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June 10, 1980

U.S. Geological Survey
Conservation Division, Eastern Region
1725 K Street NW, Suite 204
Washington, DC 20006

ATTENTION: Mr. Philip Laun

REF. Contract 14-08-0001-16330 Modification No. 1

Gentlemen:

Per Section H, Items I & IIF of referenced basic contract, please find enclosed two (2) copies of Final Field Operations Report inclusive of navigation processing report.

Very truly yours,

WHITEHALL CORPORATION-SEISMIC DIVISION

Russell H. Talty

Russell H. Talty

RHT:rf

Enclosures

cc: U.S. Geological Survey - Mr. John Behrendt
MS964, Denver West - Bldg. 2
Denver Federal Center
Denver, Colorado 80225
(1 copy of report included)

eon

FIELD OPERATIONS REPORT

ON A

MARINE SEISMIC SURVEY

OFFSHORE EAST COAST U.S.A.,

CHARLESTON AREA

FOR

U.S. GEOLOGICAL SURVEY

CONTRACT NO. 14-08-0001-16330 MODIFICATION NO. 1

BY

SEISMIC DIVISION-WHITEHALL CORPORATION

HOUSTON, TEXAS

JULY - AUGUST, 1979

TABLE OF CONTENTS

INTRODUCTION

A marine seismic survey offshore East Coast U.S.A. in the Charleston, South Carolina Area was conducted by Seismic Division-Whitehall Corporation in behalf of U.S. Geological Survey, Conservation Division (Denver, Colorado office) under Contract No. 14-08-0001-16330 Modification No. 1. The survey was begun July 22, 1979 and was completed August 1, 1979.

The following report describes the vessel, M/V Seismic Explorer, navigational and recording equipment, procedures used, and operational and statistical summaries.

Respectfully,

Seismic Division-Whitehall Corporation

Russell H. Talty

Russell H. Talty

Manager, Marine Administration

DESCRIPTION OF VESSEL

"M/V SEISMIC EXPLORER"

The vessel was contracted from Stewart & Stevenson Services, Inc., Houston, Texas, and built at Mangone Shipyard, also in Houston. Construction was completed in September, 1967. The M/V Seismic Explorer was inspected by the U.S. Coast Guard and registered at the Port of Houston in the name of Whitehall Electronics Corporation, 1133 Empire Central, Dallas, Texas, USA.

A complete overhaul of the vessel and its machinery at Mangone Shipyard was started in August, 1978 and completed in early June, 1979. Overhaul included installation of new main engines and a total complement of new state-of-art geophysical survey equipment. The following details describe the vessel:

Size:	165 Ft. O.A. x 36 Ft. Beam x 15 Ft. Deep
Normal Draft:	9.0 - 12.5 Feet
Cruising Range:	10,000 Miles
Accomodations:	Four 4-Man & Seven 2-Man Staterooms = 30 Men
Main Engines:	Two Detroit Diesel 16V-149 w/Twin Disc MG-540 Gears
Continuous BHP, each:	900 Maximum @ 1800 RPM
Speed Range:	3 to 12 Knots
Ship's Service Generators:	Two GM 871, 120 KW each
Instrument Room Generator:	One GM 371, 60 KW w/20 KW MG Set
Auxiliary Engines:	Two GM 371 - for Dual Hydraulic Power System

Radios:	(1) 35-Channel SSB Radiotelephone, CAI 35 MS, 1000 Watt, Synthesized
	(2) 78-Channel VHF Radiotelephone, INTECH V-110, Synthesized
Radio Call Sign:	WR-8350
Radar:	Decca 329 with 9 Ft. Antenna
Autopilot:	Sperry Gyropilot
Gyrocompass - Ship's Navigation:	Sperry Mark 227
- Satellite Navigation:	Arma Brown MD-X-201
Fathometers - Wheelhouse:	Simrad EX-2C
- P.D.R.:	Raytheon CESP-III
Anti-Pollution Tanks:	Waste Oil Storage Tank Waste Water/Sewage Treatment Tank
Potable Water Capacity:	7,660 Gallons, Tank Storage 1,200 Gallons/day Saline Convertor
Fuel Tank Capacity:	115,900 Gallons, Tank Storage
Lube Oil Capacity:	1,960 Gallons, Tank Storage

SEISARRAY

A 21 AIR GUN TUNED ARRAY MARINE ACOUSTIC SOURCE

The SEISARRAY was designed with a primary objective to obtain the maximum output in bar-meters with the available air supply while maintaining the best primary-bubble ratio.

The above objective was achieved by utilizing three subarrays - each based on the size ratios of 1.0, 1.2, 1.5, 1.9, 2.5, 4.0 and 6.1 (where the smallest chamber size is unity). The overall tuned array, which provides the seismic sound source, is composed of the following three sub-arrays having volumes of:

Sub-Array No. 1 - 10, 12, 15, 19, 25, 40 and 61 cubic inches (Total Gross and Net Volumes = 182 cubic inches)

Sub-Array No. 2 - 30, 36, 45, 57, 75, 185*, and 280* cubic inches (Total Gross Volume = 708 cubic inches and Total Net Volume = 647 cubic inches)

Sub-Array No. 3 - 50, 60, 75, 147*, 193*, 305* and 463* cubic inches (Total Gross Volume = 1293 cubic inches and Total Net Volume = 1153 cubic inches)

* These gun chambers are provided with wave shape kits.

TOTAL GROSS VOLUME = 2183 cubic inches.

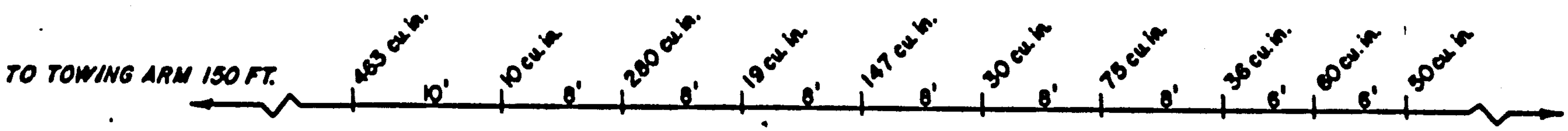
TOTAL NET VOLUME = 1982 cubic inches.

Physical arrangement of the arrays is depicted in the following schematic drawing. The 21 guns are towed astern in two parallel strings 65 feet apart. The gun group on each string is 75 feet overall and the nearest gun will be a minimum of 80 feet from the ship's stern. The entire array is normally spread over an area roughly 65 feet by 75 to 150 feet - the latter dimension being extendable by allowing one string to be towed further astern than the other. The large areal shotpoint provides for an enchancement of vertical signal and cancellation of horizontal waves. The individual guns are separated sufficiently so as to prevent significant interaction between themselves. The minimum distance used is that which would allow a six percent increase in bubble period for two guns of the largest of the two sizes involved.

