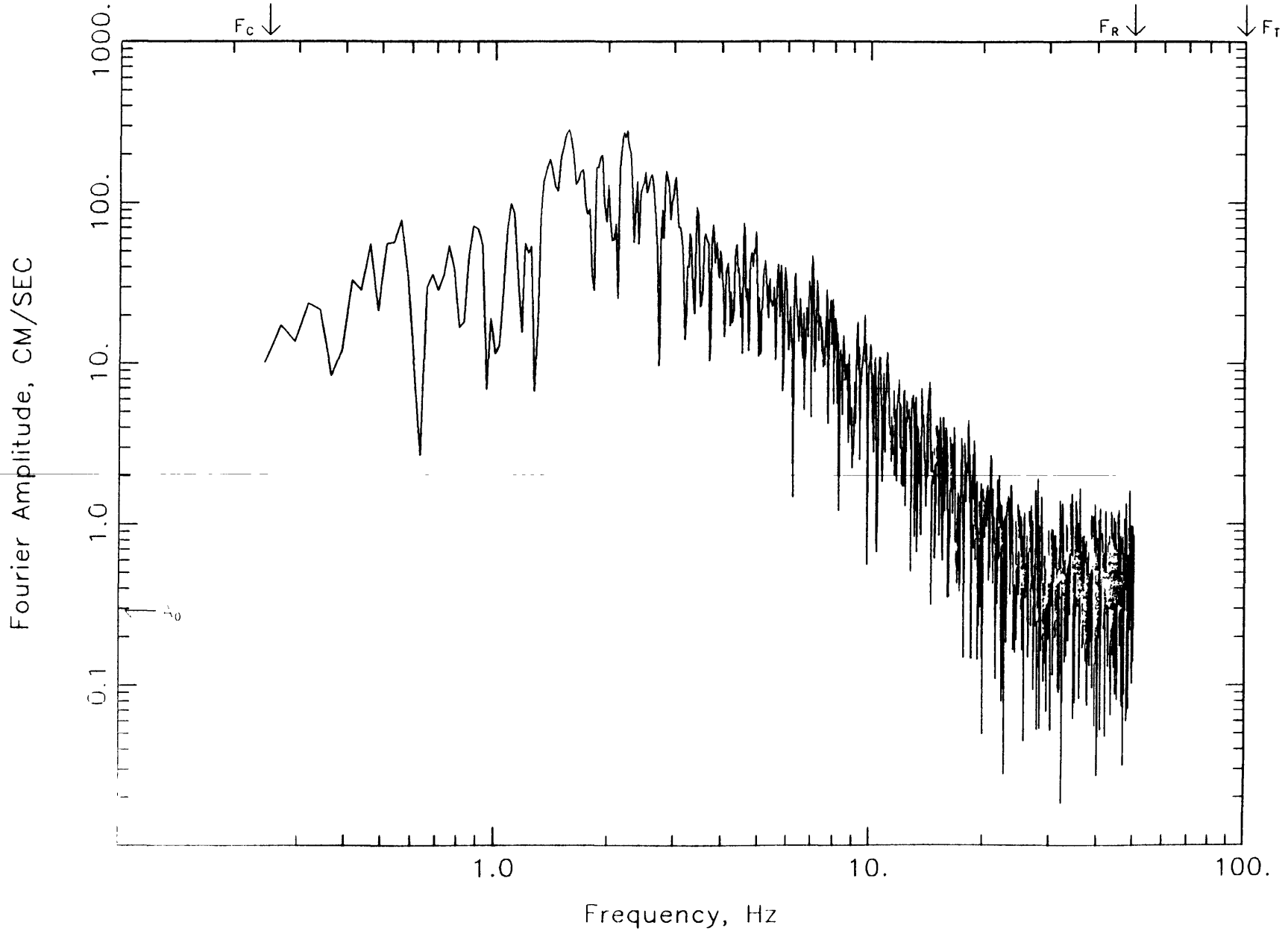


(p. 210 follows)

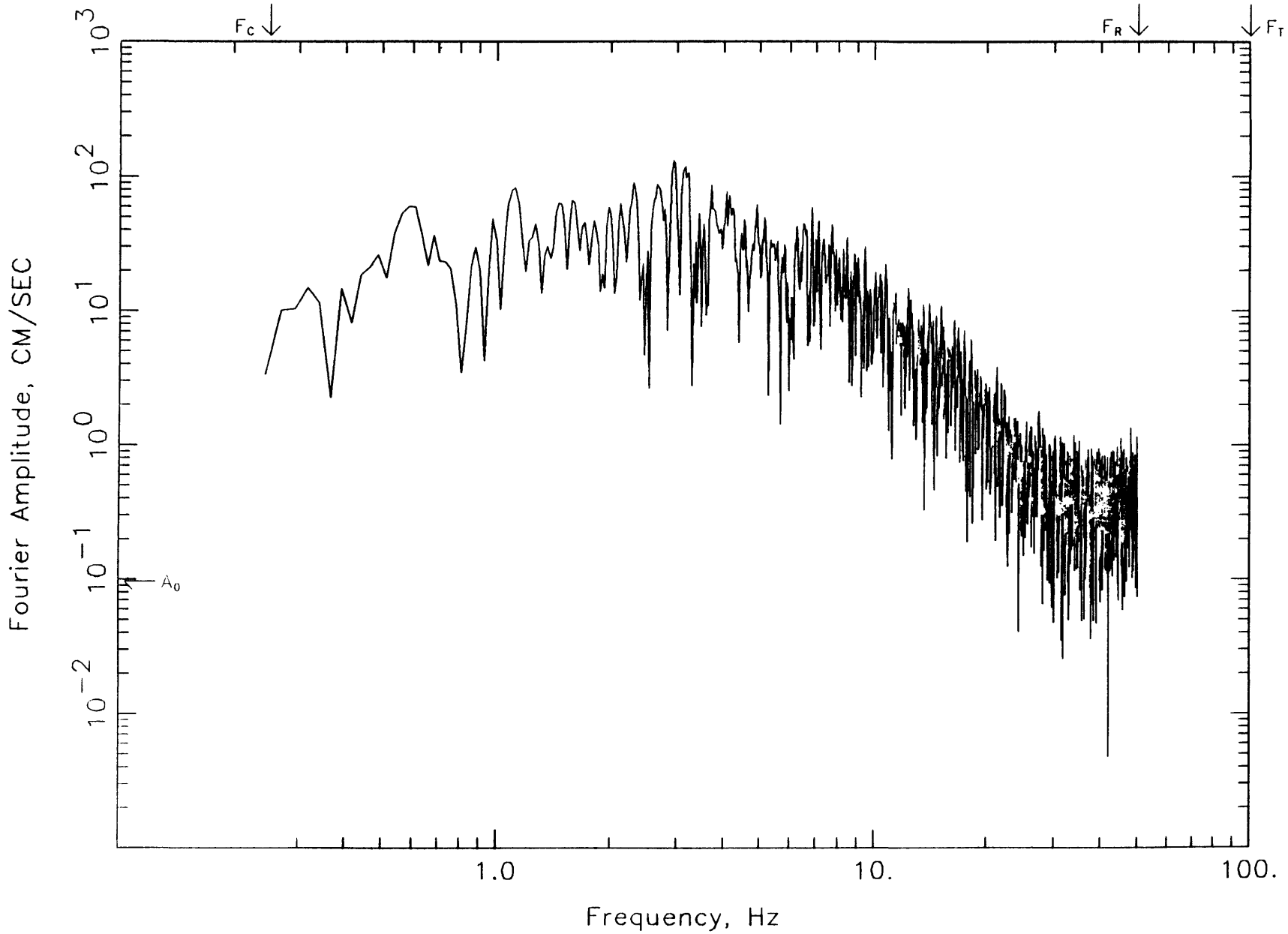
APPENDIX 4

FOURIER AMPLITUDE SPECTRUM; LOG-LOG PLOT

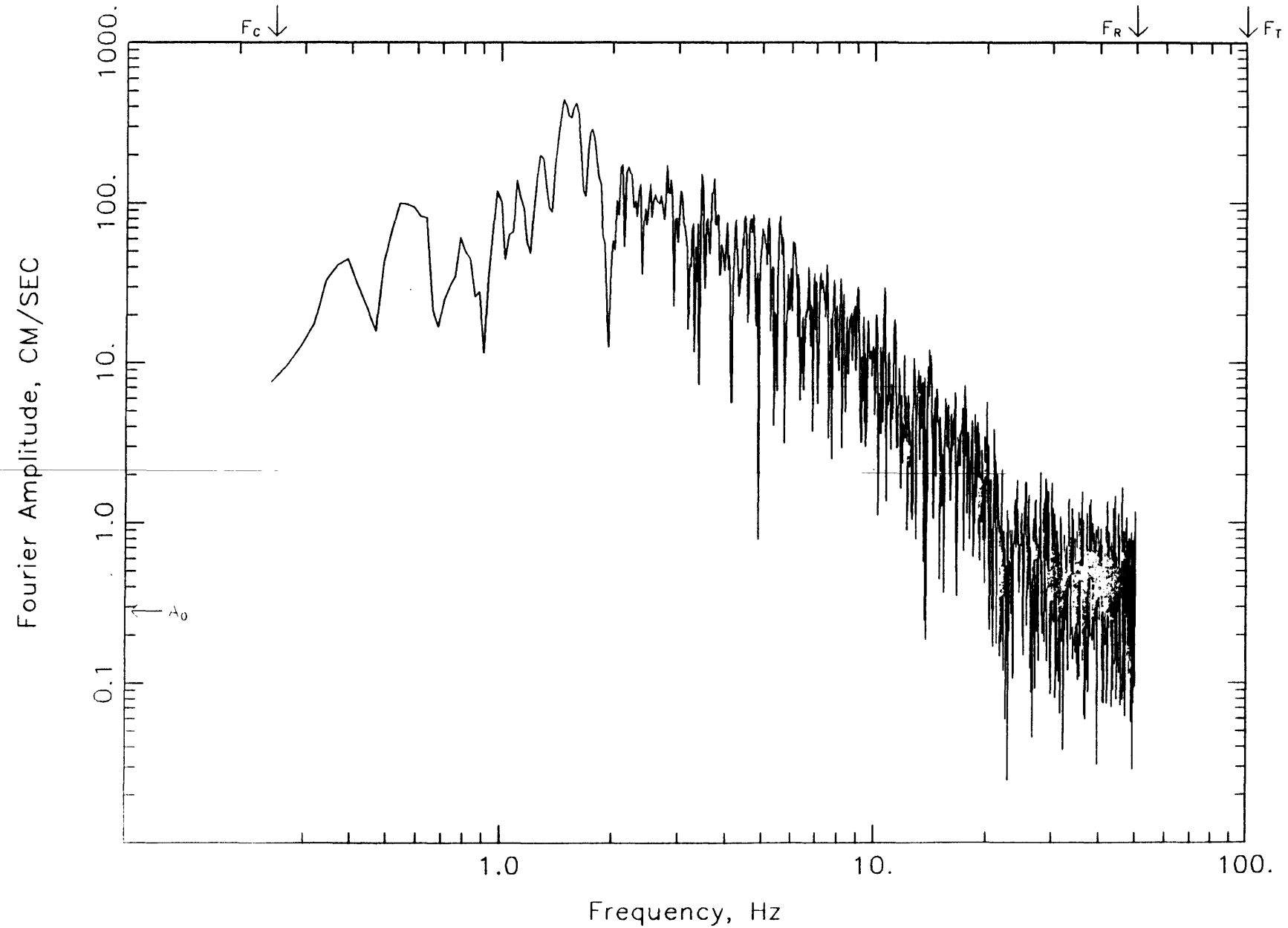
Fourier Amplitude Spectrum of Acceleration
ANDERSON DAM – CREST
340 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



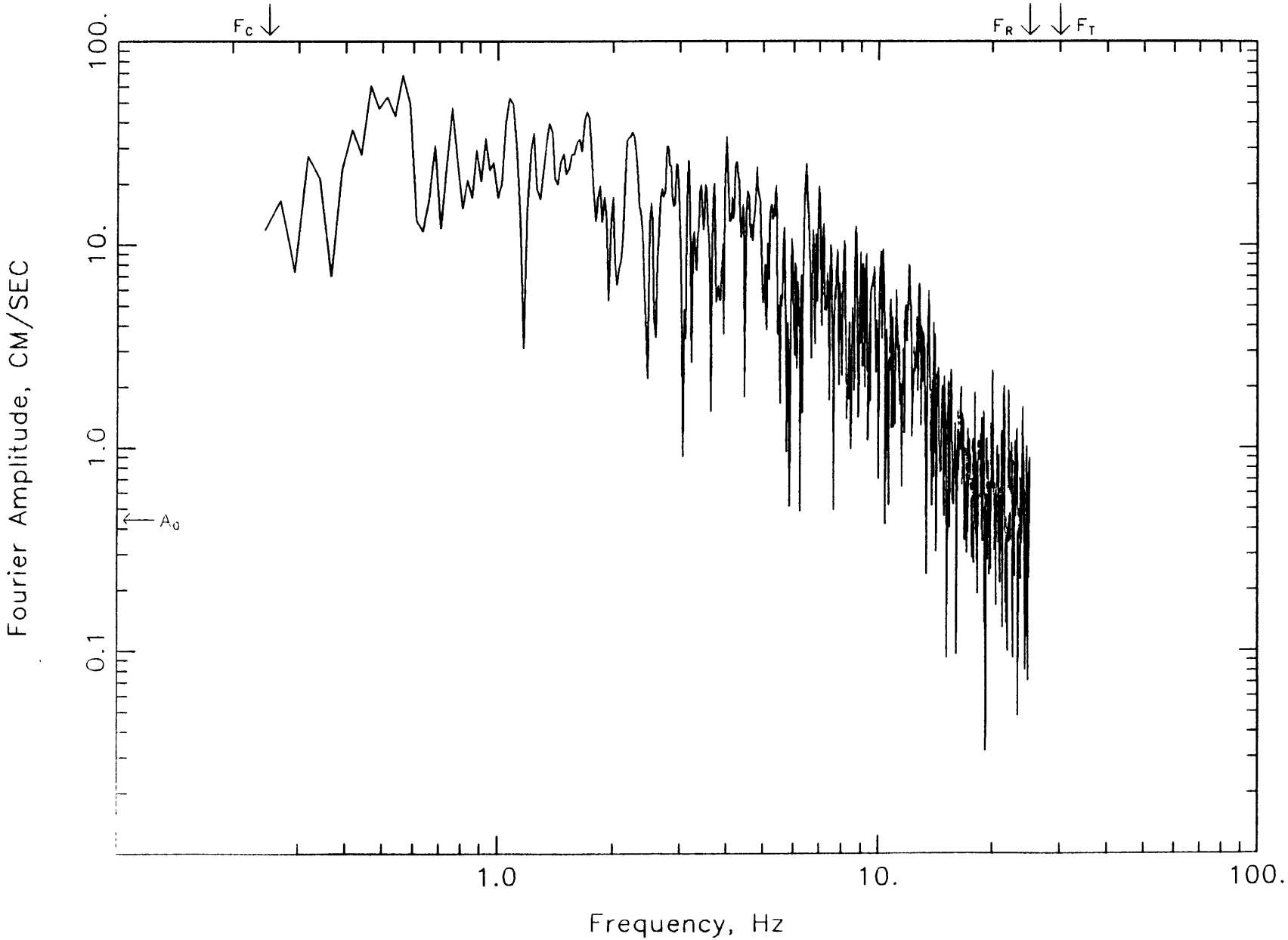
Fourier Amplitude Spectrum of Acceleration
ANDERSON DAM - CREST
UP
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



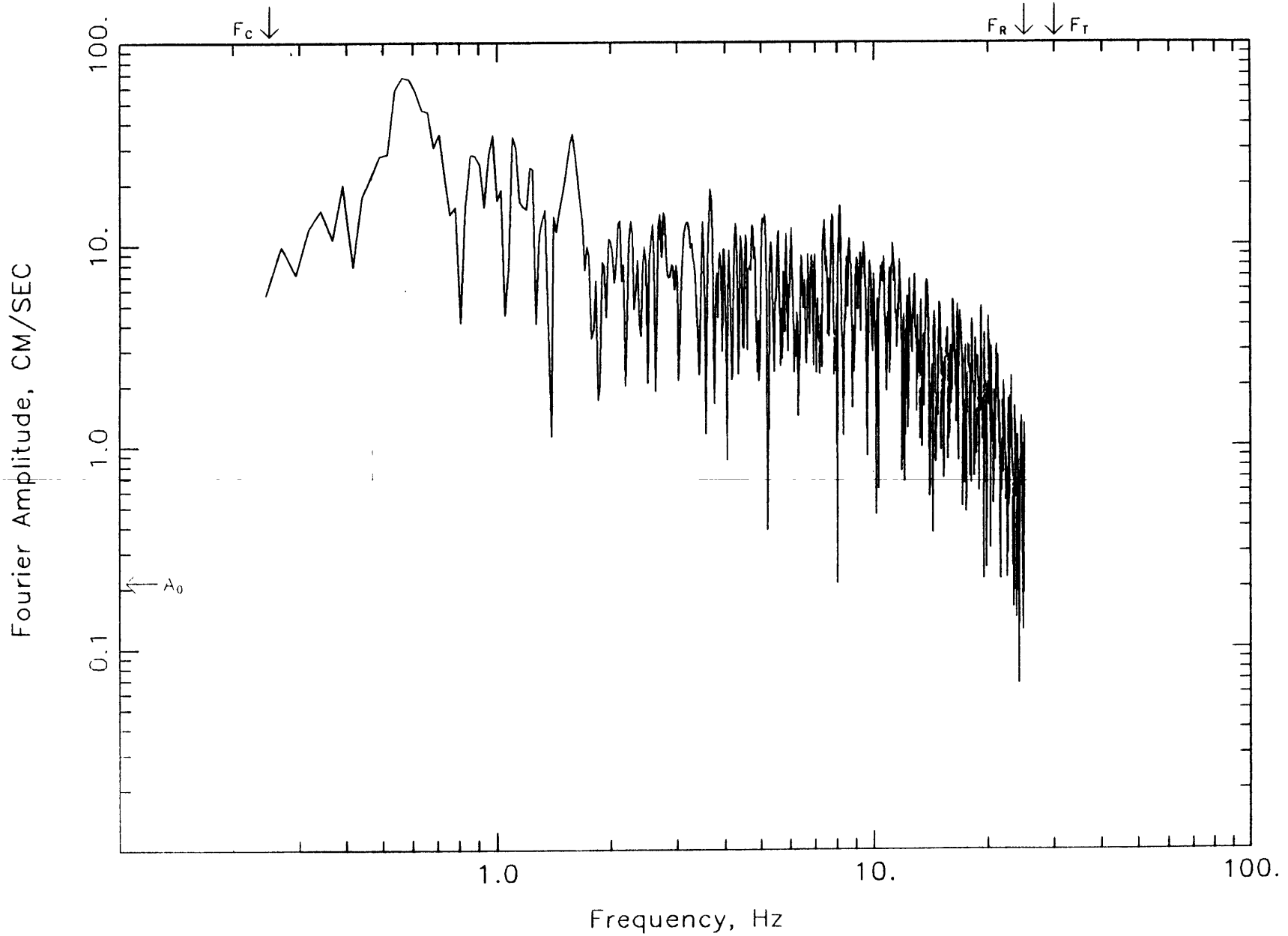
Fourier Amplitude Spectrum of Acceleration
ANDERSON DAM - CREST
250 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



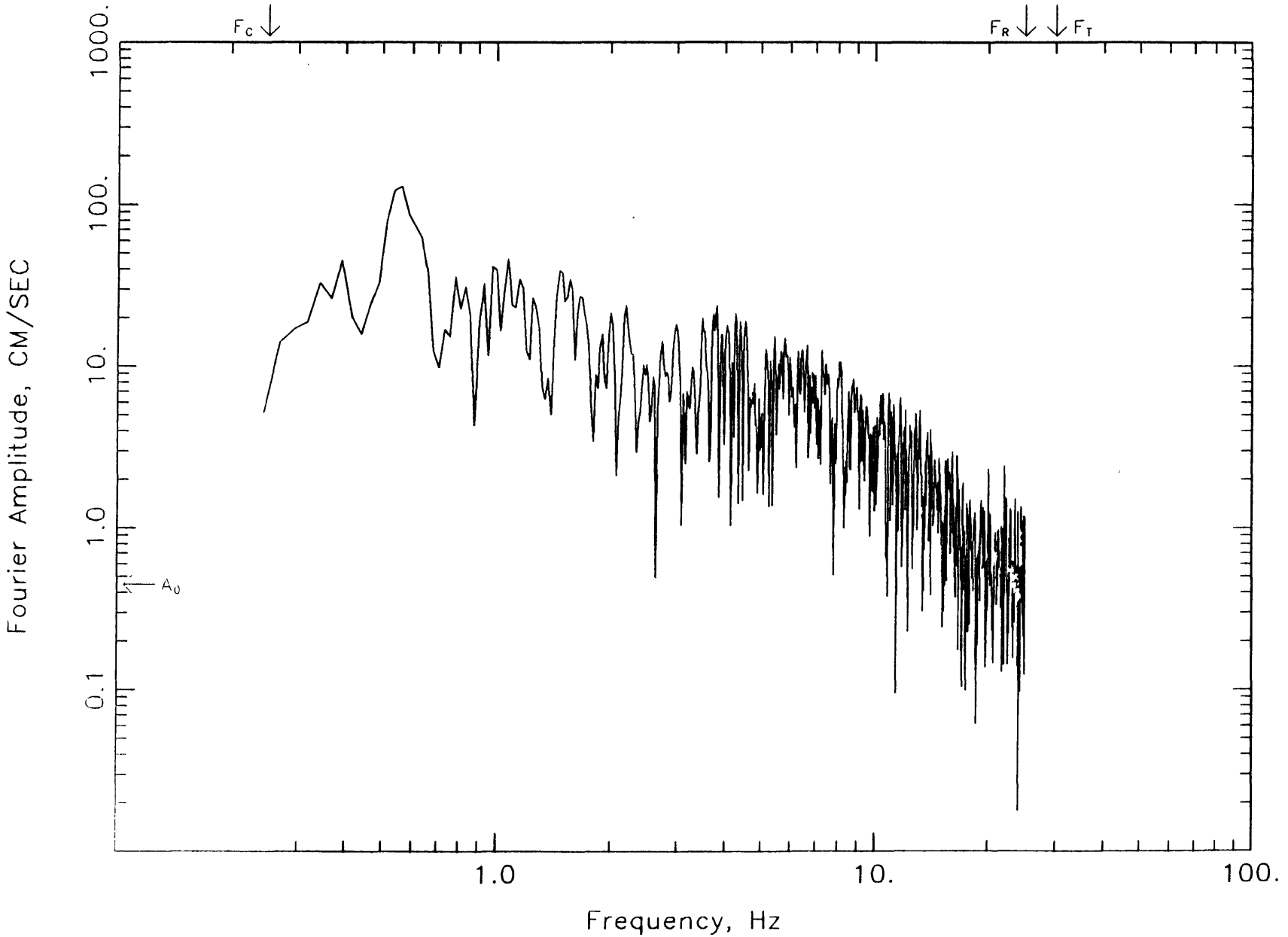
Fourier Amplitude Spectrum of Acceleration
ANDERSON DAM – LEFT ABUTMENT
340 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
HI–PASS BUTTERWORTH AT .25 HZ, ORDER 4, LO–PAS FFT AT 25–30 HZ
Computing Options= ZCROSS,NONOISE



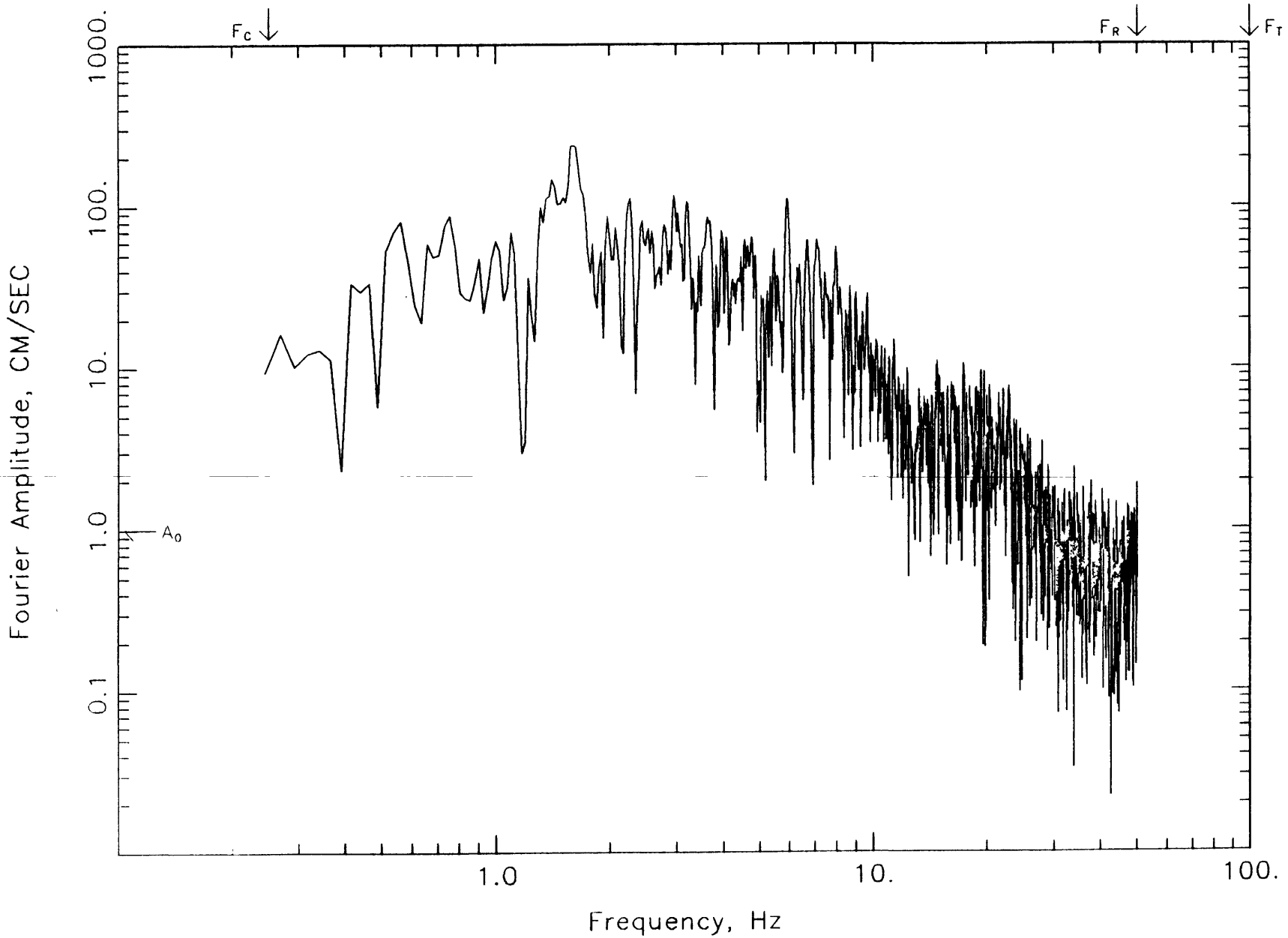
Fourier Amplitude Spectrum of Acceleration
ANDERSON DAM – LEFT ABUTMENT
UP
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
HI–PASS BUTTERWORTH AT .25 HZ, ORDER 4, LO–PAS FFT AT 25–30 HZ
Computing Options= ZCROSS,NONOISE



