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BUCYRUS®

59HR

BLAST HOLE DRILL

OPERATOR'S MANUAL

Manual No.
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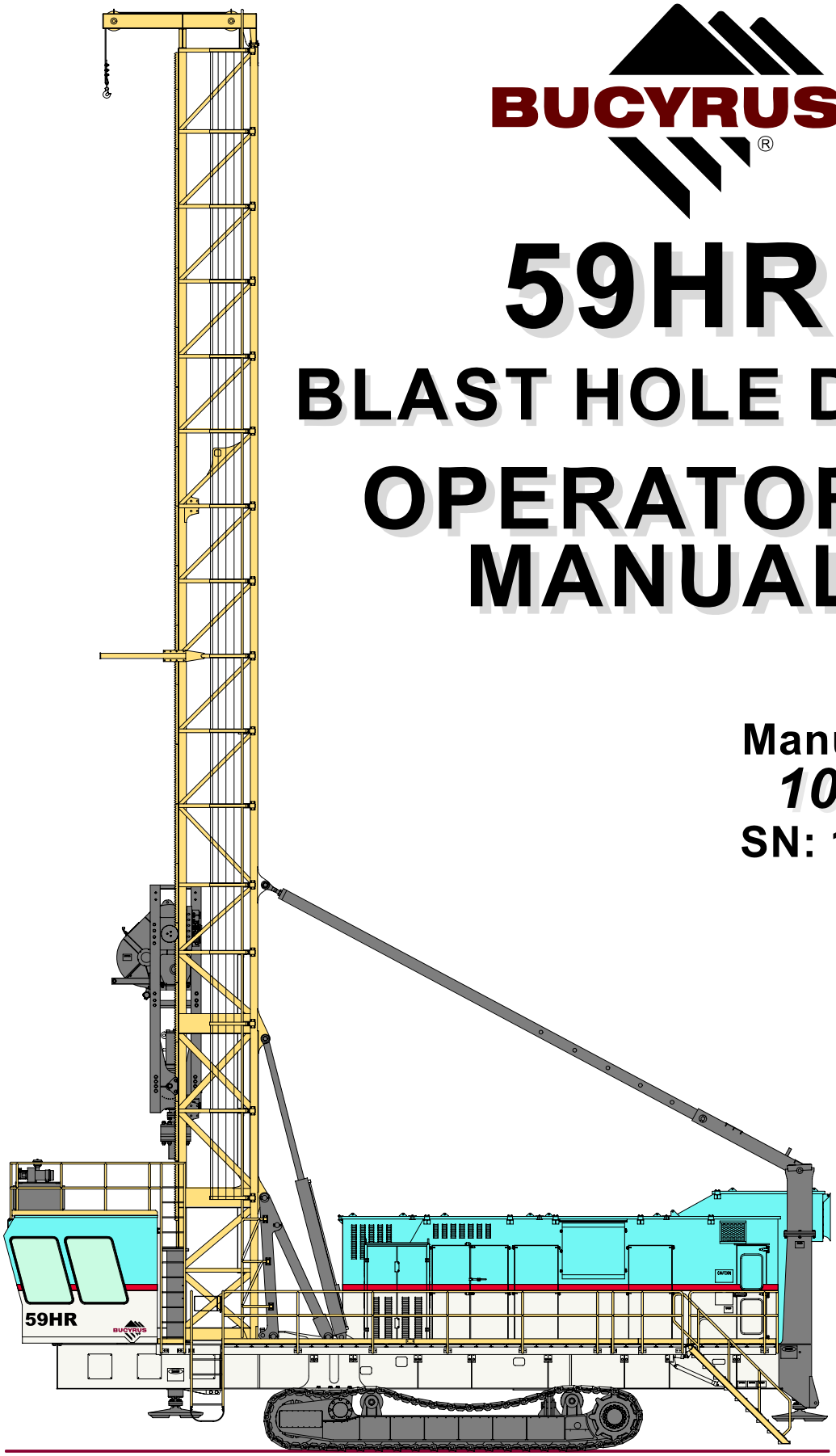

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59HR Blast Hole Drill
Operator's Manual

GENERAL INFORMATION

This manual is designed to assist the owner in the operation of this machine. By following easy to understand step-by-step procedures, the operators and maintenance personnel can perform all tasks in a safe manner. When a systematic and thorough maintenance/service procedure is used for this machine, a minimum of unplanned downtime and more reliable operation will result.

