

Verifying Proper Radiometer Leveling

The off-zenith measurement accuracy is dependent on the radiometer being level. Over time, the tripod, and the structure supporting the tripod and radiometer, can settle and may cause the radiometer to become off-level. It is important for the radiometer to be as level as possible.

Radiometrics recommends that the state of instrument leveling be checked at least every 6 months, when the radiometer is calibrated.

To be considered level, the level measurements need to be less than $|0.5^\circ|$. To view the level measurements, do the following:

1. Open a recent lv0.csv file in Microsoft Excel or other spreadsheet program, such as LibreOffice.
2. From the **data** tab, select “**sort**” (Figure 1).

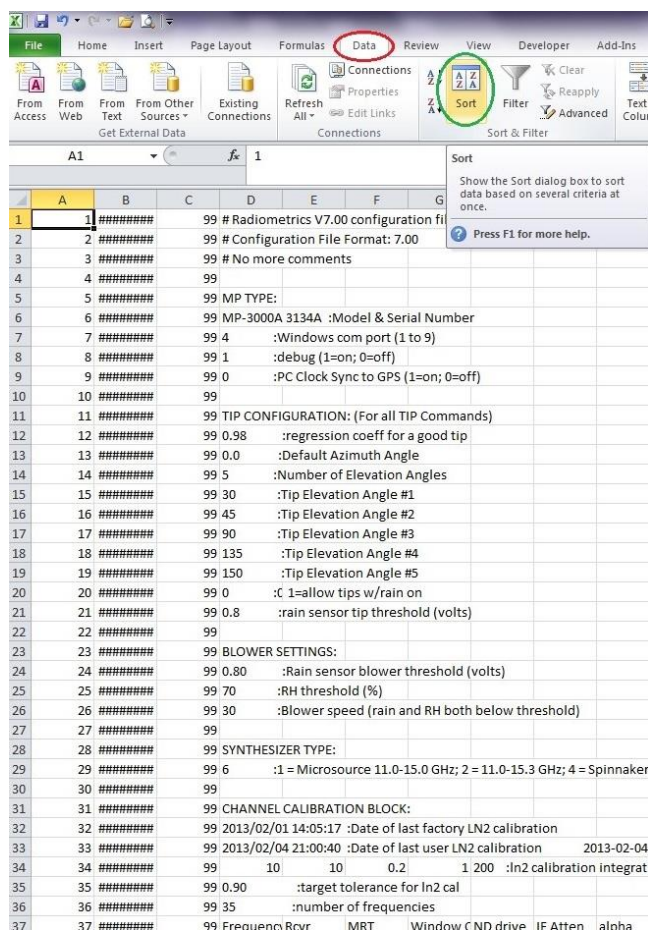


Figure 1: Sort in Microsoft Excel

3. Select the first dropdown box, and sort the file by Column C (Figure 2). Make sure that the box “my data has headers” remains unchecked.

