229601

FINAL OPERATIONS REPORT

MARINE SEISMIC SURVEY

CLIENT	:	BRIDGE OIL
CONTRACTOR	:	GEOPHYSICAL SERVICE INC
VESSEL	:	M/V EUGENE MCDERMOTT II
LOCATION	:	T-19P

TPR

OR_0214

TABLE OF CONTENTS

APPENDICES

A	FIELD TAPE INVENTORY
B	NAV TAPE / LINE NUMBER
C	DAILY OPERATIONS LOG

LIST OF ILLUSTRATIONS

PLATE	DESCRIPTION
1A..1D	TSR Recording Sequence
2	TSR Block Diagram
3	TSR with Multiplex Streamer Block Diagram
4A..4N	SEG D Recording Format
5	Antenna Location Diagram
6	Offset Determination
7	4075 cu in Airgun Array
8	Fathometer Scale
9	192 Trace Mulitplex Streamer Configuration
10	General Prospect Location

SECTION I

INTRODUCTION

SECTION I

INTRODUCTION

A 2D marine seismic survey was conducted for BRIDGE between 18th November and 23rd November 1985 . The data was collected in the Bass Basin (Permit T-19P) south of Victoria.

The purpose of the following report is to provide the reader with an insight into methods and equipment used by G.S.I to collect the data and also to highlight any problems that were encountered during the survey period.

Section I(i) consists of statistics of the Motor Vessel Eugene McDermott II.

Section I(ii) contains a list of key personnel involved with operation and maintenance of instruments and equipment employed in collection of the data and also those responsible for the assurance of quality and integrity of data recorded.

An overview of the instrumentation is detailed in section II, with section II(1) containing a brief description of the theory of operation of G.S.I.'s unique equipment. Section II(2) involves both details and discussions of the instrumentation and equipment incorporated in onboard operation.

Information regarding positional systems in use during the survey, including base station data, system calibration and navigation tape summaries are outlined in section III.

In the final section (IV) all aspects of operational procedures are provided and include shipment details and survey statistics.

A number of plates are attached with this report which illustrate various supplementary details involved with data collection and processing techniques and equipment.

i. SURVEY VESSEL - M/V EUGENE MCDERMOTT II

Flag	Republic of Panama
Homeport	Panama
Trade	Foreign-going
Owners	Geophysical Service Inc.
Call Sign	HO 9376 (Telex: HOMC 1330706)
Length	52.73 metres L.O.A.
Breadth	12.19 metres B.O.A.
Depth	4.27 metres
Draft	3.05 - 3.24 metres
Official No.	7062-PEXT-1, 7685/77
Gross Tonnage	911.66 Tonnes
Nett Tonnage	244.21 Tonnes
Main Engines	2 x 1125 HP (D399 Cat.)
Elec. Power	2 x 250 KVA Cat D
Load Line	LLoyds Register

ii. KEY PERSONNEL

Party Manager	R. Barrick
Systems Engineers	N. Blake. R. Burgoyne
Survey Operators	P. Blake T. Hartley
System Operators	D. Starling D. Murray R. Burgoyne R. Hill (trainee)
Technical Co-ordinator	M. Wilson
Quality Control	M. Wilson N. Blake
Nav Personnel	P. Young (Geomex)
Compressor Mechanic	K. Bakewell
Airgun Mechanics	T. Prentice J. Nieuwenhuize R. Taylor R. Cush
Master	C. Grubba
Vessel Supervisor	W. Lee
Client Representatives	F. Renton

SECTION II

INSTRUMENTS

SECTION II (1)

(i) THEORY OF OPERATION :- MULTIPLEX STREAMER

The Texas Instruments multiplex streamer consists of four major in water elements, Live Section I's , Live Section II's, Streamer Electronic Modules and Repeater Modules. Configured for 192 traces, the cable comprises of 16 separate "clusters" each handling a group of twelve traces. The three components making up each cluster are a SEM placed between a live I and a live II , with each live section containing 6 separate 15 metre groups. Each group or trace contains 40 acceleration cancelling "dish" type hydrophones, wired in parallel.

Data from the six traces in a live section is passed to their associated SEM where preamplifier gain is applied before the signal is low cut filtered if required. The analog signal is then digitized before being time multiplexed and passed in serial phase encoded format to the head of the live I section where it is converted to a fibre optic signal. Along with the data from the twelve traces, each SEM data block contains a Configuration Status and a Q.C. Status word. These two 16 bit words are used in the onboard Supervisors Terminal to monitor the integrity of the data being received.

The sequence of data flow in the streamer begins at SEM #1 which is programmed as the Last Active Module. Each subsequent SEM places its 18 word data block behind the previous SEM's information. Therefore SEM #16 data is the last to arrive at the Data Acquisition Unit.

A repeater module is placed between each lead in section (including the stretches) for the purpose of resynchronising and retiming of the fibre optic data stream as it travels between the last active cluster and the onboard electronics. This is a function which is also performed in each SEM, thereby negating the need for repeater modules in the active section of the streamer.

Synchronization between SEMs is maintained via the Command Bus. This bus operating at a 12 kHz rate is also the means in which commands are conveyed from the supervisor terminal and each SEM. Typical commands include the switching of low cut filters, the setting of preamplifier gain constant and the driving of the SEM's impulse and leakage test circuit.

SEM seismic data is supplied to the recording equipment at a 1ms sample rate and subsequent resampling is performed in the Data Acquisition Unit.

ii. THEORY OF OPERATION :- TRACE SEQUENTIAL RECORDER

The G.S.I. Trace Sequential Recording system is comprised of three main units, the Data Acquisition Unit, the Supervisory Terminal and the Data Recording Unit. Each unit serves a complete and separate function but all are integrated to form the data recording system.

The Data Aquisition Unit provides all interface requirements of the multiplex streamer. The data reception logic in the DAU converts the phase encoded optical data from the streamer into an electrical signal in NRZI format. The serial data is then converted to parallel and any resampling or trace mixing is performed prior to anti-alias filtering,which is achieved with the use of digital filters. D.C. offset removal is also a function performed in the Data Acquisition Unit.

The Supervisor Terminal is the means of communication between the operator and the recording and aquisition units. All configuration of streamer and recording parameters are set through software by the operator. The ST also performs quality control checks of both SEM data received and data recorded to magnetic tape. Any errors which may occur within the system during recording appear on the error log screen and are also printed to a T.I. 810 printer interfaced to the S.T.990 computer. The Supervisor Terminal also provides a communications link between the CMS III and the recording instruments. This enables header information such as shotpoint number, Julian time and line number and ID to be transferred to tape. Inversely, the ST passes record and tape reel numbers as well as error information to the CMS III for use in the Automatic Data Logging facility, discussed later in this report.

ii. THEORY OF OPERATION :- TRACE SEQUENTIAL RECORDER (cont.)

The Data Recording Unit ,controlled by its own microprocessor, is responsible for accepting the filtered multiplexed data from the Data Acquisition Unit and reformatting it into a Trace Sequential format. This is achieved by reading all of the sampled data for one complete seismic record into mass memory and then "picking" the data out from memory in a fashion which places individual trace data in blocks of complete record samples in a sequential order. This sequential data is then formatted into SEG D with the addition of general,extended and trace headers. Conversion to the Group Coded Recording system is performed by a Telex brand tape formatter which is interfaced to one of three Telex 6253 , tri-density tape transports. Reproduce display is a function also handled in the DRU, with oscillograph, oscilloscope and servo-profiler displays being controlled by the Multiplex Display Board in the DRU. Reproduce gain levels are set through the S.T. software.

System flow charts and SEG D tape format plates are attached with this report. (See index)

iii. THEORY OF OPERATION :- CONFIGURABLE MARINE SYSTEM

The Configurable Marine System's (CMS) primary roles are to maintain survey control and to record navigation and quality control data to magnetic tape, although a large number of other functions can be performed dependent on survey requirements. The heart of the CMS system is a Texas Instruments 980B mini computer. The 980 controls the flow of data between all peripheral devices. A Texas Instruments 990 mini computer and video display terminal dedicated to quality control functions (990 QC) provides the means of operator interface to the 980 system. Through the 990 QC terminal all relevant job parameters for line control are initiated to the 980B.

Another 990 mini computer dedicated to navigation control provides the 980 with position fixing information at a predetermined time interval. The 990 NAV system is capable of interfacing with a wide variety of radio positioning systems with a maximum of twelve individual range data inputs. Using combinations of these range inputs a geodetic fix position, vessel speed and heading are calculated. This fix position is passed to the 980 which, using speed and azimuth supplied by either doppler sonar and ships gyro or RPS data, dead reckons between fixes. Shotpoint positioning during a survey line is achieved in the distance mode with the CMS issuing the airgun controller and recording systems with a shot request after every 30 metres of travel. Generally real time navigation is accomplished using a three way fix routine for fix information to the 980. Occasionally, however, due to either station geometry or signal stability, it may become necessary to remove a particular station's data from the fix routine. In this instance, although data from the "dropped" station is no longer being used, it is still recorded to magnetic tape (as is data from any alternate navigation systems interfaced to the 990 NAV) and may be used in post processing if required.

As well as navigation control with the 990 NAV system the 980 is interfaced to the Texas Instruments TIGER II airgun controller, another 990 mini computer based unit. This system controls all gun firing times by calculating delays from a true firing time history table.This ensures the tuned gun array is always performing at maximum energy efficiency. A video display terminal allows operator monitoring of gun statistics and performance details. Any gun related errors are transferred to the 980B for use by the Automatic Data Logging system (ADL) . The ADL is a quality control system which logs to navigation tape any survey related data, whilst providing a hard copy of this data to the operator via the 990 QC 810 printer.

iv. THEORY OF OPERATION :- ENERGY SOURCE

An electro-pneumatic acoustic energy source known as an airgun was used for reflection work. An airgun has only two moving parts. A shuttle and a solenoid. The airgun consists of an upper and lower air chamber connected by an air passage through a moveable shuttle. Another air passage links the upper chamber with the underside of the upper flange of the shuttle and this air passage is controlled by a solenoid valve. Air, at a pressure of 2000 psi (13.8 Mpa), enters the upper chamber through its inlet forcing the shuttle closed. The shuttle is held firmly closed because the area of its upper flange is greater than the area of its lower flange. The main volume of air passes through the channel in the shuttle into the lower chamber. To fire the airgun a command from the Texas Instruments airgun controller unit (Tiger II) activates the solenoids and retracts a plunger. This permits air to pass through a porthole to the underside on the lower shuttle. This neutralizes the downward pressure of the shuttle leaving only the upward pressure on the lower flange from the lower air chamber. The rapid expulsion of air creates the bubble and resultant pulse. The air bubble collapses in a manner similar to that caused by explosives except that its period is controlled and is placed in the desired seismic frequency band.

The energy source used by the M/V Eugene McDermott II was a tuned array of 4075 cu. ins. total capacity. The array was designed for deep penetration and good resolution, having a broadband frequency output that extends below the normal low frequency band for seismic energy sources.
The array includes three low pressure ended air lines on each side of the array so that the depth can be monitored by means of static air pressure at all times. The array was ballasted with the use of plastic Norwegian buoys to ride at the contract specified depth.

The Texas Instruments airgun controller (Tiger II) monitored the firing of each airgun in the array. Individual gun firing times were continuously controlled to give phasing within +/- 1 ms for maximum pulse amplitude and front to back ratio.

The Tiger II also performed a quality control function by indicating, with individual gun LED displays, the status of a gun if it was not operating correctly, either self fire or no fire. The airgun performances were logged on both the CMS navigation tape and printer log.

SECTION II (2)

INSTRUMENT DETAILS AND DISCUSSIONS

SECTION II (2)

i. MULTIPLEX STREAMER DETAILS

Length (centre to centre)	2880 m
Group Interval	15 m
Live Section Length	89.77 m
Stretch Section Length	100 m
SEM Module Length	0.46 m
Repeater Module Length	0.3 m
No. of Hydrophones per Group	40
Hydrophone Interval	0.375m
Hydrophone Type	TI - ACR
No. of Stretch Sections	2 Front, 1 Tail
Skin Type	PVC Tropical
Location of Depth Transducers on Sections	On all Live I sections
Location of Depth Controllers	12/13, 36/37, 60/61, 84/85 108/109, 132/133, 156/157, 180/181, 187, 192.
Near Group	192
Streamer Sensitivity	8.20 uv/ubar +/- 2 dB

i(a) MULTIPLEX STREAMER DISCUSSION

The streamer depth control was maintained by proper ballasting and the use of individually addressable remote controlled " Syntron" depth levellers (birds). Streamer depths were constantly monitored throughout the survey. The depth transducers were located just before the SEM in every live I section. These depths were displayed on the TSR's Supervisory Terminal. A 'hard copy' of the depth display was printed out at the end of every line (the sample period was every 50 shotpoints).

Two stretch sections were incorporated between the vessel and the last active section to attenuate any front end jerk and propeller oriented noise bursts.The stretch sections were weighted with lead to aid in front end ballast.A bird was placed at the head of the stretch for fine adjustment of front end depth which tends to alter with vessel speed and tidal conditions. Another stretch section, along with approximately 200m of nylon rope, was placed between the tailbuoy and the first active section to reduce tailbuoy induced noise bursts.

