Control System

PV-271D / PV-291D RCS 5.6

Original Instructions
2023-12-14 | No: TIS0001677.006 en-US

Epiroc

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Revision History

Revision No.	Date	Revision
001	August 2019	Original release
002	April 2020	RCS version update
003	May 2022	Updated throughout for RCS 5.4. Added information about TUM codes. Added Installing Software Updates chapter.
004	October 2022	Added PV-291D to title.
005	April 2023	Editorial changes throughout. Updated throughout for RCS 5.5. Added Service > Actuation screen information. Added Setting > Setup > Parameters > Tower Parameters information. Added System > Logging > Fault Finding Logs screen information. Added Drill Plan Screen chapter. Added system hydrocarbon ratio information to the Module Sensors section.
006	December 2023	Editorial changes throughout. Updated throughout for RCS 5.6. Changed Setup and Propel screen to Setup screen. Updated Setup Screen sections. Added Track Auto Calibration section. References to breakout fork changed to deck fork.

1 Introduction

1.1 Safety First

Always read the information in the Safety document before starting to use the product or starting maintenance work.

1.2 The Purpose of This Publication

The control system manual is intended to give:

- Description of the control system operational and service menus.
- Description of the control system functions and parts.
- Instructions in maintenance and calibration of the monitoring function of the control system.
- Instructions in applicable settings.

1.3 Target Group

The information in this publication is intended for everyone involved in the application, operation, and maintenance of the machine and related equipment. All readers are expected to possess basic competence regarding mining methods, construction methods, and the machines used for construction and mining operation.

1.4 Customer Acknowledgment

Use only Epiroc original parts. Damage or breakdown that is caused by non-original spare parts are not covered by the warranty or product liability.

Epiroc is not responsible for damages that are caused by unauthorized modification of the machine and its associated equipment.

The manufacturer is not liable for damage that is caused by inappropriate use.

The following damages are not covered by the customer warranty policy:

- Damage from substandard repairs.
- Injury to personnel from unresolved repairs.
- Damage to equipment from unresolved repairs.

Always refer to the customer warranty policy.

Performance specifications are based on maximum computed values and are subject to revisions without notification. Nothing in this instruction extends any warranty or representation expressed or implied, regarding the products described. Any such warranties or other terms and conditions shall be in accordance with Epiroc standard terms and conditions of sale for such products, which are available upon request.

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1.5 Feedback and Contact Information

At Epiroc, we work actively to develop and continuously improve our products and associated documentation. We value customer feedback and do our best to promptly answer questions. To provide feedback, contact your local supplier at Epiroc.com, under **CONTACT**.

> ***NOTE:*** *If you give feedback via email, make sure that you use a valid email address to be able to receive and reply.*

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2100 North First Street

Garland, Texas 75040 - USA

1.6 Abbreviations

Abbreviation	Definition
ACMS	Automation Common Machine Server
ADPE	Auto Drill Plan Execution
ARC	Auto Rod Changer
CAN	Controller Area Network
CC	Central Computer
CCI	Common Communication Interface
COC	Compressor Oil Cooler
CS	Cab Side
DE	Drill End
DEF	Diesel Exhaust Fluid
DISP	Display
DTH	Down-The-Hole
EARS	Electronic Air Regulation System
ECM	Electronic Control Module

Abbreviation	Definition
ECU	Electronic Control Unit
GPS	Global Positioning System
GUI	Graphical User Interface
I/O	Input/Output
IP	Internet Protocol
IREDES	International Rock Excavation Data Exchange Standard
LED	Light-emitting Diode
LGPL	GNU Lesser General Public License
MWD	Measure While Drilling system
NCS	Non-cab Side
NDE	Non-drill End
OP	Operator Control
PTZ	Pan-Tilt-Zoom
RCS	Rig Control System
RRA	Rig Remote Access
RRC	Radio Remote Control
SE2	Service access level 2
SNTP	Simple Network Time Protocol
TCP	Transmission Control Protocol
TUM	Time Usage Model
USB	Universal Serial Bus
WLAN	Wireless Local Area Network

1.7 Disclaimer

Images of the Graphical User Interface (GUI) in this document are part of the Rig Control System (RCS) software. All images are for reference purposes only. Screen views, GUI, and informational content can change with the revision of the software or firmware.

2 About the Rig Control System

WARNING

Failure to Observe Safety Instructions

Can cause severe injury or death

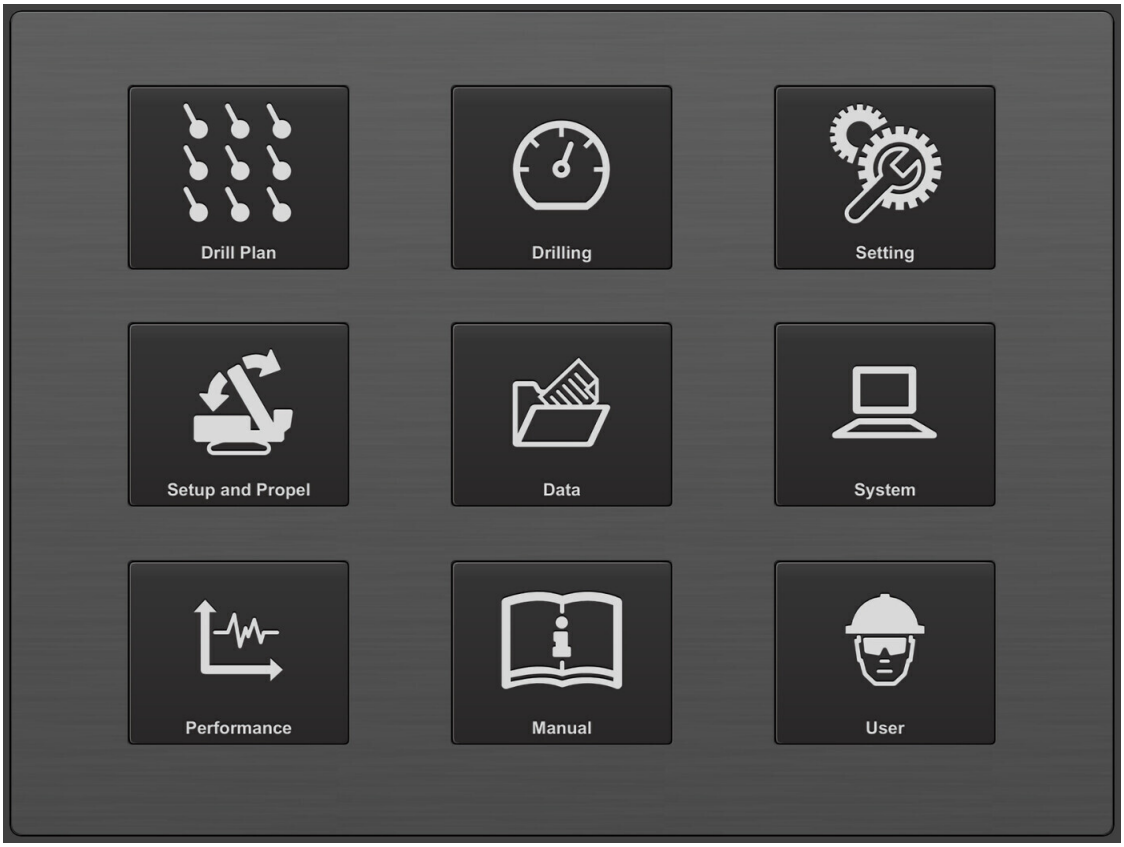
- ▶ Read the Safety Manual before operating, doing maintenance, service, or repairs on the machine.
- ▶ Know where the safety signs are on the equipment and understand their meanings.
- ▶ Obey all safety signs and warning statements.

The Rig Control System (RCS) is a graphical user interface (GUI) representation of all parameters useful to the operator. The system consists of a central computer (CC) and several electronic modules that communicate with the CC using controller area network (CAN) technology.

The RCS gives the following advantages:

- On-screen display of
  - All drilling pressures
  - Rotary head position
  - Engine J1939 data
  - Calibration and adjustment of system parameters available at the AC Service access level
- Automatic operational and safety interlocks
- Automatic identification and display of system warnings and faults
- Access to diagnostic menus and troubleshooting capabilities that are viewed directly from the display (only available at the Site Service access level).
- Options include:
  - Auto leveling
  - Auto Drill 2 system
  - Common Communication Interface (CCI)
  - Measure While Drilling system (MWD)
  - Rig Remote Access system (RRA)
  - Global Positioning System (GPS)
  - Teleremote
  - Desktop viewer
  - Rock formation analysis and data logging

2.1 Operator Display



GUI Display with Menu Screen

2.1.1 Menu and Screen Navigation

The main menu screen appears when RCS is powered up. The interactive menu buttons offer access to various information screens related to machine settings, setup, performance, operations, and recorded on-board data. Some menu displays provide read-only information while other menus let the operator change machine settings and options.

Many screens provide one level of content, but some screens are multi-level. These multi-level screens are divided into two sections. The large window on the left shows information dependent on which sub-menu is active. The right side of these screens shows available sub-menus grouped into sections by menu hierarchy. The top group of sub-menu buttons provides access to the top-level information under the main menu. The lower group of buttons show information screens relevant to the top sub-menu selection.

RCS Button Status and Navigation

Button Icon	Description
	A white icon on the button shows that a button is inactive and not selected.
	A blue icon on the button shows that a button is active and selected. The name of this button is shown in the top-left corner of the main window.
	White dots below any selected button and in the top-right corner of the main window show how many screens in total are available. The bold dot shows which screen is visible in the main window. Tapping either the button or the top-right corner of the main window toggles between the screens.

2.1.2 Icon Tray

Each screen includes an icon tray along the bottom of the screen, except for the **Menu** screen.

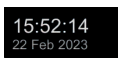
Example of the Icon Tray

Icons are color-coded as follows:

- **Red** — Error
- **Yellow** — Warning
- **White** — Information

Icons show in order of severity from right to left. Red icons are on the right, followed by yellow icons. White icons are on the left. Within each color code, icons show with the oldest event on the right. New events show to the left. Only five fault-related icons are shown in the system tray at one time. Select the system tray to view more icons.

Icon Tray Unit Descriptions

Icon	Description
	Shows the set date and time.
	Shows the current DEF tank level for Cummins® High-Horsepower Tier 4 engines.
	Shows the number of active logging functions. The icon is only highlighted if functions are active. Select the icon to display a list of active logs.

Icon	Description
	Shows the number of active overrides. The icon is only highlighted if overrides are active. Select the icon to display a list of active overrides.
	Shows TUM code information. The timer shows how long the current TUM code has been in use. Select the icon to see which TUM code is in use and display the quick list of available TUM codes. Select a different TUM code to change which TUM code is in use.
	Identifies an active event. The icon is only highlighted if the operator has not re-viewed the event. Select the icon to display a list of active events.
	Returns the operator to the **Menu** screen.
	The system tray shows a list of active events on the machine.
The following machine states appear in the system status bar.	
	Indicates that the engine or motor is not operating or is not communicating with the display.
	Shows that the machine is in Setup mode.
	Shows that the machine is in single-joystick Propel mode.
	Shows that the machine is in dual-joystick Propel mode.
	Shows that the machine is in Drill mode.
	Shows that the automatic leveling is active.
	Shows that the manual leveling jack function is active.

Icon	Description
	Shows that the hoist is active.
	Shows that the dust collector is active.

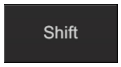
2.1.3 Keyboard Layouts

Depending on the selected field, either an alpha-numeric or numeric keyboard appears on the screen so that the user can add or edit field content. The name of the selected field appears in the top-left corner of the keyboard window.

Alpha-Numeric Keyboard

Alternate Keyboard

Alpha-Numeric and Alternate Keyboard Key Descriptions

Key	Description
	Backspaces or deletes text from the right.
	Increases cursor position to the left.
	Increases cursor position to the right.
	Toggles between the standard alpha-numeric keyboard and alternate keyboard.
	Toggles between lower and upper case.
	Saves the entered text.
	Reverts to the previously saved text.

Numeric Keyboard

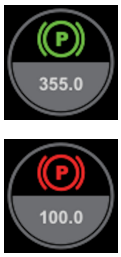
Numeric Keyboard Key Descriptions

Key	Description
	Backspaces or deletes text from the right.
	Increases cursor position to the left.
	Increases cursor position to the right.
	Toggles between a negative and positive value.
	Saves the entered text.
	Reverts to the previously saved text.

2.1.4 Information Icons

The icons in the following tables are found along the top of the main window on both the **Drill Plan** and **Setup** screens.

Parking Brake and Engine Speed

Icon	Description
	• The green icon shows that the parking brake is released and the tracks can move. • The red icon shows that the parking brake is applied and the tracks cannot move. • The number indicates the brake pressure.
	Shows the engine speed.

Drill Hole Information

Icon	Description
	ID — Shows either which drill hole is below the machine according to the drill plan, or an unplanned drill hole. **Tower angle** — Shows the required tower angle to drill the drill hole. **Target depth** — Shows the drill hole depth before zeroing the start of the drill hole. This value changes based on the height of the drill bit.

Pitch and Roll Angle Information

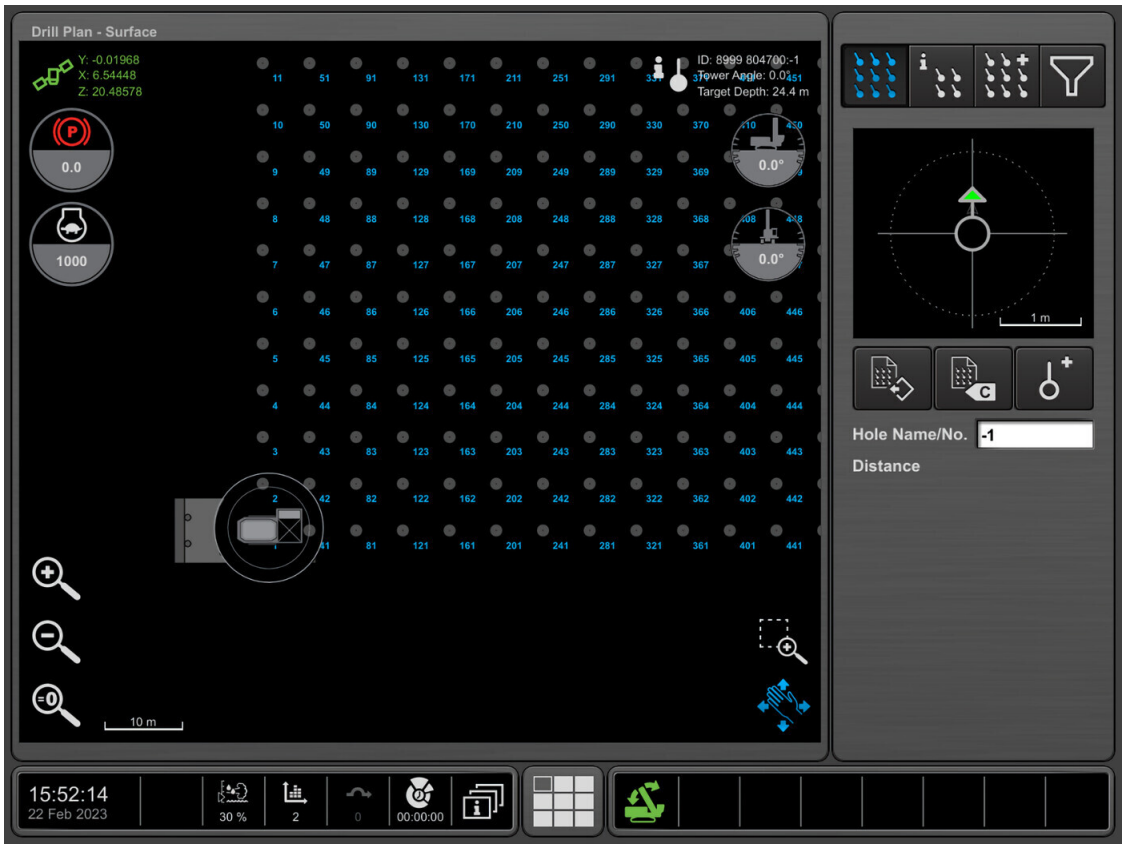
Icon	Description
	A gray icon shows that the angle is within the pitch limit value for the machine.
	A gray icon shows that the angle is within the roll limit value for the machine.
	A yellow icon shows that the pitch angle is less than the maximum value but greater than the minimum limit value.

Icon	Description
	A yellow icon shows that the roll angle is less than the maximum value but greater than the minimum limit value.
	A red icon shows that the pitch angle is greater than the maximum limit value for the machine.
	A red icon shows that the roll angle is greater than the maximum limit value for the machine.
	Shows the pitch or roll angle from the sensor input.

3 Drill Plan Screen

Drill Plan *Screen Button*

The **Drill Plan** icon is only available when GPS is active.

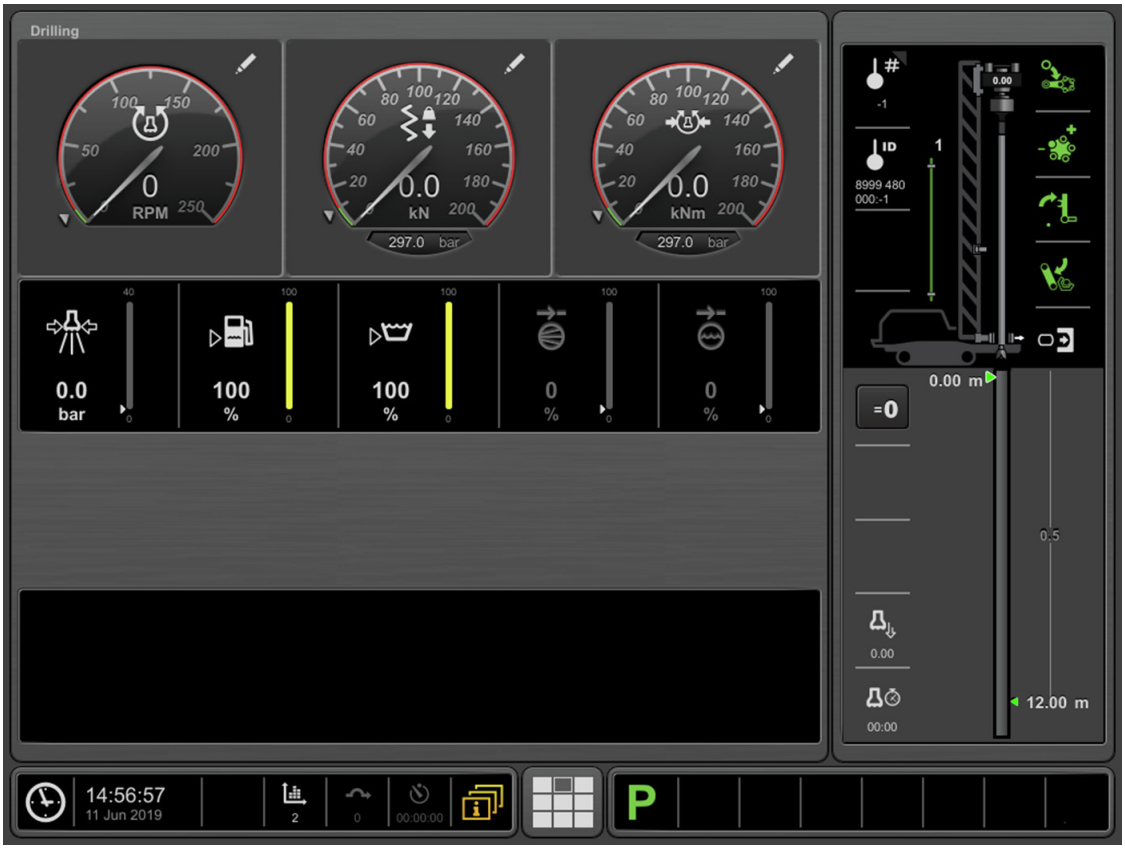


Example of the **Surface** *Screen*

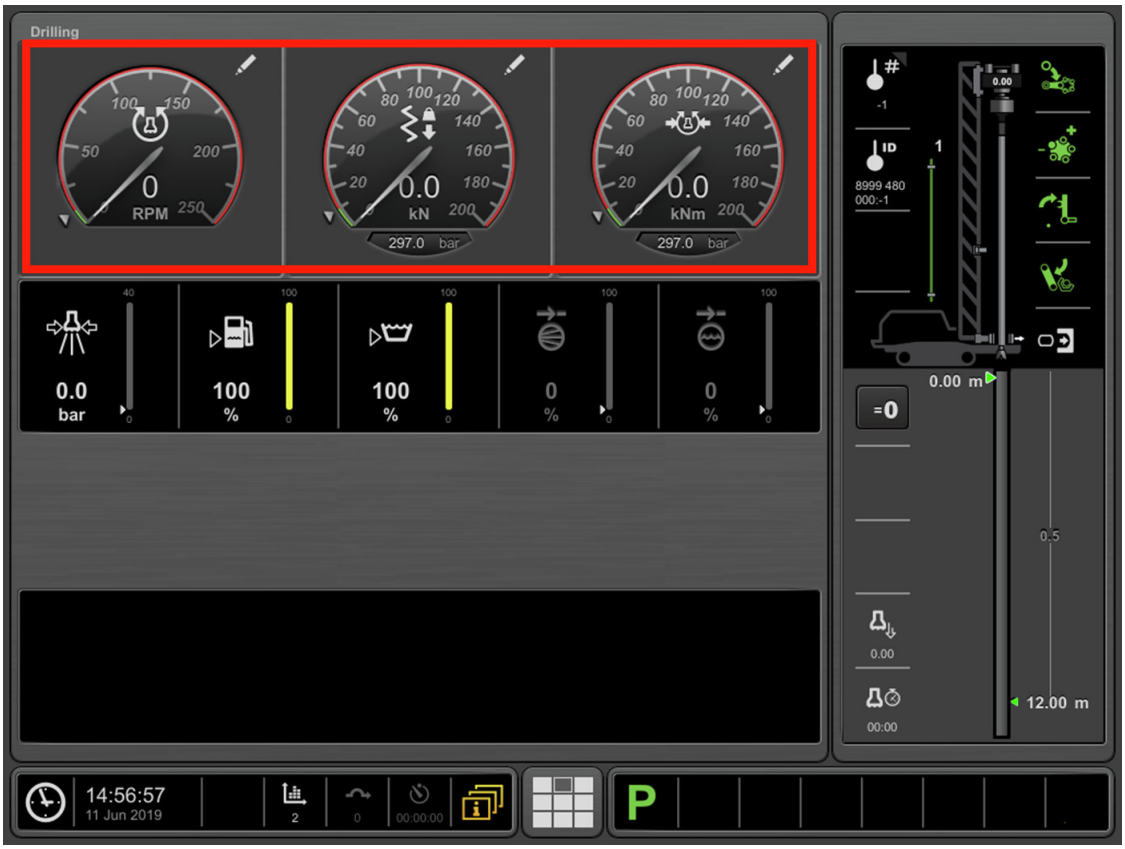
Refer to the **RCS 5 Navigation** manual for more information.

4 Drilling Screen

Drilling *Screen Button*

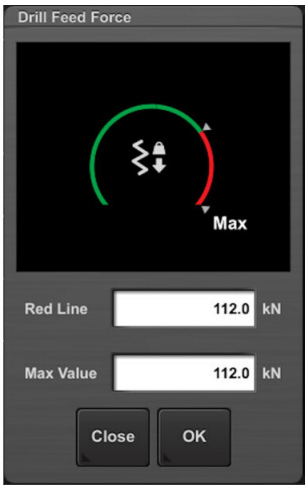


Example of the **Drilling** *Screen*



Example of **Drilling** *Screen Dial Gauges*

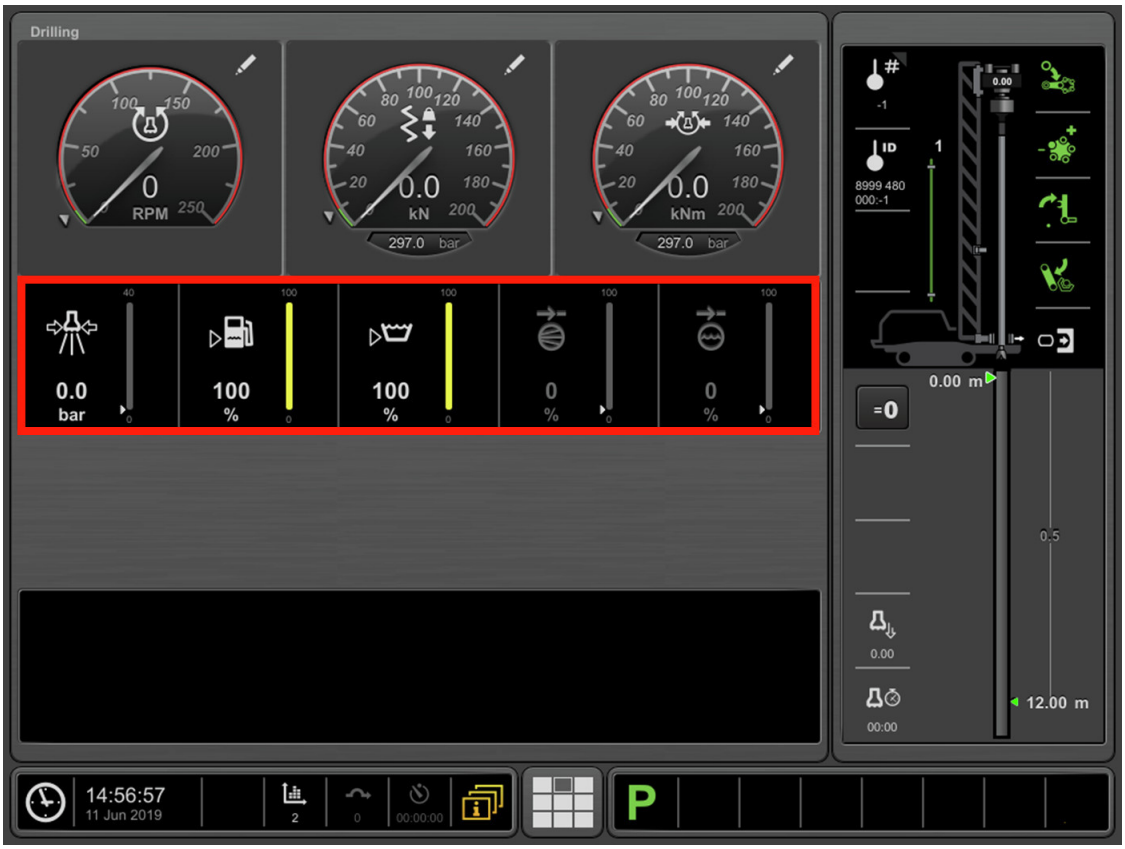
Gauge Icon	Description
	Shows the rotation speed. A positive number indicates clockwise rotation. A negative number indicates counterclockwise rotation.
	Shows the drill feed force, which is the weight on the drill bit.
	Shows the drill rotation force torque on the drill bit.



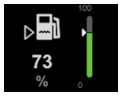
Example of the Gauge Edit Window

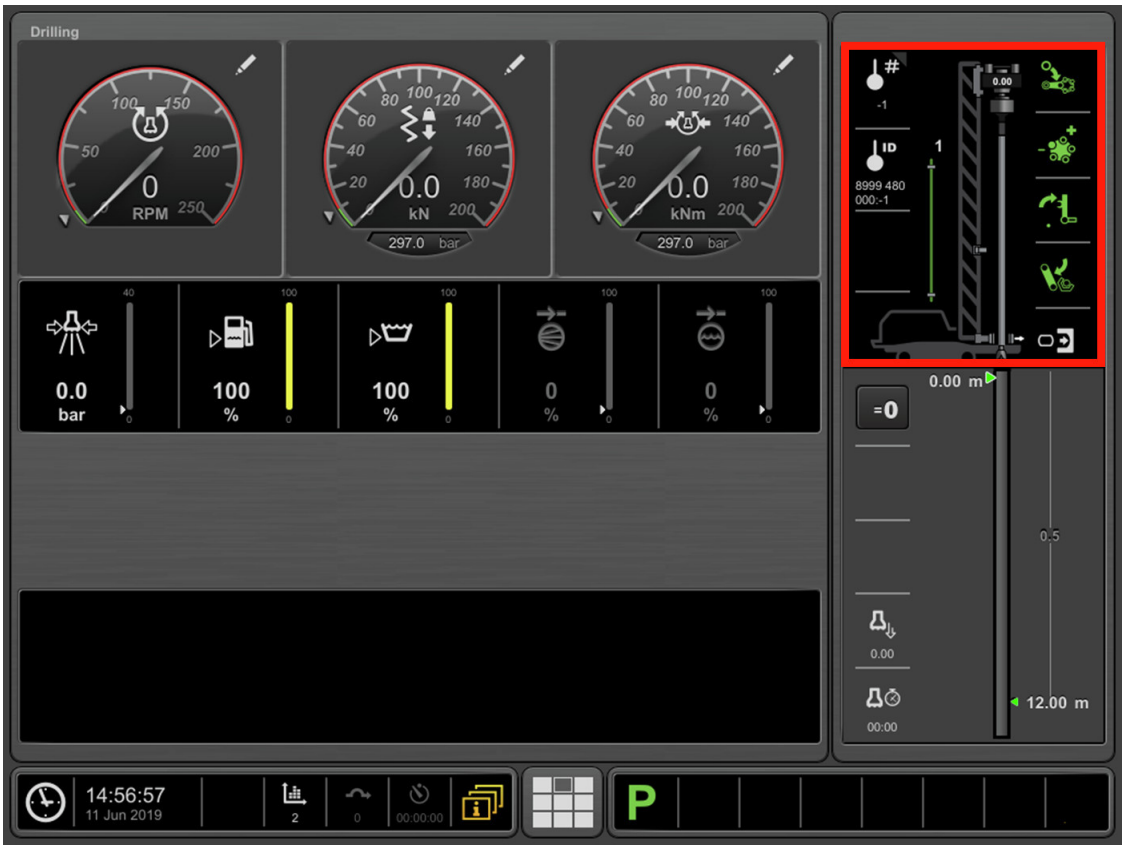
The operator can edit the maximum value and red line for the gauge when the pen is selected.

Item	Description
Red Line	Lets the operator set the start of the red line. Anything before this value displays as green.
Max Value	Lets the operator set the new maximum value for the gauge.
Close	Reverts to the previous maximum value and red line value for the gauge.
OK	Applies the new maximum value and red line value settings to the gauge.



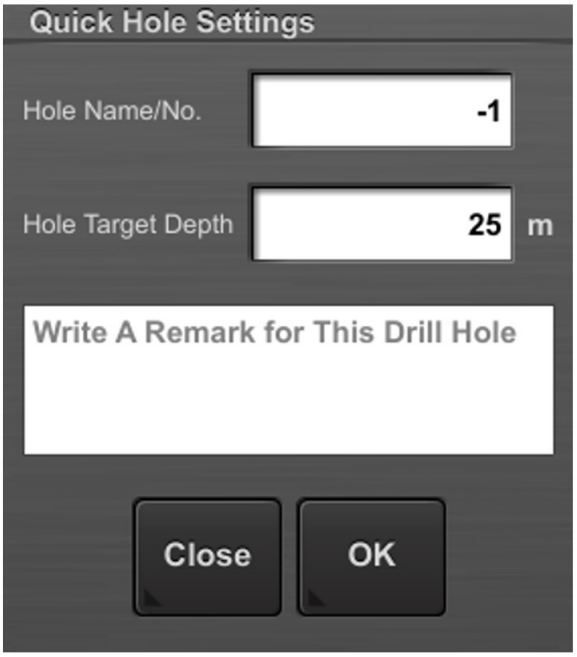
Example of **Drilling** *Screen Level Gauges*

Level Gauge	Description
	Shows the value of the drill bit air pressure at the bottom of the tower. ! **NOTE:** *The sensor is in the air line after the minimum pressure valve and it does not show the receiver tank pressure.*
	Shows the fuel tank level. The gauge shows the level status as follows: • Above 101% shows a yellow level. • Between 1% and 100% shows a green level. • Below 1% shows a gray level.
	Shows the water tank level. The gauge shows the level as follows: • Above 101% shows a yellow level. • Between 1% and 100% shows a green level. • Below 1% shows a gray level.
	Shows the amount of commanded air flow sent to the EARS controller. The gauge only illuminates when the compressor is operating.
	Shows the commanded water flow sent to the water injection system. The gauge only illuminates when the water flow is present.



Example of **Drilling** *Screen Tower Information*

Icon	Description
Drill Hole Information	
	Shows the current drill hole number.
	Shows the current drill hole ID.



Example of **Quick Hole Settings** *Edit Box*

Select one of the drill hole information icons to open the **Quick Drill Hole Settings** window.

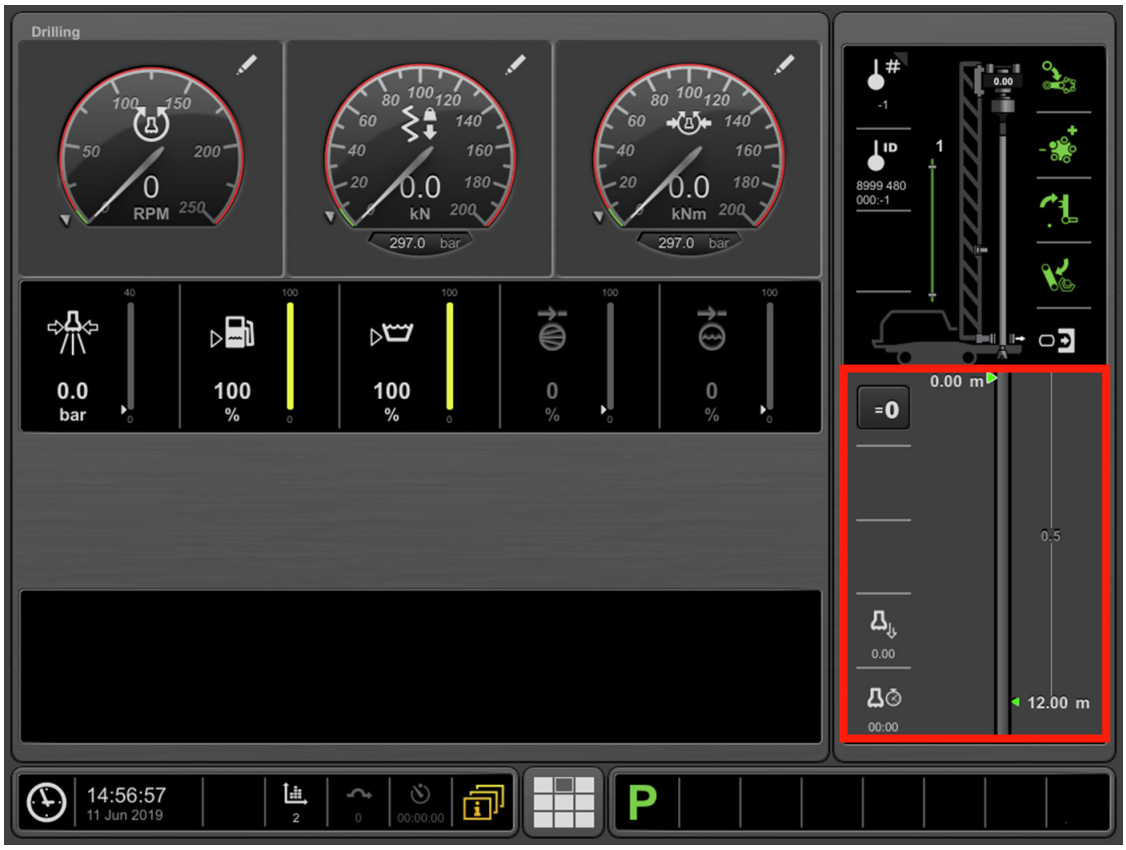
Item	Description
Hole Name/No.	Adjust by changing the values in the field. The drill hole name is independent from the **Hole ID** in the drill plan.
Hole Target Depth	Adjust by changing the values in the field. If drilling without a drill plan, editing this depth also changes the saved default drill hole depth. If the hole is part of a drill plan, set the new depth after zeroing the drill hole. After completing the drill hole, the new depth is saved as the default depth but will not change the depth of drill holes in the rest of the drill plan.
Write A Remark for This Drill Hole	Add general comments in the large free-text field for Surface Manager 2.19 or later.
Close	Select to cancel any changes and close the **Quick Drill Hole Settings** window.
OK	Select to save any changes and close the **Quick Drill Hole Settings** window.

Icon	Description
Carousel	
	Shows that the carousel is stowed and can be moved towards the rotary head. A stowed carousel is also shown with the correct amount of green drill pipe in the carousel to the left of the tower.

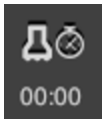
Icon	Description
	Shows that the carousel is not stowed and can be moved away from the rotary head. An unstowed carousel is also shown with the correct amount of red drill pipe in a carousel below the rotary head.
Drill Pipe Count	
	For machines with Auto Rod Changer (ARC), shows which cup position the carousel is in. The number above the carousel shows the drill pipe count. If the carousel is between positions, **!** is displayed.
Drill Pipe Support	
	Shows that the drill pipe support is in the stowed position.
	Shows that the drill pipe support is in the unstowed position.
Breakout Wrench	
	Shows that the breakout wrench is in the stowed position.
	Shows that the breakout wrench is in the unstowed position.
Deck Fork	

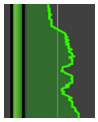
!	***NOTE:*** *The deck fork uses the same icons and adds a yellow icon when the deck fork is over the bushing.*

Icon	Description
	Shows that the deck fork is in the stowed position.
	Shows that the deck fork is in the unstowed position.
Rotary Head Position	
	Shows the rotary head position when the encoder is calibrated.
Drill Bit Position	
	A calibrated encoder with the drill bit not in the drill hole shows that the drill bit is below the deck bushing. The drill pipe below the rotary head changes to gray and is in a safe position for operating the leveling jacks and propel functions.
	Shows that the drill bit is in the drill hole. The drill pipe below the rotary head changes to red, and a red warning symbol appears. Shows that the drill bit is below the position that is safe for propelling.



Example of **Drilling** *Screen Drill Hole Information*

Icon	Description
	Lets the operator zero the drill hole manually if the following is true: • The rotary head is above the drill bit-in-hole location. • The drill pipe is 1. Change the machine from Drill mode to Propel mode, and then back to Drill mode for RCS to let you zero the drill hole manually if the previous criteria are met. The following criteria must be met for the button to be available: • The machine is in Drill mode. • The rotary head is calibrated. • The drill pipe count is 1. • The drill bit is not in the drill hole. • Auto Drill 2 is not active. • The drill hole is not already zeroed and the log is not running. If the drill hole has already been zeroed and the log is running, the drill hole cannot be zeroed again unless the machine mode has been changed from Drill mode to Propel mode, and back to Drill mode. Propelling the machine for 5 seconds closes the log file and makes it so that the drill hole is no longer zeroed. ! ***NOTE:*** *This button can only be used once per drill hole. The button resets after the machine has propelled for 5 seconds, or when the drill hole is renamed.*
	Shows the rate of penetration while drilling.
	Shows the amount of time elapsed to drill the drill hole to its current depth.
	Shows the current depth of the drilled hole.
	Shows the average drill hole penetration rate.
	Shows the desired drill hole depth as set in the automatic drill plan or manually entered by the operator.
	Shows that the drill bit is in the drill hole. The drill pipe below the rotary head changes to red, and a red warning symbol appears.

Icon	Description
	Shows the current depth of the drilled hole.
	Shows the penetration rate at the current depth.

5 Setting Screen

Setting *Screen Button*

5.1 Setting > Setup Screens

The **Setup** button enables access to the following setup applicable information screens:

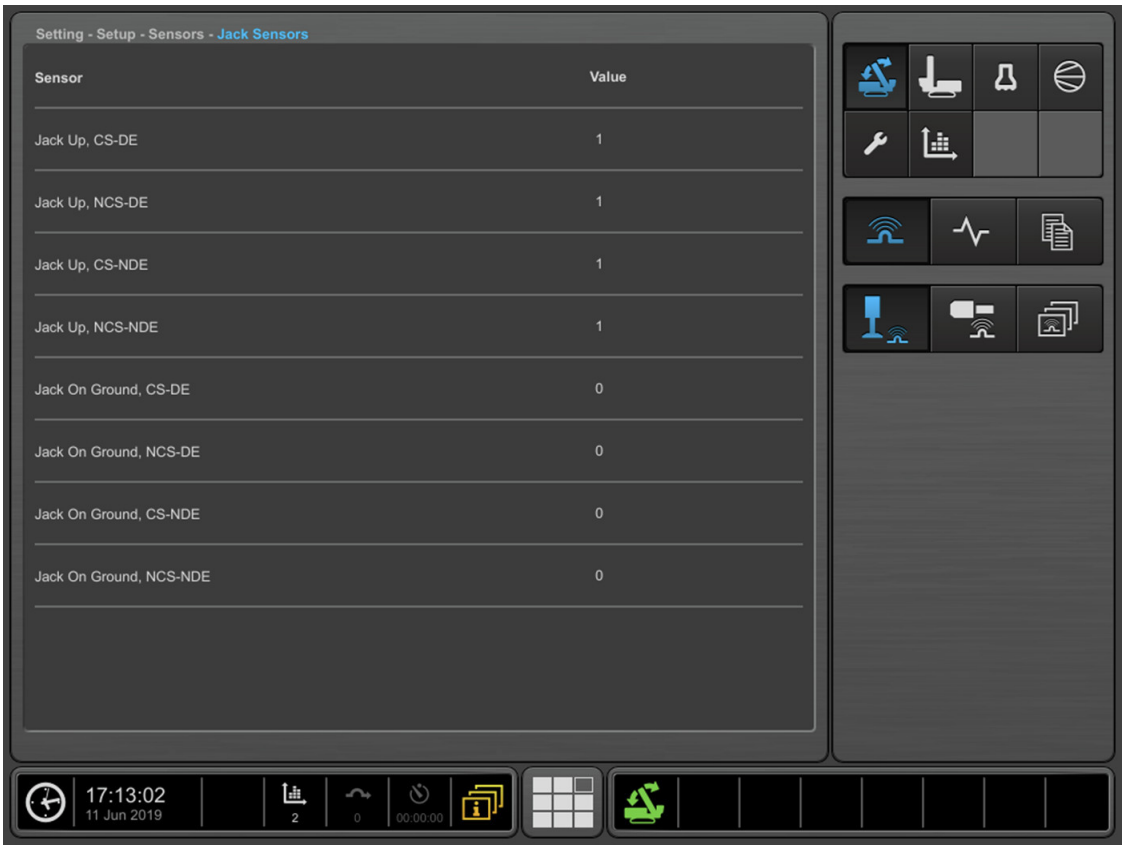
- Sensors
- Actuations
- Parameters

5.1.1 Setup > Sensors

Example of the **Jack Sensors** *Screen*

Sensor	Description
Jack Up, CS-DE	Shows that the cab side drill end leveling jack is retracted. • 1 = The cab side drill end leveling jack is retracted. • 0 = The cab side drill end leveling jack is not retracted.
Jack Up, NCS-DE	Shows that the non-cab side drill end leveling jack is retracted. • 1 = The non-cab side drill end leveling jack is retracted. • 0 = The non-cab side drill end leveling jack is not retracted.
Jack Up, CS-NDE	Shows that the cab side non-drill end leveling jack is retracted. • 1 = The cab side non-drill end leveling jack is retracted. • 0 = The cab side non-drill end leveling jack is not retracted.
Jack Up, NCS-NDE	Shows that the non-cab side non-drill end drill end leveling jack is retracted. • 1 = The non-cab side non-drill end leveling jack is retracted. • 0 = The non-cab side non-drill end leveling jack is not retracted.
Jack On Ground, CS-DE	Shows that the cab side drill end leveling jack is on the ground. • 1 = The cab side drill end leveling jack is on the ground. • 0 = The cab side drill end leveling jack is not on the ground.

Sensor	Description
Jack On Ground, NCS-DE	Shows that the non-cab side drill end leveling jack is on the ground. • 1 = The non-cab side drill end leveling jack is on the ground. • 0 = The non-cab side drill end leveling jack is not on the ground.
Jack On Ground, CS-NDE	Shows that the cab side non-drill end leveling jack is on the ground. • 1 = The cab side non-drill end leveling jack is on the ground. • 0 = The cab side non-drill end leveling jack is not on the ground.
Jack On Ground, NCS-NDE	Shows that the non-cab side non-drill end leveling jack is on the ground. • 1 = The non-cab side non-drill end leveling jack is on the ground. • 0 = The non-cab side non-drill end leveling jack is not on the ground.



Example of the **Jack Sensors** *Screen*

Sensor	Description
Jack Up, CS-DE	Shows that the cab side drill end leveling jack is retracted. • 1 = The cab side drill end leveling jack is retracted. • 0 = The cab side drill end leveling jack is not retracted.
Jack Up, NCS-DE	Shows that the non-cab side drill end leveling jack is retracted. • 1 = The non-cab side drill end leveling jack is retracted. • 0 = The non-cab side drill end leveling jack is not retracted.
Jack Up, CS-NDE	Shows that the cab side non-drill end leveling jack is retracted. • 1 = The cab side non-drill end leveling jack is retracted. • 0 = The cab side non-drill end leveling jack is not retracted.
Jack Up, NCS-NDE	Shows that the non-cab side non-drill end drill end leveling jack is retracted. • 1 = The non-cab side non-drill end leveling jack is retracted. • 0 = The non-cab side non-drill end leveling jack is not retracted.
Jack On Ground, CS-DE	Shows that the cab side drill end leveling jack is on the ground. • 1 = The cab side drill end leveling jack is on the ground. • 0 = The cab side drill end leveling jack is not on the ground.

Sensor	Description
Jack On Ground, NCS-DE	Shows that the non-cab side drill end leveling jack is on the ground. • 1 = The non-cab side drill end leveling jack is on the ground. • 0 = The non-cab side drill end leveling jack is not on the ground.
Jack On Ground, CS-NDE	Shows that the cab side non-drill end leveling jack is on the ground. • 1 = The cab side non-drill end leveling jack is on the ground. • 0 = The cab side non-drill end leveling jack is not on the ground.
Jack On Ground, NCS-NDE	Shows that the non-cab side non-drill end leveling jack is on the ground. • 1 = The non-cab side non-drill end leveling jack is on the ground. • 0 = The non-cab side non-drill end leveling jack is not on the ground.

Example of the **Pin Sensors** *Screen*

Output	Description
Vertical Pin Unlocked, CS	Shows the cab side vertical pin sensor condition. • 1 = The cab side vertical pin is not locked. • 0 = The cab side vertical pin is locked.
Vertical Pin Unlocked, NCS	Shows the non-cab side vertical pin sensor condition. • 1 = The non-cab side vertical pin is not locked. • 0 = The non-cab side vertical pin is locked.
Angle Pin Unlocked, CS	Shows the cab side angle pin sensor condition for machines that are equipped with angle drilling. • 1 = The cab side angle pin is not locked. • 0 = The cab side angle pin is locked.
Angle Pin Unlocked, NCS	Shows the non-cab side angle pin sensor condition for machines that are equipped with angle drilling. • 1 = The non-cab side angle pin is not locked. • 0 = The non-cab side angle pin is locked.
Vertical Pin Locked, CS	Shows the cab side vertical pin sensor condition. • 1 = The cab side vertical pin is locked. • 0 = The cab side vertical pin is not locked.

Output	Description
Vertical Pin Locked, NCS	Shows the non-cab side vertical pin sensor condition. • 1 = The non-cab side vertical pin is locked. • 0 = The non-cab side vertical pin is not locked.
Angle Pin Locked, CS	Shows that the cab side angle pin is sensor condition for machines that are equipped with angle drilling. • 1 = The cab side angle pin is locked. • 0 = The cab side angle pin is not locked.
Angle Pin Locked, NCS	Shows the non-cab side angle pin sensor condition for machines that are equipped with angle drilling. • 1 = The non-cab side angle pin is locked. • 0 = The non-cab side angle pin is not locked.

Example of the **Other Sensors** *Screen*

Output	Description
Tower Angle	Shows the machine tower angle.
Tower Position	Shows the tower angle from the **Auto Tower Angle** control for machines that are equipped with angle drilling.

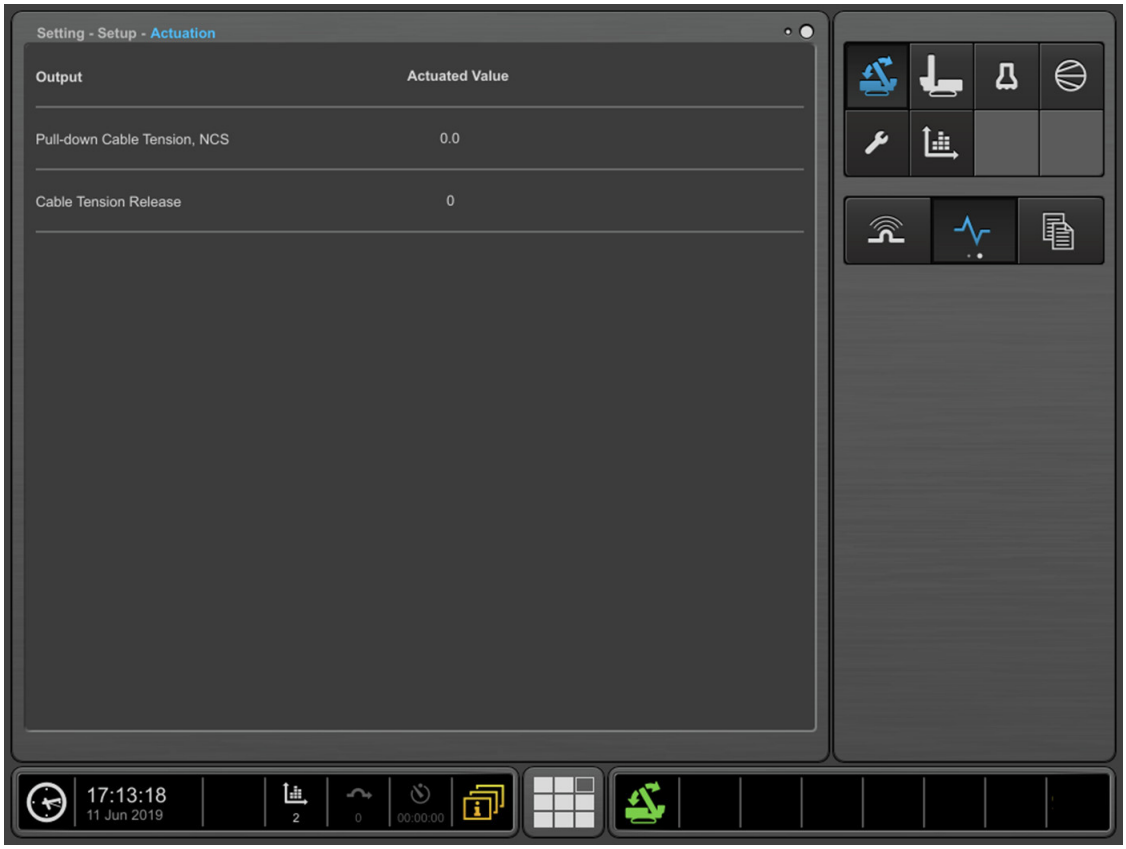
Output	Description
Hoist Move, Remote	Shows the commanded input for movement from the remote hoist controller.
Remote Hoist Activated	Shows that the remote hoist controller is energized.

5.1.2 Setup > Actuations

Example of the **Actuation** *Screen 1 of 2*

Output	Description
Vertical Pins	Shows the commanded output for the vertical pin movement.
Angle Pins	Shows the commanded output for the angle pin movement. ! ***NOTE:*** *Angle pins are only applicable when an angle package is installed.*
Tower Move	Shows the commanded output for the tower raise and lower movement.
Jack Move, CS-DE	Shows the commanded output for the cab side drill end leveling jack movement.

Output	Description
Jack Move, NCS-DE	Shows the commanded output for the non-cab side drill end leveling jack movement.
Jack Move, NDE	Shows the commanded output for the non-drill end leveling jack movement.
Hoist Move	Shows the commanded output for the hoist movement.
Pulldown Cable Tension, CS	Shows the commanded output to the cab side pulldown wire rope tension.



Example of the **Actuation** *Screen 2 of 2*

Output	Description
Pulldown Cable Tension, NCS	Shows the commanded output to the non-cab side pulldown wire rope tension.
Cable Tension Release	Shows the commanded output to the pulldown wire rope tension. • 1 = The wire rope tension is released. • 0 = The wire rope tension is not released.

