Data Report No. 0103

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1985 Kenya Rift International Seismic Project (KRISP 85) Teleseismic Experiment

The 1985 Kenya Rift International Seismic Project (KRISP 85) teleseismic experiment consisted of two arrays (Figure 1), a 110 x 100 km two-dimensional array (Green et al., 1991) and a 500-km long E-W linear array (Dahlheim et al., 1985). Both arrays crossed the central portion of the East Africa rift. The University of Wisconsin-Madison segment, a 2-dimensional reconnaissance P-wave experiment, was designed to investigate a Bouguer gravity anomaly aligned along the rift axis. Event data collected by the UW array are being made publicly available through the IRIS DMC as part of an NSF-supported project to archive historic UW-Madison digital seismic datasets collected by the research group of Prof. R. P. Meyer. In addition, event data from the concurrent E-W linear array are provided with the UW array data.

The UW teleseismic experiment was positioned to overlay much of the KRISP 85 refraction experiment in order to use the refraction data to constrain teleseismic-derived velocity models (Green, 1993; Green and Meyer, 1992; Green et al., 1991). The University of Wisconsin-Madison deployed fifteen 3-component digital seismographs in a 110 x 100 km array (Figure 1) from September 1 to December 15, 1985. Twenty-three sites were occupied due to relocation of several seismographs (see Table 1 for locations of the UW stations). During the 3 1/2 months of operation of the UW array, 84 teleseisms identified by the USGS (PDE) were recorded by 5 or more UW sites (Table 3). Of these, 27 events with near-vertical incidence arrivals (PKP) were analyzed by Green and Meyer (1992).

The University of California Los Angeles (UCLA) simultaneously operated 17 seismograph stations deployed on the E-W linear array which traversed the UW array (Dahlheim et al., 1989). Data from 12 of these sites (see Table 2 and Figure 1) are provided in this data report along with the UW instrumented data. Dahlheim et al. (1989) report 40 good quality events were recorded by the UCLA E-W profile. Data from 52 events are provided with this data report (see Table 4) including 22 events recorded by both arrays.

Data Collection and Processing

The University of Wisconsin instruments, equipped with HS10-1 1Hz natural frequency seismometers, were set to selectively trigger on teleseismic events and to record for 160 s at 50 samples/sec. The data have been assembled in the form of day volumes containing events listed in Table 3. The UW event data was preserved as SAC files containing station and timing information within the headers. The UCLA instruments used were 8 UCLA Digital Cartridge tape recorders, 3 Lennartz PCM 5800 and 3 Sprengnether DR100.(Dahlheim et al., 1989) and were set to record at 20 samples/s. Chronometers were checked every 4 to 8 days using traveling clocks set to Moscow radio time signals (Green, 1991). SAC file headers contain timing, station, and event information.

Tape Provided

The data archive consists of one DAT tape with the event- and day-volume data (in SAC format), this report in postscript and RTF formats, and miscellaneous information.

UW Seismic Recorders

The University of Wisconsin-Madison portable digital seismic recorders are wide-dynamic-range instruments (106 dB) designed for recording seismic waves from earthquakes or explosions (Table 5) [Powell, 1983]. Data from 1-Hz Hall-Sears HS-10-1 geophones were recorded at 50-Hz sampling rates, with a 4-pole Butterworth anti-aliasing filter at 12.5 Hz. A 13.6 kHz Omega receiver incorporated in each seismograph recorded data from the worldwide Omega navigational network concurrently with seismic signals. A timing-correction process developed for application to the UW seismic recorders provides 1/4 sample rms time error relative to Universal Time [Schneider et al., 1987]. Ground motion may be estimated from an average value for voltage sensitivity of 150 V/m/s for the UW Hall-Sears geophones.

Related publications:

Dahlheim, H., P. Davis, and U. Achauer, Teleseismic investigation of the East African Rift - Kenya, *U. J. Afric. Earth Sci.*, *8*, 461-470, 1989.

Green, W. Verney., Lithospheric Seismic Structure of the Cenozoic Kenya Rift and the Precambrian Midcontinent Rift from Teleseismic Tomography, Ph.D.. Thesis – University of Wisconsin-Madison, 178 pp., 1993

Green, W., and R. Meyer, Array observations of PKP phases across the Kenya Rift: Implications for structure and tectonics, *Tectonophysics, 204,* 41-58, 1992.

