MARINE SEISMIC SURVEY
GIPPSLAND BASIN
VIC P-12 & T 13 P

for

UNION TEXAS AUSTRALIA INC.
23RD LEVEL, 459 COLLINS STREET
MELBOURNE, VICTORIA 3000
AUSTRALIA

by

GEOPHYSICAL SERVICE INC.
47 Burswood Road
Victoria Park
PERTH WA 6100

PARTY 2931 M/V EUGENE MCDERMOTT II
RECORDING DATES: 15 March 1983 to 9 April 1983.

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GUT 83

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SECTION I

INTRODUCTION

A marine seismic survey was conducted by Geophysical Service Inc. using the M/V "Eugene McDermott II" in the Gippsland Basin, offshore Victoria, for Union Texas Australia Ltd. between the 14th March 1983 and the 9th of April 1983 inclusive.

The survey consisted of 1563.75 kilometres of 60 fold reflection coverage utilizing a 3600 metre streamer under continuous tow, in conjunction with a pneumatic acoustic energy source (airguns). Operations were generally conducted 24 hours a day.

Recordings were made using a 240 trace GSI Multiplex streamer in conjunction with a data aquisition unit, a supervisory terminal, a set of dual DFS V instruments with four 10 inch transports and a streamer power panel. Records were made on 12.7 mm magnetic tape in 9 track, 1600 B.P.I. SEG B digital format. (See section II - Instruments)

The ships location was determined by Argo Radio Positioning System. (See section II - SURVEY).

SECTION I

A. SURVEY VESSEL

M/V "Eugene McDermott II"

Flag	:	Panama
Homeport	:	Panama
Trade	:	Foreign Going
Owners	:	Geophysical Service Inc.
Call Sign	:	HO 9376
Length	:	52.73m
Breadth	:	12.19m
Draft	:	3.05 - 3.24m
Official Number	:	7062-PEXT-1
Gross Tonnage	:	929.89 tonnes
Nett Tonnage	:	249.09 tonnes
Main Engines	:	2 x 1125 HP (D399 CAT)
Electrical Power	:	2 x 250 KVA CAT "D"
Load Line	:	Lloyds Register

SECTION I

B. KEY PERSONNEL

Client Representative	:	Jack Schmitz
Party Manager	:	Larry Williams
Field Service Personnel	:	Mike Chen
		Paul Miller
		Colin Mann
Instrument Engineer	:	Trevor Rogers
System Operators	:	Mike Chen
		Roy Barrick
		Allan Welfare
		Bill Lloyd
Quality Controllers	:	Mike Wilson
		Bob George
Survey Operators	:	Trevor Rogers
		Jim Nash
		Tony Hoggart (O.N.I.)
Compressor Engineers	:	Mike Trigg
		Terry Hughes
Airgun Mechanics	:	Andy Temmen
		Bob Barnes
Master	:	Mike Gusterson
Boat Administrator	:	Bill Lee

SECTION II

A. INSTRUMENTS

A Texas Instruments Multiplex streamer along with associated onboard electronics, comprising a Data Acquisition unit, a supervisory terminal, Dual DFS V controller modules, 4 x 10" Tape Transports and a streamer power supply was used for Seismic Data Acquisition. All data was recorded in SEG B Tape Format at 1600 BPI.

Prior to commencement of the survey, on 4th March 1983, tape read and write skew tests, as recommended by Texas Instruments, were performed on all 4 transports by onboard GSI personnel.

Tapes recorded on each transport were frequently replayed on an alternate transport as a confirmation of readability. All data was recorded on Scotch brand, ½ inch magnetic tape.

Prior to any "sem" being deployed in the streamer, a set of tests is performed to ensure correct operation as defined by manufacturer's specifications. This procedure was implemented on each occasion a "sem" was replaced.

SECTION II

B. MULTIPLEX STREAMER THEORY OF OPERATION

Refer Plate 4

The Texas Instruments Multiplex streamer consists of four major "in water" elements, Live setion #1s, Live section #2s, streamer electronic modules and Repeater sections. Configured for 240 traces, the cable is comprised of 20 "clusters", each cluster handling a group of 12 separate traces. The three components making up a cluster are a Live 1, a Live 2 and a streamer electronic module, or "sem". The latter element is physically between a Live 1 and a Live 2. Each live section contains 6 separate 15 metre groups of 80 acceleration cancelling hydrophones wired in parallel.

Each Live 2 also contains a single hydrophone which is used as a waterbreak detector for offset determination. Data from the 6 traces in the live sections is passed to their associated sem where low cut filtering is applied (if necessary). The analog signals are then digitized, multiplexed and passed in serial phase to an optical signal and passes via a single optic fibre to the next cluster closest to the ship. The signal is reconverted to electrical in the sem end of that cluster's Live 2 for use in the sem. The use of fibre optics minimizes crossfeed, signal loss and "noise" pick up.

SECTION II

B. MULTIPLEX STREAMER THEORY OF OPERATION (contd.)

The sequence of data flow in the streamer begins at sem #1 (furthest from the ship) with each subsequent sem placing its "data block" behind the preceeding sems information. Therefore, data from sem #20 is the last to arrive at the ship. Each sem section also contains a depth transducer which, along with "gain words" for the seismic data make up an 18 word data block.

A repeater section is placed between each 100m stretch section at the frontend of the streamer for the purpose of retiming and resynchronising the optical data stream (a function which is also performed in each sem in the streamer). Both front and tail end stretches are placed in the streamer to attenuate streamer "jerk" and resulting noise bursts. The physical offset between the centre of the airgun array and the centre of the first group is determined by firing a single gun at or close to the array's centre and timing the return from the water break hydrophone located in sem #20's Live 2. Offset shot control and distance calculations are a function of the Mux streamer supervisory terminal in conjuction with a Texas Instruments 990 Computer. A manual check can also be performed using a "camera" record and a formula detailed on Plate 6.

All sampling of data in the streamer is performed at 1 millisecond and subsequent resampling at 2 or 4 milliseconds, anti-alias filtering and Quality Control checking is done in the onboard Data Acquisiton Unit and Supervisory Terminal.

SECTION II

B. MULTIPLEX STREAMER THEORY OF OPERATION (contd)

A set of dual DFS V controller modules (120 channels per module) handle SEG B formatting and recording of data on one of 4, 10 inch tape transports (120 channels per transport).

SECTION II

C. QUALITY ASSURANCE AND CONTROL

(i) Seismic Data

Whilst recording, seismic data is constantly monitored as it goes to tape using the DFS V's read after write capability. The digital data is converted to analog and monitored visually on a dual beam Cathode Ray Oscilliscope. Each beam displays every other trace (either odds or evens) of one half of the entire streamer. This provides the instrument operator with a means to detect any significant degradation in data quality, such as an increase in non-seismic noise levels.

A single trace servo-profiler also monitors one of the near traces (usually #237) and prints a graphic representation of seismic data being recorded. Every 50 shotpoints, 2 records are taken using a 64 trace oscillograph of "camera". These camera records provide a "hard copy" of data being displayed on the oscilliscope plus 4 auxillary channels including the DFS record number and the water break detector. Streamer depths are monitored along the length of the streamer at every sem section and are displayed on the supervisory terminal video display. Depth information is also passed to a TI990 computer controlled Streamer Tracking System (S.T.S.) which also displays the streamer depths on it's V.D.T. and passes the information to the CMS II for recording on tape at each shotpoint.

SECTION II

C. QUALITY ASSURANCE AND CONTROL

(i) Seismic Data (contd.)

The STS also provides the means for monitoring streamer heading information if digital compass sections are included in the streamer configuration. The CMS operator is alerted when any airgun fault occurs, e.g. an airgun self fire, misfire, or timing shift of any or all airguns in the array, via the TIGER aigun controller and the CMS error reporting and data logging systems. Any illegal change in DFS record or reel numbers are also monitored by the CMS as are missed shotpoints.

SECTION II

C. QUALITY ASSURANCE AND CONTROL

(ii) Navigation Data

A Texas Instruments Configurable Marine System (CMS II) is the heart of all navigation control and Quality Assurance. Real time navigaiton is achieved by compiling a fix position with range data supplied by the primary or secondary (if implemented) radio positioning systems. Data can be used from either 2 or 3 base stations depending on quality of signals and angles of incidence of the base stations provided.

The ship is steered by using a Houston Instruments DP1 track plotter on the Bridge which gives a graphic representation of distances both down and offline and shotpoint position and numbering. A second identical output trackplotter is situated in the Instrument Room for CMS operator monitoring.

The raw ranges of the radio positioning system(s) are recorded on one of two digi-data tape transports. The validity and reliability of navigation data is checked at a given interval (usually 5 mins) by performing a 3 way fix on stations being used, the results of which are both displayed on a video terminal and printed to the CMS Automatic Data log printer. Should any hardware error in the Nav system occur or if navigation signals become unstable the CMS operator is alerted via a comprehensive error reporting system and corrective action can be taken.

SECTION II

C. QUALITY ASSURANCE AND CONTROL

(ii) Navigation Data (contd.)

A backup system utilizing Magnavox 1107 Satellite receiver and the U.S. Navy Transit Satellite system interfaced to the CMS provides a comparison of position fixes with the Radio Navigation system for a further check on position accuracy.

A basline crossing can be performed on any Radio Navigaiton system interfaced to the CMS with ranges from both stations and observed baseline length being printed to the ADL terminal and printer at either a 10 second or a 1 minute interval. This CMS subprogram also provides the operator with a computed baseline length for comparison with the minimum observed distance.

SECTION II

D. INSTRUMENT DETAILS

Recording System	:	Dual DFS V, Serial Numbers System-1 1635, System-2 272
Tape Format	:	SEG B Phase Encoded, 1600 BPI
Header Constants	:	XXXXXXXXXX31
Tape Speed	:	98.12 ips
No. Bytes/Data Scan	:	314
No. words/Header (+ 16 from the Extender Header)	:	138
Channels (on tape)	:	240 (120 per system) Timing Word - Aux. Ch. 1 T/B Lengthened - Aux. Ch. 2
*Polarity	:	+ve pressure on Hydrophones produces a +ve number on tape and a downbreak on camera records.
Gain Control Mode	:	I.F.P.
Sample Period	:	2 m/seconds
Record Length	:	6 to 7 seconds
Recording Delay	:	0 seconds
Gain Constants	:	18 db
Final Gain	:	102 db
Dynamic Range	:	84 db (referred to input noise)
Filters - high cut	:	128 Hz at 72 db
- low cut	:	8 Hz at 18 db

SECTION II

D. INSTRUMENT DETAILS (contd.)

Header Constant Format

X Denotes a Variable

Digits 1 to 6	:	Field Tape Identification
Digit 7	:	Indicates whether the line has been attempted previously. 0 denotes that it is the first attempt, 1 denotes the second attempt etc.
Digits 8 to 10	:	Line Identification
Digits 11 and 12	:	Party Identification

SECTION II

E. ANCILLARY EQUIPMENT

Servo Profiler

Manufacturer	:	E.P.C. LABS
Model	:	4600
Serial Number	:	371
Source	:	Trace Number 237
Record Length	:	4 seconds
Gain Mode (DFS V)	:	P.G.C.
Filters	:	Production Filters

Comments :

The Servo Profiler gave clear recordings continuously during the shooting. Where structure led to a reduction in later returns, the profilers gain was increased accordingly and the change noted on the display.

SECTION II

E. ANCILLARY EQUIPMENT (contd.)

Fathometer

Manufacturer	:	Simrad
Model	:	EA
Conversion Frequency	:	1478 msec
Transducer position in relation to navigation antenna	:	FWD 16.7m (satellite) FWD 6.6m (syledis)
Instument correction for draft	:	3.4m
Calibrated	:	January 14, 1983

The Fathometer data was collected on both analog chart and CMS navigation tape.

Because of widely varying water depths the fathometer's scale was changed during most lines, at these times the shotpoint and new scale was marked on the chart display.

During Line GUT 83A-03 the Fathometer's stylus holder parted from the drive belt, while repairs were effected approximately 100 shotpoints of fathometer data was not recorded on the analog chart however, the depths were written to the CMS tape as usual.

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SECTION II

E. ANCILLARY EQUIPMENT (contd.)

Camera

Manufacturer	:	S.I.E.
Model	:	ERC-10C
Number of channels	:	64 (4 aux used)
Polarity	:	G.S.I. normal, positive pressure downbreak

Camera records display sixty data and three auxilliary traces at any one time, these are marked as either box 1, 2, 3 or 4.

BOX 1 records display traces 1 to 119, odd channels only.
BOX 2 records display traces 2 to 120, even channels only.
BOX 3 records display traces 121 to 239, odd channels only.
BOX 4 records display traces 122 to 240, even channels only.

During Line GUT 83A-59 the fluid pump failed on the camera, the problem was traced to the brushes on the top of the pump, these were cleaned and the pump was operational again. Four camera closures were missed during this period.

At the beginning of Line GUT 83A-03 timing lines were not visible on the camera records, a troubleshoot revealed that the problem lay in the crystal oscillator clock card. The card was replaced with a spare and the camera resumed normal operation. Only two closures were missed during the repairs which was well within the maximum specified.

SECTION II

E. ANCILLARY EQUIPMENT (contd.)

Magnetometer

Manufacturer	:	Geometrics
Type	:	Airborne Proton
Model Number	:	G803
Distance from Stern to Sensor	:	270m
Sensitivity	:	0.1 gamma resolution.

SECTION II

F. STREAMER DETAILS

Length, centre to centre	:	3585 Metres
Group Interval	:	15 Metres
Live Section Length	:	89 Metres
Sem Section Length	:	2 Metres
Repeater Section Length	:	7.8 Metres
Number of Hydrophones/Group	:	80
Hydrophone Interval	:	0.185 Metres
Hydrophone Type	:	T.I. - A.C.R.
Number of Stretch Sections		
Front End	:	2
Tail End	:	2
Skin Type	:	Tropical
Location of Depth Transducers	:	In all Sems
Location of Depth Controllers on Groups	:	7, 31, 55, 79, 103, 151, 175, 199, 223, 235.
Location of Waterbreaks	:	Live-2 Cluster 20 Live-2 Cluster 19
Near Group	:	Trace 240
Streamer Sensitivity	:	8.2 mv/mbar

SECTION II

G. STREAMER

A G.S.I. manufactured, 3600m multiplex streamer was utilised during this prospect. The streamer consisted of 20 clusters which are formed by one Streamer Electronics Module (SEM) between two live sections. Each live section consisted of six, 15m groups which contained 80 acceleration cancelling hydrophones in parallel. Generally there were 2 nylon stretch sections located between group 240 and the vessel. These were used to attenuate the ship's generated noise. There were also 2 stretch sections connected between group one and the tail buoy these were used to attenuate tail bouy "jerk" noise. These stretch sections were connected to the tail buoy by 250m of nylon rope.

A pressure transducer is located in the rear portion of each SEM section for depth sensing. This capability was used in all 20 SEMS (except those in clusters 3 and 5 as it was necessary to plug the ports to stop sea water entering through small leaks) for a continuous monitor of the streamers depth along its total length. The transducers were calibrated to the required depth of 12m as the streamer was deployed.

Each Live-2 section contains a single hydrophone which is used as a waterbreak detector. The time measurement for the returns from the waterbreak detector in clusters 19 and 20 were recorded on CMS tape and printer logs. On a command from the mux system operator the mux streamer offset sensor fired a single arigun located near the centre of the array immediately before the start of each line.

SECTION II

G. STREAMER (contd.)

The mux measured the arrival time of this shot at the two near water breaks and used the results to calculate the streamer offset.

The streamer offset would change during the line by +/- several metres as a result of the varying sea states and currents which caused slight variations in the stretched length of the stretch sections. The offset during this survey varied between a maximum of 206 to a minimum of 199 metres.

The streamer depth control was maintained by proper ballasting and the use of individually addressable remote controlled "cole" depth levellers.

Streamer Discussion

An address fault was the main single cause of streamer down time during the survey. The cause of the problem was leakage in the address bus, this was brought about by salt water leaking into the tail stretch, in which the bus was terminated. Two attempts to prevent water from reaching the terminating plug were unsuccessful. When the streamer was retrieved for the third time because of the address problem the address bus was terminated in the far group, Live-2 section. After this there was no re-occurence of the problem.

On the 30th March a streamer ground fault caused the termination of Line GUT 83P-15. The streamer was retrieved up to the first Live section where it was observed that water had entered the Live and one front stretch.

SECTION II

G. Streamer Discussion (contd.)

A check on the fluid tank revealed that the fluid was contaminated with water, the fluid was pumped through a separater and used to refill the affected sections. The ground fault was cleared after this action and Line GUT 83P-15 was then completed.

On the 31st March just before the commencement of Line GUT 83P-24 traces 19 to 24 became intermittently dead, it was noted on the observers and QC logs whenever these traces were not within specifications. The onboard client representative decided to allow production to begin with six bad traces at the start of a new day as unusually favourable shooting conditions prevailed.

SECTION II

H. ENERGY SOURCE

An electro-pneumatic acoustic energy source known as AIRGUNS with PNU-CON (Pneumatic Conservation) chambers were used as the energy source during this survey. The airgun consists of an upper air chamber and a lower air chamber, connected by an air passage through a moveable shuttle. Another air passage links the upper chamber with the underside of the upper flange of the shuttle and this air passage is controlled by a solenoid valve. Air, at a pressure of 2000 P.S.I. (13.8 MPa) enters the upper chamber through its inlet forcing the shuttle closed. The shuttle is held firmly closed because the area of its upper flange is greater than the area of its lower flange. The main volume of air passes through the channel in the shuttle into the lower chamber. To fire the airgun, a command from the airgun control unit activates the solenoid and retracts a plunger, this permits air to pass through a port hole to the underside of the lower shuttle. This neutralises the downward pressure on the shuttle leaving only the upward pressure in the lower flange from the lower air chamber. The rapid expulsion of air creates the bubble and resultant pulse. The air bubble collapses in a manner similar to that caused by explosives except that its period is controlled and is placed in the desired seismic frequency band.

The PNU-CON chambers save a good deal of air in the chamber instead of releasing it all, as did standard airguns. The PNU-CON chamber was developed after a mathematical model revealed that the airgun produces maximum acoustic output long before all of its air escapes.

SECTION II

H. ENERGY SOURCE (contd.)

The PNU-CON gun drops from 2000 P.S.I. to about 1000 P.S.I. when fired instead of dropping all the way to 200 P.S.I. as do standard guns.

The energy source used by the "MCDERMOTT" was a tuned airgun array of 4075 cubic inches total capacity. The array was designed for deep penetration and good resolution. This array has a broadband frequency output that extends below the normal low frequency band for seismic energy sources.

Attached, Plates 5A, 5B and 5C are the diagrams showing airgun utilisation, spacing and displays of the amplitude and energy spectra of the 4075 cubic inch PNU-CON gun array.

The array includes three low pressure open ended air lines each side of the array so that the depth of the array could be monitored by means of static air pressure at all times. The array was ballasted with the use of plastic buoys to ride at 21 feet, +/- 3 feet.

TIGER, the Texas Instrument automatic airgun contoller, monitored the firing of each airgun in the array. Individual gun firing times were continuously controlled to give phasing within +/- one millisecond for maximum pulse amplitude and front to back ratio.

The TIGER also performed a quality control function, by indicating with individual gun L.E.D. displays, the status of a gun if it was not operating correctly, either self fire or no fire.

SECTION II

H. ENERGY SOURCE (contd.)

The airgun performance was logged on both the CMS navigation tape and printer log. The Tiger operates in conjuction with the CMS II system.

The airguns were maintained by G.S.I. personnel on line changes, so that throughout the survey the airgun array was up to specifications.

SECTION II

H. ENERGY SOURCE (contd.)

4075 CUBIC INCH AIR GUN ARRAY

Operating Volume	:	4075 Cubic Inches
Total Spare Volume	:	770 Cubic Inches
Operating Pressure	:	1950 - 2000 P.S.I.
Operating Depth	:	21 Feet +/- 3 Feet
Timing Control	:	TIGER
Firing Delay	:	51.2 mseconds
Compressors	:	3 NORWALK (2 in use)
		3 LE ROI (2 in use)
SETBACK		
(Distance from ARGO Antenna to centre of Array)	:	54.49 Metres
Distance from Stern to centre of array	:	30.3 Metres

SECTION II

I. SURVEY DETAILS

Primary System	:	ARGO
Type	:	Range Range
Survey Company	:	O.N.I.
Operating Frequency	:	1.620 MHz
Ship's Antenna Height	:	21.5 M (above sea level)
Antenna Location from Stern	:	24.12 M
Antenna Location from Centre Line	:	2.84 M
Secondary System	:	SYLEDIS
Type	:	Range Range
Survey Company	:	G.S.I.
Operating Frequency	:	427.0921 MHz
Ship's Antenna Height	:	21.5 M
Antenna Location from Stern	:	25.3 M
Antenna Location from Centre Line	:	0 M

Base Station Location

ARGO Base Stations

STATION NAME	LOCATION LAT/LONG
HODDINOTS	038 27 22.94 S 147 04 37.74 E
METUNG	037 52 19.58 S 147 51 01.44 E
POINT HICKS	037 48 11.46 S 149 16 22.80 E

SECTION II

Base Station Location (contd.)

SYLEDIS Base Stations

STATION NAME	LOCATION LAT/LONG
HODDINOTS	038 27 24.26 S 147 04 32.28 E
METUNG	037 52 18.99 S 147 51 02.16 E
POINT HICKS	037 48 11.74 S 149 16 24.42 E

Final Delta Values

STATION NAME	DELTA VALUE
HODDINOTS	0.46
METUNG	0.26
POINT HICKS	0.56

SECTION III

A. NAVIGATION DISCUSSION

The primary navigation system used during the survey was ARGO, a precise Range to Range system operated by O.N.I.

The Argo Mobile Monitor was interfaced to G.S.I.'s Configurable Marine System II (CMS II), via an O.N.I. Argo Interface.

The CMS II system consisted of a Texas Instruments 980B computer and two Texas Instruments 990 computers, a System Co-ordinator, Tiger Airgun Controller, Satellite receiver, two Houston Instrument Trackplotters (one each in the instrument room and the Bridge) and two Digi-data, 800 B.P.I. ½ inch tape transports.

The CMS II function was survey control and navigation data recording. Shotpoint positioning was done in the "Distance" Mode with the CMS II triggering the DFS V instruments and also the Tiger Airgun Controller unit to fire the airguns at every 30 Metres of travel along the preplotted survey lines.

The CMS II Satellite Navigation System was utilised as an onboard Q.C. check of the Argo positioning. Also a Syledis Navigation System operated by G.S.I. was interfaced to the CMS for the purpose of calibrating the Argo and to keep an accurate check on the Argo lane counts. The Syledis and the Satellite Navigation data was also recorded on magnetic tape.

SECTION III

A. NAVIGATION DISCUSSION (contd.)

Prior to the McDermott reaching the prospect area, the Syledis equipment had been calibrated onshore to determine the delays for each station. These delays were converted to a static correction factor (in Metres) which was implemented in the CMS software and the Syledis delays were set to zero.

These static correction factors were set a -253 metres for all three Syledis base stations.

The accuracy of the Syledis navigation system was confirmed by base line crossings and three way fixes.

Once the accuracy of the Syledis Navigation System had been confirmed it was then used to calibrate the Argo Navigation System.

The Argo System was calibrated using the Syledis as the standard, and a set of Argo partials were calculated. The accuracy of the Argo was then checked in the same manner as the Syledis, using base line crossings and three way fixes. A comprehensive Argo calibration report is included with this report.

The Argo System performed well for the duration of the prospect. Due to the operating frequency of the Argo system, it is very susceptable to changes in the ionosphere. During the period from sundown to midnight the signals become unstable due to "Sky Wave" interference which is signals that have been refracted in the ionosphere and received at a later time than those travelling on the ground path.

SECTION III

A. NAVIGATION DISCUSSION (contd.)

On two occasions it was necessary to terminate lines due to the loss of accurate Argo ranges caused by the "sky wave" phenomina. As the prospect was located on the extreme edge of the Syledis operational range, the Syledis signals were generally very weak. In some instances it was necessary to navigate for short periods of time using the Syledis signals when the Argo was severly affected by sky waves and was unuseable. Whenever the water depth permitted, the sonar was implemented as the navigational velocity system during times of unstable Argo signals.

Overall, the navigation during this prospect was of a high standard with no extraordinary or major problems being encountered with the systems calibration or its operations.

SECTION III

A. NAVIGATION DISCUSSION (contd.)

Argo Calibration Report

Fixes were taken using 2 ranges of Syledis, Hoddinots and Metung. Three way fixes were not used due to the position of the boat either being in bad angles for the other station, or the range from Point Hicks was of such a distance that the range was drifting up and down. The position of the Syledis Antenna was then offset to the position of the Argo Antenna. By using inverse geodetic computations the ranges from the Mobile Argo to all Argo base stations were calculated. Ranges were then compared to the measured ranges and the difference being the delta values to add to the existing deltas in the Argo. With the first set of averages the whole calculated value was added, but with the second two sets of readings only half the value was added in order that the reading would not oscillate either side of the required delta ranges in the Argo.

On 4th March the first set of readings were taken while the vessel was off Lakes Entrance waiting for a boat to take the client off. The complete calculated averages were then added to the deltas already in the Argo System. Two sets of readings were then taken in different areas on the 5th March, one running towards the three way fix area and the second in a good three way fix area. For both sets of readings only half the calculated average delta value correction was added to the Argo System.

During the calibration period several problems were encountered with the Argo Mobile System, hence the reason calibration was spread over such a long period.

SECTION III

B. OPERATIONS DISCUSSION

This survey was conducted within two permit areas, lines in the Victorian Block (VIC P-12) were prefixed 83A and lines in the Tasmanian Block were prefixed 83P. As the CMS will only accept a numerical line identification, and as several line numbers in the Victorian Block were the same as those in Tasmanian Block, all Tasmanian Block lines were prefixed with a "9" on the CMS magnetic tape only. For example Line GUT 83P-17 will have 917 as its identification number.

Weather conditions throughout the survey varied from mild to rough, and on several occasions it was necessary to sail for Flinders Island to seek shelter. On 5th April a cold front moved across the strait bringing unfavourable shooting conditions. The streamer was reeled onboard and the vessel proceeded north of the prospect area to cross baselines. Production commenced again on the 8th April.

On the 1st April during Line GUT 83A-04, magnetometer data became excessively noisy. The problem was caused by moisture entering the cable connection between the instrument room and magnetometer reel. The connector was replaced and good readings were obtained once more. There is no chargeable magnetometer data for lines GUT 83A-04, 04A, 06 and 89. Also magnetometer data was not recorded during Line GUT 83A-02 as a ground wire came loose in the connection.

SECTION III

B. OPERATIONS DISCUSSION (contd.)

Due to the greatly varying water depths it was necessary to change the DFS record length during several lines so as to record at least five seconds of data below the sea floor. All changes in record length are clearly marked on the appropriate observers logs.

Please note that due to the Mux System hardware, a positive pressure on the hydrophones produces a positive number on tape. This is contrary to prior SEG B format protocol.

SECTION III

C. STATISTICS

First Recording Day	:	15th March 1983
Last Recording Day	:	9th April 1983
Number of Lines	:	84
Number of Kilometres	:	1563.75
Number of Shotpoints	:	52125
Average Kilometres per Recording Day	:	60.144
Seismic Data Processed at	:	Geophysical Service Inc. 6-10 Talavera Road, North Ryde, Sydney, N.S.W. 2113.
Navigation Data Processed at	:	WESCOM 514 Stirling Hwy, Peppermint Grove, Western Australia 6011.