Safe operation of the machine minimizes production delays and costly damage to equipment. Carefully study and follow all recommended procedures in this manual. Safety guidelines are intended to prevent accidents from occurring and are provided in the interest of all mine personnel. Overall safety depends upon the use of good judgment and the alertness of the entire mining crew.

Throughout this manual, the use of the terms "*LEFT*, *RIGHT*, *FRONT*, and *REAR*" refer to machine locations as viewed by the operator sitting in the operator's seat in the cab.

THIS MANUAL IS NOT THE PARTS BOOK, and cannot be used as reference material to order parts. A separate, detailed parts book has been supplied for this purpose.

Periodic additions or revisions may be made to this manual. Should you require additional information or factory service assistance, contact your regional service representative or:

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It is the policy of Bucyrus International, Inc. to improve its products whenever possible and practical to do so. The company reserves the right to make changes or add improvements to its machines at any time. This will be without incurred obligations to install such changes on machines sold previously. Due to this ongoing program of product research and development, some procedures, specifications and parts may be altered in a constant effort to improve our machines.

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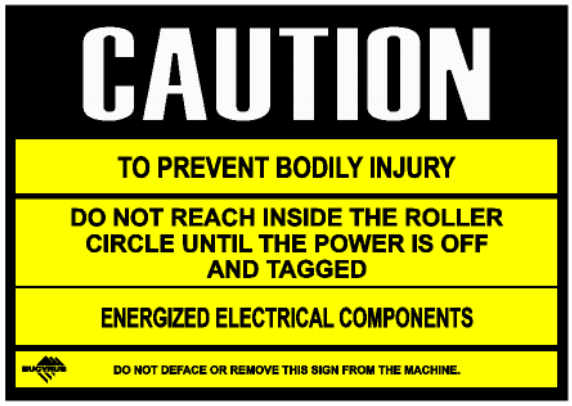

