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MGL_12   **3 December 2009**

Application Note
MGL AVIONICS
ENIGMA Log Dump V0.8

Conversion of MGL Avionics ".REC" recording files

Description

EnigmaLogDump will convert Enigma's binary recording files (.REC) into text files which can be processed easily with a spreadsheet program like Excel or Open Office Calc.

EnigmLogDump was written and supplied to ENIGMA users by Craig Payne (mailto:craig@craigandjean.com). The latest version of EnigmaLogDump can be found in the "Download" section of our www.stratomaster.eu web site.

EnigmaLogDump is a simple program designed to be run in a command window (DOS box) under Windows. However if needed the provided C source code should compile and run under any operating system.

Installation

Decompact the EnigmaLogDump.zip archive file into folder "c:/Program Files/Enigma Tools/EnigmaLogDump"

Or

Execute the self-extract archive EnigmaLogDump_SE.exe which will install the software and documentation into folder "c:/Program Files/Enigma Tools/EnigmaLogDump".

Usage

Open a DOS window: Click on Start / Execute and type « cmd »

Type `cd c:/Enigma tools/EnigmaLogDump`

Type `EnigmaLogDump` ("`tab`", "`comma`" or "`space`" without the quotes) `Enigma.rec` (or any file name)

1. tab   separate columns with a tab character
2. comma separate columns with a comma
3. space   use fixed-width columns separated by one or more spaces

Examples:

```
1. EnigmaLogDump tab enigma.rec
2. EnigmaLogDump comma enigma.rec
3. EnigmaLogDump space enigma.rec
```

Output

By default the output is just sent to the screen. To save the output to a file "redirect" it to a file name using the "angle bracket" (greater-than) found on the same key as the period in a US keyboard

```
EnigmaLogDump comma Enigma.rec > enigma.txt
```

or

```
EnigmaLogDump space a_log.rec > whatever.txt
```

Typical output:

Comma:

```
Time,alt,baro,ASI,TAS,VSI,g-s,rotor,m-v,b-v,amps,AOA,OAT,RPM,rfl1,rfl2,ch1 ...
"08/27/2007 19:20:23",1308,3174,101,103,11,99.9,0,11.3,10.9,0.0,-785,18,4359,2043,2043,0 ...
```

Space:

```
                Time    alt baro ASI TAS  VSI  g-s rotor  m-v  b-v  amps   AOA OAT  RPM ...
"08/27/2007 19:20:23"  1308 3174 101 103   11 99.9     0 11.3 10.9   0.0  -785  18 4359 ...
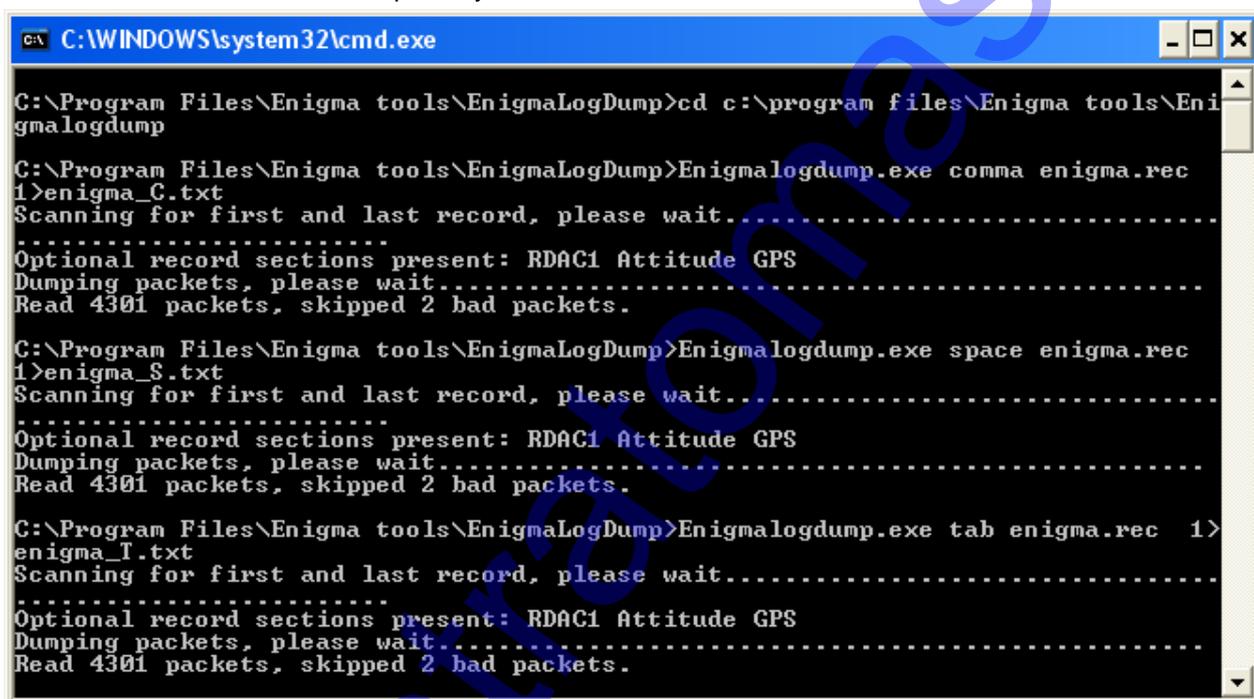```

*Tab:*