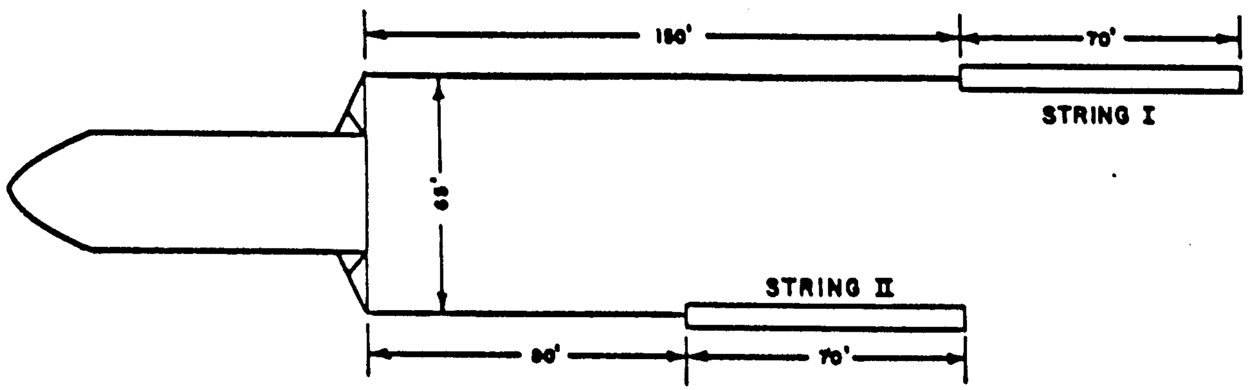
The far field waveform has been measured with a calibrated hydrophone by K.S.E.P.L., Holland. Measured peak-to-peak pressure is 56 bar-meters with a suppression ratio of 8.5 for primary-to-bubble.

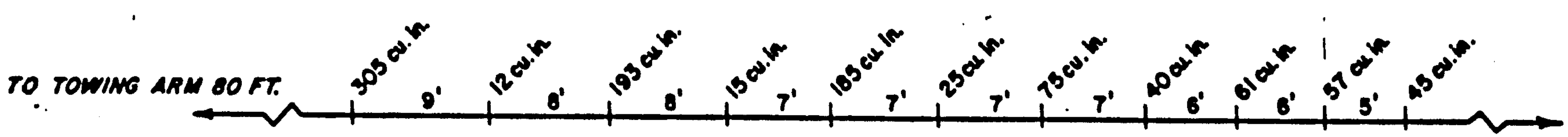
The air supply for the array is provided by an Ingersoll Rand 1100H screw type Low-Stage compressor (1100 SCFM @ 150 psi) w/Detroit Diesel 12V-71N drive and a Worthington High-Stage compressor (1000 SCFM @ 2000 spi) w/Detroit Diesel 12V-71 drive.

Each gun has a separate air supply hose, pressure gauge, cut off valve, delay time circuit and firing line.



STRING I





STRING II

Firing moment is monitored by hydrophones not more than 1 msc. of travel time from each air gun. Array depth is monitored by hydrostatic pressure on an open-ended piping attachment.

The entire array has a delay circuit (master delay) with a range of 0 to 9.9 seconds in 100 msc. steps and this master delay will allow for any desired remote controlled shooting. Each gun has a delay circuit (30 circuits available) with a range of 0-99 msc. in one (1) msc. steps which allows the operator to "tune" the array with visual monitoring on an 8-channel long retentive image scope. The electrical/mechanical solenoids, which trigger the release of air, have progressively different performance characteristics as they age through useage and will eventually fail at different ages. Therefore, the individual guns must be constantly monitored (for simultaneity) and individual delays changed to keep all guns firing at the same instant and thus keep the array "tuned".

NAVIGATION SYSTEM

The vessel is equipped with the most sophisticated completely integrated Satellite-Soppler-Sonar navigation system available on the market - The Magnavox MX-200 system. The individual components of this system are as follows:

1. Magnavox Model MX-702A Satellite receiver system with Hewlett-Packard computer with 32K memory.
2. Magnavox MX-610D, Doppler-Sonar System.
3. Arma Brown MK-X-201 Gyrocompass.
4. Magnavox Model 2001 Interface and Software.
5. MX-40 Data Logger.
6. Loran-C integrated system.
7. Magnavox 3-D Fix program.
8. Dual digital tape transports and controller.
9. Houston Instruments track plotter.
10. Two CRT display units (one in strument room and second in the pilot house)

The basic position reference for this system is obtained from the U.S. Navy Navigation Satellite System, often called "Transit". Today there are five operational satellites in circular polar orbits about 1075 Kilometers high, circling the earth every 107 minutes. On the average, position fixes are available every 60 to 90 minutes depending on the latitude of the ship. Transit measurements are with respect to sequential positions of the satellite as it passes. This process requires from 10 to 16 minutes, during which the satellite travels 4400 to 7000 kilometers, providing an excellent baseline.

There are two principal components of error in a Transit position fix. First, is the inherent system error, and the second is error introduced by unknown ship's travel during the satellite pass. The first error can be measured by observing scatter at a fixed position. Our receiver-computer system has been tested for less than 46 meters rms. The computer in our system is intergrated to receive the ship's travel from the MS-610D Doppler-Sonar System, which tracks velocity relative to the sea bottom to a water depth of 365 meters. Beyond the maximum operating depth, the sonar measures velocity with respect to the water mass, so that unknown water current becomes a source of error.

A Loran-C system is included and integrated into the SatNav system through the HP computer. The Rubidium Frequency Standard of the system permits operation in the Rho-Rho mode and the more precise incremental velocity of Loran-C will supercede sonar velocity measurements in cases of spurious bottom track or water track operational modes of the MX-610D sonar.

The Doppler-Sonar System/Loran-C system with the gyrocompass continues to track the movement of the vessel between passes and the accumulated error is proportional to the time between passes.