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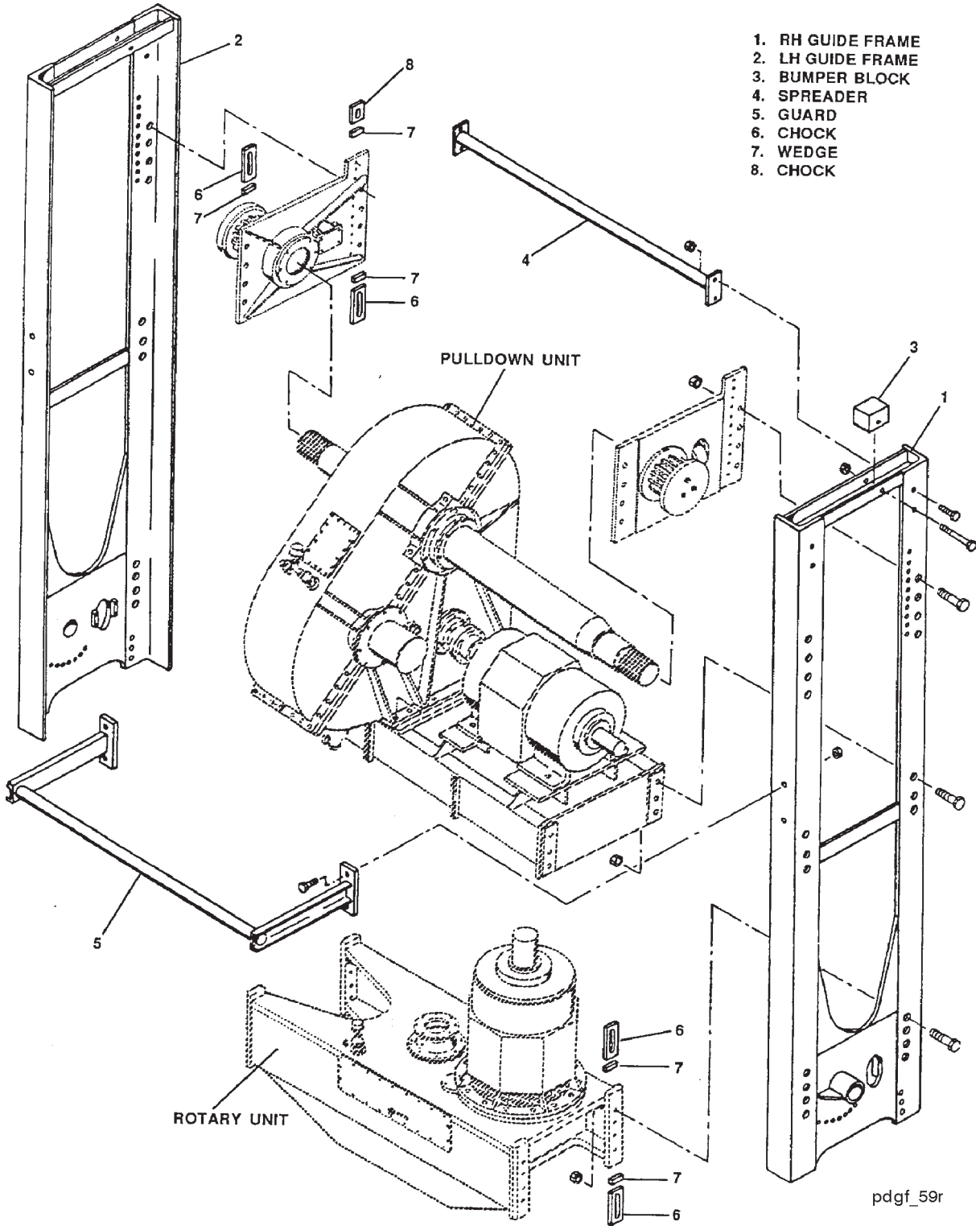
Stored Energy Signs

ROTARY/PULLDOWN MACHINERY



WINCH/MAST SELECTOR SWITCH

The winch/mast selector switch (10) is a two-position switch. Turning the switch to the WINCH position will activate the winch circuit. The joystick associated with this switch can then be used to operate the winch. Turning the switch to the MAST position will activate the mast hoist cylinder circuit and the associated joystick is used to raise or lower the drill mast.

When the machine is equipped with winch remote control, this switch has four positions. These positions are OFF, REMOTE WINCH, CONSOLE WINCH, and MAST. The REMOTE WINCH and CONSOLE WINCH positions determine whether winch is controlled at the remote station or the operator's console.

The switch is operational only when the operating mode selector switch on the propel control panel is in the DRILL position, the air compressor motor is running, and NO leveling jacks are being operated.

MAST/WINCH JOYSTICK (Right Crawler Propel)

This joystick (11) is used to raise or lower the mast, operate the auxiliary winch or right crawler.

For the joystick to control the mast raising and lowering operation, the operating mode selector switch on the propel control panel must be in the DRILL position and the mast/winch selector switch (10) must be in the MAST position.

For the joystick to control the auxiliary winch, the operating mode selector switch on the propel control panel must be in the DRILL position and the mast/winch selector switch (10) must be in the WINCH position.

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

Pushing the joystick lever forward will either raise the mast, raise the auxiliary winch line or propel the right crawler in the forward direction.

Pulling the joystick lever to the rear will either lower the mast or auxiliary winch line or propel the right crawler in the reverse direction.

