



OPERATORS MANUAL

Master Manual





CAUTION



Failure to operate this equipment properly may result in damaged equipment, downtime or injury. For any questions or training, contact Rigsmart Systems before use.

Rigsmart Systems Best Practices

- **Washing** - Please do not pressure-wash Rigsmart components. Direct application of high-pressure water can break seals and lead to moisture damage.
- **Replacing Components** - Remove batteries from spares, or components that have been replaced. Spares and replacement components will share the operating frequency of the unit they are replacing and can interfere with normal system operation if allowed to transmit.
- **Swapping components between rigs** - Rigsmart components are not directly transferable between Rigsmart systems. An identical component from one rig cannot readily be used to replace one from another rig. All components are initialized for a system receiver. This allows adjacent installations while eliminating cross-talk between components.
- **Welding** - Disconnect or power off the Rigsmart system before any welding takes place near the systems placed on the rig. Our components have built-in current protection, but welding can interfere with normal operation.
- **Adding wireless devices** – Wireless routers, bridges and or controls for non-Rigsmart systems, can potentially cause interference with Rigsmart system communications. Please consult a technician before adding wireless devices to a rig.
- **Recalibration** - Loss of power, ground thaws, slipping line and changing components can necessitate a recalibration. Consult this manual for system recalibration. If assistance is required, please contact Rigsmart Systems, at 1-780-438-9475.
- **System Malfunction** - In the event of a system malfunction, record the status of the Rigsmart system, including all alarms and current readings, prior to powering off the system. This information will assist the Rigsmart technicians determine the nature of the problem and find a prompt solution.
- **Pneumatic Device Care**- DO NOT blow Glycol or other methyl hydrates – such as brake line antifreeze or tanner gas, through air lines that lead to Rigsmart pneumatic devices. Permanent damage may occur and safety critical devices may not operate correctly.

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For sales, service or assistance:

1-780-438-9475

*You have invested in the industry's leading technology in rig safety equipment.
Thank you for your business.*

RIG SAFETY. MADE SIMPLE.

This manual covers the operation of the Rigsmart system.
Each system is custom designed to the rig and customer.
Not all information contained in this manual may pertain to your specific system.
For any questions about system design, contact Rigsmart Systems.

Warranty

Rigsmart Systems warrants to the purchaser of each new Rigsmart System that any part thereof which proves to be defective in material or workmanship **within one (1) year from date of delivery** will be repaired or replaced at no charge if the system is returned to us in Edmonton, Alberta with all freight charges prepaid. If a performance problem should occur, contact our office in Edmonton, Alberta at 1-780-438-9475.

This warranty does not cover defects resulting from accident, alteration, improper use, or failure of the purchaser to follow normal operating procedures as outlined in this instruction manual.

PLEASE NOTE:

OPENING THE DISPLAY/RECEIVER PANEL VOIDS WARRANTY.

THIS WARRANTY IS IN LIEU OF ANY WARRANTY OR MERCHANTABILITY AND OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, ALL OF WHICH ARE HEREBY EXCLUDED.

Rigsmart Systems shall in no event be liable for any special, indirect, or consequential damages whatsoever and neither assumes nor authorizes any person to assume for it any other obligation or liability.

1 Description

Anti-Collision System

The Rigsmart Anti-Collision system uses a set of wireless sensors to determine the position and height of the rig's traveling blocks, top drive and bails. When the traveling blocks or top drive is in a position that could contact or damage the rig, the panel will sound an alarm and apply the brakes. The system may also integrate a wireless crown saver which is installed near the rig crown. This switch is triggered and brakes activated when the blocks lift an attached counterweight. The rig's main brakes may be activated either pneumatically or electrically based on the design of the system.

Drill Line Weight Indicator

The Drill Line Weight Indicator detects how much weight is suspended by the blocks, and remains accurate over time and through extreme temperatures. Through its design, it does not need to be removed during a slip-and-cut and does not need recalibration as long as the size and grade of the drill line used remains the same. The weight indicator may include an analog dial gauge or a connection to a third party weight system.

Throttle Limiter Speed Control

The Rigsmart Throttle Limiter will automatically limit the speed of the traveling blocks in the ascending direction before a hard stopping limit is reached. It can be integrated pneumatically or electrically based on the design of the system.

Auxiliary Brake Speed Control

The Rigsmart Auxiliary Brake Controller will automatically engage the auxiliary brake, slowing the speed of the traveling blocks in the descending direction before a hard stopping limit is reached. It can be integrated pneumatically or electrically based on the design of the system.

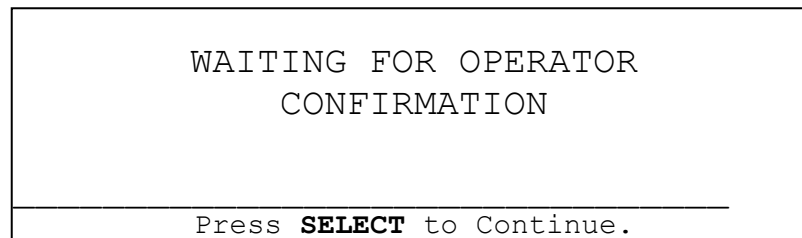
Other Devices

The Rigsmart system may include a number of other devices such as pressure sensors, emergency stops, flow meters, BOP ram transducers, Audible horns or other transducers.

2 Normal Operation

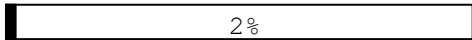
2.1 Start Up

When the Rigsmart system is powered on, a screen will appear asking for the user to accept control over the system. For safety purposes all outputs from the system are activated at this point, engaging the rig's brakes. When the user accepts control of the system, the rig's brakes are released and normal operation can Resume. This intermediary control between the system and the operator safeguards the rig in the event of an unexpected power loss/restore situation. To assume control over the system, press the SELECT button on the display panel.



2.2 Main Operation Screen

In normal operation the panel will display the currently measured load and block height information as shown below. The panel will display different screens based on what sensors are installed and activated.

1,500dN		BLOCK HEIGHT	
 2%		4.5m	
MAX LOAD =	53,400dN	MAX	25.9m
		MIN	.0m

TOP DRIVE EXTEND	BAIL TILT	ELEVATOR POSITION	BLOCK HEIGHT	
1.0°	6°	TRIP	4.5m	
			MAX	25.9m
			MIN	.0m

Pressing the SELECT button will open the Secondary Operation Screen. On this screen, the elevator orientation, as well as the angles of the top drive and bails will be displayed.

SYSTEM INFO		
BLOCK ANG	BAIL ANG	ELEV POS
0.0^	0.0^	TRIP
EXIT{	TARE SIG CAL	SETUP

After displaying the Secondary Operation Screen for 8 seconds, the panel will automatically return to the Main Operation Screen.

2.3 TARE

If the Rigsmart system is equipped with a Drill Line Weight Indicator, it will include a tare function. This enables the operator to 'zero out' the weight of the hook load. Once the tare function has been enabled, only the weight below the hook will be displayed as the actual weight on the Main Operation Screen.

SYSTEM INFO	
CROWN	WIND
OKAY	OFF
EXIT	TARE← SIG CAL SETUP

To Enable Tare Out:

- From the Main Operation Screen press the SELECT button to display the Secondary Operation Screen
- Use the up or down arrow button to select TARE. This automatically opens the Main Operation Screen and a 'T' will be displayed at the end of the bar graph.

To Disable Tare Out:

- From the Main Operation Screen press the SELECT button to display the Secondary Operation Screen.

- Use the up or down arrow button to select TARE. This automatically opens the Main Operation Screen, and the 'T' indicator will no longer be displayed.

2.4 Signal Strength

The Signals Screen displays all of the signal strengths and data packets (RF) from the wireless transducers. In optimum conditions, all signals strengths should remain above 95% with a steady increase in RF packets. It is not unusual to see occasional, momentary drops in signal strength or slight delays in RF packets, but the readings should return to normal. If they do not, see the troubleshooting section of this manual.

SYSTEM INFO		
BLOCK ANG	BAIL ANG	ELEV POS
0.0^	0.0^	TRIP
Exit	TARE	SIG CAL SETUP

SIGNAL STRENGTH		RF
LOAD MAIN	99%	15
CROWN SVR1	99%	15
EXIT	BACK←	TOP MENU

2.5 Quick Calibration Menu

The Cal Screen displays Component calibration options. From the main operating screen press the SELECT button. To access the CAL menu Press SELECT on the CAL tab.

SYSTEM INFO		
BLOCK ANG	BAIL ANG	ELEV POS
0.0^	0.0^	TRIP
Exit	TARE	SIG CAL SETUP

In this menu you will have the option to select Height Re-Cal, TD Angle, Elev Pos.

Use the arrow keys to highlight the specific function you are requiring to be calibrated then Press Select.

TOP MENU QUICK RE-CAL		
HEIGHT RE-CAL		
TD ANGLE		
ELEV POS		
EXIT	BACK	TOP MENU

2.5.1 HEIGHT CAL

2.5.2 SLIP AND CUT (First Layer Change Block Height Recalibration)

If a slip and cut operation has been done, or if the cable lay on the drum has changed in relation to the height of the block for any reason, a first layer change recalibration must be done..

TOP MENU QUICK RE-CAL		
HEIGHT RE-CAL		
TD ANGLE		
ELEV POS		
EXIT	BACK	TOP MENU

- Height Re-Cal is currently highlighted. Press the select button on this option to navigate to the quick Height Cal menu
- To perform the slip and cut height calibrations please follow the steps below.

TOP MENU>QUICK RE-CAL			
~} RESET TO 1ST LAYER CHG			
		5.3m	
RESET TO HEIGHT			
		4.5m	
BLOCK HEIGHT 4.5m RF COUNT 5			
READY - for PAY-OUT Calibration			

- Fix a strap tape to the lowest point on the latched elevators
- Move the blocks to the lowest position with the elevators touching the floor.
- Now move the top drive upwards until The drill line has reached the outside edge of the drum. You want the drill line to just starting to wrap over onto the next layer. This will be on the bottom of the drum.
- Measure the current height of the block from the rig floor to the bottom of the elevator.
- With RESET TO 1ST LAYER CHG highlighted, press the SELECT button.

TOP MENU>QUICK RE-CAL			
~} RESET TO 1ST LAYER CHG			
		5.3m	
RESET TO HEIGHT			
		4.5m	
BLOCK HEIGHT			
4.5m		RF COUNT	5
READY - for PAY-OUT Calibration			

- Use the arrow buttons to enter the height reading on the strap tape.

TOP MENU>QUICK RE-CAL			
RESET TO 1ST LAYER CHG			
		5.2m	
Press ACCEPT to save changes.			
Press SELECT to discard changes.			
BLOCK HEIGHT			
4.5m		RF COUNT	7
READY - for PAY-OUT Calibration			

- Once entered Press ACCEPT when the correct value is displayed, then press ACCEPT again to confirm and save.

TOP MENU>QUICK RE-CAL			
RESET TO 1ST LAYER CHG			
		5.2m	
SAVE - ARE YOU SURE?			
BLOCK HEIGHT			
4.5m		RF COUNT	8
READY - for PAY-OUT Calibration			

TOP MENU>QUICK RE-CAL			
RESET TO 1ST LAYER CHG			
		5.2m	
SAVING...			
BLOCK HEIGHT			
4.5m		RF COUNT	9
READY - for PAY-OUT Calibration			

- Use the arrow buttons to highlight EXIT and press SELECT.
- Press ACCEPT to confirm and return to the Main Operation Screen.

2.5.3 Simple Block Height Recalibration

If no slip-and-cut operation has been done, and the cable lay on the drum has not changed in relation to the height of the block since the last time the block height has been recalibrated, the Simple Height Recalibration can be used instead of the First Layer Change Recalibration. This recalibration is used if the system was temporarily turned off, and the blocks were moved.

- From the main operating screen press the SELECT button, use the arrow keys to navigate to CAL. To access this menu press the SELECT button On CAL

SYSTEM INFO		
BLOCK ANG	BAIL ANG	ELEV POS
0.0^	0.0^	TRIP
Exit	TARE SIG	CAL SETUP

- Use The arrow keys to Highlight HEIGHT RE-CAL press the SELECT button

TOP MENU QUICK RE-CAL		
HEIGHT RE-CAL		
TD ANGLE		
ELEV POS		
EXIT	BACK	TOP MENU

- With RESET TO HEIGHT highlighted, press the SELECT button.

TOP MENU>QUICK RE-CAL		
~}RESET TO 1ST LAYER CHG	5.3m	
RESET TO HEIGHT	4.5m	
BLOCK HEIGHT	4.5m	RF COUNT 5
READY - for PAY-OUT Calibration		

TOP MENU>QUICK RE-CAL		
RESET TO 1ST LAYER CHG	5.3m	
~}RESET TO HEIGHT	4.5m	
BLOCK HEIGHT	4.5m	RF COUNT 5
READY - for PAY-OUT Calibration		

TOP MENU> QUICK RE-CAL			
RESET TO 1ST LAYER CHG		5.3m	
RESET TO HEIGHT		4.5m~}	
BLOCK HEIGHT	4.5m	RF COUNT	5
READY - for PAY-OUT Calibration			

- Move the block to the floor (such as 0.0m with the elevator touching the floor). OR Measure the current height of the block from the rig floor to the bottom of the latched elevator.
- Use the arrow buttons to enter the measured height.

TOP MENU>HEIGHT RE-CAL			
RESET TO 1ST LAYER CHG		5.3m	
RESET TO HEIGHT		0.0m	
Press ACCEPT to save changes.			
Press SELECT to discard changes.			
BLOCK HEIGHT		4.5m	RF COUNT 7
READY - for PAY-OUT Calibration			

- Press ACCEPT once the correct value is displayed, then again to confirm.

TOP MENU>QUICK RE-CAL			
RESET TO 1ST LAYER CHG	5.3m		
RESET TO HEIGHT	0.0m		
SAVE - ARE YOU SURE?			
BLOCK HEIGHT	4.5m	RF COUNT	8
READY - for PAY-OUT Calibration			

TOP MENU>QUICK RE-CAL			
RESET TO 1ST LAYER CHG	5.3m		
RESET TO HEIGHT	0.0m	{ }	
SAVING...			
BLOCK HEIGHT	0.0m	RF COUNT	9
READY - for PAY-OUT Calibration			

- Highlight EXIT and press SELECT, then press ACCEPT to confirm and return to the Main Operation Screen.

2.6 TD ANGLE

2.6.1 Top Drive Angle Calibration Quick Cal

With the top drive and bails in 'home' position, the displayed angles should be at or near zero. If this is not the case, the angles must be adjusted to display properly. To Quick calibrate the Top drive angles follow these steps.

From the main operating screen press the SELECT button, use the arrow keys to navigate to CAL. To access this menu press the SELECT button On CAL

SYSTEM INFO		
BLOCK ANG	BAIL ANG	ELEV POS
0.0^	0.0^	TRIP
Exit	TARE SIG	CAL SETUP

TOP MENU QUICK RE-CAL		
HEIGHT RE-CAL		
TD ANGLE		
ELEV POS		
EXIT	BACK	TOP MENU

Using the arrow keys highlight TD ANGLE, to access the TD ANGLE menu press the SELECT button

TOP MENU>QUICK CAL>TD ANGLE		
~}ZERO ALL		
ZERO BLOCK ANGLE		
ZERO BAIL ANGLE		
BLOCK	0.0^ SENT	BAIL 3.5^ SENT
EXIT	BACK	TOP MENU

If both the block and bail are in the home position, or if there's only one angle, the Zero All option can be used.

Using the arrow keys Select the specific equipment by navigating to either the Block Angle or the Bail Angle. To calibrate the sensor Press the SELECT button.

TOP MENU>QUICK CAL>TD ANGLE		
~}ZERO ALL		
ZERO BLOCK ANGLE		
ZERO BAIL ANGLE		
BLOCK	0.0^ SENT	BAIL 3.5^ SENT
EXIT	BACK	TOP MENU

ZEROING BLOCK ANGLE

Once Finished the panel will display that the Specific angle sensor was Calibrated

BLOCK ANGLE ZERO

To calibrate the bail sensor simply move the cursor to the Bail Angle sensor and press the SELECT button.

If a component cannot be moved to the home position, or if only one angle needs to be calibrated, they can be reset individually.

- Use the arrow buttons to highlight ZERO ALL and press SELECT. The current angles will be set to zero.

```
TOP MENU>QUICK CAL>TD ANGLE
~} ZERO ALL
  ZERO BLOCK ANGLE
  ZERO BAIL ANGLE

BLOCK  0.0^ SENT  BAIL  3.5^ SENT  _
```

ZEROING ALL TOP DRIVE ANGLES

ALL TOP DRIVE ANGLES ZERO

2.7 ERS Rotation Calibration Quick Cal

In order for the panel to use and display the correct elevator position, the ERS transducer must be calibrated first to either DRILL or TRIP position. See the section below for instructions on how to do so.

****If the ERS has been previously calibrated but is not displaying the correct position of the top drive, the top drive block position must be recalibrated using the following procedure.***

Follow the steps bellow to calibrate the elevator position.

2.7.1 Calibrate to Trip or Drill

SYSTEM INFO		
BLOCK ANG	BAIL ANG	ELEV POS
0.0^	0.0^	TRIP
Exit	TARE SIG	CAL SETUP

This will open the Components Menu. Use the arrow buttons to highlight the CALIBRATE option and press SELECT.

TOP MENU QUICK RE-CAL		
HEIGHT RE-CAL		
TD ANGLE		
ELEV POS		
EXIT	BACK	TOP MENU

Highlight The ELEV POS option and press SELECT.

TOP MENU>QUICK CAL>ELEV POS		
~}	SET ELEV TO TRIP	
	SET ELEV TO DRILL	

****Before proceeding to the final step, ensure that the elevators are set correctly with the top drive, in either DRILL or TRIP position. Once the position is confirmed, the calibration can be finalized.****

Once the top Drive position has been confirmed use the arrow keys to navigate to set ELEV TO TRIP and use the SELECT button to set the top drive position.

SETTING ELEVATOR TO TRIP MODE

ELEVATORS SET TO TRIP MODE

Once the calibration is complete use the arrow keys to highlight EXIT in the Bottom left Corner of the display. To EXIT press the SELECT button Once then the ACCEPT button once. Now you will be able to confirm that the Top drive position has been properly calibrated on the main screen.

Operating Alarms

When the system encounters a problem (or a pre-set limit) an alarm message will flash on the display panel. For more important alarms, the panel will also beep continuously and if necessary, the rig brakes will also be applied. The message will flash and the beeping will continue until the detected problem is resolved. If however, the panel's Setup Menu is active when the system detects a problem, the alarm will instead be displayed in the status bar near the bottom of the screen and the panel will not beep.

<p>TOP DRIVE</p> <p>BAILS TILTED</p>		
<div style="border-bottom: 1px solid black; margin-bottom: 5px;"> TOP MENU </div> <div style="text-align: center; padding: 10px;"> ~} SYSTEM DIAGNOSTIC </div> <div style="border-top: 1px solid black; margin-top: 5px;"> <div style="display: flex; justify-content: space-between; padding: 2px 5px;"> TOP DRIVE BAILS TILTED <div style="text-align: center;">=20</div> EXIT </div> </div>		

If any of the components fail, or if a signal is lost for an extended period of time, a *system alarm* will sound to indicate that there is a problem. The system alarm will display in the same way as a regular operating alarm, but will be accompanied by a faster beeping sound. System alarms for top drive sensors will trigger the brake output as if the sensor had indicated that the top drive was in an unsafe position.

<p>BAIL ANGLE</p> <p>SYSTEM ALARM</p>		
<div style="border-bottom: 1px solid black; margin-bottom: 5px;"> TOP MENU </div> <div style="text-align: center; padding: 10px;"> ~} SYSTEM DIAGNOSTIC </div> <div style="border-top: 1px solid black; margin-top: 5px;"> <div style="display: flex; justify-content: space-between; padding: 2px 5px;"> BAIL ANGLE SYS NOT FUNCTIONING <div style="text-align: center;">=64</div> </div> </div>		

For more information on alarms see the Troubleshooting section at the end of this manual.

2.8 Using Bypass

The panel's BYPASS button can be used if a component is malfunctioning or needs to be temporarily overridden. Pressing BYPASS will disable the alarms and outputs for 30 seconds and allow the blocks to be moved to a safe position. The display panel will count down the 30 second interval, and then resume normal operation.

** BY-PASS **
30 SEC REMAIN
0

****It's very important to use the BYPASS button with caution. If rig activity is resumed before the bypass state is fully counted down, any potential collisions during the countdown will not be prevented by the system.****


2.9 Low Air Pressure

The Rigsmart system may be equipped to pneumatically activate the rig's main brakes. This equipment requires a steady supply of rig air of no less than 100 PSI to operate correctly. If the system detects the rig air pressure drop below 70 PSI, an alarm will register on the panel; if there is not enough air in the system to activate the rig's brake, a collision may occur.

LOW BRAKE PRESSURE
69


2.10 Using the Raise Derrick Menu

The Raise Derrick Mode is used to disable alarms associated with the crown saver counterweight. Normally, the rig brakes are applied when weight is taken off the counterweight, in order to avoid a collision between the top drive and the crown. In Raise Derrick Mode however, the counterweight alarm will not be triggered and the rig brakes will not be applied, in order to facilitate a rig-up or rig-down situation. The Raise Derrick option is only available when using the supervisor permission code.



Raise Derrick Mode

When the Rigsmart system is put into Raise Derrick Mode, all outputs are bypassed and the system will not prevent any potential collisions.



- Using the instructions in the Troubleshooting section, enter the supervisor permission code.
- From the Top Menu, use the arrow buttons to highlight OPERATIONS and press the SELECT button.
- While in Raise Derrick Mode (as indicated by the displayed message) the panel outputs will be disabled.

TOP MENU		
~}COMPONENTS		SYSTEM
HEIGHT RE-CAL		DIAGNOSTIC
OPERATIONS		
<hr/>		
MAIN LOAD=	1,500dN	BLOCK 4.5m

TOP MENU			
COMPONENTS		SYSTEM	
HEIGHT RE-CAL		DIAGNOSTIC	
~} OPERATIONS			
MAIN LOAD=		1,500dN BLOCK	4.5m

TOP MENU>OPERATIONS			
~}RAISE DERRICK			
RUN CASING			
MAIN LOAD=		1,500dN	BLOCK 4.5m

TOP MENU>OPERATIONS> RAISE DERRICK
Outputs are disabled. Exit menu to resume normal operation.
RAISING DERRICK - OUTPUT DISABLED = 27

To re-enable the brake output and return to normal operation, use the arrow buttons to highlight EXIT and press SELECT. Press the ACCEPT button to confirm switching modes.

****While in Raise Derrick Mode, all statuses for system sensors are unavailable.****

2.11 Using Run Casing Mode

The Run Casing Mode allows temporary operation of the top drive without bails attached. This option ignores the current state of the bail angle sensors and does not provide any bail collision prevention. While in Run Casing Mode, the bail angle will be shown as 'CASING' instead of the currently measured angle. The floor saver height will be adjusted to the 'TD BTM FLOOR HT' (the height of the bottom of the top drive) as set and displayed in the Anti-Collision Limits Menu (if applicable, see the Anti-Collision Limits section below for more information).