Streamer feather angle was monitored every 100 shotpoints by observing the difference between the line heading and the bearing of the tailbuoy as displayed on the ship's radar, at times when the feather angle exceeded 8 degrees readings were recorded every 50 shotpoints and the client representative informed.

ii. RECORDING SYSTEM DETAILS

Recording System		Trace Sequential Recorder Serial Number 001
Tape Format		SEG D. Group Coded Recording 6250 bpi
Tape Speed		125 ips
Channels (on tape)		193 (includes 1 auxiliary)
Gain Control Mode		I.F.P.
Sample Interval		2ms
Record Length		6 secs
Recording Delay		0 secs
Preamplifer Gain		12 dB
Final Gain		96 dB
Dynamic Range		115 dB (referred to input noise)
Filters	Lowcut	8 Hz @ 18 dB/8ve
	High cut	128 Hz @ 72 dB/8ve
Polarity		Positive Pressure Gives Positive Number on Tape

ii. RECORDING SYSTEM DETAILS (cont.)

SEG D FORMAT

Each shot consists of;
A 576 byte record plus 195 x 6164 byte data trace records.

576 byte record :-

general header	32 bytes	
6 channel set descriptors	192 bytes	(6 x 32)
8 sample skew headers	256 bytes	(8 x 32)
3 extended headers	96 bytes	(3 x 32)
	576 bytes	

Data trace record :-

# of bytes = 20 + Tmax x 1024 x 2/DT

where : T = max recording time in seconds
DT = sample period in milliseconds
20 = # of bytes/trace header

# of bytes = 20 + 6 x 1024 x 2 / 2

# of bytes = 6164 bytes

For a more detailed description see attached plates with this report.

ii(a) RECORDING SYSTEM DISCUSSION

On completion of recording of a seismic line the magnetic tapes were replayed on an alternate transport to ensure readability and data integrity. A record header was also decoded and analysed after every line as a confirmation of correct system setup and Q.C. data transfer to tape.

On occasions, the recording system experienced software problems which resulted in several shotpoints not being recorded to tape. When this occured the shotpoint number and record number relationship was clearly annotated on the TSR operators logs. There were no occurences where this problem resulted in the termination of a seismic line.

iii. SERVO PROFILER DETAILS

Manufacturer	EPC Labs
Model	3200
Serial Number	252
Source	Trace Number 188
Record Length	4 secs
Gain Mode	PGC
Filters	Production Filters

iii(a) SERVO PROFILER DISCUSSION

An event mark appeared on the profiler charts at a 50 shotpoint interval with the relevant shotpoint number annotated on that mark. This was done to aid in interpretation.

iv. FATHOMETER DETAILS

Manufacturer	Simrad
Model	EA
Water Velocity Value	1484 m/sec
Transducer Position with respect to CNP	16.7 m forward
Draft Correction	3.5 m
Calibrated	27th August 1985.

iv(a) FATHOMETER DISCUSSION

At a 50 shotpoint interval an event mark was logged to the fathometer strip chart with the relevant shotpoint number and water depth annotated alongside the mark. On any occasion where it became necessary to change fathometer scale, the shotpoint number and new scale were also logged on the chart.

The fathometer was operational for all recorded seismic lines, the only maintenance required was the replacement of the stylus which occured at the commencement of line BB85-110, no chart recording is available for the first fourty five shotpoints of this line.

v. OSCILLOGRAPH (CAMERA) DETAILS

Manufacturer	SIE
Model	ERC-10C
Number of Channels	64, with 62 being used
Polarity	Positive pressure at the hydrophones gives positive numbers on tape and an upbreak on the camera records

Camera records display 60 data channels and a record number with identification code as listed below.

Display Code	Camera Display
0	Traces 1, 2, 3, 4, ... 58, 59, 60
1	Traces 61, 62, 63, ... 119, 120
2	Traces 121, 122, 123, ... 179, 180
3	Traces 181, 182, 183, ... 239, 240
4	Traces 1, 5, 9, ... 233, 237
5	Traces 2, 5, 10, ... 234, 238
6	Traces 3, 7, 11, ... 235, 239
7	Traces 4, 8, 12, ... 236, 240
8	Traces 1, 3, 5, ... 117, 119
9	Traces 121, 123, 125, ... 237, 239
10	Traces 2, 4, 6, ... 118, 120

v(a) OSCILLOGRAPH DISCUSSION

Two separate camera records were produced at a fifty shotpoint interval whilst recording a seismic line. This provided a hard copy of every other individual trace in the streamer for the purpose of Q.C. analysis. A "noise strip" was recorded prior to the commencement and on completion of each line then replayed via the camera to visually display the ambient streamer noise levels for each line.

Generally the camera records were of a high standard and the instrument performed without failure during the survey period.

vi. ENERGY SOURCE DETAILS

4075 cu in Airgun Array

Operating Volume	4075 cu. ins.
Total Spare Volume	770 cu. ins.
Operating Pressure	1900 psi
Operating Depth	6.5 m +/- 1.0 m
Timing Control	Tiger II
Firing Delay	51.2 ms
Compressors	3 Norwalk C600 3 Le Roi 750
Setback:	
Distance from CNP To Centre of Gun Array	43.7 m
Distance from Stern To Centre of Gun Array	28.5 m

vi(a) ENERGY SOURCE DISCUSSION

The airguns were maintained by GSI personnel on line changes so that throughout the survey the airgun array was operating within specifications. Whilst recording 30m shotpoint intervals two Le Roi and two Norwalk compressors were used to maintain specified operating pressure.

SECTION III

NAVIGATION

SECTION III

i. SYSTEM DETAILS

Primary System	ARGO
Type	Range-Range Phase Comparison
Survey Company	Geomex
Operating Frequency	1702 kHz
Ships Antenna Height (Above Sea Level)	22 m
Antenna Location from Stern	24.8 m
Antenna Location from Centre Line	2.28 m (to port)
Lane Width	88.0347 m

Secondary System	SYLEDIS
Type	Range / Range Pulsed
Survey Company	Geomex
Operating Frequency	427 mHz
Antenna Height (ASL)	25 m
Antenna Location from Stern	25.8 m
Antenna Location from Centre Line	0 m

ii. BASE STATION LOCATIONS

Applicable throughout the prospect.

ARGO

Station	Position	Partial	Slot	Elevation
Point Sorell	041 07 23.63 S 146 31 42.34 E	0.75	05	30 m
North Point	040 42 52.15 S 145 15 30.28 E	0.69	06	5.5 m
Naracoopa	039 55 29.05 S 144 07 39.03 E	0.41	07	55.9 m
Liptrap	038 53 35.54 S 145 56 53.40 E	0.49	08	114.7 m

SYLEDIS

Station	Position	Delay	Beacon	Elevation
Point Sorell	041 07 24.73 S 146 31 41.93 E	-248.9 m	07	30 m
North Point	040 42 51.40 S 145 15 31.31 E	-251.3 m	03	5.5 m
Narracoopa	039 55 29.95 S 144 07 39.47 E	-239.6 m	04	56 m
Liptrap	038 53 35.43 S 145 56 51.54 E	-245.4 m	05	113.6 m
Diamond M	039 53 36.53 S 145 58 37.08 E	-237.9 m	06	30 m

iii. BASELINE CROSSINGS/SYSTEM CALIBRATION

The integrity of the Syledis navigation net was proved by baseline crossings. Once the accuracy of the Syledis system was established it was used as a standard to compute Argo lane partials. This was accomplished by crossing several Syledis Argo baselines and using the observed Syledis range to calculate the range from the vessel to the relevant Argo beacon. The computed value was compared to the observed Argo range in order to calculate the partial lane. A partial value was entered into the Argo mobile unit for each base station (see Section III ii). "Fine tunning" of the partials was achieved by positioning the vessel in an area of good base station geometry, computing a position fix from three Syledis ranges and then calculating the distance to all Argo base stations using an inverse fix mini computer program. The computed distance was compared to the observed Argo range so that the partials could be adjusted if necessary.

The calibration took place between the 6th and 8th of October 1985. The survey net had been in use from the calibration to the 17th of November and had proven itself to be reliable during the survey conducted between those dates, as well as this four Argo baselines were crossed on the 17th of November as an extra verification of the survey net. The results of the crossings are tabulated in section III iv.

Just prior to the survey commencement, replacement Syledis beacons on Liptrap and the rig Diamond Epoch were installed, these beacons had not been calibrated and were only to be used to give Argo lane count if necessary.

iv. BASELINE CROSSINGS RESULTS

ARGO:

17/11/85	Pt Sorell Nth Point	116214.27 m	116213.61 m	0.66 m
17/11/85	Pt Sorell Naracoopa	243097.08 m	243102.70 m	5.62 m
17/11/85	Liptrap Nth Point	210667.56 m	210670.00 m	2.44 m
17/11/85	Liptrap Naracoopa	194167.47 m	194183.00 m	5.53 m

v. NAVIGATION DISCUSSION

For the first half of this Survey an error went unnoticed in the Argo lane count. Because of poor weather the survey commenced in the Western most block (closest to shelter). Syledis signals from both Point Sorell and North Point stations were not received at this time due to extreme ranges and the unfavourable atmospheric conditions. During this period of inclement weather the Argo mobile unit lost lane count. When resetting Argo lane count one lane too many was added to Point Sorell and North Point and one lane too little to Cape Liptrap. This went unnoticed until the 20th November, when strong signals were recieved from the Syledis beacon on Cape Liptrap and compared with the range to the Argo beacon at the same position. This error when discovered was immediately relayed to Bridge Oil who gave their consent to carry on recording without having to reshoot the previous lines. This error is clearly and boldly marked in the CMS operators log and was compensated for during navigation processing. The total shift in the line position was dependent on the direction of each individual line.

For the majority of the survey, online positioning of the vessel was carried out using three "ARGO" ranges. However,at times when three ranges were not available for such reasons as unacceptable angles between stations or noise on signals, then the survey continued using only two "ARGO" ranges.

Skywave interference was negligible and no down time was attributed to it or in fact to any radio positioning equipment.

A more detailed discussion is provided in a separate navigation report.

vi. NAVIGATION TAPE SUMMARY

For full details of Line number/Nav. tape number correlation, See Appendix B.

SECTION IV

OPERATIONS

SECTION IV

i. OPERATIONS DISCUSSION

Apart from an incorrect lane count on Argo stations Point Sorell, North Point and Cape Liptrap from the commencement of the survey until 20:00 hours on the 20th November 1985 (see section III), the survey was conducted without incident. Record 37 on line BB85-155 was logged to be edited after interference to the recording from a source aft of the streamer, the most probable cause was the use of explosives at the nearby rig Diamond Epoch. The time of the interference was approximately 02:50 hours on the 23rd November 1985.

After a short period of rough seas which delayed the commencement of the survey, weather conditions were generally favourable. At times when the seas did increase, production was halted until the optimum survey direction, relative to the swell, was determined.

One data shipment took place from Devonport Tasmania on the 26th of November 1985.

ii. SHIPMENT DETAILS

Seismic data shipment numbers	:	2931-MISC-24-85 (26 Nov 85)
Seismic data shipped to	:	Western Geophysical 37 Jalan Pemimpin, #04-01 Singapore, 2057
Navigation data shipment number	:	2931-PER-56-85 (26 Nov 85)
Navigation data shipped to	:	Geophysical Service Inc. 47 Burswood Road Victoria Park 6100 Western Australia.

iii. STATISTICS

First Recording Day	:	18th November 1985
Last Recording Day	:	23rd November 1985
Number of Lines	:	42
Number of Kilometres	:	668.97
Number of Shotpoints	:	93012
Percentage of Misfires	:	1.77 %
Average Kilometres per Recording Day	:	111.495
Number of Magnetic Kilometres	:	nil
Number of Gravity Kilometres	:	nil

229033

APPENDIX A

FIELD TAPE INVENTORY

v. FIELD TAPE INVENTORY

DATE	TAPE NO.	LINE NO.	SP RANGE	RECORD NO.	BOX
18/11/85	819798	BB85-102	001-161	001-161	1
	819799	BB85-102	162-314	162-314	1
	819800	BB85-102	322-478	316-472	1
	819801	BB85-102	479-488	473-482	1
	819802	BB85-104	001-141	001-141	1
	819803	BB85-104	142-301	142-301	1
	819804	BB85-104	302-461	302-461	1
	819805	BB85-104	462-558	462-558	1
	819806	BB85-106	001-160	001-106	1
	819807	BB85-106	161-279	161-279	1
	819808	BB85-106	321-480	321-480	2
	819809	BB85-106	481-559	481-559	2
	819810	BB85-108	001-160	001-160	2
	819811	BB85-108	161-259	161-259	2
	819812	BB85-101	001-160	001-160	2
	819813	BB85-101	161-259	161-259	2
	819814	BB85-103	001-160	001-160	2
19/11/85	819815	BB85-103	161-320	161-320	2
	819816	BB85-103	321-432	321-432	2
	819817	BB85-103	439-598	433-592	2
	819818	BB85-103	599-750	593-744	3
	819819	BB85-105	001-160	001-160	3
	819820	BB85-105	161-320	161-320	3
	819821	BB85-105	321-480	321-480	3
	819822	BB85-105	481-629	481-629	3
	819823	BB85-107	001-160	001-160	3
	819824	BB85-107	161-320	161-320	3
	819825	BB85-107	321-459	321-459	3
	819826	BB85-109	001-160	001-160	3
	819827	BB85-109	161-320	161-320	3
	819828	BB85-109	321-418	321-418	4
	819829	BB85-111	001-160	001-160	4
	819830	BB85-111	161-320	161-320	4
	819831	BB85-111	321-389	321-389	4
	819832	BB85-113	001-160	001-161	4
	819833	BB85-113	161-320	161-320	4
	819834	BB85-113	321-440	321-440	4
	819835	BB85-113	441-498	441-498	4
	819836	BB85-115	001-141	001-141	4
	819837	BB85-115	142-282	142-282	4

v. FIELD TAPE INVENTORY (cont.)

