062001

# OPERATIONS REPORT
# MARINE SEISMIC SURVEY

## HB80-A

FOR

HEMATITE PETROLEUM PTY. LTD.,
B.H.P. HOUSE, 140 WILLIAM STREET,
MELBOURNE, VIC. 3000

CLIENT REPRESENTATIVE : J. GUY

BY

GEOPHYSICAL SERVICE INC.,
P.O. BOX 106, NORTH RYDE, NSW. 2113

PARTY 2931 : M/V "EUGENE McDERMOTT II"
OPERATIONS SUPERVISOR : R. MILES

9TH MAY 1980 TO 15TH MAY 1980

OR-020

GSI-709

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## SECTION I.

## INTRODUCTION

A marine seismic reflection survey was conducted by the M.V. "Eugene McDermott II" in the [illegible] area of Bass Strait on the HB80A Prospect (see Plate 1) for HEMATITE between 9th May 1980 and 15th May 1980.

496.5 Kilometres of 48 fold reflection coverage was shot utilizing a 2400 metre streamer under continuous tow in conjunction with a Pneumatic Acoustic Energy Source (Airguns) generally operating 24 hours a day.

Recordings were made using one set of DFS V's with 2 tape transports recording on 12.7mm magnetic tape in 9 track 1600 BPI Seg. B Digital Format. A record length of 5 sec with a sample rate of 4 msec was used.

The ship's location was determined by Maxiran, a precise radio location network owned and operated by Offshore Navigation Incorporated, of New Orleans, U.S.A. The network consisted of 3 fixed base stations and a mobile unit on the survey vessel.

## SECTION II

## OPERATION PROCEDURES

### A. RECORDING

One Texas Instruments Digital Field System V (DFS V) with two tape transports was used for all recordings. A Servo Writer Profiler was utilized to obtain 100% (Near Trace Gather) subsurface coverage (uncorrected section) of 4 seconds duration directly from monitor recording of trace #94.

Direct Read After Write (RAW) monitors were generated approximately every 50 shotpoints for quality control purposes. In making these displays the instantaneous gain was removed and programmed gain control was applied so that relative amplitude variations between traces could be observed.

### B. STREAMER

The 2400 metre, neutrally buoyant, continuous tow streamer consisted of 48 'live' sections each 50 metres in length. Seven nylon stretch sections each 50 metres in length were placed between Group 96 and the recording vessel to attenuate ship generated noise.

Six waterbreak/depth transducer sections each 4 metres in length were placed in the streamer between the front stretch and group 96 and between groups 81/80, 61/60, 41/40, 21/20 and 3/2. Six remote control 'Cole' cable depth controllers were placed on the streamer at the same positions as the depth transducers except instead of placing one between group 3/2, it was placed between group one and the tail stretch.

Two waterbreaks, one between the front stretch and Group 96 and the other between groups 81 and 80 were used.

Tail buoy bearings were checked at regular intervals to ensure the feathering angle did not exceed specified limits during recording. Occasionally, tail buoy bearings were not recorded due to sea clutter on the radar.

C. ENERGY SOURCE (AIRGUNS)

An Electro-Pneumatic Acoustic Energy Source known as "Airguns" was used for reflection work. The Airgun has basically two moving parts, the shuttle and solenoid. Compressed air is supplied to this unit at a pressure of 13789 kPa (2000 psi). The shuttle is forced to close on initial application of pressure. Compressed air fills the reservoir chamber through a central orifice in the shuttle. To discharge the gun an electrical current activates the solenoid and retracts a plunger, thus enabling compressed air to pass through a port hole to the underside of a flange at the top of the shuttle. The pressure difference above and below the shuttle then thrusts it open. The air from the chamber then escapes through four port holes near the centre of the gun and expands rapidly through the water, producing a single bubble and resultant shock wave. The air bubble collapses in a manner similar to that caused by explosives with one notable exception in that its period is controllable and is placed in the desired seismic frequency band.

There are three variables used to control the frequency content of the shock waves. These are:

i) depth of the airgun in the water
ii) pressure at which the gun is operated and
iii) size of the chambers used on the gun

Using different guns of various chamber sizes broadens and flattens the frequency spectrum of the pulse (plate 3).

The depth of the airguns was 7 - 8 metres and they were operated at a pressure of 13789 kPa (2000 psi) with the pressure never falling below 12755 kPa (1850 psi).

The individual airguns were arranged to produce a 1450 cu. in. array. This array consisted of:

i) 5 x 100 cu. in. guns = 5 x 1.640 litres
ii) 6 x 80 cu. in. guns = 6 x 1.312 litres
iii) 2 x 60 cu. in. guns = 2 x 0.984 litres
iv) 4 x 40 cu. in. guns = 4 x 0.656 litres
v) 3 x 30 cu. in. guns = 3 x 0.492 litres
vi) 2 x 20 cu. in. guns = 2 x 0.328 litres
vii) 2 x 15 cu. in. guns = 2 x 0.246 litres
viii) 2 x 10 cu. in. guns = 2 x 0.164 litres
ix) 2 x 5 cu. in. guns = 2 x 0.082 litres

These guns were arranged and spaced (see Plate 4) so as to operate as a tuned array which yields a flat frequency spectrum.

N.B. 280 cu. in. (4.592 litres of airgun volume was available in the form of spare guns
1 psi = 6.8945 kPa
1 cu. in. = 0.0164 litres

The theoretical power output of the energy source is in excess of 35 bar metres.

The shotpoint interval was 25 metres with the airguns being fired every 25 metres to give a 48 fold coverage.

D. INSTRUMENT AND NOISE TESTS

Instrument tests were carried out each morning and the results were examined in an analog form in the field. These tests consisted of Dynamic Range Determination, Amplifier Noise Test and Automatic Gain Control (AGC) Test. Frequent checks on tape speed and skew were made. Tapes from each system were read on other transports as a check to confirm readability.

A set of monthly tests were carried out on 23rd April, 1980. These tests included Harmonic Distortion, Gain Linearity, Periodic Calibration checks, skew checks, and the above-mentioned tests. These tests were analysed in the Sydney, Australia, Processing Centre using TIAC routine, and found to be up to Texas Instruments standards.

All instruments functioned satisfactorily throughout the survey and no malfunctions were encountered.

E. AIRGUN CONTROLLER

The Texas Instruments Automatic Airgun Controller (TIGER*) can be controlled:

i) COMPUTER MODE

In Computer Mode the CMS II Navigation Computer sets and monitors the last eight firing times of the individual guns in the array and keeps them to within 1 ms.

The firing instant is sensed directly from the initial shuttle movement and the array is consistently tuned.

It is also noted that there is a 51 ms delay from SOD, on tape, to the time the airguns are fired.

* TRADEMARK OF TEXAS INSTRUMENTS INC.

ii) STAND ALONE MODE

In this mode, which is independent of the CMS Navigation Computer, it sets and monitors only the last two firing times of the guns, and does essentially the same as in Computer Mode.

This detection system also provides a direct monitoring of the performance of each gun with an automatic display indicating a no-fire or self-fire for each individual gun.

F. FATHOMETER

A Simrad Model EA fathometer with an operating frequency of 38 kHz was used.

Each fathogram was identified by line number, direction shot, time and date of first shotpoint and scale. The fathograms were marked and labelled every 50 shotpoints.

This unit covers a range of 0-1700 metres in a wide variety of variable scales and is corrected for draft. It has a digital display and paper chart recorder.

No malfunctions of this unit were experienced during the survey.

G. SURVEY

The prime navigation used was Maxiran. The raw Maxiran ranges were interfaced into the CMS-II, so that all production recording was computer controlled. Recording was done in 'distance' mode, that is, by indicating a shotpoint at every 25 metres of travel along a pre-plotted line. Occasional changes to 'time' mode were made when real time shotpoints became displaced with respect to the pre-plotted shotpoint.

The required course of the vessel was displayed on centre-line trace plotters. All survey data was recorded on magnetic tape by the CMS-II for post processing, with periodic printouts for onboard monitoring.

The Maxiran equipment was calibrated onshore, then the accuracy of the survey net was verified by the M/V "EUGENE McDERMOTT II" in good angle from all 3 shore stations.

Offshore Navigation Inc., will submit a separate full report.

Velocities for navigation were provided by Maxiran or Doppler Sonar while azimuth was derived from the ship's gyro compass.

Primary navigation was under constant check by the CMS Satellite option and by three way fixes calculated by using the T.I.-59 "Three Way Fix by Iteration" programme

The survey was commenced on 10th May 1980 when line HB80A-428 was shot as a test line. Maxiran signals proved very erratic and caused the CMS to skip numerous shotpoint numbers. This line was marked as "Do Not Process" and was reshot at a later date but was still labelled as HB80A-428.

Maxiran signals continued to be erratic at times, resulting in terminations of lines HB80A-416 and 418. Although not terminated, lines HB80A-414, 416A, 418A, 420, 422, 428, 401, 402, 400 and 414A all had shotpoints missed or shotpoint numbers skipped due to erratic Maxiran signals.

At shotpoint 541 of line HB80A-406, the CMS ceased sending closures to the DFS and the line was terminated.

## SURVEY DETAILS

### PRIMARY SYSTEM

| | | |
|---|---|---|
| Type | : | Maxiran |
| Survey Company | : | Offshore Navigation Inc. |
| Operating Frequency | : | transmit 441 mHz<br>receive 429 mHz |
| Antenna Height, from sea level | : | Fwd - 21.2 metres<br>Aft - 23.1 metres |
| Antenna Location from stern of vessel | : | 25.3 metres (Aft) & 40 metres (Fwd) |

Shore Station Locations

| | | | |
|---|---|---|---|
| DOCTOR'S ROCKS | : | 041°01'01.50"S | 145°46'54.77"E |
| STONEY HEAD | : | 040°59'06.18"S | 147°01'07.23"E |
| CAPE PORTLAND | : | 040°45'18.10"S | 147°58'09.14"E |

H. PERMITTING

The Marine Operations Centre, Canberra, was advised as to the ship's location throughout the survey to enable the necessary navigation warning to mariners to be issued.

## J. OPERATIONS

The cable was reeled out into the water in the early hours of 10th May. Depth transducers were calibrated and the cable ballasted as it was laid. Once laid, the cable rode well throughout the survey and no dead traces or leakage was experienced.

The quality of seismic data collected was maintained at or above client specifications and any deviations from these specifications were immediately brought to the attention of the onboard client representative.

Raw data was monitored onboard during production and ensured that the high standard was achieved at all times.

The weather during the survey period was excellent, with calm seas ranging between states 2 and 3. No interference was experienced from other vessels and the survey was successfully completed on 15th May, 1980.

# APPENDICES

## APPENDIX A

## KEY PERSONNEL

| | |
|---|---|
| J. STANTON | BOAT MANAGER |
| H. BRIDGES | SUPERVISOR |
| C. ORR | PARTY MANAGER |
| P. JOHNSON | ADMINISTRATOR |
| C. GRUBBA | CAPTAIN |
| A. WELFARE | INSTRUMENT ENGINEER |
| I. JOHNSON | INSTRUMENT ENGINEER |
| P. HUTCHISON | INSTRUMENT ENGINEER TRAINEE |
| N. DOWDESWELL | VESSEL CONTROLLER |
| R. CAMPBELL | COMPRESSOR ENGINEER |
| S. JOYCE | QUALITY CONTROL SEISMOLOGIST |
| W. O'RAPHERTY | QUALITY CONTROL SEISMOLOGIST |
| T. MANNING | AIR GUN MECHANIC |
| P. FERRIER | AIR GUN MECHANIC |
| J. SIMMONS | AIR GUN MECHANIC |
| B. GILBERT | NAVIGATOR CMS II |
| P. MILLER | NAVIGATOR CMS II |
| J. GUY | CLIENT REPRESENTATIVE |

## APPENDIX B

## EQUIPMENT

1. 2400 Metre STREAMER

| | | |
|---|---|---|
| Type Cable A.C.H. | : | 96 trace neutrally buoyant universal gland streamer |
| Length of Live Section | : | 50 metres |
| Length of Depth Transducer Sections | : | 4 metres |
| Distance Group 1 to 96 (Centre to Centre) | : | 2395 metres |
| Group Intervals | : | 25 metres |
| Seismometer Types | : | T.I. Flatpack Acceleration cancelling. |
| Seismometer/Group | : | 15 |
| Seismometer Interval | : | 1.67 metres linear |
| Sensitivity | : | 5.15 uv/uBar $\pm$ 2 DB |

## 2. RECORDING PARAMETERS

| | | |
|---|---|---|
| Amplifier | : | T.I. DFS |
| Gain Mode | : | IFP |
| Tape Speed | : | 39-69 |
| Record Length | : | 5 sec |
| Sample Rate | : | 4 msec |
| Gain Constant | : | 24 db |
| Final Gain | : | 108 db |
| Filter - | | |
| Low Cut | : | 8 Hz @ 18 db/octave |
| High Cut | : | 128 Hz @ 72 db/octave |

## 3. DATA CHANNEL ALLOCATIONS

| FUNCTION | MONITOR TRACE NUMBER | TAPE CHANNEL |
|---|---|---|
| Traces 1-96 | 1-48 | 1-96 |
| Field Time Break | 4 | Not Recorded |
| DFS Time Break | 8 | Time Word Zero |
| Water Breaks | 53 | Aux 1 |

## APPENDIX C

## SURVEY VESSEL

## M.V. "EUGENE McDERMOTT II"

| | | |
|---|---|---|
| Flag | : | Panama |
| Homeport | : | Panama |
| Trade | : | Foreign Going-Seismic Exploration |
| Owners | : | Geophysical Service Inc. |
| Call Sign | : | HO 9376 |
| Length | : | 52.73 metres L.O.A. |
| Breadth | : | 12.19 metres |
| Depth | : | 4.27 metres |
| Draft | : | 3.05-3.24 metres |
| Official Number | : | 7062-pext-1 |
| Gross Tonnage | : | 929.89 tonnes |
| Net Tonnage | : | 249.09 tonnes |
| Engine Power | : | 2 x 839.25 HP Engines |

## APPENDIX D

## OPERATIONS STATISTICS

| | | |
|---|---|---|
| TRAVEL | : | 26.28 HOURS |
| RE-SUPPLY | : | 9.0 HOURS |
| CABLE HANDLING & FAILURE | : | 5.02 HOURS |
| SOURCE HANDLING & FAILURE | : | 0.5 HOURS |
| SHOOTING & LINE CHANGES | : | 91.33 HOURS |
| EQUIPMENT FAILURE | : | 1.78 HOURS |
| NAVIGATION SYSTEM FAILURE | : | 13.32 HOURS |
| DOWN FOR WEATHER | : | 0.0 HOURS |
| VESSEL FAILURE | : | 6.2 HOURS |
| ON LINE OBSTRUCTION | : | 1.2 HOURS |

| | | |
|---|---|---|
| KILOMETRES RECORDED | : | 496.5 |
| TOTAL SHOT POINTS | : | 19860 |
| FIELD TAPES USED | : | 421 |

APPENDIX E - FIELD TAPE INVENTORY

| DATE | TAPE NO. | LINE NO. | SHOTPOINTS |
|---|---|---|---|
| 10 May 1980 | 597846 | DO NOT PROCESS | |
| | 597847 | " | |
| | 597848 | " | |
| | 597849 | " | |
| | 597850 | " | |
| | 597851 | " | |
| | 597852 | " | |
| | 597853 | " | |
| | 597854 | " | |
| | 597855 | " | |
| | 597856 | HB80A-414 | 0691 - 0640 |
| | 597857 | " | 0639 - 0585 |
| | 597858 | " | 0584 - 0530 |
| | 597859 | " | 0529 - 0475 |
| | 597860 | " | 0474 - 0419 |
| | 597861 | " | 0418 - 0358 |
| | 597862 | " | 0357 - 0301 |
| | 597863 | " | 0300 - 0246 |
| | 597864 | " | 0245 - 0191 |
| | 597865 | " | 0190 - 0146 |
| | 597866 | " | 0145 - 0081 |
| | 597867 | " | 0080 - 0026 |
| | 597868 | " | 0025 - 9971 |
| | 597869 | " | 9970 - 9944 |
| | 597870 | HB80A-416 | 0001 - 0052 |
| | 597871 | " | 0053 - 0104 |
| | 597872 | " | 0105 - 0114 |
| | 597873 | " | 0001 - 0052 |
| | 597874 | " | 0053 - 0106 |
| | 597875 | " | 0107 - 0161 |

| DATE | TAPE NO. | LINE NO. | SHOTPOINTS |
|---|---|---|---|
| 10 May 1980 | 597876 | HB80A-416A | 0162 - 0216 |
| | 597877 | " | 0217 - 0278 |
| | 597878 | " | 0279 - 0335 |
| | 597879 | " | 0336 - 0390 |
| | 597880 | " | 0391 - 0444 |
| | 597881 | " | 0445 - 0499 |
| | 597882 | " | 0500 - 0553 |
| | 597883 | " | 0554 - 0607 |
| | 597884 | " | 0608 - 0647 |
| | 597885 | HB80A-418 | 0371 - 0317 |
| | 597886 | " | 0310 - 0263 |
| | 597887 | " | 0262 - 0229 |
| | 597888 | HB80A-418A | 0371 - 0321 |
| | 597889 | " | 0320 - 0266 |
| | 597890 | " | 0265 - 0211 |
| | 597891 | " | 0210 - 0156 |
| | 597892 | " | 0155 - 0101 |
| | 597893 | " | 0100 - 0046 |
| | 597894 | " | 0043 - (-012) |
| | 597895 | " | (-013) - (-056) |
| 11 May 1980 | 597896 | HB80A-420 | 001 - 048 |
| | 597897 | " | 049 - 103 |
| | 597898 | " | 104 - 160 |
| | 597899 | " | 166 - 231 |
| | 597900 | " | 232 - 285 |
| | 597901 | " | 286 - 340 |
| | 597902 | " | 341 - 388 |
| | 597903 | " | 389 - 414 |
| | 597904 | HB80A-422 | 661 - 611 |
| | 597905 | " | 610 - 555 |

| DATE | TAPE NO. | LINE NO. | SHOTPOINTS |
|---|---|---|---|
| 11 May 1980 | 597906 | HB80A-422 | 554 - 501 |
| | 597907 | " | 500 - 447 |
| | 597908 | " | 446 - 393 |
| | 597909 | " | 392 - 330 |
| | 597910 | " | 329 - 276 |
| | 597911 | " | 275 - 222 |
| | 597912 | " | 221 - 168 |
| | 597913 | " | 167 - 114 |
| | 597914 | " | 113 - 060 |
| | 597915 | " | 059 - 006 |
| | 597916 | " | 005 - (-16) |
| | 597917 | " | (-17) - (-64) |
| | 597918 | HB80A-424 | 001 - 051 |
| | 597919 | " | 052 - 106 |
| | 597920 | " | 107 - 161 |
| | 597921 | " | 162 - 216 |
| | 597922 | " | 217 - 270 |
| | 597923 | " | 271 - 324 |
| | 597924 | " | 325 - 379 |
| | 597925 | " | 380 - 434 |
| | 597926 | " | 435 - 489 |
| | 597927 | " | 490 - 540 |
| | 597928 | " | 541 - 576 |
| | 597929 | HB80A-426 | 341 - 292 |
| | 597930 | " | 291 - 237 |
| | 597931 | " | 236 - 182 |
| | 597932 | " | 181 - 128 |
| | 597933 | " | 127 - 074 |
| | 597934 | " | 073 - 020 |
| | 597935 | " | 019 - (-19) |

| DATE | TAPE NO. | LINE NO. | SHOTPOINTS |
|---|---|---|---|
| 11 May 1980 | 597936 | HB80A-426 | (-20) - (-56) |
| | 597937 | HB80A-428 | 001 - 052 |
| | 597938 | " | 053 - 107 |
| | 597939 | " | 108 - 162 |
| | 597940 | " | 163 - 217 |
| | 597941 | " | 218 - 272 |
| | 597942 | " | 273 - 327 |
| | 597943 | " | 328 - 382 |
| | 597944 | " | 385 - 438 |
| | 597945 | " | 400 - 494 |
| | 597946 | " | 495 - 537 |
| | 597947 | HB80A-401 | 001 - 050 |
| | 597948 | " | 051 - 104 |
| | 597949 | " | 105 - 158 |
| | 597950 | " | 159 - 211 |
| | 597951 | " | 212 - 266 |
| | 597952 | " | 267 - 319 |
| | 597953 | " | 320 - 372 |
| | 597954 | " | 373 - 425 |
| | 597955 | " | 426 - 482 |
| | 597956 | " | 483 - 534 |
| | 597957 | " | 535 - 586 |
| | 597958 | " | 587 - 597 |
| | 597959 | HB80A-400 | 851 - 0805 |
| | 597960 | " | 0804 - 0751 |
| | 597961 | " | 0750 - 698 |
| | 597962 | " | 697 - 646 |
| | 597963 | " | 645 - 592 |
| | 597964 | " | 591 - 537 |
| | 597965 | " | 536 - 483 |

| DATE | TAPE NO. | LINE NO. | SHOTPOINTS |
|---|---|---|---|
| 11 May 1980 | 597966 | HB80A-400 | 482 - 429 |
| | 597967 | " | 428 - 375 |
| | 597968 | " | 374 - 322 |
| | 597969 | " | 321 - 269 |
| | 597970 | " | 268 - 215 |
| | 597971 | " | 214 - 162 |
| | 597972 | " | 161 - 109 |
| | 597973 | " | 108 - 056 |
| | 597974 | " | 055 - 002 |
| | 597975 | " | 001 - (-56) |
| | 597976 | " | (-57) - (-57) |
| | 597977 | HB80A-402 | 001 - 052 |
| | 597978 | " | 053 - 106 |
| | 597979 | " | NO DATA ON THIS TAPE |
| | 597980 | " | 113 - 165 |
| | 597981 | " | 166 - 219 |
| | 597982 | " | 220 - 272 |
| | 597983 | " | 273 - 324 |
| | 597984 | " | 325 - 376 |
| | 597985 | " | 378 - 429 |
| | 597986 | " | 430 - 481 |
| | 597987 | " | 482 - 534 |
| | 597988 | " | 535 - 0587 |
| | 597989 | " | 588 - 642 |
| | 597990 | " | 641 - 665 |
| 12 May 1980 | 597991 | HB80A-404 | 821 - 772 |
| | 597992 | " | 771 - 717 |
| | 597993 | " | 716 - 662 |
| | 597994 | " | 661 - 607 |
| | 597995 | " | 606 - 552 |

| DATE | TAPE NO. | LINE NO. | SHOTPOINTS |
|---|---|---|---|
| 12 May 1980 | 597996 | HB80A-404 | 551 - 497 |
| | 597997 | " | 496 - 442 |
| | 597998 | " | 441 - 387 |
| | 597999 | " | 386 - 332 |
| | 598000 | " | 331 - 277 |
| | 599001 | " | 276 - 222 |
| | 599002 | " | 221 - 167 |
| | 599003 | " | 166 - 112 |
| | 599004 | " | 111 - 057 |
| | 599005 | " | 056 - 001 |
| | 599006 | " | (-1) - (-40) |
| | 599007 | " | (-41) - (-56) |
| | 599008 | HB80A-406 | 001 - 050 |
| | 599009 | " | 051 - 104 |
| | 599010 | " | 105 - 158 |
| | 599011 | " | 159 - 213 |
| | 599012 | " | 214 - 268 |
| | 599013 | " | 269 - 323 |
| | 599014 | " | 324 - 378 |
| | 599015 | " | 379 - 433 |
| | 599016 | " | 434 - 488 |
| | 599017 | " | 489 - 541 |
| | 599018 | HB80A-406A | 481 - 530 |
| | 599019 | " | 531 - 584 |
| | 599020 | " | 585 - 634 |
| | 599021 | " | 636 - 690 |
| | 599022 | " | 691 - 745 |
| | 599023 | " | 746 - 799 |
| | 599024 | " | 800 - 853 |
| | 599025 | " | 854 - 903 |

| DATE | TAPE NO. | LINE NO. | SHOTPOINTS |
|---|---|---|---|
| 12 May 1980 | 599026 | HB80A-406A | 904 - 954 |
| | 599027 | " | 955 - 1004 |
| | 599028 | " | 1005 - 1026 |
| | 599029 | HB80A-408 | 901 - 851 |
| | 599030 | " | 850 - 796 |
| | 599031 | " | 795 - 741 |
| | 599032 | " | 740 - 686 |
| | 599033 | " | 685 - 631 |
| | 599034 | " | 630 - 576 |
| | 599035 | " | 575 - 521 |
| | 599036 | " | 520 - 466 |
| | 599037 | " | 465 - 411 |
| | 599038 | " | 410 - 356 |
| | 599039 | " | 355 - 301 |
| | 599040 | " | 300 - 256 |
| | 599041 | " | 255 - 205 |
| | 599042 | " | 204 - 153 |
| | 599043 | " | 152 - 100 |
| | 599044 | " | 099 - 048 |
| | 599045 | " | 047 - (-07) |
| | 599046 | " | (-08) - (-56) |
| | 599047 | HB80A-410 | 001 - 049 |
| | 599048 | " | 050 - 0103 |
| | 599049 | " | 0104 - 0156 |
| | 599050 | " | 0157 - 0209 |
| | 599051 | " | 0210 - 0262 |
| | 599052 | " | 0263 - 0315 |
| | 599053 | " | 0316 - 0370 |
| | 599054 | " | 0371 - 0424 |
| | 599055 | " | 425 - 477 |

