

Using Portable Navigator with Aquascan Magnetometers

Introduction

The Aquascan MC5 and AX2000 magnetometers produce NMEA sentences with the magnetic data and, in the case of the AX2000, position data from a merged GPS source as a single NMEA style sentence. The MC5 magnetometer versions fitted with an RS232 serial port and updated with firmware version 2.01 will output a magnetic data in the form:

```
$MGD,-00010  
$MGD,-00010  
$MGD,-00010
```

The AX2000 and the MC5, if upgraded to AX2000 standard, outputs the data merged with the position and other data, if available in the following format:

```
Header      Mag      lat      long      Tow      depth  
            Depth (DBT)  
  
$AXMGD,-00010,5135.106,N,00259.698,W,0.0,14.0  
$AXMGD,-00010,5135.116,N,00259.688,W,0.0,14.6  
$AXMGD,-00010,5135.126,N,00259.678,W,0.0,14.9
```

The last two fields are only available in the AX2000DES/DET & AX2000PES/PET versions, these include the towfish depth monitoring facility, the last data field is provided by a combined source that provides depth (\$SDDBT) in addition to a standard positional sentence.

The following document describes how to configure Portable Navigator and NMEApro to receive the Magnetometer data, record it in a survey text log and to display it graphically using the built in PN tools. It is recommended that your read this referring to the PN Help file.

Configuring NMEApro

NMEApro, Portable Navigator’s NMEA data processing module, is very flexible and can be configured in various ways to interface with Aquascan magnetometers. In the case of the non-upgraded MC5 it is necessary to use two COM ports, one for the mag data and one for the GPS and to let NMEApro do the combining. A typical NMEApro two port configuration is shown below. Note if using plug and play NMEA (RS232) – USB cables the port numbers will change on re-starting your PC so you may have to reconfigure. In the following examples they were COM5 and COM6. First you need to start NMEApro you can do this from the start menu since it is a separate program or, if PN7 is running, you can use the button on the main toolbar shown below which opens the DDE service link to PN and launches NMEApro.



You should then click the button again to close the DDE link which will leave NMEApro running ready to configure.

Two port NMEApro configuration for use with an MC5 and separate GPS receiver.

The screenshot shows the NMEA Pro III software window. The main display area shows several NMEA sentences:

- Posn. 5: \$GPGGA,154645,4738.914,N,00322.064,W,2.07,1.2,10.7,M,48.8,M,7.0001*51
- AUX1 6: \$MGD,+00002
- AUX2 0: OFF
- AUX3 0: OFF
- AUX4 0: (empty)
- Combined: \$SPECOM,154645,4738.914,N,00322.064,W,2.07,+00002,.....

The 'Combined DDE Output Sentence' table is configured as follows:

| O/P Field | I/P Source | Field | Memo / Op. | O/P Field | I/P Source | Field | Memo / Op. |
|-----------|------------|-------|------------|-----------|------------|-------|------------|
| 1 | AUX1 | 1 | Mag Data | 6 | None | 0 | |
| 2 | None | 0 | | 7 | None | 0 | |
| 3 | None | 0 | | 8 | None | 0 | |
| 4 | None | 0 | | 9 | None | 0 | |
| 5 | None | 0 | | 10 | None | 0 | |

