BUREAU OF MINERAL RESOURCES
GEOLOGY AND GEOPHYSICS

Record 1974/15

Marine geophysical survey of the Australian continental margin

1970-73

by

079947

Compagnie Generale de Geophysique

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Record 1974/15

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MARINE GEOPHYSICAL SURVEY OF THE AUSTRALIAN CONTINENTAL MARGIN 1970 - 1973

FIELD PROGRESS REPORTS

by

COMPAGNIE GENERALE DE GEOPHYSIQUE

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Record 1974/15

MARINE GEOPHYSICAL SURVEY OF THE AUSTRALIAN CONTINENTAL MARGIN 1970 - 1973

FIELD PROGRESS REPORTS

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COMPAGNIE GENERALE DE GEOPHYSIQUE

This report was written by the contractor, Compagnie Generale de Geophysique, to record progressively the field activity of the marine geophysical survey of the Australian continental margin. It represents his view of the subject, which is not necessarily that of the Bureau of Mineral Resources.

SUMMARY

A marine geophysical survey of much of the Australian continental margin was conducted by Compagnie Generale de Geophysique (C.G.G.) under contract to the Bureau of Mineral Resources between December 1970 and January 1973. The work was divided for administrative convenience into ten surveys, numbered 10 to 19. A total of 96 000 nautical miles was traversed in waters between about 50 m and 4500 m deep at a line spacing which varied from 20 nautical miles off the east coast to 30 nautical miles in the west.

All of the data, except seismic, were acquired in digital form on magnetic tape using small electronic computers to control and monitor the input. All important measurements were recorded also in analogue chart form, both for monitoring the measurements and for backup in case of failure of the digital system.

The primary navigation control was performed by a satellite Doppler system, and detailed positions were obtained by the use of sonar Doppler equipment to interpolate continuously between the satellite fixes. For backup support to the sonar Doppler, a Chernikeeff electromagnetic log and pressure log were operated continuously and the output recorded on the digital tape along with gyrocompass bearings.

Total magnetic field measurements were made using a proton procession magnetometer trailed about 200 m behind the ship. Gravity measurements were made with a LaCoste & Romberg marine gravity meter mounted on a gyro-stabilized platform near the centre of the ship. The seismic system comprised a six-channel hydrostreamer cable and a single-channel cable both connected through a standard seismic amplifier bank to an analogue magnetic tape recorder and two analogue chart recorders. The seismic energy source was a 120 kilojoule sparker. Water depths were measured by two depth sounders, one designed for shallow water and the other for deep water.

The contractor's field reports describe the progress made during each survey, the operation of the various systems, and the quality of data recorded.

079947

BUREAU OF MINERAL RESOURCES

MARINE GEOPHYSICAL SURVEY
SOUTH & NORTH WEST COASTS OF AUSTRALIA

FIELD REPORT
7/1972 TO 8/1972

SURVEY NO. 17

BUREAU OF MINERAL RESOURCES

MARINE GEOPHYSICAL SURVEY

SOUTH COAST OF AUSTRALIA

FIELD REPORT

April 1972 to July 1972

Survey No. 16

Compagnie Generale de Geophysique
175 Alinga Street, Canberra, A.C.T.

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INTRODUCTION

Survey 16 consists of 4 cruises. The geographical limits of each cruise are approximately these:-

(Fig. A, Plates 32, 33)

CRUISE 1:

North:	38° South
South:	44° South
East:	150° East
West:	140° East

CRUISE 2:

North:	32° South
South:	39° South
East:	141° East
West:	133° East

CRUISE 3:

North:	31° South
South:	37° South
East:	138° East
West:	130° East

CRUISE 4:

North:	31° South
South:	36° South
East:	135° East
West:	124° East

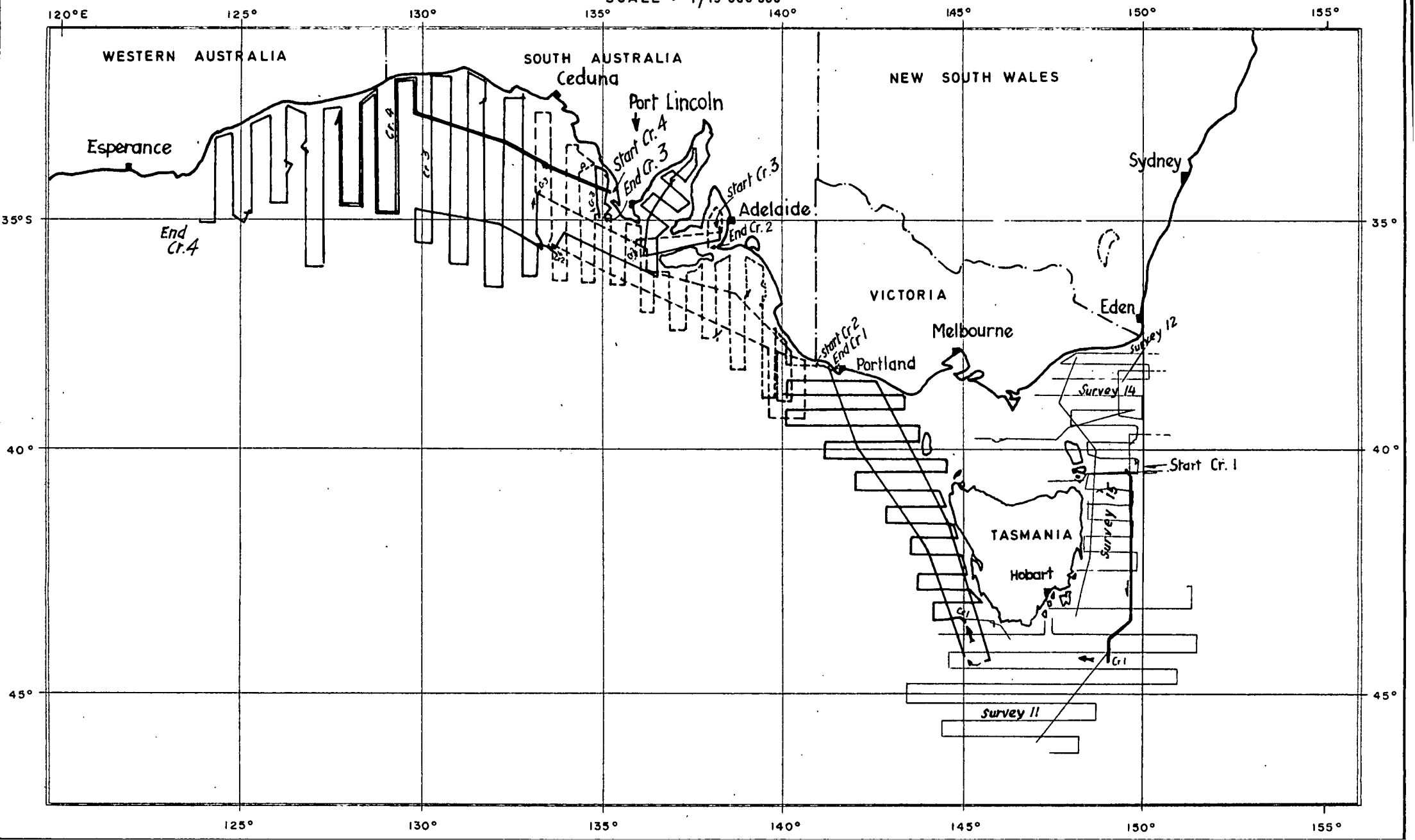
During Survey 16, the different locations of the shore station were: (Fig. B)

- Launceston (Tasmania) from Day 01 to Day 18.
- Coffin Bay (S.A.) from Day 22 to Day 69.
- Albany (W.A.) from Day 77 to the end of the Survey.

Fig. A

LOCATION SKETCH - SOUTH COAST OF AUSTRALIA - SURVEY 16

SCALE ~ 1/15 000 000



SUMMARY OF OPERATIONS

CRUISE 1 (Fig. A)

The M/V Lady Christine left Launceston on 29th March 1972 at 22.30 L.T.

Cruise 1 began on Thursday 30th March at 08.00 GMT, BMR Day 02.

The working periods were as follows:-

- From BMR Day 02 at 08.00 GMT to Day 03 at 16.40 GMT: end of the work on the Tasmanian East Coast.
- From BMR Day 04 18 10 to Day 13 06 30: stoppage due to the electrodes.
- From BMR Day 13 09 20 to Day 15 20 30: stoppage due to bad weather.
- From BMR Day 17 04 20 to Day 19 01 30.

The ship entered Portland (S.A.) on Sunday 16th April at 18.00 L.T.

CRUISE 2 (Fig. A)

The M/V Lady Chrstine left Portland on Wednesday 19th April at 18.30 L.T.

Cruise 2 began on 19th April at 15.00 GMT, on BMR Day 22.

The working periods were as follows:-

- From Day 22 15 00 to Day 23 04 10: stoppage due to main cable.
- From Day 23 06 00 to Day 24 11 00: stoppage due to the Sparker system.

- From Day 24 14 50 to Day 24 18 00: stoppage due to the main cable.

- From Day 24 23 10 to Day 25 14 30: stoppage due to bad weather.

Here took place a call in Adelaide to repair the Sparker generators damaged by the bad weather: from Day 28 00 45 to Day 30 12 15.

Operations resumed on Day 31 04 40. From this time, the working periods were:-

- From Day 31 04 40 to Day 33 04 00: stoppage due to the main cable.

- From Day 33 10 20 to Day 36 00 00: Rendezvous with a supply boat.

- From Day 36 04 40 to Day 46 09 30: travelling.

- From Day 47 01 30 to Day 48 02 10.

The ship entered Port Adelaide on Tuesday 16th May at 09.30 L.T.

CRUISE 3 (Fig. A)

The M/V Lady Christine left Port Adelaide on Friday 19th May at 18.00 L.T.

Cruise 3 began on Sunday 21st May at 16.00 GMT on Day 52.

The working periods were as follows:-

- From Day 52 16 00 to Day 53 17 30: main cable.
- From Day 53 21 00 to Day 57 23 30: supply boat.
- From Day 59 17 15 to Day 62 08 50: main engine.
- From Day 62 17 45 to Day 68 05 30: travelling.
- From Day 68 16 30 to Day 69 03 20: gravity meter.
- From Day 69 14 20 to Day 69 22 20.

The M/V Lady Chrstine entered Port Lincoln on Tuesday 6th June at 18.00 L.T.

CRUISE 4 (Fig. A)

The ship left Port Lincoln on Friday 9th June at 24.00 L.T.

Cruise 4 began on Day 74 at 10.00 GMT.

The working periods were as follows:

- From Day 74 10 00 to Day 74 20 00: gyro compass out of order.
- From Day 75 00 00 to Day 82 00 00: teletype ASR33 of the Satellite system.
- From Day 82 08 50 to Day 83 05 20: main engine.
- From Day 83 12 50 to Day 85 09 00: bad weather.
- From Day 87 00 40 to Day 88 13 10: bad weather.

The M/V Lady Christine entered Esperance on Saturday 1st July at 09.15 L.T.

STATISTICS (Tables 1 - Enclosures A to E)

Statistical Table 1 and Enclosures A to E finally complete the above observations.

Cruise 1.

TT = Total time : 512 hours 30 minutes = 0.71 month.

Working mileage (WM): 2954 nautical miles.

The breakdown of TT, in percentages is as follows:

TTS = 80% of TT

P = 20% of TT

TTS can be further divided into:

W = 80% of TTS = 64% of TT

T = 11% of TTS = 8.8% of TT

SB = 0% of TTS = 0% of TT

STATISTICS

Survey / Cruise	Total time at sea TTS	Working time	Travel time	Supply boat	Bad weather	Major breakdown	Port	Total time TT
16 / 1	427.30	341.20	45.30	0	35.20	05.20	85.00	512.30
16 / 2	639.30	439.10	44.20	04.40	45.30	108.50	80.00	719.30
16 / 3	432.00	343.10	28.40	41.45	0	18.25	78.00	510.00
16 / 4	515.00	279.10	16.30	0	194.30	25.05	46.45	562.00
TOTAL	2014.15	1402.50	135.00	46.25	275.20	154.40	289.45	2304.00
MONTHES	2.8	1.95	0.19	0.07	0.38	0.21	0.40	3.2
REDUCED TO **1 MONTH**	0.87	0.61	0.06	0.02	0.12	0.06	0.13	1
DAY / MONTH	26.25	18.28	1.78	0.66	3.56	1.97	3.75	30
TTS = 100%	100	69.64	6.78	2.52	13.56	7.50	-	-
TT = 100 %	87.4 TTS + PORT = TT	60.9	5.9	2.0	11.9	6.7	12.6	100

Table 1

BW = 8% of TTS = 6.4% of TT

MB = 1% of TTS = 0.8% of TT

Cruise 2.

TT : 719 hours 30 minutes = 1 month

WM: 4033 nautical miles

The breakdown of TT in percentages is as follows:

TTS: 89% of TT

P: 11% of TT

TTS can be further divided into:

W = 69% of TTS = 61.4% of TT

T = 7% of TTS = 6.3% of TT

SB = 1% of TTS = 0.9% of TT

BW = 7% of TTS = 6.2% of TT

MB = 16% of TTS = 14.2% of TT

Cruise 3.

TT = 510 hours = 0.71 month

WM = 3146 nautical miles

The breakdown of TT in percentages is as follows:-

TTS = 85% of TT

P = 15% of TT

TTS can be further divided into:

W: = 79% of TTS = 66.6% of TT

T: = 7% of TTS = 5.6% of TT

SB: = 10% of TTS = 8.2% of TT

BW: = 0% of TTS = -

MB: = 4% of TTS = 3.6% of TT

Cruise 4.

TT = 562 hours = 0.78 month

WM = 2442 nautical miles

The breakdown of TT in percentages is as follows:

TTS = 92%

P = 8%

TTS can be further divided into:

W:	54% of TTS	:	49.7% of TT
T:	3% of TTS	:	2.8% of TT
SB:	0% of TTS	:	-
BW:	38% of TTS	:	35% of TT
MB:	5% of TTS	:	4.5% of TT

Survey 16: General Statistics

Total duration of Survey	:	2304 hours = 3.2 months
Total working time	:	1402H50mm = 1.95 months
Total working mileage	:	12575 nautical miles
Average speed during WT	:	8.97 knots

Table 1 gives the following indications (all the results are reduced to 1 month)

Total time at sea	:	26.25 days
Total time in port	:	3.75 days

TTS is further divided as follows:

Working time	:	18.28 days
Travelling	:	1.78 day
Supply boats	:	0.66 day
Bad weather	:	3.56 days
Major breakdowns	:	1.97 day

OVERALL OPERATION OF EACH SYSTEM

NOTE: The system description is given in Appendix 1, Plates 3, 4, 5 and 41, Annexe 1 of Report Survey 14.

1. DATA ACQUISITION SYSTEM (Plate 5)

During Survey 16, the operation of the D.A.S. was upset by a significant number of desynchronisations (59). These desynchronisations can be divided up as follows:

Cruise 1: 10, of which 6 were due to navigation clock. The MISER programme was reloaded twice: on Day 06 at 01.20 and at 02.10. Besides these, two format errors in the introduction of the data halted the D.A.S. (on Day 03 at 04.20 and at 04.40).

Cruise 2: 6 desynchronisations due to the navigation clock.

Cruise 3: 24 desynchronisations (of which 7 occurred on Day 64).

Cruise 4: 19 desynchronisations: the MISER programme was reloaded on Day 83 at 04.30: the desynchronisations disappeared.

Between Cruises 1 and 2, a complete check of the navigation clock was effected. Before Cruise 4, during the port call at Port Lincoln a thorough examination of the system was carried out. No piece of equipment was found by these checks to be defective.

It remains to be said that from Day 85 the threshold time counter was jammed on value 19. The counter could not be reset to zero in spite of several programme reloadings. From day 52 at 16.00 to day 56 at 04.10 a new D.A.S. programme

JOY devised and written by the BMR was tried. These trials made it possible for this programme to be brought almost to final tuning. It will replace MISER in future surveys.

Enclosures A, B, C, D and E give the following quantitative information.

Total D.A.S. Stoppages during Survey 16: 5.hours 49 minutes which represents 0.4% of the total working time.

Tape Recorder 2020B, which had come back from an overhaul, was installed in the navigation room, during the port call preceding Cruise 4. It was not used during Cruise 4.

2. SEISMIC (Plates 3, 4 and 41)

2.1 Seismic Container (Plates 3, 41)

2.1.1 Seismic Amplifier AS626X (See Appendix 3).

This was only used during the first two cruises and operated satisfactorily.

2.1.2 Seismic Amplifier PT700SIE (Plate 41)

This amplifier is the replacement for the AS626X. The study of the possibilities of this amplifier has resulted in the adoption of the following principles of operation which are geared to optimum use of these possibilities:

- To set the initial gain of each amplifier in such a way that the noise level will be below the triggering level of the AGC.

- To have the maximum gain without distorting the first arrivals, especially in the case of the outputs of the amplifiers connected to the EPC Channel 2.

- To have a sufficient level for the magnetic recorder; the recordings are carried out with:

. -5dB Record Early Gain (REG) for the seismic Channels.

. -20dB Gain Control Unit, Early Gain (GCU EG).

For the amplifiers 8 and 9, Channel 2 on the EPC, REG varies between -40 and -20 dB, necessary settings to work below the level of distortion. When the deep waters come into consideration REG and GCUEG are at -10dB in order to increase the total gain without making each amplifier work at 0dB (full gain). Operating on the two Early Gains, a superior gain can be obtained without the AGC acting upon the noise level.

2.1.3 Ampex Recorder

During the last two cruises of Survey 16, numerous problems with equipment were encountered:

Cruise 3: On day 64, $03^{H}.18$ of stoppage was necessary to change the tacheometer lamp.

Cruise 4: A new Ampex, overhauled, was installed during the port call preceding Cruise 4. Problems encountered were these:

- Day 74 at 14.25: tacheometer lamp out and photo voltaic detector not screwed tight (03.01 lost).

- Day 74 at 18.37: brake and tape tensors problems (01.23 lost).

- Day 75 at 00.00: power supply out of order (06.32 lost).

- Day 75 at 06.50: punch roller solenoid problems (33mn lost).

The importance of this is that a total of 11 hours 29 minutes of seismic data could not be recorded. It should also be noted that although it was not used on the ship, the "Rewind" function of the recorder was not in working order for the duration of Cruise 4.

2.1.4 Seismic clock

This supplies the 100Hz reference. It operated satisfactorily during Cruise 16.

2.1.5 SMX3 Delay box

On day 54.23.00, it was discovered that there was a variation of 70ms between the TB sparker and EPC recorders. This was due to a switch being in the wrong position. Apart from this incident, the SMX3 was satisfactory on Survey 16.

2.1.6 E.P.C. Recorders Model 4100

Four EPC recorders were used; the table below gives the distribution of these recorders:

- Ch2*: Channel 2 of the main cable recorded at the paper-speed of 3"/hour.
- Ch2 : Channel 2 of the main cable recorded at the paper-speed of 12"/hour.
- PB : The play-back of the magnetic tape, (10 minutes are recorded from each channel of the main cable, of the Geotech cable and of the reference signal).
- SH : Shallow cable or Ch 1 of the main cable with shallow filters at the paper speed of 12"/hour.

Cruises	EPC1	EPC2	EPC3	EPC4
1	02 08 00 Ch2* 19 01 30	02 08 00 PB 19 01 30	02 08 00 SH 05 01 30 Ch2 11 11 01 SH 19 01 30	02 08 00 Ch2 05 01 30 SH 11 11 01 Ch2 19 01 30
2	22 15 00 Ch2* 48 02 10	22 15 00 PB 33 10 20 Ch2 48 02 10	22 15 00 SH 48 02 10	22 15 00 Ch2 33 10 20 PB 48 02 10
3	52 16 00 Ch2* 69 22 20	52 16 00 TEST 53 06 41 SH 69 22 20	52 16 00 TEST 53 00 00 Ch2 54 00 00 TEST SH 55 06 32 Ch2 69 22 20	52 16 00 TEST 53 00 00 PB 69 22 20
4	74 10 00 Ch2* 88 13 10	74 10 00 SH 88 06 00 Ch2 88 13 10	74 10 00 Ch2 88 06 00 SH 88 13 10	74 10 00 PB 88 13 10

Problems encountered in the utilisation of these recorders were thus:

Cruise 1: The 1 second sweep of the EPC4 broke down. The EPC was replaced during the port call preceding Cruise 2.

Cruise 2: An abnormally high rate of consumption of stylus belts.

Cruise 3: The EPC2 of the Seismic Room was exchanged with the recorder used for the Raytheon System.

Cruise 4: These halts were noted:

Day 75 at 02.05 for EPC3

Day 77, 78 at 06.22 of stoppages for the EPC4.

2.1.7 Sonobuoys - Refraction probes

37 Sonobuoys were used during Survey 16. The break-down of the results is as follows:

Cruises	Good Results	No results	Total
1	6	3	9
2	15	3	18
3	3	0	3
4	2	5	7
Total	26	11	37

The refraction probes were recorded simultaneously on 2 recorders at paper-speeds of 6"/hour and 12"/hour.

The negative results are due to these causes:

- No transmission or halt in emission (6 Sonobuoys).
- No emission (CR.4) - The sonobuoys at fault had been acquired in a delivery received in Adelaide on Day 50.

It should also be pointed out that all the sonobuoys used were only working on one channel; thus it was impossible to use the second receiver.

2.2 Sparker Container (plate 4)

2.2.1 Period of work with 4 electrodes: day 02 to Day 31. The replacement of an OAT caused a stoppage of 01h 20. Apart from this, the sparker system functioned satisfactorily.

2.2.2 Single electrode

During the port call in Adelaide, the sparker-container was altered to allow for the adaptation of an OAT of 200 kJ and for only one electrode to be used. This system began working on day 31 at 04.40 GMT and operated satisfactorily until the end of Survey 16. The OAT requires cleaning every 3 days with a silicone oil spray; the life of the nipples between which the spark jumps is about 200 hours. In order to allow untroubled checks and repairs and to avoid restrictive situations such as the absolute impossibility of replacing moving parts, the internal system of the OAT was modified as a function of the parameters encountered. This modification has made possible the creation of a very versatile and manageable complex.

Electrode

The length of the single electrode was extended to 100 metres, and the weight of ballast was doubled. The monitoring of the electrode depth gives these results:

At 9.5 knots, depth is 5.6 metres

At 6 knots, depth is 10.5 metres

On days 46 and 47, special nipples were tried on the electrodes (that in turn increased the diameter of the two ends of the electrodes to 2.5cm). A higher frequency of the received signal was established; this fact was easily seen on the "shallow" recordings.

The stoppages of the sparker system noted during the period day 31 to the end of Survey 16 are the following:

Day 33: the rupture of the electrode held back the start of the operation.

Day 74: an explosion in the capacitor-room held up the commencement of the operation.

Days 77 and 83: a solenoid coil of the "Hammer" exploded. For all of Survey 16, it must be seen that the check carried out in the Capacitor Room during halts in exploration made possible:

- changing burnt wires in an OAT (day 06.01.00)
- solving the intermittent problems with the synchronisation of the 4 OAT (Day 10 at 13.15 during a supply boat rendezvous)
- repairing a burnt fuse which caused 2 hours of shooting with 3 electrodes (Day 13 during maintenance work on electrodes).

2.3 Sparker Generator

On day 26, a violent storm put the two sparker generators out of action. The ship was forced to return to Adelaide where a complete overhaul of the two generators was effected. This was the only time these two pieces of equipment were malfunctioning during Survey 16.

3. SOUNDERS

3.1 Atlas Echo Sounder

The problems met with this piece of equipment were:

- a displacement from zero on the analog records: this was repaired on Day 43.

- a very short failure of the Digitizer on Day 59.

Apart from these, the resultant performances were correct (1400m analog, 600m digital).

3.2 Elac Echo Sounder

This echo sounder operated without a hitch from 20 to 4000m during Survey 16.

Maintenance work on the contactors was carried out during Cruise 2; this necessitated a stoppage of 04h 40 minutes.

3.3 Raytheon system (see Annex 1 of Report Survey 14)

The Raytheon system worked with the echo sparker during Cruise 1 and 3, the correlator being in the "off" position.

During Cruise 2, tests were undertaken, the correlator being in service and the soundings being triggered, by the EPC recorder.

The results were approximately correct up to 1300m, but it was not possible to improve the results.

A Hawker Siddeley technician was aboard the Lady Christine, for the whole of Cruise 4, to check the Raytheon equipment; a spare transducer was put to sea and it gave the same signal as the ship's transducer. The investigations were then concentrated on the electronics of the system. The emission time of the signal was altered; the signal received then improved. The analog recording obtained can be called poor; Digitization was correct in deep water but in shallow water, the digitizer remained jammed.

3.4 Digitrack Echo

This piece of equipment operated without breakdown during Survey 16 (coupling with Raytheon during Cruises 1 and 3; recording of channel 1 of the main cable during cruises 2 and 4).

4. MAGNETISM

The analysis of the magnetic results of Survey 16 makes it possible to verify a progressive increase in the breakdown period starting from Cruise 3. The summary of the stoppages during the 4 cruises is as follows:

- Day 07, 08, 10, 11 and 15: These correspond to a loss of 08h 10' of analog recordings (due to a transistor out of action in the amplification circuit).

- Day 32, 18.03: The analog and digital recordings were interrupted for 51 minutes following a Magnetic Tape alarm.

- Day 47.04.00: The analog and digital recordings were interrupted for 02h 06 following the accident with the geotech cable. The mag sensor was damaged, probably at the same time as the rupture of the seismic cable.

- Day 63.10.45: The recordings became noisy; a replacement of a cable took place and caused the loss of 04.30 of data. The recordings corresponding to the new cable are still noisy.

- Day 79.02.50: The cable taken up on Day 63 having been repaired, it was put into the sea again after the appearance of excessive noise on the recordings - loss of 03.50 of data. The recordings then improved.

- Day 87.03.20: The cable taken up on Day 79 being repaired, it was put to sea again on Day 86. It functioned properly until day 87.03.20 when the noise level became significant; another change of cable took place - loss of 01.^{H}00 of data.

- The total stoppage time for Survey 16 was 12^{H} 17mns, being 0.8% of the total working time.

The analog recordings were effected with the scale of 0-100 on the recorder, except in the areas with steep gradient.

Table 2

GRAVITY RESULTS Cruise : 1

DAYS	WORKING hours	Σ	FAILURES	Σ	GOOD	Σ	OUT OF CRITERIA	Σ
2	08·00 to 24·00	16·00		0	13.00 to 24.00	11.00	08.00 to 13.00	05.00
3	00·00 to 16·40	16.40		0	00.00 to 13.10	13.10	13.10 to 16.40	03.30
4	18·10 to 24·00	05·50		0		05.50		0
5	00·00 to 24·00	24·00		0		24.00		0
6	"	24·00		0		24.00		0
7	"	24·00		0		24.00		0
8	"	24·00		0		24.00		0
9	"	24·00		0		24.00		0
10	"	24·00		0		24.00		0
11	"	24·00		0		24.00		0
12	"	24·00		0	00.00 to 16.00	16.00	16.00 to 24.00	08.00
13	00·00 to 06·30 09·20 to 24·00	21·10		0	02.00 to 06.30 09.20 to 24.00	19.10	00.00 to 02.00	02.00
14	00·00 to 24·00	24·00		0		24.00		0
15	00·00 to 20·30	20·30		0	00.00 to 02.00	02.00	02.00 to 20.30	18.30
16			NO PRODUCTION					
17	04·20 to 24·00	19·40		0		19.40		0
18	00·00 to 24·00	24·00		0		24.00		0
19	00·00 to 01·30	01·30		0		01.30		0
	TOTAL:	341·20	TOTAL :	0	TOTAL :	304.20	TOTAL	37.00

The magnetic computations aboard the ship were, during Survey 16, carried out in the following manner:

- The shore-station sends Mag-reading–IGRF of the shore = X; on board the ship:

Magnetic anomaly: (Mag reading ship - IGRF) - (X - Y)

Y: average of X.

5. GRAVITY (Tables 2 to 5)

The recordings of Survey 16 are characterised by a series of imperfections, certain of which are very familiar (see attached comments); the description of these imperfections is:

- The Spring tension encoder digitizes incorrectly: the failure is located in bit 4 (see the report of Survey 14).

- Intermittently, the G, ST and TC traces are extremely disturbed, but the CC trace is not affected (see the report of Survey 15).

- Another breakdown which presents the same characteristics as the preceding one, with the difference that the CC trace is also affected. Despite this difference it seems that the two failures may be linked.

- The stoppages in the operation which can be imputed to normal causes during Survey 16, are these:

Day 32.18.03: 51 minutes of digital values lost (See Magnetism).

Day 69.03.20: The Spring-Tension (Analog and Digital) broke down; the gravity meter only recorded k + TC, k being the constant on which the Spring Tension is jammed. The replacement of an operational amplifier solved the problem. Time lost 11 hours.

At the request of the BMR representative the following tests were undertaken from Day 61 to Day 66: every eight hours, 2 hours of recording with 2 minutes filtering on analog

Table 3

GRAVITY RESULTS Cruise : 2

DAYS	WORKING hours	Σ	FAILURES	Σ	GOOD	Σ	OUT OF CRITERIA	Σ
22	15.00 to 24.00	09.00		0		09.00		0
23	00.00 to 04.10 06.00 to 24.00	22.10		0		22.10		0
24	00.00 to 11.00 14.50 to 18.00 23.10 to 24.00	15.00	08.25 to 09.08	0.43		14.17		0
25	00.00 to 14.30	14.30		0	00.00 to 09.00	09.00	09.00 to 14.30	05.30
				CALL	IN ADELAIDE			
31	04.40 to 24.00	19.20		0	04.40 to 18.25 19.25 to 20.45 21.50 to 24.00	17.15	18.25 to 19.25 20.45 to 21.50	02.05
32	00.00 to 24.00	24.00		0		24.00		0
33	00.00 to 04.00 10.20 to 24.00	17.40		0		17.40		0
34	00.00 to 24.00	24.00		0		24.00		0
35	"	24.00		0		24.00		0
36	04.40 to 24.00	19.20		0		19.20		0
37	00.00 to 24.00	24.00		0		24.00		0
38	"	24.00		0		24.00		0
39	"	24.00		0		24.00		0
40	"	24.00		0		24.00		0
41	"	24.00		0		24.00		0
42	"	24.00		0		24.00		0
43	"	24.00	08.23 to 08.50 09.20 to 09.42	0.49	00.00 to 08.23 08.50 to 09.20 09.42 to 24.00	23.11		0
44	"	24.00		0		24.00		0
45	"	24.00		0		24.00		0
46	00.00 to 09.30	09.30		0		09.30		0
47	01.30 to 24.00	22.30		0		22.30		0
48	00.00 to 02.10	02.10		0		02.10		0
	TOTAL : 439.10		TOTAL :	01.32	TOTAL :	430.03	TOTAL	07.35

and digital values, were effected. Simultaneously, on the analog recorders, the average-beam was taken instead of the cross coupling.

During Survey 16, the components of the Cross Coupling (see the report of Survey 15) were recorded permanently on the Rikadenki analog recorder (Cruises 1 to 3), then on a Speedomax analog recorder.

Rikadenki: from Day 09.02.37 to day 10.02.50, the Ax^2 and Vcc components were inverted on the recordings.

Speedomax: The various channels can be identified in the data by the following table:

Data	Channels
Ve	1 + 7
CC	2 + 8
Ax^2	3 + 9
Vcc	4 + 10
Ax	5 + 11
A_L	6 + 12

A summary of the gravity statistics of Survey 16 reads as follows:

Cruise 1:

- Gravity inside criteria 89.2% of the working time
- Gravity out of criteria 10.8% of the working time
- Breakdown 0% of the working time

Cruise 2:

- Gravity inside criteria 98% of the working time
- Gravity out of criteria 1.7% of the working time
- Breakdown 0.3% of the working time

Table 4

GRAVITY RESULTS Cruise : 3

DAYS	WORKING hours	Σ	FAILURES	Σ	GOOD	Σ	OUT OF CRITERIA	Σ
52	16·00 to 24·00	08·00		0		08.00		0
53	00·00 to 17·30 21·00 to 24·00	20·30		0		20.30		0
54	00·00 to 24·00	24·00		0		24.00		0
55	"	24·00		0		24.00		0
56	"	24·00		0		24.00		0
57	00·00 to 23·30	23·30		0		23.30		0
58			NO		PRODUCTION			
59	17·15 to 24·00	06·45		0		06.45		0
60	00·00 to 24·00	24·00		0	00·00 to 11·50, 13·10 to 14·20, 16·05 to 16·45 23·35 to 24·00	14.05	11·50 to 13·10 14·20 to 16·05 16·45 to 23·35	09.55
61	"	24·00		0		24.00		0
62	00·00 to 08·50 12·45 to 24·00	20·05		0		20.05		0
63	00·00 to 24·00	24·00		0		24.00		0
64	"	24·00		0		24.00		0
65	"	24·00		0	00.00 to 20.20	20.20	20.20 to 24.00	03.40
66	"	24·00		0	00·00 to 02·00, 02·40 to 03·30 08·00 to 10·00, 13·20 to 14·15, 16·00 to 24·00	13.45	02·00 to 02·40 , 03·30 to 08·00 , 10·00 to 13·20, 14·15 to 16·00	10.15
67	"	24·00		0		24.00		0
68	00·00 to 05·30 16·30 to 24·00	13·00		0		13.00		0
69	00·00 to 03·20 14·20 to 22·20	11·20		0		11.20		0
	TOTAL: 343·10		TOTAL :	0	TOTAL :	319.20	TOTAL	23.50

Table 5

GRAVITY RESULTS Cruise : 4

DAYS	WORKING hours	Σ	FAILURES	Σ	GOOD	Σ	OUT OF CRITERIA	Σ
74	10·00 to 20·00	10·00		0	10.00 to 11.00 13.50 to 20.00	07.10	11.00 to 13.50	02.50
75	00·00 to 24·00	24·00		0		24.00		0
76	"	24·00		0		24.00		0
77	"	24·00		0		24.00		0
78	"	24·00		0		24.00		0
79	"	24·00		0		24.00		0
80	"	24·00		0		24.00		0
81	"	24·00		0		24.00		0
82	08·50 to 24·00	15·10		0		15.10		0
83	00·00 to 05·20 12·50 to 24·00	16·30		0		16.30		0
84	00·00 to 24·00	24·00		0		24.00		0
85	00·00 to 09·00	09·00		0		09.00		0
86					NO PRODUCTION			
87	00·40 to 24·00	23·20		0	00.40 to 02.00 04.00 to 24.00	21.20	02.00 to 04.00	02.00
88	00·00 to 13·10	13·10		0		13.10		0
	TOTAL: 279.10		TOTAL :	0	TOTAL :	274.20	TOTAL	04.50

Cruise 3:

- Gravity inside criteria 93.1% of the working time
- Gravity out of criteria 6.9% of the working time
- Breakdown 0% of the working time

Cruise 4:

- Gravity inside criteria 98.3% of the working time
- Gravity out of criteria 1.7% of the working time
- Breakdown 0% of the working time

6. NAVIGATION

6.1 Gyro Compass

Two failures were set down during Survey 16:

* Day 74.20.00: Coupling of the gyro compass - servo motor out of order; the activities of the Lady Christine were interrupted for 4 hours.

* Before the departure of Cruise 3. General electricity failure; several hours were needed to restabilise the gyro compass (19th May).

6.2 Auto pilot

On day 77.08.40: 01h 55 minutes of stoppage due to failing of a rectifier was noted for this piece of equipment. Work was not halted thanks to the use of the electric wheel.

6.3 Sagem

This piece of equipment operated satisfactorily during Survey 16.

6.4 Sine, Cosine Potentiometer

The results obtained were poor:

* Day 09.16.30, Breakdown of the amplifiers of the system.
* Cruise 2: the lack of spare parts made it impossible to restore the situation to normal.
* Day 54.17.00. The values given by the potentiometer were introduced in the D.A.S. without calibration. A test of calibration was carried out on Day 56.05.15; the results obtained were unreliable.
* Cruise 4: The potentiometer was back in service from the beginning of Day 76.08.30. The results obtained were unreliable.

6.5 Navigation Clock

This was the source of part of the desynchronisation observed on the Data Acquisition System.
A new overhaul of this piece of equipment was undertaken at the end of Cruise 4.

6.6 V.L.F.

The following stations were recorded:

1. NWC
2. NDT
3. NPM
4. NPG
5. GBR
6. NAA

The following qualitative results were obtained:

* Cruise 1: - NWC, NDT good, NDT especially from 6 to 18 hours.
- GBR and NPG reliable for half the cruise.
- NAA and NPM generally unreliable.

* Cruise 2: - NWC and NDT good
- NPD, NPG, GBR no signal
- NAA inverse signal, better quality between 06 and 12.00

* Cruise 3: - NWC and NDT good
- NPM: worked momentarily
- NAA: gave coherent values but most of the time they were inverse.
- GBR, NPG not reliable

*Cruise 4: - Results similar to those of Cruise 3.

During Cruise 3, the analog recorders of the VLF were changed: The Speedomax Recorder replaced the Westronics. This operation was completed in 2 stages.

1. Adaptation of the 12 Speedomax channels to the 6 stations recorded, coupling of the channels.
2. Adaptation of the recorders to the VLF signals, this was finished by day 62 when:

NDT	was stopped from	02.35 to 04.20
NWC	"	04.22 to 06.07
NPM	"	06.10 to 07.07
NAA	"	10.14 to 12.15
NPG	"	13.28 to 15.59
GBR	"	16.02 to 17.16

On day 63.12.34, the calibration of all the recorders was effected (the reception of all the station being stopped).
On day 64, the VLF channels were operating (analog and digital).

"OFFSET FREQUENCY". VARIATIONS

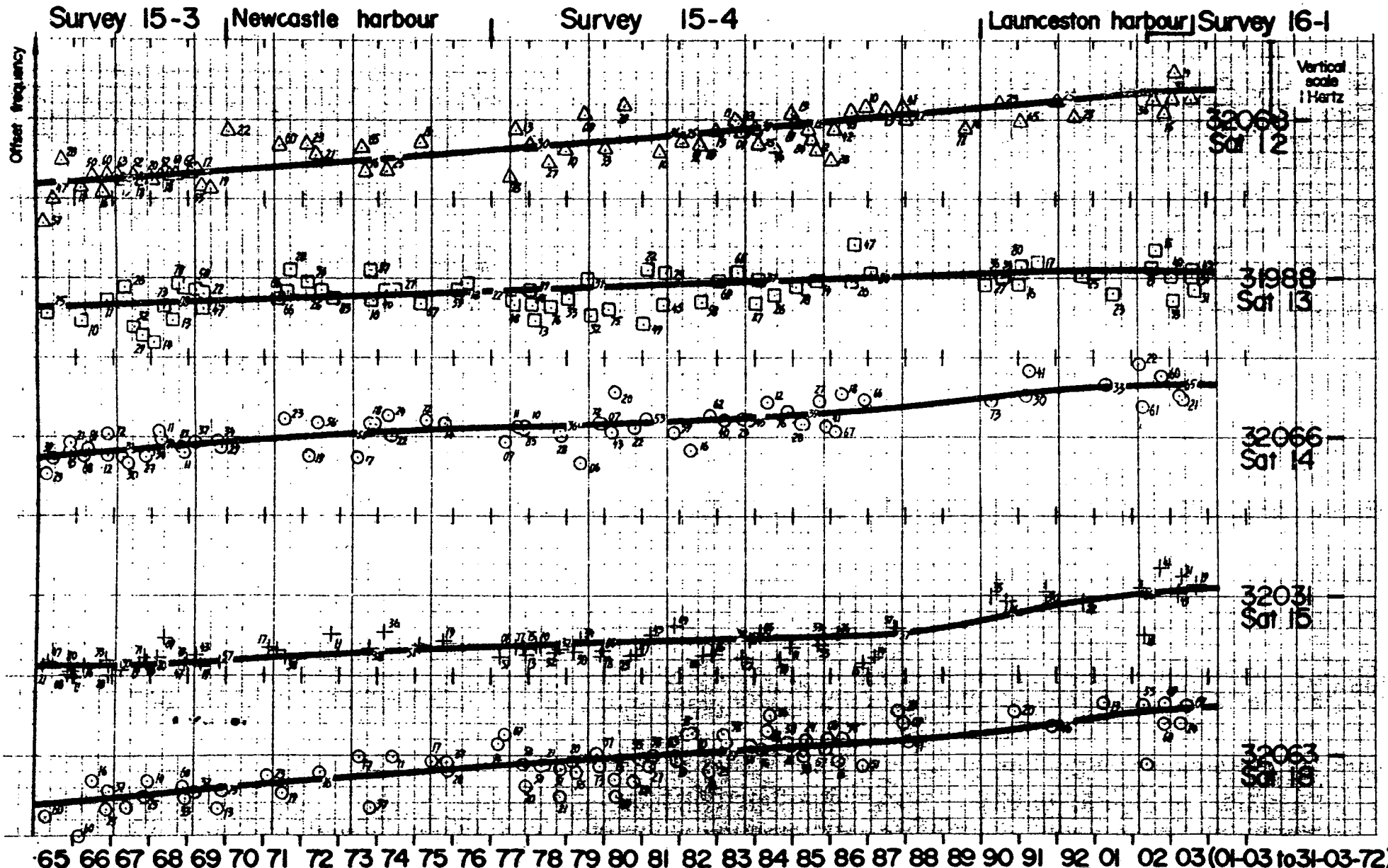


Fig. 2

"OFFSET FREQUENCY". VARIATIONS

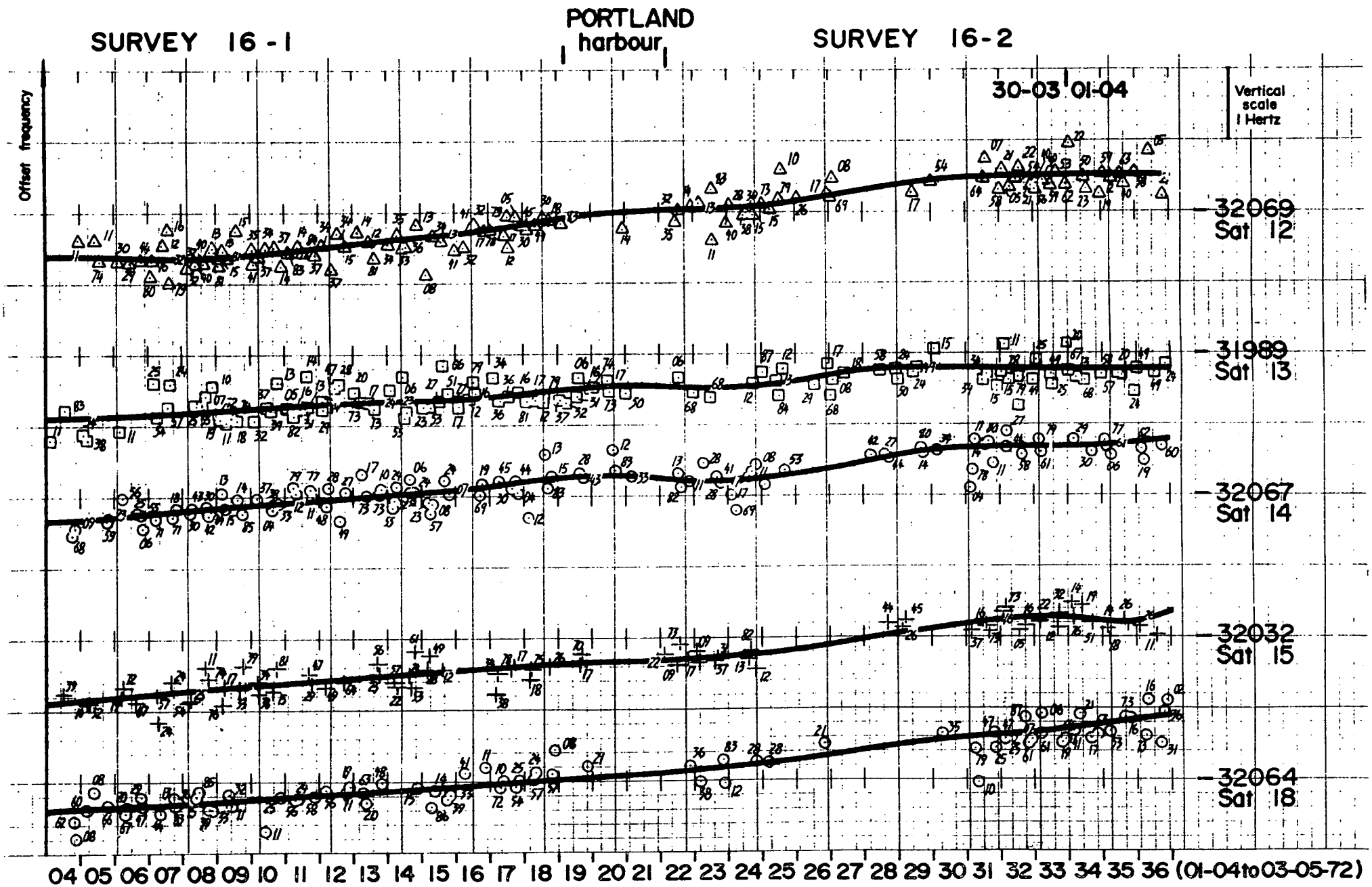


Fig. 3

"OFFSET FREQUENCY". VARIATIONS

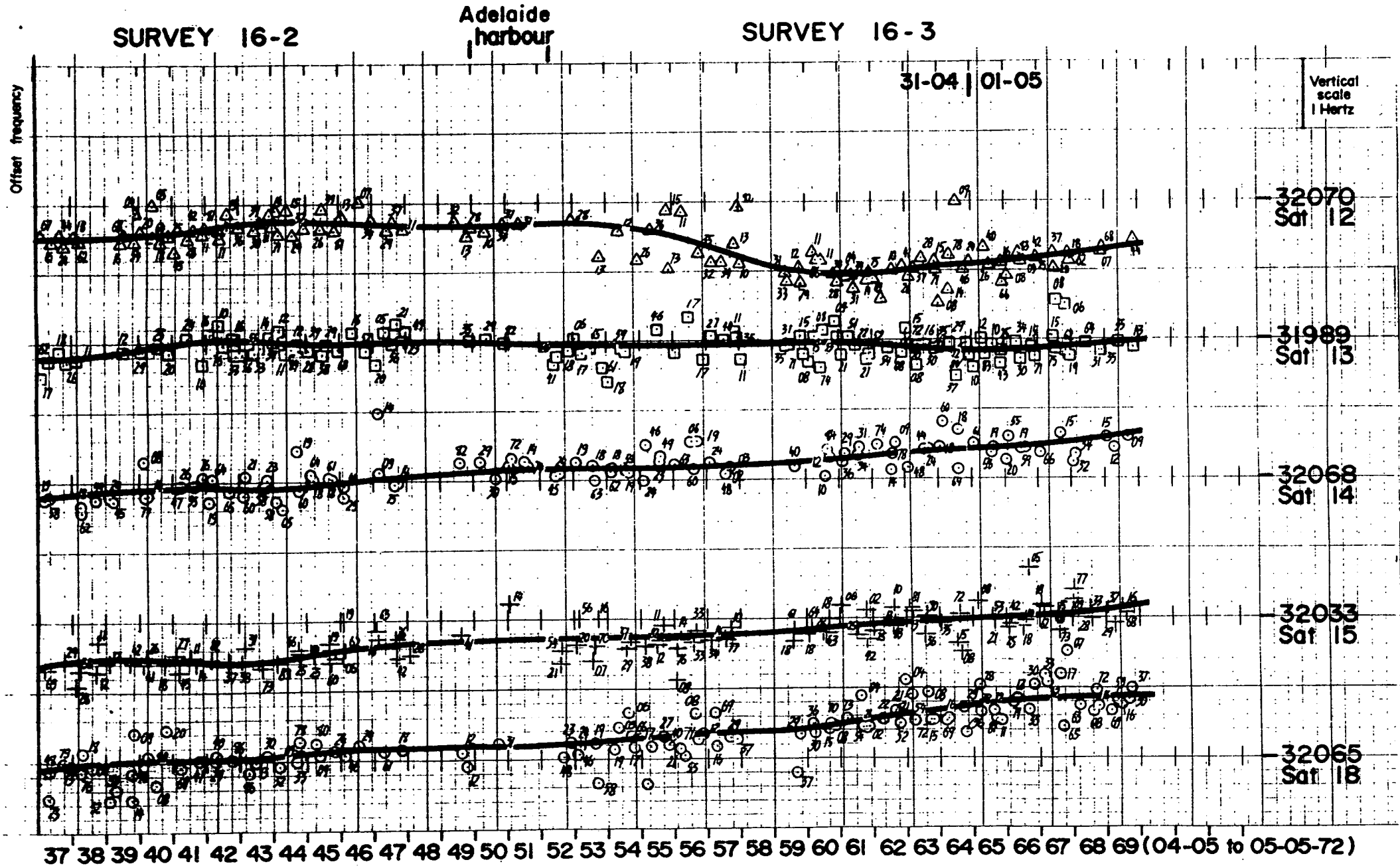


Fig. 4

"OFFSET FREQUENCY". VARIATIONS

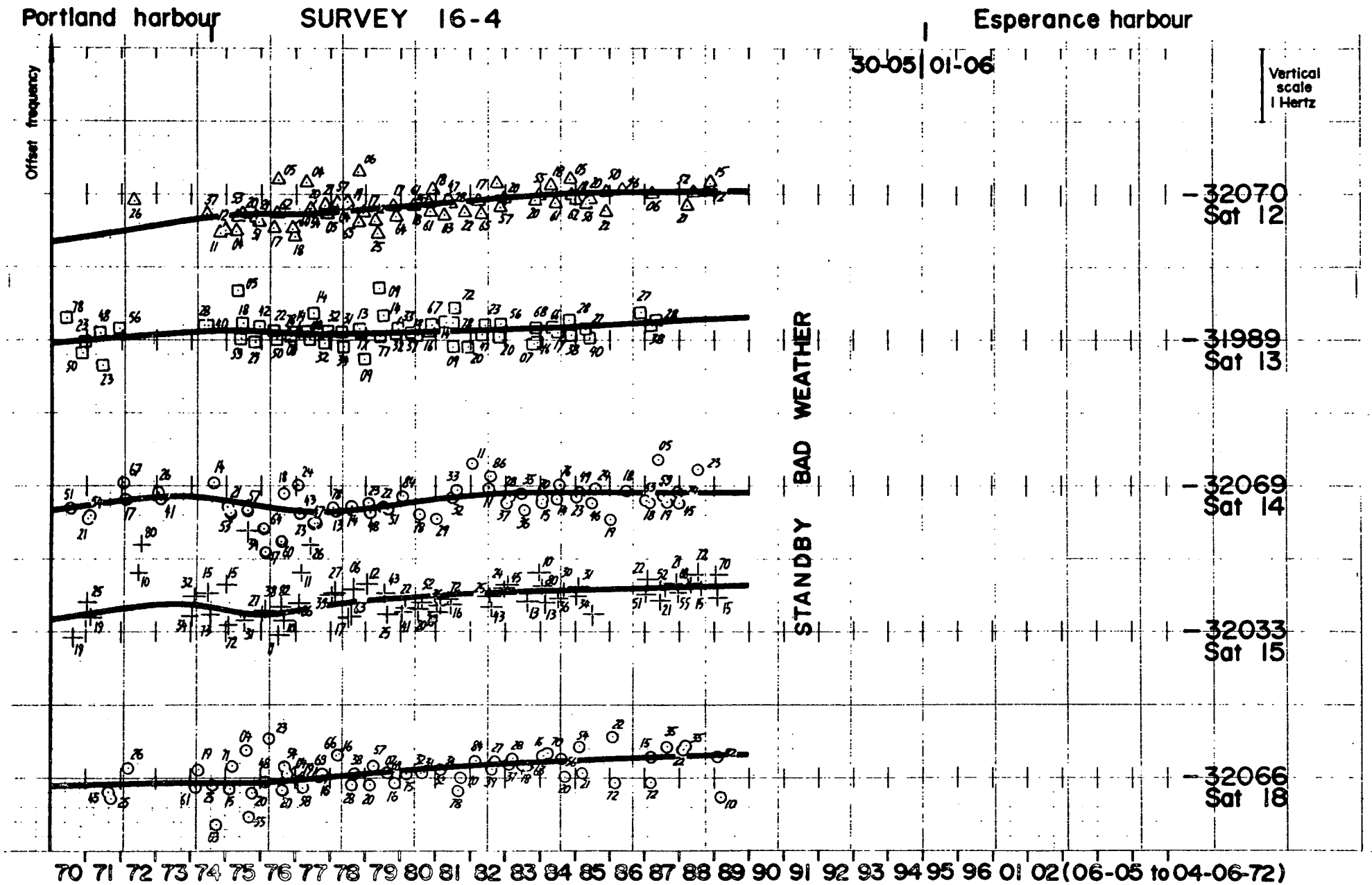


Fig. 5

6.7 Satellite System

6.7.1 Equipment

The PDP8 computer, the satellite receiver operated perfectly during the whole of Survey 16.
Teletype ASR33: Stoppage from 82.00.00 - 82.08.50
At the end of cruise 4, this piece of equipment was wrenched from its base during a violent storm; repairs not being possible on board, the Lady Christine had to return to port.

6.7.2 Results

The satellites employed were Nos. 12, 13, 14, 15, 18.
A statistical study gave the following results:

* Cruise 1 (Tables 6 to 15)

During the period from 02.04.40 to 19.02.40, 347 satellites were recorded. The breakdown of these 347 satellites is:

Satellite 12 = 70 recorded
Satellite 13 = 74 recorded
Satellite 14 = 80 recorded
Satellite 15 = 64 recorded
Satellite 18 = 59 recorded

A further processing reveals (see Table 45 and Appendix 6):

Satellite 12: 61 good being 87.1% of the total number
3 fair " 4.3% "
6 good " 8.6% "

Satellite 13: 58 good being 78.4% of the total number
5 fair " 6.8% "
11 good " 14.8% "

SURVEY 16 Cruise 1 SATELLITE N° 12

D D	H H	M M	Elevation	Δ f	Doppler	Result
02	10	28	4		3	P
02	13	56	36	0.03	7	G
02	23	16	15	0.10	7	G
03	01	08	81	-0.17	4	G
03	02	50	14	-	3	P
03	11	16	15	0.16	6	G
04	23	12	11	-0.08	5	G
05	11	12	11	-0.05	6	G
05	12	58	74	-0.07	6	G
05	14	44	17	0.05	4	G
06	00	04	30	-0.04	7	G
06	01	54	43	0.05	5	G
06	12	02	29		7	P
06	13	48	44	0	8	G
06	23	14	12	0.21	3	F
07	00	56	80	-0.07	3	G
07	02	44	16	-0.11	5	G
07	11	10	12	0.11	6	G
07	12	52	79	-0.10	5	G
07	14	42	16	-0.02	6	G
08	00	00	32	-0.10	7	G
08	01	46	40	-0.05	7	G
08	13	16	40	0.03	7	G
08	15	36	4	0.26	4	G
08	23	06	13	-0.12	6	G

D D	H H	M M	Elevation	Δ f	Doppler	Result
09	00	52	81	-0.12	7	G
09	02	40	15	-0.35	6	F
09	11	06	13	-0.04	5	G
09	12	48	81	-0.06	8	G
09	14	40	15	-0.07	5	G
09	23	58	35	0.02	7	G
10	01	44	37	-0.04	7	G
10	11	54	34	-	7	P
10	13	40	12	0.01	7	G
10	23	02	14	-0.38	4	G
11	00	50	83	-0.01	5	G
11	02	36	14	0.10	6	G
11	11	02	14	0.08	5	G
11	12	46	84	-0.08	6	G
11	14	34	14	-0.03	6	G
11	23	54	37	-0.05	7	G
12	01	40	34	-0.04	7	G
12	11	46	37	-0.13	8	G
12	13	36	34	0.08	8	G
12	23	00	15	0	5	G
13	00	46	85		7	P
13	02	34	14	0.16	6	G
13	11	00	12	0.11	5	G
13	12	40	81	-0.03	8	G
13	14	28	14	0	7	G
13	23	52	34	-0.02	7	G

Table 6

SURVEY 16 Cruise 1 SATELLITE N° 12

D D	H H	M M	Elevation	Δ f	Doppler	Result	D D	H H	M M	Elevation	Δ f	Doppler	Result
14	01	40	35	0.05	6	G							
14	11	50	33	-0.12	6	G							
14	13	34	36	-0.12	7	G							
14	23	02	13	-0.11	3	G							
15	00	42	81	-0.20	6	G							
15	11	00	16	0.06	4	G							
15	14	28	13	0.06	4	G							
17	00	38	78	0.04	7	G							
17	10	50	17	0.03	7	G							
17	12	08	36	-0.02	8	G							
17	12	36	79	-0.02	8	G							
17	14	24	12	-0.11	6	G							
17	22	00	5	-0.24	3	F							
17	23	44	45	-0.05	7	G							
18	01	30	30	-0.06	6	G							
18	22	40	44	-0.09	8	G							
18	13	30	30	-0.07	6	G							
18	22	50	18	0.08	4	G							
19	00	40	83		5	P							

Table 7

SURVEY 16 Gruise 1 SATELLITE N° 13

D D	H H	M M	Elevation	Δ f	Doppler	Result
02	11	54	13	0.04	5	G
02	13	36	86		7	P
02	15	26	15	0.08	7	G
03	00	48	40	0	6	G
03	02	34	33	-0.18	6	G
03	11	52	43	-0.08	6	G
03	14	36	31	0.04	8	G
03	16	32	3		2	P
03	15	38	15	0.18	6	G
04	15	38	15	0.16	6	G
05	00	56	38	0.14	3	G
05	02	44	34	0.11	6	G
05	16	42	2		2	P
06	03	42	11	0.02	5	G
07	01	08	54	-0.06	7	G
07	03	02	25	-0.44	3	F
07	11	28	7		3	P
07	13	10	57	-0.16	7	G
07	14	58	24	-0.13	6	G
08	00	26	24	-0.47	3	G
08	02	06	27	-0.11	8	G
08	03	54	8	0.02	5	G
08	12	22	25	-0.33	6	F
08	14	08	55	-0.16	7	G
08	15	56	7	-0.09	5	G
08	23	30	10	-0.16	6	G

D D	H H	M M	Elevation	Δ f	Doppler	Result
09	01	16	72	-0.12	7	G
09	03	04	19	-0.14	6	G
09	11	32	11		6	P
09	13	18	14	0.09	7	G
09	15	04	8	-0.15	7	G
10	00	30	32	-0.13	7	G
10	02	14	41	0.05	8	G
10	12	28	37	0.13	8	G
10	14	14	39	0.04	8	G
10	23	40	15	0.06	6	G
11	01	26	82		8	P
11	03	14	14	0.10	6	G
11	11	44	8	0.09	5	G
11	15	16	13	0.02	6	G
12	00	38	44	0.02	7	G
12	02	24	29	-0.06	8	G
12	10	56	6		4	P
12	12	38	47	0.07	7	G
12	14	26	28	0.05	7	G
13	23	50	20	0.09	4	G
13	01	38	73		7	P
13	11	52	17	-0.12	5	G
13	13	34	81	-0.10	8	G
13	15	24	10	0.30	6	G
13	23	06	6		3	P

SURVEY 16 Cruise 1 SATELLITE N° 13

D D	H H	M M	Elevation	Δ f	Doppler	Result	D D	H H	M M	Elevation	Δ f	Doppler	Result
14	00	46	54	-0.05	7	G							
14	02	36	24	-0.01	6	G							
14	11	04	6	-0.15	5	G							
14	12	50	35	-0.11	6	G							
14	14	38	23	0.04	6	G							
15	00	00	23	-0.16	6	G							
15	01	44	53		8	P							
15	03	36	07		3	P							
15	12	00	27	0.06	7	G							
15	12	40	84	0.04	7	G							
15	13	46	51	0.04	8	G							
15	15	38	6	-0.30	4	F							
17	00	08	34	0.37	6	F							
17	01	54	37	-0.14	5	G							
17	13	56	36	0.05	7	G							
17	23	20	16	-0.06	6	G							
18	01	06	86	0.02	7	G							
18	02	56	13	0.21	4	F							
18	11	22	17	-0.09	6	G							
18	13	06	79	0.08	6	G							
18	14	56	12	-0.20	6	G							
19	00	20	37	0.04	6	G							
19	02	04	32	0.01	7	G							

Satellite 14: 71 good being 88.7% of the total number
2 fair " 2.5% "
7 poor " 8.8% "

Satellite 15: 52 good being 81.2% of the total number
3 fair " 4.7% "
9 poor " 14.1% "

Satellite 18: 51 good being 86.4% of the total number
2 fair " 3.4% "
6 poor " 10.2% "

The total of 347 can be broken down into -

293 good being 84.4% of the total number
15 fair " 4.4% "
39 poor " 11.2% "

Tables 6 to 44 are set out as follows:

Column 1. Times of satellite passes
Column 2. Elevation in degrees
Column 3. Δ = Predicted frequency - calculated frequency
Column 4. Number of Doppler counts
Column 5. Value of location obtained.

To parallel these tables, the curves of variation of the offset frequency are given (Fig. 2 to 5).
The minimum elevation encountered was 04^{o} with 3 Doppler counts. The fix obtained was poor.
Out of 57 satellites with an elevation $\leqslant 11^{o}$, 31 were good, 24 fair, 2 poor.

SURVEY 16 Cruise 1 SATELLITE N° 14

D D	H H	M M	Elevation	Δ f	Doppler	Result	D D	H H	M M	Elevation	Δ f	Doppler	Result
02	04	40	22	0.13	6	G	08	04	54	30	-0.04	7	G
02	06	26	61	-0.08	8	G	08	06	38	43	-0.04	8	G
02	08	16	9	-0.29	4	F	08	16	52	30	-0.01	7	G
02	18	26	60	0.11	8	G	08	18	36	42	-0.05	8	G
02	20	16	8		3	P	08	20	28	4	0.18	5	G
03	03	50	9	0.08	5	G	09	04	04	13	-0.04	5	G
03	05	36	65	0.02	7	G	09	05	48	82	-	6	P
03	07	22	21	-0.18	7	G	09	07	34	15	-0.02	7	G
04	18	30	68	0.05	7	G	09	16	04	14	0.01	5	G
04	20	20	9	0.11	5	G	09	17	48	85	-0.08	6	G
05	03	54	7	0.01	5	G	09	19	34	15	0	7	G
05	05	38	58	0.07	8	G	10	05	00	37	0.01	6	G
05	07	26	23	0.07	6	G	10	06	44	34	0.07	7	G
05	17	38	59	0.12	7	G	10	15	14	4		3	P
05	19	26	23	0.16	6	G	10	16	54	38	-0.06	8	G
06	04	48	24	-0.01	7	G	10	18	40	33	-0.09	7	G
06	06	34	56	0.16	8	G	11	04	06	16	-0.12	6	G
06	16	48	25	0.06	7	G	11	05	52	79	0.01	8	G
06	18	34	55	0.01	8	G	11	07	40	12	-0.20	6	G
06	20	24	6	0.17	6	G	11	13	26	81	0.03	8	G
07	03	58	10		3	P	11	16	06	17	-0.20	6	G
07	05	42	71	-0.07	8	G	11	17	50	77	-0.03	8	G
07	15	58	11	0.11	5	G	11	19	38	11	0.09	7	G
07	17	42	71	-0.07	7	G							
07	19	30	18	-0.01	7	G							

Table 10

SURVEY 16 Cruise 1 SATELLITE N° 14

D D	H H	M M	Elevation	Δ f	Doppler	Result
12	03	16	5	0.15	4	G
12	05	00	48	-0.10	8	G
12	06	46	28	0.06	7	G
12	15	18	6		3	P
12	16	58	49	-0.05	8	G
12	18	44	27	0.09	8	G
13	04	12	17	0.03	4	G
13	05	56	73	0.01	8	G
13	16	08	17	0.14	7	G
13	17	54	73	-0.03	8	G
13	19	44	10	-0.01	5	G
14	03	20	5	-0.19	5	G
14	05	06	52	-0.02	7	G
14	06	52	24	0.06	7	G
14	15	20	6	-0.05	5	G
14	17	02	52	0.04	8	G
14	18	50	24	0	7	G
15	04	16	23	-0.16	5	G
15	06	00	57	-0.18	7	G
15	07	48	8	-0.38	4	G
15	09	20	14	-0.14	6	G
15	16	12	24	-0.16	8	G
15	17	58	56	0.09	8	G
15	19	50	7	0.27	5	F

D D	H H	M M	Elevation	Δ f	Doppler	Result
17	06	08	45	-0.01	4	G
17	16	20	30	-0.16	6	G
17	18	04	44	-0.02	7	G
18	03	28	12	-0.14	5	G
18	05	22	81		3	P
18	15	28	13	-0.03	5	G
18	17	12	83		6	P
18	18	58	15	0.18	7	G

Table II

SURVEY 16 Cruise 1 SATELLITE N° 15

D D	H H	M M	Elevation	Δ f	Doppler	Result
02	05	24	86	0.09	7	G
02	07	10	15		5	P
02	14	50	4		4	P
02	16	34	41	-0.06	8	G
03	04	36	43	-0.13	7	G
03	06	22	31	-0.03	7	G
03	15	46	19	0.04	6	G
03	19	20	11	-0.38	5	P
04	16	46	39		6	P
05	04	44	40	-0.02	7	G
05	06	32	32	-0.05	8	G
05	15	56	18	0.05	7	G
06	03	58	19	0.07	7	G
06	05	44	72	0.09	8	G
06	15	10	7	-0.20	4	G
07	04	54	57	0.04	6	G
07	06	42	24	-0.15	7	G
07	16	12	24	-0.02	4	G
08	04	08	25	-0.11	6	G
08	05	52	54	-0.09	7	G
08	15	22	11	-0.37	4	F
08	17	10	74	0.09	5	G
09	03	26	12	0.16	4	G
09	05	06	76	-0.14	7	G
09	06	54	17	-0.18	7	G
09	16	22	33	-0.11	4	G

D D	H H	M M	Elevation	Δ f	Doppler	Result
09	18	04	39	-0.05	8	G
10	04	20	34	-0.04	6	G
10	06	06	38	-0.05	5	G
10	15	34	15	-0.33	3	F
10	17	18	81	0.03	6	G
10	19	04	13	0.16	5	G
11	03	32	16	-0.14	5	G
11	05	14	81	-0.14	8	G
11	16	28	47	-0.06	7	G
11	18	14	29	-0.07	7	G
12	02	48	6		2	P
12	04	28	49	-0.18	8	G
12	06	12	27	-0.10	8	G
12	15	40	21	-0.05	6	G
12	17	26	64	-0.04	8	G
13	03	40	18	-0.15	7	G
13	14	54	6	-0.02	3	G
13	16	38	56	-0.11	7	G
13	18	24	23	-0.07	7	G
14	02	54	7	0.19	4	G
14	04	36	57	-0.17	8	G
14	06	24	22	-0.21	7	F
14	15	48	24	0.09	6	G
14	17	36	53	-0.04	6	G
14	19	24	6		4	P

Table 12

SURVEY 16 Cruise 1 SATELLITE N° 15

D D	H H	M M	Elevation	Δ f	Doppler	Result	D D	H H	M M	Elevation	Δ f	Doppler	Result
15	03	50	28		8	P							
15	05	40	49	0.13	5	G							
15	15	2	12	-0.13	5	G							
15	16	46	79		7	P							
17	04	00	38	-0.03	6	G							
17	05	46	34	-0.01	7	G							
17	15	10	17	-0.04	6	G							
17	16	56	17	-0.01	6	G							
18	03	14	18	-0.11	4	G							
18	04	56	75	-0.04	7	G							
18	14	26	6		3	P							
18	16	10	52	0.01	6	G							
18	17	56	26	-0.05	7	G							

Table 13

SURVEY 16 Cruise 1 SATELLITE N° 18

D D	H H	M M	Elevation	Δ f	Doppler	Result	D D	H H	M M	Elevation	Δ f	Doppler	Result
02	07	28	55	-0.09	7	G	08	07	54	85	0.03	8	G
02	09	16	25	-0.19	7	G	08	09	42	15	-0.10	7	G
02	20	26	60	-0.04	7	G	08	19	04	39	-0.06	8	G
02	22	14	09	0.13	4	G	08	20	52	33	-0.05	6	G
03	06	46	24	-0.11	4	G	09	08	52	32	0.08	7	G
03	10	18	7		5	P	09	20	02	74		8	P
04	20	34	62	-0.10	7	G	09	21	50	11	0.10	6	G
04	22	22	9	0.07	5	G	10	08	04	73	-0.13	4	G
05	08	36	60	0	6	G	10	09	52	10	0.19	5	G
05	10	26	8	-0.20	5	G	10	21	00	25	0.10	7	G
05	18	00	9	-0.08	5	G	11	07	14	56	0	7	G
05	19	44	66	-0.07	8	G	11	09	02	24	0.09	6	G
05	21	32	21	-0.11	7	G	11	20	12	58	-0.06	8	G
06	07	48	67	-0.02	7	G	11	22	00	8	0.01	6	G
06	09	34	20	-0.07	7	G	12	08	12	56	0.04	7	G
06	18	56	29	-0.03	7	G	12	10	06	7		3	P
06	20	44	47	-0.10	7	G	12	19	22	71	0.03	7	G
06	22	32	06		4	P	12	21	10	19	-0.13	7	G
07	08	42	44	0.05	8	G	13	05	40	8		2	P
07	10	36	4		4	P	13	07	24	63	-0.07	6	G
07	18	08	13	-0.19	6	G	13	09	10	20	-0.15	6	G
07	19	54	83	-0.01	6	G	13	20	20	48	0.04	8	G
07	21	42	16	-0.04	5	G							

SURVEY 16 Cruise 1 SATELLITE N° 18

D D	H H	M M	Elevation	Δ f	Doppler	Result	D D	H H	M M	Elevation	Δ f	Doppler	Result
14	08	20	47	-0.02	7	G							
14	21	18	15	0.16	6	G							
15	07	34	86	-0.07	4	G							
15	18	42	39	0.20	7	G							
15	20	28	33	0.07	7	G							
17	07	40	72	0.05	7	G							
17	09	30	10	-0.22	5	F							
17	18	50	54	-0.03	7	G							
17	19	54	4	-0.16	4	G							
17	20	36	25	0.05	8	G							
18	06	52	57	-0.09	6	G							
18	08	38	24	-0.10	6	G							
18	19	48	57	0.04	7	G							
18	21	36	8	0.45	6	F							

Table 15

SURVEY 16 Cruise 1

DAYS	SAT. 12			SAT. 13			SAT. 14			SAT. 15			SAT. 18		
	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor
02	2		1	2		1	3	1	1	2		2	4		
03	2		1	5		1	3			3		1	1		1
04	1			1			2			0		1	2		
05	3			2		1	5			3			5		
06	3	1	1	1			5			3			4		1
07	5			3	1	1	4		1	3			4		1
08	5			6	1		5			3	1		4		
09	5	1		4		1	5		1	5			2		1
10	3		1	5			4		1	4	1		3		
11	6			3		1	7			4			4		
12	4			4		1	5		1	4		1	3		1
13	5		1	4		2	5			4			3		1
14	4			5			6			4	1	1	2		
15	3			4	1	2	6	1		2		2	3		
16															
17	6	1		3	1		3			4			4	1	
18	4			4	1		3		2	4		1	3	1	
19			1	2											
TOTAL	61	3	6	58	5	11	71	2	7	52	3	9	51	2	6
TOTAL SAT.	70			74			80			64			59		
%	87.1	4.3	8.6	78.4	6.8	14.8	88.7	2.5	8.8	81.2	4.7	14.1	86.4	3.4	10.2

TOTAL SAT.	347		
TOTAL	293	15	39
%	84.4	4.4	11.2
%	88.8		11.2

Table 45

The maximum elevation encountered was 86°; 4 satellites were recorded with this elevation; 3 were good, 1 was poor.
46 satellites had an elevation $\geq 70^{\circ}$; 37 were good, 9 were poor.

* Cruise 2 (Tables 16 to 25)

During the period from 22.11.36 to 48.02.12, 386 satellites were recorded, the breakdown of these 386 satellites is -

Satellite 12 : 89 recorded
Satellite 13 : 78 recorded
Satellite 14 : 75 recorded
Satellite 15 : 69 recorded
Satellite 18 : 75 recorded

A further processing reveals (see table 46 and Appendix 6) -

Satellite 12	80	good	being 89.9%	of the total number
	8	fair	" 9.0%	"
	1	poor	" 1.1%	"
Satellite 13	70	good	being 89.7%	of the total number
	6	fair	" 7.7%	"
	2	poor	" 2.6%	"
Satellite 14	64	good	being 85.3%	of the total number
	8	fair	" 10.7%	"
	3	poor	" 4.0%	"
Satellite 15	64	good	being 92.8%	of the total number
	3	fair	" 4.3%	"
	2	poor	" 2.9%	"
Satellite 18	61	good	being 81.3%	of the total number
	10	fair	" 13.3%	"
	4	poor	" 5.4%	"

SURVEY 16 Cruise 2 SATELLITE N° 12

D D	H H	M M	Elevation	Δ f	Doppler	Result	D D	H H	M M	Elevation	Δ f	Doppler	Result
22	11	36	35	+.05	8	G	33	00	14	56	+.06	8	G
22	13	28	32	-.04	4	G	33	02	04	06	-.13	4	G
22	22	46	14	+.11	6	G	33	10	26	20	+.03	7	G
23	02	22	10	0	3	G	33	12	10	59	+.04	8	G
23	10	44	13	+.03	6	G	33	14	00	6	-.14	4	G
23	12	28	83	-.52	3	F	33	21	38	7	-2.25	4	F
23	14	16	14	-.04	6	G	33	23	20	62	-.06	8	G
23	23	38	40	-.05	7	G	34	01	12	26	-.02	4	G
24	01	24	28	-.19	7	G	34	11	14	50	-.05	8	G
24	11	32	38	+.01	8	G	34	13	02	23	+.13	8	G
24	13	20	30	+.07	7	G	34	22	26	19	-.09	7	G
24	22	44	15	-.40	3	F	35	00	14	59	+.04	6	G
25	00	28	73	+.09	8	G	35	10	22	18	+.08	7	G
25	02	38	13	+.05	5	G	35	12	10	63	-.04	6	G
25	10	40	15	+.19	6	G	35	13	56	6	-.06	5	G
25	12	24	79	+.09	8	G	35	23	20	58	+.08	7	G
25	14	14	10	-.15	5	G	36	09	30	5	+.13	4	G
31	12	14	64	-.02	8	G	36	22	22	21	+.14	5	G
31	14	06	7	+.80	4	F	37	00	10	67	+.03	8	G
31	21	40	6	-2.18	3	F	37	10	18	15	-.03	7	G
31	23	24	58	+.04	8	G	38	09	28	3	+1.14	3	F
32	01	10	21	-.10	8	G	38	11	08	44	+.08	7	G
32	09	38	5	-.14	3	G	38	12	54	24	-.01	4	G
32	11	18	54	-.14	8	G	38	22	20	18	+.14	6	G
32	13	08	22	+.02	6	G	39	00	06	62	+.04	5	G
32	22	30	21	-.06	5	G	39	10	14	16	-.02	7	G

Table 16

SURVEY 16 Cruise 2 SATELLITE N° 13

D D	H H	M M	Elevation	Δ f	Doppler	Result
22	15	20	6	+.69	4	F
23	00	40	68	+0.05	8	G
23	12	38	68	+.08	8	G
24	23	04	12	-.12	7	G
25	00	52	87	+.07	7	G
25	11	04	13	+.17	6	G
25	12	50	84	DV	7	P
25	14	38	12	+.13	6	G
31	11	30	34	+.08	8	G
31	13	16	34	+.01	8	G
31	22	44	15	+.16	6	G
32	00	30	78	+.06	8	G
32	02	18	11	-.03	6	G
32	10	46	15	0	7	G
32	12	26	79	-.03	7	G
32	14	16	10	+.28	7	F
32	23	40	49	+.04	8	G
33	01	28	25	-.14	8	G
33	09	58	4	-1.05	4	F
33	11	38	49	-.03	8	G
33	13	26	25	+.09	7	G
33	22	52	20	+.19	6	G

D D	H H	M M	Elevation	Δ f	Doppler	Result
34	00	40	70	0	5	G
34	05	48	24	+.06	7	G
34	10	56	13	+.03	5	G
34	12	36	68	-.02	8	G
34	15	48	64	-.02	7	G
34	23	50	58	-.05	6	G
35	01	40	40	-	4	F
35	11	48	57	+.07	8	G
35	13	36	20	+.16	7	G
35	23	02	24	+.18	6	G
36	00	48	49	+.03	8	G
36	11	02	24	+.08	7	G
36	12	46	49	+.02	8	G
37	01	48	17	-.16	5	G
37	11	56	62	DV	8	P
37	13	46	18	-.09	7	G
37	23	12	26	-.12	5	G
38	01	00	41	+.12	7	G
39	01	58	12	+.02	3	G
39	13	56	12	+.01	6	G
40	01	12	29	-.15	6	G
40	02	28	8	+.11	6	G
40	13	08	25	+.18	7	G
40	22	34	20	-.07	5	G

Table 18

SURVEY 16 Cruise 2 SATELLITE N° 13

D D	H H	M M	Elevation	Δ f	Doppler	Result	D D	H H	M M	Elevation	Δ f	Doppler	Result
41	10	34	24	+.09	6	G	45	00	38	28	+.13	8	G
41	12	24	51	+.05	5	G	45	10	48	38	+.03	7	G
41	21	44	10	+.03	6	G	45	12	36	29	+.06	7	G
41	23	30	76	-.01	6	G	45	00	04	16	-.17	6	G
42	01	18	16	-.13	5	G	45	23	50	68	+.09	8	G
42	09	44	10	+.01	6	G	46	10	12	16	-.06	6	G
42	11	28	76	-.07	8	G	47	00	48	16	-.09	7	G
42	13	18	16	-.05	6	G	47	01	50	9	-.46	4	F
42	22	42	33	+.12	6	G	47	09	16	5	+.54	4	F
43	00	28	36	+.18	8	G	47	10	58	56	+.17	8	G
43	10	40	33	+.12	7	G	47	12	46	21	+.05	6	G
43	11	26	35	+.03	7	G	47	22	12	23	-.02	8	G
43	21	54	14	-.03	6	G	48	00	00	49	0	7	G
43	23	40	79	+.02	8	G							
44	01	30	12	+.10	3	G							
44	09	54	11	+.07	5	G							
44	11	38	84	+.09	7	G							
44	13	26	12	+.15	6	G							
44	23	52	39	+.12	8	G							

Table 19

The total number of 386 can be broken down into:

339 good being 87.8% of the total number
35 fair " 9.1% "
12 poor " 3.1% "

The minimum elevation encountered was 02^{o} with 3 Doppler counts, delta in frequency was 2.65, the fix obtained was poor. Out of 67 satellites with an elevation $\leqslant 11^{o}$, 41 were good, 24 fair, 2 poor.
The maximum elevation encountered was 88^{o} with 6 Doppler counts, delta in frequency was .14, the fix obtained was good. 38 Satellites had an elevation $\geqslant 70^{o}$, 34 were good, 4 were poor.

* Cruise 3 (Tables 26 to 35)
During the period from 52.10.26 to 69.22.14, 316 satellites were recorded. The breakdown of these 316 satellites is:

Satellite 12 : 58 recorded
Satellite 13 : 65 recorded
Satellite 14 : 54 recorded
Satellite 15 : 67 recorded
Satellite 18 : 72 recorded

A further processing reveals (see Table 47 and Appendix 6)

Satellite 12 54 good being 93.1% of the total number
4 fair " 6.9% "

Satellite 13 61 good being 93.8% of the total number
2 fair " 3.1% "
2 poor " 3.1% "

Satellite 14 52 good being 96.3% of the total number
2 fair " 3.7% "

SURVEY 16 Cruise 2 SATELLITE N° 14

D D	H H	M M	Elevation	Δ f	Doppler	Result
22	15	38	13	+.14	6	G
22	17	20	82	-.02	8	G
22	19	10	11	-.02	7	G
23	06	20	28	-.10	7	G
23	14	50	3	+1.00	3	F
23	16	30	41	+.06	8	G
23	18	16	28	+.08	7	G
24	03	42	17	-.10	7	G
24	05	34	69	+.54	3	P
24	07	18	8	+.15	4	G
24	15	42	17	+.18	6	G
24	17	24	71	+.12	6	G
24	19	14	8	-.11	6	G
25	04	38	55	-.07	7	G
25	06	24	22	+.08	7	G
31	03	06	14	+.55	4	F
31	04	48	78	+.05	7	G
31	06	38	11	-.17	4	G
31	15	00	14	-.17	7	G
31	16	48	80	-.12	7	G
31	18	34	11	+.06	7	G

D D	H H	M M	Elevation	Δ f	Doppler	Result
32	03	58	44	-.01	8	G
32	05	44	27	-.07	8	G
32	17	40	27	-.03	8	G
33	03	08	18	-.01	6	G
33	04	52	66	-.10	6	G
33	06	40	8	-.02	4	G
34	04	04	49		6	P
34	17	44	25	-.05	8	G
35	03	10	19	-.03	6	G
35	04	56	61	-.06	7	G
35	06	46	6	+1.88	4	F
36	04	06	62	+.08	7	G
36	05	52	19	+.08	7	G
36	16	06	60	-.01	6	G
37	03	14	19	+.01	6	G
37	05	02	58	-.03	7	G
37	06	50	5	-.36	4	F
37	16	56	62	+37.24	5	P
38	02	26	6	-7.21	3	F
38	04	10	7	+.05	7	G
38	05	56	18	-.18	6	G
38	08	24	14	-.07	5	G
38	16	04	59	-.06	6	G

Table 20

SURVEY 16 Cruise 2 SATELLITE N° 14

D D	H H	M M	Elevation	Δ f	Doppler	Result	D D	H H	M M	Elevation	Δ f	Doppler	Result
39	03	18	24	+.02	7	G	45	03	30	64	+.02	6	G
39	05	14	45	+.03	7	G	45	05	18	18	+.06	7	G
40	04	14	77	-.08	7	G	45	15	26	61	-.01	6	G
40	06	00	14	-.16	6	G	45	17	12	18	+.05	7	G
40	18	06	12	-3.30	3	F	46	02	40	25	-.05	6	G
41	03	22	47	-.07	7	G	46	04	26	44	-.05	6	G
41	05	10	26	-.02	6	G	46	06	14	3	+.03	4	G
41	15	18	46	-.05	7	G	47	05	24	14	+.05	4	G
42	02	30	19	+.09	6	G	47	15	30	75	+.11	6	G
42	04	18	64	+.01	7	G	47	17	18	14	+.18	6	G
42	16	12	65	-.04	7	G							
43	01	40	6	-1.51	3	F							
43	03	26	60	+.06	7	G							
43	05	12	21	1.37	7	F							
43	15	22	58	-.04	7	G							
43	17	10	21	-.01	7	G							
44	02	34	20	-.03	7	G							
44	04	22	58	+.14	6	G							
44	06	10	5	+.10	4	G							
44	14	34	19	-.18	5	G							
44	16	16	60	+.04	7	G							

SURVEY 16 Cruise 2 SATELLITE Nº 15

D D	H H	M M	Elevation	Δ ḟ	Doppler	Result
22	14	50	9	-.01	4	G
22	16	34	73	+.09	8	G
22	18	22	17	+.03	4	G
23	02	46	9	0	3	G
23	04	38	71	-.06	4	G
23	15	46	31	+.06	7	G
23	17	32	37	+.08	7	G
24	14	58	13	-.10	6	G
24	16	44	21	+.13	6	G
24	18	32	12	+.09	5	G
31	03	28	37	-.12	6	G
31	14	40	16	+.03	5	G
31	16	26	73	-.03	7	G
32	02	40	16	+.16	6	G
32	04	24	73	-.16	8	G
32	13	54	5	+.62	3	F
32	15	38	54	+.01	7	G
33	03	38	54	0	7	G
33	05	26	22	+.04	6	G
33	14	50	22	+.02	6	G
33	16	38	54	-.14	6	G
34	02	48	19	+.04	7	G
34	04	34	63	-.06	7	G
34	14	04	7	-1.26	4	F

D D	H H	M M	Elevation	Δ f	Doppler	Result
35	03	06	63	-.01	7	G
35	05	34	18	+.03	6	G
35	15	0	26	-.12	7	G
35	16	46	43	0	7	G
36	02	58	26	0	6	G
36	14	12	11	+.11	6	G
37	03	54	69	+.01	7	G
37	15	10	29	-.07	5	G
38	03	08	28	+.06	6	G
38	04	54	38	-.04	6	G
38	14	24	12	+.18	5	G
38	18	00	11	-1.41	4	F
39	02	20	12	+.18	5	G
39	04	10	82	+8.33	4	F
39	15	20	42	+.06	6	G
40	03	16	41	-.16	7	G
40	05	04	26	+.01	6	G
40	14	32	18	+.16	7	G
40	16	18	63	0	6	G
41	02	30	27	+.01	7	G
41	04	16	45	+.14	7	G
41	13	44	11	+.12	5	G
41	17	16	14	+.04	6	G

Table 22

SURVEY 16 Cruise 2 SATELLITE N° 15

D D	H H	M M	Elevation	Δ f	Doppler	Result	D D	H H	M M	Elevation	Δ f	Doppler	Result
42	01	44	12	DV	3	DV							
42	03	28	82	+.02	6	G							
42	14	40	37	-.07	7	G							
43	02	40	37	+.19	7	G							
43	04	28	31	-.08	6	G							
43	13	54	16	-.04	6	G							
43	15	42	73	+.17	5	G							
44	03	36	88	+.14	6	G							
44	14	52	46	-.09	7	G							
44	16	38	25	+.05	7	G							
45	02	50	44	-.01	6	G							
45	04	36	25	+.10	7	G							
45	14	04	19	-.16	7	G							
45	15	50	60	+.03	6	G							
45	17	40	6	+.04	4	G							
46	02	02	19	+.12	5	G							
46	03	48	62	+.07	7	G							
47	03	00	63	-.08	6	G							
47	04	48	18	-.17	5	G							
47	14	16	26	+.10	6	G							
47	16	00	42	-.04	6	G							
48	02	12	28	+.18	6	G							

SURVEY 16 Cruise 2 SATELLITE N° 18

D D	H H	M M	Elevation	Δ f	Doppler	Result	D D	H H	M M	Elevation	Δ f	Doppler	Result
22	20	10	38	-.04	7	G	34	06	16	41	-.02	7	G
22	22	00	2	-2.65	3	P	34	08	06	21	-.01	6	G
23	08	08	38	-.04	7	G	34	17	30	23	-.11	5	G
23	19	20	83	-.08	7	G	34	17	16	63	+.02	7	G
23	21	08	12	+.14	6	G	34	21	06	06	-.22	4	G
24	07	18	8	+.15	4	G	35	07	14	53	-.02	7	G
24	09	10	12	-3.14	3	F	35	09	06	4	-1.96	4	F
24	20	20	28	-.14	7	G	35	18	40	70	+.11	7	G
25	08	18	28	+.06	7	G	35	20	16	16	-.03	6	G
31	05	12	15	+0.79	7	F	36	04	44	9	+.05	3	G
31	06	56	79	-.06	7	G	36	06	24	73	+.11	8	G
31	08	46	10	+.93	6	F	36	08	12	16	-.14	5	G
31	18	08	47	-.16	7	G	36	17	38	31	-.09	6	G
31	19	56	25	+.13	7	G	36	19	24	36	-.15	8	G
32	06	08	47	0	7	G	36	21	14	2	-.68	4	F
32	07	54	25	+.11	8	G	37	05	36	23	-.06	5	G
32	17	20	20	-.47	5	F	37	07	22	48	+.02	8	G
32	19	08	61	+.06	7	G	37	18	40	79	+.04	4	G
32	20	56	7	+.14	5	G	37	20	24	18	+.08	6	G
33	07	04	61	-.07	7	G	38	06	32	76	+.07	8	G
33	08	58	6	-.08	4	G	38	19	34	32	+.07	8	G
33	18	18	64	-1.37	8	P							
33	20	06	19	+.12	6	G							

Table 24

SURVEY 16 Cruise 2 SATELLITE N° 18

D D	H H	M M	Elevation	Δ f	Doppler	Result	D D	H H	M M	Elevation	Δ f	Doppler	Result
39	05	44	32	+.34	5	F	44	05	14	32	-.13	32	G
39	07	30	33	+.17	8	G	44	07	00	33	-.13	7	G
39	16	58	14	-.07	5	G	44	18	14	78	-.13	8	G
39	18	44	76	DV	8	P	44	20	00	9	-.15	7	G
39	20	38	9	+.59	3	F	45	06	10	80	-.08	6	G
40	06	44	80	-.20	7	G	45	07	58	9	-.05	6	G
40	08	32	8	-.02	3	G	45	19	12	24	+.11	8	G
40	19	42	20	-.14	7	G	46	05	22	46	+.12	6	G
41	05	52	69	+.14	7	G	46	07	08	24	-.02	6	G
41	07	48	18	-1.54	4	F	47	06	18	61	+.07	8	G
41	18	52	41	-.02	8	G	47	08	14	6	+2853.73	3	P
41	20	42	3	+1.32	3	F	47	19	20	18	+.17	7	G
42	05	06	29	+.10	6	G							
42	06	52	40	-.02	7	G							
42	18	02	86	-.11	4	G							
42	19	52	13	-.12	6	G							
43	06	02	86	+.15	7	G							
43	07	50	13	-.11	6	G							
43	19	02	30	-.06	8	G							

Table 25

STATISTICS_SATELLITES Cruise : 2.

DAYS	SAT. 12			SAT. 13			SAT. 14			SAT. 15			SAT. 18		
	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor
22	3			0	1		3			3			1		1
23	4	1		2			3	1		4			3		
24	3	1		1			5			3			2	1	
25	5			3		1	2		1	-			1		
31	2	2		3			5	1		3			3	2	
32	5			5	1		3			3	1		4	1	
33	6	1		4	1		3			4			3		1
34	4			6			1		1	2	1		5		
35	5			3	1		2	1		4			3	1	
36	2			3			3			2			5	1	
37	2			3		1	2	1	1	2			4		
38	3	1		1			4	1		3	1		2		
39	5			2			2			2		1	2	2	1
40	4	1		4			2	1		4			3		
41	5			4			3			4			2	2	
42	3	1		5			3			2		1	4		
43	4			5			3	2		4			3		
44	6			5			5			3			4		
45	4			5			4			5			3		
46	2			1			3			2			2		
47	3		1?	4	2?		3			4			2		1?
48				1						1					
TOTAL	80	8	1	70	6	2	64	8	3	64	3	2	61	10	4
TOTAL SAT.	89			78			75			69			75		
%	89.9	9.0	1.1	89.7	7.7	2.6	85.3	10.7	4	92.8	4.3	2.9	81.3	13.3	5.4

TOTAL SAT.	386		
TOTAL	339	35	12
%	87.8	9.1	3.1
%	96.9		3.1

Table 4.8

Satellite 15 60 good being 83.6% of the total number
6 fair " 9.0% "
1 poor " 1.4% "

Satellite 18 67 good being 93.1% of the total number
4 fair " 5.6% of "
1 poor " 1.3% "

The total of 316 can be broken down into:
294 good being 93.0% of the total number
18 fair " 5.7% "
4 poor " 1.3% "

The minimum elevation encountered was 02° with 3 Doppler counts, delta in frequency was 2.33 the fix obtained was fair.
Out of 50 satellites with an elevation $\leqslant 11^{o}$, 41 were good, 14 fair and 1 poor.
The maximum elevation encountered was 86^{o}, with 6 Doppler counts, delta in frequency was -.16, the fix obtained was good.

36 satellites had an elevation $\geqslant 70^{o}$, 33 were good, 3 were poor.

* Cruise 4 (Tables 36 to 44)
During the period from 74.00.48 to 88.13.12, 273 satellites were recorded. The breakdown of these 273 satellites is:
Satellite 12 = 57 recorded
Satellite 13 = 54 recorded
Satellite 14 = 48 recorded
Satellite 15 = 58 recorded
Satellite 18 = 56 recorded

A further processing reveals (see table 48 and Appendix 6) -

SURVEY 16 Cruise 3 SATELLITE N° 12

D D	H H	M M	Elevation	Δ f	Doppler	Result	D D	H H	M M	Elevation	Δ f	Doppler	Result
52	23	38	28	-.06	6	G	62	12	10	10	-.16	6	G
53	20	56	13	-.80	5	G	62	21	34	41	-.10	7	G
54	08	52	12	+.15	6	G	62	23	20	26	+.04	6	G
54	21	50	40	+6.41	6	F	63	09	28	37	+.07	7	G
54	23	36	26	+.02	4	G	63	11	14	28	-.12	7	G
55	09	42	36	-.01	6	G	63	20	40	15	0	6	G
55	20	54	15	-.03	6	G	63	22	24	71	-.07	7	G
55	22	38	73	+.04	7	G	64	00	14	8	+.38	4	F
56	08	50	11	-.03	5	G	64	08	38	14	-.83	4	F
56	21	44	35	+.02	6	G	64	10	18	72	+.03	7	G
57	09	38	32	-.07	6	G	64	12	08	9	-.04	6	G
57	11	24	34	-.08	5	G	64	21	30	46	-.09	7	G
57	20	52	13	+.17	5	G	64	23	18	24	+.14	6	G
57	22	36	82	+.04	6	G1	65	09	28	40	-.12	5	G
58	00	24	10	-.14	5	G	65	11	10	26	+.01	7	G
59	20	48	12	+.13	6	G	65	20	36	16	-.02	7	G
59	22	32	79	+.11	7	G	65	22	22	66	-.06	7	G
60	00	20	10	-.12	4	G	66	00	12	8	+.22	3	F
60	08	42	11	-.20	6	G	66	10	14	83	-.15	6	G
60	10	26	86	-.16	6	G	66	12	04	9	-.15	6	G
60	12	14	11	+.15	6	G	66	21	26	42	-.02	7	G
60	21	36	38	-.08	7	G	66	23	14	25	-.15	5	G
60	23	24	28	+.05	6	G	67	09	22	37	-.12	7	G
61	09	30	34	+.10	7	G	67	11	06	28	-.10	7	G
61	11	16	31	-.06	7	G	67	20	32	18	-.05	7	G
61	20	44	14	+.17	6	G	67	22	18	62	-.09	6	G
61	22	28	75	-.17	7	G	68	19	40	7	-.02	4	G

Table 26

SURVEY 16 Cruise 3 SATELLITE N° 12

D D	H H	M M	Elevation	Δ f	Doppler	Result	D D	H H	M M	Elevation	Δ f	Doppler	Result
62	00	16	9	+.08	5	G	68	21	24	68	-.14	7	G
62	08	38	12	-.10	6	G	69	22	14	44	-.19	6	G

Table 27

SURVEY 16 Cruise 3 SATELLITE N° 13

D D	H H	M M	Elevation	Δ f	Doppler	Result	D D	H H	M M	Elevation	Δ f	Doppler	Result
52	10	26	41	-.09	5	G	61	10	12	51	+.10	7	G
52	12	10	26	-.08	8	G	61	12	00	22	+.07	7	G
52	21	38	18	-.10	6	G	61	21	28	21	+.05	6	G
53	01	14	6	-.08	3	G	61	23	14	52	-.06	7	G
53	09	36	17	+.04	7	G	62	11	10	54	-.02	7	G
53	11	20	65	-.12	7	G	62	20	42	8	-.01	5	G
53	22	36	61	+.09	7	G	62	22	26	72	-.13	7	G
54	00	24	18	+.17	6	G	63	00	14	15	-.13	6	G
54	10	36	59	+.04	6	G	63	08	40	8	0	4	G
54	12	20	19	-.07	7	G	63	10	22	63	-.05	7	G
55	11	32	46	+.11	7	G	63	12	10	16	+.06	7	G
56	00	34	17	0	6	G	63	21	36	30	-.04	7	G
56	12	36	17	0	4	G	63	23	24	36	-.09	7	G
56	23	44	31	-.03	7	G	64	09	34	29	+.09	7	G
57	09	54	27	-.01	8	G	64	11	20	37	-.08	7	G
57	11	42	40	+.07	7	G	64	20	50	12	+.17	5	G
57	21	10	11	+.04	6	G	64	22	34	84	DU	7	
57	22	56	85	-	6	P	65	00	24	13	0	5	G
58	00	44	11	-.08	4	G	65	08	48	12	+.05	5	G
59	21	20	15	+.09	6	G	65	10	30	83	-.02	7	G
59	23	06	71	+.10	7	G	65	12	20	10	+.01	6	G
60	00	54	8	-.19	4	G	65	21	46	43	+.05	7	G
60	09	16	15	-.01	7	G	65	23	34	25	-.13	7	G
60	11	00	74	+.05	7	G	66	09	42	34	+.06	7	G
60	12	52	8	+.06	5	G	66	11	30	30	+.07	7	G
60	20	32	4	+.55	4	F	66	20	58	15	+.09	6	G
60	22	16	53	-.16	7	G	66	22	44	71	-.05	6	G

Table 28

SURVEY 16 Cruise 3 SATELLITE Nº 13

D D	H H	M M	Elevation	Δ f	Doppler	Result	D D	H H	M M	Elevation	Δ f	Doppler	Result
61	00	02	21	-.15	6	G	67	08	56	15	-.01	7	G
61	08	32	4	-.50	4	F	67	10	40	75	+.02	7	G
67	12	32	8	+.15	5	G							
67	20	12	6	+.02	4	G							
67	21	56	62	+.06	6	G							
67	23	42	19	+.02	7	G							
68	21	06	31	-.04	7	G							
68	22	54	35	-.03	6	G							
69	20	18	13	-.11	7	G							

Fig.

Table 29

SURVEY 16 Cruise 3 SATELLITE N° 14

D D	H H	M M	Elevation	Δ f	Doppler	Result	D D	H H	M M	Elevation	Δ f	Doppler	Result
52	14	42	45	-.05	7	G							
52	16	28	24	+.12	7	G	62	13	16	14	+.04	6	G
53	01	56	19	-.07	7	G	62	15	00	78	+.09	8	G
53	13	52	18	-.11	7	G	62	16	50	9	+.16	4	G
53	15	36	63	-.03	8	G	63	02	14	48	+.19	7	G
54	02	50	62	+.12	8	G	63	14	10	44	+.02	8	G
54	04	38	18	+.03	6	G	63	15	58	24	_.11	7	G
54	14	46	14	-.11	8	G	64	01	24	18	0	6	G
54	16	34	19	+.10	7	G	64	03	10	60	+.08	8	G
55	01	58	24	-.02	8	G	64	13	20	18	-.20	7	G
55	03	52	46	-.01	4	G	64	15	04	64	+.16	8	G
55	13	56	23	+.14	7	G	64	16	56	6	-1.17	5	F
55	15	40	49	-.12	8	G	65	02	18	61	-.04	8	G
56	02	56	63	+.09	7	G	65	14	12	58	0	8	G
56	13	08	6	+.02	4	G	65	16	02	19	+.07	6	G
56	14	48	60	-0.2	8	G	66	01	28	20	+.18	6	G
56	16	38	19	-.06	7	G	66	03	14	55	-.05	6	G
57	02	10	24	+.01	5	G	66	13	24	19	+.04	7	G
57	13	58	23	+.01	7	G	66	15	10	59	-.05	7	G
57	15	44	48	-.03	8	G	67	02	22	66	-.01	8	G
57	17	36	3	-1.95	4	F	67	16	10	15	0	5	G
60	13	14	10	-.05	5	G	68	01	30	32	+.14	7	G
60	14	56	84	-.10	8	G	68	03	18	34	-.04	4	G
60	16	46	12	+.16	6	G	69	00	40	15	-.03	5	G
61	02	10	36	+.01	8	G	69	02	26	72	-.07	7	G
61	04	02	20	+.05	5	G	69	16	10	9	-.14	6	G
61	14	06	34	+.06	8	G							

Table 3C

SURVEY 16 Cruise 3 SATELLITE N° 14

D D	H H	M M	Elevation	Δ f	Doppler	Result	D D	H H	M M	Elevation	Δ f	Doppler	Result
61	15	52	31	+.12	8	G							
62	03	08	74	_.06	7	G							

Table 31

Satellite 12	52	good	being 91.2%	of the total number
	3	fair	" 5.3%	"
	2	poor	" 3.5%	"
Satellite 13	50	good	being 92.6%	of the total number
	3	fair	" 5.6%	of "
	1	poor	" 1.8%	"
Satellite 14	43	good	being 89.6%	of the total number
	3	fair	" 6.3%	"
	2	poor	" 4.1%	"
Satellite 15	49	good	being 84.5%	of the total number
	4	fair	" 6.9%	"
	5	poor	" 8.6%	"
Satellite 18	50	good	being 89.3%	of the total number
	5	fair	" 8.9%	"
	1	poor	" 1.8%	"

The total of 273 satellites can be broken down into:

244	good	being 89.4%	of the total number
18	fair	" 6.6%	"
11	poor	" 4.0%	"

The minimum elevation encountered was 02^{o} with 3 Doppler counts, delta in frequency was -7.56, the fix obtained was poor.
Out of 47 satellites with an elevation $\leq 11^{o}$, 32 were good, 10 fair 5 poor.

The maximum elevation encountered was 86^{o} with 5 Doppler counts, delta in frequency was -0.05, the fix obtained was good.

SURVEY 16 Cruise 3 SATELLITE N° 15

D D	H H	M M	Elevation	Δ f	Doppler	Result
52	13	40	21	-.05	7	G
52	15	28	54	-.00	7	G
53	01	40	20	-.08	4	G
53	03	26	56	-.08	7	G
53	12	54	7	+.10	5	G
53	14	38	70	+.03	8	G
53	16	30	16	+.14	5	G
54	00	56	7	-.15	3	G
54	13	52	29	+.09	7	G
54	15	38	37	+.10	8	G
55	03	36	38	+.08	6	G
55	13	02	12	-.04	7	G
55	14	48	82	+.02	7	G
55	16	38	11	-.07	5	G
56	01	04	9	+.54	3	F
56	02	46	76	-.70	3	P
56	04	36	14	-.20	5	G
56	14	00	33	-.03	8	G
56	15	48	33	-.12	7	G
57	03	46	34	+.02	6	G
57	13	14	14	-.02	6	G
57	15	00	77	-.03	7	G
57	16	50	10	0	4	G
59	17	00	6	-.02	4	G
60	01	22	18	-.03	6	G
60	03	12	64	-.06	5	G

D D	H H	M M	Elevation	Δ f	Doppler	Result
60	12	36	6	-.17	5	G
60	14	20	63	-.01	8	G
60	16	12	18	+.05	5	G
61	00	38	6	+.17	3	G
61	04	14	18	+.10	3	G
61	13	32	25	+.02	7	G
61	15	22	42	+.01	7	G
61	17	10	2	+2.33	3	F
62	01	30	25	0.04	6	G
62	12	46	10	0	6	G
62	14	32	83	+.01	8	G
62	16	20	12	-.18	6	G
63	00	44	10	+.57	5	F
63	02	32	81	-.08	5	G
63	04	16	13	+.06	6	G
63	13	42	36	-.14	6	G
63	15	30	30	-.01	8	G
64	01	42	35	-.08	6	G
64	12	56	15	-.03	6	G
64	14	40	72	+.02	8	G
64	16	30	8	+.10	6	G
65	04	28	8	-.05	5	G
65	13	52	53	-.13	8	G
65	15	40	21	+.03	8	G
66	01	50	42	+.03	6	G
66	03	38	25	+.08	6	G
66	13	06	18	+.08	5	G

Table 32

SURVEY 16 Cruise 3 SATELLITE N° 15

D D	H H	M M	Elevation	Δ f	Doppler	Result	D D	H H	M M	Elevation	Δ f	Doppler	Result
66	14	52	60	+.11	7	G							
66	16	42	5	-.02	4	G							
67	01	04	18	-.17	6	G							
67	02	48	62	-.10	8	G							
67	04	40	6	-1.84	3	F							
67	12	18	6	-.08	4	G							
67	14	02	73	-.01	8	G							
67	15	50	15	-1.50	7	F							
68	00	18	9	-.13	4	G							
68	02	00	77	-.02	8	G							
68	03	54	14	-.43	3	F							
69	01	12	37	-.12	6	G							
69	02	58	29	+.07	7	G							
69	14	14	68	-.12	8	G							

Table 3.3

SURVEY 16 Cruise 3 SATELLITE N°. 18

D D	H H	M M	Elevation	Δ f	Doppler	Result
52	16	56	48	-.11	8	G
52	18	44	23	-.04	7	G
53	04	54	46	+.01	7	G
53	06	40	24	-.14	6	G
53	16	10	19	+.19	7	G
53	17	54	58	+.13	5	G
54	04	06	19	-.09	7	G
54	07	44	5	-1.13	4	F
54	15	24	6	-.03	4	G
54	17	10	66	-.08	6	G
54	18	54	17	+.02	7	G
55	05	02	64	-.16	8	G
55	06	50	17	-.14	7	G
55	16	16	27	-.11	8	G
55	18	04	40	-.10	7	G
56	04	14	21	-.15	6	G
56	06	00	55	-.02	7	G
56	15	30	8	-.15	5	G
56	17	14	71	-.02	8	G
56	19	02	12	-.10	7	G
57	05	14	69	-.18	7	G
57	07	00	16	+.03	5	G
57	16	26	29	-.03	8	G
57	18	12	37	-.08	8	G
59	16	34	37	+.05	5	G
59	18	22	29	+.09	7	G

D D	H H	M M	Elevation	Δ f	Doppler	Result
60	04	30	36	-.11	8	G
60	06	20	30	+.08	6	G
60	15	46	15	-.04	6	G
60	17	32	70	-.02	8	G
60	19	20	8	+.28	6	E
61	03	48	15	-.02	3	G
61	05	28	73	.05	8	G
61	07	22	8	+.46	3	E
61	15	00	4	+.02	3	G
61	16	42	54	+.04	8	G
61	18	30	21	+.01	7	G
62	03	00	4	+5.03	3	P
62	04	38	52	0	4	G
62	06	26	22	+.05	6	G
62	15	56	21	-.18	6	G
62	17	42	52	-.11	8	G
62	19	32	4	-.30	3	E
63	03	52	21	-.16	5	G
63	05	36	54	+.07	7	G
63	15	08	8	0	5	G
63	16	52	72	-.07	8	G
63	18	40	15	+.07	6	G
64	04	50	69	+.16	7	G
64	06	36	16	+.04	7	G
64	16	02	29	-.18	8	G
64	17	50	36	+.11	7	G

Table 34

SURVEY 16 Cruise 3 SATELLITE N° 18

D D	H H	M M	Elevation	Δ f	Doppler	Result	D D	H H	M M	Elevation	Δ f	Doppler	Result
65	04	06	28	+.16	4	G							
65	05	48	38	+.13	7	G							
65	15	16	12	+.09	6	G							
65	17	02	81	+.25	7	G							
65	18	50	11	+.15	6	G							
66	05	00	79	+.10	5	G							
66	06	48	13	-.03	4	G							
66	16	10	35	-.04	8	G							
66	18	02	30	+.17	6	G							
67	04	14	33	-.09	4	G							
67	05	54	32	+.01	7	G							
67	15	24	17	-.05	7	G							
67	17	08	65	+.08	6	G							
67	18	58	7	-.11	5	G							
68	05	08	63	+.08	7	G							
68	16	22	72	+.01	7	G							
68	18	08	16	+.11	5	G							
69	04	20	69	-.07	6	G							
69	15	34	30	-.06	7	G							
69	17	18	37	-.07	8	G							

Table 3.5

STATISTICS_SATELLITES Cruise : 3.

DAYS	SAT. 12			SAT. 13			SAT. 14			SAT. 15			SAT. 18		
	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor
52	1			3			2			2			2		
53	1			4			3			5			4		
54	2	1		3			4			3			4	1	
55	3			1			4			4			4		
56	2			3			4			3	1	1	5		
57	4			3		1	3	1		4			4		
58	1			1			0			0			0		
59	2			2			0			1			2		
60	6			5	1		3			5			4	1	
61	4			5	1		4			4	1		5	1	
62	5			3			4			4			4	1	1
63	4			6			3			4	1		5		
64	4	2		3		1	4	1		4			4		
65	4			6			3			3			5		
66	4	1		4			4			5			4		
67	4			6			2			4	2		5		
68	2			2			2			2	1		3		
69	1			1			3			3			3		
70															
71															
72															
TOTAL	54	4	0	61	2	2	52	2	0	60	6	1	67	4	1
TOTAL SAT.	58			65			54			67			72		
%	93.1	6.9	0	93.8	3.1	3.1	96.3	3.7	0	89.6	9.0	1.4	93.1	5.6	1.3

TOTAL SAT.	316		
TOTAL	294	18	0
%	93.0	5.7	1.3
%	98.7		1.3

Table 47

27 satellites had an elevation $\geqslant 70^{o}$, 23 were good, 2 fair, 2 poor.

* Survey 16: A summary of the preceding results give for Survey 16 -

- Total number of satellites recorded : 1322
- Total number of good satellites : 1170 being 88.5% of the total number
- Total number of fair satellites : 86 being 6.5% of the total number
- Total number of poor satellites : 66 being 5.0% of the total number

6.8 Sonar Doppler, Chernikeeff Log, Pressure Log

6.8.1 Sonar Doppler

This piece of equipment operated satisfactorily during Cruise 1, but cruises 2, 3, and 4 are characterised by the presence of short intermittent failures.

The breakdown of these failures is as follows:

Day 36.23.20 to Day 37.00.40 : Values computed the wrong way
Day 38.02.05 to Day 38.04.40 : "
Day 40.06.40 to Day 40.07.12 : "
Day 40.07.45 to Day 40.07.55 : "
Day 57.02.20 to Day 57.06.00 : "
Day 67.00.30 to Day 67.01.50 : "
Day 67.03.40 to Day 67.07.40 : "
Day 68.00.40 to Day 68.02.15 : "
Day 83.23.18 to Day 84.01.50 : "
Day 87.02.50 to Day 87.03.52 : "
Day 87.05.20 to Day 87.06.20 : "

Investigations carried out from the first appearance of the failure come to an end on Day 87: a defective circuit board was changed.

These intermittent failures correspond to a total stoppage of $18^{H}56$ minutes being 1.3% of the total working time.

SURVEY 16 Cruise 4 SATELLITE N° 12

D D	H H	M M	Elevation	Δ f	Doppler	Result	D D	H H	M M	Elevation	Δ f	Doppler	Result
74	10	04	37	+.01	7	G	79	22	02	64	+.09	7	G
74	19	32	11	-.14	6	G	80	03	48	12	-.18	4	G
74	23	04	12	-.09	5	G	80	08	10	18	+.03	5	G
75	07	28	4	+.07	5	G	80	09	56	61	+.04	7	G
75	09	10	53	-.08	7	G	80	11	46	5	+.17	4	G
75	10	58	20	-.06	6	G	80	19	24	5	+.50	4	F
75	20	22	21	-.09	7	G	80	21	06	61	-.01	7	G
75	22	08	51	-.04	7	G	80	22	52	18	-.05	7	G
76	08	18	13	+.05	6	G	81	07	18	3	-.18	4	G
76	10	00	80	-.15	7	G	81	09	00	47	+.05	6	G
76	11	52	9	+.09	4	G	81	10	48	23	0	6	G
76	21	14	10	+.10	7	G	81	20	12	22	+.12	7	G
76	23	00	18	-.11	6	G	82	08	06	17	-.03	7	G
77	07	26	04	+.74	4	F	82	09	50	65	+.02	7	G
77	09	08	54	-.05	7	G	82	19	20	4	+,12	4	G
77	10	54	20	-.07	7	G	82	21	04	57	+.05	7	G
77	20	20	21	+.07	7	G	82	22	50	20	+.06	7	G
77	22	06	51	-.08	6	G	83	20	08	20	+.01	7	G
78	08	16	19	+.14	5	G	83	21	54	55	=.08	7	G
78	09	56	57	-.13	6	G	84	08	02	18	-.13	6	G
78	11	48	4		4	P	84	09	46	61	-.15	6	G
78	19	26	6	-.15	4	G	84	11	40	5	-.56	3	F
78	21	10	65	+.11	7	G	84	19	16	5	-.07	4	G
78	22	58	17	+.15	6	G	84	21	00	62	-.10	7	G
79	09	02	48	+.18	6	G	84	22	46	18	+.01	7	G
79	10	50	25	+.08	7	G	85	08	52	56	+.14	6	G
79	20	16	17	+.02	7	G	87	07	08	6	-.03	4	G

Table 3.6

SURVEY 16 Cruise 4 SATELLITE N° 12

D D	H H	M M	Elevation	Δ f	Doppler	Result	D D	H H	M M	Elevation	Δ f	Doppler	Result
87	20	06	23	+1.81	3	P							
88	07	56	21	+ .20	6	G							
88	09	42	52	-.12	6	G							

Table 37

SURVEY 16 Cruise 4 SATELLITE N° 13

D D	H H	M M	Elevation	Δ f	Doppler	Result
74	08	42	28	+.13	6	G
74	10	24	40	+.08	7	G
74	19	54	12	-2.30	6	P
75	07	54	5	-.01	4	G
75	09	10	53	-.08	7	G
75	09	34	59	+.03	7	G
75	11	24	18	+.07	7	G
75	20	52	25	-.08	7	G
75	22	40	42	0	6	G
76	08	48	17	-.04	7	G
76	10	32	68	-.08	7	G
76	20	04	8	-.14	5	G
76	21	48	78	-.04	7	G
76	23	36	14	+.04	6	G
77	08	02	8	-.16	5	G
77	09	44	75	-.03	7	G
77	11	34	14	-.16	6	G
77	21	00	32	-.13	8	G
77	22	48	32	-.02	7	G
78	08	56	31	-.02	7	G
78	10	42	34	-.01	7	G
78	20	12	13	+.03	7	G
78	21	58	77	0	7	G
78	23	46	9	-.07	6	G
79	08	14	9	+19	4	G
79	09	54	77	+.07	7	G
79	11	46	14	+.61	5	F
79	21	10	33	+.06	7	G
79	22	58	32	-.06	5	G
80	09	08	37	+.02	7	G
80	10	52	28	+.06	7	G
80	20	20	16	-.09	7	G
80	22	06	67	0	7	G
81	08	20	14	-.07	6	G
81	10	06	78	0	7	G
81	11	54	9	-02	6	G
81	19	36	5	-3.0	4	F
81	23	06	20	+.03	5	G
82	09	16	47	+.06	7	G
82	11	04	23	-.12	6	G
82	20	30	20	+.17	6	G
82	22	18	56	-.08	7	G
83	19	42	7	-.05	6	G
83	21	28	68	-.11	7	G
83	23	16	16	+.19	5	G
84	07	42	7	-.80	5	F
84	09	24	66	-.02	6	G
84	11	12	17	-.11	7	G
84	20	40	28	-.12	7	G
84	22	26	38	-.08	7	G
85	08	38	97	+.08	6	G

SURVEY 16 Cruise 4 SATELLITE N° 13

D D	H H	M M	Elevation	Δ f	Doppler	Result	D D	H H	M M	Elevation	Δ f	Doppler	Result
86	22	38	27	-.11	6	G							
87	08	46	38	-.07	6	G							
87	10	34	28	+.12	7	G							

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SURVEY 16 Cruise 4 SATELLITE Nº 14

D D	H H	M M	Elevation	Δ f	Doppler	Result
74	15	30	14	0	G	G
75	00	56	21	-.03	7	G
75	02	42	53	-.02	7	G
75	14	36	57	-.01	8	G
76	01	50	47	+.14	7	G
76	03	38	24	-.15	5	G
76	13	44	43	+.14	7	G
76	15	34	25	+.11	6	G
77	01	04	24	-.01	6	G
77	02	46	43	-.02	7	G
77	12	54	23	-.20	7	G
78	01	54	78	-.11	8	G
78	03	42	13	-.15	4	G
78	13	48	74	-.23	7	G
79	01	02	23	-.16	6	G
79	02	50	48	+.01	7	G
79	12	58	22	-.05	7	G
79	14	50	51	=.18	5	G
80	00	14	8	-1.34	3	F
80	01	58	74	-.10	6	G
80	13	52	78	-.02	7	G
81	01	06	29	+.09	6	G
81	02	54	32	-.17	7	G
81	13	02	32	-.09	7	G
81	14	80	33	-.14	7	G
82	00	4	11	-.11	4	G
82	12	14	11	+.14	5	G
82	13	58	86	-.05	5	G
83	01	10	37	+.05	8	G
83	02	58	28	-.18	7	G
83	13	06	35	-.10	7	G
83	14	54	30	+.02	6	G
84	00	20	15	+.01	6	G
84	02	06	72	+.01	7	G
84	03	56	8	+.11	3	G
84	12	16	14	+.12	6	G
84	14	00	76	+39.66	5	F
85	01	16	49	-.05	7	G
85	03	02	23	-.14	7	G
87	01	22	63	-.07	6	G
87	03	06	18	-.13	6	G
87	11	32	5	-.1.20	4	F
87	13	12	59	-.03	7	G
87	15	00	19	+.01	7	G
88	00	30	24	-.08	4	G
88	02	14	45	+.16	7	G
88	04	04	3	-5.13	3	P
88	12	24	23	-2.51	7	P

Table 40

6.8.2 Chernikeeff Log

25 minutes of stoppages were noted during Survey 16.

6.8.3 Pressure Log

21 hours 22 minutes of stoppages were noted during Survey 16, owing to a defect in the manual system of resetting the mechanical part of the pressure log.

6.8.4 Statistical Analysis of the three systems

Tables 49 to 56, Fig. 6 to 29 make possible a good analysis of the different navigation systems against the satellite system.

These are set out as follows:-

* One table composed of

Column 1	:	Survey Cruise
Column 2	:	Number of measure
Column 3, 4, 5, 6	:	Speed given by Sat., SD, CL, PL.
Column 7, 8, 9	:	Ratios $\frac{Vsyst}{Vsat} = K$

(Tables 49/1 to 49/4, 51/1 to 51/5, 53/1 to 53/4 and 55/1 to 55/3).

* Curves for the three systems (SD, CL, PL) with the ratios (K) as the abscissas and satellite speed as the ordinals (Figs. 6 to 8), 12 to 14, 18 to 20 and 24 to 26).

* Histograms ratios/frequencies for the three systems. Fig. 9 to 11, 15 to 17, 21 to 23, 27 to 29 and Plate 40.

* Statistical results are grouped in Tables 50, 52, 54 and 56.

SURVEY 16 Cruise 4 SATELLITE N° 15

D D	H H	M M	Elevation	Δ f	Doppler	Result	D D	H H	M M	Elevation	Δ f	Doppler	Result
74	00	48	34	+.11	7	G	80	03	14	22	-.04	7	G
74	02	34	32	-.12	7	G	80	12	32	20	-.14	7	G
74	12	02	15	+.10	7	G	80	14	18	52	-.01	8	G
74	13	48	73	+.09	6	G	80	16	08	4	-.38	5	F
75	00	02	15	-.13	5	G	81	00	30	18	+.15	7	G
75	01	44	72	?	G	P	81	02	16	56	-.14	8	G
75	13	00	31	+.17	7	G	81	13	30	72	-.13	7	G
75	14	56	34	-.11	4	G	81	15	18	16	-.08	7	G
76	00	58	21	+.01	G	G	82	12	44	25	-.09	6	G
76	02	44	55	-.09	7	G	82	14	28	43	+.03	7	G
76	12	14	8	+.17	7	G	82	16	20	2	7.56	3	P
76	14	08	72	-.02	4	G	83	00	40	24	+.04	7	G
76	15	52	10	+.04	4	G	83	02	26	45	+.04	7	G
77	01	56	86	+.04	6	G	83	13	40	82	-.06	5	G
77	03	46	11	-11.74	5	P	83	15	28	13	+.10	7	G
77	14	10	47	-.05	8	G	83	23	56	10	+.02	4	G
77	15	02	26	-11	G	G	84	01	36	80	-.11	7	G
78	01	06	39	-.05	7	G	84	03	28	13	+.74	4	F
78	02	54	27	-.12	7	G	84	12	52	36	-.02	7	G
78	14	12	63	?	7	P	84	14	38	30	+.13	7	G
78	16	00	6	-.54	4	F	85	00	48	34	-.11	7	G
79	00	22	12	-.16	5	G	85	02	36	31	-.04	7	G
79	02	10	83	-.08	6	G	87	00	58	51	+.12	7	G
79	03.	56	10	-.02	3	G	87	02	46	22	-.15	7	G
79	13	22	43	+.15	8	G	87	12	14	21	-.04	7	G
79	15	08	25	+.08	8	G	87	14	00	52	-.09	8	G
80	01	10	41	-.12	5	G	87	15	52	4	-2.96	4	F

SURVEY 16 Cruise 4 SATELLITE N° 15

D D	H H	M M	Elevation	Δ f	Doppler	Result	D D	H H	M M	Elevation	Δ f	Doppler	Result
88	00	14	21	-.18	6	G							
88	01	56	55	-.10	7	G							
88	11	28	8	-.16	5	G							
88	13	12	72	-.36	7	P							

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SURVEY 16 Cruise 4 SATELLITE N° 18

D D	H H	M M	Elevation	Δ f	Doppler	Result	D D	H H	M M	Elevation	Δ f	Doppler	Result
74	03	48	61	+.08	8	G	79	14	34	7	-05	6	G
74	05	38	19	-.14	4	G	79	16	20	69	-.08	7	G
74	15	04	25	-.01	7	G	79	18	6	16	+.14	5	G
74	16	50	44	+.09	8	G	80	02	36	7	-9.75	3	P
74	18	40	3	+.04	3	G	80	04	14	75	-.06	7	G
75	03	.08	15	+.58	3	F	80	15	30	32	-.11	7	G
75	04	46	71	-.16	8	G	80	17	18	31	+.04	6	G
75	14	18	4	-.09	3	G	81	03	30	32	-.11	5	G
75	16	02	55	-.02	8	G	81	05	14	34	-.09	6	G
75	17	50	20	+.05	6	G	81	16	32	78	+.20	5	F
76	03	56	34	+.01	8	G	82	15	38	39	+.03	7	G
76	05	50	31	-.11	4	G	82	17	26	27	-.14	7	G
76	15	18	20	+.07	5	G	83	03	38	37	0	7	G
76	17	00	54	-.08	8	G	83	05	22	28	-.14	6	G
76	18	48	4	-.19	4	G	83	16	36	67	-.12	8	G
77	03	10	19	-.09	6	G	83	18	24	7	-.19	5	G
77	04	56	58	-19	8	G	84	02	46	16	-.16	5	G
77	14	26	7	-.08	5	G	84	04	34	70	-.11	6	G
77	16	10	69	+.05	8	G	84	06	26	7		4	G
77	17	58	16	0	6	G	84	15	48	56	-.06	6	G
78	04	04	66	-.05	7	G	84	17	38	20	+.02	5	G
78	06	00	16	+1.791	4	F	85	02	02	4	-.35	3	F
78	12	22	28	+.04	8	G	85	03	42	54	-2.05	7	F
78	15	22	28	-.05	7	G	85	05	34	54	+.09	6	G
78	1	08	38	-08	8	G	87	.03	54	72	-.13	7	G
79	03	18	20	-02	4	G	87	05	42	15	-.04	4	G
79	05	04	57	-.13	7	G	87	16	56	35	-.11	7	G

Table 4.3

SURVEY 16 Cruise 4 SATELLITE N°: 18

D D	H H	M M	Elevation	Δ f	Doppler	Result	D D	H H	M M	Elevation	Δ f	Doppler	Result
88	03	06	29	-.15	6	G							
88	04	50	36	+.10	8	G							

Table 44

STATISTICS_SATELLITES Cruise : 4.

DAYS	SAT. 12			SAT. 13			SAT. 14			SAT. 15			SAT. 18		
	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor	Good	Fair	Poor
74	3			2		1	1			4			5		
75	5			6			3			3		1	4	1	
76	5			5			4			5			5		
77	4	1		5			3			3		1	5		
78	5		1	5			3			2	1	1	4	1	
79	4			4	1		4			5			5		
80	6	1		4			2	1		4	1		3		1
81	4			4	1		4			4			2	1	
82	5			4			3			2		1	2		
83	2			3			4			5			4		
84	5	1		4	1		4	1		3	1		5		
85	1			1			2			2			1	2	
86	0	0	0	1											
87	1		1	2			4	1		4	1		3		
88	2			0			2		2	3		1	2		
TOTAL	52	3	2	50	3	1	43	3	2	49	4	5	50	5	1
TOTAL SAT.	57			54			48			58			56		
%	91.2	5.3	3.5	92.6	5.6	1.8	89.5	6.3	4.1	84.5	6.9	8.5	89.3	8.9	1.8

TOTAL SAT.	273		
TOTAL	244	1.8	11
%	89.4	6.6	4.0
%	96.0		4.0

Table 48

* Cruise 1 (Tables 49 and 50 and Fig. 6 to 11)

246 Satellites fixes were used in the statistics of the Cruise 1. The populations studied for the Chernikeeff Log and Pressure Log are composed of 207 values (tables 49/1 to 49/4).

Sonar Doppler

Fig. 6 shows up a good cluster of points within the range:

$$0.998 \leqslant K \leqslant 1.125 \quad .$$

which for a Vsat = 10 knots would give a maximum deviation in calibration of 1.3 knots.

This good cluster of K values can be seen again on the histogram of Fig. 9.

The quantitative information furnished by the histogram is: 6.9% of the data corresponds to Sonar Doppler speeds lower than those given by the satellite system.

Table 50 gives the following information:

1. Average speed during Cruise 1: 8.74 knots being a delta of .37 knots in comparison with the satellite system in favour of the Sonar Doppler.
2. Standard deviation: 1.13 knots; the spread of speeds determined by the Sonar Doppler is slightly less great than that determined by the satellite system.
3. In the domain of ratios the figures obtained are the following:

   Average of K values : 1.041

   Standard deviation : 0.048

   89.4% of the total population lies within 1 standard deviation on either side of the mean, i.e. between -

   K : 0.9991 $\Big|\Longrightarrow \quad \Delta = 0.0960$

   K : 1.0951 $\Big|$

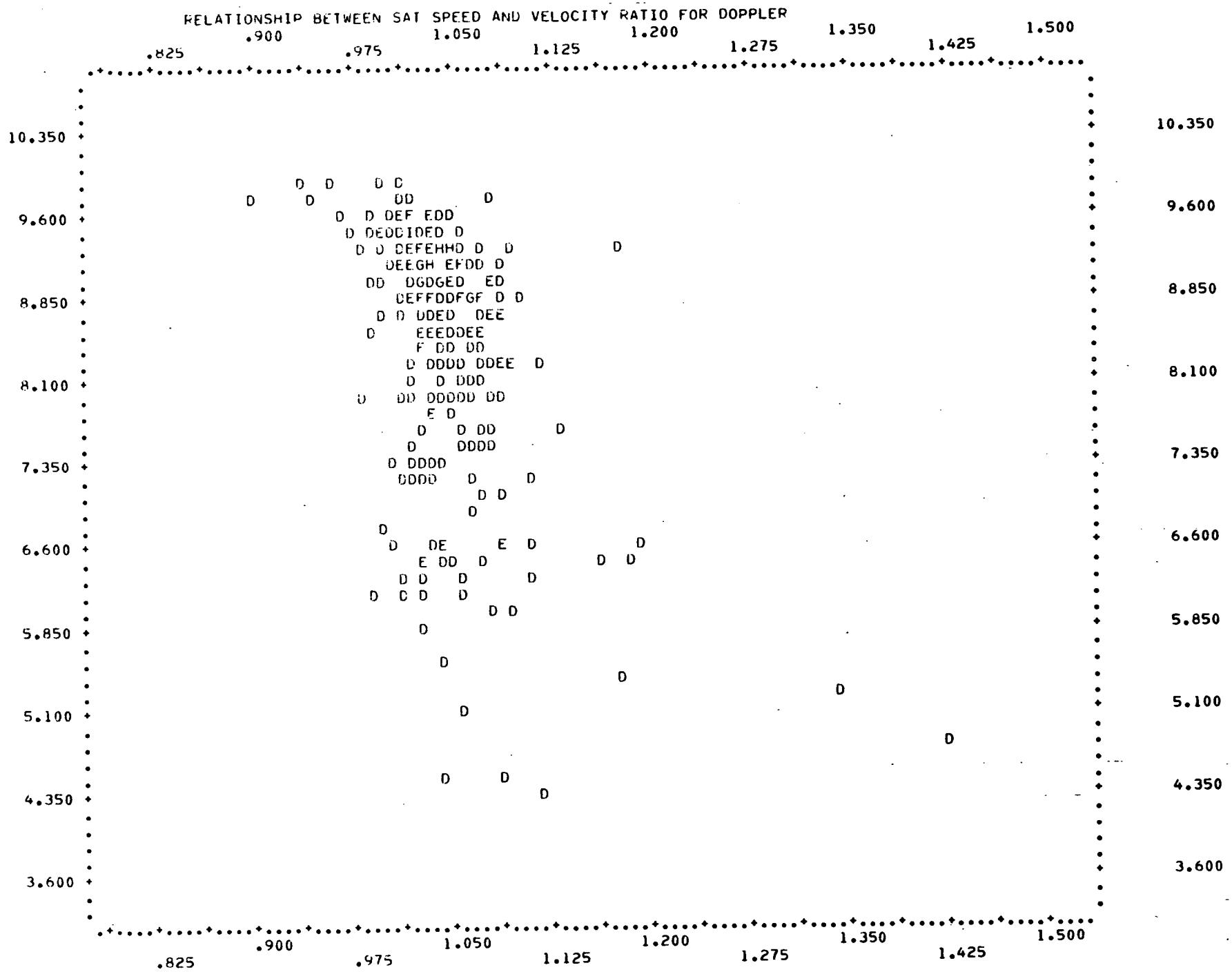

RELATIONSHIP BETWEEN SAT SPEED AND VELOCITY RATIO FOR DOPPLER
.825
.900
.975
1.050
1.125
1.200
1.275
1.350
1.425
1.500
10.350
9.600
8.850
8.100
7.350
6.600
5.850
5.100
4.350
3.600

Fig. 19

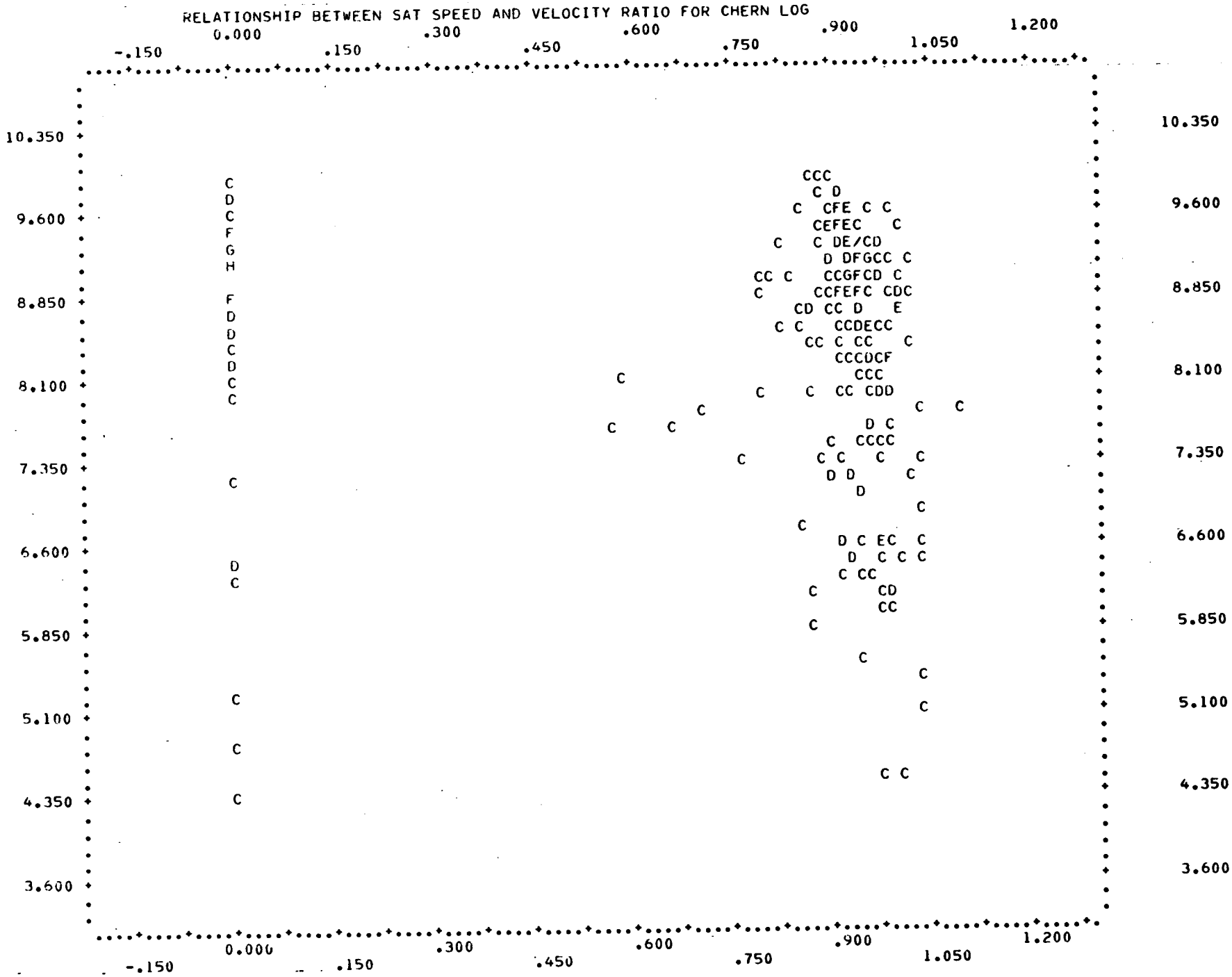

RELATIONSHIP BETWEEN SAT SPEED AND VELOCITY RATIO FOR CHERN LOG
-.150
0.000
.150
.300
.450
.600
.750
.900
1.050
1.200
10.350
9.600
8.850
8.100
7.350
6.600
5.850
5.100
4.350
3.600

Fig. 7

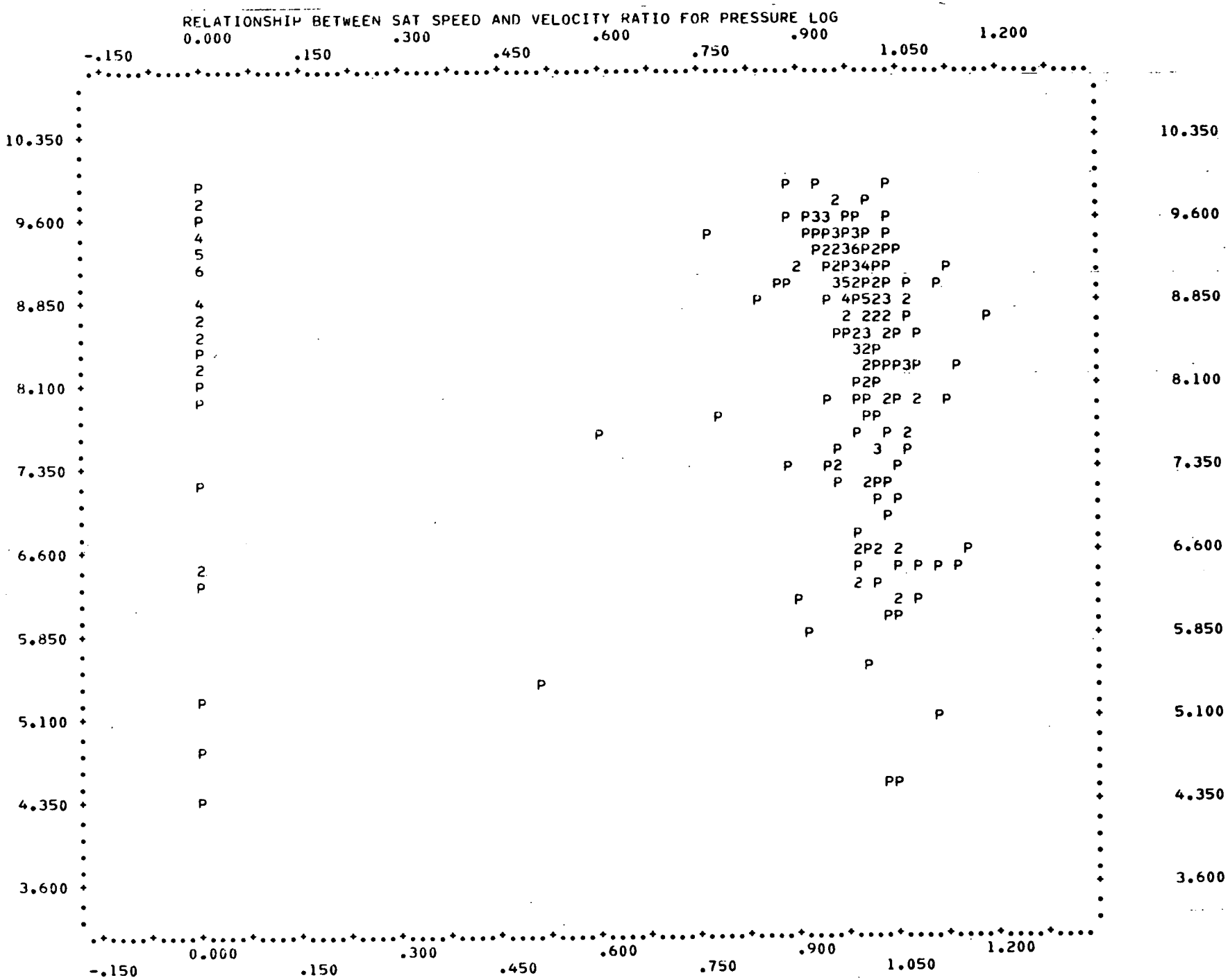

RELATIONSHIP BETWEEN SAT SPEED AND VELOCITY RATIO FOR PRESSURE LOG
-.150
0.000
.150
.300
.450
.600
.750
.900
1.050
1.200
10.350
9.600
8.850
8.100
7.350
6.600
5.850
5.100
4.350
3.600

Fig. 8

Chernikeeff Log

The cluster of the points on Fig. 7 is centred within the interval

$$0.870 \leqslant K \leqslant 1.025$$

which for, Vsat = 10 knots gives a maximum deviation in calibration of 2.1 knots.

The quantitative information furnished by the histogram of Fig. 10 is:

91.3% of the data corresponds to Chernikeeff speeds lower than those given by the satellite system.

Table 50 gives the following information:

1. Average speed during Cruise 1 : 7.80 knots
2. Standard deviation : 1.12 knots, this figure reveals a slight dispersion of the speeds given by the Chernikeeff system.
3. In the domain of ratios, the figures obtained are the following:

Average of the K values : 0.9341

Standard deviation : 0.0658

81.2% of the total population lies within 1 standard deviation on either side of the mean i.e. between -

$$\left.\begin{array}{l} K : 0.8683 \\ K : 0.9999 \end{array}\right| \Longrightarrow \Delta = 0.1312$$

Pressure Log

Figure 8 shows that it is possible to trace an approximate regression line with a slope of -104, which appears on the histogram of Fig. 11 as a good clustering of points. This histogram gives the following quantitative information.

47% of the data corresponds to pressure log speeds less than given by the satellite system.

Table 50 gives the following information -

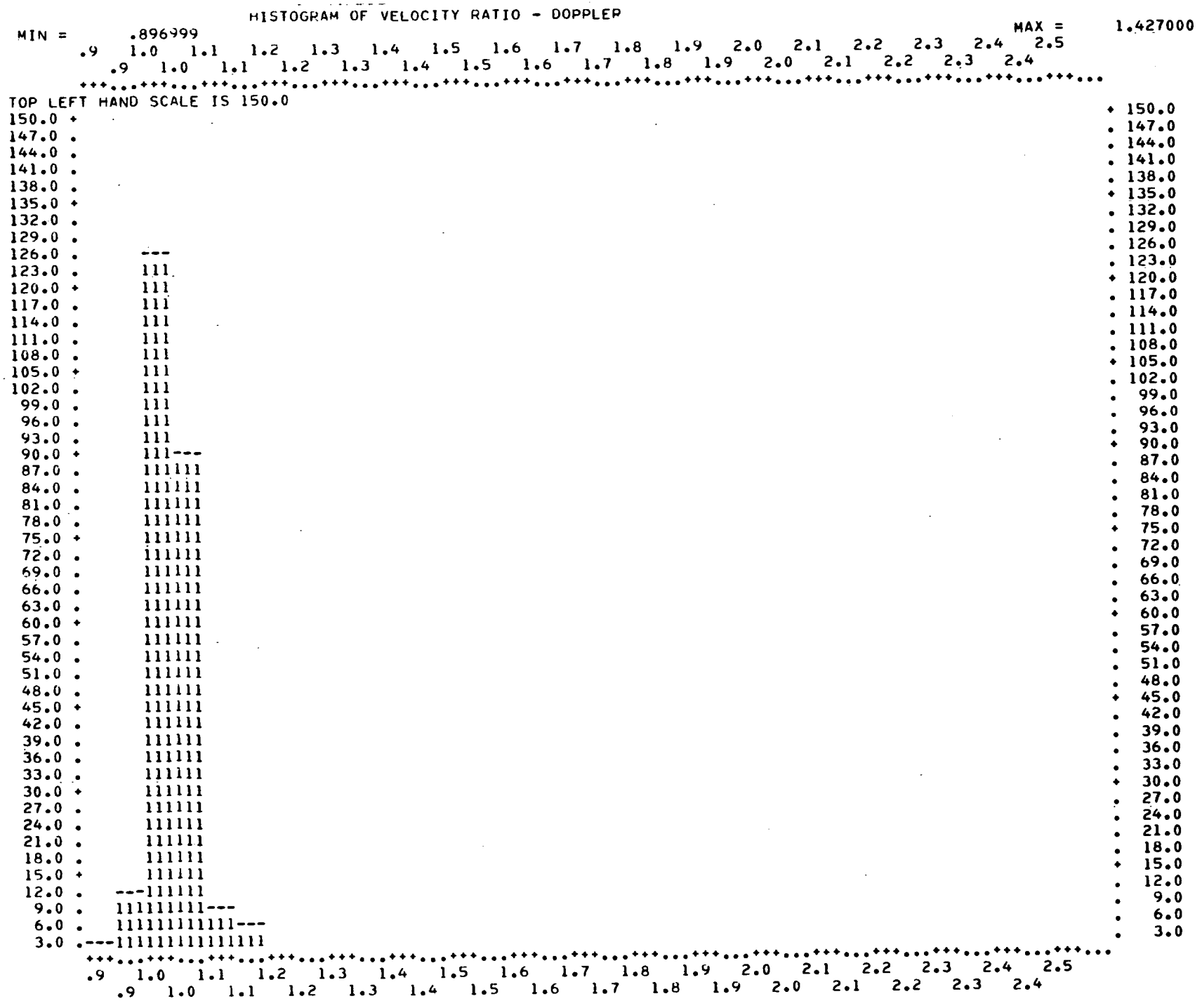

HISTOGRAM OF VELOCITY RATIO - DOPPLER
MIN = .896999
MAX = 1.427000
.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5
TOP LEFT HAND SCALE IS 150.0
150.0
147.0
144.0
141.0
138.0
135.0
132.0
129.0
126.0
123.0
120.0
117.0
114.0
111.0
108.0
105.0
102.0
99.0
96.0
93.0
90.0
87.0
84.0
81.0
78.0
75.0
72.0
69.0
66.0
63.0
60.0
57.0
54.0
51.0
48.0
45.0
42.0
39.0
36.0
33.0
30.0
27.0
24.0
21.0
18.0
15.0
12.0
9.0
6.0
3.0

Fig. 9

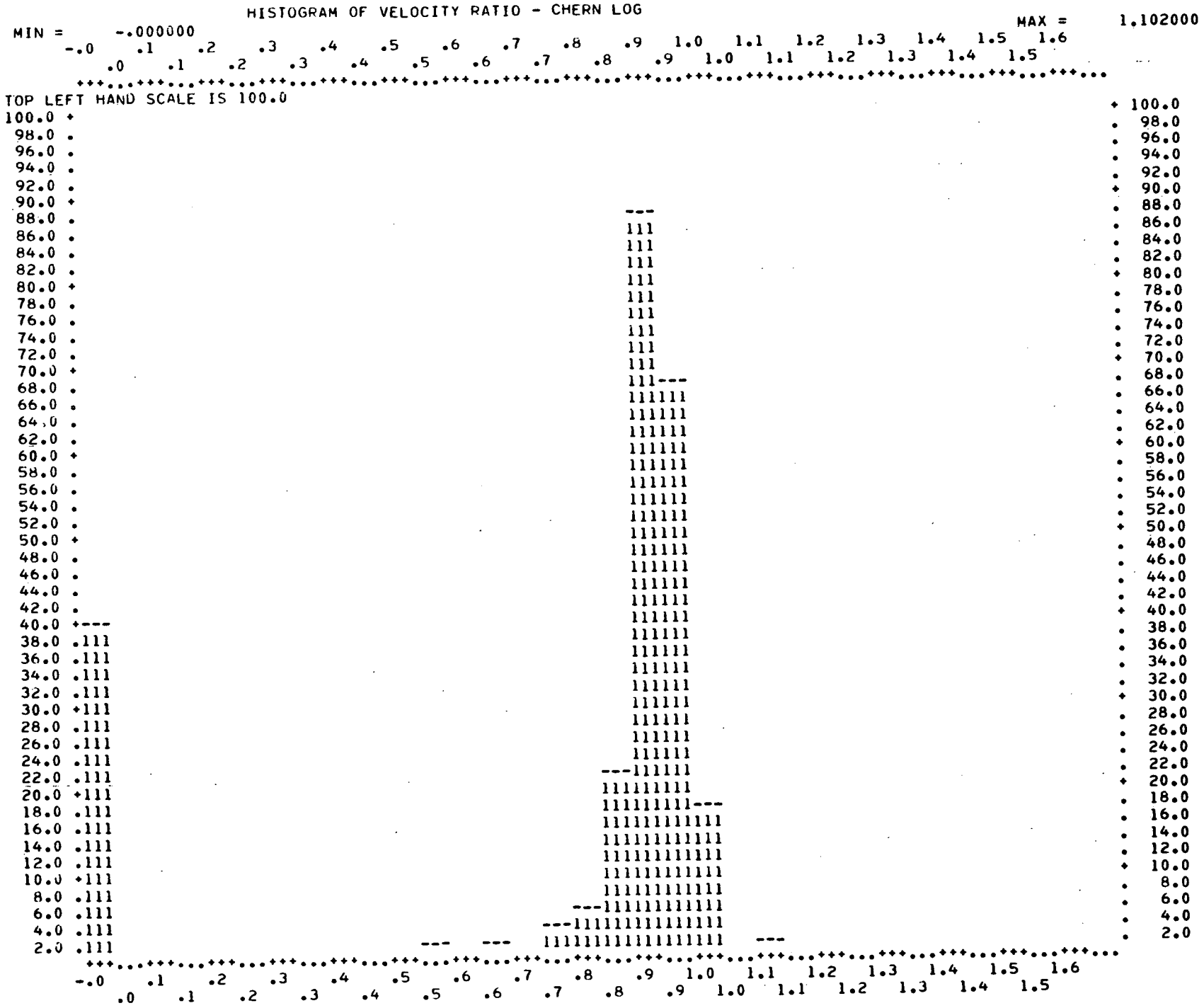

HISTOGRAM OF VELOCITY RATIO - CHERN LOG
MIN = -.000000
MAX = 1.102000
TOP LEFT HAND SCALE IS 100.0

Fig. 10

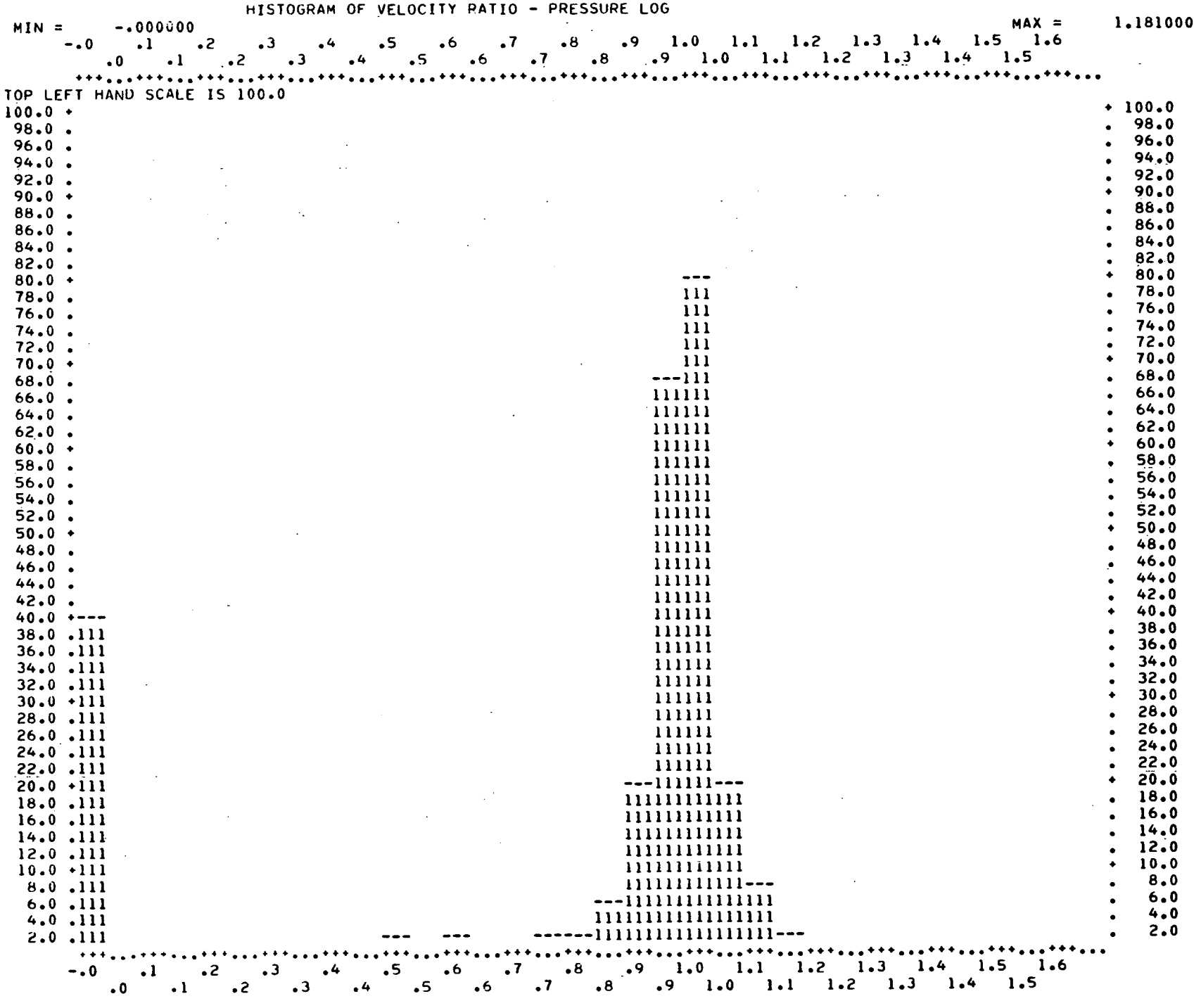

HISTOGRAM OF VELOCITY RATIO - PRESSURE LOG
MIN = -.000000
MAX = 1.181000
TOP LEFT HAND SCALE IS 100.0

Fig. 11

NAVIGATION SYSTEMS - STATISTICS Cruise : 1

SYSTEMS	PARAMETERS						
	Mean	S D	S·E of Mean	Sample	Maximum	Minimum	Range
SAT	8.3766	1.1760	0.0749	246	9.95	4.39	5.56
S D	8.7468	1.1320	0.0722	246	10.96	4.69	6.27
C L	7.7995	1.1245	0.0782	207	9.45	4.36	5.09
P L	8.3162	1.1655	0.0810	207	10.36	2.82	7.54
S D / SAT	1.0471	0.0480	0.0031	246	1.427	0.897	0.53
C L / SAT	0.9341	0.0658	0.0046	207	1.102	0.571	0.531
P L / SAT	0.9961	0.0711	0.0049	207	1.18	0.516	0.665

Table 50

1. Average speed during Cruise 1: 8.39 knots
2. Standard deviation : 1.17 knots
3. In the domain of ratios, the figures obtained are the following -

Average of the K values : 0.9961

Standard deviation : 0.0711

83.1% of the total population lies within 1 standard deviation on either side of the mean, i.e. between -

$$\left.\begin{array}{l} K : 0.9250 \\ K : 1.0671 \end{array}\right| \Rightarrow \Delta : 0.1422$$

The histograms make possible the definition of a scale factor for the three systems:

a. Sonar Doppler:

$0.950 \leqslant K_s \leqslant 1.150$

This eliminates 4% of the values.

b. Chernikeeff Log:

$0.850 \leqslant K \leqslant 1.050$

This eliminates 7.7% of the values.

c. Pressure Log:

$0.900 \leqslant K_p \leqslant 1.150$

This eliminates 7.7% of the values.

The conclusions which are meaningful for Cruise 1 are these:

- The behaviour of the 3 systems was satisfactory during Cruise 1.
- The results given by the Sonar Doppler, are, however, more consistent than those given by the two other systems.