MARINE STREAMER SYSTEM

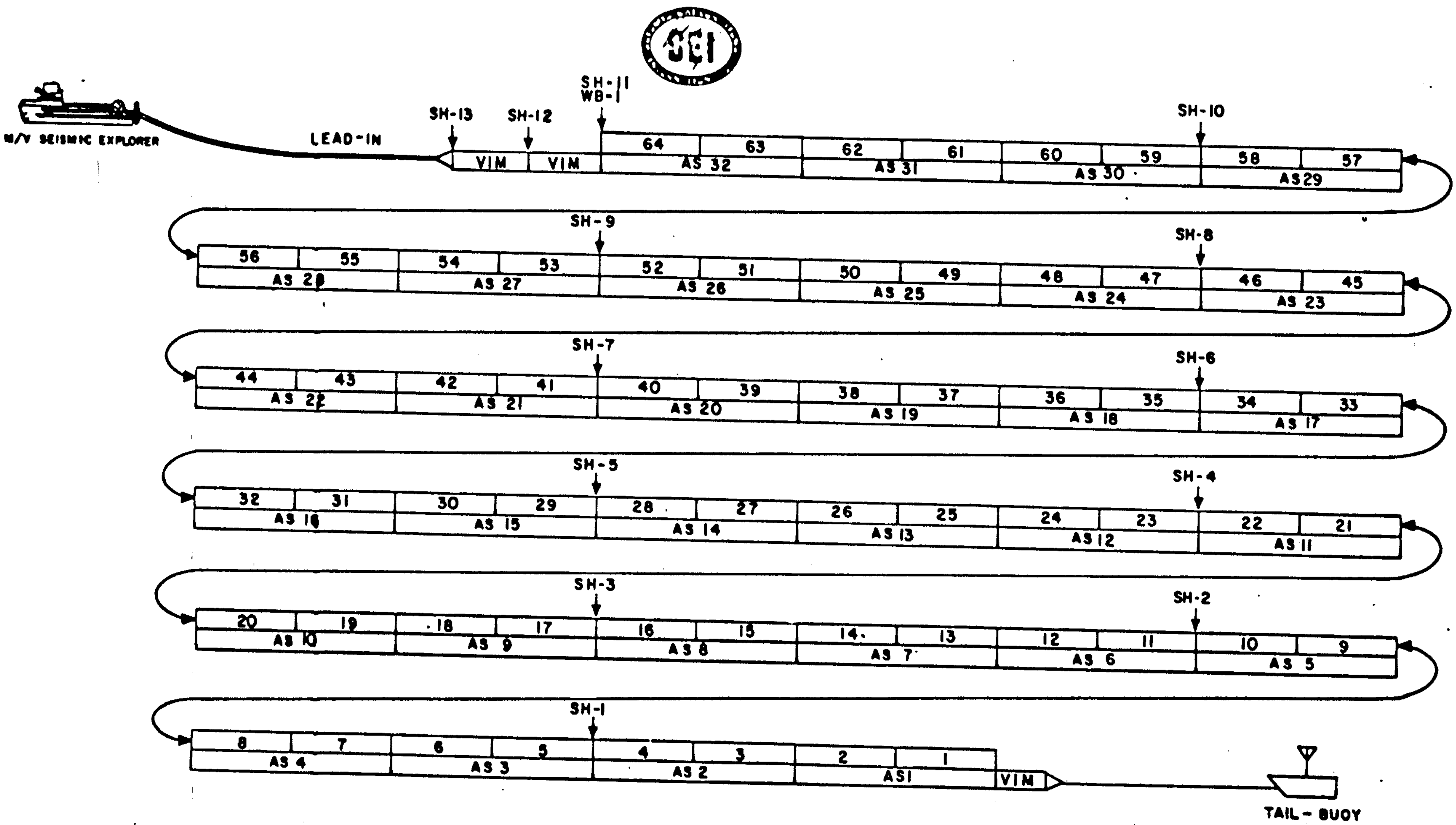
The DSS-V Century Streamer System installed on this ship is manufactured by our sister company, Seismic Engineering Company (SECo). It is a transformerless 208 seismic channel system which inputs on board through the DSS-V electronic interface to the seismic recording system with a patch panel on each side of the interface. (An additional 38 channels are provided for cable depth control, water breaks and spares for future accessories which may be added.)

The streamer system which was used on this survey consists of a "faired" lead-in cable, two 50 meter elastic "decoupler" sections, thirty two active sections, one elastic "decoupler" section and a tail buoy. Thirteen SEAHAWK cable depth controllers, controllable from the instrument room, were utilized. Ten digital read-out depth indicators provided continuous cable depth information and cable depths were read and logged at frequent intervals. A strain gauge load-cell monitored streamer tension with indicators in both the instrument room and wheelhouse.

The streamer configuration used was:

Offset Distance:	188 Meters - center of power source to center of Group No. 64.
Number Groups:	64
Section Length:	100 Meters containing 2 groups of 64 hydrophones each.
Group Length:	50 Meters
Group Interval:	50 Meters
Streamer Length:	3200 Meters

The streamer is of the neutrally buoyant oil filled type. Streamer frequency response and sensitivity are shown in the following graphs. Total harmonic distortion is less than 0.5% above 5 Hz. The deletion of transformers in the streamer and the shipboard DSS-V interface eliminates hydrophone array signal distortion and attenuation resulting from saltwater intrusion in the streamer or other possible leakage. Output was set at 100 microvolts/microbar.



VIM = VIBRATION ISOLATION MODULE (50M)
AS = ACTIVE SECTION (100M).
1-64 = 50 METER GROUPS.
SH = SEAHAWK DEPTH CONTROLLER
WB = WATER BREAK.
CP = COMPASS

STREAMER LAYOUT— U.S.G.S.
JUN - AUG '79

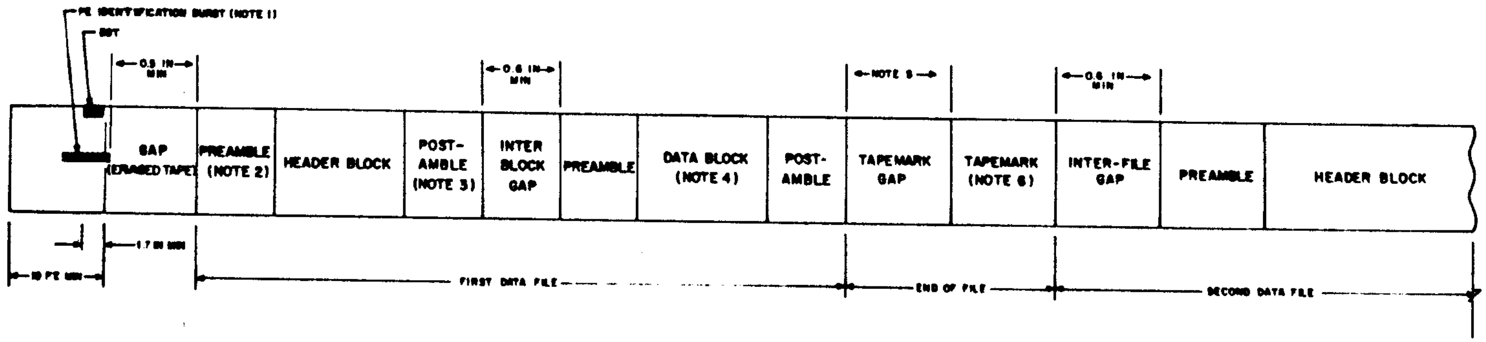
RECORDING INSTRUMENTS

The ship is equipped with a GEOSOURCE (E.S.D.) most recent Model MDS-10 digital field recording system employing I.F.P. amplifiers. These instruments are custom installed in shock-mounted computer cabinets in the main deck house instrument room, together with the cameras, controller, monitors, navigation system and peripheral equipment. The seismic data system includes the following:

1. 96 recording channels, 2 & 4 millisecond sample rates. (24 channels @ ½ msc. and 48 channels @ 1 msc. sampling are also available.)
2. Dual ten-inch reel tape transports.
3. The 2400 foot, ½ inch, 9 track tape is recorded with phase encoded data in SEG "B" Format, 1600 BPI.
4. Read-after-write, which allows data to be monitored in real time.
5. A 64 channel GEOSOURCE (E.S.D.) Model SDW-400B electrostatic camera with 300 Hz galvanometers for periodic wiggle trace monitor of the MDS-10 tape.
6. A single track Raytheon Model LSR-1811 line scan recorder for continuous section monitoring of the near trace of the seismic streamer.
7. Ten digital read-out cable depth monitors.
8. Four water break channels.
9. A Precision Depth Recorder, Raytheon CESP III system, 3.5 KHz, for sea bottom measurement and shallow sub-bottom profiling.
10. A SECo Peripheral Controller to provide automated control of the various recording functions of seismic system and additionally can provide up to 9.9 seconds - in 0.1 second increments - of delay between shot moment and tape start for deep water recording.