TOP DIVE EXTEND	BAIL TILT	ELEVATOR POSITION	BLOCK HEIGHT
1.0°	6°	TRIP	4.5m
			MAX 25.9m MIN .0m

SYSTEM INFO		
BLOCK ANG	BAIL ANG	ELEV POS
0.0^	CASING	TRIP
EXIT{	TARE	SIG CAL SETUP

The system will not indicate a lack of communication with the bail sensor, allowing movement of the bails to a location away from the panel antenna. If the panel is restarted, the system will automatically

turn off Run Casing mode, and will once again display the proper bail angle and indicate any bail-specific alarms.

Follow the instructions below to turn the Run Casing Mode on and off.

****Run Casing will only appear if ‘TOP DRIVE = on’ is shown on the panel. Run casing will not appear when ‘TOP DRIVE=off’ is shown.****

- Using the instructions in the Troubleshooting section, enter the supervisor permission code.
- From the Top Menu, use the arrow buttons to highlight OPERATIONS.
- Highlight RUN CASING and press the SELECT button to turn Run Casing Mode on or off.

```

TOP MENU
~}COMPONENTS      SYSTEM
  QUICK RE-CAL    DIAGNOSTIC
  OPERATIONS

MAIN LOAD=      1,500dN BLOCK      4.5m_
EXIT
  
```

```

TOP MENU
COMPONENTS      SYSTEM
QUICK RE-CAL    DIAGNOSTIC
~}OPERATIONS

MAIN LOAD=      1,500dN BLOCK      4.5m_
  
```

```

TOP MENU>OPERATIONS

  RAISE DERRICK
~}RUN CASING

MAIN LOAD=      1,500dN BLOCK      4.5m_
  
```

```

SWITCHING TO RUN CASING MODE
  
```

```

RUNNING CASING
  
```

- After turning Run Casing Mode on or off, use the arrow buttons to highlight EXIT and press SELECT and then ACCEPT to return to the Main Operation Screen.

****Restarting the panel will also cause the system to exit Run Casing Mode.****

3 System Calibration

3.1 Block Height Calibration

In order for the panel to use and display the correct block height, the drill line payout transducer must be calibrated first. The system will be pre-calibrated during installation, but the displayed value may need to be adjusted occasionally. See the section below for instructions on how to do so.

If the block height has been previously calibrated but the displayed block height on the panel is no longer correct, the calibration can be restored using the Height Re-Cal Menu (see the 'CAL' section for instructions).

****If the bails or elevators are changed and the new equipment is of a different size, the anti-collision limits and system calibration will need to be changed to accommodate the new equipment.****

3.2 Full Block Height Calibration – Encoder on Drawworks

If this is the first time a full block height calibration has been done, follow the steps below to calibrate the system.

1. Set the lowest point
2. Set the layer change points, all the way up the derrick
3. Set the crown calibration point

3.2.1 Enter Supervisor Mode

In order to access the calibration settings, you must first enter the supervisor permission code. Refer to the Troubleshooting section for instructions on how to do so.

- After entering the supervisor permission code and being returned to the Top Menu, new options will be available. Use the arrow buttons to highlight the COMPONENTS option and press the SELECT button.

TOP MENU			
~}	COMPONENTS	SYSTEM	
	HEIGHT RE-CAL	DIAGNOSTIC	
	OPERATIONS		
<hr/>			
MAIN LOAD=	1,500dN	BLOCK	4.5m

- This will open the Components Menu. Use the arrow buttons to highlight the CALIBRATE option and press SELECT.

TOP MENU>COMPONENTS			
	LIMITS	ENABLE/DISABLE	
~}	CALIBRATE		
	SETTINGS		
<hr/>			
MAIN LOAD=	1,500dN	BLOCK	4.5m

- This will open the Calibration Menu. Use the arrow buttons to highlight the ENCODER option and press SELECT.

TOP MENU>COMPONENTS>CALIBRATE			
LOAD	~}	Encoder	ANGLE
		TD ANGLE	
<hr/>			
MAIN LOAD=	1,500dN	BLOCK	4.5m

- This will open the ENCODER Calibration Menu.

TOP MENU>COMPONENTS>CALIBRATE> ENCODER			
~}	BLOCK POSITION	POINT 0	BLOCK POL 4
	BLOCK HEIGHT	.0m	CAL POL 1
	SETTINGS		
	OTHER	RF COUNT	1
READY - for ENCODER Calibration			

3.2.2 Calibrate the Lowest Point

- Move the block down until the elevators touch the floor.
- The distance from the rig floor to the bottom of the elevators will be entered as 0.0M.
- Ensure that the BLOCK POSITION setting shows POINT 0.

TOP MENU>COMPONENTS>CALIBRATE> ENCODER			
~}	BLOCK POSITION	POINT 0	BLOCK POL 4
	BLOCK HEIGHT	.0m	CAL POL 1
	SETTINGS		
	OTHER	RF COUNT	1
READY - for ENCODER Calibration			

- Use the arrow buttons to highlight BLOCK HEIGHT and press the SELECT button.

TOP MENU>COMPONENTS>CALIBRATE> ENCODER			
	BLOCK POSITION	POINT 0	BLOCK POL 4
	BLOCK HEIGHT	.0m{	CAL POL 1
	SETTINGS		
	OTHER	RF COUNT	1
READY - for ENCODER Calibration			

- Use the arrow buttons to adjust the number to the measured height.

TOP MENU>COMPONENTS>CALIBRATE> ENCODER			
Press ACCEPT to save changes.			
Press SELECT to discard changes.			
	BLOCK HEIGHT	4.5m{	CAL POL 1
	SETTINGS		
	OTHER	RF COUNT	7
READY - for ENCODER Calibration			

- Press the ACCEPT button once the desired height is displayed. Press ACCEPT again to confirm and store the value.

TOP MENU>COMPONENTS>CALIBRATE> ENCODER			
SAVE - ARE YOU SURE?			
BLOCK POSITION POINT 0	BLOCK POL 1		
BLOCK HEIGHT	4.5m{	CAL	POL 1
SETTINGS			
OTHER		RF COUNT	8
READY - for ENCODER Calibration			

TOP MENU>COMPONENTS>CALIBRATE> ENCODER			
SAVING...			
BLOCK POSITION POINT 0	BLOCK POL 1		
BLOCK HEIGHT	4.5m{	CAL	POL 1
SETTINGS			
OTHER		RF COUNT	8
READY - for ENCODER Calibration			

- If the position was stored correctly 'SUCCESS – POINT 0 Cal STORED' will be displayed on the status bar and BLOCK POSITION will change from POINT 0 to POINT 1.

TOP MENU>COMPONENTS>CALIBRATE> ENCODER			
BLOCK POSITION POINT 1	BLOCK POL 4		
~} BLOCK HEIGHT	4.5m	CAL	POL 4
SETTINGS			
OTHER		RF COUNT	0
SUCCESS - POINT 0 STORED			

3.2.3 Enter the Layer Change and Crown Calibration Points

Further calibration points are taken at the start of each drawworks cable layer change, and at the maximum height (near the height of the crown saver). If there are no cable layer changes on the drawworks, only the crown position point needs to be set.

If the drawworks has cable layer changes, move the block to the start of the next cable layer change. If there are no layer changes, move the block to the crown position.

- Measure the block height from the rig floor to the bottom of the elevator.
- With BLOCK HEIGHT highlighted press the SELECT button.

TOP MENU>COMPONENTS>CALIBRATE> ENCODER			
BLOCK POSITION POINT 1	BLOCK POL 4		
BLOCK HEIGHT	4.5m {	CAL	POL 4
SETTINGS			
OTHER		RF COUNT	2
SUCCESS - POINT 0 STORED			

- Use the arrow buttons to change the number to match the measurement.

TOP MENU>COMPONENTS>CALIBRATE> ENCODER			
Press ACCEPT to save changes.			
Press SELECT to discard changes.			
BLOCK HEIGHT	8.7m {	CAL	POL 4
SETTINGS			
OTHER		RF COUNT	7
SUCCESS - POINT 0 STORED			

- Press ACCEPT once the desired height is displayed. Press ACCEPT again to confirm and store the value.

TOP MENU>COMPONENTS>CALIBRATE> ENCODER			
SAVE - ARE YOU SURE?			
BLOCK HEIGHT	8.7m {	CAL	POL 4
SETTINGS			
OTHER		RF COUNT	8
SUCCESS - POINT 0 STORED			

TOP MENU>COMPONENTS>CALIBRATE> ENCODER			
SAVING...			
BLOCK HEIGHT	8.7m {	CAL	POL 4
SETTINGS			
OTHER		RF COUNT	8
SUCCESS - POINT 0 STORED			

If the position was stored correctly 'SUCCESS – FULL Cal STORED point' will be displayed on the status bar and BLOCK POSITION will change to the next point.

TOP MENU>COMPONENTS>CALIBRATE> ENCODER			
BLOCK POSITION POINT 2	BLOCK POL 4		
~ } BLOCK HEIGHT 8.7m	CAL POL 4		
SETTINGS			
OTHER	RF COUNT 0		
SUCCESS - FULL Cal STORED point			

- (Repeat the above steps for each layer change while raising the block to the crown.)
- Continue to take measurements and enter points at each layer change until the position of the crown saver is reached.
- Once the layer changes are complete, measure the height of the block near the crown saver and enter the value in the manner that the layer change points were entered.
- Once the calibration is complete, return to the Main Operation Screen to verify that everything was entered correctly.
- Use the arrow buttons to highlight EXIT and press the SELECT button.
- Press the ACCEPT button to confirm the move to the Main Operation Screen.

3.3 Full Block Height Calibration (4mA – 20mA)

SPECIAL NOTICE:

This procedure is only used if the Rigsmart system receives block height data from a PLC via a special 4-20mA input. The rig's PLC must first be calibrated before the Rigsmart system can be used. The Rigsmart system's height should be set to match the PLC's height to eliminate confusion between the two systems. When calibrating the Rigsmart block height, there is no need to physically measure the height—it may be referenced from the PLC's display. This calibration is very different from the normal Rigsmart block height calibration found on other systems.



WARNING

Potential for Accident

If there is a loss of power to the Rigsmart system or power has been turned off intentionally, a height calibration must be done.



If this is the first time the calibration has been done, follow the steps detailed in the next section. If the system has already been calibrated but is no longer displaying the correct block height, see the 'Simple Block Height Recalibration' section for instructions.

Please

- ❖ **Ensure that the HMI/PLC has been fully calibrated prior to performing the full height calibration on the Rigsmart display.**
- In order to access the calibration settings, the Supervisor Permission Code must be entered. Refer to 'Using the Supervisor Permission Code' found in the troubleshooting section at the back of this manual.

A full block height calibration is done by completing the following steps, in order:

1. Set the lowest point
2. Set the highest point

3.3.1 Calibrate the Lowest Point

- Move the block as close to the rig floor as possible with the Elevators Touching the table.
- Reference the height given by the PLC HMI.
- Ensure that the BLOCK POSITION setting shows POINT 0.

TOP MENU>COMPONENTS>CALIBRATE> ENCODER			
~}	BLOCK POSITION	POINT 0	BLOCK POL 4
	BLOCK HEIGHT	.0m	CAL POL 1
	SETTINGS		
	OTHER	RF COUNT	1
READY - for ENCODER Calibration			

- Use the arrow buttons to highlight BLOCK HEIGHT and press the SELECT button.

TOP MENU>COMPONENTS>CALIBRATE> ENCODER			
	BLOCK POSITION	POINT 0	BLOCK POL 4
	BLOCK HEIGHT	.0m{	CAL POL 1
	SETTINGS		
	OTHER	RF COUNT	1
READY - for ENCODER Calibration			

- Use the arrow buttons to adjust the block height value to match the height displayed by the PLC.

TOP MENU>COMPONENTS>CALIBRATE> ENCODER			
Press ACCEPT to save changes.			
Press SELECT to discard changes.			
BLOCK HEIGHT	4.5m{	CAL	POL 1
SETTINGS			
OTHER		RF COUNT	7
READY - for ENCODER Calibration			

Press ACCEPT once the desired height is displayed. Press ACCEPT again to confirm and store the value.

TOP MENU>COMPONENTS>CALIBRATE> ENCODER			
SAVE - ARE YOU SURE?			
BLOCK HEIGHT	4.5m{	CAL	POL 1
SETTINGS			
OTHER		RF COUNT	8
READY - for ENCODER Calibration			

TOP MENU>COMPONENTS>CALIBRATE> ENCODER			
SAVING...			
BLOCK HEIGHT	4.5m{	CAL	POL 1
SETTINGS			
OTHER		RF COUNT	8
READY - for ENCODER Calibration			

- If the position was stored correctly 'SUCCESS - POINT 0 STORED' will be displayed on the status bar and BLOCK POSITION will change from POINT 0 to POINT 1.

TOP MENU>COMPONENTS>CALIBRATE> ENCODER			
BLOCK POSITION POINT 1 BLOCK POL 4			
~} BLOCK HEIGHT	4.5m	CAL	POL 4
SETTINGS			
OTHER		RF COUNT	0
SUCCESS - POINT 0 STORED			

3.3.2 Enter the Second Calibration Point

A second calibration point must be made at the top of the derrick.

- Move the top drive to the highest point in the derrick to match the calibrated height on the HMI/PLC
- Reference the block height from the PLC.
- With BLOCK HEIGHT highlighted press SELECT.

TOP MENU>COMPONENTS>CALIBRATE> ENCODER			
BLOCK POSITION POINT 1	BLOCK POL 4		
BLOCK HEIGHT	4.5m{	CAL	POL 4
SETTINGS			
OTHER		RF COUNT	2
SUCCESS - POINT 0 STORED			

- Use the arrow buttons to change the block height value to match the height displayed by the PLC.

TOP MENU>COMPONENTS>CALIBRATE> ENCODER			
Press ACCEPT to save changes.			
Press SELECT to discard changes.			
BLOCK POSITION POINT 1	BLOCK POL 4		
BLOCK HEIGHT	8.7m{	CAL	POL 4
SETTINGS			
OTHER		RF COUNT	7
SUCCESS - POINT 0 STORED			

- Press ACCEPT once the correct height is displayed. Press ACCEPT again to confirm and store the value.

TOP MENU>COMPONENTS>CALIBRATE> ENCODER			
SAVE - ARE YOU SURE?			
BLOCK POSITION POINT 1	BLOCK POL 4		
BLOCK HEIGHT	8.7m{	CAL	POL 4
SETTINGS			
OTHER		RF COUNT	8
SUCCESS - POINT 0 STORED			

TOP MENU>COMPONENTS>CALIBRATE>ENCODER			
SAVING...			
BLOCK POSITION POINT 0	BLOCK POL 4		
BLOCK HEIGHT	8.7m	CAL	POL 4
SETTINGS			
OTHER		RF COUNT	8
SUCCESS - POINT 0 STORED			

If the position was stored correctly 'SUCCESS – FULL Cal STORED point' will be displayed on the status bar and BLOCK POSITION will change to the next point.

TOP MENU>COMPONENTS>CALIBRATE>ENCODER			
BLOCK POSITION POINT 2	BLOCK POL 4		
~}BLOCK HEIGHT	8.7m	CAL	POL 4
SETTINGS			
OTHER		RF COUNT	0
SUCCESS - FULL Cal STORED point			

- Once the calibration is complete, return to the Main Operation Screen to verify that the calibration was entered successfully.
-
- Use the arrow buttons to highlight EXIT and press the SELECT button.
- Press ACCEPT to confirm and return to the Main Operation Screen.

3.4 Top Drive Angle Calibration

With the top drive and bails in 'home' position, the displayed angles should be at or near zero. If this is not the case, the angles must be adjusted to display properly.

- Bring the bails and/or top drive to the 'home' position.
- Using the instructions in the Troubleshooting section, enter the supervisor permission code.
- After being returned to the Top Menu, use the arrow buttons to highlight the COMPONENTS option and press the SELECT button.

TOP MENU			
~}COMPONENTS	SYSTEM		
HEIGHT RE-CAL	DIAGNOSTIC		
OPERATIONS			
MAIN LOAD= 1,500dN BLOCK 4.5m			

- This will open the Components Menu. Use the arrow buttons to highlight the CALIBRATE option and press SELECT.

TOP MENU>COMPONENTS			
LIMITS		ENABLE/DISABLE	
~}CALIBRATE			
SETTINGS			
MAIN LOAD=		1,500dN BLOCK	4.5m

- From the Calibration Menu, highlight the TD ANGLE option and press SELECT.

TOP MENU>COMPONENTS> CALIBRATE			
LOAD	PAY-OUT		
~}	TD ANGLE		
<hr/>			
MAIN LOAD=	1,500dN	BLOCK	4.5m

- This will open the Top Drive Menu.

TOP MENU>COMPONENTS>CALIBRATE>TOP DRIVE			
~} ZERO ALL			
ZERO BLOCK ANGLE			
ZERO BAIL ANGLE			
<hr/>			
BLOCK	0.0^	SENT	BAIL 3.5^ SENT

If both the block and bail are in the home position, or if there's only one angle, the Zero All option can be used.

- Use the arrow buttons to highlight ZERO ALL and press SELECT. The current angles will be set to zero.

TOP MENU>COMPONENTS>CALIBRATE>**TOP DRIVE**

~} **ZERO ALL**

ZERO BLOCK ANGLE

ZERO BAIL ANGLE

BLOCK 0.0^ SENT **BAIL** 3.5^ SENT _

ZEROING ALL TOP DRIVE ANGLES

ALL TOP DRIVE ANGLES ZERO

- If a component cannot be moved to the home position, or if only one angle needs to be calibrated, they can be reset individually.
- Use the arrow buttons to highlight ZERO BAIL ANGLE or ZERO BLOCK ANGLE and press SELECT. The selected angle will be set to zero.

TOP MENU>COMPONENTS>CALIBRATE>**TOP DRIVE**

ZERO ALL

ZERO BLOCK ANGLE

~} **ZERO BAIL ANGLE**

BLOCK 0.0^ SENT **BAIL** 3.5^ SENT _

ZEROING BAIL ANGLE

BAIL ANGLE ZERO

When finished, highlight EXIT and press SELECT, and then press ACCEPT. The angle should now display '0.0°' in the home position.

3.5 Load Field Calibration

The Rigsmart Weight Indicator is pre-calibrated. As long as the same size and type of drill line is used, no adjustments are required (even if the line rider is taken off during a rig move). However, if the weight indicator readings are inaccurate, minor adjustments can be made to the calibration. The original factory calibration is stored in the panel and can be restored at any time. It is recommended that the line rider be returned after 1000 working days for recalibration and recertification.

3.5.1 Set Span

When performing a field calibration we strongly recommend that you use a weight that is more than half the amount of the total weight span of the load indicator.

- Example, if you have a 40,000lb load indicator you must use more the 20,000lb known weight
- To calibrate the system to a particular, known weight, use the following steps
- To enter the supervisor permission code refer to the troubleshooting section in the back of this manual
- In the Top Menu, use the arrow buttons to highlight COMPONENTS and press the SELECT button.

TOP MENU		
~ } COMPONENTS	SYSTEM	
QUICK CAL	DIAGNOSTIC	
OPERATIONS		
MAIN LOAD=	1,500dN	CRWN= OKAY _

- Use the arrow buttons to highlight CALIBRATE and press SELECT.

TOP MENU>COMPONENTS		
LIMITS	ENABLE/DISABLE	
~}CALIBRATE		
SETTINGS		
MAIN LOAD= 1,500dN CRWN= OKAY		

- Highlight LOAD and press SELECT.

TOP MENU>COMPONENTS>CALIBRATE		
~}LOAD		

- Highlight SET SPAN and press SELECT. Use the arrow buttons to change the value to the known weight on the hook.
- When the correct weight is displayed, press ACCEPT twice to save.

TOP MENU>COMPONENTS>CALIBRATE>LOAD MAIN		
~}SET SPAN	11,100dN	
SET ZERO	000dN	
FACTORY CAL		
	MAIL POL 1	
MAIN LOAD= 1,500dN CRWN= OKAY _		

TOP MENU>COMPONENTS>CALIBRATE>LOAD MAIN		
SET SPAN	11,100dN	-
Press ACCEPT to save changes.		
Press SELECT to discard changes.		
MAIN LOAD= 1,500dN CRWN= OKAY _		

TOP MENU>COMPONENTS>CALIBRATE>LOAD MAIN		SET
SPAN	11,100dN	-
SAVE - ARE YOU SURE?		
MAIN LOAD= 1,500dN CRWN= OKAY _		

TOP MENU>COMPONENTS>CALIBRATE> LOAD MAIN SET SPAN		
11.100dN{-		
SAVING . . .		
MAIN LOAD=	1,500dN	CRWN= OKAY _

3.5.2 Restore Factory Load Calibration

To calibrate the system to the original factory calibrations use the following steps:

- To enter the supervisor permission code See page
- In the Top Menu, use the arrow buttons to highlight COMPONENTS and press SELECT.
- Use the arrow buttons to highlight CALIBRATE and press SELECT.
- Highlight LOAD and press SELECT.

TOP MENU		
~} COMPONENTS	SYSTEM	
QUICK CAL	DIAGNOSTIC	
OPERATIONS		
MAIN LOAD=	1,500dN	CRWN= OKAY _

TOP MENU>COMPONENTS		
LIMITS	ENABLE/DISABLE	
~} CALIBRATE		
SETTINGS		
MAIN LOAD=	1,500dN	CRWN= OKAY _

TOP MENU>COMPONENTS>CALIBRATE		
~}LOAD		
</		

- Use the arrow buttons to highlight FACTORY CAL and press SELECT.
- Press ACCEPT twice to save.

TOP MENU>COMPONENTS>CALIBRATE>LOAD MAIN		
SET SPAN	11,100dN	
SET ZERO	000dN	
~}FACTORY CAL		
	MAIL POL 1	
MAIN LOAD=	1,500dN	CR

TOP MENU>COMPONENTS>CALIBRATE>LOAD MAIN		
SET SPAN	11.100dN	-
Press ACCEPT to save changes.		
Press SELECT to discard changes.		
MAIN LOAD=	1,500dN	CRWN= OKAY _

TOP MENU>COMPONENTS>CALIBRATE>LOAD MAIN		
SET		
SPAN	11.100dN	-
SAVE - ARE YOU SURE?		
MAIN LOAD=	1,500dN	CRWN= OKAY _

TOP MENU>COMPONENTS>CALIBRATE>LOAD MAIN		
SET SPAN		
11.100dN	-	
SAVING...		
MAIN LOAD=	1,500dN	CRWN= OKAY _

3.5.3 POL (Parts of Line)

POL is used in weight calculation. The parts of line for the particular rig **must** be set in the panel before the correct weight will be displayed. Use the following steps to set the POL:

- Using the instructions in the Troubleshooting section, enter the supervisor permission code.
- In the Top Menu, use the arrow buttons to highlight COMPONENTS and press the SELECT button.
- Highlight SETTINGS and press SELECT.
- Highlight LOAD and press SELECT.

TOP MENU		
~} COMPONENTS	SYSTEM	
	DIAGNOSTIC	
OPERATIONS		
<hr/>		
MAIN LOAD=	1,500dN	CRWN= OKAY <u> </u>

TOP MENU>COMPONENTS		
LIMITS	ENABLE/DISABLE	
CALIBRATE		
~} SETTINGS		
<hr/>		
MAIN LOAD=	1,500dN	CRWN= OKAY <u> </u>

TOP MENU>COMPONENTS>SETTINGS		
~} LOAD		
<hr/>		
MAIN LOAD=	1,500dN	CRWN= OKAY <u> </u>

- Highlight MAIN POL and press SELECT.
- Use the arrow keys to change POL to the correct value.

