

PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

Shot Number 17 Shot Point 2

Shot Time (Julian day, hr, min, sec): 207:09:04:00.320

Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape	
---	----	-----	Db	Grade	---	----	-----	Db	Grade	---	----	-----	Db	Grade
101	121.36	55.7		5	340	11.74	116.4	48	0	379	55.17	111.8	12	9
301	50.18	292.7	12	0	341	12.54	121.2	30	0	380	56.22	111.8		4
302	48.16	292.9		4	342	13.02	126.1	30	0	381	56.92	112.1		4
303	39.33	293.0		4	343	14.60	124.7		1	382	57.70	112.3	12	0
304	37.75	293.1	12	0	344	16.53	115.9		1	383	58.60	112.3	12	0
305	36.04	293.1	12	9	345	17.69	115.6	30	0	384	59.55	112.7	12	9
306	34.77	293.1	12	9	346	19.16	115.0	30	0	385	60.39	112.6	12	0
307	33.42	292.7	12	0	347	20.50	115.5	30	0	386	61.26	112.5	12	0
308	32.07	292.9	12	0	348	22.52	116.0	30	9	387	62.15	112.5	12	0
309	30.82	292.2	12	8	349	23.87	117.1		4	388	63.05	112.6	12	0
310	29.59	292.2		3	350	25.13	117.9	30	4	389	64.23	112.4	12	0
311	27.62	292.1		4	351	25.10	117.0	30	0	390	65.04	112.3	12	0
313	25.15	290.7	12	0	352	26.57	117.5		4	391	65.87	112.3		4
314	23.70	290.7	12	0	353	27.75	116.4	12	0	392	66.82	112.4	12	0
315	22.34	290.9	12	0	354	31.66	115.7	30	0	393	67.54	113.0	12	0
316	20.97	291.1	30	0	355	32.67	117.0	12	0	394	68.44	113.5	12	0
317	19.34	291.4	30	0	356	33.07	116.3	12	0	395	68.93	114.2		4
319	16.61	292.5	30	0	357	34.12	115.2	12	9	396	69.78	114.3	12	0
320	15.36	293.6	30	0	358	36.13	114.9	12	0	397	71.04	114.4	12	0
321	14.05	295.1		4	359	37.12	114.4	12	9	398	71.91	114.5	12	9
322	12.66	297.0	30	0	360	37.92	115.1		4	399	72.79	114.7	12	0
323	11.40	296.1	30	0	361	39.00	114.7	12	2	400	74.10	115.0	12	9
324	9.97	294.8	30	0	362	39.39	114.3		4	401	74.98	115.1	30	9
325	8.55	293.2	48	9	363	40.34	114.3		4	402	75.87	115.2		1
326	7.22	289.1	48	0	364	40.62	114.0		4	403	76.59	115.1		4
327	5.90	283.6		4	365	41.80	114.0	30	0	404	77.46	115.0	30	0
328	4.66	278.8		1	366	42.72	113.5	30	0	405	78.34	114.8	12	0
329	3.19	281.6	30	6	367	43.61	113.0		4	406	79.25	114.7		4
330	2.00	294.4	88	9	368	44.46	112.5	30	9	407	80.11	114.5	30	9
331	0.62	300.0		4	369	46.24	111.5		2	408	80.96	114.4	30	0
332	0.00	180.0		4	370	46.96	111.4		4	409	81.81	114.2	30	9
333	0.88	104.6		4	372	48.39	112.2		1	410	82.67	114.1	30	0
334	2.07	116.7		4	373	49.31	111.9		4	411	83.50	114.0	30	0
335	3.99	114.1		4	374	50.53	111.6	12	0	412	84.37	113.8		1
336	5.43	105.6		4	375	51.42	111.6	12	0	501	85.87	113.7		1
337	6.68	112.4	30	9	376	52.40	111.7		4	502	87.36	113.6	12	9
338	8.22	118.3		1	377	53.26	111.9	30	0					
339	9.96	115.7	48	0	378	54.09	111.9	12	0					

PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

Shot Number 18 Shot Point 7

Shot Time (Julian day, hr, min, sec): 211:05:00:00.008

Loc	Dist (km)	Azim (deg)	Tape Db	Grade	Loc	Dist (km)	Azim (deg)	Tape Db	Grade	Loc	Dist (km)	Azim (deg)	Tape Db	Grade
101	198.96	330.2	12	5	541	102.48	298.4	12	0	581	51.84	298.1	12	0
501	141.95	299.7	12	0	542	101.79	298.3	12	0	582	50.43	297.6	12	0
502	140.46	299.8	12	0	543	100.92	298.4	12	0	583	49.15	297.7	12	0
503	138.74	300.0		3	544	100.00	298.5	12	0	584	47.84	297.8	12	0
504	137.42	300.4		1	545	99.10	298.5	12	0	585	46.12	297.8	12	0
505	136.50	300.6	12	0	546	98.22	298.5	12	0	586	44.94	297.1	12	0
506	134.61	300.2	12	0	547	97.23	298.3	12	0	587	44.23	297.7	12	0
507	133.22	300.2	12	0	548	96.41	298.3	12	0	588	42.65	296.9	12	0
508	132.74	301.0	12	0	549	95.67	298.4	12	0	589	40.58	297.7		4
509	131.51	301.3	12	0	550	94.63	298.8	12	0	590	39.27	295.9	12	0
510	130.31	301.3	12	0	551	93.81	298.6	12	0	591	37.57	294.9	12	0
511	129.49	301.6	12	0	552	92.99	298.2	12	0	592	36.37	295.6		1
512	128.52	301.9	12	0	553	91.60	297.9	12	0	593	34.98	296.1	12	0
513	127.92	302.2	12	0	554	90.15	298.1	12	0	594	34.44	296.2	12	0
514	126.98	302.4	12	0	555	89.12	298.5	12	0	595	33.54	295.3	12	0
515	126.06	302.2	12	0	556	88.16	298.3	12	0	596	32.27	295.1	12	0
516	124.98	301.6	12	0	557	86.71	298.5	12	0	597	30.66	294.7	12	0
517	124.30	301.4	12	0	558	85.39	298.5	12	0	598	29.23	297.7	30	0
518	123.41	301.2	12	0	559	83.94	298.6	12	0	599	27.61	297.8	30	0
519	122.59	301.1	12	0	560	82.61	298.6	12	0	600	26.49	294.9	30	0
520	121.73	300.9	12	0	561	81.39	298.6	12	0	601	24.99	293.6	12	0
521	120.86	300.7	12	2	562	79.92	298.0	12	0	602	22.63	294.3	30	0
522	120.01	300.6	12	0	563	78.90	297.5	12	0	603	21.65	296.4	30	0
523	119.11	300.4	12	0	564	77.49	297.5	12	0	604	20.71	297.8	30	0
524	118.34	300.2	12	0	565	76.20	297.9		1	605	18.80	299.9	30	0
525	117.20	300.1	12	0	566	74.40	298.4	12	0	606	17.61	300.2	30	0
526	116.48	299.8	12	0	567	72.15	298.8	12	0	607	16.03	297.1	30	0
527	115.70	299.6		1	568	70.40	298.6		4	608	14.86	294.7	30	0
529	113.65	298.7	12	0	569	68.76	298.7	12	0	609	13.21	298.0	30	0
530	112.82	298.7	12	0	570	67.61	298.3	12	0	610	11.61	293.5	30	0
531	111.14	298.3	12	0	571	65.41	299.0	12	0	611	10.17	295.1	48	0
532	110.44	298.3	12	0	572	63.74	299.0	12	0	612	8.85	300.1	48	1
533	109.69	298.3	12	0	573	62.51	298.5	12	0	613	8.13	305.3	48	0
534	108.95	298.2	12	0	574	61.53	297.8	12	0	614	5.68	302.1	48	0
535	107.86	298.5	12	0	575	60.32	297.2		1	615	4.87	295.1	68	0
536	107.20	298.5	12	0	576	59.26	297.2	12	0	616	3.22	301.8	68	0
537	106.33	298.5	12	0	577	57.94	297.2	12	0	617	1.53	268.4	88	0
538	105.37	298.5	12	0	578	56.22	297.4	12	0	618	0.09	236.3	88	0
539	104.45	298.6	12	0	579	54.82	297.7	12	0					
540	103.43	298.6	12	0	580	53.29	297.9	12	0					

PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

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Shot Number 19 Shot Point B

Shot Time (Julian day, hr, min, sec): 211:05:02:00.012

Loc	Dist (km)	Azim (deg)	Db	Tape Grade	Loc	Dist (km)	Azim (deg)	Db	Tape Grade	Loc	Dist (km)	Azim (deg)	Db	Tape Grade
101	0.07	200.3		5	541	124.28	175.2	12	0	581	157.55	159.5	12	0
501	105.19	192.6	12	0	542	124.73	175.0	12	0	582	158.86	159.3	12	0
502	105.41	191.8	30	0	543	125.04	174.6	12	0	583	159.78	159.0	12	0
503	105.50	190.9		3	544	125.42	174.2	12	0	584	160.65	158.6	12	0
504	105.00	190.0		1	545	125.92	173.8	12	0	585	161.94	158.2	12	0
505	104.88	189.5	12	0	546	126.42	173.5	12	0	586	163.23	158.1	12	0
506	106.45	188.7	12	0	547	127.27	173.2	12	0	587	163.45	157.8	12	0
507	106.95	188.0	12	0	548	127.79	173.0	12	0	588	165.02	157.6	12	0
508	105.30	187.3	12	0	549	127.99	172.6	12	0	589	166.22	157.0		4
509	105.27	186.6	12	0	550	128.14	172.1	12	0	590	168.02	157.0	12	0
510	105.65	186.0	12	0	551	128.82	171.9	12	0	591	169.72	156.8	12	0
511	105.46	185.4	12	0	552	129.86	171.7	12	0	592	170.31	156.4		1
512	105.31	184.8	12	0	553	131.13	171.4	12	0	593	171.16	156.0	12	0
513	104.86	184.3	12	0	554	131.70	170.8	12	0	594	171.53	155.9	12	0
514	105.00	183.8	12	0	555	131.82	170.3	12	0	595	172.59	155.8	12	0
515	105.84	183.5	12	0	556	132.56	170.0	12	0	596	173.61	155.6	12	0
516	107.48	183.3	12	0	557	133.30	169.4	12	0	597	174.97	155.3	12	0
517	108.13	183.0	12	0	558	134.12	169.0	12	0	598	175.07	154.6	12	0
518	108.87	182.7	30	0	559	134.91	168.5	12	0	599	176.31	154.3	12	0
519	109.56	182.4	12	0	560	135.69	168.0	12	0	600	178.04	154.4	12	0
520	110.39	182.1	12	0	561	136.56	167.7	12	0	601	179.56	154.2	12	0
521	111.06	181.8	12	2	562	138.07	167.4	12	0	602	181.15	153.6	12	0
522	111.74	181.5	12	0	563	139.28	167.3	12	0	603	181.41	153.2	12	0
523	112.46	181.2	12	0	564	140.15	166.8	12	0	604	181.87	152.9	12	0
524	113.16	180.9	12	0	565	140.61	166.3		1	605	183.02	152.4	12	0
525	113.85	180.5	12	0	566	141.29	165.5	12	0	606	183.97	152.2	12	0
526	114.74	180.3	12	0	567	142.46	164.7	12	0	607	185.79	152.1	12	0
527	115.52	180.1		1	568	143.84	164.3		4	608	187.11	152.1	12	0
529	118.16	179.6	12	0	569	144.93	163.8	12	0	609	187.96	151.6	12	0
530	118.58	179.3	12	0	570	146.07	163.6	12	0	610	189.83	151.5	12	0
531	119.99	178.7	12	0	571	147.03	162.8	12	0	611	190.78	151.2	12	0
532	120.37	178.5	12	0	572	148.20	162.3	12	0	612	191.41	150.8		1
533	120.78	178.2	12	0	573	149.50	162.1	12	0	613	191.67	150.5	12	0
534	121.21	177.9	12	0	574	150.68	162.1	12	0	614	194.02	150.2	12	0
535	121.35	177.3	12	0	575	152.03	161.9		1	615	195.04	150.3	12	0
536	121.65	177.0	12	0	576	152.77	161.6	12	0	616	196.18	149.9	12	0
537	122.04	176.7	12	0	577	153.68	161.3	12	0	617	198.29	149.8	12	0
538	122.63	176.3	12	0	578	154.76	160.8	12	0	618	199.02	149.5	12	0
539	122.95	175.9	12	0	579	155.58	160.4	12	0					
540	123.48	175.5	12	0	580	156.59	159.9	12	0					

PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

Shot Number 20 Shot Point 14

Shot Time (Julian day, hr, min, sec): 211:05:04:00.012

Loc	Dist (km)	Azim (deg)	Db	Tape Grade	Loc	Dist (km)	Azim (deg)	Db	Tape Grade	Loc	Dist (km)	Azim (deg)	Db	Tape Grade
101	108.73	2.6		5	541	21.58	134.6	30	0	581	71.58	122.9	12	0
501	19.04	288.5	30	0	542	22.26	134.3	30	0	582	73.02	123.1	12	0
502	17.54	288.3	30	0	543	23.04	133.3	30	0	583	74.29	123.0	12	0
503	15.76	288.7		3	544	23.89	132.3	30	0	584	75.58	122.7	12	0
504	14.30	291.6		1	545	24.76	131.8	30	0	585	77.29	122.6	12	0
505	13.33	293.0	30	0	546	25.62	131.3	30	0	586	78.53	123.0	12	0
506	11.62	287.3	30	0	547	26.66	131.6	12	0	587	79.18	122.6	12	0
507	10.27	285.6	30	0	548	27.48	131.3	12	0	588	80.81	122.8	12	0
508	9.49	296.5	30	0	549	28.14	130.4	12	0	589	82.81	122.3		4
509	8.24	299.9	30	0	550	29.04	128.9	12	0	590	84.26	123.0	12	0
510	7.04	300.8	30	0	551	29.89	129.0	30	0	591	86.03	123.3	12	0
511	6.25	306.2	30	0	552	30.84	130.0	12	0	592	87.16	122.9		1
512	5.39	314.0	30	0	553	32.32	130.4	30	0	593	88.50	122.6	12	0
513	5.06	324.4	30	0	554	33.65	129.3	12	0	594	89.02	122.5	12	0
514	4.38	333.3	48	0	555	34.55	127.9	12	0	595	89.99	122.8	12	0
515	3.36	334.9	48	0	556	35.53	127.9	12	0	596	91.26	122.7	12	0
516	1.80	319.8	48	6	557	36.92	127.2	12	0	597	92.89	122.7	12	0
517	1.05	312.8	48	6	558	38.23	126.9	12	0	598	94.12	121.7	12	0
518	0.20	251.6	48	6	559	39.63	126.4	12	0	599	95.73	121.5	12	0
519	0.85	157.0	48	6	560	40.93	125.9	12	0	600	96.99	122.3	12	0
520	1.83	152.7	48	6	561	42.16	125.9	12	0	601	98.57	122.5	12	0
521	2.73	148.2	12	2	562	43.72	126.5	12	0	602	100.85	122.1	12	0
522	3.63	146.2	48	0	563	44.85	127.2	12	0	603	101.72	121.6	12	0
523	4.58	144.9	48	0	564	46.24	126.9	12	0	604	102.61	121.2	12	0
524	5.44	145.0	48	0	565	47.42	126.0		1	605	104.48	120.8	12	0
525	6.55	142.0	48	0	566	49.11	124.9	12	0	606	105.67	120.7	12	0
526	7.46	144.2	48	0	567	51.29	124.1	12	0	607	107.29	121.2	12	0
527	8.36	144.7		1	568	53.06	124.1		4	608	108.53	121.4	12	0
529	11.06	148.8	30	0	569	54.68	123.9	12	0	609	110.08	120.9	12	0
530	11.80	146.9	30	0	570	55.88	124.2	12	0	610	111.78	121.3	12	0
531	13.60	146.0	30	0	571	57.98	123.2	12	0	611	113.17	121.1	12	0
532	14.25	144.8	48	0	572	59.64	123.0	12	0	612	114.43	120.6		1
533	14.93	143.6	30	0	573	60.92	123.5	12	0	613	115.16	120.3	12	0
534	15.63	142.7	30	0	574	61.97	124.0	12	0	614	117.60	120.5	12	0
535	16.45	139.6	30	0	575	63.26	124.5		1	615	118.43	120.8	12	0
536	17.05	138.7	30	0	576	64.31	124.3	12	0	616	120.05	120.5	12	0
537	17.85	137.4	48	0	577	65.61	124.2	12	0	617	121.99	120.9	12	0
538	18.78	136.8	48	0	578	67.29	123.8	12	0	618	123.23	120.6	12	0
539	19.60	135.4	30	0	579	68.65	123.4	12	0					
540	20.57	134.5	30	0	580	70.16	123.1	12	0					

PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

Shot Number 21 Shot Point 1

Shot Time (Julian day, hr, min, sec): 211:05:06:00.012

Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape	
			Db	Grade				Db	Grade				Db	Grade
101	154.63	71.2	30	5	541	175.44	114.8	12	0	581	226.05	115.3	12	0
501	136.19	113.0	30	0	542	176.12	114.9	12	0	582	227.45	115.4	12	0
502	137.69	112.9	30	0	543	176.99	114.8	12	0	583	228.73	115.4	12	0
503	139.45	112.8		3	544	177.92	114.8	12	0	584	230.05	115.3	12	0
504	140.86	112.5		1	545	178.82	114.8	12	0	585	231.77	115.3	12	0
505	141.82	112.3	12	0	546	179.70	114.8	12	0	586	232.95	115.5	12	0
506	143.60	112.8	12	0	547	180.67	114.9	12	0	587	233.66	115.4	12	0
507	144.98	112.8	12	0	548	181.50	114.9	12	0	588	235.23	115.5	12	0
508	145.68	112.1	12	0	549	182.24	114.9	12	7	589	237.31	115.4		4
509	146.96	111.9	12	0	550	183.30	114.7	12	0	590	238.63	115.7	12	0
510	148.17	111.9	12	0	551	184.11	114.8	12	0	591	240.35	115.8	12	0
511	149.06	111.7	12	0	552	184.91	115.0	12	0	592	241.54	115.7		1
512	150.12	111.6	12	0	553	186.29	115.2	12	0	593	242.92	115.6	12	0
513	150.83	111.3	12	0	554	187.74	115.1	12	0	594	243.45	115.6	12	0
514	151.82	111.2	12	0	555	188.80	114.9	12	0	595	244.37	115.7	12	0
515	152.65	111.4	12	0	556	189.75	115.0	12	0	596	245.64	115.7	12	0
516	153.54	112.0	12	0	557	191.20	114.9	12	0	597	247.26	115.8	12	0
517	154.16	112.2	12	0	558	192.52	114.9	12	0	598	248.66	115.4	12	0
518	155.00	112.3	30	0	559	193.97	114.9	12	0	599	250.28	115.4	12	0
519	155.77	112.5	12	0	560	195.30	114.9	12	0	600	251.42	115.7	12	0
520	156.57	112.7	12	0	561	196.53	114.9	12	0	601	252.96	115.8	12	0
521	157.39	112.8	12	2	562	197.97	115.2	12	0	602	255.29	115.7	12	0
522	158.21	113.0	12	0	563	198.99	115.4	12	0	603	256.24	115.5	12	0
523	159.07	113.1	12	0	564	200.40	115.4	12	0	604	257.18	115.4	12	0
524	159.81	113.3	12	0	565	201.69	115.2		1	605	259.10	115.3	12	0
525	160.93	113.4	12	0	566	203.50	115.0	12	0	606	260.30	115.3	12	0
526	161.60	113.6	12	0	567	205.77	114.9	12	0	607	261.86	115.5	12	0
527	162.35	113.8		1	568	207.51	115.0		4	608	263.04	115.6	12	0
529	164.29	114.5	12	0	569	209.15	115.0	12	0	609	264.67	115.4	12	0
530	165.12	114.5	12	0	570	210.29	115.1	12	0	610	266.30	115.6	12	0
531	166.77	114.8	12	0	571	212.51	114.9	12	0	611	267.72	115.5	12	0
532	167.48	114.8	12	0	572	214.16	114.9	12	0	612	269.05	115.4		1
533	168.22	114.8	12	0	573	215.39	115.1	12	0	613	269.83	115.2	12	0
534	168.95	114.9	12	0	574	216.35	115.3	12	0	614	272.23	115.4	12	0
535	170.06	114.7	12	0	575	217.57	115.5		1	615	273.02	115.5	12	0
536	170.72	114.7	12	0	576	218.63	115.5	12	0	616	274.68	115.4	12	0
537	171.60	114.7	12	0	577	219.95	115.5	12	0	617	276.54	115.6	12	0
538	172.55	114.8	12	0	578	221.67	115.4	12	0	618	277.84	115.5	12	0
539	173.47	114.7	12	0	579	223.07	115.4	12	0					
540	174.50	114.7	12	0	580	224.60	115.3	12	0					

PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

61

Shot Number 22 Shot Point 15

Shot Time (Julian day, hr, min, sec): 211:05:08:00.011

Loc	Dist (km)	Azim (deg)	Tape Db	Grade	Loc	Dist (km)	Azim (deg)	Tape Db	Grade	Loc	Dist (km)	Azim (deg)	Tape Db	Grade
101	120.16	358.8		5	541	8.64	115.0	30	0	581	59.27	117.5	12	0
501	31.02	304.5	12	0	542	9.32	115.7	12	0	582	60.68	117.9	12	0
502	29.57	305.2	12	0	543	10.19	114.9	12	0	583	61.96	117.9	12	0
503	27.91	306.5		3	544	11.13	114.3	12	0	584	63.27	117.7	12	0
504	26.74	308.9		1	545	12.02	114.5	30	0	585	64.99	117.7	12	0
505	25.91	310.3	12	0	546	12.90	114.8	30	0	586	66.18	118.2	12	2
506	23.89	308.8	12	0	547	13.88	116.5	12	0	587	66.88	117.8	12	0
507	22.52	309.4	12	0	548	14.70	116.8	12	0	588	68.47	118.2	12	0
508	22.46	314.6	12	0	549	15.44	115.8	12	0	589	70.53	117.7		4
509	21.43	316.8	12	0	550	16.51	114.0	12	0	590	71.89	118.7	12	0
510	20.32	318.1	12	0	551	17.31	115.0	12	0	591	73.63	119.1	12	0
511	19.73	320.5	12	0	552	18.12	117.3	12	0	592	74.79	118.7		1
512	19.05	323.3	12	0	553	19.52	119.0	12	0	593	76.16	118.4	12	0
513	18.82	326.2	12	0	554	20.95	117.9	12	0	594	76.69	116.3	12	0
514	18.11	328.4	12	0	555	22.00	116.2	12	0	595	77.63	118.7	12	0
515	17.09	328.5	30	0	556	22.95	116.8	12	0	596	78.90	118.7	12	0
516	15.55	326.1	30	0	557	24.40	116.4	12	0	597	80.53	118.8	12	0
517	14.77	325.9	30	0	558	25.72	116.5	12	0	598	81.88	117.6	12	0
518	13.81	326.1	30	0	559	27.18	116.2	12	0	599	83.50	117.6	12	0
519	12.92	326.2	30	0	560	28.51	116.1	12	0	600	84.67	118.5	12	0
520	11.94	326.0	30	0	561	29.73	116.4	12	0	601	86.22	118.8	12	0
521	11.03	326.5	12	2	562	31.19	117.8	12	0	602	88.54	118.4	12	0
522	10.13	327.1	30	0	563	32.23	119.1	12	0	603	89.47	117.9	12	0
523	9.18	327.8	30	0	564	33.64	118.9	12	0	604	90.40	117.5	12	0
524	8.32	328.1	30	0	565	34.91	118.0		1	605	92.32	117.1	12	0
525	7.25	331.3	12	0	566	36.71	116.9	12	0	606	93.51	117.1	12	0
526	6.31	330.0	30	0	567	38.97	116.3	12	0	607	95.08	117.6	12	0
527	5.41	330.1		1	568	40.71	116.7		4	608	96.28	118.0	12	0
529	2.73	318.7	48	0	569	42.35	116.7	12	0	609	97.89	117.5	12	0
530	1.96	326.6	48	0	570	43.50	117.3	12	0	610	99.54	118.0	12	0
531	0.26	19.8	48	6	571	45.72	116.3	12	0	611	100.96	117.8	12	0
532	0.70	100.3	48	6	572	47.38	116.3	12	0	612	102.26	117.3		1
533	1.43	111.0	48	6	573	48.60	117.1	12	0	613	103.04	116.9	12	0
534	2.16	115.3	48	6	574	49.58	117.9	12	0	614	105.44	117.2	12	0
535	3.29	107.9	48	0	575	50.81	118.6		1	615	106.24	117.6	12	0
536	3.95	109.0	48	0	576	51.87	118.6	12	0	616	107.90	117.3	12	0
537	4.83	109.8	48	0	577	53.19	118.5	12	0	617	109.78	117.8	12	0
538	5.76	112.2	30	0	578	54.90	118.2	12	0	618	111.06	117.5	12	0
539	6.70	111.4	30	0	579	56.29	117.9	12	0					
540	7.72	112.1	30	0	580	57.82	117.7	12	0					

PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

Shot Number 23 Shot Point 4

Shot Time (Julian day, hr, min, sec): 211:07:00:00.008

Loc	Dist (km)	Azim (deg)	Tape Db	Grade	Loc	Dist (km)	Azim (deg)	Tape Db	Grade	Loc	Dist (km)	Azim (deg)	Tape Db	Grade
101	105.02	12.6	12	0	541	39.86	122.2	12	0	581	90.44	119.7	12	0
501	0.29	122.2	88	0	542	40.55	122.3	12	0	582	91.86	120.0	12	0
502	1.79	112.3	30	6	543	41.40	121.9	12	0	583	93.14	119.9	12	0
503	3.57	108.2		3	544	42.32	121.6	12	0	584	94.44	119.7	12	0
504	5.10	100.2		1	545	43.21	121.5	12	0	585	96.16	119.7	30	0
505	6.12	99.0	48	0	546	44.09	121.5	30	0	586	97.37	120.0	12	0
506	7.71	110.7	48	0	547	45.10	121.8	12	0	587	98.05	119.7	12	0
507	9.09	112.0	48	0	548	45.93	121.8	12	0	588	99.66	120.0	12	0
508	10.01	101.1	48	0	549	46.64	121.4	12	0	589	101.70	119.6		4
509	11.36	100.4	48	0	550	47.65	120.7	12	0	590	103.09	120.2	12	0
510	12.53	101.8	30	0	551	48.48	120.9	30	0	591	104.85	120.5	12	0
511	13.50	100.5	30	0	552	49.35	121.7	30	0	592	106.00	120.2		1
512	14.63	99.5	30	0	553	50.78	122.2	30	0	593	107.36	120.0	12	0
513	15.50	97.5	30	0	554	52.19	121.6	12	0	594	107.88	119.9	12	0
514	16.50	97.8	30	0	555	53.18	120.9	12	0	595	108.83	120.2	12	0
515	17.17	100.4	48	0	556	54.15	121.0	12	0	596	110.11	120.2	12	0
516	17.81	105.5	30	0	557	55.58	120.7	12	0	597	111.73	120.2	12	0
517	18.37	107.2	30	0	558	56.90	120.7	12	0	598	113.04	119.3	12	0
518	19.17	108.9	48	0	559	58.34	120.4	12	0	599	114.65	119.3	12	0
519	19.90	110.4	30	0	560	59.66	120.3	12	0	600	115.86	119.9	12	4
520	20.68	112.1	30	0	561	60.89	120.3	12	0	601	117.43	120.1	12	0
521	21.50	113.2	12	2	562	62.40	121.0	12	0	602	119.73	119.8	12	0
522	22.31	114.2	30	0	563	63.47	121.5	12	0	603	120.63	119.4	12	0
523	23.18	115.3	30	0	564	64.88	121.4	12	0	604	121.55	119.1	12	0
524	23.93	116.3	30	0	565	66.12	120.9		1	605	123.44	118.8	12	0
525	25.06	116.8	30	0	566	67.88	120.2	12	0	606	124.63	118.7	12	0
526	25.76	118.2	30	0	567	70.11	119.7	12	0	607	126.23	119.1	12	0
527	26.55	119.2		1	568	71.87	119.9		4	608	127.45	119.4	12	0
529	28.68	122.9	30	0	569	73.50	119.8	12	0	609	129.04	119.0	12	0
530	29.52	122.9	12	0	570	74.67	120.1	12	0	610	130.71	119.3	12	0
531	31.25	123.8	30	0	571	76.84	119.4	12	0	611	132.11	119.2	12	0
532	31.96	123.8	30	0	572	78.51	119.4	30	0	612	133.39	118.8		1
533	32.71	123.7	12	0	573	79.76	119.8	12	0	613	134.15	118.5	12	0
534	33.45	123.7	12	0	574	80.77	120.2	30	0	614	136.57	118.7	12	0
535	34.49	122.7	30	0	575	82.03	120.7		1	615	137.39	119.0	12	0
536	35.14	122.6	30	0	576	83.08	120.6	12	0	616	139.03	118.7	12	0
537	36.01	122.3	30	0	577	84.40	120.5	12	0	617	140.93	119.1	12	0
538	36.97	122.4	12	0	578	86.10	120.3	12	0	618	142.20	118.8	12	0
539	37.87	122.0	30	0	579	87.48	120.1	12	0					
540	38.89	121.8	12	0	580	89.00	119.9	12	0					

PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

63

Shot Number 24 Shot Point 3

Shot Time (Julian day, hr, min, sec): 211:07:02:00.012

Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape	
---	---	---	Db	Grade	---	---	---	Db	Grade	---	---	---	Db	Grade
101	105.83	36.9	12	0	541	84.60	117.5	30	0	581	135.24	117.5	30	0
501	45.25	113.7	30	0	542	85.28	117.6	30	0	582	136.65	117.7	30	0
502	46.75	113.5	30	0	543	86.15	117.4	30	0	583	137.93	117.6	12	0
503	48.51	113.2		3	544	87.08	117.3	30	0	584	139.24	117.6	12	0
504	49.93	112.2		1	545	87.97	117.3	30	0	585	140.96	117.5	30	0
505	50.90	111.8	48	0	546	88.85	117.3	30	0	586	142.16	117.8	12	0
506	52.66	113.1	48	0	547	89.84	117.6	30	0	587	142.85	117.6	30	0
507	54.04	113.3	30	0	548	90.67	117.6	12	0	588	144.44	117.8	30	0
508	54.76	111.3	30	0	549	91.40	117.4	12	0	589	146.50	117.5		4
509	56.06	110.9	30	0	550	92.44	117.1	12	0	590	147.86	118.0	30	0
510	57.27	111.0	30	0	551	93.26	117.2	30	0	591	149.60	118.2	30	0
511	58.17	110.5	30	0	552	94.09	117.7	30	0	592	150.77	118.0		1
512	59.24	110.1	30	0	553	95.49	118.0	30	0	593	152.14	117.9	30	0
513	59.99	109.4	30	0	554	96.93	117.8	30	0	594	152.67	117.8	12	0
514	60.98	109.3	30	0	555	97.96	117.4	30	0	595	153.60	118.0	12	0
515	61.79	109.9	48	0	556	98.92	117.5	30	0	596	154.88	118.0	12	0
516	62.63	111.2	48	0	557	100.36	117.4	30	0	597	156.50	118.1	30	0
517	63.24	111.7	48	0	558	101.69	117.4	30	0	598	157.85	117.5	30	0
518	64.07	112.1	48	0	559	103.14	117.3	30	0	599	159.47	117.4	30	0
519	64.83	112.5	48	0	560	104.46	117.2	30	0	600	160.65	117.9		4
520	65.63	113.0	48	0	561	105.69	117.3	30	0	601	162.19	118.1	12	0
521	66.45	113.4	12	2	562	107.16	117.7	30	0	602	164.51	117.9	12	0
522	67.27	113.7	30	0	563	108.20	118.1	30	0	603	165.44	117.6	12	0
523	68.13	114.1	48	0	564	109.61	118.0	30	0	604	166.37	117.4	12	0
524	68.87	114.4	30	0	565	110.88	117.7		1	605	168.28	117.2	30	0
525	70.00	114.6	30	0	566	112.67	117.4	30	0	606	169.48	117.1	12	0
526	70.67	115.2	30	0	567	114.93	117.1	30	0	607	171.05	117.4	12	0
527	71.43	115.6		1	568	116.68	117.3		4	608	172.25	117.6	12	0
529	73.42	117.1	30	0	569	118.31	117.2	30	0	609	173.86	117.4	30	0
530	74.26	117.1	30	0	570	119.47	117.5	30	0	610	175.51	117.6	12	0
531	75.94	117.7	30	0	571	121.67	117.1	30	0	611	176.93	117.5	30	0
532	76.64	117.7	30	0	572	123.34	117.1	30	0	612	178.23	117.2		1
533	77.39	117.7	30	0	573	124.56	117.4	30	0	613	179.00	117.0	12	0
534	78.13	117.8	30	0	574	125.55	117.7	30	0	614	181.41	117.2	12	0
535	79.21	117.4	30	0	575	126.78	118.0		1	615	182.21	117.4	30	0
536	79.87	117.4	30	0	576	127.84	117.9	30	0	616	183.86	117.3	12	0
537	80.75	117.3	30	0	577	129.16	117.9	12	0	617	185.75	117.5	12	0
538	81.70	117.4	30	0	578	130.87	117.8	30	0	618	187.03	117.3	30	0
539	82.62	117.3	30	0	579	132.26	117.7	30	0					
540	83.65	117.3	30	0	580	133.80	117.6	30	0					

PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

64

Shot Number 25 Shot Point 6

Shot Time (Julian day, hr, min, sec): 211:07:06:00.008

Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape		Loc	Dist (km)	Azim (deg)	Tape	
---	---	---	Db	Grade	---	---	---	Db	Grade	---	---	---	Db	Grade
101	171.15	336.5	12	5	541	67.60	299.3	12	0	581	16.98	301.8	30	0
501	107.12	300.6	12	0	542	66.92	299.2	12	0	582	15.55	300.7	30	0
502	105.64	300.8	12	0	543	66.05	299.4	12	0	583	14.28	301.1	30	0
503	103.92	301.0		3	544	65.13	299.6	12	0	584	12.98	302.2	30	0
504	102.63	301.6		1	545	64.23	299.6	12	0	585	11.27	302.9	48	0
505	101.72	301.9	12	0	546	63.35	299.6	12	0	586	10.04	300.1	30	0
506	99.81	301.4	12	0	547	62.36	299.3	12	0	587	9.37	303.2	48	0
507	98.42	301.4	12	0	548	61.53	299.3	12	0	588	7.76	300.2	48	0
508	98.00	302.5	12	0	549	60.80	299.5	12	0	589	5.76	307.0		4
509	96.79	302.9	12	0	550	59.78	300.1	12	0	590	4.35	294.0	48	0
510	95.59	303.0	12	0	551	58.95	299.9	12	0	591	2.76	279.4	48	0
511	94.79	303.4	12	0	552	58.11	299.2	12	0	592	1.49	283.4		1
512	93.85	303.8	12	0	553	56.71	298.7	12	0	593	0.06	283.9	88	6
513	93.27	304.3	12	0	554	55.27	299.1	12	0	594	0.48	109.9	88	0
514	92.34	304.5	12	0	555	54.25	299.7	12	0	595	1.47	136.4	88	0
515	91.41	304.3	12	0	556	53.28	299.6	12	0	596	2.72	128.6	48	0
516	90.28	303.5	12	0	557	51.84	299.8	12	0	597	4.34	126.4	48	0
517	89.59	303.2	12	0	558	50.52	299.8	12	0	598	5.75	108.0	48	0
518	88.68	303.0	12	0	559	49.08	300.1	12	0	599	7.36	109.6	48	0
519	87.86	302.8	12	0	560	47.75	300.2	12	0	600	8.45	119.7		4
520	86.98	302.5	12	0	561	46.53	300.1	12	0	601	10.01	122.2	48	0
521	86.11	302.3	12	2	562	45.04	299.3	12	0	602	12.32	119.2	48	0
522	85.24	302.1	12	0	563	44.00	298.4	12	0	603	13.26	115.4	30	0
523	84.34	301.9	12	0	564	42.59	298.5	12	0	604	14.23	113.6	30	0
524	83.55	301.7	12	0	565	41.31	299.2		1	605	16.20	111.5	48	0
525	82.40	301.6	12	0	566	39.54	300.2	12	0	606	17.40	111.8	30	0
526	81.67	301.2	12	0	567	37.31	301.1	30	0	607	18.89	115.1	30	0
527	80.87	300.9		1	568	35.55	300.8		4	608	20.06	117.0	30	0
529	78.79	299.6	12	0	569	33.92	301.0	12	0	609	21.71	114.8	30	0
530	77.95	299.6	12	0	570	32.74	300.3	30	0	610	23.32	117.2	30	0
531	76.26	299.1	12	0	571	30.58	302.0	30	0	611	24.75	116.3	30	0
532	75.56	299.0	12	0	572	28.92	302.3	30	0	612	26.09	114.6		1
533	74.81	299.0	12	0	573	27.66	301.2	30	0	613	26.92	113.2	30	0
534	74.07	299.0	12	0	574	26.65	300.0	30	0	614	29.28	114.7	30	0
535	72.99	299.3	12	0	575	25.41	298.4		4	615	30.04	116.1	30	0
536	72.33	299.4	12	0	576	24.36	298.4	30	0	616	31.71	115.3	12	0
537	71.46	299.4	12	0	577	23.04	298.6	30	0	617	33.57	117.1	12	0
538	70.50	299.4	12	0	578	21.33	299.3	30	0	618	34.87	116.0	30	0
539	69.58	299.5	12	0	579	19.94	300.2	30	0					
540	68.56	299.6	12	0	580	18.42	300.9	30	0					

