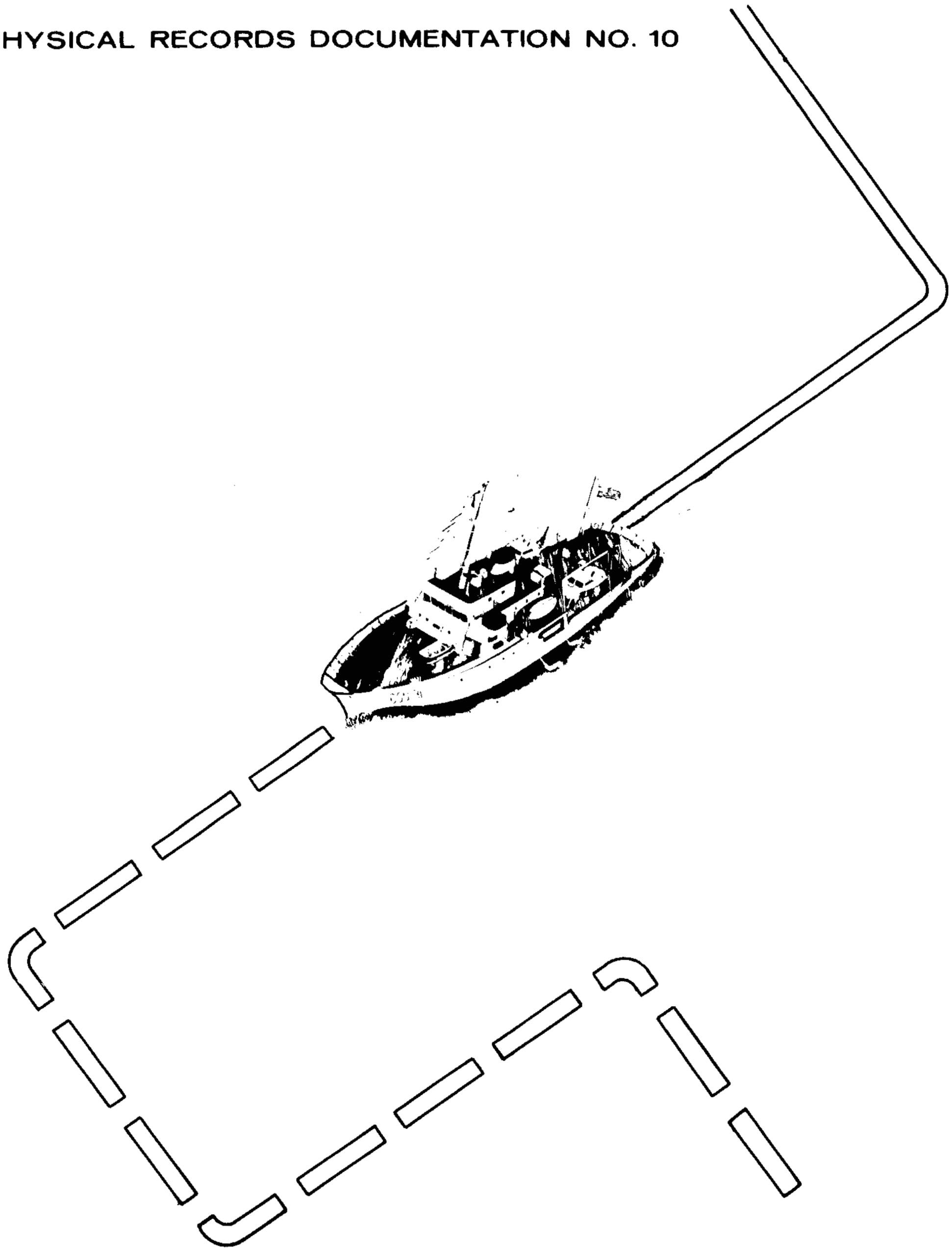
THE MARINE GEOPHYSICAL DATA EXCHANGE FORMAT - 'MGD77'

(Bathymetry, Magnetics, and Gravity)

KEY TO GEOPHYSICAL RECORDS DOCUMENTATION NO. 10
(REVISED)



U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL GEOPHYSICAL AND SOLAR-TERRESTRIAL DATA CENTER
BOULDER, COLORADO

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KGRD No. 10. *The Marine Geophysical Data Exchange Format - 'MGD77' (Bathymetry, Magnetics, and Gravity).*

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(REVISED)

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National Geophysical and Solar-Terrestrial Data Center
Boulder, Colorado
September 1977
December 1981 (Revised)

ACKNOWLEDGMENTS

To acknowledge the numerous contributors to this undertaking is a difficult task. However, I would like to thank those whose contributions have been the most important. I first would like to thank Fred Walton for having the concept of the "Workshop for Marine Geophysical Data Formats" and for his leadership in its initial stages. We at NGSDC will miss Fred's initiative and wish him luck in his new career.

The participants in the workshop (whose names appear on the following page) demonstrated remarkable commitment to this format's development. Through the constructive process of debate, they arrived at a consensus that reflected deliberate, thoughtful, and innovative approaches.

At the conclusion of the workshop, a six-member task group was established; these names appear as coauthors of this publication. Through several draft versions, this group donated countless hours (that were rigidly controlled by short deadlines) critiquing the format, debating alternative approaches (often through tedious, long-distance telephone calls), and finally reaching the consensus that appears here.

Members of the NGSDC staff have also supported this endeavor. In particular, I would like to acknowledge the assistance of Daniel Metzger, Lt. Christopher Lawrence, Nettie Holmberg, and David Clark.

Allen M. Hittelman

Allen M. Hittelman
National Geophysical and Solar-
Terrestrial Data Center
September 1977

PARTICIPANTS IN THE WORKSHOP FOR MARINE GEOPHYSICAL DATA FORMATS

Boulder, Colorado

January 18-20, 1977

Norman Bailey	U.S. Geological Survey, Woods Hole, Mass.
James Chandlee	Defense Mapping Agency Hydrographic Center, Suitland, Md.
Thomas Chase	U.S. Geological Survey, Menlo Park, Calif.
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Fred Walton	NGSDC/NOAA, Boulder, Colo.

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*Members of task group finalizing format.