5.1.3 Setup > Parameters

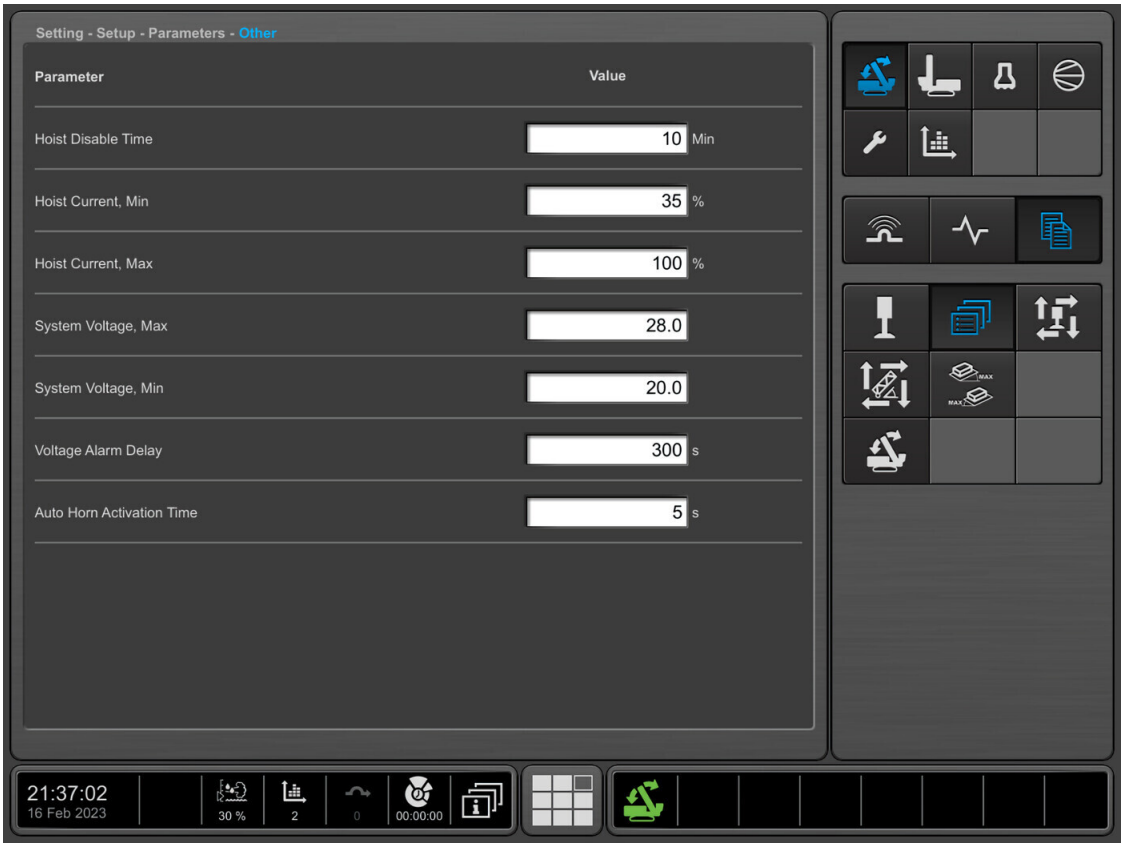
Jack Parameters

Example of the **Jacks** *Screen*

Parameter	Description
Jack Percent Limit, Remote	Sets the maximum output value for the commanded movement when using the RRC option to operate the leveling jack functions.
Jack Up, CS	Sets the minimum and maximum percentage of current that is required for cab side leveling jack retraction when the commanded output from the controller is minimum.
Jack Down, CS	Sets the minimum and maximum percentage of current that is required for cab side leveling jack extension when the commanded output from the controller is minimum.
Jack Up, NDE	Sets the minimum and maximum percentage of current that is required for non-drill end leveling jack retraction when the operator commands 100% output from the controller.
Jack Down, NDE	Sets the minimum and maximum percentage of current that is required for non-drill end leveling jack extension when the operator commands 100% output from the controller.

Parameter	Description
Jack Up, NCS	Sets the minimum and maximum percentage of current that is required for non-cab side leveling jack retraction when the operator commands 100% output from the controller.
Jack Down, NCS	Sets the minimum and maximum percentage of current that is required for non-cab side leveling jack extension when the operator commands 100% output from the controller.
Time for All Up	Sets the time that is required to hold the up or down joystick switch before commanding leveling jack movement. This setting is to make sure that an accidental movement of the joystick switch has no effect on the leveling jacks.

Other Parameters



Example of the **Other** *Screen*

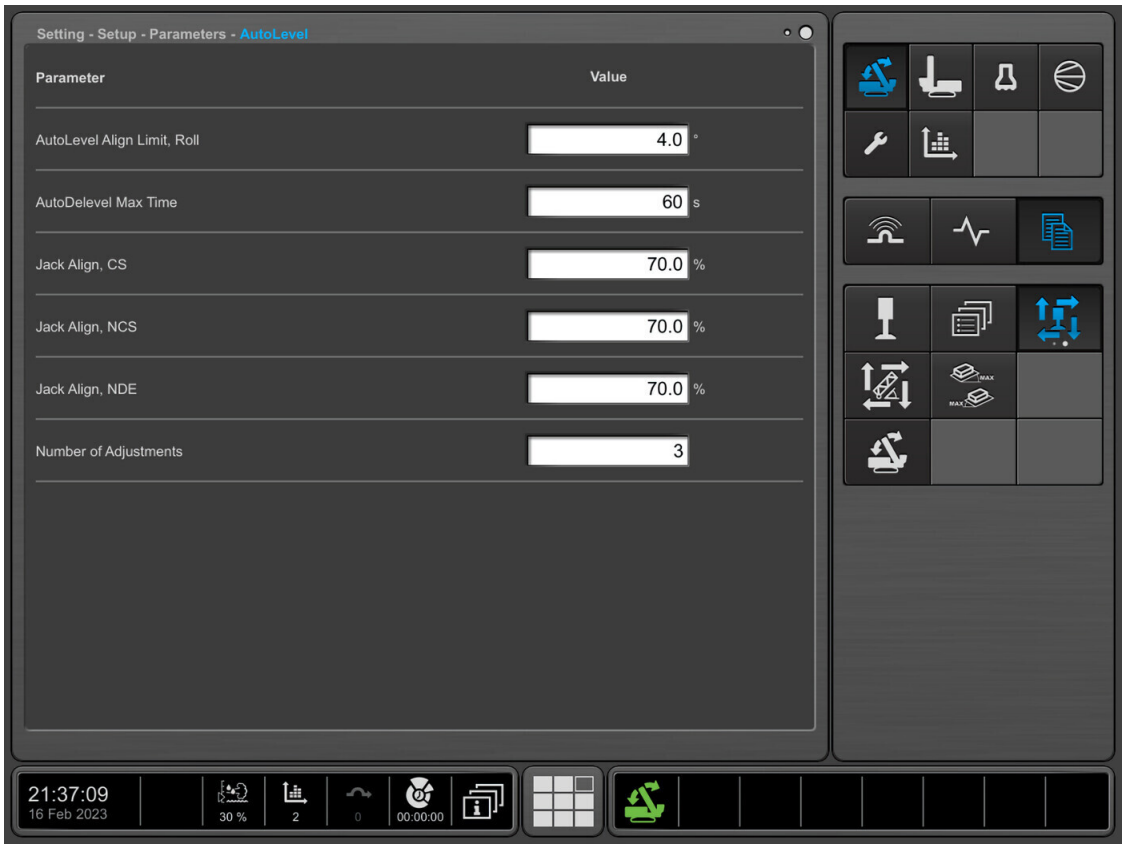
Parameter	Description
Hoist Disable Time	Sets the time to de-energize the hoist function when no input from the hoist movement is received.
Hoist Current, Min	Sets the minimum percentage of current that is required for hoist movement when the left main joystick switch is held and the joystick is moved away from neutral.
Hoist Current, Max	Sets the maximum percentage of current that is required for hoist movement when the left main joystick switch is held and the joystick is moved to 100% of stroke.
System Voltage, Max	Sets the maximum system voltage.
System Voltage, Min	Sets the minimum system voltage.
Voltage Alarm Delay	Sets the amount of time before a system event starts and inhibits operation in response to the system voltage not complying with the set minimum and maximum values.
Auto Horn Activation Time	Sets the length of time in seconds that the horn is automatically on.

AutoLevel Parameters

Example of the **AutoLevel** *Screen 1 of 2*

Parameter	Description
Jack, CS	Sets the percent output to the drill end cab side leveling jack.
Jack, NCS	Sets the percent value to the drill end non-cab side leveling jack.
Jack, NDE	Sets the percent output to the non-drill end leveling jack.
AutoLevel Max Time	Sets the maximum time for a complete leveling or raise machine cycle.
All Down Max Time	Sets the maximum time that is allowed for all leveling jacks to lower to the ground.
Pitch Max Time	Sets the maximum time that is allowed for the pitch angle to be near zero.
Roll Max Time	Sets the maximum time that is allowed for the roll angle to be near zero.
Pitch Angle Limit	Sets the target point in the pitch direction. This value must be greater than 0.0.

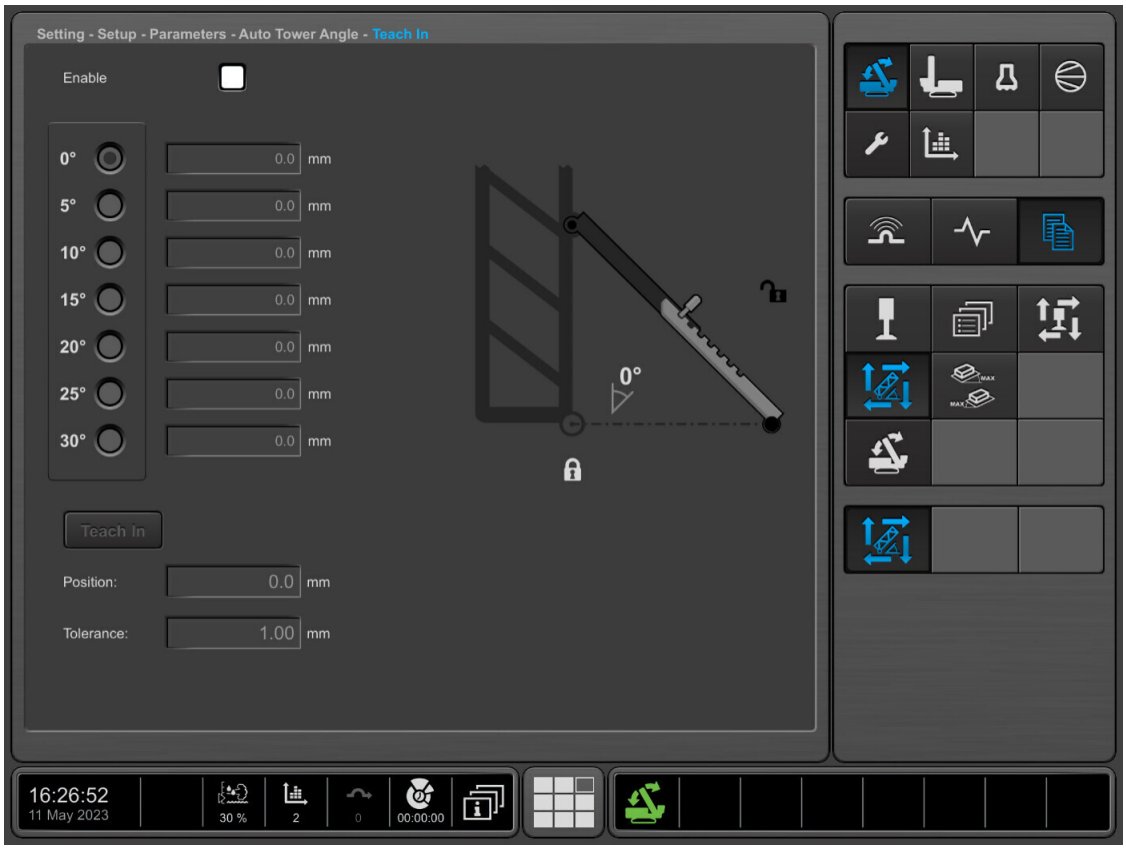
Parameter	Description
Roll Angle Limit	Sets the target point in the roll direction. This value must be greater than 0.0.
AutoLevel Align Limit, Pitch	Sets the pitch limit that is allowed during AutoLevel. If this angle limit is exceeded, the RCS tries to raise the low point of the machine until the angle is less than the align limit value. Once the angle is less than the align limit, normal auto leveling operations continue.



Example of the **AutoLevel** *Screen 2 of 2*

Parameter	Description
AutoLevel Align Limit, Roll	Sets the roll limit that is allowed during AutoLevel. If this angle limit is exceeded, the RCS tries to raise the low point of the machine until the angle is less than the align limit value. Once the angle is less than the align limit, normal auto leveling operations continue.
AutoDelevel Max Time	Sets the maximum time that is allowed for deleveling the machine.
Jack Align, CS	Sets the maximum output to the cab side leveling jack when it is on the ground and the align parameters are active.
Jack Align, NCS	Sets the maximum output to the non-cab side leveling jack when it is on the ground and the align parameters are active.

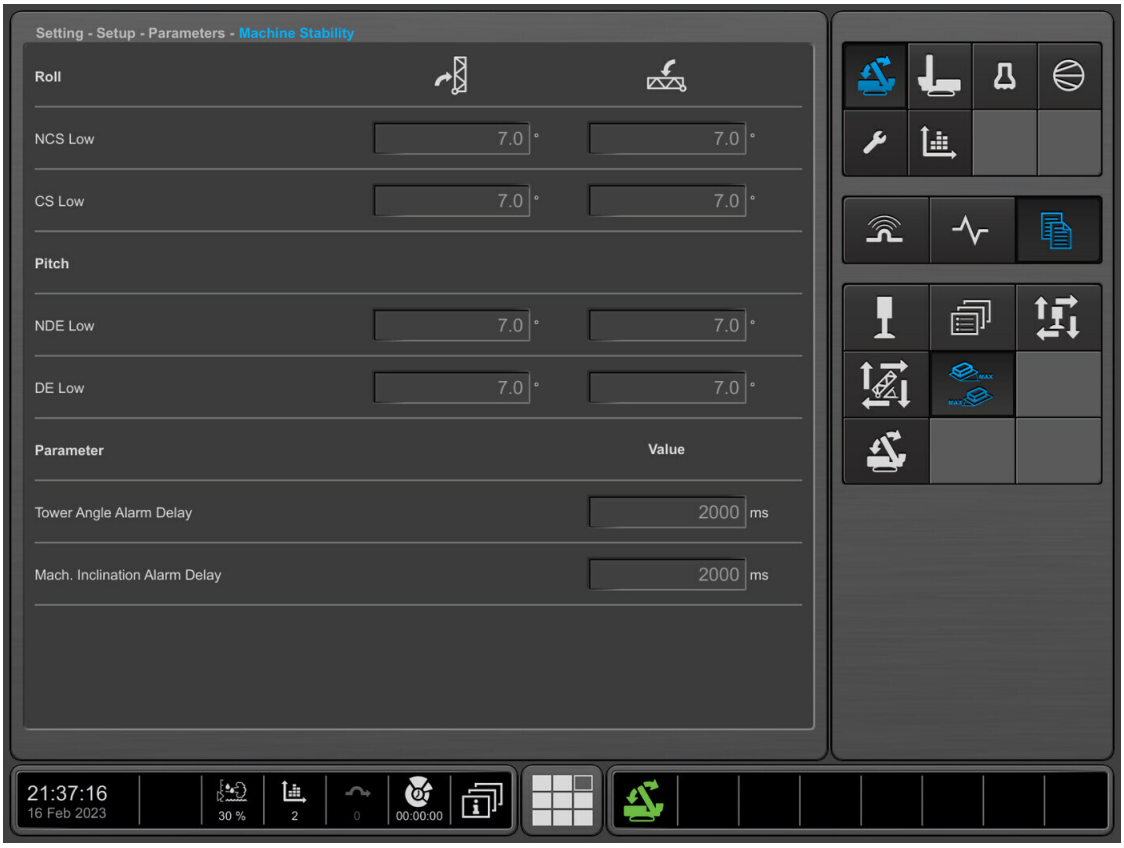
Parameter	Description
Jack Align, NDE	Sets the maximum output to the non-drill end leveling jack when it is on the ground and the align parameters are active.
Number of Adjustments	Sets the allowable number of adjustments when the roll angle is outside of tolerance. AutoLevel continues adjusting roll and raise to the non-drill end until the roll angle is within tolerance or the number of adjustments is reached.



Example of the **Teach In** *Screen*

Output	Description
Enable	Enables the use of Auto Tower Angle and enables the calibration process.
0°, 5°, 10°, 15°, 20°, 25°, 30°	Indicates the angle being calibrated during the calibration process. If a certain angle is not needed, set its value to 0.0 to de-select the position.
Teach In	When selected, the value in the **Position** box is copied to the box next to the selected angle during the calibration process.
Position	Indicates the position of the tower.
Tolerance	Sets the tolerance value.

Machine Stability Parameters

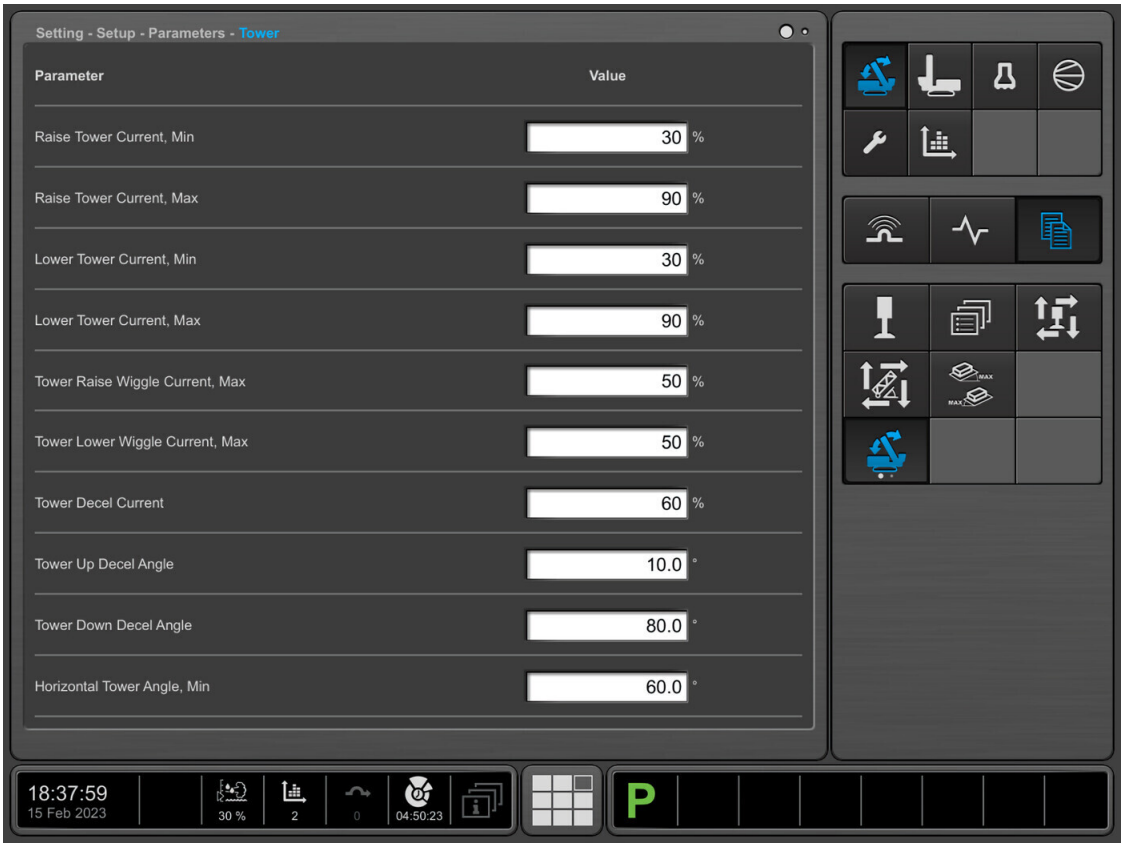


Example of the **Machine Stability** *Screen*

Parameter	Description
Roll	
NCS Low - tower up	Sets the maximum allowable roll angle for leveling with the non-cab side of the machine low and the tower up.
NCS Low - tower down	Sets the maximum allowable roll angle for leveling with the non-cab side of the machine low and the tower down.
CS Low - tower up	Sets the maximum allowable roll angle for leveling with the cab side of the machine low and the tower up.
CS Low - tower down	Sets the maximum allowable roll angle for leveling with the cab side of the machine low and the tower down.
Pitch	
NDE Low - tower up	Sets the maximum allowable pitch angle for leveling with the non-drill end of the machine low and the tower up.
NDE Low - tower down	Sets the maximum allowable pitch angle for leveling with the non-drill end of the machine low and the tower down.

Parameter	Description
DE Low - tower up	Sets the maximum allowable pitch angle for leveling with the drill end of the machine low and the tower up.
DE Low - tower down	Sets the maximum allowable pitch angle for leveling with the drill end of the machine low and the tower down.
Tower Angle Alarm Delay	Sets the amount of time before a system event starts and inhibits operation in response to the tower angle not complying with the set minimum and maximum values.
Mach. Inclination Alarm Delay	Sets the amount of time before a system event starts and inhibits operation in response to the machine inclination not complying with the stability limit.

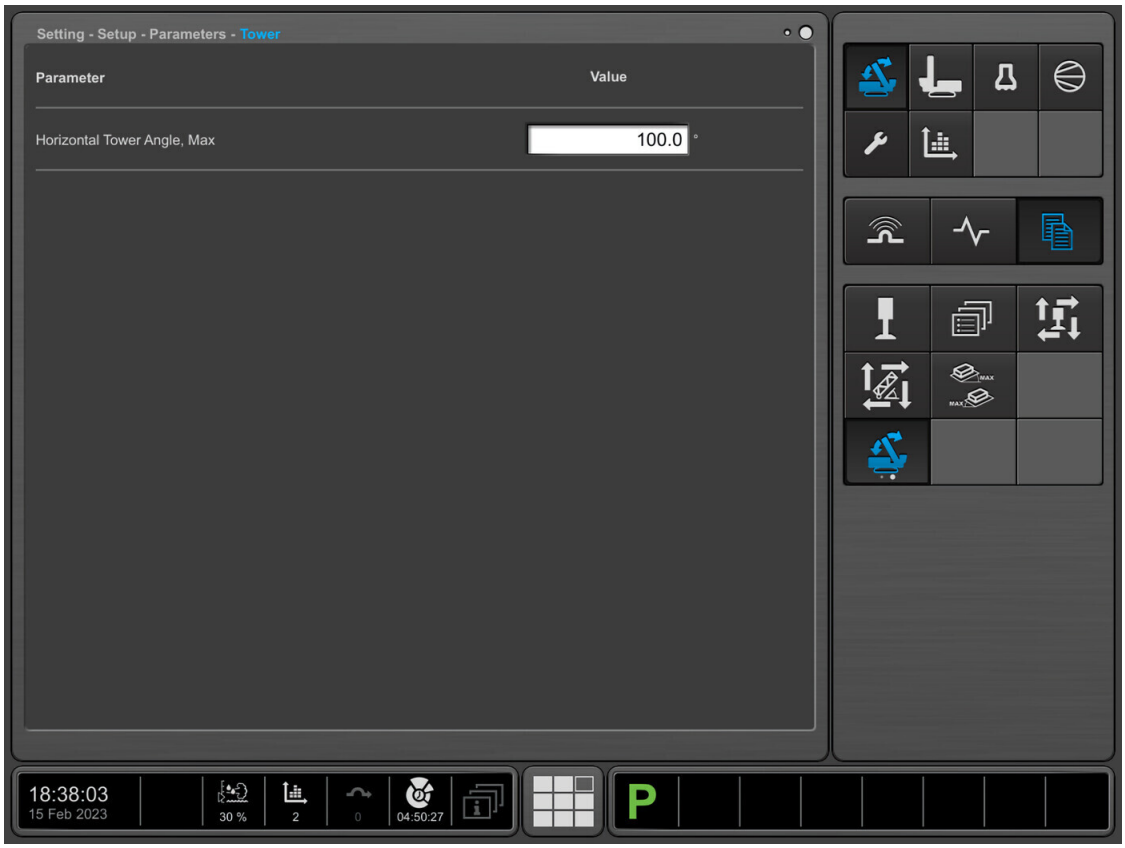
Tower Parameters



Example of the **Tower** *Screen 1 of 2*

Parameter	Description
Raise Tower Current, Min	Sets the minimum percentage of current that is required for tower movement when the right main joystick is moved slightly away from the neutral position.
Raise Tower Current, Max	Sets the maximum percentage of current sent for tower movement when the right main joystick is moved to 100% output.
Lower Tower Current, Min	Sets the minimum percentage of current that is required for tower movement when the right main joystick is moved slightly away from the neutral position.
Lower Tower Current, Max	Sets the maximum percentage of current sent for tower movement when the right main joystick is moved to 100% output.
Tower Raise Wiggle Current, Max	Sets the percentage value for limiting output when using the tower wiggle feature. This output is available when the tower pins are either locked or between the locked and unlocked position, and tower movement is commanded.
Tower Lower Wiggle Current, Max	Sets the amount of time before a system event starts and inhibits operation in response to the system voltage not complying with the set minimum and maximum values.

Parameter	Description
Tower Decel Current	Sets the percentage value for the current to reduce the tower speed when the tower is within the tower up or down deceleration angle.
Tower Up Decel Angle	Sets the angle value for deceleration when the tower up function on RCS uses the **Tower Decel Current** value instead of the **Tower Max Current** value.
Tower Down Decel Angle	Sets the angle value for deceleration when the tower down function on RCS uses the **Tower Decel Current** value instead of the **Tower Max Current** value.
Horizontal Tower Angle, Min	Sets the minimum angle at which the system recognizes the tower is horizontal.



Example of the **Tower** *Screen 2 of 2*

Parameter	Description
Horizontal Tower Angle, Max	Sets the maximum value for the horizontal angle of the tower.

5.2 Setting > Rig Screens

The **Rig** button enables access to the following machine applicable information screens:

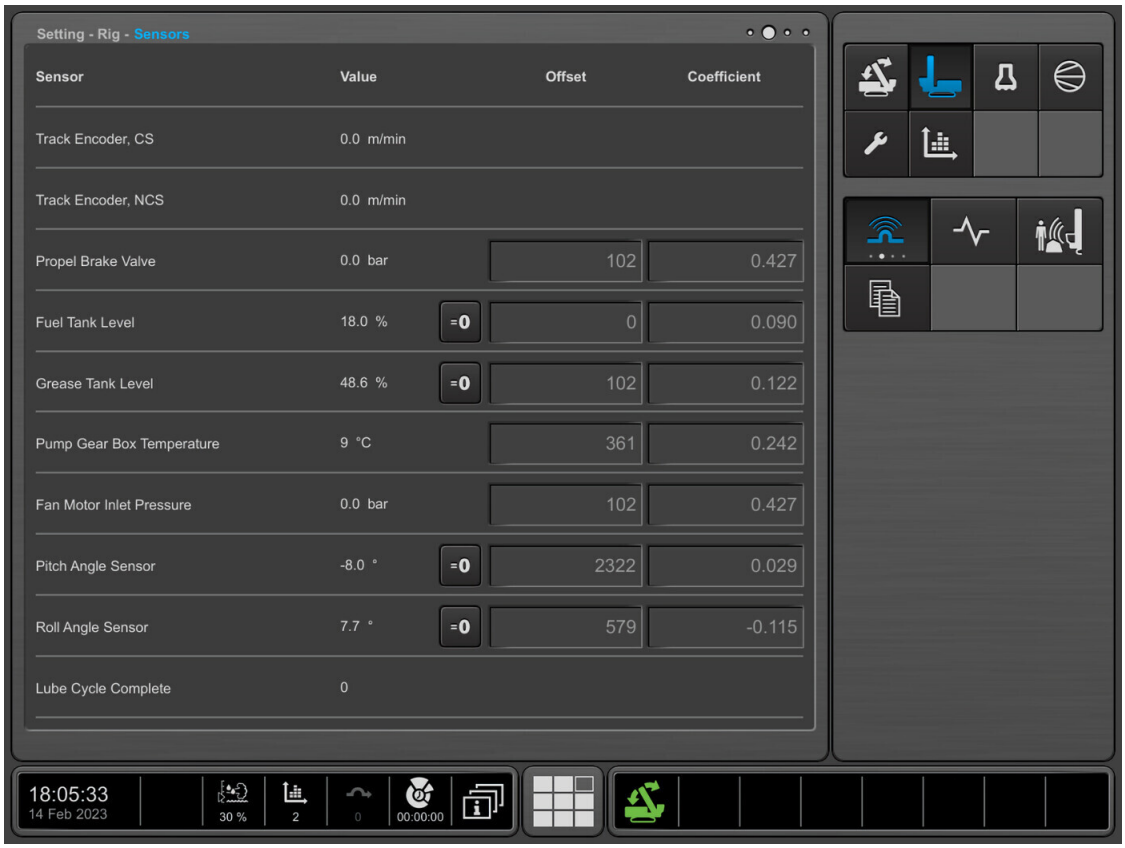
- Sensors
- Actuation
- Guards
- Parameters
- Safe to Board

5.2.1 Rig > Sensors

Example of the **Sensors** *Screen 1 of 4*

Sensor	Description
Pump Press CS, A	Shows the main pump pressure for the cab side A side.
Pump Press CS, B	Shows the main pump pressure for the cab side B side.
Hot Oil Shuttle Press, CS	Shows the pressure for the cab side hot oil shuttle.
Pump Press, NCS A	Shows the main pump pressure for the non-cab side A side.
Pump Press, NCS B	Shows the main pump pressure for the non-cab side B side.
Hot Oil Shuttle Press, NCS	Shows the pressure for the non-cab side hot oil shuttle.

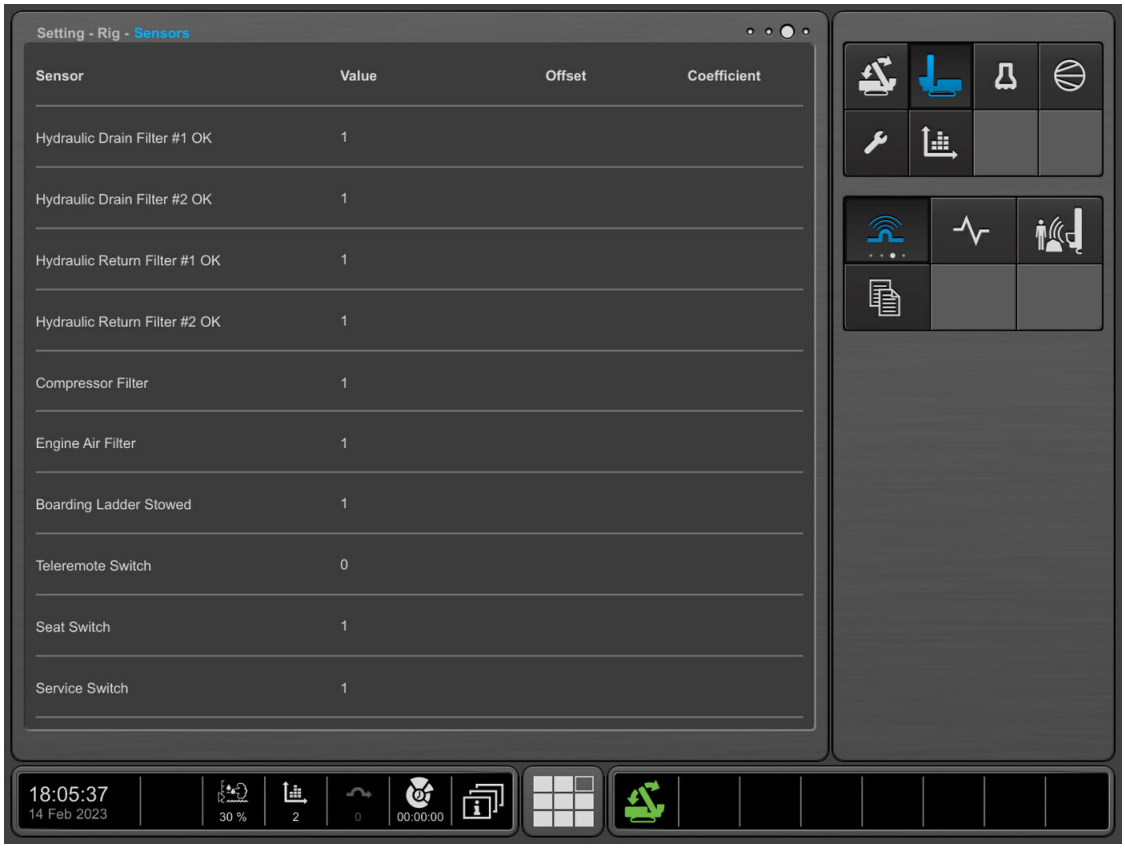
Sensor	Description
Supercharge Manifold Press	Shows the pressure for the supercharge manifold.
Return Hydraulic Press	Shows the pressure for the return hydraulic manifold.
Drain Hydraulic Press	Shows the pressure for the drain manifold.
Hydraulic Oil Temp	Shows the temperature of the hydraulic oil.



Example of the **Sensors** *Screen 2 of 4*

Sensor	Description
Track Encoder, CS	Shows the speed of the cab side track.
Track Encoder, NCS	Shows the speed of the non-cab side track.
Propel Brake Valve	Shows the propel brake pressure.
Fuel Tank Level	Shows the level of fuel in the fuel tank.
Grease Tank Level	Shows the level of the automatic lubrication grease tank.
Pump Gear Box Temperature	Shows the temperature of the pump gearbox.
Fan Motor Inlet Pressure	Shows the fan circuit manifold pressure from the input.
Pitch Angle Sensor	Shows the pitch angle of the machine.

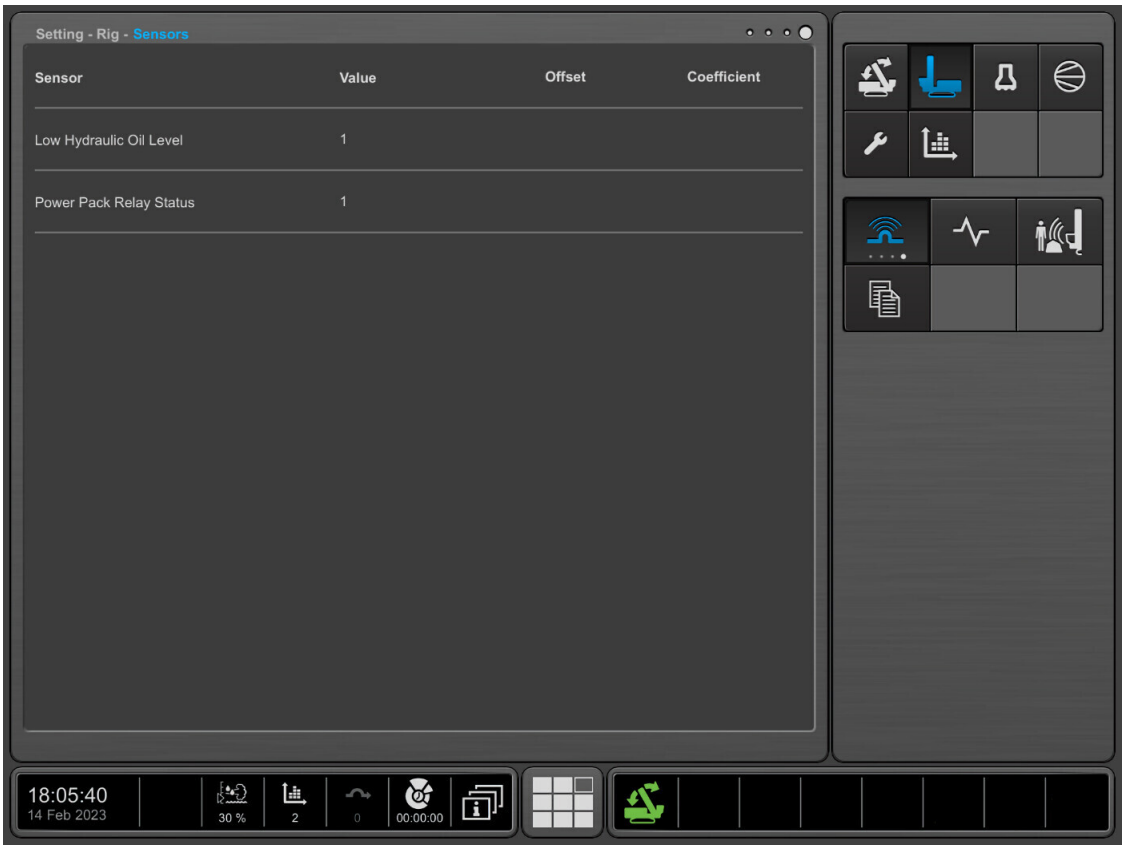
Sensor	Description
Roll Angle Sensor	Shows the roll angle of the machine.
Lube Cycle Complete	Shows when the automatic lubrication cycle is complete. • 1 = The lubrication cycle is complete. • 0 = The lubrication cycle is not complete.



Example of the **Sensors** *Screen 3 of 4*

Sensor	Description
Hydraulic Drain Filter #1 OK	Shows if oil is bypassing the hydraulic drain filter. • 1 = The oil is not bypassing the filter. • 0 = The oil is bypassing the filter.
Hydraulic Drain Filter #2 OK	Shows if oil is bypassing the hydraulic drain filter. • 1 = The oil is not bypassing the filter. • 0 = The oil is bypassing the filter.
Hydraulic Return Filter #1 OK	Shows if oil is bypassing the hydraulic return filter. • 1 = The oil is not bypassing the filter. • 0 = The oil is bypassing the filter.

Sensor	Description
Hydraulic Return Filter #2 OK	Shows if oil is bypassing the hydraulic return filter. • 1 = The oil is not bypassing the filter. • 0 = The oil is bypassing the filter.
Compressor Filter	Shows when the oil filter is restricted from input on low-pressure machines. • 1 = There is no restriction detected. • 0 = The filter restriction is detected.
Engine Air Filter	Shows when the engine air filter is restricted from input. • 1 = There is no restriction detected. • 0 = The filter restriction is detected.
Boarding Ladder Stowed	Shows that the boarding ladder is in the stowed position. • 1 = The boarding ladder is stowed. • 0 = The boarding ladder is not stowed.
Teleremote Switch	Shows the Teleremote switch condition. • 1 =The Teleremote switch is energized. • 0 = The Teleremote switch is not energized.
Seat Switch	Shows the seat switch condition. • 1 =The seat switch is energized and normal operation is allowed. • 0 = The seat switch is not energized and an interlock will occur.
Service Switch	Shows the service switch condition. • 1 =The service switch is energized. • 0 = The service switch is not energized.



Example of the **Sensors** *Screen 4 of 4*

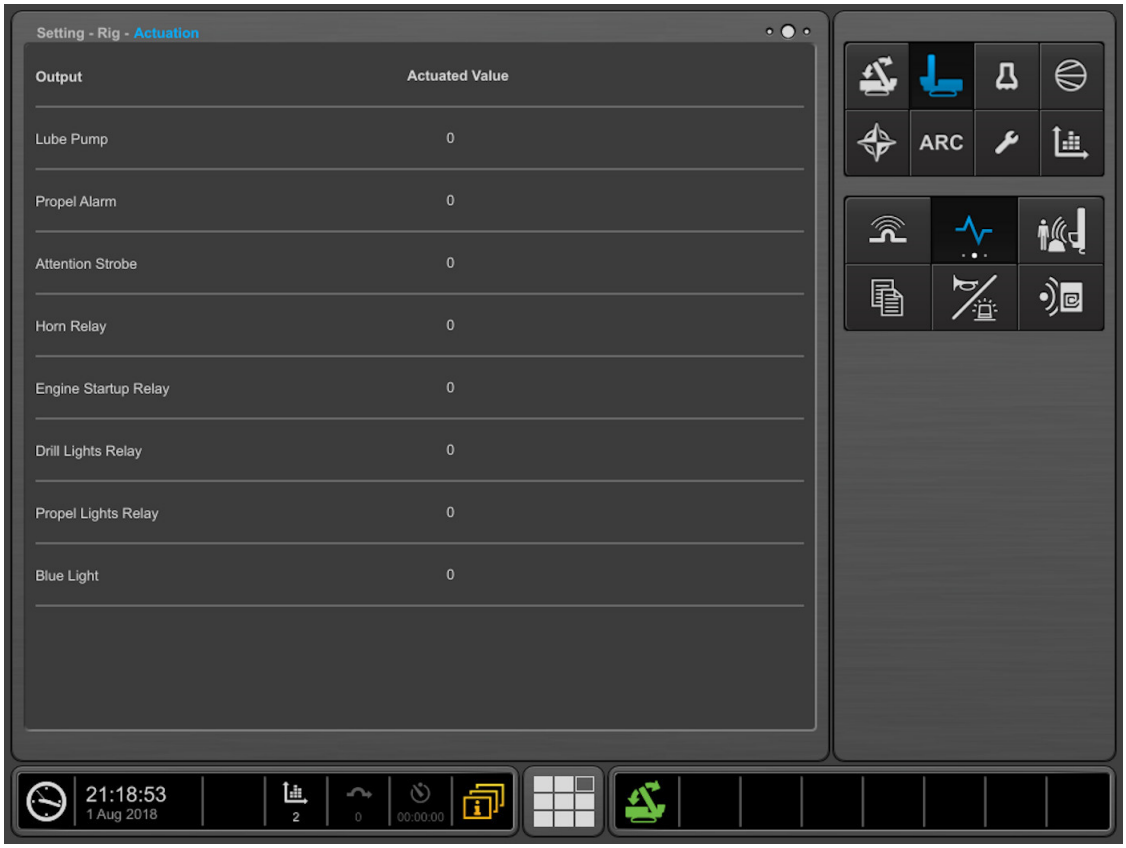
Sensor	Description
Low Hydraulic Oil Level	Shows the hydraulic low level shut-off circuit condition. • 1 = The hydraulic oil level is not low, and the emergency stop is not energized. • 0 = The hydraulic oil level is low, and the emergency stop is energized.
Power Pack Relay Status	Shows the status of the power pack relay. • 1 = The power pack relay is energized. • 0 = The power pack relay is not energized.

5.2.2 Rig > Actuation

Example of the **Actuation** *Screen 1 of 3*

Output	Description
Fan Speed	Shows the value of the output current that is sent to the fan speed control valve.
Feed Pump	Shows the value of the output current that is sent to the cab side main pump.
Rotation Pump	Shows the value of the output current that is sent to the non-cab side main pump.
Dust Flaps	Shows the value of the output current that is sent to the dust curtain control.
Diverter Valve	Shows the output condition to the diverter valve. • 1 = The diverter shifted to Propel mode. • 0 = The diverter shifted to Drill mode.
Propel Brake Release	Shows the output condition to the brake release solenoid. • 1 = The brake is released. • 0 = The brake is not released.

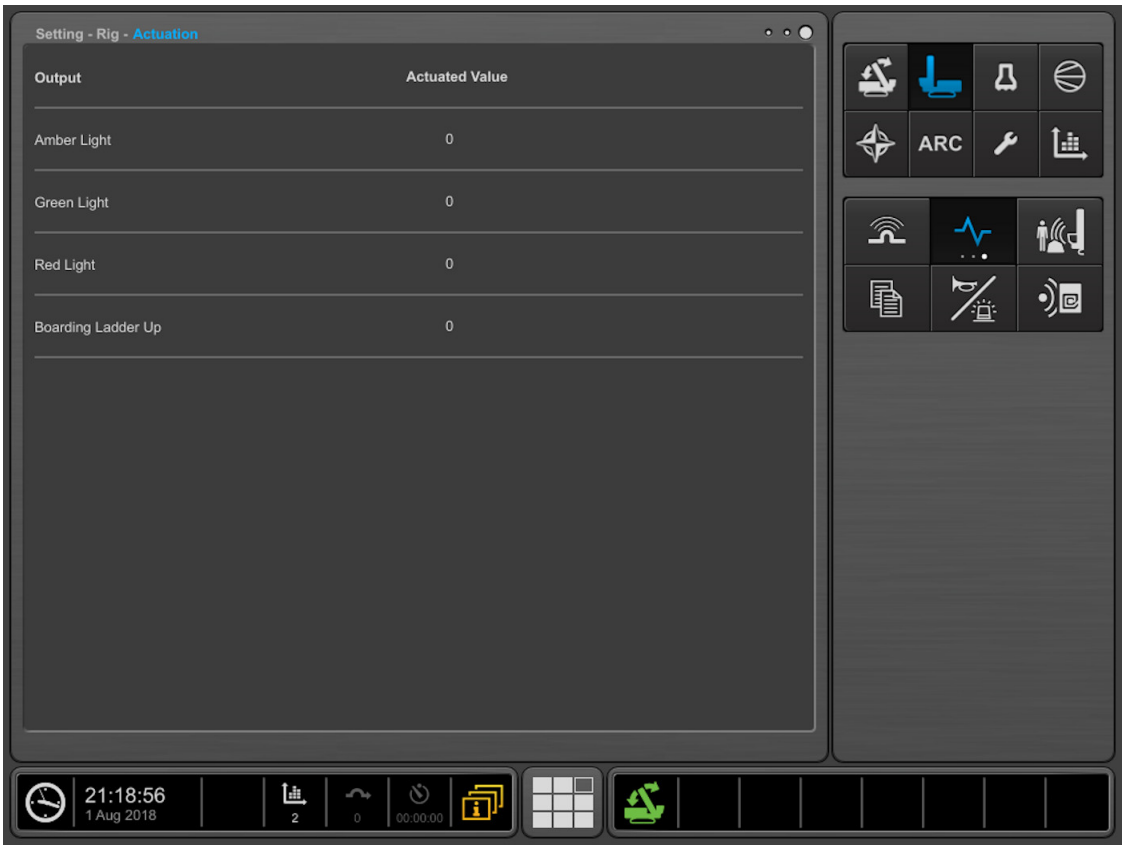
Output	Description
Fan Control Enable	Shows when RCS is controlling the fan speed. • 1 = RCS is controlling the fan speed. • 0 = RCS is not controlling the fan speed, and the output is set to the maximum speed.
RCS Engine Shutdown	Shows if RCS has shut off the engine. • 1 = RCS has shut off the engine. • 0 = RCS has not shut off the engine.



Example of the **Actuation** *Screen 2 of 3*

Output	Description
Lube Pump	Shows if the automatic lubrication pump is commanded to operate. • 1 = The automatic lubrication pump is on. • 0 = The automatic lubrication pump is off.
Propel Alarm	Shows the commanded output to the propel alarm. • 1 = The propel alarm output is on. • 0 = The propel alarm output is off.

Output	Description
Attention Strobe	Shows the commanded output to the attention strobe. • 1 = The attention strobe output is on. • 0 = The attention strobe output is off.
Horn Relay	Shows the commanded output to the horn relay. • 1 = The horn relay is on. • 0 = The horn relay is off.
Engine Startup Relay	Shows the commanded output to the engine startup relay. • 1 = The engine startup relay is on. • 0 = The engine startup relay is off.
Drill Lights Relay	Shows the commanded output to the drill lights relay. • 1 = The drill lights relay is on. • 0 = The drill lights relay is off.
Propel Lights Relay	Shows the commanded output to the propel lights relay. • 1 = The propel lights relay is on. • 0 = The propel lights relay is off.
Blue Light	Shows the commanded output to the blue light relay. • 1 = The blue light relay is on. • 0 = The blue light relay is off.



Example of the **Actuation** *Screen 3 of 3*

Output	Description
Amber Light	Shows the commanded output to the amber light relay. • 1 = The amber light relay is on. • 0 = The amber light relay is off.
Green Light	Shows the commanded output to the green light relay. • 1 = The green light relay is on. • 0 = The green light relay is off.
Red Light	Shows the commanded output to the red light relay. • 1 = The red light relay is on. • 0 = The red light relay is off.
Boarding Ladder Up	Shows the commanded output to the boarding ladder up relay. • 1 = The boarding ladder up relay is on. • 0 = The boarding ladder up relay is off.

5.2.3 Rig > Guards

Example of the **Guards** *Screen*

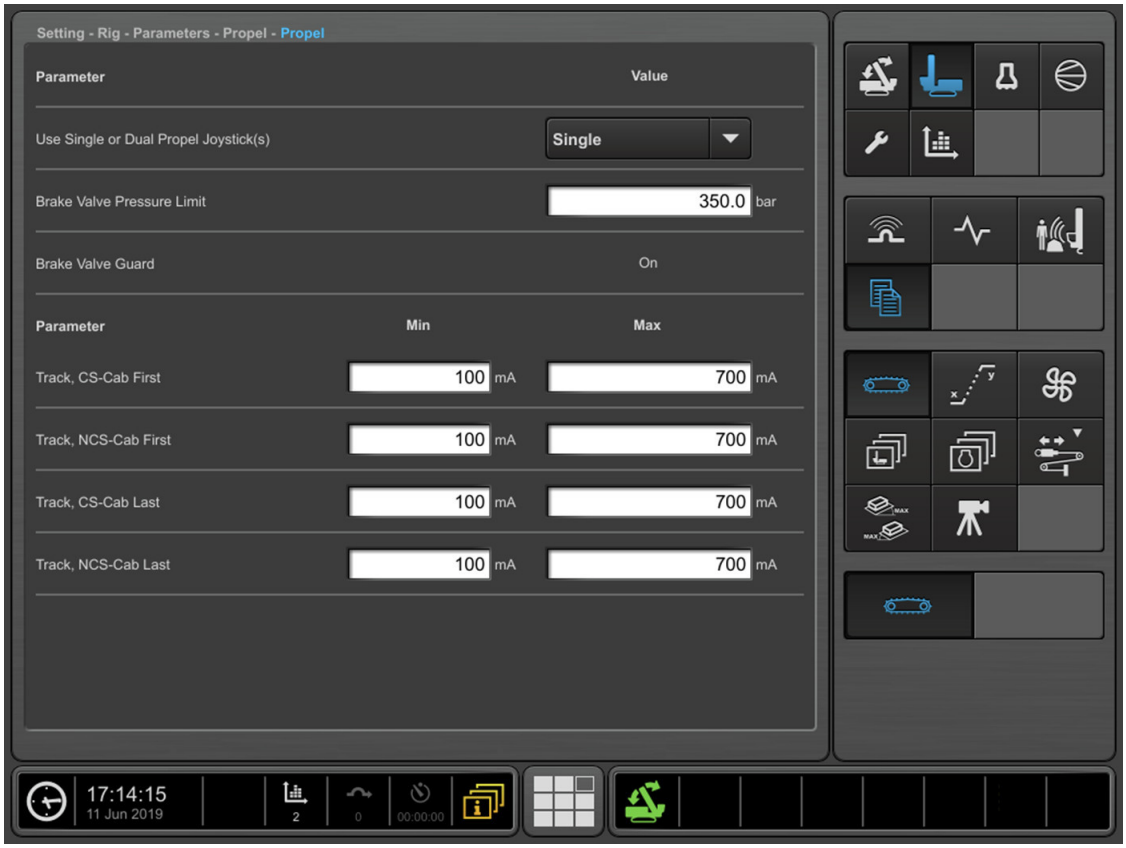
Sensor	Description
E-Stop, Deck Level Zone	Shows the drill end emergency stop circuit condition. • 1 = The emergency stop is not active. • 0 = The emergency stop is active.
E-Stop, Ground Level Zone	Shows the ground level emergency stop circuit condition. • 1 = The emergency stop is not active. • 0 = The emergency stop is active.
E-Stop, Tower Zone	Shows the tower zone shut-off circuit condition. • 1 = The emergency stop is not active. • 0 = The emergency stop is active.
E-Stop, Remote Hoist Switch	Shows the remote hoist control circuit condition. • 1 = The remote hoist control emergency stop is not active. • 0 = The remote hoist control emergency stop is active.
E-Stop, Remote Hoist Pendant	Shows the remote hoist pendant condition. • 1 = The remote hoist pendant emergency stop is not active. • 0 = The remote hoist pendant emergency stop is active.

Sensor	Description
E-Stop, Power Pack Zone	Shows the power pack zone shut-off circuit condition. • 1 = The emergency stop is not active. • 0 = The emergency stop is active.
E-Stop, CS Compressor Temp	Shows compressor shut-off circuit condition. • 1 = The compressor emergency stop is not active. • 0 = The compressor emergency stop is active.
E-Stop, Relay Status	Shows the emergency stop relay is active from input. • 1 = The emergency stop is not active. • 0 = The sensor signal is lost, and the emergency stop is active.
Drill String Interlock	Shows the drill string interlock circuit condition. • 1 = The drill string interlock is not active. • 0 = The drill string interlock is active.