DATE	TAPE NO.	LINE NO.	SP RANGE	RECORD NO.	BOX
19/11/85	819838	BB85-115	283-423	283-423	5
	819839	BB85-115	424-489	424-489	5
	819840	BB85-117	001-141	001-141	5
	819841	BB85-117	142-282	142-282	5
	819842	BB85-117	283-423	283-483	5
	819843	BB85-117	424-489	424-489	5
	819844	BB85-119	001-160	001-160	5
20/11/85	819845	BB85-119	161-320	161-320	5
	819846	BB85-119	321-459	321-459	5
	819847	BB85-121	001-160	001-160	5
	819848	BB85-121	161-320	161-320	6
	819849	BB85-121	321-480	321-480	6
	819850	BB85-121	481-489	481-489	6
	819851	BB85-123	001-160	001-160	6
	819852	BB85-123	161-320	161-320	6
	819853	BB85-123	321-459	321-459	6
	819854	BB85-125	001-160	001-160	6
	819855	BB85-125	161-320	161-320	6
	819856	BB85-125	321-399	321-399	6
	819857	BB85-127	001-160	001-160	6
	819858	BB85-127	161-320	161-320	7
	819859	BB85-127	321-439	161-439	7
	819860	BB85-129	001-160	001-160	7
	819861	BB85-129	161-320	161-320	7
	819862	BB85-129	321-478	321-478	7
	819863	BB85-131	001-160	001-160	7
	819864	BB85-131	161-320	161-320	7
	819865	BB85-131	321-480	321-480	7
	819866	BB85-131	481-509	481-509	7
	819867	BB85-133	001-160	001-160	7
	819868	BB85-133	161-320	161-320	8
	819869	BB85-133	321-480	321-480	8
	819870	BB85-133	481-548	481-548	8
	819871	BB85-135	001-160	001-160	8
	819872	BB85-135	161-320	161-320	8
	819873	BB85-135	321-480	321-480	8
	819874	BB85-135	481-640	481-640	8
	819875	BB85-135	641-659	641-659	8
	819876	BB85-137	001-141	001-141	8
	819877	BB85-137	142-282	142-282	8

v. FIELD TAPE INVENTORY (cont.)

DATE	TAPE NO.	LINE NO.	SP RANGE	RECORD NO.	BOX
20/11/85	819878	BB85-137	283-339	283-339	9
21/11/85	819879	BB85-118	001-160	001-160	9
	819880	BB85-118	161-320	161-320	9
	819881	BB85-118	321-480	321-480	9
	819882	BB85-118	481-504	481-504	9
	819883	BB85-118	512-671	504-663	9
	819884	BB85-118	672-831	664-823	9
	819885	BB85-118	832-839	824-831	9
	819886	BB85-120	001-160	001-160	9
	819887	BB85-120	161-320	161-320	9
	819888	BB85-120	321-480	321-480	10
	819889	BB85-120	481-549	481-549	10
	819890	BB85-122	001-160	001-160	10
	819891	BB85-122	161-320	161-320	10
	819892	BB85-122	321-480	321-480	10
	819893	BB85-122	480-509	480-509	10
	819894	BB85-124	001-160	001-160	10
	819895	BB85-124	161-320	161-320	10
	819896	BB85-124	321-480	321-480	10
	819897	BB85-124	481-640	481-640	10
	819898	BB85-124	641-719	641-719	11
	819899	BB85-126	001-160	001-160	11
	819900	BB85-126	161-320	161-320	11
	819901	BB85-126	321-480	321-480	11
	819902	BB85-126	481-589	481-589	11
	819903	BB85-126	590-719	590-719	11
	819904	BB85-153	001-160	001-160	11
	819905	BB85-153	161-298	161-298	11
	819906	BB85-149	001-160	001-160	11
	819907	BB85-149	161-320	161-320	11
	819908	BB85-149	320-480	320-480	12
	819909	BB85-149	481-579	481-579	12
	819910	BB85-145	001-160	001-160	12
	819911	BB85-145	161-320	161-320	12
	819912	BB85-145	321-480	321-480	12
	819913	BB85-145	481-599	481-599	12
22/11/85	819914	BB85-114	001-160	001-160	12
	819915	BB85-114	161-320	161-320	12
	819916	BB85-114	321-480	321-480	12
	819917	BB85-114	481-640	481-640	12

v. FIELD TAPE INVENTORY (cont.)

DATE	TAPE NO.	LINE NO.	SP RANGE	RECORD NO.	BOX
22/11/85	819918	BB85-114	641-800	641-800	13
	819919	BB85-114	801-960	801-960	13
	819620	BB85-114	960-1019	960-1019	13
	819921	BB85-116	001-160	001-160	13
	819922	BB85-116	161-320	161-320	13
	819923	BB85-116	321-480	321-480	13
	819924	BB85-116	481-620	481-620	13
	819925	BB85-116	621-780	621-780	13
	819926	BB85-116	780-849	780-849	13
	819927	BB85-110	001-160	001-160	13
	819928	BB85-110	161-320	161-320	14
	819929	BB85-110	321-480	321-480	14
	819930	BB85-110	481-620	481-620	14
	819931	BB85-110	620-789	620-789	14
	819932	BB85-112	001-160	001-160	14
	819933	BB85-112	161-320	161-320	14
	819934	BB85-112	321-480	321-480	14
	819935	BB85-112	481-640	481-640	14
	819936	BB85-112	641-800	641-800	14
	819937	BB85-112	801-960	801-960	14
	819938	BB85-112	961-1120	961-1120	15
	819939	BB85-112	1121-1208	1121-1208	15
	819940	BB85-139	001-160	001-160	15
	819941	BB85-139	161-171	161-171	15
	819942	BB85-139	179-339	172-332	15
	819943	BB85-141	001-140	001-140	15
	819944	BB85-141	141-280	141-280	15
	819945	BB85-141	281-328	281-328	15
	819946	BB85-143	001-160	001-160	15
	819947	BB85-143	161-320	161-320	15
	819948	BB85-143	321-389	321-389	16
	819949	BB85-147	001-160	001-160	16
	819950	BB85-147	161-320	161-320	16
	819951	BB85-147	321-480	321-480	16
	819952	BB85-147	481-599	481-599	16
	819953	BB85-151	001-160	001-160	16
	819954	BB85-151	161-320	161-320	16
	819955	BB85-151	321-329	321-329	16
	819956	BB85-155	001-160	001-160	16
	819957	BB85-155	161-288	161-288	16

v. <u>FIELD TAPE INVENTORY</u> (cont.)

DATE	TAPE NO.	LINE NO.	SP RANGE	RECORD NO.	BOX
23/11/85	819958	BB85-157	001-160	001-157	17
	819959	BB85-157	161-309	161-309	17
	819	BB85			
	819	BB85			
	819	BB85			
	819	BB85			
	819	BB85			
	819	BB85			
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	819	BB85			
	819	BB85			

APPENDIX B

NAV TAPE / LINE NUMBER

DATE	LINE	NAV. TAPE	STATUS
18/11/85	BB85-102	20209	COMPLETE
18/11/85	BB85-104	20209	COMPLETE
18/11/85	BB85-106	20209	COMPLETE
18/11/85	BB85-108	20209	COMPLETE
18/11/85	BB85-101	20209	COMPLETE
18/11/85	BB85-103	20209	COMPLETE
19/11/85	BB85-105	20209	COMPLETE
19/11/85	BB85-107	20209	COMPLETE
19/11/85	BB85-109	20209	COMPLETE
19/11/85	BB85-111	20209	COMPLETE
19/11/85	BB85-113	20209	COMPLETE
19/11/85	BB85-115	20209	COMPLETE
19/11/85	BB85-117	20209	COMPLETE
19/11/85	BB85-119	20209	COMPLETE
20/11/85	BB85-121	20209	COMPLETE
20/11/85	BB85-123	20209	COMPLETE
20/11/85	BB85-125	20209	COMPLETE
20/11/85	BB85-127	20209	COMPLETE
20/11/85	BB85-129	20209	COMPLETE
20/11/85	BB85-131	20209	COMPLETE
20/11/85	BB85-133	20209	COMPLETE
20/11/85	BB85-135	20209	COMPLETE
20/11/85	BB85-137	20209	COMPLETE
21/11/85	BB85-118	20209	COMPLETE
21/11/85	BB85-120	20209	COMPLETE
21/11/85	BB85-122	20209	COMPLETE
21/11/85	BB85-124	20209	COMPLETE
21/11/85	BB85-126	20209	COMPLETE
21/11/85	BB85-153	20209	COMPLETE
21/11/85	BB85-149	20210	COMPLETE
21/11/85	BB85-145	20210	COMPLETE
22/11/85	BB85-114	20210	COMPLETE
22/11/85	BB85-116	20210	COMPLETE
22/11/85	BB85-110	20210	COMPLETE
22/11/85	BB85-112	20210	COMPLETE
22/11/85	BB85-139	20210	COMPLETE
22/11/85	BB85-141	20210	COMPLETE
22/11/85	BB85-143	20210	COMPLETE
22/11/85	BB85-147	20210	COMPLETE
22/11/85	BB85-151	20210	COMPLETE
22/11/85	BB85-155	20210	COMPLETE
22/11/85	BB85-157	20210	COMPLETE

APPENDIX C

DAILY OPERATIONS LOG

DAILY OPERATIONS LOG

NOVEMBER 17TH
Eugene McDermott II departed Devonport for prospect area. Four baseline crossings were completed before seeking shelter from rough seas near King Island. Streamer was deployed and ballasted then retrieved for repair of cable levellers.

NOVEMBER 18TH
The cable was deployed and then retrieved again due to parity errors at SEM 12, this was repaired and the streamer deployed again. Aborted run-ins to lines 106 & 102 due to swell noise. A transport hangup during line BB85-102 caused the loss of 8 shotpoints during the line.

NOVEMBER 19TH
A small fishing boat ignored signals to stay away from end of streamer and tail bouy so the line change to line BB85-119 was extended slightly to ensure safety of streamer.

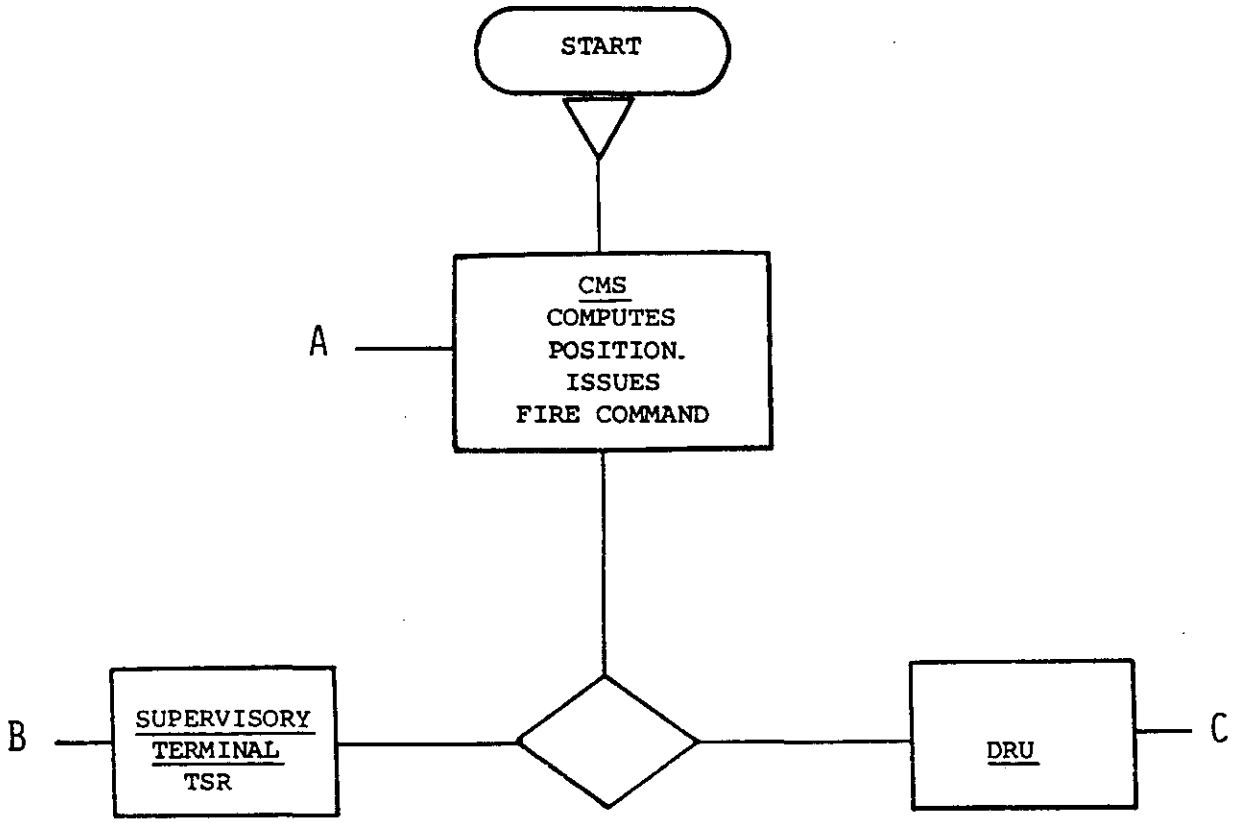
NOVEMBER 20
Navigation was corrected as explained in section III (v) Navigation Discussion (Pg. 25) of this report. Aborted run-ins to lines 139 & 116 due to swell noise. A TSR problem resulted in the loss of 5 records during line BB85-118.

NOVEMBER 21
Aborted run-in to line 116 due to swell noise.

NOVEMBER 22
Lost 7 records from line BB85-139 due to transport hangup.

NOVEMBER 23
Completed Bridge Oil prospect.