PREFACE TO REVISION (1981)

The MGD77 format has experienced much success during the past 4 years. It has been sanctioned by the Intergovernmental Oceanographic Commission (IOC) as an accepted standard for international data exchange, and it has been translated into French, Japanese, and Russian.

The format also has become the foundation for an interactive, graphical inventory system at the National Geophysical and Solar-Terrestrial Data Center (NGSDC). This inventory file, which is routinely accessed remotely by data users in academia and industry, integrates the documentation portion of the format with a subset of the navigational information from the data record. As of November 1981, the data base maintained by NGSDC contained approximately 12.2 million data records.

In this revision, some changes have been made either to clarify ambiguities or to correct minor errors. All sections that have been revised are highlighted by the following symbol, ✱.

CONTENTS

INTRODUCTION

Since June 1972, the marine geophysical community has used data exchange formats designed and recommended by an ad hoc working group for the Ocean Science Committee (of the National Academy of Sciences/National Research Council). These formats have been successfully used and have contributed substantially to improvements in data exchange and data management practices. During the use of these exchange formats, deficiencies primarily relating to lack of sufficient detail and documentation have been identified. Informal discussions with many users in industry, government (both national and international), and academia prompted the National Geophysical and Solar-Terrestrial Data Center to host a workshop with a representative group of marine geophysical data contributors and users. The "Workshop for Marine Geophysical Data Formats" was held in Boulder, Colorado, on January 18-20, 1977. Twenty-four participants attended the workshop, and from these, six were selected to be members of a task group which would formalize the results of the meeting.

At the start of the Workshop for Marine Geophysical Data Formats, five underlying themes were expressed: (1) include documentation with the data, (2) expand contents of the data record, (3) increase precision of the data parameters, (4) allow data record length to exceed 80 characters, and (5) include sufficient flexibility to circumvent the need for frequent data format revisions. These concerns provided the foundation for the "MGD77" format, which include: (a) a header structure that documents the data and permits growth to a dynamic formatting system, and (b) a data record (of 120 characters) with increased content and precision.

To finalize the format, the workshop recommended the formation and membership of a task group, the framework in which they should operate, and a distribution list from which they should solicit recommendations on draft forms of the format.

The participants recommended that all future submissions of marine geophysical data to the data center be in the new format; however, the data center should support both the existing (merge-merge) and the new (MGD77) formats allowing for transition over a period of time.

The task group concluded that workshops such as these are exceptionally valuable and should be scheduled periodically. They provide a valuable forum in which open dialogue can solve common problems and facilitate greater cooperation.

During the workshop, the participants were advised by a representative of the International Oceanographic Commission (IOC) of a general data exchange format (known as "GF-2") that was being proposed by the IOC as the basis for international exchange of marine geophysical data. This format is a modification of an exchange format developed by the Global Atmospheric Research Programme (GARP) for their Atlantic Tropical Experiment (GATE). Although time and conditions did not permit a thorough presentation of this format, it was the consensus of the workshop participants to try to define the underway marine geophysical exchange format to contain dynamic information similar to the "GF-2" format. During subsequent deliberation, the majority of the task group felt that it was undesirable to make this format a "subset" of the GATE or "GF-2" format; furthermore, they believed that although a dynamic format was desirable, the development of such a system would require extensive further discussions (which might take a year or more) and that a format should be established immediately to eliminate the shortcomings of the present format. The "MGD77" format was designed to accomplish this immediate requirement while permitting expansion to a dynamic format at a future date. (The National Geophysical and Solar-Terrestrial Data Center hopes to sponsor periodic "workshops" in marine geology and geophysics; this issue is certainly an appropriate topic for such a forum.) The "MGD77" format is intended to replace the 1972 exchange format; all data prepared in this format would be acceptable to an expanded dynamic system.

In February and March 1977, draft versions of this format were distributed to approximately 60 scientists throughout the world; critiques were received from the following organizations:

1. Atlantic Oceanographic and Meteorological Laboratory, NOAA
2. Bedford Institute of Oceanography, Nova Scotia
3. Center for Experimental Design and Data Analysis, NOAA
4. Defense Mapping Agency Hydrographic Center
5. Lamont-Doherty Geological Observatory
6. National Geophysical and Solar-Terrestrial Data Center, NOAA
7. Naval Ocean Research and Development Activity
8. Oregon State University
9. Scripps Institution of Oceanography
10. U.S. Geological Survey, Menlo Park, Calif.
11. U.S. Geological Survey, Woods Hole, Mass.
12. University of Hawaii at Manoa
13. University of Rhode Island
14. Woods Hole Oceanographic Institution

GENERAL DESCRIPTION

The digital magnetic tape format presented, to be referred to as "MGD77," is an exchange format for marine geophysical data (bathymetry, magnetics, and gravity). It is intended to be used for the transmission of data to and from a data center, and may be useful for the exchange of data between marine institutions.

1. For the purpose of data exchange, the physical and recording characteristics of the digital magnetic tapes are as follows:

(a) Magnetic tapes are ½ inch (12.7 mm) wide with a maximum reel diameter of 10½ inches (266.7 mm) and a maximum length of 2,400 feet (732 m).

* (b) Magnetic tapes are unlabeled and can be recorded either as BCD, 7-track, or ASCII or EBCDIC, 9-track. Tape densities will be established between the exchanging parties. (NOTE: The preferred recording parameters are ASCII, 9-track, 1,600 BPI.)

2. The tape structure consists of physical records (which contain either header or data information), separated by interrecord gaps (IRG) and organized into files. The files are separated by end-of-file marks (EOFs) (sometimes called tape marks), in the sequence:

file header record - type "1"	(one to four physical records)	File #1
:		
file header record - type "2"	(zero to four physical records)	
:		
physical data record - type "3"	(as many records as required)	
EOF		
file header record - type "1"	(one to four physical records)	File #2
:		
file header record - type "2"	(zero to four physical records)	
:		
physical data record - type "3"	(as many records as required)	
:		
EOF		
:		
:		
:		
file header record - type "1"	(one to four physical records)	File #N (last file on tape)
:		
file header record - type "2"	(zero to four physical records)	
:		
physical data record - type "3"	(as many records as required)	
EOF		
EOF		

3. Unless specifically agreed upon in advance by exchange participants, all physical records will
* be 1,920 characters in length.