! ***NOTE:*** *Refer to the machine electrical schematic to determine emergency stops that are connected to these inputs.*

5.2.4 Rig > Parameters

Propel Parameters

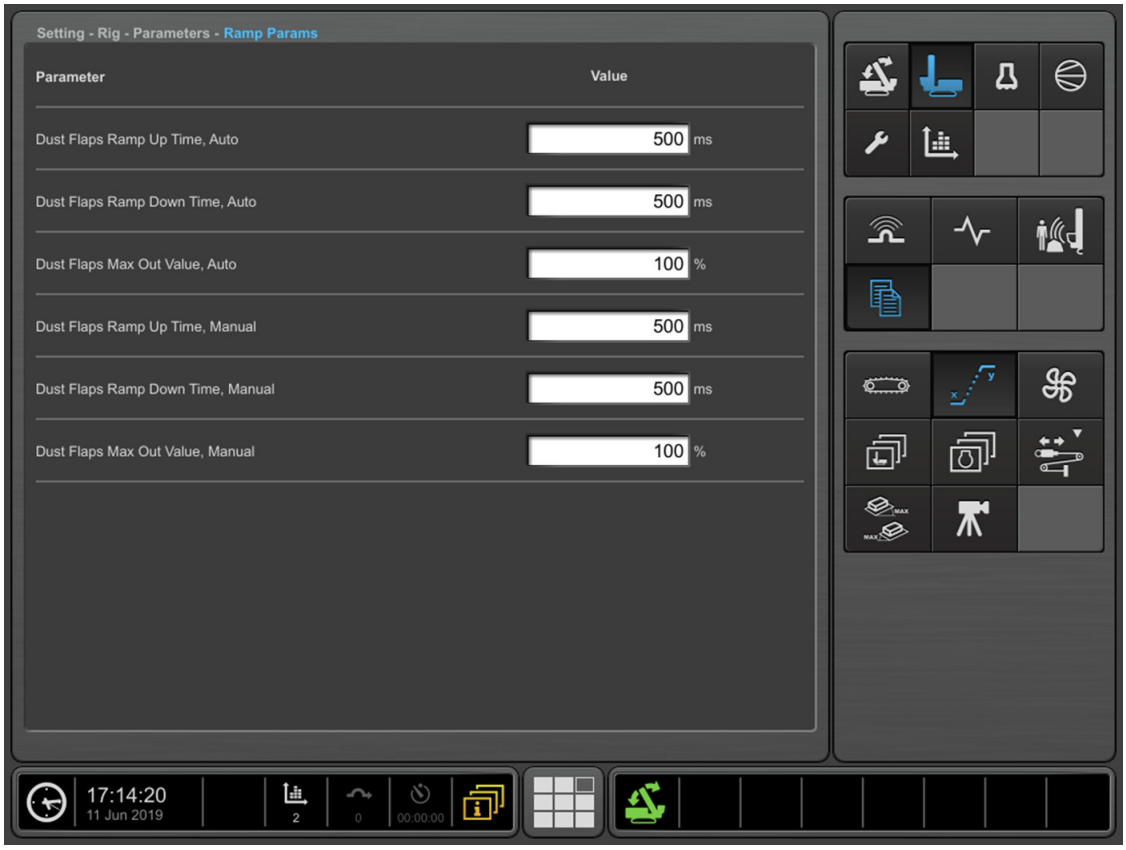


Example of the **Propel** *Screen*

Parameter	Description
Use Single or Dual Propel Joystick(s)	Allows the operator to change between single or dual joystick propelling operation. The RCS must be started again to change control.
Brake Valve Pressure Limit	Sets the minimum pressure value that is required for RCS to detect that the brakes are released.
Brake Valve Guard	This parameter is an interlock indicator that energizes when the brake pressure is less than the setting value.
Track, CS-Cab First	Sets the range of current used to move the cab-side track in the cab-first direction.
Track, NCS-Cab First	Sets the range of current used to move the non-cab side track in the cab-first direction.
Track, CS-Cab Last	Sets the range of current used to move the cab-side track in the cab-last direction.
Track, NCS-Cab Last	Sets the range of current used to move the non-cab side track in the cab-last direction.

Parameter	Description
Min	Sets the minimum current value required when the joystick is moved out of neutral with the brake released.
Max	Sets the maximum current value required when the joystick is moved to 100% of joystick movement with the brake released.

Ramp Parameters

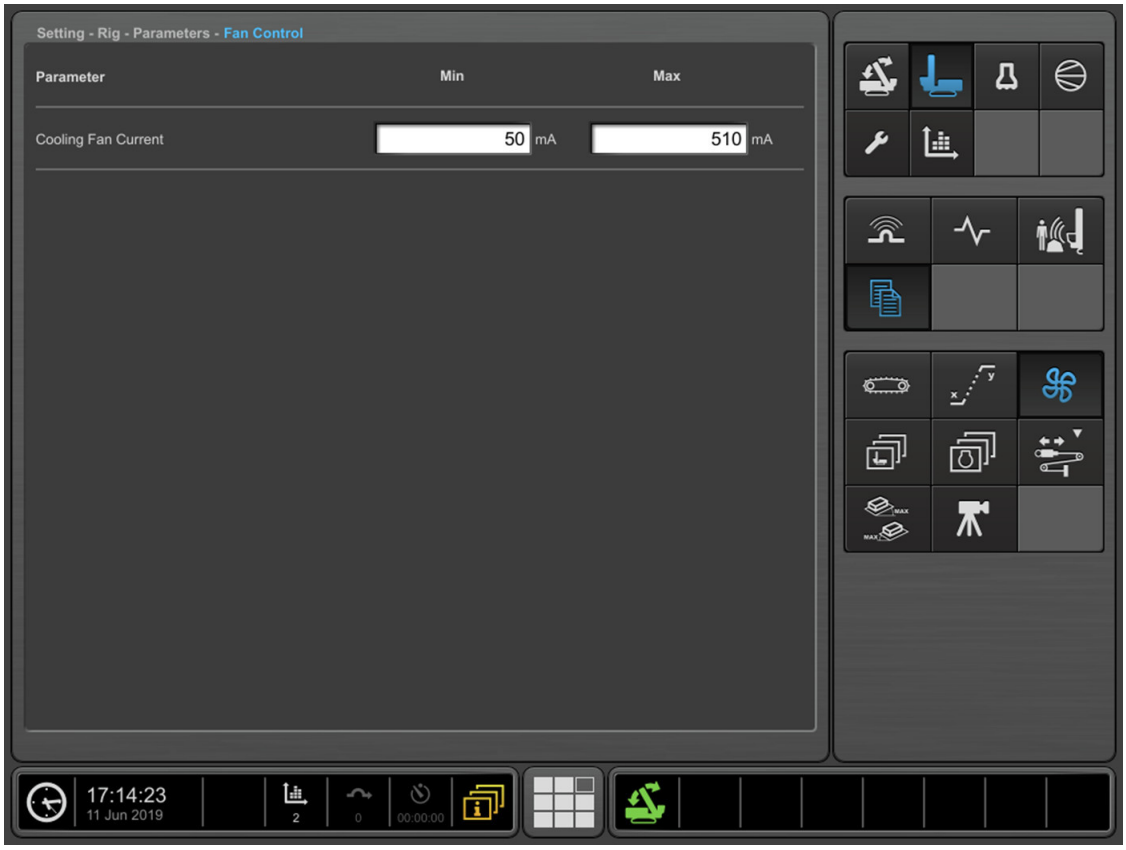


Example of the **Ramp Params** *Screen*

Parameter	Description
Dust Flaps Ramp Up Time, Auto	Sets the time taken to increase the output from 0% to the maximum automatic setting for dust flaps when energizing begins.
Dust Flaps Ramp Down Time, Auto	Sets the time taken to decrease the output from the maximum automatic setting for dust flaps to 0% when energizing stops.
Dust Flaps Max Out Value, Auto	Sets the maximum output speed for the auto dust flaps.
Dust Flaps Ramp Up Time, Manual	Sets the time taken to increase the output from 0% to the maximum value for the dust flaps when the activation button is pressed.

Parameter	Description
Dust Flaps Ramp Down Time, Manual	Sets the time taken to decrease the output to 0% from the maximum value when the activation button stops being pressed.
Dust Flaps Max Out Value, Manual	Sets the maximum output speed for the manual dust flaps.

Fan Control



Example of the **Fan Control** *Screen*

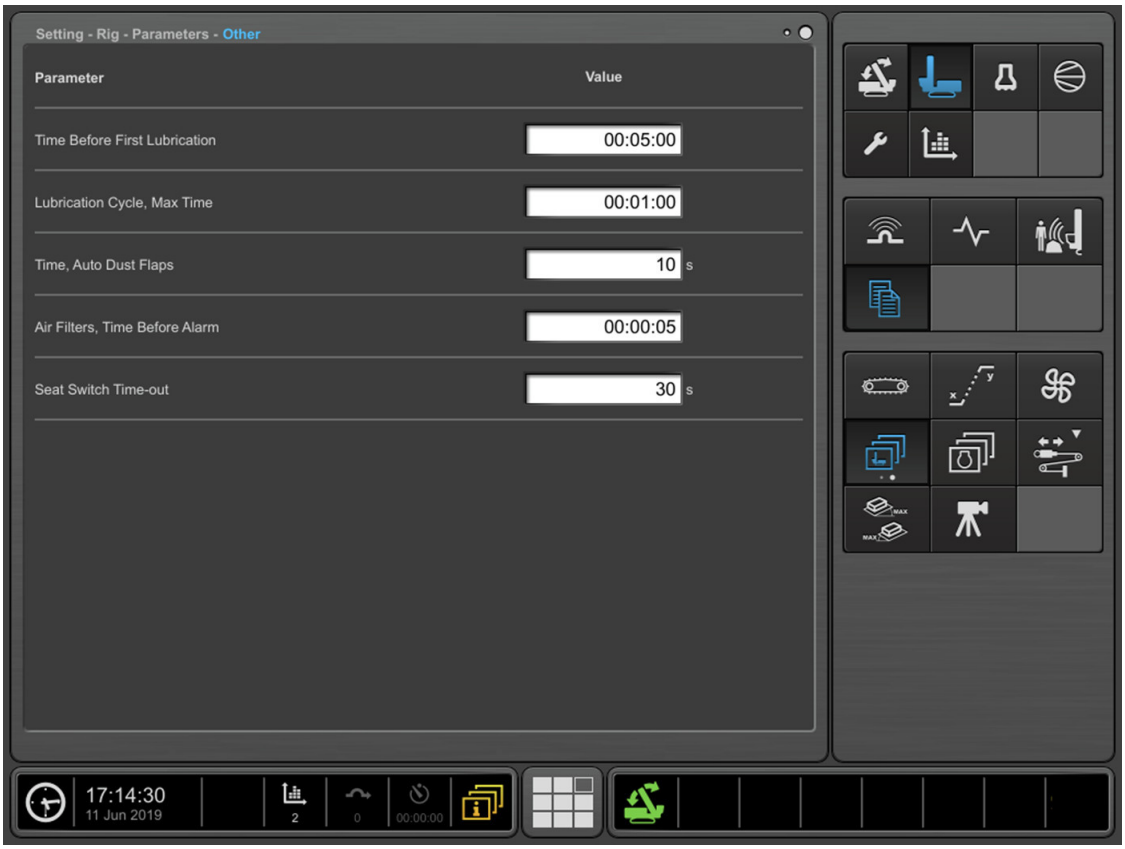
Parameter	Description
Cooling Fan Current, Min	Sets the minimum current output to the cooling fan control.
Cooling Fan Current, Max	Sets the maximum current output to the cooling fan control. This value must cause the fan to turn no faster than the factory setting.

Other Parameters

Example of the **Other** *Screen 1 of 2*

Parameter	Description
Hyd Drain Filter #1 Warning Time	Sets the delay time for when an event or warning message appears after the switch on the hydraulic drain filter energizes. The recommended warning time limit is 1 minute.
Hyd Return Filter #1 Warning Time	Sets the delay time for when an event or warning message appears after the switch on the hydraulic return filter energizes. The recommended warning time limit is 1 minute.
Hyd Drain Filter #2 Warning Time	Sets the delay time for when an event or warning message appears after the switch on the hydraulic drain filter energizes. The recommended warning time limit is 1 minute.
Hyd Return Filter #2 Warning Time	Sets the delay time for when an event or warning message appears after the switch on the hydraulic return filter energizes. The recommended warning time limit is 1 minute.
Hydraulic Oil Temperature, Warning	Sets the temperature at which the system shows an error and event showing that the hydraulic temperature is too hot.
Hydraulic Oil Temperature, Shut Down	Sets the temperature at which the system shows an error and event that the hydraulic temperature is too hot, and shuts off the machine.

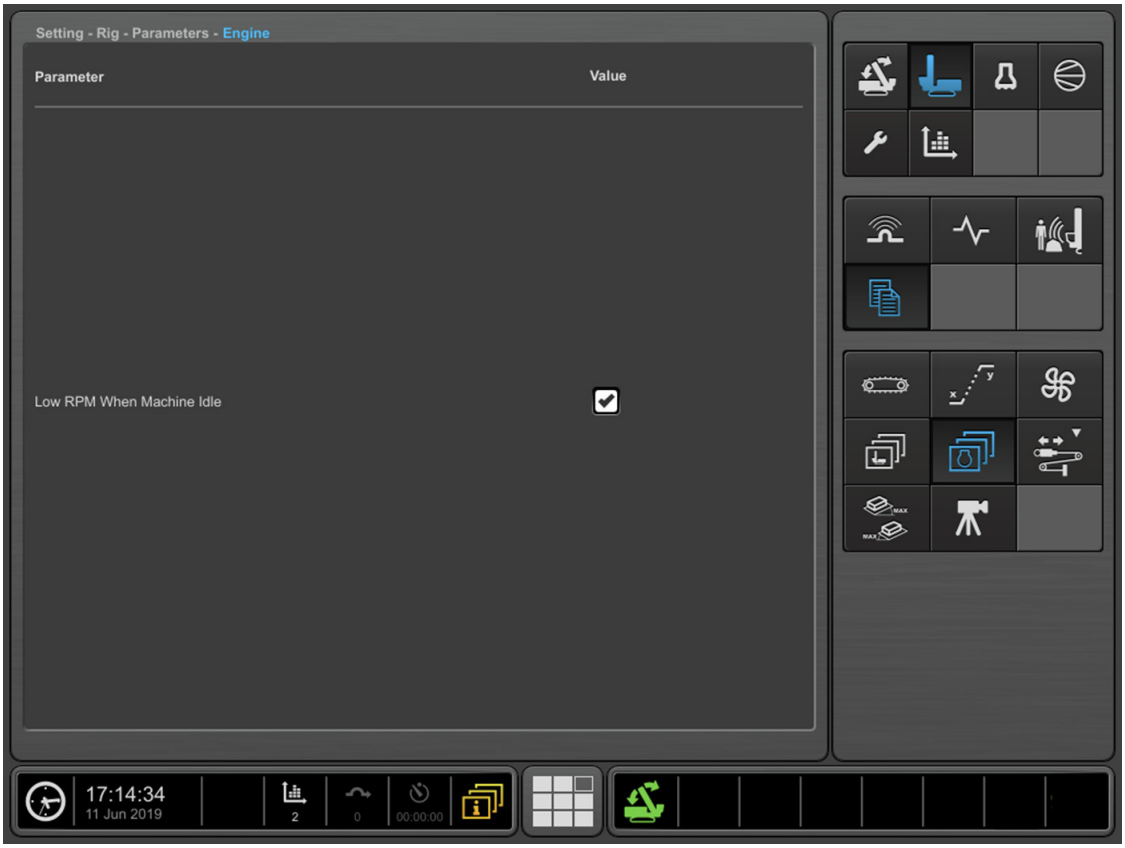
Parameter	Description
Grease Tank Low Level	Sets the level value at which the system shows an event or warning that the grease level is too low. The recommended value setting is 10%.
Grease Tank Low Reset Level	Sets the level value the system uses to reset the low tank event. This value must be greater than low level.
Low Fuel Level	Sets the level value at which the system shows an event or warning that the fuel level is low.
Activate Lube Cycle	Sets the time for the lubrication cycle activation frequency. The recommended time setting is 01:30:00.



Example of the **Other** *Screen 2 of 2*

Parameter	Description
Time Before First Lubrication	Sets the time to energize the lubrication cycle after the RCS starts. The recommended time is 00:05:00 minutes for pneumatically-operated systems and 00:01:00 minute for electrically-operated systems.
Lubrication Cycle, Max Time	Sets the maximum time for one lubrication cycle to complete. The recommended time setting is 00:05:00 minutes. The parameter can fault 3 times before the RCS locks out the lubrication cycle. In the event of a lockout, the RCS must be reset before the lubrication cycle can be started again.
Time, Auto Dust Flaps	Sets the maximum amount of time that the **Max Out Value, Auto, Dust Flaps** is actuated for.
Air Filters, Time Before Alarm	Sets the time for when the system starts to show a warning or event identifying restrictions in the air system. The recommended time setting is 00:02:00 minutes.
Seat Switch Time-out	Sets the amount of time that the operator can be out of the seat before the seat switch interlock inhibits the drilling operation.

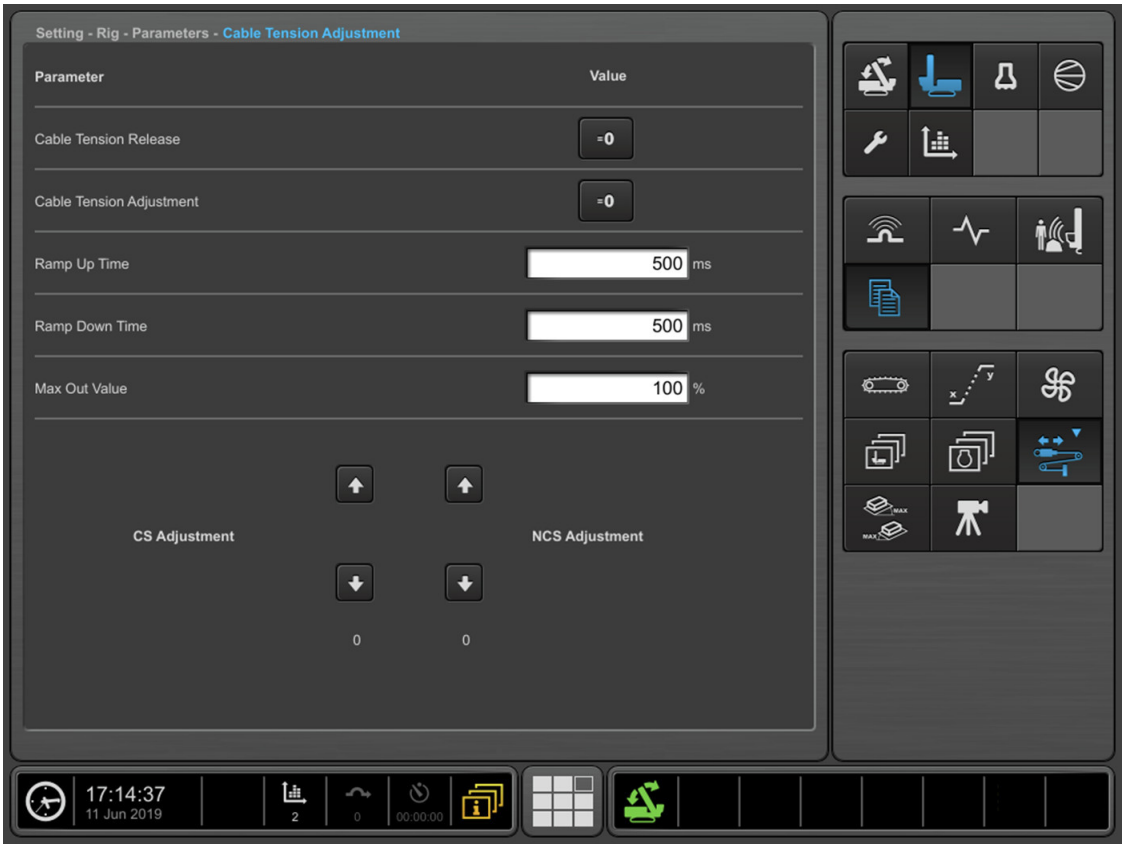
Engine Parameters



Example of the **Engine** *Screen*

Parameter	Description
Low RPM When Machine Idle	When selected, the engine automatically returns to low idle when all of the controls have been in the neutral position for 5 minutes.

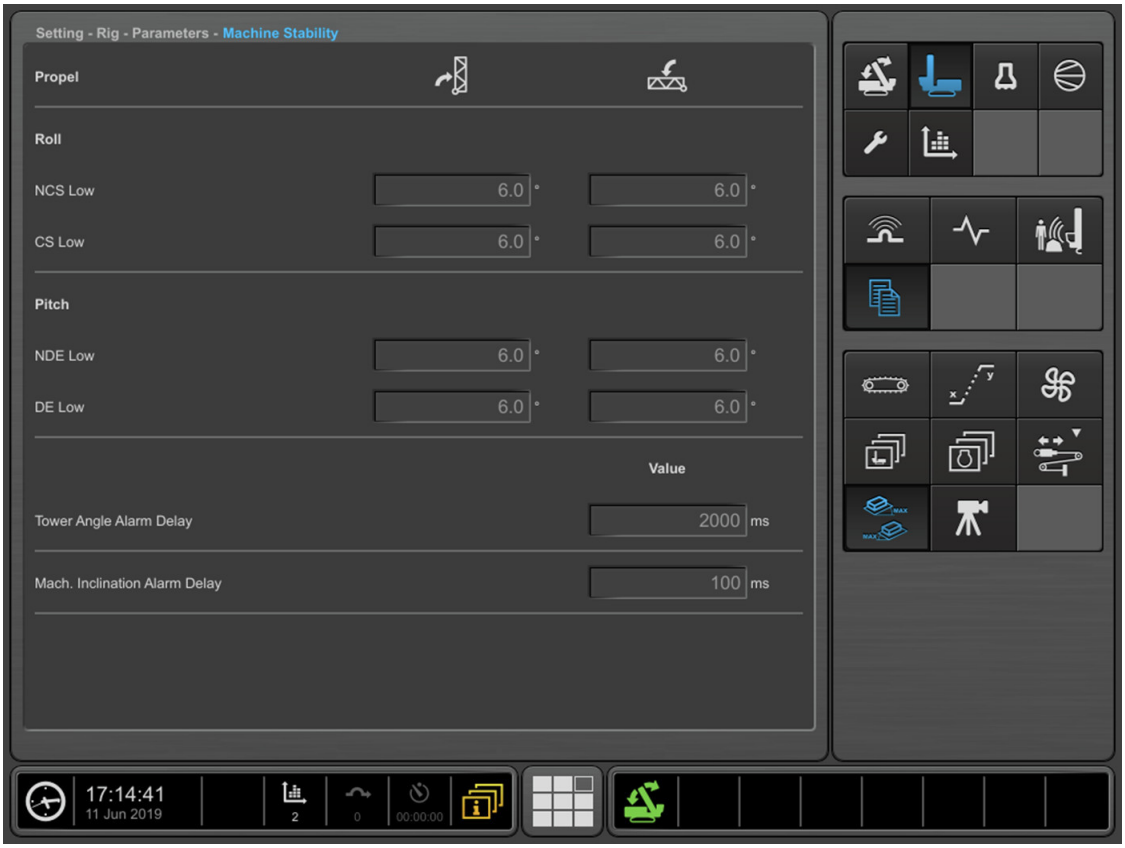
Cable Tension Adjustment



Example of the **Cable Tension Adjustment** *Screen*

Parameter	Description
Cable Tension Release	Releases the wire rope tension solenoid for the holdback wire rope. The user must be in Setup mode to energize the release.
Cable Tension Adjustment	Mandatory activation to loosen or tighten the wire rope. Must be active to allow wire rope adjustment when pressing the arrow. When active, the **=0** turns blue and the button appears to be pressed.
Ramp Up Time	Sets the time that is taken to increase the output from 0% to the **Max Out Value** setting when the activation button is pressed.
Ramp Down Time	Sets the time that is taken to decrease the output to 0% from the **Max Out Value** setting when the activation button stops being pressed.
Max Out Value	Sets the maximum output speed for the wire rope tensioners.
CS / NCS Adjustment	Allows the user to loosen or tighten wire ropes one side at a time. The up arrow icon increases the wire rope tension while the down arrow icon decreases the wire rope tension. The numbers below the down arrows show the actual commanded output.

Machine Stability Parameters



Example of the **Machine Stability** *Screen*

Parameter	Description
Roll	
NCS Low (tower up)	Sets the maximum allowable roll angle for leveling with the non-cab side of the machine low and the tower up.
NCS Low (tower down)	Sets the maximum allowable roll angle for leveling with the non-cab side of the machine low and the tower down.
CS Low (tower up)	Sets the maximum allowable roll angle for leveling with the cab side of the machine low and the tower up.
CS Low (tower down)	Sets the maximum allowable roll angle for leveling with the cab side of the machine low and the tower down.
Pitch	
NDE Low (tower up)	Sets the maximum allowable pitch angle for leveling with the non-drill end of the machine low and the tower up.
NDE Low (tower down)	Sets the maximum allowable pitch angle for leveling with the non-drill end of the machine low and the tower down.

Parameter	Description
DE Low (tower up)	Sets the maximum allowable pitch angle for leveling with the drill end of the machine low and the tower up.
DE Low (tower down)	Sets the maximum allowable pitch angle for leveling with the drill end of the machine low and the tower down.
Tower Angle Alarm Delay	Sets the amount of time before a system event starts and inhibits the operation in response to the tower angle not complying with the minimum and maximum values.
Mach. Inclination Alarm Delay	Sets the amount of time before a system event starts and inhibits the operation in response to the machine inclination not complying with the stability limit.

5.3 Setting > Drilling Screens

The **Drilling** button enables access to the following drilling applicable information screens:

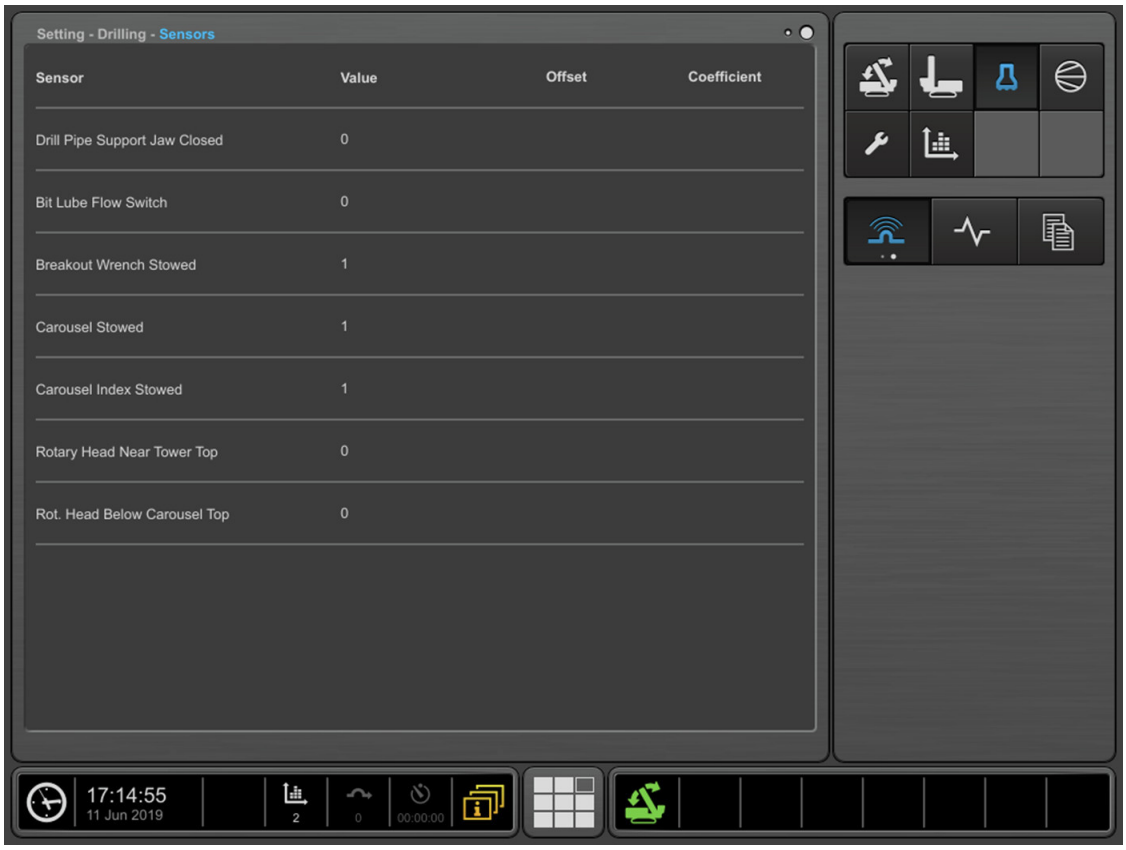
- Sensors
- Actuations
- Parameters

5.3.1 Drilling > Sensors

Example of the **Sensors** *Screen 1 of 2*

Sensor	Description
Head Absolute Encoder	Shows the rotary head position and direction of travel from input.
Holdback Pressure	Shows the hold-back pressure in the feed manifold input.
Auxiliary Pressure	Shows the auxiliary pressure value.
Water Tank Level	Shows the water tank level from input.
Rotary Head Gear Box Pressure	Shows the rotary head gearbox pressure.
Rotary Head Gear Box Temperature	Shows the rotary head gearbox temperature.
Bit Lube Tank Level	Shows the drill bit lubrication tank level from input.
Bit Speed	Shows the rotary head speed from input.

Sensor	Description
Drill Pipe Support Open	Shows when the drill pipe support is in the stowed or open position. • 1 = The drill pipe support is in the stowed or open position. • 0 = The drill pipe support is not in the stowed or open position.
Drill Pipe Support Closed	Shows when the drill pipe support is in the unstowed or closed position. • 1 = The drill pipe support is closed. • 0 = The drill pipe support is not closed.



Example of the **Sensors** *Screen 2 of 2*

Sensor	Description
Drill Pipe Support Jaw Closed	Shows the condition of the drill pipe support jaw from the input. • 1 = The drill pipe support jaw is engaged. • 0 = The drill pipe support jaw is not engaged.
Bit Lube Flow Switch	Shows the condition of the drill bit lubrication flow switch. • 1 = The drill bit lubrication flow is detected. • 0 = The drill bit lubrication flow is not detected.

Sensor	Description
Breakout Wrench Stowed	Shows when the breakout wrench is in the stowed position. • 1 = The breakout wrench is stowed. • 0 = The breakout wrench is not stowed.
Carousel Stowed	Shows when the carousel is in a stowed position from the input. • 1 = The carousel is stowed. • 0 = The carousel is not stowed.
Carousel Index Stowed	Shows when the carousel index is in a stowed position from the input. • 1 = The carousel index is stowed. • 0 = The carousel index is not stowed.
Rotary Head Near Tower Top	Shows when the rotary head is passing through the upper calibration position input. The rotary head completes deceleration at this location.
Rotary Head Below Carousel Top	Shows when the rotary head is passing below the carousel hat position input. RCS gives a warning if the drill hole is not zeroed and stops the feed if the drill pipe support is not stowed

5.3.2 Drilling > Actuations

Example of the **Actuations** *Screen 1 of 2*

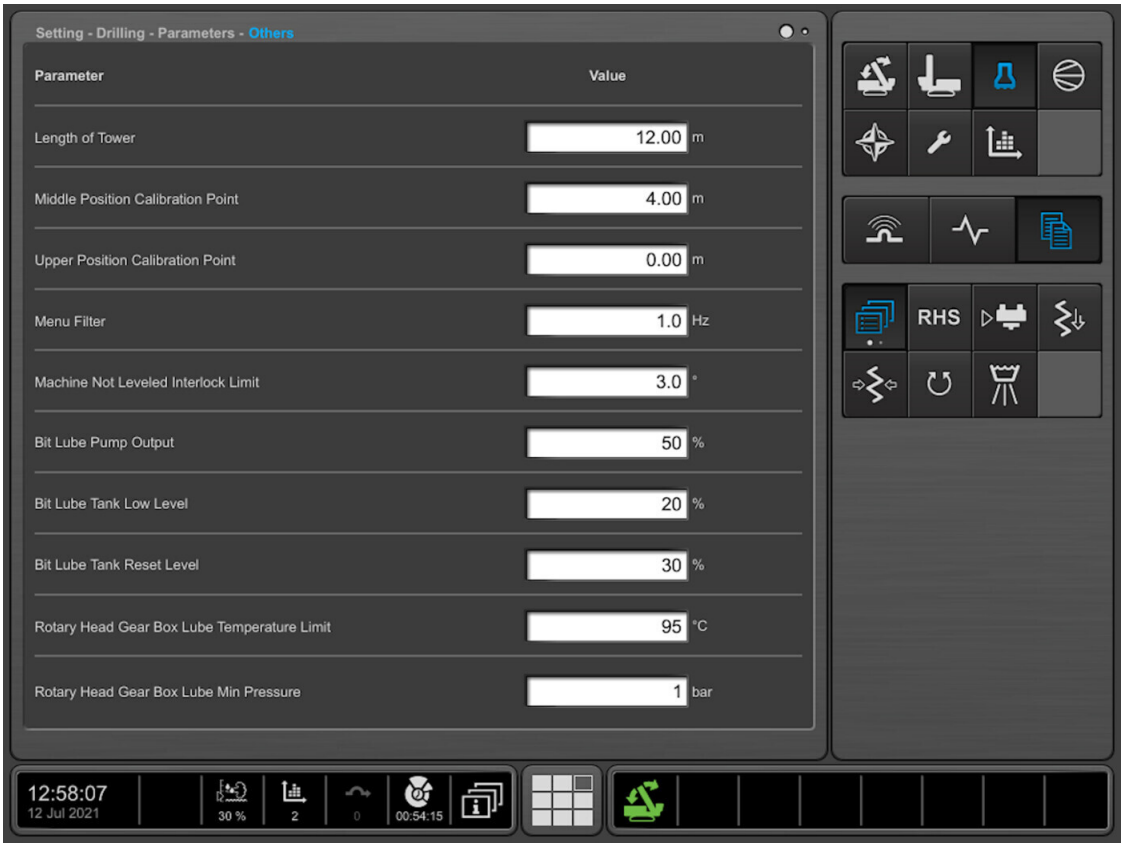
Output	Description
Carousel Swing	Shows the commanded output for the carousel swing operation.
Carousel Rotation	Shows the commanded output from the carousel index operation.
Drill Pipe Support Arm	Shows the commanded output for the drill pipe support operation.
Feed Force	Shows the commanded output to the feed force control valve.
Rotary Torque Control	Shows the commanded output to the rotary torque control valve.
Water Injection/Dust Collector	Shows the commanded output to the water injection coil. Negative values represent water actuation, and positive values represent dust collector actuation.
Dust Collector Pulsator	Shows the commanded output to the dust collector pulsator.
Thread Lube Electric Powered	Shows the commanded output to the electrically-powered thread lubrication.

Example of the **Actuations** *Screen 2 of 2*

Output	Description
Feed Pump	Shows the output current to the cab side pump.
Rotation Pump	Shows the output current to the non-cab side main pump.
Deck Fork/Clamp	Shows the value of the output current that is sent to the deck fork control.
Breakout Wrench Swing	Shows the value of the output current that is sent to the breakout wrench swing control.
Breakout Wrench Jaw	Shows the value of the output current that is sent to the breakout wrench control clamp.
2-Speed Rotary Head	Shows the output current to the 2-speed rotary head.
Mist Water Output	Shows the output current to the mist water output.
Dust Hood	Shows the value of the output current that is sent to the dust hood.

5.3.3 Drilling > Parameters

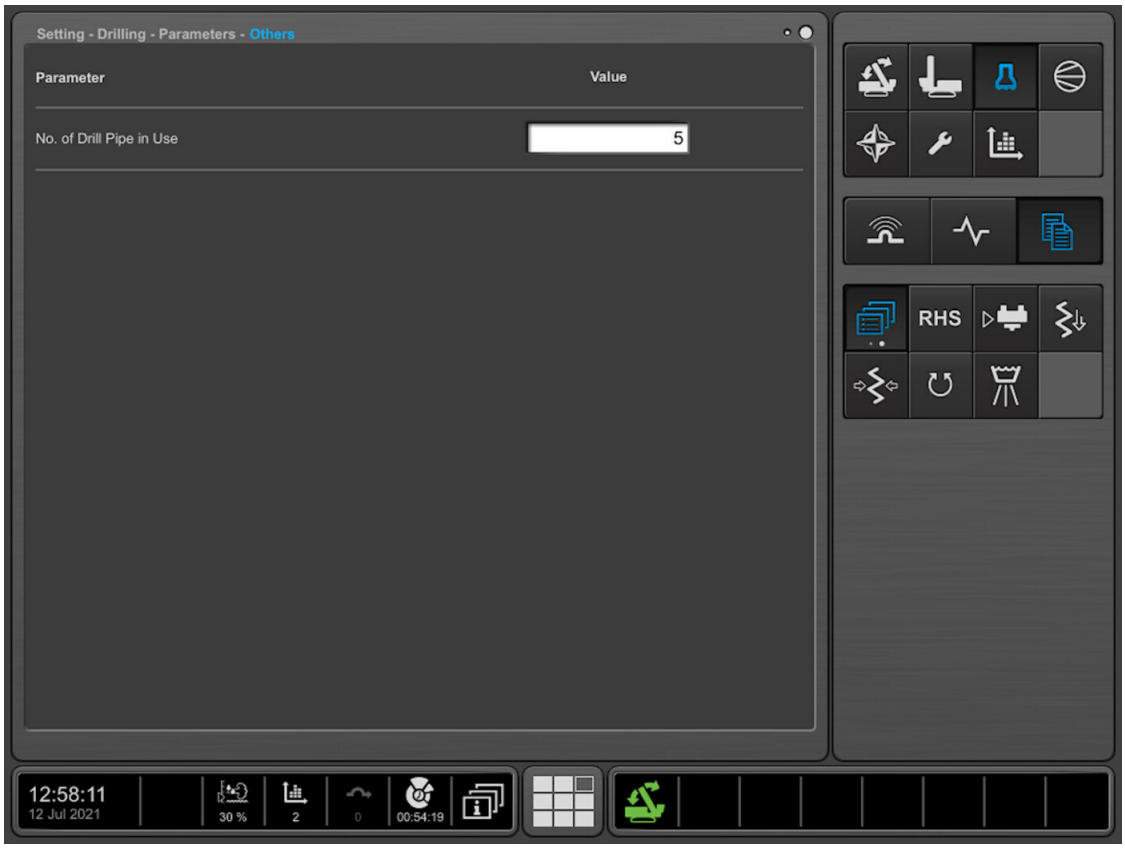
Others



Example of the **Others** *Screen 1 of 2*

Output	Description
Length of Tower	Sets the total head movement in the tower.
Middle Position Calibration Point	Sets the rotary head middle calibration position.
Upper Position Calibration Point	Sets the rotary head upper calibration position.
Menu Filter	Sets the frequency at which the GUI refreshes.
Machine Not Leveled Interlock Limit	Sets the maximum machine angle that is allowed to begin drilling and resets the drill hole as a limit interlock.
Bit Lube Pump Output	Sets the flow rate of the drill bit lubrication pump as a percentage of the maximum pump output.
Bit Lube Tank Low Level	Sets the level value at which the system shows an event or warning that the drill bit lubricant level is too low.
Bit Lube Tank Reset Level	Sets the level value at which the system must be greater than to clear a low-level warning.

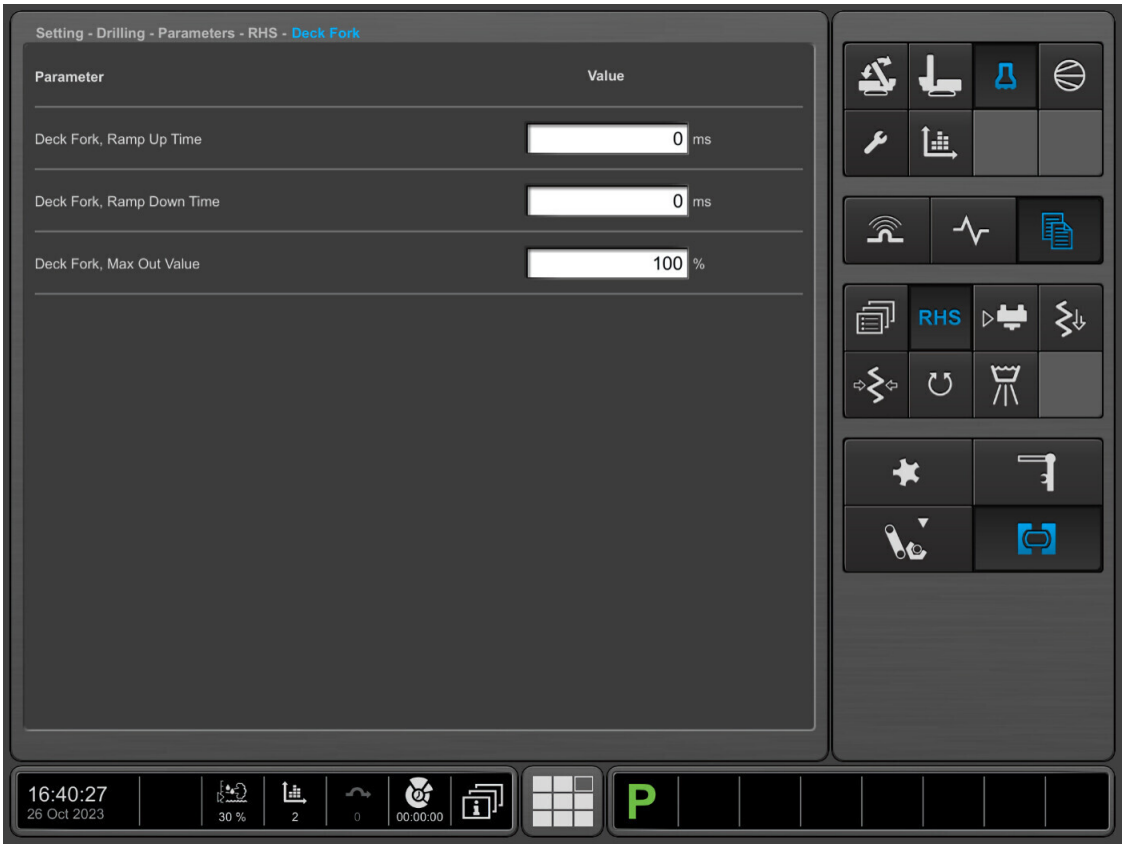
Output	Description
Rotary Head Gear Box Lube Temperature Limit	Sets the maximum allowed temperature. Triggers an event if the actual temperature exceeds this setting.
Rotary Head Gear Box Lube Min Pressure	Sets the minimum allowed pressure. Triggers an event if the actual pressure is lower than this setting.



Example of the **Others** *Screen 2 of 2*

Output	Description
No. of Drill Pipe in Use	Sets the number of drill pipes in use.

RHS



Example of the **Deck Fork** *Screen*

Parameter	Description
Deck Fork, Ramp Up Time	Sets the time taken to increase the output from 0% to the maximum value for the deck fork setting when the activation button is pressed.
Deck Fork, Ramp Down Time	Sets the time taken to decrease the output to 0% from the deck fork maximum value when the activation button stops being pressed.
Deck Fork, Max Out Value	Sets the maximum output speed for the deck fork.

Example of the **Carousel** *Screen*

Parameter	Description
Carousel Rotation Ramp Up Time	Shows the time taken to increase the output from 0% to the **Carousel Rotation Max Out Value** setting when the activation button is pressed.
Carousel Rotation Ramp Down Time	Shows the time taken to decrease the output to 0% of the **Carousel Rotation Max Out Value** setting when the activation button stops being pressed.
Carousel Rotation Max Out Value	Sets the maximum output speed for the carousel indexes in the clockwise direction.
Carousel Rotation Max In Value	Sets the maximum output speed for the carousel indexes in the counterclockwise direction.
Carousel Swing Ramp Up Time	Shows the time taken to increase the output from 0% to the carousel swing maximum value setting when the activation button is pressed.
Carousel Swing Ramp Down Time	Shows the time taken to decrease the output to 0% of the carousel swing maximum value setting when the activation button stops being pressed.
Carousel Swing Max Out Value	Sets the maximum output speed for the carousel to stow.
Carousel Swing Max In Value	Sets the maximum output speed for the carousel to un-stow.

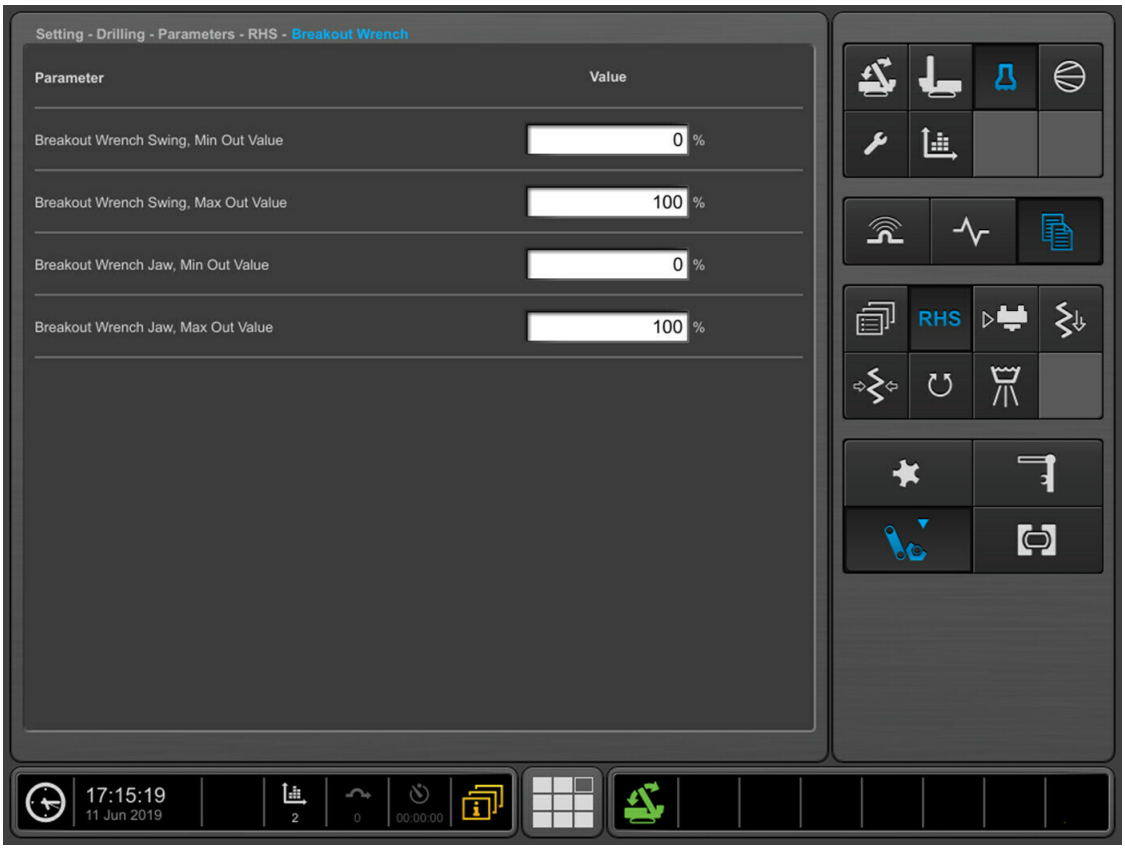
Example of the **Drill Pipe Support** *Screen 1 of 2*

Parameter	Description
Drill Pipe Support Arm Ramp Up Time	Sets the time taken to increase the output from 0% to the drill pipe support arm maximum out open/close setting when the activation button is pressed.
Drill Pipe Support Arm Ramp Down Time	Sets the time taken to decrease the output to 0% of the drill pipe support arm maximum out open/close settings when the activation button stops being pressed.
Drill Pipe Support Arm Max Out Open Value	Sets the maximum output speed for the drill pipe support to open in manual mode.
Drill Pipe Support Arm Max Out Close Value	Sets the maximum output speed for the drill pipe support to close in manual mode.
Output Time, Auto Closing of Drill Pipe Support	Sets the maximum amount of time the system has to close the drill pipe support when in Auto mode. If a closed signal is not received before the end of this time, an error/event is displayed.
Drill Pipe Support Arm Ramp Up Time, Auto	Sets the time taken to increase the output from 0% to the drill pipe support arm maximum out open/close settings when the activation button is pressed.

Parameter	Description
Drill Pipe Support Arm Ramp Down Time, Auto	Sets the time taken to decrease the output to 0% of the drill pipe support arm maximum out open/close settings when the activation button is released.
Drill Pipe Support Arm Max Out Open Val., Auto	Sets the maximum output speed for the drill pipe support to open in Auto mode.
Drill Pipe Support Arm Max Out Close Val., Auto	Sets the maximum output speed for the drill pipe support to close in Auto mode.

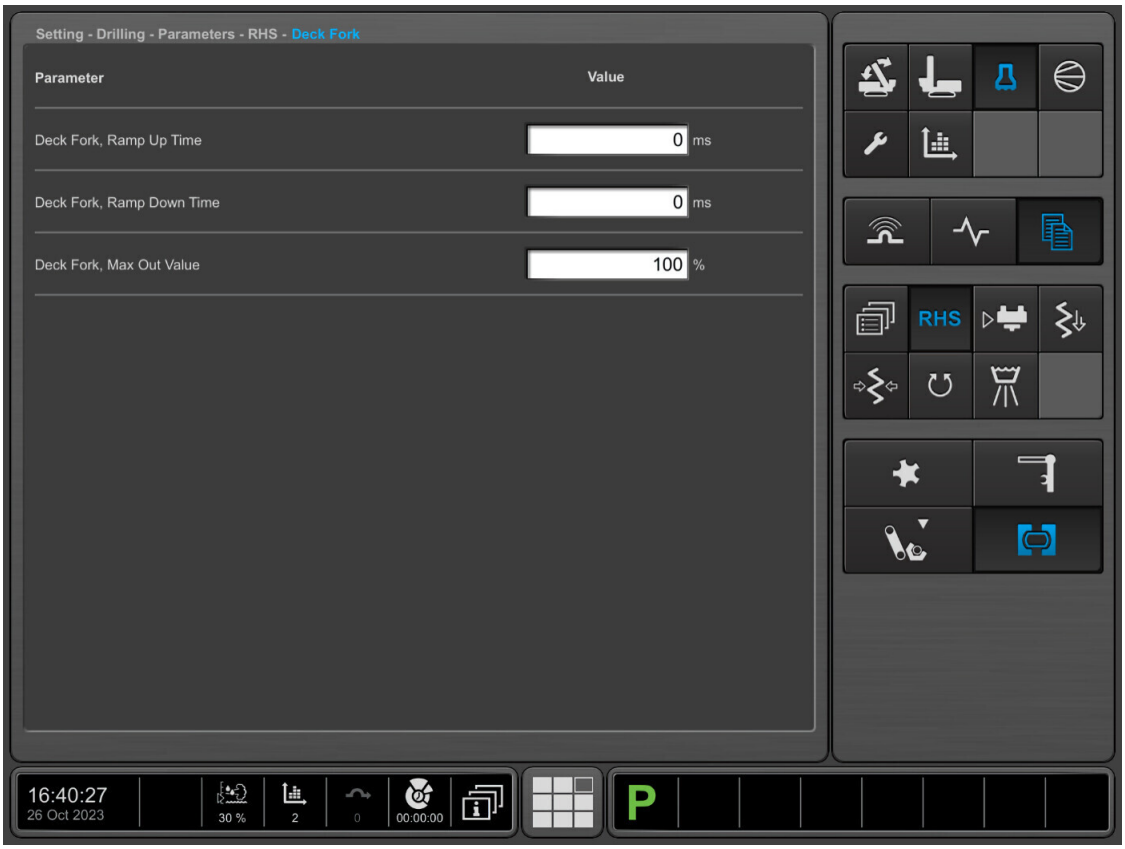
Example of the **Drill Pipe Support** *Screen 2 of 2*

Parameter	Description
Drill Pipe Support Fully Open, Max Time	Sets the maximum time allowed for the drill pipe support to fully open.
Drill Pipe Support Jaw Close, Max Time	Sets the maximum time allowed for the drill pipe support jaw to fully close.
Drill Pipe Support Close, Max Time	Sets the maximum time allowed for the drill pipe support to close.



Example of the **Breakout Wrench** *Screen*

Parameter	Description
Breakout Wrench Swing, Min Out Value	Sets the minimum percentage of current required to swing the breakout wrench when the joystick is only slightly engaged.
Breakout Wrench Swing, Max Out Value	Sets the maximum percentage of current required to swing the breakout wrench when the joystick is 100% engaged.
Breakout Wrench Jaw, Min Out Value	Sets the maximum percentage of current required to move the breakout wrench jaw when the joystick is only slightly engaged.
Breakout Wrench Jaw, Max Out Value	Sets the maximum percentage of current required to move the breakout wrench jaw when the joystick is 100% engaged.



