

## **NBP9602 - SEISMIC RECORDING AND PROCESSING**

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### **Recording**

Approximately 1220 nautical miles of multichannel, and 900 nautical miles of single channel seismic reflection data were collected during late February and March of 1996 in the Ross, Amundsen and Bellingshausen Seas. Nine sonobuoys were launched, eight of which turned on. Seismic data was collected with a five gun array, shooting every 12 or 15 seconds at 5 to 6 knots, in water depths ranging from 3400 to 4600 meters. Sea and ice conditions varied. In general, the "single channel system" was used in areas where ice was expected. The "single channel" streamer was actually a modification of the full 1.2 km 48 channel streamer. In the single channel configuration, the last 16 channels of the multichannel streamer were towed, and arrivals at the last 12 channels were recorded. The streamer needed to be weighted down in this configuration, making it difficult to quickly alternate between the single channel and multichannel configuration. In the beginning the arrivals on the 12 channels were summed in groups of four and recorded onto three channels, while later in the cruise all 12 channels were recorded separately.

All multichannel and single channel data were recorded in SEG-D 8048 format on a OYO DAS-1 digital recorder running software version 1.26B. Data were recorded with a 2 or 3 second deep water delay, record lengths of 8.192 or 6.144 seconds, and a sample rate of 0.002 seconds. In general the recording system worked well. The few problems we did encounter included the fact that the OYO system does not update dates and times correctly when it is not in recording mode, resulting in the wrong time stamp being recorded in some file headers. The second, and more serious problem was the writing of corrupted file headers on a number of tapes. This problem appears to be the result of the OYO system defaulting to preamp gains upon reboot, and/or that the streamer layout was different than the number of channels the system was actually recording. Correspondence with the OYO software writers suggest that the data are retrievable from these tapes, and that the headers can be rebuilt.

### **Processing**

The original SEG-D-8048 DAT tapes were copied onto exabyte tapes on a SPARC-2 workstation. They were then loaded into the SIOSEIS software package, brought along by Steve Cande on his SUN workstation, and converted to SEG-Y format. Some preliminary processing and quality control was done using the "ISIS" seismic processing software brought along by Caltech. Unfortunately the system tended to lock up, and often ran out of enough memory to run the various applications.

A significant amount of time was spent attempting to process data with the Seismic Processing Workshop (SPW version 2.6.4) software running on a POWERMAC. The MAC was running system software 7.5.2, with 32 meg of built in memory, and had 6 Gbytes of disk space available for loading data. As had been the case with the previous cruise (NBP9601), we had difficulty loading data from the original DAT tapes, but were successful in loading data from the exabyte copies of the original data.

Numerous problems encountered with the SPW software, as well as unfamiliarity with the quirks of the software, made it difficult to accomplish much processing outside of quality control. These problems included the system locking up, system errors, insufficient

memory, and ultimately corrupted disks. Unfortunately, a hard reboot of the MAC made it impossible to record any associated error messages, or information about where the processing step had failed. Although the SPW support personnel were quick to respond to questions, a number of questions remain unresolved. The most significant one is the fact that the system does not appear to be calculating the correct seismic velocities using parabolic velocity picking functions. We expect that this problem is related to the fact that we recorded data with deep water delays, although this has yet to be confirmed. Attempts to circumvent this problem by using reasonable velocities were unsuccessful. These attempts resulted in strange looking common mid-point stacks which we did not believe.

In many cases the software is carefully documented. However, at times the documentation (which is for an older version of SPW) did not agree with the newer version of the software on the ship. This was especially true for the documentation for entering the cable geometries.

As expected, processing on the MAC is slower than what would be expected for a SUN system. To load 2000 shots of 48 channel data from a 8500 exabyte tape takes approximately 3 hours. Each step in the SPW processing system writes a new data file (using up disk space). Geometry definitions, CMP sorts, etc. for this data can each take approximately 45 minutes, if the system does not lock up.

Dave Leger (ASA) wrote software that uses NGL coordinate files and the OYO shot logfiles from rvdas to generate geometry files which SPW can load from disk. The code for this "spw\_geometry" lives in the rvdas utilities area, and is user friendly in that it tells the user what parameters it needs as input.