4. The type of record is identified by the first character of each physical record (i.e., 1,920-character unit) and also the first character in each logical data record (i.e., 120-character unit).

5. A file is defined as all observations that conveniently constitute a data set (e.g., a port-to-port survey). A file ideally should not span two tapes; however, if a file is too long to fit onto one magnetic tape, it can be continued on additional reels, repeating the header information. (NOTE: Indicate tape sequence on external tape label.)

6. While all alphanumeric characters are acceptable, to simplify BCD-EBCDIC conversions limit the use of special characters to the following:

. period
, comma
* asterisk
+ plus
- minus
= equal
(left parenthesis
) right parenthesis
/ slash

* 7. If a field is 0's filled, the sign column should contain a +; if the field is 9's filled, it should contain a 9.

THE HEADER RECORD

The purpose of the header records is to document both the content and structure of the geophysical data contained within subsequent data records. In general, documentation that is constant throughout the cruise will be in the header records, while documentation that is variable will be in the data record.

The "MGD77" format allows for two different kinds of headers--type "1" and type "2". Within this publication, header type "1" is precisely defined both for content and structure, while header type "2" is being reserved for future use (at such time as the marine geophysical community develops a self-documenting dynamic formatting system).

Each header record consists of 1,920 characters, containing fields which are both fixed and freely formatted. All fields within the header that have not been coded with information should be blank-filled, and all plain language statements should be left-justified.

HEADER RECORD--TYPE "1"

Header record type "1" is the only header record which is *required* by the format. It consists of a "sequence" of twenty-four 80-character images; thus, it is easily coded on keypunch cards. Furthermore, the field lengths within the header record are designed to allow one to read the information (by computer) as a series of 120-character logical records--the same logical record length as the data records. Within a file of data, there *must* appear at least one and at most four type "1" header records:

Header record-type "1" (containing sequence numbers 01-24)	*mandatory*
IRG	
Header record-type "1" (containing sequence numbers 25-48)	*optional*
IRG	
Header record-type "1" (containing sequence numbers 49-72)	*optional*
IRG	
Header record-type "1" (containing sequence numbers 73-96)	*optional*
IRG	
:	
.	

The following is a detailed description of the first header record. To help the marine geophysical community prepare this documentation, a coding pad is available free of charge from the National Geophysical and Solar-Terrestrial Data Center; a sample page is included as a foldout on page 11.

First Type "1" Header Record

Sequence No. 1

Character Nos.	Length of field	Code	Description
1	1	I1	RECORD TYPE - Set to "1".
2-9	8	8A1	CRUISE IDENTIFIER - internal survey identifier, as it appears in the data record (characters 2-9).
10-14	5	5A1	FORMAT ACRONYM - Set to "MGD77".
15-22	8	I8	DATA CENTER FILE NUMBER - reserved for the use of the data center. Contributing institutions should leave blank.
23	1	I1	NUMBER OF TYPE "1" HEADERS - (i.e., 1-4).
24	1	I1	NUMBER OF TYPE "2" HEADERS - Since type "2" is reserved for future use, set to "0".

Sequence No. 1 (Cont.)

<table>
<tr><th>Character Nos.</th><th>Length of field</th><th>Code</th><th>Description</th></tr>
<tr><td>25-26</td><td>2</td><td>I2</td><td>NUMBER OF DATA PARAMETERS - Set to "29".</td></tr>
<tr><td>27-31</td><td>5</td><td>5I1</td><td>PARAMETERS SURVEYED CODE
<table>
<tr><th>COLUMN NO.</th><th>PARAMETER SURVEYED</th></tr>
<tr><td>27</td><td>bathymetry (e.g., 12 kHz or 3.5 kHz used for digitized bathymetry)</td></tr>
<tr><td>28</td><td>magnetics</td></tr>
<tr><td>29</td><td>gravity</td></tr>
<tr><td>30</td><td>high-resolution seismics (e.g., 3.5 kHz)</td></tr>
<tr><td>31</td><td>deep penetration seismics (e.g., large airgun)</td></tr>
</table>
CODE - (for columns 27-31)
0 or blank - Unspecified
1 - Parameter NOT surveyed
3 - Parameter surveyed, not contained in file
5 - Parameter surveyed, contained in file.</td></tr>
<tr><td>32-37</td><td>6</td><td>3I2</td><td>FILE CREATION DATE (YYMMDD).</td></tr>
<tr><td>38-78</td><td>41</td><td>41A1</td><td>CONTRIBUTING INSTITUTION - *in plain language*.</td></tr>
<tr><td>79-80</td><td>2</td><td>I2</td><td>SEQUENCE NUMBER - Set to "01".</td></tr>
<tr><td colspan="4">Sequence No. 2</td></tr>
<tr><td>1-18</td><td>18</td><td>18A1</td><td>COUNTRY - *in plain language*.</td></tr>
<tr><td>19-39</td><td>21</td><td>21A1</td><td>PLATFORM NAME - *in plain language*.</td></tr>
<tr><td>40</td><td>1</td><td>I1</td><td>PLATFORM TYPE CODE
0 - Unspecified
1 - Surface ship
2 - Submersible ship
3 - Aircraft
4 - Buoy
5 - Mobile land
6 - Fixed land
7 - Deep tow
8 - Anchored seafloor instrument
9 - Other, specify in following platform type field, columns 41-46.</td></tr>
<tr><td>41-46</td><td>6</td><td>6A1</td><td>PLATFORM TYPE - *in plain language* (e.g., "SHIP", "PLANE", "SUB", etc.).</td></tr>
<tr><td>47-78</td><td>32</td><td>32A1</td><td>CHIEF SCIENTIST(S) - *in plain language*.</td></tr>
<tr><td>79-80</td><td>2</td><td>I2</td><td>SEQUENCE NUMBER - Set to "02".</td></tr>
<tr><td colspan="4">Sequence No. 3</td></tr>
<tr><td>1-58</td><td>58</td><td>58A1</td><td>PROJECT, CRUISE & LEG - *in plain language* (e.g., "SURVOPS 6-69", "INDOPAC, Leg 3", "UNITED GEO I - Leg 1", etc.).</td></tr>
<tr><td>59-78</td><td>20</td><td>20A1</td><td>FUNDING - *in plain language* (e.g., agency or institution).</td></tr>
<tr><td>79-80</td><td>2</td><td>I2</td><td>SEQUENCE NUMBER - Set to "03".</td></tr>
</table>

