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NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL ENVIRONMENTAL SATELLITE, DATA, AND INFORMATION SERVICE

# THE MAGNETIC SURVEYS EXCHANGE FORMAT - "MAG88T"

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## I. INTRODUCTION

During 1988 the National Geophysical Data Center decided to integrate it's collection of worldwide aeromagnetic survey data into the already existing GEODAS (GEOphysical DAta System) data managment system. In doing this NGDC created a digital header to document key information about these surveys. The ARO88 header was patterned after the MGD77 exchange format header. In 2010 it was decided that the time was ripe to create an exchange format for not just aeromag data but for any trackline data, including marine magnetics. The new format, MAG88T would follow the formatting techniques of the Tab-delimited MGD77T Marine Trackline Geophysics Exchange Format. Integrating NGDC's aeromagnetic data into GEODAS systems allows for assimilation into an already developed system and a standardized software interface for the user.

## II. GENERAL DESCRIPTION

The digital format presented, and referred to as "MAG88T", is an exchange format for aeromagnetics and other magnetics data The format 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 institutions, and to be used by various software programs as an import or export format. Data is to be exchanged as files, a header (documentation) file and a data file for each survey operation. Generally each survey operation is a flight or port-to-port operation of a survey vessel, but in may be several of these operations of the same platform are combined into a single survey operation, especially if this is the manner of organizing the data at the contributing institution. Data may be exchanged via the Internet or on various mass storage devices such as magnetic tapes, removable disks and DVDs. The National Geophysical Data Center uses the World Wide Web as its chief method of distribution of these data.

Data Exchange

1. For exchange of MAG88T data participants shall establish type and format of the media to be exchanged and method of distribution.

2. The MAG88T header record(s) and the MAG88T data records will be contained in separate files.

3. Each survey operation shall have one MAG88T tab-delimited Header record with a tab following header fields (and thus a single end-of-record character). Unspecified fields will contain zero characters (field-ending tab follows previous tab immediately). Tabs are generally omitted for any trailing unspecified fields, including the tab for the last specified field (software read statements must be prepared for this).

4. The MAG88T data records are sequentially and chronologically organized until the end of the file. The data records are varying length for with a tab following the data fields. (Each record is followed by an end-of-record character.) Unspecified fields will be nil (tab immediately follows previous field's delimiting tab)). Tabs will generally be omitted for any trailing unspecified fields, including the tab for the last specified field (software read statements must be prepared for this).

5. A survey is defined as all observations that conveniently constitute a survey operation (e.g., a flight, series of flights, a port-to-port survey or in some cases several surveys). A survey file ideally should not span two media or 2 file sets.

## III. THE MAG88T HEADER RECORD

The purpose of the Header Record is to document both the content and structure of the aeromagnetic data contained within the data records. In general, documentation that is constant throughout the operation will be in the Header Record, while documentation that is variable will be in the Data Records.

The Header Record contains fields which are both fixed and freely formatted text. Each field is followed by a tab character. Unspecified or unused fields are nil (a tab immediately follows the previous field). Tabs are generally omitted for any trailing unspecified fields, including the tab for the last specified field.

**Format Conventions for the Header Record:**

**1.** For floating pt numbers, all decimal points are **explicit** (e.g. 123.456 signifies a value of +123.456)

**2.** Leading zeros and blanks are discouraged in numeric fields. Trailing blanks in numeric fields are not allowed.

**3.** Where floating pt values are whole numbers, the decimal part/decimal pt are not required.

**4.** In floating pt values, trailing zeros after the last significant digit past the decimal are not required.

**5.** Unspecified fields are **nil** (tab immediately follows previous field's delimiting tab).

**6.** All plain language fields should be trimmed of beginning and ending blanks.

**7.** All "corrections" are understood to be **added**.

**8.** An End-of-Line (End-of-Record) character follows the last field. Embedded End-of-Line characters within fields are not allowed.

The following is a detailed description of the Header Record for MAG88T. Fields can be of type integer, floating point or character. Fields that always represent whole numbers are designated as integers. Fields that may contain a decimal component are float, and fields that are alphanumeric are character.