| DATE | TAPE NO. | LINE NO. | SHOTPOINTS |
|---|---|---|---|
| 12 May 1980 | 599056 | HB80A-410 | 478 - 528 |
| | 599057 | " | 529 - 580 |
| | 599058 | " | 581 - 633 |
| | 599059 | " | 634 - 685 |
| | 599060 | " | 686 - 738 |
| | 599061 | " | 739 - 790 |
| | 599062 | " | 791 - 843 |
| | 599063 | " | 844 - 896 |
| | 599064 | " | 897 - 950 |
| | 599065 | " | 951 - 1004 |
| | 599066 | " | 1005 - 1057 |
| | 599067 | " | 1058 - 1078 |
| | 599068 | HB80A-412 | 401 - 351 |
| | 599069 | " | 350 - 299 |
| | 599070 | " | 298 - 245 |
| | 599071 | " | 244 - 193 |
| | 599072 | " | 192 - 140 |
| | 599073 | " | 139 - 087 |
| | 599074 | " | 86 - 034 |
| | 599075 | " | 033 - (-19) |
| | 599076 | " | (-20) - (-56) |
| | 599077 | HB80A-414A | 001 - 050 |
| | 599078 | " | 051 - 104 |
| | 599079 | " | 105 - 158 |
| | 599080 | " | 159 - 211 |
| | 599081 | " | 212 - 264 |
| | 599082 | " | 265 - 318 |
| | 599083 | " | 319 - 371 |
| | 599084 | " | 372 - 425 |
| | 599085 | " | 426 - 479 |

| DATE | TAPE NO. | LINE NO. | SHOTPOINTS |
|---|---|---|---|
| 12 May 1980 | 599086 | HB80A-414A | 480 - 533 |
| | 599087 | " | 534 - 586 |
| | 599088 | " | 587 - 638 |
| | 599089 | " | 639 - 735 |
| | 599090 | " | 736 - 786 |
| | 599091 | " | 787 - 791 |
| 13 May 1980 | 599092 | HB80A-230 | 101 - 150 |
| | 599093 | " | 151 - 204 |
| | 599094 | " | 205 - 258 |
| | 599095 | " | 259 - 312 |
| | 599096 | " | 313 - 367 |
| | 599097 | " | 368 - 421 |
| | 599098 | " | 422 - 475 |
| | 599099 | " | 476 - 529 |
| | 599100 | " | 530 - 583 |
| | 599101 | " | 584 - 637 |
| | 599102 | " | 638 - 691 |
| | 599103 | " | 692 - 756 |
| | 599104 | " | 757 - 810 |
| | 599105 | " | 811 - 864 |
| | 599106 | " | 865 - 918 |
| | 599107 | " | 919 - 972 |
| | 599108 | " | 973 - 1026 |
| | 599109 | " | 1027 - 1080 |
| | 599110 | " | 1081 - 1134 |
| | 599111 | " | 1135 - 1175 |
| | 599112 | HB80A-405 | 1431 - 1382 |
| | 599113 | " | 1381 - 1327 |
| | 599114 | " | 1326 - 1272 |
| | 599115 | " | 1271 - 1217 |

| DATE | TAPE NO. | LINE NO. | SHOTPOINTS |
|---|---|---|---|
| 13 May 1980 | 599116 | HB80A-405 | 1216 - 1162 |
| | 599117 | " | 1161 - 1107 |
| | 599118 | " | 1106 - 1052 |
| | 599119 | " | 1051 - 997 |
| | 599120 | " | 996 - 941 |
| | 599121 | " | 940 - 886 |
| | 599122 | " | 885 - 831 |
| | 599123 | " | 830 - 776 |
| | 599124 | " | 775 - 721 |
| | 599125 | " | 720 - 666 |
| | 599126 | " | 665 - 611 |
| | 599127 | " | 610 - 556 |
| | 599128 | " | 555 - 501 |
| | 599129 | " | 500 - 446 |
| | 599130 | " | 445 - 390 |
| | 599131 | " | 389 - 335 |
| | 599132 | " | 334 - 280 |
| | 599133 | " | 279 - 225 |
| | 599134 | " | 224 - 180 |
| | 599135 | " | 179 - 130 |
| | 599136 | " | 129 - 080 |
| | 599137 | " | 079 - 044 |
| | 599138 | HB80A-403 | 101 - 150 |
| | 599139 | " | 151 - 204 |
| | 599140 | " | 205 - 258 |
| | 599141 | " | 259 - 312 |
| | 599142 | " | 313 - 367 |
| | 599143 | " | 368 - 421 |
| | 599144 | " | 422 - 474 |
| | 599145 | " | 475 - 527 |

| DATE | TAPE NO. | LINE NO. | SHOTPOINTS |
|---|---|---|---|
| 13 May 1980 | 599146 | HB80A-403 | 528 - 580 |
| | 599147 | " | 581 - 632 |
| | 599148 | " | 633 - 684 |
| | 599149 | " | 685 - 739 |
| | 599150 | " | 740 - 767 |
| | 599151 | HB80A-407 | 791 - 743 |
| | 599152 | " | 742 - 689 |
| | 599153 | " | 688 - 636 |
| | 599154 | " | 635 - 584 |
| | 599155 | " | 583 - 532 |
| | 599156 | " | 531 - 479 |
| | 599157 | " | 478 - 424 |
| | 599158 | " | 423 - 373 |
| | 599159 | " | 372 - 322 |
| | 599160 | " | 321 - 270 |
| | 599161 | " | 269 - 217 |
| | 599162 | " | 216 - 164 |
| | 599163 | " | 165 - 112 |
| | 599164 | " | 111 - 60 |
| | 599165 | " | 59 - 39 |
| 14 May 1980 | 599166 | HB80A-409 | 101 - 151 |
| | 599167 | " | 152 - 205 |
| | 599168 | " | 206 - 260 |
| | 599169 | " | 261 - 315 |
| | 599170 | " | 316 - 370 |
| | 599171 | " | 371 - 425 |
| | 599172 | " | 426 - 480 |
| | 599173 | " | 481 - 535 |
| | 599174 | " | 536 - 590 |
| | 599175 | " | 591 - 645 |

| DATE | TAPE NO. | LINE NO. | SHOTPOINTS |
|---|---|---|---|
| 14 May 1980 | 599176 | HB80A-409 | 646 - 700 |
| | 599177 | " | 701 - 755 |
| | 599178 | " | 756 - 805 |
| | 599179 | " | 806 - 837 |
| | 599180 | HB80A-436 | 523 - 473 |
| | 599181 | " | 472 - 419 |
| | 599182 | " | 418 - 365 |
| | 599183 | " | 364 - 311 |
| | 599184 | " | 310 - 257 |
| | 599185 | " | 256 - 205 |
| | 599186 | " | 204 - 153 |
| | 599187 | " | 152 - 100 |
| | 599188 | " | 099 - 046 |
| | 599189 | HB80A-411 | 101 - 151 |
| | 599190 | " | 152 - 204 |
| | 599191 | " | 205 - 258 |
| | 599192 | " | 259 - 312 |
| | 599193 | " | 313 - 364 |
| | 599194 | " | 365 - 417 |
| | 599195 | " | 418 - 470 |
| | 599196 | " | 471 - 496 |
| | 599197 | HB80A-413 | 423 - 375 |
| | 599198 | " | 374 - 321 |
| | 599199 | " | 320 - 269 |
| | 599200 | " | 268 - 216 |
| | 599201 | " | 215 - 162 |
| | 599202 | " | 161 - 108 |
| | 599203 | " | 107 - 055 |
| | 599204 | " | 054 - 047 |
| | 599205 | HB80A-415 | 101 - 149 |

| DATE | TAPE NO. | LINE NO. | SHOTPOINTS |
|---|---|---|---|
| 14 May 1980 | 599206 | HB80A-415 | 150 - 203 |
| | 599207 | " | 204 - 258 |
| | 599208 | " | 259 - 312 |
| | 599209 | " | 313 - 365 |
| | 599210 | " | 366 - 418 |
| | 599211 | " | 419 - 465 |
| | 599212 | HB80A-417 | 421 - 371 |
| | 599213 | " | 370 - 318 |
| | 599214 | " | 317 - 264 |
| | 599215 | " | 263 - 211 |
| | 599216 | " | 210 - 158 |
| | 599217 | " | 157 - 106 |
| | 599218 | " | 105 - 053 |
| | 599219 | " | 052 - 047 |
| | 599220 | HB80A-419 | 101 - 149 |
| | 599221 | " | 150 - 203 |
| | 599222 | " | 204 - 257 |
| | 599223 | " | 258 - 311 |
| | 599224 | " | 312 - 365 |
| | 599225 | " | 366 - 420 |
| | 599226 | " | 421 - 475 |
| | 599227 | " | 476 - 477 |
| 15 May 1980 | 599228 | HB80A-421 | 379 - 330 |
| | 599229 | " | 329 - 276 |
| | 599230 | " | 275 - 222 |
| | 599231 | " | 221 - 168 |
| | 599232 | " | 167 - 114 |
| | 599233 | " | 113 - 070 |
| | 599234 | " | 069 - 047 |
| | 599235 | HB80A-434 | 648 - 599 |

| DATE | TAPE NO. | LINE NO. | SHOTPOINTS |
|---|---|---|---|
| 15 May 1980 | 599236 | HB80A-434 | 598 - 544 |
| | 599237 | " | 543 - 489 |
| | 599238 | " | 488 - 434 |
| | 599239 | " | 433 - 379 |
| | 599240 | " | 378 - 324 |
| | 599241 | " | 323 - 269 |
| | 599242 | " | 268 - 214 |
| | 599243 | " | 213 - 159 |
| | 599244 | " | 158 - 104 |
| | 599245 | " | 103 - 059 |
| | 599246 | " | 058 - 046 |
| | 599247 | HB80A-432 | 101 - 150 |
| | 599248 | " | 151 - 204 |
| | 599249 | " | 205 - 258 |
| | 599250 | " | 259 - 312 |
| | 599251 | " | 313 - 366 |
| | 599252 | " | 367 - 421 |
| | 599253 | " | 422 - 475 |
| | 599254 | " | 476 - 530 |
| | 599255 | " | 531 - 584 |
| | 599256 | " | 585 - 621 |
| | 599257 | " | 622 - 640 |
| | 599258 | HB80A-430 | 464 - 415 |
| | 599259 | " | 414 - 360 |
| | 599260 | " | 359 - 305 |
| | 599261 | " | 304 - 250 |
| | 599262 | " | 249 - 195 |
| | 599263 | " | 194 - 140 |
| | 599264 | " | 139 - 090 |
| | 599265 | " | 089 - 063 |

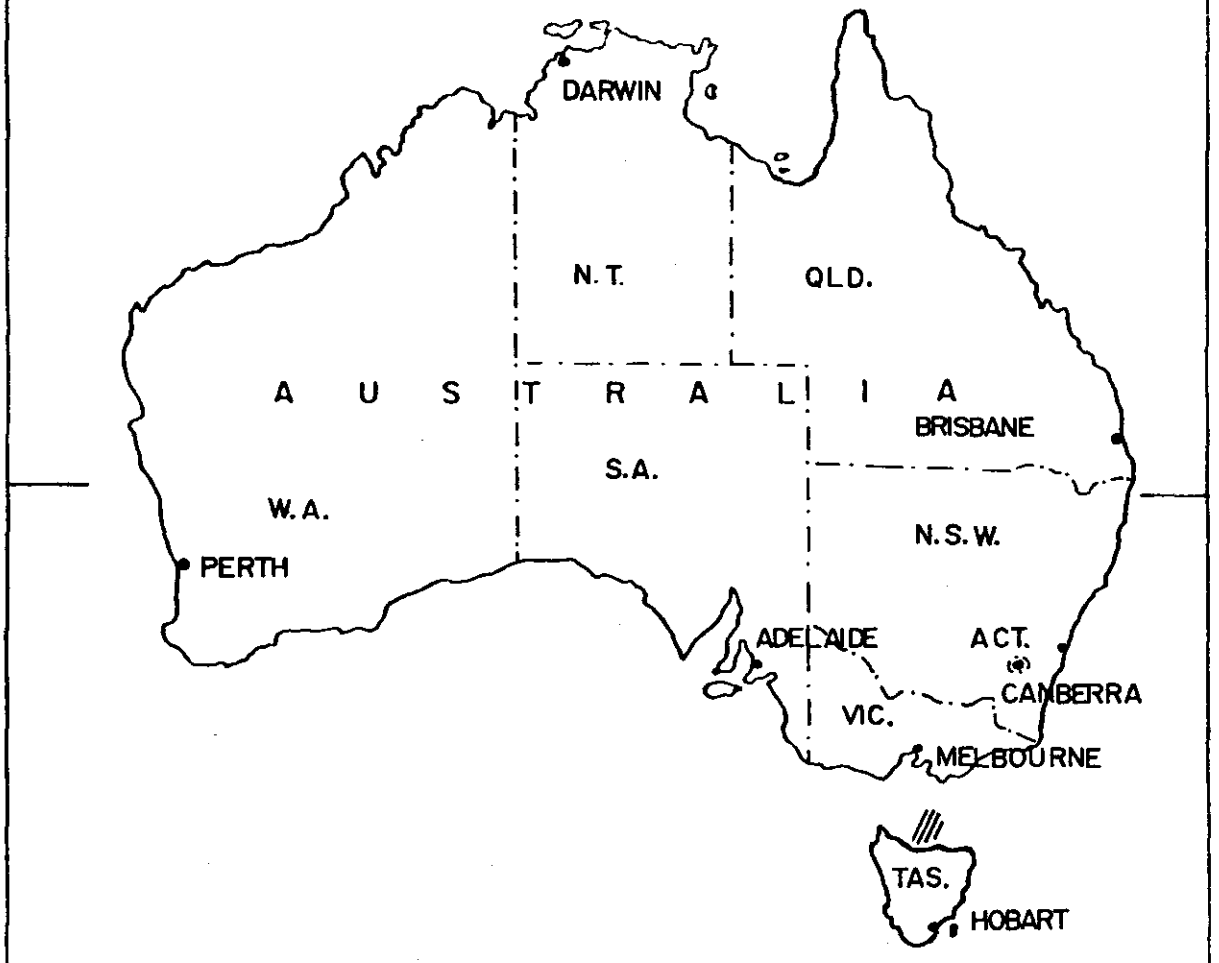
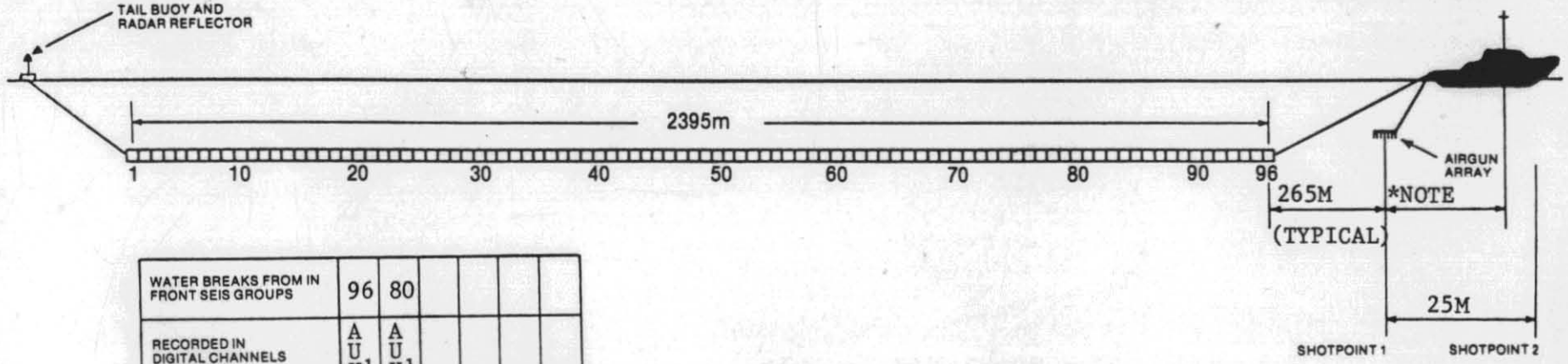



PLATE 1 - LOCATION OF PROSPECT

5 cm

GSI-708




| | | | | | | |
|---|---|---|---|---|---|---|
| WATER BREAKS FROM IN FRONT SEIS GROUPS | 96 | 80 | | | | |
| RECORDED IN DIGITAL CHANNELS | AUX1 | AUX1 | | | | |
| DISPLAYED ON SEISMOGRAPH TRACES | 53 | 53 | | | | |

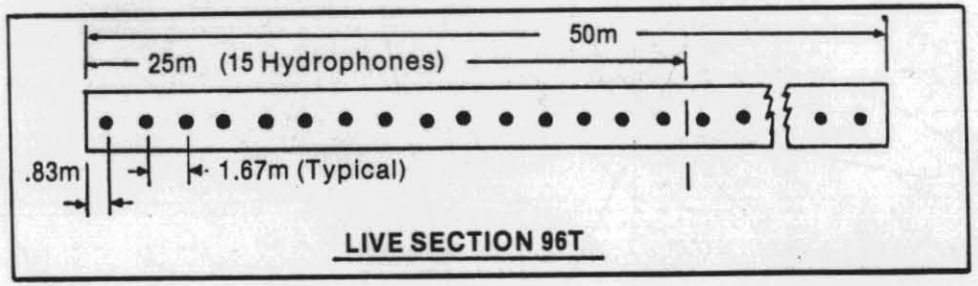
| | | | | | | |
|---|---|---|---|---|---|---|
| DEPTH TRANSDUCER NUMBERS | 1 | 2 | 3 | 4 | 5 | 6 |
| AT/NEAR SEIS GROUP NUMBERS | 2/3 | 20/21 | 40/41 | 60/61 | 80/81 | 96/FE |

| | | | | | | |
|---|---|---|---|---|---|---|
| DEPTH CONTROLLER AT SEIS GROUP NUMBERS | TE 1 | 20 21 | 40 41 | 60 61 | 80 81 | 96 FE |

| | |
|---|---|
| NYLON STRETCH | 7 (FRONT) 5 (TAIL) |
| PIG SECTIONS | NONE |

* NOTE: 58.2 Port
59.13 STBD
Distances to Aft Maxiran Antenna
For Distance to Fwd Maxiran Antenna,
add 14.7 M

6 TRANSDUCER SECTIONS 4M LONG




**LIVE SECTION 96T**

**MARINE CABLE DIAGRAM**
2400 METRES
(OFFEND SPREAD — 96 GROUPS)

G.S.I. PARTY: 2931
SHIP: M/V"EUGENE McDERMOTT II"
CLIENT: BHP-HEMATITE
AREA: BASS STRAIT POOKANAH/BASS WEST
DATE: 9TH TO 15TH MAY 1980

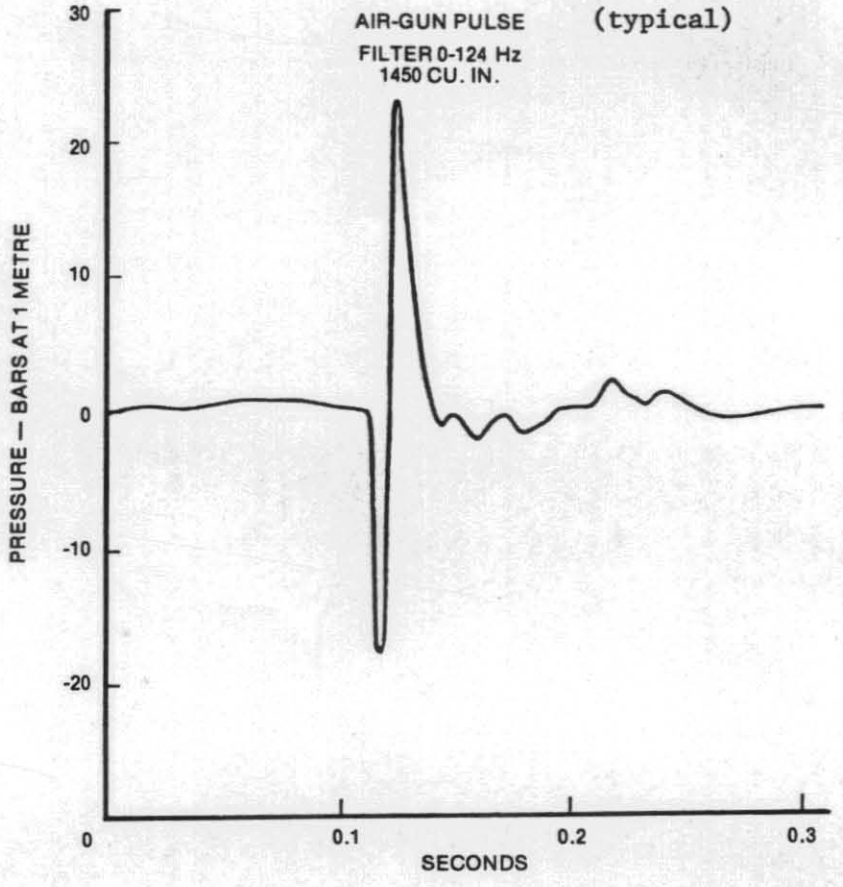
PLATE 2 - LIVE SECTION

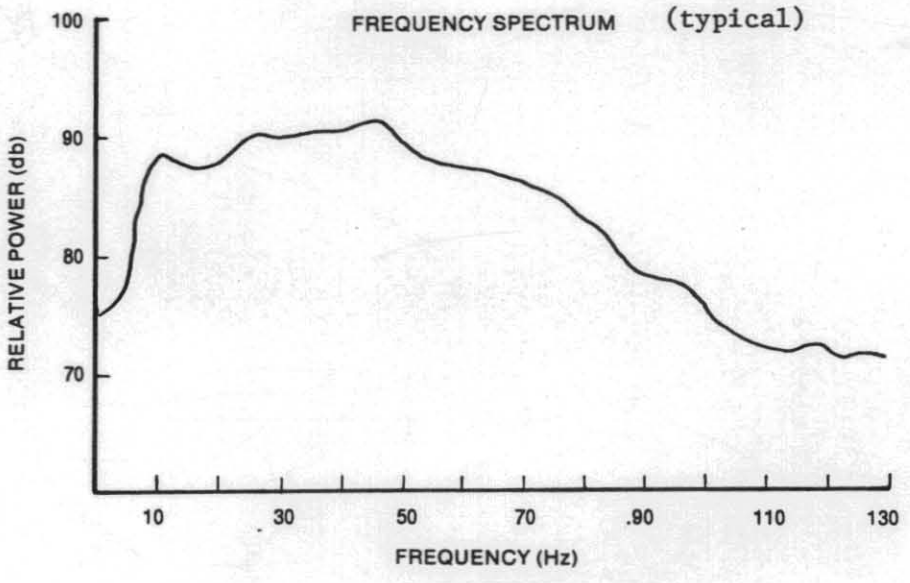
062036

5 cm

062037

# PLATE 3 - AIRGUN PULSE & SPECTRUM



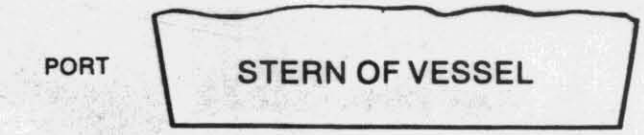

Airgun Pulse Form and Frequency Spectrum

5 cm

GSI-709

062038

PLATE 4 - AIRGUN ARRAY




| SIZE | GUN No. | DISTANCE |
|---|---|---|
| 1.311 litre | 1 | 0.46m |
| 1.639 | 2 | |
| | | 3.35 |
| 1.639 | 3 | |
| 1.639 | 4 | |
| | | 2.59 |
| 1.311 | 5 | |
| 1.311 | 6 | |
| | | 2.44 |
| 0.963 | 7 | |
| | | 2.13 |
| 0.963 | 8 | |
| | | 2.13 |
| 0.655 | 9 | |
| | | 1.83 |
| 0.655 | 10 | |
| | | 1.83 |
| 0.492 | 11 | |
| | | 1.68 |
| 0.328 | 12 | |
| | | 1.52 |
| 0.246 | 13 | |
| 0.164 | 14 | |
| | | 1.22 |
| 0.062 | 15 | |

| SIZE | GUN No. | DISTANCE |
|---|---|---|
| 1.639 | 17 | 0.46m |
| 1.639 | 18 | |
| | | 3.35 |
| 1.311 | 19 | |
| 1.311 | 20 | |
| | | 3.05 |
| 1.639 | 21 | |
| 1.639 | 22 | |
| | | 2.59 |
| 1.311 | 23 | |
| | | 2.44 |
| 1.311 | 24 | |
| | | 2.13 |
| 0.655 | 25 | |
| | | 2.13 |
| 0.655 | 26 | |
| | | 1.83 |
| 0.492 | 27 | |
| | | 1.68 |
| 0.492 | 28 | |
| | | 1.68 |
| 0.328 | 29 | |
| | | 1.52 |
| 0.246 | 30 | |
| | | 1.37 |
| 0.164 | 31 | |
| | | 1.22 |
| 0.062 | 32 | |

