

AccuGrade[®]

Laser Grade Control System



Track-Type Tractors

System Components

Laser Receiver	LR400-C
Electric Mast	EM400-C
In-Cab Display	CB420-C

AccuGrade® Laser Grade Control System

Advanced laser technology solutions simplify grading, improve accuracy, increase productivity and lower operating costs.

Caterpillar® is helping customers revolutionize the way they move dirt with new technology solutions for earthmoving machines. Solutions that provide greater accuracy, higher productivity, lower operating costs, and more profitability.

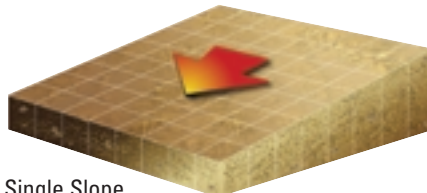
The AccuGrade Laser Grade Control System is a high technology earthmoving tool that allows dozer operators to fine grade with increased accuracy without the use of traditional stakes or grade checkers. Using advanced laser technology, machine-mounted components and an off-board laser transmitter, this state-of-the-art machine control system provides precise elevation information on an in-cab display to achieve accurate blade positioning. By automatically controlling the lift and tilt of the blade, operators can improve their efficiency and get to grade faster and in fewer passes than ever before.

Applications

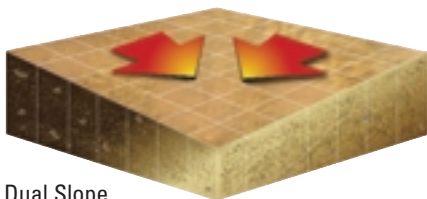
AccuGrade is designed for a wide range of construction earthwork applications requiring tight tolerances and high production rates. Field-proven and versatile, the dual laser system is ideal for fine grading of sites with flat planes, single slopes, or dual slope surfaces, such as industrial, commercial and residential building sites.



Flat Plane



Single Slope



Dual Slope



Operation

The AccuGrade Laser Grade Control System is simple to set up and operate on the work site.

An off-board tripod-mounted laser transmitter emits a thin beam of light that rotates 360°, creating a grade reference over the work area.

A digital laser receiver, mounted on a telescopic mast above the machine's cutting edge, is used to detect the laser beam. With the cutting edge placed at finish elevation, the electric mast automatically positions the laser receiver to within 1.5 mm of the center of the laser beam. As the blade moves above or below finish grade elevation, correction information is sent to the in-cab display.

The in-cab display shows the blade's position relative to grade and indicates cut or fill requirements of the work area.

The automatic blade control feature precisely controls the lift and/or tilt of the cutting edge, depending on single or dual receiver grade control system configuration. Based on correction signals, a dual hydraulic control valve automatically raises or lowers the machine's cutting edge to maintain the blade's elevation for precise grade control and optimum productivity.

A controller area network (CAN), mounted on the machine, provides the communication network for all components. The industry standard for electronic data communication, CAN technology allows components to be easily added or removed depending on the application.

Unique control functions allow the system to be user configured to suit operator preference and specific job site requirements.

Components

1) Laser Transmitter. The transmitter (sold separately) is mounted on a tripod or trailer so the laser beam can rotate unobstructed above the earthmoving equipment. Transmitting the plane of light above the work area allows several machines to effectively work in any direction from one laser transmitter.

2) Laser Receiver (LR400-C). Digital linear laser receivers, mounted on electric masts over the cutting edge, detect the laser beam strike. The receiver picks up the laser's reference plane position relative to finish grade, measuring height deviation from the on-grade location to the laser beam strike at 1 mm (0.04 in) accuracy, and sends blade position information to the system. 360° of optimum laser detection and 267 mm (10.5 in) of detection length keep the machine in the beam longer for greater accuracy. Two receivers are required for two-dimensional control – lift and tilt.