```
Time   alt   baro  ASI   TAS   VSI   g-s   rotor  m-v   b-v   amps ...
"08/27/2007 19:20:23"    1308  3174  101   103   11    99.9  0      11.3  10.9  0.0 ...
```

BAT file

The archive contains a BATch file (ELD.BAT) operating in the c:/Enigma tools/EnigmaLogDump folder, which processes an enigma.rec file into 3 files:

1. enigma_C.txt comma separated
2. enigma_S.txt space separated
3. enigma_T.txt tab separated

You can edit the batch file to adapt it to your needs.

EnigmaLogDump and Excel

Excel can directly read the output of EnigmaLogDump in any of the three formats.

If you use "File-Open" then a series of dialogs will step you through importing the data. If you indicate that the first column is a date in MDY order then Excel will convert it to a date/time.

You may see nothing but "######" in the date column but that is because the column is too narrow to display the full value. Just double-click on the line separating column A from B and the column width will expand to be a perfect fit.

With Excel it is best to use commas as the separator and give your output file an extension of ".csv" (comma-separated variables). Files with an extension of csv have an Excel icon and will automatically open in Excel (skipping the "import" dialog described above). In fact you can open a csv file just by typing its name at a command prompt.

Graph examples

Altitude
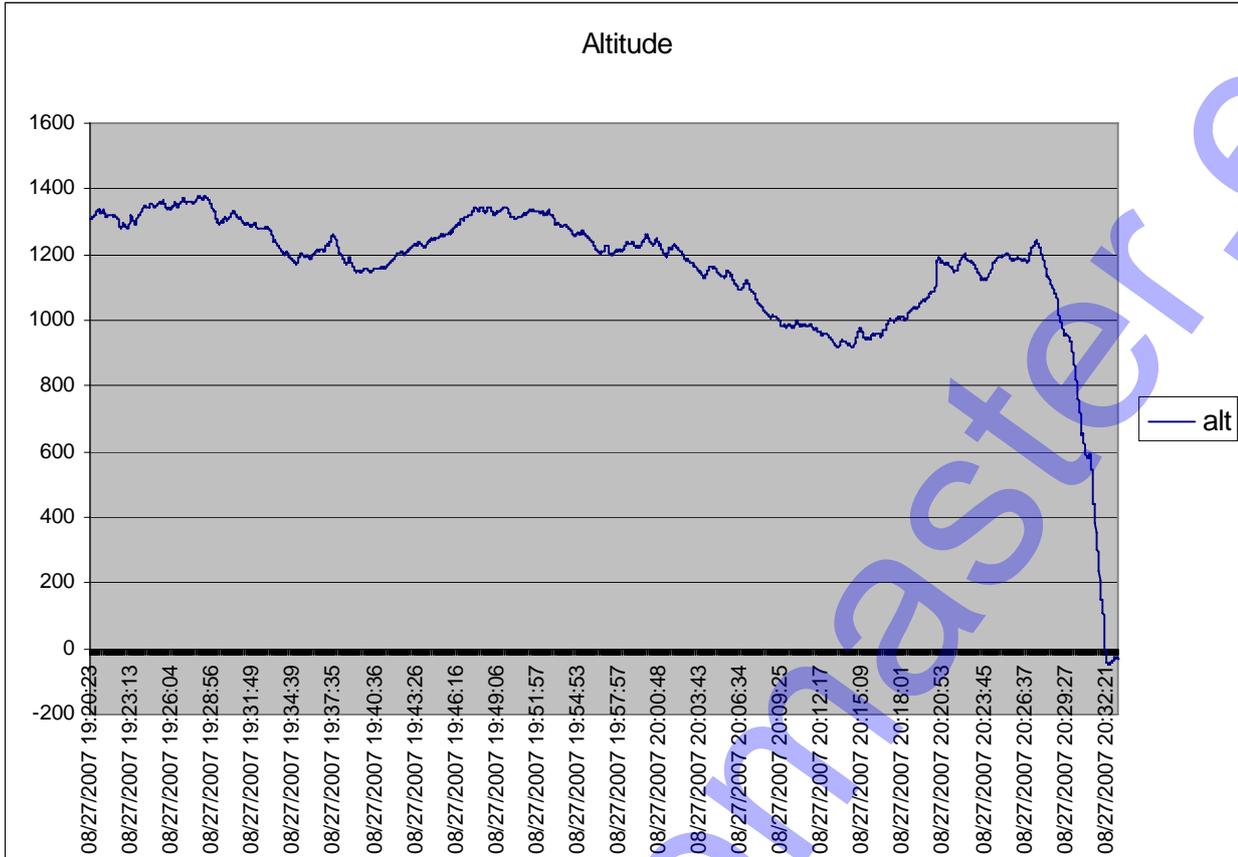
GPS track
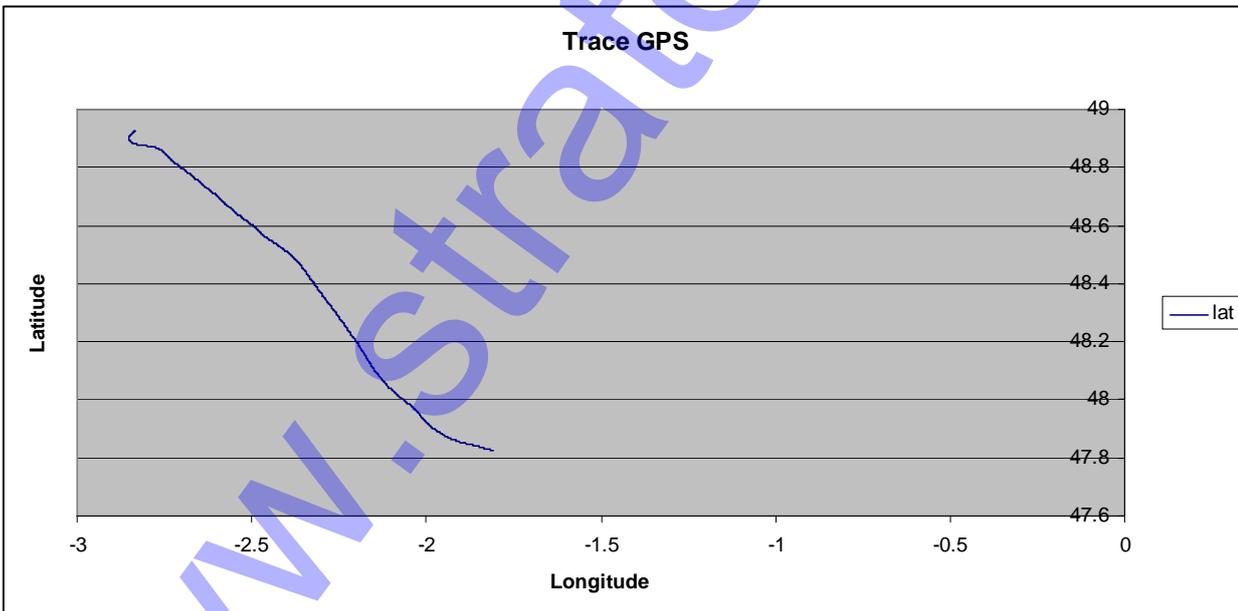
EGT, CHT & Water temperatures

EGT, CHT et Eau

Legend: tc1, tc2, tc3, h2o, tc4

RPM and Fuel Flow