10.7m

○SPARE GUN

AIR GUN ARRAY (23.763 litres)

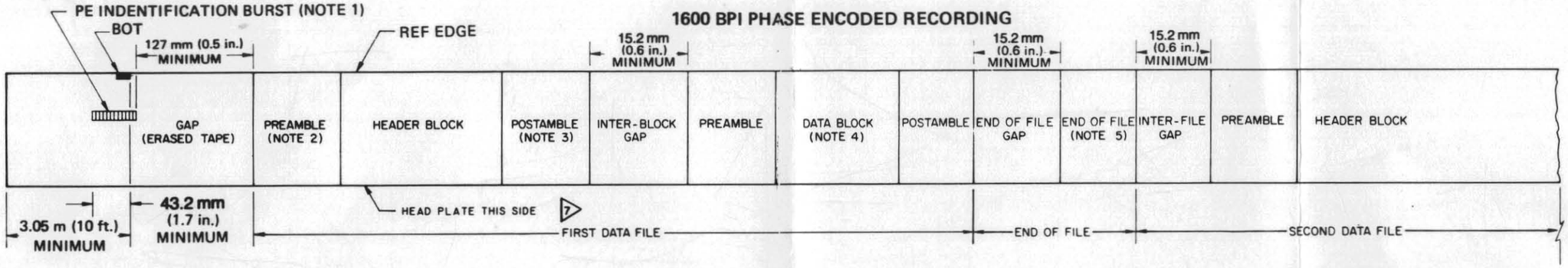
5 cm

GSI-709

PLATE 5a

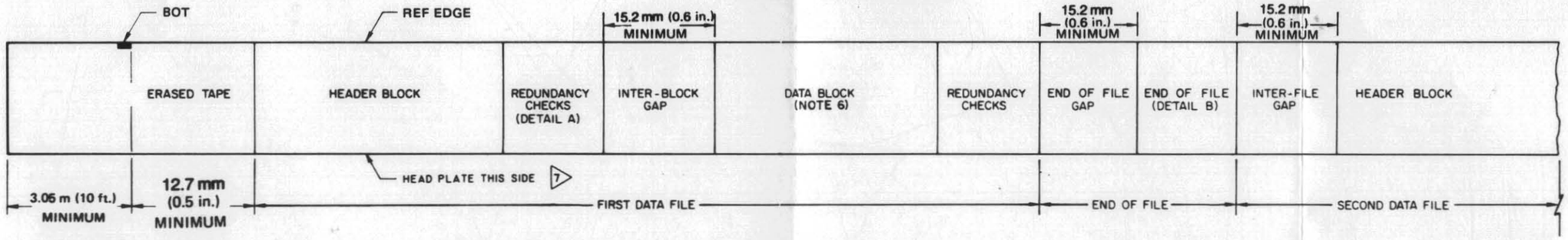
062039

## 1600 BPI PHASE ENCODED RECORDING

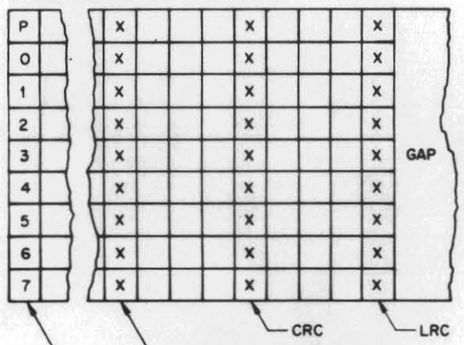



TAPE MOTION (TAPE VIEWED OXIDE DOWN)

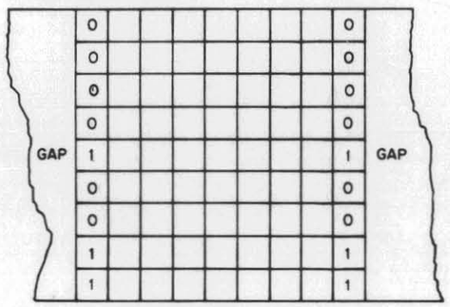
## 800 BPI NRZI RECORDING



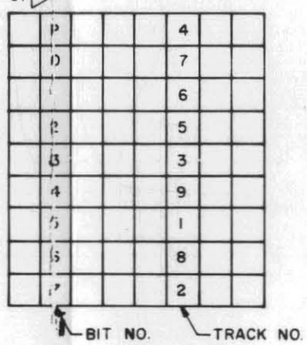

A. NRZI REDUNDANCY CHECKS




B. NRZI END OF FILE




C. 7




### 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-bits in all tracks. (Includes the parity track).

3 - Postamble consists of one character with 1-bits in all tracks followed by forty characters with 0-bits in all tracks. (Includes the parity track.)

4 - Synchronous recording, inter-block gap is extended until timebreak is received. Data is stored in a buffer memory while the preamble is being written. First start of scan is written immediately after the preamble.

5 - PE end of file consists of 80 flux reversals at 3200 FCI in bits P, 0, 2, 5, 6, and 7. Bits 1, 3, and 4 are dc-erased.

6 - Synchronous data recording: inter-block gap is erased until timebreak. First start of scan is then written.

7 Order and location of tracks on tape, direction of magnetization and all other applicable specifications in accordance with IBM file S360-19, form A22-6862-4. The track number for each bit is shown in detail C. Track numbers are the same for 800 BPI NRZI and 1600 BPI PE. Tracks are numbered consecutively with track 1 the maximum distance from the head plate and track 9 adjacent to the head plate. See C below.

5 cm

# PLATE 5B – TAPE FORMAT

062040

## LEGEND

$F_1$-$F_4$ File number - 4 BCD digits

$Y_1$-$Y_4$ Format Code - 4 BCD digits 0200 for SEG–B (with no header extension)

$K_1$-$K_{12}$ General constants entered from panel switches - 12 BCD digits

$B_1$-$B_3$ Bytes per multiplexer scan in data block - 3 BCD digits. Bytes per scan = 2.5 x no. of channels +14

$M_3$-$M_8$ Instrument serial number - 6 BCD digits.

$R_1$,$R_2$ Record length in multiples of 1.024 seconds. 00 if manual stop is selected.

J Amplifier gain control mode -1001 is recorded to designate floating point gain control system.

$LC_1$,$LC_2$ Low-cut filter frequency (Hz) - 2 BCD digits. 00 (out), 03, 05, 08, 12, 18, or 27.
NOTE: 03 is actually 3.56Hz.
05 is actually 5.33Hz.

LS Low-cut filter slope in multiples of 6 dB/octave - 1 BCD digit. Normally 3, (18dB octave) for DFS-V.

$S_1$,$S_2$ Notch (rejection) filter frequency - 2 BCD digits. 00 (out) 50, or 60 (for 60 or 16 2/3).

A Alias filter frequency:
1 - 256Hz 4 - 64Hz
2 - 128Hz 8 - 32Hz

D Channel identification code:

| BIT 0 | 1 | 2 | TYPE CHANNEL |
|---|---|---|---|
| 0 | 0 | 0 | Unused channel |
| 1 | 0 | 0 | Waterbreak channel |
| 0 | 1 | 0 | Timebreak channel |
| 0 | 0 | 1 | Seis channel |
| 0 | 1 | 1 | Uphold channel |
| 1 | 0 | 1 | Time counter |
| 1 | 1 | 1 | Other |

Z Record type:
8 - normal shot 4 } Not used
2 - test record 1 }

$W_N$ Ones recorded for normal field timebreak recording. Zeros record if system operated from internal timebreak.

$T_1$-$T_{14}$ 14 bit binary timing word

$T_{14}$ - 1 millisecond

$T_1$ - 8,192 seconds

$Q_N$ Digitized output of A/D converter

$Q_s$ - sign (note 4)

$Q_1$ - 4096 millivolts

$Q_{14}$ - 0.50 millivolt

$G_N$ Binary gain code for channel N. Least significant bit (6dB) is always 0 for quaternary coded IFP gain.

P Vertical (byte) parity. Bit P is one if bits 0 - 7 of the same byte contains an even number of ones.

CH Number of channels. Bit 6 of the four sync group bytes, indicates number of seismic data channels.

| BYTE | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 24 CH | 0 | 0 | 0 | 0 |
| 36 CH | 0 | 1 | 0 | 0 |
| 48 CH | 0 | 0 | 0 | 1 |
| Other | 1 | 1 | 1 | 1 |

See B, bytes per scan.

No. of data channels =

$$\frac{\text{Bytes per scan}-14}{2.5}$$

**Format conforms to the SEG standard specific values shown, such as filter settings, etc, are those of the DFS–V.**

I Sample interval recorded according to the following table:

| BIT 4 | 5 | 6 | 7 | SAMPLE INTERVAL |
|---|---|---|---|---|
| 0 | 0 | 0 | 1 | 1 millisecond |
| 0 | 0 | 1 | 0 | 2 milliseconds |
| 0 | 1 | 0 | 0 | 4 milliseconds |
| 1 | 0 | 0 | 0 | 8 milliseconds |
| 1 | 0 | 0 | 1 | 0.5 milliseconds |
| 1 | 0 | 1 | 0 | 1 millisecond |
| 1 | 1 | 0 | 0 | 2 milliseconds |

All zeros for other sample intervals

GC Gain constant (fixed gain) recorded as a 4 - bit binary code. The most significant bit has a gain value of $2^3$ (48dB): the least significant bit has a gain value of $2^1$ (6dB). The least significant bit is recorded as a zero for the DFS–V.

GW Gain word recorded as a 4-bit binary code. 0000 is recorded when operating in floating point gain control. When operating in manual gain control, the most significant bit has a gain value of 2 (48dB) and the least significant bit has a gain value of $2^1$ (6dB). The least significant bit is recorded as a zero for the DFS–V.

## NOTES

1 - Auxiliary channel identification code assignments are as follows unless otherwise specified:
AUX 1 will always be the timing counter.

| 28 or 60 Seis channels | Number of seis Channels other than 28 or 60 |
|---|---|
| AUX 2 unused • | AUX 2 uphole |
| AUX 3 unused • | AUX 3 timebreak |
| AUX 4 uphold | AUX 4 unused |
| AUX 5 timebreak | AUX 5 unused |

• These AUX channels are not available for data and will always be recorded as zero in the data record.

2 - Additional externally supplied digital data may be recorded in the header block following byte 36+2n.

3 - Negative values are recorded in 1's complement code (standard) or 2's complement (optional).

PLATE 5c

062041

## HEADER BLOCK

| BIT NUMBER (SCHEMATIC) | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | (F) | (E) | | | 24 + 2n | | | | | | | | 36 + 2n (NOTE 3) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P |
| 0 | | | 8 | $F_1$ | $F_3$ | $Y_1$ | $Y_3$ | $K_1$ | $K_3$ | $K_5$ | $K_7$ | $K_9$ | $K_{11}$ | $B_1$ | $B_3$ | 0 | $M_3$ | $M_5$ | $M_7$ | $R_1$ | J | $LC_1$ | LS | 0 | 0 | $S_1$ | A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | D | 0 | D | 0 | D | 0 |
| 1 | | | 4 | $F_1$ | $F_3$ | $Y_1$ | $Y_3$ | $K_1$ | $K_3$ | $K_5$ | $K_7$ | $K_9$ | $K_{11}$ | $B_1$ | $B_3$ | 0 | $M_3$ | $M_5$ | $M_7$ | $R_1$ | J | $LC_1$ | LS | 0 | 0 | $S_1$ | A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | D | 0 | D | 0 | D | 0 |
| 2 | | | 2 | $F_1$ | $F_3$ | $Y_1$ | $Y_3$ | $K_1$ | $K_3$ | $K_5$ | $K_7$ | $K_9$ | $K_{11}$ | $B_1$ | $B_3$ | 0 | $M_3$ | $M_5$ | $M_7$ | $R_1$ | J | $LC_1$ | LS | 0 | 0 | $S_1$ | A | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | D | 0 | D | 0 | D | 0 |
| 3 | | | 1 | $F_1$ | $F_3$ | $Y_1$ | $Y_3$ | $K_1$ | $K_3$ | $K_5$ | $K_7$ | $K_9$ | $K_{11}$ | $B_1$ | $B_3$ | 1 | $M_3$ | $M_5$ | $M_7$ | $R_1$ | J | $LC_1$ | LS | 0 | 0 | $S_1$ | A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | | | 8 | $F_2$ | $F_4$ | $Y_2$ | $Y_4$ | $K_2$ | $K_4$ | $K_6$ | $K_8$ | $K_{10}$ | $K_{12}$ | $B_2$ | I | 0 | $M_4$ | $M_6$ | $M_8$ | $R_2$ | Z | $LC_2$ | 0 | 0 | 0 | $S_2$ | 0 | GC | GW | GC | GW | GC | GW | GC | GW | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5 | | | 4 | $F_2$ | $F_4$ | $Y_2$ | $Y_4$ | $K_2$ | $K_4$ | $K_6$ | $K_8$ | $K_{10}$ | $K_{12}$ | $B_2$ | I | 1 | $M_4$ | $M_6$ | $M_8$ | $R_2$ | Z | $LC_2$ | 0 | 0 | 0 | $S_2$ | 0 | GC | GW | GC | GW | GC | GW | GC | GW | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6 | | | 2 | $F_2$ | $F_4$ | $Y_2$ | $Y_4$ | $K_2$ | $K_4$ | $K_6$ | $K_8$ | $K_{10}$ | $K_{12}$ | $B_2$ | I | 0 | $M_4$ | $M_6$ | $M_8$ | $R_2$ | Z | $LC_2$ | 0 | 0 | 0 | $S_2$ | 0 | GC | GW | GC | GW | GC | GW | GC | GW | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | | | 1 | $F_2$ | $F_4$ | $Y_2$ | $Y_4$ | $K_2$ | $K_4$ | $K_6$ | $K_8$ | $K_{10}$ | $K_{12}$ | $B_2$ | I | 1 | $M_4$ | $M_6$ | $M_8$ | $R_2$ | Z | $LC_2$ | 0 | 0 | 0 | $S_2$ | 0 | GC | GW | GC | GW | GC | GW | GC | GW | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TYPICAL PACKED BCD VALUE | | | | FILE NUMBER | | FORMAT CODE | | GENERAL CONSTANTS | | | | | | BYTES/SCAN (B) SAMPLE INTERVAL (I) | | TEXAS INSTRUMENTS IDENTIFICATION (15) | INSTRUMENT SERIAL NUMBER | | | RECORD LENGTH (R) GAIN MODE (J) RECORD TYPE (Z) | | | LOW-CUT FILTER | | RESERVED FOR HIGH-CUT FILTER | | NOTCH FILTER (S) ALIAS FILTER (A) | | SEIS CHANNEL 1 FIXED & EARLY GAIN (NOTE 1) | | SEIS CHANNEL 2 GAIN | | SEIS CHANNEL n-1 GAIN | | SEIS CHANNEL n GAIN | | AUXILIARY CHANNEL 1 TIMING COUNTER (NOTE 1) | | AUXILIARY CHANNEL 2 (NOTE 1) | | AUXILIARY CHANNEL 3 (NOTE 1) | | AUXILIARY CHANNEL 4 (NOTE 1) | | AUXILIARY CHANNEL 5 (NOTE 1) | | ZERO DATA 2 BYTES | |

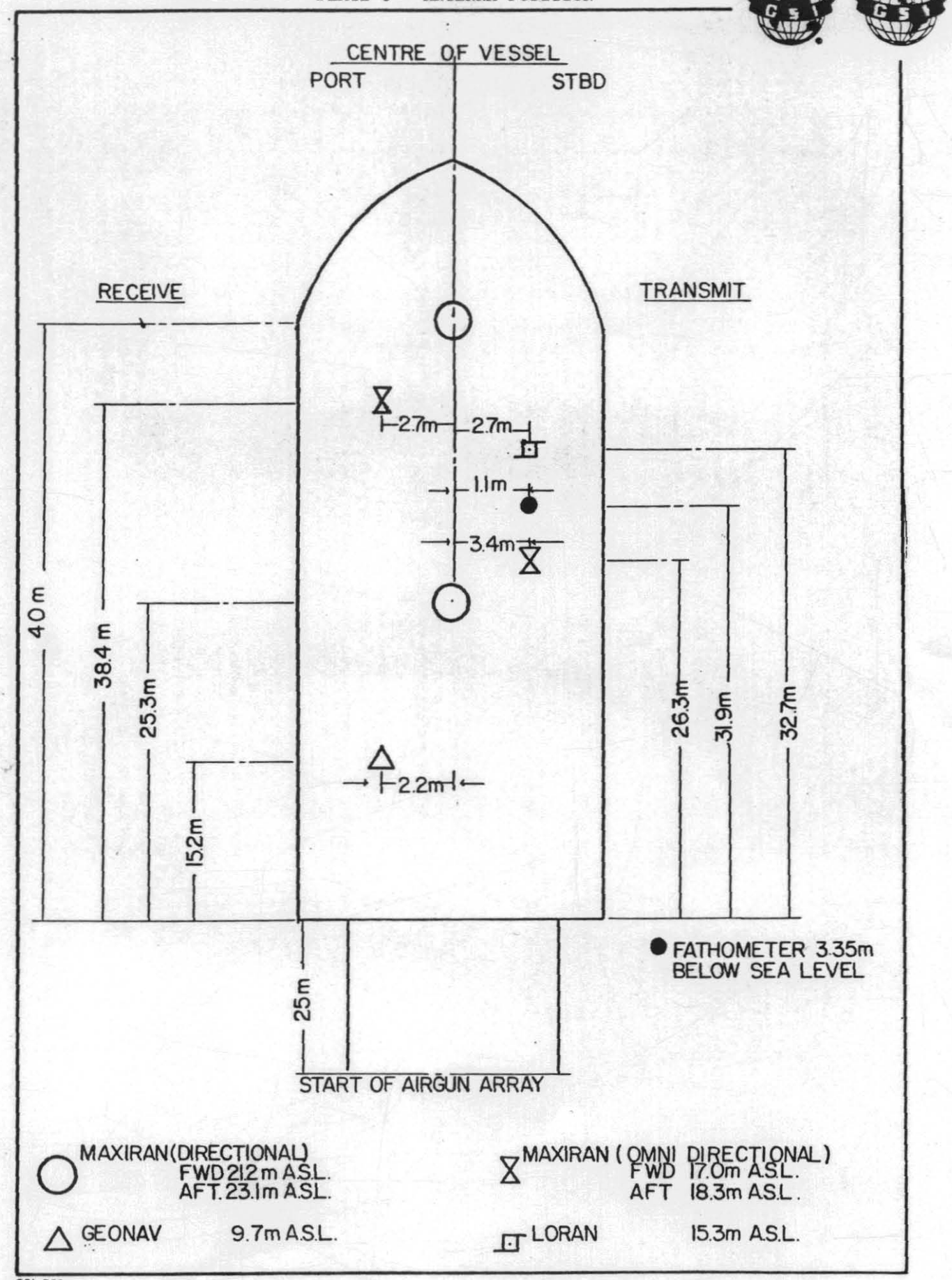
## DATA BLOCK

| BIT NUMBER (SCHEMATIC) | | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P | | P | P | $W_1$ | $W_3$ | $W_5$ | $W_7$ | $T_1$ | $T_8$ | $Q_S$ | $Q_8$ | $Q_S$ | $Q_8$ | $Q_S$ | $Q_8$ | $Q_S$ | $Q_8$ | $G_1$ | $G_3$ | $Q_S$ | $Q_8$ | $Q_S$ | $Q_8$ | $Q_S$ | $Q_8$ | $Q_S$ | $Q_8$ | $G_5$ | $G_7$ | $Q_S$ | $Q_8$ | $Q_S$ | $Q_8$ | $W_1$ | $W_3$ | $W_5$ | $W_7$ | $T_1$ | $T_8$ | $Q_S$ | $Q_8$ | $W_1$ | $W_3$ | $W_5$ | $W_7$ | $Q_S$ | $Q_8$ |
| 0 | | S | $2^6$ | $W_1$ | $W_3$ | $W_5$ | $W_7$ | $T_2$ | $T_9$ | $Q_1$ | $Q_9$ | $Q_1$ | $Q_9$ | $Q_1$ | $Q_9$ | $Q_1$ | $Q_9$ | $G_1$ | $G_3$ | $Q_1$ | $Q_9$ | $Q_1$ | $Q_9$ | $Q_1$ | $Q_9$ | $Q_1$ | $Q_9$ | $G_5$ | $G_7$ | $Q_1$ | $Q_9$ | $Q_1$ | $Q_9$ | $W_1$ | $W_3$ | $W_5$ | $W_7$ | $T_2$ | $T_9$ | $Q_1$ | $Q_9$ | $W_1$ | $W_3$ | $W_5$ | $W_7$ | $Q_1$ | $Q_9$ |
| 1 | | $2^{13}$ | $2^5$ | $W_1$ | $W_3$ | $W_5$ | $W_7$ | $T_3$ | $T_{10}$ | $Q_2$ | $Q_{10}$ | $Q_2$ | $Q_{10}$ | $Q_2$ | $Q_{10}$ | $Q_2$ | $Q_{10}$ | $G_1$ | $G_3$ | $Q_2$ | $Q_{10}$ | $Q_2$ | $Q_{10}$ | $Q_2$ | $Q_{10}$ | $Q_2$ | $Q_{10}$ | $G_5$ | $G_7$ | $Q_2$ | $Q_{10}$ | $Q_2$ | $Q_{10}$ | $W_1$ | $W_3$ | $W_5$ | $W_7$ | $T_3$ | $T_{10}$ | $Q_2$ | $Q_{10}$ | $W_1$ | $W_3$ | $W_5$ | $W_7$ | $Q_2$ | $Q_{10}$ |
| 2 | | $2^{12}$ | $2^4$ | $W_2$ | $W_4$ | $W_6$ | $W_8$ | $T_4$ | $T_{11}$ | $Q_3$ | $Q_{11}$ | $Q_3$ | $Q_{11}$ | $Q_3$ | $Q_{11}$ | $Q_3$ | $Q_{11}$ | $G_1$ | $G_3$ | $Q_3$ | $Q_{11}$ | $Q_3$ | $Q_{11}$ | $Q_3$ | $Q_{11}$ | $Q_3$ | $Q_{11}$ | $G_5$ | $G_7$ | $Q_3$ | $Q_{11}$ | $Q_3$ | $Q_{11}$ | $W_2$ | $W_4$ | $W_6$ | $W_8$ | $T_4$ | $T_{11}$ | $Q_3$ | $Q_{11}$ | $W_2$ | $W_4$ | $W_6$ | $W_8$ | $Q_3$ | $Q_{11}$ |
| 3 | | $2^{11}$ | $2^3$ | $W_2$ | $W_4$ | $W_6$ | $W_8$ | $T_5$ | $T_{12}$ | $Q_4$ | $Q_{12}$ | $Q_4$ | $Q_{12}$ | $Q_4$ | $Q_{12}$ | $Q_4$ | $Q_{12}$ | $G_2$ | $G_4$ | $Q_4$ | $Q_{12}$ | $Q_4$ | $Q_{12}$ | $Q_4$ | $Q_{12}$ | $Q_4$ | $Q_{12}$ | $G_6$ | $G_8$ | $Q_4$ | $Q_{12}$ | $Q_4$ | $Q_{12}$ | $W_2$ | $W_4$ | $W_6$ | $W_8$ | $T_5$ | $T_{12}$ | $Q_4$ | $Q_{12}$ | $W_2$ | $W_4$ | $W_6$ | $W_8$ | $Q_4$ | $Q_{12}$ |
| 4 | | $2^{10}$ | $2^2$ | $W_2$ | $W_4$ | $W_6$ | $W_8$ | $T_6$ | $T_{13}$ | $Q_5$ | $Q_{13}$ | $Q_5$ | $Q_{13}$ | $Q_5$ | $Q_{13}$ | $Q_5$ | $Q_{13}$ | $G_2$ | $G_4$ | $Q_5$ | $Q_{13}$ | $Q_5$ | $Q_{13}$ | $Q_5$ | $Q_{13}$ | $Q_5$ | $Q_{13}$ | $G_6$ | $G_8$ | $Q_5$ | $Q_{13}$ | $Q_5$ | $Q_{13}$ | $W_2$ | $W_4$ | $W_6$ | $W_8$ | $T_6$ | $T_{13}$ | $Q_5$ | $Q_{13}$ | $W_2$ | $W_4$ | $W_6$ | $W_8$ | $Q_5$ | $Q_{13}$ |
| 5 | | $2^9$ | $2^1$ | 0 | 0 | 0 | 0 | $T_7$ | $T_{14}$ | $Q_6$ | $Q_{14}$ | $Q_6$ | $Q_{14}$ | $Q_6$ | $Q_{14}$ | $Q_6$ | $Q_{14}$ | $G_2$ | $G_4$ | $Q_6$ | $Q_{14}$ | $Q_6$ | $Q_{14}$ | $Q_6$ | $Q_{14}$ | $Q_6$ | $Q_{14}$ | $G_6$ | $G_8$ | $Q_6$ | $Q_{14}$ | $Q_6$ | $Q_{14}$ | CH | CH | CH | CH | $T_7$ | $T_{14}$ | $Q_6$ | $Q_{14}$ | CH | CH | CH | CH | $Q_6$ | $Q_{14}$ |
| 6 | | $2^8$ | $2^0$ | 1 | 1 | 1 | 1 | 0 | 0 | $Q_7$ | 0 | $Q_7$ | 0 | $Q_7$ | 0 | $Q_7$ | 0 | $G_2$ | $G_4$ | $Q_7$ | 0 | $Q_7$ | 0 | $Q_7$ | 0 | $Q_7$ | 0 | $G_6$ | $G_8$ | $Q_7$ | 0 | $Q_7$ | 0 | 1 | 1 | 1 | 1 | 0 | 0 | $Q_7$ | 0 | 1 | 1 | 1 | 1 | $Q_7$ | 0 |
| 7 | | $2^7$ | 0 | SYNC GROUP (NOTE 6) | | AUX 1 | | AUX 2 | | AUX 3 | | AUX 4 | | AUX 5 | | GAIN 1-4 | | SEIS 1 | | SEIS 2 | | SEIS 3 | | SEIS 4 | | GAIN 5-8 | | SEIS 5 | | SEIS n | | SYNC GROUP | | AUX 1 | | SEIS n | | SYNC GROUP | | SEIS n | |
| TYPICAL DATA VALUE | | | | FIRST DATA SCAN | | | | | | | | | | | | | | | | | | | | | | | | | | SECOND DATA SCAN | | | | | | LAST DATA SCAN | | | |

