Table of Contents

1 Description

The Rigsmart System consists of a pair of Ram Position Sensors for each BOP Ram on the unit, a LED Ram Indicator module for each set of rams for use by the driller, and a Rigsmart panel to control and monitor the whole system. The Ram Position Sensors will be attached to each side of the ram, giving a definite indication of the position of both sides of the ram in case one side remains closed, or partially closed, while the other side is open. Each LED Ram Indicator module will correspond to a pair of ram sensors. The green light will indicate that both sides of the ram are open, while a red light will indicate that one or both sides of the ram are closed. The Rigsmart Panel will act as a ram indicator and will be able to turn off the LED Ram Indicators when they are not being used, to conserve battery life. If equipped, the Strobe Hub allows for large scale viewing of Ram Position Sensor status. If one Ram Position Sensor is detecting its BOP Ram closed the Strobe Light will switch to Red.

2 Normal Operation

In normal operation the panel will display the current BOP ram status with graphic as shown below.

```
   RAM1          RAM2          RAM3
 CLOSED         OPEN          OPEN
    ◉           (•)           (•)
```

If you press the SELECT key, you will be taken to the secondary operation screen. On this screen BOP ram pair status, LED status and average ram pair temperature will be displayed.

```
              SYSTEM INFO
   RAM1          RAM2          RAM3
 CLOSED         OPEN          OPEN
  18.0°C        18.0°C        18.0°C
LED    OFF   LED     ON   LED     ON
EXIT←  LEDS ON/OFF    SIG   INFO  SETUP
```

After displaying the secondary operation screen for 8 seconds, the panel will automatically return to the main operation screen.

3 Standard Alerts

When the BOP rams are closed there is a screen flash and the pneumatic control will activate. There will be no audible alarm for this. The screens are shown below:

```
        RAM1

      CLOSED
```

```
TOP MENU
LED INDICATORS  → SYSTEM
                  DIAGNOSTIC
OPERATIONS

RAM 1 CLOSED                  =23
       EXIT
```

4 Operating Alarms

When the system encounters a problem an alarm message will flash on the panel screen, and the panel will beep. The message will flash and the beeping will continue until the detected problem is resolved.

5 | RAM2 SIDE B SYSTEM ALARM

```
TOP MENU
LED INDICATORS  →SYSTEM
                 DIAGNOSTIC
OPERATIONS

RAM2 SIDE B SENSOR NOT FUNCTIONING =403
     EXIT
```

Top Menu

Through normal system use the operator will occasionally need to access more advanced system menus to turn on and off different parts of the system. The system is designed to be modular so sets of Rams and LEDs can be added and taken away without major software changes. Also LEDs can be individually turned on or off, rather then all at once. All of these options can be accessed through the Top Menu.

```
TOP MENU
LED INDICATORS →SYSTEM
                DIAGNOSTIC
OPERATIONS


RAM2 SIDE B SENSOR NOT FUNCTIONING =403
        EXIT
```

5.1 LED Indicators Menu

When the snubbing unit is not being used you may wish to turn off the LED Indicator modules to extend their battery life.
To turn on or off LEDs individually do the following:

- From the Top Menu, use the arrow keys to select LED INDICATORS and press SELECT.

```
TOP MENU
  →LED INDICATORS SYSTEM
                  DIAGNOSTIC
    OPERATIONS


RAM2 SIDE B SENSOR NOT FUNCTIONING =403
        EXIT
```

- Use the arrow keys to select either all LEDS or the particular LED you wish to turn off and press SELECT. Using the arrow keys you will then be able to change the value from on to off. Once the correct state has been set press the ACCEPT key twice to save.

```
TOP MENU)LED INDICATORS
→ALL LEDS      ON
  LED 1        ON
  LED 2        OFF
  LED 3        ON


      EXIT        BACK        TOP MENU
```

5.2 Enable/ Disable

If a particular RAM pair or LED is not required at all, it can be disabled from the system. While this device is disabled no communication will occur between the transducer and the panel. The transducer will not operate and no alarms will be registered from the transducer. All other devices (that have not been disabled) will continue to work as normal.
To disable (or re-enable) a device, do the following:

- Enter the supervisor permission code, using the steps in the back of this manual
- From the TOP MENU use the arrow keys to go to Components and press SELECT

```
TOP MENU
  LED INDICATORS    SYSTEM
→COMPONENTS         DIAGNOSTIC
  OPERATIONS


         RAM 1 = OPEN
      EXIT
```

