



## BladePro 3D Automatic Grade Control System

**NOTHING FINISHES FASTER**

Trimble's BladePro<sup>®</sup> 3D Automatic Grade Control System puts cutting-edge technology on your cutting edge—the blade of your earthmoving machine. Precise, automatic blade control finishes every job faster and more accurately, often with just one pass. Using your choice of positioning sensor systems—ATS, GPS, laser, or sonic, with accuracies as tight as  $\pm 5$  mm (0.02 ft.)—your operators can build the site to precise grade with no stringlines, no stakes, and no grade-checkers.

The BladePro 3D system is a rugged, easy-to-use machine control system that helps even novice operators cut to grade precisely. It gives you more value and greater return from your machine and operator. It quickly pays for itself—often on the first project—through increased productivity, material savings, and faster project completion. Trimble's proven, cutting-edge technology helps you cut to grade, cut costs, and make more money on every earthmoving project.

## BLADEPRO 3D FINISHES THE JOB FASTER AND BETTER

The BladePro 3D system takes your fine-grade earthmoving project to the next level of productivity and profit. The system's three-dimensional (3D) capability allows operators to quickly grade complex designs such as vertical curves, transitions, super-elevated curves, and complex site designs without stakes, stringlines, or layout, with accuracies down to a fraction of an inch. The operator steers the machine; the system controls the blade.

### PROVEN FEATURES, PROFITABLE BENEFITS

BladePro 3D is excellent for contractors who want the flexibility to do both site development and precise finished grade work. The system can be used with any machine that requires automatic controls, such as motorgraders, dozers, mills, and trimmers.

**Flexibility**—allows contractors to choose the positioning sensor—GPS, ATS (automatic tracking sensor), laser, or sonic—that best suits the needs of the current project.

**Highly visible color display**—shows site maps, profile, and cross-section views, including easy-view “on-grade” and “on-line” color displays showing blade position relative to the site design.

**Automatic blade control**—interfaces to hydraulic valves for automatic control of elevation and cross-slope of the blade.

**Fast**—eliminates setting up stringlines or stakes for roads, railways and airport construction.

**Fast, local service and support**—with experienced dealers around the world, you can be sure to get the service and support you need when you need it.

### BLADEPRO 3D APPLICATIONS

- Residential development
- Commercial development
- Parking lots
- Road construction
- Airport construction

### POWERFUL FLEXIBILITY

BladePro 3D uses a common computing and control platform that is sensor- and application-independent. This gives you the flexibility to use the sensor (ATS, GPS, laser, or sonic tracer) that best fits your current job.

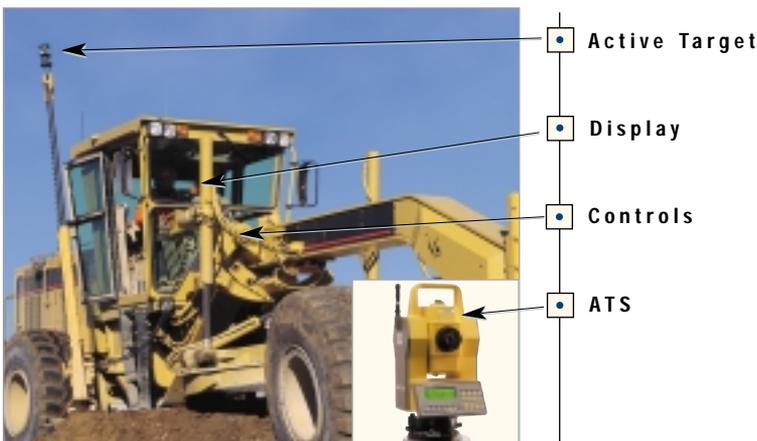
### HOW BLADEPRO 3D WORKS

The BladePro 3D system uses either GPS or ATS technology to track and control the actual position, elevation and cross-slope of a grader's blade on a job site. The sensor system measures the X, Y, and Z coordinates of the blade's present position. The in-cab display unit compares that data to the preloaded digital terrain model (DTM). The design elevation and cross-slope are then calculated for the current position, and the blade control components automatically move the blade to the correct cut or fill position elevation and slope. Grade and slope information, as well as the blade's position, are clearly displayed for the operator's reference on the in-cab display.