TSR RECORDING SEQUENCE



229044

PLATE 1B

TSR RECORDING SEQUENCE

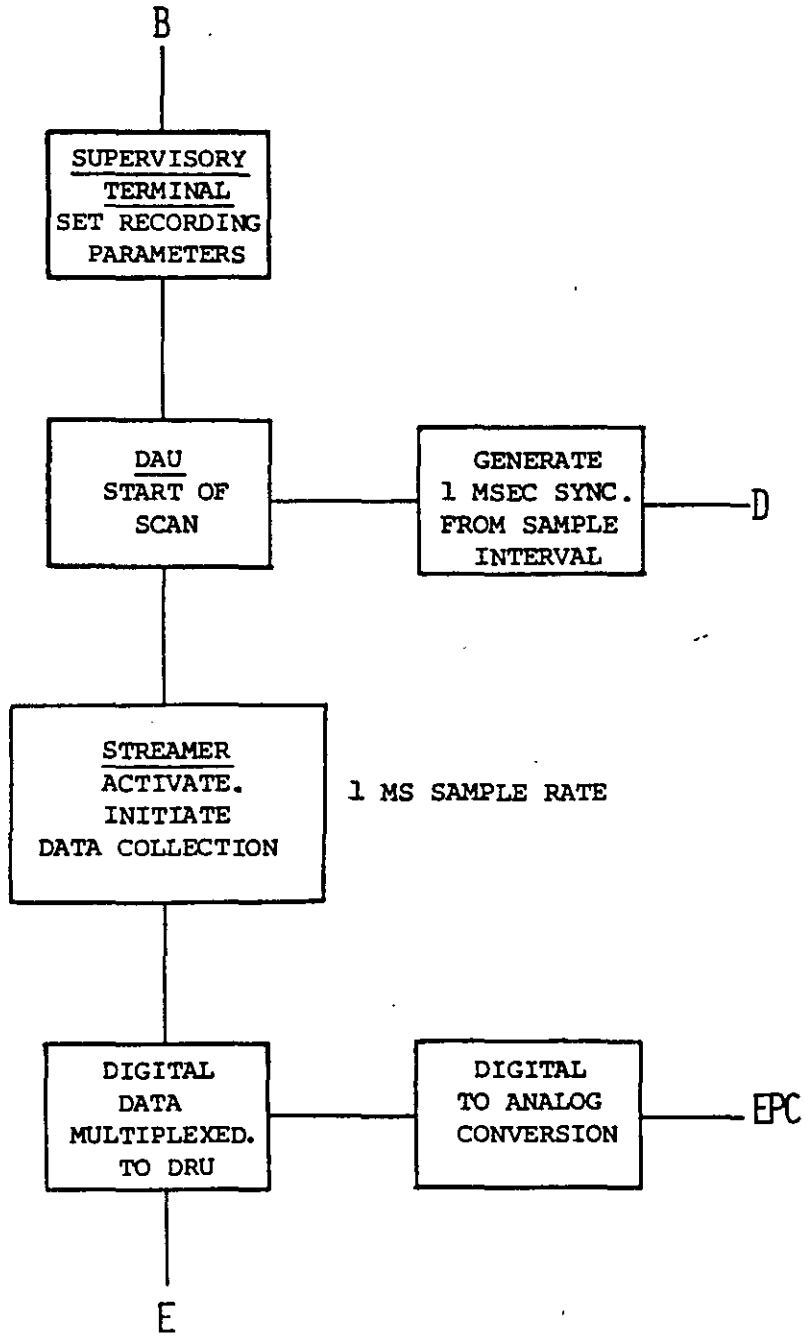
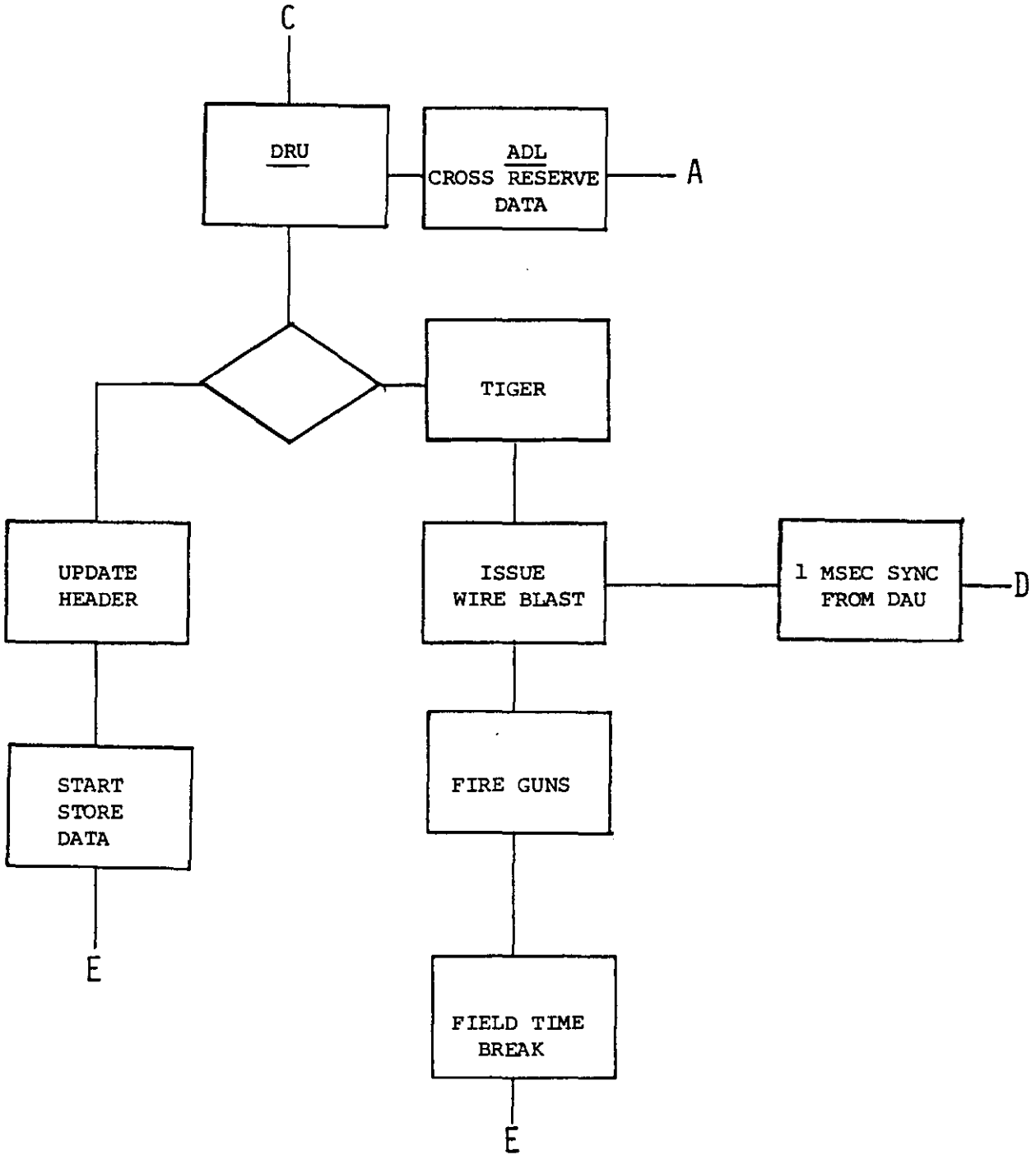
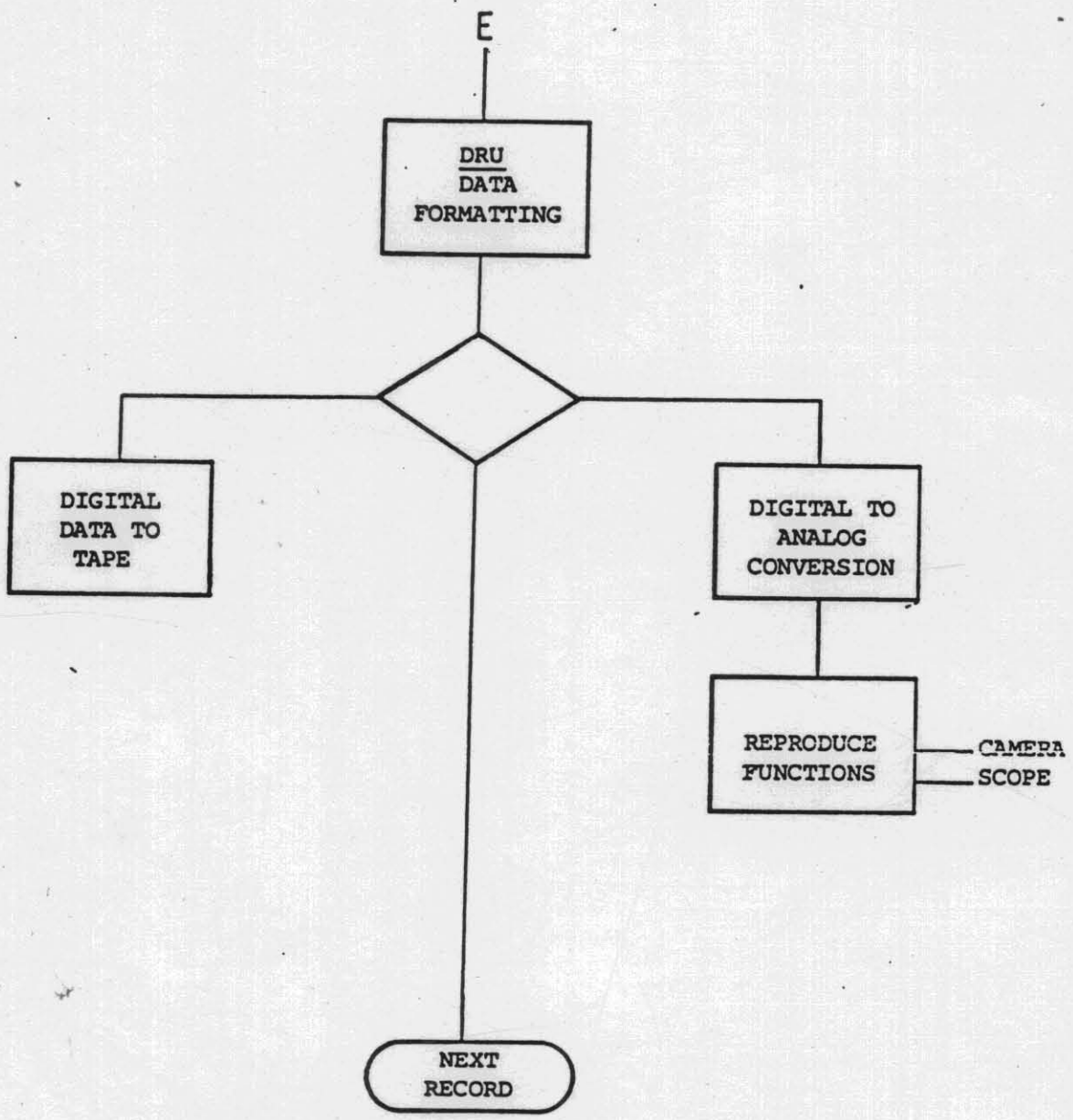
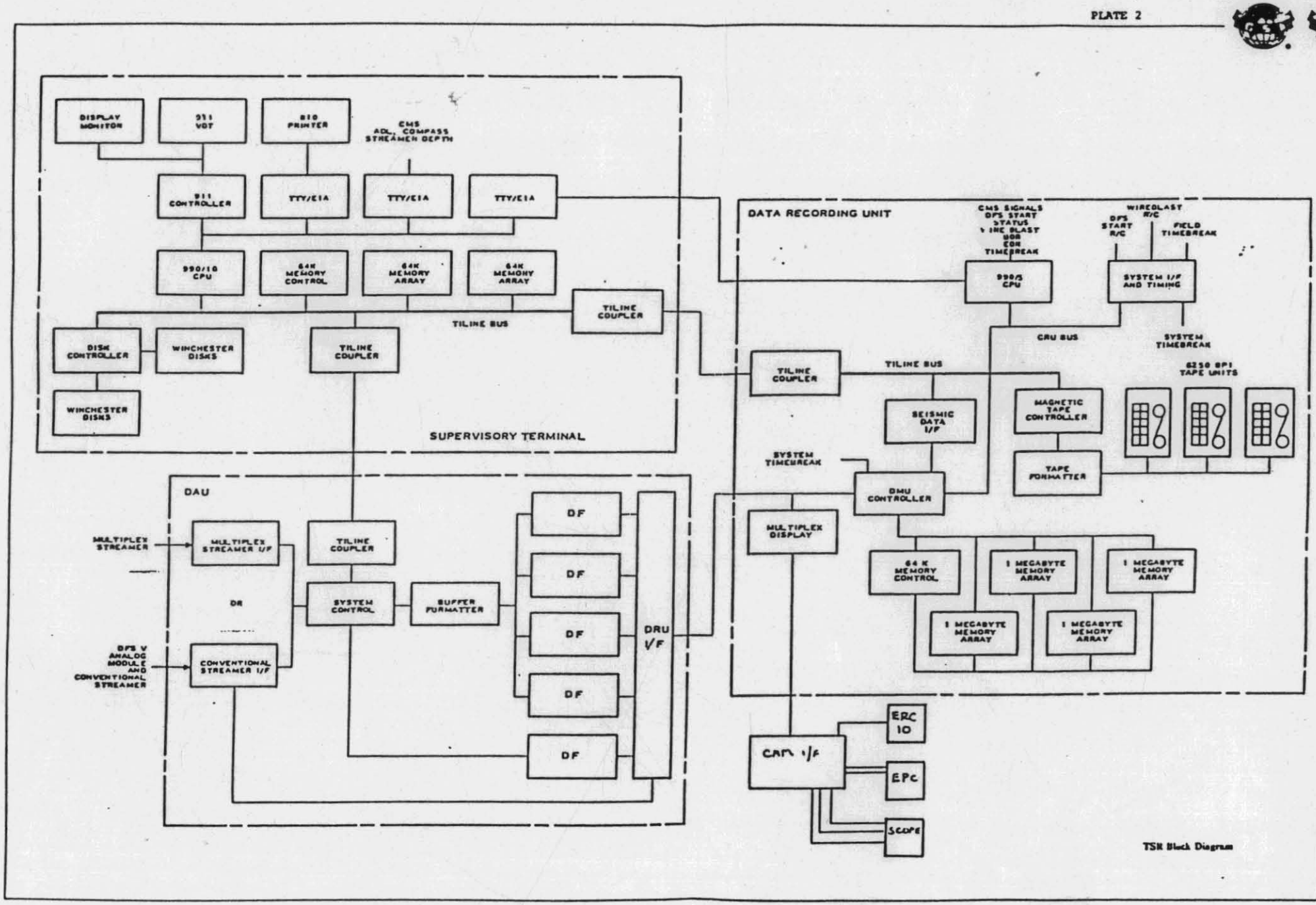