Green, W., U. Achauer, and R. Meyer, A three-dimensional seismic image of the crust and upper mantle beneath the Kenya rift, *Nature, 354,* 199-203, 1991.

Powell, L.A., Engineering Description of the U.W. Portable Digital Seismograph, Proceedings of the Committee on Controlled Source Seismology (CCSS), Workshop on Portable Digital Seismograph Development, Los Altos, California, 121-122, 1983.

Schneider, J.F., R.C. Aster, L.A. Powell, and R.P. Meyer, Timing of portable seismographs from Omega navigation signals, *Bull. Seismo. Soc. Am.*, *77*, 1457-1478, 1987.

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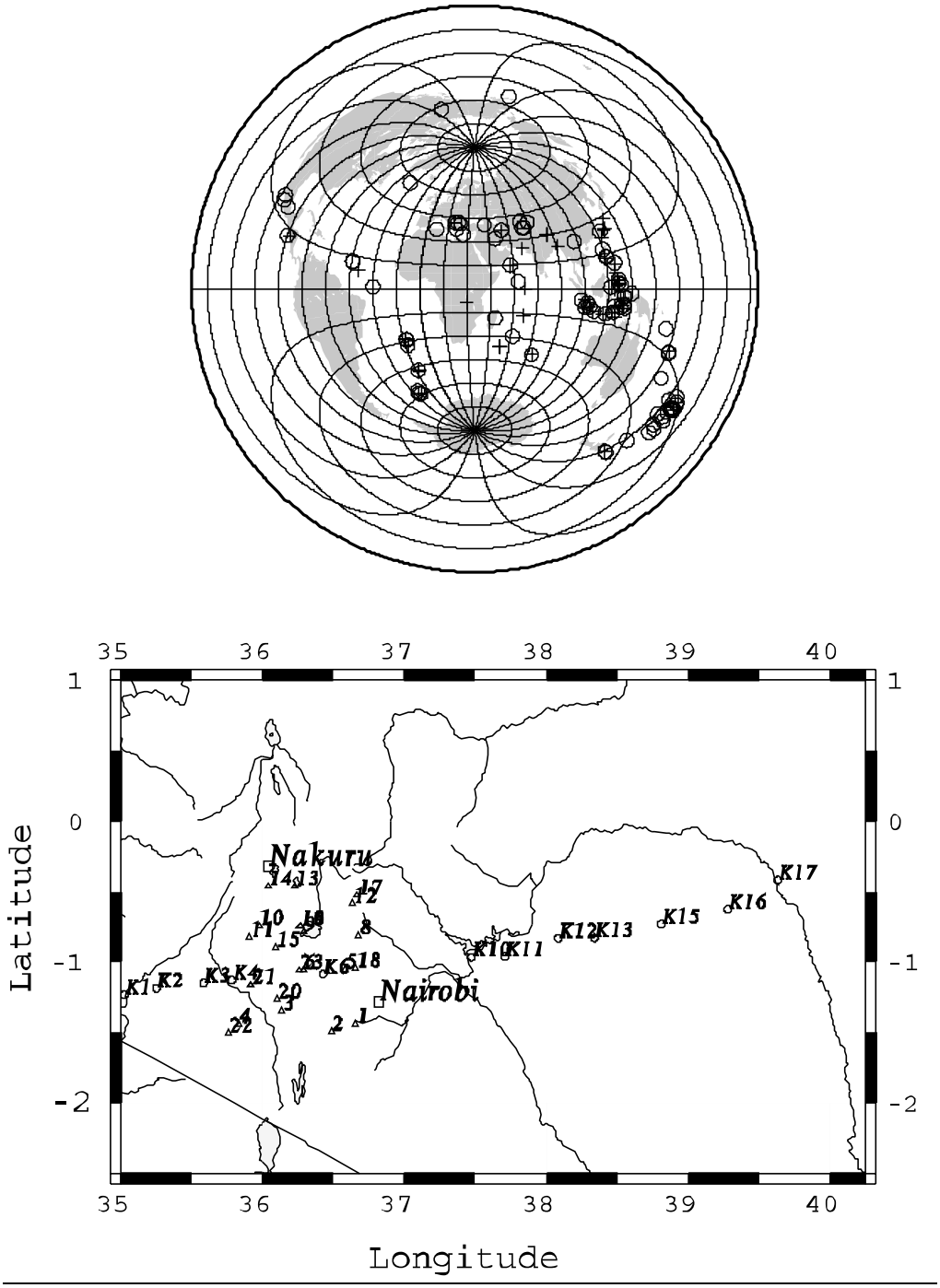

Figure 1. Map of the 22 UW station (triangle) and 12 of 19 UCLA stations (circle) of the KRISP 85 Teleseismic Experiment are displayed in the lower panel. The 84 teleseismic events recorded by the UW array (triangle) and 52 events recorded by the UCLA array (circle) are displayed in the upper panel. Twenty-two events were recorded by both sets of instruments. These 12 UCLA stations were available from UW tar tapes and are provided in this data report with the archiving of the UW instrumented KRISP85 teleseismic data set.