TOP MENU>COMPONENTS>SETTINGS>LOAD MAIN		
~} MAIN POL	6 WINCH	main
<hr/>		
MAIN LOAD=	1,500dN	CRWN= OKAY <u> </u>

- Press ACCEPT twice to save.

TOP MENU>COMPONENTS>SETTINGS>LOAD MAIN		
~} MAIN POL	6 WINCH	main
Press ACCEPT to save changes.		
Press SELECT to discard changes.		
<hr/>		
MAIN LOAD=	1,500dN	CRWN= OKAY <u> </u>

TOP MENU>COMPONENTS>SETTINGS>LOAD MAIN			~}MAIN
POL.	6 WINCH	main	
SAVE - ARE YOU SURE?			
MAIN LOAD=	1,500dN	CRWN=	OKAY

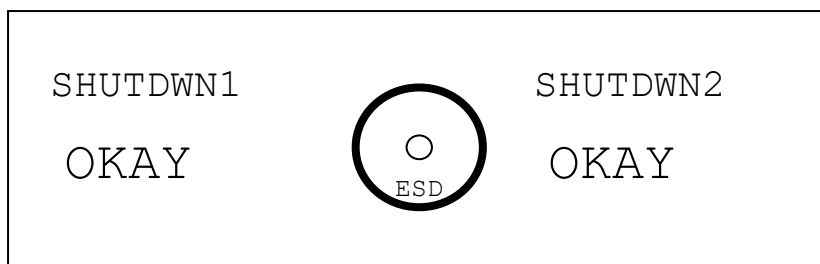
3.6 Wireless sensors

The Rigsmart system can be comprised of many different wireless radio sensors performing different safety functions. Each sensor listed here may not be a functioning part of your system. For more information please contact a Rigsmart service technician for more detailed information.

3.6.1 Emergency Shutdown

The Rigsmart system may be equipped with Emergency Shutdown (ESD) switches. These switches send a wireless signal to the display panel, which then shuts down a corresponding output—usually an engine kill or braking system.

In normal operation the panel will display “SHUTDWN1 OKAY” and “SHUTDWN2 OKAY”, as shown below, to indicate that no problems are detected.



The ESD alarm is triggered when any of the ESD switches are pressed. The alarm will flash on the display panel with an audible beeping while the switch is set. The display will also alternate between an alarm message indicating which switch was triggered, and the main status screen showing a status of ‘ALRM’ for the ESD switch that was pressed.



To resolve the alarm, simply pull out the ESD button on the switch.

The BYPASS button (on the front of the display panel) is used to temporarily restore normal system functionality during an alarm condition. However, due to the emergency nature of the ESD switch, the bypass cannot be used to override an alarm caused by an ESD switch being set.

If an ESD switch fails due to damage, dead battery or loss of signal, the corresponding output of the alarm hub will be triggered (as if the switch were set). In this case, the BYPASS button can be used to temporarily restore normal operation.

3.6.2 Crownsaver Sensor

- The Rigsmart system may be equipped with a crownsaver switch. These switches send a wireless signal to the display panel, which then shuts down a corresponding output—usually a Band / Drum braking system or an Eaton brake.
- The Crownsaver is installed on the opposite side of the dead end line that passes through the traveling blocks
- The counterweight is installed on the slowest moving line that passes through the traveling blocks.
- In normal operation the panel will display “CROWNSAVER OKAY”, as shown below, to indicate that no problems are detected.



The crownsaver alarm is triggered when The counterweight is lifted by the traveling blocks. The alarm will flash on the display panel with an audible beeping while the switch is set. The display will also alternate between an alarm message indicating which switch was triggered, and the main status screen showing a status of ‘CROWNSAVER 1 ALM’ code 4

CROWNSAVER 1 ALM

4

The Rigsmart system uses digitally stored limits to determine when the traveling blocks or top drive is in an unsafe position. Situations where the Rigsmart system would intervene include:

3.6.3 Crown Saver

- The Crown Saver prevents collisions between the travelling block and the rig crown.
- The Crown Saver is activated when the block travels above the Crown Saver Height Limit.

3.6.4 Pay-Out Transducer

- The Pay-Out transducer provides a digital Floor Saver limit which prevents collisions between the elevator (or top drive) and the rig floor.
- The Floor Saver is activated when the block travels below the Floor Saver Height Limit.
- If the Auto-Adjusting Floor Saver Height feature is enabled, the floor saver height will automatically adjust when the bails are tilted. This allows the top drive to move closer to the floor than would otherwise be safe with the bails floated.
- The Pay-Out transducer provides a digital Software Crown Saver limit which prevents collisions between the top drive and the Crown.

3.6.5 Monkey Board Angle Sensor

- The monkey board angle sensor provides an angle reading indicating if the monkey board is in the down position for Tripping applications or drilling from the Derrick.
- Or if the monkey board is folded back for applications when drilling out of the V-door and making connection out of the mouse hole.
- This allows additional room for the EXTEND FRAME and ELEVATORS to scope out from the torque track.
- If this applies to your Rig you will have an additional set of BLOCK and BAIL angle limits, you can find those under COMPONENTS>LIMITS>TD ANGLE>ALT BLOCK ANG>ALT BAIL ANG

3.6.6 Extend Frame / Link Tilt

- The Monkey Board Saver prevents collisions between the top drive and bails and the monkey board.

- The rigs brake will be activated if the bails and/or block are past their V-door Limits, while the block is above the monkey board, and the block moves below the Elevator Monkey Board Height Limit.
- The rigs brake will be activated if the bails are past their V-door Limits, while the block is below the monkey board, and moves above the Bail Monkey Board Height Limit.
- The rigs brake will be activated if the block is extended past its V-door Limit while below the monkey board, and moves above the Block Monkey Board Height Limit.

3.6.7 Torque Track Saver

- The Torque Track Saver prevents collision between the elevators (and bails) and the torque track.
- The brakes will be activated if the bails are tilted past their Drawworks Limit and the block is above the Torque Track Height.

3.6.8 Iron RoughNeck sensor

- The Iron Roughneck Sensor prevents collision between the elevators (and bails) and the Iron Roughneck Wrench
- The Brakes will be activated if the Iron Roughneck sensor is extended past the set angle limit and the blocks travel into the offset zone.

3.6.9 Stabbing Arm sensor

- The Stabbing Arm Sensor prevents collision between the elevators (and Top Drive) With the stabbing arm
- The Brakes will be activated if the Stabbing arm sensor is extended past the set angle limit and the blocks travel into the offset zone.
-

3.6.10 Load Limits

- The Maximum Load Limit prevents over-pulling on the drawworks, derrick structure and drill line. An alarm will sound at 90% and 100% of the set limit.

3.6.11 Pressure Limits

- The Maximum Pressure Limit prevents over-pressuring of pipes and lines. An alarm will sound when this limit is reached.

3.6.12 Wind Limits

- The Maximum Wind Speed Limit sounds an alarm when environmental wind speeds rise above the limit.

IF THE BAILS OR ELEVATORS ARE CHANGED AND THE NEW EQUIPMENT IS OF A DIFFERENT SIZE, THE ANTI-COLLISION LIMITS AND SYTEM CALIBRATION WILL NEED TO BE ADJUSTED TO ACCOMODATE THE NEW EQUIPMENT.

3.7 Bail and Block Angle Limits

Definitions

Setting the angle limits allows customization of safe operating zones of the bails and top drive. Use the instructions in the next section to set the Top Drive Angle Limits.

The Block Angle transducer should be mounted so that it is on the side of the top drive facing the driller's console In Trip Mode.

The Bail Angle transducer should be mounted so that it is on the side of the bails facing the driller's console while the top drive is in Trip orientation. The Bail Angle ON D limits will then refer to Trip position and the OFF D limits will refer to Drill position.

Block Angle ON D, VD1 – The maximum angle of top drive extension that will allow the top drive to safely pass by the monkey board with the angle sensor mounted on the driller side.

Block Angle ON D, VD2 – Used in conjunction with the Bail VD2 to determine partial extend. This angle is slightly more than the fully retracted position.

The Block Angle OFF D - Not used

Bail Angle ON D, VD1 – The maximum angle of bail tilt that will allow the bails and elevator to safely pass by the monkey board when the top drive is in Trip position.

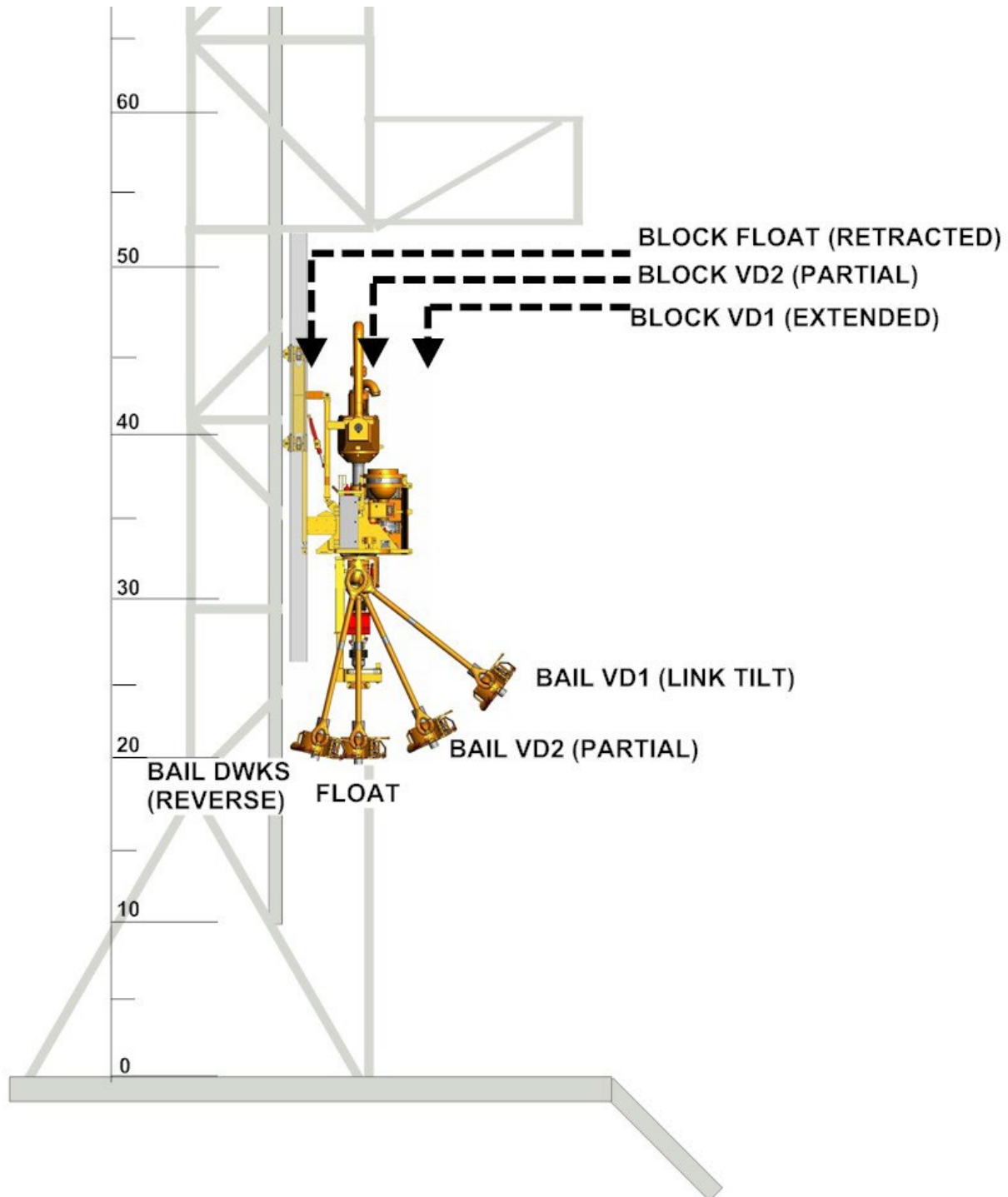
Bail Angle ON D, VD2 – Used in conjunction with the Block VD2 to determine partial extend. This angle is slightly more than the floated position.

Bail Angle ON D, DWKS – The maximum negative angle of bail tilt that will allow the bails and elevator to safely pass by the torque track when the top drive is in Trip position.

Bail Angle OFF D, VD1 – The maximum negative angle of bail tilt that will allow the bails and elevator to safely pass by the monkey board when the top drive is in Drill position.

Bail Angle OFF D, VD2 – Used in conjunction with the Block VD2 to determine partial extend. This angle is slightly more than the floated position.

Bail Angle OFF D, DWKS – The maximum angle of bail tilt that will allow the bails and elevator to safely pass by the torque track when the top drive is in Drill position.



See the following pages for instructions on how to set limits illustrated above.

3.7.1 Procedure Overview

Set the VD1 Limits first, then the VD2

Limits.

3.7.2 VD1 Limits

For the Bail:

1. Set the 'On D' Limits:
 - a. Turn the top drive to the TRIP position. Bail angle sensor will be facing the Driller, if the elevators are facing the V-Door and the Bail angle sensor is on the OFF D side of the top drive. Remove the sensor and Fix to the opposing Bail arm on the ON D side of bail arm.
 - b. Run the top drive up to the monkey board, so the elevators are level with the diving board.
 - c. Slowly link tilt out until the horns on the elevators are just about to contact the diving board (on a small rig this may be as little as 4 or 5 degrees, on a larger rig this may be 15 or 16 degrees).
 - d. **SET VD1** (positive value)- maximum bail angle before hitting the monkey board.
 - e. Float the bails and then link tilt them in the opposite direction as VD1, towards the torque track, until just before making contact.
 - f. **SET DWKS** (negative value)- maximum rear angle.
2. Set the 'OFF D' Limits:
 - a. Turn the top drive to the DRILL position.
 - b. Repeat steps 1(b) – 1(f) for DRILL position.
 - c. For DRILL position, **VD1** and **VD2** should be negative, and **DWKS** should be positive.

For the Block:

1. Set On D Limits, (OFF D is not used):
 - a. Position the top drive to be just under the monkey board.
 - b. Extend the top drive so that its top nearly makes contact with the monkey board.
 - c. **SET VD1**- Maximum angle the top drive can be extended before hitting the monkey board (this is a positive value).

- d. Retract the top drive back in fully then extend it slightly, just out of 'home' position.

3.7.3 VD2 Limits

1. Set VD1 on the bail and block as usual.
2. Return everything to the floated, 'home' position.
3. Raise the top drive to just below the monkey board, so the results of the angles can easily be seen in comparison to the monkey board.
4. Link tilt out the bails to a couple degrees less than Bail VD1 (at VD1, there's already an alarm set point).
5. Extend out the block until just before the bails contact the monkey board (still link tilted). (This should be a much shorter extension than the Block VD1 Limit).
6. Set this limit as Block Extend VD2.
7. Return everything to the floated home position.
8. Extend the block to several degrees less than Block VD1 (at VD1 there's already an alarm set point).
9. Link tilt out the bails (still block extended) until just before they contact the monkey board (this angle should be much less than the Bail VD1 Limit).
10. Set this angle as Bail VD2.

3.7.4 Step by Step Instructions

Using the instructions in the Troubleshooting section, enter the supervisor permission code.

- From the Top Menu, highlight the COMPONENTS option and press SELECT.

TOP MENU			
~}COMPONENTS		SYSTEM	
QUICK RE-CAL		DIAGNOSTIC	
OPERATIONS			
MAIN LOAD=	1,500dN	BLOCK	4.5m_

- This will open the Components Menu. Use the arrow buttons to highlight the LIMITS option and press SELECT.

TOP MENU>COMPONENTS			
~}LIMITS		ENABLE/DISABLE	
CALIBRATE			
SETTINGS			
MAIN LOAD=	1,500dN	BLOCK	4.5m

- Highlight the TD ANGLE option and press SELECT.

TOP MENU>COMPONENTS> LIMITS			
LOAD	ENCODER		
~} TD ANGLE			
MAIN LOAD=	1,500dN	BLOCK	4.5m

- Highlight the angle limit to be changed and press SELECT. (Both the block and bail are set in the same manner).
- This will open the specific angle sensor's Limits Menu.

TOP MENU>COMPONENTS>LIMITS>TD ANGLE			
~}BLOCK ANG		ALT BLOCK ANG	
BAIL ANG		ALT BAIL ANG	
BLOCK	0.0^ SENT	BAIL	0.0^ SENT

TOP MENU>COMPONENTS>LIMITS> BAIL ANGLE					
ON D			OFF D		
~} VD 1	90.0^	SET	VD 1	-90.0^	SET
VD 2	90.0^	SET	VD 2	-90.0^	SET
DWKS	-90.0^	SET	DWKS	90.0^	SET
<hr/>					
BLOCK	0.0^	SENT	BAIL	0.0^	SENT

The displayed limits can be changed in two ways. To change the limits *manually*:

- Highlight the limit to be changed and press SELECT.

TOP MENU>COMPONENTS>LIMITS> BAIL ANGLE									
ON D					OFF D				
VD 1	90.0^	SET	VD 1	-90.0^	{		SET		
VD 2	90.0^	SET	VD 2	-90.0^	SET				
DWKS	-90.0^	SET	DWKS	90.0^	SET				
BLOCK	0.0^	SENT	BAIL	0.0^	SENT				

- Use the arrow buttons to change the displayed value to the desired limit.

TOP MENU>COMPONENTS>LIMITS> BAIL ANGLE									
ON D					OFF D				
VD 1	90.0^	SET	VD 1	-90.0^	{		SET		
Press ACCEPT to save changes.									
Press SELECT to discard changes.									
DWKS	-90.0^	SET	DWKS	90.0^	SET				
BLOCK	0.0^	SENT	BAIL	0.0^	SENT				

- When the proper limit value is displayed, press the ACCEPT button. Press ACCEPT again to confirm and save the new limit.

TOP MENU>COMPONENTS>LIMITS> BAIL ANGLE									
ON D					OFF D				
VD 1	90.0^	SET	VD 1	-90.0^	{		SET		
SAVE - ARE YOU SURE?									
DWKS	-90.0^	SET	DWKS	90.0^	SET				
BLOCK	0.0^	SENT	BAIL	0.0^	SENT				

TOP MENU>COMPONENTS>LIMITS> BAIL ANGLE									
ON D					OFF D				
VD 1	90.0^	SET	VD 1	-90.0^	{		SET		
SAVING...									
DWKS	-90.0^	SET	DWKS	90.0^	SET				
BLOCK	0.0^	SENT	BAIL	0.0^	SENT				

To set the limit *automatically*:

- Tilt the bails or extend the block to the position to be used as the new limit. When the bails and/or block are physically at the new limit position, use the arrow buttons to highlight SET beside the corresponding limit to be set.

TOP MENU>COMPONENTS>LIMITS> BAIL ANGLE									
ON D					OFF D				
VD 1	90.0^	SET	VD 1	-90.0^~}	SET				
VD 2	90.0^	SET	VD 2	-90.0^	SET				
DWKS	-90.0^	SET	DWKS	90.0^	SET				
BLOCK	0.0^	SENT	BAIL	0.0^	SENT				

- Press the SELECT button to set the limit to the current angle.

SETTING BAIL ANGLE

BAIL ANGLE SET

3.8 Crown and Floor Saver Limits

The Pay-Out Crown & Floor Limits Menu allows specification of the crown saver and floor saver related settings.

CROWN SVR HT—The distance from the floor to the bottom of the elevator when the top of the travelling blocks are near the crown, with enough space to avoid collision if the brakes are applied.

This software crown saver is not the same as a hardware wireless crown saver (which may or may not be installed).

FLOOR SVR HT—The distance from the floor to the bottom of the elevators when the elevators are near the floor, but with enough space to avoid collision if the brakes were applied.

CROWN SAVER / FLOOR SAVER— This allows the enabling (ON) and disabling (OFF) of the block height crown saver and/or floor saver alarms.

WARNING: Disabling the crown or floor saver will remove any protection that the Rigsmart system provides against crown and/or floor collision. Disabling the crown or floor saver will also disable any speed control for the respective direction.

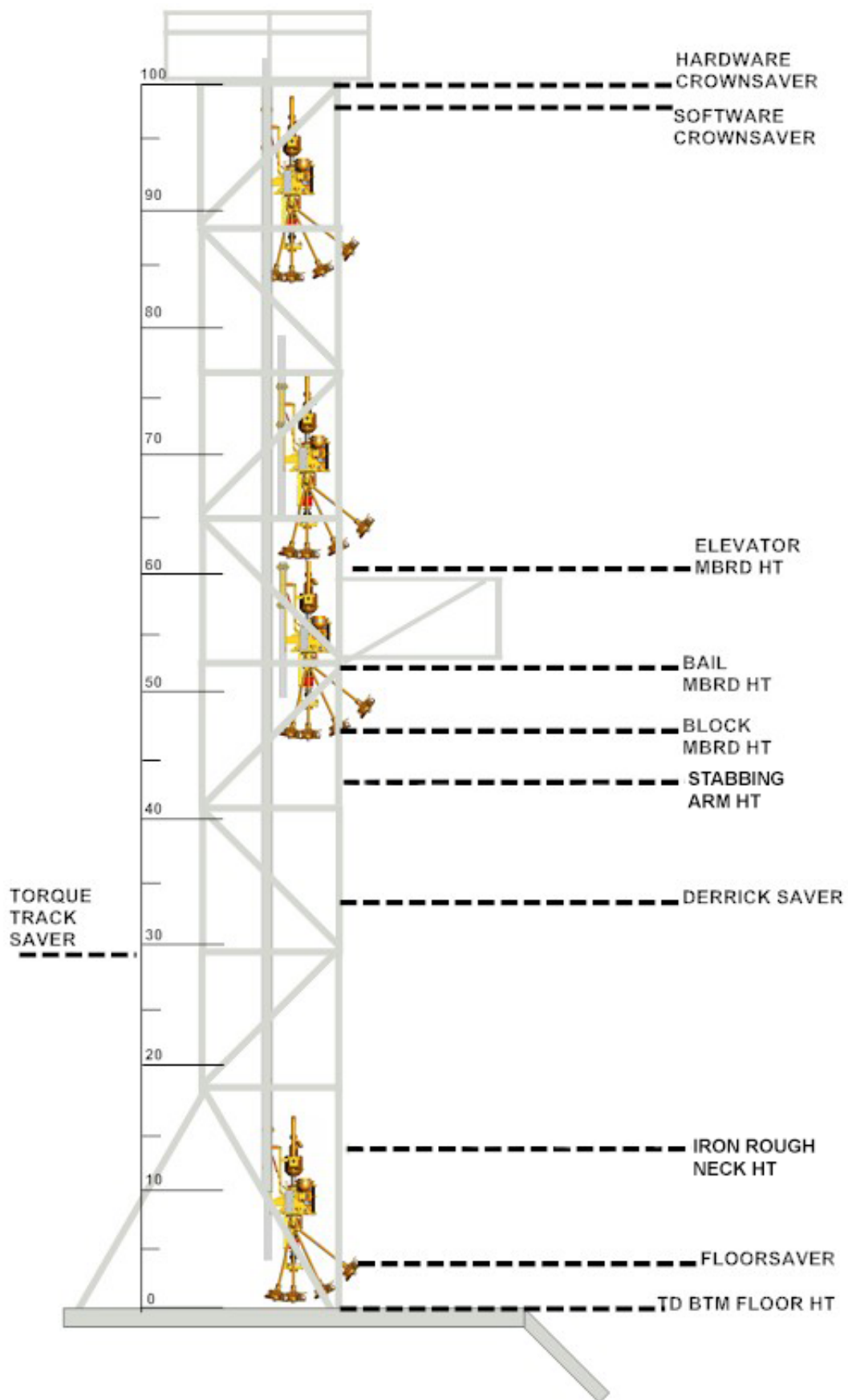
STABBING BOARD HT— The Stabbing Arm Sensor prevents collision between the elevators (and Top Drive) With the stabbing arm. The Brakes will be activated if the Stabbing arm sensor is extended past the set angle limit and the blocks travel into the offset zone.