PLATE 1C

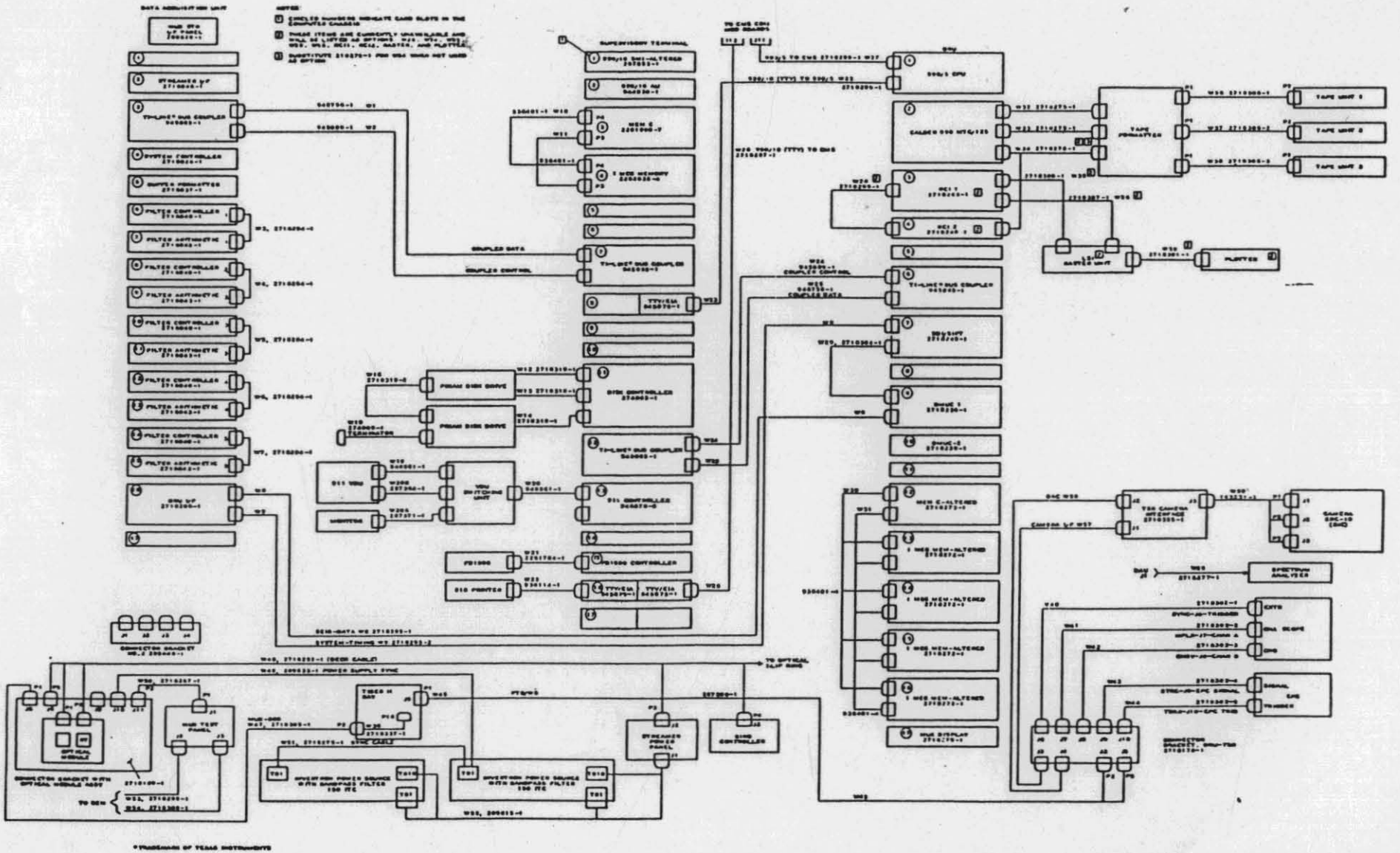

C
DRU
ADL
CROSS RESERVE
DATA
A
TIGER
UPDATE
HEADER
ISSUE
WIRE BLAST
1 MSEC SYNC
FROM DAU
D
START
STORE
DATA
FIRE GUNS
E
FIELD TIME
BREAK
E

TSR RECORDING SEQUENCE

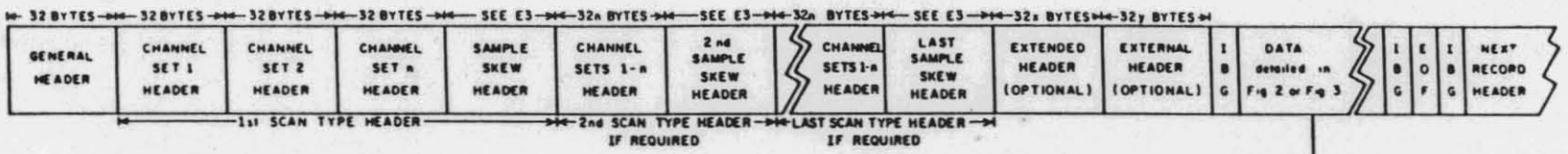




TSR Block Diagram



TSR With Multiplex Streamer



Record format

SOS = START OF SCAN (4 BYTES)

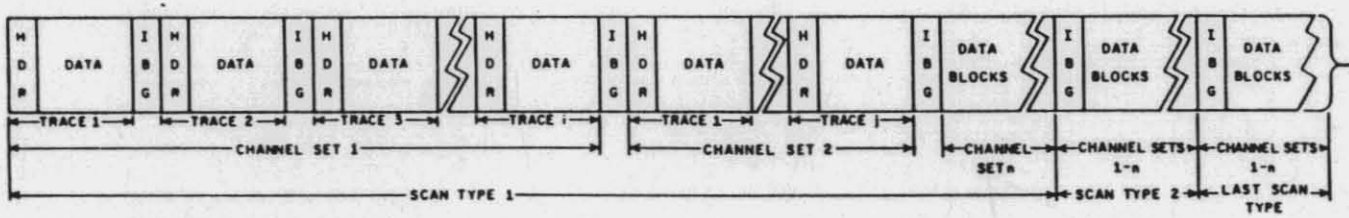
T = TIMING WORD (4 BYTES)

HDR = TRACE HEADER (20 BYTES)

IBG = INTER BLOCK GAP

E3 = REFERENCE APPENDIX E3

x AND y ARE GENERAL HEADER ENTRIES



Demultiplexed data blocks

2 byte quaternary exponent data recording method

The following illustrated the 16-bit word and the corresponding bit weights:

Bit	0	1	2	3	4	5	6	7
Byte 1	S	C_2	C_1	C_0	Q_{-1}	Q_{-2}	Q_{-3}	Q_{-4}
Byte 2	Q_{-5}	Q_{-6}	Q_{-7}	Q_{-8}	Q_{-9}	Q_{-10}	Q_{-11}	Q_{-12}

S=sign bit.—(One = negative number).

C=quaternary exponent.—This is a three bit positive binary exponent of 4 written as 4^{CCC} where CCC can assume values from 0–7.

Q_{1-12} – *fraction.*—This is a 12 bit one's complement binary fraction. The radix point is to the left of the most significant bit (Q_{-1}) with the MSB being defined as 2^{-1}. The fraction can have values from $-1 + 2^{-12}$ to $1 - 2^{-12}$. In order to guarantee the uniqueness of the start of scan, negative zero is invalid and must be converted to positive zero.

Input signal = S.QQQQ,QQQQ,QQQQ $\times 4^{CCC} \times 2^{MP}$ millivolts where 2^{MP} is the value required to descale the data sample to the recording system input level. MP is defined in Byte 8 of each channel set descriptor in the scan type header.

4C

TRACK NO.	4	7	6	5	3	9	L	8	2
BIT NO.	P	0	1	2	3	4	5	6	7

BCD VALUE MSD	8	4	2	1	8	4	2	1	LSD
BINARY VALUE MSB	128	64	32	16	8	4	2	1	LSB

FILE NUMBER	F_1	F_1	F_1	F_1	F_2	F_2	F_2	F_2	1
	F_3	F_3	F_3	F_3	F_4	F_4	F_4	F_4	2
FORMAT CODE	Y_1	Y_1	Y_1	Y_1	Y_2	Y_2	Y_2	Y_2	3
	Y_3	Y_3	Y_3	Y_3	Y_4	Y_4	Y_4	Y_4	4
GENERAL CONSTANTS	K_1	K_1	K_1	K_1	K_2	K_2	K_2	K_2	5
	K_3	K_3	K_3	K_3	K_4	K_4	K_4	K_4	6
	K_5	K_5	K_5	K_5	K_6	K_6	K_6	K_6	7
	K_7	K_7	K_7	K_7	K_8	K_8	K_8	K_8	8
	K_9	K_9	K_9	K_9	K_{10}	K_{10}	K_{10}	K_{10}	9
	K_{11}	K_{11}	K_{11}	K_{11}	K_{12}	K_{12}	K_{12}	K_{12}	10
YEAR	YR_1	YR_1	YR_1	YR_1	YR_2	YR_2	YR_2	YR_2	11
DAY (DY)	0	0	0	0	DY_1	DY_1	DY_1	DY_1	12
	DY_2	DY_2	DY_2	DY_2	DY_3	DY_3	DY_3	DY_3	13
HOUR	H_1	H_1	H_1	H_1	H_2	H_2	H_2	H_2	14
MINUTE	MI_1	MI_1	MI_1	MI_1	MI_2	MI_2	MI_2	MI_2	15
SECOND	SE_1	SE_1	SE_1	SE_1	SE_2	SE_2	SE_2	SE_2	16
MANUFACTURER'S CODE	M_1	M_1	M_1	M_1	M_2	M_2	M_2	M_2	17
MANUFACTURER'S SERIAL NUMBER	M_3	M_3	M_3	M_3	M_4	M_4	M_4	M_4	18
	M_5	M_5	M_5	M_5	M_6	M_6	M_6	M_6	19
BYTES PER SCAN	B_1	B_1	B_1	B_1	B_2	B_2	B_2	B_2	20
	B_3	B_3	B_3	B_3	B_4	B_4	B_4	B_4	21
	B_5	B_5	B_5	B_5	B_6	B_6	B_6	B_6	22
BASE SCAN INTERVAL	I_3	I_2	I_1	I_0	I_{-1}	I_{-2}	I_{-3}	I_{-4}	23
POLARITY (P) SCANS/BLOCK EXPONENT (S/Bx)	P	P	P	P	S/B_{x3}	S/B_{x2}	S/B_{x1}	S/B_{x0}	24
SCANS/BLOCK	S/B_7	S/B_6	S/B_5	S/B_4	S/B_3	S/B_2	S/B_1	S/B_0	25
RECORD TYPE (Z)	Z	Z	Z	Z	R_1	R_1	R_1	R_1	26
RECORD LENGTH (R)	R_2	R_2	R_2	R_2	R_3	R_3	R_3	R_3	27
SCAN TYPES/RECORD	ST/R_1	ST/R_1	ST/R_1	ST/R_1	ST/R_2	ST/R_2	ST/R_2	ST/R_2	28
CHANNEL SETS /SCAN TYPE	CS_1	CS_1	CS_1	CS_1	CS_2	CS_2	CS_2	CS_2	29
SKEW BLOCKS	SK_1	SK_1	SK_1	SK_1	SK_2	SK_2	SK_2	SK_2	30
EXTENDED HEADER BLOCKS	EC_1	EC_1	EC_1	EC_1	EC_2	EC_2	EC_2	EC_2	31
EXTERNAL HEADER BLOCKS	EX_1	EX_1	EX_1	EX_1	EX_2	EX_2	EX_2	EX_2	32

General header

TRACK NO.	4	7	6	5	3	9	1	8	2
BIT NO.	P	0	1	2	3	4	5	6	7
BCD VALUE MSD		8	4	2	1	8	4	2	1 LSD
BINARY VALUE MSB		128	64	32	16	8	4	2	1 LSB