Example of the **Deck Fork** *Screen*

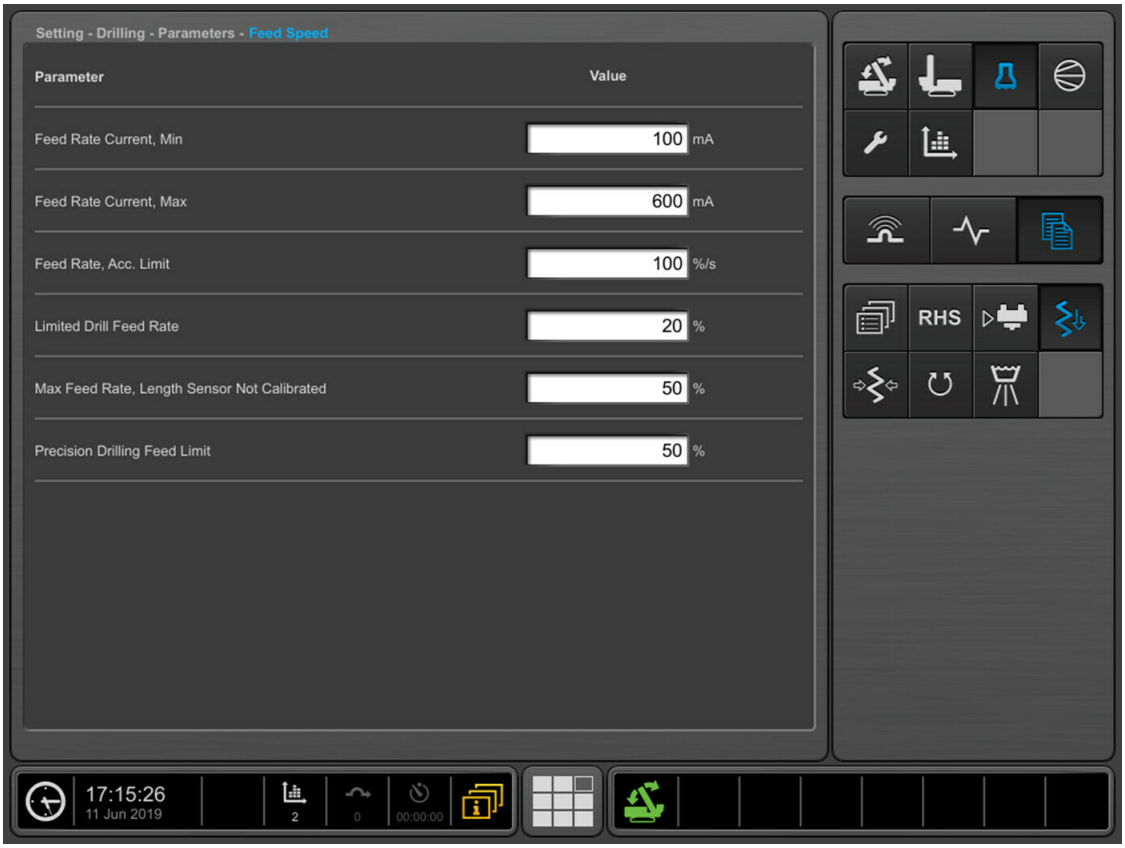
Parameter	Description
Deck Fork, Ramp Up Time	Sets the time taken to increase the output from 0% to the maximum value for the deck fork setting when the activation button is pressed.
Deck Fork, Ramp Down Time	Sets the time taken to decrease the output to 0% from the deck fork maximum value when the activation button stops being pressed.
Deck Fork, Max Out Value	Sets the maximum output speed for the deck fork.

Rotary Head Interlock Positions

Example of the **Rotary Head Interlock Positions** *Screen*

Parameter	Description
Teach In Position	Sets the rotary head position to the actual encoder position. If the operator enters a rotary head position value, it changes to the entered position.
Taught In Rotary Head Position	Shows the setting for the position that is selected in the **Teach In Position** drop-down box.
Current Rotary Head Position	Shows the current rotary head position sensor value.
Position Tolerance	Shows the rotary head position upper and lower limit.
Brake Distance, Down	Sets the distance from the teach in position to the position where the rotary head decelerates when moving down.
Brake Distance, Up	Sets the distance from the teach in position to the position where the rotary head decelerates when moving up.
Rapid Position Change Detection	If the rotary head position from the encoder differs from the rotary head position given by the proximity calibration points by more than this value, feed stops and a calibration error displays.

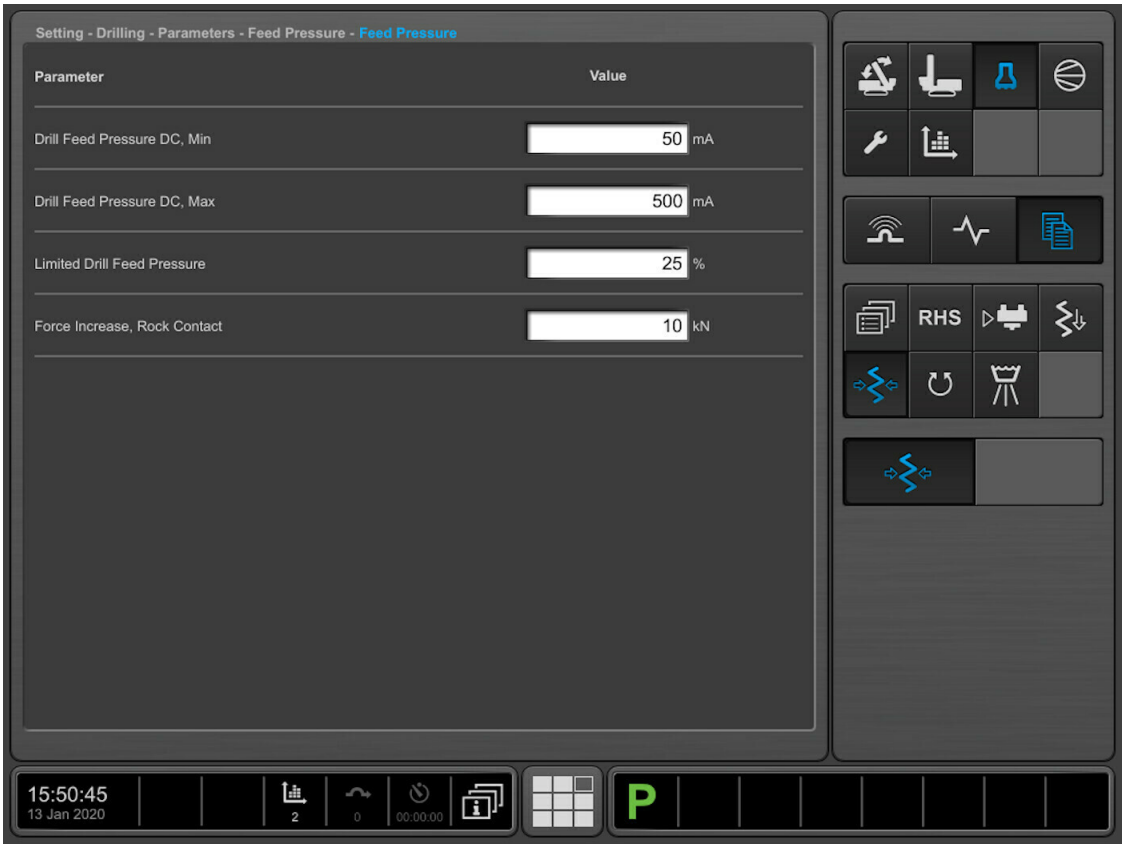
Feed Speed



Example of the **Feed Speed** *Screen*

Parameter	Description
Feed Rate Current, Min	Sets the amount of current that is applied to the pump stroker when minimum feed speed is commanded from the right main joystick.
Feed Rate Current, Max	Sets the amount of current that is applied to the pump stroker when maximum feed speed is commanded from the right main joystick.
Feed Rate, Acc. Limit	Sets the maximum acceleration of the rotary head.
Limited Drill Feed Rate	Sets the maximum output speed allowed when the rotary head is at near tower top and lower tower positions.
Max Feed Rate, Length Sensor Not Calibrated	Sets the maximum output allowed when the length sensor is not calibrated.
Precision Drilling Feed Limit	Sets the maximum output speed that is used when the switch on the right main joystick is held in the up position.

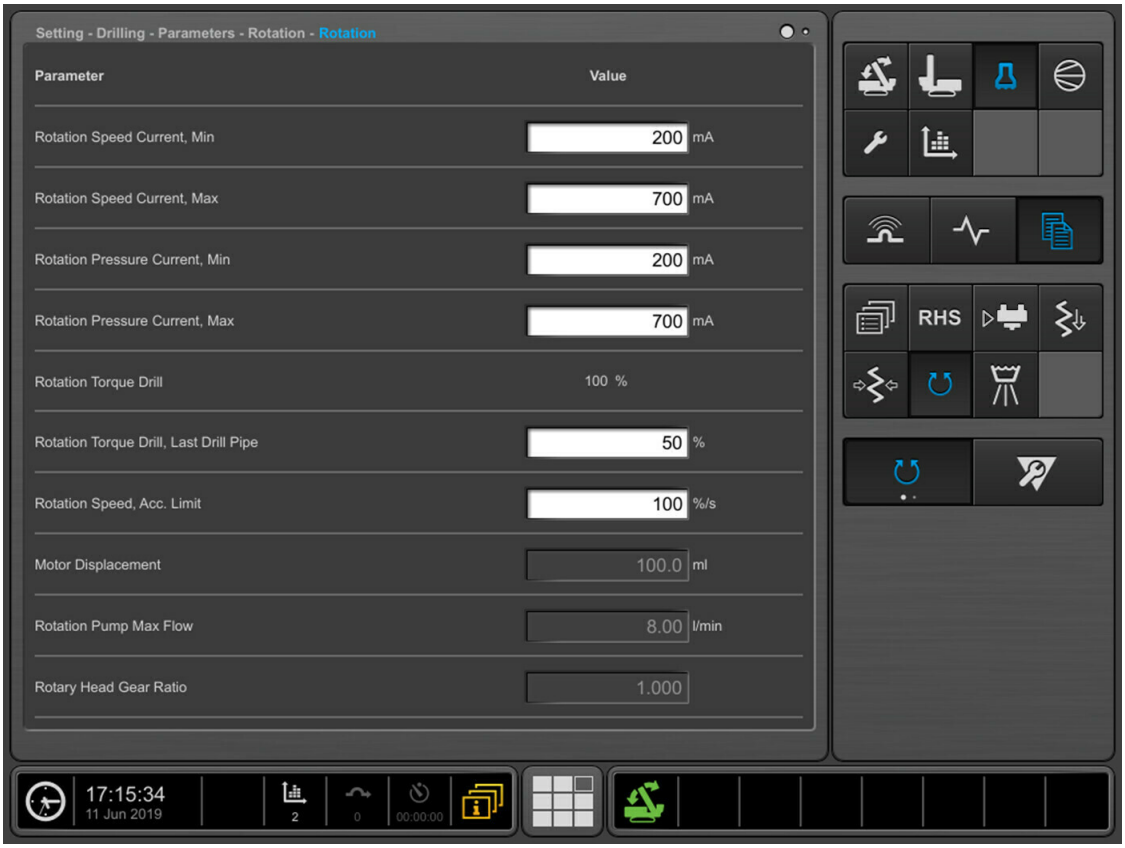
Feed Pressure



Example of the **Feed Pressure** *Screen*

Parameter	Description
Drill Feed Pressure DC, Min	Sets the minimum current applied when 0% pulldown pressure is requested.
Drill Feed Pressure DC, Max	Sets the minimum current applied when 100% pulldown pressure is requested.
Limited Drill Feed Pressure	Sets the maximum feed pressure command to the pump when the limited feed force interlock is energized, which happens when at least one leveling jack is not fully extended and is bearing machine weight.
Force Increase, Rock Contact	Sets the amount of force increase needed to automatically zero the drill hole.

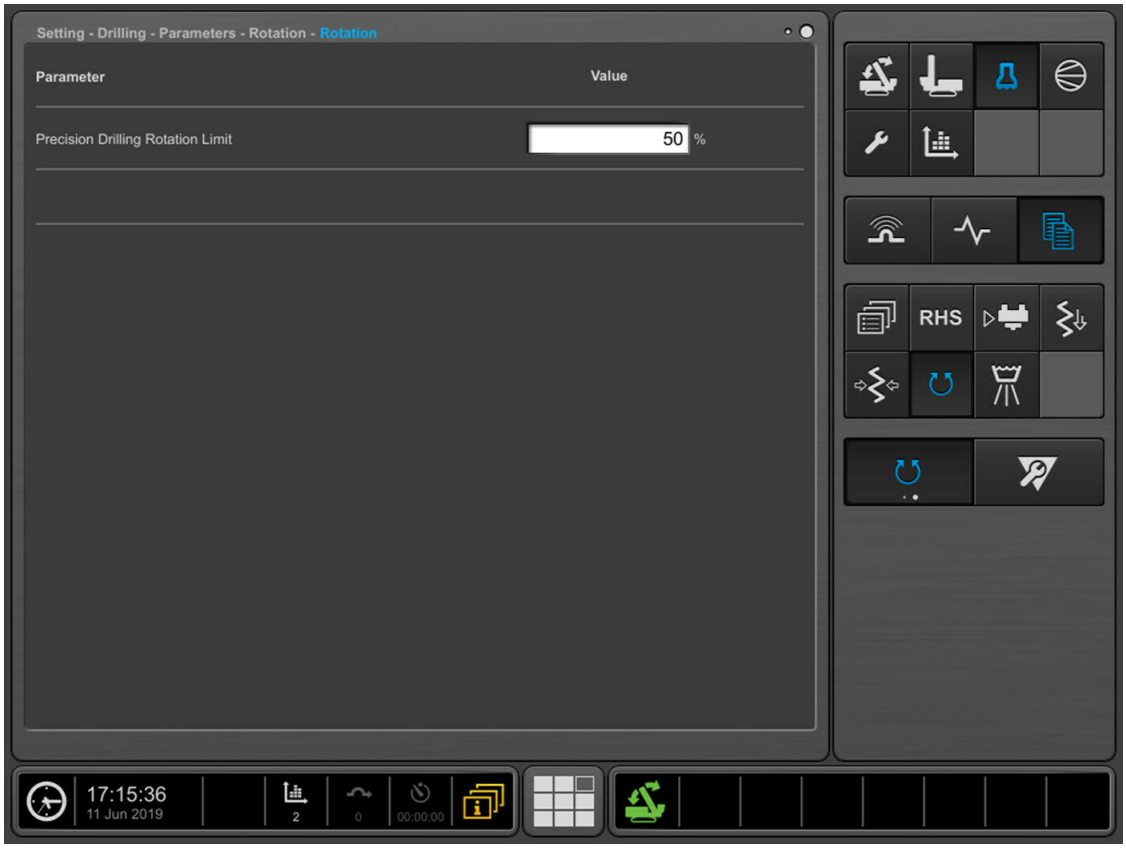
Rotation



Example of the **Rotation** *Screen 1of 2*

Parameter	Description
Rotation Speed Current, Min	Sets the amount of current that is used when the minimum rotation speed is commanded from the left main joystick.
Rotation Speed Current, Max	Sets the amount of current that is used when the maximum rotation speed is commanded from the left main joystick.
Rotation Pressure Current, Min	Sets the amount of current that is used when 0% **Rotation Torque Drill** is commanded.
Rotation Pressure Current, Max	Sets the amount of current that is used when 100% **Rotation Torque Drill** is commanded.
Rotation Torque Drill	Shows the rotation torque setting from the knob on the right operator control panel.
Rotation Torque Drill, Last Drill Pipe	Sets the rotation torque percentage for the last drill pipe.
Rotation Speed, Acc. Limit	Sets the acceleration limit of the pump in percent output per second.
Motor Displacement	Shows the displacement of the rotation motor.

Parameter	Description
Rotation Pump Max Flow	Shows the maximum flow of the rotation pump.
Rotary Head Gear Ratio	Shows the gear ratio of the rotary head.



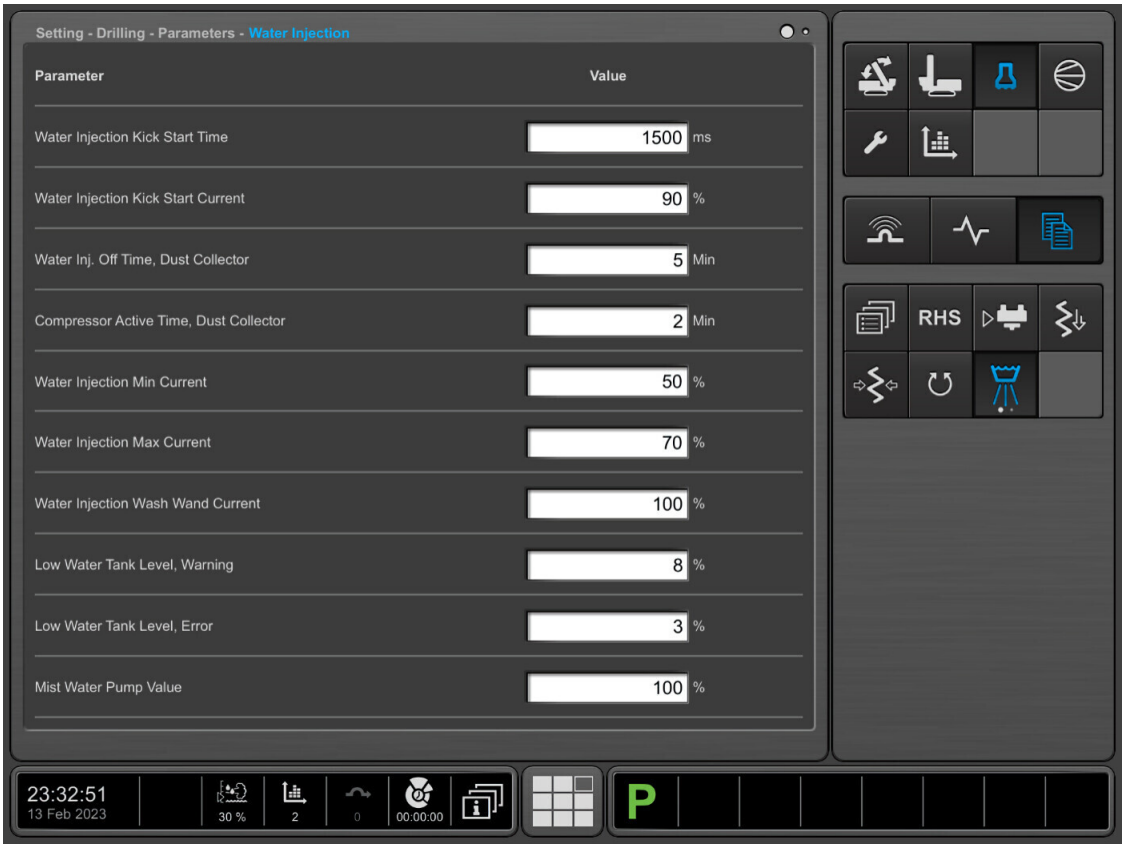
Example of the **Rotation** *Screen 2 of 2*

Parameter	Description
Precision Drilling Rotation Limit	Sets the maximum output speed that is used when the switch on the left main joystick is held in the up position.

Example of the **Rotary Head Torque Calibration** *Screen*

Parameter	Description
Start Torque Calibration	When selected, this initiates torque calibration
Rotary Speed	Shows current rotation speed
Output	Shows the requested pump output
Calculated Displacement	Shows the displacement of the rotation motor
Use Calibration Parameters	When selected, this changes the user editable field to the value determined by RCS after the calibration is complete.
Displacement Parameter	Shows the displacement value that RCS uses to calculate torque.
Current Calibration State	• **Deactivated** — The rotary head torque calibration is off. • **Active** — The rotary head torque calibration is in progress. The rotary head speed is increasing to maximum. • **MeasureRpm** — The rotary head speed is being analyzed.

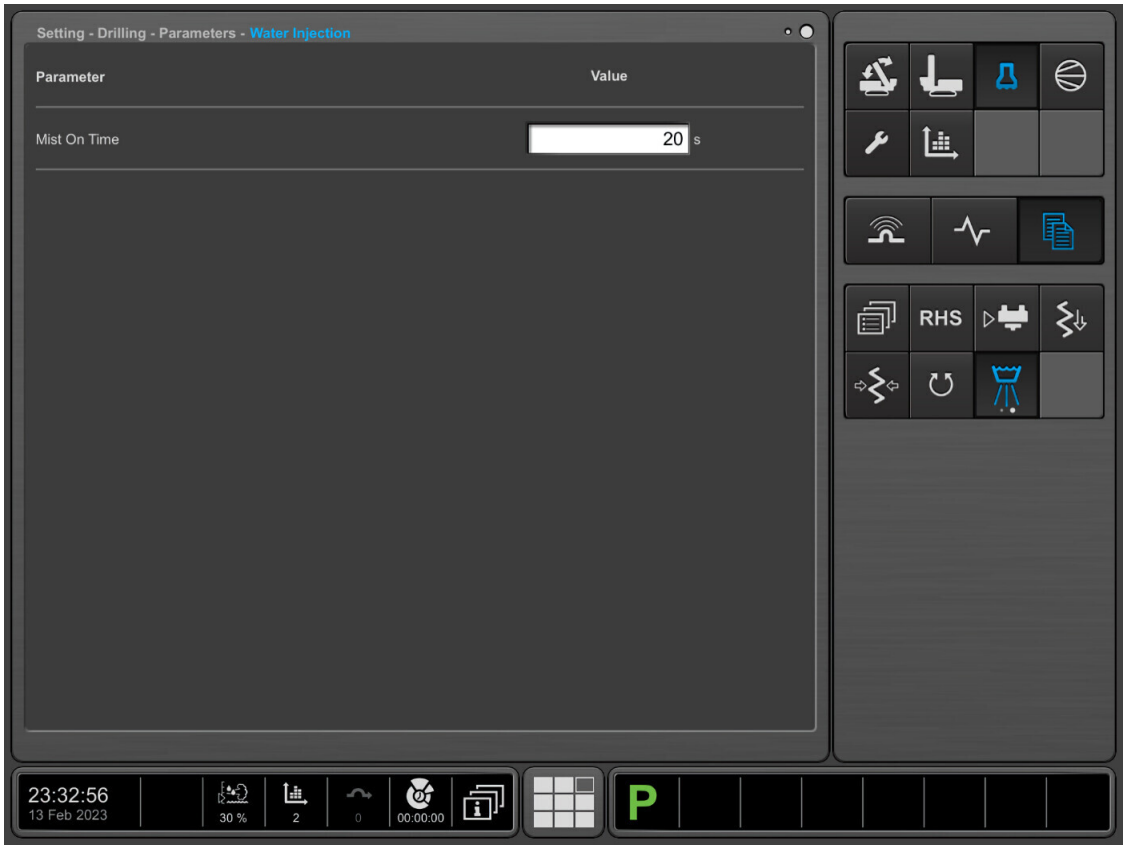
Water Injection



Example of **Water Injection** *Screen 1 of 2*

Parameter	Description
Water Injection Kick Start Time	When water injection is on, sets the duration that the kick start current is energized. A high current is required to start pump turnover; a lower current can then be used for lower water flow.
Water Injection Kick Start Current	Sets the amount of water output used when the water injection first starts to assist the pump turnover.
Water Inj. Off Time, Dust Collector	Sets the amount of time the water injection must be off before the dust collector can be energized.
Compressor Active Time, Dust Collector	Sets the amount of time the compressor must be energized before the dust collector can be energized.
Water Injection Min Current	Sets the minimum output value commanded to make sure that the pump operates as slowly as possible without stalling.
Water Injection Max Current	Sets the maximum output value commanded so the pump operates as fast as possible at full speed.
Water Injection Wash Wand Current	Sets the maximum output value commanded when energizing the wash wand option.

Parameter	Description
Low Water Tank Level, Warning	Sets the percentage value for starting the low water tank level warning. An event or warning appears while the system still allows the water injection pump operation.
Low Water Tank Level, Error	Sets the percentage value for starting the low water tank error. An event or warning appears, and the water injection pump is disabled.
Mist Water Pump Value	Sets the percentage value of maximum output that the water mist pump valve operates.



Example of **Water Injection** *Screen 2 of 2*

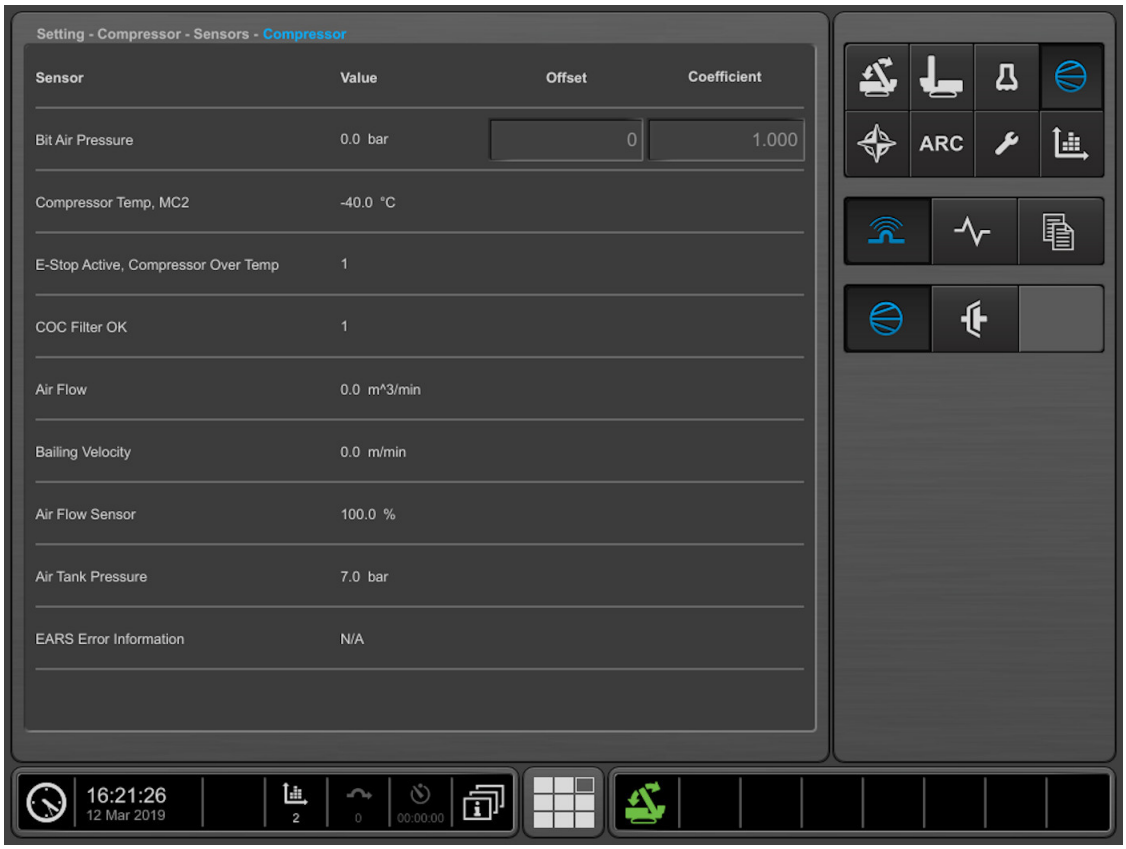
Parameter	Description
Mist On Time	Sets the length of time that water mist discharges when commanded on.

5.4 Setting > Compressor Screens

The **Compressor** button enables access to the following compressor applicable information screens:

- Sensors
- Actuations
- Parameters

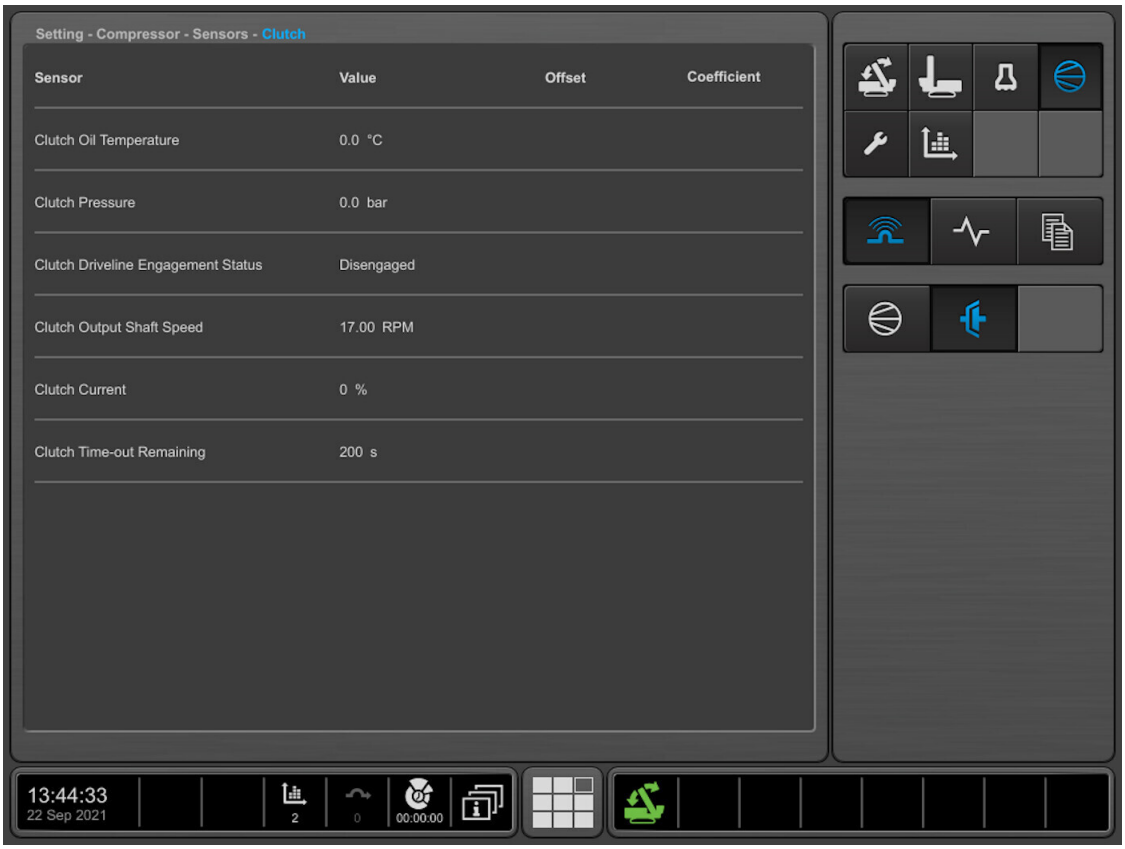
5.4.1 Compressor > Sensors



Example of the **Compressor** *Screen*

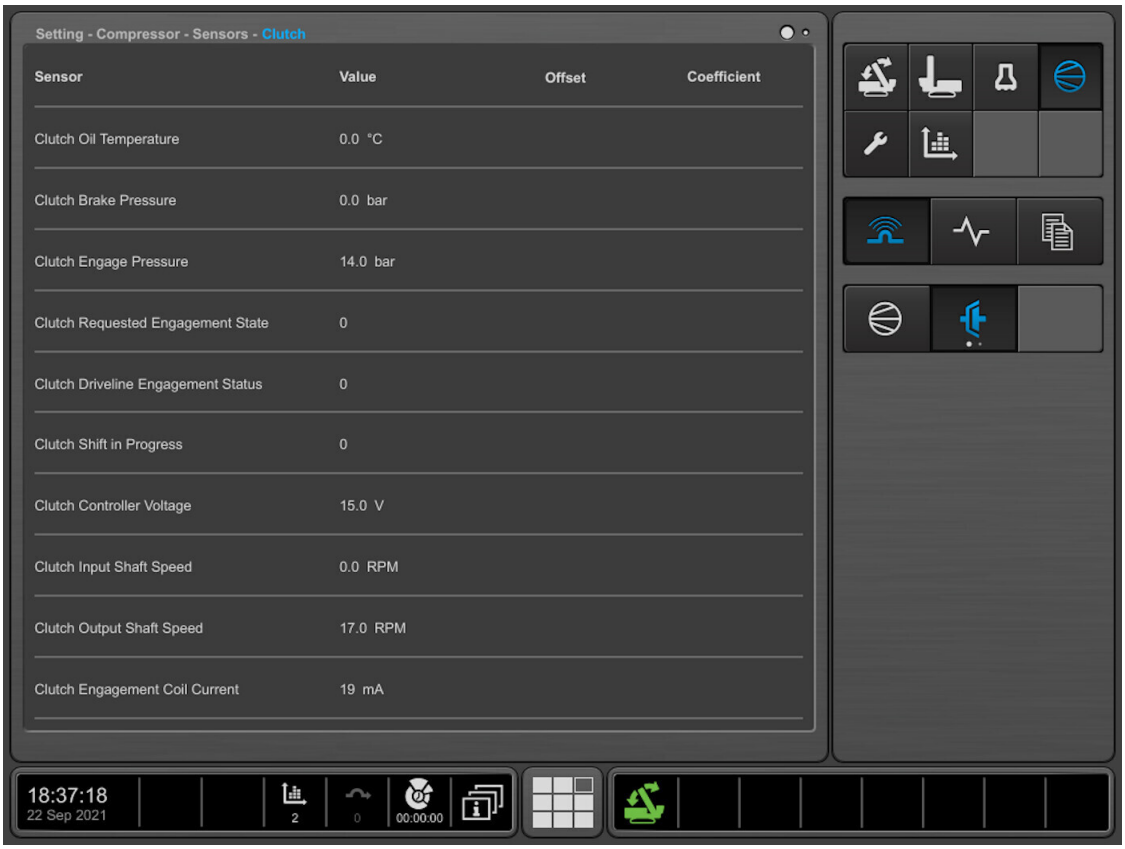
Sensor	Description
Bit Air Pressure	Shows the drilling air pressure as measured at the air pipe on the tower support.
Compressor Temp, MC2	Shows the temperature value of the compressor.
E-stop Active, Compressor Over Temp	Shows the compressor shut-off circuit condition. • 1 = The compressor emergency stop is not active. • 0 = The compressor emergency stop is active.

Sensor	Description
COC Filter Ok	Shows the status of the COC filter. • 1 = Indicates that no restriction is detected. • 0 = Indicates that a restriction is detected.
Air Flow	Shows the volume of air flow calculated from the **Air Flow Sensor** value and the **Compressor** parameter.
Bailing Velocity	Shows the speed of the air that is traveling up and out of the drill hole. This speed is calculated using the **Air Flow Sensor** value and drill bit and drill pipe parameters.
Air Flow Sensor	Shows the percentage flow for the compressor sent from the EARS controller.
Air Tank Pressure	Shows the receiver tank pressure sent from the EARS controller.
EARS Error Information	Shows a message for the EARS error code that is received from the EARS controller. Refer to the **RCS Events and Interlocks** document for information on specific error codes.



Example of the **Clutch** *Screen for an Optional Clutch Controller*

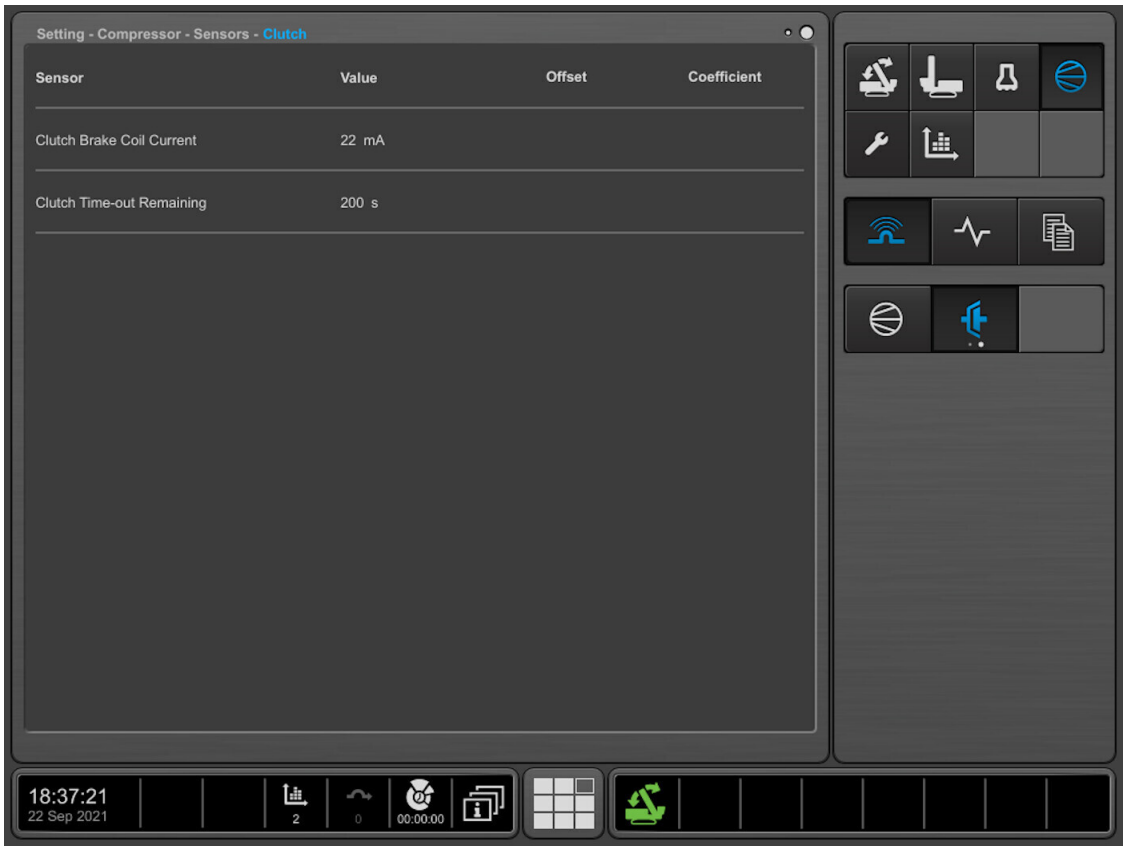
Sensor	Description
Clutch Oil Temperature	Shows the oil temperature reading sent from the controller.
Clutch Pressure	Shows the working pressure of the clutch.
Clutch Driveline Engagement Status	Shows when the clutch is not in the neutral position in response to controller output. • 1 = The clutch is not in the neutral position. • 0 = The clutch is in the neutral position.
Clutch Output Shaft Speed	Shows the output speed sent from the controller.
Clutch Current	Shows the current applied to the brake coil.
Clutch Time-out Remaining	Shows the time delay required before clutch engagement can be tried after a failed engagement.



Example of the **Clutch** *Screen 1 of 2 for an Optional Twin Disc™ Clutch Controller*

Sensor	Description
Clutch Oil Temperature	Shows the oil temperature reading sent from the controller.
Clutch Brake Pressure	Shows the brake pressure of the clutch.
Clutch Engage Pressure	Shows the engage pressure of the clutch.
Clutch Requested Engagement State	Shows if EARS has requested the clutch to engage. • 1 = EARS has requested the clutch to engage. • 0 = EARS has not request the clutch to engage.
Clutch Driveline Engagement Status	Shows when the clutch is not in the neutral position in response to controller output. • 1 = The clutch is not in the neutral position. • 0 = The clutch is in the neutral position.
Clutch Shift in Progress	Shows when the clutch is moving between the engaged and disengaged positions. • 1 = The clutch is between the engaged and disengaged positions. • 0 = The clutch is not between the engaged and disengaged positions.
Clutch Controller Voltage	Shows the voltage at the clutch control module.

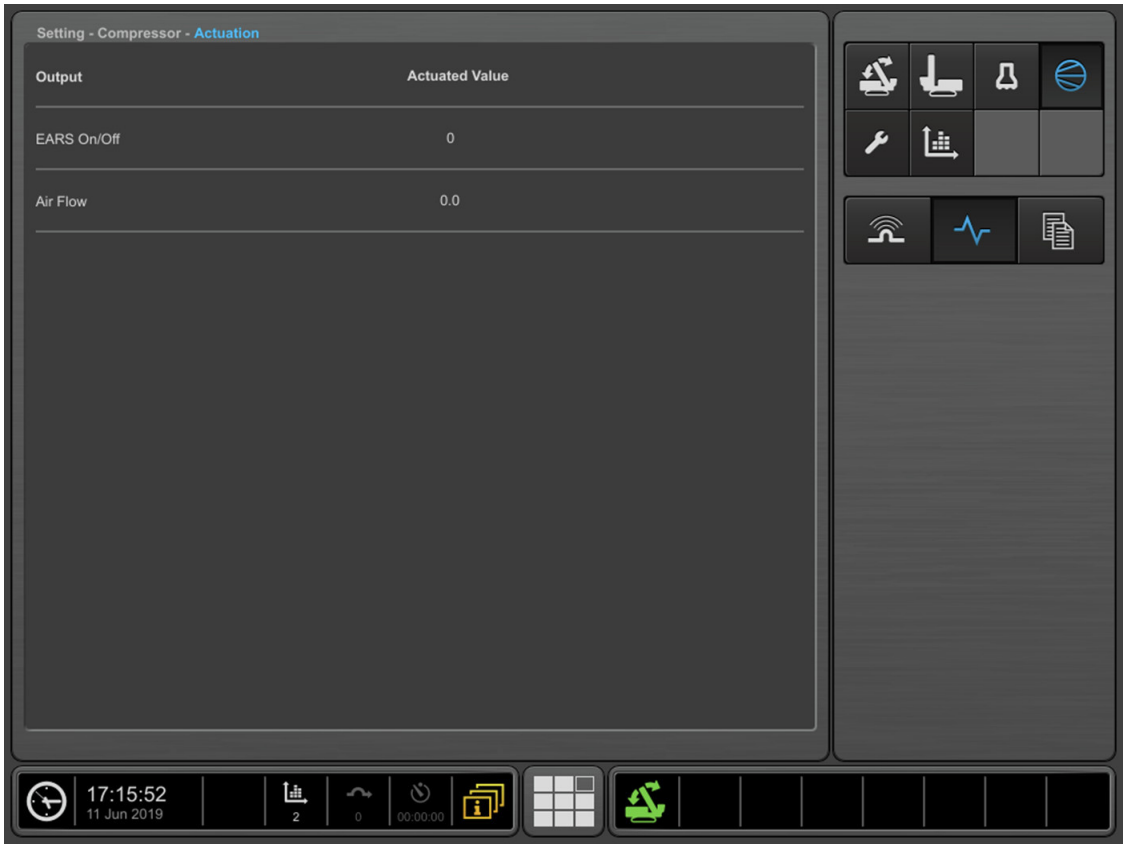
Sensor	Description
Clutch Input Shaft Speed	Shows the clutch input speed.
Clutch Output Shaft Speed	Shows the clutch output speed.
Clutch Engagement Coil Current	Shows the current applied to the engagement coil.



Example of the **Clutch** *Screen 2 of 2 for an Optional Twin Disc™ Clutch Controller*

Sensor	Description
Clutch Brake Coil Current	Shows the current applied to the brake coil.
Clutch Time-out Remaining	Shows the time delay required before clutch engagement can be tried after a failed engagement.

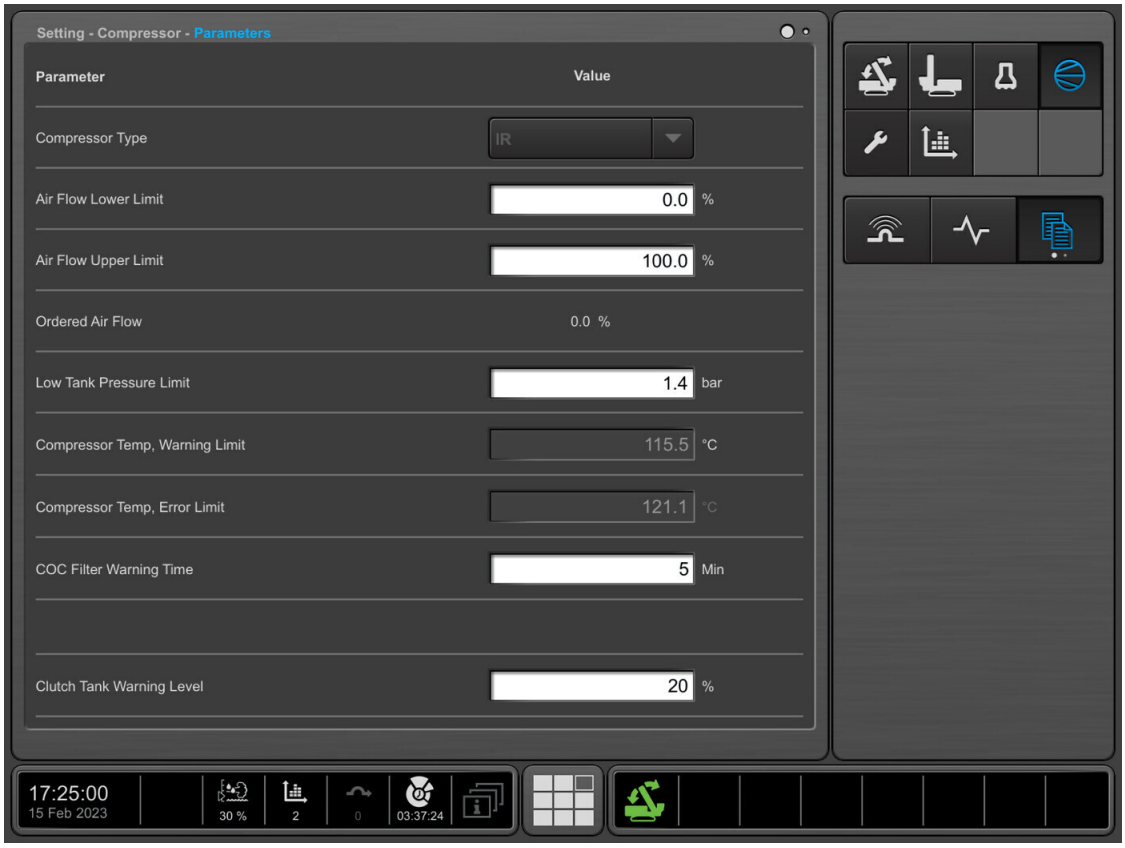
5.4.2 Compressor > Actuation



Example of the **Actuation** *Screen*

Output	Description
EARS On/Off	Shows when the air is commanded on or off to EARS. • 1 = Air commanded on. • 0 = Air commanded off.
Air Flow	Shows the commanded air flow sent to EARS.

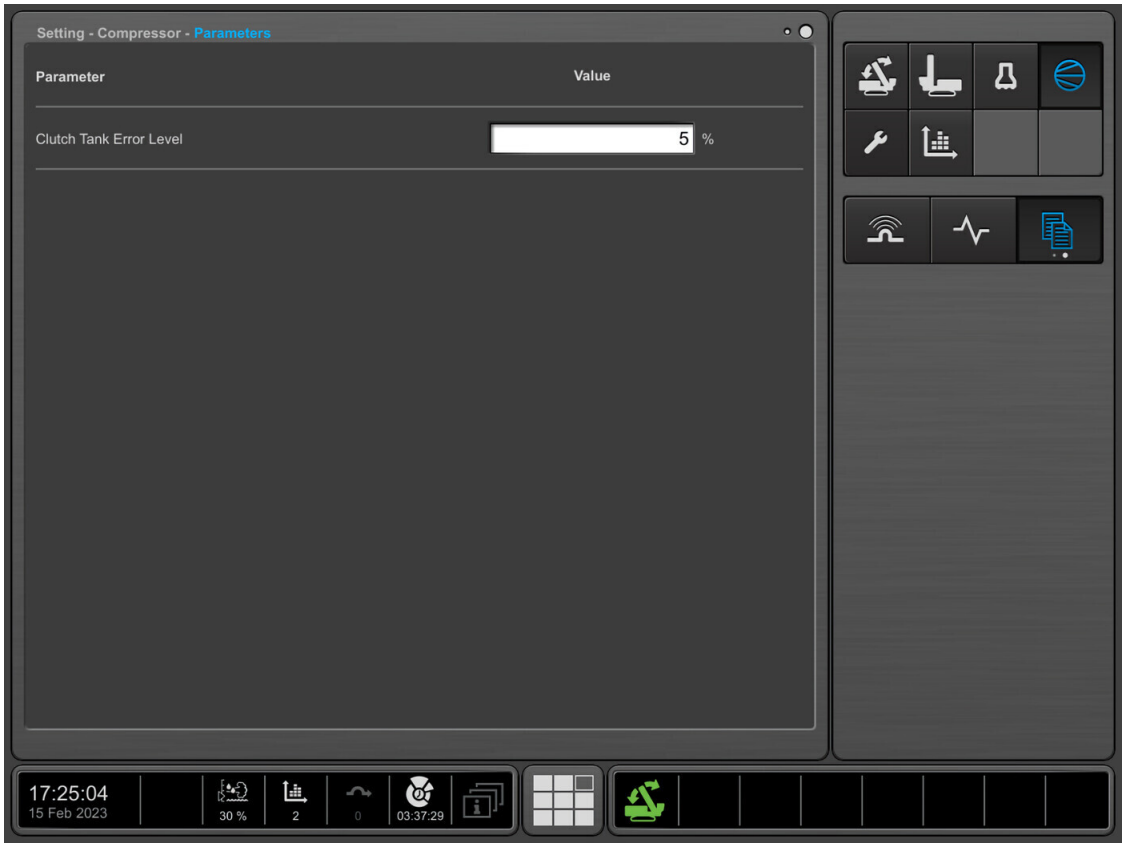
5.4.3 Compressor > Parameters



Example of the **Parameters** *Screen 1 of 2*

Parameter	Description
Compressor Type	Sets the compressor type to either IR (Ingersoll Rand) or AC (Atlas Copco).
Air Flow Lower Limit	Sets the minimum output that the operator can command when the compressor is enabled. Less than 6% commanded flow turns the tank pressure to minimum, which effectively shuts off the compressor but keeps the clutch engaged.
Air Flow Upper Limit	Sets the maximum output that the operator can command when the compressor is enabled. The recommended value setting is 100%, but the setting can be lowered if the bailing velocity is too high.
Ordered Air Flow	The percentage of the operator-commanded air flow from the +/- buttons on the right operator control panel. This value also appears in the drilling screen.
Low Tank Pressure Limit	Sets the lowest limit for the receiver tank pressure. Any value below this limit results in a system event. Set this limit to zero on machines with a clutch.
Compressor Temp, Warning Limit	Sets the temperature at which the system shows an event or warning that the compressor discharge temperature is too hot.

Parameter	Description
Compressor Temp, Error Limit	Sets the temperature at which the system shows an event or warning that the discharge temperature is too hot and shuts off the machine.
COC Filter Warning Time	Shows the time delay before a filter warning event occurs.
Clutch Tank Warning Level	Sets the level at which a low fluid warning is given.



Example of the **Parameters** *Screen 2 of 2*

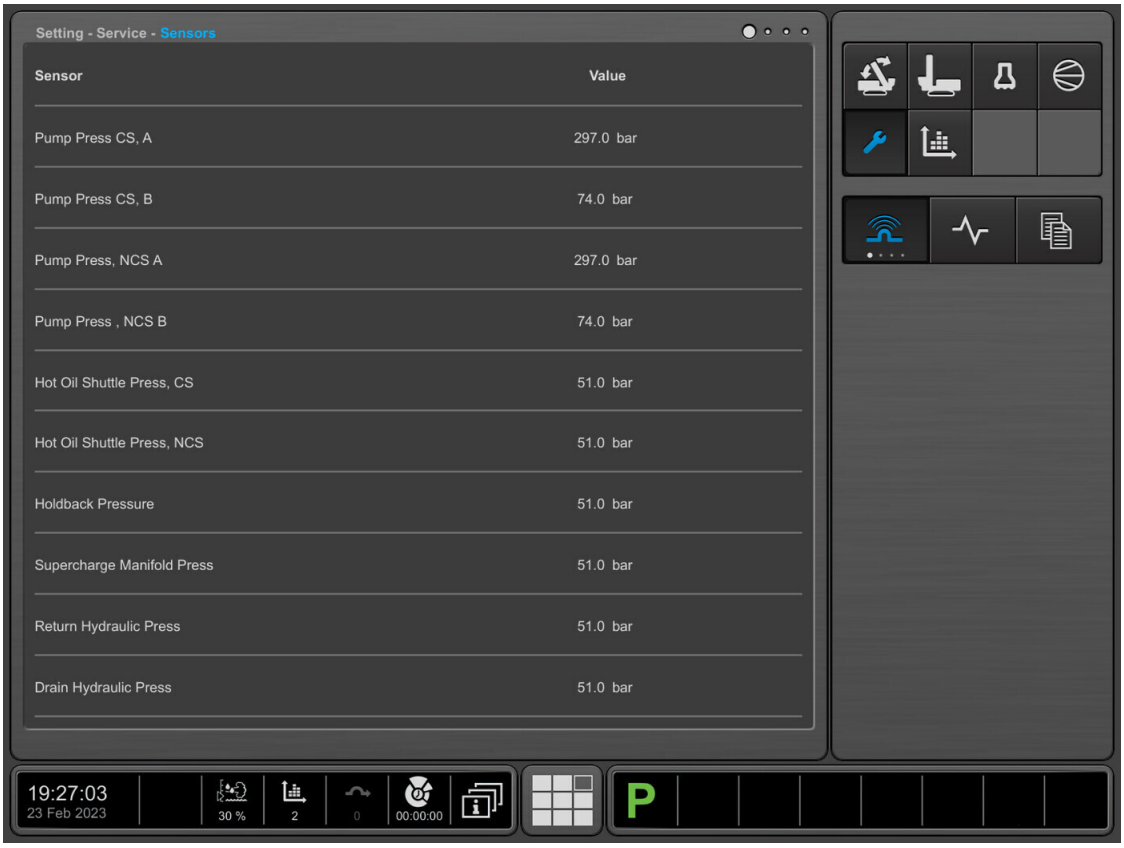
Parameter	Description
Clutch Tank Error Level	Sets the level at which a clutch tank error is given.