### **Recommendations**

The following procedures for seismic data processing are recommended for future NBP cruises. If the science party plans to use the SPW processing system, a SUN system should be available for copying the original DAT tapes to exabyte. In addition, it would be preferable that the person responsible for the data processing already have some familiarity with running the SPW software. A significant amount of time was spent just trying to get the software to do simple tasks such as geometry definition, CMP sorts, and receiver gathers. Having previous cruise flow charts available is helpful if the nature of the recording is the same, e.g. same record lengths, sample rates, etc.

If the ISIS processing system is used, a more powerful computer than the SPARC-2 is recommended. In addition at least four gigabytes of disk space should also be available.

**NBP9602 - CANDE/STOCK ANTARCTIC CRUISE**  
**MULTICHANNEL & SINGLE CHANNEL SEISMIC CONFIGURATIONS**  
**Recorded on OYO - DAS 1 software version 1.26B**

**MCS-48 configuration (Seistapes # 1 - 10)**

GPS antenna to stern - 44 meters  
stern to guns - 53 meters  
guns to near channel - 265 meters  
5 geophones per channel group (2.5 meters apart)  
channel groups - 25 meters long (1200 meters total length)  
streamer depth ~ 10 meters  
gun depths ~ 5 meters  
*channels 3, 34, 37 and 46 dead; 4 noisy*  
*deployed 5 - 210 in <sup>3</sup> air guns; gun 5 dead, gun 1 injector error*

**SCS - 5 channel configuration (Seistape # 11)**

modification of the multichannel streamer  
400 meters of streamer in water  
recording five channels (44, 45, 46 (dead), 47 and 48) on channels 1-5  
active section = 125 meters (5 -5 geophone channel groups)  
GPS antenna to stern - 44 meters  
stern to guns - 30 meters  
guns to near channel(44) - 245 meters  
streamer depth ~ 3 meters  
gun depths ~ 5 meters  
*1 - 210 cubic inch air gun*

**SCS - 12 channel configuration (Seistape # 12)**

modification of the multichannel streamer  
400 meters of streamer in water  
recording twelve channels (37(dead), 38, 39, 40, 41, 42, 43, 44, 45, 46 (dead),  
47 and 48) on channels 1-12  
active section = 300 meters (5 -5 geophone channel groups)  
GPS antenna to stern - 44 meters  
stern to guns - 30 meters  
  
guns to near channel(37) - 75 meters  
streamer depth ~ 3 meters  
gun depths ~ 5 meters  
*1 - 210 cubic inch air gun*

**SCS - 12 channel (summed onto 3 recorded channels) configuration (Seistape # 13)**

modification of the multichannel streamer  
400 meters of streamer in water  
recording twelve channels (37(dead), 38, 39, 40) on channel 10; 41, 42, 43, & 44 on channel 11; 45, 46 (dead), 47 and 48) on channel 12  
active section = 300 meters (5 -5 geophone channel groups)  
GPS antenna to stern - 44 meters  
stern to guns - 30 meters  
guns to near channel(37+) - (120 meters) - 100 meter "channel" spacing (150, 250 and 350 meters from stern)  
streamer depth ~ 3 meters  
gun depths ~ 5 meters  
*1 - 210 cubic inch air gun*

**SCS - 12 channel (summed onto 3 recorded channels) configuration (Seistape # 14 - 17)**

modification of the multichannel streamer  
300 meters of streamer in water - channels 37 and 38 essentially out of the water  
recording twelve channels - (37(dead), 38, 39, 40) on channel 1; 41, 42, 43, & 44 on channel 2; 45, 46 (dead), 47 and 48) on channel 3  
active section - 300 meters (5 -5 geophone channel groups);  
GPS antenna to stern - 44 meters  
stern to guns - 30 meters  
guns to near channel(37+) - (20 meters) - 100 meter "channel" spacing (50, 150 and 250 meters from stern)  
streamer depth ~ 3 meters  
gun depths ~ 5 meters

**SCS - 12 channel (summed on 3 recorded channels) configuration (Seistapes # 18 - 28)**

modification of the multichannel streamer  
400 meters of streamer in water  
recording twelve channels (37(dead), 38, 39, 40) on channel 1; 41, 42, 43, & 44 on channel 2; 45, 46 (dead), 47 and 48) on channel 3  
active section = 300 meters (5 -5 geophone channel groups)  
GPS antenna to stern - 44 meters  
stern to guns - 30 meters  
guns to near channel(37+) - (120 meters) - 100 meter "channel" spacing (150, 250 and 350 meters from stern)  
streamer depth ~ 3 meters  
gun depths ~ 5 meters  
*deployed 5 - 210 in<sup>3</sup> air guns;*