Table 1. Locations of UW stations deployed in KRISP85 Teleseismic Experiment.

Station ID	Latitude	Longitude	Elev(m)	Name
1	-1.438	36.657	1980	Ngong
2	-1.493	36.481	1020	Emerit
3	-1.349	36.137	1430	Mosiro
4	-1.441	35.829	1850	Narosura
5	-1.054	36.577	1750	Mayer's
6	-1.058	36.285	1640	Susaa
7	-1.160	35.917	1910	Narok
8	-0.810	36.676	2500	South
9	-0.787	36.285	1920	Naivasha
10	-0.743	35.973	2770	Suypeo
11	-0.824	35.906	2460	Enabelibel
12	-0.584	36.635	2640	North
13	-0.463	36.223	1790	Elementeita
14	-0.463	36.036	2060	Kiriri
15	-0.895	36.090	2880	Melili
16	-0.744	36.262	1920	Ndabibi
17	-0.524	36.667	3220	Aberdare
18	-1.042	36.656	2220	Uplands
19	-0.744	36.262	1920	Melili
20	-1.264	36.099	1670	Mosiro
21	-1.160	35.917	1910	Narok
22	-1.507	35.756	2000	Narosura
23	-1.058	36.255	1700	Susua

Table 2. Locations of UCLA stations deployed in the KRISP85 Teleseismic Experiment.

StationId	Latitude	Longitude	elev(m)	Name
K01	-1.23517	35.023	1680	Masai Mara
K01	-1.23317	35.0257	1680	After 10/11/85
K02	-1.18667	35.25	1780	Aitong
K03	-1.152	35.5833	1925	Ngorengore
K04	-1.12933	35.782	1920	Narok
K06	-1.08833	36.4243	1595	Mt.Suswa
K10	-0.9675	37.4727	1130	Ekarakara
K11	-0.964	37.7095	1100	Kaewa
K12	-0.831833	38.0855	960	Mwingi
K13	-0.83	38.339	770	Nguni
K15	-0.733	38.8095	570	Katumba
K16	-0.6275	39.2788	290	Kzzz
K17	-0.420833	39.6313	140	Garissa

Table 3. Locations of UW events recorded by the KRISP85 Teleseismic Experiment.