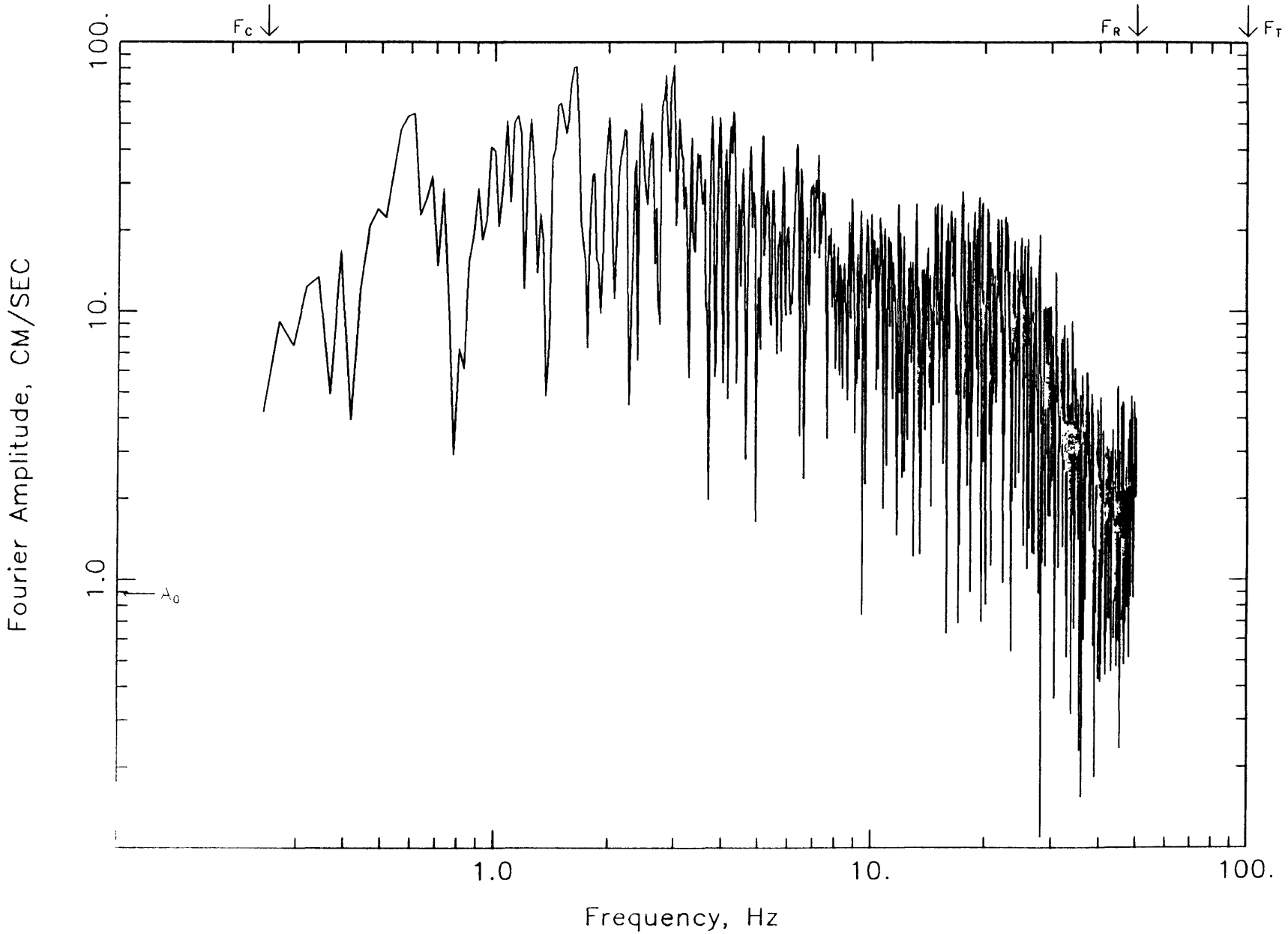
Fourier Amplitude Spectrum of Acceleration
ANDERSON DAM – LEFT ABUTMENT
250 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
HI-PASS BUTTERWORTH AT .25 HZ, ORDER 4, LO-PAS FFT AT 25-30 HZ
Computing Options= ZCROSS,NONOISE



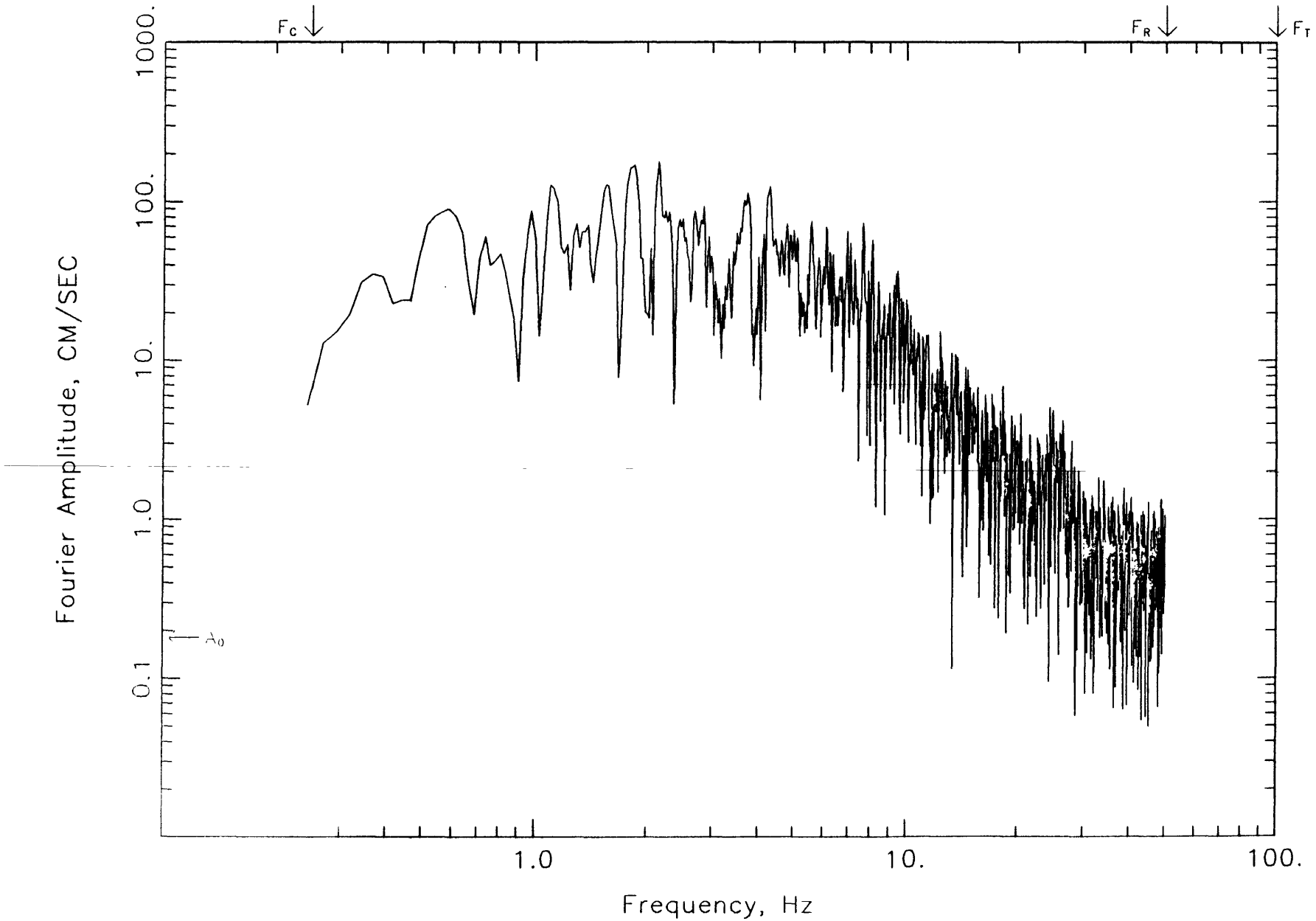
Fourier Amplitude Spectrum of Acceleration
ANDERSON DAM - DOWNSTREAM
340 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



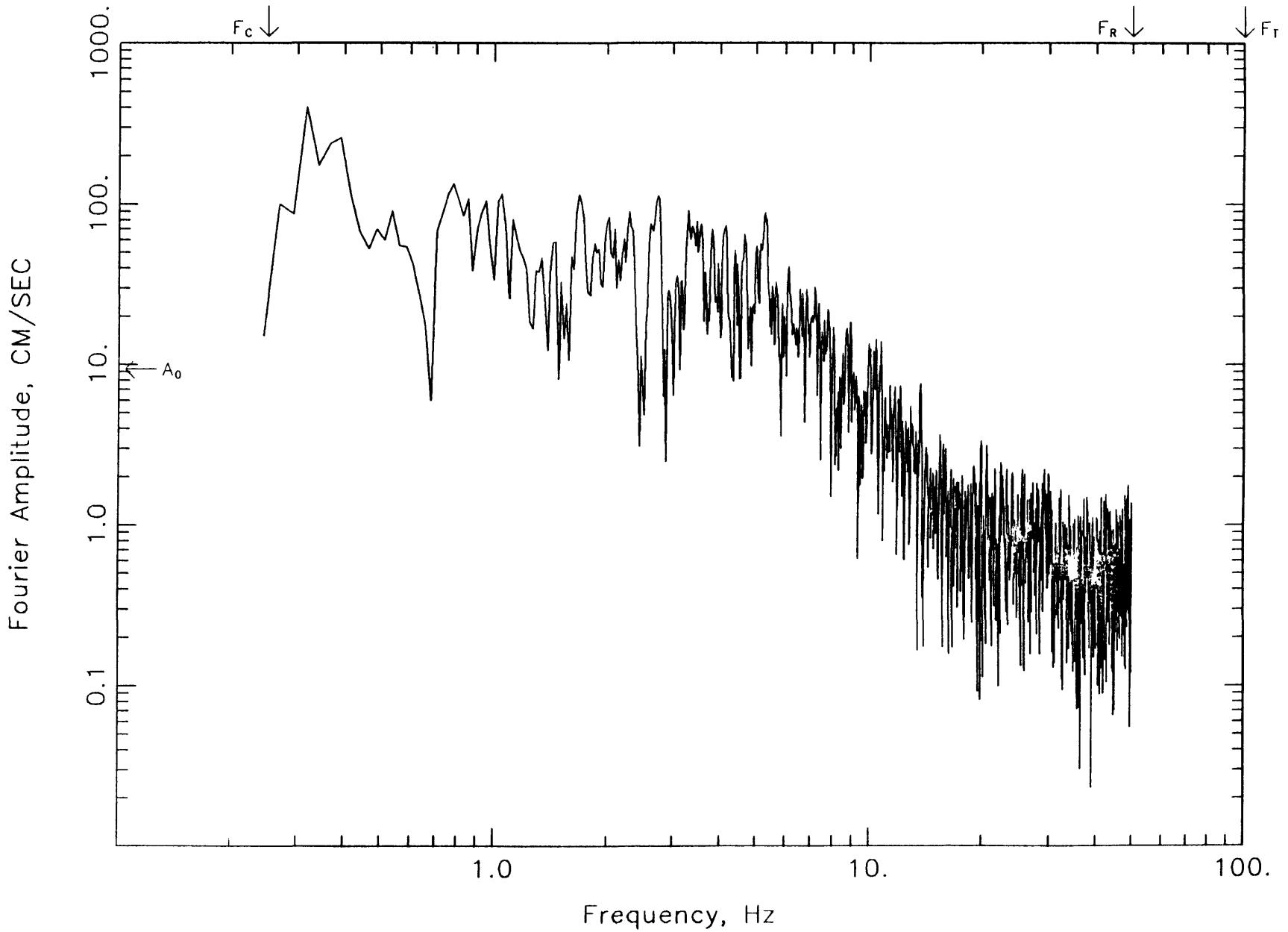
Fourier Amplitude Spectrum of Acceleration
ANDERSON DAM – DOWNSTREAM
UP
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



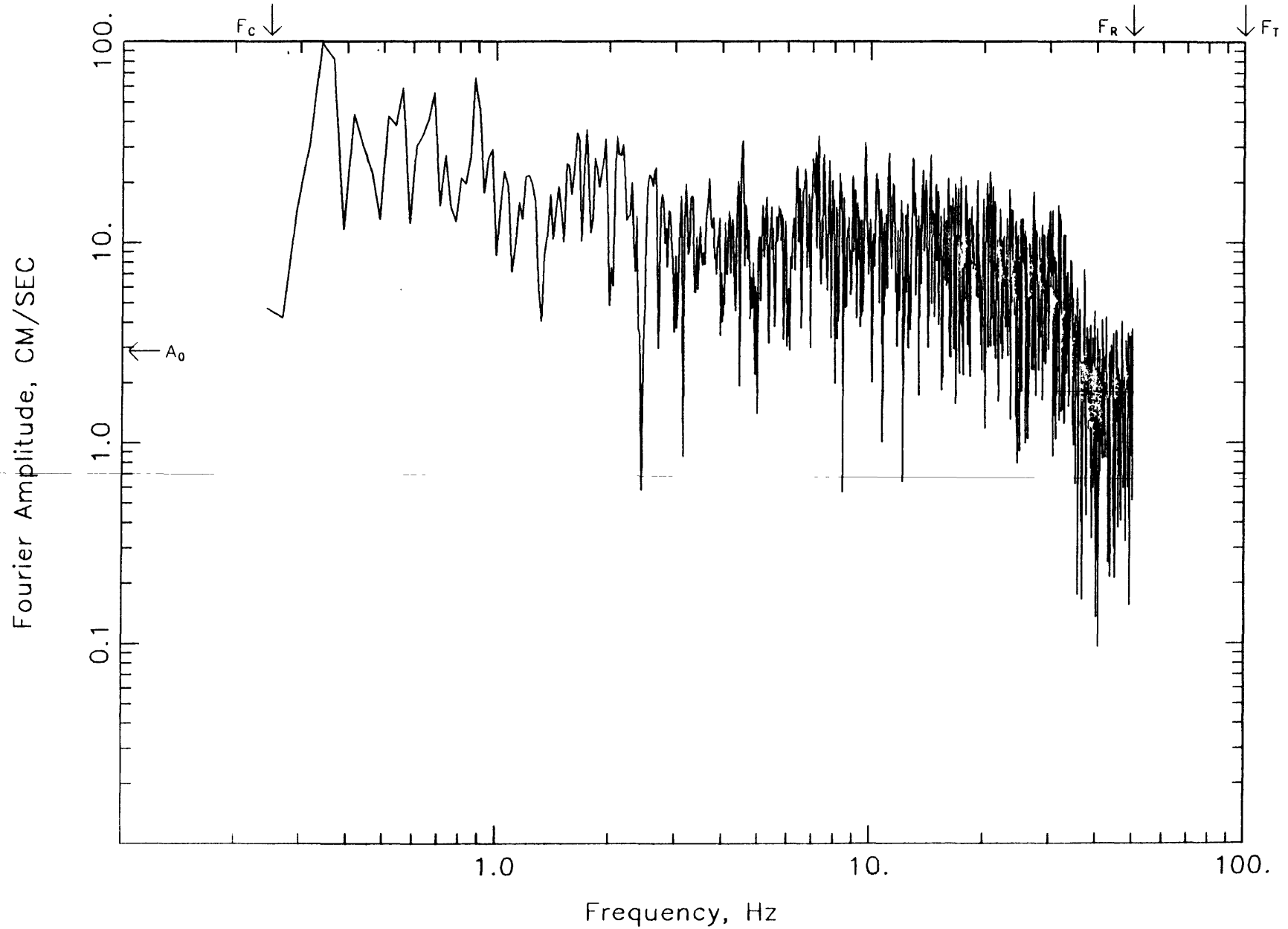
Fourier Amplitude Spectrum of Acceleration
ANDERSON DAM – DOWNSTREAM
250 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



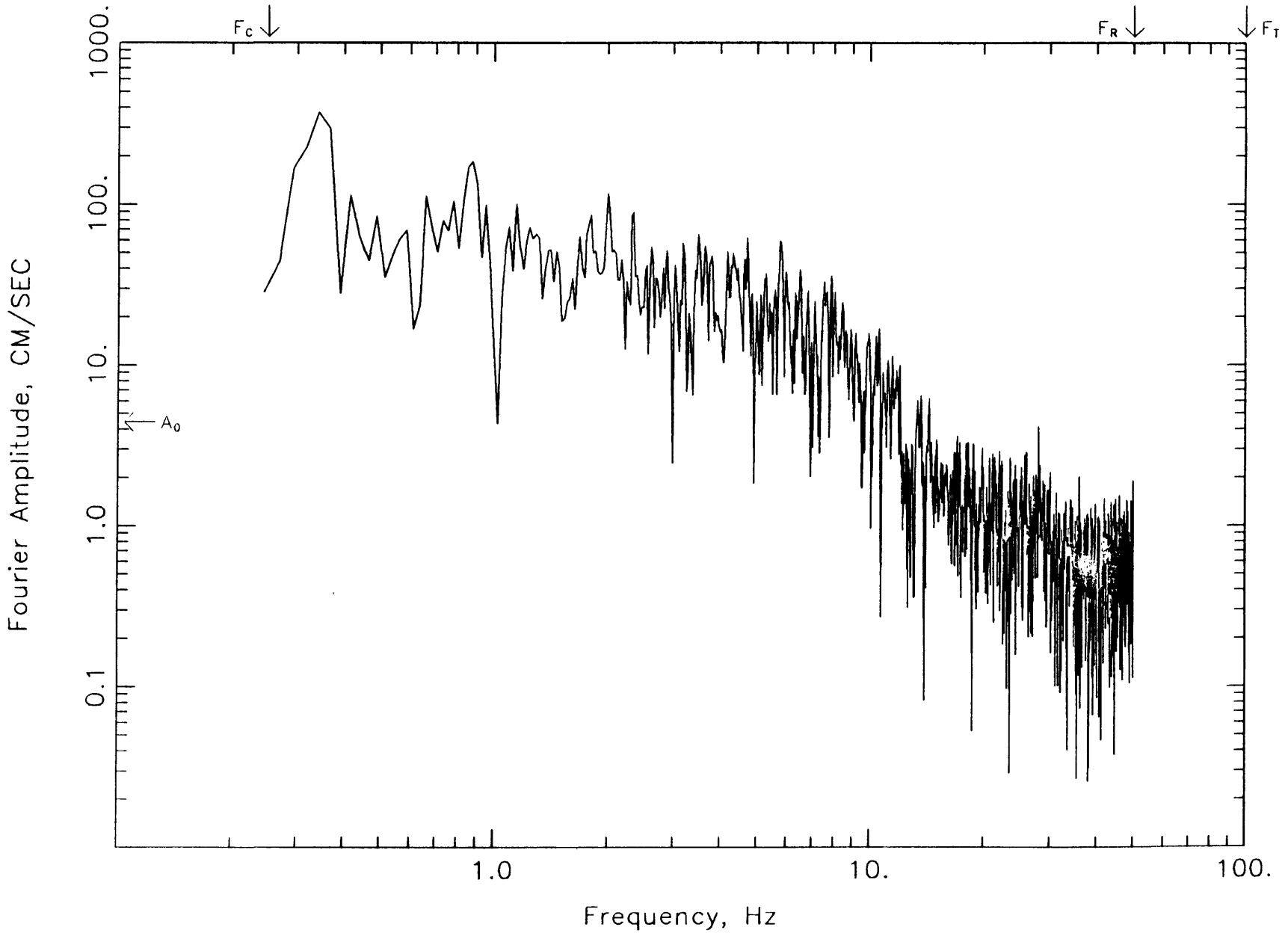
Fourier Amplitude Spectrum of Acceleration
SUNNYVALE - COLTON AVENUE
360 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



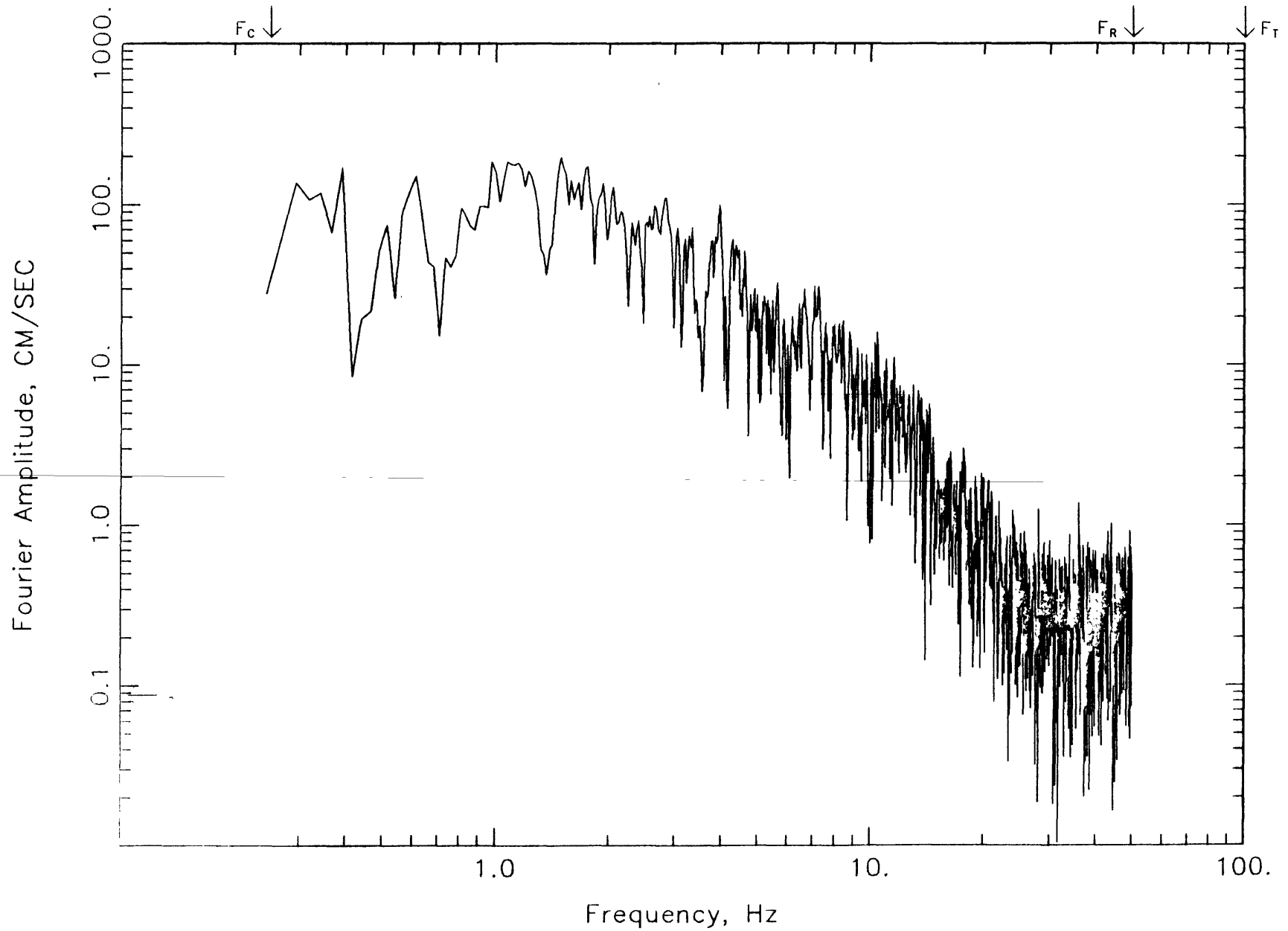
Fourier Amplitude Spectrum of Acceleration
SUNNYVALE - COLTON AVENUE
UP
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



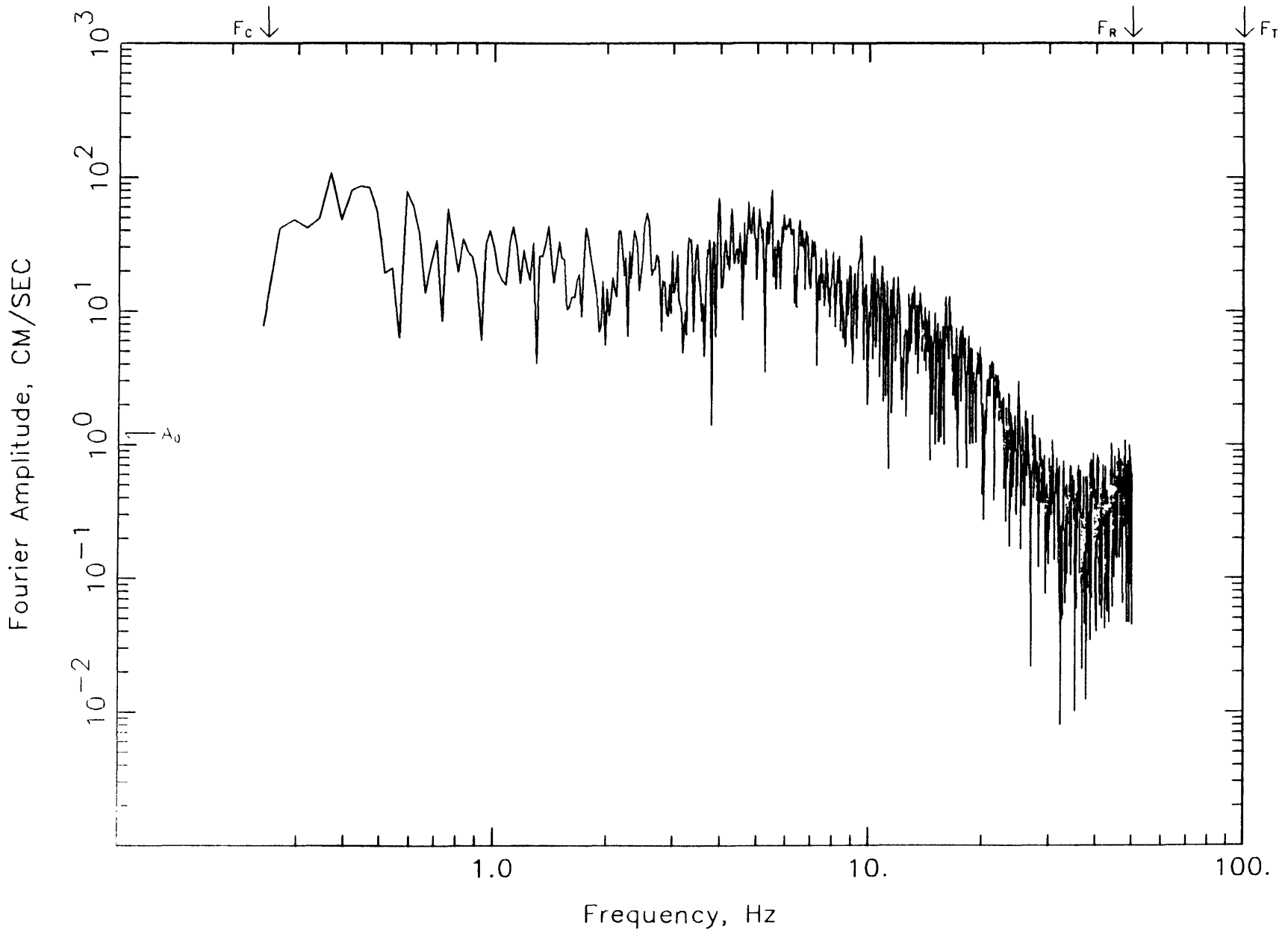
Fourier Amplitude Spectrum of Acceleration
SUNNYVALE - COLTON AVENUE
270 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