T/mn & L/h
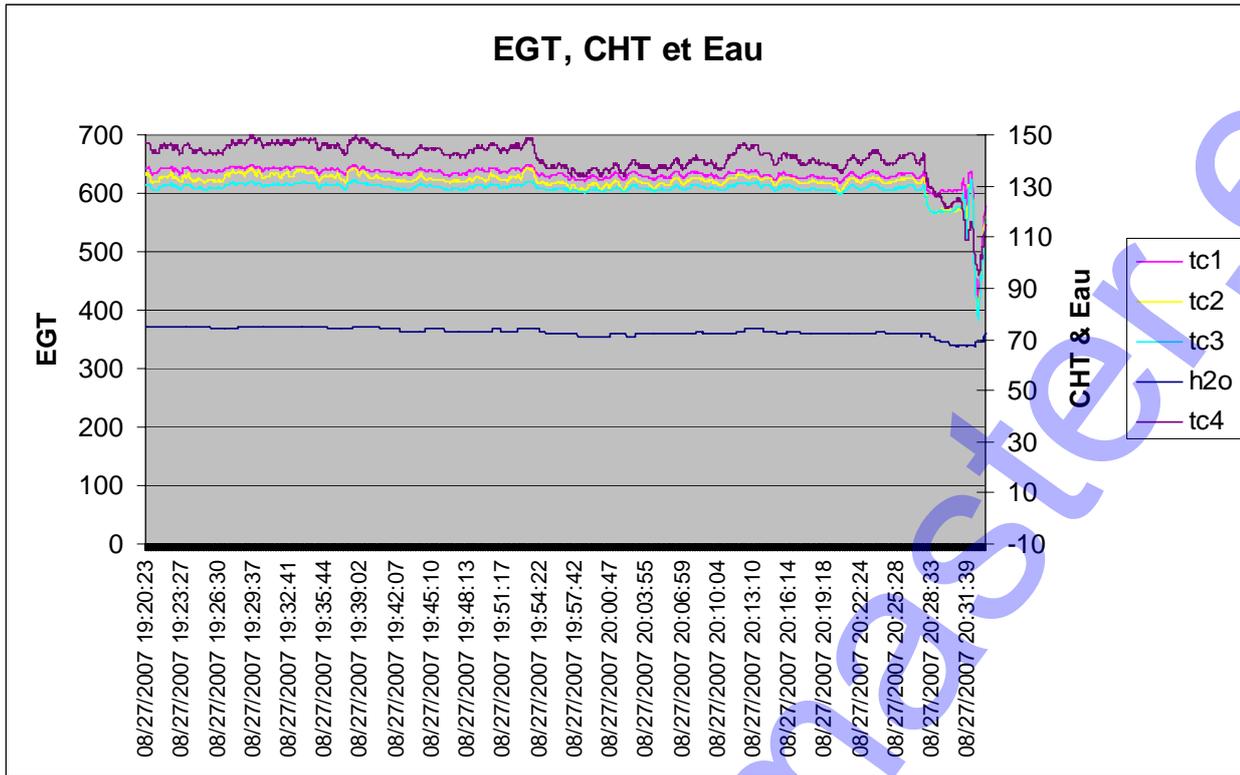
Legend: RPM, flow
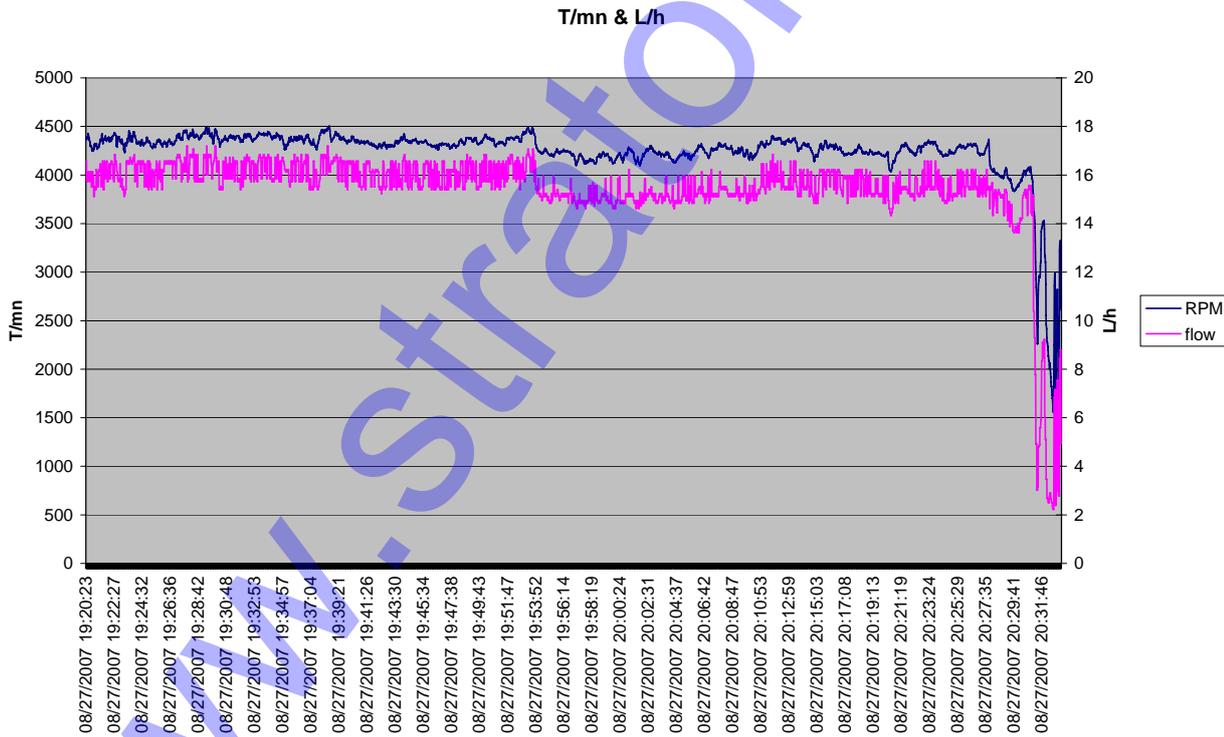
Column headings

Hobbs – Firmware under 1.0.0.4

Hobbs	Hobbs meter	Seconds

Date and time Firmware 1.0.0.4 and above

Time	Date and time	

Primary flight data

Alt	Altitude	Feet, can be negative
Baro	Barometer	Raw ambient pressure. To convert in 10th of a millibar: (Baro+389)*10000 div 3686
ASI	Air speed	miles / hour
TAS	True Air Speed	miles / hour
VSI	Vertical speed	Feet/minute. Positive & negative
g-s	Glide slope	Positive & negative
rotor	Rotor RPM	RPM (Bit 15 is rotor input status)
m-v	Main volts	Volts
b-v	Backup volts	Volts
amps	Charge/discharge Amps	Amperes
AOA	Angle of attack	
OAT	Outside air temperature	°C Positive & negative

RDAC 1

| RPM	Engine RPM	RPM
rfl1	Raw reading from fuel tank 1	0-4091
rfl2	Raw reading from fuel tank 2	0-4091
ch1	Rotax cylinder head temperature 1	°C
ch2	Rotax cylinder head temperature 2	°C
flow	Fuel flow	L/h
MAP	Manifold pressure	MilliBar
fl1	Fuel level 1	Liters
fl2	Fuel level 2	Liters
flc	Calculated fuel level	Liters
o-t	Oil temperature	°C
oil-p	Oil pressure	BAR
carb	Carb ice probe	°C, Positive & negative
f-p	Fuel pressure	BAR
h2o	Water temperature	°C
tc1	thermocouple 1	°C
tc2	thermocouple 2	°C
tc3	thermocouple 3	°C
tc4	thermocouple 4	°C
tc5	thermocouple 5	°C
tc6	thermocouple 6	°C
tc7	thermocouple 7	°C
tc8	thermocouple 8	°C
tc9	thermocouple 9	°C
tc10	thermocouple 10	°C
tc11	thermocouple 11	°C
tc12	thermocouple 12	°C

1.0.0.4 and above:

rch1	Raw ADC reading from CHT1	0-4091