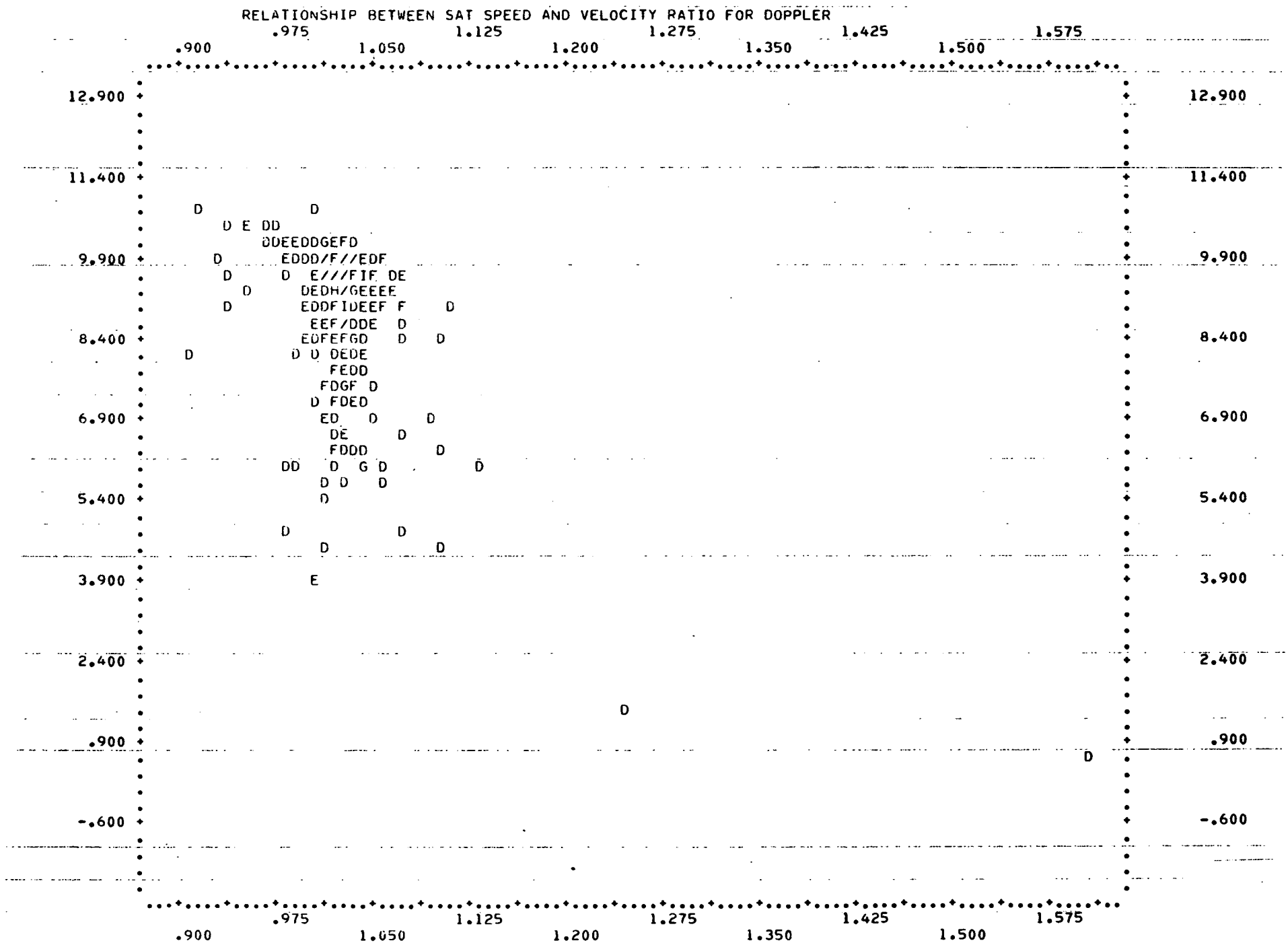

RELATIONSHIP BETWEEN SAT SPEED AND VELOCITY RATIO FOR DOPPLER
.900
.975
1.050
1.125
1.200
1.275
1.350
1.425
1.500
1.575
12.900
11.400
9.900
8.400
6.900
5.400
3.900
2.400
.900
-.600

Fig. 12

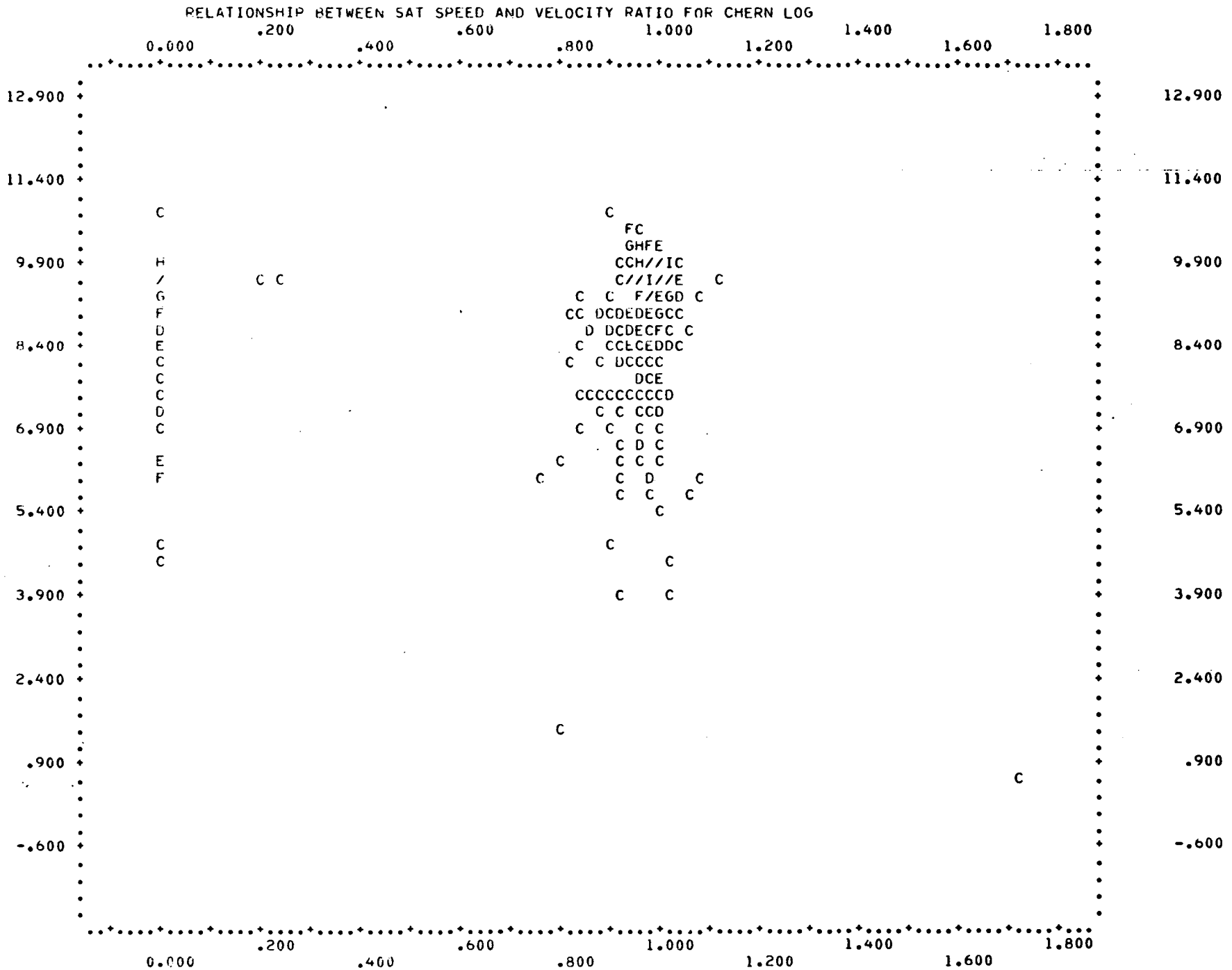

RELATIONSHIP BETWEEN SAT SPEED AND VELOCITY RATIO FOR CHERN LOG
0.000
.200
.400
.600
.800
1.000
1.200
1.400
1.600
1.800
12.900
11.400
9.900
8.400
6.900
5.400
3.900
2.400
.900
-.600

Fig. 13

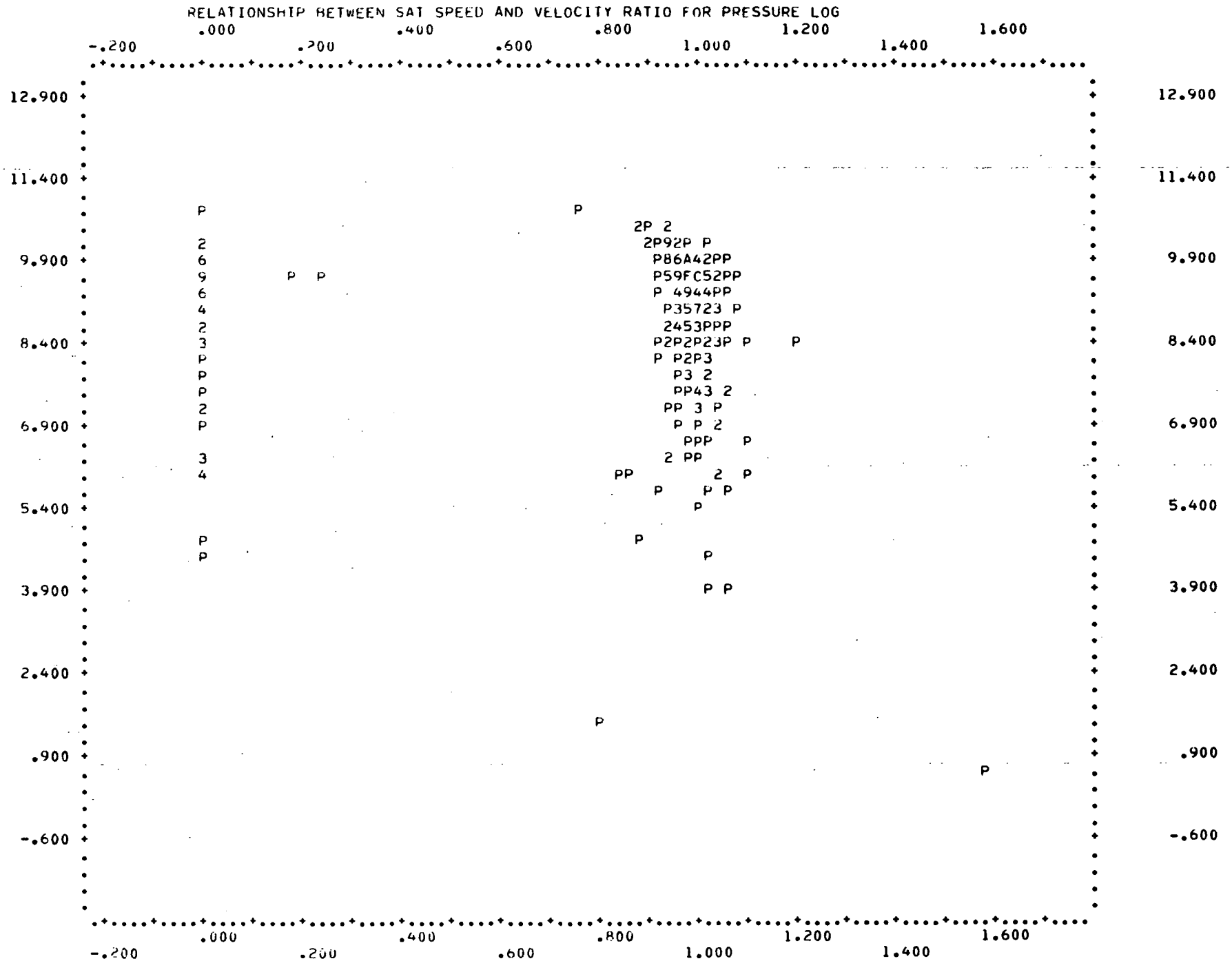

RELATIONSHIP BETWEEN SAT SPEED AND VELOCITY RATIO FOR PRESSURE LOG
-.200
.000
.200
.400
.600
.800
1.000
1.200
1.400
1.600
12.900
11.400
9.900
8.400
6.900
5.400
3.900
2.400
.900
-.600

Fig. 14

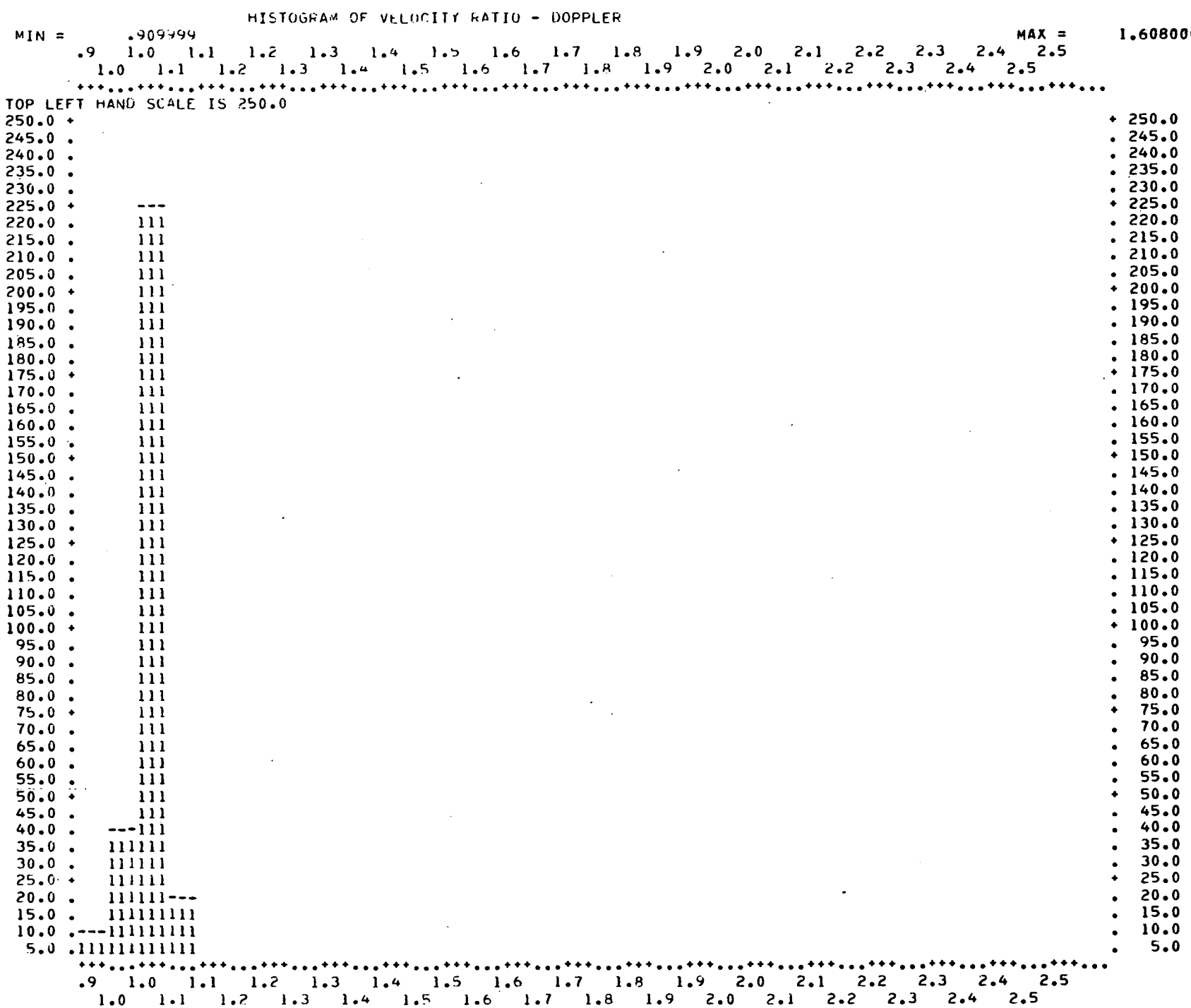

HISTOGRAM OF VELOCITY RATIO - DOPPLER
MIN = .909999
MAX = 1.608000
.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5
1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5
TOP LEFT HAND SCALE IS 250.0
250.0
245.0
240.0
235.0
230.0
225.0
220.0
215.0
210.0
205.0
200.0
195.0
190.0
185.0
180.0
175.0
170.0
165.0
160.0
155.0
150.0
145.0
140.0
135.0
130.0
125.0
120.0
115.0
110.0
105.0
100.0
95.0
90.0
85.0
80.0
75.0
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0

Fig. 15

HISTOGRAM OF VELOCITY RATIO - CHERN LOG

THE VALUE GIVEN FOR THE INTERVAL WIDTH IS TOO SMALL.
A NEW VALUE, .0509, HAS BEEN SUBSTITUTED.

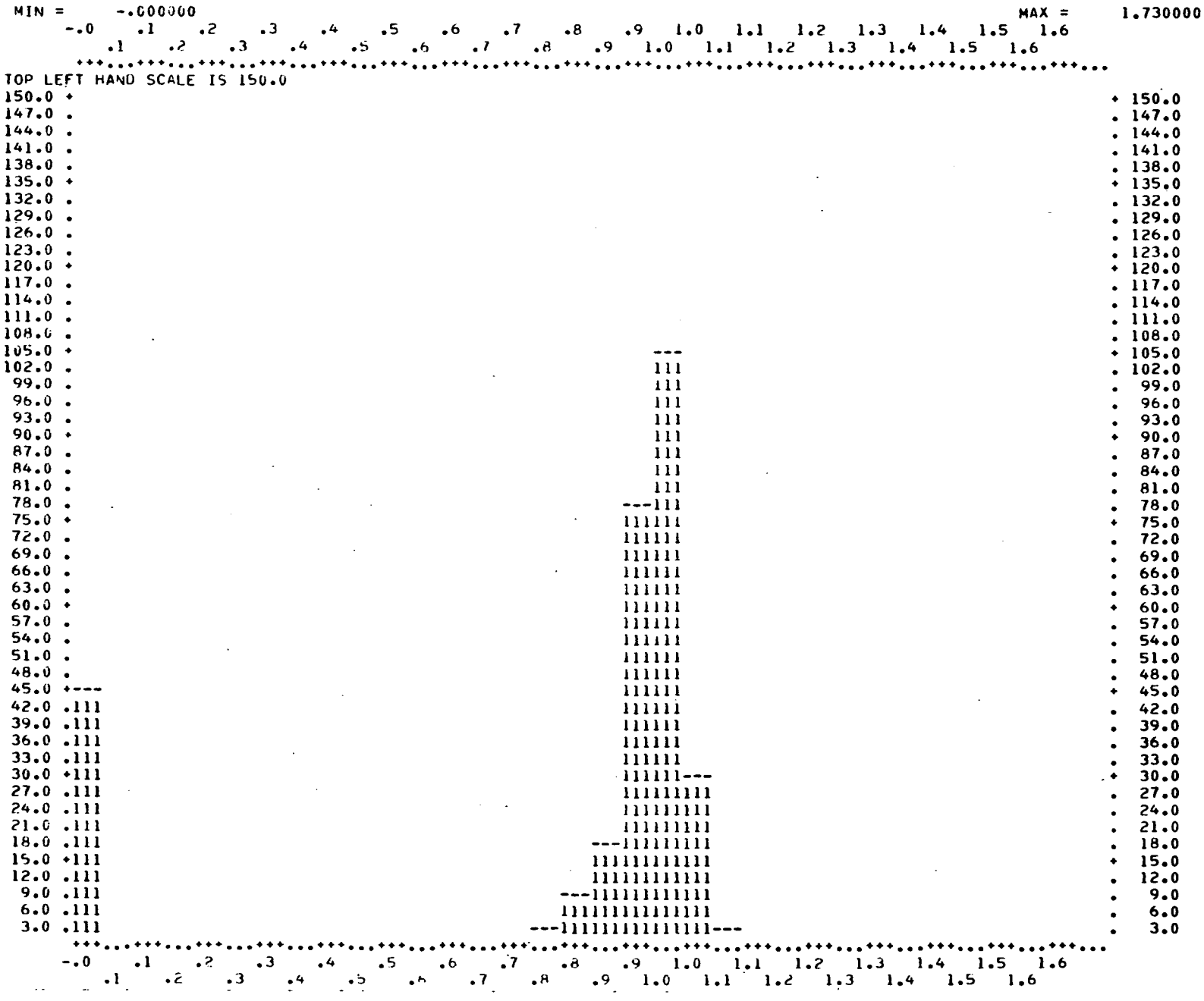


Fig. 16

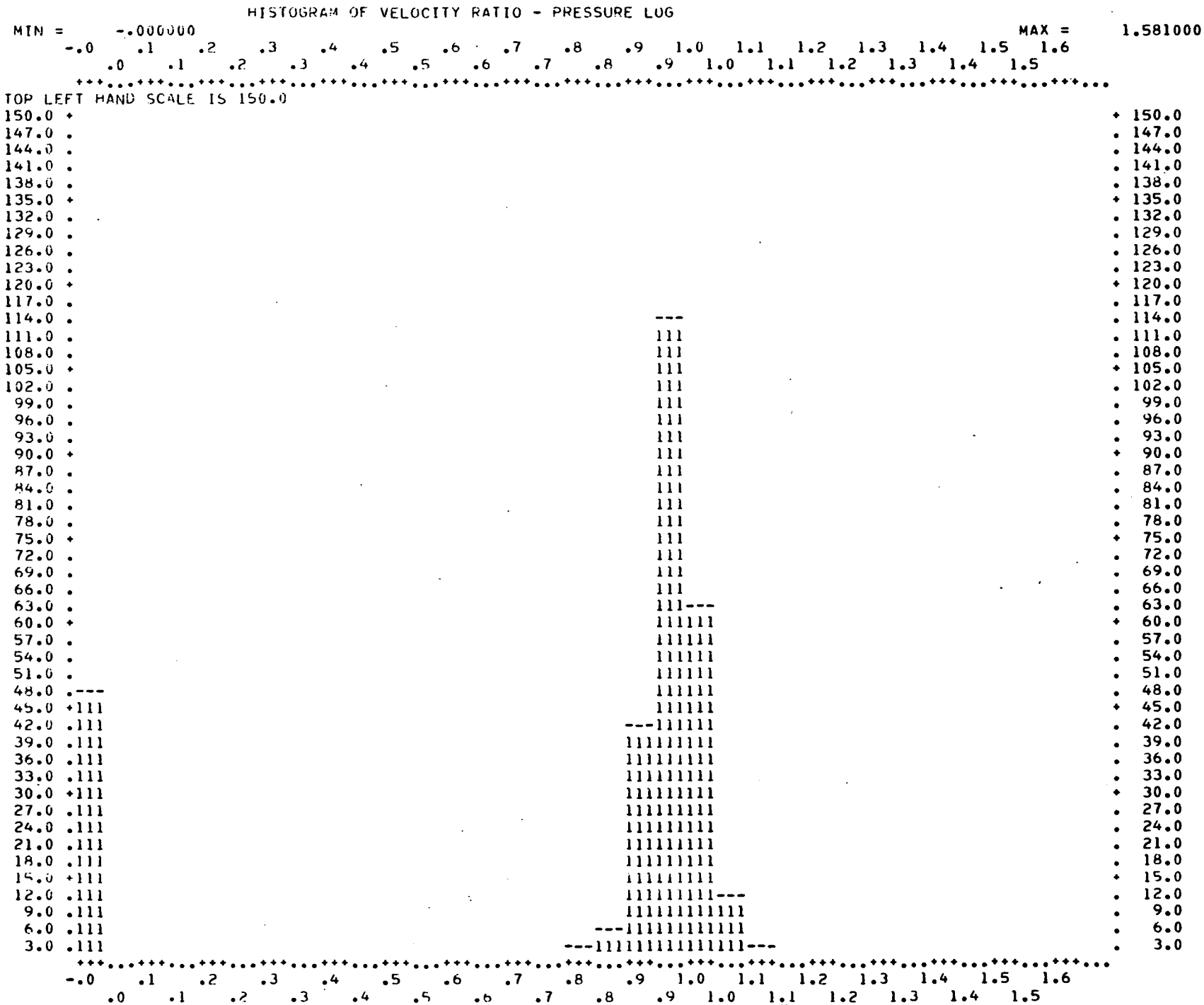

HISTOGRAM OF VELOCITY RATIO - PRESSURE LOG
MIN = -.000000
MAX = 1.581000
TOP LEFT HAND SCALE IS 150.0

Fig. 17

NAVIGATION SYSTEMS - STATISTICS Cruise : 2

SYSTEMS	PARAMETERS						
	Mean	S D	S E of Mean	Sample	Maximum	Minimum	Range
SAT	8.7306	1.4755	0.0864	292	10.84	0.7400	10.100
S D	8.9429	1.4731	0.0862	292	10.75	1.190	9.560
C L	8.4710	1.6243	0.1034	247	10.56	1.250	9.310
P L	8.5614	1.5110	0.0967	244	10.56	1.170	9.390
$\frac{SD}{SAT}$	1.0276	0.0453	0.0027	292	1.608	0.910	0.698
$\frac{CL}{SAT}$	0.9650	0.0977	0.0027	247	1.730	0.196	1.534
$\frac{PL}{SAT}$	0.9792	0.0926	0.0059	244	1.581	0.188	1.393

Table 5.2

* Cruise 2 (Fig. 12 to 17 and Tables 51 to 52)

292 Satellites fixes were used in the statistics of Cruise 2. The population studied for Chernikeeff Log and Pressure Log respectively were composed of 247 and 244 values (Tables 51/1 to 51/5).

Sonar Doppler

The analysis of figure 12 permits the following observations to be made:

The majority of points cluster within the interval (1.005, 1,057) with a tendency for the great satellite speeds to give a ratio K less than 1.

This appears on the histogram of Figure 15 as an accumulation of points in the interval cited above.

The histogram gives the following quantitative information:

10% of the K values correspond to speeds lower than those given by satellite system.

Table 52 gives the following information:

1. Average speed during Cruise 2: 8.94 knots, being a delta of 0.2 knots in comparison with the satellite system in favour of the Sonar Doppler.
2. Standard deviation: 1.47 knots corresponds to a spread of the same magnitude as that observed for the satellite speeds.
3. In the domain of ratios the figures obtained are the following -

   Average of the K values : 1.027

   Standard deviation : 0.045

91.8% of the total population lies within 1 standard deviation on either side of the mean, i.e. between

$$\left.\begin{array}{l} K : 0.9823 \\ K : 1.0729 \end{array}\right| \Rightarrow \Delta = 0.0906$$

Chernikeeff Log

Figure 13 shows a good cluster of points in the interval of K values (0.880, 1.000) which for Vsat = 10 knots gives a maximum deviation in calibration of 1.20 knots.

The histogram, Fig. 16, gives the following quantitative information. 72% of the total population corresponds to speed lower than the satellite speed.

Table 52 gives the following information:

1. Average speed during Cruise 2: 8.47 knots
2. Standard deviation : 1.62 knots, slightly superior to the corresponding one for the satellite system.
3. In the domain of ratios, the figures obtained are the following:

Average of the K values : 0.9650

Standard deviation : 0.0977

93.1% of the population lies within 1 standard deviation on either side of the mean, i.e. between:

$$\left.\begin{array}{l} K : 0.8673 \\ K : 1.0627 \end{array}\right| \Rightarrow \Delta = 0.1954$$

Pressure Log

Figure 14 shows a good cluster of points in the interval (0.920, 1.060) of the K values which, for Vsat = 10 knots gives a maximum deviation in calibration of 1.4 knots.

The histogram, Figure 17, gives the following quantitative information: 67.2% of the data corresponds to pressure speeds lower than those given by the satellite system.

Table 52 gives the following information:

1. Average speed during Cruise 2: 8.56 knots
2. Standard deviation : 1.51 knots
3. Average of the K values : 0.0926

97.5% of the total population lies within 1 standard deviation on either side of the mean, i.e. between:

$$\left.\begin{array}{l} K : 0.8866 \\ K : 1.0718 \end{array}\right| \Rightarrow \quad \Delta = 0.1852$$

The histograms of Cruise 2 make possible to define a scale factor for the 3 systems:

a. Sonar Doppler

$1.0 \leqslant K. \leqslant 1.1$

This eliminates 10.3% of the values.

b. Chernikeeff Log

$0.950 \leqslant K \leqslant 1.1$

This eliminates 12.1% of the data.

c. Pressure Log

$0.900 \leqslant K \leqslant 1.050$

This eliminates 10% of the values

Cruise 2 of Survey 16 is marked by the excellent operation of all three systems SD, CL and PL.

* Cruise 3 (Fig. 18 to 23 and Tables 53 to 54)

235 satellite fixes were used in the statistics of Cruise 3. The populations studied for the Chernikeeff Log and Pressure Log are respectively composed of 169 and 150 values. (Tables 53/1 and 53/4).

Sonar Doppler

The clustering of points in the interval (0.990, 1.075) shown in Figure 18 indicates that for Vsat = 10 knots there is a maximum deviation in calibration of 0.85 knots.

The histogram of Figure 21 furnishes the following quantitative information: 11% of the speeds provided by the Sonar Doppler are lower than those given by the Satellite System.

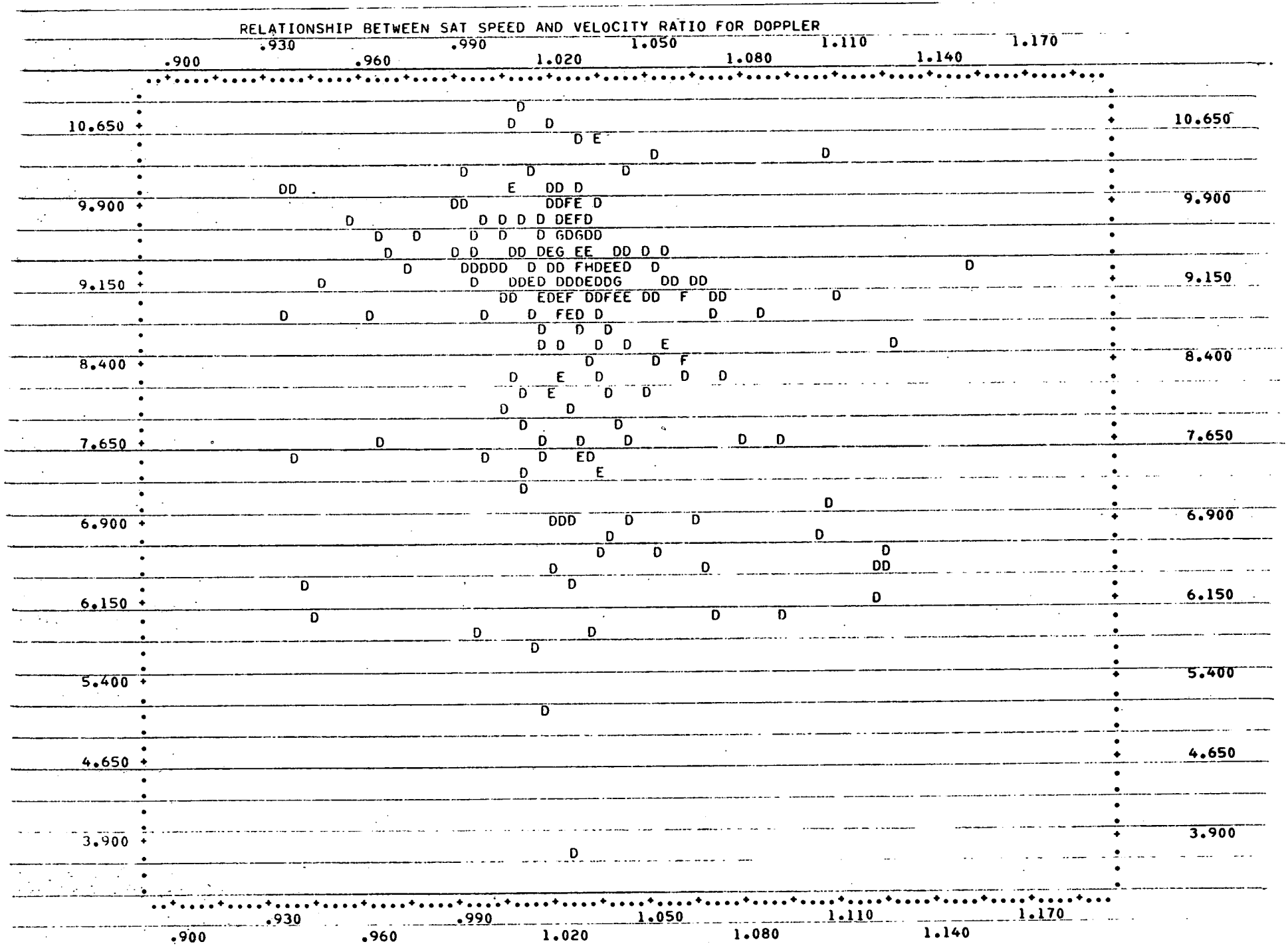
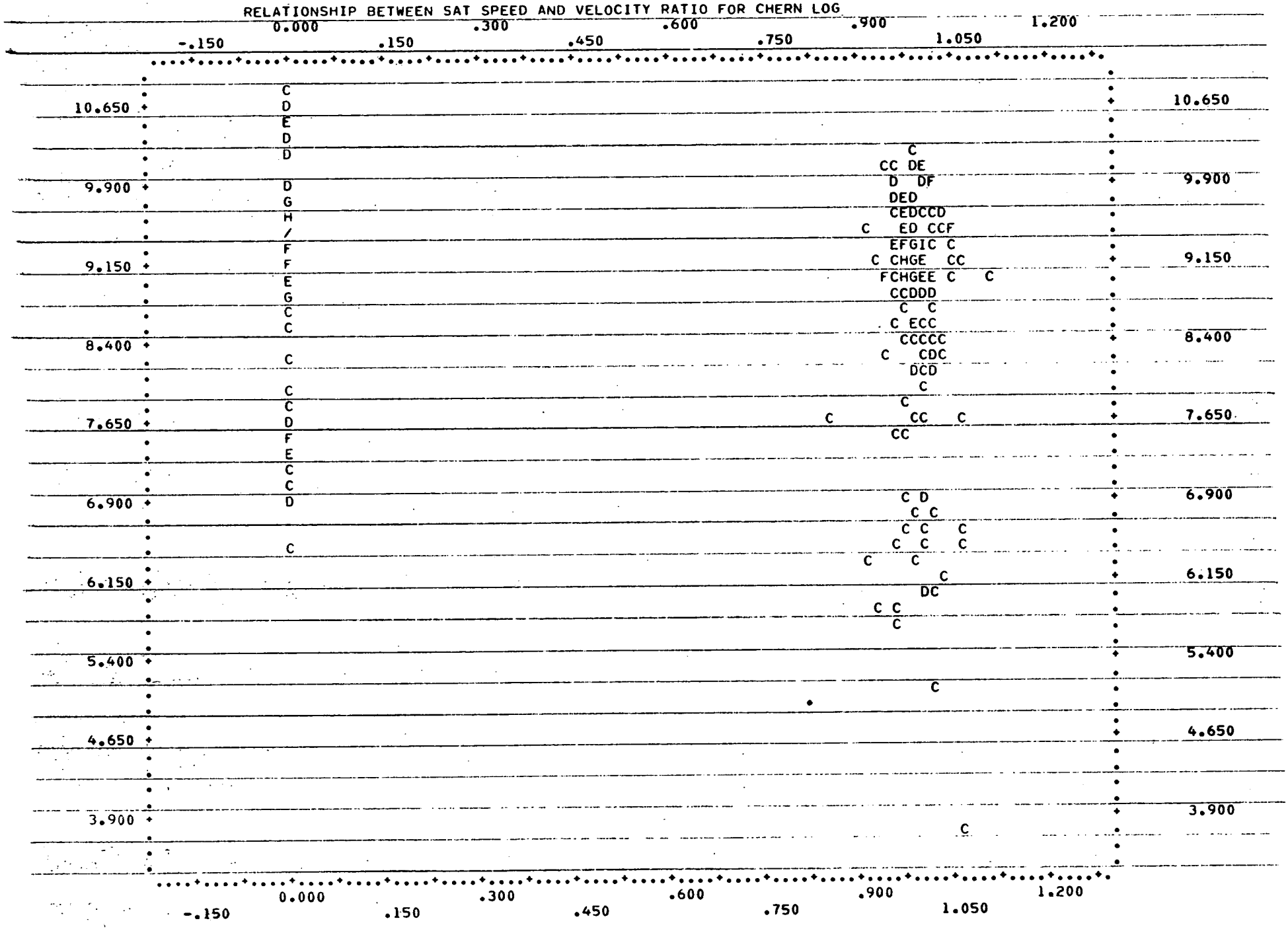

RELATIONSHIP BETWEEN SAT SPEED AND VELOCITY RATIO FOR DOPPLER
.900
.930
.960
.990
1.020
1.050
1.080
1.110
1.140
1.170
10.650
9.900
9.150
8.400
7.650
6.900
6.150
5.400
4.650
3.900

Fig. 18


RELATIONSHIP BETWEEN SAT SPEED AND VELOCITY RATIO FOR CHERN LOG
-.150
0.000
.150
.300
.450
.600
.750
.900
1.050
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10.650
9.900
9.150
8.400
7.650
6.900
6.150
5.400
4.650
3.900

Fig. 19

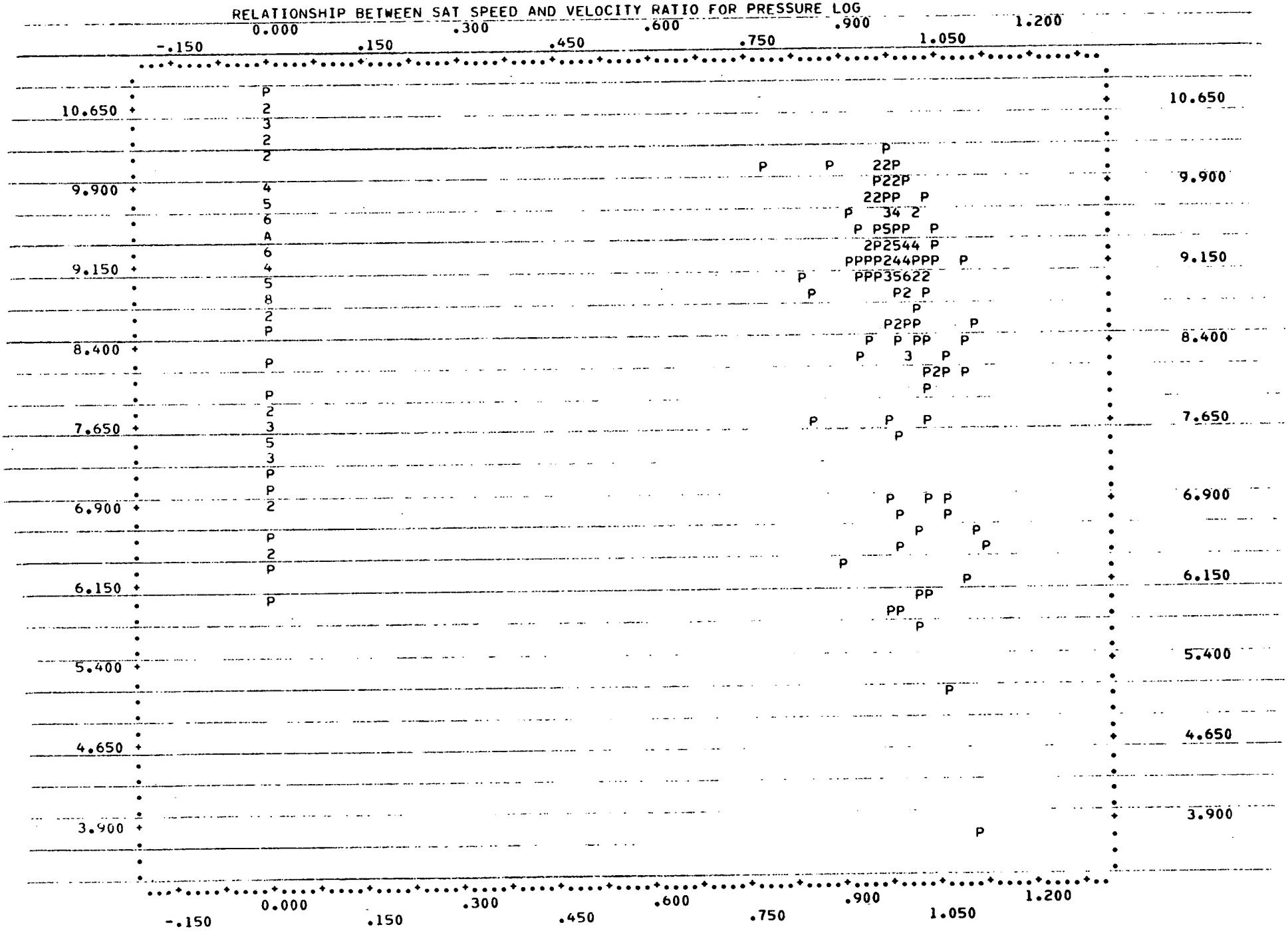

RELATIONSHIP BETWEEN SAT SPEED AND VELOCITY RATIO FOR PRESSURE LOG
-.150
0.000
.150
.300
.450
.600
.750
.900
1.050
1.200
10.650
9.900
9.150
8.400
7.650
6.900
6.150
5.400
4.650
3.900

Fig. 20

Table 54 gives the following information:

1. Average speed during Cruise 3: 9.05 knots
2. Standard deviation: 1.15 knots

Both these numbers are larger than those supplied by the Satellite System.

3. In the domains of ratios, the figures obtained are the following:

Average of the K values 1.0291

Standard deviation 0.0324

80.4% of the total population lies within 1 standard deviation on either side of the mean, i.e. between:

K : 0.9967 | $\Longrightarrow \Delta$ = 0.0848

K : 1.0615 |

Chernikeeff Log

Figure 19 displays a clustering of Chernikeeff values in the interval (0.945, 1.050) which points to a maximum deviation in calibration of 1.05 knots for Vsat = 10 knots.

This clustering stands out on the histogram of figure 22. This histogram gives the following information: 59% of the speeds furnished by the CL are lower than the speeds given by the Satellite System.

(Two points should be noticed, for these, K $\leqslant$0.2; both these aberrant values are the results of an error in the introduction of the data of the "hourly position" program).

Table 54 gives the following information:

1. Average speed during Cruise 3 : 8.67 knots
2. Standard deviation : 1.16 knots (greater than those of all the other systems).
3. In the domain of ratios, the figures obtained are the following average of the K values : 0.9937

Average of the K values : 0.9937

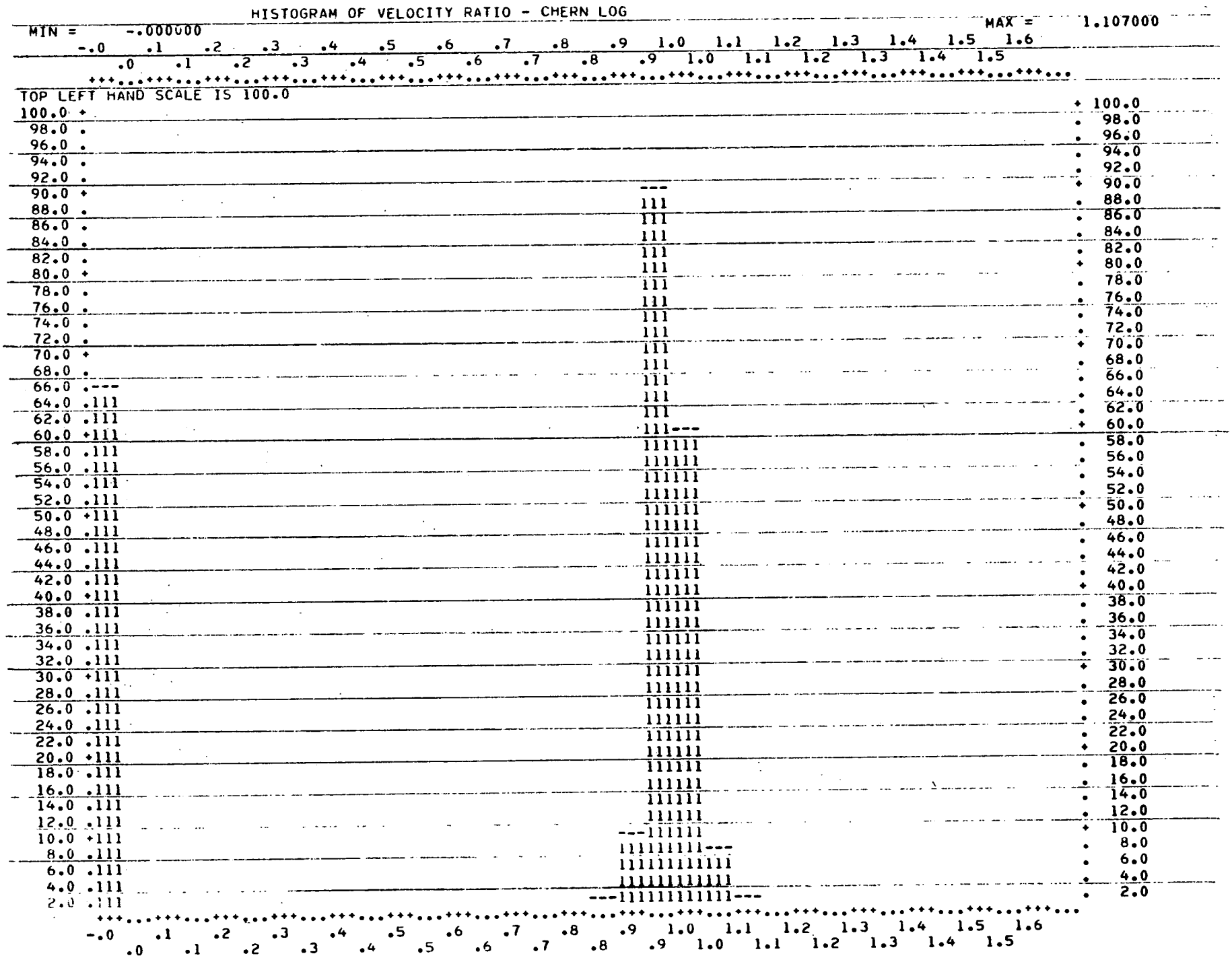
Standard deviation : 0.0322

76.92% of the total population lies within 1 standard deviation

HISTOGRAM OF VELOCITY RATIO - DOPPLER

MIN = .935999 MAX = 1.153000

```
      .9  1.0  1.1  1.2  1.3  1.4  1.5  1.6  1.7  1.8  1.9  2.0  2.1  2.2  2.3  2.4  2.5
        1.0  1.1  1.2  1.3  1.4  1.5  1.6  1.7  1.8  1.9  2.0  2.1  2.2  2.3  2.4  2.5
        +++...+++...+++...+
```


HISTOGRAM OF VELOCITY RATIO - CHERN LOG
MIN = -.000000
MAX = 1.107000
-.0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0 1.1 1.2 1.3 1.4 1.5 1.6
.0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0 1.1 1.2 1.3 1.4 1.5
TOP LEFT HAND SCALE IS 100.0
100.0
98.0
96.0
94.0
92.0
90.0
88.0
86.0
84.0
82.0
80.0
78.0
76.0
74.0
72.0
70.0
68.0
66.0 .---
64.0 .111
62.0 .111
60.0 +111
58.0 .111
56.0 .111
54.0 .111
52.0 .111
50.0 +111
48.0 .111
46.0 .111
44.0 .111
42.0 .111
40.0 +111
38.0 .111
36.0 .111
34.0 .111
32.0 .111
30.0 +111
28.0 .111
26.0 .111
24.0 .111
22.0 .111
20.0 +111
18.0 .111
16.0 .111
14.0 .111
12.0 .111
10.0 +111
8.0 .111
6.0 .111
4.0 .111
2.0 .111

111
111
111

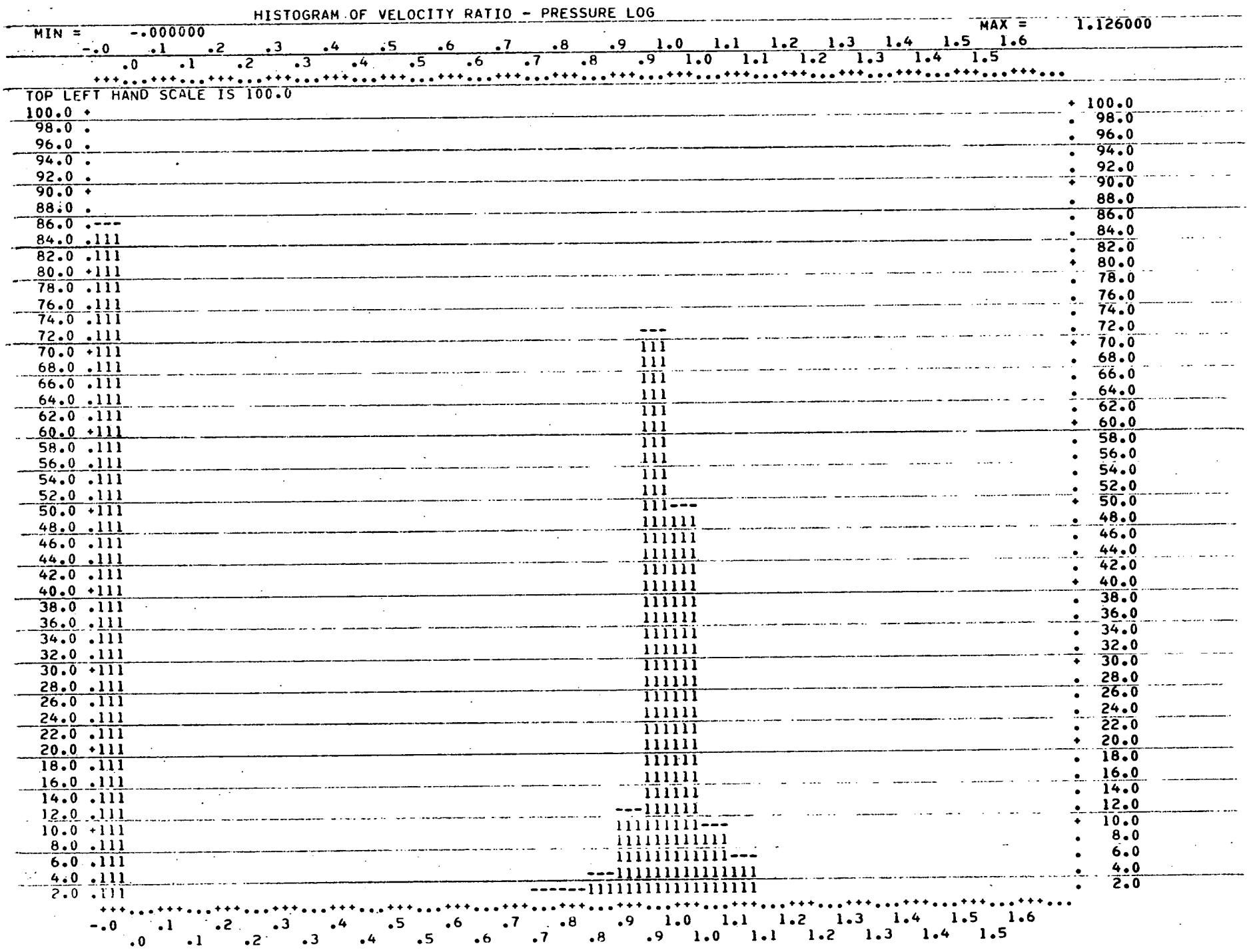

HISTOGRAM OF VELOCITY RATIO - PRESSURE LOG
MIN = -.000000
MAX = 1.126000
-.0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0 1.1 1.2 1.3 1.4 1.5 1.6
.0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0 1.1 1.2 1.3 1.4 1.5
TOP LEFT HAND SCALE IS 100.0
100.0
98.0
96.0
94.0
92.0
90.0
88.0
86.0
84.0
82.0
80.0
78.0
76.0
74.0
72.0
70.0
68.0
66.0
64.0
62.0
60.0
58.0
56.0
54.0
52.0
50.0
48.0
46.0
44.0
42.0
40.0
38.0
36.0
34.0
32.0
30.0
28.0
26.0
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0

Fig. 23

NAVIGATION SYSTEMS - STATISTICS Cruise : 3

SYSTEMS	PARAMETERS						
	Mean	S D	S E of Mean	Sample	Maximum	Minimum	Range
SAT	8.8042	1.1388	0.0743	235	10.780	3.820	6.960
S D	9.0536	1.1503	0.0750	235	11.440	3.920	7.520
C L	8.6691	1.1627	0.0894	169	10.100	4.040	6.060
P L	8.7067	1.0671	0.0871	150	10.160	4.240	5.920
$\frac{S D}{SAT}$	1.0291	0.0324	0.0021	235	1.153	0.936	0.217
$\frac{C L}{SAT}$	0.9937	0.0322	0.0025	169	1.107	0.861	0.246
$\frac{P L}{SAT}$	0.9946	0.0489	0.0040	150	1.126	0.778	0.348

Table 54

on either side of the mean, i.e. between

$$\left.\begin{array}{l} K : 0.9615 \\ K : 1.0259 \end{array}\right| \Rightarrow \Delta = 0.0644$$

Pressure Log

Figure 20 shows that the points representing pressure speeds are set out along one straight line of slope . The scatter is at the rate of 1.2 knots for Vsat = 10 knots.

The histogram (Fig. 23) explains this dispersion. The figures given by the histogram are:

58% of the speeds provided by the Pressure Log system are less than those provided by the Satellite System.

Table 54 gives the following information -

1. Average speed during Cruise 3 : 8.71 knots
2. Standard deviation : 1.07 knots
3. In the domain of ratios, the figures obtained are the following:

Average of the K values : 0.9946

Standard deviation : 0.0489

83.33% of the total population lies within 1 standard deviation on either side of the mean, i.e. between -

$$\left.\begin{array}{l} K : 0.9457 \\ K : 1.0435 \end{array}\right| \Rightarrow \Delta : 0.0978$$

The histograms make it possible to define one scale factor for the 3 systems for Cruise 3:

1. Sonar Doppler

$0.950 \leqslant K \leqslant 1.150$

This eliminates 0% of the values

2. Chernikeeff Log

$0.900 \leqslant K \leqslant 1.100$

This eliminates 2.4% of the values

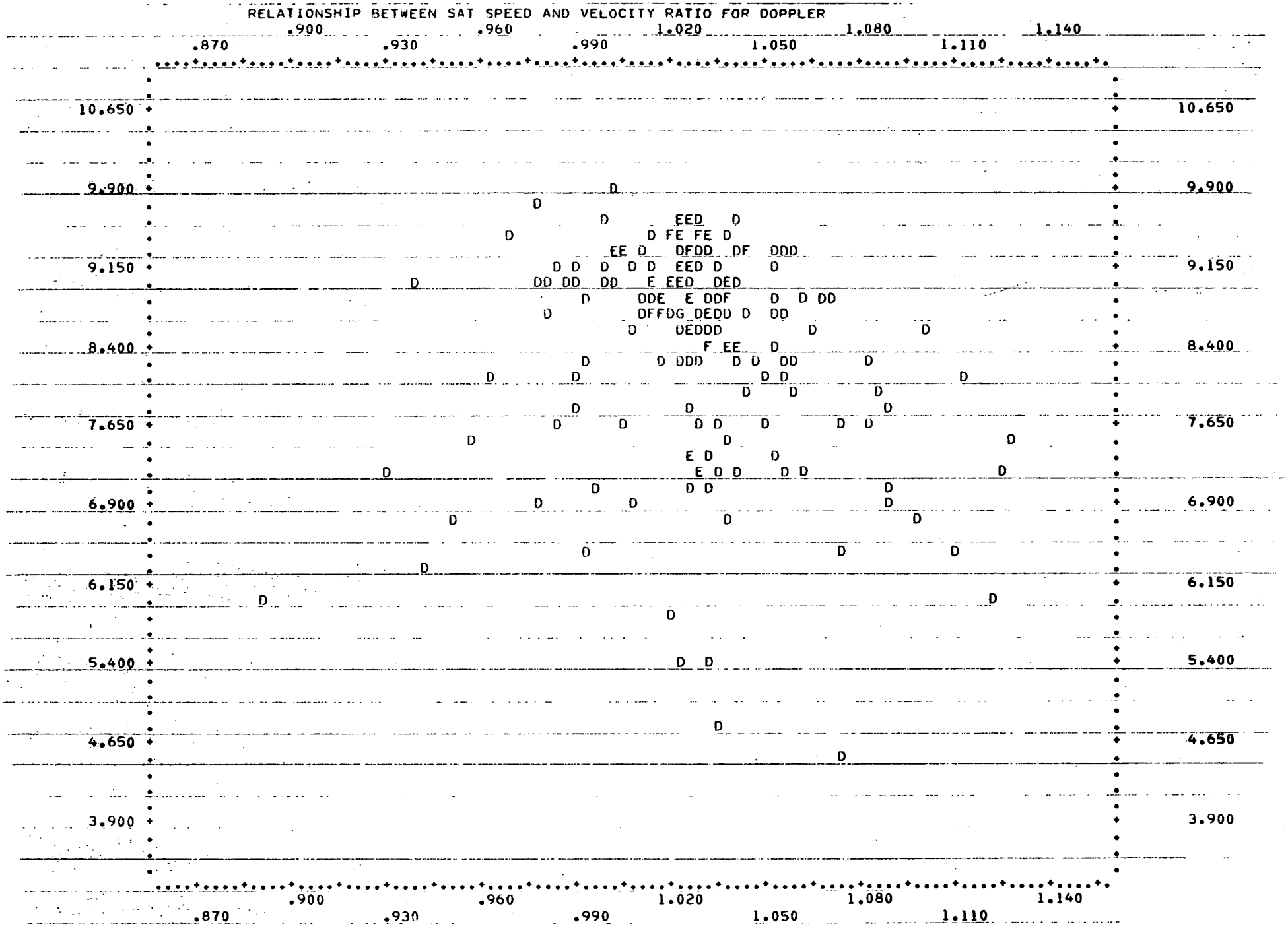

RELATIONSHIP BETWEEN SAT SPEED AND VELOCITY RATIO FOR DOPPLER
.870
.900
.930
.960
.990
1.020
1.050
1.080
1.110
1.140
10.650
9.900
9.150
8.400
7.650
6.900
6.150
5.400
4.650
3.900

Fig. 27

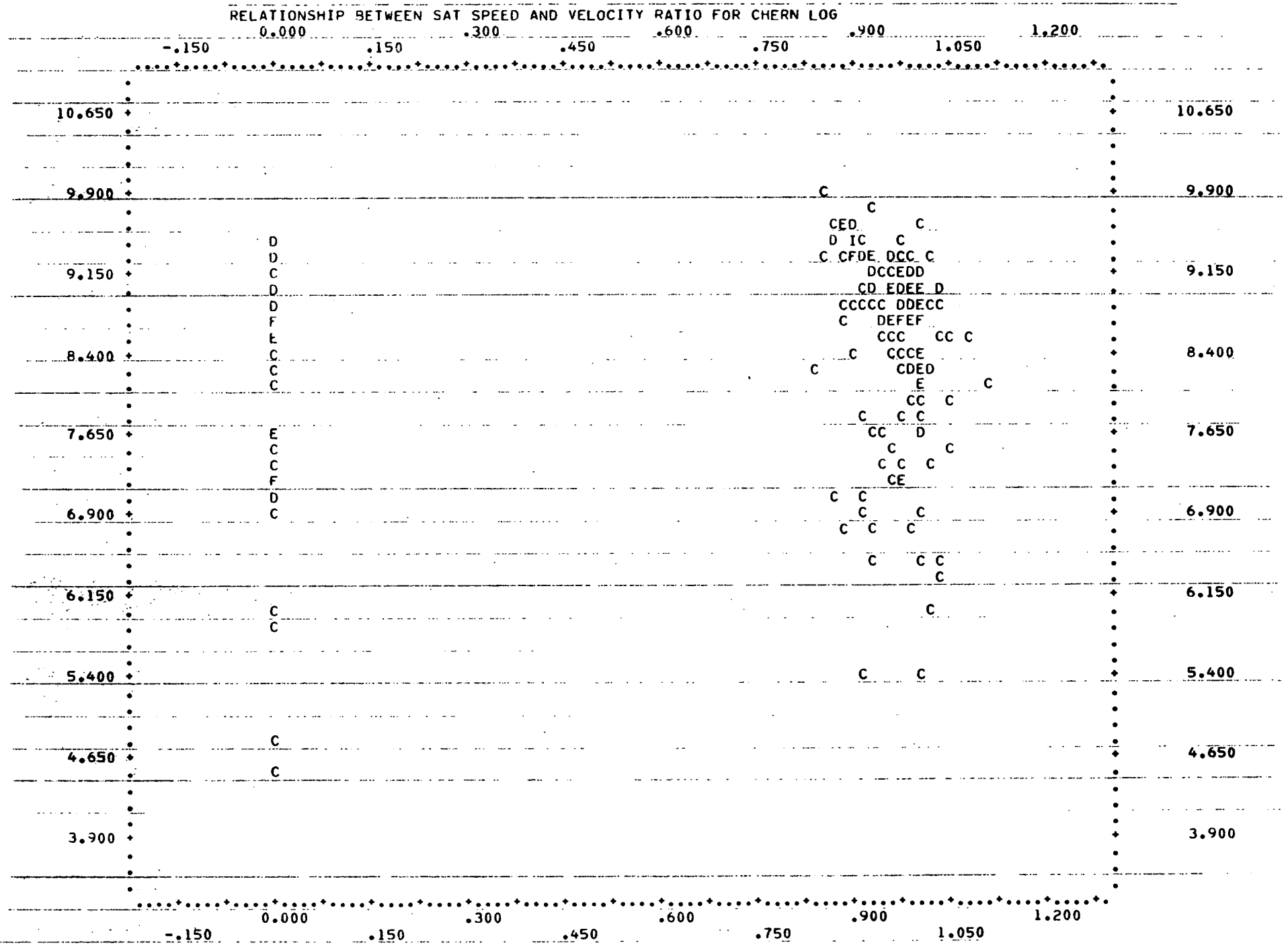

RELATIONSHIP BETWEEN SAT SPEED AND VELOCITY RATIO FOR CHERN LOG
0.000
.300
.600
.900
1.200
-.150
.150
.450
.750
1.050
10.650
9.900
9.150
8.400
7.650
6.900
6.150
5.400
4.650
3.900

Fig. 25

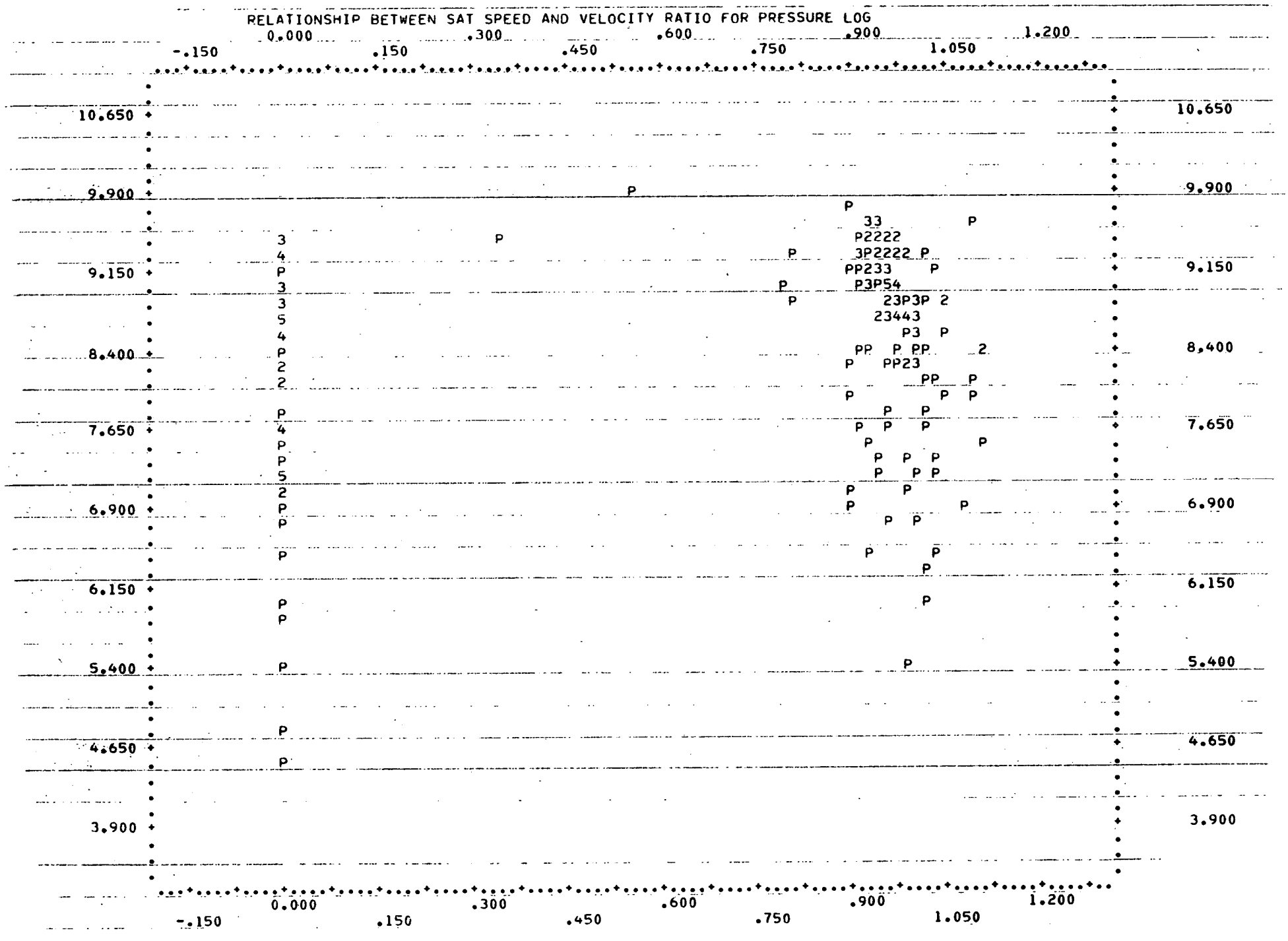

RELATIONSHIP BETWEEN SAT SPEED AND VELOCITY RATIO FOR PRESSURE LOG
0.000
.300
.600
.900
1.200
-.150
.150
.450
.750
1.050
10.650
9.900
9.150
8.400
7.650
6.900
6.150
5.400
4.650
3.900

Fig. 26

3. Pressure Log

$0.900 \leqslant K \leqslant 1.100$

This eliminates 9.3% of the values.

The results of Cruise 3 show that the 3 navigation systems operated very satisfactorily.

* Cruise 4: (Fig. 24 to 29 and Tables 55 to 56)

188 Satellite fixes were used in the statistics of Cruise 1. The populations studied for the Chernikeeff Log and the Pressure Log are composed of 153 and 138 values respectively (Tables 55/1 to 55/3).

Sonar Doppler

Figure 24 shows a clustering of K values in the interval (0.975, 1.059) which indicates that for a Satellite speed of 10 knots there is a dispersion of 0.8 knots. The histogram of Figure 27 presents the same picture. This histogram furnishes the following quantitative information:
13.8% of the data corresponds to Sonar Doppler speeds lower than those given by the satellite system.

Table 56 gives the following information.

1. Average speed during Cruise 4 : 8.66 knots
2. Standard deviation : 1.02 knots, greater than those given by the 2 other systems.
3. In the domain of ratios, the figures obtained are the following:

Average of K values : 1.0283

Standard deviation : 0.0332

75% of the total population lies within 1 standard deviation on either side of the mean.

$$\left.\begin{array}{l} K : 0.9951 \\ K : 1.0615 \end{array}\right| \Longrightarrow \Delta = 0.0664$$

HISTOGRAM OF VELOCITY RATIO - DOPPLER

MIN = .890999 MAX = 1.128000

.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5

TOP LEFT HAND SCALE IS 150.0

```
150.0 +                                                                  + 150.0
147.0 .                                                                  . 147.0
144.0 .                                                                  . 144.0
141.0 .                                                                  . 141.0
138.0 .                                                                  . 138.0
135.0 +                                                                  + 135.0
132.0 .                                                                  . 132.0
129.0 .                                                                  . 129.0
126.0 .                                                                  . 126.0
123.0 .      ---                                                         . 123.0
120.0 +      111                                                         + 120.0
117.0 .      111                                                         . 117.0
114.0 .      111                                                         . 114.0
111.0 .      111                                                         . 111.0
108.0 .      111                                                         . 108.0
105.0 +      111                                                         + 105.0
102.0 .      111                                                         . 102.0
 99.0 .      111                                                         .  99.0
 96.0 .      111                                                         .  96.0
 93.0 .      111                                                         .  93.0
 90.0 +      111                                                         +  90.0
 87.0 .      111                                                         .  87.0
 84.0 .      111                                                         .  84.0
 81.0 .      111                                                         .  81.0
 78.0 .      111                                                         .  78.0
 75.0 +      111                                                         +  75.0
 72.0 .      111                                                         .  72.0
 69.0 .      111                                                         .  69.0
 66.0 .      111                                                         .  66.0
 63.0 .      111                                                         .  63.0
 60.0 +      111                                                         +  60.0
 57.0 .      111                                                         .  57.0
 54.0 .      111                                                         .  54.0
 51.0 .      111                                                         .  51.0
 48.0 .      111                                                         .  48.0
 45.0 +      111                                                         +  45.0
 42.0 .      111---                                                      .  42.0
 39.0 .      111111                                                      .  39.0
 36.0 .      111111                                                      .  36.0
 33.0 .      111111                                                      .  33.0
 30.0 +      111111                                                      +  30.0
 27.0 .      111111                                                      .  27.0
 24.0 .      111111                                                      .  24.0
 21.0 .      111111                                                      .  21.0
 18.0 .      111111                                                      .  18.0
 15.0 +   ---111111                                                      +  15.0
 12.0 .   111111111                                                      .  12.0
  9.0 .   111111111                                                      .   9.0
  6.0 .   111111111---                                                   .   6.0
  3.0 .---111111111111                                                   .   3.0
```

.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5

Fig. 27

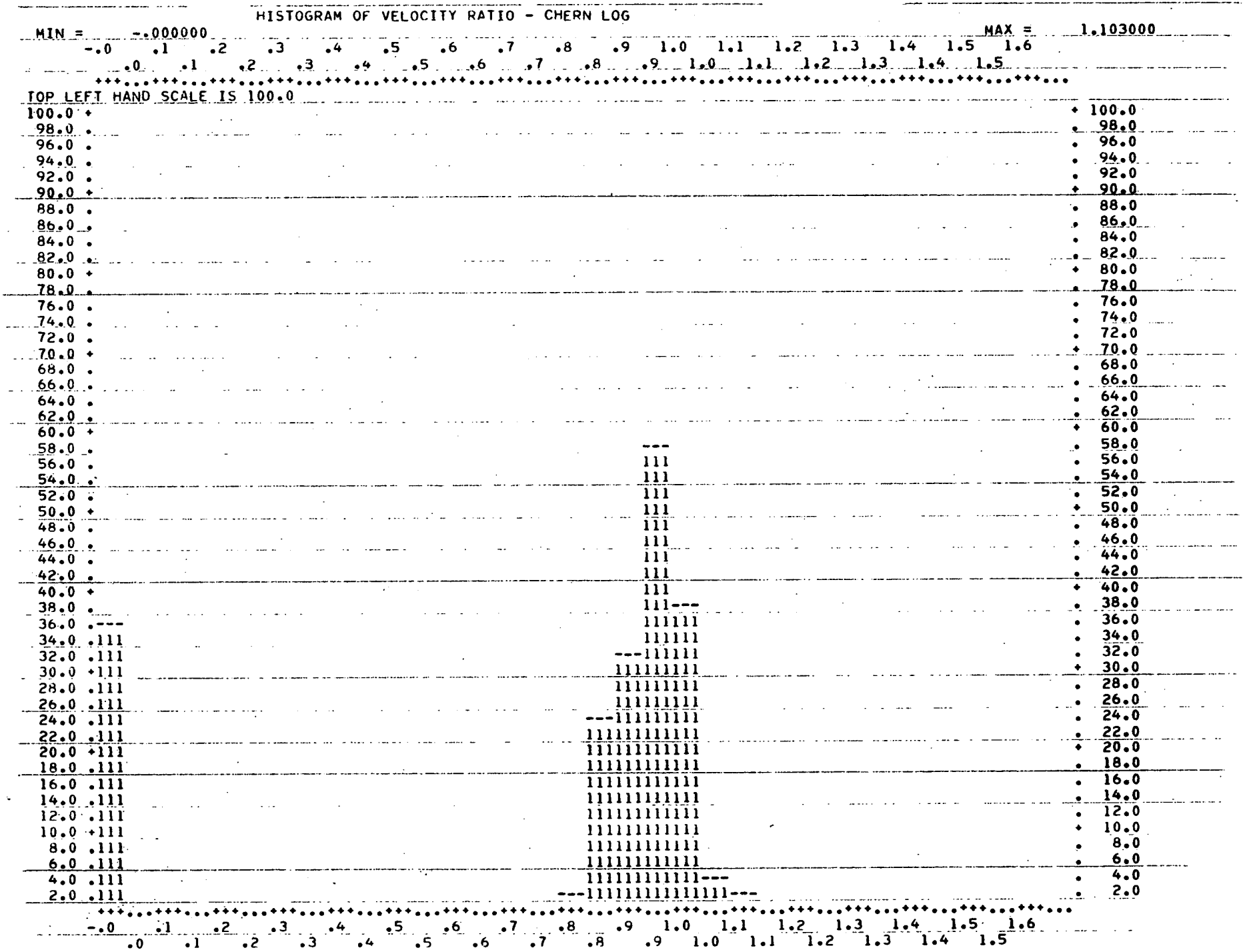

HISTOGRAM OF VELOCITY RATIO - CHERN LOG
MIN = -.000000
MAX = 1.103000
-.0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0 1.1 1.2 1.3 1.4 1.5 1.6
.0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0 1.1 1.2 1.3 1.4 1.5
TOP LEFT HAND SCALE IS 100.0
100.0
98.0
96.0
94.0
92.0
90.0
88.0
86.0
84.0
82.0
80.0
78.0
76.0
74.0
72.0
70.0
68.0
66.0
64.0
62.0
60.0
58.0
56.0
54.0
52.0
50.0
48.0
46.0
44.0
42.0
40.0
38.0
36.0
34.0
32.0
30.0
28.0
26.0
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0

Fig. 28

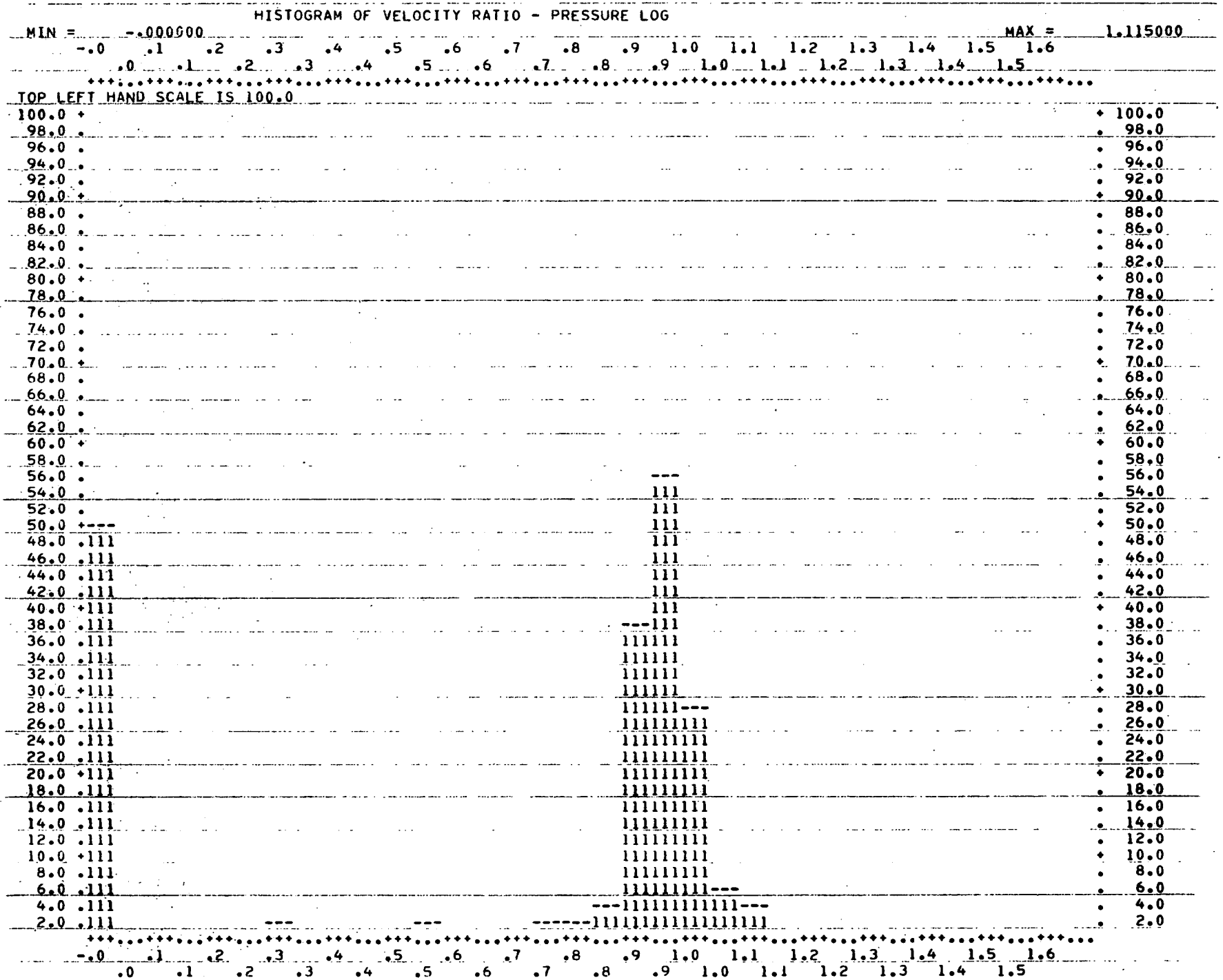

HISTOGRAM OF VELOCITY RATIO - PRESSURE LOG
MIN = -.000000
MAX = 1.115000
-.0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0 1.1 1.2 1.3 1.4 1.5 1.6
.0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0 1.1 1.2 1.3 1.4 1.5
TOP LEFT HAND SCALE IS 100.0
100.0 98.0 96.0 94.0 92.0 90.0 88.0 86.0 84.0 82.0 80.0 78.0 76.0 74.0 72.0 70.0 68.0 66.0 64.0 62.0 60.0 58.0 56.0 54.0 52.0 50.0 48.0 46.0 44.0 42.0 40.0 38.0 36.0 34.0 32.0 30.0 28.0 26.0 24.0 22.0 20.0 18.0 16.0 14.0 12.0 10.0 8.0 6.0 4.0 2.0

Fig. 29

NAVIGATION SYSTEMS - STATISTICS Cruise : 4

SYSTEMS	PARAMETERS						
	Mean	S D	S·E of Mean	Sample	Maximum	Minimum	Range
SAT	8.4284	1.0032	0.0732	188	9.9700	4.550	5.420
S D	8.6623	1.0250	0.0748	188	10.000	4.890	5.110
C L	8.2197	0.8451	0.0683	153	9.620	4.950	4.670
P L	8.2827	0.9453	0.0805	138	10.510	3.32	7.190
$\frac{S D}{SAT}$	1.0283	0.0332	0.0024	188	1.128	0.891	0.237
$\frac{C L}{SAT}$	0.9630	0.0497	0.0040	153	1.103	0.847	0.256
$\frac{P L}{SAT}$	0.9651	0.823	0.0070	138	1.115	0.349	0.766

Table 56

Chernikeeff Log

Figure 25 shows a cluster of points in the interval (0.870, 1.035) which indicates a maximum dispersion of 1.65 knots for Vsat : 10 knots. It must be pointed out that the points seem inclined to follow one regression line with a slope of -15.
The histogram of Figure 28 provides the following information: 73.2% of the data corresponds to Sonar Doppler speeds lower than those given by the Satellite System.

Table 56 gives the following information

1. Average speed during Cruise 4 : 8.28 knots
2. Standard deviation: 0.94 knots
3. In the domain of ratios, the figures obtained are the following

Average of K values : 0.9651

Standard deviation : 0.0823

91.3% of the total population lies within 1 standard deviation on either side of the mean, i.e. between

$$\left.\begin{array}{l} K : 0.8828 \\ K : 1.0474 \end{array}\right| \Rightarrow \Delta = 0.1646$$

For Cruise 3, the 3 systems operated satisfactorily; the most consistent was the Sonar Doppler.
The histograms of Cruise 4 make it possible to define a scale factor for the 3 systems.

a. Sonar Doppler

$0.950 \leqslant K \leqslant 1.150$

This eliminates 1.6% of the values

b. Chernikeeff Log

$0.850 \leqslant K \leqslant 1.050$

This eliminates 5.2% of the values

SURVEY 16					
	cr 1	cr 2	cr 3	cr 4	cr 5
Average of $K = \mu$					
S D	1.0471	1.0276	1.0291	1.0283	
CH	0.9341	0.9650	0.9937	0.9630	
PL	0.9961	0.9792	0.9946	0.9651	
Standard deviation of $\mu = \sigma$					
SD	0.0480	0.0453	0.0324	0.0332	
CH	0.0658	0.0977	0.0322	0.0497	
PL	0.0711	0.0926	0.0489	0.0823	
Absolute dispersion σ/μ					
SD	458	440	315	323	
CH	704	1012	324	516	
PL	714	945	491	852	

Table 57

c. Pressure Log

$0.900 \leqslant K \leqslant 1.000$

This eliminates 11.6% of the values

* Summary of the working of the 3 systems during Survey 16.

The operation of the 3 systems is summarized in Table 57. Attention is drawn, in particular, to the weak values of absolute dispersion given by the Sonar Doppler System. The best overall results were obtained during Cruise 3.

7. CABLES

7.1 Main cable (Fig. 30)

7.1.1 Operation of the main cable

* Cruise 1 : Satisfactory.

* Cruise 2 : The main cable was damaged at the time of the crossing of a fishing zone (lobster-pot). The repairs were carried out on Day 33 and they account for 06 hours 20 minutes of stoppage.

* Cruise 3 : The main cable was not utilized from Day 53.21.00 to Day 55.04.06 whilst shooting was carried out in the shallower waters of Spencers Gulf (only the geotech cable was used). From the beginning of Cruise 3, the lengthening of the single electrode brought an increase in the distance from the ship to channel 1, so as to keep an offset of 300 metres.

* Cruise 4 : An accident, as yet unexplained resulted in the tearing of the retention cable from the winch of the main cable; this meant a halt of 54 minutes.

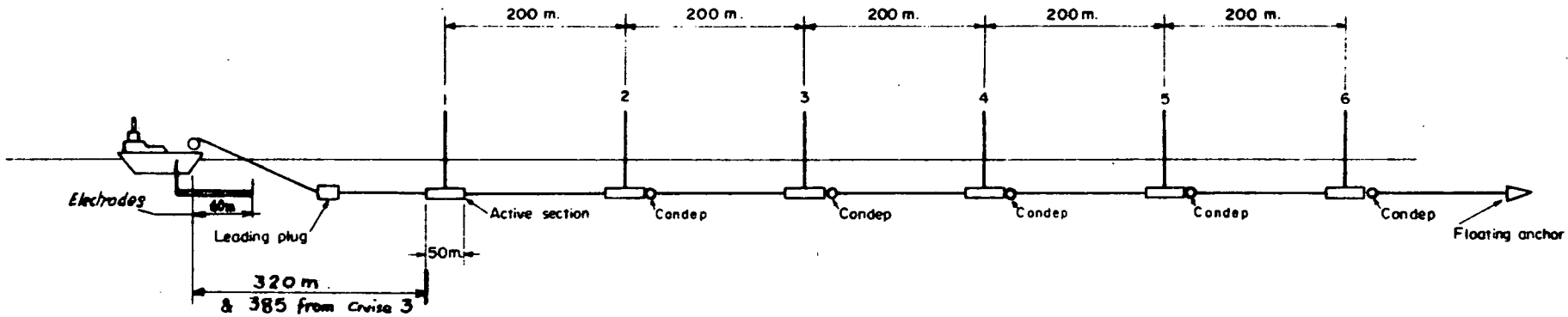
7.1.2 Noise level

The noise levels encountered during Survey 16 are described in tables 58, 59 and figures 33 to 38.

From the commencement of Cruise 1, the noise test procedure and computation were the following: (statistical method).

CGG STREAMER CABLE - 6 CHANNELS

1000 metres 48 hydrophones per trace



TRACE DIAGRAM

48 hydrophones HC 301 (2 sensors per phone)

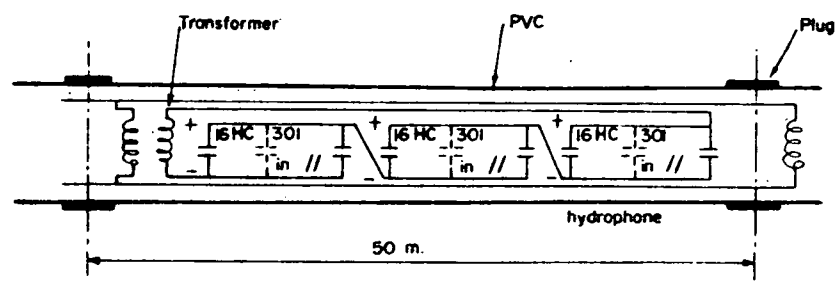
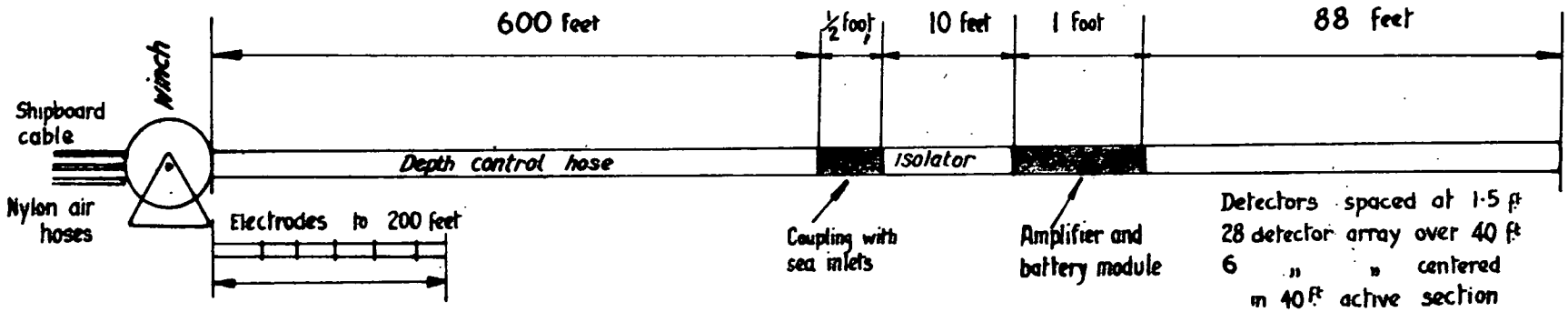


FIG 30

GEOTECH CABLE

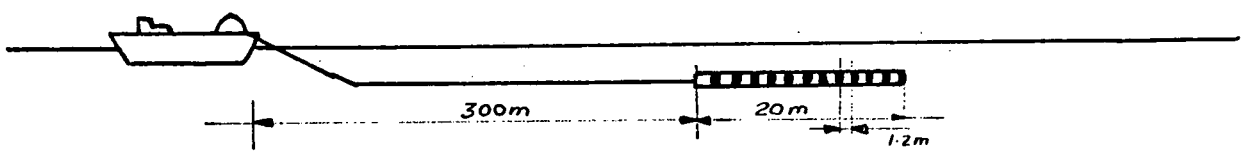


sketch not to scale.

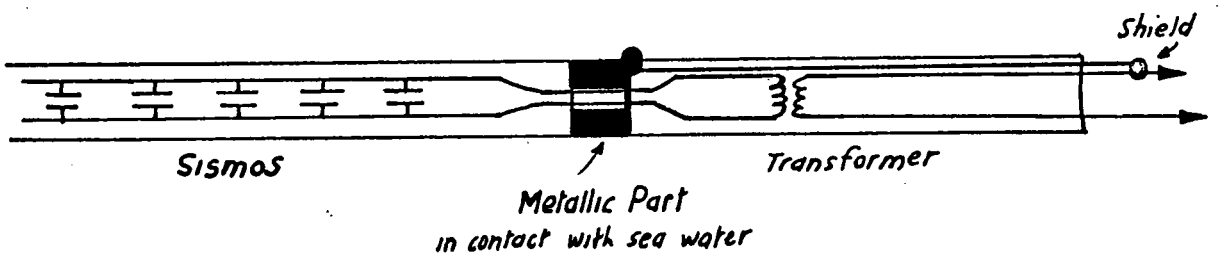
FIG. 21

SINGLE CHANNEL

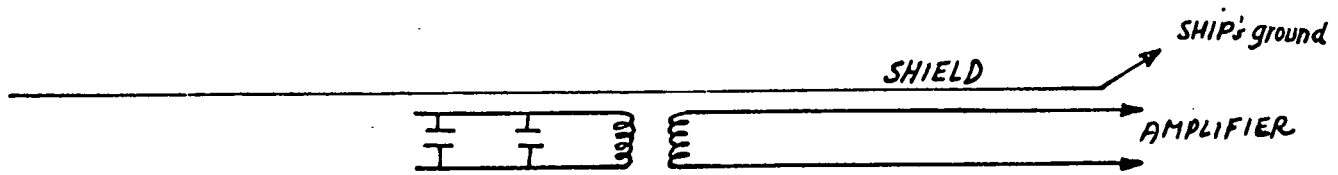
B M R cable



A

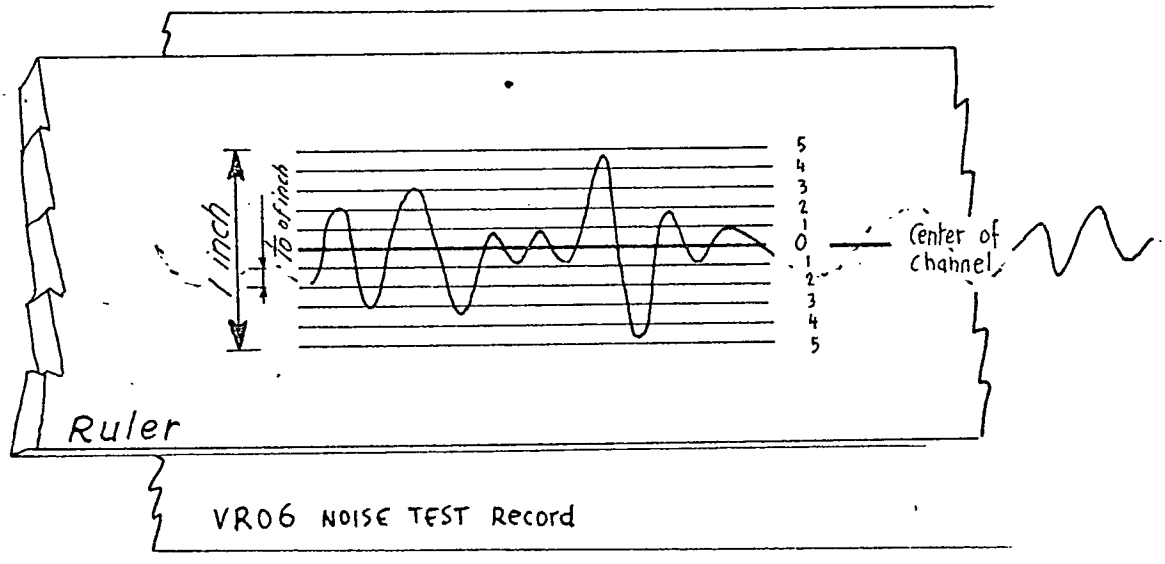


B



* Obtaining on the VRO6 camera a recording of the noise level on the 6 channels with the corresponding "parallel amplifiers".

* Computation of the noise levels with the assistance of a special ruler (see figure).



The peaks located between the lines n-1 and n are counted on an identical time interval for the 6 channels. (The intervals represented on the rule are weighted as function of the parallel amplifiers sinusoides). The sum of these peaks is multiplied by the coefficient $\frac{2n-1}{2}$

The noise level, in μV is given by the formula

$$\frac{\sum_{n=1}^{n=6} P_n \left(\frac{2n-1}{2} \right)}{\sum_{n=1}^{n=6} P_n} \times 20$$

where P_n is the number of peaks belonging to the interval (n-1, n).

The following table gives the principal results:

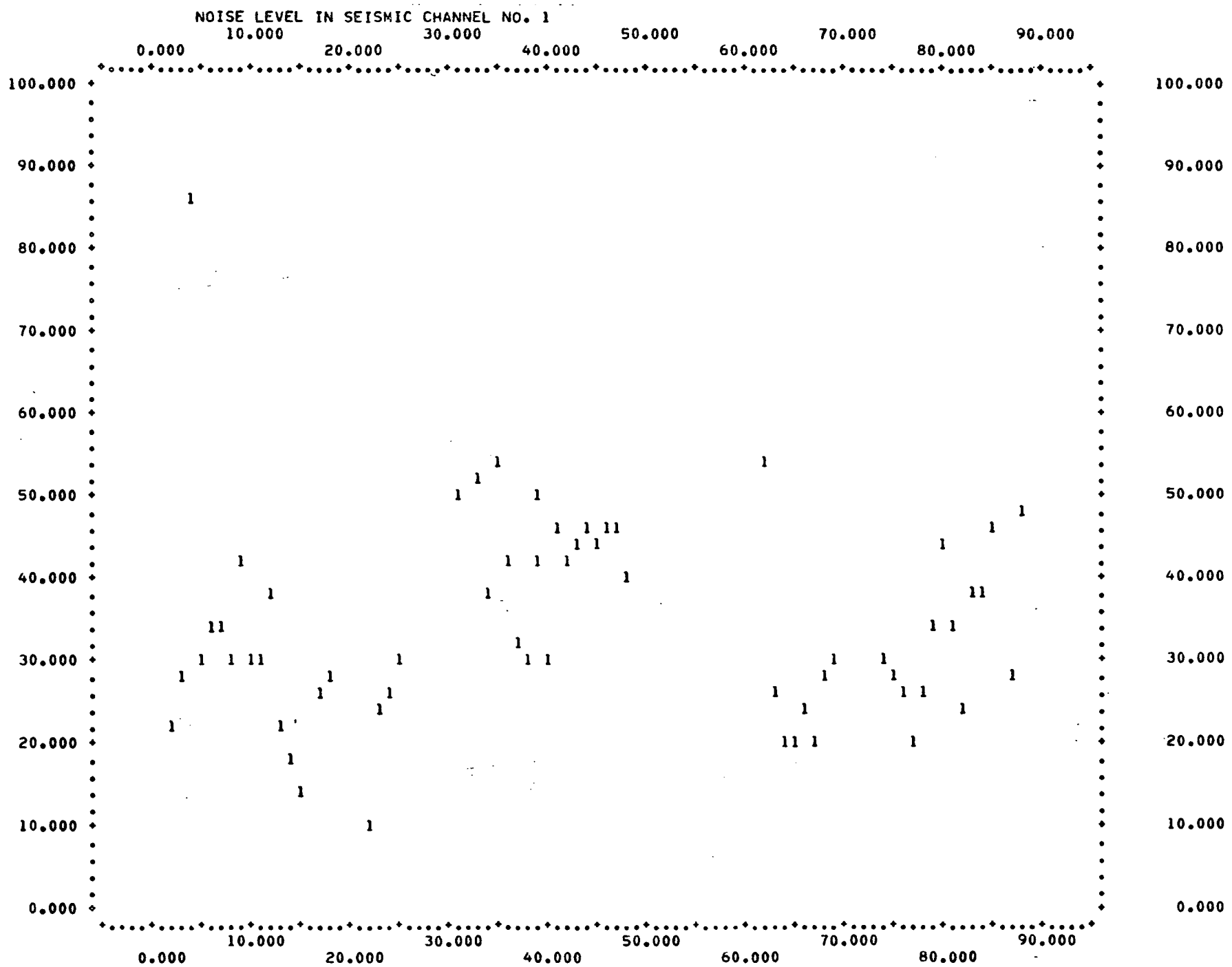

NOISE LEVEL IN SEISMIC CHANNEL NO. 1
0.000
10.000
20.000
30.000
40.000
50.000
60.000
70.000
80.000
90.000
100.000

Fig. 33

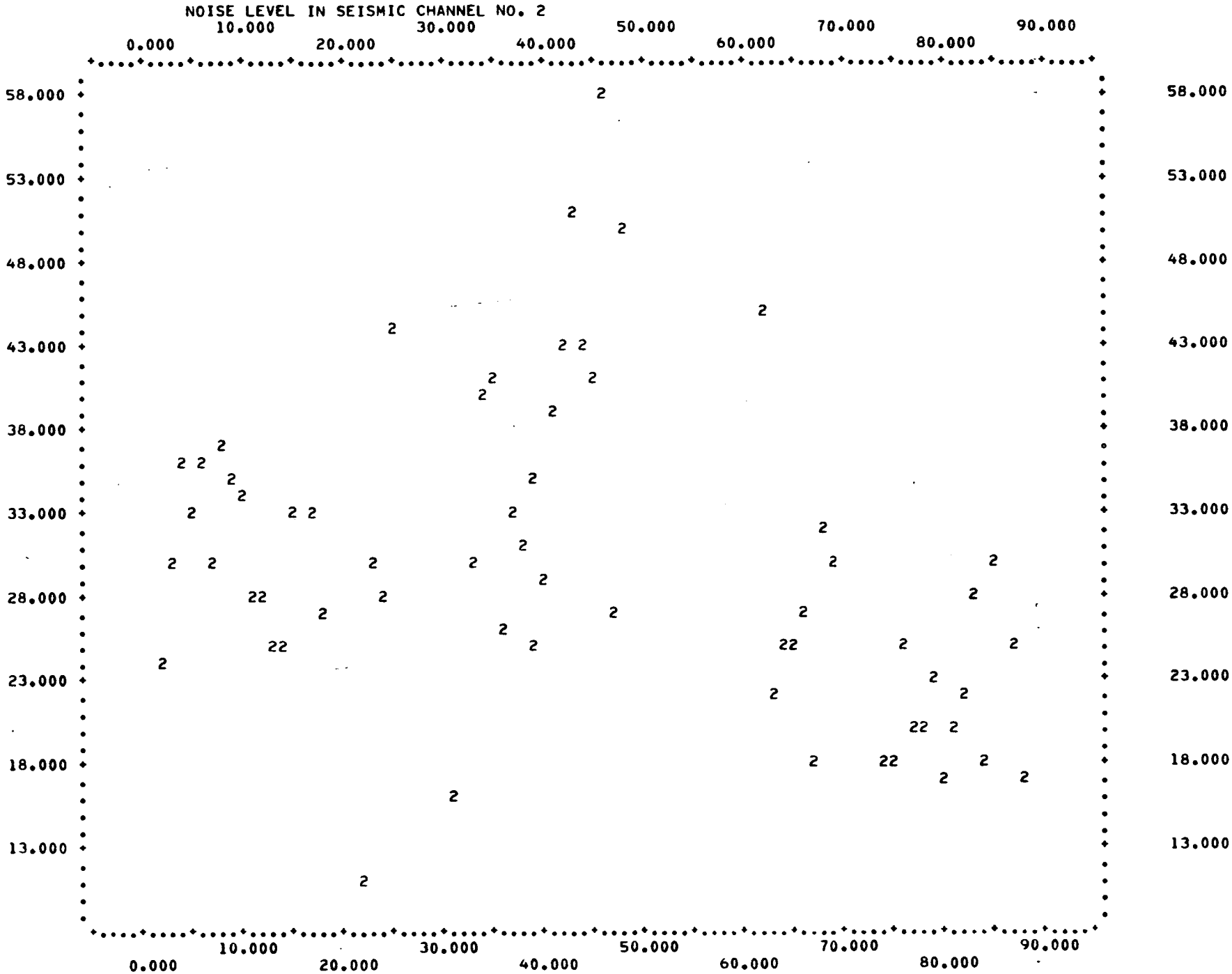

NOISE LEVEL IN SEISMIC CHANNEL NO. 2
0.000
10.000
20.000
30.000
40.000
50.000
60.000
70.000
80.000
90.000
58.000
53.000
48.000
43.000
38.000
33.000
28.000
23.000
18.000
13.000

Fig. 34

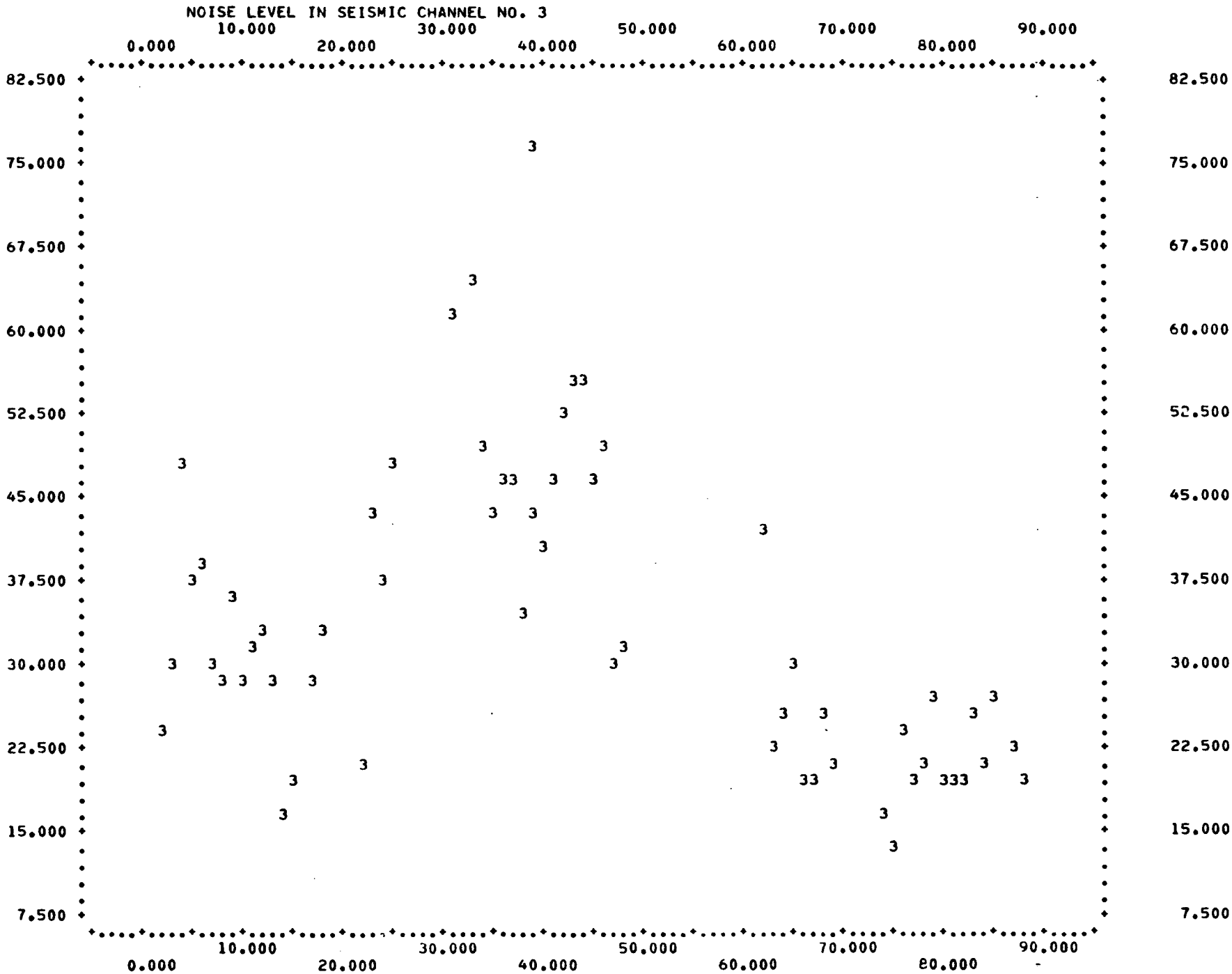

NOISE LEVEL IN SEISMIC CHANNEL NO. 3
0.000
10.000
20.000
30.000
40.000
50.000
60.000
70.000
80.000
90.000
82.500
75.000
67.500
60.000
52.500
45.000
37.500
30.000
22.500
15.000
7.500

Fig. 35

Average maximum noise levels recorded

1. With the AS626X

Channel 1	39 μ V	CR2
Channel 2	35 μV	CR2
Channel 3	46 μV	CR2
Channel 4	34 μV	CR2
Channel 5	36 μV	CR2
Channel 6	42 μV	CR2

2. With the PT700

Channel 1	32 μV	CR4
Channel 2	38 μV	CR3
Channel 3	25 μV	CR3
Channel 4	26 μV	CR3
Channel 5	38 μV	CR3
Channel 6	37 μV	CR3

For all of Survey 16 the noisiest channel was Channel 6; the channel showing the greatest absolute dispersion was Channel 3.

7.2 Geotech Cable (Fig. 31)

* Cruise 1: Until Day 06.01.47, this cable showed leakage and was replaced by Channel 1 of the main cable with the shallow filters.

Until Day 15, the geotech cable functioned satisfactorily; from Day 15 the signal/noise ratio left much to be desired; a check of the cable effected on Day 16 however did not reveal anything abnormal. It was then decided to utilize Channel 1 of the main cable with the "shallow" filters.

* Cruise 2: One Geotech cable having been returned to Canberra for a complete check, the recordings were made with the second Geotech cable; this cable operated satisfactorily until Day 47.03.50 which was the time that the ring fixing this cable to the Lady Christine broke off. The Geotech cable was discovered at the end of Cruise 2 tangled around the main cable.

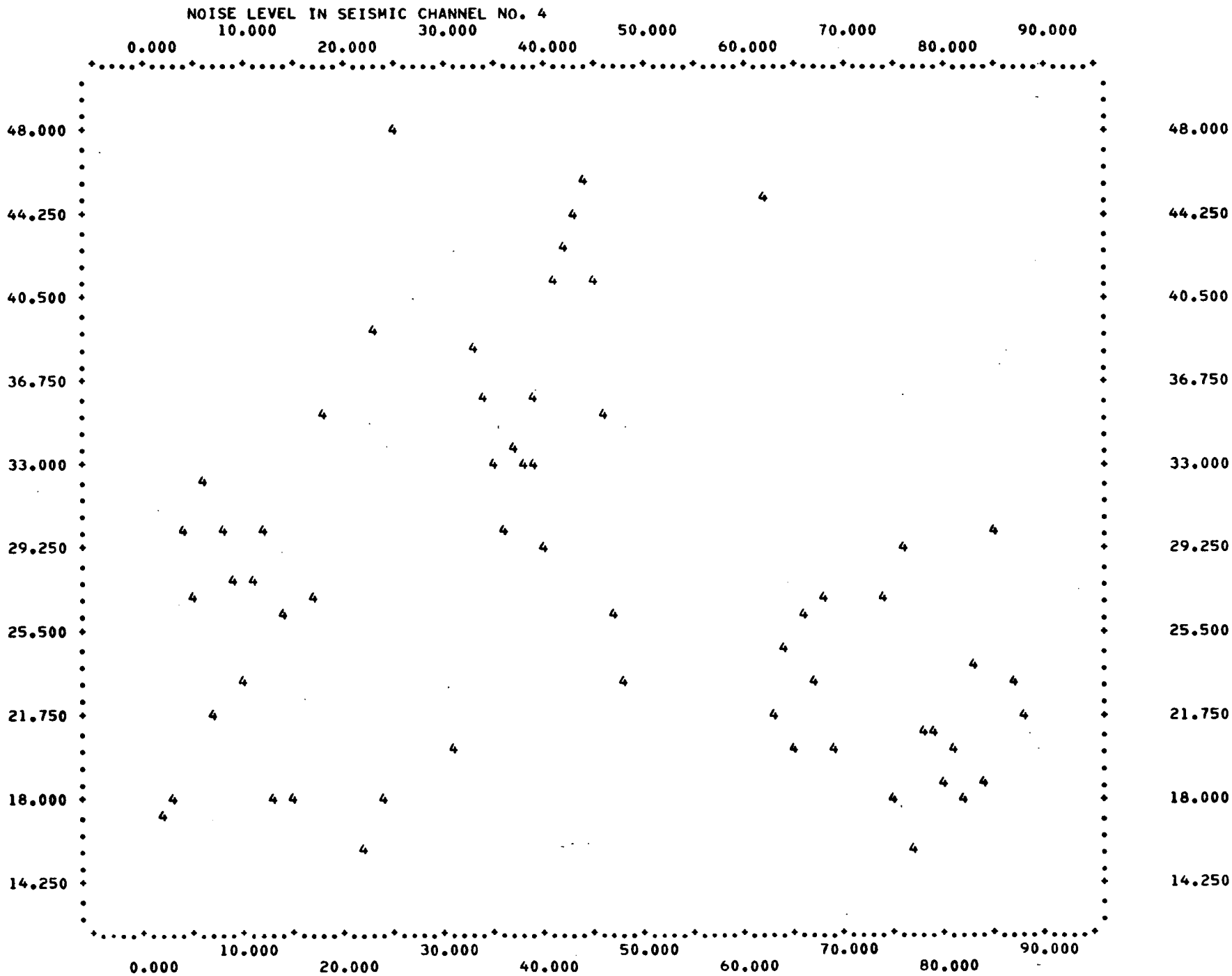

NOISE LEVEL IN SEISMIC CHANNEL NO. 4
0.000
10.000
20.000
30.000
40.000
50.000
60.000
70.000
80.000
90.000
48.000
44.250
40.500
36.750
33.000
29.250
25.500
21.750
18.000
14.250

Fig. 36

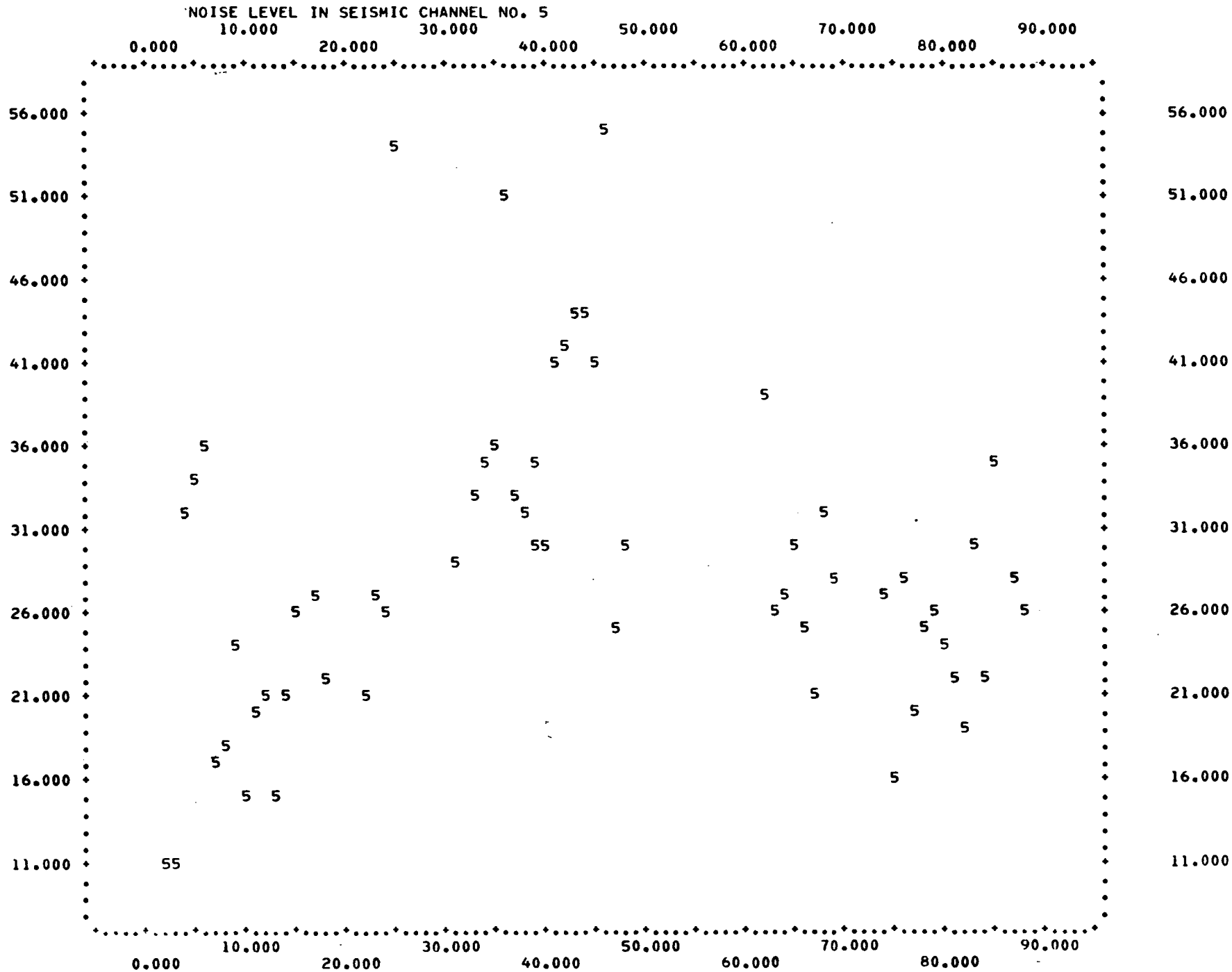

NOISE LEVEL IN SEISMIC CHANNEL NO. 5
0.000
10.000
20.000
30.000
40.000
50.000
60.000
70.000
80.000
90.000
56.000
51.000
46.000
41.000
36.000
31.000
26.000
21.000
16.000
11.000

Fig. 37

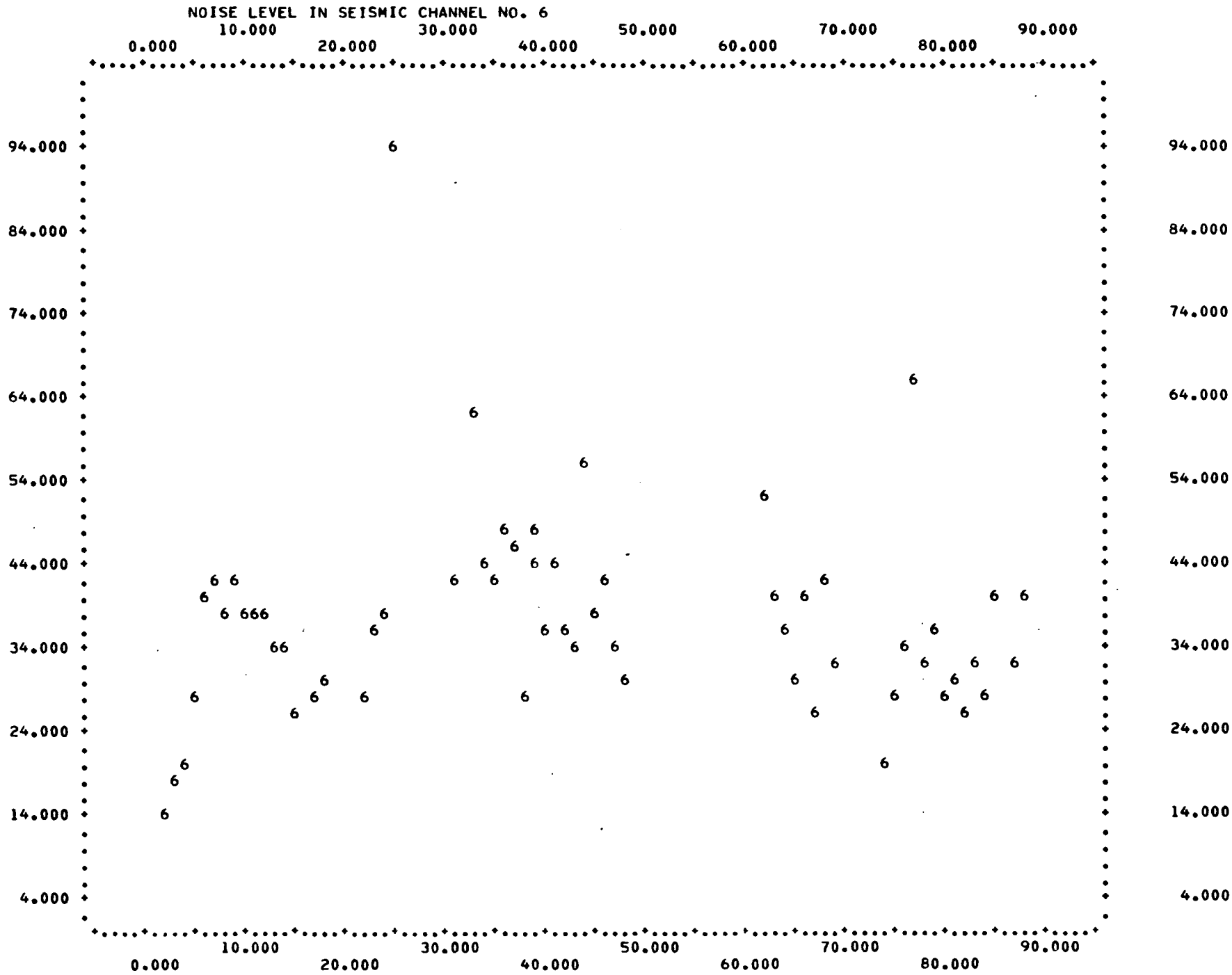

NOISE LEVEL IN SEISMIC CHANNEL NO. 6
0.000
10.000
20.000
30.000
40.000
50.000
60.000
70.000
80.000
90.000
94.000
84.000
74.000
64.000
54.000
44.000
34.000
24.000
14.000
4.000

Fig. 38

* Cruise 3: The results were poor until Day 60 when it was decided to record channel 1 of the main cable instead of the Geotech. The second Geotech cable was returned to Canberra and the end of Cruise 3.

7.3 Single Channel (see Fig. 32)

On Day 62.03.35, a single channel cable belonging to the BMR was tried (A). It seemed that the re-establishment of a circuit with corrected earth (B) would resolve the problem; i.e. very poor results. Nothing came of this; it was decided then to replace the leading section (during Cruise 4); the effect of this was to re-establish normal values for the "leakage" and "continuity" parameters but the results obtained were still poor; this streamer was therefore sent back to Canberra at the end of the survey.

8. SHORE STATION (Fig. B)

During Survey 16, the shore station was located in turn at:

Launceston (2), Coffin Bay and Albany.

Launceston (2): from 01.00.00 to 18.24.00
Latitude 41°33'30"
Longitude 147°16'10"
IGRF 62536

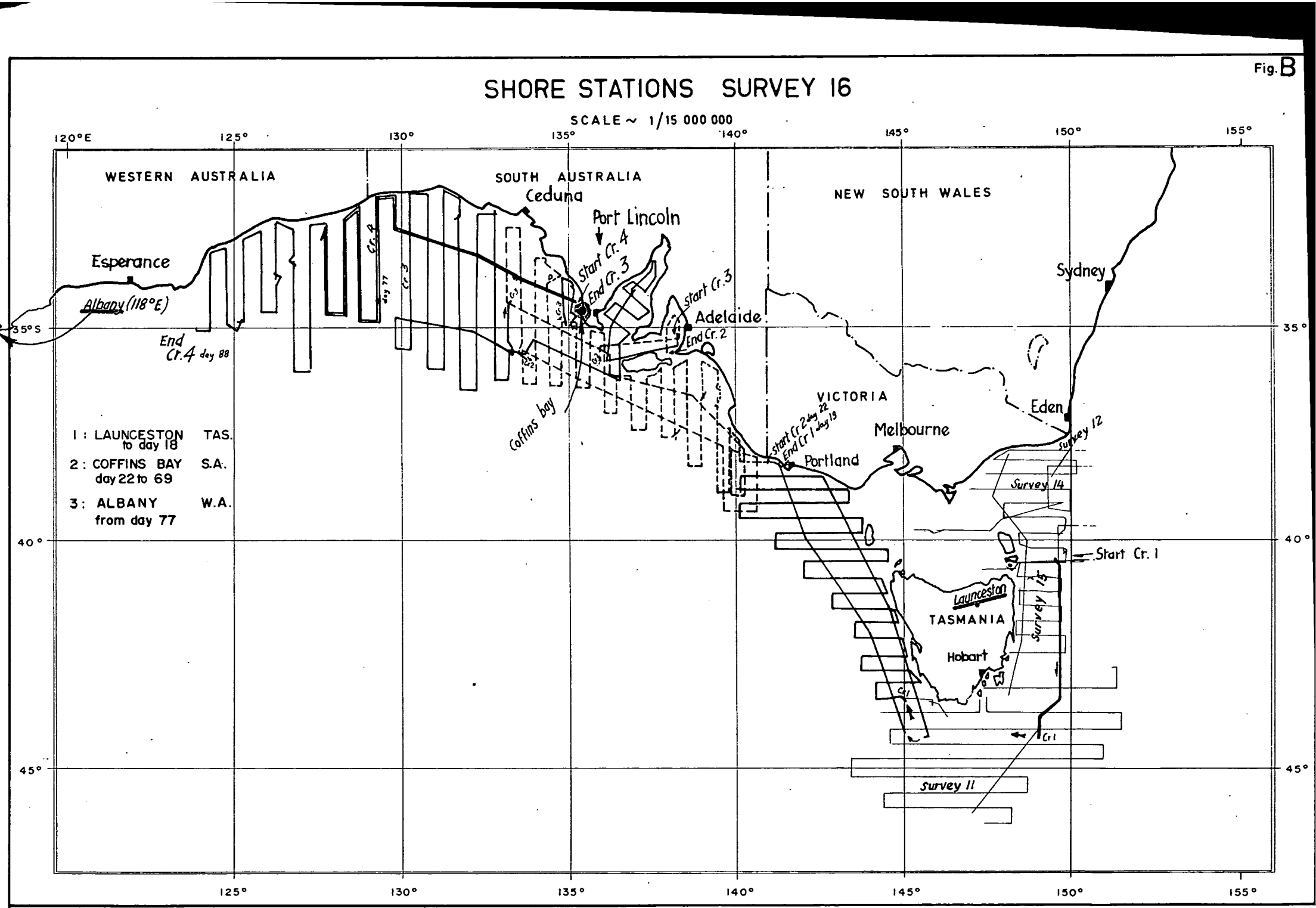
Coffin Bay: from 22.06. 00 to 69.24.00
Latitude 37°37'28"
Longitude 135°28'36"
IGRF 60300

Albany from 77.16.30 to the end of Survey 16
Latitude 35°01'17"
Longitude 117°54'36"
IGRF 60597

Fig. B

SHORE STATIONS SURVEY 16

SCALE ~ 1/15 000 000



Computations were effected as follows:

Shore diurnal = Mag readings - IGRF (shore) = X

Magnetic anomaly = Mag readings (ship) - IGRF (ship) - (X-Y)

Y being the average of X.

The following stoppage (removal time not included) were noted during Survey 16:

Day 24	00.00	to	00.59	Adjustment - calibration
Day 25	00.00	to	01.28	" "
Day 31	00.31	to	01.39	" "
Day 40	03.40	to	06.20	Domestic power Supply out
Day 43	00.00	to	06.30	" "
Day 63	16.45	to	23.10	Alarm
Day 80	16.00	to	24.00	"
Day 81	00.00	to	06.15	"
Day 81	17.30	to	24.00	Shift of Sensor mag.
Day 82	00.00	to	24.00	" "

In all 63H55mn (2.8% of the 96 days of the Survey).

The various removal of the shore station corresponded to 238H 30mn of shore station stoppages.

The total stoppage are thus 302H 25mn being 13.1% of the 96 days of the survey.

The following technical remarks should be made for Survey 16

Launceston (2): Sampling 1 minute
paper speed: 6"/hour
installation of an EMI clock

Coffin Bay: from day 30 sampling 10"
from day 34 paper speed 12"/hour

Albany: On Day 83, the Sensor was removed following poor results on days 81 and 82.

9. WEATHER (Tables 60 to 68)

* Cruise 1: 35H 20mn of stoppage due to bad weather; work was halted on day 15.20.30 because of bad weather.

* Cruise 2: Very violent weather was the cause of the technical port call at Adelaide (repairs of the Sparker generators). Another storm held up the end of cruise port call in Adelaide: the Lady Christine was quite unable to change course and was forced to remain in the "heave to" position.

* Cruise 3: Fine weather for the whole of Cruise 3.

* Cruise 4: Fine weather for 15 days finally deteriorated on Day 84. Work was stopped on Day 85.09.00 and began again on Day 87.00.40; it stopped again. On Day 88.13.10. The impossibility of working in such bad weather was put to good use by the Lady Christine in replenishing stocks of food and filling up with fresh water at Esperance (from Day 89.10.00 to 89.16.00). It was at the end of Day 89 that the persistent bad weather caused the teletype ASR33 to be torn from its base.

This accident was responsible for the absolute end of work and the port call at Esperance on Day 93.16.00; the date of the port call was delayed because of the bad weather.

The total of stoppage due to bad weather during Survey 16 was 275 hours 20 minutes.

Table 60

SEA STATE CRUISE 1

DAY	Hour	WIND direction (degrés)	WIND speed (knots)	SEA direction	SEA state (Beaufort)	SWELL direction	SWELL high (feet)	TENDENCY
02	0000							
	0600	260	10		3	270	4	
	1200							
	1800	190	15		4	180	6,7	
03		230	15		3	180	6	
		250	15		4	225	8	
		250	20		7	230	12	increasing
		250	10		5	260	8	
04		260	22		6	270	12,14	
		260	18		6	270	12	
		-	0		0	270	6	decreasing
		280	5		1	270	8	
05		-	0		calm	270	7	
		-	0		"	240	4	
		-	0		"	240	4	
		-	0		"	240	4	
06		-	0		"	260	5	
		260	2		1	240	4	
		230	3		1	240	5,6	
		340	6		2	250	3	
07		340	8		2	260	5	
		270	6		3	270	4	
		270	8		3	260	5,6	
		180	10		3	260	3,4	
08		225	10		4	230	5,6	
		230	8		2	230	3	
		variable	2		1	230	4	
		- "	0		calm	260	2	
09		- "	0		"	260	5	
		45	6		2	270	5	
		variable	4		2	260	5,6	
		90	6		2	45	5	
10		45	10		3,4	230	6	
		45	10		4	230	4	
		45	15		4	230	5	
		80	5		2	260	3	
11		70	9		2,3	260	5	
		60	10		3	60	6	
		270	14		3,4	290	2	
		000	20		4	-	-	
12		270	18		4	310	4	
		270	22		5	270	6,8	increasing
		260	23		5,6	270	8	
		260	24		6	270	9	

SEA STATE CRUISE 1

DAY	Hour	WIND		SEA		SWELL		TENDENCY
		direction (degrés)	speed (knots)	direction	state(Beaufort)	direction	high (feet)	
13	0000	235	12		4	260	10	
	0600	270	5		1	260	10	
	1200	variable	-		1	260	8	
	1800	40	6		3	200	6,8	
14		70	3		3	190	6	
		40	10		3	260	6	
		45	14		4	270	4	
		315	18		4	270	6	
15		260	25		5	270	12	increasing
		235	25		6	260	18	
		240	27		6	260	18	
		270	22		6	270	12	
16		230	25		6	260	18	
		230	25		6	240	10	
		220	12		4	260	12	
		230	3		1	230	6	
17		250	15		3	260	10	
		240	5		2	240	5,6	decreasing
		240	10		3	270	7	
		210	6		3	240	6	
18		210	9		3	240	6	
		210	8		3	230	6	
		230	7		3	270	7	
		230	5		2	230	9	
19		230	5		2	230	5	

SEA STATE CRUISE 2

DAY	Hour	WIND direction (degrés)	WIND speed (knots)	SEA direction	SEA state (Beaufort)	SWELL direction	SWELL high (feet)	TENDENCY
22	0000							
	0600							
	1200	45	8	45	2	360	5	
	1800	320	10	320	2	360	5	
23		360	18	360	3	345	6	increasing
		320	9	320	2	315	4	decreasing
		360	9	360	2	315	4	
		340	12	340	2	315	6	
24		340	9	340	2	315	6	
		340	12	340	2	340	9	increasing
		330	12	340	2	245	7	
		340	12	340	2	245	9	
25		270	15	270	2	260	7	
		270	20	270	3	270	9	
		260	35	200	4	260	12	increasing
		260	40	260	6	260	15	
26		260	50	260	8,9	260	20	
		260	50	240	8,9	260	20	
		240	45	240	8	240	20	
		220	45	210	7	220	15	
27		220	40	210	6	220	12	
		210	35	210	6	220	12	
				Adelaide Harbour				
31		330	15	210	3	210	14	
		230	10	230	3	230	15	
		230	10	230	3	230	14	
		310	15	310	3	310	12	
32		330	16	330	3	240	10	
		330	18	330	3	240	10	
		330	8	330	2	240	6	decreasing
		330	10	330	2	240	9	
33		030	6	020	2	240	8	
		350	10	030	2	240	9	
		270	10	350	2	240	9	
		300	10	300	2	240	6	increasing
34		000	10	010	2	210	6	
		000	5	010	2	230	6	
		000	8	000	1	210	6	
		000	10	000	1	210	6	
35		340	8	340	1	210	6	
		300	5	360	1	210	5	
		320	8	340	1	210	5	
		010	5	010	1	210	5	

SEA STATE CRUISE 2

DAY	Hour	WIND direction (degrés)	WIND speed (knots)	SEA direction	SEA state(Beaufort)	SWELL direction	SWELL high (feet)	TENDENCY
36	0000	130	6	130	1	230	5	stationary
	0600	120	15	130	1	210	6	
	1200	120	15	120	2	"	6	
	1800	120	20	120	2	"	6	
37		030	11	040	2	"	6	
		240	3	040	1	"	5	
		240	3	040	1	"	5	
		020	8	090	1	"	5	
38		030	11	030	2	"	3	
		030	14	030	2	"	3	
		030	8	030	2	"	"	
		040	14	040	2	"	"	
39		040	8	040	1	240	"	
		040	6	140	1	"	"	
		040	6	140	1	"	"	
		020	6	020	1	"	"	
40		090	8	090	1	"	6	
		020	8	090	1	"	6	
		090	11	090	2	"	7	
		020	14	090	2	"	6	
41		090	11	090	2	"	6	
		020	10	090	2	"	5	
		090	8	090	2	"	5	
		090	8	090	2	"	3	decreasing
42		350	10	350	"	"	"	
		320	15	350	"	"	"	
		"	10	320	"	"	"	
		"	8	320	"	"	2	
43		270	8	270	1	"	2	
		250	12	250	1	"	3	
		"	8	"	1	"	4	
		"	15	"	2	"	3,4	
44		230	5	240	1	"	4	increasing
		180	15	180	2	"	5	
		"	15	180	"	"	6	
		150	15	180	"	"	5,6	
45		090	20	090	3	240	5,6	
		050	12	050	"	210	4	
		120	8	120	"	"	4	
		120	18	120	"	"	3	
46		020	20	020	"	"	5	
		020	20	"	"	"	6	
		060	25	"	4	"	6	
		030	30	030	4	"	6	

SEA STATE CRUISE 2

DAY	Hour	WIND		SEA		SWELL		TENDENCY
		direction (degrés)	speed (knots)	direction	state(Beaufort)	direction	high (feet)	
47	0000	010	26	000	4	200	7	
	0600	010	30	000	4	210	6	
	1200	000	30	000	4	"	6	
	1800	000	17	000	3	"	5	decreasing
48		320	13	270	3	210	5	
—								
—								
—								
—								
—								
—								
—								
—								
—								
—								

SEA STATE CRUISE 3

DAY	Hour	WIND direction (degrés)	WIND speed (knots)	SEA direction	SEA state(Beaufort)	SWELL direction	SWELL high (feet)	TENDENCY
52	0000							
	0600							
	1200	210	20	210	3	210	3	
	1800	"	8	"	2	"	3	
53		"	"	"	"	"	3	
		"	"	"	"	"	6	
		"	"	"	"	"	3	stationary
		045	"	050	"	"	3	
54		070	10	070	"	"	1	
		"	7	"	"	"	2	
		"	8	"	"	"	3	
		"	10	"	"	"	2	
55		340	8	340	"	"	1	
		180	5	180	"	"	2	
		"	7	"	"	"	5	
		"	10	"	"	"	5	
56		"	20	"	3	"	5	
		"	15	"	3	"	5	
		160	17	160	4	240	6	
		160	18	160	4	"	6	
57		045	10	045	3	"	5	
		060	8	060	2	"	5	
		075	10	075	2	"	6	
		075	10	075	2	"	5	
58		075	10	075	"	"	4	
		140	10	140	"	"	4	
		"	21	"	3	210	6	
		"	20	"	4	"	5	
59		090	20	090	4	"	5	
		"	10	"	3	"	4	
		"	22	"	4	"	4	
		"	20	"	4	"	5	
60		"	20	"	3	"	5	
		"	20	"	3	"	5	
		"	22	"	3	"	4	
		"	26	"	4	"	6	
61		"	16	"	3	"	5	
		050	20	090	3	"	5	
		070	22	070	4	"	5	
		"	20	"	4	"	5	
62		"	16	"	3	"	5	
		"	8	"	3	"	3	
		090	12	090	2	"	3	
		040	10	040	2	"	3	

SEA STATE CRUISE 3

DAY	Hour	WIND		SEA		SWELL		TENDENCY
		direction (degrés)	speed (knots)	direction	state(Beaufort)	direction	high (feet)	
63	0000	100	10	100	2	210	3	
	0600	110	8	110	"	"	3	
	1200	090	8	090	"	"	2	
	1800	090	12	090	"	"	3	
64		030	17	030	3	"	2	
		030	20	030	3	"	"	
		020	33	020	4	"	"	
		"	34	"	5	"	"	
65		"	32	"	5	"	"	
		350	18	350	4	"	"	
		270	12	270	3	"	"	
		270	15	"	"	"	"	
66		220	20	220	"	"	"	
		"	20	"	"	"	"	
		"	12	"	"	"	"	
		290	13	290	"	"	"	
67		210	10	210	"	220	6	increasing
		200	16	200	"	"	6	
		210	16	210	"	"	5	
		140	14	140	"	"	5	
68		040	10	040	2	"	6	
		040	10	040	2	"	6	
		050	8	nil	-	"	5	
		"	5	nil	-	"	3	
69		"	10	050	2	"	6	
		180	5	180	"	240	"	
		050	12	050	"	"	"	
		050	12	050	"	"	"	

SEA STATE CRUISE 4

DAY	Hour	WIND		SEA		SWELL		TENDENCY
		direction (degrés)	speed (knots)	direction	state(Beaufort)	direction	high (feet)	
74	0000	160	15		3	240	6	
	0600	150	20		4	"	6	
	1200	110	11		3	"	8	increasing
	1800	110	14		3	"	7	
75		090	14		3	220	8	
		"	9		2	240	8	
		"	10		2	"	7	
		120	10		2	"	5	
76		045	22		3	"	6	
		050	5		2	"	2	decreasing
		050	30		3	"	8	increasing
		"	30		4	"	8	
77		"	20		3	"	6	
		"	20		3	"	8	
		"	40		4	"	8	
		"	35		5	"	10	
78		"	25		4	"	9	
		"	18		4	"	5	decreasing
		"	12		4	"	6	
		"	20		4	"	8	
79		050	20		4	"	8	
		040	25		4	"	8	
		040	26		4	"	7	
		040	24		4	"	8	
80		210	12		3	210	3	
		210	8		2	"	4	
		050	8		2	"	6	stationary
		070	22		3	220	7	
81		090	22		4	"	5	
		"	22		4	240	6	
		"	24		4	"	6	
		"	24		4	"	6	
82		330	14		3	"	6	
		"	10		"	"	4	
		"	12		"	"	5	
		"	12		"	"	4	
83		240	12		"	"	6	
		200	14		"	"	"	
		200	12		"	"	"	
		180	8		"	"	"	
84		120	6		2	"	"	
		080	18		3	"	"	
		050	22		4	"	"	
		050	24		4	"	"	

SEA STATE CRUISE 4

DAY	Hour	WIND direction (degrés)	WIND speed (knots)	SEA direction	SEA state (Beaufort)	SWELL direction	SWELL high (feet)	TENDENCY
85	0000	050	28		5	240	6	
	0600	030	26		5	220	6	
	1200	"	34		6	-	-	
	1800	"	36		6	-	-	
86		010	28		6	-	-	
		010	26		5	-	-	
		010	31		6	-	-	
		180	15		5	-	-	
87		180	15		3	240	10	stationary
		180	10		3	"	10	
		280	12		3	"	10	
		270	12		3	"	10	
88		320	18		3	220	10	
		330	15		3	220	10	
		330	28		5	-	-	
		300	29		6	-	-	
89		290	40		7	-	-	
		270	36		7	-	-	
				Esperance Harbour				
90		260	36		6			
		"	27		5	240	10	
		"	30		6	240	12	
91		"	46		8	-	-	
		"	48		9	-	-	increasing
		"	50		10	-	-	
		230	50		10	-	-	
92		024	28		9	-	-	
		022	30		8	-	-	
		230	30		8	-	-	
		220	32		8	-	-	
93		230	36		8	-	-	
		200	28		7	-	-	
		200	16		6	240	10	
		200	18		5	240	10	

10. SUPPLY BOATS

Three supply boats were organised for Survey 16.

* Day 10 from 13.15 to 13.40, work did not stop.

* Day 36 from 00.00 to 04.40: work stopped, staff were disembarked in the Lady Christine's rubber boat.

* Day 57.23.30 to 58.17.15: the rendezvous with the supply boat was not achieved following difficult sea conditions and poor radio contact. The ship had to make a short call at Ceduna to disembark BMR staff.

The total stoppage for supply boats was 46 hours 25 minutes.

11. SHIP-SHORE COMMUNICATIONS

The communication difficulties between ship and shore station resulted in some misunderstanding. The most notable one was the rendezvous missed with the supply boat on Day 53.

GENERAL COMMENTS

1. DATA ACQUISITION SYSTEM

The problem of desynchronisation and its consequences for CGG Canberra office is very irritating. The new programme JOY will mean a very marked improvement in this state of affairs. The perfect operation of the 7970 tape recorder should be taken in account.

2. SEISMIC

The utilisation of the PT700 amplifier to its full capacity was not as easily done as had been thought. This result was achieved thanks to excellent collaboration between the chief seismic observer and the representative of BMR. A penetration of 2 seconds was noted with a depth of 7400ms double time.

The improvements experienced with passage on a single electrode have already been described in the report of Survey 15.

It should be noted that one of the Ampex recorders operated in a very unsatisfactory way despite a recent general overhaul. This has been already pointed out in the report of Survey 14.

The only negative point encountered in the utilisation of the EPC recorders is that they have an abnormally high rate of consumption of stylus belts. Apart from this, these recorders produce work of rare quality.

Certain of the problems encountered with refraction probes could have been avoided by utilising sonobuoys working on various frequencies.

3. SOUNDERS

The quality of the work carried out on the Raytheon System by the Hawker-Siddeley technician should particularly be remarked upon.

4. MAGNETISM

The problems have made the acquisition of a new mag cable a matter of urgency. It has been ordered twice, once from varian, once from geometrics; it will be interesting to compare performances of these two cables.

5. GRAVITY

Problems occurring during Survey 16 with the S24 are similar to those described in the report of Survey 15. Apparently in spite of the repairs described in this report, and the general overhaul of the equipment at Austin the same failure persists. It is still clear that the cause must be the reading lamp or the circuits surrounding this lamp. It therefore may be permitted to ask if the reading lamp used, which are all part of the same order, may not have a major defect of manufacture.

On the subject of tests undertaken on the S24 "every eight hours, 2 hours of recording with 2 minutes filtering on analogic and digital values were effected". The digital values are also effected by the change of filtering and this results in a very difficult problem for the processing office in Canberra to solve. Thus it is suggested that such tests should in future be effected after consultation with the Canberra office.

RESULTS

For Survey 16, the data furnished by the 3 fundamental pieces of equipment can be considered to be of good quality. Particularly the results provided by the Gravity meters have made possible a high quality study of the Great Australian Bight. Only the magnetometer has furnished from time to time, borderline recordings which, with correct processing, can be brought within the criteria of standard quality.

STATISTICS PRODUCTION

The statistical table of Survey 14 shows that Survey 16 was very good as regards production.

- The bad weather was the cause of the 2 main halts in production.

* Cruise 2 in which the bad weather put the alternators of the sparker out of order and obliged the ship to return to Adelaide. (Counted under the heading "Stoppages due to major breakdowns).

* Cruise 3 in which the bad weather interrupted all operations for 194H 30 mn.

- The time passed in port was a reasonable length. It corresponds to 3 days of port call out of 24 days at sea.
- The time taken up in travelling (1.42 days out of a cruise of 24 days) should be able to be further reduced to the advantage of working time.

TABLES

COMPARATIVE SPEEDS FOR NAVIGATIONAL SYSTEMS.

161	1	7.200	7.450	6.430	7.280	1.035	.893	1.011
161	2	8.660	9.010	7.850	8.680	1.040	.906	1.002
161	3	8.290	9.010	7.960	8.700	1.087	.960	1.049
161	4	8.130	8.680	7.970	8.260	1.068	.980	1.016
161	5	7.010	7.500	6.610	7.150	1.070	.943	1.020
161	6	7.220	7.300	6.490	6.950	1.011	.899	.963
161	7	7.470	7.900	7.070	7.600	1.058	.946	1.017
161	8	7.890	8.560	7.730	8.220	1.085	.980	1.042
161	9	8.380	8.790	8.010	8.320	1.049	.956	.993
161	10	8.420	8.770	0.000	0.000	1.042	0.000	0.000
161	11	8.640	9.000	0.000	0.000	1.042	0.000	0.000
161	12	8.590	9.130	8.210	8.630	1.063	.956	1.005
161	13	8.670	8.990	0.000	0.000	1.037	0.000	0.000
161	14	8.510	8.860	0.000	0.000	1.041	0.000	0.000
161	15	8.050	8.630	7.670	8.090	1.072	.953	1.005
161	16	8.210	8.570	0.000	0.000	1.044	0.000	0.000
161	17	5.280	7.070	0.000	0.000	1.339	0.000	0.000
161	18	6.310	6.990	0.000	0.000	1.108	0.000	0.000
161	19	4.800	6.850	0.000	0.000	1.427	0.000	0.000
161	20	5.470	6.440	5.630	2.820	1.177	1.029	.516
161	21	6.600	7.860	6.850	7.590	1.191	1.038	1.150
161	22	7.610	8.640	7.580	8.150	1.135	.996	1.071
161	23	4.390	4.900	0.000	0.000	1.116	0.000	0.000
161	24	8.070	8.230	0.000	0.000	1.020	0.000	0.000
161	25	7.760	8.050	8.550	7.750	1.037	1.102	.999
161	26	8.810	8.970	8.200	8.830	1.018	.931	1.002
161	27	6.640	6.910	6.320	6.540	1.041	.952	.985
161	28	9.360	9.780	8.880	9.170	1.045	.949	.980
161	29	7.530	8.020	7.330	7.680	1.065	.973	1.020
161	30	9.510	9.710	8.940	9.460	1.021	.940	.995
161	31	9.310	10.960	9.010	9.660	1.177	.968	1.038
161	32	9.720	8.720	8.950	9.770	.897	.921	1.005
161	33	9.570	10.030	8.970	9.890	1.048	.937	1.033
161	34	4.490	4.690	4.360	4.650	1.045	.971	1.036
161	35	7.940	8.360	7.860	8.590	1.053	.990	1.082
161	36	8.260	8.660	7.940	8.320	1.048	.961	1.007
161	37	9.420	9.930	9.450	9.410	1.054	1.003	.999
161	38	8.440	9.020	8.620	8.440	1.069	1.021	1.000
161	39	9.090	9.550	8.960	9.120	1.051	.986	1.003
161	40	7.330	7.530	7.170	7.040	1.027	.978	.960
161	41	6.880	7.310	7.080	7.070	1.063	1.029	1.028
161	42	9.540	9.920	9.450	9.430	1.040	.991	.988
161	43	7.990	7.880	0.000	0.000	.986	0.000	0.000
161	44	7.220	7.990	0.000	0.000	1.107	0.000	0.000
161	45	9.650	9.810	9.320	9.010	1.017	.966	.934
161	46	9.130	9.660	9.310	9.240	1.058	1.020	1.012
161	47	7.240	7.390	7.340	7.310	1.021	1.014	1.010
161	48	6.550	6.580	6.460	6.720	1.005	.986	1.026
161	49	6.200	6.260	6.090	6.490	1.010	.982	1.047
161	50	8.870	9.400	8.890	8.890	1.060	1.002	1.002
161	51	8.800	9.420	8.350	8.800	1.070	.949	1.000
161	52	7.520	8.090	7.400	7.720	1.076	.984	1.027
161	53	6.590	6.890	6.000	6.620	1.046	.910	1.005
161	54	9.280	9.670	8.580	9.220	1.042	.925	.994
161	55	9.420	9.700	8.310	9.820	1.030	.882	1.042
161	56	9.360	9.800	8.860	9.220	1.047	.947	.985
161	57	5.600	5.830	5.290	5.630	1.041	.945	1.005
161	58	7.420	7.570	7.650	7.770	1.020	1.031	1.047
161	59	8.910	9.110	8.390	9.000	1.022	.942	1.010

161	60	8.550	9.010	8.330	9.180	1.054	.974	1.074
161	61	8.250	8.960	8.190	8.830	1.086	.993	1.070
161	62	8.280	9.070	8.240	8.910	1.095	.995	1.076
161	63	6.610	7.210	6.050	6.700	1.091	.915	1.014
161	64	7.380	7.640	6.520	7.000	1.035	.883	.949
161	65	8.900	9.550	8.120	9.250	1.073	.912	1.039
161	66	9.070	9.500	8.140	8.990	1.047	.897	.991
161	67	8.920	9.460	8.120	9.480	1.061	.910	1.063
161	68	8.920	9.530	8.040	9.090	1.068	.901	1.019
161	69	8.700	9.330	8.010	9.210	1.072	.921	1.059
161	70	6.410	6.600	5.950	6.910	1.030	.928	1.078
161	71	8.550	8.860	0.000	0.000	1.036	0.000	0.000
161	72	8.310	8.480	0.000	0.000	1.020	0.000	0.000
161	73	7.960	8.230	7.870	8.410	1.034	.989	1.057
161	74	8.260	9.030	8.140	8.760	1.093	.985	1.061
161	75	8.620	9.200	8.200	9.000	1.067	.951	1.044
161	76	8.590	9.240	8.200	8.600	1.076	.955	1.001
161	77	8.920	9.250	8.300	8.740	1.037	.930	.980
161	78	9.010	9.400	8.380	8.840	1.043	.930	.981
161	79	7.280	7.570	6.700	7.010	1.040	.920	.963
161	80	9.360	9.790	8.780	9.250	1.046	.938	.988
161	81	7.700	8.130	7.350	7.670	1.056	.955	.996
161	82	9.340	9.740	8.710	9.270	1.043	.933	.993
161	83	9.480	9.650	8.750	9.320	1.018	.923	.983
161	84	9.220	9.680	8.770	9.190	1.050	.951	.997
161	85	9.600	9.740	8.800	9.330	1.015	.917	.972
161	86	9.250	9.710	8.790	9.200	1.050	.950	.995
161	87	9.350	9.650	8.800	9.420	1.032	.941	1.007
161	88	9.300	9.620	8.780	9.440	1.034	.944	1.015
161	89	9.150	9.360	8.810	9.440	1.023	.963	1.032
161	90	9.110	9.440	0.000	0.000	1.036	0.000	0.000
161	91	9.380	9.760	0.000	0.000	1.041	0.000	0.000
161	92	6.300	6.380	5.780	6.420	1.013	.917	1.019
161	93	6.010	6.590	5.830	6.250	1.097	.970	1.040
161	94	6.780	6.740	5.820	6.700	.994	.858	.988
161	95	7.840	8.120	8.060	6.110	1.036	1.028	.779
161	96	9.470	9.630	8.730	9.300	1.017	.922	.982
161	97	9.460	9.780	8.580	8.990	1.034	.907	.950
161	98	9.390	9.720	8.650	7.170	1.035	.921	.764
161	99	8.940	9.650	8.670	9.470	1.079	.970	1.059
161	100	9.490	9.710	8.620	9.330	1.023	.908	.983
161	101	9.240	10.090	8.830	9.660	1.092	.956	1.045
161	102	8.210	8.670	7.560	8.240	1.056	.921	1.004
161	103	8.910	9.520	8.400	9.210	1.068	.943	1.034
161	104	8.980	9.750	7.140	7.910	1.086	.795	.881
161	105	9.120	9.670	8.440	9.150	1.060	.925	1.003
161	106	7.190	7.650	6.680	7.420	1.064	.929	1.032
161	107	7.270	7.470	6.720	7.420	1.028	.924	1.021
161	108	8.840	9.230	0.000	0.000	1.044	0.000	0.000
161	109	8.800	9.130	8.180	9.320	1.037	.930	1.059
161	110	8.770	9.210	8.240	8.790	1.050	.940	1.002
161	111	9.020	9.300	8.330	8.810	1.031	.924	.977
161	112	9.000	9.330	8.470	9.140	1.037	.941	1.016
161	113	8.850	9.370	8.380	8.400	1.059	.947	.949
161	114	8.840	9.280	6.970	7.370	1.050	.788	.834
161	115	8.480	8.720	8.360	8.400	1.028	.986	.991
161	116	8.860	9.110	9.100	9.000	1.028	1.027	1.016
161	117	5.060	5.340	5.230	5.630	1.055	1.034	1.113
161	118	9.020	9.270	8.440	10.060	1.028	.936	1.115
161	119	8.290	8.600	7.700	8.830	1.037	.929	1.065
161	120	8.940	9.400	8.920	9.310	1.051	.998	1.041
161	121	8.850	8.970	0.000	0.000	1.014	0.000	0.000
161	122	9.260	9.900	9.070	9.500	1.069	.979	1.026
161	123	9.220	9.850	8.910	9.470	1.068	.966	1.027
161	124	9.220	9.890	8.800	9.250	1.073	.954	1.003
161	125	9.680	9.810	8.590	9.320	1.013	.887	.963

61	126	9.320	9.790	0.000	0.000	1.050	0.000	0.000
61	127	9.290	9.750	8.600	9.150	1.050	.926	.985
61	128	9.210	9.750	8.640	10.340	1.059	.938	1.123
61	129	8.940	9.660	8.620	9.180	1.081	.964	1.027
61	130	8.430	8.650	7.680	8.400	1.026	.911	.996
161	131	8.520	8.950	7.920	8.780	1.050	.930	1.031
161	132	8.360	8.900	7.960	8.420	1.065	.952	1.007
161	133	6.610	7.210	6.470	6.950	1.091	.979	1.051
161	134	8.880	9.110	8.100	8.720	1.026	.912	.982
161	135	6.490	6.670	6.020	6.400	1.028	.928	.986
161	136	9.060	9.480	8.310	8.710	1.046	.917	.961
161	137	8.980	9.480	7.610	7.780	1.056	.847	.866
161	138	9.520	9.430	8.500	8.710	.991	.893	.915
161	139	9.300	9.460	8.500	8.760	1.017	.914	.942
161	140	9.360	9.490	8.610	8.780	1.014	.920	.938
161	141	9.910	9.520	8.690	8.830	.961	.877	.891
161	142	9.230	9.660	0.000	0.000	1.047	0.000	0.000
161	143	9.370	9.740	8.850	9.150	1.039	.945	.977
161	144	9.690	9.870	8.830	9.260	1.019	.911	.956
161	145	9.370	9.880	8.860	9.180	1.054	.946	.980
161	146	9.870	10.000	8.760	9.250	1.013	.888	.937
161	147	9.220	9.520	0.000	0.000	1.033	0.000	0.000
161	148	9.800	10.590	0.000	0.000	1.081	0.000	0.000
161	149	7.310	7.360	5.570	6.440	1.007	.762	.881
161	150	6.180	6.340	6.080	6.630	1.026	.984	1.073
161	151	6.490	6.830	0.000	0.000	1.052	0.000	0.000
161	152	6.390	6.660	0.000	0.000	1.042	0.000	0.000
161	153	6.120	6.470	6.030	6.420	1.057	.985	1.049
161	154	6.240	6.590	5.950	6.180	1.056	.954	.990
161	155	6.070	6.540	5.980	6.340	1.077	.985	1.044
161	156	6.470	6.950	6.340	6.800	1.074	.980	1.051
161	157	6.540	7.260	6.370	6.870	1.110	.974	1.050
161	158	6.380	7.430	6.450	7.240	1.165	1.011	1.135
161	159	6.380	7.570	6.580	7.120	1.187	1.031	1.116
161	160	7.050	7.670	6.660	7.350	1.088	.945	1.043
161	161	7.490	8.100	7.230	7.980	1.081	.965	1.065
161	162	7.910	8.060	7.310	7.810	1.019	.924	.987
161	163	7.940	8.430	7.600	8.530	1.062	.957	1.074
161	164	8.110	8.460	7.670	8.050	1.043	.946	.993
161	165	7.960	8.570	7.710	8.190	1.077	.969	1.029
161	166	7.620	8.200	7.310	7.860	1.076	.959	1.031
161	167	8.250	8.900	8.080	8.420	1.079	.979	1.021
161	168	4.540	4.920	4.580	4.740	1.084	1.009	1.044
161	169	9.030	9.230	8.440	8.660	1.022	.935	.959
161	170	8.930	9.150	8.470	8.890	1.025	.948	.996
161	171	7.650	7.860	4.370	4.640	1.027	.571	.607
161	172	8.600	9.250	8.180	8.870	1.076	.951	1.031
161	173	9.150	9.180	8.890	8.760	1.003	.972	.957
161	174	9.320	9.190	7.660	8.720	.986	.822	.936
161	175	9.690	9.150	0.000	0.000	.944	0.000	0.000
161	176	9.520	9.290	0.000	0.000	.976	0.000	0.000
161	177	8.250	9.190	8.170	9.390	1.114	.990	1.138
161	178	8.850	9.140	8.140	8.690	1.033	.920	.982
161	179	9.640	9.660	8.170	8.500	1.002	.848	.882
161	180	8.610	8.910	7.910	8.450	1.035	.919	.981
161	181	9.220	9.470	8.350	8.240	1.027	.906	.894
161	182	8.290	8.900	7.880	8.560	1.074	.951	1.033
161	183	9.480	9.620	8.600	8.860	1.015	.907	.935
161	184	9.480	9.700	8.660	9.140	1.023	.914	.964
161	185	9.590	9.730	8.710	8.790	1.015	.908	.917
161	186	7.530	7.700	6.830	7.210	1.023	.907	.958
161	187	6.160	6.080	5.330	5.560	.987	.865	.903
161	188	7.970	8.070	7.280	7.480	1.013	.913	.939
161	189	9.130	9.400	8.740	8.920	1.030	.957	.977
161	190	9.540	9.860	8.900	8.990	1.034	.933	.942
161	191	9.920	9.860	8.970	10.290	.994	.904	1.037

61	192	9.580	9.910	8.970	9.090	1.034	.936	.949
61	193	9.670	9.850	8.870	9.070	1.019	.917	.938
61	194	9.600	9.780	8.650	8.910	1.019	.901	.928
61	195	9.160	9.510	8.190	8.810	1.038	.894	.962
161	196	9.310	9.570	8.270	8.910	1.028	.888	.957
161	197	9.510	9.450	0.000	0.000	.994	0.000	0.000
161	198	9.120	9.360	0.000	0.000	1.026	0.000	0.000
161	199	9.100	9.250	0.000	0.000	1.016	0.000	0.000
161	200	8.900	9.140	0.000	0.000	1.027	0.000	0.000
161	201	8.650	8.860	7.560	8.840	1.024	.874	1.022
161	202	8.530	8.760	7.270	8.540	1.027	.852	1.001
161	203	8.670	8.780	7.430	8.490	1.013	.857	.979
161	204	8.680	8.690	7.500	8.400	1.001	.864	.968
161	205	8.390	8.600	7.330	8.360	1.025	.874	.996
161	206	8.350	8.570	7.330	8.550	1.026	.878	1.024
161	207	8.530	8.470	6.990	8.140	.993	.819	.954
161	208	7.930	8.400	6.860	7.990	1.059	.865	1.008
161	209	7.640	8.240	5.040	8.130	1.079	.660	1.064
161	210	8.070	8.530	4.690	8.130	1.057	.581	1.007
161	211	7.820	8.210	5.470	7.980	1.050	.699	1.020
161	212	8.010	8.370	6.330	8.990	1.045	.790	1.122
161	213	6.370	6.560	6.030	6.270	1.030	.947	.984
161	214	8.940	8.860	7.260	8.720	.991	.812	.975
161	215	9.260	9.250	0.000	0.000	.999	0.000	0.000
161	216	9.240	9.460	0.000	0.000	1.024	0.000	0.000
161	217	8.820	9.440	7.820	8.730	1.070	.887	.990
161	218	8.710	9.440	8.270	8.860	1.084	.949	1.017
161	219	8.900	9.490	0.000	0.000	1.066	0.000	0.000
161	220	9.080	9.390	0.000	0.000	1.034	0.000	0.000
161	221	8.960	9.360	8.520	8.800	1.045	.951	.982
161	222	8.880	9.820	8.530	8.610	1.106	.961	.970
161	223	9.050	9.060	8.430	8.750	1.001	.931	.967
161	224	9.070	9.350	8.580	8.780	1.031	.946	.968
161	225	9.190	9.420	8.700	8.630	1.025	.947	.939
161	226	9.190	9.370	8.680	9.080	1.020	.945	.988
161	227	9.670	9.390	0.000	0.000	.971	0.000	0.000
161	228	9.950	9.360	0.000	0.000	.941	0.000	0.000
161	229	9.530	9.420	8.760	8.900	.988	.919	.934
161	230	9.440	9.480	8.770	9.010	1.004	.929	.954
161	231	9.110	9.440	8.450	8.260	1.036	.928	.907
161	232	9.340	9.540	8.790	9.010	1.021	.941	.965
161	233	8.620	8.980	8.300	8.550	1.042	.963	.992
161	234	6.610	6.830	6.460	6.520	1.033	.977	.986
161	235	8.870	9.660	8.860	9.180	1.089	.999	1.035
161	236	8.770	9.520	8.850	10.360	1.086	1.009	1.181
161	237	8.700	9.380	8.680	8.960	1.078	.998	1.030
161	238	8.860	9.440	8.780	8.870	1.065	.991	1.001
161	239	8.740	9.460	8.790	9.020	1.082	1.006	1.032
161	240	9.150	9.920	8.790	9.000	1.084	.961	.984
161	241	9.220	9.330	0.000	0.000	1.012	0.000	0.000
161	242	9.230	9.500	0.000	0.000	1.029	0.000	0.000
161	243	9.440	9.450	0.000	0.000	1.001	0.000	0.000
161	244	8.980	9.390	8.780	9.040	1.046	.978	1.007
161	245	9.480	9.690	8.750	9.070	1.022	.923	.957
161	246	5.790	5.970	5.050	5.300	1.031	.872	.915

COMPARATIVE SPEEDS FOR NAVIGATIONAL SYSTEMS.