3) Electric Masts (EM400-C). Electrically adjustable machine-mounted telescopic masts are used for mounting the laser receivers over the cutting edge, ensuring unobstructed laser reception. Powered by an electric motor, the operator can vertically raise and lower the masts from inside the cab for precise positioning of the receivers' elevation.



4) In-Cab Display (CB420-C). The in-cab, dual channel operator interface with easy-to-read LED grade indicator and backlit graphical LCD numeric elevation display shows the operator all AccuGrade system level information. The grade



display automatically compensates for varying light conditions to ensure comfortable viewing. Simple controls offer easy set-up, operation and access to system menus, allowing the operator to focus on productivity. A built-in beeper provides audible tones to indicate grade errors, switch activation and system health. Push button operation allows the operator to easily switch from manual mode for rough grading to automatic mode for fine grading. Unique control features can be easily configured for user or job site customization.

- **Elevation Display** – provides single or dual elevation data to the operator
- **Dual Color Grade Display** – shows bright green for “on-grade”, and amber for above and below grade
- **Operating Modes** – customizes the display for the application. During *linked, independent or cut/fill* operation, the screen displays unique graphic information and control features relevant only to the selected operating mode.

- **Dual Elevation Adjustment** – allows fine adjustment of the blade's lift and tilt elevation.
- **Left/Right Auto-Bench** – one button benching enables fast accurate calibration of the blade to finish grade.
- **Auto/Manual Control** – enables operator to easily switch between automatic or manual operating modes.
- **Left/Right Auto/Man Indicators** – indicates active operating mode: automatic or manual.

Weatherproof Design. All components are designed for dependable performance in harsh environments. Durable housings protect the components from dust and weather on tough job sites and in adverse conditions.



Features

User selectable controls ensure quick set-up and simple operation for accurate machine and grade control.

- **Automatic Benching.** Automatically positions both laser receivers to within ± 1.5 mm of the center of the laser beam with the push of a button for fast accurate calibration of the blade to finish grade. Auto benching reduces downtime and maintains precise material control without leaving the cab.
- **Single Point Benching.** Differences in mast mounting heights and blade wear are remembered and automatically transferred to the center mast to ensure accurate simple benching of both laser receivers to a common grade hub, eliminating elevation errors between the receiver locations and ensuring consistent and repeatable accuracy.
- **Linked Elevation.** Links both the lift and tilt functions to common switches. Since both elevations are adjusted together, only one elevation needs to be displayed, simplifying operation and reducing errors.
- **Automatic/Manual Control.** Single push button controls both the lift and tilt functions, eliminating the complexity and confusion of independent automatic/manual controls. Automatic control of blade's lift and tilt provides consistent accuracy with higher productivity by reducing grade control demands on operator.
- **Single Elevation Offset Switch.** User adjustable blade elevation offset controls both the lift and tilt functions in sync, ensuring the blade remains level at the right elevation. Provides quick blade elevation adjustments for cutting down high areas while keeping the machine productive in high gear.
- **Independent Elevation Control.** Allows each mast/laser receiver elevation to be set separately when the application requires independent adjustment of the blade's lift and tilt functions.
- **Cut/Fill Elevation.** Displays the amount of cut or fill required to get to final grade. Allows the operator to quickly check the cut or fill necessary to reach final grade, minimizing material usage and the distance material is moved.
- **Safety Interlock.** Automatically disengages the AccuGrade System if:
 - the machine is in "park"
 - the machine is in "neutral" for 60 seconds or more
 - the health of the AccuGrade System is at risk.

