Technical Manual

2. Inspect the crawler belts for broken or cracked pads, missing lock pins, loose track pins, and proper crawler belt tension.

3. Check the drive tumbler gearcase, hydraulic motor and hoses for leaks. Check the lubricant level in the drive tumbler gearcase.

4. Inspect the crawler frames for cracks and dirt or ice buildup. Check the rollers and tumblers for proper lubrication, free operation, and dirt or ice buildup. Check axle attachment pins and bolts.

5. Check the dust curtains for tears. Be sure that the curtains are not frozen to the ground or covered with cuttings.

6. Inspect the trail cable for proper placement out of the line of travel of the drill. Inspect the insulation for cuts or abrasion. Make sure the cable is kept out of water and away from sharp rocks. Have an electrician inspect the strain relief device and the condition of the cable where it enters the machine.

CAUTION: THE MACHINE TRAIL CABLE CARRIES A LETHAL VOLTAGE. HANDLE THE CABLE IN AN APPROVED MANNER WITH APPROVED RUBBER GLOVES AND INSULATED HOOKS OR TONGS.

7. Inspect the underside of the machine for cracks, loose hoses or wires, dirt or ice accumulation, or other deterioration or damage. If loose wires are noted, do not touch them but notify an electrician immediately.

8. Inspect the leveling jack spuds for proper lubricant covering. Inspect the leveling jack pads for cracks, broken or missing pins, or excessive dirt accumulation.

9. Inspect the mast braces and locking pins. Replace missing or defective components immediately. Verify that all adjusting bolts are properly adjusted. Check all hoses and cylinders for leaking.

CAUTION: USE A SAFETY BELT AND LANYARD TO PROTECT AGAINST FALLS WHEN CLIMBING ON THE MAST BRACES OR WORKING ON THE MACHINERY HOUSE ROOF.

10. Inspect the mast hinge pins for loose or missing keepers or bolts. Replace missing or damaged parts immediately. Check the pins for sufficient lubrication and lubricate if necessary.

ROTARY SPEED SELECTOR SWITCH

The rotary speed selector switch (6) is a three position switch located above the rotary rheostat. This switch determines the speed/torque range of the rotary motor. In the LOW position, the motor has the highest torque capability but is limited in speed to about 85-100 RPM at the bit. In the HIGH position, the motor has a higher speed capability (110-140 RPM range) but motor torque will be less (typically 68% to 74%). The MEDIUM position provides for operation between the HIGH and LOW positions.

The switch should be set to the range that most closely matches the desired bit speed range. The LOW setting is sufficient for most conditions. If more speed is desired, select the desired range as needed.

HOIST BRAKE SWITCH

The hoist brake switch (7) is a two-position switch. It is used to set or release the hoist brake.

This switch must be in the RELEASE position before the hoist/pulldown drive is allowed to move the rotary head assembly. Placing the switch into the SET position during machine operation immediately disables hoist/pulldown drive operation.

Under normal operating conditions, the hoist/pulldown speed rheostat must be set to "0" before setting the brake.

PIPE RACK SELECTOR SWITCH

The pipe rack selector switch (8) is a four-position switch used to determine which pipe rack will be operated. For machines without a pipe rack or with only one pipe rack, this switch is not used.

PIPE RACK JOYSTICK (Left Crawler Propel)

This joystick (9) will operate the pipe rack or the left crawler (secondary propel control). For the joystick to control the pipe rack, the operating mode selector switch on the propel control panel must be in the DRILL position and the hoist/pulldown speed selector switch (5) in the PIPE RACK/ JOINT position.

For the joystick to control the left crawler the operating mode selector switch on the propel control panel must be in the SECONDARY PROPEL position.

Full forward or rearward movement of the joystick will supply the fastest motion.

This switch is equipped with a lock feature. To move the switch out of the NEUTRAL position the switch knob must be lifted.