Sequence No. 4

Character Nos.	Length of field	Code	Description
1-6	6	3I2	SURVEY DEPARTURE DATE (YYMMDD).
7-40	34	34A1	PORT OF DEPARTURE - *in plain language* (i.e., city, country).
41-46	6	3I2	SURVEY ARRIVAL DATE (YYMMDD).
47-78	32	32A1	PORT OF ARRIVAL - *in plain language* (i.e., city, country).
79-80	2	I2	SEQUENCE NUMBER - Set to "04".
Sequence No. 5			
1-40	40	40A1	NAVIGATION INSTRUMENTATION - *in plain language* (e.g., "SAT/LORAN A/SEXTANT").
41-78	38	38A1	POSITION DETERMINATION METHOD - *in plain language* (e.g., "PRIM - SATELLITE, SEC-LORAN A").
79-80	2	I2	SEQUENCE NUMBER - Set to "05".
Sequence No. 6			
1-40	40	40A1	BATHYMETRY INSTRUMENTATION - *in plain language*. Include information such as frequency, beam width, and sweep speed of recorder.
41-78	38	38A1	ADDITIONAL FORMS OF BATHYMETRY DATA - *in plain language* (e.g., "MICROFILM", "ANALOG RECORDS", etc.).
79-80	2	I2	SEQUENCE NUMBER - Set to "06".
Sequence No. 7			
1-40	40	40A1	MAGNETICS INSTRUMENTATION - *in plain language* (e.g., "PROTON PRECESSION MAG-GEOMETRICS G-801").
41-78	38	38A1	ADDITIONAL FORMS OF MAGNETICS DATA - *in plain language* (e.g., "PUNCH TAPE", "ANALOG RECORDS", etc.).
79-80	2	I2	SEQUENCE NUMBER - Set to "07".
Sequence No. 8			
1-40	40	40A1	GRAVITY INSTRUMENTATION - *in plain language* (e.g., "L and R S-26").
41-78	38	38A1	ADDITIONAL FORMS OF GRAVITY DATA - *in plain language* (e.g., "MICROFILM", "ANALOG RECORDS", etc.).
79-80	2	I2	SEQUENCE NUMBER - Set to "08".

Sequence No. 9

Character Nos.	Length of field	Code	Description
1-40	40	40A1	SEISMIC INSTRUMENTATION - *in plain language*. Include the size of the sound source, the recording frequency filters, and the number of channels (e.g., "1700-CU IN. AIRGUN, 8-62 HZ, 36 CHANNELS").
41-78	38	38A1	FORMATS OF SEISMIC DATA - *in plain language* (e.g., "DIGITAL", "MICROFILM", "NEGATIVES", etc.).
79-80	2	I2	SEQUENCE NUMBER - Set to "09".

Sequence No. 10

1	1	A1	FORMAT TYPE - Set to "A", which means format contains integers, floating points, and alphanumerics.
2-75	74	74A1	FORMAT DESCRIPTION - This is one method of reading (not writing) the data in *FORTRAN*. Set to the following: "(I1, A8, F5.2, 4I2, F5.3, F8.5, F9.5, I1, F6.4, F6.1, I2, I1, 3F6.1, I1, F5.1, F6.0, F7.1,". (NOTE: continued in sequence number 11.)
76-78	3	blank	
79-80	2	I2	SEQUENCE NUMBER - Set to "10".

Sequence No. 11

1-17	17	17A1	FORMAT DESCRIPTION - (continued). Set to the following: "F6.1, F5.1, A8, 4I1)".
18-78	61	blank	
79-80	2	I2	SEQUENCE NUMBER - Set to "11".

Sequence No. 12

1-3	3	F3.1	GENERAL DIGITIZING RATE OF BATHYMETRY - This rate is that which is present within the data records; its precision is 0.1 minute. If there is no general digitizing rate, fill with 9s (e.g., if values were coded every 5 minutes, set to "050").
4-15	12	12A1	GENERAL SAMPLING RATE OF BATHYMETRY - *in plain language*. This rate is instrumentation-dependent (e.g., "1/SECOND").
16-20	5	F5.1	ASSUMED SOUND VELOCITY - Accurate to 0.1 meter/sec. Historically, in the U.S. this speed has been 800 fathoms/sec, which equals 1463.0 meters/sec.; however, some recorders have a calibration of 1500 meters/sec (e.g., "14630").

Sequence No. 12 (Cont.)

Character Nos.	Length of field	Code	Description
21-22	2	I2	BATHYMETRY DATUM CODE 00 - No correction applied (sea level) 01 - Lowest normal low water 02 - Mean lower low water 03 - Lowest low water 04 - Mean lower low water spring 05 - Indian spring low water 06 - Mean low water spring 07 - Mean sea level 08 - Mean low water 09 - Equatorial spring low water 10 - Tropic lower low water 11 - Lowest astronomical tide 88 - Other, specify in additional documentation portion of header. * (NOTE: One should not confuse these codes, which correct bathymetry values to a common datum, with corrections for transducer depth or Matthews Zones.)
23-78	56	56A1	INTERPOLATION SCHEME - *in plain language*. This field allows for a description of the interpolation scheme used, should some of the data records contain interpolated values (e.g., "5-MINUTE INTERVALS AND PEAKS AND TROUGHS").
79-80	2	I2	SEQUENCE NUMBER - Set to "12".
Sequence No. 13			
1-3	3	F3.1	GENERAL DIGITIZING RATE OF MAGNETICS - This rate is that which is present within the data records; its precision is 0.1 minute. If there is no general digitizing rate, fill with 9s.
4-5	2	I2	GENERAL SAMPLING RATE OF MAGNETICS - This rate is instrumentation-dependent and the precision is 1 second (e.g., if the pulse rate is every 3 seconds, set to "03").
6-9	4	I4	MAGNETIC SENSOR TOW DISTANCE - This is the distance from the navigation reference to the leading sensor; its precision is 1 m.
10-14	5	F5.1	SENSOR DEPTH - This is the estimated depth of the lead magnetic sensor to the nearest 0.1 m. *
15-17	3	I3	HORIZONTAL SENSOR SEPARATION - If two sensors are used, this is their separation distance; its precision is 1 m.
18-19	2	I2	REFERENCE FIELD CODE - This is the reference field used to determine the residual magnetics: 00 - Unused 01 - AWC 70 02 - AWC 75 03 - IGRF-65 04 - IGRF-75 05 - GSFC-1266 06 - GSFC 0674 (POGO 0674) 07 - UK 75 08 - POGO 0368 09 - POGO 1068 10 - POGO 0869 88 - Other, specify in following field, columns 20-31. *

Sequence No. 13 (Cont.)