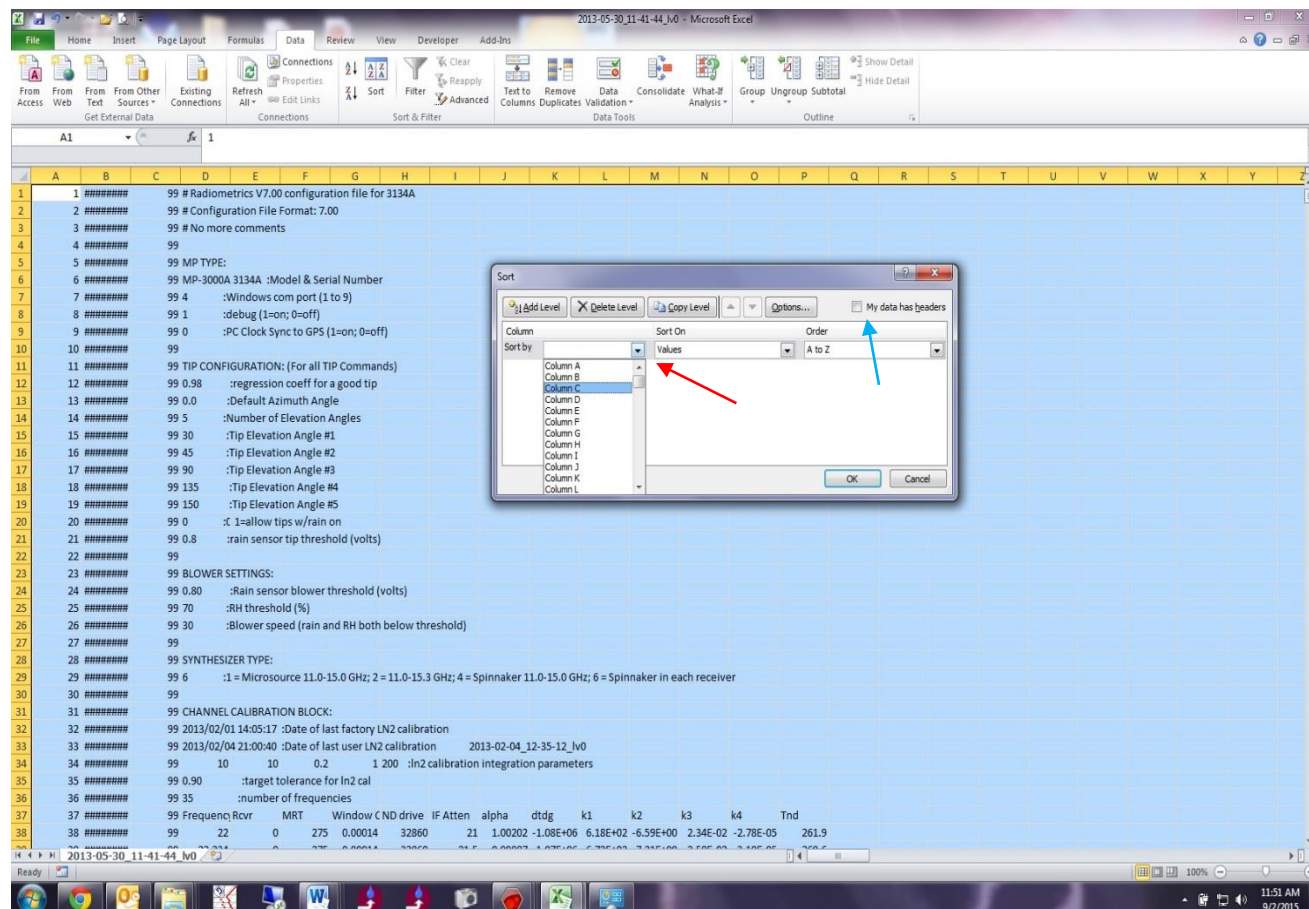
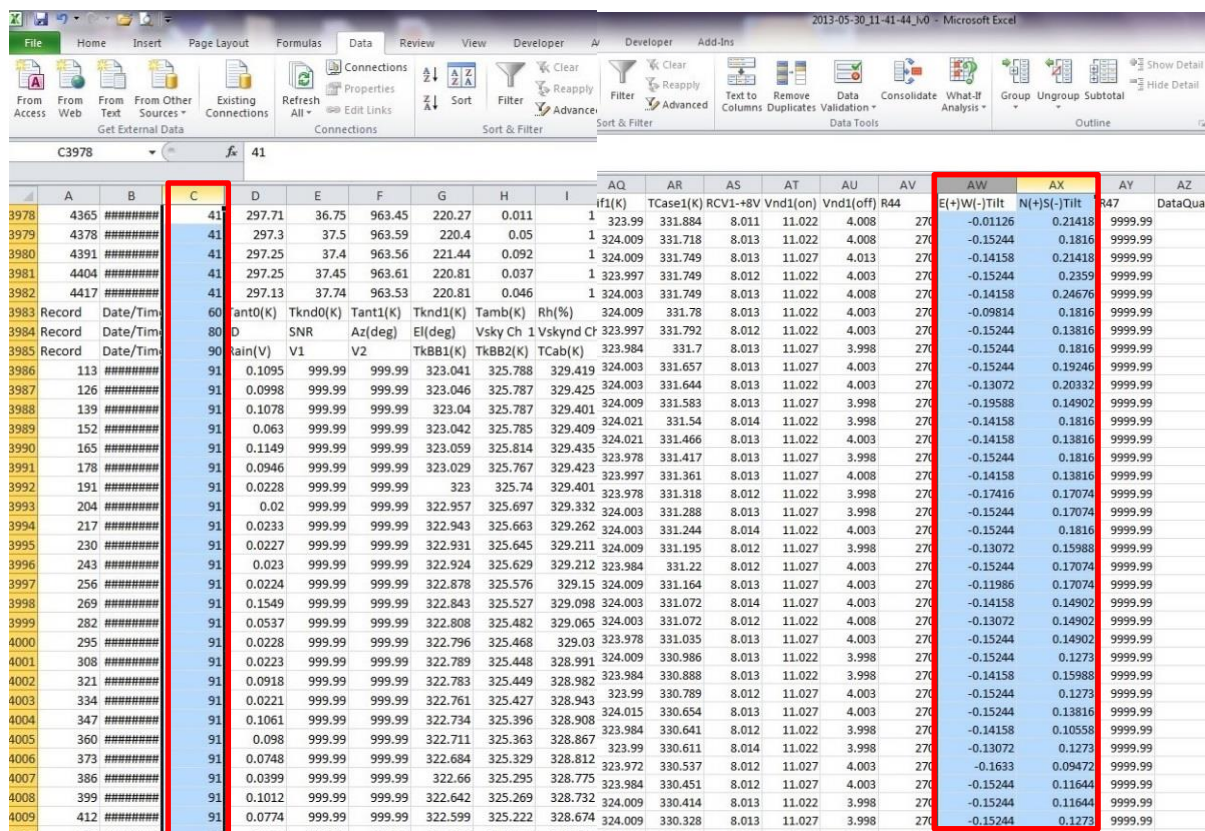


