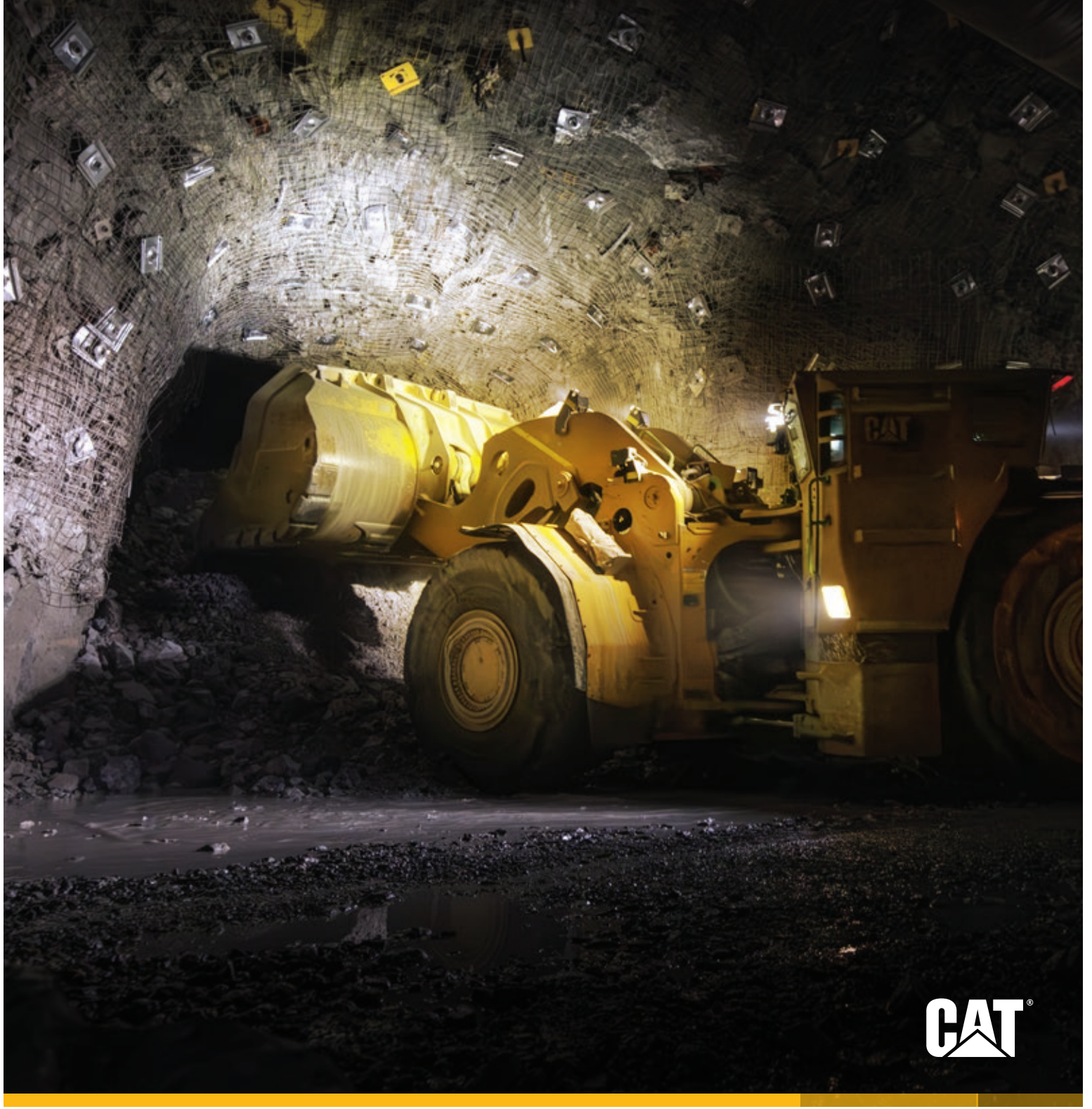


CAT® UNDERGROUND MINING

# LOADER TECHNOLOGIES



**CAT**®





## **CAT® UNDERGROUND MINING LOADER TECHNOLOGY OPTIONS**

Cat underground hard rock loaders are enhanced by a variety of standard and optional technologies to help make them safer, more efficient and more productive. These industry-leading technologies drive down costs and drive up production across your operation.

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*Please note that not all technologies are available on all models. Contact your Cat dealer for more information on available options for your specific machine.*

# IMPROVE PRODUCTIVITY

Your loaders dictate the pace of your entire operation, and a properly loaded bucket is the biggest contributor to a loader's productivity.

Too little material and your productivity suffers, as even small reductions in payload add up, requiring more and more cycles over the life of your mine. But overloading the bucket can be just

as bad, making momentary gains in production by damaging the machine and ultimately increasing costs and maintenance downtime.