SECTION III

D. PERMITTING

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

SECTION III

E. PRODUCTION DETAILS

SHIPMENT NO. 2931-PERTH-09-83

DATE	LINE GUT-83A	SHOTPOINT RANGE	CHARGEABLE RANGE	KMS	LINE STATUS
MAR	81	1001-1291	1001-1291	08.73	COMPLETE
15	28	1001-1811	1001-1811	24.33	COMPLETE
	37	1001-1086	NIL	NIL	T. B. R.
	37A	1001-1793	1001-1793	23.79	COMPLETE
16	39	1001-1700	1001-1700	21.00	COMPLETE
	43	1001-1126	NIL	NIL	T. B. R.
	43A	1001-1229	1001-1229	06.87	T. B. C.
	31	1001-1561	1001-1561	16.83	COMPLETE
	29	1001-1800	1001-1800	24.00	COMPLETE
17	33	1001-1900	1001-1900	27.00	COMPLETE
	35	1001-2016	1001-2016	30.48	COMPLETE
	43B	1096-1606	1096-1606	11.31	COMPLETE
	45	1001-1187	1001-1187	05.61	COMPLETE
	41	1001-1241	1001-1241	07.23	COMPLETE
18	49	1001-1949	1001-1949	28.47	COMPLETE
	51	1001-1841	1001-1841	25.23	COMPLETE
	57	1001-1769	1001-1769	23.07	COMPLETE
	53	1001-1411	1001-1411	12.33	COMPLETE
	55	1001-1730	1001-1730	21.90	M. S. P.
19	55	1731-2426	1731-2426	20.88	COMPLETE
	69	1001-1791	1001-1791	23.73	COMPLETE
	59	1001-1221	1001-1221	06.63	COMPLETE
	61	1001-2009	1001-2009	30.27	COMPLETE
	63	1001-1891	1001-1891	26.73	COMPLETE
	40	1001-2281	1001-2281	38.43	COMPLETE
	07	1001-1370	1001-1370	11.10	M. S. P.
20	07	1371-1660	1371-1660	08.70	COMPLETE
	05	1001-1390	1001-1390	11.70	COMPLETE
	03	1001-1421	1001-1421	12.63	COMPLETE
	54	1001-1909	1001-1909	27.27	COMPLETE
	58	1001-1471	1001-1471	14.13	COMPLETE
	09	1001-1390	1001-1390	11.70	COMPLETE
	46	1001-1361	1001-1361	10.83	COMPLETE
25	08	1001-1320	1001-1320	09.60	M. S. P.
26	08	1321-2164	1321-2164	25.32	COMPLETE
	10	1001-1088	NIL	NIL	T. B. R.
	10A	1001-1390	1001-1390	11.70	COMPLETE
	43	1001-1410	1001-1410	12.30	COMPLETE

DATE	LINE GUT-83P	SHOTPOINT RANGE	CHARGEABLE RANGE	KMS	LINE STATUS
MAR	17	1001-1262	1001-1262	07.86	T. B. C.
29	17A	1141-1701	1263-1701	13.17	COMPLETE
	25	1001-1489	1001-1489	14.67	COMPLETE
	18	1001-1084	NIL	NIL	T. B. R.
	18A	1001-1350	1001-1350	10.50	M. S. P.
30	18A	1351-1555	1351-1555	06.15	COMPLETE
	04A	1001-1241	1001-1241	07.23	COMPLETE
	05A	1001-1190	1001-1190	05.70	COMPLETE
	15	1001-1237	1001-1221	06.63	T. B. C.
	15A	1101-1510	1222-1510	08.67	COMPLETE
	21	1001-1740	1001-1740	22.20	COMPLETE
31	24	1001-1570	1001-1570	17.10	COMPLETE
	09	1001-1571	1001-1571	17.13	COMPLETE
	10	1001-1689	1001-1689	20.67	COMPLETE
	12	1001-1354	1001-1354	10.62	COMPLETE
	13	1001-1320	1001-1320	09.60	COMPLETE
	GUT-83A				
	26	1001-2173	1001-2173	35.19	COMPLETE
	24	1001-1850	1001-1850	25.50	M. S. P.
APR	24	1851-2080	1851-2080	06.90	COMPLETE
01	18	1001-2050	1001-2050	31.50	COMPLETE
	81A	1001-1370	1001-1370	11.10	COMPLETE
	79	1001-1411	1001-1411	12.33	COMPLETE
	77	1001-1490	1001-1490	14.70	COMPLETE
	75	1001-1831	1001-1831	24.93	COMPLETE
	91	1001-1640	1001-1640	19.20	COMPLETE
	04	1001-1112	NIL	NIL	T. B. R.
02	04A	1001-1501	1001-1501	15.03	COMPLETE
	06	1001-1470	1001-1470	14.10	COMPLETE
	89	1001-1572	1001-1572	17.16	COMPLETE
	87	1001-1570	1001-1570	17.10	COMPLETE
	85	1001-1601	1001-1601	18.03	COMPLETE
	83	1001-1590	1001-1590	17.70	COMPLETE
	62	1001-1389	1001-1389	11.67	COMPLETE
	14	1001-1760	1001-1760	22.80	M. S. P.
03	14	1761-1890	1761-1867	03.21	T. B. C.
	14A	1741-2296	1868-2296	12.87	COMPLETE
	12	1001-1785	1001-1785	23.55	INCOMPLETE
	16	1001-2050	1001-2050	31.50	COMPLETE
	30	1001-1611	1001-1611	18.33	COMPLETE
	73	1001-1320	1001-1320	09.60	COMPLETE
	25	1001-1851	1001-1851	25.53	COMPLETE
04	19	1001-1811	1001-1811	24.33	COMPLETE
	50	1001-2339	1001-2339	40.17	COMPLETE

DATE	LINE GUT-83P	SHOTPOINT RANGE	CHARGEABLE RANGE	KMS	LINE STATUS
APR	27	1001-1579	1001-1579	17.37	COMPLETE
04	26	1001-1339	1001-1339	10.17	COMPLETE
	20	1001-1330	1001-1261	07.83	T. B. C.
05	20A	1141-2020	1262-2020	22.77	COMPLETE
08	02	1001-1680	1001-1680	20.40	COMPLETE
	93	1001-1571	1001-1571	17.13	COMPLETE
	22	1001-1770	1001-1770	23.10	COMPLETE
	64	1001-1963	1001-1963	28.89	COMPLETE
	20	1001-1490	1001-1490	14.70	COMPLETE
	12A	1001-0692	1001-0692	09.27	COMPLETE
	08A	1301-1673	NIL	NIL	T. B. R.
09	08B	9001-9449	NIL	NIL	COMPLETE
	44	1001-1800	1001-1800	24.00	COMPLETE
	48	1001-2562	1001-2562	46.86	COMPLETE
	01	1001-1250	1001-1250	07.50	COMPLETE

TOTAL CHARGEABLE KMS = 1563.750

KEY

T. B. R. = TO BE RESHOT

T. B. C. = TO BE CONTINUED

M. S. P. = MIDNIGHT SHOTPOINT

F. FIELD TAPE LOG INVENTORY

DATE	TAPE NO.	LINE	SHOTPOINTS
15 MAR 83	704814	GUT83A-81	1001-1036
	704815		1037-1074
	704816		1075-1112
	704817		1113-1151
	704818		1153-1190
	704819		1191-1228
	704820		1229-1266
15 MAR 83	704821	GUT83A-81	1267-1291
15 MAR 83	704822	GUT83A-28	1001-1037
	704823		1038-1078
	704824		1070-1122
	704825		1123-1167
	704826		1168-1211
	704827		1212-1243
	704828		1244-1287
	704829		1288-1331
	704830		1332-1375
	704831		1376-1419
	704832		1420-1463
	704833		1464-1507
	704834		1508-1551
	704835		1552-1595
	704836		1596-1639
	704837		1640-1683
	704838		1684-1727
	704839		1728-1771
	704840		1771-1811
	704841		DO NOT PROCESS
	704842		DO NOT PROCESS
	704843		DO NOT PROCESS

DATE	TAPE NO.	LINE	SHOTPOINTS
15 MAR 83	703919	GUT83A-81	1001-1028
	703920		1029-1065
	703921		1066-1105
	703922		1106-1143
	703923		1-44-1181
	703924		1182-1219
	703925		1220-1257
15 MAR 83	703926	GUT83A-81	1258-1291
15 MAR 83	703927	GUT83A-28	1001-1026
	703928		1027-1065
	703929		1066-1109
	703930		1110-1153
	703931		1154-1197
	703932		1198-1228
	703933		1229-1272
	703934		1273-1316
	703935		1317-1360
	703936		1316-1404
	703937		1405-1448
	703938		1449-1492
	703939		1493-1536
	703940		1537-1580
	703941		1581-1624
	703942		1625-1668
	703943		1669-1712
	703944		1713-1756
	703945		1757-1790
	703946		1791-1811
	703947		DO NOT PROCESS
	703948		DO NOT PROCESS

DATE	TAPE NO.	LINE	SHOTPOINTS
15 MAR 83	703949	GUT83A-37A	1001-1044
	703950		1045-1088
	703951		1089-1132
	703952		1133-1176
	703953		1177-1220
	703954		1221-1264
	703955		1265-1308
	703956		1309-1352
	703957		1353-1396
	703958		1397-1440
	703959		1441-1484
	703960		1485-1528
	703961		1529-1572
	703962		1573-1616
	703963		1617-1660
	703964		1661-1704
	703965		1705-1748
	703966		1749-1780
	703967		1781-1793
16 MAR 83	703968	GUT83A-39	1001-1022
	703969		1023-1066
	703970		1067-1110
	703971		1111-1154
	703972		1155-1198
	703973		1199-1242
	703974		1243-1286
	703975		1287-1330
	703976		1331-1374
	703977		1375-1418
	703978		1419-1462

099045

DATE	TAPE NO.	LINE	SHOTPOINTS
15 MAR 83	704844	GUT83A-37A	1001-1020
	704845		1021-1064
	704846		1065-1108
	704847		1109-1152
	704848		1153-1196
	704849		1197-1240
	704850		1241-1284
	704851		1285-1328
	704852		1329-1372
	704853		1373-1416
	704854		1417-1460
	704855		1461-1504
	704856		1505-1548
	704857		1549-1592
	704858		1593-1636
	704859		1637-1680
	704860		1681-1724
	704861		1725-1768
	704862		1769-1793
16 MAR 83	704863	GUT83A-39	1001-1042
	704864		1043-1086
	704865		1087-1130
	704866		1131-1174
	704867		1175-1219
	704868		1220-1263
	704869		1264-1307
	704870		1308-1351
	704871		1352-1395
	704872		1396-1439
16 MAR 83	704873	GUT83A-39	1440-1483

DATE	TAPE NO.	LINE	SHOTPOINTS
16 MAR 83	703979	GUT83A-39	1463-1506
	703980		1507-1550
	703981		1551-1594
	703982		1595-1638
	703983		1639-1682
16 MAR 83	703984	GUT83A-39	1683-1700
16 MAR 83	703985	GUT83A-43	DO NOT PROCESS
	703986		DO NOT PROCESS
	703987		DO NOT PROCESS
16 MAR 83	672002	GUT83A-A3A	1001-1042
	672003		1043-1086
	672004		1087-1130
	672005		1131-1174
	672006		1175-1218
	672007		DO NOT PROCESS
16 MAR 83	672008	GUT83A-31	1001-1020
	672009		1021-1064
	672010		1065-1108
	672011		1109-1152
	672012		1152-1156
	672013		1157-1201
	672014		1204-1247
	672015		1248-1291
	672016		1292-1335
	672017		1336-1379
	672018		1380-1423
	672019		1424-1467
	672020		1468-1511
	672021		1512-1540
	672022		1541-1561

DATE	TAPE NO.	LINE	SHOTPOINTS
16 MAR 83	704874	GUT83A-39	1484-1527
	704875		1528-1571
	704876		1572-1615
	704877		1616-1659
16 MAR 83	704878	GUT83A-39	1660-1700
16 MAR 83	704879	GUT83A-43	DO NOT PROCESS
	704880		DO NOT PROCESS
	704881		DO NOT PROCESS
16 MAR 83	704882	GUT83A-43A	1001-1020
	704883		1021-1064
	704884		1065-1108
	704885		1109-1152
	704886		1153-1196
	704887		1197-1229
16 MAR 83	704888	GUT83A-31	1001-1042
	704889		1043-1086
	704890		1087-1130
	704891		1131-1174
	704892		1175-1218
	704893		1219-1263
	704894		1264-1307
	704895		1308-1351
	704896		1352-1395
	704897		1396-1439
	704898		1440-1483
	704899		1484-1527
16 MAR 83	704901	GUT83A-29	1001-1020
	704902		1021-1064
	704903		1065-1108

DATE	TAPE NO.	LINE	SHOTPOINTS
16 MAR 83	672023	GUT83A-29	1001-1042
	672024		1043-1086
	672025		1087-1130
	672026		1131-1174
	672027		1175-1218
	672028		1219-1262
	672029		1263-1306
	672030		1307-1350
	672031		1351-1394
	672032		1395-1438
	672033		1439-1482
	672034		1483-1526
	672035		1527-1570
	672036		1571-1614
	672037		1615-1658
	672038		1659-1702
	672039		1703-1746
	672040		1747-1790
	672041		1791-1800
17 MAR 83	672042	GUT83A-33	1001-1042
	672043		1043-1086
	672044		1087-1130
	672045		1131-1174
	672046		1175-1218
	672047		1219-1262
	672048		1263-1306
	672049		1307-1350
	672050		1351-1394
	672051		1395-1438
	672052		1439-1482

DATE	TAPE NO.	LINE	SHOTPOINTS
16 MAR 83	704904	GUT83A-29	1109-1152
	704905		1153-1196
	704906		1197-1240
	704907		1241-1284
	704908		1285-1328
	704909		1329-1372
	704910		1373-1416
	704911		1417-1460
	704912		1461-1504
	704913		1505-1548
	704914		1549-1592
	704915		1593-1636
	704916		1637-1680
	704917		1681-1725
	704918		1726-1769
	704919		1770-1800
17 MAR 83	704920	GUT83A-33	1001-1025
	704921		1026-1069
	704922		1070-1113
	704923		1114-1157
	704924		1158-1201
	704925		1202-1245
	704926		1246-1289
	704927		1290-1333
	704928		1334-1377
	704929		1378-1421
	704930		1422-1465
	704931		1466-1509
	704932		1510-1553
	704933		1554-1597

DATE	TAPE NO.	LINE	SHOTPOINTS
17 MAR 83	672053	GUT83A-33	1483-1626
	672054		1527-1570
	672055		1571-1614
	672056		1615-1658
	672057		1659-1702
	672058		1703-1746
	672059		1747-1790
	672060		1791-1834
	672061		1835-1878
17 MAR 83	672062	GUT83A-33	1878-1900
17 MAR 83	672063	GUT83A-35	1001-1020
	672064		1025-1032
	672065		1033-1064
	672066		1065-1107
	672067		1108-1151
	672068		1152-1195
	672069		1196-1239
	672070		1240-1283
	672071		1284-1327
	672072		1328-1371
	672073		1372-1415
	672074		1416-1459
	672075		1460-1504
	672076		1507-1550
	672077		1551-1595
	672078		1596-1639
	672079		1640-1683
	672080		1684-1727
	672081		1728-1771
	672082		1772-1815

DATE	TAPE NO.	LINE	SHOTPOINTS
17 MAR 83	704934	GUT83A-33	1598-1641
	704935		1642-1685
	704936		1686-1729
	704937		1730-1773
	704938		1774-1817
	704939		1818-1861
17 MAR 83	704940	GUT83A-33	1862-1900
17 MAR 83	704941	GUT83A-35	1001-1042
	704942		1043-1086
	704943		1087-1129
	704944		1130-1173
	704945		1174-1217
	704946		1218-1261
	704947		1262-1305
	704948		1306-1349
	704949		1350-1393
	704950		1394-1437
	704951		1438-1481
	704952		1482-1525
	704953		1526-1569
	704954		1570-1613
	704955		1614-1658
	704956		1659-1702
	704957		1703-1746
	704958		1747-1790
	704959		1791-1834
	704960		1835-1878
	704961		1879-1922
	704962		1923-1966
	704963		1967-2010

DATE	TAPE NO.	LINE	SHOTPOINTS
17 MAR 83	672083	GUT83A-35	1816-1859
	672084		1860-1903
	672085		1904-1947
	672086		1948-1991
	672087		1992-2016
17 MAR 83	672088	GUT83A-43B	1096-1137
	672089		1138-1181
	672090		1182-1225
	672091		1226-1269
	672092		1270-1313
	672093		1314-1357
	672094		1358-1401
	672095		2402-1445
	672096		1446-1489
	672097		1490-1533
	672098		1534-1577
	672099		1578-1600
17 MAR 83	672100	GUT83A-45	1001-1042
	672101		1043-1086
	672102		1087-1130
	672103		1131-1165
	672104		1166-1187
17 MAR 83	672105	GUT83A-41	1001-1020
	672106		1021-1064
	672107		1065-1108
	672108		1109-1152
	672109		1153-1196
	672110		1197-1233
	672111		1234-1241
18 MAR 83	672112	GUT83A-49	1001-1042

DATE	TAPE NO.	LINE	SHOTPOINTS
17 MAR 83	704964	GUT83A-35	2011-2016
17 MAR 83	704965	GUT83A-43B	1096-1115
	704966		1116-1159
	704967		1160-1203
	704968		1204-1247
	704969		1248-1291
	704970		1292-1335
	704971		1336-1379
	704972		1380-1423
	704973		1424-1467
	704974		1468-1510
	704975		1511-1545
	704976		1546-1598
	704977		1599-1606
17 MAR 83	704978	GUT83A-45	1001-1020
	704979		1021-1064
	704980		1065-1108
	704981		1109-1151
	704982		1152-1180
	704983		1181-1187
17 MAR 83	704984	GUT83A-41	1001-1142
	704985		1143-1086
	704986		1087-1130
	704987		1131-1174
	704988		1175-1218
	704989		1219-1241
18 MAR 83	377501	GUT83A-49	1001-1031
	377502		1032-1075
	377503		1076-1120
	377504		1121-1160

DATE	TAPE NO.	LINE	SHOTPOINTS
18 MAR 83	672113	GUT83A-49	1043-1086
	672114		1087-1130
	672115		1131-1174
	672116		1175-1218
	672117		1219-1262
	672118		1263-1306
	672119		1307-1350
	672120		1351-1394
	672121		1395-1438
	672122		1439-1482
	672123		1483-1526
	672124		1527-1570
	672125		1571-1614
	672126		1615-1658
	672127		1659-1702
	672128		1703-1746
	672129		1747-1790
	672130		1791-1834
	672131		1835-1878
	672132		1879-1922
	672133		1923-1949
18 MAR 83	672134	GUT83A-49	1923-1949
18 MAR 83	672134	GUT83A-51	1001-1042
	672135		1043-1086
	672136		1087-1130
	672137		1131-1174
	672138		1175-1218
	672139		1219-1262
	672140		1263-1306
	672141		1307-1350
	672142		1351-1394

DATE	TAPE NO.	LINE	SHOTPOINTS
18 MAR 83	377505	GUT83A-49	1161-1204
	377506		1205-1248
	377507		1249-1293
	377508		1294-1337
	377509		1338-1381
	377510		1382-1425
	377511		1426-1469
	377512		1470-1513
	377513		1514-1557
	377514		1558-1601
	377515		1602-1645
	377516		1646-1689
	377517		1690-1733
	377518		1734-1777
	377519		1778-1821
	377520		1822-1865
	377521		1866-1909
	377522		1910-1949
18 MAR 83	377523	GUT83A-51	1001-1026
	377524		1027-1070
	377525		1071-1115
	377526		1116-1159
	377527		1160-1203
	377528		1204-1247
	377529		1248-1291
	377530		1292-1335
	377531		1336-1380
	377532		1381-1424
	377533		1425-1468
	377534		1469-1512

DATE	TAPE NO.	LINE	SHOTPOINTS
18 MAR 83	672143	GUT83A-51	1395-1438
	672144		1439-1482
	672145		1483-1526
	672146		1527-1570
	672147		1571-1614
	672148		1615-1658
	672149		1659-1702
	672150		1703-1746
	672151		1747-1790
	672152		1791-1827
	672153		1828-1841
18 MAR 83	672154	GUT83A-57	1001-1042
	672155		1043-1086
	672156		1087-1130
	672157		1131-1174
	672158		1175-1218
	672159		1219-1262
	672160		1263-1306
	672161		1307-1350
	672162		1351-1394
	672163		1395-1438
	672164		1439-1482
	672165		1483-1526
	672166		1527-1570
	672167		1571-1614
	672168		1615-1658
	672169		1659-1702
	672170		1703-1746
	672171		1747-1769
18 MAR 83	672172	GUT83A-53	1001-1020

DATE	TAPE NO.	LINE	SHOTPOINTS
18 MAR 83	377535	GUT83A-51	1513-1556
	377536		1557-1600
	377537		1601-1644
	377538		1645-1688
	377539		1689-1732
	377540		1733-1776
	377541		1777-1821
	377542		1822-1841
18 MAR 83	377543	GUT83A-57	1001-1020
	377544		1021-1064
	377545		1065-1109
	377546		1110-1153
	377547		1154-1197
	377548		1198-1241
	377549		1242-1285
	377550		1286-1329
	377551		1330-1373
	377552		1374-1417
	377553		1418-1461
	377554		1462-1505
	377555		1506-1549
	377556		1550-1593
	377557		1594-1638
	377558		1639-1682
	377559		1683-1726
	377560		1727-1764
	377561		1765-1769
18 MAR 83	377562	GUT83A-53	1001-1042
	377563		1043-1086
	377564		1087-1130

DATE	TAPE NO.	LINE	SHOTPOINTS
18 MAR 83	672173	GUT83A-53	1021-1064
	672174		1065-1108
	672175		1109-1152
	672176		1153-1196
	672177		1197-1240
	672178		1241-1284
	672179		1285-1328
	672180		1329-1372
	672181		1373-1411
18 MAR 83	672182	GUT83A-55	1001-1020
	672183		1021-1064
	672184		1065-1108
	672185		1109-1152
	672186		1153-1196
	672187		1197-1240
	672188		1241-1284
	672189		1285-1328
	672190		1329-1372
	672191		1373-1416
	672192		1417-1460
	672193		1461-1504
	672194		1505-1548
	672195		1549-1592
	672196		1593-1635
	672197		1636-1679
	672198		1680-1723
	672199		1724-1767
	672200		1768-1811
	672201		1812-1855
	672202		1856-1899

DATE	TAPE NO.	LINE	SHOTPOINTS
18 MAR 83	377565	GUT83A-53	1131-1175
	377566		1176-1219
	377567		1220-1264
	377568		1265-1308
	377569		1304-1352
	377570		1353-1396
	377571		1397-1411
18 MAR 83	377572	GUT83A-55	1001-1042
	377573		1043-1086
	377574		1087-1130
	377575		1131-1174
	377576		1175-1218
	377577		1219-1262
	377578		1263-1306
	377579		1307-1351
	377580		1352-1395
	377581		1396-1439
	377582		1440-1483
	377583		1484-1527
	377584		1528-1570
	377585		1571-1614
	377586		1615-1658
	377587		1659-1702
	377588		1703-1746
	377589		1747-1790
	377590		1791-1834
	377591		1835-1879
	377592		1880-1923
	377593		1924-1967
	377594		1968-2010

DATE	TAPE NO.	LINE	SHOTPOINTS
19 MAR 83	672203	GUT83A-55	1900-1944
	672204		1946-1989
	672205		1990-2033
	672206		2034-2076
	672207		2077-2714
	672208		2115-2138
	672209		2141-2178
	672210		2179-2216
	672211		2220-2257
	672212		2258-2280
	672213		2281-2312
	672214		2313-1350
	672215		2315-1388
	672216		2389-2426
19 MAR 83	672217	GUT83A-69	1001-1037
	672218		1038-1075
	672219		1076-1113
	672220		1114-1151
	672221		1152-1189
	672222		1190-1227
	672223		1228-1252
	672224		1253-1282
	672225		1283-1326
	672226		1327-1368
	672227		1369-1412
	672228		1413-1456
	672229		1457-1500
	672230		1501-1544
	672231		1545-1588
	672232		1589-1632

DATE	TAPE NO.	LINE	SHOTPOINTS
19 MAR 83	377595	GUT83A-55	2011-2054
	377596		2055-2094
	377597		2095-2132
	377598		2133-2170
	377599		2171-2204
	377600		2205-2242
	377601		2243-2281
	377602		2283-2320
	377603		2321-2358
	377604		2359-2396
	377605		2397-2426
19 MAR 83	377606	GUT83A-69	1001-1022
	377607		1023-1061
	377608		1062-1099
	377609		1100-1137
	377610		1138-1172
	377611		1173-1210
	377612		1211-1249
	377613		NO DATA
	377614		1255-1298
	377615		1299-1342
	377616		1343-1386
	377617		1387-1431
	377618		1432-1475
	377619		1476-1519
	377620		1520-1563
	377621		1564-1608
	377622		1613-1656
	377623		1657-1700
	377624		1701-1744

DATE	TAPE NO.	LINE	SHOTPOINTS
19 MAR 83	672233	GUT83A-69	1633-1676
	672234		1677-1720
	672235		1721-1764
	672236		1765-1791
19 MAR 83	672237	GUT83A-59	1001-1042
	672238		1043-1086
	672239		1087-1130
	672240		1131-1174
	672241		-175-1210
19 MAR 83	672242	GUT83A-59	1211-1221
19 MAR 83	672243	GUT83A-61	1001-1042
	672244		1043-1086
	672245		1087-1130
	672246		1131-1174
	672247		1175-1218
	672248		1219-1262
	672249		1263-1306
	672250		1307-1350
	672251		1351-1394
	672252		1395-1438
	672253		1439-1482
	672254		1483-1526
	672255		1527-1570
	672256		1571-1614
	672257		1615-1658
	672258		1659-1700
	672259		1701-1738
	672260		1739-1776
	672261		1777-1814
	672262		1815-1853

DATE	TAPE NO.	LINE	SHOTPOINTS
19 MAR 83	377625	GUT83A-69	1745-1781
	377626		1782-1791
19 MAR 83	377627	GUT83A-59	1001-1023
	377628		1024-1067
	377629		1068-1112
	377630		1113-1156
	377631		1157-1190
	377632		1191-1221
19 MAR 83	377633	GUT83A-61	1001-1021
	377634		1022-1065
	377635		1066-1110
	377636		1111-1154
	377637		1155-1198
	377638		1199-1242
	377639		1243-1286
	377640		1287-1330
	377641		1331-1374
	377642		1375-1418
	377643		1419-1462
	377644		1463-1506
	377645		1507-1550
	377646		1551-1594
	377647		1595-1638
	377648		1639-1682
	377649		1683-1721
	377650		1723-1760
	377651		1761-1798
	377652		1799-1836
	377653		1837-1875
	377654		1876-1913

DATE	TAPE NO.	LINE	SHOTPOINTS
19 MAR 83	672263	GUT83A-61	1854-1891
	672264		1892-1929
	672265		1930-1967
	672266		1968-2005
	672267		2006-2008
19 MAR 83	672268	GUT83A-63	1001-1020
	672269		1021-1058
	672270		1059-1096
	672271		1097-1136
	672272		1137-1174
	672273		1175-1212
	672274		1213-1250
	672275		1251-1288
	672276		1289-1326
	672277		1327-1364
	672278		1365-1404
	672279		1405-1448
	672280		1449-1492
	672281		1493-1536
	672282		1537-1580
	672283		1581-1624
	672284		1625-1668
	672285		1669-1712
	672286		1713-1756
	672287		1757-1800
	672288		1801-1844
	672289		1845-1881
	672290		1882-1891
19 MAR 83	672291	GUT83A-40	1001-1042
	672292		1043-1086

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DATE	TAPE NO.	LINE	SHOTPOINTS
19 MAR 83	377655	GUT83A-61	1914-1951
	377656		1952-1988
	377657		1994-2009
19 MAR 83	377658	GUT83A-63	1001-1036
	377659		1037-1074
	377660		1075-1112
	377661		1113-1150
	377662		1151-1188
	377663		1189-1226
	377664		1227-1264
	377665		1265-1302
	377666		1303-1340
	377667		1341-1378
	377668		1379-1420
	377669		1421-1465
	377670		1466-1509
	377671		1510-1553
	377672		1554-1597
	377673		1598-1641
	377674		1642-1685
	377675		1685-1729
	377676		1730-1773
	377677		1774-1817
	377678		1818-1861
	377679		1862-1891
19 MAR 83	377680	GUT83A-40	1001-1020
	377681		1021-1065
	377682		1066-1108
	377683		1109-1152
	377684		1153-1196

DATE	TAPE NO.	LINE	SHOTPOINTS
19 MAR 83	672293	GUT83A-40	1087-1131
	672294		1132-1175
	672295		1176-1219
	672296		1220-1262
	672297		1263-1306
	672298		1307-1350
	672299		1351-1392
	672300		1393-1436
	672301		1437-1480
	672302		1481-1524
	672303		1525-1568
	672304		1569-1611
	672305		1612-1654
	672306		1659-1701
	672307		1702-1745
	672308		1746-1789
	672309		1790-1833
	672310		1834-1878
	672311		1880-1923
	672312		1924-1967
	672313		1968-2011
	672314		2012-2055
	672315		2056-2099
	672316		2100-2143
	672317		2144-2187
	672318		2188-2231
	672319		2232-2275
	672320		2276-2281
19 MAR 83	672321	GUT83A-07	1001-1020
	672322		1021-1064