rch2	Raw ADC reading from CHT2	0-4091
rot	Raw oil temperature	0-4091
rop	Raw oil pressure	0-4091

ref	reference reading from RDAC for thermocouple compensation	
fail	1 if RDAC has failed	0 or 1
unk	Unknown (pre 1.0.0.4)	

RDAC 2

RPM	Engine RPM	RPM
rfl1	Raw reading from fuel tank 1	0-4091
rfl2	Raw reading from fuel tank 2	0-4091
ch1	Rotax cylinder head temperature 1	°C
ch2	Rotax cylinder head temperature 2	°C
flow	Fuel flow	L/h
MAP	Manifold pressure	MilliBar
fl1	Fuel level 1	Liters
fl2	Fuel level 2	Liters
flc	Calculated fuel level	Liters
o-t	Oil temperature	°C
oil-p	Oil pressure	BAR
carb	Carb ice probe	°C, Positive & negative
f-p	Fuel pressure	BAR
h2o	Water temperature	°C
tc1	thermocouple 1	°C
tc2	thermocouple 2	°C
tc3	thermocouple 3	°C
tc4	thermocouple 4	°C
tc5	thermocouple 5	°C
tc6	thermocouple 6	°C
tc7	thermocouple 7	°C
tc8	thermocouple 8	°C
tc9	thermocouple 9	°C
tc10	thermocouple 10	°C
tc11	thermocouple 11	°C
tc12	thermocouple 12	°C

1.0.0.4 and above:

rch1	Raw ADC reading from CHT1	0-4091
rch2	Raw ADC reading from CHT2	0-4091
rot	Raw oil temperature	0-4091
rop	Raw oil pressure	0-4091

ref	reference reading from RDAC for thermocouple compensation	
fail	1 if RDAC has failed	0 or 1

unk	Unknown (pre 1.0.0.4)	

Attitude

bank	Bank indicator	+/- 180° Degrees
ptch	Pitch indicator	+/- 90° Degrees
slip	Slip indicator	+/- 50
hdg	Magnetic heading	0-359 Degrees
yaw	Gyro yaw	0-359 Degrees
G	G force	1/10 G
turn	Turn rate	minutes:seconds

GPS

lat	Latitude	Decimal degree
long	Longitude	Decimal degree
hdg	GPS heading	0-359 Degrees
gs	Ground speed	Miles/hour