PASSCAL 1986 NORTHERN NEVADA EXPERIMENT

Shot Number 26 Shot Point 5
 Shot Time (Julian day, hr, min, sec): 211:07:08:00.009

Loc	Dist (km)	Azim (deg)	Tape Db Grade	Loc	Dist (km)	Azim (deg)	Tape Db Grade	Loc	Dist (km)	Azim (deg)	Tape Db Grade
101	127.88	352.9	5	541	6.40	299.1	48 0	581	44.24	117.9	12 0
501	45.96	302.0	12 0	542	5.71	298.3	48 0	582	45.65	118.4	12 0
502	44.49	302.4	12 0	543	4.85	300.6	48 0	583	46.93	118.3	12 0
503	42.79	303.2	3	544	3.94	303.4	68 0	584	48.24	118.1	12 0
504	41.55	304.6	1	545	3.05	305.2	68 0	585	49.96	118.1	12 4
505	40.68	305.4	12 0	546	2.18	307.8	88 0	586	51.16	118.7	12 0
506	38.72	304.2	12 0	547	1.16	299.0	88 0	587	51.85	118.2	12 0
507	37.33	304.4	12 0	548	0.33	291.5	88 0	588	53.45	118.8	12 0
508	37.06	307.5	12 0	549	0.47	88.0	88 0	589	55.50	118.1	4
509	35.91	308.6	12 0	550	1.64	89.4	68 0	590	56.87	119.3	12 0
510	34.75	309.1	12 1	551	2.33	104.5	48 6	591	58.61	119.8	12 0
511	34.03	310.3	12 0	552	3.09	120.6	48 0	592	59.77	119.3	1
512	33.18	311.7	12 0	553	4.54	126.7	48 0	593	61.14	118.9	12 0
513	32.74	313.2	12 0	554	5.94	121.1	48 0	594	61.67	118.8	12 0
514	31.89	314.2	12 0	555	6.97	115.4	48 0	595	62.61	119.3	12 4
515	30.89	313.7	30 0	556	7.92	117.1	30 0	596	63.88	119.3	12 0
516	29.58	311.7	30 0	557	9.37	116.1	30 0	597	65.51	119.4	12 0
517	28.84	311.3	30 0	558	10.69	116.3	30 0	598	66.85	117.9	12 0
518	27.90	310.8	30 0	559	12.15	115.8	30 0	599	68.47	117.9	12 0
519	27.03	310.4	30 0	560	13.48	115.6	30 0	600	69.65	118.9	4
520	26.10	309.7	30 0	561	14.70	116.2	30 0	601	71.20	119.3	12 0
521	25.20	309.4	12 2	562	16.16	119.0	30 0	602	73.52	118.9	12 0
522	24.31	308.9	30 0	563	17.22	121.2	30 0	603	74.44	118.2	12 0
523	23.37	308.5	30 0	564	18.63	120.8	30 0	604	75.37	117.8	12 0
524	22.55	307.9	30 0	565	19.89	119.1	1	605	77.29	117.3	12 0
525	21.40	307.9	30 0	566	21.68	117.2	30 0	606	78.48	117.2	12 0
526	20.60	306.5	30 0	567	23.94	116.1	30 0	607	80.05	117.9	12 0
527	19.77	305.4	1	568	25.68	116.8	4	608	81.25	118.3	12 0
529	17.59	300.1	30 0	569	27.32	116.7	12 0	609	82.87	117.7	12 0
530	16.75	300.1	30 0	570	28.47	117.7	12 0	610	84.51	118.3	12 0
531	15.06	297.7	30 0	571	30.68	116.2	30 0	611	85.93	118.0	12 0
532	14.36	297.6	30 0	572	32.35	116.2	12 0	612	87.23	117.5	1
533	13.61	297.4	30 0	573	33.57	117.3	12 0	613	88.01	117.0	12 0
534	12.88	297.0	30 0	574	34.55	118.5	12 0	614	90.41	117.4	12 0
535	11.79	299.2	30 0	575	35.79	119.5	1	615	91.21	117.8	12 0
536	11.13	299.5	48 0	576	36.85	119.5	12 0	616	92.87	117.5	12 0
537	10.26	300.0	48 0	577	38.16	119.3	12 0	617	94.75	118.1	12 0
538	9.30	299.6	30 0	578	39.87	118.9	12 0	618	96.04	117.7	12 0
539	8.39	301.0	48 0	579	41.27	118.4	12 0				
540	7.37	301.6	48 0	580	42.80	118.2	12 0				

Appendix B

Merged GEOS data for deployment 1. Additional information pertaining to GEOS recorders deployed during the northern Nevada PASSCAL experiment is given in a separate report (Dietel and Borchardt, 1987). Each table contains shot number, shotpoint number, and the following column headings:

Loc	- location number of the GEOS recorder (see Table 2).
GEOS LOC	- location number of the GEOS recorder given in Dietel and Borchardt (1987).
GEOS UNIT	- unit number of the GEOS recorder.
Distance (km)	- distance in kilometers from the shotpoint to the recorder.
Azimuth (deg)	- azimuth from the shotpoint to the recorder. (in degrees clockwise from north).

