

6 SeaSPY Data Format

Data that is presented by the magnetometer during cycling can appear in one of three formats. An operator can choose between formats using the 'b' command in diagnostic mode.

6.1 Standard Format

The Standard data format is the most commonly used, and is the usually the default setting when a SeaSPY magnetometer is first shipped. The data string appears as follows:

```
*YY.JJJ/HH:MM:SS.S F:FFFFFF.FFF S:SSS D:+DDD.Dm A:AAA.A L:L TTTms_Q:QQ !!!! CR LF
```

The first character of each line is always * (ASCII code 42). This leading character is supplied for automated data collection systems that require periodic synchronization with the data stream.

Each letter shown in italics stands for a digit of a particular record in the reading.

Number	Description
<i>Y</i>	Year (time of reading).
<i>J</i>	Julian day (time of reading).
<i>H</i>	Hour (time of reading).
<i>M</i>	Minute (time of reading).
<i>S</i>	Second (time of reading).
<i>F</i>	Magnetic field (nT).
<i>S</i>	Signal Strength of reading. This is a raw number generated by the magnetometer that gives (in part) a good indication of the quality of the final total field measurement. Anything over 80 is considered an acceptable signal, and anything over 130 is considered excellent.
<i>D</i>	Towfish Depth. The value shown is in meters. The depth sensor can be calibrated using the P and p commands.
<i>A</i>	Towfish Altitude. The value shown is in meters. If no echosounder is installed, this field will not be present. If an echosounder is installed, but it cannot obtain a 'lock' on the seafloor (for example if it is too far away) this value will be 000.0m.
<i>L</i>	Leak sensor output, 0-9. 0 indicates no leak, and 9 indicates that a leak is present.
<i>T</i>	Measurement time. Ideally, this should be the magnetometer's cycling time minus 35ms, with a maximum of 965ms. If you see a G message, indicating that measurement was prematurely terminated due to a high gradient condition, this value will tell you how severe the gradient is.

<i>Q</i>	Signal quality. This is a two-digit number between 00 to 99. The left digit is a good indication of signal strength, and the right digit indicates how much information was available for measurement.
<i>!</i>	Warning Messages.
<i>CR</i>	Carriage Return (ASCII code 13).
<i>LF</i>	Line Feed (ASCII code 10).

Table 6-1: Standard Data Format Description

The data string also contains various letters designators throughout the string (Non-italicized letters) to help identify data types (Table 6-2).

Letter	Meaning
F:	Total magnetic field reading following
S:	Signal strength following
D:	Depth reading following (+/-)
A:	Altitude reading following
L:	Leak indicator value following

Table 6-2: Letter designators in the data string

6.1.1 Warning Messages

There are four different warning messages that can be displayed in the raw data log by the magnetometer. The warning messages may be summarized as follows (Table 7-3). See Section 7.1 for location of warning messages in the raw data log ('!' in example string).

Letter	Meaning
W	Weak signal. This message is displayed if the signal strength for the reading is below a threshold value
G	Gradient condition. In high magnetic gradients, the signal produced by the sensor decays more quickly. This message occurs if the measurement time was prematurely terminated due to a quickly decaying signal. The strength of the gradient can be estimated by observing the measurement time. Note that sensitivity will decrease as the measurement time decreases.
P	Poor reading. This message is displayed if the signal is sampled for too short a time period, for whatever the reason. Expect this message under conditions of extremely high magnetic gradient.
M	Instrument Mistuned. The magnetometer may decide to display this message under extremely poor signal conditions, which is characteristic of poor tuning setting. When this message occurs, the instrument will attempt to retune by executing an initialize tuning procedure, if the auto-tuning feature is enabled.

Table 6-3: Warning Messages

6.2 Compact Format

The compact format contains most of the information of the standard format, but with no annotation. It contains 24h time information, but no date, no signal quality value, and does not support the optional echosounder/altimeter. The compact data format is necessary if interfacing to an Edgetech DF-1000 digital side-scan sonar.

The compact data string appears as follows:

```
*HH:MM:SS.S FFFFFFF.FFF SSS TTTT +DDDD.Dm !!!!! CR LF
```

Each letter shown in italics stands for a digit of a particular record in the reading.

Letter	Description
H	Hour (time of reading).
M	Minute (time of reading).
S	Second (time of reading).
F	Magnetic field (nT).
S	Signal Strength of reading. This is a raw number generated by the magnetometer that gives (in part) a good indication of the quality of the final total field measurement. Anything over 80 is considered an acceptable signal, and anything over 130 is considered excellent.
T	Measurement time. Ideally, this should be the magnetometer's cycling time minus 35ms, with a maximum of 965ms. If you see a G message, indicating that measurement was prematurely terminated due to a high gradient condition, this value will tell you how severe the gradient is.
D	Towfish Depth. The value shown is in meters. The depth sensor can be calibrated using the P and p commands.
W	Warning Messages.
CR	Carriage Return (ASCII code 13).
LF	Line Feed (ASCII code 10).

Table 6-4: Compact Data Format Description

The warning messages above are identical to those in the standard data format description, summarized in Table 6-3. The one additional message is the leak message, the first of the group. If a leak is present, an 'L' message will be visible in this section.

6.3 SIS-1000 Compatible Format

The compact data format contains only magnetic field, signal strength, and pressure depth. The optional echosounder/altimeter is not supported in this mode. It is necessary to switch to the SIS-1000 compatible format when interfacing to a Benthos SIS-1000 or SIS-3000 system. Note that this mode is not required if interfacing to a Benthos SIS-1500 digital side scan sonar system.