Character Nos.	Length of field	Code	Description
20-31	12	12A1	REFERENCE FIELD - *in plain language.*
32-78	47	47A1	METHOD OF APPLYING RESIDUAL FIELD - *in plain language.* The procedure used in applying this reduction to the data (e.g., "LINEAR INTERP. IN 60 MI. SQUARE").
79-80	2	I2	SEQUENCE NUMBER - Set to "13".
Sequence No. 14			
1-3	3	F3.1	GENERAL DIGITIZING RATE OF GRAVITY - This rate is that which is present within the data records; its precision is 0.1 minute. If there is no general digitizing rate, fill with 9s.
4-5	2	I2	GENERAL SAMPLING RATE OF GRAVITY - This rate is instrumentation dependent; its precision is 1 second. If recording is continuous, set to "00".
6	1	I1	THEORETICAL GRAVITY FORMULA CODE - 1 - Heiskanen 1924 $\gamma_o = 978.052\ (1 + 0.005\ 285 \sin^2\Phi - 0.000\ 0070 \sin^2 2\Phi + 0.000\ 027 \cos^2\Phi \cos^2 (\lambda - 18°))$ 2 - International 1930 $\gamma_o = 978.0490\ (1 + 0.005\ 2884 \sin^2\Phi - 0.000\ 0059 \sin^2 2\Phi)$ 3 - IAG System 1967 $\gamma_o = 978.03185\ (1 + 0.005\ 278895 \sin^2\Phi + 0.000\ 023462 \sin^4\Phi)$ 8 - Other - specify in the following field, columns 7-23.
* 7-23	17	17A1	THEORETICAL GRAVITY FORMULA - *in plain language* (e.g., "INTERNATIONAL '30", "IAG SYSTEM (1967)", etc.).
24	1	I1	REFERENCE SYSTEM CODE - This identifies the reference field: 1 - Local system - specify in the following field, columns 25-40. 2 - Potsdam system 3 - System IGSN 71 9 - Other, specify in the following field, columns 25-40.
25-40	16	16A1	REFERENCE SYSTEM - *in plain language* (e.g., "POTSDAM SYSTEM", "SYSTEM IGSN 71", etc.).
41-78	38	38A1	CORRECTIONS APPLIED - *in plain language.* Drift, tare, and bias corrections applied (e.g., "+0.075 MGAL PER DAY").
79-80	2	I2	SEQUENCE NUMBER - Set to "14".

Sequence No. 15

Character Nos.	Length of field	Code	Description
1-7	7	F7.1	DEPARTURE BASE STATION GRAVITY - Represents gravity at sea level; its precision is 0.1 mgal.(Network value preferred.) *
8-40	33	33A1	DEPARTURE BASE STATION DESCRIPTION - *in plain language.* Indicates name and number of station.
41-47	7	F7.1	ARRIVAL BASE STATION GRAVITY - Represents gravity at sea level; its precision is 0.1 mgal.(Network value preferred.) *
48-78	31	31A1	ARRIVAL BASE STATION DESCRIPTION - *in plain language.* Indicates name and number of station.
79-80	2	I2	SEQUENCE NUMBER - Set to "15".
Sequence No. 16			
1-2	2	I2	NUMBER OF 10-DEGREE IDENTIFIERS - This is the number of 4-digit 10-degree identifiers, excluding the "9999" flag, which will follow this field (see appendix 1).
3	1	blank	*
4-78	75	15(I4,1X)	10-DEGREE IDENTIFIERS - This is a series of 4-digit codes, separated by commas, which identify the 10-degree squares through which the survey collected data (see appendix 1). Code "9999" after last identifier.
79-80	2	I2	SEQUENCE NUMBER - Set to "16".
Sequence No. 17			
1-75	75	15(I4,1X)	10-DEGREE IDENTIFIERS - (continued). *
76-78	3	blank	
79-80	2	I2	SEQUENCE NUMBER - Set to "17".
Sequence Nos. 18-24			
1-78	78	78A1	ADDITIONAL DOCUMENTATION - *in plain language.* This is a freely formatted field.
79-80	2	I2	SEQUENCE NUMBER - Set equal to "18" through "24", sequentially.

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*Fields 1-78 in sequence numbers 16 and 17 may be blank filled by the contributing institution. The data center can determine these codes by a computer search of the latitudes and longitudes within the tape file.

National Oceanic and Atmospheric Administration
Environmental Data Service
National Geophysical and Solar-Terrestrial Data Center

MARINE GEOPHYSICAL DATA DOCUMENTATION CODING FORM

	CRUISE IDENTIFIER (as in data record)	FORMAT ACRONYM	DATA CENTER FILE NUMBER	NO. OF HEADERS: TYPE "1"	NO. OF HEADERS: TYPE "2"	PARAMETERS SURVEYED: NUMBER OF PARAMETERS	BATHYMETRY	MAGNETICS	GRAVITY	H.R. SEIS.	O.P. SEIS.	FILE CREATION DATE Y Y M M D D	CONTRIBUTING INSTITUTION	SEQ. NO.
1	2–9	10–14	15–22	23	24	25–26	27	28	29	30	31	32–37	38–78	79–80
1		MGD77				29								01

COUNTRY	PLATFORM NAME	PLATFORM TYPE: CODE	PLATFORM TYPE: plain language	CHIEF SCIENTIST(S)	SEQ. NO.
1–18	19–39	40	41–46	47–78	79–80
					02