NOTE: THE JOYSTICKS SHOULD BE MOVED IN PAIRS. SINGLE JOYSTICKS MAY BE USED FOR THE FINAL ADJUSTMENT OF LEVELING JACKS. ALL FOUR LEVELING JACK JOYSTICKS SHOULD NOT BE MOVED AT THE SAME TIME.

AUTOMATIC LEVELING SWITCH

The automatic leveling switch (5) is a three-position spring return switch. Turning the switch to the EXTEND position will extend the leveling jack cylinders and raise the machine. Turning the switch to the RETRACT position will retract the cylinders and lower the machine. When this switch is being used, the manual leveling joysticks are not functional.

NOTE: THE AUTOMATIC LEVELING SWITCH IS A SPRING-RETURN SWITCH. THE SWITCH MUST BE HELD UNTIL THE DESIRED ACTION OF THE LEVELING JACKS HAS BEEN ACHIEVED. RELEASING THE SWITCH WILL ALLOW IT TO RETURN TO THE NEUTRAL POSITION BUT THE JACKS WILL REMAIN IN THE POSITION TO WHICH THEY WERE MOVED.

WATER INJECTION ON/OFF SWITCH (Optional)

The water injection on/off switch (6) is a two-position switch used to start-up or shut-off the water injection system. When the switch is turned to the OFF position, it will stop the pump.

When the machine is equipped with a deck washdown system, this switch has an additional position designated WASHDOWN. When the switch is in the WASHDOWN position, water to the main air pipe is shutoff and all water is directed to the washdown system on the deck.

WATER INJECTION FLOW CONTROL (Optional)

The water injection flow control (7) is a potentiometer used to regulate the water flow. Full counterclockwise rotation of the control will shut-off water flow. Full clockwise rotation of the control will supply maximum flow of water.

HORN PUSH-BUTTON

The horn push-button (8) is used to sound the warning horn of the machine.

DEPTH INDICATOR RESET PUSH-BUTTON

The depth indicator reset push-button (9) is used to zero out the depth meter, as shown on the Operator's display terminal Operator's Display screen, when one hole is completed and another is to be started. This function can also be performed on the operator's display terminal keypad.

MACHINERY CHECK

The following is a list of points and equipment that should be checked for proper operation immediately following start-up of the drill. If operating difficulties are not found during this procedure, they probably will not be noticed until some point in time at which the system or component will cease to function and cause serious damage to the machine.

1. Check the main air system for leaks.

2. Verify that the air compressor radiator fan is operating correctly. Check the coolant system for leaks.

3. Check for leaks in the hydraulic system.

BREAK-IN OF NEW COMPONENTS

When a machine is new, is returned to service after a long period of storage, or is returned to service after major repairs, certain precautions must be taken upon initial start-up and for a time following the start-up. These precautions are necessary to insure that the full service life of the components is realized.

ROTARY DRIVE UNIT BREAK-IN

Break-in of the rotary gear case is limited to reduced loading during the first 100 hours of operation and a complete oil change at the end of the break-in period.

This break-in period applies only to new gearcases or gearcases in which a new gear has been installed.

HOIST/PULLDOWN GEARCASE BREAK-IN

Break-in for the hoist/pulldown gearcase is limited to reduced loading during the first 100 hours of operation and a complete oil change at the end of the break-in period.

The break-in period applies only to new gearcase or gearcases in which a new gear has been installed.