GEOS 20 SECOND VERTICAL COMPONENT DATA: DEPLOYMENT 1
 Sampling interval = 5 msec.; Tmin = -2
 Reduction velocity = 6.0 km/sec; Gain = 54 Db

Shot Number 1					Shot Number 4					Shot Number 7				
LOC	GEOS LOC	GEOS UNIT	DISTANCE (km)	AZIMUTH (deg)	LOC	GEOS LOC	GEOS UNIT	DISTANCE (km)	AZIMUTH (deg)	LOC	GEOS LOC	GEOS UNIT	DISTANCE (km)	AZIMUTH (deg)
164	G64	7	99.721	191.150	164	G64	7	137.770	110.500	164	G64	7	100.665	30.732
165	G65	22	101.154	191.667	165	G65	22	137.141	111.160	165	G65	22	99.011	30.520
167	G67	33	104.016	192.556	167	G67	33	136.117	112.470	167	G67	33	95.789	30.176
168	G68	31	104.982	192.717	168	G68	31	136.015	112.470	168	G68	31	94.779	30.188
171	G71	17	109.516	193.955	171	G71	17	134.667	114.970	171	G71	17	89.765	29.642
172	G72	4	111.150	194.371	172	G72	4	134.232	115.720	172	G72	4	87.973	29.433
173	G73	8	112.946	194.375	173	G73	8	134.624	116.470	173	G73	8	86.242	29.749
175	G75	24	115.284	194.936	175	G75	24	134.082	117.550	175	G75	24	83.691	29.444
179	G79	39	120.990	196.926	179	G79	39	131.499	120.370	179	G79	39	77.204	27.517
181	G81	12	124.755	197.036	188	G87	29	131.028	126.810	181	G81	12	73.466	27.901
186	G85	16	132.064	199.085						186	G85	16	65.529	25.100
188	G87	29	134.976	199.029						188	G87	29	62.653	25.526
190	G89	15	137.834	198.893										

Shot Number 2				
LOC	GEOS LOC	GEOS UNIT	DISTANCE (km)	AZIMUTH (deg)
164	G64	7	55.065	32.862
165	G65	22	53.400	32.530
167	G67	33	50.161	31.992
168	G68	31	49.153	32.049
171	G71	17	44.117	31.131
172	G72	4	42.318	30.754
173	G73	8	40.600	31.475
175	G75	24	38.038	30.907
179	G79	39	31.545	26.460
186	G85	16	20.100	17.841
188	G87	29	17.187	18.139
190	G89	15	14.328	19.347

Shot Number 5				
LOC	GEOS LOC	GEOS UNIT	DISTANCE (km)	AZIMUTH (deg)
164	G64	7	36.985	190.949
165	G65	22	38.423	192.315
167	G67	33	41.323	194.500
168	G68	31	42.948	194.854
171	G71	17	46.948	197.525
172	G72	4	48.632	198.352
173	G73	8	50.425	198.216
175	G75	24	52.838	199.264
179	G79	39	58.898	202.918
181	G81	12	62.666	202.778
186	G85	16	70.445	205.997
188	G87	29	73.320	205.616
191	G91	9	78.826	204.425

Shot Number 8				
LOC	GEOS LOC	GEOS UNIT	DISTANCE (km)	AZIMUTH (deg)
164	G64	7	6.121	40.489
165	G65	22	4.429	39.312
167	G67	33	1.160	34.565
168	G68	31	0.179	64.724
171	G71	17	4.929	219.355
172	G72	4	6.750	219.561
173	G73	8	8.411	214.358
175	G75	24	10.992	215.694
179	G79	39	17.857	221.836
181	G81	12	21.412	218.141
186	G85	16	29.911	221.549
188	G87	29	32.571	219.361

Shot Number 3				
LOC	GEOS LOC	GEOS UNIT	DISTANCE (km)	AZIMUTH (deg)
164	G64	7	100.665	30.732
165	G65	22	99.011	30.520
167	G67	33	95.789	30.176
168	G68	31	94.779	30.188
171	G71	17	89.765	29.642
172	G72	4	87.973	29.433
173	G73	8	86.242	29.749
175	G75	24	83.691	29.444
179	G79	39	77.204	27.517
186	G85	16	65.529	25.100
188	G87	29	62.653	25.526
190	G89	15	59.860	26.172

Shot Number 6				
LOC	GEOS LOC	GEOS UNIT	DISTANCE (km)	AZIMUTH (deg)
164	G64	7	99.721	191.150
165	G65	22	101.154	191.667
167	G67	33	104.016	192.556
168	G68	31	104.982	192.717
171	G71	17	109.516	193.955
172	G72	4	111.150	194.371
173	G73	8	112.946	194.375
175	G75	24	115.284	194.936
179	G79	39	120.990	196.926
181	G81	12	124.755	197.036
186	G85	16	132.064	199.085
188	G87	29	134.976	199.029

APPENDIX C

Instrument Response of Seismic Cassette Recorders and GEOS

The data set presented in this report is a combination of vertical-component data recorded by both seismic cassette recorders (Healy and others, 1982), and GEOS (Borcherdt and others, 1985) recorders. A careful comparison of the instrument response of these two different seismic recording systems is required to properly merge the data. Manufacturer's specifications and actual field calibration measurements are used to estimate the relative responses of the two recorder systems.

Seismic Cassette Recorders

Each SCR consists of a Mark Products L-4CTM 2-Hz geophone and a USGS-designed amplifier-VCO. The playback consists of a TRI-COMTM discriminator and a 12-bit DEC ADV11-CTM A/D convertor. The velocity response of the system peaks at about 6 Hz, but is relatively flat in the frequency range of 2 to 20 Hz (Figure 3; Dawson and Stauber, 1986).

For an input ground motion $A_g(t)$, the overall system output, $C_{DC}(t)$, in digital counts is:

$$C_{DC}(t) = [C_{LE} * C_{SA} * C_{VCO} * C_{DSC} * C_{A/D}]A_g(t) \quad (C-1)$$

Where,

C_{LE} is the effective motor constant (V/(cm/s)) of the seismometer-L-pad combination. For the L-4C seismometer, $C_{LE} = 1.0 \pm 0.1$ V/(cm/s).

C_{SA} is the system gain (ratio of output voltage to input voltage). $C_{SA} = 10(G - a/20)$ where "G" is the maximum gain (db) of the amplifier-VCO (100.6 ± 0.7 db), and "a" is the channel attenuation setting (usually 12, 30, 48, 68, or 88 db)

C_{VCO} is the VCO sensitivity (Hz/V) For the seismic cassette recorders, the VCO sensitivity has been set to ± 125 Hz deviation for ± 5.00 V input, or $C_{VCO} = 25.0$ Hz/V

C_{DSC} is the discriminator sensitivity (V/Hz). For the USGS seismic refraction playback system, the discriminator is set to ± 5.00 V output for an input of ± 125 Hz, or $C_{DSC} = 0.04$ Hz/V

$C_{A/D}$ is the digitizer sensitivity (counts/V). In the playback system, the DEC ADV11-C A/D board is set to 0-4095 counts output for a ± 5.00 V input, or $C_{A/D} = 409.5$ counts/V

Prior to each recording window, each SCR performs a calibration sequence consisting of a 10-Hz sine wave with amplitudes of 1, 10, 100, and 1000 microvolts (RMS). The calibration levels for each recorder are then measured during playback. These calibration levels may then be used to determine the average maximum system gain, G , for all the SCRs. By using over 800 separate calibration measurements made during the PASSCAL experiment, we have obtained an average maximum system gain, $G = 100.6 \pm 0.7$ db. The standard deviation of G , 0.7 db (about 8% of G_{SA}) is a measure of the total uncertainty in output of the amplifier-VCO-discriminator-A/D combination. This 8% uncertainty combined with the uncertainty in seismometer output (about 10% of C_{LE}) gives a total system output uncertainty of 13% (about 1.1 db).