MDS-10 TAPE FORMAT "B"

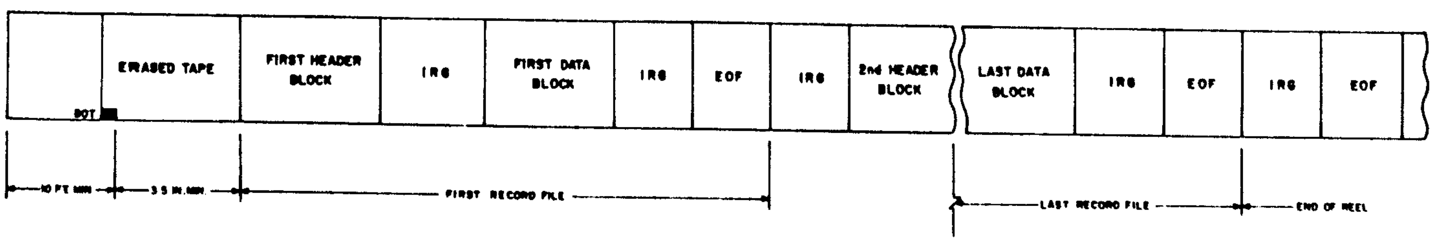
1600 BPI PHASE ENCODING RECORDING



NOTES:

1. PE IDENTIFICATION BURST CONSISTS OF 1600 FLUX REVERSALS PER INCH IN TRACK P, ALL OTHER TRACKS DC ERASED
2. PREAMBLE CONSISTS OF FORTY CHARACTERS WITH 0-BITS IN ALL TRACKS FOLLOWED BY ONE CHARACTER WITH 1-BIT IN ALL TRACKS.
3. POSTAMBLE CONSISTS OF ONE CHARACTER WITH 1-BITS IN ALL TRACKS FOLLOWED BY FORTY CHARACTERS WITH 0-BIT IN ALL TRACKS.
4. SYNCHRONOUS DATA RECORDING: DATA RECORDING DOES NOT BEGIN UNTIL TIMEBREAK. TAPE IS ERASED UNTIL TIMEBREAK THEN, THE PREAMBLE AND FIRST SYNC BYTE ARE WRITTEN
5. TAPEMARK GAP: STANDARD 0.6 IN. MIN
6. PE TAPEMARK CONSISTS OF 80 FLUX REVERSALS AT 3200 FCI IN TRACKS P, 0, 2, 5, 6 AND 7 TRACKS 1, 3 AND 4 ARE DC-ERASED

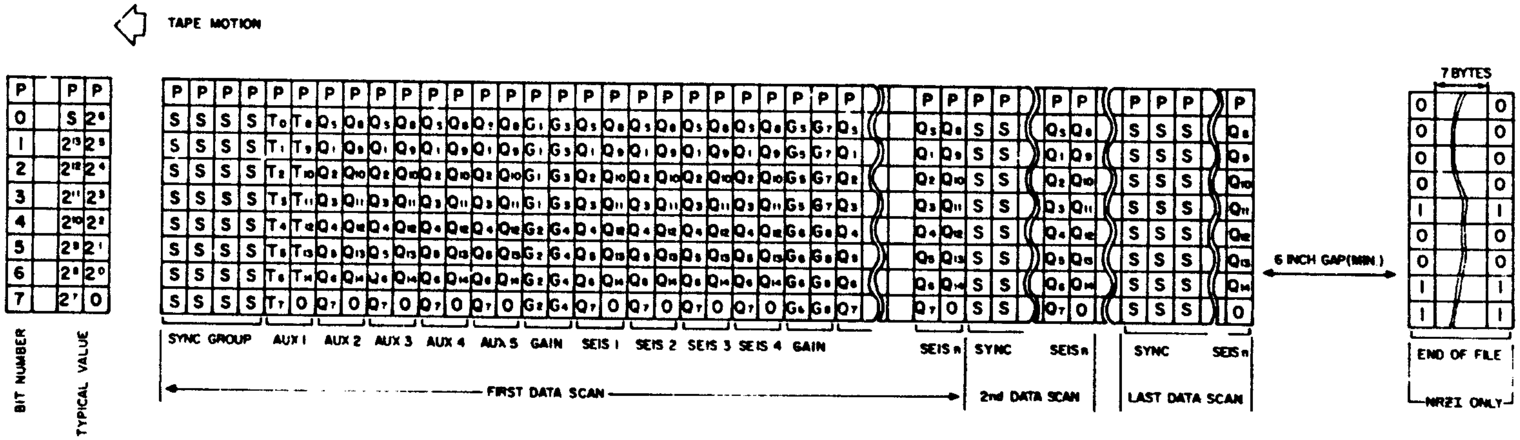
800 BPI NRZ RECORDING



NOTES

1. ORDER AND LOCATION OF TRACKS ON TAPE DIRECTION OF MAGNE-TIZATION LOCATION AND CONTENT OF REDUNDANCY CHECK CHARACTERS AND ALL OTHERS APPLICABLE SPACI-FICATIONS IN ACCORDANCE WITH IBM FILE NO 5360-19. FORM A22-6562 AND TR 00.151 JUNE 1964
2. SYNCHRONOUS DATA RECORD: DATA RECORDING DOES NOT BEGIN UNTIL TIMEBREAK. TAPE IS ERASED UNTIL THE FIRST SYNC BYTE IS WRITTEN.

MDS-10 FORMAT "B" DATA BLOCK



S — SYNC ONE IN BITS 0-5 & 7 OF FIRST FOUR BYTES OF EACH DATA SCAN. BIT 6 OF FIRST FOUR BYTES INDICATES NO. OF SEISMIC DATA CHANNELS.