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

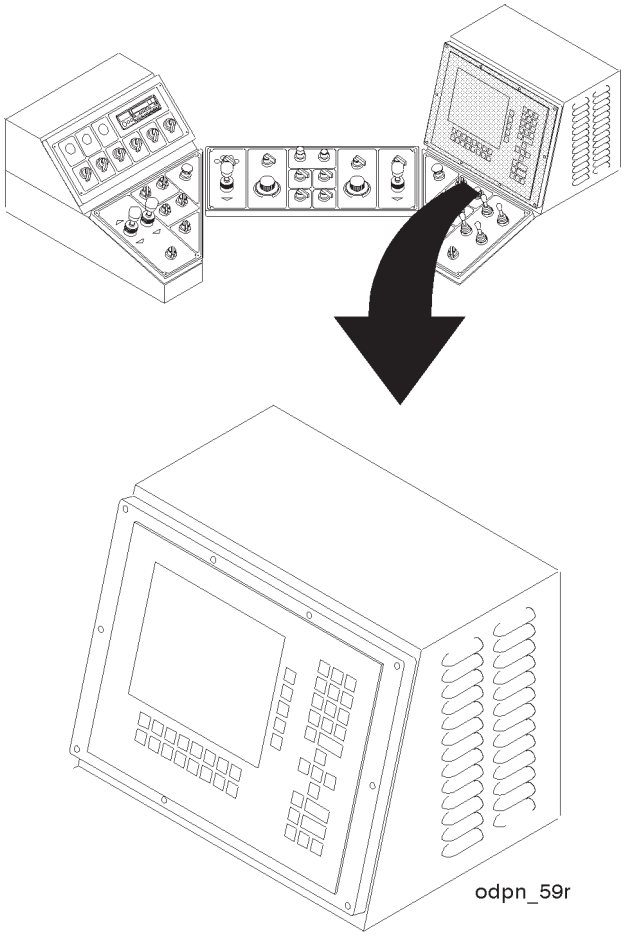
This switch is equipped with a lock feature. To move the switch out of the NEUTRAL position the switch knob must be lifted.

OPERATOR'S DISPLAY TERMINAL

The Operator's Display Terminal consists of an active matrix display, keypads and industrial computer (PC).

The operator's Display Terminal displays status information for all PLC controlled machine functions. Some machine setup parameters may be entered using the keypad.

Refer to the topic at the end of this section for further operational procedures for the Operator's Display Terminal.



Operator's Display Panel

ONBOARD INSPECTION

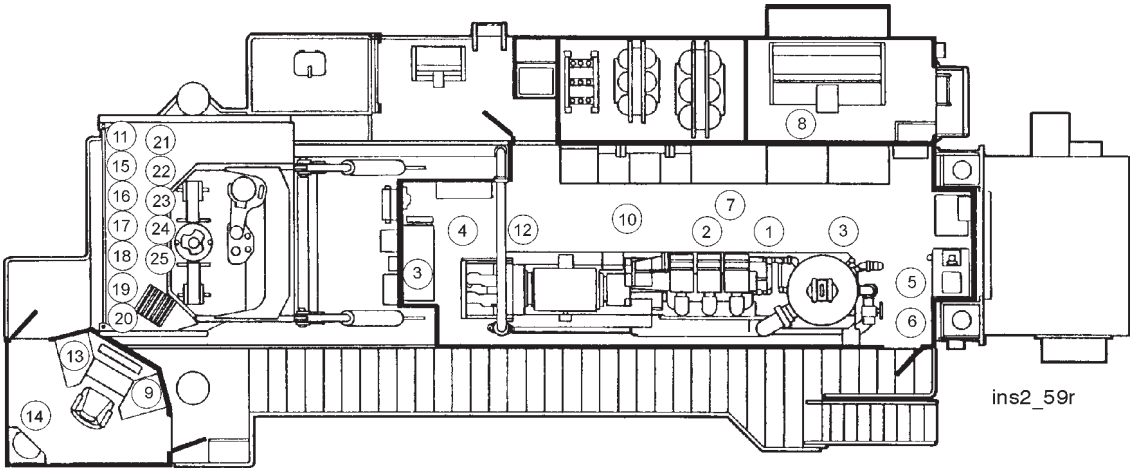
1. Inspect the air compressor lubrication lines for leaks. Correct any leaks found immediately.