5.5 Setting > Service Screens

The **Service** button enables access to the following information screens:

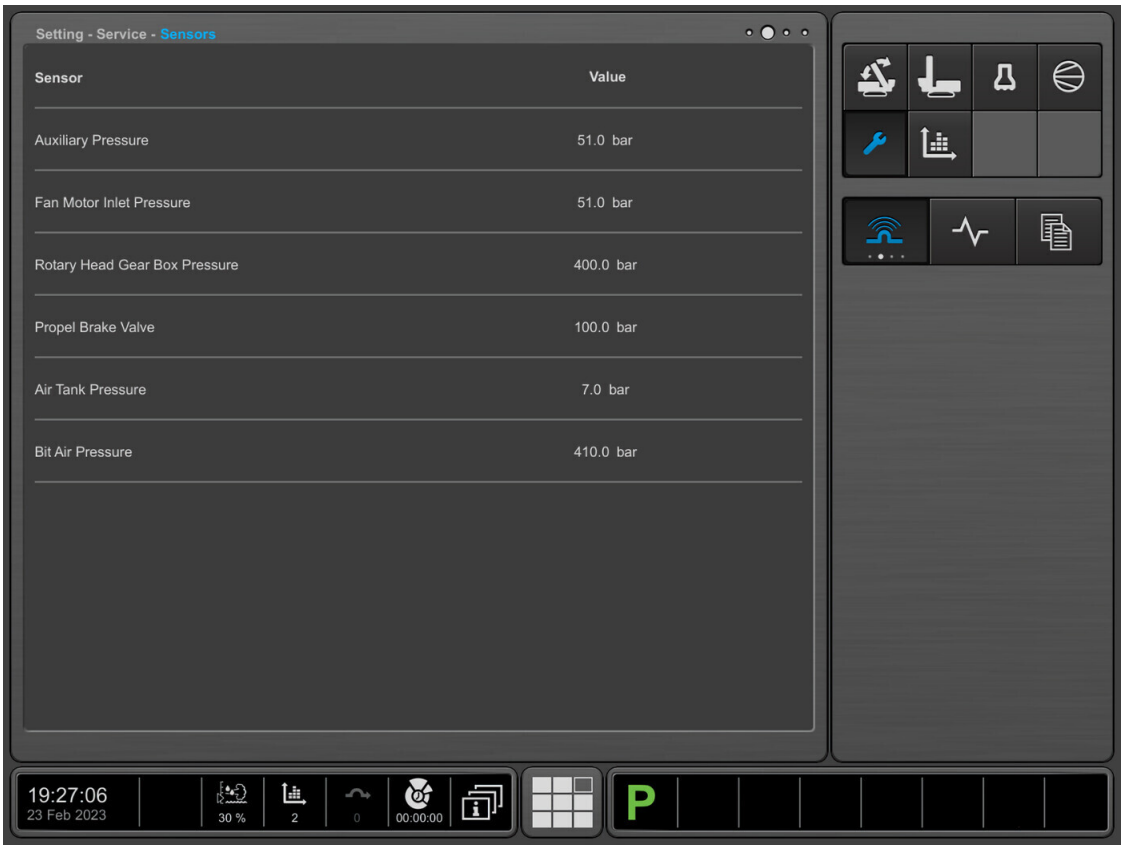
- Sensors
- Parameters

5.5.1 Service > Sensors



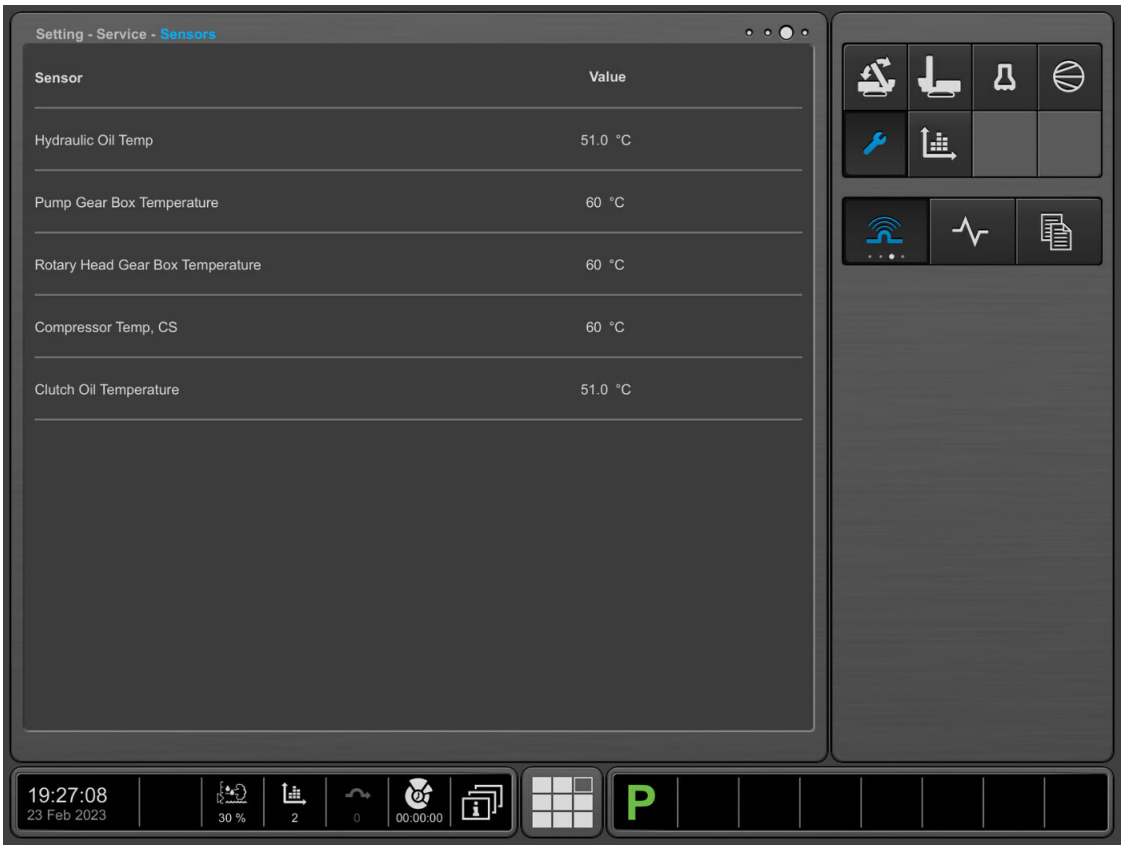
Example of the **Sensors** *Screen 1 of 4*

Sensor	Description
Pump Press CS, A	Shows the cab side main pump pressure value from the feed down and forward propel direction.
Pump Press CS, B	Shows the cab side main pump pressure value from the feed up and reverse propel direction.
Pump Press, NCS A	Shows the non-cab side main pump pressure value from the rotary head clockwise rotation and forward propel direction.
Pump Press, NCS B	Shows the non-cab side main pump pressure value from the rotary head counterclockwise rotation and reverse propel direction.
Hot Oil Shuttle Press, CS	Shows the cab side hot oil shuttle pressure value.
Hot Oil Shuttle Press, NCS	Shows the non-cab side hot oil shuttle pressure value.
Holdback Pressure	Shows the holdback pressure value.
Supercharge Manifold Press	Shows the supercharge manifold pressure value.
Return Hydraulic Press	Shows the return manifold hydraulic pressure value.
Drain Hydraulic Press	Shows the drain hydraulic pressure value.



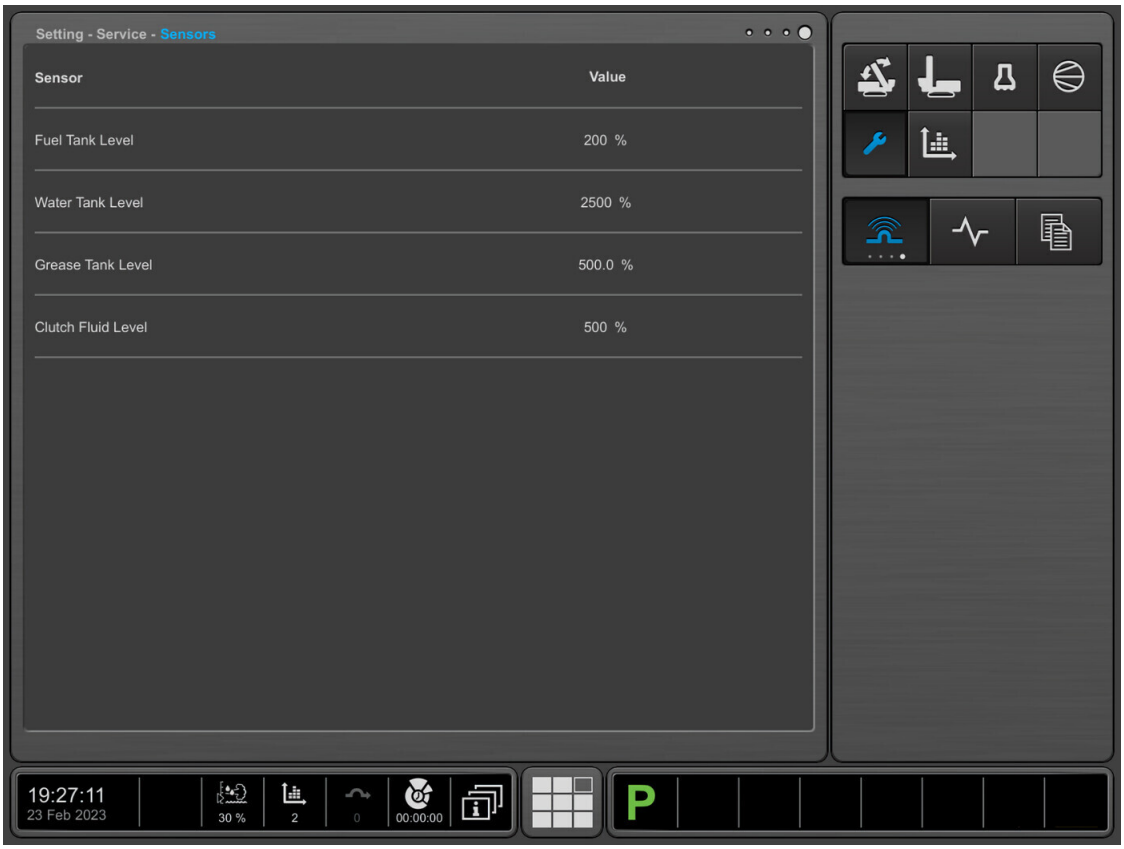
Example of the **Sensors** *Screen 2 of 4*

Sensor	Description
Auxiliary Pressure	Shows the auxiliary pressure value.
Fan Motor Inlet Pressure	Shows the fan motor inlet pressure value.
Rotary Head Gear Box Pressure	Shows the rotary head gearbox pressure.
Propel Brake Valve	Shows the propel brake pressure value.
Air Tank Pressure	Shows the air tank pressure value.
Bit Air Pressure	Shows the drill bit air pressure value.



Example of the **Sensors** *Screen 3 of 4*

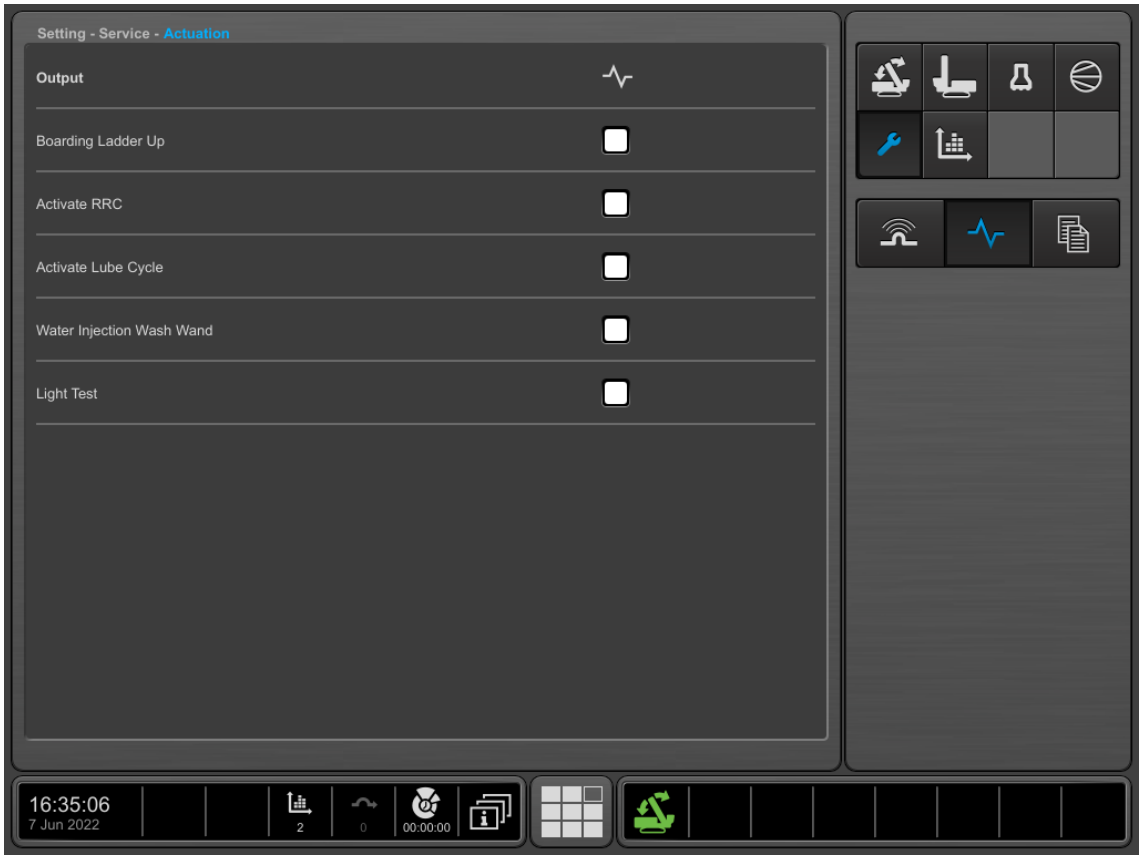
Sensor	Description
Hydraulic Oil Temp	Shows the hydraulic oil temperature value.
Pump Gear Box Temperature	Shows the pump gearbox temperature.
Rotary Head Gear Box Temperature	Shows the rotary head gearbox temperature.
Compressor Temp, CS	Shows the cab side compressor temperature value.
Clutch Oil Temperature	Shows the clutch oil temperature value.



Example of the **Sensors** *Screen 4 of 4*

Sensor	Description
Fuel Tank Level	Shows the fuel tank level value.
Water Tank Level	Shows the water tank level value.
Grease Tank Level	Shows the grease tank level value.
Clutch Fluid Level	Shows the clutch fluid level value.

5.5.2 Service > Actuation

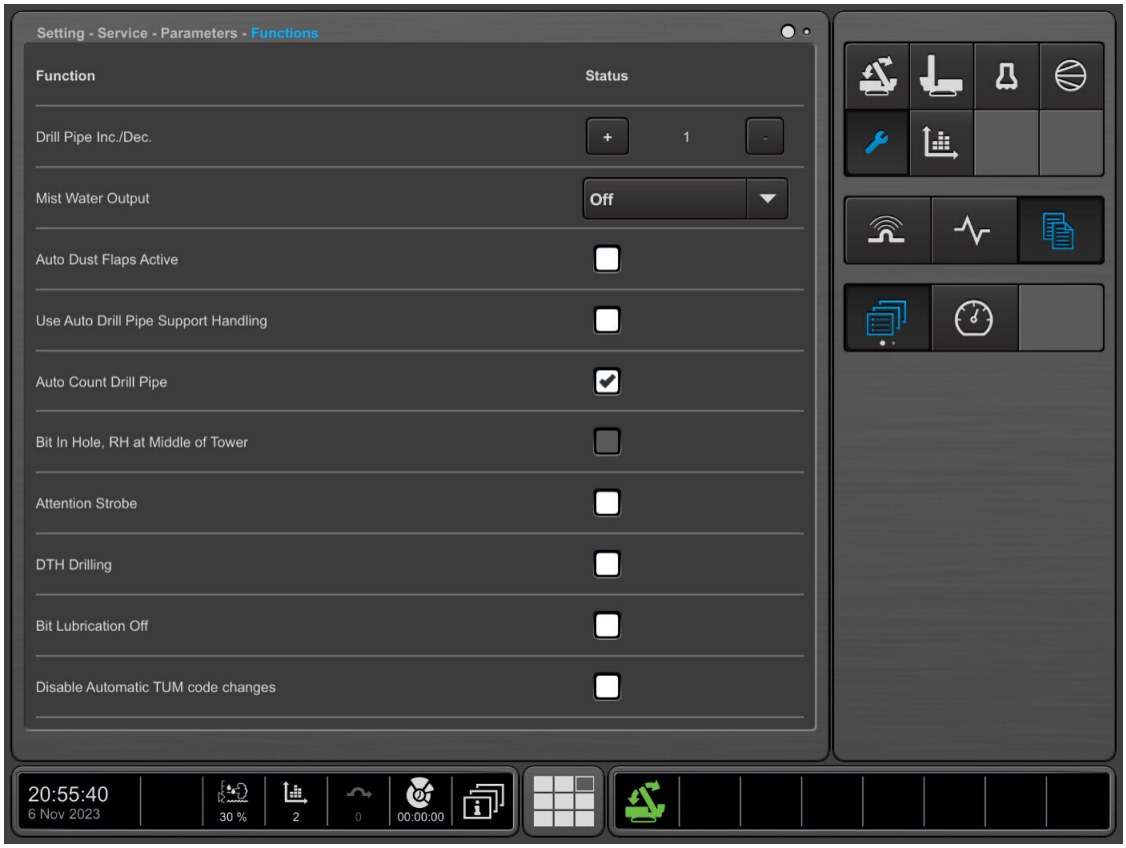


Example of the **Actuation** *Screen*

Output	Description
Boarding Ladder Up	Select the check box to raise the boarding ladder. The check box clears when the boarding ladder is raised.
Activate RRC	Select the check box to activate the RRC. Deselect the check box to deactivate rig remote control.
Activate Lube Cycle	Select the check box to activate a lubrication cycle. The check box clears when the lubrication cycle is complete.
Water Injection Wash Wand	Select the check box to activate the water injection wash wand. Deselect the check box to deactivate the water injection wash wand.
Light Test	Select the check box to activate the lights for testing purposes. Deselect the check box to deactivate the lights. The light test is canceled if the user navigates to another screen. These lights (if equipped) are active during the light test: • Attention strobe • All safe-to-board lights • Drill lights • Propel lights

5.5.3 Service > Parameters

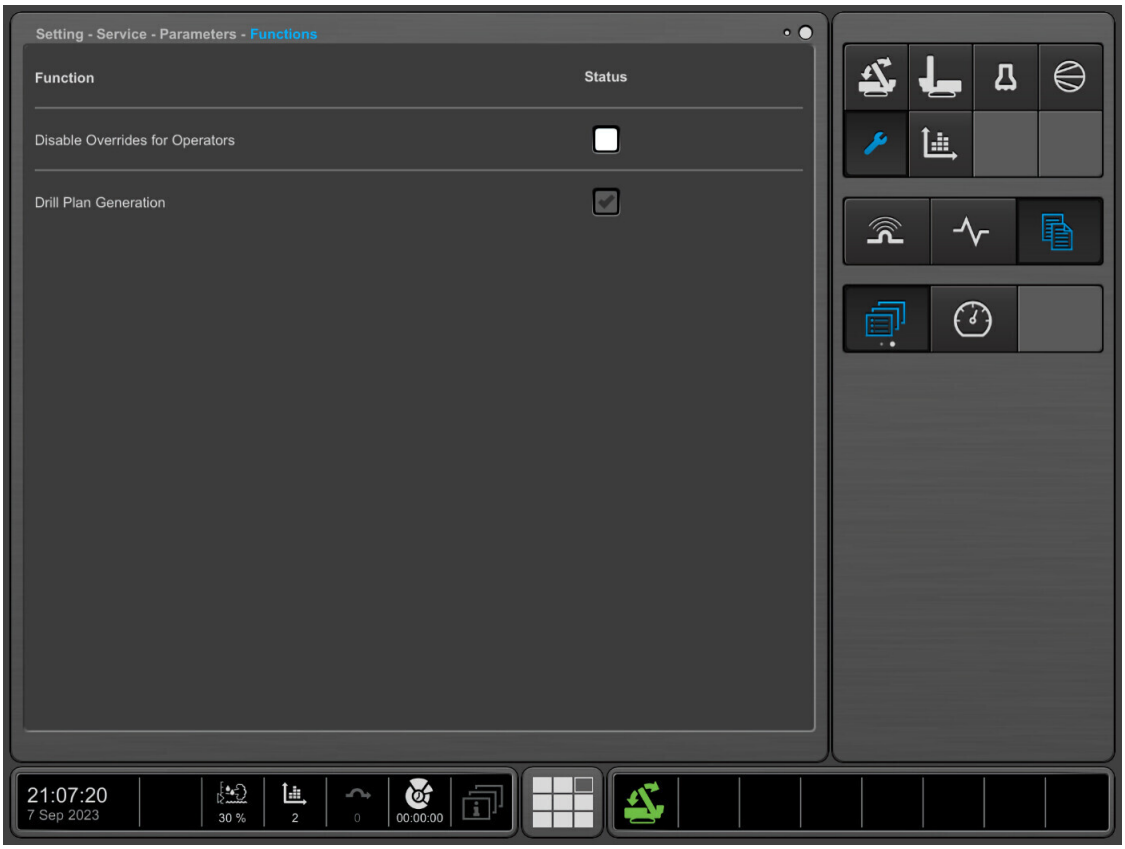
Functions



Example of the **Functions** *Screen 1 of 2*

Parameter	Description
Drill Pipe Inc./Dec.	Increases or decreases the current number of drill pipes in use.
Mist Water Output	Allows the mist water output to be set to **On**, **Off**, or **Auto**. • **On** — Allows the water mist function to activate when the **Water Injection On/Off** button is set to on. • **Off** — Water mist does not activate. • **Auto** — Water mist activates for a set time at a set rate when the machine lowers onto its tracks.
Auto Dust Flaps Active	Commands the dust curtain to raise and lower automatically depending on the drill end leveling jack position.
Use Auto Drill Pipe Support Handling	Allows automatic energizing to open and close the drill pipe support based on the rotary head position.
Auto Count Drill Pipe	Enables the automatic drill pipe counting option.

Parameter	Description
Bit In Hole, RH at Middle of Tower	Allows tower movement, machine leveling, and machine propelling functions to operate when the following conditions are met: • One drill pipe is stowed in the carousel and the rotary head is connected to the second drill pipe. • The rotary head is high enough for the drill bit to be out of the way. • The breakout wrench is unstowed.
Attention Strobe	Enables the attention strobe output.
DTH Drilling	Enables down-the-hole drilling.
Bit Lubrication Off	Disables automatic drill bit lubrication.
Disable Automatic TUM Code Changes	Disables automatic TUM code changes for 30 minutes.



Example of the **Functions** *Screen 2 of 2*

Parameter	Description
Bit In Hole Reminder	Displays a reminder to do a check for the drill bit in the drill hole when the engine or motor is started and the rotary head position is not calibrated.
Disable Overrides for Operators	Turns on and off the overrides available to the operators.
Drill Plan Generation	Shows if drill plan generation is active.

GUI Params

Example of the **GUI Params** *Screen*

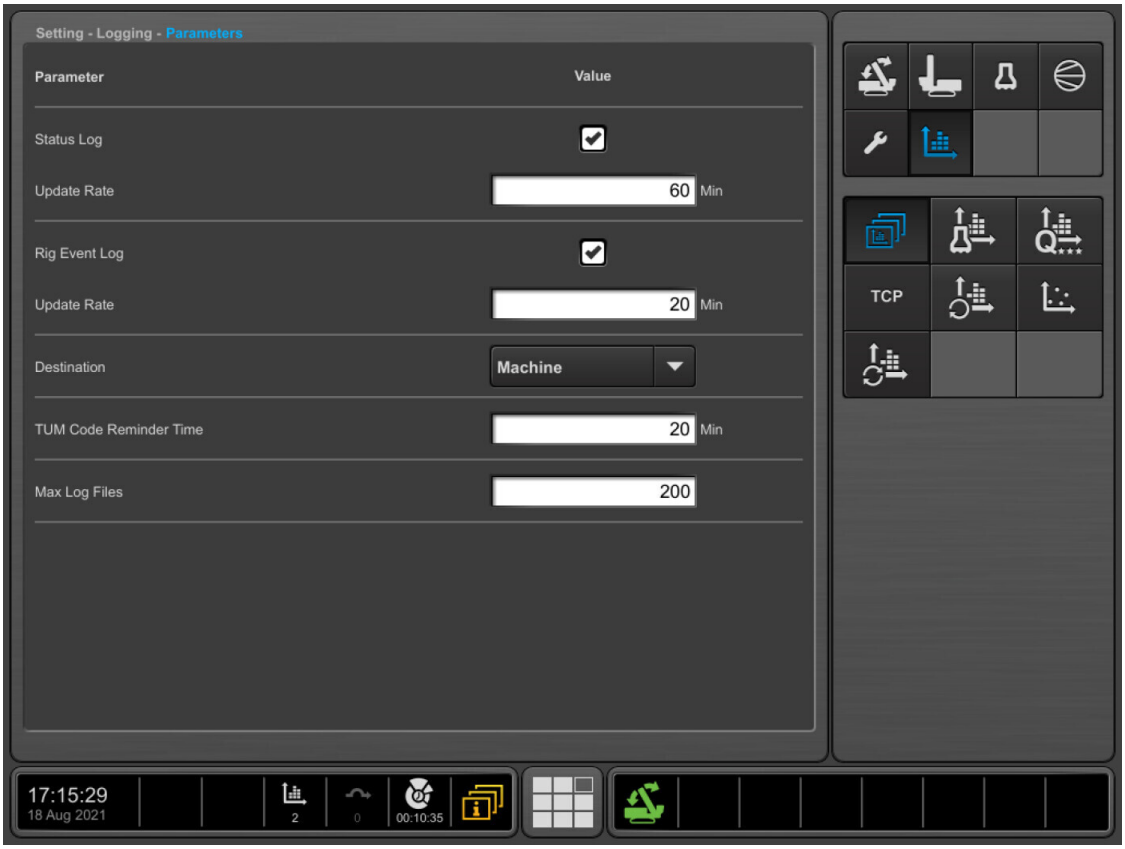
Parameter	Description
Use Metric Units In Drill Parameters	When checked, the user can view metric units for drilled distance only when the RCS is set to US Standard units.
Drill Plan − Use Feet	When checked, the user can view drill plan information in US Standard units.
Rotation RPM Red Limit	Sets the red area of the rotation speed gauge on the **Drilling** screen.
Rotation Speed Max Value	Sets the maximum speed that is shown on the rotation gauge on the **Drilling** screen.
Bit Air Pressure Max Value	Sets the maximum value at which the drill bit air pressure bar graph turns yellow on the **Drilling** screen.
Weight On Bit Red Limit	Sets the red area of the weight-on-bit gauge on the **Drilling** screen.
Weight On Bit Max Value	Sets the maximum weight-on-bit value that appears on the **Drilling** screen gauge.
Rotation Torque Red Limit	Sets the red area of the rotation torque gauge on the **Drilling** screen.
Rotation Torque Max Value	Sets the maximum rotation torque value that appears on the **Drilling** screen gauge.

5.6 Setting > Logging Screens

The **Logging** button enables access to the following information screens:

- Parameters
- MWD
- Quality Log
- TCP Monitoring
- Cyclic Log
- Event Log
- Cyclic Sync Log

5.6.1 Logging > Parameters

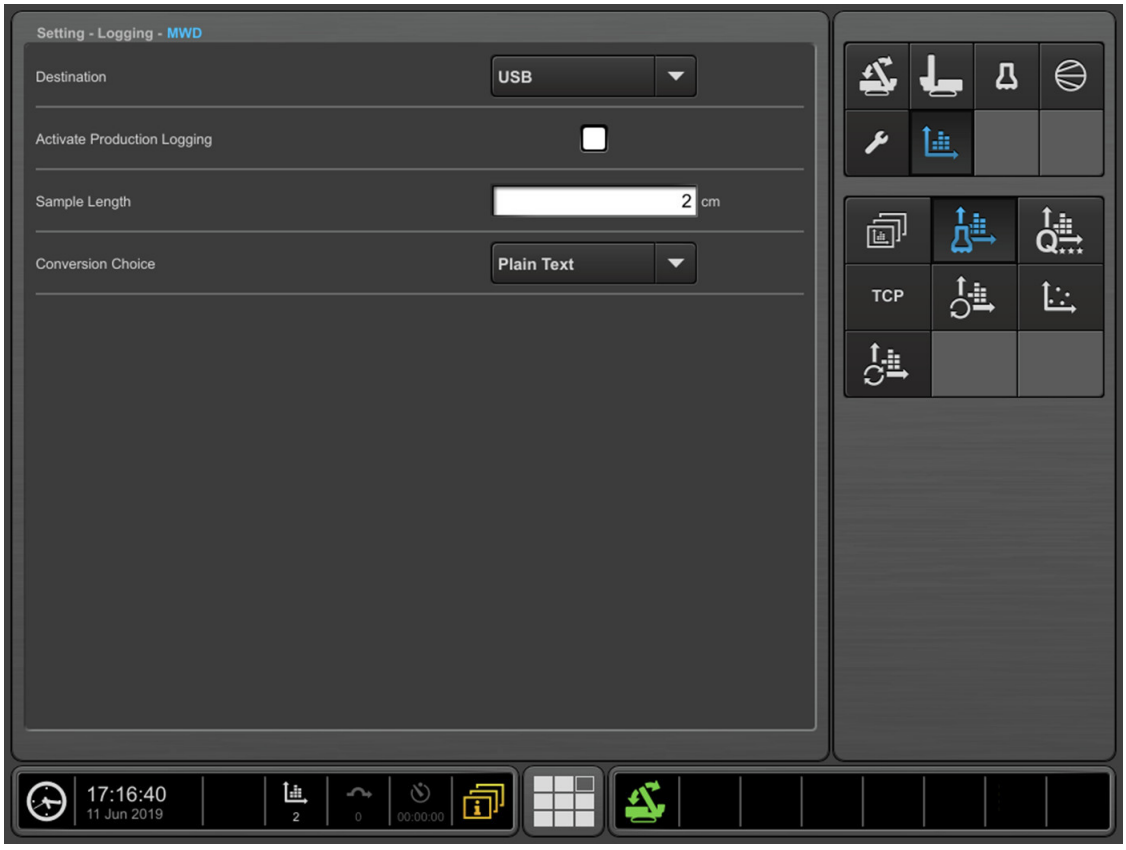


Example of the **Parameters** *Screen*

Output	Description
Status Log	Enables the status log.
Update Rate	Sets how frequently the status log is generated.
Rig Event Log	Enables the event log.
Update Rate	Sets how frequently the event log is generated.
Destination	Sets the location for where the log file is saved.

Output	Description
TUM Code Reminder Time	Sets the duration of time before a TUM code reminder is triggered.
Max Log Files	Sets the maximum quantity of log files allowed in each folder. A warning indicates when the number of files in any folder exceeds 90%, 95%, and 100% of capacity. Auto Drill Plan Execution (ADPE) stops at 95% capacity. At 100% capacity, the oldest logs from the corresponding folder are deleted to reduce the quantity of files in the folder to 90%.

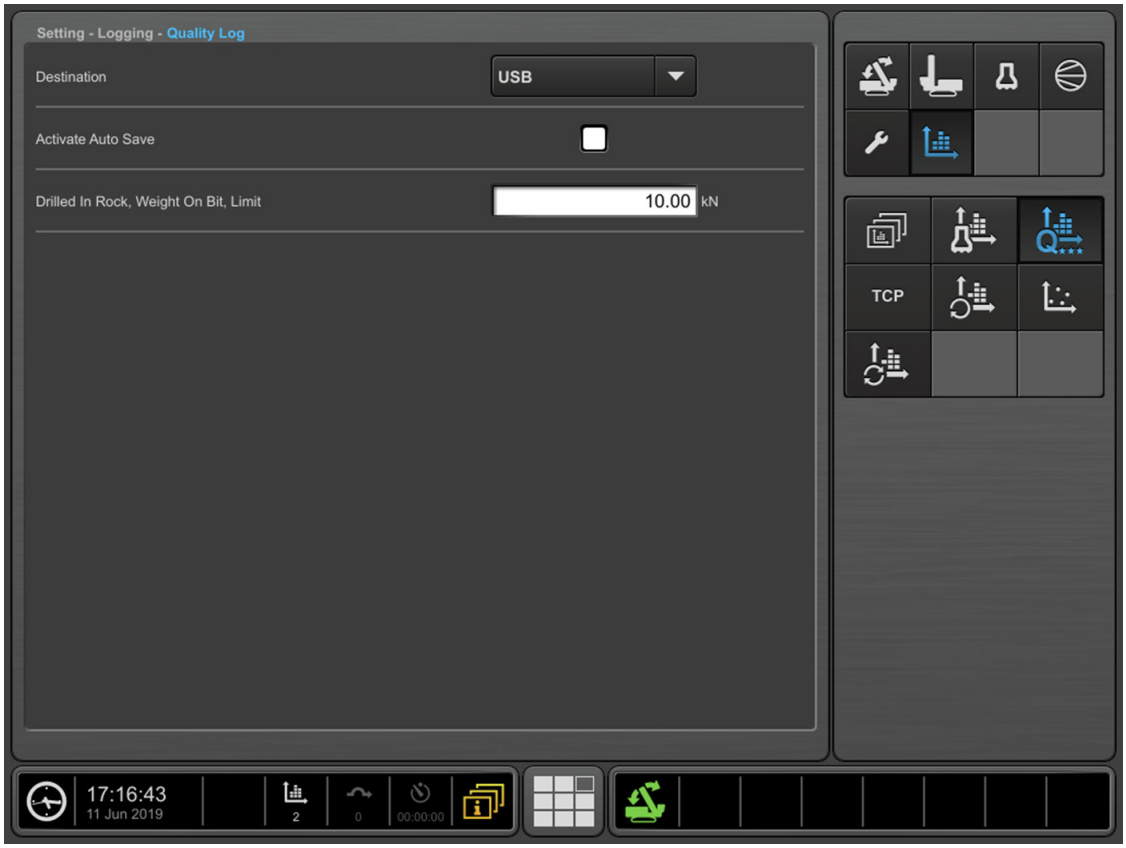
5.6.2 Logging > MWD



Example of the **MWD** *Screen*

Output	Description
Destination	Sets the location for where the log file is saved.
Activate Production Logging	Logs generate automatically during production when this is selected.
Sample Length	Sets the drilling depth increment for log generation.
Conversion Choice	Sets the log conversion to plain text, Minestar™, or IREDES™.

5.6.3 Logging > Quality Log



Example of the **Quality Log** *Screen*

Output	Description
Destination	Sets the location for where the log file is saved.
Activate Auto Save	Logs save automatically when this is selected.
Drilled In Rock, Weight On Bit, Limit	Sets the threshold to determine what is considered for consumable depth tracking.

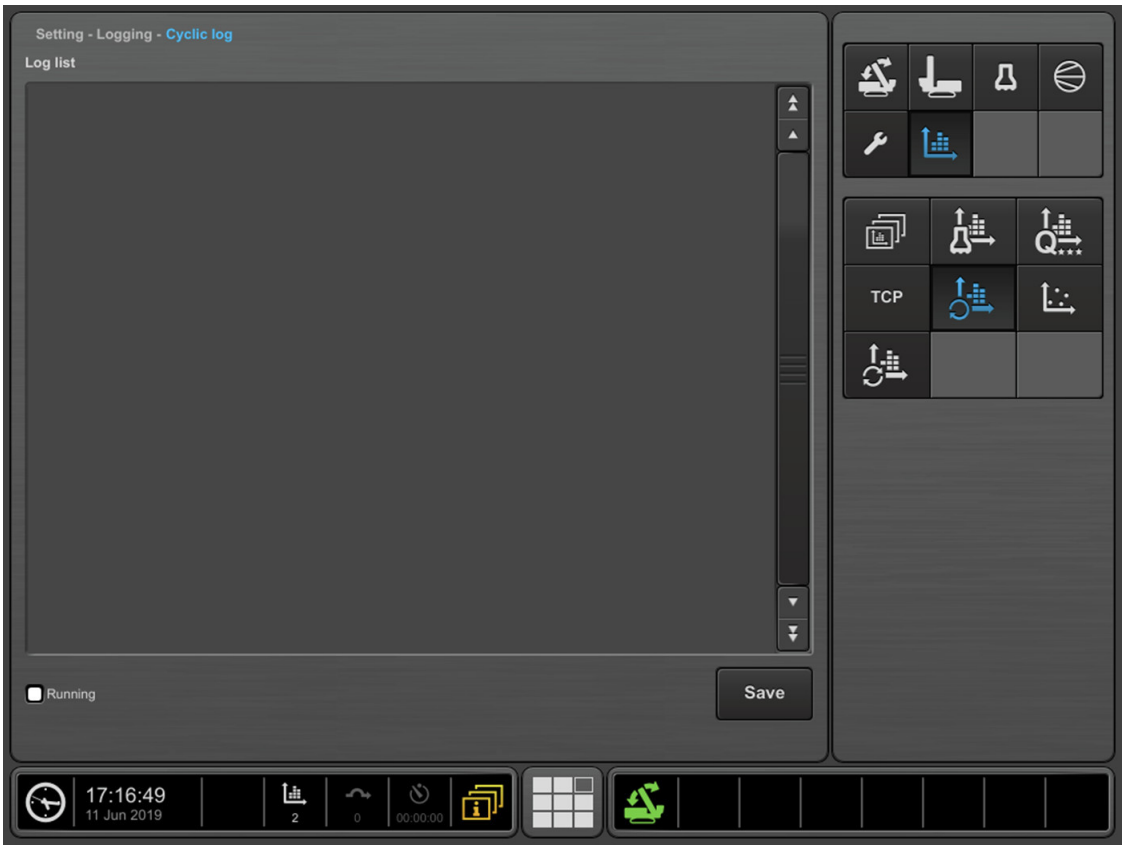
5.6.4 Logging > TCP Monitoring

Example of the **TCP Monitoring** *Screen*

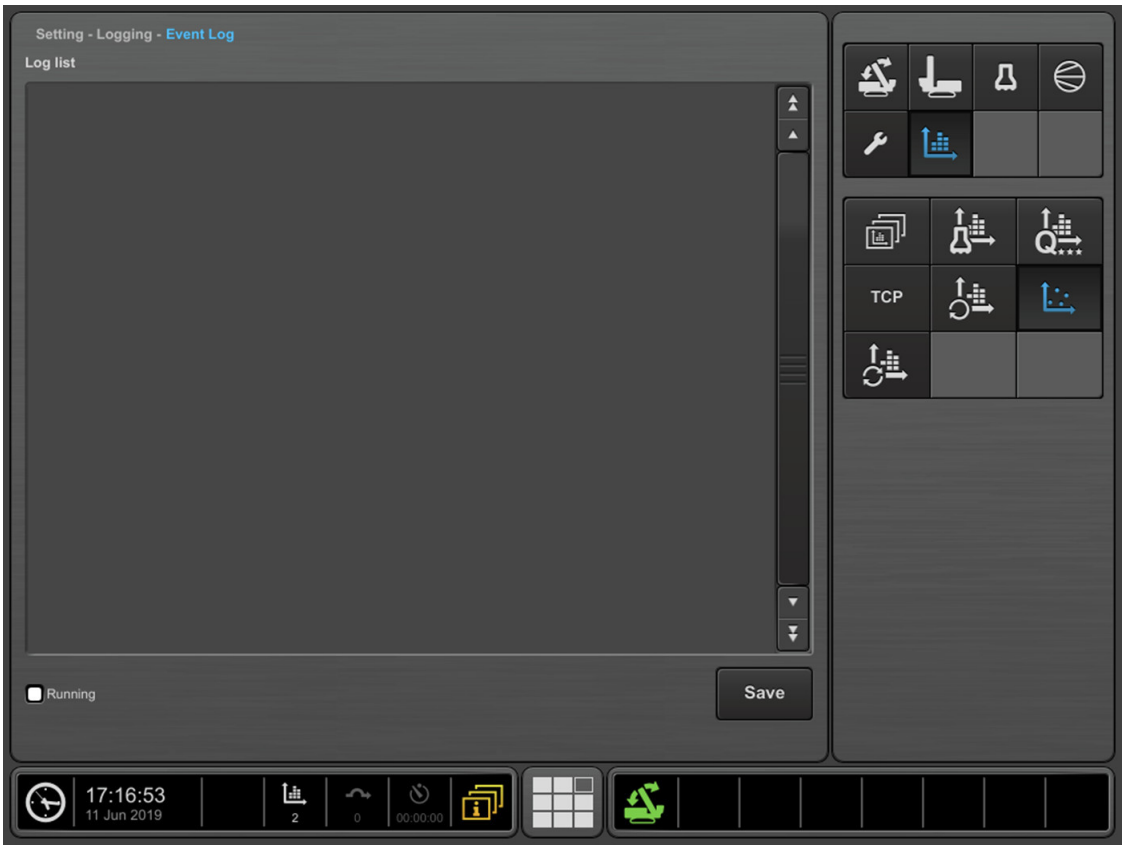
Output	Description
MWD Update Interval	Sets the measure while drilling update interval.
Alive Update Interval	Sets the interval to send the alive message to a third-party interface.
Status	Shows if the TCP monitoring is connected.

5.6.5 Logging > Cyclic Log, Event Log, and Cyclic Sync Log

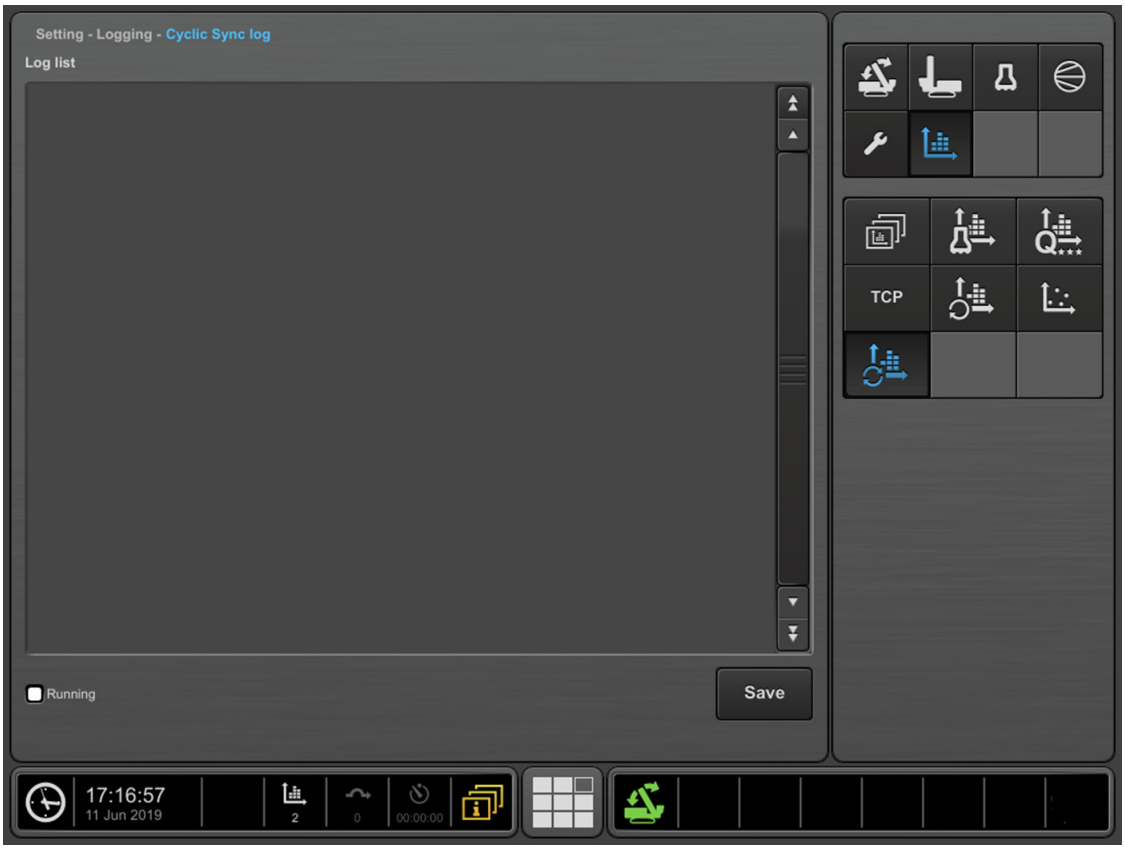
The **Cyclic Log**, **Event Log**, and **Cyclic Sync Log** screens are the same. A list of logs displays in the main window. A check box indicates if the log is running. Logs can be saved by selecting the log and then the **Save** button.



Example of the **Cyclic Log** *Screen*



Example of the **Event Log** *Screen*

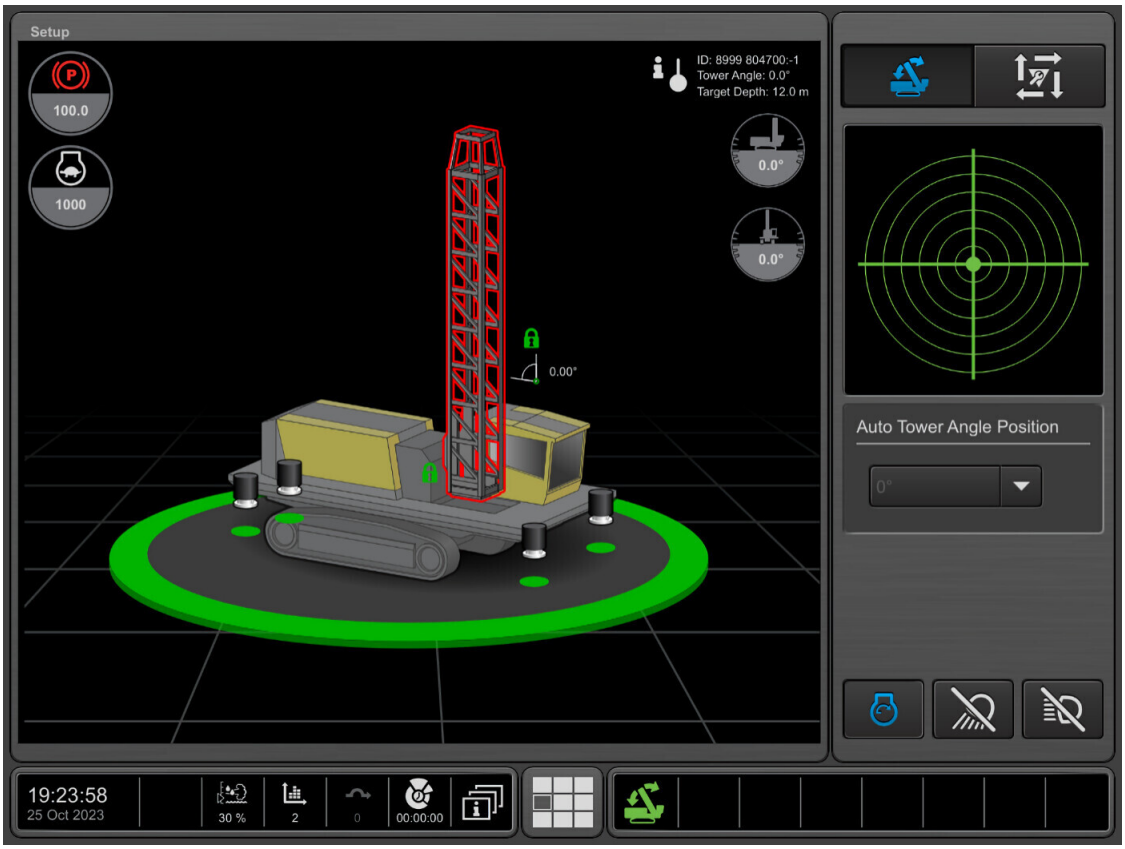


Example of the **Cyclic Sync Log** *Screen*

6 Setup Screen

Setup *Screen Button*

The appearance of the **Setup** screen depends on which state is enabled.



Example of the **Setup** *Screen*

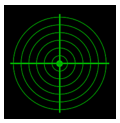
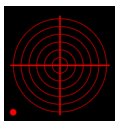
Icon	Description
	Starts and stops the engine: • The engine is on. Stops the engine. • The engine is off. Starts the engine.
	Toggles on and off the drill lights: • The drill lights are on. Switches off the drill lights. • The drill lights are off. Switches on the drill lights.
	Toggles on and off the propel lights: • The propel lights are on. Switches off the propel lights. • The propel lights are off. Switches on the propel lights.

6.1 Level Indicator

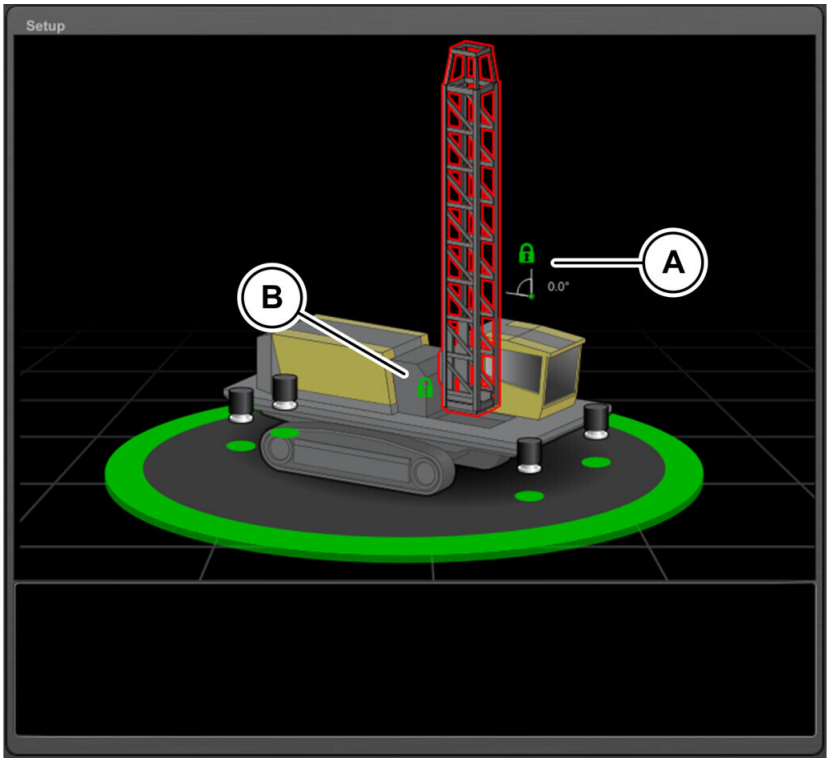
The machine level indicator is shown on the right side of the **Setup** screen. The appearance of a dot in the level indicator and its proximity to the center point signifies the degree of levelness between the machine and horizontal. Any increasing level imbalances between the machine and the drilled hole result in a proportional positioning of the dot further away from the center origin point.

> ***NOTE:*** *The machine pitch and roll parameters can be viewed from the* **Setting** > **Rig** > **Parameters** > **Rig Stability** *screen and the* **Setting** > **Setup** > **Parameters** > **Rig Stability** *screen.*

Level Information

Icon	Description
	The green icon shows that the pitch or roll angle is less than the pitch or roll limit value for the machine.
	The yellow icon shows that the pitch or roll angle is less than the maximum pitch or roll limit value but greater than the minimum pitch or roll limit value.
	The red icon shows that the pitch or roll value is greater than the maximum pitch or roll limit value.