Figure 2: Column C

4. Scroll down towards the bottom of the file to find the type 91 records in Column C (Figure 3).

5. Scroll over to find columns AW and AX to find the tilt values (Figure 3).



	A	B	C	D	E	F	G	H	I	AQ	AR	AS	AT	AU	AV	AW	AX	AY	AZ
3978	4365	#####	41	297.71	36.75	963.45	220.27	0.011	1	323.99	331.884	8.011	11.022	4.008	270	-0.01126	0.21418	9999.99	
3979	4378	#####	41	297.3	37.5	963.59	220.4	0.05	1	324.009	331.718	8.013	11.022	4.008	270	-0.15244	0.1816	9999.99	
3980	4391	#####	41	297.25	37.4	963.56	221.44	0.092	1	324.009	331.749	8.013	11.027	4.013	270	-0.14158	0.21418	9999.99	
3981	4404	#####	41	297.25	37.45	963.61	220.81	0.037	1	323.997	331.749	8.012	11.022	4.003	270	-0.15244	0.2359	9999.99	
3982	4417	#####	41	297.13	37.74	963.53	220.81	0.046	1	324.003	331.749	8.013	11.022	4.008	270	-0.14158	0.24676	9999.99	
3983	Record	Date/Time	60	ant0(K)	Tknd0(K)	Tant1(K)	Tknd1(K)	Tamb(K)	Rh(%)	324.009	331.78	8.013	11.022	4.003	270	-0.09814	0.1816	9999.99	
3984	Record	Date/Time	80	D	SNR	Az(deg)	El(deg)	Vsky Ch 1	Vskynd C	323.997	331.792	8.012	11.022	4.003	270	-0.15244	0.13816	9999.99	
3985	Record	Date/Time	90	gain(V)	V1	V2	TkBB1(K)	TkBB2(K)	TCab(K)	323.984	331.7	8.013	11.027	3.998	270	-0.15244	0.1816	9999.99	
3986	113	#####	91	0.1095	999.99	999.99	323.041	325.788	329.419	324.003	331.657	8.013	11.027	4.003	270	-0.15244	0.19246	9999.99	
3987	126	#####	91	0.0998	999.99	999.99	323.046	325.787	329.425	324.003	331.644	8.013	11.022	4.003	270	-0.13072	0.20332	9999.99	
3988	139	#####	91	0.1078	999.99	999.99	323.04	325.787	329.401	324.009	331.583	8.013	11.027	3.998	270	-0.19588	0.14902	9999.99	
3989	152	#####	91	0.063	999.99	999.99	323.042	325.785	329.409	324.021	331.54	8.014	11.022	3.998	270	-0.14158	0.1816	9999.99	
3990	165	#####	91	0.1149	999.99	999.99	323.059	325.814	329.435	324.021	331.466	8.013	11.022	4.003	270	-0.14158	0.13816	9999.99	
3991	178	#####	91	0.0946	999.99	999.99	323.029	325.767	329.423	323.978	331.417	8.013	11.027	3.998	270	-0.15244	0.1816	9999.99	
3992	191	#####	91	0.0228	999.99	999.99	323	325.74	329.401	323.997	331.361	8.013	11.027	4.008	270	-0.14158	0.13816	9999.99	
3993	204	#####	91	0.02	999.99	999.99	322.957	325.697	329.332	323.978	331.318	8.012	11.022	3.998	270	-0.17416	0.17074	9999.99	
3994	217	#####	91	0.0233	999.99	999.99	322.943	325.663	329.262	324.003	331.288	8.013	11.027	3.998	270	-0.15244	0.17074	9999.99	
3995	230	#####	91	0.0227	999.99	999.99	322.931	325.645	329.211	324.009	331.244	8.014	11.022	4.003	270	-0.15244	0.1816	9999.99	
3996	243	#####	91	0.023	999.99	999.99	322.924	325.629	329.212	323.984	331.195	8.012	11.027	3.998	270	-0.13072	0.15988	9999.99	
3997	256	#####	91	0.0224	999.99	999.99	322.878	325.576	329.15	324.009	331.22	8.012	11.027	4.003	270	-0.15244	0.17074	9999.99	
3998	269	#####	91	0.1549	999.99	999.99	322.843	325.527	329.098	324.003	331.164	8.013	11.027	4.003	270	-0.11986	0.17074	9999.99	
3999	282	#####	91	0.0537	999.99	999.99	322.808	325.482	329.065	324.003	331.072	8.012	11.022	4.008	270	-0.14158	0.14902	9999.99	
4000	295	#####	91	0.0228	999.99	999.99	322.796	325.468	329.03	323.978	331.035	8.013	11.027	4.003	270	-0.13072	0.14902	9999.99	
4001	308	#####	91	0.0223	999.99	999.99	322.789	325.448	328.991	324.009	330.986	8.013	11.022	3.998	270	-0.15244	0.1273	9999.99	
4002	321	#####	91	0.0918	999.99	999.99	322.783	325.449	328.982	323.984	330.888	8.013	11.022	3.998	270	-0.14158	0.15988	9999.99	
4003	334	#####	91	0.0221	999.99	999.99	322.761	325.427	328.943	323.99	330.789	8.012	11.027	4.003	270	-0.15244	0.1273	9999.99	
4004	347	#####	91	0.1061	999.99	999.99	322.734	325.396	328.908	324.015	330.654	8.013	11.027	4.003	270	-0.15244	0.13816	9999.99	
4005	360	#####	91	0.098	999.99	999.99	322.711	325.363	328.867	323.984	330.641	8.012	11.022	3.998	270	-0.14158	0.10558	9999.99	
4006	373	#####	91	0.0748	999.99	999.99	322.684	325.329	328.812	323.99	330.611	8.014	11.022	3.998	270	-0.13072	0.1273	9999.99	
4007	386	#####	91	0.0399	999.99	999.99	322.66	325.295	328.775	323.972	330.537	8.012	11.027	4.003	270	-0.1633	0.09472	9999.99	
4008	399	#####	91	0.1012	999.99	999.99	322.642	325.269	328.732	323.984	330.451	8.012	11.027	4.003	270	-0.15244	0.11644	9999.99	
4009	412	#####	91	0.0774	999.99	999.99	322.599	325.222	328.674	324.009	330.414	8.013	11.022	3.998	270	-0.15244	0.11644	9999.99	