g-alt	GPS Altitude	Feets
status	GPS status	0 = Acquiring 1 = Dead reckoning 2 = 2D fix 3 = 3D fix
sats	Number of satellites	
hac	Horizontal accuracy (radius)	
vac	Vertical accuracy	

Notes on graphing log data

Ground track

If you are logging your GPS data one of the flashiest (and easiest) things you can do is plot your ground track. Just select the latitude and longitude columns in Excel, select "Insert-chart" and choose "XY (Scatter)". A sub-type of "smoothed lines without markers" looks good. Note that by default the first column (latitude) gets placed on the horizontal axis. So if you want north to be up you will have to edit the chart to have longitude be the horizontal (X) axis and latitude be the vertical (Y) axis. Or before you create the chart just cut and paste the longitude column before the latitude column.

Other graphs

For other plots include the first (time) column and also choose an XY plot. Time will be plotted on the X axis. For a less cluttered chart you can right-click on the X scale, choose "Format Axis" and under the "Number" tab select a time format that doesn't include the date.

If you don't like the starting and ending times and increments that Excel automatically chooses you can select your own. Right-click on the horizontal time scale, choose "Format Axis" and click on the "Scale" tab. The fields will show some large odd numbers but you can enter your own values in "mm/dd/yyyy hh:mm" format for the minimum and maximum values and hh:mm for the major and minor units.