IRON ROUGHNECK HT— The Iron Roughneck Sensor prevents collision between the elevators (and bails) and the Iron Roughneck Wrench. The Brakes will be activated if the Iron Roughneck sensor is extended past the set angle limit and the blocks travel into the offset zone.

TD BTM FLOOR HT—The indicated block height with the bails fully tilted or removed and the bottom of the top drive (pipe handler) approaching the floor, with enough space to avoid collision if the brakes were applied. This height will generally be negative and lower than the floor saver height.

BAIL LENGTH—The length of the bails being used. This length is used when using the Auto-Adjust Floor Height feature. The distance may need to be adjusted to accommodate the bail pivot point and the height of the elevator and will usually be longer than the actual measured length of the bails.

ADJ FLOOR—Set this option to ON to enable the Auto-Adjust Floor Height feature. With this feature enabled, the floor height is automatically adjusted as the bails are tilted. This allows the top drive to move closer to the floor than would otherwise be safe with the bails floated.



See below for instructions on how to set limits that define the above situations.

Procedure Overview

For the software crown saver, floor saver, TD BTM FLOOR HT:

NOTE: Ensure the Full height calibration procedure has been completed prior to performing these steps.

1. Set the crown saver (this should be just below the *hardware*, wireless crown saver):
 - a. Move the blocks up until they are touching the hardware crown saver, then move them back down slightly (the exact distance below is up to the rig manager's discretion).
 - b. Use the **SET HERE** function to define this limit.
2. Set the floor saver (this should be where the bottom of the elevators just meet the floor, with the bails floated):
 - a. Bring the blocks down to the floor with the elevators floated.
 - b. Use the **SET HERE** function to define this limit.
 - c. If the rig is not equipped with a top drive and bails, bring the Kelly bar down to the floor, where a collision would occur.
3. Turn the crown and floor savers on.
4. Set the TD BTM FLOOR HT:
 - a. At the floor, link-tilt the bails all the way out.
 - b. Lower the pipe handler as far as possible.
 - c. Bring the top drive down to the floor, so the bottom of the pipe handler touches the floor, or where you would set your slips.
 - d. Use the **SET HERE** function to define this limit.

NOTE: The TD BTM FLOOR HT value will be a negative number.

5. Turn the ADJ FLOOR option on (this will only work if the bail angle limits are already set).
6. Set the bail length to 9.1M

3.8.1 Step by Step Crown and floor limit Instructions

Follow the instructions below to set the Block Height Limits.

- Using the instructions in the Troubleshooting section, enter the supervisor permission code.
- From the Top Menu, use the arrow buttons to highlight the COMPONENTS option and press SELECT.

TOP MENU			
~}	COMPONENTS	SYSTEM	
	QUICK RE-CAL	DIAGNOSTIC	
	OPERATIONS		
<hr/>			
MAIN LOAD=	1,500dN	BLOCK	4.5m

- From the Components Menu, highlight the LIMITS option and press SELECT.

TOP MENU>COMPONENTS			
~}	LIMITS	ENABLE/DISABLE	
	CALIBRATE		
	SETTINGS		
<hr/>			
MAIN LOAD=	1,500dN	BLOCK	4.5m

- Highlight the ENCODER option and press SELECT.

TOP MENU>COMPONENTS>LIMITS			
LOAD	~}	ENCODER	
ANGLE		TD ANGLE	
<hr/>			
MAIN LOAD=	1,500dN	BLOCK	4.5m

TOP MENU>COMPONENTS>LIMITS> ENCODER	
~} CROWN & FLOOR	
ANTI-COLLISION	
BLOCK SPEED	
BLOCK HEIGHT	4.5m

TOP MENU>COMPONENTS>LIMITS> CRWN & FLR			
~} CROWN SVR HT	31.8m	SET HERE	
FLOOR SVR HT	0.0m	SET HERE	
CROWN SAVER	on	FLOOR SAVER	on
STAB BRD HT	0.0m SH	IRON RN	0.0m SH
TD BTM FLOOR HT	-.9	SET HERE	
BAIL LENGTH	3.0m	ADJ FLOOR	off
BLOCK HEIGHT	4.5m		
EXIT	BACK	TOP MENU	

From the Crown and Floor Saver Limits Menu, the displayed limits can be changed in two ways. To change the limits *manually*:

- Highlight the limit to be changed and press SELECT.

TOP MENU>COMPONENTS>LIMITS> CRWN & FLR			
CROWN SVR HT	31.7m	SET HERE	
Press ACCEPT to save changes.			
Press SELECT to discard changes.			
CROWN SAVER	on	FLOOR SAVER	on
TD BTM FLOOR HT	-.9	SET HERE	
BAIL LENGTH	3.0m	ADJ FLOOR	off
BLOCK HEIGHT	4.5m		

- Use the arrow keys to change the displayed value to the desired limit.
- When the correct limit is displayed, press the ACCEPT button. Press ACCEPT again to confirm and save the new limit.

TOP MENU>COMPONENTS>LIMITS> CRWN & FLR			
CROWN SVR HT	31.7m	SET HERE	
SAVE - ARE YOU SURE?			
CROWN SAVER	on	FLOOR SAVER	on
TD BTM FLOOR HT	-.9	SET HERE	
BAIL LENGTH	3.0m	ADJ FLOOR	off
BLOCK HEIGHT	4.5m		

TOP MENU>COMPONENTS>LIMITS> CRWN & FLR	
CROWN SVR HT	31.7m (SET HERE)
SAVING...	
CROWN SAVER	ON FLOOR SAVER ON
TD BTM FLOOR HT	-.9 SET HERE
BAIL LENGTH	3.0m ADJ FLOOR off
BLOCK HEIGHT	4.5m

To set the limit *automatically*:

- Raise or lower the block to the position that will be used as the new limit.
- When the block is in position, use the arrow buttons to highlight SET HERE beside the corresponding limit on the display panel.

TOP MENU>COMPONENTS>LIMITS> CRWN & FLR	
CROWN SVR HT	31.8m~} SET HERE
FLOOR SVR HT	0.0m SET HERE
CROWN SAVER	on FLOOR SAVER on
STAB BRD HT	0.0m SH IRON RN 0.0m SH
TD BTM FLOOR HT	-.9 SET HERE
BAIL LENGTH	3.0m ADJ FLOOR off
BLOCK HEIGHT	4.5m
EXIT	BACK TOP MENU

- Press the SELECT button to set the limit to the current block height.

SETTING CROWN SAVER HEIGHT

CROWN SAVER HEIGHT SET

- Once setting the limits is complete, use the arrow buttons to highlight EXIT, press SELECT and then ACCEPT to confirm.

3.9 Anti-Collision Limits

Setting the anti-collision limits allows specification of the monkey board height, derrick collision point and torque track collision point.

ELEVATOR MBRD HT (downward collision prevention) — This limit references the distance between the rig floor and the bottom of the elevator while the top drive is above the monkey board. It is set at a point where a collision between the elevator and the top of the monkey board would be prevented if the rig brakes were applied.

BAIL MBRD HT (upward collision prevention) — This limit references the distance between the rig floor and the bottom of the elevator, while the bails are below the monkey board. It is set at a point where a collision between the bails and the monkey board would be prevented if the rig brakes were applied.

BLOCK MBRD HT (upward collision prevention) — This limit references the distance between the rig floor and the bottom of the elevator while the top drive is below the monkey board, and the top drive is extended from the torque track. It is set at a point where a collision between the top of the traveling blocks and the bottom of the monkey board would be prevented if the rig brakes were applied.

TORQUE TRACK HT (upward collision prevention) — This limit references the distance between the rig floor and the bottom of the elevator, while the bails are approaching and link tilted towards the torque track. It is set at a point where a collision between the bails and the torque track would be prevented if the rig brakes were applied. *This limit is only used when an elevator position top drive rotation sensor is installed.*

DERRICK SVR HT (upward collision prevention) — This limit references the distance between the rig floor and the bottom of the elevator, at a point where a collision would occur between the derrick structure and the top drive (if turned sideways, in either trip or drill position). *Tilting the bails while above this height limit will cause the rig brakes to be applied.*

3.9.1 Procedure Overview

1. Set the **ELEVATOR MBRD HT** (this point is above the monkey boards, where the bottom of the elevators would contact the top of the monkey boards).
 - a. (The ELEVATOR MBRD HT Limit references the BAIL VD1 Limit).
 - b. Move the top drive to a position above the monkey boards and link tilt the bails out to the BAIL VD1 limit.
 - c. Move the top drive down to a point slightly above where the bottom of the elevators would contact the top of the monkey board.
 - d. Use the **SET HERE** function to define this limit.
2. Set the **BLOCK MBRD HT** (this point is below the monkey board, where the top drive would contact the bottom of the monkey board, if it were extended).
 - a. (The BLOCK MBRD HT Limit references the BLOCK VD1 Limit).
 - b. Move the top drive to a position below the monkey board and extend it from the torque track to the BLOCK VD1 Limit.
 - c. Move the top drive to a point slightly below where its top would contact the bottom of the monkey board.
 - d. Use the **SET HERE** function to define this limit.
3. Set the **BAIL MBRD HT** (this point is below the monkey board, where the bails would contact the monkey board if they were link tilted while the top drive was being raised).
 - a. (This point references the BAIL VD1 Limit).
 - b. Move the top drive to a point below the monkey board and link tilt them out as far as possible—past the BAIL VD1 Limit.
 - c. Move the top drive to a point slightly below where the top of the tilted bail arms would contact the bottom of the monkey board.
 - d. Use the **SET HERE** function to define this limit.
4. Set the **TORQUE TRACK HT** (this point is near the floor, where the bails would contact the bottom of the torque track, if they were reverse link tilted).
 - a. (This point references the BAIL DWKS Limit).

- b. Move the top drive down to the drill floor and link tilt the bails backwards to the BAIL DWKS limit.
 - c. Move the top drive to a point slightly below where the top of the elevators would contact the bottom of the torque track.
 - d. Use the **SET HERE** function to define this limit.
5. Set the **DERRICK SVR HT** (this is the height at which the bails would contact the derrick if they were link tilted, and the top drive turned sideways).
 - a. (This limit references the BAIL DWKS Limit).
 - b. Move the top drive to a position above the normal working area of the drill floor.
 - c. Use the **SET HERE** function to define this limit.

3.9.2 Step by Step Instructions

Follow the instructions below to set anti-collision height limits.

- Using the instructions in the Troubleshooting section, enter the supervisor permission code.
- From the Top Menu, use the arrow buttons to highlight the COMPONENTS option and press SELECT.

TOP MENU			
~ } COMPONENTS SYSTEM			
QUICK RE-CAL DIAGNOSTIC			
OPERATIONS			
MAIN LOAD= 1,500dN BLOCK 4.5m			

- From the Components Menu, use the arrow buttons to highlight the LIMITS option and press SELECT.

TOP MENU>COMPONENTS			
~ } LIMITS ENABLE/DISABLE			
CALIBRATE			
SETTINGS			
MAIN LOAD= 1,500dN BLOCK 4.5m			

- Use the arrow keys to highlight the ENCODER option and press SELECT.

TOP MENU>COMPONENTS> LIMITS			
~} LOAD ENCODER			
TD ANGLE			
MAIN LOAD= 1,500dN BLOCK 4.5m			

TOP MENU>COMPONENTS> LIMITS			
LOAD ~} ENCODER			
TD ANGLE			
MAIN LOAD= 1,500dN BLOCK 4.5m			

- Use the arrow keys to highlight the ANTI-COLLISION option and press SELECT.

TOP MENU>COMPONENTS>LIMITS> ENCODER			
~} CROWN & FLOOR			
ANTI-COLLISION			
BLOCK SPEED			
BLOCK HEIGHT 4.5m			

TOP MENU>COMPONENTS>LIMITS> ENCODER			
CROWN & FLOOR			
~} ANTI-COLLISION			
BLOCK SPEED			
BLOCK HEIGHT 4.5m			

- This will open the Anti-Collision Limits Menu.

TOP MENU>COMPONENTS>LIMITS> ANTI-COLLIS			
~} ELEVATOR MBRD HT 25.9m SET HERE			
BAIL MBRD HT 21.8m SET HERE			
BLOCK MBRD HT 20.4m SET HERE			
TORQUE TRACK HT 3.7m SET HERE			
DERRICK SVR HT .0m SET HERE			
BLOCK HEIGHT 4.5m			

The displayed limits can be changed in two ways. To change the limits *manually*:

- Highlight the limit to be changed and press SELECT.

TOP MENU>COMPONENTS>LIMITS> ANTI-COLLIS		
ELEVATOR MBRD HT	25.9m {	SET HERE
BAIL MBRD HT	21.8m	SET HERE
BLOCK MBRD HT	20.4m	SET HERE
TORQUE TRACK HT	3.7m	SET HERE
DERRICK SVR HT	.0m	SET HERE
BLOCK HEIGHT	24.9m	

- Use the arrow keys to change the displayed value to the desired limit.

TOP MENU>COMPONENTS>LIMITS> ANTI-COLLIS		
ELEVATOR MBRD HT	24.9m {	SET HERE
Press ACCEPT to save changes.		
Press SELECT to discard changes.		
BLOCK MBRD HT	20.4m	SET HERE
TORQUE TRACK HT	3.7m	SET HERE
DERRICK SVR HT	.0m	SET HERE
BLOCK HEIGHT	24.9m	

- When the correct value is displayed, press the ACCEPT button to set the new limit, then again to confirm and save it.

TOP MENU>COMPONENTS>LIMITS> ANTI-COLLIS		
ELEVATOR MBRD HT	24.9m {	SET HERE
SAVE - ARE YOU SURE?		
BLOCK MBRD HT	20.4m	SET HERE
TORQUE TRACK HT	3.7m	SET HERE
DERRICK SVR HT	.0m	SET HERE
BLOCK HEIGHT	24.9m	

TOP MENU>COMPONENTS>LIMITS> ANTI-COLLIS		
ELEVATOR MBRD HT	24.9m {	SET HERE
SAVING...		
BLOCK MBRD HT	20.4m	SET HERE
TORQUE TRACK HT	3.7m	SET HERE
DERRICK SVR HT	.0m	SET HERE
BLOCK HEIGHT	24.9m	

To set the limits *automatically*:

- Raise or lower the block to the position of the new limit.
- With the block in place, use the arrow keys to highlight SET HERE beside the corresponding limit to be set.

TOP MENU>COMPONENTS>LIMITS> ANTI-COLLIS			
ELEVATOR MBRD HT	25.9m	~}	SET HERE
BAIL MBRD HT	21.8m		SET HERE
BLOCK MBRD HT	20.4m		SET HERE
TORQUE TRACK HT	3.7m		SET HERE
DERRICK SVR HT	.0m		SET HERE
BLOCK HEIGHT		24.9m	

- Press the SELECT button to set the limit to the current height.

SETTING ELEVATOR MBOARD HEIGHT

ELEVATOR MBOARD HEIGHT SET

TOP MENU>COMPONENTS>LIMITS> ANTI-COLLIS			
ELEVATOR MBRD HT	24.9m	~}	SET HERE
BAIL MBRD HT	21.8m		SET HERE
BLOCK MBRD HT	20.4m		SET HERE
TORQUE TRACK HT	3.7m		SET HERE
DERRICK SVR HT	.0m		SET HERE
BLOCK HEIGHT		24.9m	

- When you are done changing limits, use the arrow keys to highlight EXIT and press SELECT and then ACCEPT.

3.10 Load Limits

The Rigsmart Weight Indicator uses a pre-set limit to determine when to alarm. The Maximum Load Limit is usually set to the smallest maximum load limit of all the load bearing components (derrick structure, sub structure, drill line, etc).

Use the following instructions to change this load limit:

- Using the instructions in the Troubleshooting section, enter the supervisor permission code.
- In the Top Menu, use the arrow buttons to highlight COMPONENTS and press SELECT.

TOP MENU		
~}	COMPONENTS	SYSTEM
	QUICK CAL	DIAGNOSTIC
	OPERATIONS	
MAIN LOAD=	1,500dN	CRWN= OKAY

- From the Components Menu, highlight LIMITS and press SELECT.

TOP MENU>COMPONENTS		
~} LIMITS	ENABLE/DISABLE	
CALIBRATE		
SETTINGS		
<hr/>		
MAIN LOAD=	1,500dN	CRWN= OKAY

- Highlight LOAD and press SELECT.

TOP MENU>COMPONENTS>LIMITS		
~}LOAD		
MAIN LOAD=	1,500dN	CRWN= OKAY

TOP MENU>COMPONENTS>LIMITS>LOAD			
MAX LOAD MAIN		11,100dN{-	
MAIN LOAD=		1,500dN	CRWN= OKAY _

- Use the arrows and SELECT button to select a MAX LOAD MAIN value. This is the value at which the MAX LOAD alarm will be triggered.
- After selecting the desired value, press the ACCEPT button to set the new limit, and again to confirm the changes.

TOP MENU>COMPONENTS>LIMITS>LOAD			
MAX LOAD MAIN		11,100dN{-	
Press ACCEPT to save changes.			
Press SELECT to discard changes.			
MAIN LOAD=		1,500dN	CRWN= OKAY _ EXIT

TOP MENU>COMPONENTS>LIMITS>LOAD			
MAX LOAD MAIN		11,100dN{-	
SAVE - ARE YOU SURE?			
MAIN LOAD=		1,500dN	CRWN= OKAY
			EXIT

TOP MENU>COMPONENTS>LIMITS>LOAD		
MAX LOAD MAIN	11.100dN	-
SAVING...		
MAIN LOAD=	1,500dN	CRWN= OKAY

3.11 Pressure Limits

The Rigsmart Pressure Sensors use pre-set limits to determine when to alarm. When a pressure limit is reached, the panel will alarm but no output will be triggered (unless specifically requested by the customer).

Use the following steps to set the pressure limits:

- Using the instructions in the Troubleshooting section, enter the supervisor permission code.
- From the Top Menu, use the arrow buttons to highlight COMPONENTS and press SELECT.

TOP MENU			
~}	COMPONENTS	SYSTEM	
	QUICK RE-CAL	DIAGNOSTIC	
	OPERATIONS		
<hr/>			
MAIN LOAD=	1,500dN	BLOCK	4.5m

- Highlight the LIMITS option and press SELECT.

TOP MENU>COMPONENTS			
~}	LIMITS	ENABLE/DISABLE	
	CALIBRATE		
	SETTINGS		
<hr/>			
MAIN LOAD=	1,500dN	BLOCK	4.5m

- Highlight the PRESSURE and press SELECT.
- Highlight and select the specific pressure sensor to be set. When selected, change the limit to the required maximum value. Press the ACCEPT button twice to save the change.

TOP MENU>COMPONENTS>LIMITS			
LOAD	ENCODER	~}	PRESSURE
	TD ANGLE		
	LEVEL		WIND
<hr/>			
MAIN LOAD=	1	Updated January, 2022)	4.5m

TOP MENU>COMPONENTS>LIMITS> PRESSURE			
~} PRESS1	68,948kPa	PRESS4	68,948kPa
PRESS2	68,948kPa	PRESS4	68,948kPa
PRESS3	68,948kPa		
MAIN LOAD= 1,500dN BLOCK 4.5m			

3.12 Wind Speed Limits

The Rigsmart Wind Speed Sensor will display the current wind speed. When a pre-set wind speed limit is reached, an alarm will sound but no output will be triggered (unless specifically requested by the customer).

Use the following steps to set the wind speed limits:

- Using the instructions in the Troubleshooting section, enter the supervisor permission code.
- From the Top Menu, use the arrow buttons to highlight COMPONENTS and press SELECT.

TOP MENU		
~}COMPONENTS	SYSTEM	
QUICK RE-CAL	DIAGNOSTIC	
OPERATIONS		
MAIN LOAD= 1,500dN BLOCK 4.5m		

- From the Components Menu, highlight LIMITS and press SELECT.

TOP MENU>COMPONENTS		
~} LIMITS	ENABLE/DISABLE	
CALIBRATE		
SETTINGS		
MAIN LOAD=	1,500dN BLOCK	4.5m

- Highlight the WIND option and press SELECT.

TOP MENU>COMPONENTS>LIMITS		
LOAD	ENCODER	PRESSURE
	TD ANGLE	
	LEVEL	~} WIND
<hr/>		
MAIN LOAD=	1,500dN BLOCK	4.5m

- Use the arrow buttons to highlight and select MAX WIND. When selected, change the limit to the required maximum value. Press ACCEPT twice to save the change.

TOP MENU>COMPONENTS>LIMITS>PRESSURE		
~} MAX WIND	95kmh	
<hr/>		
MAIN LOAD=	1,500dN BLOCK	4.5m

3.13 Iron Rough Neck Sensor

To Set the Iron rough neck sensor Height limit, Move the Iron Roughneck wrench into the operating position. Ensure the wrench is set to the highest working position. Bring the top drive above the Iron roughneck sensor; ensure there is enough room for the blocks stop without any possible contact.

To set the iron Roughneck sensor use the arrow keys to highlight IRON RN then press the SELECT button.

TOP MENU>COMPONENTS>LIMITS>CRWN & FLR		
CROWN SVR HT	31.8m	SET HERE
FLOOR SVR HT	0.0m	SET HERE
CROWN SAVER	on	FLOOR SAVER on
STAB BRD HT	0.0m SH~}	IRON RN 0.0m SH
TD BTM FLOOR HT	-.9	SET HERE
BAIL LENGTH	9.1m	ADJ FLOOR on
<hr/>		
BLOCK HEIGHT	3.0m	
EXIT	BACK	TOP MENU

Use the arrow keys to change to the desired height, press the ACCEPT button twice to save the changes.

TOP MENU>COMPONENTS>LIMITS>CRWN & FLR		
CROWN SVR HT	31.8m	SET HERE
FLOOR SVR HT	0.0m	SET HERE
CROWN SAVER	on	FLOOR SAVER on
STAB BRD HT	0.0m SH	IRON RN 3.0m~} SH
TD BTM FLOOR HT	-.9	SET HERE
BAIL LENGTH	9.1m	ADJ FLOOR on
<hr/>		
BLOCK HEIGHT	3.0m	
EXIT	BACK	TOP MENU

TOP MENU>COMPONENTS>LIMITS>CRWN & FLR			
CROWN SVR HT	31.8m	SET HERE	
SAVE - ARE YOU SURE?			
STAB BRD HT	0.0m	SH	IRON RN 3.0m~}SH
TD BTM FLOOR HT	-.9	SET HERE	
BAIL LENGTH	9.1m	ADJ FLOOR	on
BLOCK HEIGHT		3.0m	
EXIT	BACK	TOP MENU	

TOP MENU>COMPONENTS>LIMITS>CRWN & FLR			
CROWN SVR HT	31.8m	SET HERE	
SAVING...			
STAB BRD HT	0.0m	SH	IRON RN 3.0m~}SH
TD BTM FLOOR HT	-.9	SET HERE	
BAIL LENGTH	9.1m	ADJ FLOOR	on
BLOCK HEIGHT		3.0m	
EXIT	BACK	TOP MENU	

To Calibrate the Iron roughneck Angle home position, move the Iron roughneck sensor into the Home position.