PROJECT, CRUISE & LEG	FUNDING	SEQ. NO.
1–58	59–78	79–80
		03

DEPARTURE DATE Y Y M M D D	DEPARTURE PORT (CITY, COUNTRY)	ARRIVAL DATE Y Y M M D D	ARRIVAL PORT (CITY, COUNTRY)	SEQ. NO.
1–6	7–40	41–46	47–78	79–80
				04

NAVIGATION INSTRUMENTATION	POSITION DETERMINATION METHOD	SEQ. NO.
1–40	41–78	79–80
		05

BATHYMETRY INSTRUMENTATION	ADDITIONAL FORMS OF BATHYMETRY DATA	SEQ. NO.
1–40	41–78	79–80
		06

MAGNETICS INSTRUMENTATION	ADDITIONAL FORMS OF MAGNETICS DATA	SEQ. NO.
1–40	41–78	79–80
		07

GRAVITY INSTRUMENTATION	ADDITIONAL FORMS OF GRAVITY DATA	SEQ. NO.
1–40	41–78	79–80
		08

SEISMIC INSTRUMENTATION	FORMATS OF SEISMIC DATA	SEQ. NO.
1–40	41–78	79–80
		09

FORMAT TYPE	DATA FORMAT DESCRIPTION (IN FORTRAN)	SEQ. NO.
1	2–78	79–80
A	(I1,A8,F5.2,4I2,F5.3,F8.5,F9.5,I1,F6.4,F6.1,I2,I1,3F6.1,I1,F5.1,F6.0,F7.1,	10

	SEQ. NO.
1–78	79–80
F6.1,F5.1,A8,4I1)	11

BATHYMETRY

DIGITIZING RATE (MIN)	SAMPLING RATE	SOUND VELOCITY (METERS/SEC)	BATHY DATUM CODE	INTERPOLATION SCHEME	SEQ. NO.
1 2 3	4 5 6 7 8 9 10 11 12 13 14 15	16 17 18 19 20	21 22	23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78	79 80
					1 2

MAGNETICS

DIGITIZING RATE (MIN)	SAMPLING RATE (SEC)	SENSOR TOW DIST. (METERS)	SENSOR DEPTH (METERS)	HORIZONTAL SENSOR SEPARATION (METERS)	REFERENCE FIELD	REFERENCE FIELD	METHOD OF DERIVING RESIDUAL FIELD	SEQ. NO.
1 2 3	4 5	6 7 8 9	10 11 12 13 14	15 16 17	18 19	20 21 22 23 24 25 26 27 28 29 30 31	32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78	79 80
								1 3

GRAVITY

DIGITIZING RATE (MIN)	SAMPLING RATE (SEC)	CODE	THEORETICAL GRAV. FORMULA in plain language	CODE	REFERENCE SYSTEM in plain language	CORRECTIONS APPLIED	SEQ. NO.
1 2 3	4 5	6	7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23	24	25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40	41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78	79 80
							1 4

BASE STATION GRAVITY (MGAL)	DEPARTURE BASE STATION DESCRIPTION	BASE STATION GRAVITY (MGAL)	ARRIVAL BASE STATION DESCRIPTION	SEQ. NO.
1 2 3 4 5 6 7	8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40	41 42 43 44 45 46 47	48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78	79 80
				1 5

NO. OF AREA IDENTIFIERS	10-DEGREE AREA IDENTIFIERS	SEQ. NO.
1 2 3	4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78	79 80
		1 6

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78	79 80
	1 7

ADDITIONAL DOCUMENTATION

	SEQ. NO.
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78	79 80
	1 8
	1 9
	2 0
	2 1
	2 2
	2 3
	2 4

Other Type "1" Header Records. Should there be insufficient space in the additional documentation portion of the first header record - type "1", one may use up to three additional physical records (i.e., 1,920 characters each) in the following format:

a) Continue to label each 80-character image by assigning sequence numbers to columns 79-80 (e.g., the second physical header record will contain sequence numbers 25-48; the third physical header record will contain sequence numbers 49-72; the fourth physical header record will contain sequence numbers 73-96).

b) The first 80-character image within each physical record (sequence numbers 25, 49, and 73) should contain the same information in columns 1-22 as appears in sequence no. "01".

c) All other undefined columns may be filled with additional documentation which is freely formatted.

HEADER RECORD--TYPE "2"

At present, this record is not defined; it is being reserved for future use to support a dynamic format.

THE DATA RECORD

The data record presents underway marine geophysical data in a correlative manner. Geophysical data (bathymetry, magnetics, and gravity) and seismic information (shot-point identification) are presented with a corresponding time and position. Documentation that is variable throughout the cruise also is included within each data record. If primary navigation exists at a juncture where no geophysical data are present, this record should be included with the data parameter fields left unused (9s filled).

The logical record length is 120 characters and the blocking factor is 16 logical records per physical record (i.e., 1,920 characters).

Format Conventions:

1. All decimal points are implied.
2. All signs are confined to specified columns.
3. Leading zeros and blanks are equivalent.
4. Unknown or unused fields are to be filled with 9s (DO NOT BLANK FILL).
5. All "corrections," such as time zone, diurnal magnetics and Eötvös, are understood to be added (e.g., time zone correction is the number of hours which must be added to the recorded time to determine GMT).
6. All numeric fields are right-justified.
7. All alphanumeric fields are left-justified.

Character Nos.	Length of field	Code	Description
1	1	I1	DATA RECORD TYPE - All data records are defined and set to "3".
2-9	8	8A1	CRUISE IDENTIFIER - Institution identification (for reference purposes) is identical to that which appears in header type "1", sequence no. "01", columns 2-9. (NOTE: left-justify).
10	1	A1	SIGN FOR TIME ZONE CORRECTION.
11-14	4	F4.2	TIME ZONE CORRECTION - Corrects survey time (in characters 15-27) to GMT when added: *equals zero when time is GMT.* Time zone normally falls between -13 and +12 inclusively. (NOTE: If possible GMT should be entered, thus setting field to "0000"; however, if analog and digital records are in local time, it is desirable to maintain local time to facilitate data correlation.)

The Data Record (Cont.)