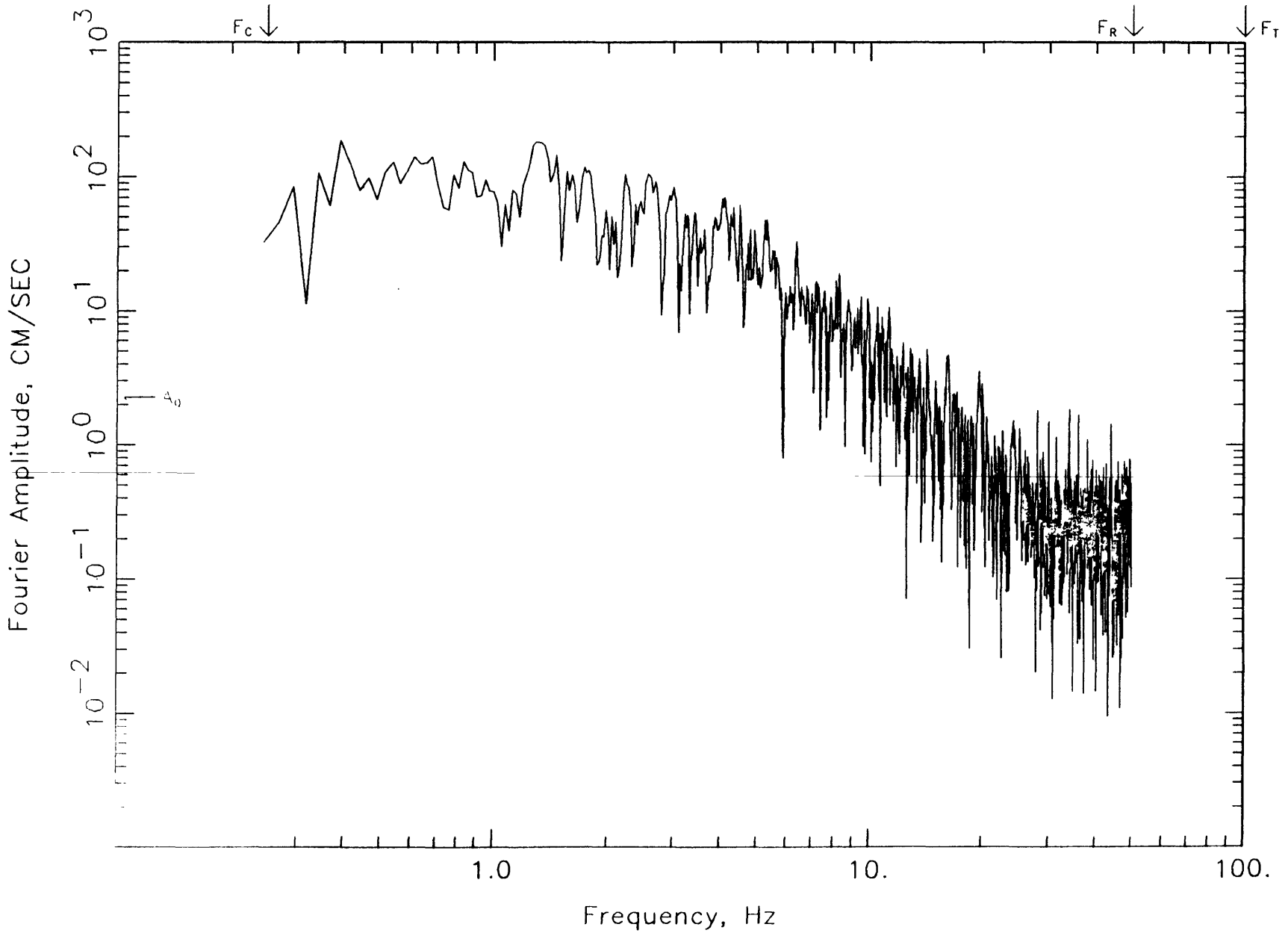
Fourier Amplitude Spectrum of Acceleration
HOLLISTER AIRPORT (DIFFERENTIAL ARRAY)
255 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



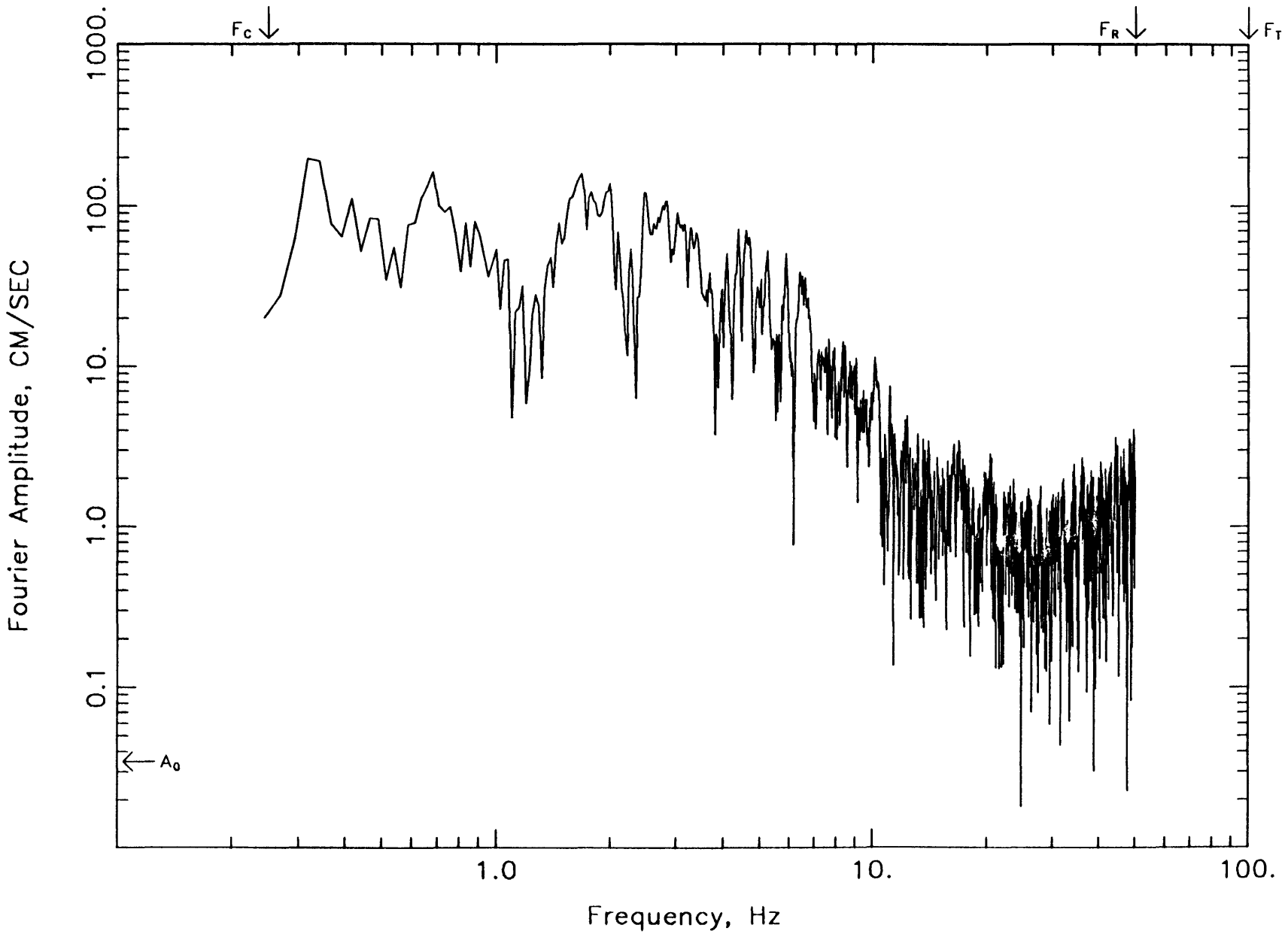
Fourier Amplitude Spectrum of Acceleration
HOLLISTER AIRPORT (DIFFERENTIAL ARRAY)
UP
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



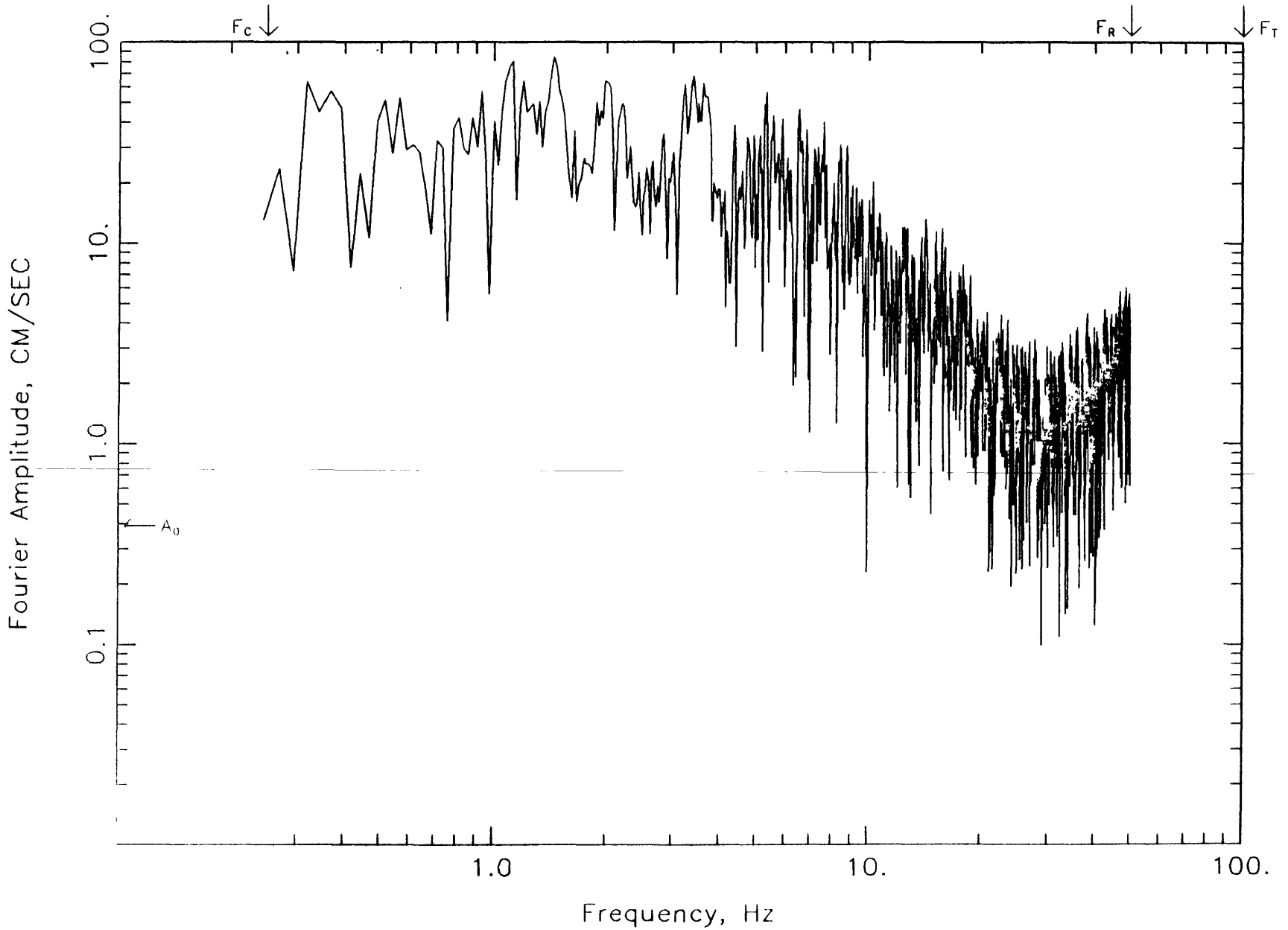
Fourier Amplitude Spectrum of Acceleration
HOLLISTER AIRPORT (DIFFERENTIAL ARRAY)
165 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



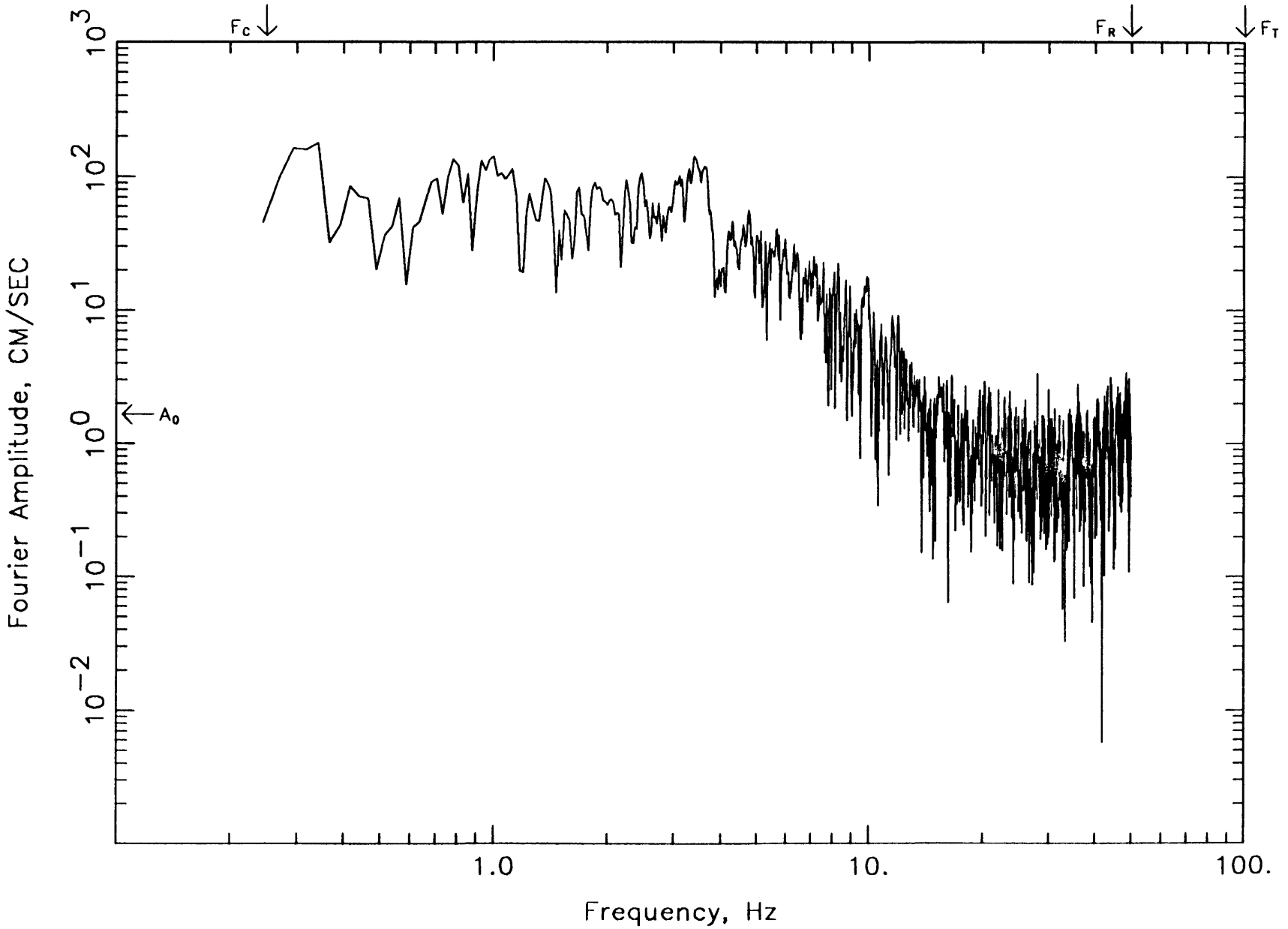
Fourier Amplitude Spectrum of Acceleration
PALO ALTO VA HOSPITAL – BLDG 1, BASEMENT
302 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



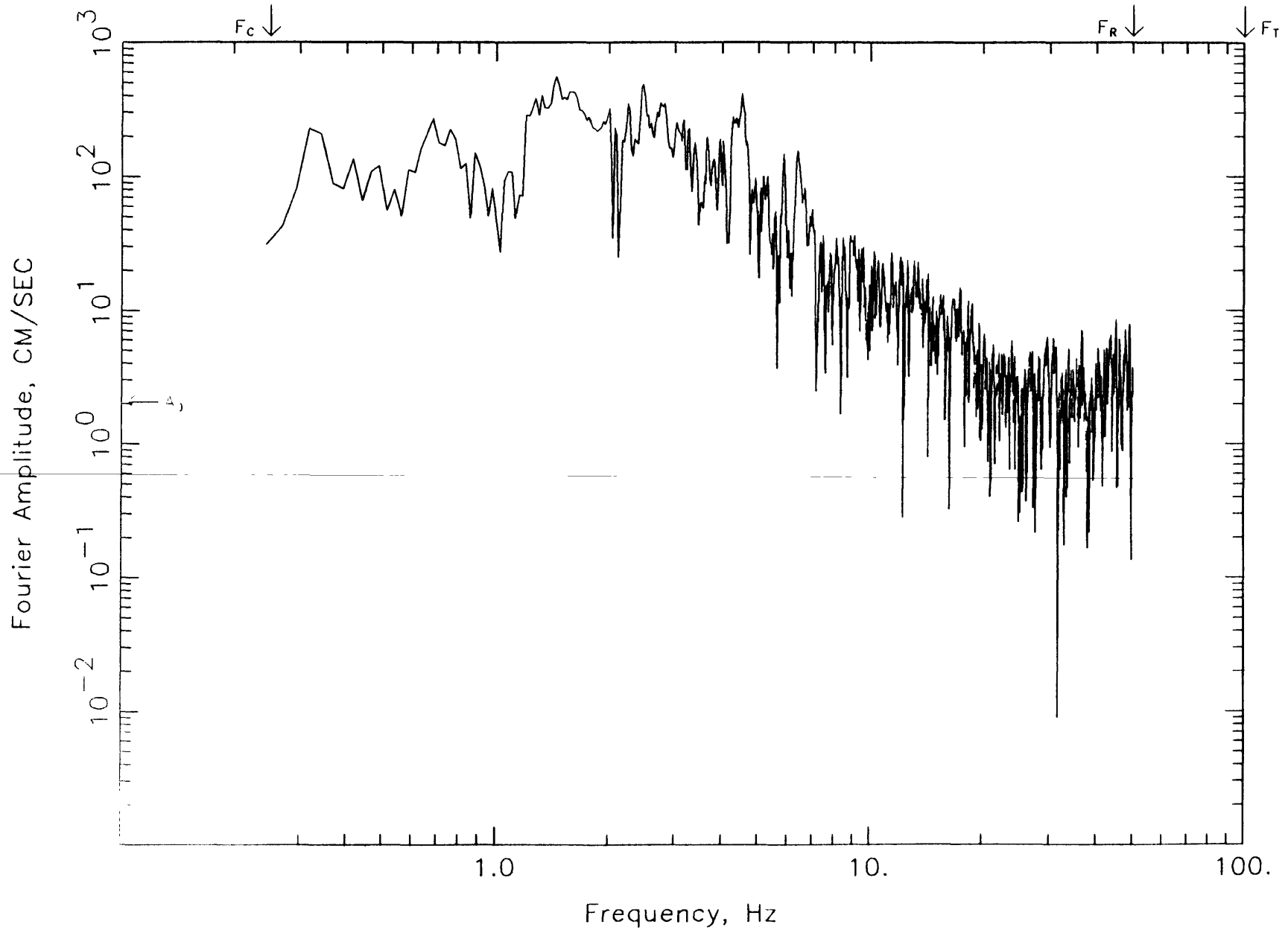
Fourier Amplitude Spectrum of Acceleration
PALO ALTO VA HOSPITAL - BLDG 1, BASEMENT
UP
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



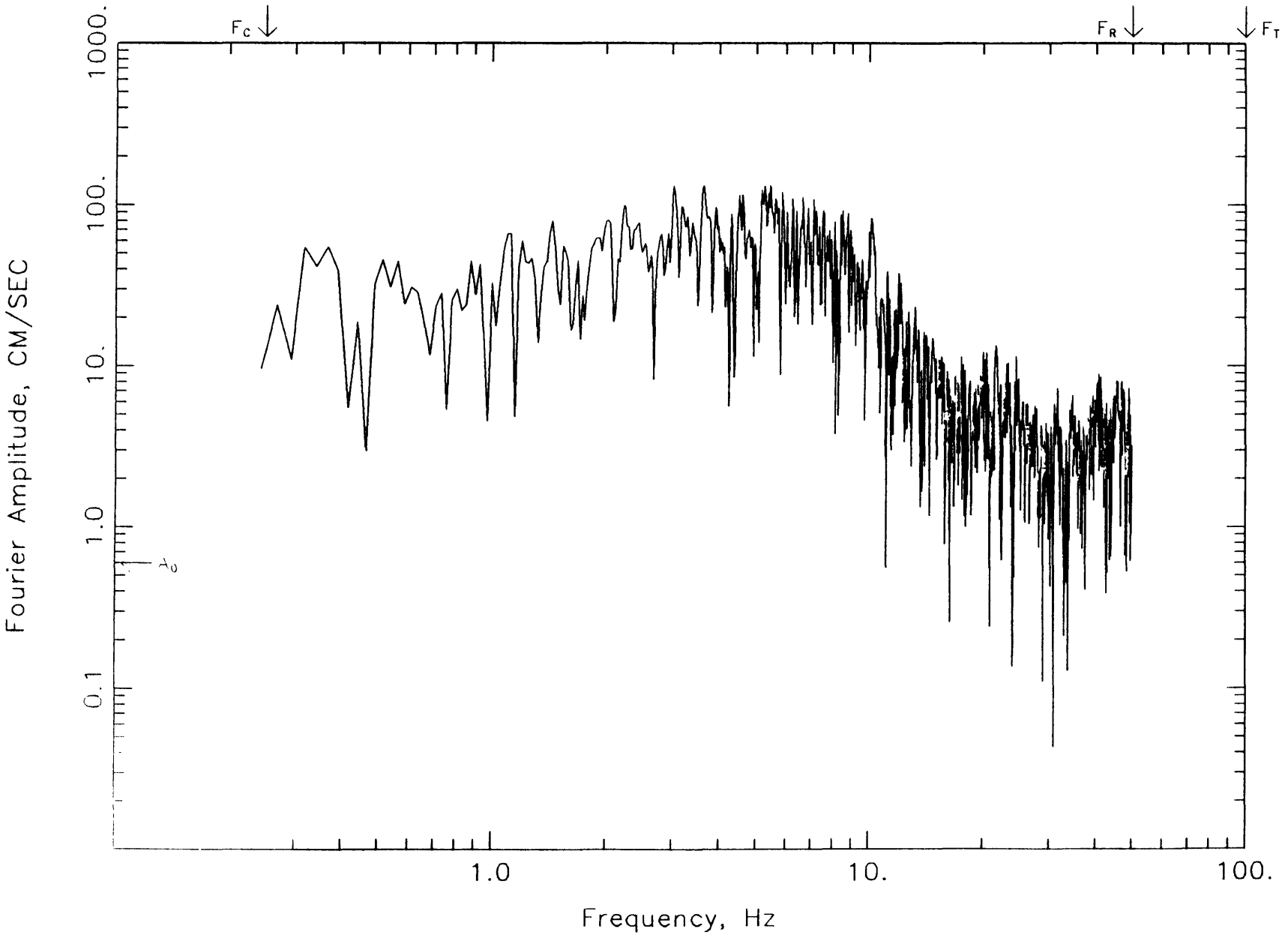
Fourier Amplitude Spectrum of Acceleration
PALO ALTO VA HOSPITAL - BLDG 1, BASEMENT
212 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



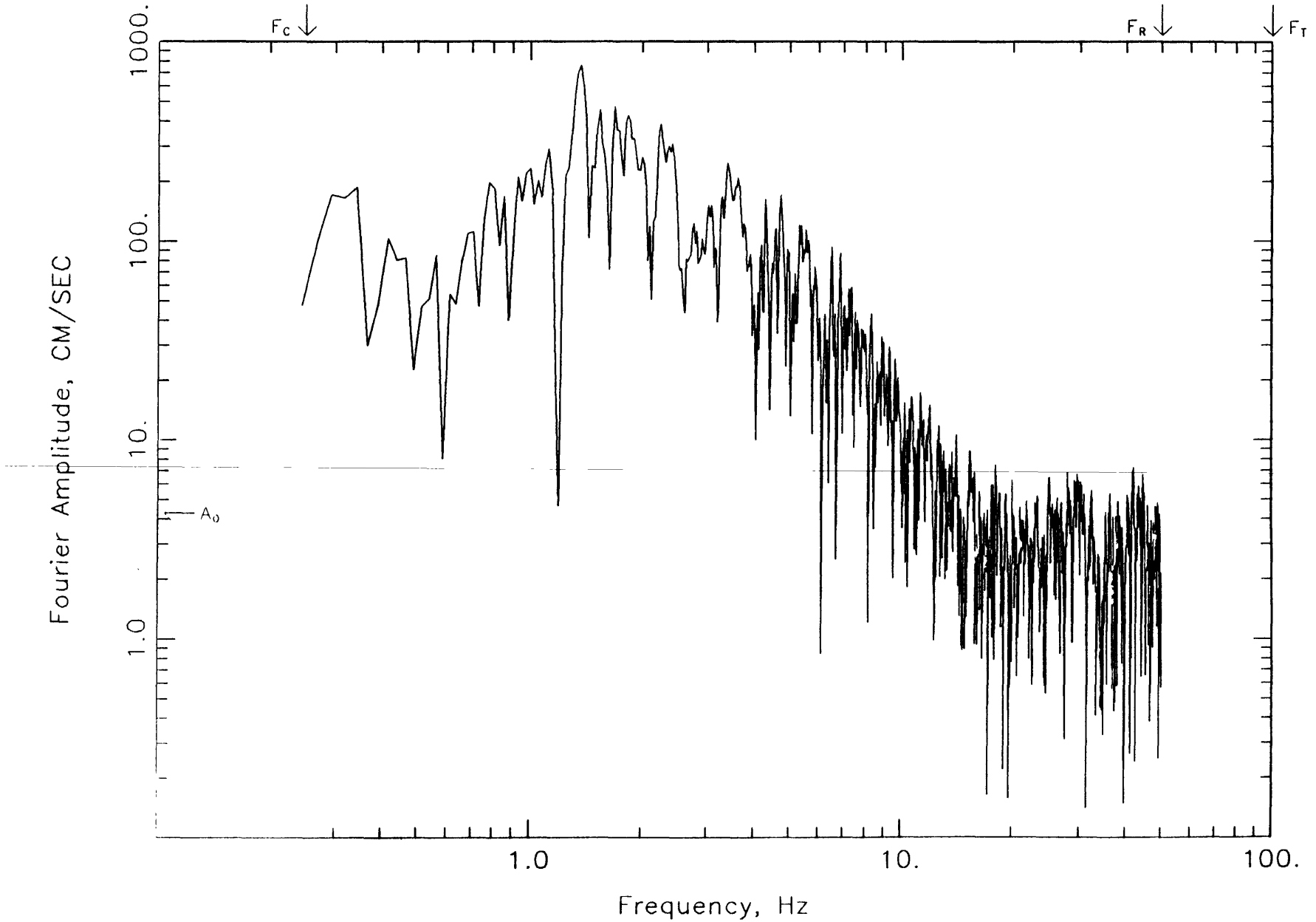
Fourier Amplitude Spectrum of Acceleration
PALO ALTO VA HOSPITAL - BLDG 1, ROOF (7TH LEVEL)
302 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