**MCS-48 Seistapes # 29 - 54**

GPS antenna to stern - 44 meters  
stern to guns - 53 meters  
guns to near channel - 265 meters  
5 geophones per channel group (2.5 meters apart)  
channel groups - 25 meters long (1200 meters total length)  
streamer depth ~ 10 meters  
gun depths ~ 5 meters  
*channels 3, 34, 37, 42 and 46 dead; 4, 41 and 46 noisy*  
*deployed 5 - 210 in <sup>3</sup> air guns; gun 1 dead (shooting 4 out of 5 guns)*  
*on seistape # 52, guns being pulled to surface periodically due to high waves*

NBP002 SEISMIC TAPE LOG

LINE #	TAPES	START FILE	END FILE	START LAT	START LONG	END LAT	END LONG	GMT JDAY	START TIME	END TIME	ENDING DEPTH (m)	AVG VEL (km/sec)	RECORD LENGTH (SEC)	SAMPLE RATE (HSEC)	POP RATE (SEC)	DELAY (SEC)	TYPE	# CHANNEL	COMMENTS	SHOT
1	1	1	76	-69.45 S	179.37	-69.46.407	179.44.076	56	08:27	08:42	3738	5 to 6	8.192	2	12	3	MCS-48	48 + AUX	TIME ON TAPE IS LOCAL TIME (JDAY 055 2027); ADJUSTED SHOT TIMES BY ADDING EXACTLY 12.0 HOURS AND CHANGING JDAY TO 56	..
1	2	77	2076	-69.46.407	179.44.076	-70.0.970	-177.52.830	56	08:52	17:15	3738	5 to 6	8.192	2	15	3	MCS-48	48 + AUX	TIME ON TAPE IS LOCAL TIME (JDAY 055 2027); ADJUST SHOT TIMES BY ADDING EXACTLY 12.0 HOURS	..
1	3	2077	4076	-70.0.970	-177.52.830	-70.37 S	-177.00 W	56	17:17	01:36	3738	5 to 6	8.192	2	15	2	MCS-48	48 + AUX	OYO DAS1 says JDAY 056-43:35 END TIME: ADJUST SHOT TIMES BY ADDING EXACTLY 12.0 HOURS	..
1	4	4077	6093	-70.37 S	-177.00 W	-70.43 59' S	176.50 4.1 W	57	01:41	10:05	3753	5 to 6	8.192	2	15	2	MCS-48	48 + AUX	OYO DAS 1 says 057 22:05 END TIME: 120 meter tape	..
1	5	6094	8093	-70.43 59' S	176.50 4.1 W	-70.16.114	-177.42.072	57	10:10	18:29	3753	5 to 6	8.192	2	15	2	MCS-48	48 + AUX	OYO DAS 1 CLOCK FIXED TO CORRECT TIME (10:10 start)	..
1	6	8094	9883	-70.16.114	-177.42.072	-70.1.306	-179.49.470	57	18:30	02:04	3622	5 to 6	8.192	2	15	2	MCS-48	48 + AUX	120 meter tape (DAT DRIVE ON BOARD WOULDNT READ)	..
1	7	1	247	-70.1'S	179.50 W	-69.58 S	179.48 E	58	02:08	03:21	3622	5 to 6	8.192	2	15	2	MCS-48	48 + AUX		..
1	8	248	2247	-69.58 S	179.48 E	-69.36 S	177.38 E	58	03:25	11:45	3500	5 to 6	8.192	2	15	2	MCS-48	48 + AUX		..
1	9	2248	4247	-69.9 S	177.38 E	-69.9 S	176.19 E	58	11:49	20:10	3460	5 to 6	8.192	2	15	2	MCS-48	48 + AUX		..
1	10	4248	5101	-69.9 S	176.19 E	-69.49.6 S	176.24.3 E	58	20:16	23:49	3620	5 to 6	8.192	2	15	2	MCS-48	48 + SONBY SONOBUOY # 1		..
2	11	46	307	-68.28 S	176.50 E	-68.31'S	177.9 E	59	06:44	07:39	3460	5 to 6	6.144	2	10	2	SCS-5	5	OYO shots say Jday 058: ONE GUN (DAY FIXED IN SEGY FILES)	..