| [Field #] | Type | FIELD_ID | Description |
|---|---|---|---|
| [1] | char | SURVEY_ID | SURVEY IDENTIFIER<br>Identifier supplied by the contributing organization, else given by NGDC in a manner which represents the data. NGDC assumes a limit of 24 characters for the survey id at this time. |
| [2] | char | FORMAT_88 | FORMAT ACRONYM ("MAG88T") |
| [3] | char | PARAMS_CO | PARAMETERS SURVEYED CODE<br>if code is present, parameter is contained in file; else use blank(s)<br><br>Col Code Parameter Surveyed<br>1 T Total Field<br>2 R Residual Field<br>3 X North Vector Component<br>4 Y East Vector Component<br>5 Z Vertical Component<br>6 D Magnetic Declination<br>7 H Horizontal Intensity<br>8 I Magnetic Inclination<br>9 E Electromagnetics<br>10 O Other (e.g. radiometrics) |
| [4] | int | DATE_CREAT | FILE CREATION DATE (YYYYMMDD)<br>date data records were last altered. |
| [5] | char | INST_SRC | SOURCE INSTITUTION<br>organization which collected the data. Include contributor if different from collector. |
| [6] | char | COUNTRY | COUNTRY |
| [7] | char | PLATFORM | PLATFORM NAME |
| [8] | char | PLAT_TYP | PLATFORM TYPE<br>(e.g. "Airplane",Ship,"Mobile Land", etc.) |
| [9] | char | CHIEF | CHIEF SIENTIST(S) |
| [10] | char | PROJECT | PROJECT<br>(e.g. "China Sea, high density, 1 min") |
| [11] | char | DATE_DEP | COMMENCEMENT DATE (YYYYMMDD) |
| [12] | char | PORT_DEP | COMMENCEMENT LOCATION<br>city, country, airport |
| [13] | char | DATE_ARR | COMPLETION DATE (YYYYMMDD) |
| [14] | char | PORT_ARR | COMPLETION LOCATION<br>city, country, airport |
| [15] | char | POS_INFO | POSITION DETERMINATION METHOD / GEODETIC DATUM<br>e.g. " ASN-101 Inertial, ASN-84 Inertial, ARNNS Satellite, Radar Alt. GASS-integrate |
| [16] | float | LAT_TOP | TOP-MOST LATITUDE OF SURVEY |

| | | | |
|---|---|---|---|
| [17] | float | LAT_BOTTOM | BOTTOM-MOST LATITUDE OF SURVEY |
| [18] | float | LON_LEFT | LEFT-MOST LONGITUDE OF SURVEY |
| [19] | float | LON_RIGHT | RIGHT-MOST LONGITUDE OF SURVEY |
| [20] | char | TRK_SPACE | TRACKLINE SPACINGS<br>(e.g. NW-SE 37 km.) |
| [21] | char | NOM_ALT | NOMINAL ALTITUDE (OR SENSOR DEPTH)<br>(e.g. 6000 Ft BAR (1828.8 meters) |
| [22] | char | NOM_SPEED | NOMINAL SPEED<br>(e.g. 120 knots) |
| [23] | int | TOTAL_OBS | TOTAL OBSERVATIONS |
| [24] | float | TOTAL_DIST | TOTAL TRACK DISTANCE IN NAUTICAL IN KILOMETERS |
| [25] | char | INSTRUMENT | MAGNETICS INSTRUMENTATION<br>(e.g. Geometrics G801/3 Proton Precession) |
| [26] | char | SAMP_RATE | GENERAL SAMPLING RATE OF MAGNETICS<br>(e.g. 4.0 seconds) |
| [27] | char | TOW_DIST | MAGNETIC SENSOR TOW DISTANCE IN METERS<br>The distance from the navigation reference to the leading sensor.(e.g. “20 meters”, “Stinger” |
| [28] | char | SENSITIV | MAGNETIC SENSITIVITY<br>(e.g. 0.001) |
| [29] | char | REF_FIELD | REFERENCE FIELD USED<br>e.g., "IGRF-85" |
| [30] | char | ADD_DOC | ADDITIONAL DOCUMENTATION<br>Information concerning this survey not contained in other header fields. Embedded End-of-Line characters are NOT ALLOWED. |

## IV. THE DATA RECORDS

The Aeromagnetic Survey records at NGDC are organized by survey operation, one survey per file. In addition to the MAG88T Format, the data records are available in the same format as they were received in. The marine magnetics at NGDC area available in both the MAG88T Format and the MGD77T Format.

**Format Conventions for the MAG88T Data Record:**

**1.** For floating pt numbers, all decimal points are **explicit** (e.g. 123.456 signifies a value of +123.456)

**2.** Leading zeros and blanks are discouraged in numeric fields. Trailing blanks in numeric fields are not allowed.

**3.** Where float values are whole numbers, the decimal part/decimal pt are not required.

**4.** In floats, trailing zeros after the last significant digit past the decimal are not required.

**5.** Unspecified fields are **nil** (tab immediately follows previous field’s delimiting tab).

**6.** All character fields should be trimmed of beginning and ending blanks.

**7.** Trailing tabs (trailing unspecified values) are generally omitted, including the tab for the last specified (used) field.