162	1	9.030	9.020	8.110	8.770	.999	.898	.971
162	2	8.200	7.460	7.600	8.320	.910	.927	1.015
162	3	8.990	9.950	7.910	8.830	1.107	.880	.982
162	4	9.280	9.390	7.790	9.250	1.012	.839	.997
162	5	8.860	9.340	7.800	8.800	1.054	.880	.993
162	6	5.890	6.690	5.420	6.510	1.136	.920	1.105
162	7	8.190	8.560	7.200	8.160	1.045	.879	.996
162	8	7.400	7.580	6.910	7.820	1.024	.934	1.057
162	9	6.620	6.780	6.150	7.290	1.024	.929	1.101
162	10	1.570	1.950	1.250	1.260	1.242	.796	.803
162	11	8.020	8.210	6.560	7.670	1.024	.818	.956
162	12	8.670	8.850	7.420	8.420	1.021	.856	.971
162	13	8.760	9.120	7.600	8.580	1.041	.868	.979
162	14	9.040	9.240	7.580	8.880	1.022	.838	.982
162	15	9.030	9.050	7.360	8.600	1.002	.815	.952
162	16	6.330	6.440	5.110	6.180	1.017	.807	.976
162	17	8.420	8.590	0.000	0.000	1.020	0.000	0.000
162	18	8.290	8.600	6.920	8.590	1.037	.835	1.036
162	19	7.520	7.720	6.370	7.570	1.027	.847	1.007
162	20	8.580	8.820	7.730	8.280	1.028	.901	.965
162	21	8.700	8.950	7.810	8.440	1.029	.898	.970
162	22	8.390	9.010	7.810	8.610	1.074	.931	1.026
162	23	8.080	8.430	7.690	8.250	1.043	.952	1.021
162	24	8.050	7.970	0.000	0.000	.990	0.000	0.000
162	25	6.370	6.630	0.000	0.000	1.041	0.000	0.000
162	26	6.030	6.280	4.610	5.210	1.041	.765	.864
162	27	7.740	7.910	7.400	7.940	1.022	.956	1.026
162	28	7.990	8.250	7.390	8.170	1.033	.925	1.023
162	29	6.220	6.450	5.680	5.820	1.037	.913	.936
162	30	6.860	6.930	6.130	6.820	1.010	.894	.994
162	31	8.510	8.720	7.570	8.870	1.025	.890	1.042
162	32	7.260	7.420	6.430	7.210	1.022	.886	.993
162	33	7.610	7.820	6.900	7.760	1.028	.907	1.020
162	34	3.840	3.870	3.560	4.100	1.008	.927	1.068
162	35	6.980	7.140	5.860	7.230	1.023	.840	1.036
162	36	7.590	7.750	6.590	7.990	1.021	.868	1.053
162	37	7.530	7.790	6.550	7.750	1.035	.870	1.029
162	38	4.370	4.810	0.000	0.000	1.101	0.000	0.000
162	39	8.870	9.090	8.270	8.590	1.025	.932	.968
162	40	9.810	10.110	9.130	9.660	1.031	.931	.985
162	41	9.880	10.010	9.180	9.330	1.013	.929	.944
162	42	9.620	10.000	9.130	9.400	1.040	.949	.977
162	43	9.580	10.000	9.130	9.780	1.044	.953	1.021
162	44	9.420	9.930	9.060	9.290	1.054	.962	.986
162	45	9.600	9.990	8.960	9.290	1.041	.933	.968
162	46	9.300	9.910	0.000	0.000	1.066	0.000	0.000
162	47	6.190	6.830	0.000	0.000	1.103	0.000	0.000
162	48	6.990	7.650	6.750	7.280	1.094	.966	1.041
162	49	8.510	8.820	7.980	8.330	1.036	.938	.979
162	50	8.890	9.200	8.390	8.850	1.035	.944	.996
162	51	8.890	9.320	8.590	8.890	1.048	.966	1.000
162	52	8.840	9.300	8.500	8.820	1.052	.962	.998
162	53	8.470	9.370	8.600	10.100	1.106	1.015	1.192
162	54	9.200	9.400	8.760	8.850	1.022	.952	.962
162	55	8.990	9.670	8.800	8.780	1.076	.979	.977
162	56	9.090	9.440	0.000	0.000	1.039	0.000	0.000
162	57	8.720	9.160	0.000	0.000	1.050	0.000	0.000
162	58	9.090	9.320	9.000	9.460	1.025	.990	1.041
162	59	9.450	9.690	9.190	9.320	1.025	.972	.986

162	60	9.420	9.770	9.570	9.340	1.037	1.016	.992
162	61	6.500	6.630	6.280	6.660	1.020	.966	1.025
162	62	8.450	8.580	8.020	8.210	1.015	.949	.972
162	63	4.600	4.660	4.710	4.730	1.013	1.024	1.028
162	64	9.470	9.690	9.180	9.340	1.023	.969	.986
162	65	8.270	8.270	0.000	0.000	1.000	0.000	0.000
162	66	9.520	9.790	0.000	0.000	1.028	0.000	0.000
162	67	9.590	9.880	9.180	9.330	1.030	.957	.973
162	68	9.550	9.770	9.160	9.600	1.023	.959	1.005
162	69	9.560	9.850	9.160	9.360	1.030	.958	.979
162	70	9.590	9.760	9.130	9.240	1.018	.952	.964
162	71	9.720	9.750	9.050	9.180	1.003	.931	.944
162	72	9.700	9.850	8.940	9.600	1.015	.922	.990
162	73	4.880	4.810	4.360	4.330	.986	.893	.887
162	74	.740	1.190	1.280	1.170	1.608	1.730	1.581
162	75	8.780	9.060	8.390	8.870	1.032	.956	1.010
162	76	8.590	8.710	8.090	8.240	1.014	.942	.959
162	77	8.980	9.370	8.580	9.320	1.043	.955	1.038
162	77	8.980	9.370	8.580	9.320	1.043	.955	1.038
162	78	7.630	7.920	7.320	7.400	1.038	.959	.970
162	79	9.300	9.780	9.090	9.160	1.052	.977	.985
162	80	9.050	9.550	9.200	9.360	1.055	1.017	1.034
162	81	9.110	9.310	9.120	9.110	1.022	1.001	1.000
162	82	9.310	9.530	9.110	9.100	1.024	.979	.977
162	83	9.250	9.570	9.090	9.000	1.035	.983	.973
162	84	8.560	8.780	8.160	8.100	1.026	.953	.946
162	85	5.930	5.880	5.830	4.940	.992	.983	.833
162	86	8.560	8.760	0.000	0.000	1.023	0.000	0.000
162	87	6.010	6.250	0.000	0.000	1.040	0.000	0.000
162	88	5.960	6.080	5.830	6.160	1.020	.978	1.034
162	89	7.060	7.100	6.540	6.640	1.006	.926	.941
162	90	9.300	9.570	9.030	9.050	1.029	.971	.973
162	91	9.580	9.680	9.050	9.100	1.010	.945	.950
162	92	9.570	9.760	9.070	10.340	1.020	.948	1.080
162	93	6.600	7.060	6.580	6.640	1.070	.997	1.006
162	94	8.820	9.440	8.850	8.770	1.070	1.003	.994
162	95	6.490	6.660	6.260	6.390	1.026	.965	.985
162	96	9.480	9.500	0.000	0.000	1.002	0.000	0.000
162	97	9.130	9.560	9.030	9.130	1.047	.989	1.000
162	98	8.500	8.760	8.400	8.500	1.031	.988	1.000
162	99	8.580	8.820	8.800	8.910	1.028	1.026	1.038
162	100	8.940	9.040	8.950	8.750	1.011	1.001	.979
162	101	6.330	6.460	6.100	6.340	1.021	.964	1.002
162	102	8.280	8.240	7.610	7.660	.995	.919	.925
162	103	9.520	9.670	9.040	9.170	1.016	.950	.963
162	104	9.150	9.650	8.980	9.630	1.055	.981	1.052
162	105	8.670	8.730	8.220	8.200	1.007	.948	.946
162	106	6.020	6.280	0.000	6.270	1.043	0.000	1.042
162	107	9.620	10.070	9.610	9.360	1.047	.999	.973
162	108	9.550	10.030	9.630	9.280	1.050	1.008	.972
162	109	9.560	10.060	9.650	9.280	1.052	1.009	.971
162	110	9.230	9.810	9.670	9.490	1.063	1.048	1.028
162	111	9.330	9.560	9.600	9.340	1.025	1.029	1.001
162	112	9.430	9.710	9.300	9.230	1.030	.986	.979
162	113	9.450	9.730	9.380	9.400	1.030	.993	.995
162	114	7.400	7.520	7.530	7.360	1.016	1.018	.995
162	115	9.250	9.670	9.460	9.330	1.045	1.023	1.009
162	116	3.830	3.840	3.920	3.890	1.003	1.023	1.016
162	117	6.920	6.990	6.940	6.630	1.010	1.003	.958
162	118	6.150	6.260	6.130	5.810	1.018	.997	.945
162	119	8.920	9.130	8.830	8.500	1.024	.990	.953
162	120	9.630	9.930	9.440	9.210	1.031	.980	.956
162	121	9.430	9.810	9.510	9.060	1.040	1.008	.961
162	122	9.640	9.900	0.000	0.000	1.027	0.000	0.000
162	123	7.390	7.470	0.000	0.000	1.011	0.000	0.000
162	124	8.490	8.820	8.490	8.620	1.039	1.000	1.015

62	125	8.990	9.610	0.000	0.000	1.069	0.000	0.000
62	126	8.850	9.350	0.000	0.000	1.056	0.000	0.000
62	127	8.990	9.000	9.340	9.160	1.001	1.039	1.019
62	128	9.340	9.330	9.390	9.120	.999	1.005	.976
62	129	9.480	9.740	9.480	9.340	1.027	1.000	.985
62	130	9.650	9.910	9.700	9.600	1.027	1.005	.995
62	131	8.060	8.090	7.820	7.490	1.004	.970	.929
62	132	7.340	7.590	7.300	7.360	1.034	.995	1.003
162	133	7.930	8.150	7.990	7.720	1.028	1.008	.974
162	134	9.800	10.060	0.000	0.000	1.027	0.000	0.000
162	135	10.010	9.810	0.000	0.000	.980	0.000	0.000
162	136	9.690	9.920	9.640	9.420	1.024	.995	.972
162	137	8.380	8.400	0.000	0.000	1.002	0.000	0.000
162	138	6.280	6.450	0.000	0.000	1.027	0.000	0.000
162	139	7.880	8.040	7.880	7.710	1.020	1.000	.978
162	140	9.930	9.250	9.700	9.610	.932	.977	.968
162	141	9.800	9.720	9.810	9.660	.992	1.001	.986
162	142	9.490	9.700	9.810	9.770	1.022	1.034	1.030
162	143	9.200	9.660	9.840	9.540	1.050	1.070	1.037
162	144	9.480	9.700	9.880	9.870	1.023	1.042	1.041
162	145	9.840	10.190	9.940	9.760	1.036	1.010	.992
162	146	9.910	10.180	10.100	10.360	1.027	1.019	1.045
162	147	9.490	9.770	9.550	9.580	1.030	1.006	1.009
162	148	9.670	9.840	0.000	0.000	1.018	0.000	0.000
162	149	8.350	8.500	8.100	7.910	1.018	.970	.947
162	150	8.700	8.880	8.700	8.450	1.021	1.000	.971
162	151	7.100	7.330	7.080	7.410	1.032	.997	1.044
162	152	6.100	6.350	0.000	0.000	1.041	0.000	0.000
162	153	9.970	10.260	0.000	0.000	1.029	0.000	0.000
162	154	9.950	10.230	10.200	9.760	1.028	1.025	.981
162	155	9.910	10.260	10.210	10.560	1.035	1.030	1.066
162	156	9.990	10.280	10.200	9.850	1.029	1.021	.986
162	157	9.960	10.300	10.170	9.750	1.034	1.021	.979
162	158	10.090	10.360	10.180	9.620	1.027	1.009	.953
162	159	9.930	10.280	0.000	0.000	1.035	0.000	0.000
162	160	10.160	10.260	10.110	9.800	1.010	.995	.965
162	161	10.160	10.300	10.120	9.540	1.014	.996	.939
162	162	8.870	9.050	8.760	8.810	1.020	.988	.993
162	163	9.840	10.150	9.900	10.110	1.032	1.006	1.027
162	164	8.650	8.680	8.470	8.390	1.003	.979	.970
162	165	10.080	9.960	9.780	9.470	.988	.970	.939
162	166	5.480	5.550	5.460	5.440	1.013	.996	.993
162	167	9.570	9.750	9.790	10.110	1.019	1.023	1.056
162	168	9.440	9.640	0.000	0.000	1.021	0.000	0.000
162	169	9.520	9.660	0.000	0.000	1.015	0.000	0.000
162	170	9.580	8.950	0.000	0.000	.934	0.000	0.000
162	171	9.620	9.490	9.700	9.310	.986	1.008	.968
162	172	10.730	10.750	0.000	0.000	1.002	0.000	0.000
162	173	9.310	9.520	0.000	0.000	1.023	0.000	0.000
162	174	9.780	9.900	0.000	0.000	1.012	0.000	0.000
162	175	9.760	9.910	9.590	9.260	1.015	.983	.949
162	176	10.150	9.840	9.600	0.000	.969	.946	0.000
162	177	10.050	9.890	9.680	0.000	.984	.963	0.000
162	178	10.000	9.840	9.620	9.550	.984	.962	.955
162	179	9.940	9.930	9.770	9.370	.999	.983	.943
162	180	10.420	10.120	9.790	9.760	.971	.940	.937
162	181	10.470	9.990	9.830	9.310	.954	.939	.889
162	182	10.500	9.970	9.790	9.330	.950	.932	.889
162	183	10.840	9.930	9.780	8.230	.916	.902	.759
162	184	10.530	9.900	9.790	9.550	.940	.930	.907
162	185	8.920	8.330	8.230	8.320	.934	.923	.933
162	186	9.230	8.810	8.920	8.540	.954	.966	.925
162	187	10.160	10.140	9.820	9.560	.998	.967	.941
162	188	9.260	9.290	0.000	0.000	1.003	0.000	0.000
162	189	10.130	10.250	9.850	10.250	1.012	.972	1.012
162	190	10.160	10.240	9.590	10.020	1.008	.944	.986

62	191	10.050	10.260	9.760	9.450	1.021	.971	.940
62	192	9.790	10.320	9.860	9.530	1.054	1.007	.973
62	193	7.880	8.240	7.880	7.600	1.046	1.000	.964
62	194	9.840	10.250	9.830	9.550	1.042	.999	.971
62	195	7.480	7.700	7.410	7.220	1.029	.991	.965
62	196	9.760	10.150	9.810	9.510	1.040	1.005	.974
62	197	9.920	10.130	9.770	9.510	1.021	.985	.959
62	198	9.930	10.530	10.190	9.900	1.060	1.026	.997
62	199	9.470	10.100	9.710	9.260	1.067	1.025	.978
62	200	9.490	9.880	10.560	9.250	1.041	1.113	.975
62	201	8.770	9.000	8.680	8.700	1.026	.990	.992
62	202	9.340	9.690	9.790	9.510	1.037	1.048	1.018
62	203	9.610	9.850	9.810	9.700	1.025	1.021	1.009
62	204	5.780	6.100	6.130	6.120	1.055	1.061	1.059
62	205	10.410	10.180	9.920	9.690	.978	.953	.931
62	206	10.080	10.190	9.950	9.570	1.011	.987	.949
62	207	9.900	10.250	9.940	9.550	1.035	1.004	.965
62	208	9.750	10.320	9.910	10.010	1.058	1.016	1.027
62	209	9.700	10.380	9.810	9.810	1.070	1.011	1.011
62	210	7.140	7.460	6.920	6.890	1.045	.969	.965
62	211	7.660	7.890	7.530	7.500	1.030	.983	.979
62	212	9.780	10.300	9.810	9.600	1.053	1.003	.982
62	213	8.820	9.080	8.730	8.530	1.029	.990	.967
62	214	9.480	9.760	9.830	9.630	1.030	1.037	1.016
62	215	9.740	10.010	9.860	9.570	1.028	1.012	.983
62	216	9.920	10.050	9.810	9.410	1.013	.989	.949
62	217	9.740	9.980	9.780	9.740	1.025	1.004	1.000
62	218	10.230	10.430	9.880	9.560	1.020	.966	.935
62	219	9.800	10.070	9.850	9.770	1.028	1.005	.997
62	220	9.660	9.880	9.850	9.590	1.023	1.020	.993
62	221	9.910	10.080	9.860	9.530	1.017	.995	.962
62	222	9.490	9.710	9.460	9.080	1.023	.997	.957
62	223	9.980	10.210	9.810	9.370	1.023	.983	.939
62	224	9.710	10.100	9.800	9.490	1.040	1.009	.977
62	225	7.370	7.480	7.230	7.520	1.015	.981	1.020
62	226	7.840	7.990	0.000	0.000	1.019	0.000	0.000
62	227	9.680	10.010	0.000	0.000	1.034	0.000	0.000
62	228	9.680	9.930	1.900	1.820	1.026	.196	.188
62	229	9.430	9.690	9.670	9.550	1.028	1.025	1.013
62	230	9.460	9.580	9.650	9.520	1.013	1.020	1.006
62	231	9.620	9.710	9.600	9.640	1.009	.998	1.002
62	232	7.350	7.610	7.490	7.360	1.035	1.019	1.001
62	233	9.920	10.280	9.610	9.760	1.036	.969	.984
62	234	10.080	10.390	9.640	9.570	1.031	.956	.949
62	235	8.530	8.640	8.330	8.010	1.013	.977	.939
62	236	9.940	10.070	0.000	0.000	1.013	0.000	0.000
62	237	9.800	10.090	9.640	9.120	1.030	.984	.931
62	238	9.670	9.890	9.130	8.870	1.023	.944	.917
62	239	9.790	9.930	9.490	9.110	1.014	.969	.931
62	240	9.510	9.670	9.440	9.070	1.017	.993	.954
62	241	9.810	9.970	9.450	9.170	1.016	.963	.935
62	242	8.380	8.600	8.070	9.190	1.026	.963	1.097
62	243	6.140	6.030	0.000	0.000	.982	0.000	0.000
62	244	7.070	7.230	0.000	0.000	1.023	0.000	0.000
62	245	10.290	10.020	9.600	9.300	.974	.933	.904
62	246	9.490	10.170	9.620	9.640	1.072	1.014	1.016
62	247	10.170	10.020	9.590	9.250	.985	.943	.910
62	248	8.260	8.390	8.210	7.970	1.016	.994	.965
62	249	10.050	10.300	9.590	9.430	1.025	.954	.938
62	250	9.870	10.110	9.490	9.380	1.024	.961	.950
62	251	9.670	9.970	9.260	9.860	1.031	.958	1.020
62	252	9.590	9.800	8.990	9.310	1.022	.937	.971
62	253	9.360	9.630	9.020	9.600	1.029	.964	1.026
62	254	9.430	9.680	9.190	9.280	1.027	.975	.984
62	255	9.540	9.690	9.360	9.570	1.016	.981	1.003
62	256	9.640	9.890	2.290	2.250	1.026	.238	.233

62	257	7.130	7.280	6.970	7.060	1.021	.978	.990
62	258	8.860	9.090	0.000	0.000	1.026	0.000	0.000
62	259	6.030	6.360	6.490	0.000	1.055	1.076	0.000
62	260	5.630	5.710	5.490	5.740	1.014	.975	1.020
62	261	8.210	8.390	8.180	8.110	1.022	.996	.988
162	262	9.430	9.640	9.370	8.990	1.022	.994	.953
162	263	9.510	9.780	9.400	9.000	1.028	.988	.946
162	264	9.570	9.830	9.360	9.070	1.027	.978	.948
162	265	9.470	9.730	9.150	8.940	1.027	.966	.944
162	266	9.430	9.720	9.320	0.000	1.031	.988	0.000
162	267	9.360	9.700	9.460	9.200	1.036	1.011	.983
162	268	9.700	9.880	0.000	0.000	1.019	0.000	0.000
162	269	9.560	9.900	0.000	0.000	1.036	0.000	0.000
162	270	9.680	10.000	9.560	9.170	1.033	.988	.947
162	271	10.040	10.110	9.570	9.150	1.007	.953	.911
162	272	10.180	10.080	9.550	9.100	.990	.938	.894
162	273	9.610	10.000	9.420	9.130	1.041	.980	.950
162	274	5.550	5.690	5.100	5.060	1.025	.919	.912
162	275	4.670	5.010	0.000	0.000	1.073	0.000	0.000
162	276	7.070	7.280	0.000	0.000	1.030	0.000	0.000
162	277	6.930	7.270	0.000	0.000	1.049	0.000	0.000
162	278	8.040	8.280	7.480	7.830	1.030	.930	.974
162	279	8.680	8.820	7.910	8.310	1.016	.911	.957
162	280	8.280	8.570	8.460	8.600	1.035	1.022	1.039
162	281	8.580	8.810	9.010	9.090	1.027	1.050	1.059
162	282	8.540	8.830	8.920	9.110	1.034	1.044	1.067
162	283	8.900	9.170	8.910	9.100	1.030	1.001	1.022
162	284	9.270	9.480	0.000	0.000	1.023	0.000	0.000
162	285	9.380	9.440	8.380	8.990	1.006	.893	.958
162	286	8.880	9.520	8.430	9.580	1.072	.949	1.079
162	287	7.370	7.740	6.830	7.310	1.050	.927	.992
162	288	9.110	9.360	8.410	9.100	1.027	.923	.999
162	289	7.820	8.110	7.490	7.930	1.037	.958	1.014
162	290	9.560	9.830	9.000	9.610	1.028	.941	1.005
162	291	10.180	10.550	9.670	9.660	1.036	.950	.949
162	292	9.820	10.120	9.620	9.720	1.031	.980	.990

COMPARATIVE SPEEDS FOR NAVIGATIONAL SYSTEMS.

163	1	9.230	9.430	0.000	0.000	1.022	0.000	0.000
163	2	9.490	9.960	0.000	0.000	1.050	0.000	0.000
163	3	7.570	7.710	0.000	0.000	1.018	0.000	0.000
163	4	9.270	9.530	0.000	0.000	1.028	0.000	0.000
163	5	9.690	9.970	0.000	0.000	1.029	0.000	0.000
163	6	9.680	9.980	0.000	0.000	1.031	0.000	0.000
163	7	10.200	10.130	0.000	0.000	.993	0.000	0.000
163	8	9.150	9.430	0.000	0.000	1.031	0.000	0.000
163	9	8.920	9.190	0.000	0.000	1.030	0.000	0.000
163	10	6.870	7.010	0.000	0.000	1.020	0.000	0.000
163	11	9.880	10.090	0.000	0.000	1.021	0.000	0.000
163	12	9.050	9.280	0.000	0.000	1.025	0.000	0.000
163	13	9.510	9.740	0.000	0.000	1.024	0.000	0.000
163	14	9.730	9.950	0.000	0.000	1.023	0.000	0.000
163	15	9.560	9.780	0.000	0.000	1.023	0.000	0.000
163	16	9.460	9.640	0.000	0.000	1.019	0.000	0.000
163	17	9.450	9.540	0.000	0.000	1.010	0.000	0.000
163	18	7.690	7.920	0.000	0.000	1.030	0.000	0.000
163	19	9.710	9.960	0.000	0.000	1.026	0.000	0.000
163	20	10.780	10.890	0.000	0.000	1.010	0.000	0.000
163	21	9.350	9.650	0.000	0.000	1.032	0.000	0.000
163	22	8.640	8.780	0.000	0.000	1.016	0.000	0.000
163	23	10.190	10.630	0.000	0.000	1.043	0.000	0.000
163	24	7.960	8.000	0.000	0.000	1.005	0.000	0.000
163	25	8.800	9.120	0.000	0.000	1.036	0.000	0.000
163	26	8.840	8.970	0.000	0.000	1.015	0.000	0.000
163	27	10.580	10.790	0.000	0.000	1.020	0.000	0.000
163	28	10.510	10.800	0.000	0.000	1.028	0.000	0.000
163	29	10.360	10.900	0.000	0.000	1.052	0.000	0.000
163	30	10.580	10.670	0.000	0.000	1.009	0.000	0.000
163	31	10.430	10.790	0.000	0.000	1.035	0.000	0.000
163	32	9.150	9.360	0.000	0.000	1.023	0.000	0.000
163	33	7.680	7.820	0.000	0.000	1.018	0.000	0.000
163	34	10.490	10.870	0.000	0.000	1.036	0.000	0.000
163	35	7.520	7.740	0.000	0.000	1.029	0.000	0.000
163	36	9.140	9.270	0.000	0.000	1.014	0.000	0.000
163	37	7.400	7.490	0.000	0.000	1.012	0.000	0.000
163	38	9.430	9.730	0.000	0.000	1.032	0.000	0.000
163	39	9.170	9.540	0.000	0.000	1.040	0.000	0.000
163	40	9.390	9.470	0.000	0.000	1.009	0.000	0.000
163	41	7.460	7.690	0.000	0.000	1.031	0.000	0.000
163	42	9.790	9.360	0.000	0.000	.956	0.000	0.000
163	43	10.340	11.440	0.000	0.000	1.106	0.000	0.000
163	44	9.860	10.130	0.000	0.000	1.027	0.000	0.000
163	45	9.530	9.850	0.000	0.000	1.034	0.000	0.000
163	46	9.550	9.840	0.000	0.000	1.030	0.000	0.000
163	47	9.010	10.010	0.000	0.000	1.111	0.000	0.000
163	48	9.450	9.970	0.000	0.000	1.055	0.000	0.000
163	49	9.590	9.650	0.000	0.000	1.006	0.000	0.000
163	50	9.230	10.640	9.700	0.000	1.153	1.051	0.000
163	51	9.450	9.850	9.750	0.000	1.042	1.032	0.000
163	52	7.600	8.290	8.120	7.900	1.091	1.068	1.039
163	53	7.010	7.770	0.000	0.000	1.108	0.000	0.000
163	54	8.490	8.690	0.000	0.000	1.024	0.000	0.000
163	55	8.360	8.870	8.410	8.250	1.061	1.006	.987
163	56	8.310	8.820	8.410	8.300	1.061	1.012	.999
163	57	8.570	8.870	8.490	8.650	1.035	.991	1.009
163	58	8.320	8.940	8.500	8.320	1.075	1.022	1.000

63	59	7.350	7.600	0.000	0.000	1.034	0.000	0.000
63	60	7.180	7.250	0.000	0.000	1.010	0.000	0.000
63	61	9.130	9.100	9.110	9.000	.997	.998	.986
163	62	8.870	8.300	9.000	8.950	.936	1.015	1.009
163	63	9.230	9.230	9.230	0.000	1.000	1.000	0.000
163	64	9.310	9.090	9.090	0.000	.976	.976	0.000
163	65	9.440	9.140	9.140	9.110	.968	.968	.965
163	66	8.950	9.250	0.000	8.860	1.034	0.000	.990
163	67	9.180	9.470	8.970	9.000	1.032	.977	.980
163	68	8.950	9.110	9.000	9.000	1.018	1.006	1.006
163	69	8.930	9.160	8.910	8.930	1.026	.998	1.000
163	70	9.130	9.260	9.000	9.000	1.014	.986	.986
163	71	8.900	9.100	8.810	0.000	1.022	.990	0.000
163	72	8.930	9.140	8.800	8.860	1.024	.985	.992
163	73	9.060	9.450	8.800	9.000	1.043	.971	.993
163	74	8.900	9.100	8.780	8.920	1.022	.987	1.002
163	75	9.000	9.170	8.730	8.890	1.019	.970	.988
163	76	9.060	9.420	8.880	9.020	1.040	.980	.996
163	77	5.820	6.000	5.560	5.710	1.031	.955	.981
163	78	9.320	9.670	9.310	8.860	1.038	.999	.951
163	79	8.280	8.480	0.000	0.000	1.024	0.000	0.000
163	80	7.780	7.870	0.000	0.000	1.012	0.000	0.000
163	81	8.010	8.210	8.040	8.260	1.025	1.004	1.031
163	82	8.030	8.200	8.210	8.290	1.021	1.022	1.032
163	83	8.320	8.610	7.890	7.790	1.035	.948	.936
163	84	8.520	9.610	8.380	8.310	1.128	.984	.975
163	85	8.850	8.530	0.000	0.000	.964	0.000	0.000
163	86	9.120	9.360	8.690	8.480	1.026	.953	.930
163	87	8.610	8.990	8.500	8.460	1.044	.987	.983
163	88	8.460	8.920	8.420	8.010	1.054	.995	.947
163	89	9.040	9.080	8.500	0.000	1.004	.940	0.000
163	90	8.940	9.170	8.460	0.000	1.026	.946	0.000
163	91	9.010	9.300	8.630	0.000	1.032	.958	0.000
163	92	9.020	9.360	8.730	8.720	1.038	.968	.967
163	93	8.960	9.310	9.920	9.230	1.039	1.107	1.030
163	94	9.100	9.210	8.520	8.300	1.012	.936	.912
163	95	9.020	9.090	8.470	8.340	1.008	.939	.925
163	96	9.010	9.160	8.480	8.490	1.017	.941	.942
163	97	9.060	9.420	8.770	8.870	1.040	.968	.979
163	98	9.130	9.470	8.880	10.040	1.037	.973	1.100
163	99	9.150	9.520	9.000	8.730	1.040	.984	.954
163	100	9.070	9.520	9.040	9.160	1.050	.997	1.010
163	101	7.730	8.040	7.590	0.000	1.040	.982	0.000
163	102	9.450	9.410	8.630	8.830	.996	.913	.934
163	103	7.430	6.970	7.160	7.380	.938	.964	.993
163	104	9.350	9.470	8.980	9.280	1.013	.960	.993
163	105	9.350	9.530	8.960	9.130	1.019	.958	.976
163	106	9.260	9.670	8.960	9.180	1.044	.968	.991
163	107	9.110	9.650	8.900	9.130	1.059	.977	1.002
163	108	9.090	9.590	8.870	9.190	1.055	.976	1.011
163	109	9.060	9.530	8.860	9.170	1.052	.978	1.012
163	110	8.960	9.600	8.860	9.080	1.071	.989	1.013
163	111	8.870	9.630	8.940	7.600	1.086	1.008	.857
163	112	9.040	9.590	8.980	7.560	1.061	.993	.836
163	113	8.840	9.470	8.960	9.110	1.071	1.014	1.031
163	114	9.110	9.440	9.080	9.310	1.036	.997	1.022
163	115	9.000	9.570	9.220	9.140	1.063	1.024	1.016
163	116	9.310	9.590	9.260	9.490	1.030	.995	1.019
163	117	9.260	9.570	9.360	9.250	1.033	1.011	.999
163	118	9.480	9.690	9.380	9.190	1.022	.989	.969
163	119	9.710	9.990	9.440	9.240	1.029	.972	.952
163	120	9.780	10.020	9.450	9.250	1.025	.966	.946
163	121	9.350	9.640	9.500	9.350	1.031	1.016	1.000
163	122	9.220	9.390	9.160	9.130	1.018	.993	.990
163	123	3.820	3.920	4.040	4.240	1.026	1.058	1.110
163	124	9.660	9.630	9.400	9.400	.997	.973	.973

163	125	9.390	9.650	9.140	9.210	1.028	.973	.981
163	126	8.390	8.670	8.160	9.210	1.033	.973	1.098
163	127	10.040	10.330	10.030	9.600	1.029	.999	.956
163	128	6.280	6.440	6.200	0.000	1.025	.987	0.000
163	129	9.620	9.890	9.850	9.810	1.028	1.024	1.020
163	130	9.570	9.820	9.900	9.770	1.026	1.034	1.021
163	131	9.410	9.670	9.840	9.110	1.028	1.046	.968
163	132	9.480	9.690	9.890	0.000	1.022	1.043	0.000
163	133	9.450	9.680	9.920	9.480	1.024	1.050	1.003
163	134	9.460	9.880	9.960	9.260	1.044	1.053	.979
163	135	9.890	10.170	9.900	9.980	1.028	1.001	1.009
163	136	10.020	10.090	9.860	9.720	1.007	.984	.970
163	137	7.460	7.450	7.260	0.000	.999	.973	0.000
163	138	6.360	6.000	5.790	5.760	.943	.910	.906
163	139	9.330	9.360	9.170	8.990	1.003	.983	.964
163	140	10.100	10.170	10.040	9.910	1.007	.994	.981
163	141	10.180	10.310	10.100	9.870	1.013	.992	.970
163	142	9.970	10.270	10.090	9.820	1.030	1.012	.985
163	143	10.000	10.220	10.070	9.920	1.022	1.007	.992
163	144	9.910	10.260	10.080	9.660	1.035	1.017	.975
163	145	10.050	10.260	10.070	9.720	1.021	1.002	.967
163	146	9.940	10.210	10.080	0.000	1.027	1.014	0.000
163	147	9.920	10.170	10.050	9.650	1.025	1.013	.973
163	148	8.810	9.040	8.900	0.000	1.026	1.010	0.000
163	149	9.970	9.880	9.510	0.000	.991	.954	0.000
163	150	7.290	7.550	0.000	0.000	1.036	0.000	0.000
163	151	9.430	9.630	9.240	9.340	1.021	.980	.990
163	152	9.030	9.430	9.160	9.340	1.044	1.014	1.034
163	153	8.550	9.040	8.760	8.700	1.057	1.025	1.018
163	154	8.400	8.910	8.510	8.600	1.061	1.013	1.024
163	155	7.720	8.340	7.780	0.000	1.080	1.008	0.000
163	156	6.710	7.410	6.830	7.130	1.104	1.018	1.063
163	157	6.200	6.950	6.430	6.800	1.121	1.037	1.097
163	158	6.450	7.240	0.000	0.000	1.122	0.000	0.000
163	159	6.440	7.250	6.830	7.250	1.126	1.061	1.126
163	160	6.630	7.460	7.030	7.350	1.125	1.060	1.109
163	161	6.880	7.330	6.920	7.120	1.065	1.006	1.035
163	162	6.610	6.850	6.470	6.740	1.036	.979	1.020
163	163	5.950	6.380	6.110	0.000	1.072	1.027	0.000
163	164	6.450	6.890	6.460	0.000	1.068	1.002	0.000
163	165	6.880	7.190	6.740	7.280	1.045	.980	1.058
163	166	6.580	6.930	6.600	0.000	1.053	1.003	0.000
163	167	6.850	7.020	0.000	0.000	1.025	0.000	0.000
163	168	8.250	8.430	8.530	8.270	1.022	1.034	1.002
163	169	9.630	9.850	9.920	9.600	1.023	1.030	.997
163	170	9.830	10.070	10.030	9.770	1.024	1.020	.994
163	171	6.900	7.050	6.970	6.740	1.022	1.010	.977
163	172	9.140	9.510	9.550	9.530	1.040	1.045	1.043
163	173	8.980	9.180	9.400	9.020	1.022	1.047	1.004
163	174	5.040	5.120	5.150	5.380	1.016	1.022	1.067
163	175	5.820	5.790	5.430	5.730	.995	.933	.985
163	176	5.640	5.720	5.400	5.730	1.014	.957	1.016
163	177	8.810	9.000	8.560	0.000	1.022	.972	0.000
163	178	8.640	8.900	8.370	0.000	1.030	.969	0.000
163	179	8.530	8.670	8.140	8.480	1.016	.954	.994
163	180	8.150	8.320	8.020	8.620	1.021	.984	1.058
163	181	8.170	8.270	8.120	8.940	1.012	.994	1.094
163	182	8.160	8.460	8.240	8.570	1.037	1.010	1.050
163	183	8.220	8.280	8.430	8.730	1.007	1.026	1.062
163	184	8.150	8.550	8.310	8.500	1.049	1.020	1.043
163	185	8.560	9.040	8.550	9.500	1.056	.999	1.110
163	186	8.900	9.130	8.610	8.770	1.026	.967	.985
163	187	9.150	8.680	8.860	9.030	.949	.968	.987
163	188	9.280	9.320	8.960	9.440	1.004	.966	1.017
163	189	9.190	9.450	8.960	8.990	1.028	.975	.978
163	190	9.210	9.580	9.090	9.200	1.040	.987	.999

163	191	9.270	9.590	9.100	9.330	1.035	.982	1.006
163	192	9.070	9.750	9.130	9.130	1.075	1.007	1.007
163	193	9.270	9.770	9.040	9.010	1.054	.975	.972
163	194	9.160	9.790	9.160	8.700	1.069	1.000	.950
163	195	6.040	6.590	6.090	6.260	1.091	1.008	1.036
163	196	6.380	6.510	6.150	6.320	1.020	.964	.991
163	197	9.010	9.560	8.940	8.790	1.061	.992	.976
163	198	9.260	9.550	9.140	9.160	1.031	.987	.989
163	199	9.350	9.720	9.380	8.800	1.040	1.003	.941
163	200	8.890	8.880	0.000	0.000	.999	0.000	0.000
163	201	9.440	9.340	0.000	0.000	.989	0.000	0.000
163	202	9.540	9.330	9.300	9.460	.978	.975	.992
163	203	9.350	9.280	9.260	9.540	.993	.990	1.020
163	204	9.650	9.310	9.280	9.460	.965	.962	.980
163	205	9.370	9.330	9.320	9.580	.996	.995	1.022
163	206	9.270	9.660	9.340	9.680	1.042	1.008	1.044
163	207	9.580	9.800	9.360	9.460	1.023	.977	.987
163	208	9.680	9.850	9.430	9.450	1.018	.974	.976
163	209	9.900	9.840	9.480	9.570	.994	.958	.967
163	210	9.260	9.600	9.360	9.290	1.037	1.011	1.003
163	211	9.800	9.780	9.480	10.160	.998	.967	1.037
163	212	9.680	9.730	9.500	9.590	1.005	.981	.991
163	213	9.470	9.640	9.410	9.290	1.018	.994	.981
163	214	8.390	8.900	8.700	8.640	1.061	1.037	1.030
163	215	10.010	9.390	9.650	7.790	.938	.964	.778
163	216	10.090	9.450	9.510	9.000	.937	.943	.892
163	217	7.640	7.390	7.620	7.440	.967	.997	.974
163	218	6.020	5.680	6.090	6.170	.944	1.012	1.025
163	219	9.170	9.240	9.230	9.170	1.008	1.007	1.000
163	220	9.150	9.750	9.760	9.490	1.066	1.067	1.037
163	221	9.370	9.640	0.000	9.340	1.029	0.000	.997
163	222	9.750	10.030	9.650	9.300	1.029	.990	.954
163	223	9.660	9.970	9.620	9.380	1.032	.996	.971
163	224	9.760	9.860	9.600	9.340	1.010	.984	.957
163	225	9.620	9.890	9.540	0.000	1.028	.992	0.000
163	226	6.820	7.080	6.740	6.740	1.038	.988	.988
163	227	9.480	9.790	9.700	9.920	1.033	1.023	1.046
163	228	9.630	9.910	9.700	9.560	1.029	1.007	.993
163	229	8.960	9.310	9.120	8.760	1.039	1.018	.978
163	230	9.640	9.860	0.000	8.850	1.023	0.000	.918
163	231	9.260	9.550	9.330	9.180	1.031	1.008	.991
163	232	8.740	9.080	8.910	8.980	1.039	1.019	1.027
163	233	9.670	9.840	0.000	0.000	1.018	0.000	0.000
163	234	7.560	7.780	0.000	0.000	1.029	0.000	0.000
163	235	7.720	8.050	6.650	6.650	1.043	.861	.861

COMPARATIVE SPEEDS FOR NAVIGATIONAL SYSTEMS.

164	1	9.430	9.690	0.000	0.000	1.028	0.000	0.000
164	2	9.400	9.620	8.480	9.120	1.023	.902	.970
164	3	9.360	9.650	8.460	7.590	1.031	.904	.811
164	4	9.370	9.610	8.410	8.610	1.026	.898	.919
164	5	9.390	9.660	8.420	8.990	1.029	.897	.957
164	6	9.490	9.720	8.480	8.990	1.024	.894	.947
164	7	9.270	9.510	8.490	9.010	1.026	.916	.972
164	8	9.350	9.440	8.020	9.530	1.010	.858	1.019
164	9	9.580	9.870	8.460	8.940	1.030	.883	.933
164	10	9.610	9.840	8.420	9.150	1.024	.876	.952
164	11	9.540	9.760	8.460	8.900	1.023	.887	.933
164	12	9.570	9.570	8.580	9.000	1.000	.897	.940
164	13	9.640	9.890	8.570	9.000	1.026	.889	.934
164	14	9.970	10.000	8.520	5.500	1.003	.855	.552
164	15	9.470	9.770	8.570	8.690	1.032	.905	.918
164	16	9.600	9.990	8.570	9.110	1.041	.893	.949
164	17	9.440	9.710	8.470	8.960	1.029	.897	.949
164	18	9.440	9.640	8.450	9.170	1.021	.895	.971
164	19	9.430	9.740	8.460	9.050	1.033	.897	.960
164	20	9.260	9.660	8.390	9.000	1.043	.906	.972
164	21	9.520	9.700	8.330	3.320	1.019	.875	.349
164	22	8.210	8.160	6.950	0.000	.994	.847	0.000
164	23	8.870	9.030	7.790	7.250	1.018	.878	.817
164	24	8.360	8.640	7.510	8.190	1.033	.898	.980
164	25	8.720	8.910	0.000	0.000	1.022	0.000	0.000
164	26	8.890	9.200	8.180	9.340	1.035	.920	1.051
164	27	9.340	9.370	8.290	8.990	1.003	.888	.963
164	28	7.560	7.850	0.000	0.000	1.038	0.000	0.000
164	29	7.120	7.340	6.180	6.460	1.031	.868	.907
164	30	9.430	9.610	8.240	8.800	1.019	.874	.933
164	31	9.250	9.510	0.000	0.000	1.028	0.000	0.000
164	32	9.150	9.350	0.000	0.000	1.022	0.000	0.000
164	33	8.890	9.130	8.010	8.650	1.027	.901	.973
164	34	8.810	8.930	0.000	0.000	1.014	0.000	0.000
164	35	6.780	9.110	0.000	0.000	1.038	0.000	0.000
164	36	8.830	9.100	8.250	8.790	1.031	.934	.995
164	37	9.280	9.500	8.330	8.800	1.024	.898	.948
164	38	9.210	9.690	8.560	8.820	1.052	.929	.958
164	39	9.370	9.770	0.000	0.000	1.043	0.000	0.000
164	40	9.270	9.750	8.560	9.160	1.052	.923	.988
164	41	9.230	9.780	8.550	9.200	1.060	.926	.997
164	42	9.280	9.810	8.590	0.000	1.057	.926	0.000
164	43	9.350	9.750	8.600	0.000	1.043	.920	0.000
164	44	9.460	9.810	8.610	0.000	1.037	.910	0.000
164	45	7.160	8.060	0.000	0.000	1.126	0.000	0.000
164	46	5.850	5.970	0.000	0.000	1.021	0.000	0.000
164	47	7.840	7.770	7.150	7.470	.991	.912	.953
164	48	7.120	7.310	0.000	0.000	1.027	0.000	0.000
164	49	7.250	7.650	0.000	0.000	1.055	0.000	0.000
164	50	7.000	7.620	0.000	0.000	1.089	0.000	0.000
164	51	7.360	7.760	0.000	0.000	1.054	0.000	0.000
164	52	6.830	7.440	6.840	7.410	1.089	1.001	1.085
164	53	7.070	7.040	6.510	7.000	.996	.921	.990
164	54	6.710	6.380	5.980	6.720	.951	.891	1.001
164	55	6.820	7.080	6.380	6.590	1.038	.935	.966
164	56	7.590	7.810	7.100	7.300	1.029	.935	.962
164	57	7.210	7.510	6.920	7.430	1.042	.960	1.031
164	58	7.400	7.590	7.190	7.610	1.026	.972	1.028
164	59	7.830	8.030	7.620	7.950	1.026	.973	1.015
164	60	8.270	8.410	8.010	8.250	1.017	.969	.998
164	61	8.320	8.660	8.270	8.320	1.041	.994	1.000

164	62	8.730	9.010	8.640	8.680	1.032	.990	.994
164	63	4.780	4.950	0.000	0.000	1.036	0.000	0.000
164	64	9.550	9.800	9.620	10.510	1.026	1.007	1.101
164	65	9.330	9.700	9.560	8.900	1.040	1.025	.954
164	66	8.470	8.740	8.510	7.940	1.032	1.005	.937
164	67	9.310	9.540	9.210	8.820	1.025	.989	.947
164	68	9.180	9.410	9.200	8.720	1.025	1.002	.950
164	69	9.040	9.270	9.130	8.750	1.025	1.010	.968
164	70	9.050	9.240	9.300	8.820	1.021	1.028	.975
164	71	9.010	9.340	9.290	8.320	1.037	1.031	.923
164	72	9.520	9.660	9.270	8.810	1.015	.974	.925
164	73	9.790	9.570	9.130	8.790	.978	.933	.898
164	74	9.200	9.520	9.090	8.720	1.035	.988	.948
164	75	8.860	9.500	9.040	9.240	1.072	1.020	1.043
164	76	8.880	9.430	8.970	8.670	1.062	1.010	.976
164	77	8.600	9.480	9.050	8.690	1.102	1.052	1.010
164	78	6.040	6.780	6.150	6.180	1.123	1.018	1.023
164	79	8.930	9.050	8.180	8.570	1.013	.916	.960
164	80	7.620	7.880	0.000	0.000	1.034	0.000	0.000
164	81	7.270	7.720	0.000	0.000	1.062	0.000	0.000
164	82	7.630	8.190	7.630	7.740	1.073	1.000	1.014
164	83	7.660	8.290	7.740	0.000	1.082	1.010	0.000
164	84	7.740	8.430	7.800	0.000	1.089	1.008	0.000
164	85	6.420	7.120	6.460	0.000	1.109	1.006	0.000
164	86	5.370	5.540	4.950	0.000	1.032	.922	0.000
164	87	6.720	7.370	6.700	0.000	1.097	.997	0.000
164	88	7.490	8.450	7.910	8.340	1.128	1.056	1.113
164	89	8.120	8.570	8.100	8.330	1.055	.998	1.026
164	90	8.340	8.680	8.230	8.320	1.041	.987	.998
164	91	8.720	8.860	8.620	8.540	1.016	.989	.979
164	92	9.090	9.340	8.870	8.780	1.028	.976	.966
164	93	9.060	9.430	8.960	0.000	1.041	.989	0.000
164	94	7.220	7.470	7.060	0.000	1.035	.978	0.000
164	95	8.550	8.810	9.200	9.000	1.030	1.076	1.053
164	96	7.180	7.380	0.000	0.000	1.028	0.000	0.000
164	97	8.520	8.750	0.000	0.000	1.027	0.000	0.000
164	98	8.270	8.510	8.400	8.130	1.029	1.016	.983
164	99	8.790	9.400	9.140	8.790	1.069	1.040	1.000
164	100	9.150	9.380	9.150	8.750	1.025	1.000	.956
164	101	9.310	9.370	9.080	8.570	1.006	.975	.921
164	102	9.020	9.370	9.000	7.200	1.039	.998	.798
164	103	8.640	9.110	8.730	0.000	1.054	1.010	0.000
164	104	8.460	8.910	8.500	8.650	1.053	1.005	1.022
164	105	8.290	8.780	8.400	8.160	1.059	1.013	.984
164	106	7.960	8.650	8.300	7.150	1.087	1.043	.898
164	107	8.160	8.560	8.210	0.000	1.049	1.006	0.000
164	108	8.180	8.640	8.180	8.000	1.056	1.000	.978
164	109	8.420	8.730	8.150	9.390	1.037	.968	1.115
164	110	8.690	8.900	0.000	0.000	1.024	0.000	0.000
164	111	8.950	8.940	8.530	8.330	.999	.953	.931
164	112	8.700	9.010	8.390	8.310	1.036	.964	.955
164	113	8.670	8.870	8.400	8.370	1.023	.969	.965
164	114	6.870	6.710	6.300	6.190	.977	.917	.901
164	115	8.900	9.380	9.000	0.000	1.054	1.011	0.000
164	116	7.600	7.970	0.000	0.000	1.049	0.000	0.000
164	117	8.560	8.620	8.060	8.550	1.007	.942	.999
164	118	8.420	8.750	0.000	0.000	1.039	0.000	0.000
164	119	8.560	8.780	0.000	0.000	1.026	0.000	0.000
164	120	8.480	8.750	8.140	8.550	1.032	.960	1.008
164	121	8.640	8.770	8.260	8.580	1.015	.956	.993
164	122	8.700	8.800	8.250	8.480	1.011	.948	.975
164	123	8.940	8.950	8.270	8.570	1.001	.925	.959
164	124	9.390	9.090	0.000	0.000	.968	0.000	0.000
164	125	9.070	8.960	0.000	0.000	.988	0.000	0.000
164	126	8.530	8.840	0.000	0.000	1.036	0.000	0.000
164	127	4.550	4.890	0.000	0.000	1.075	0.000	0.000

164	128	8.270	8.950	0.000	0.000	1.082	0.000	0.000
164	129	8.290	8.490	8.300	7.910	1.024	1.001	.954
164	130	8.980	9.170	8.940	8.660	1.021	.996	.964
164	131	8.900	9.250	8.990	8.590	1.039	1.010	.965
164	132	8.990	9.310	8.980	8.600	1.036	.999	.957
164	133	9.060	9.280	8.940	8.650	1.024	.987	.955
164	134	7.360	7.590	7.540	7.290	1.031	1.024	.990
164	135	5.410	5.540	5.450	5.360	1.024	1.007	.991
164	136	8.730	9.110	8.710	8.820	1.044	.998	1.010
164	137	8.440	8.710	8.450	7.700	1.032	1.001	.912
164	138	8.490	8.680	8.230	0.000	1.022	.969	0.000
164	139	8.250	8.470	8.170	7.470	1.027	.990	.905
164	140	8.020	8.370	7.990	8.390	1.044	.996	1.046
164	141	8.280	8.680	8.300	8.350	1.048	1.002	1.008
164	142	8.170	8.090	8.150	8.430	.990	.998	1.032
164	143	7.970	8.440	7.990	8.690	1.059	1.003	1.090
164	144	8.150	7.840	0.000	0.000	.962	0.000	0.000
164	145	6.520	7.010	6.710	6.700	1.075	1.029	1.028
164	146	8.810	8.910	8.600	9.000	1.011	.976	1.022
164	147	8.710	8.850	8.500	8.260	1.016	.976	.948
164	148	8.700	8.530	0.000	0.000	.980	0.000	0.000
164	149	8.770	9.270	8.860	8.480	1.057	1.010	.967
164	150	8.050	8.970	8.880	8.780	1.114	1.103	1.091
164	151	6.360	6.000	6.570	6.520	.943	1.033	1.025
164	152	9.020	8.940	0.000	0.000	.991	0.000	0.000
164	153	9.120	8.980	8.980	9.500	.985	.985	1.042
164	154	9.070	8.890	8.890	8.830	.980	.980	.974
164	155	8.770	9.030	8.810	8.700	1.030	1.005	.992
164	156	8.760	8.910	0.000	0.000	1.017	0.000	0.000
164	157	7.710	7.590	0.000	0.000	.984	0.000	0.000
164	158	8.730	8.900	8.430	8.780	1.019	.966	1.006
164	159	8.730	9.000	8.510	8.730	1.031	.975	1.000
164	160	8.830	9.050	8.360	8.880	1.025	.947	1.006
164	161	8.740	8.940	8.210	8.640	1.023	.939	.989
164	162	8.410	8.750	8.090	9.350	1.040	.962	1.112
164	163	9.120	9.030	8.470	8.140	.990	.929	.893
164	164	8.840	9.000	8.640	8.500	1.018	.977	.962
164	165	9.140	9.200	8.700	8.400	1.007	.952	.919
164	166	7.720	7.750	7.310	7.110	1.004	.947	.921
164	167	6.420	6.370	5.940	6.000	.992	.925	.935
164	168	8.640	8.760	8.460	8.160	1.014	.979	.944
164	169	8.490	9.040	8.770	8.350	1.065	1.033	.984
164	170	8.640	8.980	8.550	8.390	1.039	.990	.971
164	171	9.050	9.170	8.750	8.540	1.013	.967	.944
164	172	9.030	9.230	8.720	8.390	1.022	.966	.929
164	173	8.830	9.170	8.680	8.570	1.039	.983	.971
164	174	7.320	7.500	6.960	6.880	1.025	.951	.940
164	175	8.740	8.860	7.770	8.580	1.014	.889	.982
164	176	5.960	5.310	0.000	0.000	.891	0.000	0.000
164	177	7.470	7.150	7.210	7.000	.957	.965	.937
164	178	7.180	6.670	6.950	7.180	.929	.968	1.000
164	179	8.930	8.380	8.340	8.110	.938	.934	.908
164	180	8.840	8.770	8.770	8.950	.992	.992	1.012
164	181	8.950	8.740	8.750	8.770	.977	.978	.980
164	182	9.200	9.180	8.840	8.610	.998	.961	.936
164	183	9.160	9.300	8.870	8.580	1.015	.968	.937
164	184	9.340	9.360	8.950	8.580	1.002	.958	.919
164	185	9.180	9.390	8.970	8.630	1.023	.977	.940
164	186	9.310	9.370	8.990	8.600	1.006	.966	.924
164	187	7.270	7.470	7.140	6.900	1.028	.982	.949
164	188	6.920	6.980	0.000	0.000	1.009	0.000	0.000

Table 58

PRINTOUT OF CHANNEL NOISE OBSERVATIONS

SURV.	CRUI.	DAY	CH-1	CH-2	CH-3	CH-4	CH-5	CH-6
16	1	2	21	24	24	17	11	13
16	1	3	28	30	30	18	11	18
16	1	4	86	36	48	30	32	20
16	1	5	30	33	38	27	34	28
16	1	6	34	36	39	32	36	40
16	1	7	34	30	30	22	17	41
16	1	8	30	37	28	30	18	37
16	1	9	41	35	36	28	24	41
16	1	10	29	34	29	23	15	38
16	1	11	30	28	31	28	20	38
16	1	12	37	28	33	30	21	37
16	1	13	21	25	28	18	15	34
16	1	14	18	25	17	26	21	34
16	1	15	14	33	19	18	26	25
16	1	17	25	33	29	27	27	27
16	1	18	28	27	33	35	22	29
16	2	22	10	11	21	16	21	28
16	2	23	23	30	44	39	27	35
16	2	24	25	28	37	18	26	37
16	2	25	30	44	48	48	54	94
16	2	31	50	16	62	20	29	41
16	2	39	50	25	77	36	35	47
16	2	33	51	30	65	38	33	61
16	2	34	38	40	49	36	35	44
16	2	35	54	41	44	33	36	41
16	2	36	42	26	47	30	51	47
16	2	37	31	33	47	34	33	46
16	2	38	30	31	34	33	32	28
16	2	39	41	35	43	33	30	44
16	2	40	30	29	40	29	30	35
16	2	41	46	39	46	41	41	43
16	2	42	42	43	52	43	42	36
16	2	43	44	51	56	44	44	33
16	2	44	45	43	55	46	44	56
16	2	45	43	41	47	41	41	38
16	2	46	45	58	50	35	55	42
16	2	47	45	27	30	26	25	33
16	2	48	40	50	32	23	30	30
16	3	62	53	45	42	45	39	52
16	3	63	25	22	22	22	26	40
16	3	64	20	25	25	25	27	35
16	3	65	20	25	30	20	30	30
16	3	66	23	27	19	26	25	40
16	3	67	20	18	20	23	21	26
16	3	68	27	32	25	27	32	42
16	3	69	29	30	21	20	28	31
16	4	74	30	18	16	27	27	20
16	4	75	27	18	14	18	16	27
16	4	76	26	25	24	29	28	33
16	4	77	20	20	20	16	20	65
16	4	78	25	20	21	21	25	31
16	4	79	33	23	27	21	26	35
16	4	80	44	17	19	19	24	28
16	4	81	33	20	20	20	22	29
16	4	82	24	22	20	18	19	25
16	4	83	38	28	26	24	30	32
16	4	84	38	18	21	19	22	27
16	4	85	45	30	27	30	35	40
16	4	87	28	25	23	23	28	32
16	4	88	48	17	20	22	26	39

	VAR NO	MEAN	S.D.	S.E. OF MEAN	SAMPLE	MAXIMUM	MINIMUM	RANGE
Survey 16	1	43.6500	27.4559	3.5445	60	88.0000	2.0000	86.0000
	2	33.9500	12.4552	1.6080	60	86.0000	10.0000	76.0000
	3	29.8333	9.4352	1.2181	60	58.0000	11.0000	47.0000
	4	33.6667	13.7344	1.7731	60	77.0000	14.0000	63.0000
	5	27.7667	8.4359	1.0891	60	48.0000	16.0000	32.0000
	6	28.6667	9.5503	1.2329	60	55.0000	11.0000	44.0000
	7	36.6333	12.1697	1.5711	60	94.0000	13.0000	81.0000
Cr 1	8	31.6250	16.1075	4.0269	16	86.0000	14.0000	72.0000
	9	30.8750	4.3186	1.0796	16	37.0000	24.0000	13.0000
	10	30.7500	7.5322	1.8830	16	48.0000	17.0000	31.0000
	11	25.5625	5.5972	1.3993	16	35.0000	17.0000	18.0000
	12	21.8750	7.6234	1.9059	16	36.0000	11.0000	25.0000
	13	31.2500	8.7445	2.1861	16	41.0000	13.0000	28.0000
Cr 2	14	38.8636	10.7628	2.2946	22	54.0000	10.0000	44.0000
	15	35.0455	11.2736	2.4035	22	58.0000	11.0000	47.0000
	16	46.6364	12.2923	2.6207	22	77.0000	21.0000	56.0000
	17	33.7273	8.9239	1.9026	22	48.0000	16.0000	32.0000
	18	36.0909	9.3702	1.9977	22	55.0000	21.0000	34.0000
	19	42.6818	14.1434	3.0154	22	94.0000	28.0000	66.0000
Cr 3	20	27.1250	10.9992	3.8888	8	53.0000	20.0000	33.0000
	21	28.0000	8.1416	2.8785	8	45.0000	18.0000	27.0000
	22	25.5000	7.5404	2.6659	8	42.0000	19.0000	23.0000
	23	26.0000	8.1064	2.8661	8	45.0000	20.0000	25.0000
	24	28.5000	5.3719	1.8992	8	39.0000	21.0000	18.0000
	25	37.0000	8.2635	2.9216	8	52.0000	26.0000	26.0000
Cr 4	26	32.7857	8.6485	2.3114	14	48.0000	20.0000	28.0000
	27	21.5000	4.1649	1.1131	14	30.0000	17.0000	13.0000
	28	21.2857	3.8316	1.0240	14	27.0000	14.0000	13.0000
	29	21.9286	4.2511	1.1361	14	30.0000	16.0000	14.0000
	30	24.8571	4.8810	1.3045	14	35.0000	16.0000	19.0000
	31	33.0714	10.6154	2.8371	14	65.0000	20.0000	45.0000

Amplifier AS626 X
Cr1 - Cr2

Amplifier PT 700
Cr3 - Cr4

Table 59

BUREAU OF MINERAL RESOURCES

MARINE GEOPHYSICAL SURVEY
SOUTH COAST OF AUSTRALIA

079947

FIELD REPORT

04/1972 to 07/1972

Survey No. 16

BUREAU OF MINERAL RESOURCES

MARINE GEOPHYSICAL SURVEY

SOUTH & NORTH WEST COASTS OF AUSTRALIA

FIELD REPORT

July, 1972 to September, 1972

SURVEY No. 17

Compagnie Generale de Geophysique
39 Booroondara Street, REID 2601

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INTRODUCTION

Survey 17 consists of 4 cruises. The geographical limits of each cruise are approximately:- (Fig. A, Plates 44, 45, 46)

CRUISE 1:

North : 26° South
South : 36° South
East : 120° East
West : 108° East

CRUISE 2:

North : 20° South
South : 32° South
East : 118° East
West : 107° East

CRUISE 3:

North : 16° South
South : 20° South
East : 122° East
West : 109° East

CRUISE 4:

North : 14° South
South : 25° South
East : 122° East
West : 113° East

During Survey 17, the different locations of the shore station were: (Fig. B)

- Albany (W.A.) From day 01 to 09
- Onslow (W.A.) From day 16 to the end of the survey.

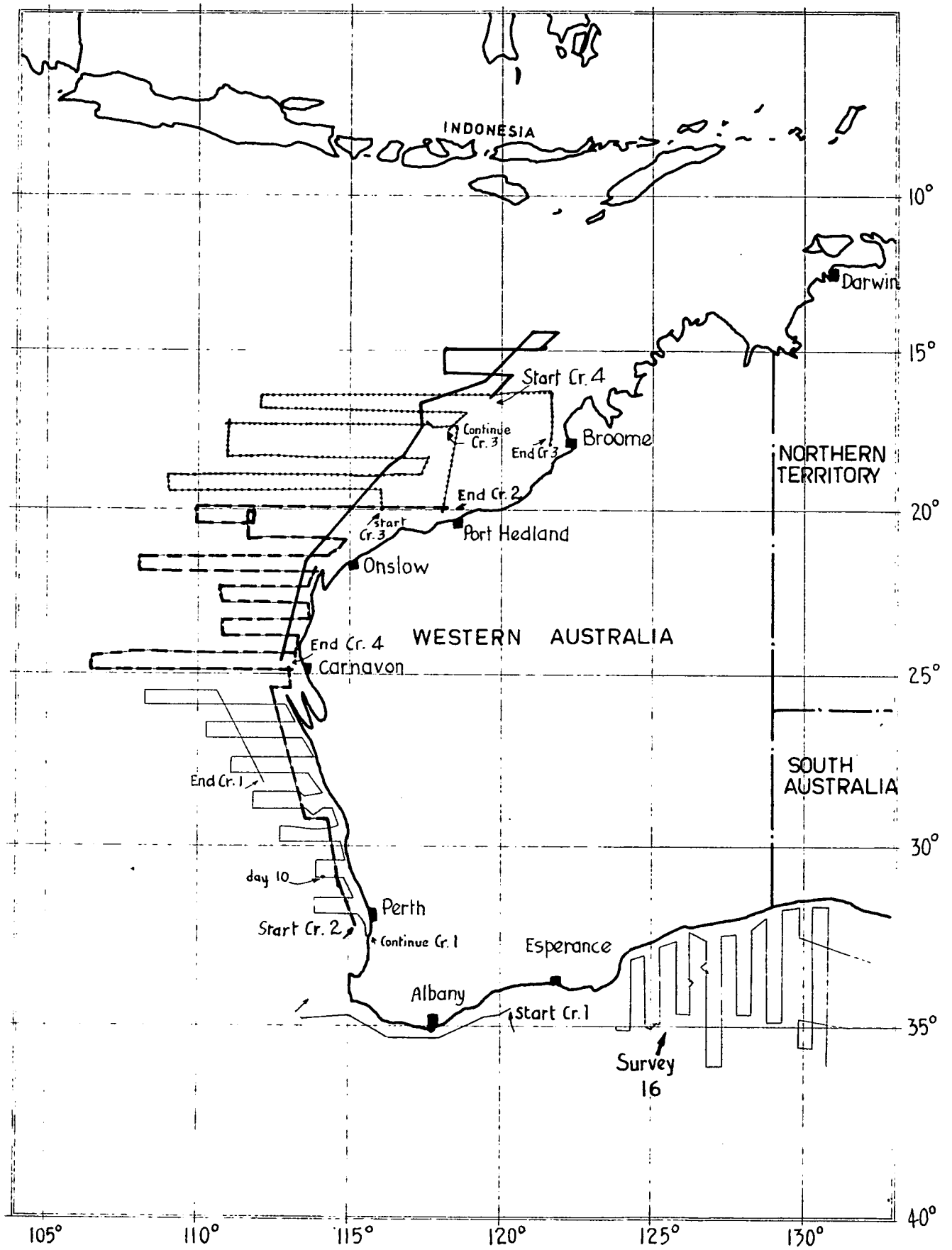
FIG A

LOCATION SKETCH for

SOUTH, WEST and NORTH COASTS OF AUSTRALIA

SCALE 1 / 20000000

SURVEY 17



SUMMARY OF OPERATIONS

Cruise 1 (Fig. A)

The M/V Lady Christine left Esperance (W.A.) on 04th July, 1972 to 0600 LT

Cruise 1 began on 04th July at 1510 GMT, BMR Day 02.

The working periods were as follows:-

- From day 021510 to 040940 = Stoppage for bad weather
- From day 081420 to 201000 = Stoppage for bad weather.

It is to be noted that a call in Bunbury occurred on day 08 from 0045 to 0815 during the bad weather stand-by. The ship berthed at Freemantle on 25th July, 1972 at 0700 LT.

Cruise 2 (Fig. A)

The M/V Lady Christine left Freemantle (W.A.) on 27th July, 1972 at 1800 LT. This start was delayed from 1400 LT by a breakdown in the engine room.

Cruise 2 began on 28th July at 1920 GMT, BMR Day 25.

The working period were as follows:-

- From day 251920 to 260700 : Stoppage for Fishing nets in main cable
- From day 261300 to 281800 : Stoppage for main engine troubles
- From day 292100 to 331800 : Stoppage for disembarkation of BMR staff
- From day 340840 to 380420 : Stoppage for main engine troubles
- From day 380630 to 420400 : Stoppage for PDP 8 Computer troubles
- From day 421530 to 462130 : End of cruise 2

The ship berthed at Port Hedland (W.A.) on 18th August, 1972.

Cruise 3 (Fig. A)

The M/V Lady Christine left Port Hedland (W.A.) on 21st August, 1972 at 0200 LT. This start was delayed from the 20th August 1800 LT by difficulties in adjusting the cross-gyro device in

the gravity room.

Cruise 3 began on 21st August 1972 at 1200 GMT, BMR Day 50.

The working periods were as follows:-

- From day 501200 to 540530 : Stoppage for main cable troubles
- From day 541350 to 572300 : Stoppage for main engine troubles
- From day 580620 to 600920 : Stoppage for main engine troubles
- From day 601300 to 611650 : Sail to Port Hedland - departure was then delayed by main engine troubles
- From day 642350 to 711040 : End of Cruise 3.

The ship berthed at Broome on 12th September 1972 at 0045 LT.

Cruise 4 (Fig. A)

The M/V Lady Christine left Broome (W.A.) on 14th September 1972 at 1100 LT.

Cruise 4 began on 15th September at 0040 GMT, BMR Day 75.

The working periods were as follows:-

- From day 750040 to 770500 : Stoppage for gravity meter failure
- From day 800000 to 850500 : End of Cruise 4

The ship berthed at Carnavon (W.A.) on 25th sSeptember, 1972.

Statistics (Table 1)

Statistical table 1 gives the final information

* Cruise 1

TT = Total time : $586^{h}20$ = 0.81 month

WM = Working Mileage : 2840 Nautical miles

The breakdown of TT in percentages is as follows:

STATISTICS

Survey / Cruise	Total time at sea TTS	Working time	Travel time	Supply boat	Bad weather	Major breakdown	Port	Total time TT
17 / 1	497.30	326.10	42.15	0	125.05	04.00	88.50	586.20
17 / 2	515.40	444.50	24.10	0	0	46.40	68.20	584.00
17 / 3	480.15	404.20	56.35	06.00	0	13.20	103.25	583.40
17 / 4	273.30	177.20	37.55	0	0	58.15	12.30	286.00
TOTAL	1766.55	1352.40	160.55	06.00	125.05	122.15	273.05	2040.00
MONTHES	2.454	1.879	0.223	0.008	0.174	0.170	0.379	2.833
REDUCED TO 1 MONTH	0.866	0.663	0.079	0.003	0.061	0.060	0.134	1
DAY / MONTH	25.98	19.89	2.37	0.09	1.83	1.80	4.02	30
TTS = 100%	100	76.56	9.12	0.35	7.04	6.93	-	-
TT = 100 %	86.6 TTS + PORT = TT	66.3	7.9	0.3	6.1	6.0	13.4	100

Table 1

(TT = Total time at sea plus time at port)

TTS = Total time at sea = 84.8% of TT
P = Port = 15.2% of TT

TTS can be further divided into:

W = Working time	= 55.5% of TT	= 65.5% of TTS
T = Travel time	= 7.2% of TT	= 8.5% of TTS
SB = Supply boat	= 0% of TT	= 0% of TTS
BW = Bad weather	= 21.5% of TT	= 25.3% of TTS
MB = Major breakdown	= 0.6% of TT	= 0.7% of TTS

* Cruise 2

TT = $584^{h}00$	= 0.81 months	
WM =	= 3759 nautical miles	
TTS =	= 88.3% of TT	
P = Port	= 11.7% of TT	
W = 76.2% of TT	= 86.3% of TTS	
T = 4.1% of TT	= 4.7% of TTS	
SB = 0% of TT	= 0% of TTS	
BW = 0% of TT	= 0% of TTS	
MB = 8.0% of TT	= 10.0% of TTS	

* Cruise 3

TT = $583^{h}40$	= 0.81 months	
WM	= 3215 nautical miles	
TTS	= 82.3% of TT	
P	= 17.7% of TT	
W = 69.3% of TT	= 84.2% of TTS	
T = 9.7% of TT	= 11.8% of TTS	
SB = 1.0% of TT	= 1.2% of TTS	
BW = 0% of TT	= 0% of TTS	
MB = 2.3% of TT	= 2.8% of TTS	

* Cruise 4

TT = $286^{h}00$	=	0.40 months
WM =	=	1379 nautical miles
TTS	=	95.6% of TT
P	=	4.4% of TT
W = 62.0% of TT	=	64.8% of TTS
T = 13.2% of TT	=	13.9% of TTS
SB = 0% of TT	=	0% of TTS
BW = 0% of TT	=	0% of TTS
MB = 20.4% of TT	=	21.3% of TTS

Survey 16 : General Statistics

Total duration of Survey	: $2040^{h}00$	=	2.83 months
Total working time	: $1352^{h}40$	=	1.88 months
Total working mileage	:		11193 nautical miles
Average speed during WT	:		8.27 knots

Table 1 gives the following information (All the results are reduced to 1 month):

TTS	=	25.98 days
P	=	4.02 days

TTS is further divided into:

WT	=	19.89 days
T	=	2.37 days
SB	=	0.09 days
BW	=	1.83 days
MB	=	1.80 days

OVERALL OPERATION OF EACH SYSTEM

1. DATA ACQUISITION SYSTEM (Plate 5)

A new D.A.S. programme called JOY was used instead of MISER. This new programme computed: Free-air anomaly, Magnetism values, corrected from IGRF and half-hour positions.

Mr. Ian Briggs of BMR stayed on board the ship during the whole of Cruise 1 for adjustments and modifications of JOY which operated well, without major problems.

Cruise 1: Setting up of new programme JOY. Only 1 desynchronisation occurred on day 08, 1215 to 1220.

Cruise 2: Before leaving Carnavon, final modifications of JOY were made. The programme operated satisfactorily throughout the Cruise. One desynchronisation due to the STM2 clock happened on day 35, 1156 to 1210.

Cruise 3: The programme ran correctly throughout the cruise.

Cruise 4: As the programme failed on day 83 at 1230, no acquisition was done to 1300. No other problem arose until the end of the cruise

2. SEISMIC (Plates 3, 4, 41)

2.1 Seismic Container (Plates 3, 41)

2.1.1 Seismic Amplifier SIE PT 700 (Plate 41)

* No problems encountered during Cruises 1 and 2
* During Cruise 3, because the air-conditioning failed in the seismic cab, the amplifiers became too hot. They were alternatively changed with the spare one previously cooled down. As a consequence of the bad functioning of the air-conditioning, a slight 60 HZ interference was noticed on records.
* Despite work done by an air-conditioning expert during the call to Broome, only one unit remained working correctly,

obliging Cruise 4 to be shortened.

2.1.2 Ampex Recorder

* Cruise 1 : A new Ampex Recorder was received from Canberra and exchanged with the one previously in use.

* Cruise 2 : Another new recorder was received from Canberra. As the tape speed regulation showed malfunctions it was sent back to Canberra before leaving Freemantle. A few troubles were experienced from day 41.1107 to 1602, due to a faulty connection, "shallow cable" was not recorded

- Day 43.0708 to 0734 : recorder stoppage
- Day 45.0747 to 0944 : tape speed regulation breakdown.

* Cruise 3 : The Ampex recorder was exchanged with another one received from Canberra. It operated satisfactory.

* Cruise 4 : No problems throughout the Cruise.

2.1.3 Seismic Equipment Tests

New instructions were received from the Bureau for the testing of seismic equipment on 25th July, 1972. Two types of test were required to be carried out:

1. Exhaustive checks at the beginning of each Cruise to ensure that the equipment is kept at the highest dynamic range possible. An accuracy of 2% was desired in all measurements.
2. Routine checks to see that the noise level were acceptable.

* At the start of each new magnetic tape: amplifier and noise tests for PT 700.

* To be done every two hours:
  - seismic cables noise test
  - check of leakage, continuity of cables
  - checks of depth of electrodes and cables.

New instructions of playback, monitoring were also received; in particular a special check of ten minute time marks was done. On the playback recorder, this signal came from that recorded on the magnetic tape.

2.1.4 Seismic Clock

This supplies the 100 HZ reference. It operated satisfactorily during the whole of Survey 17

2.1.5 SM x 3 Delay Box

No problem arose.

2.1.6 EPC Recorders Model 4100

Four EPC recorders were used.

The table below gives the distribution of these recorders.

* Cruise 1:

EPC 1 : 021510 to 201000 : CH2 slow speed

EPC 2 : 021510 to 201000 : CH2 fast speed

EPC 3 : 021510 to 201000 : CH1 with shallow filters, sonobuoys

EPC 4 : 021510 to 201000 : Play-back, sonobuoys

* Cruise 2:

EPC 1 : 251920 to 462130 : CH2 slow speed

EPC 2 : 251920 to 462130 : CH2 fast speed

EPC 3 : 251920 to 260700 : Not operating

260700 to 261432 : CH1 with shallow filters

261431 to 281135 : Play-back

281135 to 321030 : CH1 with shallow filters, sonobuoys

321030 to 462130 : Play back

EPC 4 : 251920 to 260216 : Play back

260216 to 281135 : Not operating

281135 to 321030 : Play back, sonobuoys

321030 to 462130 : CH1 with shallow filters, sonobuoys

* Cruise 3:

EPC 1 : 501200 to 711040 : CH2 slow speed

EPC 2 : 501200 to 711040 : CH2 Fast speed

EPC 3 : 501200 to 711040 : Play back, sonobuoys

EPC 4 : 501200 to 711040 : CH1 with shallow filters, sonobuoys

* Cruise 4:

EPC 1 : 750040 to 850500 : CH2 slow speed

EPC 2 : 750040 to 850500 : CH2 fast speed

EPC 3 : 750040 to 750438 : Play back.

750438 to 850500 : CH1 with shallow filters, sonobuoys

EPC 4 : 750040 to 750438 : CH1 with shallow filters

750438 to 850500 : Play back, sonobuoys.

Nevertheless, few breakdowns occurred with these recorders during Survey 17. They were as follows:

* Cruise 1:

Day 030000 to 0148, breakdown EPC 3

Day 041227 to 1310, pen motor failure EPC 4

Day 081823 to 2200, breakdown EPC 4

Day 101400 to 1443, stoppage EPC 3.

Records were also stopped when cleaning OAT, or during power supply breakdown.

* Cruise 2:

Day 251920 to 260700 : breakdown EPC 3

Day 260216 to 181135 : breakdown EPC 4

Day 350515 to 1450 : breakdown EPC 4

* Cruise 3:

A new recorder was received; it was used for the display of P.B (EPC 3). There were no stoppages with EPC recorders during this Cruise.

* Cruise 4:

Few stoppages:

Day 750040 to 750438 : breakdown EPC 3

Day 750740 to 750805 : breakdown EPC 4

Day 801912 to 801923 : breakdown EPC 4

Day 841732 to 841815 : breakdown EPC 4

2.1.7 VRO 6 Camera

This piece of equipment worked without a hitch throughout the Survey.

2.1.8 Refraction Probes - Sonobuoys

The following table gives the results for the sonobuoys used during Survey 17.

	Good	Bad	Total
Cruise 1	4	1	5
Cruise 2	3	2	5
Cruise 3	5	1	6
Cruise 4	4	4	8
Survey	16	8	24

The buoys drifting into the main cable or its tail buoy are the main reasons for the poor performance.

2.2 Sparker Container (Plate 4)

The maintenance of the single O.A.T. effected simultaneously with the lengthening of the electrode was the principal cause for the halt in the operation of the sparker. The varied maintenance work represents 10^h27^m i.e. 0.77% of working time. The other significant stoppages were:

* Cruise 1: Owing to a failure of the A.C. power supply from the ship, the sparker stopped on day 15; a short circuit, whilst getting under way again, stopped the seismic operation for two hours.

* All Cruises Generally at the same time as the cleaning of the O.A.T., the O.A.T. electrodes gap was adjusted. A special adjustment was made on day 55 at 13.35 (8 minutes stoppages)

3. SOUNDERS

3.1 Elac Sounders

Only two stoppages to change faulty spare parts:

381051 to 381101

390729 to 390940

3.2 Atlas Sounders

The principal problem has been parasitic interferences upsetting the digital output of this system:

* Cruise 1: Digital values wrong for depth greater than 70 meters (Sonar Doppler interferences?)

* Cruise 2: From day 300420 to day 331800, maintenance

work was carried out to try to eliminate S.D. interference.

* Cruise 3: From 0 to 80 meters, the values, both analog and digital were satisfactory if Raytheon Sounder stopped.

3.3 Raytheon System

The quality of the recording given by this echo sounder is inferior to that which the operator is entitled to expect from such a sophisticated system. On Cruise 2, in spite of a stoppage for an hour on Day 270400, the results remained poor right to the end of the Cruise. During cruise 3, 6.5 days of checking (from 530000) were necessary to bring the data to an acceptable quality. During cruise 4, the system operated satisfactorily.

It must be pointed out that the Raytheon values were put into the D.A.S. from day 131950. Either Raytheon, or Edo, or Atlas values will be put into the D.A.S. during Survey 17.

4 - MAGNETISM

For the first cruise of this Survey, the quality of the data provided by the system was appreciably lower than expected. The installation, before departure of the second cruise of a new sensor cable made it possible to obtain data of a satisfactory quality.

* Cruise 1: Days 2 and 3 were allocated for the repair of available cables aboard ship in order to obtain recordings on the following days. Yet, because of the quality of the cables and of the meteorological conditions, the recordings were noisy until the end of the Cruise.

* Cruise 2: The new cable was installed during the port call at Freemantle; during the call at Carnavon, some lead was put on the sensor, in order to sink it deeper and decrease its sensitivity to the sea state. However, the analysis of results shows that the records seem less steady in deep water. Lead was taken out from day 352330 to 352345.

On Day 37, the noise level became too great, the kerosene was replaced (13.20 to 14.10)

On Day 39, from 15.00 to 16.00, no analog values only.

On Cruises 3 and 4, operation was satisfactory with low noise level. The only 2 anomalies to be reported were the absence of analog records on Day 50 (20.03 to 21.38) and day 68 (13.17 to 14.08).

GRAVITY RESULTS cruise : 1

DAYS	WORKING hours	Σ	FAILURES	Σ	GOOD	Σ	OUT OF CRITERIA	Σ
2	1510-2400	08.50		0		08.50		0
3	0000-2400	24.00	0000-0130	01.30	0130 to 0520 0700 to 0920 1120 to 2030 2250 to 2400	16.30	0520 - 0700 0920 - 1120 2030 - 2250	06.00
4	0000-0940	09.40		0	0000-0750	07.50	0750-0940	01.50
5	0			0		0		0
6	0			0		0		0
7	0			0		0		0
8	1420-2400	09.40		0	1420-1620 1740-2000	04.20	1620-1740 2000-2400	05.20
9	0000-2400	24.00		0	0140-1930 2040-2210	19.20	0000-0140 1930-2040 2210-2400	04.40
10	"	24.00		0	0210-1930	17.20	0000-0210 1930-2400	06.40
11	"	24.00		0	0420-1050 1630-2400	14.00	0000-0420 1050-1630	10.00
12	"	24.00		0	0450-0610 0940-2400	15.40	0000-0450 0610-0940	08.20
13	"	24.00		0		24.00		0
14	"	24.00		0		24.00		0
15	"	24.00		0		24.00		0
16	"	24.00		0		24.00		0
17	"	24.00		0		24.00		0
18	"	24.00		0		24.00		0
19	"	24.00		0		24.00		0
20	0000-1000	10.00		0		10.00		0
21			End Cruise 1					
	TOTAL	326.10	TOTAL	01.30	TOTAL	281.50	TOTAL	42.50

GRAVITY RESULTS cruise: 2

DAYS	WORKING hours	Σ	FAILURES	Σ	GOOD	Σ	OUT OF CRITERIA	Σ
25	1920-2400	04.40		0		04.40		0
26	0000-0700 1300-2400	18.00		0		18.00		0
27	0000-2400	24.00		0		24.00		0
28	0000-1800	18.00		0		18.00		0
29	2100-2400	03.00		0		03.00		0
30	0000-2400	24.00		0	0000-2000	20.00	2000-2400	04.00
31	"	24.00		0	1900-2400	05.00	0000-1900	19.00
32	"	24.00		0	0000-1100 1500-2000	16.00	1100-1500 2000-2400	08.00
33	0000-1800	18.00		0		18.00		0
34	0840-2400	15.20		0		15.20		0
35	0000-2400	24.00		0		24.00		0
36	"	24.00		0		24.00		0
37	"	24.00		0		24.00		0
38	0000-0420 0630-2400	21.50	1245-1330	00.45		21.05		0
39	0000-2400	24.00		0	0000-2200	22.00	2200-2400	02.00
40	"	24.00		0	0100-2400	23.00	0000-0100	01.00
41	"	"		0		24.00		0
42	0000-0400 1530-2400	12.30		0		12.30		0
43	0000-2400	24.00		0		24.00		0
44	"	24.00	0650-0745 2205-2225 2245-2315	01.45		22.15		0
45	"	24.00		0		24.00		0
46	0000-2130	21.30		0		21.30		0
	TOTAL	444.50	TOTAL	02.30	TOTAL	408.20	TOTAL	34.00

5 - GRAVITY (Tables 2, 3, 4 and 5)

The defective functioning of the reading lamp was at the bottom of the main trouble arising during this Survey (Cruise 3)

* Cruise 1 (Table 2)

The bad weather appreciably affected the quality of the results; besides from 160115 to 171404 the "beam position" was recorded instead of the spring tension.

* Cruise 2 (Table 3)

Two main failures:

- 381245 to 381330 : burnt amplifier on the average beam circuit

Day 44 - 06.50 to 07.45)
22.05 to 22.25) bad contact on servo motor of S.T.
22.45 to 23.15)

* Cruise 3 (Table 4)

A failure appearing and disappearing without outside intervention upset the operation of the gravity meter. Eighteen hours of data will be lost as a consequence of this failure which seemed to arise from the reading lamp. The end of Cruise port call will be devoted to efforts to resolve this problem.

* Cruise 4 (Table 5)

The reading lamp blew out; at sea a new reading has been set up, but the ship must go to Broome to do a gravity tie. Before the complete failure, several intermittent failures totalled 01.43 on Day 76 and 01.20 on Day 07. The main failure occurred at 770235. The second part of the Cruise will be satisfactory.

GRAVITY RESULTS cruise : 3

DAYS	WORKING hours	Σ	FAILURES	Σ	GOOD	Σ	OUT OF CRITERIA	Σ
50	12.00-2400	12.00		0		12.00		0
51	0000-2400	24.00	0210-0500	02.50		21.10		0
52	"	24.00		0		24.00		0
53	"	24.00		0		24.00		0
54	0000-0530 1350-2400	15.40		0		15.40		0
55	0000-2400	24.00		0		24.00		0
56	"	24.00		0	0000-1415	14.15	1415-2400	09.45
57	0000-2300	23.00		0		18.40	0100-0220 0320-0420 0610-0710 1200-1300	04.20
58	0620-2400	17.40		0		17.40		0
59	0000-2400	24.00	1720-1900 2315-2400	02.25		21.35		0
60	0000-0920 1300-2400	20.20	0000-0050 0205-0355	02.40		17.40		0
61	0000-1650	16.50		0		16.50		
62		0						
63		0						
64	2350-2400	00.10		0		00.10		0
65	0000-2400	24.00		04.09	0000 to 0002, 0010 to 0638 0650 to 0838, 0845 to 1010 1114 to 1145, 1425 to 1917 1923 to 2400	19.51		0
66	"	24.00	0220-0230 0455-0550 0618-0718	02.05	0000 to 0210, 0230 to 0455 0550 to 0618, 0718 to 1450 1700 to 1825, 1925 to 2040	15.25	1450-1700 1825-1925 2040-2400	06.30
67	"	24.00	0351 to 0428 0700 to 0828 0932 to 1020 2130 to 2228	03.51	1110-2130 2228-2400	11.52	0000-0351 0428-0700 0828-0932 1020-1110	08.17
68	"	24.00		0		24.00		0
69	"	24.00		0		24.00		0
70	"	24.00		0		24.00		
71	0000-1040	10.40		0		10.40		0
	TOTAL	404.20	TOTAL	18.00	TOTAL	357.28	TOTAL	28.52

GRAVITY RESULTS cruise: 4

DAYS	WORKING hours	Σ	FAILURES	Σ	GOOD	Σ	OUT OF CRITERIA	Σ
75	0040-2400	23.20		0		23.20		0
76	0000-2400	24.00		01.49	0000-0723 0753-0931 1000-2310	22.11		0
77	0000-0500	05.00	0000-0120 0345-0500	02.35	0120-0345	02.25		0
78		0						
79		0						
80	0000-2400	24.00		0		24.00		0
81	"	24.00		0		24.00		0
82	"	24.00		0		24.00		0
83	"	24.00		0		24.00		0
84	"	24.00		0	0000-1805 1940-2400	22.25	1805-1940	01.35
85	0000-0500	05.00		0		05.00		0
	TOTAL	177.20	TOTAL	04.24	TOTAL	171.21	TOTAL	01.35

* Gravity Results

	In Criteria	Out of Criteria	Failure
Cruise 1	281.50	42.50	01.30
in % of WT	86.4%	13.1%	0.5%
Cruise 2	408.20	34.00	02.30
in % of WT	91.8%	7.6%	0.6%
Cruise 3	357.28	22.52	18.00
in % of WT	89.7%	5.7%	0.6%
Cruise 4	171.21	01.35	04.24
in % of WT	96.6%	0.9%	0.5%
Survey	1218.59	101.17	26.24
in % of WT	90.5%	7.5%	2.0%

6 - NAVIGATION

6.1 Autopilot

Two small failures during Cruise 1

Day 13.02.10 to 13.03.00 : fuses in steering

Day 13.03.15 to 13.06.15 : short circuit of a lamp on the bridge

Apart from this incident, this piece of equipment worked satisfactorily throughout the Cruise.

6.2 Gyro Compass

Operated satisfactorily.

6.3 Navigation Clock

Few problems with the clock during this Survey.

* Cruise 2 : no time break from 35.11.56 to 35.12.10
* Cruise 4 : clock was running too fast from 81.06.30 to 81.07.30.

6.4 Sin-Cos Potentiometer

The results provided by this system are generally unreliable or poor.

6.5 Sagem

Some problems during Cruise 3: the difference of 3 to 4 degrees between the gyro compass and the recorded heading was sometimes notable, and a re-adjustment was carried out.

6.6 V.L.F. and Omega Station (Fig. 39, 40)

The results of the different V.L.F. stations are of inequal value according to the place of transmission and reception, and the time of reception.

* Cruise 1: The following stations were recorded:
  - NWC: owing to the neighbourhood of the station, the signal was saturated.
  - NPM, NPG, GBR : no results
  - NAA: give results sometimes; but the signal did not seem to come the right way.
* Cruise 2: The following stations were recorded:
  - NWC, NDT : good reception
  - NPG, GBR : worked occasionally
  - NPM, NAA : unreliable

On Day 39.09.40, VLF was stopped at the request of BMR to bring in some modifications:

Fig. 39

GOOD RECEPTIONS
V . L . F . Cruise : 1

DAYS	N W C	N D T				
2	15.00 — 24.00	15.00 — 22.00				
3	01.40 — 23.00	07.40 — 23.00				
4	00.00 — 24.00	00.00 — 24.00				
5						
6						
7						
8	13.30 — 22.20	13.30 — 22.20				
9	00.00 — 24.00	00.00 — 24.00				
10	00.00 — 23.00	07.20 — 22.20				
11	00.00 — 24.00	00.00 — 24.00				
12	00.00 — 24.00	00.00 — 24.00				
13	00.00 — 24.00	00.00 — 24.00				
14	00.00 — 24.00	00.00 — 24.00				
15	00.00 — 24.00	00.00 — 24.00				
16	00.00 — 24.00	00.00 — 24.00				
17	00.00 — 24.00	07.00 — 24.00				
18	00.00 — 24.00	00.00 — 24.00				
19	00.00 — 24.00	00.00 — 24.00				
20	00.00 — 10.00	00.00 — 10.00				

GOOD RECEPTIONS
V . L . F . Cruise : 2

Fig. 40

DAYS	NDT	NAA	NWC	GBR	NPG	NPM
25	19.00 — 24.00	23.00 — 24.00	19.00 — 24.00			
26	01.30 — 23.00	01.30 — 09.00	01.30 — 23.00			
27	00.00 — 24.00	20.46 — 22.06	00.00 — 24.00	20.46 — 22.06		
28	00.00 — 18.00		00.00 — 18.00	08.30 — 11.00	07.10 — 11.00	
29	21.00 — 24.00		21.00 — 24.00	22.00 — 24.00	22.00 — 24.00	
30	00.00 — 21.00		00.00 — 24.00	00.00 — 02.30	00.00 — 02.30	
31	08.00 — 24.00	06.30 — 11.00	00.00 — 24.00	06.30 — 11.00		
32	00.00 — 24.00		00.00 — 24.00	09.00 — 11.30		
33	00.00 — 18.00		00.00 — 18.00			
34	08.00 — 24.00		08.00 — 24.00			
35	00.00 — 24.00		00.00 — 24.00	22.00 — 24.00		
36	00.00 — 24.00		06.00 — 24.00	00.00 — 03.00		
37	00.00 — 24.00		00.00 — 24.00		10.00 — 13.10	
38	00.00 — 24.00		00.00 — 24.00	08.00 — 24.00	10.00 — 24.00	08.00 — 11.00
39	00.00 — 11.00		00.00 — 11.00	00.00 — 11.00		
40						
41						
42						
43						
44						
45						
46						

- fix both Speedomax recorders at 100% of their chart width
- settle in 5 receivers which will record:
  1. NWC
  2. NDT
  3. NPM
  4. GBR
  5. Omega Station: Aldra, Haiku, Trinidad
- Tune the last receiver to monitor each of the VLF and Omega stations for 3 hours. The modifications were finished on day 46 and the V.L.F. was recorded again at 15.30 on this day.

* Cruise 3 In order to get comparison with previous surveys, VLF and Omega Stations were recorded as follows:

- A recorder for each of NWC, NDT, NPM and GBR and another one for Aldra, Haiku, Trinidad
- Aldra and Trinidad: gave few results at the beginning of the cruise Very quickly, the ship diurnal became unuseable.
- Haiku and NPM: gave no results
- GBR, though the ship diurnal was wide, the results were correct
- NDT: gave good data
- NWC: very good

* Cruise 4: Similar results to those of Cruise 3.

Tables 39, 40 give times of poor reception for VLF and Omega Stations (For Cruise 1 and 2)

6.7 Satellite Navigation

6.7.1 Equipment

The only trouble in the system was caused by teletype ASR33. On Day 42, from 04.00 to 15.30, it was impossible to replay the satellite majority voted data tapes; first the failure was attributed to the PDP 8. In fact, it was due to a faulty key of the TTY.

* Cruise 2: Two stoppages occurred as a consequence of failures of the power supply from the ship (52.01.39 to 52.01.48 and 61.05.12 to 61.05.18) One more stoppage was due to the failure of the TTY punch (50.14.00 to 50.15.00)

6.7.2 Results

The quality of fixes recorded during Survey 17 is shown in the following tables and figures

* Plot of raw and smoothed frequency of satellite fixes:

Cruise 1	Fig. No. 1, 2
Cruise 2	Fig. No. 3, 4
Cruise 3	Fig. No. 5, 6
Cruise 4	Fig. No. 7

* List of satellite fixes given for each Satellite used

- first column is : satellite fix time
- second column is : raw frequency
- third column is : smoothed frequency
- fourth column is : weight given by the programme to the satellite fix.

Cruise 1	Table No. 6
Cruise 2	Table No. 7
Cruise 3	Table No. 8
Cruise 4	Table No. 9

* List of satellite fixes given in increasing time order

- first column is : smoothed frequency
- second column is : raw frequency
- third column is : weight given by navigator on board M/V Lady Christine (function of Satellite fix quality)
- fourth column is : elevation
- fifth column is : number of satellite
- sixth column is : satellite fix time
- seventh column is : Survey number
- eighth column is : Difference smoothed - raw frequency

Cruise 1	Tables No. 10, 11
Cruise 2	Tables No. 12, 13
Cruise 3	Tables No. 14, 15
Cruise 4	Tables No. 16.

6.8 Sonar Doppler, Chernikeeff Log, Pressure Log

6.8.1 Sonar Doppler

The Sonar Doppler stopped only when the power supply of the ship stopped.

Fig. 1

PLOT OF RAW AND SMOOTHED OFFSET FREQUENCIES OF

SATELLITE FIXES FOR

SURVEY 17/1

SCALE IS .10 HERTZ TO ONE PRINT POSITION.

SATELLITE NO 12 HAS VALUE 32071.50 AT ORDINATE 10 AND PLOT CODE -A-.
SATELLITE NO 13 HAS VALUE 31990.10 AT ORDINATE 30 AND PLOT CODE -B-.
SATELLITE NO 14 HAS VALUE 32070.60 AT ORDINATE 50 AND PLOT CODE -C-.
SATELLITE NO 15 HAS VALUE 32034.30 AT ORDINATE 70 AND PLOT CODE -D-.
SATELLITE NO 18 HAS VALUE 32067.00 AT ORDINATE 90 AND PLOT CODE -E-.

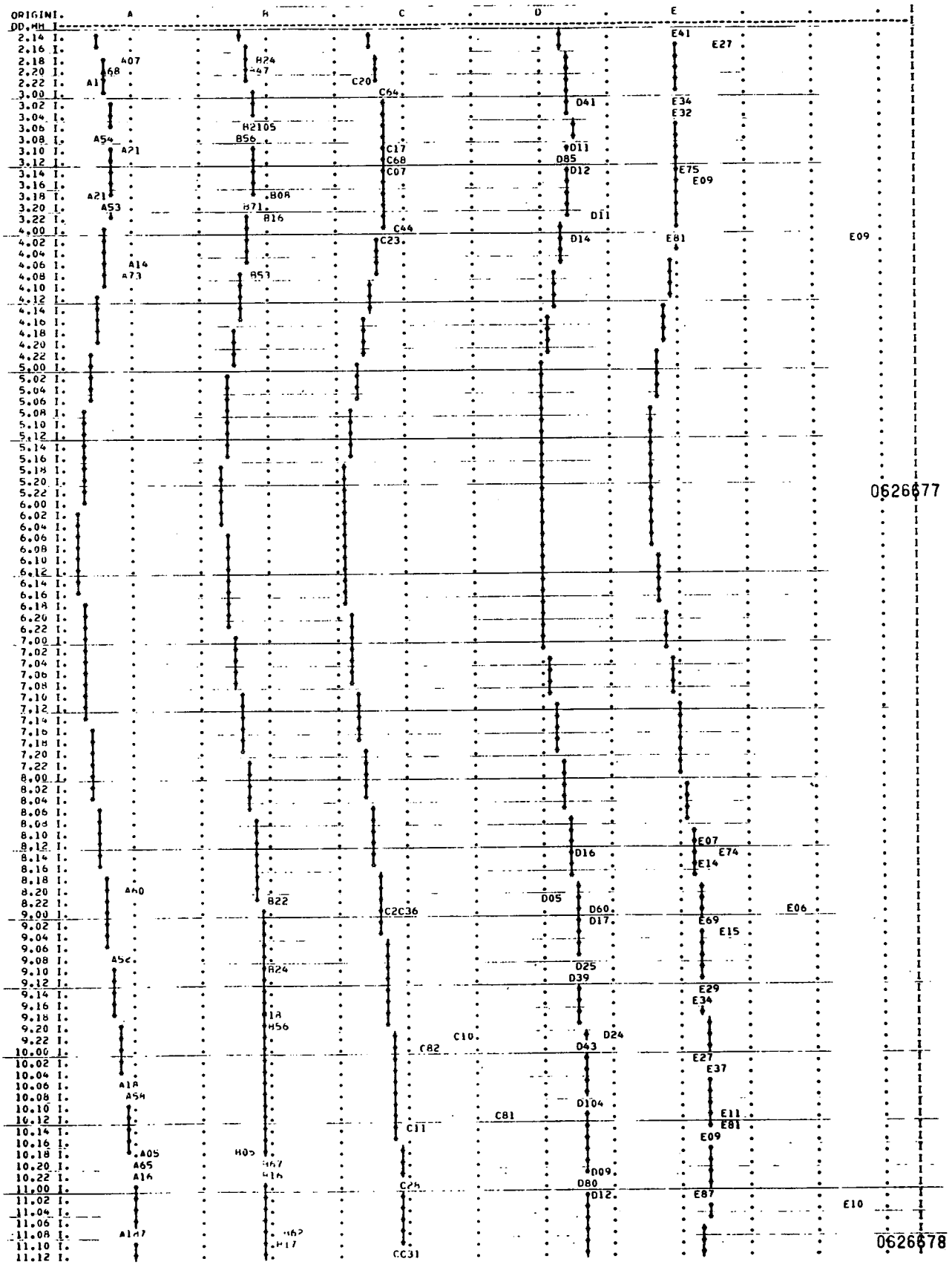
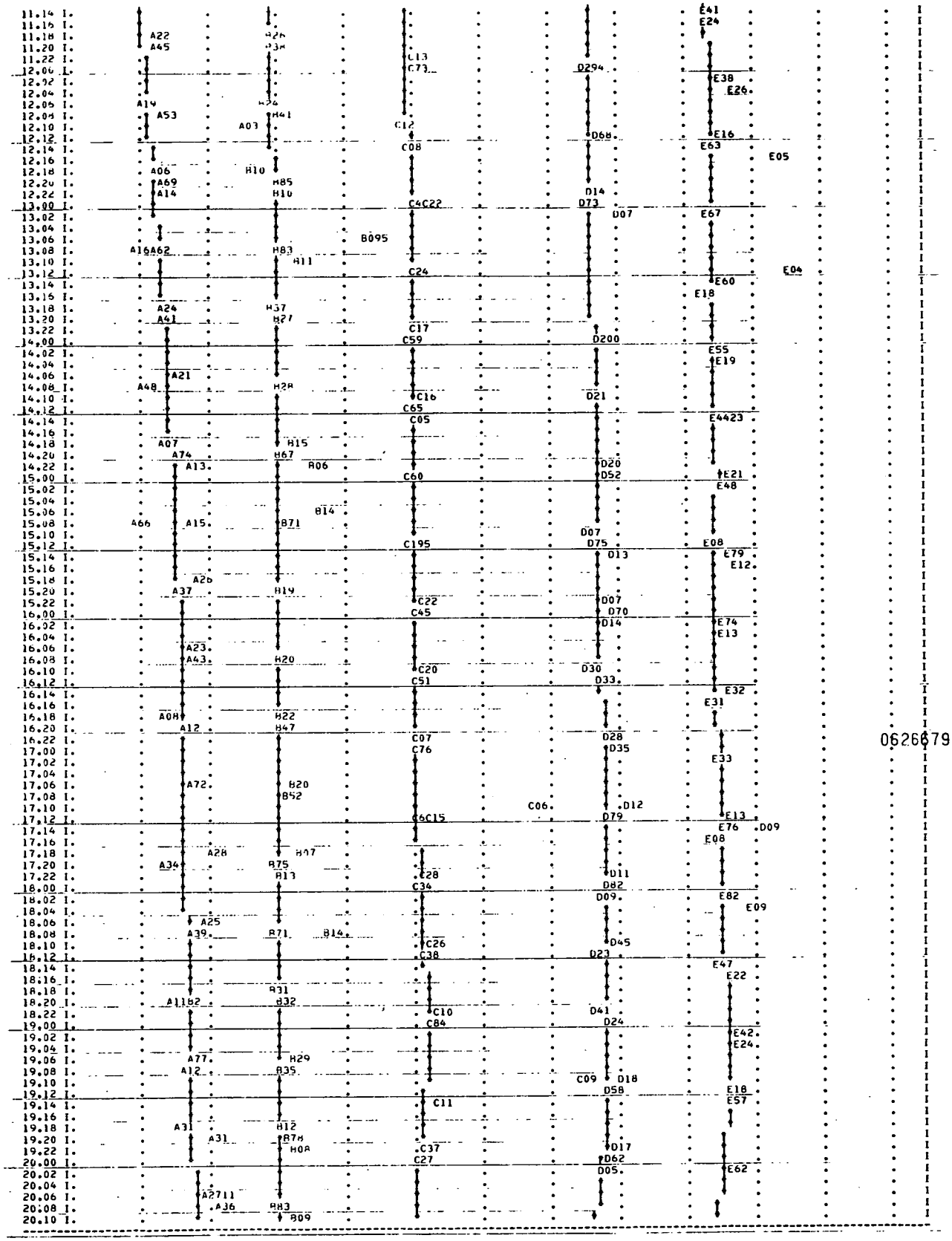


Fig. 2



0626679

Fig. 3

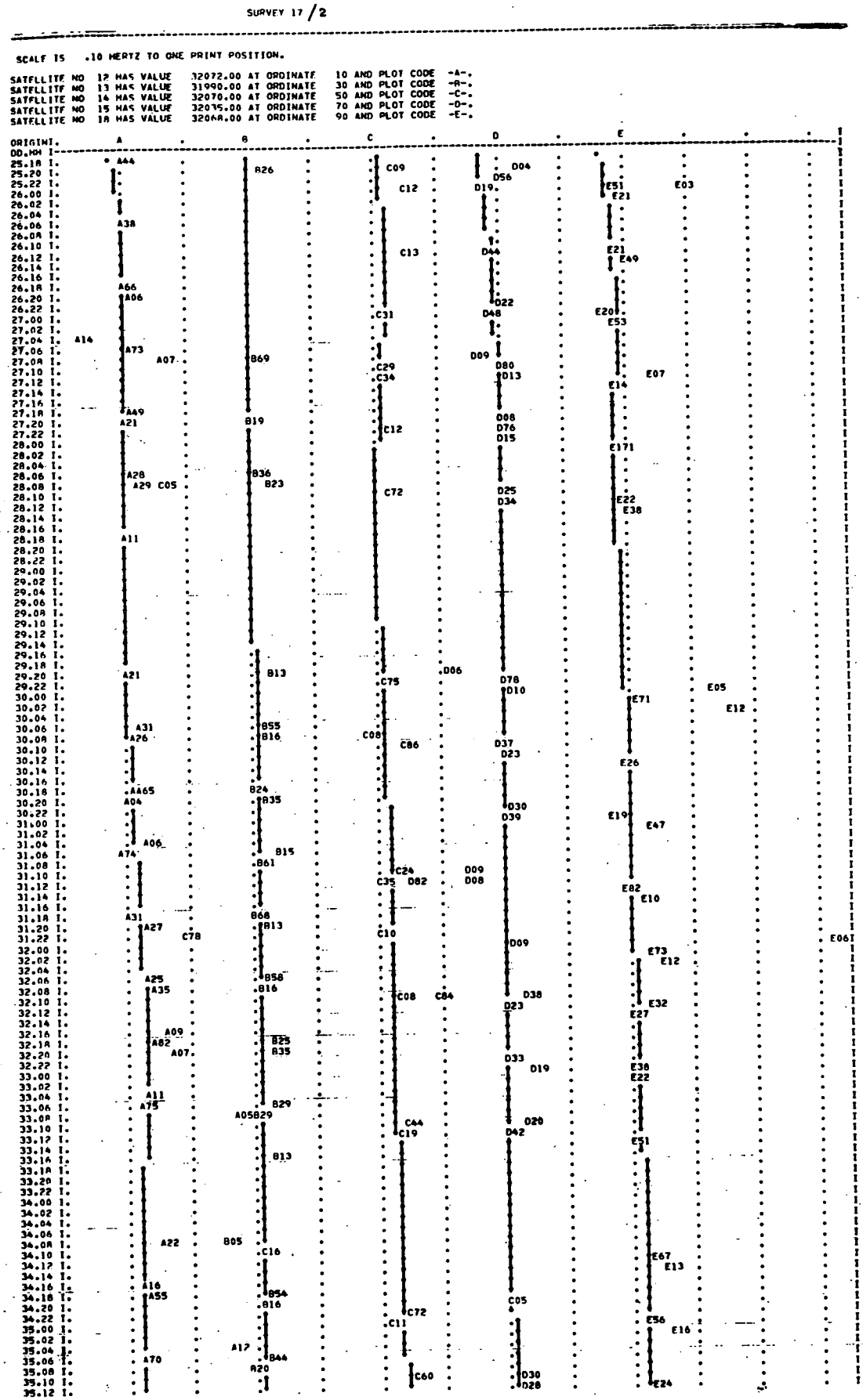
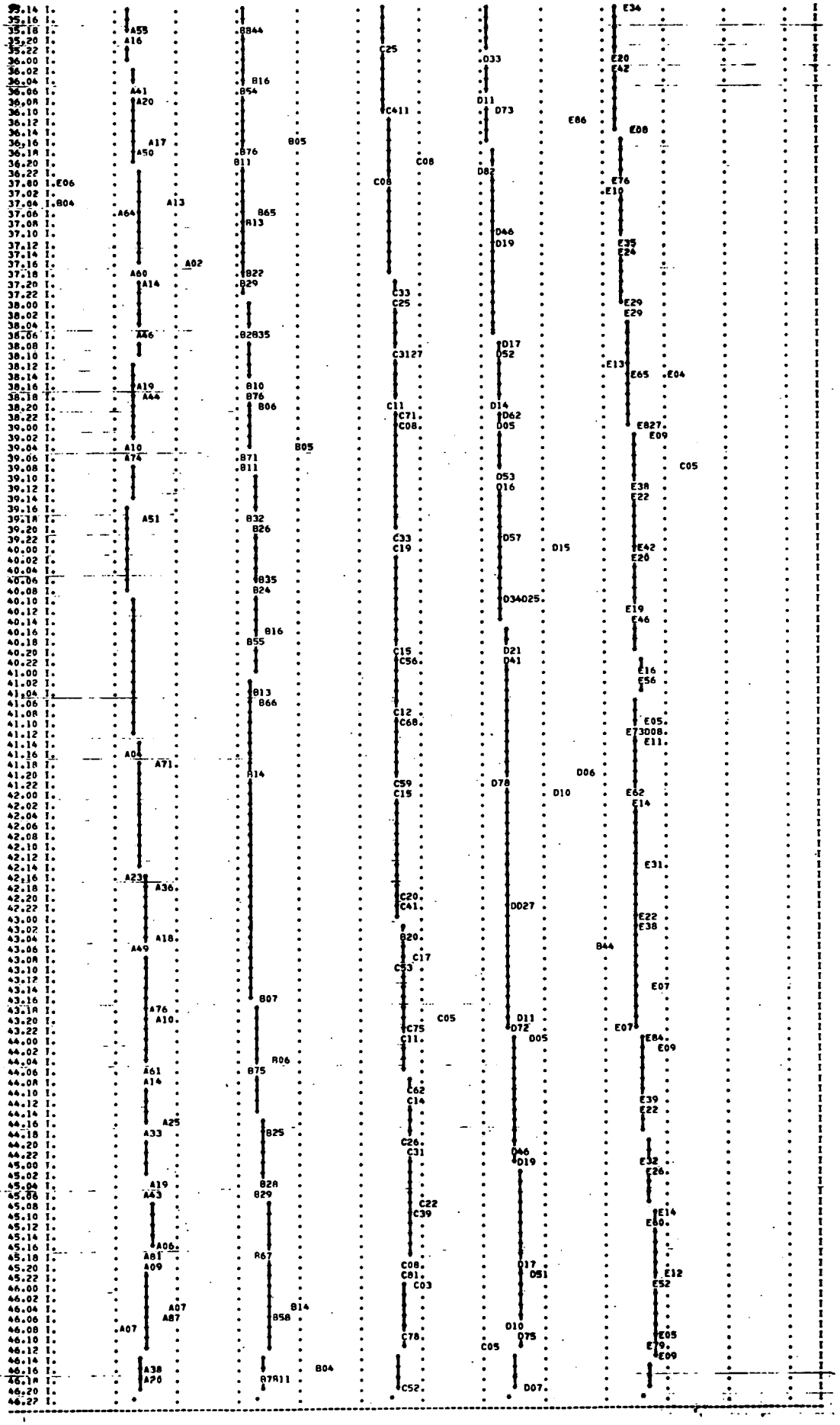

SURVEY 17 /2
SCALE IS .10 HERTZ TO ONE PRINT POSITION.
SATELLITE NO 12 HAS VALUE 32072.00 AT ORDINATE 10 AND PLOT CODE -A-.
SATELLITE NO 13 HAS VALUE 31990.00 AT ORDINATE 30 AND PLOT CODE -B-.
SATELLITE NO 14 HAS VALUE 32070.00 AT ORDINATE 50 AND PLOT CODE -C-.
SATELLITE NO 15 HAS VALUE 32035.00 AT ORDINATE 70 AND PLOT CODE -D-.
SATELLITE NO 18 HAS VALUE 32068.00 AT ORDINATE 90 AND PLOT CODE -E-.
ORIGIN.
DD.HH
A
B
C
D
E

Fig. 4



SCALE IS .10 HERTZ TO OUR PRINT POSITION.

SATELLITE NO 12 HAS VALUE 32673.00 AT ORDINATE 10 AND PLOT CODE -A-.
SATELLITE NO 13 HAS VALUE 32640.00 AT ORDINATE 30 AND PLOT CODE -B-.
SATELLITE NO 14 HAS VALUE 32671.00 AT ORDINATE 50 AND PLOT CODE -C-.
SATELLITE NO 15 HAS VALUE 32634.00 AT ORDINATE 70 AND PLOT CODE -D-.
SATELLITE NO 18 HAS VALUE 32669.00 AT ORDINATE 90 AND PLOT CODE -E-.

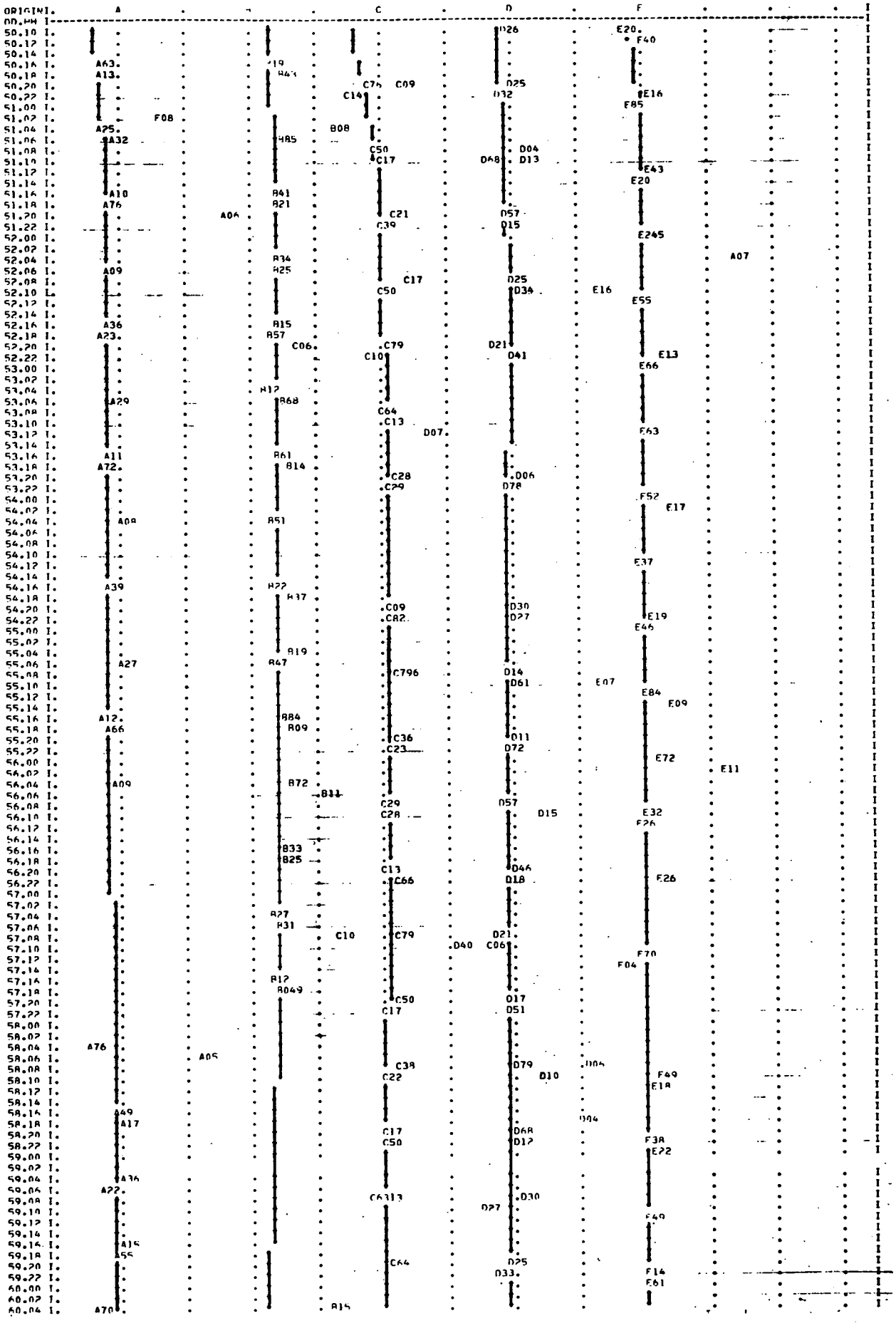


Fig. 6

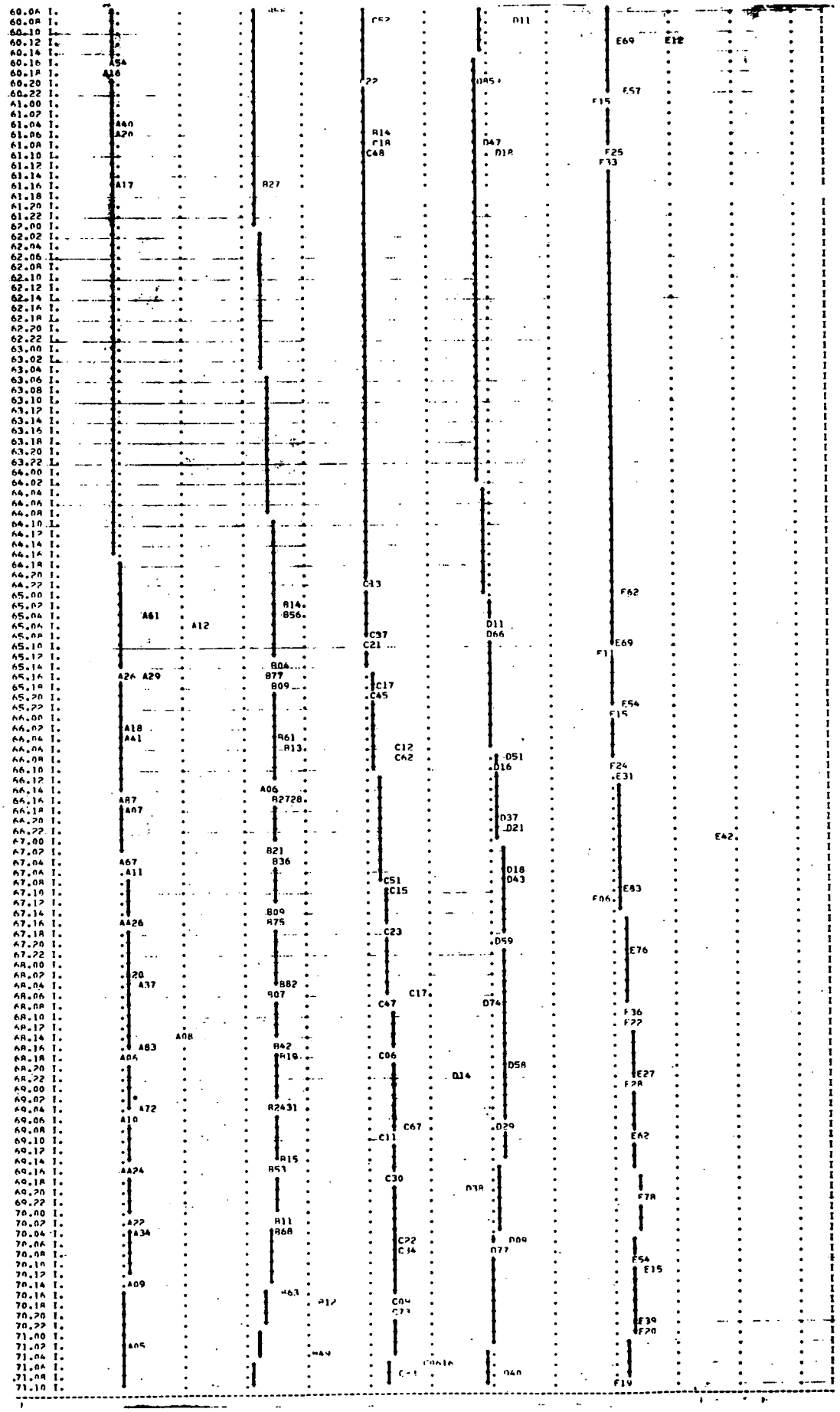
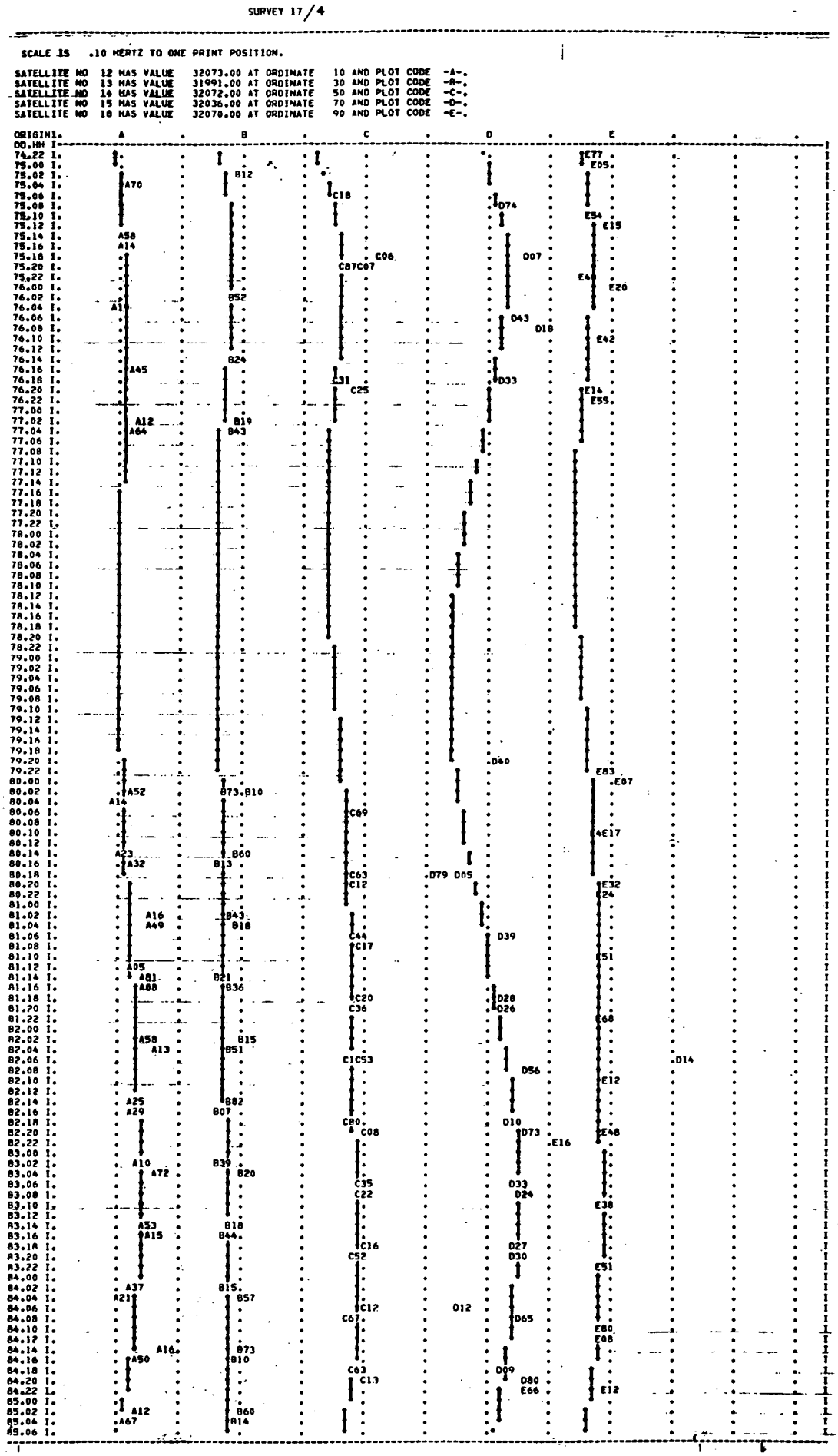


Fig. 7


SURVEY 17/4
SCALE IS .10 HERTZ TO ONE PRINT POSITION.
SATELLITE NO 12 HAS VALUE 32073.00 AT ORDINATE 10 AND PLOT CODE -A-.
SATELLITE NO 13 HAS VALUE 31991.00 AT ORDINATE 30 AND PLOT CODE -B-.
SATELLITE NO 14 HAS VALUE 32072.00 AT ORDINATE 50 AND PLOT CODE -C-.
SATELLITE NO 15 HAS VALUE 32036.00 AT ORDINATE 70 AND PLOT CODE -D-.
SATELLITE NO 18 HAS VALUE 32070.00 AT ORDINATE 90 AND PLOT CODE -E-.
ORIGIN1.
OO.HH I
A
B
C
D
E

Day 14	07.37 to 08.55
Day 15	06.08 to 06.18
Day 17	08.36 to 08.42
Day 28	12.05 to 12.17
Day 31	03.00 to 03.07

6.8.2 Chernikeeff Log

This piece of equipment worked without a hitch during the whole cruise.

6.8.3 Pressure Log

The numerous stoppages of the Pressure Log, in this Survey were due to a malfunction of the clockwork mechanism of the system; during Cruise 3, the Pressure Log had to be reset once a day when the clockwork mechanism stopped.

6.8.4. Statistical Analysis of the Three Navigation Systems

Tables 17/1 to 25B and Figures 8 to 31 give the analysis of the operation of the various navigation systems. These tables and figures are described here:

* Tables composed of
  - Column 1 : Survey Cruise
  - Column 2 : Number of measurement
  - Column 3, 4, 5, 6 : Speed given by Sat, S.D. C.L. P.L.
  - Column 7, 8, 9 : Ratios $\frac{V_{syst}}{V_{sat}} = K$.

  Cruise 1 : Tables 17/1 to 17/4
  Cruise 2 : Tables 19/1 to 19/5
  Cruise 3 : Tables 21/1 to 21/4
  Cruise 4 : Tables 23/1 to 23/2

* Curves for the three systems (S.D., C.L., P.L.) with the ratios K as the abscissas and satellite speeds as the ordinals

  Cruise 1 : Figures 8 to 10
  Cruise 2 : Figures14 to 16
  Cruise 3 : Figures20 to 22
  Cruise 4 : Figures26 to 28

* Statistical results are grouped in Table 18 for Cruise 1, 20 for Cruise 2, 22 for Cruise 3, 24 for Cruise 4. The synthesis of all these data are in Tables 25A and 25B, where μ is the mean and σ the standard deviation

NAVIGATIONAL SYSTEMS — STATISTICS RECAPITULATORY

CRUISES / SYSTEMS	1	2	3	4	5
Average of $K = \mu$					
Sonar Doppler	1.0363	1.0609	1.0276	1.0162	
Chernikeeff log	1.0319	.9997	.9080	.9369	
Pressure log	.9952	.9858	.9145	.8863	
Standard deviation of $\mu = \sigma$					
Sonar Doppler	.0754	.0829	.0671	.0559	
Chernikeeff log	.1082	.0844	.0686	.0711	
Pressure log	.1229	.0950	0.0748	.0542	
Absolute dispersion σ/μ					
Sonar Doppler	728	781	653	550	
Chernikeeff log	1049	844	756	759	
Pressure log	1235	964	818	612	

Table 25 A

SURVEY: 17

NAVIGATION SYSTEMS : SYNTHESIS

Cruise	System	$\mu - \sigma$	$\mu + \sigma$	σ	Data $\in \mu \pm \sigma$ in %	Data with $K < 1$ in %	Scale factor $\leq K \leq$		Eliminated % by scale factor
1	SD	0·9609	1·1117	0·0754	74·5	25·9	0·95	1·20	11·8
	CH	0·9237	1·1401	0·1082	75·0	34·8	0·90	1·15	22·7
	PL	0·8723	1·1181	0·1229	69·7	53·8	0·80	1·15	12·6
2	SD	0·9780	1·1438	0·0829	69·4	19·2	0·95	1·25	8·1
	CH	0·9153	1·0841	0·0844	74·1	50·0	0·85	1·10	14·1
	PL	0·8908	1·0808	0·0950	70·4	56·1	0·85	1·10	6
3	SD	0·9605	1·0947	0·0671	76·5	33·5	0·95	1·20	5·4
	CH	0·8394	0·9766	0·0686	75·2	92·7	0·80	1·0	12·6
	PL	0·8397	0·9893	0·0748	81·5	90·0	0·80	1·05	12
4	SD	0·9603	1·0721	0·0559	72·6	38·7	0·90	1·15	2
	CH	0·8658	1·0080	0·0711	69·2	82·0	0·80	1·05	6·7
	PL	0·8321	0·9405	0·0542	73	98	0·80	1·0	5·7
5	SD								
	PL								
	CH						$\leq K \leq$		

Table 25 B

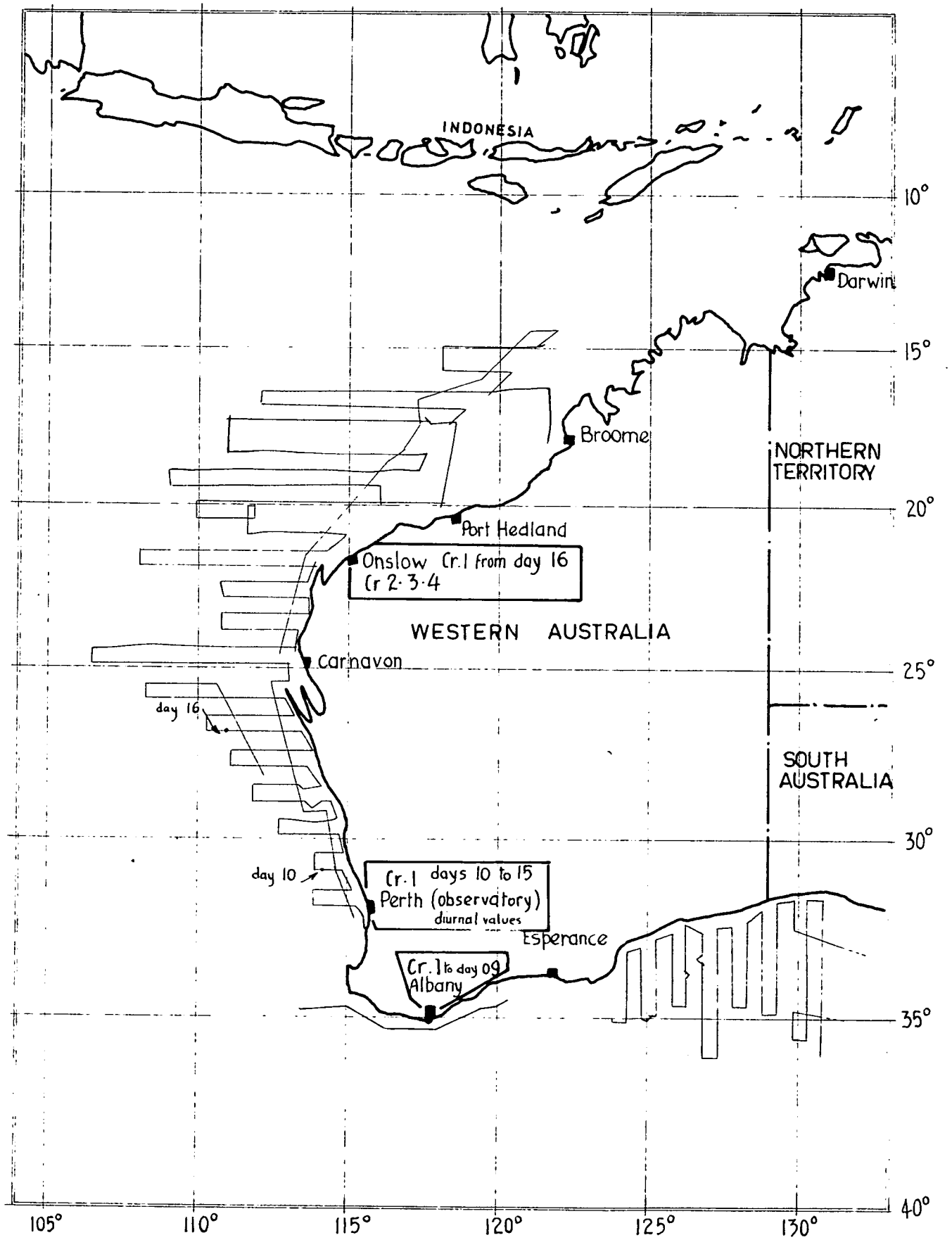
FIG. B

SHORE STATIONS

SOUTH, WEST and NORTH COASTS OF AUSTRALIA

SCALE 1 / 20000000

SURVEY 17



* Besides, the intrinsic behaviour of each system, it must be pointed out, that the average speed of the M/V Lady Christine steadily decreased due to the following reasons:

- General fatigue of the main engine of the ship
- State of the hull, the propeller, after nearly two years at sea
- Sailing in the area approaching the Equator.

7. CABLES

7.1 Main Cable (Fig. 32):

Satisfactory operation of this cable throughout the Survey. Yet it must be pointed out:

*Cruise 2 : High noise level due to its fouling with a fishing net. Working was stopped from 26.07.00 to 26.13.00. The C.G.G. tail buoy was replaced by a catamaran.

*Cruise 3 : Leakage and 60 Hz parasites were found. Cable was rolled in on Day 54 from 05.30 to 15.50.

On Day 58, some water was found in the leading section, during a check made whilst work was stopped for another reason.

*Channel 1 of the main cable, with "shallow" filter, was used for shallow data during the whole Survey.

* Noise Level:

Tables 26 to 27 and Figures 33 to 38 give a description of the noise levels on the various channels of the main cable. The maximum noise level reached by each channel was:

Channel 1 = 50 μV
Channel 2 = 44 μV
Channel 3 = 40 μV
Channel 4 = 66 μV
Channel 5 = 56 μV
Channel 6 = 71 μV

7.2 Geotech Cable

This cable was sent to Seismic Supply, Brisbane for a complete overhaul during Survey 17.

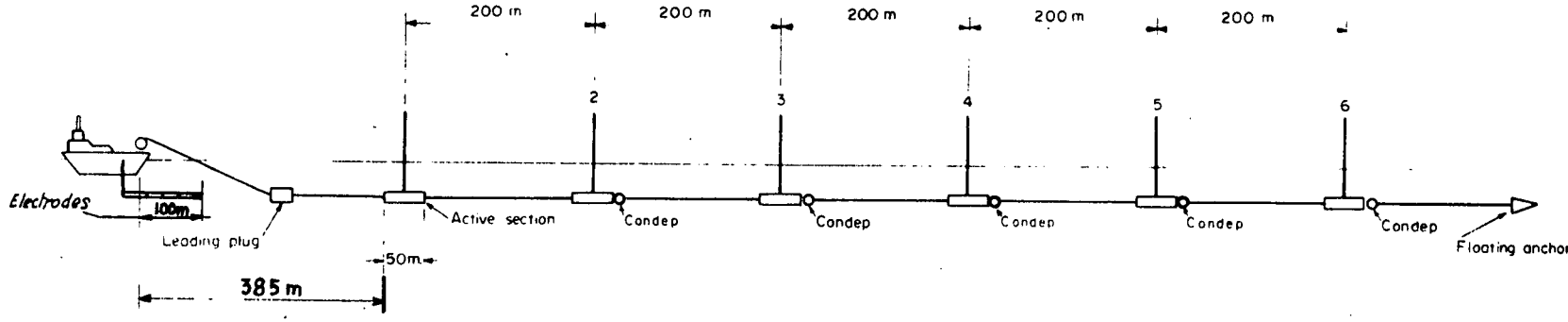
8. SHORE STATION (Fig. B)

For Survey 17, the shore station had two locations

* Albany, Middleton Beach from Day 01 to 10 inclusive

CGG STREAMER CABLE - 6 CHANNELS

1000 metres 48 hydrophones per trace



TRACE DIAGRAM 48 hydrophones HC 301 (2 sensors per phone)

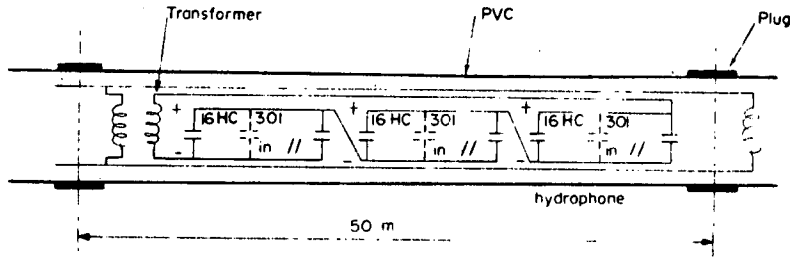


FIG. 32

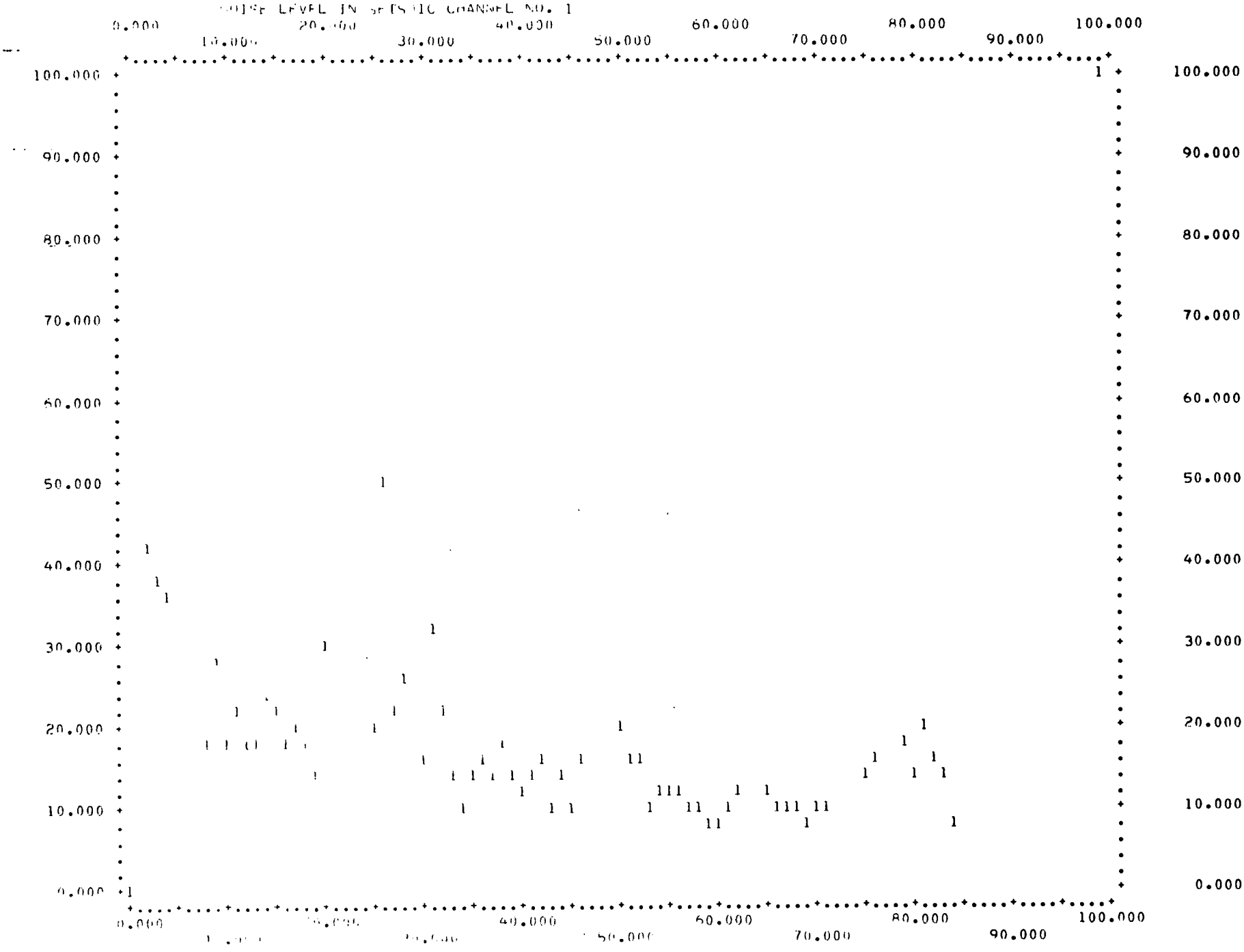

NOISE LEVEL IN SEISMIC CHANNEL NO. 1
0.000
10.000
20.000
30.000
40.000
50.000
60.000
70.000
80.000
90.000
100.000

Fig. 33

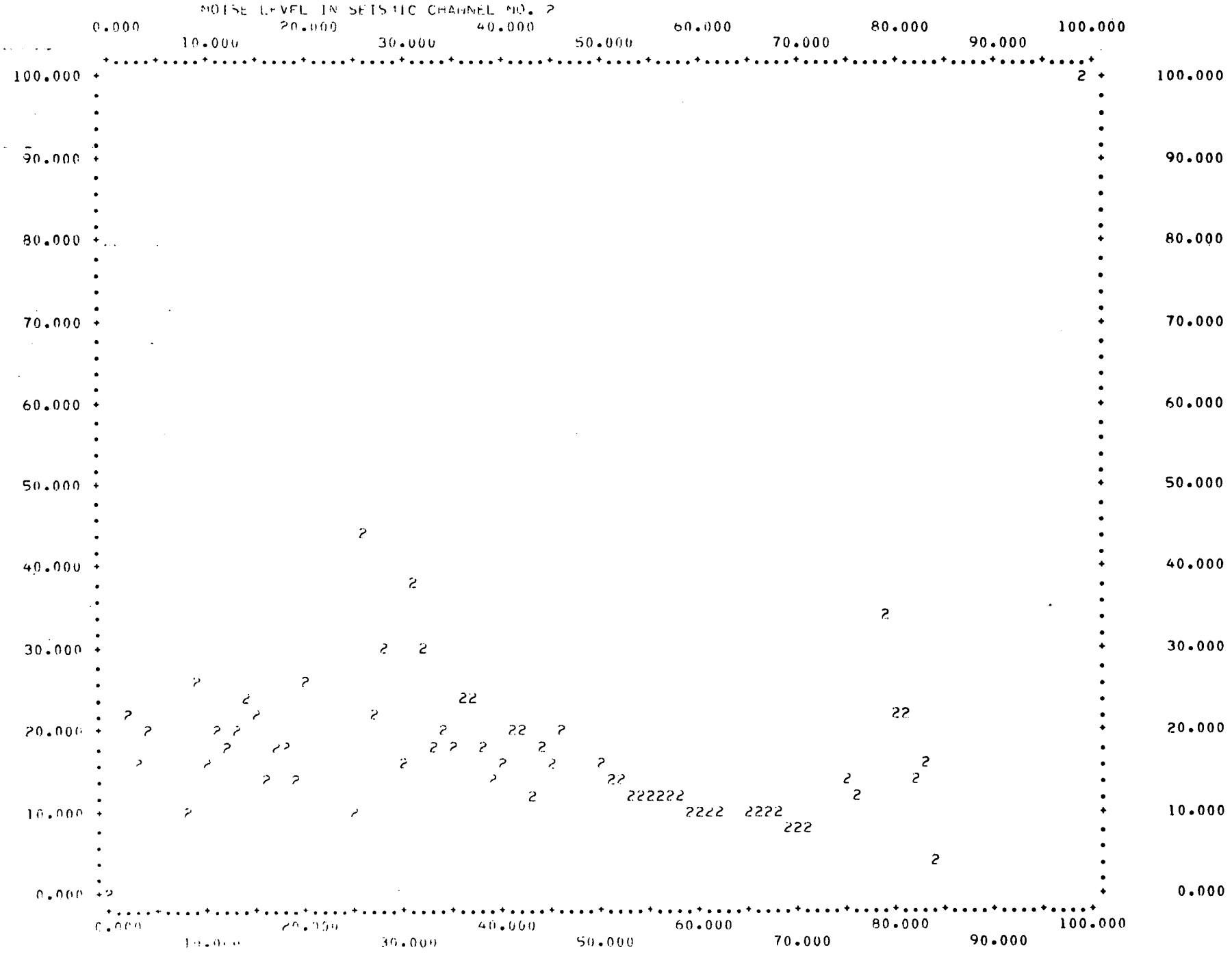

NOISE LEVEL IN SEISMIC CHANNEL NO. 2
0.000
10.000
20.000
30.000
40.000
50.000
60.000
70.000
80.000
90.000
100.000
100.000
90.000
80.000
70.000
60.000
50.000
40.000
30.000
20.000
10.000
0.000

Fig. 34

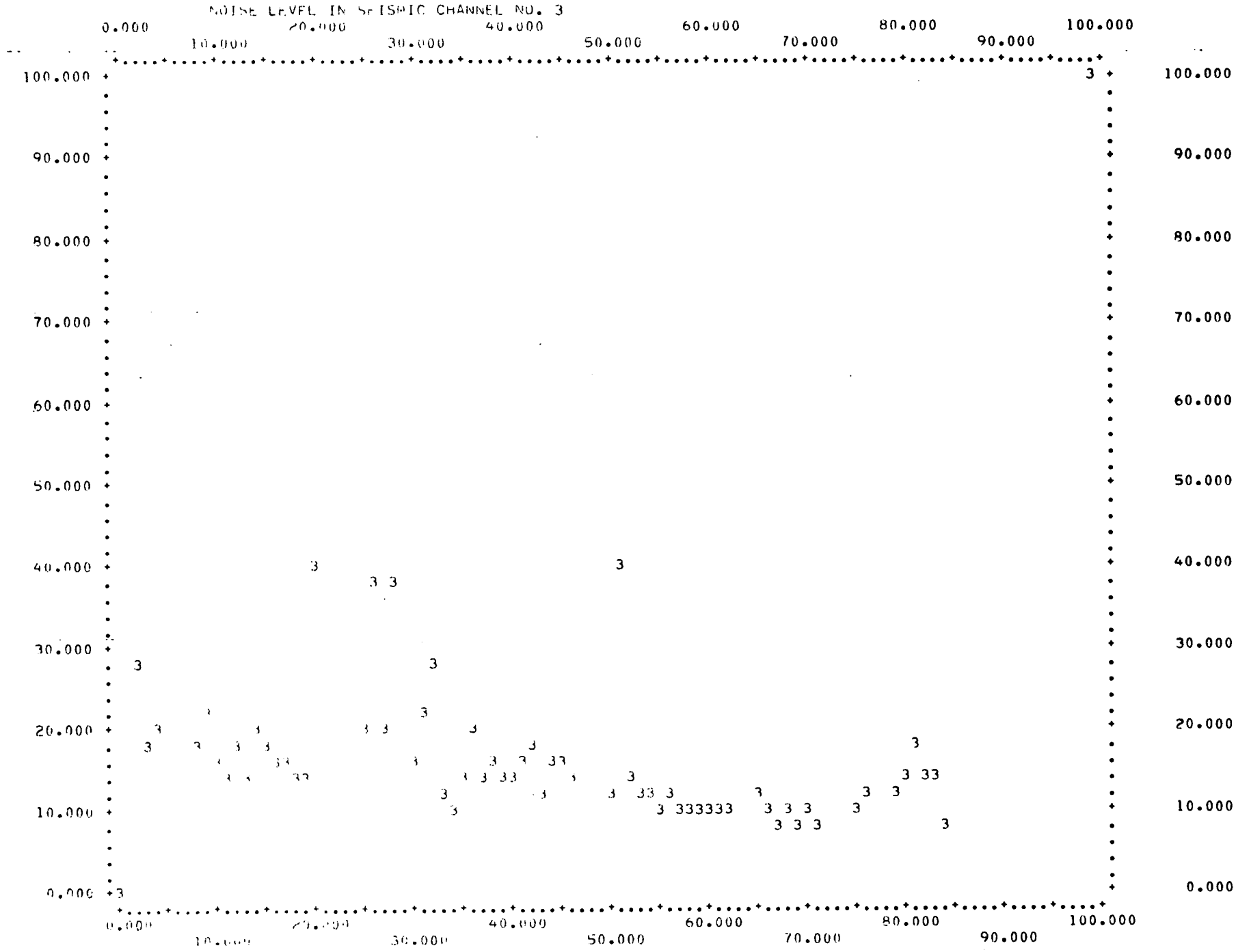

NOISE LEVEL IN SEISMIC CHANNEL NO. 3
0.000
10.000
20.000
30.000
40.000
50.000
60.000
70.000
80.000
90.000
100.000

Fig. 35

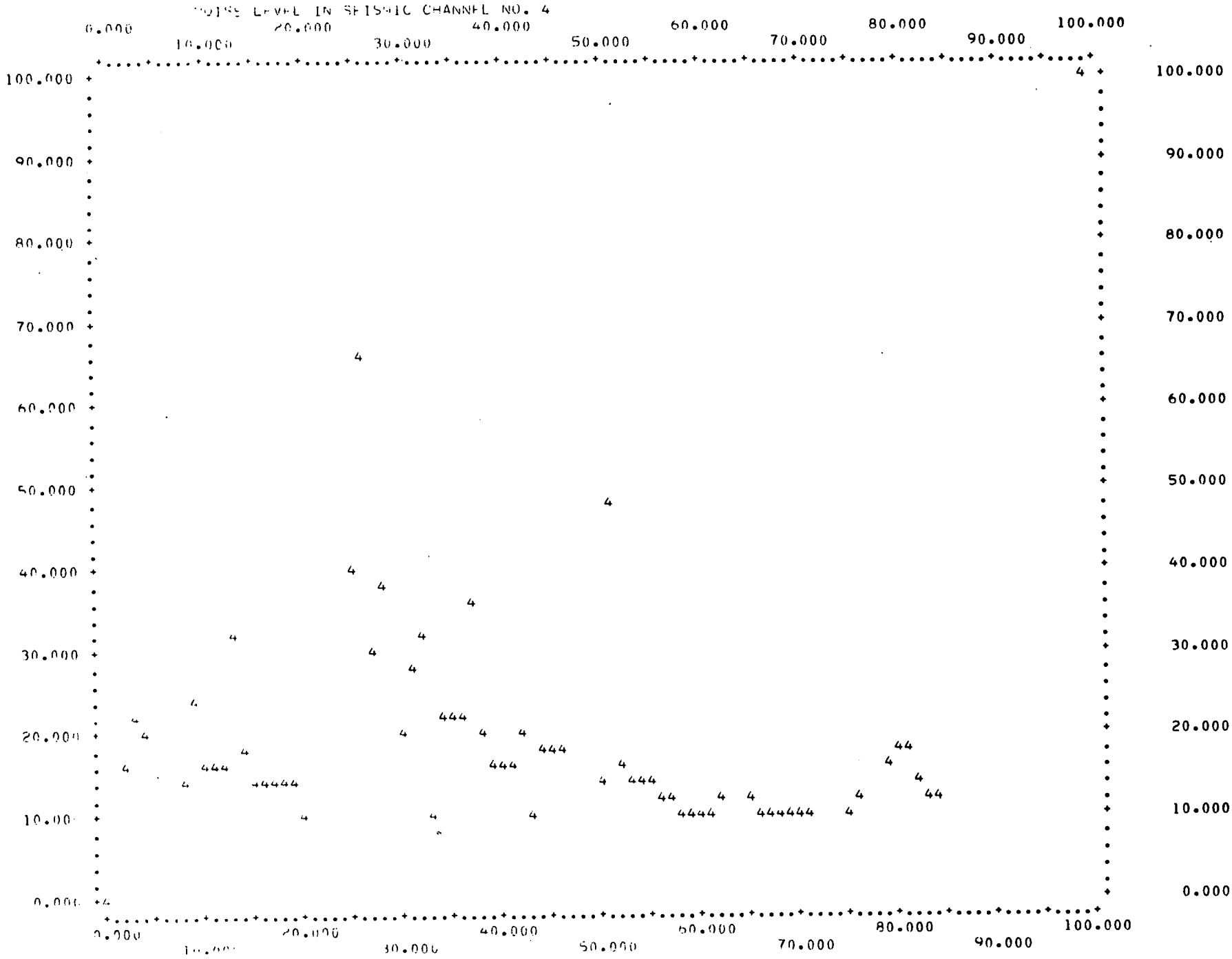

NOISE LEVEL IN SEISMIC CHANNEL NO. 4
0.000
10.000
20.000
30.000
40.000
50.000
60.000
70.000
80.000
90.000
100.000

Fig. 36

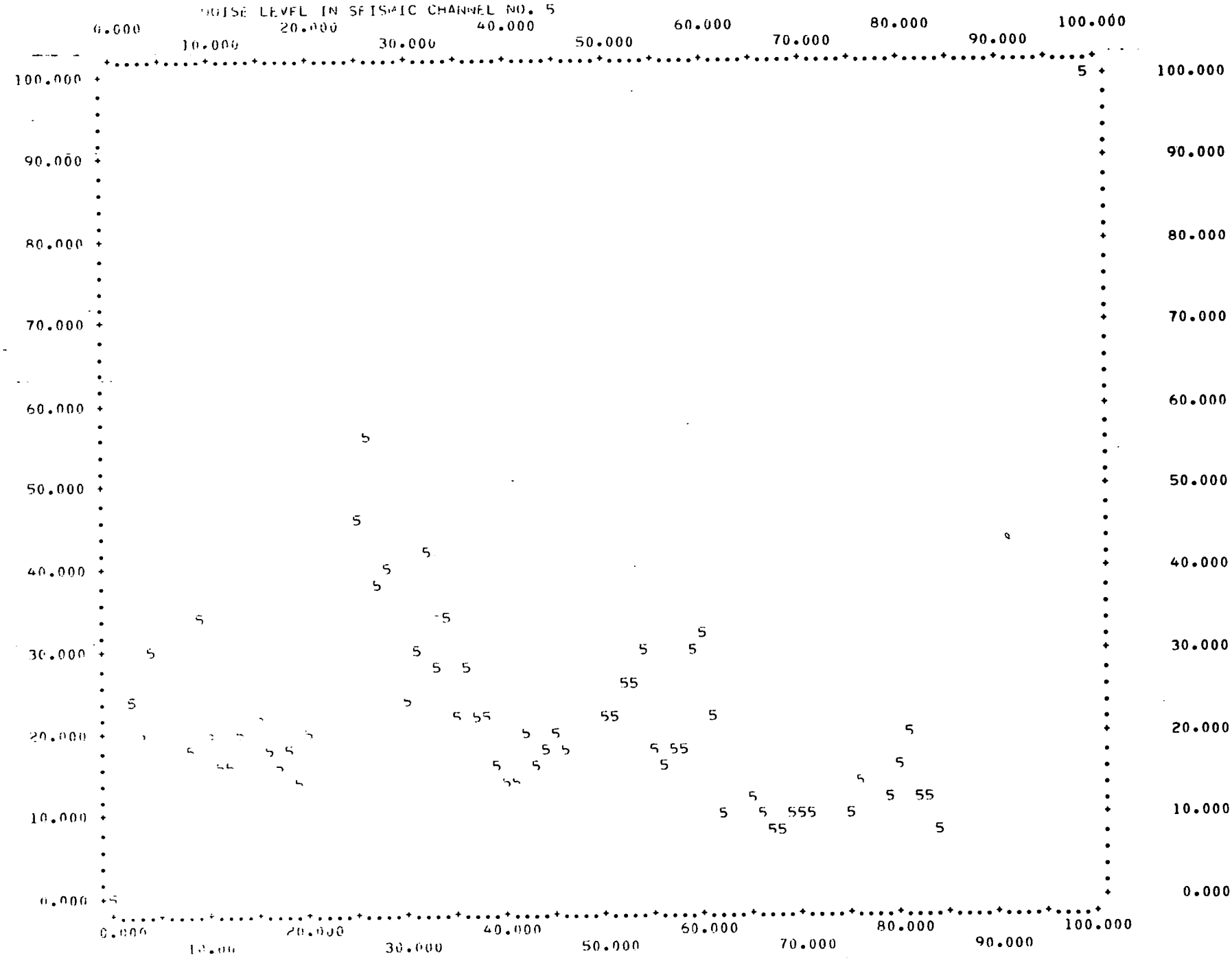

NOISE LEVEL IN SEISMIC CHANNEL NO. 5
0.000
10.000
20.000
30.000
40.000
50.000
60.000
70.000
80.000
90.000
100.000

Fig. 37

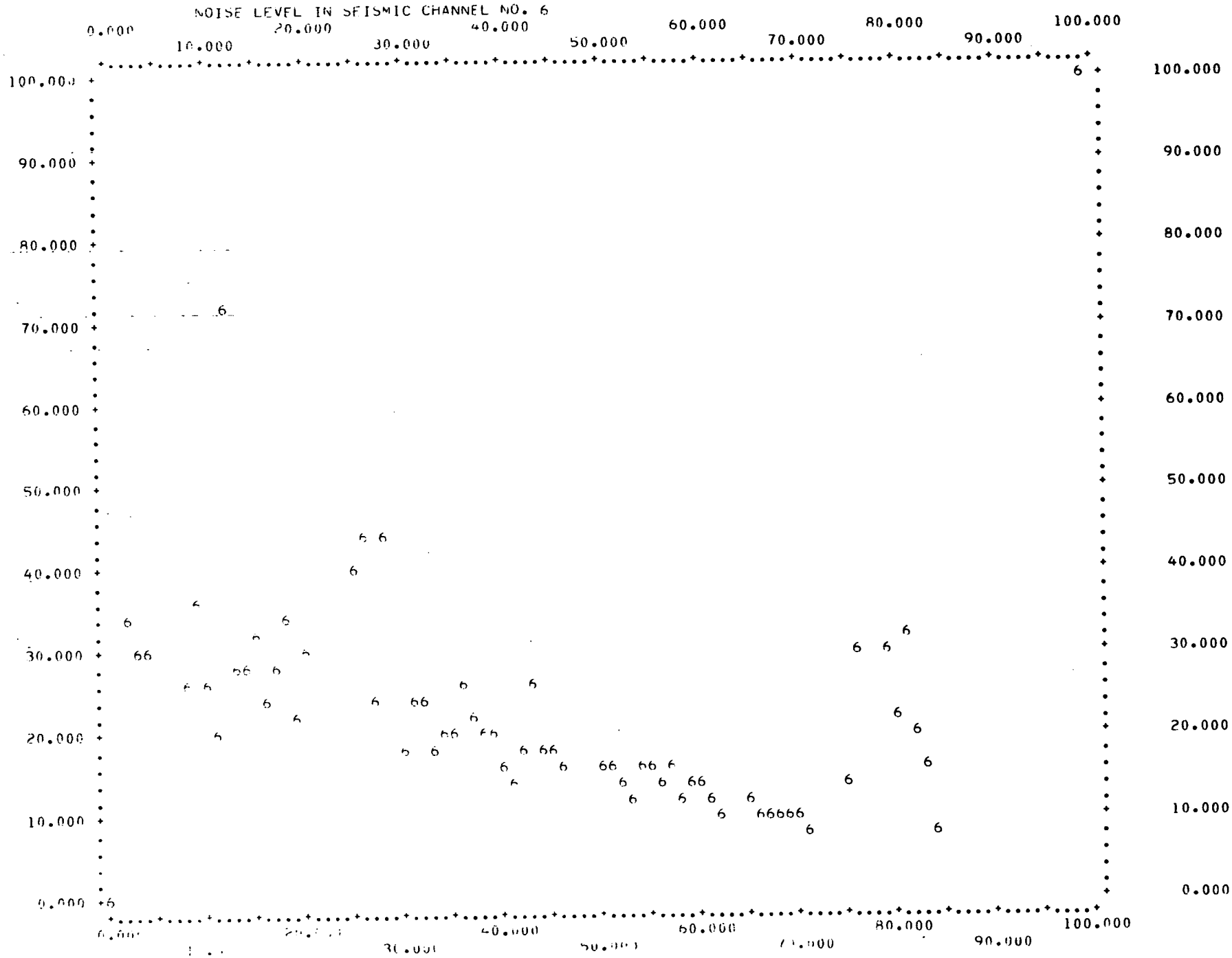

NOISE LEVEL IN SEISMIC CHANNEL NO. 6
0.000
10.000
20.000
30.000
40.000
50.000
60.000
70.000
80.000
90.000
100.000

Fig. 38

Lat 35° 01' 11"
Long 117° 36' 36"
IGRF 60597

* Onslow, from Day 16 to 85 inclusive

Lat 21° 38' 15"
Long 115° 06' 35"
IGRF 52891

During the shipping of the shore-station from Albany to Onslow, it was intended to use the data fromPerth Geomagnetic Observatory (Mundaring). Unfortunately, the data were received too late to be used for the ship's computations.

Several stoppages occurred at the Onslow shore station, mainly due to battery out of order, and public power supply out = 85.50 of stoppages, i.e. approximately 4% of the duration of the whole Survey.

9. WEATHER (Tables 28 to 35)

Excepting Cruise 1, the weather was generally fine for this Survey. From day 04.09.40 to day 08.14.20, no work could be done because of the sea state. The south portion of the proposed traverses had to be left and work began again on the south-north line near Freemantle. At the end of Cruise 1, bad weather stopped production on day 20.10.00. An attempt to begin work was made on Day 21 at 09.15, but without success. On the last two days of the last Cruise, seas became rough and the ship had to sail against a strong wind which reached force 6.

10. SUPPLY BOAT

No rendezvous with the supply boat was organised for Survey 17. Nevertheless, a stoppage for bad weather during Cruise 1 was turned to good account to go to Bunbury, and bring on board water and supplies. Likewise, the call at Port Hedland during Cruise 3, was used to take away some supplies (accounted for under supply-boat in stop statistics.).

SEA STATE CRUISE 1

DAY	Hour	WIND direction (degrés)	WIND speed (knots)	SEA direction	SEA state(Beaufort)	SWELL direction	SWELL high (feet)	TENDENCY
	0000			ESPERANCE BAY				
2	0600	270	24	270	4	240	12	
	1200	"	23	"	4	"	12	
	1800	"	16	"	4	"	10	
		"	6	"	3	"	"	
3		220	2	"	3	"	"	
		230	4	230	2	"	"	
		330	4	360	2	"	"	
		020	26	020	3	230	"	
4		"	18	"	4	"	"	
		"	50	"	6	---		
		"	55	"	8	---		
		270	42	270	7	---		
5				FLINDER'S BAY				Anchorage
				--- "	---			"
		270	35	--- "	---			"
		260	40	--- "	---			"
6				--- "	---			"
		230	28	--- "	---			"
		240	20	--- "	---			"
		200	20	--- "	---			"
7		240	16	240	5			
		270	20	270	5			
				GEOGRAPHE BAY				
				BUNBURY				
8		270	10	270	3	240	16	
		270	18	"	4	"	18	
		200	26	200	5	"	20	
9		"	16	"	4	220	16	
		"	6	"	3	"	12	
		270	8	"	3	"	10	
		260	21	260	4	"	20	
10		270	16	"	4	"	16	
		"	26	270	5	"	16	
		"	24	"	5	"	16	
		250	26	250	5	240	20	
		"	18	"	4	"	12	
11		200	16	200	4	"	18	
		"	20	"	4	"	18	
		210	24	210	4	"	18	
		"	24	"	4	"	18	
12		"	14	"	4	"	14	
		110	10	"	3	"	10	

SEA STATE CRUISE 1

DAY	Hour	WIND		SEA		SWELL		TENDENCY
		direction (degrés)	speed (knots)	direction	state(Beaufort)	direction	high (feet)	
13	0000	120	12	120	3	220	14	
	0600	"	4	"	2	"	8	
	1200	"	5	"	2	"	6	
	1800	050	12	050	2	"	6	
14		050	10	"	2	"	10	
		090	4	090	2	"	10	
		150	12	050	2	"	10	
		120	4	120	2	"	8	
15		"	4	"	2	"	9	
		320	6	320	2	"	6	
		200	14	200	3	"	8	
		"	14	"	3	"	3	
16		180	18	180	3	"	8	
		150	18	150	3	"	8	
		130	20	130	3	"	10	
		140	22	140	3	"	10	
17		180	18	180	3	"	10	
		"	10	"	2	"	10	
		"	12	"	2	"	12	
		150	10	150	2	"	12	
18		"	10	"	2	"	10	
		"	10	"	2	"	10	
		130	8	130	2	"	10	
		040	14	040	3	"	10	
19		080	16	080	3	"	10	
		070	6	070	3	"	8	
		"	8	"	3	"	8	
		360	10	360	3	"	6	
20		"	20	"	4	"	10	
		"	30	"	5	"	8	
		300	30	300	5	"	10	
		240	4	240	6	"	10	
21		180	27	180	5	"	14	
		"	20	"	5	"	14	
		"	16	"	4	"	14	
		150	12	150	3	"	14	
22		170	12	170	2	"	14	
		100	4	170	2	"	12	
		140	11	140	2	"	12	
		110	14	110	2	"	10	

SEA STATE CRUISE 2

DAY	Hour	WIND direction (degrés)	WIND speed (knots)	SEA direction	SEA state(Beaufort)	SWELL direction	SWELL high (feet)	TENDENCY
25	0000			As wind				
	0600							
	1200							
	1800	160	12			220	10	
26		130	20	"	5	"	10	
		"	04	"	3	"	10	
		110	12	"	4	"	8	
		040	24	"	4	"	8	
27		060	9	"	4	"	8	
		140	6	"	0	"	8	
		200	4	"	3	"	8	
		220	10	"	3	"	8	
28		200	16	"	4	"	8	
		"	18	"	5	"	8	
		150	20	"	7	"	10	
		"	16	"	7	"	10	
29		120	15	"	6	Anchorage SHARK BAY		
		150	14	"	4	---		
		"	14	"	4	---		
		090	10	"	3	---		
30		040	12	"	3	220	10	
		330	30	"	3	"	10	
		300	30	"	6	"	10	
		230	22	"	6	"	10	
31		260	16	"	7	"	12	
		250	12	"	7	"	12	
		250	25	"	7	"	12	
		"	12	"	7	"	12	
32		240	18	"	6	"	12	
		190	13	"	4	"	10	
		"	28	"	6	"	12	
		130	18	"	4	"	10	
33		140	08	"	4	"	10	
		"	16	"	4	"	10	
		"	20	"	5	"	10	
		"	20	"	5	"	10	
34				CARNAVON		---		
		160	18	As wind	5	220	8	
		140	10	"	5	"	8	
		210	14	"	5	"	8	
35		150	12	"	3	"	10	
		140	08	"	2	"	8	
		140	20	"	3	"	8	
		130	16	"	3	"	8	

SEA STATE CRUISE 2

DAY	Hour	WIND		SEA		SWELL		TENDENCY
		direction (degrés)	speed (knots)	direction	state (Beaufort)	direction	high (feet)	
36	0000	130	18	as wind	5	220	8	
	0600	"	10		4	"	8	
	1200	180	12		5	"	8	
	1800	190	17		4	"	6	
37		"	6		5	"	8	
		140	15		4	"	6	
		"	13		4	"	8	
		"	18		4	"	8	
38		"	16		4	200	8	
		"	10		4	"	8	
		180	14		5	"	8	
		"	16		6	"	8	
39		"	16		8	180	10	
		120	16		8	"	10	
		130	16		8	"	10	
		160	12		8	"	10	
40		140	23		8	"	10	
		"	10		6	"	6	
		"	12		6	"	6	
		110	10		6	"	6	
41		"	8		5	"	6	
		90	18		5	"	4	
		60	18		7	"	6	
		360	8		7	"	4	
42		270	18		7	250	8	
		260	14		7	"	8	
		180	14		5	"	5	
		220	16		5	"	5	
43		180	12		4	240	8	
		200	12		4	"	6	
		180	8		3	"	6	
		150	16		3	"	6	
44		180	15		4	"	8	
				CALM		"	6	
		280	12		3	"	7	
		240	10		3	"	6	
45		270	10		4	"	7	
		230	14		4	"	7	
		200	14		5	"	7	
		180	16		4	"	6	
46		"	18		5	"	8	
		"	20		5	"	6	
		220	12		5	"	7	
		190	10		5	"	6	

SEA STATE CRUISE 3

DAY	Hour	WIND		SEA		SWELL		TENDENCY
		direction (degrés)	speed (knots)	direction	state(Beaufort)	direction	high (feet)	
50	0000	190	14	As wind	3	240	7	
	0600	220	5		2	"	3	
	1200	"	01		1	"	3	
	1800	"	07		1	"	3	
51		"	14		2	"	8	
		"	12		2	"	6	
		160	08		2	"	7	
		"	04		2	"	7	
52		150	06		2	"1	8	
		"	10		2	"	8	
		180	07		2	"	8	
		120	13		2	"	7	
53		130	14		2	"	7	
		"	05		1	"	7	
		200	12		1	"	7	
		180	05		1	"	4	
54		"	12		1	"	6	
		"	08		1	210	6	
		230	10		1	220	6	
		200	14		2	"	6	
55		180	12		2	"	6	
		220	11		2	"	6	
		"	10		2	"	6	
		"	10		2	"	6	
56		200	14		3	"	13	
		220	18		4	"	13	
		"	24		5	"	13	
		"	20		4	"	13	
57		150	12		3	"	13	
		140	12		3	"	13	
		130	14		3	"	13	
		"	10		3	"	13	
58		160	6		3	"	13	3
		"	10		3	"	13	
		130	20		4	"	13	
		"	12		3	"	13	
59		150	14		3	210	12	
		140	16		3	variable	9	
		120	12		3	180	9	
		"	08		2	variable	9	
60		180	12		2	210	8	
		140	10		2	"	8	
		220	10		2	"	8	
		---	--	---	-	"	5	

SEA STATE CRUISE 3

DAY	Hour	WIND direction (degrés)	WIND speed (knots)	SEA direction	SEA state(Beaufort)	SWELL direction	SWELL high (feet)	TENDENCY
61	0000	180	12	as wind	2	210	6	
	0600	"	05		2	"	6	
	1200	"	05		1	"	5	
	1800	"	06		1	"	4	
				PORT HEDLAND				
65		230	10	as wind	2	240	6	
		"	12		2	"	6	
		"	06		2	"	6	
		"	10		2	"	7	
66		180	13		3	"	10	
		220	15		3	"	12	
		"	18		4	"	12	
		"	22		4	"	12	
67		200	20		4	"	12	
		"	22		4	"	12	
		"	20		4	"	12	
		"	22		4	"	12	
68		140	10		3	"	6	
		"	12		3	"	12	
		090	15		3	"	10	
		"	15		3	"	9	
69		170	12		3	"	6	
		130	10		3	220	6	
		"	14		2	"	6	
		"	10		2	"	5	
70		120	03		1	"	3	
		"	03		1	"	2	
		"	03		1	"	2	
		CALM		CALM		"	2	
71		"		"		"	2	
		270	06	as wind	1	"	2	
		"	09		1	"	2	

SEA STATE CRUISE 4

DAY	Hour	WIND direction (degrés)	WIND speed (knots)	SEA direction	SEA state (Beaufort)	SWELL direction	SWELL high (feet)	TENDENCY
74	0000							
	0600							
	1200	320	12	as wind	1	-	-	
	1800	"	12		2	-	-	
75			CALM			220	3	
			"			240	2	
			"			"	2	
			"			"	2	
76		050	10		1	"	2	
			CALM		-	"	2	
		200	12		1	"	2	
			CALM		-	"	3	
77		220	8		2	"	3	
		320	8		2	"	3	
		230	8		2	"	3	
		"	8		2	"	3	
78		"	18	BROOME	2	"	3	
79		020	8	as wind	2	240	3	
		020	3		1	"	4	
			CALM		-	"	3	
80			"		-	"	3	
		090	8		1	"	3	
		120	4		1	"	3	
			CALM		-	"	3	
81		090	3		-	230	3	
		210	8		2	"	3	
		"	5		1	"	3	
		"	5		1	"	3	
82		220	15		2	"	3	
		210	10		2	"	3	
		220	9		1	"	3	
		230	9		1	"	3	
83		"	12		2	"	7	
		"	10		3	"	7	
		"	19		3	"	8	
		"	12		3	"	8	
84		190	17		4	200	8	
		"	17		4	"	9	
		"	24		8	210	13	
		"	24		8	"	15	

SEA STATE CRUISE 4

DAY	Hour	WIND		SEA		SWELL		TENDENCY
		direction (degrés)	speed (knots)	direction	state(Beaufort)	direction	high (feet)	
85	0000	180	24	as wind	8	200	15	
	0600	"	24		8	"	15	
	1200	"	24		8	"	15	
	1800							

11. SHIP SHORE COMMUNICATIONS

During the whole of Survey 17, ship-shore communications were carried out by the boat manager who transported the SSB and set it up in the different dwelling in which he lived.