2	12	308	2311	-68.32'S	177.9 E	-68.48 S	178.55 E	59	07:39	13:13	3620	5 to 6	6.144	2	10	2	SCS-12	12	OYO shots say Jday 058 - can't read past second file - no EOF	..
2	13	2312	6074	-68.48 S	178.56 E	-69.11 S	177.40 W	59	13:19	23:46	3948	5 to 6	6.144	2	10	2	SCS -12	12	OYO shots say Jday 058 (DAY FIXED IN SEGY FILES)	..
2	14	6075	6198	-69.11 S	177.40 W	-69.10 S	177.30 W	60	00:10	00:31	3821	5 to 6	6.144	2	10	2	SCS	12 on 3	OYO shots say Jday 058 (DAY FIXED IN SEGY FILES)	..
2	15	6199	8198	-69.10 S	177.30 W	-69.4.264 S	-175.54.414	60	00:52	06:25	3980	5 to 6	6.144	2	10	2	SCS	12 on 3	OYO dates ok after reboot, shots say Jday 060	..
2	16	1	4000	-69.4.264	-175.54.414	-69.6.719 S	-173.46.386	60	06:33	17:39	3979	5 to 6	6.144	2	10	2	SCS	12 on 3		..
2	17	4001	558	-69.9.776 S	-173.47.38	-69.12.318	-173.36.402	60	19:15	20:51	4182.6	5 to 6	6.144	2	10	2	SCS	12 on 3	files 4001, 4572, 4574, 4575 at beginning of tape	..
3	18	1	308	-70.12'S	-170.0 W	-70.17'S	-170.0 W	63	03:23	04:15	4132	5.5	6.144	2	10	2	SCS	12 on 3	OYO DAS 1 says 061 03:23 (JDAY FIXED IN SEGY FILES)	..
3	19	309	1284	-70.18 S	-170.0.664 W	-70.42.969	-170.0.664 W	63	04:24	08:24	3888.6	5.5	8.192	2	15	2	SCS	12 on 3	OYO DAS 1 says 061 04:24 (REBOOT AFTER THIS TAPE) (JDAY FIXED IN SEGY FILES)	..
3	20	1285	2065	-70.44.78	-170.0.0 W	-71.2.434	-170.0.192	63	08:52	12:09	4131	5 to 6	8.192	2	15	2	SCS	12 on 3	STRANGE FILE HEADERS - ALL DIFFERENT SIZES - SENDING COPY TO OYO	..
3	21	1	454	-71.39.162	-169.48.876	-71.53.91	-169.50.382	63	19:10	21:10	4086	5 to 6	8.192	2	15	2	SCS	12 on 3	STRANGE FILE HEADERS - ALL DIFF SIZES - REBOOT - SENDING COPY TO OYO	..
3	22	455	1299	-71.51 S	-169.50 W	-72.16 S	-169.51 W	63	21:31	01:03	4033	5 to 6	8.192	2	15	2	SCS	12 on 3	HEADERS OK, line OK	..
4	23	1	2000	-72.18.922	-159.59.068	-71.48 S	-158.45 W	64	20:32	04:48	4327	5 to 6	8.192	2	15	2	SCS	12 on 3	SONOBUOYS 2 and 3 (Fracture Zone ?) (Sonobuoy # 3 files 500-775)	..
4	24	2001	4004	-71.48 S	-158.46 W	-72.24 S	-158.59 W	65	04:48	13:09	4324	5 to 6	8.192	2	15	2	SCS	12 on 3	SONOBUOY 4 files 2704-3046; missing shots 2002-2006	..
4	25	4005	6004	-72.24 S	-158.59 W	-72.52.156	-159.59.016	65	13:12	21:34	4257	5 to 6	8.192	2	15	2	SCS	12 on 3		..
4	26	6005	8004	-72.31.905 S	-159.59.1 W	-72.23.223	-157.40.614	65	21:36	05:56	4325	5 to 6	8.192	2	15	2	SCS	12 on 3		..
4	27	1	3000	-72.23 S	-157.59 W	-72.24.9 S	-153.21.948	66	06:05	18:34	4189.3	5 to 6	8.192	2	15	2	SCS	12 on 3		..