2. Check the condition of the air compressor intake filter. Replace the filter cartridge if the red flag is visible in the service indicator. Empty the dust hopper and clean the pre-cleaner element. Inspect the housing and ductwork for damage or leaks. Repair or replace leaking components.

3. Check the oil level in the hydraulic tank. Fill the tank to the proper level as described on the instruction plate on the tank.

4. Check hydraulic system for leaks. Correct all leaks immediately and clean up all oil spills immediately.

5. If the machine is equipped with a bit lubricator for the main air system, check that the lubricator is full.



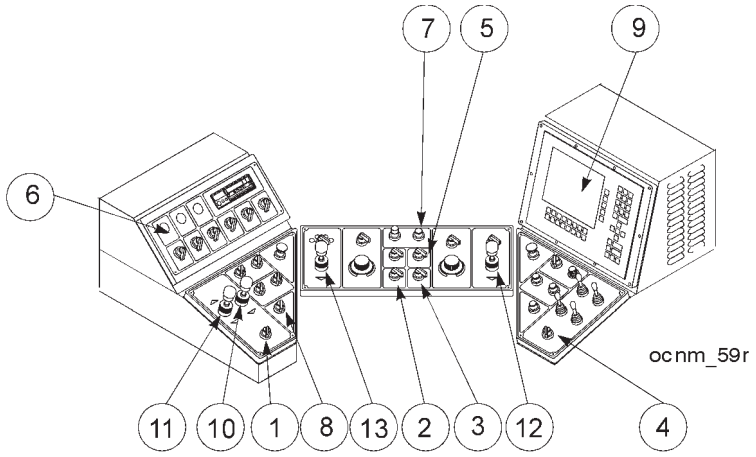
Onboard Inspection Items

6. Inspect the automatic lubrication central pumping stations for proper operation. Check the supply of lubricant and change or refill drums as necessary.

7. Close and lock all electrical cabinet doors.

CAUTION: Assume all parts inside of the electrical cabinets are energized. All electrical components should be serviced by qualified electrical personnel only.

8. Inspect the compressor radiator and fan. Check for signs of deterioration or damage to hoses, valves, fittings, etc. Check for leaks at all joints. Check the radiator core for blockage by dust, dirt, leaves, paper, etc. and clean as necessary



1. Operating Mode Selector Switch
2. Hoist Brake Switch
3. Tool Wrench Switch
4. Automatic Levelling Switch
5. Dust Curtain Switch
6. Boarding Stairs Switch
7. Drill/Propel “ON” Pushbutton
8. Propel Speed Selector Switch
9. Panelview Monitor
10. RH Propel Joystick - Primary
11. LH Propel Joystick - Primary
12. RH Propel Joystick - Secondary
13. LH Propel Joystick - Secondary

Operator Controls - Propel

1. Verify that the hoist brake is set. Verify that the tool string is clamped with the tool wrenches to prevent the tools from moving during the propel operation. Also, verify that the tool string is hoisted to a position to avoid striking the ground when the machine is propelled. Verify that the leveling jacks are fully retracted and that the dust curtains are fully raised. Verify that the boarding stair is raised.

2. Move the operating mode selector switch to PRIMARY PROPEL, SECONDARY PROPEL, or to REMOTE PROPEL. The remote propel is radio controlled.

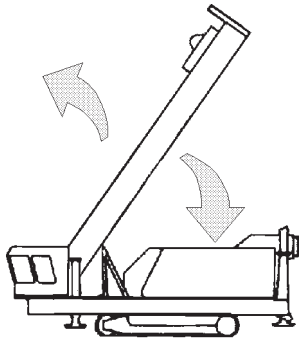
3. Press the drill/propel control ON pushbutton. The automatic leveling/propel screen will appear on the operator’s display terminal. If the propelling is being done from the remote propel station, turn the enabling key switch to the ENABLE position.

