AccuGrade® Compaction GPS Mapping & Measurement System
The AccuGrade®
Connected Work Site
AccuGrade®

• Rugged, reliable machine control and guidance solution.

• AccuGrade® Ready Option (ARO) – Integrated into the machine systems and controls at the factory.

• “Plug-and-Play” – Controller Area Network (CAN) for communication between components with common connectors across products.

• AccuGrade® Office – Converts and analyzes data; manages and communicates with machines.
AccuGrade® Technologies

AccuGrade® Cross Slope
Controls the slope of the blade to maintain desired surface cross slope.

AccuGrade® Sonic
Maintains the blade at a vertical distance to an external reference.

AccuGrade® Laser
Provides constant elevation information for accurate blade positioning.

AccuGrade® ATS (Advanced Tracking System)
Instrument tracks a on-board target for precise 3D positioning.

AccuGrade® GPS
Compares the blade position to a 3D computerized site plan.

AccuGrade® Site Reference System
Allows the operator to set target grades relative to points on the work-site.
AccuGrade® Product Line

Track Type Tractor
AccuGrade® Laser
AccuGrade® GPS

Motor Grader
AccuGrade® Cross Slope
AccuGrade® Sonic
AccuGrade® Laser
AccuGrade® GPS
AccuGrade® ATS

Excavator
AccuGrade® GPS
(indicate only)

Compactor
AccuGrade® Compaction GPS
(indicate only)

Backhoe Loader
AccuGrade® Site / Laser Reference System
(indicate only)
AccuGrade® Compaction

System Components

• Vibratory Control System

• Mapping System
AccuGrade® Compaction

System Components

• Vibratory Control System
  – Accelerometer (Geodynamik)
  – Microcontrollers
  – Vibration control switches at operator station

• Mapping System
**AccuGrade® Compaction**

**System Components**

- **Vibratory Control System**
  - Accelerometer (Geodynamik)
  - Microcontrollers
  - Vibration control switches at operator station

- **Mapping System**
  - Mast mounted GPS receiver
  - Data Radio
  - Drum slope sensor
  - In-cab display
AccuGrade® Compaction

- Display
- Radio
- GPS Receiver
- Controllers
- Slope Sensor
- Accelerometer

Global Paving
Intelligent Compaction Definition

The definition varies from manufacturer-to-manufacturer and agency-to-agency.

Caterpillar defines Intelligent Compaction as…

*A system that measures soil or asphalt compaction, displays the measurements to the operator, records and maps the compaction results using a GPS mapping system, and controls or guides the machine compaction effort in responses to the measurement system.*
Intelligent Compaction Definition

A system that measures soil or asphalt compaction…

- Utilizes Geodynamik Compaction Meter Value (CMV - CAT CCV)
  - Accelerometer based system
  - Measures soil stiffness
  - Detects sub-surface objects
  - Proofs sub-base
  - Indicates decoupling potential (Resonance Meter Value - RMV)
Intelligent Compaction Definition

... displays the measurement to the operator...

- Intuitive on-board display
- Color Gradient scale for CCV & Pass Count
- On-board microcontrollers convert and communicate data
- Proof Mode Summary
- Operator views real-time information for...
  - CCV - Speed
  - RMV - Amplitude
  - Passes - Frequency
  - Targets (CCV & Passes) - Position (Lat./Long./Elev.)
Intelligent Compaction Definition

... records and maps the compaction results using a GPS mapping system...

- Mast mounted GPS receiver
  - Real Time Kinematic (RTK) or Autonomous
- Flash card data storage or wireless data transfer
- Machine mounted data radio
  - Communicates with base station for RTK calculations
  - Communicates wireless data
- Associates compaction measurements with location and time
Intelligent Compaction Definition

... and controls or guides the machine compaction effort in response to the measurement system.

- Engineering design files converted by AccuGrade® Office
- Using in cab graphical display, the operator …
  - Monitors/records real-time compaction measurements
  - Monitors/records machine location/elevation
  - Avoid decoupling; monitor decoupling potential
  - Measures/records final compaction results (Proofing Mode)
  - Terminates/adjusts compaction effort accordingly
AccuGrade® Office

- Converts engineering design files to AccuGrade® compatible format
- Supports wireless communication between the machine and office
- Allows “drill-down” of compaction data
- Compatible with all AccuGrade® machines
- Supports text messaging in real time with operator
- Productivity module for cycle times, as-built data, and production related information
- Compaction module for detailed compaction analysis
AccuGrade® Office

Compaction Module

- Allows inspectors to analyze compaction data by providing a detailed view of the various layers, passes, and CCV’s of the designated compaction area.

- The module enables the inspector to save and view the time, date and location of compaction information such as…

  - CCV/layer
  - CCV/pass
  - Thickness/pass
  - Thickness/layer
  - RMV
  - Amplitude
  - Direction of travel
  - Vibration state
AccuGrade® Office
AccuGrade® for Asphalt

Caterpillar’s system will consist of the following...

- Temperature mapping
- Pass count mapping

The look and feel will match AccuGrade® for Soil Compactors.

- CCV replaced with Mat Temperature
Machine Drive Power Method

• Caterpillar proprietary method currently in development.
• Measures energy required to propel the machine over soil
• Ideal for cohesive soils
• Ideal for non-vibratory compactors.
Operator Display
Operator Display

PRESS
Operator Display
Operator Display
Operator Display
Operator Display

Adjust CCV Color Scales

Enter the percentages of the target CCV value that each color boundary represents.

- Gray: 130%
- Green: 80%
- Blue: 60%
- Red: 40%
- Yellow: 20%

Default
Operator Display