

# Cat<sup>®</sup> Terrain

for Drilling



## Terrain for Drilling Features

### More value for your mine.

- *Improves the accuracy of drilling depth, provides feedback on the variation of bench geology, and improves safety and efficiency by keeping the operator in the cab.*
- *Records and measures multiple drill parameters to optimize machine utilization and improve the overall efficiency of drilling and blasting operations.*
- *Uses Global Navigation Satellite System (GNSS) to provide three-dimensional positioning of the bit to ensure holes are drilled according to the designed drill pattern.*
- *Offers a number of options enabling users to identify the features required by their mine site and then tailor the system to meet specified needs.*



### Contents

Terrain for Drilling .....	3
Features and Benefits .....	4
Office Software .....	5
Production Monitoring .....	6
Strata Recognition .....	7
Drill Guidance .....	8
On-Board Components.....	9
Support .....	9
Specifications.....	10
Notes.....	11

**Cat® MineStar™ System is the industry's broadest suite of integrated mine operations and mobile equipment management technologies configurable to suit your operation's needs.**

**Terrain, a capability set of Cat MineStar System, enables high-precision management of drilling, dragline, grading and loading operations through the use of guidance technology. It increases machine productivity and provides you real-time feedback for improved efficiency.**

**Terrain for drilling accurately guides the operator, reports on drill and operator productivity, and allows remote, real-time supervision of drilling activity and blast planning.**

# Terrain for Drilling

Improves the accuracy, safety and efficiency of drilling operations.

Mining is a function of a number of processes, and it is important to consider the impact that optimal drilling and blasting has on downstream mining activities such as loading, hauling, crushing, and milling. Technology that helps to optimize and improve drill and blasting operations can positively impact productivity and overall efficiency of the entire mining cycle.

Terrain assists operations in:

- Accurately executing drill patterns
- Ensuring designed hole depths are maintained
- Identifying local variations in bench geology as a basis for developing specific hole loading instructions
- Recording comprehensive data on all facets of drill operation as the basis for calculating machine utilization and productivity statistics, towards benchmarking of best practices and development of key performance indicators

Users can purchase just Production Monitoring or can combine that with Guidance for additional functionality.

Uptime and productivity is key to any successful mining operation. With Terrain for drilling, knowing what your drills are doing, how many holes are drilled each shift, and when and why a drill is down provides the information you need to drive operational improvements.



# Features and Benefits

Increase drill productivity, accuracy, efficiency and safety.



## Increased Accuracy

Guidance is a proven, practical tool for ensuring holes are consistently drilled within designed tolerance, producing optimal charge distributions and improved fragmentation.

## Increased Efficiency

- Reducing or eliminating survey work required to maintain staked blasthole pattern minimizes downtime waiting for a new or updated pattern to be manually surveyed.
- Minimizing pre- and post-blast survey to measure depth and collar elevations.
- Reducing over and under-drilling via precise hole depth control, resulting in more even bench grades.
- Reducing blasting costs through improved loading instructions.
- Tracking consumables allows monitoring of bit, stabilizer and steels to ensure components are replaced as required, thereby reducing costs.
- Hole to hole updates provide operators with real-time status of other holes being drilled on the same pattern reducing rework of holes being redrilled.

## Increased Safety

- The Bootleg Display allows blast designers to indicate the location of the previous bench bootleg locations on the blast pattern design for the current bench. This helps ensure current holes are not drilled into a hole from the previous bench.
- BorderGuard allows blast designers to designate a virtual boundary within which the drill is intended to operate.
- Pipe-In-Hole sounds an alarm and can lock the propel mechanism if the drill operator attempts to move the drill to the next hole while the bit and steel is still in the hole.
- Reducing or eliminating survey work that causes personnel to be working on unreliable surfaces near moving equipment.

For more information about how Cat products promote safety at your mine site, visit [SAFETY.CAT.COM](https://www.cat.com/safety).



# Office Software

Manage your mines from anywhere in the world.

Utilizing an easy to deploy, web-based architecture, Terrain allows mines to more efficiently manage their operations by sharing information such as machine location, operational status, and progress to the work plan. User login and roles ensure staff can only access the data and functions necessary to do their job without jeopardizing sensitive operational data.