BYTE	1	2	3	4
VALUE	2^0	2^1	2^2	2^3
12 CH	0	0	0	0
24 CH	0	1	0	0
48 CH	0	0	1	0
96 CH	0	0	0	1
192 CH				

$T_0 - T_{14}$ — TIMING WORD: BIT 7 LSB BYTES ALWAYS ZERO.
$T_0 = 16384$ ms
$T_{14} = 1$ ms

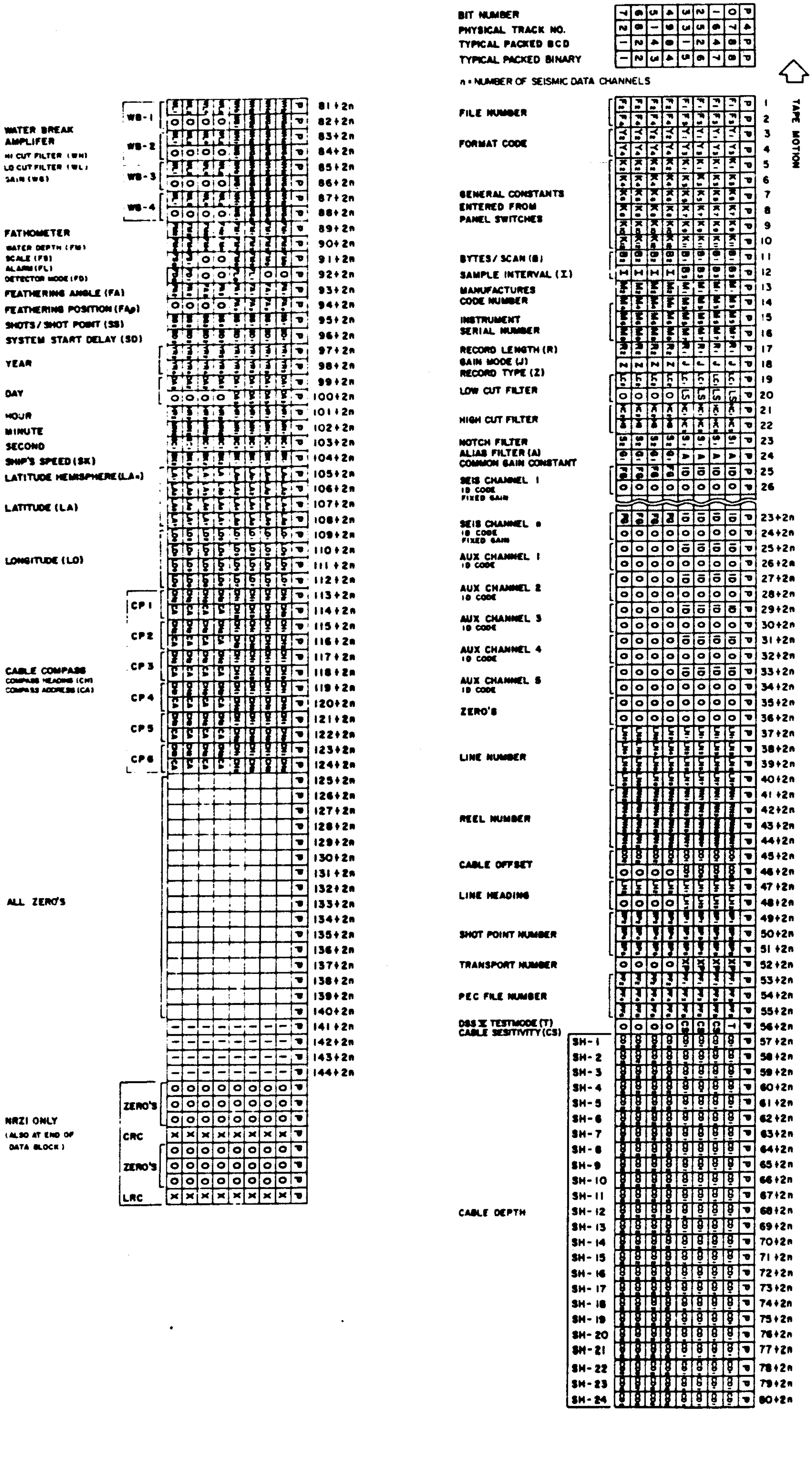
Q — DIGITIZED OUTPUT OF NO CONVERTER
QS = SIGN (1 = MINUS)
Q1 = 5.0 V
Q14 = 0.6 mV
NEGATIVE NUMBERS ARE RECORDED IN TWO'S COMPLEMENT CODE

G_n — BINARY VARIABLE: MAY BE ZERO OR ONE DEPENDING ON DATA

Gn	48 DB
Gn	24 DB
Gn	12 DB
Gn	6 DB

P — VERTICAL (BYTE) PARITY: BIT P IS ONE IF BITS 0-7 OF THE SAME BYTE CONTAIN ANY EVEN NUMBER OF ONES (ODD PARITY)

MDS-10 FORMAT "B" EXTENDED HEADER BLOCK



MDS-10 FORMAT "B" EXTENDED HEADER

BYTE NO.		LETTERS	DESCRIPTION	
1		F_1, F_2	4-digit file number.	
2		F_3, F_4		
3		Y_1, Y_2	4-digit format code.	
4		Y_3, Y_4		
5		K_1, K_2	12-digit general constants.	
6		K_3, K_4		
7		K_5, K_6		
8		K_7, K_8		
9		K_9, K_{10}		
10		K_{11}, K_{12}		
11		B_1, B_2	3-digit bytes per data scan	
12	MSD	B_3		
12	LSD	I	1-digit sample interval in milliseconds.	
13		M_1, M_2	2-digit manufacturers code.	
14		M_3, M_4	6-digit equipment serial number.	
15		M_5, M_6		
16		M_7, M_8		
17		R_1, R_2	2-digit record length in seconds.	
18	MSD	J	Amplifier gain control mode: 8=binary gain, 4=programmed gain, 2=ganged AGC, 1=individual AGC, 9=floating point gain control.	
18	LSD	Z	1-digit type of record: 8=shot, 4=shot bridle, 2=test, 1=other.	
19		LC_1, LC_2	2-digit low-cut filter setting in hertz.	
20	MSD	LS	Low-cut filter shope: 0=out 3=18 db/oct 6=36 db/oct	
20	LSD		All zero's.	
21			All zero's.	
22			All zero's.	
23		S_1, S_2	2-digit notch filter in hertz.	
24		A	Alias filter setting. 0=500 hz 1=250 hz 2=125 hz 4= 62 hz 8= 31 hz	
25	MSD	ID	1-digit channel identification code.	Seis channel 1
25	LSD	FG	1-digit fixed gain (pre-amp).	
26			All zero's.	
23+2n	MSD	ID	1-digit channel identification code.	Seis channel n
23+2n	LSD	FG	1-digit fixed gain (pre-amp).	
24+2n			All zero's.	
25+2n	MSD	ID	1-digit channel identification code.	Aux channel 1
25+2n	LSD		All zero's.	
26+2n			All zero's.	
27+2n	MSD	ID	1-digit channel identification code.	Aux channel 2
27+2n	LSD		All zero's.	
28+2n			All zero's.	
29+2n	MSD	ID	1-digit channel identification code.	Aux channel 3
29+2n	LSD		All zero's.	
30+2n			All zero's.	
31+2n	MSD	ID	1-digit channel identification code.	Aux channel 4
31+2n	LSD		All zero's.	
32+2n			All zero's.	
33+2n	MSD	ID	1-digit channel identification code.	Aux channel 5
33+2n	LSD		All zero's.	
34+2n			All zero's.	
35+2n			All zero's.	
36+2n			All zero's.	
37+2n		LN_1, LN_2	8-digit line number.	
38+2n		LN_3, LN_4		
39+2n		LN_5, LN_6		
40+2n		LN_7, LN_8		
41+2n		RN_1, RN_2	8-digit real number.	
42+2n		RN_3, RN_4		
43+2n		RN_5, RN_6		
44+2n		RN_7, RN_8		
45+2n		CO_1, CO_2		
46+2n	MSD	CO_3		
46+2n	LSD		All zero's.	
47+2n		LH_1, LH_2	3-digit line heading in degrees.	
48+2n	MSD	LH_3		
48+2n	LSD		All zero's.	
49+2n		SP_1, SP_2	6-digit shop point number.	
50+2n		SP_3, SP_4		
51+2n		SP_5, SP_6		
52+2n	MSD	XP	1-digit tape transport number.	
52+2n	LSD		All zero's.	