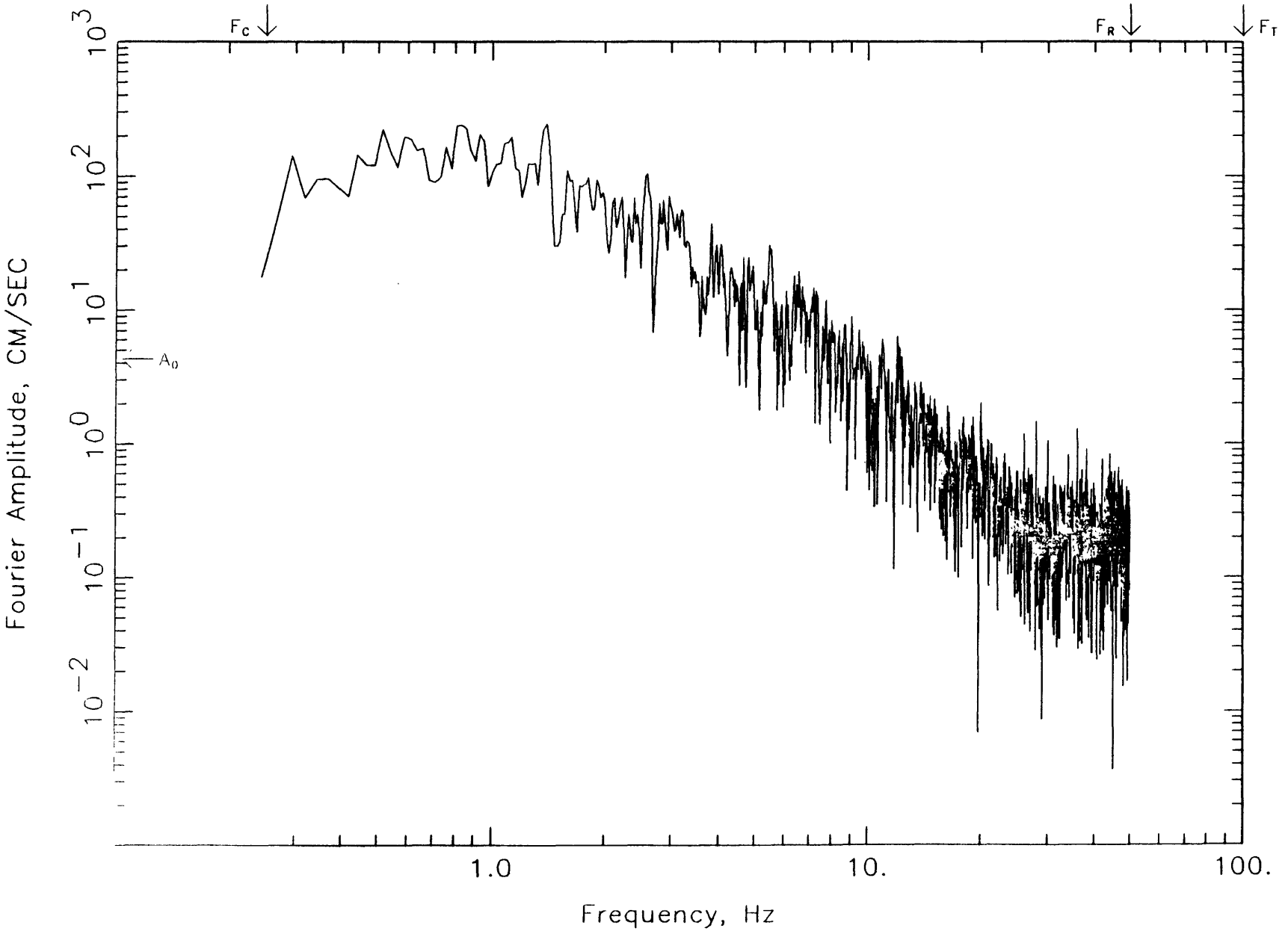
Fourier Amplitude Spectrum of Acceleration
PALO ALTO VA HOSPITAL - BLDG 1, ROOF (7TH LEVEL)
UP
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



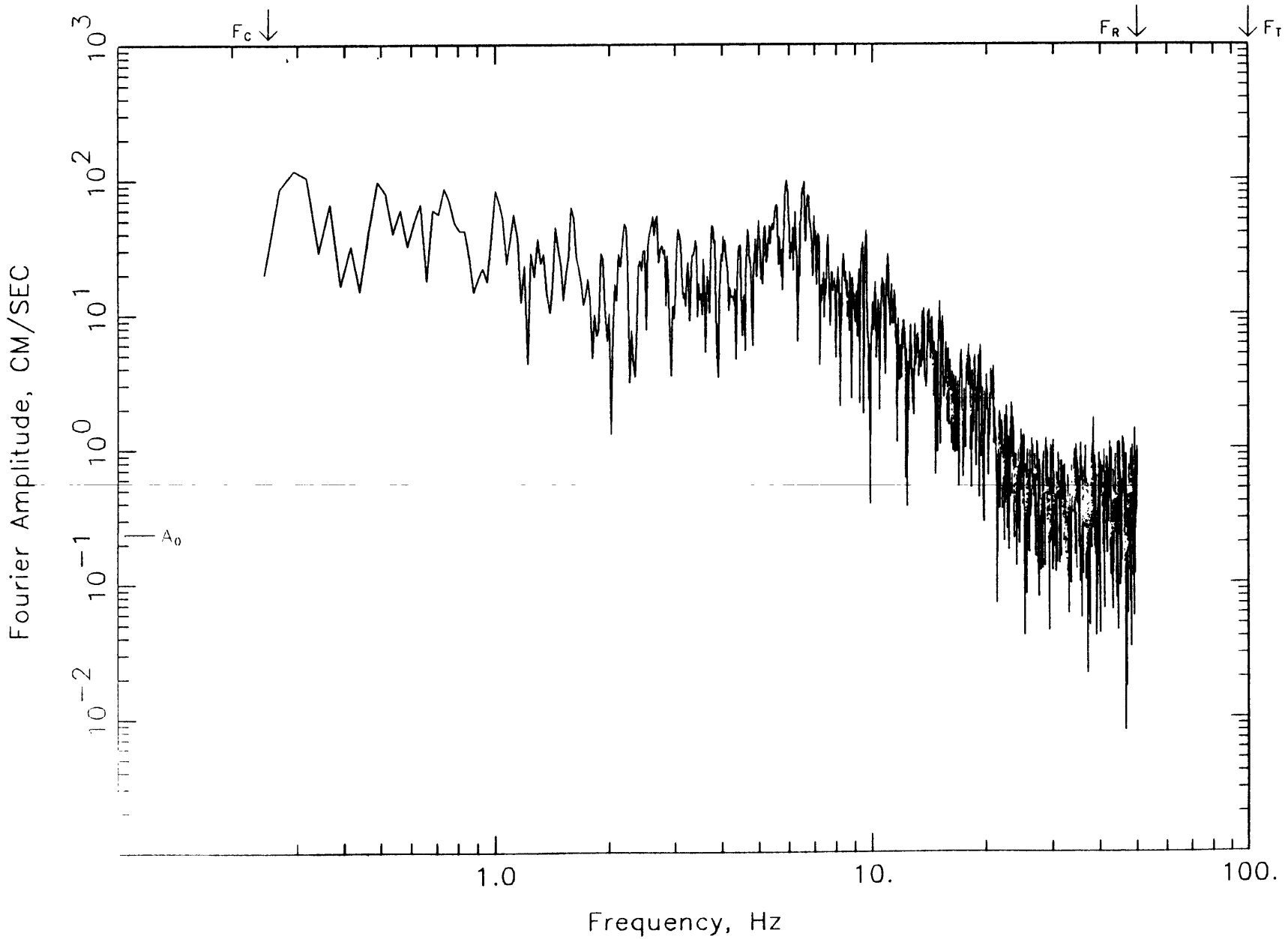
Fourier Amplitude Spectrum of Acceleration
PALO ALTO VA HOSPITAL – BLDG 1, ROOF (7TH LEVEL)
212 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



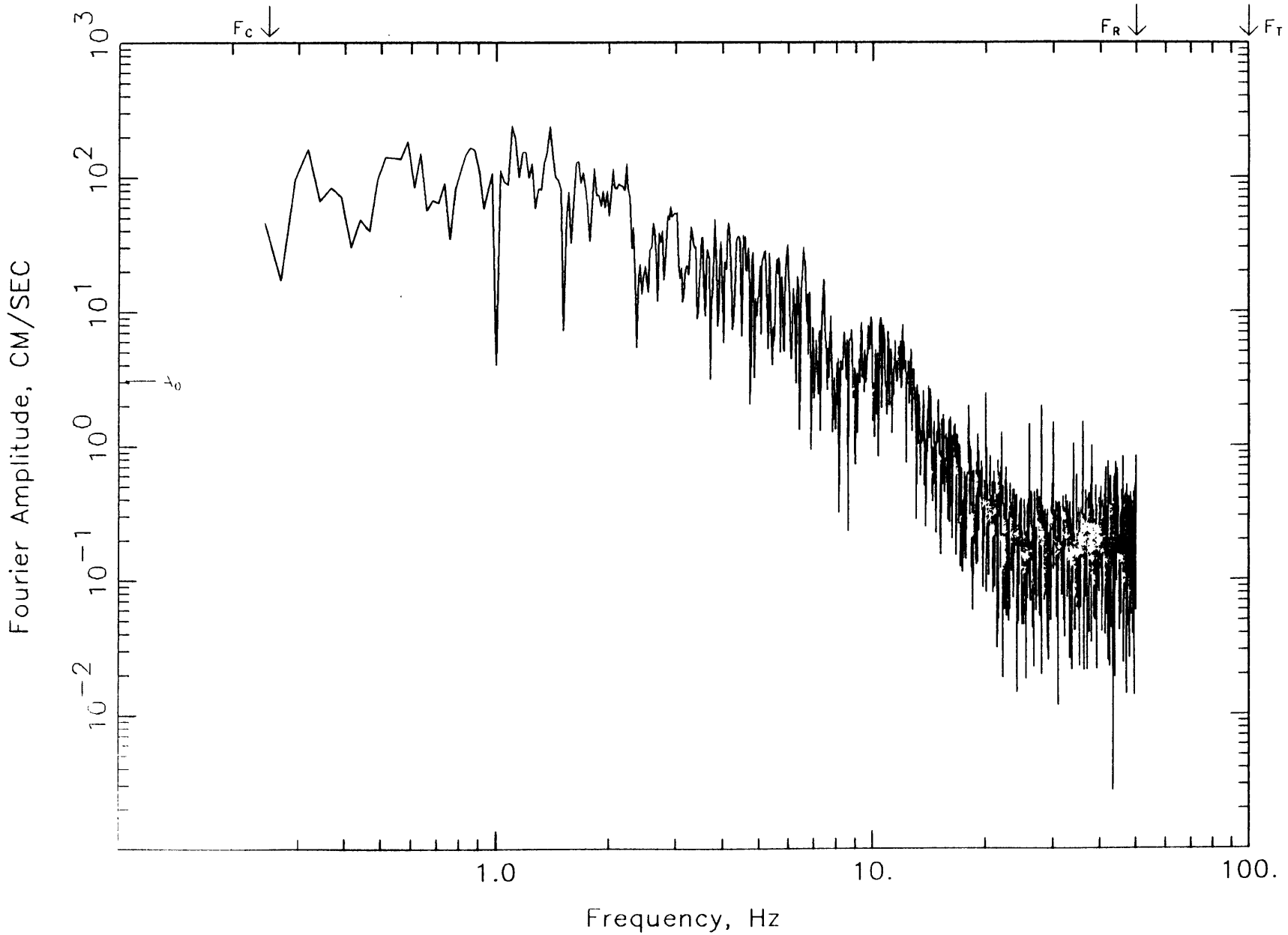
Fourier Amplitude Spectrum of Acceleration
HOLLISTER CITY HALL ANNEX - BASEMENT
180 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



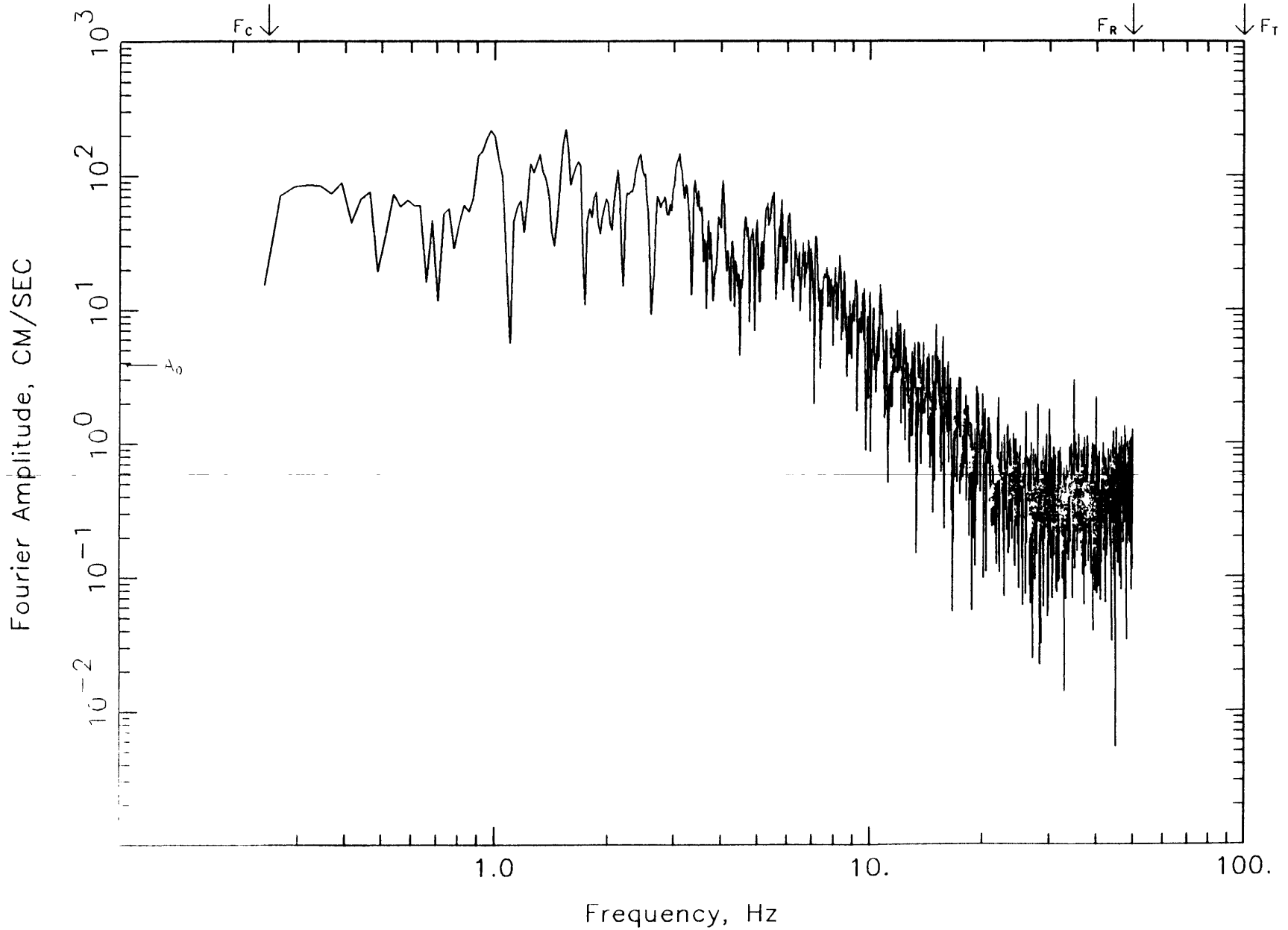
Fourier Amplitude Spectrum of Acceleration
HOLLISTER CITY HALL ANNEX – BASEMENT
UP
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



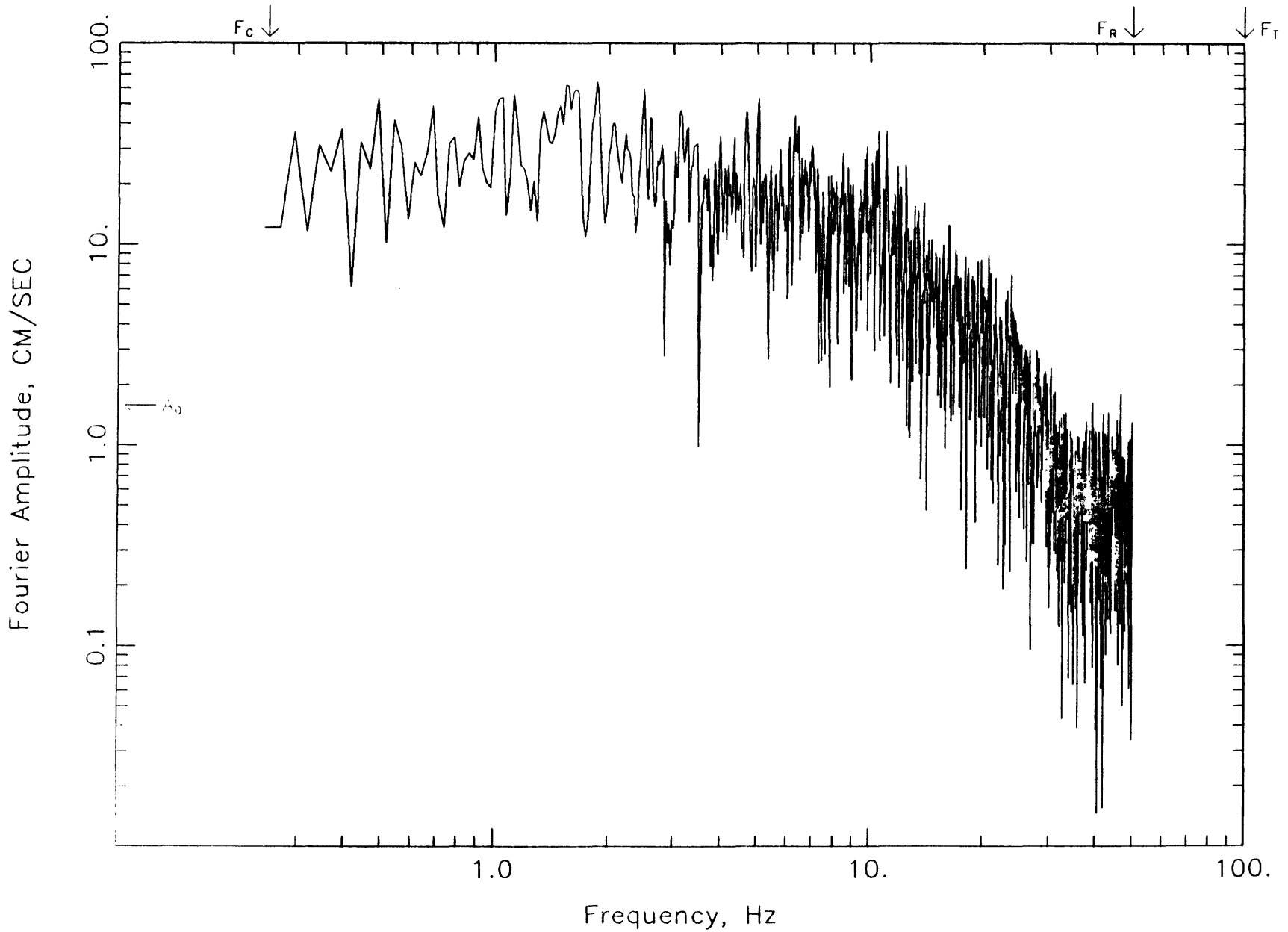
Fourier Amplitude Spectrum of Acceleration
HOLLISTER CITY HALL ANNEX - BASEMENT
090 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



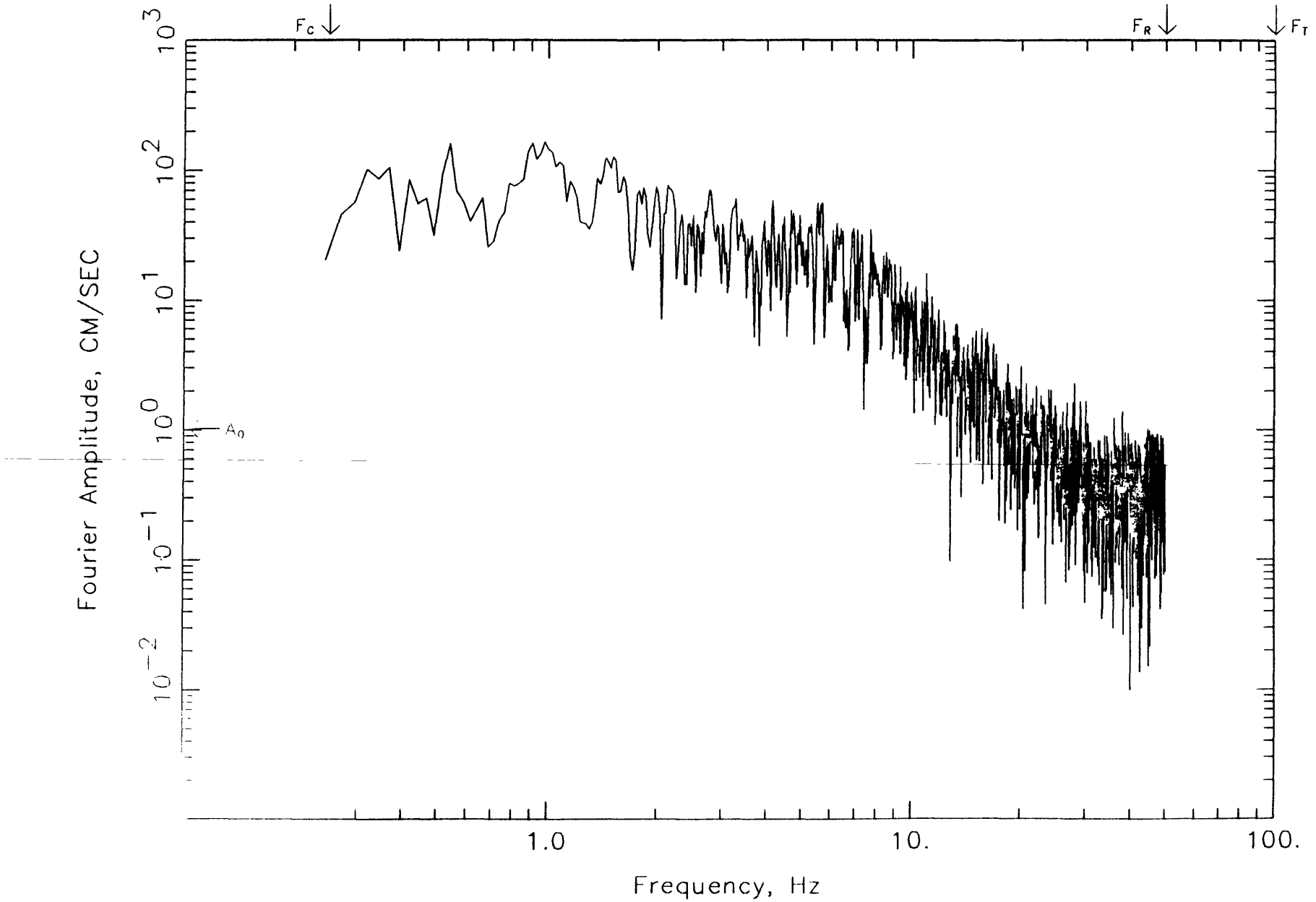
Fourier Amplitude Spectrum of Acceleration
STANFORD UNIVERSITY - SLAC TEST LAB
360 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