The office software, when coupled with the appropriate on-board hardware and software, gives mines the ability to define and manage various applications, enhance safety through avoidance zones/operational borders and pre-operation checklists, and track the location and job status of machines. Four additional capabilities can be optionally licensed to maximize productivity and reinforce the site's operational practices. Packages include:

## Productivity

Productivity allows the mine to track and analyze machine utilization and productivity by machine type and operator. Reporting tools generate information on machine utilization, timelines, operator productivity and other parameters to help identify and correct operational inefficiencies. It also enables the assignment of job tasks to grading and loading tools. Operators can even request the creation and assignment of a task to another machine (such as clean-up a spill). The information about each task is tracked and stored for reporting purposes.

## Position & Material

The Position & Material capability package allows machines to share position and job status information both on-board and in the office. This knowledge helps reinforce safe operating practices when working in close proximity. The Position & Material capability package also enables machine-to-machine cut and fill status sharing within grading and loading applications in real-time including sharing cut/fill information from draglines to dozers.

Drill-to-drill hole status updates are also now available with this package. As drills operate, hole status is shared with all drills that have knowledge of the hole such as drills that share the same pattern. This feature improves productivity by preventing operators working on the same pattern from re-drilling previously drilled holes.

## Data Share

Allows Terrain to share data made available via the licensed capability packages with other applications such as competitive fleet management systems, data reporting systems, and position monitoring systems via an industry standard interface.

## Multi-Site

Allows for management of multiple Terrain-equipped sites from a single control center. By licensing the optional Multi-Site package at each mine, customers can monitor and manage work activities for multiple mines based on their universally defined user access permissions.

# Production Monitoring

Accurately monitors production statistics.



Production Monitoring is the only buttonless system on the market today. Systems that require operator input to identify operating states such as leveling, rod handling, hole cleaning or re-drilling often result in inconsistent data. Terrain is an ergonomic solution that minimizes interaction so the operator can focus on drilling. The automated data capture, display and on-board reporting results in more accurate and consistent information.

Production Monitoring displays depth, shows penetration rate and generates production and utilization statistics such as cumulative footage/meterage, number of holes drilled, time spent drilling, propelling between holes, and rod handling.

## Consumables Tracking

Production Monitoring also offers the ability to track four consumables as a standard feature, with optional expansion to ten additional consumables. Consumables tracking for the bit, stabilizer and three steels allow recording the number of revolutions, total time and footage/meterage for each consumable during drilling. The system uses sensors and logic to determine the drilling state, such as when the drill is engaged in breaking new ground, which results in a more meaningful tracking of consumables performance than competitive systems that simply track time between installation and removal of a consumable.

## Hole Profile

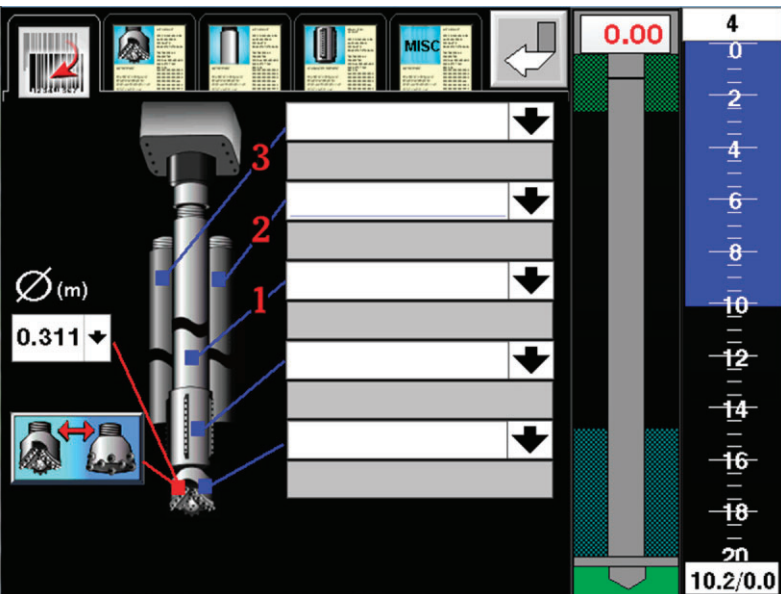
Records and displays RPM, weight on bit, rotary torque and air pressure. On-going monitoring of these parameters can be used to estimate changes in bench geology and assess individual drill operating practices.