*“20 years ago, we probably would have needed three more men on the crew just to do half the work we do today with one man and an instrument and the BladePro 3D.*

*It even checks your grade as you go, with accuracy as good as or better than what a grade checker can give you.”*

Barth Burgett, Vice President,  
Kokosing Construction



## SAVES YOU TIME AND MONEY ON EVERY JOB . . .

Using BladePro 3D, you will complete jobs faster, slash machine operation costs, and reduce material overages, significantly cutting the cost of getting the job done and making you more competitive. The system:

- allows excess material to be removed easily.
- saves on paving materials by providing a uniform sub-base.
- cuts surveying and engineering costs significantly—no stakes, hubs, or stringlines to set.
- controls grade in real-time—no more waiting for a surveyor or grade checker; replace constant grade checking by verifying grade only once.
- solves complex designs quickly—flies through transitions and vertical, spiral, and super-elevated curves.
- eliminates waiting for staking or blue topping.
- eliminates rework—constant grade information allows the operator to get to grade quicker.
- is easy to learn and operate—operators become proficient immediately.

## . . . AND IMPROVES YOUR PERFORMANCE

BladePro 3D:

- gets you on and off the job much faster.
- lets you work day and night if necessary
- increases rough grade accuracy.
- increases finish grade accuracy.

- eliminates variation from one end of a project to the other.
- provides better quality for the project owner.

## BLADEPRO 3D COMPONENTS

There are four elements of the BladePro 3D system:

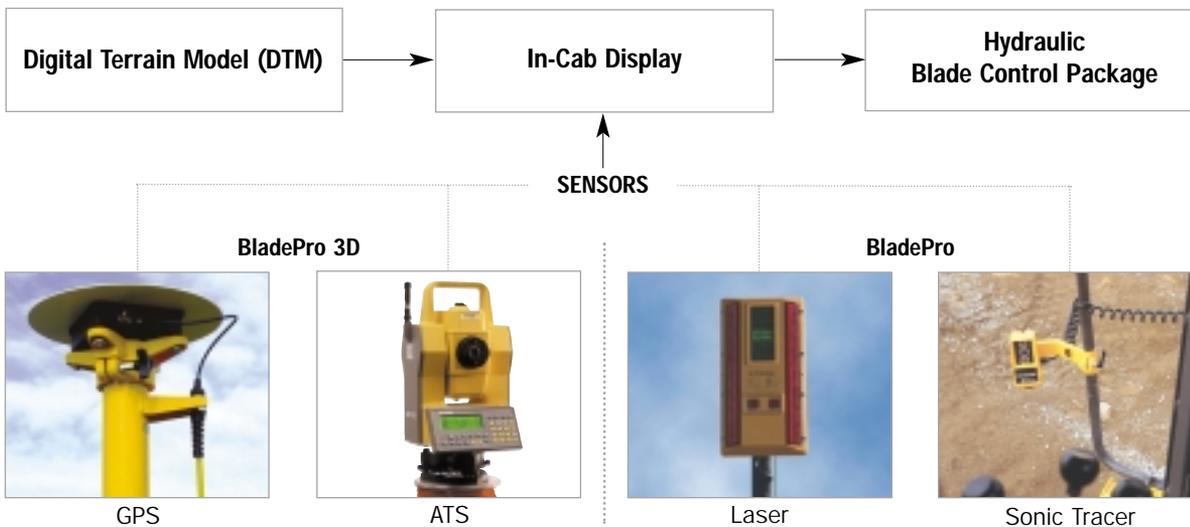
- job site digital design data
- in-cab display/computer unit
- hydraulic blade control package
- position sensor subsystem

The software and the display/computer unit are the same in all systems; the blade-control package is matched to your specific machine.

The BladePro 3D system can be used with a variety of positioning sensors, giving you the flexibility to choose the best measuring technology for the current project:

- The ATS robotic total station, accurate to  $\pm 5$  mm (0.02 ft.), is ideal for finished grade work.
- GPS is ideal for site preparation and bulk earthworks and is accurate to  $\pm 30$  mm (0.1 ft.).

BladePro 3D also can be used as a two-dimension machine control system, using either a laser receiver and transmitter for flat plane work or a Sonic Tracer to follow an existing reference line. The laser and sonic height controls are suitable for flat or continuous grade applications for fine grading. You can start with this basic BladePro configuration and easily upgrade to the full BladePro 3D system at any time.



## THE BLADEPRO 3D SYSTEM

### Job Site Digital Design Data

BladePro 3D uses the powerful Trimble Terramodel software, which accepts input files created by a wide range of design packages and produces a DTM file for the project. Projects created in Terramodel are straightforward to construct on site because they come from a model, not from just a drawing. The project DTM file is easily transferred from the office computer to the in-cab display/computer via a standard computer data card.