4. At the control console or remote propel station, turn the propel selector switch to the SLOW SPEED position.

NOTE: There are two propel speeds available to the operator, slow speed and normal. For the inexperienced operator or for maneuvering in tight spots and in drill patterns, the SLOW SPEED setting allows for a more relaxed control operation.

3. Once the mast is vertical, move the mast lock switch to the LOCK position to lock the mast in the vertical position. Return the lever to the neutral position when the latch is in position. Blinking (Mast Pins Out) on operator's display terminal operator's display screen will disappear when mast is locked in position. Turn the mast brace lock switch to the LOCKED position to secure the mast and brace in the vertical position.

NOTE: When moving the mast for angle hole drilling, on machines with mast lengths of 65 ft. (19.8 M) or more, the drill pipe must be stored in the racks and the rotary head lowered to its lowest position.



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4. If the mast is to be set up for angle drilling move the A-frame lock switch and the mast brace lock switch to the UNLOCK position to release the A-frame front leg lock pin and mast brace lock pins. The readout (A-frame Pins Out and Mast Brace Pin Out) will show up on the bottom of operator's display screen of the operator's display terminal.

5. Verify that the winch/mast selector switch is still in the mast position, then lift and pull the mast joystick slowly to the rear. Slowly lower the mast to the desired drilling angle, then turn the mast brace lock switch to the LOCKED position to secure the mast and brace in the desired position.

MAST LOWERING

NOTE: Refer to the cautions at the beginning of MAST RAISING.

To lower the mast:

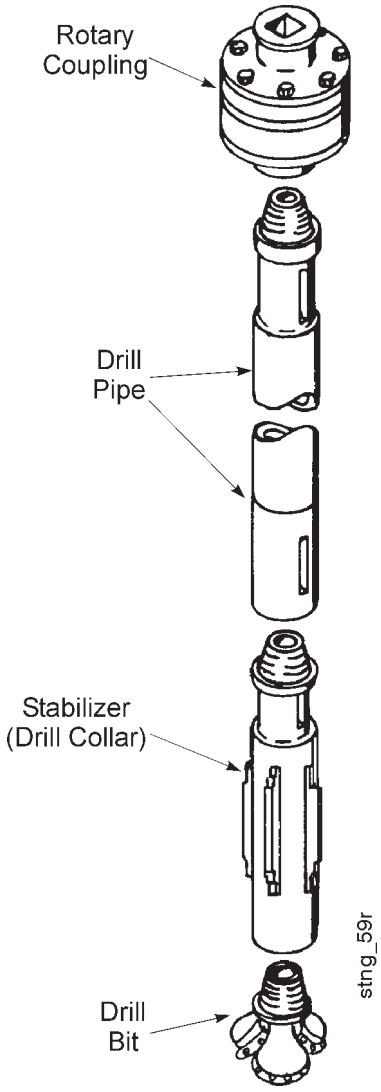
1. Remove the drill pipe from the rotary drive unit and store it in the pipe racks. Remove the bit and stabilizer from the machine. Clear the drill deck of all tools and materials which could fall off during the lowering procedure. Secure the auxiliary winch hook. Be sure the auxiliary winch line is secured to the mast. Raise the dust curtains. Lower the rotary/pulldown unit to its lowest position. Verify that the machine is level.

2. Check the condition of the mast hinge pins, lugs and cylinder pins.

3. If the machine is set up for angle drilling and the mast is at an angle proceed to step 4. If the machine is set up for vertical drilling proceed to step 5.

DRILL TOOL STRING ASSEMBLY

The tool string consists of one or more sections of drill pipe, a stabilizer (drill collar) and a bit. In assembling the tool string, the stabilizer is the first item installed, then comes a section of drill pipe and finally the bit.