Character Nos.	Length of field	Code	Description
15-16	2	I2	YEAR - (e.g., 1972 is represented as 72).
17-18	2	I2	MONTH - (e.g., February is represented as 02).
19-20	2	I2	DAY - day of month.
21-22	2	I2	HOUR - hour of day.
23-27	5	F5.3	MINUTES - precision to 0.001 minute.
28	1	A1	SIGN FOR LATITUDE + = North - = South
29-35	7	F7.5	LATITUDE - precision to 0.00001 degree (which is approximately 1.1 m).
36	1	A1	SIGN FOR LONGITUDE + = East - = West
37-44	8	F8.5	LONGITUDE - precision to 0.00001 degree.
45	1	I1	POSITION TYPE CODE - indicates how the navigation was obtained: 1 = Observed fix 3 = Interpolated 9 = Unspecified.
46-51	6	F6.4	**BATHYMETRY, TRAVELTIME - 2-way traveltime corrected for transducer depth and other such corrections, especially in shallow water (define procedure in additional documentation portion of header, especially if the traveltime has not been corrected for transducer depth). Precision is 0.0001 second (assuming 800 fathoms/second, this is approximately** 0.15 meters. If unspecified, set to "999999".
* 52-57	6	F6.1	BATHYMETRY, CORRECTED DEPTH - **Corrected depth in** meters; precision is 0.1 m. If unspecified set to "999999".
58-59	2	I2	BATHYMETRY CORRECTION CODE - This code details the procedure used for determining the sound velocity correction to depth: 01-55 Matthews Zone - use only if Matthews Zones were used to correct depth 59 Matthews corrections used but zones unspecified in data record 60 S. Kuwahara Formula 61 Wilson Formula 62 Del Grosso Formula 88 Other (describe correction procedure in Additional Documentation portion of header) 99 Unspecified.
60	1	I1	BATHYMETRY TYPE CODE - indicates how the data record's bathymetry value was obtained: 1 = Observed 3 = Interpolated (explain scheme in header type "1", sequence no. 12, columns 23-78) 9 = Unspecified.

The Data Record (Cont.)

Character Nos.	Length of field	Code	Description
61-66	6	F6.1	MAGNETICS TOTAL FIELD, 1ST SENSOR - total field leading (closest to ship) sensor. This field is used if only one sensor is employed. Precision is 0.1 nanotesla (gamma). If unspecified, set to "999999".
67-72	6	F6.1	MAGNETICS TOTAL FIELD, 2ND SENSOR - total field for trailing sensor. If only one sensor is employed or if field is unspecified, set to "999999". (Sensor separation defined in header type "1", sequence no. 13, columns 15-17.) Precision is 0.1 nanotesla.
73	1	A1	SIGN FOR RESIDUAL FIELD.
74-78	5	F5.1	MAGNETICS RESIDUAL FIELD - residual field; precision is 0.1 nanotesla. The reference field used is coded in header type "1", sequence no. 13, columns 18-19. If unspecified set to "99999".
79	1	I1	SENSOR USED FOR RESIDUAL FIELD 1 = 1st or leading sensor 2 = 2nd or trailing sensor 9 = Unspecified.
80	1	A1	SIGN FOR DIURNAL CORRECTION.
81-84	4	F4.1	MAGNETICS DIURNAL CORRECTION - Precision is 0.1 nanotesla; if 9 filled (i.e., set to "9999"), total and residual fields are assumed to be uncorrected. If used, total and residuals are assumed to have been already corrected.
85	1	A1	SIGN FOR DEPTH OR ALTITUDE OF MAGNETIC SENSOR + = Below sea level - = Above sea level
86-90	5	F5.0	DEPTH OR ALTITUDE OF LEAD MAGNETIC SENSOR - position of sensor below or above sea level; precision is 1 m. If unspecified set to "00000".
91-97	7	F7.1	OBSERVED GRAVITY - Corrected for Eötvös, drift and tares. Precision of 0.1 mgal. If unspecified, set to "9999999".
98	1	A1	SIGN FOR EOTVOS CORRECTION.
99-103	5	F5.1	EOTVOS CORRECTION - $E = 7.5 V \cos\Phi \sin\alpha + 0.0042 V^2$ (if V^2 is not used, make note in additional documentation portion of header type "1".). If unspecified, set to "99999".
104	1	A1	SIGN FOR FREE-AIR ANOMALY.
105-108	4	F4.1	FREE-AIR ANOMALY - precision is 0.1 mgal. Free-air Anomaly = $G_{observed} - G_{theoretical}$ (The formula used to compute $G_{theoretical}$ should be coded in header type "1", sequence no. 14, column 6; the reference system should be coded in header type "1", sequence no. 14, column 24.) If unspecified, set to "9999".

The Data Record (Cont.)

Character Nos.	Length of field	Code	Description
109-116	8	8A1	SEISMIC SHOT-POINT IDENTIFICATION - used for cross referencing analog seismic data with digital geophysical data. There are two methods to code this data: METHOD A - Use shot-point line and/or number when firing; fill with 9s when not firing. METHOD B - code as follows: "00000000" - No firing "11111111" - Firing "99999999" - Unspecified.
117	1	I1	QUALITY CODE FOR GRAVITY - 0 - Data of good quality 1 - 0-3 mgals 2 - 3-5 mgals 3 - 5-10 mgals 4 - >10 mgals } root mean square of cross checks or quality estimate 5 - Suspected poor (but usable) quality 6 - Known poor (but usable) quality 7 - Suspected bad (unusable) quality 8 - Known bad (unusable) quality 9 - Unspecified.
118	1	I1	QUALITY CODE FOR MAGNETICS - 0 - Data of good quality 1 - Low level of instrument noise 2 - High level of instrument noise 3 - Minor Magnetic Disturbance (storm) affecting data 4 - Major Magnetic Disturbance (storm) affecting data 5 - Suspected poor (but usable) quality 6 - Known poor (but usable) quality 7 - Suspected bad (unusable) quality 8 - Known bad (unusable) quality 9 - Unspecified.
119	1	I1	QUALITY CODE FOR BATHYMETRY - 0 - Data of good quality 1 - Maximum effective beam half-width less than 5° 2 - Maximum effective beam half-width 5° - 16° 3 - Maximum effective beam half-width 16° - 25° 4 - Maximum effective beam half-width greater than 25° 5 - Suspected poor (but usable) quality 6 - Known poor (but usable) quality 7 - Suspected bad (unusable) quality 8 - Known bad (unusable) quality 9 - Unspecified.
120	1	I1	QUALITY CODE FOR NAVIGATION - 5 - Suspected, by the originating institution 6 - Suspected, by the data center 9 - No identifiable problem found. (NOTE - Institution will most frequently 9 fill this field; however, should they wish to code a "5", the data center will not contradict. The data center's quality control program, which performs (among other checks) a vectorial analysis of the navigation, is available in a printout form upon request).