6.2 Tower Pin Locations



Example of the Tower Pin Locations

A	Angle tower pin	B	Vertical tower pin

6.3 Tower Pin Condition

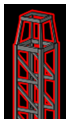
Tower Pin Condition Information

Icon	Description
	Green identifies that the pins are locked.
	Yellow identifies that the pins are between the locked and unlocked condition.
	Red identifies that the pins are unlocked.

6.4 Tower Angle Indication

The actual tower angle is displayed to the right side of the tower.

Example of Tower Angle Indication Symbols

Icon	Description
	The tower is not movable.
	The tower is movable.
	Shows the current tower angle.
	Shows the current tower angle. When the tower vertical pins are unlocked, a green dot appears at the top of the icon to show that vertical geometry calculations are being used.

!	***NOTE:*** *The tower no longer appears highlighted in red when it is allowed to move.*

6.5 Leveling Jacks

One leveling jack icon appears for each position of the machine. The leveling jacks have three conditions:

- Leveling jacks on ground
- Leveling jacks retracted
- Leveling jacks in transition

Leveling Jacks Display Screen Information

Leveling Jacks on Ground	Leveling Jacks Retracted	Leveling Jack in Transition
When the leveling jacks are on the ground, they have a red highlight under the leveling jack pad.	When the leveling jacks are retracted, they have a green highlight under the leveling jack pad.	When the leveling jacks are in transition, they have a yellow highlight under the leveling jack pad.

6.6 Propel State

When the propel state is selected, the track actuating direction arrows appear on the screen.

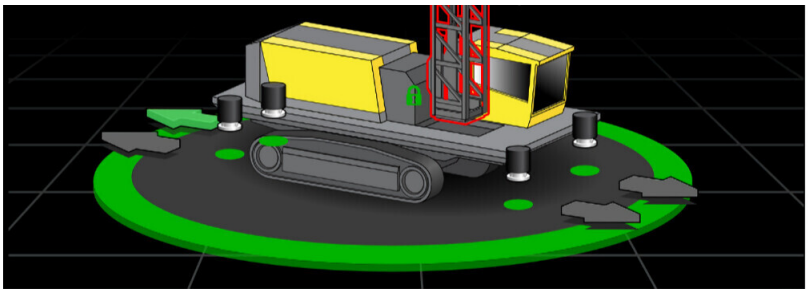
Propel State

The operator can select from one of eight available propel output actuations.

> ***NOTE:*** *Propel functions are designed for use with the seat facing the drill end of the machine. When the seat is facing the non-drill end of the machine, the left multifunction joystick in single joystick propel and left and right main joysticks in dual joystick propel function as if the seat is facing the drill end. Refer to the Operation manual for this machine for information on single joystick propel and dual joystick propel functions.*
>
> - Move the joystick(s) to the right and the non-drill end of the machine moves to the left.
> - Move the joystick(s) to the left and the drill end of the machine moves to the right.

6.6.1 Cab Side, Non-drill End Track Propel Output

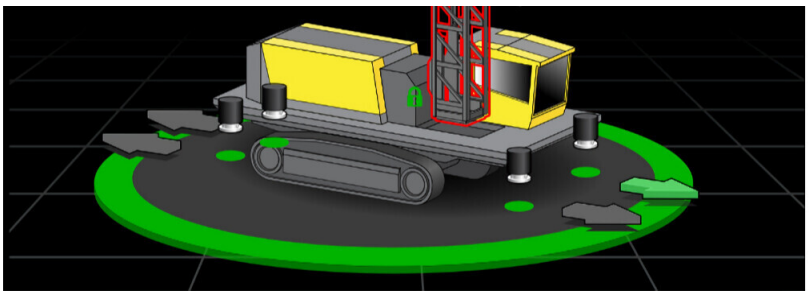
When the operator commands the cab side track to propel the non-drill end first, the green icon appears (figure Cab Side, Non-drill End Track Propel Output).



Cab Side, Non-drill End Track Propel Output

6.6.2 Cab Side, Drill End Track Propel Output

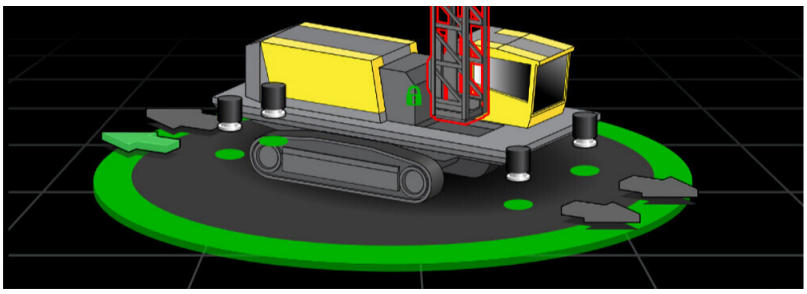
When the operator commands action for the cab side track to propel the drill end first, the green icon appears (figure Cab Side, Drill End Track Propel Output).



Cab Side, Drill End Track Propel Output

6.6.3 Non-cab Side, Non-drill End Propel Output

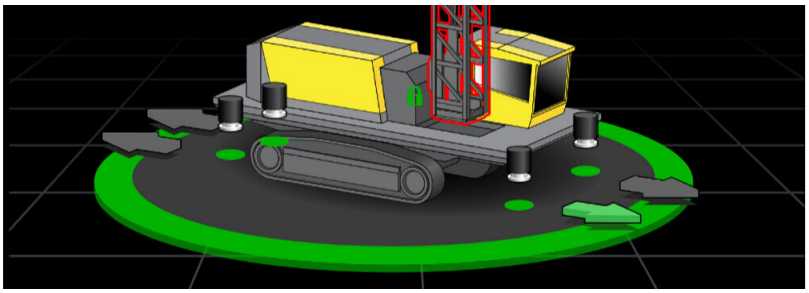
When the operator commands action for the non-cab side track to propel the non-drill end first, the green icon appears (figure Non-cab Side, Non-drill End Propel Output).



Non-cab Side, Non-drill End Propel Output

6.6.4 Non-cab Side, Drill End Propel Output

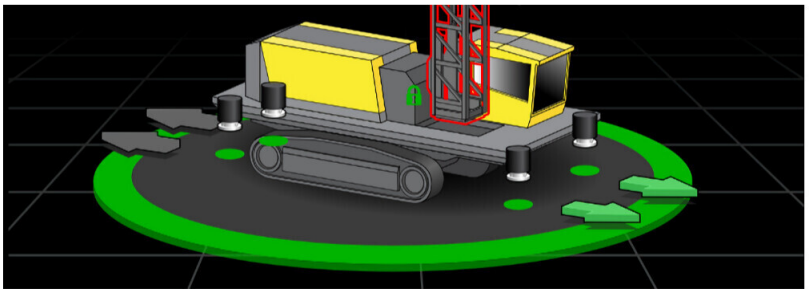
When the operator commands action for the non-cab side track to propel the drill end first, the green icon appears (figure Non-cab Side, Drill End Propel Output).



Non-cab Side, Drill End Propel Output

6.6.5 Drill End Propel Output

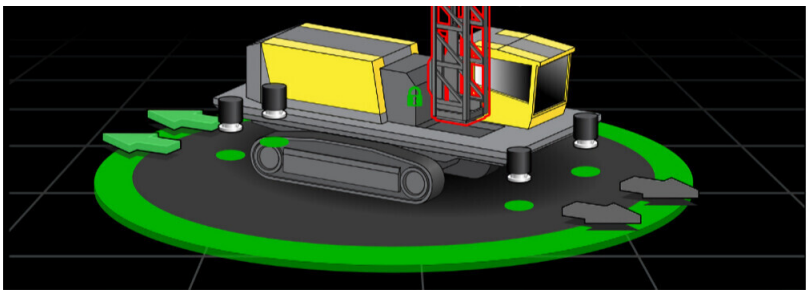
When the operator commands action to propel both of the tracks towards the drill end first, the green icons appear (figure Drill End Propelled First).



Drill End Propelled First

6.6.6 Non-drill End Propel Output

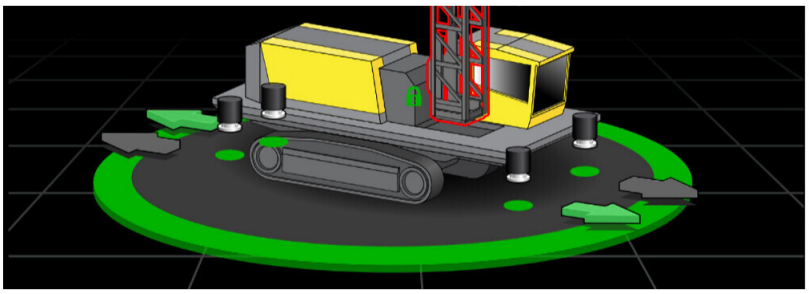
When the operator commands action to propel both of the tracks towards the non-drill end first, the green icons appear (figure Non-drill End Propelled First).



Non-drill End Propelled First

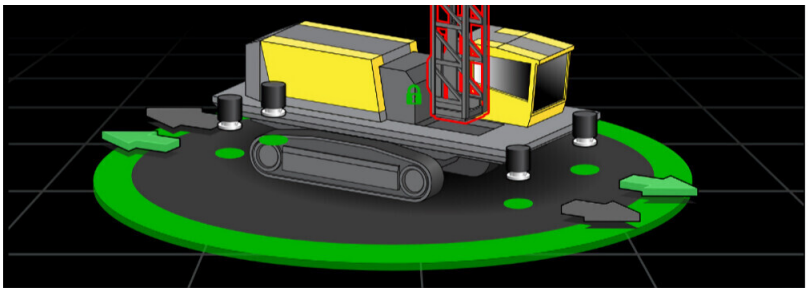
6.6.7 Counter Rotation Propel Output

When the operator commands action to counter rotate to the non-cab side first, the green icons appear (figure Counter Rotate to Non-cab Side).



Counter Rotate to Non-cab Side

When the operator commands action to counter rotate to the cab side first, the green icons appear (figure Counter Rotate to Cab Side).

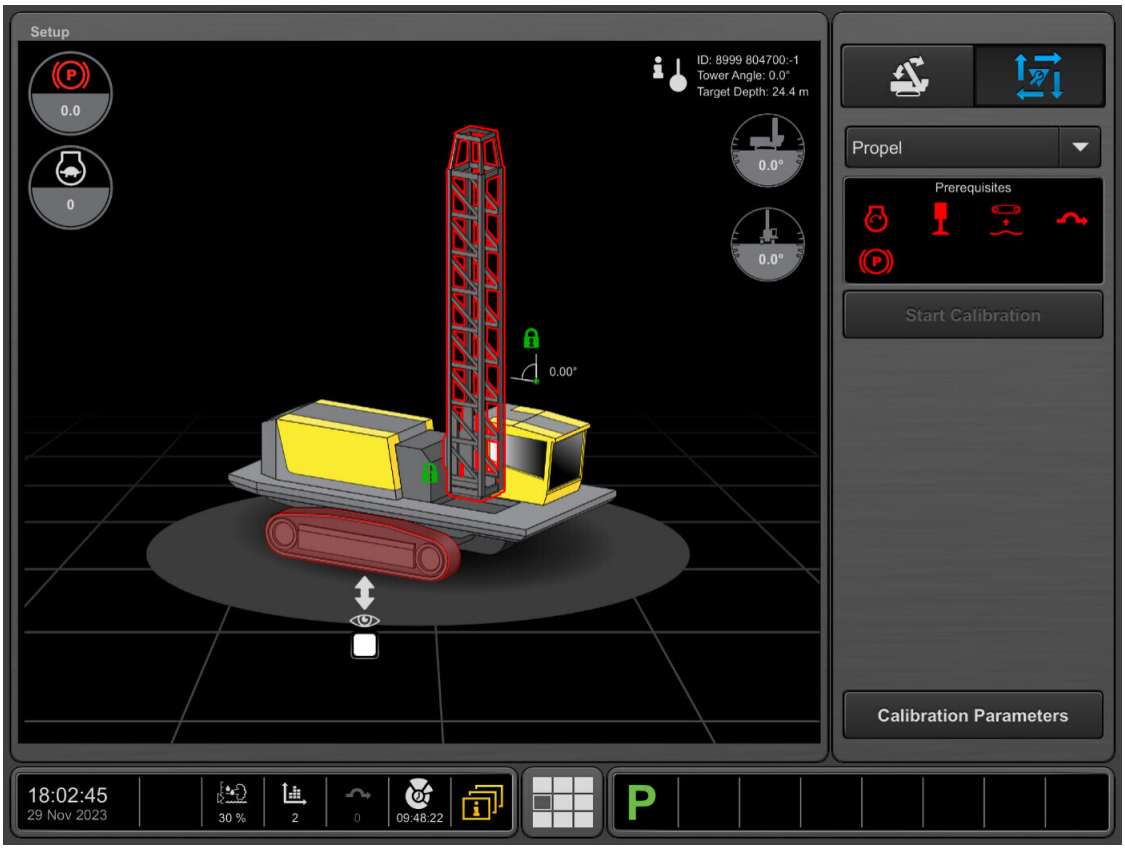


Counter Rotate to Cab Side

6.7 Track Auto Calibration

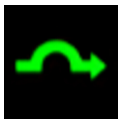
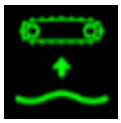
Track Auto Calibration *button*

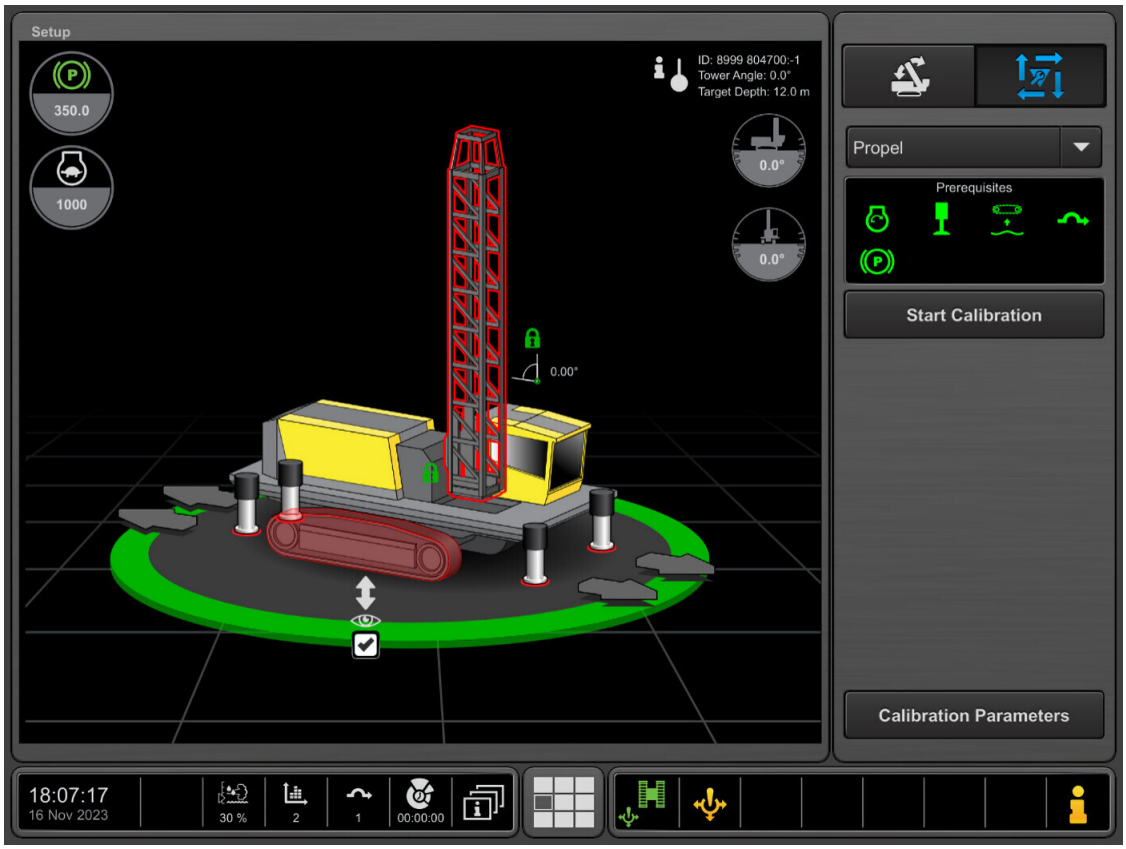
Select the **Track Auto Calibration** button on the **Setup** screen to access the **Track Auto Calibration** screen. Track auto calibration is available when all **Prerequisites** are met.



Example of the Track Auto Calibration Screen

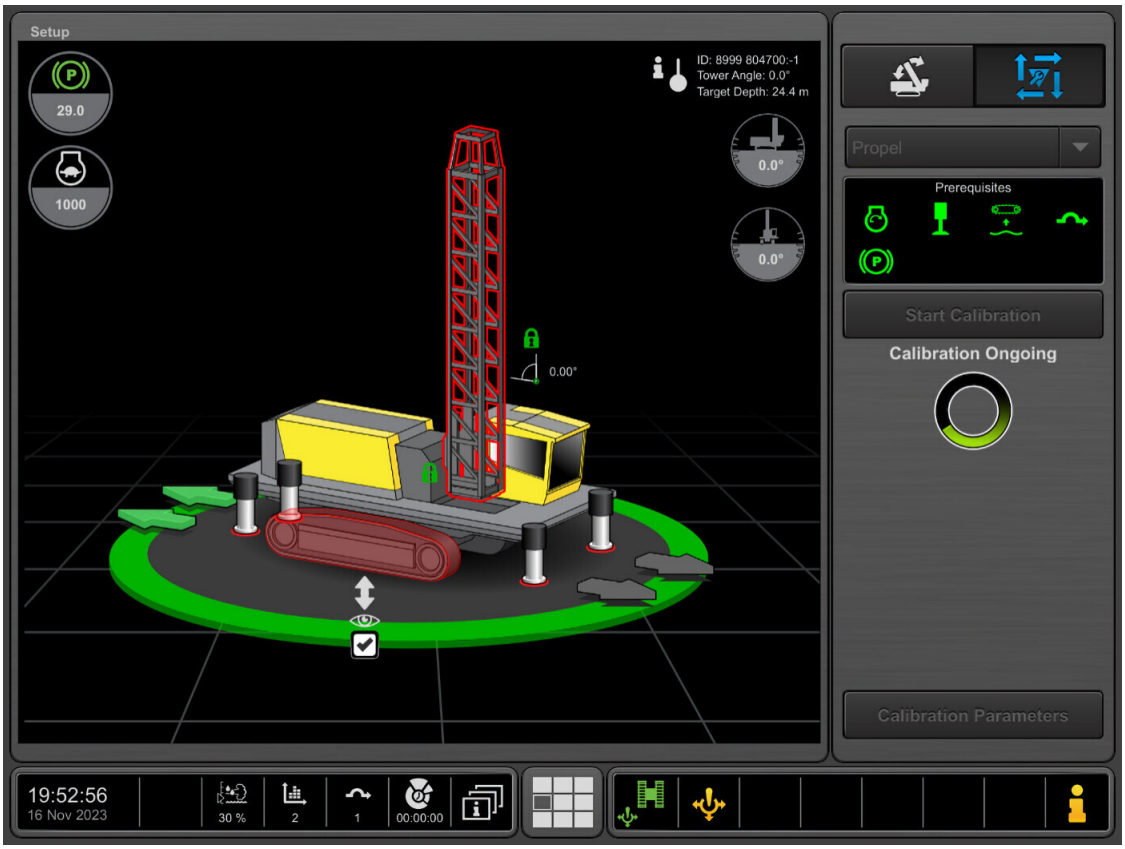
Icons and Buttons	Description
	The prerequisite engine condition is not met. The engine is off.
	The prerequisite engine condition is met. The engine is on.
	The prerequisite jack condition is not met. The jacks are not on the ground.
	The prerequisite jack condition is met. The jacks are on the ground.
	The prerequisite override condition is not met. The **Jacks Not Fully Retracted, Propel** override is not selected.

Icons and Buttons	Description
	The prerequisite override condition is met. The **Jacks Not Fully Retracted, Propel** override is active.
	The prerequisite parking brake condition is not met. The parking brake is not released.
	The prerequisite parking brake condition is met. The parking brake is released and the tracks can freely move.
	The prerequisite track condition is not met. The Tracks Above Ground Visual Inspection check box is not checked.
	The prerequisite track condition is met. The Tracks Above Ground Visual Inspection check box is checked.
Start Calibration	The **Start Calibration** button is available when all prerequisites are met.
Calibration Parameters	Shows the **Calibration Parameters** screen.



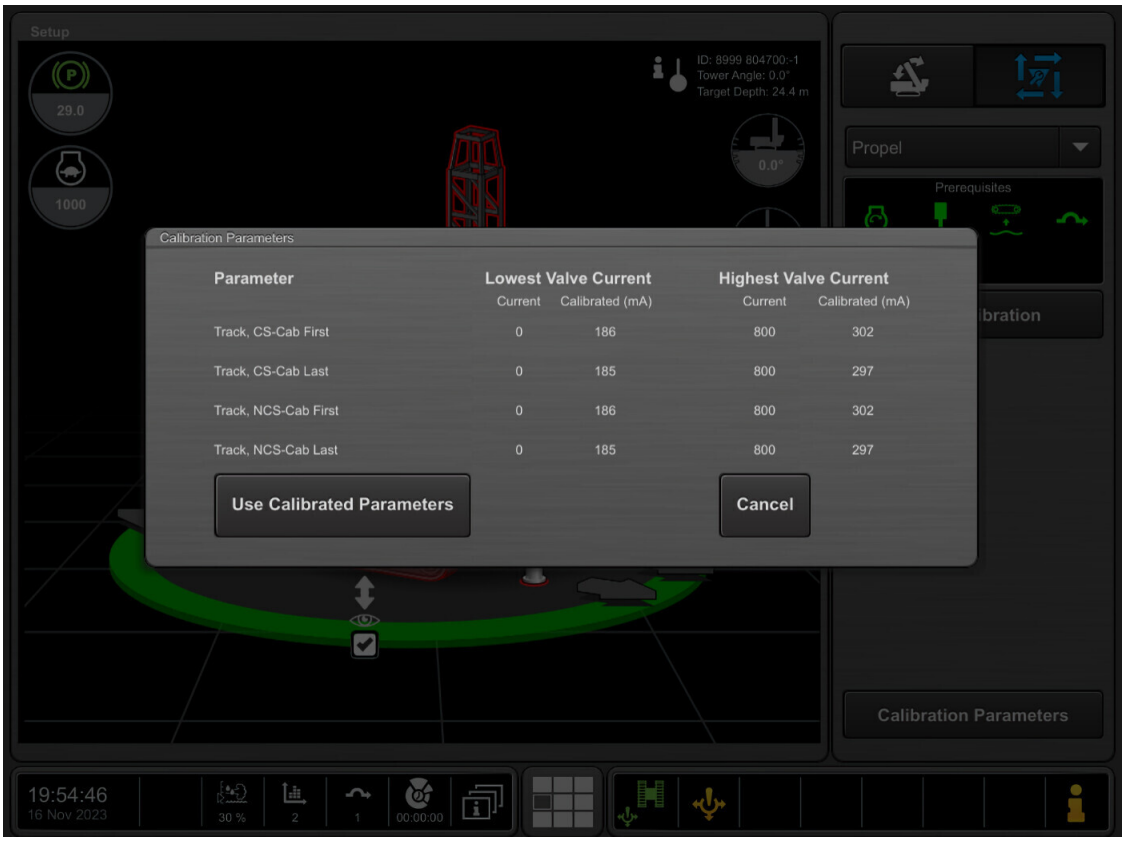
All Prerequisites Are Met

The tracks are active during auto calibration. Track movement is shown on the **Setup** screen.



Track Auto Calibration Is Ongoing

The **Calibration Parameters** screen shows once track auto calibration is complete.



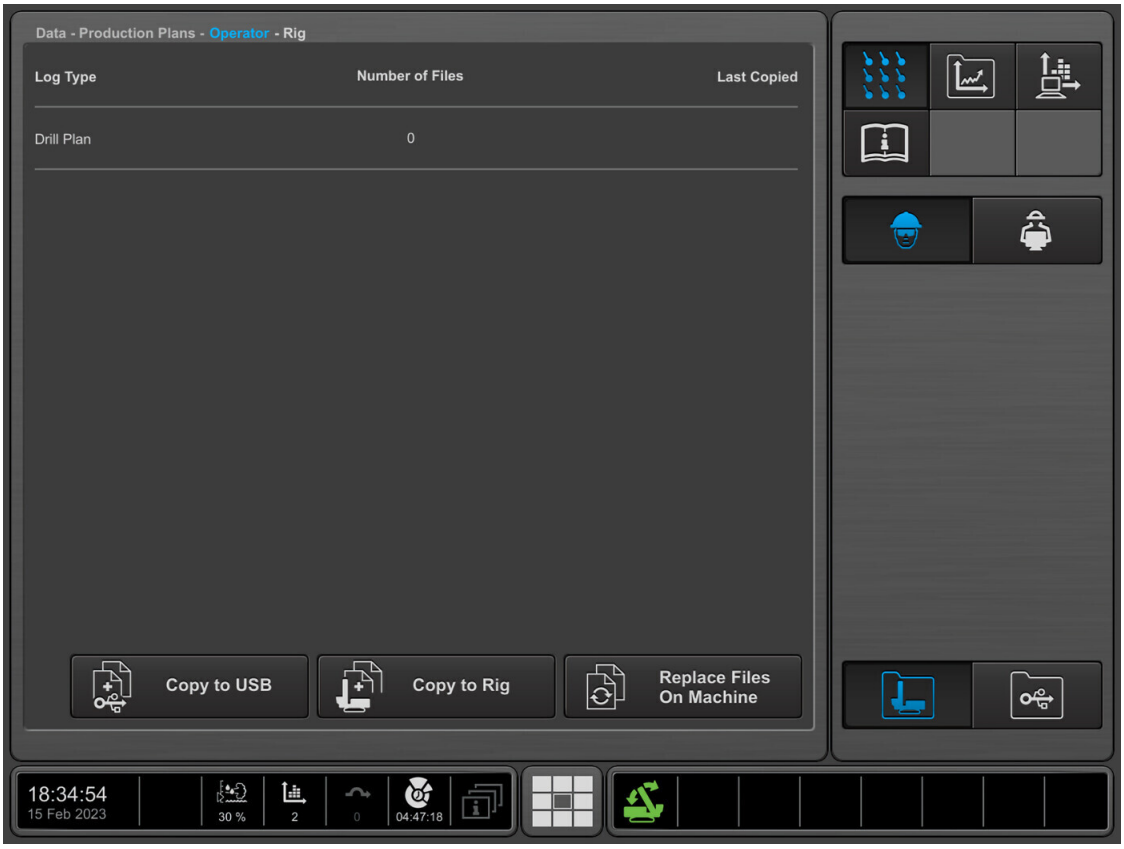
Example of the Track Auto **Calibration Parameters** *Screen*

Item	Description
Parameter	Shows the parameters affected by the track calibration.
Lowest Valve Current	Shows the current and calibrated values for the lowest valve current.
Highest Valve Current	Shows the current and calibrated values for the highest valve current.
Use Calibrated Parameters button	Accepts the new parameters and returns to the **Setup** screen.
Cancel button	Returns to the **Setup** screen.

7 Data Screen

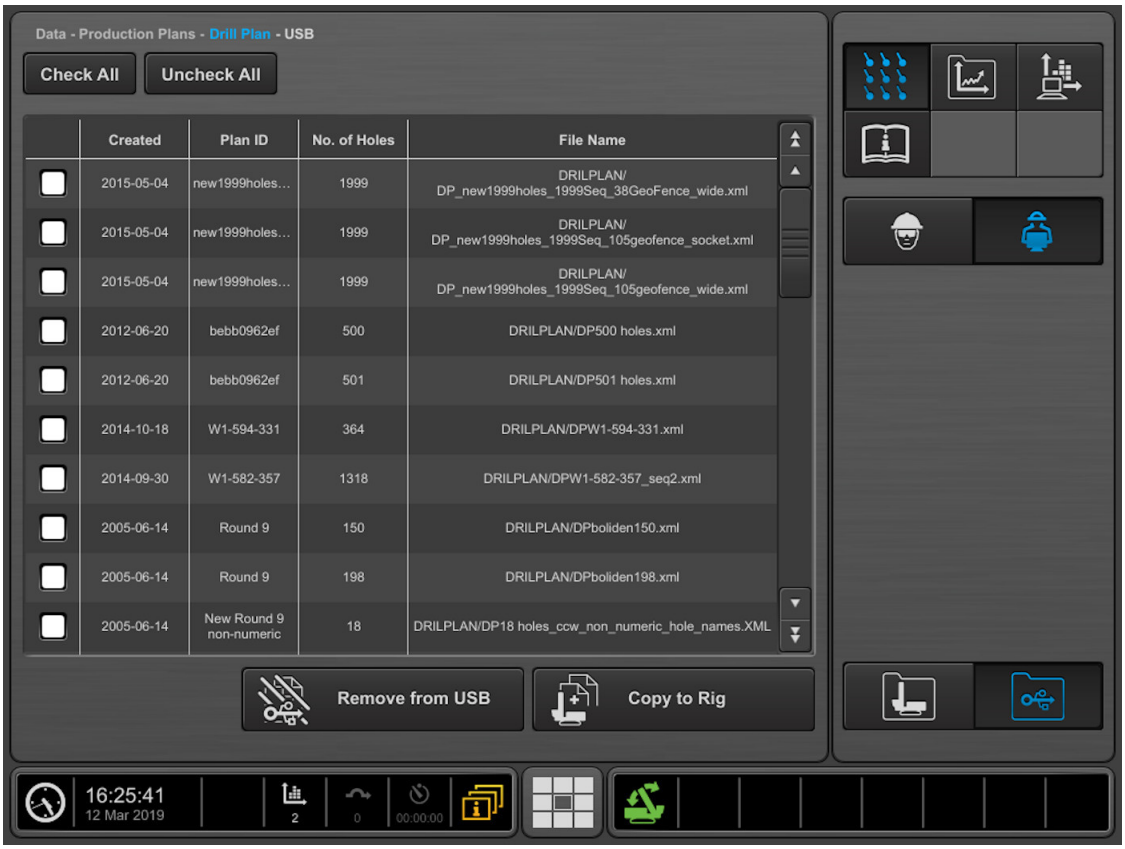
Data *Screen Button*

The **Data** > **Production Plans** > **Operator** screen shows the number of drill plans that are located on the machine or the USB flash drive, depending on the selection. The operator can add and replace files on the machine and the USB flash drive.



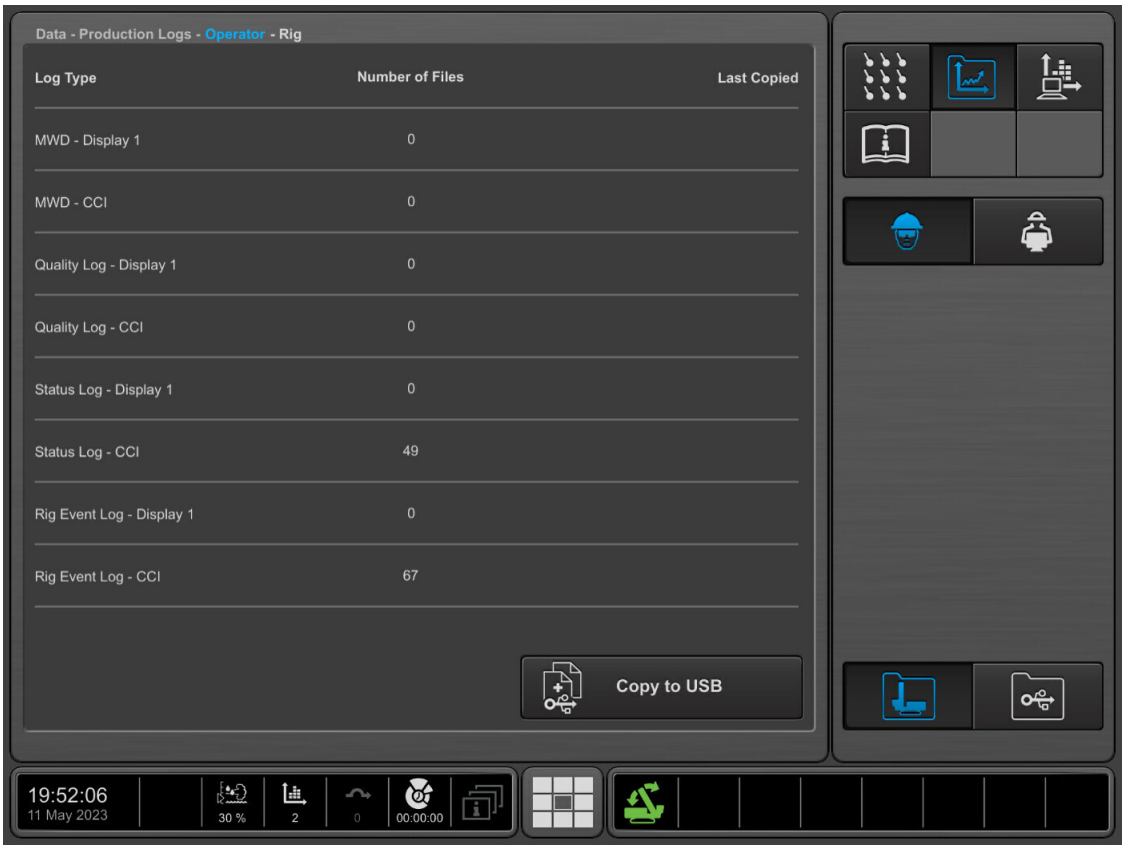
Example of the **Operator** *Screen*

The **Data** > **Production Plans** > **Drill Plan** > **Administration** screen has more information and functionality than what is available to the operator. The administrator can copy and remove drill plans from the machine or the USB flash drive, depending on the selection.



Example of the **Drill Plan** *Screen*

The **Data** > **Production Logs** > **Operator** screen shows the number of logs that are located on the machine or the USB flash drive, depending on the selection.



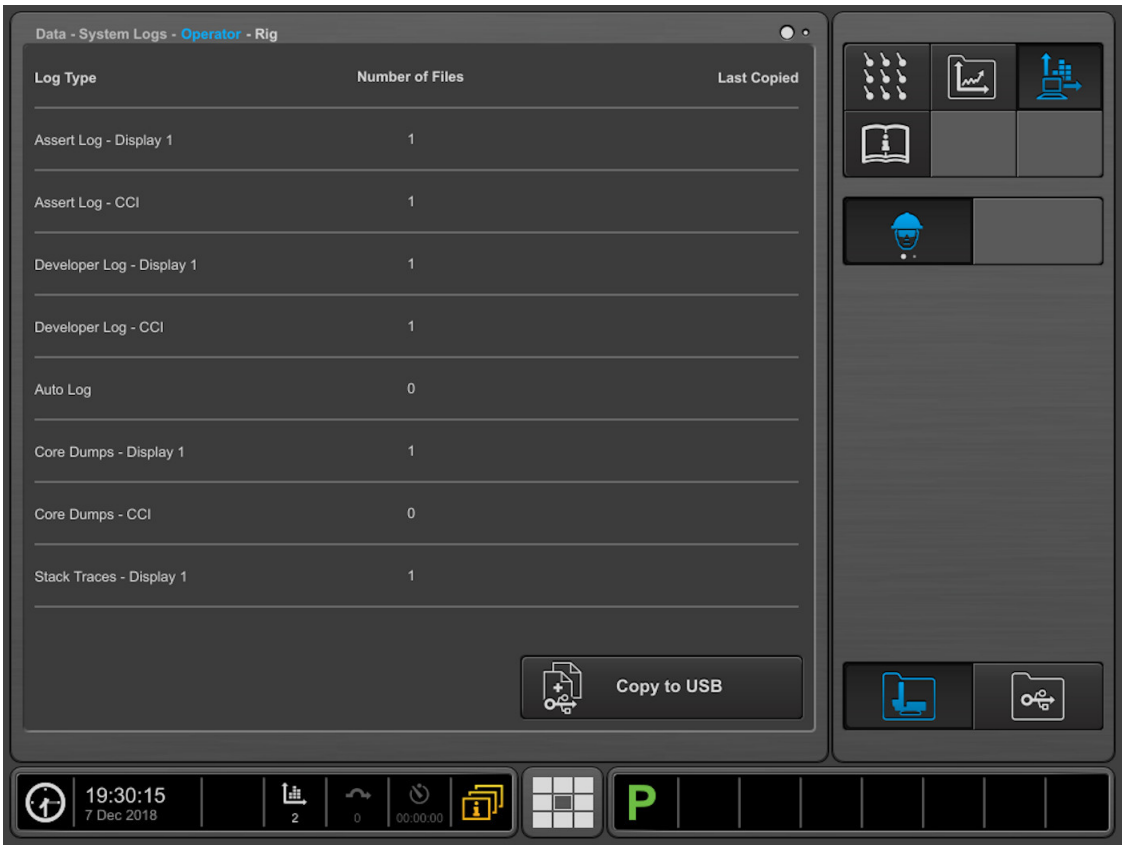
Example of the **Operator** *Screen*

Log Type	Number of Files
MWD - Display 1	Lists the total number of MWD logs on the display.
MWD - CCI	Lists the total number of MWD logs on the CCI.
Quality Log - Display 1	Lists the total number of quality logs on the display.
Quality Log - CCI	Lists the total number of quality logs on the CCI.
Status Log - Display 1	Lists the total number of status logs on the display.
Status Log - CCI	Lists the total number of status logs on the CCI.
Rig Event Log - Display 1	Lists the total number of machine event logs on the display.
Rig Event Log - CCI	Lists the total number of machine event logs on the CCI.

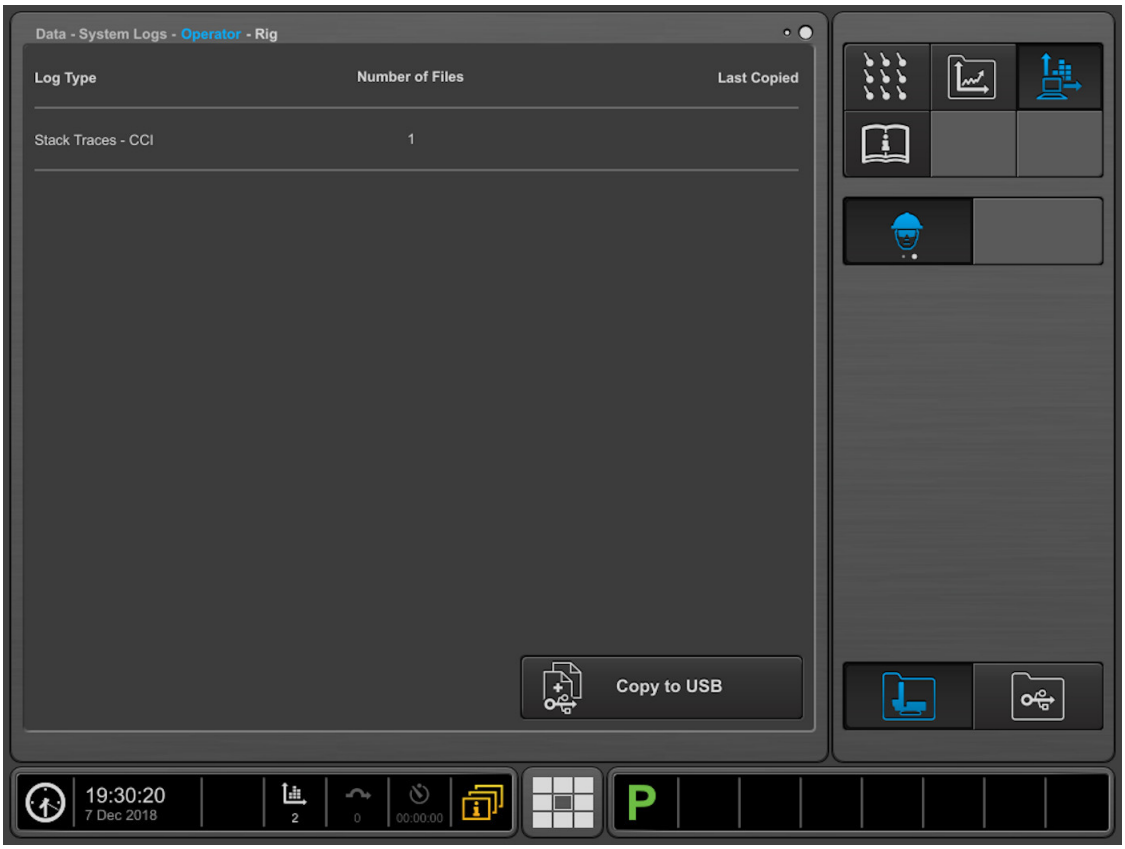
The **Data** > **Production Logs** > **Administration** screens have more information and functionality than what is available to the operator. The administrator can copy and remove files from the machine or the USB flash drive, depending on the selection.

Example of the **MWD** *Screen*

If the RCS detects an internal problem or saves log files after a display crash, the logs are found on the **Data** > **System Logs** > **Operator** screens. The logs can be saved and sent to Epiroc for analysis.

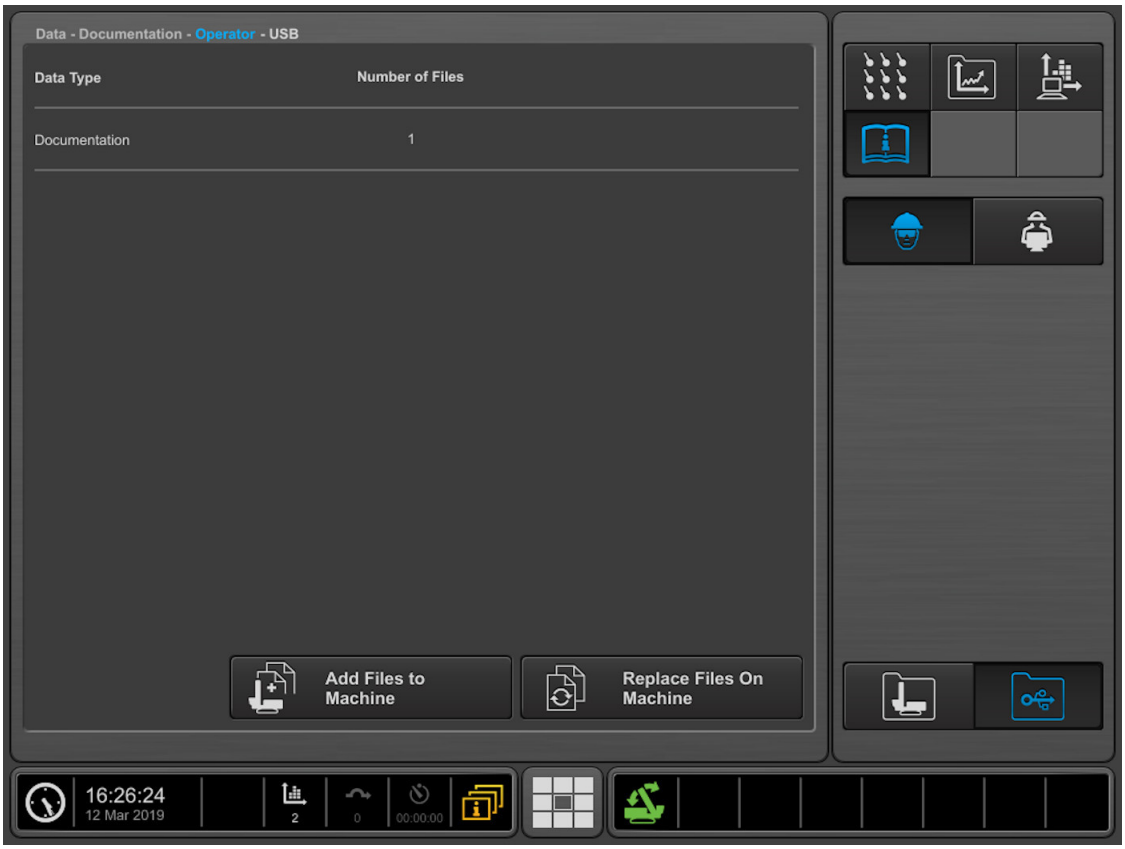


Example of the **Operator Rig** *Screen 1 of 2*



Example of the **Operator Rig** *Screen 2 of 2*

The **Data** > **Documentation** > **Operator** screen shows the number of files that are located on the machine or the USB flash drive, depending on the selection. The operator can add and replace files on the machine and the USB flash drive.



Example of the **Operator USB** *Screen*

The **Data** > **Documentation** > **Administration** screen has more information and functionality than what is available to the operator. The administrator can copy and remove files from the machine or the USB flash drive, depending on the selection.

Example of the **Administration** *Screen*

8 System Screen

System *Screen Button*

The **System** menu allows the operator to access and view the following:

- RCS hardware information
- Hardware error log
- Lever Control or Joystick calibration
- Administration screen to set unit of measurement and screen brightness
- System event log
- Ethernet IP addresses

WARNING

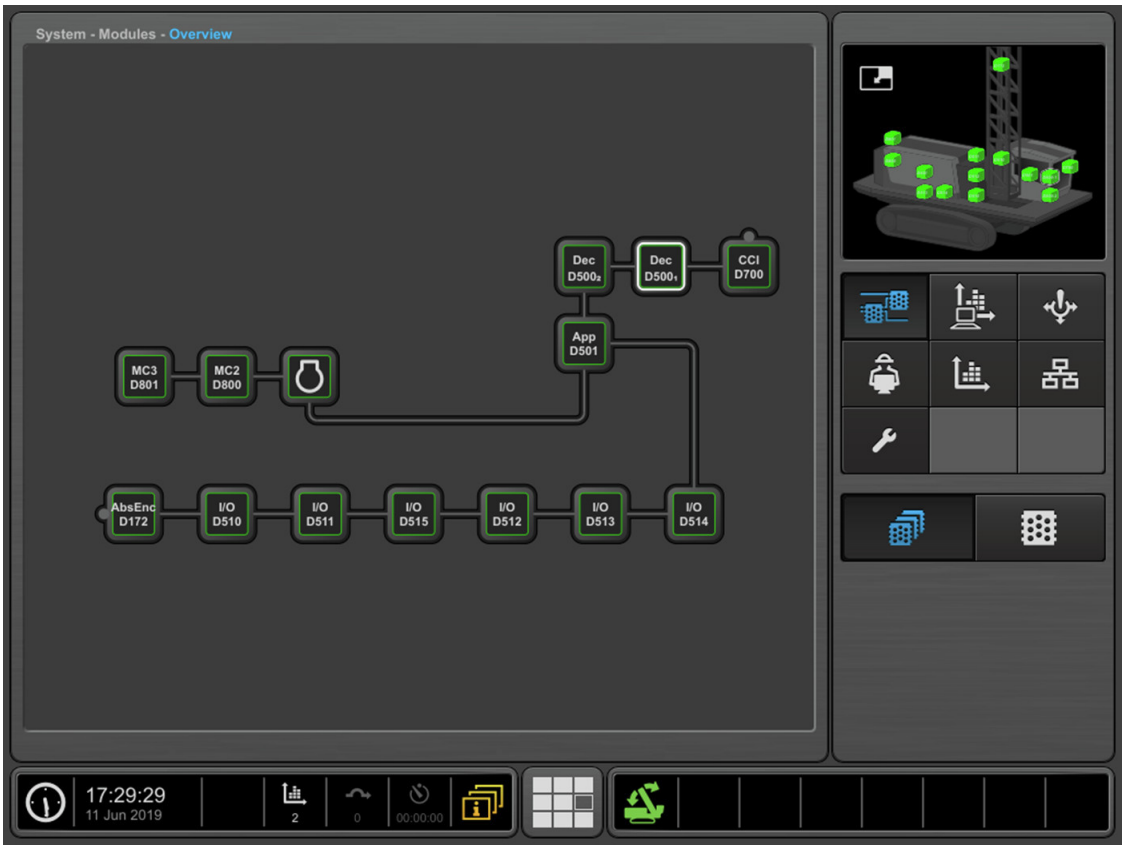
Risk of Unexpected Behavior

Active CAN faults may cause invalid interlock information, leading to serious injury or death and machine damage.

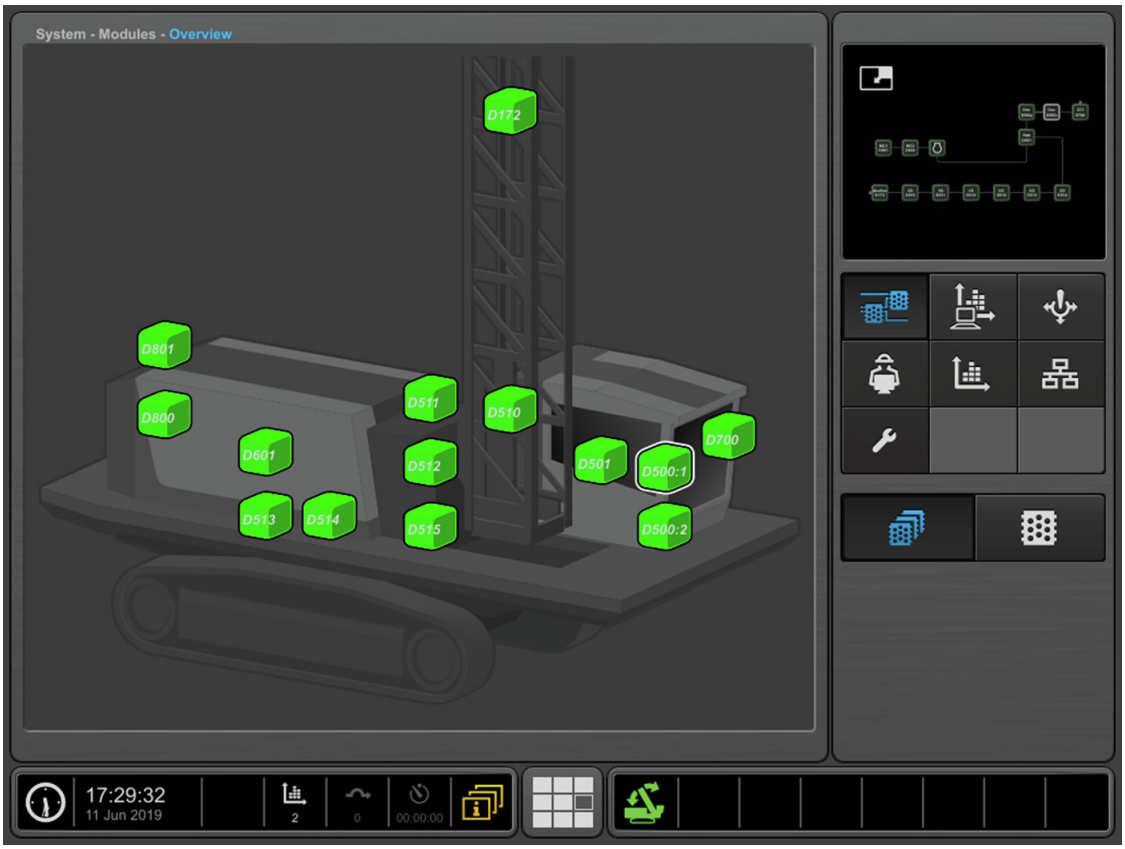
▶ When a CAN fault is active on an I/O module, the interlocks for that module are no longer valid. Do not use the machine when a CAN fault is active without verifying all interlocks before commanding machine movement.

Accessing the menu shows all of the input/output (I/O) modules comprising the system and their status. There are two CAN bus networks on the machine. The first network includes the display computer (central computer), I/O modules, and decoder. The second network is the display computer connected to the engine, EARS (MC2), and E-Stop V2 (MC3) using J1939.

Select the module toggle icon at the top-right corner to switch between 2D and 3D layout view.



Example of the **Overview** *2D Screen*



Example of the **Overview** *3D Screen*

2D View	3D View	Description
		Green icon status shows no communication or output issues with a module.
		Yellow icon status may signify the following: • Fault detected with one or more module output. • Fault detected with software version.
		Red icon status identifies a fault with the CAN communication to the module.