LINE #	TAPES	START FILE	END FILE	START LAT	START LONG	END LAT	END LONG	GMT JDAY	START TIME	END TIME	ENDING DEPTH (m)	AVG VEL (km/sec)	RECORD LENGTH (SEC)	SAMPLE RATE (HZ/SEC)	POP RATE (sec)	DELAY (sec)	TYPE	# CHANNELS	SONOBUOY #5 files 3695-4060	COMMENTS	SEOF
4	28	3001	4197	-72.243° S	-153.219° W	-72.40° S	-152.29° W	66	19:16	00:16	4107	5 to 6	8.192	2	15	2	SCS	12 on 3			..
5	29	0	1549	-69.19° S	129.45° W	-68.44° S	130.12° W	74	02:16	09:00	4164.7	6	8.192	2	15	2	MCS	48	5 GUNS		..
5	30	1550	3549	-68.43° S	130.13° W	-68.1678° S	131.22.96	74	09:06	17:00	4185.3	6	8.192	2	15	2	MCS	48	5 GUNS		..
5	31	3550	5550	-68.1340° S	131.23.56° W	-67.1° S	132.32° W	74	17:31	01:53	4560	6	8.192	2	15	2	MCS	48	4 GUNS??		..
6	32	1	2000	-67.19° S	132.32° W	-67.24° S	-131.18° W	75	01:55	10:16	4555.2	6	8.192	2	15	2	MCS	48			..
6	33	2001	4000	-67.24° S	-131.18° W	-68.5° S	-130.0° W	75	10:17	18:50	4221.9	6	8.192	2	15	2	MCS	48			..
6	34	4001	6000	-68.56° S	-130.0° W	-68.44° S	-128.42° W	75	18:55	03:18	3758	6	8.192	2	15	2	MCS	48			..
6	35	6001	6050	-68.44.67° S	-128.42° W	-68.45° S	-128.40.4° W	76	03:21	03:44	3724.6	6	8.192	2	15	2	MCS	48			..
6	36	6051	6549	-68.46° S	-128.39° W	-68.57.8° S	-128.39° W	76	03:36	06:03	3569	6	8.192	2	15	2	MCS	48			..
6	37	6550	8549	-68.45° S	128.16° W	-69.2° S	-126.2° W	76	06:03	14:23	3447.4	6	8.192	2	15	2	MCS	48			..
6	38	8550	10144	-69.1° S	-126.19° W	-68.50° S	-124.33° W	76	14:28	21:06	4071	6	8.192	2	15	2	MCS	48	COULDN'T CONVERT SHOTS WITH FILE NUMBERS LARGER THAN 9999 - WITH SIOSEIS		..
7	39	1	2000	-68.49° S	-124.34° W	-68.11° S	125.55° W	76	21:25	05:46	4097	6	8.192	2	15	2	MCS	48			..
7	40	2001	4000	-68.10° S	-125.55° W	-67.31° S	127.13° W	77	05:49	14:09	4309	6	8.192	2	15	2	MCS	48			..
7	41	4001	6000	-67.32° S	-127.15° W	-65.53° S	128.30° W	77	14:13	22:33	4385	6	8.192	2	15	2	MCS	48			..
7	42	6001	8000	-66.53° S	128.31° W	-66.17° S	129.4° W	77	22:36	06:57	4679.5	6	8.192	2	15	2	MCS	48			..
7	43	8001	9999	-66.16° S	129.33° W	-66.31° S	-122.33° W	78	06:57	15:21	4730	6	8.192	2	15	2	MCS	48			..
7	44	1	2000	-66.3° S	127.31° W	-66.41° S	126.21° W	78	15:28	23:48	4255	6	8.192	2	15	2	MCS	48			..
7	45	2001	2774	-66.41° S	-126.20° W	-66.56° S	-125.53° W	78	23:50	03:30	4384	6	8.192	2	15	2	MCS	48	TAPE REWOUND ITSELF BEFORE 2000 FILES		..
7	46	2775	3256	-69.59.11° S	-125.48° W	-67.10° S	-125.27° W	79	03:32	05:50	4336.1	6	8.192	2	15	2	MCS	48	TAPE REWOUND ITSELF EARLY - BEFORE 2000 files		..
7	47	3257	5259	-67.10° S	-125.26° W	-67.50° S	-124.9° W	79	05:57	14:12	4201	6	8.192	2	15	2	MCS	48			..
7	48	5260	6526	-68.23° S	-123.02° W	-67.51° S	-124.1° W	79	14:20	21:14	4295	6	8.192	2	15	2	MCS	48			..
7	49	6527	7173	-68.23° S	-123.02° W	-68.36° 59° W	-122.35° W	79	21:16	23:58	4227	6	8.192	2	15	2	MCS	48	SONOBUOYS 6, 7, 8 and 9 ON AUXILIARY CHANNEL		..
8	50	1	3000	-68.08° S	-130.08° W	-67.39° S	-127.45° W	83	23:52	12:22	4313	5 to 6	8.192	2	15	2	SCS	12	BAD HEADERS - ALL DIFFERENT SIZES (DISPLAY DIDN'T MATCH RECORDING PARAMETERS??) - SENDING COPIES TO OYO		..
8	51	3001	4153	67.40° S	-127.43° W	-68.57° S	-126.48° W	84	12:34	18:18	4153	5 to 6	8.192	2	15	2	SCS	12	BAD HEADERS - ALL DIFFERENT SIZES (DISPLAY DIDN'T MATCH RECORDING PARAMETERS??) - SENDING COPIES TO OYO		..
8	52	1	3000	-68.78° S	-126.47° W	-68.13.81° S	-128.1.8° W	84	18:27	06:57	4057.5	5 to 6	8.192	2	15	2	SCS	12	HEADERS OK - TIM FIXED DISPLAY, AND CHECKED HEADERS ON OYO		..
8	53	3001	6000	-68.12.5° S	-128.29° W	-67.23° S	-128.20° W	85	07:12	19:45	4336	5 to 6	8.192	2	15	2	SCS	12			..
8	54	6001	8666	-67.23° S	-122.19° W	-66.41° S	-126.17° W	85	19:51	07:02	3756	5 to 6	8.192	2	15	2	SCS	12			..