5 cm

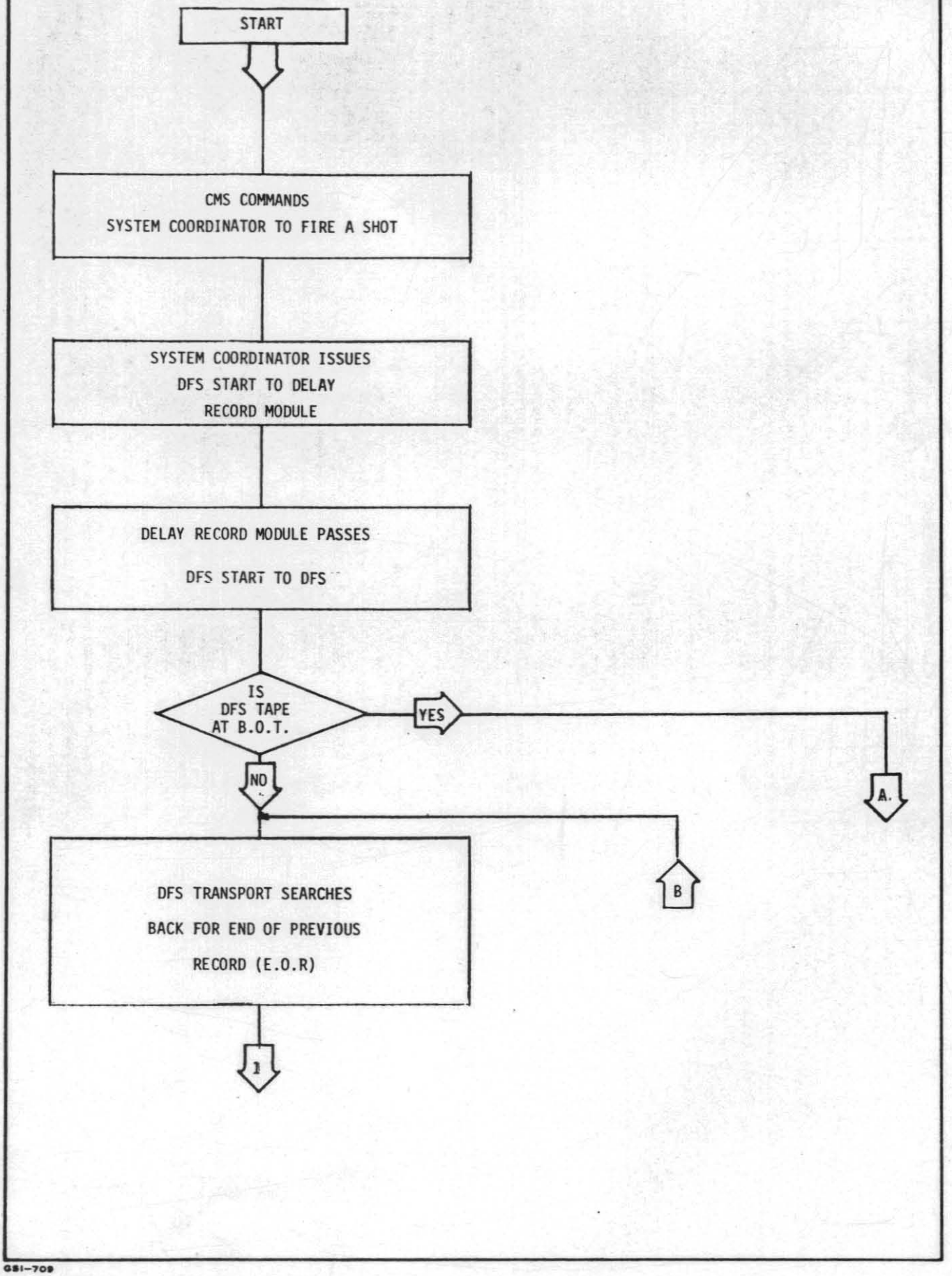
062042

PLATE 6 - ANTENNA POSITION



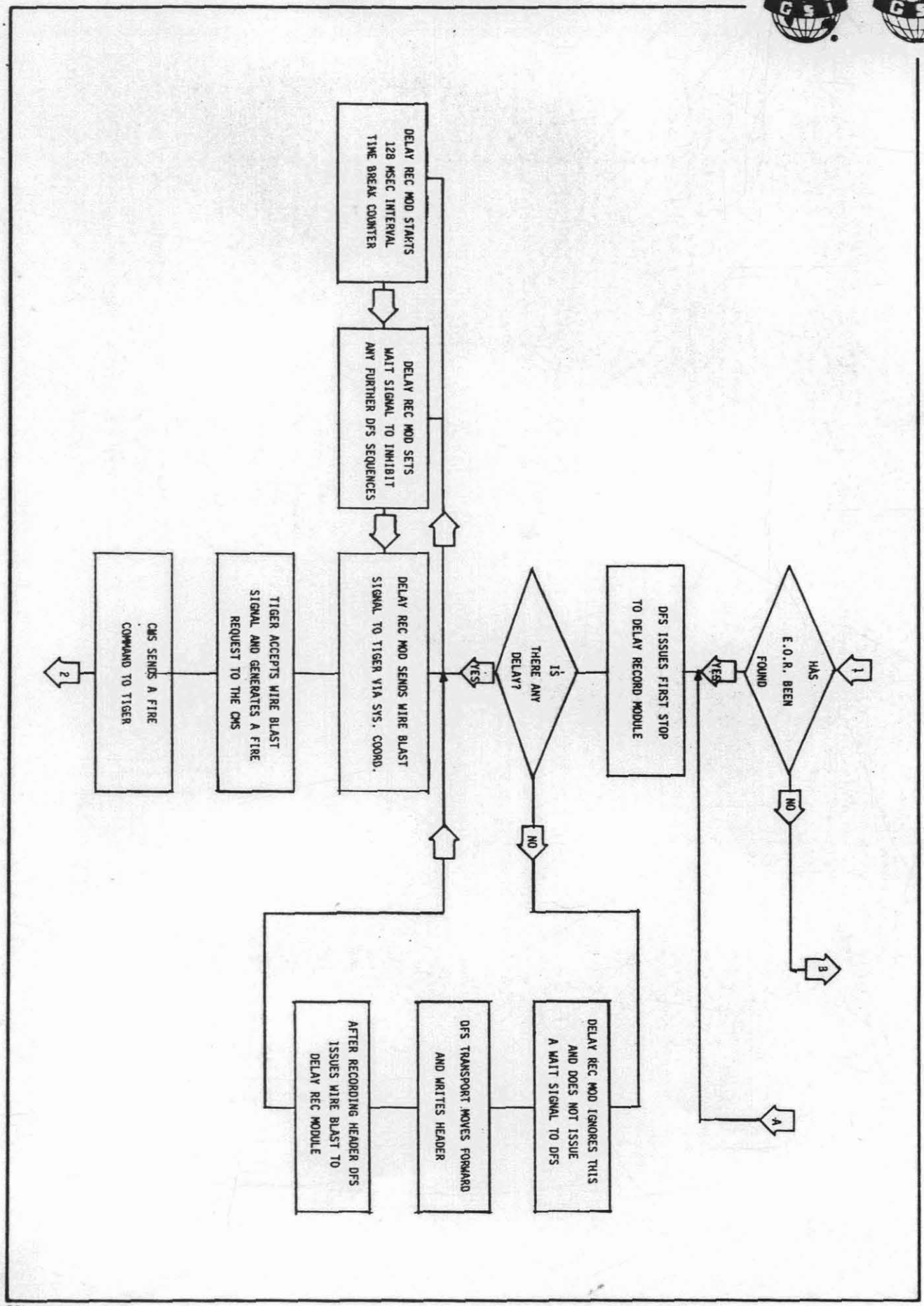

GSI-709

PLATE 7A - SYSTEM SET-UP



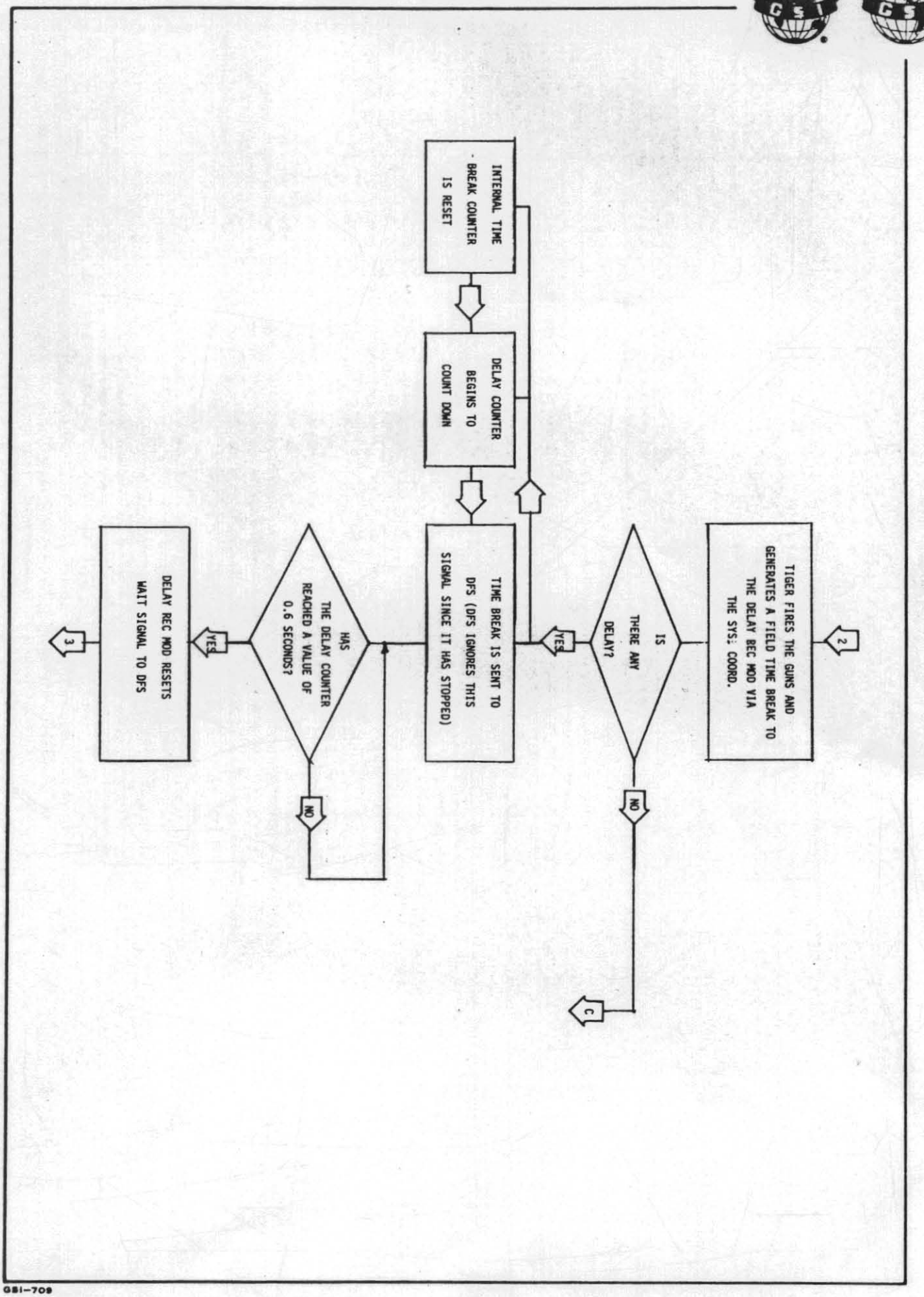

GSI-709

PLATE 7B - SYSTEM SET-UP



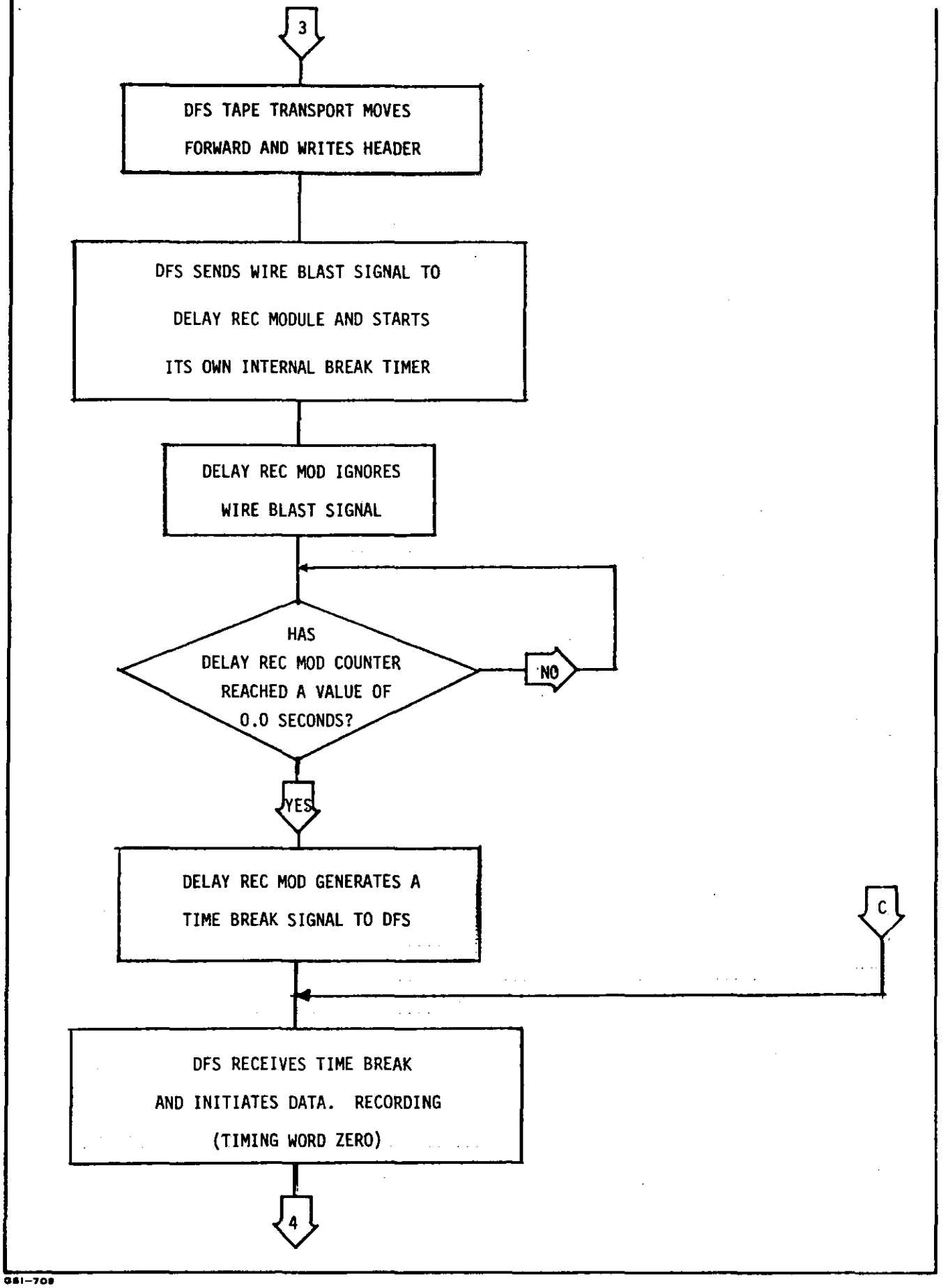

GSI-709

# PLATE 7C - SYSTEM SET-UP



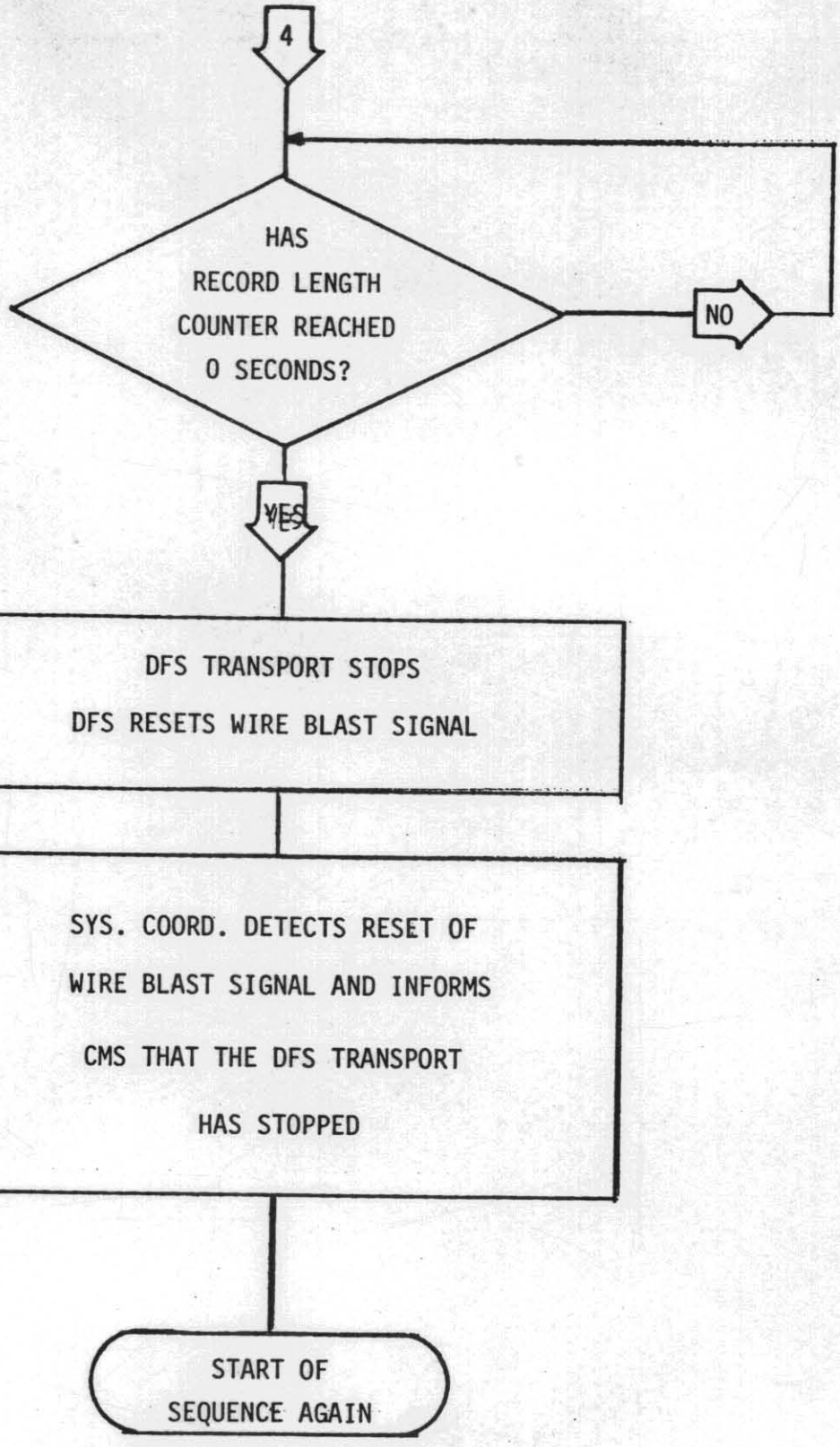

GSI-709

PLATE 7D - SYSTEM SET-UP




GSI-708

PLATE 7E - SYSTEM SET-UP



# FINAL REPORT

# OFFSHORE NAVIGATION, INC.

# PROJECT 1201



GEOPHYSICAL SERVICE INTERNATIONAL

PARTY 2931

FOR

HEMATITE PETROLEUM PTY., LTD.

TASMANIA, AUSTRALIA

BASS STRAIT SURVEY

MAY 1980

# A B S T R A C T

Offshore Navigation, Inc. (ONI) provided a Maxiran Radiopositioning System to a marine seismic operation that was conducted in Bass Strait, off the coast of Tasmania, Australia.

The Maxiran system provided ranges to a C.M.S. Navigation System that was provided and operated by the prime contractor and operator, Geophysical Service International (GSI).

The principal was Hematite Petroleum Pty., Ltd. (HEMATITE.)

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APPENDIX A - Daily Operations Logs

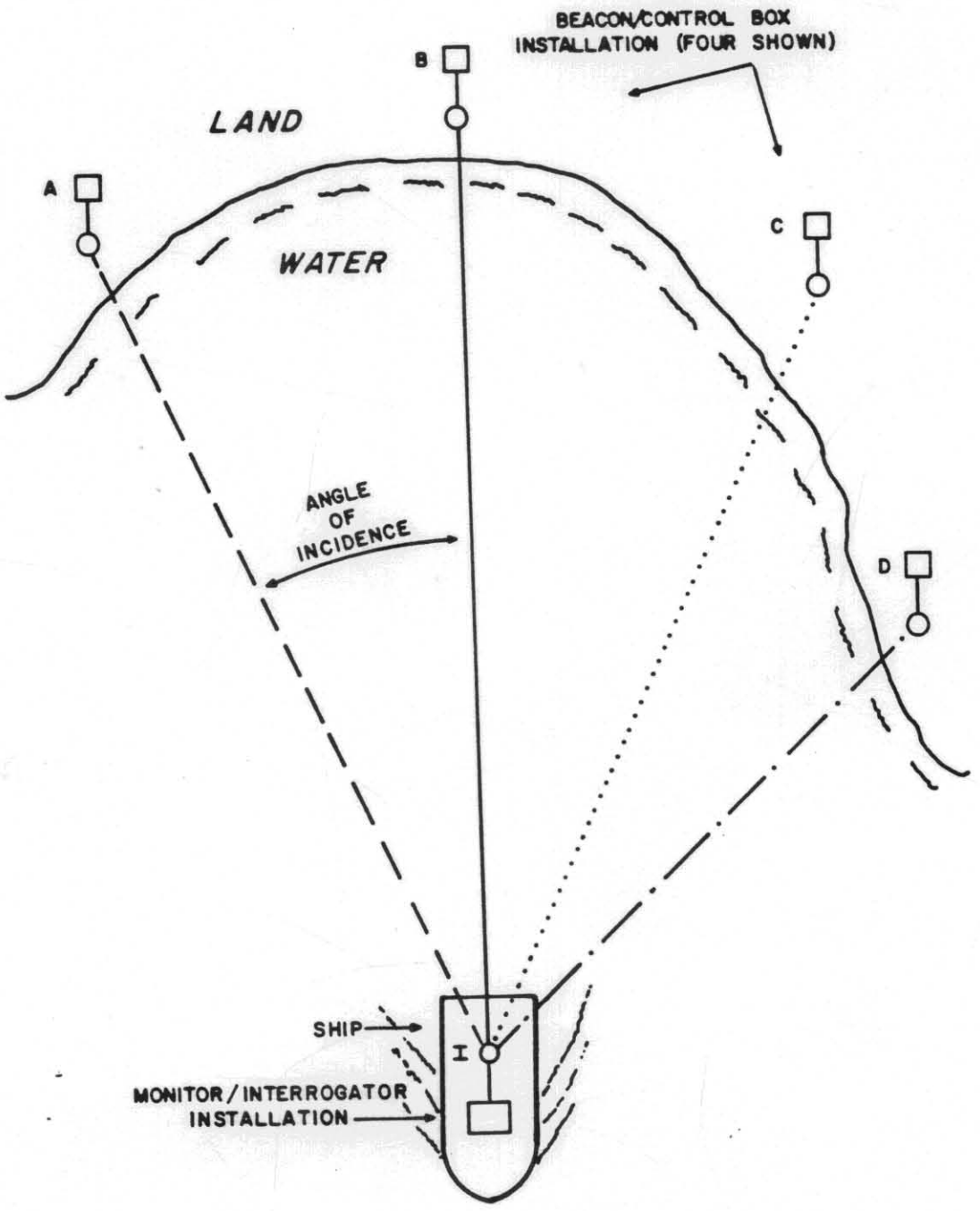
## I. THE MAXIRAN RADIOPOSITIONING SYSTEM

The Maxiran Radiopositioning System is a precision electronic ranging system capable of both manual and automatic tracking of range. It is especially useful for measuring distances across bodies of water.