Specifications

CB420-C In-Cab Display

- LCD Display: 128 x 64 pixel, with LED backlight
- Display Colors: green/amber
- Output: English/Metric
- Operating Temperature: -29° C to 60° C (-20° F to 140° F)
- Storage Temperature: -40° C to 80° C (-40° F to 176° F)
- Humidity: 100%
- Sealing: IP-54 protected against dust, water splash.
- Emissions and Susceptibility: CE compliant, exceeds ISO 13766
- Electrical Input: 9-32V DC
- Control Interface: SAE J1939 CAN
- Network Connector: 6-pin
- Remote Switch Connector: 6-socket
- Data Connector: 9-socket
- Length: 295 mm (7.7 in)
- Width: 130 mm (5.1 in)
- Depth: 102 mm (4.0 in)
- Weight: <1.4 kg (3.0 lb)

LR400-C Laser Receiver

- Linear detection angle: 360°
- Linear detection height: 267 mm (10.5 in)
- Linear detection accuracy: 1.5 mm (0.06 in)
- On-grade display accuracy: Narrow: ±4.5 mm (0.18 in) Standard: ±12 mm (0.48 in) Wide: ±24 mm (0.96 in)
- Transmitter Speed: 270-1320 rpm
- LED Display: built-in grade, automatic contrast, brilliant green “on-grade”
- On-off, selectable accuracy
- Operating Temperature: -29° C to 60° C (-20° F to 140° F)
- Storage Temperature: -40° C to 80° C (-40° F to 176° F)
- Humidity: 100%
- Housing: die cast, waterproof
- Sealing: IP68 sealed to 20.7 kPa (3 psi)
- Emissions and Susceptibility: CE compliant, ISO 13766
- Power: machine or battery
- Electrical Input: 9-30V DC

- Control Interface: SAE J1939 CAN
- Network Connector: 6-pin
- Height: 305 mm (12 in)
- Width: 152 mm (6 in)
- Depth: 60 mm (2.4 in)
- Weight: 1.6 kg (3.5 lb)

EM400-C Electric Mast

- Adjustment range: 1640 mm (64.5 in) to 2900 mm (113 in)
- Position Repeatability: ±1 mm (1.2 in/sec)
- Input/Output: 10 to 30V DC
- Operation: 12 and 24V
- Output: English/Metric
- Operating Temperature: -29° C to 60° C (-20° F to 140° F)
- Storage Temperature: -40° C to 80° C (-40° F to 176° F)
- Humidity: 100%
- Sealing: IP-54 protected against dust, water splash.
- Emissions and Susceptibility: CE compliant, exceeds ISO 13766
- Electrical Input: 9-32V DC
- Control Interface: SAE J1939 CAN
- CAN Connector: 10-pin
- Receiver Connector: 6-pin
- Height Retracted: 1640 mm (64.6 in)
- Height Extended: 2900 mm (114.2 in)
- Base Diameter: 240 mm (9.4 in)
- Weight: 25 kg (55 lb)

Customer Support

For over 25 years, Caterpillar has been providing electronic and electrical components and systems for the earthmoving industry – real world technology solutions that enhance the value of Cat products and make customers more productive and profitable. Your Cat Dealer is ready to assist you with matching technology solutions to the application, obtaining infrastructure components, setting up your system and providing support.

Feature Summary

- Eliminates steps in traditional grading without the use of stakes, string lines or grade checkers.
- In-cab display allows operators to check grade from within the cab, eliminating the need for grade checkers, communication errors, rework, and idle machine time.
- Digital linear laser receiver and proportional valve control allows operators to get to grade faster and with greater accuracy while reducing costs and increasing job site profitability.
- Dual LED grade display provides relative blade position to finish grade for manual operation and grade correction information for automatic operation.
- Automatic control of blade’s lift and tilt provides consistent accuracy with higher productivity by reducing grade control demands on operator.
- Exclusive “linked elevation mode” provides single box user interface with dual control.
- Auto benching of blade elevation reduces downtime and maintains precise material control without leaving the cab.
- Controller Area Network (CAN) allows plug and play expandability.
- Integrated machine and system design offers fast, easy setup.
- Service and support is unmatched in the industry.

AccuGrade Laser Grade Control System Track-Type Tractors

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Featured machines in photos may include additional equipment.
See your Caterpillar dealer for available options.

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