### In-cab Display/Computer

The in-cab display/computer receives real-time positioning data from the positioning sensor system, compares this data with the X, Y, and Z coordinates specified by the design DTM file, and outputs control instructions to the hydraulic blade control to position the blade. A colorful, graphical display provides bright, clear cross-sectional, longitudinal, and plan views of the site, so the operator always knows the exact location of the machine on the site and the exact position and elevation of the blade. The rugged display unit, built especially for the tough construction environment, eliminates the need to use a flimsy laptop computer on site.



### Hydraulic Blade-Control Package

Trimble offers customer designed blade-control packages for installation on a wide range of construction machines. These packages feature proportional valves for a smooth accurate control of the machines hydraulics.

## WHY ATS?

- For finished grade
- Fast and accurate to  $\pm 5$  mm (0.02 ft.)
- Dual function robotic total station for:
  - stakeless machine control
  - survey applications
- Built-in search system
- Target recognition
- 700 m range in dynamic operation
- Requires one ATS per machine



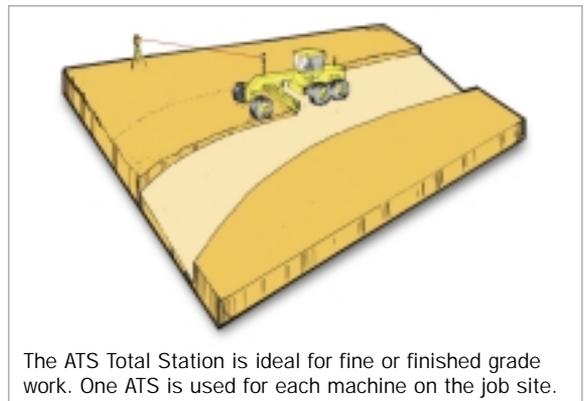
### ATS SENSOR

Trimble's Advanced Tracking Sensor (ATS) robotic total station can be used as a sensor for a virtually unlimited number of applications for guiding and controlling construction machinery as well as for surveying.

## HOW ATS WORKS

The ATS robotic total station automatically locks on to the active target, which is mounted on the blade of the machine. The ATS continuously measures the target's position and transmits the data to the in-cab computer, which then determines the desired elevation and slope for that position.

The ATS instrument has built-in "search intelligence" and very quickly searches for and finds the target mounted on the machine. A target recognition feature enables the ATS to lock on to the desired target and ignore other active targets of nearby survey crews, other machines, or reflective surfaces. If the lock is lost due to a passing vehicle or other interruption, the ATS quickly relocates the target automatically.



The ATS Total Station is ideal for fine or finished grade work. One ATS is used for each machine on the job site.

## WHY GPS?

- For bulk earthworks
- Accurate to  $\pm 30$  mm (0.1 ft.)
- High data rate (10 Hz)
- Real-time, 3D positioning over large area from one base station
- No limit on number of machines controlled
- Available 24 hours/day anywhere in the world



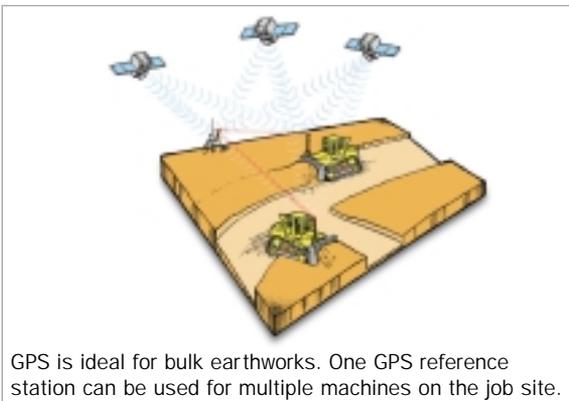
### GPS SENSOR

The Global Positioning System (GPS) is a set of satellites operated by the United States Department of Defense. Each satellite broadcasts radio signals containing precise time and other information. A GPS receiver on the ground receives signals from several satellites and computes its location in three dimensions.

### HOW GPS WORKS

The high-accuracy position data required for grade-control applications is achieved by using a real-time kinematic (RTK) positioning, which requires two GPS receivers. One, the GPS base station, is fixed in one place whose position is precisely determined. The second, or rover, receiver is mounted on the earthmoving machine. Both receivers receive the GPS satellite signals at the same time.