Figure 3: Type 91 Records (left) and Tilt Values (right)

6. To be considered level, the values in the column should be less than $|0.5^\circ|$, such as this case. The first column, AW, is the East/West tilt, or the tilt along the length of the radiometer. The second column, AX, is the North/South tilt, or the tilt along the width of the radiometer. A slight variation from measurement to measurement is expected as the leveling sensor is very accurate. If the tripod needs leveling, please refer to the insert from the user manual below: “Leveling the Tripod”.

Leveling the Tripod

Before installing the Profiling Radiometer, the mounting surface must be leveled using the bubble level supplied with the TP-2000 Tripod (or similar). The instrument must be mounted on a level surface to ensure accurate antenna elevation angles and TIP calibrations. If the triangular Tripod Top Plate is not level within $1/8^{\text{th}}$ of a bubble in all directions when the tripod is in position at the installation site, adjust one or more of the telescoping tripod legs to different lengths as required to make it level. First, align the level in the plane of the leg to be adjusted first. Then loosen the leg collar clamp on that leg using the $1/4''$ Allen wrench as shown in Figure . The lower leg will slide freely inside the upper leg. To adjust the leg length,

move the lower leg up or down as necessary. When the bubble in the level is centered, tighten the collar clamp. Repeat for each leg as necessary to make the triangular Tripod Top Plate level in all directions.



Figure 4: Leveling the TP-2000 Tripod

1. Align the level in the plane of the leg to be adjusted first.
2. Then loosen the leg collar clamp on that leg using the 1/4" Allen wrench as shown in Figure 4.

The lower leg will slide freely inside the upper leg. To adjust the leg length, move the lower leg up or down as necessary.

3. When the bubble in the level is centered, tighten the collar clamp.
4. Repeat for each leg as necessary to make the triangular mounting plate level in all directions. Refer to Figure 5, for a quick leveling reference.



Figure 5: Leveling directions

NOTE:

Exercise reasonable care when assembling the Tripod to avoid denting or damaging the Tripod legs. Dents in the legs will prevent the inner tube from being extended/shortened.