GEOPHYSICAL DATA RECORD

*

"3" IDENTIFIER	CRUISE INDENTIFIER								TIME ZONE CORRECTION					DATE						TIME							LATITUDE (DEGREES) N=+ S=-								LONGITUDE (DEGREES) E=+ W=-									POSITION TYPE	BATHYMETRY														
									SIGN					YEAR		MONTH		DAY		HOUR		MINUTE					SIGN								SIGN										TRAVEL TIME (2-WAY) (SECONDS)						CORRECTED DEPTH (METERS)						CORRECTION PROCEDURE CODE		TYPE CODE
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
3	C	/	5	0	4				+	0	0	0	0	7	2	0	2	0	3	1	0	3	0	0	0	0	-	4	0	0	2	0	8	0	+	0	5	2	3	1	2	0	0	1	0	6	0	3	4	3	0	4	5	2	0	0	2	3	1

MAGNETICS (NANOTESLAS)																														GRAVITY (MGALS)																		SEISMIC								QUALITY CODES			
TOTAL FIELD (SENSOR 1)						TOTAL FIELD (SENSOR 2)						RESIDUAL FIELD						RES SENSOR	DIURNAL CORRECTION					ALTITUDE (-) OR DEPTH (+) OF SENSOR (METERS)						OBSERVED GRAVITY							EÖTVÖS CORRECTION						FREE-AIR ANOMALY					SHOT POINT IDENTIFICATION								GRAVITY	MAGNETICS	BATHYMETRY	NAVIGATION
												SIGN							SIGN					SIGN													SIGN						SIGN																
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120
2	5	6	0	7	0	9	9	9	9	9	9	-	0	0	3	7	0	9	9	9	9	9	9	+	0	0	0	6	0	9	7	9	8	8	1	1	+	0	0	2	0	3	-	0	0	9	0	0	0	0	0	0	1	2	6	3	5	9	6

For the fictitious example above:

Cruise: R/V CONRAD, Cruise 15, leg 4
Date: 3 February 1972
Time: 10:30 a.m. (GMT)
Latitude: 40,02080°S
Longitude: 52.31200°E
Position type: Observed fix
Bathymetry 2-way traveltime: 6.0343 sec.
Bathymetry corrected depth: 4520.0 m
Bathymetry correction procedure:
Matthews Zone #23
Bathymetry data type: Observed value
Magnetics total field: 25607.0 nanoteslas (one sensor)
Magnetics residual field: - 0037.0 nanoteslas
Diurnal correction: Not supplied
Depth of sensor: 60 m
Observed gravity: 979,881.1 mgals
Eötvös correction: +20.3 mgals
Free-air anomaly: - 009.0 mgals
Seismic Shot-Point No.: 126
Quality for gravity: Within 5-10 mgals
Quality for magnetics: Suspected poor (but usable)
Quality for bathymetry: Unspecified
Quality for navigation: Suspected, based on Data Center's velocity analysis.

APPENDIX I

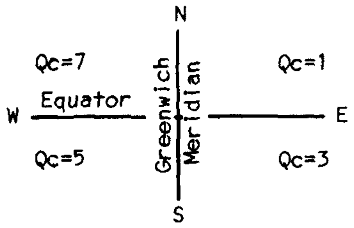
10-DEGREE-SQUARE IDENTIFIER CODE

A 10-degree-square area can be easily identified by constructing a four-digit number. The components of this number, in order of their construction are described as follows:

Quadrant - A one-digit number identifies the quadrant of the world with the following significance to each digit:

1st digit = Quadrant number

Qc Code	Latitude	Longitude
1	North	East
3	South	East
5	South	West
7	North	West



10-Degree Square - The next three digits identify a unique 10-degree square; thus, the significant digits consist of:

2nd digit = Tens digit of degrees latitude
3rd digit = Hundreds digit of degrees longitude
4th digit = Tens digit of degrees longitude

		10-DEGREE SQ IDENT. CODE			
Examples:		Qc	Lat	Long	Long
(i)	37 degrees 48' S, 4 degrees 13' E	3	3	0	0
(ii)	21.6 degrees S, 14.3 degrees W	5	2	0	1
(iii)	34 degrees 28' N, 143 degrees 27'W	7	3	1	4
* (iv)	75 degrees N, 43 degrees E	1	7	0	4

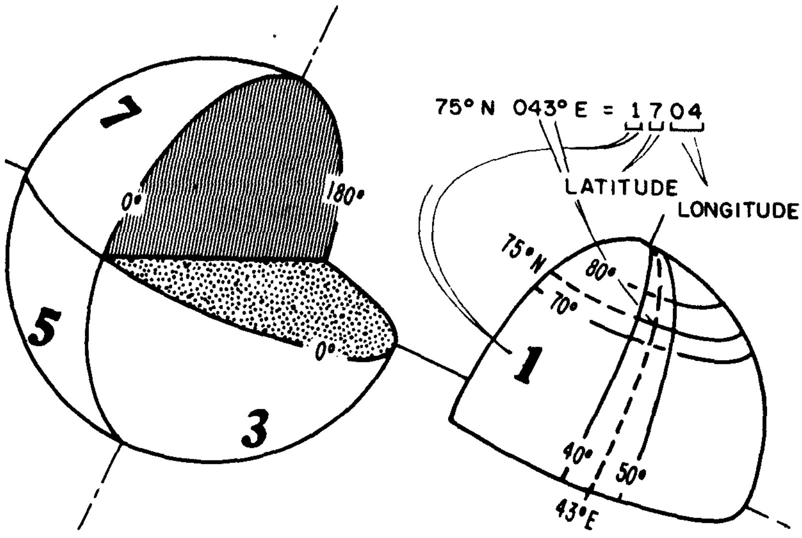


Illustration for Example (iv)

☆ U.S. GOVERNMENT PRINTING OFFICE: 1981—577-048/83 Region No. 8