Id	Name	m:d:yr	hr:mn:sc	latitude	longitude	Depth	Mag	#	Directory
1	fiji	08:28:85	20:50:49.0	-21.000	-178.990	629	6.1	6	W240
2	s_sand	08:29:85	06:13:10.8	-57.243	-025.333	50	5.6	5	W241
3	xinjia	08:29:85	23:39:48.8	39.441	075.452	17	5.2	8	W241
4	nphili	08:30:85	20:27:10.7	16.982	119.938	29	5.4	8	W242
5	yunnan	09:01:85	19:07:42.2	23.769	102.738	10	5.0	8	W244
6	minaha	09:01:85	22:25:34.1	00.665	121.430	83	5.1	9	W244
7	halmah	09:03:85	23:32:47.5	01.409	128.153	114	5.7	10	W246
8	banda	09:05:85	03:53:12.0	-07.364	128.472	143	5.3	6	W248
9	tonga	09:05:85	06:34:58.0	-18.559	-173.632	33	4.6	5	W248
10	ceram	09:07:85	00:22:01.5	-03.079	130.348	26	5.6	7	W250
11	ceram	09:07:85	04:40:30.0	-03.136	130.279	24	5.5	7	W250
12	greece	09:07:85	10:20:50.2	37.445	021.235	31	5.3	8	W250
13	tonga	09:11:85	17:47:31.0	-15.350	-173.540	30	5.8	10	W254
14	xinjin	09:11:85	20:45:49.5	39.356	075.407	15	5.8	10	W254
15	sphili	09:11:85	22:07:10.7	13.594	120.893	135	4.9	7	W254
16	oaxaca	09:15:85	07:57:53.6	17.980	-097.160	63	6.0	5	W258
17	tonga	09:15:85	11:25:05.3	-19.220	-175.600	258	5.6	8	W258
18	tonga	09:15:85	17:31:00.6	-16.800	-174.870	81	5.7	9	W258
19	sumba	09:15:85	22:58:42.6	-10.809	119.298	39	5.4	5	W258
20	tonga	09:16:85	02:54:02.0	-15.296	-174.153	139	4.9	7	W259
21	iran	09:18:85	00:10:34.8	31.627	049.447	33	5.2	5	W261
22	tonga	09:19:85	08:06:21.0	-18.060	-175.540	302	4.9	7	W262
23	michoa	09:19:85	13:17:50.1	18.540	-102.553	29	6.4	8	W262
24	taiwan	09:20:85	15:01:23.5	24.593	122.280	18	5.3	5	W263
25	guerre	09:21:85	01:37:15.1	17.810	-101.690	42	6.2	7	W264
26	snatla	09:22:85	18:23:12.2	12.510	-044.316	10	5.7	6	W265
27	banda	09:24:85	20:28:52.4	-06.405	130.037	147	5.6	9	W267
28	snatla	09:25:85	07:06:45.7	12.443	-044.333	10	5.3	6	W268
29	tonga	09:26:85	04:16:22.0	-16.000	-173.200	41	4.7	8	W269
30	kermad	09:26:85	07:27:47.0	-34.610	-178.570	16	6.4	12	W269
31	solomo	09:27:85	03:39:08.8	-09.810	159.850	33	6.2	9	W270
32	tonga	09:27:85	10:10:15.9	-22.179	-174.600	11	6.2	9	W270
33	crete	09:27:85	16:39:48.7	34.506	026.599	61	5.6	10	W270
34	tonga	09:28:85	05:50:39.0	-20.910	-174.090	18	5.1	5	W271
35	yugosl	09:28:85	14:50:15.2	41.581	022.254	7	5.0	9	W271
36	sphili	10:01:85	10:01:44.8	13.669	120.766	119	4.6	5	W274
37	hind_k	10:02:85	21:31:36.4	36.473	070.139	217	4.8	6	W275
38	afghan	10:03:85	18:07:38.2	36.500	071.604	80	5.4	8	W276
39	malaga	10:04:85	15:17:07.1	-18.304	048.433	10	5.3	8	W277
40	canada	10:05:85	15:24:02.2	62.237	-124.226	10	6.5	12	W278
41	vanuat	10:06:85	12:00:49.2	-18.961	169.432	273	5.7	9	W279
42	java	10:09:85	01:15:04.6	-06.791	107.082	154	5.9	11	W282
43	alaska	10:09:85	09:33:32.4	54.765	-159.613	30	6.2	9	W282
44	fiji	10:12:85	02:12:57.9	-21.656	-176.382	155	5.9	11	W285
45	el_sal	10:12:85	20:29:20.8	13.154	-089.720	42	5.4	5	W285
46	c_atla	10:12:85	22:20:38.0	00.917	-029.921	10	5.4	9	W285
47	tajik	10:13:85	15:59:51.2	40.301	069.823	16	5.8	12	W286
48	nnatla	10:18:85	01:44:28.9	56.757	-034.119	10	5.2	5	W291
49	carlsb	10:18:85	16:55:30.9	04.454	062.660	10	5.2	6	W291
50	sphili	10:19:85	20:51:20.8	10.460	125.157	42	5.3	7	W292
51	kermad	10:20:85	21:36:40.1	-29.012	-178.773	256	5.4	5	W293
52	java	10:25:85	06:47:04.7	-09.203	105.595	10	5.4	5	W298