- Using the arrow keys highlight enable/disable and press SELECT
- Using the arrow keys highlight Manual and press SELECT
- Using the arrow keys highlight RAM&LEDS and press SELECT

```
TOP MENU>COMPONENTS
                    →ENABLE/DISABLE



          RAM 1 = OPEN
     EXIT      BACK      TOP MENU
```

```
TOP MENU>COMPONENTS>ENABLE/DISABLE
          AUTOENABLE
          AUTODISABLE
        →MANUAL

          RAM 1 = OPEN
     EXIT      BACK      TOP MENU
```

```
TOP MENU>COMPONENTS>ENABLE/DISABLE

    →RAM&LEDS


          RAM 1 = OPEN
     EXIT      BACK      TOP MENU
```

- Using the arrow keys highlight the specific RAM or LED you wish to disable/enable and press SELECT
- Once selected, use the arrow keys to change the value to enable or disable and press ACCEPT twice to save.

```
TOP MENU>COMPONENTS>ENABLE/DISABLE
 →RAM 1A  ENABLE     LED 1    ENABLE
  RAM 1B  ENABLE     LED 2    ENABLE
  RAM 2A  DISABLE    LED 3    DISABLE
  RAM 2B  DISABLE

           RAM 1 = OPEN
    EXIT         BACK       TOP MENU
```

6 Troubleshooting

6.1 How to enter supervisor permission

- From the Main Operation Screen press SELECT.
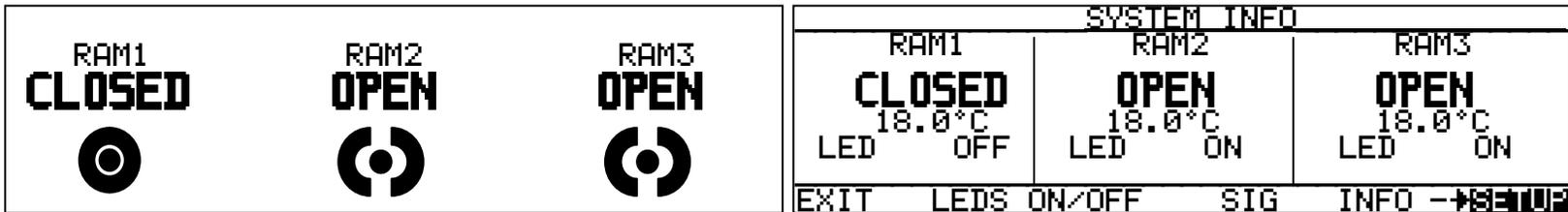
- Use the up or down arrows on the panel to highlight the SETUP option and press SELECT.

If you do not press any keys for 8 seconds while viewing the Secondary Operation Screen, you will automatically be returned to the Main Operation Screen. Press SELECT again to return to the Secondary Operation Screen.

- You will now be in the TOP MENU. Use the Up and Down arrow keys to highlight SYSTEM and

```
TOP MENU
                           →SYSTEM
                            DIAGNOSTIC
                            CALCULATIONS


RAM1 IS CLOSED                              = 23
     EXIT
```

  press SELECT

- Use the Up and Down arrow keys to highlight PERMISSION and press SELECT

```
TOP MENU>SYSTEM
 →ABOUT              PERMISSION
  LCD CONTRAST




RAM1 IS CLOSED                       = 23
     EXIT        BACK        TOP MENU
```
```
TOP MENU>SYSTEM
  ABOUT             →PERMISSION
  LCD CONTRAST




RAM1 IS CLOSED                       = 23
     EXIT        BACK        TOP MENU
```

- On the PERMISSION screen, with the word PERMISSION highlighted press SELECT and the

```
TOP MENU>SYSTEM>PERMISSION

 Enter Permission code:

       →PERMISSION    127

RAM1 IS CLOSED                       = 23
     EXIT        BACK        TOP MENU
```
```
TOP MENU>SYSTEM>PERMISSION

 Enter Permission code:

        PERMISSION    127←

RAM1 IS CLOSED                       = 23
EXIT          BACK        TOP MENU
```

  value next to it will also be highlighted.

- With the number highlighted, use the Up and Down arrows to change the value to the predetermined Supervisor Permission Code. This number is set with the rig manager at

```
 TOP MENU>SYSTEM>PERMISSION

Press ACCEPT to save changes.
Press SELECT to discard changes.
            PERMISSION   1234

RAM1 IS CLOSED                     = 23
        EXIT       BACK      TOP MENU
```

installation.