SCAN TYPE NUMBER	ST_1	ST_1	ST_1	ST_1	ST_2	ST_2	ST_2	ST_2	1
CHANNEL SET NUMBER	CN_1	CN_1	CN_1	CN_1	CN_2	CN_2	CN_2	CN_2	2
CHANNEL SET START TIME	TF_{16}	TF_{15}	TF_{14}	TF_{13}	TF_{12}	TF_{11}	TF_{10}	TF_9	3
	TF_8	TF_7	TF_6	TF_5	TF_4	TF_3	TF_2	TF_1	4
CHANNEL SET END TIME	TE_{16}	TE_{15}	TE_{14}	TE_{13}	TE_{12}	TE_{11}	TE_{10}	TE_9	5
	TE_8	TE_7	TE_6	TE_5	TE_4	TE_3	TE_2	TE_1	6
	0	0	0	0	0	0	0	0	7
DESCALE MULTIPLIER	MP_3	MP_4	MP_3	MP_2	MP_1	MP_0	MP_{-1}	MP_{-2}	8
NUMBER OF CHANNELS	C/S_1	C/S_1	C/S_1	C/S_1	C/S_2	C/S_2	C/S_2	C/S_2	9
	C/S_3	C/S_3	C/S_3	C/S_3	C/S_4	C/S_4	C/S_4	C/S_4	10
CHANNEL TYPE (C)	C_1	C_1	C_1	C_1	0	0	0	0	11
SAMPLES/CHANNEL (S/C) CHANNEL GAIN (J)	S/C	S/C	S/C	S/C	J	J	J	J	12
ALIAS FILTER FREQUENCY	AF_1	AF_1	AF_1	AF_1	AF_2	AF_2	AF_2	AF_2	13
	AF_3	AF_3	AF_3	AF_3	AF_4	AF_4	AF_4	AF_4	14
ALIAS FILTER SLOPE (AS)	0	0	0	0	AS_1	AS_1	AS_1	AS_1	15
	AS_2	AS_2	AS_2	AS_2	AS_3	AS_3	AS_3	AS_3	16
LOW CUT FILTER	LC_1	LC_1	LC_1	LC_1	LC_2	LC_2	LC_2	LC_2	17
	LC_3	LC_3	LC_3	LC_3	LC_4	LC_4	LC_4	LC_4	18
LOW CUT FILTER SLOPE (LS)	0	0	0	0	LS_1	LS_1	LS_1	LS_1	19
	LS_2	LS_2	LS_2	LS_2	LS_3	LS_3	LS_3	LS_3	20
FIRST NOTCH FILTER	NT_1	NT_1	NT_1	NT_1	NT_2	NT_2	NT_2	NT_2	21
	NT_3	NT_3	NT_3	NT_3	NT_4	NT_4	NT_4	NT_4	22
SECOND NOTCH FILTER	NT_1	NT_1	NT_1	NT_1	NT_2	NT_2	NT_2	NT_2	23
	NT_3	NT_3	NT_3	NT_3	NT_4	NT_4	NT_4	NT_4	24
THIRD NOTCH FILTER	NT_1	NT_1	NT_1	NT_1	NT_2	NT_2	NT_2	NT_2	25
	NT_3	NT_3	NT_3	NT_3	NT_4	NT_4	NT_4	NT_4	26
	0	0	0	0	0	0	0	Q	27
	0	0	0	0	0	0	0	0	28
	0	0	0	0	0	0	0	0	29
	0	0	0	0	0	0	0	0	30
	0	0	0	0	0	0	0	0	31
	0	0	0	0	0	0	0	0	32

Channel set descriptor

4E

FILE NUMBER	F_1	F_1	F_1	F_1	F_2	F_2	F_2	F_2	1
	F_3	F_3	F_3	F_3	F_4	F_4	F_4	F_4	2
SCAN TYPE NUMBER	ST_1	ST_1	ST_1	ST_1	ST_2	ST_2	ST_2	ST_2	3
CHANNEL SET NUMBER	CN_1	CN_1	CN_1	CN_1	CN_2	CN_2	CN_2	CN_2	4
TRACE NUMBER	TN_1	TN_1	TN_1	TN_1	TN_2	TN_2	TN_2	TN_2	5
	TN_3	TN_3	TN_3	TN_3	TN_4	TN_4	TN_4	TN_4	6
FIRST TIMING WORD	T_{15}	T_{14}	T_{13}	T_{12}	T_{11}	T_{10}	T_9	T_8	7
	T_7	T_6	T_5	T_4	T_3	T_2	T_1	T_0	8
	T_{-1}	T_{-2}	T_{-3}	T_{-4}	T_{-5}	T_{-6}	T_{-7}	T_{-8}	9
	0	0	0	0	0	0	0	0	10
SAMPLE SKEW	SS_{-1}	SS_{-2}	SS_{-3}	SS_{-4}	SS_{-5}	SS_{-6}	SS_{-7}	SS_{-8}	11
	0	0	0	0	0	0	0	0	12
TIME BREAK WINDOW	TW_{15}	TW_{14}	TW_{13}	TW_{12}	TW_{11}	TW_{10}	TW_9	TW_8	13
	TW_7	TW_6	TW_5	TW_4	TW_3	TW_2	TW_1	TW_0	14
	TW_{-1}	TW_{-2}	TW_{-3}	TW_{-4}	TW_{-5}	TW_{-6}	TW_{-7}	TW_{-8}	15
	0	0	0	0	0	0	0	0	16
	0	0	0	0	0	0	0	0	17
	0	0	0	0	0	0	0	0	18
	0	0	0	0	0	0	0	0	19
	0	0	0	0	0	0	0	0	20

Demultiplexed trace header

4F

HEADER BLOCK PARAMETERS

General header

All values are in packed BCD unless otherwise specified.

INDEX BYTE	ABBREVIATION	DESCRIPTION
1	F_1, F_2	File number of four
2	F_3, F_4	digits (0–9999)
3	Y_1, Y_2	Format code:
4	Y_3, Y_4	0015 20 bit binary multiplexed 0022 8 bit quaternary multiplexed 0024 16 bit quaternary multiplexed 0042 8 bit hexadecimal multiplexed 0044 16 bit hexadecimal multiplexed 0048 32 bit hexadecimal multiplexed 8015 20 bit binary demultiplexed 8022 8 bit quaternary demultiplexed 8024 16 bit quaternary demultiplexed 8042 8 bit hexadecimal demultiplexed 8044 16 bit hexadecimal demultiplexed 8048 32 bit hexadecimal demultiplexed 0200 Illegal, do not use 0000 Illegal, do not use
5	K_1, K_2	General constants, 12 digits
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	YR_1, YR_2	Last two digits of year (0–99)
12	0, DY_1	Julian day 3 digits (1–366)
13	DY_2, DY_3	
14	H_1, H_2	Hour of day 2 digits (0–23) (Greenwich Mean Time)
15	MI_1, MI_2	Minute of hour 2 digits (0–59)
16	SE_1, SE_2	Second of minute 2 digits (0–59)
17	M_1, M_2	Manufacturer's code 2 digits Note: See Appendix B for the current assignments
18	M_3, M_4	Manufacturer's serial number, 4 digits
19	M_5, M_6	
20	B_1, B_2	Bytes per scan 6 digits (1–999,999) are utilized in the multiplexed formats to identify the number of bytes (including data, auxiliary, sync, and timing bytes, etc.) required to make up a complete scan. In a demultiplexed record, this field is not used and is recorded as zeros. (See Appendix E2)
21	B_3, B_4	
22	B_5, B_6	
23	I_3 thru I_{-4}	**Base scan interval.**—This is coded as a binary number with the LSB equal to 1/16 msec. This will allow sampling intervals from 1/16 through 8 msec

4G

GENERAL HEADER

INDEX BYTE	ABBREVIATION	DESCRIPTION
		in binary steps. Thus, the allowable base scan intervals are $^1/_{16}$, $^1/_8$, $^1/_4$, $^1/_2$, 1, 2, 4, and 8 msec. The base scan interval is always the difference between successive timing words. Each channel used will be sampled one or more times per base scan interval.
24	P,	**Polarity.**—These 4 binary bits are measured on the sensors, cables, instrument, and source combination and are set into the system manually. The codes are: 0000 Untested 0001 Zero 0010 45 degrees 0011 90 degrees 0100 135 degrees 0101 180 degrees 0110 225 degrees 0111 270 degrees 1000 315 degrees 1001 1010 1011 1100 unassigned 1101 1110 1111[c]
	, S/BX_3 thru S/BX_0	This binary number (range 0 to 15) is an exponent of 2 and is used in conjunction with S/B (Byte 25).
25	S/B_7 thru S/B_0	This binary number (range 0 to 255) is used in conjunction with S/BX (see Byte 24) to indicate the number of scans in a block. If it is 0, the data body is one continuous block. Otherwise, the data body is composed of multiple blocks, each block containing $S/B \times 2^{S/BX}$ scans. It is valid only for multiplexed data.
26	Z,	Record type Bits 0 1 2 3 0 0 1 0 Test record 0 1 0 0 Parallel channel test 0 1 1 0 Direct channel test 1 0 0 0 Normal record 0 0 0 1 Other
27	, R_1 R_2, R_3	Record length from time zero (in increments of 0.5 times 1.024 sec). This value can be set from 00.5 to 99.5 representing times from 0.512 sec. to 101.888 sec. A setting of 00.0 indicates the record length is indeterminate.

[c]Details of polarity codes and test methods are listed in the following reference: Thigpen, B. B., Dalby, A. E., Landrum, R., 1975, Special report of the subcommittee on polarity standards: Geophysics, v. 40, p. 694.

4H

GENERAL HEADER

INDEX BYTE	ABBREVIATION	DESCRIPTION
28	ST/R_1, ST/R_2	Scan types per record. This 2 digit code is the number of scan types per record (1–99). (Zero is invalid.)
29	CS_1, CS_2	Number of channel sets per scan type (1–99). (Zero is invalid.) This 2 digit code is the number of channel sets per scan. If multiple scan types are used (such as in a switching sampling interval environment), this number is equal to the number of channel sets contained in the scan type with the largest number of channel sets. If scan types also exist with less than this maximum number of channel sets per scan type, dummy channel set descriptors will have to be recorded in the scan type header. This can be done by setting the number of channels in the dummy channel set descriptor to zero (reference Bytes 9 and 10 of the scan type header description). Example 6 illustrates this requirement.
30	SK_1, SK_2	Number of 32 byte fields added to the end of each scan type header in order to record the sample skew of all channels (0–99). (See Appendix E3). Zero indicates that skew is not recorded.
31	EC_1, EC_2	Extended header length. The extended header is used to record additional equipment parameters. An example of this would be parameters generated by the addition of a field stacker to the system. The two digits (0–99) in this field specify the number of 32 byte extensions.
32	EX_1, EX_2	External header length. The external header is used to record additional user supplied information in the header. The two digits (0–99) in this field specify the number of 32 byte extensions.

Scan type header (channel set descriptor)

The scan type header is determined by the system configuration and consists of one or more channel set descriptors each of 32 bytes followed by a series of 32 byte sample skew fields. A channel set is defined as a group of channels operating with the same set of parameters and being sampled as part of a scan of data. A scan type header can be composed of from 1 to 99 channel set descriptors. If dynamic parameter changes are required during the recording, additional scan type headers must be added, each containing the channel set descriptors necessary to define the new parameters. Each scan type header must have the same number of channel set descriptors (see Appendix E4 for header length calculation).

CHANNEL SET DESCRIPTOR

INDEX BYTE	ABBREVIATION	DESCRIPTION
1	ST_1, ST_2	These two digits (1–99) identify the number of the scan type header to be described by the subsequent bytes. The first scan type header is 1 and the last scan type header number is the same value as Byte 28 (ST/R) of the general header. If a scan type header contains more than one channel set descriptor, the scan type header number will be repeated in each of its channel set descriptors. If the system does not have dynamic parameter changes during the record, such as switched sampling intervals, there will only be one scan type header required.
2	CN_1, CN_2	These two digits (1–99) identify the channel set to be described in the next 30 bytes within this scan type header. The first channel set is "1" and the last channel set number is the same number as Byte 29 (CS) of the general header. If the scan actually contains fewer channel sets than CS, then dummy channel set descriptors are included as specified in Byte 29 of general header.
3 4	TF_{16} thru TF_9 TF_8 thru TF_1	Channel set starting time. This is a binary number where $TF_1 = 2^1$ msec (2-msec increments). This number identifies the timing word of the first scan of data in this channel set. In a single scan type record, this would typically be recorded as a zero (an exception might be deep water recording). In multiple scan type records, this number represents the starting time, in milliseconds, of the channel set. Start times from 0 to 131,070 msec (in 2-msec increments) can be recorded.
5 6	TE_{16} thru TE_9 TE_8 thru TE_1	Channel set end time. This is a binary number where $TE_1 = 2^1$ milliseconds (2 millisecond increments). These two bytes represent the record end time of the channel set in milliseconds. In a multiplexed record, all channels of a channel set must be of the same length. TE may be used in a demultiplexed record to allow the termination of a particular channel set shorter than other channel sets within its scan type. In a single scan type record, Bytes 5 and 6 would be the length of the record. End times up to 131,070 msec (in 2-msec increments) can be recorded.
7	0, 0	
8	MP_5, MP_4 thru MP_{-2}	This sign magnitude binary number is the exponent of the base 2 multiplier to be used to descale the data on tape to obtain input voltage in millivolts. The radix point is between MP_0 and MP_{-1}. This multiplier has a range of $2^{31.75}$ to $2^{-31.75}$. (See Appendix E7.)
9 10	C/S_1, C/S_2 C/S_3, C/S_4	This is the number of channels in this channel set. It can assume a number from 0–9999.