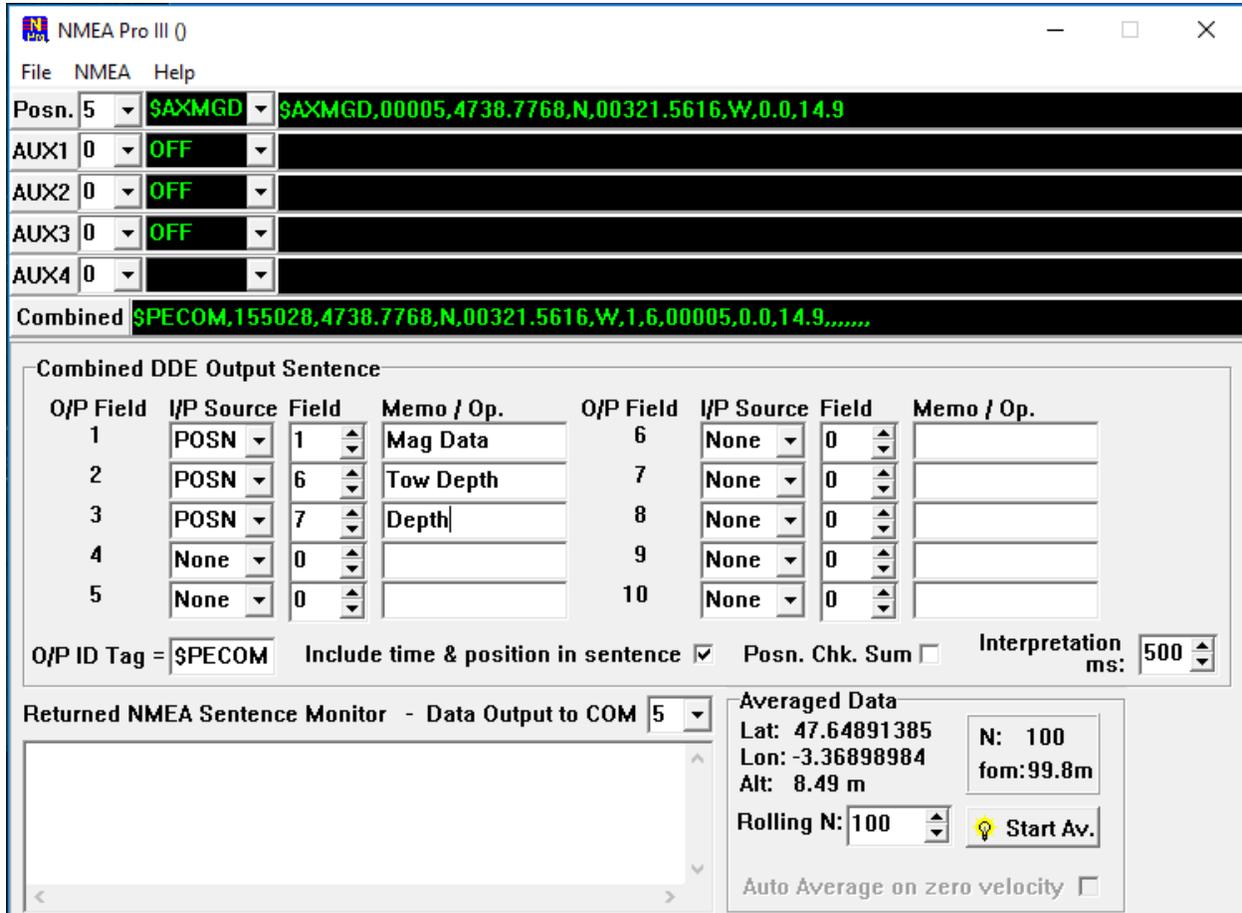
Below the table, the 'O/P ID Tag' is set to \$SPECOM. The 'Include time & position in sentence' checkbox is checked. The 'Posn. Chk. Sum' checkbox is unchecked. The 'Interpretation ms' is set to 500.

The 'Returned NMEA Sentence Monitor' shows 'Data Output to COM 5'. The 'Averaged Data' section displays:

- Lat: 47.65118834
- Lon: -3.37730762
- Alt: 3.68 m
- N: 100
- fom: 99.8m
- Rolling N: 100
- Start Av. button (lightbulb icon)
- Auto Average on zero velocity checkbox (unchecked)

With the AX2000 or an upgraded MC5 with merged position data it is possible to use a single COM port if using NMEApro 5.0.2, the latest release of NMEApro. This version has the ability to recognise the Aquascan sentence and insert the time field into the Combined Sentence time and position fields. This version of NMEApro can be downloaded from the ESL website as an upgrade to all PN 7 installations. However, if you are using an earlier version of NMEApro you must use the two COM port method described above. The AX2000 / NMEapro 5.0.2 one port configuration is shown below:

One port NMEApro configuration for use with an AX2000 or an upgraded MC5



Although it is possible to type any filter value into all versions of NMEApro, version 5.0.2 has the \$AXMGD and \$MGD NMEA filters in the pulldown lists to make it easier to configure for Aquascan magnetometers. On starting NMEApro it uses its last COM port configuration. If it gives “**port #n not available**” messages, OK them all and then restore the NMEApro window. Next click: Menu / NMEA / NMEA Input Config / Auto Detect Ports. It will now be restored to the default state of either no COM ports or the new COM port numbers shown. A single COM port will be automatically configured as Virtual port 1. If any ports were present you will have to manually check and configure the associated Virtual ports. Click NMEA / NMEA Input Config / Virtual port 1, 2 etc. Setting the Baud rate and COM no. of each Vp as required. If NMEApro’s window is blank due to config mismatch, then after auto detecting ports close and reopen it.

Logging the Magnetometer data

The next sections describe how to configure Portable Navigator to record and to plot the magnetometer and position data. First you need to configure the Log Format to include the required data.

In all the above examples the Mag data is inserted into the combined sentence as AUX field 1. If available, the Tow depth and the Depth can be inserted as AUX field 2 and AUX field 3 as shown in the 2nd example. In PN Preferences / Logs set the Log format parser string to e.g.

@f,@t,@p:3,@c,@s,@1,@2,@3

Note that you can use the math and editing facilities in NMEApro to modify the values passed to the log file as follows. This is done by inserting the operation code into the Memo / Op field for each data field (See following extract from the PN NMEApro help file):

The possible operations are as follows:

\n Remove leading n characters
/n Remove trailing n characters
[*x.x+y.y] Multiply by x.x and then add y.y. (To subtract use +-x.x)
"a" Insert literal at start of field
!a! Insert literal at end of field

Note - The format and processing order is important!

The processing order is as shown above. A typical example could be Depth [*0.304878+-1.3] i.e. convert depth from feet to metres and add an offset of minus 1.3 metres. **The scale and offset factors must be enclosed in square brackets** as shown and there must be +y.y after the scale factor even if there is no offset. So if scaling only was required, the above example would become: [*0.304878+0]. Spaces are not permitted within the brackets. If offset only is required it can be entered without a scale factor, for example [+1.63]. The character stripping functions can be useful when working with proprietary sentences e.g. Trimble \$PTNL,GGK, which has the characters EHT at the start of the Ellipsoid Height field. These can be removed with "\3"



Having configured NMEApro and started it receiving the NMEA data next you must open the NMEA Server link by clicking the left of the above buttons on the PN main toolbar. Note this button will launch NMEApro if it is not already running. Also make sure the next button is not flashing red; if it is click it so that it stops flashing. This is the Survey Log on/off button. When pressed in (off) it flashes red! You are now ready to start logging data. If data is being recorded you can use Main menu / tools / Text Log Viewer to see what has been recorded. In the following example it included Fix no., Time, Position, COG, SOG, Mag data, Towfish Depth and Depth. You can add other things too e.g. Date @d. See the PN help file under Parser Terms.