GENERAL COMMENTS

1 - DATA ACQUISITION SYSTEM

The new acquisition programme, designed by the BMR, operated very satisfactorily. The information furnished by this programme has considerably simplified the computing work aboard ship. However problems of time increment are not resolved. The introduction of another clock in the H.P. computer, simultaneously with the getting under way of a new programme, should make it possible to eliminate them finally.

2 - SEISMIC EQUIPMENT

The equipment on board operated correctly. It must be realised, nevertheless, that there are two problems of maintenance which seem a very long time in resolution:

* Repair of the Geotech cable in the Seismic Supply workshop. (This cable was unavailable for the whole Survey)
* Defective functioning of the air-conditioner of the seismic room; a minor trouble it would seem, but in fact, considerably perturbing the smooth operation of all the seismic equipment. More than permanent repairs, a completely new air-conditioning system appears to be absolutely necessary.

3 - SOUNDERS

* Elac Sounder

Remarkable performance by this system.

* Atlas Sounder

Numerous interferences continue. When three echo-sounders, one sonar doppler, one set of seismic equipment operate simultaneously on a ship, particular attention must be given to the shieldings, the placement of the various transducers and the cabling generally.

* Raytheon Sounder

A system, so sophisticated in theory, must be capable of producing better results. It seems difficult to find the true cause of the mediocre quality of results:- fault of manufacture, of

maintenance... It must be understood also that the utilisation of this system requires the appointment of a permanent operator to reset it whenever the bottom shows a gradient.

4 - MAGNETISM

The presence of a spare cable in perfect working order would have avoided the troubles with noise level on the magnetic data of Cruise 1.

5 - GRAVITY

Only one problem, difficult to find, simple to correct when found: the aleatory performance of the reading lamp. Apart from this, the system worked satisfactorily; the results were linked to the sea-state.

6 - NAVIGATION

The regular decrease in the average speed of the ship should be remarked upon. The ideal solution of this problem is a complete overhaul of the ship: engines, hull, propeller ....; i.e. a stay in dry-dock which means stopping the Survey for at least one month. This solution being difficult to achieve, thorough repairs are made at each call in order to limit the decrease of the boat's performance.

CONCLUSIONS

RESULTS

Leaving aside Cruise 1, the data recorded are very satisfactory in quality. The main remaining problem is the consistent decrease of the speed of the ship.

STATISTICAL ANALYSIS

The statistical results of Survey 17 are satisfactory, in the area which concerns the division of time between the Survey, the travelling, the stoppages and the port calls. Still, the surveyed mileage is down, because of the slower speed.

FIGURES

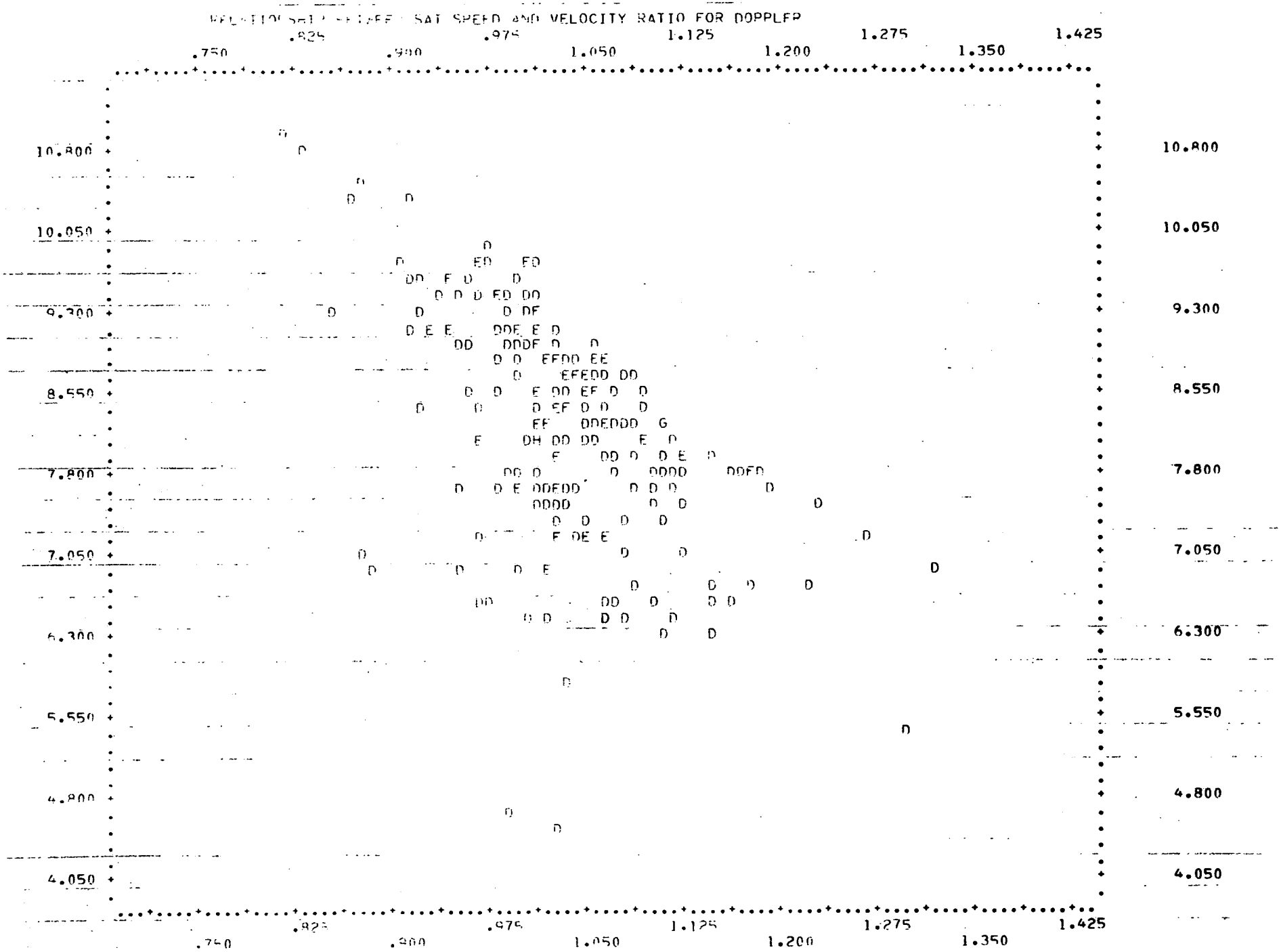

RELATIONSHIP BETWEEN SAT SPEED AND VELOCITY RATIO FOR DOPPLER
.750
.825
.900
.975
1.050
1.125
1.200
1.275
1.350
1.425
10.800
10.050
9.300
8.550
7.800
7.050
6.300
5.550
4.800
4.050

Fig. 8

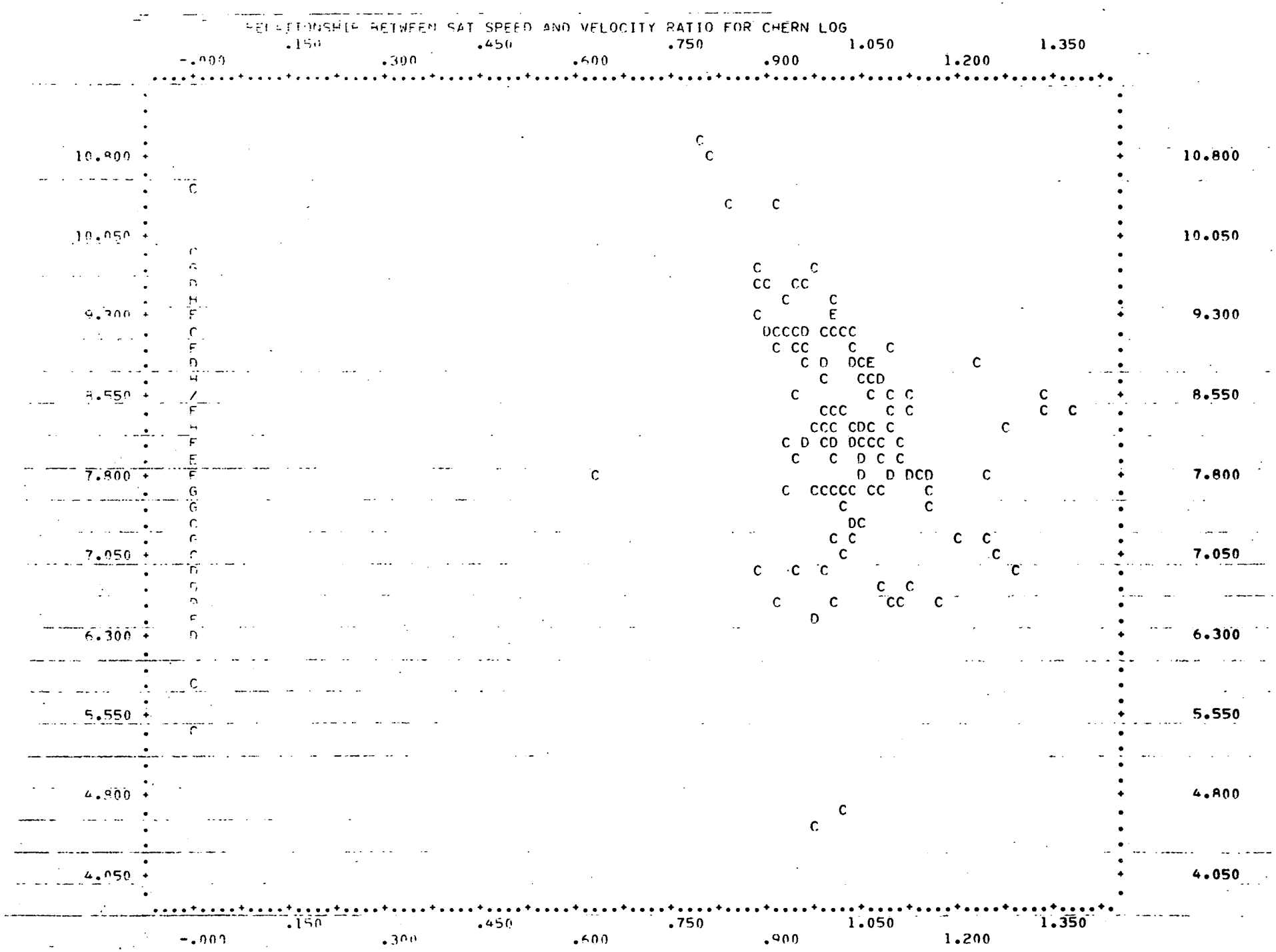

RELATIONSHIP BETWEEN SAT SPEED AND VELOCITY RATIO FOR CHERN LOG
-.000
.150
.300
.450
.600
.750
.900
1.050
1.200
1.350
10.800
10.050
9.300
8.550
7.800
7.050
6.300
5.550
4.800
4.050

Fig. 9

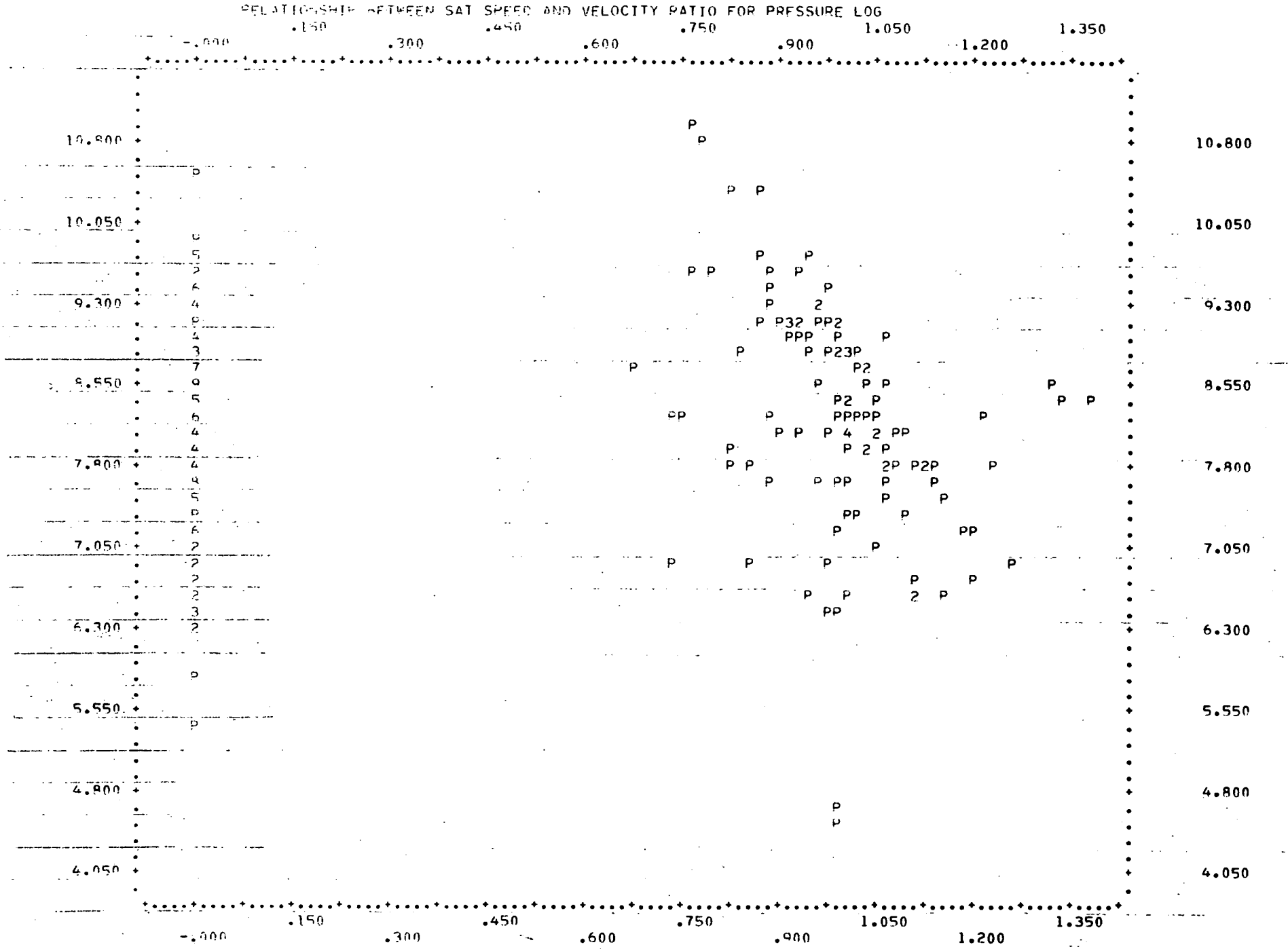

RELATIONSHIP BETWEEN SAT SPEED AND VELOCITY RATIO FOR PRESSURE LOG
-.000
.150
.300
.450
.600
.750
.900
1.050
1.200
1.350
10.800
10.050
9.300
8.550
7.800
7.050
6.300
5.550
4.800
4.050

Fig. 10

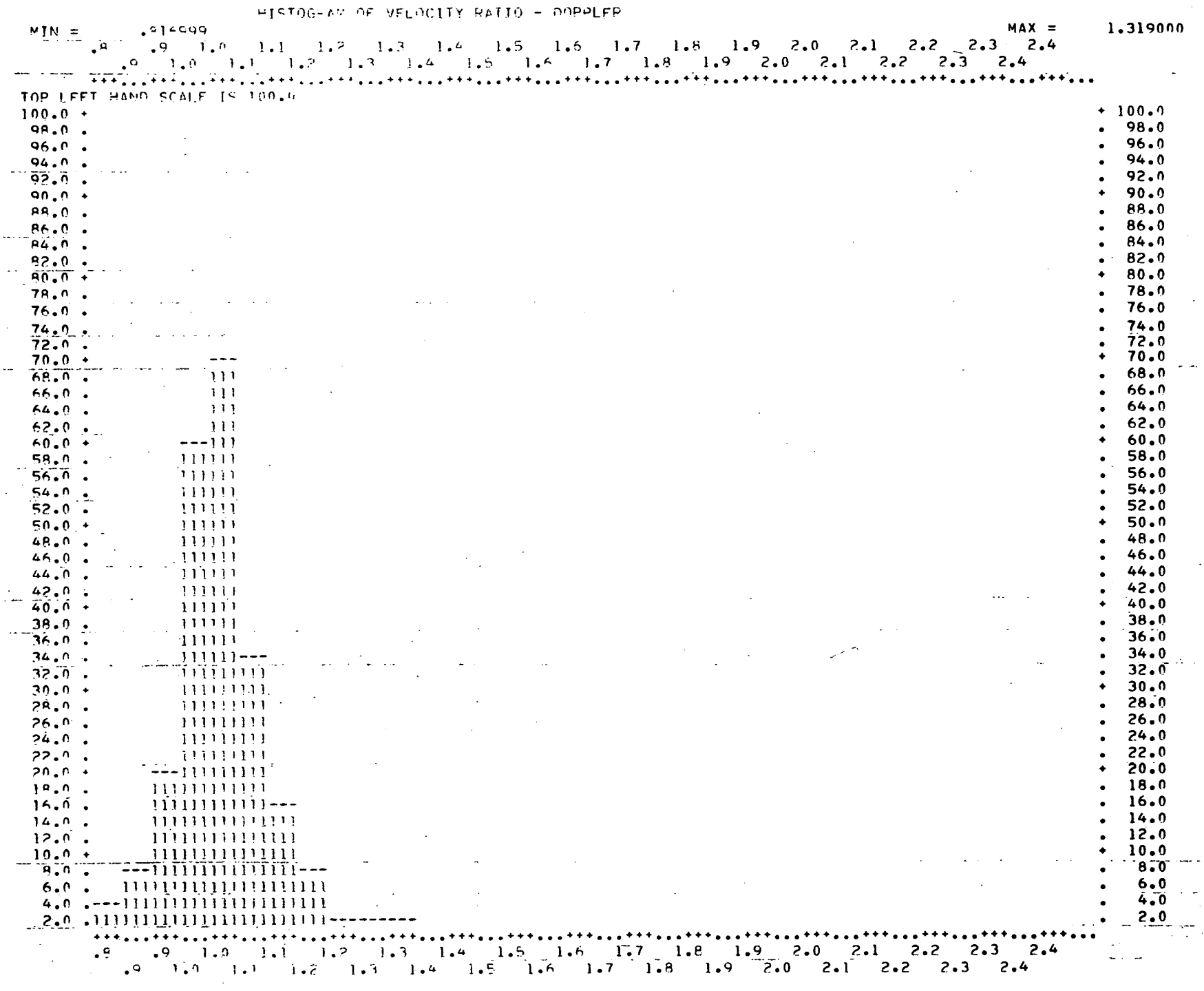

HISTOGRAM OF VELOCITY RATIO - DOPPLER
MIN = .914999
MAX = 1.319000
.8 .9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4
TOP LEFT HAND SCALE IS 100.0
100.0
98.0
96.0
94.0
92.0
90.0
88.0
86.0
84.0
82.0
80.0
78.0
76.0
74.0
72.0
70.0
68.0
66.0
64.0
62.0
60.0
58.0
56.0
54.0
52.0
50.0
48.0
46.0
44.0
42.0
40.0
38.0
36.0
34.0
32.0
30.0
28.0
26.0
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0

Fig. 11

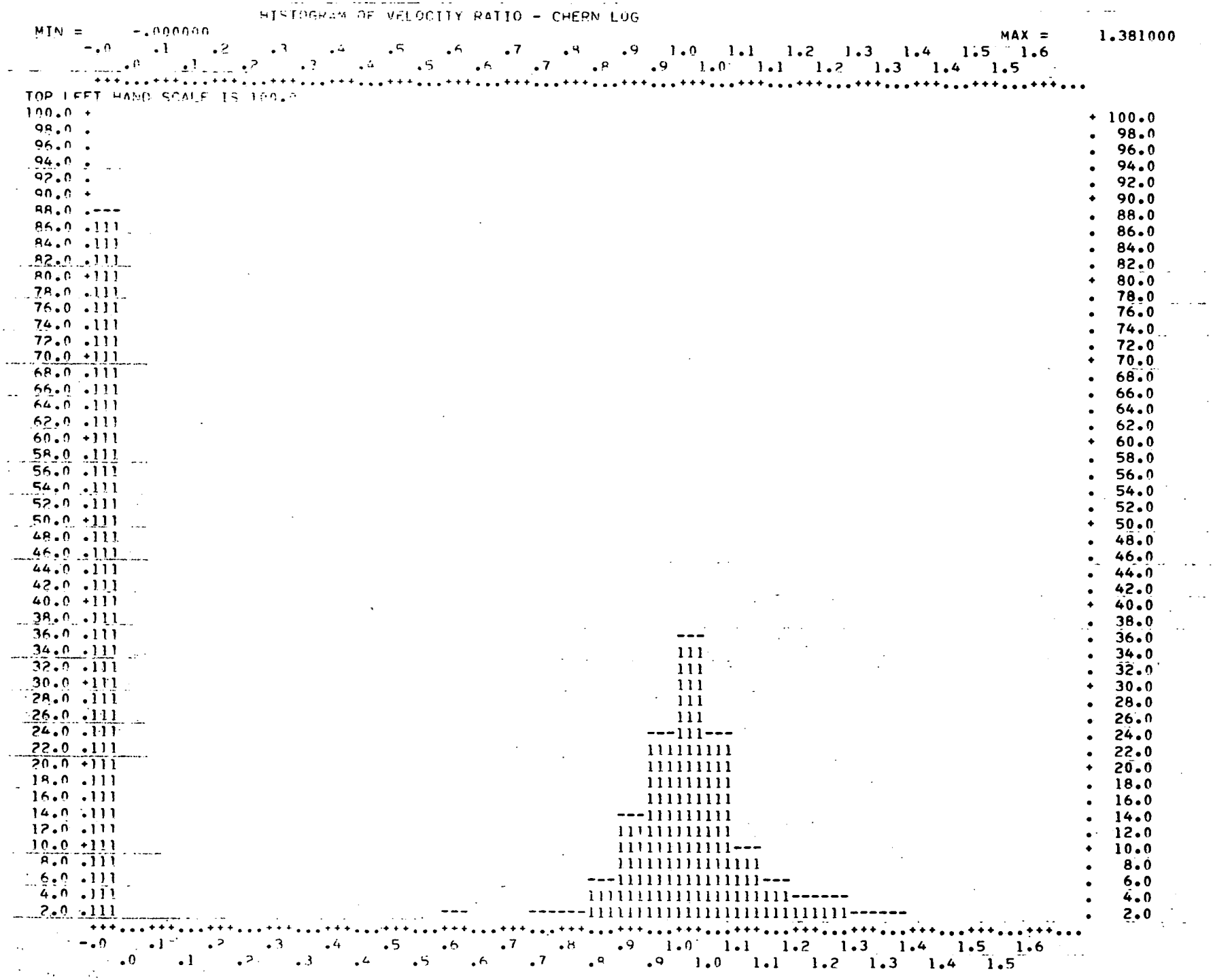

HISTOGRAM OF VELOCITY RATIO - CHERN LOG
MIN = -.000000
MAX = 1.381000
-.0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0 1.1 1.2 1.3 1.4 1.5 1.6
TOP LEFT HAND SCALE IS 100.0
100.0
98.0
96.0
94.0
92.0
90.0
88.0
86.0
84.0
82.0
80.0
78.0
76.0
74.0
72.0
70.0
68.0
66.0
64.0
62.0
60.0
58.0
56.0
54.0
52.0
50.0
48.0
46.0
44.0
42.0
40.0
38.0
36.0
34.0
32.0
30.0
28.0
26.0
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0

Fig. 12

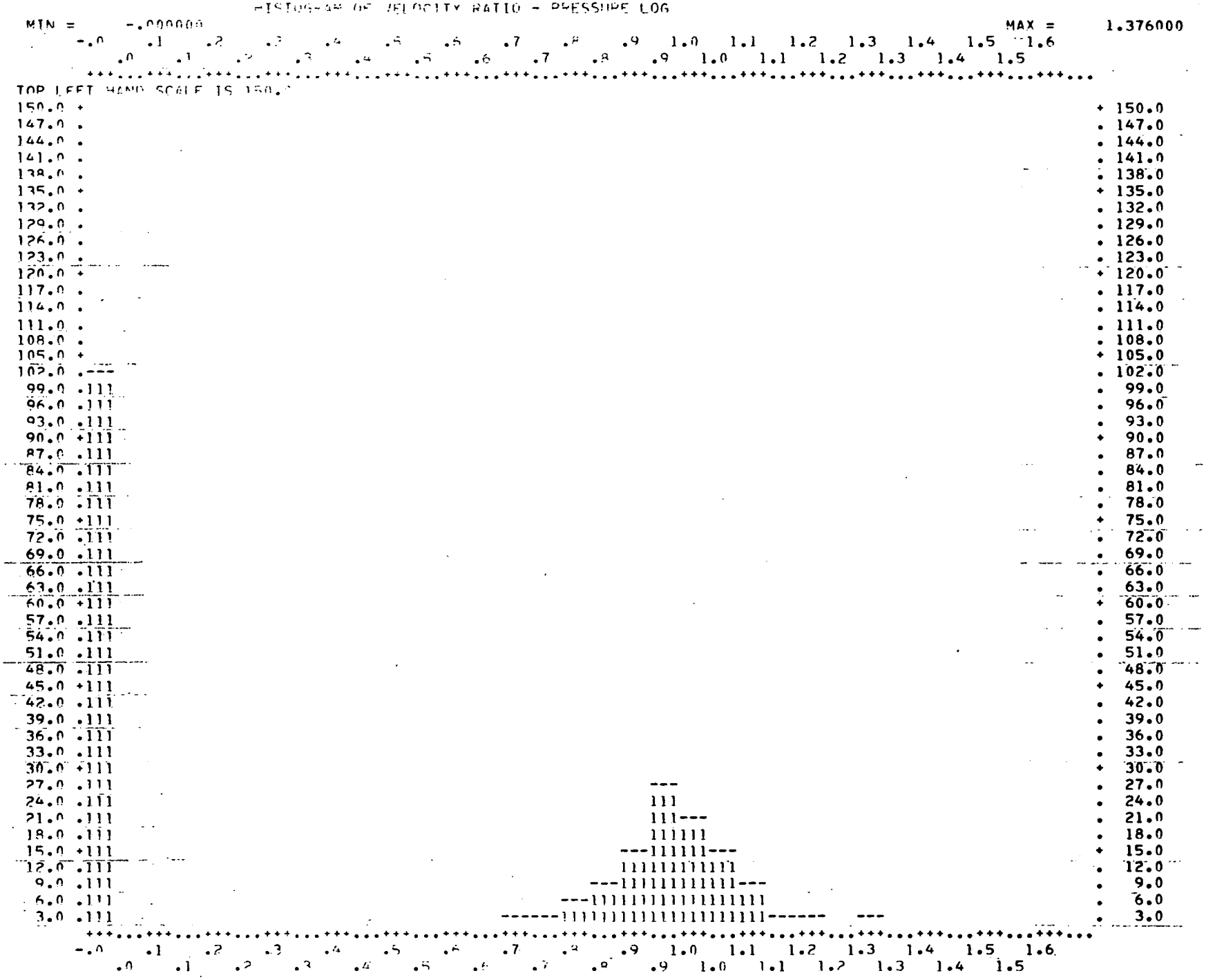

HISTOGRAM OF VELOCITY RATIO - PRESSURE LOG
MIN = -.000000
MAX = 1.376000
-.0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0 1.1 1.2 1.3 1.4 1.5 1.6
.0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0 1.1 1.2 1.3 1.4 1.5
TOP LEFT HAND SCALE IS 150.
150.0
147.0
144.0
141.0
138.0
135.0
132.0
129.0
126.0
123.0
120.0
117.0
114.0
111.0
108.0
105.0
102.0
99.0
96.0
93.0
90.0
87.0
84.0
81.0
78.0
75.0
72.0
69.0
66.0
63.0
60.0
57.0
54.0
51.0
48.0
45.0
42.0
39.0
36.0
33.0
30.0
27.0
24.0
21.0
18.0
15.0
12.0
9.0
6.0
3.0

Fig. 13

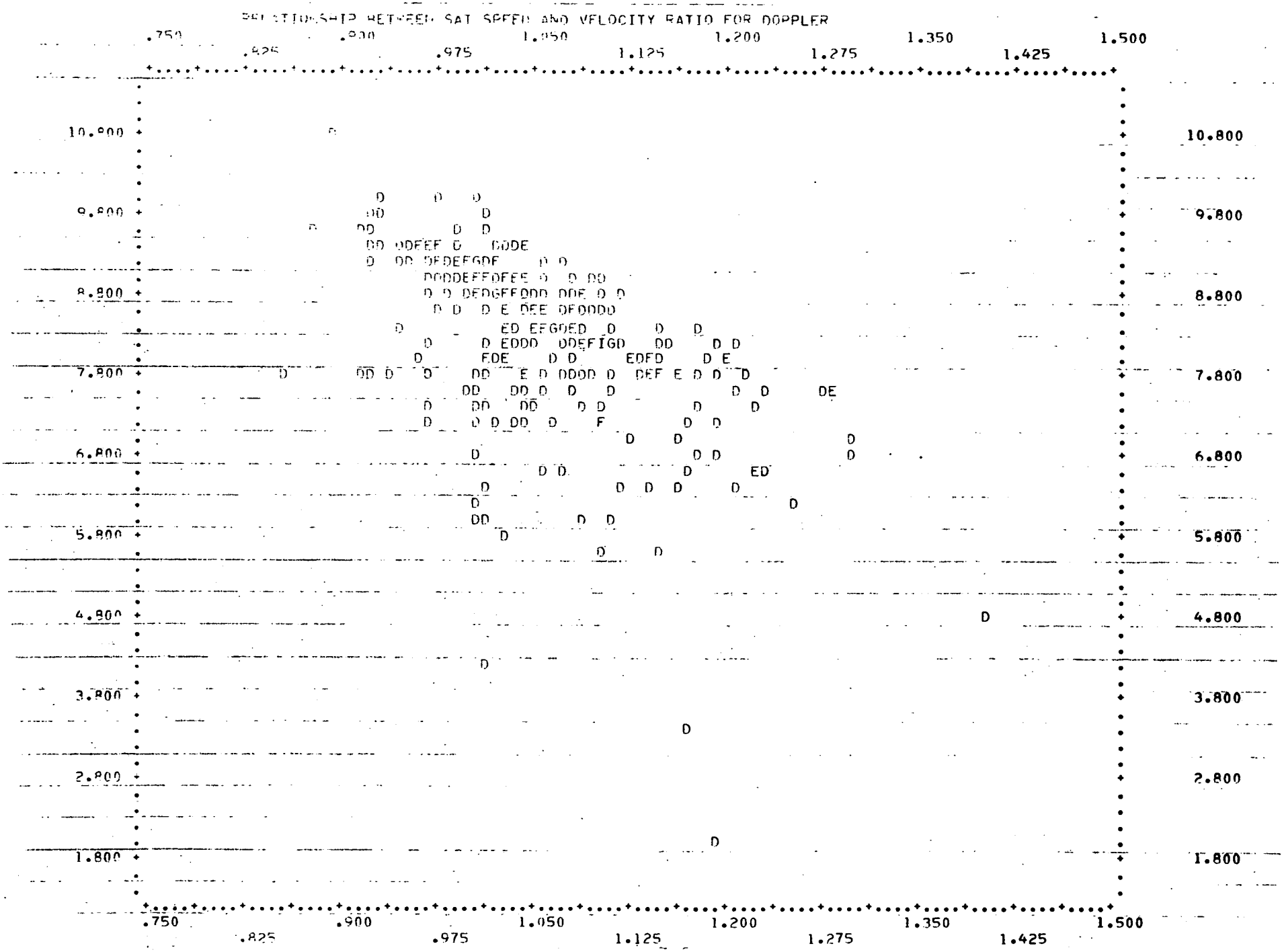

RELATIONSHIP BETWEEN SAT SPEED AND VELOCITY RATIO FOR DOPPLER
.750
.825
.900
.975
1.050
1.125
1.200
1.275
1.350
1.425
1.500
10.800
9.800
8.800
7.800
6.800
5.800
4.800
3.800
2.800
1.800

Fig. 14

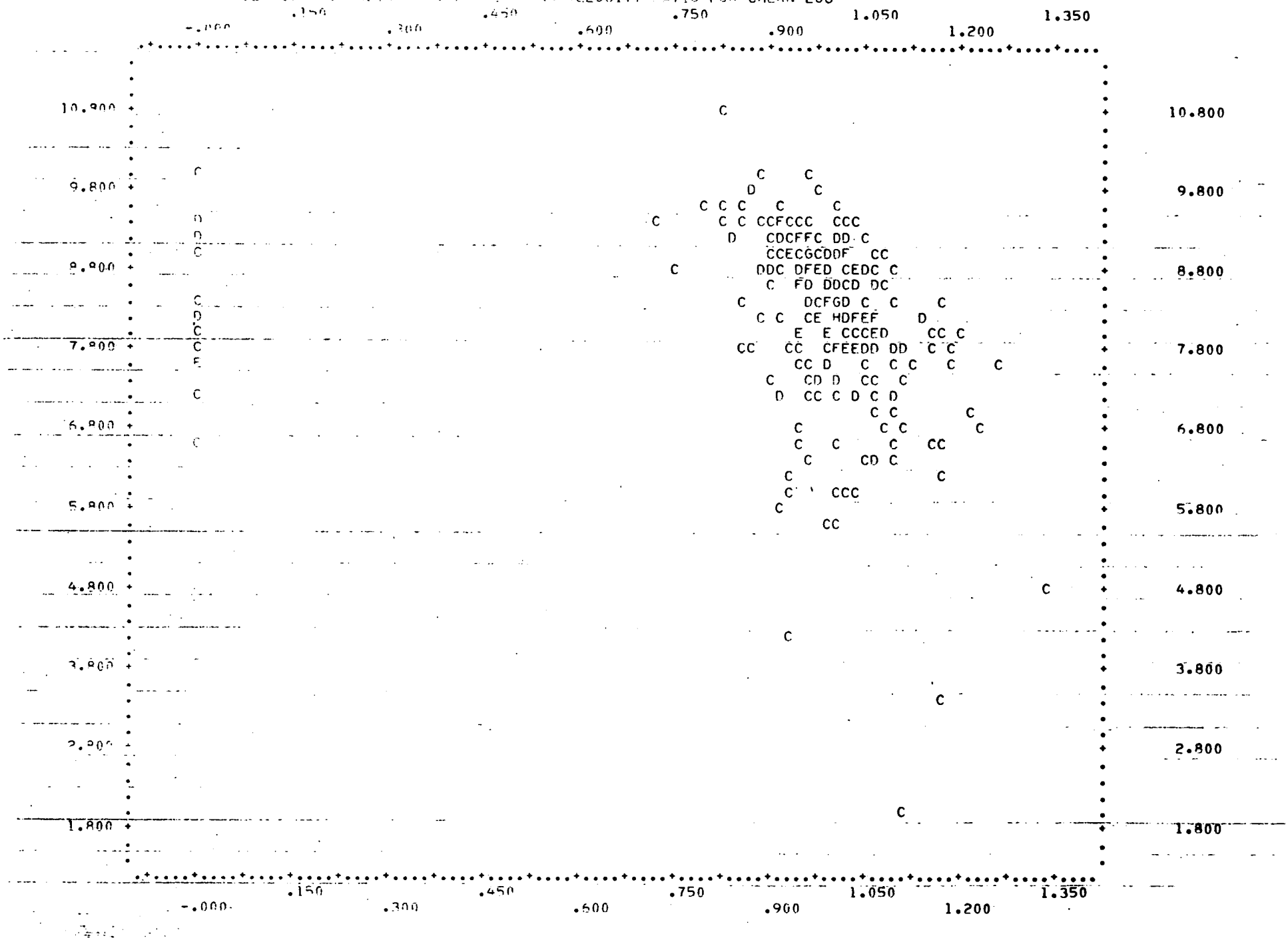

RELATIONSHIP BETWEEN SAT SPEED AND VELOCITY RATIO FOR CHERN LOG
-.000
.150
.300
.450
.600
.750
.900
1.050
1.200
1.350
10.800
9.800
8.800
7.800
6.800
5.800
4.800
3.800
2.800
1.800

Fig. 15

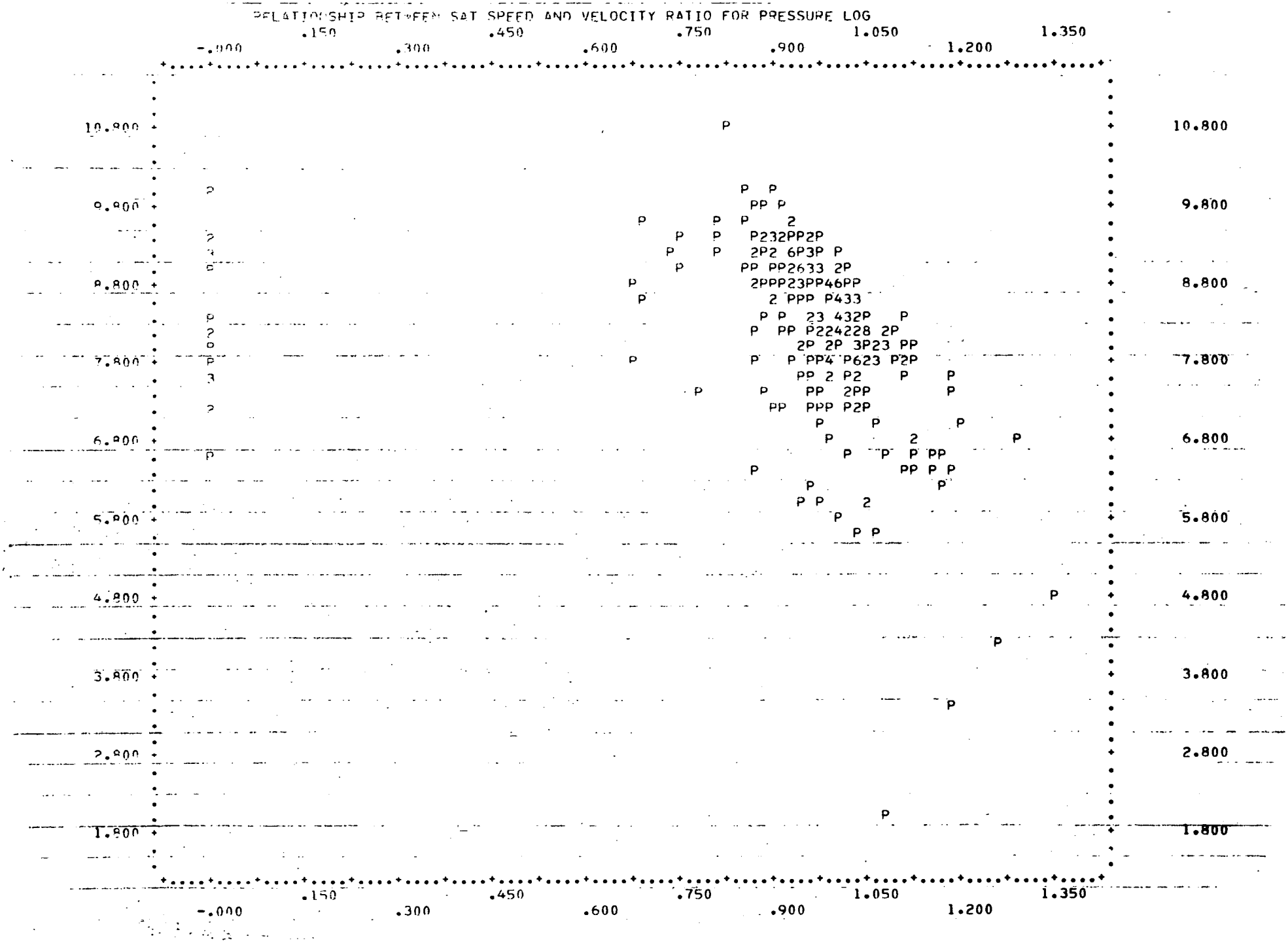

RELATIONSHIP BETWEEN SAT SPEED AND VELOCITY RATIO FOR PRESSURE LOG
-.000
.150
.300
.450
.600
.750
.900
1.050
1.200
1.350
10.800
9.800
8.800
7.800
6.800
5.800
4.800
3.800
2.800
1.800

Fig. 16

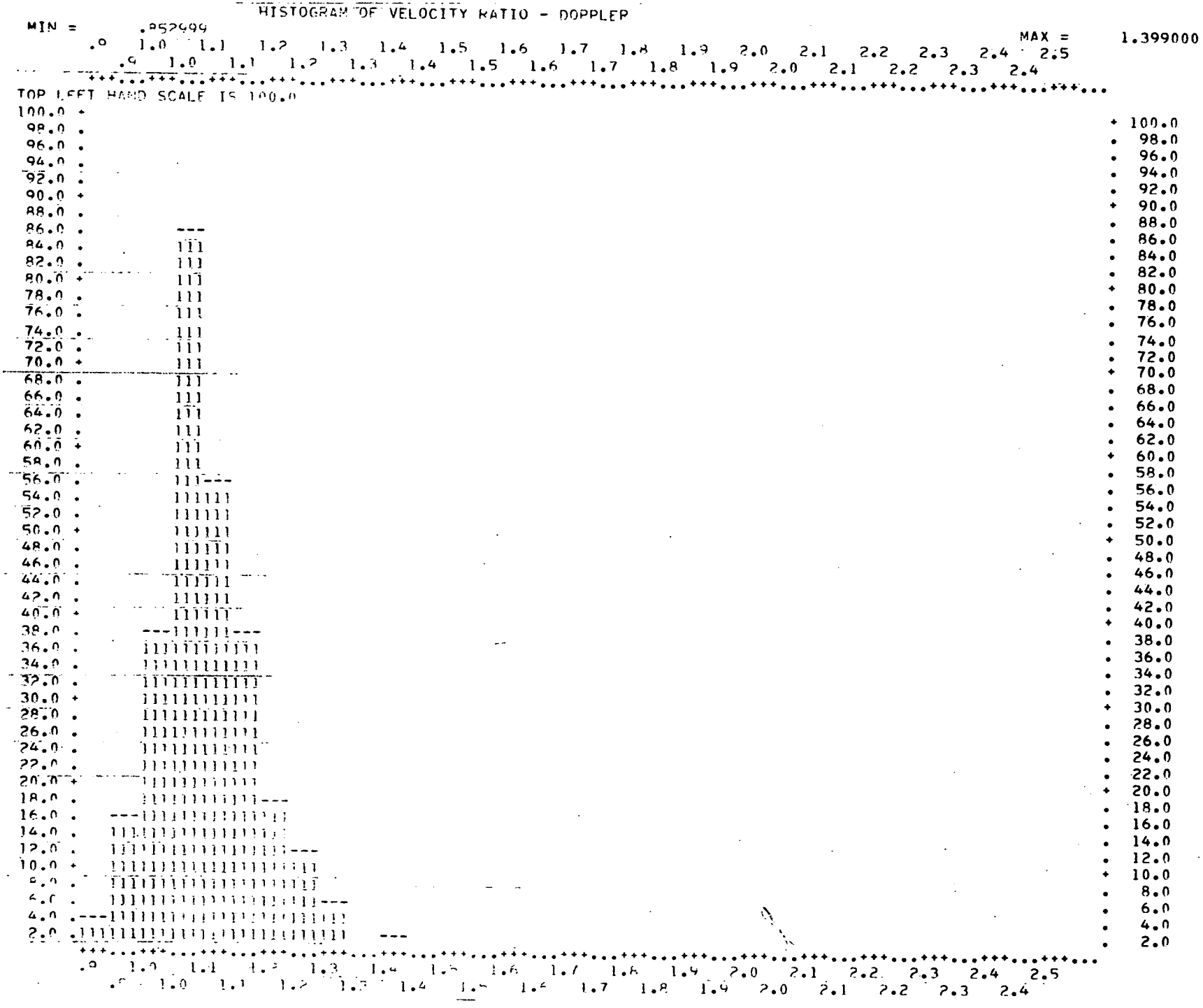

HISTOGRAM OF VELOCITY RATIO - DOPPLER
MIN = .852999
MAX = 1.399000
.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4
TOP LEFT HAND SCALE IS 100.0
100.0
98.0
96.0
94.0
92.0
90.0
88.0
86.0
84.0
82.0
80.0
78.0
76.0
74.0
72.0
70.0
68.0
66.0
64.0
62.0
60.0
58.0
56.0
54.0
52.0
50.0
48.0
46.0
44.0
42.0
40.0
38.0
36.0
34.0
32.0
30.0
28.0
26.0
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0

Fig. 17

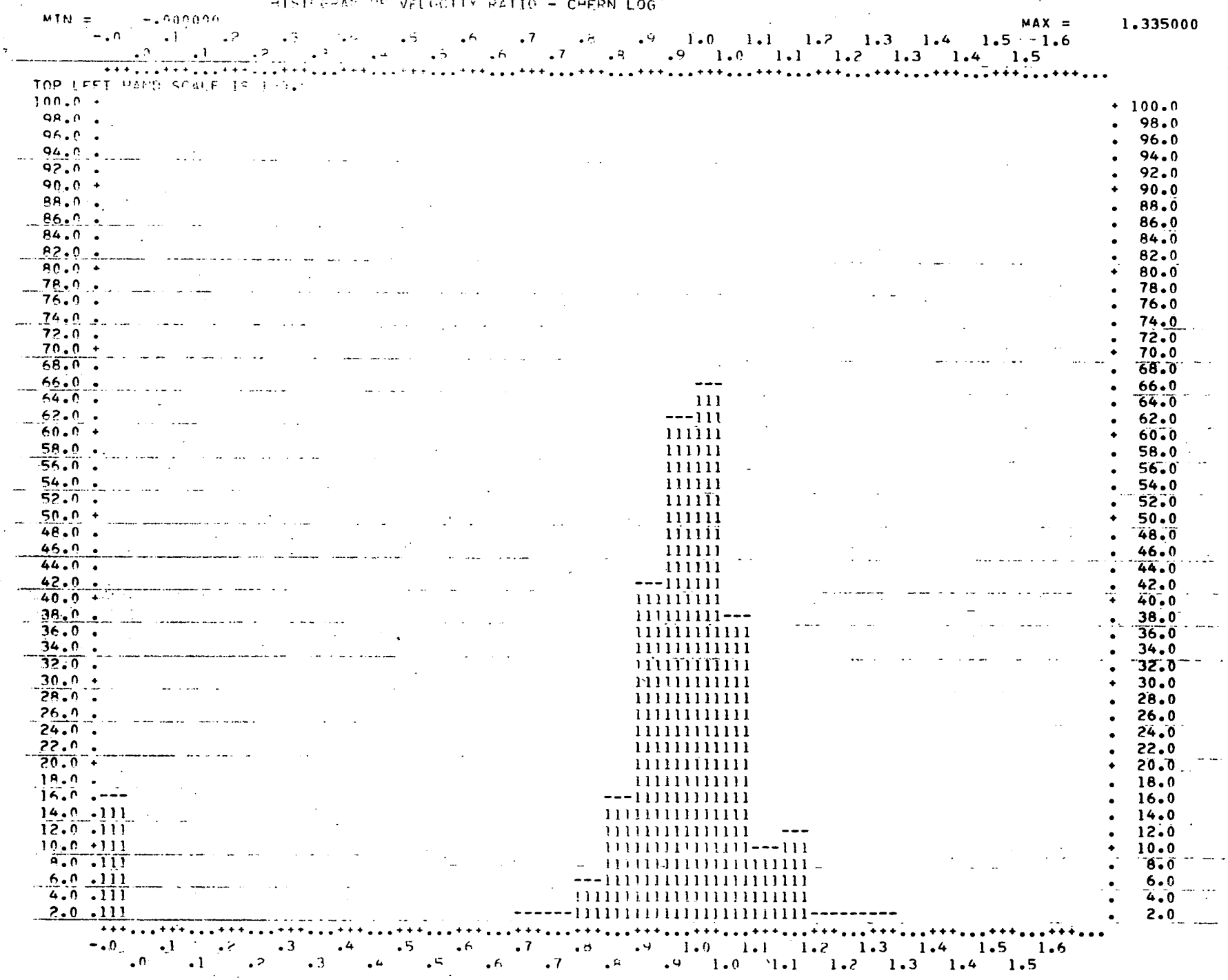

HISTOGRAM OF VELOCITY RATIO - CHERN LOG
MIN = -.000000
MAX = 1.335000
TOP LEFT HAND SCALE IS 1=2.

Fig. 18

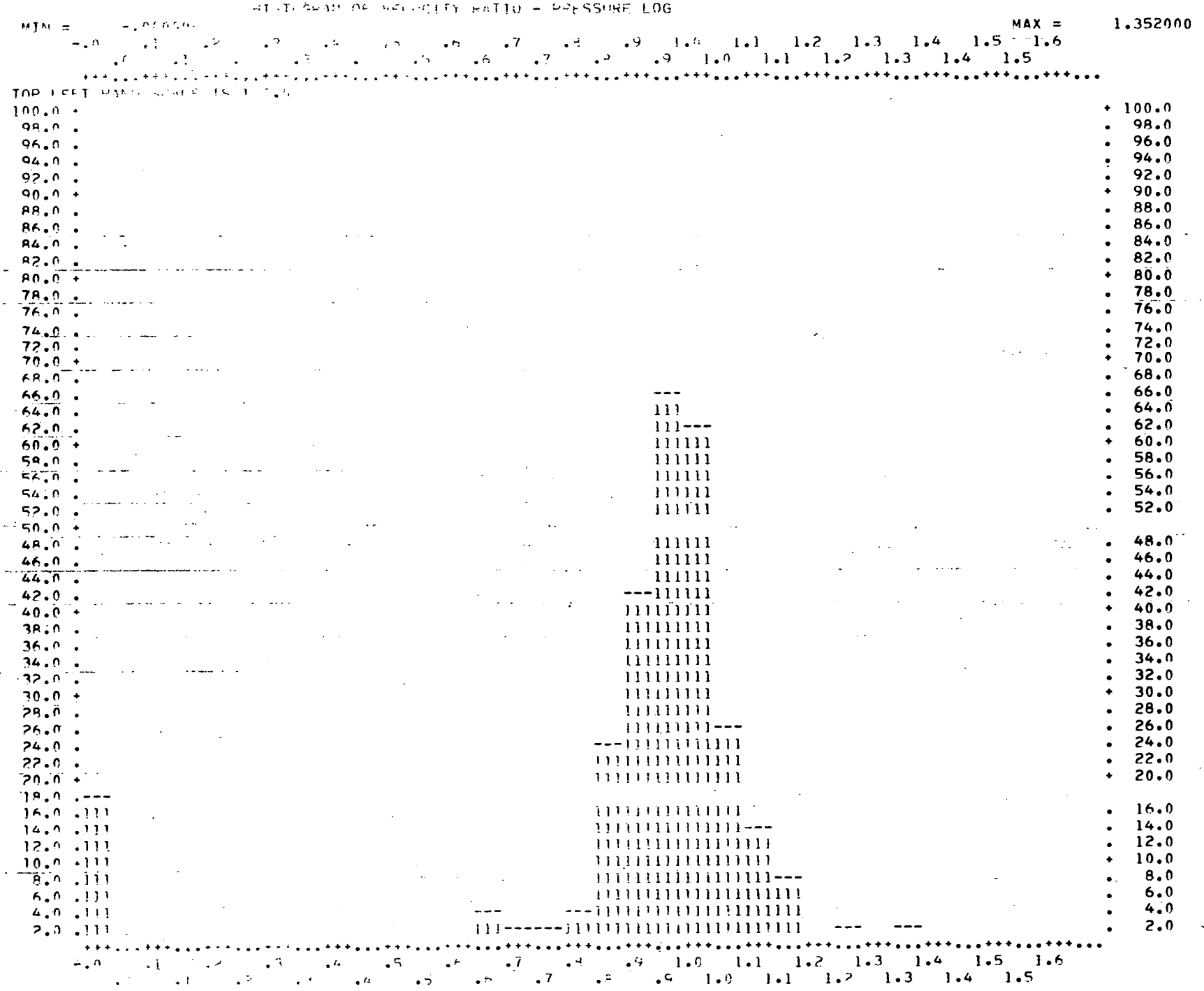


Fig. 19

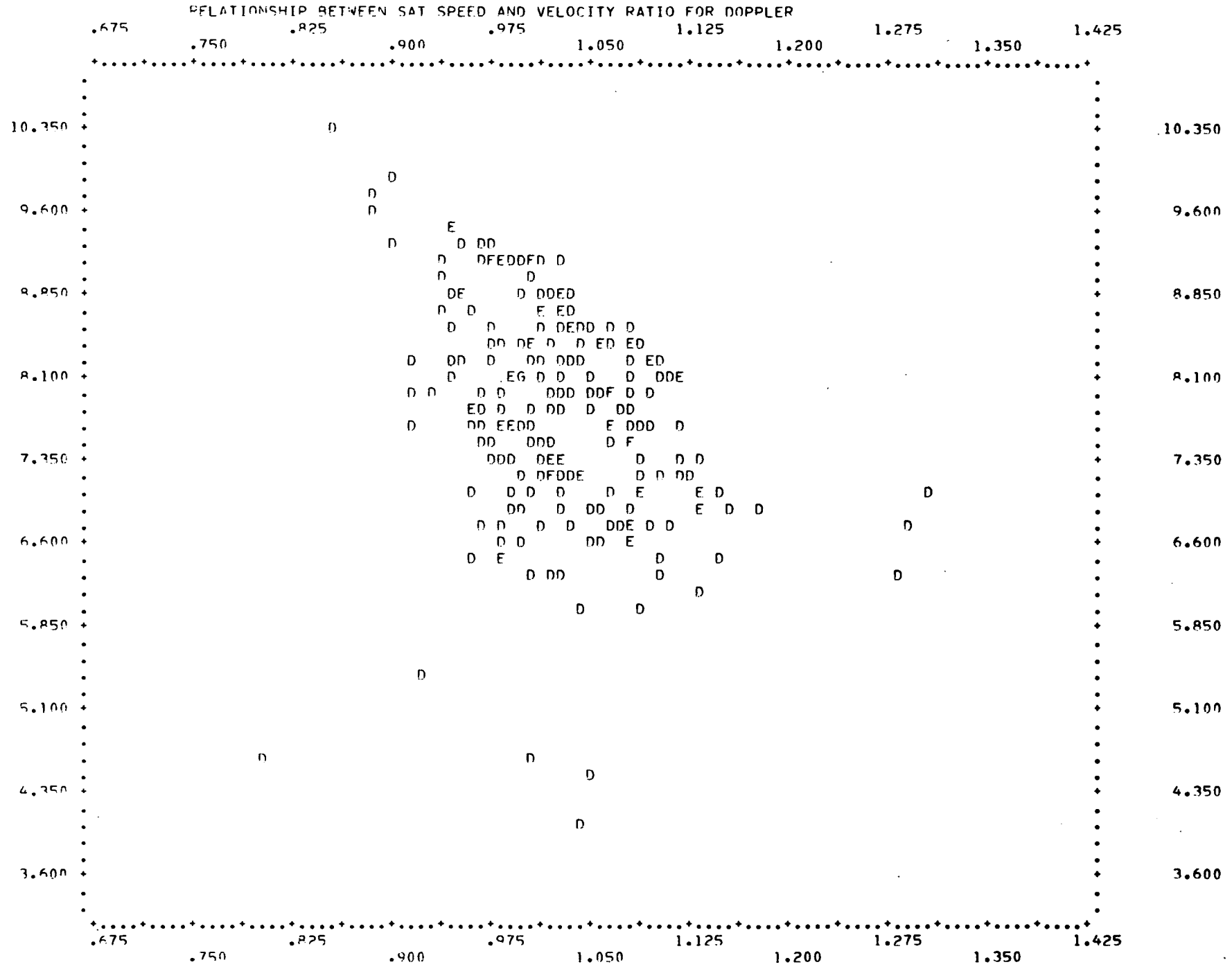

RELATIONSHIP BETWEEN SAT SPEED AND VELOCITY RATIO FOR DOPPLER
.675
.750
.825
.900
.975
1.050
1.125
1.200
1.275
1.350
1.425
10.350
9.600
8.850
8.100
7.350
6.600
5.850
5.100
4.350
3.600

Fig. 20

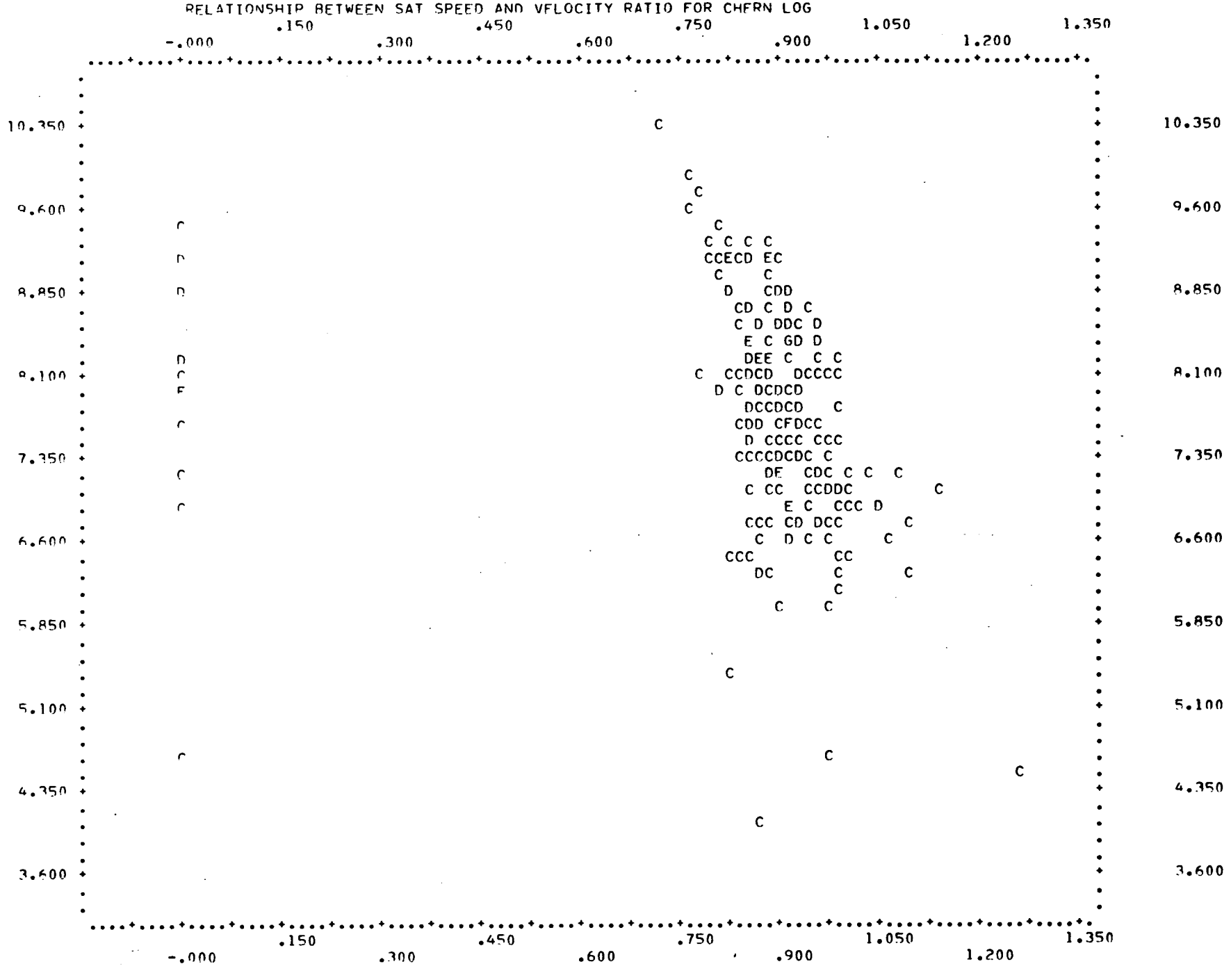

RELATIONSHIP BETWEEN SAT SPEED AND VELOCITY RATIO FOR CHERN LOG
-.000
.150
.300
.450
.600
.750
.900
1.050
1.200
1.350
10.350
9.600
8.850
8.100
7.350
6.600
5.850
5.100
4.350
3.600

Fig. 21

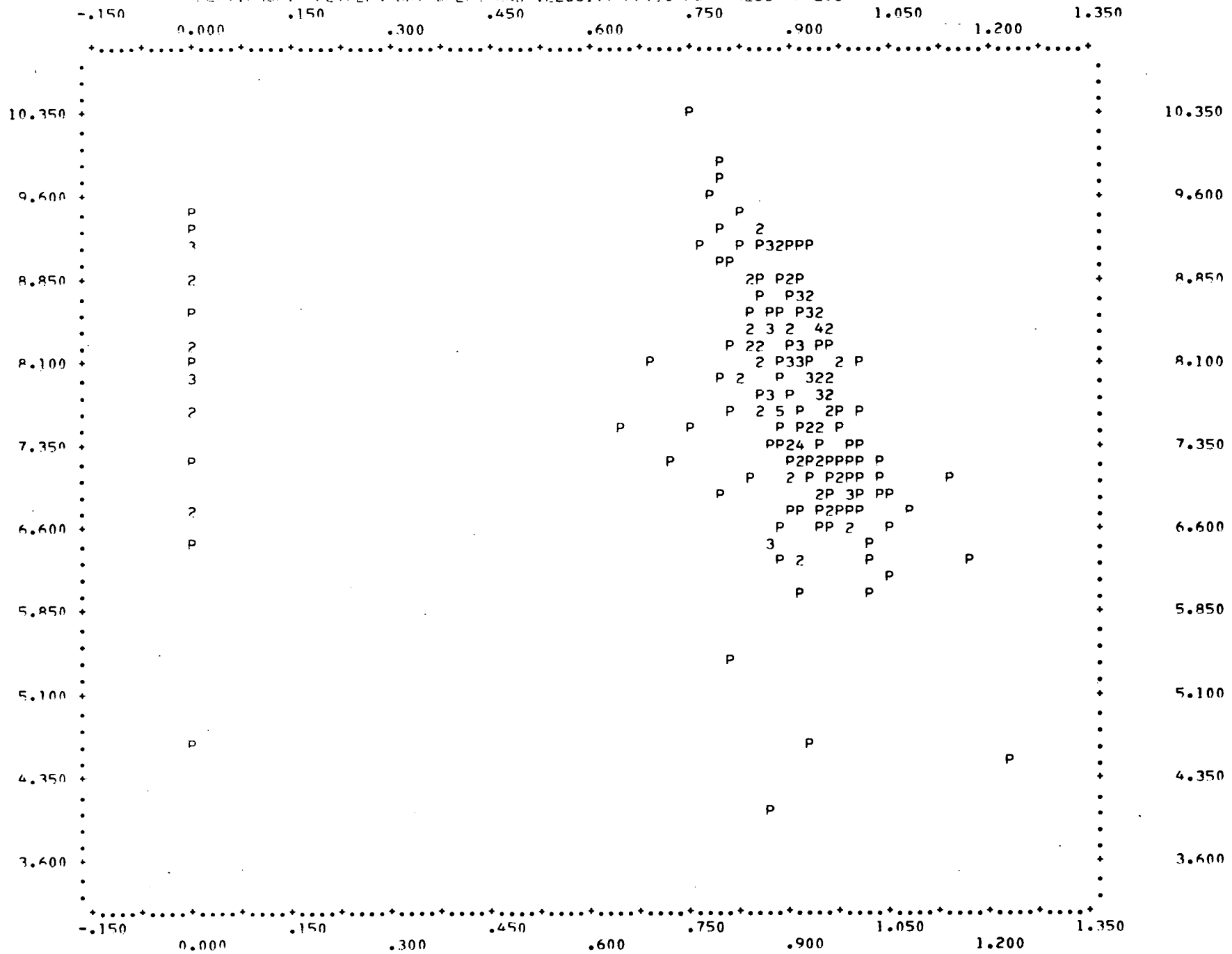

RELATIONSHIP BETWEEN SAT SPEED AND VELOCITY RATIO FOR PRESSURE LOG
-.150
0.000
.150
.300
.450
.600
.750
.900
1.050
1.200
1.350
10.350
9.600
8.850
8.100
7.350
6.600
5.850
5.100
4.350
3.600

Fig. 22

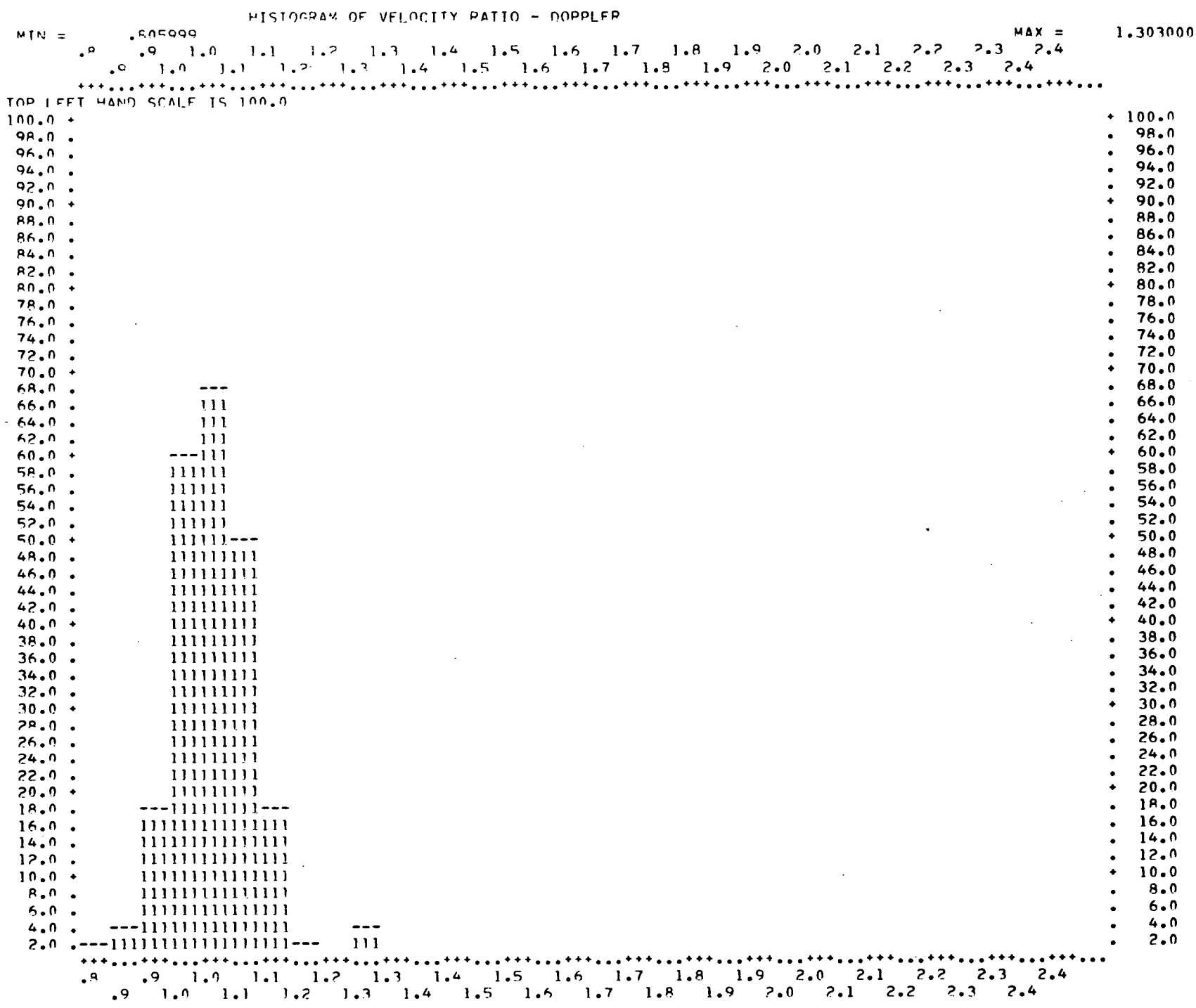

HISTOGRAM OF VELOCITY RATIO - DOPPLER
MIN = .805999
MAX = 1.303000
.8 .9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4
TOP LEFT HAND SCALE IS 100.0
100.0
98.0
96.0
94.0
92.0
90.0
88.0
86.0
84.0
82.0
80.0
78.0
76.0
74.0
72.0
70.0
68.0
66.0
64.0
62.0
60.0
58.0
56.0
54.0
52.0
50.0
48.0
46.0
44.0
42.0
40.0
38.0
36.0
34.0
32.0
30.0
28.0
26.0
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0

Fig. 23

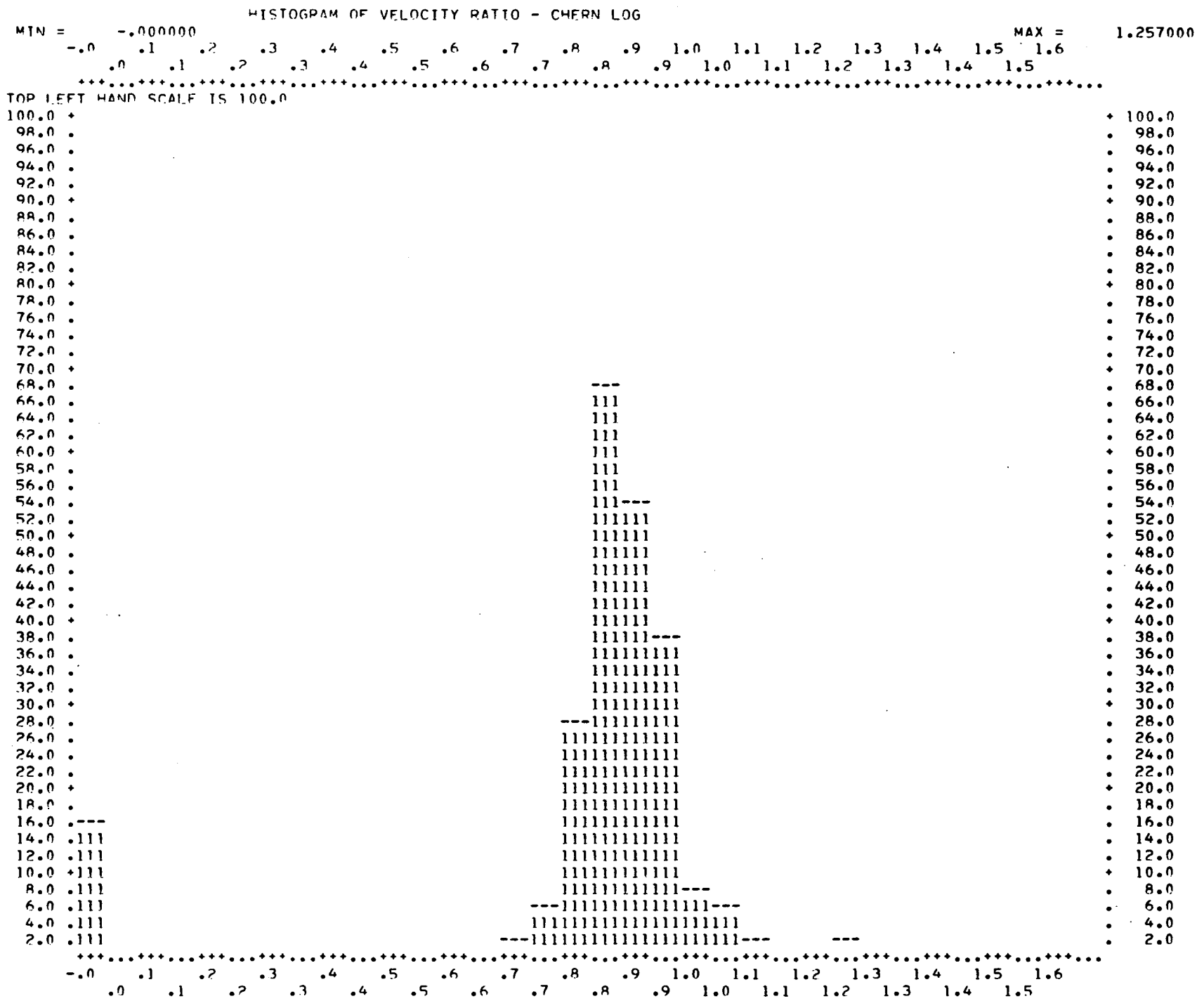
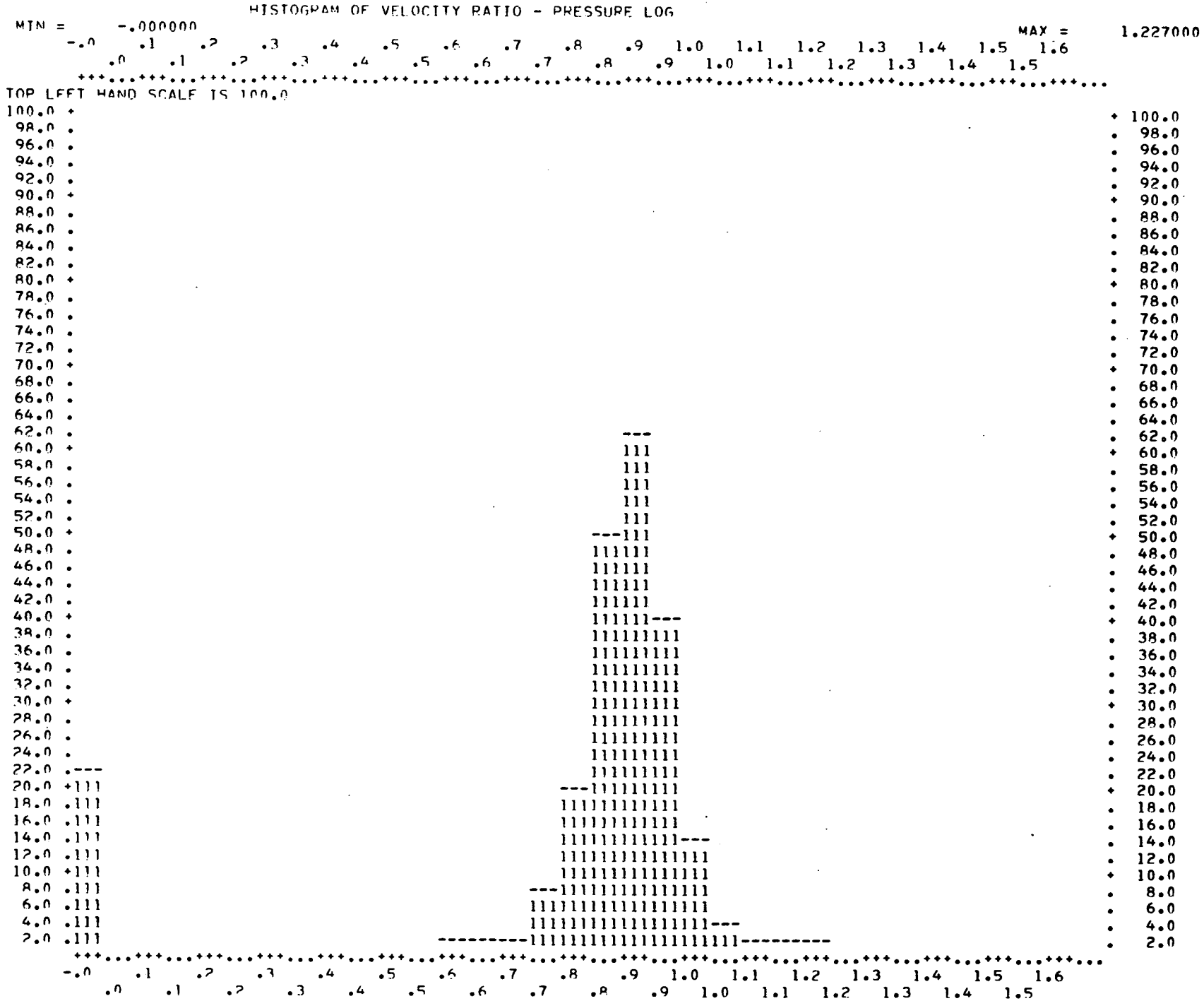

HISTOGRAM OF VELOCITY RATIO - CHERN LOG
MIN = -.000000
MAX = 1.257000
TOP LEFT HAND SCALE IS 100.0

Fig. 24


HISTOGRAM OF VELOCITY RATIO - PRESSURE LOG
MIN = -.000000
MAX = 1.227000
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.0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0 1.1 1.2 1.3 1.4 1.5
TOP LEFT HAND SCALE IS 100.0
100.0
98.0
96.0
94.0
92.0
90.0
88.0
86.0
84.0
82.0
80.0
78.0
76.0
74.0
72.0
70.0
68.0
66.0
64.0
62.0
60.0
58.0
56.0
54.0
52.0
50.0
48.0
46.0
44.0
42.0
40.0
38.0
36.0
34.0
32.0
30.0
28.0
26.0
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0

Fig. 25

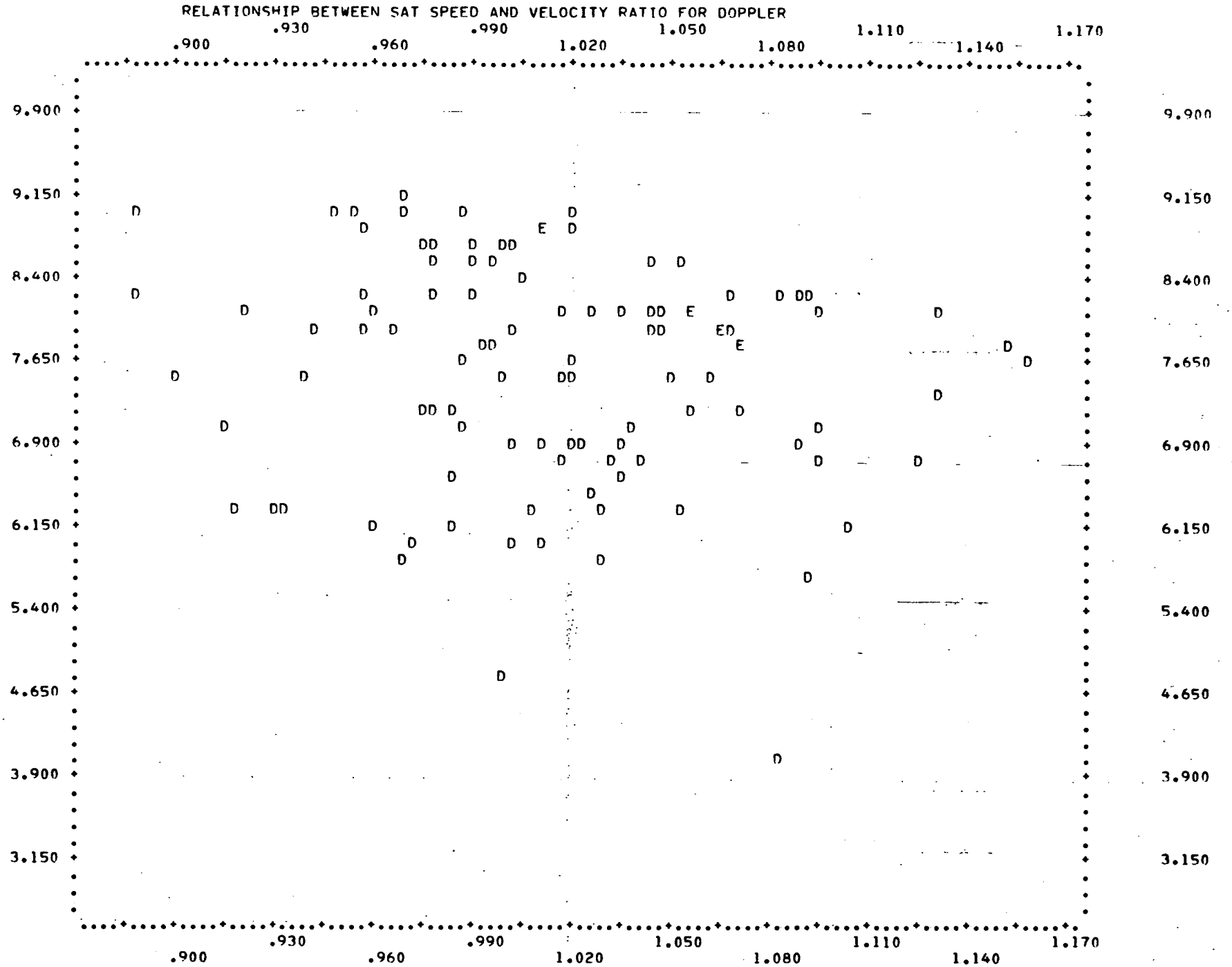
RELATIONSHIP BETWEEN SAT SPEED AND VELOCITY RATIO FOR DOPPLER
.900
.930
.960
.990
1.020
1.050
1.080
1.110
1.140
1.170
9.900
9.150
8.400
7.650
6.900
6.150
5.400
4.650
3.900
3.150

Fig. 26

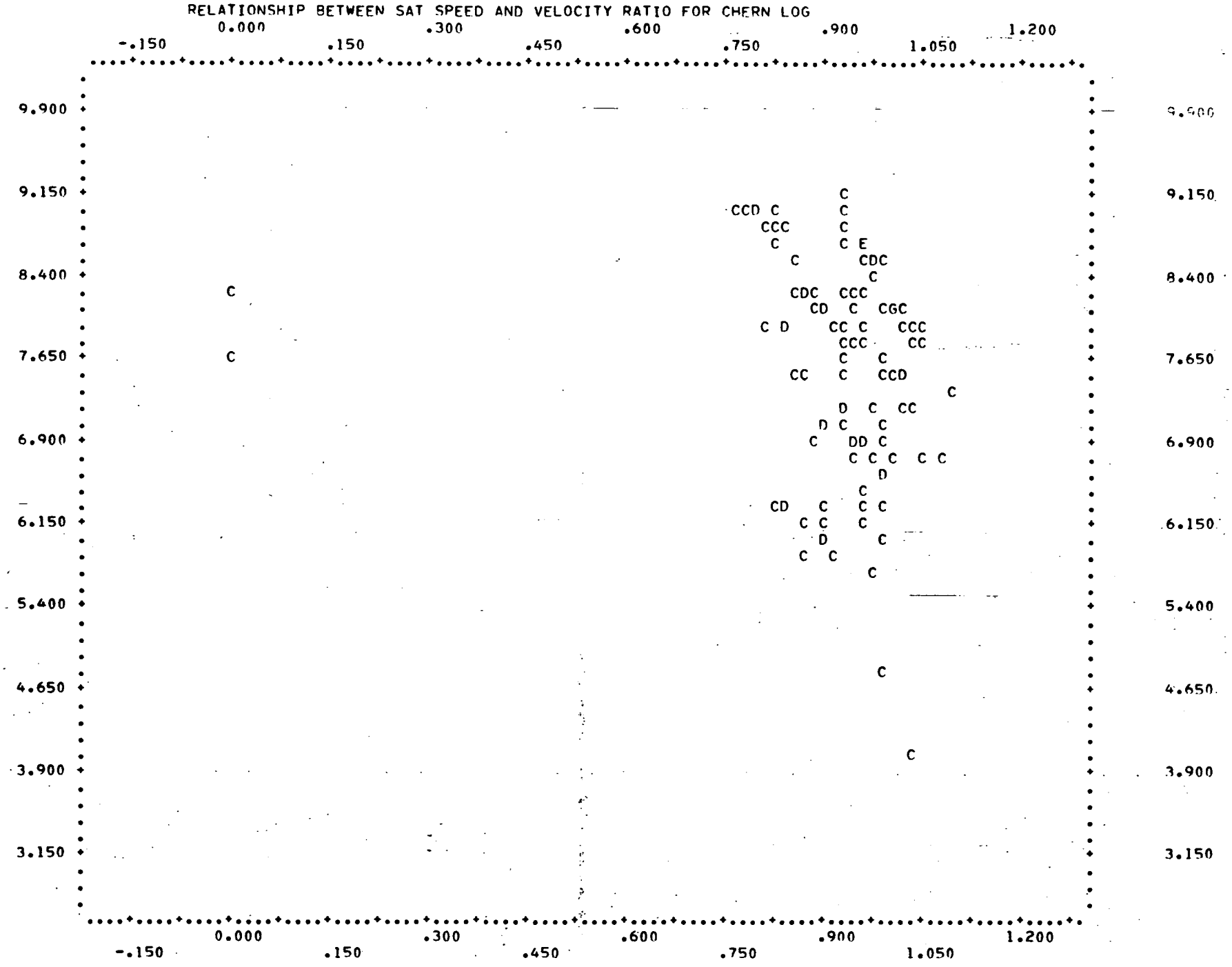
RELATIONSHIP BETWEEN SAT SPEED AND VELOCITY RATIO FOR CHERN LOG
-.150
0.000
.150
.300
.450
.600
.750
.900
1.050
1.200
9.900
9.150
8.400
7.650
6.900
6.150
5.400
4.650
3.900
3.150

Fig. 27

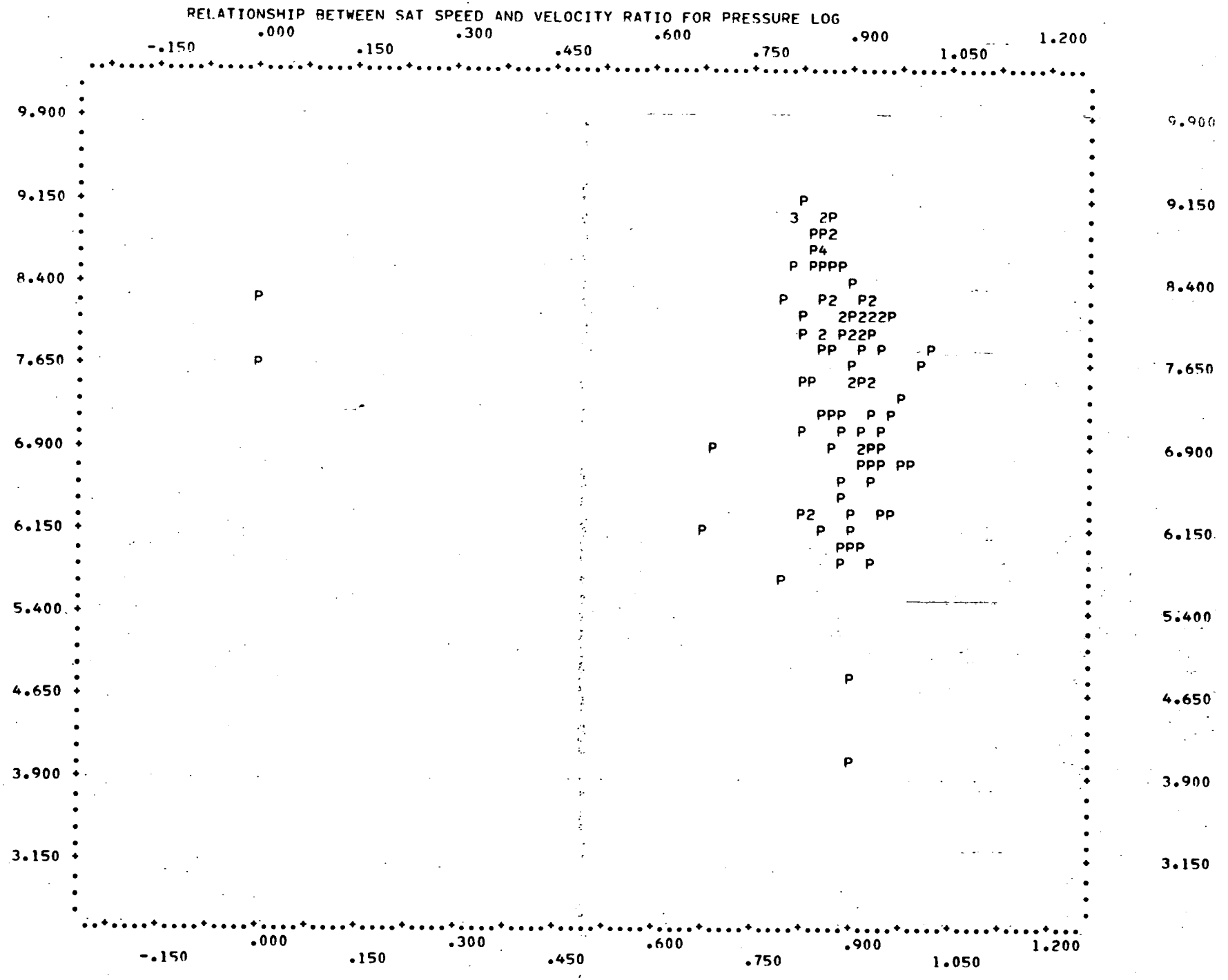
RELATIONSHIP BETWEEN SAT SPEED AND VELOCITY RATIO FOR PRESSURE LOG
-.150
.000
.150
.300
.450
.600
.750
.900
1.050
1.200
9.900
9.150
8.400
7.650
6.900
6.150
5.400
4.650
3.900
3.150

Fig. 28

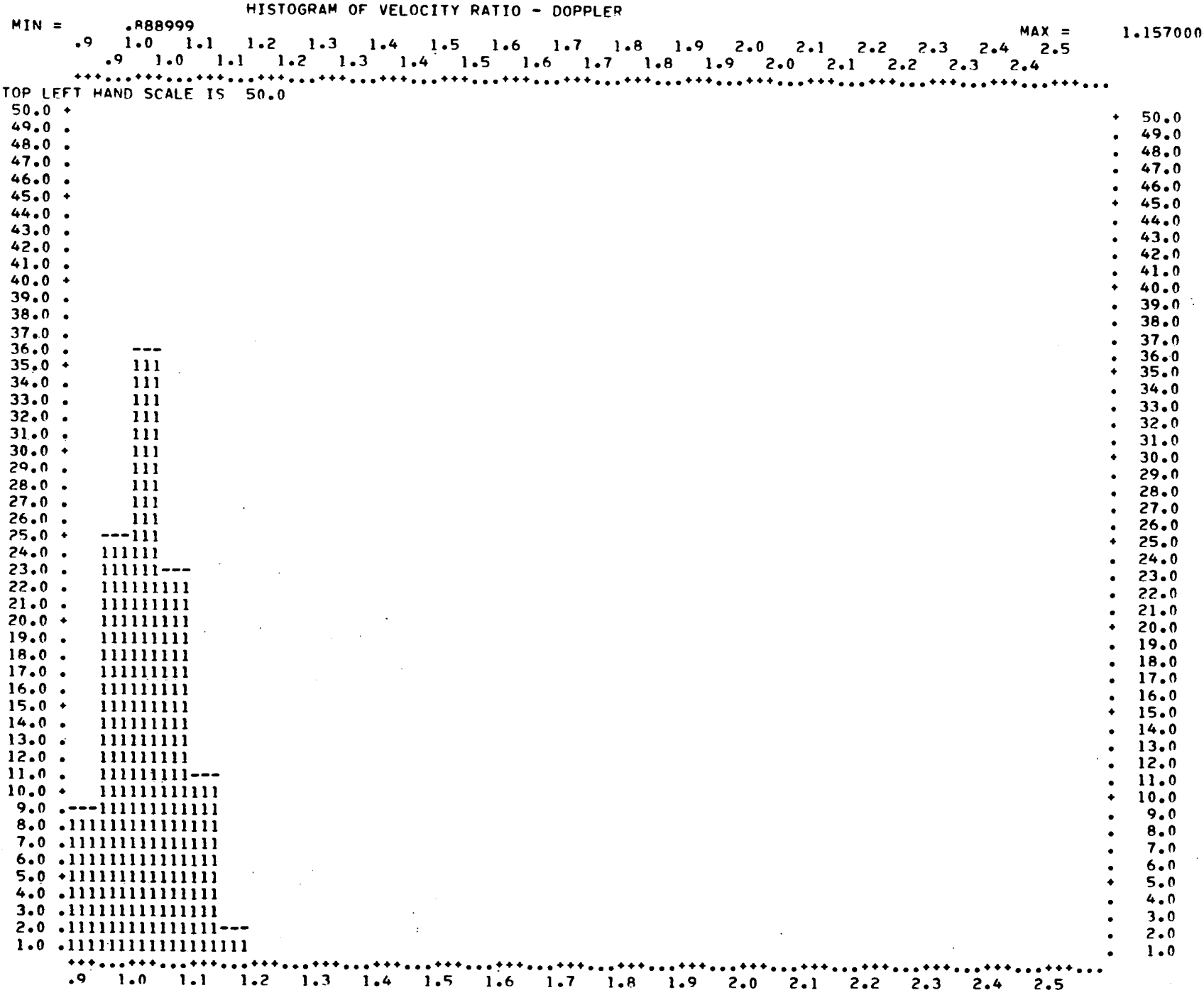
HISTOGRAM OF VELOCITY RATIO - DOPPLER
MIN = .888999
MAX = 1.157000
.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5
TOP LEFT HAND SCALE IS 50.0

Fig. 29

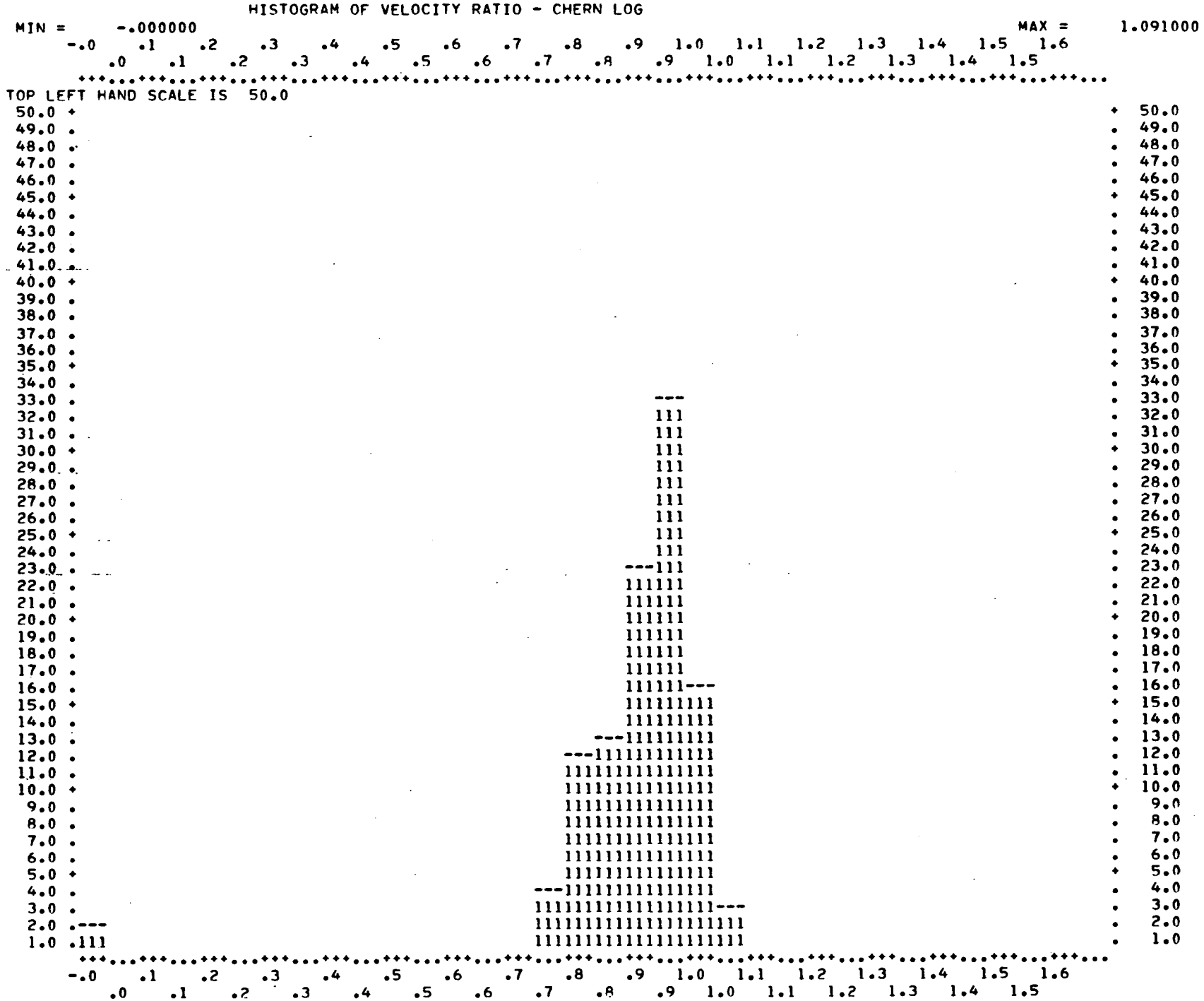
HISTOGRAM OF VELOCITY RATIO - CHERN LOG
MIN = -.000000
MAX = 1.091000
TOP LEFT HAND SCALE IS 50.0

Fig. 30

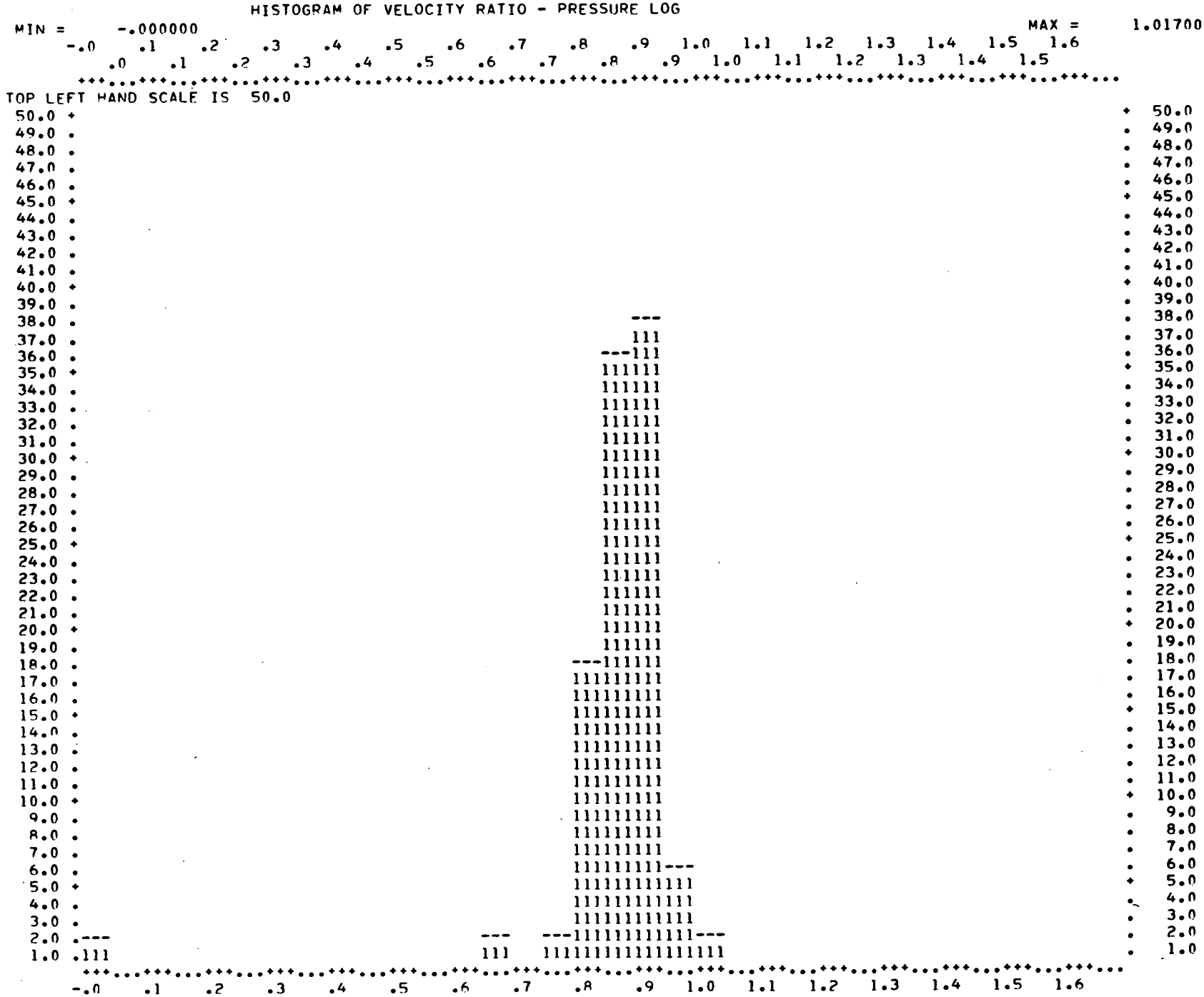
HISTOGRAM OF VELOCITY RATIO - PRESSURE LOG
MIN = -.000000
MAX = 1.017000
TOP LEFT HAND SCALE IS 50.0

Fig. 31

TABLES

Table 6

SATELLITE NO. 12 - NO OF FIXES = 40

DD HHMMM	RAW freq.	SMOOTHED f.	WEIGHT
2.1848	32070.77	32070.44	1.00
2.2032	32070.50	32070.50	1.00
2.2218	32070.28	32070.42	.22
3.0646	32072.87	32070.58	0.00
3.0824	32070.41	32070.49	.33
3.1014	32070.48	32070.54	1.00
3.1436	32070.27	32070.57	1.00
3.2122	32070.47	32070.56	.44
4.0736	32070.42	32070.46	.44
4.0916	32070.74	32070.47	1.00
8.2022	32070.74	32070.47	1.00
9.0616	32070.61	32070.57	.33
10.0718	32070.72	32070.75	.33
10.0904	32070.84	32070.77	1.00
10.1056	31677.54	32070.78	0.00
10.1436	32071.05	32070.84	1.00
10.2018	32070.96	32070.86	1.00
10.2206	32070.86	32070.87	1.00
11.0608	32070.85	32070.95	1.00
11.0958	32070.67	32070.96	.33
11.1924	32071.16	32071.03	.44
11.2110	32071.10	32071.04	.44
12.0718	32071.00	32071.12	1.00
12.0902	32071.31	32071.13	1.00
12.1052	32072.47	32071.14	0.00
12.1832	32071.25	32071.19	0.00
12.2016	32071.31	32071.20	1.00
12.2202	32071.27	32071.22	1.00
13.0626	32074.36	32071.27	0.00
13.0806	32071.24	32071.28	1.00
13.0954	32070.85	32071.29	.22
13.1922	32071.32	32071.34	1.00
13.2106	32071.32	32071.35	1.00
14.0712	32071.49	32071.41	1.00
14.0900	32071.01	32071.41	.22
14.1830	32071.25	32071.46	.33
14.2012	32071.46	32071.46	1.00
14.2200	32071.67	32071.47	1.00
15.0802	32070.77	32071.51	0.00
15.0952	32071.66	32071.52	1.00
15.1918	32071.76	32071.55	1.00
15.2104	32071.54	32071.55	1.00
16.0708	32071.69	32071.58	1.00
16.0852	32071.64	32071.58	1.00
16.1826	32071.33	32071.60	1.00
16.2008	32071.56	32071.61	1.00
16.2156	32071.67	32071.61	1.00
17.0758	32071.75	32071.63	1.00
17.1914	32071.98	32071.64	1.00
17.2100	32071.35	32071.64	1.00
18.0704	32071.93	32071.65	1.00
18.0848	32071.75	32071.66	1.00
18.2006	32071.61	32071.67	1.00
18.2152	32071.37	32071.67	1.00
19.0754	32071.76	32071.69	1.00
19.0946	32071.64	32071.70	1.00
19.1910	32071.52	32071.73	1.00
19.2056	32072.03	32071.73	1.00
20.0700	32071.93	32071.78	1.00
20.0850	32072.05	32071.79	1.00

SATELLITE NO. 13 - NO OF FIXES = 58

2.1954	31989.85	31989.63	1.00
2.2142	31989.60	31989.65	1.00
3.0752	31989.61	31989.69	1.00
3.0938	31989.53	31989.69	1.00
3.1908	31990.08	31989.66	.22
3.2052	31989.63	31989.64	1.00
3.2240	31989.88	31989.63	1.00
4.0852	31989.73	31989.53	1.00
8.2210	31990.00	31989.74	1.00
9.1014	31989.87	31989.79	1.00
9.1936	31989.82	31989.80	1.00
9.2122	31989.96	31989.81	1.00
10.1850	31989.43	31989.81	.11
10.2034	31989.81	31989.81	1.00
10.2222	31989.84	31989.81	1.00
11.0834	31990.20	31989.81	.22
11.1020	31990.11	31989.81	.33
11.1946	31989.77	31989.82	1.00
11.2132	31989.81	31989.82	1.00
12.0740	31989.72	31989.84	1.00
12.0926	31989.99	31989.84	1.00
12.1458	31989.50	31989.86	.33
12.2044	31989.99	31989.86	1.00
12.2232	31989.92	31989.87	1.00
13.0656	31991.28	31989.86	0.00
13.0836	31989.92	31989.89	1.00
13.1026	31990.27	31989.89	.22
13.1954	31989.77	31989.91	1.00
13.2142	31989.92	31989.91	1.00
14.0936	31989.96	31989.93	1.00
14.1908	31990.24	31989.94	.33
14.2052	31989.97	31989.94	1.00
14.2242	31990.48	31989.94	0.00
15.0706	31990.64	31989.94	0.00
15.0846	31990.05	31989.94	1.00
15.2004	31990.03	31989.94	1.00
15.2152	31989.93	31989.94	1.00
16.0800	31990.01	31989.93	1.00
16.0944	31989.94	31989.93	1.00
16.1916	31989.87	31989.94	1.00
16.2102	31989.93	31989.94	1.00
17.0710	31990.10	31989.95	.44
17.0854	31990.04	31989.95	1.00
17.1830	31990.28	31989.97	.33
17.2014	31989.84	31989.97	1.00
17.2202	31989.93	31989.97	1.00
18.0806	31989.85	31990.00	.44
18.0956	31990.75	31990.00	0.00
18.1926	31989.76	31990.02	.22
18.2112	31989.94	31990.03	1.00
19.0718	31990.22	31990.04	1.00
19.0904	31990.63	31990.04	1.00
19.1838	31989.93	31990.03	1.00
19.2024	31990.14	31990.02	1.00
19.2212	31990.15	31990.02	1.00
20.0632	31989.03	31989.98	0.00
20.0814	31989.83	31989.94	.33
20.1004	31990.16	31989.96	1.00

SATELLITE NO. 14 - NO OF FIXES = 52

2.2350	32069.24	32069.57	.11
3.0136	32069.51	32069.59	1.00
3.1150	32069.63	32069.63	1.00
3.1332	32069.65	32069.62	1.00
3.1522	32069.71	32069.62	1.00
4.0046	32069.48	32069.55	1.00
4.0236	32069.59	32069.53	1.00
9.0004	32069.59	32069.51	1.00
9.0150	32069.83	32069.53	1.00
9.2318	32070.72	32069.67	0.00
10.0058	32070.18	32069.67	.22
10.1250	32071.32	32069.73	0.00
10.1440	32069.86	32069.74	1.00
11.0008	32069.75	32069.77	1.00
11.0154	32069.82	32069.78	1.00
11.1200	32069.70	32069.81	1.00
11.1348	32069.78	32069.81	1.00
11.2318	32069.93	32069.83	1.00
12.0102	32069.87	32069.84	1.00
12.1112	32069.73	32069.85	1.00
12.1444	32069.83	32069.86	1.00
13.0012	32070.00	32069.87	1.00
13.0158	32070.20	32069.87	.33
13.1204	32069.89	32069.88	1.00
13.1350	32070.01	32069.88	1.00
13.2322	32069.90	32069.89	1.00
14.0106	32069.82	32069.89	1.00
14.1116	32070.08	32069.89	1.00
14.1258	32069.80	32069.89	1.00
14.1450	32070.01	32069.89	1.00
15.0016	32069.82	32069.90	1.00
15.1206	32069.92	32069.91	1.00
15.1356	32069.79	32069.91	1.00
15.2326	32070.08	32069.92	1.00
16.0112	32070.00	32069.92	1.00
16.1118	32070.07	32069.94	1.00
16.1302	32069.94	32069.94	1.00
16.2236	32070.00	32069.97	1.00
17.0020	32070.00	32069.98	1.00
17.1030	32071.66	32070.02	0.00
17.1212	32069.91	32070.02	.44
17.1358	32070.24	32070.03	.44
17.2328	32070.05	32070.08	1.00
18.0116	32069.99	32070.09	1.00
18.1120	32070.21	32070.14	1.00
18.1308	32070.05	32070.14	1.00
18.2240	32070.26	32070.17	1.00
19.0024	32070.24	32070.17	1.00
19.1034	32072.39	32070.15	0.00
19.1406	32070.34	32070.14	1.00
19.2332	32070.08	32070.06	1.00
20.0118	32070.04	32070.04	1.00

SATELLITE NO. 15 - NO OF FIXES = 54

3.0200	32034.56	32034.44	1.00
3.1124	32034.52	32034.44	1.00
3.1310	32034.32	32034.43	1.00
3.1458	32034.51	32034.42	1.00
3.2324	32034.82	32034.35	.22
4.0256	32034.52	32034.31	1.00
8.1430	32034.54	32034.42	1.00
8.2256	32034.00	32034.48	0.00
9.0038	32034.72	32034.49	1.00
9.0226	32034.67	32034.50	1.00
9.1158	32034.53	32034.53	1.00
9.1342	32034.45	32034.54	1.00
9.2354	32034.91	32034.55	.33
10.0136	32034.45	32034.56	1.00
10.1108	32034.48	32034.56	1.00
10.2304	32034.74	32034.56	1.00
11.0046	32034.50	32034.56	1.00
11.0236	32034.68	32034.56	1.00
12.0000	32034.57	32034.56	1.00
12.0146	32034.48	32034.57	1.00
12.1304	32034.73	32034.58	1.00
12.2314	32034.64	32034.60	1.00
13.0056	32034.46	32034.61	.44
13.0250	32035.00	32034.61	.22
14.0010	32034.75	32034.66	1.00
14.0156	32034.72	32034.66	1.00
14.1132	32034.57	32034.68	1.00
14.2322	32034.78	32034.70	1.00
15.0106	32034.81	32034.70	1.00
15.1042	32034.46	32034.72	.33
15.1230	32034.60	32034.72	1.00
15.1416	32034.94	32034.72	.44
15.2236	32034.85	32034.73	1.00
16.0020	32034.92	32034.73	.44
16.0208	32034.85	32034.73	1.00
16.1138	32034.51	32034.75	.33
16.1328	32034.65	32034.75	1.00
16.2330	32034.85	32034.76	1.00
17.0118	32034.86	32034.77	1.00
17.1052	32035.14	32034.78	.22
17.1238	32034.76	32034.79	1.00
17.1430	32037.12	32034.79	0.00
17.2244	32034.95	32034.81	1.00
18.0028	32034.44	32034.81	1.00
18.0218	32034.64	32034.82	1.00
18.1148	32034.86	32034.83	1.00
18.1336	32034.62	32034.83	.44
18.2340	32034.61	32034.84	.44
19.0126	32034.83	32034.83	1.00
19.1102	32034.95	32034.81	1.00
19.1440	32034.79	32034.81	1.00
19.2254	32034.89	32034.75	1.00
20.0038	32034.85	32034.74	1.00
20.0230	32034.64	32034.72	1.00

SATELLITE NO. 18 - NO OF FIXES = 61

2.1456	32066.91	32066.89	.44
2.1646	32067.55	32066.92	.11
3.0252	32066.93	32067.01	.44
3.0440	32067.03	32067.02	1.00
3.1408	32067.00	32067.00	1.00
3.1554	32067.11	32066.99	1.00
3.1742	32067.27	32066.97	1.00
4.0212	32069.62	32066.89	0.00
4.0350	32066.76	32066.87	.11
8.1338	32067.33	32067.20	1.00
8.1524	32067.57	32067.21	.33
8.1712	32067.34	32067.23	1.00
9.0140	32068.58	32067.29	0.00
9.0320	32067.29	32067.30	1.00
9.0506	32067.64	32067.31	1.00
9.1434	32067.31	32067.34	1.00
9.1622	32067.14	32067.35	1.00
10.0230	32067.29	32067.36	1.00
10.0416	32067.36	32067.36	1.00
10.1348	32067.62	32067.36	.33
10.1532	32067.58	32067.36	1.00
10.1724	32067.33	32067.36	1.00
11.0326	32067.14	32067.35	.33
11.0520	32069.37	32067.35	0.00
11.1444	32067.33	32067.35	1.00
11.1632	32067.33	32067.35	1.00
12.0242	32067.50	32067.36	1.00
12.0428	32067.74	32067.36	.33
12.1358	32067.48	32067.37	1.00
12.1542	32067.34	32067.38	1.00
12.1732	32068.28	32067.38	0.00
13.0334	32067.33	32067.40	1.00
13.1310	32068.54	32067.41	0.00
13.1452	32067.54	32067.42	1.00
13.1640	32067.26	32067.42	.33
14.0246	32067.41	32067.44	1.00
14.0436	32067.52	32067.44	1.00
14.1406	32067.58	32067.45	1.00
14.1550	32067.40	32067.45	1.00
15.0158	32067.64	32067.45	.44
15.0346	32067.47	32067.45	1.00
15.1318	32067.29	32067.45	1.00
15.1504	32067.55	32067.45	1.00
15.1650	32067.73	32067.45	.33
16.0254	32067.50	32067.44	1.00
16.0442	32067.53	32067.44	1.00
16.1414	32067.58	32067.45	1.00
16.1600	32067.29	32067.45	.44
17.0352	32067.44	32067.46	1.00
17.1326	32067.58	32067.44	1.00
17.1510	32067.53	32067.44	1.00
17.1700	32067.36	32067.44	.33
18.0304	32067.51	32067.52	1.00
18.0454	32067.80	32067.53	0.00
18.1422	32067.41	32067.56	1.00
18.1608	32067.57	32067.56	1.00
19.0216	32067.63	32067.58	1.00
19.0400	32067.67	32067.58	1.00
19.1334	32067.66	32067.57	1.00
19.1520	32067.60	32067.56	1.00
20.0310	32067.60	32067.49	1.00

SATELLITE NO. 12 - NO OF FIXES = 75

25.1858	32071.88	32071.75	1.00
26.0650	32071.95	32071.91	1.00
26.1804	32071.95	32071.99	1.00
26.1950	32071.97	32072.00	1.00
26.2138	32072.06	32072.01	1.00
27.0558	32071.17	32072.03	0.00
27.0740	32072.13	32072.03	1.00
27.0932	32072.62	32072.03	0.00
27.1856	32072.09	32072.02	1.00
27.2042	32071.91	32072.02	.44
28.0646	32072.11	32072.01	1.00
28.0832	32072.15	32072.01	1.00
28.1804	32071.88	32072.00	.33
29.2040	32071.94	32072.01	.44
30.0642	32072.21	32072.04	1.00
30.0828	32072.13	32072.04	1.00
30.1800	32072.18	32072.08	1.00
30.1946	32072.18	32072.09	1.00
30.2134	32071.95	32072.10	.33
31.0550	32072.30	32072.14	.33
31.0732	32071.78	32072.15	.11
31.1850	32071.88	32072.21	.22
31.2036	32072.35	32072.22	1.00
32.0640	32072.26	32072.26	1.00
32.0824	32072.37	32072.26	1.00
32.1756	32072.63	32072.28	.22
32.1942	32072.41	32072.28	.44
32.2130	32072.69	32072.29	.11
33.0546	32072.32	32072.28	1.00
33.0730	32072.20	32072.27	1.00
33.0920	32073.66	32072.27	0.00
34.0822	32072.52	32072.20	.33
34.1752	32072.20	32072.18	1.00
34.1938	32072.26	32072.18	1.00
35.0544	32073.59	32072.18	0.00
35.0726	32072.18	32072.18	1.00
35.1844	32072.28	32072.22	1.00
35.2032	32072.24	32072.23	1.00
36.0630	32072.30	32072.28	1.00
36.0820	32072.39	32072.29	1.00
36.1750	32072.56	32072.33	.44
36.1934	32072.44	32072.34	1.00
37.0542	32072.91	32072.38	0.00
37.0722	32072.12	32072.38	.33
37.1658	32073.19	32072.39	0.00
37.1840	32072.29	32072.39	1.00
37.2028	32072.49	32072.39	1.00
38.0626	32072.42	32072.37	1.00
38.1746	32072.36	32072.32	1.00
38.1934	32072.48	32072.32	1.00
39.0538	32072.18	32072.28	.22
39.0720	32072.22	32072.27	.22
39.1842	32072.51	32072.24	1.00
41.1650	32072.15	32072.37	.22
41.1838	32072.67	32072.38	.44
42.1738	32072.24	32072.46	.33
42.1926	32072.67	32072.46	1.00
43.0526	32072.68	32072.48	1.00
43.0710	32072.32	32072.48	.44
43.1830	32072.56	32072.50	1.00
43.2018	32072.67	32072.50	1.00
44.0620	32072.50	32072.51	1.00
44.0804	32072.46	32072.51	1.00
44.1736	32072.81	32072.53	.33
44.1922	32072.46	32072.53	1.00
45.0522	32072.62	32072.55	1.00
45.0706	32072.52	32072.56	1.00
45.1644	32072.67	32072.56	1.00
45.1826	32072.46	32072.56	1.00
45.2016	32072.46	32072.55	1.00
46.0430	32072.96	32072.52	.22
46.0612	32072.81	32072.51	.33
46.0800	32072.14	32072.50	.11
46.1732	32072.52	32072.39	1.00
46.1918	32072.50	32072.37	1.00

SATELLITE NO. 13 - NO OF FIXES = 70

25.2054	31990.16	31989.93	1.00
27.0800	31990.10	31990.02	1.00
27.2102	31990.02	31989.99	1.00
28.0714	31990.07	31989.99	1.00
28.0854	31990.13	31989.99	.22
29.2112	31990.30	31990.07	.44
30.0716	31990.17	31990.10	1.00
30.0904	31990.25	31990.10	1.00
30.1836	31989.92	31990.12	.33
30.2022	31990.24	31990.12	1.00
31.0628	31990.43	31990.13	.22
31.0814	31990.09	31990.13	1.00
31.1934	31990.06	31990.14	1.00
31.2122	31990.17	31990.14	1.00
32.0726	31990.22	31990.14	1.00
32.0912	31990.05	31990.14	1.00
32.1846	31990.28	31990.14	1.00
32.2032	31990.26	31990.14	1.00
33.0638	31990.26	31990.14	1.00
33.0822	31989.93	31990.14	.44
33.1758	31990.31	31990.15	1.00
34.0924	31989.43	31990.15	0.00
34.1856	31990.24	31990.15	1.00
34.2044	31990.12	31990.15	1.00
35.0644	31990.15	31990.14	1.00
35.0832	31989.77	31990.14	.11
35.1806	31990.14	31990.13	1.00
35.1952	31990.21	31990.13	1.00
36.0556	31990.31	31990.12	1.00
36.0742	31990.14	31990.12	1.00
36.1720	31990.86	31990.12	0.00
36.1904	31990.10	31990.11	1.00
36.2054	31990.03	31990.11	.33
37.0514	32037.05	31990.12	0.00
37.0654	31990.42	31990.12	.44
37.0842	31990.15	31990.12	1.00
37.1816	31990.18	31990.14	1.00
37.2002	31990.12	31990.14	1.00
38.0606	31990.13	31990.17	1.00
38.0754	31990.29	31990.18	1.00
38.1730	31990.23	31990.21	1.00
38.1914	31990.21	31990.21	1.00
38.2104	31990.40	31990.22	1.00
39.0520	31991.00	31990.24	0.00
39.0702	31990.14	31990.25	1.00
39.0854	31990.09	31990.25	.33
39.1826	31990.21	31990.27	1.00
39.2012	31990.32	31990.27	1.00
40.0614	31990.41	31990.27	1.00
40.0802	31990.30	31990.27	1.00
40.1738	31990.49	31990.26	.44
40.1924	31990.24	31990.26	1.00
41.0528	31990.31	31990.24	1.00
41.0712	31990.43	31990.24	1.00
41.2024	31990.24	31990.22	1.00
43.0544	31992.65	31990.22	0.00
43.0732	31995.94	31990.23	0.00
43.1700	31990.41	31990.25	1.00
44.0452	31990.58	31990.30	.33
44.0634	31990.19	31990.31	.33
44.1800	31990.49	31990.37	1.00
44.1948	31990.50	31990.38	1.00
45.0546	31990.45	31990.44	1.00
45.0730	31990.33	31990.45	1.00
45.1854	31990.33	31990.49	.22
46.0456	31990.88	31990.49	.11
46.0642	31990.60	31990.48	.44
46.1624	31991.35	31990.41	0.00
46.1804	31990.44	31990.39	1.00
46.1956	31990.59	31990.37	1.00

SATELLITE NO. 14 - NO OF FIXES = 66

25.2158	32070.34	32070.11	1.00
26.0132	32070.54	32070.14	.22
26.1328	32070.52	32070.19	.22
27.0042	32070.09	32070.17	1.00
27.1044	32070.05	32070.12	.44
27.1234	32070.12	32070.12	1.00
27.2202	32070.24	32070.07	1.00
28.0956	32079.10	32070.03	0.00
28.1138	32070.19	32070.03	1.00
29.2210	32070.11	32070.08	.44
29.2352	32070.06	32070.09	.33
30.0958	32069.68	32070.12	0.00
30.1142	32070.37	32070.13	1.00
31.1052	32070.31	32070.18	1.00
31.1236	32069.99	32070.18	.11
31.2212	32070.02	32070.19	.11
31.2358	32066.84	32070.20	0.00
32.1002	32070.35	32070.21	1.00
32.1146	32070.93	32070.21	0.00
33.1054	32070.39	32070.25	1.00
33.1242	32070.30	32070.25	1.00
34.1004	32030.48	32070.29	0.00
34.2128	32071.97	32070.32	0.00
34.2312	32070.42	32070.33	1.00
35.0056	32070.10	32070.33	.11
35.1058	32070.50	32070.36	1.00
35.2218	32070.39	32070.41	1.00
36.1010	32070.60	32070.45	1.00
36.1152	32070.53	32070.46	1.00
36.2130	32070.98	32070.49	.11
37.0102	32070.29	32070.50	.22
37.2222	32070.60	32070.56	1.00
38.0010	32070.59	32070.56	1.00
38.1016	32070.80	32070.58	.44
38.1158	32070.55	32070.58	1.00
38.2132	32070.50	32070.58	1.00
38.2316	32070.69	32070.59	1.00
39.0106	32070.75	32070.59	1.00
39.0926	32075.29	32070.59	0.00
39.2226	32070.60	32070.59	1.00
40.0012	32070.64	32070.59	1.00
40.2136	32070.59	32070.58	1.00
40.2320	32070.74	32070.58	1.00
41.0926	32070.58	32070.58	1.00
41.1112	32070.65	32070.58	1.00
41.2230	32070.56	32070.59	1.00
42.0018	32070.59	32070.59	1.00
42.2138	32070.66	32070.64	1.00
42.2326	32070.71	32070.65	1.00
43.0926	32070.94	32070.68	1.00
43.1112	32070.55	32070.68	.44
43.2050	32071.31	32070.72	.11
43.2234	32070.80	32070.72	1.00
44.0022	32070.69	32070.73	1.00
44.1020	32070.78	32070.76	1.00
44.1210	32070.81	32070.76	1.00
44.2144	32070.72	32070.78	1.00
44.2330	32070.77	32070.78	1.00
45.0930	32070.98	32070.79	.33
45.1116	32070.94	32070.79	.44
45.2056	32070.69	32070.76	1.00
45.2238	32070.72	32070.75	1.00
46.0028	32070.88	32070.74	1.00
46.1024	32070.65	32070.67	1.00
46.1216	32072.02	32070.65	0.00
46.2146	32070.73	32070.54	1.00

SATELLITE NO. 15 - NO OF FIXES = 69

25.2142	32035.31	32034.62	0.00
25.2322	32034.96	32034.64	1.00
26.0110	32034.64	32034.66	1.00
26.1276	32034.70	32034.77	1.00
26.2236	32034.94	32034.83	1.00
27.0020	32034.72	32034.84	1.00
27.0954	32034.63	32034.86	.22
27.1140	32034.91	32034.87	1.00
27.1328	32035.07	32034.87	.33
27.2150	32034.93	32034.88	1.00
27.2334	32034.98	32034.88	1.00
28.0122	32034.87	32034.88	1.00
28.1052	32035.02	32034.88	1.00
28.1240	32034.86	32034.89	1.00
29.2158	32034.84	32034.90	0.00
29.2340	32035.00	32034.90	1.00
30.0132	32035.09	32034.91	1.00
30.1102	32034.84	32034.91	1.00
30.1250	32034.93	32034.92	1.00
30.2252	32035.09	32034.93	1.00
31.0038	32034.86	32034.93	1.00
31.1016	32034.29	32034.94	0.00
31.1200	32033.40	32034.95	0.00
31.1350	32034.33	32034.95	0.00
32.0142	32035.08	32034.97	1.00
32.1112	32035.26	32034.98	.44
32.1300	32034.90	32034.98	1.00
32.2302	32035.01	32034.99	1.00
33.0054	32035.44	32035.00	.22
33.1024	32035.32	32035.01	.33
33.1210	32035.03	32035.01	1.00
35.1036	32035.25	32035.07	1.00
35.1222	32035.16	32035.08	1.00
36.0010	32035.12	32035.10	1.00
36.0948	32034.95	32035.13	.22
36.1132	32035.29	32035.13	1.00
36.1324	32036.48	32035.14	0.00
36.2322	32034.93	32035.17	.22
37.1044	32035.26	32035.20	1.00
37.1232	32035.26	32035.20	1.00
38.0958	32035.39	32035.26	1.00
38.1144	32035.32	32035.26	1.00
38.2148	32035.24	32035.29	1.00
38.2334	32035.39	32035.29	1.00
39.0124	32035.28	32035.29	1.00
39.1054	32035.35	32035.31	1.00
39.1242	32035.31	32035.31	1.00
39.2246	32035.36	32035.33	1.00
40.0036	32036.17	32035.33	0.00
40.1008	32035.67	32035.35	.22
40.1154	32035.40	32035.35	1.00
40.2158	32035.43	32035.36	1.00
40.2344	32035.44	32035.36	1.00
41.1256	32037.73	32035.37	0.00
41.2112	32036.64	32035.38	0.00
41.2252	32035.23	32035.38	.22
42.0046	32036.21	32035.38	0.00
42.2206	32035.50	32035.40	1.00
42.2354	32035.56	32035.41	1.00
43.2122	32035.55	32035.45	1.00
43.2304	32035.50	32035.45	1.00
44.0054	32035.77	32035.46	.33
44.2214	32035.47	32035.54	1.00
45.0004	32035.56	32035.55	1.00
45.2128	32035.62	32035.61	1.00
45.2314	32035.82	32035.61	.44
46.0852	32035.41	32035.58	.22
46.1038	32035.64	32035.57	1.00
46.2042	32035.45	32035.46	1.00

SATELLITE NO. 18 - NO OF FIXES = 83

26.0012	32068.91	32067.62	0.00
26.0156	32067.73	32067.64	1.00
26.0342	32067.79	32067.66	1.00
26.1308	32067.68	32067.73	1.00
26.1458	32067.92	32067.74	1.00
27.0108	32067.66	32067.74	.22
27.0248	32067.72	32067.76	1.00
27.1224	32068.18	32067.75	0.00
27.1554	32067.73	32067.75	1.00
28.0202	32067.83	32067.74	1.00
28.0346	32067.66	32067.73	1.00
28.1322	32067.83	32067.74	1.00
28.1508	32067.96	32067.74	1.00
30.0026	32069.32	32067.85	0.00
30.0208	32068.05	32067.86	1.00
30.0402	32069.61	32067.86	0.00
30.1514	32067.78	32067.91	1.00
31.0118	32067.60	32067.95	.33
31.0310	32068.34	32067.96	.33
31.1424	32067.75	32068.00	.44
31.1614	32068.21	32068.01	1.00
32.0036	32071.16	32068.04	0.00
32.0216	32068.33	32068.05	1.00
32.0404	32068.46	32068.05	.44
32.1342	32068.33	32068.08	.44
32.1524	32067.96	32068.09	.44
33.0126	32067.96	32068.12	.44
33.0314	32067.97	32068.12	.44
33.1434	32067.90	32068.15	.22
34.1344	32068.26	32068.19	1.00
34.1534	32068.47	32068.19	.33
35.0136	32068.19	32068.20	1.00
35.0324	32068.56	32068.21	.33
35.1256	32068.27	32068.22	1.00
35.1446	32068.37	32068.22	1.00
36.0046	32068.22	32068.23	1.00
36.0232	32068.24	32068.23	1.00
36.1354	32067.44	32068.25	0.00
36.1542	32068.54	32068.25	.44
37.0004	32071.58	32068.27	0.00
37.0142	32068.25	32068.27	1.00
37.0332	32068.14	32068.28	.33
37.1304	32068.27	32068.30	1.00
37.1452	32068.28	32068.31	1.00
38.0056	32068.45	32068.35	1.00
38.0242	32068.41	32068.35	1.00
38.1218	32068.08	32068.40	.11
38.1402	32068.47	32068.40	1.00
38.1552	32069.12	32068.41	0.00
39.0008	32068.49	32068.45	.44
39.0152	32068.59	32068.45	1.00
39.0342	32068.80	32068.46	.22
39.1316	32068.54	32068.50	1.00
39.1500	32068.53	32068.50	1.00
40.0102	32068.63	32068.53	1.00
40.0250	32068.46	32068.53	1.00
40.1226	32068.37	32068.55	.44
40.1412	32068.51	32068.55	1.00
41.0016	32068.58	32068.55	1.00
41.0200	32068.56	32068.55	1.00
41.1140	32068.68	32068.55	1.00
41.1322	32068.44	32068.55	1.00
41.1510	32068.71	32068.55	1.00
42.0110	32068.45	32068.54	.44
42.0300	32068.50	32068.54	1.00
42.1420	32068.67	32068.53	1.00
43.0022	32068.57	32068.52	1.00
43.0208	32068.61	32068.52	1.00
43.1520	32068.85	32068.53	1.00
43.2338	32068.19	32068.55	1.00
44.0120	32068.67	32068.56	1.00
44.0308	32068.91	32068.56	.33
44.1242	32068.44	32068.61	1.00
44.1430	32068.57	32068.62	.44
45.0030	32068.60	32068.69	.44
45.0218	32068.67	32068.70	1.00
45.1154	32068.94	32068.77	1.00
45.1340	32068.70	32068.78	1.00
45.2344	32068.96	32068.82	1.00
46.0128	32068.76	32068.82	1.00
46.1108	32068.93	32068.78	1.00
46.1250	32068.69	32068.77	1.00
46.1440	32068.86	32068.75	1.00

Table 7

Table 8

SATELLITE NO. 12 - NO OF FIXES = 61

50.1726	32072.64	32072.58	1.00
50.1912	32072.63	32072.59	1.00
51.0510	32072.63	32072.66	1.00
51.0658	32072.83	32072.66	1.00
51.1632	32072.81	32072.70	1.00
51.1816	32072.66	32072.70	1.00
51.2008	32074.55	32072.70	0.00
52.0420	32069.80	32072.71	0.00
52.0602	32072.70	32072.71	1.00
52.0750	32072.69	32072.71	1.00
52.1722	32072.76	32072.71	1.00
52.1912	32072.59	32072.71	1.00
53.0652	32072.82	32072.69	1.00
53.1628	32072.67	32072.68	1.00
53.1814	32072.57	32072.67	.44
54.0414	32072.99	32072.67	.33
54.1720	32072.65	32072.67	1.00
55.0654	32072.88	32072.68	1.00
55.1624	32072.64	32072.69	1.00
55.1810	32072.69	32072.69	1.00
56.0410	32072.84	32072.71	1.00
56.0550	32072.37	32072.80	0.00
56.0742	32074.21	32072.80	0.00
56.1712	32072.84	32072.81	1.00
58.1858	32072.98	32072.82	1.00
59.0456	32072.91	32072.83	1.00
59.0642	32072.60	32072.83	.22
59.1618	32072.99	32072.83	1.00
59.1802	32072.78	32072.84	1.00
60.0546	32072.51	32072.84	0.00
60.1708	32072.82	32072.84	1.00
60.1856	32072.69	32072.84	.33
61.0452	32072.92	32072.84	1.00
61.0642	32072.99	32072.84	1.00
61.1612	32072.89	32072.83	1.00
65.0446	32073.16	32072.88	.22
65.0634	32074.15	32072.89	0.00
65.1606	32072.88	32072.92	.33
65.1758	32073.36	32072.93	.33
66.0350	32073.12	32072.97	1.00
66.0536	32073.07	32072.97	1.00
66.1518	32075.28	32073.01	0.00
66.1700	32072.95	32073.02	1.00
66.1846	32073.08	32073.02	1.00
67.0440	32073.01	32073.06	1.00
67.0628	32073.14	32073.06	1.00
67.1604	32072.99	32073.09	1.00
67.1750	32073.05	32073.10	1.00
68.0346	32073.09	32073.12	1.00
68.0538	32073.31	32073.13	1.00
68.1512	32073.89	32073.14	0.00
68.1656	32073.28	32073.15	1.00
68.1844	32072.91	32073.15	.33
69.0438	32073.30	32073.15	1.00
69.0626	32073.04	32073.15	1.00
69.1600	32072.99	32073.14	.44
69.1746	32073.06	32073.13	1.00
70.0344	32073.09	32073.10	1.00
70.0530	32073.21	32073.10	1.00
70.1508	32073.07	32073.05	1.00
71.0250	32073.14	32072.97	1.00

SATELLITE NO. 13 - NO OF FIXES = 61

50.1638	31990.34	31990.32	1.00
50.1826	31990.52	31990.32	1.00
51.0432	31991.31	31990.36	0.00
51.0612	31990.50	31990.37	1.00
51.1736	31990.43	31990.39	1.00
51.1922	31990.39	31990.39	1.00
52.0524	31990.44	31990.40	1.00
52.0712	31990.39	31990.40	1.00
52.1648	31990.37	31990.40	1.00
52.1834	31990.32	31990.40	1.00
53.0438	31990.22	31990.40	1.00
53.0620	31990.47	31990.40	1.00
53.1744	31990.37	31990.39	1.00
53.1934	31990.59	31990.39	1.00
54.0534	31990.34	31990.40	1.00
54.1656	31990.30	31990.40	1.00
54.1844	31990.58	31990.41	1.00
55.0446	31990.55	31990.42	1.00
55.0630	31990.33	31990.42	1.00
55.1754	31990.47	31990.43	1.00
55.1944	31990.61	31990.43	1.00
56.0540	31990.58	31990.44	1.00
56.0730	31991.14	31990.44	0.00
56.1706	31990.48	31990.44	1.00
56.1854	31990.47	31990.44	1.00
57.0456	31990.34	31990.43	1.00
57.0640	31990.37	31990.43	1.00
57.1620	31990.34	31990.41	1.00
57.1804	31990.52	31990.40	1.00
57.1954	31990.42	31990.40	1.00
60.0418	31991.21	31990.22	0.00
60.0604	31990.50	31990.22	1.00
61.0702	31992.17	31990.21	0.00
61.1636	31990.39	31990.23	1.00
65.0346	31990.65	31990.49	1.00
65.0538	31990.69	31990.49	.33
65.1512	31990.46	31990.50	1.00
65.1654	31990.44	31990.50	1.00
65.1844	31990.53	31990.50	1.00
66.0440	31990.44	31990.50	1.00
66.0630	31990.71	31990.50	.44
66.1608	31990.65	31990.50	1.00
66.1756	31990.53	31990.50	1.00
67.0354	31990.42	31990.50	1.00
67.0540	31990.54	31990.50	1.00
67.1520	31990.45	31990.50	1.00
67.1704	31990.36	31990.50	.44
68.0450	31990.62	31990.51	1.00
68.0640	31990.37	31990.51	1.00
68.1616	31990.53	31990.52	1.00
68.1804	31990.58	31990.52	1.00
69.0402	31990.58	31990.52	1.00
69.0550	31990.40	31990.52	1.00
69.1528	31990.59	31990.50	1.00
69.1714	31990.43	31990.50	1.00
70.0316	31990.54	31990.45	1.00
70.0500	31990.49	31990.44	1.00
70.1624	31990.55	31990.33	1.00
70.1816	31991.22	31990.31	0.00
71.0416	31991.14	31990.17	0.00
71.0600	31993.06	31990.14	0.00

SATELLITE NO. 14 - NO OF FIXES = 64

50.2012	32071.10	32070.66	.22
50.2154	32070.72	32070.69	.44
50.2342	32070.36	32070.71	0.00
51.0942	32070.77	32070.84	.44
51.1128	32070.97	32070.86	1.00
51.2104	32071.17	32070.95	1.00
51.2250	32070.91	32070.96	1.00
52.0852	32071.38	32071.02	.22
52.1038	32070.89	32071.03	1.00
52.2016	32069.64	32071.05	0.00
52.2158	32071.05	32071.04	1.00
52.2346	32070.45	32071.06	.22
53.0944	32070.99	32071.07	1.00
53.1132	32071.13	32071.07	1.00
53.2108	32071.25	32071.07	.22
53.2254	32071.12	32071.07	1.00
54.2018	32071.13	32071.07	1.00
54.2202	32071.09	32071.07	1.00
55.0806	32071.33	32071.07	.33
55.0950	32071.19	32071.07	1.00
55.2110	32071.21	32071.06	.44
55.2258	32071.12	32071.06	1.00
56.0856	32070.91	32071.06	1.00
56.1044	32071.03	32071.06	1.00
56.2020	32070.97	32071.06	1.00
56.2206	32071.21	32071.06	.44
57.0810	32070.17	32071.05	0.00
57.0952	32071.22	32071.05	1.00
57.1144	32072.62	32071.05	0.00
57.2116	32071.18	32071.05	1.00
57.2302	32071.02	32071.05	1.00
58.0900	32071.20	32071.05	1.00
58.1050	32071.00	32071.05	1.00
58.2024	32071.02	32071.05	1.00
58.2210	32071.04	32071.05	1.00
59.0810	32070.91	32071.04	1.00
59.0954	32070.71	32071.04	0.00
59.2118	32071.06	32071.04	1.00
60.0904	32071.21	32071.03	1.00
60.2028	32071.04	32071.01	1.00
61.0814	32071.16	32071.00	1.00
61.1002	32071.08	32070.99	1.00
64.2224	32070.86	32070.98	.22
65.0820	32071.08	32071.02	1.00
65.1012	32070.86	32071.03	.22
65.1946	32071.22	32071.07	1.00
65.2130	32071.10	32071.08	1.00
66.0730	32071.48	32071.13	.33
66.0914	32071.46	32071.14	.44
67.0824	32071.29	32071.25	1.00
67.1010	32071.40	32071.26	1.00
67.1948	32071.30	32071.30	1.00
68.0736	32071.66	32071.34	.22
68.0920	32071.17	32071.35	.44
68.1900	32071.23	32071.38	1.00
69.0830	32071.57	32071.40	.44
69.1018	32071.23	32071.40	.44
69.1952	32071.32	32071.41	1.00
70.0730	32071.52	32071.40	1.00
70.0924	32071.50	32071.40	1.00
70.1902	32071.36	32071.38	1.00
70.2048	32071.44	32071.38	1.00
71.0652	32071.91	32071.35	.11
71.0834	32071.50	32071.34	1.00

SATELLITE NO. 15 - NO OF FIXES = 62

50.1100	32035.85	32035.69	1.00
50.2058	32035.90	32035.75	1.00
50.2246	32035.72	32035.76	1.00
51.0826	32036.15	32035.81	.33
51.1008	32035.46	32035.81	.33
51.1158	32036.16	32035.82	.33
51.2156	32035.85	32035.84	1.00
51.2346	32035.81	32035.85	1.00
52.0922	32035.96	32035.86	1.00
52.1108	32036.12	32035.86	.33
52.2110	32035.60	32035.86	1.00
52.2256	32035.88	32035.86	1.00
53.1208	32034.64	32035.85	0.00
53.2024	32036.06	32035.85	.33
53.2208	32035.84	32035.84	1.00
54.2118	32035.87	32035.83	1.00
54.2306	32036.00	32035.83	1.00
55.0842	32035.81	32035.82	1.00
55.1030	32035.94	32035.82	1.00
55.2032	32035.92	32035.82	1.00
55.2216	32035.83	32035.82	1.00
56.0940	32035.70	32035.81	1.00
56.1130	32036.42	32035.81	0.00
56.2128	32035.96	32035.81	1.00
56.2316	32035.79	32035.81	1.00
57.0854	32035.60	32035.80	.33
57.1040	32034.97	32035.80	0.00
57.2040	32035.78	32035.80	1.00
57.2226	32035.78	32035.80	1.00
58.0808	32037.14	32035.79	0.00
58.0950	32035.92	32035.79	1.00
58.1140	32036.38	32035.79	0.00
58.1956	32037.03	32035.78	0.00
58.2136	32035.95	32035.78	1.00
58.2326	32035.93	32035.78	1.00
59.0902	32036.07	32035.78	.44
59.1050	32035.44	32035.77	1.00
59.2048	32035.76	32035.77	1.00
59.2236	32035.64	32035.76	1.00
60.0816	32036.54	32035.76	0.00
60.2002	32035.95	32035.74	1.00
60.2148	32035.84	32035.74	1.00
61.0912	32035.86	32035.73	.33
61.1100	32036.16	32035.73	.33
65.0752	32035.99	32035.89	.44
65.0932	32035.96	32035.90	.44
66.0844	32036.29	32036.06	1.00
66.1032	32036.06	32036.07	1.00
66.2030	32036.18	32036.13	1.00
66.2218	32036.28	32036.14	1.00
67.0758	32036.28	32036.19	1.00
67.0942	32036.12	32036.19	1.00
67.2128	32036.10	32036.23	1.00
68.0854	32035.80	32036.24	.22
68.2040	32036.29	32036.22	1.00
68.2228	32035.25	32036.22	0.00
69.0806	32036.09	32036.18	1.00
69.0952	32036.12	32036.18	1.00
69.2138	32035.50	32036.11	0.00
70.0718	32036.27	32036.04	1.00
70.0904	32035.88	32036.02	.22
71.0816	32036.19	32035.78	.33

SATELLITE NO. 16 - NO OF FIXES = 64

50.1122	32068.61	32068.73	.33
50.1308	32068.91	32068.76	1.00
50.2312	32069.14	32068.87	1.00
51.0056	32068.68	32068.89	.33
51.0248	32061.66	32068.91	0.00
51.1218	32069.07	32068.96	1.00
51.1406	32068.85	32068.97	1.00
52.0010	32069.12	32068.99	1.00
52.0154	32068.90	32068.99	1.00
52.1132	32068.21	32068.99	0.00
52.1316	32068.78	32068.99	.44
52.2322	32069.29	32068.97	.33
53.0108	32069.01	32068.96	1.00
53.1228	32068.99	32068.93	1.00
54.0016	32068.93	32068.91	1.00
54.0206	32069.36	32068.90	.22
54.1326	32068.83	32068.89	1.00
54.2330	32069.05	32068.90	1.00
55.0116	32068.80	32068.90	1.00
55.1052	32068.20	32068.91	0.00
55.1238	32068.87	32068.91	1.00
55.1428	32069.40	32068.91	0.00
56.0024	32069.23	32068.92	.33
56.0214	32070.18	32068.93	0.00
56.1148	32068.98	32068.94	1.00
56.1334	32068.83	32068.95	1.00
56.2336	32069.15	32068.96	1.00
57.1744	32068.76	32068.98	.22
57.1436	32068.54	32068.98	0.00
58.1156	32069.23	32068.98	.33
58.1344	32069.09	32068.98	1.00
58.2344	32068.98	32068.98	1.00
59.0132	32069.10	32068.98	1.00
59.1256	32068.96	32068.97	1.00
59.2258	32068.99	32068.96	1.00
60.0040	32068.90	32068.96	1.00
60.1206	32069.22	32068.95	.44
60.1356	32069.99	32068.95	0.00
60.2210	32069.30	32068.94	.22
60.2352	32069.30	32068.94	0.00
61.0142	32068.66	32068.94	0.00
61.1120	32069.04	32068.94	1.00
61.1302	32068.82	32068.94	.33
65.0010	32069.24	32068.98	1.00
65.1132	32069.14	32069.00	1.00
65.1322	32068.74	32069.00	.22
65.2320	32069.20	32069.02	1.00
66.0110	32069.04	32069.03	1.00
66.1050	32068.92	32069.05	1.00
66.1232	32069.05	32069.06	1.00
67.0022	32070.49	32069.09	0.00
67.1142	32069.15	32069.14	1.00
67.1330	32068.57	32069.14	0.00
67.2328	32069.34	32069.19	1.00
68.1054	32069.24	32069.24	1.00
68.1240	32069.25	32069.25	1.00
68.2242	32069.38	32069.30	1.00
69.0026	32069.17	32069.30	1.00
69.1152	32069.35	32069.34	1.00
69.2336	32069.39	32069.35	1.00
70.1102	32069.26	32069.33	1.00
70.1250	32069.52	32069.33	.44
70.2248	32069.41	32069.27	1.00
71.0036	32069.42	32069.25	1.00
71.1012	32069.03	32069.15	.33

Table 9

SATELLITE NO. 12 - NO OF FIXES = 30

75.0428	32073.12	32072.91	1.00
75.1548	32072.96	32073.06	.44
75.1736	32073.04	32073.08	1.00
76.0518	32072.82	32073.13	.33
76.1642	32073.23	32073.13	1.00
77.0242	32073.32	32073.09	1.00
77.0428	32073.21	32073.09	1.00
80.0324	32073.18	32073.08	1.00
80.0512	32072.81	32073.08	.11
80.1448	32072.96	32073.13	.33
80.1636	32073.15	32073.13	1.00
81.0232	32073.54	32073.18	.33
81.0416	32073.49	32073.19	.44
81.1356	32073.22	32073.24	1.00
81.1538	32073.39	32073.25	1.00
81.1726	32073.44	32073.26	1.00
82.0320	32073.39	32073.31	1.00
82.0510	32073.57	32073.31	.33
82.1444	32073.24	32073.35	1.00
82.1632	32073.22	32073.35	1.00
83.0228	32073.31	32073.38	1.00
83.0412	32073.59	32073.38	.22
83.1532	32073.37	32073.38	1.00
83.1720	32073.48	32073.37	1.00
84.0318	32073.24	32073.33	1.00
84.0506	32072.95	32073.32	.11
84.1438	32073.66	32073.24	.33
84.1624	32073.29	32073.23	1.00
85.0226	32073.26	32073.02	1.00
85.0410	32073.11	32073.06	.33

SATELLITE NO. 13 - NO OF FIXES = 27

75.0250	31990.75	31990.58	1.00
76.0340	31990.69	31990.71	1.00
76.1508	31990.67	31990.64	1.00
77.0254	31990.75	31990.56	1.00
77.0440	31990.67	31990.54	1.00
80.0214	31991.07	31990.56	0.00
80.0358	31990.58	31990.56	1.00
80.1526	31990.78	31990.59	1.00
80.1714	31990.50	31990.59	1.00
81.0310	31990.72	31990.60	1.00
81.0458	31990.85	31990.60	1.00
81.1438	31990.50	31990.61	1.00
81.1624	31990.65	31990.62	1.00
82.0224	31990.92	31990.63	.44
82.0408	31990.71	31990.63	1.00
82.1534	31990.66	31990.65	1.00
82.1722	31990.50	31990.65	.44
83.0320	31990.54	31990.67	1.00
83.0510	31990.89	31990.68	1.00
83.1444	31990.66	31990.70	1.00
83.1632	31990.61	31990.70	1.00
84.0234	31990.58	31990.72	1.00
84.0420	31990.87	31990.73	1.00
84.1542	31990.86	31990.74	1.00
84.1732	31990.77	31990.74	1.00
85.0332	31990.88	31990.73	1.00
85.0520	31990.80	31990.72	1.00

SATELLITE NO. 14 - NO OF FIXES = 26

75.0656	32071.44	32071.33	1.00
75.1820	32072.19	32071.49	0.00
75.2004	32071.49	32071.50	1.00
75.2152	32071.78	32071.51	.33
76.1912	32071.37	32071.42	.44
76.2100	32071.68	32071.40	1.00
80.0610	32071.74	32071.58	1.00
80.0754	32071.70	32071.59	1.00
80.1920	32071.65	32071.63	1.00
80.2110	32071.66	32071.64	1.00
81.0704	32071.66	32071.66	1.00
81.0852	32071.82	32071.67	1.00
81.1830	32071.83	32071.69	1.00
81.2016	32071.66	32071.69	1.00
82.0614	32071.64	32071.71	1.00
82.0758	32071.77	32071.71	1.00
82.1922	32071.60	32071.75	1.00
82.2112	32071.88	32071.75	1.00
83.0708	32071.85	32071.79	1.00
83.0856	32071.79	32071.79	1.00
83.1832	32071.93	32071.81	1.00
83.2016	32071.69	32071.82	1.00
84.0620	32071.91	32071.81	1.00
84.0804	32071.59	32071.80	.44
84.1926	32071.68	32071.72	1.00
84.2114	32071.99	32071.71	1.00

SATELLITE NO. 15 - NO OF FIXES = 23

75.0836	32036.20	32036.16	1.00
75.1840	32036.64	32036.29	0.00
76.0746	32036.37	32036.22	1.00
76.0936	32036.79	32036.20	0.00
76.1936	32036.22	32036.02	1.00
79.2042	32036.05	32035.35	.33
80.1810	32035.42	32035.65	0.00
80.1952	32035.01	32035.68	.22
81.0724	32036.19	32035.89	1.00
81.1906	32036.20	32036.12	1.00
81.2052	32036.20	32036.15	1.00
82.0638	32039.10	32036.31	0.00
82.0820	32036.55	32036.33	1.00
82.1822	32036.33	32036.44	1.00
82.2004	32036.59	32036.45	1.00
83.0730	32036.43	32036.50	1.00
83.0918	32036.50	32036.50	1.00
83.1920	32036.37	32036.48	1.00
83.2104	32036.36	32036.47	1.00
84.0644	32035.41	32036.40	0.00
84.0826	32036.46	32036.39	1.00
84.1832	32036.23	32036.28	1.00
84.2016	32036.60	32036.26	1.00

SATELLITE NO. 18 - NO OF FIXES = 27

74.2304	32069.48	32069.40	1.00
75.0056	32069.58	32069.43	1.00
75.1030	32069.54	32069.56	1.00
75.1220	32069.80	32069.57	.33
75.2218	32069.40	32069.58	1.00
76.0004	32069.89	32069.58	.11
76.1128	32069.66	32069.51	1.00
76.2130	32069.53	32069.42	1.00
76.2316	32069.55	32069.41	1.00
79.2232	32069.68	32069.55	1.00
80.0024	32070.12	32069.56	0.00
80.1000	32069.57	32069.61	1.00
80.1148	32069.75	32069.62	1.00
80.2146	32069.82	32069.66	1.00
80.2330	32069.72	32069.67	1.00
81.1056	32069.68	32069.70	1.00
81.2242	32069.74	32069.72	1.00
82.1008	32069.82	32069.73	1.00
82.1154	32069.77	32069.73	1.00
82.2154	32069.81	32069.75	1.00
82.2340	32069.04	32069.75	0.00
83.1104	32069.74	32069.76	1.00
83.2252	32069.74	32069.75	1.00
84.1014	32069.66	32069.70	1.00
84.1202	32069.74	32069.69	1.00
84.2204	32068.48	32069.59	0.00
84.2352	32069.78	32069.57	1.00

Table 10

SMOOTHED f.	RAW frequency	WEIGHT	Elevation	SAT N°	DD HH MM	Survey N°	Δ smoothed - raw
32066.89	32066.91	5	41.	14	2.1456	17	-.0
32066.92	32067.55	8	27.	14	2.1044	17	-.6
32070.48	32071.77	0	7.	12	2.1445	17	-.3
31989.63	31989.85	0	24.	13	2.1454	17	-.2
32070.50	32070.50	0	88.	12	2.2012	17	.0
31989.65	31989.64	0	47.	13	2.2142	17	-.0
32070.52	32071.28	7	17.	12	2.2218	17	.2
32069.57	32069.24	6	20.	14	2.2350	17	.3
32069.59	32069.58	0	84.	14	3.0136	17	.0
32034.44	32034.56	0	41.	15	3.0200	17	-.1
32067.01	32065.93	5	34.	18	3.0252	17	.1
32067.02	32067.03	0	32.	14	3.0440	17	-.0
32070.58	32072.87	9	5.	12	3.0644	17	-2.3
31989.69	31989.61	0	21.	13	3.0752	17	.1
32070.59	32071.41	6	54.	12	3.0824	17	.2
31989.69	31989.53	0	56.	13	3.0938	17	.2
32070.59	32070.40	0	21.	12	3.1014	17	-.2
32034.44	32034.52	0	11.	15	3.1124	17	-.1
32069.63	32069.65	0	17.	14	3.1150	17	-.0
32034.43	32034.32	0	85.	15	3.1310	17	.1
32069.62	32069.65	0	84.	14	3.1332	17	-.0
32067.00	32067.06	0	14.	18	3.1408	17	-.1
32034.42	32034.51	0	12.	15	3.1458	17	-.1
32069.62	32069.73	0	7.	14	3.1522	17	-.1
32066.99	32067.11	0	75.	18	3.1554	17	-.1
32066.97	32067.27	0	9.	18	3.1742	17	-.3
31989.66	31990.08	7	8.	13	3.1908	17	-.4
32070.57	32070.29	0	21.	12	3.1936	17	.3
31989.64	31989.63	0	71.	13	3.2052	17	.0
32070.56	32070.47	5	53.	12	3.2122	17	.1
31989.63	31989.88	0	16.	13	3.2240	17	-.2
32034.35	32034.82	7	11.	15	3.2324	17	-.5
32069.55	32069.90	0	44.	14	4.0046	17	-.3
32066.89	32069.62	9	9.	18	4.0212	17	-2.7
32069.53	32067.59	0	23.	14	4.0236	17	-.1
32034.31	32034.52	0	14.	15	4.0256	17	-.2
32066.87	32066.76	8	81.	18	4.0350	17	.1
32070.48	32070.92	5	14.	12	4.0736	17	-.4
31989.53	31989.73	0	53.	13	4.0852	17	-.2
32070.47	32070.79	0	73.	12	4.0916	17	-.3
32067.20	32067.33	0	7.	18	4.1338	17	-.1
32034.42	32034.54	0	16.	15	4.1430	17	-.1
32067.21	32067.57	6	74.	18	4.1524	17	-.4
32067.23	32067.30	0	14.	18	4.1712	17	-.1
32070.47	32070.79	0	60.	12	4.2022	17	-.3
31989.74	31990.00	0	22.	13	4.2210	17	-.3
32034.48	32034.00	9	5.	15	4.2256	17	.5
32069.51	32069.59	0	27.	14	9.0004	17	-.1
32034.49	32034.72	0	69.	15	9.0038	17	-.2
32067.29	32068.58	9	6.	18	9.0140	17	-1.3
32069.53	32069.83	0	36.	14	9.0150	17	-.3
32034.50	32034.67	0	17.	15	9.0226	17	-.2
32067.30	32067.26	0	69.	18	9.0320	17	.0
32067.31	32067.64	0	15.	18	9.0506	17	-.3
32070.57	32070.61	6	52.	12	9.0816	17	-.0
31989.79	31989.87	0	24.	13	9.1014	17	-.1
32034.53	32034.53	0	25.	15	9.1158	17	.0
32034.54	32034.45	0	39.	15	9.1342	17	.1
32067.34	32067.31	0	29.	18	9.1434	17	.0
32067.35	32067.19	0	34.	18	9.1622	17	.2
31989.80	31989.82	0	18.	13	9.1936	17	-.0
31989.81	31989.96	0	56.	13	9.2122	17	-.2
32069.67	32070.72	9	10.	14	9.2318	17	-1.1
32034.55	32034.91	6	24.	15	9.2354	17	-.4
32069.67	32070.18	7	82.	14	10.0058	17	-.5
32034.56	32034.46	0	43.	15	10.0136	17	.1
32067.36	32067.25	0	27.	18	10.0230	17	.1
32067.36	32067.36	0	37.	18	10.0416	17	.0
32070.75	32070.72	6	18.	12	10.0718	17	.0
32070.77	32070.84	0	58.	12	10.0904	17	-.1
32070.78	31677.54	9	4.	12	10.1056	17	393.2
32034.56	32034.48	0	10.	15	10.1108	17	.1
32069.73	32071.32	9	81.	14	10.1250	17	-1.6
32067.36	32067.62	6	11.	18	10.1348	17	-.3
32069.74	32069.86	0	11.	14	10.1440	17	-.1
32067.36	32067.56	0	91.	18	10.1532	17	-.2
32067.36	32067.33	0	9.	18	10.1724	17	.0
32070.84	32071.05	0	5.	12	10.1836	17	-.2
31989.81	31989.43	8	5.	13	10.1850	17	.4
32070.86	32071.46	0	65.	12	10.2018	17	-.1
31989.81	31989.81	0	67.	13	10.2034	17	.0
32070.87	32070.86	0	16.	12	10.2206	17	.0
31989.81	31989.84	0	16.	13	10.2222	17	-.0
32034.56	32034.74	0	9.	15	10.2304	17	-.2
32069.77	32069.75	6	35.	14	11.0008	17	.0
32034.56	32034.50	0	80.	15	11.0046	17	.1
32069.78	32069.82	0	28.	14	11.0154	17	-.0
32034.56	32034.66	0	12.	15	11.0236	17	-.1
32067.35	32067.18	6	87.	18	11.0326	17	.2
32067.35	32069.37	9	10.	18	11.0520	17	-2.0
32070.95	32070.85	0	57.	12	11.0808	17	.1
31989.81	31990.20	7	62.	13	11.0834	17	-.4
32070.96	32070.67	6	18.	12	11.0958	17	.3
31989.81	31990.11	6	17.	13	11.1020	17	-.3
32069.81	32069.70	0	32.	14	11.1200	17	.1
32069.81	32069.78	0	31.	14	11.1348	17	.0
32067.35	32067.35	0	41.	18	11.1444	17	-.0
32067.35	32067.33	0	24.	18	11.1632	17	.0
32071.03	32071.16	5	22.	12	11.1924	17	-.1
31989.82	31989.77	0	26.	13	11.1946	17	.1
32071.04	32071.16	5	45.	12	11.2110	17	-.1
31989.82	31989.81	0	34.	13	11.2132	17	.0
32069.83	32069.93	0	13.	14	11.2318	17	-.1
32034.56	32034.57	0	14.	15	12.0000	17	-.0
32069.84	32069.87	0	73.	14	12.0102	17	-.0
32034.57	32034.48	0	29.	15	12.0146	17	.1
32067.36	32067.50	0	38.	18	12.0242	17	-.1
32067.36	32067.74	6	26.	18	12.0426	17	-.4
32071.12	32071.00	0	14.	12	12.0718	17	.1
31989.84	31989.72	0	24.	13	12.0740	17	.1
32071.13	32071.31	0	53.	12	12.0902	17	-.2
31989.84	31989.99	0	41.	13	12.0926	17	-.1
32071.14	32072.47	9	3.	12	12.1052	17	-1.3
32069.85	32069.73	0	12.	14	12.1112	17	.1
32034.58	32034.73	0	68.	15	12.1304	17	-.1
32067.37	32067.46	0	16.	18	12.1356	17	-.1
32069.86	32069.83	0	8.	14	12.1444	17	.0
32067.38	32067.30	0	61.	18	12.1542	17	.1
32067.38	32068.26	9	5.	18	12.1712	17	-.9
32071.19	32071.25	9	8.	12	12.1752	17	-.1
31989.86	31989.50	6	16.	13	12.1958	17	.4
32071.20	32071.31	0	44.	12	12.2016	17	-.1
31989.86	31989.99	0	45.	13	12.2044	17	-.1
32071.22	32071.29	0	14.	12	12.2202	17	-.1

Table 11

31989.87	31989.92	0	10.	13	12.2232	17	-.1
32034.60	32034.64	0	14.	15	12.2314	17	-.0
32069.87	32070.00	0	47.	14	13.0012	17	-.1
32034.61	32034.66	5	43.	15	13.0056	17	.1
32069.87	32070.20	[illegible]	22.	14	13.0154	17	-.3
32034.61	32035.00	7	7.	15	13.0250	17	-.4
32067.40	32067.33	0	57.	18	13.0334	17	.1
32071.27	32074.36	9	5.	12	13.0626	17	-3.1
31989.88	31991.24	9	9.	13	13.0656	17	-1.4
32071.28	32071.24	0	56.	12	13.0806	17	.0
31989.89	31989.92	0	43.	13	13.0836	17	-.0
32071.29	32070.85	7	16.	12	13.0954	17	.4
31989.89	31990.27	7	11.	13	13.1026	17	-.4
32069.88	32069.89	0	41.	14	13.1204	17	-.0
32067.41	32066.54	9	4.	18	13.1310	17	-1.1
32069.88	32070.01	0	24.	14	13.1350	17	-.1
32067.42	32067.54	0	60.	18	13.1452	17	-.1
32067.42	32067.20	0	18.	18	13.1640	17	.2
32071.34	32071.32	0	24.	12	13.1922	17	.0
31989.91	31989.77	0	37.	13	13.1954	17	.1
32071.35	32071.32	0	41.	12	13.2106	17	.0
31989.91	31989.92	0	27.	13	13.2142	17	-.0
32069.89	32069.90	0	17.	14	13.2322	17	-.0
32034.66	32034.76	0	50.	15	14.0010	17	-.1
32069.89	32069.82	0	54.	14	14.0106	17	.1
32034.66	32034.72	0	20.	15	14.0156	17	-.1
32067.44	32067.41	0	55.	18	14.0246	17	.0
32067.44	32067.52	0	19.	18	14.0436	17	-.1
32071.41	32071.49	0	21.	12	14.0712	17	-.1
32071.41	32071.01	7	48.	12	14.0900	17	.4
31989.93	31989.96	0	28.	13	14.0936	17	-.0
32069.89	32070.08	0	10.	14	14.1116	17	-.2
32034.68	32034.57	0	21.	15	14.1132	17	.1
32069.89	32069.80	0	65.	14	14.1258	17	.1
32067.45	32067.55	0	23.	18	14.1406	17	-.1
32069.89	32070.01	0	5.	14	14.1450	17	-.1
32067.45	32067.40	0	44.	18	14.1550	17	.0
32071.46	32071.24	6	7.	12	14.1830	17	.2
31989.94	31990.24	6	15.	13	14.1908	17	-.3
32071.46	32071.46	0	74.	12	14.2012	17	.0
31989.94	31989.97	0	67.	13	14.2052	17	-.0
32071.47	32071.67	0	13.	12	14.2200	17	-.2
31989.94	31990.48	9	6.	13	14.2242	17	-.5
32034.70	32034.78	0	20.	15	14.2322	17	-.1
32069.90	32069.82	0	60.	14	15.0016	17	.1
32034.70	32034.81	0	52.	15	15.0106	17	-.1
32067.45	32067.64	5	21.	18	15.0156	17	-.2
32067.45	32067.47	0	48.	18	15.0346	17	-.0
31989.94	31990.64	9	14.	13	15.0706	17	-.7
32071.51	32070.77	9	66.	12	15.0802	17	.7
31989.94	31990.05	0	71.	13	15.0846	17	-.1
32071.52	32071.66	0	15.	12	15.0952	17	-.1
32034.72	32034.46	9	7.	15	15.1042	17	.3
32069.91	32069.92	0	55.	14	15.1206	17	-.0
32034.72	32034.60	0	75.	15	15.1230	17	.1
32067.45	32067.29	0	8.	18	15.1318	17	.2
32069.91	32069.76	0	19.	14	15.1356	17	.1
32034.72	32034.94	5	13.	15	15.1416	17	-.2
32067.45	32067.55	0	79.	18	15.1504	17	-.1
32067.45	32067.73	6	12.	18	15.1650	17	-.3
32071.55	32071.76	0	76.	12	15.1918	17	-.2
31989.94	31990.03	0	56.	13	15.2004	17	-.1
32071.55	32071.54	0	37.	12	15.2104	17	.0
31989.94	31989.93	0	19.	13	15.2152	17	.0
32034.73	32034.85	0	7.	15	15.2235	17	-.1
32069.92	32070.08	0	22.	14	15.2326	17	-.2
32034.73	32034.92	5	70.	15	16.0020	17	-.2
32069.92	32070.00	0	45.	14	16.0112	17	-.1
32034.73	32034.85	0	14.	15	16.0208	17	-.1
32067.44	32067.50	0	74.	18	16.0254	17	-.1
32067.44	32067.53	0	13.	18	16.0442	17	-.1
32071.58	32071.69	0	23.	12	16.0708	17	-.1
31989.93	31990.01	0	51.	13	16.0800	17	-.1
32071.58	32071.68	0	43.	12	16.0852	17	-.1
31989.93	31989.99	0	20.	13	16.0944	17	-.1
32069.94	32070.07	0	20.	14	16.1118	17	-.1
32034.75	32034.51	6	30.	15	16.1138	17	.2
32069.94	32069.94	0	51.	14	16.1302	17	.0
32034.75	32034.65	0	33.	15	16.1328	17	.1
32067.45	32067.58	0	32.	18	16.1414	17	-.1
32067.45	32067.28	5	31.	18	16.1600	17	.2
32071.60	32071.33	0	8.	12	16.1826	17	.3
31989.94	31989.87	0	22.	13	16.1916	17	.1
32071.61	32071.56	0	79.	12	16.2008	17	.0
31989.94	31989.93	0	47.	13	16.2102	17	.0
32071.61	32071.60	0	12.	12	16.2156	17	.0
32069.97	32070.00	0	7.	14	16.2236	17	-.0
32034.76	32034.85	0	28.	15	16.2330	17	-.1
32069.98	32070.00	0	76.	14	17.0020	17	-.0
32034.77	32034.88	0	35.	15	17.0118	17	-.1
32067.46	32067.44	0	33.	18	17.0352	17	.0
31989.95	31990.16	5	20.	13	17.0710	17	-.2
32071.63	32071.75	0	72.	12	17.0758	17	-.1
31989.95	31990.09	0	52.	13	17.0854	17	-.1
32070.02	32071.66	9	6.	14	17.1030	17	-1.6
32034.78	32035.14	7	12.	15	17.1052	17	-.4
32070.02	32069.91	5	69.	14	17.1212	17	.1
32034.79	32034.76	0	79.	15	17.1238	17	.0
32067.48	32067.58	0	13.	18	17.1326	17	-.1
32070.03	32070.24	5	15.	14	17.1358	17	-.2
32034.79	32037.12	9	9.	15	17.1430	17	-2.3
32067.48	32067.53	0	76.	18	17.1510	17	-.0
32067.49	32067.30	6	8.	18	17.1700	17	.2
31989.97	31990.28	6	7.	13	17.1830	17	-.3
32071.64	32071.98	0	28.	12	17.1914	17	-.3
31989.97	31989.84	0	75.	13	17.2014	17	.1
32071.64	32071.35	0	34.	12	17.2100	17	.3
31989.97	31989.93	0	13.	13	17.2202	17	.0
32034.81	32034.95	0	11.	15	17.2244	17	-.1
32070.08	32070.05	0	28.	14	17.2328	17	.0
32034.81	32034.84	0	62.	15	18.0028	17	-.0
32070.09	32069.99	0	34.	14	18.0116	17	.1
32034.82	32034.69	0	9.	15	18.0218	17	.1
32067.52	32067.51	0	82.	18	18.0304	17	.0
32067.53	32067.86	9	9.	18	18.0454	17	-.3
32071.65	32071.93	0	25.	12	18.0704	17	-.3
31990.00	31989.85	5	71.	13	18.0806	17	.1
32071.66	32071.75	0	39.	12	18.0848	17	-.1
31990.00	31990.75	9	14.	13	18.0956	17	-.7
32070.14	32070.21	0	26.	14	18.1120	17	-.1
32034.83	32034.86	0	45.	15	18.1148	17	-.0
32070.14	32070.05	0	38.	14	18.1308	17	.1
32034.83	32034.67	5	23.	15	18.1336	17	.2
32067.56	32067.41	0	47.	18	18.1422	17	.1
32067.56	32067.57	0	22.	18	18.1608	17	-.0
31990.02	31989.78	7	31.	13	18.1726	17	.2
32071.67	32071.61	0	82.	12	18.2006	17	.1
31990.03	31989.99	0	32.	13	18.2112	17	.0
32071.67	32071.37	0	11.	12	18.2152	17	.3
32070.17	32070.26	0	19.	14	18.2240	17	-.1
32034.84	32034.61	5	41.	15	18.2340	17	.2
32070.17	32070.20	0	84.	14	18.0024	17	-.0

32034.83	32034.83	0	24.	15	19.0126	17	.0
32067.58	32067.64	0	42.	18	19.0216	17	-.1
32067.58	32067.67	0	24.	18	19.0406	17	-.1
31990.04	31990.22	0	29.	13	19.0718	17	-.2
32071.69	32071.75	0	77.	12	19.0754	17	-.1
31990.04	31990.04	0	35.	13	19.0904	17	.0
32071.70	32071.64	0	12.	12	19.0946	17	.1
32070.15	32072.39	9	9.	14	19.1034	17	-2.2
32034.81	32034.99	0	18.	15	19.1102	17	-.2
32034.81	32034.78	0	58.	15	19.1246	17	.0
32067.57	32067.60	0	18.	18	19.1334	17	-.0
32070.14	32070.34	0	11.	14	19.1406	17	-.2
32067.57	32067.60	0	57.	18	19.1520	17	-.0
31990.03	31989.93	0	12.	13	19.1838	17	.1
32071.73	32071.50	0	31.	12	19.1910	17	.2
31990.02	31990.14	0	78.	13	19.2024	17	-.1
32071.73	32072.03	0	31.	12	19.2056	17	-.3
31990.02	31990.15	0	8.	13	19.2212	17	-.1
32034.75	32034.89	0	17.	15	19.2254	17	-.1
32070.06	32070.08	0	37.	14	19.2332	17	-.0
32034.74	32034.85	0	62.	15	20.0038	17	-.1
32070.04	32070.04	0	27.	14	20.0118	17	-.0
32034.72	32034.69	0	5.	15	20.0230	17	.0
32067.49	32067.60	0	52.	18	20.0310	17	-.1
31989.98	31989.03	9	11.	13	20.0632	17	1.0
32071.78	32071.93	0	27.	12	20.0700	17	-.2
31989.98	31989.83	0	83.	13	20.0814	17	.1
32071.79	32072.05	0	30.	12	20.0850	17	-.3
31989.96	31990.16	0	4.	13	20.1004	17	-.2

Table 12

PRINTOUT OF PUNCHED CARD OUTPUT FILE.

