

3.5 How to Manage Data

Data are stored in ASCII format and one file is created every 24 hours on the flash memory of the electronics computer small case.

The name of the files is defined as follow :

yyymmdd.dat

where : yyyy is the year
mm is the month
dd is the day

example : 20090830.dat includes all the data collected on August 30, 2009.

These data files appear in the “SODAR FILES” window under SodterGraphic (Ethernet or WiFi). They can be retrieved on the netbook computer by clicking on one file and then on the “COPY” button. After some time the file will have been transferred on the hard disk of the netbook and its name will be displayed in the “Local PC” window. You can open this file (by double clicking on it), transfer it ...

All those data files are stored in the following directory :

Computer > Local Disk (C:) > Users > sodar > My Documents > Sodar-Machine

On the Desktop screen of the netbook, there is a “Sodar-Machine” shortcut to go directly to this directory

Description of a SODAR Data Block

The SODAR data block consists of two parts: the header and the measurements. Both parts appear in a column format, with the header on top and the measurements below the header. Both parts appear in a printout of data. An example data block is shown in the next figure.

The header contains four lines.

The first line of the header displays the values of the different sensors which are now available with this new electronic case design. It contains the GPS coordinates (GPS LAT and GPS LONG), the values of the 2D inclinometer (ROLL and PITCH) in degrees, the compass reading (AZIMUT –as previously explained not valid for now : see page III-23) in degrees respect to the geographic north (thanks the the GPS we can take into account the declination), the temperature inside the electronic box (T IN) in Celsius degrees, the pressure (PmBARS) in millibars, The outside temperature (T OUT) in Celsius degrees and the relative humidity (RH%) in percentage.

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The second line of the header contains the block number (BL#), the date, (MONTH, DAY, and YEAR), the time (HOUR and MIN), and the number of validations for each beam (VAL1, VAL2, and VAL3). On average the validations should be a few hundreds per beam. The values appear on the line directly beneath the header type.

The third line of the header begins with the normalized probabilities of false signals (SPU1, SPU2 and SPU3). If the SPU values average around 3 or less, everything is normal.

The environmental noise values for each beam are indicated by NOIS1, NOIS2, and NOIS3 in dBA units when ignoring the last digit (which is the number of dB's which have been cancelled by the noise subtraction technique). The performance of a Sodar highly depends on the ambient acoustic noise level. We recommend that this level would not exceed 60/65 dBA's for a PA0 and 50/55 dBA's for a PA5. If the last digit for one beam exceeds 4 dB's the corresponding beam is very likely under the influence of a spurious noise source (typically such as an air conditioner, a pump, or even a fan from a sensor on top of a nearby meteorological tower because of the corresponding high elevation angle the antenna diagram is less efficient. Typically improving the situation is done by slightly re-orienting the antenna (keep in mind that there are 4 tilted beams perpendicular to the antenna sides) and/or by "baffling" the identified noise source.

The FEMAX value in CT units/10 corresponds to the maximum ground clutter for all tilted beams and whatever the distance to the obstacle. It should be less than 100.

FEMAX can be high because of obstacles nearby the Sodar with a setting of HMIN at too low a value. For instance as discussed in paragraph 3.4 HMIN can be set at 13 meter with a PA0 operating with ALTMAX = 0. However on most sites this will be too low (due to nearby obstacles at 13 meters horizontal distance) and this will generate a high FEMAX resulting in some emitted frequencies being suppressed causing an altitude range reduction. In such case increasing HMIN to 30 meters for instance will solve the problem and by trial and error 25 meters may be acceptable on such specific site. These trials must last at least a day as ground clutter has a significant diurnal variation. Trying to start too close to the ground will cause an altitude range reduction because not all the available frequencies will be emitted.

SOFTW indicates the Sodar/RASS software version.

The fourth line of the header lists the number of frequencies emitted along the considered beam. Depending on the operation mode ("ALTMAX" set to 0 or 1) and the maximum required range the system will automatically use either up to 9 frequencies or up to 15 frequencies. If the number is less than 9 (15 respectively) this means that the Sodar has automatically suppressed some emitted frequencies in order to minimize ground clutter. If this is the case for one beam 1 or beam 2 you may have to re-orient the antenna.

Keep in mind that looking for the obstacle which may cause the ground clutter you must consider the direct tilted beam and its opposite as the Sodar uses 4 tilted beams (perpendicular to the antenna sides).

Ignoring the last digits, SNR 1, 2 and 3 stand for the average signal-to-noise ratios for beams (11,12), (21,22), 3.

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Their minimum value is 7 and they should stay below 11. The last digit is in tens of % the total bandwidth with "standard" spectral characteristics. If it gets below 5 very often, please contact us (you may face electrical grounding problems for instance).

CHECK represents the noise (in dBA) which is measured by the reference antenna, which is made of the 4 transducers at the 4 corners of the antenna

The difference between NOIS 1, 2, and 3 on one side and CHECK on the other should remain roughly constant. If not, the directivity of the active antenna has degraded. In such case please contact us (it is very unlikely that the antenna itself would be the cause but most probably the phased array steering electronics).

JAM summarizes the on line tests. It should be 0. If it shows values in the tens this tells that the band pass analog filters are no more nominal. If it shows values as only one digit this tells that the audio power amplifiers channels inputs or outputs (in phase and/or amplitude) are no longer nominal.

Before describing the different data outputs we would like to clarify the general approach of our software.

By principle of the spectral analysis method it is impossible to infer that all measurements are good even with our multi-frequency coding technique which not only allows much more power output without losing vertical resolution but which most of all is a very powerful consensus technique. As a consequence at the end of the averaging period the data gathered include right and wrong data.

By "pausing" at intervals (the Sodar does not emit and goes through all the usual processing) we are able to characterize the false validations probability. With sophisticated algorithms which control more than 1,000 signal to noise ratio thresholds (one per beam and per frequency point) we are able to keep the false validation threshold under a predetermined level.

Then at the end of the averaging period by asking for a given total of validations (true and false) we can guarantee the precision of our outputs. If this is not the case the system automatically outputs -9999 at the corresponding altitude for the considered parameter.

Contrary to all other remote sensing systems we do not need any quality factor to be used after the fact. Our systems are fully real time.

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The measurements appear below the header, in columns. The first column always contains the altitude of the measurements. A listing of all other possible measurement types appears below.

TITLE	PARAMETER DESCRIPTION	UNIT
ALT	Altitude	meters
CT	echo strength	no unit
SPEED	horizontal wind speed	cm/s
DIR	wind direction	degrees
S DIR	standard deviation of the wind direction	degrees
W	vertical wind speed	cm/s
SW	standard deviation of the vertical wind speed	cm/s
SU	standard deviation of the horizontal wind (along wind)	cm/s
SV	standard deviation of the horizontal wind (cross wind)	cm/s
INVM	inversion and/or mixing height	meters
STAB	stability class	1 (F) stable 2(E) slight stable 3(D) neutral 4(C) slightly unstable 5 (B) unstable
ETAM	turbulent mechanical dissipation rate coefficient	$\text{cm}^2 \text{s}^{-5}$
KZ	vertical turbulent eddy diffusion coefficient	$\text{m}^2 \text{s}^{-3}$
DT/DZ	Lapse rate estimation	degrees Centigrade/km
ECH T	RASS echo	no unit
T	RASS temperature	$^{\circ}\text{C} \times 10$
ST	standard deviation of the RASS temperature	$^{\circ}\text{C} \times 10$
-9999	This value indicates that no measurement is available for that altitude.	no unit