The use of the Maxiran requires three or more electronic installations. For the purposes of this discussion, one of these installations is assumed to be aboard a ship (see Figure 1). This installation consists of the Maxiran Monitor and Interrogator. The other installations are located on shore. Each of these installations consist of a Maxiran Beacon and a Control Box. There are two or more of the Beacon Control Box installations situated at appropriate locations on shore.

In operation, the Monitor/Interrogator installation transmits a radio signal (containing a Beacon-Select code which addresses a selected Beacon) which is picked up by all of the Beacon/Control Box installations. Each Beacon decodes the received signal and decides whether the Beacon-Select code transmitted corresponds to that Beacon. If the Beacon-Select code is correct for a Beacon, it responds

# FIGURE-1. TYPICAL MAXIRAN SYSTEM



I. THE MAXIRAN RADIOPOSITIONING SYSTEM (continued)

by transmitting a radio signal reply. The Monitor measures the amount of time elapsed between the Interrogator's transmission and the received reply sent by the Beacon. Since, for all practical purposes, radio signals travel at a known speed, the time elapsed between transmission and response is a measure of the distance the radio signal travelled. The elapsed time is converted by the Monitor into distance and then displayed. By knowing the location of the land stations and the current distance from the ship to each of them, the position of the ship can be readily calculated.

For the purposes of this discussion, let us first assume that only two Beacons are being utilized. These are the Beacons marked "A" and "B" in Figure 1. Since the distance from Beacon "A" to the Interrogator (call it distance A1) and the distance from Beacon "B" to the Interrogator (call it distance B1) are now known (these distances are the distances displayed on the Monitor front panel), we can use some geometry to calculate the position of the ship with reference to Beacons "A" and "B".

I. THE MAXIRAN RADIOPOSITIONING SYSTEM (continued)

As illustrated in Figure 2, the distances of A1 and B1 define two intersecting circles, one with a radius of length A1 centered about Beacon "A", the other with radius of length B1 centered about Beacon "B". These two circles intersect at two points (marked I and I' in Figure 2). Obviously, the ship can only be located at one of these points. Since point I' happens to be located on land, we can safely assume that the ship is located at Point I.

There is always some uncertainty associated with the exact measurements of the Beacons. This is illustrated in Figure 3. Figure 3 illustrates an enlarged view of the intersection of the circles shown in Figure 2. If the tolerance of the measurements of Beacon "B" is plus-or-minus 5 meters, then the two solid lines in Figure 3 are 10 meters apart. The tolerance of the measurements of Beacon "A" should be the same as that of Beacon "B", but this is not always the case due to differences in geographical location. Under the above conditions, we only know that the ship is located somewhere in the shaded area of Figure 3.

FIGURE-2. SYSTEM WITH TWO BEACONS

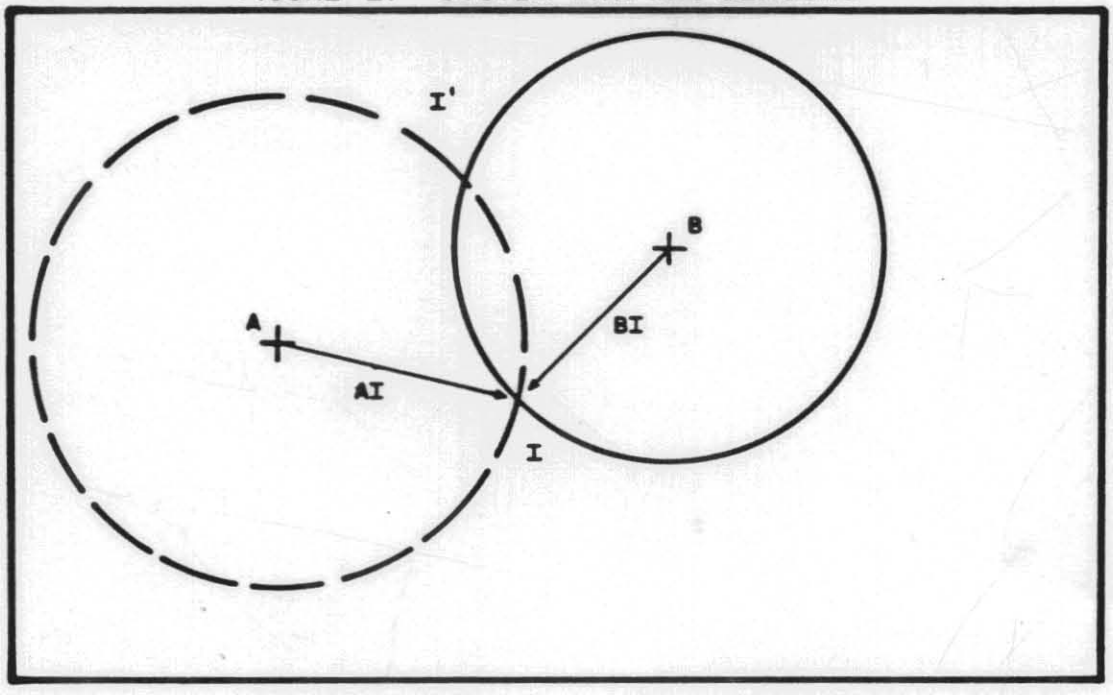
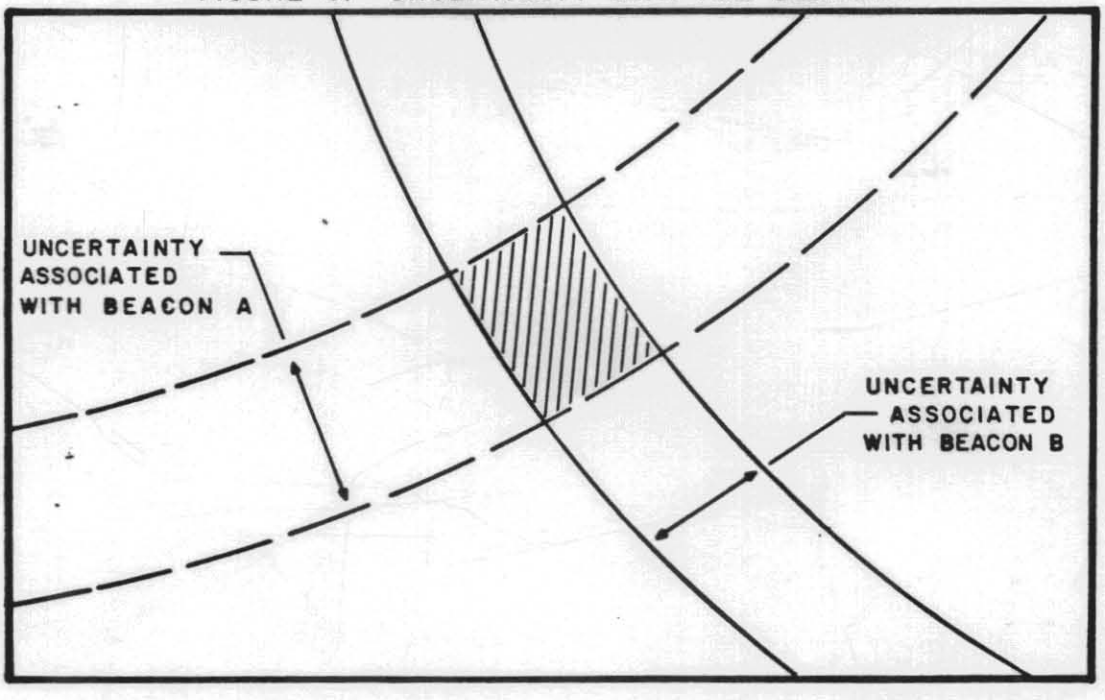



FIGURE-3. UNCERTAINTY WITH TWO BEACONS



I. THE MAXIRAN RADIOPOSITIONING SYSTEM (continued)

For the purposes of the following discussion, it is assumed that there are now three Beacons utilized. Now three circles are defined instead of the two from the discussion above. The third distance, from Beacon "C" to the Interrogator (call it distance C1), defines a circle of radius length CI centered about Beacon "C". The new situation is illustrated in Figure 4. Notice that with the three circles, there is only one location where all three circles can intersect. This eliminates the ambiguity associated with using only two Beacons. Now there is no I' to worry about. An additional advantage of using three Beacons is illustrated in Figure 5. Now the area of uncertainity has been reduced even though the tolerance of Beacon "C"'s measurement is no better than that of the other Beacons.

As the ship moves along, one or more of the Beacons may become unusable for various reasons (out of range, too small or too great an operating angle, etc.), if additional Beacons are situated on shore, they may be interrogated as desired to greatly expand the range and usability of the system.

FIGURE-4. SYSTEM WITH THREE BEACONS

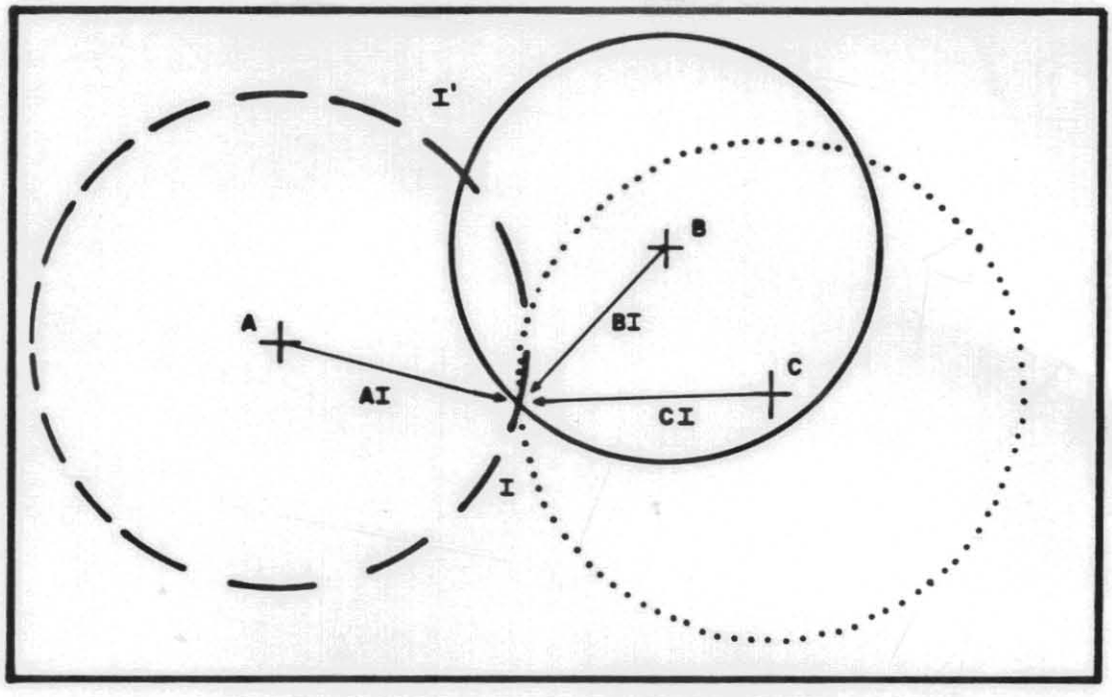
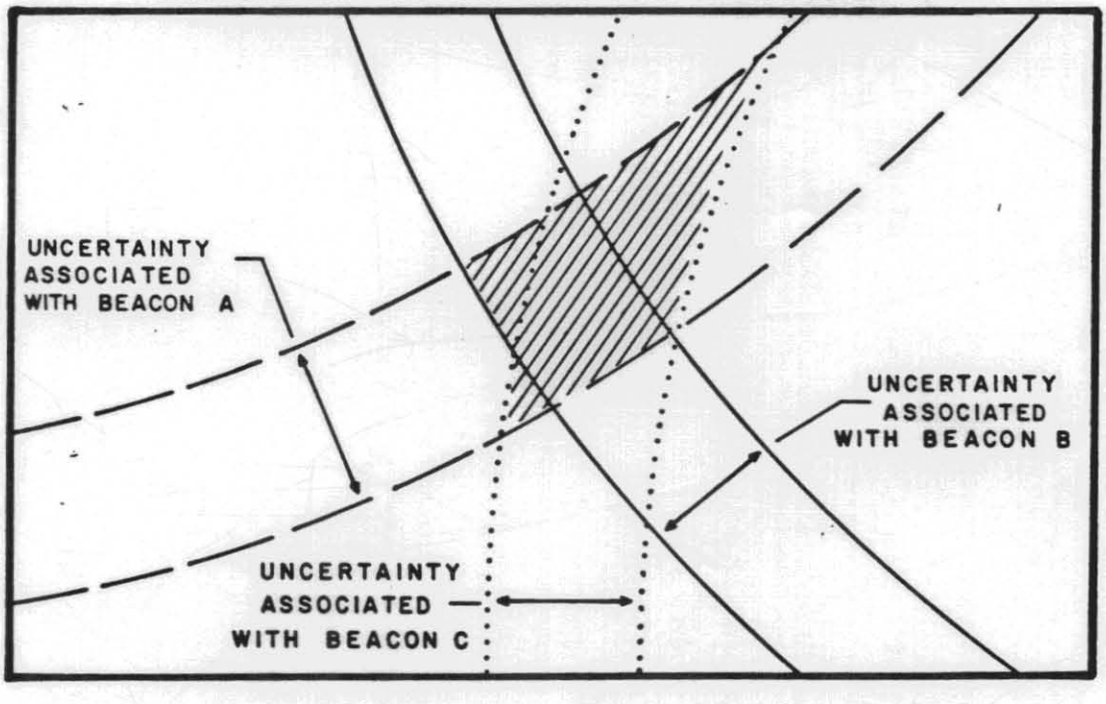



FIGURE-5. UNCERTAINTY WITH THREE BEACONS



I. THE MAXIRAN RADIOPOSITIONING SYSTEM (continued)

As many as three different Beacons may be selected at one time by the proper setting of the Monitor's Beacon Select switches.

## II. AREA OF OPERATIONS

Operations, conducted during the period covered by this report, were located off the coast of Tasmania, Australia in Bass Strait. The work area extended up to approximately 150 kilometers offshore.

The ONI base of operation for this survey was established at Lakes Entrance, Victoria on 1 May 1980.

## III. FIELD OPERATIONS RECAP

ONI personnel and the Maxiran system were in the operational area prior to the commencement of this survey for another operation that was conducted under GSI control. The Maxiran mobile indicating equipment and ONI mobile operators were on board the recording vessel, M/V EUGENE McDERMOTT II, for this other operation. Maxiran base station equipment had been previously installed at Station Cape Portland (ST 770), but this equipment, along with Maxiran base station equipment at stations located in Victoria, was transported to Station Stony Head (ST 868) for a check of the Maxiran calibration.

III. FIELD OPERATIONS RECAP (continued)

The M/V EUGENE McDERMOTT II arrived at Devonport, Tasmania at 0835 hours 9 May 1980. The Maxiran mobile equipment was removed from the vessel and transported to Station Doctors Rocks (92/4). The Maxiran system was checked over the Stations Doctors Rocks (92/4)/Stony Head (ST 868) baseline between 1600 and 1700 hours 9 May. See "Maxiran Calibration" of this report for details. On completion of the calibration check, one Maxiran base station installation remained at Station Stony Head (ST 868). The other two installations were transported to Stations Cape Portland (ST 770) and Doctors Rocks (92/4). All three Maxiran base stations were erected and operational on 9 May 1980. The Maxiran mobile indicating equipment was returned to Devonport and re-installed on board the M/V EUGENE McDERMOTT II.

The M/V EUGENE McDERMOTT II departed Devonport at 2110 hours 9 May 1980 and proceeded to the operational area. Geophysical operations in the HEMATITE Prospect Area began at 0621 hours 10 May and were completed at 0907 hours 15 May 1980. See Appendix A of this report for details.

III. FIELD OPERATIONS RECAP (continued)

Maxiran baseline measurements were recorded between stations in Tasmania and stations in Victoria during this operation. See Appendix A for ranges observed.

The Maxiran base station equipment and operators remained at their respective sites on completion of this survey for another operation to be conducted under GSI control.

The Maxiran mobile equipment and operators remained on board the M/V EUGENE McDERMOTT II at the request of GSI.

## IV. GENERAL INFORMATION

A. Maxiran frequencies used were:

| | |
|---|---|
| Mobile Transmitter | 441 MHz |
| Base Transmitter | 429 MHz |

B. Satisfactory radiotelephone communications between all Maxiran installations were maintained on the frequencies of 7840 and 4637.5 (SSB) kilocycles.

C. The Maxiran field data was turned over to a GSI representative on board the recording vessel on completion of the survey.

D. Three Maxiran base station installations were provided by ONI for this survey.

E. Three Maxiran base station sites were occupied during this operation. They were:

STATION CAPE PORTLAND (ST 770)
STATION DOCTORS ROCKS (92/4)
STATION STONY HEAD (ST 868)

F. Maximum Maxiran range observed during the survey was 200 kilometers.

IV. GENERAL INFORMATION (continued)

G. The Maxiran mobile indicating unit was checked daily during the operation for proper zero set. The equipment was zero checked at a setting of 000.000 kilometers and fixed tested with calibration cable.

H. ONI provided the following peripheral equipment for this survey:

Dual Antenna System

Serial Printer

## V. MAPPING

Maxiran preplots of the survey were provided to the field operations by GSI. The interval between shot-point locations was constant at 25 meters.

No final mapping was accomplished by ONI on this survey. All Maxiran field data was turned over to the GSI representative on board the recording vessel on completion of the survey.

## VI. MAXIRAN CALIBRATION

The Maxiran system was checked for proper calibration on 9 May 1980. For this calibration check, the Maxiran mobile equipment was installed at Station Doctors Rocks (92/4). The Maxiran base station equipment was installed at Stations Stony Head (ST 868) and Cape Portland (ST 770). The Maxiran system was checked over a computed Stations Doctors Rocks (92/4)/Stony Head (ST 868) baseline of 104.116 kilometers, and a computed Stations Doctors Rocks (92/4)/Cape Portland (ST 770) baseline of 186.626 kilometers.

The following pages are the Maxiran Calibration Report obtained from the field.

062066

# OFFSHORE NAVIGATION, INC.



## MAXIRAN CALIBRATION REPORT

DATE:

| MOBILE STATION | | | BASE STATION | | |
|---|---|---|---|---|---|
| LOCATION: DOCTORS ROCKS | | | LOCATION: CAPE PORTLAND | | |
| OPERATOR: A.HOGGART & H.R.BRIDGES | | | OPERATOR: D.TAYLOR & P.COE | | |
| UNIT | MODEL | SERIAL No. | UNIT | MODEL | SERIAL No. |
| MONITOR | NMM.01 | 004 | BEACON | N.T.L.01 | 047 CODE 2 |
| INTERROGATOR | NTM.01 | 038 | CONTROL BOX | NCL.01 | 051 |
| AMPLIFIER | | | AMPLIFIER | | |
| AMPLIFIER P/S | | | AMPLIFIER P/S | | |
| PREAMP | | | PREAMP | | |
| COAX | TYPE: LOW POWER | LENGTH | COAX | TYPE: LOW POWER | LENGTH |
| ANTENNA | TYPE: LOG PERIODIC | HEIGHT: 40 Ft | ANTENNA | TYPE: LOG PERIODIC | HEIGHT: 45 Ft |
| INPUT VOLTAGE | 115 | | INPUT VOLTAGE | 115 | |
| TX. FREQUENCY | 441 | | TX. FREQUENCY | 429 | |
| RX. FREQUENCY | 429 | | RX. FREQUENCY | 441 | |
| RX. GAIN SETTING | MINIMUM | | RX. GAIN SETTING | MINIMUM | |
| WEATHER CONDITIONS | OVERCAST & RAINING | | WEATHER CONDITIONS | OVERCAST & RAINING | |

NOTE: MOBILE & BASE AT TOP OF TOWER LOW POWER

OBSERVED RANGE IN CALIBRATE: 191.458 KM

COMPUTED SLANT RANGE: 186.626 Km KM

∴ MOBILE ZERO SETTING IS: 4832 KM

OBSERVED RANGE IN OPERATE: 186.626 KM TIME: 1530

SIGNED: H.R.BRIDGES

NOTES REGARDING CALIBRATION PROCEDURES:

1. All equipment will be allowed to warm up for at least 30 minutes prior to calibrating.
2. All readings entered hereon will be final readings for the item in question, not preliminary or intermediate readings.
3. Each report will be complete in itself. Do not refer to other reports for information.
4. Use the reverse side of this report for any additional comments deemed necessary or advisable for completeness and clarity.

062067

# OFFSHORE NAVIGATION, INC.



## MAXIRAN CALIBRATION REPORT

DATE:

| MOBILE STATION | | | BASE STATION | | |
|---|---|---|---|---|---|
| LOCATION: DOCTORS ROCKS | | | LOCATION: CAPE PORTLAND | | |
| OPERATOR: A.HOGGART & H.R.BRIDGES | | | OPERATOR: D.TAYLOR & P.COE | | |
| UNIT | MODEL | SERIAL No. | UNIT | MODEL | SERIAL No. |
| MONITOR | MTM.01 | 004 | BEACON | N.T.L.01 | 059 CODE 2 |
| INTERROGATOR | MTM.01 | 038 | CONTROL BOX | MCL.01 | 051 |
| AMPLIFIER | | | AMPLIFIER | | |
| AMPLIFIER P/S | | | AMPLIFIER P/S | | |
| PREAMP | | | PREAMP | | |
| COAX | TYPE: LOW POWER | LENGTH | COAX | TYPE: LOW POWER | LENGTH |
| ANTENNA | TYPE: LOG PERIODIC | HEIGHT: 40 Ft | ANTENNA | TYPE: LOG PERIODIC | HEIGHT: 45 Ft |
| INPUT VOLTAGE | 115 | | INPUT VOLTAGE | 115 | |
| TX. FREQUENCY | 441 | | TX. FREQUENCY | 429 | |
| RX. FREQUENCY | 429 | | RX. FREQUENCY | 441 | |
| RX. GAIN SETTING | MINIMUM | | RX. GAIN SETTING | MINIMUM | |
| WEATHER CONDITIONS | OVERCAST & RAINING | | WEATHER CONDITIONS | OVERCAST & RAINING | |

NOTE: MOBILE & BASE AT TOP OF TOWER LOW POWER

OBSERVED RANGE IN CALIBRATE: 191.458 KM

COMPUTED SLANT RANGE: 186.626 Km KM

∴ MOBILE ZERO SETTING IS: 4832 KM

OBSERVED RANGE IN OPERATE: 186.626 KM TIME: 1530

SIGNED: H.R.BRIDGES

NOTES REGARDING CALIBRATION PROCEDURES:

1. All equipment will be allowed to warm up for at least 30 minutes prior to calibrating.
2. All readings entered hereon will be final readings for the item in question, not preliminary or intermediate readings.
3. Each report will be complete in itself. Do not refer to other reports for information.
4. Use the reverse side of this report for any additional comments deemed necessary or advisable for completeness and clarity.

062068

# OFFSHORE NAVIGATION, INC.



## MAXIRAN CALIBRATION REPORT

DATE: 9 MAY 1980

| MOBILE STATION | | | BASE STATION | | |
|---|---|---|---|---|---|
| LOCATION: DOCTOR,S ROCKS | | | LOCATION: STONY HEAD | | |
| OPERATOR: A.HOGGART & H.R.BRIDGES | | | OPERATOR: D.TAYLOR & P.COE | | |
| UNIT | MODEL | SERIAL No. | UNIT | MODEL | SERIAL No. |
| MONITOR | NTM.01 | 004 | BEACON | NTL.01 | 021 CODE 5 |
| INTERROGATOR | NTM.01 | 038 | CONTROL BOX | NCL.01 | 051 |
| AMPLIFIER | | | AMPLIFIER | | |
| AMPLIFIER P/S | | | AMPLIFIER P/S | | |
| PREAMP | | | PREAMP | | |
| COAX | TYPE: LOW POWER | LENGTH | COAX | TYPE: LOW POWER | LENGTH |
| ANTENNA | TYPE: LOG PERIODIC | HEIGHT: 40 Ft | ANTENNA | TYPE: LOG PERIODIC | HEIGHT: 45 Ft |
| INPUT VOLTAGE | 115 | | INPUT VOLTAGE | 115 | |
| TX. FREQUENCY | 441 | | TX. FREQUENCY | 429 | |
| RX. FREQUENCY | 429 | | RX. FREQUENCY | 441 | |
| RX. GAIN SETTING | MINIMUM | | RX. GAIN SETTING | MINIMUM | |
| WEATHER CONDITIONS | OVERCAST & RAINING | | WEATHER CONDITIONS | OVERCAST & RAINING | |

NOTE: MOBILE & BASE AT TOP OF TOWER LOW POWER

OBSERVED RANGE IN CALIBRATE: ~~XXXXXXXX~~ 108.948 KM

COMPUTED SLANT RANGE: ~~XXXXXXXX~~ 104.116 KM

∴ MOBILE ZERO SETTING IS: 4832 KM

OBSERVED RANGE IN OPERATE: 104.116 KM TIME: 1600 ~~1700~~

SIGNED: H.R.BRIDGES

NOTES REGARDING CALIBRATION PROCEDURES:

1. All equipment will be allowed to warm up for at least 30 minutes prior to calibrating.
2. All readings entered hereon will be final readings for the item in question, not preliminary or intermediate readings.
3. Each report will be complete in itself. Do not refer to other reports for information.
4. Use the reverse side of this report for any additional comments deemed necessary or advisable for completeness and clarity.