- Using the instructions in the Troubleshooting section, enter the supervisor permission code.
- From the Top Menu, use the arrow buttons to highlight COMPONENTS and press SELECT.

TOP MENU			
~}COMPONENTS		SYSTEM	
QUICK RE-CAL		DIAGNOSTIC	
OPERATIONS			
<hr/>			
MAIN LOAD=	1,500dN	BLOCK	3.0m

- Highlight Calibrate and press SELECT

TOP MENU>COMPONENTS			
LIMITS		ENABLE/DISABLE	
~}CALIBRATE			
<hr/>			
MAIN LOAD=	1,500dN	BLOCK	3.0m

- Highlight **ANGLE** press **SELECT**

TOP MENU>COMPONENTS>CALIBRATE			
~}ANGLE			
ENCODER			
TD ANGLE			
ELEV POS			
<hr/>			
MAIN LOAD=	1,500dN	BLOCK	3.0m

- Press the Arrow keys to highlight the Zero Iron Roughneck, Press **SELECT**

TOP MENU>COMPONENTS>CALIBRATE>ANGLE			
SIDE		ZERO	
IRN RN	~}LEFT		89.0^
STAB	LEFT		2.0^
RACK	LRFT		0.0^
<hr/>			
RACK	89.0^	STAB	2.0^

- Use the arrow keys to change to **ZERO**, ensure the Iron Roughneck sensor is fully retracted. Press the **ACCEPT** button

TOP MENU>COMPONENTS>CALIBRATE>ANGLE			
SIDE		ZERO	
RACK	LEFT	~}0.0^	
STAB	LEFT	2.0^	
<hr/>			
SAVE - ARE YOU SURE?			
<hr/>			
RACK	89.0^	STAB	2.0^

- To save the change press the **ACCEPT** button

TOP MENU>COMPONENTS>CALIBRATE>ANGLE			
SIDE		ZERO	
RACK	LEFT	~}0.0^	
STAB	LEFT	2.0^	
<hr/>			
SAVING...			
<hr/>			
RACK	89.0^	STAB	2.0^

TOP MENU>COMPONENTS>CALIBRATE>ANGLE			
SIDE		ZERO	
IRN RN	LEFT		0.0^
STAB	~}LEFT		2.0^
RACK	LRFT		0.0^
<hr/>			
RACK	0.0^	STAB	2.0^

To Set the Iron roughneck MIN / MAX angle LIMIT.

- Using the instructions in the Troubleshooting section, enter the supervisor permission code.
- From the Top Menu, use the arrow buttons to highlight COMPONENTS and press SELECT.

TOP MENU		
~}	COMPONENTS	SYSTEM
	QUICK RE-CAL	DIAGNOSTIC
	OPERATIONS	
MAIN LOAD=	1,500dN BLOCK	3.0m

- Highlight LIMITS and press SELECT

TOP MENU>COMPONENTS		
<hr/>		
~}LIMITS	ENABLE/DISABLE	
CALIBRATE		
 <		

- Highlight ANGLE press SELECT

TOP MENU>COMPONENTS>CALIBRATE		
~ } ANGLE	ENCODER	
	TD ANGLE	
	ELEV POS	
MAIN LOAD=	1,500dN BLOCK	3.0m

- Defaults are set to 90 degrees and – 90 degrees
- Press the Arrow keys to highlight the Zero Iron Roughneck, Press SELECT

TOP MENU>COMPONENTS>CALIBRATE>ANGLE		
~} IRN RN MAX	90.0^	MIN -90.0^
STAB MAX	90.0^	MIN -90.0^
RACK MAX	90.0^	MIN -90.0^
<hr/>		
IRN RN	89.0^	STAB 2.0^

- Use the arrow keys to Navigate to the MIN selector, ensure the Iron Roughneck sensor is fully retracted. Press the SELECT button

TOP MENU>COMPONENTS>CALIBRATE>ANGLE			
IRN RN MAX	90.0^	~}MIN	0.0^
STAB MAX	90.0^	MIN	-90.0^
RACK MAX	90.0^	MIN	-90.0^
<hr/>			
IRN RN	89.0^	STAB	2.0^

- Use the arrow keys to change to 0.0 Degree, Then press the ACCEPT button TWICE.

TOP MENU>COMPONENTS>CALIBRATE>ANGLE			
IRN RN MAX	90.0^	~}MIN	0.0^
STAB MAX	90.0^	MIN	-90.0^
<hr/>			
SAVE - ARE YOU SURE?			
<hr/>			
IRN RN	0.0^	STAB	2.0^

TOP MENU>COMPONENTS>CALIBRATE>ANGLE			
IRN RN MAX	90.0^	~}MIN	0.0^
STAB MAX	90.0^	MIN	-90.0^
<hr/>			
SAVING...			
<hr/>			
IRN RN	0.0^	STAB	2.0^

To set the max Iron Roughneck angle limit, move the Iron roughneck Wrench into the furthest position before the top drive will contact the wrench. Reference the Task bar at the bottom of the screen for the angle limit.

TOP MENU>COMPONENTS>CALIBRATE>ANGLE			
~}IRN RN MAX	90.0^	MIN	0.0^
STAB MAX	90.0^	MIN	-90.0^
RACK MAX	90.0^	MIN	-90.0^
<hr/>			
IRN RN	34.5^	STAB	2.0^

- To change the Degree value on the Iron Rough press the SELECT button

TOP MENU>COMPONENTS>CALIBRATE>ANGLE			
IRN RN MAX	90.0^~}	MIN	0.0^
STAB MAX	90.0^	MIN	-90.0^
RACK MAX	90.0^	MIN	-90.0^
<hr/>			
IRN RN	34.5^	STAB	2.0^

- Use the Arrow keys to change to the angle displayed on the bottom of the menu.

TOP MENU>COMPONENTS>CALIBRATE> ANGLE			
IRN RN MAX	34.5^~}	MIN	0.0^
STAB MAX	90.0^	MIN	-90.0^
RACK MAX	90.0^	MIN	-90.0^
IRN RN 34.5^ STAB 2.0^			

- To save the changes press the ACCEPT button TWICE

TOP MENU>COMPONENTS>CALIBRATE> ANGLE			
IRN RN MAX	34.5^~}	MIN	0.0^
STAB MAX	90.0^	MIN	-90.0^
SAVE - ARE YOU SURE?			
IRN RN 34.5^ STAB 2.0^			

TOP MENU>COMPONENTS>CALIBRATE> ANGLE			
IRN RN MAX	34.5^~}	MIN	0.0^
STAB MAX	90.0^	MIN	-90.0^
SAVING...			
IRN RN 34.5^ STAB 2.0^			

TOP MENU>COMPONENTS>CALIBRATE> ANGLE			
IRN RN MAX	34.5^	MIN	0.0^
~}STAB MAX	90.0^	MIN	-90.0^
RACK MAX	90.0^	MIN	-90.0^
IRN RN 34.5^ STAB 2.0^			

3.14 Stabbing board sensor

To Set the Stabbing board height limit. Move the Stabbing arm into the operating position. Ensure the Arm or board is out in the fully extended working position. Bring the top drive above the Stabbing arm sensor, ensure there is enough room for the blocks stop without any possible contact.

To set the Stabbing board / Arm sensor use the arrow keys to highlight STAB BRD HT then press the SELECT button

TOP MENU>COMPONENTS>LIMITS>CRWN & FLR			
CROWN SVR HT	31.8m	SET HERE	
FLOOR SVR HT	0.0m	SET HERE	
CROWN SAVER	on	FLOOR SAVER	on
~}STAB BRD HT	0.0m SH	IRON RN 3.0m SH	
TD BTM FLOOR HT	-.9	SET HERE	
BAIL LENGTH	9.1m	ADJ FLOOR	on
BLOCK HEIGHT		3.0m	
EXIT	BACK	TOP MENU	

Use the arrow keys to change to the desired height, press the ACCEPT button twice to save the changes.

TOP MENU>COMPONENTS>LIMITS>CRWN & FLR			
CROWN SVR HT	31.8m	SET HERE	
FLOOR SVR HT	0.0m	SET HERE	
CROWN SAVER	on	FLOOR SAVER	on
STAB BRD HT	18.0m~}	SH IRON RN 3.0m SH	
TD BTM FLOOR HT	-.9	SET HERE	
BAIL LENGTH	9.1m	ADJ FLOOR	on
BLOCK HEIGHT		18.0m	
EXIT	BACK	TOP MENU	

TOP MENU>COMPONENTS>LIMITS>CRWN & FLR			
CROWN SVR HT	31.8m	SET HERE	
SAVE - ARE YOU SURE?			
STAB BRD HT	18.0m~}	SH IRON RN 3.0m SH	
TD BTM FLOOR HT	-.9	SET HERE	
BAIL LENGTH	9.1m	ADJ FLOOR	on
BLOCK HEIGHT		18.0m	
EXIT	BACK	TOP MENU	

TOP MENU>COMPONENTS>LIMITS>CRWN & FLR			
CROWN SVR HT	31.8m	SET HERE	
SAVING...			
STAB BRD HT	18.0m~}	SH IRON RN 3.0m SH	
TD BTM FLOOR HT	-.9	SET HERE	
BAIL LENGTH	9.1m	ADJ FLOOR	on
BLOCK HEIGHT		18.0m	
EXIT	BACK	TOP MENU	

TOP MENU>COMPONENTS>LIMITS> CRWN & FLR			
CROWN SVR HT	31.8m	SET HERE	
FLOOR SVR HT	0.0m	SET HERE	
CROWN SAVER	on	FLOOR SAVER	on
STAB BRD HT	18.0m~	}SH	IRON RN 3.0m SH
TD BTM FLOOR HT	-.9	SET HERE	
BAIL LENGTH	9.1m	ADJ FLOOR	on
BLOCK HEIGHT		18.0m	
EXIT	BACK	TOP MENU	

To Calibrate the Stabbing Arm Angle home position, move the Stabbing Arm sensor into the Home position.

- Using the instructions in the Troubleshooting section, enter the supervisor permission code.
- From the Top Menu, use the arrow buttons to highlight COMPONENTS and press SELECT.

TOP MENU			
~}COMPONENTS		SYSTEM	
QUICK RE-CAL		DIAGNOSTIC	
OPERATIONS			
MAIN LOAD=		1,500dN BLOCK	4.5m

- Highlight Calibrate and press SELECT

TOP MENU>COMPONENTS			
LIMITS		ENABLE/DISABLE	
~}CALIBRATE			

- Highlight ANGLE press SELECT

TOP MENU>COMPONENTS>CALIBRATE			
~ } ANGLE			
ENCODER			
TD ANGLE			
ELEV POS			
MAIN LOAD=		1,500dN BLOCK	4.5m

- Use the Arrow keys to highlight the Stabbing Arm Degree Value, Press SELECT

TOP MENU>COMPONENTS>CALIBRATE> ANGLE		
	SIDE	ZERO
IRN RN	~} LEFT	0.0^
STAB	LEFT	2.0^
RACK	LRFT	0.0^
<hr/>		
RACK	0.0^	STAB 2.0^

TOP MENU>COMPONENTS>CALIBRATE> ANGLE		
	SIDE	ZERO
IRN RN	LEFT	0.0^
STAB	LEFT	2.0^~}
RACK	LRFT	0.0^
<hr/>		
RACK	0.0^	STAB 2.0^

Use the arrow keys to change to ZERO, ensure the Stabbing Arm sensor is fully retracted. Press the ACCEPT button TWICE

TOP MENU>COMPONENTS>CALIBRATE> ANGLE		
	SIDE	ZERO
RACK	LEFT	0.0^
STAB	LEFT	0.0^~}
RACK	LRFT	0.0^
<hr/>		
RACK	0.0^	STAB 0.0^

TOP MENU>COMPONENTS>CALIBRATE> ANGLE		
	SIDE	ZERO
RACK	LEFT	0.0^
STAB	LEFT	0.0^~}
<hr/>		
SAVE - ARE YOU SURE?		
<hr/>		
RACK	0.0^	STAB 0.0^

TOP MENU>COMPONENTS>CALIBRATE> ANGLE		
	SIDE	ZERO
RACK	LEFT	0.0^
STAB	LEFT	0.0^~}
<hr/>		
SAVING...		
<hr/>		
RACK	0.0^	STAB 0.0^

To Set the Stabbing Arm MIN / MAX angle LIMIT.

- Using the instructions in the Troubleshooting section, enter the supervisor permission code.
- From the Top Menu, use the arrow buttons to highlight COMPONENTS and press SELECT.

TOP MENU		
~} COMPONENTS	SYSTEM	
QUICK RE-CAL	DIAGNOSTIC	
OPERATIONS		
<hr/>		
MAIN LOAD=	1,500dN BLOCK	18.0m

- Highlight LIMITS and press SELECT

TOP MENU>COMPONENTS		
~} LIMITS	ENABLE/DISABLE	
CALIBRATE		
<hr/>		
MAIN LOAD=	1,500dN BLOCK	18.0m

- Highlight ANGLE press SELECT

TOP MENU>COMPONENTS>CALIBRATE		
~} ANGLE	ENCODER	
	TD ANGLE	
	ELEV POS	
<hr/>		
MAIN LOAD=	1,500dN BLOCK	18.0m

- Defaults are set to 90 degrees and – 90 degrees
- Use the Arrow keys to highlight the Stabbing Arm MIN, Press SELECT

TOP MENU>COMPONENTS>CALIBRATE>ANGLE		
~} IRN RN MAX	34.5^	MIN 0.0^
STAB MAX	90.0^	MIN -90.0^
RACK MAX	90.0^	MIN -90.0^
<hr/>		
IRN RN	0.0^	STAB 2.0^

TOP MENU>COMPONENTS>CALIBRATE>ANGLE		
IRN RN MAX	34.5^	MIN 0.0^
STAB MAX	90.0^	~} MIN -90.0^
RACK MAX	90.0^	MIN -90.0^
<hr/>		
IRN RN	0.0^	STAB 2.0^

```
TOP MENU>COMPONENTS>CALIBRATE>ANGLE
IRN RN MAX 34.5^      MIN  0.0^
STAB MAX  90.0^      MIN  0.0^~}
RACK MAX   90.0^      MIN -90.0^
IRN RN    0.0^      STAB 0.0^
```

- Use the arrow keys to Change MIN, ensure the Stabbing Arm sensor is fully retracted. Press the ACCEPT button TWICE.

```
TOP MENU>COMPONENTS>CALIBRATE>ANGLE
IRN RN MAX 34.5^      MIN -90.0^
STAB MAX  90.0^      MIN  0.0^~}
SAVE - ARE YOU SURE?
IRN RN    0.0^      STAB 0.0^
```

```
TOP MENU>COMPONENTS>CALIBRATE>ANGLE
IRN RN MAX 34.5^      MIN  0.0^
STAB MAX  90.0^      MIN  0.0^~}
SAVING...
IRN RN    0.0^      STAB 0.0^
```

```
TOP MENU>COMPONENTS>CALIBRATE>ANGLE
~} IRN RN MAX 34.5^      MIN  0.0^
STAB MAX  90.0^      MIN  0.0^
RACK MAX   90.0^      MIN -90.0^
IRN RN    0.0^      STAB 0.0^
```

To set the max Stabbing Arm angle limit, move the Stabbing Arm into the furthest working position. Reference the Task bar at the bottom of the screen for the angle limit.

```
TOP MENU>COMPONENTS>CALIBRATE>ANGLE
~} IRN RN MAX 34.5^      MIN  0.0^
STAB MAX  90.0^      MIN  0.0^
RACK MAX   90.0^      MIN -90.0^
IRN RN    34.5^      STAB 26.0^
```

- Use the arrow keys to navigate to STAB MAX to change the Degree value on the Stabbing Arm press the SELECT button

TOP MENU>COMPONENTS>CALIBRATE> ANGLE			
IRN RN MAX	34.5^	MIN	0.0^
STAB MAX	26.0^~}	MIN	0.0^
RACK MAX	90.0^	MIN	-90.0^
IRN RN 34.5^		STAB 26.0^	

- Use the arrow Keys to Change to the displayed Angle reading. To save the changes press the ACCEPT button TWICE

TOP MENU>COMPONENTS>CALIBRATE> ANGLE			
IRN RN MAX	34.5^	MIN	0.0^
STAB MAX	26.0^~}	MIN	0.0^
SAVE - ARE YOU SURE?			
IRN RN 34.5^		STAB 26.0^	

TOP MENU>COMPONENTS>CALIBRATE> ANGLE			
IRN RN MAX	34.5^	MIN	0.0^
STAB MAX	26.0^~}	MIN	0.0^
SAVING...			
IRN RN 34.5^		STAB 26.0^	

To Calibrate the Racking Board Angle Down position, move the Racking Board sensor into the Down position.

- Using the instructions in the Troubleshooting section, enter the supervisor permission code.
- From the Top Menu, use the arrow buttons to highlight COMPONENTS and press SELECT.

TOP MENU		
~}	COMPONENTS	SYSTEM
	QUICK RE-CAL	DIAGNOSTIC
	OPERATIONS	
MAIN LOAD= 1,500dN BLOCK 18.0m		

- Highlight Calibrate and press SELECT

TOP MENU>COMPONENTS			
LIMITS		ENABLE/DISABLE	
~}CALIBRATE			

- Highlight **ANGLE** press **SELECT**

TOP MENU>COMPONENTS> CALIBRATE			
		~}ANGLE	
ENCODER			
TD ANGLE			
ELEV POS			
<hr/>			
MAIN LOAD=	1,500dN	BLOCK	18.0m

- Use the Arrow keys to highlight the Racking Board Degree Value, Press **SELECT**

TOP MENU>COMPONENTS>CALIBRATE> ANGLE			
SIDE		ZERO	
IRN RN	~} LEFT		0.0^
STAB	LEFT		0.0^
RACK	LRFT		10.0^
<hr/>			
RACK	0.0^	STAB 2.0^	RACK 10.0^

TOP MENU>COMPONENTS>CALIBRATE> ANGLE			
SIDE		ZERO	
IRN RN	LEFT		0.0^
STAB	LEFT		0.0^
RACK	LRFT		10.0^~}
<hr/>			
RACK	0.0^	STAB 2.0^	RACK 10.0^

Use the arrow keys to change to **ZERO**, ensure the Stabbing Arm sensor is fully retracted. Press the **ACCEPT** button **TWICE**

TOP MENU>COMPONENTS>CALIBRATE> ANGLE			
SIDE		ZERO	
RACK	LEFT		0.0^
STAB	LEFT		0.0^
RACK	LRFT		10.0^~}
<hr/>			
RACK	0.0^	STAB 0.0^	RACK 10.0^

TOP MENU>COMPONENTS>CALIBRATE> ANGLE			
<hr/>			
SAVE - ARE YOU SURE?			
<hr/>			
STAB	LEFT		0.0^
RACK	LRFT		0.0^~}
<hr/>			
RACK	0.0^	STAB 0.0^	RACK 0.0^

TOP MENU>COMPONENTS>CALIBRATE> ANGLE			
SAVING...			
STAB	LEFT	0.0^	
RACK	LRFT	0.0^~}	
<hr/>			
RACK	0.0^	STAB 0.0^	RACK 0.0^

TOP MENU>COMPONENTS>CALIBRATE> ANGLE			
	SIDE	ZERO	
~}RACK	LEFT	0.0^	
STAB	LEFT	0.0^	
RACK	LRFT	0.0^	
<hr/>			
RACK	0.0^	STAB 0.0^	RACK 0.0^

To Set the Racking Board MIN / MAX angle LIMIT.

- Using the instructions in the Troubleshooting section, enter the supervisor permission code.
- From the Top Menu, use the arrow buttons to highlight COMPONENTS and press SELECT.

TOP MENU			
~}COMPONENTS	SYSTEM		
QUICK RE-CAL	DIAGNOSTIC		
OPERATIONS			
<hr/>			
MAIN LOAD=	1,500dN	BLOCK	4.5m

- Highlight LIMITS and press SELECT

TOP MENU>COMPONENTS			
~}LIMITS	ENABLE/DISABLE		
CALIBRATE			
<hr/>			
MAIN LOAD=	1,500dN	BLOCK	4.5m

- Highlight ANGLE press SELECT

TOP MENU>COMPONENTS>CALIBRATE			
~}ANGLE	ENCODER		
	TD ANGLE		
	ELEV POS		
<hr/>			
MAIN LOAD=	1,500dN	BLOCK	4.5m

- Defaults are set to 90 degrees and – 90 degrees
- Use the Arrow keys to highlight the RACK MIN, Press SELECT

TOP MENU>COMPONENTS>CALIBRATE>ANGLE					
~} IRN RN MAX 34.5^ MIN 0.0^					
STAB MAX 26.0^ MIN 0.0^					
RACK MAX 90.0^ MIN -90.0^					
IRN RN 0.0^ STAB 0.0^ RACK 0.0^					

TOP MENU>COMPONENTS>CALIBRATE>ANGLE					
IRN RN MAX 34.5^ MIN 0.0^					
STAB MAX 26.0^ MIN 0.0^					
RACK MAX 90.0^ ~}MIN -90.0^					
IRN RN 0.0^ STAB 0.0^ RACK 0.0^					

- Use the arrow keys to Change RACK MIN, ensure the RACKING BOARD sensor is In the DOWN Position. Press the ACCEPT button TWICE.

TOP MENU>COMPONENTS>CALIBRATE>ANGLE					
IRN RN MAX 34.5^ MIN 0.0^					
STAB MAX 26.0^ MIN 0.0^					
RACK MAX 90.0^ MIN 0.0^~}					
IRN RN 0.0^ STAB 0.0^ RACK 0.0^					

TOP MENU>COMPONENTS>CALIBRATE>ANGLE					
SAVE - ARE YOU SURE?					
RACK MAX 90.0^ MIN 0.0^~}					
IRN RN 0.0^ STAB 0.0^ RACK 0.0^					

TOP MENU>COMPONENTS>CALIBRATE>ANGLE					
SAVING...					
RACK MAX 90.0^ MIN 0.0^~}					
IRN RN 0.0^ STAB 0.0^ RACK 0.0^					

TOP MENU>COMPONENTS>CALIBRATE>ANGLE					
~}	IRN RN MAX	34.5^	MIN	0.0^	
	STAB MAX	26.0^	MIN	0.0^	
	RACK MAX	90.0^	MIN	0.0^	
<hr/>					
	IRN RN	0.0^	STAB	0.0^	RACK 0.0^

To set the max Racking Board angle limit, Fold The Racking board Back on top of itself. Reference the Task bar at the bottom of the screen for the angle limit.