DATE	TAPE NO.	LINE	SHOTPOINTS
19 MAR 83	377685	GUT83A-40	1197-1240
	377686		1245-1288
	377687		1289-1332
	377688		1333-1376
	377689		1377-1420
	377690		1421-1464
	377691		1465-1508
	377692		1509-1552
	377693		1553-1596
	377694		1597-1640
	377695		1641-1684
	377696		1685-1728
	377697		1729-1773
	377698		1774-1817
	377699		1818-1861
	377700		1862-1901
	377701		1902-1950
	377702		1951-1994
	377703		1995-2083
	377704		2039-2082
	377705		2083-2126
	377706		2127-2170
	377707		2171-2214
	377708		2215-2218
	377709		2222-2266
	377710		2267-2281
19 MAR 83	377711	GUT83A-07	1001-1042
	377712		1043-1086
	377713		1087-1131
	377314		1132-1175

DATE	TAPE NO.	LINE NO.	SHOTPOINTS
19 MAR 83	672323	GUT83A-07	1065-1108
	672324		1109-1152
	672325		1153-1196
	672326		1197-1240
	672327		1241-1284
	672328		1285-1328
	672329		1329-1372
	672330		1373-1416
20 MAR 83	672331		1417-1460
	672332		1461-1504
	672333		1505-1548
	672334		1549-1592
	672335		1593-1636
	672336	GUT83A-07	1637-1660
	672337	GUT83A-05	1001-1042
	672338		1043-1086
	672339		1087-1130
	672340		1131-1174
	672341		1175-1218
	672342		1219-1262
	672343		1263-1306
	672344		1307-1350
	672345	GUT83A-05	1351-1390
	672346	GUT83A-03	1001-1042
	672347		1043-1086
	672348		1087-1130
	672349		1131-1174
	672350		1175-1218
	672351		1219-1262
	672352		1263-1306

DATE	TAPE NO.	LINE NO.	SHOTPOINTS
19 MAR 83	377715	GUT83A-07	1176-1219
	377716		1220-1263
	377717		1264-1307
	377718		1308-1352
	377719		1353-1396
	377720		1397-1440
	377721		1441-1484
	377722		1485-1528
	377723		1529-1573
	377724		1574-1617
20 MAR 83	377725	GUT83A-07	1618-1660
	377726		1001-1025
	377727		1026-1070
	377728		1071-1114
	377729		1115-1158
	377730		1159-1202
	377731		1203-1241
	377732		1242-1285
	377733		1286-1330
	377734		1331-1374
	377735	GUT83A-05	1375-1390
	377736	GUT83A-03	1001-1025
	377737		1026-1069
	377738		1070-1113
	377739		1114-1158
	377740		1159-1202
	377741		1203-1241
	377742		1242-1285
	377743		1286-1329
	377744		1330-1373

DATE	TAPE NO.	LINE NO.	SHOTPOINTS
20 MAR 83	672353	GUT83A-03	1307-1349
	672354		1350-1393
	672355		1394-1421
	672356	GUT83A-54	1001-1042
	672357		1043-1086
	672358		1087-1130
	672359		1131-1174
	672360		1175-1218
	672361		1219-1262
	672362		1263-1306
	672363		1307-1350
	672364		1351-1394
	672365		1395-1419
	672366		1425-1467
	672367		1468-1511
	672368		1512-1555
	672369		1556-1599
	672370		1600-1643
	672371		1644-1687
	672372		1688-1731
	672373		1732-1775
	672374		1776-1819
	672375		1820-1863
	672376		1864-1894
	672377	GUT83A-54	1895-1909
	672378	GUT83A-58	1001-1042
	672379		1043-1086
	672380		1087-1130
	672381		1131-1174
	672382		1175-1218

DATE	TAPE NO.	LINE NO.	SHOTPOINTS
20 MAR 83	377745	GUT83A-03	1176-1418
	377746		1419-1421
	377747	GUT83A-54	1001-1024
	377748		1025-1068
	377749		1069-1113
	377750		1114-1157
	377751		1158-1202
	377752		1203-1241
	377753		1242-1286
	377754		1287-1330
	377755		1331-1375
	377756		1376-1419
	377757		1425-1460
	377758		1461-1496
	377759		1497-1540
	377760		1541-1584
	377761		1585-1628
	377762		1629-1672
	377763		1673-1716
	377764		1717-1761
	377765		1762-1805
	377766		1806-1849
	377767		1850-1880
	377768	GUT83A-54	1881-1909
	377769	GUT83A-58	1001-1020
	377770		1021-1064
	377771		1065-1108
	377772		1109-1152
	377773		1153-1197
	377774		1198-1241

DATE	TAPE NO.	LINE NO.	SHOTPOINTS
20 MAR 83	672383	GUT83A-58	1219-1262
	672384		1263-1306
	672385		1307-1350
	672386		1351-1394
	672387		1395-1439
	672388	GUT83A-58	1440-1471
	672389	GUT83A-09	1001-1040
	672390		1041-1084
	672391		1085-1128
	672392		1129-1172
	672393		1173-1216
	672394		1217-1260
	672395		1261-1304
	672396		1305-1348
	672397	GUT83A-09	1349-1390
	672398	GUT83A-46	1001-1042
	672399		1043-1087
	672400		1088-1130
	672401		1131-1174
	672402		1175-1218
	672403		1219-1262
	672404		1263-1306
	672405		1307-1350
	672406	GUT83A-46	1351-1361
	672407	GUT83A-08	1001-1020
	672408		1021-1058
	672409		1059-1095
	672410		1096-1133
	672411		1134-1170
	672412		1171-1208

DATE	TAPE NO.	LINE NO.	SHOTPOINTS
20 MAR 83	377775	GUT83A-58	1242-1285
	377776		1286-1329
	377777		1330-1374
	377778		1383-1427
	377779	GUT83A-58	1428-1471
	377780	GUT83A-09	1001-1020
	377781		1021-1065
	377782		1066-1109
	377783		1110-1154
	377784		1155-1198
	377785		1199-1243
	377786		1244-1287
	377787		1288-1331
	377788		1332-1364
	377789	GUT83A-09	1365-1390
	377790	GUT83A-46	1001-1020
	377791		1021-1064
	377792		1065-1083
	377793		1086-1114
	377794		1115-1154
	377795		1155-1198
	377796		1199-1242
	377797		1243-1286
	377798		1287-1330
	377799	GUT83A-46	1331-1361
25 MAR 83	377800	GUT83A-08	1001-1035
	377801		1036-1074
	377802		1075-1112
	377803		1113-1150
	377804		1151-1188

DATE	TAPE NO.	LINE NO.	SHOTPOINTS
25 MAR 83	672413	GUT83A-08	1209-1246
	672414		1247-1284
	672415		1285-1322
26 MAR 83	672416		1323-1360
	672417		1361-1398
	672418		1399-1436
	672419		1437-1474
	672420		1475-1512
	672421		1551-1588
	672422		1589-1626
	672424		1627-1664
	672425		1665-1702
	672426		1703-1740
	672427		1741-1778
	672428		1779-1816
	672429		1817-1854
	672430		1855-1896
	672431		1897-1940
	672432		1941-1984
	672433		1985-2028
	672434		2029-2072
	672435		2073-2116
	672436		2117-2154
	672437	GUT83A-08	2155-2164
	672438	GUT83A-10	DO NOT PROCESS
	672439		DO NOT PROCESS
	672440		DO NOT PROCESS
	672441	GUT83A-10A	1001-1042
	672442		1043-1086

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DATE	TAPE NO.	LINE NO.	SHOTPOINTS
25 MAR 83	377805	GUT83A-08	1189-1227
	377806		1229-1266
	377807		1267-1305
	377808		1306-1343
26 MAR 83	377809		1344-1381
	377810		1382-1419
	377811		1420-1457
	377812		1458-1495
	377813		1496-1533
	377814		1534-1571
	377815		1572-1609
	377816		1610-1647
	377817		1648-1685
	377818		1686-1723
	377819		1724-1761
	377820		1762-1799
	377821		1800-1837
	377822		1838-1877
	377823		1878-1921
	377824		1922-1965
	377825		1966-2009
	377826		2010-2053
	377827		2054-2097
	377828		2098-2141
	377829	GUT83A-08	2142-2164
	377830	GUT83A-10	DO NOT PROCESS
	377831		DO NOT PROCESS
	377832	GUT83A-10A	1001-1022
	377833		1023-1066
	377834		1068-1111

DATE	TAPE NO.	LINE NO.	SHOTPOINTS
26MAR 83	672443	GUT83A-10A	1087-1130
	672444		1131-1174
	672445		1175-1218
	672446		1219-1262
	672447		1263-1306
	672448		1307-1350
	672449	GUT83A-10A	1351-1390
	672450	GUT83A-34	1001-1037
	672451		1038-1075
	672452		1076-1113
	672453		1114-1151
	672454		1152-1189
	672455		1190-1227
	672456		1228-1265
	672457		1266-1303
	672458		1304-1341
	672459		1342-1379
	672460	GUT83A-34	1380-1410
29 MAR 83	672461	GUT83P-17	1001-1024
	672462		1025-1068
	672463		1069-1112
	672464		1113-1156
	672465		1157-1200
	672466	GUT83P-17	1245-1262
	672468	GUT83P-17A	1141-1161
	672469		1161-1205
	672470		1206-1249
	672471		1250-1293
	672472		1294-1337

DATE	TAPE NO.	LINE NO.	SHOTPOINTS
26 MAR 83	377835	GUT83A-10A	1112-1155
	377836		1156-1199
	377837		1200-1243
	377838		1244-1287
	377839		1288-1332
	377840		1333-1376
	377841	GUT83A-10A	1377-1390
	377842	GUT83A-34	1001-1022
	377843		1023-1060
	377844		1061-1098
	377845		1099-1136
	377846		1137-1174
	377847		1175-1212
	377848		1213-1250
	377849		1251-1288
	377850		1289-1326
	377851		1327-1364
	377852		1365-1393
	377853	GUT83A-34	1394-1410
29 MAR 83	377854	GUT83P-17	1001-1041
	377855		1042-1086
	377856		1087-1130
	377857		1131-1174
	377858		1175-1218
	377859	GUT83P-17	1219-1262
	377860	GUT83P-17A	1141-1182
	377861		1183-1227
	377862		1228-1271
	377863		1272-1315
	377864		1316-1359

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DATE	TAPE NO.	LINE NO.	SHOTPOINTS
29 MAR 83	672473	GUT83P-17A	1338-1381
	672474		1382-1425
	672475		1426-1469
	672476		1470-1513
	672477		1514-1557
	672478		1558-1601
	672479		1602-1645
	672480		1646-1689
	672481	E.O.L.	1690-1701
	672482	GUT83P-25	1001-1020
	672483		1021-1064
	672484		1065-1108
	672485		1109-1152
	672486		1153-1196
	672487		1197-1240
	672488		1241-1284
	672489		1285-1328
	672490		1329-1372
	672491		1373-1416
	672492		1417-1460
	672493	E.O.L.	1461-1489
	672494	GUT83P-18	1001-1020
	672495		1021-1064
	672496		1065-1084
	672497	GUT83P-18A	1001-1042
	672498		1043-1086
	672499		1087-1088
	672500		1191-1134
	672501		1135-1178
	672502		1179-1227

DATE	TAPE NO.	LINE NO.	SHOTPOINTS
29 MAR 83	377865	GUT83P-17A	1360-1404
	377866		1405-1448
	377867		1449-1492
	377868		1493-1536
	377869		1537-1581
	377870		1582-1625
	377871		1626-1670
	377872	E.O.L.	1671-1701
	377873	GUT83P-25	1001-1042
	377874		1043-1086
	377875		1087-1131
	377876		1132-1175
	377877		1176-1220
	377878		1221-1264
	377879		1265-1308
	377880		1309-1352
	377881		1353-1396
	377882		1397-1440
	377883		1441-1475
	377884	GUT83P-25	1476-1489
	377885	GUT83P-18	1001-1041
	377886		1042-1084
	377887	GUT83P-18A	1001-1020
	377888		1021-1064
	377889		1065-1108
	377890		1109-1152
	377891		1153-1196
	377892		1197-1240
	377893		1241-1284
	377894		1285-1328

DATE	TAPE NO.	LINE NO.	SHOTPOINTS
29 MAR 83	672503	GUT83P-18A	1223-1266
	672504		1267-1310
	672505		1311-1354
30 MAR 83	672506		1355-1398
	672507		1399-1442
	672508		1443-1486
	672509		1487-1530
	672510	GUT83P-18A	1531-1555
	672511	GUT83P-04A	1001-1041
	672512		1042-1085
	672513		1086-1129
	672514		1130-1173
	672515		1174-1214
	672516	GUT83P-04A	1215-1241
	672517	GUT83P-05A	1001-1042
	672518		1043-1086
	672519		1087-1130
	672520		1131-1170
	672521	GUT83P-05A	1171-1190
	672522	GUT83P-15	1001-1042
	672523		1043-1086
	672524		1087-1130
	672525		1131-1174
	672526		1175-1218
	672527		1219-1237
	672528	GUT83P-15A	1101-1142
	672529		1143-1186
	672530		1187-1230
	672531		1231-1274
	672532		1275-1318

DATE	TAPE NO.	LINE NO.	SHOTPOINTS
30 MAR 83	377895	GUT83P-18A	1329-1372
	377896		1373-1416
	377897		1417-1460
	377898		1461-1504
	377899		1505-1549
	377900	GUT83P-18A	1550-1555
	377901	GUT83P-04A	1001-1023
	377902		1024-1067
	377903		1068-1111
	377904		1112-1154
	377905		1155-1197
	377906	GUT83P-04A	1198-1241
	377907	GUT83P-05A	1001-1024
	377908		1025-1068
	377909		1069-1112
	377910		1113-1156
	377911	GUT83P-05A	1157-1190
	377912	GUT83P-15	1001-1022
	377913		1023-1067
	377914		1068-1111
	377915		1112-1155
	377916		1156-1199
	377917		1200-1237
	377918	GUT83P-15A	1101-1123
	377919		1124-1167
	377920		1168-1211
	377921		1212-1255
	377922		1256-1299
	377923		1300-1343
	377924		1344-1387

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DATE	TAPE NO.	LINE NO.	SHOTPOINTS
30 MAR 83	672533	GUT83P-15A	1319-1362
	672534		1363-1406
	672535		1407-1450
	672536		1451-1494
	672537	GUT83P-15A	1495-1510
	672538	GUT83P-21	1001-1020
	672539		1021-1064
	672540		1065-1108
	672541		1109-1152
	672542		1153-1196
	672543		1197-1240
	672544		1241-1284
	672545		1285-1328
	672546		1329-1372
	672547		1373-1416
	672548		1417-1460
	672549		1461-1504
	672550		1505-1548
	672551		1549-1592
	672552		1593-1636
	672553		1637-1680
	672554		1681-1720
	672555	E.O.L.	1721-1740
31 MAR 83	672556	GUT83P-24	1001-1042
	672557		1043-1086
	672558		1087-1130
	672559		1131-1174
	672560		1175-1218
	672561		1219-1262
	672562		1263-1306

DATE	TAPE NO.	LINE NO.	SHOTPOINTS
30 MAR 83	377925	GUT83P-15A	1388-1432
	377926		1433-1476
	377927	GUT83P-15A	1477-1510
	377928	GUT83P-21	1001-1042
	377929		1043-1086
	377930		1087-1130
	377931		1131-1174
	377932		1175-1218
	377933		1219-1262
	377934		1263-1306
	377935		1307-1350
	377936		1351-1394
	377937		1395-1438
	377938		1439-1482
	377939		1483-1526
	377940		1527-1570
	377941		1571-1615
	377942		1616-1659
	377943		1660-1702
	377944	GUT83P-21	1703-1740
31 MAR 83	377945	GUT83P-24	1001-1024
	377946		1025-1068
	377947		1069-1113
	377948		1114-1157
	377949		1158-1202
	377950		1203-1246
	377951		1247-1291
	377952		1292-1335
	377953		1336-1380
	377954		1381-1424

DATE	TAPE NO.	LINE NO.	SHOTPOINTS
31 MAR 83	672563	GUT83P-24	1307-1350
	672564		1351-1394
	672565		1395-1438
	672566		1439-1480
	672567		1481-1518
	672568		1519-1556
	672569	GUT83P-24	1557-1570
	672570	GUT83P-09	1001-1037
	672571		1038-1081
	672572		1082-1125
	672573		1126-1169
	672574		1170-1213
	672575		1214-1257
	672576		1258-1301
	672577		1302-1345
	672578		1346-1389
	672579		1390-1433
	672580		1434-1477
	672581		1478-1521
	672582		1522-1565
	672583	E.O.L.	1566-1571
	672584	GUT83P-10	1001-1042
	672585		1043-1086
	672586		1087-1130
	672587		1131-1174
	672588		1175-1218
	672589		1219-1262
	672590		1263-1306
	672591		1307-1350
	672592		1351-1394

DATE	TAPE NO.	LINE NO.	SHOTPOINTS
31 MAR 83	377955	GUT83P-24	1425-1469
	377956		1470-1507
	377957		1508-1544
	377958	GUT83P-24	1545-1570
	377959	GUT83P-09	1001-1022
	377960		1023-1065
	377961		1066-1109
	377962		1110-1153
	377963		1154-1197
	377964		1198-1241
	377965		1242-1284
	377966		1285-1327
	377967		1328-1371
	377968		1372-1414
	377969		1415-1459
	377970		1460-1503
	377971		1504-1548
	377972	GUT83P-09	1549-1571
	377973	GUT83P-10	1001-1022
	377974		1023-1066
	377975		1067-1111
	377976		1112-1155
	377977		1156-1199
	377978		1200-1243
	377979		1244-1287
	377980		1288-1331
	377981		1332-1375
	377982		1376-1419
	377983		1420-1463
	377984		1464-1507

DATE	TAPE NO.	LINE NO.	SHOTPOINTS
31 MAR 83	672593	GUT83P-10	1395-1438
	672594		1439-1482
	672595		1483-1526
	672596		1527-1570
	672597		1571-1614
	672598		1615-1653
	672599	GUT83P-10	1654-1689
	672600	GUT83P-12	1001-1042
	672601		1043-1086
	672602		1087-1130
	672603		1131-1174
	672604		1175-1218
	672605		1219-1262
	672606		1263-1310
	672607	GUT83P-12	1311-1354
	672608	GUT83P-13	1001-1020
	672609		1021-1064
	672610		1065-1108
	672611		1109-1152
	672612		1153-1194
	672613		1196-1237
	672614		1234-1271
	672615		1272-1309
	672616	GUT83P-13	1310-1320
	672617	GUT83A-26	1001-1037
	672618		1038-1077
	672619		1078-1121
	672620		1122-1165
	672621		1166-1209
	672622		1210-1253

DATE	TAPE NO.	LINE NO.	SHOTPOINTS
31 MAR 83	377985	GUT83P-10	1508-1551
	377986		1552-1595
	377987		1596-1637
	377988		1638-1670
	377989	GUT83P-10	1671-1689
	377990	GUT83P-12	1001-1023
	377981		1024-1067
	377982		1068-1111
	377993		1112-1155
	377994		1156-1199
	377995		1200-1243
	377996		1244-1287
	377997		1288-1331
	377998	GUT83P-12	1332-1354
	377999	GUT83P-13	1001-1041
	378000		1042-1085
	378001		1086-1129
	378002		1130-1173
	378003		1174-1214
	378004		1215-1252
	378005		1253-1290
	378006	GUT83P-13	1291-1320
	378007	GUT83A-26	1001-1020
	378008		1021-1059
	378009		1060-1102
	378010		1103-1146
	378011		1147-1190
	378012		1191-1234
	378013		1235-1278
	378014		1279-1322

DATE	TAPE NO.	LINE NO.	SHOTPOINTS
31 MAR 83	672623	GUT83A-26	1254-1297
	672624		1298-1341
	672625		1342-1385
	672626		1386-1429
	672627		1430-1473
	672628		1474-1517
	672629		1518-1561
	672630		1562-1605
	672631		1606-1649
	672632		1650-1693
	672633		1694-1737
	672634		1738-1781
	672635		1782-1825
	672636		1826-1869
	672637		1870-1913
	672638		1914-1957
	672639		1958-2001
	672640		2002-2045
	672641		2046-2089
	672642		2090-2133
	672643	GUT83A-26	2134-2173
	672644	GUT83A-24	1001-1020
	672645		1021-1064
	672646		1065-1108
	672647		1109-1152
	672648		1153-1196
	672649		1197-1240
	672650		1241-1284
	672651		1285-1328
	672652		1329-1372

DATE	TAPE NO.	LINE NO.	SHOTPOINTS
31 MAR 83	378015	GUT83A-26	1323-1366
	378016		1367-1410
	378017		1411-1454
	378018		1455-1498
	378019		1499-1542
	378020		1543-1586
	378021		1587-1631
	378022		1632-1675
	378023		1676-1719
	378024		1720-1763
	378025		1764-1807
	378026		1808-1851
	378027		1852-1895
	378028		1846-1939
	378029		1940-1983
	378030		1984-2027
	378031		2028-2071
	378032		2072-2115
	378033		2116-2160
	378034	GUT83A-26	2161-2173
	378035	GUT83A-24	1001-1042
	378036		1043-1086
	378037		1087-1130
	378038		1131-1174
	378039		1175-1219
	378040		1220-1263
	378041		1264-1307
	378042		1308-1351
	378043		1352-1395
	378044		1396-1439

DATE	TAPE NO.	LINE NO.	SHOTPOINTS
31 MAR 83	672653	GUT83A-24	1373-1416
	672654		1417-1460
	672655		1461-1504
	672656		1505-1548
	672657		1549-1592
	672658		1593-1636
	672659		1637-1680
	672660		1681-1724
	672661		1725-1768
	672662		1769-1812
	672663		1813-1856
01 APR 83	672664		1857-1900
	672665		1901-1944
	672666		1945-1988
	672667		1989-2029
	672668		2030-2060
	672669	GUT83A-24	2061-2080
	672670	GUT83A-18	1001-1037
	672671		1038-1075
	672672		1076-1113
	672673		1114-1153
	672674		1155-1192
	672675		1193-1236
	672676		1237-1280
	672677		1281-1324
	672678		1325-1368
	672679		1369-1412
	672680		1413-1456
	672681		1457-1499
	672682		1500-1543

DATE	TAPE NO.	LINE NO.	SHOTPOINTS
31 MAR 83	378045	GUT83A-24	1440-1483
	378046		1484-1527
	378047		1528-1571
	378048		1572-1615
	378049		1616-1659
	378050		1660-1703
	378051		1704-1747
	378052		1748-1791
	378053		1792-1835
01 APR 83	378054		1836-1879
	378055		1880-1923
	378056		1924-1967
	378057		1968-2011
	378058		2012-2049
	378059	GUT83A-24	2050-2080
	378060	GUT83A-18	1001-1025
	378061		1026-1063
	378062		1064-1099
	378063		1100-1138
	378064		1139-1176
	378065		1177-1218
	378066		1219-1261
	378067		1262-1305
	378068		1306-1348
	378069		1349-1393
	378070		1394-1437
	378071		1438-1482
	378072		1483-1526
	378073		1527-1570
	378074		1571-1614

DATE	TAPE NO.	LINE NO.	SHOTPOINTS
01 APR 83	672683	GUT83A-18	1544-1587
	672684		1588-1631
	672685		1632-1675
	672686		1676-1719
	672687		1720-1763
	672688		1764-1807
	672689		1808-1851
	672690		1852-1895
	672691		1896-1939
	672692		1940-1983
	672693		1984-2027
	672694	GUT83A-18	2028-2050
	672695	GUT83A-81A	1001-1042
	672696		1043-1086
	672697		1087-1130
	672698		1131-1174
	672699		1175-1218
	672700		1219-1257
	672701		1259-1296
	672702		1297-1332
	672703	GUT83A-81A	1333-1370
	672704	GUT83A-79	1001-1037
	672705		1038-1075
	672706		1076-1113
	672707		1114-1151
	672708		1152-1195
	672709		1196-1239
	672710		1240-1283
	672711		1284-1327
	672712		1328-1371

DATE	TAPE NO.	LINE NO.	SHOTPOINTS
01 APR 83	378075	GUT83A-18	1615-1659
	378076		1660-1703
	378077		1704-1747
	378078		1748-1791
	378079		1792-1834
	378080		1835-1877
	378081		1878-1920
	378082		1921-1964
	378083		1965-2008
	378084	GUT83A-18	2009-2050
	378085	GUT83A-81A	1001-1022
	378086		1023-1066
	378087		1067-1110
	378088		1111-1154
	378089		1155-1199
	378090		1200-1241
	378091		1242-1280
	378092		1281-1318
	378093		1319-1356
	378094	GUT83A-81A	1357-1370
	378095	GUT83A-79	1001-1018
	378096		1019-1056
	378097		1057-1095
	378098		1096-1133
	378099		1134-1174
	378100		1175-1218
	378101		1219-1263
	378102		1264-1307
	378103		1308-1352
	378104		1353-1390

DATE	TAPE NO.	LINE NO.	SHOTPOINTS
01 APR 83	672713	GUT83A-79	1372-1411
	672714	GUT83A-77	1001-1042
	672715		1043-1086
	672716		1087-1130
	672717		1131-1174
	672718		1175-1218
	672719		1219-1262
	672720		1263-1306
	672721		1308-1345
	672722		1346-1383
	672723		1384-1421
	672724		1422-1459
	672725		1460-1489
	672726	GUT83A-75	1001-1036
	672727		1037-1074
	672728		1075-1112
	672729		1113-1151
	672730		1152-1190
	672731		1191-1234
	672732		1235-1278
	672733		1279-1322
	672734		1323-1366
	672735		1367-1410
	672736		1411-1454
	672737		1455-1498
	672738		1499-1542
	672739		1543-1586
	672740		1587-1630
	672741		1631-1674
	672742		1675-1718

DATE	TAPE NO.	LINE NO.	SHOTPOINTS
01 APR 83	378105	GUT83A-79	1391-1411
	378106	GUT83A-77	1001-1022
	378107		1023-1067
	378108		1068-1111
	378109		1112-1155
	378110		1156-1199
	378111		1200-1243
	378112		1244-1287
	378113		1288-1328
	378114		1329-1366
	378115		1367-1404
	378116		1405-1442
	378117		1443-1475
	378118	GUT83A-77	1476-1489
	378119	GUT83A-75	1001-1020
	378120		1021-1058
	378121		1059-1096
	378122		1097-1135
	378123		1136-1173
	378124		1174-1215
	378125		1216-1259
	378126		1260-1303
	378127		1304-1347
	378128		1348-1391
	378129		1392-1435
	378130		1436-1479
	378131		1480-1523
	378132		1524-1567
	378133		1568-1611
	378134		1612-1655

DATE	TAPE NO.	LINE NO.	SHOTPOINTS
01 APR 83	672743	GUT83A-75	1719-1762
	672744		1763-1806
	672745	GUT83A-75	1807-1831
	672746	GUT83A-91	1001-1042
	672747		1043-1086
	672748		1087-1130
	672749		1131-1174
	672750		1175-1218
	672751		1219-1262
	672752		1263-1306
	672753		1307-1350
	672754		1351-1394
	672755		1395-1436
	672756		1438-1475
	672757		1476-1513
	672758		1514-1550
	672759		1551-1588
	672760		1589-1620
	672761	GUT83A-91	1621-1640
	672762	GUT83A-04	DO NOT PROCESS
	672763		DO NOT PROCESS
	672764		DO NOT PROCESS
	672765		DO NOT PROCESS
02 APR 83	672766	GUT83A-04A	1001-1036
	672767		1037-1074
	672768		1075-1112
	672769		1113-1150
	672770		1151-1188
	672771		1189-1226
	672772		1227-1269

DATE	TAPE NO.	LINE NO.	SHOTPOINTS
01 APR 83	378135	GUT83A-75	1656-1699
	378136		1700-1743
	378137		1744-1787
	378138		1788-1820
	378139	GUT83A-75	1821-1831
	378140	GUT83A-91	1001-1020
	378141		1021-1064
	378142		1065-1108
	378143		1109-1152
	378144		1153-1196
	378145		1197-1240
	378146		1241-1284
	378147		1285-1328
	378148		1329-1372
	378149		1373-1416
	378150		1417-1456
	378151		1457-1494
	378152		1495-1532
	378153		1533-1570
	378154		1571-1608
	378155	GUT83A-91	1609-1640
	378156	GUT83A-04	DO NOT PROCESS
	378157		DO NOT PROCESS
	378158		DO NOT PROCESS
02 APR 83	378159	GUT83A-04A	1001-1018
	378160		1019-1056
	378161		1057-1094
	378162		1095-1132
	378163		1133-1171
	378164		1173-1210