062069

# OFFSHORE NAVIGATION, INC.



## MAXIRAN CALIBRATION REPORT

DATE: 9 MAY 1980

| MOBILE STATION | | | BASE STATION | | |
|---|---|---|---|---|---|
| LOCATION: [illegible] | | | LOCATION: STONY ISLAND | | |
| OPERATOR: [illegible] | | | OPERATOR: D. TAYLOR & P. [illegible] | | |
| UNIT | MODEL | SERIAL No. | UNIT | MODEL | SERIAL No. |
| MONITOR | MTM.01 | 006 | BEACON | NTL.01 | 022 CODE 3 |
| INTERROGATOR | NTM.01 | 024 | CONTROL BOX | NTL.01 | 051 |
| AMPLIFIER | | | AMPLIFIER | | |
| AMPLIFIER P/S | | | AMPLIFIER P/S | | |
| PREAMP | | | PREAMP | | |
| COAX | TYPE: LOW POWER | LENGTH: | COAX | TYPE: LOW POWER | LENGTH: |
| ANTENNA | TYPE: LOG PERIODIC | HEIGHT: 40 Ft | ANTENNA | TYPE: LOG PERIODIC | HEIGHT: 45 Ft |
| INPUT VOLTAGE | 115 | | INPUT VOLTAGE | 115 | |
| TX. FREQUENCY | 641 | | TX. FREQUENCY | 429 | |
| RX. FREQUENCY | 429 | | RX. FREQUENCY | 641 | |
| RX. GAIN SETTING | MEDIUM | | RX. GAIN SETTING | MEDIUM | |
| WEATHER CONDITIONS | OVERCAST & RAINING | | WEATHER CONDITIONS | OVERCAST & RAINING | |

NOTE: MOBILE & BASE AT TOP OF TOWER LOW POWER

OBSERVED RANGE IN CALIBRATE: [illegible] 108.948 KM

COMPUTED SLANT RANGE: [illegible] 104.116 KM

∴ MOBILE ZERO SETTING IS: 4.832 KM

OBSERVED RANGE IN OPERATE: 104.116 KM TIME: 1600—1700

SIGNED: [illegible]

### NOTES REGARDING CALIBRATION PROCEDURES:

1. All equipment will be allowed to warm up for at least 30 minutes prior to calibrating.
2. All readings entered hereon will be final readings for the item in question, not preliminary or intermediate readings.
3. Each report will be complete in itself. Do not refer to other reports for information.
4. Use the reverse side of this report for any additional comments deemed necessary or advisable for completeness and clarity.

062070

# OFFSHORE NAVIGATION, INC.



## MAXIRAN CALIBRATION REPORT

DATE: 9 MAY 1980

| MOBILE STATION | | | BASE STATION | | |
|---|---|---|---|---|---|
| LOCATION: DOCTOR,S ROCKS | | | LOCATION: STONY HEAD | | |
| OPERATOR: A.HOGGART & H.R.BRIDGES | | | OPERATOR: D.TAYLOR & P.COE | | |
| UNIT | MODEL | SERIAL No. | UNIT | MODEL | SERIAL No. |
| MONITOR | MTM.01 | 004 | BEACON | NTL.01 | 022 CODE 3 |
| INTERROGATOR | NTM.01 | 038 | CONTROL BOX | NCL.01 | 051 |
| AMPLIFIER | | | AMPLIFIER | | |
| AMPLIFIER P/S | | | AMPLIFIER P/S | | |
| PREAMP | | | PREAMP | | |
| COAX | TYPE | LENGTH | COAX | TYPE | LENGTH |
| | LOW POWER | | | LOW POWER | |
| ANTENNA | TYPE | HEIGHT | ANTENNA | TYPE | HEIGHT |
| | LOG PERIODIC | 40 Ft | | LOG PERIODIC | 45 Ft |
| INPUT VOLTAGE | 115 | | INPUT VOLTAGE | 115 | |
| TX. FREQUENCY | 441 | | TX. FREQUENCY | 429 | |
| RX. FREQUENCY | 429 | | RX. FREQUENCY | 441 | |
| RX. GAIN SETTING | MINIMUM | | RX. GAIN SETTING | MINIMUM | |
| WEATHER CONDITIONS | OVERCAST & RAINING | | WEATHER CONDITIONS | OVERCAST & RAINING | |
| | | | | | |
| | | | | | |

NOTE: MOBILE & BASE AT TOP OF TOWER LOW POWER

OBSERVED RANGE IN CALIBRATE: ~~XXXXXXXXX~~ 108.948 KM

COMPUTED SLANT RANGE: ~~XXXXXXXXX~~ 104.116 KM

∴ MOBILE ZERO SETTING IS: 4832 KM

OBSERVED RANGE IN OPERATE: 104.116 KM TIME: 1600---1700

SIGNED: H.R.BRIDGES

### NOTES REGARDING CALIBRATION PROCEDURES:

1. All equipment will be allowed to warm up for at least 30 minutes prior to calibrating.
2. All readings entered hereon will be final readings for the item in question, not preliminary or intermediate readings.
3. Each report will be complete in itself. Do not refer to other reports for information.
4. Use the reverse side of this report for any additional comments deemed necessary or advisable for completeness and clarity.

062071

# OFFSHORE NAVIGATION, INC.



## MAXIRAN CALIBRATION REPORT

DATE: 9 MAY 1980

| MOBILE STATION | | | BASE STATION | | |
|---|---|---|---|---|---|
| LOCATION: DOCTOR'S ROCKS | | | LOCATION: STONY HEAD | | |
| OPERATOR: [illegible] | | | OPERATOR: D.TAYLOR & P.COX | | |
| UNIT | MODEL | SERIAL No. | UNIT | MODEL | SERIAL No. |
| MONITOR | MTM.01 | 004 | BEACON | NTL.01 | 045 CODE 3 |
| INTERROGATOR | NTM.01 | 038 | CONTROL BOX | NCL.01 | 051 |
| AMPLIFIER | | | AMPLIFIER | | |
| AMPLIFIER P/S | | | AMPLIFIER P/S | | |
| PREAMP | | | PREAMP | | |
| COAX: TYPE | LENGTH | | COAX: TYPE | LENGTH | |
| LOW POWER | | | LOW POWER | | |
| ANTENNA: TYPE | HEIGHT | | ANTENNA: TYPE | HEIGHT | |
| LOG PERIODIC | 40 Ft | | LOG PERIODIC | 45 Ft | |
| INPUT VOLTAGE | 115 | | INPUT VOLTAGE | 115 | |
| TX. FREQUENCY | 441 | | TX. FREQUENCY | 429 | |
| RX. FREQUENCY | 429 | | RX. FREQUENCY | 441 | |
| RX. GAIN SETTING | MEDIUM | | RX. GAIN SETTING | MEDIUM | |
| WEATHER CONDITIONS | OVERCAST & RAINING | | WEATHER CONDITIONS | OVERCAST & RAINING | |

NOTE: MOBILE & BASE AT TOP OF TOWER LOW POWER

OBSERVED RANGE IN CALIBRATE: [illegible] 108.948 KM

COMPUTED SLANT RANGE: [illegible] 104.116 KM

∴ MOBILE ZERO SETTING IS: 4032 KM

OBSERVED RANGE IN OPERATE: 104.116 KM TIME: 1600---1700

SIGNED: H.R.BRIDGES

### NOTES REGARDING CALIBRATION PROCEDURES:

1. All equipment will be allowed to warm up for at least 30 minutes prior to calibrating.
2. All readings entered hereon will be final readings for the item in question, not preliminary or intermediate readings.
3. Each report will be complete in itself. Do not refer to other reports for information.
4. Use the reverse side of this report for any additional comments deemed necessary or advisable for completeness and clarity.

062672

# OFFSHORE NAVIGATION, INC.



## MAXIRAN CALIBRATION REPORT

DATE: 9 MAY 1980

| MOBILE STATION | | | BASE STATION | | |
|---|---|---|---|---|---|
| LOCATION: DOCTOR,S ROCKS | | | LOCATION: STONY HEAD | | |
| OPERATOR: A.HOGGART & H.R.BRIDGES | | | OPERATOR: D.TAYLOR & P.COE | | |
| UNIT | MODEL | SERIAL No. | UNIT | MODEL | SERIAL No. |
| MONITOR | NMM.01 | 004 | BEACON | NTL.01 | 067 CODE 5 |
| INTERROGATOR | NTM.01 | 038 | CONTROL BOX | NCL.01 | 051 |
| AMPLIFIER | | | AMPLIFIER | | |
| AMPLIFIER P/S | | | AMPLIFIER P/S | | |
| PREAMP | | | PREAMP | | |
| COAX | TYPE | LENGTH | COAX | TYPE | LENGTH |
| | LOW POWER | | | LOW POWER | |
| ANTENNA | TYPE | HEIGHT | ANTENNA | TYPE | HEIGHT |
| | LOG PERIODIC | 40 Ft | | LOG PERIODIC | 45 Ft |
| INPUT VOLTAGE | 115 | | INPUT VOLTAGE | 115 | |
| TX. FREQUENCY | 441 | | TX. FREQUENCY | 429 | |
| RX. FREQUENCY | 429 | | RX. FREQUENCY | 441 | |
| RX. GAIN SETTING | MINIMUM | | RX. GAIN SETTING | MINIMUM | |
| WEATHER CONDITIONS | OVERCAST & RAINING | | WEATHER CONDITIONS | OVERCAST & RAINING | |

NOTE: MOBILE & BASE AT TOP OF TOWER LOW POWER

OBSERVED RANGE IN CALIBRATE: XXXXXXXXX 108.948 KM

COMPUTED SLANT RANGE: XXXXXXXXX 104.116 KM

∴ MOBILE ZERO SETTING IS: 4832 KM

OBSERVED RANGE IN OPERATE: 104.116 KM TIME: 1600---1700

SIGNED: H.R.BRIDGES

NOTES REGARDING CALIBRATION PROCEDURES:

1. All equipment will be allowed to warm up for at least 30 minutes prior to calibrating.
2. All readings entered hereon will be final readings for the item in question, not preliminary or intermediate readings.
3. Each report will be complete in itself. Do not refer to other reports for information.
4. Use the reverse side of this report for any additional comments deemed necessary or advisable for completeness and clarity.

## VII. BASIC CONTROL

The following Maxiran base stations were occupied to control this survey. Coordinates, as listed below, were obtained from Lands Department, Tasmania Station Summary sheets submitted to the ONI New Orleans office from the field.

Universal Transverse Mercator Projection
Australian National Spheroid
Zone 55
Central Meridian 147° East
AUSTRALIAN GEODETIC DATUM

STATION CAPE PORTLAND (ST 770):

| | | |
|---|---|---|
| Latitude | 40°45'18".10 S | N = 5,487,969 meters |
| Longitude | 147°58'09".14 E | E = 581,814 meters |
| Elevation | 52 meters | |

STATION DOCTORS ROCKS (92/4):

| | | |
|---|---|---|
| Latitude | 41°01'01".50 S | N = 5,458,616 meters |
| Longitude | 145°46'54".77 E | E = 397,579 meters |
| Elevation | 22 meters | |

STATION STONY HEAD (ST 868):

| | | |
|---|---|---|
| Latitude | 40°59'06".16 S | N = 5,462,887 meters |
| Longitude | 147°01'07".22 E | E = 501,571 meters |
| Elevation | 89 meters | |

## VIII. PERSONNEL

| NAME | POSITION |
|---|---|
| Bridges, H. | Party Chief |
| Hoggart, A. | Mobile Operator |
| Taylor, D. | Mobile Operator |
| Coe, P. | Base Operator |
| Molloy, R. | Base Operator |

## IX. DISTRIBUTION

Geophysical Service International
25 Barracks Street
Perth, W.A.
AUSTRALIA

Attention: Mr. John Stanton — Nine copies

Offshore Navigation, Inc.
Post Office Box 23504
Harahan, Louisiana 70183 — Two copies

Offshore Navigation, Inc.
Post Office Box 291
Cloverdale, W.A. 6105
AUSTRALIA — One copy

STATION: CAPE PORTLAND (ST 770)

LOCATED: Station Cape Portland (ST 770) is located near Cape Portland, Tasmania, Australia, and 26.4 kilometers from the town of Gladstone.

NOTE: This station is named "STATION CHARMOUTH HILL S.T. 770" on the Lands Department, Tasmania survey sheet.

The station is located on a large clear hill in a 1,000-acre paddock.

ACCESS: From Launceston, Tasmania, proceed on the Bass Highway to Scottsdale. Continue on the Bass Highway through Scottsdale and drive a total of 107 kilometers from Launceston to the signposted junction to Gladstone. At Gladstone, turn right at Mr. Watt's Garage, and set the odometer to 00.00 kilometers. From the garage, drive 2.4 kilometers, and take the lefthand fork (Cape Portland Road). Drive down Cape Portland Road past Rushy Lagoon (12.9 kilometers), and follow the gravel road to the gate at Mr. H. Mills' farm, a total of 25.3 kilometers from Mr. Watt's Garage. Cross this gate and follow the track to the station marker, a total of 26.4 kilometers from the garage. This is a drive-on site, and can be reached by four-wheel drive or two-wheel drive vehicles.

MARKER: The station marker is a standard Australian trig marker with a brass stud marked "ST 770."

There are four reference marks that were established at this station. Reference Marks 1, 2, and 4 consist of 0.46m long steel star bars at ground level in concrete. R.M. 1 and 2 are on line to distant trig. R.M. 3 consists of a 0.54m long galvanized iron pipe at ground level in concrete. Stone piles are over each reference mark.

STATION: CAPE PORTLAND (ST 770) (continued)

GENERAL: The station property is owned by Mr. Hugh Mills, Cape Portland, Gladstone, Tasmania. Mr. Mills' phone number is 003 572123. Permission to occupy the station must be obtained from Mr. Mill.

Labor, camping supplies, and the majority of food items must be obtained in Launceston. Camping equipment can be rented in Launceston from Allgoods. Water, oil, and gasoline can be obtained from Mr. Watt's Garage. There is a limited amount of food that can be obtained in Gladstone. Fresh fruit, vegetables, and meat can be obtained in Gladstone.

The station site is very windy and cold. It is suggested that a caravan be used. Mr. Watt can hire a caravan in Gladstone to be placed at the station.

A 50-foot tower was erected at this station, the minimum height required to clear surrounding brush and obstructions. Star stakes were used to secure the tower. No rent was paid to Mr. Mill for use of this station.

ELEVATION: 52 meters

SKETCH: See next page.

AUSTRALIAN GEODETIC DATUM

| GEOGRAPHICAL COORDINATES | | UTM PROJ., AUST. NAT. SPHEROID ZONE 55, C. M. 147° EAST | |
|---|---|---|---|
| Latitude | Longitude | North | East |
| 40°45'18".10 S | 147°58'09".14 E | 5,487,969 meters | 581,814 meters |

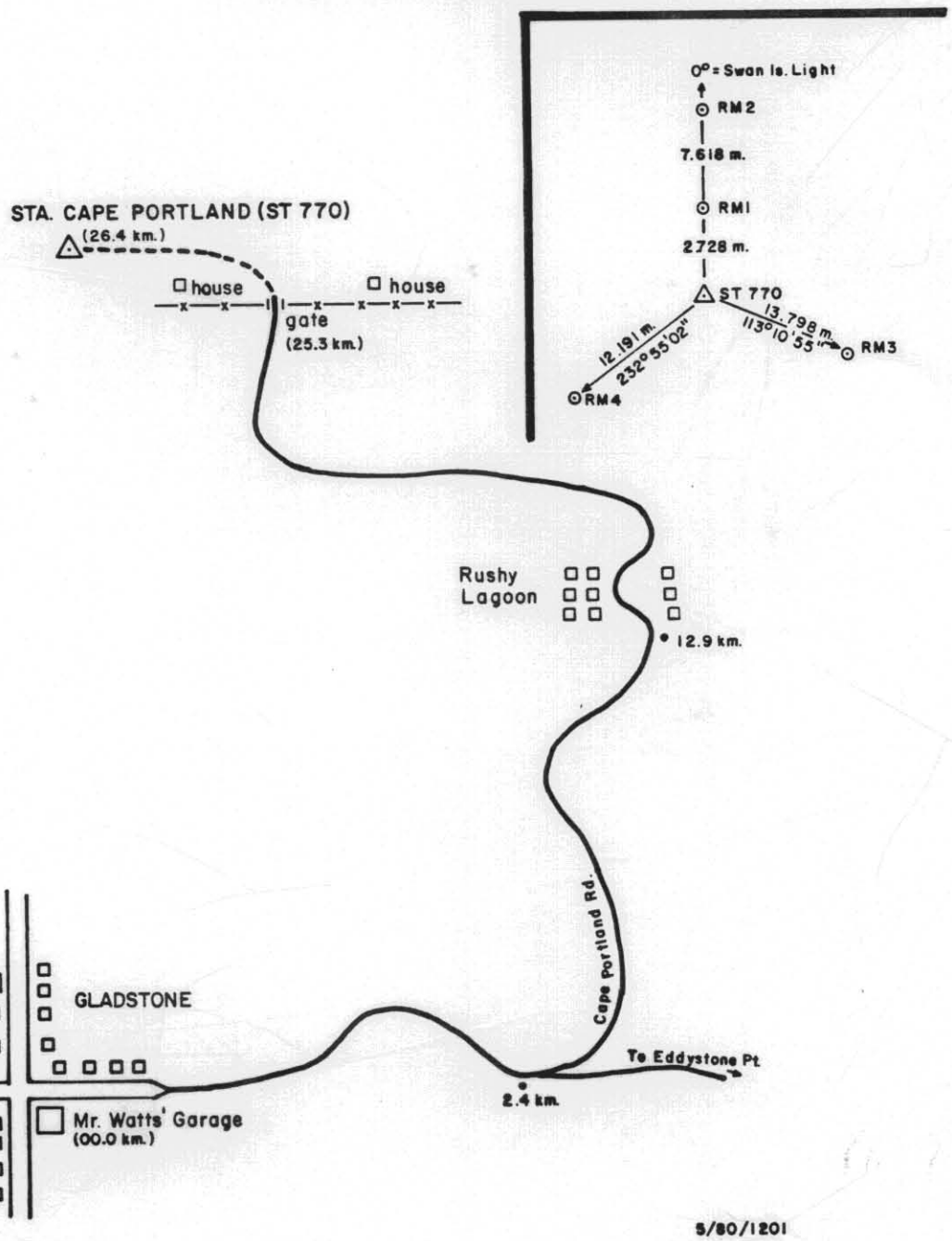
062677

# STA. CAPE PORTLAND (ST 770)—AUSTRALIA

LAT. 40°45' 18".10 S
LONG. 147°58' 09".14 E
ELEV. 52 meters

N 5,487,969 meters
E 581,814 meters

UTM PROJECTION, AUST. NATIONAL SPHEROID
ZONE 55 C.M. 147° E
AUSTRALIAN GEODETIC DATUM




5/80/1201

5 cm

OFFSHORE NAVIGATION, INC.

STATION: DOCTORS ROCKS (92/4)

LOCATED: This station is located at Doctors Rocks, on the northern coast of Tasmania, Australia, and northwest of Somerset, Tasmania.

ACCESS: From Burnie, travel on Highway #1 towards Smithton for 6 kilometers to Somerset and a bridge. Cross the bridge and travel another 5.8 kilometers to a gate signposted "Doctors Rocks." Go through this gate and follow the track for 0.4 kilometer to the station marker, which is located on the lefthand side of the track on a small hill. This is a drive-on station.

MARKER: This station is marked by a 1-foot square concrete block with a 1-inch brass P.W.D. pin embedded in its center. A Tasmania Survey reference post is attached to the fence, 1.8 meters at a bearing of 090° from the marker.

Table Cape is due north of the station marker. The farm house of Mr. Bill Busby, the station property owner, is at a bearing of 230° from the marker.

GENERAL: Fuel, food, oil, and labor can be obtained from Burnie. There is no water at this station site.

Permission must be obtained from Mr. Busby to occupy this station. His phone number is Burnie 422045. No rent was paid for use of his property.

The station is very windy, and care should be taken in raising a tower.

A caravan should be used at this site. One can be rented in Somerset at phone 314555.

STATION: DOCTORS ROCKS (92/4) (continued)

A 40-foot tower was erected at this station, the minimum height required to clear surrounding brush and obstructions. Clear vista is from 000° to 130°. Star stakes were used to secure the tower.

ELEVATION: 22 meters

SKETCH: See next page.

AUSTRALIAN GEODETIC DATUM

| GEOGRAPHICAL COORDINATES | | UTM PROJ., AUST. NAT. SPHEROID ZONE 55, C. M. 147° EAST | |
|---|---|---|---|
| Latitude | Longitude | North | East |
| 41°01'01".50 S | 145°46'54".77 E | 5,458,616 meters | 397,579 meters |

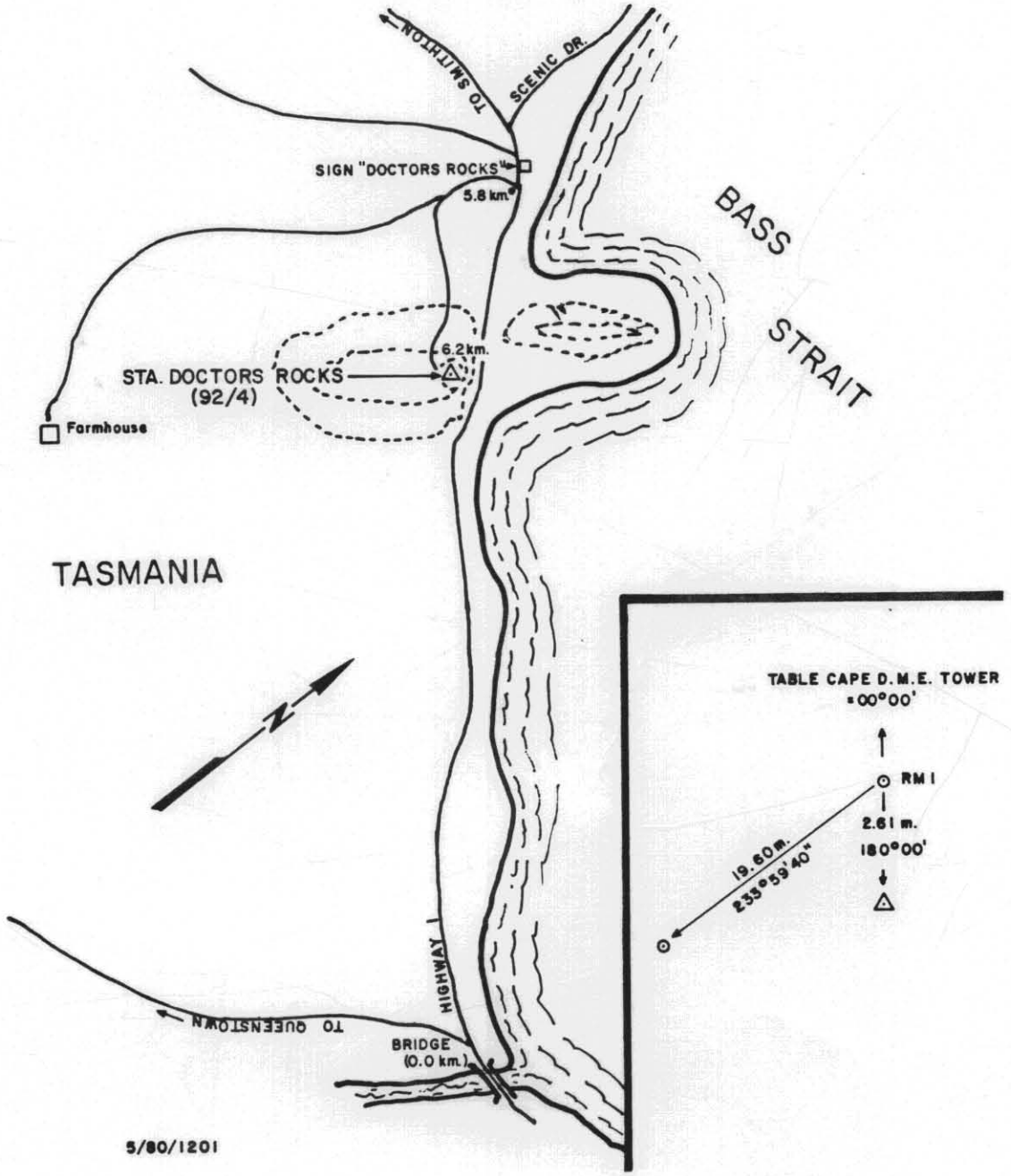
062080

# STA. DOCTORS ROCKS (92/4)——AUSTRALIA

LAT. 41°01' 01".50 S
LONG. 145°46' 54".77 E
ELEV. 22 meters

N 5,458,616 meters
E 397,579 meters

UTM PROJECTION, AUST NATIONAL SPHEROID
ZONE 55 C.M. 147° E
AUSTRALIAN GEODETIC DATUM




5 cm

OFFSHORE NAVIGATION, INC.