The base station receiver broadcasts its observed information, together with its location and other data, across a wireless data radio link to the rover receiver. The rover combines the base-station data with its own GPS data to compute a very precise position relative



GPS is ideal for bulk earthworks. One GPS reference station can be used for multiple machines on the job site.

to the base station. BladePro 3D with GPS can guide the operator to within an inch of desired grade anywhere on the site.



### LASER SENSOR

The laser sensor subsystem uses laser technology to generate a plane of light above your job site. This plane of light provides a stable and accurate reference from which a level or sloped site is created—whatever the job specification requires. Mounting a laser receiver relative to the cutting edge of your equipment puts the benchmark on the machine and allows you to check grade from the cab of the machine. You prepare your site without staking, with more accuracy, with less rework, while you reduce machine and operator downtime.



### SONIC SENSOR

The Tracer ultrasonic grade controller is also mounted on the motor grader blade and can be used to “follow” a physical reference. The Tracer uses proven sonic technology to “read” and “lock on” to an elevation reference such as curb and gutter, string line, the previous pass, or the existing surface. It can easily follow existing reference surfaces to ensure accurate matching from pass to pass.

The laser/receiver system and Tracer system are completely compatible and interchangeable.

### CROSS-SLOPE CONTROL SENSORS

The sonic or laser elevation control devices maintain the blade height on one or both sides. The cross-slope control system uses a series of sensors to monitor the actual blade slope, the rotation of the blade, and the mainfall of the machine in the direction of travel. In addition, an optional machine articulation sensor is available for use on machines such as road graders. These sensors are mounted at various positions on the machine and their outputs are fed to the control box, which determines the amount and direction of the correction needed to maintain the desired cross-slope.

## THE ELEMENTS OF A PROJECT

Following the initial system setup for a site, the BladePro 3D system is ready to save you time and money in every phase of the project.

**Initial Setup** of the locations for the ATS total station or the GPS base station must be established prior to actually moving dirt on a site.

**The ATS Station Setup** can be positioned between 15 to 300 meters (50 to 985 ft.) from the extremes of the work area. It can be set up on a known point (the coordinates for the point and a reference object are known), or as a free station (relative to 3–10 points whose coordinates are known).

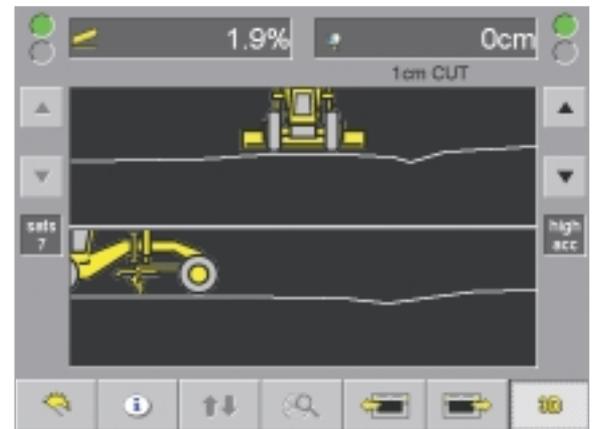
**GPS Base Station Setup** establishes the location of the GPS reference receiver and the data radio which transmits the reference data to the machine-mounted data radio(s). The base station should be near the center of the construction site. For sites where work may continue for a long time, use a semi-permanent location such as the roof of the site office. The GPS antenna should be located on a known (surveyed) point. (A GPS position is always the position at the antenna.)



**GPS Site Coordinate Calibration** determines the relationship between the project's grid coordinate system (northing, easting, and elevation) and the GPS coordinate system (latitude, longitude, and ellipsoidal height). The calibration is determined once for a site. Calibration can be performed by a surveyor or by a contractor surveying with GPS. Trimble's calibration technique uses multiple control points for the highest accuracy.

**Design Data** based on the engineering design for the project is stored on a data card that is then inserted into the in-cab display/computer unit at the start of work. The data may be a DTM, or it may be a road surface based on roading templates. The design data is used to compute cut/fill at any point on the site.

**Moving Dirt** is easier. At the beginning of the job, the foreman or the machine operator inserts the site design data card into the in-cab display/computer unit. The computer reads the Terramodel project files and continuously displays the exact location of the machine's blade with respect to the design.



The machine operator works directly to the design without relying on grade checkers or stakes. The operator can switch between the Plan View Map and a cross-sectional view of blade position with a single key press. The automatic blade controls continuously adjust the position of the blade as the machine moves across the site. Grading is fast and efficient, with just one pass often being sufficient to complete the job.

## AVAILABLE DISPLAYS

The following screen views are available for the machine operator to use during dirt-moving operations. The operator can switch between displays with a single button push. Note that each view is simple and clear, and presents its data in easy-to-understand form.