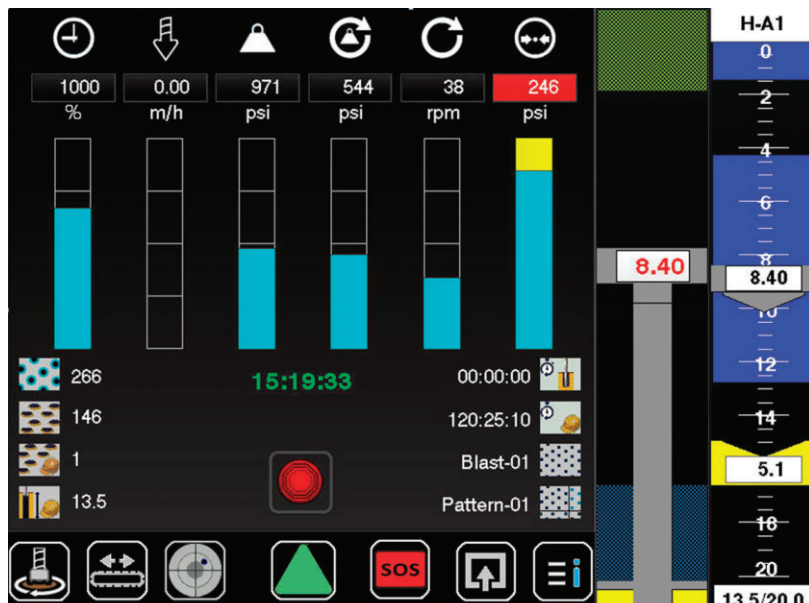
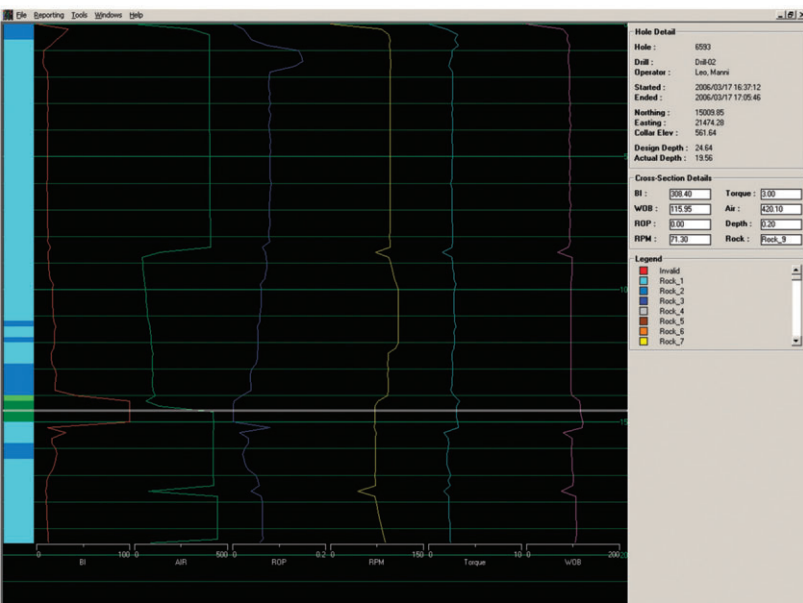
## Pipe-In-Hole

Sounds an alarm, or with an optional relay circuit, can lockout the propel mechanism and prevent the operator from moving the drill while the drill steel or pipe is in the hole.

## Auto-Delay

When an operator forgets to log a delay, or notes the delay but forgets to cancel it later, errors can occur in productivity reports. This feature, configurable to office preferences, automatically records unlogged delays and cancels forgotten delays once work resumes, improving report accuracy.