STATION: STONY HEAD (ST 868)

LOCATED: This station is located at Stony Head, on the north coast of Tasmania, Australia.

ACCESS: No written access was submitted from the field. Lands Department, Tasmania Station Summary sheet indicates that this station is west-northwest of Weymouth, and just west of Black Rock Point.

This is a drive-on site with four-wheel drive vehicle.

MARKER: The station trig marker consists of a concrete block with a brass ST mark (numbered 868).

There are four reference marks at this station. See Sketch for distances and bearings, which are referenced to Low Head Lighthouse. RM 1, 2, and 3 consists of a stainless steel bar in concrete at ground level. RM 4 is a S.H. nail in a 0.05 meter diameter pipe set in concrete in an old mound of dirt.

ELEVATION: 89 meters

SKETCH: See next page.

AUSTRALIAN GEODETIC DATUM

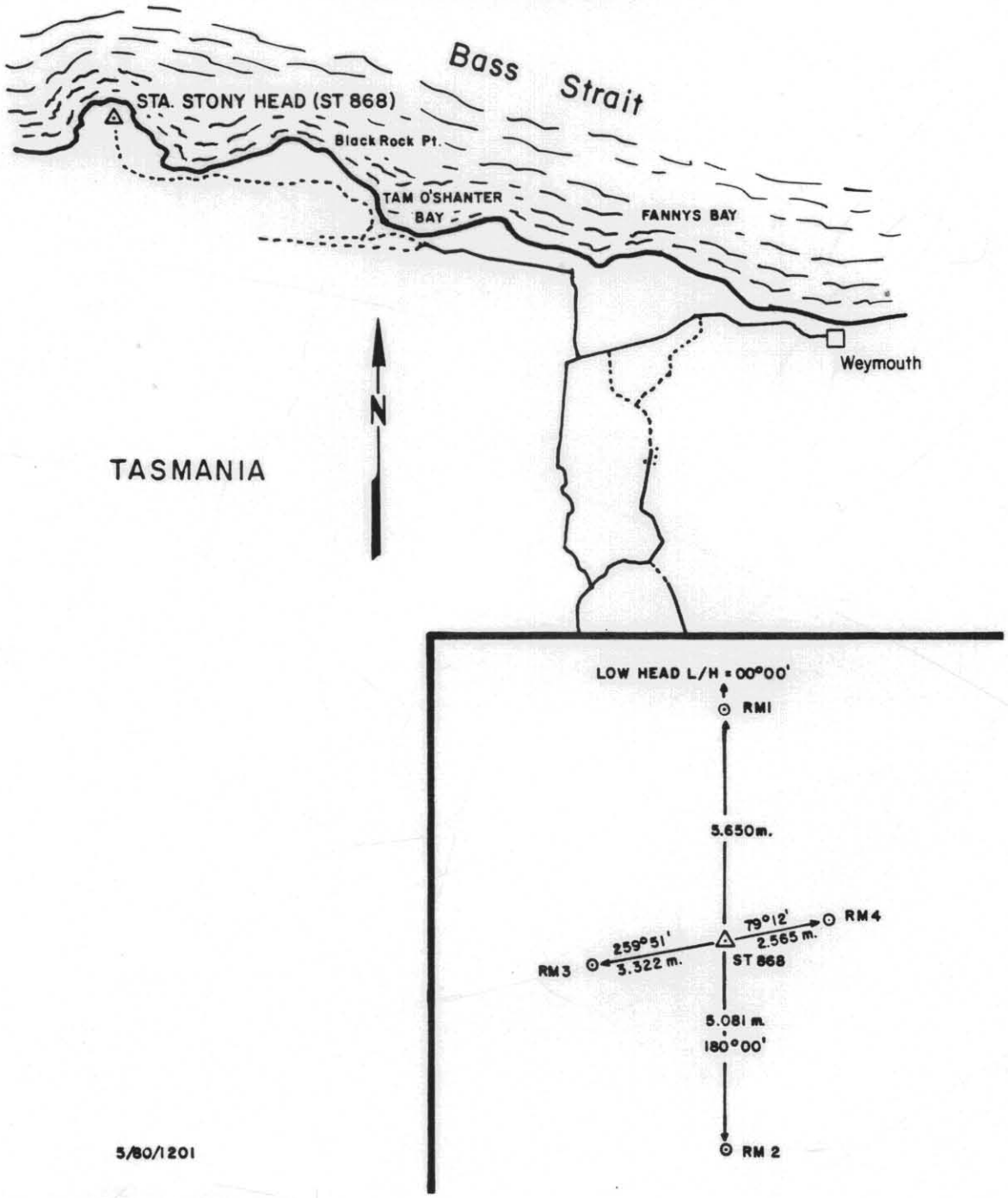
| GEOGRAPHICAL COORDINATES | | UTM PROJ., AUST. NAT. SPHEROID ZONE 55, C. M. 147° EAST | |
|---|---|---|---|
| Latitude | Longitude | North | East |
| 40°59'06".16 S | 147°01'07".22 E | 5,462,887 meters | 501,571 meters |

# STA. STONY HEAD (ST 868)——AUSTRALIA

LAT. 40°59' 06".16 S
LONG. 147°01' 07".22 E
ELEV. 89 meters

N 5,462,887 meters
E 501,571 meters

UTM PROJECTION, AUST NATIONAL SPHEROID
ZONE 55 C.M. 147° E
AUSTRALIAN GEODETIC DATUM

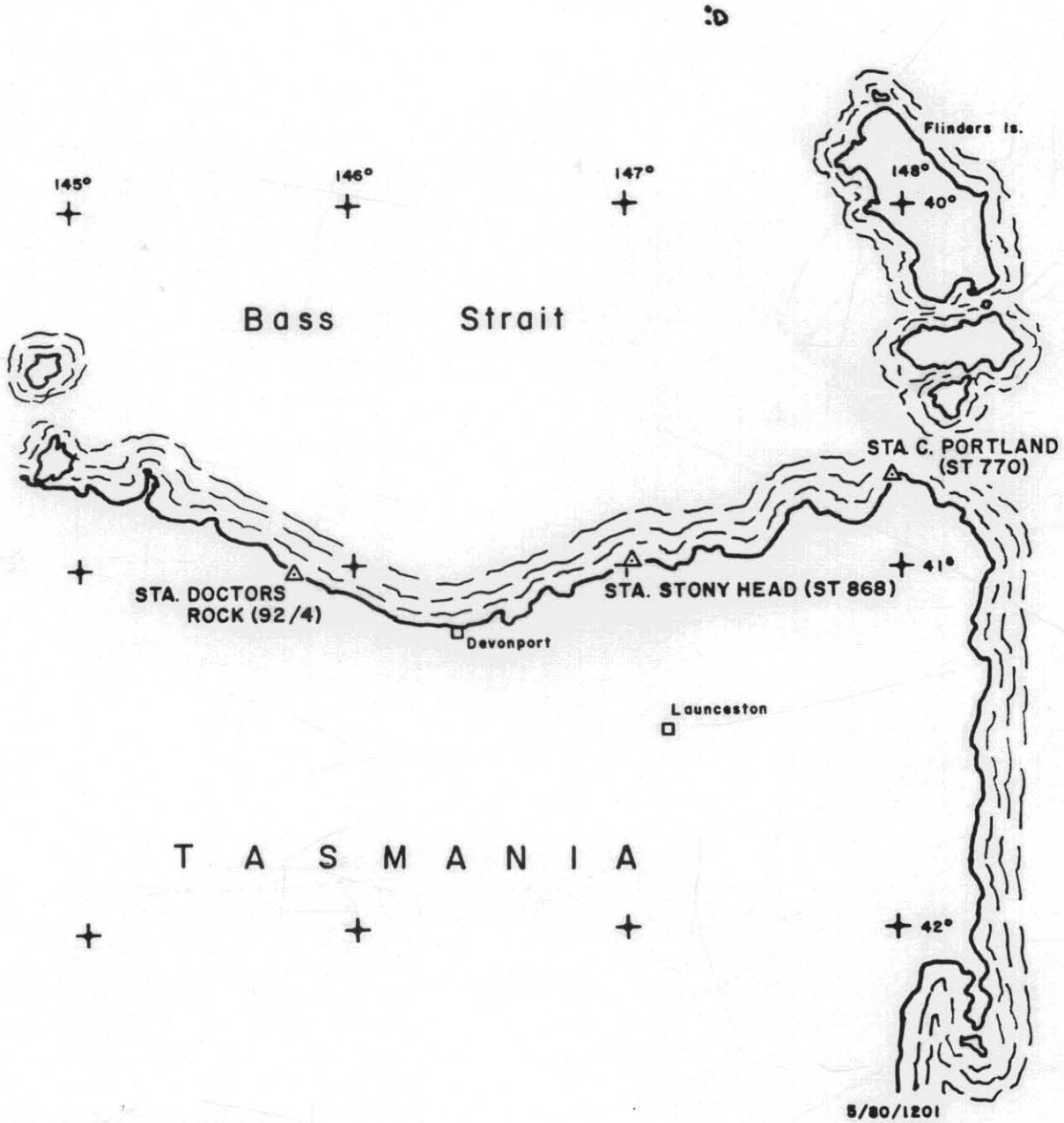



5/80/1201

5 cm

062083

# AREA OF OPERATIONS




OFFSHORE NAVIGATION, INC.

# APPENDIX A

# DAILY OPERATIONS LOGS

062085

# OFFSHORE NAVIGATION INC.
## MAXIRAN DAILY OPERATIONS LOG

Project Number 1201 Date MAY 9TH 1980 Boat EUGENE McDERMOTT II Client Party Number 2931
Geophysical Company G.S.I Oil Company HEMATITE PETROLEUM Radio Frequency 1637.5 KHz
Country AUSTRALIA Area/ Prospect BASS STRAIT Stepback Shot Point Interval

| Mobile Station | FREQUENCY | INTERROGATOR | MONITOR | AMPLIFIER | ANTENNA SYSTEM |
|---|---|---|---|---|---|
| | 441 MHz | 038 | 004 | 012 | T× OMNI R× L.P.L. |

BASE STATIONS

| Position | Operator | Frequency | Beacon | Control Box | Amplifier | Code |
|---|---|---|---|---|---|---|
| DR.S ROCKS | P. BROERSEN | 429 MHz | 022 | 051 | ~ | 4 |
| STONEY HEAD | P. COE | 429 MHz | 067 | 052 | ~ | 5 |
| CAPE PORTLAND | R. MOLLOY | 429 MHz | 059 | 058 | ~ | 2 |
| | | | | | | |

OPERATING TIME

| Time On | Time Off | Requested By | System Used For |
|---|---|---|---|
| 2110 | 2400 | C. ORR | NAVIGATION |
| | | | |
| | | | |
| | | | |

O/T Requested By — Total System - Hours Operation for Client: 2 HRS. 50 MINS

LOST TIME

| From | To | Hours Lost | Reason(s) |
|---|---|---|---|
| | | NIL | |
| | | | |
| | | | |
| | | | |

Brief Operations Log & Remarks 0001 ENROUTE FOR DEVONPORT
0835 ALONGSIDE IN DEVON PORT
TAKE MOBILE EQUIPMENT OFF THE BOAT TO STATION DR.S, ROCKS FOR CALIBRATION CHECK
1600-1700 CALIBRATION CHECK AS PER CALIBRATION LOGS
2110 LEFT PORT HEADING FOR PROSPECT - SYSTEM ON IN OPERATE
2400 HEADING FOR PROSPECT

Mobile Operators A. HOGGART
D. TAYLOR
Party Chief H. BRIDGES

Form N-1A SEE INSTRUCTIONS ON REVERSE

062686

# OFFSHORE NAVIGATION INC.
## MAXIRAN DAILY OPERATIONS LOG

Project Number 1201 Date MAY 10TH 1980 Boat EUGENE McDERMOTT II Client Party Number 2931
Geophysical Company G.S.I. Oil Company HEMATITE PETROLEUM Radio Frequency 4637.5 KHz
Country AUSTRALIA Area/Prospect BASS STRAIT Stepback Shot Point Interval 25m

| Mobile Station | FREQUENCY | INTERROGATOR | MONITOR | AMPLIFIER | ANTENNA SYSTEM |
|---|---|---|---|---|---|
| | 441 MHZ | 038 | 004 | 012 | Tx Omni Rx L.P. L.S. |

BASE STATIONS

| Position | Operator | Frequency | Beacon | Control Box | Amplifier | Code |
|---|---|---|---|---|---|---|
| DR.S ROCKS | P. BROGRSEN | 429MHz | 022 | 051 | — | 4 |
| STONEY HEAD | P. COE | 429MHz | 067 | 052 | — | 5 |
| CAPE PORTLAND | R. MOLLOY | 429MHz | 059 | 058 | — | 2 |
| | | | | | | |

OPERATING TIME

| Time On | Time Off | Requested By | System Used For |
|---|---|---|---|
| 0001 | 2400 | C. ORR | NAVIGATION |
| | | | |
| | | | |
| | | | |

O/T Requested By — Total System - Hours Operation for Client 24 hrs

LOST TIME

| From | To | Hours Lost | Reason(s) |
|---|---|---|---|
| | | | |
| | | | |
| | | NIL | |
| | | | |

Brief Operations Log & Remarks 0001 HEADING FOR PROSPECT
0020 COMMENCE LAYING CABLE
0621 – 0751 SP1 – SP 559 TEST LINE NE BAD MISS TIE WITH DRs ROCKS NOTED TAKING 3 WAY FIXES WITH A NORTHERN STATION TO PROVE SYSTEM
1147 – 1339 SP1 – SP 746 LINE H 80A 416 S.W.
1437 – 1454 SP1 – SP 111 LINE H 80A 416 N.E. LINE TERMINATED TO CHANGE ZERO SETS AS REQUESTED BY PERTH OFFICE DRs ROCKS REMAINS 4.882 PORTLAND & STONEY HEAD NOW 4.929
1700 – 1847 SP1 – SP 647 LINE H 80A 416 N.E.
1946 – 2007 SP 371 – SP 232 LINE H 80A 418 S.W. TERMINATED OUT OF NAV SPECS DUE TO POOR SIGNALS
2225 – 2335 SP 371 – SP 995 LINE H80A 418A S.W.
2400 LINE CHANGE

Mobile Operators A. HOGGART 00 – 12
D. TAYLOR 12 – 24 Party Chief H. BRIDGES

Form N-1A SEE INSTRUCTIONS ON REVERSE

062687

# OFFSHORE NAVIGATION INC.
## MAXIRAN DAILY OPERATIONS LOG

Project Number 1201 Date MAY 11TH 1980 Boat EUGENE McDERMOTT II Client Party Number 2931

Geophysical Company G.S.I. Oil Company HEMATITE PETROLEUM Radio Frequency 4637.5

Country AUSTRALIA Area/Prospect BASS STRAIT Stepback Shot Point Interval 25m

| Mobile Station | FREQUENCY | INTERROGATOR | MONITOR | AMPLIFIER | ANTENNA SYSTEM |
|---|---|---|---|---|---|
| | 461 MHZ | 038 | 004 | 012 | Tx OMNI Rx L.P.L. |

BASE STATIONS

| Position | Operator | Frequency | Beacon | Control Box | Amplifier | Code |
|---|---|---|---|---|---|---|
| DRS ROCKS | P. BROGRSEN | 429 MHZ | 022 | 051 | / | 4 |
| STONEY HEAD | P. COE | 429 MHZ | 067 | 052 | / | 5 |
| CAPE PORTLAND | R. MOLLOY | 429 MHZ | 059 | 058 | / | 2 |
| | | | | | | |

OPERATING TIME

| Time On | Time Off | Requested By | System Used For |
|---|---|---|---|
| 0001 | 2400 | C. ORR | NAVIGATION |
| | | | |
| | | | |
| | | | |

O/T Requested By — Total System - Hours Operation for Client 24 HRS

LOST TIME

| From | To | Hours Lost | Reason(s) |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

Brief Operations Log & Remarks 0001 ON LINE CHANGE

0059 – 0201 SP1 – SP 413 LINE H80A 420 N.E.

0343 – 0531 SP1 – SP 716 LINE H80A 422 SW

0647 – 0814 SP1 – SP 576 LINE H80A 424 N.E.

0922 – 1126 SP341 – SP 995 LINE H80A 426 SW

1150 – 1309 SP1 – SP 537 LINE H80A 428 NE

1615 – 1548 SP1 – SP 597 LINE H80A 401 NW

1718 – 1937 SP851 – SP 996 LINE H80A 400 SW

2043 – 2224 SP1 – SP 665 LINE H80A 402 NE

2400 LINE CHANGE

Mobile Operators A. HOGGART 00–12

D. TAYLOR 12–24 Party Chief H. BRIDGES

Form N-1A SEE INSTRUCTIONS ON REVERSE

062088

# OFFSHORE NAVIGATION INC.
## MAXIRAN DAILY OPERATIONS LOG

Project Number 1201 Date MAY 12TH 1980 Boat EUGENE McDERMOTT II Client Party Number 2931
Geophysical Company G.S.I. Oil Company HEMATITE PETROLEUM Radio Frequency 4637.5 KHz
Country AUSTRALIA Area/Prospect BASS STRAITS Stepback Shot Point Interval 25 M

| Mobile Station | FREQUENCY | INTERROGATOR | MONITOR | AMPLIFIER | ANTENNA SYSTEM |
|---|---|---|---|---|---|
| | 441 MHZ | 038 | 004 | 012 | Tx OMNI Rx LPL |

BASE STATIONS

| Position | Operator | Frequency | Beacon | Control Box | Amplifier | Code |
|---|---|---|---|---|---|---|
| D.R.S. ROCKS | P. BROERSEN | 429 MHZ | 022 | 051 | ✓ | 4 |
| STONEY HEAD | P. COE | 429 MHZ | 067 | 052 | ✓ | 5 |
| CAPE PORTLAND | R. MOLLOY | 429 MHZ | 059 | 058 | ✓ | 2 |
| | | | | | | |

OPERATING TIME

| Time On | Time Off | Requested By | System Used For |
|---|---|---|---|
| 0001 | 2400 | C. ORR | NAVIGATION |
| | | | |
| | | | |
| | | | |

O/T Requested By — Total System - Hours Operation for Client 24 HRS

LOST TIME

| From | To | Hours Lost | Reason(s) |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

Brief Operations Log & Remarks 0001 LINE CHANGE
0107 - 0322 SP 821 - SP 9945 LINE H 80A 406 S.W.
0436 - 0600 SP 1 - SP 541 LINE H 80A 406 NE
CIRCLE C.M.S. FAILURE
0747 - 0913 SP 481 - SP 1026 LINE H 80A 1406 NE
1014 - 1245 SP 901 - SP 9945 LINE H 80A 408 SW
1405 - 1701 SP 1 - SP 1078 LINE H 80A 410 N.E.
1806 - 1923 SP 401 - SP 9945 LINE H 80A 412 SW
2116 - 2313 SP 1 - SP 746 LINE H 80A 414A NE

2400 LINE CHANGE

Mobile Operators A. HOGGART 00-12
D. TAYLOR 12-24 Party Chief H. BRIDGES

Form N-1A SEE INSTRUCTIONS ON REVERSE

062689

# OFFSHORE NAVIGATION INC.
## MAXIRAN DAILY OPERATIONS LOG

Project Number 1201 Date MAY 13TH 1980 Boat ENGEING McDERMOTT II Client Party Number 2931
Geophysical Company G.S.I. Oil Company HEMATITE PETROLEUM Radio Frequency 4637.5 KHz
Country AUSTRALIA Area/Prospect BASS STRAIT Stepback Shot Point Interval 25m

| Mobile Station | FREQUENCY | INTERROGATOR | MONITOR | AMPLIFIER | ANTENNA SYSTEM |
|---|---|---|---|---|---|
| | 441 MHZ | 038 | 004 | 012 | Tx Rx OMNI LPLs |

BASE STATIONS

| Position | Operator | Frequency | Beacon | Control Box | Amplifier | Code |
|---|---|---|---|---|---|---|
| DR.s ROCKS | P. BROERSEN | 429 MHZ | 022 | 051 | — | 4 |
| STONEY HEAD | P. COE | 429 MHZ | 067 | 052 | — | 5 |
| CAPE PORTLAND | R. MOLLOY | 429 MHZ | 059 | 058 | — | 2 |
| | | | | | | |

OPERATING TIME

| Time On | Time Off | Requested By | System Used For |
|---|---|---|---|
| 0001 | 2400 | C. ORR | NAVIGATION |
| | | | |
| | | | |
| | | | |

O/T Requested By — Total System - Hours Operation for Client: 24 hrs

LOST TIME

| From | To | Hours Lost | Reason(s) |
|---|---|---|---|
| | | NIL | |
| | | | |
| | | | |
| | | | |

Brief Operations Log & Remarks

0001 LINE CHANGE
0039 - 0319 SP 101 - SP 1165 LINE H 80A 230 S.E.
0535 - 0911 SP 1431 - SP 44 LINE H 80A 405 N.W.
1015 DRS ROCKS ON NEW MARKER OK.
1106 - 1250 SP 101 - SP 767 LINE H 80A 403 SE
1300 - 1930 CIRCLING FOR REPAIRS TO AUTO PILOT NO, GO HANDSTEER
2023 - 2223 SP 791 - SP 39 LINE H 80A 407 NW.

2400 LINE CHANGE

Mobile Operators A. HOGGART 00 - 12
D. TAYLOR 12 - 24 Party Chief H. BRIDGES

Form N-1A SEE INSTRUCTIONS ON REVERSE

# OFFSHORE NAVIGATION INC.
# MAXIRAN DAILY OPERATIONS LOG

062090

Project Number 1201 Date MAY 16TH 1980 Boat EUGENE McDERMOTT II Client Party Number 2931

Geophysical Company G.S.I. Oil Company HEMATITE PETROLEUM Radio Frequency 4637.5 KHz

Country AUSTRALIA Area/Prospect BASS STRAIT Stepback Shot Point Interval 25m

| Mobile Station | FREQUENCY | INTERROGATOR | MONITOR | AMPLIFIER | ANTENNA SYSTEM |
|---|---|---|---|---|---|
| | 461 MHZ | 038 | 004 | 012 | TX OMNI RX L.P.L's |

BASE STATIONS

| Position | Operator | Frequency | Beacon | Control Box | Amplifier | Code |
|---|---|---|---|---|---|---|
| DR.'s ROCKS | P. BROERSEN | 429 MHz | 022 | 051 | | 4 |
| STONEY HEAD | P. COE | 429 MHz | 067 | 052 | | 5 |
| CAPE PORTLAND | R. MOLLOY | 429 MHz | 059 | 058 | | 2 |
| | | | | | | |

OPERATING TIME

| Time On | Time Off | Requested By | System Used For |
|---|---|---|---|
| 0001 | 2400 | C. ORR | NAVIGATION |
| | | | |
| | | | |
| | | | |

O/T Requested By — Total System - Hours Operation for Client: 24 hrs

LOST TIME

| From | To | Hours Lost | Reason(s) |
|---|---|---|---|
| | | NIL | |
| | | | |
| | | | |
| | | | |

Brief Operations Log & Remarks

0001 LINE CHANGE
0017 - 0213 SP101 - SP837 LINE HB80A 49 S.E.
HEADING FOR WESTERN AREA
0820 - 0830 MT TAYLOR - DRS ROCKS BASE LINE = 398.095 BAD SIGNALS
0915 - 0925 BLACK WARRI - DRS ROCKS BASE LINE = 299.459* SHAKEY SIGNALS
1115 - 1230 SP 523 - SP 46 LINE HB 80A 436 W.N.W
1350 - 1656 SP 101 - SP 495 LINE HB 80A 411 NNE
1603 - 1703 SP 423 - SP 67 LINE HB 80A 413 S.S.W.
1820 - 1916 SP 101 - SP 465 LINE HB 80A 415 NNE.
2026 - 2124 SP 421 - SP 47 LINE HB 80A 417 SSW
2232 - 2329 SP 101 - SP 477 LINE HB 80A 419 NNE
2400 LINE CHANGE

* SHORTEST READINGS NOTED BUT CALCULATED OUT TO 299.440

Mobile Operators A. HOGGART 00-12
D. TAYLOR 12-24 Party Chief H. BRIDGES

Form N-1A SEE INSTRUCTIONS ON REVERSE

062691

# OFFSHORE NAVIGATION INC.
## MAXIRAN DAILY OPERATIONS LOG

Project Number 1201 Date MAY 15TH 1980 Boat EUGENE McDERMOTT II Client Party Number 2931

Geophysical Company G.S.I. Oil Company HEMATITE PETROLEUM Radio Frequency 4637.5 KHz

Country AUSTRALIA Area/Prospect BASS STRAIT Stepback Shot Point Interval 25m

| Mobile Station | FREQUENCY | INTERROGATOR | MONITOR | AMPLIFIER | ANTENNA SYSTEM |
|---|---|---|---|---|---|
| | 441 MHZ | 038 | 004 | 009 | Tx OMNI Rx L.P.L. |

BASE STATIONS

| Position | Operator | Frequency | Beacon | Control Box | Amplifier | Code |
|---|---|---|---|---|---|---|
| DR.S ROCKS | P. BROERSEN | 429 MHZ | 022 | 051 | | 4 |
| STONEY HEAD | P. COE | 429 MHZ | 067 | 052 | | 5 |
| CAPE PORTLAND | R. MOLLOY | 429 MHZ | 059 | 058 | | 2 |
| | | | | | | |

OPERATING TIME

| Time On | Time Off | Requested By | System Used For |
|---|---|---|---|
| 0001 | 1730 | C. ORR | NAVIGATION |
| | | | |
| | | | |
| | | | |

O/T Requested By — Total System - Hours Operation for Client: 17.30

LOST TIME

| From | To | Hours Lost | Reason(s) |
|---|---|---|---|
| | | | |
| | | NIL. | |
| | | | |
| | | | |

Brief Operations Log & Remarks

0001 LINE CHANGE
0026 - 0120 SP 379 - SP 47 LINE HB 80A 421 S.S.W.
0247 - 0425 SP 648 - SP 46 LINE HB 80A 436 W.N.W.
0533 - 0657 SP 101 - SP 640 LINE HB 80A 432 E.S.E.
0806 - 0907 SP 466 - SP 63 LINE HB 80A 430 W.N.W
0953 - 1036 BRING IN CABLE
1157 - 1208 BASE LINE BLACK WARRI TO DOCTORS ROCKS 299.442
1216 - 1291 BASE LINE BLACK WARRI TO DOCTORS ROCKS 299.419
1245 - 1315 BASELINE: DR's ROCKS - TAYLOR 110° 398.053, 290° 398.054.
1543 - 1608 BASELINE: DR's ROCKS - PORTLAND 165° 186.594, 350° 186.596.
1730 - 2400 At anchor offshore Devenport for client change & data drop. Tony Haggart ashore, Ray Foxon on board.

