ANTI-COLLISION SYSTEM: Model H18XX Non Integrated: H18XX -Rev02-2018 N.I.

The Monkey Board Anti-Collision system is an integral part of the crown saver / anti-collision system.

The system should help the driller avoid a collision between the monkey board and extended bails or top drive frame. The reliability of the system depends on many factors. The driller should not completely count on the system to prevent collisions in all situations.

The system consists of a main control unit, a wireless bails angle sensor, a wireless frame angle sensor, drillers control box and torque tube proximity sensor kit.

Bails and frame extend angle sensors send the angle position of the bails and the frame wirelessly to the main control unit. Each sensor is fitted with a lithium 3.6V 19 Ah battery. The battery life depends on the usage but typically lasts for about 2 to 6 months.

COMPONENTS:

Main Control Box: Contains a Gateway-receiver and a PLC. The gateway communicates with both wireless sensors and sends bails and top drive frame positions to the PLC. PLC processes the data and controls Eaton brake and drum clutch if the top drive approaches a collision point with the monkey board.

Main Control Unit Lights:

RUN – ON when system is ready and fully operational. OFF is system is disabled or faulty. Rapidly blinking if anti-collision system activates Eaton brake.

BATTERY OK – ON when both angle sensor batteries are at the full capacity. OFF if one of batteries is low or one of the angle sensors in not working. If OFF, the system will not operate.

BRAKE ON – ON when the top drive or bails are in the collision zone and the Eaton brake is activated (DW clutch disengaged)

CLUTCH – ON when DW clutch is engaged

SENSOR L – ON when the top drive torque tube bushing is in the zone of lower proximity sensor

SENSOR H – ON when the top drive torque tube bushing is in the zone of upper proximity sensor

Main Control Unit Receptacles:

CLUTCH – 4 pin, male, connects the clutch pressure switch (located inside the driller's panel)

SENSORS – 4 pin, female, connects lower and upper torque tube proximity switches using 4 wire cable and "T" splitter

MUSTANG – 3 pin, male, connection from Crown Saver control box (brake solenoid signal from Mustang Crown Saver passing through anti-collision box)

BRAKE – 3 pin, female supply to Eaton brake/ DW clutch solenoid located in driller's panel

10 PIN AMPHENOL – connects Driller's Control box to the main panel

Main Control box lights can be used as a useful troubleshooting tool.

The Main Control box is installed on the derrick. Mounting bolts must be secured using cotter pins and naylock nuts. Check the pins weekly and ensure that they are in good condition and free of rust.

Driller's Control Box:

Driller's control box contains a green (READY) light, two red light/push buttons (FRAME and BAILS), two position selector switch (DRILL/ TRIP) and a 80dB sounder. This box connects to the Main Control Box by 10 wire/ 10 pin connector.

Driller's Control Box functions:

RUN - ON when system is ready and fully operational. OFF is system is disabled (selector switch in DRILL position) or the system is faulty. Blinks rapidly if anti-collision system activates Eaton brake (when the top drive approaches the monkey board collision point and frame, bails or a combination of both is over extended).

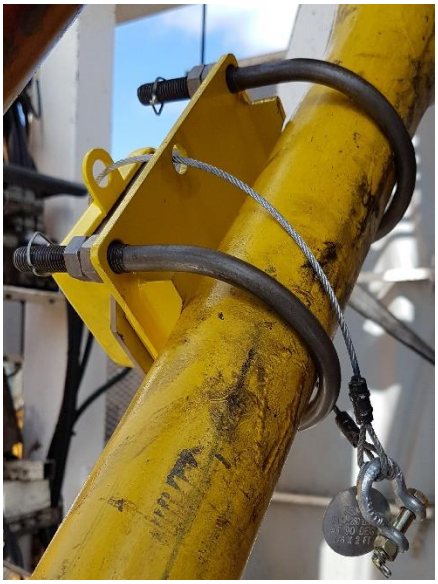
FRAME – Push button/light, ON when top drive frame is extended beyond set point. Blinks at 1 sec interval if the frame setting is at the default setting (when system is first powered up).

BAILS – Push button/light, ON when top drive bails are extended beyond set point. Blinks at 1 sec interval if the bails setting is at the default setting (when system is first powered up).

DRILL/TRIP – Two position switch, when in DRILL position, the system is disabled (READY light goes OFF)

80 dB Sounder - Active if anti-collision system activates Eaton brake (when the top drive approaches the monkey board collision point and frame, bails or a combination of both is over extended).

BAILS ANGLE SENSOR:



Bails angle sensor should be installed sideways on upper portion of the bails, arrow pointing down. The sensor base should be in the same plane with the bails/frame movement (antenna facing to or away of dog house).

Use only original mounting hardware. The sensor and the guard are fastened using 3/8" x 3/4" grade 8 bolts secured with lock wire.

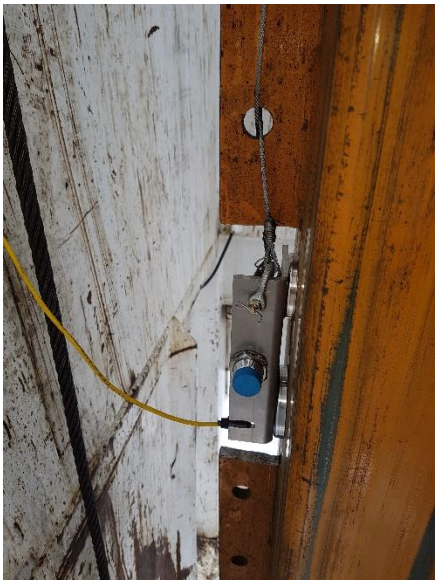
3 ½" U bolts with cotter pins, wrap around the bails and hold the assembly firmly in place. Approved, 19" safety rope with a shackle and a cotter pin is used as second retention.