DATE	TAPE NO.	LINE NO.	SHOTPOINTS
02 APR 83	672773	GUT83A-04A	1270-1313
	672774		1314-1357
	672775		1358-1401
	672776		1402-1445
	672777		1446-1480
	672778	GUT83A-04A	1481-1501
	672779	GUT83A-06	1001-1021
	672780		1022-1065
	672781		1066-1109
	672782		1110-1153
	672783		1154-1197
	672784		1198-1238
	672785		1239-1276
	672786		1277-1314
	672787		1315-1352
	672788		1353-1390
	672789		1391-1428
	672790		1429-1459
	672791	GUT83A-06	1460-1470
	672792	GUT83A-89	1001-1036
	672793		1037-1074
	672794		1075-1112
	672795		1113-1156
	672796		1157-1200
	672797		1201-1244
	672798		1245-1288
	672799		1289-1332
	672800		1333-1376
	672801		1377-1420
	672802		1421-1464

DATE	TAPE NO.	LINE NO.	SHOTPOINTS
2 APR 83	378165	GUT83A-04A	1211-1251
	378166		1252-1295
	378167		1296-1339
	378168		1340-1383
	378169		1384-1427
	378170		1428-1471
	378171	GUT83A-04A	1472-1501
	378172	GUT83A-06	1001-1042
	378173		1043-1086
	378174		1087-1130
	378175		1131-1174
	378176		1175-1218
	378177		1219-1256
	378178		1257-1294
	378179		1295-1333
	378180		1335-1372
	378181		1373-1410
	378182		1411-1448
	378183	GUT83A-06	1449-1470
	378184	GUT83A-89	1001-1020
	378185		1021-1058
	378186		1059-1096
	378187		1097-1138
	378188		1139-1182
	378189		1183-1227
	378190		1228-1271
	378191		1272-1315
	378192		1316-1359
	378193		1360-1403
	378194		1404-1447

DATE	TAPE NO.	LINE NO.	SHOTPOINTS
02 APR 83	672803	GUT83A-89	1465-1508
	672804		1509-1552
	672805	GUT83A-89	1553-1572
	672806	GUT83A-87	1001-1022
	672807		1023-1066
	672808		1067-1110
	672809		1111-1154
	672810		1155-1198
	672811		1199-1242
	672812		1243-1286
	672813		1287-1330
	672814		1331-1374
	672815		1375-1417
	672816		1419-1457
	672817		1458-1495
	672818		1497-1535
	672819	GUT83A-87	1536-1570
	672820	GUT83A-85	1001-1020
	672821		1021-1057
	672822		1058-1095
	672823		1096-1133
	672824		1134-1171
	672825		1172-1215
	672826		1216-1259
	672827		1260-1303
	672828		1304-1347
	672829		1348-1391
	672830		1392-1435
	672831		1436-1479
	672832		1480-1523

DATE	TAPE NO.	LINE	SHOTPOINTS
2 APR 83	378195	GUT83A-89	1448-1491
	378196		1492-1535
	378197		1536-1572
2 APR 83	378198	GUT83A-87	1001-1042
	378199		1043-1086
	378200		1087-1130
	378201		1131-1173
	378202		1174-1217
	378203		1218-1261
	378204		1262-1305
	378205		1306-1349
	378206		1350-1393
	378207		1394-1434
	378208		1435-1473
	378209		1474-1513
	378210		1515-1553
	378211		1554-1570
2 APR 83	378212	GUT83A-85	1001-1036
	378213		1037-1074
	378314		1075-1112
	378315		1113-1150
	378316		1151-1191
	378317		1192-1235
	378318		1236-1279
	378319		1280-1324
	378320		1325-1368
	378321		1369-1412
	378322		1413-1456
	378323		1457-1500
	378224		1501-1544

DATE	TAPE NO.	LINE	SHOTPOINTS
2 APR 83	672833	GUT83A-85	1524-1567
	672834		1568-1601
	672835	GUT83A-83	1001-1042
	672836		1043-1086
	672837		1087-1130
	672838		1131-1174
	672839		1175-1218
	672840		1219-1262
	672841		1263-1303
	672842		1304-1341
	672843		1342-1379
	672844		1380-1417
	672845		1418-1455
	672846		1456-1494
	672847		1495-1531
	672848		153201569
	672849		1570-1590
2 APR 83	672850	GUT83A-62	1001-1020
	672851		1021-1059
	672852		1060-1097
	672853		1098-1139
	672854		1140-1177
	672855		1178-1217
	672856		1218-1255
	672857		1256-1293
	672858		1294-1331
	672859		1332-1369
	672860		1370-1389
2 APR 83	672861	GUT83A-14	1001-1020
	672862		1021-1064

DATE	TAPE NO.	LINE	SHOTPOINTS
2 APR 83	378225	GUT83A-85	1545-1580
	378226		1581-1601
2 APR 83	378227	GUT83A-83	1001-1020
	378228		1021-1064
	378229		1065-1108
	378230		1109-1152
	378231		1153-1189
	378232		1190-1232
	378233		1234-1276
	378234		1278-1314
	378235		1315-1352
	378236		1353-1389
	378237		1390-1402
	378238		1403-1440
	378239		1441-1475
	378240		1476-1513
	378241		1514-1551
	378242		1552-1580
	378243		1581-1590
2 APR 83	378244	GUT83A-62	1001-1036
	378245		1037-1075
	378246		1076-1115
	378247		1116-1156
	378248		1158-1194
	378249		1195-1233
	378250		1234-1271
	378251		1272-1309
	378252		1310-1347
	378253		1348-1380
	378254		1381-1389

DATE	TAPE NO.	LINE	SHOTPOINTS
2 APR 83	672863	GUT83A-14	1065-1108
	672864		1109-1152
	672865		1153-1196
	672866		1197-1240
	672867		1241-1284
	672868		1285-1328
	672869		1329-1371
	672870		1372-1415
	672871		1416-1459
	672872		1460-1503
	672873		1504-1542
	672874		1543-1586
	672875		1587-1630
	672876		1631-1674
	672877		1675-1717
	672878		1718-1755
3 APR 83	672879	GUT83A-14	1756-1793
	672880		1794-1831
	672881		1831-1870
	672882		1871-1890
3 APR 83	672883	GUT83A-14A	1741-1758
	672884		1759-1796
	672885		1797-1834
	672886		1835-1872
	672887		1873-1910
	672888		1911-1948
	672889		1949-1986
	672890		1987-2024
	672891		2025-2062
	672892		2063-2100

DATE	TAPE NO.	LINE	SHOTPOINTS
3 APR 83	378255	GUT83A-14	1001-1042
	378256		1043-1086
	378257		1087-1130
	378258		1131-1174
	378359		1175-1218
	378260		1219-1262
	378261		1263-1306
	378262		1307-1350
	378263		1351-1394
	378264		1395-1438
	378265		1439-1482
	378266		1483-1523
	378267		1524-1565
	378268		1566-1609
	378269		1610-1653
	378270		1654-1697
	378271		1698-1737
3 APR 83	378272	GUT83A-14	1738-1775
	378273		1776-1813
	378274		1814-1851
	378275		1852-1890
3 APR 83	378276	GUT83A-14A	1741-1776
	378277		1777-1815
	378278		1817-1854
	378279		1855-1892
	378280		1893-1930
	378281		1931-1968
	378282		1969-2006
	378283		2007-2044
	378284		2045-2083

DATE	TAPE NO	LINE	SHOTPOINTS
3 APR 83	672893	GUT83A-14A	2101-2138
	672894		2139-2176
	672895		2177-2214
	672896		2215-1152
	672897		2253-2279
	672898		2280-2296
3 APR 83	672899	GUT83A-12	1001-1018
	672900		1019-1056
	672901		1057-1094
	672902		1095-1132
	672903		1133-1170
	672904		1171-1208
	672905		1209-1246
	672906		1247-1290
	672907		1291-1334
	672908		1335-1378
	672909		1379-1422
	672910		1423-1466
	672911		1467-1510
	672912		1511-1554
	672913		1555-1598
	672914		1599-1642
	672915		1643-1686
	672916		1687-1730
	672917		1731-1763
	672918		1764-1785
3 APR 83	672919	GUT83A-16	1001-1042
	672920		1043-1086
	672921		1087-1130
	672922		1131-1174

DATE	TAPE NO.	LINE	SHOTPOINTS
3 APR 83	378285	GUT83A-14A	2084-2121
	378286		2122-2159
	378287		2160-2197
	378288		2198-2235
	378289		2236-2268
	378290		2269-2296
3 APR 83	378291	GUT83A-12	1001-1036
	378292		1037-1074
	378293		1075-1112
	378294		1113-1149
	378295		1150-1187
	378296		1188-1187
	378297		1226-1266
	378298		1267-1310
	378299		1311-1354
	378300		1355-1398
	378301		1399-1442
	378302		1443-1486
	378303		1487-1530
	378304		1531-1574
	378305		1575-1618
	378306		1619-1662
	378307		1663-1706
	378308		1707-1750
	378309		1751-1785
3 APR 83	378310	GUT83A-16	1001-1022
	378311		1023-1066
	378312		1067-1110
	378313		1111-1155
	378314		1156-1199

DATE	TAPE NO.	LINE	SHOTPOINTS
3 APR 83	672923	GUT83A-16	1175-1218
	672924		1219-1262
	672925		1263-1306
	672926		1307-1350
	672927		1351-1394
	672928		1395-1438
	672929		1439-1482
	672930		1483-1527
	672931		1528-1571
	672932		1572-1615
	672933		1616-1659
	672934		1660-1703
	672935		1704-1747
	672936		1748-1789
	672937		1790-1827
	672938		1828-1865
	672939		1866-1903
	672940		1904-1941
	672941		1942-1979
	672942		1980-2017
	672943		2018-2050
3 APR 83	672944	GUT83A-30	1001-1020
	672945		1021-1064
	672946		1065-1108
	672947		1109-1152
	672948		1153-1196
	672949		1197-1240
	672950		1241-1284
	672951		1285-1328
	672952		1329-1372

DATE	TAPE NO.	LINE	SHOTPOINTS
3 APR 83	378315	GUT83A-16	1200-1244
	378316		1245-1288
	378317		1289-1332
	378318		1333-1376
	378319		1377-1420
	378320		1421-1464
	378321		1465-1508
	378322		1509-1552
	378323		1553-1596
	378324		1597-1640
	378325		1641-1684
	378326		1685-1728
	378327		1729-1773
	378328		1779-1811
	378329		1812-1849
	378330		1850-1887
	378331		1888-1925
	378332		1926-1963
	378333		1964-2001
	378334		2002-2030
	378335		2031-2050
3 APR 83	378336	GUT83A-30	1001-1042
	378337		1043-1086
	378338		1087-1130
	378339		1131-1174
	378340		1175-1218
	378341		1219-1262
	378342		1263-1306
	378343		1307-1350
	378344		1351-1394

DATE	TAPE NO.	LINE	SHOTPOINTS
3 APR 83	672953	GUT83A-30	1373-1416
	672954		1417-1460
	672956		1461-1504
	672957		1549-1592
	672958		1593-1611
	672959	GUT83A-73	1001-1042
	672960		1043-1082
	672961		1083-1128
	672962		1129-1172
	672963		1173-1216
	672964		1217-1260
	672965		1261-1304
	672966		1305-1320
3 APR 83	672967	GUT83A-25	1001-1042
	672968		1043-1086
	672969		1087-1130
	672970		1131-1174
	672971		1175-1218
	672972		1219-1262
	672973		1263-1306
	672974		1307-1350
	672975		1351-1394
	672976		1395-1438
	672977		1439-1482
	672978		1483-1526
	672979		1527-1570
	672980		1571-1614
	672981		1615-1658
	672982		1659-1702

DATE	TAPE NO.	LINE	SHOTPOINTS
3 APR 83	378345	GUT83A-30	1395-1438
	378346		1439-1482
	378347		1483-1526
	378348		1527-1570
	378349		1571-1611
3 APR 83	378350	GUT83A-73	1001-1020
	378351		1021-1064
	378352		1065-1108
	378353		1109-1152
	378354		1153-1196
	378355		1197-1240
	378356		1241-1284
	378357		1285-1320
3 APR 83	378358	GUT83A-25	1001-1020
	378359		1021-1064
	378360		1065-1108
	378361		1109-1152
	378362		1153-1196
	378363		1197-1240
	378364		1241-1284
	378365		1285-1328
	378366		1329-1372
	378367		1373-1416
	378368		1417-1460
	378369		1461-1504
	378370		1505-1548
	378371		1549-1592
	378372		1593-1636
	378373		1637-1680
	378374		1618-1724

DATE	TAPE NO.	LINE	SHOTPOINTS
3 APR 83	672983	GUT83A-25	1703-1746
	672984		1747-1790
	672985		1791-1834
	672986		1835-1851
4 APR 83	672987	GUT83A-19	1001-1043
	672988		1044-1087
	672989		1088-1131
	672990		1132-1175
	672991		1176-1219
	672992		1220-1263
	672993		1264-1307
	672994		1308-1351
	672995		1352-1395
	672996		1396-1439
	672997		1440-1442
	672998		1444-1487
	672999		1488-1490
	673000		1491-1534
	673001		1535-1578
	673002		1579-1622
	673003		1623-1666
	673004		1667-1710
	673005		1711-1754
	673006		1755-1783
	673007		1784-1811
4 APR 83	673008	GUT83A-50	1001-1042
	673009		1043-1086
	673010		1087-1130
	673011		1131-1174
	673012		1175-1218

DATE	TAPE NO.	LINE	SHOTPOINTS
3 APR 83	378375	GUT83A-25	1725-1768
	378376		1769-1812
	378377		1813-1851
4 APR 83	378378	GUT83A-19	1001-1023
	378379		1024-1067
	378380		1068-1111
	378381		1112-1155
	378382		1156-1199
	378383		1200-1243
	378384		1244-1287
	378385		1288-1331
	378386		1332-1375
	378387		1376-1419
	378388		1420-1463
	378389		1464-1507
	378390		1508-1551
	378391		1552-1595
	378392		1596-1639
	378393		1640-1683
	378394		1684-1727
	378395		1728-1771
	378396		1772-1811
4 APR 83	378397	GUT83A-50	1001-1023
	378398		1024-1067
	378399		1068-1112
	378400		1113-1156
	378401		1157-1200
	378402		1201-1244
	378403		1245-1288
	378404		1289-1332

DATE	TAPE NO.	LINE	SHOTPOINTS
4 APR 83	673013	GUT83A-50	1219-1262
	673014		1263-1306
	673015		1307-1350
	673016		1351-1394
	673017		1395-1438
	673018		1439-1482
	673019		1438-1526
	673020		1527-1570
	673021		1571-1614
	673022		1615-1658
	673023		1659-1702
	673024		1703-1746
	673025		1747-1790
	673026		1791-1834
	673027		1835-1878
	673028		1879-1922
	673029		1923-1966
	673030		1967-2010
	673031		2011-2054
	673032		2055-2098
	673033		2099-2098
	673034		2143-2186
	673035		2187-2230
	673036		2231-2274
	673037		2275-2310
	673038		2311-2339
4 APR 83	673039	GUT83P-27	1001-1042
	673040		1043-1086
	673041		1087-1130
	673042		1131-1174

DATE	TAPE NO.	LINE	SHOTPOINTS
4 APR 83	378405	GUT83A-50	1333-1376
	378406		1377-1420
	378407		1421-1464
	378408		1465-1508
	378409		1509-1552
	378410		1553-1596
	378411		1597-1640
	378412		1641-1684
	378413		1685-1728
	378414		1729-1772
	378415		1773-1816
	378416		1817-1860
	378417		1861-1904
	378418		1905-1948
	378419		1949-1992
	378420		1993-2036
	378421		2037-2080
	378422		2081-2124
	378423		2125-2168
	378424		2169-2212
	378425		2213-2256
	378426		2257-2300
	378427		2301-2339
4 APR 83	378428	GUT83P-27	1001-1020
	378429		1021-1064
	378430		1065-1108
	378431		1109-1152
	378432		1153-1196
	378433		1197-1240
	378434		1241-1284

DATE	TAPE NO.	LINE	SHOTPOINTS
4 APR 83	673043	GUT83P-27	1175-1218
	673044		1219-1262
	673045		1263-1306
	673046		1307-1350
	673047		1351-1394
	673048		1395-1438
	673049		1439-1482
	673050		1483-1526
	673051		1527-1570
	673052		1571-1579
4 APR 83	673053	GUT83P-26	1001-1042
	673054		1043-1086
	673055		1087-1130
	673056		1131-1174
	673057		1175-1218
	673058		1219-1262
	673059		1263-1306
	673060		1307-1339
4 APR 83	673061	GUT83P-20	1001-1020
	673062		1021-1064
	673063		1065-1108
	673064		1109-1152
	673065		1153-1196
	673066		1197-1240
	673067		1241-1284
	673068		1285-1328
	673069		1329-1340
5 APR 83	673070	GUT83P-20A	1141-1182
	673071		1183-1226
	673072		1227-1270

DATE	TAPE NO.	LINE	SHOTPOINTS
4 APR 83	378435	GUT83P-27	1285-1328
	378436		1329-1372
	378437		1373-1416
	378438		1417-1460
	378439		1461-1504
	378440		1505-1548
	378441		1549-1579
4 APR 83	378442	GUT83P-26	1001-1020
	378443		1021-1064
	378444		1065-1108
	378445		1109-1152
	378446		1153-1196
	378447		1197-1240
	378448		1241-1284
	378449		1285-1320
	378450		1321-1339
4 APR. 83	378451	GUT83P-20	1001-1042
	378452		1043-1086
	378453		1087-1130
	378454		1131-1174
	378455		1175-1218
	378456		1219-1262
	378457		1263-1306
	378458		1307-1330
5 APR 83	378459	GUT83P-20A	1141-1162
	378460		1165-1208
	378461		1209-1252
	378462		1253-1296
	378463		1297-1340
	378464		1341-1384

DATE	TAPE NO.	LINE	SHOTPOINTS
5 APR 83	673073	GUT83P-20A	1271-1314
	673074		1315-1358
	673075		1359-1402
	673076		1403-1446
	673077		1447-1490
	673078		1491-1534
	673079		1535-1578
	673080		1579-1622
	673081		1623-1666
	673082		1667-1710
	673083		1711-1754
	673084		1755-1798
	673085		1799-1842
	673086		1843-1886
	673087		1887-1930
	673088		1931-1974
	673089		1975-2010
	673090		2011-2020

DATE	TAPE NO.	LINE	SHOTPOINTS
5 APR 83	378465	GUT83P-20A	1385-1428
	378466		1429-1472
	378467		1473-1516
	378468		1517-1560
	378469		1561-1604
	378470		1605-1648
	378471		1649-1692
	378472		1693-1736
	378473		1737-1780
	378474		1781-1824
	378475		1825-1868
	378476		1869-1912
	378477		1913-1956
	378478		1957-1997
	378479		1998-2020
8 APR 83	378480	GUT83A-2	1001-1018
	378481		1019-1056
	378482		1057-1096
	378483		1097-1140
	378484		1141-1184
	378485		1185-1228
	378486		1229-1270
	378487		1271-1308
	378488		1309-1346
	378489		1347-1384
	378490		1385-1422
	378491		1423-1460
	378492		1461-1498
	378493		1499-1536
	378494		1537-1574

DATE	TAPE NO.	LINE	SHOTPOINTS
8 APR 83	673103	GUT83A-02	1479-2516
	673104		1517-1554
	673105		1555-1592
	673106		1593-1630
	673107		1631-1660
	673108		1661-1680
8 APR 83	673109	GUT83A-93	1001-1036
	673110		1037-1075
	673111		1076-1113
	673112		1114-1155
	673113		1156-1199
	673114		1200-1243
	673115		1244-1287
	673116		1288-1331
	673117		1332-1375
	673118		1376-1419
	673119		1420-1463
	673120		1464-1507
	673121		1508-1551
	673122		1552-1571
8 APR 83	673123	GUT83A-22	1001-1042
	673124		1043-1086
	673125		1087-1130
	673126		1131-1174
	673127		1175-1218
	673128		1219-1262
	673129		1263-1306
	673130		1307-1350
	673131		1351-1394
	673132		1395-1438

DATE	TAPE NO.	LINE	SHOTPOINTS
8 APR 83	378495	GUT83A-2	1575-1612
	378496		1613-1648
	378497		1649-1680
8 APR 83	378498	GUT83A-93	1001-1018
	378499		1019-1056
	378500		1058-1095
	378501		1096-1133
	378502		1134-1177
	378503		1178-1221
	378504		1222-1265
	378505		1266-1309
	378506		1310-1353
	378507		1354-1397
	378508		1398-1441
	378509		1442-1485
	378510		1486-1529
	378511		1530-1571
8 APR 83	378512	GUT83A-22	1001-1022
	378513		1023-1066
	378514		1067-1110
	378515		1111-1154
	378516		1155-1198
	378517		1199-1242
	378518		1243-1286
	378519		1287-1330
	378520		1331-1374
	378521		1375-1418
	378522		1419-1462
	378523		1463-1506
	378524		1507-1550

DATE	TAPE NO.	LINE	SHOTPOINTS
8 APR 83	673133	GUT83A-22	1439-1482
	673134		1483-1526
	673135		1527-1570
	673136		1571-1614
	673137		1615-1658
	673138		1659-1702
	673139		1703-1742
	673140		1743-1770
8 APR 83	673141	GUT83A-64	1001-1037
	673142		1038-1075
	673143		1076-1113
	673144		1114-1151
	673145		1152-1189
	673146		1190-1227
	673147		1228-1265
	673148		1266-1309
	673149		1310-1353
	673150		1354-1397
	673151		1398-1441
	673152		1442-1485
	673153		1486-1529
	673154		1530-1573
	673155		1574-1617
	673156		1618-1661
	673157		1662-1705
	673158		1706-1749
	673159		1750-1793
	673160		1794-1837
	673161		1838-1881
	673162		1882-1925

DATE	TAPE NO.	LINE	SHOTPOINTS
8 APR 83	387025	GUT83A-22	1551-1594
	387026		1595-1638
	387027		1639-1682
	387028		1638-1726
	387029		1727-1770
8 APR 83	387030	GUT83A-64	1001-1018
	387031		1019-1056
	387032		1057-1094
	387033		1095-1132
	387034		1133-1170
	387035		1171-1208
	387036		1209-1246
	387037		1247-1287
	387038		1288-1331
	387039		1332-1375
	387040		1376-1419
	387041		1420-1463
	387042		1464-1467
	387043		1468-1511
	387044		1512-1555
	387045		1556-1594
	387046		1595-1638
	387047		1639-1682
	387048		1683-1726
	387049		1727-1770
	387050		1771-1814
	387051		1815-1858
	387052		1859-1902
	387053		1903-1946
	387054		1947-1963

DATE	TAPE NO.	LINE	SHOTPOINTS
8 APR 83	673163	GUT83A-64	1928-1963
8 APR 83	673164	GUT83A-20	1001-1026
	673165		1027-1070
	673166		1071-1096
	673167		1097-1140
	673168		1141-1184
	673169		1185-1228
	673170		1229-1272
	673171		1273-1316
	673172		1317-1360
	673173		1361-1404
	673174		1405-1448
	673175		1449-1490
8 APR 83	673176	GUT83A-12A	1001- 992
	673177		991- 954
	673178		953- 916
	673179		915- 818
	673180		877- 840
	673181		839- 802
	673182		801- 764
	673183		763- 726
	673184		725- 692
	673185	GUT83A-8A	DO NOT PROCESS
	673186		DO NOT PROCESS
	673187		DO NOT PROCESS
	674188		DO NOT PROCESS
	673189		DO NOT PROCESS
	673190		DO NOT PROCESS
	673191		DO NOT PROCESS
	673192		DO NOT PROCESS

DATE	TAPE NO.	LINE	SHOTPOINTS
8 APR 83	387055	GUT83A-20	1001-1020
	387056		1030-1073
	387057		1074-1117
	387058		1118-1161
	387059		1162-1205
	387060		1206-1249
	387061		1250-1293
	387062		1294-1337
	387063		1338-1381
	387064		1382-1425
	387065		1426-1469
	387066		1470-1490
8 APR 83	387067	GUT83A-12A	1001- 977
	387068		976- 939
	387069		938- 901
	387070		900- 863
	387071		862- 825
	387072		824- 787
	387073		786- 749
	387074		748- 711
	387075		710- 611
8 APR 83	387076	GUT83A-8A	DO NOT PROCESS
	387077		DO NOT PROCESS
	387078		DO NOT PROCESS
	387079		DO NOT PROCESS
	387080		DO NOT PROCESS
	387081		DO NOT PROCESS
	387082		DO NOT PROCESS
	387083		DO NOT PROCESS
	387084		DO NOT PROCESS

DATE	TAPE NO.	LINE	SHOTPOINTS
8 APR 83	673193	GUT83A-8A	DO NOT PROCESS
	673194		DO NOT PROCESS
	673195	GUT83A-8B	9001-9036
	673196		9037-9074
	673197		9075-9112
	673198		9113-9151
	673199		9152-9189
	673200		9190-9227
	673201		9228-9265
	673202		9266-9302
	673203		9303-9340
	673204		9341-9378
	673205		9379-9416
	673206		9417-9449
9 APR 83	673207	GUT83A-44	1001-1042
	673208		1043-1086
	673209		1087-1130
	673210		1131-1174
	673211		1175-1218
	673212		1219-1262
	673213		1263-1306
	673214		1307-1350
	673215		1351-1394
	673216		1395-1438
	673217		1439-1482
	673218		1483-1526
	673219		1527-1570
	673220		1571-1614
	673221		1615-1658
	673222		1659-1702

DATE	TAPE NO.	LINE	SHOTPOINTS
8 APR 83	387085	GUT83A-8A	DO NOT PROCESS
9 APR 83	387086	GUT83A-8B	9001-9019
	387087		9020-2057
	387088		9058-9095
	387089		9096-9133
	387090		9134-9172
	387091		9173-9210
	387092		9211-9248
	387093		9252-9289
	387094		9290-9327
	387095		9328-9365
	387096		9366-9403
	387097		9404-9441
	387098		9442-9449
	387099	GUT83A-44	1001-1025
	387100		1026-1069
	387101		1070-1113
	387102		1114-1157
	387103		1158-1201
	387104		1202-1245
	387105		1246-1289
	387106		1290-1333
	387107		1334-1377
	387108		1378-1421
	387109		1422-1465
	387110		1466-1509
	387111		1510-1553
	387112		1554-1597
	387113		1598-1641
	387114		1642-1658