The **Grade Display View** screen displays the current blade position and grade correction.



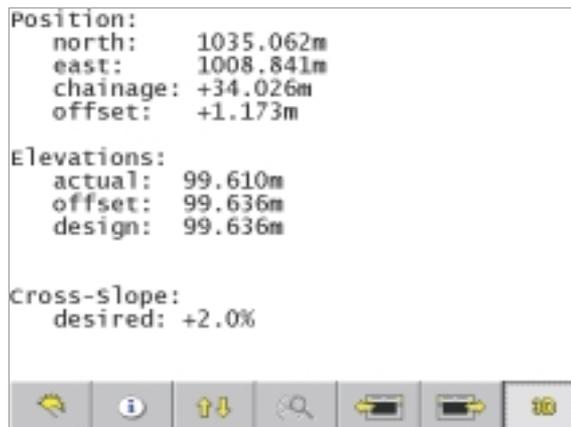
The **Cross-section View** screen displays a cross-section of the design at the operating elevation and the current location. The operator can zoom the display in or out simply by touching the screen.



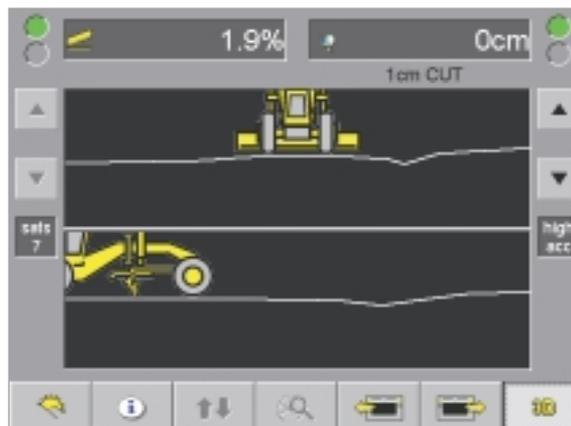
The **Plan View** screen shows the machine position relative to the site. It displays all layers that are active in the current Terramodel job or project. The operator can zoom the display in or out simply by touching the screen.



The **Data View** screen displays position information to ensure that the system is set up correctly; this view also aids in troubleshooting.



The **Profile and Cross-section View** screen displays two views of the machine as it travels through the site.



## FEATURES

- Ideal for a range of earthmoving applications—from bulk earthworks through to finished grade
- Sensor independence uses ATS, GPS, laser, or sonic sensors for positioning
- Bright color display is easily readable in broad daylight
- Simple operation: operators are proficient immediately
- Proven automatic blade control system for elevation and slope
- Multiple views of the design configuration including: plan view, cross-section view, and data view
- Easy data transfer between office and machine using data card
- Field-proven, ruggedized components
- Support for numerous design and estimating software packages.

Visitors are always welcome to the Trimble website at [www.trimble.com](http://www.trimble.com)

For more information, contact your nearest Trimble Distributor or Trimble Office as shown below.

## CONCLUSION

The BladePro 3D Automatic Grade Control System...

**One of Trimble's tools for the future.  
From a long tradition of innovation.**

The construction industry is more demanding and competitive than ever before. Using the BladePro 3D system, contractors can reduce rework, machine operating costs, labor costs, and material overages. This adds up to reduced costs and time for earth moving and fine grading operations, resulting in increased profits. Contractors today are using Trimble 3D machine control to win bids because these systems significantly reduce project length and costs. A BladePro 3D system pays for itself quickly—often on the first project!

Trimble, in combination with Spectra Precision, the pioneer of the machine control industry, helps you improve your processes and productivity with the most complete range of earthmoving and grade control solutions. With the largest worldwide dealer and service network in the industry, no other company can match Trimble's service and support. Our experienced local dealers are more than sales reps—they are your business partners.

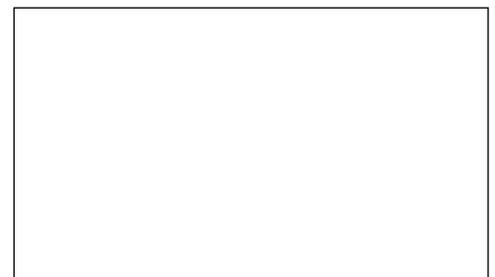
Unequaled experience in the construction industry, backed by relentless commitment to quality and innovation ensures that the products we offer are not just tools, but solutions that enable you to work more productively and profitably every day. From concept to completion, Trimble positions you for success.



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