HEX value	Channel type
0	unused
2	seismic
4	time break
6	gun pulses
8	water break
A	time counter
B	50 hz (camera)
E	sweep

BCD value	1	2	3	4
Fixed Gain	12db	24db	36db	48db

53+2n	PF_1, PF_2	6-digit PEC file number.
54+2n	PF_3, PF_4	
55+2n	PF_5, PF_6	
		DSS V electronic interface
56+2n MSD	T	8=test mode, 1=test / 0=operate
	CS	4=cable sensitivity,
	CS	2=cable sensitivity,
	CS	1=cable sensitivity
56+2n LSD		All zero's.

BCD value	7	6	5	4	3	2	1	0
Sensitivity uv/ub	100	75	50	25	20	15	10	5

CABLE DEPTH INDICATORS

57+2n	CD_1, CD_2	2-digit cable depth (feet) #1
58+2n	CD_1, CD_2	2-digit cable depth (feet) #2
59+2n	CD_1, CD_2	2-digit cable depth (feet) #3
60+2n	CD_1, CD_2	2-digit cable depth (feet) #4
61+2n	CD_1, CD_2	2-digit cable depth (feet) #5
62+2n	CD_1, CD_2	2-digit cable depth (feet) #6
63+2n	CD_1, CD_2	2-digit cable depth (feet) #7
64+2n	CD_1, CD_2	2-digit cable depth (feet) #8
65+2n	CD_1, CD_2	2-digit cable depth (feet) #9
66+2n	CD_1, CD_2	2-digit cable depth (feet) #10
67+2n	CD_1, CD_2	2-digit cable depth (feet) #11
68+2n	CD_1, CD_2	2-digit cable depth (feet) #12
69+2n	CD_1, CD_2	2-digit cable depth (feet) #13
70+2n	CD_1, CD_2	2-digit cable depth (feet) #14
71+2n	CD_1, CD_2	2-digit cable depth (feet) #15
72+2n	CD_1, CD_2	2-digit cable depth (feet) #16
73+2n	CD_1, CD_2	2-digit cable depth (feet) #17
74+2n	CD_1, CD_2	2-digit cable depth (feet) #18
75+2n	CD_1, CD_2	2-digit cable depth (feet) #19
76+2n	CD_1, CD_2	2-digit cable depth (feet) #20
77+2n	CD_1, CD_2	2-digit cable depth (feet) #21
78+2n	CD_1, CD_2	2-digit cable depth (feet) #22
79+2n	CD_1, CD_2	2-digit cable depth (feet) #23
80+2n	CD_1, CD_2	2-digit cable depth (feet) #24

WATER BREAK AMPLIFIER

81+2n MSD	WH	1-digit Hi-cut filter setting.	#1
81+2n LSD	WL	1-digit Lo-cut filter setting.	#1
82+2n MSD	WG	1-digit Gain setting.	#1
82+2n LSD		All zero's.	
83+2n MSD	WH	1-digit Hi-cut filter setting.	#2
83+2n LSD	WL	1-digit Lo-cut filter setting.	#2
84+2n MSD	WG	1-digit Gain setting.	#2
84+2n LSD		All zero's.	
85+2n MSD	WH	1-digit Hi-cut filter setting.	#3
85+2n LSD	WL	1-digit Lo-cut filter setting.	#3
86+2n MSD	WG	1-digit Gain setting.	#3
86+2n LSD		All zero's.	
87+2n MSD	WH	1-digit Hi-cut filter setting.	#4
87+2n LSD	WL	1-digit Lo-cut filter setting.	#4
88+2n MSD	WG	1-digit Gain setting.	#4
88+2n LSD		All zero's	

Hex value	0	1	2	3	4	5	6	7	8	9	A	B
Hi-cut filter (hz)	out	4800	3200	2400	1600	1200	800	600	400	300	200	150

Hex value	0	1	2	3	4	5	6	7	8	9	A	B
Lo-cut filter (hz)	100	150	200	300	400	600	800	1200	1600	2400	3200	4800

BCD value	0	1	2	3	4	5
Gain (db)	24	36	48	60	72	84

89+2n	FM_1, FM_2	5-digit fathometer reading in tenths.
90+2n	FM_3, FM_4	
91+2n MSD	FM_5	
91+2n LSD	FS	1-digit fathometer scale.
92+2n MSD	FL	1-digit fathometer alarm.
92+2n LSD	FD	1-digit fathometer detector mode.
93+2n	FA_1, FA_2	2-digit cable feathering angle in degrees.
94+2n MSD	FA	1-digit feathering angle position.
94+2n LSD		All zero's
95+2n	SS_1, SS_2	2-digit shots/shot point.
96+2n	SD_1, SD_2	2-digit system start delay in $\frac{1}{10}$ seconds.
97+2n	YR_1, YR_2	4-digit year.
98+2n	YR_3, YR_4	
99+2n	DA_1, DA_2	3-digit julien day.
100+2n MSD	DA_3	
100+2n LSD		All zero's
101+2n	HR_1, HR_2	2-digit hour (GMT).
102+2n	MN_1, MN_2	2-digit minute.
103+2n	SC_1, SC_2	2-digit second.
104+2n	SK_1, SK_2	2-digit ships speed in 1/10 knots.

BCD value	0	1	2
Scale	meters	feet	fathoms

BCD value	0	2	3
Alarm	2nd	1st	No

BCD value	0	2	3
Detector mode	First	Last	Peak

Hex value	B	D
Position	Right	Left

SHIPS POSITION (WGS-72 DATUM)

105+2n MSD	LA	1-digit latitude hemisphere. 0 = Northern / F = Southern
105+2n LSD	LA_1	2-digit latitude-degrees.
106+2n MSD	LA_2	
106+2n LSD	LA_3	2-digit latitude-minutes.
107+2n MSD	LA_4	
107+2n LSD	LA_5	3-digit latitude - $\frac{1}{1000}$ minutes.
108+2n	LA_6, LA_7	
109+2n	LO_1, LO_2	2-digit longitude-degrees.
110+2n MSD	LO_3	
110+2n LSD	LO_4	2-digit longitude-minutes.
111+2n MSD	LO_5	
111+2n LSD	LO_6	3-digit longitude - $\frac{1}{1000}$ minutes.
111+2n	LO_7, LO_8	

CABLE COMPASS (MAGNETIC HEADING)

113+2n	CH_1, CH_2	3-digit compass heading in degrees.	
114+2n MSD	CH_3		#1
114+2n LSD	CA	1-digit compass address.	
115+2n	CH_1, CH_2	3-digit compass heading in degrees.	
116+2n MSD	CH_3		#2
116+2n LSD	CA	1-digit compass address.	
117+2n	CH_1 CH_2	3-digit compass heading in degrees.	
117+2n MSD	CH_3		#3
117+2n LSD	CA	1-digit compass address.	
118+2n	CH_1, CH_2	3-digit compass heading in degrees.	
119+2n MSD	CH_3		#4
119+2n LSD	CA	1-digit compass address.	
120+2n	CH_1, CH_2	3-digit compass heading in degrees.	
121+2n MSD	CH_3		#5
121+2n LSD	CA	1-digit compass address.	
122+2n	CH_1, CH_2	3-digit compass heading in degrees.	
123+2n MSD	CH_3		#6
123+2n LSD	CH	1-digit compass address.	

125+2n - 140+2n ALL ZERO'S.