TOP MENU>COMPONENTS>CALIBRATE>ANGLE					
~}	IRN RN MAX	34.5^	MIN	0.0^	
	STAB MAX	90.0^	MIN	0.0^	
	RACK MAX	90.0^	MIN	0.0^	
<hr/>					
	IRN RN	34.5^	STAB	26.0^	RACK 180.0^

- Use the arrow keys to navigate to RACK MAX to change the Degree value on the Racking Board press the SELECT button

TOP MENU>COMPONENTS>CALIBRATE>ANGLE					
	IRN RN MAX	34.5^	MIN	0.0^	
	STAB MAX	26.0^	MIN	0.0^	
	RACK MAX	90.0^~}	MIN	-90.0^	
<hr/>					
	IRN RN	34.5^	STAB	26.0^	RACK 180.0^

- Use the arrow Keys to Change to the displayed Angle reading. To save the changes press the ACCEPT button TWICE

TOP MENU>COMPONENTS>CALIBRATE>ANGLE					
<hr/>					
SAVE - ARE YOU SURE?					
	RACK MAX	45.0^~}	MIN	-90.0^	
<hr/>					
	IRN RN	34.5^	STAB	26.0^	RACK 180.0^

TOP MENU>COMPONENTS>CALIBRATE>ANGLE					
<hr/>					
SAVING...					
	RACK MAX	45.0^~}	MIN	-90.0^	
<hr/>					
	IRN RN	34.5^	STAB	26.0^	RACK 180.0^

TOP MENU>COMPONENTS>CALIBRATE> ANGLE					
~}	IRN RN MAX	34.5^	MIN	0.0^	
	STAB MAX	26.0^	MIN	0.0^	
	RACK MAX	45.0^	MIN	0.0^	
<hr/>					
	IRN RN	34.5^	STAB	26.0^	RACK 180.0^

To view the status on your angle sensors, ie: Racking board, Stabbing Arm, Iron Roughneck. Navigate to the ABOUT menu. In this Menu you will be able to see multiple sensors.

From the Top Menu, use the arrow buttons to highlight SYSTEM and press SELECT

TOP MENU		
	SYSTEM	
~}	QUICK RE-CAL	DIAGNOSTIC
<hr/>		
MAIN LOAD=	1,500dN BLOCK	4.5m

TOP MENU		
	~}	SYSTEM
	QUICK RE-CAL	DIAGNOSTIC
<hr/>		
MAIN LOAD=	1,500dN BLOCK	4.5m

- Use the arrow keys to highlight ABOUT and press SELECT


TOP MENU>SYSTEM		
~}	ABOUT	PERMISSION
	LCD CONTRAST	
<hr/>		
MAIN LOAD=	1,500dN BLOCK	4.5m

KEY: CGBKMKM		CFREQ:100
Ver: RS3.9.2	SN: 00000	FREQ:101
PAYO: OK	ANG: ALM	TDANG: 1
ELEV: OK	IMD: OK	
<hr/>		
MAIN LOAD=	1,500dN BLOCK	4.5m

4 Speed Control Limits- Throttle Limiter and Aux Brake Controller


The Throttle Limiter and Aux Brake Controller automatically reduce the speed of the blocks before a hard limit is reached. There is a 'Height Offset' value that controls the distance the throttle limiter and brake controller engage before a hard limit is reached. Setup, maintenance and troubleshooting of the Throttle Limiter and Aux Brake Controller is complex and should be done with the aid of Rigsmart Systems service. If maintenance is required, please call the 24 hour support line at: 1-780-438-9475.

4.1 Block Speed and Height Offsets



WARNING

Make sure hard-stopping limits are set and tested first. Moving the blocks quickly can be dangerous; be certain that the blocks are able to stop before a collision occurs when testing speed limiting.



MAKE SURE HARD-STOPPING LIMITS ARE SET AND TESTED FIRST!

As with any other limit, these settings will be specific to each individual rig.

Before setting the limits for each device, the maximum possible speeds of upwards and downwards travel must be found.

To view travel speeds, follow these steps:

1. Enter the supervisor permission code found in the troubleshooting section of this manual:
2. **Go To:** TOP MENU>DIAGNOSTICS>DEVICE DIAG>PAYOUT

TOP MENU		
COMPONENTS	SYSTEM	
HEIGHT RE-CAL	~}	DIAGNOSTIC
OPERATIONS		
<hr/>		
MAIN LOAD=	1,500dN BLOCK	4.5m

TOP MENU>DIAGNOSTIC		
SIGNALS	VIEWER	RF METER
OUTPUTS	VOLTAGE	
~}	DEVICE DIAG	FIRMWARE
<hr/>		
MAIN LOAD=	1,500dN BLOCK	4.5m

TOP MENU>DIAGNOSTIC> DEVICE DIAG		
Em SHUTDOWN	CNV4-20mA	TEMPERATURE
THROT OVR	TOP DRIVE	THROT LIM
	SPEED CTRL ~}	ENCODER
<hr/>		
MAIN LOAD=	1,500dN BLOCK	4.5m

TOP MENU>DIAGNOSTIC> ENCODER		
PT A	.0m	PT B .0m PT C 0.0m
REF CNT	0	REF HT 0.0m
CURR A/D	0	
CURR CNT	0	HEIGHT 4.5m
SPEED	0	0.0rpm 0.00m/sec
<hr/>		
MAIN LOAD=	1,500dN BLOCK	4.5m

3. Monitor the value 'SPEED' for steps 4 and 5.
 4. Raise the blocks as fast as possible and record the top speed reached.
 5. Drop the blocks (complete free fall) and record the top speed reached.
- From the Top Menu, use the arrow buttons to highlight COMPONENTS and press SELECT.

TOP MENU		
~}	COMPONENTS	SYSTEM
	HEIGHT RE-CAL	DIAGNOSTIC
	OPERATIONS	
<hr/>		
MAIN LOAD=	1,500dN BLOCK	4.5m

- Highlight the LIMITS option and press SELECT.

TOP MENU> COMPONENTS		
~}	LIMITS	ENABLE/DISABLE
	CALIBRATE	
	SETTINGS	
<hr/>		
MAIN LOAD=	1,500dN BLOCK	4.5m

- Highlight the ENCODER option and press SELECT.

TOP MENU>COMPONENTS> LIMITS			
LOAD	~}	ENCODER	
		TD ANGLE	
<hr/>			
MAIN LOAD=	1,500dN	BLOCK	4.5m
EXIT	BACK	TOP MENU	

- Highlight BLOCK SPEED and press SELECT.

TOP MENU>COMPONENTS>LIMITS> ENCODER			
CROWN & FLOOR			
ANTI-COLLISION			
	~}	BLOCK SPEED	
<hr/>			
BLOCK HEIGHT		4.5m	
EXIT	BACK	TOP MENU	

- To set the block speed press the SELECT button, using the arrow keys adjust the limit

TOP MENU>COMPONENTS>LIMITS> BLOCK SPEED			
~}	UP SPD	0.00m/s	MIN 0.00m/s
	DOWN SPD	0.00m/s	MIN 0.00m/s
	SPD ALM	off	
	OFFSETS		
<hr/>			
BLOCK HEIGHT		4.5m	
EXIT	BACK	TOP MENU	

- After selecting the desired value, press the ACCEPT button to set the new limit, and again to confirm the changes.

TOP MENU>COMPONENTS>LIMITS> BLOCK SPEED			
UP SPD	1.47m/s	MIN	0.00m/s
<hr/>			
SAVE - ARE YOU SURE?			
<hr/>			
OFFSETS			
<hr/>			
MAIN LOAD=	1,500dN	CRWN= OKAY	EXIT

TOP MENU>COMPONENTS>LIMITS> BLOCK SPEED			
UP SPD	1.47	MIN	0.00m/s
<hr/>			
SAVING...			
<hr/>			
FLOOR OFFSET			
<hr/>			
MAIN LOAD=	1,500dN	CRWN= OKAY	

To set the speed OFFSET zones, use the arrow keys to highlight the offsets tab. Press the SELECT button to gain access to the menu.

TOP MENU>COMPONENTS>LIMITS>BLOCK SPEED			
UP SPD	0.00m/s	MIN	0.00m/s
DOWN SPD	0.00m/s	MIN	0.00m/s
SPD ALM	off		
~}OFFSETS			
BLOCK HEIGHT		4.5m	
EXIT	BACK	TOP MENU	

- To change the crown offset use the arrow keys to highlight, press the SELECT button.

TOP MENU>COMPONENTS>LIMITS>BLOCK SPEED			
~}CROWN OFFSET			
5m	MIN	0.0m	
MBRD TOP OFFSET	0m	MIN	0.0m
MBRD BTM OFFSET	0m	MIN	0.0m
FLOOR OFFSET	0m	MIN	0.0m
EXIT	BACK	TOP MENU	

TOP MENU>COMPONENTS>LIMITS>BLOCK SPEED			
CROWN OFFSET	6m~}	MIN	0.0m
MBRD TOP OFFSET	0m	MIN	0.0m
MBRD BTM OFFSET	0m	MIN	0.0m
FLOOR OFFSET	0m	MIN	0.0m
EXIT	BACK	TOP MENU	

- Use the arrow keys to change to the desired limit to safely slow the traveling blocks down, press the ACCEPT button Twice to save the change.

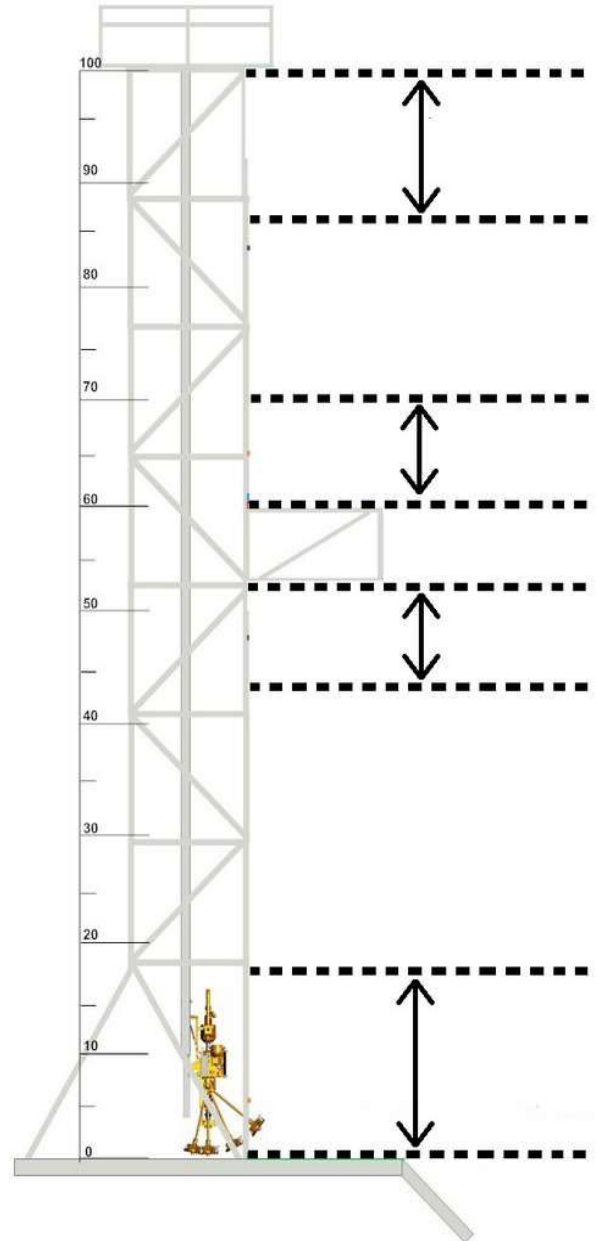
TOP MENU>COMPONENTS>LIMITS>BLOCK SPEED			
CROWN OFFSET	6m~}	MIN	0.00m/s
SAVE - ARE YOU SURE?			
FLOOR OFFSET	0m	MIN	0.00m/s
MAIN LOAD=	1,500dN	CRWN= OKAY	EXIT

TOP MENU>COMPONENTS>LIMITS>BLOCK SPEED			
CROWN OFFSET	6m~}	MIN	0.00m/s
SAVING...			
FLOOR OFFSET	0m	MIN	0.00m/s
MAIN LOAD=	1,500dN	CRWN= OKAY	

****Each OFFSET value can be set independently.
A value of '0' disables the specific zone.****

In the BLOCK SPEED Menu the following options are available:

- CROWN OFFSET—Indicates the distance below the software crown saver that the throttle limiter will begin limiting the throttle in the upwards direction. This should be a positive number.
- MBRD TOP OFFSET—Indicates the distance above the monkey board that the aux brake controller will begin engaging the aux brake in the downwards direction. This should be a positive number.
- MBRD BOTTOM OFFSET—Indicates the distance below the monkey board that the throttle limiter will begin limiting the throttle in the upwards direction. This should be a positive number.
- FLOOR OFFSET—Indicates the distance above the drill floor that the aux brake controller will begin engaging the aux brake in the downwards direction. This should be a positive number.
- MAX SPEED UP—Indicates the maximum payout speed in the upward direction before the throttle limiter is engaged. It is defined on a 0-999 scale.
- MAX SPEED DOWN—Indicates the maximum payout speed in the downwards direction before the aux brake controller is engaged. It is defined on a 0-999 scale.
- SPD ALM (Block Speed Alarm)—Enables and disables the speed control. ***This must be set to ON for any speed control to work.***



4.2 Pneumatic Control Boxes

Pneumatic control is separated into two individual boxes: the Pneumatic Throttle Limiter and the Pneumatic Aux Brake Controller. The Pneumatic Throttle Limiter is integrated between a full pressure rig airline and the airline to the rig engine's throttle. While no limits (set within the Rigsmart system) are being exceeded, the throttle limiter will pass the original air signal to the engine. If these limits are breached, the throttle limiter will regulate the air signal pressure before passing it to the engine.

The Pneumatic Aux Brake Controller is integrated between a full pressure rig airline and the rig's brakes. This control box will pass the original air signal to the brakes, as long as no set Rigsmart system limits are breached. If limits are breached, the controller will regulate the air pressure being supplied to the brake accordingly.

4.3 Electric Control Boxes

Electric control is separated into two individual boxes: the Electric Throttle Limiter and the Electric Brake Controller. The Electric Throttle Limiter intakes an electric signal from the rig's normal throttle control. While no limits (set within the Rigsmart system) are being exceeded, the throttle limiter will pass the original electric control signal to the rig's existing PLC or throttle control. If limits are breached, the limiter will modify the throttle signal accordingly before passing it on.

The Electric Brake Controller outputs a signal based on the current alarm condition of the system. The signal is sent to the rig's existing PLC or electric auxiliary brake controller.

4.4 Setup and Operation

4.4.1 Activate and Enable

To engage the Pneumatic Throttle Kickout and/or Brake Controller, enter the Limits Menu and set SPD ALM to 'ON':

1. Enter the Supervisor permission code
2. **Go To:** COMPONENTS>LIMITS>PAYOUT>BLOCKSPEED
3. Change SPD ALM to 'ON'
4. Set the offset and speed values

1. Have the driller manually control the aux brake. Note how much pressure is required to grab and slow the blocks. The aux brake should not be set to stop the blocks – only slow it down.
2. Adjust the regulator in the pneumatics box to match the driller's manual control.

Set the speed limits and offsets:

1. Enter the supervisor permission code To enter the Supervisor permission code see the troubleshooting section in the back of the manual.
2. **Go To: COMPONENTS>LIMITS>PAYOUT>BLOCK SPEED**

TOP MENU>COMPONENTS>LIMITS>BLOCK SPEED				
~} CROWN OFFSET	5m	UP SPD	63	
MBRD TOP OFFSET	5m	DOWN SPD	63	
MBRD BTM OFFSET	5m	SPD ALM	ON	
FLOOR OFFSET	5m			
EXIT	BACK	BLOCK HEIGHT 24.7m		

3. Set each offset to the desired distance. For testing and setup purposes, use only the crown and floor saver; give each at least 10m offsets.
4. Set both the upwards and downwards speed limits to values lower than the max speeds found above.

4.4.2 Pneumatic Regulators

Each Rigsmart pneumatic box has a regulator on the output signal. Along with the limits in the software, these pneumatic regulators also need to be adjusted. The following steps describe how to do this.

Throttle Kickout:

1. Adjust the throttle kickout regulator to approximately half of the input air pressure. The regulator will only show pressure on it when there is pressure coming in from the driller's throttle.
2. Adjust this by having the driller raise the blocks at full speed. Watch what the input pressure reads (coming from the throttle) and quickly adjust the output regulator to approximately half this value, while the blocks are still being raised at full speed. To ensure these pressures are set correctly, the driller may have to raise the blocks several times, so there's enough time to both view the original pressure and change the output pressure.

Aux Brake Controller:

1. Have the driller manually control the aux brake. Note how much pressure is required to grab and slow the blocks. The aux brake should not be set to stop the blocks – only slow it down.
2. Adjust the regulator in the pneumatics box to match the driller's manual control.

4.4.3 Testing To test the limits:

1. Set all the limits listed above.
2. Set the HEIGHT OFFSET to at least 10m. This ensures a large window for viewing the speed limiting in action before a hard limit is reached.
3. Set the crown and floor saver limits with some extra padding distance, in case the driller has to stop the blocks manually.
4. Bring the top drive and blocks to the middle of the derrick height and float the top drive bails.
5. Test the Throttle Kickout:
 - a. Move the top drive towards the crown at a high speed. Note the block height to see when the limiting is supposed to engage.
 - b. The system should begin limiting speed at the crown saver height (CROWN OFFSET). For example, with a crown height of 30m and an offset of 10m, limiting starts at 20m.
 - c. Based on how the throttle kickout engaged, the MAX SPEED UP and pneumatic regulator may need to be adjusted.
 - d. First, change the MAX SPEED UP value, and repeat the tests until the kickout works at the correct speed.
 - e. Second, change the pneumatic regulator and repeat the tests until the kickout slows the speed appropriately.
 - f. The correct amount of speed control will vary by rig and user preference. A speed reduction of approximately 50% (or idle) is normal.
6. Test the Brake Controller:
 - a. Move the top drive towards the floor at a high speed, and note the block height to see when the braking is supposed to engage.
 - b. Speed limiting should begin at the floor saver height + height offset. For example, if the floor height is 5m with an offset of 10m, braking starts at 15m.

- c. Based on how the braking engaged, the MAX SPEED DOWN and pneumatic regulator may need to be adjusted.
 - d. First, change the MAX SPEED DOWN value and repeat the tests until the braking engages at the correct speed.
 - e. Second, change the pneumatic regulator value and repeat the tests until the braking slows the speed appropriately.
 - f. The correct amount of speed control will vary by rig and user preference. A speed reduction of approximately 50% is normal.
7. After the correct speed and pneumatic regulator values are found for both devices:
- a. Reset the HEIGHT OFFSET values back to their correct values.
 - b. Reset the crown and floor saver limits back to their correct values.
 - c. Test the Throttle Kickout for all limits in the upwards direction.
 - d. Test the Brake Controller for all limits in the downwards direction.
 - e. The Pneumatic Throttle Kickout and Brake Controller will operate the same for monkey board limits as it does for the crown and floor saver limits.

Enable/ Disable

If a particular sensor is not functioning, it can be disabled from the system. While this device is disabled, no communication will occur between its transducer and the panel. The transducer will not operate and will not register alarms on the panel. All other devices (that have not been disabled) will continue to work as normal.

To disable (or re-enable) a device, follow these steps:

- Enter the supervisor permission code, as outlined in the Troubleshooting section.
- In the Top Menu, use the arrow buttons to highlight COMPONENTS and press the SELECT button.

TOP MENU	
~} COMPONENTS	SYSTEM
OPERATIONS	DIAGNOSTIC
RACK BOARD NOT FUNCTIONING	

- Using the arrow buttons, highlight ENABLE / DISABLE and press SELECT.
- Highlight MANUAL and press SELECT.
- Highlight ANGLE and press SELECT.

TOP MENU>COMPONENTS	
~} ENABLE/DISABLE	
RACK BOARD NOT FUNCTIONING	

```

TOP MENU>COMPONENTS>ENABLE/DISABLE
                        AUTOENABLE
                        AUTODISABLE
                        ~}MANUAL
                        _____
                        RACK BOARD NOT FUNCTIONING
EXIT          BACK          TOP MENU
  
```

```

TOP MENU>COMPONENTS>ENABLE/DISABLE
                        TOP DRIVE
~}ANGLE
                        _____
                        RACK BOARD NOT FUNCTIONING
EXIT          BACK          TOP MENU
  
```

- Highlight the specific ANGLE to be enabled or disabled and press SELECT.
- Once selected, use the arrow buttons to change the value to ENABLE or DISABLE and press the ACCEPT button twice to save the change.

```

TOP MENU>COMPONENTS>ENABLE/DISABLE
~}RACK BRD          enable
  IRN RN            enable
  STAB BOARD        enable
                        _____
                        RACK BOARD NOT FUNCTIONING
EXIT          BACK          TOP MENU
  
```

```

TOP MENU>COMPONENTS>ENABLE/DISABLE
RACK BRD          enable~}
  IRN RN            enable
  STAB BOARD        enable
                        _____
                        RACK BOARD NOT FUNCTIONING
EXIT          BACK          TOP MENU
  
```

```

TOP MENU>COMPONENTS>ENABLE/DISABLE
RACK BRD          disable~}
  IRN RN            enable
  STAB BOARD        enable
                        _____
                        RACK BOARD NOT FUNCTIONING
EXIT          BACK          TOP MENU
  
```

SAVE - ARE YOU SURE?

TOP MENU>COMPONENTS> ENABLE/DISABLE	
RACK BRD	disable~}
SAVING...	
RACK BOARD NOT FUNCTIONING	
EXIT	BACK TOP MENU

TOP MENU>COMPONENTS> ENABLE/DISABLE	
RACK BRD	disable
~}IRN RN	enable
STAB BOARD	enable
EXIT BACK TOP MENU	

5 Troubleshooting

It is important to note that after the Rigsmart system sets an alarm or detects a significant disruption. This commonly occurs during rig-up operations, or after the rig air supply has been shut off. Pressing the BYPASS button on the panel will advance these screen messages and return the system to normal operation.

5.1 Testing the Hardware Wireless Crown Saver, with a Software Crown Saver Installed

The hardware wireless crown saver is set higher in the derrick then the software crown saver. To test the hardware crown saver the software crown saver must temporarily be disabled. If the software crown saver is not temporarily disabled, then the brakes will be applied before hitting the hardware crown saver. To temporarily disable the software crown saver complete the following steps:

- After entering the supervisor permission code, use the arrow keys to highlight the COMPONENTS option in the Top Menu and press SELECT.

TOP MENU	
~}COMPONENTS	SYSTEM
QUICK-CAL	DIAGNOSTIC
OPERATIONS	
MAIN LOAD= 1,5	

- This will open the Components Menu. Use the arrow buttons to highlight the LIMITS option and press SELECT.

TOP MENU>COMPONENTS		
~}	LIMITS	ENABLE/DISABLE
	CALIBRATE	
	SETTINGS	
MAIN LOAD=	1,500dN BLOCK	31.7m

- Highlight the PAY-OUT option and press SELECT.

TOP MENU>COMPONENTS>LIMITS		
LOAD	~} ENCODER	
	TD ANGLE	
MAIN LOAD= 1,500dN BLOCK 31.7m		

- Highlight the CROWN & FLOOR option and press SELECT.

TOP MENU>COMPONENTS>LIMITS>ENCODER		
	~} CROWN & FLOOR	
	ANTI-COLLISION	
	BLOCK SPEED	
BLOCK HEIGHT 31.7m		

- This will open the Crown & Floor Saver Limits Menu.