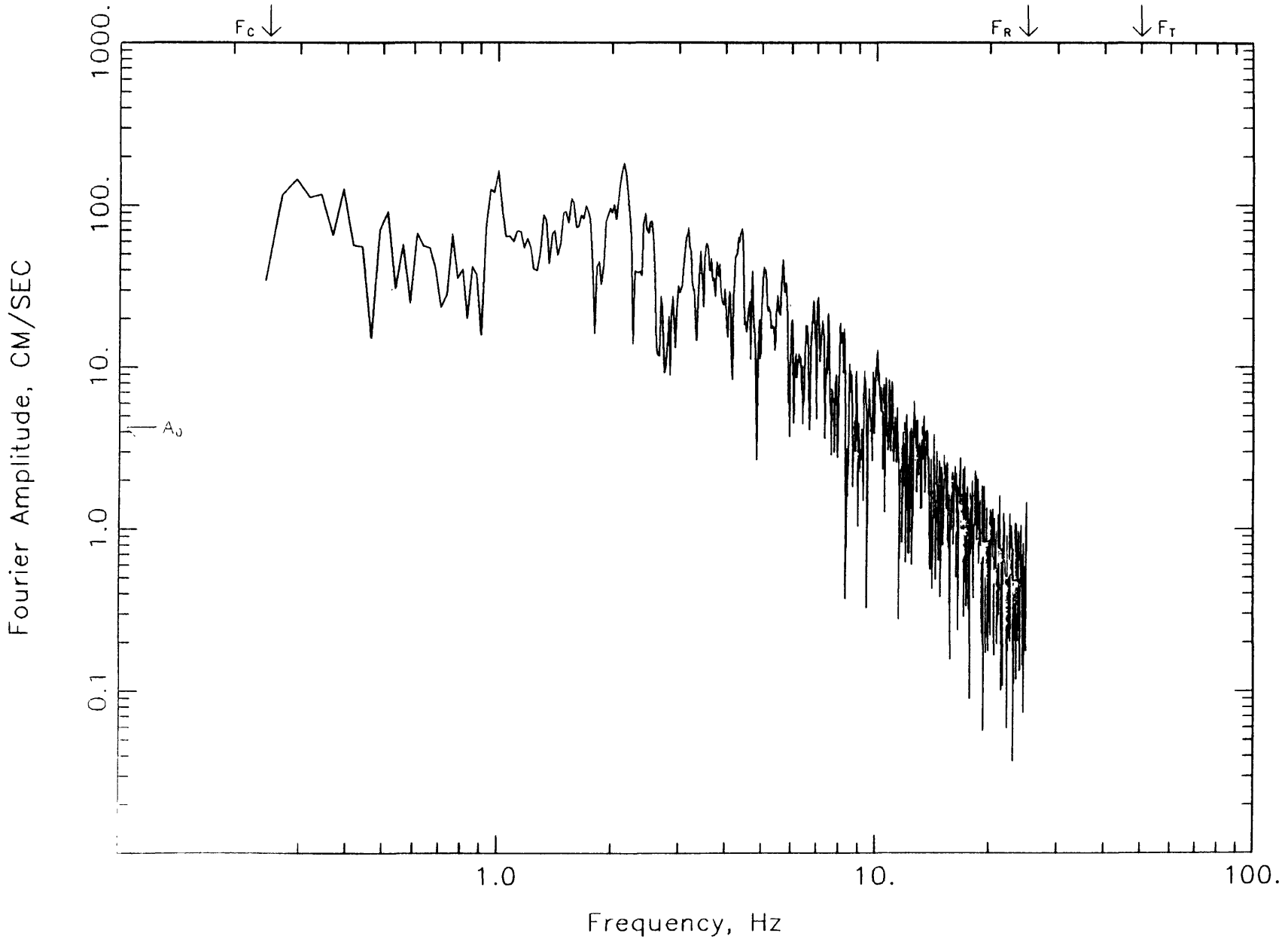
Fourier Amplitude Spectrum of Acceleration
STANFORD UNIVERSITY - SLAC TEST LAB
UP
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



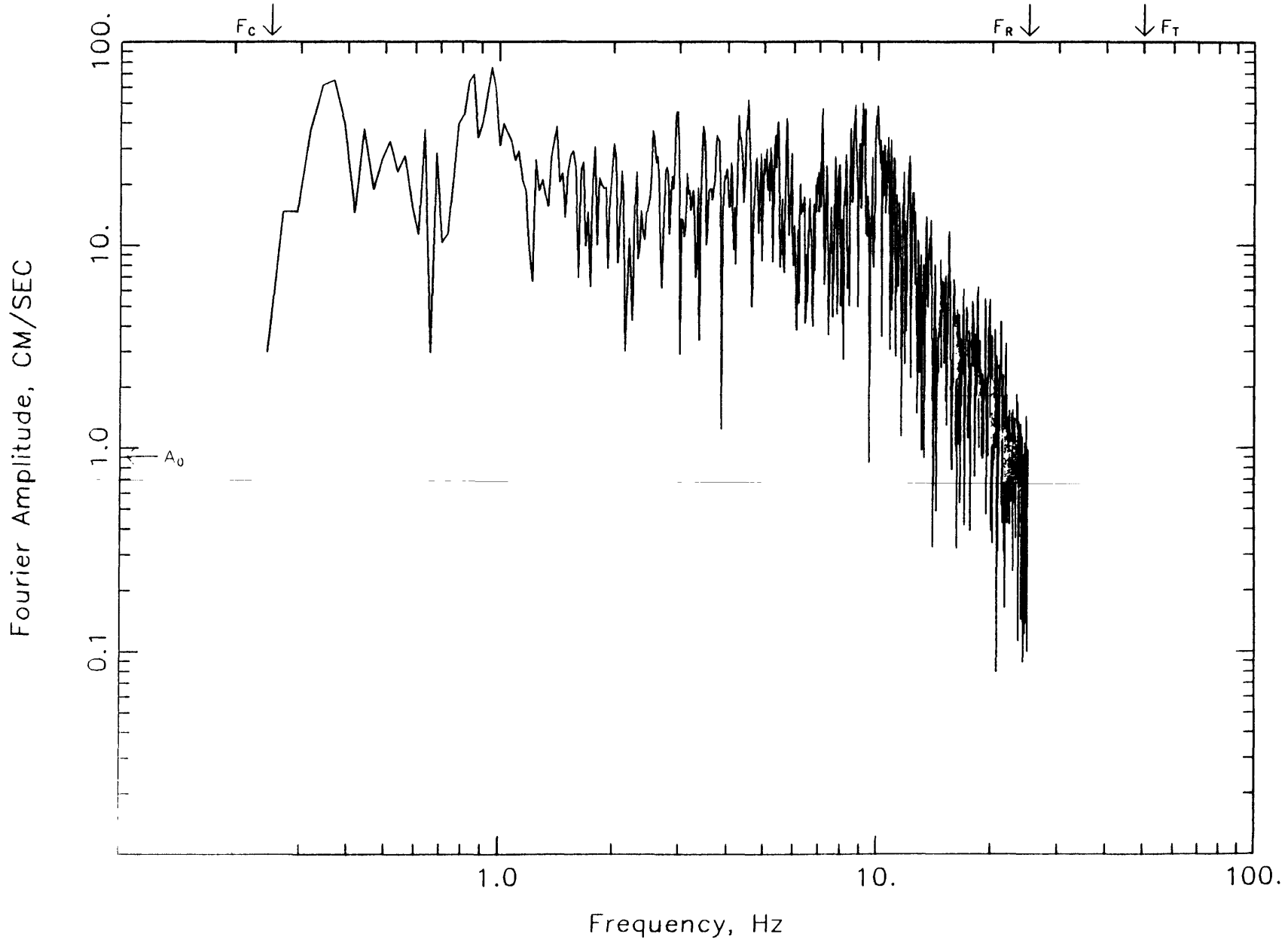
Fourier Amplitude Spectrum of Acceleration
STANFORD UNIVERSITY – SLAC TEST LAB
270 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



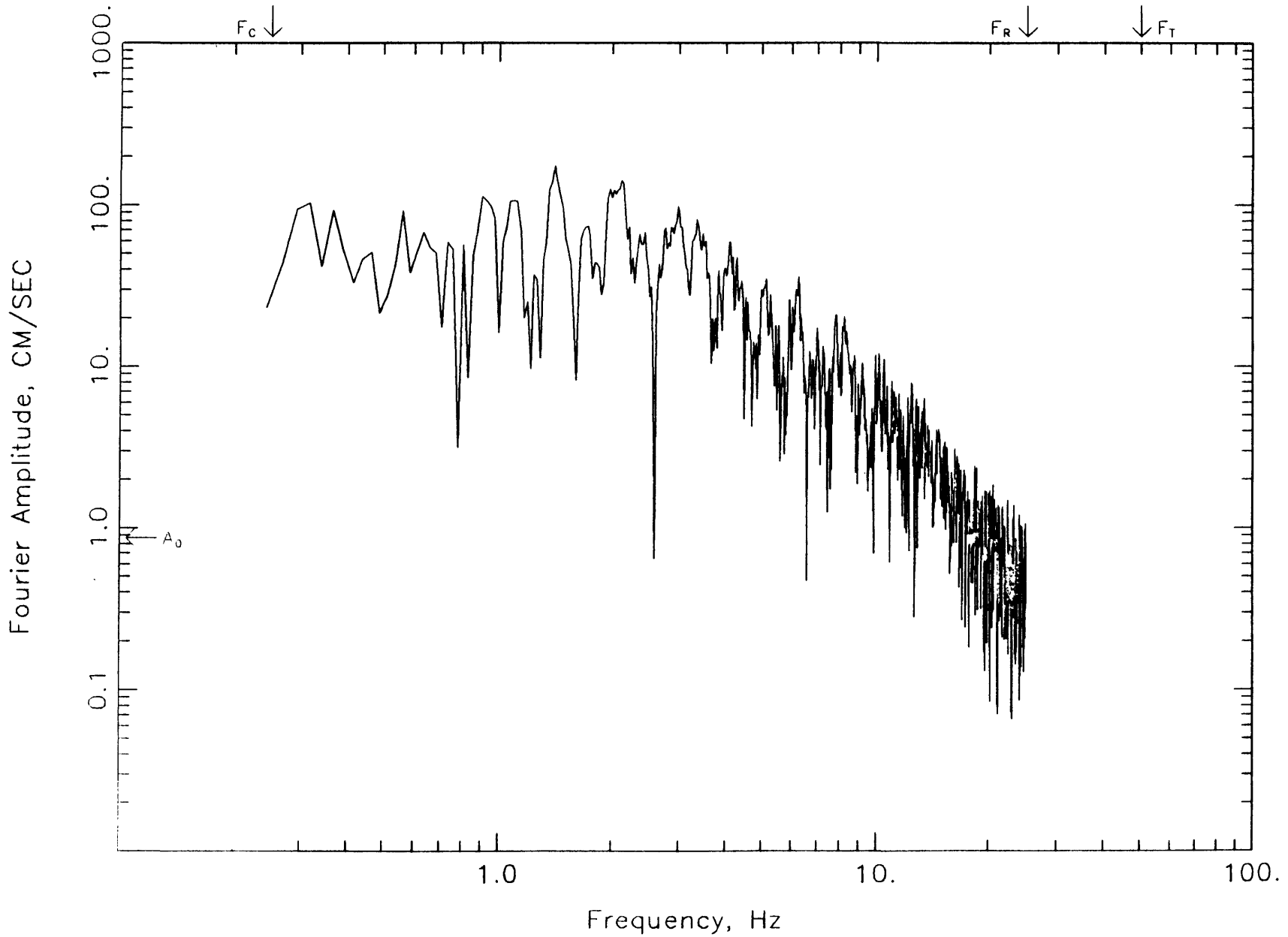
Fourier Amplitude Spectrum of Acceleration
STANFORD PARKING GARAGE, GRND LEVEL
360 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



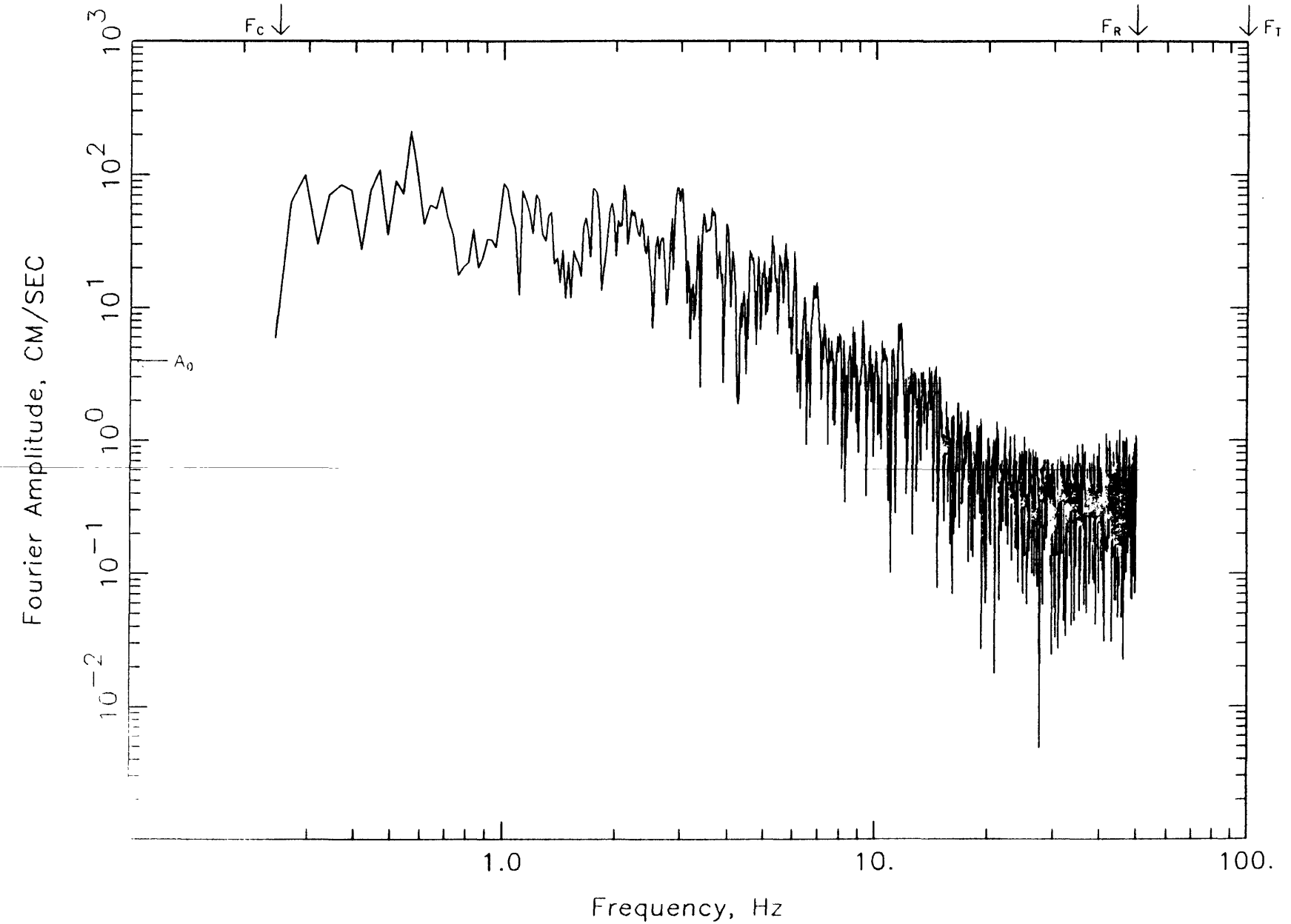
Fourier Amplitude Spectrum of Acceleration
STANFORD PARKING GARAGE, GRND LEVEL
UP
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



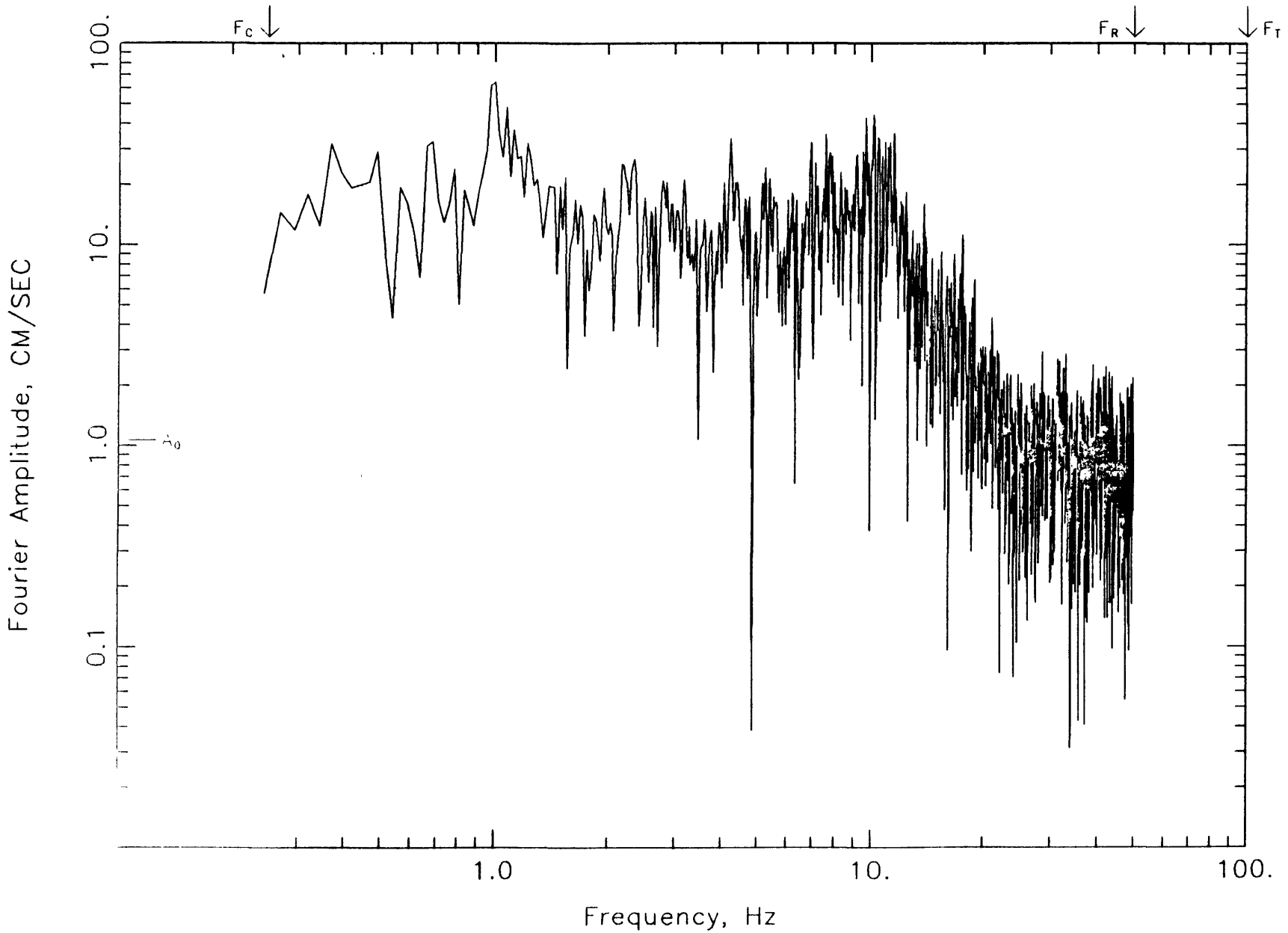
Fourier Amplitude Spectrum of Acceleration
STANFORD PARKING GARAGE, GRND LEVEL
90 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



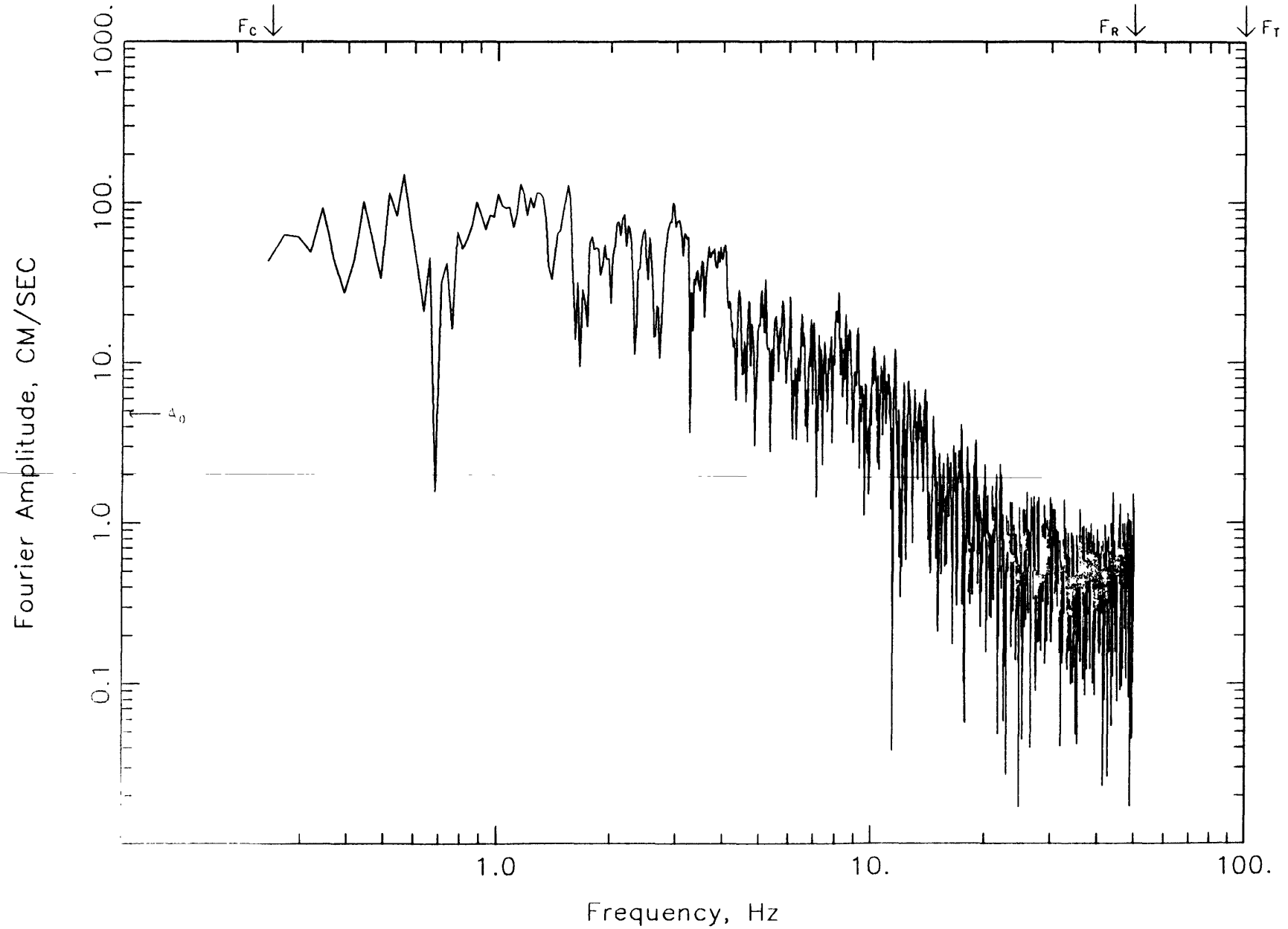
Fourier Amplitude Spectrum of Acceleration
MENLO PARK VA HOSPITAL - BLDG 137
110 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



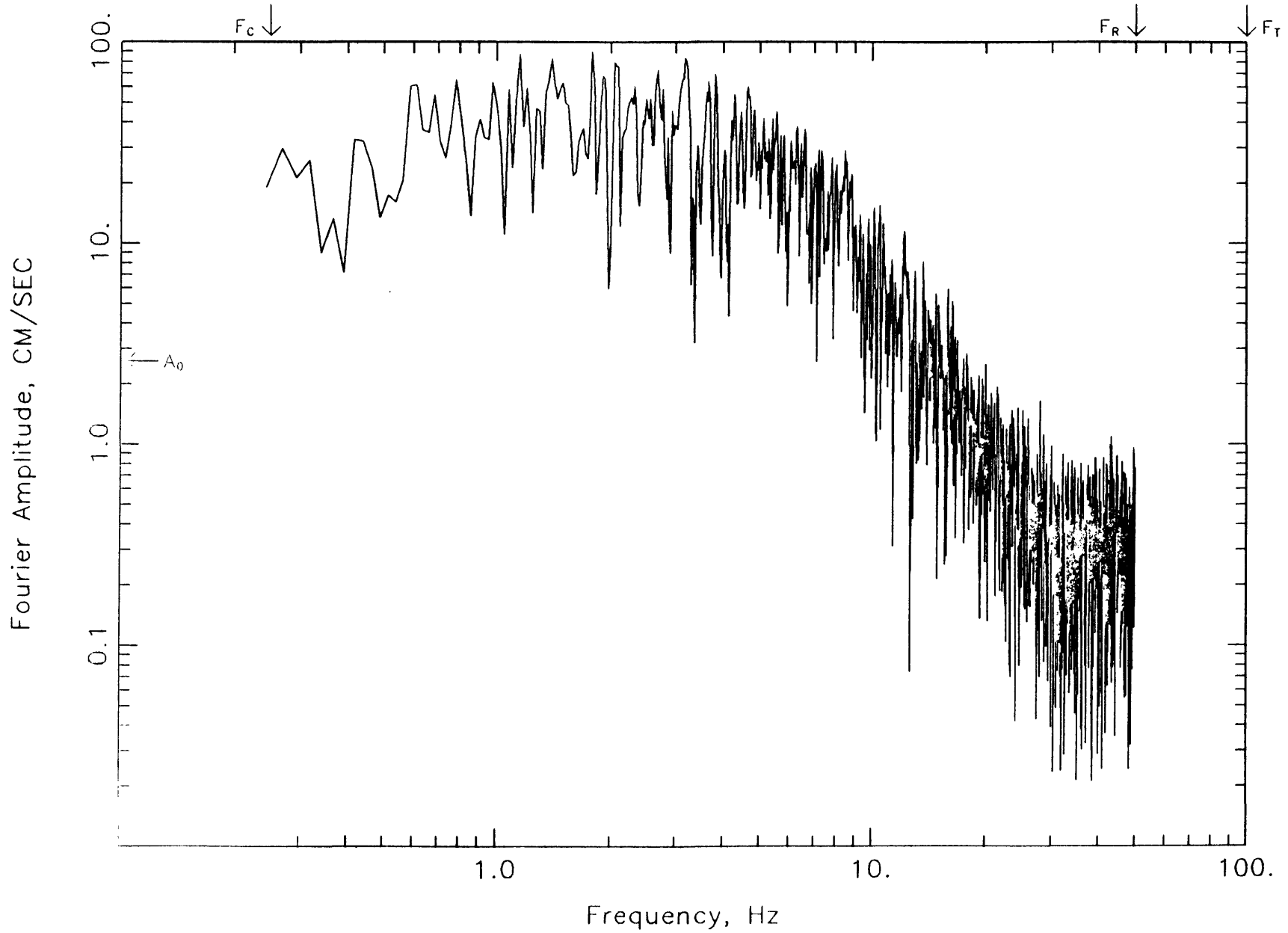
Fourier Amplitude Spectrum of Acceleration
MENLO PARK VA HOSPITAL – BLDG 137
UP
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