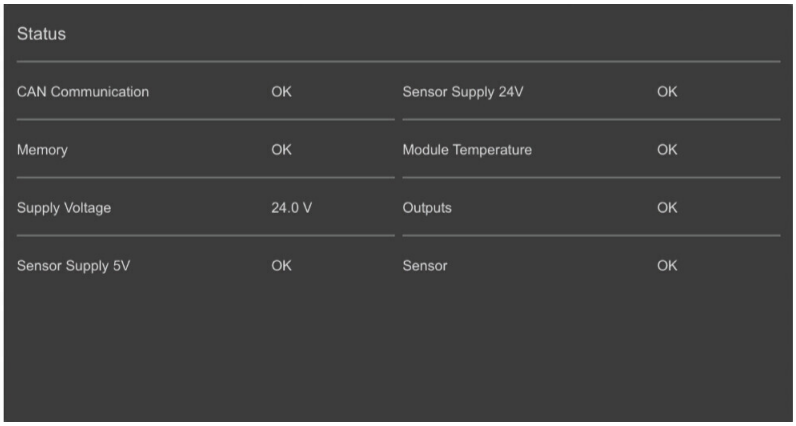
The display computer and diesel engine ECM are connected by J1939 CAN bus. The engine ECM are identified as D601. All engine protection is handled by the engine ECM. Only engine starting, normal throttle up and throttle down, normal engine shutdown, and emergency shutdown (non-engine related) are controlled through the RCS system. The engine J1939 CAN bus is connected to the RCS display computer to show the engine parameter data, SAE faults, and status, as well as EARS and emergency stop information.

All modules and decoders are nodes on the network. Any node that has an issue, an off-line or error communication, or an open output all appear as red. Select the red module to determine the reason. Often the reason is a missing output load. A less frequent reason is the loss of

CAN communication. A system fault such as a break in CAN communication or power supply to the module appear with the corresponding module shown in red. The status LED starts flashing rapidly. The normal flash rate is one flash per second. All nodes that are operational and on-line appear green in color. Select the icon to access more information about that particular module.

8.1 Status Information

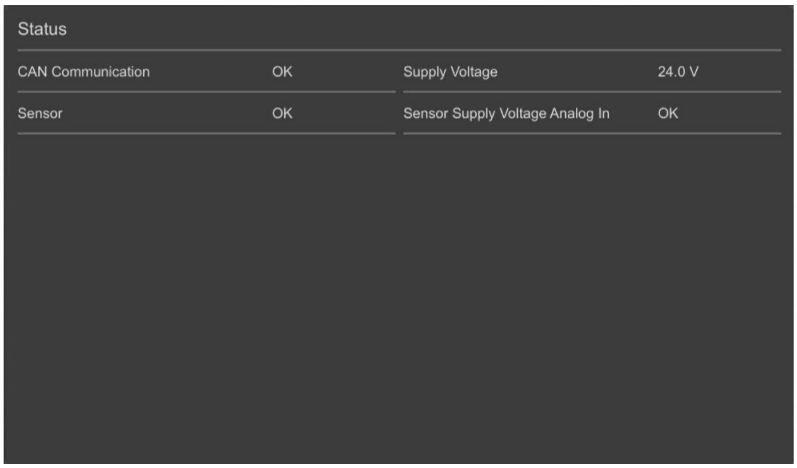
The information in the **Status** screen changes depending on the selected component type.



Example of I/O and RRC Module **Status** *Screen*

I/O and RRC Module Status Screen Descriptions

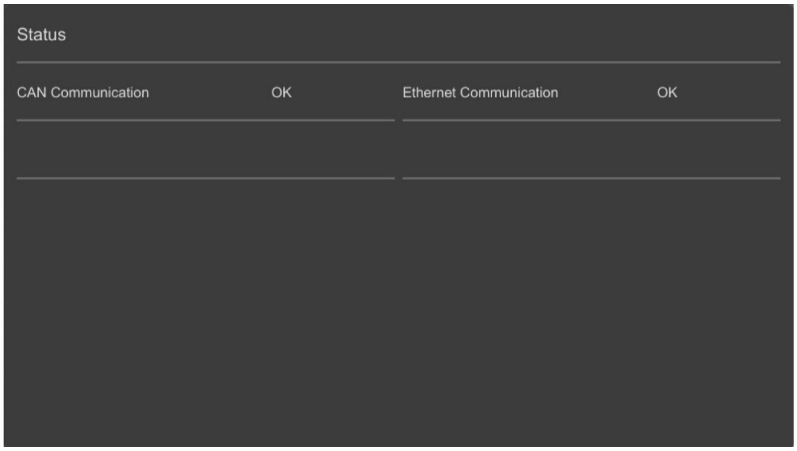
Status	Description
CAN Communication	Shows the CAN communication condition.
Memory	Shows the memory condition on the selected component.
Supply voltage	Shows the supply voltage of the component.
Sensor supply 24V	Shows the supply voltage output to the sensors.
Module temperature	Shows if the temperature of a component is within acceptable range.
Outputs	Shows any detected faults with the output connections.
Sensor supply 5V	Shows the supply voltage output to the sensors.
Sensor	Shows any detected faults with the sensor connections.



Example of Decoder Module **Status** *Screen*

Decoder Module Status Screen Descriptions

Status	Description
CAN Communication	Shows the condition of the CAN communication module.
Sensor	Shows any detected faults with the sensor connections.
Supply Voltage	Shows the supply voltage of the component.
Sensor supply voltage analogue in	Shows the supply voltage feedback from the operator panel and the joy-stick.



Example of RCS GUI Module **Status** *Screen*

RCS GUI Module Status Screen Descriptions

Status	Description
CAN communication	Shows the condition of the CAN communication module.
Ethernet communication	Shows the condition of the Ethernet connection to the network switch.

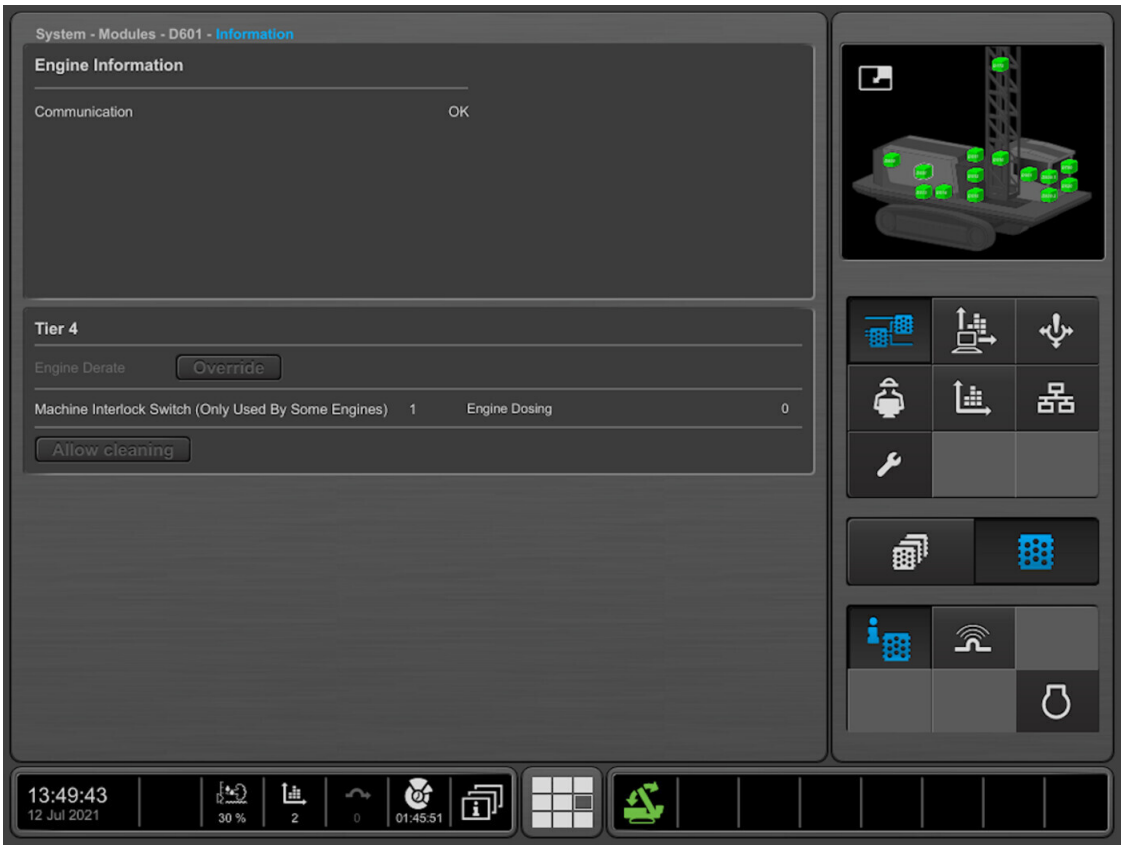
8.2 Module Detailed Information

Selecting any of the modules shows the **System** > **Modules** > * > **Information** screen.

* Refers to the module name from the modules list in the system section.

Example of the **Information** *Screen for the D510 Module*

Identifier	Status Description
Article number	Shows the article number of the component.
Version	Shows the application version of the installed component.
Serial number	Shows the serial number of the installed component.



Example of the **Information** *Screen for the D601 Module*

Identifier	Status Description
Machine Interlock Switch	Present on machines with Cummins® High-Horsepower Tier 4 engines only. Shows if aftertreatment cleaning is allowed. • 1 = The machine has been idle for 5 minutes and aftertreatment cleaning is allowed. • 0 = The machine is energized and aftertreatment cleaning is not allowed.
Engine Dosing	Shows when extra diesel is injected into the aftertreatment system to help with cleaning. • 1 = Engine dosing is energized. • 0 = Engine dosing is not energized.

8.2.1 Module Sensors

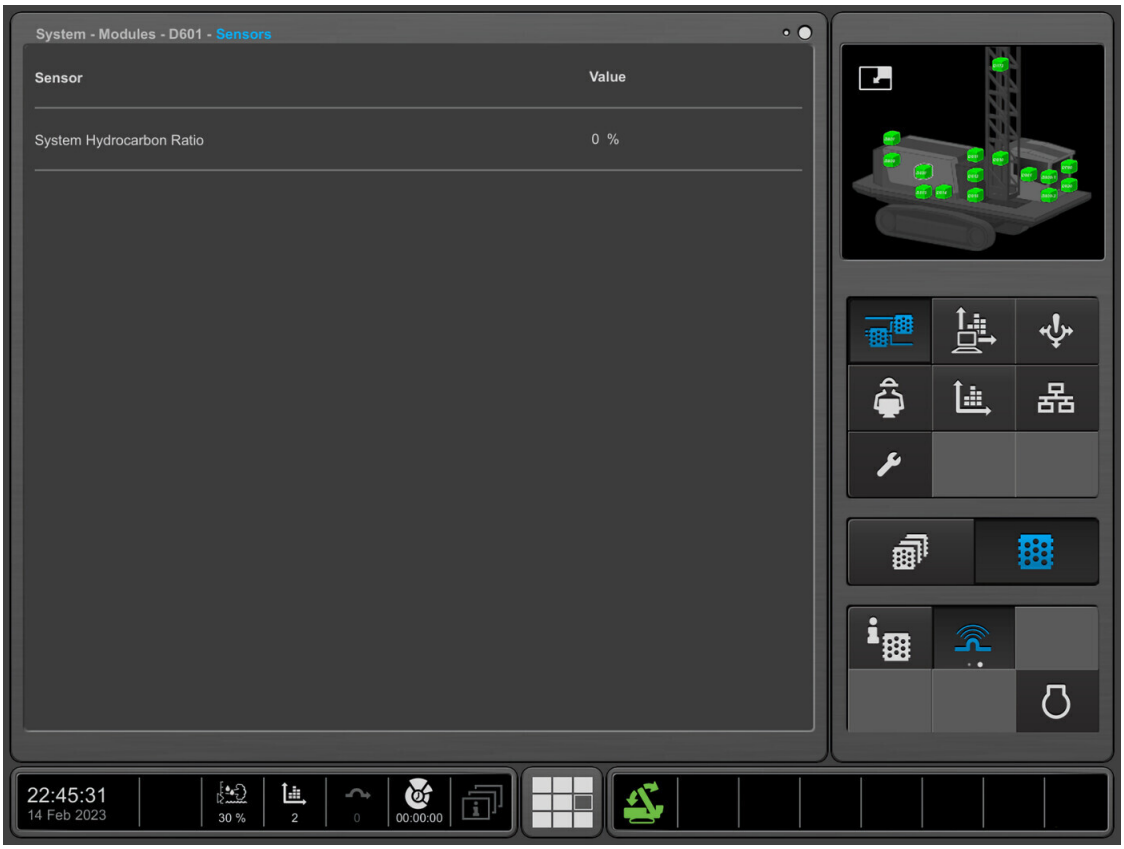
Select **System** > **Modules** > * > **Sensors** to view sensor input status from assigned ports.

* Refers to the module name from the modules list in the system section.

Example of the **Information** *Screen 1 of 2 for the D510 Module*

Example of the **Information** *Screen 2 of 2 for the D510 Module*

Example of the **Information** *Screen 1 of 2 for the D601 Module*



Example of the **Information** *Screen 2 of 2 for the D601 Module*

> ***NOTE:*** *The* **System Hydrocarbon Ratio** *shows when the Tier 4 engine option is enabled. A system event message appears when the measured percentage is above 83%. The system event message clears when the measured percentage decreases to below 78%.*

8.2.2 Module Actuations

Select **System** > **Modules** > * > **Actuations** to view sensor input status from assigned ports.

* Refers to the module name from the modules list in the system section.

Example of the **Actuations** *Screen for the D510 Module*

8.2.3 Module Schematics

Select **System** > **Modules** > * > **Module Schematics** to view all connections to RCS components. The **Module Schematics** screen shows the following:

- Input and output conditions
- Power supply conditions
- Status information

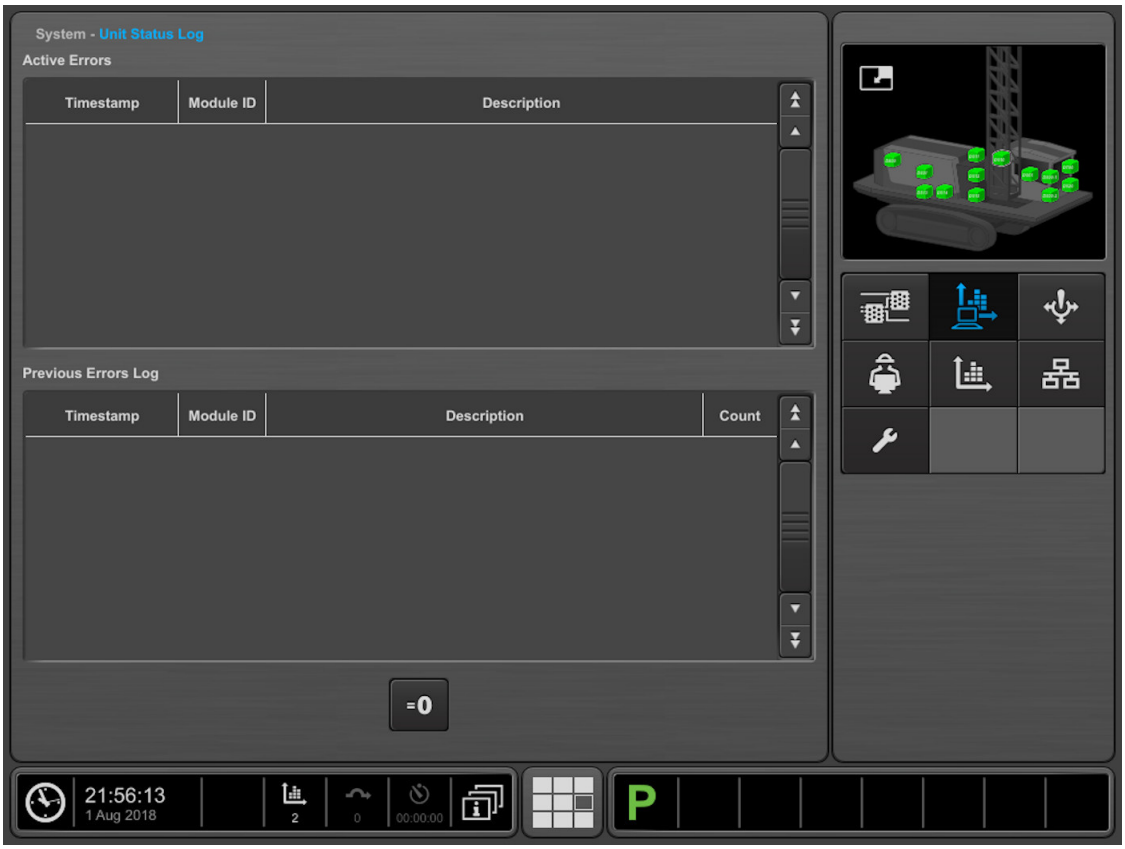
* Refers to the module name from the modules list in the system section.

Example of the **Module Schematics** *Screen for the D511 Module*

> ***NOTE:*** *Refer to machine specific electrical schematics for further information on component connections.*

8.2.4 Unit Status Log

The **Unit Status Log** shows the logged records and component issues.



Example of the **Unit Status Log** *Screen*

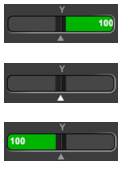
Identifier	Status Description
[redacted]=0[redacted]	Resets the error logs to 0 (zero).
Timestamp	Shows the date and time of the error. <DATE><TIME>
Module ID	Shows the module associated with the error.
Description	Shows the error contact point and the error description.
Digital input error, flickering value	Shows the digital input changed between active (1) and not active (0) repeatedly.
Analog input error, signal out of range	Shows the analog input as either: • Voltage input is less than 0.25 VDC or greater than 4.8 VDC. • Current input less than 0.22 mA or greater than 20 mA.

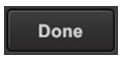
8.3 Controls and Calibration

The **System** > **Controls and Calibration** > **Control Calibration** screen gives the user two options:

- Control and joystick calibration
- RRC diagnostics

Example of the **Control Calibration** *Screen*

Graphic	Description
	Shows movement of the joystick along the X axis. Movement of the joystick along this axis away from and towards the operator is depicted on the GUI. The graphics show the joystick all the way away from the operator, neutral, and all the way towards the operator.
	Shows movement of the joystick along the Y axis. Movement of the joystick along this axis to the left and right is depicted on the GUI. The graphics show the joystick all the way to the left, neutral, and all the way to the right.

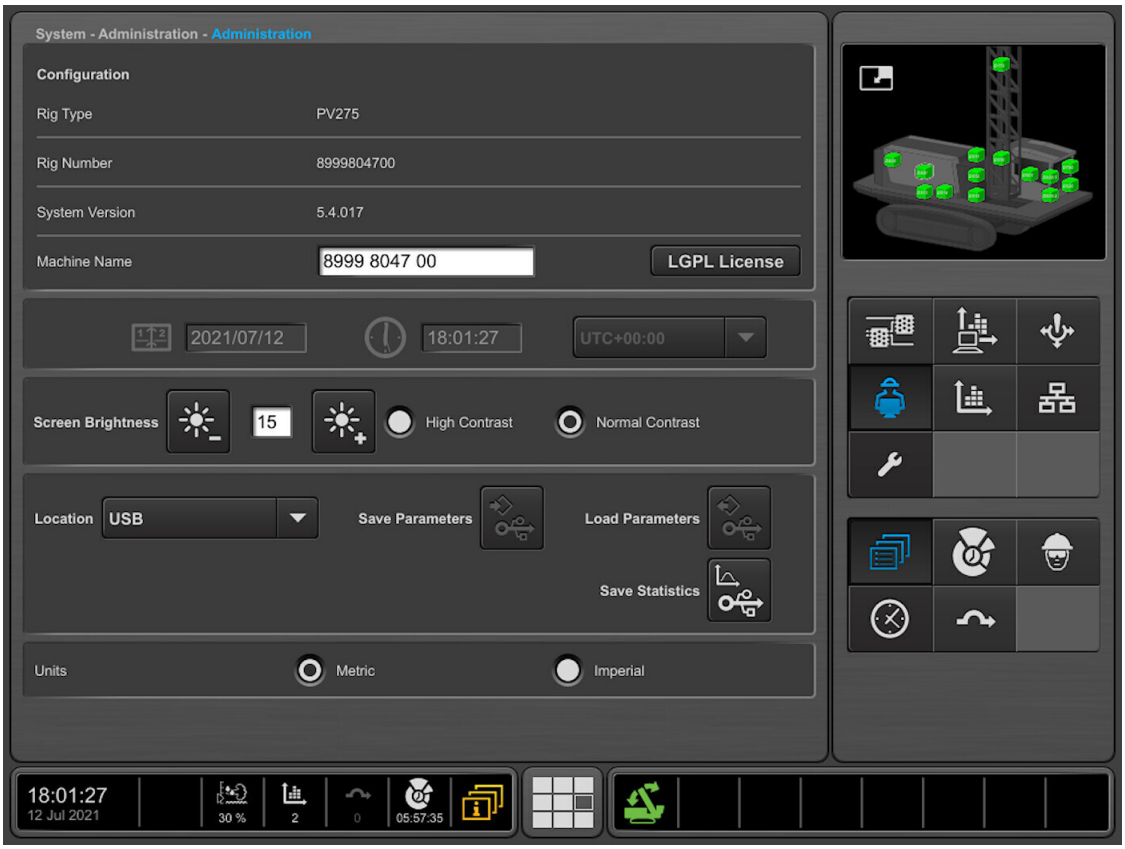
Graphic	Description
	Shows movement of the switch on the joystick along the Z axis. Movement of the switch along this axis away from and towards the operator is depicted on the GUI. The graphics show the joystick all the way away from the operator, neutral, and all the way towards the operator.
	Shows movement of the feed force knob. Adjustment of the knob is depicted graphically on the GUI. The graphics show movement of the knob all the way to the left and right.
	Shows movement of the holdback force knob. Adjustment of the knob is depicted graphically on the GUI. The graphics show movement of the knob all the way to the left and right.
	The **Calibration** button enables the operator to calibrate the machine controls. Selecting this button after calibration will reset the controls.
	Select the **Done** button to exit the control calibration mode.
	This is not available at this access level.
	This is not available at this access level.

Control Calibration is Active

8.4 Administration

Selecting **Administration** provides the user with two options:

- Administration
- Delay codes



Example of the **Administration** *Screen*

Identifier	Description
Rig Type	Identifies the machine type.
Rig Number	Shows the machine's assigned serial number.
System Version	Shows the currently installed software version.
Machine Name	Shows the unique identifier for the machine set by the customer. Selecting this field show a alpha-numeric keyboard that allows the operator to change the machine name. This information is used on production logging reports.
LGPL License	Displays the GNU Lesser General Public License agreement.
Date	Sets the calendar date in year/month/day format. This field cannot be edited if the machine is connected to a time server.
Time	Sets the time in 24-hour format. This field cannot be edited if the machine is connected to a time server.
Time Zone	Sets the time zone for the location of the machine. This field cannot be edited if the machine is connected to a time server.
Screen Brightness	Select the decrease or increase screen brightness button to adjust the brightness. The buttons adjust brightness by increments of 1 between values of 1 and 9, and after 9 by increments of 2 up to 15. Select the free-text field to enter a brightness value.

Identifier	Description
High Contrast **Normal Contrast**	Sets the screen to either a high-contrast presentation with a light gray background or a normal presentation with a dark gray background.
Location	Sets the location from where parameters and statistics are saved and loaded.
Save Parameters	Saves the parameter database to the target. The machine must be off to save parameters.
Load Parameters	Loads the parameter database from the system. The machine must be off to load parameters.
Save Statistics	Saves a file of current statistics that are viewable on the **Performance** screen.
Units	Allows the user to select between metric and US Standard units shown on the RCS GUI.

8.4.1 TUM

Example of the **TUM** *Screen 1 of 2*

The active TUM code and its start time appear at the top of the window.

Identifier	Description
Show all categories	Allows the user to filter by category which TUM codes show in the window.
Search	Allows the user to do a keyword search to find TUM codes. Search results show in the window.
	Clears the keyword search result.
Start	Starts the selected TUM code.
TUM code list	TUM codes with a selected check box appear in the TUM code quick-select list in the system tray. Remove the check from the check box to remove the TUM code from the quick-select list. Selected TUM codes are blue. Select **Start** to start the selected TUM code.
Load	Opens a window to let you load a TUM code list to the RCS display.
Machine or **USB Save**	Saves the TUM code list to either the machine or USB flash drive based on the selection.

Example of the **TUM** *Screen 2 of 2*

On the automated TUM screen, you can do the following:

- Add, edit, and delete automated TUM transitions.
- Enable or disable transitions.
- Import and export all transitions to a file. Importing transitions overrides all existing configurations.

8.4.2 Operators

Example of the **Operators** *Screen*

The **System** > **Administration** > **Operators** screen shows which operators are currently available. New operators can be added individually by entering the user name into the free text field and selecting **New Operator**. User lists can be loaded from a USB flast drive by selecting **Load**. To remove a user from the list, select the user or users to remove and select **Delete**.

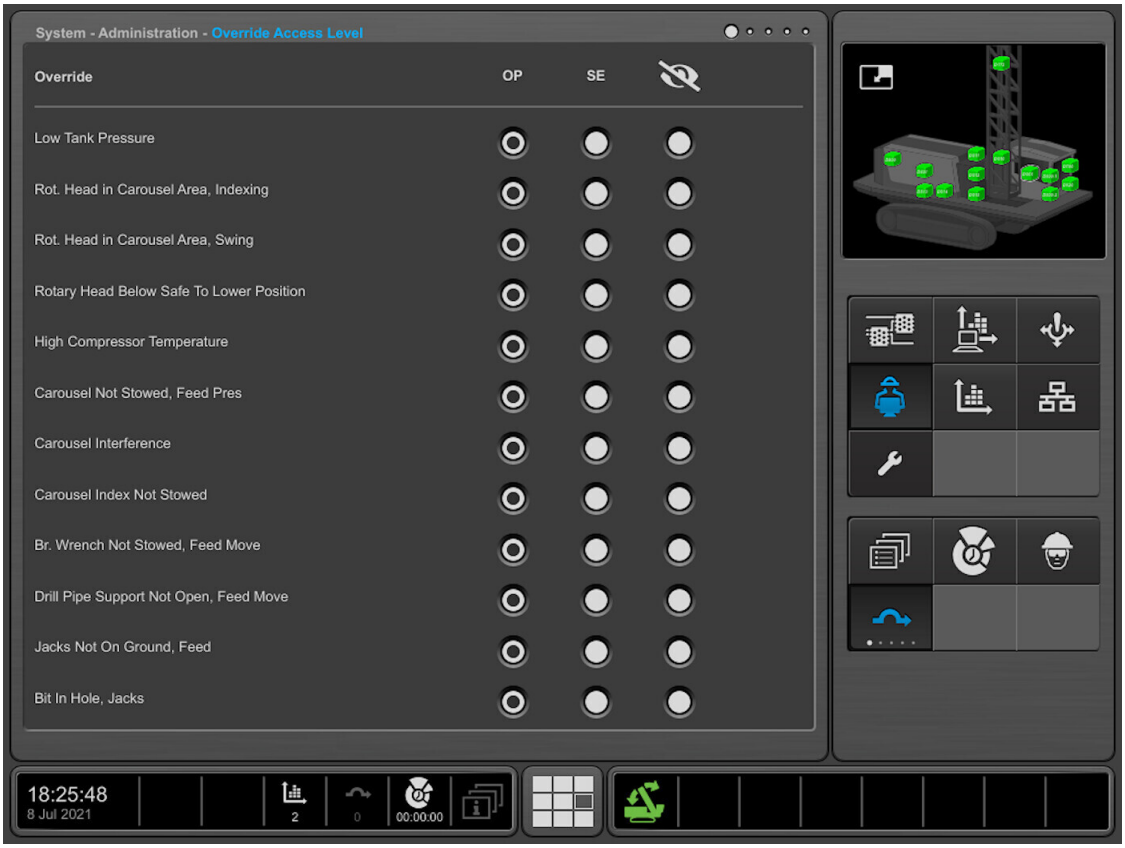
> ***NOTE:*** *If Surface Manager is active in the program, users cannot manually load users. Users can use the* **Load** *button to select a new file.*

8.4.3 SNTP Client

Example of the **SNTP Client** *Screen*

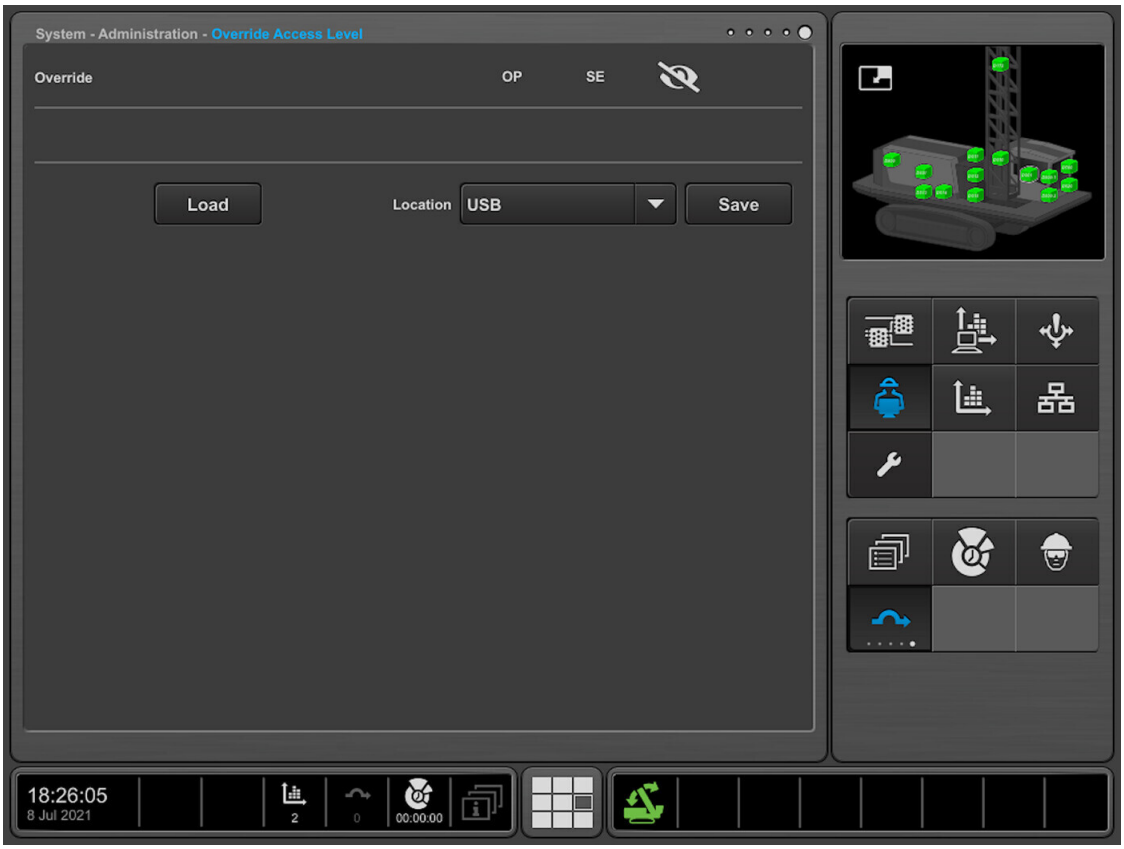
Identifier	Description
SNTP Client on CCI	Enables the simple network time protocol client on the CCI, which allows the RCS to synchronize its clock with a network clock.
Server IP	Sets the IP address of the simple network time protocol server.
Max Time Difference	Sets the maximum allowed time difference between the machine and the simple network time protocol server.

8.4.4 Override Access Level



Example of the **Override Access Level** *Screen*

The **System** > **Administration** > **Override Access Level** screens let the user with **SE2** access or higher customize the overrides for lower-level users **OP** and **SE**. Selecting a higher access level for an override prevents users with lower access levels from using that override. Selecting the **Hidden** setting prevents all **OP** and **SE** users from using that override.



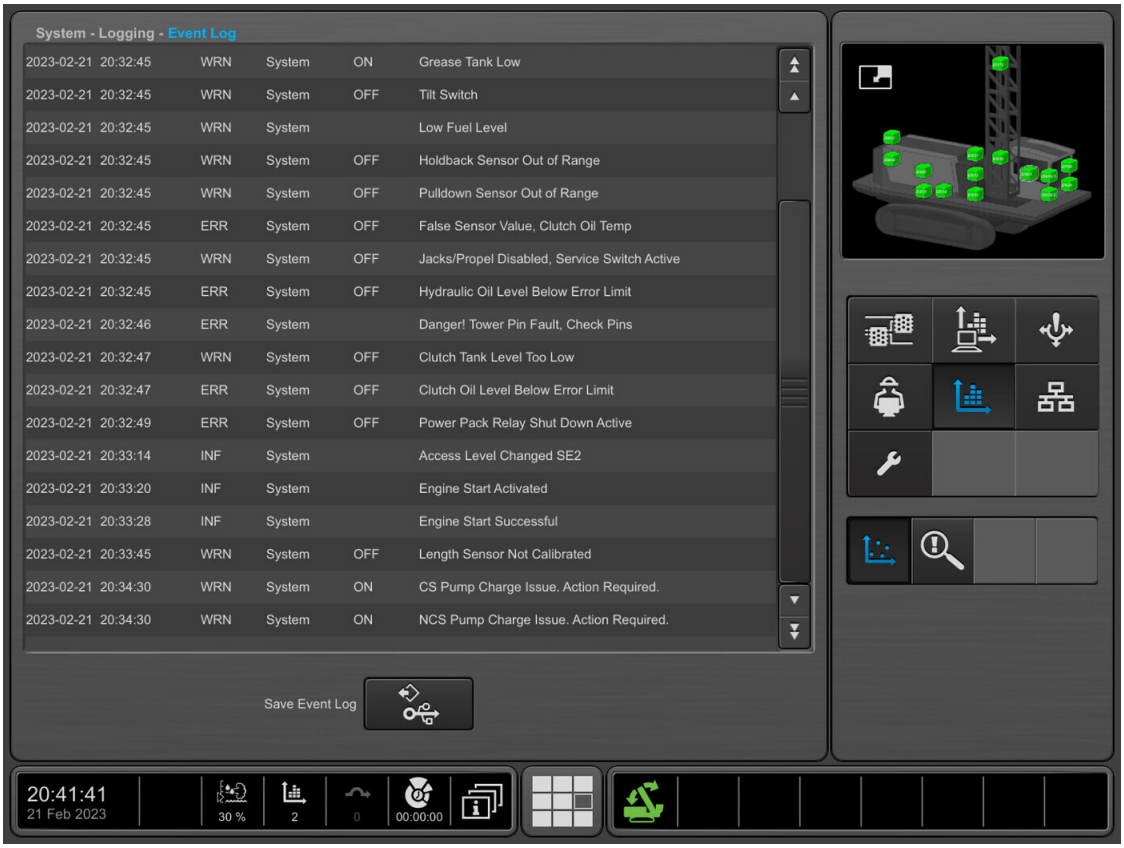
Example of the **Override Access Level** *Last Screen*

Lets the user import or export a file containing the customized override access levels. The name of the file is **OverrideAccessLevel.json**.

- The file can be imported onto the machine from a USB flash drive by setting the location to **Machine** and selecting **Load**.
- The file can be exported onto a USB flash drive from the machine by setting the location to **USB** and selecting **Save**.

8.5 Logging

8.5.1 Event Log



Example of the **Event Log** *Screen*

Event Log Format

Identifier	Description
Date	Shows the date logged in the following format: YYYY-MM-DD YYYY=Year, MM=Month, DD=Day
Time	Shows the time logged in the following format: HH:MM:SS HH=Hours, MM=Minutes, SS=Seconds
Event Type	Shows what type of event has occurred. INF=Information, ERR=Error, WRN=Warning
System	Default Status Identification System
Event Condition	Shows if the event is active or inactive.

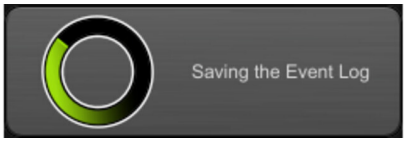
Identifier	Description
	ON=Event Active, OFF=Event Inactive
Event Description	Brief description of the event that occurred

Saving an Event Log to a USB Flash Drive

1. Insert an Epiroc USB flash drive into the X7 connection port.
2. Select the **Save Event Log** button.

Step result

➔ The RCS GUI shows the event log save occurring.



The **Event Log Saved** system message appears when the save operation is complete.

3. Select **Ok** on the **Event Log Saved** system message to close the message.

8.5.2 Fault Finding Logs

Example of the **Fault Finding Log** *Screen*

Selecting the **Save** button will save the fault finding logs to a USB flash drive.

8.6 Network

The **System** > **Network** > **General** screen gives the two options:

- Network general settings.
- CCI, RRA, and ACMS network settings.

Example of the **General** *Screen 1 of 2*

Identifier	Description
DISP	Shows network settings of the DISP module.
Ethernet Card	Identifies the network adapter that is installed in RCS GUI.
Link Status	Shows the condition of the connection between the Ethernet card and network hardware. • **Unknown**: No connection to network switch detected. • **Link Established**: Connection to network switch detected.
IP Address	IP address for RCS GUI. Default: 192.168.100.030
Subnet Mask	Subnet mask of Epiroc network. Default: 255.255.255.000
Gateway	Gateway of Epiroc network. Default: 192.168.100.001
Ping from DISP	Verifies connectivity between the display and a given IP address.
Video Server	IP address for the video server.

Example of the **General** *Screen 2 of 2*

Identifier	Description
CCI	Shows network settings of the CCI module.
Ethernet Card	Shows the connection status of the Ethernet card.
Link Status	Shows if the controller is connected to the network.
IP Address	IP address of the Epiroc network. Default: 192.168.100.010
Subnet Mask	Subnet mask of the Epiroc network. Default: 255.255.255.000
Gateway	Gateway address of the Epiroc network. Default: 192.168.100.001
Ping from CCI	Shows the network response time with a ping from the CCI to the provided IP address.
CCI - External Interface	Shows network settings of the CCI - external interface module.
Ethernet Card	Shows the connection status of the Ethernet card.
Link Status	Shows if the controller is connected to the network.

Identifier	Description
IP Address	IP address of the mine or external network. The IP address is the connection to X10 of the CCI.
Subnet Mask	Subnet mask of the mine or external network.
Gateway	Gateway address of the mine or external network.

Example of the **Remote** *Screen*

Identifier	Description
RRA Server	Shows the network address that is used for machine connection with the RRA server. Machine connection with the RRA server is only required for the production logging option.
Server IP	Shows the IP address of the RRA server. The end user must provide this address.
Discovery Agent Port	Shows the port that is used to communicate the production files. Default Port: 5289

Example of the **Certiq** *Screen*

Identifier	Description
Machine Number	Sets the number of the machine.
Machine Name	Sets the name of the machine.
Last Communication Time	Shows the date and time when the Certiq system on the machine last communicated with the Central Back Office.
Certiq Running	Shows if Certiq is operating.
Configuration Version	Shows the version of the configuration that is used for the Certiq system.
Memory Full	Shows an indicator when the memory is full.

8.7 Configuration

Example of the **Machine Options** *Screen*

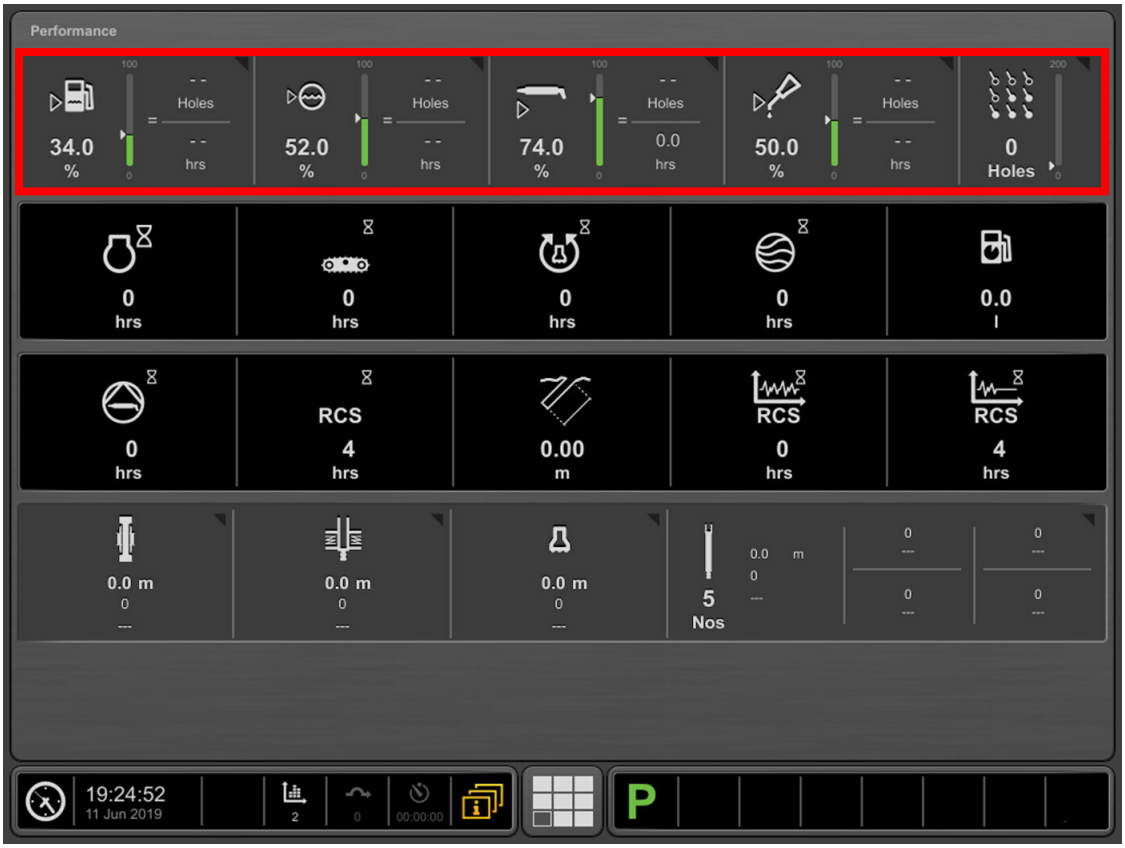
The **System** > **Configuration** screens show which features are included in the RCS. The **Configuration** screens are for information only and cannot be edited.

9 Performance Screen

Performance *Screen Button*

Example of the **Performance** *Screen*

9.1 Gauges



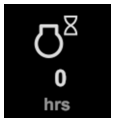
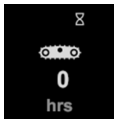
Example of the **Performance** *Screen Gauges Window*

Icon	Description
	The fuel gauge shows the percentage of the fuel in the fuel tank. The gauge also provides an estimate of how many drill holes can be drilled and how many hours of operation remain before the fuel tank is empty if the fuel tank is less than 98% full.
	The water gauge shows the percentage of the water in the water tank. The gauge also provides an estimate of how many drill holes can be drilled and how many hours of operation remain before the water tank is empty if the water tank is less than 98% full.
	The grease gauge shows the percentage of the grease in the grease tank. The gauge also provides an estimate of how many drill holes can be drilled and how many hours of operation remain before the grease tank is empty.
	The drill bit lubrication gauge shows the percentage of lubricant in the drill bit lubricant tank. The gauge also provides an estimate of how many drill holes can be drilled and how many hours of operation remain before the drill bit lubricant tank is empty.
	Shows the total number of drill holes drilled for the current drill plan.

Select the triangle located at the top-right of each consumable frame to reset the gauge calculation.

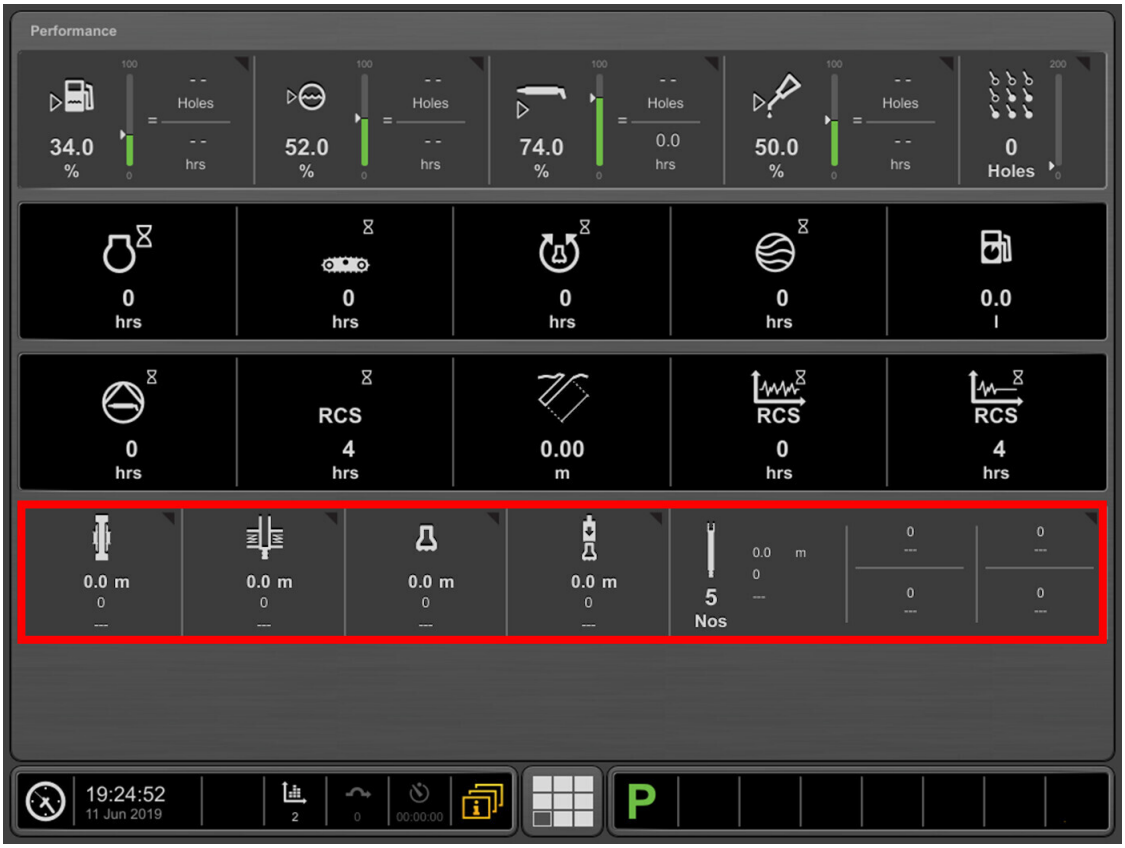
9.2 Cumulative Machine Statistics

Example of the **Performance** *Screen Cumulative Machine Statistics Window*

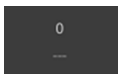
Icon	Description
	Shows engine operating hours that are received from the Engine Control Module data via the J1939 connection.
	Shows the total number of propel hours. The propel hours increase when in Propel mode and once the switch on the left multifunction joystick is pressed if single joystick propel is active or both switches on the main joysticks are pressed if dual joystick propel is active, and the operator commands movement. ! ***NOTE:*** *Leaving the machine in Propel mode with the parking brake released does not increase the total number of propel hours.*

Icon	Description
	Shows the total rotation hours for the rotary head. The rotation hours only increase in Drill mode when the switch on the right main joystick is pressed and the operator commands rotation. ! ***NOTE:*** *Leaving the machine in Drill mode does not increase the total number of rotation hours.*
	Shows the total number of active hours for the compressor.
	Shows the total fuel that is consumed in liters or gallons since the RCS was powered up.
	Shows the total number of active hours for the lubrication pump.
	Shows the total number of active hours for RCS GUI. ! ***NOTE:*** *This value excludes the time that is taken for the RCS GUI to start.*
	Shows the total number for the accumulated drill depth in meters or feet.
	Shows the total amount of time that the machine has been operating.
	Shows the total amount of time that the machine has been idle.

9.3 Drill String



Example of the **Performance** *Screen Drill String Window*

Icon	Description
	Shows the distance drilled in meters or feet, the serial number, and the install date of the stabilizer.
	Shows the distance drilled in meters or feet, the serial number, and the install date of the shock sub.
	Shows the distance drilled in meters or feet, the serial number, and the install date of the drill bit.
	Shows the distance drilled in meters or feet, the serial number, and the install date of the hammer.
	Shows the distance drilled in meters or feet, the serial number, and the install date of the first drill pipe.
	Shows the distance drilled in meters or feet, the serial number, and the install date of the drill pipe from 2 to 6.

Select the triangle located at the top-right corner of each component frame to change the serial number. A system window appears that allows the operator to change the serial number of a component. Drill bit diameter can also be changed.

9.4 Drill Pipe Consumables

Selecting the starter drill pipe or drill pipe button provides access to the drill pipe consumable windows. The operator is able to choose a specific drill pipe in the **Drill Pipes** window and view or change the drill pipe serial number, diameter, and length.

Example of the **Drill Pipe Status** *Window*

Example of the **Drill Pipes** *Dialog Box*

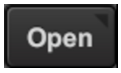
Example of the **Drill Pipes** *Dialog Box*

10 Manual Screen

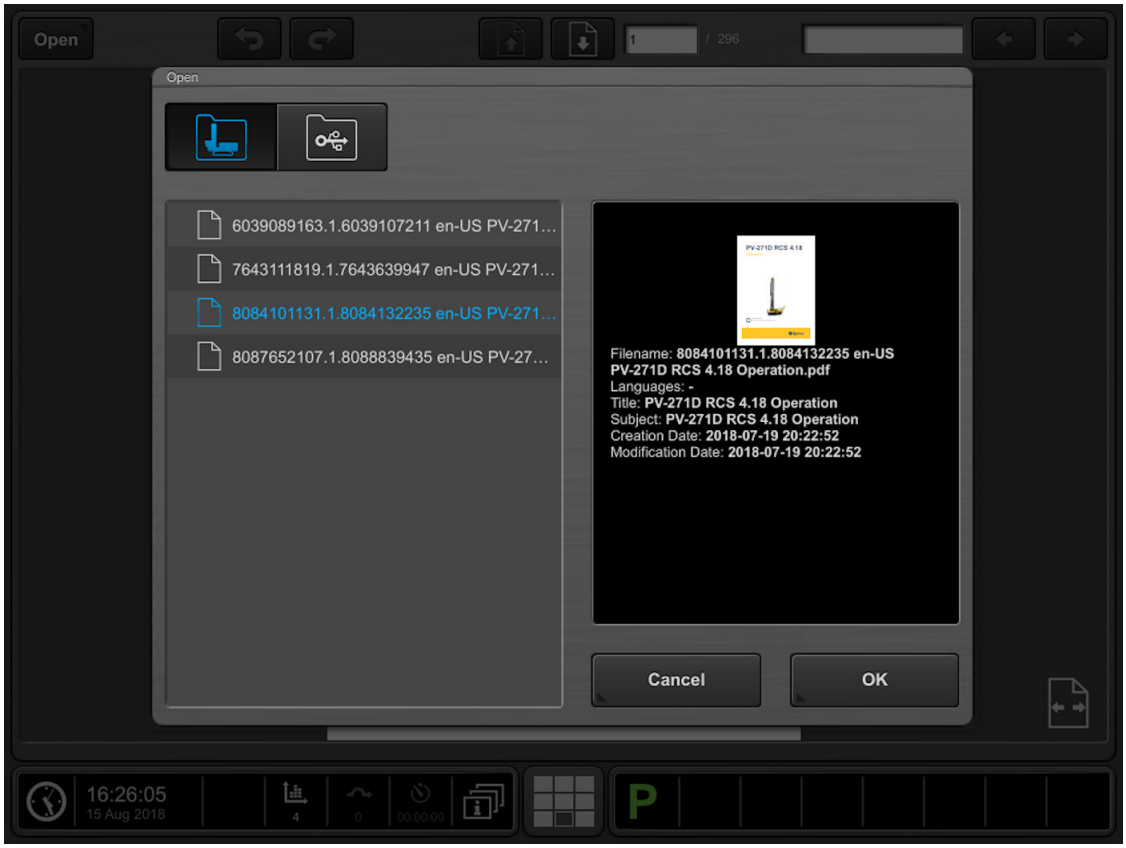
Manual *Screen Button*

> ***NOTE:*** *Only simple .pdf files from Epiroc can be effectively viewed with the* **Manual** *screen.*

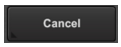
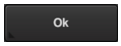
Example of the **Manual** *Screen*

Icon	Description
	Opens the **Open** menu.
	Returns the user to the previously viewed page.
	Skips forward to the next page.
	Shows the previous page.
	Shows the next page.
	Shows the current page being viewed out of the total number of pages in the document. If the page number field is selected, the numeric keyboard appears and allows the user to enter a specific page number.
	The search field lets the user enter text to search within the document. The arrows search forward and backward from the current page, depending on which arrow is selected.

The **Open** menu lets the user select and preview a document before opening.



Example of the **Open** *Menu*

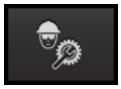
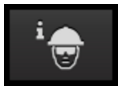
Icon	Description
	Shows the documents on the CCI module.
	Shows the documents on the USB flash drive.
	Cancels opening the selected document.
	Opens the selected document on the **Manual** screen. The **Ok** button is enabled once a document is chosen.