These technologies are designed to help your operators achieve optimal payloads, driving your operation to new heights of productivity while extending the life of your buckets and Ground Engaging Tools (GET). And ultimately, the life of your machine.

## CAT PRODUCTION MEASUREMENT SYSTEM

The Cat Production Measurement (CPM) payload management system helps your loader operators achieve their target payloads, reducing wear on the machine and keeping material flowing smoothly. CPM includes an integrated onboard payload scale that tracks material management, cycle count and time so operators can track their performance as they work.

It can also deliver production reports wirelessly or via a wired connection, allowing you to analyze each operator's performance and identify opportunities for improvement.



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## AUTODIG

Consistency is the key to productivity, and AutoDig was designed to ensure consistent loader operation. It's a software-enabled attachment that controls the implement system during bucket loading, helping operators achieve the correct payload with every pass. AutoDig helps reduce likelihood of over- or under-loading, and can even flick the bucket to shake off loose rock that might end up on your haul roads.

AutoDig automates the dig cycle, using hydraulic sensors to ensure the bucket is properly loaded and weight is correctly distributed. The operator positions the machine in front of the pile, engages AutoDig and applies the throttle — and AutoDig does the rest. AutoDig can be activated from the cab, line of sight console or Command for underground remote station. By removing the operator from the cab, AutoDig allows you to maximize operator safety without sacrificing performance.

The operator maintains full control of the machine throughout the process, and can stop the system at any time if an issue arises.



AutoDig is a useful training tool for new or less skilled operators — they can gain confidence and familiarity with the digging process while also achieving high productivity and efficiency. And while it won't outperform a highly skilled operator on any individual dig, even the best operators have off days.

One of the greatest benefits of AutoDig is simple integration with our autonomous offerings. Digging is complex to automate, but it's critical to the development of successful underground autonomy. The algorithm that powers AutoDig is the result of a significant time investment and extensive studies of operator characterization and results in optimized, consistent loading. AutoDig is also a key component of Cat MineStar™ solutions.

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## ASSIST FEATURES

- + Machine speed limits and gear limits are programmable, allowing operators to control the machine's top speed. This helps save fuel by limiting runout speed in load-and-carry applications. Limiting machine speed can also help you comply with safety regulations and best practices.
- + Auto lights high and low beam, auto directional switching and auto boom lights increase safety and visibility.
- + Traction control reduces tire wear.
- + Automatic retarding controls and maintains speed on grade.
- + New hydraulic features include: in-cylinder sensors, electronically controlled cylinder snubbing and in-cab adjustable boom kickouts.



# FOCUSED ON SAFETY

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The safety of your people is your top priority, and we agree. That's why we design all our machines with a focus on safety, not only for operators but for anyone working in, on or around the machine.



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## MACHINE VISIBILITY ENHANCED BY STANDARD AND OPTIONAL CAMERAS

Standard and optional cameras help increase operator visibility and awareness, reducing the risk of collisions.

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## OPERATOR PRESENCE SYSTEM

The Operator Presence System helps ensure the machine doesn't move without an operator present and in control. A door sensor tracks when operators enter and exit the cab, neutralizing the engine and hydraulic system if no operator is detected.

If the operator fails to apply the park brake before exiting the cab, it automatically engages the park brake, neutralizes the steering implement and transmission control and shuts down the engine. This helps protect the operator, the machine and others nearby from any uncontrolled movements, especially during startup and shutdown.

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## TIRE PRESSURE MONITORING SYSTEM

This system provides early warning when tires lose pressure, reducing the risk of an incident that could result in harm to the operator or someone working nearby. Wireless sensors inside each tire provide real-time, temperature-compensated alerts when they detect under-inflation or rapid decompression.



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## ADDITIONAL SAFETY TECHNOLOGY

- + Seat belt monitoring interacts with the park brake, preventing machine motion if the seatbelt isn't fastened.
- + Anti-rollback prevents the machine from rolling back, reducing the risk of collisions.

# KEEP YOUR MACHINE RUNNING

Nothing slows your operation down like unplanned downtime. But with the right technologies, you can stay ahead of potential issues and keep your machines running smoothly for reduced maintenance costs and increased machine availability.



## COLOR MULTI-PURPOSE DISPLAY (CMPD) SCREEN

The multi-purpose CMPD display gives operators quick, easy access to critical machine health information. This allows them to make the right decisions and prevent small issues from turning into big ones down the line.



## CAT ELECTRONIC TECHNICIAN (ET)

Cat ET is a service tool that makes electronic troubleshooting fast and easy. It lets your Cat dealer quickly gather key diagnostic data on the machine's electrical system so they can make effective repairs.