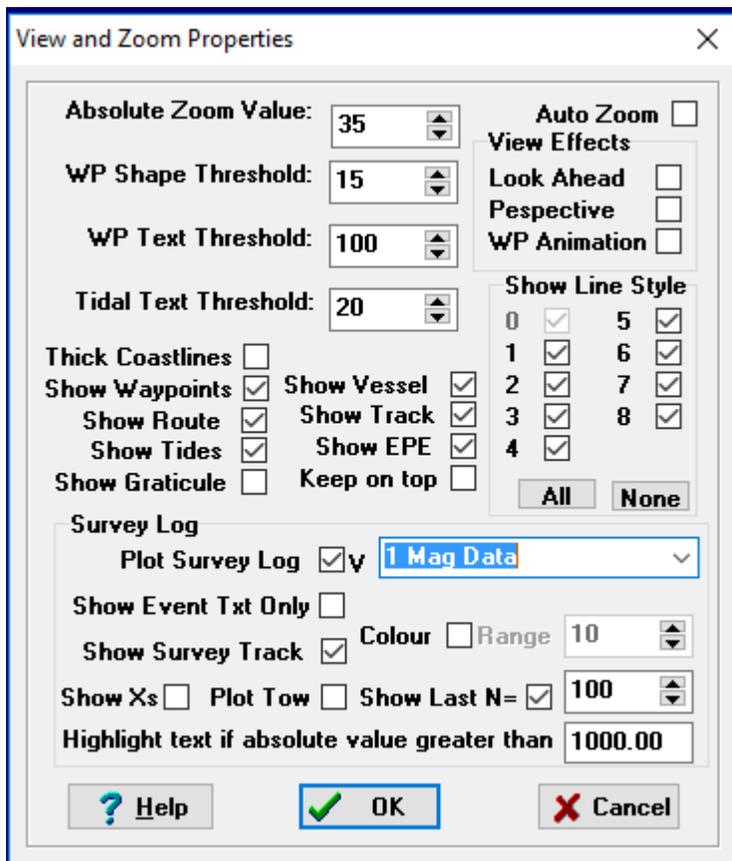
The logged data in the above example will appear as follows:

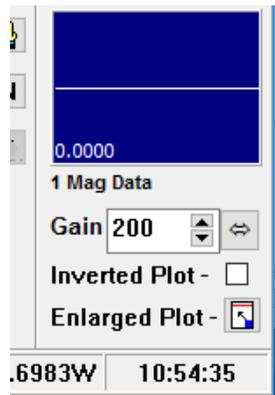
```

Log Date : 18-02-17
@f,@t,@p:3,@c,@s,@1,@2,@3
00001,160406,4738.264,N,00319.686,W,113,5.99,00003,0.0,14.8
00002,160407,4738.263,N,00319.684,W,112,5.96,00006,0.0,14.1
00003,160408,4738.263,N,00319.681,W,112,6.01,00000,0.0,14.0
00004,160409,4738.262,N,00319.679,W,112,6.03,00000,0.0,14.1
00005,160410,4738.261,N,00319.677,W,112,6.03,00005,0.0,14.5
00006,160411,4738.261,N,00319.674,W,112,6.01,00000,0.0,14.5
00007,160412,4738.260,N,00319.672,W,112,6.01,00000,0.0,14.9
00008,160413,4738.260,N,00319.670,W,112,6.03,00000,0.0,14.4
00009,160414,4738.259,N,00319.668,W,112,6.01,00002,0.0,14.6
00010,160415,4738.258,N,00319.665,W,112,6.01,00000,0.0,14.5
(In this example the tow depth (field @2) was not available so is recorded as zero.)
    
```