53	banda	10:25:85	18:12:19.5	-07.077	124.284	596	5.9	8	W298
54	algeri	10:27:85	19:34:57.1	36.460	006.761	10	5.5	9	W300
55	fiji	10:27:85	22:35:18.0	-17.717	-178.835	565	5.4	7	W300
56	tanimb	10:28:85	10:28:14.5	-07.331	130.850	33	5.3	5	W301
57	tonga	10:28:85	12:52:31.2	-15.400	-175.990	33	5.5	8	W301
58	sumatr	10:29:85	05:19:26.4	-05.713	103.110	33	5.2	8	W302
59	iran	10:29:85	13:13:44.6	36.681	054.750	53	6.0	5	W302
60	tonga	11:04:85	22:43:25.0	-17.010	-174.630	144	4.8	7	W308
61	s_sand	11:06:85	08:15:39.6	-58.716	-026.223	132	5.7	8	W310
62	tonga	11:06:85	22:16:16.9	-16.370	-173.270	50	5.1	8	W310
63	turkey	11:07:85	08:26:21.4	40.310	042.307	33	5.1	7	W311
64	n_zeal	11:07:85	19:12:31.8	-35.210	-179.320	49	6.2	9	W311
65	timor	11:09:85	12:56:12.1	-09.818	123.739	26	5.5	9	W313
66	greece	11:09:85	23:30:42.9	41.262	023.988	22	5.4	9	W313
67	nsatla	11:10:85	19:40:34.0	-29.010	-013.165	10	5.5	8	W314
68	nsatla	11:14:85	02:11:45.6	-28.912	-013.109	10	5.3	7	W318
69	ssatla	11:16:85	01:56:43.1	-47.143	-013.397	10	5.2	7	W320
70	m_indi	11:16:85	04:12:18.8	-38.577	078.368	10	5.8	7	W320
71	irian	11:17:85	09:40:21.2	-01.639	134.911	10	6.0	5	W321
72	nsatla	11:18:85	18:18:34.7	-32.298	-013.364	10	5.4	6	W322
73	java	11:20:85	02:49:44.8	-10.449	111.817	33	5.1	7	W324
74	moluca	11:21:85	02:27:18.7	02.374	126.729	68	5.4	7	W325
75	albani	11:21:85	21:57:14.9	41.703	019.388	25	5.5	9	W325
76	s_sand	11:24:85	21:32:41.8	-59.450	-024.842	37	5.3	5	W328
77	java	11:25:85	16:26:30.4	-08.649	108.495	68	5.1	5	W329
78	vanuat	11:28:85	02:25:42.6	-14.030	166.220	33	6.0	6	W332
79	vanuat	11:28:85	03:49:55.5	-13.980	166.100	43	6.2	6	W332
80	vanuat	11:28:85	06:37:47.0	-13.850	166.260	25	5.6	6	W332
81	at-ind	11:30:85	02:28:11.5	-29.235	061.253	10	5.6	6	W334
82	tonga	11:30:85	03:04:18.8	-16.366	-174.197	165	5.7	6	W334
83	talaud	12:14:85	06:46:11.7	03.683	126.600	22	5.8	5	W348
84	arabia	12:14:85	18:13:31.5	14.712	057.999	10	5.5	6	W348

Table 4. Locations of UCLA events recorded by the KRISP85 Teleseismic Experiment.