The SIS-1000 compatible data string appears as follows:

```
$ FFFFFFF.FFF SSSS DDDD CR LF
```

Note that the first character of the SIS-1000 compatible data string is a '\$', not a '*' as is the case with the other two data formats.

F	Magnetic field (nT). If the field value is less than 100,000nT (which is usually the case) there will be a space after the \$ sign. If the field value is 100,000nT or greater, the space will be replaced with a '1'.
S	Signal Strength of reading. This is a raw number generated by the magnetometer that gives (in part) a good indication of the quality of the final total field measurement. Anything over 800 is considered an acceptable signal, and anything over 1300 is considered excellent. It is identical to the signal strength value in the other data formats, multiplied by 10.
D	Towfish Depth. The value shown is in units of 0.1 meter. If the towfish depth exceeds 999.9m, an extra digit will be displayed. Important: if a leak is detected, this value will consistently read 9999.
CR	Carriage Return (ASCII code 13).
LF	Line Feed (ASCII code 10).

Table 6-5: SIS1000 Compatible Data Format Description

6.4 Appended GPS Data

If you configure the SeaLINK software to append GPS data to the standard SeaSPY data log file (Section 7.9) additional data fields will be added to the SeaLINK log file (Section 7.9). An example of the added fields are displayed below:

```
X:XXXXXXXX.X Y:YYYYYYY.Y Z:zzZ x:xx.xxxxxx y:yy.yyyyyyy NOLBX:XXXXXXXX.X
NOLBY:YYYYYYY.Y NOLBZ:ZZ NOLBx:xx.xxxxxx NOLBy:yyy.yyyyyyy <real>
```

Table 6-6 gives the meaning of each letter in italics and Table 6-7 identifies the letter designators:

Number	Description
<i>X</i>	UTM Easting (WGS 84)
<i>Y</i>	UTM WGS84 Northing (WGS 84)
<i>z</i>	UTM zone #
<i>Z</i>	UTM zone letter designator
<i>x</i>	Longitude (WGS 84)
<i>y</i>	Latitude (WGS 84)

Table 6-6 GPS data format description

Letter	Meaning
X:	UTM easting reading following
Y:	UTM northing reading following
x:	Longitude reading following
y:	Latitude reading following
NOLB_:	position reading with no Layback correction Applied following
<real>	String that states whether that the tagged GPS co-ordinates for this data point was recorded by the GPS.
<interp>	String that states the tagged GPS co-ordinates for this data point was interpolated by the software. This will occur when the GPS sampling rate is less than the mag sampling rate.
<layback interpolation>	Notifies the user that the layback calculation has started, and that the first few calculated fish positions should be interpreted with caution.

Table 6-7 Letter designators in the appended GPS data

All coordinate data tagged to magnetic readings by SeaLINK is based on the **World Geodetic System 1984 reference ellipsoid (WGS84 datum)**. Latitude and longitude coordinates use decimal degree units, while the UTM coordinates are output in metres. UTM coordinates are also assigned the appropriate UTM zone number and letter designator automatically.

6.5 SeaLINK Customizable File Log

This file format is produced by the SeaLINK software and contains data specified by the user. There are several options regarding what data is included in this file log (as described in Section 7.6) therefore its format varies. The letter designators in the string are the same as in the SeaLINK raw data log. Refer to the tables 6-1 to 6-7.

6.6 Gradiometer Format

6.6.1 SeaLINK Array

SeaLINK-Array produces a unique data format that is a combination of two SeaSPY magnetometer sensors. The data string also contains magnetic gradient, which is calculated as a straight difference between the two magnetometer data fields.

An example of a typical data string, and a description of its space-delimited columns are as follows:

```
Sun Nov 14 17:35:53.000 056239.816 +0001.6 182 0964 056177.265 +0001.1 181 0963 +000062.551
```

Columns 1-3: Date.

Column 4: Time in 24h format.

Column 5: Magnetic field of Towfish 1 (as specified in *File|Preferences|Grad* dialog)

Column 6: Depth of Towfish 1 in m.

Column 7: Signal strength of Towfish 1.

Column 8: Sample time of Towfish 1 in ms.

Column 9: Magnetic field of Towfish 2.

Column 10: Depth of Towfish 2 in m.

Column 11: Signal strength of Towfish 2.

Column 12: Sample time of Towfish 2 in ms.

Column 13: Magnetic gradient (Field1-Field2). There is no distance value taken into account here. To obtain true gradient (nT/m) divide by the distance between the towfish.

6.6.2 With the Smart Transceiver

When using a smart transceiver to conduct a gradiometer survey (See Section 7.14), the following data format will be displayed in the main terminal when the magnetometers start cycling:

```
*YY.JJJ/HH:MM:SS.S F[FFFFFF.FFF SSS TTTT DDDD.D !!!] R[FFFFFF.FFF SSS TTTT DDDD.D !!!] -GRADIENT
```

Refer to table 6.1 for meanings of the letters in italics. An example of a typical string is as follows:

```
*02.233/09:33:45.0 F[056397.170 244 0197 0316.6 ____] R[056397.224 129 0197 0316.8 ____] -000000.054
```

Note that the string has two bracketed areas, beginning with a 'F' and 'R' designators. This means that the information following in the bracketed area refers to the Front and Rear towfish respectively.

The last column is the difference in the measure field value between the two towfish (F-R). To obtain the true magnetic gradient divide the value by the distance between the two towfish.

Note that the underscores in the warning message fields for each towfish represent that no warning messages are occurring (see Table 6-2 for warning messages).