TOP MENU>COMPONENTS>LIMITS>CRWN & FLR		
CROWN SVR HT	31.8m	SET HERE
FLOOR SVR HT	0.0m	
~} CROWN SAVER	on	FLOOR SAVER on
STAB BRD HT	18.0m	SH IRON RN 3.0m SH
TD BTM FLOOR HT	-.9	SET HERE
BAIL LENGTH	9.1m	ADJ FLOOR on
BLOCK HEIGHT 31.7m		
EXIT	BACK	TOP MENU

- Use the arrow keys to highlight CROWNSAVER, press SELECT
- Use the arrow key to change to OFF, press the ACCEPT button TWICE

TOP MENU>COMPONENTS>LIMITS>CRWN & FLR				
CROWN SVR HT	31.8m	SET HERE		
FLOOR SVR HT	0.0m	SET HERE		
CROWN SAVER	on~}	FLOOR SAVER	on	
STAB BRD HT	18.0m	SH	IRON RN 3.0m	SH
TD BTM FLOOR HT	-.9	SET HERE		
BAIL LENGTH	9.1m	ADJ FLOOR	on	
BLOCK HEIGHT		31.7m		
EXIT	BACK	TOP MENU		

TOP MENU>COMPONENTS>LIMITS>CRWN & FLR				
CROWN SVR HT	31.8m	SET HERE		
FLOOR SVR HT	0.0m	SET HERE		
CROWN SAVER	OFF~}	FLOOR SAVER	on	
SAVE - ARE YOU SURE?				
BAIL LENGTH	9.1m	ADJ FLOOR	on	
BLOCK HEIGHT		31.7m		
EXIT	BACK	TOP MENU		

TOP MENU>COMPONENTS>LIMITS>CRWN & FLR				
CROWN SVR HT	31.8m	SET HERE		
FLOOR SVR HT	0.0m	SET HERE		
CROWN SAVER	OFF~}	FLOOR SAVER	on	
SAVING...				
BAIL LENGTH	9.1m	ADJ FLOOR	on	
BLOCK HEIGHT		31.7m		
EXIT	BACK	TOP MENU		
TOP MENU>COMPONENTS>LIMITS>CRWN & FLR				
CROWN SVR HT	31.8m	SET HERE		
FLOOR SVR HT	0.0m	SET HERE		
CROWN SAVER	OFF~}	FLOOR SAVER	on	
STAB BRD HT	18.0m	SH	IRON RN 3.0m	SH
TD BTM FLOOR HT	-.9	SET HERE		
BAIL LENGTH	9.1m	ADJ FLOOR	on	
BLOCK HEIGHT		31.7m		
EXIT	BACK	TOP MENU		

- Test the crown saver.
- Repeat the steps listed above and turn the software crown saver back ON.

5.2 Using the Supervisor Permission Code

The supervisor permission code is used to make changes to the system. The code is given to the rig manager or supervisor when the system is installed. If this code has been lost, Rigsmart Systems can provide the code to the rig manager over the phone.

- From the Main Operation Screen press the SELECT button.

<div>1,500dN</div> <div>2%</div> <div>MAX LOAD = 53,400dN</div>		<div>BLOCK HEIGHT</div> <div>4.5m</div> <div>MAX 25.9m</div> <div>MIN .0m</div>
SYSTEM INFO		
BLOCK ANG	BAIL ANG	ELEV POS
0.0^	0.0^	TRIP
EXIT{	TARE SIG CAL	SETUP

- Use the up and down arrows on the panel to highlight the SETUP option and press SELECT.

SYSTEM INFO		
BLOCK ANG	BAIL ANG	ELEV POS
0.0^	0.0^	TRIP
EXIT	TARE SIG CAL ~}	SETUP

If no buttons are pressed for 8 seconds while viewing the Secondary Operation Screen, redirection to the Main Operation Screen will automatically occur. Press SELECT again to return to the Secondary Operation Screen.

- From the Top Menu, use the up and down arrows to highlight SYSTEM and press SELECT.

TOP MENU	
QUICK RE-CAL	~ } SYSTEM DIAGNOSTIC
EXIT	

- Use the up and down arrow buttons to highlight PERMISSION and press SELECT.

TOP MENU>SYSTEM	
~ } ABOUT LCD CONTRAST	PERMISSION
EXIT	BACK TOP MENU

TOP MENU>SYSTEM	
ABOUT LCD CONTRAST	~ } PERMISSION
EXIT	BACK TOP MENU

- On the PERMISSION screen, with the word PERMISSION highlighted, press the SELECT button.

TOP MENU>SYSTEM>PERMISSION	
Enter permission code:	
~ } PERMISSION	127
EXIT	BACK TOP MENU

TOP MENU>SYSTEM>PERMISSION		
Enter permission code:		
PERMISSION 127~}		
EXIT	BACK	TOP MENU

- Use the up and down arrows to change the value to the predetermined supervisor permission code. This number is set with the rig manager during installation.

TOP MENU>SYSTEM>PERMISSION		
Press ACCEPT to save changes. Press SELECT to discard changes.		
PERMISSION 111~}		
MAIN LOAD=	1,500dN	BLOCK 4.5m
EXIT	BACK	TOP MENU

- When the desired value is reached, press the ACCEPT button once to accept the change, then again to confirm and save the selection.

TOP MENU>SYSTEM>PERMISSION		
SAVE - ARE YOU SURE?		
PERMISSION 111~}		
MAIN LOAD=	1,500dN	BLOCK 4.5m

TOP MENU>SYSTEM>PERMISSION		
SAVING...		
PERMISSION 111~}		
MAIN LOAD=	1,500dN	BLOCK 4.5m

- After entering the correct permission code, the Top Menu will open. New options will be available in many menus.

TOP MENU			
~}COMPONENTS		SYSTEM	
QUICK RE-CAL		DIAGNOSTIC	
OPERATIONS			
MAIN LOAD=		1,500dN BLOCK	4.5m

- If an incorrect permission code is entered, simply use the up and down arrows to highlight PERMISSION and repeat the previous steps to retry.

If the permission code is unavailable, please contact Rigsmart Service at 1-780-438-9475.

5.3 Diagnostics

If there is a problem with the Rigsmart system, it might be necessary to access important system information for troubleshooting purposes. A 'Diagnostic Menu' is available via the supervisor permission code. All of the information under this menu is read only; no damage can be done to the system by viewing it.

To enter the Diagnostics Menu:

- Enter the supervisor permission code as outlined in the Troubleshooting section of this manual.
- From the Top Menu, use the arrow buttons to highlight DIAGNOSTICS and press the SELECT button.

TOP MENU		
COMPONENTS	SYSTEM	
QUICK RE-CAL	~} DIAGNOSTIC	
OPERATIONS		
<hr/>		
MAIN LOAD=	1,500dN BLOCK	4.5m

TOP MENU>DIAGNOSTIC		
SIGNALS	VIEWER	RF METER
OUTPUTS	VOLTAGE	
~} DEVICE DIAG	FIRMWARE	
<hr/>		
MAIN LOAD=	1,500dN BLOCK	4.5m

5.3.1 Signals

The Signals Screen shows the signal strength of all enabled wireless devices.

5.3.2 Outputs

The Outputs Screen shows the current output status of either the Alarm Hub or Panel wire.

5.3.3 Device Diag

The Device Diag Screen shows very detailed information about specific devices. Each device shows different information specific to its function.

5.3.4 Viewer

The Viewer Screen displays load calibration info and device IDs.

5.3.5 Voltage

The Voltage Menu displays the current voltage entering the panel.

5.3.6 Firmware

The Firmware Menu displays information about the panel's loaded firmware.

5.3.7 RF Meter

The RF Meter Screen shows the quality of the wireless signals being received. This is different than the Signals Screen, which shows the signal strengths.

TOP MENU>DIAGNOSTIC>DEVICE DIAG			
Em SHUTDOWN	-20mA	TEMPERATURE	
THROT OVR	TOP DRIVE		
	SPEED CTRL ~}	ENCODER	
<hr/>			
MAIN LOAD=	1,5		

TOP MENU>DIAGNOSTIC>ENCODER			
PT A	.0m	PT B	.
REF CNT	0	REF HT	0.0m
CURR A/D			
CURR CNT	0	HEIGHT	4.5m
SPEED	0	0.0rpm	0.00m/sec
<hr/>			
MAIN LOAD=	1,5		

5.4 Battery Replacement

The Rigsmart Display Panel will indicate when a component battery is low. **Batteries indicated as being low on power should be replaced immediately with the help of a Rigsmart service technician: (780) 438-9475.** The serial number of the system will be required and can be found on the display panel or the transmitter itself. Once the technical problem has been verified as being due to a dead battery, follow the steps below to replace it.

Tools and Equipment for Battery Replacement:

The battery replacement kit contains:

- (1) 3.6 Volt Lithium Ion D-cell battery
- (1) 1/8 Inch Allen key

NOTE: The transmitter should be removed from the rig before battery replacement occurs. However, replacement can still be done with the transmitter on the rig. If it is raining or snowing, remove the transmitter and perform the battery replacement indoors or under cover.

To Replace the Battery:

1. Remove the screws from the battery compartment lid and remove the lid.
2. Remove the battery from the holder.
3. Insert the new battery according to the battery orientation diagram on the base of the battery clip.
4. Ensure that the o-ring is greased and has not been damaged, as this will affect the seal.
5. Secure the lid with the screws.



Front View with Lid On



Front View with Lid Off



Front View with Battery Out

5.5 Antenna and Signal Issues

All of the wireless sensors on the Rigsmart system are received by the panel through a common antenna. If there is a problem with the antenna, the wireless sensors may not work correctly.

For the best possible communication, the Rigsmart antenna should have a clear line-of-sight to each wireless transducer, which should be no more than 100m away. In practice this may be challenging to obtain; the best compromise for line-of-sight to every wireless transducer should be made.

The Rigsmart antenna can be fitted with an extension cable so that it can be placed further away from the panel. Every effort should be made to reduce the number of extension cables and connector fittings used; each extension and connector fitting will reduce the signal strength.

	SIGNAL STRENGTH	RF
LOAD MAIN	60%	15
CROWN SVR1	10%	7
BAIL ANG	FAIL	0
PAY-OUT	FAIL	0
EXIT	BACK ←	TOP MENU

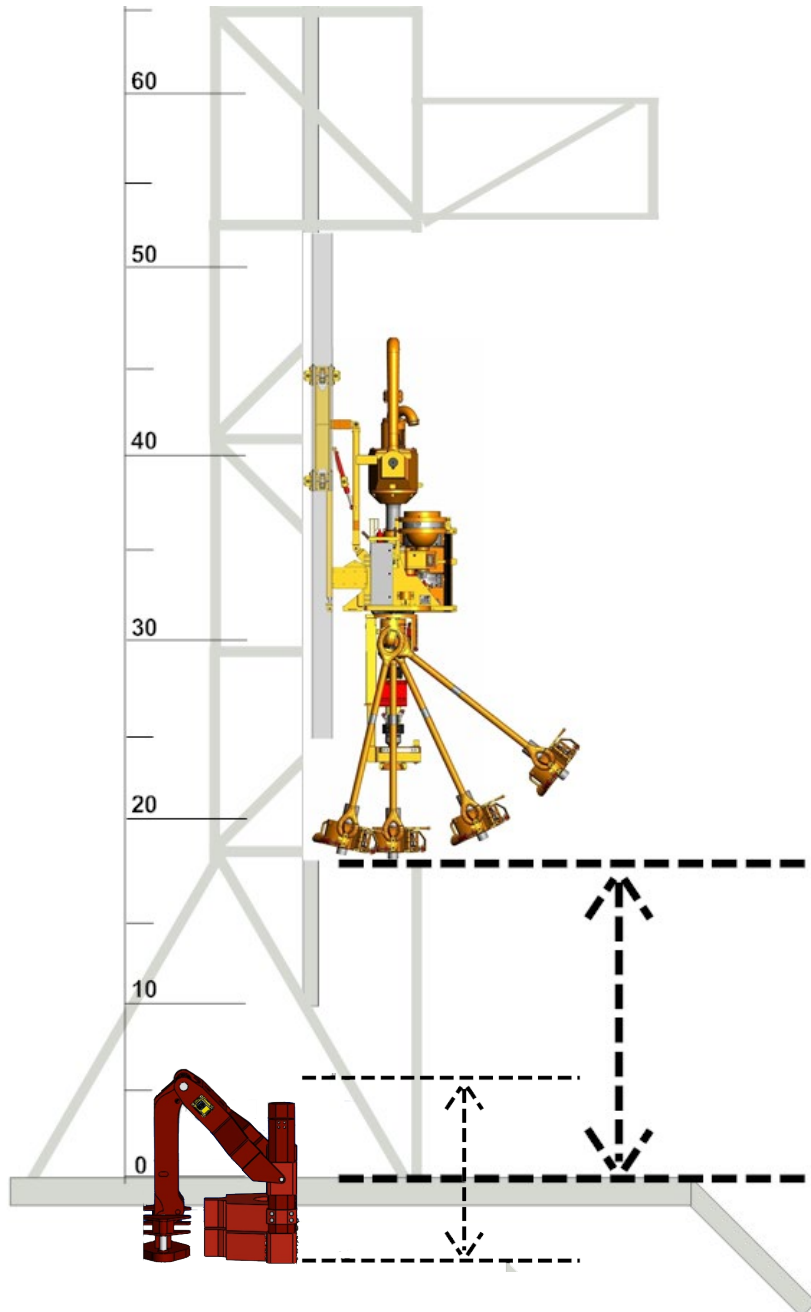
If any particular sensor is experiencing a loss of signal, there are a few quick troubleshooting steps that can easily be completed before contacting technical support:

1. The most common issue is a dead battery. If the battery in a sensor is dead, it cannot transmit and will have no signal. Replace the battery and recheck the signal.
2. Move the sensor closer to the antenna. Check to see if the signal has returned.
3. Check to ensure there are no breaks, pinches or cuts in the antenna cable. Very tight bends or crimps in the antenna cable may permanently damage the wire inside.
4. If all transducers are experiencing a signal failure, there may be an issue with the antenna – it is the common point for all the devices.
 - a. Move the antenna around and check to see if the signal has returned.
 - b. Often, moving the antenna inside the derrick structure will improve signals from a top drive.
 - c. Change the orientation of the antenna; if it is placed vertically, change it so it is mounted horizontally.

- d. Replace the antenna completely.

5.6 Measuring Block and Top Drive Heights

When calibrating block height or setting anti-collision limits, it is very important to measure heights correctly. It should be noted that the 'Block Height' is not actually the height of the traveling blocks, rather the height of the lowest point of the top drive or the bottom of the latched elevators. This is common to most height calculation systems. The drill floor is always used as the reference point of measurements. When using a top drive, measure from the floor to the bottom of the elevators. If there is no top drive, measure from the floor to the top of the Kelly bar. The important factor is that measurement reference points remain constant through the calibration and limit-setting process.



Common Error Messages Codes and Solutions

During the course of operation, alarms may be displayed on the panel screen. The following list contains all alarms, with their reference numbers and brief descriptions. Refer to this list for troubleshooting purposes.

Alarm Text	Number	Description
** BY-PASS ** XX SEC REMAIN	0	This message indicates that the BYPASS button has been pressed, which will disable all alarms for 30 seconds. During this 30 seconds, this message will flash to indicate how much time is left.
MAIN LOAD ABOVE PRESET	3	This alarm indicates that the measured load is above the entered load limit. If this alarm is being triggered at too low or too high a load value, the limit may need to be adjusted.
CROWN SAVER 1 ALARM	4	This alarm indicates that the Crown Saver Counterweight is lifted and the block is approaching the crown of the rig.
BLOCK HEIGHT ABOVE MAXIMUM	8	This alarm indicates that the measured block height is above the entered preset crown saver height. If this alarm is being triggered when the block is not near the crown the block height may need recalibration, or the crown saver height value may need to be changed.
BLOCK HEIGHT BELOW MINIMUM	9	This alarm indicates that the measured block height is below the entered preset minimum (floor) height. If this alarm is being triggered when the block is not near the floor, the minimum height value or block height may need recalibration.
Em SHUTDOWN 1 *** STOP ***	12	This alarm indicates that the Emergency Shutdown button has been pressed.
CROWN SAVER 1 ABOVE THRESHOLD	14	This alarm indicates that the weight on the Crown Saver Switch is too high or that it has been damaged. Check for extra weight on the crown saver counterweight or obvious physical damage.
TOP DRIVE BLOCK EXTENDED	19	This alarm indicates that the top drive is extended away from the derrick while there is a danger of it contacting the monkey board. If this alarm is being triggered while the top drive is not extended, it may be necessary to zero the block angle or adjust the set limits. See the Calibration or Limits section for more information.
TOP DRIVE BAILS TILTED	20	This alarm indicates that the bails are tilted while there is a danger of them contacting the monkey board. If this alarm is being triggered while the bails are not tilted, it may be necessary to zero the bail angle or adjust the set limits. See the Calibration or Limits section for more information.
ELEVATOR POS ALARM	21	This alarm indicates that the bails are tilted while the elevator is not in trip nor drill position. If this alarm is being triggered while the elevator is in trip or drill position, it may be necessary to adjust the positioning of the sensor in relation to the RFID targets.
TOP DRIVE BLK & BAILS EXT	25	This alarm indicates that both the bails and block are at least partially extended while there is a danger of the bails contacting the monkey board. If this alarm is being triggered while the bails are not tilted, it may be necessary to zero the bail angle or adjust the set limits. See the Calibration or Limits section for more information.
TOP DRIVE BAILS TILTED	26	This alarm indicates that the bails are tilted while there is a danger of them contacting the torque track. If this alarm is being triggered while the bails are not tilted, it may be necessary to zero the bail angle or adjust the set limits. See the Calibration or Limits section for more information.
LOAD 90% OF MAXIMUM LOAD	29	This alarm indicates that the measured load is approaching the entered load limit. If this alarm is being triggered at too low or too high a load value, the limit may need to be adjusted.

ALARM HUB MALFUNCTION	43	This alarm indicates that the panel cannot communicate with the attached Alarm Hub. This can happen if the cable between the panel and the Alarm Hub is disconnected or damaged.
MAIN LOAD SYSTEM ALARM	45	This alarm indicates that the panel is not receiving a signal from the Load Sensor. Either the sensor has stopped functioning due to a dead battery, damage, or failure, or the signal strength from the switch is too low. Try repositioning the antenna for a more direct line-of-sight with the sensor.
CROWN SAVER 1 SYSTEM ALARM	47	This alarm indicates that the panel is not receiving a signal from the Crown Saver Switch. Either the switch has stopped functioning due to a dead battery, damage, or failure, or the signal strength from the switch is too low. Try repositioning the antenna for a more direct line-of-sight with the switch.
RFID TAG READER SYSTEM ALARM	51	This alarm indicates that the Elevator Position Transmitter cannot communicate with the RFID Tag Reader. This can happen if the cable between the Tag Reader and Transmitter is disconnected or damaged.
LINE PAY-OUT SYSTEM ALARM	54	This alarm indicates that the panel is not receiving a signal from the Pay-Out Sensor. Either the sensor has stopped functioning due to lost power, damage, or failure, or the signal strength from the sensor is too low. Try repositioning the antenna for a more direct line-of-sight with the sensor.
Em SHUTDOWN 1 SYSTEM ALARM	59	This alarm indicates that the panel is not receiving a signal from the Emergency Shutdown sensor. Either the sensor has stopped functioning due to a dead battery, damage, or failure, or the signal strength from the sensor is too low. Try repositioning the antenna for a more direct line-of-sight with the sensor.
BLOCK ANGLE SYSTEM ALARM	63	This alarm indicates that the panel is not receiving a signal from the Block Angle Sensor. Either the sensor has stopped functioning due to a dead battery, damage, or failure, or the signal strength from the sensor is too low. Try repositioning the antenna for a more direct line-of-sight with the sensor.
BAIL ANGLE SYSTEM ALARM	64	This alarm indicates that the panel is not receiving a signal from the Bail Angle Sensor. Either the sensor has stopped functioning due to a dead battery, damage, or failure, or the signal strength from the sensor is too low. Try repositioning the antenna for a more direct line-of-sight with the sensor.
ELEVATOR POS SYSTEM ALARM	65	This alarm indicates that the panel is not receiving a signal from the Elevator Position Sensor. Either the sensor has stopped functioning due to a loss of power, damage, or failure, or the signal strength from the sensor is too low. Try repositioning the antenna for a more direct line-of-sight with the sensor.
LOW BRAKE PRESSURE DETECTED	69	This alarm indicates that the rig air pressure into the Main Air Kill has dropped below 70psi. This may have been done intentionally to bypass the Rigsmart system, or it may be due to an air pressure leak or malfunction. To resolve this, increase the rig air pressure going into the Main Air Kill.
MAIN LOAD LOW BATTERY	72	This alarm indicates that the battery in the Load Sensor is low. Please contact our service department for a replacement.
CROWN SAVER 1 LOW BATTERY	74	This alarm indicates that the battery in the Crown Saver Switch is low. Please contact our service department for a replacement.
Em SHUTDOWN LOW BATTERY	84	This alarm indicates that the battery in the Emergency Shutdown Sensor is low. Please contact our service department for a replacement.
BLOCK ANGLE LOW BATTERY	87	This alarm indicates that the battery in the Top Drive Extend Angle Sensor is low. Please contact our service department for a replacement.
BAIL ANGLE LOW BATTERY	237	This alarm indicates that the battery in the Bail Tilt Angle Sensor is low. Please contact our service department for a replacement.

