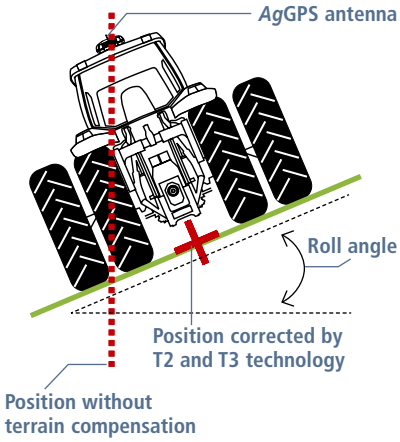
FACTSHEET

TRIMBLE T2 AND T3 TECHNOLOGY

YOU CAN DEPEND ON THE ACCURACY AND EFFICIENCY OF YOUR TRIMBLE GPS ASSISTED STEERING OR AUTOMATED GUIDANCE SYSTEMS WHEN WORKING ON ROLLING TERRAIN AND ROUGH GROUND, THANKS TO T2 AND T3 TECHNOLOGY.

T2 AND T3 TERRAIN COMPENSATION TECHNOLOGY

Improves accuracy when driving straight lines across sloping or rough terrain by minimizing skips and overlaps.



Trimble developed T2® and T3™ technology to minimize skips and overlaps between each pass when working on rough and sloping fields. This concept is called 'terrain compensation'.

WHAT IS TERRAIN COMPENSATION?

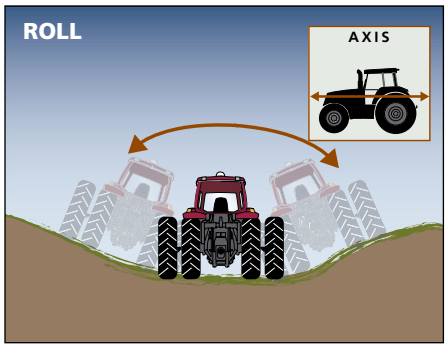
Terrain compensation calculates the difference between the GPS antenna's location and the actual desired position of the vehicle's center point on the ground, no matter what slope the vehicle is on (see diagram on the left).

To make these calculations, sensors such as accelerometers and gyroscopes, can be mounted in different axes to compensate for roll, pitch, and yaw. When mounted on the roll axis the sensors are used to measure the grade of the ground and how fast that grade changes.

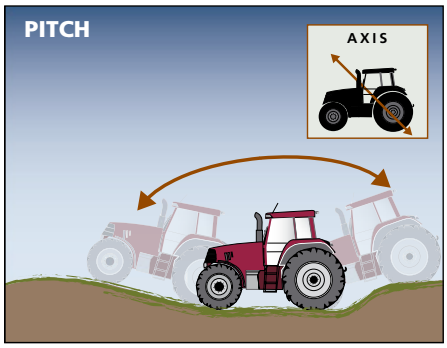
Using this information the system can then tell the difference between a bump and a slope and compensate the position of the vehicle accordingly. When the sensors are mounted on the pitch axis they are used to compensate the vehicles position when driving up or down a slope/hill. Additionally when mounted on the yaw axis the sensors are used to compensate for crabbing which is caused by steering up the slope constantly, to keep the vehicle in a straight line.

EXPLAINING ROLL, PITCH, AND YAW

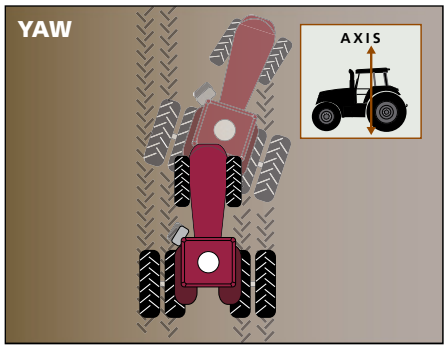
The illustrations below show how the lines running through the vehicle center show 3 axis that the vehicle rotates around, resulting in roll, pitch, and yaw:



ROLL: Rotates on horizontal (front to back) axis



PITCH: Rotates on the side to side axis



YAW: Rotates on vertical top to bottom axis

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SENSORS

With accelerometers and gyroscopes the slope and the change in slope can be accurately measured. The system measures a bump, such as ditches, rocks or a change in hillside slopes, and then compensates the vehicles position accordingly. The gyroscopes and accelerometers that Trimble use are very accurate and work in extreme temperatures.

ACCELEROMETER

The accelerometer determines the angle of the inclination by measuring the direction towards the center of the earth using gravitational pull. By measuring the direction to the center of the earth, the vehicle's tilt can be determined and the correct compensation factor applied to the GPS position.

GYROSCOPE

The gyroscope measures the speed that the angle changes. This is done by measuring minute oscillations of a silicon ring and then calculating the changes to the oscillations when the gyroscope is rotated around its axis.

What does Trimble offer?

*Ag*GPS EZ-STEER 500 SYSTEM WITH T2 TECHNOLOGY

The Trimble® *Ag*GPS® EZ-Steer® 500 assisted steering system comes standard with T2 technology.

The EZ-Steer 500 system uses two accelerometers and two gyroscopes to compensate for roll and yaw. Information from these sensors that are located in the steering controller is used at 50 times a second to compensate the GPS position for sloping and rough terrain. The EZ-Steer controller can be in mounted in several specific orientations within the vehicle cab.

The EZ-Steer system with T2 technology is ideal for applications that require guidance accuracy of 6–8 inch pass-to-pass[1] accuracy on rolling, sloping, or rough terrain, such as ditches, waterways, and terraces.

The EZ-Steer system combines a friction wheel with GPS guidance from the EZ-Guide® 500 lightbar and turns the steering wheel for you.

*Ag*GPS AUTOPILOT SYSTEM WITH T3 TECHNOLOGY (STANDARD)

The Trimble *Ag*GPS Autopilot™ automated steering system comes standard with T3 technology.

The Autopilot system uses three gyroscopes and three accelerometers to compensate for roll, pitch, and yaw (which are located in the *Ag*GPS NavController II). Information from these sensors is used at 50 times a second to compensate the GPS position for sloping and rough terrain. This fast update rate ensures an optimal amount of information is provided, allowing the Autopilot system to maintain one inch steering accuracy at any speed and any pattern. The *Ag*GPS Autopilot NavController II can be mounted in any orientation.

Connecting to the vehicle's hydraulic steering system, the Autopilot system is ideal for applications that require one inch year-to-year[2] repeatable automated steering.

NOT ALL GPS GUIDANCE AND STEERING PRODUCTS ARE CREATED EQUAL.
SOME PRODUCTS:
Only have one accelerometer for tilt correction and, as a result, do not compensate for rough terrain and can only adjust for *gradually* changing slopes.
Have one gyroscope, limiting their ability to compensate for rough ground and changing slopes.
Use only two vertical GPS positions to correct the roll of the vehicle. By using these two GPS positions, that are only accurate to +/-1.5 inches, it is difficult to accurately obtain the angle measurement required to calculate the compensation for sloping terrain.

1. *+/- 6-8 inch accuracy 95% of the time using WAAS corrections on straight swaths at speeds up to 12 mph.*
2. *+/- 1 inch pass-to-pass, year-to-year accuracy using RTK corrections 95% of the time.*

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