**8.** All "corrections", such diurnal magnetics, and Eotvos, are understood to be **added** (e.g., value in EoTvos correction is the number of nanoteslas which must be added to the total field to correct for diurnal variation).

**9.** For field values which differ from the definitions below, use the Additional Documentation to describe how the values were arrived at.

**10.** A heading/title column record with  will generally be the first record of each data file.  This can be omitted. The suggested Field Ids should be considered:
SURVEY_ID
DATE
TIME
LAT
LON
ALT_BAROM
ALT_GPS
ALT_RADAR
POS_TYPE
LINEID
FIDUCIAL
TRK_DIR
NAV_QUALCO
MAG_TOTOBS
MAG_TOTCOR
MAG_RES
MAG_DECLIN
MAG_HORIZ
MAG_X_NRTH
MAG_Y_EAST
MAG_Z_VERT
MAG_INCLIN
MAG_DICORR
IGRF_CORR
MAG_QUALCO

The following is a detailed description of the MAG88T Data Record. Fields can be of type integer, floating point, or character. Fields that always represent whole numbers are described as type **int**; fields that may contain a decimal component are **float**, and fields that are alphanumeric are **char**.

| Field Number | Type | Description |
|---|---|---|
| [1] | char | SURVEY IDENTIFIER<br>Identifier supplied by the contributing organization in a manner which represents the data. Generally identical to that in MAG88T header record. |
| [3] | int | DATE (YYYYMMDD)<br>e.g. 19720530 |
| [3] | float | TIME<br>Hours, Minutes and decimal Seconds<br>i.e. 11:59:40.333pm = 235940.333 |
| [4] | float | LATITUDE<br>in decimal degrees<br>+ = East; - = West<br>Between -90 and 90 degrees |
| [5] | float | LONGITUDE<br>in decimal degrees<br>+ = East; - = West<br>Between -90 and 90 degrees |
| [6] | float | ALTITUDE - BAROMETRIC<br>Mean Sea Level, in meters |
| [7] | float | ALTITUDE - GPS<br>Mean Sea Level, in meters |
| [8] | float | ALTITUDE - RADAR<br>Terrain Clearance, in meters |
| [9] | int | POSITION TYPE CODE<br>Indicates how lat/lon was obtained:<br>1 = Observed fix<br>3 = Interpolated<br>nil = Unspecified |
| [10] | char | LINE/TRACK/SEGMENT ID<br>Flight Line Number, etc. |
| [11] | char | FIDUCIAL/Point Id<br>Measurement fiducial number or Point Identifier. |
| [12] | float | TRACK/LINE DIRECTION<br>In decimal degrees from North. |
| [13] | int | QUALITY CODE FOR NAVIGATION<br>1 – good<br>2 – fair<br>3 – poor<br>4 – bad<br>5 – Suspected, by the originating institution<br>6 – Suspected, by the Data Center<br>nil – Unspecified |

(Note: - Institution will most frequently fill this field; should they have reason to code the field as 1 through 6, the data center will not contradict.)

[14] float MAGNETICS TOTAL FIELD, OBSERVED/CALCULATED/1ST SENSOR
Magnetics Total Intensity in nanoteslas; for main magnetometer, or calculated from component observed values. For Gradiometer data this can be used for the first sensor measurement. Detail in MAGNETICS INSTRUMENTATION and Additional Documentation header fields.

[15] float MAGNETICS TOTAL FIELD, CORRECTED/2ND SENSOR
Total Intensity corrected for diurnal, line-leveling, etc.
For Gradiometer data this can be used for the second sensor measurement. Detail in MAGNETICS INSTRUMENTATION and Additional Documentation header fields.

[16] float MAGNETICS RESIDUAL FIELD
Calculated, In nanoteslas

[17] float D: MAGNETICS FIELD DECLINATION
In decimal degrees

[18] float H: MAGNETICS HORIZONTAL INTENSITY
In nanoteslas

[19] float X: NORTH VECTOR COMPONENT OF HORIZONTAL INTENSITY
In nanoteslas, + = North

[20] float Y: EAST VECTOR COMPONENT OF HORIZONTAL INTENSITY
In nanoteslas, + = East

[22] float Z: VERTICAL COMPONENT OF TOTAL FIELD
In nanoteslas, + = Upward

[22] float I: MAGNETIC FIELD INCLINATION
In decimal degrees, from horizontal

[23] float MAGNETICS DIURNAL CORRECTION -
In nanoteslas.

[24] float IGRF CORRECTION USED
In nanoteslas

[25] int QUALITY CODE FOR MAGNETICS FIELDS
1 – good
2 – fair
3 – poor
4 – bad
5 – Suspected bad by Contributor
6 – Suspected bad by Data Center
nil - Unspecified

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## APPENDIX B NGDC CONTACTS

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