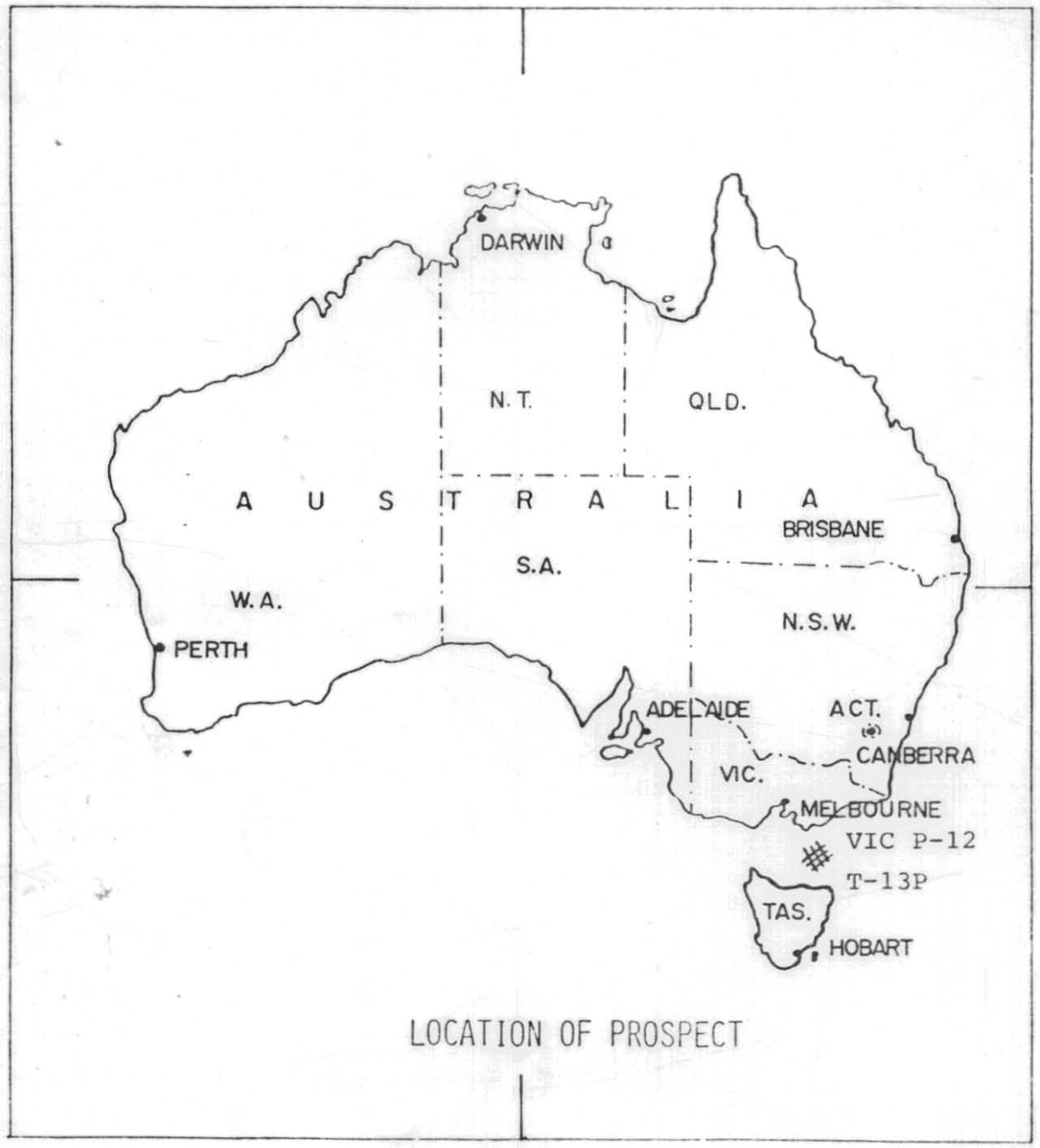
DATE	TAPE NO.	LINE	SHOTPOINTS
9 APR 83	673223	GUT83A-44	1703-1746
	673224		1747-1789
	673225		1790-1800
	673226	GUT83A-48	1001-1020
	673227		1021-1064
	673228		1065-1108
	673229		1109-1152
	673230		1153-1196
	673231		1197-1240
	673232		1241-1284
	673233		1285-1328
	673234		1329-1369
	673235		1370-1413
	673236		1414-1457
	673237		1458-1501
	673238		1502-1545
	673239		1546-1589
	673240		1590-1633
	673241		1634-1677
	673242		1678-1721
	673243		1722-1765
	673244		1766-1809
	673245		1810-1853
	673246		1854-1897
	673247		1898-1941
	673248		1942-1979
	673249		1980-2023
	673250		2024-2067
	673251		2068-2111
	673252		2112-2155

DATE	TAPE NO.	LINE	SHOTPOINTS
9 APR 83	387115	GUT83A-44	1686-1729
	387116		1730-1773
	387117		1774-1800
	387118	GUT83A-45	1001-1041
	387119		1042-1085
	387120		1086-1129
	387121		1130-1173
	387122		1174-1217
	387123		1218-1261
	387124		1262-1305
	387125		1306-1347
	387126		1348-1391
	387127		1392-1435
	387128		1436-1479
	387129		1480-1523
	387130		1524-1567
	387131		1568-1611
	387132		1612-1655
	387133		1656-1699
	387134		1700-1743
	387135		1744-1787
	387136		1788-1831
	387137		1832-1875
	387138		1876-1919
	387139		1920-1957
	387140		1958-2001
	387141		2002-2045
	387142		2046-2089
	387143		2090-2133
	387144		2134-2177

DATE	TAPE NO.	LINE	SHOTPOINTS
9 APR 83	673253	GUT83A-48	2156-2199
	673254		2200-2243
	673255		2244-2287
	673256		2288-2331
	673257		2332-2375
	673258		2376-2419
	673259		2420-2463
	673260		2464-2507
	673261		2508-2540
	673262		2541-2562
9 APR 83	673263	GUT83A-01	1001-1042
	673264		1043-1086
	673265		1087-1130
	673266		1131-1174
	673267		1175-1218
	673268		1219-1250

DATE	TAPE NO.	LINE	SHOTPOINTS
9 APR 83	387145	GUT83A-48	2178-2221
	387146		2222-2265
	387147		2266-2309
	387148		2310-2353
	387149		2354-2397
	387150		2398-2441
	387151		244202385
	387152		2486-2529
	387153		2530-2562
9 APR 83	387154	GUT83A-01	1001-1021
	387155		1022-1065
	387156		1066-1109
	387157		1110-1153
	387158		1154-1197
	387159		1198-1230
	387160		1231-1250

099132

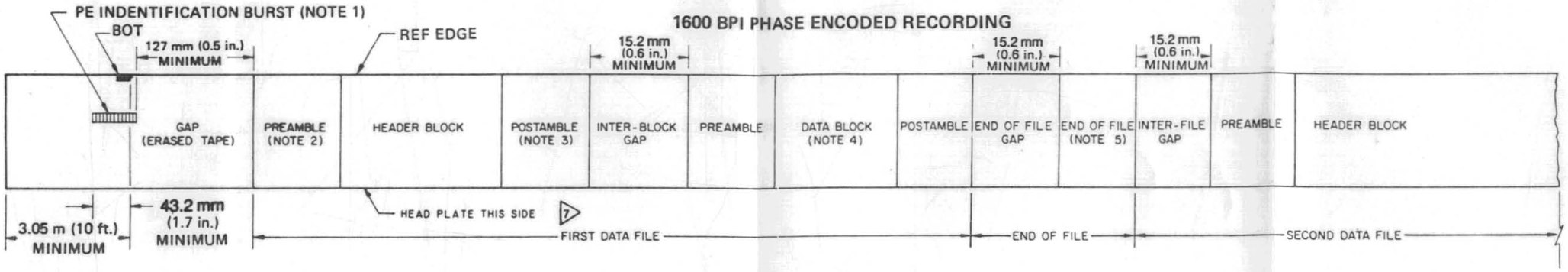


LOCATION OF PROSPECT

5 cm

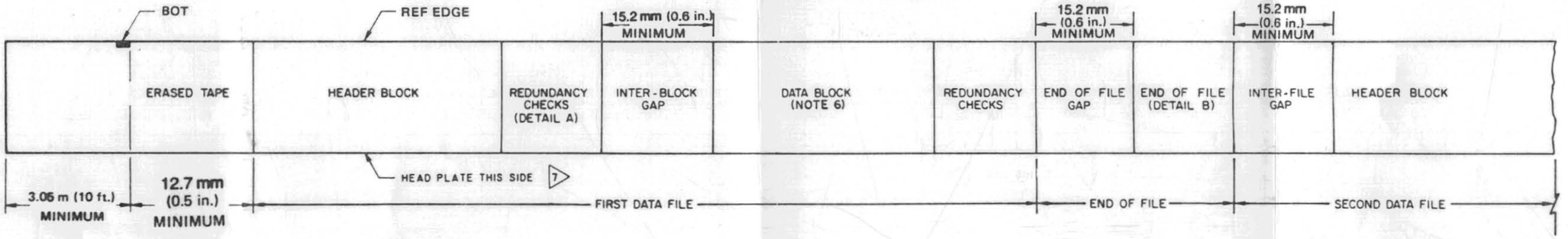
GSI-708

1600 BPI PHASE ENCODED RECORDING

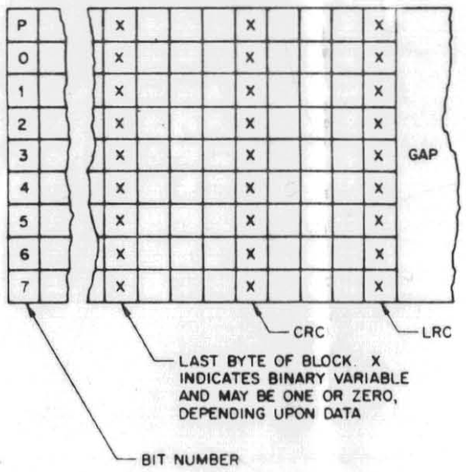


TAPE MOTION (TAPE VIEWED OXIDE DOWN)

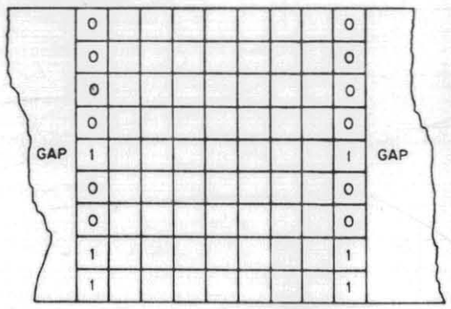
800 BPI NRZI RECORDING



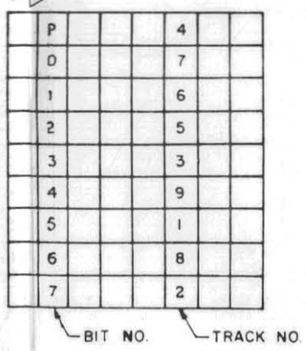
A NRZI REDUNDANCY CHECKS



B. NRZI END OF FILE



C 7



5 cm

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.

099134

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_1-M_6 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
2 - test record 1
} Not used

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

O_N Digitized output of A/D converter

O_S - sign (note 4)

O_1 - 4096 millivolts

O_{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 2C

HEADER BLOCK

Bit number (schematic)			Typical packed BCD value	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24				
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
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
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
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
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
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
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
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
				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) (F)	(E)	Seis channel 2 gain	

Bit number (schematic)				24 + 2n												36 + 2n (NOTE 3)
P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
0	0	0	0	0	1	0	D	0	D	0	D	0	D	0	0	0
1	0	0	0	0	0	0	D	0	D	0	D	0	D	0	0	0
2	1	0	1	0	1	0	D	0	D	0	D	0	D	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	GC	GW	GC	GW	0	0	0	0	0	0	0	0	0	0	0	0
5	GC	GW	GC	GW	0	0	0	0	0	0	0	0	0	0	0	0
6	GC	GW	GC	GW	0	0	0	0	0	0	0	0	0	0	0	0
7	GC	GW	GC	GW	0	0	0	0	0	0	0	0	0	0	0	0
	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

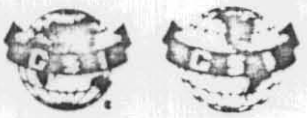
FIRST DATA SCAN

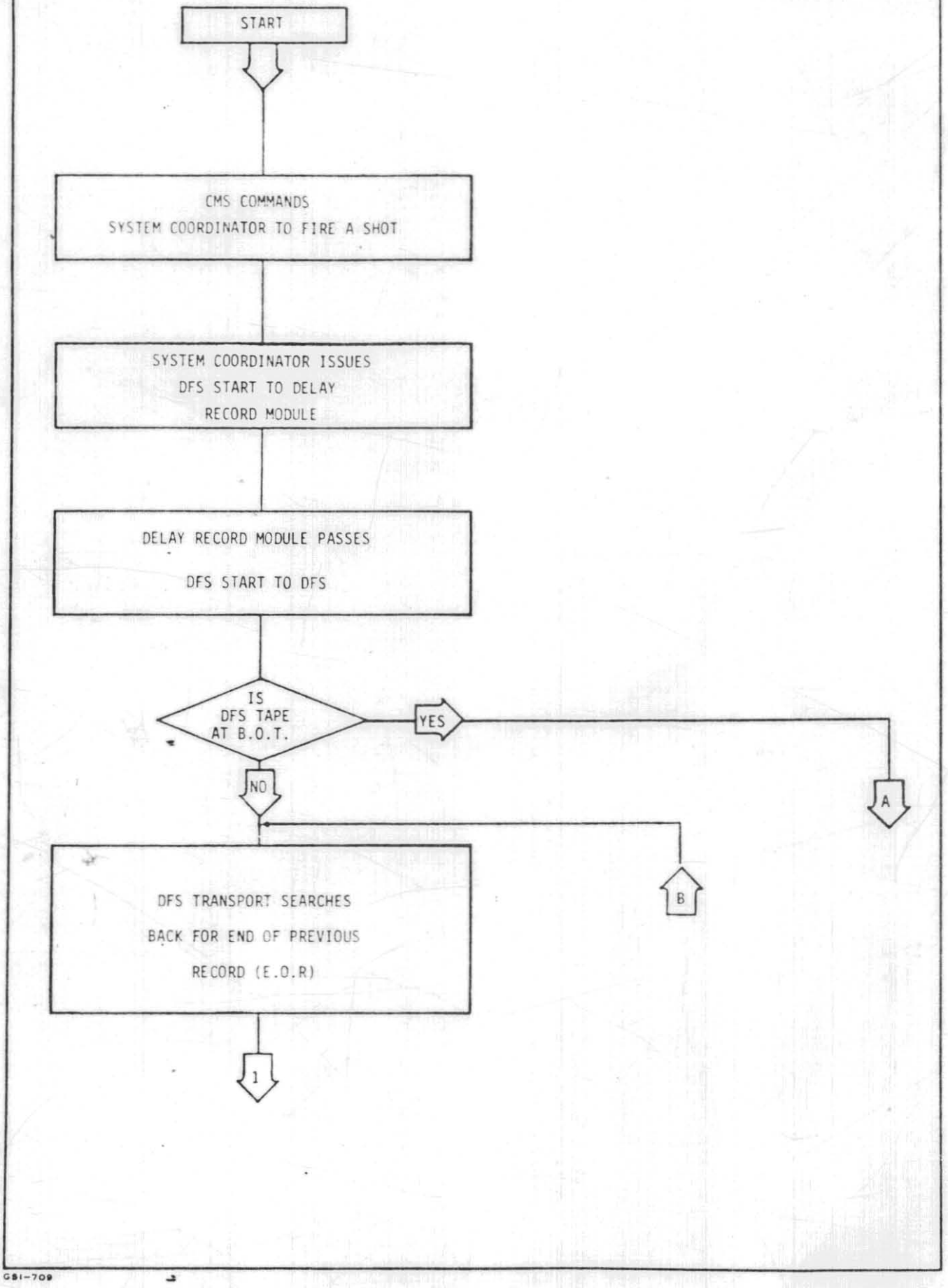
Bit number (schematic)		Typical data value		Sync group (note 6)				Aux 1		Aux 2		Aux 3		Aux 4		Aux 5		Gain 1-4		Seis 1		Seis 2		Seis 3		Seis 4		Gain 5-8		Seis 5	
P		P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
0		S	2^6	W_1	W_3	W_5	W_7	T_1	T_8	Q_S	Q_8	Q_S	Q_8	Q_S	Q_8	Q_S	Q_8	G_1	G_3	Q_S	Q_8	Q_S	Q_8	Q_S	Q_8	Q_S	Q_8	G_5	G_7	Q_S	Q_8
1		2^{13}	2^5	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
2		2^{12}	2^4	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}
3		2^{11}	2^3	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}
4		2^{10}	2^2	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}
5		2^9	2^1	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}
6		2^8	2^0	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}
7		2^7	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

Bit number (schematic)	Seis n (first data scan)		Sync group (second data scan)				Aux 1		Seis n (second data scan)		Sync group (last data scan)				Seis n (last data scan)	
P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
0	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
1	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
2	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}
3	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}
4	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}
5	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}
6	Q_6	Q_{14}	CH	CH	CH	CH	T_7	T_{14}	Q_6	Q_{14}	CH	CH	CH	CH	Q_6	Q_{14}
7	Q_7	0	1	1	1	1	0	0	Q_7	0	1	1	1	1	Q_7	0

← FIRST DATA SCAN → ← SECOND DATA SCAN → ← LAST DATA SCAN →

099136





GBI-709

PLATE 3B 099137

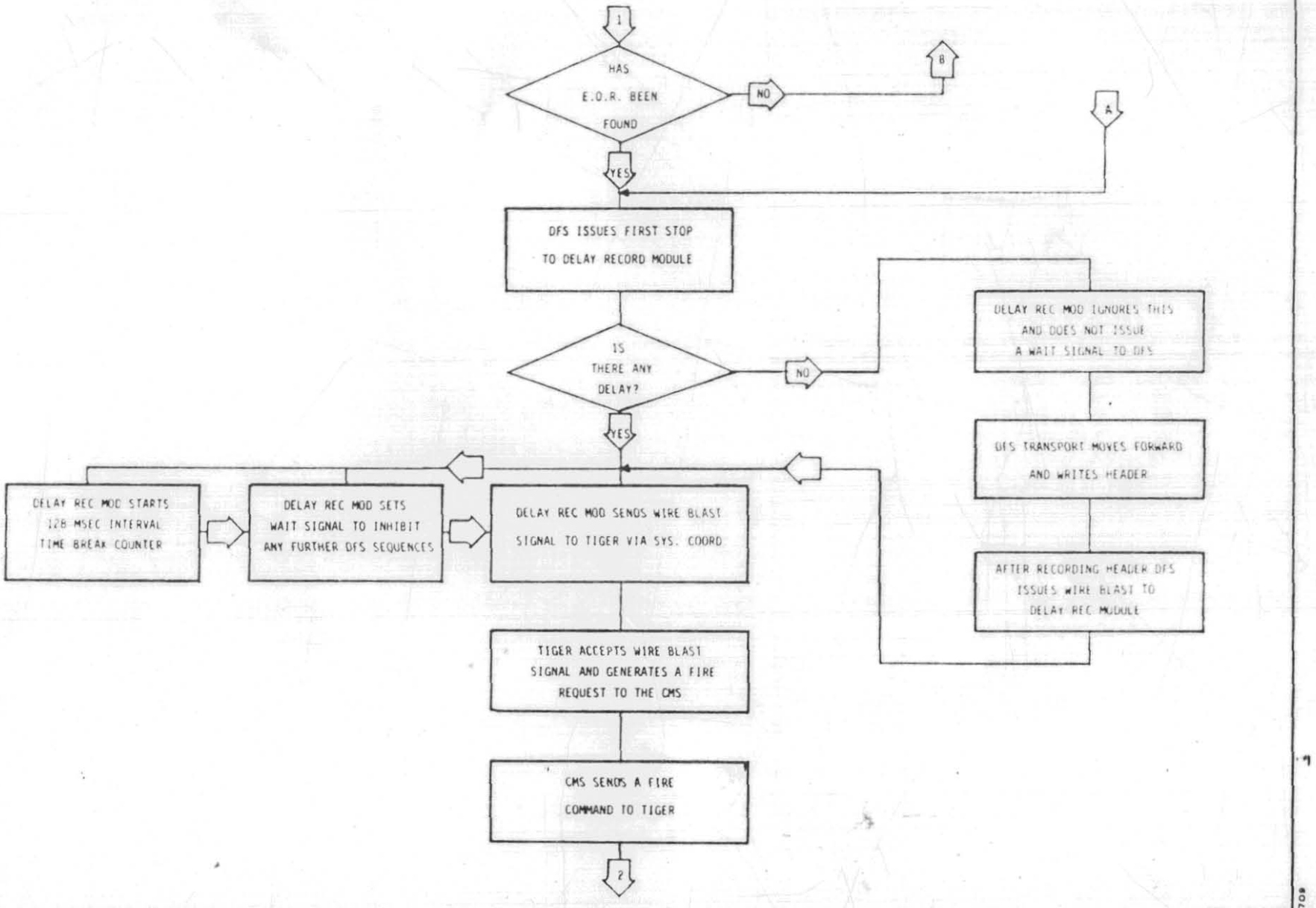
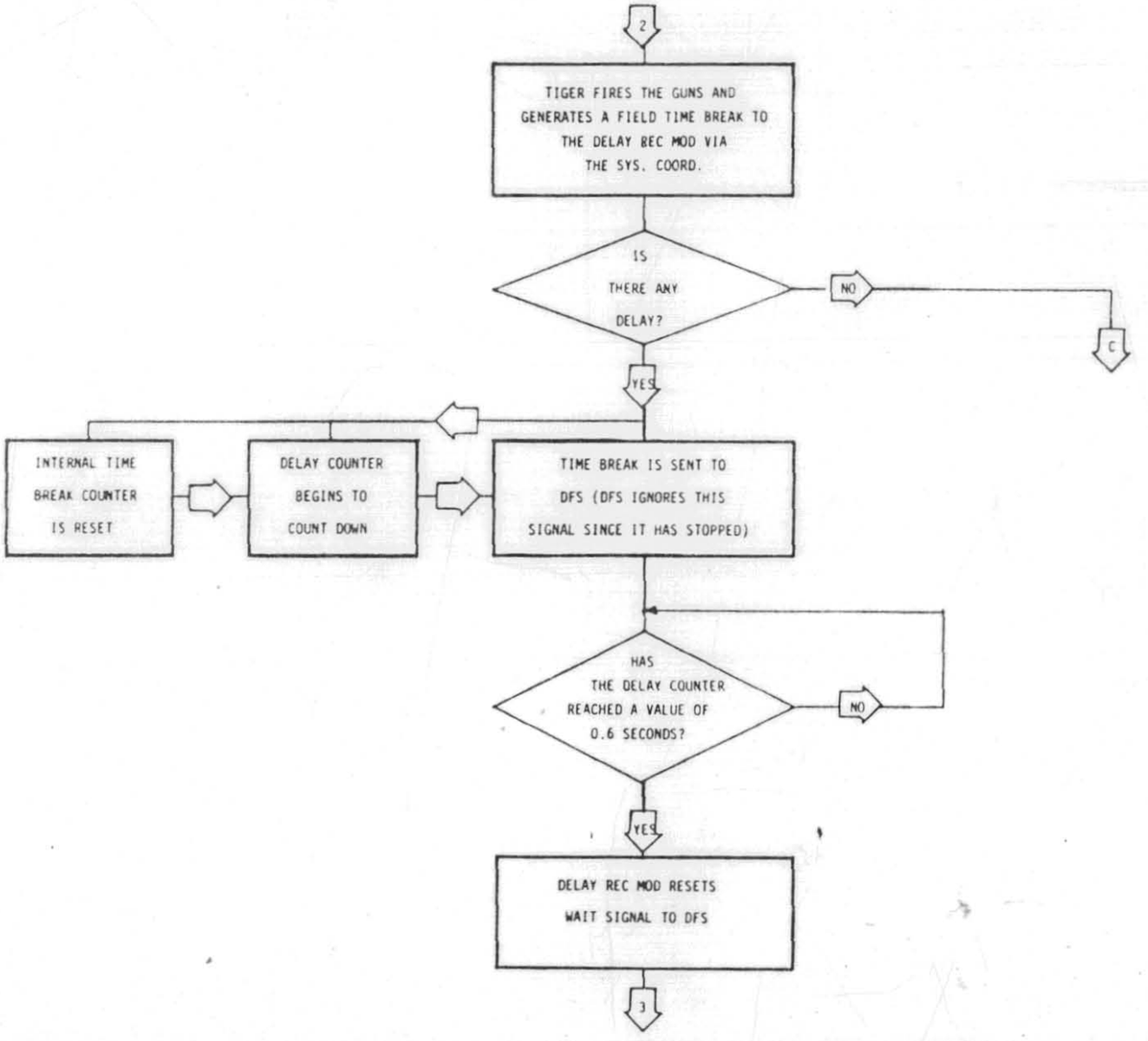
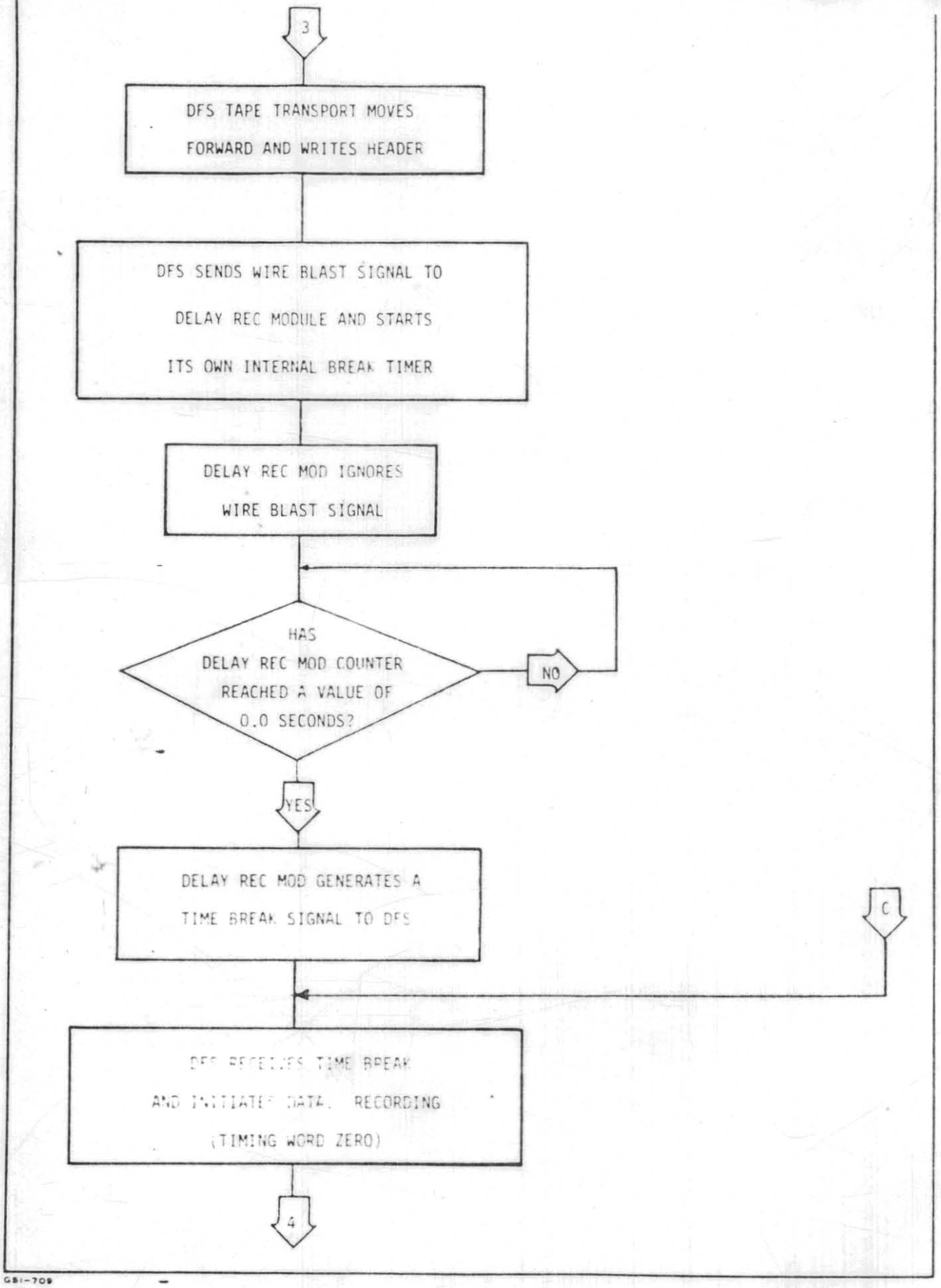
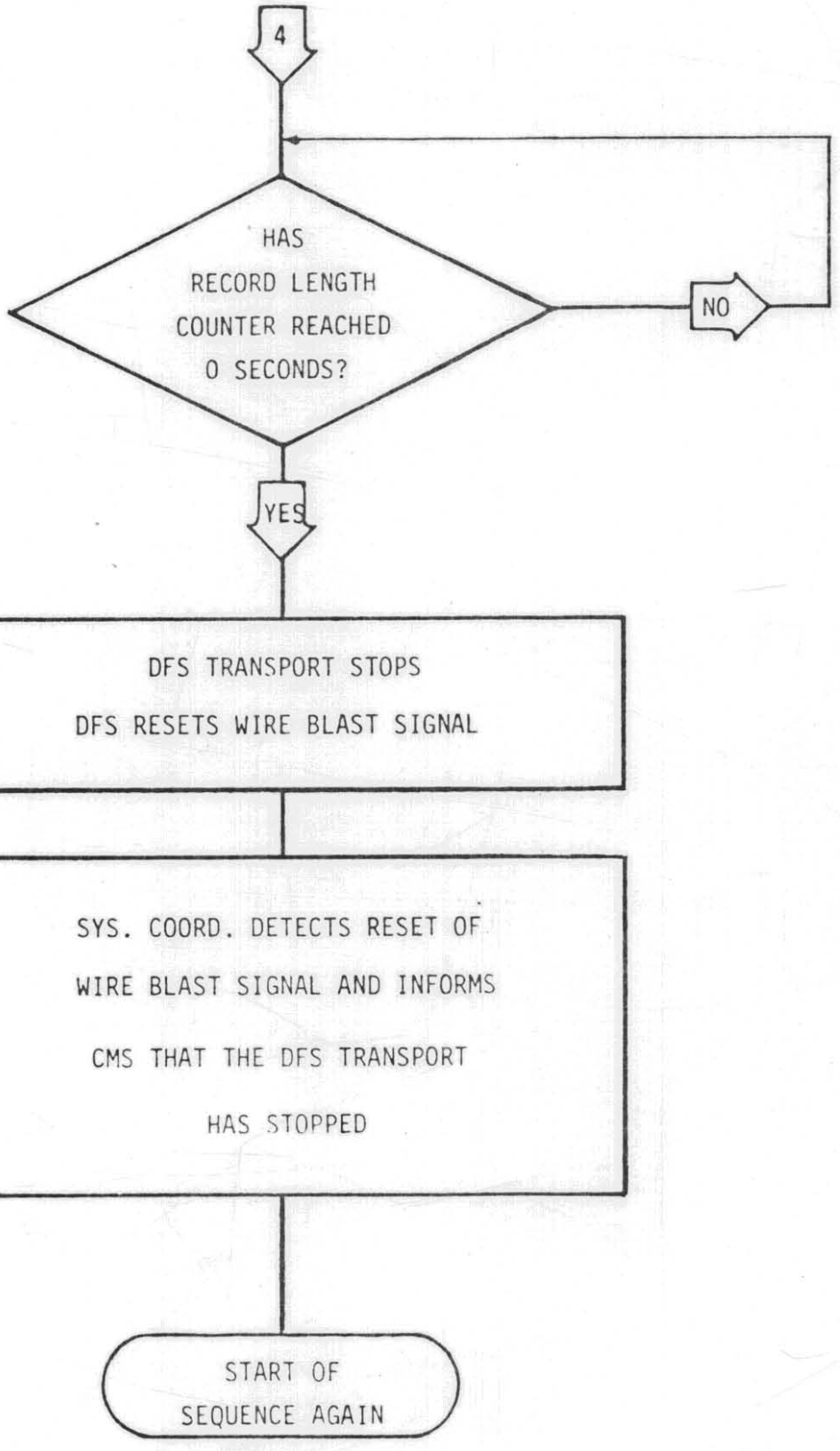