GEOS

GEOS is a USGS-built and -designed multipurpose digital seismic recording system (Borcherdt and others 1985). GEOS is capable of recording on 6 separate channels, but only the response of the vertical-component velocity channel will be covered here. For 1986 PASSCAL Basin and Range experiment, the recording system consisted of a Mark Products™ L-22 1-Hz geophone, a preamplifier with preprogramable gain settings ranging from 0 to 60 db at 6 db increments, and a 16-bit CMOS A/D convertor. Each channel has a total dynamic range of better than 96 db.

For an input ground motion $A_g(t)$, the overall system output, $G_{DC}(t)$, in digital counts is:

$$G_{DC}(t) = [G_{LE} * G_{SA} * G_R * G_{A/D}]A_g(t) \quad (C-2)$$

where,

G_{LE} is the effective motor constant (V/(cm/s)) of the seismometer-L-pad combination. For the L-22 seismometer, $G_{LE} = 0.5 \pm 0.05$ V/(cm/s).

G_{SA} is the system gain, $G_{SA} = 10(\text{gain}/20)$ where gain is the preset gain of the amplifier. For deployment 1, gain was set to 54 db. Gain settings for deployments 2 and 3 are given in Dietel and Borcherdt (1987).

G_R is a voltage adjustment ratio in the preamplifier. ± 10 V input gives 8.191 V output. That is, $G_R = 0.8191$

$G_{A/D}$ is the digitizer sensitivity (counts/V). The digitizer produces an output of ± 32767 counts (15 bits plus sign) for an input of ± 8.191 V, or $G_{A/D} = 4000$ counts/V.

The system component gain parameters for both SCR and GEOS are summarized in Table C-1.

Table C-1

System Gain Parameters

	SCR	GEOS
seismometer	: $C_{LE} = 1.0 \pm 0.1$ cm/s	$G_{LE} = 0.05 \pm 0.05$ v/(cm/s)
amplifier	: $C_{SA} = 10(G-a)/20$ $G = 100.6 \pm 0.6$ db	$G_{SA} = 10(\text{gain}/20)$ gain = 54 db for dep. 1 $G_R = 0.8191$
VCO	: $C_{VCO} = 25.0$ Hz/V	N/A
discriminator	: $C_{DSC} = 0.04$ V/Hz	N/A
A/D	: $C_{A/D} = 409.5$ counts/V	$G_{A/D} = 4000$ counts/V

To correct the SCR data for system gain, the unnormalized amplitude should be multiplied by: $10^{a/20}$. Attenuation values for each data trace are given in Appendix A (under the column labeled "db").

To obtain an estimate of an equivalent value of "a" for the GEOS data, we need to equate C_{DC} and G_{DC} in equations C-1 and C-2, and then solve for C_{SA} .

$$C_{SA} = \frac{G_{LE} * G_{SA} * G_R * G_{A/D}}{C_{LE} * C_{VCO} * C_{DSC} * C_{A/D}} \quad (C-3)$$

Substituting for C_{SA} and G_{SA} ,

$$10^{\frac{G-a}{20}} = \frac{10^{\frac{\text{gain}}{20}} * G_{LE} * G_R * G_{A/D}}{C_{LE} * C_{VCO} * C_{DSC} * C_{A/D}} \quad (C-4)$$

or,

$$a = G - \text{gain} - 20 \log\left(\frac{G_{LE} * G_R * G_{A/D}}{C_{LE} * C_{VCO} * C_{DSC} * C_{A/D}}\right) \quad (C-5)$$

Using the values given in Table C-1, $a = 34.6$ db. That is, the output of a GEOS recorder set a gain = 54 db is equivalent to that of a seismic cassette recorder with attenuation set to 34.6 db.

Appendix D

Archive Tape Data Format

Archive data tapes are written in SEG Y standard format (Barry et al, 1975). Recording density is 1600 bpi, phase encoded (PE). In order to accommodate seismic refraction data, some minor changes have been made to the tape header fields. A complete list of header fields is provided in the card image portion of the reel identification header, shown below:

```

C 1 REEL IDENTIFICATION HEADER BYTES:
C 2 3217 -3218 sampling interval (microsecs).
C 3 3221 -3222 number of samples per trace.
C 4 3225 -3226 data sample format code.
C 5 3255 -3256 measurement system (1 = meters; 2 = feet).
C 6
C 7
C 8 TRACE IDENTIFICATION HEADER BYTES:
C 9 1 - 4 trace sequence number within reel.
C10 5 - 8 trace sequence number within reel.
C11 9 - 12 station location number.
C12 29 - 30 trace ID code (1 = seismic data).
C13 37 - 40 shotpoint-receiver distance (M).
C14 41 - 44 station elevation (M).
C15 45 - 48 shotpoint elevation (M).
C16 49 - 52 source depth (M).
C17 69 - 70 scalar to be applied to all elevations.
C18 71 - 72 scalar to be applies to all coordinates.
C19 73 - 76 shotpoint coordinate - X.
C20 77 - 80 shotpoint coordinate - Y.
C21 81 - 84 receiver coordinate - X.
C22 85 - 88 receiver coordinate - Y.
C23 89 - 90 coordinate units (1 = meters; 2 = seconds of arc).
C24 115 - 116 number of samples in this trace.
C25 117 - 118 sample interval in microseconds for this trace.
C26 121 - 122 instrument attenuation in db.
C27 157 - 158 shot time - year.
C28 159 - 160 shot time - day of year.
C29 161 - 162 shot time - hour of day (24 hour clock).
C30 163 - 164 shot time - minute of hour.
C31 165 - 166 shot time - second of minute.
C32 167 - 168 time basis code (2 = GMT).
C33 181 - 182 shot time - milliseconds.
C34 183 - 184 shotpoint location number.
C35 185 - 186 recording instrument unit number.

```


C36 191 - 192 distance weighting exponent (hundredths).
 C37 193 - 194 shot sequence number (shot number).
 C38 195 - 196 shot size (kg).
 C39 197 - 200 shot point - station azimuth (second of arc).
 C40 201 - 204 time of first point minus shot time (msec).

The data point format is "32 bit floating point", and the appropriate bytes (3225-3226) of the binary reel id header contain a value of 1. The trace amplitudes have not been adjusted for instrument gain, but the gain correction factor can be estimated from the instrument attenuation value (att) specified in bytes 121-122. To correct for gain, the data should be demeaned and then multiplied by:

$$\frac{(\text{att}/20)}{10}$$

The measurement system (bytes 3255-3256 of the binary reel header) is set to 1, meters.

Shotpoint and receiver coordinates are in seconds of arc (byte field 89-90). The coordinate scalar multiplier (bytes 71-72) is set to -100, so the coordinates (bytes 73-88) are in hundredths of a second of arc.

Bytes 157-166 and bytes 181-182 refer to the shot detonation time. The time of the first data sample is found by adding the shot detonation time to the time specified in bytes 201-204.

Since there is no weighting of amplitudes with distance for archive tapes, the distance weighting exponent (bytes 191-192) is not used.

Shot sequence number (bytes 193-194) refers to the order in which shots were fired during the field campaign (shot number).