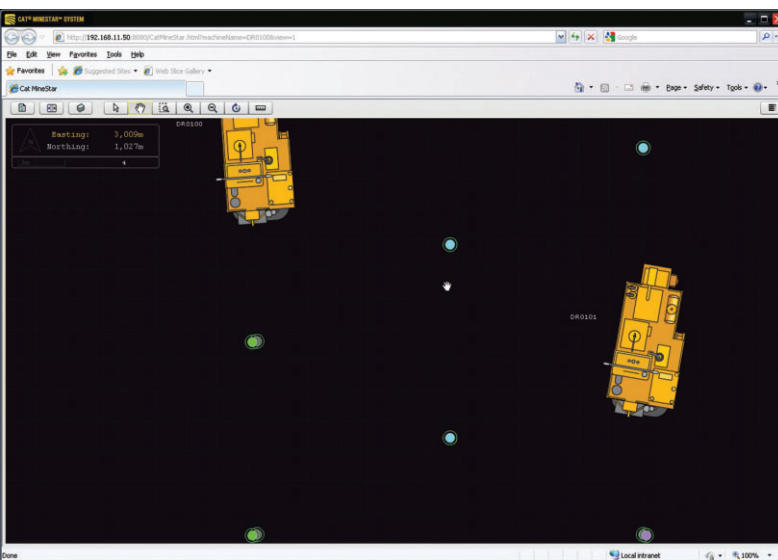
# Strata Recognition

Know what you're drilling.

The Strata Recognition option undertakes an on-line analysis of the drill operating parameters provided by the Hole Profile option to analyze the rockmass being drilled. A proprietary algorithm acts on this data to derive the Blastability Index, which reflects variations in the overall competency of the bench geology. This data is used as the basis for determining the optimal hole loading instructions. A mine can achieve significant savings by better matching explosive properties to the characteristics of the rockmass being blasted. Strata information can also be used to fine tune other downstream processes such as improving blending and optimizing crushing.

# Guidance

Improving accuracy of actual holes drilled against plan.



Guidance uses GNSS navigation to ensure the operator accurately executes the blast pattern developed by the mine office. Operators can be confident they're drilling at the precise hole location every time, reducing the margin of error over traditional surveying and staking techniques.

Guidance compensates for irregularities in the actual collar elevations. A drill operator is typically given a standard, designed drill depth for all holes in a pattern. On an irregular surface, if the operator drills all holes to the same hole depth, then the blasted surface will replicate the initial, irregular surface. This system automatically identifies the collar elevation and calculates the correct drill depth for each hole.

The mine survey department at many mines commits up to 40% of its resources to the staking and restaking of drill patterns. This module eliminates the need for survey support to design and execute drill patterns, and removes the need for personnel to be working on the bench in close proximity to moving equipment. The drill operator is provided a digital map from which to accurately execute the desired pattern with no concern for drill cables, tracks or support vehicles knocking over wooden stakes or destroying paint-marks.

## Bootleg Display

A bootleg is the bottom of hole location from a previous bench. In the event of a misfire, it's important to know the bootleg location so the operator doesn't drill into an unspent booster. When starting a new drill pattern or redrilling, the system tracks the location of the bootleg to prevent the operator from drilling into it.

## BorderGuard

Allows blast designers to designate a virtual boundary within which the drill is intended to operate.