PLATE 3C 099135

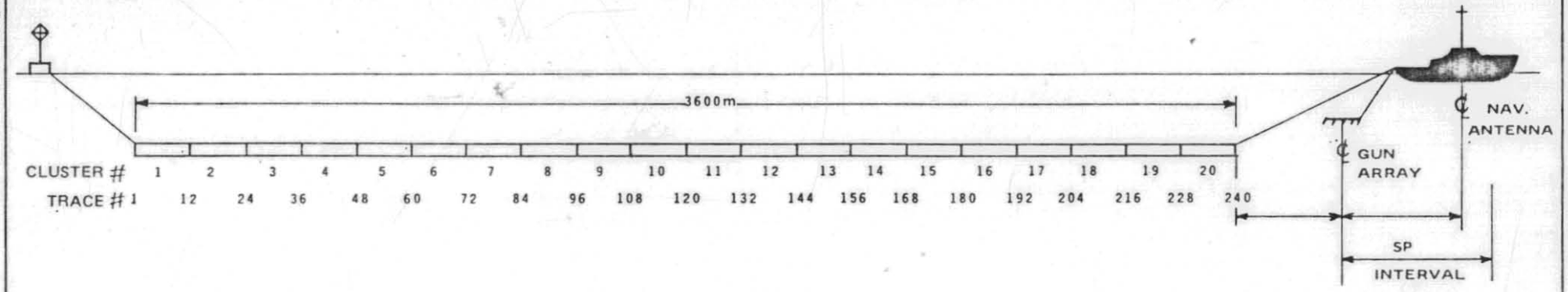


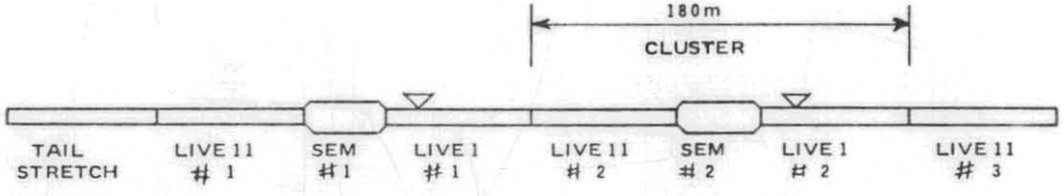

3
DFS TAPE TRANSPORT MOVES FORWARD AND WRITES HEADER
DFS SENDS WIRE BLAST SIGNAL TO DELAY REC MODULE AND STARTS ITS OWN INTERNAL BREAK TIMER
DELAY REC MOD IGNORES WIRE BLAST SIGNAL
HAS DELAY REC MOD COUNTER REACHED A VALUE OF 0.0 SECONDS?
NO
YES
DELAY REC MOD GENERATES A TIME BREAK SIGNAL TO DFS
C
AND INITIATES DATA RECORDING
(TIMING WORD ZERO)
4

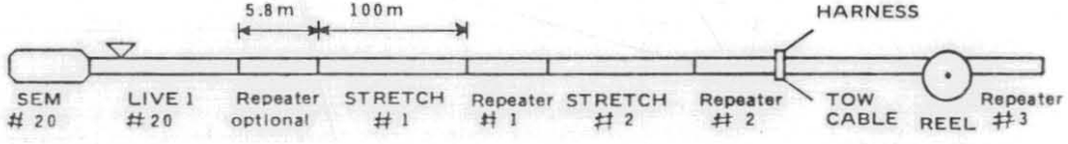
GSI-709


4
HAS
RECORD LENGTH
COUNTER REACHED
0 SECONDS?
NO
YES
DFS TRANSPORT STOPS
DFS RESETS WIRE BLAST SIGNAL
SYS. COORD. DETECTS RESET OF
WIRE BLAST SIGNAL AND INFORMS
CMS THAT THE DFS TRANSPORT
HAS STOPPED
START OF
SEQUENCE AGAIN

GSI-709





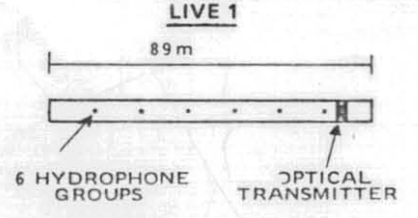


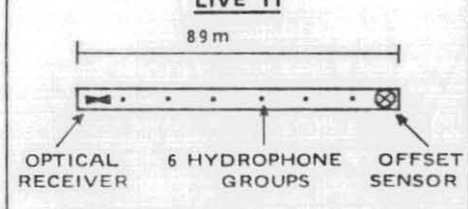
DEPTH CONTROLLER AT (Marked ▽)

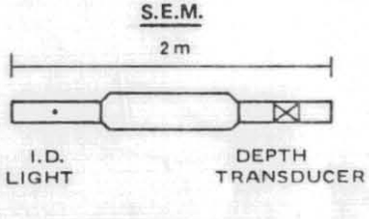
LIVE 1 NUMBERS

1	3	5	7	9	11	13	15	17	19	20	

EACH 180m LONG CLUSTER
CONTAINS 12 x 15m LONG GROUPS







G.S.I. MARINE MULTIPLEX STREAMER DIAGRAM

G.S.I. PARTY 2931

SHIP M/V "Eugene McDermott II"

CLIENT Union Texas Australia Inc

CHANNELS 240

LENGTH 3600m

DATE 15 March - 9 April, 1983

5 cm

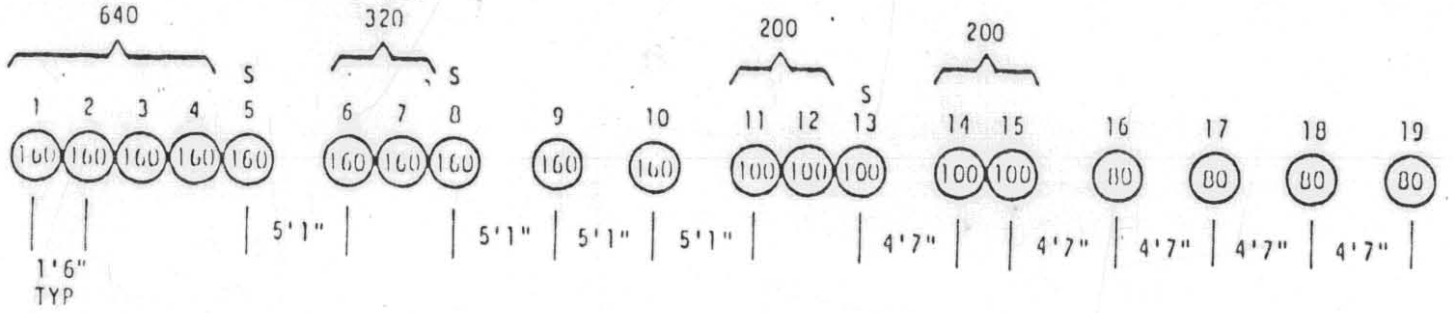
PLATE 4

0991141

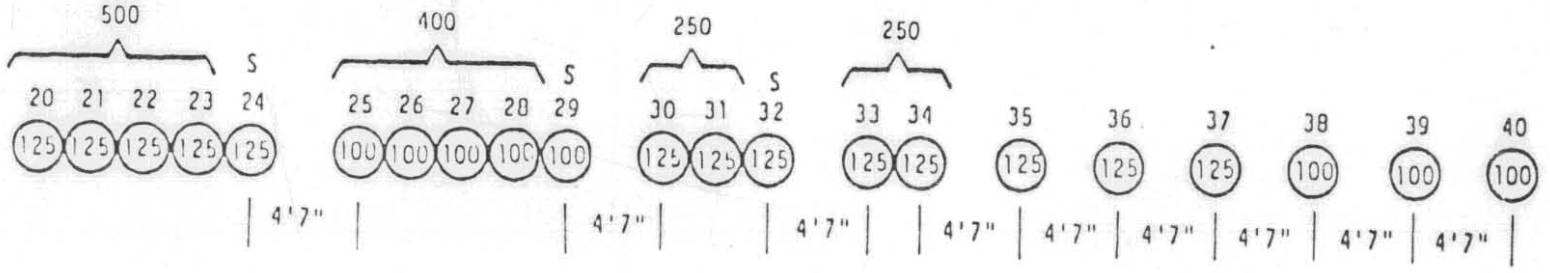
4000-CUBIC-INCH AIR GUN ARRAY

5 cm

STARBOARD STRING (56'9", 19 GUNS)



PORT STRING (57'9", 21 GUNS)



25'-30'

NOTES:

1. GUN SIZE IN CUBIC INCHES
2. GUN SPACING IN FEET AND INCHES; CENTERLINE-TO-CENTERLINE SPACING OF ALL COALESCED GUNS IS 1'6"
3. SPARE GUNS DENOTED BY "S"
4. GUNS 1-10 ARE MOD III PC, GUNS 11-40 ARE MOD II PC
5. MEASURED AVERAGE PERFORMANCE:

   P_a = 80 BAR-M (P-P, 0-125 HZ)

   P_a/P_b = 10

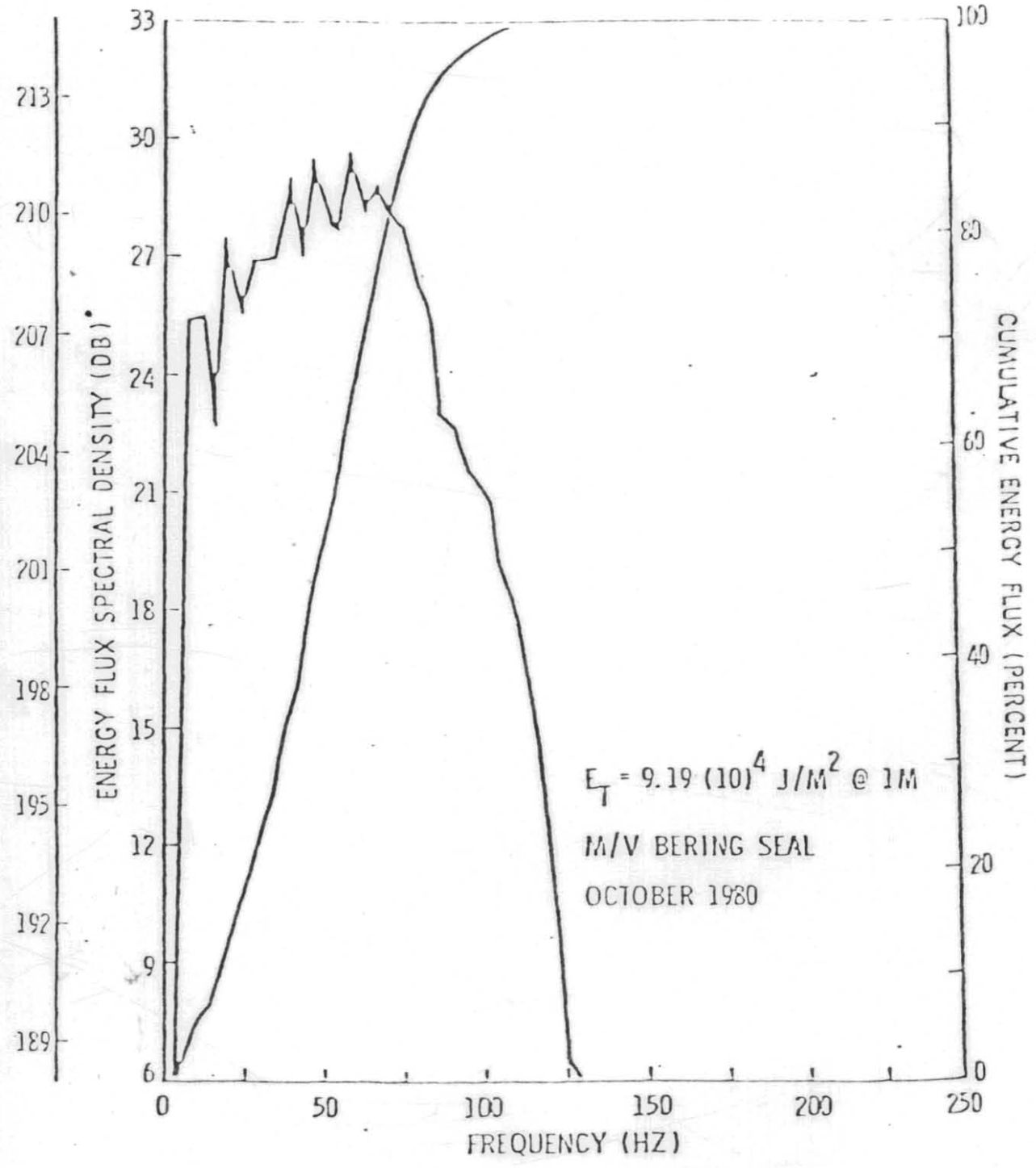
ARRAY COMPOSITION

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

4075 ACTIVE

PLATE 5A

PLATE 5B



* DB REFERRED TO 1 JOULE/M** 2/HZ AT 1 METER

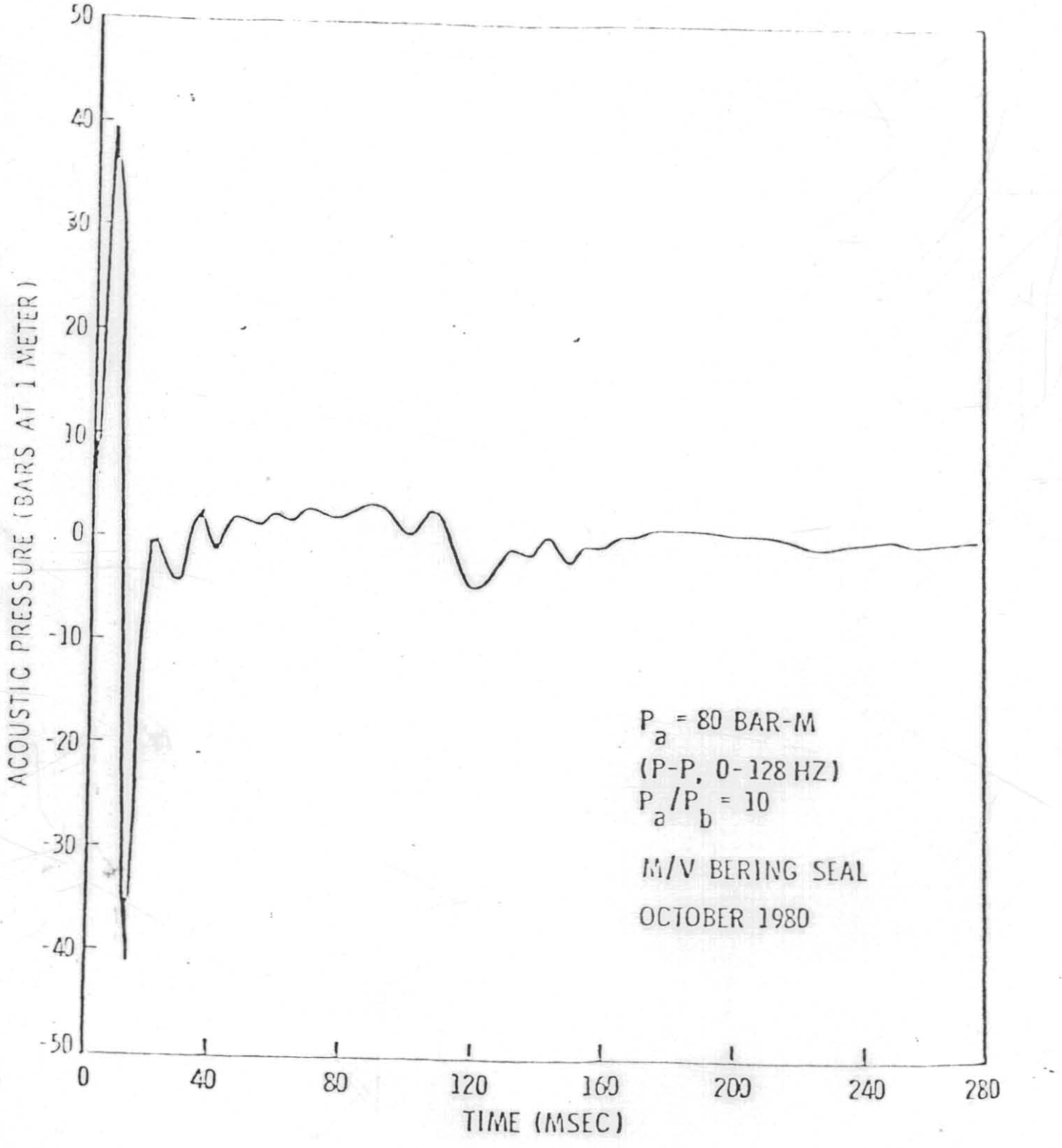
** DB REFERRED TO 1 MICROPASCAL/HZ AT 1 METER

Amplitude and Energy Spectra of 4000 PNU-CON Array

5 cm

PLATE 5C

099144



Farfield Signature of 4000 PNU-CON Array

5 cm

OFFSET DETERMINATION

PHYSICAL MEASUREMENT

1. Number of stretch sections:		2x100m x (3x6m repeaters)
2. Total length of stretch sections	:	218M
3. Half group length (near group)	:	7.5m
4. Distance from boat to near group centre.	:	(2 + 3) = 225.5
5. Distance from boat to centre of source	:	30.37m
6. Calculate offset (4 - 5 = 6)	:	194.8m

TIME MEASUREMENT

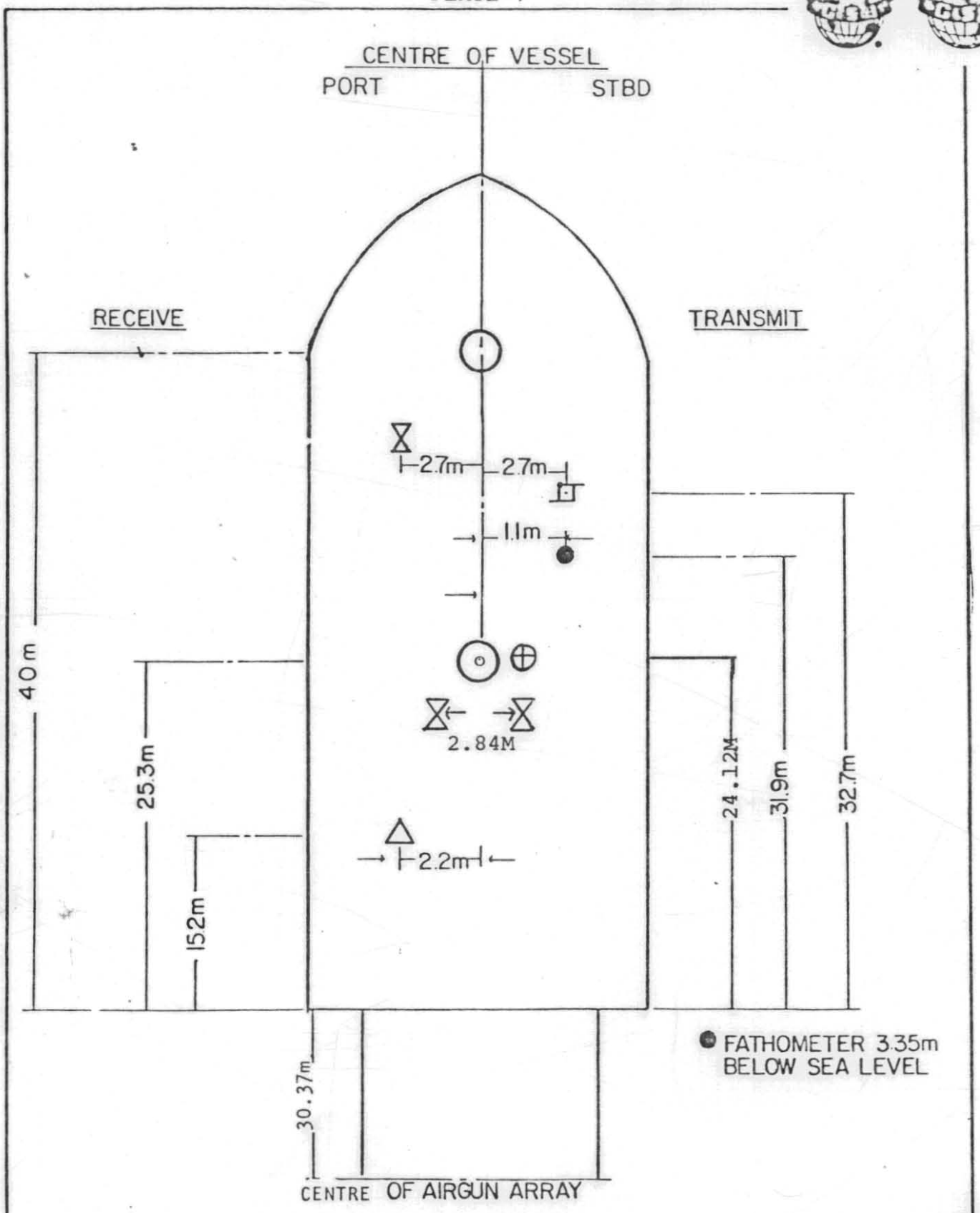
1. Travel time from gun fired to waterbreak sensor	:	253msecs
2. Time delay to Tiger	:	51.2msecs
3. Speed of sound in water	:	1.48 m/ms
4. (- 2) x 3 = 4	:	298.66m
5. Distance form gun fired to array centre	:	-2.55m
6. Distance from waterbreak hydrophone to near trace centre	:	- 96.1m
7. Offset (4 + 5 + 6 = 7	:	200m

Offset is computed and displayed on the multiplex streamer supervisory terminal after all relevant information is input and an offset shot is requested.

THE ABOVE IS AN EXAMPLE ONLY

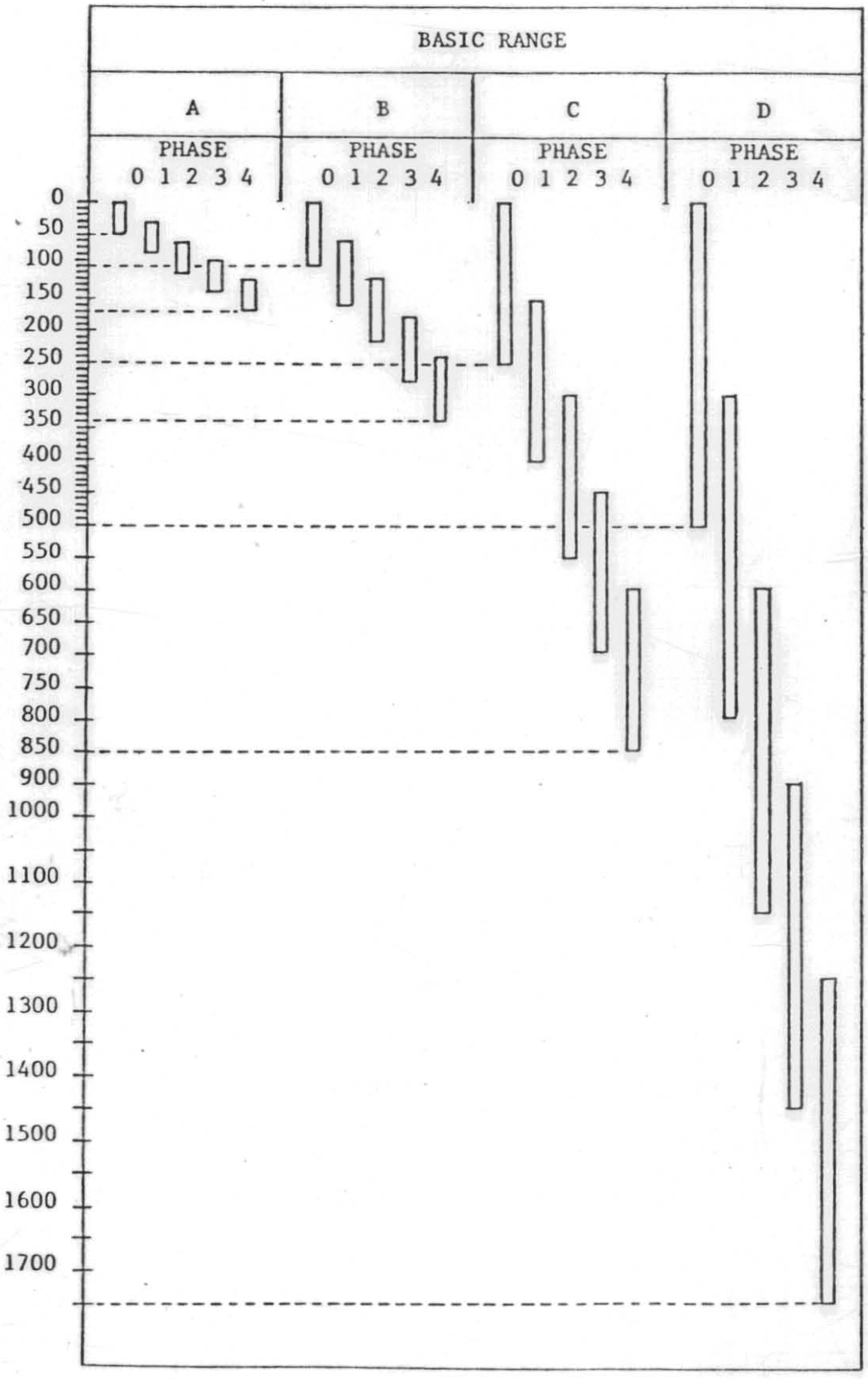
099146

PLATE 7



099147

SIMRAD MODEL EA FATHOMETER SCALE



81-709

5 cm

T/13P Part 19 Vol 2 099148

DATA PROCESSING REPORT

SURVEY:- VIC-P12, T-13P
GIPPSLAND

COMPANY:- UNION TEXAS AUSTRALIA, INC
COMPANY ADDRESS:- 459 COLLINS ST.,
LEVEL 23,
MELBOURNE,
VICTORIA 3000,
AUSTRALIA.