## CAT PRODUCT LINK™ ELITE

Gathering timely, accurate data about machine performance and health can be the difference between a long, productive shift and a period of unplanned downtime. The Cat Product Link Elite system boosts connectivity and increases the availability of data collected by Cat underground loaders by equipping them with hardware to collect and transmit information into local or cloud-hosted applications for analysis. The system opens the door for industry-leading equipment health and condition monitoring services from Caterpillar and your local Cat dealer, and is also a key component of several Cat MineStar solutions.

### BUCKET AND GROUND ENGAGING TOOL MANAGEMENT WITH THE CAT BUCKET PRO APP

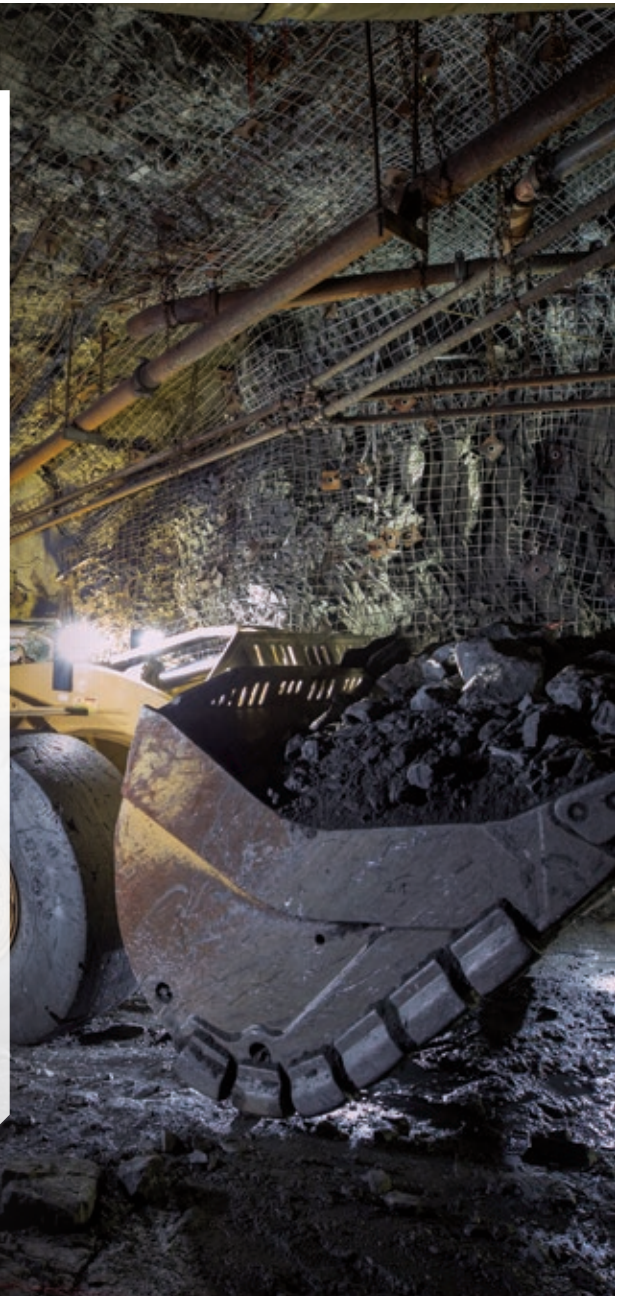
The Cat Bucket Pro App helps you keep your bucket at maximum productivity.

You'll get real-time data on GET performance that will help you plan maintenance, manage your inventory and know your cost per ton.

- + Use your smartphone, iPad or tablet to perform regular inspections of GET and get instant reports.
- + Go online to calculate costs and view production trends of each bucket.
- + Use data to reduce costs and improve production of your GET system.

When you use Bucket Pro, your dealer can provide:

- + GET Inspection Reports. These instant, on-site reports include percent worn, future change-out dates and average life of all your GET.
- + Bucket Cycle Summary. These monthly summaries show bucket cycle trends for cost per ton, cost per hour and productivity, as well as average life trends.





# TRACK, MONITOR, AUTOMATE & MANAGE YOUR ASSETS

— WITH  
**CAT MINESTAR<sup>™</sup>**  
**SOLUTIONS**

Cat underground loaders can be equipped with Cat MineStar Solutions, a suite of industry-leading technologies that help manage equipment, improve uptime, increase safety and even automate operation. No matter the size, type or complexity of your operation, there is a Cat MineStar solution that can help deal with the challenges you face every day.