32071.75	32071.88	0	44.	12	25.1858	17	-.1
31989.93	31990.14	0	26.	13	25.2054	17	-.2
32034.62	32035.31	9	4.	15	25.2142	17	-.7
32070.11	32070.34	0	9.	14	25.2158	17	-.2
32034.64	32034.94	0	56.	15	25.2322	17	-.3
32067.62	32068.91	9	3.	18	26.0012	17	-1.3
32034.66	32034.66	0	19.	15	26.0110	17	.0
32070.14	32070.54	7	12.	14	26.0132	17	-.4
32067.64	32067.73	0	51.	18	26.0156	17	-.1
32067.66	32067.79	0	21.	18	26.0342	17	-.1
32071.91	32071.95	0	38.	12	26.0650	17	-.0
32034.77	32034.70	0	44.	15	26.1226	17	.1
32067.73	32067.68	0	21.	18	26.1308	17	.1
32070.19	32070.52	7	13.	14	26.1328	17	-.3
32067.74	32067.92	0	49.	18	26.1458	17	-.2
32071.99	32071.95	0	15.	12	26.1804	17	.0
32072.00	32071.97	0	66.	12	26.1950	17	.0
32072.01	32072.06	0	6.	12	26.2138	17	-.1
32034.83	32034.94	0	22.	15	26.2236	17	-.1
32034.84	32034.72	0	48.	15	27.0020	17	.1
32070.17	32070.09	0	31.	14	27.0042	17	.1
32067.76	32067.86	7	20.	18	27.0108	17	.3
32067.76	32067.72	0	53.	18	27.0248	17	.0
32072.03	32071.17	9	14.	12	27.0558	17	.9
32072.03	32072.13	0	73.	12	27.0740	17	-.1
31990.02	31990.10	0	69.	13	27.0800	17	-.1
32072.03	32072.62	9	7.	12	27.0932	17	-.6
32034.86	32034.53	7	9.	15	27.0956	17	.3
32070.12	32070.05	5	29.	14	27.1044	17	.1
32034.87	32034.91	0	80.	15	27.1140	17	-.0
32067.75	32068.38	9	7.	18	27.1224	17	-.6
32070.12	32070.12	0	34.	14	27.1234	17	-.0
32034.87	32035.07	6	13.	15	27.1328	17	-.2
32067.75	32067.73	0	14.	18	27.1554	17	.0
32072.02	32072.09	0	49.	12	27.1656	17	-.1
32072.02	32071.91	5	21.	12	27.2042	17	.1
31989.99	31990.02	0	19.	13	27.2102	17	-.0
32034.88	32034.93	0	8.	15	27.2150	17	-.1
32070.07	32070.24	0	12.	14	27.2202	17	-.2
32034.88	32034.98	0	76.	15	27.2334	17	-.1
32034.88	32034.87	0	15.	15	28.0122	17	.0
32067.74	32067.83	0	51.	18	28.0202	17	-.1
32067.73	32067.66	0	17.	18	28.0346	17	.1
32072.01	32072.11	0	28.	12	28.0646	17	-.1
31989.99	31990.07	0	36.	13	28.0714	17	-.1
32072.01	32072.15	0	29.	12	28.0832	17	-.1
31989.99	31990.33	7	23.	13	28.0854	17	-.3
32070.03	32079.10	9	5.	14	28.0956	17	-9.1
32034.88	32035.02	0	25.	15	28.1052	17	-.1
32070.03	32070.19	0	72.	14	28.1138	17	-.2
32034.89	32034.86	0	34.	15	28.1240	17	.0
32067.74	32067.83	0	22.	18	28.1322	17	-.1
32067.74	32067.96	0	38.	18	28.1508	17	-.2
32072.00	32071.88	6	11.	12	28.1804	17	.1
32072.01	32071.94	5	21.	12	29.2040	17	.1
31990.07	31990.30	5	13.	13	29.2112	17	-.2
32034.90	32034.04	9	6.	15	29.2158	17	.9
32070.08	32070.11	5	11.	14	29.2210	17	-.0
32034.90	32035.00	0	78.	15	29.2340	17	-.1
32070.09	32070.06	6	75.	14	29.2352	17	.0
32067.85	32069.32	9	5.	18	30.0026	17	-1.5
32034.91	32035.09	0	10.	15	30.0132	17	-.2
32067.86	32068.05	0	71.	18	30.0208	17	-.2
32067.86	32069.61	9	12.	18	30.0402	17	-1.7
32072.04	32072.21	0	31.	12	30.0642	17	-.2
31990.10	31990.17	0	55.	13	30.0716	17	-.1
32072.04	32072.13	0	26.	12	30.0828	17	-.1
31990.10	31990.25	0	16.	13	30.0904	17	-.2
32070.12	32069.68	9	8.	14	30.0958	17	.4
32034.91	32034.84	0	37.	15	30.1102	17	.1
32070.13	32070.37	0	86.	14	30.1142	17	-.2
32034.92	32034.93	0	23.	15	30.1250	17	-.0
32067.91	32067.78	0	26.	18	30.1514	17	.1
32072.08	32072.10	0	13.	12	30.1800	17	-.0
31990.12	31989.92	6	24.	13	30.1836	17	-.2
32072.09	32072.18	0	65.	12	30.1946	17	-.1
31990.12	31990.24	0	35.	13	30.2022	17	-.1
32072.10	32071.95	6	4.	12	30.2134	17	.2
32034.93	32035.09	0	30.	15	30.2252	17	-.2
32034.93	32034.86	0	39.	15	31.0038	17	.1
32067.95	32067.60	6	19.	18	31.0118	17	.4
32067.96	32068.34	6	47.	18	31.0310	17	-.4
32072.14	32072.30	6	6.	12	31.0550	17	-.2
31990.13	31990.43	7	15.	13	31.0628	17	-.3
32072.15	32071.78	8	74.	12	31.0732	17	.4
31990.13	31990.09	0	61.	13	31.0814	17	.0
32034.94	32034.29	9	9.	15	31.1016	17	.7
32070.18	32070.31	0	24.	14	31.1052	17	-.1
32034.95	32033.40	9	82.	15	31.1200	17	1.5
32070.18	32069.99	8	35.	14	31.1236	17	.2
32034.95	32034.33	9	8.	15	31.1350	17	.6
32068.00	32067.75	5	82.	18	31.1424	17	.3
32068.01	32068.21	0	10.	18	31.1614	17	-.2
32072.21	32071.88	7	31.	12	31.1850	17	.3
31990.14	31990.04	0	68.	13	31.1934	17	.1
32072.22	32072.35	0	27.	12	31.2036	17	-.1
31990.14	31990.17	0	13.	13	31.2122	17	-.0
32070.19	32070.02	8	10.	14	31.2212	17	.2
32070.20	32066.84	9	78.	14	31.2356	17	3.4
32068.04	32071.16	9	6.	18	32.0036	17	-3.1
32034.97	32035.08	0	9.	15	32.0142	17	-.1
32068.05	32068.33	0	73.	18	32.0216	17	-.3
32068.05	32068.46	5	12.	18	32.0404	17	-.4
32072.26	32072.26	0	25.	12	32.0640	17	-.0
31990.14	31990.22	0	58.	13	32.0726	17	-.1
32072.26	32072.37	0	35.	12	32.0824	17	-.1
31990.14	31990.09	0	16.	13	32.0912	17	.1
32070.21	32070.35	0	8.	14	32.1002	17	-.1
32034.98	32035.26	5	38.	15	32.1112	17	-.3
32070.21	32070.93	9	84.	14	32.1146	17	-.7
32034.98	32034.90	0	23.	15	32.1300	17	.1
32068.08	32068.33	5	32.	18	32.1342	17	-.2
32068.09	32067.96	5	27.	18	32.1524	17	.1
32072.28	32072.63	7	9.	12	32.1756	17	-.3
31990.14	31990.28	0	25.	13	32.1846	17	-.1
32072.28	32072.41	5	82.	12	32.1942	17	-.1
31990.14	31990.26	0	35.	13	32.2032	17	-.1
32072.29	32072.69	8	7.	12	32.2130	17	-.4
32034.99	32035.01	0	33.	15	32.2302	17	-.0
32035.00	32035.44	7	19.	15	33.0054	17	-.4
32068.12	32067.96	5	38.	18	33.0126	17	.2
32068.12	32067.97	5	22.	18	33.0314	17	.1
32072.28	32072.32	0	11.	12	33.0546	17	-.0
31990.14	31990.26	0	29.	13	33.0638	17	-.1
32072.27	32072.26	0	75.	12	33.0730	17	.1
31990.14	31989.93	5	29.	13	33.0822	17	.2
32072.27	32073.66	9	5.	12	33.0920	17	-1.4
32035.01	32035.32	6	20.	15	33.1024	17	-.3
32070.28	32070.39	0	44.	14	33.1054	17	-.1
32035.01	32035.03	0	42.	15	33.1210	17	-.0
32070.25	32070.30	0	19.	14	33.1242	17	-.1
32068.15	32067.90	7	51.	18	33.1434	17	.2
31990.15	31990.31	0	13.	13	33.1758	17	-.2
32072.20	32072.52	6	22.	12	34.0822	17	-.3
31990.15	31989.43	9	5.	13	34.0924	17	.7
32070.29	32030.48	9	16.	14	34.1004	17	39.8
32068.19	32068.26	0	67.	18	34.1344	17	-.1
32068.19	32068.47	6	13.	18	34.1534	17	-.3
32072.18	32072.20	0	14.	12	34.1752	17	-.0
31990.15	31990.24	0	54.	13	34.1856	17	-.1
32072.18	32072.26	0	55.	12	34.1938	17	-.1
31990.15	31990.12	0	16.	13	34.2044	17	.0
32070.32	32071.97	9	5.	14	34.2128	17	-1.6
32070.33	32070.42	0	77.	14	34.2312	17	-.1
32070.33	32070.10	8	11.	14	35.0056	17	.2
32068.20	32068.19	0	56.	18	35.0136	17	.0
32068.21	32068.56	6	16.	18	35.0324	17	-.4
32072.18	32073.59	9	12.	12	35.0544	17	-1.4
31990.14	31990.15	0	44.	13	35.0644	17	-.0
32072.18	32072.18	0	70.	12	35.0726	17	.0
31990.14	31989.77	8	20.	13	35.0832	17	.4
32035.07	32035.25	0	30.	15	35.1036	17	-.2
32070.36	32070.50	0	60.	14	35.1058	17	-.1
32035.08	32035.16	0	28.	15	35.1222	17	-.1
32068.22	32068.27	0	24.	18	35.1256	17	-.1
32068.22	32068.37	0	34.	18	35.1446	17	-.2
31990.13	31990.14	0	20.	13	35.1806	17	-.0
32072.22	32072.28	0	55.	12	35.1844	17	-.1
31990.13	31990.21	0	44.	13	35.1952	17	-.1
32072.23	32072.24	0	16.	12	35.2032	17	-.0
32070.41	32070.39	0	25.	14	35.2218	17	.0
32035.10	32035.12	0	33.	15	36.0010	17	-.0
32068.23	32068.22	0	20.	18	36.0046	17	.0
32068.23	32068.24	0	42.	18	36.0232	17	-.0
31990.12	31990.31	0	16.	13	36.0556	17	-.2
32072.28	32072.30	0	41.	12	36.0630	17	-.0
31990.12	31990.14	0	54.	13	36.0742	17	-.0
32072.29	32072.39	0	20.	12	36.0820	17	-.1
32035.13	32034.95	7	11.	15	36.0948	17	.2
32070.45	32070.60	0	71.	14	36.1010	17	-.1
32035.13	32035.29	0	73.	15	36.1132	17	-.2
32070.46	32070.53	0	41.	14	36.1152	17	-.1
32035.14	32036.48	9	5.	15	36.1324	17	-1.3
32068.25	32067.44	9	88.	18	36.1354	17	.8
32068.25	32068.54	5	8.	18	36.1542	17	-.3
31990.12	31990.86	9	5.	13	36.1720	17	-.7
32072.33	32072.56	5	17.	12	36.1750	17	-.2
31990.11	31990.10	0	76.	13	36.1904	17	.0
32072.34	32072.44	0	50.	12	36.1934	17	-.1
31990.11	31990.03	6	11.	13	36.2054	17	.1
32070.49	32070.98	8	8.	14	36.2130	17	-.5
32035.17	32034.93	7	82.	15	36.2322	17	.2
32068.27	32071.58	9	6.	18	37.0004	17	-3.3
32070.50	32070.29	7	8.	14	37.0102	17	.2
32068.27	32068.25	0	76.	18	37.0142	17	.0
32068.28	32068.14	6	10.	18	37.0332	17	.1
31990.12	32037.05	9	4.	13	37.0514	17	-46.9
32072.38	32072.91	9	13.	12	37.0542	17	-.5
31990.12	31990.42	5	65.	13	37.0654	17	-.3
32072.38	32072.12	6	64.	12	37.0722	17	.3
31990.12	31990.15	0	13.	13	37.0842	17	-.0
32035.20	32035.26	0	46.	15	37.1044	17	-.1
32035.20	32035.26	0	19.	15	37.1232	17	-.1
32068.30	32068.27	0	35.	18	37.1304	17	.0
32068.31	32068.28	0	24.	18	37.1452	17	.0
32072.39	32073.19	9	2.	12	37.1658	17	-.8
31990.14	31990.18	0	22.	13	37.1816	17	-.0
32072.39	32072.29	0	60.	12	37.1840	17	.1
31990.14	31990.12	0	29.	13	37.2002	17	.0
32072.39	32072.49	0	14.	12	37.2028	17	-.1
32070.56	32070.60	0	33.	14	37.2222	17	-.0
32070.56	32070.59	0	25.	14	38.0010	17	-.0
32068.35	32068.45	0	29.	18	38.0056	17	-.1
32068.35	32068.41	0	29.	18	38.0242	17	-.1
31990.17	31990.13	0	24.	13	38.0606	17	.0
32072.37	32072.42	0	46.	12	38.0626	17	-.1
31990.18	31990.29	0	35.	13	38.0754	17	-.1
32035.26	32035.39	0	17.	15	38.0958	17	-.1
32070.58	32070.80	5	27.	14	38.1016	17	-.2
32035.26	32035.32	0	52.	15	38.1144	17	-.1
32070.58	32070.55	0	31.	14	38.1158	17	.0
32068.40	32068.08	8	13.	18	38.1218	17	.3
32068.40	32068.47	0	65.	18	38.1402	17	-.1
32068.41	32069.12	9	4.	18	38.1552	17	-.7
31990.21	31990.23	0	10.	13	38.1730	17	-.0
32072.32	32072.36	0	19.	12	38.1746	17	-.0
31990.21	31990.21	0	76.	13	38.1914	17	.0
32072.32	32072.48	0	44.	12	38.1934	17	-.2
31990.22	31990.40	0	6.	13	38.2104	17	-.2
32070.58	32070.50	0	11.	14	38.2132	17	.1
32035.29	32035.24	0	14.	15	38.2148	17	.0
32070.59	32070.69	0	71.	14	38.2316	17	-.1
32035.29	32035.39	0	62.	15	38.2334	17	-.1
32068.45	32068.69	5	7.	18	39.0008	17	-.2
32070.59	32070.75	0	8.	14	39.0106	17	-.2
32035.29	32035.28	0	5.	15	39.0124	17	.0
32068.45	32068.59	0	82.	18	39.0152	17	-.1
32068.46	32068.80	7	9.	18	39.0342	17	-.3
31990.24	31991.00	9	5.	13	39.0520	17	-.8
32072.28	32072.18	7	10.	12	39.0538	17	.1
31990.25	31990.14	0	71.	13	39.0702	17	.1
32072.27	32072.22	7	74.	12	39.0720	17	.1
31990.25	31990.09	6	11.	13	39.0854	17	.2
32070.59	32075.29	9	5.	14	39.0926	17	-4.7
32035.31	32035.35	0	53.	15	39.1054	17	-.0
32035.31	32035.31	0	16.	15	39.1242	17	.0
32068.50	32068.54	0	38.	18	39.1316	17	-.0
32068.50	32068.53	0	22.	18	39.1500	17	-.0
31990.27	31990.21	0	32.	13	39.1826	17	.1
32072.24	32072.51	0	51.	12	39.1842	17	-.3
31990.27	31990.32	0	26.	13	39.2012	17	-.0
32070.59	32070.60	0	33.	14	39.2226	17	-.0
32035.33	32035.36	0	57.	15	39.2246	17	-.0
32070.59	32070.64	0	19.	14	40.0012	17	-.1
32035.33	32036.17	9	15.	15	40.0036	17	-.8
32068.53	32068.63	0	42.	18	40.0102	17	-.1
32068.53	32068.46	0	20.	18	40.0250	17	.1
31990.27	31990.41	0	35.	13	40.0614	17	-.1
31990.27	31990.30	0	24.	13	40.0802	17	-.0
32035.35	32035.67	7	25.	15	40.1008	17	-.3
32035.35	32035.40	0	34.	15	40.1154	17	-.1
32068.55	32068.37	5	19.	18	40.1226	17	.2
32068.55	32068.51	0	46.	18	40.1412	17	.0
31990.26	31990.40	5	16.	13	40.1738	17	-.2
31990.26	31990.24	0	55.	13	40.1924	17	.0
32070.58	32070.59	0	15.	14	40.2136	17	-.0
32035.36	32035.43	0	21.	15	40.2158	17	-.1
32070.58	32070.74	0	56.	14	40.2320	17	-.2
32035.36	32035.44	0	41.	15	40.2344	17	-.1
32068.55	32068.58	0	16.	18	41.0016	17	-.0
32068.55	32068.56	0	56.	18	41.0200	17	-.0
31990.24	31990.31	0	13.	13	41.0528	17	-.1

Table 13

31990.24	31990.43	0	66.	13	41.0712	17	-.2
32070.58	32070.58	0	12.	14	41.0926	17	-.0
32070.58	32070.65	0	68.	14	41.1112	17	-.1
32068.55	32068.68	0	5.	18	41.1140	17	-.1
32035.37	32037.73	9	8.	15	41.1256	17	-2.4
32068.55	32068.44	0	73.	18	41.1322	17	.1
32068.55	32068.71	0	11.	18	41.1510	17	-.2
32072.37	32072.15	7	4.	12	41.1650	17	.2
32072.38	32072.67	5	71.	12	41.1838	17	-.3
31990.22	31990.24	0	14.	13	41.2024	17	-.0
32035.38	32036.64	9	6.	15	41.2112	17	-1.3
32070.59	32070.56	0	59.	14	41.2230	17	.0
32035.38	32035.23	7	78.	15	41.2252	17	.1
32070.59	32070.59	0	15.	14	42.0018	17	.0
32035.38	32036.21	9	10.	15	42.0046	17	-.8
32068.54	32068.45	5	62.	18	42.0110	17	.1
32068.54	32068.50	0	14.	18	42.0300	17	.0
32068.53	32068.67	0	31.	18	42.1420	17	-.1
32072.46	32072.24	6	23.	12	42.1738	17	.2
32072.46	32072.67	0	36.	12	42.1926	17	-.2
32070.64	32070.66	0	20.	14	42.2138	17	-.0
32035.40	32035.50	0	30.	15	42.2206	17	-.1
32070.65	32070.71	0	41.	14	42.2326	17	-.1
32035.41	32035.56	0	27.	15	42.2354	17	-.2
32068.52	32068.57	0	22.	18	43.0022	17	-.0
32068.52	32068.61	0	38.	18	43.0208	17	-.1
32072.48	32072.68	0	18.	12	43.0526	17	-.2
31990.22	31992.65	9	20.	13	43.0544	17	-2.4
32072.48	32072.32	5	49.	12	43.0710	17	.2
31990.23	31995.94	9	44.	13	43.0732	17	-5.7
32070.68	32070.94	0	17.	14	43.0926	17	-.3
32070.68	32070.55	5	53.	14	43.1112	17	.1
32068.53	32068.85	0	7.	18	43.1520	17	-.3
31990.25	31990.41	0	7.	13	43.1700	17	-.2
32072.50	32072.56	0	76.	12	43.1830	17	-.1
32072.50	32072.67	0	10.	12	43.2018	17	-.2
32070.72	32071.31	8	5.	14	43.2050	17	-.6
32035.45	32035.55	0	11.	15	43.2122	17	-.1
32070.72	32070.80	0	75.	14	43.2234	17	-.1
32035.45	32035.50	0	72.	15	43.2304	17	-.0
32068.55	32068.19	0	7.	18	43.2338	17	.4
32070.73	32070.69	0	11.	14	44.0022	17	.0
32035.46	32035.77	6	5.	15	44.0054	17	-.3
32068.56	32068.67	0	84.	18	44.0120	17	-.1
32068.56	32068.91	6	9.	18	44.0308	17	-.3
31990.30	31990.58	6	6.	13	44.0452	17	-.3
32072.51	32072.50	0	61.	12	44.0620	17	.0
31990.31	31990.19	6	75.	13	44.0634	17	.1
32072.51	32072.46	0	14.	12	44.0804	17	.1
32070.76	32070.78	0	62.	14	44.1020	17	-.0
32070.76	32070.81	0	14.	14	44.1210	17	-.0
32068.61	32068.64	0	39.	18	44.1242	17	-.0
32068.62	32068.57	5	22.	18	44.1430	17	.0
32072.53	32072.81	6	25.	12	44.1736	17	-.3
31990.37	31990.49	0	34.	13	44.1800	17	-.1
32072.53	32072.46	0	33.	12	44.1922	17	.1
31990.38	31990.50	0	25.	13	44.1948	17	-.1
32070.78	32070.72	0	26.	14	44.2144	17	.1
32035.54	32035.47	0	46.	15	44.2214	17	.1
32070.78	32070.77	0	31.	14	44.2330	17	.0
32035.55	32035.56	0	19.	15	45.0004	17	-.0
32068.69	32068.60	5	32.	18	45.0030	17	.1
32068.70	32068.67	0	26.	18	45.0218	17	.0
32072.55	32072.62	0	19.	12	45.0522	17	-.1
31990.44	31990.45	0	28.	13	45.0546	17	-.0
32072.56	32072.52	0	43.	12	45.0706	17	.0
31990.45	31990.33	0	29.	13	45.0730	17	.1
32070.79	32070.98	6	22.	14	45.0930	17	-.2
32070.79	32070.94	5	39.	14	45.1116	17	-.2
32068.77	32068.94	0	14.	18	45.1154	17	-.2
32068.78	32068.70	0	60.	18	45.1340	17	.1
32072.56	32072.67	0	6.	12	45.1644	17	-.1
32072.56	32072.46	0	81.	12	45.1826	17	.1
31990.49	31990.33	7	67.	13	45.1854	17	.2
32072.55	32072.46	0	9.	12	45.2016	17	.1
32070.76	32070.69	0	8.	14	45.2056	17	.1
32035.61	32035.62	0	17.	15	45.2128	17	-.0
32070.75	32070.72	0	81.	14	45.2238	17	.0
32035.61	32035.82	5	51.	15	45.2314	17	-.2
32068.82	32068.96	0	12.	18	45.2344	17	-.1
32070.74	32070.88	0	3.	14	46.0028	17	-.1
32068.82	32068.76	0	52.	18	46.0128	17	.1
32072.52	32072.86	7	7.	12	46.0430	17	-.3
31990.49	31990.88	8	14.	13	46.0456	17	-.4
32072.51	32072.81	6	87.	12	46.0612	17	-.3
31990.48	31990.60	5	58.	13	46.0642	17	-.1
32072.50	32072.14	8	7.	12	46.0800	17	.4
32035.58	32035.41	7	10.	15	46.0852	17	.2
32070.67	32070.65	0	78.	14	46.1024	17	.0
32035.57	32035.64	0	75.	15	46.1038	17	-.1
32068.78	32068.93	0	5.	18	46.1108	17	-.1
32070.65	32072.02	9	5.	14	46.1216	17	-1.4
32068.77	32068.69	0	79.	18	46.1250	17	.1
32068.75	32068.86	0	9.	18	46.1440	17	-.1
31990.41	31991.35	9	4.	13	46.1624	17	-.9
32072.39	32072.52	0	38.	12	46.1732	17	-.1
31990.39	31990.44	0	72.	13	46.1804	17	-.0
32072.37	32072.50	0	20.	12	46.1918	17	-.1
31990.37	31990.59	0	11.	13	46.1956	17	-.2
32035.46	32035.65	0	7.	15	46.2042	17	-.2
32070.54	32070.73	0	52.	14	46.2146	17	-.2

Table 14

32035.69	32035.85	0	26.	15	50.1100	17	-.2
32068.73	32068.61	6	20.	18	50.1122	17	.1
32068.76	32068.91	0	40.	18	50.1308	17	-.2
31990.32	31990.34	0	19.	13	50.1638	17	-.0
32072.58	32072.64	0	63.	12	50.1726	17	-.1
31990.32	31990.52	0	43.	13	50.1826	17	-.2
32072.59	32072.63	0	13.	12	50.1912	17	-.0
32070.66	32071.10	7	9.	14	50.2012	17	-.6
32035.75	32035.90	0	25.	15	50.2058	17	-.1
32070.69	32070.72	5	76.	14	50.2154	17	-.0
32035.76	32035.72	0	32.	15	50.2246	17	.0
32068.87	32069.14	0	16.	18	50.2312	17	-.3
32070.71	32070.36	9	14.	14	50.2342	17	.4
32068.89	32068.68	6	85.	18	51.0056	17	.2
32068.91	32061.46	9	8.	18	51.0248	17	7.4
31990.36	31991.31	9	8.	13	51.0432	17	-.9
32072.66	32072.63	0	25.	12	51.0510	17	.0
31990.37	31990.50	0	85.	13	51.0612	17	-.1
32072.66	32072.83	0	32.	12	51.0658	17	-.2
32035.81	32036.15	6	4.	15	51.0826	17	-.3
32070.84	32070.77	5	50.	14	51.0942	17	.1
32035.81	32035.46	6	68.	15	51.1008	17	.4
32035.81							
32070.86	32070.97	0	17.	14	51.1128	17	-.1
32070.86							
32035.82	32036.16	6	13.	15	51.1158	17	-.3
32068.96	32069.07	0	43.	18	51.1218	17	-.1
32068.97	32068.85	0	20.	18	51.1406	17	.1
32072.70	32072.81	0	10.	12	51.1632	17	-.1
31990.39	31990.43	0	41.	13	51.1736	17	-.0
32072.70	32072.66	0	76.	12	51.1816	17	.0
31990.39	31990.39	0	21.	13	51.1922	17	.0
32072.70	32074.55	9	6.	12	51.2008	17	-1.8
32070.95	32071.17	0	21.	14	51.2104	17	-.2
32035.84	32035.85	0	57.	15	51.2156	17	-.0
32070.96	32070.91	0	39.	14	51.2250	17	.1
32035.85	32035.81	0	15.	15	51.2346	17	.0
32068.99	32069.12	0	35.	18	52.0010	17	-.1
32068.99	32068.90	0	24.	18	52.0154	17	.1
32072.71	32069.80	9	7.	12	52.0420	17	2.9
31990.40	31990.44	0	34.	13	52.0524	17	-.0
32072.71	32072.70	0	84.	12	52.0602	17	.0
31990.40	31990.39	0	25.	13	52.0712	17	.0
32072.71	32072.69	0	9.	12	52.0750	17	.0
32071.02	32071.38	7	17.	14	52.0852	17	-.4
32035.86	32035.96	0	25.	15	52.0922	17	-.1
32071.03	32070.89	0	50.	14	52.1038	17	.1
32035.86	32036.12	6	34.	15	52.1108	17	-.3
32068.99	32068.21	9	16.	18	52.1132	17	.8
32068.99	32068.78	5	55.	18	52.1316	17	.2
31990.40	31990.37	0	15.	13	52.1648	17	.0
32072.71	32072.74	0	36.	12	52.1722	17	-.0
31990.40	31990.32	0	57.	13	52.1834	17	.1
32072.71	32072.59	0	23.	12	52.1912	17	.1
32071.05	32069.64	9	6.	14	52.2016	17	1.4
32035.86	32035.60	0	21.	15	52.2110	17	.3
32071.04	32071.05	0	79.	14	52.2158	17	.0
32035.86	32035.88	0	41.	15	52.2256	17	-.0
32068.97	32069.29	6	13.	18	52.2322	17	-.3
32071.06	32070.65	7	10.	14	52.2346	17	.4
32068.96	32069.01	0	66.	18	53.0108	17	-.0
31990.40	31990.22	0	12.	13	53.0438	17	.2
31990.40	31990.47	0	68.	13	53.0620	17	-.1
32072.69	32072.82	0	29.	12	53.0652	17	-.1
32071.07	32070.99	0	64.	14	53.0944	17	.1
32071.07	32071.13	0	13.	14	53.1132	17	-.1
32035.85	32034.64	9	7.	15	53.1208	17	1.2
32068.93	32068.99	0	63.	18	53.1228	17	-.1
32072.68	32072.67	0	11.	12	53.1628	17	.0
31990.39	31990.37	0	61.	13	53.1744	17	.0
32072.67	32072.57	5	72.	12	53.1814	17	.1
31990.39	31990.59	0	14.	13	53.1934	17	-.2
32035.85	32036.06	6	6.	15	53.2024	17	-.2
32071.07	32071.25	7	28.	14	53.2108	17	-.2
32035.84	32035.84	0	78.	15	53.2208	17	.0
32071.07	32071.12	0	29.	14	53.2254	17	-.0
32068.91	32068.93	0	52.	18	54.0016	17	-.0
32068.90	32069.36	7	17.	18	54.0206	17	-.5
32072.67	32072.99	6	8.	12	54.0414	17	-.3
31990.40	31990.34	0	51.	13	54.0534	17	.1
32068.89	32068.83	0	37.	18	54.1326	17	.1
31990.40	31990.30	0	22.	13	54.1656	17	.1
32072.67	32072.65	0	39.	12	54.1720	17	.0
31990.41	31990.58	0	37.	13	54.1844	17	-.2
32071.07	32071.13	0	9.	14	54.2018	17	-.1
32035.83	32035.87	0	30.	15	54.2118	17	-.0
32071.07	32071.09	0	82.	14	54.2202	17	-.0
32035.83	32036.00	0	27.	15	54.2306	17	-.2
32068.90	32069.05	0	19.	18	54.2330	17	-.2
32068.90	32068.80	0	46.	18	55.0116	17	.1
31990.42	31990.55	0	19.	13	55.0446	17	-.1
31990.42	31990.33	0	47.	13	55.0630	17	.1
32072.68	32072.88	0	27.	12	55.0654	17	-.2
32071.07	32071.33	6	6.	14	55.0806	17	-.3
32035.82	32035.81	0	14.	15	55.0842	17	.0
32071.07	32071.19	0	79.	14	55.0950	17	-.1
32035.82	32035.94	0	61.	15	55.1030	17	-.1
32068.91	32068.20	9	7.	18	55.1052	17	.7
32068.91	32068.87	0	84.	18	55.1238	17	.0
32068.91	32069.40	9	9.	18	55.1428	17	-.5
32072.69	32072.64	0	12.	12	55.1624	17	.1
31990.43	31990.47	0	84.	13	55.1754	17	-.0
32072.69	32072.69	0	66.	12	55.1810	17	.0
31990.43	31990.61	0	9.	13	55.1944	17	-.2
32035.82	32035.92	0	11.	15	55.2032	17	-.1
32071.04	32071.21	5	36.	14	55.2110	17	-.1
32035.82	32035.83	0	72.	15	55.2216	17	-.0
32071.04	32071.12	0	23.	14	55.2258	17	-.1
32068.92	32069.23	6	72.	18	56.0024	17	-.3
32068.93	32070.18	9	11.	18	56.0214	17	-1.3
32072.71	32072.84	0	9.	12	56.0410	17	-.1
31990.44	31990.58	0	72.	13	56.0540	17	-.1
31990.44	31991.14	9	11.	13	56.0730	17	-.7
32071.04	32070.91	0	29.	14	56.0856	17	.1
32035.81	32035.70	0	57.	15	56.0940	17	.1
32071.04	32071.03	0	28.	14	56.1044	17	.0
32035.81	32036.42	9	15.	15	56.1130	17	-.6
32068.94	32068.98	0	32.	18	56.1148	17	-.0
32068.95	32068.83	0	26.	18	56.1334	17	.1
31990.44	31990.48	0	33.	13	56.1706	17	-.0
31990.44	31990.47	0	25.	13	56.1854	17	-.0
32071.04	32070.97	0	13.	14	56.2020	17	.1
32035.81	32035.96	0	46.	15	56.2128	17	-.2
32071.04	32071.21	5	66.	14	56.2206	17	-.2
32035.81	32035.79	0	18.	15	56.2316	17	.0
32068.96	32069.15	0	26.	18	56.2336	17	-.2
31990.43	31990.34	0	27.	13	57.0456	17	.1
31990.43	31990.37	0	31.	13	57.0640	17	.1
32071.05	32070.17	9	10.	14	57.0810	17	.9

Table 15

32035.80	32035.60	6	21.	15	57.0854	17	.2
32071.05	32071.22	0	79.	14	57.0952	17	-.2
32035.80	32034.97	9	40.	15	57.1040	17	.8
32071.05	32072.42	9	6.	14	57.1144	17	-1.6
32068.98	32068.76	7	70.	18	57.1244	17	.2
32068.98	32068.54	9	4.	18	57.1436	17	.4
31990.41	31990.34	0	12.	13	57.1620	17	.1
31990.40	31990.52	0	69.	13	57.1804	17	-.1
31990.40	31990.42	0	4.	13	57.1954	17	-.0
32035.80	32035.78	0	17.	15	57.2040	17	.0
32071.05	32071.18	0	50.	14	57.2114	17	-.1
32035.80	32035.78	0	51.	15	57.2226	17	.0
32071.05	32071.02	0	17.	14	57.2302	17	.0
32072.80	32072.37	9	76.	12	58.0550	17	.4
32072.80	32074.21	9	5.	12	58.0742	17	-1.4
32035.79	32037.14	9	6.	15	58.0808	17	-1.3
32071.05	32071.20	0	38.	14	58.0900	17	-.2
32035.79	32035.92	0	79.	15	58.0950	17	-.1
32071.05	32071.00	0	22.	14	58.1050	17	.0
32035.79	32036.38	9	10.	15	58.1140	17	-.6
32068.98	32069.23	6	49.	18	58.1156	17	-.2
32068.98	32069.09	0	18.	18	58.1344	17	-.1
32072.81	32072.84	0	49.	12	58.1712	17	-.0
32072.82	32072.98	0	17.	12	58.1858	17	-.2
32035.78	32037.03	9	4.	15	58.1956	17	-1.2
32071.05	32071.02	0	17.	14	58.2024	17	.0
32035.78	32035.95	0	68.	15	58.2136	17	-.2
32071.05	32071.04	0	50.	14	58.2210	17	.0
32035.78	32035.93	0	12.	15	58.2326	17	-.1
32035.78							
32068.98	32068.98	0	38.	18	58.2344	17	-.0
32068.98	32069.10	0	22.	18	59.0132	17	-.1
32072.83	32072.91	0	36.	12	59.0456	17	-.1
32072.83	32072.60	7	22.	12	59.0642	17	.2
32071.04	32070.91	0	13.	14	59.0810	17	.1
32035.78	32036.07	5	30.	15	59.0902	17	-.3
32071.04	32070.71	9	63.	14	59.0954	17	.3
32035.77	32035.44	0	27.	15	59.1050	17	.3
32068.97	32068.96	0	49.	18	59.1256	17	.0
32072.83	32072.99	0	15.	12	59.1618	17	-.2
32072.84	32072.78	0	55.	12	59.1802	17	.1
32035.77	32035.76	0	25.	15	59.2048	17	.0
32071.04	32071.06	0	64.	14	59.2118	17	-.0
32035.76	32035.64	0	33.	15	59.2236	17	.1
32068.96	32068.99	0	14.	18	59.2258	17	-.0
32068.96	32068.90	0	61.	18	60.0040	17	.1
31990.22	31991.21	9	15.	13	60.0418	17	-1.0
32072.84	32072.51	9	70.	12	60.0546	17	.3
31990.22	31990.50	0	58.	13	60.0604	17	-.3
32035.76	32036.54	9	11.	15	60.0816	17	-.8
32071.03	32071.21	0	52.	14	60.0904	17	-.2
32068.95	32069.22	5	69.	18	60.1206	17	-.3
32068.95	32069.99	9	12.	18	60.1356	17	-1.0
32072.84	32072.82	0	54.	12	60.1708	17	.0
32072.84	32072.69	6	16.	12	60.1856	17	.1
32035.74	32035.95	0	9.	15	60.2002	17	-.2
32071.01	32071.04	0	22.	14	60.2028	17	-.0
32035.74	32035.84	0	85.	15	60.2148	17	-.1
32068.94	32069.30	7	2.	18	60.2210	17	-.4
32068.94	32069.30	9	57.	18	60.2352	17	-.4
32068.94	32068.66	9	15.	18	61.0142	17	.3
32072.84	32072.92	0	40.	12	61.0452	17	-.1
32072.84	32072.99	0	20.	12	61.0642	17	-.2
31990.21	31992.17	9	14.	13	61.0702	17	-2.0
32071.00	32071.16	0	18.	14	61.0814	17	-.2
32035.73	32035.86	6	47.	15	61.0912	17	-.1
32070.99	32071.08	0	48.	14	61.1002	17	-.1
32035.73	32036.16	6	18.	15	61.1100	17	-.4
32068.94	32069.04	0	25.	18	61.1120	17	-.1
32068.94	32068.82	6	33.	18	61.1302	17	.1
32072.83	32072.89	0	17.	12	61.1612	17	-.1
31990.23	31990.39	0	27.	13	61.1636	17	-.2
32070.98	32070.86	7	13.	14	64.2224	17	.1
32068.98	32069.24	0	62.	18	65.0010	17	-.3
31990.49	31990.65	0	14.	13	65.0346	17	-.2
32072.88	32073.36	7	61.	12	65.0446	17	-.5
31990.49	31990.69	6	56.	13	65.0538	17	-.2
32072.89	32074.15	9	12.	12	65.0634	17	-1.3
32035.89	32035.99	5	11.	15	65.0752	17	-.1
32071.02	32071.08	0	37.	14	65.0820	17	-.1
32035.90	32035.96	5	66.	15	65.0932	17	-.1
32071.03	32070.86	7	21.	14	65.1012	17	.2
32069.00	32069.14	0	69.	18	65.1132	17	-.1
32069.00	32068.74	7	11.	18	65.1322	17	.3
31990.50	31990.46	0	4.	13	65.1512	17	.0
32072.92	32072.88	6	26.	12	65.1606	17	.0
31990.50	31990.44	0	77.	13	65.1654	17	.1
32072.93	32073.36	6	29.	12	65.1758	17	-.4
31990.50	31990.53	0	9.	13	65.1844	17	-.0
32071.07	32071.22	0	17.	14	65.1946	17	-.1
32071.08	32071.10	0	45.	14	65.2130	17	-.0
32069.02	32069.20	0	54.	18	65.2320	17	-.2
32069.03	32069.04	0	15.	18	66.0110	17	-.0
32072.97	32073.12	0	18.	12	66.0350	17	-.2
31990.50	31990.64	0	61.	13	66.0440	17	-.1
32072.97	32073.07	0	41.	12	66.0536	17	-.1
31990.50	31990.71	5	13.	13	66.0630	17	-.2
32071.13	32071.48	6	12.	14	66.0730	17	-.4
32036.06	32036.29	0	51.	15	66.0844	17	-.2
32071.14	32071.46	5	62.	14	66.0914	17	-.3
32036.07	32036.06	0	16.	15	66.1032	17	.0
32069.05	32068.92	0	24.	18	66.1050	17	.1
32069.06	32069.05	0	31.	18	66.1232	17	.0
32073.01	32075.28	9	6.	12	66.1518	17	-2.3
31990.50	31990.65	0	28.	13	66.1608	17	-.2
32073.02	32072.95	0	87.	12	66.1700	17	.1
31990.50	31990.53	0	27.	13	66.1754	17	-.0
32073.02	32073.08	0	7.	12	66.1846	17	-.1
32036.13	32036.18	0	37.	15	66.2030	17	-.1
32036.14	32036.28	0	21.	15	66.2218	17	-.1
32069.09	32070.69	9	42.	18	67.0022	17	-1.6
31990.50	31990.42	0	21.	13	67.0354	17	.1
32073.06	32073.01	0	67.	12	67.0440	17	.0
31990.50	31990.54	0	36.	13	67.0540	17	-.0
32073.06	32073.14	0	11.	12	67.0628	17	-.1
32036.19	32036.28	0	18.	15	67.0758	17	-.1
32071.25	32071.29	0	51.	14	67.0824	17	-.0
32036.19	32036.32	0	43.	15	67.0942	17	-.1
32071.26	32071.40	0	15.	14	67.1010	17	-.1
32069.14	32069.15	0	83.	18	67.1142	17	-.0
32069.14	32068.57	9	6.	18	67.1330	17	.6
31990.50	31990.45	0	9.	13	67.1520	17	.1
32073.09	32072.99	0	28.	12	67.1604	17	.1
31990.50	31990.36	5	75.	13	67.1704	17	.1
32073.10	32073.05	0	26.	12	67.1750	17	.0
32071.30	32071.38	0	23.	14	67.1948	17	.0
32036.23	32036.10	0	59.	15	67.2128	17	.1
32069.19	32069.34	0	76.	18	67.2328	17	-.2
32073.12	32073.09	0	20.	12	68.0346	17	.0
31990.51	31990.62	0	82.	13	68.0450	17	-.1
32073.13	32073.31	0	37.	12	68.0538	17	-.2
31990.51	31990.37	0	7.	13	68.0640	17	.1
32071.34	32071.46	7	17.	14	68.0736	17	-.1
32036.24	32035.80	7	74.	15	68.0854	17	.4
32071.35	32071.17	5	47.	14	68.0920	17	.2
32069.24	32069.24	0	36.	18	68.1054	17	.0
32069.25	32069.25	0	22.	18	68.1240	17	-.0
32073.16	32073.89	9	8.	12	68.1512	17	-.7
31990.52	31990.53	0	42.	13	68.1616	17	-.0
32073.15	32073.28	0	83.	12	68.1656	17	-.1
31990.52	31990.58	0	19.	13	68.1804	17	-.1
32073.15	32072.91	6	6.	12	68.1844	17	.2
32071.38	32071.23	0	6.	14	68.1900	17	.1
32036.22	32036.29	0	58.	15	68.2040	17	-.1
32036.22	32035.95	9	14.	15	68.2228	17	1.0
32069.30	32069.38	0	27.	18	68.2242	17	-.1
32069.30	32069.17	0	28.	18	69.0026	17	.1
31990.52	31990.58	0	31.	13	69.0402	17	-.1
32073.15	32073.30	0	72.	12	69.0438	17	-.2
31990.52	31990.40	0	24.	13	69.0550	17	.1
32073.15	32073.04	0	10.	12	69.0626	17	.1
32036.18	32036.09	0	27.	15	69.0806	17	.1
32071.40	32071.57	5	67.	14	69.0830	17	-.2
32036.18	32036.12	0	29.	15	69.0952	17	.1
32071.40	32071.23	5	11.	14	69.1018	17	.2
32069.34	32069.35	0	62.	18	69.1152	17	-.0
31990.50	31990.59	0	15.	13	69.1528	17	-.1
32073.14	32072.99	5	31.	12	69.1600	17	.1
31990.50	31990.43	0	53.	13	69.1714	17	.1
32073.13	32073.06	0	24.	12	69.1746	17	.1
32071.41	32071.32	0	30.	14	69.1952	17	.1
32036.11	32035.50	9	18.	15	69.2138	17	.6
32069.35	32069.39	0	78.	18	69.2336	17	-.0
31990.45	31990.54	0	11.	13	70.0316	17	-.1
32073.10	32073.09	0	22.	12	70.0344	17	.0
31990.44	31990.49	0	68.	13	70.0500	17	-.1
32073.10	32073.21	0	34.	12	70.0530	17	-.1
32036.04	32036.27	0	9.	15	70.0718	17	-.2
32071.40	32071.52	0	22.	14	70.0738	17	-.1
32036.02	32035.88	7	77.	15	70.0904	17	.1
32071.40	32071.50	0	34.	14	70.0924	17	-.1
32069.33	32069.26	0	54.	18	70.1102	17	.1
32069.33	32069.52	5	15.	18	70.1250	17	-.2
32073.05	32073.07	0	9.	12	70.1508	17	-.0
31990.33	31990.55	0	63.	13	70.1624	17	-.2
31990.31	31991.22	9	12.	13	70.1816	17	-.9
32071.38	32071.36	0	9.	14	70.1902	17	.0
32071.38	32071.44	0	73.	14	70.2048	17	-.1
32069.27	32069.41	0	39.	18	70.2248	17	-.1
32069.25	32069.42	0	20.	18	71.0036	17	-.2
32072.97	32073.14	0	5.	12	71.0250	17	-.2
31990.17	31991.14	9	49.	13	71.0418	17	-1.0
31990.14	31993.06	9	16.	13	71.0600	17	-2.9
32071.35	32071.91	8	6.	14	71.0652	17	-.6
32035.78	32036.19	6	40.	15	71.0816	17	-.4
32071.34	32071.50	0	83.	14	71.0834	17	-.2
32069.15	32069.03	6	19.	18	71.1012	17	.1
32073.15							
31990.52							

Table 16

32069.40	32069.48	0	77.	18	74.2304	17	-.1
32069.43	32069.58	0	5.	18	75.0056	17	-.1
31990.68	31990.75	0	12.	13	75.0250	17	-.2
32072.91	32073.12	0	70.	12	75.0428	17	-.2
32071.33	32071.44	0	18.	14	75.0656	17	-.1
32036.14	32036.20	0	74.	15	75.0836	17	-.0
32069.56	32069.54	0	54.	18	75.1030	17	.0
32069.57	32069.80	6	15.	18	75.1220	17	-.2
32073.06	32072.96	5	58.	12	75.1548	17	.1
32073.08	32073.04	0	14.	12	75.1736	17	.0
32071.49	32072.19	9	6.	14	75.1820	17	-.7
32036.29	32036.64	9	7.	15	75.1840	17	-.4
32071.50	32071.49	0	87.	14	75.2004	17	.0
32071.51	32071.78	6	7.	14	75.2152	17	-.3
32069.58	32069.40	0	40.	18	75.2218	17	.2
32069.58	32069.89	8	20.	18	76.0004	17	-.3
31990.71	31990.69	0	52.	13	76.0340	17	.0
32073.13	32072.82	6	19.	12	76.0518	17	.3
32036.22	32036.37	0	43.	15	76.0746	17	-.1
32036.20	32036.79	9	18.	15	76.0936	17	-.6
32069.51	32069.66	0	42.	18	76.1128	17	-.2
31990.64	31990.67	0	24.	13	76.1508	17	-.0
32073.13	32073.23	0	45.	12	76.1642	17	-.1
32071.42	32071.37	5	31.	14	76.1912	17	.0
32036.02	32036.22	0	33.	15	76.1936	17	-.2
32071.40	32071.68	0	25.	14	76.2100	17	-.3
32069.42	32069.53	0	14.	18	76.2130	17	-.1
32069.41	32069.55	0	55.	18	76.2316	17	-.1
32073.09	32073.32	0	12.	12	77.0242	17	-.2
31990.56	31990.75	0	19.	13	77.0254	17	-.2
32073.09	32073.21	0	64.	12	77.0428	17	-.1
31990.54	31990.67	0	43.	13	77.0440	17	-.1
32035.80	32036.05	6	40.	15	79.2042	17	-.7
32069.55	32069.68	0	83.	18	79.2232	17	-.1
32069.56	32070.12	9	7.	18	80.0024	17	-.6
31990.56	31991.07	9	10.	13	80.0214	17	-.5
32073.08	32073.18	0	52.	12	80.0324	17	-.1
31990.56	31990.58	0	73.	13	80.0358	17	-.0
32073.08	32072.81	8	14.	12	80.0512	17	.3
32071.58	32071.74	0	11.	14	80.0610	17	-.2
32071.59	32071.70	0	69.	14	80.0754	17	-.1
32069.61	32069.57	0	44.	18	80.1000	17	.0
32069.62	32069.75	0	17.	18	80.1148	17	-.1
32073.13	32072.96	6	23.	12	80.1448	17	.2
31990.59	31990.78	0	60.	13	80.1526	17	-.2
32073.13	32073.15	0	32.	12	80.1636	17	-.0
31990.59	31990.50	0	13.	13	80.1714	17	.1
32035.80	32035.42	9	5.	15	80.1810	17	.2
32071.63	32071.65	0	63.	14	80.1920	17	-.0
32035.80	32035.01	7	79.	15	80.1952	17	.7
32071.64	32071.66	0	12.	14	80.2110	17	-.0
32069.66	32069.82	0	32.	18	80.2146	17	-.2
32069.67	32069.72	0	24.	18	80.2330	17	-.1
32073.18	32073.54	6	16.	12	81.0232	17	-.4
31990.60	31990.72	0	43.	13	81.0310	17	-.1
32073.19	32073.49	5	49.	12	81.0416	17	-.3
31990.60	31990.85	0	18.	13	81.0458	17	-.2
32071.66	32071.66	0	44.	14	81.0704	17	.0
32035.89	32036.19	0	39.	15	81.0724	17	-.3
32071.67	32071.82	0	17.	14	81.0852	17	-.2
32069.70	32069.68	0	51.	18	81.1056	17	.0
32073.24	32073.22	0	5.	12	81.1356	17	.0
31990.61	31990.50	0	21.	13	81.1438	17	.1
32073.25	32073.39	0	81.	12	81.1538	17	-.1
31990.62	31990.65	0	36.	13	81.1624	17	-.0
32073.26	32073.44	0	8.	12	81.1726	17	-.2
32071.69	32071.83	0	20.	14	81.1830	17	-.1
32036.12	32036.20	0	28.	15	81.1906	17	-.1
32071.69	32071.66	0	36.	14	81.2016	17	.0
32036.15	32036.20	0	26.	15	81.2052	17	-.1
32069.72	32069.74	0	68.	18	81.2242	17	-.0
31990.63	31990.92	5	15.	13	82.0224	17	-.3
32073.31	32073.39	0	58.	12	82.0320	17	-.1
31990.63	31990.71	0	51.	13	82.0408	17	-.1
32073.31	32073.57	6	13.	12	82.0510	17	-.3
32071.71	32071.64	0	15.	14	82.0614	17	.1
32036.31	32039.10	9	14.	15	82.0638	17	-2.8
32071.71	32071.77	0	53.	14	82.0758	17	-.1
32036.33	32036.55	0	56.	15	82.0820	17	-.2
32069.73	32069.82	0	65.	18	82.1008	17	-.1
32069.73	32069.77	0	12.	18	82.1154	17	-.0
32073.35	32073.24	0	25.	12	82.1444	17	.1
31990.65	31990.66	0	82.	13	82.1534	17	-.0
32073.35	32073.22	0	29.	12	82.1632	17	.1
31990.65	31990.50	5	7.	13	82.1722	17	.1
32036.44	32036.33	0	10.	15	82.1822	17	.1
32071.75	32071.60	0	80.	14	82.1922	17	.1
32036.45	32036.59	0	73.	15	82.2004	17	-.1
32071.75	32071.88	0	9.	14	82.2112	17	-.1
32069.75	32069.81	0	48.	18	82.2154	17	-.1
32069.75	32069.04	9	16.	18	82.2340	17	.7
32073.38	32073.31	0	10.	12	83.0228	17	.1
31990.67	31990.54	0	39.	13	83.0320	17	.1
32073.38	32073.59	7	72.	12	83.0412	17	-.2
31990.68	31990.89	0	20.	13	83.0510	17	-.2
32071.79	32071.85	0	35.	14	83.0708	17	-.1
32036.50	32036.43	0	33.	15	83.0730	17	.1
32071.79	32071.79	0	22.	14	83.0856	17	.0
32036.50	32036.50	0	24.	15	83.0918	17	.0
32069.76	32069.74	0	38.	18	83.1104	17	.0
31990.70	31990.66	0	18.	13	83.1444	17	.0
32073.38	32073.37	0	53.	12	83.1532	17	.0
31990.70	31990.61	0	44.	13	83.1632	17	.1
32073.37	32073.48	0	15.	12	83.1720	17	-.1
32071.81	32071.93	0	16.	14	83.1832	17	-.1
32036.48	32036.37	0	27.	15	83.1920	17	.1
32071.82	32071.69	0	52.	14	83.2016	17	.1
32036.47	32036.36	0	30.	15	83.2104	17	.1
32069.75	32069.74	0	51.	18	83.2252	17	.0
31990.72	31990.58	0	15.	13	84.0234	17	.1
32073.33	32073.24	0	37.	12	84.0318	17	.1
31990.73	31990.87	0	57.	13	84.0420	17	-.1
32073.32	32072.95	8	21.	12	84.0506	17	.4
32071.81	32071.91	0	12.	14	84.0620	17	-.1
32036.40	32035.41	9	12.	15	84.0644	17	1.0
32071.80	32071.59	5	67.	14	84.0804	17	.2
32036.39	32036.46	0	65.	15	84.0826	17	-.1
32069.70	32069.66	0	80.	18	84.1014	17	.0
32069.69	32069.74	0	8.	18	84.1202	17	-.1
32073.24	32073.66	6	14.	12	84.1438	17	-.4
31990.74	31990.86	0	73.	13	84.1542	17	-.1
32073.23	32073.29	0	50.	12	84.1624	17	-.1
31990.74	31990.77	0	10.	13	84.1732	17	-.0
32036.28	32036.23	0	9.	15	84.1832	17	.1
32071.72	32071.68	0	63.	14	84.1926	17	.0
32036.26	32036.60	0	80.	15	84.2016	17	-.3
32071.71	32071.99	0	13.	14	84.2114	17	-.3
32069.59	32068.48	9	66.	18	84.2204	17	1.1
32069.57	32069.78	0	12.	18	84.2352	17	-.2
32073.09	32073.24	0	12.	12	85.0226	17	-.2
31990.73	31990.88	0	60.	13	85.0332	17	-.2
32073.06	32073.11	6	67.	12	85.0410	17	-.1
31990.72	31990.80	0	14.	13	85.0520	17	-.1

COMPARATIVE SPEEDS FOR NAVIGATIONAL SYSTEMS.

171	1	7.530	7.650	0.000	0.000	1.016	0.000	0.000
171	2	7.220	7.410	0.000	0.000	1.026	0.000	0.000
171	3	7.760	7.710	0.000	0.000	.994	0.000	0.000
171	4	7.400	7.770	0.000	0.000	1.050	0.000	0.000
171	5	7.650	7.650	0.000	0.000	1.000	0.000	0.000
171	6	7.810	7.880	4.940	0.000	1.009	.633	0.000
171	7	7.630	7.860	0.000	0.000	1.030	0.000	0.000
171	8	8.390	7.710	0.000	0.000	.919	0.000	0.000
171	9	6.570	6.990	0.000	0.000	1.064	0.000	0.000
171	10	7.710	7.720	7.940	0.000	1.001	1.035	0.000
171	11	8.330	8.450	9.110	0.000	1.016	1.094	0.000
171	12	8.450	8.760	0.000	0.000	1.037	0.000	0.000
171	13	8.850	9.030	10.940	0.000	1.020	1.236	0.000
171	14	8.620	9.220	0.000	0.000	1.070	0.000	0.000
171	15	8.840	9.110	0.000	0.000	1.031	0.000	0.000
171	16	8.370	8.830	0.000	0.000	.994	0.000	0.000
171	17	8.600	8.820	0.000	0.000	1.025	0.000	0.000
171	18	8.460	8.750	0.000	0.000	1.034	0.000	0.000
171	19	8.240	8.410	0.000	0.000	1.021	0.000	0.000
171	20	8.240	8.830	0.000	0.000	1.072	0.000	0.000
171	21	8.670	8.970	0.000	0.000	1.035	0.000	0.000
171	22	9.750	9.520	0.000	0.000	1.007	0.000	0.000
171	23	9.470	9.610	0.000	0.000	1.015	0.000	0.000
171	24	8.600	9.000	9.530	0.000	1.047	1.120	0.000
171	25	9.350	9.450	0.000	0.000	1.011	0.000	0.000
171	26	8.670	8.990	0.000	0.000	1.037	0.000	0.000
171	27	8.570	9.050	0.000	0.000	1.066	0.000	0.000
171	28	8.700	9.160	0.000	0.000	1.053	0.000	0.000
171	29	9.510	9.220	0.000	0.000	.970	0.000	0.000
171	30	9.500	9.340	0.000	0.000	.983	0.000	0.000
171	31	9.410	9.220	0.000	0.000	.980	0.000	0.000
171	32	9.340	7.970	0.000	0.000	.853	0.000	0.000
171	33	7.520	7.800	0.000	0.000	1.037	0.000	0.000
171	34	9.700	9.790	0.000	0.000	1.009	0.000	0.000
171	35	8.150	8.240	9.090	8.900	1.011	1.115	1.092
171	36	6.650	7.320	7.780	7.730	1.101	1.170	1.162
171	37	7.240	7.730	8.700	8.710	1.068	1.202	1.203
171	38	7.110	7.990	8.940	0.000	1.124	1.257	0.000
171	39	6.790	8.020	0.000	0.000	1.181	0.000	0.000
171	40	8.340	8.760	11.180	11.080	1.050	1.341	1.329
171	41	8.350	8.640	11.530	11.490	1.035	1.381	1.376
171	42	8.480	8.610	11.330	11.210	1.015	1.336	1.322
171	43	6.520	7.660	0.000	0.000	1.164	0.000	0.000
171	44	8.000	9.200	0.000	0.000	1.150	0.000	0.000
171	45	9.050	9.560	9.980	9.650	1.056	1.092	1.066
171	46	8.530	9.340	0.000	0.000	1.095	0.000	0.000
171	47	9.760	9.490	0.000	0.000	.972	0.000	0.000
171	48	9.930	9.700	0.000	0.000	.977	0.000	0.000
171	49	6.900	6.590	6.530	6.860	.999	.946	.849
171	50	9.130	9.110	3.010	3.770	.998	.997	.961
171	51	8.270	8.790	10.540	10.010	1.062	1.281	1.210
171	52	7.590	8.490	0.000	0.000	1.119	0.000	0.000
171	53	7.850	9.660	9.530	9.630	1.103	1.251	1.227
171	54	6.420	6.850	0.000	0.000	1.083	0.000	0.000
171	55	7.980	8.870	0.000	0.000	1.112	0.000	0.000
171	56	6.520	6.960	0.000	0.000	1.067	0.000	0.000
171	57	9.660	9.670	0.000	0.000	1.001	0.000	0.000
171	58	9.760	9.840	0.000	0.000	1.008	0.000	0.000
171	59	7.190	7.390	0.000	0.000	1.029	0.000	0.000

171	60	9.010	9.140	0.000	0.000	1.014	0.000	0.000
171	61	7.440	7.650	0.000	0.000	1.028	0.000	0.000
171	62	6.750	7.350	0.000	0.000	1.089	0.000	0.000
171	63	5.440	7.080	0.000	0.000	1.301	0.000	0.000
171	64	6.330	7.250	0.000	0.000	1.145	0.000	0.000
171	65	6.280	6.960	0.000	0.000	1.108	0.000	0.000
171	66	6.500	7.280	0.000	0.000	1.120	0.000	0.000
171	67	7.150	7.620	0.000	0.000	1.066	0.000	0.000
171	68	7.450	7.520	0.000	0.000	1.017	0.000	0.000
171	69	6.870	6.090	0.000	0.000	.886	0.000	0.000
171	70	7.760	7.660	0.000	0.000	.987	0.000	0.000
171	71	7.870	9.260	0.000	0.000	1.177	0.000	0.000
171	72	10.510	9.190	0.000	0.000	.874	0.000	0.000
171	73	8.300	8.820	0.000	0.000	1.063	0.000	0.000
171	74	9.010	8.570	0.000	0.000	.951	0.000	0.000
171	75	8.520	8.620	0.000	0.000	1.012	0.000	0.000
171	76	8.550	8.860	0.000	0.000	1.036	0.000	0.000
171	77	8.230	8.730	0.000	0.000	1.061	0.000	0.000
171	78	8.710	8.700	0.000	0.000	.999	0.000	0.000
171	79	5.850	6.050	0.000	0.000	1.034	0.000	0.000
171	80	9.020	9.090	0.000	0.000	1.008	0.000	0.000
171	81	9.270	9.390	0.000	0.000	1.012	0.000	0.000
171	82	7.640	7.880	0.000	0.000	1.031	0.000	0.000
171	83	8.050	8.290	0.000	0.000	1.030	0.000	0.000
171	84	8.570	8.410	8.140	8.180	.951	.950	.954
171	85	6.530	7.020	7.220	7.240	1.075	1.106	1.109
171	86	6.580	6.400	6.530	6.540	.973	1.000	1.009
171	87	8.040	8.430	8.330	8.030	1.049	1.036	.999
171	88	8.140	8.250	8.000	7.900	1.014	.983	.971
171	89	7.310	7.910	7.610	7.310	1.082	1.041	1.000
171	90	8.040	8.830	8.530	8.490	1.098	1.068	1.056
171	91	7.860	8.510	8.640	8.370	1.121	1.099	1.065
171	92	7.890	8.900	8.770	8.480	1.128	1.112	.821
171	93	9.480	8.880	8.790	8.440	.937	.927	.890
171	94	9.580	8.850	0.000	0.000	.924	0.000	0.000
171	95	7.110	6.260	0.000	0.000	.880	0.000	0.000
171	96	8.150	7.860	7.790	7.590	.964	.955	.931
171	97	6.380	6.500	6.250	6.260	1.019	.980	.981
171	98	8.860	8.700	8.510	8.400	.982	.960	.948
171	99	9.190	8.550	8.540	8.420	.930	.929	.916
171	100	9.110	8.490	8.330	8.170	.931	.914	.897
171	101	9.090	8.310	8.130	7.910	.914	.894	.870
171	102	7.660	8.420	8.240	8.110	1.099	1.076	1.059
171	103	8.180	8.310	8.210	8.090	1.016	1.004	.989
171	104	7.360	7.590	7.770	7.540	1.031	1.056	1.024
171	105	8.510	8.920	9.380	9.030	1.048	1.102	1.061
171	106	8.870	9.080	9.250	9.090	1.024	1.043	1.025
171	107	4.650	4.600	4.740	4.620	.989	1.019	.994
171	108	8.030	8.110	8.320	8.060	1.010	1.036	1.004
171	109	9.210	9.330	9.520	9.040	1.012	1.034	.987
171	110	7.720	7.990	8.190	6.790	1.035	1.060	.880
171	111	8.760	9.300	9.440	8.930	1.062	1.078	1.019
171	112	9.690	9.390	0.000	0.000	.969	0.000	0.000
171	113	9.460	9.380	0.000	0.000	.992	0.000	0.000
171	114	8.850	9.400	9.390	8.750	1.062	1.061	.989
171	115	9.150	9.390	9.340	8.910	1.026	1.021	.974
171	116	8.700	9.390	9.320	0.000	1.079	1.071	0.000
171	117	8.830	9.420	9.360	8.760	1.067	1.060	.992
171	118	9.360	9.510	9.350	8.970	1.016	1.002	.958
171	119	8.690	9.420	9.360	8.960	1.084	1.077	1.031
171	120	8.880	9.390	9.400	8.970	1.057	1.059	1.010
171	121	9.310	9.380	9.300	8.930	1.008	.999	.959
171	122	7.580	7.250	7.040	0.000	.956	.929	0.000
171	123	9.610	9.100	9.110	7.570	.947	.948	.788
171	124	7.610	7.450	7.550	7.310	.979	.992	.961
171	125	8.670	9.200	9.150	8.950	1.061	1.055	1.032

171	126	9.130	9.250	9.150	9.000	1.013	1.002	.986
171	127	8.870	9.250	9.230	8.910	1.043	1.041	1.005
171	128	9.660	9.240	9.320	8.930	.957	.965	.924
171	129	9.680	9.400	9.440	9.090	.971	.975	.939
171	130	10.300	9.390	9.440	8.940	.912	.917	.868
171	131	9.390	9.420	9.470	9.090	1.003	1.009	.968
171	132	9.070	9.350	9.430	9.010	1.031	1.040	.993
171	133	9.310	9.190	9.330	0.000	.987	1.002	0.000
171	134	8.370	9.170	9.430	8.850	1.095	1.127	1.057
171	135	9.470	9.000	0.000	0.000	.950	0.000	0.000
171	136	8.760	9.140	0.000	0.000	1.048	0.000	0.000
171	137	7.720	7.930	0.000	0.000	1.014	0.000	0.000
171	138	8.010	8.240	0.000	0.000	1.029	0.000	0.000
171	139	8.920	9.440	9.170	8.910	1.058	1.028	.999
171	140	8.620	9.150	9.140	8.950	1.061	1.060	1.038
171	141	8.300	9.210	0.000	0.000	1.110	0.000	0.000
171	142	8.320	9.240	9.070	8.780	1.113	1.090	1.055
171	143	7.770	9.140	8.920	8.770	1.183	1.156	1.129
171	144	6.950	9.170	8.970	8.760	1.319	1.291	1.260
171	145	7.230	9.190	8.960	8.610	1.271	1.239	1.191
171	146	7.770	9.170	8.970	8.700	1.180	1.154	1.120
171	147	7.820	9.190	8.940	8.670	1.174	1.143	1.134
171	148	7.660	9.110	8.970	8.630	1.189	1.154	1.133
171	149	7.830	9.100	8.430	8.660	1.162	1.128	.851
171	150	7.870	8.870	8.590	8.540	1.127	1.091	1.085
171	151	6.860	6.990	8.760	8.640	1.014	.985	.968
171	152	8.090	8.870	8.530	8.470	1.096	1.054	1.047
171	153	9.130	9.140	8.700	8.500	1.061	.953	.931
171	154	6.870	6.530	8.840	8.000	.951	.885	.728
171	155	9.110	8.980	8.680	8.300	.986	.953	.911
171	156	9.160	9.090	8.660	8.480	.991	.945	.926
171	157	6.600	6.370	6.930	6.260	.965	.908	.948
171	158	8.580	8.250	0.000	0.000	.962	0.000	0.000
171	159	8.440	8.160	0.000	0.000	.967	0.000	0.000
171	160	7.940	8.140	7.530	8.000	1.025	.948	1.008
171	161	6.720	8.240	7.580	8.070	1.226	1.129	1.201
171	162	7.540	8.340	7.730	8.080	1.106	1.025	1.072
171	163	7.430	8.340	0.000	0.000	1.122	0.000	0.000
171	164	7.290	8.080	7.540	7.950	1.108	1.034	1.091
171	165	7.700	8.380	7.430	0.000	1.088	1.017	0.000
171	166	8.000	8.510	8.040	0.000	1.064	1.005	0.000
171	167	8.170	8.430	8.170	0.000	1.056	1.000	0.000
171	168	7.850	8.710	8.230	8.370	1.110	1.048	1.066
171	169	7.920	8.510	8.280	8.220	1.074	1.043	1.038
171	170	4.470	4.590	4.390	4.410	1.027	.982	.987
171	171	6.950	7.100	0.000	0.000	1.022	0.000	0.000
171	172	9.020	8.920	0.000	0.000	.989	0.000	0.000
171	173	7.190	7.490	7.440	0.000	1.042	1.035	0.000
171	174	8.780	8.950	8.630	7.420	1.019	.983	.845
171	175	8.370	8.900	8.510	8.430	1.063	1.017	1.007
171	176	7.930	8.930	8.550	9.480	1.126	1.078	1.069
171	177	8.950	8.590	8.230	8.130	.960	.920	.908
171	178	6.570	7.550	7.150	7.300	1.149	1.093	1.111
171	179	7.980	8.700	8.370	8.310	1.090	1.049	1.041
171	180	8.190	8.820	8.570	8.420	1.077	1.046	1.028
171	181	7.460	9.180	8.630	8.570	1.231	1.157	1.149
171	182	9.610	9.080	8.620	8.560	.946	.897	.891
171	183	8.230	9.120	8.660	6.150	1.108	1.052	.747
171	184	8.990	9.100	8.640	8.510	1.012	.961	.947
171	185	9.060	9.030	8.550	8.450	.997	.944	.933
171	186	8.570	9.030	0.000	0.000	1.054	0.000	0.000
171	187	8.630	9.010	0.000	0.000	1.044	0.000	0.000
171	188	8.270	9.020	0.000	0.000	1.091	0.000	0.000
171	189	8.790	9.120	8.670	8.560	1.038	.986	.974
171	190	7.780	9.110	8.730	8.620	1.171	1.122	1.108
171	191	8.100	9.080	8.720	8.780	1.121	1.077	1.084

171	192	8.210	9.090	8.760	6.000	1.107	1.067	.731
171	193	8.760	9.110	8.730	5.940	1.040	.997	.678
171	194	8.130	8.240	7.780	8.110	1.014	.957	.998
171	195	6.410	6.460	6.230	6.340	1.008	.972	.989
171	196	8.130	7.860	7.510	7.350	.967	.924	.904
171	197	7.660	7.840	7.470	7.750	1.023	.975	1.012
171	198	7.620	7.940	7.650	7.590	1.042	1.004	.996
171	199	6.780	7.760	7.370	7.530	1.145	1.087	1.111
171	200	7.090	7.650	7.260	7.440	1.079	1.024	1.049
171	201	7.240	7.620	0.000	0.000	1.052	0.000	0.000
171	202	7.180	6.920	0.000	0.000	.964	0.000	0.000
171	203	8.140	8.190	0.000	0.000	1.006	0.000	0.000
171	204	8.140	8.230	0.000	0.000	1.011	0.000	0.000
171	205	8.320	8.430	8.070	7.330	1.013	.970	.881
171	206	7.180	7.540	7.250	7.150	1.050	1.010	.996
171	207	8.190	8.350	8.120	8.250	1.020	.991	1.007
171	208	8.080	8.370	8.100	8.060	1.036	1.002	.998
171	209	7.780	8.320	8.130	6.400	1.069	1.045	.823
171	210	8.360	8.560	8.300	8.240	1.024	.993	.986
171	211	8.270	8.660	8.510	8.440	1.047	1.029	1.021
171	212	8.380	8.630	8.480	8.380	1.030	1.012	1.000
171	213	9.220	8.700	0.000	0.000	.944	0.000	0.000
171	214	10.900	8.900	8.630	8.370	.817	.792	.768
171	215	10.310	8.990	8.710	8.540	.871	.845	.828
171	216	10.790	9.000	8.700	8.400	.834	.806	.778
171	217	9.770	8.880	8.600	8.460	.909	.880	.866
171	218	9.560	8.750	8.450	7.270	.915	.884	.760
171	219	9.290	8.570	8.300	8.290	.922	.883	.892
171	220	9.150	8.650	8.240	8.320	.945	.901	.909

NAVIGATION SYSTEMS - STATISTICS Cruise : 1

SYSTEMS	PARAMETERS						
	Mean	S D	S·E of Mean	Sample	Maximum	Minimum	Range
SAT	8.2141	1.0320	.0696	220	10.9	4.47	6.43
S D	8.4723	.8949	.0603	220	9.84	4.59	5.25
C L	8.4495	1.1083	.0965	132	11.53	4.39	7.14
P L	8.1491	1.1189	.1026	119	11.49	4.41	7.08
$\frac{SD}{SAT}$	1.0363	.0754	.0051	220	1.319	.817	.502
$\frac{CL}{SAT}$	1.0319	.1082	.0094	132	1.381	.633	.748
$\frac{PL}{SAT}$	.9952	.1229	.0113	119	1.376	.678	.698

Table 18

COMPARATIVE SPEEDS FOR NAVIGATIONAL SYSTEMS.

172	1	8.950	9.060	8.550	8.680	1.012	.955	.970
172	2	9.100	9.090	8.620	9.110	.999	.947	1.001
172	3	8.790	9.090	8.650	8.770	1.034	.984	.998
172	4	9.240	9.180	8.810	8.650	.931	.873	.877
172	5	8.520	9.180	8.520	8.700	1.077	1.000	1.021
172	6	6.810	8.850	8.350	8.800	1.300	1.226	1.292
172	7	8.550	8.920	8.220	8.760	1.050	.961	1.025
172	8	7.420	9.070	8.290	8.800	1.222	1.117	1.186
172	9	8.310	8.790	8.320	8.670	1.058	1.001	1.043
172	10	8.610	8.880	8.080	8.610	1.031	.938	1.000
172	11	8.010	8.130	7.950	7.680	1.015	.993	.959
172	12	8.910	8.830	8.500	6.710	.991	.954	.753
172	13	9.070	8.960	8.430	8.260	.977	.929	.911
172	14	9.060	9.090	8.730	8.520	1.002	.964	.940
172	15	8.420	9.130	8.810	8.570	1.084	1.046	1.018
172	16	8.560	9.150	8.850	8.540	1.069	1.034	.998
172	17	8.720	9.240	8.920	8.630	1.060	1.023	.990
172	18	9.090	9.290	8.920	8.650	1.022	.981	.952
172	19	9.290	9.350	8.950	8.700	1.006	.963	.936
172	20	9.040	9.290	8.940	8.610	1.028	.989	.952
172	21	6.490	6.590	6.190	5.670	1.015	.954	.874
172	22	9.330	9.220	8.940	9.000	.988	.962	.965
172	23	7.790	7.110	6.770	6.780	.913	.869	.870
172	24	7.380	7.420	7.060	7.050	1.005	.957	.955
172	25	8.750	9.010	6.590	8.730	1.030	.753	.998
172	26	9.220	9.050	0.000	0.000	.982	0.000	0.000
172	27	9.420	9.110	8.730	8.620	.967	.927	.915
172	28	9.400	9.040	8.650	8.560	.962	.920	.911
172	29	9.910	9.040	8.590	8.610	.922	.876	.878
172	30	8.980	8.820	8.370	8.520	.982	.932	.949
172	31	8.700	8.930	8.320	8.640	1.026	.956	.993
172	32	9.200	8.900	8.260	8.550	.967	.898	.929
172	33	8.250	8.830	8.100	8.430	1.070	.982	1.022
172	34	8.060	8.590	8.020	8.330	1.066	.995	1.033
172	35	8.470	8.900	8.380	8.500	1.051	.989	1.004
172	36	7.560	7.840	7.240	7.460	1.037	.958	.987
172	37	7.920	8.110	7.860	7.520	1.024	.992	.949
172	38	7.710	8.040	7.870	7.590	1.043	1.021	.984
172	39	6.260	6.280	5.860	6.000	1.003	.936	.958
172	40	7.490	8.140	7.910	7.580	1.088	1.057	1.013
172	41	8.830	9.350	9.150	8.730	1.053	1.030	.983
172	42	8.930	9.330	9.130	8.720	1.045	1.021	.976
172	43	9.000	9.380	9.200	8.760	1.042	1.022	.973
172	44	8.540	9.290	9.170	8.690	1.088	1.074	1.018
172	45	8.120	9.340	9.260	8.720	1.150	1.140	1.074
172	46	8.110	9.350	9.230	8.710	1.153	1.138	1.074
172	47	8.720	9.400	9.240	8.700	1.078	1.060	.998
172	48	7.720	8.180	8.040	7.630	1.060	1.041	.988
172	49	9.270	9.320	9.250	8.830	1.005	.998	.953
172	50	9.240	9.140	8.950	8.780	.989	.969	.950
172	51	7.740	9.210	8.950	8.700	1.190	1.156	1.124
172	52	8.260	9.080	8.780	8.620	1.099	1.063	1.044
172	53	9.230	9.090	8.760	8.660	1.104	1.064	1.052
172	54	7.810	9.060	8.700	8.620	1.160	1.114	1.104
172	55	7.750	8.590	8.190	8.220	1.108	1.057	1.061
172	56	8.170	8.960	8.460	8.590	1.097	1.035	1.051
172	57	8.170	8.930	8.430	8.550	1.093	1.032	1.047
172	58	8.000	8.640	8.150	8.340	1.080	1.019	1.042
172	59	7.760	8.390	7.800	8.080	1.081	1.005	1.041

172	60	7.910	8.150	7.530	7.950	1.030	.952	1.005
172	61	6.860	6.890	6.450	6.780	1.004	.940	.988
172	62	8.140	8.390	8.150	8.220	1.029	1.001	1.010
172	63	8.120	8.320	8.160	8.150	1.025	1.005	1.004
172	64	3.340	3.910	3.890	3.940	1.171	1.165	1.180
172	65	7.450	7.180	6.740	6.570	.964	.905	.882
172	66	9.230	9.200	8.810	0.000	.997	.954	0.000
172	67	9.490	9.080	8.560	7.720	.957	.902	.813
172	68	9.140	9.070	7.630	7.450	.992	.835	.815
172	69	8.130	9.040	8.610	8.570	1.112	1.059	1.054
172	70	8.600	9.110	8.690	8.470	1.059	1.010	.985
172	71	9.100	9.110	8.590	6.630	1.001	.944	.729
172	72	9.370	8.910	8.510	8.250	.951	.908	.880
172	73	9.320	9.030	8.510	8.440	.969	.913	.906
172	74	8.730	9.040	8.480	8.330	1.036	.971	.954
172	75	8.770	9.150	8.590	7.580	1.043	.979	.864
172	76	8.690	9.160	8.600	8.690	1.054	.990	1.000
172	77	9.150	9.270	8.830	8.520	1.013	.965	.931
172	78	9.420	9.210	8.840	8.520	.978	.938	.904
172	79	9.400	9.180	6.770	8.340	.977	.720	.887
172	80	9.040	9.070	8.660	8.390	1.003	.958	.928
172	81	8.210	9.100	8.700	8.470	1.108	1.060	1.032
172	82	9.100	9.140	8.700	8.420	1.004	.956	.925
172	83	8.340	8.650	8.300	8.050	1.037	.995	.965
172	84	8.850	8.990	8.510	8.250	1.016	.962	.932
172	85	8.460	8.940	8.390	8.600	1.057	.992	1.017
172	86	5.900	6.540	5.900	6.190	1.108	1.000	1.049
172	87	5.520	6.100	5.440	5.740	1.105	.986	1.040
172	88	7.740	7.250	6.590	7.180	.937	.851	.928
172	89	8.330	7.850	7.170	7.560	.942	.861	.908
172	90	8.210	7.920	7.280	7.610	.965	.887	.927
172	91	8.570	8.340	7.770	7.940	.973	.907	.926
172	92	8.190	8.500	7.940	8.050	1.038	.969	.983
172	93	9.030	8.720	8.120	8.090	.966	.899	.896
172	94	8.730	8.760	8.220	8.260	1.003	.942	.946
172	95	8.840	8.790	8.290	8.250	.994	.938	.933
172	96	9.350	8.810	8.270	6.960	.942	.884	.744
172	97	9.350	9.750	9.610	8.930	1.043	1.028	.955
172	98	8.040	9.670	9.440	8.900	1.203	1.174	1.107
172	99	8.050	9.520	9.300	8.750	1.183	1.155	1.087
172	100	7.870	9.570	9.270	8.720	1.216	1.178	1.108
172	101	8.380	9.290	9.160	8.730	1.109	1.093	1.042
172	102	8.360	9.600	0.000	0.000	1.148	0.000	0.000
172	103	8.220	9.800	0.000	0.000	1.192	0.000	0.000
172	104	7.730	8.060	7.880	5.220	1.043	1.019	.675
172	105	2.000	2.390	2.210	2.160	1.195	1.105	1.080
172	106	8.620	9.560	9.120	8.880	1.109	1.058	1.030
172	107	8.770	9.690	9.210	9.000	1.105	1.050	1.026
172	108	8.830	9.630	9.150	8.860	1.091	1.036	1.003
172	109	7.660	9.440	9.110	7.550	1.232	1.189	.986
172	110	8.670	9.070	9.210	8.940	1.046	1.062	1.031
172	111	9.240	9.410	9.290	8.090	1.018	1.005	.876
172	112	9.710	9.840	9.460	8.940	1.013	.974	.921
172	113	9.340	9.730	0.000	0.000	1.042	0.000	0.000
172	114	9.970	10.020	0.000	0.000	1.005	0.000	0.000
172	115	7.570	7.580	7.520	7.160	1.001	.993	.946
172	116	7.140	7.870	7.790	7.340	1.102	1.091	1.028
172	117	9.190	9.850	0.000	0.000	1.072	0.000	0.000
172	118	8.360	9.850	9.820	9.270	1.178	1.175	1.109
172	119	8.980	9.820	9.750	9.130	1.094	1.086	1.017
172	120	8.960	9.860	0.000	0.000	1.100	0.000	0.000
172	121	8.790	9.810	9.640	9.040	1.116	1.097	1.028
172	122	8.150	9.830	0.000	0.000	1.206	0.000	0.000
172	123	7.680	9.880	0.000	0.000	1.286	0.000	0.000
172	124	9.290	9.790	9.690	9.080	1.054	1.043	.977
172	125	10.050	9.790	9.680	9.070	.974	.963	.902

172	126	7.690	9.790	0.000	0.000	1.275	0.000	0.000
172	127	7.610	9.730	9.580	9.030	1.279	1.259	1.187
172	128	7.920	9.530	9.490	8.940	1.203	1.198	1.129
172	129	8.960	9.660	9.510	9.000	1.078	1.061	1.004
172	130	9.300	9.630	9.520	9.000	1.035	1.024	.968
172	131	9.500	9.620	9.510	8.870	1.013	1.001	.934
172	132	9.380	9.540	9.460	8.890	1.017	1.009	.948
172	133	9.280	9.460	9.420	8.850	1.019	1.015	.954
172	134	9.250	9.440	9.420	8.880	1.021	1.018	.960
172	135	8.990	9.310	9.170	8.630	1.036	1.020	.960
172	136	8.920	9.130	8.980	8.570	1.024	1.007	.961
172	137	8.920	9.080	8.910	8.460	1.011	.992	.942
172	138	5.980	6.040	5.540	5.630	1.010	.926	.941
172	139	6.590	7.050	6.620	7.100	1.070	1.005	1.077
172	140	6.370	7.110	6.700	7.560	1.116	1.052	1.187
172	141	7.730	6.590	7.180	7.640	.853	.929	.988
172	142	7.930	8.110	7.450	7.850	1.023	.939	.990
172	143	7.390	7.480	7.260	5.730	1.012	.982	.775
172	144	7.820	7.860	8.040	7.770	1.005	1.028	.994
172	145	5.940	5.990	6.180	5.820	1.008	1.040	.980
172	146	7.510	7.960	8.180	7.790	1.060	1.089	1.037
172	147	8.800	9.090	9.250	8.820	1.033	1.051	1.002
172	148	9.080	9.360	9.200	8.770	1.031	1.013	.966
172	149	9.390	9.650	0.000	0.000	1.028	0.000	0.000
172	150	8.790	9.540	9.150	8.830	1.085	1.041	1.005
172	151	10.070	9.330	8.890	8.640	.927	.883	.858
172	152	9.110	9.170	8.590	8.470	1.007	.943	.930
172	153	8.720	8.970	8.400	8.500	1.029	.963	.975
172	154	8.990	8.960	8.350	8.330	.997	.929	.927
172	155	8.420	9.020	8.460	8.580	1.078	1.005	1.019
172	156	8.080	9.090	8.440	8.500	1.125	1.045	1.052
172	157	7.270	8.670	7.990	7.460	1.193	1.099	1.026
172	158	6.670	8.180	7.780	7.700	1.226	1.166	1.154
172	159	6.670	8.220	7.750	7.830	1.232	1.162	1.174
172	160	6.120	7.650	7.140	7.200	1.250	1.167	1.176
172	161	6.370	7.260	6.750	7.170	1.140	1.060	1.126
172	162	6.340	7.380	6.910	7.080	1.164	1.090	1.117
172	163	7.290	7.530	7.060	6.620	1.033	.968	.908
172	164	6.540	7.670	7.200	7.350	1.173	1.101	1.124
172	165	7.740	7.140	0.000	0.000	.922	0.000	0.000
172	166	7.830	7.560	7.360	7.470	.969	.940	.954
172	167	7.950	7.630	0.000	0.000	.960	0.000	0.000
172	168	7.370	7.740	7.360	7.530	1.050	.999	1.022
172	169	6.530	7.980	0.000	0.000	1.222	0.000	0.000
172	170	7.590	7.650	7.180	7.270	1.008	.946	.958
172	171	7.030	8.170	7.690	6.860	1.162	1.094	.976
172	172	6.830	8.040	7.570	7.650	1.177	1.108	1.120
172	173	7.050	7.920	7.470	7.540	1.123	1.060	1.070
172	174	7.260	7.310	6.980	6.940	1.007	.961	.956
172	175	8.920	9.400	9.020	8.900	1.054	1.011	.998
172	176	8.640	9.320	8.890	8.730	1.079	1.029	1.010
172	177	7.260	7.980	7.530	7.470	1.099	1.037	1.029
172	178	8.670	9.550	8.820	8.970	1.101	1.017	1.035
172	179	10.810	9.620	8.940	8.990	.890	.827	.832
172	180	9.650	9.550	8.880	9.020	.990	.920	.935
172	181	8.770	9.390	8.700	8.740	1.071	.992	.997
172	182	7.240	8.470	7.710	0.000	1.170	1.065	0.000
172	183	5.720	5.880	5.200	5.750	1.028	.909	1.005
172	184	7.190	7.330	6.590	7.140	1.021	.918	.994
172	185	8.050	9.180	8.330	8.720	1.140	1.035	1.083
172	186	8.270	9.130	8.250	8.710	1.104	.998	1.053
172	187	8.290	9.170	8.330	8.760	1.106	1.005	1.057
172	188	8.270	9.060	8.290	8.010	1.096	1.002	.969
172	189	8.450	9.000	8.320	8.150	1.065	.985	.964
172	190	8.360	8.900	8.210	8.670	1.065	.982	1.037
172	191	8.040	9.190	8.560	8.730	1.143	1.065	1.086

172	192	9.090	9.100	8.530	8.650	1.001	.938	.952
172	193	9.620	8.770	8.270	8.270	.912	.860	.860
172	194	9.460	8.700	8.130	8.200	.920	.859	.867
172	195	9.610	8.830	7.890	6.680	.919	.821	.695
172	196	9.390	8.720	7.740	8.730	.929	.824	.930
172	197	9.290	8.570	7.830	8.050	.922	.843	.867
172	198	9.660	8.500	7.720	7.870	.880	.799	.815
172	199	8.840	8.530	7.870	8.070	.971	.890	.913
172	200	8.230	8.330	7.590	7.120	1.012	.922	.865
172	201	7.560	8.170	7.430	7.670	1.081	.983	1.015
172	202	6.770	8.090	7.320	7.570	1.195	1.081	1.118
172	203	5.520	6.330	5.530	5.870	1.147	1.002	1.063
172	204	6.470	7.800	6.920	7.430	1.206	1.070	1.148
172	205	7.130	7.600	0.000	0.000	1.066	0.000	0.000
172	206	6.630	7.020	6.290	6.770	1.059	.949	1.021
172	207	5.970	6.500	6.110	6.260	1.089	1.023	1.049
172	208	7.780	8.370	7.660	8.040	1.076	.985	1.033
172	209	7.480	8.260	7.520	7.730	1.104	1.005	1.033
172	210	7.680	8.020	0.000	0.000	1.044	0.000	0.000
172	211	4.270	4.330	3.950	5.350	1.014	.925	1.253
172	212	9.190	8.990	8.340	8.310	.978	.908	.904
172	213	8.430	9.110	8.450	8.410	1.081	1.002	.998
172	214	8.060	9.120	8.550	8.570	1.132	1.061	1.063
172	215	7.590	9.160	8.540	8.470	1.207	1.125	1.116
172	216	8.220	9.160	8.570	8.570	1.114	1.043	1.043
172	217	7.010	9.120	8.500	8.360	1.301	1.213	1.193.
172	218	7.740	9.130	8.540	8.490	1.180	1.103	1.097
172	219	7.860	9.010	8.310	8.360	1.146	1.057	1.064
172	220	8.190	9.010	8.330	8.340	1.100	1.017	1.018
172	221	4.710	6.590	6.290	6.370	1.399	1.335	1.352
172	222	8.490	9.060	8.480	8.540	1.067	.999	1.006
172	223	8.070	8.200	7.590	7.600	1.016	.941	.942
172	224	7.270	8.000	7.470	7.590	1.100	1.028	1.044
172	225	8.690	8.610	8.310	6.050	.991	.956	.696
172	226	7.100	6.950	6.490	6.350	.965	.914	.894
172	227	8.360	8.980	8.570	8.410	1.074	1.025	1.006
172	228	7.890	9.010	8.560	8.200	1.142	1.090	1.039
172	229	7.990	8.970	8.530	8.300	1.124	1.069	1.040
172	230	8.180	8.910	8.490	8.280	1.089	1.038	1.012
172	231	7.900	9.050	8.590	8.370	1.146	1.087	1.059
172	232	8.220	9.140	8.610	9.000	1.112	1.047	1.095
172	233	7.750	9.000	8.510	8.270	1.161	1.098	1.067
172	234	7.690	8.510	8.010	7.930	1.108	1.043	1.033
172	235	7.870	7.960	7.900	7.700	1.011	1.004	.978
172	236	9.180	8.690	8.490	8.240	.947	.925	.898
172	237	7.210	7.500	7.250	7.020	1.040	1.006	.974
172	238	9.320	9.090	8.560	8.380	.975	.918	.899
172	239	9.270	9.060	8.550	8.250	.977	.922	.890
172	240	8.860	9.020	8.560	8.410	1.018	.966	.949
172	241	9.130	8.720	8.580	8.540	.955	.940	.935
172	242	8.480	9.060	8.640	8.270	1.068	1.019	.975
172	243	8.860	9.040	8.600	8.000	1.020	.971	.903
172	244	7.960	9.060	8.600	7.890	1.138	1.080	.991
172	245	8.910	9.030	8.550	7.750	1.013	.960	.870
172	246	8.110	9.000	8.490	8.020	1.110	1.047	.996
172	247	8.290	9.000	8.480	8.110	1.086	1.023	.978
172	248	8.610	9.030	8.510	8.180	1.049	.988	.950
172	249	8.270	9.120	8.520	8.250	1.103	1.030	.998
172	250	7.860	9.010	8.330	8.090	1.146	1.060	1.029
172	251	7.860	9.010	8.330	8.090	1.146	1.060	1.029
172	252	7.850	8.890	8.050	8.250	1.132	1.025	1.051
172	253	7.480	8.780	8.000	7.900	1.174	1.070	1.056
172	254	7.710	8.770	8.030	8.100	1.137	1.042	1.051
172	255	8.500	8.760	8.070	8.210	1.031	.949	.966
172	256	8.110	8.780	8.100	8.370	1.083	.999	1.032
172	257	8.470	8.730	8.100	8.230	1.031	.956	.972

172	258	8.470	8.730	8.100	8.230	1.031	.956	.972
172	259	7.850	8.620	7.890	8.150	1.098	1.005	1.038
172	260	8.740	8.580	7.910	8.320	.982	.894	.952
172	261	7.860	8.560	7.940	8.010	1.089	1.010	1.019
172	262	8.870	9.070	7.870	8.000	1.023	.887	.676
172	263	8.900	9.100	7.990	7.690	1.022	.898	.864
172	264	8.220	8.550	8.020	7.840	1.040	.976	.954
172	265	8.640	8.770	8.190	7.790	1.015	.948	.902
172	266	8.350	8.760	8.340	7.410	1.049	.999	.887
172	267	8.940	9.250	8.160	7.710	1.035	.913	.862
172	268	8.510	9.340	8.100	7.690	1.098	.952	.904
172	269	8.770	8.840	8.030	7.780	1.008	.916	.887
172	270	8.260	8.660	7.910	7.530	1.045	.958	.918
172	271	7.360	7.680	7.160	7.140	1.043	.973	.970

NAVIGATION SYSTEMS - STATISTICS Cruise : 2

SYSTEMS	PARAMETERS						
	Mean	S D	S·E of Mean	Sample	Maximum	Minimum	Range
SAT	8.1989	1.0795	.0656	271	10.81	2.0	8.81
S D	8.6511	.99	.0601	271	10.02	2.39	7.63
C L	8.1477	1.0107	.0633	255	9.92	2.21	7.61
P L	8.0150	.9344	.0587	253	9.27	2.16	7.11
$\frac{SD}{SAT}$	1.0609	.0829	.0050	271	1.339	.853	.546
$\frac{CL}{SAT}$	.9997	.0844	.0053	255	1.335	.720	.615
$\frac{PL}{SAT}$	.9858	.0950	.0060	253	1.352	.675	.677

Table 20

COMPARATIVE SPEEDS FOR NAVIGATIONAL SYSTEMS.

173	1	8.440	8.500	7.410	7.370	1.007	.878	.873
173	2	8.260	8.040	7.190	7.070	.973	.870	.856
173	3	8.320	8.990	7.940	7.870	1.081	.954	.946
173	4	8.610	9.070	8.060	8.000	1.053	.936	.929
173	5	8.120	9.050	8.060	7.430	1.115	.993	.915
173	6	8.510	8.900	7.780	7.870	1.046	.914	.925
173	7	8.160	8.820	7.600	7.930	1.081	.931	.972
173	8	9.380	8.840	7.570	7.730	.942	.807	.824
173	9	8.910	8.900	0.000	0.000	.999	0.000	0.000
173	10	9.150	8.950	0.000	0.000	.978	0.000	0.000
173	11	8.800	9.130	0.000	0.000	1.037	0.000	0.000
173	12	8.320	9.110	0.000	0.000	1.095	0.000	0.000
173	13	7.090	9.240	8.070	8.070	1.303	1.138	1.138
173	14	8.490	9.170	8.130	0.000	1.080	.958	0.000
173	15	9.190	9.250	8.140	0.000	1.007	.886	0.000
173	16	9.120	9.200	8.170	8.000	1.009	.896	.877
173	17	9.310	9.050	8.170	7.970	.972	.878	.856
173	18	9.360	9.030	8.060	7.970	.965	.861	.851
173	19	9.220	9.070	8.100	7.920	.984	.879	.859
173	20	8.630	8.060	8.110	8.000	.934	.940	.927
173	21	8.600	9.130	8.200	8.080	1.062	.953	.940
173	22	8.420	9.130	8.130	8.000	1.084	.966	.950
173	23	8.230	9.090	8.090	7.930	1.104	.983	.964
173	24	9.100	9.070	8.070	8.500	.997	.887	.934
173	25	8.890	8.410	8.060	7.960	.946	.907	.895
173	26	8.910	9.130	8.090	8.030	1.025	.908	.901
173	27	8.910	9.170	8.020	8.110	1.029	.900	.910
173	28	9.190	9.090	0.000	0.000	.989	0.000	0.000
173	29	8.280	9.040	0.000	0.000	1.092	0.000	0.000
173	30	8.910	9.000	7.920	7.890	1.010	.889	.886
173	31	9.420	8.920	0.000	0.000	.947	0.000	0.000
173	32	9.040	8.500	7.360	7.360	.940	.814	.814
173	33	8.490	8.730	7.680	7.810	1.028	.905	.920
173	34	6.470	6.220	5.360	5.630	.961	.828	.870
173	35	9.150	8.560	7.380	7.580	.936	.807	.828
173	36	9.640	8.510	7.360	7.580	.883	.763	.786
173	37	9.700	8.610	7.520	7.680	.888	.775	.792
173	38	7.960	8.710	0.000	0.000	1.094	0.000	0.000
173	39	8.050	8.890	7.820	0.000	1.104	.971	0.000
173	40	8.350	8.860	7.750	7.000	1.061	.928	.838
173	41	8.460	8.820	7.760	8.050	1.043	.917	.952
173	42	8.660	8.920	7.880	7.970	1.030	.910	.920
173	43	8.350	9.000	7.980	8.060	1.078	.956	.965
173	44	8.740	8.970	7.950	7.870	1.026	.910	.900
173	45	8.620	8.940	7.950	8.160	1.037	.922	.947
173	46	8.780	8.980	7.990	7.440	1.023	.910	.847
173	47	9.010	9.070	7.940	7.180	1.007	.881	.797
173	48	8.460	9.030	7.730	8.100	1.067	.914	.957
173	49	8.370	9.030	7.790	7.970	1.079	.931	.952
173	50	8.120	9.000	7.780	7.960	1.108	.958	.980
173	51	8.440	8.950	7.700	7.980	1.060	.912	.945
173	52	8.740	9.020	7.750	7.980	1.032	.887	.913
173	53	9.190	9.010	7.700	8.260	.980	.838	.899
173	54	9.320	8.870	7.620	0.000	.952	.818	0.000
173	55	7.710	7.610	6.580	0.000	.987	.853	0.000
173	56	8.820	8.380	7.250	7.360	.950	.822	.834
173	57	9.970	8.960	7.570	8.000	.899	.759	.802
173	58	9.210	8.940	7.560	8.000	.971	.821	.869
173	59	9.170	8.940	7.550	7.980	.975	.823	.870
173	60	8.760	8.890	7.500	8.200	1.015	.856	.936
173	61	8.530	8.830	7.450	7.890	1.035	.873	.925

173	62	10.300	8.810	7.450	7.750	.855	.723	.752
173	63	8.750	8.840	7.470	7.980	1.010	.854	.912
173	64	9.150	8.930	7.610	8.030	.976	.832	.878
173	65	9.110	9.170	7.770	8.080	1.007	.853	.887
173	66	9.080	9.150	7.750	8.250	1.008	.854	.909
173	67	8.070	9.010	7.670	8.170	1.116	.950	1.012
173	68	7.660	8.180	7.280	6.740	1.068	.950	.880
173	69	4.000	4.160	3.470	3.490	1.040	.867	.872
173	70	8.070	8.460	7.480	7.530	1.048	.927	.933
173	71	7.980	8.460	7.410	7.560	1.060	.929	.947
173	72	7.800	8.370	7.230	7.420	1.073	.927	.951
173	73	7.770	8.400	7.240	7.450	1.081	.932	.959
173	74	7.720	8.360	7.190	0.000	1.083	.931	0.000
173	75	7.910	8.160	6.980	7.320	1.032	.882	.925
173	76	6.870	7.430	6.320	6.770	1.082	.920	.985
173	77	8.170	8.170	6.870	7.360	1.000	.841	.901
173	78	7.960	8.110	6.690	7.360	1.019	.840	.925
173	79	8.120	8.060	6.700	7.310	.993	.825	.900
173	80	7.350	8.200	6.790	7.310	1.116	.924	.995
173	81	6.920	8.160	6.850	5.490	1.179	.990	.793
173	82	7.540	8.160	6.880	5.660	1.082	.912	.751
173	83	7.890	8.300	7.060	7.440	1.052	.895	.943
173	84	8.170	8.260	6.980	7.250	1.011	.854	.887
173	85	8.050	8.260	6.270	7.320	1.026	.779	.909
173	86	7.600	8.320	7.040	7.420	1.095	.926	.976
173	87	8.430	8.470	7.180	7.540	1.005	.852	.894
173	88	6.700	8.650	7.350	7.200	1.291	1.097	1.075
173	89	8.260	8.530	7.310	7.610	1.033	.885	.921
173	90	7.890	8.420	0.000	0.000	1.067	0.000	0.000
173	91	8.000	8.630	0.000	0.000	1.079	0.000	0.000
173	92	8.440	8.250	7.160	7.350	.977	.848	.871
173	93	6.390	7.340	6.420	6.480	1.149	1.005	1.014
173	94	6.920	7.830	6.930	7.210	1.132	1.001	1.042
173	95	7.110	7.740	6.850	7.110	1.089	.963	1.000
173	96	7.510	7.680	6.750	7.000	1.023	.899	.932
173	97	7.540	7.620	6.720	6.940	1.011	.891	.920
173	98	7.680	7.610	6.720	7.000	.991	.875	.911
173	99	7.800	7.820	6.690	7.000	1.003	.858	.897
173	100	7.580	8.270	6.990	7.300	1.091	.922	.963
173	101	8.020	8.240	7.010	7.450	1.027	.874	.929
173	102	7.480	8.070	6.940	7.330	1.079	.928	.980
173	103	7.290	8.250	7.140	7.380	1.132	.979	1.012
173	104	7.660	8.550	7.390	7.700	1.116	.965	1.005
173	105	8.240	8.560	7.490	7.600	1.039	.909	.922
173	106	7.960	8.450	7.340	7.660	1.062	.922	.962
173	107	7.900	8.440	7.340	7.590	1.068	.929	.961
173	108	8.270	8.480	7.280	7.500	1.025	.880	.907
173	109	6.280	8.060	6.900	7.330	1.283	1.099	1.167
173	110	8.780	8.390	7.280	7.500	.956	.829	.854
173	111	8.570	8.340	7.220	7.530	.973	.842	.879
173	112	7.840	8.060	7.010	7.410	1.028	.894	.945
173	113	6.060	6.600	5.880	6.200	1.089	.970	1.023
173	114	6.800	6.600	5.800	0.000	.971	.853	0.000
173	115	7.370	8.020	6.960	6.920	1.088	.944	.939
173	116	7.050	8.070	6.930	7.280	1.145	.983	1.033
173	117	7.250	7.910	6.900	7.190	1.091	.952	.992
173	118	7.070	8.010	7.010	6.380	1.133	.992	.902
173	119	7.200	8.100	7.070	7.270	1.125	.982	1.010
173	120	7.860	8.280	7.160	7.410	1.053	.911	.943
173	121	8.310	8.400	7.200	7.600	1.011	.866	.915
173	122	7.080	8.020	6.870	7.000	1.133	.970	.989
173	123	6.260	6.380	5.450	5.730	1.019	.871	.915
173	124	6.560	6.950	5.970	6.230	1.059	.910	.950
173	125	8.160	8.110	6.970	7.330	.994	.854	.898
173	126	8.100	8.070	0.000	7.370	.996	0.000	.910
173	127	4.680	4.690	4.570	4.330	1.002	.976	.925

173	128	9.290	8.330	7.370	7.440	.897	.793	.801
173	129	8.750	8.430	7.400	7.490	.963	.846	.856
173	130	8.250	7.800	7.000	7.070	.945	.848	.857
173	131	8.110	8.040	7.190	5.650	.991	.887	.697
173	132	7.530	7.590	7.250	7.140	1.008	.963	.948
173	133	7.600	8.070	0.000	7.300	1.062	0.000	.961
173	134	6.860	7.040	0.000	7.240	1.026	0.000	1.055
173	135	7.180	7.310	7.720	7.440	1.018	1.075	1.036
173	136	7.730	7.860	7.700	7.380	1.017	.996	.955
173	137	8.330	8.330	7.560	7.230	1.000	.908	.868
173	138	8.490	8.630	7.580	7.380	1.016	.893	.869
173	139	8.370	8.560	7.650	7.500	1.023	.914	.896
173	140	7.720	7.050	6.560	6.260	.913	.850	.811
173	141	8.560	8.070	7.510	7.220	.943	.877	.843
173	142	4.590	3.700	0.000	0.000	.806	0.000	0.000
173	143	7.200	8.060	0.000	0.000	1.119	0.000	0.000
173	144	6.950	8.010	7.280	6.890	1.153	1.047	.991
173	145	7.560	8.060	7.360	7.040	1.066	.974	.931
173	146	7.440	8.060	7.370	7.070	1.083	.991	.950
173	147	7.230	7.990	7.470	7.060	1.105	1.033	.976
173	148	6.970	7.880	7.360	7.020	1.131	1.056	1.007
173	149	7.040	7.630	7.050	6.890	1.084	1.001	.979
173	150	7.190	7.490	6.920	6.750	1.042	.962	.939
173	151	6.950	7.310	6.540	6.600	1.052	.941	.950
173	152	6.010	6.260	5.420	5.510	1.042	.902	.917
173	153	7.000	7.180	6.340	6.560	1.026	.906	.937
173	154	7.240	7.340	6.480	6.720	1.014	.895	.928
173	155	7.720	7.420	6.510	6.640	.961	.843	.860
173	156	7.510	7.330	6.450	6.670	.976	.859	.888
173	157	7.190	7.320	6.440	6.600	1.018	.896	.918
173	158	7.920	7.260	6.390	6.570	.917	.807	.830
173	159	7.930	7.390	6.460	6.600	.932	.815	.832
173	160	7.130	7.300	6.380	6.690	1.024	.895	.938
173	161	7.280	7.190	6.330	6.330	.988	.870	.870
173	162	6.630	7.170	6.250	6.530	1.081	.943	.985
173	163	6.680	7.160	6.220	6.440	1.072	.931	.964
173	164	6.870	7.260	6.330	6.570	1.057	.921	.956
173	165	7.350	7.250	6.300	6.530	.986	.857	.888
173	166	7.280	7.080	6.120	6.500	.973	.841	.893
173	167	7.570	7.330	6.420	4.840	.968	.848	.639
173	168	7.320	7.400	6.460	6.650	1.011	.883	.908
173	169	7.220	7.470	6.370	6.600	1.035	.882	.914
173	170	7.360	7.540	6.620	6.620	1.024	.899	.899
173	171	7.420	7.550	6.650	6.770	1.018	.896	.912
173	172	7.720	7.570	6.700	6.840	.981	.868	.886
173	173	7.870	7.540	6.680	6.850	.958	.849	.870
173	174	5.440	5.020	4.450	4.410	.923	.818	.811
173	175	6.140	6.960	6.070	6.410	1.134	.989	1.044
173	176	6.360	7.000	6.280	6.510	1.101	.987	1.024
173	177	6.590	7.140	6.410	6.560	1.083	.973	.995
173	178	6.740	7.290	6.460	6.540	1.082	.958	.970
173	179	6.760	7.390	6.520	6.700	1.093	.964	.991
173	180	7.130	7.130	6.300	6.460	1.000	.884	.906
173	181	6.830	6.790	6.200	6.460	.994	.908	.946
173	182	6.700	6.560	5.830	6.050	.979	.870	.903
173	183	6.420	6.290	5.440	5.590	.980	.847	.871
173	184	6.250	6.400	5.540	5.740	1.024	.886	.918
173	185	6.280	6.320	5.510	5.600	1.006	.877	.892
173	186	6.390	6.260	5.500	5.550	.980	.861	.869
173	187	6.560	6.470	5.690	5.780	.986	.867	.881
173	188	6.700	6.790	5.940	6.110	1.013	.887	.912
173	189	6.550	6.870	6.010	6.290	1.049	.918	.960
173	190	6.720	7.140	6.260	6.460	1.062	.932	.961
173	191	6.810	7.040	6.260	6.420	1.034	.919	.943
173	192	7.010	6.950	6.180	6.330	.991	.882	.903
173	193	6.430	7.090	6.320	0.000	1.103	.983	0.000

173	194	6.680	7.220	6.500	0.000	1.081	.973	0.000
173	195	7.080	6.820	6.100	6.000	.963	.862	.847
173	196	6.710	7.460	6.640	6.730	1.112	.990	1.003
173	197	7.010	7.480	6.650	6.690	1.067	.949	.954
173	198	7.310	7.480	6.680	6.700	1.023	.914	.917
173	199	7.310	7.510	6.810	6.690	1.027	.932	.915
173	200	7.880	7.600	6.880	6.940	.964	.873	.881
173	201	7.840	7.510	6.860	6.650	.958	.875	.848
173	202	7.660	7.430	6.840	6.560	.970	.893	.856
173	203	7.660	7.620	6.980	6.810	.995	.911	.889
173	204	7.850	7.710	7.060	6.800	.982	.899	.866
173	205	7.880	7.770	7.100	6.210	.986	.901	.788
173	206	8.320	7.640	7.060	6.790	.918	.849	.816
173	207	7.680	7.720	7.060	6.800	1.005	.919	.885
173	208	7.830	7.560	6.980	6.830	.966	.891	.872
173	209	7.270	7.390	7.000	5.180	1.017	.963	.713
173	210	7.680	7.520	7.070	6.810	.979	.921	.887
173	211	8.110	7.680	7.210	6.890	.947	.889	.850
173	212	8.180	7.760	7.180	6.910	.949	.878	.845
173	213	8.400	8.270	7.210	7.030	.985	.858	.837
173	214	7.250	7.580	7.270	6.940	1.046	1.003	.957
173	215	4.440	4.670	5.580	5.450	1.052	1.257	1.227
173	216	8.200	8.240	7.180	6.900	1.005	.876	.841
173	217	9.100	9.380	7.200	6.940	1.031	.791	.763
173	218	8.120	8.080	7.100	6.970	.995	.874	.858
173	219	6.950	6.900	7.060	6.840	.993	1.016	.984
173	220	6.590	6.550	7.030	6.930	.994	1.067	1.052
173	221	7.100	7.120	6.960	6.910	1.003	.980	.973

NAVIGATION SYSTEMS - STATISTICS Cruise : 3

SYSTEMS	PARAMETERS						
	Mean	S D	S·E of Mean	Sample	Maximum	Minimum	Range
SAT	7.7733	.9927	.0668	221	10.30	4.00	6.30
S D	7.9653	.9441	.0635	221	9.38	3.70	5.68
C L	7.0074	.7488	.0522	206	8.20	3.47	4.73
P L	7.0536	.7904	.0559	200	8.50	3.49	5.01
$\frac{S D}{SAT}$	1.0276	.0671	.0045	221	1.303	.806	.497
$\frac{C L}{SAT}$	.9080	.0686	.0048	206	1.257	.723	.534
$\frac{P L}{SAT}$	.9145	.0748	.0053	200	1.227	.639	.588

Table 22

COMPARATIVE SPEEDS FOR NAVIGATIONAL SYSTEMS.

174	1	6.890	7.500	6.130	4.720	1.089	.890	.685
174	2	8.850	9.020	7.370	7.710	1.019	.833	.871
174	3	8.620	8.990	7.320	6.970	1.043	.849	.809
174	4	7.440	7.900	6.440	6.970	1.062	.866	.937
174	5	8.960	9.140	7.360	7.840	1.020	.821	.875
174	6	8.880	8.990	7.210	7.690	1.012	.812	.866
174	7	7.010	7.670	6.300	6.610	1.094	.899	.943
174	8	8.240	8.790	7.250	7.610	1.067	.880	.924
174	9	8.170	8.940	7.280	7.660	1.094	.891	.938
174	10	8.070	9.130	7.290	7.750	1.131	.903	.960
174	11	7.930	7.950	6.470	6.980	1.003	.816	.880
174	12	8.820	8.910	7.220	7.590	1.010	.819	.861
174	13	6.190	6.840	5.590	4.210	1.105	.903	.680
174	14	9.040	8.920	7.170	7.670	.987	.793	.848
174	15	9.000	8.710	7.020	7.230	.968	.780	.803
174	16	9.010	8.530	6.890	7.340	.947	.765	.815
174	17	7.940	8.310	6.670	7.200	1.047	.840	.907
174	18	7.700	8.910	7.120	7.750	1.157	.925	1.006
174	19	8.220	8.900	7.130	7.640	1.083	.867	.929
174	20	8.240	8.990	7.100	7.600	1.091	.862	.922
174	21	9.060	8.050	7.140	7.700	.889	.788	.850
174	22	8.240	8.970	0.000	0.000	1.089	0.000	0.000
174	23	7.740	8.920	7.200	7.870	1.152	.930	1.017
174	24	7.940	8.300	6.680	7.100	1.045	.841	.894
174	25	8.750	8.730	7.200	7.500	.998	.823	.857
174	26	4.000	4.330	4.140	3.580	1.083	1.035	.895
174	27	7.920	8.470	8.270	7.340	1.069	1.044	.927
174	28	8.120	8.510	8.200	7.540	1.048	1.010	.929
174	29	8.420	8.470	8.170	7.590	1.006	.970	.901
174	30	7.890	8.410	8.120	7.210	1.066	1.029	.914
174	31	8.140	8.340	8.140	7.550	1.025	1.000	.928
174	32	4.780	4.780	4.760	4.310	1.000	.996	.902
174	33	8.500	8.940	8.370	7.480	1.052	.985	.880
174	34	8.720	8.750	8.160	7.390	1.003	.936	.847
174	35	6.490	6.650	6.240	5.730	1.025	.961	.883
174	36	8.700	8.600	8.310	7.420	.989	.955	.853
174	37	8.680	8.500	8.280	7.460	.979	.954	.859
174	38	8.710	8.490	8.310	7.420	.975	.954	.852
174	39	8.620	8.430	8.300	7.420	.978	.963	.861
174	40	8.590	8.510	8.360	7.530	.991	.973	.877
174	41	8.600	8.570	8.430	7.170	.997	.980	.834
174	42	8.170	8.320	8.150	7.270	1.018	.998	.890
174	43	7.960	7.500	7.340	6.590	.942	.922	.828
174	44	9.140	8.870	8.510	7.580	.970	.931	.829
174	45	8.940	8.520	8.290	7.270	.953	.927	.813
174	46	8.880	8.500	8.260	7.430	.957	.930	.837
174	47	8.320	8.140	7.800	7.070	.978	.938	.850
174	48	7.830	8.380	8.150	7.160	1.070	1.041	.914
174	49	7.740	8.290	8.070	7.310	1.071	1.043	.944
174	50	8.070	8.520	8.190	7.380	1.056	1.015	.914
174	51	8.020	8.530	8.160	7.360	1.064	1.017	.918
174	52	8.050	8.500	8.100	7.330	1.056	1.006	.911
174	53	8.140	8.500	8.170	7.670	1.044	1.004	.942
174	54	8.110	8.390	8.040	7.280	1.035	.991	.898
174	55	7.350	8.320	8.020	7.170	1.132	1.091	.976
174	56	6.690	6.900	6.680	6.100	1.031	.999	.912
174	57	8.180	8.110	7.810	7.160	.991	.955	.875
174	58	8.210	7.860	7.690	7.180	.957	.937	.875
174	59	8.100	7.780	7.650	7.150	.960	.944	.883

174	60	6.610	6.510	6.500	5.810	.985	.983	.879
174	61	6.130	5.890	5.850	5.250	.961	.954	.856
174	62	7.560	7.090	7.020	6.380	.938	.929	.844
174	63	8.000	7.660	7.650	6.780	.957	.956	.848
174	64	7.240	7.760	7.520	6.900	1.072	1.039	.953
174	65	7.670	7.830	7.600	6.920	1.021	.991	.902
174	66	7.950	7.690	7.340	6.820	.967	.923	.858
174	67	7.840	7.780	7.450	6.710	.992	.950	.856
174	68	7.810	7.770	7.470	6.790	.995	.956	.869
174	69	7.440	7.820	7.570	6.870	1.051	1.017	.923
174	70	7.460	7.580	7.560	6.690	1.016	1.013	.897
174	71	7.450	7.590	7.520	6.810	1.019	1.009	.914
174	72	7.540	7.540	7.510	6.830	1.000	.996	.906
174	73	7.260	7.080	7.030	6.310	.975	.968	.869
174	74	5.980	5.990	5.920	5.450	1.002	.990	.911
174	75	7.010	6.410	6.310	5.790	.914	.900	.826
174	76	8.230	7.320	7.170	6.550	.889	.871	.796
174	77	8.130	7.490	7.260	6.740	.921	.893	.829
174	78	7.600	7.510	0.000	0.000	.988	0.000	0.000
174	79	7.270	7.670	7.370	6.750	1.055	1.014	.928
174	80	6.740	7.590	7.280	6.700	1.126	1.080	.994
174	81	6.690	7.330	7.050	6.500	1.096	1.054	.972
174	82	7.000	7.270	6.950	6.420	1.039	.993	.917
174	83	6.930	7.180	6.860	6.500	1.036	.990	.938
174	84	6.780	7.060	6.660	6.430	1.041	.982	.948
174	85	6.860	7.020	6.600	6.250	1.023	.962	.911
174	86	6.810	6.930	6.470	6.330	1.018	.950	.930
174	87	6.600	6.840	6.490	6.150	1.036	.983	.932
174	88	7.140	6.980	6.600	6.140	.978	.924	.860
174	89	7.150	7.040	6.650	6.290	.985	.930	.880
174	90	6.890	7.020	6.610	6.260	1.019	.959	.909
174	91	7.050	6.960	6.540	6.240	.987	.928	.885
174	92	7.510	6.770	6.430	6.250	.901	.856	.832
174	93	6.860	6.940	6.490	6.370	1.012	.946	.929
174	94	6.850	6.870	6.460	6.000	1.003	.943	.876
174	95	6.300	6.630	6.220	5.940	1.052	.987	.943
174	96	5.680	6.200	5.570	4.500	1.092	.981	.792
174	97	6.030	6.100	5.430	5.440	1.012	.900	.902
174	98	5.880	6.050	5.370	5.430	1.029	.913	.923
174	99	5.910	5.720	5.140	5.200	.968	.870	.880
174	100	6.240	5.820	5.200	5.210	.933	.833	.835
174	101	6.230	5.720	5.180	5.110	.918	.831	.820
174	102	6.270	5.830	5.220	5.280	.930	.833	.842
174	103	6.120	6.020	5.370	5.490	.984	.877	.897
174	104	6.350	6.410	5.730	5.730	1.009	.902	.902
174	105	6.260	6.440	5.980	5.990	1.029	.955	.957
174	106	5.950	5.780	5.330	5.230	.971	.896	.879

NAVIGATION SYSTEMS - STATISTICS Cruise : 4

SYSTEMS	PARAMETERS						
	Mean	S D	S·E of Mean	Sample	Maximum	Minimum	Range
SAT	7.5565	1.0092	.0980	106	9.14	4.00	5.14
S D	7.6716	1.0528	.1023	106	9.14	4.33	4.81
C L	7.0547	.9661	.0947	104	8.51	4.14	4.37
P L	6.6831	.9138	.0896	104	7.87	3.58	4.29
$\frac{SD}{SAT}$	1.0162	.0559	.0054	106	1.157	.889	.268
$\frac{CL}{SAT}$	.9369	.0711	.0070	104	1.091	.765	.326
$\frac{PL}{SAT}$	.8863	.0542	.0053	104	1.017	.680	.337

Table 24

Table 26

PRINTOUT OF CHANNEL NOISE [illegible] READINGS

SUPV.	CREW	DAY	CH-1	CH-2	CH-3	CH-4	CH-5	CH-6
17	1	0	0	0	0	0	0	0
17	1	99	99	99	99	99	99	99
17	1	2	42	22	24	16	23	33
17	1	3	38	15	17	21	20	30
17	1	4	36	20	20	20	30	30
17	1	8	17	10	17	14	17	26
17	1	9	27	25	22	24	34	36
17	1	10	19	16	15	16	19	26
17	1	11	22	20	14	15	16	19
17	1	12	18	17	19	16	15	71
17	1	13	18	19	14	32	20	28
17	1	14	24	24	20	17	21	28
17	1	15	22	21	18	14	22	31
17	1	16	17	14	16	13	18	23
17	1	17	19	18	15	13	15	27
17	1	18	18	17	14	14	16	33
17	1	19	13	13	14	13	14	21
17	1	20	30	25	40	10	20	30
17	2	25	20	19	20	40	45	40
17	2	26	50	44	35	66	56	43
17	2	27	22	22	19	29	37	23
17	2	28	26	30	37	37	40	44
17	2	30	15	15	15	20	24	18
17	2	31	32	38	22	27	29	23
17	2	32	21	29	28	32	41	23
17	2	33	14	18	11	10	27	17
17	2	34	16	20	10	22	33	20
17	2	35	13	18	14	21	21	20
17	2	36	15	23	19	21	28	25
17	2	37	14	23	14	36	21	21
17	2	38	18	18	16	20	22	20
17	2	39	14	14	13	16	16	19
17	2	40	12	15	13	15	14	15
17	2	41	14	19	15	16	14	14
17	2	42	15	19	17	20	20	18
17	2	43	9	12	11	10	15	25
17	2	44	13	17	15	18	17	18
17	2	45	10	15	16	17	19	18
17	2	46	16	19	13	17	18	15
17	3	50	20	15	11	13	22	15
17	3	51	15	15	40	48	21	16
17	3	52	15	14	13	15	26	14
17	3	53	10	11	11	13	25	12
17	3	54	11	12	12	14	29	15
17	3	55	12	11	10	13	18	16
17	3	56	11	11	11	12	15	14
17	3	57	10	11	9	11	17	15
17	3	58	10	11	10	10	18	12
17	3	59	7	9	9	9	30	13
17	3	60	8	10	9	9	32	13
17	3	61	9	9	10	10	22	11
17	3	62	12	10	10	12	10	10
17	3	65	11	9	11	12	11	11
17	3	66	9	9	9	10	10	10
17	3	67	9	9	8	9	8	10
17	3	68	10	9	9	9	8	9
17	3	69	8	8	8	10	9	9
17	3	70	9	8	9	10	9	10
17	3	71	10	8	8	10	10	8
17	4	75	13	14	10	10	10	13
17	4	76	15	12	11	12	14	30
17	4	79	18	33	12	15	12	30
17	4	80	13	21	13	17	15	22
17	4	81	20	21	14	17	19	31
17	4	82	15	13	14	14	11	20
17	4	83	13	16	14	11	11	16
17	4	84	7	4	7	12	7	7

	VAR NO	MEAN	S.D.	S.E. OF MEAN	SAMPLE	MAXIMUM	MINIMUM	RANGE
Survey 17	1	42.8769	23.5.16	2.9274	65	84.0000	2.0000	82.0000
	2	16.6923	[illegible]	1.0540	65	50.0000	7.0000	43.0000
	3	16.5538	7.3148	.9159	65	44.0000	4.0000	40.0000
	4	15.4462	7.[illegible]87	.9264	65	40.0000	7.0000	33.0000
	5	17.6154	10.1438	1.2582	65	66.0000	9.0000	57.0000
	6	20.4308	9.5900	1.1895	65	56.0000	7.0000	49.0000
	7	21.2769	10.7362	1.3317	65	71.0000	7.0000	64.0000
Cr 1	8	23.6875	8.5769	2.1442	16	42.0000	13.0000	29.0000
	9	18.5625	4.4567	1.1142	16	26.0000	10.0000	16.0000
	10	18.8750	6.7515	1.6879	16	40.0000	14.0000	26.0000
	11	16.7500	5.3479	1.3370	16	32.0000	10.0000	22.0000
	12	20.1250	5.3526	1.3381	16	34.0000	14.0000	20.0000
	13	30.7500	11.6247	2.9062	16	71.0000	19.0000	52.0000
Cr 2	14	17.9048	9.1864	2.0046	21	50.0000	9.0000	41.0000
	15	20.8571	8.3264	1.8170	21	44.0000	10.0000	34.0000
	16	17.9048	7.7065	1.6817	21	38.0000	10.0000	28.0000
	17	24.2857	12.7157	2.7750	21	66.0000	10.0000	56.0000
	18	26.5238	11.5526	2.5210	21	56.0000	14.0000	42.0000
	19	22.8095	8.7442	1.9082	21	44.0000	14.0000	30.0000
Cr 3	20	10.8000	2.9842	.6673	20	20.0000	7.0000	13.0000
	21	10.3500	1.9808	.4429	20	15.0000	8.0000	7.0000
	22	11.3500	6.8769	1.5377	20	40.0000	8.0000	32.0000
	23	12.9500	8.4447	1.8883	20	48.0000	9.0000	39.0000
	24	17.5000	8.0230	1.7940	20	32.0000	8.0000	24.0000
	25	12.1500	2.5169	.5632	20	16.0000	8.0000	8.0000
Cr 4	26	14.2500	3.8522	1.3726	8	20.0000	7.0000	13.0000
	27	16.7500	8.5147	3.0104	8	33.0000	4.0000	29.0000
	28	12.3750	3.2486	1.1486	8	18.0000	7.0000	11.0000
	29	13.5000	2.6726	.9449	8	17.0000	10.0000	7.0000
	30	12.3750	3.6228	1.2809	8	19.0000	7.0000	12.0000
	31	21.1250	8.8550	3.1307	8	31.0000	7.0000	24.0000

Table 27

BUREAU OF MINERAL RESOURCES

MARINE GEOPHYSICAL SURVEY NORTH-WEST, WEST, AND SOUTHS COASTS OF AUSTRALIA

FIELD REPORT
09/1972 TO 12/1972

SURVEY No. 18

BUREAU OF MINERAL RESOURCES

MARINE GEOPHYSICAL SURVEY

NORTH-WEST, WEST AND SOUTH-WEST COASTS OF AUSTRALIA

FIELD REPORT

September 1972 to December 1972

Survey No.18

Compagnie Generale de Geophysique
39 Booroondara Street, REID, A.C.T.

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INTRODUCTION

Survey 18 consists of 3 cruises. The geographical limits of each cruise are approximately these: (Fig. A, Enclosures 44, 45, 46)

* CRUISE 1:

North	:	South	14° 30'
South	:	South	25° 30'
East	:	East	121° 00'
West	:	East	110° 30'

* CRUISE 2

North	:	13° 30' South
South	:	16° 30' South
East	:	132° 00' East
West	:	118° 30' East

* CRUISE 3

North	:	17° 30' South
South	:	35° 30' South
East	:	108° 00' East
West	:	115° 30' East

As shown fig. A, survey 18 covered an extensive area throughout the western coast of Australia.

The shore station was located first at Onslow (until day 11) then at Darwin, (until day 45), and finally at Albany.(Fig.B)

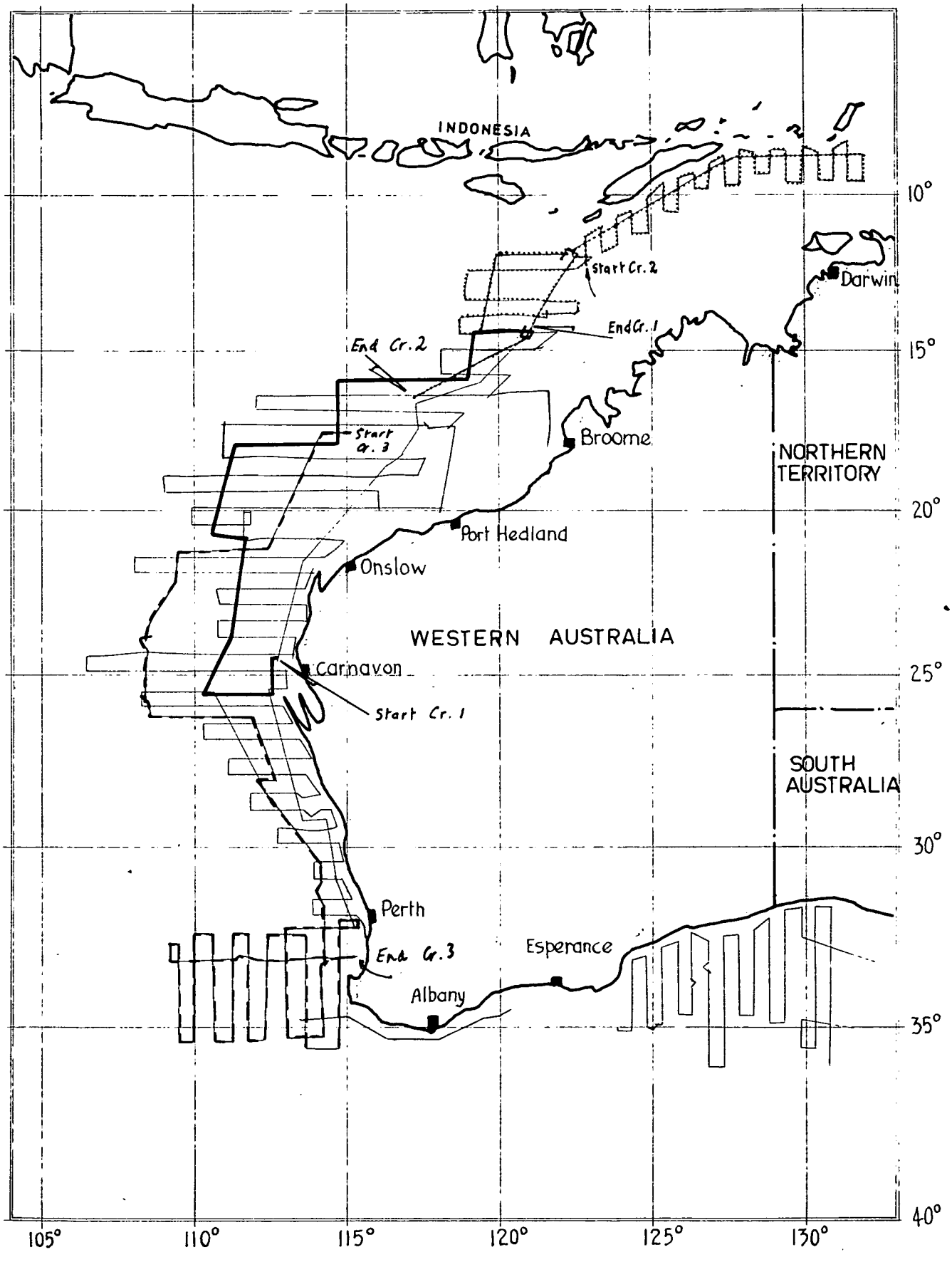
FIG A

LOCATION SKETCH for

SOUTH, WEST and NORTH COASTS OF AUSTRALIA

SCALE 1 / 20000000

SURVEY 18



SUMMARY OF OPERATIONS

Cruise 1

Survey 18 began on Tuesday 25th September 1972 at 08.00 L.T (00.00GMT), ships being called in Carnarvon (W.A). Ship left Carnarvon on 27th September at 19.00 L.T (BMR day 02.11.00). There was no stoppage for any reason during this cruise which ended on BMR day 11.06.00, on request of the BMR, by reason of the low cruising speed. Ship berthed at Darwin (N.T.) on 9th of October at 17.00 L.T (BMR day 14.07.30)

Cruise 2

M/V Lady Christine left Darwin on 13th of October 1972 at 24.00 L.T (BMR day 18.14.30);

The periods of exploitation were the following:

BMR days 21.06.40 to 32.02.15 : stoppage for Supply boat

BMR days 34.15.50 to 40.06.00 : stoppage for engine room trouble

BMR days 40.14.20 to 43.03.30 : stoppage for sparker trouble

BMR days 43.16.20 to 45.20.30 : End of cruise.

Ship berthed at Port Hedland (W.A.) on 11th November at 12.30. (BMR day 47.04.00)

Cruise 3

M/V Lady Christine left Port Hedland (W.A.) on 14th of November at 00.00 L.T (BMR day 49.16.00).

The periods of exploitation were the following:

BMR days 50.19.00 to 53.21.50 : Stoppage for bad weather

BMR days 56.20.40 to 56.03.10 : Stoppage for D.A.S trouble

BMR days 57.02.10 to 60.05.30 : Stoppage for bad weather

BMR days 62.04.30 to 62.23.15 : Stoppage for bad weather

BMR days 63.07.40 to 74.10.00 : Stoppage for cable breakdown

BMR days 74.17.00 to 75.17.00 : End of cruise

Ship berthed at Fremantle (W.A.) on 10th of December at 11.00 L.T. (BMR day 76.03.00).

Survey 18 ends on Wednesday 13th of December at 08.00 L.T. (BMR day 78.24.00)

STATISTICS

Table 1 gives statistical results of survey 18.

* Cruise 1

TT : 432 hours .00 minutes

Working mileage: 1559.5 miles

The breakdown of TT in percentages is as follows:

TTS: 66.20 = Total time at sea

P: 33.80 = Port

TTS can be further divided into:

W : 71.38% of TTS = 47.26% of TT

T : 28.62% of TTS = 18.94% of TT

SB: 0 % of TTS = 0% of TT

BW: 0 % of TTS = 0% of TT

MB: 0 % of TTS = 0% of TT

* Cruise 2

TT : 736 hours

Working mileage: 3990 miles

The breakdown of TT in percentages is as follows

TTS: 88.04%

PRODUCTION STATISTICS

Survey / Cruise	Total time at sea TTS	Working time	Travel time	Supply boat	Bad weather	Major breakdown	Port	Total time TT
18 1	286 . 00	204 . 10	81 . 50	0	0	0	146 . 00	432 . 00
18 2	648 . 00	507 . 05	47 . 50	61 . 35	0	31 . 30	88 . 00	736 . 00
18 3	635 . 00	476 . 45	37 . 00	28 . 30	68 . 45	24 . 00	69 . 00	704 . 00
TOTAL	1569 . 00	1188 . 00	166 . 40	90 . 05	68 . 45	55 . 30	303 . 00	1872 . 00
MONTHES	2 . 179	1 . 650	0 . 231	0 . 125	0 . 095	0 . 078	0 . 421	2 . 6
REDUCED TO 1 MONTH	0 . 838	0 . 634	0 . 089	0 . 049	0 . 036	0 . 030	0 . 162	1 . 0
DAY / MONTH	25 . 14	19 . 02	2 . 67	1 . 47	1 . 08	0 . 9	4 . 86	30
TTS = 100%	100	75 . 66	10 . 62	5 . 82	5 . 85	4 . 30	3 . 57	-
TT = 100 %	83 . 8 TTS + PORT = TT	63 . 4	8 . 9	4 . 9	3 . 6	3 . 0	16 . 2	100

Table 1

P: 11.96%

TTS can be further divided into:

W :	78.25% of TTS :	68.89% of TT
T :	7.38% of TTS :	6.50% of TT
SB :	9.50% of TTS :	8.37% of TT
BW :	0 % of TTS :	0 % of TT
MB :	4.87% of TTS :	4.28% of TT

*Cruise 3

TT : 706 hours

Working mileage : 4072.5 miles

The breakdown of TT in percentage is as follows

TTS : 90.20%

P : 9.80%

TTS can be further divided into:

W :	75.08% of TTS :	67.72% of TT
T :	5.83% of TTS :	5.26% of TT
SB :	4.49% of TTS :	4.05% of TT
BW :	10.83% of TTS :	9.76% of TT
MB :	3.77% of TTS :	3.41% of TT

SURVEY 18: General Statistics (Table 1)

Total duration of Survey : 1872 Hours - (78 days)

Total working time : 1188.00 hours

Total working mileage : 9622 miles

Table gives the following indications (days per month)

Total time at sea : 25.14

Total time in port : 4.86

TTS can be further divided as follows:

Working time: 19.02 bad weather: 1.08

Travelling : 2.67 major breakdown: 0.9

Supply boat : 1.47

OVERALL OPERATION OF EACH SYSTEM

1. DATA ACQUISITION SYSTEM (Enclosure 5)

Two kinds of troubles occurred during this survey:

- The first one was linked to a malfunctioning of the masterclock, causing the incorrect recording of data on the tape. (cf Navigation clock §)
- The second one came from the multiverter. Between cruises 1 and 2, the multiverter spare cards were sent to Hewlett - Packard for a complete check - Unfortunately, one failure occurred during cruise 2 to this multiverter (34.21.30 to 35.00.55). The spare cards being not on board, to keep the Data Acquisition system running, the multiverter was short circuited in the computer register, causing the VLF and sine, cosine channels to be missing - Nevertheless, this failure was repaired during the first stoppage of working (on day 40).
- During this survey, the following stoppages must be pointed out:

06.09.00 to 06.05.30 : unknown reason.

51.18.20 to 51.19.40 : multiverter trouble

56.17.40 to 56.20.40 : Sercel interface trouble. Working must stop at 20.40 and start again the next day at 02.10

2. SEISMIC (Enclosures 3, 4, 41)

2.1 Seismic container (Enclosure 3)

2.1.1 Seismic amplifier P.T.700 (Enclosure 41)

This piece of equipment worked without a hitch during the whole survey.

2.1.2 Ampex recorder.

Very few problems arose with this piece of equipment:

00.25 during cruise 1 (05.01.20) and 02.23 during cruise 3 (63.18.32) for a faulty tacheometer lamp.

2.1.3 E.P.C. Recorders.

Very few problems with these recorders; except for EPC 4 on day 59 from 15.30 to 16.45; P.B were recorded on EPC 3 during this time.

From day 69.08.15 to 70.08.51, tests were carried out on the recorded speed - Ch 2 was recorded instead of Geotech on E.P.C.3 at the paper speed of 20 cm/hours.

It must be pointed, that, during the ship power plant failure, all records were stopped (day 41.51.73).

The following table gives the displays of records for each EPC.

EPC 1	EPC 2	EPC 3	EPC 4
02.17.50	02.17.50	02.17.50	02.17.50
Ch 2 slow speed	Ch 2 fast speed	Geotech	P.B
11.06.00	11.06.00	11.06.00	11.06.00
21.06.40	21.06.40	21.06.40	21.06.40
Ch 2 slow speed	Ch 2 fast speed		
27.00.08	27.00.08		
Ch 1 slow speed	Ch 1 fast speed	Geotech	P.B
32.00.15	32.00.15		
34.15.50	34.15.50		
Ch 2 slow speed	Ch 2 fast speed		
45.20.30	45.20.30	45.20.30	45.20.30

50.19.00	50.19.00	50.19.00	50.19.00
		Geotech	
		59.15.30	
		P.B	
		59.16.45	
Ch 2 slow speed	Ch 2 fast speed	Geotech	P.B
		69.08.15	
		Ch 2 + filters	
		70.08.51	
		Geotech	
75.17.00	75.17.00	75.17.00	75.17.00
		SONOBUOYS recorded	
		on this recorder	

2.1.4 Sonobuoys

The following table gives the result of sonobuoys used during survey 18:

	GOOD	BAD	TOTAL
Cruise 1	2	0	2
Cruise 2	13	4	17
Cruise 3	4	0	4
SURVEY 18	19	4	23

Sometimes, especially cruise 2, the results were quite satisfactory.

2.2. Sparker container (Enclosure 4)

Apart from the time devoted to clean the O.A.T, there was only one stoppage of the speaker due to an explosion of a capacitor(from 43.00.43 to 43.16.20).

The times used for cleaning the O.A.T are the following ones:

Cruise 1 : 00.54

Cruise 2 : 02.31

Cruise 3 : 03.03

Survey 18 : 06.28 i.e 0.54% of working time

2.3. Sparker generators

One of the two generators was stopped from 03.01.00 to 03.07.15 in order to fix the power output:

- Brushes were changed
- Output check volt meter was checked
- During the stoppage, shot interval was increased in order to get enough time to charge the capacitors of the sparker room with the other generator.

During cruise 2, both generators were stopped and checked, from 45.01.40 to 45.02.03, because the fan belt of one of the engines was broken.

3. SOUNDERS

3.1. Elac Sounder

Some troubles occured during cruise 3:

* from 53.13.40 to 53.13.57 : time mark troubles.
* from 65.05.52 to 65.06.07 : motor-brushes
* from 68.14.20 to 68.14.40 : motor-brushes

i.e. 52' of stoppage i.e 0.07% of working time

3.2 Atlas Sounder

As this survey took place in deep water, this sounder was not used most of the time. Nevertheless, maintenance check were carried out during cruise 1.

3.3 Raytheon Sounder

Satisfactory results were obtained with this system during this cruise, although it does not track when the bottom become too deep.

4. MAGNETISM

Behaviour of the system was quite satisfactory during this survey; except during cruise 2 when a blown diode in the polarization circuit stopped the recording of data from 24.17.05 to 25.00.30.

During cruise 3, few small stoppages occured:

.62.10.44 to 62.10.58 : Rolling in of the cable which looked to be tangled with the Geotech cable

.56.18.35 to 56.20.40 : small break on the records due to work on D.A.S.

.57.19.10.to 57.20.05 : pen trouble on mag recorder (digital output O.K).

5. GRAVITY (Table 2 to 5)

Operation of this system was very satisfactory during this survey; only noteworthy stoppages:

- from 74.05.47 to 74.06.15; an amplifier is replaced in the A L circuit
- from 63.15.38 to 63.16 08; failure analog recorder.
- The following table give the quality of gravity results:

	Good	out of criteria	failure
Cruise 1	199.30	04.40	00.00
in % of WT	97.71%	2.29%	0%

Table 2

GRAVITY RESULTS cruise : I

DAYS	WORKING hours	Σ	FAILURES	Σ	GOOD	Σ	OUT OF CRITERIA	Σ
02	17.50 to 24.00	06.10		0	17.50 to 24.00	06.10		0
03	00.00 to 24.00	24.00		0	00.00 to 24.00	24.00		0
04	"	24.00		0	"	24.00		0
05	"	24.00		0	"	24.00		0
06	"	24.00		0	"	24.00		0
07	"	24.00		0	00.00 to 10.05 11.25 to 24.00	22.40	10.05 to 11.25	01.20
08	"	24.00		0	00.00 to 13.15 16.35 to 24.00	20.40	13.15 to 16.35	03.20
09	"	24.00		0	00.00 to 24.00	24.00		0
10	"	24.00		0	"	24.00		0
11	00.00 to 06.00	06.00		0	00.00 to 06.00	06.00		0
TOTAL		204.10	TOTAL	0	TOTAL	199.30	TOTAL	04.40

Table 3

GRAVITY RESULTS cruise : 2

DAYS	WORKING hours	Σ	FAILURES	Σ	GOOD	Σ	OUT OF CRITERIA	Σ
21	06.40 to 24.00	17.20		0	06.40 to 24.00	17.20		0
22	00.00 to 24.00	24.00		0	00.00 to 24.00	24.00		0
23	"	24.00		0	"	24.00		0
24	"	24.00		0	"	24.00		0
25	"	24.00		0	"	24.00		0
26	"	24.00		0	"	24.00		0
27	"	24.00		0	"	24.00		0
28	"	24.00		0	"	24.00		0
29	"	24.00		0	"	24.00		0
30	"	24.00		0	"	24.00		0
31	"	24.00		0	"	24.00		0
32	00.00 to 02.15			0	00.00 to 02.15	02.15		0
33				NO	PRODUCTION			
34	15.50 to 24.00	08.10		0	15.50 to 24.00	08.10		0
35	00.00 to 24.00	24.00		0	00.00 to 24.00	24.00		0
36	"	24.00		0	"	24.00		0
37	"	24.00		0	"	24.00		0
38	"	24.00		0	"	24.00		0
39	"	24.00		0	"	24.00		0
40	00.00 to 06.00 14.20 to 24.00	15.40		0	00.00 to 06.00 14.20 to 24.00	15.40		0
41	00.00 to 24.00	24.00		0	00.00 to 24.00	24.00		0
42	"	24.00		0	"	24.00		0
43	16.20 to 24.00	11.10		0	16.20 to 24.00	11.10		0
44	00.00 to 24.00	24.00		0	00.00 to 24.00	24.00		0
45	00.00 to 20.30	20.30		0	00.00 to 20.30	20.30		0
	TOTAL	507.05	TOTAL	0	TOTAL	507.05	TOTAL	0

Table 4

GRAVITY RESULTS cruise : 3

DAYS	WORKING hours	Σ	FAILURES	Σ	GOOD	Σ	OUT OF CRITERIA	Σ
50	19.00 to 24.00	05.00			19.00 to 24.00	05.00		0
51	00.00 to 24.00	24.00		0	00.00 to 24.00	24.00		0
52	"	24.00			"	24.00		0
53	00.00 to 21.50	21.50		0	00.00 to 15.30 17.20 to 21.50	20.00	15.30 to 17.20	01.50
54				NO	PRODUCTION			
55								
56	03.10 to 20.40	17.30		0	04.30 to 20.40	16.10	03.10 to 04.30	01.20
57	02.10 to 24.00	21.50		0	02.10 to 24.00	21.50		0
58	00.00 to 24.00	24.00		0	00.00 to 24.00	24.00		0
59	"	24.00		0	00.00 TO 06.30 07.30 TO 09.00 11.10 TO 19.00 22.10 TO 24.00	17.40	06.30 TO 07.30 09.00 TO 11.10 19.00 TO 22.10	06.20
60	00.00 to 05.30	05.30		0	00.00 to 05.30	05.30		0
61				NO	PRODUCTION			
62	04.30 to 23.15	18.45		0	04.30 to 23.15	18.45		0
63	07.40 to 24.00	16.20		0	07.40 to 24.00	16.20		0
64	00.00 to 24.00	24.00		0	00.00 to 24.00	24.00		0
65	"	24.00		0	"	24.00		0
66	"	24.00		0	"	24.00		0
67	"	24.00		0	"	24.00		0
68	"	24.00		0	"	24.00		0
69	"	24.00		0	"	24.00		0
70	"	24.00		0	"	24.00		0
71	"	24.00		0	"	24.00		0
72	"	24.00		0	"	24.00		0
73	"	24.00		0	"	24.00		0
74	00.00 to 10.00 17.00 to 24.00	17.00	05.47 to 06.15	00.28	00.00 TO 05.47 06.15 TO 10.00 17.00 TO 24.00	16.32		0
	TOTAL	459.45	TOTAL	00.28	TOTAL	449.47	TOTAL	09.30

Table:5

GRAVITY RESULTS cruise: 3

DAYS	WORKING hours	Σ	FAILURES	Σ	GOOD	Σ	OUT OF CRITE[illegible]	Σ
		459.45		00.28		449.47		09.30
75	00.00 to 17.00	17.00		0	00.00 to 17.00	17.00		0
	TOTAL	476.45	TOTAL	00.28	TOTAL	466.47	TOTAL	09.30

	Good	out of criteria	failure
Cruise 2	507.05	00.00	00.00
in % of WT	100%	0%	0%
Cruise 3	446.47	09.30	00.28
in % of WT	97.90%	1.99%	0.11%
Survey	1173.22	14.10	00.28
in % of WT	98.77%	1.19%	0.04%

6. NAVIGATION

6.1 Gyro Compass and Autopilot

Two failures occured during this survey:

- From day 41.09.53 to 41.10.30 : during this interruption, the ship was steered by hand, autopilot and gyro compass being out of use.
- From day 74.03.47 to 74.03.53 : gyro compass out.

6.2 Navigation clock

The master clock was running to rapidly, because of sparker interference. In order to avoid too large discrepencies between real time and "clock time", the masterclock was ajusted on the time signal given by navigation satellites. All the troubles were over on Day 57.11.15.

6.3 Sin-Cos Potentiometer

Cruise 1 and 2 was used to design and build a new preamplifier for this system. (cruise 2, the potentiometer was already working, but giving too inaccurate results).

On cruise 3, day 59.00.28, the system was stopped to fit the new amplifier and filters. Everything was working satisfactorily on day 64 and put into DAS at 10.19.