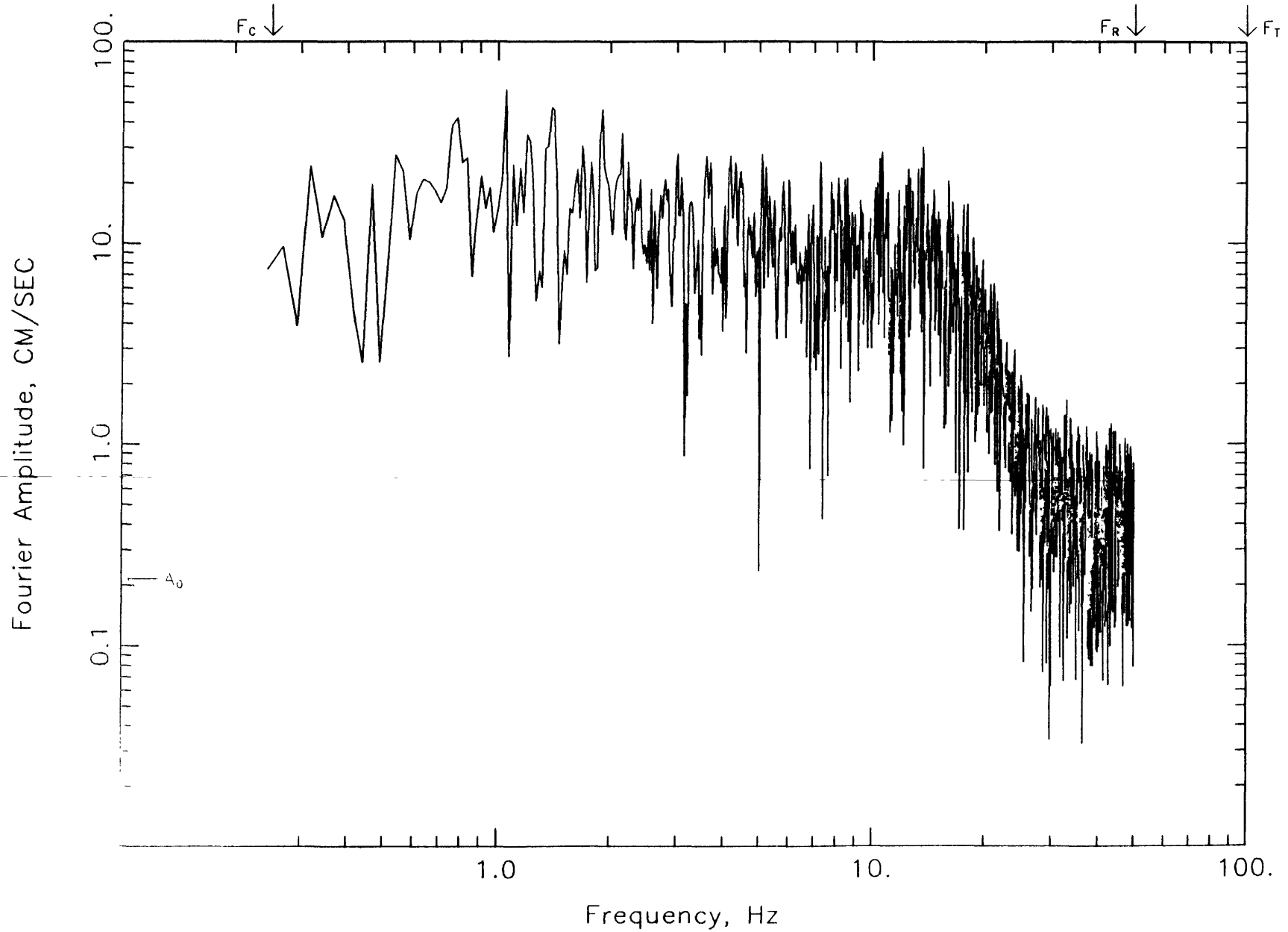
Fourier Amplitude Spectrum of Acceleration
MENLO PARK VA HOSPITAL - BLDG 137
20 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



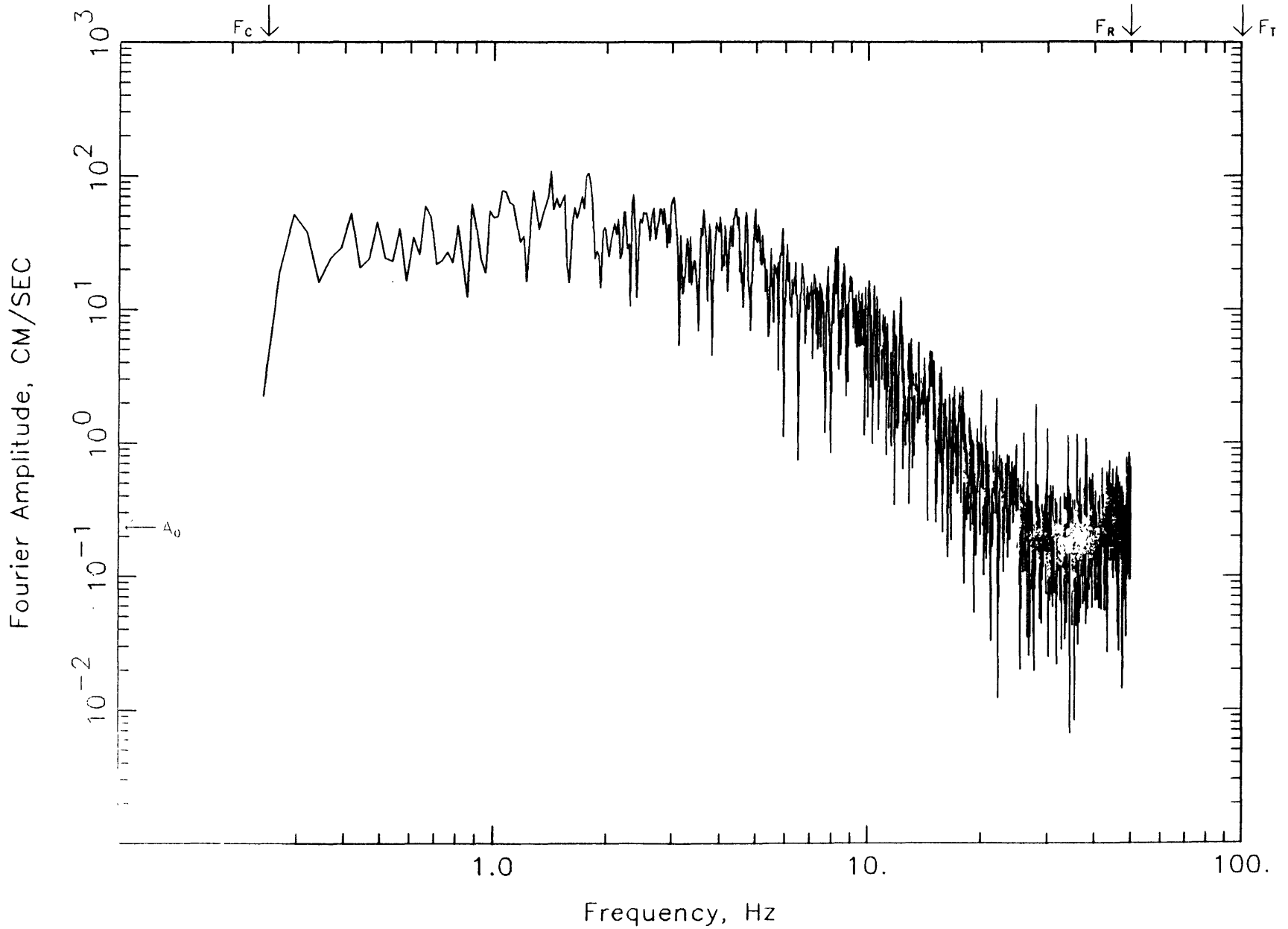
Fourier Amplitude Spectrum of Acceleration
CALAVERAS ARRAY - FREMONT, EMERSON CT.
180 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



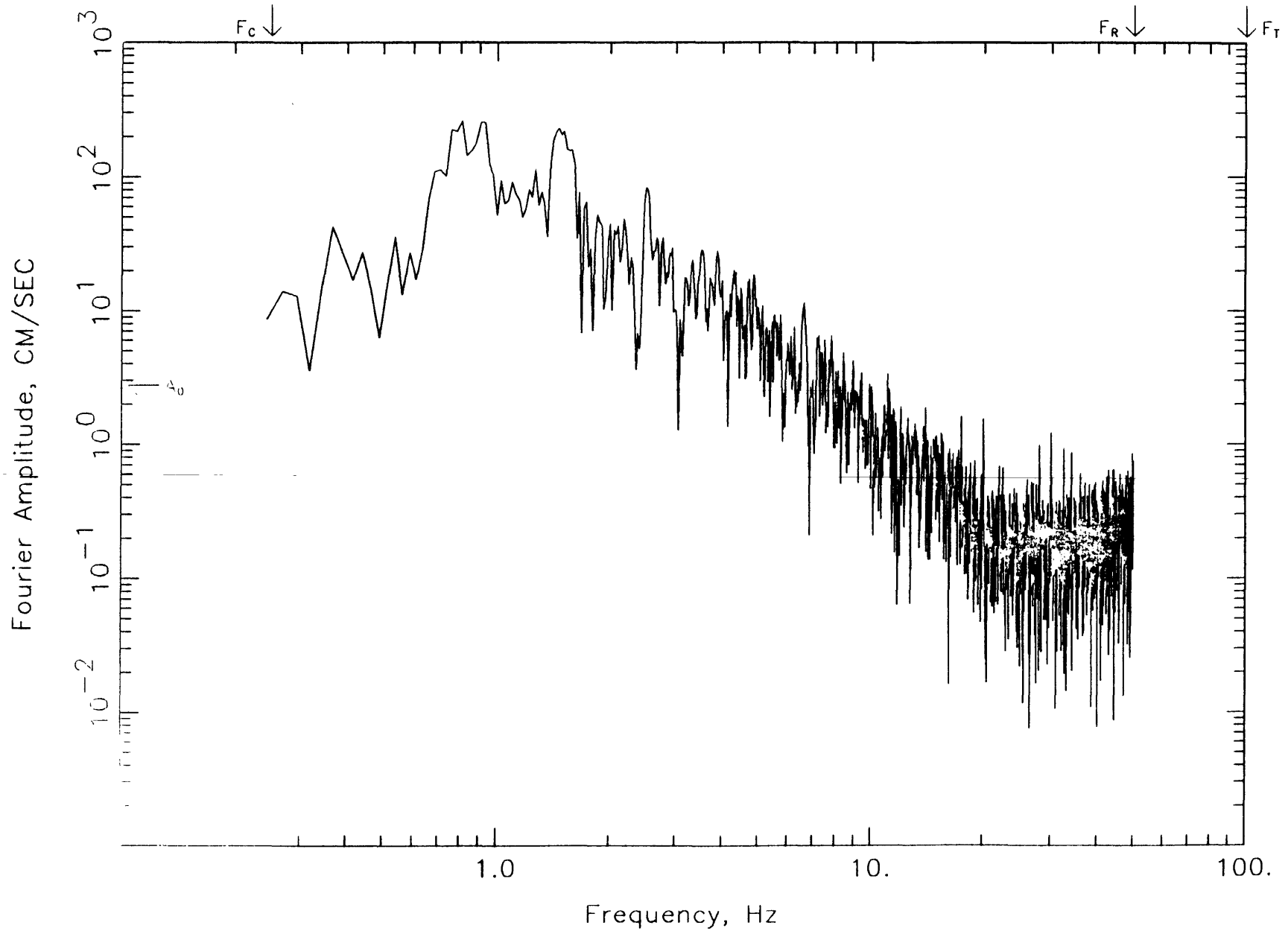
Fourier Amplitude Spectrum of Acceleration
CALAVERAS ARRAY - FREMONT, EMERSON CT.
UP
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



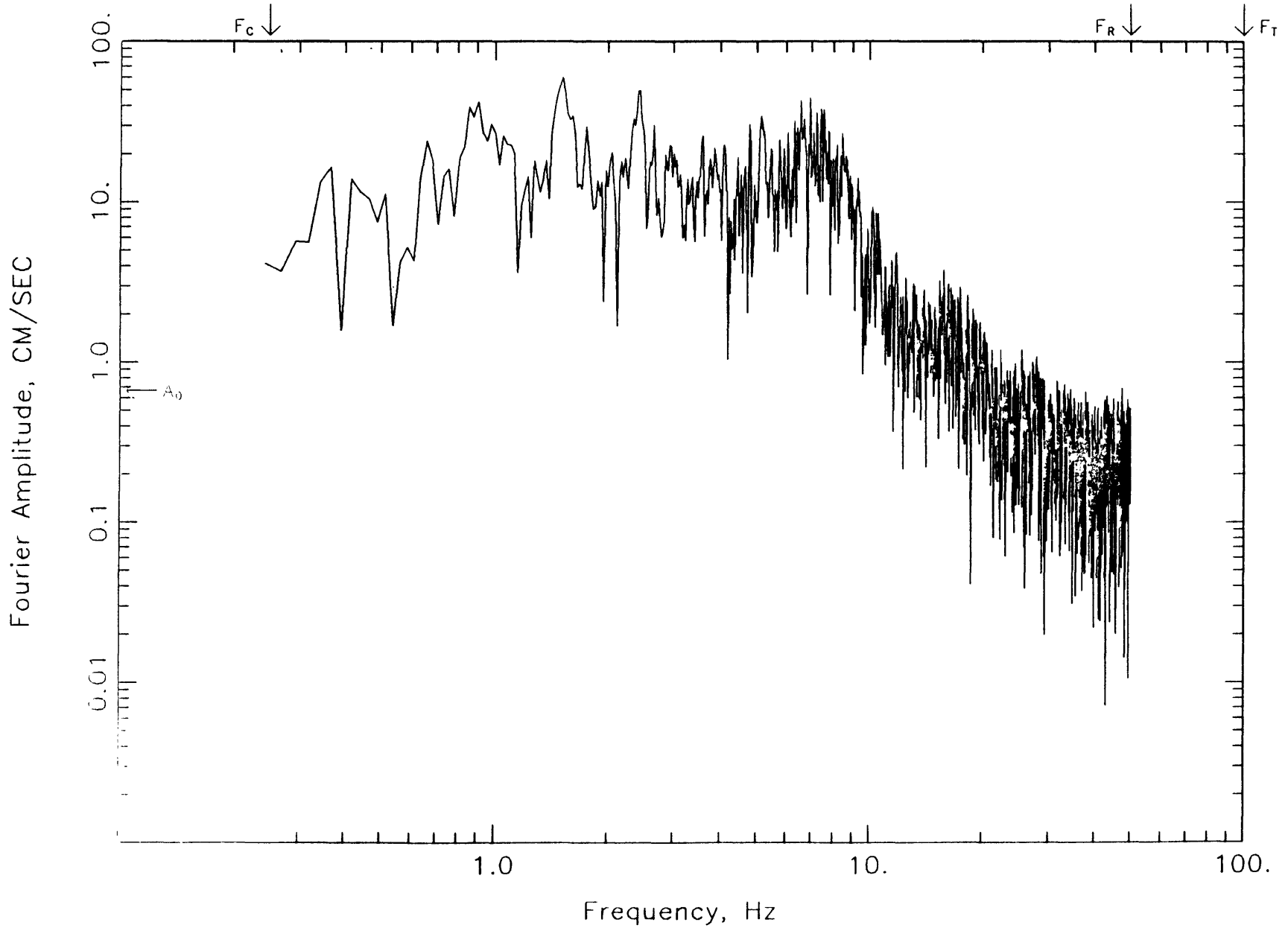
Fourier Amplitude Spectrum of Acceleration
CALAVERAS ARRAY - FREMONT, EMERSON CT.
090 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



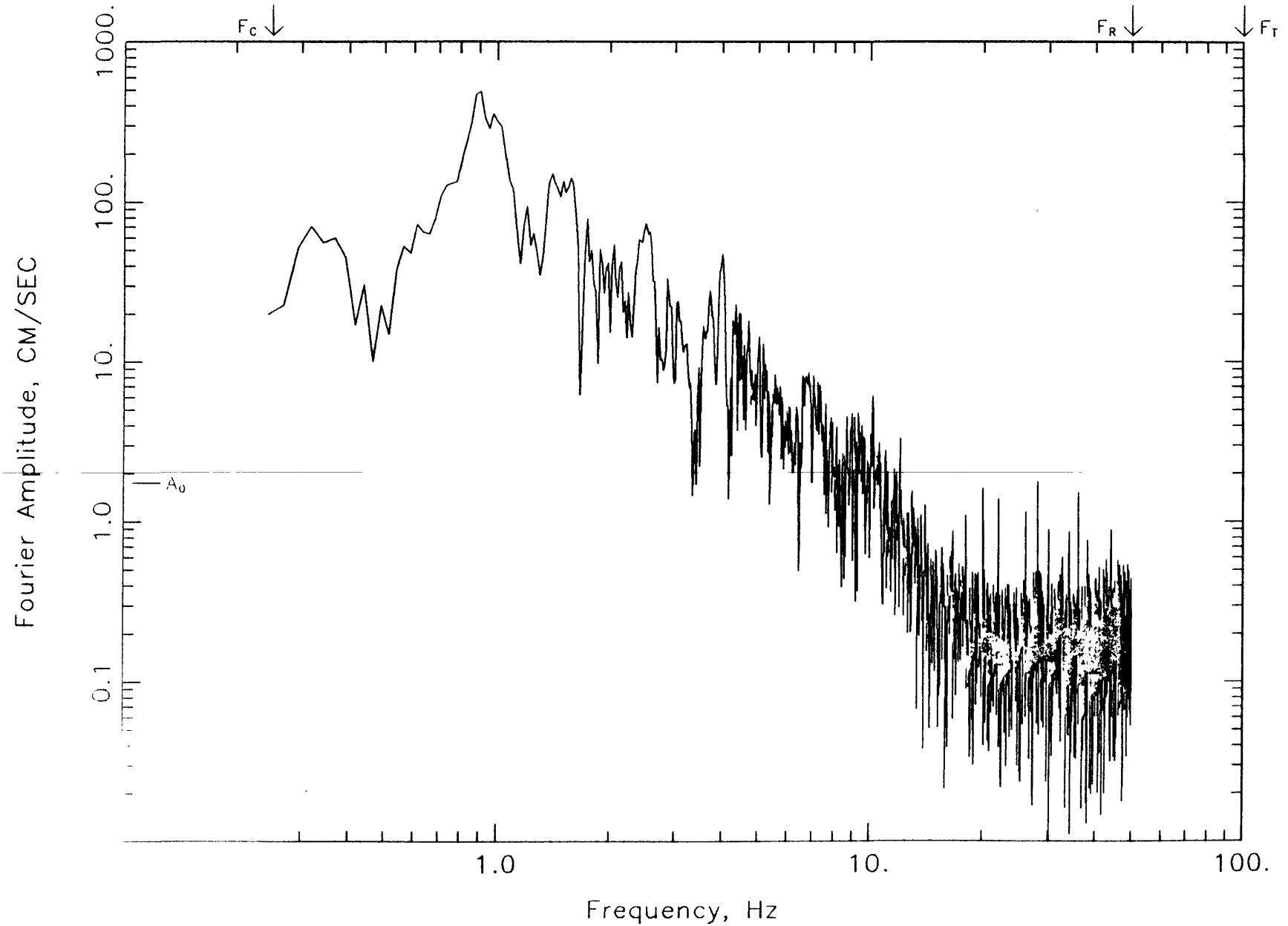
Fourier Amplitude Spectrum of Acceleration
APEEL ARRAY #2, REDWOOD CITY
133 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



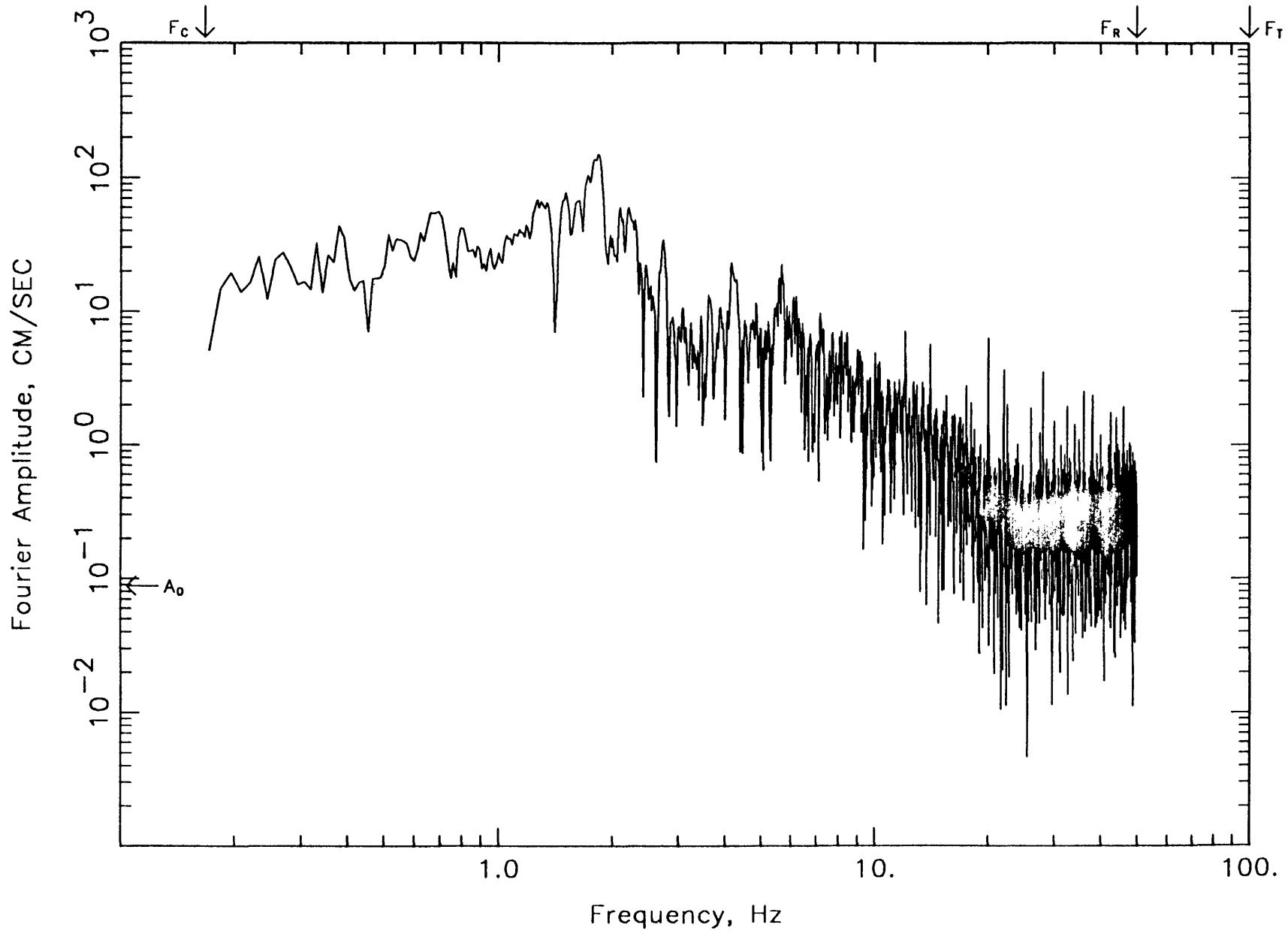
Fourier Amplitude Spectrum of Acceleration
APEEL ARRAY #2, REDWOOD CITY
UP
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



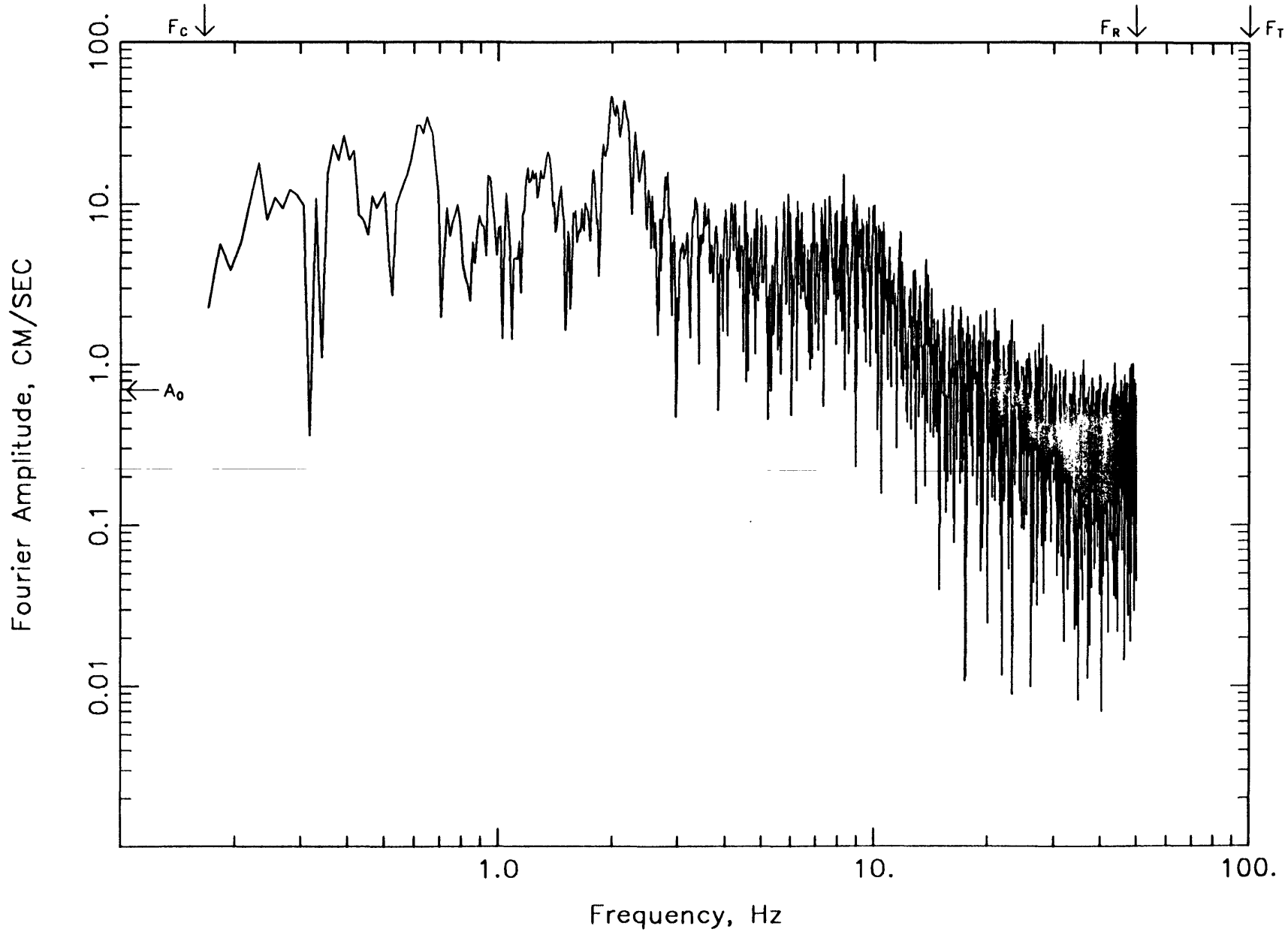
Fourier Amplitude Spectrum of Acceleration
APEEL ARRAY #2, REDWOOD CITY
043 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT 0.25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