BY:-
GEOPHYSICAL SERVICE INTERNATIONAL
6 - 10 TALAVERA ROAD,
NORTH RYDE. N.S.W. 2113

PARTY 6860
C. WILKINS
DATE: DECEMBER 1983

GUT 83

GSI—709

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SECTION I.
INTRODUCTION

A seismic reflection survey was conducted by the M/V Eugene Mcdermott II in the Gippsland Basin off the south coast of Australia (see Plate I) in permits VIC-P12 and T-13P. The data was shot between March and April 1983. The survey covered approx. 1600 Km using the following shooting parameters:-

-	Streamer configuration	- 3600m Multiplexor cable with 240 groups, 20 SEMS (near trace 240)
-	Group length	- 15m (80 hydrophones @ 0.185m)
-	Shot interval	- 30m (60 fold) 1 pop per SP
-	Shot depth	- 6 m average
-	Record length	- 6 or 7 secs varying with WB
-	Sample period	- 2 ms
-	Cable depth	- 12m average
-	Filter settings	- High cut and slope 128hz @ 72db/oct
		- Low cut and slope 8hz @ 18db/oct
-	Navigation - primary	- ARGO
	- secondary	- SYLEDIS
-	Airguns	- 4075 cu.in. operating at 2000 p.s.i. (51.2ms delay i.e. a negative time shift)
-	Recording instruments	- Dual DFS V's (nears and fars)-
-	Tape format	2 x 120 traces,(157 chnls each) SEGB
-	Shotpoint location	- CDP (for maps and sections)
-	Offset range	- 199m - 206m
-	Polarity	- Reverse (A positive pressure at the hydrophone produced a positive number on tape and a downward deflection on the camera records)

Processing was mostly carried out in G.S.I.'s Sydney office on *TIMAP 4 computers. Some lines were processed up to raw stack on *TIMAP 2 computers in Sydney and Perth to assist turnaround.

* GSI Trademark

SECTION II
EXPERIMENTAL WORK

Tests were carried out on Line GUT 83A - 16

1) The field record for SPs 1301 & 1489 were displayed with values of TAR:-2,4,6,8,10 db/sec to a maximum time of 3.5 secs. These locations were chosen to represent data in shallow and deep water areas.

2) An F-K noise analysis was performed using a TAR of 7 db/sec, to 3.5 seconds at SPs 1301, 1465, 1490. These three locations were chosen to represent data in :-
   a) shallow flat areas
   b) deep water with steeply positively dipping water bottom
   c) deep water with steeply negatively dipping water bottom

3) Also with a TAR of 7db/sec, varying values of velocity filter cuts as listed below were applied. The resultant shot records were displayed together with their appropriate F-K noise analysis. This was conducted at SP 1301, 1465, 1490.
   i) VEF cuts of +4, -2 ms/trace
   ii) VEF cuts of +5, -2 ms/trace
   iii)VEF cuts of +6, -2 ms/trace
   iv) VEF cuts of +7, -2 ms/trace
   v) VEF cuts of +8, -2 ms/trace

   No PDR or DSG were applied for this test.

4) A cable configuration test was run near a typical submarine channel area located at SP1390-1490 to compare the following:-
   i) 240 trace processing with VEF, applied
   ii)240 " " " " " then decimate to 120tr.
   iii)240 trace 2 on 1 smash no VEF applied
   iv)240 trace 2 on 1 smash, with VEF applied.
   v) 120 alternate trace, with VEF applied.
   vi)120 near traces with VEF applied.
   Designature was applied to all 6 versions

5) A Deconvolution before stack test was conducted on Line 83A-16 SP 1390-1490. VEF of (+5, -2)ms/trace was applied on all options.
   i) Designature
   ii)gapped deconvolution 2 x 200ms operator with a 64 ms gap
   iii)whitening deconvolution 2 x 200ms operator
   iv) no deconvolution

6) A fold test was run at SP 1425-1550 on line 83A-16 using near 5, 10, 15, 20, 25, 30 fold traces with the normal stack ramp to ramp out noise due to NMO stretch etc.
   The purpose of this was to see what could be done with ramping to enhance the data below the water bottom channel zone where irregular moveout and diffractions deteriorated primary events.

7) A post-stack Deconvolution test was run at two locations
   a) Line 83A-16 SP 1421-1470 to represent deep data
   b) Line 83A-44 SP 1001-1025 to represent shallow data
   Deconvolution options tested were:-
   i) gapped 2 filters, 200 ms (168 ms active, 32ms gap)
   ii) " " " (136 ms " 64ms gap)
   iii)these were compared with a display of no post stack deconvolution.
   iv) GSI's post stack wavelet processing deconvolution TRANSCOMP was tested using the TCOMP option with 2 x 800ms gates starting 940 ms and 1760 ms (SP 1420-1455)

8) A filter analysis was run on line GUT-83A-44 (shallow water data) SP1001-1025 and line 83A-16 SP 1421-1445.
   Input data had deconvolution applied with 2 filters,168ms operators and a 24ms gap.

Passbands tested were:-

out - out	35- 70
0 - 10	40- 80
10- 20	45- 90
15- 30	50-100
20- 40	55-110
25- 50	60-120
30- 60	10-65
	15-65

Scaling was applied with (250,500,500,750,2000)ms gates after filtering.

9) 2 scaling tests were conducted.

a) SP 1001-1025 on line 83A-44 the following gate-scalers were tested:-

i) 1 x 3000 ms
ii) 5 x 1000 ms
iii) 2 x 200, 2 x 500, 750, 1850 ms
iv) 10 x 500 ms
v) 2 x 2000 ms
vi) 1 x 4800 ms

b) SP 1421-1445 on line 83A-16 the following gate-scalers were tested:-

i) 1 x 3000 ms
ii) 5 x 1000 ms
iii) 250,500,500,750,2000 ms
iv) no scaling
v) 10 x 500 ms
vi) 2 x 2000 ms

Design gate start time was water bottom + 100 ms

Design gates were non-overlapping but on application were 50% overlapping.

10) a)An alternative form of scaling - fast DGCS (32 ms gates) was applied post stack on line 83A-85 to see what high frequency data might be enhanced inbetween the high amplitude unconformities. It did do such but at the expense of the overall data quality. It looked extremely overscaled and the major events were lost amongst the background noise - giving an effective lowering of the signal to noise ratio.

b) The fast DGCS was then applied pre stack. This gave a letter looking section than a), but all semblance of a true amplitude section is destroyed by this step. Thus although it showed lower amplitude intrabed events it was at the expense of amplitude preservation. The sections were produced as a matter of interest only at GSI instigation for the clients future reference.

11) Display Tests

These were carried out on line 83A-16 SP 1390-1490 except where indicated otherwise. Several display scales were produced:-

a)	Decimation in display (using alternate traces)	64tpi, 3.75"/s*
b)	no decimation	48 tpi, 1.875"/s*
c)	"	25.6tpi, 3.75"/s
d)	"	29.54tpi, "
e)	"	34.91tpi, "
f)	"	38.40tpi, "
g)	"	48.00tpi, "

Then on line 83A-85 (the whole line):-

h)	2 on 1 mix	29.54tpi, 3.75"/s
i)	Decimation in dislay	29.54tpi, "

* denotes whole line

12) Line 83P-10 was migrated with GSI'S F-K domain wave equation migration using MSTK 7 narrow angle requesting smoothing and dip-correction. This was run twice:-

a) applying 500 ms scalers pre migration

b) with no scaling pre migration

The aim here was to check if spacially varying amplitude anomalies due to geology would produce migration artifacts as shown by b) and if scaling prior to stack would eliminate these as shown by section a). As a result , no artifacts occurred on this line and section b) enhanced the shallow data better than section a)

13) Further Migration Tests

Several lines were migrated amongst which was line 83A-12 which had a particularly deep channel. The exact location of the canyon bottom was unclear. We therefore paused at this stage to see if the parameters needed adjusting for the canyon areas. The following comparisons were performed:

a) Revised velocities , narrow angle

b) Revised velocities , wide angle

c) Original velocities, narrow angle

d) Original velocities, wide angle

e) 2 pass migration (migration with water velocity to remove water bottom multiple diffractions followed by migration using the residual velocity)

f) the original section was rescaled with 4 x 200 ms scalers followed by 500 ms. (The choice of scaling parameters had been based on the 2 test locations. Inspection of the final stacks had shown that in the much deeper water areas, not represented in the tests, the scaling could be optimised by using shorter gates in the first second below water bottom.)

The sections a) to d) showed no noticeable improvement on the original section. The revised scaling was a definite improvement. It was therefore decided to go ahead with ourprevious migration parameters but change the post migration scaling to include short scalers up front.

SECTION III
PRODUCTION PROCESSING

All lines were processed to 5.0 seconds. Only the near 120 traces were processed to produce 30 fold data.

PREPROCESSING

DEMULTIPLEXING

RESAMPLE 2ms to 4 ms resampling with a minimum phase filter

TAR Inelastic attenuation parameter ALPHA =6.5 db/sec (exponential factor)
T2 (cut off time for ALPHA) =3.5 secs
Spherical divergence corrections were applied

STATIC A time shift of -51.2ms to compensate the airgun delay

PDR

Offset	369	999	1989	(m)
start time	0	950	1800	(ms)
ramp length	100			(ms)

OR Waterbottom minus 200 ms, whichever is the larger time.

VEF Velocity Filtering (V4) in the F-K domain
positive cut + 5 msec/trace (+ 3000m/sec)
negative cut - 2 msec/trace (- 7500m/sec)

DSG Designature V4 - standard marine wavelet designed from the whole shot record.
Low cut slope submitted as 24db/octave
high cut slope submitted as 72 db/octave
fmax was input as 125 hz

TVS Gate length 3000 ms
No. gates 1

Start time (ms)	waterbot + 100 ms	waterbot + 300ms
offset	near	far

using regular scalers

INTERMEDIATE PROCESSING

VELSCANS 9 Depthpoint Velocity Analyses to determine the stacking function (1 per 3.0km average)

5 Stacking functions were used.

1000ms scalers were applied pre stack.

The following parameters were also applicable:-

processing gates (ms)		smash	+/- dip
0	500	3	3
500	1000	5	6
1000	1600	7	6
1600	2600	9	6
2600	3800	9	4
3800	5000	9	4

Stack Ramp:-

Offset	369	909	1989
Fold	3	12	30
Time (ms)	0	1050	1750

ramp length = 100 ms for all traces.

Filter:-

Time (ms)	500	3000
passband (hz)	12.5-60	10-45

Display:- Vertical scale 3"/s

horizontal scale 25 tpi

(this scale differed from the stack film displays in order that the 5 seconds of data fit in the 20" size gould paper frame.)

Velocity bounds and functions followed water bottom on the lines produced by TIMAP IV. For the lines processed on TIMAP II the bounds and velocities were manually changed along the lines to follow water bottom

POSTPROCESSING

NMO — Normal Moveout application using stacking functions interpreted by GSI.
Static corrections for shot and receiver depth below sea level were applied at this stage.

RAMP — First break suppression application
Ramp on

Time (msecs.)	Offset (metres)
0	249
250	309
450	609
1800	1989

STACK — Common depthpoint stack 30 fold, 120 trace, 7.5M depthpoint interval.

TVF — Time Variant Filtering

Passband (hz)	Time (ms)
10 - 90	0
10 - 80	500
10 - 70	1000
10 - 65	1800
10 - 55	2100
10 - 45	2300
10 - 40	2500
10 - 40	5000

TVS — Time Variant Scaling -
All lines were scaled using 500 ms scaling gates Design gate start time was water bottom + 200 ms. Gate overlap was 0% in design, 50% in application.

DISPLAY 1 Adjacent traces were summed just prior to display
Horiz. Scale 29.54 trace / inch (1:17445)
Vert. Scale 3.75 in /sec
Mode VA/WT 10% Bias
polarity normal
(a trough represents a positive pressure at the hydrophone)

DISPLAY 2 Horiz. Scale 48.00 trace / inch (1:14173)
Vert. Scale 1.875 in /sec
Mode VA/WT 10% Bias
Polarity normal (as above)

MIGRATION The lines as specified in appendix C were also migrated using GSI's F-K domain wave equation migration (Version 7) wide angle. Stacking velocities were checked then made horizon consistent using an ancilliary velocity conditioning program. these velocities were then input to the migration program where they were subsequently smoothed and dip corrected by the migration program.

DISPLAY 3 Adjacent traces were summed just prior to display.
Horiz. Scale - 29.54 trace/inch (1:17445)
Vert. Scale - 3.75 "/sec
Mode - VA/WT, 10% Bias
Polarity - Normal (as above)

DISPLAY 4 Horiz. Scale - 48 trace/inch (1:14173)
Vert. Scale - 1.875 "/sec
Mode - VA/WT, 10% Bias
Polarity - Normal (as above)

TAPES

Field tapes and raw stack tapes in SEG-Y format were shipped to Geomagnetics. Observers logs, field reports, shipboard sections, fathometer rolls and paper monitors were shipped to Union Texas in Melbourne.
Migtration tapes were erased with client approval.

SECTION V

COMMENTS

Permit VIC-P12 consisted of shallow water lines in the West progressing to deepwater in the Northeast of the block (approx.2.4s maximum 2 way water bottom time on line 83A-55). Several of the deep water lines crossed deep canyons. In permit T-13P the lines were shot in the Northeastern sector of the block and showed a similar distribution of shallow water in the West tending to deepwater (approx 1.5s maximum 2 way water bottom time on line 83P-21) in the Northeast. Deep water canyons were also evident in this block as shown on line 83P-20A.

Several factors must be considered when processing deep water data. As the water depth becomes deeper or shallower along the line, this affects :- a)the ramp
b)the scaling gate start time
c)the filter start time
d)the velocity funtions used on the velocity analysis
e)the velocity boundaries used on the velocity analysis.

All of these were accommodated in processing by using the option for start times and velocity functions to follow water bottom as annotated in the record headers.

DEEPWATER CHANNELS

The water bottom canyons presented processing problems. The distorted ray paths caused by such geological features affect the validity of the velocity analyses and deteriorate the stacked data.

The approach to solving these problems was as follows:-

1) to place velocity analyses in the canyons to show just what the moveout curve was like and what would give the optimum stack. The picks were treated with suspicion, since the moveout curve was not hyperbolic. In some cases where the velocity analysis was uninterpretable, a function was calculated for that water depth from the adjacent velocity analysis outside the canyon, based on the interval velocities.
2) Secondly the use of velocity filtering helped to attenuate some of the anomalous parts of the moveout curve, which would otherwise degrade the stacked events.
3) The stack ramp test showed that the optimum stack ramp for this type of data allowed only the near 15 traces to contribute down to water bottom plus 1500 ms. With less traces than this the water bottom multiple was too strong whilst with any more, the diffractions started to monopolise the section.

DEEPWATER MULTIPLES

Multiples are evident on the data in deep water areas. The deep water multiple period is too long for deconvolution to attack. An alternative would be to use DEMULT. However DEMULT can only be effective when the data exhibits hyperbolic moveout. The majority of the deepwater lines contain canyons where the moveout curve is no longer hyperbolic since the raypaths are abnormal. DEMULT in this case cannot attack the multiple adequately and is just as likely to attack the primary. Secondly, in the application of DEMULT, a quarter of the traces (near) must be zeroed. Since the far offset traces were already being ramped out in the channel zones, there would be very few traces left at all.

It is possible that DEMULT could be used on selected portions of lines which do not contain irregular water bottoms. However, to do so might not be desirable as it would be rather difficult practically and would cause some rather abrupt changes in the continuity of the data. It is worth remembering that one of the areas of interest to the client lay in the channel zone where DEMULT cannot be effective.

Another manifestation of the multiple problem in deepwater is that its amplitude on the far offset traces is so high in some cases that it does not stack out and because of the depth it is not ramped out. It occurs on the half scale non-decimated data as a 4 trace chequerboard pattern at a time somewhat greater than the water bottom multiple time as measured from zero offset. On the decimated section it reduces to a 2 trace chequerboard pattern. This only occurs on the deepest lines.

SHALLOW WATER MULTIPLES

Basement in the shallow water area is on average at 1.0 second. The strongest multiples here are from the water bottom. This period falls within the working time range of deconvolution. However, results of the post-stack deconvolution test on line 83A-44 were not successful enough for the client to apply it on a prospect-wide basis. The same test in deep water on line 83A-16 showed no multiple attenuation as there were no short period multiples. Deconvolution did help to sharpen the wavelet on both the deep and shallow water data. The autocorrelations run much later on line 83A-55 did show evidence of multiple energy in the shallow water section which was attenuated by the application of gapped deconvolution. The single fold cover on some of the shallow lines showed that the water bottom multiple was masking the primaries. In retrospect, for these areas a gapped deconvolution in conjunction with DSG may have improved the primaries more than a post stack deconvolution.

MIGRATION

As detailed in the experimental section, extra migration tests were initiated in the canyon areas but to no avail. It was found in practice, that the best results were obtained when the migration velocity was kept to 1480 m/sec. down to the apex of the first strong anticlinal diffraaction situated in the canyon. On the stacked section of course, data existed above this time owing to reflections from the sides of the canyon. This apex was often below the next major event beneath the water bottom such that the apex could have originated as a syncline in either the water bottom or this next major event. For migration, the knee times of the velocity must be horizon consistent, representing the dip of the data, and each function having the same number of legs. With water bottom dropping below the second major event, this often caused problems. On one or two of the lines where the water bottom looked almost sinusoidal with many water velocity diffractions extending to the first major primary below water bottom, it was found that the first velocity layer was practically 1480m/sec and thus a pseudo flat water bottom horizon model was used to migrate the data. Results were excellent as all the water velocity diffractions collapsed back to the water bottom.

Migrations on some lines such as 83A-63, over less steep sided canyon areas did not collapse the very extensive diffraction patterns originating at water bottom. Several attempts were made to correct this by slowing the velocity down. The attempts were unsuccessful. It can only be concluded that the direction of the line was not perpendicular to the ravine such that the diffractions were not from the plane of the section.

The only further comment concerns one line where the presence of some anomalous looking anticlines superimposed on the continuous primaries of the stacked section migrate into synclines on the migrated section. This data must be from out of the plane of the section and should thus be ignored.

A similar effect may be seen on line 83A-8 where the irregular waterbottom has created multiples of the waterbottom diffractions at twice the waterbottom time. This has given rise to many "smiles" after migration.

SCALING

Special attention needs to be paid to scaling in deepwater areas. The water bottom becomes a very strong event. The deep water scaling tests were conducted on data with a water bottom around 700 ms. As the waterbottom increased (beyond 700 ms) in time, the next major high amplitude event approached the water bottom to within 200ms in places. The scaling gate start time was 200ms below the waterbottom. This next event thus strayed in or out of the first 500 ms scaling gate according to geology. As a result, when the event fell inside the first 500 ms scaling gate, the scaler computed decreased to compensate, causing a shadow zone. When the event was not included in the computations for the first scaler, the scaler value was much higher such that the intermediate data was shown to full advantage. However, this was at the expense of creating a high amplitude water bottom and next major event since the scaler computed from the first gate is extrapolated back to time zero from the centre of that first gate. This is why the scaling was adjusted on the migrated sections to accommodate these geological variations.

WATERBOTTOM "JITTER"

For those not familiar with the cause, perhaps some explanation might be relevant to explain the "jitter" at the water bottom in the shallow water data. Whenever the fold is less than the number of traces on the spread, this phenomena may be seen. Refractions, reflected refractions, multiples and watertottom reverberations are all common causes of this chequerboarding. With this particular data, 120 trace, 30 fold, the first 4 cdp sets of offsets are different and then this pattern is repeated every 4 traces. After moveout, any multiple or linear event will occur at an increasing time on each offset trace. When each of the 4 different sets of offsets are stacked, these multiples/linear events will occur at different times- giving rise to a chequerboard pattern. Events with linear stepout appear as a constant frequency whereas events with an NMO type stepout appear as a varying frequency. The chequerboard pattern occurs over 2 traces on the decimated sections.

TIMAP II / IV

Some lines were processed on Timap II whilst others were processed on Timap IV. There are some differences which can be seen on the data which warrant an explanation. Firstly data start time on the final stacks processed on Timap IV is ramped to approximately 100 ms whilst on Timap II it is ramped to 200ms. This is only apparent where the water bottom is less than 200 ms. The idea of the ramp is to eliminate the very early data with NMO stretch. The algorithms governing this are slightly different.

Secondly on Timap IV, the bounds and velocity function used on the velocity analyses can be made to follow the waterbottom at each location automatically according to the water depth annotated in the header of the input CDPS. With Timap II this is not possible so the functions and bounds must be changed manually along the line as the water depth increases or decreases..

Respectfully submitted.

C. Wilkins

Cherry Wilkins

Processing Party Chief

APPENDIX A

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 records by the DFS system binary gain control system and correcting for inelastic attenuation and spherical divergence losses.

VELOCITY FILTERING (VEF) V4

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) appears 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 velocity 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 aliased events. However, when aliased noise overlays signal, velocity filtering loses its discriminating power.

DESIGNATURE (DESIG 4*)

Designature is 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 4 is the particular designature process in the current VELFILT program and provides an alternative to conventional pre-CDP stack deconvolution (TVD). DESIG 4 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 4 is not time-variant.

DESIG 4 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.

* Trademark of Texas Instrument Inc.

VELOCITY ANALYSIS- VELSCAN

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

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 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 time, 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 of 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 attentuate 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. Several time gates with no 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 and 50% overlap.

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-varying manner.

MSTACK V7

GSI F-K domain migration routine uses the Kirchhoff integral solution to the scalar wave equation. It equates to the final solution of the downward continuation finite difference method. This method will migrate data correctly in the presence of a lateral velocity field. In the 'wide' angle mode it has a practical dip limit, approaching 90 degrees. On sections with events with 'true' structural dip of less than 20 degrees it is recommended to use the 'dip' limited option. This option helps to prevent excessive wave front noise on low S/N ratio data. The 'dip' limited option emulates finite difference migration in F-K space without the dispersive effect associated with the Z© term.

TRANSCOMP V1

This term covers a suite of 3 separate post stack processes which may be applied individually or in combination with each other. The 3 processes are *GAP, TCOMP, and NMP and are described below.

*GAP

This process is designed to deconvolve medium period multiples, with periods between about 100 milliseconds and 1 second. The trace data in user-selected space variant time gates is transformed into the cepstral domain, where the multiple energy for a specified multiple period can be isolated by a simple subtraction process. This multiple data is then inverse transformed back to the frequency domain, where it gives the power spectrum of the multiple sequence. Since the multiples are a minimum phase effect, their phase spectrum can be computed from their power spectrum, and an inverse filter designed to attenuate the multiples. Filters are designed in this way for each time gate on each trace, and then applied in a time and space variant manner. This process is designed to attenuate only one multiple period, which is supplied by the user, and can be space variant.

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TCOMP

This is a post-stack time-variant deconvolution process designed to correct for the minimum phase transmission effects that result from interbed and short period multiples. Ideally, the input data has been processed through DESIG which has collapsed the time-invariant, geology-independent shot wavelet to a zero phase band-limited pulse. Shallow data, where transmission effects are minimal, should have a relatively flat spectrum, while deeper data will show increasing transmission effects, resulting in increased high frequency attenuation. The transmission effect is isolated by using power spectral ratios for user-specified time gates to define spectra from which the filters are designed. Since the first gate spectrum is used as a reference spectrum to which subsequent gate spectra are corrected, at least two gates must be supplied.

NMP

This is a deconvolution technique designed to take advantage of the improved signal-to-noise ratio provided by stack to make the final wavelet zero phase. NMP assumes that the input wavelet is near zero phase and estimates from data within user-specified, optionally space-variant, time windows the residual wavelet. Each estimate incorporates a large number of adjacent traces. The method consists of an assessment of the reflection series being made from the input trace. The location and strength of the reflectors come from an examination of the local maxima on the envelope of the associated complex trace. The polarity of each reflection coefficient comes from an examination of the polarity of the input trace at the relevant time. By correlating this estimated reflection series with the trace, the residual wavelet is determined and spatially averaged. It is then inverted to give a filter which is applied to the data (time and spatially variant, if so designed), to make a final adjustment to the wavelet phase.

SEGY TAPES OF STACKED DATA

VSN NUMBER : 600190

LINE NUMBER	S.P. RANGE	C.D.P. RANGE
GUT83A-1	1001-1250	1001-2116
GUT83A-2	1001-1680	1001-3836
GUT83A-3	1001-1421	1001-2800
GUT83A-4A	1001-1501	1001-3120
GUT83A-5	1001-1390	1001-2676
GUT83A-6	1001-1470	1001-2996
GUT83A-7	1001-1660	1001-3756

VSN NUMBER : 600191

LINE NUMBER	S.P. RANGE	C.D.P. RANGE
GUT83A-8	1001-2164	1001-5772
GUT83A-9	1001-1390	1-1676
GUT83A-10A	1001-1390	1001-2676
GUT83A-12	1001-1785	1001-4256
GUT83A-12A	1001-692	1001-2356
GUT83A-43A	1001-1166	1-780

VSN NUMBER : 600192

LINE NUMBER	S.P.RANGE	C.D.P. RANGE
GUT83A-14	1001-1811	1-3360
GUT83A-14A	1741-2296	1-2340
GUT83A-16	1001-2050	1121-5436
GUT83A-81	1001-1291	1001-2280

VSN NUMBER : 600193

LINE NUMBER	S.P.RANGE	C.D.P.RANGE
GUT83A-18	1001-2050	1001-5316
GUT83A-19	1001-1811	1-3360
GUT83A-20	1001-1490	1001-3076
GUT83A-34	1001-1410	1-1756

VSN NUMBER : 600194

LINE NUMBER	S.P.RANGE	C.D.P.RANGE
GUT83A-22	1001-1770	1001- 4196
GUT83A-24	1001-2080	1001- 5436
GUT83A-25	1001-1851	1001- 4520
GUT83A-43B	1096-1606	1- 2160

VSN NUMBER : 600195

LINE NUMBER	S.P.RANGE	C.D.P.RANGE
GUT83A-26	1001-2172	1-4804
GUT83A-28	1001-1811	1-3360
GUT83A-41	1001-1241	1-1080

VSN NUMBER : 600196

LINE NUMBER	S.P.RANGE	C.D.P RANGE
GUT83A-29	1001-1800	1001-4316
GUT83A-30	1001-1611	1-2560
GUT83A-31	1001-1561	1-2360
GUT83A-44	1001-1800	1001-4316

VSN NUMBER : 600197

LINE NUMBER	S.P.RANGE	C.D.P.RANGE
GUT83A-35	1001-2016	1-4180
GUT83A-1037	1001-1793	1-3288
GUT83A-58	1002-1471	1-1996

VSN NUMBER : 600198

LINE NUMBER	S.P. RANGE	C.D.P. RANGE
GUT83A-39	1001-1700	1-2916
GUT83A-40	1001-2281	1001-6240
GUT83A-57	1001-1769	1-3188

VSN NUMBER : 600199

LINE NUMBER	S.P. RANGE	C.D.P.RANGE
GUT83A-45	1001-1187	1-864
GUT83A-48	1001-2562	1-6364
GUT83A-69	1001-1791	1001-4280

VSN NUMBER : 600200

LINE NUMBER	S.P. RANGE	C.D.P.RANGE
GUT83A-49	1001-1949	1-3912
GUT83A-50	1001-2339	1001-6472
GUT83A-53	1001-1411	1-1760

VSN NUMBER : 600201

LINE NUMBER	S.P.RANGE	C.D.P.RANGE
GUT83A-46	1001-1361	1-1560
GUT83A-55	1001-2426	1001-6820
GUT83A-61	1001-2009	1001-5152
GUT83A-62	1001-1389	1001-2672

VSN NUMBER : 600202

LINE NUMBER	S.P.RANGE	C.D.P.RANGE
GUT83A-51	1001-1841	1-3480
GUT83A-54	1001-1909	1-3752
GUT83A-63	1001-1891	1001-4680

VSN NUMBER : 600203

LINE NUMBER	S.P.RANGE	C.D.P.RANGE
GUT83A-59	1001-1221	1001-2000
GUT83A-64	1001-1963	1-3968
GUT83A-73	1001-1320	1001-2396
GUT83A-75	1001-1831	1001-4440
GUT83A-77	1001-1490	1001-3076

VSN NUMBER : 600204

LINE NUMBER	S.P.RANGE	C.D.P.RANGE
GUT83A-79	1001-1411	1001-2760
GUT83A-81A	1001-1370	1001-2596
GUT83A-83	1001-1590	1001-3476
GUT83A-85	1001-1601	1001-3520
GUT83A-87	1001-1570	1-2396