Output from list.disk.sun on mcs2.segy:

HEADER ERROR

Enter the name of the SEG Y disk file to be dumped.  
 ENTER THE SKIP CYCLE BETWEEN TRACES TO PRINT.

SHOT	TR	RP	TR ID	RANGE	DELAY	NSAMPS	SI	YR	DAY	HR	MIN	SEC	EOG
77	1	0	0 1	0	3000	4096	2000	1996	55	20	52	30	0
77	2	0	0 1	0	3000	4096	2000	1996	55	20	52	30	0

...

825	47	0	0 1	0	3000	4096	2000	1996	55	23	59	54	0
825	48	0	0 1	0	3000	4096	2000	1996	55	23	59	54	0
* 826	1	0	0 1	0	3000	4096	2000	1996	57	0	0	9	0
826	2	0	0 1	0	3000	4096	2000	1996	57	0	0	9	0

\* = line 35956 of list\_disk\_sun

Not only is there a discrepancy between local time and gmt time as noted in the tape logs, but there is also a skipped day (Julian day 56), which occurs at shot 826.

The discrepancy noted in the log is that the times on tape should be corrected by adding 12:00 hours.

e.g. the start time which is  
 day:55 hour:20 min:52 sec:30  
 should be  
 day:56 hour:08 min:52 sec:30

[SEE THE ATTACHED SCRIPTS FOR  
 CORRECTING THE HEADERS IN  
 BOTH mcs2.segy AND  
 mcs3.segy]



```
../sioseis/sioseis.solaris << eof
```

```
# file: tape2_correct.script
```

```
procs diskin header diskoa end
```

```
    diskin
```

```
        ipath mcs2.segy
```

```
        decimf 2
```

```
    end
```

```
end
```

```
header
```

```
    fno   77 lno   107 ihdr 80 56 81 8 spat no end
```

```
    fno  108 lno   346 ihdr 80 56 81 9 spat no end
```

```
    fno  347 lno   585 ihdr 80 56 81 10 spat no end
```

```
    fno  586 lno   825 ihdr 80 56 81 11 spat no end
```

```
    fno  826 lno  1065 ihdr 80 56 81 12 spat no end
```

```
    fno 1066 lno  1305 ihdr 80 56 81 13 spat no end
```

```
    fno 1306 lno  1545 ihdr 80 56 81 14 spat no end
```

```
    fno 1546 lno  1785 ihdr 80 56 81 15 spat no end
```

```
    fno 1786 lno  2025 ihdr 80 56 81 16 spat no end
```

```
    fno 2026 lno  2076 ihdr 80 56 81 17 spat no end
```

```
end
```

```
diskoa
```

```
    opath mcs2_fixed_header.segy
```

```
end
```

```
end
```

```
end
```

```
eof
```

```
../sioseis/list.disk.sun < list_disk_test_input > list_disk_test_output
```