INSTRUMENT TESTS

These instrument tests were made soon after the cable was laid out and before shooting commenced in this area:

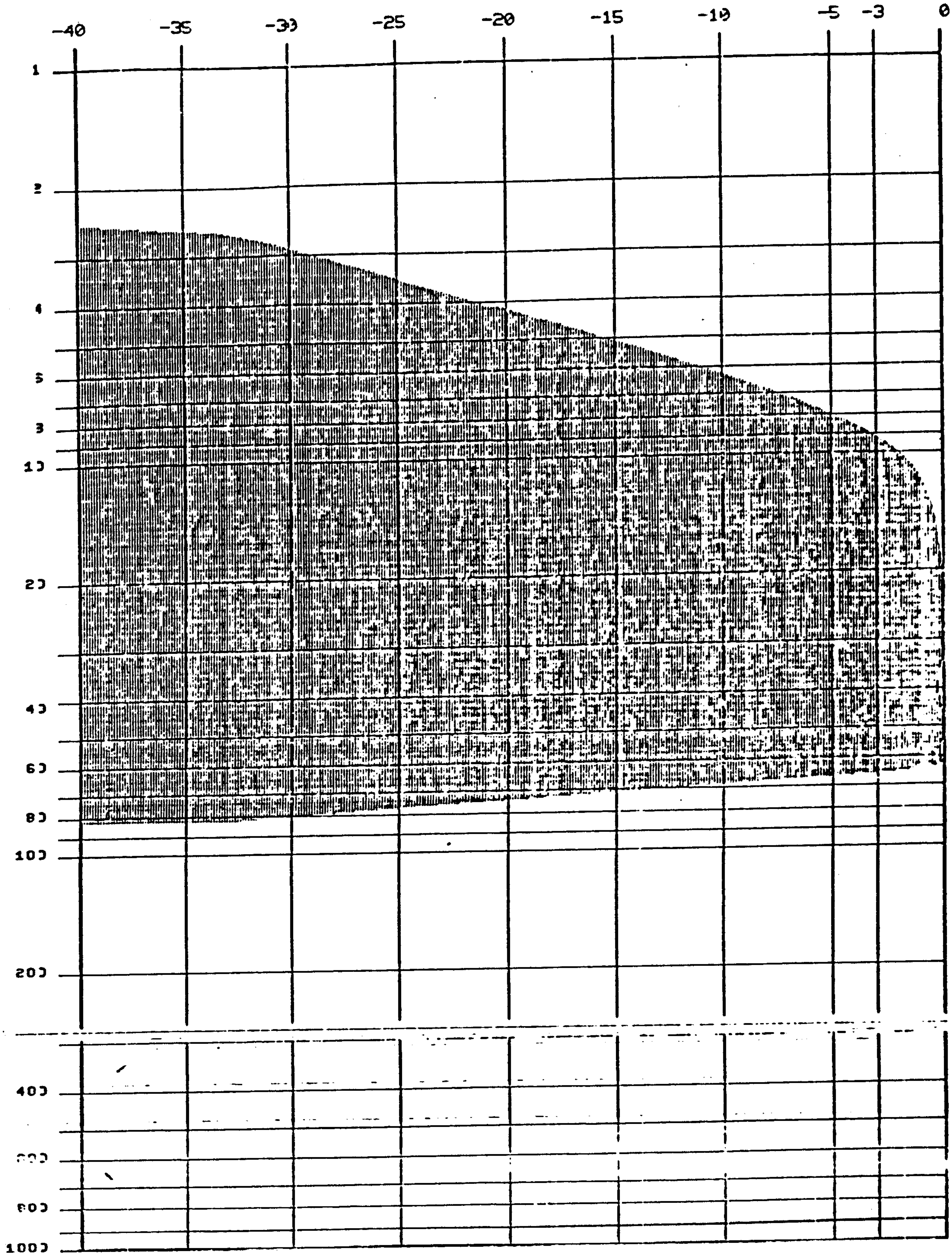
1) Hydrophone polarity check (tap test)
2) Maximum gain noise test
3) Converter Linearity check
4) Dynamic range check

In addition to the above, the following SEISA recommended tests were made:

1) "Cross-Talk" Test
2) Cable leakage check
3) Cable continuity check
4) Cable noise check
5) Depth transducer calibration

FILTER AMPLITUDE RESPONSE CURVE

A bandpass filter of 9-62 Hz with a slope of 18 dB per octave on the low cutoff response and 80 dB per octave on the high side was used for this survey. The following graph presents the system amplitude response. This response is for the total system from input terminals to the magnetic tape. The curves were obtained by applying a single input pulse and calculating the response by computer analysis from the data read from the recorder magnetic tape.



-40
-35
-30
-25
-20
-15
-10
-5
-3
0
1
2
4
6
8
10
20
40
60
80
100
200
400
600
800
1000

RECORDING PARAMETERS

SOURCE:	Air Gun, 21 guns @ 1982 cu. in.
FIRING PRESSURE OF GUNS:	1800 - 2000 psi
SOURCE DEPTH:	7 Meters
TYPE CABLE:	Century DSS V Streamer (SECO)
CABLE DEPTH:	10 Meters Average
NUMBER OF RECORDING GROUPS:	64
GEOPHONES PER RECORDING GROUP:	64
GROUP INTERVAL:	50 Meters
GROUP LENGTH:	50 Meters
DISTANCE FROM CENTER OF AIR GUN ARRAY TO CENTER OF GROUP NO. 1:	3338 Meters
DISTANCE FROM CENTER OF AIR GUN ARRAY TO CENTER OF GROUP NO. 64:	188 Meters
POPS PER SHOTPOINT:	1
NUMBER OF SHOTPOINTS PER KILOMETER:	20
INSTRUMENTS:	MDS-10
FORMAT:	SEG Format "B" - 1600 BPI - 9 track
RECORD LENGTH:	5 secs.
SAMPLE RATE:	4 msec.
GAIN MODE:	Instantaneous Floating Point Gain Constant 24 dB
FILTER:	LC 8 Hz, slope 18 dB/octave HC 62 Hz, slope 80 dB/octave Notch out

TAPE CHANNEL ASSIGNMENT:	1-64	Seismic Data
	65-96	No Data Input
	Aux. 1	Timing Word
	Aux. 2	W/B Sum
	Aux. 3	Time Break
	Aux. 4	Gun Phone Sum
	Aux. 5	50 Hz
MONITOR TRACE ASSIGNMENT:	1-48	Seismic Data
	49	Time Break
	50	Gun Phone Sum
	51	W/B Sum
	52	File Number
	53	50 Hz

SEISMIC PARTY KEY PERSONNEL

Captain/Party Manager:	T. Horsfield
Instrument Engineer:	J. Burns, C. Hutchins
Navigator (SatNav):	J. Edwards
Sound Source Engineer:	J. Dolan

DISPOSITION OF DATA

All navigation data were delivered to Satellite Positioning Corp. in Houston, Texas for processing and plotting. The plotting was included on base maps delivered to Washington D.C. on 8-23-79. On 8-30-79 the following data was delivered to client in Denver, Colorado.

1 - Digital magnetic tape with latitude, longitude, time and date of every plotted shotpoint.

1 - Computer print out of above tape.

SatNav tape reels, TTY printouts and navigation reports were shipped to client's Denver office first week of October 1979.