During following four days, final adjustments and calibrations were carried out. Unfortunately on day 68 due to a faulty channel on the multiverter, only sine digital values were output.

6.4. Sagem interface.

No problems during this survey

6.5. V.L.F. (Fig 30,31,32)

The time of good reception of various V.L.F. stations is given in figures 30,31,32 for cruise 1,2,3 respectively.

* Cruise 1

- VLF Stations NWC, NDT and GBR gave good results.
- Omega stations, Aldra,Trinidad, Haiku and VLF station NPM gave poor results.

* Cruise 2

The results are similar to those of cruise 1 except with regard to Omega station Aldra which gave good results half of the time.

* Cruise 3

- VLF stations except NPM were generally good.
- Omega stations :

Aldra gave good results mostly at night time.
Haiku gave some results at the end of the cruise but was generally unreliable
Trinidad was unusable.

- On day 67 from 10.28 to 14.05, digital recording of NWC for maintenance on its multiverter's channel.

GOOD RECEPTIONS
V . L . F . Cruise : I

DAYS				N D T	G B R	N W C
02				GOOD	GOOD	GOOD
03						
04						
05						
06						
07						
08						
09						
10						
11						

FIG 30

GOOD RECEPTIONS
V . L . F . Cruise : 2

DAYS	A L D R A			N D T	G B R	N W C
21	12 . 00 to 24 . 00				12 . 00 to 24 . 00	06 . 40 to 24 . 00
22	00 . 00 to 07 . 00 18 . 00 to 24 . 00				00 . 00 to 01 . 00 20 . 00 to 24 . 00	00 . 00 to 24 . 00
23	01 . 00 to 06 . 00 19 . 00 to 24 . 00				20 . 00 to 24 . 00	03 . 00 to 24 . 00
24	19 . 00 to 24 . 00			21 . 00 to 24 . 00	12 . 00 to 24 . 00	00 . 00 to 24 . 00
25	05 . 00 to 05 . 00 10 . 00 to 11 . 00 20 . 00 to 24 . 00				18 . 00 to 24 . 00	"
26	00 . 00 to 02 . 00 19 . 00 to 24 . 00				19 . 00 to 24 . 00	"
27	00 . 00 to 05 . 00 22 . 00 to 24 . 00			14 . 00 to 15 . 00 20 . 00 to 24 . 00	13 . 00 to 24 . 00	"
28	00 . 00 to 05 . 00 20 . 00 to 24 . 00			09 . 00 to 11 . 00 15 . 00 to 22 . 00	15 . 00 to 24 . 00	"
29	00 . 00 to 04 . 00 19 . 00 to 23 . 00			00 . 00 to 02 . 00 07 . 00 to 09 . 00 12 . 00 to 24 . 00	00 . 00 to 02 . 00 19 . 00 to 24 . 00	"
30	00 . 00 to 06 . 00 18 . 00 to 24 . 00			10 . 00 to 24 . 00	00 . 00 to 05 . 00 07 . 00 to 08 . 00 12 . 00 to 24 . 00	02 . 00 to 24 . 00
31	00 . 00 to 03 . 00 18 . 00 to 24 . 00			00 . 00 to 06 . 00 10 . 00 to 24 . 00	00 . 00 to 03 . 00 13 . 00 to 24 . 00	00 . 00 to 02 . 00 08 . 00 to 24 . 00
32	00 . 00 to 02 . 15			00 . 00 to 02 . 15	00 . 00 to 02 . 15	00 . 00 to 02 . 15
34	20 . 00 to 24 . 00			15 . 50 to 24 . 00	15 . 50 to 24 . 00	15 . 50 to 24 . 00
35	00 . 00 to 02 . 00 20 . 00 to 24 . 00			00 . 00 to 16 . 00 21 . 00 to 24 . 00	00 . 00 – 03 . 00 14 . 00 – 16 . 00 08 . 00 – 12 . 00 22 . 00 – 24 . 00	00 . 00 to 24 . 00
36	00 . 00 to 04 . 00 19 . 00 to 24 . 00			00 . 00 to 24 . 00	00 . 00 to 05 . 00 11 . 00 to 12 . 00 19 . 00 to 24 . 00	"
37	00 . 00 to 04 . 00 15 . 00 to 24 . 00			00 . 00 to 02 . 00 07 . 00 to 12 . 00 21 . 00 to 22 . 00	00 . 00 to 05 . 00 13 . 00 to 15 . 00 22 . 00 to 23 . 00	02 . 00 to 24 . 00
38	21 . 00 to 24 . 00			00 . 00 to 24 . 00	00 . 00 to 24 . 00	00 . 00 to 24 . 00
39	00 . 00 to 06 . 00 15 . 00 to 24 . 00			"	00 . 00 to 03 . 00 08 . 00 to 24 . 00	"
40	00 . 00 to 01 . 00 14 . 20 to 24 . 00			00 . 00 to 06 . 00 14 . 20 to 24 . 00	00 . 00 to 06 . 00 14 . 20 to 24 . 00	00 . 00 to 06 . 00 14 . 20 to 24 . 00
41	21 . 00 to 24 . 00			00 . 00 to 12 . 00 21 . 00 to 24 . 00	00 . 00 to 12 . 00 17 . 00 to 24 . 00	00 . 00 24 . 00
42	13 . 00 to 24 . 00			00 . 00 to 24 . 00	00 . 00 to 06 . 00 18 . 00 to 24 . 00	"
43	00 . 00 to 03 . 30 16 . 20 to 24 . 00			00 . 00 to 03 . 30 16 . 20 to 18 . 00	16 . 20 to 24 . 00	00 . 00 to 03 . 30 16 . 20 to 24 . 00
44	00 . 00 to 05 . 00 22 . 00 to 24 . 00			09 . 00 to 11 . 00 19 . 00 to 24 . 00	00 . 00 to 03 . 00 21 . 00 to 24 . 00	07 . 00 to 24 . 00
45	–			00 . 00 to 11 . 00	00 . 00 to 06 . 00 15 . 00 to 20 . 30	00 . 00 to 20 . 30

FIG 31

GOOD RECEPTIONS
V . L . F . Cruise : 3

DAYS	ALDRA		HAIKU	NDT	GBR	NWC
48						
49						
50				18 . 20 to 19 . 00		18 . 20 to 24 . 00
51	21 . 00 to 22 . 00			11 . 00 to 24 . 00	00 . 00 to 02 . 00 05 . 00 to 24 . 00	03 . 00 to 24 . 00
52	14 . 00 to 24 . 00			00 . 00 to 24 . 00	00 . 00 to 24 . 00	00 . 00 to 24 . 00
53	17 . 00 to 20 . 00			00 . 00 to 21 . 50	00 . 00 to 21 . 50	00 . 00 to 21 . 50
56	15 . 00 to 21 . 00			03 . 00 to 10 . 00 14 . 00 to 21 . 00	03 . 00 to 11 . 00 14 . 00 to 21 . 00	03 . 00 to 24 . 00
57	13 . 00 to 24 . 00			03 . 00 to 24 . 00	03 . 00 to 24 . 00	03 . 00 to 24 . 00
58	00 . 00 to 05 . 00 14 . 00 to 24 . 00			07 . 00 to 11 . 00	00 . 00 to 24 . 00	00 . 00 to 24 . 00
59	00 . 00 to 05 . 00 13 . 00 to 24 . 00			06 . 00 to 24 . 00	"	"
60	00 . 00 to 05 . 30			00 . 00 to 05 . 30	00 . 00 to 05 . 30	00 . 00 to 05 . 30
62	04 . 30 to 06 . 00 13 . 00 to 22 . 00			04 . 30 to 12 . 00 16 . 00 to 19 . 00	04 . 30 to 07 . 00 13 . 00 to 24 . 00	04 . 30 to 24 . 00
63	14 . 00 to 24 . 00			07 . 40 to 24 . 00	07 . 40 to 12 . 00 21 . 00 to 24 . 00	07 . 40 to 24 . 00
64	00 . 00 to 02 . 00 13 . 00 to 24 . 00			00 . 00 to 10 . 00 17 . 00 to 24 . 00	00 . 00 to 10 . 00 14 . 00 to 24 . 00	00 . 00 to 24 . 00
65	00 . 00 to 01 . 00 13 . 00 to 24 . 00			06 . 00 to 24 . 00	00 . 00 to 13 . 00 16 . 00 to 24 . 00	03 . 00 to 24 . 00
66	00 . 00 to 05 . 00 13 . 00 to 24 . 00			00 . 00 to 24 . 00	00 . 00 to 24 . 00	00 . 00 to 24 . 00
67	00 . 00 to 06 . 00 18 . 00 to 24 . 00			00 . 00 to 04 . 00 18 . 00 to 24 . 00	"	00 00 to 10 . 00 15 . 00 to 24 . 00
68	00 . 00 to 03 . 00 13 . 00 to 23 . 00			00 . 00 to 24 . 00	"	00 . 00 to 24 . 00
69	13 . 00 to 22 . 00		02 . 00 to 03 . 00	00 . 00 to 22 . 00	"	"
70	13 . 00 to 24 . 00			00 . 00 to 09 . 00 20 . 00 to 24 . 00	"	"
71	00 . 00 to 04 . 00 12 . 00 to 24 . 00		00 . 00 to 04 . 00	03 00 to 22 . 00	00 . 00 to 10 . 00	"
72	00 . 00 to 05 . 00 13 . 00 to 24 . 00		00 . 00 to 04 . 00	08 . 00 to 24 . 00	00 . 00 to 24 . 00	06 . 00 to 24 . 00
73	15 . 00 to 18 . 00			00 . 00 to 18 . 00	"	00 . 00 to 24 . 00
74	19 . 00 to 22 . 00			00 . 00 to 09 . 00 17 . 00 to 24 . 00	08 . 00 to 09 . 00 17 . 00 to 24 . 00	00 . 00 to 09 . 00 17 . 00 to 24 . 00
75	15 . 00 to 16 . 00		00 . 00 to 02 . 00	00 . 00 to 17 . 00	00 . 00 to 17 . 00	00 . 00 to 17 . 00

FIG. 32

6.6 Satellite System

6.6.1.. Equipment:

This system stopped when power supply from the ship failed. Only one problem arose with this system: on day 72,73 due to a malfunctioning of the keyboard of the ASR 33 teletype, which prevented the replay of punched satellite data tapes.

6.6.2 Results

The quality of fixes recorded during Survey 18 is shown in the following tables and figure

* Plot of raw and smoothed frequency of satellite fixes:

  Cruise 1 fig No. 1

  Cruise 2 fig No. 2,3,4

  Cruise 3 fig No. 5,6,7

* List of satellite fixes given for each satellite used

  - first column : satellite fix time
  - second column : raw frequency
  - third column : smoothed frequency
  - fourth column : weight given by the program to the satellite fix.

  Cruise 1 Table No 6,7

  Cruise 2 Table No 8,9

  Cruise 3 Table No 10,11

* List of satellite fixes given in increasing time order.

  - first column is : smoothed frequency
  - second column is : raw frequency
  - third column is : weight given by navigator on board M/V Lady Christine

Fig 1

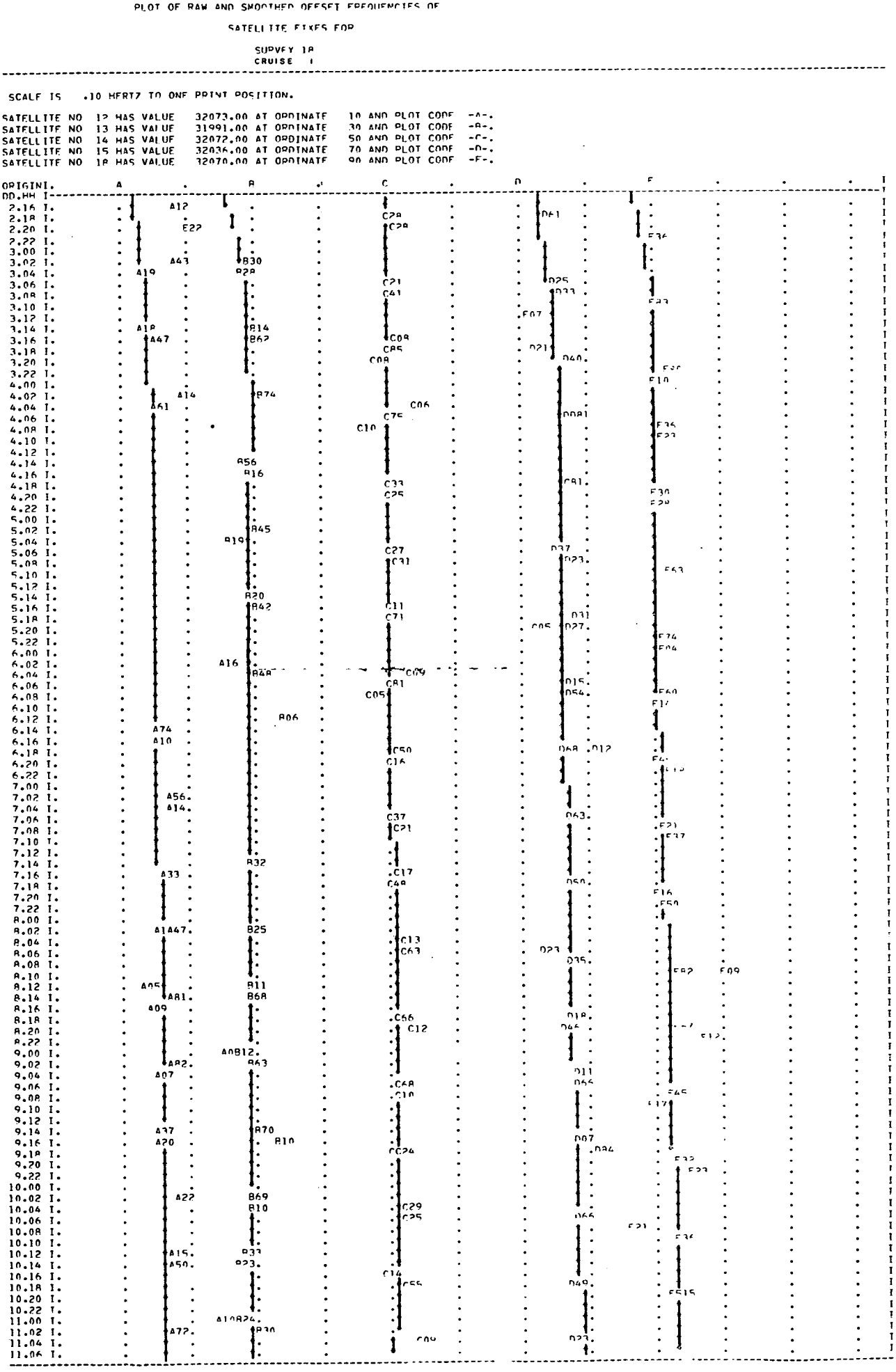

PLOT OF RAW AND SMOOTHED OFFSET FREQUENCIES OF
SATELLITE FIXES FOR
SURVEY 18
CRUISE 1
SCALE IS .10 HERTZ TO ONE PRINT POSITION.
SATELLITE NO 12 HAS VALUE 32073.00 AT ORDINATE 10 AND PLOT CODE -A-.
SATELLITE NO 13 HAS VALUE 31991.00 AT ORDINATE 30 AND PLOT CODE -B-.
SATELLITE NO 14 HAS VALUE 32072.00 AT ORDINATE 50 AND PLOT CODE -C-.
SATELLITE NO 15 HAS VALUE 32036.00 AT ORDINATE 70 AND PLOT CODE -D-.
SATELLITE NO 18 HAS VALUE 32070.00 AT ORDINATE 90 AND PLOT CODE -E-.
ORIGINI.
DD.HH I
A
B
C
D
E

Fig 2

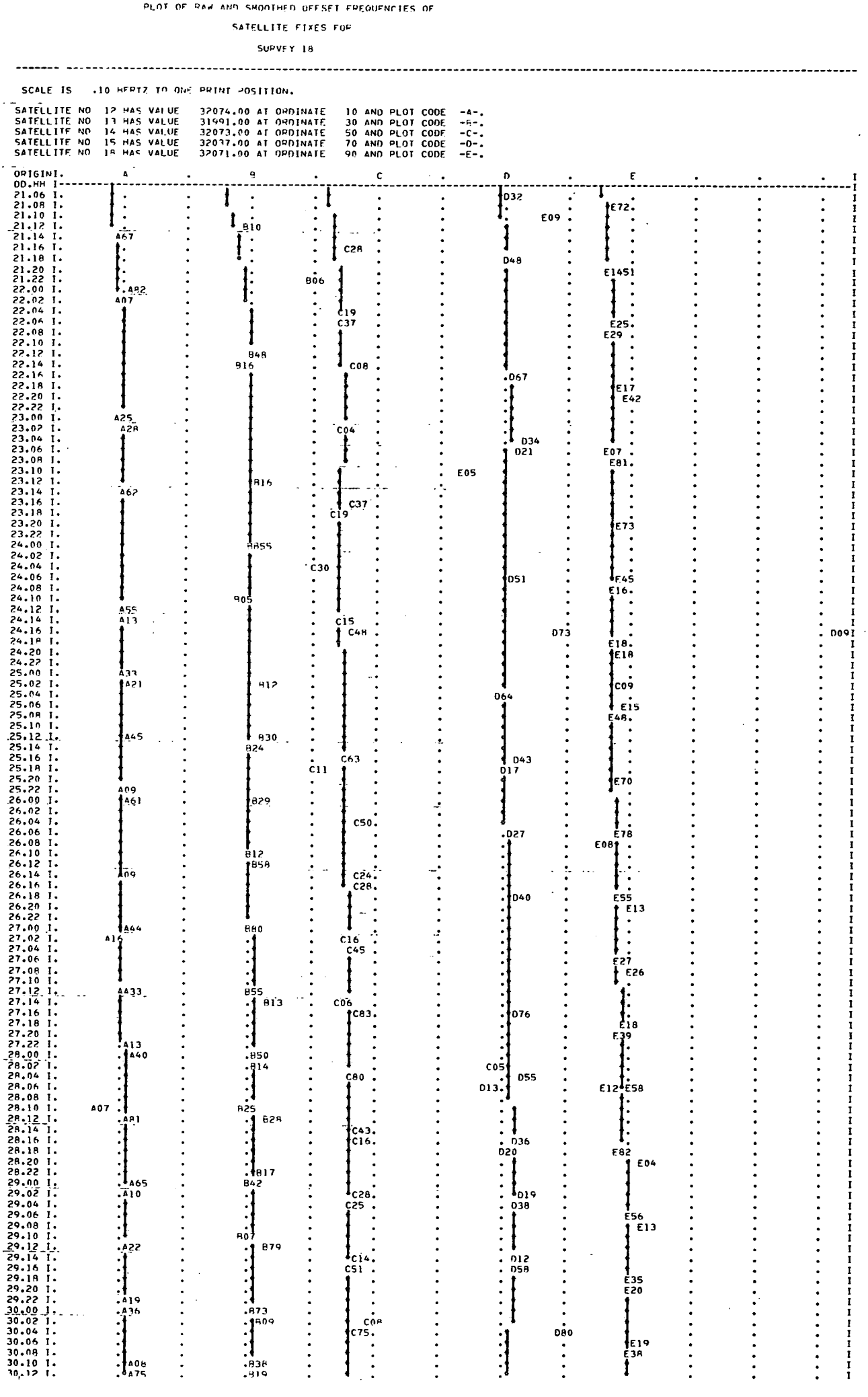

PLOT OF RAW AND SMOOTHED OFFSET FREQUENCIES OF
SATELLITE FIXES FOR
SURVEY 18
SCALE IS .10 HERTZ TO ONE PRINT POSITION.
SATELLITE NO 12 HAS VALUE 32074.00 AT ORDINATE 10 AND PLOT CODE -A-.
SATELLITE NO 13 HAS VALUE 31991.00 AT ORDINATE 30 AND PLOT CODE -B-.
SATELLITE NO 14 HAS VALUE 32073.00 AT ORDINATE 50 AND PLOT CODE -C-.
SATELLITE NO 15 HAS VALUE 32037.00 AT ORDINATE 70 AND PLOT CODE -D-.
SATELLITE NO 18 HAS VALUE 32071.00 AT ORDINATE 90 AND PLOT CODE -E-.
ORIGIN I. A . B . C . D . E . I
DD.HH I

Fig 3

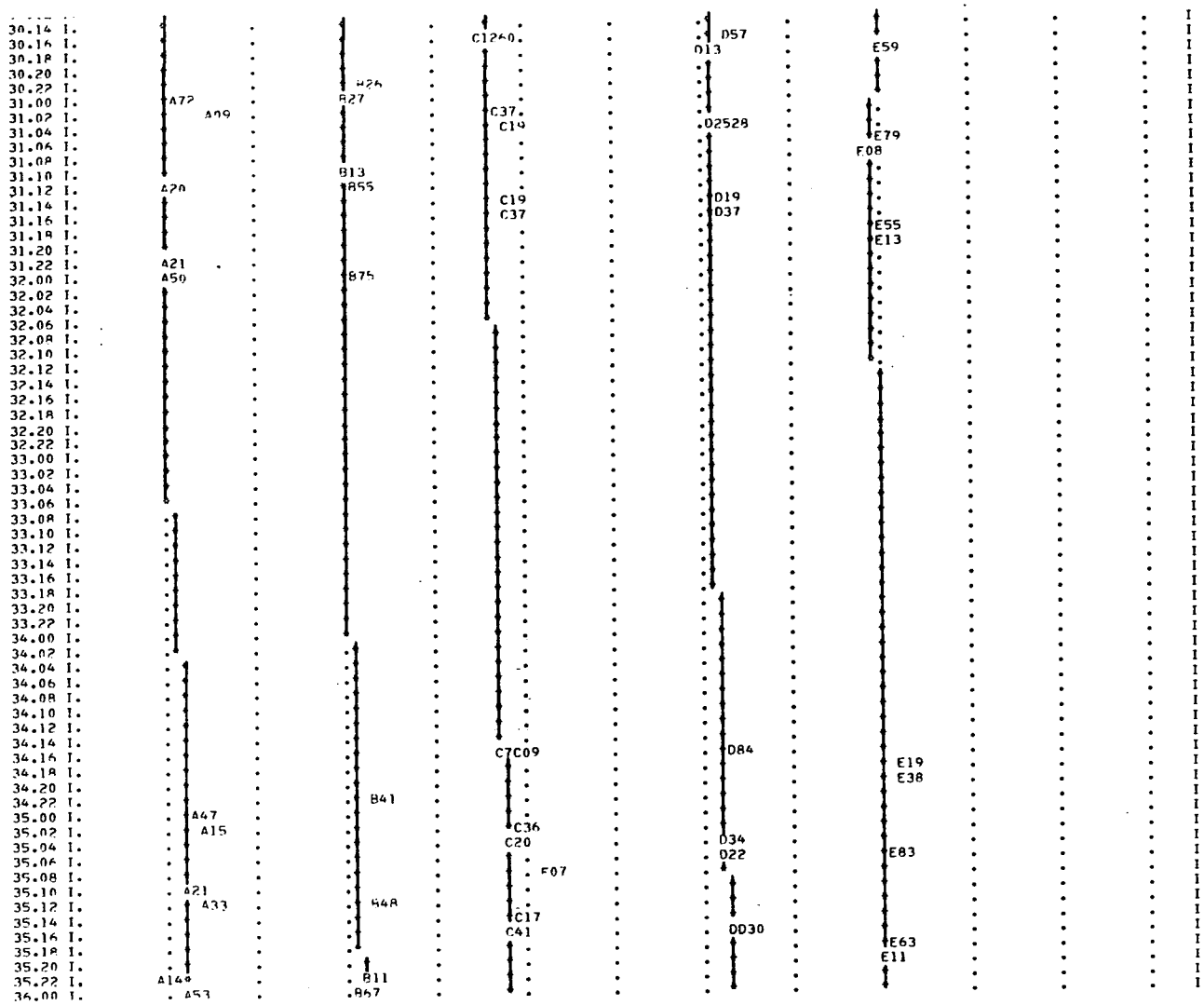

30.14 I.
30.16 I.
30.18 I.
30.20 I.
30.22 I.
31.00 I.
31.02 I.
31.04 I.
31.06 I.
31.08 I.
31.10 I.
31.12 I.
31.14 I.
31.16 I.
31.18 I.
31.20 I.
31.22 I.
32.00 I.
32.02 I.
32.04 I.
32.06 I.
32.08 I.
32.10 I.
32.12 I.
32.14 I.
32.16 I.
32.18 I.
32.20 I.
32.22 I.
33.00 I.
33.02 I.
33.04 I.
33.06 I.
33.08 I.
33.10 I.
33.12 I.
33.14 I.
33.16 I.
33.18 I.
33.20 I.
33.22 I.
34.00 I.
34.02 I.
34.04 I.
34.06 I.
34.08 I.
34.10 I.
34.12 I.
34.14 I.
34.16 I.
34.18 I.
34.20 I.
34.22 I.
35.00 I.
35.02 I.
35.04 I.
35.06 I.
35.08 I.
35.10 I.
35.12 I.
35.14 I.
35.16 I.
35.18 I.
35.20 I.
35.22 I.
36.00 I.
A72
A99
A20
A21
A50
A47
A15
A21
A33
A144
A53
B26
B27
B13
B55
B75
B41
B48
B11
B67
C12
C40
C37
C19
C19
C37
C7
C09
C36
C20
F07
C17
C41
D57
D13
D2528
D19
D37
D84
D34
D22
DD30
E59
E79
F08
E55
E13
E19
E38
E83
E63
E11

Fig 4

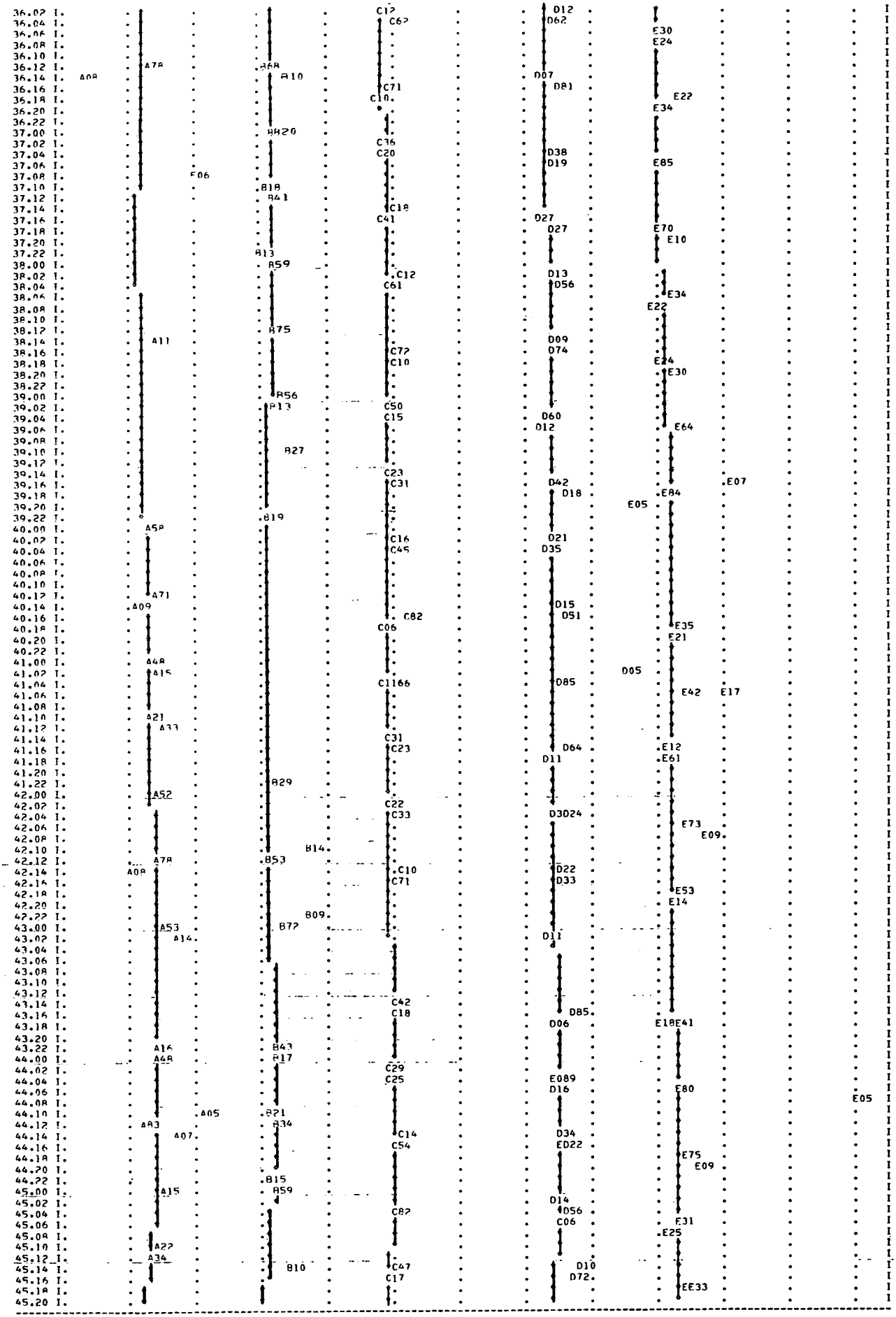


Fig 5

PLOT OF RAW AND SMOOTHED OFFSET FREQUENCIES OF
SATELLITE FIXES FOR
SURVEY 18

SCALE IS .10 HERTZ TO ONE PRINT POSITION.

SATELLITE NO 12 HAS VALUE 32074.00 AT ORDINATE 10 AND PLOT CODE -A-.
SATELLITE NO 13 HAS VALUE 31991.60 AT ORDINATE 30 AND PLOT CODE -B-.
SATELLITE NO 14 HAS VALUE 32073.60 AT ORDINATE 50 AND PLOT CODE -C-.
SATELLITE NO 15 HAS VALUE 32074.80 AT ORDINATE 70 AND PLOT CODE -D-.
SATELLITE NO 18 HAS VALUE 32072.00 AT ORDINATE 90 AND PLOT CODE -E-.

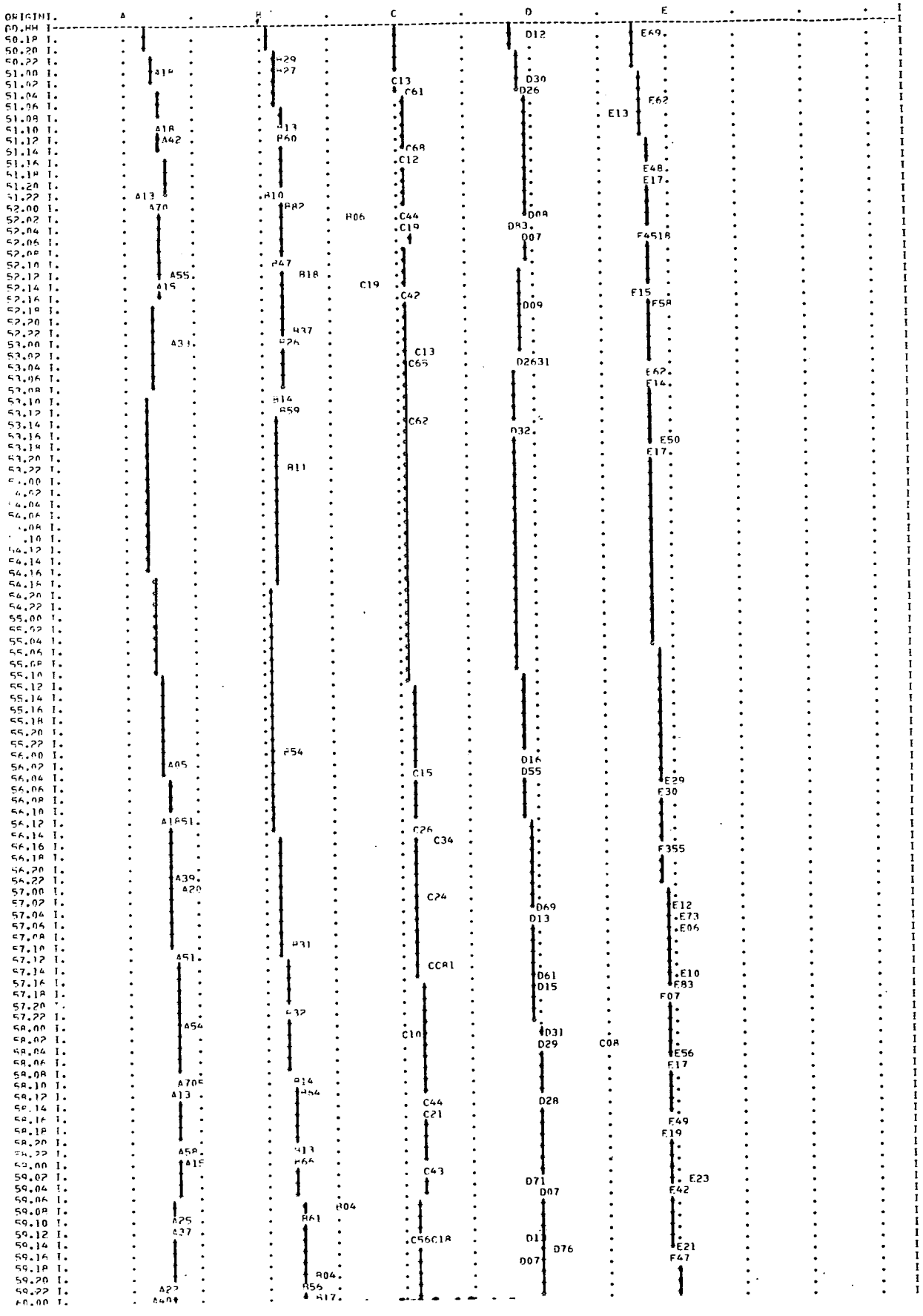


Fig 6

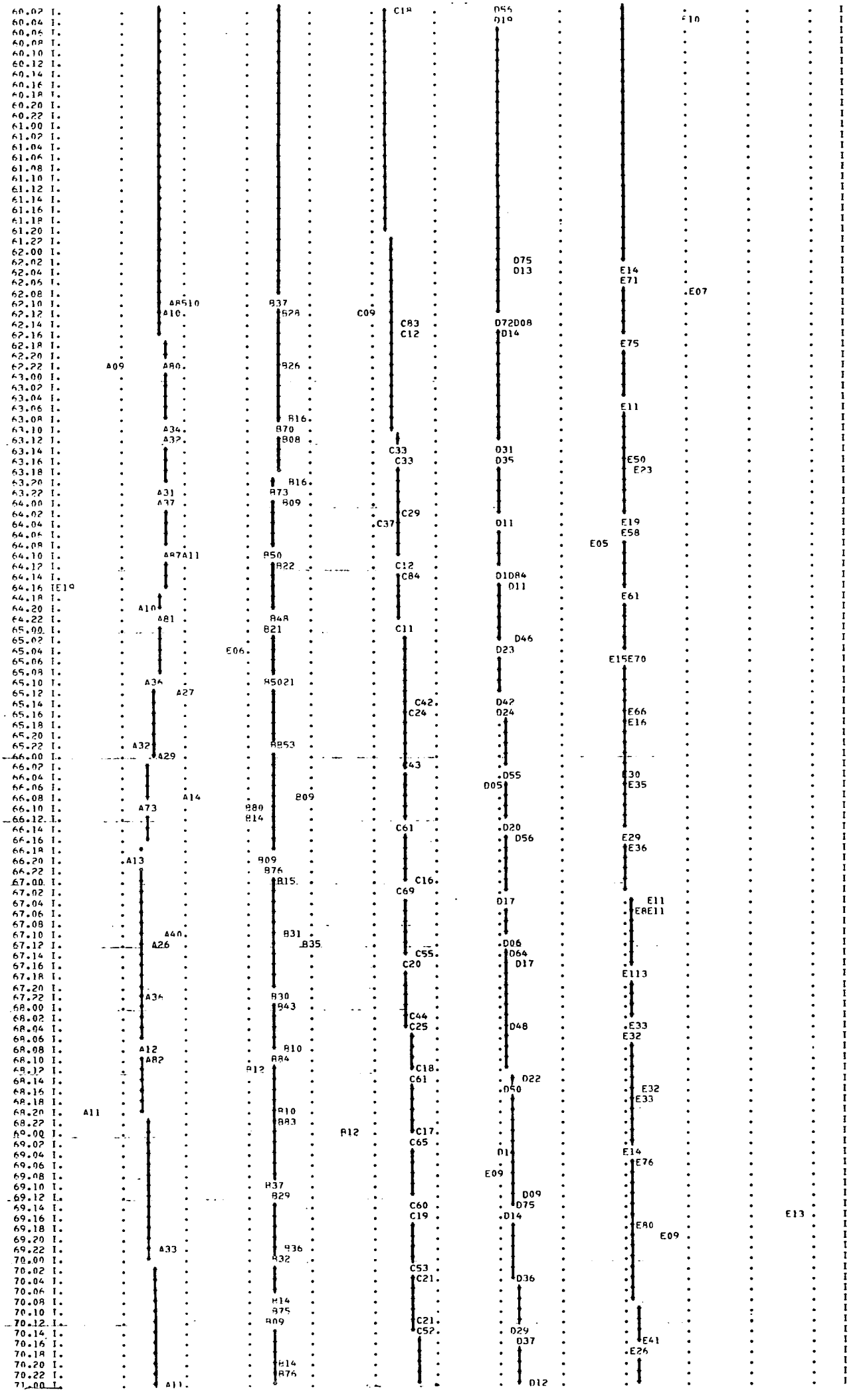
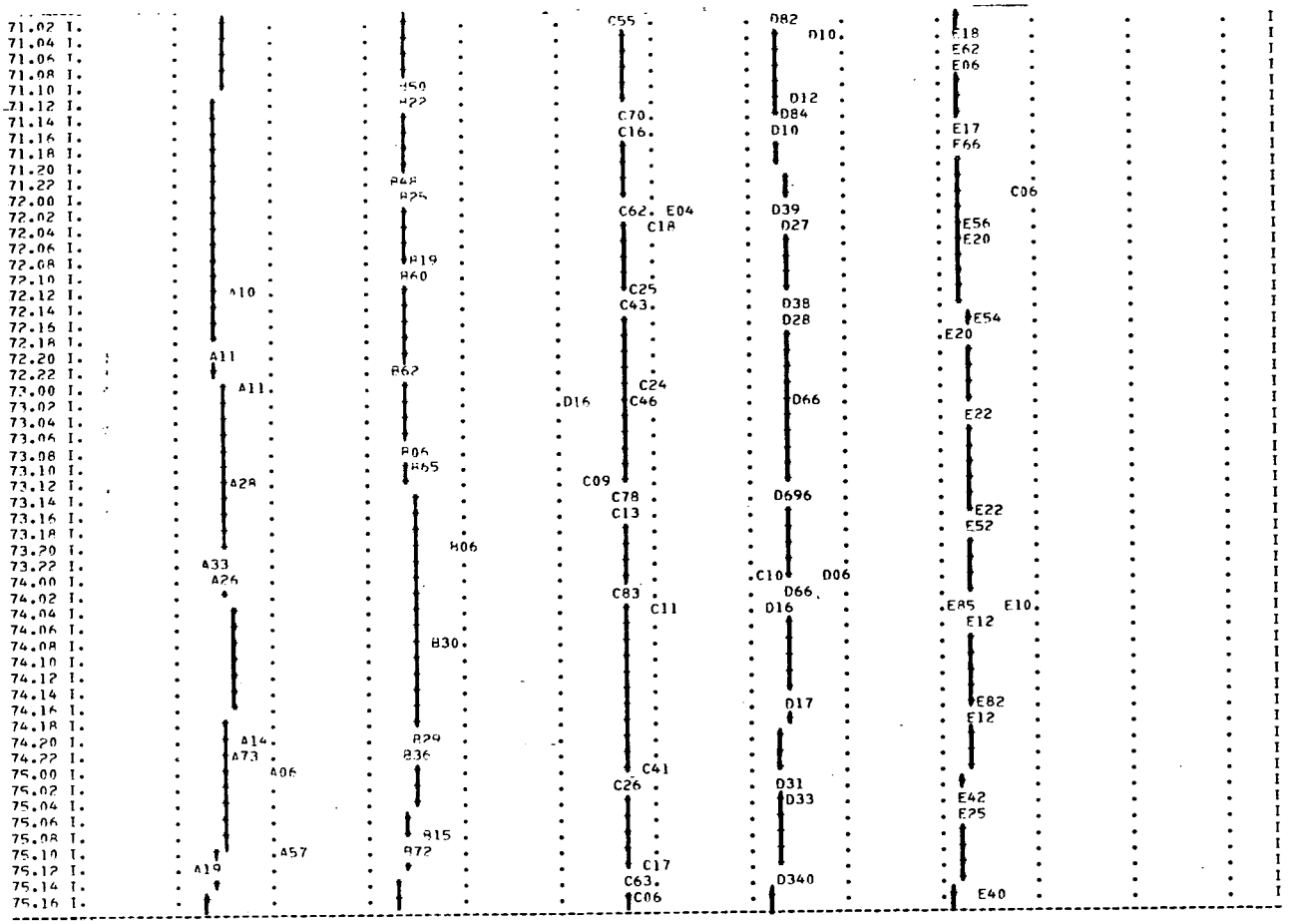


Fig 7


71.02 I.
71.04 I.
71.06 I.
71.08 I.
71.10 I.
71.12 I.
71.14 I.
71.16 I.
71.18 I.
71.20 I.
71.22 I.
72.00 I.
72.02 I.
72.04 I.
72.06 I.
72.08 I.
72.10 I.
72.12 I.
72.14 I.
72.16 I.
72.18 I.
72.20 I.
72.22 I.
73.00 I.
73.02 I.
73.04 I.
73.06 I.
73.08 I.
73.10 I.
73.12 I.
73.14 I.
73.16 I.
73.18 I.
73.20 I.
73.22 I.
74.00 I.
74.02 I.
74.04 I.
74.06 I.
74.08 I.
74.10 I.
74.12 I.
74.14 I.
74.16 I.
74.18 I.
74.20 I.
74.22 I.
75.00 I.
75.02 I.
75.04 I.
75.06 I.
75.08 I.
75.10 I.
75.12 I.
75.14 I.
75.16 I.
A10
A11
A11.
A28
A33
A26
A14
A73
A06
A57
A19
B50
B22
B48
B25
B19
B60
B62
B06
B65
B06
B30.
B29
B36
B15
B72
C55
C70.
C16.
C62. E04
C18
C25
C43.
C24
C46
D16
C09
C78
C13
C83
C11
C41
C26
C17
C63.
C06
D82
D10.
D12
D84
D10
D39
D27
D38
D28
D66
D696
C10
D06
D66
D16
D17
D31
D33
D340
E18
E62
E06
E17
F66
C06
E56
E20
E54
E20
E22
E22
E52
E85
E10.
E12
E82
E12
E42
E25
E40

(function of Satellite fix quality)

- fourth column is : elevation.
- fifth column is : number of satellite
- sixth column is : satellite fix time
- seventh column is : survey number
- eighth column is : difference smoothed - raw frequency

Cruise 1 Tables No. 12

Cruise 2 Tables No. 13,14,15

Cruise 3 Tables No. 16,17,18

6.7 Sonar Doppler,Chernikeeff Log, Pressure Log,

6.7.1. Sonar Doppler

In addition to the stoppages due to the power supply failures of the ship the sonar doppler stopped from 73.03.00 to 73.06.00

6.7.2 Chernikeeff Log

Due to an electrical failure, this piece of equipment stopped from 11.11.15 to 11.12.40. Apart from this incident, this log worked in a satisfactory way during the whole survey.

6.7.3 Pressure Log

Except cruise 1, this log was out of order because of damaged pipes. It should be fixed before the beginning of the next survey.

6.7.4 Statistical analysis of the three navigation systems.

Tables 19/1 to 26 and figures 8 to 21 give the analysis of the operation of the various navigation systems. These tables and figures are described here:

* Tables composed of

  - Column 1 : Survey cruise
  - Column 2 : Number of Measurement
  - Column 3.4.5.6 : Speed given by Sat, SD,CL,PL.
  - Column 7.8.9 : Ratios $\frac{V.syst}{V.sat} = K$

  Cruise 1 : Tables 19/1 to 19/2

  Cruise 2 : Tables 21/1 to 21/5

  Cruise 3 : Tables 23/1 to 23/4

* Curves for the three systems (S.D, C.L., P.L.) with the ratios K as the abscissas and satellite speeds as the ordinates

  Cruise 1 : figures 8 to 10

  Cruise 2 : figures 14 & 15 (no plot for pressure log)

  Cruise 3 : figures 18 & 19 (no plot for pressure log)

* Histograms ratios/frequencies for the three systems

  Cruise 1 : figures 11 to 13

  Cruise 2 : figures 16 & 17 (no histogram for pressure log)

  Cruise 3 : figures 20 & 21 (no histogram for pressure log)

* Statistical results are grouped in table 20 for cruise 1, 22 for cruise 2, 24 for cruise 3. The synthesis of all these data are in tables 25 and 26, where μ is the mean and σ the standard deviation.

* The general behaviour of the working navigation systems was quite satisfactory. Nevertheless, the slow average speed must be pointed out:

NAVIGATIONAL SYSTEMS — STATISTICS RECAPITULATORY

CRUISES / SYSTEMS	1	2	3	4	5
Average of $K = \mu$					
Sonar Doppler	1.0382	1.0197	1.0435		
Chernikeeff log	0.9640	.9831	.9632		
Pressure log	0.9508	NOT	WORKING		
Standard deviation of $\mu = \sigma$					
Sonar Doppler	.0718	.0697	.0541		
Chernikeeff log	.0525	.0739	.0595		
Pressure log	.0919	—	—		
Absolute dispersion σ/μ					
Sonar Doppler	692	683	518		
Chernikeeff log	544	751	618		
Pressure log	966	—	—		

Table 25

SURVEY 18

NAVIGATION SYSTEMS : SYNTHESIS

Cruise	System	$\mu - \sigma$	$\mu + \sigma$	σ	Data $\in \mu \pm \sigma$ in %	Data with $K < 1$ in %	Scale factor $\leq K \leq$		Eliminated % by scale factor
1	SD	0.9664	1.1100	.0718	66.4 %	37.2 %	0.95	1.15	13.3 %
	CH	0.9115	1.0165	.0525	70.5 %	77.1 %	0.85	1.10	0.0 %
	PL	0.8589	1.0427	.0919	64.8 %	71.4 %	0.80	1.10	8.3 %
2	SD	0.9500	1.0894	.0697	71.0 %	33.9 %	0.90	1.10	7.1 %
	CH	0.9092	1.0570	.0739	74.2 %	58.4 %	0.85	1.10	6.4 %
	PL								
3	SD	0.9894	1.0976	.0541	68.8 %	20.4 %	0.95	1.15	6.9 %
	CH	0.9037	1.0227	.0595	71.1 %	73.2 %	0.85	1.05	9.2 %
	PL								
4	SD								
	CH								
	PL								
5	SD								
	PL								
	CH						$\leq K \leq$		

Table 26

* Cruise 1 : 7.47 knots (average satellite speed)
* Cruise 2 : 7.56 knots (average satellite speed)
* Cruise 3 : 8.46 knots (average satellite speed)

During Darwin call, intensive maintenance work was carried out on the ship to get rid of this slow speed:

* scrubbing of the hull. After inspection of the hull by divers there was found 4 feet of heavy grass below L.W.L and side and bottom hull was slimmed with large barnicles.
* Dismantling and overhaul of main engine turbo blower.

These repairs being made, speed test at sea showed an average speed of 9.3 knots, (full speed without any towing cable). Nevertheless the average speed at sea did not increase very much when operations began again; but the following remarks must be pointed out:

* Although the hull has been scrubbed, no paint has been applied.
* The propeller is not in very good condition (blades tips severely eroded)
* high ambient temperature and north Australian waters reduces engine efficiency. In order not to exceed limit temperature of the engine provided by the Deutz engine manufacter, propeller pitch had to be reduced.
* The normal marine engineering practice to run a massive engine at an economic working power output is to use approximately 80% of full power output. It will be a hazard to run a ship 24 hours a day at 100% of full power output.

After the Port Hedland call, where new maintenance was carried out on the main engine turbo-blower, the average speed increased again. It is noteworthy that the ship was sailing southwards, leaving tropical waters during this period.

7. CABLES

7.1 Main cable. (Fig 22)

Operations with this cable were satisfactory throughout the survey. One stoppage only was due to this cable.

During operations in Timor Sea, the cable was towed at 30 feet depth. After leaving Timor Sea, it was put again at 45 feet (cruise 2).

On cruise 3 leakage was found in the cable. On day 74.10.00, working stopped and the cable rolled in : 4 neutral parts were torn probably by sharks; 3 of them were replaced as the catamaran. Work began again at 17.00.

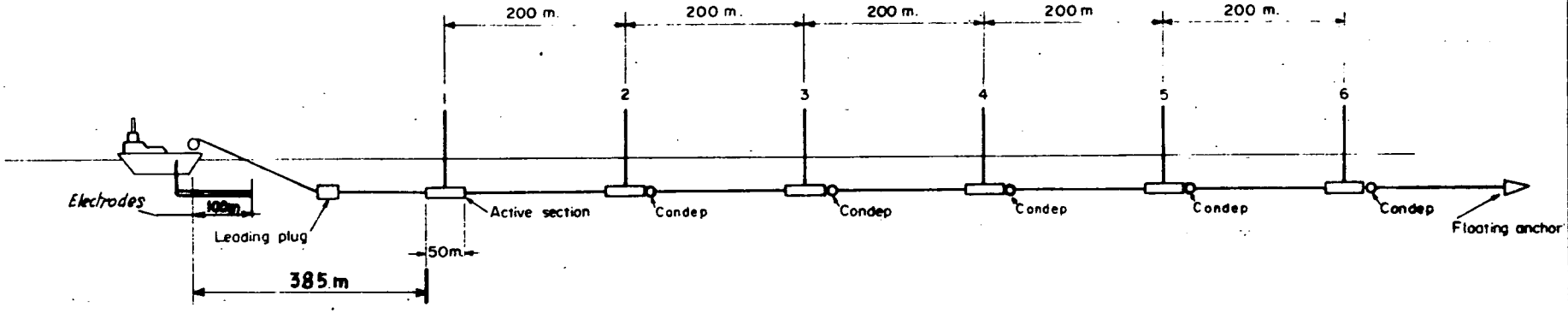
Noise levels for the main cable are described in figure 24 to 29 and tables 27,28; The maximum noise levels reached by each channel were:

Channel 1 = 30 µV
Channel 2 = 69 µV
Channel 3 = 34 µV
Channel 4 = 21 µV
Channel 5 = 36 µV
Channel 6 = 41 µV

The noise level seems to be increasing as the survey goes; probably that is due to the increased speed.

CGG STREAMER CABLE - 6 CHANNELS

1000 metres 48 hydrophones per trace



TRACE DIAGRAM 48 hydrophones HC 301 (2 sensors per phone)

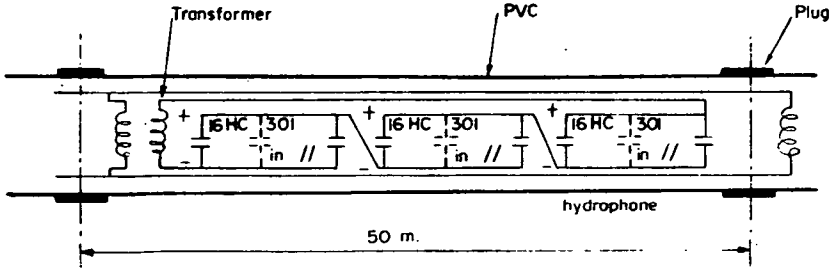
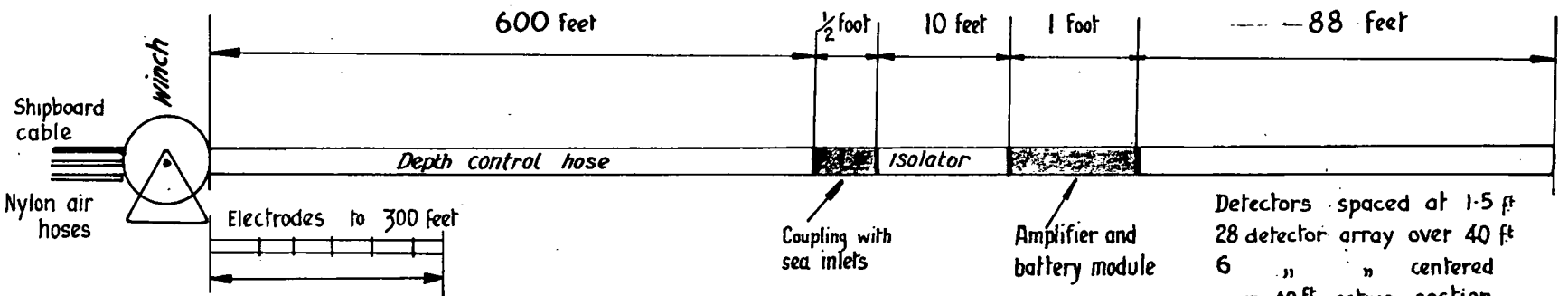


FIG. 22

GEOTECH CABLE



sketch not to scale.

FIG. 23

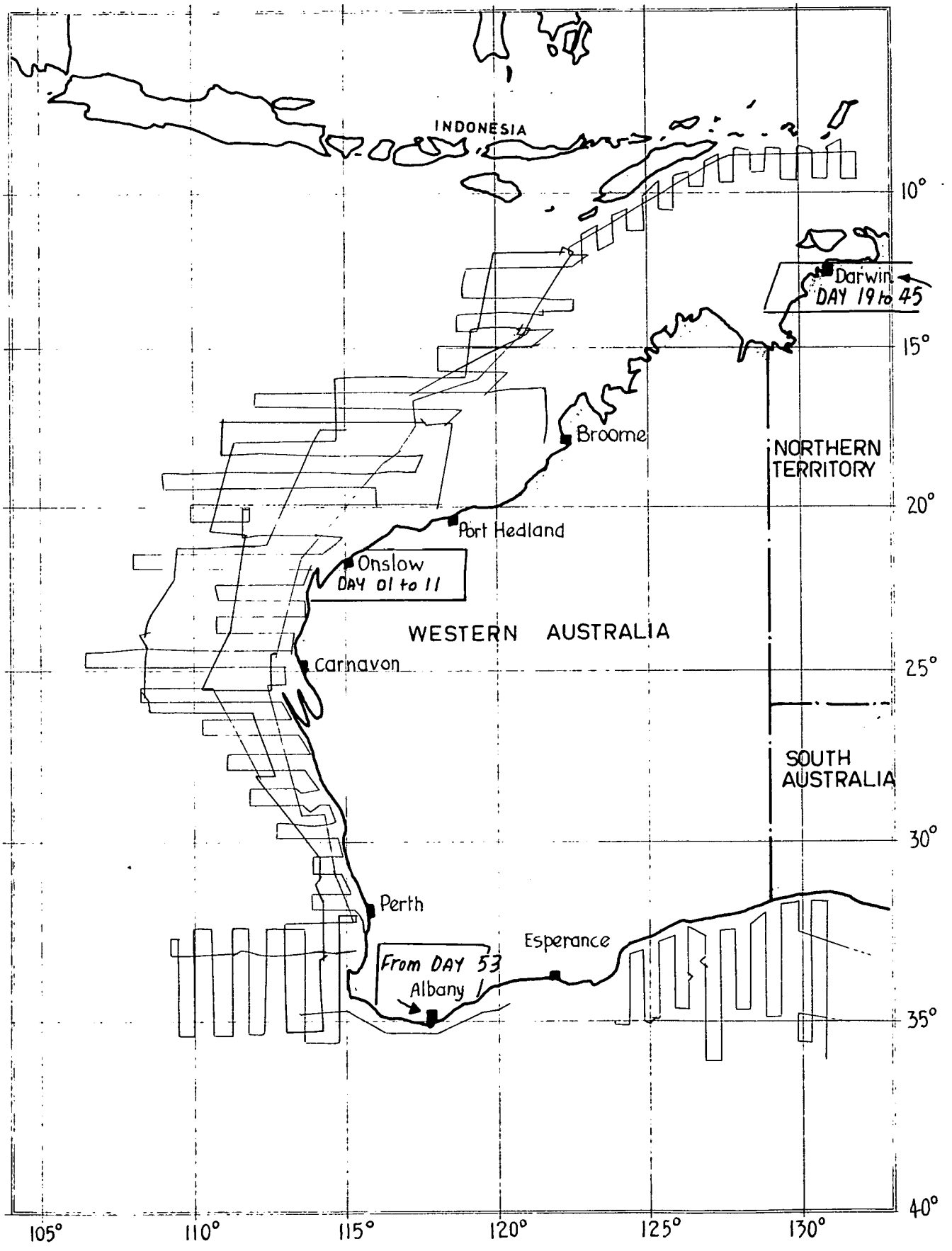
FIG B

SHORE STATIONS FOR

SOUTH, WEST and NORTH COASTS OF AUSTRALIA

SCALE 1 / 20000000

SURVEY 18



7.2 Geotech cable (Fig 23)

After 3 service days, this cable became noisy, because of interferences arising from the air conditioner of the seismic container - A solution was found by using another leading section between the winch and the seismic container. No records were made from 05.00.25 to 07.07.30.

On cruise 3 from 70.06.30 to 70.08.51, Geotech cable was out of use for maintenance work.

8. SHORE STATION (Fig B)

It was located at 3 different places

* Onslow from day 01 to 11
  Lat = 21° 38'15"
  Long= 115°06'35"
  IGRF= 52891

* Darwin from day 19 to 45
  Lat = 12° 25'30"
  Long = 130° 49'54"
  IGRF = 46446.9

* Emu point from 53.10.00 to the end of the Survey
  Lat = 35° 00'00"
  Long = 117° 56'00"
  IGRF = 60598

No noteworthy stoppages occured - Records were generally of good quality and showed various kinds of geomagnetic phenomena (day 37,38).

9. WEATHER (Tables 29 to 35)

The weather was generally fine, except during the first part of cruise 3 when a strong south-east wind stopped the survey for 68 hours 45 minutes i.e. 4.3% of total at sea of the survey (only stoppage for bad weather of this survey).

10. SUPPLY-BOAT

One supply boat was organised during cruise 2 to bring supplies aboard the M/V Lady Christine and disembark a technical officer of the Bureau ; The only supply-boat available being at Darwin, and the ship being at the East of TIMOR Island, the 2 ships were sailing for a rendezvous which took place on day 33.10.00 at the largest distance from Darwin authorized for the supply boat.

During cruise 3, a call at Fremantle during a stoppage for bad weather, has been used to go to Fremantle to take away some supplies.

Stoppages for supply boat represent 5.85% of the total time at sea.

11. SHIP-SHORE COMMUNICATIONS

The boat manager who was in charge of the communications during this survey carried with him the shore transceiver along the west coast of Australia. The communications were satisfactory.

SEA STATE CRUISE 1

DAY	Hour	WIND direction (degrés)	WIND speed (knots)	SEA direction	SEA high (feet)	SWELL direction	SWELL high (feet)	TENDENCY
2	0000							
	0600							
	1200							
	1800	200	14	AS WIND	5	205	8	Decreasing
3		"	14		5	210	8	
		240	10		4	"	8	
		220	13		5	"	8	Steady
		"	8		3	"	6	
4		330	3		1	"	5	Decreasing
		CALM				"	5	
		330	6		1	"	4	Steady
		"	6		1	"	4	
5		"	8		1	"	3	
		290	8		1	"	3	
		300	5		2	"	3	
		160	10		2	"	3	
6		"	10		2	"	3	
		"	10		2	"	3	
		"	8		2	"	3	
		140	10		3	"	3	Increasing
7		160	20		4	"	3	
		170	24		6	"	6	
		190	22		6	"	6	Steady
		"	20		6	"	6	
8		"	20		6	"	6	
		"	18		6	"	6	
		"	24		6	"	6	
		"	16		5	"	6	
9		"	20		6	"	6	
		200	18		6	"	6	
		180	10		4	"	4	Decreasing
		"	10		3	"	4	
10		210	13		3	"	4	Steady
		"	10		3	"	4	
		"	12		3	"	4	
		"	10		3	"	4	Decreasing
11		180	5		1	"	4	
		"	5		1	"	3	Steady
		"	5		1	"	3	
		"	5		1	"	3	
12		210	7		1	"	3	
		200	8		1	"	3	
		"	14		1	"	2	
		"	12		1	210	2	

SEA STATE CRUISE 2

DAY	Hour	WIND direction (degrés)	WIND speed (knots)	SEA direction	SEA high (feet)	SWELL direction	SWELL high (feet)	TENDENCY
21	0000	070	4	AS WIND	2	220	3	Steady
	0600	110	4		2	"	2	
	1200	080	10		3	"	2	
	1800	"	13		4	"	2	
22		"	12		4	"	2	
		"	14		4	"	2	
		"	20		5	-	-	
		"	14		4	-	-	
23		070	6		3	-	-	
		050	6		2	-	-	
		070	8		2	-	-	
		070	8		2	-	-	
24		-	-		-	120	3	
		-	-		-	"	3	
		-	-		-	"	3	
		-	-		-	"	2	
25		320	4		1	"	2	
		110	5		1	"	2	
		110	2		1	"	2	
		-	-		-	"	1	
26		-	-		-	"	1	
		110	5		2	"	1	
		"	10		2	"	1	
		"	10		2	"	1	
27		"	3		1	"	1	
		090	3		1	"	1	
		110	10		1	"	1	
		"	6		1	"	1	
28		"	6		1	"	1	
		090	8		1	"	1	
		080	8		1	"	1	
		"	8		1	"	1	
29		100	10		1	80	4	
		080	5		1	"	4	
		"	6		1	"	4	
		"	5		1	"	4	
30		110	5		1	"	4	
		110	5		1	"	4	
		080	8		1	"	3	
		CALM			SMOOTH	"	3	
31		080	3		1	"	3	
		CALM			SMOOTH	NIL	-	
		"			"	"	-	
		"			"	"	-	

SEA STATE CRUISE 2

DAY	Hour	WIND direction (degrés)	WIND speed (knots)	SEA direction	SEA high (feet)	SWELL direction	SWELL high (feet)	TENDENCY
32	0000	110	12	AS WIND	2	NIL	-	Increasing
	0600	090	10		2	080	2	steady
	1200	070	10		2	"	2	
	1800	"	10		2	"	2	
33		"	13		3	"	3	Increasing
		CALM	-	SMOOTH		"	3	Decreasing
		010	8		2	"	3	steady
		"	8		2	"	3	
34		100	9		2	"	3	
		"	12		2	"	3	Increasing
		80	14		3	"	3	steady
		"	14		3	"	3	
35		060	8		2	"	5	Decreasing
		080	8		2	"	5	
		"	6		2	"	5	steady
		"	6		2	"	4	
36		"	7		2	210	4	
		"	6		2	220	4	
		100	2		1	110	3	Decreasing
		CALM		SMOOTH		"	3	
37		100	6		1	220	3	Increasing
		130	4		1	"	3	
		180	10		2	"	3	
		"	8		2	"	6	steady
38		"	8		2	"	6	
		"	12		3	"	6	
		"	15		3	"	6	Increasing
		"	12		3	"	6	
39		"	13		3	"	6	steady
		"	10		2	"	6	
		"	12		3	"	6	
		"	12		3	"	6	
40		220	12		3	"	4	
		"	12		3	"	5	
		"	14		3	"	4	
		"	15		3	"	4	
41		"	12		3	"	6	
		"	12		3	"	6	
		"	18		4	"	6	Increasing
		"	18		4	"	6	steady
42		"	10		3	"	5	Decreasing
		"	10		3	"	5	steady
		"	10		3	"	4	
		"	5		2	"	4	

SEA STATE CRUISE 2

DAY	Hour	WIND direction (degrés)	WIND speed (knots)	SEA direction	SEA high (feet)	SWELL direction	SWELL high (feet)	TENDENCY
43	0000	270	8	AS WIND	2	220	4	
	0600	"	5		2	"	4	
	1200	"	5		2	"	4	
	1800	CALM	-		SMOOTH	"	4	
44		350	10		2	"	4	
		270	5		2	"	4	
		300	10		2	"	4	
		"	10		2	"	4	
45		"	8		2	"	4	
		"	12		3	240	4	Increasing
		"	12		3	"	6	
		300	12		3	220	6	

SEA STATE CRUISE 3

DAY	Hour	WIND direction (degrés)	WIND speed (knots)	SEA direction	SEA [illegible]	SWELL direction	SWELL high (feet)	TENDENCY
50	0000	090	6	AS WIND	1	220	3	
	0600	"	6		1	"	4	Stationnary
	1200	CALM			-	"	5	
	1800	"			-	"	6	
51		130	16		2	"	6	
		150	2		1	"	6	
		CALM			-	"	5	
		200	9		1	"	5	
52		190	16		2	"	6	Increasing
		180	8		2	"	6	steady
		170	8		2	"	5	
		"	16		2	"	6	
53		160	26		3	180	7	Increasing
		180	20		4	"	8	
		"	26		5	"	10	
		170	22		6	160	11	
54		160	28		6	"	14	steady
		"	25		6	"	14	
		140	26		6	"	14	
		"	25		6	"	14	
55		160	28		6	"	14	
		"	25		6	"	15	
		"	24		6	"	15	
		"	24		5	"	15	Decreasing
56		"	18		4	"	13	
		"	18		4	"	13	Steady
		210	20		4	170	13	
		"	13		3	"	12	Decreasing
57		200	8		3	"	10	Steady
		170	9		3	"	9	
		160	12		3	"	8	
		170	16		3	"	7	
58		150	11		2	"	7	Decreasing
		"	10		2	"	7	Steady
		190	11		2	"	7	
		"	11		2	"	7	
59		170	24		4	"	9	Increasing
		"	24		5	"	9	
		180	27		6	"	10	
		"	29		6	"	10	Steady
60		"	27		6	"	10	
		"	28		7	"	10	Increasing
		190	32		7	"	13	Steady
		"	35		7	"	13	DAY 62 IN PORT

SEA STATE CRUISE 3

DAY	Hour	WIND direction (degrés)	WIND speed (knots)	SEA direction	SEA state (Beaufort)	SWELL direction	SWELL high (feet)	TENDENCY
62	0000	060	13	As WIND	2	190	7	
	0600	"	10		2	"	7	Steady
	1200	090	12		2	"	7	
	1800	"	18		3	"	9	Increasing
63		150	27		4	170	12	
		"	10		3	"	8	Decreasing
		170	22		3	"	8	steady
		"	12		3	"	8	
64		140	118		4	220	8	Increasing
		180	12		4	"	8	steady
		170	19		4	"	8	
		"	18		4	"	8	
65		200	14		4	"	8	
		"	14		3	210	8	Decreasing
		"	19		4	220	8	Increasing
		"	20		4	"	8	Steady
66		170	19		4	"	8	
		180	22		5	"	8	Increasing
		150	21		5	170	12	steady
		"	16		4	190	9	Decreasing
67		160	8		3	220	8	
		140	9		3	"	8	Steady
		"	23		4	"	10	Increasing
		"	22		5	"	11	
68		110	22		5	140	14	Steady
		120	19		4	"	12	Decreasing
		140	17		4	160	11	Steady
		"	18		4	"	10	
69		120	19		4	140	11	
		160	10		3	120	9	Decreasing
		"	14		3	"	9	steady
		Variable	8		2	"	5	Decreasing
70		220	10		2	180	5	Steady
		180	9		2	"	5	
		210	2		1	"	5	Decreasing
		200	2		1	200	5	Steady
71		250	9		2	230	9	Increasing
		190	8		2	"	8	steady
		160	13		2	"	7	
		"	14		3	"	7	Increasing
72		140	23		4	220	7	
		"	18		4	"	9	Steady
		150	17		4	"	10	
		"	16		4	"	9	

SEA STATE CRUISE 3

Table 35

DAY	Hour	WIND		SEA		SWELL		TENDENCY
		direction (degrés)	speed (knots)	direction	state(Beaufort)	direction	high (feet)	
73	0000	140	12	AS WIND	4	220	9	Steady
	0600	"	13		4	"	9	
	1200	"	21		4	"	9	Decreasing
	1800	"	20		4	"	9	Steady
74		120	20		4	200	8	
		130	18		4	"	7	Decreasing
		"	16		3	"	6	Steady
		"	13		3	"	5	
75		140	11		3	120	5	
		"	6		2	240	5	Decreasing
		"	8		2	"	4	Steady
		"	7		1	"	3	Decreasing
76		240	10		1	220	2	Steady

GENERAL COMMENTS

I DATA ACQUISITION SYSTEM

The two main problems encountered with this system were due to the master clock and the multiverter. The first one could be solved by the use of an internal clock in the Hewlett Packard computer.

The second one shows the difficult maintenance problem when the ship is working far from any large industrial centre or port. However,it must be pointed that the missing channels are not essential and, in particular, sine and cosine of the heading can be easily recomputed by a further processing of the data.

II SEISMIC

Results and recording were satisfactory. This quality was probably due to the low working speed.

III SOUNDERS

Results satisfactory.

IV MAGNETIC

The data recorded were of satisfactory quality.

V GRAVITY

98.77% of good gravity was recorded. One of the highest percentages ever reached.

CONCLUSIONS

RESULTS

This survey has provided very satisfactory data; slow working speed, good weather, longer port-call allowing more maintenance, are the most certain reasons for the quality obtained, unfortunately to the detriment of surveyed mileage.

STATISTICS PRODUCTION

In this area, results are satisfactory; however a better planning of supplies would have avoided a waste of time in the rendezvous with the supply boat off Darwin.

FIGURES

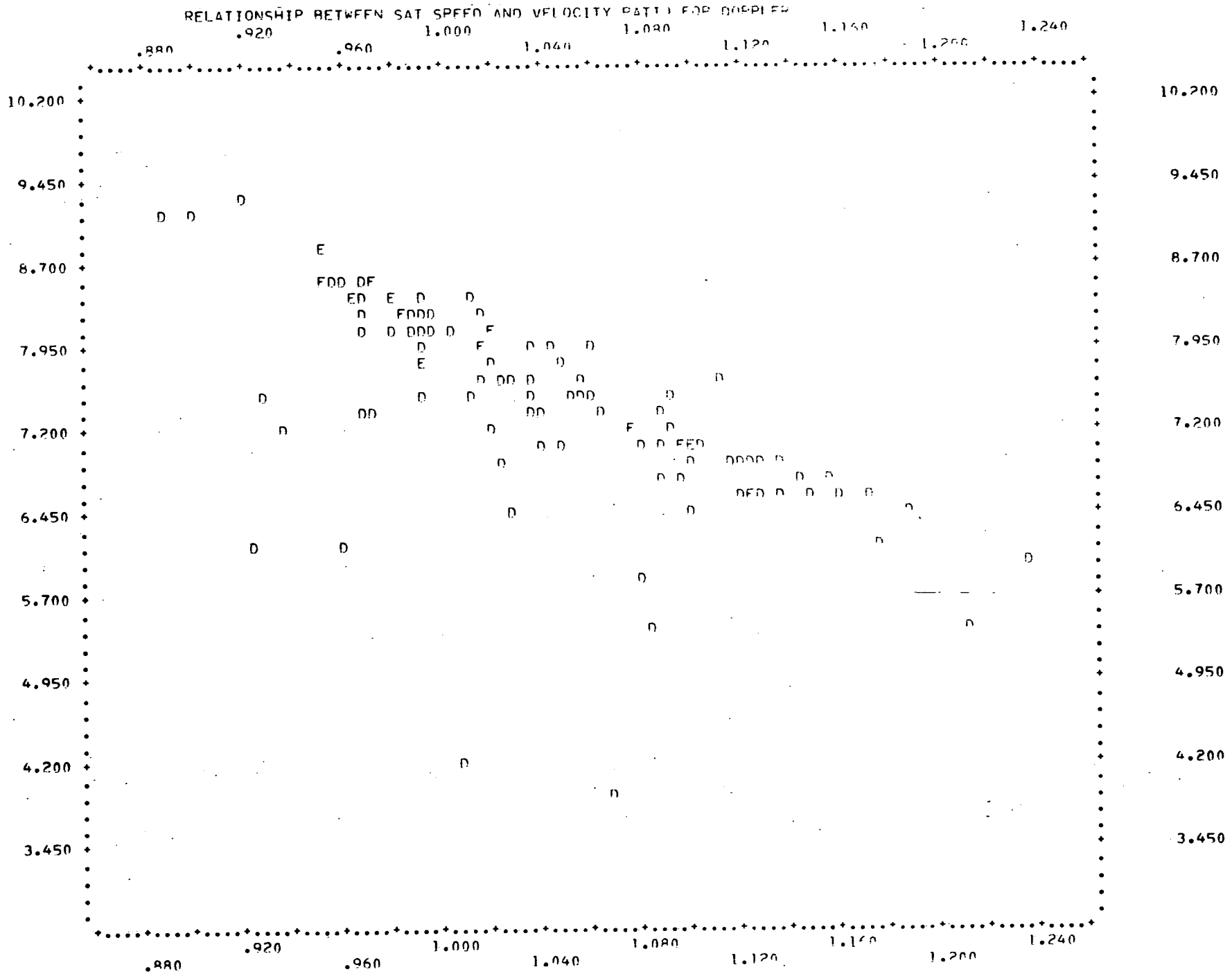

RELATIONSHIP BETWEEN SAT SPEED AND VELOCITY PATH FOR DOPPLER
.880
.920
.960
1.000
1.040
1.080
1.120
1.160
1.200
1.240
10.200
9.450
8.700
7.950
7.200
6.450
5.700
4.950
4.200
3.450

Fig 8

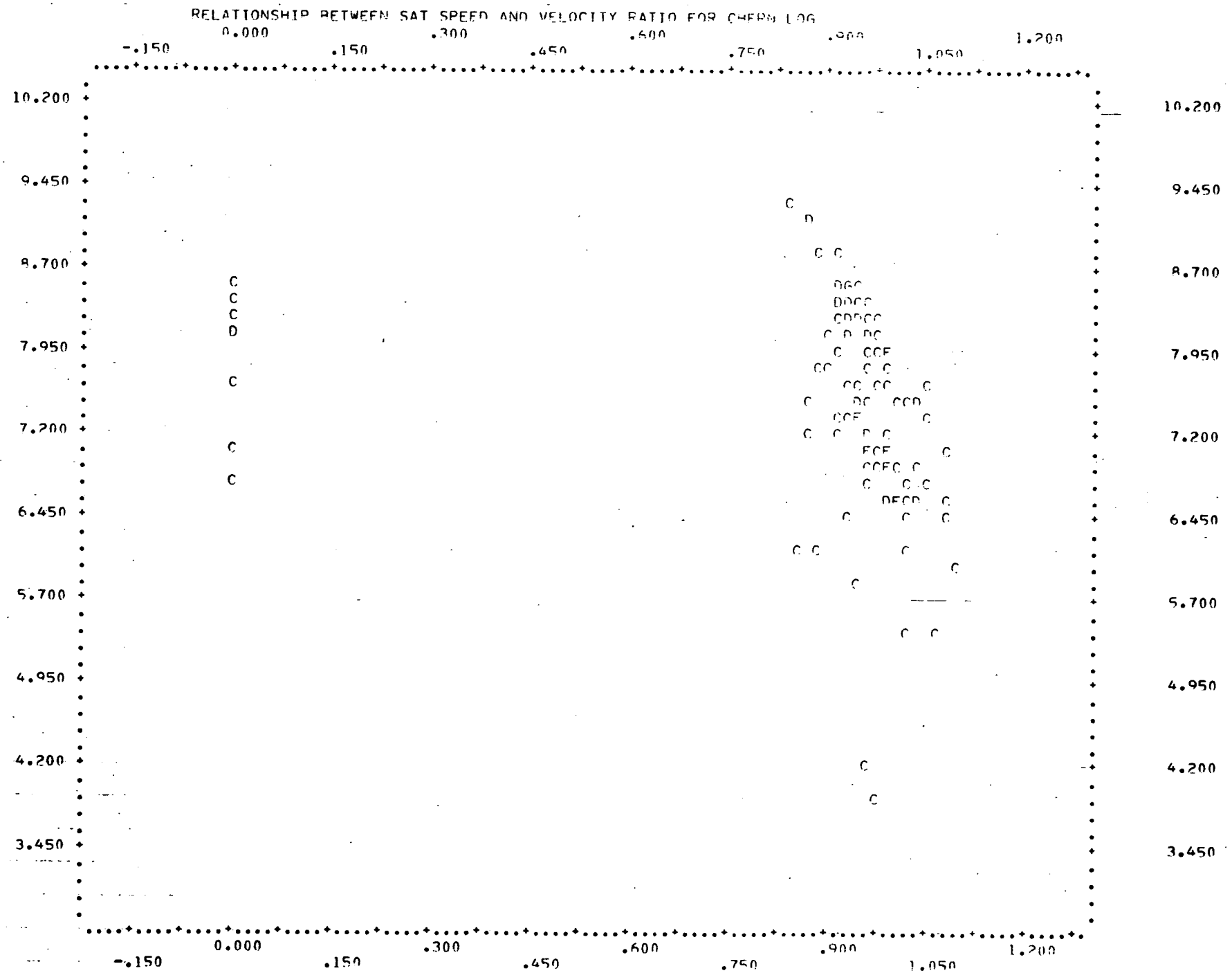

RELATIONSHIP BETWEEN SAT SPEED AND VELOCITY RATIO FOR CHERN LOG
-.150
0.000
.150
.300
.450
.600
.750
.900
1.050
1.200
10.200
9.450
8.700
7.950
7.200
6.450
5.700
4.950
4.200
3.450

Fig 9

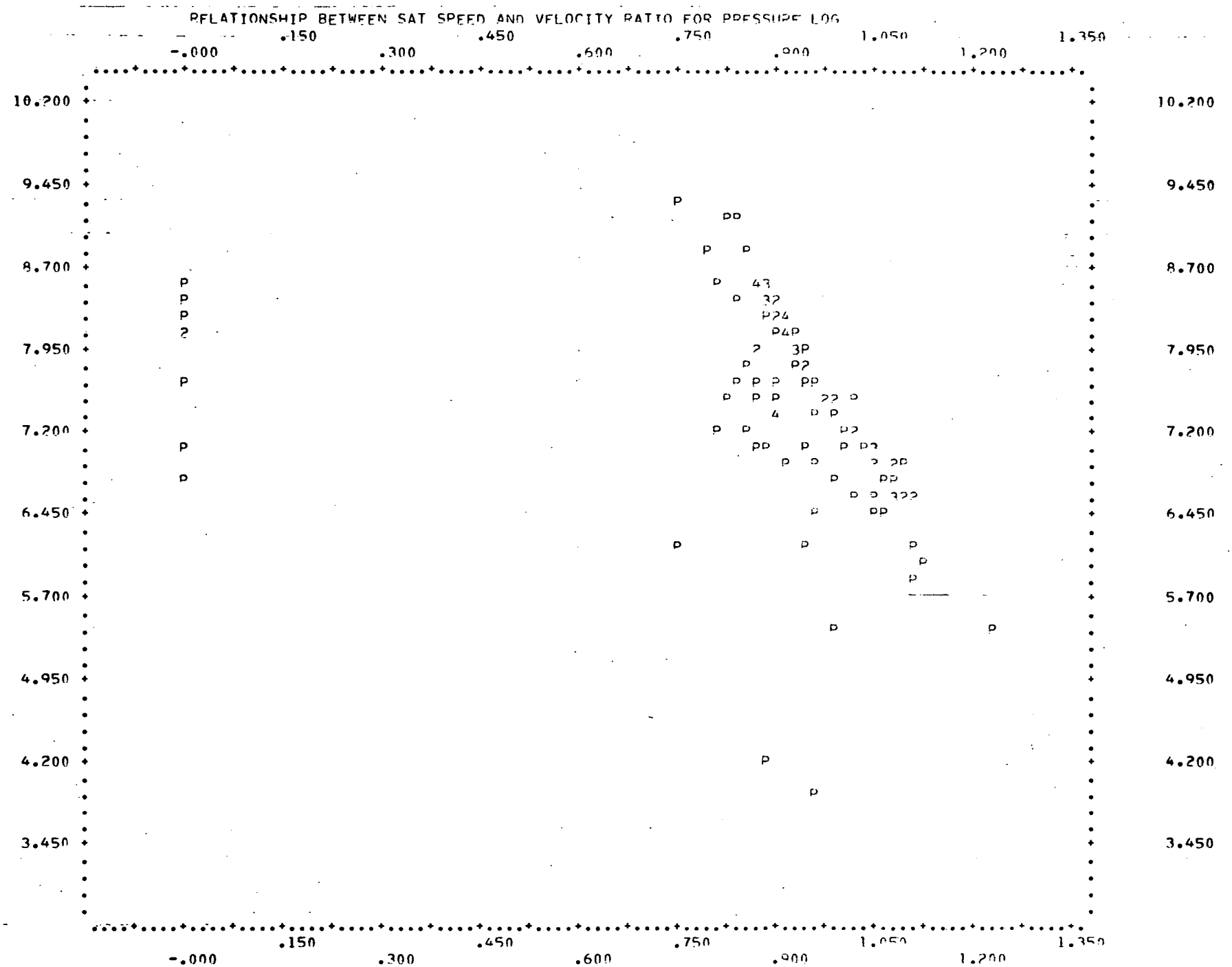

RELATIONSHIP BETWEEN SAT SPEED AND VELOCITY RATIO FOR PRESSURE LOG
-.000
.150
.300
.450
.600
.750
.900
1.050
1.200
1.350
10.200
9.450
8.700
7.950
7.200
6.450
5.700
4.950
4.200
3.450

Fig 10

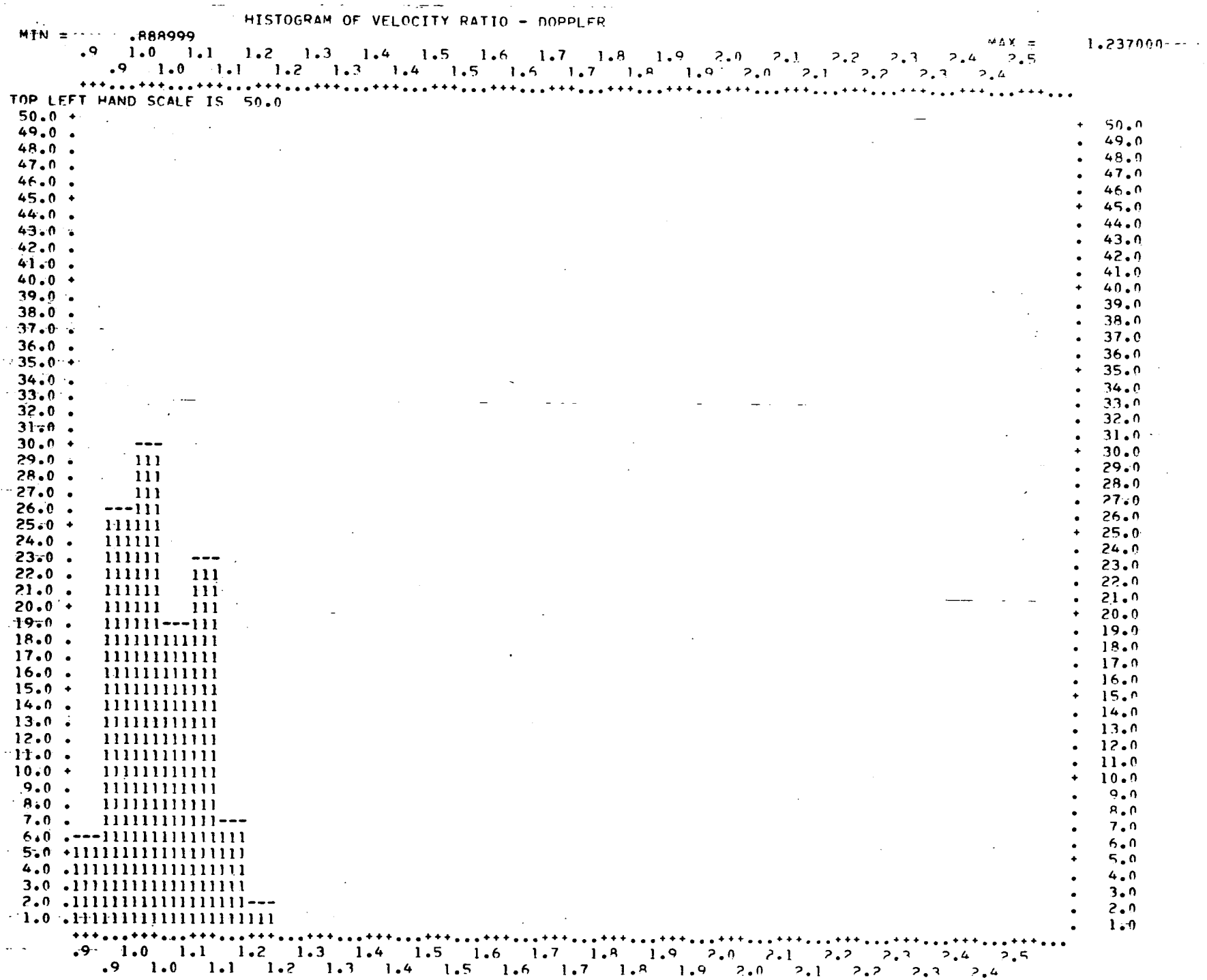

HISTOGRAM OF VELOCITY RATIO - DOPPLER
MIN = .888999
MAX = 1.237000
.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5
TOP LEFT HAND SCALE IS 50.0
50.0
49.0
48.0
47.0
46.0
45.0
44.0
43.0
42.0
41.0
40.0
39.0
38.0
37.0
36.0
35.0
34.0
33.0
32.0
31.0
30.0
29.0
28.0
27.0
26.0
25.0
24.0
23.0
22.0
21.0
20.0
19.0
18.0
17.0
16.0
15.0
14.0
13.0
12.0
11.0
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0

Fig 11

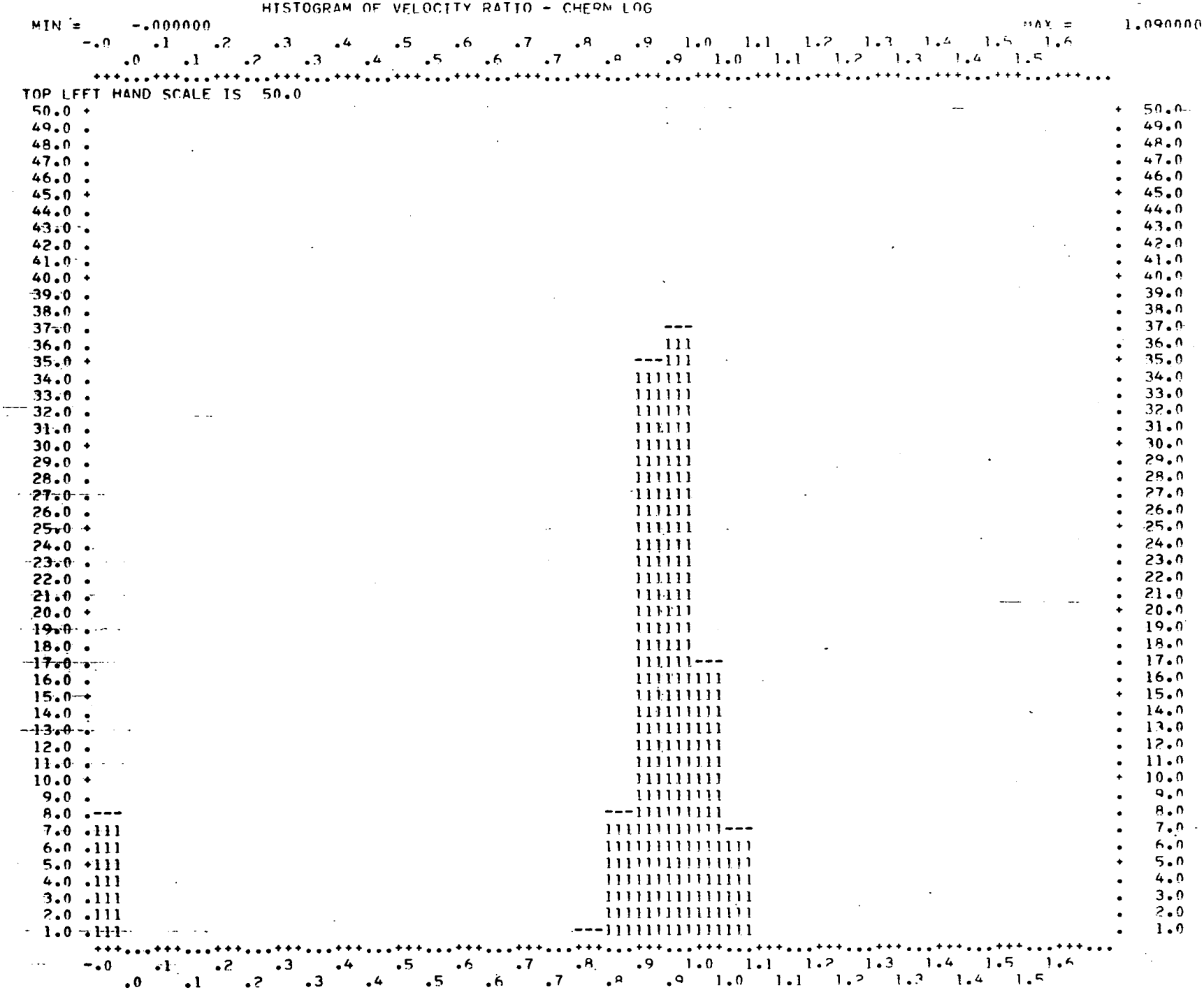

HISTOGRAM OF VELOCITY RATIO - CHERN LOG
MIN = -.000000
MAX = 1.090000
TOP LEFT HAND SCALE IS 50.0

Fig 12

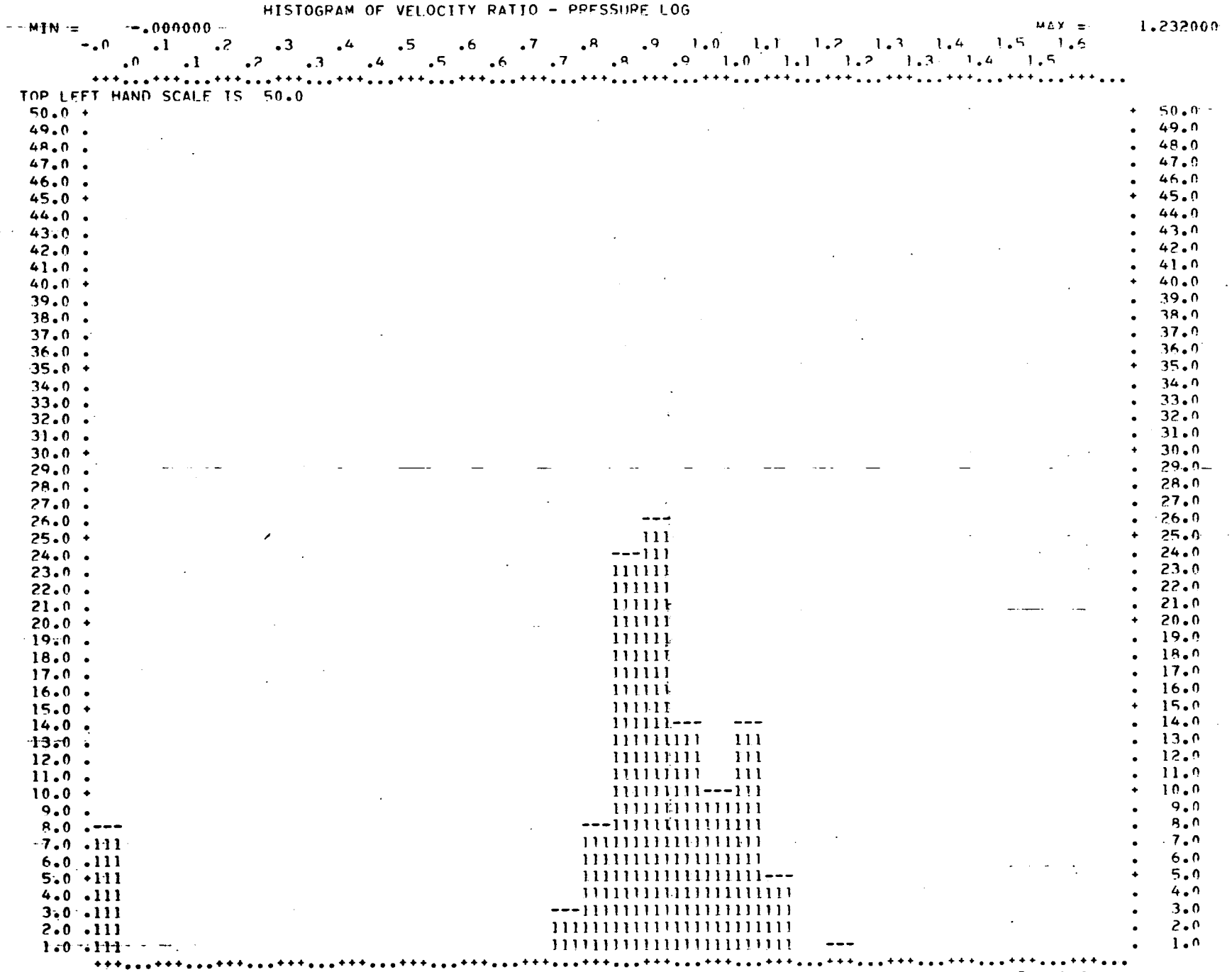

HISTOGRAM OF VELOCITY RATIO - PRESSURE LOG
MIN = -.000000
MAX = 1.232000
TOP LEFT HAND SCALE IS 50.0

Fig 13

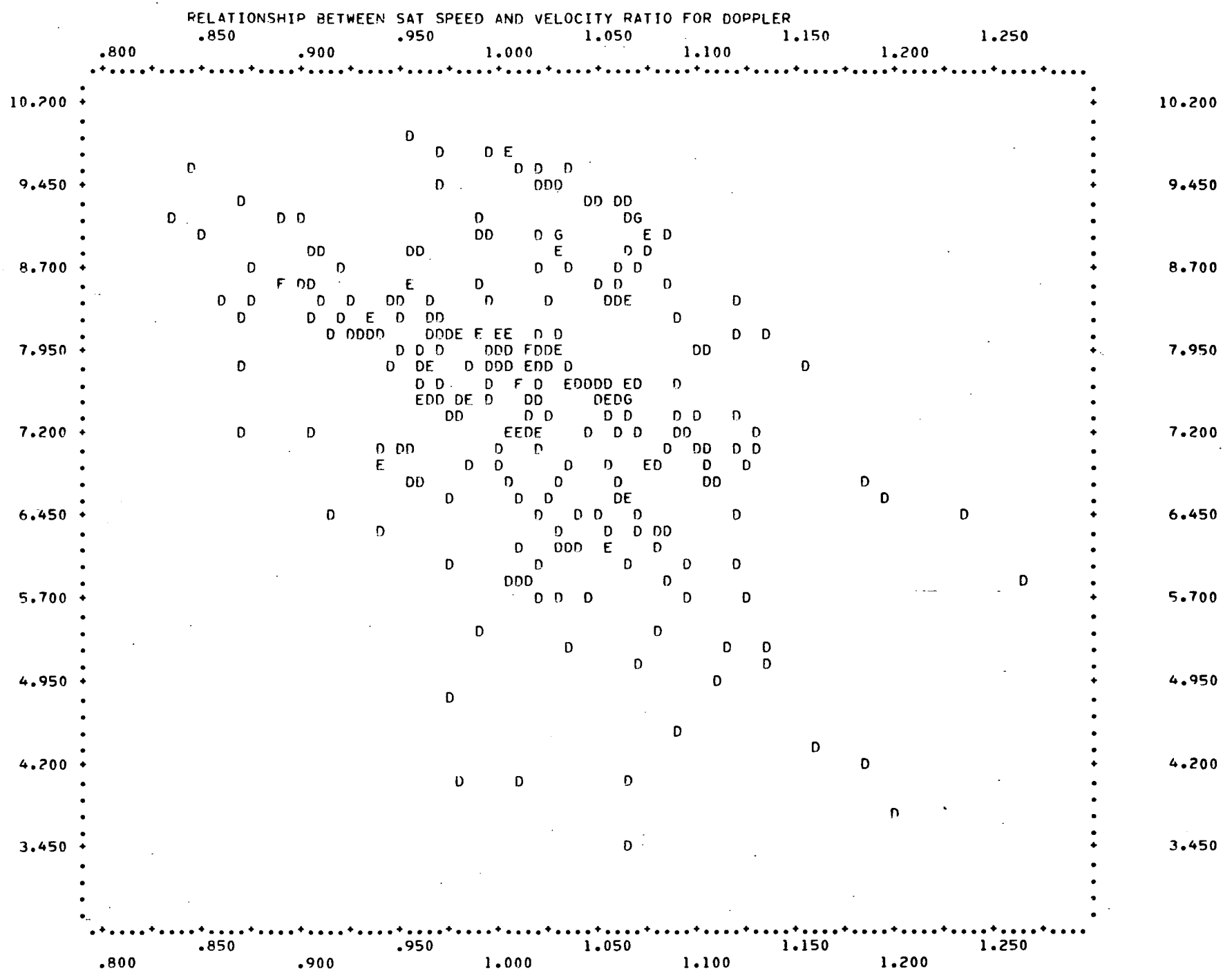

RELATIONSHIP BETWEEN SAT SPEED AND VELOCITY RATIO FOR DOPPLER
.800
.850
.900
.950
1.000
1.050
1.100
1.150
1.200
1.250
10.200
9.450
8.700
7.950
7.200
6.450
5.700
4.950
4.200
3.450

Fig 14

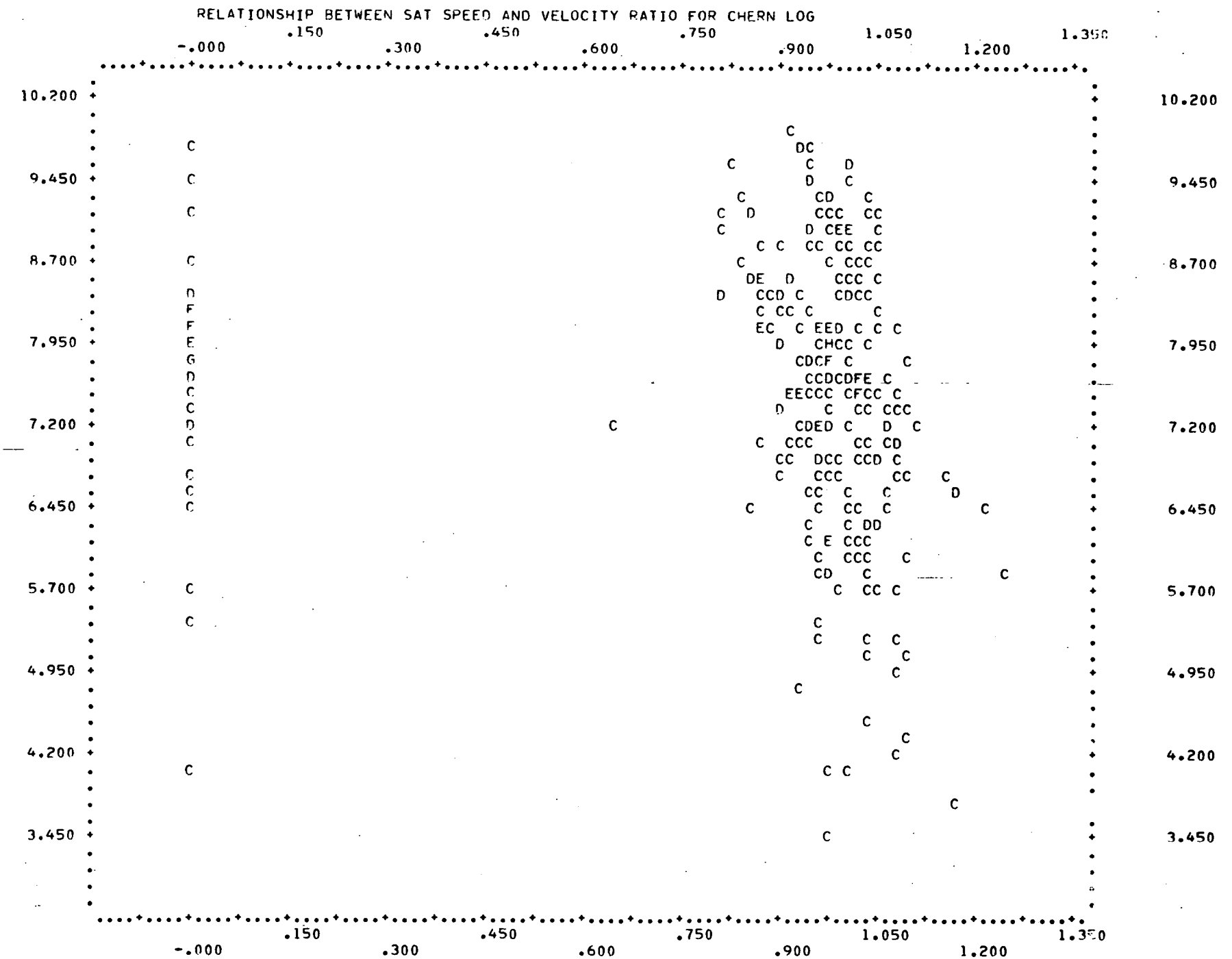

RELATIONSHIP BETWEEN SAT SPEED AND VELOCITY RATIO FOR CHERN LOG
-.000
.150
.300
.450
.600
.750
.900
1.050
1.200
1.350
10.200
9.450
8.700
7.950
7.200
6.450
5.700
4.950
4.200
3.450

Fig 15

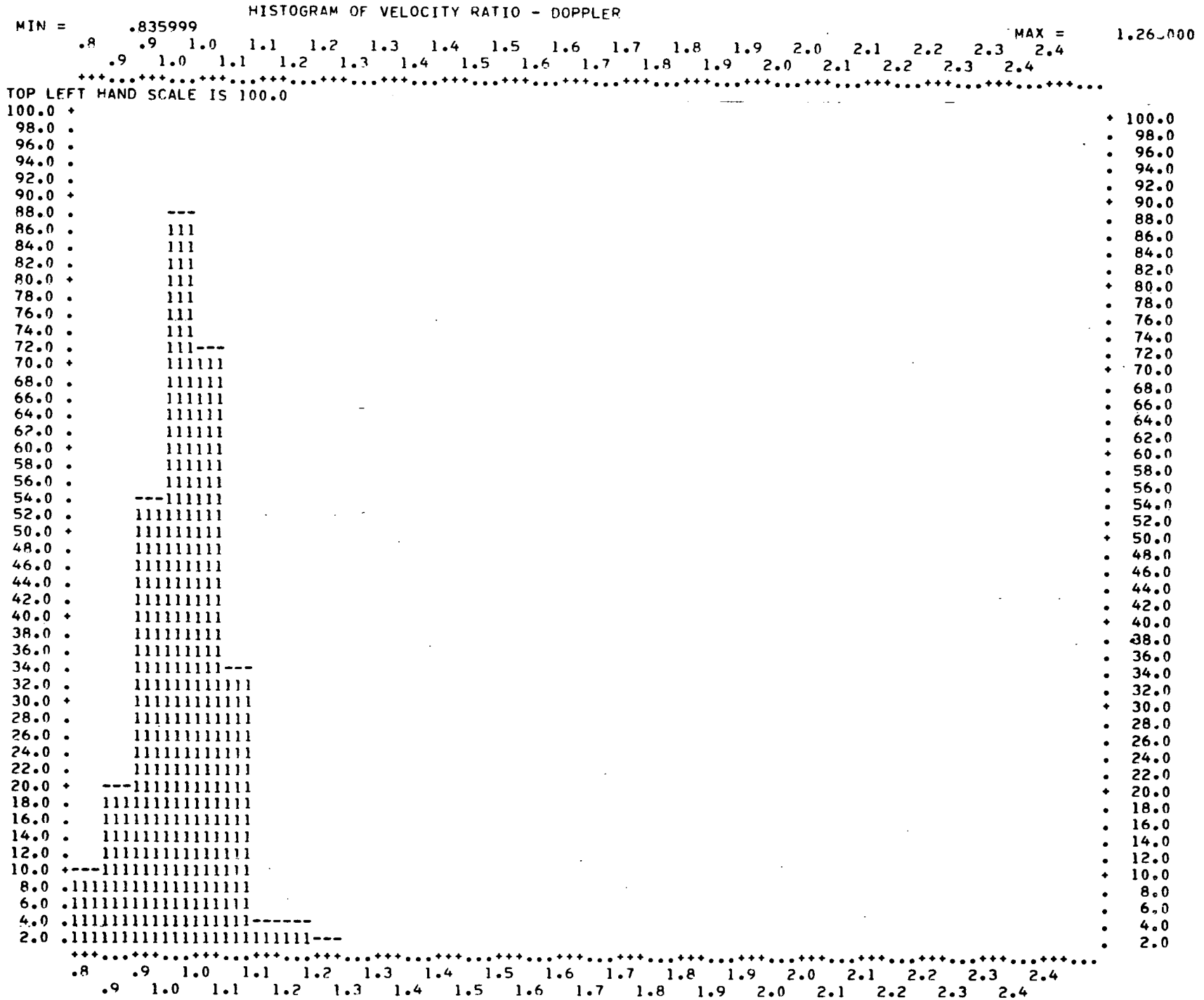

HISTOGRAM OF VELOCITY RATIO - DOPPLER
MIN = .835999
MAX = 1.26000
TOP LEFT HAND SCALE IS 100.0
.8 .9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4
.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4

Fig 16

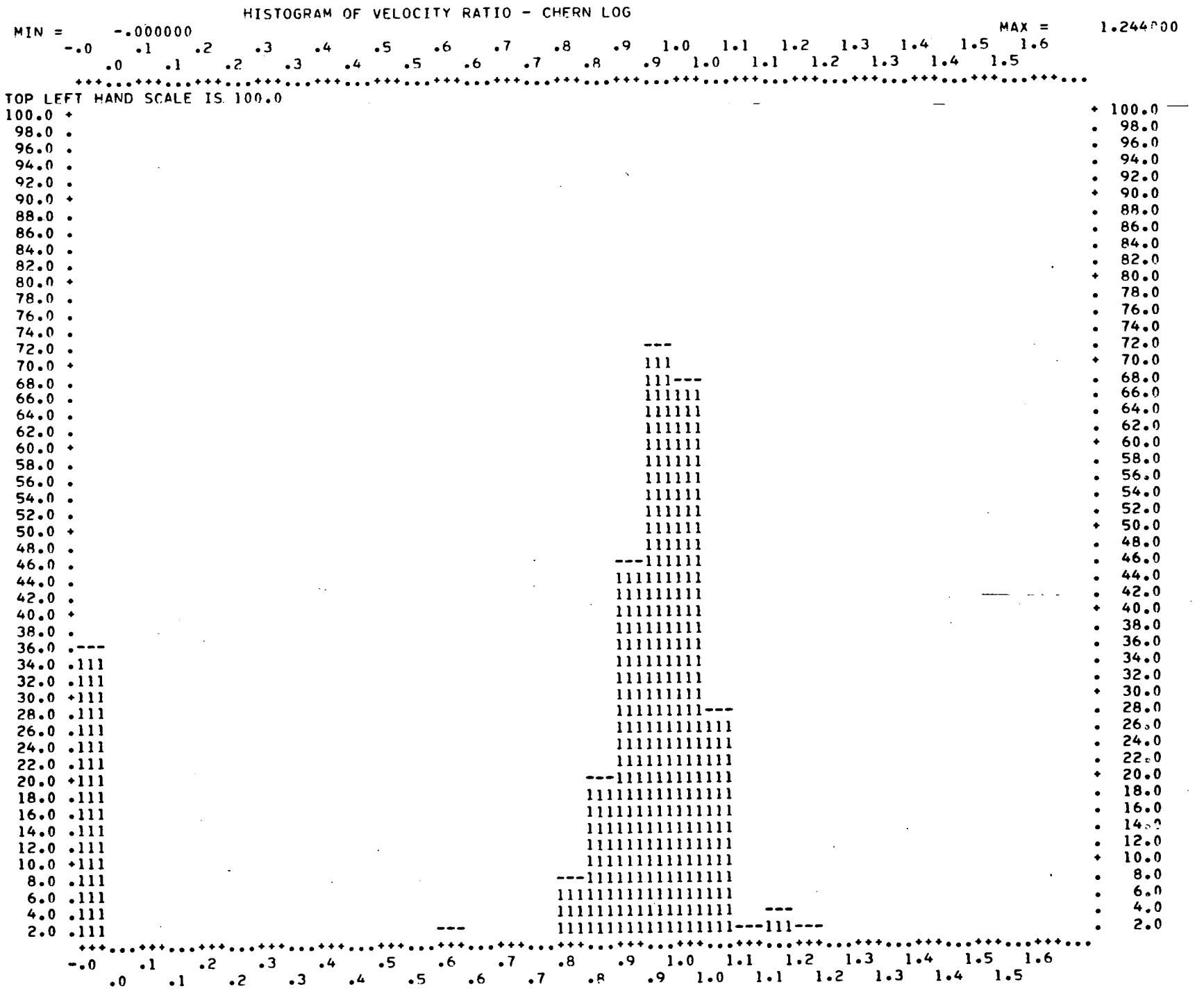

HISTOGRAM OF VELOCITY RATIO - CHERN LOG
MIN = -.000000
MAX = 1.244000
TOP LEFT HAND SCALE IS 100.0

Fig 17

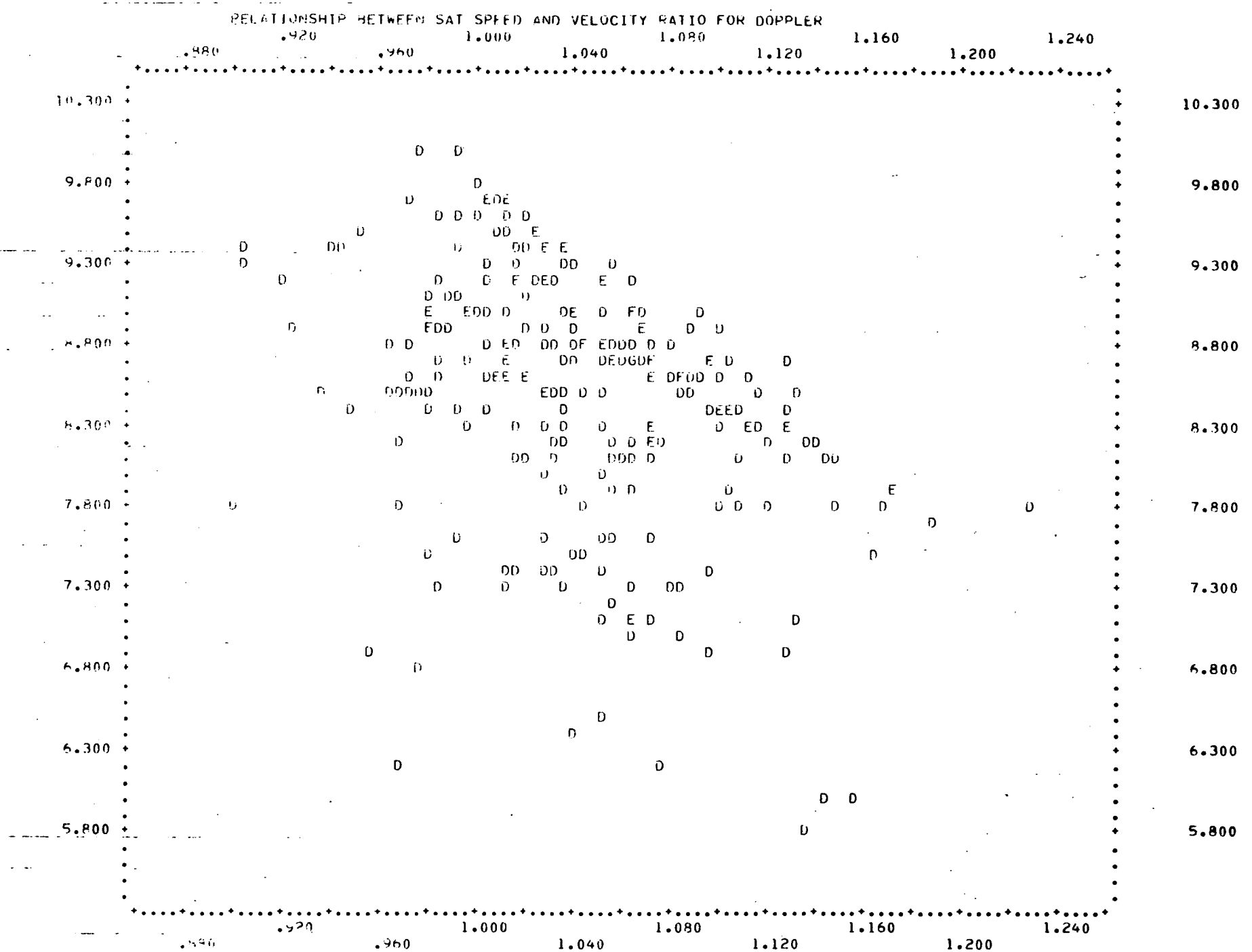

RELATIONSHIP BETWEEN SAT SPEED AND VELOCITY RATIO FOR DOPPLER
.920
1.000
1.080
1.160
1.240
.880
.960
1.040
1.120
1.200
10.300
9.800
9.300
8.800
8.300
7.800
7.300
6.800
6.300
5.800

Fig 18

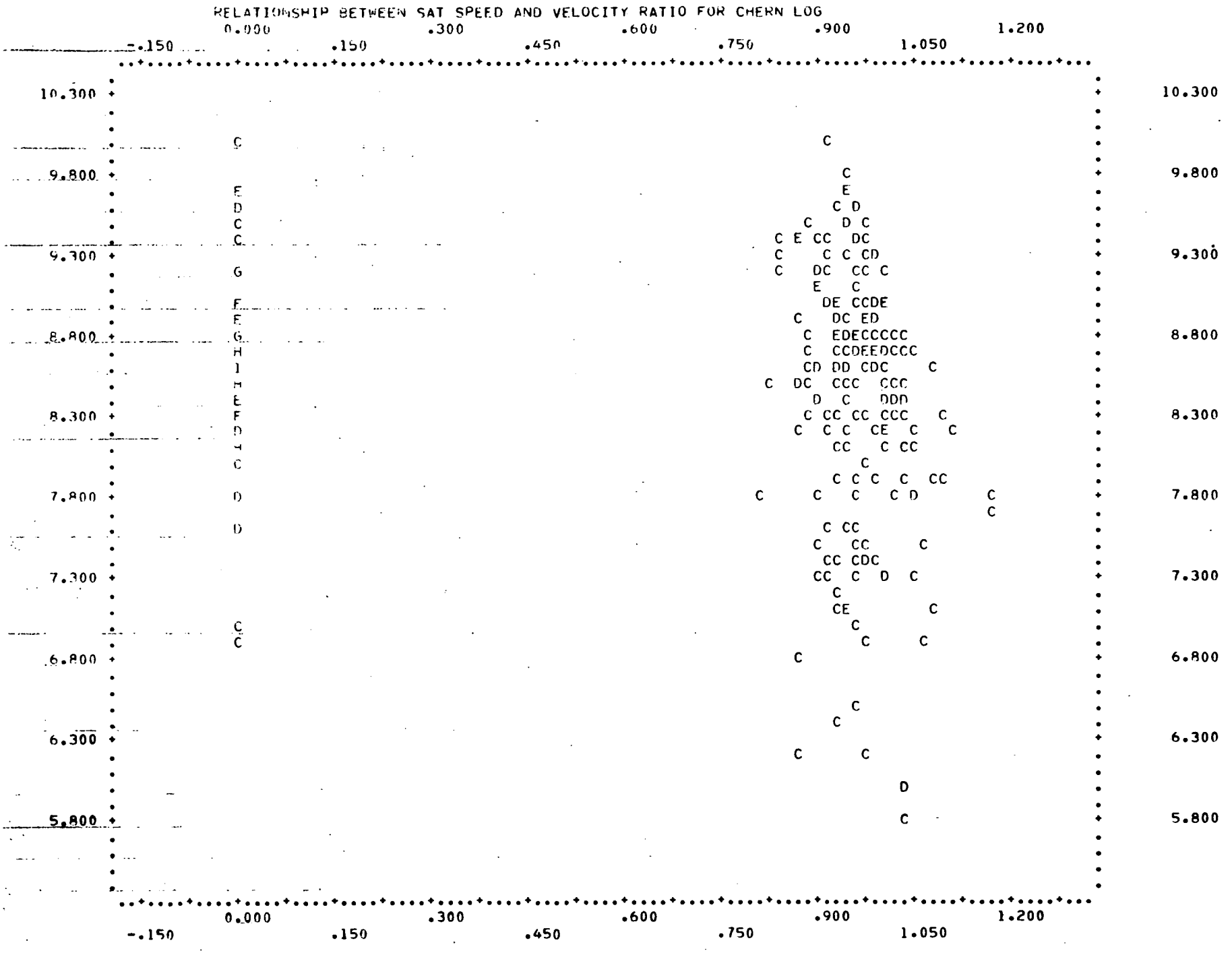

RELATIONSHIP BETWEEN SAT SPEED AND VELOCITY RATIO FOR CHERN LOG
0.000
.300
.600
.900
1.200
-.150
.150
.450
.750
1.050
10.300
9.800
9.300
8.800
8.300
7.800
7.300
6.800
6.300
5.800

Fig 19

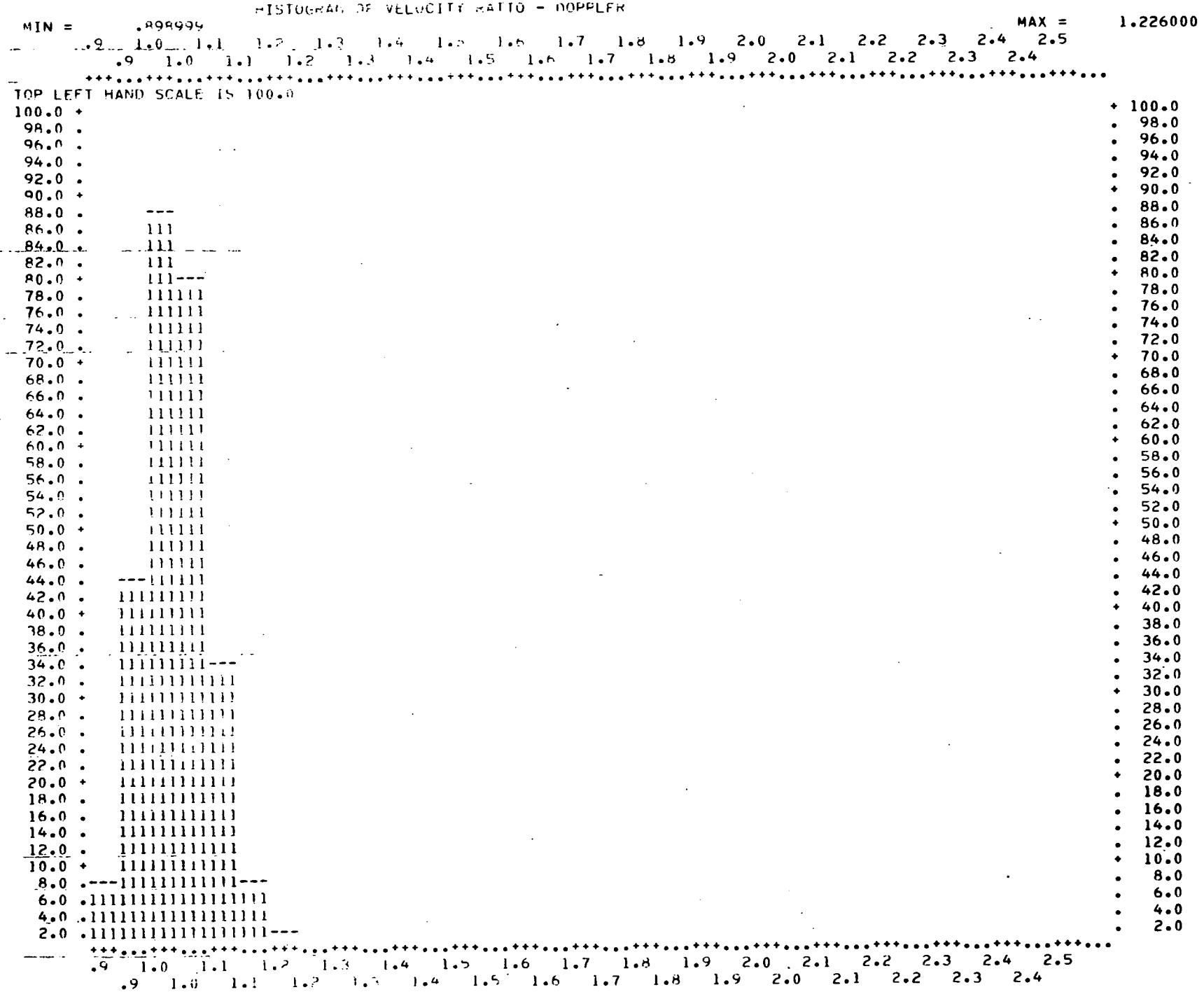

HISTOGRAM OF VELOCITY RATIO - DOPPLER
MIN = .898999
MAX = 1.226000
.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5
TOP LEFT HAND SCALE IS 100.0
100.0
98.0
96.0
94.0
92.0
90.0
88.0
86.0
84.0
82.0
80.0
78.0
76.0
74.0
72.0
70.0
68.0
66.0
64.0
62.0
60.0
58.0
56.0
54.0
52.0
50.0
48.0
46.0
44.0
42.0
40.0
38.0
36.0
34.0
32.0
30.0
28.0
26.0
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0

Fig. 20

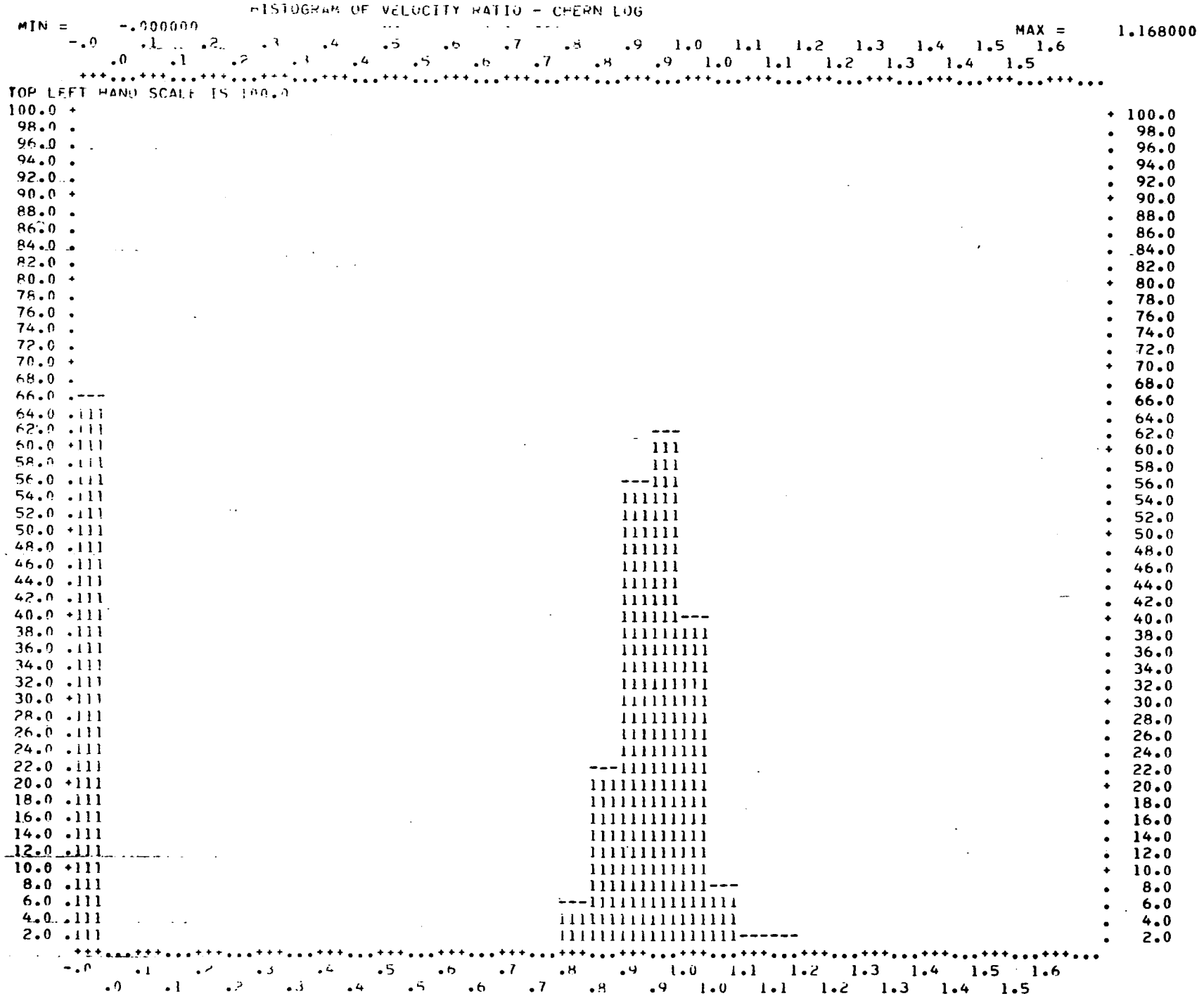

HISTOGRAM OF VELOCITY RATIO - CHERN LOG
MIN = -.000000
MAX = 1.168000
-.0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0 1.1 1.2 1.3 1.4 1.5 1.6
.0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0 1.1 1.2 1.3 1.4 1.5
TOP LEFT HAND SCALE IS 100.0
100.0
98.0
96.0
94.0
92.0
90.0
88.0
86.0
84.0
82.0
80.0
78.0
76.0
74.0
72.0
70.0
68.0
66.0
64.0
62.0
60.0
58.0
56.0
54.0
52.0
50.0
48.0
46.0
44.0
42.0
40.0
38.0
36.0
34.0
32.0
30.0
28.0
26.0
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0

Fig 21

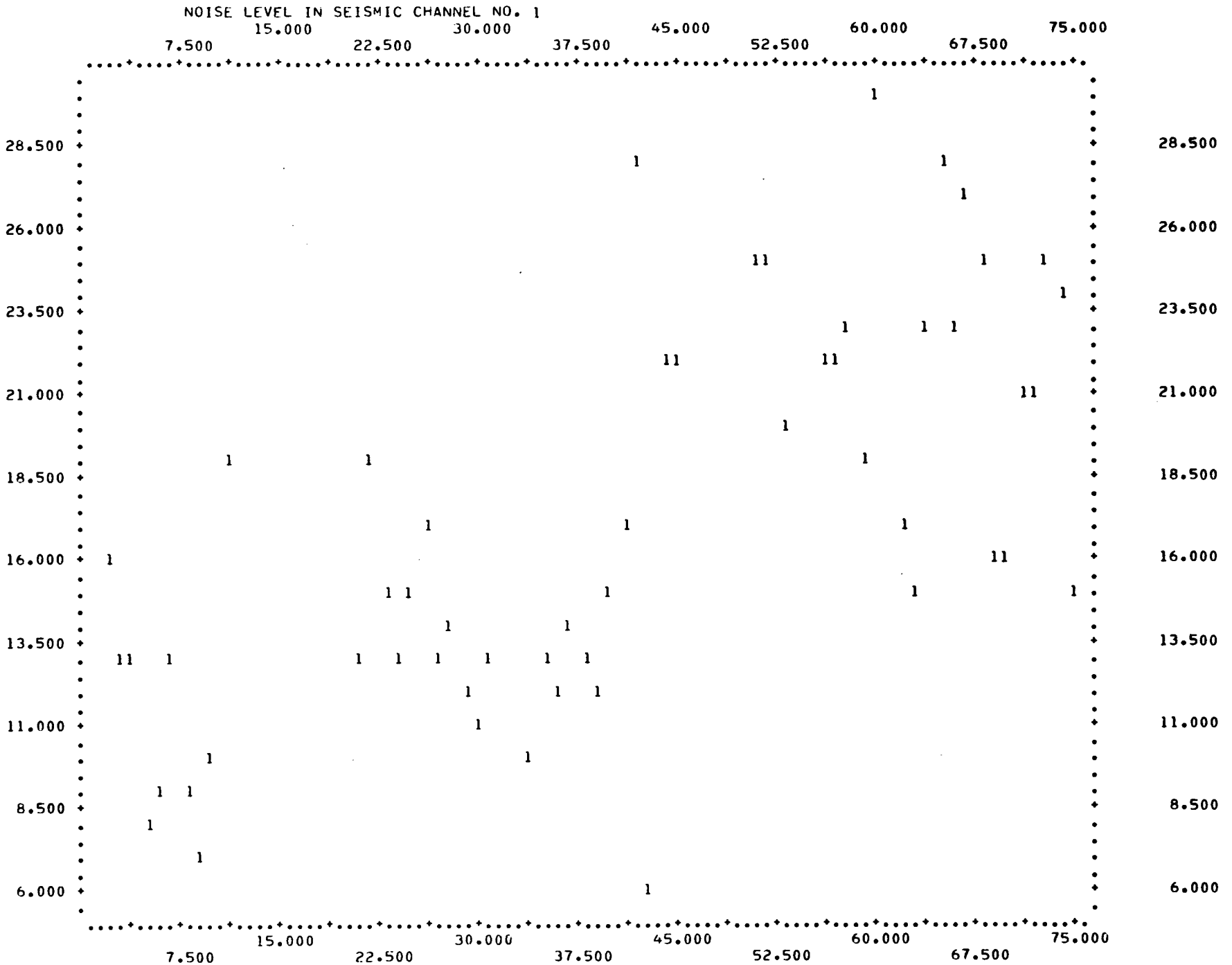

NOISE LEVEL IN SEISMIC CHANNEL NO. 1
7.500
15.000
22.500
30.000
37.500
45.000
52.500
60.000
67.500
75.000
28.500
26.000
23.500
21.000
18.500
16.000
13.500
11.000
8.500
6.000

Fig 24

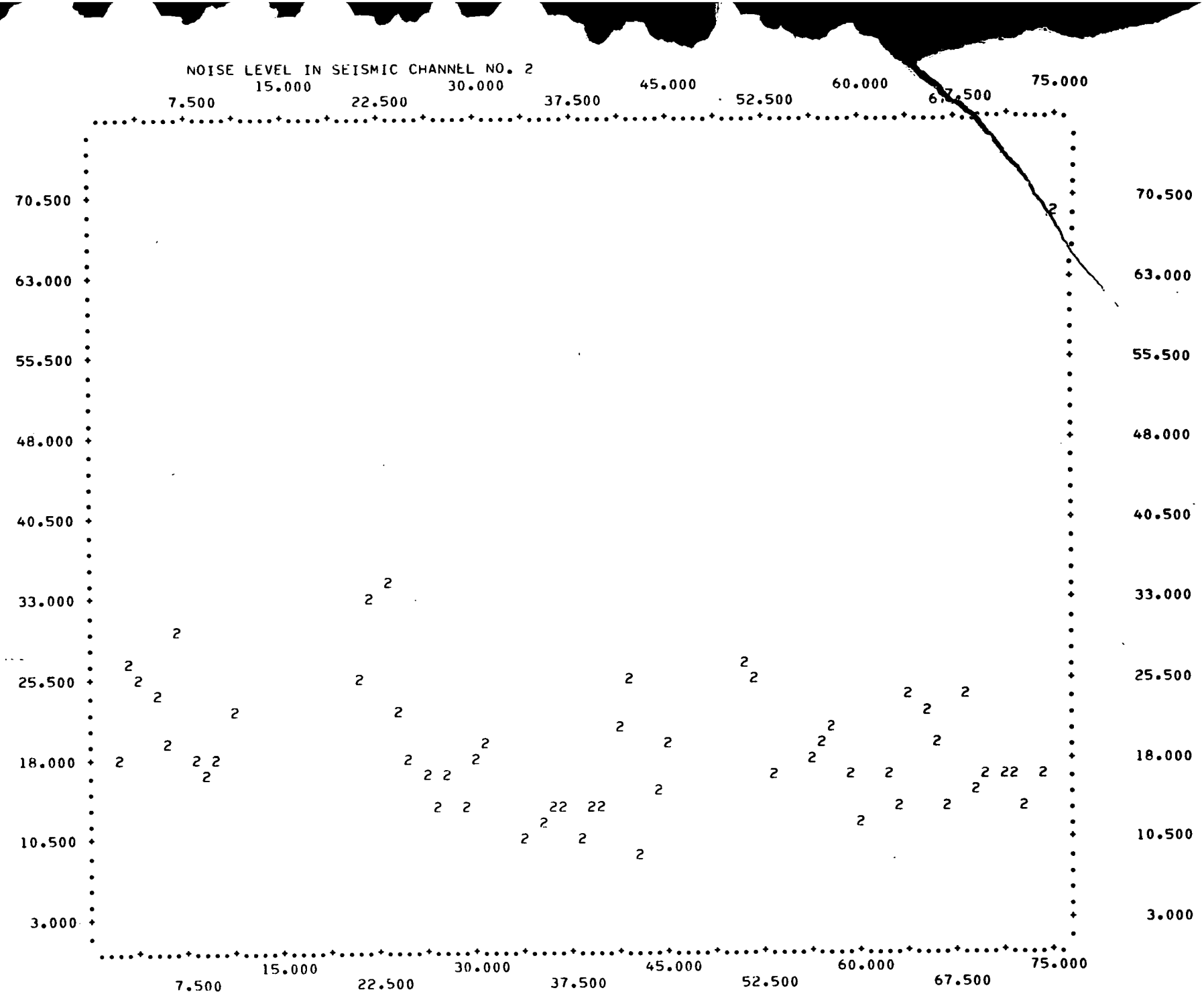

NOISE LEVEL IN SEISMIC CHANNEL NO. 2
7.500
15.000
22.500
30.000
37.500
45.000
52.500
60.000
67.500
75.000
70.500
63.000
55.500
48.000
40.500
33.000
25.500
18.000
10.500
3.000

Fig 25

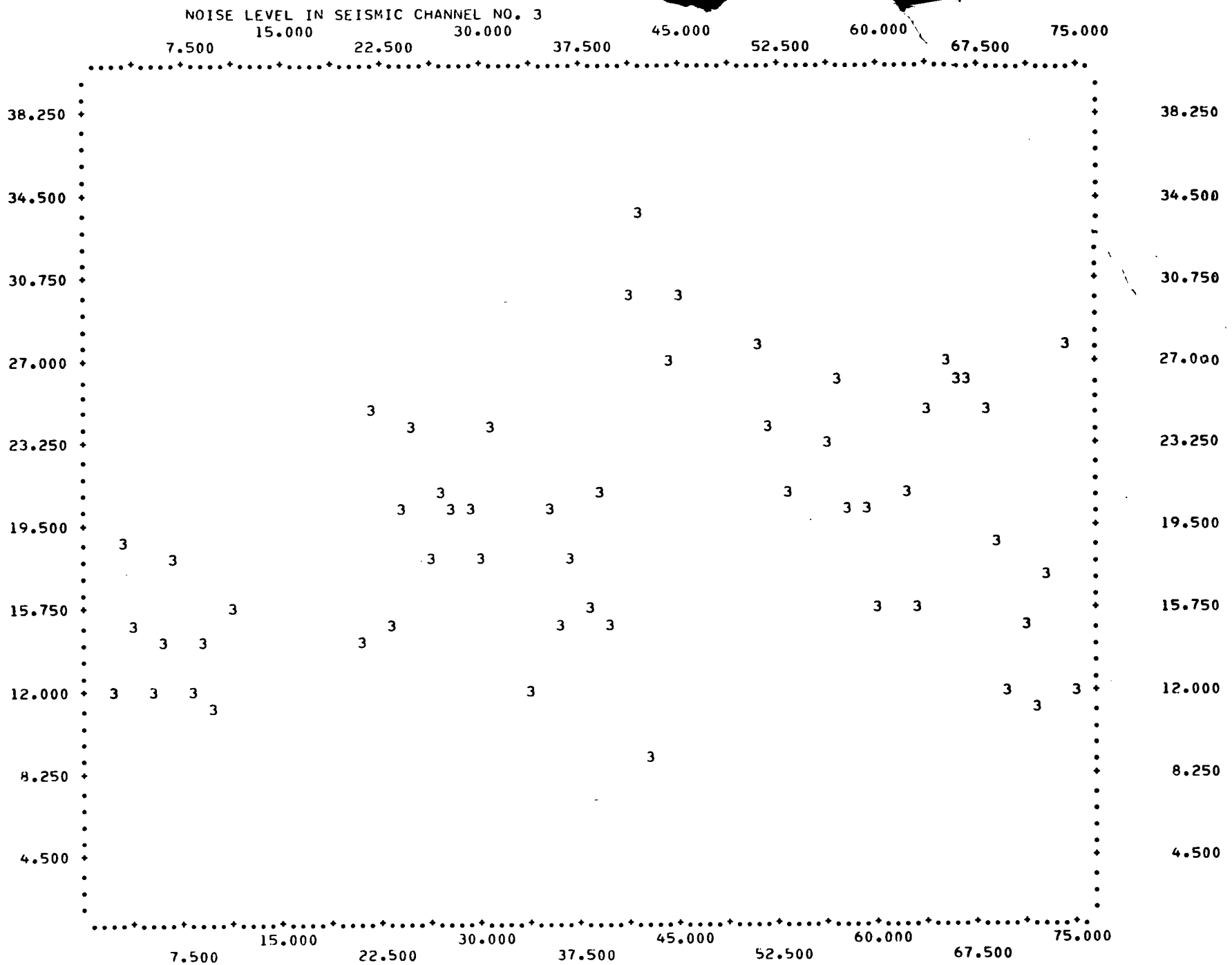

NOISE LEVEL IN SEISMIC CHANNEL NO. 3
7.500
15.000
22.500
30.000
37.500
45.000
52.500
60.000
67.500
75.000
38.250
34.500
30.750
27.000
23.250
19.500
15.750
12.000
8.250
4.500

Fig 26

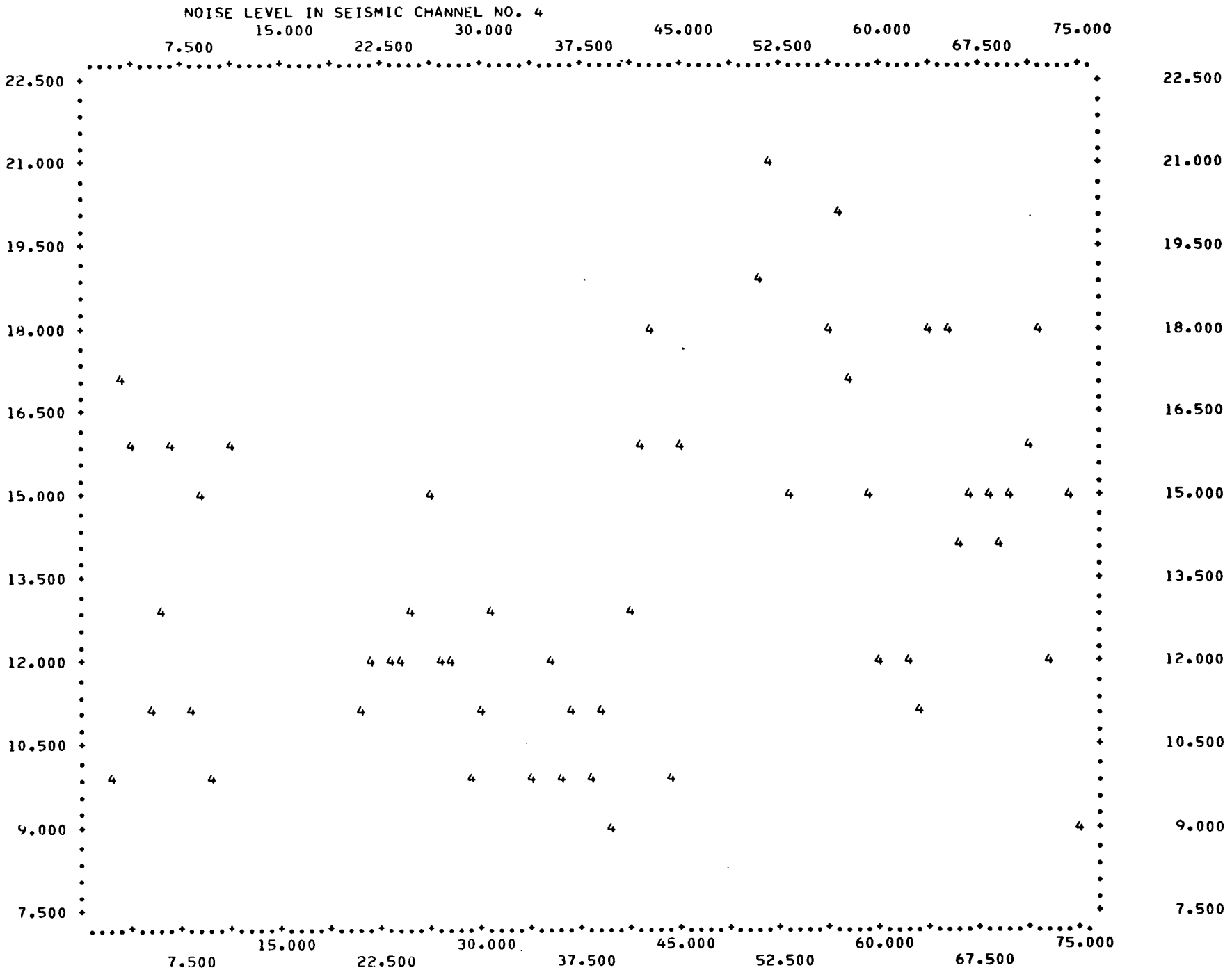

NOISE LEVEL IN SEISMIC CHANNEL NO. 4
7.500
15.000
22.500
30.000
37.500
45.000
52.500
60.000
67.500
75.000
22.500
21.000
19.500
18.000
16.500
15.000
13.500
12.000
10.500
9.000
7.500

Fig 27

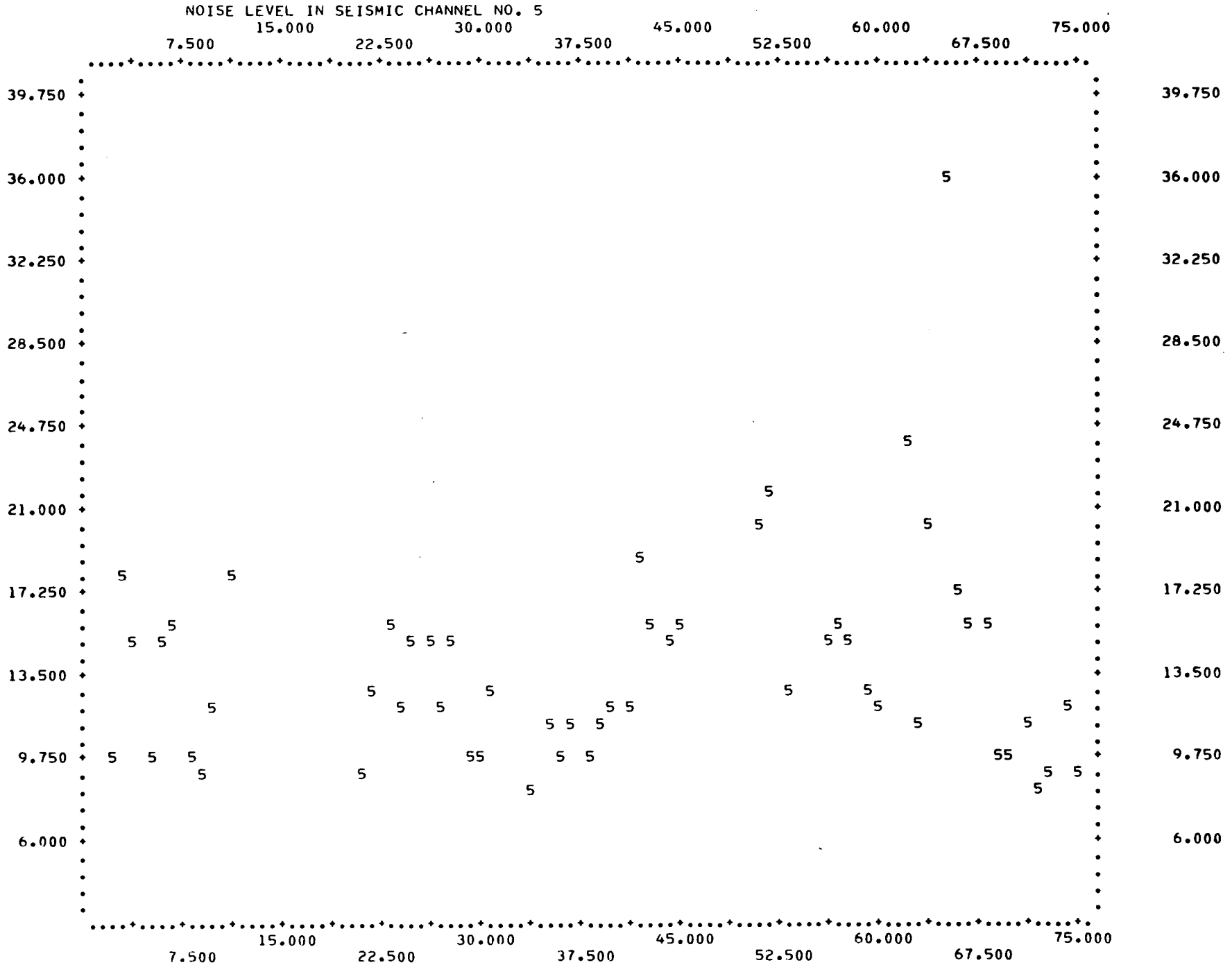

NOISE LEVEL IN SEISMIC CHANNEL NO. 5
7.500
15.000
22.500
30.000
37.500
45.000
52.500
60.000
67.500
75.000
39.750
36.000
32.250
28.500
24.750
21.000
17.250
13.500
9.750
6.000

Fig 28

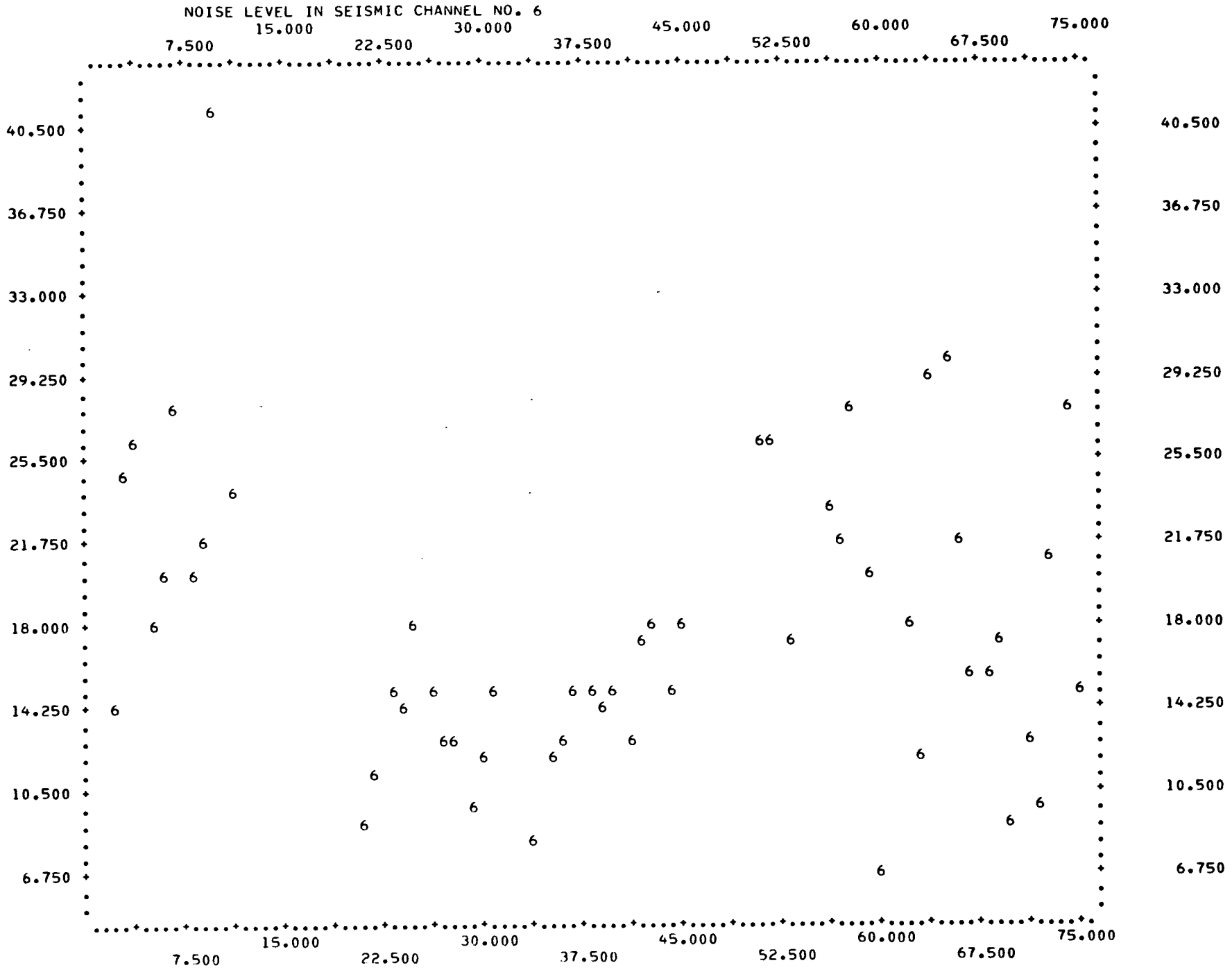

NOISE LEVEL IN SEISMIC CHANNEL NO. 6
7.500
15.000
22.500
30.000
37.500
45.000
52.500
60.000
67.500
75.000
40.500
36.750
33.000
29.250
25.500
21.750
18.000
14.250
10.500
6.750

Fig 29

TABLES

CRUISE I

SATELLITE NO. 12 - NO OF FIXES = 29

DD HH.MM	RAW freq.	SMOOTHED f.	WEIGHT
2.1714	32073.77	32073.22	.22
3.0314	32073.76	32073.34	.33
3.0500	32073.30	32073.35	1.00
3.1432	32073.31	32073.41	1.00
3.1618	32073.54	32073.42	1.00
4.0220	32073.92	32073.45	.11
4.0404	32073.53	32073.45	1.00
6.0220	32074.52	32073.46	0.00
6.1520	32073.46	32073.49	1.00
6.1708	32073.53	32073.49	1.00
7.0304	32073.71	32073.52	1.00
7.0452	32073.74	32073.52	.44
7.1612	32073.58	32073.55	1.00
8.0210	32073.47	32073.58	1.00
8.0354	32073.70	32073.58	1.00
8.1334	32073.29	32073.60	.22
8.1518	32073.75	32073.61	.44
8.1708	32073.38	32073.61	.44
9.0118	32074.48	32073.62	0.00
9.0258	32073.74	32073.63	1.00
9.0450	32073.46	32073.63	1.00
9.1422	32073.54	32073.64	1.00
9.1610	32073.47	32073.64	1.00
10.0204	32073.78	32073.64	1.00
10.0350	32073.76	32073.64	1.00
10.1330	32073.69	32073.65	1.00
10.1514	32073.68	32073.65	1.00
11.0112	32074.39	32073.65	0.00
11.0254	32073.68	32073.65	1.00

SATELLITE NO. 13 - NO OF FIXES = 27

3.0254	31990.77	31990.72	1.00
3.0440	31990.73	31990.74	1.00
3.1414	31990.93	31990.82	1.00
3.1600	31991.01	31990.83	.67
4.0350	31991.06	31990.86	.33
4.1512	31990.67	31990.84	1.00
4.1700	31990.80	31990.84	1.00
5.0300	31990.86	31990.81	1.00
5.0448	31990.51	31990.81	.22
5.1426	31990.79	31990.78	1.00
5.1612	31990.91	31990.78	1.00
6.0404	31990.98	31990.76	1.00
6.1340	31991.38	31990.76	0.00
7.1434	31990.79	31990.79	1.00
8.0220	31990.79	31990.80	1.00
8.1348	31990.82	31990.82	1.00
8.1532	31990.80	31990.82	1.00
9.0134	31990.60	31990.82	.33
9.0318	31990.78	31990.82	1.00
9.1444	31990.92	31990.82	1.00
9.1638	31991.28	31990.82	.22
10.0228	31990.78	31990.82	1.00
10.0418	31990.84	31990.82	1.00
10.1356	31990.74	31990.81	1.00
10.1544	31990.56	31990.81	.22
11.0140	31990.63	31990.80	.33
11.0328	31990.99	31990.80	1.00

SATELLITE NO. 14 - NO OF FIXES = 40

2.1838	32072.00	32071.89	1.00
2.2026	32072.10	32071.90	.67
3.0628	32071.99	32071.92	1.00
3.0812	32071.99	32071.92	1.00
3.1748	32072.07	32071.92	.44
3.1932	32071.94	32071.92	1.00
3.2120	32071.68	32071.92	1.00
4.0540	32072.42	32071.92	0.00
4.0720	32072.01	32071.91	1.00
4.0910	32071.47	32071.91	0.00
4.1842	32071.87	32071.90	1.00
4.1950	32037.05	32071.90	0.00
4.2030	32071.90	32071.90	1.00
5.0630	32071.96	32071.90	1.00
5.0816	32072.07	32071.90	1.00
5.1754	32071.86	32071.91	1.00
5.1938	32071.98	32071.91	1.00
5.2128	32074.19	32071.92	0.00
6.0540	32072.34	32071.94	.22
6.0722	32071.88	32071.94	1.00
6.0914	32071.64	32071.95	.22
6.1846	32072.07	32071.99	1.00
6.2034	32072.01	32071.99	1.00
7.0634	32072.03	32072.03	1.00
7.0820	32072.05	32072.04	1.00
7.1756	32072.12	32072.08	1.00
7.1942	32072.01	32072.08	1.00
8.0542	32072.21	32072.11	.44
8.0726	32072.17	32072.12	1.00
8.1852	32072.12	32072.13	1.00
8.2040	32072.26	32072.14	.33
9.0634	32072.06	32072.14	1.00
9.0824	32072.10	32072.14	1.00
9.1802	32071.98	32072.13	1.00
9.1948	32072.14	32072.12	1.00
10.0544	32072.19	32072.10	1.00
10.0730	32072.17	32072.10	1.00
10.1710	32071.83	32072.08	.33
10.1900	32072.16	32072.07	1.00
11.0456	32072.44	32072.04	.22

Table 7

CRUISE

SATELLITE NO. 15 - NO OF FIXES = 28

2.1938	32036.41	32036.31	1.00
3.0658	32036.52	32036.45	1.00
3.0844	32036.58	32036.47	1.00
3.1852	32036.20	32036.54	1.00
3.2036	32036.71	32036.55	1.00
4.0612	32036.65	32036.59	1.00
4.0758	32036.82	32036.59	.33
5.0710	32036.50	32036.62	1.00
5.0858	32036.75	32036.62	1.00
5.1902	32036.80	32036.62	.44
5.2046	32036.72	32036.62	1.00
6.0622	32036.68	32036.63	1.00
6.0808	32036.66	32036.63	1.00
6.1812	32037.12	32036.64	0.00
6.1956	32036.59	32036.64	1.00
7.0720	32036.70	32036.66	1.00
7.1908	32036.67	32036.68	1.00
8.0632	32036.32	32036.70	.22
8.0820	32036.71	32036.71	1.00
8.1820	32036.74	32036.73	1.00
8.2006	32036.64	32036.73	1.00
9.0546	32036.84	32036.76	1.00
9.0732	32036.82	32036.76	1.00
9.1734	32036.84	32036.78	1.00
9.1920	32037.08	32036.79	.22
10.0642	32036.76	32036.82	1.00
10.1828	32036.75	32036.85	1.00
11.0556	32036.67	32036.88	1.00

SATELLITE NO. 18 - NO OF FIXES = 33

2.2128	32075.47	32069.74	0.00
2.2310	32069.94	32069.77	1.00
3.1032	32069.97	32069.91	1.00
3.1218	32067.98	32069.93	0.00
3.2222	32070.17	32070.00	.44
4.0010	32070.00	32070.01	1.00
4.0942	32070.09	32070.03	1.00
4.1128	32070.06	32070.03	1.00
4.2132	32069.96	32070.03	1.00
4.2320	32069.93	32070.03	1.00
5.1040	32070.16	32070.02	1.00
5.2230	32070.14	32070.03	1.00
6.0018	32070.10	32070.03	1.00
6.0952	32070.08	32070.04	1.00
6.1140	32069.95	32070.05	1.00
6.2138	32069.99	32070.07	1.00
6.2330	32070.20	32070.07	1.00
7.0904	32070.09	32070.10	1.00
7.1050	32070.19	32070.10	1.00
7.2052	32069.98	32070.13	1.00
7.2236	32070.11	32070.14	1.00
8.1000	32070.27	32070.17	1.00
8.1152	32071.00	32070.18	0.00
8.2150	32070.31	32070.20	1.00
8.2338	32070.69	32070.21	0.00
9.0914	32070.18	32070.23	1.00
9.1100	32069.84	32070.23	.33
9.2058	32070.29	32070.25	1.00
9.2244	32070.51	32070.26	.33
10.0824	32069.52	32070.28	0.00
10.1010	32070.27	32070.28	1.00
10.2010	32070.31	32070.29	1.00
10.2158	32070.23	32070.30	1.00

Table 8

SATELLITE NO. 12 - NO OF FIXES = 67

DD HH MM	RAW freq.	SMOOTHED f.	WEIGHT
21.1402	32073.83	32073.76	1.00
22.0144	32074.06	32073.86	1.00
22.0332	32073.85	32073.87	1.00
23.0048	32073.85	32073.96	1.00
23.0234	32074.04	32073.96	1.00
23.1400	32073.95	32073.97	1.00
24.1304	32074.03	32073.97	1.00
24.1452	32073.95	32073.96	1.00
25.0042	32073.93	32073.96	1.00
25.0230	32074.10	32073.96	1.00
25.1210	32074.10	32073.95	1.0
25.1356	32074.08	32073.95	1.00
25.2350	32073.90	32073.95	1.00
26.0134	32074.13	32073.95	1.00
26.1452	32073.91	32073.97	1.00
27.0038	32074.05	32073.99	1.00
27.0226	32073.73	32073.99	.44
27.1206	32073.97	32074.02	1.00
27.1352	32074.12	32074.03	1.00
27.2346	32074.10	32074.06	1.00
28.0130	32074.18	32074.06	1.00
28.1116	32073.50	32074.09	0.00
28.1258	32074.11	32074.09	1.00
29.0036	32074.16	32074.11	1.00
29.0224	32074.09	32074.11	1.00
29.1204	32074.09	32074.11	1.00
29.1350	32074.07	32074.11	1.00
29.2342	32074.08	32074.09	1.00
30.0126	32074.13	32074.09	1.00
30.1110	32074.16	32074.05	1.00
30.1254	32074.20	32074.05	1.00
31.0032	32074.11	32074.01	1.00
31.0222	32074.51	32074.00	.11
31.1200	32073.90	32073.97	.78
31.1346	32074.03	32073.97	1.00
31.2338	32074.04	32073.96	1.00
32.0124	32074.00	32073.96	1.00
35.0024	32074.31	32074.23	1.00
35.0214	32074.42	32074.23	.8
35.1152	32074.25	32074.24	1.0
35.1342	32074.42	32074.24	.7
35.2336	32073.75	32074.22	0.00
36.0118	32074.20	32074.22	1.00
36.1244	32074.35	32074.20	1.00
36.1430	32073.17	32074.19	0.00
38.1426	32074.39	32074.16	1.00
40.0110	32074.35	32074.26	1.00
40.1234	32074.42	32074.29	1.00
40.1424	32074.14	32074.29	1.00
41.0016	32074.31	32074.31	1.
41.0202	32074.37	32074.31	1.
41.1140	32074.30	32074.33	1.
41.1326	32074.54	32074.33	1.
42.0106	32074.44	32074.35	1.00
42.1232	32074.37	32074.36	1.00
42.1420	32074.00	32074.37	.22
43.0012	32074.52	32074.38	1.00
43.0200	32074.74	32074.39	.22
43.2318	32074.45	32074.43	1.00
44.0102	32074.39	32074.43	1.00
44.1046	32075.05	32074.43	0.00
44.1228	32074.20	32074.43	.2
44.1416	32074.68	32074.43	.44
45.0010	32074.46	32074.9	1.00
45.0158	32074.48	32074.34	1.00
45.1132	32074.43	32074.31	1.00
45.1318	32074.32	32074.30	1.00