Plotting the magnetometer data

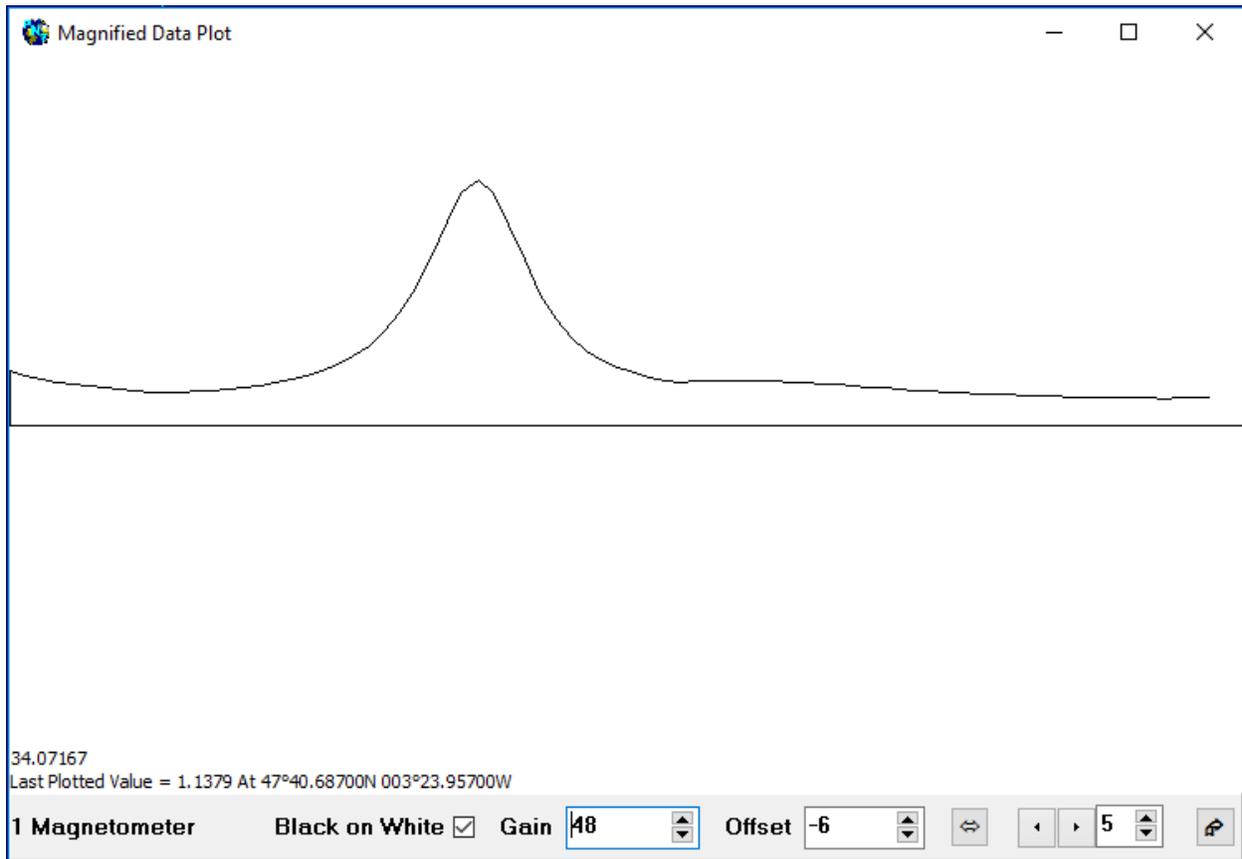
This can be done live while recording the data or off line afterwards from the text log file. Use the View / Zoom properties dialogue to add the Aux field e.g. 1 to the “Plot Survey Log V” box. You just need the field no. to identify it, after which you can type what you like. I typed “1 Mag Data” this then appears as the title in the graphic plot.