Seismic data digital magnetic tapes, fathometer charts, monitor records, and observers reports were delivered to our Geophysical Data Processing Center, Inc. in Houston, Texas, for processing and section plotting. Disposition of the processed data is covered in separate processing report.

QUALITY CONTROL PERSONNEL

Mr. Ken Bayer of USGS was aboard the vessel during the survey in the capacity of Quality Control Supervisor.

OPERATIONAL SUMMARY

As reported in Mr. Dean Denton's letters of May 8 and June 7, 1979, our anticipated completion of vessel overhaul and instrument installation was delayed at least four (4) weeks (actually 4 weeks plus 10 days) due to the extreme flood conditions in Houston, Texas beginning April 17th and the domino sequence of delays in dry dock facilities; welding services; drying out; final deliveries of parts, materials and supplies - all resulting from the flooding and subsequent continuing wet weather.

Area:	Charleston, South Carolina Area
Date of Beginning of Survey:	July 22, 1979
Date of Completion of Survey:	August 1, 1979

STATISTICAL REPORT

DATE	LINE	SP's	KM's (Effective)	REMARKS:
July 22, 1979				Enroute to area.
July 23, 1979				Scouting obstructions, Line CH-1.
July 24, 1979				Repairing compressor drive diesel.
July 25, 1979	CH-3	1-1455	72.75	
	CH-2	1-		
July 26, 1979		-2784	139.20	
	CH-5	1-1010	50.50	
July 27, 1979	CH-4			No start, to port for further repairs on compressor drive diesel.
July 28, 1979				Repairs.
July 29, 1979				Repairs.
July 30, 1979				Repairs - sailed @ 21:00.
July 31, 1979	CH-1	1-1474	73.70	
	CH-6	1-		
August 1, 1979		-1125	56.25	
	CH-4	1-901	45.05	Line broken, computer out.
	CH-4A	869A-1064	8.15	
				Survey complete, enroute Tampa, Florida.

SUMMARY

Working Days	4
Repair Days	5
Other Days	2
Total:	11
Number of Lines	6
Total Kilometers	445.60
Average Line Length, Kms.	74.26
Average Kms./Total Days	40.50
Average Kms./Working Days	111.40

Satellite Positioning Corp.
P.O. Box 36928
Houston, Texas 77036

15 August 1979

Mr. Russell Talty
Seismic Explorations International, S.A.
3410 Mercer, Suite 201
Houston, Texas 77027

Dear Mr. Talty:

Enclosed herewith are the final post-processed maps and magnetic tapes for the U.S.G.S. project which we have handled at SPC. You will note that the terms of the contract/proposal with the U.S.G.S. called for four copies of each map on stable base film and two black line paper prints plus a digital magnetic tape with the latitude, longitude, time and date for every plotted point, plus a printout of the tape.

The processing of the navigation data acquired by the Magnavox INS aboard your marine vessel was fairly straightforward. We encountered no major problems with the data, and we were pleased at the high degree of correlation between the operator's logs and the tapes, so that our difficulties were kept to a minimum. The system positions were smoothed through the satellite updates in order to obtain a smooth track of the vessel at all times while online. After system position smoothing we converted all data to Clarke 1866 spheroid, North American Datum of 1927. We applied the stepback of 179 meters to get to the CDP position desired by you. Then we transformed all positions from latitude and longitude to UTM grid for mapping, using central meridians of 75 and 81 degrees west longitude as appropriate.

The mapping was performed on the UTM grid at scales of 1:96,000 and 1:500,000 as per the U.S.G.S. contract/proposal. "Tic" marks at every 80000 feet were annotated as well as lat/long intersection tics at every 15 minutes of arc on the 1:96,000 scale maps. On the 1:500,000 scale maps, we placed grid tics at 200,000 feet intervals and lat/long tics at every 30 minutes of arc. The tic marks are of different size for the grid and geographicals, with the labelling of the grid tics at left and bottom and the labelling of the geographical tics at top and right. The title block reflects your contract number with the U.S.G.S. (14-08-001-16330), plus all other pertinent information about the data acquisition, processing and mapping. There are a total of 15 maps covering the areas whose line numbers begin with the letters D, M, V, G and F at the scale of 1:96,000. Three maps in 1:500,000 scale were needed for these lines. For the "CH" lines, we needed three maps at 1:96,000 and one map at 1:500,000.

The requirement for the annotation of the BLM blocks on these maps was waived by Mr. Don Clark of the U.S.G.S., verbally by telephone conversation. He stated to us that written authorization for the elimination of these block lines would be sent.

The format of the contents of the accompanying digital magnetic tape appears on an enclosure. The tape contains every tenth point of each line of the prospect, which is an interval of 500 meters. The maps are also done at 500 meter intervals, which more than satisfies the U.S.G.S. requirement. Labelling of the points on the maps is at 50 shotpoint (2500 meter) intervals.

All raw field tapes, plots, logs and printouts that you furnished us in order to perform the processing are being returned to you at this time.

This correspondence will serve as a "Final Report" for this particular project and a copy of this should be forwarded to the U.S.G.S. with the raw and processed data and tapes.

If there are any questions concerning the processing or mapping please feel free to direct them to us at SPC. We appreciate the opportunity to serve you in this project and hope that you will call on us again for navigation and survey data processing.

Sincerely yours,

Gary M. Jones

GARY M. JONES
Senior Navigation Systems Analyst

Enclosures

FORMAT OF POST-PLOT TAPE FURNISHED TO THE UNITED STATES GEOLOGICAL SURVEY BY SATELLITE POSITIONING CORP., HOUSTON, TEXAS 77036.

The tape is in modified U.K. Offshore Operators Association (UKOOA) format. It is 1/2 inch digital magnetic tape IBM compatible, 9 track, 1600 BPI, EBCDIC character coding, odd parity. Each record is 80 bytes, followed by an inter-record gap.

The tape is divided into two parts, a four-record header, and a multi-record shotpoint data section. The header records allow adequate identification of the survey and include further useful general information. The four header records and shotpoint data records are terminated by an EOF record and then an end-of-file mark.

Form of Header Record:

1. Name of survey, area, license block number	Fortran format 10A8
2. Client (contractor), month, year	" " "
3. Processing center, stepback	" " "
4. Map scale, spheroid, projection, central meridians	" " "

Form of Data Record:

Each 80 byte record contains data for one shotpoint

a. Line name (left justified)	Cols 1-10, format 2A5
b. Shotpoint name (right justified)	Cols 11-18, format 2A4
c. Blank	Cols 19-20, format 2X
d. Latitude (degrees, minutes and seconds with N or S; seconds to 1 decimal place)	Cols 21-30, format I3, I2, F4.1, A1
e. Longitude (degrees, minutes and seconds with E or W; seconds to 1 decimal place)	Cols 31-40, format I3, I2, F4.1, A1
f. Map grid eastings (feet)	Cols 41-50, format I10
g. Map grid northings (feet)	Cols 51-60, format I10
h. Blank	Cols 61-65, format 5X
i. Day and time -- Julian Day	Cols 66-68, format I3
Hour	Cols 69-70, format I2
Minute	Cols 71-72, format I2
Second	Cols 73-74, format I2
j. Blank	Cols 75-80, format 6X.

End of Data

The data are terminated by a record containing line name set to "EOF".