FRAME ANGLE SENSOR:

Frame angle sensor should be installed sideways on upper portion of top drive scissors, arrow pointing down. Use only original mounting hardware. The assembly is fastened using 1/2" x 3 1/2" grade 8 bolts, secured with cotter pins. Approved, 19" safety rope with a shackle and a cotter pin is used as second retention.

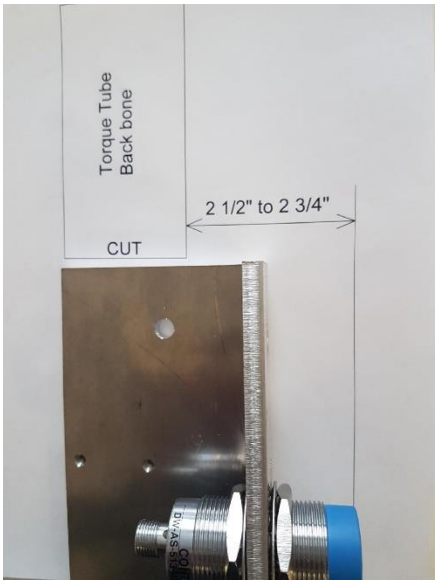
Bails and frame sensors are not interchangeable.

TORQUE TUBE PROXIMITY SENSORS:



There are two torque tube proximity sensors: lower and upper. Both sensors are of the same type and they are interchangable. The sensor cableas are specific and **they are not interchangable**. Each sensor is installed on an aluminium L bracket with two 200lb magnets.

19" approved safety rope is the secondary retention for the assembly. When istalling the assembly, make sure that all parts are in good shape and free of rust. Clean any existing debris from the magnets. If magnets are not fully engaged with the torque tube, the magnet holding capacity would be decreassed. The secondary retention should be positioned on the way that torque bushing passes by freely without possibilty of touching the rope or the assembly. The sensor cable should be fastened to the L bracket and pointed away from the torque tube. The end of the blue tip of the sensor should be positioned between 2 ½" and 2 ¾" from the bolt pattern back bone of the torque tube (see the picture on the right).



T CONNECTOR:

T Connector is located on the derrick close to derrick split and connects torque tube proximity sensor cables to the main cable.

Lower and higher sensor cable can be connected in any of two ports.

PRESSURE SWITCH:

The pressure switch is installed in the clutch air line inside the driller's panel.

OPERATION AND INITIAL SET UP:

After the system is powered up, the FRAME and BAILS lights on Driller's control box will be flashing indicating that the collision points have not been set.

Setting Frame and Bails collision points:

- Extend frame to the point that top drive would just touch monkey board or fingers. Press the FRAME push button for 2 seconds (memorizing the frame angle). Retract the frame.
- Extend Bails to the point that bails would just touch the monkey board or fingers. Press the BAILS push button for 2 seconds (memorizing the bails angle). Retract the bails.
- Both FRAME and BAILS light should be OFF
- Extend frame beyond the collision point. FRAME light should turn ON. Retract the frame. Frame light should go OFF
- Extend bails beyond the collision point. BAILS light should turn ON. Retract the bails. BAILS light should go OFF
- Run the block up. When top drive is passing below monkey board, SENSOR L light on the main box should turn ON. When top drive is passing above monkey board, SENSOR H light on the main box should turn ON. If top drive is back down, both of those lights should stay OFF
- Every time the DW clutch is engaged, the CLUTCH light on the main box should turn ON

There is a slight delay in the displayed angle to ensure smother operation of the system.

To test the system:

Extend bails beyond collision point (the bails sensor angle is greater than the pre-set angle) and slowly hoist up. The draw-works should stop moving a few feet before reaching monkey board. After DW is stopped, retract the bails and proceed hoisting above the monkey board. When close to the crown, extend bails again beyond collision point. Ensure that on its way down, DW stops a few feet before collision with the monkey board.

Repeat the same test procedure using TD frame extend.

Hint: If bails cylinder brackets prevent bails to be extended far enough for proper set up of the bails collision point, reverse the pipe handler 180 deg when setting bails collision point.

The system must be tested at the beginning of each shift.

The sensor mountings must be inspected at the beginning of each shift.

The sensors must be properly secured using approved safety rope, safety pins and lock wire.

Troubleshooting:

There is a small LED light installed on each sensor and the gateway. The sensor and the gateway light should blink every time a sensor changes angle. If not, the sensor battery may be bad. Check the main control box for the status of the battery.

Inside the Main Control Box, Power and Run lights should be ON all the time (if not, check that the 120VAC power is present and the PLC toggle switch is in the RUN position).

Battery replacement:

Use only original lithium 3.6v 19Ah battery.

- Remove two front bolts holding sensor cower
- Remove two sensor screws and locate a slot along the shorter edge of the sensor cover
- Remove the sensor cover (do not damage the gasket)
- Replace the battery (make sure that the plus of the battery is facing the red wire inside the sensor)
- Secure the sensor with lock wire and a safety rope

For detailed battery instruction refer to document **H18XX Battery.**

For technical support call Rig Automation Ltd. 780.739.0323 (after hours 780.719.0323)

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