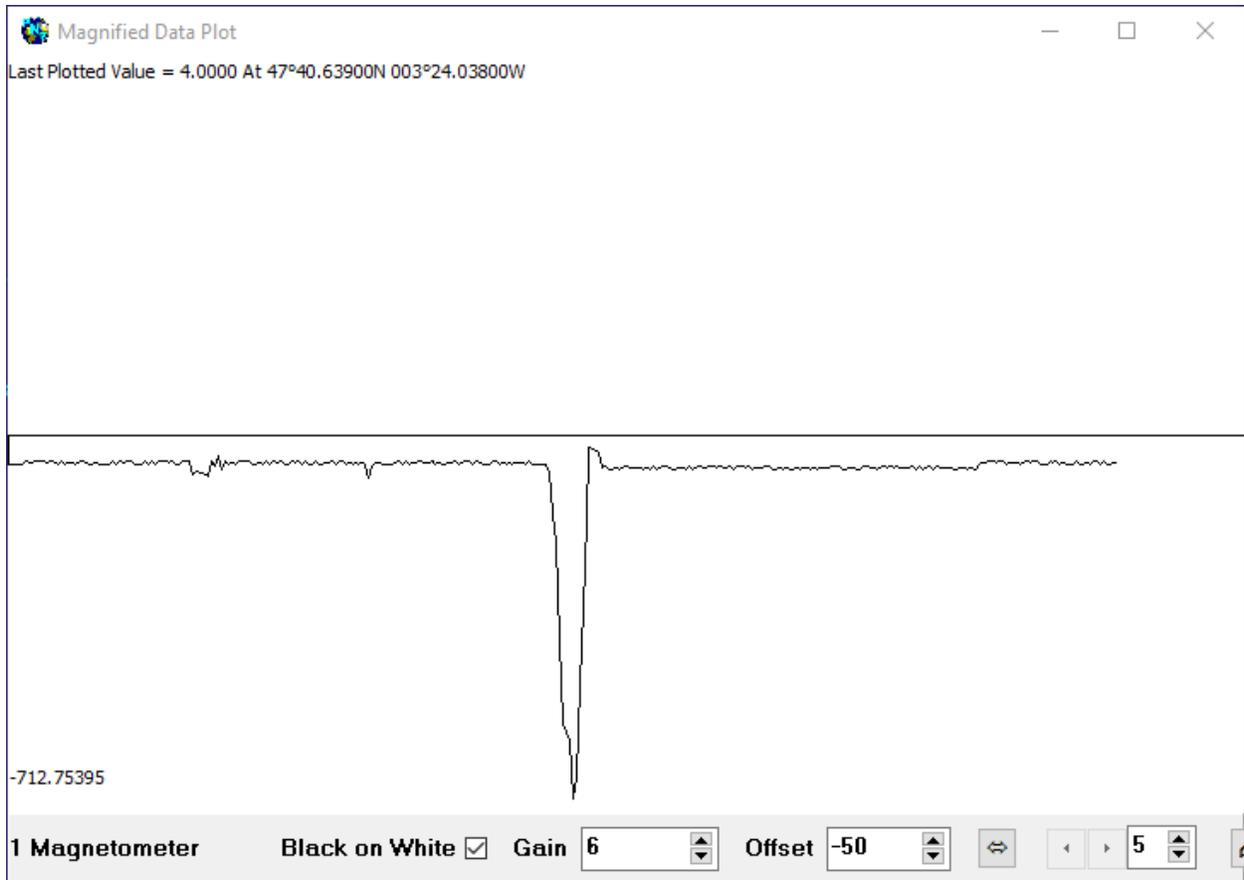


Next click the Enlarged Plot button (bottom right on main PN window). While logging you will now be live plotting the last 100 data values of the selected field. In the Magnified Plot window you can play with the gain and offset buttons to get the best result. The offset value enables you to shift the plotting origin up or down to get the plot on the screen with a higher gain value to show small variations in the data. See enlarged plot example below:

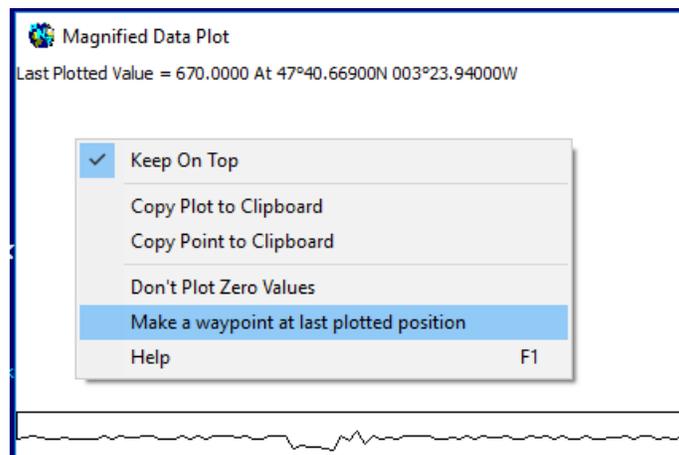
Here's what it should look like. This is with simulated magnetic target AX2000 data using AISsim :