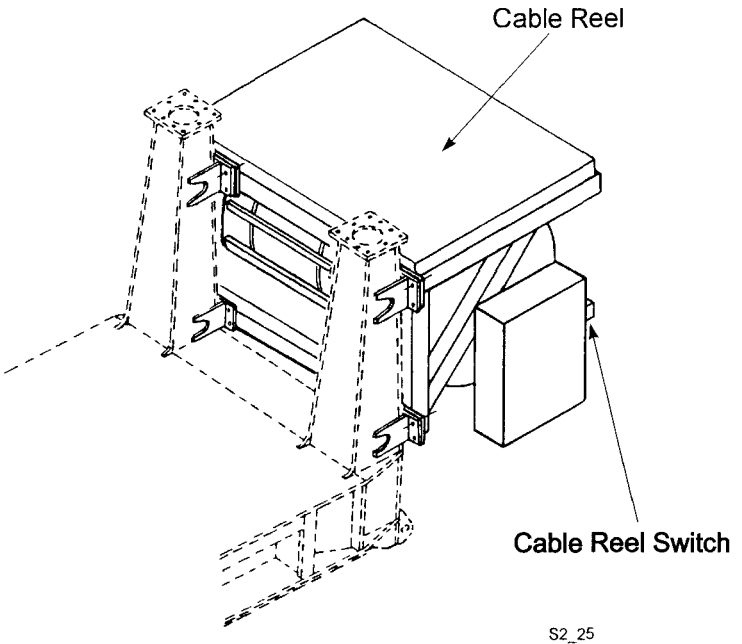
CABLE REEL OPERATION

When the cable reel switch is in the AUTO position, is designed to pick up trail cable as the drill moves toward its power source. It is not designed to drag the trail cable over the ground.

The line pull is proportional to operating pressure. The correct line pull is when there is sufficient pull on the cable to wind it on the reel, but not too great to put unnecessary strain on the trail cable.

The line speed is dependent on the volume of hydraulic oil flowing through the system. The correct line speed is slightly faster than the travel speed of the drill.

To manually operate the cable reel, proceed as follows:



CABLE REEL

1. Start the main air compressor motor or turn ON the external cable reel switch. This will automatically start the cable reel hydraulic system motor. Allow the oil to circulate for about 5 minutes.

2. To spool the trail cable onto the reel, turn the cable reel switch to the REEL IN position.

3. To spool the trail cable off of the reel, turn the cable reel switch to the REEL OUT position.

PIPE RACK OPERATION

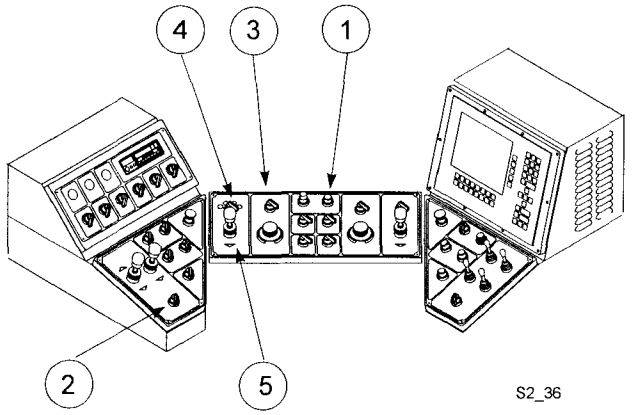
The machine can be equipped with 1 to 4 pipe racks and depending upon the number of pipe racks the pipe rack configuration and operation will be different.

On a machines with one pipe rack, the rack will be on a swing out arm and will be in #1 position .

On a machine with two pipe racks, the racks will be on swing out arms and will be in #1 and #4 positions.

On a machine with three pipe racks, two pipe racks will be located on a carousel that swings out and then is rotated. This carousel houses pipe racks in #1 and #2 positions as shown. The third pipe rack is a swing out rack that will be in #4 position.

On a machine with four pipe racks, there are two swing out carousels with two racks in each carousel. The carousels rotate to make each rack available for use. The left carousel houses racks #1 and #2 and the right carousel racks #3 and #4.



1. Drill/Propel "ON" Pushbutton
2. Operating Mode Selector Switch
3. Hoist/Pulldown Speed Selector Switch
4. Pipe Rack Selector Switch
5. Pipe Rack Joystick

PIPE RACK OPERATING CONTROLS

The general method of operating the pipe racks is as follows:

1. Place the operating mode selector switch in the DRILL position. The main air compressor must be energized.

2. Verify that the operating mode selector switch is in the DRILL position and that the hoist/ pulldown speed selector switch is in the PIPE RACK/JOINT position.

3. Select the desired pipe rack.

4. Lift and move the pipe rack joystick, located on the main control panel, out of neutral to perform the desired operation.