VSN NUMBER : 600205

LINE NUMBER	S.P.RANGE	C.D.P.RANGE
GUT83A-89	1001-1572	1-2404
GUT83A-91	1001-1640	1001-3676
GUT83A-93	1001-1571	1001-3400

VSN NUMBER : 600206

LINE NUMBER	S.P.RANGE	C.D.P.RANGE
GUT83A-33	1001-1900	1-3716

VSN NUMBER : 600187

LINE NUMBER	S.P. RANGE	C.D.P.RANGE
GUT83P-4A	1001-1241	1001-2080
GUT83P-5A	1001-1190	1001-1876
GUT83P-9	1001-1571	1001-3400
GUT83P-10	1001-1689	1001-3872
GUT83P-12	1001-1354	1001-2532
GUT83P-13	1001-1320	1001-2396
GUT83P-15	1001-1171	1001-1800
GUT83P-15A	1001-1510	1001-2756
GUT83P-17	1001-1211	1001-1960

VSN NUMBER : 600188

LINE NUMBER	S.P. RANGE	C.D.P.RANGE
GUT83P-17A	1141-1701	1001-3360
GUT83P-18A	1001-1555	1-2336
GUT83P-20	1001-1211	1001-1960
GUT83P-20A	1141-2020	1-3636
GUT83P-21	1001-1740	1-3076

VSN NUMBER : 600189

LINE NUMBER	S.P. RANGE	C.D.P.RANGE
GUT83P-24	1001-1570	1001-3396
GUT83P-25	1001-1489	1001-3072
GUT83P-26	1001-1339	1-1472
GUT83P-27	1001-1579	1-2432

APPENDIX C

UNION TEXAS

LINE NUMBER	KMS	SHOTPOINT RANGE	NO. VEL	MSTK
GUT-83A-1	7.5	1001-1250	3	NA
GUT-83A-2	20.4	1001-1680	9	
GUT-83A-3	12.63	1001-1421	4	NA
GUT-83A-4A	15.03	1001-1501	6	
GUT-83A-5	11.7	1001-1390	4	NA
GUT-83A-6	14.1	1001-1470	5	
GUT-83A-7	19.8	1001-1660	7	NA
GUT-83A-8	34.92	1001-2164	12	
GUT-83A-9	11.73	1001-1390	4	NA
GUT-83A-10A	11.7	1001-1390	6	
GUT-83A-12	23.55	1001-1785	10	
GUT-83A-12A	9.3	1001-692	4	
GUT-83A-14	24.33	1001-1811	9	
GUT-83A-14A	16.68	1741-2296	6	
GUT-83A-16	31.50	1001-2050	10	
GUT-83A-18	31.5	1001-2050	13	
GUT-83A-19	24.33	1001-1811	8	NA
GUT-83A-20	14.7	1001-1490	7	
GUT-83A-22	23.10	1001-1770	9	
GUT-83A-24	32.4	1001-2080	11	
GUT-83A-25	25.53	1001-1851	9	NA
GUT-83A-26	35.19	1001-2173	13	
GUT-83A-28	24.33	1001-1811	9	
GUT-83A-29	24.0	1001-1800	8	NA
GUT-83A-30	18.33	1001-1611	6	
GUT-83A-31	16.83	1001-1561	6	NA
GUT-83A-33	27.0	1001-1900	9	NA
GUT-83A-34	12.3	1001-1410	5	
GUT-83A-35	30.48	1001-2016	10	NA
GUT-83A-37A	23.79	1001-1793	8	NA
GUT-83A-39	21.0	1001-1700	7	NA
GUT-83A-40	38.43	1001-2281	13	NA
GUT-83A-41	7.23	1001-1241	3	NA
GUT-83A-43A	4.98	1001-1166	2	NA
GUT-83A-43B	15.33	1096-1606	5	NA
GUT-83A-44	24.0	1001-1800	8	NA
GUT-83A-45	5.61	1001-1187	2	NA
GUT-83A-46	10.83	1001-1361	4	NA
GUT-83A-48	46.86	1001-2562	16	NA
GUT-83A-49	28.47	1001-1949	10	NA
GUT-83A-50	40.17	1001-2339	14	NA

KEY NA = NOT APPLICABLE AS THESE LINES WERE NOT MIGRATED

LINE NUMBER	KMS	SHOTPOINT RANGE	NO. VEL	MSTK
GUT-83A-51	25.23	1001-1841	9	NA
GUT-83A-53	12.33	1001-1411	4	NA
GUT-83A-54	27.27	1001-1909	10	NA
GUT-83A-55	42.78	1001-2426	18	
GUT-83A-57	23.07	1001-1769	8	NA
GUT-83A-58	14.13	1001-1471	5	NA
GUT-83A-59	6.63	1001-1221	2	NA
GUT-83A-61	30.27	1001-2009	10	
GUT-83A-62	11.67	1001-1389	6	
GUT-83A-63	26.73	1001-1891	9	
GUT-83A-64	28.89	1001-1963	9	
GUT-83A-69	23.73	1001-1791	9	
GUT-83A-73	9.6	1001-1320	3	NA
GUT-83A-75	24.93	1001-1831	8	
GUT-83A-77	14.7	1001-1490	6	
GUT-83A-79	12.33	1001-1411	5	
GUT-83A-81	8.73	1001-1291	3	
GUT-83A-81A	11.1	1001-1370	4	
GUT-83A-83	17.70	1001-1590	7	
GUT-83A-85	18.03	1001-1601	6	
GUT-83A-87	17.1	1001-1570	8	
GUT-83A-89	17.16	1001-1572	6	
GUT-83A-91	19.2	1001-1640	7	
GUT-83A-93	17.13	1001-1571	6	

KEY NA = NOT APPLICABLE

LINE NUMBER	KMS	SHOTPOINT RANGE	NO. VEL	MSTK
GUT-83P-4A	7.23	1001-1241	3	
GUT-83P-5A	5.7	1001-1190	2	
GUT-83P-9	17.13	1001-1571	7	
GUT-83P-10	20.67	1001-1689	7	
GUT-83P-12	10.62	1001-1354	5	
GUT-83P-13	9.6	1001-1320	4	
GUT-83P-15	5.13	1001-1171	2	
GUT-83P-15A	12.30	1101-1510	4	
GUT-83P-17	6.33	1001-1211	2	
GUT-83P-17A	16.83	1141-1701	6	
GUT-83P-18A	16.65	1001-1555	6	
GUT-83P-20	6.33	1001-1211	2	
GUT-83P-20A	26.4	1141-2020	9	
GUT-83P-21	22.2	1001-1740	9	
GUT-83P-24	17.1	1001-1570	8	
GUT-83P-25	14.67	1001-1489	6	
GUT-83P-26	10.17	1001-1339	3	
GUT-83P-27	17.37	1001-1579	6	

NB ALL THE LINES IN 83P WERE MIGRATED

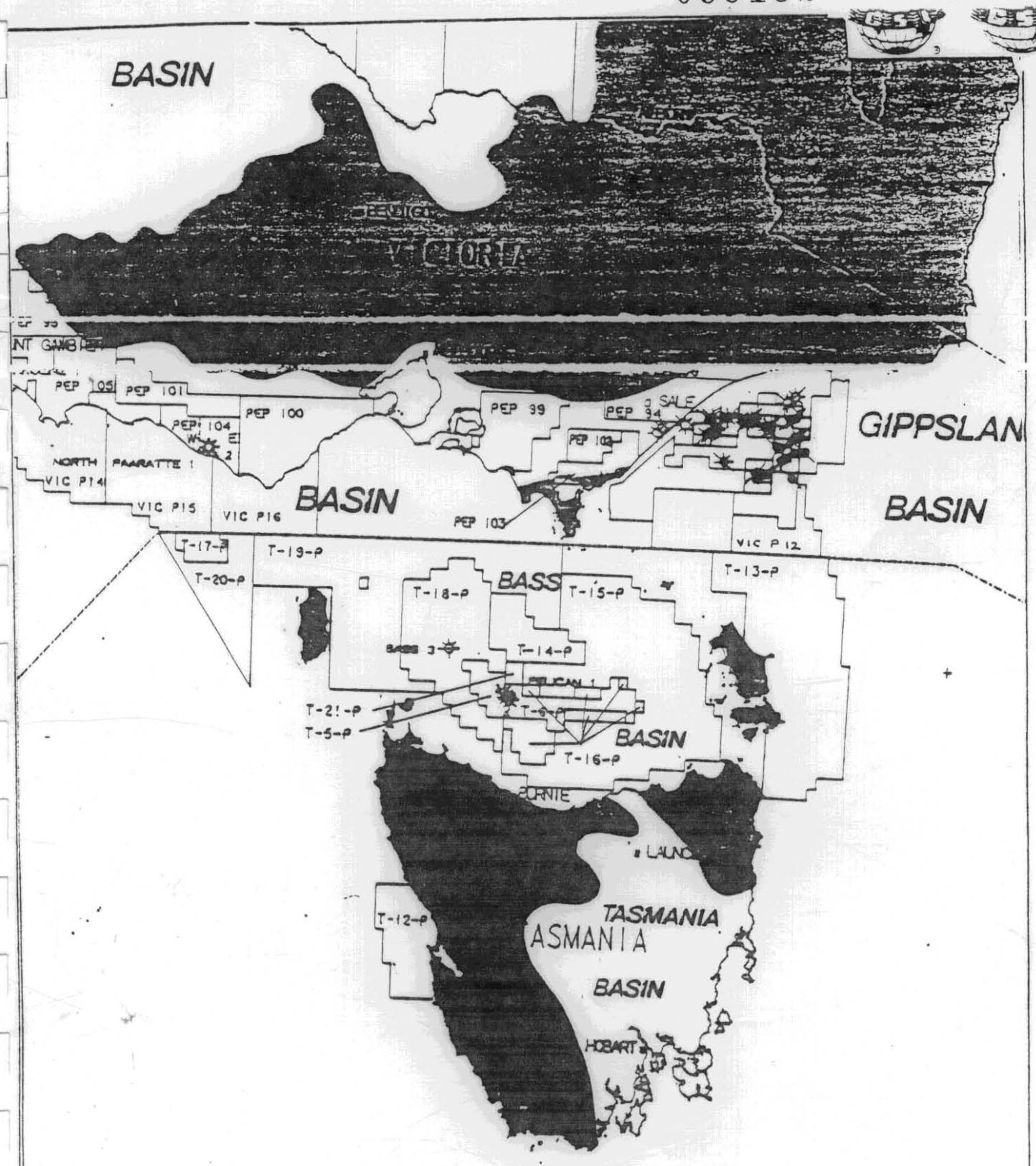


PLATE I

GSI-709

PROCESSING FLOW DIAGRAM

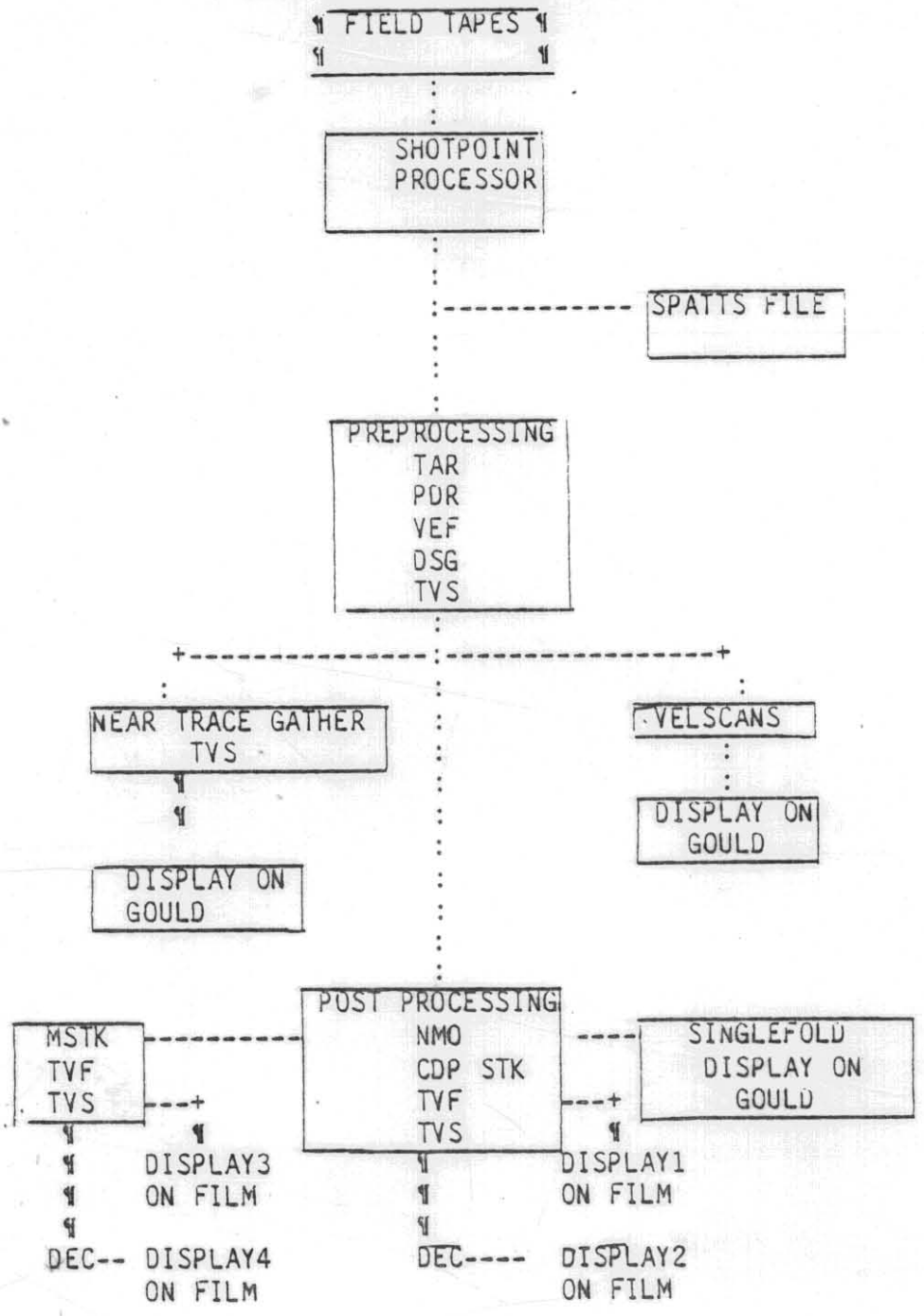


PLATE II

T/13P Part 18 099184

REPORT ON

PROCESSING OF MARINE MAGNETIC DATA

FROM VIC P12

AND T13/P

FOR

UNION TEXAS AUSTRALIA INC.

E.A. Howell
ECL AUSTRALIA PTY. LTD.
16 Altona Street
West Perth 6005
Western Australia

November, 1983

GUT 83P

CONTENTS

ENCLOSURES

1. CONCLUSIONS & RECOMMENDATIONS

The processing has been complicated by problems due to significant misties (ranging up to 55 nT in one case). The exact cause of the misties is not apparent; however, they could be related to either of the three factors below :-

1) Acquisition errors - The q.c. report documents two problems with the magnetometer: a) the original fish had to be replaced due to leakage through a ruptured diaphragm; b) the watertight plug at the reel had to be replaced.

2) Inadequate diurnal control - Diurnal variations are never constant from place to place and major changes often occur at the coastline. The diurnal variations recorded several hundred kilometres from the survey area may not be relevant.

3) Magnetic storm activity.

Due to the inevitable distortion of anomalies on the map introduced by smoothing out the misties, it is recommended that profiles should be generated for each line (with no levelling) if any quantitative interpretation is planned.

2. INTRODUCTION

This report describes the steps taken in processing 1565 line km of marine magnetic data acquired in permits VIC P12 and T 13/P in the Gippsland Basin, offshore Australia. Data was collected by Geophysical Services Inc. using the survey vessel "MV Eugene McDermott II" for Union Texas Australia Inc.

Data supplied to Tesla 10 Pty. Ltd. consisted of :-

1) Magnetic field tape in GSI's CMS format.

2) UKOAA format navigation tape.

The end-product is a Total Magnetic Intensity contour map at a scale of 1:100,000 contoured at an interval of 10nT over the survey area.

3. PROCESSING SEQUENCE

The processing was conducted with the aid of a series of displays at a scale of 1:200,000 on paper. The processing sequence is described in terms of these displays :-

1) Line locations - to check all navigation data on UKOAA tape were present and all lines identifiable.

2) Raw data display - the data was displayed in profile form on the map to detect noisy and unacceptable data (see Enclosure 1). The scale of the profiles is 1cm = 160 nT. Following this, 'spikes' were normally 'edited out'.

3) All data was then automatically contoured at an interval of 10 nT. The display showed a degree of "herringboning" and it was thus decided to split the data sets into a NW-SE set and a NE-SW set to assess the effect misties were having in creating spurious anomalies. The two displays showed generally consistent data from both data sets in the western and southern part of the area but significant differences in trends in the north-eastern quadrant with features orientated NE-SW on that data set and NW-SE on the other set.

4) A display incorporating tie-line levelling was then generated but the results indicated that by forcing the intersections to tie and distributing the discrepancies "new anomalies" were being introduced that were not apparent on individual profile lines. At this stage it was decided that the mistie problem could be improved by application of diurnal corrections. No adjacent base magnetometer readings were available for this survey so the best attempt at obtaining diurnal control was made. Daily analogue records were obtained (after considerable delay) from the Bureau of Mineral Resources (BMR, Canberra) showing readings taken from a station at Toolangi, Victoria (several hundred kilometers from the survey area). These records were digitised and corrections applied to the data accordingly.

In the western and southern parts and parts of the north-east the diurnal corrections improved the intersection ties and more consistent results were obtained; however, in parts of the eastern area the diurnal corrections actually exacerbated the problem. A more detailed analysis of the mis-ties was needed and data from both NW-SE and NE-SW sets were examined and analysed. A histogram showing distribution of the misties is presented as Enclosure 2. Mis-ties of up to 15 nT were rated acceptable (assuring a measurement accuracy of 10 nT the error expected would be $\sqrt{10^2 + 10^2}$ = 14 nT. 55% of the intersections were acceptable. The remaining 45% were examined critically.

Consequently it was deemed necessary to drop out some lines and parts of lines. The final Total Magnetic Intensity map was then generated. (Enclosure 3).

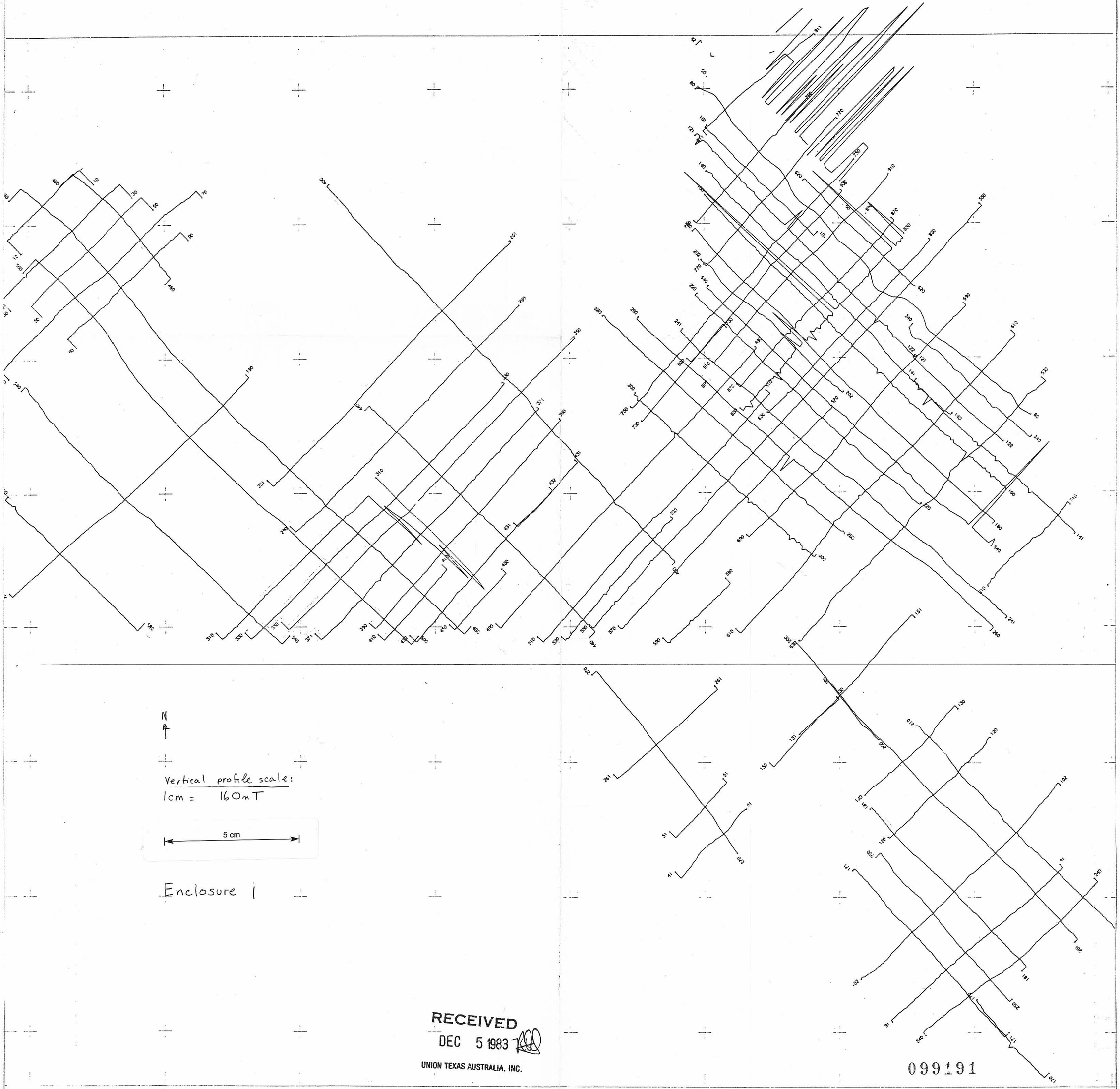
4. FINAL TOTAL MAGNETIC INTENSITY MAP

The final map has data missing from the following lines :-

83P	-	02	*
83P	-	04A	*
83P	-	15A	(1100 - 1300)
83A	-	4A	*
83A	-	6	*
83A	-	8	(All)
83A	-	14	(1550 - 1867)
83A	-	14A	(All)
83A	-	20	(All)
83A	-	22	(All)
83A	-	30	(All)
83A	-	57	(1600 - 1769)
83A	-	59	(All)
83A	-	63	(1100 - 1350) (1650 - 1891)
83A	-	73	*
83A	-	75	(All)
83A	-	85	(All)
83A	-	89	*

* Poor or no recording documented in q.c. acquisition report.

Anomalies within the grid have been checked against initial profiles to ensure that the levelling had not introduced spurious anomalies.

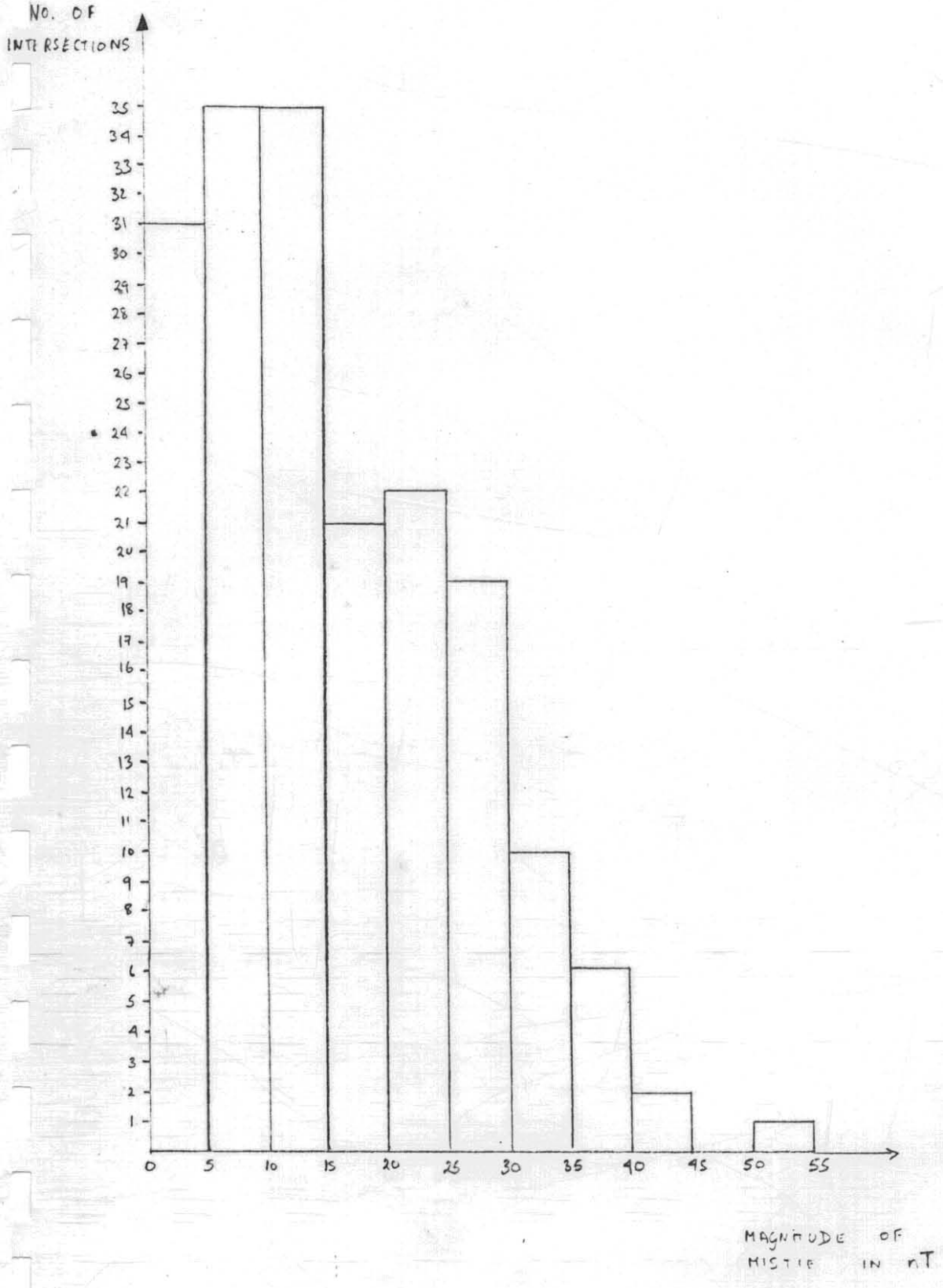


N

Vertical profile scale:
1cm = 160mT

5 cm

Enclosure 1



Enclosure 2 - Histogram showing mistie distribution

5 cm

5700000 N

5680000 N

5660000 N

5640000 N

580000 E

600000 E

620000 E

640000 E

660000 E

SURVEY SPECIFICATIONS

DATA ACQUISITION	:	GEOPHYSICAL SERVICE INC
DATE	:	MARCH - APRIL 1983
MAGNETOMETER	:	GEOMETRICS G803 PROTON PRECESSION MAGNETOMETER RECORDING TO 0.1 nT
ACQUISITION	:	TO 9 TRACK MAGNETIC TAPE AND MULTI-CHANNEL ANALOGUE RECORDERS.
NAVIGATION	:	ARGO SYSTEM. C.D.P. POSITIONS
CO-ORDINATION	:	UTM CO-ORDINATES. AUST. NAT. SPHEROID CENTRAL MERIDIAN 147 DEG EAST
LINE SPACING	:	VARIABLE
LINE DIRECTION	:	NE - SW & NW - SE
DATA PROCESSING	:	TESLA-IO PTY LTD
JOB NUMBER	:	TA1044

N

LOCATION DIAGRAM

SURVEY AREA

LEGEND

CONTOUR INTERVAL - 10 NANOTESLAS
GRID MESH SIZE - 1500m X 1500m
IGRF REMOVED - 1975 MODEL
DATUM ADDED - 2000 NANOTESLAS

200 nT CONTOUR
50 nT CONTOUR
10 nT CONTOUR

NOTE : DATA FROM THE FOLLOWING LINES HAS BEEN EXCLUDED FROM THE PRODUCTION OF THIS MAP

83P-04A	83P-15A	83A-57	83A-59
83A-63	83A-73	83A-75	83A-85
83A-89	83A-4A	83A-6	83A-08
83A-14	83A-14A	83A-20	83A-22
83A-30			

0 1 2 3 4 5 6 7 8 9 10 Km

SCALE 1:100000

5 cm

UNION TEXAS AUSTRALIA INC.

GIPPSLAND BASIN
BASS STRAIT - VIC P12
MAGNETIC CONTOURS

PROJ NO.	DATE: 14-OCT-83

099193

OR-0105

T/13P part 18