4J

CHANNEL SET DESCRIPTOR

INDEX BYTE	ABBREVIATION	DESCRIPTION
11	C_1, 0	Channel type identification: Bit 0 1 2 3 0 1 1 1 Other 0 1 1 0 External data 0 1 0 1 Time counter[d] 0 1 0 0 Water break 0 0 1 1 Up hole 0 0 1 0 Time break 0 0 0 1 Seis 0 0 0 0 Unused 1 0 0 0 Signature, unfiltered 1 0 0 1 Signature, filtered
12	S/C,	This packed BCD number is an exponent of 2. The number ($2^{S/C}$) represents the number of subscans of this channel set in the base scan. Possible values for this parameter ($2^{S/C}$) are 1 to 512 (2^0 to 2^9). Reference Byte 23 of the general header.)
12	, J	Channel gain control method. Bits 4 5 6 7 — Gain mode 0 0 0 1 - (1) Individual AGC 0 0 1 0 - (2) Ganged AGC 0 0 1 1 - (3) Fixed gain 0 1 0 0 - (4) Programmed gain 1 0 0 0 - (8) Binary gain control 1 0 0 1 - (9) IFP gain control
13 14	AF_1, AF_2 AF_3, AF_4	Alias filter frequency. It can be coded for any frequency from 0 to 9999 Hz.
15 16	0, AS_1 AS_2, AS_3	Alias filter slope in dB per octave. It can be coded from 0 to 999 dB in 1-dB steps. A zero indicates the filter is out (see Appendix E5 for definition).
17 18	LC_1, LC_2 LC_3, LC_4	Low-cut filter setting. It can be coded for any frequency from 0 to 9999 Hz.
19 20	0, LS_1 LS_2, LS_3	Low-cut filter slope. It can be coded for any slope from 0 to 999 dB per octave. A zero slope indicates the filter is out. (See Appendix E5 for definition.)
21 22	NT_1, NT_2 NT_3, NT_4	Notch frequency setting. It can be coded for any frequency from 0 to 999.9 Hz. The out filter is written as 000.0 Hz.

[d]Illegal code for this format because the timing counter is part of the start of scan and cannot be identified as part of a channel.

4K

CHANNEL SET DESCRIPTOR

INDEX BYTE	ABBREVIATION	DESCRIPTION
The following notch filters are coded in a similar manner:		
23	NT_1, NT_2	Second notch frequency
24	NT_3, NT_4	
25	NT_1, NT_2	Third notch frequency
26	NT_3, NT_4	
27		
28		
29	Unused. Written as zeros.	
30		
31		
32		

4L

—GLOSSARY

Base scan interval The time between timing words. A base scan interval usually contains one scan but under some conditions may contain multiple subscans.

Block The data between gaps on tape.

Channel set One or more channels sampled at the same sampling interval and containing the same filter, fixed gain, and other fixed parameter information.

Channel set descriptor A unit of the scan type header describing the parameters of a channel set.

Data recording method The arrangement of bits to represent samples on tape.

File All data recorded from a single energy impulse or sweep. It may also be the sum of a number of energy impulses or sweeps. Literally, it is all of the blocks between file marks.

Format Data recording method combined with a multiplexed/demultiplexed indicator (see general header Bytes 3 and 4).

General header The first header in the header block. It contains information common to the entire record.

Index byte The byte number of some particular parameter within the general or scan type header.

Packed BCD Binary coded decimal digits represented by four data bits.

Sample skew The fraction of the base scan interval between the timing word and the actual time the sample was taken in a base scan interval (not related to position on tape).

Sampling interval The interval between readings such as the time between successive samples of a digital seismic trace.

Scan One complete sequence of events, such as sampling all channels. Data recorded during a base scan interval.

Scan interval The interval between readings of all samples contained in a scan type.

Scan type One complete set of channel sets which make up a scan. A seismic record contains multiple scans, and may or may not contain more than one scan type.

Scan type header A header containing one or more channel set descriptors and the skew information.

Subscan A set of samples containing one sample for each channel in a channel set.

Time break window Time interval in which time break is expected. If time break does not occur by the end of the window, internal time break is generated.

Trace A record of one seismic channel within a scan type. A collection of a sequential set of points from one seismic channel.

Trace block A block containing the data of one trace or a part of a trace with constant parameters.

4 M

HEADER DESCRIPTORS

G = general header S = scan type header (channel set descriptor)

ABBREVIATION	HEADER	BYTE NO.	DESCRIPTION
AF	S	13, 14	ALIAS FILTER FREQUENCY
AS	S	15, 16	ALIAS FILTER SLOPE
B	G	20, 21, 22	BYTES PER SCAN (MULTIPLEXED ONLY)
BCD	—		BINARY CODED DECIMAL
BOT			BEGINNING OF TAPE MARK
C	S	11	CHANNEL TYPE IDENTIFICATION
CN	S	2	CHANNEL SET NUMBER
CS	G	29	CHANNEL SETS PER SCAN TYPE
C/S	S	9, 10	CHANNELS IN THIS CHANNEL SET
DP	—		DYNAMIC PARAMETER CHANGE BIT (SEE THE MULTIPLEXED DATA BLOCK, SOS BYTE 4)
DY	G	12, 13	DAY OF YEAR
EC	G	31	EXTENDED HEADER LENGTH
EOF	—		END OF FILE MARK
EOT			END OF TAPE MARK
EX	G	32	EXTERNAL HEADER LENGTH
F	G	1, 2	FILE NUMBER
H	G	14	HOUR OF DAY
HDR	—		HEADER FOR DEMULTIPLEXED TRACE
HL	—		HEADER LENGTH (SEE APPENDIX E4)
I	G	23	BASE SCAN INTERVAL
IBG	—		INTERBLOCK GAP (ALSO GAP)
ITB	—		INTERNAL TIME BREAK (SEE THE MULTIPLEXED DATA BLOCK, SOS BYTE 4)
J	S	12	GAIN CONTROL METHOD
K	G	5 THRU 10	GENERAL CONSTANTS
LC	S	17, 18	LOW CUT FILTER FREQUENCY
LS	S	19, 20	LOW CUT FILTER SLOPE
LSB	—		LEAST SIGNIFICANT BIT
LSD	—		LEAST SIGNIFICANT DIGIT
M	G	17 THRU 19	MANUFACTURER'S CODE AND SERIAL NUMBER
MI	G	15	MINUTE OF HOUR
MP	S	8	DESCALING EXPONENT
MSB	—		MOST SIGNIFICANT BIT
MSD	—		MOST SIGNIFICANT DIGIT
NT	S	21 THRU 26	NOTCH FILTER FREQUENCY
P	G	24	POLARITY
R	G	26, 27	RECORD LENGTH
S	—		SIGN BIT
S/B, S/BX	G	24, 25	NUMBER OF SCANS PER BLOCK

4N

HEADER DESCRIPTORS

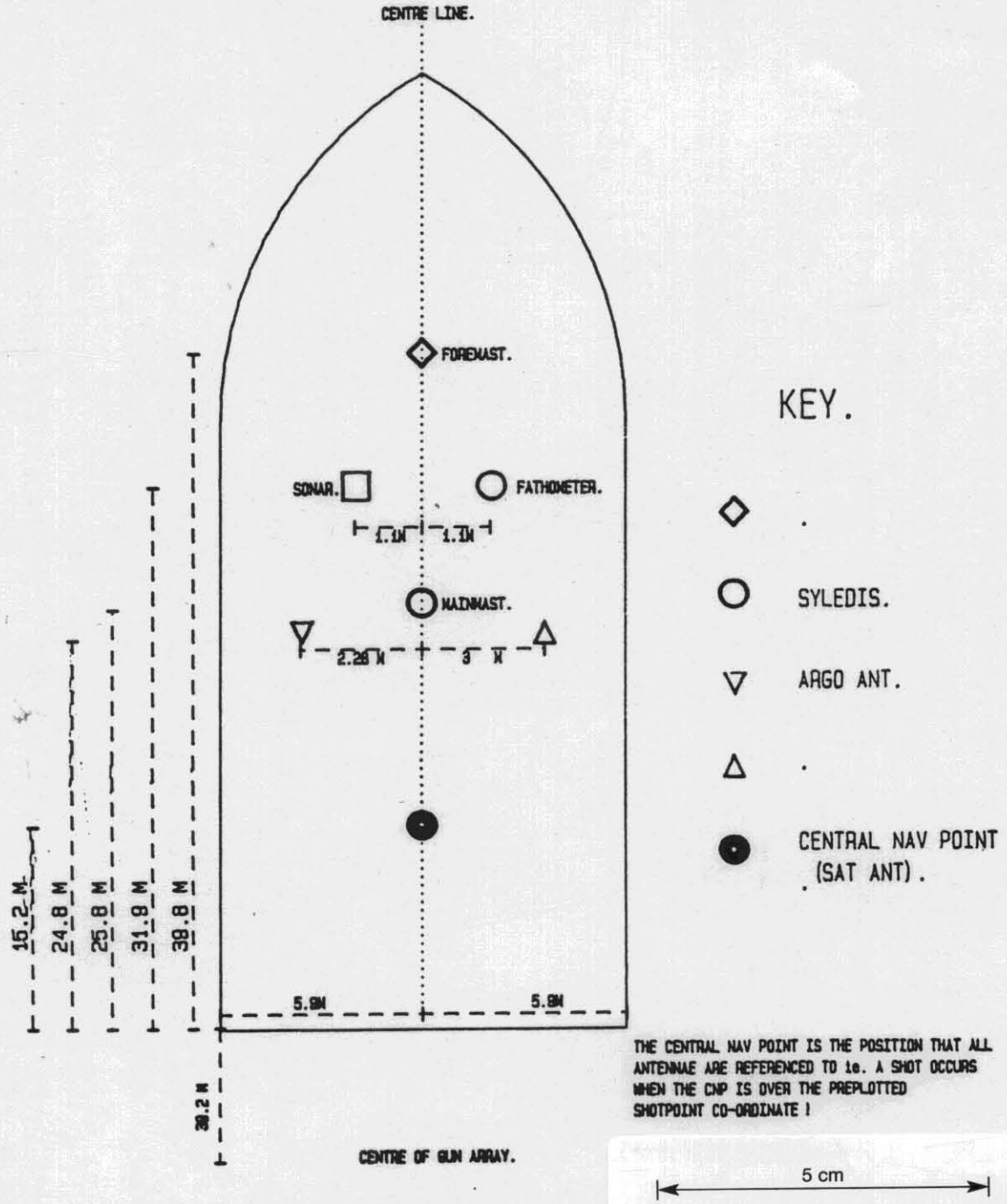
ABBREVIATION	HEADER	BYTE NO.	DESCRIPTION
S/C	S	12	EXPONENT OF SAMPLES PER CHANNEL IN THE BASE SCAN
SE	G	16	SECOND OF MINUTE
SK	G	30	NUMBER OF 32 BYTE SKEW FIELDS
SOS	—		START OF SCAN (MULTIPLEXED DATA BLOCK)
SS	—		SAMPLE SKEW
S/S	—		SAMPLES/SCAN
ST	S	1	SCAN TYPE NUMBER
ST/R	G	28	SCAN TYPES PER RECORD
T	—		TIMING WORD (MULTIPLEXED DATA BLOCK)
TF	S	3, 4	FIRST TIMING WORD IN THIS CHANNEL SET
TE	S	5, 6	END TIME OF THIS CHANNEL SET
TN	—		DEMULTIPLEXED TRACE NO. (SEE TRACE HEADER)
TW	—		TIME BREAK WINDOW (SEE DEMULTIPLEXED DATA BLOCK, TRACE HEADER BYTES 13, 14 AND 15)
TWI	—		TIME BREAK WINDOW INDICATOR (SEE MULTIPLEXED DATA BLOCK, SOS BYTE 4)
Y	G	3, 4	FORMAT CODE (DATA RECORDING METHOD)
YR	G	11	YEAR (LAST TWO DIGITS)
Z	G	26	RECORD TYPE

229063

PLATE (5)

M/V EUGENE McDERMOTT II .

CLIENT: BRIDGE OIL DATE: NOV 1985



GSI-709

PLATE 6

OFFSET CALCULATION

The offset was calculated by firing a single gun at or close to the array centre and measuring the time (t) to the first break from the near group on the trace analysis programs display.