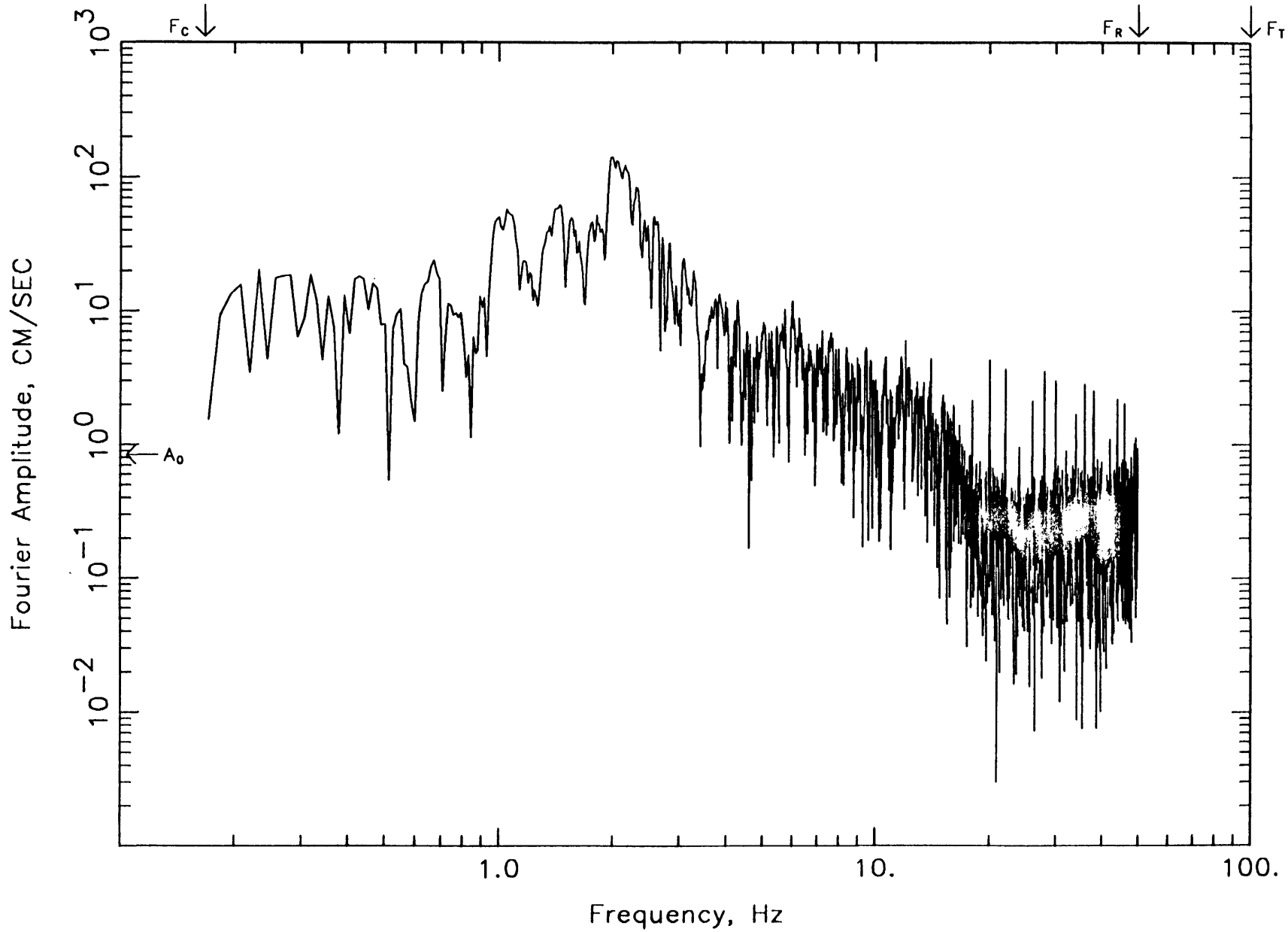
Fourier Amplitude Spectrum of Acceleration
SAN FRANCISCO, TRANSAMERICA BLDG – BASEMENT
261 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



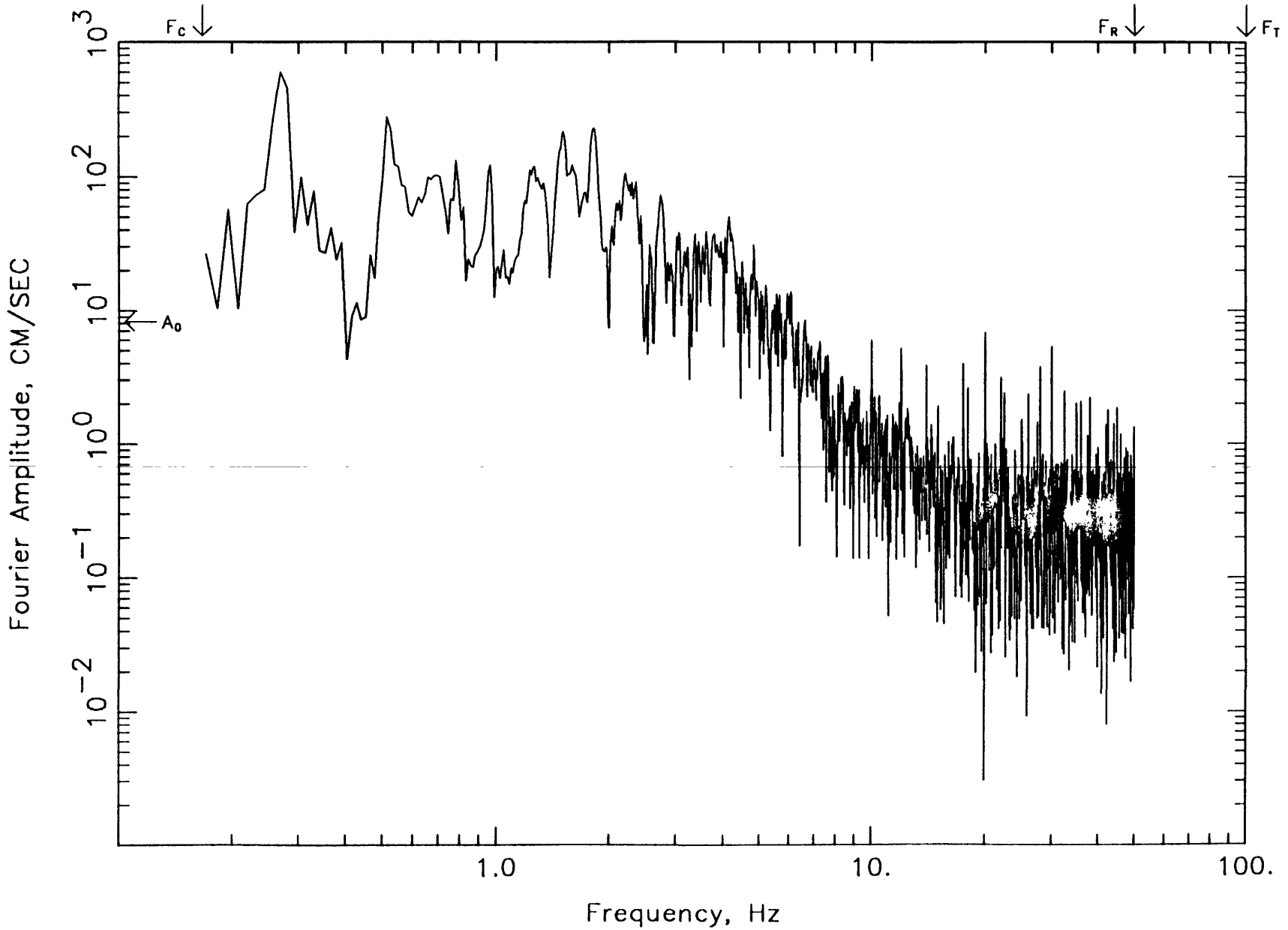
Fourier Amplitude Spectrum of Acceleration
SAN FRANCISCO, TRANSAMERICA BLDG - BASEMENT
UP
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



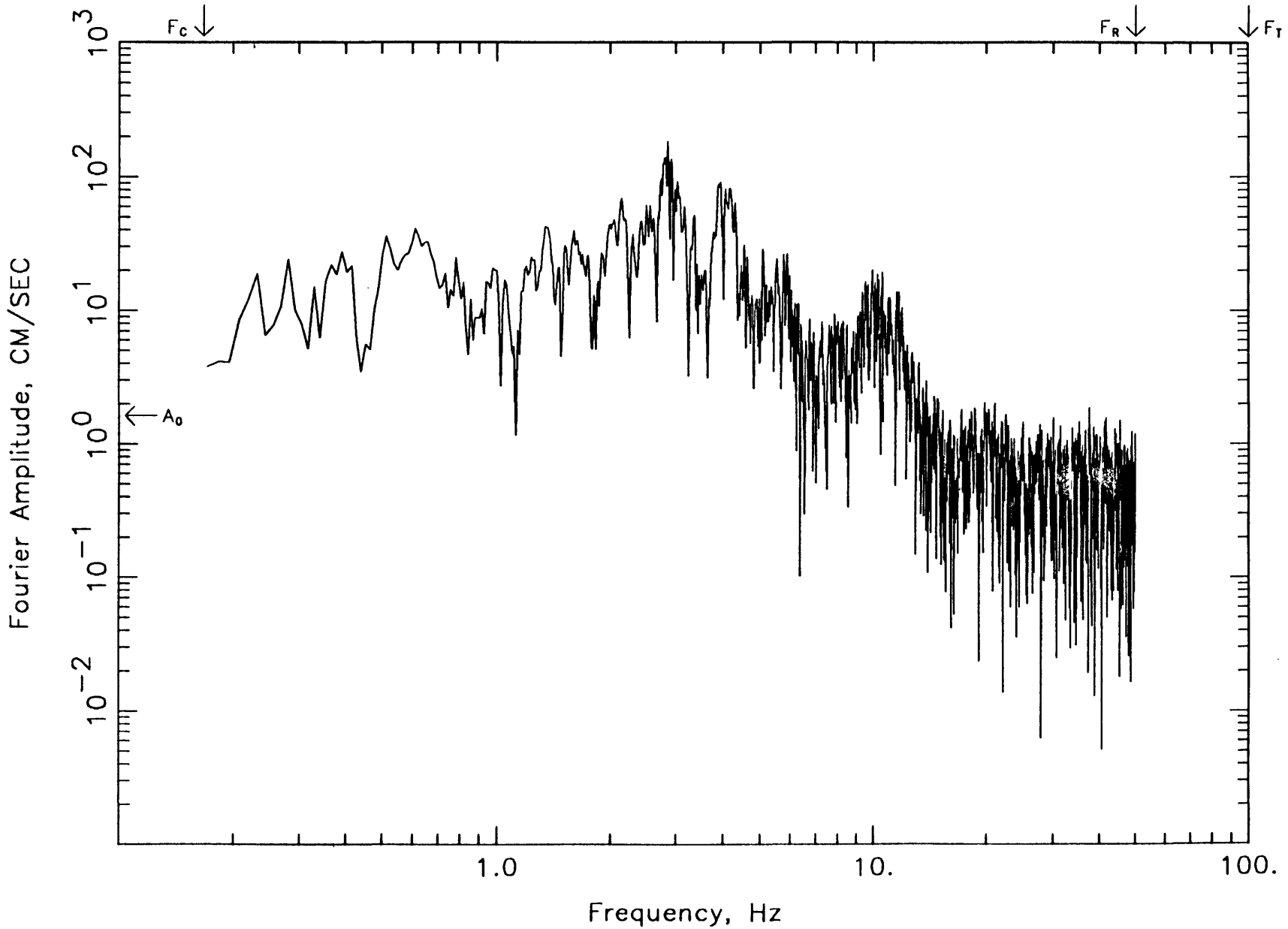
Fourier Amplitude Spectrum of Acceleration
SAN FRANCISCO, TRANSAMERICA BLDG – BASEMENT
171 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



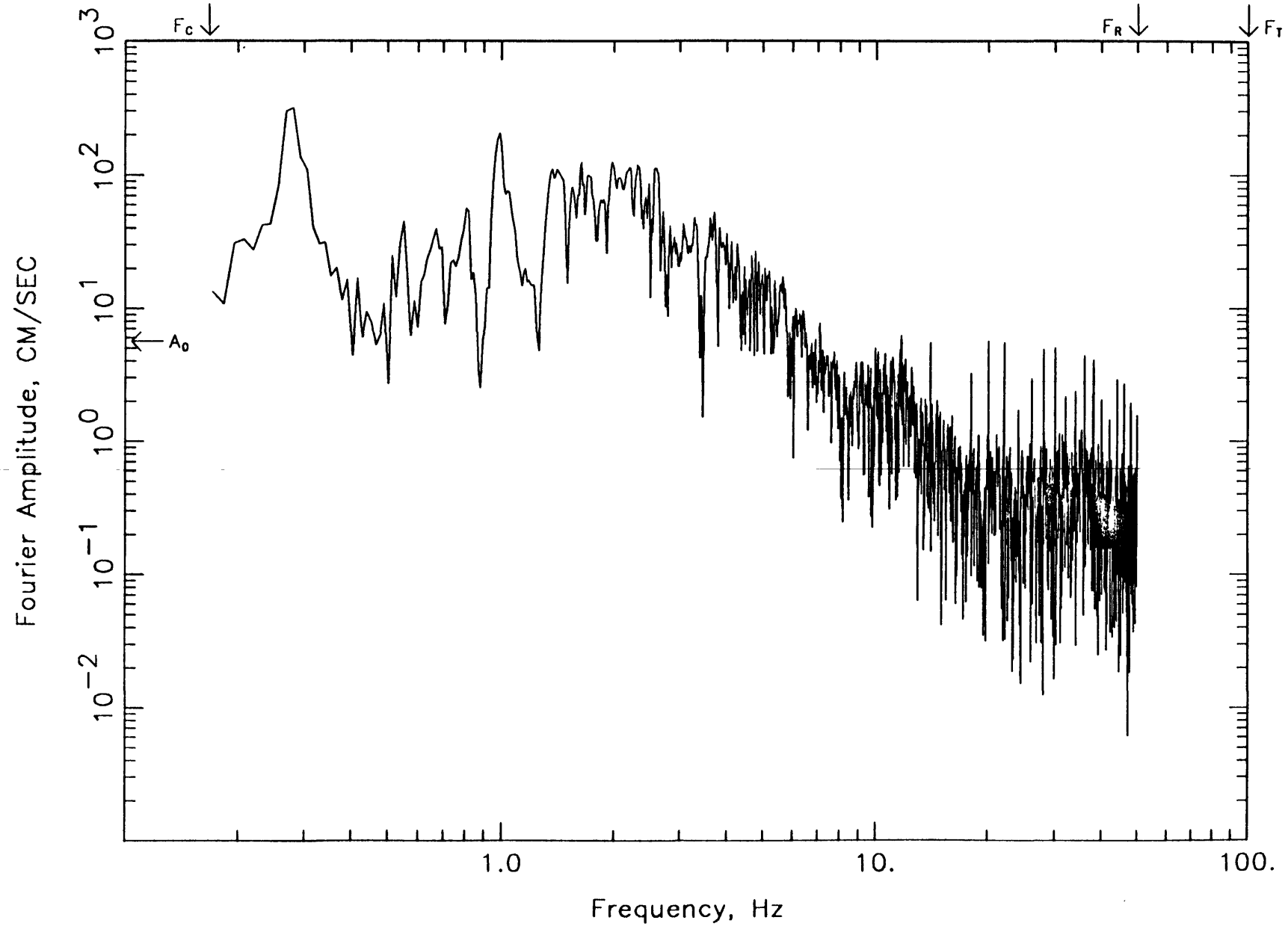
Fourier Amplitude Spectrum of Acceleration
SAN FRANCISCO, TRANSAMERICA BLDG – 29TH FLOOR
261 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



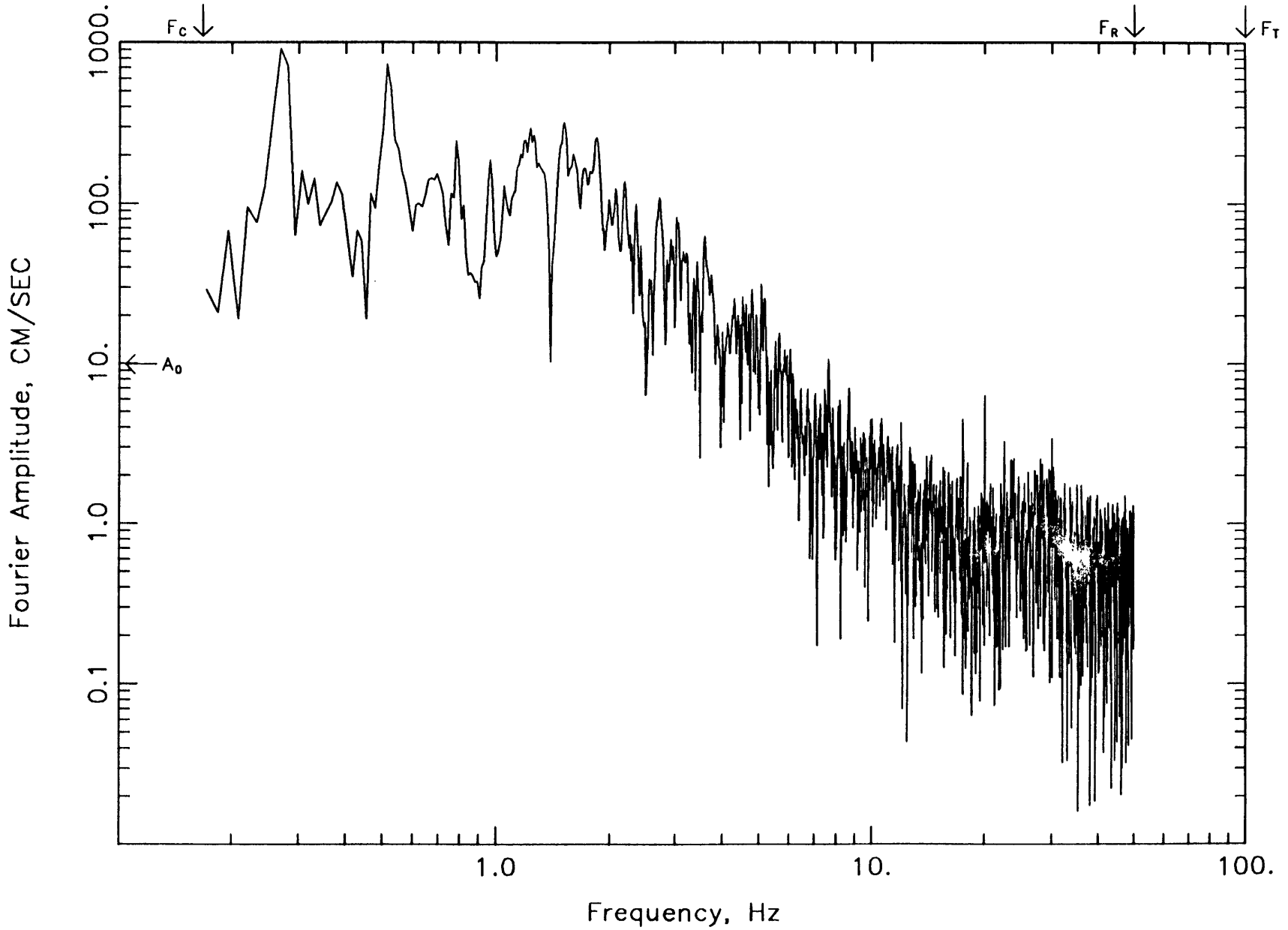
Fourier Amplitude Spectrum of Acceleration
SAN FRANCISCO, TRANSAMERICA BLDG - 29TH FLOOR
UP
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



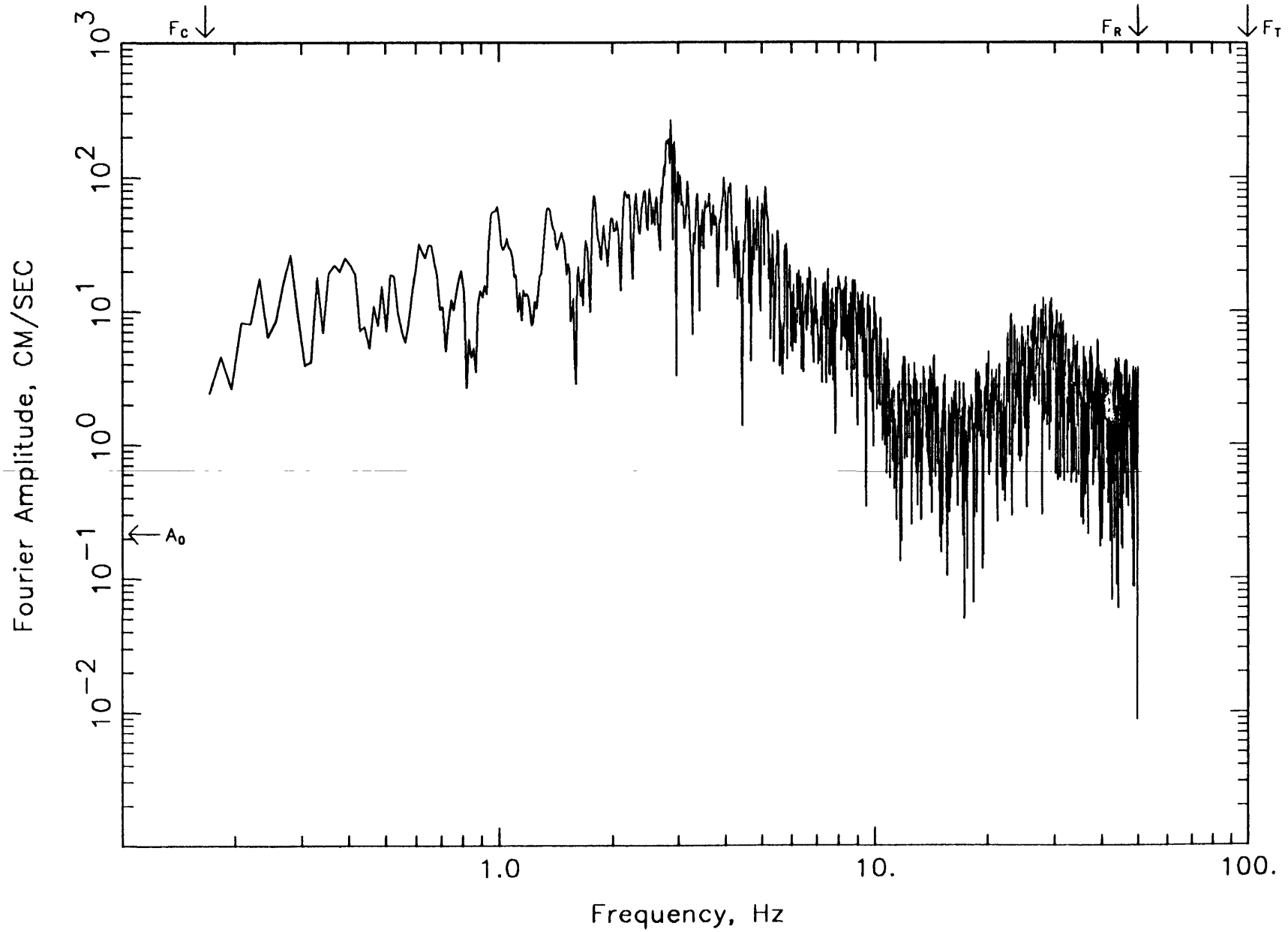
Fourier Amplitude Spectrum of Acceleration
SAN FRANCISCO, TRANSAMERICA BLDG – 29TH FLOOR
171 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



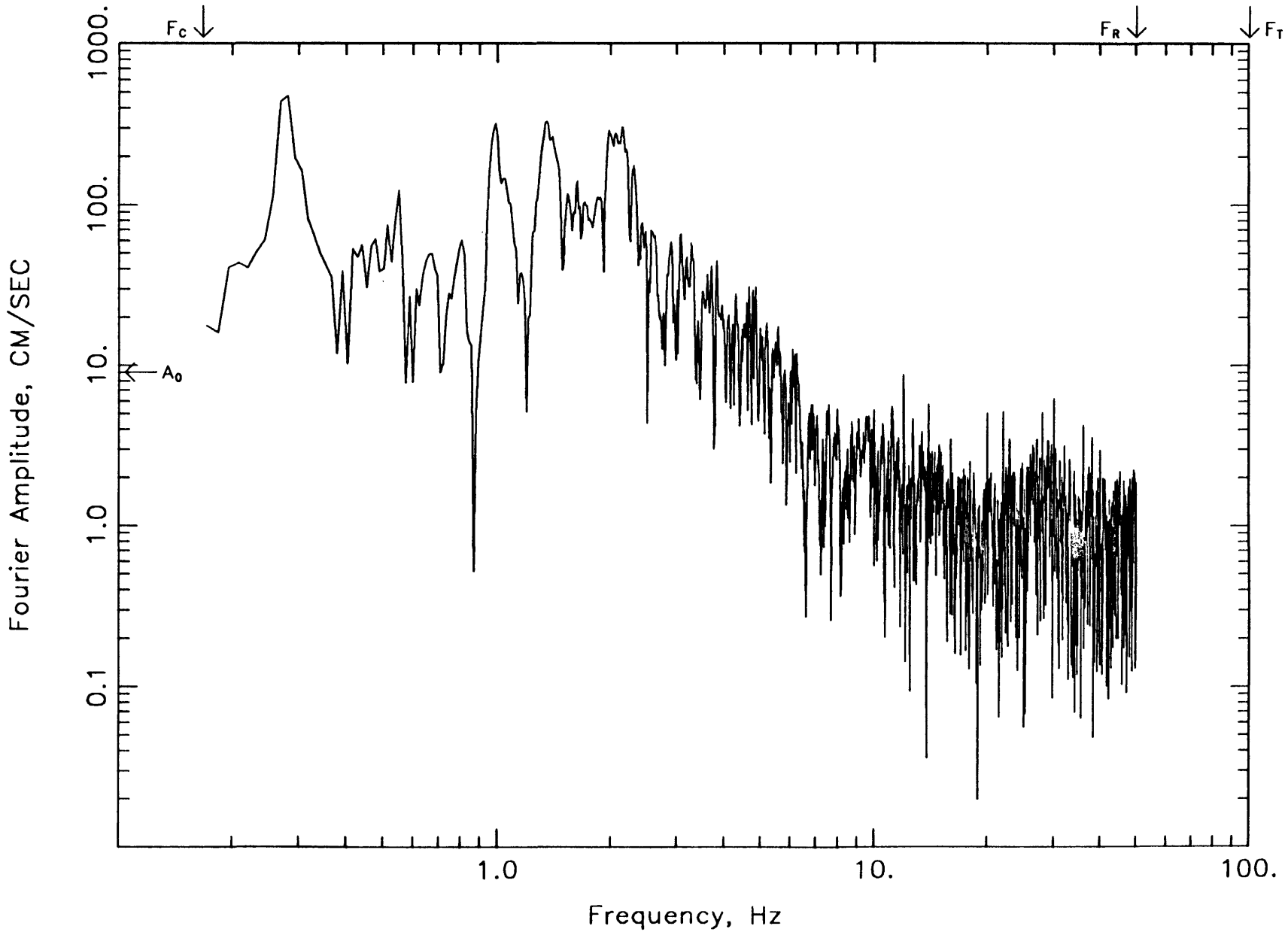
Fourier Amplitude Spectrum of Acceleration
SAN FRANCISCO, TRANSAMERICA BLDG - 49TH FLOOR
261 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