- When you have reached the desired number press the ACCEPT key once to accept the value,

```
 TOP MENU>SYSTEM>PERMISSION

    SAVE - ARE YOU SURE?
          PERMISSION   1234

RAM1 IS CLOSED             = 23
    EXIT      BACK    TOP MENU
```
```
 TOP MENU>SYSTEM>PERMISSION

       SAVING...
          PERMISSION   1234

RAM1 IS CLOSED             = 23
    EXIT      BACK    TOP MENU
```

then press ACCEPT again to confirm and save your selection.

- If you enter the correct permission code, you will be returned to the TOP MENU. New options will be available in many menus.

```
 TOP MENU
   →COMPONENTS        SYSTEM
    HEIGHT RE-CAL     DIAGNOSTIC
    RAISE DERRICK     CALCULATIONS
    RUN CASING

 RAM1 IS CLOSED                      = 23
    EXIT
```

If you enter an incorrect permission code, simply use the Up or Down arrows to highlight PERMISSION again and repeat the previous step to enter a different code.

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

6.2 General Troubleshooting

Symptom	Cause	Solution
Panel Alarm Message		
Panel displays the message "RAM## SYSTEM ALARM" (where ## represents a number-letter combination referring to a ram)	• The panel is not receiving a signal from the indicated Ram Position Sensor	• Reposition the antenna so that it is in direct line of sight with the Ram Position Sensors • Check antenna connection • Check for signs of physical damage
Panel displays the message "RAM## LOW BATTERY" (where ## represents a number letter combination referring to a ram)	• The battery in the indicated Ram Position Sensor is low	• Contact the Rigsmart service department for a replacement battery.
Panel Display		
Panel incorrectly shows a ram as being open when it is closed, or vice versa	• One side of the rams is locked or stuck in an unexpected position	• Verify this by physically checking the rams
	• The panel antenna is not positioned where it can receive the best signal from the Ram Position Sensors: too far away, behind an obstruction	• Reposition the antenna so that it is in direct line of sight with the Ram Position Sensors
	• The panel is receiving a conflicting signal from another sensor with the same ID	• If you have recently received a replacement component, ensure that the red and black wires have been cut on old component.

Symptom	Cause	Solution
LED Indicators		
The LED Indicator lights flash alternating red and green	• The LED Indicator is not receiving a signal from the Ram Position Sensors	• Check the Rigsmart panel for displayed errors, then check the signal strength screen. • Reposition the LED Indicator so that it is in direct line of sight with the Ram Position Sensors • Check for signs of physical damage • The battery in one of the Ram Position Sensors may be dead. Contact the Rigsmart service department.
The LED Indicator gives a double flash, or no longer flashes brightly	• The LED Indicator battery is low	• Contact the Rigsmart service department for a replacement battery
The LED Indicator does not turn on or off when turned on or off by the panel	• The LED Indicator cannot receive a signal from the panel	• Try turning the LED Indicators on and then off again, or vice versa • Reposition the LED Indicator so that it is in direct line of sight with the panel antenna • Check for signs of physical damage
	• The LED Indicator has been disabled	• Contact the Rigsmart Service department for assistance with adjusting the transmission settings

6.3 Alarms

During the course of operation you may see various alarms displayed on the screen of the panel. You can look up the alarm in the following list to see what it means and any possible solutions.

Alarm Text	Number	Description
** BY-PASS ** XX SEC REMAIN	0	This message indicates that the By-pass button has been pressed on the front of the panel. Pressing the By-pass button will disable all alarms for 30 seconds. During the 30 seconds this message will flash on the main screen of the panel to indicate how much time is left.
RAM1 CLOSED	23	This message indicates that Both Ram 1A and Ram 1B are closed. This denotes that the pistons on both sides of the BOP are advanced. This message also indicates that the throttle is being diverted through the regulated path in the Throttle Override Pneumatics Box.
RAM1 SIDE A CLOSED	24	This message indicates that only Ram 1A is NOT detecting the BOP piston and Ram 1B IS detecting the BOP piston. This message also indicates that the throttle is being diverted through the regulated path in the Throttle Override Pneumatics Box. This can be due to only one of the pistons being advanced or the Ram Position Sensor being shifted away from the piston. Check the BOP for proper ram function.
RAM1 SIDE A SYSTEM ALARM	53	This alarm indicates that the panel is not receiving a signal from the 1A Ram Position 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.
RAM1 SIDE A LOW BATTERY	80	This alarm indicates that the battery in the 1A Ram Position Sensor is low. Please contact our service department for a replacement.
RAM2 CLOSED	173	This message indicates that Both Ram 2A and Ram 2B are closed. This denotes that the pistons on both sides of the BOP are advanced. This message also indicates that the throttle is being diverted through the regulated path in the Throttle Override Pneumatics Box. This is displayed only if BOP Ram set 1 is detected as open.
RAM1 SIDE B CLOSED	174	This message indicates that only Ram 1B is NOT detecting the BOP piston and Ram 1A IS detecting the BOP piston. This message also indicates that the throttle is being diverted through the regulated path in the Throttle Override Pneumatics Box. This can be due to only one of the pistons being advanced or the Ram Position Sensor being shifted away from the piston. Check the BOP for proper ram function.

