

Using Tiltmeters as Precision Levels

Tech Note

You can use Applied Geomechanics Tiltmeters and Miniature Tilt Sensors to level platforms and equipment within a few microradians of true level. Here's how:

1. The sensors in all "high-gain" and "mid-range" tiltmeters are installed within 100 microradians of absolute level. In other words, when the base of the tiltmeter is perfectly level, the tiltmeter output indicates 100 microradians or less. This value is the "bias" of the tiltmeter.
2. You can measure and remove the bias by following the procedure outlined in our "Measuring and Removing Tiltmeter Bias" Tech Note.
3. After measuring the bias, install the tiltmeter on your platform. Adjust the platform until the tiltmeter output is equal to the bias value. At this point, the platform is level.
4. Another method, which does not require measurement of the bias, is to place the tiltmeter on the platform, take a reading, then rotate it 180 degrees about its vertical axis and take another reading. When the readings are the same in both orientations, the platform is level.
5. You should be able to level the platform to an absolute accuracy of better than 5 microradians using these techniques. The method described in paragraph 4 above is typically preferred because it automatically compensates for any zero shift caused by temperature changes.
6. For greatest accuracy, place the tiltmeter on the platform 30 or more minutes before you begin your readings. This allows the thin surface layer of liquid on the internal walls of the sensor to drain into the pool and equilibrate. Moving the sensor slowly while keeping it level helps to maintain high accuracy.