5.7 Alarm Code Master List

No.	Alarm Text 1	Alarm Text 2	Menu Alarm Text
1	STRING WEIGHT	TOO HIGH	STRING WEIGHT TOO HIGH
2	LOAD OVER	PIPE STRENGTH	MAIN LOAD OVER PIPE STRENGTH
3	MAIN LOAD	ABOVE PRESET	MAIN LOAD ABOVE PRESET
4	CROWN SAVER 1	ALARM	CROWN SAVER 1 ALARM
7	THROT OVERRIDE	PEDAL PRESSED	THROT OVERRIDE PEDAL PRESSED
8	BLOCK HEIGHT	ABOVE MAXIMUM	BLOCK HEIGHT ABOVE PRESET MAXIMUM
9	BLOCK HEIGHT	BELOW MINIMUM	BLOCK HEIGHT BELOW PRESET MINIMUM
10	H2S 1	ABOVE LIMIT	H2S 1 LEVELS ABOVE MAXIMUM LIMIT
11	LEL 1	ABOVE LIMIT	LEL 1 LEVELS ABOVE MAXIMUM LIMIT
12	Em SHUTDOWN 1	*** STOP ***	Em SHUTDOWN 1 ***STOP***
13	PRESSURE 1	ABOVE PRESET	PRESSURE 1 ABOVE PRESET MAXIMUM
14	CROWN SAVER 1	ABOVE THRESHOLD	CROWN SAVER 1 ABOVE THRESHOLD
15	ROLL	ABOVE PRESET	ROLL OVER PRESET MAXIMUM
16	IRON DERRICKMAN	EXTENDED	IRON DERRICKMAN EXTENDED
17	MAIN ANGLE	ABOVE PRESET	MAIN ANGLE ABOVE PRESET MAXIMUM
18	MAIN ANGLE	BELOW PRESET	MAIN ANGLE BELOW PRESET MINIMUM
19	TOP DRIVE	BLOCK EXTENDED	TOP DRIVE BLOCK EXTENDED
20	TOP DRIVE	BAILS TILTED	TOP DRIVE BAILS TILTED
21	ELEVATOR POS	ALARM	TOP DRIVE ELEVATOR POSITION ALARM
22	WIND SPEED	ABOVE PRESET	WIND SPEED ABOVE PRESET MAXIMUM
23	RAM1	CLOSED	RAM1 IS CLOSED
24	RAM1 SIDE A	CLOSED	RAM1 SIDE A IS CLOSED
25	TOP DRIVE	BLK & BAILS EXT	TOP DRIVE BLOCK & BAILS EXTENDED
26	TOP DRIVE	BAILS TILTED	TOP DRIVE BAILS TILTED
27	RAISING DERRICK	OUTPUT DISABLED	RAISING DERRICK - OUTPUT DISABLED
28	MAIN 90% OF	PIPE STRENGTH	MAIN LOAD AT 90% OF PIPE STRENGTH
29	MAIN 90% OF	PRESET	MAIN LOAD AT 90% OF MAXIMUM LOAD
30	** BY-PASS **	SEC REMAIN	** BY-PASS PRESSED **
31	BLOCK SPEED	OVER LIMIT	BLOCK SPEED OVER MAXIMUM LIMIT
32	BLOCK SPEED	OVER LIMIT	BLOCK SPEED OVER MAXIMUM LIMIT
39	SERIAL ADC IN	MALFUNCTION	SERIAL ADC INPUT MALFUNCTION
40	THROT CONTROL	MALFUNCTION	THROTTLE CONTROL MALFUNCTION
41	BRAKE CONTROL	MALFUNCTION	BRAKE CONTROL MALFUNCTION
42	SERIAL LIMIT TX	MALFUNCTION	LIMIT TRANSMITTER MALFUNCTION
43	ALARM HUB	MALFUNCTION	ALARM HUB MALFUNCTION
44	STROBE HUB	MALFUNCTION	STROBE HUB MALFUNCTION
45	MAIN LOAD	SYSTEM ALARM	MAIN LOAD NOT FUNCTIONING
46	MAIN ANGLE	SYSTEM ALARM	MAIN ANGLE NOT FUNCTIONING
47	CROWN SAVER 1	SYSTEM ALARM	CROWN SAVER 1 NOT FUNCTIONING
48	LASER	SYSTEM ALARM	LASER NOT FUNCTIONING
49	INPUT SIGNAL	SYSTEM ALARM	INPUT SIGNAL NOT FUNCTIONING
50	WIND SPEED	SYSTEM ALARM	WIND SPEED NOT FUNCTIONING
51	RFID TAG READER	SYSTEM ALARM	RF TAG READER NOT FUNCTIONING
52	LEVELING	SYSTEM ALARM	LEVELING SENSOR NOT FUNCTIONING
53	RAM1 SIDE A	SYSTEM ALARM	RAM1 SIDE A SENSOR NOT FUNCTIONING


No.	Alarm Text 1	Alarm Text 2	Menu Alarm Text
54	LINE PAY-OUT	SYSTEM ALARM	LINE PAY-OUT SYSTEM NOT FUNCTIONING
55	THROT LIMITER	SYSTEM ALARM	THROTTLE LIMITER NOT FUNCTIONING
56	THROT OVERRIDE	SYSTEM ALARM	THROTTLE OVERRIDE NOT FUNCTIONING
57	H2S 1	SYSTEM ALARM	H2S 1 SYSTEM NOT FUNCTIONING
58	LEL 1	SYSTEM ALARM	LEL 1 SYSTEM NOT FUNCTIONING
59	Em SHUTDOWN 1	SYSTEM ALARM	Em SHUTDOWN 1 SYS NOT FUNCTIONING
60	PRESSURE 1	SYSTEM ALARM	PRESSURE 1 NOT FUNCTIONING
61	PUMP SPEED	SYSTEM ALARM	ROTARY SPEED SYS NOT FUNCTIONING
62	4-20mA CONVRTER	SYSTEM ALARM	4 to 20mA CONVERTER NOT FUNCTIONING
63	BLOCK ANGLE	SYSTEM ALARM	BLOCK ANGLE SYS NOT FUNCTIONING
64	BAIL ANGLE	SYSTEM ALARM	BAIL ANGLE SYS NOT FUNCTIONING
65	ELEVATOR POS	SYSTEM ALARM	ELEVATOR POS SYS NOT FUNCTIONING
66	FLOW SENSOR 1	SYSTEM ALARM	FLOW SENSOR 1 NOT FUNCTIONING
67	LCD DIAL	SYSTEM ALARM	LCD DIAL SYSTEM ALARM
68	DISPLAY	OVERFLOW	DISPLAY OVERFLOW ALARM
69	LOW BRAKE	PRESSURE	LOW BRAKE PRESSURE DETECTED
70	CHECKSUM	ERROR:	MEMORY ERROR - CHECKSUM ALARM
72	MAIN LOAD	LOW BATTERY	MAIN LOAD LOW BATTERY
73	MAIN ANGLE	LOW BATTERY	MAIN ANGLE LOW BATTERY
74	CROWN SAVER 1	LOW BATTERY	CROWN SAVER 1 LOW BATTERY
75	JIB ANGLE	LOW BATTERY	JIB ANGLE LOW BATTERY
76	PANEL RELAY	DETECT SHORT	PANEL RELAY DETECT SHORT CIRCUIT
77	MAIN LD REPEATR	LOW BATTERY	MAIN LOAD REPEATER LOW BATTERY
78	LEVELING	LOW BATTERY	LEVELING SENSOR LOW BATTERY
79	WIND SPEED	LOW BATTERY	WIND SPEED LOW BATTERY
80	RAM1 SIDE A	LOW BATTERY	RAM1 SIDE A SENSOR LOW BATTERY
81	H2S 1	LOW BATTERY	H2S 1 SENSOR LOW BATTERY
82	LEL 1	LOW BATTERY	LEL 1 SENSOR LOW BATTERY
84	Em SHUTDOWN 1	LOW BATTERY	Em SHUTDOWN 1 LOW BATTERY
85	MODBUS SLAVE	MODE SELECTED	MODBUS SLAVE MODE SELECTED
86	PRESSURE 1	LOW BATTERY	PRESSURE 1 LOW BATTERY
87	BLOCK ANGLE	LOW BATTERY	TD BLOCK ANGL LOW BATTERY
88	FLOW SENSOR 1	LOW BATTERY	FLOW SENSOR 1 LOW BATTERY
89	LINE PAY-OUT	LOW BATTERY	PAY-OUT TRANSDUCER LOW BATTERY
153	AUX1 LOAD	ABOVE PRESET	AUX1 LOAD ABOVE PRESET
154	CROWN SAVER 2	ALARM	CROWN SAVER 2 ALARM
160	H2S 2	ABOVE LIMIT	H2S 2 LEVELS ABOVE MAXIMUM LIMIT
161	LEL 2	ABOVE LIMIT	LEL 2 LEVELS ABOVE MAXIMUM LIMIT
162	Em SHUTDOWN 2	*** STOP ***	Em SHUTDOWN 2 ***STOP***
163	PRESSURE 2	ABOVE PRESET	PRESSURE 2 ABOVE PRESET MAXIMUM
164	CROWN SAVER 2	ABOVE THRESHOLD	CROWN SAVER 2 ABOVE THRESHOLD
165	PITCH	ABOVE PRESET	PITCH OVER PRESET MAXIMUM
167	AUX1 ANGLE	ABOVE PRESET	AUX1 ANGLE ABOVE PRESET MAXIMUM
168	AUX1 ANGLE	BELOW PRESET	AUX1 ANGLE BELOW PRESET MINIMUM
173	RAM2	CLOSED	RAM2 IS CLOSED
174	RAM1 SIDE B	CLOSED	RAM1 SIDE B IS CLOSED
178	AUX1 90% OF	PIPE STRENGTH	AUX1 LOAD AT 90% OF PIPE STRENGTH
179	AUX1 90% OF	PRESET	AUX1 LOAD AT 90% OF MAXIMUM LOAD

No.	Alarm Text 1	Alarm Text 2	Menu Alarm Text
195	AUX1 LOAD	SYSTEM ALARM	AUX1 LOAD NOT FUNCTIONING
196	AUX1 ANGLE	SYSTEM ALARM	AUX1 ANGLE NOT FUNCTIONING
197	CROWN SAVER 2	SYSTEM ALARM	CROWN SAVER 2 NOT FUNCTIONING
203	RAM1 SIDE B	SYSTEM ALARM	RAM1 SIDE B SENSOR NOT FUNCTIONING
207	H2S 2	SYSTEM ALARM	H2S 2 SYSTEM NOT FUNCTIONING
208	LEL 2	SYSTEM ALARM	LEL 2 SYSTEM NOT FUNCTIONING
209	Em SHUTDOWN 2	SYSTEM ALARM	Em SHUTDOWN 2 SYS NOT FUNCTIONING
210	PRESSURE 2	SYSTEM ALARM	PRESSURE 2 NOT FUNCTIONING
216	FLOW SENSOR 2	SYSTEM ALARM	FLOW SENSOR 2 NOT FUNCTIONING
222	AUX1 LOAD	LOW BATTERY	AUX1 LOAD LOW BATTERY =
223	AUX1 ANGLE	LOW BATTERY	AUX1 ANGLE LOW BATTERY =
224	CROWN SAVER 2	LOW BATTERY	CROWN SAVER 2 LOW BATTERY
230	RAM1 SIDE B	LOW BATTERY	RAM1 SIDE B SENSOR LOW BATTERY
231	H2S 2	LOW BATTERY	H2S 2 SENSOR LOW BATTERY
232	LEL 2	LOW BATTERY	LEL 2 SENSOR LOW BATTERY
234	Em SHUTDOWN 2	LOW BATTERY	Em SHUTDOWN 2 LOW BATTERY
236	PRESSURE 2	LOW BATTERY	PRESSURE 2 LOW BATTERY
237	BAIL ANGLE	LOW BATTERY	TD BAIL ANGLE LOW BATTERY
238	FLOW SENSOR 2	LOW BATTERY	FLOW SENSOR 2 LOW BATTERY
253	AUX2 LOAD	ABOVE PRESET	AUX2 LOAD ABOVE PRESET
254	CROWN SAVER 3	ALARM	CROWN SAVER 3 ALARM
260	H2S 3	ABOVE LIMIT	H2S 3 LEVELS ABOVE MAXIMUM LIMIT
261	LEL 3	ABOVE LIMIT	LEL 3 LEVELS ABOVE MAXIMUM LIMIT
262	Em SHUTDOWN 3	*** STOP ***	Em SHUTDOWN 3 ***STOP***
263	PRESSURE 3	ABOVE PRESET	PRESSURE 3 ABOVE PRESET MAXIMUM
264	CROWN SAVER 3	ABOVE THRESHOLD	CROWN SAVER 3 ABOVE THRESHOLD
265	PITCH & ROLL	ABOVE PRESET	PITCH AND ROLL OVER PRESET MAXIMUM
267	AUX2 ANGLE	ABOVE PRESET	AUX2 ANGLE ABOVE PRESET MAXIMUM
268	AUX2 ANGLE	BELOW PRESET	AUX2 ANGLE BELOW PRESET MINIMUM
273	RAM3	CLOSED	RAM3 IS CLOSED
274	RAM2 SIDE A	CLOSED	RAM2 SIDE A IS CLOSED
278	AUX2 90% OF	PIPE STRENGTH	AUX2 LOAD AT 90% OF PIPE STRENGTH
279	AUX2 90% OF	PRESET	AUX2 LOAD AT 90% OF MAXIMUM LOAD
295	AUX2 LOAD	SYSTEM ALARM	AUX2 LOAD NOT FUNCTIONING
296	AUX2 ANGLE	SYSTEM ALARM	AUX2 ANGLE NOT FUNCTIONING
297	CROWN SAVER 3	SYSTEM ALARM	CROWN SAVER 3 NOT FUNCTIONING
303	RAM2 SIDE A	SYSTEM ALARM	RAM2 SIDE A SENSOR NOT FUNCTIONING
307	H2S 3	SYSTEM ALARM	H2S 3 SYSTEM NOT FUNCTIONING
308	LEL 3	SYSTEM ALARM	LEL 3 SYSTEM NOT FUNCTIONING
309	Em SHUTDOWN 3	SYSTEM ALARM	Em SHUTDOWN 3 SYS NOT FUNCTIONING
310	PRESSURE 3	SYSTEM ALARM	PRESSURE 3 NOT FUNCTIONING
316	FLOW SENSOR 3	SYSTEM ALARM	FLOW SENSOR 3 NOT FUNCTIONING
322	AUX2 LOAD	LOW BATTERY	AUX2 LOAD LOW BATTERY
323	AUX2 ANGLE	LOW BATTERY	AUX2 ANGLE LOW BATTERY
324	CROWN SAVER 3	LOW BATTERY	CROWN SAVER 3 LOW BATTERY
330	RAM2 SIDE A	LOW BATTERY	RAM2 SIDE A SENSOR LOW BATTERY
331	H2S 3	LOW BATTERY	H2S 3 SENSOR LOW BATTERY
332	LEL 3	LOW BATTERY	LEL 3 SENSOR LOW BATTERY


No.	Alarm Text 1	Alarm Text 2	Menu Alarm Text
334	Em SHUTDOWN 3	LOW BATTERY	Em SHUTDOWN 3 LOW BATTERY
336	PRESSURE 3	LOW BATTERY	PRESSURE 3 LOW BATTERY
337	ELEV POSITION	LOW BATTERY	ELEV POSITION LOW BATTERY
338	FLOW SENSOR 3	LOW BATTERY	FLOW SENSOR 3 LOW BATTERY
360	H2S 4	ABOVE LIMIT	H2S 4 LEVELS ABOVE MAXIMUM LIMIT
361	LEL 4	ABOVE LIMIT	LEL 4 LEVELS ABOVE MAXIMUM LIMIT
362	Em SHUTDOWN 4	*** STOP ***	Em SHUTDOWN 4 ***STOP***
363	PRESSURE 4	ABOVE PRESET	PRESSURE 4 ABOVE PRESET MAXIMUM
374	RAM2 SIDE B	CLOSED	RAM2 SIDE B IS CLOSED
403	RAM2 SIDE B	SYSTEM ALARM	RAM2 SIDE B SENSOR NOT FUNCTIONING
407	H2S 4	SYSTEM ALARM	H2S 4 SYSTEM NOT FUNCTIONING
408	LEL 4	SYSTEM ALARM	LEL 4 SYSTEM NOT FUNCTIONING
409	Em SHUTDOWN 4	SYSTEM ALARM	Em SHUTDOWN 4 SYS NOT FUNCTIONING
410	PRESSURE 4	SYSTEM ALARM	PRESSURE 4 NOT FUNCTIONING
430	RAM2 SIDE B	LOW BATTERY	RAM2 SIDE B SENSOR LOW BATTERY
431	H2S 4	LOW BATTERY	H2S 4 SENSOR LOW BATTERY
432	LEL 4	LOW BATTERY	LEL 4 SENSOR LOW BATTERY
434	Em SHUTDOWN 4	LOW BATTERY	Em SHUTDOWN 4 LOW BATTERY
436	PRESSURE 4	LOW BATTERY	PRESSURE 4 LOW BATTERY
463	PRESSURE 5	ABOVE PRESET	PRESSURE 5 ABOVE PRESET MAXIMUM
474	RAM3 SIDE A	CLOSED	RAM3 SIDE A IS CLOSED
503	RAM3 SIDE A	SYSTEM ALARM	RAM3 SIDE A SENSOR NOT FUNCTIONING
510	PRESSURE 5	SYSTEM ALARM	PRESSURE 5 NOT FUNCTIONING
530	RAM3 SIDE A	LOW BATTERY	RAM3 SIDE A SENSOR LOW BATTERY
536	PRESSURE 5	LOW BATTERY	PRESSURE 5 LOW BATTERY
563	PRESSURE 6	ABOVE PRESET	PRESSURE 6 ABOVE PRESET MAXIMUM
574	RAM3 SIDE B	CLOSED	RAM3 SIDE B IS CLOSED
603	RAM3 SIDE B	SYSTEM ALARM	RAM3 SIDE B SENSOR NOT FUNCTIONING
610	PRESSURE 6	SYSTEM ALARM	PRESSURE 6 NOT FUNCTIONING
630	RAM3 SIDE B	LOW BATTERY	RAM3 SIDE B SENSOR LOW BATTERY
636	PRESSURE 6	LOW BATTERY	PRESSURE 6 LOW BATTERY

5.8 In the Event of System Power Loss

In the event of a rig black out while the Rigsmart System is in use (either while drilling, rig-up, rig-down, or any other time), complete the following steps to avoid potential accidents. By default, if power is lost to the Rigsmart System, the main brakes will engage. The brakes will not be released until power is restored to the Rigsmart system.



WARNING
Potential for Accident
The Rigsmart system may unexpectedly release the brakes if the following steps are not completed correctly.



1. Stop operations.
2. **Chain brake the main brakes.**
(This ensures that the rig's blocks will not move while the power issue is being resolved).
3. Rigsmart has built in protection in the event of a power loss.
4. Once power is restored the Rigsmart panel will display WAITING FOR OPERATOR CONFIRMATION.
5. To return to normal operation press the SELECT button on the Rigsmart panel.
6. Once the operator has assumed control of the rig again, confirm the block height matches the position of the traveling blocks. If the height does not match a calibration will be needed.
 - a. Complete a 'First Layer Change' height recalibration.
 - b. If the block height is supplied by a 4-20mA connection to a PLC, a height calibration must be done.
7. Continue operations.

6 Service

6.1 Regular System Maintenance

For the Rigsmart system to operate correctly there are a number of regular system maintenance items that should be tended to on a regular basis. Consistent testing of the system should be worked into the

rig's regular schedule to ensure that it is continuously protecting the rig. This maintenance list is a guide only; if the customer's safety program recommends more frequent safety checks, the greater of the two should be observed. For example, if the customer's safety policy is to check the crown saver every tour, the Rigsmart crown saver should be checked at the same time.

Maintenance Item	Description	Frequency				
		Every Day	Weekly	Monthly	On Rig Move	As Required
General						
Load Calibration	Any device used to indicate weight should be returned to Rigsmart Systems annually to ensure proper calibration and functionality.					X (annually)
Visual inspection of equipment	Visual inspection of components, transducers and brackets. Checking for obvious damage.				X	
Wash equipment	If equipment becomes heavily soiled with drilling fluids or mud they should be sprayed off. Make sure all covers are securely closed and lids are tight. Use only a light spray with soap and water. Do not pressure wash with high pressure sprays. No harsh chemicals or diesel fuel should be used.					X
Function Crown Saver	The hardware and software Crown Savers should be tested every day to ensure functionality.	X				
Limit Testing	Test each of the Anti-Collision Limits. Make sure the brakes activate correctly and the limits are placed in the correct positions.		X			
Emergency Shutdown	If equipped, test the Emergency Shutdown to ensure it functions correctly.	X				
Maintenance Item	Description	Frequency				
		Every Day	Weekly	Monthly	On Rig Move	As Required
General						

Elevator Position	If equipped, rotate the top drive pipe handler to ensure the Elevator Position Sensor is working correctly and all micro-dots are being sensed.				X	
Check Safety Cables	Ensure all safety cables on overhead equipment are connected and tight.				X	
Electrical						
Antenna Connection	Apply a moderate amount of dielectric grease to create a watertight seal on the antenna connection and any extension cables or bulkheads. Make sure each connection is tight.				X	
Check Electrical Cables	Check cables for damage, kinks or pinch points.				X	
Replace Batteries	If a transducer's battery has died or the panel displays a 'low battery' warning message, replace the battery in the corresponding component. After replacing the battery, ensure that the lid is greased and closed tightly.					X
Electrical Connections	All electrical cables NOT on the component stand should be opened and a moderate amount of dielectric grease should be applied to create a water tight seal. Make sure to tighten connections when connecting and reconnecting. NOTE: This should NOT be done while drilling, as the brakes will be applied if a connection is broken.				X	
Pneumatic						
Check Hoses	Check hoses for damage, kinks or pinch points.				X	
Air Pressure	The supply pressure tank should be checked to ensure there is a constant supply of at least 90PSI.		X			
Maintenance Item	Description	Frequency				
		Every Day	Weekly	Monthly	On Rig Move	As Required
General						

Pneumatic Filters	All of Rigsmart's pneumatic boxes have air filters in them; these filters should be checked and cleaned.		X			
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6.2 The Rigsmart Replacement Exchange System:

1. A customer calls with a valid Rigsmart component serial number. (XXX-XXXX.), and specifies which components need to be replaced. (Example: Panel, Crown Saver, Bail Angle, Elevator Rotation System...etc.).
2. A replacement agreement is then faxed to the customer. The customer is responsible for signing and returning the agreement to Rigsmart Systems. No product will leave Rigsmart Systems until this agreement is signed.
3. The replacement parts are spooled up and tested.
4. Parts are then shipped to the customer. If the system is still within the warranty period, no charges will be applied at this time, unless importing to a country with a value added tax (VAT). If the part's warranty period is expired, the customer is responsible for the cost of freight. A purchase order number will be required.
5. Upon receiving the new parts, the customer can then reuse the same box to package and ship the faulty or damaged components back to Rigsmart Systems.

Service Contact Information

E-mail: service@rigsmart.com
Telephone: +1 780 438 9475
Facsimile: +1 780 438 9477
Address: 4908 97 Street NW
 Edmonton, Alberta
 Canada T6E 5S1

Replacement Agreement – please complete
Between Rigsmart Systems and

Company:
Address:
City:
State/Province:
Zip/Postal Code:

Contact Name:
Phone:
Fax:

Serial Number: n/a	Service Order #:
Component(s):	Replacement Value: \$

On behalf of (COMPANY)_____ I hereby request in writing, replacement system component(s) for Rigsmart System (RS#_____). I agree to return the non-functioning component(s) to Rigsmart Systems at the above address within 15 business days of receipt. In the event I fail to return the non-functioning component(s) to Rigsmart Systems within 15 business days – and do not notify Rigsmart Systems, I hereby authorize Rigsmart Systems to charge my account or credit card on file for the cost of the equipment as detailed on this agreement.

I understand this replacement is being provided as a service. Any subsequent costs charged for this replacement due to loss are non-refundable. I also understand that there may be additional fees to repair the component(s) being replaced. If this is a replacement for a known repair please provide a purchase order number in the space below

COMPLETION AND RETURN OF THIS AGREEMENT, AND ACCEPTANCE OF REPLACEMENT EQUIPMENT CONSTITUTES ACCEPTANCE OF THESE TERMS AND CONDITIONS. AS AN AUTHORIZED EMPLOYEE OF YOUR COMPANY, BY SIGNING THIS DOCUMENT IT BECOMES A BINDING CONTRACT.

***Authorized
Signature:**

***Name:**

Title:

***Date:**

***Purchase Order
Number:**

Service Tech:

Title:

Date:

**Crane/Rig
Description**

Fax copy of signed agreement to 1-780-438-9477

***These fields are mandatory. If a Purchase Order Number is not available, please print name in field**

****Note: No equipment shall be shipped until a completed copy is received by Rigsmart Systems****

7 Rigsmart Systems Training- DRILLER SIGN OFF PAGE

Trainer: _____ Company: _____	Date: _____ Rig #: _____
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Skill or Task	Page	Date	Trained	N/A
<i>Best Practises</i>	2			
<i>System Description</i>	6			
<i>Normal Operation</i>	7			
<i>Operating Alarms</i>	10			
<i>Using By-pass</i>	11			
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