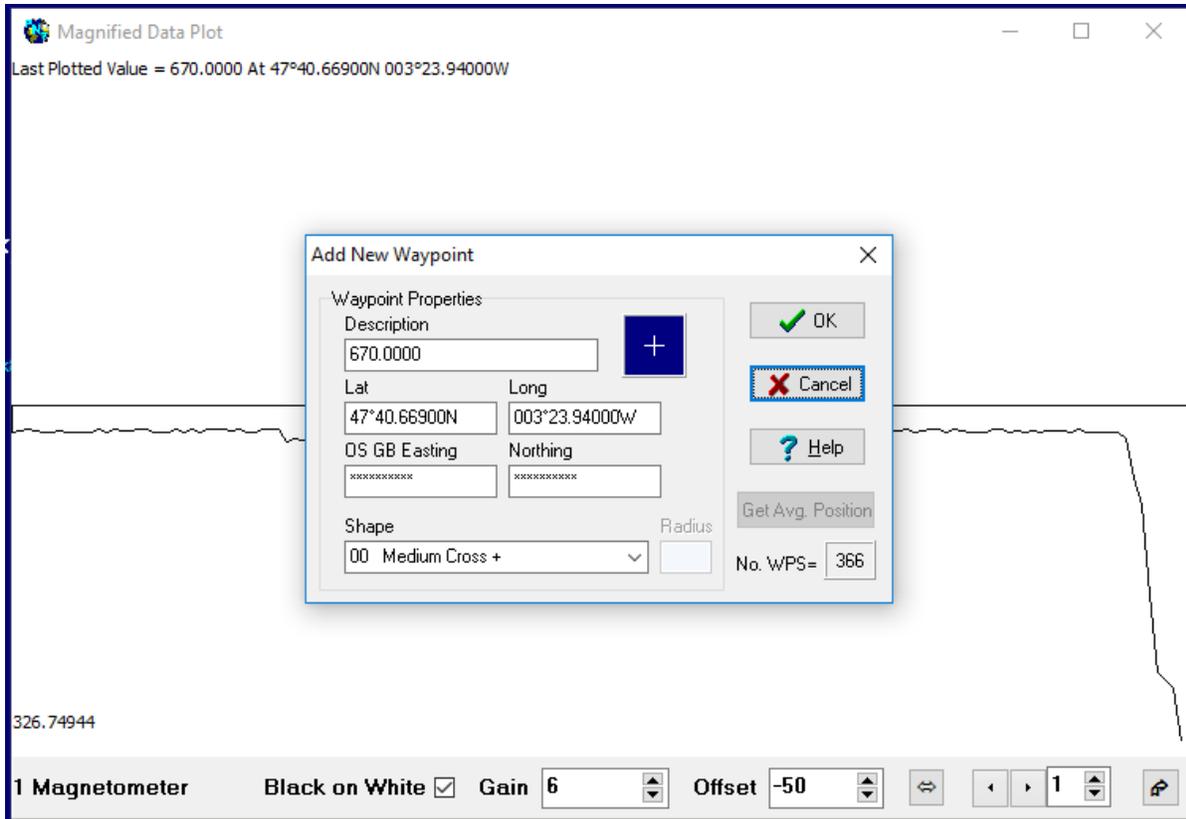


Plotting a Survey text log off-line is accomplished by opening the log file in PN using Main menu / File / Open file / Logs or short cut key F2. Then use the above plotting method as described in the PN Help file.



This plot shows the measurement capabilities of the plotter. Just hover the cursor on a peak and the value appears in the lower left corner. Also the last plotted value and position appear on the screen. Use data zoom and the left right shift buttons to shift the peak value to the last plotted position i.e. the right hand end of the plot area then use the popup menu to make a waypoint at that position as shown in the next two pictures. See PN Help.





The Waypoint will appear on the Portable Navigator chart with the logged value, the default shape being + and the logged value annotated. Note that you can change the WP shape by using the pulldown list in the Add New Waypoint dialogue to, for example, the magnetic WP symbol as shown below. Once you have changed the shape the new shape will be used for the next sequence of waypoints until it is changed again.



Full details of the whole process can be found in the PN Help file. Also note that you can generate these waypoints automatically while logging data. Their generation can be triggered if the value exceeds a certain limit and if the rate of change between samples exceeds a set limit. See the PN Help file under “Preferences / AGWP” to enable this and set up the limits.