SATELLITE NO. 13 - NO OF FIXES = 64

21.1210	31990.83	31990.63	1.00
21.2358	31991.96	31990.81	0.00
22.1306	31991.04	31990.94	1.00
22.1454	31990.65	31990.95	0.00
23.1218	31991.07	31991.02	.22
24.0002	31991.02	31991.02	1.00
24.0148	31991.08	31991.02	1.00
24.1134	31990.70	31991.02	.33
25.0250	31991.24	31991.02	.78
25.1232	31991.16	31991.02	1.00
25.1414	31991.04	31991.02	1.00
26.0010	31991.12	31991.03	1.00
26.0156	31991.13	31991.03	1.00
26.1140	31991.01	31991.03	1.00
26.1326	31991.14	31991.04	1.00
27.0106	31990.90	31991.05	1.00
27.1236	31991.00	31991.07	1.00
27.1426	31991.26	31991.07	1.00
28.0018	31991.12	31991.08	1.00
28.0206	31991.08	31991.09	1.00
28.1148	31990.85	31991.10	.44
28.1336	31991.26	31991.10	1.00
28.2332	31991.24	31991.11	1.00
29.0116	31990.96	31991.11	1.00
29.1104	31990.82	31991.10	.44
29.1246	31991.27	31991.10	1.00
30.0028	31991.06	31991.08	1.00
30.0218	31991.16	31991.08	1.00
30.1158	31991.10	31991.05	1.00
30.1346	31991.11	31991.05	1.00
30.2340	31991.15	31991.02	1.00
31.0126	31991.04	31991.02	1.00
31.1110	31991.04	31991.00	1.00
31.1256	31991.08	31990.99	1.00
32.0036	31991.05	31990.98	1.00
34.2358	31991.28	31991.11	1.00
35.1314	31991.35	31991.14	1.00
35.2314	31991.23	31991.16	1.00
36.0056	31991.10	31991.16	1.00
36.1224	31991.08	31991.17	1.00
36.1414	31991.42	31991.17	.44
37.0008	31991.23	31991.17	1.00
37.0156	31991.28	31991.18	1.00
37.1136	31991.13	31991.18	1.00
37.1322	31991.20	31991.18	1.00
37.2322	31991.02	31991.17	1.00
38.0106	31991.19	31991.17	1.00
38.1234	31991.18	31991.16	1.00
39.0022	31991.31	31991.15	1.00
39.0206	31991.21	31991.15	1.00
39.1146	31991.40	31991.14	1.00
39.2330	31991.11	31991.13	1.00
41.2340	31991.19	31991.12	1.00
42.1108	31991.68	31991.12	.11
42.1252	31991.11	31991.13	1.00
42.2254	31991.67	31991.14	.11
43.0038	31991.31	31991.14	1.00
43.2346	31991.24	31991.18	1.00
44.0136	31991.19	31991.18	1.00
44.1116	31991.08	31991.18	1.00
44.1302	31991.21	31991.18	1.00
44.2302	31991.08	31991.16	1.00
45.0046	31991.22	31991.16	1.00
45.1400	31991.36	31991.06	1.00

SATELLITE NO. 14 - NO OF FIXES = 80

21.1638	32072.38	32072.24	1.00
22.0420	32072.35	32072.32	1.00
22.0606	32072.32	32072.32	1.00
22.1548	32072.48	32072.36	1.00
23.0334	32072.26	32072.35	1.00
23.1642	32072.53	32072.34	1.00
23.1830	32072.17	32072.34	.78
24.0424	32071.86	32072.34	0.00
24.1552	32072.35	32072.35	1.00
24.1736	32072.51	32072.35	1.00
25.0334	32039.20	32072.36	0.00
25.1646	32072.40	32072.39	1.00
25.1836	32071.88	32072.40	0.00
26.0428	32072.55	32072.42	1.00
26.1556	32072.61	32072.45	1.00
26.1742	32072.62	32072.45	1.00
27.0336	32072.40	32072.47	1.00
27.0522	32072.47	32072.47	1.00
27.1508	32072.32	32072.49	1.00
27.1650	32072.55	32072.49	1.00
28.0248	32074.81	32072.51	0.00
28.0430	32072.51	32072.51	1.00
28.1558	32072.58	32072.52	1.00
28.1746	32072.59	32072.52	1.00
29.0338	32072.60	32072.53	1.00
29.0526	32072.53	32072.53	1.00
29.1508	32072.59	32072.53	1.00
29.1654	32072.52	32072.53	1.00
30.0250	32072.80	32072.54	.44
30.0434	32072.55	32072.54	1.00
30.1602	32072.58	32072.54	1.00
30.1750	32072.37	32072.54	1.00
31.0342	32072.62	32072.54	1.00
31.0530	32072.66	32072.54	1.00
31.1512	32072.65	32072.54	1.00
31.1658	32072.66	32072.54	1.00
34.1610	32072.62	32072.65	1.00
34.1758	32072.79	32072.65	1.00
35.0350	32072.78	32072.67	1.00
35.0538	32072.74	32072.68	1.00
35.1518	32072.78	32072.70	1.00
35.1704	32072.72	32072.70	1.00
36.0302	32072.70	32072.72	1.00
36.0446	32072.88	32072.72	1.00
36.1612	32072.85	32072.74	1.00
36.1800	32072.64	32072.75	1.00
37.0354	32072.67	32072.76	1.00
37.0542	32072.67	32072.76	1.00
37.1522	32072.86	32072.78	1.00
37.1708	32072.68	32072.78	1.00
38.0306	32073.07	32072.79	1.00
38.0450	32072.78	32072.80	1.00
38.1616	32072.87	32072.81	1.00
38.1804	32073.02	32072.81	.33
39.0358	32072.85	32072.82	1.00
39.0546	32072.84	32072.82	1.00
39.1524	32072.79	32072.82	1.00
39.1712	32072.88	32072.82	1.00
40.0308	32072.98	32072.82	1.00
40.0454	32072.88	32072.82	1.00
40.1620	32073.21	32072.82	.11
40.1810	32072.65	32072.82	1.00
41.0404	32072.88	32072.82	1.00
41.0550	32072.70	32072.82	1.00
41.1528	32072.79	32072.82	1.00
41.1714	32072.96	32072.82	1.00
42.0312	32072.82	32072.82	1.00
42.0458	32072.94	32072.82	1.00
42.1440	32073.10	32072.83	.44
42.1624	32072.94	32072.83	1.00
43.1532	32072.86	32072.86	1.00
43.1720	32072.92	32072.89	1.00
44.0316	32072.80	32072.91	1.00
44.0504	32072.85	32072.92	1.00
44.1442	32073.05	32072.92	1.00
44.1628	32072.97	32072.92	1.00
45.0410	32072.96	32072.89	1.00
45.0602	32075.54	32072.89	0.00
45.1536	32073.02	32072.81	1.00
45.1728	32072.80	32072.80	1.00

Table 9

SATELLITE NO. 15 - NO OF FIXES = 73

21.0644	32036.91	32036.80	1.00
21.1834	32036.98	32036.95	1.00
22.1742	32037.07	32037.05	1.00
23.0508	32037.26	32037.05	.44
23.0656	32037.22	32037.05	.67
24.0606	32037.06	32037.01	1.00
24.1610	32042.24	32037.01	0.00
24.1758	32037.79	32037.01	0.00
25.0520	32036.81	32037.01	.44
25.1706	32037.23	32037.03	1.00
25.1850	32037.04	32037.03	1.00
26.0618	32037.13	32037.05	1.00
26.1800	32037.22	32037.07	1.00
27.1712	32037.18	32037.12	1.00
28.0444	32037.31	32037.14	.78
28.0638	32049.18	32037.15	0.00
28.1626	32037.15	32037.16	1.00
28.1812	32036.94	32037.16	.78
29.0354	32037.27	32037.17	1.00
29.0542	32037.20	32037.17	1.00
29.1536	32037.18	32037.16	1.00
29.1720	32037.21	32037.16	1.00
30.0456	32037.88	32037.15	0.00
30.1632	32037.27	32037.13	1.00
30.1820	32036.92	32037.13	.44
31.0406	32037.29	32037.11	1.00
31.0550	32037.12	32037.11	1.00
31.1548	32037.24	32037.10	1.00
31.1734	32037.20	32037.10	1.00
34.1658	32037.27	32037.21	1.00
35.0422	32037.21	32037.24	1.00
35.0610	32037.15	32037.24	1.00
35.1606	32037.31	32037.27	1.00
35.1752	32037.40	32037.27	1.00
36.0336	32037.49	32037.29	1.00
36.0520	32037.44	32037.29	1.00
36.1520	32037.24	32037.31	1.00
36.1704	32037.49	32037.32	.78
37.0432	32037.43	32037.34	1.00
37.0620	32037.36	32037.34	1.00
37.1616	32037.21	32037.35	1.00
37.1804	32037.41	32037.36	1.00
38.0346	32037.40	32037.37	1.00
38.0530	32037.48	32037.37	1.00
38.1530	32037.44	32037.38	1.00
38.1714	32037.41	32037.38	1.00
39.0440	32037.28	32037.39	1.00
39.0630	32037.17	32037.39	1.00
39.1626	32037.45	32037.39	1.00
39.1814	32037.64	32037.39	.33
40.0354	32037.43	32037.40	1.00
40.0540	32037.29	32037.40	1.00
40.1540	32037.53	32037.40	1.00
40.1724	32037.56	32037.40	1.00
41.0308	32038.48	32037.41	0.00
41.0450	32037.54	32037.41	1.00
41.1634	32037.64	32037.41	.67
41.1824	32037.35	32037.41	1.00
42.0404	32037.43	32037.42	1.00
42.0550	32037.58	32037.42	1.00
42.1546	32037.47	32037.43	1.00
42.1734	32037.49	32037.43	1.00
43.0316	32037.26	32037.45	1.00
43.1644	32037.69	32037.47	.67
43.1836	32037.42	32037.47	1.00
44.0412	32037.52	32037.49	1.00
44.0602	32037.41	32037.49	1.00
44.1558	32037.49	32037.49	1.00
44.1744	32037.60	32037.49	1.00
45.0326	32037.37	32037.48	1.00
45.0510	32037.55	32037.48	1.00
45.1512	32037.79	32037.44	.33
45.1656	32037.67	32037.43	.78

SATELLITE NO. 18 - NO OF FIXES = 86

21.0818	32070.62	32070.45	1.00
21.1008	32069.47	32070.47	0.00
21.2000	32070.73	32070.55	1.00
21.2150	32070.53	32070.56	1.00
22.0730	32070.59	32070.60	1.00
22.0916	32070.51	32070.61	1.00
22.1914	32070.70	32070.63	1.00
22.2058	32070.82	32070.63	.67
23.0646	32070.52	32070.63	1.00
23.0828	32070.59	32070.63	1.00
23.1020	32105.76	32070.63	0.00
23.2008	32070.74	32070.63	1.00
24.0738	32070.69	32070.62	1.00
24.0928	32070.60	32070.62	1.00
24.1922	32070.62	32070.62	1.00
24.2108	32070.70	32070.62	1.00
25.0654	32070.78	32070.63	1.00
25.0836	32070.62	32070.63	1.00
25.2018	32070.65	32070.64	1.00
26.0748	32070.73	32070.67	1.00
26.0938	32070.37	32070.67	.22
26.1928	32070.72	32070.70	1.00
26.2116	32070.96	32070.70	.67
27.0658	32070.68	32070.73	1.00
27.0846	32070.97	32070.74	.78
27.1842	32070.80	32070.78	1.00
27.2028	32070.74	32070.78	1.00
28.0612	32070.51	32070.82	.44
28.0756	32070.93	32070.82	1.00
28.1936	32070.73	32070.86	1.00
28.2128	32071.21	32070.86	.22
29.0708	32070.96	32070.88	1.00
29.0856	32071.20	32070.88	.22
29.1848	32070.91	32070.88	1.00
29.2036	32070.89	32070.88	1.00
30.0620	32071.12	32070.88	.44
30.0810	32070.88	32070.87	1.00
30.1946	32070.96	32070.86	1.00
31.0718	32070.92	32070.84	1.00
31.0904	32070.67	32070.84	.67
31.1856	32071.00	32070.84	1.00
31.2044	32070.92	32070.83	1.00
34.1818	32071.15	32071.01	1.00
34.2008	32071.15	32071.01	1.00
35.0736	32071.14	32071.02	1.00
35.0922	32079.74	32071.02	0.00
35.1920	32071.05	32071.03	1.00
35.2104	32070.96	32071.03	1.00
36.0644	32070.99	32071.02	1.00
36.0830	32070.97	32071.02	1.00
36.1826	32071.32	32071.02	.67
36.2014	32070.99	32071.02	1.00
37.0742	32071.04	32071.02	1.00
37.0930	32063.91	32071.02	0.00
37.1924	32071.04	32071.04	1.00
37.2112	32071.17	32071.04	1.00
38.0652	32071.16	32071.06	1.00
38.0838	32070.82	32071.07	.22
38.1836	32071.04	32071.10	1.00
38.2022	32071.19	32071.11	1.00
39.0748	32071.32	32071.15	1.00
39.1752	32072.13	32071.19	0.00
39.1932	32071.13	32071.19	1.00
39.2122	32070.53	32071.20	0.00
40.1844	32071.35	32071.23	1.00
40.2032	32071.16	32071.23	1.00
41.0616	32071.99	32071.23	.22
41.0758	32071.41	32071.23	1.00
41.1758	32071.12	32071.22	1.00
41.1940	32071.06	32071.22	1.00
42.0710	32071.38	32071.21	1.00
42.0858	32071.67	32071.21	.11
42.1852	32071.28	32071.21	1.00
42.2040	32071.23	32071.21	1.00
43.1802	32071.04	32071.25	.44
43.1948	32071.33	32071.26	1.00
44.0534	32069.30	32071.29	0.00
44.0716	32071.32	32071.29	1.00
44.0908	32074.02	32071.30	0.00
44.1718	32069.40	32071.32	0.00
44.1908	32071.39	32071.32	1.00
44.2052	32071.61	32071.32	.33
45.0628	32071.28	32071.32	1.00
45.0816	32071.06	32071.32	.22
45.1812	32071.38	32071.29	1.00
45.1958	32071.51	32071.28	1.00

Table 10

SATELLITE NO. 12 - NO OF FIXES =

51.0000	32074.54	32074.41	1.00
51.0146	32074.54	32074.44	1.00
51.1122	32074.52	32074.53	1.00
51.1306	32074.55	32074.54	1.00
51.2308	32074.22	32074.55	.22
52.0050	32074.45	32074.55	1.00
52.1212	32074.65	32074.46	1.00
52.1400	32074.53	32074.48	1.00
53.0000	32074.44	32074.41	1.00
56.0236	32074.57	32074.54	1.00
56.1204	32074.69	32074.54	1.00
56.1350	32074.48	32074.59	1.00
56.2352	32074.68	32074.62	1.00
57.0138	32074.80	32074.63	.78
57.1254	32074.75	32074.65	.89
58.0042	32074.78	32074.66	.89
58.1016	32074.85	32074.66	.78
58.1158	32074.74	32074.66	1.00
58.1346	32074.64	32074.66	1.00
58.2348	32074.74	32074.66	1.00
59.0136	32074.80	32074.65	.89
59.1104	32074.58	32074.64	1.00
59.1250	32074.62	32074.64	1.00
59.2254	32074.43	32074.63	.44
60.0040	32074.34	32074.63	.22
62.1006	32074.96	32074.63	1.00
62.1150	32074.77	32074.64	1.00
62.1338	32074.66	32074.64	1.00
62.2200	32073.72	32074.66	0.00
62.2342	32074.70	32074.66	1.00
63.1056	32074.69	32074.68	1.00
63.1242	32074.70	32074.68	1.00
63.2248	32074.64	32074.69	1.00
64.0034	32074.56	32074.69	.78
64.1002	32075.01	32074.67	.67
64.1148	32074.73	32074.67	1.00
64.2156	32074.31	32074.63	.22
64.2340	32074.57	32074.62	.78
65.1052	32074.42	32074.55	.67
65.1238	32074.91	32074.54	.67
65.2244	32074.22	32074.47	.44
66.0030	32074.59	32074.46	1.00
66.0958	32074.96	32074.39	.11
66.1142	32074.34	32074.38	.89
66.2152	32074.13	32074.33	.67
67.1048	32074.74	32074.29	.22
67.1234	32074.46	32074.24	1.00
67.2240	32074.41	32074.28	1.00
68.0958	32074.28	32074.31	.89
68.1140	32074.37	32074.32	1.00
68.2148	32074.32	32074.35	0.00
69.2240	32074.59	32074.44	.89
71.0120	3[illegible] 74.69	32074.46	.78
72.1320	3[illegible] 74.58	32074.44	1.00
72.2144	32074.40	32074.45	1.00
73.0114	32074.66	32074.46	.89
73.1224	32074.57	32074.50	1.00
73.2232	32074.35	32074.54	.89
74.0016	32074.44	32074.54	1.00
74.2138	32074.65	32074.53	1.00
74.2320	32074.62	32074.53	1.00
75.0114	32075.03	32074.51	.22
75.1038	32075.05	32074.42	.22
75.1220	32074.24	32074.40	.44

SATELLITE NO. 13 - NO OF FIXES = [illegible] 97

50.2328	31991.31	31991.17	1.00
51.0116	31991.36	31991.19	1.00
51.1054	31991.26	31991.28	1.00
51.1240	31991.27	31991.29	1.00
51.2244	31991.08	31991.32	.44
52.0026	31991.39	31991.33	1.00
52.0218	31992.34	31991.34	1.00
52.1150	31991.27	31991.33	1.00
52.1338	31991.59	31991.32	.44
52.2342	31991.53	31991.30	.78
53.0126	31991.28	31991.29	1.00
53.1102	31991.15	31991.26	1.00
53.1244	31991.33	31991.25	1.00
53.2254	31991.38	31991.21	1.00
56.0054	31991.32	31991.12	1.00
57.1118	31991.40	31991.24	1.00
57.2310	31991.27	31991.30	1.00
58.1030	31991.45	31991.36	1.00
58.1216	31991.46	31991.37	1.00
58.2224	31991.45	31991.42	1.00
59.0008	31991.38	31991.42	1.00
59.0944	31991.97	31991.46	0.00
59.1130	31991.49	31991.46	1.00
59.2140	31991.71	31991.49	.44
59.2320	31991.50	31991.49	1.00
60.0110	31991.69	31991.50	.44
62.1046	31991.40	31991.49	1.00
62.1234	31991.59	31991.48	1.00
62.2242	31991.58	31991.48	1.00
63.0958	31991.68	31991.46	.67
63.1144	31991.48	31991.46	1.00
63.1332	31991.61	31991.46	.89
63.2156	31991.72	31991.45	.44
63.2340	31991.39	31991.44	1.00
64.0132	31991.63	31991.44	.89
64.1056	31991.30	31991.43	.78
64.1242	31991.47	31991.43	1.00
64.2252	31991.44	31991.42	1.00
65.0038	31991.28	31991.42	.78
65.1008	31991.50	31991.42	1.00
65.1154	31991.27	31991.42	.67
65.2204	31991.39	31991.42	1.00
65.2348	31991.48	31991.42	1.00
66.0920	31991.81	31991.42	.22
66.1104	31991.02	31991.42	0.00
66.1252	31990.98	31991.42	0.00
66.2118	31991.17	31991.42	.22
66.2302	31991.32	31991.42	.78
67.0050	31991.53	31991.42	1.00
67.1016	31991.57	31991.43	1.00
67.1208	31991.89	31991.43	0.00
67.2212	31991.44	31991.43	1.00
68.0000	31991.51	31991.43	1.00
68.0930	31991.55	31991.44	1.00
68.1114	31991.42	31991.44	1.00
68.1302	31990.95	31991.44	0.00
68.2126	31991.53	31991.44	1.00
68.2310	31991.50	31991.44	1.00
69.0100	31992.53	31991.44	0.00
69.1026	31991.34	31991.44	1.00
69.1212	31991.40	31991.44	1.00
69.2222	31991.61	31991.43	1.00
70.0008	31991.44	31991.43	1.00
70.0938	31991.44	31991.42	1.00
70.1124	31991.39	31991.41	1.00
70.1312	31991.32	31991.41	.89
70.2136	31991.53	31991.40	1.00
70.2320	31991.46	31991.39	1.00
71.1038	31991.36	31991.38	1.00
71.1222	31991.39	31991.37	1.00
71.2230	31991.33	31991.36	.89
72.0018	31991.42	31991.36	1.00
72.0946	31991.54	31991.37	1.00
72.1134	31991.36	31991.37	.89
72.2332	31991.34	31991.39	.89
73.0900	31991.36	31991.43	.89
73.1044	31991.47	31991.44	1.00
73.2058	31991.87	31991.48	.22
74.0956	31991.68	31991.51	.89
74.2152	31991.46	31991.49	1.00
74.2338	31991.42	31991.4[illegible]	1.00
75.0908	31991.62	31991.41	1.00
75.1056	31991.38	31991.39	.78

SATELLITE NO. 14 - NO OF FIXES = 76

51.0234	32073.04	32073.02	1.00
51.0424	32073.23	32073.04	.78
51.1546	32073.21	32073.13	.89
51.1734	32073.13	32073.13	1.00
52.0332	32073.11	32073.15	1.00
52.0520	32073.12	32073.15	1.00
52.1454	32072.37	32073.14	0.00
52.1642	32073.08	32073.13	1.00
53.0244	32073.32	32073.19	.78
53.0428	32073.15	32073.10	1.00
53.1548	32073.23	32073.04	1.00
56.0534	32073.24	32073.20	.44
56.1500	32073.21	32073.22	1.00
56.1648	32073.47	32073.22	.44
57.0252	32073.43	32073.24	.78
57.1410	32073.39	32073.25	.89
57.1554	32073.50	32073.25	.44
58.0204	32073.04	32073.25	.44
58.0540	32075.92	32073.26	0.00
58.1506	32073.29	32073.26	1.00
58.1650	32073.28	32073.25	1.00
59.0254	32073.27	32073.25	1.00
59.1412	32073.36	32073.26	1.00
59.1554	32073.14	32073.24	.89
60.0206	32073.41	32073.24	1.00
62.1324	32072.68	32073.28	0.00
62.1510	32073.50	32073.25	1.00
62.1700	32073.46	32073.30	1.00
63.1418	32073.34	32073.36	1.00
63.1604	32073.36	32073.37	1.00
64.0214	32073.48	32073.40	1.00
64.0402	32073.11	32073.40	.22
64.1324	32073.44	32073.43	1.00
64.1512	32073.48	32073.43	1.00
65.0124	32073.43	32073.45	1.00
65.1422	32073.48	32073.47	.67
65.1610	32073.63	32073.47	.78
66.0216	32073.48	32073.48	1.00
66.1516	32073.43	32073.49	1.00
67.0128	32073.73	32073.51	.67
67.0312	32073.43	32073.51	.89
67.1424	32073.65	32073.52	1.00
67.1614	32073.46	32073.53	1.00
68.0220	32073.54	32073.55	1.00
68.0408	32073.58	32073.55	1.00
68.1334	32073.66	32073.57	1.00
68.1520	32073.64	32073.57	1.00
69.0130	32073.65	32073.59	1.00
69.0314	32073.63	32073.60	1.00
69.1428	32073.62	32073.62	1.00
69.1616	32073.61	32073.63	1.00
70.0224	32073.62	32073.64	1.00
70.0410	32073.67	32073.64	1.00
70.1342	32073.75	32073.65	1.00
70.1524	32073.69	32073.64	1.00
71.0318	32073.59	32073.66	1.00
71.1432	32073.74	32073.66	1.00
71.1620	32073.65	32073.66	1.00
72.0048	32077.84	32073.66	0.00
72.0226	32073.70	32073.66	1.00
72.0416	32074.03	32073.67	.22
72.1342	32073.76	32073.67	1.00
72.1528	32073.70	32073.67	1.00
73.0140	32073.87	32073.68	.89
73.0322	32073.79	32073.68	1.00
73.1252	32073.30	32073.70	.22
73.1436	32073.62	32073.70	.89
73.1624	32073.59	32073.70	.89
74.0052	32075.13	32073.71	0.00
74.0230	32073.56	32073.71	.78
74.0420	32074.03	32073.71	.44
75.0140	32073.87	32073.72	1.00
75.0326	32073.64	32073.71	1.00
75.1258	32073.86	32073.69	1.00
75.1440	32073.72	32073.69	1.00
75.1630	32073.78	32073.68	1.00

Table 11

SATELLITE NO. 15 - NO OF FIXES = 91

50.1816	32037.96	32037.62	.44
51.0358	32037.93	32037.74	.44
51.0540	32037.75	32037.75	1.00
52.0306	32038.01	32037.79	.44
52.0450	32037.63	32037.78	1.00
52.0640	32037.93	32037.78	.89
52.1828	32037.83	32037.71	1.00
53.0402	32037.88	32037.66	1.00
53.0548	32037.67	32037.65	1.00
53.1738	32037.60	32037.60	.72
56.0324	32037.69	32037.72	.78
56.0510	32037.69	32037.72	.78
57.0420	32038.02	32037.80	.89
57.0610	32037.79	32037.80	1.00
57.1612	32037.96	32037.83	1.00
57.1800	32038.02	32037.83	.89
58.0332	32038.07	32037.86	.89
58.0520	32037.92	32037.86	1.00
58.1526	32037.89	32037.88	1.00
59.0430	32037.69	32037.90	.44
59.0620	32037.93	32037.91	1.00
59.1438	32037.70	32037.92	.44
59.1626	32038.15	32037.92	.78
59.1814	32037.60	32037.93	.22
60.0340	32037.87	32037.94	1.00
60.0528	32037.95	32037.94	1.00
62.0352	32038.31	32038.00	.44
62.0540	32038.26	32038.00	.67
62.1402	32038.34	32038.01	.22
62.1544	32038.02	32038.01	1.00
62.1734	32038.12	32038.01	1.00
63.1458	32038.00	32038.02	1.00
63.1644	32038.02	32038.02	1.00
64.0548	32037.93	32038.03	.89
64.1412	32037.99	32038.04	1.00
64.1556	32038.19	32038.04	1.00
64.1746	32038.21	32038.04	1.00
65.0314	32038.34	32038.04	.67
65.0500	32037.93	32038.04	.78
65.1506	32037.93	32038.05	.78
65.1654	32037.95	32038.05	.78
66.0410	32038.05	32038.06	1.00
66.0600	32037.73	32038.06	0.00
66.1420	32038.12	32038.07	1.00
66.1606	32038.26	32038.07	1.00
67.0510	32037.97	32038.09	.78
67.1334	32038.05	32038.10	.89
67.1516	32038.17	32038.10	1.00
67.1706	32038.31	32038.11	1.00
68.0424	32038.19	32038.13	1.00
68.1430	32038.41	32038.15	.78
68.1614	32038.08	32038.16	.89
69.0520	32037.97	32038.19	.78
69.1344	32038.36	32038.21	1.00
69.1528	32038.27	32038.21	1.00
69.1716	32038.10	32038.22	.89
70.0432	32038.32	32038.25	1.00
70.1438	32038.16	32038.28	1.00
70.1626	32038.32	32038.28	1.00
71.0156	32038.53	32038.31	.78
71.0342	32038.29	32038.31	1.00
71.0530	32038.68	32038.32	.22
71.1352	32038.47	32038.34	1.00
71.1536	32038.37	32038.34	1.00
71.1728	32038.33	32038.34	1.00
72.0254	32038.30	32038.36	1.00
72.0444	32038.42	32038.37	1.00
72.1450	32038.45	32038.38	1.00
72.1636	32038.39	32038.39	1.00
73.0212	32035.97	32038.39	0.00
73.0352	32038.50	32038.40	1.00
73.1404	32038.45	32038.40	1.00
73.1546	32038.34	32038.40	1.00
74.0120	32038.77	32038.39	.22
74.0304	32038.37	32038.39	1.00
74.0452	32038.21	32038.39	.89
74.1648	32038.41	32038.35	1.00
75.0216	32038.34	32038.32	1.00
75.0402	32038.36	32038.31	1.00
75.1412	32038.38	32038.25	1.00
75.1556	32038.35	32038.24	1.00

SATELLITE NO. 18 - NO OF FIXES = 91

50.1928	32071.55	32071.40	1.00
51.0652	32071.70	32071.51	.78
51.0840	32071.10	32071.52	.22
51.1840	32071.57	32071.57	1.00
51.2026	32071.61	32071.57	1.00
52.0604	32071.74	32071.59	.78
52.0750	32071.54	32071.59	1.00
52.1754	32071.42	32071.58	.78
52.1938	32071.74	32071.58	.89
53.0700	32071.55	32071.57	1.00
53.0848	32071.57	32071.57	1.00
53.1850	32071.85	32071.57	.78
53.2036	32071.63	32071.57	1.00
56.0620	32071.77	32071.72	1.00
56.0806	32071.68	32071.72	1.00
56.1810	32071.78	32071.74	1.00
56.1956	32071.72	32071.74	1.00
57.0530	32071.94	32071.76	.78
57.0716	32072.11	32071.76	.22
57.0906	32072.07	32071.76	.22
57.1724	32072.08	32071.77	.22
57.1908	32071.86	32071.77	1.00
57.2056	32071.72	32071.77	1.00
58.0626	32071.99	32071.78	.44
58.0814	32071.78	32071.79	1.00
58.1818	32071.79	32071.80	1.00
58.2006	32071.74	32071.80	1.00
59.0538	32072.25	32071.82	.11
59.0724	32071.85	32071.83	1.00
59.1732	32072.01	32071.85	.78
59.1916	32071.85	32071.86	.89
60.0450	32072.96	32071.86	0.00
62.0456	32071.94	32071.98	1.00
62.0642	32071.95	32071.98	1.00
62.0834	32073.14	32071.98	.44
62.1836	32071.86	32071.98	1.00
63.0740	32071.89	32071.97	1.00
63.1748	32072.07	32071.97	1.00
63.1938	32072.22	32071.97	.44
64.0504	32071.92	32071.96	1.00
64.0650	32072.04	32071.96	1.00
64.0840	32071.39	32071.96	0.00
64.1702	32062.95	32071.96	0.00
64.1846	32072.02	32071.96	1.00
65.0418	32078.19	32071.97	0.00
65.0602	32072.11	32071.97	1.00
65.0750	32071.67	32071.97	.44
65.1756	32072.06	32071.99	1.00
65.1944	32072.05	32071.99	1.00
66.0512	32071.86	32072.01	1.00
66.0658	32072.12	32072.01	1.00
66.1710	32071.92	32072.03	1.00
66.1856	32072.11	32072.03	1.00
67.0424	32072.41	32072.05	.22
67.0610	32072.19	32072.05	.89
67.0758	32072.38	32072.06	.22
67.1804	32072.11	32072.07	1.00
67.1954	32071.94	32072.08	.67
68.0522	32072.14	32072.09	1.00
68.0710	32072.03	32072.09	1.00
68.1718	32072.28	32072.10	.89
68.1904	32072.20	32072.10	1.00
69.0432	32071.95	32072.11	.78
69.0618	32072.21	32072.12	1.00
69.0808	32069.66	32072.12	0.00
69.1636	32074.63	32072.13	0.00
69.1814	32072.20	32072.13	1.00
69.2006	32072.61	32072.13	0.00
70.1726	32072.33	32072.16	.89
70.1912	32072.11	32072.17	1.00
71.0442	32072.24	32072.18	1.00
71.0626	32072.19	32072.19	1.00
71.0816	32072.25	32072.19	1.00
71.1640	32072.15	32072.21	1.00
71.1822	32072.17	32072.21	1.00
72.0354	32081.74	32072.23	0.00
72.0538	32072.29	32072.23	1.00
72.0724	32072.35	32072.23	1.00
72.1734	32072.40	32072.25	1.00
72.1922	32072.14	32072.26	1.00
73.0450	32072.32	32072.28	.89
73.1648	32072.42	32072.29	.89
73.1830	32072.29	32072.29	1.00
74.0402	32072.73	32072.30	.22
74.0546	32072.07	32072.30	.78
74.0734	32072.30	32072.29	1.00
74.1742	32072.42	32072.28	1.00
74.1930	32072.27	32072.27	1.00
75.0458	32072.18	32072.23	1.00
75.0646	32072.20	32072.22	.89
75.1652	32072.16	32072.14	1.00

PRINTOUT OF PUNCHED CARD OUTPUT FILE.

SMOOTHED t	RAW frequency	WEIGHT	Elevation	SAT N°	DD HH MM	Survey N°	Δsmoothed-raw
32073.22	32073.77	7	12.	12	2.1714	1A	-.5
32071.89	32072.00	0	28.	14	2.1838	1A	-.1
32036.31	32036.41	0	61.	15	2.193A	1A	-.1
32071.90	32072.10	3	28.	14	2.2026	1A	-.2
32069.74	32075.47	9	22.	18	2.2128	1A	-5.7
32069.77	32069.94	0	36.	1A	2.2310	1A	-.2
31990.72	31990.77	0	30.	13	3.0254	1A	-.1
32073.34	32073.76	6	43.	12	3.0314	1A	-.4
31990.74	31990.73	0	28.	13	3.0440	1A	.0
32073.35	32073.30	0	19.	12	3.0500	1A	.1
32071.92	32071.99	0	21.	14	3.0628	1A	-.1
32036.45	32036.52	0	25.	15	3.0658	1A	-.1
32071.92	32071.99	0	41.	14	3.0812	1A	-.1
32036.47	32036.58	0	33.	15	3.0844	1A	-.1
32069.91	32069.97	0	83.	18	3.1032	1A	-.1
32069.93	32067.98	9	7.	18	3.1218	1A	2.0
31990.82	31990.93	0	14.	13	3.1414	1A	-.1
32073.41	32073.31	0	18.	12	3.1432	1A	.1
31990.83	31991.01	3	62.	13	3.1600	1A	-.2
32073.42	32073.54	0	47.	12	3.161A	1A	-.1
32071.92	32072.07	5	8.	14	3.1748	1A	-.1
32036.54	32036.20	0	21.	15	3.1852	1A	.3
32071.92	32071.94	0	85.	14	3.1932	1A	-.0
32036.55	32036.71	0	40.	15	3.2036	1A	-.2
32071.92	32071.68	0	8.	14	3.2120	1A	.2
32070.00	32070.17	5	80.	18	3.2222	1A	-.2
32070.01	32070.00	0	10.	18	4.0010	1A	.0
32073.45	32073.92	8	14.	12	4.0220	1A	-.5
31990.86	31991.06	6	74.	13	4.0350	1A	-.2
32073.45	32073.53	0	61.	12	4.0404	1A	-.1
32071.92	32072.42	9	6.	14	4.0540	1A	-.5
32036.59	32036.65	0	9.	15	4.0612	1A	-.1
32071.91	32072.01	0	75.	14	4.0720	1A	-.1
32036.59	32036.82	6	81.	15	4.0758	1A	-.2
32071.91	32071.47	9	10.	14	4.0910	1A	.4
32070.03	32070.09	0	36.	18	4.0942	1A	-.1
32070.03	32070.06	0	23.	18	4.1128	1A	-.0
31990.84	31990.67	0	56.	13	4.1512	1A	.2
31990.84	31990.80	0	16.	13	4.1700	1A	.0
32071.90	32071.87	0	33.	14	4.1842	1A	.0
32071.90	32037.05	9	81.	14	4.1950	1A	34.9
32071.90	32071.90	0	25.	14	4.2030	1A	.0
32070.03	32069.96	0	30.	18	4.2132	1A	.1
32070.03	32069.93	0	28.	18	4.2320	1A	.1
31990.81	31990.86	0	45.	13	5.0300	1A	-.0
31990.81	31990.51	7	19.	13	5.0448	1A	.3
32071.90	32071.96	0	27.	14	5.0630	1A	-.1
32036.62	32036.50	0	37.	15	5.0710	1A	.1
32071.90	32072.07	0	31.	14	5.0816	1A	-.2
32036.62	32036.75	0	23.	15	5.0858	1A	-.1
32070.02	32070.16	0	63.	18	5.1040	1A	-.1
31990.78	31990.79	0	20.	13	5.1426	1A	-.0
31990.78	31990.91	0	42.	13	5.1612	1A	-.1
32071.91	32071.86	0	11.	14	5.1754	1A	.0
32036.62	32036.80	5	31.	15	5.1902	1A	-.2
32071.91	32071.98	0	71.	14	5.1938	1A	-.1
32036.62	32036.72	0	27.	15	5.2046	1A	-.1
32071.92	32074.19	9	5.	14	5.2128	1A	-2.3
32070.03	32070.14	0	74.	18	5.2230	1A	-.1
32070.03	32070.10	0	4.	18	6.0018	1A	-.1
32073.46	32074.52	9	16.	12	6.0220	1A	-1.1
31990.76	31990.98	0	48.	13	6.0404	1A	-.2
32071.94	32072.34	7	9.	14	6.0540	1A	-.4
32036.63	32036.68	0	15.	15	6.0622	1A	-.1
32071.94	32071.88	0	81.	14	6.0722	1A	.1
32036.63	32036.66	0	54.	15	6.0808	1A	-.0
32071.95	32071.64	7	5.	14	6.0914	1A	.3
32070.04	32070.08	0	60.	18	6.0952	1A	-.0
32070.05	32069.95	0	14.	18	6.1140	1A	.1
31990.76	31991.38	9	6.	13	6.1340	1A	-.6
32073.49	32073.46	0	74.	12	6.1520	1A	.0
32073.49	32073.53	0	10.	12	6.1708	1A	-.0
32036.64	32037.12	9	12.	15	6.1812	1A	-.5
32071.99	32072.07	0	50.	14	6.1846	1A	-.1
32036.64	32036.59	0	68.	15	6.1956	1A	.1
32071.99	32072.01	0	16.	14	6.2034	1A	-.0
32070.07	32069.99	0	46.	18	6.2138	1A	.1
32070.07	32070.20	0	18.	18	6.2330	1A	-.1
32073.52	32073.71	0	56.	12	7.0304	1A	-.2
32073.52	32073.74	5	14.	12	7.0452	1A	-.2
32072.03	32072.03	0	37.	14	7.0634	1A	.0
32036.66	32036.70	0	63.	15	7.0720	1A	-.0
32072.04	32072.05	0	21.	14	7.0820	1A	-.0
32070.10	32070.09	0	21.	18	7.0904	1A	.0
32070.10	32070.19	0	37.	18	7.1050	1A	-.1
31990.79	31990.79	0	32.	13	7.1434	1A	-.0
32073.55	32073.58	0	33.	12	7.1612	1A	-.0
32072.08	32072.12	0	17.	14	7.1756	1A	-.0
32036.68	32036.67	0	50.	15	7.1908	1A	.0
32072.08	32072.01	0	48.	14	7.1942	1A	.1
32070.13	32069.98	0	16.	18	7.2052	1A	.2
32070.14	32070.11	0	50.	18	7.2236	1A	.0
32073.58	32073.47	0	17.	12	8.0210	1A	.1
31990.80	31990.79	0	25.	13	8.0220	1A	.0
32073.58	32073.70	0	47.	12	8.0354	1A	-.1
32072.11	32072.21	5	13.	14	8.0542	1A	-.1
32036.70	32036.32	7	23.	15	8.0632	1A	.4
32072.12	32072.17	0	63.	14	8.0726	1A	-.1
32036.71	32036.71	0	35.	15	8.0820	1A	-.0
32070.17	32070.27	0	82.	18	8.1000	1A	-.1
32070.18	32071.00	9	9.	18	8.1152	1A	-.8
32073.60	32073.29	7	5.	12	8.1334	1A	.3
31990.82	31990.82	0	11.	13	8.1348	1A	-.0
32073.61	32073.75	5	81.	12	8.1518	1A	-.1
31990.82	31990.80	0	68.	13	8.1532	1A	.0
32073.61	32073.38	5	9.	12	8.1708	1A	.2
32036.73	32036.74	0	18.	15	8.1820	1A	-.0
32072.13	32072.12	0	66.	14	8.1852	1A	.0
32036.73	32036.64	0	46.	15	8.2006	1A	.1
32072.14	32072.26	6	12.	14	8.2040	1A	-.1
32070.20	32070.31	0	67.	18	8.2150	1A	-.1
32070.21	32070.69	9	12.	18	8.2338	1A	-.5
32073.62	32074.48	9	5.	12	9.0118	1A	-.9
31990.82	31990.60	6	12.	13	9.0134	1A	.2
32073.63	32073.74	0	82.	12	9.0258	1A	-.1
31990.82	31990.78	0	63.	13	9.0318	1A	.0
32073.63	32073.46	0	7.	12	9.0450	1A	.2
32036.76	32036.84	0	11.	15	9.0546	1A	-.1
32072.14	32072.06	0	68.	14	9.0634	1A	.1
32036.76	32036.82	0	66.	15	9.0732	1A	-.1
32072.14	32072.10	0	10.	14	9.0824	1A	.0
32070.23	32070.18	0	45.	18	9.0914	1A	.1
32070.23	32069.84	6	17.	18	9.1100	1A	.4
32073.64	32073.54	0	[illegible]	12	9.1422	1A	.1

CRUISE I CONTINUATION

31990.82	31990.92	0	70.	13	9.1444	1A	-.1
32073.64	32073.47	0	20.	12	9.1610	1A	.2
31990.82	31991.28	7	10.	13	9.1638	1A	-.5
32036.78	32036.84	0	7.	15	9.1734	1A	-.1
32072.13	32071.98	0	31.	14	9.1802	1A	.1
32036.79	32037.08	7	84.	15	9.1920	1A	-.3
32072.12	32072.14	0	24.	14	9.1948	1A	-.0
32070.25	32070.29	0	32.	18	9.2058	1A	-.0
32070.26	32070.51	6	23.	18	9.2244	1A	-.3
32073.64	32073.78	0	33.	12	10.0204	1A	-.1
31990.82	31990.78	0	69.	13	10.0228	1A	.0
32073.64	32073.76	0	22.	12	10.0350	1A	-.1
31990.82	31990.84	0	10.	13	10.041A	1A	-.0
32072.10	32072.19	0	29.	14	10.0544	1A	-.1
32036.82	32036.76	0	66.	15	10.0642	1A	.1
32072.10	32072.17	0	25.	14	10.0730	1A	-.1
32070.28	32069.52	9	21.	18	10.0824	1A	.8
32070.28	32070.27	0	36.	18	10.1010	1A	.0
32073.65	32073.69	0	15.	12	10.1330	1A	-.0
31990.81	31990.74	0	33.	13	10.1356	1A	.1
32073.65	32073.68	0	50.	12	10.1514	1A	-.0
31990.81	31990.56	7	23.	13	10.1544	1A	.3
32072.08	32071.83	6	14.	14	10.1710	1A	.2
32036.85	32036.75	0	49.	15	10.1828	1A	.1
32072.07	32072.16	0	55.	14	10.1900	1A	-.1
32070.29	32070.31	0	15.	18	10.2010	1A	-.0
32070.30	32070.23	0	51.	18	10.2158	1A	.1
32073.65	32074.39	9	10.	12	11.0112	1A	-.7
31990.80	31990.63	6	24.	13	11.0140	1A	.2
32073.65	32073.68	0	72.	12	11.0254	1A	-.0
31990.80	31990.99	0	30.	13	11.0328	1A	-.2
32072.04	32072.44	7	9.	14	11.0456	1A	-.4
32036.88	32036.67	0	23.	15	11.0556	1A	.2

Table 13

PRINTOUT OF PUNCHED CARD OUTPUT FILE.

SMOOTHED f	RAW frequency	WEIGHT	Elevation	SAT N°	DD HH MM	Survey N°	Δ smoothed - raw
32036.80	32036.91	0	32.	15	21.0644	18	-.1
32070.45	32070.62	0	72.	18	21.0818	18	-.2
32070.47	32069.47	9	9.	18	21.1008	18	1.0
31990.63	31990.83	0	10.	13	21.1210	18	-.2
32073.76	32073.83	0	67.	12	21.1402	18	-.1
32072.24	32072.38	0	28.	14	21.1638	18	-.1
32036.95	32036.98	0	48.	15	21.1834	18	-.0
32070.55	32070.73	0	51.	18	21.2000	18	-.2
32070.56	32070.53	0	14.	18	21.2150	18	.0
31990.81	31991.86	9	6.	13	21.2358	18	-1.0
32073.86	32074.06	0	82.	12	22.0144	18	-.2
32073.87	32073.85	0	7.	12	22.0332	18	.0
32072.32	32072.35	0	19.	14	22.0420	18	-.0
32072.32	32072.32	0	37.	14	22.0606	18	.0
32070.60	32070.59	0	25.	18	22.0730	18	.0
32070.61	32070.51	0	29.	18	22.0916	18	.1
31990.94	31991.04	0	48.	13	22.1306	18	-.1
31990.95	31990.65	9	16.	13	22.1454	18	.3
32072.35	32072.48	0	8.	14	22.1548	18	-.1
32037.05	32037.07	0	67.	15	22.1742	18	-.0
32070.63	32070.70	0	17.	18	22.1914	18	-.1
32070.63	32070.82	3	42.	18	22.2058	18	-.2
32073.96	32073.85	0	25.	12	23.0048	18	.1
32073.96	32074.04	0	28.	12	23.0234	18	-.1
32072.35	32072.26	0	4.	14	23.0334	18	.1
32037.05	32037.26	5	34.	15	23.0508	18	-.2
32070.63	32070.52	0	7.	18	23.0646	18	.1
32037.05	32037.22	3	21.	15	23.0656	18	-.2
32070.63	32070.59	0	81.	18	23.0828	18	.0
32070.63	32105.76	9	5.	18	23.1020	18	-35.1
31991.02	31991.07	7	16.	13	23.1218	18	-.1
32073.97	32073.95	0	62.	12	23.1400	18	.0
32072.34	32072.53	0	37.	14	23.1642	18	-.2
32072.34	32072.17	2	19.	14	23.1830	18	.2
32070.63	32070.74	0	73.	18	23.2008	18	-.1
31991.02	31991.02	0	13.	13	24.0002	18	.0
31991.02	31991.08	0	55.	13	24.0148	18	-.1
32072.34	32071.86	9	30.	14	24.0424	18	.5
32037.01	32037.06	0	51.	15	24.0606	18	-.0
32070.62	32070.69	0	45.	18	24.0738	18	-.1
32070.62	32070.60	0	16.	18	24.0928	18	.0
31991.02	31990.70	6	5.	13	24.1134	18	.3
32073.97	32074.03	0	55.	12	24.1304	18	-.1
32073.96	32073.95	0	13.	12	24.1452	18	.0
32072.35	32072.35	0	15.	14	24.1552	18	-.0
32037.01	32042.24	9	9.	15	24.1610	18	-5.2
32072.35	32072.51	0	48.	14	24.1736	18	-.2
32037.01	32037.79	9	73.	15	24.1758	18	-.8
32070.62	32070.62	0	14.	18	24.1922	18	.0
32070.62	32070.70	0	18.	18	24.2108	18	-.1
32073.96	32073.93	0	33.	12	25.0042	18	.0
32073.96	32074.10	0	21.	12	25.0230	18	-.1
31991.02	31991.24	2	12.	13	25.0250	18	-.2
32072.36	32039.20	9	9.	14	25.0334	18	33.2
32037.01	32036.81	5	64.	15	25.0520	18	.2
32070.63	32070.78	0	15.	18	25.0654	18	-.2
32070.63	32070.62	0	48.	18	25.0836	18	.0
32073.95	32074.10	0	16.	12	25.1210	18	-.1
31991.02	31991.16	0	30.	13	25.1232	18	-.1
32073.95	32074.08	0	45.	12	25.1356	18	-.1
31991.02	31991.04	0	24.	13	25.1414	18	-.0
32072.39	32072.40	0	63.	14	25.1646	18	-.0
32037.03	32037.23	0	43.	15	25.1706	18	-.2
32072.40	32071.88	9	11.	14	25.1836	18	.5
32037.03	32037.04	0	17.	15	25.1850	18	-.0
32070.64	32070.65	0	70.	18	25.2018	18	-.0
32073.95	32073.90	0	9.	12	25.2350	18	.1
31991.03	31991.12	0	24.	13	26.0010	18	-.1
32073.95	32074.13	0	61.	12	26.0134	18	-.2
31991.03	31991.13	0	29.	13	26.0156	18	-.1
32072.42	32072.55	0	50.	14	26.0428	18	-.1
32037.05	32037.13	0	27.	15	26.0618	18	-.1
32070.67	32070.73	0	78.	18	26.0748	18	-.1
32070.67	32070.37	7	8.	18	26.0938	18	.3
31991.03	31991.01	0	12.	13	26.1140	18	.0
31991.04	31991.14	0	58.	13	26.1326	18	-.1
32073.97	32073.91	0	9.	12	26.1452	18	.1
32072.45	32072.61	0	24.	14	26.1556	18	-.2
32072.45	32072.62	0	28.	14	26.1742	18	-.2
32037.07	32037.22	0	40.	15	26.1800	18	-.1
32070.70	32070.72	0	55.	18	26.1928	18	-.0
32070.70	32070.96	3	13.	18	26.2116	18	-.3
32073.99	32074.05	0	44.	12	27.0038	18	-.1
31991.05	31990.90	0	80.	13	27.0106	18	.1
32073.99	32073.73	5	16.	12	27.0226	18	.3
32072.47	32072.40	0	16.	14	27.0336	18	.1
32072.47	32072.47	0	45.	14	27.0522	18	.0
32070.73	32070.68	0	27.	18	27.0658	18	.1
32070.74	32070.97	2	26.	18	27.0846	18	-.2
32074.02	32073.97	0	21.	12	27.1206	18	.1
31991.07	31991.00	0	55.	13	27.1236	18	.1
32074.03	32074.12	0	33.	12	27.1352	18	-.1
31991.07	31991.26	0	13.	13	27.1426	18	-.2
32072.49	32072.32	0	6.	14	27.1508	18	.2
32072.49	32072.55	0	83.	14	27.1650	18	-.1
32037.12	32037.18	0	76.	15	27.1712	18	-.1
32070.78	32070.80	0	18.	18	27.1842	18	-.0
32070.78	32070.74	0	39.	18	27.2028	18	.0
32074.06	32074.10	0	13.	12	27.2346	18	-.0
31991.08	31991.12	0	50.	13	28.0018	18	-.0
32074.06	32074.18	0	40.	12	28.0130	18	-.1
31991.09	31991.08	0	14.	13	28.0206	18	.0
32072.51	32074.81	9	5.	14	28.0248	18	-2.3
32072.51	32072.51	0	80.	14	28.0430	18	-.0
32037.14	32037.31	2	55.	15	28.0444	18	-.2
32070.82	32070.51	5	12.	18	28.0612	18	.3
32037.15	32049.18	9	13.	15	28.0638	18	-12.0
32070.82	32070.93	0	58.	18	28.0756	18	-.1
32074.09	32073.50	9	7.	12	28.1116	18	.6
31991.10	31990.85	5	25.	13	28.1148	18	.2
32074.09	32074.11	0	81.	12	28.1258	18	-.0
31991.10	31991.26	0	28.	13	28.1336	18	-.2
32072.52	32072.59	0	43.	14	28.1558	18	-.1
32037.16	32037.15	0	36.	15	28.1626	18	.0
32072.52	32072.59	0	16.	14	28.1746	18	-.1
32037.16	32036.94	2	20.	15	28.1812	18	.2
32070.86	32070.73	0	82.	18	28.1936	18	.1
32070.86	32071.21	7	4.	18	28.2128	18	-.4
31991.11	31991.24	0	17.	13	28.2332	18	-.1
32074.11	32074.16	0	65.	12	29.0036	18	-.0
31991.11	31990.96	0	42.	13	29.0116	18	.1
32074.11	32074.09	0	10.	12	29.0224	18	.0
32072.53	32072.60	0	28.	14	29.0338	18	-.1
32037.17	32037.27	0	19.	15	29.0354	18	-.1
32072.53	32072.53	0	25.	14	29.0526	18	.0
32037.17	32037.20	0	38.	15	29.0542	18	-.0
32070.88	32070.96	0	56.	18	29.0708	18	-.1
32070.88	32071.20	7	13.	18	29.0856	18	-.3

Table 14

31991.10	31990.82	5	7.	13	29.1104	18	.3
32074.11	32074.09	0	30.	12	29.1204	18	.0
31991.10	31991.27	0	79.	13	29.1246	18	-.2
32074.11	32074.07	0	22.	12	29.1350	18	.0
32072.53	32072.59	0	14.	14	29.1508	18	-.1
32037.16	32037.18	0	12.	15	29.1536	18	-.0
32072.53	32072.52	0	51.	14	29.1654	18	.0
32037.16	32037.21	0	58.	15	29.1720	18	-.0
32070.88	32070.91	0	35.	18	29.1848	18	-.0
32070.88	32070.89	0	20.	18	29.2036	18	-.0
32074.09	32074.08	0	19.	12	29.2342	18	.0
31991.08	31991.06	0	73.	13	30.0028	18	.0
32074.09	32074.13	0	36.	12	30.0126	18	-.0
31991.08	31991.16	0	9.	13	30.0218	18	-.1
32072.54	32072.80	5	8.	14	30.0250	18	-.3
32072.54	32072.55	0	75.	14	30.0434	18	-.0
32037.15	32037.88	9	80.	15	30.0456	18	-.7
32070.88	32071.12	5	19.	18	30.0620	18	-.2
32070.87	32070.88	0	38.	18	30.0810	18	-.0
32074.05	32074.16	0	8.	12	30.1110	18	-.1
31991.05	31991.10	0	38.	13	30.1158	18	-.0
32074.05	32074.20	0	75.	12	30.1254	18	-.2
31991.05	31991.11	0	19.	13	30.1346	18	-.1
32072.54	32072.58	0	60.	14	30.1602	18	-.0
32037.13	32037.27	0	57.	15	30.1632	18	-.1
32072.54	32072.37	0	12.	14	30.1750	18	.2
32037.13	32036.92	5	13.	15	30.1820	18	.2
32070.86	32070.96	0	59.	18	30.1946	18	-.1
31991.02	31991.15	0	24.	13	30.2340	18	-.1
32074.01	32074.11	0	72.	12	31.0032	18	-.1
31991.02	31991.04	0	27.	13	31.0126	18	-.0
32074.00	32074.51	8	9.	12	31.0222	18	-.5
32072.54	32072.62	0	37.	14	31.0342	18	-.1
32037.11	32037.29	0	28.	15	31.0406	18	-.2
32072.54	32072.66	0	19.	14	31.0530	18	-.1
32037.11	32037.12	0	25.	15	31.0550	18	-.0
32070.84	32070.92	0	79.	18	31.0718	18	-.1
32070.84	32070.67	3	8.	18	31.0904	18	.2
31991.00	31991.04	0	13.	13	31.1110	18	-.0
32073.97	32073.90	2	34.	12	31.1200	18	.1
31990.99	31991.09	0	55.	13	31.1256	18	-.1
32073.97	32074.03	0	20.	12	31.1346	18	-.1
32072.54	32072.65	0	19.	14	31.1512	18	-.1
32037.10	32037.24	0	19.	15	31.1548	18	-.1
32072.54	32072.66	0	37.	14	31.1658	18	-.1
32037.10	32037.20	0	37.	15	31.1734	18	-.1
32070.84	32071.00	0	55.	18	31.1856	18	-.2
32070.83	32070.92	0	13.	18	31.2044	18	-.1
32073.96	32074.04	0	21.	12	31.2338	18	-.1
31990.98	31991.05	0	75.	13	32.0036	18	-.1
32073.96	32074.00	0	50.	12	32.0124	18	-.0
32072.65	32072.62	0	71.	14	34.1610	18	.0
32037.21	32037.27	0	84.	15	34.1658	18	-.1
32072.65	32072.79	0	9.	14	34.1758	18	-.1
32071.01	32071.15	0	19.	18	34.1818	18	-.1
32071.01	32071.15	0	38.	18	34.2008	18	-.1
31991.11	31991.28	0	41.	13	34.2358	18	-.2
32074.23	32074.31	0	47.	12	35.0024	18	-.1
32074.23	32074.42	3	15.	12	35.0214	18	-.2
32072.67	32072.79	0	36.	14	35.0350	18	-.1
32037.24	32037.21	0	34.	15	35.0422	18	.0
32072.68	32072.74	0	20.	14	35.0538	18	-.1
32037.24	32037.15	0	22.	15	35.0610	18	.1
32071.02	32071.14	0	83.	18	35.0736	18	-.1
32071.02	32070.74	4	7.	18	35.0922	18	-8.7
32074.24	32074.25	0	21.	12	35.1152	18	-.0
31991.14	31991.35	0	48.	13	35.1314	18	-.2
32074.24	32074.42	2	33.	12	35.1342	18	-.2
32072.70	32072.78	0	17.	14	35.1518	18	-.1
32037.27	32037.31	0	24.	15	35.1606	18	-.0
32072.70	32072.72	0	41.	14	35.1704	18	-.0
32037.27	32037.40	0	30.	15	35.1752	18	-.1
32071.03	32071.05	0	63.	18	35.1920	18	-.0
32071.03	32070.94	0	11.	18	35.2104	18	.1
31991.16	31991.23	0	11.	13	35.2314	18	-.1
32074.22	32073.75	9	14.	12	35.2336	18	.5
31991.16	31991.10	0	67.	13	36.0056	18	.1
32074.22	32074.20	0	53.	12	36.0118	18	.0
32072.72	32072.70	0	12.	14	36.0302	18	.0
32037.29	32037.49	0	12.	15	36.0336	18	-.2
32072.72	32072.88	0	62.	14	36.0446	18	-.2
32037.29	32037.44	0	62.	15	36.0520	18	-.1
32071.02	32070.99	0	30.	18	36.0644	18	.0
32071.02	32070.97	0	24.	18	36.0830	18	.1
31991.17	31991.08	0	68.	13	36.1224	18	.1
32074.20	32074.35	0	78.	12	36.1244	18	-.2
31991.17	31991.42	5	10.	13	36.1414	18	-.2
32074.19	32073.17	9	8.	12	36.1430	18	1.0
32037.31	32037.24	0	7.	15	36.1520	18	.1
32072.74	32072.85	0	71.	14	36.1612	18	-.1
32037.32	32037.49	2	81.	15	36.1704	18	-.2
32072.75	32072.64	0	10.	14	36.1800	18	.1
32071.02	32071.32	3	22.	18	36.1826	18	-.3
32071.02	32070.99	0	34.	18	36.2014	18	.0
31991.17	31991.23	0	36.	13	37.0008	18	-.1
31991.18	31991.28	0	20.	13	37.0156	18	-.1
32072.76	32072.67	0	36.	14	37.0354	18	.1
32037.34	32037.43	0	38.	15	37.0432	18	-.1
32072.76	32072.67	0	20.	14	37.0542	18	.1
32037.34	32037.36	0	14.	15	37.0620	18	-.0
32071.02	32071.04	0	85.	18	37.0742	18	-.0
32071.02	32063.91	9	6.	18	37.0930	18	7.1
31991.18	31991.13	0	18.	13	37.1136	18	.0
31991.18	31991.20	0	41.	13	37.1322	18	-.0
32072.78	32072.86	0	18.	14	37.1522	18	-.1
32037.35	32037.21	0	27.	15	37.1616	18	.1
32072.78	32072.68	0	41.	14	37.1708	18	.1
32037.36	32037.41	0	27.	15	37.1804	18	-.1
32071.04	32071.04	0	70.	18	37.1924	18	-.0
32071.04	32071.17	0	10.	18	37.2112	18	-.1
31991.17	31991.02	0	13.	13	37.2322	18	.2
31991.17	31991.19	0	59.	13	38.0106	18	-.0
32072.79	32073.07	0	12.	14	38.0306	18	-.3
32037.37	32037.40	0	13.	15	38.0346	18	-.0
32072.80	32072.78	0	61.	14	38.0450	18	.0
32037.37	32037.48	0	56.	15	38.0530	18	-.1
32071.06	32071.16	0	34.	18	38.0652	18	-.1
32071.07	32070.82	7	22.	18	38.0838	18	.3
31991.16	31991.18	0	75.	13	38.1234	18	-.0
32074.16	32074.39	0	11.	12	38.1426	18	-.2
32037.38	32037.44	0	9.	15	38.1530	18	-.1
32072.81	32072.87	0	72.	14	38.1616	18	-.1
32037.38	32037.41	0	74.	15	38.1714	18	-.0
32072.81	32073.02	6	10.	14	38.1804	18	-.2
32071.10	32071.04	0	24.	18	38.1836	18	.1
32071.11	32071.19	0	30.	18	38.2022	18	-.1
31991.15	31991.31	0	56.	13	39.0022	18	-.2
31991.15	31991.21	0	13.	13	39.0206	18	-.1
32072.82	32072.85	0	50.	14	39.0358	18	-.0
32037.39	32037.28	0	60.	15	39.0440	18	.1
32072.82	32072.84	0	15.	14	39.0546	18	-.0
32037.39	32037.17	0	12.	15	39.0630	18	.2

Table 15

32071.15	32071.32	0	64.	18	39.0748	18	-.2
31991.14	31991.40	0	27.	13	39.1140	18	-.3
32072.82	32072.79	0	23.	14	39.1524	18	.0
32037.39	32037.45	0	42.	15	39.1626	18	-.1
32072.82	32072.88	0	31.	14	39.1712	18	-.1
32071.19	32072.13	9	7.	18	39.1752	18	-.9
32037.39	32037.64	6	18.	15	39.1814	18	-.2
32071.19	32071.13	0	84.	18	39.1932	18	.1
32071.20	32070.53	9	5.	18	39.2122	18	.7
31991.13	31991.11	0	19.	13	39.2330	18	.0
32074.26	32074.35	0	58.	12	40.0110	18	-.1
32072.82	32072.98	0	16.	14	40.0308	18	-.2
32037.40	32037.43	0	21.	15	40.0354	18	-.0
32072.82	32072.88	0	45.	14	40.0454	18	-.1
32037.40	32037.28	0	35.	15	40.0540	18	.1
32074.29	32074.42	0	71.	12	40.1234	18	-.1
32074.29	32074.14	0	9.	12	40.1424	18	.2
32037.40	32037.53	0	15.	15	40.1540	18	-.1
32072.82	32073.21	8	82.	14	40.1620	18	-.4
32037.40	32037.56	0	51.	15	40.1724	18	-.2
32072.82	32072.65	0	6.	14	40.1810	18	.2
32071.23	32071.35	0	35.	18	40.1844	18	-.1
32071.23	32071.16	0	21.	18	40.2032	18	.1
32074.31	32074.31	0	48.	12	41.0016	18	-.0
32074.31	32074.37	0	15.	12	41.0202	18	-.1
32037.41	32038.48	9	5.	15	41.0308	18	-1.1
32072.82	32072.88	0	66.	14	41.0404	18	-.1
32037.41	32037.54	0	85.	15	41.0450	18	-.1
32072.82	32072.70	0	11.	14	41.0550	18	.1
32071.23	32071.99	7	17.	18	41.0616	18	-.8
32071.23	32071.41	0	42.	18	41.0758	18	-.2
32074.33	32074.30	0	21.	12	41.1140	18	.0
32074.33	32074.54	0	33.	12	41.1326	18	-.2
32072.82	32072.79	0	31.	14	41.1528	18	.0
32037.41	32037.64	3	64.	15	41.1634	18	-.2
32072.82	32072.96	0	23.	14	41.1714	18	-.1
32071.22	32071.12	0	12.	18	41.1758	18	.1
32037.41	32037.35	0	11.	15	41.1824	18	.1
32071.22	32071.06	0	61.	18	41.1940	18	.2
31991.12	31991.19	0	29.	13	41.2340	18	-.1
32074.35	32074.44	0	52.	12	42.0106	18	-.1
32072.82	32072.82	0	22.	14	42.0312	18	.0
32037.42	32037.43	0	31.	15	42.0404	18	-.0
32072.82	32072.94	0	33.	14	42.0458	18	-.1
32037.42	32037.58	0	24.	15	42.0550	18	-.2
32071.21	32071.38	0	73.	18	42.0710	18	-.2
32071.21	32071.67	8	9.	18	42.0856	18	-.5
31991.12	31991.68	8	14.	13	42.1108	18	-.6
32074.36	32074.37	0	78.	12	42.1232	18	-.0
31991.13	31991.11	0	53.	13	42.1252	18	.0
32074.37	32074.00	7	8.	12	42.1420	18	.4
32072.83	32073.10	5	10.	14	42.1440	18	-.3
32037.43	32037.47	0	22.	15	42.1546	18	-.0
32072.83	32072.94	0	71.	14	42.1624	18	-.1
32037.43	32037.49	0	33.	15	42.1734	18	-.1
32071.21	32071.28	0	53.	18	42.1852	18	-.1
32071.21	32071.23	0	14.	18	42.2040	18	-.0
31991.14	31991.67	8	9.	13	42.2254	18	-.5
32074.38	32074.52	0	53.	12	43.0012	18	-.1
31991.14	31991.31	0	72.	13	43.0038	18	-.2
32074.39	32074.74	7	14.	12	43.0200	18	-.4
32037.45	32037.26	0	11.	15	43.0316	18	.2
32072.88	32072.86	0	42.	14	43.1532	18	.0
32037.47	32037.69	3	85.	15	43.1644	18	-.2
32072.89	32072.92	0	18.	14	43.1720	18	-.0
32071.25	32071.04	5	18.	18	43.1802	18	.2
32037.47	32037.42	0	6.	15	43.1836	18	.1
32071.26	32071.33	0	41.	18	43.1948	18	-.1
32074.43	32074.45	0	16.	12	43.2318	18	-.0
31991.18	31991.24	0	43.	13	43.2346	18	-.1
32074.43	32074.39	0	48.	12	44.0102	18	.0
31991.18	31991.19	0	17.	13	44.0136	18	-.0
32072.91	32072.88	0	29.	14	44.0316	18	.1
32037.49	32037.52	0	49.	15	44.0412	18	-.0
32072.92	32072.85	0	25.	14	44.0504	18	.1
32071.29	32069.30	9	8.	18	44.0534	18	2.0
32037.49	32037.41	0	16.	15	44.0602	18	.1
32071.29	32071.32	0	80.	18	44.0716	18	-.0
32071.30	32074.02	9	5.	18	44.0908	18	-2.7
32074.43	32075.05	9	5.	12	44.1046	18	-.6
31991.18	31991.08	0	21.	13	44.1116	18	.1
32074.43	32074.29	1	83.	12	44.1228	18	.2
31991.18	31991.21	0	34.	13	44.1302	18	-.0
32074.43	32074.68	5	7.	12	44.1416	18	-.3
32072.92	32073.05	0	14.	14	44.1442	18	-.1
32037.49	32037.49	0	34.	15	44.1558	18	.0
32072.92	32072.97	0	54.	14	44.1628	18	-.0
32071.32	32069.40	9	4.	18	44.1718	18	1.9
32037.49	32037.60	0	22.	15	44.1744	18	-.1
32071.32	32071.39	0	75.	18	44.1908	18	-.1
32071.32	32071.61	6	9.	18	44.2052	18	-.3
31991.16	31991.08	0	15.	13	44.2302	18	.1
32074.39	32074.46	0	50.	12	45.0010	18	-.1
31991.16	31991.22	0	59.	13	45.0046	18	-.1
32074.38	32074.48	0	15.	12	45.0158	18	-.1
32037.48	32037.37	0	14.	15	45.0326	18	.1
32072.89	32072.96	0	82.	14	45.0410	18	-.1
32037.48	32037.55	0	56.	15	45.0510	18	-.1
32072.89	32075.54	9	6.	14	45.0602	18	-2.7
32071.32	32071.29	0	31.	18	45.0628	18	.0
32071.32	32071.06	7	25.	18	45.0816	18	.3
32074.31	32074.43	0	22.	12	45.1132	18	-.1
32074.30	32074.32	0	34.	12	45.1318	18	-.0
31991.08	31991.34	0	10.	13	45.1400	18	-.3
32037.44	32037.79	6	10.	15	45.1512	18	-.4
32072.81	32073.02	0	47.	14	45.1536	18	-.2
32037.43	32037.67	2	72.	15	45.1656	18	-.2
32072.80	32072.80	0	17.	14	45.1728	18	-.0
32071.29	32071.38	0	23.	18	45.1812	18	-.1
32071.28	32071.51	0	33.	18	45.1958	18	-.2

Table 16

PRINTOUT OF PUNCHED CARD INPUT FILE.

32037.62	32037.[illegible]	5	12.	15	51.1916	18	-.2
32071.60	32071.[illegible]	0	59.	14	50.1525	18	-.2
31991.17	31991.31	0	26.	14	50.1325	18	-.1
32074.41	32074.56	0	43.	12	51.0000	18	-.1
31991.19	31991.35	0	27.	13	51.0115	18	-.2
32074.44	32074.54		14.	12	51.0145	18	-.1
32073.02	32073.04		13.	14	51.0235	18	-.0
32037.74	32037.93	5	30.	15	51.0356	18	-.2
32073.04	32073.23	2	51.	14	51.0424	18	-.2
32037.75	32037.75	0	28.	15	51.0540	18	.0
32071.51	32071.70	2	62.	18	51.0652	18	-.2
32071.52	32071.10	7	13.	18	51.0440	18	.4
31991.24	31991.26	0	13.	13	51.1054	18	.0
32074.53	32074.52	0	18.	12	51.1122	18	.0
31991.29	31991.27	0	50.	13	51.1240	18	.0
32074.54	32074.55	0	42.	12	51.1306	18	-.0
32073.13	32073.21	1	64.	14	51.1546	18	-.1
32073.13	32073.13	0	12.	14	51.1734	18	.0
32071.57	32071.57	0	48.	14	51.1840	18	-.0
32071.57	32071.61	0	17.	18	51.2026	18	-.0
31991.32	31991.09	5	10.	13	51.2244	18	.2
32074.55	32074.22	7	19.	12	51.2309	18	.3
31991.33	31991.30	0	22.	13	52.0026	18	-.1
32074.55	32074.45	0	70.	12	52.0050	18	.1
31991.33	31992.34	9	6.	13	52.0218	18	-1.0
32037.79	32038.01	5	8.	15	52.0306	18	-.2
32073.15	32073.11	0	44.	14	52.0332	18	.0
32037.78	32037.63	0	83.	15	52.0450	18	.2
32073.15	32073.12	0	19.	14	52.0520	18	.0
32071.59	32071.74	2	18.	18	52.0604	18	-.2
32037.78	32037.83	1	7.	15	52.0640	18	-.1
32071.59	32071.54	0	45.	18	52.0750	18	.0
31991.33	31991.23	0	47.	13	52.1150	18	.1
32074.49	32074.65	0	55.	12	52.1212	18	-.2
31991.32	31991.59	5	18.	13	52.1338	18	-.3
32074.48	32074.53	0	15.	12	52.1400	18	-.1
32073.14	32072.37	9	19.	14	52.1454	18	.8
32073.13	32073.08	0	42.	14	52.1642	18	.1
32071.58	32071.62	2	15.	18	52.1754	18	.2
32037.71	32037.83	0	9.	15	52.1828	18	-.1
32071.58	32071.74	1	58.	18	52.1938	18	-.2
31991.30	31991.53	2	37.	13	52.2342	18	-.2
32074.41	32074.64	0	33.	12	53.0000	18	-.3
31991.29	31991.28	0	26.	13	53.0126	18	.0
32073.10	32073.32	2	13.	14	53.0244	18	-.2
32037.66	32037.88	0	31.	15	53.0402	18	-.2
32073.10	32073.15	0	65.	14	53.0428	18	-.1
32037.65	32037.67	0	26.	15	53.0548	18	-.0
32071.57	32071.55	0	62.	18	53.0700	18	.0
32071.57	32071.57	0	14.	18	53.0848	18	-.0
31991.24	31991.15	0	14.	13	53.1102	18	.1
31991.25	31991.33	0	59.	13	53.1248	18	-.1
32073.08	32073.23	0	62.	14	53.1548	18	-.2
32037.60	32037.66	2	32.	15	53.1738	18	-.0
32071.57	32071.85	2	50.	18	53.1850	18	-.3
32071.57	32071.63	0	17.	18	53.2036	18	-.1
31991.21	31991.32	0	11.	13	53.2254	18	-.2
31991.12	31991.32	0	54.	13	56.0054	18	-.2
32074.54	32074.57	0	5.	12	56.0236	18	-.0
32037.72	32037.69	2	16.	15	56.0324	18	.0
32037.72	32037.63	2	65.	15	56.0510	18	.0
32073.20	32073.24	5	15.	14	56.0534	18	-.0
32071.72	32071.77		29.	18	56.0620	18	-.1
32071.72	32071.69	0	30.	18	56.0806	18	.0
32074.54	32074.49	0	51.	12	56.1204	18	-.1
32074.59	32074.49	0	19.	12	56.1350	18	.1
32073.22	32073.21	0	26.	14	56.1500	18	.0
32073.22	32073.47	5	34.	14	56.1648	18	-.2
32071.74	32071.78	0	25.	18	56.1810	18	-.0
32071.74	32071.72	0	35.	18	56.1956	18	.0
32074.62	32074.68	0	36.	12	56.2352	18	-.1
32074.63	32074.80	2	20.	12	57.0134	18	-.2
32073.24	32073.43	2	24.	14	57.0252	18	-.2
32037.40	32038.02	1	69.	15	57.0420	18	-.2
32071.76	32071.94	2	12.	18	57.0530	18	-.2
32037.80	32037.79	0	13.	15	57.0610	18	.0
32071.76	32072.11	7	73.	18	57.0716	18	-.4
32071.76	32072.07	7	6.	18	57.0900	18	-.3
31991.24	31991.40	0	31.	13	57.1118	18	-.2
32074.65	32074.75	1	51.	12	57.1254	18	-.1
32073.25	32073.39	1	9.	14	57.1410	18	-.1
32073.25	32073.50	5	81.	14	57.1554	18	-.3
32037.83	32037.96	0	61.	15	57.1612	18	-.1
32071.77	32072.08	7	10.	18	57.1724	18	-.3
32037.83	32038.02	1	15.	15	57.1800	18	-.2
32071.77	32071.86	0	83.	18	57.1908	18	-.1
32071.77	32071.72	0	7.	18	57.2056	18	.1
31991.30	31991.27	0	32.	13	57.2310	18	.0
32074.66	32074.78	1	54.	12	58.0042	18	-.1
32073.25	32073.04	5	10.	14	58.0204	18	.2
32037.84	32038.07	1	31.	15	58.0332	18	-.2
32037.84	32037.93	0	29.	15	58.0520	18	-.1
32073.26	32075.93	9	8.	14	58.0540	18	-2.7
32071.78	32071.98	5	56.	18	58.0628	18	-.2
32071.79	32071.78	0	17.	18	58.0814	18	.0
32074.66	32074.85	2	5.	12	58.1016	18	-.2
31991.36	31991.45	0	14.	13	58.1030	18	-.1
32074.66	32074.74	0	70.	12	58.1158	18	-.1
31991.37	31991.44	0	64.	13	58.1215	18	-.1
32074.66	32074.64	0	13.	12	58.1348	18	.0
32073.24	32073.29	0	44.	14	58.1506	18	-.0
32037.38	32037.80	0	28.	15	58.1526	18	-.0
32073.25	32073.22	0	21.	14	58.1650	18	-.0
32071.80	32071.75	0	49.	18	58.1818	18	.0
32071.80	32071.74	0	14.	18	58.2006	18	.1
31991.42	31991.45	0	13.	13	58.2224	18	-.0
32074.66	32074.74	0	54.	12	58.2348	18	-.1
31991.42	31991.38	0	66.	13	58.0000	18	.0
32074.65	32074.86	1	15.	12	58.0136	18	-.1
32073.25	32073.27	0	43.	14	58.0254	18	-.0
32037.90	32037.69	5	71.	15	58.0430	18	.2
32071.82	32072.25	8	23.	18	58.0538	18	-.4
32037.91	32037.93	0	7.	15	58.0620	18	-.0
32071.83	32071.85	0	42.	18	58.0724	18	-.0
31991.44	31991.97	5	4.	13	58.0944	18	-.5
32074.64	32074.58	0	25.	12	58.1104	18	.1
31991.44	31991.40	0	61.	13	58.1130	18	-.0
32074.64	32074.62	0	37.	12	58.1256	18	.0
32073.25	32073.34	0	16.	14	58.1412	18	-.1
32037.92	32037.78	5	13.	15	58.1438	18	.2
32073.24	32073.14	1	58.	14	58.1558	18	.1
32037.92	32038.15	2	76.	15	58.1626	18	-.2
32071.85	32072.01	2	21.	18	58.1732	18	-.2
32037.93	32037.68	7	7.	15	58.1814	18	.3
32071.86	32071.85	1	47.	18	58.1916	18	.0
31991.49	31991.71	5	4.	13	58.2140	18	-.2
32074.63	32074.43	5	22.	12	58.2254	18	.2
31991.49	31991.50	0	6.	13	58.2320	18	-.0

Table 17

32074.63	32074.34	7	40.	12	60.0040	1A	.3
31991.50	31991.69	5	17.	13	60.0110	1A	-.2
32073.24	32073.41	0	18.	14	60.0206	1A	-.2
32037.94	32037.87	0	56.	15	60.0340	1A	.1
32071.88	32072.96	9	10.	1A	60.0450	1A	-1.1
32037.94	32037.95	0	19.	15	60.0528	1A	-.0
32038.00	32038.31	5	75.	15	60.0352	1A	-.3
32071.98	32071.94	0	14.	1A	60.0456	1A	.0
32038.00	32038.26	3	13.	15	60.0540	1A	-.3
32071.98	32071.95	0	71.	1A	60.0642	1A	.0
32071.98	32073.14	5	7.	1A	60.0834	1A	-1.2
32074.63	32074.96	0	10.	12	60.1006	1A	-.3
31991.49	31991.40	0	37.	13	60.1046	1A	.1
32074.64	32074.77	0	85.	12	60.1150	1A	-.1
31991.49	31991.59	0	28.	13	60.1234	1A	-.1
32073.29	32072.68	9	9.	14	60.1324	1A	.6
32074.64	32074.66	0	10.	12	60.1338	1A	-.0
32038.01	32038.34	7	8.	15	60.1402	1A	-.3
32073.29	32073.50	0	83.	14	60.1510	1A	-.2
32038.01	32038.02	0	72.	15	60.1544	1A	-.0
32073.30	32073.44	0	12.	14	60.1700	1A	-.2
32038.01	32038.12	0	14.	15	60.1734	1A	-.1
32071.94	32071.86	0	75.	1A	60.1836	1A	.1
32074.66	32073.72	9	9.	12	60.2200	1A	.9
31991.48	31991.58	0	26.	13	60.2242	1A	-.1
32074.66	32074.70	0	80.	12	60.2342	1A	-.0
32071.97	32071.89	0	11.	1A	63.0740	1A	.1
31991.46	31991.68	3	16.	13	63.0958	1A	-.2
32074.68	32074.46	0	34.	12	63.1056	1A	-.0
31991.46	31991.48	0	70.	13	63.1144	1A	-.0
32074.68	32074.70	0	32.	12	63.1242	1A	-.0
31991.46	31991.61	1	8.	13	63.1332	1A	-.2
32073.34	32073.34	0	33.	14	63.1418	1A	.0
32038.02	32038.00	0	31.	15	63.1458	1A	.0
32073.37	32073.36	0	33.	14	63.1604	1A	.0
32038.02	32038.02	0	35.	15	63.1644	1A	.0
32071.97	32072.07	0	50.	1A	63.1748	1A	-.1
32071.97	32072.22	5	23.	1A	63.1938	1A	-.3
31991.45	31991.72	5	16.	13	63.2156	1A	-.3
32074.69	32074.64	0	31.	12	63.2248	1A	.0
31991.44	31991.39	0	73.	13	63.2340	1A	.1
32074.69	32074.56	2	37.	12	64.0034	1A	.1
31991.44	31991.63	1	9.	13	64.0132	1A	-.2
32073.40	32073.48	0	29.	14	64.0214	1A	-.1
32073.40	32073.11	7	37.	14	64.0402	1A	.3
32071.96	32071.92	0	19.	1A	64.0504	1A	.0
32038.03	32037.93	1	11.	15	64.0548	1A	.1
32071.96	32072.04	0	58.	1A	64.0650	1A	-.1
32071.96	32071.39	9	5.	1A	64.0840	1A	.6
32074.67	32075.01	3	11.	12	64.1002	1A	-.3
31991.43	31991.36	2	50.	13	64.1056	1A	.1
32074.67	32074.73	0	67.	12	64.1148	1A	-.1
31991.43	31991.47	0	22.	13	64.1242	1A	-.0
32073.43	32073.44	0	12.	14	64.1326	1A	-.0
32038.04	32037.99	0	12.	15	64.1412	1A	.0
32073.43	32073.48	0	84.	14	64.1512	1A	-.1
32038.04	32038.19	0	84.	15	64.1556	1A	-.2
32071.96	32062.95	9	19.	1A	64.1702	1A	9.0
32038.04	32038.21	0	11.	15	64.1746	1A	-.2
32071.96	32072.02	0	61.	1A	64.1846	1A	-.1
32074.63	32074.31	7	10.	12	64.2156	1A	.3
31991.42	31991.44	0	48.	13	64.2252	1A	-.0
32074.62	32074.57	2	81.	12	64.2340	1A	.1
31991.42	31991.28	2	21.	13	65.0038	1A	.1
32073.45	32073.43	0	11.	14	65.0124	1A	.0
32038.04	32038.34	5	46.	15	65.0314	1A	-.3
32071.97	32072.19	9	6.	1A	65.0418	1A	-6.2
32038.04	32037.93	2	23.	15	65.0500	1A	.1
32071.97	32072.11	0	76.	1A	65.0602	1A	-.1
32071.97	32071.67	5	15.	1A	65.0750	1A	.3
31991.42	31991.50	0	21.	13	65.1008	1A	-.1
32074.55	32074.42	3	36.	12	65.1052	1A	.1
31991.42	31991.27	3	50.	13	65.1154	1A	.1
32074.54	32074.91	3	27.	12	65.1238	1A	-.4
32073.47	32073.68	3	42.	14	65.1422	1A	-.2
32038.05	32037.93	2	42.	15	65.1506	1A	.1
32073.47	32073.63	2	24.	14	65.1610	1A	-.2
32038.05	32037.95	2	24.	15	65.1654	1A	.1
32071.99	32072.06	0	66.	1A	65.1756	1A	-.1
32071.99	32072.05	0	16.	1A	65.1944	1A	-.1
31991.42	31991.39	0	20.	13	65.2204	1A	.0
32074.47	32074.22	5	32.	12	65.2244	1A	.3
31991.42	31991.48	0	53.	13	65.2348	1A	-.1
32074.46	32074.59	0	29.	12	66.0030	1A	-.1
32073.48	32073.48	0	43.	14	66.0216	1A	.0
32038.06	32038.05	0	55.	15	66.0410	1A	.0
32072.01	32071.86	0	30.	1A	66.0512	1A	.1
32038.06	32037.73	9	5.	15	66.0600	1A	.3
32072.01	32072.12	0	35.	1A	66.0658	1A	-.1
31991.42	31991.81	7	9.	13	66.0920	1A	-.4
32074.39	32074.96	8	14.	12	66.0958	1A	-.6
31991.42	31991.02	9	80.	13	66.1104	1A	.4
32074.38	32074.34	1	73.	12	66.1142	1A	.0
31991.42	31990.98	9	14.	13	66.1252	1A	.4
32038.07	32038.12	0	20.	15	66.1420	1A	-.1
32073.49	32073.43	0	61.	14	66.1516	1A	.1
32038.07	32038.26	0	56.	15	66.1606	1A	-.2
32072.03	32071.92	0	29.	1A	66.1710	1A	.1
32072.03	32072.11	0	36.	1A	66.1856	1A	-.1
31991.42	31991.17	7	9.	13	66.2118	1A	.2
32074.33	32074.13	3	13.	12	66.2152	1A	.2
31991.42	31991.32	2	76.	13	66.2302	1A	.1
31991.42	31991.53	0	15.	13	67.0050	1A	-.1
32073.51	32073.73	3	14.	14	67.0128	1A	-.2
32073.51	32073.43	1	69.	14	67.0312	1A	.1
32072.05	32072.41	7	11.	1A	67.0424	1A	-.4
32038.09	32037.97	2	17.	15	67.0510	1A	.1
32072.05	32072.19	1	86.	1A	67.0610	1A	-.1
32072.06	32072.38	7	11.	1A	67.0758	1A	-.3
31991.43	31991.57	0	31.	13	67.1016	1A	-.1
32074.29	32074.74	7	40.	12	67.1046	1A	-.5
31991.43	31991.89	9	35.	13	67.1208	1A	-.5
32074.28	32074.44	0	28.	12	67.1234	1A	-.2
32038.10	32038.05	1	6.	15	67.1334	1A	.1
32073.52	32073.65	0	55.	14	67.1424	1A	-.1
32038.10	32038.17	0	64.	15	67.1516	1A	-.1
32073.53	32073.46	0	20.	14	67.1614	1A	.1
32038.11	32038.31	0	17.	15	67.1706	1A	-.2
32072.07	32072.11	0	83.	1A	67.1804	1A	-.0
32072.08	32071.94	0	11.	1A	67.1954	1A	.1
31991.43	31991.44	0	30.	13	67.2212	1A	-.0
32074.28	32074.41	0	34.	12	67.2240	1A	-.1
31991.43	31991.61	0	43.	13	68.0000	1A	-.1
32073.55	32073.56	0	46.	14	68.0220	1A	-.0
32073.55	32073.58	0	25.	14	68.0408	1A	-.0
32038.13	32038.19	0	48.	15	68.0424	1A	-.1
32072.09	32072.14	0	33.	1A	68.0522	1A	-.1
32072.09	32072.03	0	32.	1A	68.0710	1A	.1
31991.44	31991.55	0	10.	13	68.0930	1A	-.1
32074.31	32074.28	1	12.	12	68.0958	1A	.0
31991.44	31991.43	0	44.	13	68.1114	1A	.0
32074.32	32074.37	0	82.	12	68.1140	1A	-.1

Table 18

31991.44	31990.95	6	12.	13	68.1302	18	.5
32073.57	32073.66	0	18.	14	68.1334	18	-.1
32038.15	32038.41	2	22.	15	68.1430	18	-.3
32073.57	32073.64	0	61.	14	68.1520	18	-.1
32038.16	32038.08	1	50.	15	68.1614	18	.1
32072.10	32072.28	1	32.	18	68.1718	18	-.2
32072.10	32072.20	0	33.	18	68.1904	18	-.1
31991.44	31991.53	0	18.	13	68.2126	18	-.1
32074.35	32073.32	9	11.	12	68.2148	18	1.0
31991.44	31991.50	0	33.	13	68.2310	18	-.1
31991.44	31992.53	9	12.	13	69.0100	18	-1.1
32073.59	32073.65	0	17.	14	69.0130	18	-.1
32073.60	32073.63	0	65.	14	69.0314	18	-.0
32072.11	32071.95	2	14.	18	69.0432	18	.2
32038.19	32037.97	2	14.	15	69.0520	18	.2
32072.12	32072.21	0	76.	18	69.0618	18	-.1
32072.12	32069.66	9	9.	18	69.0808	18	2.5
31991.44	31991.34	0	37.	13	69.1026	18	.1
31991.44	31991.40	0	29.	13	69.1212	18	.0
32038.21	32038.34	0	9.	15	69.1344	18	-.2
32073.62	32073.62	0	60.	14	69.1428	18	-.0
32038.21	32038.27	0	75.	15	69.1528	18	-.1
32073.62	32073.61	0	19.	14	69.1616	18	.0
32072.13	32074.63	9	13.	18	69.1636	18	-2.5
32038.22	32038.10	1	14.	15	69.1716	18	.1
32072.13	32072.20	0	80.	18	69.1814	18	-.1
32072.13	32072.61	9	9.	18	69.2006	18	-.5
31991.43	31991.61	0	36.	13	69.2222	18	-.2
32074.44	32074.59	1	33.	12	69.2240	18	-.1
31991.43	31991.44	0	32.	13	70.0008	18	-.0
32073.64	32073.62	0	53.	14	70.0224	18	.0
32073.64	32073.67	0	21.	14	70.0410	18	-.0
32038.25	32038.32	0	36.	15	70.0432	18	-.1
31991.42	31991.44	0	14.	13	70.0938	18	-.0
31991.41	31991.39	0	75.	13	70.1124	18	.0
31991.41	31991.32	1	9.	13	70.1312	18	.1
32073.65	32073.75	0	21.	14	70.1342	18	-.1
32038.28	32038.16	0	29.	15	70.1438	18	.1
32073.65	32073.69	0	52.	14	70.1524	18	-.0
32038.28	32038.32	0	37.	15	70.1626	18	-.0
32072.16	32072.33	1	41.	18	70.1726	18	-.2
32072.17	32072.11	0	26.	18	70.1912	18	.1
31991.40	31991.53	0	14.	13	70.2136	18	-.1
31991.39	31991.46	0	76.	13	70.2320	18	-.1
32074.46	32074.69	2	11.	12	71.0120	18	-.2
32038.31	32038.53	2	12.	15	71.0156	18	-.2
32073.66	32073.59	0	55.	14	71.0318	18	.1
32038.31	32038.29	0	82.	15	71.0342	18	.0
32072.18	32072.24	0	14.	18	71.0442	18	-.1
32038.32	32038.68	7	10.	15	71.0530	18	-.4
32072.19	32072.19	0	62.	18	71.0626	18	-.0
32072.19	32072.25	0	6.	18	71.0816	18	-.1
31991.38	31991.36	0	50.	13	71.1038	18	.0
31991.37	31991.39	0	22.	13	71.1222	18	-.0
32038.34	32038.47	0	12.	15	71.1352	18	-.1
32073.64	32073.74	0	70.	14	71.1432	18	-.1
32038.34	32038.37	0	84.	15	71.1536	18	-.0
32073.66	32073.65	0	16.	14	71.1620	18	.0
32072.21	32072.15	0	17.	18	71.1640	18	.1
32038.34	32038.33	0	10.	15	71.1728	18	.0
32072.21	32072.17	0	66.	18	71.1822	18	.0
31991.36	31991.33	1	48.	13	71.2230	18	.0
31991.36	31991.42	0	25.	13	72.0018	18	-.1
32073.66	32077.84	9	6.	14	72.0048	18	-4.2
32073.66	32073.78	0	62.	14	72.0226	18	-.0
32038.36	32038.38	0	34.	15	72.0254	18	-.1
32072.23	32081.74	9	4.	18	72.0354	18	-9.5
32073.67	32074.03	7	18.	14	72.0416	18	-.4
32038.37	32038.42	0	27.	15	72.0444	18	-.1
32072.23	32072.29	0	56.	18	72.0538	18	-.1
32072.23	32072.35	0	20.	18	72.0724	18	-.1
31991.37	31991.54	0	19.	13	72.0946	18	-.2
31991.37	31991.34	1	60.	13	72.1134	18	.0
32074.44	32074.58	0	10.	12	72.1320	18	-.1
32073.67	32073.76	0	25.	14	72.1342	18	-.1
32038.38	32038.45	0	38.	15	72.1450	18	-.1
32073.67	32073.70	0	43.	14	72.1528	18	-.0
32038.39	32038.39	0	28.	15	72.1636	18	-.0
32072.25	32072.40	0	54.	18	72.1734	18	-.1
32072.26	32072.14	0	20.	18	72.1922	18	.1
32074.45	32074.48	0	11.	12	72.2144	18	.0
31991.39	31991.34	1	62.	13	72.2332	18	.1
32074.46	32074.66	1	11.	12	73.0114	18	-.2
32073.68	32073.87	1	24.	14	73.0140	18	-.2
32038.39	32035.97	9	16.	15	73.0212	18	2.4
32073.68	32073.79	0	46.	14	73.0322	18	-.1
32038.40	32038.50	0	66.	15	73.0352	18	-.1
32072.28	32072.32	1	22.	18	73.0450	18	-.0
31991.43	31991.36	1	6.	13	73.0900	18	.1
31991.44	31991.47	0	65.	13	73.1044	18	-.0
32074.50	32074.57	0	28.	12	73.1224	18	-.1
32073.70	32073.30	7	9.	14	73.1252	18	.4
32038.40	32038.45	0	16.	15	73.1404	18	-.1
32073.70	32073.62	1	78.	14	73.1436	18	.1
32038.40	32038.34	0	69.	15	73.1546	18	.1
32073.70	32073.59	1	13.	14	73.1624	18	.1
32072.29	32072.42	1	22.	18	73.1648	18	-.1
32072.29	32072.29	0	52.	18	73.1830	18	.0
31991.48	31991.87	7	6.	13	73.2058	18	-.4
32074.54	32074.35	1	33.	12	73.2232	18	.2
32074.54	32074.44	0	26.	12	74.0016	18	.1
32073.71	32075.13	9	10.	14	74.0052	18	-1.4
32038.39	32038.77	7	6.	15	74.0120	18	-.4
32073.71	32073.56	2	83.	14	74.0230	18	.2
32038.39	32038.37	0	66.	15	74.0304	18	.0
32072.30	32072.73	7	10.	18	74.0402	18	-.4
32073.71	32074.03	5	11.	14	74.0420	18	-.3
32038.38	32038.21	1	16.	15	74.0452	18	.2
32072.30	32072.07	2	85.	18	74.0546	18	.2
32072.29	32072.30	0	12.	18	74.0734	18	-.0
31991.51	31991.68	1	30.	13	74.0956	18	-.2
32038.35	32038.41	0	17.	15	74.1648	18	-.1
32072.28	32072.42	0	82.	18	74.1742	18	-.1
32072.27	32072.27	0	12.	18	74.1930	18	-.0
32074.53	32074.65	0	14.	12	74.2138	18	-.1
31991.49	31991.46	0	29.	13	74.2152	18	.0
32074.53	32074.62	0	73.	12	74.2320	18	-.1
31991.48	31991.42	0	36.	13	74.2338	18	.1
32074.51	32075.03	7	6.	12	75.0114	18	-.5
32073.72	32073.87	0	41.	14	75.0140	18	-.2
32038.32	32038.34	0	31.	15	75.0216	18	-.0
32073.71	32073.64	0	26.	14	75.0326	18	.1
32038.31	32038.36	0	33.	15	75.0402	18	-.0
32072.23	32072.18	0	42.	18	75.0458	18	.0
32072.22	32072.20	1	25.	18	75.0646	18	.0
31991.41	31991.62	0	15.	13	75.0908	18	-.2
32074.42	32075.05	7	57.	12	75.1038	18	-.6
31991.39	31991.33	2	72.	13	75.1056	18	.0
32074.40	32074.24	5	19.	12	75.1220	18	.2
32073.69	32073.86	0	17.	14	75.1258	18	-.2
32038.25	32038.38	0	30.	15	75.1412	18	-.1
32073.69	32073.72	0	63.	14	75.1440	18	-.0
32038.24	32038.35	0	34.	15	75.1556	18	-.1
32073.68	32073.78	0	4.	14	75.1630	18	-.1
32072.14	32072.36	0	40.	18	75.1652	18	-.2

COMPARATIVE SPEEDS FOR NAVIGATIONAL SYSTEMS.

181	1	7.190	7.330	6.600	5.870	1.019	.918	.816
181	2	7.090	7.370	6.790	6.150	1.039	.958	.867
181	3	7.610	7.720	7.220	6.370	1.014	.949	.837
181	4	7.740	7.890	7.400	6.620	1.019	.956	.855
181	5	7.630	7.840	7.410	6.640	1.028	.971	.870
181	6	7.530	7.620	7.590	6.600	1.012	1.008	.876
181	7	6.980	7.310	6.930	6.200	1.047	.993	.888
181	8	7.930	8.050	7.590	6.900	1.015	.957	.870
181	9	7.690	8.130	7.640	6.890	1.057	.993	.896
181	10	8.010	8.310	7.780	7.400	1.037	.971	.924
181	11	7.910	8.390	7.880	6.890	1.061	.996	.871
181	12	7.580	8.440	7.950	7.130	1.113	1.049	.941
181	13	8.830	8.400	7.820	7.000	.951	.886	.793
181	14	8.410	8.490	7.890	7.020	1.010	.938	.835
181	15	9.290	8.530	7.870	7.000	.918	.847	.753
181	16	6.220	5.740	5.340	4.690	.923	.859	.754
181	17	8.320	8.440	8.090	7.380	1.014	.972	.887
181	18	8.610	8.370	8.010	7.620	.972	.930	.885
181	19	8.360	8.280	8.040	7.520	.990	.962	.900
181	20	8.550	8.320	8.040	6.920	.973	.940	.809
181	21	8.820	8.380	8.070	7.560	.950	.915	.857
181	22	8.550	8.270	7.970	7.480	.967	.932	.875
181	23	8.560	8.300	7.930	7.470	.970	.926	.873
181	24	8.470	8.170	7.860	7.530	.965	.928	.889
181	25	8.130	8.070	7.880	7.440	.993	.969	.915
181	26	7.950	8.070	7.910	7.530	1.015	.995	.947
181	27	8.490	8.070	7.910	7.500	.951	.932	.883
181	28	9.090	8.080	7.870	7.640	.889	.866	.840
181	29	9.120	8.190	7.930	7.550	.898	.870	.828
181	30	8.540	8.120	7.910	7.500	.951	.926	.878
181	31	8.240	8.090	7.900	7.500	.982	.959	.910
181	32	5.430	5.890	5.520	5.350	1.085	1.017	.985
181	33	8.340	8.170	7.680	7.500	.980	.921	.899
181	34	7.460	8.140	7.720	7.360	1.091	1.035	.987
181	35	7.400	8.050	7.770	7.280	1.088	1.050	.984
181	36	7.570	8.020	7.800	7.410	1.059	1.030	.979
181	37	7.570	7.990	7.750	7.430	1.055	1.024	.982
181	38	7.430	6.900	6.430	6.170	.929	.865	.830
181	39	8.620	8.250	7.850	7.530	.957	.911	.874
181	40	8.590	8.230	7.880	7.500	.958	.917	.873
181	41	8.440	8.160	7.880	7.500	.967	.934	.889
181	42	8.230	8.180	7.830	7.500	.994	.951	.911
181	43	8.220	8.090	7.740	7.500	.984	.942	.912
181	44	8.550	8.140	0.000	0.000	.952	0.000	0.000
181	45	8.390	8.100	0.000	0.000	.965	0.000	0.000
181	46	8.260	8.140	7.690	7.570	.985	.931	.916
181	47	7.640	7.910	0.000	0.000	1.035	0.000	0.000
181	48	7.120	7.860	0.000	0.000	1.104	0.000	0.000
181	49	7.120	7.700	7.740	7.440	1.081	1.087	1.045
181	50	6.460	7.120	6.600	6.870	1.102	1.022	1.063
181	51	6.640	7.470	6.720	7.330	1.125	1.012	1.104
181	52	6.580	7.390	6.590	7.220	1.123	1.002	1.097
181	53	6.780	7.370	6.540	7.200	1.087	.965	1.062
181	54	6.560	7.390	6.570	7.260	1.127	1.002	1.107
181	55	6.670	7.460	6.650	7.220	1.118	.997	1.082
181	56	6.630	7.520	6.720	7.200	1.134	1.014	1.086
181	57	6.570	7.620	6.820	7.190	1.160	1.038	1.094
181	58	6.660	7.650	6.880	7.220	1.149	1.033	1.084
181	59	5.350	6.480	5.720	6.590	1.211	1.069	1.232
181	60	5.900	6.360	5.550	6.520	1.078	.941	1.105
181	61	6.030	7.460	6.570	6.800	1.237	1.090	1.128
181	62	6.110	7.180	6.250	6.740	1.175	1.023	1.103

181	63	6.650	7.470	6.540	6.980	1.123	.953	1.047
181	64	7.080	7.750	6.820	7.070	1.095	.963	.999
181	65	7.420	7.900	6.990	7.160	1.065	.942	.965
181	66	6.910	7.070	6.720	6.300	1.023	.973	.912
181	67	8.100	8.140	7.770	7.330	1.005	.959	.905
181	68	8.030	8.190	0.000	0.000	1.020	0.000	0.000
181	69	8.280	8.220	0.000	0.000	.993	0.000	0.000
181	70	8.140	8.290	7.830	7.500	1.018	.962	.921
181	71	7.930	8.280	7.810	7.420	1.044	.985	.936
181	72	7.860	8.220	7.760	7.400	1.046	.987	.941
181	73	8.320	8.230	7.780	7.550	.989	.935	.907
181	74	8.410	8.230	7.750	7.440	.979	.922	.885
181	75	7.270	6.790	6.310	6.170	.934	.868	.849
181	76	7.860	7.800	6.900	7.440	.992	.878	.947
181	77	6.870	7.700	6.800	7.370	1.121	.990	1.073
181	78	6.950	7.640	6.680	7.330	1.099	.961	1.055
181	79	7.010	7.710	6.780	7.390	1.100	.967	1.054
181	80	6.720	7.760	0.000	0.000	1.155	0.000	0.000
181	81	7.250	7.800	6.910	7.380	1.076	.953	1.018
181	82	6.850	7.730	6.830	7.350	1.128	.997	1.073
181	83	6.840	7.760	6.910	7.500	1.135	1.010	1.096
181	84	7.000	7.700	6.930	7.340	1.100	.990	1.049
181	85	7.100	7.790	6.880	7.320	1.097	.969	1.031
181	86	6.790	7.770	6.880	7.370	1.144	1.013	1.085
181	87	6.970	7.770	6.940	7.270	1.115	.996	1.043
181	88	7.210	7.750	6.930	7.390	1.075	.961	1.025
181	89	7.180	7.830	7.090	7.260	1.091	.987	1.011
181	90	8.010	7.950	7.290	7.440	.993	.910	.929
181	91	8.050	8.010	7.300	7.390	.995	.907	.918
181	92	7.380	7.150	6.820	6.660	.969	.924	.902
181	93	8.090	7.910	7.540	7.460	.978	.932	.922
181	94	8.170	7.890	0.000	0.000	.966	0.000	0.000
181	95	8.030	7.920	7.490	7.460	.986	.933	.929
181	96	8.270	8.000	7.520	7.500	.967	.909	.907
181	97	7.370	7.170	6.690	6.650	.973	.908	.902
181	98	7.500	7.890	7.150	7.450	1.052	.953	.993
181	99	7.700	7.870	7.150	7.370	1.022	.929	.957
181	100	7.740	7.660	6.970	7.240	.990	.901	.935
181	101	6.420	6.600	5.940	6.180	1.028	.925	.963
181	102	7.040	7.670	7.010	6.690	1.089	.996	.950
181	103	7.360	7.650	6.970	6.610	1.039	.947	.898
181	104	7.430	7.690	7.020	7.600	1.035	.945	1.023
181	105	6.860	7.700	7.070	6.630	1.122	1.031	.966
181	106	6.550	7.680	7.040	6.690	1.173	1.075	1.021
181	107	6.390	7.590	6.920	6.750	1.188	1.083	1.056
181	108	7.380	7.630	6.990	6.690	1.034	.947	.907
181	109	3.960	4.220	3.850	3.830	1.066	.972	.967
181	110	6.130	5.890	5.430	5.820	.961	.886	.949
181	111	4.270	4.300	4.110	3.790	1.007	.963	.888
181	112	7.500	7.450	7.090	6.710	.993	.945	.895
181	113	6.750	7.400	7.100	6.730	1.096	1.052	.997

NAVIGATION SYSTEMS - STATISTICS Cruise : 1

SYSTEMS	PARAMETERS						
	Mean	S D	S·E of Mean	Sample	Maximum	Minimum	Range
SAT	7.4700	.9290	.0874	113	9.2900	3.96	5.33
S D	7.7111	.7059	.0664	113	8.53	4.22	4.31
C L	7.1474	.7821	.0763	105	8.09	3.85	4.24
P L	7.0215	.6873	.0671	105	7.64	3.79	3.85
$\frac{S D}{SAT}$	1.0382	.0718	.0068	113	1.23	.8890	.348
$\frac{C L}{SAT}$	0.9640	.0525	.0051	105	1.09	.8470	.243
$\frac{P L}{SAT}$	0.9508	.0919	.0090	105	1.23	.7530	.479

Table 20

COMPARATIVE SPEEDS FOR NAVIGATIONAL SYSTEMS.

182	1	4.030	3.950	3.920	0.000	.980	.973	0.000
182	2	8.370	8.570	8.280	0.000	1.024	.989	0.000
182	3	8.100	8.130	7.870	0.000	1.004	.972	0.000
182	4	6.730	7.440	7.250	0.000	1.105	1.077	0.000
182	5	6.730	7.990	7.740	0.000	1.187	1.150	0.000
182	6	6.450	7.960	7.830	0.000	1.234	1.214	0.000
182	7	3.740	4.480	4.390	0.000	1.198	1.174	0.000
182	8	8.880	8.470	8.400	0.000	.954	.946	0.000
182	9	6.950	6.950	6.800	0.000	1.000	.978	0.000
182	10	7.620	7.870	7.840	0.000	1.033	1.029	0.000
182	11	7.040	7.180	7.210	0.000	1.020	1.024	0.000
182	12	7.810	8.070	7.830	0.000	1.033	1.003	0.000
182	13	7.660	8.100	7.780	0.000	1.057	1.016	0.000
182	14	5.970	6.700	6.500	0.000	1.122	1.089	0.000
182	15	6.590	7.890	7.730	0.000	1.197	1.173	0.000
182	16	5.810	7.340	7.230	0.000	1.263	1.244	0.000
182	17	8.820	8.480	8.410	0.000	.961	.954	0.000
182	18	8.500	8.430	8.430	0.000	.992	.992	0.000
182	19	5.990	6.110	5.980	0.000	1.020	.998	0.000
182	20	7.710	8.100	7.900	0.000	1.051	1.025	0.000
182	21	7.390	7.500	0.000	0.000	1.015	0.000	0.000
182	22	8.100	8.130	0.000	0.000	1.004	0.000	0.000
182	23	7.530	7.640	7.580	0.000	1.015	1.007	0.000
182	24	7.510	7.300	7.130	0.000	.972	.949	0.000
182	25	7.430	7.150	6.940	0.000	.962	.934	0.000
182	26	4.060	4.100	4.080	0.000	1.010	1.005	0.000
182	27	8.090	8.330	8.310	0.000	1.030	1.027	0.000
182	28	8.350	8.300	0.000	0.000	.994	0.000	0.000
182	29	5.710	5.830	0.000	0.000	1.021	0.000	0.000
182	30	6.270	6.800	6.480	0.000	1.085	1.033	0.000
182	31	6.580	6.410	6.170	0.000	.974	.938	0.000
182	32	7.640	8.160	7.930	0.000	1.068	1.038	0.000
182	33	7.180	8.100	7.970	0.000	1.128	1.110	0.000
182	34	7.570	8.070	8.130	0.000	1.066	1.074	0.000
182	35	6.570	6.960	7.040	0.000	1.059	1.072	0.000
182	36	7.320	8.060	7.960	0.000	1.101	1.087	0.000
182	37	7.300	8.180	8.040	0.000	1.121	1.101	0.000
182	38	4.480	4.890	4.650	0.000	1.092	1.038	0.000
182	39	8.170	8.070	7.880	0.000	.988	.965	0.000
182	40	7.670	8.170	7.820	0.000	1.065	1.020	0.000
182	41	6.130	6.620	6.380	0.000	1.080	1.041	0.000
182	42	7.990	8.200	7.820	0.000	1.026	.979	0.000
182	43	7.810	8.000	7.640	0.000	1.024	.978	0.000
182	44	6.240	6.570	6.550	0.000	1.053	1.050	0.000
182	45	6.080	6.410	6.230	0.000	1.054	1.025	0.000
182	46	7.920	7.960	7.870	0.000	1.005	.994	0.000
182	47	5.920	5.940	5.760	0.000	1.003	.973	0.000
182	48	8.770	8.050	0.000	0.000	.918	0.000	0.000
182	49	8.900	8.090	7.950	0.000	.909	.893	0.000
182	50	7.790	7.480	7.390	0.000	.960	.949	0.000
182	51	7.620	7.680	7.620	0.000	1.008	1.000	0.000
182	52	7.620	8.100	7.820	0.000	1.063	1.026	0.000
182	53	7.880	8.010	7.740	0.000	1.016	.982	0.000
182	54	6.430	6.690	6.450	0.000	1.040	1.003	0.000
182	55	8.060	8.210	7.880	0.000	1.019	.978	0.000
182	56	7.870	7.990	7.720	0.000	1.015	.981	0.000
182	57	6.150	6.340	6.190	0.000	1.031	1.007	0.000
182	58	7.960	7.960	7.700	0.000	1.000	.967	0.000
182	59	6.330	5.950	5.940	0.000	.940	.938	0.000
182	60	8.070	8.080	8.000	0.000	1.001	.991	0.000
182	61	8.030	7.960	7.910	0.000	.991	.985	0.000
182	62	5.130	5.500	5.340	0.000	1.072	1.041	0.000

182	63	7.520	7.980	7.700	0.000	1.061	1.024	0.000
182	64	6.300	6.800	6.590	0.000	1.079	1.046	0.000
182	65	7.480	7.890	7.710	0.000	1.055	1.031	0.000
182	66	7.390	7.860	7.660	0.000	1.064	1.037	0.000
182	67	7.560	7.960	0.000	0.000	1.053	0.000	0.000
182	68	6.600	7.020	0.000	0.000	1.064	0.000	0.000
182	69	6.930	7.450	7.280	0.000	1.075	1.051	0.000
182	70	4.920	5.470	5.340	0.000	1.112	1.085	0.000
182	71	7.450	7.940	7.780	0.000	1.066	1.044	0.000
182	72	7.630	7.950	7.890	0.000	1.042	1.034	0.000
182	73	8.120	7.950	7.890	0.000	.979	.972	0.000
182	74	8.110	7.920	7.840	0.000	.977	.967	0.000
182	75	5.810	5.880	5.660	0.000	1.012	.974	0.000
182	76	5.870	5.960	5.640	0.000	1.015	.961	0.000
182	77	6.170	6.220	6.000	0.000	1.008	.972	0.000
182	78	7.620	7.900	7.530	0.000	1.037	.988	0.000
182	79	7.670	7.820	7.520	0.000	1.020	.980	0.000
182	80	7.100	7.800	7.560	0.000	1.099	1.065	0.000
182	81	7.170	7.820	7.630	0.000	1.091	1.064	0.000
182	82	5.190	5.790	5.620	0.000	1.116	1.083	0.000
182	83	6.930	7.650	7.450	0.000	1.104	1.075	0.000
182	84	5.380	5.810	0.000	0.000	1.080	0.000	0.000
182	85	8.260	7.990	0.000	0.000	.967	0.000	0.000
182	86	8.220	7.970	7.740	0.000	.970	.942	0.000
182	87	7.890	7.990	7.730	0.000	1.013	.980	0.000
182	88	6.700	6.740	6.530	0.000	1.006	.975	0.000
182	89	7.530	7.280	6.910	0.000	.967	.918	0.000
182	90	7.190	7.280	6.900	0.000	1.013	.960	0.000
182	91	7.250	7.280	6.930	0.000	1.004	.956	0.000
182	92	7.070	7.060	0.000	0.000	.999	0.000	0.000
182	93	8.110	7.870	0.000	0.000	.970	0.000	0.000
182	94	7.900	7.870	0.000	0.000	.996	0.000	0.000
182	95	7.870	7.880	7.460	0.000	1.001	.948	0.000
182	96	8.380	7.970	7.600	0.000	.951	.907	0.000
182	97	6.370	6.560	6.360	0.000	1.030	.998	0.000
182	98	6.670	7.100	6.750	0.000	1.064	1.012	0.000
182	99	7.530	7.400	7.020	0.000	.983	.932	0.000
182	100	4.300	4.990	4.690	0.000	1.160	1.091	0.000
182	101	7.840	7.810	7.510	.310	.996	.958	.040
182	102	7.720	7.790	7.500	.460	1.009	.972	.060
182	103	7.740	7.840	7.580	0.000	1.013	.979	0.000
182	104	7.450	7.830	7.550	0.000	1.051	1.013	0.000
182	105	7.290	7.690	7.440	.060	1.055	1.021	.008
182	106	7.070	7.810	7.640	0.000	1.105	1.081	0.000
182	107	6.530	6.680	7.620	0.000	1.023	1.167	0.000
182	108	5.670	5.930	6.110	0.000	1.046	1.078	0.000
182	109	7.590	7.560	7.160	0.000	.996	.943	0.000
182	110	6.290	6.740	6.470	0.000	1.072	1.029	0.000
182	111	6.980	7.870	6.070	0.000	1.128	.870	0.000
182	112	7.270	7.780	4.720	0.000	1.070	.649	0.000
182	113	7.210	7.370	6.910	0.000	1.022	.958	0.000
182	114	7.990	8.220	7.800	0.000	1.029	.976	0.000
182	115	7.990	8.150	7.790	0.000	1.020	.975	0.000
182	116	8.570	8.190	7.780	0.000	.956	.908	0.000
182	117	7.950	8.200	7.800	0.000	1.031	.981	0.000
182	118	8.460	8.160	7.810	0.000	.965	.923	0.000
182	119	9.080	8.160	7.800	0.000	.899	.859	0.000
182	120	9.530	8.060	7.810	0.000	.846	.820	0.000
182	121	9.170	8.150	7.820	0.000	.889	.853	0.000
182	122	8.560	8.180	7.820	0.000	.956	.914	0.000
182	123	8.140	7.570	7.200	0.000	.930	.885	0.000
182	124	7.310	7.510	7.180	0.000	1.027	.982	0.000
182	125	7.850	7.880	7.630	0.000	1.004	.972	0.000
182	126	8.030	8.030	7.650	0.000	1.000	.953	0.000
182	127	7.620	7.960	7.640	0.000	1.045	1.003	0.000
182	128	8.130	7.960	0.000	0.000	.979	0.000	0.000

182	129	7.930	8.030	0.000	0.000	1.013	0.000	0.000
182	130	7.750	7.910	0.000	0.000	1.021	0.000	0.000
182	131	7.100	7.960	7.700	0.000	1.121	1.085	0.000
182	132	7.230	7.920	7.700	0.000	1.095	1.065	0.000
182	133	7.510	8.010	7.700	0.000	1.067	1.025	0.000
182	134	8.340	7.890	7.510	0.000	.946	.900	0.000
182	135	8.830	7.970	7.730	0.000	.903	.875	0.000
182	136	9.230	8.040	7.770	0.000	.871	.842	0.000
182	137	4.170	4.940	4.480	0.000	1.185	1.074	0.000
182	138	8.150	7.670	7.100	0.000	.941	.871	0.000
182	139	7.240	6.550	0.000	0.000	.905	0.000	0.000
182	140	7.780	7.360	0.000	0.000	.946	0.000	0.000
182	141	7.750	7.620	0.000	0.000	.983	0.000	0.000
182	142	8.160	7.640	0.000	0.000	.936	0.000	0.000
182	143	8.260	7.720	0.000	0.000	.935	0.000	0.000
182	144	8.000	7.750	0.000	0.000	.969	0.000	0.000
182	145	8.080	7.780	7.500	0.000	.963	.928	0.000
182	146	8.180	7.760	7.500	0.000	.949	.917	0.000
182	147	8.310	7.780	0.000	0.000	.936	0.000	0.000
182	148	7.820	6.810	0.000	0.000	.871	0.000	0.000
182	149	7.140	6.220	0.000	0.000	.871	0.000	0.000
182	150	8.180	7.100	0.000	0.000	.868	0.000	0.000
182	151	7.650	7.360	0.000	0.000	.962	0.000	0.000
182	152	9.120	7.620	7.320	0.000	.836	.803	0.000
182	153	8.720	7.650	7.290	0.000	.877	.836	0.000
182	154	9.030	7.680	7.370	0.000	.850	.816	0.000
182	155	8.600	7.670	7.330	0.000	.892	.852	0.000
182	156	8.320	7.660	7.470	0.000	.921	.898	0.000
182	157	8.540	7.620	7.410	0.000	.892	.868	0.000
182	158	7.860	7.590	7.360	0.000	.966	.936	0.000
182	159	8.540	7.610	7.360	0.000	.891	.862	0.000
182	160	8.490	7.670	7.410	0.000	.903	.873	0.000
182	161	8.540	7.700	7.390	0.000	.902	.865	0.000
182	162	8.470	7.720	7.410	0.000	.911	.875	0.000
182	163	8.390	7.740	7.380	0.000	.923	.880	0.000
182	164	6.910	6.490	6.180	0.000	.939	.894	0.000
182	165	5.380	5.330	5.130	0.000	.991	.954	0.000
182	166	7.230	7.370	7.080	0.000	1.019	.979	0.000
182	167	4.030	4.300	0.000	0.000	1.067	0.000	0.000
182	168	7.850	7.560	0.000	0.000	.963	0.000	0.000
182	169	7.610	7.380	0.000	0.000	.970	0.000	0.000
182	170	7.480	7.460	7.190	0.000	.997	.961	0.000
182	171	6.950	7.480	7.130	0.000	1.076	1.026	0.000
182	172	7.220	7.650	7.250	0.000	1.060	1.004	0.000
182	173	7.100	7.720	7.320	0.000	1.087	1.031	0.000
182	174	7.670	7.730	7.340	0.000	1.008	.957	0.000
182	175	7.440	7.590	7.280	0.000	1.020	.978	0.000
182	176	6.760	7.500	7.390	0.000	1.109	1.093	0.000
182	177	7.550	7.430	7.040	0.000	.984	.932	0.000
182	178	6.780	6.490	0.000	0.000	.957	0.000	0.000
182	179	7.960	7.650	7.220	0.000	.961	.907	0.000
182	180	7.990	7.580	7.250	0.000	.949	.907	0.000
182	181	8.240	7.440	7.150	0.000	.903	.868	0.000
182	182	8.070	7.370	6.990	0.000	.913	.866	0.000
182	183	8.360	7.310	6.820	0.000	.874	.816	0.000
182	184	8.440	7.270	6.860	0.000	.861	.813	0.000
182	185	8.040	7.440	6.980	0.000	.925	.868	0.000
182	186	6.410	5.850	5.500	0.000	.913	.858	0.000
182	187	6.940	6.830	6.670	0.000	.984	.961	0.000
182	188	7.040	6.720	6.640	0.000	.955	.943	0.000
182	189	7.020	6.660	6.530	0.000	.949	.930	0.000
182	190	7.080	6.640	6.480	0.000	.938	.915	0.000
182	191	6.940	6.540	6.390	0.000	.942	.921	0.000
182	192	6.200	6.540	6.080	0.000	1.055	.981	0.000
182	193	7.180	7.250	6.740	0.000	1.010	.939	0.000
182	194	6.820	7.220	6.750	0.000	1.059	.990	0.000

182	195	6.470	7.250	6.880	0.000	1.121	1.063	0.000
182	196	7.570	7.250	6.880	0.000	.958	.909	0.000
182	197	7.460	7.310	6.810	0.000	.980	.913	0.000
182	198	7.390	7.240	6.700	0.000	.980	.907	0.000
182	199	7.370	7.190	6.680	0.000	.976	.906	0.000
182	200	7.220	7.240	6.760	0.000	1.003	.936	0.000
182	201	7.160	7.220	6.730	0.000	1.008	.940	0.000
182	202	6.710	6.900	6.450	0.000	1.028	.961	0.000
182	203	6.080	6.320	5.950	0.000	1.039	.979	0.000
182	204	6.890	7.120	6.660	0.000	1.033	.967	0.000
182	205	6.830	7.220	6.800	0.000	1.057	.996	0.000
182	206	5.200	5.380	5.010	0.000	1.035	.963	0.000
182	207	6.790	6.520	6.140	0.000	.960	.904	0.000
182	208	6.560	6.610	6.250	0.000	1.008	.953	0.000
182	209	4.810	4.690	4.450	0.000	.975	.925	0.000
182	210	6.490	6.820	6.250	0.000	1.051	.963	0.000
182	211	6.510	6.970	6.640	0.000	1.071	1.020	0.000
182	212	6.030	6.590	6.210	0.000	1.093	1.030	0.000
182	213	5.900	6.400	6.130	0.000	1.085	1.039	0.000
182	214	5.960	6.340	6.050	0.000	1.064	1.015	0.000
182	215	5.690	6.400	5.960	0.000	1.125	1.047	0.000
182	216	3.480	3.700	3.410	0.000	1.063	.980	0.000
182	217	7.170	7.500	6.950	0.000	1.046	.969	0.000
182	218	7.980	8.790	8.050	0.000	1.102	1.009	0.000
182	219	8.020	8.860	8.280	0.000	1.105	1.032	0.000
182	220	7.820	9.050	8.550	0.000	1.157	1.093	0.000
182	221	8.100	9.180	8.750	0.000	1.133	1.080	0.000
182	222	8.280	9.020	8.640	0.000	1.089	1.043	0.000
182	223	5.300	6.010	5.450	0.000	1.134	1.028	0.000
182	224	6.950	7.810	7.250	0.000	1.124	1.043	0.000
182	225	8.340	9.340	0.000	0.000	1.120	0.000	0.000
182	226	8.170	9.150	8.620	0.000	1.120	1.055	0.000
182	227	5.730	6.270	5.960	0.000	1.094	1.040	0.000
182	228	8.440	8.910	8.470	0.000	1.056	1.004	0.000
182	229	6.490	6.630	0.000	0.000	1.022	0.000	0.000
182	230	9.500	9.780	0.000	0.000	1.029	0.000	0.000
182	231	9.710	9.750	0.000	0.000	1.004	0.000	0.000
182	232	9.150	9.770	9.120	0.000	1.068	.997	0.000
182	233	9.720	9.770	9.160	0.000	1.005	.942	0.000
182	234	9.140	9.060	0.000	0.000	.991	0.000	0.000
182	235	9.520	9.700	9.600	0.000	1.019	1.008	0.000
182	236	9.570	9.680	9.650	0.000	1.011	1.008	0.000
182	237	9.130	9.790	9.630	0.000	1.072	1.055	0.000
182	238	9.530	9.870	9.580	0.000	1.036	1.005	0.000
182	239	9.070	9.840	9.570	0.000	1.085	1.055	0.000
182	240	9.310	9.870	9.580	0.000	1.060	1.029	0.000
182	241	9.180	9.820	9.550	0.000	1.070	1.040	0.000
182	242	7.370	8.050	7.860	0.000	1.092	1.066	0.000
182	243	9.070	9.750	8.890	0.000	1.075	.980	0.000
182	244	9.160	9.740	8.760	0.000	1.063	.956	0.000
182	245	9.140	9.760	8.850	0.000	1.068	.968	0.000
182	246	9.330	9.730	8.930	0.000	1.043	.957	0.000
182	247	9.500	9.760	8.950	0.000	1.027	.942	0.000
182	248	9.230	9.810	9.050	0.000	1.063	.980	0.000
182	249	9.660	9.840	9.090	0.000	1.019	.941	0.000
182	250	9.060	9.750	9.110	0.000	1.076	1.006	0.000
182	251	9.330	9.790	9.150	0.000	1.049	.981	0.000
182	252	6.130	6.350	5.770	0.000	1.036	.941	0.000
182	253	9.720	9.660	9.100	0.000	.994	.936	0.000
182	254	7.660	8.340	8.160	0.000	1.089	1.065	0.000
182	255	5.960	5.810	5.730	0.000	.975	.961	0.000
182	256	9.730	9.450	9.110	0.000	.971	.936	0.000
182	257	9.860	9.430	9.050	0.000	.956	.918	0.000
182	258	9.030	9.320	8.970	0.000	1.032	.993	0.000
182	259	8.970	9.220	8.900	0.000	1.028	.992	0.000
182	260	8.650	9.160	8.870	0.000	1.059	1.025	0.000

182	261	8.840	9.100	8.820	0.000	1.029	.998	0.000
182	262	8.940	9.190	8.980	0.000	1.028	1.004	0.000
182	263	8.800	9.440	9.170	0.000	1.073	1.042	0.000
182	264	8.780	9.360	9.180	0.000	1.066	1.046	0.000
182	265	8.670	9.290	9.010	0.000	1.072	1.039	0.000
182	266	9.050	9.210	8.980	0.000	1.018	.992	0.000
182	267	9.000	9.290	9.030	0.000	1.032	1.003	0.000
182	268	9.380	9.120	8.800	0.000	.972	.938	0.000
182	269	8.560	9.090	8.690	0.000	1.062	1.015	0.000
182	270	8.500	9.240	8.890	0.000	1.087	1.046	0.000
182	271	7.460	7.930	7.600	0.000	1.063	1.019	0.000
182	272	5.630	5.800	5.560	0.000	1.030	.988	0.000
182	273	5.060	5.740	5.530	0.000	1.134	1.093	0.000
182	274	6.900	7.440	7.110	0.000	1.078	1.030	0.000
182	275	8.790	9.050	8.730	0.000	1.030	.993	0.000
182	276	8.690	8.980	8.770	0.000	1.033	1.009	0.000
182	277	8.470	9.030	8.710	0.000	1.066	1.028	0.000
182	278	8.430	8.980	8.580	0.000	1.065	1.018	0.000
182	279	8.400	8.920	8.440	0.000	1.062	1.005	0.000
182	280	8.930	8.870	8.430	0.000	.993	.944	0.000
182	281	8.520	8.940	8.530	0.000	1.049	1.001	0.000
182	282	8.930	8.830	8.460	0.000	.989	.947	0.000
182	283	8.710	8.890	8.530	0.000	1.021	.979	0.000

NAVIGATION SYSTEMS - STATISTICS Cruise : 2

SYSTEMS	PARAMETERS						
	Mean	S D	S·E of Mean	Sample	Maximum	Minimum	Range
SAT	7.5558	1.2216	.0726	283	9.86	3.48	6.38
S D	7.6719	1.1767	.0699	283	9.87	3.70	6.17
C L	7.3777	1.1577	.0735	248	9.65	3.41	6.24
P L		N O T		W O R K I N G			
S D / SAT	1.0197	.0697	.0041	283	1.263	.836	.427
C L / SAT	0.9831	.0739	.0047	248	1.244	.649	.595
P L / SAT							

Table 22

COMPARATIVE SPEEDS FOR NAVIGATIONAL SYSTEMS.

183	1	7.790	9.550	9.100	0.000	1.226	1.168	0.000
183	2	9.190	9.460	9.230	0.000	1.029	1.004	0.000
183	3	9.250	9.580	9.210	0.000	1.036	.996	0.000
183	4	7.290	7.870	7.690	0.000	1.080	1.055	0.000
183	5	8.910	9.100	0.000	0.000	1.021	0.000	0.000
183	6	7.670	9.130	8.960	0.000	1.190	1.168	0.000
183	7	8.770	9.150	9.090	0.000	1.043	1.036	0.000
183	8	8.610	9.230	0.000	0.000	1.072	0.000	0.000
183	9	8.590	9.460	9.320	0.000	1.101	1.085	0.000
183	10	8.230	9.390	9.190	0.000	1.141	1.117	0.000
183	11	8.300	9.370	9.120	0.000	1.129	1.099	0.000
183	12	8.120	9.320	0.000	0.000	1.148	0.000	0.000
183	13	8.330	9.280	0.000	0.000	1.114	0.000	0.000
183	14	8.540	9.240	0.000	0.000	1.082	0.000	0.000
183	15	8.810	9.180	8.750	0.000	1.042	.993	0.000
183	16	8.790	9.240	8.830	0.000	1.051	1.005	0.000
183	17	9.140	9.040	8.780	0.000	.989	.961	0.000
183	18	8.460	8.840	0.000	0.000	1.045	0.000	0.000
183	19	8.670	8.760	0.000	0.000	1.010	0.000	0.000
183	20	8.530	8.780	0.000	0.000	1.029	0.000	0.000
183	21	8.440	8.730	0.000	0.000	1.034	0.000	0.000
183	22	8.160	8.790	0.000	0.000	1.076	0.000	0.000
183	23	8.950	8.930	8.280	0.000	.998	.925	0.000
183	24	9.510	9.580	8.960	0.000	1.007	.942	0.000
183	25	9.000	9.580	8.930	0.000	1.064	.992	0.000
183	26	9.020	9.600	9.100	0.000	1.064	1.009	0.000
183	27	9.450	9.680	9.190	0.000	1.024	.972	0.000
183	28	9.190	9.650	0.000	0.000	1.050	0.000	0.000
183	29	9.340	9.490	8.850	0.000	1.016	.948	0.000
183	30	9.170	9.450	8.880	0.000	1.031	.968	0.000
183	31	9.620	9.450	8.910	0.000	.982	.926	0.000
183	32	7.380	8.090	7.360	0.000	1.096	.997	0.000
183	33	7.260	7.880	7.270	0.000	1.085	1.001	0.000
183	34	6.890	7.760	7.310	0.000	1.126	1.061	0.000
183	35	7.140	8.090	7.710	0.000	1.133	1.080	0.000
183	36	7.320	7.790	7.330	0.000	1.064	1.001	0.000
183	37	8.120	8.270	7.650	0.000	1.018	.942	0.000
183	38	8.750	8.440	7.750	0.000	.965	.886	0.000
183	39	9.200	8.460	7.670	0.000	.920	.834	0.000
183	40	8.620	8.490	7.660	0.000	.985	.889	0.000
183	41	8.510	8.200	7.420	0.000	.964	.872	0.000
183	42	8.150	7.880	7.120	0.000	.967	.874	0.000
183	43	7.750	6.970	6.310	0.000	.899	.814	0.000
183	44	6.860	6.560	0.000	0.000	.956	0.000	0.000
183	45	8.170	8.750	8.110	0.000	1.071	.993	0.000
183	46	7.750	7.490	6.960	0.000	.966	.898	0.000
183	47	7.590	7.520	6.990	0.000	.991	.921	0.000
183	48	7.470	7.760	7.150	0.000	1.039	.957	0.000
183	49	7.560	7.760	7.240	0.000	1.026	.958	0.000
183	50	7.770	8.100	7.480	0.000	1.042	.963	0.000
183	51	7.930	8.380	7.670	0.000	1.057	.967	0.000
183	52	8.010	8.420	0.000	0.000	1.051	0.000	0.000
183	53	8.200	8.450	0.000	0.000	1.030	0.000	0.000
183	54	7.520	7.860	7.330	0.000	1.045	.975	0.000
183	55	8.250	8.470	7.870	0.000	1.027	.954	0.000
183	56	8.160	8.740	8.210	0.000	1.071	1.006	0.000
183	57	7.250	7.320	6.920	0.000	1.010	.954	0.000
183	58	8.340	8.930	8.090	0.000	1.071	.970	0.000
183	59	8.350	8.270	8.440	0.000	.990	1.011	0.000
183	60	8.400	9.200	8.460	0.000	1.095	1.007	0.000
183	61	8.440	9.340	8.550	0.000	1.107	1.013	0.000
183	62	7.940	9.310	8.580	0.000	1.173	1.081	0.000
183	63	8.190	9.310	8.550	0.000	1.137	1.044	0.000
183	64	8.260	9.320	8.460	0.000	1.128	1.024	0.000

183	65	8.700	9.270	8.460	0.000	1.066	.972	0.000
183	66	8.960	9.330	8.760	0.000	1.041	.978	0.000
183	67	8.020	8.250	7.780	0.000	1.029	.970	0.000
183	68	8.760	8.850	8.410	0.000	1.010	.960	0.000
183	69	8.950	8.900	8.320	0.000	.994	.930	0.000
183	70	9.030	8.840	8.210	0.000	.979	.909	0.000
183	71	8.900	8.720	8.270	0.000	.980	.929	0.000
183	72	7.810	8.970	0.000	0.000	1.149	0.000	0.000
183	73	8.130	8.990	0.000	0.000	1.106	0.000	0.000
183	74	9.160	9.420	0.000	0.000	1.028	0.000	0.000
183	75	7.600	8.140	0.000	0.000	1.071	0.000	0.000
183	76	7.550	7.930	0.000	0.000	1.050	0.000	0.000
183	77	7.620	8.040	7.190	0.000	1.055	.944	0.000
183	78	7.370	7.750	6.870	0.000	1.052	.932	0.000
183	79	7.050	7.550	6.700	0.000	1.071	.950	0.000
183	80	7.070	7.440	6.600	0.000	1.052	.934	0.000
183	81	7.140	7.590	6.720	0.000	1.063	.941	0.000
183	82	7.110	7.570	6.710	0.000	1.065	.944	0.000
183	83	7.300	7.550	6.710	0.000	1.034	.919	0.000
183	84	7.420	7.660	6.840	0.000	1.032	.922	0.000
183	85	7.190	7.590	6.740	0.000	1.056	.937	0.000
183	86	7.030	7.490	0.000	0.000	1.065	0.000	0.000
183	87	6.930	7.590	6.730	0.000	1.095	.971	0.000
183	88	6.990	7.570	6.730	0.000	1.083	.963	0.000
183	89	6.840	6.660	5.960	0.000	.974	.871	0.000
183	90	6.220	6.690	6.030	0.000	1.076	.969	0.000
183	91	6.460	6.800	6.180	0.000	1.053	.957	0.000
183	92	5.990	6.850	6.180	0.000	1.144	1.032	0.000
183	93	5.820	6.620	5.990	0.000	1.137	1.029	0.000
183	94	6.020	6.950	6.190	0.000	1.154	1.028	0.000
183	95	8.230	8.760	8.320	0.000	1.064	1.011	0.000
183	96	7.900	8.720	8.200	0.000	1.104	1.038	0.000
183	97	7.810	8.640	7.930	0.000	1.106	1.015	0.000
183	98	8.380	9.240	8.500	0.000	1.103	1.014	0.000
183	99	8.390	9.250	8.640	0.000	1.103	1.030	0.000
183	100	8.670	9.300	8.670	0.000	1.073	1.000	0.000
183	101	8.140	8.630	8.220	0.000	1.060	1.010	0.000
183	102	7.890	8.170	7.770	0.000	1.035	.985	0.000
183	103	7.310	7.180	6.560	0.000	.982	.897	0.000
183	104	6.400	6.660	5.970	0.000	1.041	.933	0.000
183	105	6.230	6.030	5.430	0.000	.968	.872	0.000
183	106	7.480	7.320	6.780	0.000	.979	.906	0.000
183	107	8.630	8.690	0.000	0.000	1.007	0.000	0.000
183	108	8.110	8.570	0.000	0.000	1.057	0.000	0.000
183	109	7.770	8.550	0.000	0.000	1.100	0.000	0.000
183	110	7.450	8.690	7.980	0.000	1.166	1.071	0.000
183	111	7.840	8.780	8.200	0.000	1.120	1.046	0.000
183	112	8.620	8.730	7.970	0.000	1.013	.925	0.000
183	113	8.610	8.770	8.100	0.000	1.019	.941	0.000
183	114	8.850	8.750	8.170	0.000	.989	.923	0.000
183	115	8.950	8.760	8.130	0.000	.979	.908	0.000
183	116	9.090	8.890	8.190	0.000	.978	.901	0.000
183	117	8.600	9.380	8.480	0.000	1.091	.986	0.000
183	118	8.680	9.500	8.560	0.000	1.094	.986	0.000
183	119	8.840	9.400	0.000	0.000	1.063	0.000	0.000
183	120	8.740	9.220	0.000	0.000	1.055	0.000	0.000
183	121	8.120	8.230	0.000	0.000	1.014	0.000	0.000
183	122	9.310	9.330	8.560	0.000	1.002	.919	0.000
183	123	9.150	9.310	0.000	0.000	1.017	0.000	0.000
183	124	8.140	9.320	8.560	0.000	1.145	1.052	0.000
183	125	8.300	9.260	8.570	0.000	1.116	1.033	0.000
183	126	8.710	9.250	8.600	0.000	1.062	.987	0.000
183	127	8.840	9.290	8.590	0.000	1.051	.972	0.000
183	128	8.560	9.270	8.640	0.000	1.083	1.009	0.000
183	129	8.710	9.270	8.730	0.000	1.064	1.002	0.000
183	130	8.740	9.240	0.000	0.000	1.057	0.000	0.000

183	131	8.610	9.280	0.000	0.000	1.078	0.000	0.000
183	132	8.350	9.190	8.700	0.000	1.101	1.042	0.000
183	133	7.900	9.250	8.700	0.000	1.171	1.101	0.000
183	134	8.650	9.160	8.370	0.000	1.059	.968	0.000
183	135	8.550	9.270	8.520	0.000	1.084	.996	0.000
183	136	8.980	9.450	0.000	0.000	1.052	0.000	0.000
183	137	9.670	9.410	0.000	0.000	.973	0.000	0.000
183	138	8.760	9.380	0.000	0.000	1.071	0.000	0.000
183	139	8.840	9.370	0.000	0.000	1.060	0.000	0.000
183	140	8.530	9.290	0.000	0.000	1.089	0.000	0.000
183	141	8.320	9.150	0.000	0.000	1.100	0.000	0.000
183	142	8.530	7.990	7.090	0.000	.937	.831	0.000
183	143	9.150	9.300	8.740	0.000	1.016	.955	0.000
183	144	8.790	8.830	0.000	0.000	1.005	0.000	0.000
183	145	8.670	8.760	7.660	0.000	1.010	.884	0.000
183	146	8.570	8.730	0.000	0.000	1.019	0.000	0.000
183	147	9.410	8.490	7.900	0.000	.902	.840	0.000
183	148	9.300	8.410	7.830	0.000	.904	.842	0.000
183	149	8.600	8.350	7.710	0.000	.971	.897	0.000
183	150	7.390	7.590	7.110	0.000	1.027	.962	0.000
183	151	7.440	7.540	7.200	0.000	1.013	.968	0.000
183	152	7.400	7.500	7.270	0.000	1.014	.982	0.000
183	153	8.510	8.270	7.340	0.000	.972	.863	0.000
183	154	8.910	8.760	0.000	0.000	.983	0.000	0.000
183	155	8.490	8.270	0.000	0.000	.975	0.000	0.000
183	156	8.450	8.190	7.510	0.000	.969	.889	0.000
183	157	8.270	8.390	7.740	0.000	1.015	.936	0.000
183	158	8.420	8.260	7.630	0.000	.981	.906	0.000
183	159	8.410	8.430	7.530	0.000	1.002	.901	0.000
183	160	9.560	9.550	0.000	0.000	.999	0.000	0.000
183	161	8.600	9.350	8.350	0.000	1.087	.971	0.000
183	162	8.740	9.660	8.650	0.000	1.105	.990	0.000
183	163	8.770	9.470	8.360	0.000	1.080	.953	0.000
183	164	8.900	9.510	8.460	0.000	1.069	.951	0.000
183	165	8.950	9.330	8.570	0.000	1.041	.956	0.000
183	166	8.200	9.190	8.240	0.000	1.121	1.005	0.000
183	167	7.800	9.120	8.150	0.000	1.169	1.045	0.000
183	168	8.340	9.260	0.000	0.000	1.110	0.000	0.000
183	169	8.400	9.240	0.000	0.000	1.100	0.000	0.000
183	170	9.410	9.570	0.000	0.000	1.017	0.000	0.000
183	171	8.570	9.510	0.000	0.000	1.110	0.000	0.000
183	172	9.480	9.020	8.340	0.000	.951	.880	0.000
183	173	9.370	9.290	8.400	0.000	.991	.896	0.000
183	174	8.790	8.920	8.180	0.000	1.015	.931	0.000
183	175	8.450	8.770	8.090	0.000	1.038	.957	0.000
183	176	8.57	8.660	7.990	0.000	1.011	.932	0.000
183	177	8.620	8.670	8.090	0.000	1.006	.939	0.000
183	178	8.690	8.660	8.130	0.000	.997	.936	0.000
183	179	8.760	8.860	8.170	0.000	1.011	.933	0.000
183	180	8.470	8.720	7.960	0.000	1.030	.940	0.000
183	181	8.270	8.870	8.270	0.000	1.073	1.000	0.000
183	182	8.820	9.110	8.390	0.000	1.033	.951	0.000
183	183	10.010	9.930	0.000	0.000	.992	0.000	0.000
183	184	9.950	9.720	9.070	0.000	.977	.912	0.000
183	185	9.730	9.810	0.000	0.000	1.008	0.000	0.000
183	186	8.880	9.770	0.000	0.000	1.100	0.000	0.000
183	187	9.350	9.700	9.090	0.000	1.037	.972	0.000
183	188	9.260	9.760	9.090	0.000	1.054	.982	0.000
183	189	9.690	9.810	9.150	0.000	1.012	.944	0.000
183	190	9.690	9.790	9.210	0.000	1.010	.950	0.000
183	191	9.560	9.670	9.170	0.000	1.012	.959	0.000
183	192	9.200	9.690	0.000	0.000	1.053	0.000	0.000
183	193	9.600	9.800	0.000	0.000	1.021	0.000	0.000
183	194	8.570	9.170	0.000	0.000	1.070	0.000	0.000
183	195	8.880	9.110	8.720	0.000	1.026	.982	0.000
183	196	8.540	8.980	8.610	0.000	1.052	1.008	0.000

183	197	8.930	9.300	8.880	0.000	1.041	.994	0.000
183	198	8.830	8.590	8.990	0.000	.973	1.018	0.000
183	199	8.660	9.780	9.070	0.000	1.129	1.047	0.000
183	200	8.980	9.800	9.060	0.000	1.091	1.009	0.000
183	201	8.710	8.570	8.990	0.000	.984	1.032	0.000
183	202	8.690	9.530	8.900	0.000	1.097	1.024	0.000
183	203	9.000	9.560	8.980	0.000	1.062	.998	0.000
183	204	8.930	8.250	8.860	0.000	.924	.992	0.000
183	205	9.470	9.710	0.000	0.000	1.025	0.000	0.000
183	206	9.440	9.710	8.180	0.000	1.029	.867	0.000
183	207	9.310	9.690	9.240	0.000	1.041	.992	0.000
183	208	9.150	9.740	8.200	0.000	1.064	.896	0.000
183	209	9.610	9.540	9.270	0.000	.993	.965	0.000
183	210	9.810	9.790	9.230	0.000	.998	.941	0.000
183	211	9.710	9.740	9.180	0.000	1.003	.945	0.000
183	212	9.350	9.700	9.010	0.000	1.037	.964	0.000
183	213	9.390	9.640	9.000	0.000	1.027	.958	0.000
183	214	9.510	9.630	8.970	0.000	1.013	.943	0.000
183	215	8.950	9.550	8.800	0.000	1.067	.983	0.000
183	216	8.460	9.430	8.790	0.000	1.115	1.039	0.000
183	217	8.160	8.610	7.670	0.000	1.055	.940	0.000
183	218	8.450	8.690	7.880	0.000	1.028	.933	0.000
183	219	8.700	9.010	8.180	0.000	1.036	.940	0.000
183	220	9.060	8.970	8.170	0.000	.990	.902	0.000
183	221	8.820	9.160	8.270	0.000	1.039	.938	0.000
183	222	9.000	9.020	8.360	0.000	1.002	.929	0.000
183	223	9.180	9.030	8.330	0.000	.984	.907	0.000
183	224	9.400	8.880	8.150	0.000	.945	.870	0.000
183	225	9.430	8.870	8.150	0.000	.941	.867	0.000
183	226	9.020	8.990	0.000	0.000	.997	0.000	0.000
183	227	8.670	9.010	0.000	0.000	1.039	0.000	0.000
183	228	9.020	9.140	0.000	0.000	1.013	0.000	0.000
183	229	8.890	9.170	0.000	0.000	1.042	0.000	0.000
183	230	8.690	9.150	0.000	0.000	1.053	0.000	0.000
183	231	9.730	9.770	0.000	0.000	1.004	0.000	0.000
183	232	9.040	9.350	0.000	0.000	1.034	0.000	0.000
183	233	8.550	9.280	0.000	0.000	1.085	0.000	0.000
183	234	8.740	9.360	0.000	0.000	1.071	0.000	0.000
183	235	8.090	8.600	0.000	0.000	1.063	0.000	0.000
183	236	8.120	8.390	0.000	0.000	1.033	0.000	0.000
183	237	8.250	8.560	0.000	0.000	1.038	0.000	0.000
183	238	8.360	9.410	0.000	0.000	1.126	0.000	0.000
183	239	9.370	9.570	8.610	0.000	1.021	.919	0.000
183	240	9.210	9.440	8.450	0.000	1.025	.917	0.000
183	241	8.580	8.600	7.680	0.000	1.002	.895	0.000
183	242	8.470	8.290	0.000	0.000	.979	0.000	0.000
183	243	8.260	8.210	7.250	0.000	.994	.881	0.000
183	244	7.930	8.430	7.320	0.000	1.063	.923	0.000
183	245	8.110	8.690	7.570	0.000	1.072	.933	0.000
183	246	8.210	8.500	7.540	0.000	1.035	.918	0.000
183	247	8.860	8.670	7.720	0.000	.979	.871	0.000
183	248	8.300	8.740	7.640	0.000	1.053	.920	0.000
183	249	8.440	8.010	8.010	0.000	.949	.949	0.000
183	250	8.830	9.090	8.180	0.000	1.029	.926	0.000
183	251	8.670	9.220	8.310	0.000	1.063	.958	0.000
183	252	8.720	9.260	8.390	0.000	1.062	.962	0.000
183	253	8.120	9.170	8.380	0.000	1.129	1.032	0.000
183	254	8.830	9.310	8.420	0.000	1.054	.954	0.000
183	255	8.680	9.290	8.500	0.000	1.070	.979	0.000
183	256	8.890	9.490	8.670	0.000	1.067	.975	0.000
183	257	8.880	9.660	8.700	8.880	1.088	.980	1.000
183	258	8.470	9.580	8.630	27.000	1.131	1.019	3.188
183	259	9.100	9.260	8.250	0.000	1.018	.907	0.000
183	260	9.200	9.220	0.000	0.000	1.002	0.000	0.000

NAVIGATION SYSTEMS - STATISTICS Cruise : 3

SYSTEMS	PARAMETERS						
	Mean	S D	S·E of Mean	Sample	Maximum	Minimum	Range
SAT	8.4626	.7687	.0477	260	10.01	5.82	4.19
S D	8.8155	.7601	.0471	260	9.93	6.03	3.90
C L	8.0869	.8196	.0588	194	9.32	5.43	3.89
P L		N O T		W O R K	I N G		
$\frac{S D}{SAT}$	1.0435	.0541	.0034	260	1.226	.899	.327
$\frac{C L}{SAT}$	0.9632	.0595	.0043	194	1.168	.814	.354
$\frac{P L}{SAT}$							

Table 24

PRINTOUT OF CHANNEL NOISE OBSERVATIONS

SURV.	CRUI.	DAY	CH-1	CH-2	CH-3	CH-4	CH-5	CH-6
18	1	2	16	18	12	10	10	14
18	1	3	13	27	19	17	18	25
18	1	4	13	26	15	16	15	26
18	1	5	8	24	12	11	10	18
18	1	6	9	20	14	13	15	20
18	1	7	13	30	18	16	16	28
18	1	8	9	18	12	11	10	20
18	1	9	7	16	14	15	9	22
18	1	10	10	18	11	10	12	41
18	1	11	19	22	16	16	18	24
18	2	21	13	25	14	11	9	9
18	2	22	19	33	25	12	13	11
18	2	23	15	35	15	12	16	15
18	2	24	13	22	20	12	12	14
18	2	25	15	18	24	13	15	18
18	2	26	17	17	18	15	15	15
18	2	27	13	14	21	12	12	13
18	2	28	14	16	20	12	15	13
18	2	29	12	13	20	10	10	10
18	2	30	11	18	18	11	10	12
18	2	31	13	20	24	13	13	15
18	2	34	10	10	12	10	8	8
18	2	35	13	12	20	12	11	12
18	2	36	12	14	15	10	10	13
18	2	37	14	13	18	11	11	15
18	2	38	13	11	16	10	10	15
18	2	39	12	13	21	11	11	14
18	2	40	15	13	15	9	12	15
18	2	41	17	21	30	13	12	13
18	2	42	28	25	34	16	19	17
18	2	43	6	9	9	18	16	18
18	2	44	22	15	27	10	15	15
18	2	45	22	19	30	16	16	18
18	3	51	25	27	28	19	20	26
18	3	52	25	26	24	21	22	26
18	3	53	20	17	21	15	13	17
18	3	56	22	18	23	18	15	23
18	3	57	22	19	26	20	16	22
18	3	58	23	21	20	17	15	28
18	3	59	19	17	20	15	13	20
18	3	60	30	12	16	12	12	7
18	3	62	17	17	21	12	24	18
18	3	63	15	13	16	11	11	12
18	3	64	23	24	25	18	20	29
18	3	65	28	23	27	18	36	30
18	3	66	23	19	26	14	17	22
18	3	67	27	14	26	15	16	16
18	3	68	25	24	25	15	16	16
18	3	69	16	15	19	14	10	17
18	3	70	16	16	12	15	10	9
18	3	71	21	16	15	16	11	13
18	3	72	21	16	11	18	8	10
18	3	73	25	13	17	12	9	21
18	3	74	24	16	28	15	12	28
18	3	75	15	69	12	9	9	15

Table 28

	VAR NO	MEAN	S.D.	S.E. OF MEAN	SAMPLE	MAXIMUM	MINIMUM	RANGE
Survey 18	1	40.5455	22.5108	3.0353	55	75.0000	2.0000	73.0000
	2	17.0545	5.9330	.8000	55	30.0000	6.0000	24.0000
	3	19.5818	8.8332	1.1911	55	69.0000	9.0000	60.0000
	4	19.4000	5.8329	.7865	55	34.0000	9.0000	25.0000
	5	13.6909	3.0421	.4102	55	21.0000	9.0000	12.0000
	6	13.8000	4.7391	.6390	55	36.0000	8.0000	28.0000
	7	17.8364	6.6493	.8966	55	41.0000	7.0000	34.0000
Cr 1	8	11.7000	3.8020	1.2023	10	19.0000	7.0000	12.0000
	9	21.9000	4.6774	1.4791	10	30.0000	16.0000	14.0000
	10	14.3000	2.7101	.8570	10	19.0000	11.0000	8.0000
	11	13.5000	2.7988	.8851	10	17.0000	10.0000	7.0000
	12	13.3000	3.4976	1.1060	10	18.0000	9.0000	9.0000
	13	23.8000	7.3151	2.3132	10	41.0000	14.0000	27.0000
Cr 2	14	14.7391	4.5946	.9580	23	28.0000	6.0000	22.0000
	15	17.6522	6.7931	1.4165	23	35.0000	9.0000	26.0000
	16	20.2609	6.1290	1.2780	23	34.0000	9.0000	25.0000
	17	12.1304	2.2624	.4717	23	18.0000	9.0000	9.0000
	18	12.6522	2.7734	.5783	23	19.0000	8.0000	11.0000
	19	13.8261	2.7078	.5646	23	18.0000	8.0000	10.0000
Cr 3	20	21.9091	4.2416	.9043	22	30.0000	15.0000	15.0000
	21	20.5455	11.6322	2.4800	22	69.0000	12.0000	57.0000
	22	20.8182	5.4479	1.1615	22	28.0000	11.0000	17.0000
	23	15.4091	3.0497	.6502	22	21.0000	9.0000	12.0000
	24	15.2273	6.3840	1.3611	22	36.0000	8.0000	28.0000
	25	19.3182	6.7991	1.4496	22	30.0000	7.0000	23.0000

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BUREAU OF MINERAL RESOURCES

MARINE GEOPHYSICAL SURVEY
WEST COAST OF AUSTRALIA

FIELD REPORT
12/1972 TO 01/1973
SURVEY No. 19

BUREAU OF MINERAL RESOURCES

MARINE GEOPHYSICAL SURVEY

WEST COAST OF AUSTRALIA

FIELD REPORT

December 1972 to January 1973

Survey No. 19

Compagnie Generale de Geophysique

39 Booroondara Street REID, A.C.T.

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INTRODUCTION

Survey 19 consists of one cruise only and is the last survey of the Australian Continental Shelf Survey, 1971/1972

The geographical limits are approximately these: (Fig. A, plates 33, 44)

North : 32° South

South : 38° South

East : 130° East

West : 109° East

During Survey 19, the shore station was located near ALBANY (W.A.) at EMU POINT.

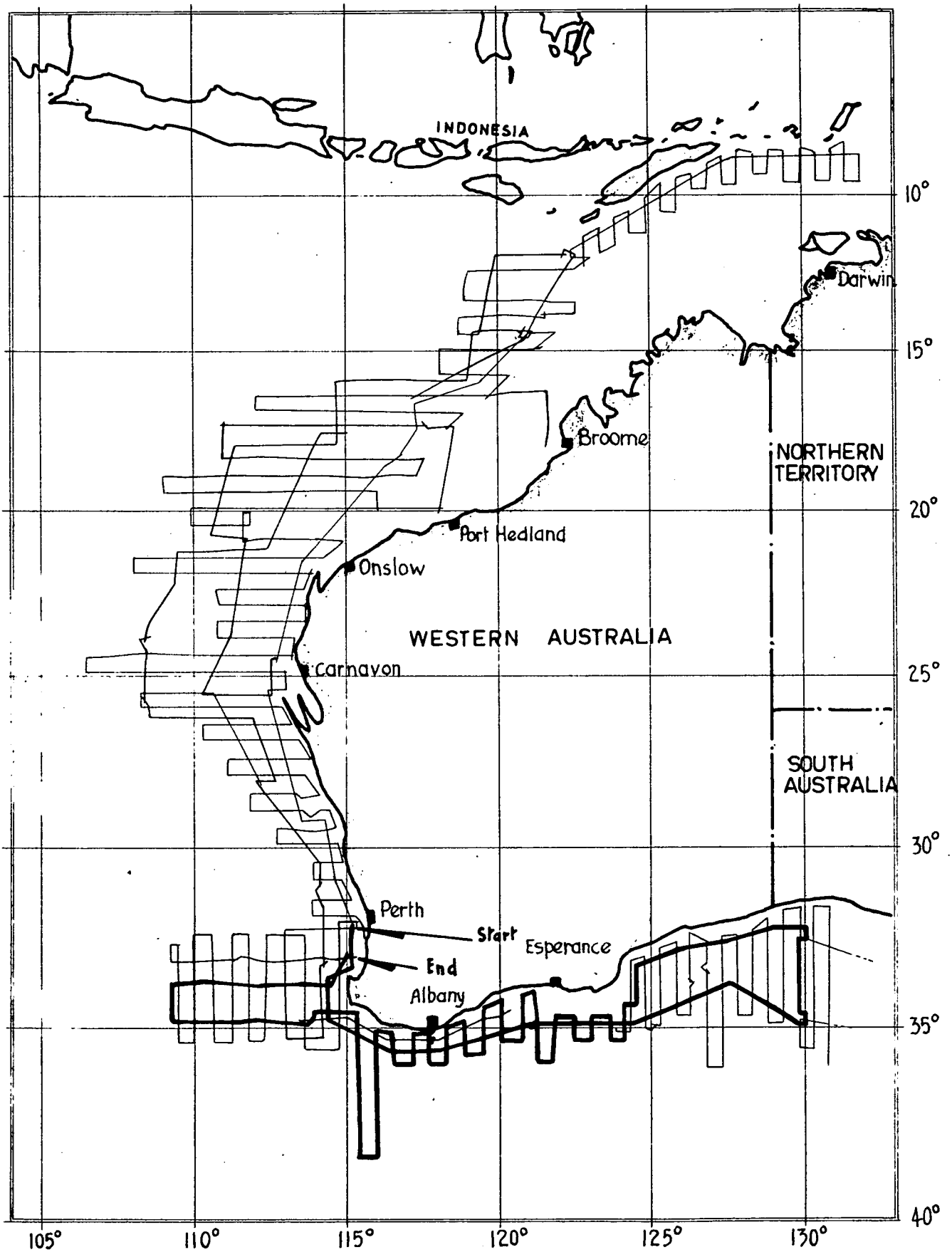
FIG A

LOCATION SKETCH for

SOUTH, WEST and NORTH COASTS OF AUSTRALIA

SCALE 1 / 20000000

SURVEY 19



SUMMARY OF OPERATIONS

The M/V Lady Christine left Freemantle (W.A.) on 13th December 1972 at 23.30 LT.

The cruise began on 14th December at 03.30 GMT BMR day 02.

The working periods are as follows:-

From day 02.03.30 to 08.19.00:	stoppage for supplies in Albany, start delayed by bad weather
From day 11.04.00 to 21.08.30:	stoppage due to bad weather
From day 22.01.45 to 24.17.00:	End of Survey.

The M/V Lady Christine entered Freemantle on 6th of January 1973 at 08.30 LT

This call was the last for the survey of the Continental Shelf of Australia. All BMR equipment was dismantled by the Department of Supply and sent to Canberra. This was completed by 7th January 1973 and the ship left for Singapore on 10th January 1973.

STATISTICS

Survey / Cruise	Total time at sea TTS	Working time	Travel time	Supply boat	Bad weather	Major breakdown	Port	Total time TT
19 1	561·00	467·15	27·30	04·30	35·15	26·30	87·00	648·00
TOTAL	561·00	467·15	27·30	04·30	35·15	26·30	87·00	648·00
MONTHES	0·779	0·649	0·038	0·006	0·049	0·037	0·121	0·900
REDUCED TO 1 MONTH	0·866	0·721	0·042	0·007	0·054	0·042	0·134	1·0
DAY / MONTH	25·98	21·63	1·26	0·21	1·62	1·26	4·02	30
TTS = 100%	100	83·3	4·9	0·8	6·3	4·7	–	–
TT = 100 %	86·6 TTS + PORT = TT	72·1	4·2	0·7	5·4	4·2	13·4	100

STATISTICS (Table 1)

Statistical table 1 gives the following information

* Total time (TT) : 648 hours = 0.90 month
  (TT = total time at sea + time in port)
* Working mileage (WM) : 4017 Nautical miles
* Working time (WT) : 467 hours 15 minutes
* Mean speed : 8.6 Knots

The breakdown of TT, in percentage is as follows:-

* Total time at sea (TTS): 86.6% of TT
* Port (P) : 13.4% of TT

TTS can be further divided into:

* Working time (WT) : 83.3% of TTS = 72.1% of TT
* Travel (T) : 4.9% of TTS = 4.2% of TT
* Supply boat (SB) : 0.8% of TTS = 0.7% of TT
* Bad weather (BW) : 6.3% of TTS = 5.4% of TT
* Major breakdown (MB) : 4.7% of TTS = 4.2% of TT

These results will be discussed at the end of the report.

OVERALL OPERATION OF EACH SYSTEM

I. DATA ACQUISITION SYSTEM (plate 5)

A few hours after leaving Fremantle, although a check of this system was carried out during the call - in particular the sin-cos channels -, a breakdown occurred on the Multiverter. The reason for this failure could not be found. The survey continued without the multiverter, i.e. sin - cos and VLF channels were not recorded on tape.

A Hewlett - Packard technician was expected at the Albany call, but this was cancelled and the multiverter remained out of use for the whole survey.

