

**CAUTIONS REGARDING INSTALLATION OF PV SOLAR PANEL SYSTEMS**

- 1 - Do not drill holes in frame. Do not cut or modify parts or rails.
- 2 - Work under dry conditions with dry tools.
- 3 - Do not stand or step on solar module.
- 4 - Do not install near flammable gases.
- 5 - Do not drop or allow objects to fall onto module.
- 6 - Completely cover solar module with opaque materials when wiring to halt production of electricity.
- 7 - Keep the back side of solar module surfaces free of foreign objects.
- 8 - Do not use chemicals on solar modules when cleaning.
- 9 - Do not wear metallic jewellery, which may cause electrical shock.
- 10 - Do not touch cable electrical contacts.
- 11 - Do not expose solar modules to sunlight that is concentrated with mirrors, lenses or similar means.
- 12 - Consult local codes and other applicable laws and statutes concerning required permits and regulations concerning installation and inspection requirements. Install solar modules and systems according to applicable codes.
- 13 - Product should be installed and maintained by qualified personnel. Keep unauthorized personnel away from solar modules.
- 14 - Avoid shadowing cells in order to prevent solar module hot spots and/or reduction in power.
- 15 - Avoid installing panels and mounting systems in high corrosion areas.

**CALCULATING THE BEST ANGLES FOR PV SOLAR PANELS TO BE MOUNTED AT AND COMPENSATING FOR THE MOVEMENT OF THE SUN**

Whilst it's a popular misconception that photovoltaic (PV) Solar Panels need sunlight in order to operate, it's still important to ensure that they are mounted in such a way as to obtain the maximum exposure to available daylight.

The PV Solar Panel Mounting Frame allows manual adjustment of the mounting angle to compensate for the altered position of the sun in different seasons.

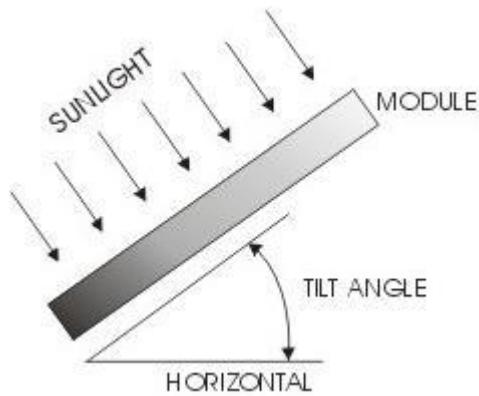
Would you like your system to generate the maximum energy during the winter, during the summer or to generate approximately the same amount of energy all year round? Your answer to this question will affect the optimum angle at which your PV Solar Panels should be angled in order to meet your requirements.

Another factor which may be overlooked is the reflectivity of your PV Solar Panels. Steeper angling can increase the reflectivity of your panels which will result in a loss of light-to-energy conversion performance.

**A GENERALLY ACCEPTED CALCULATION OF THE BEST ANGLES FOR MOUNTING PV SOLAR PANELS**

Although there are a number of dedicated resources on the internet that will allow you to calculate precisely the optimum angle for your PV Solar Panels to be mounted at, the following calculation should enable your PV Solar Panels to perform in excess of 90% of their maximum rated capacity.

To calculate the optimum angle for the PV Solar Panel the latitude of the installation is required. In the Northern Hemisphere the PV Solar Panel should be tilted due south, in the Southern Hemisphere the PV Solar Panel should be tilted due north.



In the winter months, when there's less sun, take your latitude, multiply it by 0.9, and then add 29 degrees.

$$\text{Optimum Winter Angle} = (\text{Latitude} * 0.9) + 29$$

**For example:**

If your latitude is 40 degrees, the angle you want to tilt your panels in the winter is:  $(40 * 0.9) + 29 = 65$  degrees.

In the summer months take your latitude, multiply it by 0.9, and subtract 23.5 degrees.

$$\text{Optimum Summer Angle} = (\text{Latitude} * 0.9) - 23.5$$

**For example:**

If your latitude is 40 degrees, your panels should be tilted at:  $(40 * 0.9) - 23.5 = 12.5$  degrees.

$$\text{Fixed Optimum Angle} = (\text{Latitude} * 0.9) + 5.5$$

**For example:**

If your latitude is 40 degrees, your panels should be tilted at:  $(40 * 0.9) + 5.5 = 41.5$  degrees.

Of course, the correct angle for solar panels is for ideal locations but in the real world, we deal with trees & buildings that may shade the panels, or areas with lots of leaves, dust, or debris. You might need to adjust the angle a little bit to compensate for less-than-ideal conditions.

The correct angle for your project will depend very much as to when you want to get the best out of your photovoltaic system. If you want to get the best performance during the summer months, you would angle your photovoltaic panels according to the height of the sun in the sky during these months. If you want to improve your winter performance, you would angle your photovoltaic panels towards the winter months in order to get the best performance at that time of year.

If you have the opportunity to adjust your photovoltaic panels throughout the year, you will benefit from having the optimum performance from your solar system all of the time.

During any stage of the installation Soil Instruments will be pleased to offer advice.

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