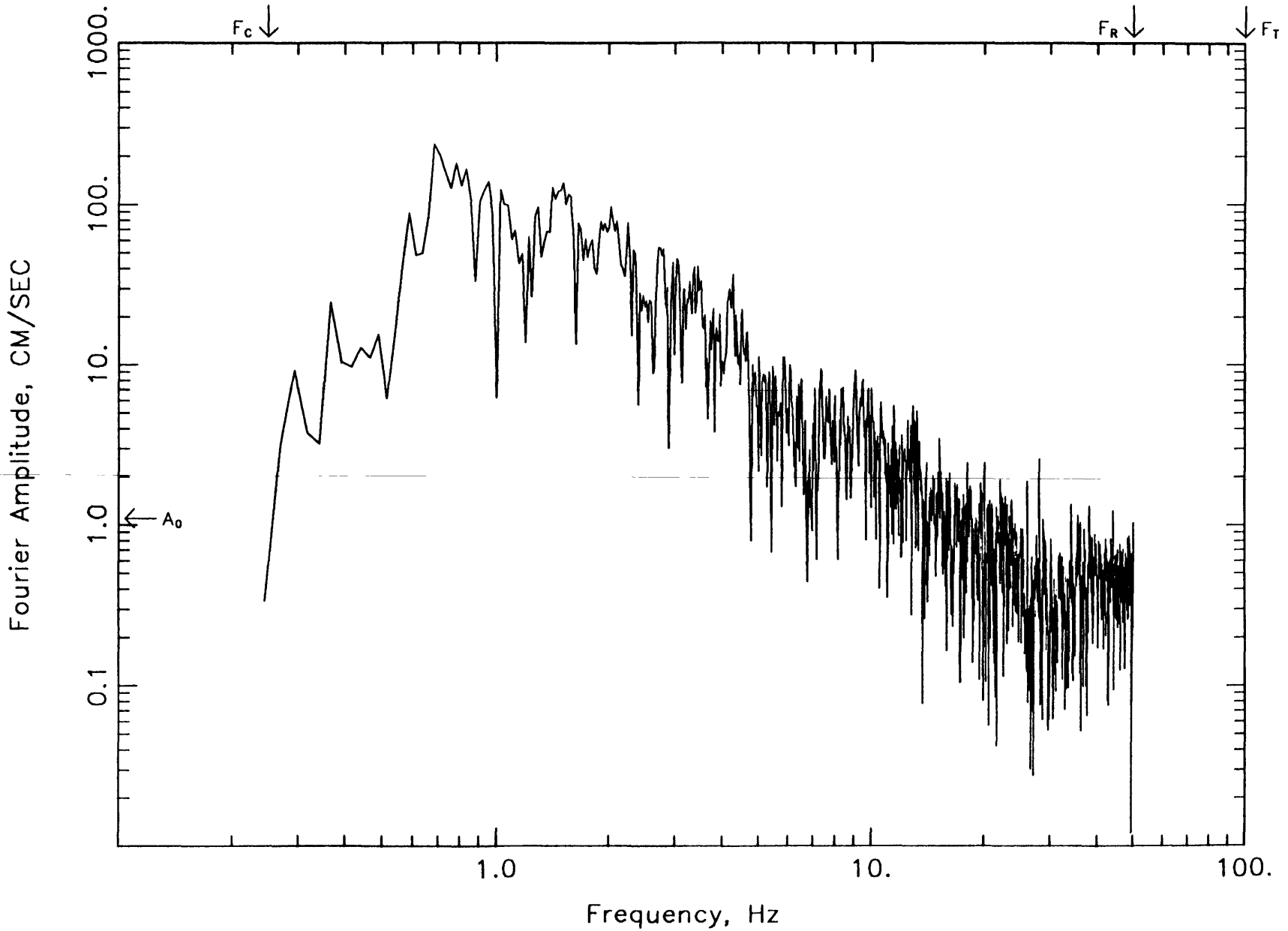
Fourier Amplitude Spectrum of Acceleration
SAN FRANCISCO, TRANSAMERICA BLDG – 49TH FLOOR
UP
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



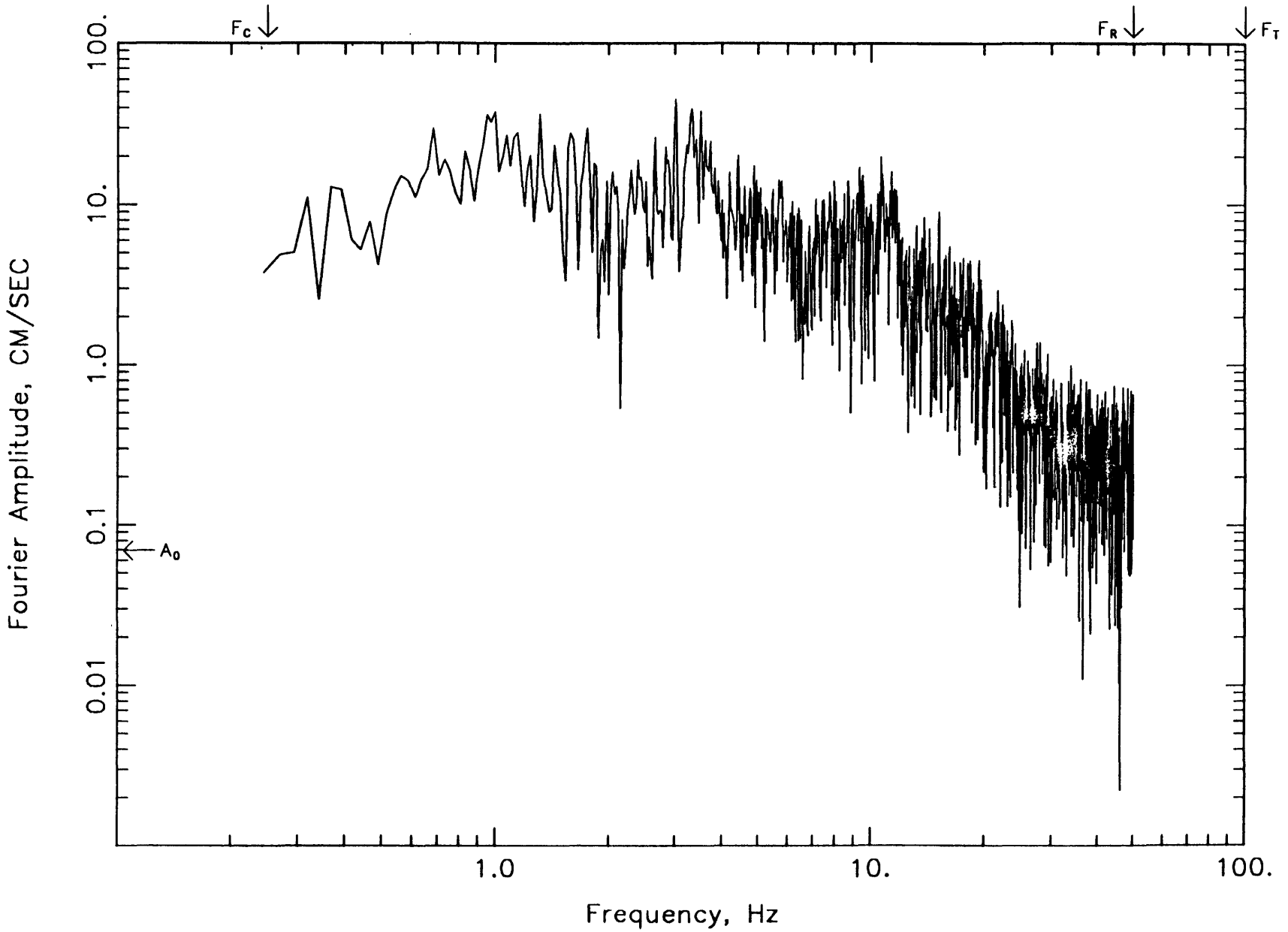
Fourier Amplitude Spectrum of Acceleration
SAN FRANCISCO, TRANSAMERICA BLDG – 49TH FLOOR
171 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .167 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



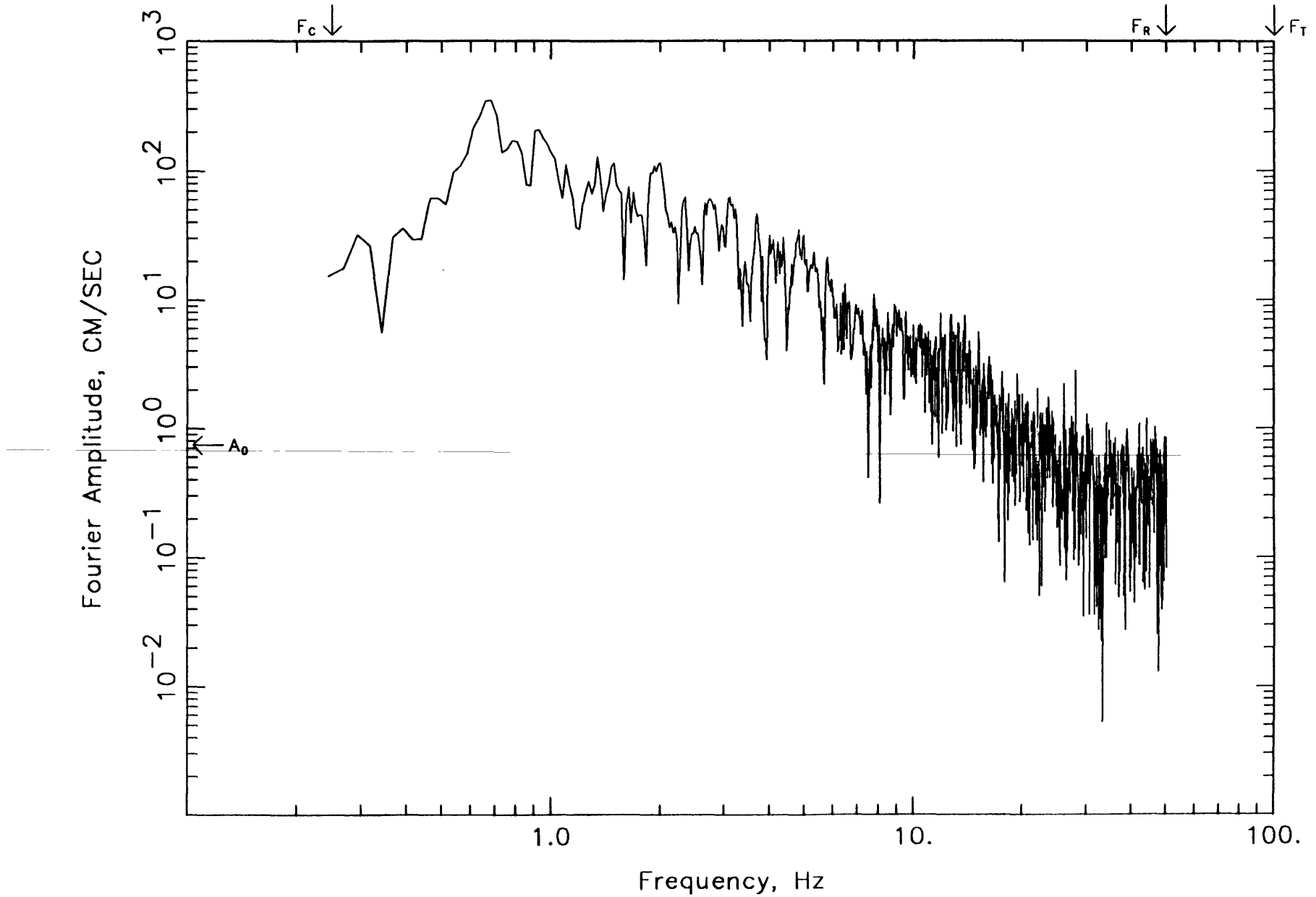
Fourier Amplitude Spectrum of Acceleration
EMERYVILLE – 6363 CHRISTIE AVE, S GROUND SITE
350 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



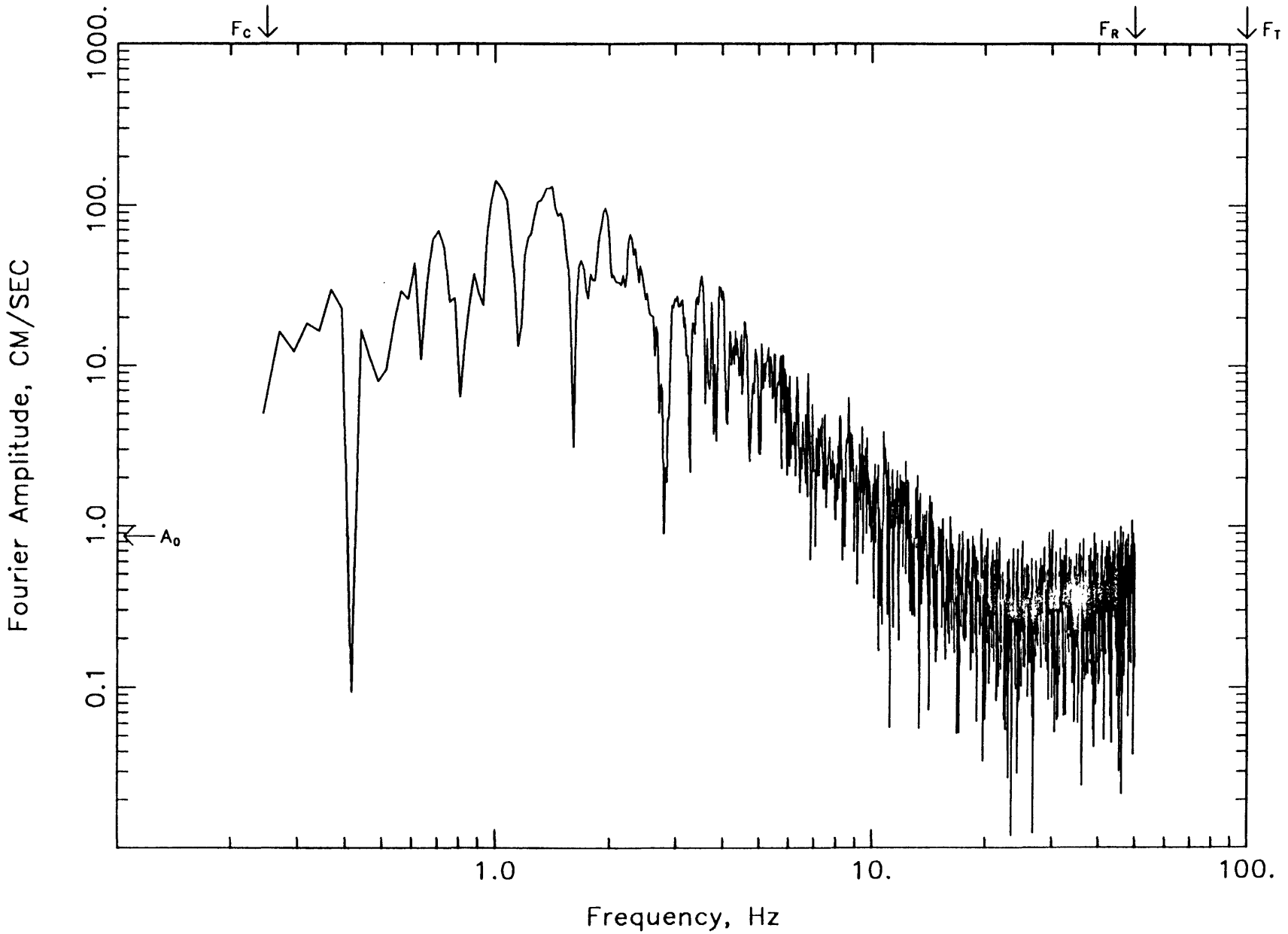
Fourier Amplitude Spectrum of Acceleration
EMERYVILLE – 6363 CHRISTIE AVE, S GROUND SITE
UP
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



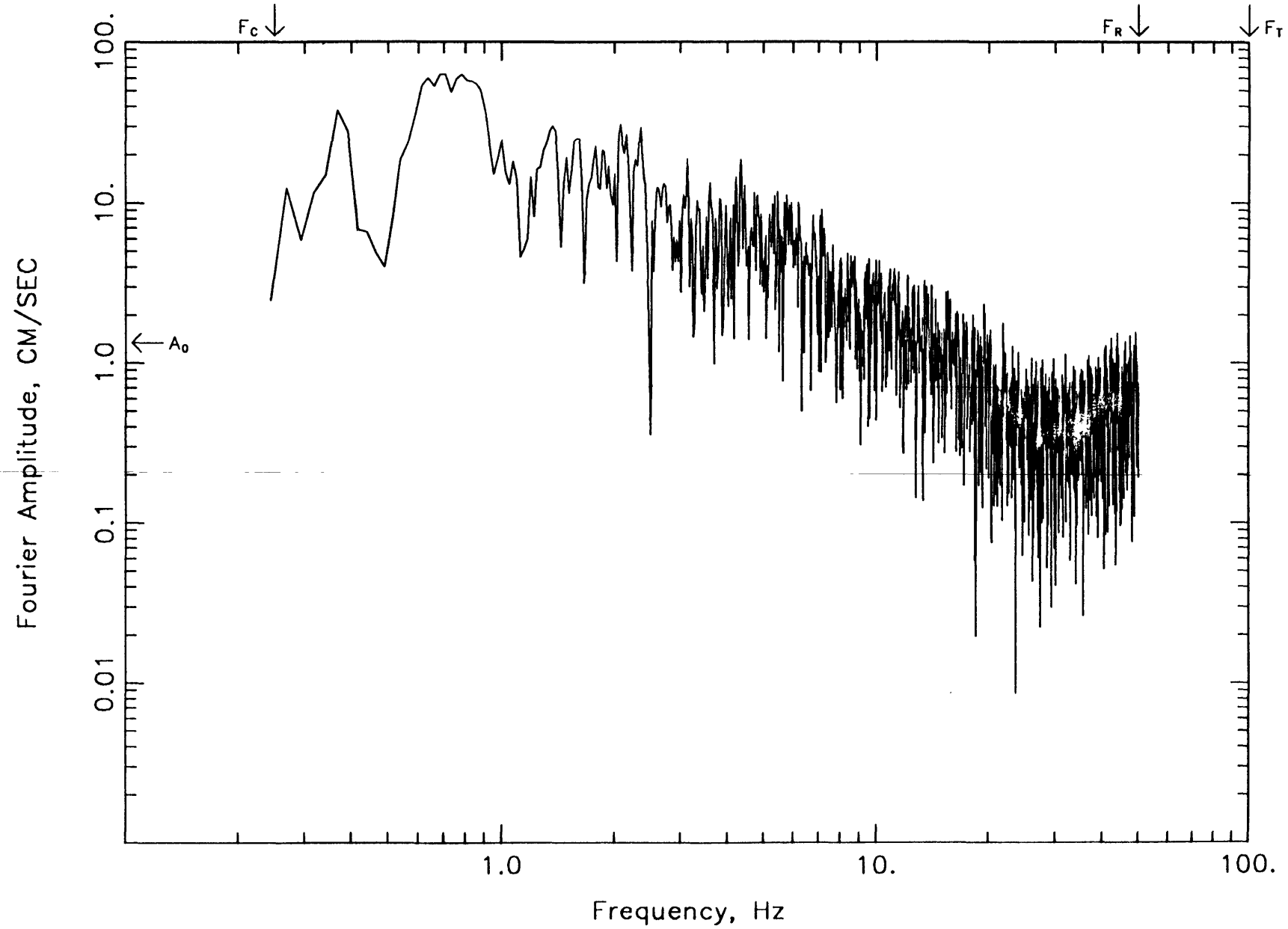
Fourier Amplitude Spectrum of Acceleration
EMERYVILLE - 6363 CHRISTIE AVE, S GROUND SITE
260 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 - 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



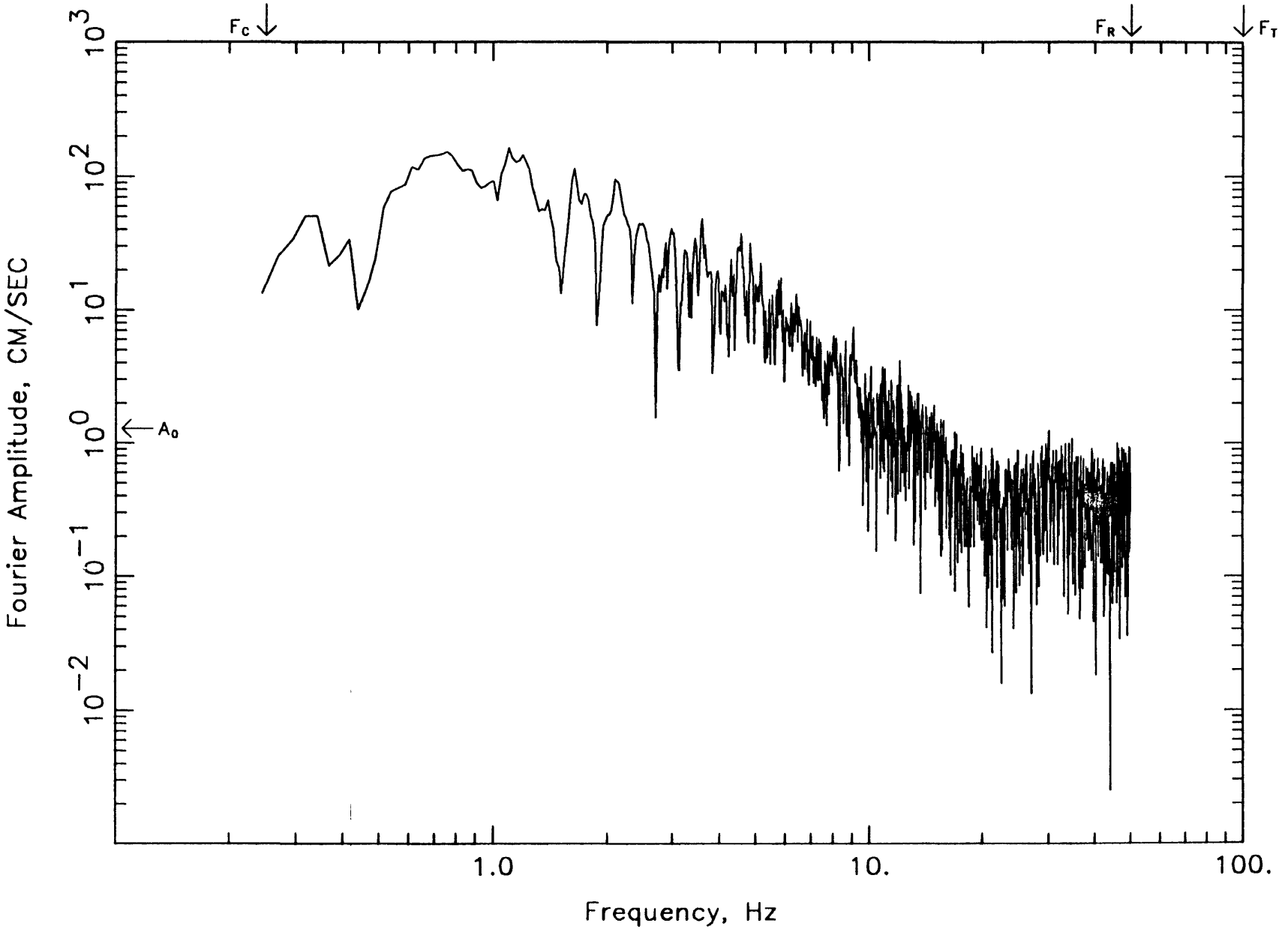
Fourier Amplitude Spectrum of Acceleration
SAN FRANCISCO – GOLDEN GATE BRIDGE, ABUTMENT BLDG
360 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



Fourier Amplitude Spectrum of Acceleration
SAN FRANCISCO – GOLDEN GATE BRIDGE, ABUTMENT BLDG
UP
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



Fourier Amplitude Spectrum of Acceleration
SAN FRANCISCO – GOLDEN GATE BRIDGE, ABUTMENT BLDG
270 DEGREES
EARTHQUAKE OF OCTOBER 18, 1989 – 0004 GMT
BUTTERWORTH AT .25 HZ, ORDER 4
Computing Options= ZCROSS,NONOISE



(p. 266 follows)

APPENDIX 5

CURRENT LIST OF PROCESSED RECORDS

CURRENT LIST OF PROCESSED RECORDS

USGS processing of records from the USGS Cooperative 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, documenting the digital data on tape. Contact the USGS for reports; NGDC for tapes (see Preface).

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)
		OFR 89-122 (Brady and others, 1989a)
November 24, 1987; 0154 and 1315	Superstition Hills, California; MS 6.2 and MS 6.6	OFR 89-87 (Brady and others, 1989b)
October 18, 1989; 0004	Loma Prieta, California; MS 7.1	OFR 90-XXX (Brady and Mork, 1990)

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, El Centro Hospital
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 84-626.
Records (13): May 2, 1983, 2342 Gmt:
Pleasant Valley Pump Plant: switchyard, basement
(This is a U.S. Bureau of Reclamation station)

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,
(U.S. BuRec) 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
(U.S. BuRec)
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
(This is a U.S. Bureau of Reclamation station)
San Jose 101/280/680 bridge
Hollister Differential Array No. 1, 3, 4, 5

December 23, 1985; with foreshock and aftershocks; Northwest Territories, Canada; 86-1-PGC.
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, 5, 6

October 1, 1987; Whittier Narrows, California, Volume 1; 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

October 1, 1987; Records (11)	Whittier Narrows, California, Volume 2; OFR 89-122 Los Angeles, 4407 Jasper Street Los Angeles, Griffith Park Observatory Orange County Reservoir: Abutment Brea Dam: Crest, left abutment, downstream Carbon Canyon Dam: Crest, left abutment Long Beach; Calif. State Univ. Long Beach Santa Ana River Bridge: North abutment (SMA-1) North abutment, traces 1-3 Mid-span, traces 4-6 Below isolator, traces 7-9 Above isolator, traces 10-12
November 24, 1987; 0154 and 1315; Records (2)	Superstition Hills, California, OFR 89-87 Imperial Wildlife Liquefaction Array
October 18, 1989; 0004; Records (18)	Loma Prieta, California, OFR 90-XXX Anderson Dam: Crest, left abutment, downstream Sunnyvale, Colton Avenue Hollister Airport Differential Array Palo Alto VA Hospital, Bldg. 1: Basement, roof Hollister City Hall: Basement Stanford University, SLAC: Test lab Stanford University, Parking garage Menlo Park VA Hospital, Bldg. 37 Fremont, Emerson Court APEEL Array Stn. 2, Redwood City San Francisco, 600 Montgomery St.: Basement, 29th, 49th Emeryville, 6363 Christie: Ground site south San Francisco, Golden Gate Bridge

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