> ***NOTE:*** *Blue text shows that a file is selected. Press the* **Ok** *button to open the file.*

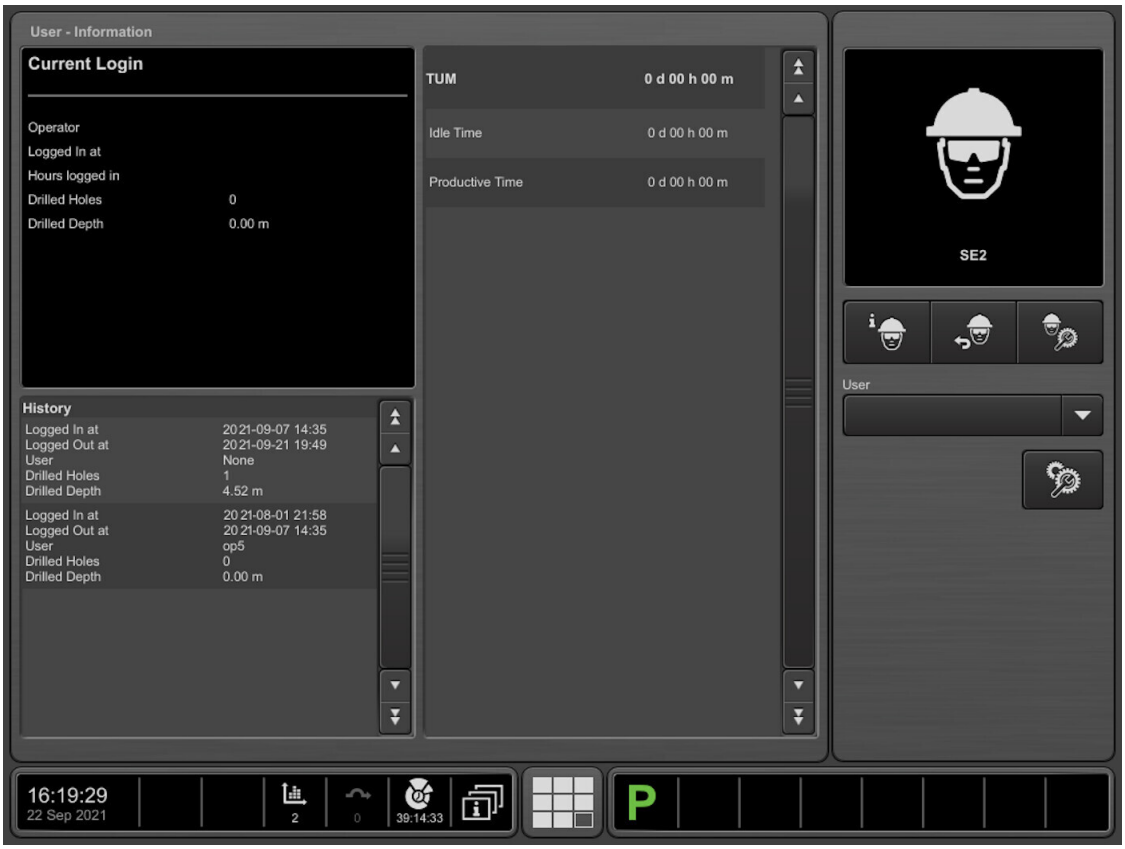
11 User Screen

User *Screen Button*

Example of the **User** *Screen*

Icon	Description
	Opens the **Login** dialog box. The default access level at startup is OP.
	Logs the current user out of the system. The **Logout** button is active only when a user is logged into the system at SE access level or higher. ! *NOTE: The* **Logout** *button replaces the* **Login** *button when the user login is successful.*
	Opens the **Preferences** menu.
	Shows the **Information** menu.

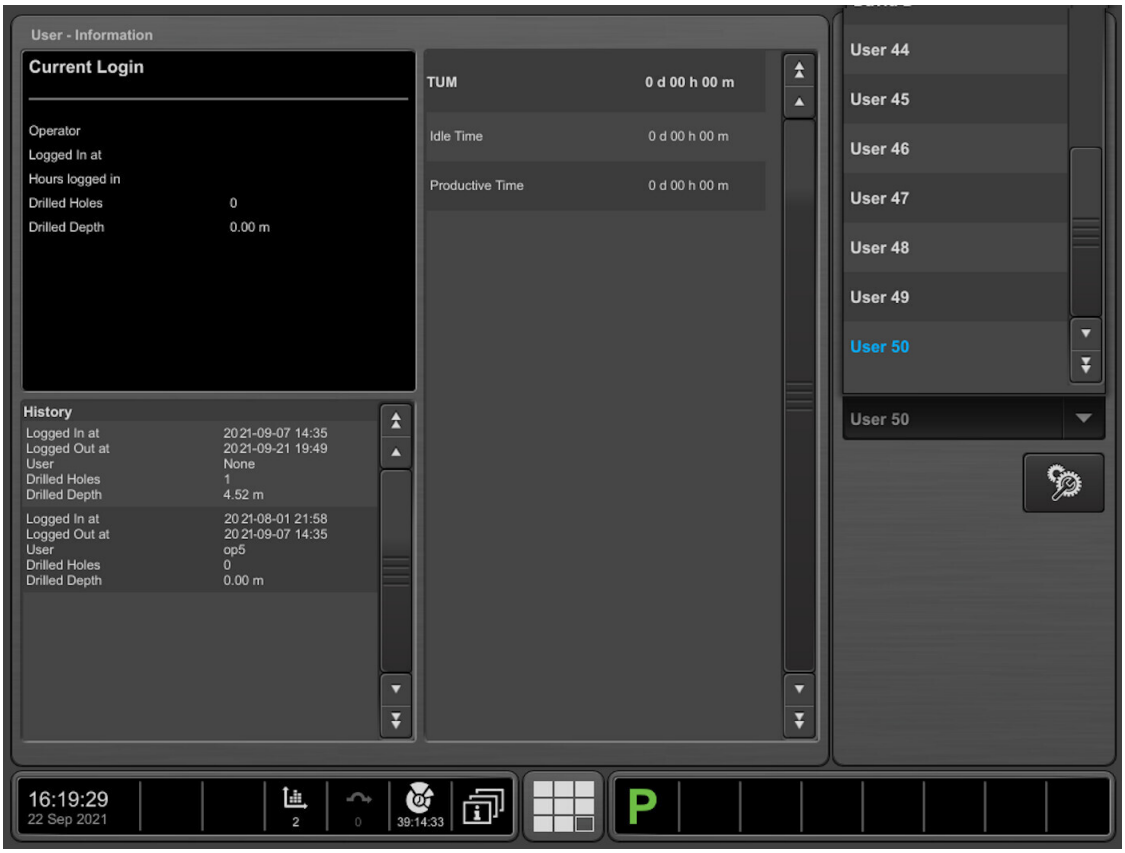
The following steps guide the user on selecting a user from the **User** drop-down menu after successfully logging in to the system.



Example of the **User** *Screen*

The **User** drop-down menu shows a list of registered system users. When selected, the user name is highlighted in blue.

1. Select the **Login** button.
2. Enter the password.
   - If the password is correct, the user access level permissions are raised.
   - If the password is incorrect, the **Login User Unknown** message appears.
3. Select the correct user from the **User** drop-down menu.



*Example of the***User** *Screen*

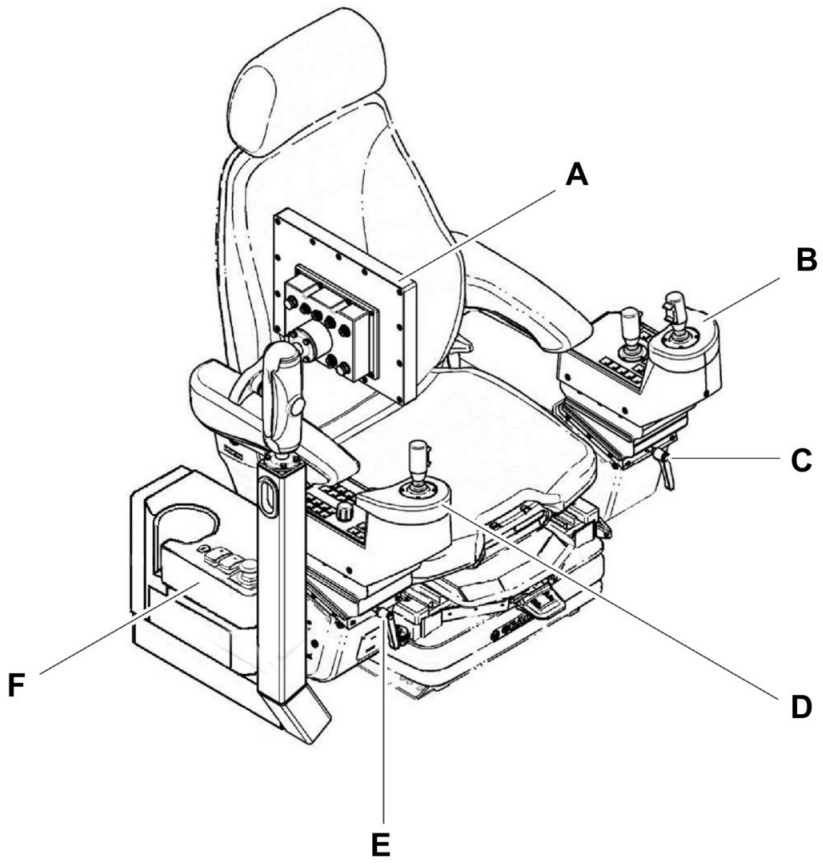
Identifier	Description
Current Login	Shows login information for the current user.
History	Shows login history of the current RCS session.
TUM	Shows the TUM Code history of the current RCS session.

Example of the **Preferences** *Screen*

The operator can select between available languages. English and Swedish are available on all machines. Current language files available are as follows:

- English
- Arabic
- Bulgarian
- Chinese
- Finnish
- French
- Hindi
- Indonesian
- Portuguese
- Russian
- Spanish
- Swedish

12 Rig Control System Operator Controls

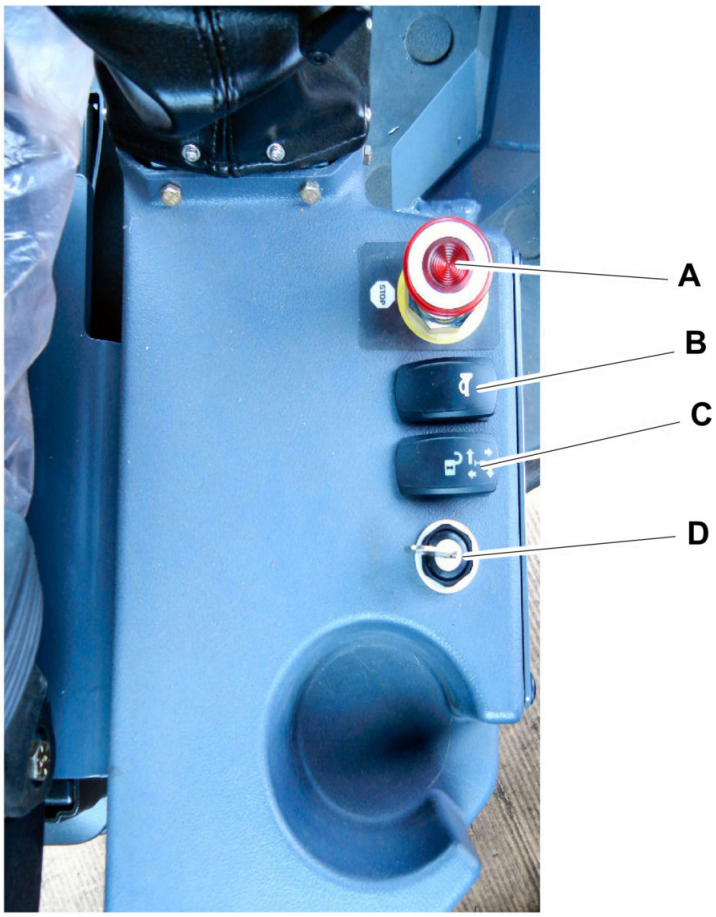


Operator Seat Controls

A	Touchscreen display	B	Left operator control panel
C	Adjusting levers (back lever not shown)	D	Right operator control panel
E	Adjusting levers (back lever not shown)	F	Lower control panel

12.1 Lower Control Panel

The lower control panel is located to the right of the operator seat.



Lower Control Panel

A	Emergency stop button	B	Horn
C	Leveling Jack AutoLevel Bypass button	D	Key switch

USB Port

There is a USB slot on the seat to insert a USB flash drive for saving or loading files to the RCS.

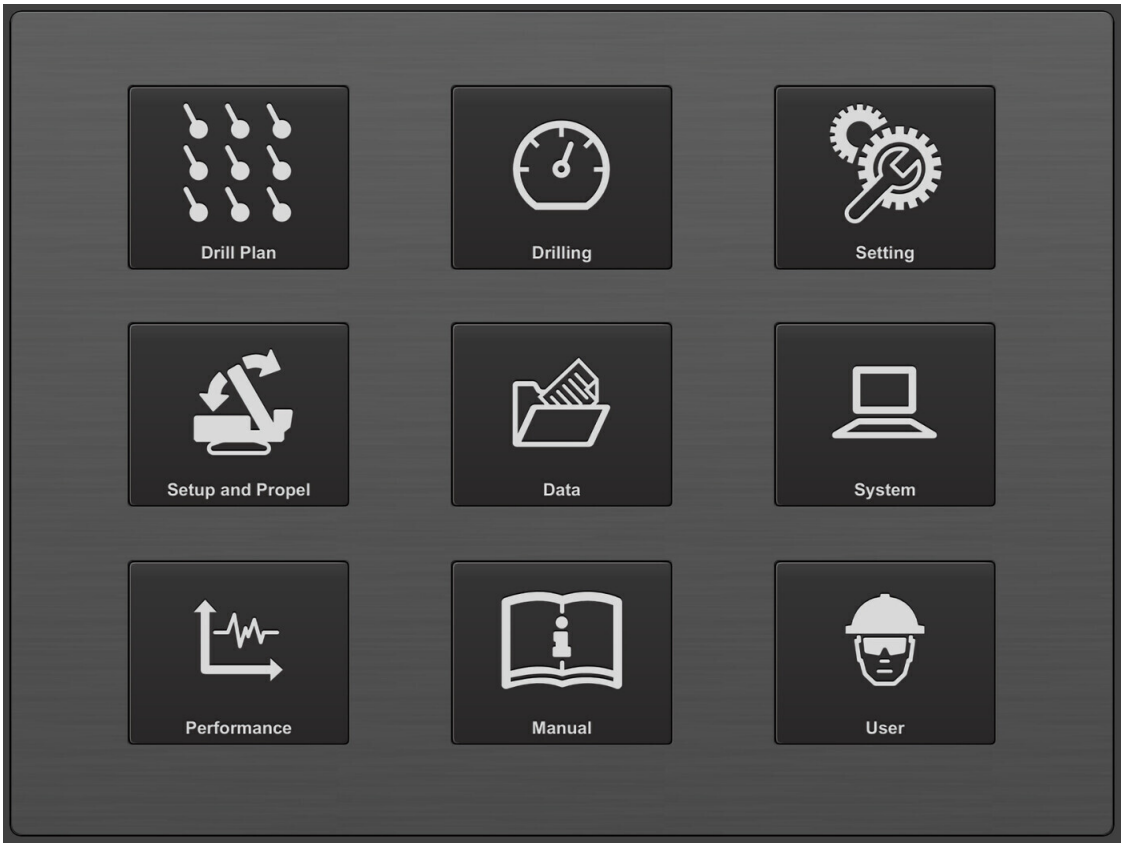
NOTICE

Misuse of USB Port

Damage to the RCS

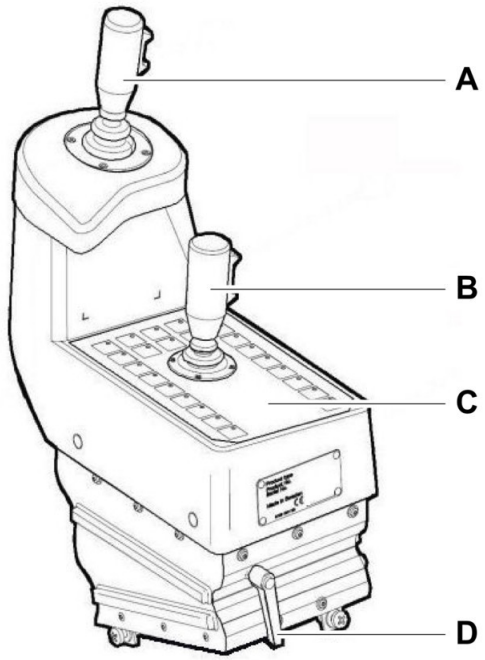
- Only use Epiroc approved USB flash drives in the USB port to exchange information with RCS. Plugging in any other device, such as a cell phone, can damage RCS. The USB port is not for charging devices.

12.2 System Display



RCS5 System Display

12.3 Left Operator Control Panel



Left Operator Control Panel

A	Left main joystick	B	Left multi joystick
C	Mode and function buttons	D	Left operator control panel adjusting levers

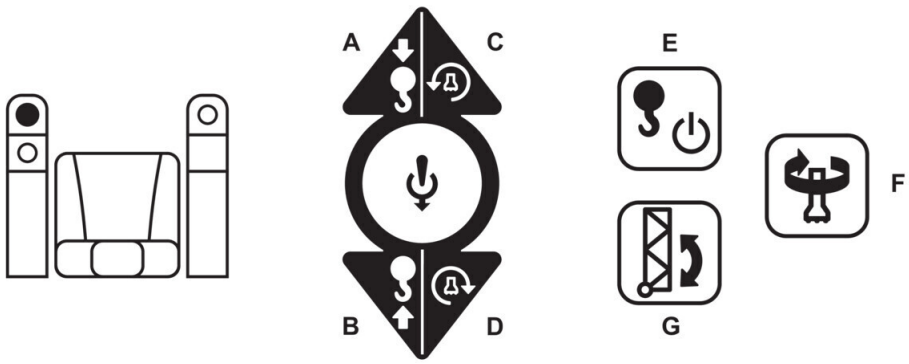
Left Operator Control Panel

Controller	Description	Input Action
Left main joystick	One multi-function, single-axis, non self-centering, friction hold, analog joystick with a switch. The left main joystick controls the following: • Drill mode - Drill rotation • Setup mode - Hoist functions • Propel mode - Propel functions when operating dual-joystick propel	Press and hold the joystick switch. Move the joystick forward and backward from the center position.
Left main joystick switch	Press and hold the joystick switch while moving the left joystick.	Press and hold.

Controller	Description	Input Action
Left multifunction joystick	One dual-axis, spring-centered, analog joystick with analog return-to-zero switch. The left multifunction joystick controls the following: • Drill mode - Breakout wrench functions • Setup mode - Leveling jack functions • Propel mode - Propel functions when operating single-joystick propel • Camera mode - Controls the pan-tilt-zoom (PTZ) camera functions	Press and hold the joystick switch. Move the joystick forward/backward/left/right from the center position.
Left multifunction joystick switch	Press and hold the joystick switch while moving the left joystick.	Press and hold.
Mode and function buttons	Digital function buttons.	Press and release, or press and hold.
Left operator control panel adjusting levers	Two adjusting levers to adjust the left operator control panel to a comfortable operating position.	Counterclockwise to loosen and adjust. Clockwise to tighten and lock.

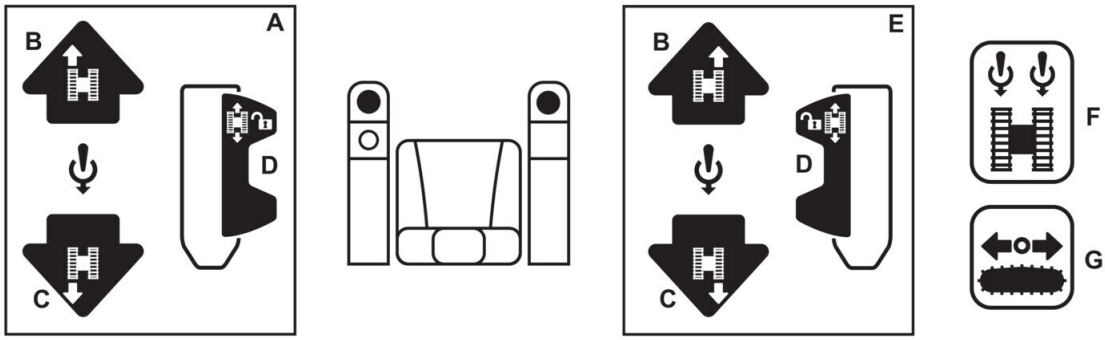
12.3.1 Left Joysticks

Left Main Joystick



Left Main Joystick

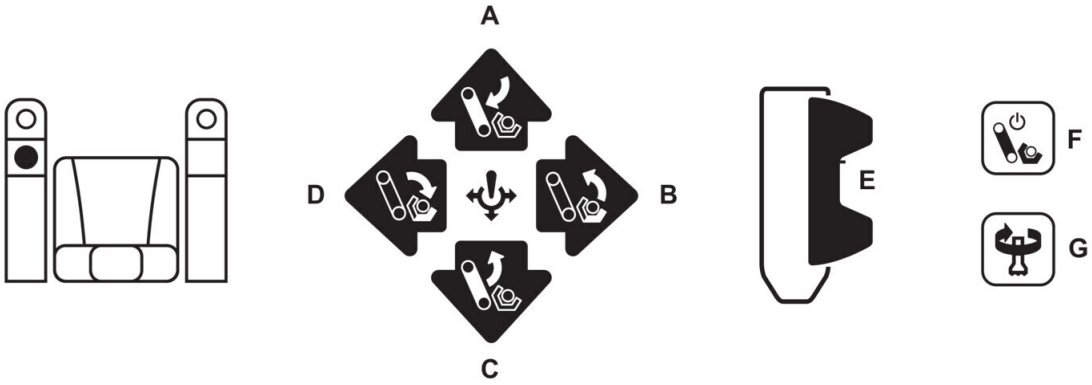
A	Lower the hoist	B	Raise the hoist
C	Counterclockwise rotation	D	Clockwise rotation
E	Activate Cab Hoist button	F	Drill mode button
G	Setup mode button		



Dual-Joystick Propel Joystick Functions When Propel Mode Is Active

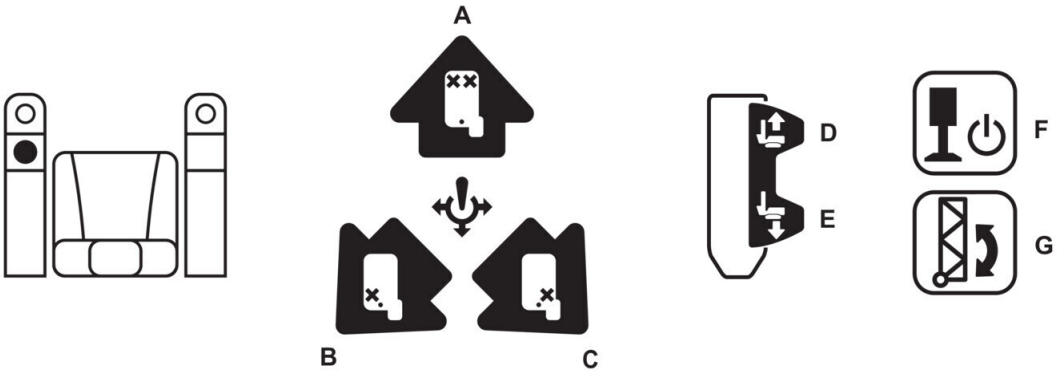
A	Left main joystick controls	B	Forward propel
C	Reverse propel	D	Propel interlock trigger
E	Right main joystick controls	F	Dual-joystick propel
G	Propel mode button		

Left Multifunction Joystick



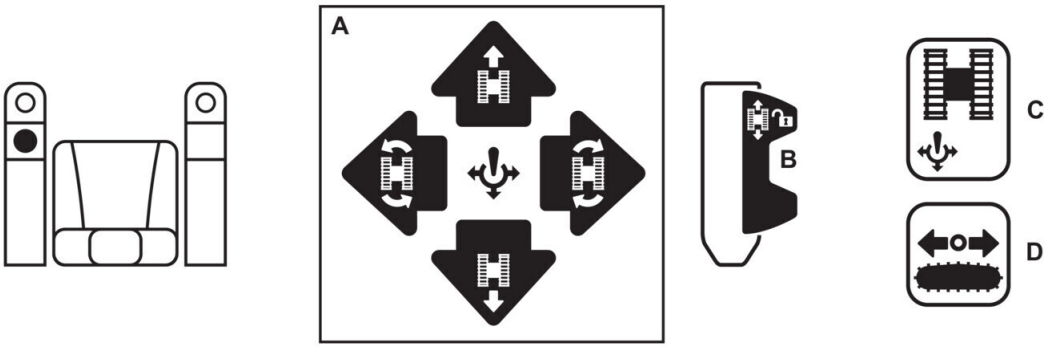
Breakout Wrench Functions When Drill Mode Is Active

A	Breakout wrench stow	B	Break joint
C	Breakout wrench unstow	D	Release jaws
E	Breakout wrench interlock trigger	F	Activate Breakout Wrench button
G	Drill mode button		



Leveling Jack Functions When Activate Leveling Jacks and Setup Mode Are Active

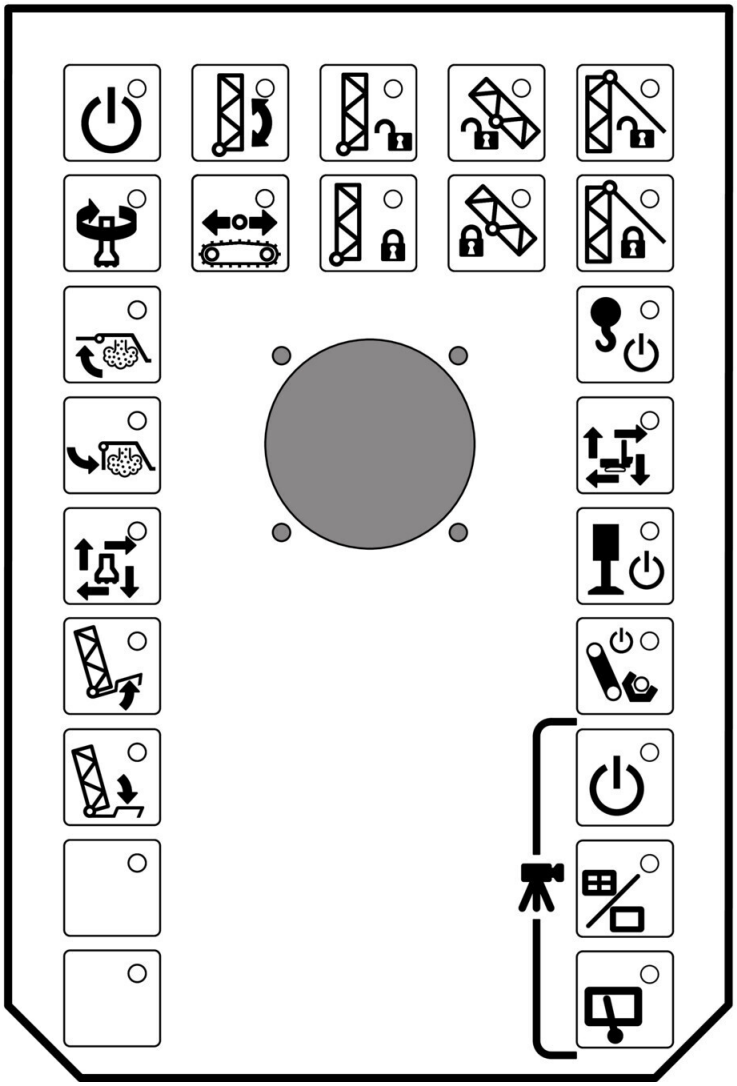
A	Non-drill end leveling jack	B	Non-cab side leveling jack
C	Cab side leveling jack	D	Raise machine
E	Lower machine	F	Activate Leveling Jacks button
G	Setup mode button		



Single-Joystick Propel Functions When Propel Mode Is Active

A	Propel direction	B	Propel interlock trigger
C	Single-joystick propel	D	Propel mode button

12.3.2 Mode and Function Buttons



Left Operator Control Panel

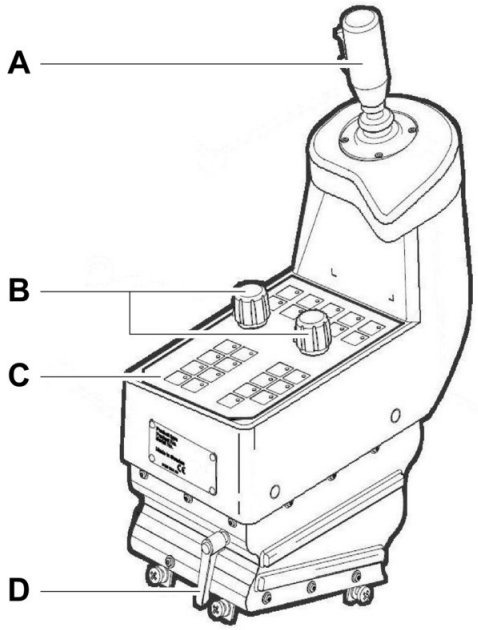
Mode and Function Buttons

Icon	Function	Description
	Operator Control Panel On/Off	Switches the operator control panels on or off.

Icon	Function	Description
		! **NOTE:** *Switch off the Operator Control Panel On/Off button to prevent accidental actuation of components from the control panel when someone is on or near the machine but not inside the cab.*
	Setup mode	Shifts the controls to Setup mode. All active joystick functions are mapped to setup activities, such as Tower Raise and Lower, Hoist, and Leveling Jacks.
	Tower Vertical Unlock	Unlocks the vertical tower pin.
	Tower Angle Unlock	Unlocks the tower angle pin.
	Strut Unlock	Unlocks the strut pin, if applicable.
	Drill mode	Shifts controls to Drill mode. All necessary controls are mapped to the drilling functions.
	Propel mode	Shifts controls to the Propel mode. All necessary controls are mapped to propelling functions.
	Tower Vertical Lock	Locks the vertical tower pin.
	Tower Angle Lock	Locks the tower angle pin.
	Strut Lock	Locks the strut pin, if applicable.
	Dust Flaps Up	Raises the dust flaps.
	Dust Flaps Down	Lowers the dust flaps.
	Auto Drill	Auto Drill option. The Auto button on the right control panel must be held down while pushing the Auto Drill button on the left control panel.

Icon	Function	Description
	Dust Hood Up	Raises the dust hood on equipped machines.
	Dust Hood Down	Lowers the dust hood on equipped machines.
	Activate Cab Hoist	Energizes the hoist control. The left main joystick is mapped to raise and lower the hoist when the button is energized. De-energize when not in use for safety.
	Auto Navigation	Auto Navigation option. The Auto button on the right control panel must be held down while pushing the Auto Navigation button on the left control panel.
	Activate Leveling Jacks	Energizes the leveling jack control. The left multifunction joystick is mapped to level the machine when this button is energized. De-energize when not in use for safety.
	Activate Breakout Wrench	Energizes the breakout wrench. The left multifunction joystick is mapped to control breakout wrench movement when this button is energized. De-energize for safety when not in use.
	Camera Function Buttons	Indicates the group of buttons that are associated with the optional cameras.
	Camera On/Off	Switches the left multifunction operator control joystick to move the PTZ camera.
	Camera Screen View	Switches between multi-camera view and single-camera view.
	PTZ Camera Wiper	Energizes the wiper on the PTZ camera.

12.4 Right Operator Control Panel



Right Operator Control Panel

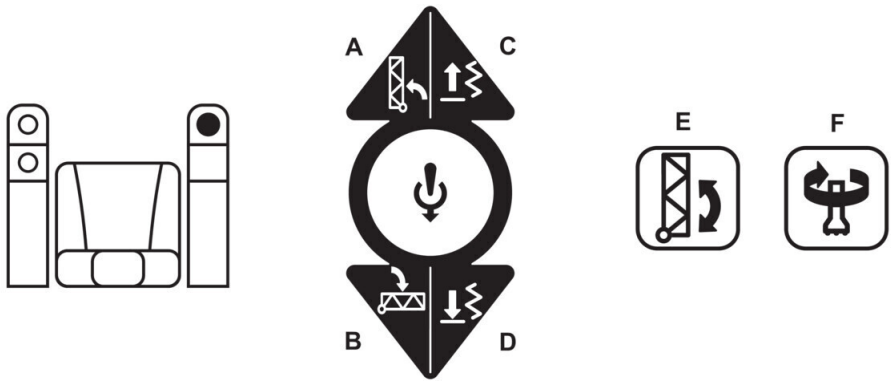
A	Right main joystick	B	Adjustable control knobs
C	Mode and function buttons	D	Right control panel adjusting levers

Right Operator Control Panel

Controller	Description	Input Action
Right main joystick	One multi-function, single axis, non self-centering, friction hold, analog joystick with a switch. The right main joystick controls the following: • Setup mode - Tower raise and lower functions • Drill mode - Penetration rate functions	Press and hold the joystick switch. Move the joystick forward and rearward from the center position.
Right main joystick switch	Press and hold the joystick switch while moving the right main joystick.	Press and hold.

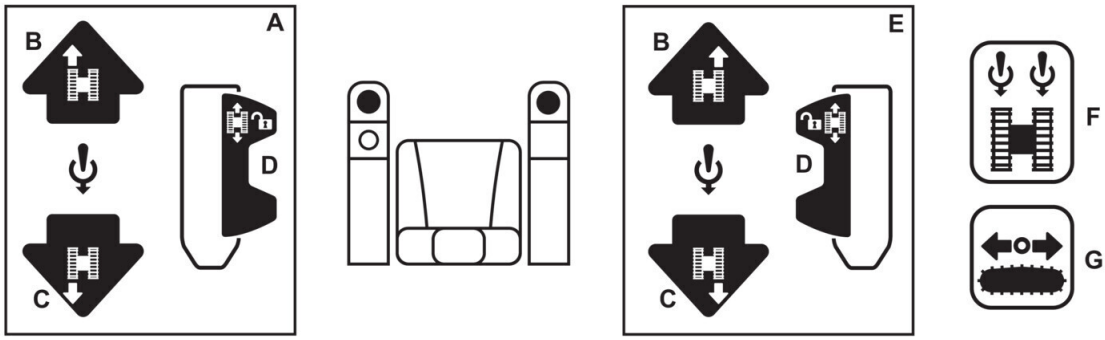
Controller	Description	Input Action
Feed force control dial	One rotary control dial increases or decreases feed pressure while in Drill mode.	Clockwise to increase. Counter-clockwise to decrease.
Holdback control dial	One rotary control dial increases or decreases holdback force while in Drill mode. (Option)	Clockwise to increase. Counter-clockwise to decrease.
Function buttons	Digital function buttons	Press and release, or press and hold.
Right operator control panel adjusting levers	Two adjusting levers to adjust the control panel to a comfortable operating position.	Counterclockwise to loosen and adjust. Clockwise to tighten and lock.

12.4.1 Right Main Joystick



Right Main Joystick

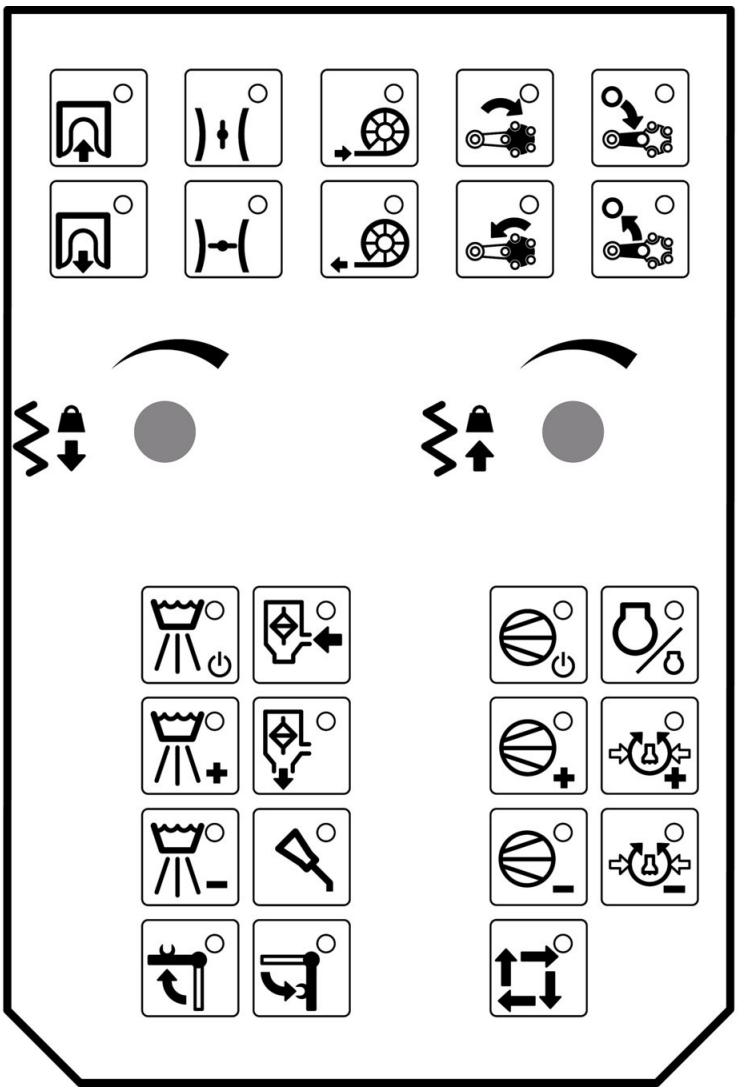
A	Raise the tower	B	Lower the tower
C	Feed up	D	Feed down
E	Setup mode button	F	Drill mode button



Dual-Joystick Propel Joystick Functions When Propel Mode Is Active

A	Left main joystick controls	B	Forward propel
C	Reverse propel	D	Propel interlock trigger
E	Right main joystick controls	F	Dual-joystick propel
G	Propel mode button		

12.4.2 Mode and Function Buttons



Right Operator Control Panel

Mode and Function Buttons

Icon	Function	Description
	Sliding Fork Wrench Disengage or Table Clamp Disengage	Retracts the sliding fork wrench so that it disengages from the drill pipe.
	Sliding Fork Wrench Engage or Table Clamp Engage	Extends the sliding fork wrench so that it engages the drill pipe.
	Air Throttle Open	Opens the drill air throttle (option for high pressure machines only).

Icon	Function	Description
	Air Throttle Close	Closes the drill air throttle (option for high pressure machines only).
	Cable Reel In	Winds the cable on the cable reel on electric machines.
	Cable Reel Out	Unwinds the cable on the cable reel on electric machines.
	Carousel Index Clockwise	Moves the carousel in a clockwise direction.
	Carousel Index Counterclockwise	Moves the carousel in a counterclockwise direction.
	Carousel Swing Stow	Moves the carousel to the stowed position.
	Carousel Swing Out	Moves the carousel to the unstowed position.
	Feed Force Control	Adjusts the feed force while in Drill mode.
	Holdback Control	Adjusts the holdback pressure while in Drill mode. (Option)
	Water Injection On/Off	Energizes and de-energizes the water injection pump.
	Water Flow Increase	Increases the water injection flow rate. Water injection must be energized.
	Water Flow Decrease	Decreases the water injection flow rate. Water injection must be energized.
	Drill Pipe Support Close	Engages (closes) the drill pipe support.
	Drill Pipe Support Open	Moves the drill pipe support out of the way (open).

Icon	Function	Description
	Dust Collector On/Off	Energizes and de-energizes the dust collector.
	Dust Collector Cleaning On/Off	Starts the dust collector pulsator. The pulsator is energized when the dust collector is energized.
	Thread Lubrication On/Off	Starts and stops the thread grease engage function.
	Air Regulation On/Off	Energizes and de-energizes the drill air control.
	Air Flow Increase	Increases the air flow. Air regulation must be energized.
	Air Flow Decrease	Decreases the air flow. Air regulation must be energized.
	Auto	The Auto button must be energized before starting automated functions.
	Engine Speed High/Low	Adjusts the engine speed between low and high idle.
	Rotation Torque Increase	Increases the amount of pressure applied to the rotary head rotation motors to increase the torque on the drill bit during drilling.
	Rotation Torque Decrease	Decreases the amount of pressure applied to the rotary head rotation motors to limit torque on the drill bit during drilling.

12.5 Radio Remote Control

WARNING

Remote Operation

Can cause personal injury or property damage

- ▶ Special training is required to use the RRC system.

Radio Remote Control

A	Emergency stop		

The Radio Remote Control (RRC) system lets the operator work in a safer, more efficient way in unsecured environments. The RRC system has a working distance of approximately 60 meters (197 feet) with a clear line of sight between the hand-held RRC and the machine antennas.

12.6 Operator Dash Switches and Circuit Breakers

Refer to the operation manual for this machine for information on operator dash switches and circuit breakers.

13 Operating Modes

There are four operating modes for RCS. The four operating modes are:

- Park mode
- Setup mode
- Drill mode
- Propel mode

Each control panel button has a light-emitting diode (LED) that illuminates when the panel button is active. No LEDs are illuminated until the Operator Control Panel On/Off button on the left operator control panel is activated.

13.1 Park Mode

The RCS is in Park mode when it is operating, but the engine is not. Once the engine is operating, the RCS enters Setup mode.

13.2 Setup Mode

While the Setup mode is active, the right main joystick on the right control panel is active and mapped to the tower raising and lowering functions. Moving the joystick raises and lowers the tower. Tower raising and lowering speed is proportional to the amount of joystick movement from the threshold to maximum. Pressing and holding the switch and pushing the joystick away from the operator raises the tower. Pressing and holding the switch and pulling the joystick towards the operator lowers the tower.

While in Setup mode, the Activate Cab Hoist button on the left operator control panel is pushed to energize the hoist. When activated, the left main joystick is mapped to operate the appropriate spool valve for using the hoist/winch to raise and lower the loads. The Activate Cab Hoist button has an LED that illuminates when the hoist control is active. Pressing and holding the digital toggle button and pushing the joystick away from the operator lowers the hoist load. Pressing and holding the switch and pulling the joystick toward the operator raises the hoist load. Always de-energize the hoist when it is not in use.

The machine can be leveled in Setup mode and Drill mode. When the Activate Leveling Jacks button is activated, the on-screen level indicator is shown on the display screen. The left multifunction joystick on the left operator control panel is mapped to the appropriate valve spools for operating the leveling jacks. Anytime the left multifunction joystick is active, the leveling jacks can be actuated. The switch provides proportional control of leveling jack extend speeds. Always de-energize the leveling jacks by de-selecting the Activate Leveling Jacks button when not in use.

13.3 Drill Mode

When Drill mode is selected, the hydraulics are shifted and the controls are mapped to do drilling functions. The machine can also be leveled in Drill mode and Setup mode.

While the Drill mode is active, the right main joystick on the right operator control panel is active and mapped to the feed up and feed down drilling functions. Moving the joystick raises and lowers the rotary head. Drill feed direction and speed is proportional to the amount of joystick movement from threshold to maximum. Pressing and holding the switch and pushing the joystick away from the operator feeds up the rotary head and drill string. Pressing and holding the switch and pulling the joystick towards the operator lowers the rotary head and drill string.

While the Drill mode is active, the left main joystick on the left operator control panel is active and mapped to drill string rotation functions. Moving the joystick rotates the drill string. Drill rotation direction and speed is proportional to the amount of joystick movement from threshold to maximum. Pressing and holding the switch and pushing the joystick away from the operator rotates the drill string counterclockwise. Pressing and holding the switch and pulling the joystick towards the operator rotates the drill string clockwise.

While in Drill mode, the Activate Breakout Wrench button on the left operator control panel is pushed to energize the breakout wrench. When activated, the left multifunction joystick on the left operator control panel is mapped to the appropriate valve spools for operating the breakout wrench functions. The Activate Breakout Wrench button has an LED that illuminates when the breakout wrench control is active.

When the left multifunction joystick is active, the breakout wrench can be actuated. The switch must be pressed and held in while operating the breakout wrench. Always de-energize the breakout wrench (de-select the Activate Breakout Wrench button) when not in use.

13.4 Propel Mode

The following occurs when the machine is in Propel mode:

- The hydraulic diverter valves are energized to send hydraulic flow to the track motors.
- The propel alarm is energized.

The operator can choose to use the left multifunction joystick or the left main and right main joysticks when propelling the machine. Each mode is enabled from the **Settings** > **Rig** > **Parameters** > **Propel** screen. Single joystick propel uses the left multifunction joystick. Dual joystick propel uses the left main and right main joysticks.

The brake is released only when the joystick switch is pushed on the active joystick(s) depending on if single joystick propel or dual joystick propel is active. Once the joystick switch is pushed, wait for two seconds to move the joystick off center. Otherwise, the RCS generates a Loss of Brake Pressure fault. The operator can also observe the brake pressure gauge on the **Propel** screen. When the brake release reaches above the minimum of 24 bar (350 psi) pressure, move the left multifunction joystick or left main and right main joysticks to propel the machine.

14 Fault Finding Using the RCS

Fault finding can be done directly from the RCS display. The system status bar on the bottom of the RCS shows active conditions and faults.

> ! ***NOTE:*** *Only five fault-related icons are displayed in the system status bar at a time. Select the Information icon in the system tray to view more.*

Refer to RCS 5 Events and Interlocks Manual for more information.

15 Installing Software Updates

This procedure explains how to update the RCS software. The same procedure also restores previous releases of RCS. To restore a previous release, select **Restore** instead of **Update** and select one of the previous two releases.

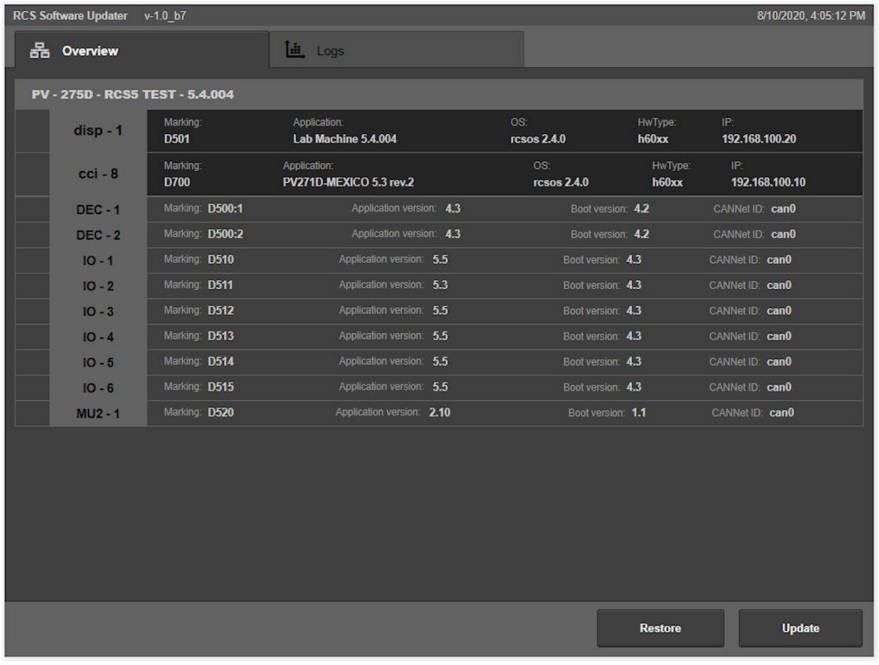
Precondition

- ✓ The existing RCS parameters are saved.
- ✓ The RCS display screen is off.
- ✓ The PKG file containing the software upgrade is installed on the root (top) level of the Epiroc approved USB flash drive. Only one PKG file can be installed at the root level at a time. Any previous PKG file must be moved to another folder or uninstalled from the USB flash drive before installing the new PKG file.

1. Disconnect the X12 port on the RCS 5 machine router.
2. Put the USB flash drive into the USB port.
3. Use the key switch to start the control system and RCS display screen.

Step result

➔ When RCS has started, the **Overview** screen shows the current RCS software version for each connected device. The new RCS release to be installed appears above the list of devices.

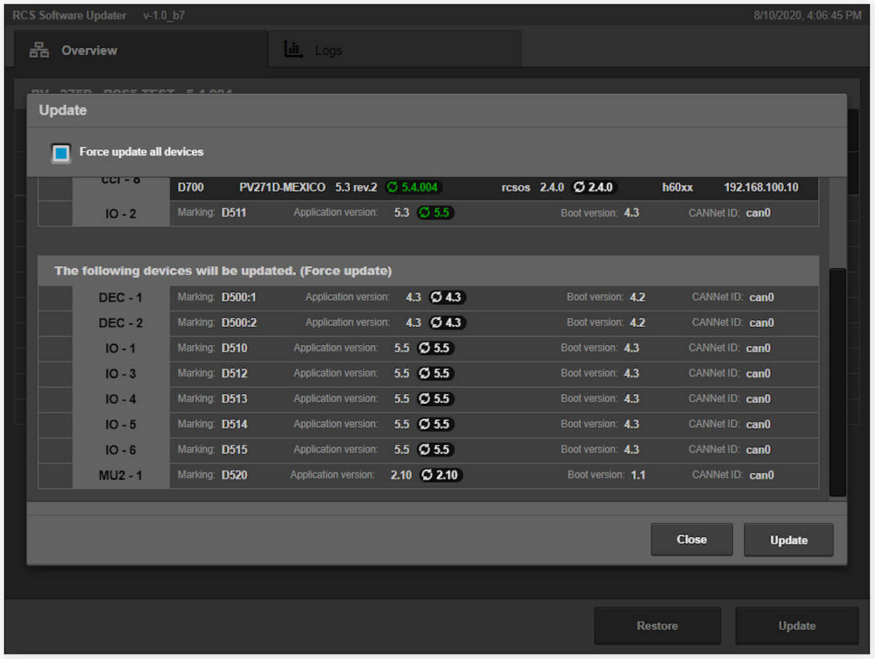


Example of the **Overview** *Screen*

4. Select the **Update** button.

Step result

➔ The **Update** screen shows the new RCS version to be installed for each connected device.

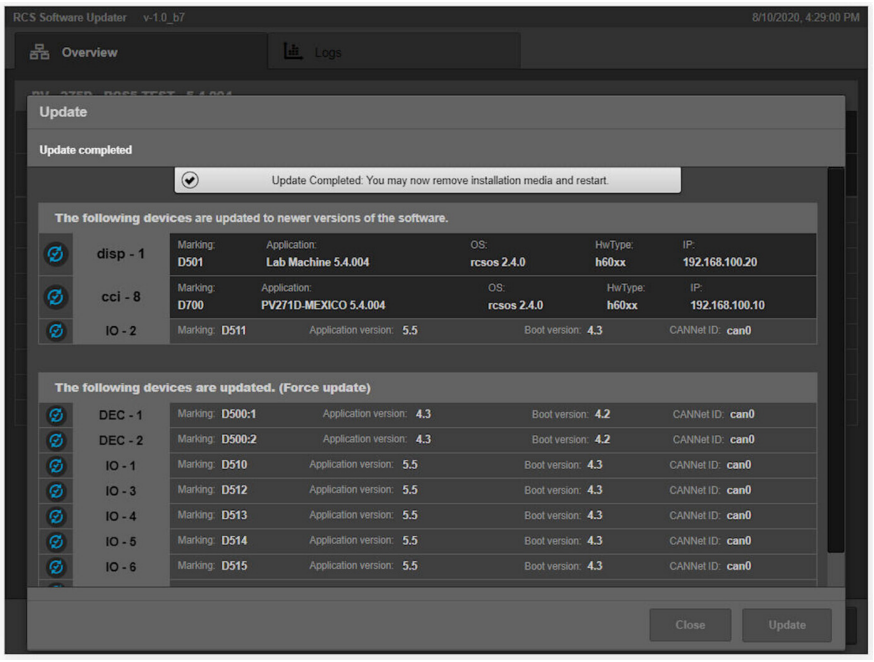


Example of the **Update** *Screen*

5. Select **Force update all devices** to update all of the connected devices.

Step result

➔ The **Update** screen shows the progress of the updates for each device. When the update is completed, an **Update completed** message appears near the top of the screen.



Example of the **Update** *Screen with the Update Completed Message*

6. Select the **Close** button.
7. Use the key switch to stop the control system and RCS display screen.
8. Remove the USB flash drive from the USB port.
9. Use the key switch to start the control system.
10. Put the USB flash drive into the USB port.
11. Load the machine parameters.
12. Start the machine.
13. Keep the X12 port disconnected.
14. Repeat steps 1 through 13 for all machines that are connected to the network.
15. Connect the X12 port on the RCS 5 machine router.
16. Start the machine.
17. Repeat steps 15 and 16 for all machines that are connected to the network.

2023-12-14 | No: TIS0001677.006 en-US