evt	name	lat	lon	depth	yr	day	UW Id
1	eq8510192051	10.270	125.900	42.0	1985	292	50
2	eq8510230049	-11.600	125.900	14.0	1985	296	
3	eq8510250647	-9.120	105.350	10.0	1985	298	52
4	eq8510251812	-7.400	124.170	596.0	1985	298	53
5	eq8510281028	-7.190	130.510	61.0	1985	301	56
6	eq8510291313	36.400	54.450	53.0	1985	302	59
7	eq8511021553	0.000	123.520	119.0	1985	306	
8	eq8511030357	23.350	91.300	33.0	1985	307	
9	eq8511030423	0.170	121.580	157.0	1985	307	
10	eq8511042123	13.400	120.110	77.0	1985	308	
11	eq8511060815	-58.430	-26.130	132.0	1985	310	61
12	eq8511062216	-16.110	-173.190	33.0	1985	310	62
13	eq8511071912	-35.150	-179.200	44.0	1985	311	64
14	eq8511080838	6.370	124.900	46.0	1985	312	
15	eq8511091256	-9.490	123.440	26.0	1985	313	65
16	eq8511101940	-29.000	-13.900	10.0	1985	314	67
17	eq8511102046	-6.580	129.110	160.0	1985	314	
18	eq8511111216	-3.200	129.440	73.0	1985	315	
19	eq8511121543	1.540	127.110	114.0	1985	316	
20	eq8511140211	-28.540	-13.600	10.0	1985	318	68
21	eq8511150539	13.500	-88.410	89.0	1985	319	
22	eq8511151035	-47.130	-13.230	10.0	1985	319	
23	eq8511160156	-47.800	-13.230	10.0	1985	320	69
24	eq8511162330	-38.340	78.220	10.0	1985	320	
25	eq8511181818	-32.170	-13.210	10.0	1985	322	72
26	eq8511191403	28.400	128.520	135.0	1985	323	
27	eq8511200249	-10.260	111.490	33.0	1985	324	73
28	eq8511210227	2.220	126.430	68.0	1985	325	74
29	eq8511212157	41.420	19.230	25.0	1985	325	75
30	eq8511241042	9.100	-40.370	10.0	1985	328	
31	eq8511242132	-59.270	-24.500	37.0	1985	328	76
32	eq8511251626	-8.380	108.290	68.0	1985	329	77
33	eq8511260027	22.340	121.560	27.0	1985	330	
34	eq8511261005	24.800	125.100	21.0	1985	330	
35	eq8511261323	24.800	125.800	35.0	1985	330	
36	eq8511280349	-13.590	166.110	33.0	1985	332	79
37	eq8511281740	-8.400	30.000	10.0	1985	332	
38	eq8511300304	-16.220	-174.110	165.0	1985	334	89
39	eq8512010616	-16.320	66.420	10.0	1985	335	
40	eq8512031242	-11.190	118.150	33.0	1985	337	
41	eq8512072126	0.260	66.590	10.0	1985	341	
42	eq8512081335	30.550	86.350	37.0	1985	342	
43	eq8512081424	30.530	86.320	33.0	1985	342	
44	eq8512091158	-5.390	105.490	148.0	1985	343	
45	eq8512121238	-6.430	108.100	251.0	1985	346	
46	eq8512140646	3.410	126.360	22.0	1985	348	83
47	eq8512141813	14.420	57.590	10.0	1985	348	84
48	eq8512170013	-36.000	53.300	10.0	1985	351	
49	eq8512170049	-36.100	53.270	10.0	1985	351	
50	eq8512170654	24.530	67.230	33.0	1985	351	
51	eq8512171447	3.440	126.390	33.0	1985	351	
52	eq8512171456	-4.270	128.250	228.0	1985	351	

Table 5. General specifications, University of Wisconsin-Madison digital 3-component recorders

DATA STORAGE:	5" reel 1/4" tape, 1800 feet	or	SCSI 3-1/2" disk	
CAPACITY:	20 Mbyte		210 Mbyte	
FORMAT:	4-track; 3-channel + error correction		multi-stream packet	
DYNAMIC RANGE:	106 dB	Noise = 0.25 μV P-P	Clipping = 0.05 V P-P	
CALIBRATION:	Random binary sequence and step current applied to seismometer coils through a bridge (at programmed start times)			
PASSBAND:	Low end: 2 poles at 0.09 Hz High end: 4-pole Butterworth at (0.25 * sample rate)			
SAMPLE RATE:	25, 50, 100, 200, 400 samples/second			
PRE-EVENT DELAY:	512, 1024, 2048 samples/channel			
MODES:	Programmed and/or multiple-mode triggered			
PROGRAMMING:	Time (ddd – hr:mn:sc), repeat interval and count for run, calibrate, trigger arm and disarm (24 entries)			
RUN TIMES:	Programmable to 1000 minutes in 1 sec steps with optional programmed limits on total recording time for each mode			
TRIGGER HARDWARE:	STA/delayed LTA ratio; broadband or teleseismic filtered			
TRIGGER SOFTWARE:	Three frequency band Walsh transform filter to discriminate teleseismic, regional, and noise; with independent run times			
STATUS REVIEW:	Omega signal, time, configuration, schedules, number of events recorded and time used for each mode, times of last 500 events, seismometer period and damping			
TIMING INTERNAL:	1 mHz TCXO, +/- 1 x 10^{-6} over temperature range			
EXTERNAL:	13.6 kHz Omega VLF phase recorded with seismic data; worldwide coverage (except Antarctica and central Greenland) Post-processing time corrections: +/- 1 x 10^{-8} oscillator error; 1/4 sample RMS time error relative to U.T.			
POWER:	12.5 V DC +/- 20% 40 ma average current waiting for trigger 400 ma average current recording to tape 50 ma average current recording to disk			
DIMENSIONS:	56 x 33 x 40 cm			
WEIGHT:	22 kg			
TEMPERATURE:	0 deg to 50 deg C normal range (tape operates to 0 deg C) -20 deg to 70 dec C reduced spec. (disk operates to –20 deg C) -40 deg to 80 deg C storage			