NOTE: VERIFY THAT THE UPPER GATE ON THE PIPE RACK IS OPEN BEFORE RETRACTING THE PIPE RACK. RETRACTING THE PIPE RACK WITH THE GATE CLOSED WILL CAUSE DAMAGE TO THE PIPE RACK.

10. Once the pipe rack has been stored the pipe should be cleaned out using the bailing air. Remove all personnel from the area and turn on the bailing air for a moment. After cleaning the pipe, clean and lubricate the threads and shoulder on the lower end of the pipe and the upper end of the stabilizer.

CAUTION: BEFORE WORKING AROUND THE TOOL STRING SET THE HOIST BRAKE. DEPRESS THE DRILL/PROPEL CONTROL OFF PUSH-BUTTON.

11. Release the hoist brake and lower the rotary/pulldown unit until the drill pipe is approximately 1 foot above the upper end of the stabilizer. Reset the hoist brake.

12. Turn the rotary rheostat clockwise until the drill pipe begins to turn at approximately 5 RPM as shown on operator's display terminal operator's display screen. Release the hoist brake and carefully lower the rotary drive unit until the drill pipe contacts the stabilizer. Allow the rotary drive unit to continue to lower under gravity while the drill pipe is threading onto the stabilizer.

13. When the stabilizer begins to turn with the drill pipe, check the joint between the stabilizer and the pipe. The shoulders on the pipe and stabilizer must be together. If there is clearance between the shoulders, it will be necessary to tighten the joint some more before the stabilizer is released. If the shoulders of the pipe and stabilizer are contacting, the joint is made up.

Installation of the drill bit is the last step in preparing the tool string.

To install the bit, proceed as follows:

1. Hoist the completed drill pipe/stabilizer assembly 2 to 3 ft (0.6 to 0.9 m) off the drill deck. Place the bit basket (furnished with machine) into the hole left by the guide bushing in the drill deck. Remove all personnel from the drilling deck and the immediate area. Turn on the main air stream to blow any contaminants from the drill pipe and stabilizer.

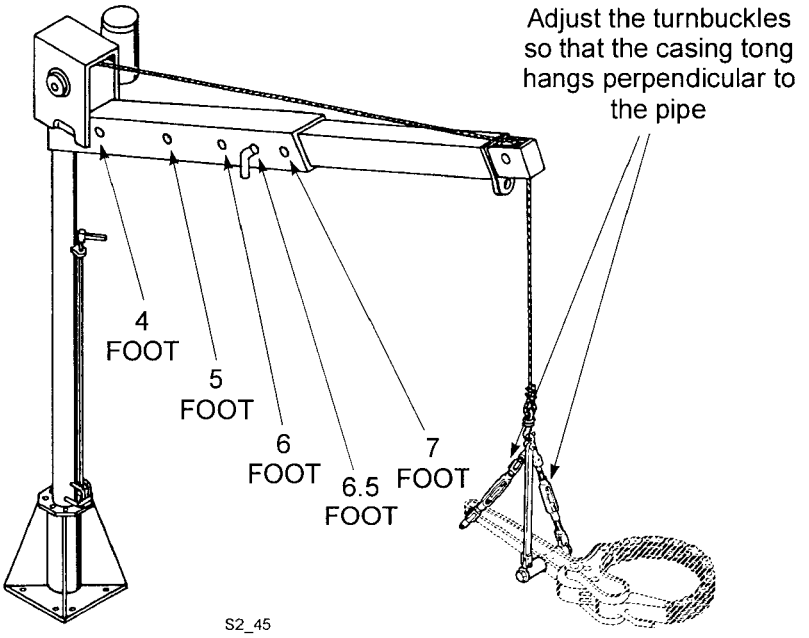
2. Place the bit into the bit basket. Coat the threads and shoulders of the bit and stabilizer with drill pipe thread compound.

To make a joint with the pipe positioner, proceed as with normal joint assembly. When the pipe rack has been moved into position, retract the positioner into place and lock the jaws around the pipe. Proceed as normal to make the joint. Once the joint is made, open the positioner jaws and extend the positioner to the stored position.