## DETECT

Detect provides in-cab alerts that can prevent unintended interactions between people and assets. Using a high precision peer-to-peer proximity detection system, Detect alerts operators to act and prevent incidents. With Detect, you can track people and machines in real time, no matter where they are underground. It provides operators with continuous awareness of their surroundings with sub-meter accuracy, along with the location and status of all personnel and assets.



## FLEET

Cat MineStar Fleet for underground provides real-time visibility to cycle time, payload and other key operational parameters. It automatically records and tracks data up and down the value chain, providing insights that help you identify what's working and fix what's not.

Thanks to our proprietary high-precision underground positioning technology, mines can accurately track personnel and assets to sub-meter accuracy. This also gives you access to critical cycle information, so you can better understand machine usage and overall efficiency of operations. Real-time two-way task management provides essential data that positively impacts productivity and helps you optimize the entire mining operation. Fleet is only available for block cave operations.

## CAT MINESTAR SOLUTIONS



### HEALTH

MineStar Health products and services enable you to collect and transmit equipment data that enables proactive maintenance services and predictive equipment analysis. By staying connected with your machines, you can head off small problems while they're still small and keep your machines running as efficiently as possible as long as possible.





## COMMAND

Equipping your loader with Cat MineStar Command enables multiple levels of autonomy:

- + Line-of-sight remote control
- + Tele-remote operation
- + Guide assist
- + Copilot
- + Auto-pilot, which enables full autonomous cycles

This building-block approach allows you to capture value at your most economic entry point while allowing scalability as technology grows. Command for underground enables remote operation of load-haul dump machines. These range from simple line of sight to full autonomy, providing immediate productivity and efficiency gains and improving safety. Command allows you to relocate operators to a safe, comfortable location underground or on the surface. Automation improves the accuracy of tunnel navigation, boosting productivity and reducing machine damage caused by contact with drive walls.

# TECHNOLOGY SOLUTION AVAILABILITY BY MACHINE MODEL



**R1300G**



**R1600H**

- S** Standard
- O** Optional
- V** Available

	FACTORY FIT	RETROFIT	FACTORY FIT	RETROFIT
<b>PRODUCTIVITY</b>				
Cat Production Measurement				
AutoDig				
Programmable machine speed limits and gear limits	<b>S</b>		<b>S</b>	
Auto lights				
Traction Control				
Automatic Retarding Controls				
Hydraulic features: in-cylinder sensors, electronic controlled cylinder snubbing, in-cab adjustable boom kickouts				
<b>SAFETY</b>				
Tire Pressure Monitoring System		<b>V</b>		<b>V</b>
Operator Presence System			<b>S</b>	
Cameras (standard camera and additional optional cameras)		<b>V</b>		<b>V</b>
Seat Belt Monitoring		<b>V</b>		<b>V</b>
Anti-Rollback feature				
<b>SERVICEABILITY AND MAINTENANCE</b>				
CMPD Screen			<b>S</b>	
Cat Electronic Technician	<b>S</b>		<b>S</b>	
Bucket Pro App	<b>O</b>	<b>V</b>	<b>O</b>	<b>V</b>
Cat Product Link Elite		<b>V</b>	<b>S</b>	<b>V</b>
<b>REMOTE CONTROL</b>				
			<b>O</b>	<b>V</b>
<b>CAT MINESTAR</b>				
				<b>V</b>



### R1700

### R1700 XE

### R2900 XE

R1700		R1700 XE		R2900 XE		
FACTORY FIT	RETROFIT	FACTORY FIT	RETROFIT	FACTORY FIT	RETROFIT	
						<b>PRODUCTIVITY</b>
O	V	O	V	O	V	Cat Production Measurement
O	V	O	V	O	V	AutoDig
S		S		S		Programmable machine speed limits and gear limits
				S		Auto lights
S		S		S		Traction Control
S		S		S		Automatic Retarding Controls
				S		Hydraulic features: in-cylinder sensors, electronic controlled cylinder snubbing, in-cab adjustable boom kickouts
						<b>SAFETY</b>
O	V	O	V	O	V	Tire Pressure Monitoring System
S		S		S		Operator Presence System
S/O	V	S/O	V	S/O	V	Cameras (standard camera and additional optional cameras)
S	V	S	V	S	V	Seat Belt Monitoring
				S		Anti-Rollback feature
						<b>SERVICEABILITY AND MAINTENANCE</b>
S		S		S		CMPD Screen
S		S		S		Cat Electronic Technician
O	V	O	V	O	V	Bucket Pro App
S	V	S	V	S	V	Cat Product Link Elite
O	V	O	V	O	V	<b>REMOTE CONTROL</b>
O	V		V	O	V	<b>CAT MINESTAR</b>



# LOADER TECHNOLOGIES

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

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Materials and specifications are subject to change without notice. Featured machines in photos may include additional equipment. See your Cat dealer for available options.

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