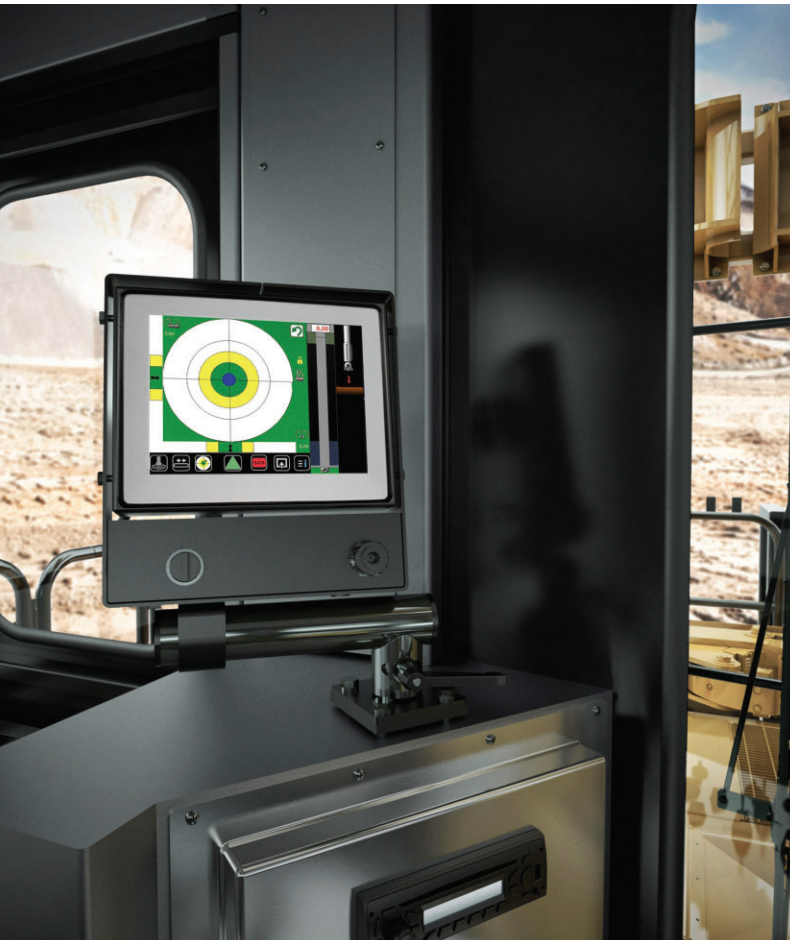
## Hole to Hole Updates

As drills operate, the status of each hole is shared with other drills, such as those on the same blast pattern, reducing the risk of redrilling holes. Data provided to the operator includes hole location, depth and current status.



# On-Board Components

Built-to-last in harsh mining environments.



## Touch Screen Display

The touch screen graphical display provides real-time production information to the operator through an easy-to-use interface. Designed for reliable performance in extreme operating conditions, the unit is built to withstand shock and vibration and is sealed against dust and moisture.

## GNSS Receiver

The MS992 is the next generation GNSS receiver from Caterpillar. The rugged housing and internal shock isolation system of the MS992 enable it to withstand the harsh conditions encountered on mine sites. Two MS992 GNSS receivers on each drill compute positions and heading with centimeter-level accuracy to ensure precise machine location. The MS992 supports the newest GPS and GLONASS signals, faster system initialization times, better tracking and accuracy characteristics, and leverages increased satellite availability for mines with deep pits or locations in the far northern and southern hemispheres.

## Communications Radio Interface

A rugged ethernet port on the touch screen display allows convenient connection to third party radios.

## Support

Global and local.

For more than 25 years, Caterpillar has been providing electronic components and systems for the mining industry – real-world technology solutions that enhance the value of Cat products, making customers more productive and profitable. Your Cat dealer is ready to assist with matching mining technology systems to your application and obtaining knowledgeable support.

From sales and implementation to support and service, count on your Cat dealer to provide all your technology product needs. Repair options for select drill components are available from factory-trained technicians at the Caterpillar Machine Control & Guidance Repair Center.



# Terrain for Drilling Specifications

## GNSS Receiver

Horizontal accuracy	10 mm	0.39 in
Vertical accuracy	20 mm	0.79 in
Operating range	Up to 10 km (6.2 miles)	
Network connector	16-pin	
Electrical input	9 to 32 V DC	
Operating temperature	-40° C to 70° C (-40° F to 158° F)	
Storage temperature	-50° C to 85° C (-67° F to 185° F)	
Height	147 mm	5.8 in
Width	232 mm	9.1 in
Depth	251 mm	9.9 in
Weight	3.8 kg	8.3 lb

## Touch Screen Display

Display screen	264 mm (10.4 in) LCD display, 800 × 600 transfective color SVGA	
Electrical input	9 to 32 V DC	
Memory drive	2 GB RAM, 8 GB internal compact flash	
Operating temperature	-20° C to 70° C (-4° F to 185° F)	
Storage temperature	-50° C to 85° C (-58° F to 185° F)	
Humidity	100%	
Height	236.8 mm	9.3 in
Width	282.6 mm	11.1 in
Depth	122.9 mm	4.8 in
Weight	5.4 kg	12.0 lb



For more complete information on Cat products, dealer services, and industry solutions, visit us on the web at [www.cat.com](http://www.cat.com)

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Replaces AEHQ6176-02

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