From 02.20.35 to 02.22.52 the teletype ASR 35 broke down. The ASR 33 from the seismic room was installed and used until the repair of the ASR 35 day 04.05.00

II SEISMIC (plates 3, 4, 31)

II.1 Seismic Container (plates 3, 41)

II.1.1 Seismic Amplifier SIE PT700 (plate 41)

A 15 minutes stoppage occurred, day 05.07.53 on CH2 amplifier. This piece of equipment worked without problem during the survey

II.1.2 Ampex Recorder

A new Ampex Recorder was received before leaving Fremantle. It worked satisfactorily until day 23

when channel 10 broke down. - 100 HZ signal was recorded on channel 9 from day 23.02.28.

II.1.3 EPC Recorders

Several stoppages of the EPC 4 must be pointed out;

- from 03.13.10 to 03.14.50: changed between RAYTHEON EPC and EPC 4 seismic room
- from 06.02.42 to 06.07.40:
- from 14.01.23 to 14.02.04

During the call at Albany, a new recorder was received and replaced EPC 4.

A few tests of paper speed were carried out on EPC 3 :
- from 12.10.10 to 12.18.59
- from 13.13.10 to 13.17.20

The following table gives the display for each EPC Recorder.

EPC 1	EPC 2	EPC 3	EPC 4
02.03.30	02.03.30	02.03.30	02.03.30
		Geotech	P.B.
		06.02.40	06.02.40
		P.B.	Geotech
		12.10.10	15.02.00
		Ch 2 fast speed	Ch 2 + Shallow filter
Ch 2	Ch 2 fast speed	12.18.59	15.08.38
Slow speed		P.B.	Ch 1 + Shallow filter
		13.13.30	16.05.05
		Ch 2 fast speed	Geotech
		13.17.00	23.01.32
		P.B.	Ch 1 + Shallow filter
24.17.00	24.17.00	24.17.00	24.17.00

II.1.4 Air Conditioner system

Before the beginning of the survey a complete overhaul of the seismic room air conditioner system was carried out by Carrier technicians.

II.1.5 Refraction Probes - Sonobuoys

10 Sonobuoys were launched - 8 gave good results (5 of them showed two or more refractors) 2 Sonobuoys had transmitting stoppages.

II.1.6 Sparker Container (plate 4)

123 minutes were spent to clean the OAT and to lengthen the electrodes - stoppage on day 15 was extended because of trouble with the self starter of the starboard side - generator.

Few other stoppages to be noted

- from 03.18.37 to 03.19.14
- from 13.07.50 to 13.07.57
- from 23.01.04 to 13.01.32 i.e. 72 minutes of stoppage

No stoppages were due the electrodes.

III SOUNDERS

III.1. Atlas Sounder and Elac Sounder

Both Systems worked the whole cruise without stoppage. The Atlas system remained out of scale for most of the cruise.

III.2 Raytheon System

This system provided reliable data especially through the digital output. The analogue output was disturbed due to trouble with the EPC recorder - This recorder was stopped on day 03 from 13.55 to 15.20 to be swapped with one of the seismic room. Day 18, again the analogue records were of very poor quality due to several stoppages and the bad functioning of the E.P.C.

IV MAGNETISM

The magnetometer worked very satisfactory during the whole cruise. In order to decrease the noise level which looked like becoming slightly more important than usual, the kerosine of the sensor was changed during the Albany call.

V GRAVITY (table 2)

The only failure which occured to the gravitymeter during this cruise was the failure of the longitudinal gyro. The change was made from 03.17.30 to 03.18.40. A Gravity tie made at Albany on day 10 did not show any significant change of the zero following the repairs.

The following tables give the gravity results for Survey 19.

	good	out of criteria	failure
	433 45	32 10	01 20
% of WT	92.8%	6.9%	0.3%

GRAVITY RESULTS cruise : I

DAYS	WORKING hours	Σ	FAILURES	Σ	GOOD	Σ	OUT OF CRITERIA	Σ
02	00.00 to 24.00	20.30		0	03.30 to 24.00	20.30		0
03	00.00 to 24.00	24.00	17.20 to 18.40	01.20	00.00 to 17.20 18.40 to 24.00	22.40		0
04	"	24.00		0	00.00 to 24.00	24.00		0
05	"	24.00		0	"	24.00		0
06	"	24.00		0	00.00 TO 03.30 05.50 TO 07.10 10.50 TO 19.40 20.40 TO 24.00	17.00	03.30 TO 05.50 07.10 TO 10.50 19.40 TO 20.40	07.00
07	"	24.00		0	00.00 TO 03.10 04.20 TO 08.20 11.35 TO 15.00 17.20 TO 24.00	17.15	03.10 TO 04.20 08.20 TO 11.35 15.00 TO 17.20	06.45
08	00.00 to 19.00	19.00		0	00.00 to 19.00	19.00		0
09				NO	PRODUCTION			
10								
11	04.00 to 24.00	20.00		0	04.00 to 24.00	20.00		0
12	00.00 to 24.00	24.00		0	00.00 to 09.40 12.00 to 24.00	21.40	09.40 to 12.00	02.20
13	"	24.00		0	00.00 TO 02.30 03.35 TO 11.10 13.30 TO 24.00	20.35	02.30 to 03.35 11.10 to 13.30	03.25
14	"	24.00		0	00.00 to 06.50 08.45 to 24.00	22.05	06.50 to 08.45	01.55
15	"	24.00		0	00.00 to 24.00	24.00		0
16	"	24.00		0	"	24.00		0
17	"	24.00		0	"	24.00		0
18	"	24.00		0	"	24.00		0
19	"	24.00		0	"	24.00		0
20	"	24.00		0	"	24.00		0
21	00.00 to 08.30	08.30		0		0	00.00 to 08.30	08.30
22	01.45 to 24.00	22.15			04.00 to 24.00	20.00	01.45 to 04.00	02.15
23	00.00 to 24.00	24.00		0	00.00 to 24.00	24.00		0
24	00.00 to 17.00	17.00		0	00.00 to 17.00	17.00		0
	TOTAL	467.15	TOTAL	01.20	TOTAL	433.45	TOTAL	32.10

VI NAVIGATION

VI.1. Gyro compass and autopilot

No problem arose with this piece of equipment during the whole cruise.

VI.2 Navigation clock

This clock worked satisfactorily thoughout the cruise.

VI.3 Sine-Cosine potentiometer

This equipment did not provide any data, due to the breakdown of the multiverter.

VI.4 SAGEM interface

This piece equipment worked without trouble thoughout the cruise.

VI.5 V.L.F. (fig. 18)

Due to the breakdown of the multiverter, only analogue records were made.

The stations recorded were Aldra, Trinidad, Haiku (Omega network) and NDT, GBR, NWC (VLF stations).

Aldra and Trinidad did not give any results, Haiku and NDT (first third of the cruise) gave some results. GBR and NWC gave good results.

GOOD RECEPTIONS
V . L . F . Cruise : I

DAYS	ALDRA	TRINIDAD	HAIKU	NDT	GBR	NWC
02	14 . 00 to 19 . 00			03 . 30 to 24 . 00	03 . 30 to 24 . 00	03 . 30 to 24 . 00
03				00 . 00 to 09 . 00 12 . 00 to 24 . 00	00 . 00 to 09 . 00 12 . 00 to 24 . 00	00 . 00 to 24 . 00
04			04 . 00 to 06 . 00 20 . 00 to 24 . 00	02 . 00 to 24 . 00	00 . 00 to 24 . 00	"
05			00 . 00 to 06 . 00 20 . 00 to 24 . 00	00 . 00 to 24 . 00	00 . 00 to 06 . 00 11 . 00 to 12 . 00 21 . 00 to 24 . 00	"
06			00 . 00 to 07 . 00 20 . 00 to 24 . 00	00 . 00 to 07 . 00 12 . 00 to 23 . 00	05 . 00 to 23 . 00	"
07			00 . 00 to 07 . 00 23 . 00 to 24 . 00	00 . 00 to 02 . 00 11 . 00 to 24 . 00	02 . 00 to 09 . 00 14 . 00 to 24 . 00	"
08		04 . 00 to 05 . 00	00 . 00 to 07 . 00	06 . 00 to 19 . 00	02 . 00 to 19 . 00	02 . 00 to 19 . 00
11			21 . 00 to 23 . 00		04 . 00 to 24 . 00	04 . 00 to 24 . 00
12			00 . 00 to 05 . 00		00 . 00 to 24 . 00	00 . 00 to 24 . 00
13			22 . 00 to 24 . 00		"	"
14			00 . 00 to 02 . 00		"	"
15					"	00 . 40 to 24 . 00
16					"	00 . 00 to 24 . 00
17			00 . 00 to 01 . 00		"	"
18					00 . 00 to 12 . 00	"
19					00 . 00 to 06 . 00 10 . 00 to 12 . 00 17 . 00 to 24 . 00	"
20					00 . 00 to 24 . 00	"
21					00 . 00 to 08 . 30	00 . 00 to 08 . 30
22			21 . 00 to 24 . 00		01 . 45 to 24 . 00	03 . 00 to 24 . 00
23					00 . 00 to 06 . 00 08 . 00 to 24 . 00	00 . 00 to 24 . 00
24					00 . 00 to 17 . 00	00 . 00 to 17 . 00

Fig 18

Two failures occurred to the analogue recorder SPEEDOMAX of VLF amplitudes Day 06 = from 16.10 to Day 07 at 02.00

Day 12 = from 00.10 to 03.54

Figure gives the time of good reception for each of the VLF or Omega stations.

VI.6 Satellite system.

VI.6.1 Equipment.

Several stoppages occurred to the Transit system, mainly due to the punched tape reader of the teletype ASR 33. The most noteworthy ones were =

Day 03 from 04.50 to 05.40

Day 15 from 06.00 to 07.00

Day 22 from 01.50 to 06.00

As a consequence, a few satellite passes (3) could not be recorded. But the replay of the fixes was very difficult, the navigator being obliged to punch again the majority data useful for his replay.

VI.6.2 Results

The quality of fixes recorded during Survey 19 is shown in the following tables and figures.

* Plot of raw and smoothed frequency of satellites fixes
  Cruise : Fig. No. 1, 2, 3

* List of satellite fixes given for each satellite used:

- first column is : Satellite fix time
- Second column is : raw frequency
- Third column is : smoothed frequency
- Fourth column is : weight given by the programme to

Fig. 1

PLOT OF RAW AND SMOOTHED OFFSET FREQUENCIES OF

SATELLITE FIXES FOR

SURVEY 19

SCALE IS .10 HERTZ TO ONE PRINT POSITION.

SATELLITE NO 12 HAS VALUE 32075.00 AT ORDINATE 10 AND PLOT CODE -A-.
SATELLITE NO 13 HAS VALUE 31991.00 AT ORDINATE 30 AND PLOT CODE -B-.
SATELLITE NO 14 HAS VALUE 32074.00 AT ORDINATE 50 AND PLOT CODE -C-.
SATELLITE NO 15 HAS VALUE 32039.00 AT ORDINATE 70 AND PLOT CODE -D-.
SATELLITE NO 18 HAS VALUE 32073.00 AT ORDINATE 90 AND PLOT CODE -E-.

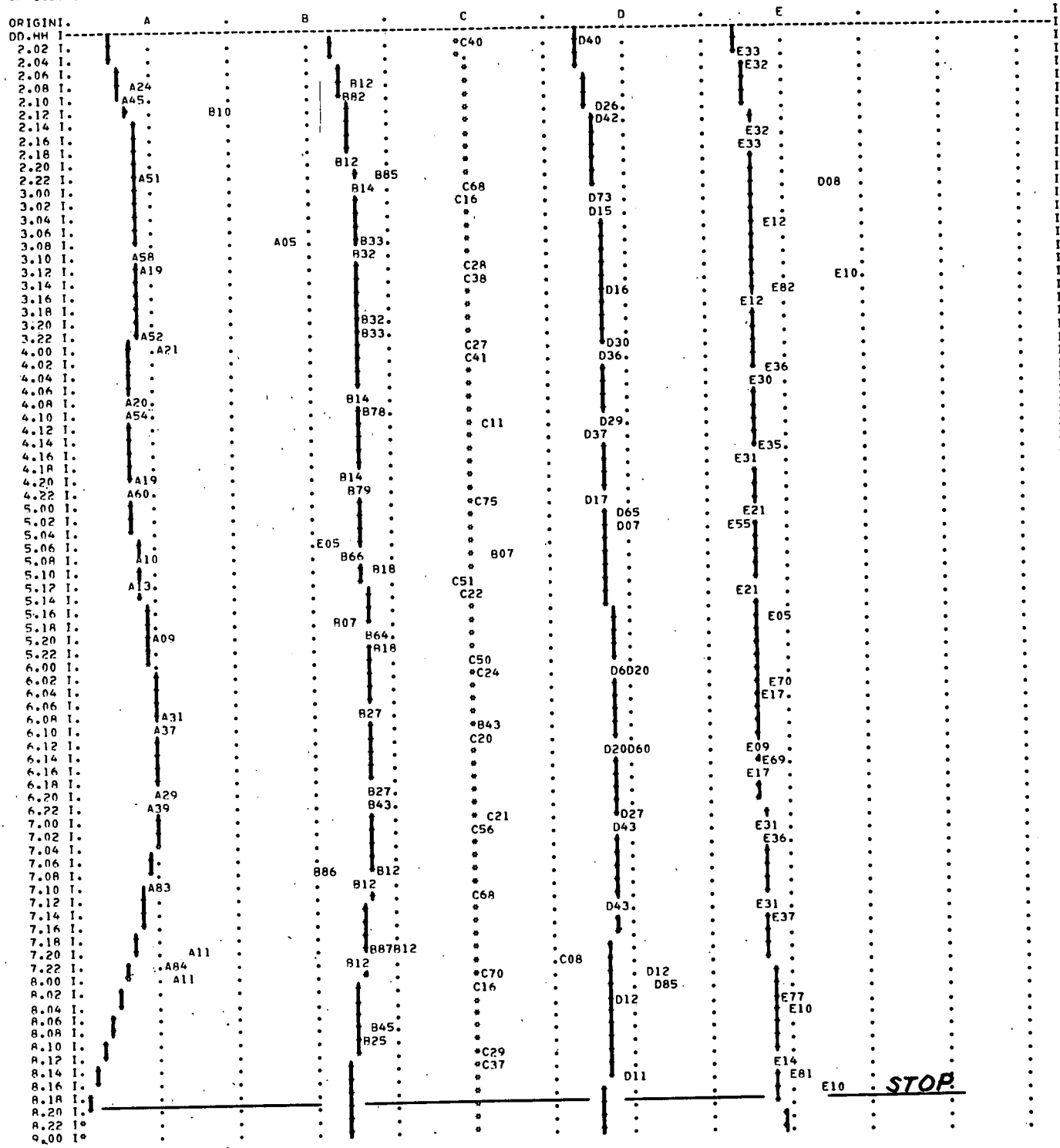


Fig. 2

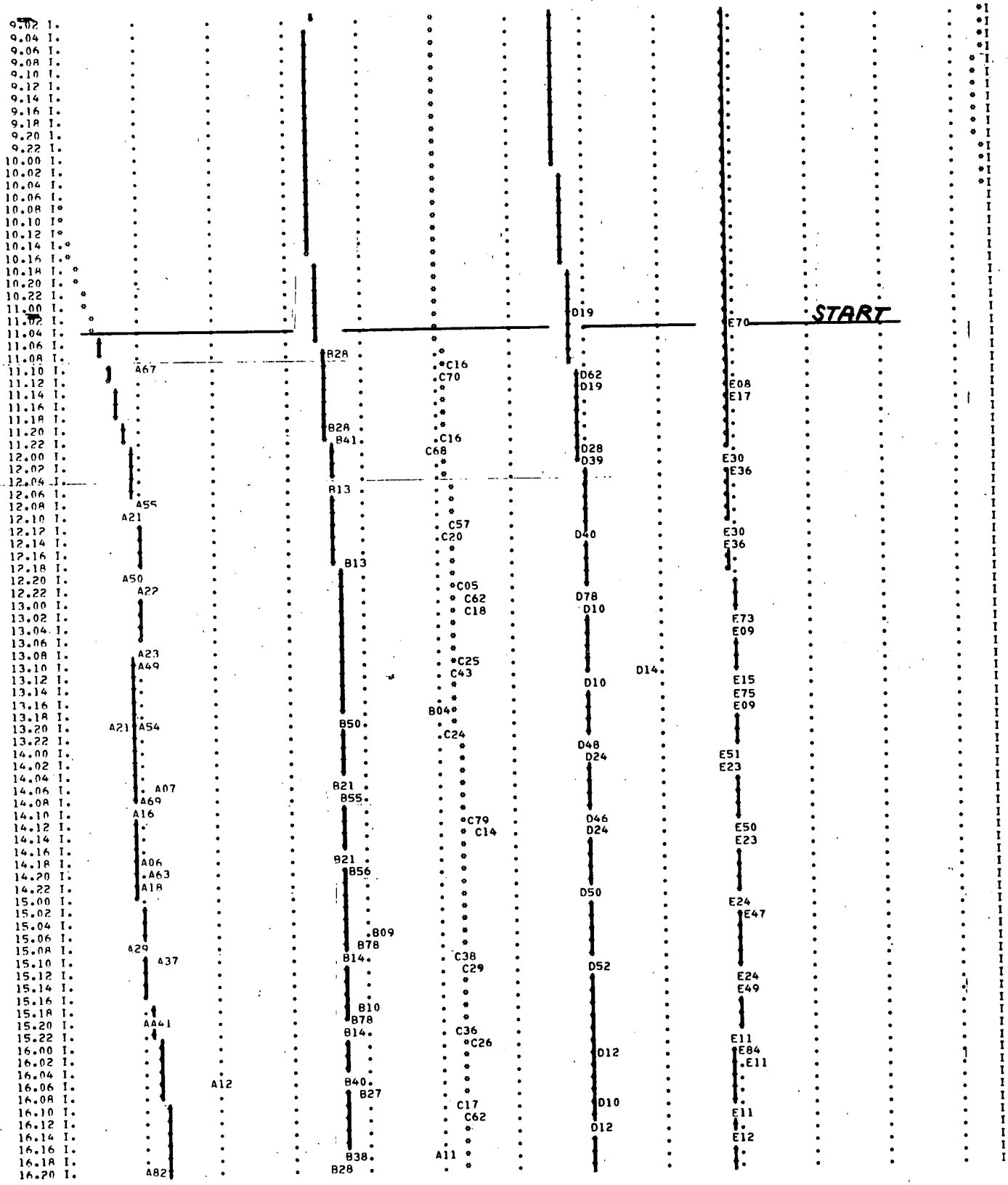
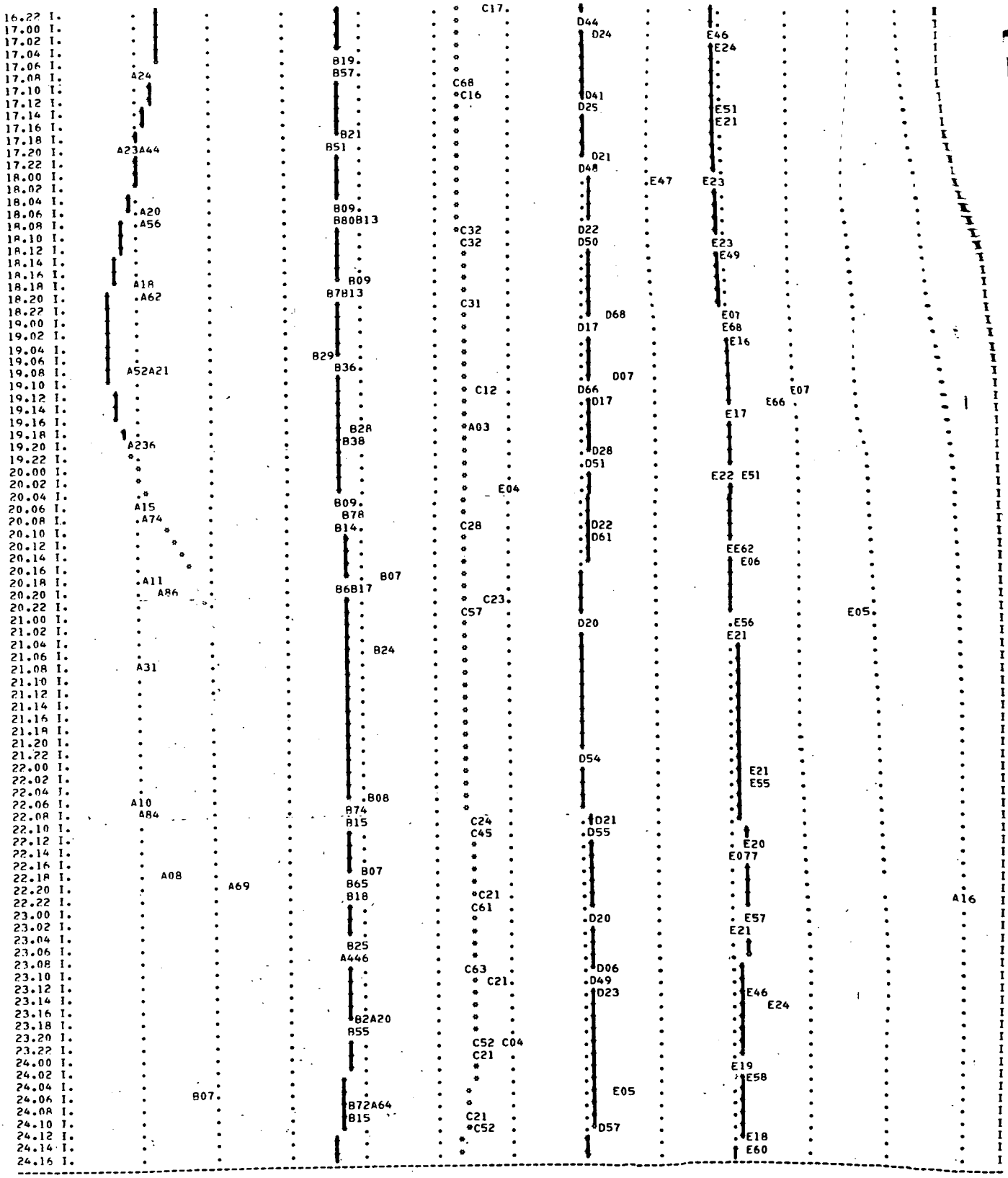


Fig. 3


16.22 I.
17.00 I.
17.02 I.
17.04 I.
17.06 I.
17.08 I.
17.10 I.
17.12 I.
17.14 I.
17.16 I.
17.18 I.
17.20 I.
17.22 I.
18.00 I.
18.02 I.
18.04 I.
18.06 I.
18.08 I.
18.10 I.
18.12 I.
18.14 I.
18.16 I.
18.18 I.
18.20 I.
18.22 I.
19.00 I.
19.02 I.
19.04 I.
19.06 I.
19.08 I.
19.10 I.
19.12 I.
19.14 I.
19.16 I.
19.18 I.
19.20 I.
19.22 I.
20.00 I.
20.02 I.
20.04 I.
20.06 I.
20.08 I.
20.10 I.
20.12 I.
20.14 I.
20.16 I.
20.18 I.
20.20 I.
20.22 I.
21.00 I.
21.02 I.
21.04 I.
21.06 I.
21.08 I.
21.10 I.
21.12 I.
21.14 I.
21.16 I.
21.18 I.
21.20 I.
21.22 I.
22.00 I.
22.02 I.
22.04 I.
22.06 I.
22.08 I.
22.10 I.
22.12 I.
22.14 I.
22.16 I.
22.18 I.
22.20 I.
22.22 I.
23.00 I.
23.02 I.
23.04 I.
23.06 I.
23.08 I.
23.10 I.
23.12 I.
23.14 I.
23.16 I.
23.18 I.
23.20 I.
23.22 I.
24.00 I.
24.02 I.
24.04 I.
24.06 I.
24.08 I.
24.10 I.
24.12 I.
24.14 I.
24.16 I.
A24
A23A44
A20
A56
A18
A62
A52A21
A236
A15
A74
A11
A86
A31
A10
A84
A08
A69
B07.
B19.
B57.
B21
B51
B09.
B80B13
B09
B7B13
B29
B36.
B28
B38
B09.
B78
B14.
B07
B6B17
B24
.B08
B74
B15
B07
B65
B18
B25
A446
B2A20
B55
B72A64
B15
C17.
C68
C16
C32
C32
C31
C12
A03
E04
C28
C23.
C57
C24
C45
C21
C61
C63
C21.
C52 C04
C21
C21
C52
D44
D24
D41
D25
D21
D48
E47
D22
D50
D68
D17
D07
D66
D17
D28
D51
D22
D61
D20
D54
D21
D55
D20
D06
D49
D23
E05
D57
E46
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E07
E68
E16
E17
E22 E51
EE62
E06
.E56
E21
E21
E55
E20
E077
E57
E21
E46
E24
E19
E58
E18
E60
E07
E66
E05
A16

the satellite fix,

Cruise : Tables No. 3, 4

* List of satellite fixes given in increasing time order.
- first column is = smoothed frequency
- second column is = raw frequency
- third column is = weight given by navigator on board M/V Lady Christine (function of Satellite fix quality).
- fourth column is = elevation.
- fifth column is = number of satellite
- sixth column is = satellite fix time
- seventh column is = survey number
- eighth column is = difference smoothed - raw frequency.

Cruise : Tables No. 5, 6, 7

VI.7 Sonar Doppler, Chernikeeff log, Pressure Log.

VI.7.1 Sonar Doppler

Only one breakdown occurred on this system on day 20 from 02.30 to 05.30. The log Chernikeeff was used for the dead reckoning during this time.

VI.7.2 Chernikeeff Log

This system worked without stoppage throughout the cruise. However it must be noted that the raw speed provided by the system was generally too low; in order to get speeds usable on board a calibration factor was

Table 3

SATELLITE NO. 12 - NO OF FIXES = 72

DD HHMM	RAW freq.	SMOOTHED freq.	WEIGHT
2.0932	32074.65	32074.58	1.00
2.1118	32074.60	32074.61	1.00
2.2310	32074.77	32074.74	1.00
3.0840	32076.63	32074.73	0.00
3.1024	32074.71	32074.72	1.00
3.1210	32074.84	32074.72	.89
3.2216	32074.84	32074.65	.89
4.0004	32075.05	32074.64	.22
4.0928	32074.57	32074.59	1.00
4.1114	32074.61	32074.58	1.00
4.2122	32074.65	32074.60	1.00
4.2308	32074.60	32074.61	1.00
5.0834	32074.69	32074.69	1.00
5.1206	32074.55	32074.73	1.00
5.2032	32074.89	32074.82	.89
6.0926	32075.06	32074.92	.44
6.1110	32075.04	32074.93	.44
6.2120	32074.95	32074.93	.89
6.2306	32074.83	32074.92	1.00
7.1022	32074.85	32074.78	1.00
7.2028	32075.38	32074.56	0.00
7.2212	32075.10	32074.52	.44
8.0002	32075.15	32074.47	.33
11.1012	32074.88	32074.47	1.00
12.0916	32074.86	32074.86	1.00
12.1100	32074.73	32074.87	1.00
12.2106	32074.72	32074.89	1.00
12.2256	32074.93	32074.89	1.00
13.0818	32074.96	32074.86	1.00
13.1004	32074.89	32074.85	1.00
13.2012	32074.46	32074.79	.11
13.2158	32074.98	32074.79	1.00
14.0726	32075.23	32074.76	.33
14.0910	32074.96	32074.76	1.00
14.1056	32074.75	32074.76	1.00
14.1922	32074.92	32074.80	1.00
14.2106	32075.06	32074.81	1.00
14.2252	32074.87	32074.83	1.00
15.0814	32074.70	32074.94	.89
15.1000	32075.16	32074.96	.89
15.2010	32074.89	32075.10	1.00
15.2154	32075.08	32075.13	1.00
16.0722	32075.91	32075.24	0.00
16.1922	32078.88	32075.31	0.00
16.2058	32074.86	32075.31	1.00
17.0812	32075.02	32075.23	1.00
17.0958	32074.91	32075.20	1.00
17.2004	32075.12	32075.01	1.00
17.2152	32074.68	32074.97	.44
18.0720	32075.12	32074.75	1.00
18.0904	32075.13	32074.72	1.00
18.1914	32074.97	32074.55	1.00
18.2056	32075.11	32074.53	1.00
19.0810	32074.85	32074.51	1.00
19.0954	32075.17	32074.53	1.00
19.1822	32079.46	32074.71	0.00
19.2000	32074.87	32074.77	1.00
19.2148	32074.83	32074.84	.89
20.0714	32075.03	32075.26	1.00
20.0858	32075.12	32075.34	1.00
20.1910	32075.14	32075.81	1.00
20.2052	32075.26	32075.87	.78
21.0808	32074.99	32074.10	1.00
22.0712	32074.79	32074.77	.56
22.0858	32074.98	32074.52	1.00
22.1908	32075.33	32072.57	.56
22.2048	32076.16	32072.16	0.00
22.2238	32073.34	32071.66	0.00
23.0948	32077.68	32067.82	0.00
23.1958	32078.11	32062.88	0.00
24.0854	32078.14	32054.26	0.00
24.1042	32078.24	32052.83	0.00

SATELLITE NO. 13 - NO OF FIXES = 87

2.0838	31991.59	31991.42	1.00
2.1024	31991.53	31991.45	1.00
2.1212	31989.70	31991.48	0.00
2.2036	31991.42	31991.57	.89
2.2220	31991.94	31991.58	.22
3.0008	31991.61	31991.59	1.00
3.0934	31991.73	31991.63	1.00
3.1122	31991.62	31991.63	1.00
3.2132	31991.72	31991.62	1.00
3.2318	31991.67	31991.62	1.00
4.0846	31991.68	31991.60	1.00
4.1032	31991.74	31991.60	1.00
4.2044	31991.60	31991.60	.78
4.2228	31991.54	31991.61	1.00
5.0800	31993.31	31991.63	.22
5.0944	31991.45	31991.64	.89
5.1132	31991.85	31991.64	.78
5.1958	31991.28	31991.67	.11
5.2140	31991.69	31991.68	1.00
5.2328	31991.83	31991.68	.78
6.0854	31991.59	31991.71	1.00
6.1052	31993.05	31991.71	0.00
6.2054	31991.69	31991.71	1.00
6.2240	31991.69	31991.71	1.00
7.0808	31991.84	31991.68	.89
7.0952	31990.94	31991.67	0.00
7.1142	31991.54	31991.66	1.00
7.2008	31991.99	31991.60	.33
7.2150	31991.75	31991.58	1.00
7.2340	31991.41	31991.57	.78
8.0904	31991.67	31991.49	1.00
8.1052	31991.62	31991.47	1.00
11.0826	31991.56	31991.45	1.00
11.2022	31991.61	31991.54	1.00
11.2208	31991.71	31991.55	1.00
12.0738	31991.61	31991.60	1.00
12.1936	31991.88	31991.65	1.00
13.1850	31992.93	31991.69	0.00
13.2032	31991.69	31991.69	1.00
14.0746	31991.62	31991.70	1.00
14.0932	31991.71	31991.70	1.00
14.1944	31991.63	31991.70	1.00
14.2130	31991.78	31991.70	1.00
15.0700	31992.12	31991.70	.11
15.0844	31991.86	31991.70	1.00
15.1032	31991.74	31991.70	1.00
15.1858	31991.90	31991.70	.89
15.2040	31991.76	31991.70	1.00
15.2230	31991.65	31991.70	1.00
16.0756	31991.74	31991.70	1.00
16.0942	31991.86	31991.70	1.00
16.1952	31991.72	31991.71	1.00
16.2140	31991.54	31991.71	.89
17.0708	31991.71	31991.71	1.00
17.0854	31991.66	31991.71	1.00
17.1904	31991.85	31991.72	1.00
17.2048	31991.64	31991.72	1.00
18.0620	31991.69	31991.72	1.00
18.0804	31991.73	31991.72	1.00
18.0954	31991.97	31991.72	.78
18.1818	31991.93	31991.73	.89
18.2000	31991.56	31991.73	.78
18.2150	31991.79	31991.73	1.00
19.0716	31991.45	31991.74	.22
19.0904	31991.71	31991.74	1.00
19.1912	31991.93	31991.74	.89
19.2058	31991.85	31991.74	1.00
20.0628	31991.74	31991.75	1.00
20.0816	31991.82	31991.75	1.00
20.1002	31991.65	31991.75	1.00
20.1828	31992.31	31991.76	0.00
20.2010	31991.69	31991.76	1.00
20.2158	31991.90	31991.76	1.00
21.0726	31992.23	31991.77	.11
22.0638	31992.09	31991.80	.44
22.0822	31991.83	31991.81	1.00
22.1010	31991.81	31991.81	1.00
22.1838	31991.98	31991.83	1.00
22.2020	31991.77	31991.83	1.00
22.2208	31991.83	31991.83	1.00
23.0734	31991.78	31991.83	1.00
23.0920	31991.77	31991.83	1.00
23.1934	31991.87	31991.80	1.00
23.2118	31991.77	31991.79	1.00
24.0648	31989.60	31991.72	0.00
24.0832	31991.84	31991.70	1.00
24.1020	31991.78	31991.68	1.00

SATELLITE NO. 14 - NO OF FIXES = 64

2.0242	32074.02	32073.82	1.00
3.0150	32073.98	32073.96	1.00
3.0340	32073.84	32073.96	1.00
3.1306	32074.04	32073.96	1.00
3.1452	32074.03	32073.96	1.00
4.0102	32074.00	32073.95	1.00
4.0246	32073.95	32073.95	1.00
4.1216	32074.17	32073.94	.78
5.0012	32074.05	32073.93	1.00
5.0154	32074.06	32073.94	1.00
5.1308	32073.66	32073.95	.33
5.1458	32073.84	32073.95	1.00
6.0106	32073.90	32073.97	1.00
6.0252	32074.09	32073.97	1.00
6.1216	32073.90	32073.99	1.00
7.0014	32074.17	32074.00	1.00
7.0200	32073.90	32074.00	1.00
7.1312	32074.04	32073.99	1.00
7.2328	32075.06	32073.97	0.00
8.0108	32074.14	32073.97	1.00
8.0256	32074.04	32073.97	1.00
8.1222	32074.09	32073.95	1.00
8.1408	32074.07	32073.95	1.00
11.1134	32074.22	32074.07	1.00
11.1320	32074.13	32074.08	1.00
11.2332	32074.13	32074.12	1.00
12.0114	32073.84	32074.13	.22
12.1228	32074.19	32074.17	1.00
12.1416	32074.10	32074.18	1.00
12.2242	32074.28	32074.20	1.00
13.0026	32074.40	32074.21	.89
13.0212	32074.41	32074.21	.89
13.1138	32074.30	32074.23	1.00
13.1324	32074.24	32074.24	1.00
13.2334	32074.10	32074.25	1.00
14.1234	32074.36	32074.26	1.00
14.1422	32074.52	32074.26	.67
15.1142	32074.19	32074.26	1.00
15.1328	32074.30	32074.26	1.00
15.2336	32074.23	32074.26	1.00
16.0124	32074.36	32074.26	1.00
16.1050	32074.22	32074.26	1.00
16.1236	32074.29	32074.26	1.00
16.2250	32074.72	32074.26	.11
17.1146	32074.30	32074.28	1.00
17.1334	32074.45	32074.29	1.00
18.1054	32074.44	32074.35	1.00
18.1242	32074.39	32074.36	1.00
18.2250	32074.43	32074.38	1.00
19.1336	32074.57	32074.41	1.00
20.1058	32074.38	32074.42	1.00
20.2254	32074.71	32074.41	.56
21.0038	32074.44	32074.41	1.00
22.1102	32074.49	32074.45	1.00
22.1248	32074.46	32074.46	1.00
22.2258	32074.63	32074.50	1.00
23.0042	32074.52	32074.51	1.00
23.1156	32074.44	32074.53	1.00
23.1344	32074.71	32074.53	.89
23.2212	32074.93	32074.50	0.00
23.2352	32074.47	32074.49	1.00
24.0138	32074.46	32074.48	1.00
24.1106	32074.45	32074.37	1.00
24.1252	32074.47	32074.34	1.00

Table 4

SATELLITE NO. 15 - NO OF FIXES = 74

2.0334	32038.40	32038.31	.89
2.1344	32038.55	32038.45	1.00
2.1528	32038.59	32038.47	1.00
3.0100	32041.47	32038.54	0.00
3.0244	32038.50	32038.55	1.00
3.0434	32038.52	32038.55	1.00
3.1628	32038.65	32038.58	1.00
4.0156	32038.72	32038.59	1.00
4.0344	32038.56	32038.59	1.00
4.1352	32038.61	32038.59	1.00
4.1538	32038.44	32038.59	.89
5.0108	32038.41	32038.61	.78
5.0254	32038.76	32038.61	1.00
5.0444	32038.80	32038.62	1.00
6.0206	32038.69	32038.67	1.00
6.0354	32038.95	32038.68	.67
6.1412	32038.96	32038.70	.67
6.1552	32038.58	32038.70	1.00
7.0118	32038.75	32038.70	1.00
7.0304	32038.69	32038.69	1.00
7.1500	32038.55	32038.66	.89
8.0030	32039.19	32038.62	.11
8.0216	32039.31	32038.62	0.00
8.0404	32038.67	32038.61	1.00
8.1602	32038.80	32038.56	1.00
11.0326	32038.77	32038.70	1.00
11.1338	32038.98	32038.77	1.00
11.1522	32038.90	32038.78	1.00
12.0050	32038.89	32038.84	1.00
12.0236	32038.98	32038.85	1.00
12.1432	32038.78	32038.88	1.00
13.0004	32038.80	32038.89	1.00
13.0148	32038.78	32038.89	1.00
13.0336	32038.99	32038.89	1.00
13.1204	32039.73	32038.89	0.00
13.1534	32039.02	32038.89	1.00
14.0100	32038.84	32038.88	1.00
14.0248	32038.93	32038.88	1.00
14.1256	32038.98	32038.88	1.00
14.1444	32038.90	32038.88	1.00
15.0012	32038.79	32038.88	.89
15.0158	32038.85	32038.88	1.00
15.1214	32038.95	32038.90	1.00
15.1356	32039.00	32038.90	1.00
16.0258	32039.12	32038.93	1.00
16.1122	32039.05	32038.96	1.00
16.1454	32039.04	32038.97	1.00
17.0022	32038.95	32038.99	1.00
17.0208	32039.18	32039.00	1.00
17.1216	32039.10	32039.02	1.00
17.1404	32038.92	32039.03	1.00
17.2334	32039.16	32039.05	1.00
18.0120	32038.92	32039.05	1.00
18.1132	32038.93	32039.07	1.00
18.1314	32038.97	32039.07	1.00
19.0030	32039.39	32039.08	.67
19.0218	32039.04	32039.08	1.00
19.1046	32039.48	32039.08	.33
19.1226	32038.90	32039.08	.89
19.1418	32039.25	32039.08	1.00
19.2344	32039.21	32039.07	1.00
20.0128	32039.12	32039.07	1.00
20.1142	32039.17	32039.06	1.00
20.1326	32039.16	32039.05	1.00
21.0228	32038.91	32039.04	.56
22.0138	32039.04	32039.04	1.00
22.1154	32039.18	32039.06	1.00
22.1336	32039.14	32039.07	1.00
23.0238	32039.06	32039.11	1.00
23.1106	32039.23	32039.13	1.00
23.1248	32039.07	32039.13	1.00
23.1434	32039.15	32039.13	1.00
24.1200	32039.17	32039.06	1.00
24.1344	32039.19	32039.05	1.00

SATELLITE NO. 18 - NO OF FIXES = 94

2.0428	32072.38	32072.33	1.00
2.0612	32072.46	32072.36	1.00
2.1622	32072.51	32072.47	1.00
2.1810	32072.45	32072.49	1.00
3.0710	32072.68	32072.54	.44
3.1536	32073.71	32072.54	0.00
3.1718	32072.77	32072.53	.44
3.1908	32072.43	32072.53	1.00
4.0436	32072.69	32072.51	.89
4.0620	32072.50	32072.50	1.00
4.1630	32072.60	32072.48	1.00
4.1818	32072.34	32072.48	1.00
5.0348	32072.37	32072.47	.89
5.0532	32072.24	32072.47	.33
5.0722	32079.55	32072.47	0.00
5.1546	32072.30	32072.47	.44
5.1920	32072.72	32072.47	1.00
6.0442	32072.74	32072.49	1.00
6.0628	32072.60	32072.50	1.00
6.1458	32072.45	32072.52	1.00
6.1640	32072.41	32072.53	1.00
6.1828	32072.43	32072.53	.89
7.0352	32072.53	32072.57	1.00
7.0538	32072.60	32072.57	1.00
7.1550	32072.47	32072.62	1.00
7.1736	32072.68	32072.63	1.00
8.0450	32072.80	32072.68	1.00
8.0638	32072.93	32072.69	.56
8.1504	32072.71	32072.72	1.00
8.1648	32072.92	32072.73	1.00
8.1840	32073.41	32072.74	0.00
11.0410	32072.87	32072.82	1.00
11.1424	32073.03	32072.82	.67
11.1606	32072.95	32072.82	.89
11.1756	32072.91	32072.82	1.00
12.0320	32072.85	32072.82	1.00
12.0510	32072.92	32072.83	1.00
12.1518	32072.75	32072.84	1.00
12.1704	32072.78	32072.84	1.00
13.0418	32072.89	32072.87	1.00
13.0608	32072.97	32072.87	1.00
13.1432	32073.02	32072.89	.89
13.1614	32072.98	32072.89	1.00
13.1806	32072.94	32072.89	1.00
14.0330	32072.74	32072.91	1.00
14.0516	32072.65	32072.91	.89
14.1526	32072.88	32072.91	.89
14.1714	32072.94	32072.91	1.00
15.0240	32072.84	32072.90	1.00
15.0430	32073.08	32072.90	.89
15.1438	32073.03	32072.88	1.00
15.1624	32073.00	32072.87	1.00
16.0152	32072.76	32072.85	1.00
16.0338	32072.99	32072.84	1.00
16.0526	32073.10	32072.84	1.00
16.1352	32072.75	32072.82	.89
16.1724	32072.85	32072.81	1.00
17.0250	32072.82	32072.80	1.00
17.0436	32072.99	32072.80	1.00
17.1444	32072.86	32072.79	1.00
17.1632	32073.04	32072.79	1.00
18.0200	32072.70	32072.80	.56
18.0348	32072.03	32072.81	1.00
18.1358	32072.82	32072.83	.44
18.1544	32072.89	32072.83	1.00
19.0112	32072.92	32072.86	1.00
19.0256	32072.90	32072.86	1.00
19.0446	32073.10	32072.87	1.00
19.1314	32073.98	32072.90	0.00
19.1454	32073.41	32072.91	0.00
19.1642	32072.99	32072.92	1.00
20.0208	32072.73	32072.96	.44
20.0354	32073.25	32072.96	.99
20.0546	32069.85	32072.97	0.00
20.1406	32072.95	32073.01	1.00
20.1552	32073.10	32073.01	1.00
20.1744	32073.22	32073.02	1.00
21.0124	32074.74	32073.05	0.00
21.0306	32073.08	32073.06	1.00
21.0454	32073.01	32073.07	1.00
22.0218	32073.26	32073.14	1.00
22.0404	32073.31	32073.14	.99
22.1416	32073.17	32073.15	1.00
22.1602	32073.14	32073.16	1.00
22.1752	32072.89	32073.16	.67
23.0314	32073.19	32073.16	1.00
23.0502	32073.03	32073.15	1.00
23.1512	32073.24	32073.14	1.00
23.1700	32073.49	32073.14	.44
24.0226	32072.93	32073.11	.89
24.0412	32073.16	32073.10	1.00
24.0602	32071.28	32073.10	0.00
24.1426	32073.24	32073.06	1.00
24.1608	32073.21	32073.05	1.00

Table 5

PRINTOUT OF PUNCHED CARD OUTPUT FILE.

SMOOTHED Freq.	RAW Freq.	WEIGHT	Elevation	SAT Nº	DD HH MM	Survey Nº	Δ Smoothed - Raw
32073.82	32074.02	0	40.	14	2.0242	19	-.2
32038.31	32038.40	1	40.	15	2.0334	19	-.1
32072.33	32072.38	0	33.	18	2.0426	19	-.0
32072.36	32072.46	0	32.	18	2.0612	19	-.1
31991.42	31991.59	0	12.	13	2.0838	19	-.2
32074.58	32074.65	0	24.	12	2.0932	19	-.1
31991.45	31991.53	0	82.	13	2.1024	19	-.1
32074.61	32074.60	0	45.	12	2.1118	19	.0
31991.48	31989.70	9	10.	13	2.1212	19	1.8
32038.45	32038.55	0	26.	15	2.1344	19	-.1
32038.47	32038.59	0	42.	15	2.1528	19	-.1
32072.47	32072.51	0	32.	18	2.1622	19	-.0
32072.49	32072.45	0	33.	18	2.1810	19	.0
31991.57	31991.42	1	12.	13	2.2036	19	.2
31991.58	31991.94	7	85.	13	2.2220	19	-.4
32074.74	32074.77	0	51.	12	2.2310	19	-.0
31991.59	31991.61	0	14.	13	3.0008	19	-.0
32038.54	32041.47	9	8.	15	3.0100	19	-2.9
32073.96	32073.98	0	68.	14	3.0150	19	-.0
32038.55	32038.50	0	73.	15	3.0244	19	.0
32073.96	32073.84	0	16.	14	3.0340	19	.1
32038.55	32038.52	0	15.	15	3.0434	19	.0
32072.54	32072.68	1	12.	18	3.0710	19	-.1
32074.73	32076.63	9	5.	12	3.0840	19	-1.9
31991.63	31991.73	0	33.	13	3.0934	19	-.1
32074.72	32074.71	0	58.	12	3.1024	19	.0
31991.63	31991.62	0	32.	13	3.1122	19	.0
32074.72	32074.84	1	19.	12	3.1210	19	-.1
32073.96	32074.04	0	28.	14	3.1306	19	-.1
32073.96	32074.03	0	38.	14	3.1452	19	-.1
32072.54	32073.71	9	10.	18	3.1536	19	-1.2
32038.58	32038.65	0	16.	15	3.1628	19	-.1
32072.53	32072.77	5	82.	18	3.1718	19	-.2
32072.53	32072.43	0	12.	18	3.1908	19	.1
31991.62	31991.72	0	32.	13	3.2132	19	-.1
32074.65	32074.84	1	52.	12	3.2216	19	-.2
31991.62	31991.67	0	33.	13	3.2318	19	-.1
32074.64	32075.05	7	21.	12	4.0004	19	-.4
32073.95	32074.00	0	27.	14	4.0102	19	-.0
32038.59	32038.72	0	30.	15	4.0156	19	-.1
32073.95	32073.95	0	41.	14	4.0246	19	-.0
32038.59	32038.56	0	36.	15	4.0344	19	.0
32072.51	32072.69	1	36.	18	4.0436	19	-.2
32072.50	32072.50	0	30.	18	4.0620	19	.0
31991.60	31991.48	0	14.	13	4.0846	19	.1
32074.59	32074.57	0	20.	12	4.0928	19	.0
31991.60	31991.74	0	78.	13	4.1032	19	-.1
32074.58	32074.61	0	54.	12	4.1114	19	-.0
32073.94	32074.17	2	11.	14	4.1216	19	-.2
32038.59	32038.61	0	29.	15	4.1352	19	-.0
32038.59	32038.44	1	37.	15	4.1538	19	.2
32072.48	32072.60	0	35.	18	4.1630	19	-.1
32072.48	32072.34	0	31.	18	4.1818	19	.1
31991.60	31991.40	2	14.	13	4.2044	19	.2
32074.60	32074.65	0	19.	12	4.2122	19	-.0
31991.61	31991.54	0	79.	13	4.2228	19	.1
32074.61	32074.60	0	60.	12	4.2308	19	.0
32073.93	32074.05	0	15.	14	5.0012	19	-.1
32038.61	32038.41	2	17.	15	5.0108	19	.2
32073.94	32074.06	0	75.	14	5.0154	19	-.1
32038.61	32038.76	0	65.	15	5.0254	19	-.1
32072.47	32072.37	1	21.	18	5.0348	19	.1
32038.62	32038.80	0	7.	15	5.0444	19	-.2
32072.47	32072.24	6	55.	18	5.0532	19	.2
32072.47	32079.55	9	5.	18	5.0722	19	-7.1
31991.63	31993.31	7	7.	13	5.0800	19	-1.7
32074.69	32074.69	0	10.	12	5.0834	19	.0
31991.64	31991.45	1	66.	13	5.0944	19	.2
31991.64	31991.85	2	18.	13	5.1132	19	-.2
32074.73	32074.55	0	13.	12	5.1206	19	.2
32073.95	32073.66	6	51.	14	5.1308	19	.3
32073.95	32073.84	0	22.	14	5.1458	19	.1
32072.47	32072.30	5	21.	18	5.1546	19	.2
32072.47	32072.72	0	5.	18	5.1920	19	-.2
31991.67	31991.28	8	7.	13	5.1958	19	.4
32074.82	32074.89	1	9.	12	5.2032	19	-.1
31991.68	31991.69	0	64.	13	5.2140	19	-.0
31991.68	31991.83	2	18.	13	5.2328	19	-.1
32073.97	32073.90	0	50.	14	6.0106	19	.1
32038.67	32038.69	0	60.	15	6.0206	19	-.0
32073.97	32074.09	0	24.	14	6.0252	19	-.1
32038.68	32038.95	3	20.	15	6.0354	19	-.3
32072.49	32072.74	0	70.	18	6.0442	19	-.2
32072.50	32072.60	0	17.	18	6.0628	19	-.1
31991.71	31991.59	0	27.	13	6.0854	19	.1
32074.92	32075.06	5	31.	12	6.0926	19	-.1
31991.71	31993.05	9	43.	13	6.1052	19	-1.3
32074.93	32075.04	5	37.	12	6.1110	19	-.1
32073.99	32073.90	0	20.	14	6.1216	19	.1
32038.70	32038.96	3	60.	15	6.1412	19	-.3
32072.52	32072.45	0	9.	18	6.1458	19	.1
32038.70	32038.58	0	20.	15	6.1552	19	.1
32072.53	32072.61	0	69.	18	6.1640	19	-.1
32072.53	32072.43	1	17.	18	6.1828	19	.1
31991.71	31991.69	0	27.	13	6.2054	19	.0
32074.93	32074.95	1	29.	12	6.2120	19	-.0
31991.71	31991.69	0	43.	13	6.2240	19	.0
32074.92	32074.83	0	39.	12	6.2306	19	.1
32074.00	32074.17	0	21.	14	7.0014	19	-.2
32038.70	32038.75	0	27.	15	7.0118	19	-.1
32074.00	32073.90	0	56.	14	7.0200	19	.1
32038.69	32038.69	0	43.	15	7.0304	19	.0
32072.57	32072.53	0	31.	18	7.0352	19	.0
32072.57	32072.60	0	36.	18	7.0538	19	-.0
31991.68	31991.84	1	12.	13	7.0808	19	-.2
31991.67	31990.94	9	86.	13	7.0952	19	.7
32074.78	32074.85	0	83.	12	7.1022	19	-.1
31991.66	31991.54	0	12.	13	7.1142	19	.1
32073.99	32074.04	0	68.	14	7.1312	19	-.1
32038.66	32038.55	1	43.	15	7.1500	19	.1
32072.62	32072.47	0	31.	18	7.1550	19	.1
32072.63	32072.68	0	37.	18	7.1736	19	-.1
31991.60	31991.99	6	12.	13	7.2008	19	-.4
32074.56	32075.38	9	11.	12	7.2028	19	-.8
31991.58	31991.75	0	87.	13	7.2150	19	-.2
32074.52	32075.10	5	84.	12	7.2212	19	-.6
32073.97	32075.06	9	8.	14	7.2328	19	-1.1
31991.57	31991.41	2	12.	13	7.2340	19	.2
32074.47	32075.15	6	11.	12	8.0002	19	-.7
32038.62	32039.19	8	12.	15	8.0030	19	-.6
32073.97	32074.14	0	70.	14	8.0108	19	-.2
32038.62	32039.31	9	85.	15	8.0216	19	-.7
32073.97	32074.04	0	16.	14	8.0256	19	-.1
32038.61	32038.67	0	12.	15	8.0404	19	-.1
32072.68	32072.80	0	77.	18	8.0450	19	-.1
32072.69	32072.93	4	10.	18	8.0638	19	-.2
31991.49	31991.67	0	45.	13	8.0904	19	-.2
31991.47	31991.62	8	75.	13	8.1052	19	-.1

Table 6

32073.95	32074.09	0	24.	14	8.1222	19	-.1
32073.95	32074.07	0	37.	14	8.1408	19	-.1
32072.72	32072.71	0	14.	18	8.1504	19	.0
32038.56	32038.60	0	11.	15	8.1607	19	-.2
32072.73	32072.92	0	31.	18	8.1648	19	-.2
32072.74	32073.41	9	10.	18	8.1840	19	-.7
32038.70	32038.77	0	19.	15	11.0326	19	-.1
32072.82	32072.87	0	70.	18	11.0410	19	-.0
31991.45	31991.56	0	24.	13	11.0826	19	-.1
32074.47	32074.88	0	67.	12	11.1012	19	-.4
32074.07	32074.22	0	16.	14	11.1134	19	-.1
32074.08	32074.13	0	70.	14	11.1320	19	-.0
32038.77	32038.98	0	62.	15	11.1338	19	-.2
32072.82	32073.03	3	8.	18	11.1424	19	-.2
32038.78	32038.90	0	19.	15	11.1522	19	-.1
32072.82	32072.95	1	68.	18	11.1606	19	-.1
32072.82	32072.91	0	17.	18	11.1756	19	-.1
31991.54	31991.61	0	28.	13	11.2022	19	-.1
31991.55	31991.71	0	41.	13	11.2208	19	-.2
32074.12	32074.13	0	16.	14	11.2332	19	-.0
32038.84	32038.89	0	28.	15	12.0050	19	-.1
32074.13	32073.84	7	68.	14	12.0114	19	.3
32038.85	32038.98	0	39.	15	12.0236	19	-.1
32072.82	32072.85	0	30.	18	12.0320	19	-.0
32072.83	32072.92	0	36.	18	12.0510	19	-.1
31991.60	31991.61	0	13.	13	12.0738	19	-.0
32074.86	32074.86	0	55.	12	12.0916	19	.0
32074.87	32074.73	0	21.	12	12.1100	19	.1
32074.17	32074.19	0	57.	14	12.1228	19	-.0
32074.18	32074.10	0	20.	14	12.1416	19	.1
32038.88	32038.78	0	40.	15	12.1432	19	.1
32072.84	32072.75	0	30.	18	12.1518	19	.1
32072.84	32072.78	0	36.	18	12.1704	19	.1
31991.65	31991.80	0	13.	13	12.1936	19	-.2
32074.89	32074.72	0	50.	12	12.2106	19	.2
32074.20	32074.28	0	5.	14	12.2242	19	-.1
32074.89	32074.93	0	22.	12	12.2256	19	-.0
32038.89	32038.80	0	14.	15	13.0004	19	.1
32074.21	32074.40	1	62.	14	13.0026	19	-.2
32038.89	32038.78	0	78.	15	13.0148	19	.1
32074.21	32074.41	1	18.	14	13.0212	19	-.2
32038.89	32038.99	0	10.	15	13.0336	19	-.1
32072.87	32072.89	0	73.	18	13.0418	19	-.0
32072.87	32072.97	0	9.	18	13.0608	19	-.1
32074.86	32074.96	0	23.	12	13.0818	19	-.1
32074.85	32074.89	0	49.	12	13.1004	19	-.0
32074.23	32074.30	0	25.	14	13.1138	19	-.1
32038.89	32039.73	9	14.	15	13.1204	19	-.8
32074.24	32074.24	0	43.	14	13.1324	19	-.0
32072.89	32073.02	1	15.	18	13.1432	19	-.1
32038.89	32039.02	0	10.	15	13.1534	19	-.1
32072.89	32072.98	0	75.	18	13.1614	19	-.1
32072.89	32072.94	0	9.	18	13.1806	19	-.0
31991.69	31992.93	9	4.	13	13.1850	19	-1.2
32074.79	32074.46	8	21.	12	13.2012	19	.3
31991.69	31991.69	0	50.	13	13.2032	19	.0
32074.79	32074.98	0	54.	12	13.2158	19	-.2
32074.25	32074.10	0	24.	14	13.2334	19	.2
32038.88	32038.84	0	48.	15	14.0100	19	.0
32038.88	32038.93	0	24.	15	14.0248	19	-.1
32072.91	32072.74	0	51.	18	14.0330	19	.2
32072.91	32072.65	1	23.	18	14.0516	19	.3
32074.76	32075.23	6	7.	12	14.0726	19	-.5
31991.70	31991.62	0	21.	13	14.0746	19	.1
32074.76	32074.96	0	69.	12	14.0910	19	-.2
31991.70	31991.71	0	55.	13	14.0932	19	-.0
32074.76	32074.75	0	16.	12	14.1056	19	.0
32074.26	32074.36	0	79.	14	14.1234	19	-.1
32038.88	32038.98	0	46.	15	14.1256	19	-.1
32074.26	32074.52	3	14.	14	14.1422	19	-.3
32038.88	32038.90	0	24.	15	14.1444	19	-.0
32072.91	32072.88	1	50.	18	14.1526	19	.0
32072.91	32072.94	0	23.	18	14.1714	19	-.0
32074.80	32074.92	0	6.	12	14.1922	19	-.1
31991.70	31991.63	0	21.	13	14.1944	19	.1
32074.81	32075.06	0	63.	12	14.2106	19	-.2
31991.70	31991.78	0	56.	13	14.2130	19	-.1
32074.83	32074.87	0	18.	12	14.2252	19	-.0
32038.88	32038.79	1	23.	15	15.0012	19	.1
32038.88	32038.85	0	50.	15	15.0158	19	.0
32072.90	32072.84	0	24.	18	15.0240	19	.1
32072.90	32073.08	1	47.	18	15.0430	19	-.2
31991.70	31992.12	8	9.	13	15.0700	19	-.4
32074.94	32074.70	1	29.	12	15.0814	19	.2
31991.70	31991.86	0	78.	13	15.0844	19	-.2
32074.96	32075.16	1	37.	12	15.1000	19	-.2
31991.70	31991.74	0	14.	13	15.1032	19	-.0
32074.26	32074.19	0	38.	14	15.1142	19	.1
32038.90	32038.95	0	22.	15	15.1214	19	-.1
32074.26	32074.30	0	29.	14	15.1328	19	-.0
32038.90	32039.00	0	52.	15	15.1356	19	-.1
32072.88	32073.03	0	24.	18	15.1438	19	-.2
32072.87	32073.00	0	49.	18	15.1624	19	-.1
31991.70	31991.90	1	10.	13	15.1858	19	-.2
32075.10	32074.89	0	26.	12	15.2010	19	.2
31991.70	31991.76	0	78.	13	15.2040	19	-.1
32075.13	32075.08	0	41.	12	15.2154	19	.0
31991.70	31991.65	0	14.	13	15.2230	19	.1
32074.26	32074.23	0	36.	14	15.2336	19	.0
32074.26	32074.36	0	26.	14	16.0124	19	-.1
32072.85	32072.76	0	11.	18	16.0152	19	.1
32038.93	32039.12	0	12.	15	16.0258	19	-.2
32072.84	32072.99	0	84.	18	16.0338	19	-.1
32072.84	32073.10	0	11.	18	16.0526	19	-.3
32075.24	32075.91	9	12.	12	16.0722	19	-.7
31991.70	31991.74	0	40.	13	16.0756	19	-.0
31991.70	31991.86	0	27.	13	16.0942	19	-.2
32074.26	32074.22	0	17.	14	16.1050	19	.0
32038.96	32039.05	0	10.	15	16.1122	19	-.1
32074.26	32074.29	0	62.	14	16.1236	19	-.0
32072.82	32072.75	1	11.	18	16.1352	19	.1
32038.97	32039.04	0	12.	15	16.1454	19	-.1
32072.81	32072.85	0	12.	18	16.1724	19	-.0
32075.31	32038.88	9	11.	12	16.1922	19	-3.6
31991.71	31991.72	0	38.	13	16.1952	19	-.0
32075.31	32074.86	0	82.	12	16.2058	19	.4
31991.71	31991.54	1	28.	13	16.2140	19	.2
32074.26	32074.72	8	17.	14	16.2250	19	-.5
32038.99	32038.95	0	44.	15	17.0022	19	.0
32039.00	32039.18	0	24.	15	17.0208	19	-.2
32072.80	32072.82	0	46.	18	17.0250	19	-.0
32072.80	32072.99	0	24.	18	17.0436	19	-.2
31991.71	31991.71	0	19.	13	17.0708	19	-.0
32075.23	32075.02	0	43.	12	17.0812	19	.2
31991.71	31991.66	0	57.	13	17.0854	19	.1
32075.20	32074.91	0	24.	12	17.0958	19	.3
32074.28	32074.30	0	68.	14	17.1146	19	-.0
32039.02	32039.10	0	41.	15	17.1216	19	-.1
32074.29	32074.45	0	16.	14	17.1334	19	-.2
32039.03	32038.92	0	25.	15	17.1404	19	.1
32072.79	32072.86	0	51.	18	17.1444	19	-.1
32072.79	32073.04	0	21.	18	17.1632	19	-.2

Table 7

31991.72	31991.85	0	21.	13	17.1904	19	-.1
32075.01	32075.12	0	44.	12	17.2004	19	-.1
31991.72	31991.64	0	51.	13	17.2048	19	.1
32074.97	32074.68	5	23.	12	17.2152	19	.3
32039.05	32039.16	0	21.	15	17.2334	19	-.1
32039.05	32038.92	0	48.	15	18.0120	19	.1
32072.80	32072.70	4	23.	15	18.0200	19	.1
32072.91	32072.03	0	47.	18	18.0348	19	.8
31991.72	31991.69	0	9.	13	18.0620	19	.0
32074.75	32075.12	0	20.	12	18.0720	19	-.4
31991.72	31991.73	0	80.	13	18.0804	19	-.0
32074.72	32075.13	0	56.	12	18.0904	19	-.4
31991.72	31991.97	2	13.	13	18.0954	19	-.2
32074.35	32074.44	0	32.	14	18.1054	19	-.1
32039.07	32038.93	0	22.	15	18.1132	19	.1
32074.36	32074.39	0	32.	14	18.1242	19	-.0
32039.07	32038.97	0	50.	15	18.1314	19	.1
32072.83	32072.82	1	23.	18	18.1358	19	.0
32072.83	32072.89	0	49.	18	18.1544	19	-.1
31991.73	31991.93	1	9.	13	18.1818	19	-.2
32074.55	32074.97	0	18.	12	18.1914	19	-.4
31991.73	31991.56	2	79.	13	18.2000	19	.2
32074.53	32075.11	0	62.	12	18.2056	19	-.6
31991.73	31991.79	0	13.	13	18.2150	19	-.1
32074.38	32074.43	0	31.	14	18.2250	19	-.0
32039.08	32039.39	3	66.	15	19.0030	19	-.3
32072.86	32072.92	0	7.	18	19.0112	19	-.1
32039.08	32039.04	0	17.	15	19.0218	19	.0
32072.86	32072.90	0	68.	18	19.0256	19	-.0
32072.87	32073.10	0	16.	18	19.0446	19	-.2
31991.74	31991.45	7	29.	13	19.0716	19	.3
32074.51	32074.85	0	52.	12	19.0810	19	-.3
31991.74	31991.71	0	36.	13	19.0904	19	.0
32074.53	32075.17	0	21.	12	19.0954	19	-.6
32039.08	32039.48	6	7.	15	19.1046	19	-.4
32039.08	32038.90	1	66.	15	19.1226	19	.2
32072.90	32073.98	9	7.	18	19.1314	19	-1.1
32074.41	32074.57	0	12.	14	19.1336	19	-.2
32039.08	32039.25	0	17.	15	19.1418	19	-.2
32072.91	32073.61	9	66.	18	19.1454	19	-.7
32072.92	32072.99	0	17.	18	19.1642	19	-.1
32074.71	32079.46	9	3.	12	19.1822	19	-4.7
31991.74	31991.93	1	28.	13	19.1912	19	-.2
32074.77	32074.87	0	46.	12	19.2000	19	-.1
31991.74	31991.85	0	38.	13	19.2058	19	-.1
32074.84	32074.83	1	23.	12	19.2148	19	.0
32039.07	32039.21	0	28.	15	19.2344	19	-.1
32039.07	32039.12	0	51.	15	20.0128	19	-.0
32072.96	32072.73	5	22.	18	20.0208	19	.2
32072.96	32073.25	1	51.	18	20.0354	19	-.3
32072.97	32069.85	9	4.	18	20.0546	19	3.1
31991.75	31991.74	0	9.	13	20.0628	19	.0
32075.26	32075.03	0	15.	12	20.0714	19	.2
31991.75	31991.82	0	78.	13	20.0816	19	-.1
32075.34	32075.12	0	74.	12	20.0858	19	.2
31991.75	31991.65	0	14.	13	20.1002	19	.1
32074.42	32074.38	0	28.	14	20.1058	19	.0
32039.04	32039.17	0	22.	15	20.1142	19	-.1
32039.05	32039.16	0	61.	15	20.1326	19	-.1
32073.01	32072.95	0	19.	18	20.1406	19	.1
32073.01	32073.10	0	62.	18	20.1552	19	-.1
32073.02	32073.22	0	6.	18	20.1744	19	-.2
31991.76	31992.31	9	7.	13	20.1828	19	-.6
32075.81	32075.14	0	11.	12	20.1910	19	.7
31991.76	31991.69	0	67.	13	20.2010	19	.1
32075.87	32075.26	2	86.	12	20.2052	19	.6
31991.76	31991.90	0	17.	13	20.2158	19	-.1
32074.41	32074.71	4	21.	14	20.2254	19	-.3
32074.41	32074.44	0	57.	14	21.0038	19	-.0
32073.05	32074.74	9	5.	18	21.0124	19	-1.7
32039.04	32038.91	4	20.	15	21.0228	19	.1
32073.06	32073.08	0	56.	18	21.0306	19	-.0
32073.07	32073.01	0	21.	18	21.0454	19	.1
31991.77	31992.23	8	24.	13	21.0726	19	-.5
32076.10	32074.99	0	31.	12	21.0808	19	1.1
32039.04	32039.04	0	54.	15	22.0138	19	-.0
32073.14	32073.26	0	21.	18	22.0218	19	-.1
32073.14	32073.31	1	55.	18	22.0404	19	-.2
31991.80	31992.09	5	8.	13	22.0638	19	-.3
32074.77	32074.79	4	10.	12	22.0712	19	-.0
31991.81	31991.83	0	74.	13	22.0822	19	-.0
32074.52	32074.98	0	84.	12	22.0858	19	-.5
31991.81	31991.81	0	15.	13	22.1010	19	-.0
32074.45	32074.49	0	24.	14	22.1102	19	-.0
32039.06	32039.18	0	21.	15	22.1154	19	-.1
32074.46	32074.46	0	45.	14	22.1248	19	.0
32039.07	32039.14	0	55.	15	22.1336	19	-.1
32073.15	32073.17	0	20.	18	22.1416	19	-.0
32073.16	32073.14	0	57.	18	22.1602	19	.0
32073.16	32072.89	3	7.	18	22.1752	19	.3
31991.83	31991.98	0	7.	13	22.1838	19	-.2
32072.57	32075.33	4	8.	12	22.1908	19	-2.8
31991.83	31991.77	0	65.	13	22.2020	19	.1
32072.16	32076.16	9	69.	12	22.2048	19	-4.0
31991.83	31991.83	0	18.	13	22.2208	19	.0
32071.66	32073.34	9	16.	12	22.2238	19	-1.7
32074.50	32074.63	0	21.	14	22.2258	19	-.1
32074.51	32074.52	0	61.	14	23.0042	19	-.0
32039.11	32039.06	0	20.	15	23.0238	19	.0
32073.16	32073.19	0	57.	18	23.0314	19	-.0
32073.15	32073.03	0	21.	18	23.0502	19	.1
31991.83	31991.78	0	25.	13	23.0734	19	.1
31991.83	31991.77	0	46.	13	23.0920	19	.1
32067.82	32077.68	9	44.	12	23.0948	19	-9.9
32039.13	32039.23	0	6.	15	23.1106	19	-.1
32074.53	32074.44	0	63.	14	23.1156	19	.1
32039.13	32039.07	0	49.	15	23.1248	19	.1
32074.53	32074.71	1	21.	14	23.1344	19	-.2
32039.13	32039.15	0	23.	15	23.1434	19	-.0
32073.14	32073.24	0	46.	18	23.1512	19	-.1
32073.14	32073.49	5	24.	18	23.1700	19	-.4
31991.80	31991.87	0	21.	13	23.1934	19	-.1
32062.88	32078.11	9	20.	12	23.1958	19	-15.2
31991.79	31991.77	0	55.	13	23.2118	19	.0
32074.50	32074.93	9	4.	14	23.2212	19	-.4
32074.49	32074.47	0	52.	14	23.2352	19	.0
32074.48	32074.46	0	21.	14	24.0138	19	.0
32073.11	32072.93	1	19.	18	24.0226	19	.2
32073.10	32073.15	0	58.	18	24.0412	19	-.1
32073.10	32071.28	5	5.	18	24.0602	19	1.8
31991.72	31989.60	9	7.	13	24.0648	19	2.1
31991.70	31991.84	0	72.	13	24.0832	19	-.1
32054.26	32078.14	9	64.	12	24.0854	19	-23.9
31991.68	31991.78	0	15.	13	24.1020	19	-.1
32052.83	32078.24	9	17.	12	24.1042	19	-25.4
32074.37	32074.45	0	21.	14	24.1106	19	-.1
32039.06	32039.17	0	19.	15	24.1200	19	-.1
32074.34	32074.47	0	52.	14	24.1252	19	-.1
32039.05	32039.19	0	57.	15	24.1344	19	-.1
32073.04	32073.24	0	18.	18	24.1426	19	-.2
32073.05	32073.21	0	60.	18	24.1608	19	-.2

input in the D.A.S in order to get a consistent value on the 10 minutes print out only, data recorded on the tape being raw data.

VI.7.3 Pressure Log

After the call of Fremantle the pressure log started working but gave a speed too low. (from day 2 to 8). This problem was solved during the call at Albany and the pressure log worked satisfactorily afterwards.

VI.7.4 Statistical analysis of the three systems

A statistical analysis is only possible for the Sonar Doppler.

As a matter of fact, these analysis is made from data printed out on the 10 minutes listings of the ship for a whole cruise.

For the Chernikeeff log these data are not a picture of the behaviour of the system because several calibrations factors have been used in order to get printed out data usable on board the ship = Calibration factor of 1.25 input on day 04.05.26, then 1.1, then again 1.25. This means that all means and standard deviation computed cannot tell the story of this log during this cruise.

For the pressure log it is easy to see on the histogram fig. 9 and plot fig. 6 that there are two different calibrations. This corresponds to data before and after day 8 when repairs were carried out on this system.

COMPARATIVE SPEEDS FOR NAVIGATIONAL SYSTEMS.

191	1	8.600	8.660	6.010	6.460	1.007	.699	.751
191	2	8.430	8.430	5.930	6.220	1.000	.703	.738
191	3	8.190	8.210	5.660	5.960	1.002	.691	.728
191	4	8.230	8.250	5.440	5.770	1.002	.661	.701
191	5	8.410	9.020	5.990	6.450	1.073	.712	.767
191	6	8.780	9.330	6.490	6.690	1.063	.739	.762
191	7	8.580	9.360	6.820	6.550	1.091	.795	.763
191	8	8.540	9.360	6.820	6.770	1.096	.799	.793
191	9	8.770	9.030	-0.000	-0.000	1.030	0.000	0.000
191	10	8.820	9.190	-0.000	-0.000	1.042	0.000	0.000
191	11	8.890	9.330	6.750	6.780	1.049	.759	.763
191	12	8.290	9.410	-0.000	-0.000	1.135	0.000	0.000
191	13	8.110	9.360	-0.000	-0.000	1.154	0.000	0.000
191	14	8.710	9.480	-0.000	-0.000	1.088	0.000	0.000
191	15	8.850	9.540	-0.000	-0.000	1.078	0.000	0.000
191	16	8.620	9.350	6.790	6.720	1.085	.788	.780
191	17	8.830	9.170	6.720	6.620	1.039	.761	.750
191	18	8.230	9.320	6.770	6.690	1.132	.823	.813
191	19	8.730	8.530	6.460	6.290	.977	.740	.721
191	20	9.060	8.680	6.560	6.410	.958	.724	.708
191	21	9.270	8.600	6.490	6.390	.928	.700	.689
191	22	9.490	8.610	6.490	6.260	.907	.684	.660
191	23	9.010	8.620	6.590	6.310	.957	.731	.700
191	24	8.560	9.060	7.010	6.600	1.058	.819	.771
191	25	8.710	9.350	7.060	6.720	1.073	.811	.772
191	26	8.670	9.220	7.050	6.690	1.063	.813	.772
191	27	9.000	9.280	8.040	6.630	1.031	.893	.737
191	28	9.290	9.590	8.900	6.660	1.032	.958	.717
191	29	9.520	9.660	8.920	6.710	1.015	.937	.705
191	30	9.350	9.600	8.960	6.670	1.027	.958	.713
191	31	9.690	9.890	8.970	6.680	1.021	.926	.689
191	32	9.210	9.900	8.950	6.690	1.075	.972	.726
191	33	9.490	9.840	9.000	-0.000	1.037	.948	0.000
191	34	8.760	9.170	8.410	6.460	1.047	.960	.737
191	35	8.590	9.350	8.800	6.740	1.088	1.024	.785
191	36	9.390	9.510	8.860	6.770	1.013	.944	.721
191	37	8.960	9.480	8.910	6.730	1.058	.994	.751
191	38	9.580	9.640	9.060	6.660	1.006	.946	.695
191	39	9.570	9.840	9.110	6.730	1.028	.952	.703
191	40	9.030	9.170	8.480	6.530	1.016	.939	.723
191	41	8.360	8.270	-0.000	-0.000	.989	0.000	0.000
191	42	9.070	9.750	-0.000	-0.000	1.075	0.000	0.000
191	43	8.550	8.710	-0.000	-0.000	1.019	0.000	0.000
191	44	8.710	8.650	-0.000	-0.000	.993	0.000	0.000
191	45	8.170	8.670	7.850	6.350	1.061	.961	.777
191	46	8.270	8.870	7.950	6.390	1.073	.961	.773
191	47	8.050	8.950	8.090	6.470	1.112	1.005	.806
191	48	7.980	8.560	8.200	6.500	1.073	1.028	.815
191	49	8.020	8.560	8.380	5.990	1.067	1.045	.747
191	50	8.110	8.590	-0.000	-0.000	1.059	0.000	0.000
191	51	8.300	8.700	-0.000	-0.000	1.048	0.000	0.000
191	52	8.450	8.790	-0.000	-0.000	1.040	0.000	0.000
191	53	8.620	8.680	-0.000	-0.000	1.007	0.000	0.000
191	54	8.610	8.760	-0.000	-0.000	1.017	0.000	0.000
191	55	8.880	8.720	-0.000	-0.000	.982	0.000	0.000
191	56	9.030	8.820	8.110	6.450	.977	.898	.714
191	57	9.120	8.980	8.200	-0.000	.985	.899	0.000
191	58	8.610	8.880	8.180	6.480	1.031	.950	.753
191	59	9.580	9.620	-0.000	-0.000	1.004	0.000	0.000
191	60	8.400	8.170	7.840	6.690	.973	.933	.796
191	61	8.570	8.470	8.000	6.220	.988	.933	.726
191	62	8.760	8.570	8.160	6.230	.978	.932	.711

191	63	9.070	8.740	8.280	6.260	.964	.913	.690
191	64	9.030	8.770	8.280	6.280	.971	.917	.695
191	65	8.870	8.560	8.100	6.280	.965	.913	.708
191	66	8.500	8.560	8.310	-0.000	1.007	.978	0.000
191	67	8.520	8.470	8.310	6.120	.994	.975	.718
191	68	8.010	8.400	-0.000	-0.000	1.049	0.000	0.000
191	69	7.760	8.320	7.850	6.280	1.072	1.012	.809
191	70	7.750	8.120	7.530	6.020	1.048	.972	.777
191	71	8.790	8.390	-0.000	-0.000	.954	0.000	0.000
191	72	8.530	8.370	-0.000	-0.000	.981	0.000	0.000
191	73	8.350	8.310	-0.000	-0.000	.995	0.000	0.000
191	74	8.290	8.270	-0.000	-0.000	.998	0.000	0.000
191	75	8.370	8.490	8.160	6.310	1.014	.975	.754
191	76	8.320	8.580	7.560	-0.000	1.031	.909	0.000
191	77	9.230	9.070	8.610	6.680	.983	.933	.724
191	78	8.630	8.770	8.330	6.720	1.016	.965	.779
191	79	8.860	8.790	8.230	6.520	.992	.929	.736
191	80	8.910	8.980	8.450	6.610	1.008	.948	.742
191	81	9.200	9.080	8.560	6.670	.987	.930	.725
191	82	8.640	9.410	-0.000	-0.000	1.089	0.000	0.000
191	83	9.160	9.420	8.860	6.410	1.028	.967	.700
191	84	8.960	9.250	8.100	9.140	1.033	.904	1.020
191	85	7.980	8.050	7.300	7.520	1.009	.915	.942
191	86	8.100	9.030	7.980	9.070	1.115	.985	1.120
191	87	9.070	9.280	8.280	8.660	1.023	.913	.955
191	88	9.040	9.120	8.110	9.230	1.009	.897	1.021
191	89	8.670	8.940	7.920	9.140	1.031	.913	1.054
191	90	8.700	8.710	7.690	9.050	1.001	.884	1.040
191	91	8.330	8.390	7.530	8.600	1.007	.904	1.032
191	92	8.560	8.720	7.980	9.070	1.019	.932	1.060
191	93	8.310	8.850	7.960	9.050	1.065	.958	1.089
191	94	8.800	8.910	7.940	9.260	1.012	.902	1.052
191	95	8.240	8.340	7.430	8.390	1.017	.902	1.018
191	96	7.950	8.080	7.140	8.590	1.016	.898	1.081
191	97	7.810	8.290	7.330	8.790	1.061	.939	1.125
191	98	7.980	8.670	7.750	8.890	1.086	.971	1.114
191	99	8.830	8.750	7.830	9.000	.991	.887	1.019
191	100	8.320	8.670	7.730	8.870	1.042	.929	1.066
191	101	8.400	8.240	7.870	8.990	.986	.937	1.070
191	102	9.090	9.070	-0.000	-0.000	.998	0.000	0.000
191	103	8.630	8.680	8.220	9.090	1.006	.952	1.053
191	104	8.710	8.490	8.010	8.730	.975	.920	1.002
191	105	8.120	8.800	7.770	9.050	1.084	.957	1.115
191	106	7.170	8.280	7.190	8.920	1.155	1.003	1.244
191	107	7.150	8.340	7.290	8.850	1.166	1.020	1.238
191	108	7.640	8.570	7.550	8.940	1.122	.988	1.170
191	109	7.820	8.170	7.230	8.260	1.045	.931	1.056
191	110	8.360	9.000	8.010	8.940	1.077	.958	1.069
191	111	8.500	8.950	8.040	9.080	1.053	.946	1.068
191	112	8.690	9.030	8.090	9.280	1.039	.931	1.068
191	113	9.010	9.010	8.050	9.150	1.000	.893	1.016
191	114	9.120	9.100	8.270	9.260	.998	.907	1.015
191	115	8.630	8.480	7.070	7.390	.983	.819	.856
191	116	8.630	8.540	7.790	8.850	.990	.903	1.025
191	117	8.290	8.260	7.400	8.850	.996	.893	1.068
191	118	8.500	8.220	7.410	8.770	.967	.872	1.032
191	119	8.600	8.300	7.440	8.750	.965	.865	1.017
191	120	8.740	8.350	7.470	8.820	.955	.855	1.009
191	121	8.620	8.310	7.460	8.850	.964	.865	1.027
191	122	7.970	8.110	7.250	8.390	1.018	.910	1.053
191	123	9.600	9.090	-0.000	-0.000	.947	0.000	0.000
191	124	9.470	9.070	-0.000	-0.000	.958	0.000	0.000
191	125	9.120	9.030	8.250	9.070	.990	.905	.995
191	126	8.820	9.040	8.240	9.240	1.025	.934	1.048
191	127	8.670	8.870	8.140	9.220	1.023	.939	1.063
191	128	9.310	9.080	8.030	8.660	.975	.863	.930

191	129	9.000	9.020	-0.000	-0.000	1.002	0.000	0.000
191	130	8.650	8.860	7.710	8.320	1.024	.891	.962
191	131	9.330	9.370	8.210	9.080	1.004	.880	.973
191	132	9.230	9.230	8.220	9.000	1.000	.891	.975
191	133	9.150	9.110	8.250	8.980	.996	.902	.981
191	134	9.290	9.160	-0.000	-0.000	.986	0.000	0.000
191	135	8.770	8.980	7.950	8.910	1.024	.906	1.016
191	136	8.760	8.130	8.170	9.050	.928	.933	1.033
191	137	9.080	9.260	-0.000	-0.000	1.020	0.000	0.000
191	138	9.260	9.080	8.270	8.990	.981	.893	.971
191	139	9.180	9.060	8.320	9.070	.987	.906	.988
191	140	9.030	9.250	8.250	9.080	1.024	.914	1.006
191	141	9.300	9.130	8.240	8.990	.982	.886	.967
191	142	8.810	8.830	8.220	9.080	1.002	.933	1.031
191	143	8.770	8.790	8.330	9.160	1.002	.950	1.044
191	144	8.790	8.820	8.430	9.190	1.003	.959	1.046
191	145	9.470	8.790	7.650	7.810	.928	.808	.825
191	146	8.920	9.180	7.980	8.160	1.029	.895	.915
191	147	9.610	9.860	8.450	8.780	1.026	.879	.914
191	148	9.370	9.760	8.340	-0.000	1.042	.890	0.000
191	149	9.250	9.680	8.250	8.710	1.046	.892	.942
191	150	9.410	9.630	8.310	8.830	1.023	.883	.938
191	151	9.050	9.370	8.150	8.840	1.035	.901	.977
191	152	8.930	9.270	8.240	8.710	1.038	.923	.975
191	153	8.720	9.000	8.230	8.850	1.032	.944	1.015
191	154	8.740	8.990	8.140	8.810	1.029	.931	1.008
191	155	8.510	8.930	8.030	8.870	1.044	.944	1.042
191	156	8.890	8.830	7.900	8.800	.993	.889	.990
191	157	8.440	8.750	7.830	8.770	1.037	.928	1.039
191	158	8.140	8.410	-0.000	-0.000	1.033	0.000	0.000
191	159	8.170	8.510	7.740	8.400	1.042	.947	1.028
191	160	8.540	8.530	7.830	8.450	.999	.917	.989
191	161	8.370	8.700	7.750	8.510	1.039	.926	1.017
191	162	8.660	8.970	7.900	8.550	1.036	.912	.987
191	163	7.930	8.220	7.160	7.970	1.037	.903	1.005
191	164	7.830	8.150	6.900	8.820	1.041	.881	1.126
191	165	7.890	8.210	6.770	8.750	1.041	.858	1.110
191	166	7.850	8.080	6.700	9.090	1.029	.854	1.158
191	167	8.040	8.120	6.700	8.680	1.010	.833	1.080
191	168	8.260	8.210	6.920	8.740	.994	.838	1.058
191	169	8.360	8.160	7.010	8.620	.976	.839	1.031
191	170	8.510	8.330	7.090	8.730	.979	.833	1.026
191	171	9.010	8.560	7.320	8.710	.950	.812	.967
191	172	9.220	8.700	7.630	8.800	.944	.828	.954
191	173	8.720	8.790	7.780	8.760	1.008	.892	1.005
191	174	8.600	9.300	-0.000	-0.000	1.061	0.000	0.000
191	175	9.320	9.260	8.090	8.990	.994	.868	.965
191	176	8.610	9.200	7.960	8.940	1.069	.925	1.038
191	177	8.800	9.200	8.510	8.980	1.045	.967	1.020
191	178	8.830	9.150	9.000	9.000	1.036	1.019	1.019
191	179	8.270	8.620	8.560	8.880	1.042	1.035	1.074
191	180	8.620	9.190	9.010	8.680	1.066	1.045	1.030
191	181	8.410	9.180	9.040	8.880	1.092	1.075	1.056
191	182	8.480	9.140	9.220	8.910	1.078	1.087	1.051
191	183	8.700	9.040	9.320	8.850	1.039	1.071	1.017
191	184	8.720	9.340	9.650	8.880	1.071	1.107	1.018
191	185	9.080	9.330	9.610	8.880	1.028	1.058	.978
191	186	8.550	9.170	9.500	9.000	1.073	1.111	1.053
191	187	9.390	9.160	-0.000	-0.000	.976	0.000	0.000
191	188	8.960	9.400	-0.000	-0.000	1.049	0.000	0.000
191	189	9.350	9.420	9.650	8.880	1.007	1.032	.950
191	190	9.220	9.570	-0.000	-0.000	1.038	0.000	0.000
191	191	9.240	9.290	-0.000	-0.000	1.005	0.000	0.000
191	192	8.800	8.780	-0.000	-0.000	.998	0.000	0.000
191	193	9.030	9.000	9.490	9.000	.997	1.051	.997
191	194	8.760	9.030	9.510	8.880	1.031	1.086	1.014

191	195	8.960	9.070	9.480	8.910	1.012	1.058	.994
191	196	8.480	9.010	9.360	8.710	1.062	1.104	1.027
191	197	8.670	9.480	9.560	9.000	1.093	1.103	1.038
191	198	8.790	9.610	9.530	9.000	1.093	1.084	1.024
191	199	8.860	9.650	9.390	8.850	1.089	1.060	.999
191	200	8.700	9.440	7.610	8.940	1.085	.875	1.028
191	201	8.570	9.020	7.690	8.910	1.053	.897	1.040
191	202	8.400	8.790	7.320	8.900	1.046	.871	1.060
191	203	8.240	8.540	7.080	8.830	1.036	.859	1.072
191	204	7.780	7.900	6.580	8.360	1.015	.846	1.075
191	205	6.820	7.340	6.210	7.790	1.076	.911	1.142
191	206	6.530	6.540	6.060	7.210	1.002	.928	1.104
191	207	6.430	6.290	6.450	6.940	.978	1.003	1.079
191	208	6.750	6.410	6.460	6.920	.950	.957	1.025
191	209	8.500	8.520	-0.000	-0.000	1.002	0.000	0.000
191	210	8.310	8.420	8.500	8.610	1.013	1.023	1.036
191	211	8.030	8.510	8.480	8.540	1.060	1.056	1.064
191	212	7.960	8.590	8.610	8.650	1.079	1.082	1.087
191	213	8.280	8.540	8.570	8.660	1.031	1.035	1.046
191	214	8.330	8.530	8.590	8.500	1.024	1.031	1.020
191	215	8.180	8.370	8.550	8.700	1.023	1.045	1.064
191	216	8.300	8.430	8.530	8.490	1.015	1.028	1.023
191	217	8.370	8.550	8.690	8.530	1.022	1.038	1.019
191	218	8.350	8.530	8.720	8.610	1.022	1.044	1.031
191	219	8.790	8.430	-0.000	-0.000	.959	0.000	0.000
191	220	8.500	8.700	-0.000	-0.000	1.024	0.000	0.000
191	221	7.810	8.340	8.440	8.280	1.068	1.081	1.060
191	222	8.370	8.930	8.960	8.660	1.067	1.070	1.035
191	223	8.430	8.630	8.790	8.830	1.024	1.043	1.047
191	224	8.680	8.510	8.640	8.540	.980	.995	.984
191	225	8.870	9.030	9.170	8.720	1.018	1.034	.983
191	226	8.940	9.220	9.260	8.920	1.031	1.036	.998
191	227	8.420	9.200	9.270	8.880	1.093	1.101	1.055
191	228	8.170	9.390	9.390	8.780	1.149	1.149	1.075
191	229	8.730	9.340	9.360	8.880	1.070	1.072	1.017
191	230	8.090	9.290	9.330	8.990	1.148	1.153	1.111
191	231	8.150	9.320	9.350	8.880	1.144	1.147	1.090
191	232	8.490	9.300	9.480	8.920	1.095	1.117	1.051
191	233	8.590	9.050	9.030	8.920	1.054	1.051	1.038
191	234	7.990	8.960	8.800	8.940	1.121	1.101	1.119
191	235	8.230	8.930	8.920	8.990	1.091	1.084	1.092
191	236	8.700	9.170	9.120	8.930	1.054	1.048	1.026
191	237	8.550	8.940	8.730	8.650	1.034	1.021	1.012
191	238	9.320	9.360	-0.000	-0.000	1.004	0.000	0.000
191	239	9.430	9.590	9.710	9.000	1.007	1.030	.954
191	240	9.450	9.560	9.620	8.870	1.012	1.018	.939
191	241	9.540	9.600	9.630	9.000	1.005	1.009	.943
191	242	9.280	9.520	9.710	9.000	1.026	1.046	.970
191	243	10.040	9.930	9.700	9.000	.989	.966	.896

Consequently no meaning of statistical mean and standard deviation can be assumed when there are data of different definitions in a set.

However, all numeric values, histograms, plots described now are attached to this survey report.

* Table 8/1 to 8/4 composed of =

- Column 1 = Survey cruise
- Column 2 = Number of measure
- Columns 3.4.5.6 = Speed given by Sat, SD, CL, PL.

* Curves for the three systems (SD, CL, PL) with the ratios (K) as the abscissas and satellite speed as the ordinates (figs 4 to 6)

* Histogram ratios for the three systems (figs 7 to 9).

* Statistical results are grouped in tables to where δ is the mean of K and μ the standard deviation.

All these tables and figures show a good behaviour of the sonar Doppler during this cruise. Also, calibration factors applied to Chernikeeff values look very reasonable and allowed a good dead reckoning in case of failure of the Sonar Doppler. Statistics and Synthesis are given in tables 9, 10A, 10B.

The Data collected for the Pressure Log after day 8 show that the repairs produced satisfactory operations for this system till the end of the Survey.

It must be pointed out, that the cruising speed was during this survey returning to a normal level.

NAVIGATION SYSTEMS - STATISTICS

SYSTEMS	PARAMETERS						
	Mean	S D	S·E of Mean	Sample	Maximum	Minimum	Range
SAT	8·6418	0·5389	0·0346	243	10·040	6·430	3·610
S D	8·8697	0·5333	0·0342	243	9·930	6·290	3·640
C L							
P L							
$\frac{\text{S D}}{\text{SAT}}$	1·0274	0·0451	0·0029	243	1·166	0·907	0·257
$\frac{\text{C L}}{\text{SAT}}$							
$\frac{\text{P L}}{\text{SAT}}$							

NAVIGATIONAL SYSTEMS — STATISTICS RECAPITULATORY

CRUISES / SYSTEMS	1	2	3	4	5
Average of $K = \mu$					
Sonar Doppler	1·0274				
Chernikeeff log		NOT SIGNIFICANT			
Pressure log		" "			
Standard deviation of $\mu = \sigma$					
Sonar Doppler	0·0451				
Chernikeeff log		" "			
Pressure log		" "			
Absolute dispersion σ/μ					
Sonar Doppler	439				
Chernikeeff log	—				
Pressure log	—				

Table 10 A

SURVEY 19

NAVIGATIONNAL SYSTEMS : SYNTHESIS

Cruise	System	$\mu - \sigma$	$\mu + \sigma$	σ	Data $\in \mu \pm \sigma$ in %	Data with $K < 1$ in %	Scale factor $\leq K \leq$	Eliminated % by scale factor
1	SD	0·9823	1·0725	0·0451	69	25	1·0 1·15	8·6
	CH							
	PL							
2	SD							
	CH							
	PL							
3	SD							
	CH							
	PL							
4	SD							
	CH							
	PL							
5	SD							
	PL							
	CH						$\leq K \leq$	

T 10 B

VII CABLES

VII.1 Main cable (fig. 10)

After the call of Albany (day 10) start of operations was delayed by troubles with the main cable = several channels (4, 5 and 6) suffered leakage. Working could begin only at 11.04.00 after one day spent to check and repair faulty channels.

Noise level was generally slightly greater than in previous cruises.

The following maxima were reached =

Channel 1 = 42 μ volts

Channel 2 = 29 μ volts

Channel 3 = 36 μ volts

Channel 4 = 23 μ volts

Channel 5 = 51 μ volts

Channel 6 = 25 μ volts

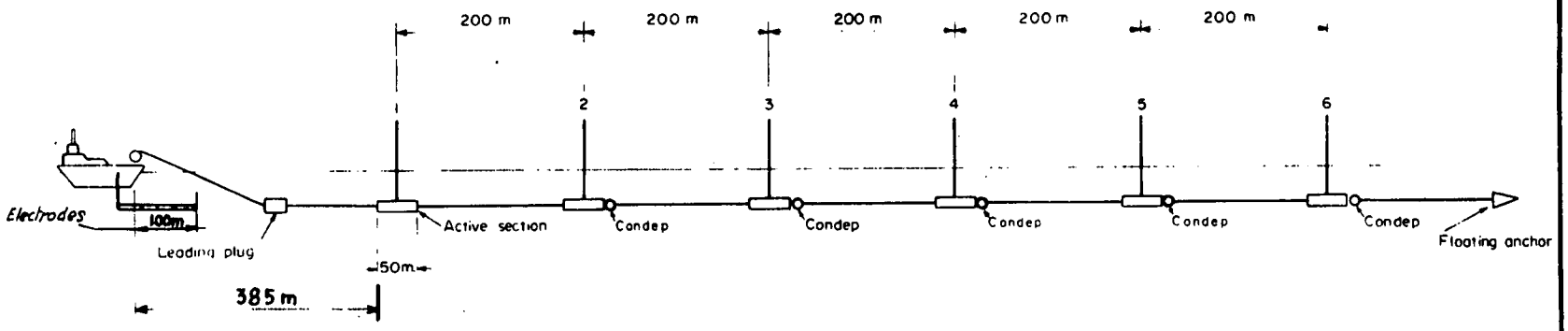
The noise levels contended with on the main cable are described in tables 11, 12 and figures 12 to 17

VII.2 Geotech cable (fig 11)

Several troubles arose with the geotech cable. On day 15 leakage were found on the Geotech cable. At 01.05 it was picked up in order to check. The active part of the cable was tested and appeared quite normal. The fault was found at the connection between the active part and the tractor cable. The metallic tractor cable was rusty and broken. Some strands of it had damaged the conductor cables, putting them in contact with sea water. Part of the cable was cut and the connection refitted. Geotech was put on record again on Day 16.05.05 and worked satisfactorily

CGG STREAMER CABLE - 6 CHANNELS

1000 metres 48 hydrophones per trace



TRACE DIAGRAM 48 hydrophones HC 301 (2 sensors per phone)

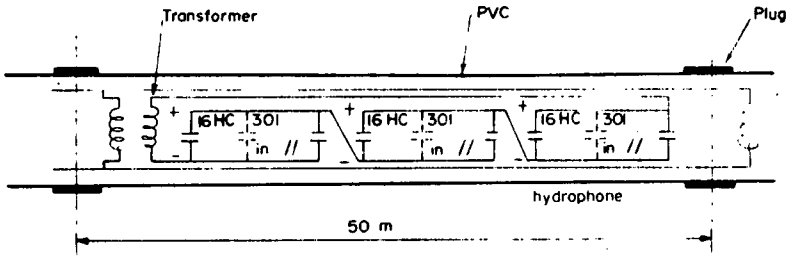
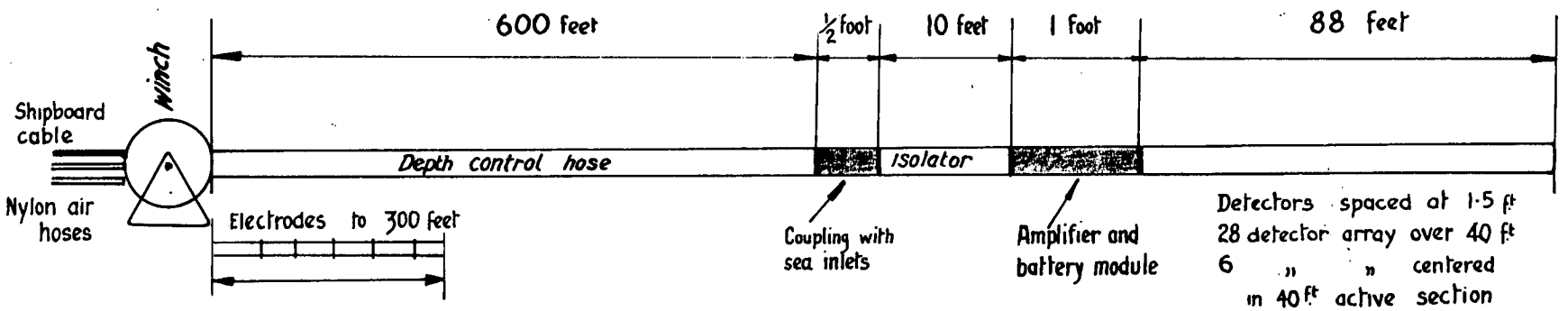


FIG. 10

GEOTECH CABLE



sketch not to scale.

FIG. 11

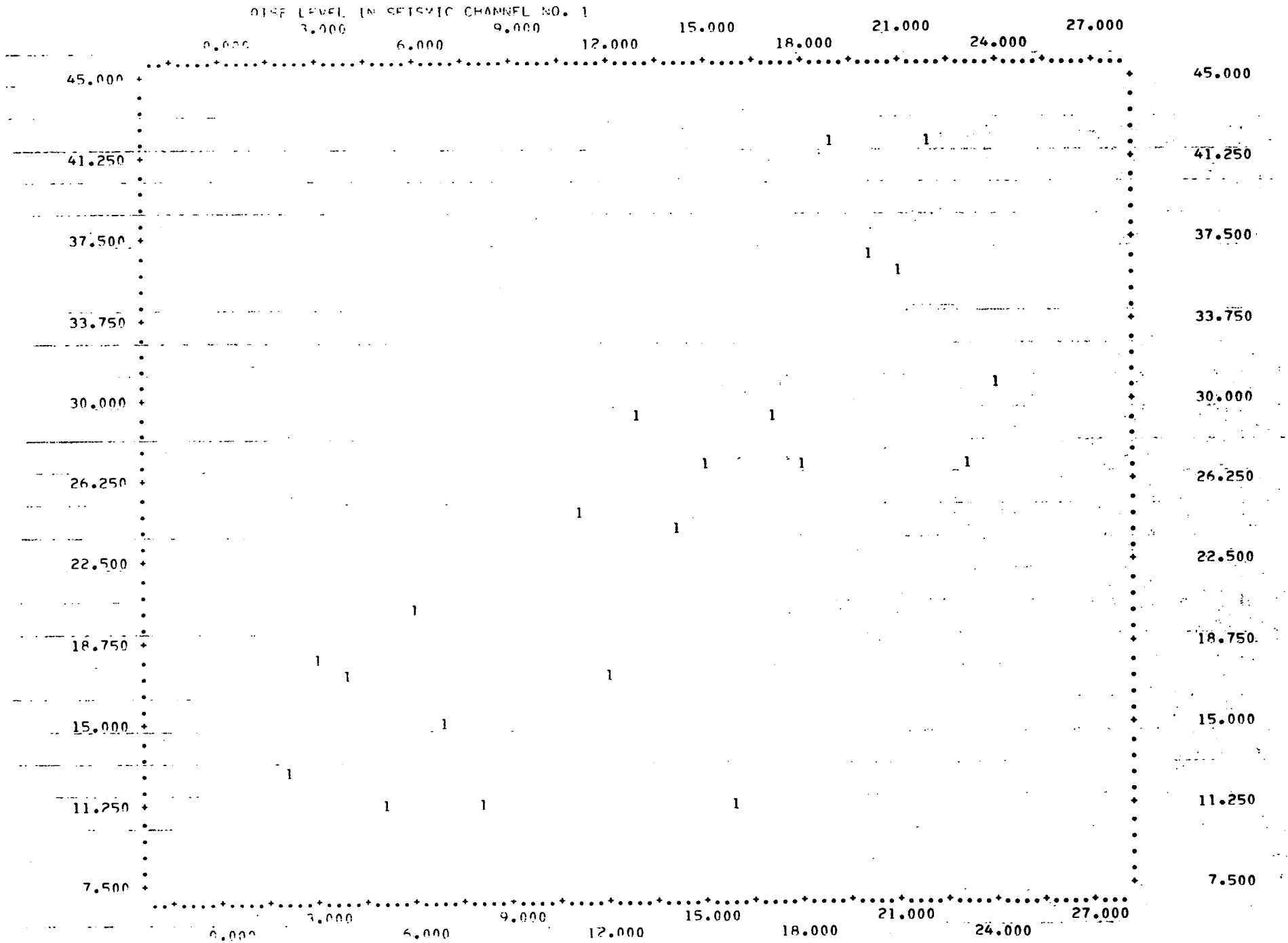

NOISE LEVEL IN SEISMIC CHANNEL NO. 1
3.000
9.000
15.000
21.000
27.000
0.000
6.000
12.000
18.000
24.000
45.000
41.250
37.500
33.750
30.000
26.250
22.500
18.750
15.000
11.250
7.500

Fig. 12

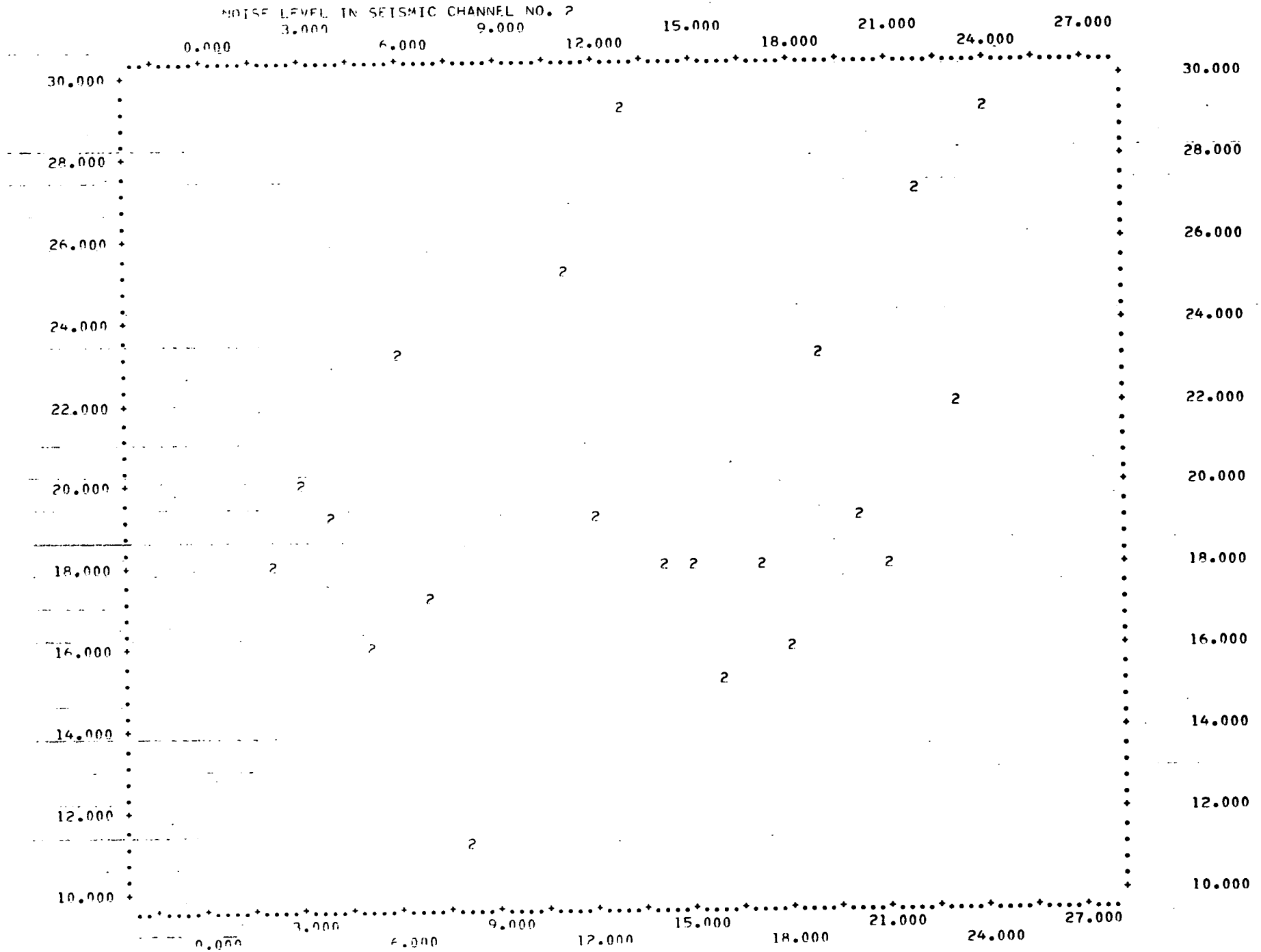

NOISE LEVEL IN SEISMIC CHANNEL NO. 2
0.000
3.000
6.000
9.000
12.000
15.000
18.000
21.000
24.000
27.000
30.000
28.000
26.000
24.000
22.000
20.000
18.000
16.000
14.000
12.000
10.000

Fig. 13

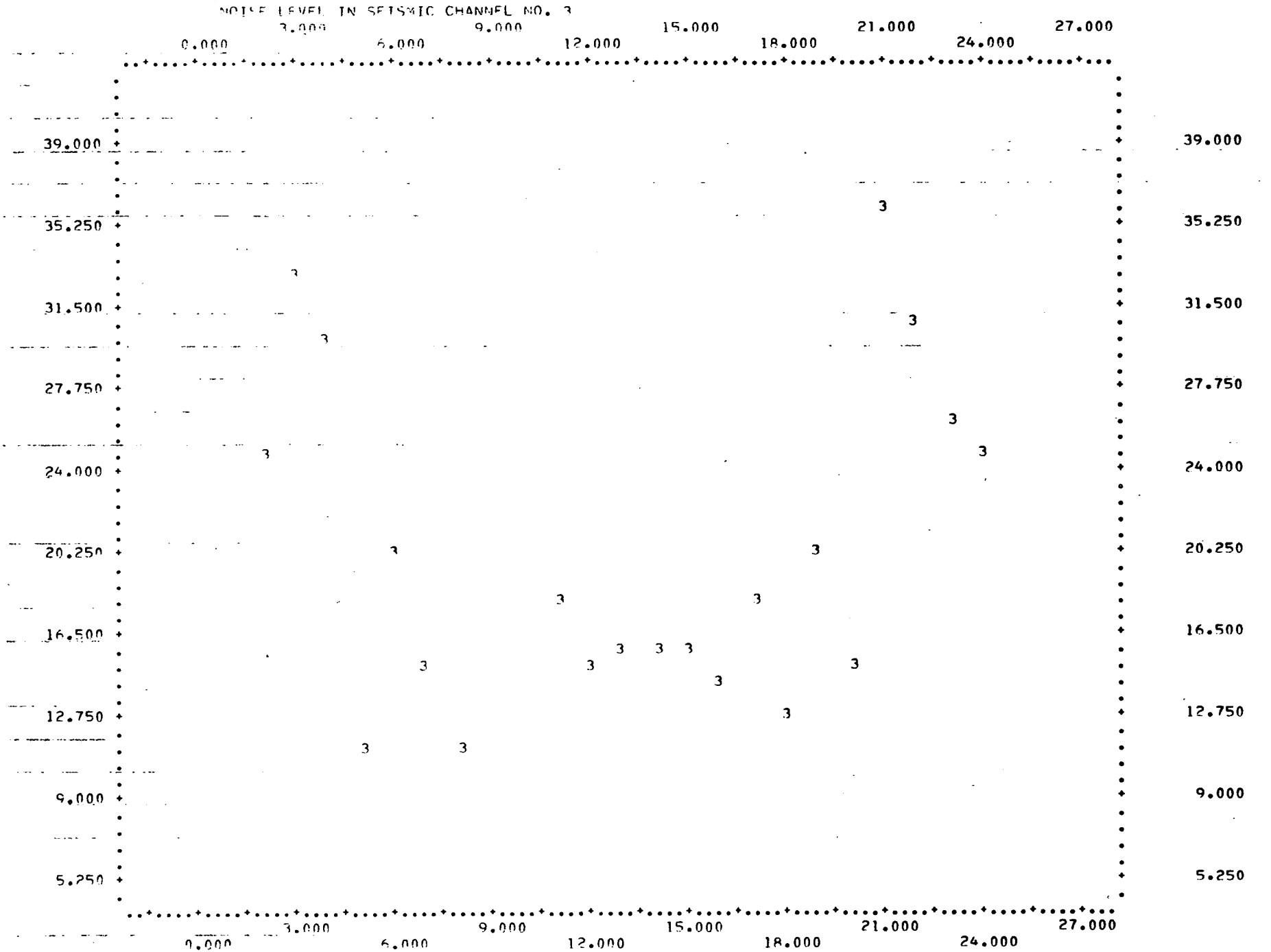

NOISE LEVEL IN SEISMIC CHANNEL NO. 3
0.000
3.000
6.000
9.000
12.000
15.000
18.000
21.000
24.000
27.000
39.000
35.250
31.500
27.750
24.000
20.250
16.500
12.750
9.000
5.250

Fig. 14

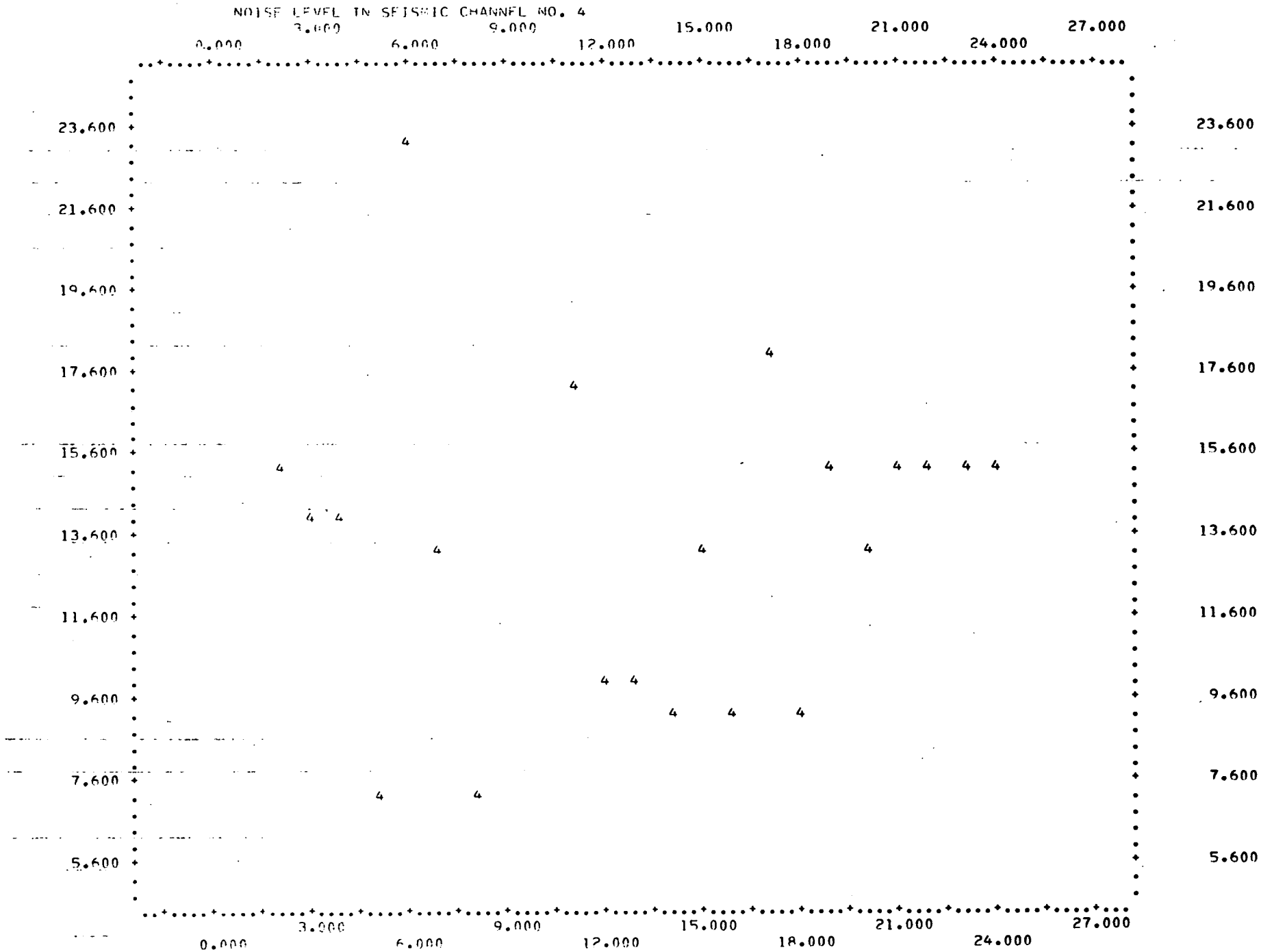

NOISE LEVEL IN SEISMIC CHANNEL NO. 4
0.000
3.000
6.000
9.000
12.000
15.000
18.000
21.000
24.000
27.000
23.600
21.600
19.600
17.600
15.600
13.600
11.600
9.600
7.600
5.600

Fig. 15

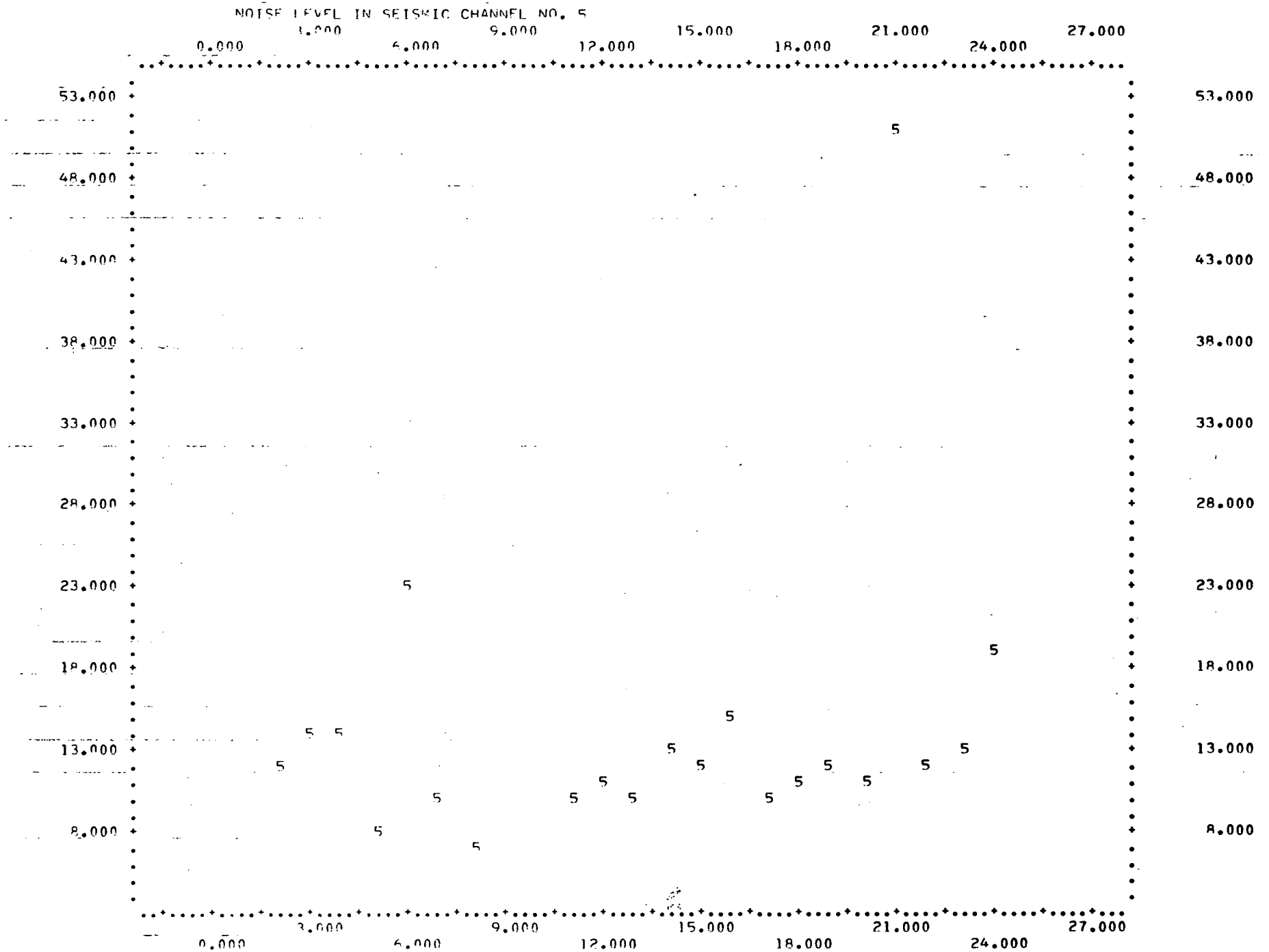

NOISE LEVEL IN SEISMIC CHANNEL NO. 5
0.000
3.000
6.000
9.000
12.000
15.000
18.000
21.000
24.000
27.000
53.000
48.000
43.000
38.000
33.000
28.000
23.000
18.000
13.000
8.000

Fig. 16

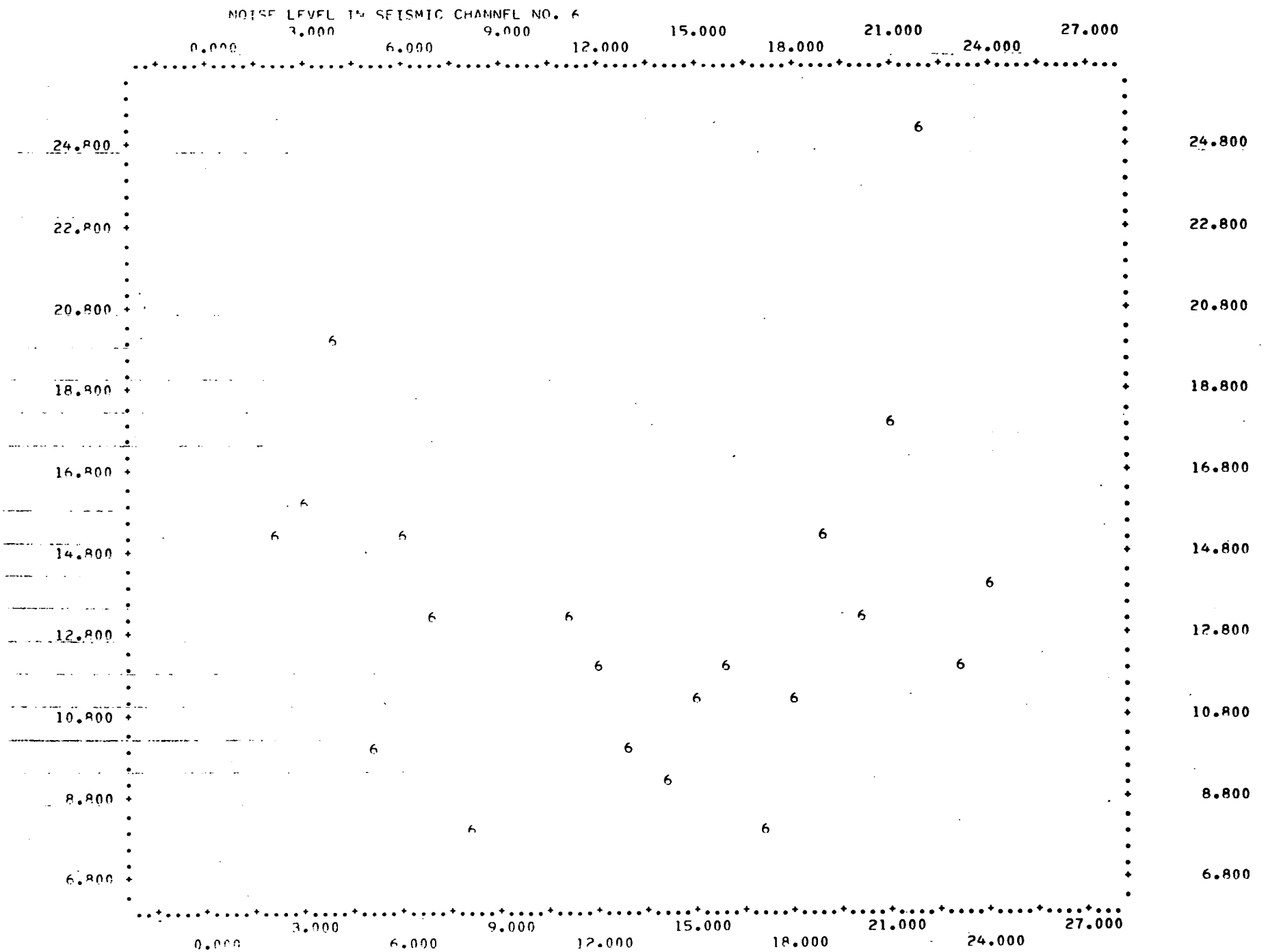

NOISE LEVEL IN SEISMIC CHANNEL NO. 6
0.000
3.000
6.000
9.000
12.000
15.000
18.000
21.000
24.000
27.000
24.800
22.800
20.800
18.800
16.800
14.800
12.800
10.800
8.800
6.800

Fig. 17

Table 11

PRINTOUT OF CHANNEL NOISE OBSERVATIONS

SURV.	CRUI.	DAY	CH-1	CH-2	CH-3	CH-4	CH-5	CH-6
19	1	2	13	18	25	15	12	15
19	1	3	18	20	33	14	14	16
19	1	4	17	19	30	14	14	20
19	1	5	11	16	11	7	8	10
19	1	6	20	23	20	23	23	15
19	1	7	15	17	15	13	10	13
19	1	8	11	11	11	7	7	8
19	1	11	25	25	18	17	10	13
19	1	12	17	19	15	10	11	12
19	1	13	29	29	16	10	10	10
19	1	14	24	18	16	9	13	9
19	1	15	27	18	16	13	12	11
19	1	16	11	15	14	9	15	12
19	1	17	29	18	18	18	10	8
19	1	18	27	16	13	9	11	11
19	1	19	42	23	20	15	12	15
19	1	20	37	19	15	13	11	13
19	1	21	36	18	36	15	51	18
19	1	22	42	27	31	15	12	25
19	1	23	27	22	26	15	13	12
19	1	24	31	29	25	15	19	14

VAR NO	MEAN	S.D.	S.E. OF MEAN	SAMPLE	MAXIMUM	MINIMUM	RANGE
1	13.3333	7.0166	1.5312	21	24.0000	2.0000	22.0000
2	24.2381	9.8636	2.1524	21	42.0000	11.0000	31.0000
3	20.0000	4.6260	1.0095	21	29.0000	11.0000	18.0000
4	20.1905	7.4473	1.6251	21	36.0000	11.0000	25.0000
5	13.1429	3.9024	.8516	21	23.0000	7.0000	16.0000
6	14.1905	9.1357	1.9936	21	51.0000	7.0000	44.0000
7	13.3333	4.0784	.8900	21	25.0000	8.0000	17.0000
8	24.2381	9.8636	2.1524	21	42.0000	11.0000	31.0000
9	20.0000	4.6260	1.0095	21	29.0000	11.0000	18.0000
10	20.1905	7.4473	1.6251	21	36.0000	11.0000	25.0000
11	13.1429	3.9024	.8516	21	23.0000	7.0000	16.0000
12	14.1905	9.1357	1.9936	21	51.0000	7.0000	44.0000
13	13.3333	4.0784	.8900	21	25.0000	8.0000	17.0000

Survey 19

Table 12

until day 22.

On this day from 13.00 to 17.00 the preamplifier was put on charge. On day 23 leakages were found again on the cable which was picked up (at 01.04). Repairs of day 16 were found normal in the active part.

Consequently the leakage must be somewhere along the tractor cable, a strand of it having probably damaged the conductors.

Until the end of the cruise, channel 1 and shallow filter was recorded instead of Geotech cable.

VIII SHORE - STATION (fig B)

The shore station was located in Albany Emu Point and worked without any stoppage during the whole survey.

* Latitude $35^{o}00$
* Longitude $117^{o}56$ Est
* IGRF 60598

IX Weather (tables 13, 14, 15)

The weather was not generally fine during this survey, sea state being for most of the time around 4 on the Beaufort scale. Off South - West coast a heavy South West swell was encountered.

Weather was better when shooting in the Great Australian Bight.

Bad weather stopped shooting from 21.08.30 to 22.01.45 and delayed departure from Albany (day 9/10).

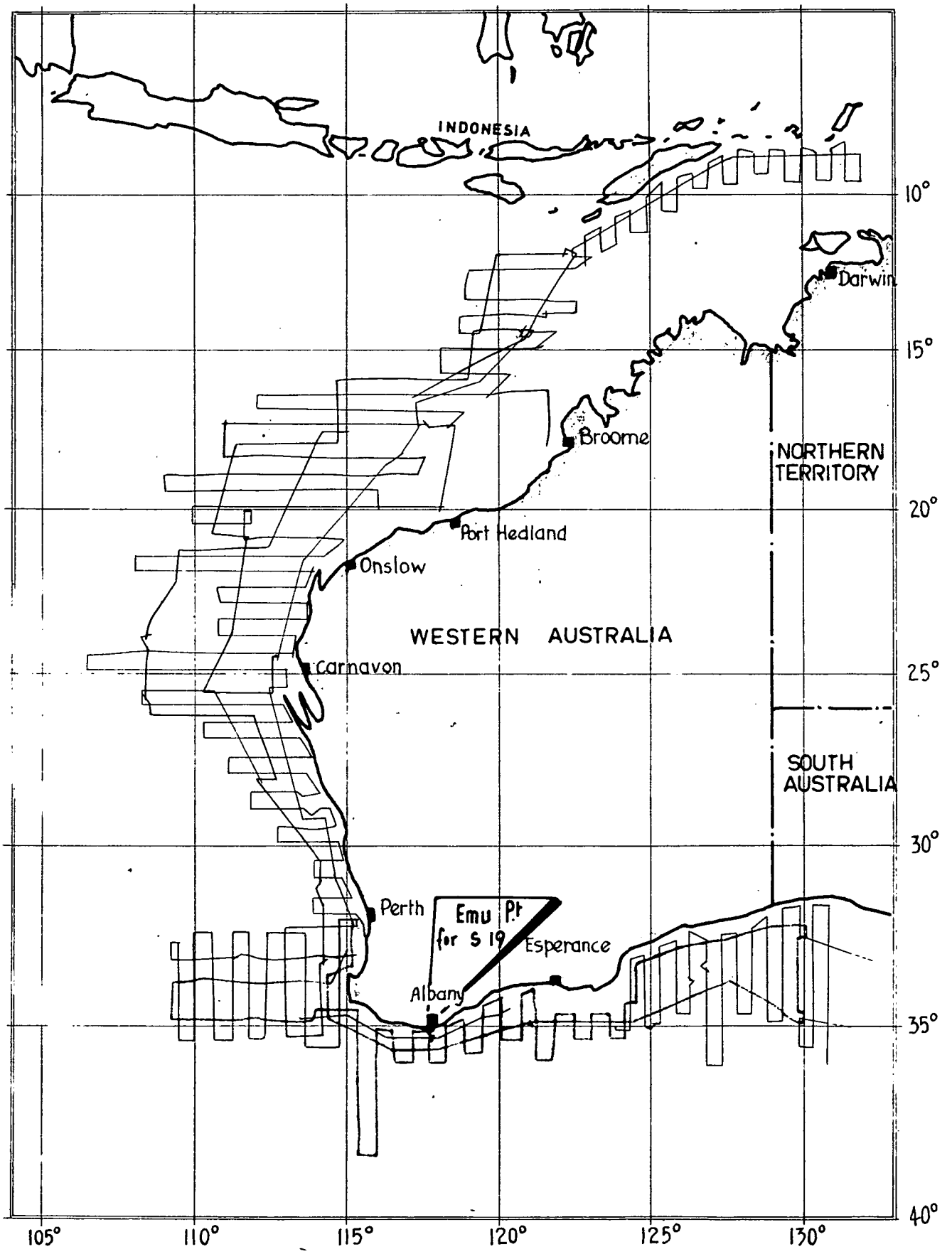
FIG B

SHORE STATIONS

SOUTH, WEST and NORTH COASTS OF AUSTRALIA

SCALE 1 / 20000000

SURVEY 19



SEA STATE CRUISE 1

DAY	Hour	WIND direction (degrés)	WIND speed (knots)	SEA direction	SEA state (Beaufort)	SWELL direction	SWELL high (feet)	TENDENCY
02	0000	180	25	AS WIND	4	200	9	
	0600	"	18		4	"	6	Stationnary
	1200	"	16		4	"	6	
	1800	"	10		3	"	8	Decreasing
03		"	5		2	"	10	
		"	4		2	"	10	stationnary
		"	4		2	"	10	
		"	4		2	"	10	
04		"	4		2	"	8	
		"	4		2	"	8	
		"	4		1	"	6	Decreasing
		"	4		1	"	4	Stationnary
05		270	4		1	"	3	
		"	4		1	210	3	
		090	4		1	220	3	
		270	14		2	"	5	Increasing
06		"	10		3	270	7	
		"	12		3	250	9	stationnary
		"	10		3	"	10	
		"	8		3	"	10	
07		315	22		4	"	10	Increasing
		"	25		5	"	15	
		"	17		5	"	12	stationnary
		"	16		4	"	11	Decreasing
08		270	8		3	"	10	
		"	8		2	"	10	
		"	8		2	"	10	stationnary
		ALBANY						
09								
10		225	3		1	225	5	
		"	5		1	220	5	stationnary
		140	7		2	"	6	Increasing
11		070	12		3	"	8	
		120	12		3	"	8	Stationnary
		130	18		4	"	8	Increasing
		070	20		4	"	8	Stationnary
12		045	12		4	"	8	
		070	20		4	"	8	
		"	16		4	"	8	
		350	12		4	"	6	

SEA STATE CRUISE I

DAY	Hour	WIND direction (degrés)	WIND speed (knots)	SEA direction	SEA state (Beaufort)	SWELL direction	SWELL high (feet)	TENDENCY
13	0000	240	20	AS WIND	5	150	8	Increasing
	0600	"	20		5	"	8	Stationary
	1200	"	16		4	"	8	Decreasing
	1800	250	16		4	"	8	Stationary
14		240	13		4	220	5	
		250	15		4	"	5	
		250	12		3	"	8	Decreasing
		315	12		3	"	8	Stationary
15		330	10		3	"	8	
		330	10		2	"	10	Decreasing
			CALM			"	10	
		130	8		2	"	10	Increasing
16		VARIABLE	5		1	"	8	Decreasing
		230	5		1	"	8	Stationary
		VARIABLE	3		1	"	8	
		"	3		1	"	7	
17		"	3		1	"	4	
		170	10		2	"	4	Increasing
		160	18		3	"	4	
		100	20		3	"	5	Stationary
18		120	10		3	"	4	
		"	24		4	"	4	Increasing
		"	18		4	"	4	Stationary
		080	14		3	"	5	Decreasing
19		"	8		3	"	5	
		060	15		3	"	6	
		"	10		2	"	5	Decreasing
		040	8		2	"	5	Stationary
20		VARIABLE			2	"	5	
		220	8		2	"	4	
		VARIABLE			2	"	4	
		270	12		3	"	5	Increasing
21		230	16		3	230	8	Stationary
		"	22		4	"	14	Increasing
		"	28		5	"	15	
		"	28		6	"	15	
22		220	13		5	220	13	Decreasing
		180	15		4	200	13	
		"	4		3	"	13	
		"	4		2	"	13	
23		270	5		2	220	8	Stationary
		"	5		2	"	8	
		180	5		2	"	4	
		120	5		2	"	4	

SEA STATE CRUISE I

DAY	Hour	WIND direction (degrés)	WIND speed (knots)	SEA direction	SEA state (Beaufort)	SWELL direction	SWELL high (feet)	TENDENCY
24	0000	130	22	AS WIND	3	220	5	Increasing
	0600	180	20		3	"	5	Stationary
	1200	180	20		2	"	3	Decreasing
	1800							

The total stoppage time for bad weather was 35 hours 15 minutes, i.e. 6.3% of total time at sea.

X Supply boat.

No rendez-vous with a supply-boat was carried out during this survey. However 04 hours 30 minutes are accounted as supply boat, being the part of the call at Albany (day 8/9) which can be considered due to supply of the Lady Christine.

XI SHIP - SHORE COMMUNICATIONS

The boat manager was in charge of the shore transceiver which he carried along the south west coast of Australia

GENERAL COMMENTS

I DATA ACQUISITION SYSTEM.

Apart from the failure of the multiverter which essentially prevented the recording of the VLF channels, the data acquisition system operated satisfactorily, allowing magnetic recordings of good quality.

II SEISMIC

* In relation to the seismic container, apart from a few troubles coming from the E.P.C. recorders, it must be pointed out that again the seismic air conditioner needed to be overhauled before the start of this cruise. A newly designed system appears to be indispensable.

* In relation to the seismic cables, it appears that the CGG cables have begun to be fatigued but on the other hand some remarks must be made about the Geotech cable :

* This cable stayed about one whole survey in a workshop to be fixed.

* The quality of the repairs must be questioned: the active part, after four months of use was only held by the clip of the sheath, the tractor cable being broken.

* Four months life for a cable is rather short.

III SOUNDERS

The Atlas and Elac worked satisfactorily. The Raytheon system provided good digital data, but a recorder

in good working state would have improved the quality of the analogue data

IV MAGNETISM

System worked quite satisfactory throughout the survey.

V GRAVITY

Data was recorded quite satisfactory: 92.8% of gravity within criteria. Quick change of gyro emphazises the spare parts problem: availability of one spare gyro permitted very short stoppages of recordings.

VI NAVIGATION

The navigation itself was not affected by the malfunctionning of 2 of the three navigation systems. It can be said also that good checking and knowledge of these navigation aids allowed full use of the possibilities of the D.A.S program. Further processing with calibration factors also will allow the use, in a satisfactory way of all the raw data

CONCLUSIONS

RESULTS

All major systems provided satisfactory data. In relation to the speed, attention must be drawn to an increase in the mean speed allowing the survey of 4017 nautical miles at the average speed of 8.6 knots.

STATISTICAL RESULTS

This last survey of the continental shelf is the one which shows the most important number of working days (when expressed in days per month). This survey is in fact probably what can best be done in relation to the breakdown of working time, stoppage and time at port.

FIGURES

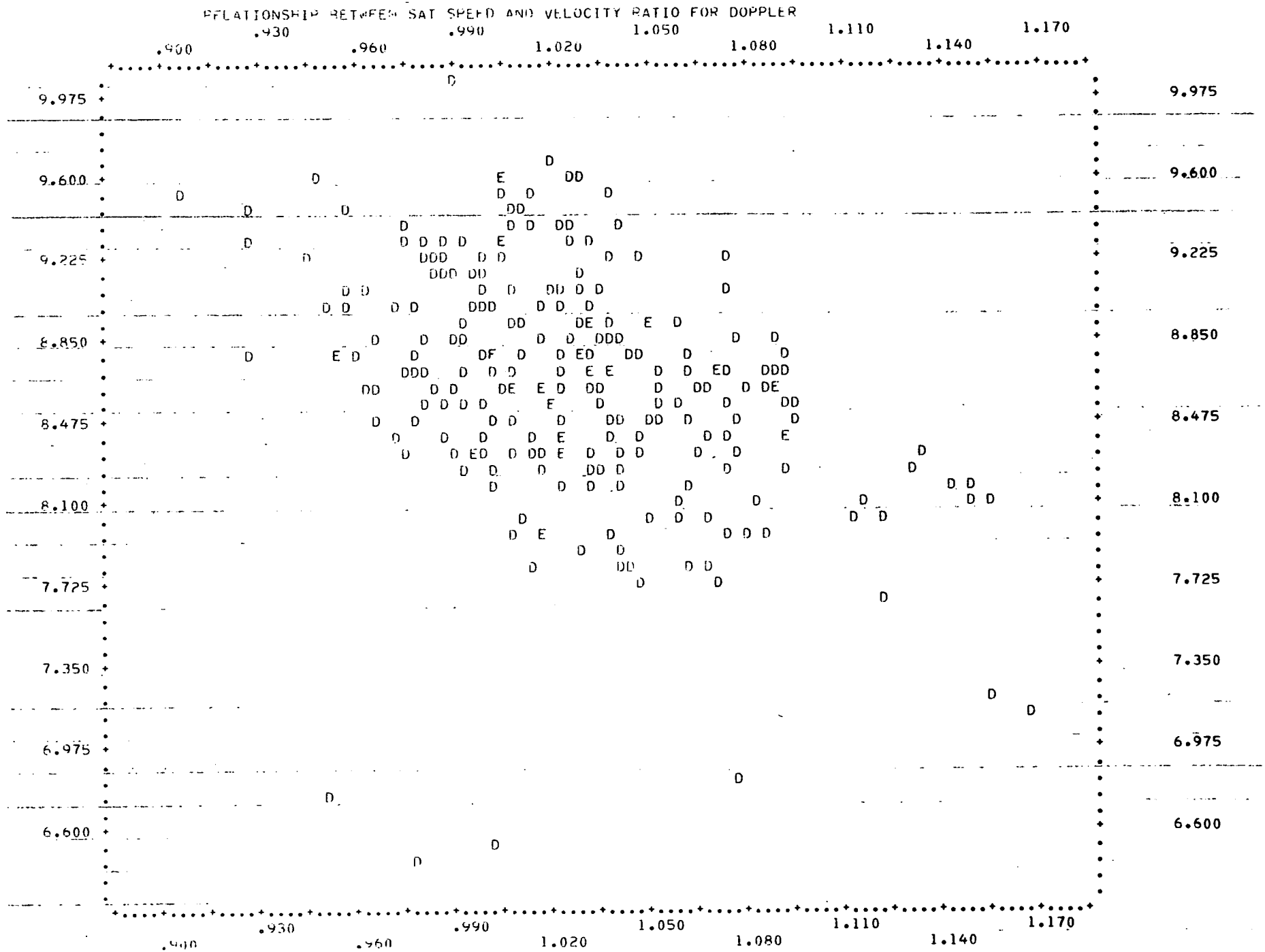

RELATIONSHIP BETWEEN SAT SPEED AND VELOCITY RATIO FOR DOPPLER
.900
.930
.960
.990
1.020
1.050
1.080
1.110
1.140
1.170
9.975
9.600
9.225
8.850
8.475
8.100
7.725
7.350
6.975
6.600

Fig. 4

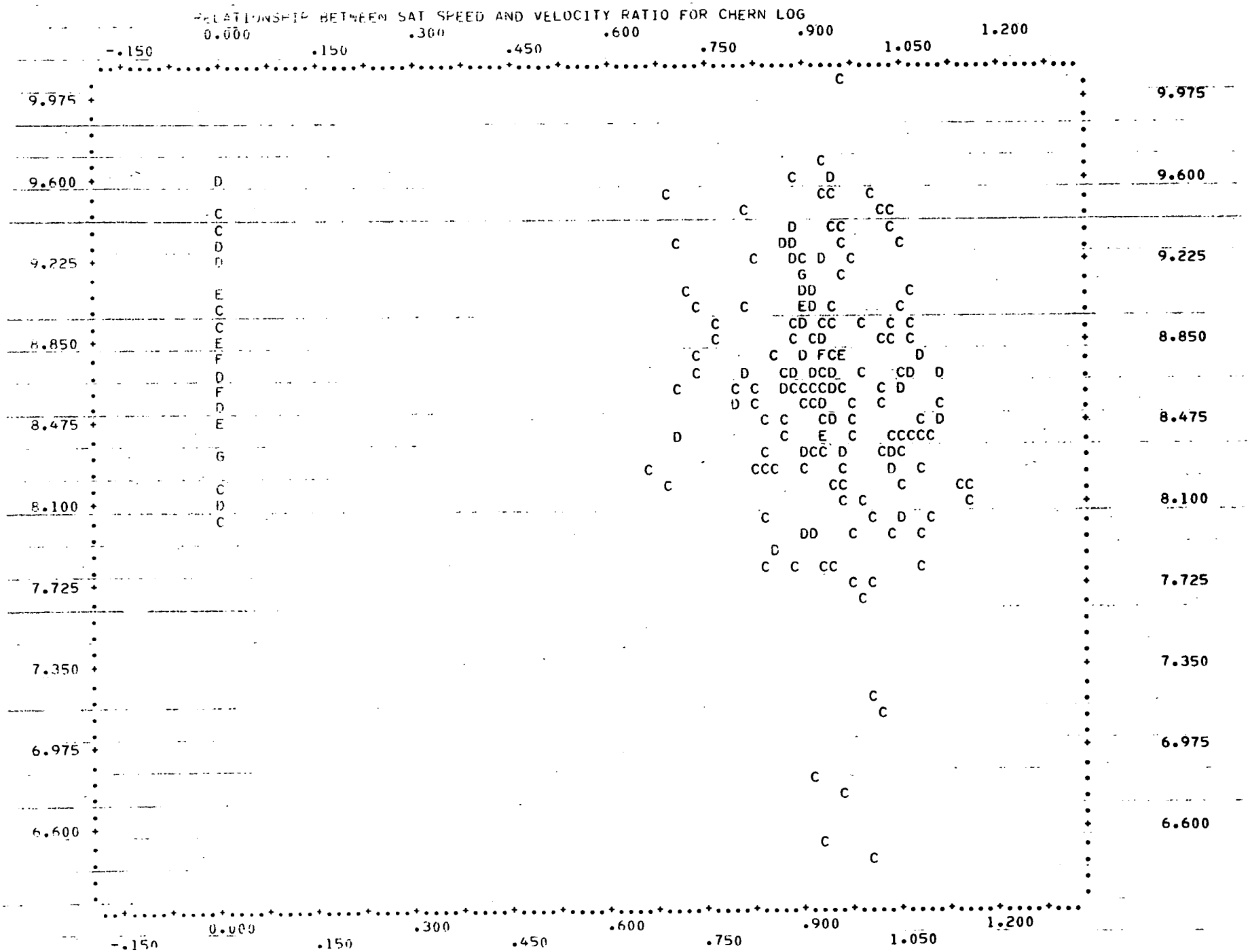

RELATIONSHIP BETWEEN SAT SPEED AND VELOCITY RATIO FOR CHERN LOG
0.000
.300
.600
.900
1.200
-.150
.150
.450
.750
1.050
9.975
9.600
9.225
8.850
8.475
8.100
7.725
7.350
6.975
6.600

Fig. 5

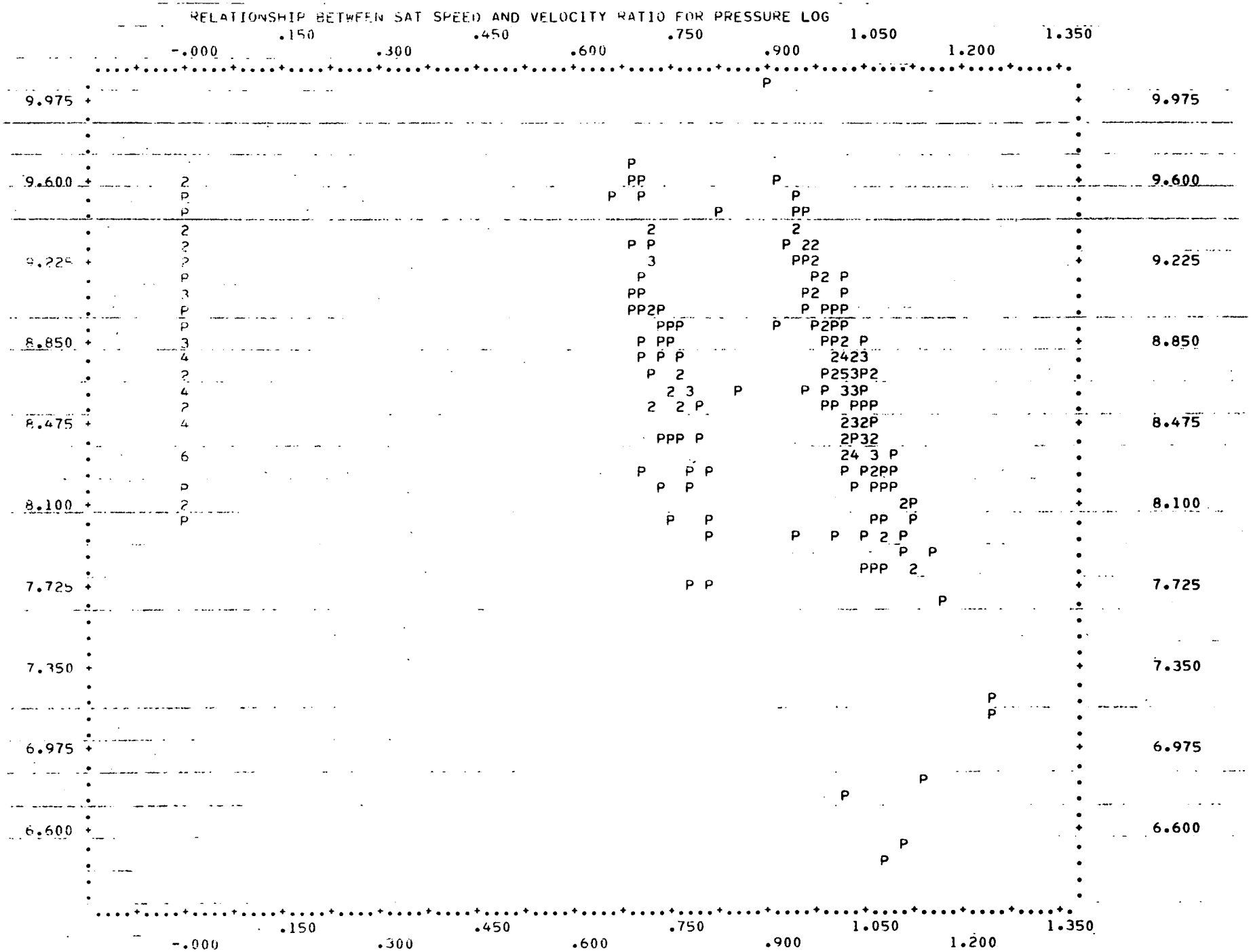

RELATIONSHIP BETWEEN SAT SPEED AND VELOCITY RATIO FOR PRESSURE LOG
-.000
.150
.300
.450
.600
.750
.900
1.050
1.200
1.350
9.975
9.600
9.225
8.850
8.475
8.100
7.725
7.350
6.975
6.600

Fig. 6

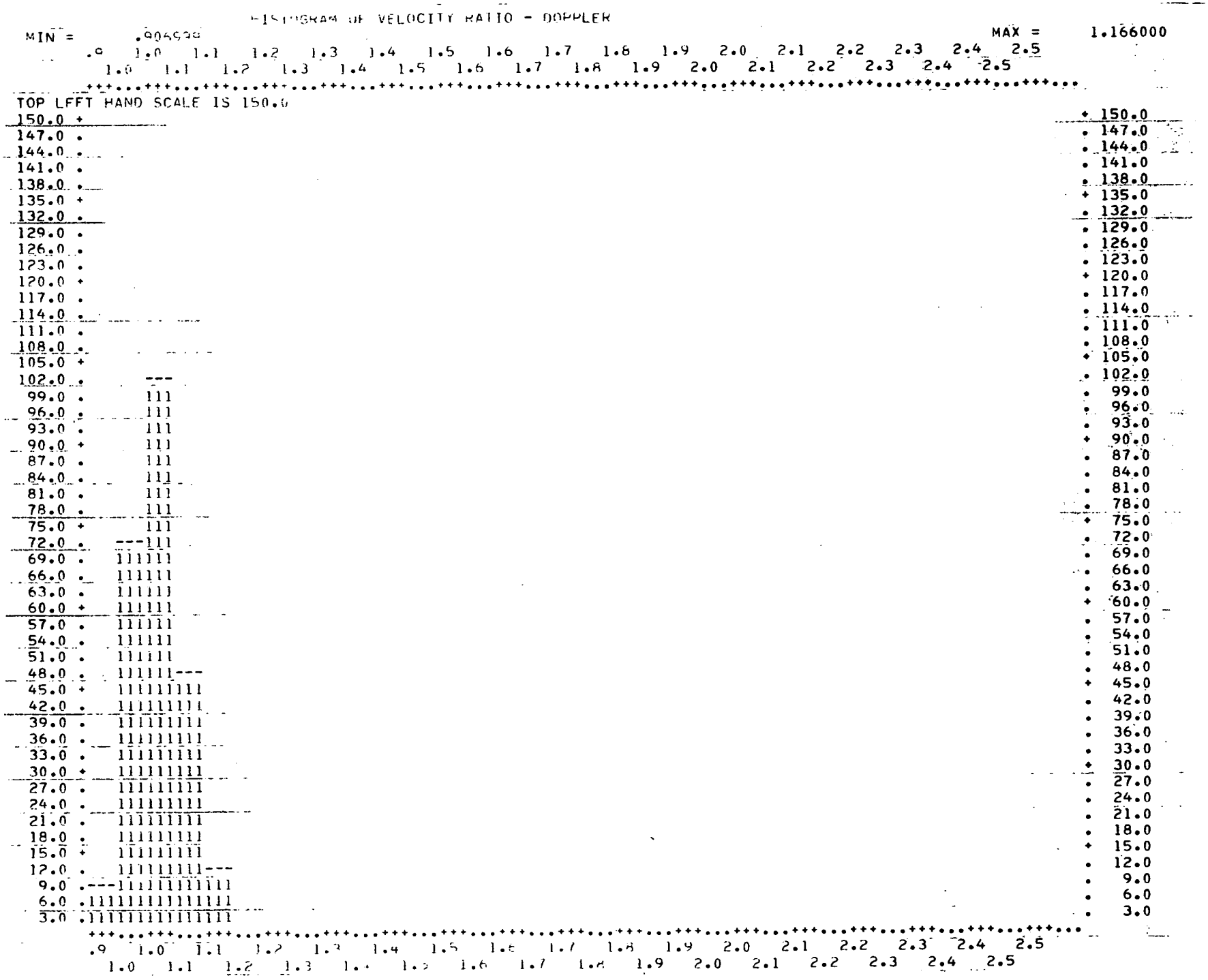

HISTOGRAM OF VELOCITY RATIO - DOPPLER
MIN = .904600
MAX = 1.166000
.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5
1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5
TOP LEFT HAND SCALE IS 150.0
150.0 +
147.0 .
144.0 .
141.0 .
138.0 .
135.0 +
132.0 .
129.0 .
126.0 .
123.0 .
120.0 +
117.0 .
114.0 .
111.0 .
108.0 .
105.0 +
102.0 . ---
99.0 . 111
96.0 . 111
93.0 . 111
90.0 + 111
87.0 . 111
84.0 . 111
81.0 . 111
78.0 . 111
75.0 + 111
72.0 . ---111
69.0 . 111111
66.0 . 111111
63.0 . 111111
60.0 + 111111
57.0 . 111111
54.0 . 111111
51.0 . 111111
48.0 . 111111---
45.0 + 111111111
42.0 . 111111111
39.0 . 111111111
36.0 . 111111111
33.0 . 111111111
30.0 + 111111111
27.0 . 111111111
24.0 . 111111111
21.0 . 111111111
18.0 . 111111111
15.0 + 111111111
12.0 . 111111111---
9.0 .---1111111111111
6.0 .111111111111111
3.0 .111111111111111
.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5
1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5

Fig. 7

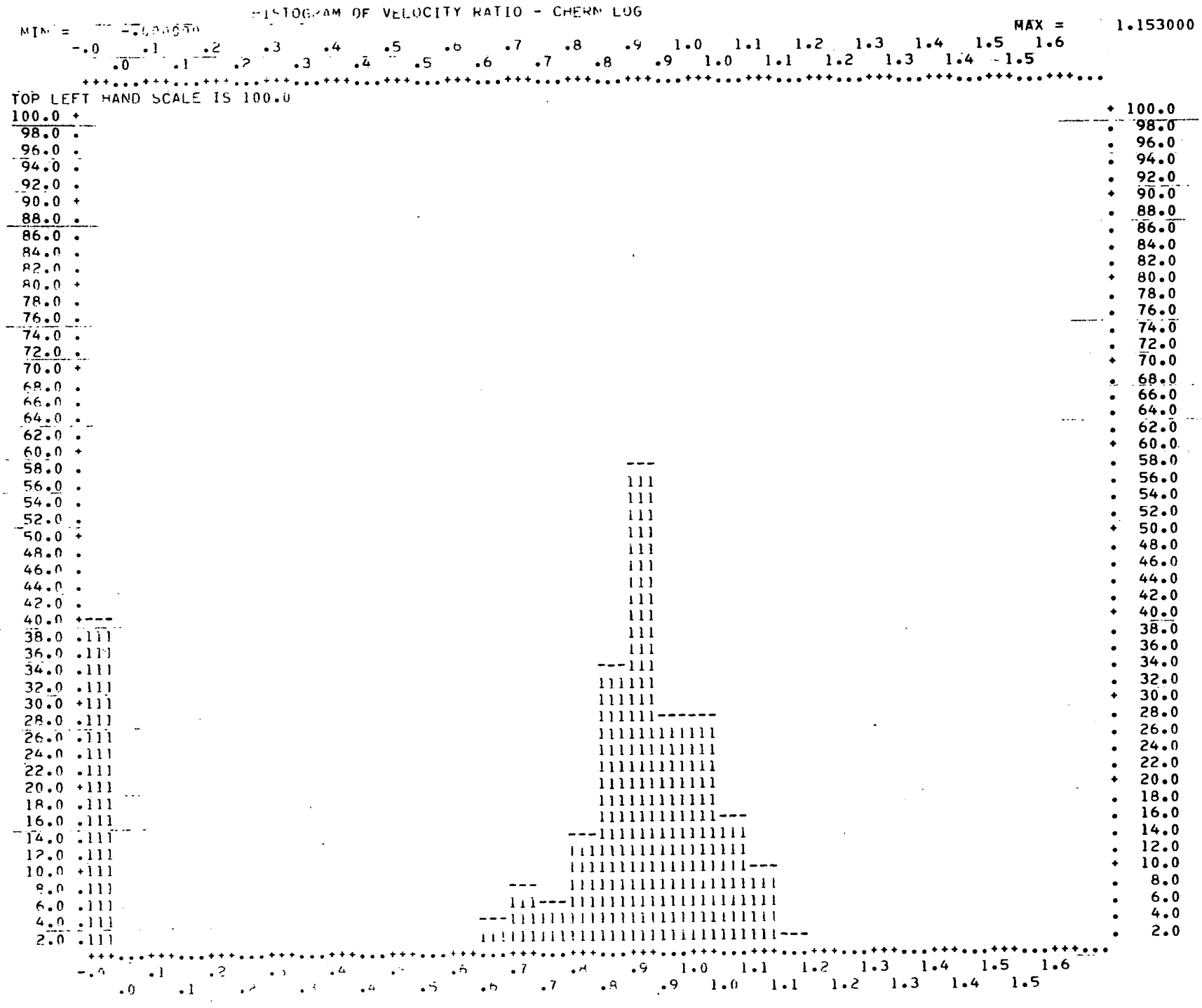

HISTOGRAM OF VELOCITY RATIO - CHERN LOG
MIN =
MAX = 1.153000
TOP LEFT HAND SCALE IS 100.0

Fig. 8

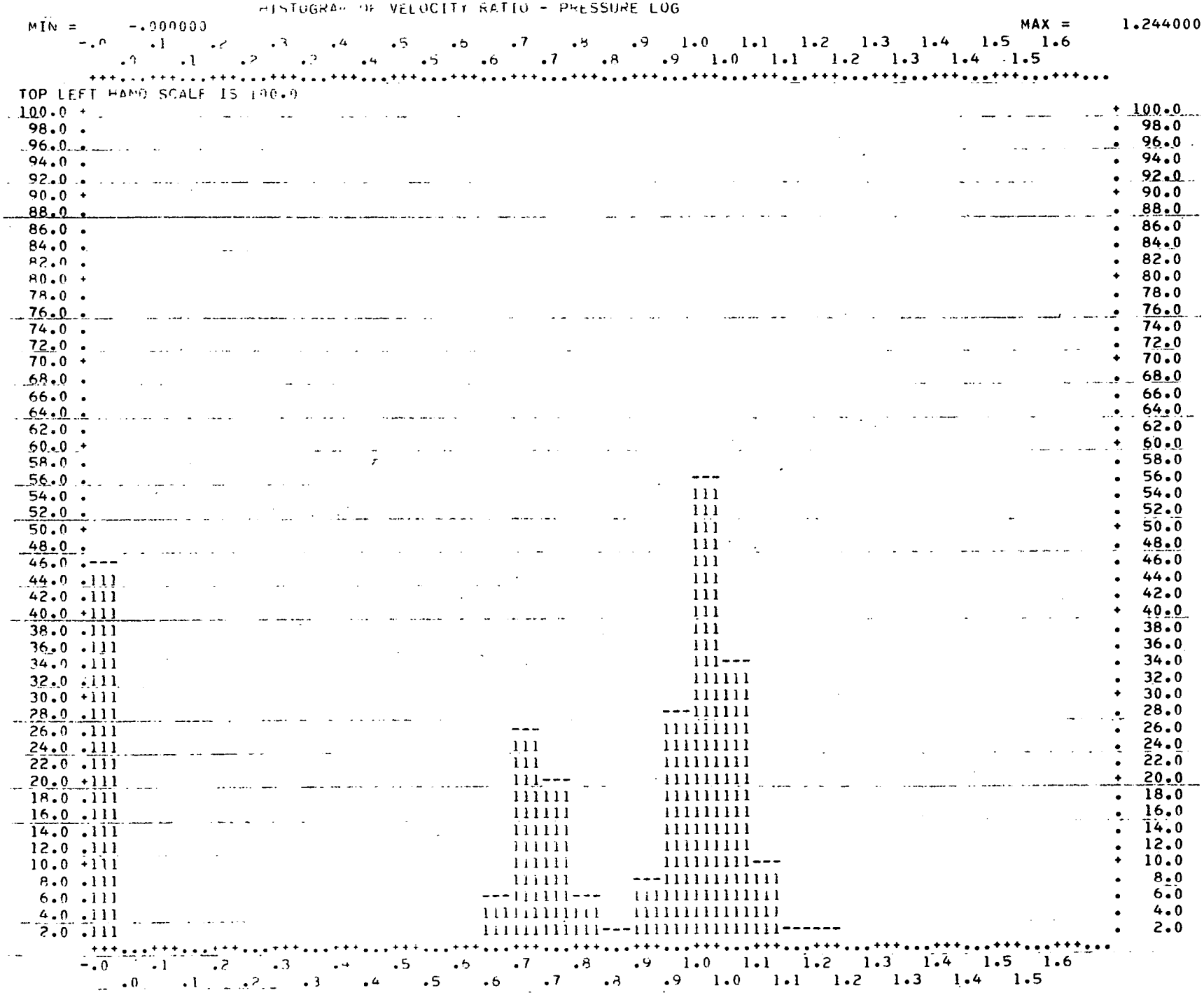

HISTOGRAM OF VELOCITY RATIO - PRESSURE LOG
MIN = -.000000
MAX = 1.244000
-.0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0 1.1 1.2 1.3 1.4 1.5 1.6
.0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0 1.1 1.2 1.3 1.4 1.5
TOP LEFT HAND SCALE IS 100.0
100.0
98.0
96.0
94.0
92.0
90.0
88.0
86.0
84.0
82.0
80.0
78.0
76.0
74.0
72.0
70.0
68.0
66.0
64.0
62.0
60.0
58.0
56.0
54.0
52.0
50.0
48.0
46.0
44.0
42.0
40.0
38.0
36.0
34.0
32.0
30.0
28.0
26.0
24.0
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0

Fig. 9