To break a joint both the pipe positioner and the breakout wrench are utilized. The pipe positioner is used to hold the pipe in position to be loaded into the pipe rack. The breakout wrench is used to break the joint.

To break a joint, proceed as normal with joint disassembly. Proceed as normal with joint disassembly. Before breaking the joint completely, clamp the pipe with the pipe positioner. After breaking the joint, hoist the drill pipe and lower the pipe rack, release the jaws and extend the positioner. Proceed as normal with the pipe joint disassembly procedure.

NOTE: THE CASING TONG JIB CRANE IS DESIGNED SO THAT IT CAN BE EXTENDED FROM 4 TO 7 FEET. FOR VERTICAL DRILLING, THE CRANE SHOULD BE EXTENDED TO THE 5 FOOT POSITION. FOR ANGLE DRILLING OF 30 DEGREES THE CRANE SHOULD BE EXTENDED TO THE 6.5 FOOT POSITION.



JIB CRANE

Unconsolidated material presents another problem due to the fact that the voids in the material may allow the bailing air to escape through the sides of the hole, rather than passing along the drill pipe and exiting through the top of the hole. This loss of air reduces the volume of air available to bail the hole, causing the cuttings to fall to the bottom of the hole and be reground by the bit. This further reduces the penetration rate since these cuttings must be ground up by the bit and bailed out of the hole or they will plug the hole. Unconsolidated material may also cause the hole to cave in. This creates problems due to the sudden addition of material into the hole and the resultant loss of bailing velocity due to the increased diameter of the hole.

If unconsolidated material is causing the loss of bailing air volume or caving of the hole it is necessary to continually clean the hole as the recycled cuttings or the caved material will plug the hole. Closely monitor both the bailing air pressure and the flow of cuttings from the hole. If the air is being lost the air pressure will remain constant but the flow of cuttings will stop or drastically decrease while penetration does not decrease. Continue drilling for a few feet to try and get past the leak. If the bailing air pressure starts to rise, the hole is plugging. Immediately hoist the tool string until the pressure drops and allow the drill string to rotate for a few moments to clear itself. Then lower the tool string to the bottom of the hole and clean it out. It may be necessary to regrind the cuttings to make them small enough to seal the leak and be bailed out of the hole by reduced air volume. Once the hole is clean, repeat the hoisting and lowering procedure every 2 to 3 feet (0.3 to 0.6 m) to keep it so.

If the material tends to cave in from the sides of the hole, the tool string can become stuck in the hole quickly. If the caved material is small, it will fit between the cones of the roller and fall to the bottom of the hole. The hole can then be cleaned out using the same procedure as for a leaky hole. If the caved material is large it will be necessary to pull the tool string out of the hole and then redrill the caved material.

NOTE: BE VERY CAUTIOUS WHEN DRILLING IN FORMATIONS WHICH TEND TO CAVE IN EASILY, ESPECIALLY IF THE MATERIAL CAVES IN LARGE BLOCKS. SHOULD THE MATERIAL THAT CAVES INTO THE HOLE BE TOO LARGE TO LIFT WITH THE ROTARY DRIVE UNIT OR TOO HARD TO BREAK WITH THE TOP OF THE BIT, THE TOOL STRING WILL HAVE TO BE ABANDONED IN THE HOLE.

Experience will dictate what procedure to follow when encountering material which tends to cave in. When the formation is unfamiliar always be cautious. Caution may result in lower production, but it could save a great amount of work and a complete tool string should the tool string become stuck. Always clean the hole often and monitor the air pressure constantly. If the air pressure starts to climb, hoist the tool string immediately — do not wait to see if the pressure will level off or not. By the time it is determined what the air pressure will be, the hole is plugged. Cleaning the hole often accomplishes two things.

First, it removes the caved in materials from the hole. Second, it loosens any potentially hazardous material and causes it to cave in while the stool string is being hoisted. If the hole caves in while in the hoist mode there is a better chance of recovering from the cave in.