OFFSET = (t - gun delay - filter delay) x water sound vel.
+ length of group/2

= (180 - 51.2 - 3.0) x 1.484 + 7.5

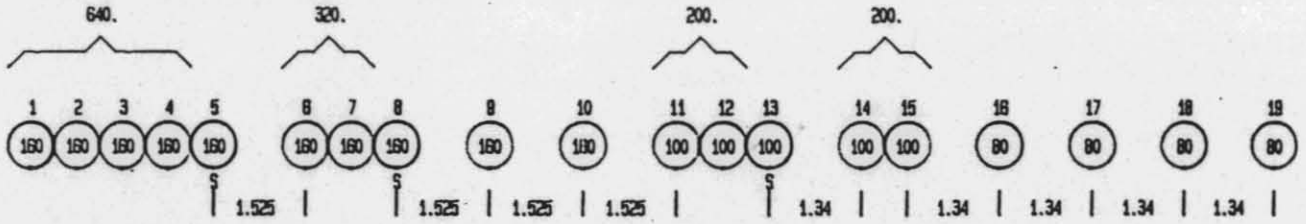
= 194 m

PHYSICAL OFFSET MEASUREMENT

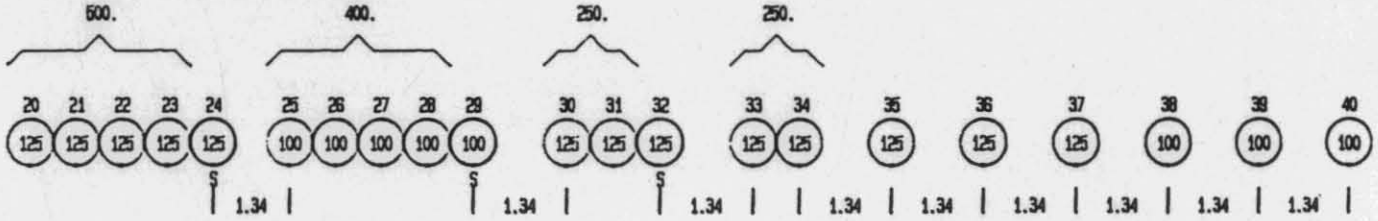
Stretch Section Length	200.0 m
+ Dist. from Stern to Tow Fixture Approx.	10.0 m
+ Stretch Factor (max. 8%)	16.0 m
+ 1/2 Group Length	7.5 m
- Stern to Centre of Gun Array.	28.5 m
TOTAL (max)	205.0 m

4075 CUBIC-INCH MOD II/III AIRGUN ARRAY

STARBOARD STRING (19 GUNS, 18.25 M)



PORT STRING (21 GUNS, 18.6 M)



NOTES-

1. GUN SIZE IN CUBIC INCHES
2. CENTRELINE TO CENTRELINE SPACING OF ALL COALESCED GUNS IS 0.545 METRES
3. SPARE GUNS DENOTED BY "S"
4. GUNS 1 - 10 ARE MOD III PC, GUNS 11 - 40 ARE MOD II PC
5. PREDICTED AVERAGE PERFORMANCE- Pa=80 BAR-M (P-P, 0-125 Hz) Pa/Pb=10:

ARRAY COMPOSITION

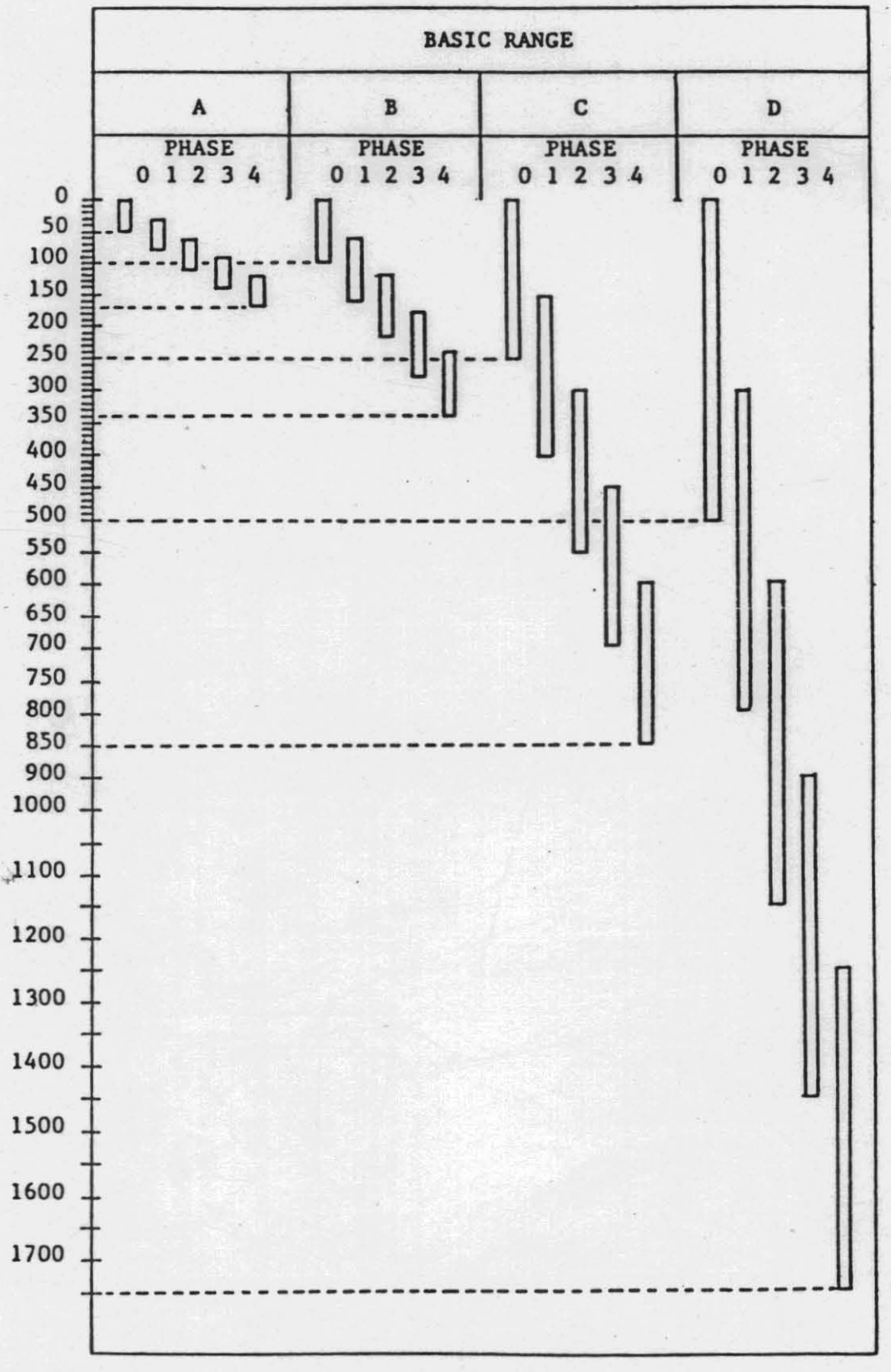
1 X 640	4075 ACTIVE	
1 X 500		
1 X 400		
1 X 320		
2 X 250		
2 X 200		
2 X 160		
3 X 125		
3 X 100		
4 X 80.		
		2 X 160
	770 SPARE	1 X 125
		1 X 100.

5 cm

PLATE 7

229065

SIMRAD MODEL EA FATHOMETER SCALE

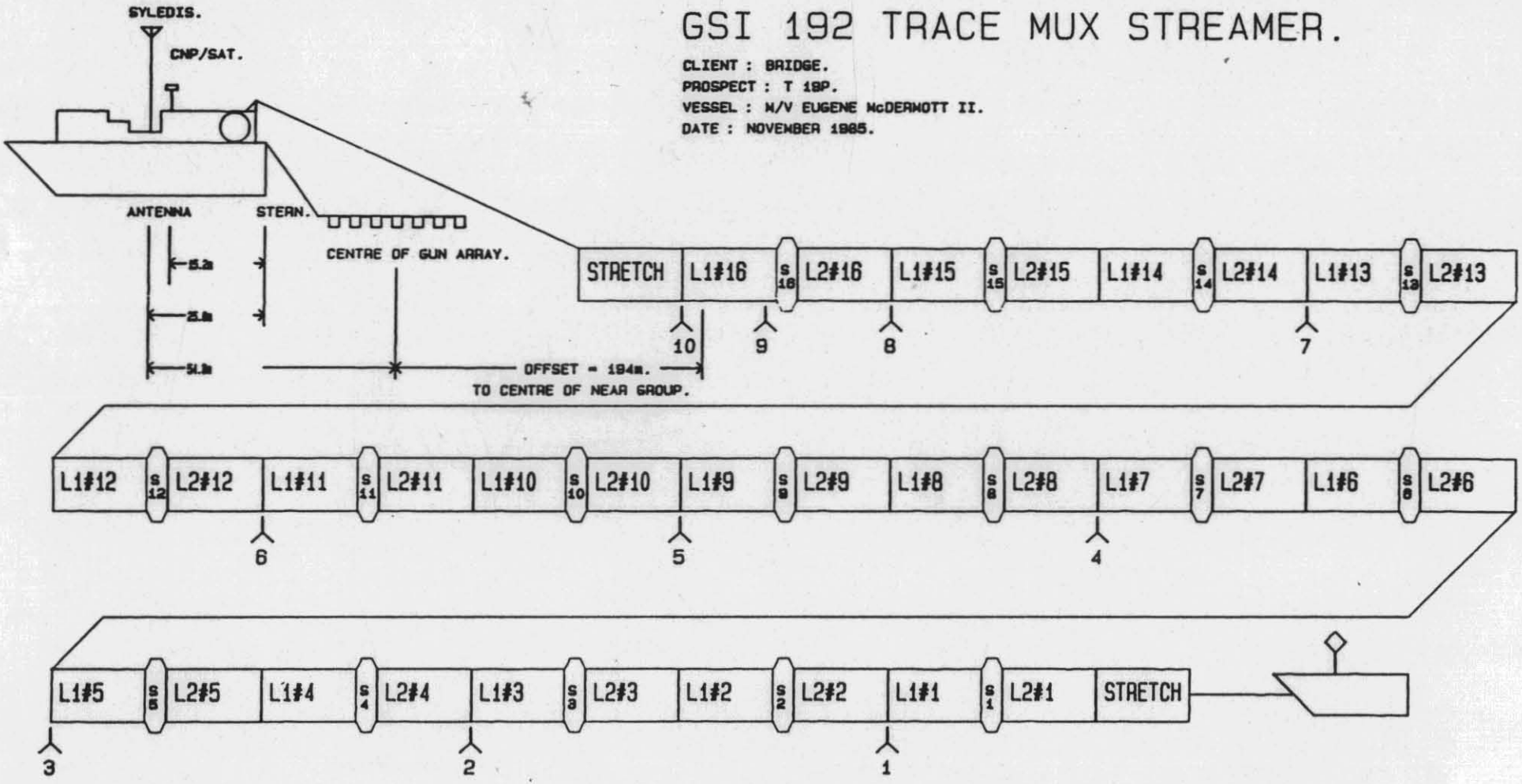


GSI—709

5 cm

GSI 192 TRACE MUX STREAMER.

CLIENT : BRIDGE.
PROSPECT : T 19P.
VESSEL : M/V EUGENE McDERMOTT II.
DATE : NOVEMBER 1985.



CABLE LEVELLER.

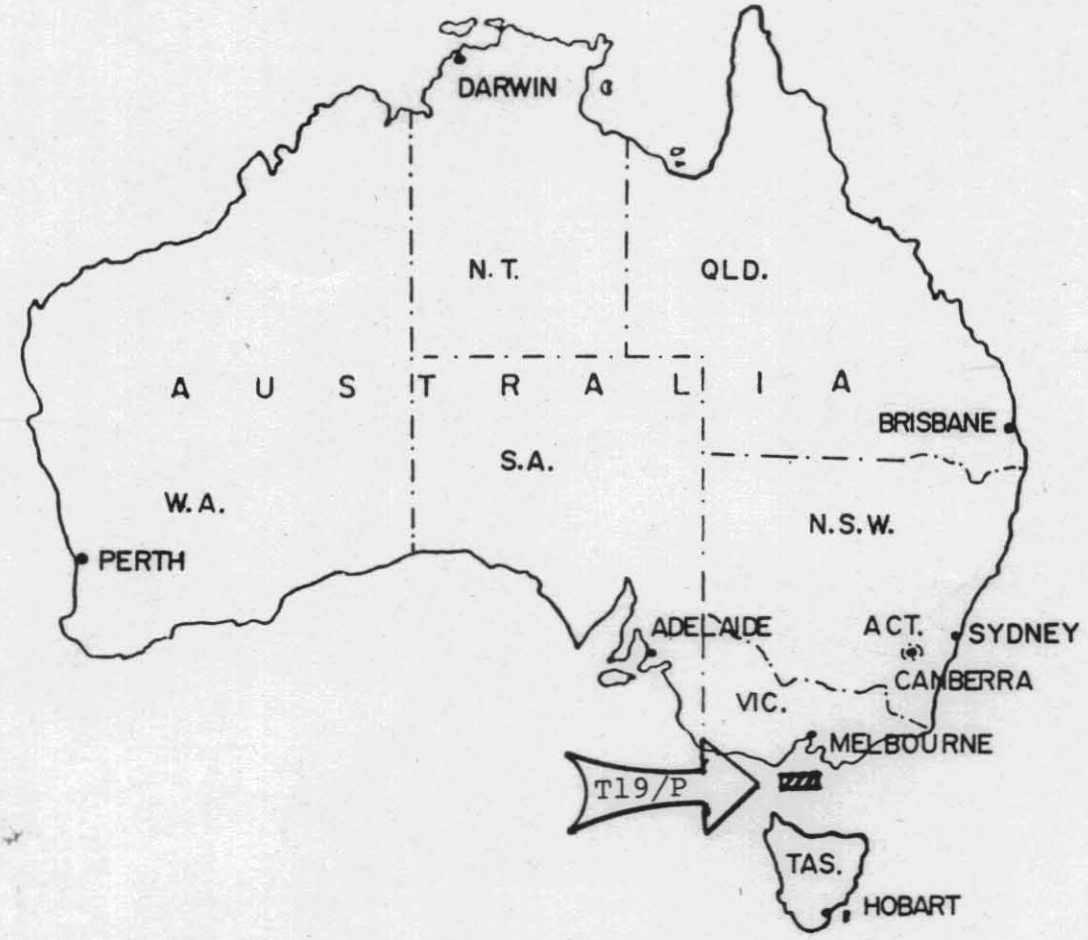
5 cm

NOTE :

1 : TOTAL LENGTH OF A L1/SEM/L2 CLUSTER IS 180m.
2 : GROUP LENGTH IS 15m.
3 : OFFSET CALCULATION : 2 X 100m STRETCH + 10m (CABLE TOW CLAMP) + 7.5m (CENTRE OF NEAR GROUP) +8m (8 % STRETCH FACTOR) - 28.5m (STERN TO CENTRE OF GUNS) !
4 : THE CENTRAL NAV POINT IS THE POSITION THAT ALL ANTENNAE ARE REFERENCED TO ie. A SHOT OCCURS WHEN THE CNP IS OVER THE PREPLOTTED SHOTPOINT CO-ORDINATE !

PLATE (9)

PLATE (10)



LOCATION OF PROSPECT

GSI 709