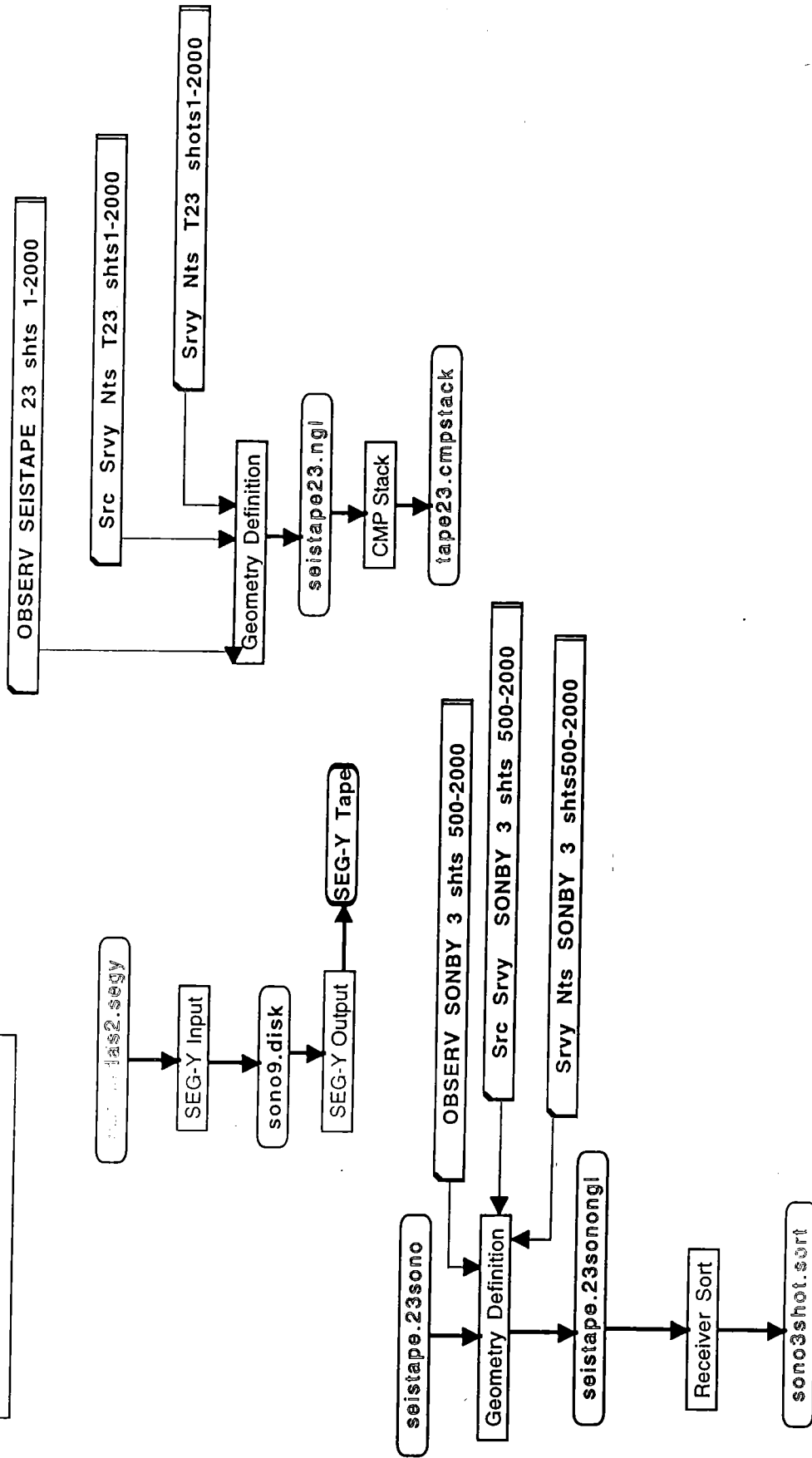
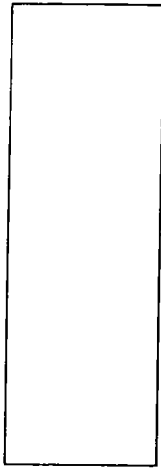
```

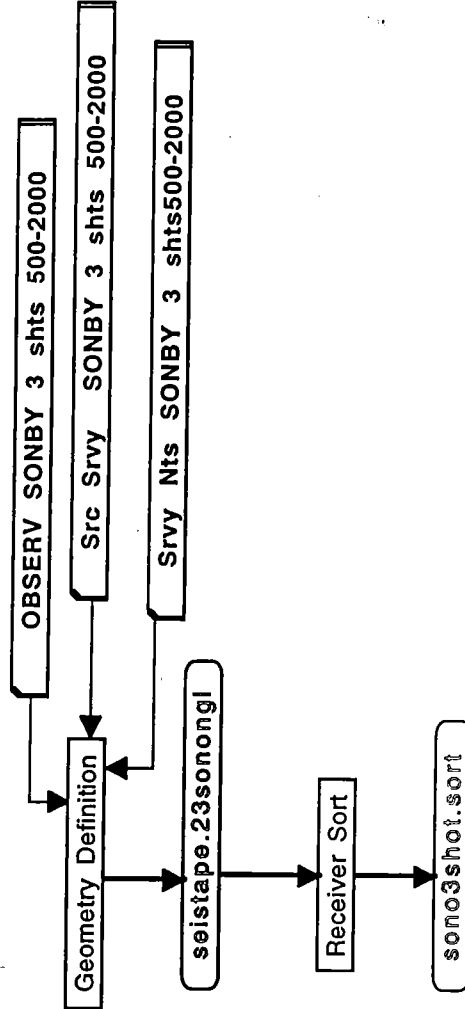
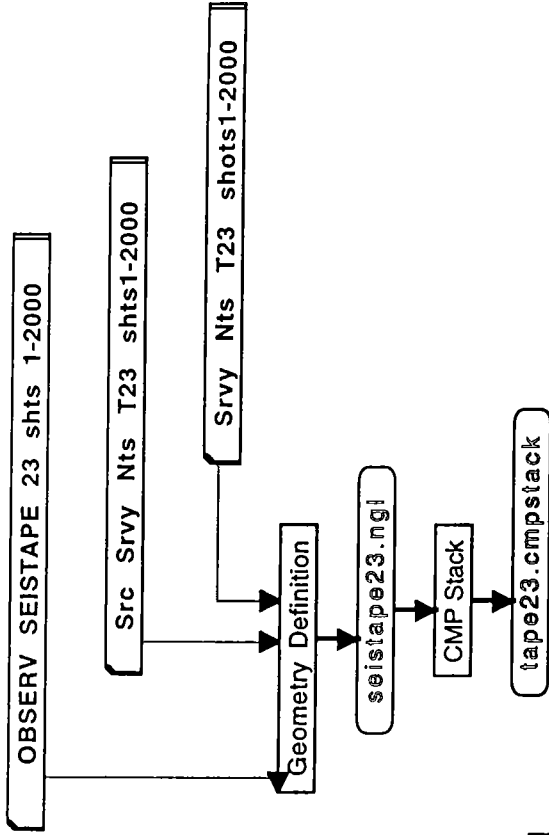
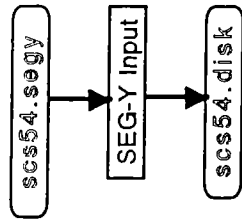
sioseis.solaris << eof
# file: tape3_correct.script
procs diskin header diskoa end
    diskin
        ipath mcs3.segy
        fno 2077 lno 2972
        decimf 2
    end
end
header
    fno 2077 lno 2251 ihdr 80 56 81 17 spat no end
    fno 2252 lno 2491 ihdr 80 56 81 18 spat no end
    fno 2492 lno 2731 ihdr 80 56 81 19 spat no end
    fno 2732 lno 2972 ihdr 80 56 81 20 spat no end
end
diskoa
    opath mcs3_fixed_header.segy
end
end
eof

#list.disk.sun < list_disk_test_input > list_disk_test_output

```

2973	3212	↔ 80 56 81 21
3213	3452	80 56 81 22
3453	3692	80 56 81 23
3693	3932	81 00
3933	4152	81 01
4153	4391	81 02
4392	4631	81 03
4632	4871	81 04
4872	5111	05
5112	5351	06
5351	5591	07
5592	5830	08
5831	6070	09
6071	6092	10







Trace Balance

Velocity Function