Mobile Operators A. HAGGART 00 - 12
D. TAYLOR 12 - 24 Party Chief H. BRIDGES

Form N-1A

SEE INSTRUCTIONS ON REVERSE

062092

DATA PROCESSING REPORT
BASS STRAIT T/5P & T/6P
HB 80A SURVEY
COMPANY:- HEMATITE PETROLEUM

COMPANY ADDRESS:- 140, WILLIAM STREET,
MELBOURNE, VIC. 3000.

BY

GEOPHYSICAL SERVICE INTERNATIONAL
UNIT D, 8 BYFIELD STREET,
NORTH RYDE. N.S.W. 2113

PARTY 6854
C. WILKINS
1980 SURVEY

**AMG REFERENCE POINTS ADDED**

OR-020

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## SECTION I.

## INTRODUCTION

A seismic reflection survey was conducted by the M/V Eugene McDermott II Party 2931 in Bass Strait off the North coast of Tasmania (see plate 1) between the 9th and 15th of May 1980.

The survey covered approximately 500KM using the following shooting parameters:-

- Streamer configuration - 2424m cable with 96 groups equally spaced.
- Group length - 25m (15 hydrophones at 1.67 spacing)
- Shot interval - 25m (48 fold)
- Depth point interval - 12.5m
- Record length - 5 secs
- Sample period - 2 ms
- Cable Depth - 11m average
- Filter settings - High cut and slope 128hz @ 72db/oct
  - Low cut and slope 8 hz @ 18db/oct
- Navigation - Maxiran by O.N.I. - Primary
  Geonav by G.S.I. - Secondary
- Airguns - 1450 cu.in. operating at 2000 p.s.i. (-51ms delay)
- Instruments - DFS V 1 System - Tape format SEG B

Processing was written in G.S.I.'s Sydney office and processed in G.S.I. Singapore, on TIMAP* 980 computers.

* Trademark of Texas Instruments.

## SECTION II

## EXPERIMENTAL WORK

Field data was received in June soon after which analytical work commenced. The standard suite of tests as listed below were conducted on Line HB80-414, representing the Pookanah Area and Line HB80-417 representing the Pipipa Area.

PREPROCESSING TESTS:

- True Amplitude Recovery Test on 2 field records with 3 recovery rates - 4,6 and 8 db/sec with cut off time of 5.0 seconds.
- F-K Noise Analysis on 2 records with TAR only
- F-K Noise Analysis on 2 records with TAR and Pre Deconvolution ramping.
- F-K Noise Analysis on 2 record with TAR + Pre Deconvolution Ramping + Velocity Filtering.
- F-K Noise Analysis on 2 records with TAR + Velocity Filtering. (Up to this stage tests were run at SP400 on Line 414 and SP250 on Line 417)
- Comparison over a 100 depthpoints between.
  - A. Designature
  - B. Whitening Deconvolution
  - C. Gapped Deconvolution

POST PROCESSING TESTS

- Post Stack Deconvolution comparison over 100 Depthpoints between

  A. No deconvolution

  B. 24ms gapped deconvolution, 196ms operator, 2 gates

  C. 64ms " " " " " "

- Filter Analyses over 50 depthpoints with the following passbands in hertz.

| | |
|---|---|
| 10 - 60 | 25 - 50 |
| OUT - OUT | 30 - 60 |
| 5 - 10 | 40 - 80 |
| 10 - 20 | 50 - 100 |
| 20 - 40 | 60 - 120 |

- Post stack scaling test with 3 sets of parameters of 50 depthpoints.

  A. 500 ms gates 10% overlap

  B. 1000 ms gates 10% overlap

  C. 2000 ms gates 10% overlap

A demult test was not required. However when the first few lines were stacked, it was evident that a strong event at an average 2 way time of 1.0 seconds was generating a first class multiple. A test was run to see if the multiple could be eliminated simply by using the selective trace ramp method. This proved quite successful and was subsequently employed.

The low cut of the filter passband was also raised to 12 Hz to attenuate the multiple. This was based on examination of the filter analysis.

## SECTION III

## PRODUCTION PROCESSING

96 Trace, 48 Fold, 2ms, tmax 5.0 secs, depth point interval 12.5 metres as input.

TAR — Inelastic attenuation parameter (exponential factor)
= 4.0 db/sec.
T2 (cut off time for ) = 5.0 secs.

RESAMPLE — From 2ms to 4ms with antialias filter (This was omitted from the stacked side panel in error as the Junior Geophysicists report mistakenly stated the data was shot 4ms)

STATIC — - 51 ms airgun delay

PDR — TDR (start time of ramp at offset zero) 0 msec
LDR (length of ramp at offset zero) 180 msec
VDR (velocity used in computation of ramp times with increasing offset) 1200 m/sec
KPR (percentage offset factor for increasing ramp length) 5%

VEF — Velocity Filter + 8ms/trace, -5ms/trace Pookanah
+ 8ms/trace, -2ms/trace Pipipa

DSG Designature

CDP Gather 96 trace 48 fold

VELSCANS 11 Depthpoint Velocity Analyses to determine the stacking function (1 per 1.2 KM) These were interpreted by Hematite.

NMO Normal Moveout application using stacking functions derived from 11 depthpoint velscans

RAMP First break suppression application

RAMP ON

| Time (secs.) | Offset (metres) |
|---|---|
| 0 | 0 |
| 0.1 | Near offset |
| 1.0 | 875 |
| 2.7 | 2700 |

Selective Trace Ramp Off (To attenuate strong multiple)

CDP traces 2, 3, 4, 5, 7, 8, 10, 11, 13, 15, 17 and 20 were ramped off before the strong multiple (as indicated by velocity analyses) in 30 to 50 ms increments depending on how shallow the strong primary was.

(Trace 2 being the second nearest offset trace)

TVD No post-stack deconvolution was applied.

TVF Time Variant Filtering

All lines were filtered with the following passband

| Time(secs) | Passband(hz) |
|---|---|
| 0.0 | 12-60 |
| 0.8 | 12-60 |
| 1.5 | 12-50 |
| 5.0 | 12-50 |

No scaling was applied.

MSTK All dip lines in Pookanah and Pipipa were migrated with GSI's wave equation migration performed in the F-K domain.

Lines migrated were:-

T/5P HB80A - 411
413
415
417
419
421

T/6P 400
402
404
406
406A
408
410
412
414
416A
418A
420
422
424
426
428

| | | |
|---|---|---|
| DISPLAY | Horiz. Scale | 20 T.P.cm (1:25000) |
| | Vert. Scale | 10 cm/sec |
| | Mode | VA/WT 20% Bias |
| | Polarity | Normal |

TAPES Field tapes, Raw Stack tapes and migrated stack tapes were shipped to Hematite's Office in Melbourne.

FIELD DATA Field monitors, fathometers, shipboard sections, observers logs and QC reports etc. were also shipped to Hematite, Melbourne.

Respectfully submitted:

C. Wilkins

CHERRY WILKINS

Processing Party Chief

# APPENDIX A

## PROCESS DESCRIPTIONS

### TRUE AMPLITUDE RECOVERY(TAR)

The TAR process is applied to digital field records to produce output records on which relative amplitudes of reflections on each trace are approximately true and traces evenly modulated. This consists of removing the gain imposed on the field record during recording and correcting for inelastic attenuation and spherical divergence losses.

### VELOCITY FILTERING (VEF)

Velocity filtering is a multichannel process. Multichannel filtering is a two-dimensional frequency-wavenumber filtering operation that can be used to discriminate against specified velocities on pre-stacked data or against specified dips on stacked data.

Velocity filtering processes transform the data from the space time (X-T) domain to the frequency-wavenumber (F-K, where K = reciprocal of wavelength) domain where the filter is applied. After filter application the process transforms back to the X-T domain for further conventional process applications.

The apparent velocity of noise must be adequately separated from the primary signal for the process to be effective. Examples of noise alignment that can be removed are hard bottom refraction, mud roll and cable jerk. These types of noise alignments have a velocity slower than primary signal or have a dip opposite from the primary.

A window of primary dip zones to keep is specified and dips outside this window are rejected.

A linear event in the X-T domain (implying constant velocity) appear as a linear event in the F-K domain where lines of constant velocity pass through the origin. Thus, a multitude of noise events, with the same velocity, at various times on the input record join on the F-K plane into a single event. In general seismic reflections (signal) have higher apparent velocities than noise propagating horizontally in a direct path from source to receiver; therefore, recorded signal appears in a different region of the F-K plane from the noise.

This provides the basis for signal-to-noise enhancement used in velocity filtering. The process is analogous to muting in X-T.

Aliasing both in the frequency and wavenumber axes can be predicted from the time sampling period and the spatial sampling (or group interval) of the input data. Spatial sampling determines, to a large extent, the effectiveness of the process. Velocity filtering attenuates some portions of alaised events. However, when aliased noise overlays signal, velocity filtering loses its discriminating power.

DESIGNATURE (DESIG 1*)

Designature is a a generic name for processes which attempt to replace an arbitrary source wavelet convolved with the reflection sequence with a shorter wavelet of improved resolving capability.

DESIG 1 is the particular designature process in the current VELFILT program and provides an alternative to conventional pre-CDP stack deconvolution (TVD). DESIG 1 is a multichannel process, like VELFILT that can use the entire record to estimate the wavelet, whereas TVD is a single channel process that only uses a portion of a trace to design an operator. While TVD is time and offset-variant DESIG 1 is not time-variant.

* Trademark of Texas Instruments inc.

DESIG 1 can better account for the source and receiver ghosts found in marine data than TVD can.

Once the signal-to-noise ratio of the primary events is improved by velocity filtering, designature is applied in the common source point domain. Designature estimates the source wavelet from the seismic traces and attempts to collapse it to a zero phase pulse. The source domain is chosen since all traces originate from the same source.

PREDECONVOLUTION RAMP (PDR)

PDR is the process whereby first arrival unwanted noise at the front end of seismic records is removed. This is applied prior to deconvolution design.

VELOCITY ANALYSIS

As part of any velocity analysis routine, static corrections to compensate for shot and cable depth, and multiplexor delays are applied.

DISCRETE (VELSCAN)

GSI's VELSCAN Velocity Module is a discrete Velocity Analysis mode making use of advanced picking logic to generate events as functions of time, amplitude, moveout and dip. The event picking proceeds in the following manner:

- NMO corrections corresponding to a series of moveout functions are applied to a set of depth point traces. For each moveout function, the NMO-corrected traces are stacked. The resulting traces consist of amplitudes as functions of time and moveout.
- Identical operations are applied to adjacent depth points, adding the dimension of space.
- Dip is applied and for each value of dip, the traces are stacked across depth points. The result is a set of amplitudes as functions of time, moveout and dip.
- An event is located by searching for an amplitude extremum in the time, moveout and dip domains. An extremum may be either a maximum or minimum; that is, both peaks and troughs are picked. The event attributes of time, amplitude, moveout and dip are assigned to the centre depth point.

NORMAL MOVEOUT CORRECTIONS (NMO)

Reflection arrival times at the surface,from a horizontal reflecting interface, increase with offset from seismic source in a predictable manner known as the normal moveout effect. NMO at a a given location is a function of offset, depth to the reflector and the velocity of the medium between the reflector and the surface.

NMO corrections remove the NMO increase in reflection times with offset (or spread geometry) and reduce all reflection times to the value they would have if source and receiver were coincident.

NMO corrections involve some stretching of the data. This is greatest at early record times but decreases with increasing record time. In order to avoid gross distortion at early record times ramps are applied to zero out the early part of the traces where NMO is excessive and to phase in the NMO corrections gradually.

COMMON DEPTH POINT STACK (CDP)

The common depth-point stack is the summation of all the traces with a common depth point into one stacked output trace for each depth point. This summation is performed after the application of NMO and static corrections to each of the individual traces. If these corrections are appropriate then trace signals will reinforce whilst random noise will fail to reinforce. The improvement in signal-to-noise (S/N) ratio of a stacked trace compared to the input traces is theoretically equal to the square root of N, where N is the number of traces summed together. Thus, if the fold of stack is 48 fold, then the improvement is approximately 7.

In addition to improving the S/N ratio, stacking can also attenuate or suppress undesired reflection events such as multiple reflections. This is because an appropriately applied NMO correction will only partially correct multiple reflections so that they will not reinforce when summed but will suffer destructive interference to some degree.

In practice, the early live portion of the NMO output traces have more distortion than is acceptable. For this and possibly other reasons, a ramp function is applied to the input traces before summation. Each trace may have up to three ramps applied to it to accept or reject portions of the input trace as desired. Quite commonly short offset traces are rejected at depth to improve multiple attenuation.

To accommodate the varying summation, or fold, implicit in this ramping a recovery scaler is applied to normalise the energy output level to that of the full fold stack.

TIME VARIANT FILTERING (TVF)

Filtering is commonly applied in a time variant manner to take account of the higher frequency content of the shallow seismic signal and the lower frequency content at depth when rejecting unwanted frequencies, or noise.

By appropriate filter design, unwanted frequencies may be attenuated, or removed, the most common application is the band-pass filter which discriminates against the high and low frequency spectrum of the input trace where no significant signal energy is present.

TIME VARIANT SCALING (TVS)

Time Variant Scaling (TVS) produces amplitude equalisation in a time variant manner down the seismic trace as well as from trace to trace. Up to twenty time gates with variable overlap can be used to compute time variant scalers for each gate to raise all gates to the same energy level.

Scalers computed for each gate are applied at the gate centre, with linear interpolation between gate centres.

Gate amplitudes are measured for a set of continuous gates on each trace and scalers are computed for each gate to make the amplitude constant or proportional to the amplitudes. The scalers are applied in a continuously time-variant manner.

TIME VARIANT DECONVOLUTION (TVD)

The purpose of TVD is to take reverberating series of wavelets and reduce them to the time domain spike and this implies normalising the frequency spectrum. At the same time TVD is desireable to collapse and stabilise wavelet shapes from broad or variable input wavelets.

TVD is accomplished by the application of one or more filters designed from individual data trace autocorrelation functions.

Gapped TVD is the process of deconvolution without total spectral whitening. This differs from Spike TVD which gives total spectral whitening. This means the frequency spectrum in gapped deconvolution will show that the high frequency noise area is not amplified

MIXING

This involves combining energy from adjacent trace of the same record. In a 2 on 1 MIX, traces are summed as follows:-

| Input trace | Output trace |
|---|---|
| 1 | |
| 2 | 1 |
| 3 | |
| 4 | 2 |
| etc. | etc. |

Some noise cancellation is achieved by mixing.

RESAMPLE

This process changes the input field sample period to a larger sample period, say 2ms to 4ms, for processing. Anti-alias filters are applied prior to the resampling.

## WIDE ANGLE WAVE EQUATION MIGRATION

Wide Angle Wave Equation Migration is the name given to G.S.I.'s Frequency-Wavenumber (F-K) domain method of wave equation migration. This F-K domain method offers several advantages over the previous conventional time domain methods of wave equation migration:-

- The ability to migrate correctly in the presence of lateral velocity variations.
- A practical dip limit closely approaching 90 degrees.
- No induced aliasing of flat data, even with a large trace interval.
- The ability to reduce the aliasing of dipping data.

The F-K migration process can be broken down into five main steps, as follows:

1. The input section is converted, in effect, to a depth section. (Strictly speaking, it is converted to a constant velocity section.)
2. The "depth" section is transformed into the F-K domain.

3. The data is migrated in the F-K domain. This procedure is illustrated in Fig.1. The energy from all events with the same dip on the "depth" section will fall on the same dip line on the F-K plane, and migration shifts that energy to a different dip line, by a movement parallel to the F-axis, as indicated in Fig. 1. Thus all dip lines on the F-K plane will move to new positions, except the zero dip line which falls along the F-axis.

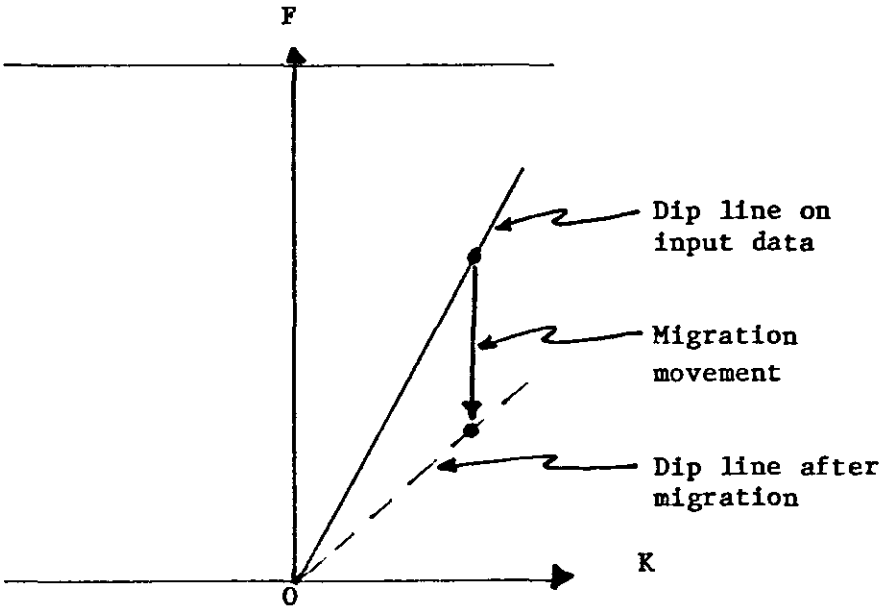
4. The migrated F-K plane data is inverse transformed back to the time domain. It is now in the form of a mgirated "depth" section.

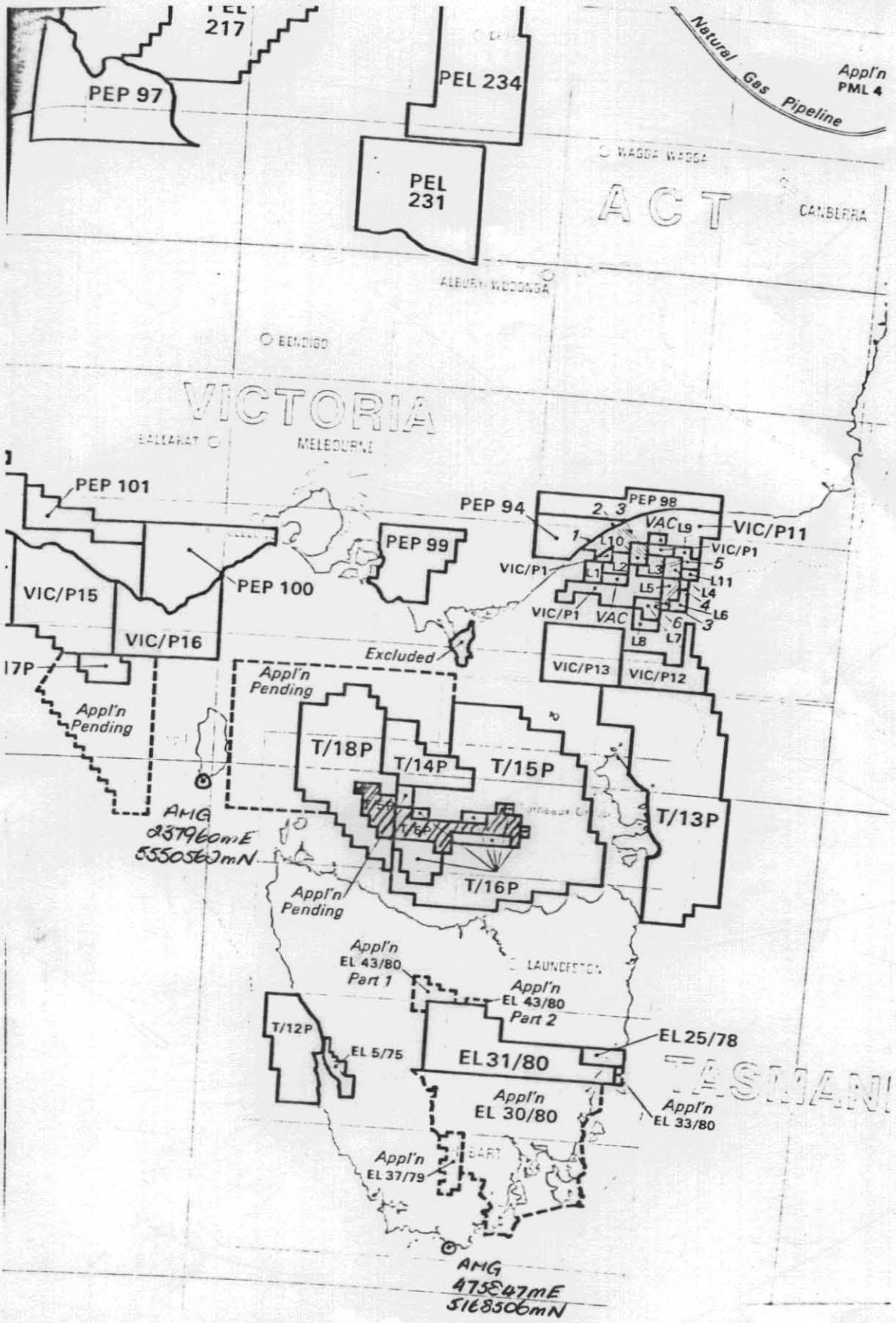
5. The migrated "depth" (constant velocity) section is now converted back to a time variant velocity field which is the migrated input velocity field.

For this last step, the input velocity field must be migrated independantly from the seismic data, and this requires that the manner in which the velocity field is specified must include a definition of the dips on the input data. This is accomplished by specifying the velocity field as time-velocity pairs which track structurally conformable events across the section.

Any migration process can only be as accurate as the velocity field used for the migration. However, the ability of this F-K migration process to correctly migrate in a laterally varying velocity field makes it more sensitive to errors in the input velocity field than the conventional time domain migration methods, and consequently a more detailed velocity interpretation is generally necessary before F-K migration.

## F-K DOMAIN MIGRATION






**AMG REFERENCE POINTS ADDED**

GSI-709

PLATE 1

PROCESSING FLOW CHART

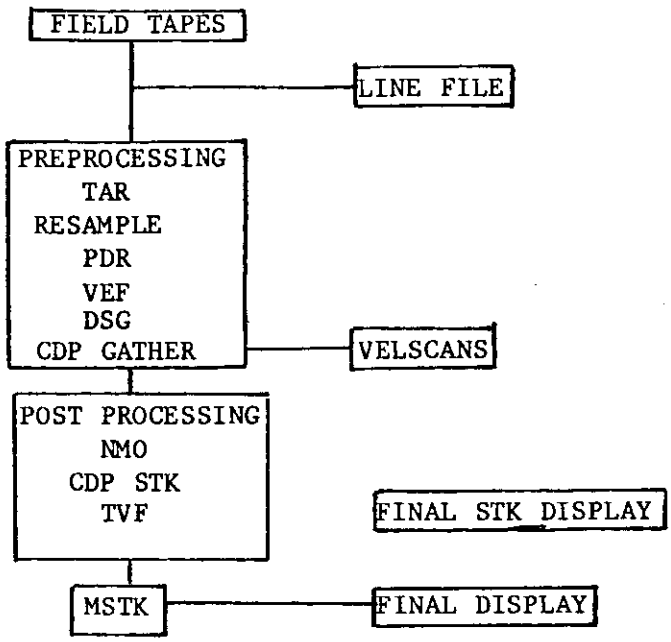



PLATE 2