Alarm Text	Number	Description
RAM1 SIDE B SYSTEM ALARM	203	This alarm indicates that the panel is not receiving a signal from the 1B Ram Position 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.
RAM1 SIDE B LOW BATTERY	230	This alarm indicates that the battery in the 1B Ram Position Sensor is low. Please contact our service department for a replacement.
RAM3 CLOSED	273	This message indicates that Both Ram 3A and Ram 3B are closed. This denotes that the pistons on both sides of the BOP are advanced. This message also indicates that the throttle is being diverted through the regulated path in the Throttle Override Pneumatics Box. This is displayed only if BOP Ram sets 1 and 2 are detected as open.
RAM2 SIDE A CLOSED	274	This message indicates that only Ram 2A is NOT detecting the BOP piston and Ram 2B IS detecting the BOP piston. This message also indicates that the throttle is being diverted through the regulated path in the Throttle Override Pneumatics Box. This can be due to only one of the pistons being advanced or the Ram Position Sensor being shifted away from the piston. Check the BOP for proper ram function. This is displayed only if BOP Ram set 1 is detected as open.
RAM2 SIDE A SYSTEM ALARM	303	This alarm indicates that the panel is not receiving a signal from the 2A Ram Position 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.
RAM2 SIDE A LOW BATTERY	330	This alarm indicates that the battery in the 2A Ram Position Sensor is low. Please contact our service department for a replacement.
RAM2 SIDE B CLOSED	374	This message indicates that only Ram 2B is NOT detecting the BOP piston and Ram 2A IS detecting the BOP piston. This message also indicates that the throttle is being diverted through the regulated path in the Throttle Override Pneumatics Box. This can be due to only one of the pistons being advanced or the Ram Position Sensor being shifted away from the piston. Check the BOP for proper ram function. This is displayed only if BOP Ram set 1 is detected as open.
RAM2 SIDE B SYSTEM ALARM	403	This alarm indicates that the panel is not receiving a signal from the 2B Ram Position 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.
RAM2 SIDE B LOW BATTERY	430	This alarm indicates that the battery in the 2B Ram Position Sensor is low. Please contact our service department for a replacement.

Alarm Text	Number	Description
RAM3 SIDE A CLOSED	474	This message indicates that only Ram 3A is NOT detecting the BOP piston and Ram 3B IS detecting the BOP piston. This message also indicates that the throttle is being diverted through the regulated path in the Throttle Override Pneumatics Box. This can be due to only one of the pistons being advanced or the Ram Position Sensor being shifted away from the piston. Check the BOP for proper ram function. This is displayed only if BOP Ram sets 1 and 2 are detected as open.
RAM3 SIDE A SYSTEM ALARM	503	This alarm indicates that the panel is not receiving a signal from the 3A Ram Position 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.
RAM3 SIDE A LOW BATTERY	530	This alarm indicates that the battery in the 3A Ram Position Sensor is low. Please contact our service department for a replacement.
RAM3 SIDE B CLOSED	574	This message indicates that only Ram 3B is NOT detecting the BOP piston and Ram 3A IS detecting the BOP piston. This message also indicates that the throttle is being diverted through the regulated path in the Throttle Override Pneumatics Box. This can be due to only one of the pistons being advanced or the Ram Position Sensor being shifted away from the piston. Check the BOP for proper ram function. This is displayed only if BOP Ram sets 1 and 2 are detected as open.
RAM3 SIDE B SYSTEM ALARM	603	This alarm indicates that the panel is not receiving a signal from the 3B Ram Position 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.
RAM3 SIDE B LOW BATTERY	630	This alarm indicates that the battery in the 3B Ram Position Sensor is low. Please contact our service department for a replacement.

Rigsmart Systems Inc. www.rigsmart.com (780) 438-9475