If your log includes many flights you can select a specific time span for your chart. You can either select the individual cells of interest (tedious) or use filtering. Click Data-Filter-AutoFilter. A small triangle will appear next to each heading. Click on the one next to "Time" and choose "Custom". Select "is greater than", "And", "is less than" and enter two dates and times in the format mm/dd/yyyy hh:mm. You can clear the filter by choosing "All". Note that the chart updates automatically as you change the filter. You can turn off filtering by again clicking on Data-Filter-AutoFilter.

Some of the numbers you want to plot are large (RPM, altitude) while others are small (oil pressure, OAT). There are a couple of things you can do to make them fit on the same chart well. First create the chart as outlined above. Then edit the chart by right-clicking on the item you want to change. One simple fix is to change to a logarithmic vertical scale. Right-click on the scale, choose "Format Axis", the "Scale" tab, click the check-box "Logarithmic scale" and then OK.

A better solution is to have two vertical scales. Right-click on the line representing large numbers (like altitude) and choose "Format Data Series". The choose the "Axis" tab and click on "Secondary axis" and OK. When I do this in Excel 2003 it adds unwanted markers to the line (triangles). To remove these and see just the line again right-click on the line, select the "Patterns" tab and under "Marker click on "None".

In general if you don't like something on your charts try right-clicking or double-clicking on it and exploring the options.