To install the stabilizer proceed as follows:

1. Place the stabilizer to be installed in a position so as to be accessible to the auxiliary inch line. Clean and lubricate the threads and shoulders on each end of the stabilizer. Install a lifting bell on the pin (upper) end of the stabilizer and lift it onto the drilling deck with the auxiliary winch line. Securely block the stabilizer horizontally on blocking sufficient enough to place the stabilizer 8-10 inches above the drill deck. Remove the auxiliary winch line.

2. Remove the guide bushing from the hole in the drill deck. Place the guide bushing on the upper end of the stabilizer with the tapered end of the bushing toward the lower (box) end of the stabilizer. Reattach the auxiliary winch line to the lifting bell.

3. Install the stabilizer and drill bushing in the hole in the drill deck. Make sure the drill bushing is seated properly. Lower the stabilizer until the slots in the stabilizer are aligned with the tool wrenches. Extend the tool wrenches to hold the stabilizer in place.

4. Remove the auxiliary winch line from the stabilizer and secure it out of the way. Remove the lifting bell from the stabilizer and store it.

NOTE: The use of stabilizers that have been modified or that do not allow this procedure to be used should be avoided. The use of nonstandard stabilizers will make assembly and disassembly of the tool string difficult and dangerous.

6. Position the pipe rack and install the new section of pipe to the rotary unit.

7. Once the new section of pipe is attached to the rotary unit and the pipe rack stored, lower the pipe until it is approximately 3 feet above the drilling deck. Set the hoist brake. Place a cover over the threads on the pipe held by the tool wrench. Clear all personnel from the area and turn the main air stream on to blow away any dirt from inside of the pipe attached to the rotary unit. After turning off the main air stream, remove the cover from the lower pipe and clean and lube both the pin threads on the lower pipe and the box threads on the upper pipe.

8. After cleaning and lubricating the threads, turn the rotary rheostat until the drill pipe is rotating at approximately 5 RPM as shown on the operator's display terminal operator's display screen. Lower the rotary/pulldown unit slowly by gravity until the threads begin to contact. Once the threads begin to join the two pipes, attempt to minimize the pressure on the threads by allowing the joint to close slightly while holding the upper pipe in position with the hoist brake, then allowing the upper pipe to descend slightly to keep the tool wrench from losing its grip on the lower pipe. Once the joint is tight, stop the rotary motion.

NOTE: Be sure that the joint is made properly before attempting to unclamp the lower pipe. Should the joint not be made properly and fail, the lower pipe will fall into the hole and be difficult to recover.

9. Unclamp the tool wrench and retract it fully. The second section of pipe is now installed.

To install the third section of pipe, follow the procedure for installation of the second section of pipe, except that the third section of pipe is now installed between the rotary unit and the second section of pipe.

REMOVAL OF MULTIPLE SECTION DRILL PIPE

Disassembly of multiple section pipe strings is essentially the same as disassembly of a single section of pipe. The difference is that instead of the stabilizer being held by the tool wrench, it is the first or second section of pipe.

The tool string is disassembled to reverse order of assembly. First, the last section of pipe to be installed is removed, followed by the second section of pipe installed, and then the first. In each case the lower section of pipe is held by the tool wrench while the joint is broken by the breakout wrench. The joint is then disassembled by the rotary motion and the pipe stored in the pipe rack. The procedure is then repeated as necessary to remove all, or part of the tool string.

NOTE: For normal operation it is not necessary to completely disassemble the tool string to move from hole-to-hole within the drill pattern as long as the stability limitations are not exceeded. Do not disassemble the tool string more than necessary.

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.

If the hole should become plugged there are two ways to recover the tool string. Each method depends upon what type of material has plugged the hole. If the material that is plugging the hole is small (less than 6 inches [15.2 cm] square), it is possible to grind the material sufficiently to allow it to pass between the lobes of the bit and fall to the bottom of the hole. This condition can be observed if the bailing air pressure increases over normal working range. Large, chunky material will let the bailing air through, while fine material won't. Also, when attempting to hoist out of the hole the tool string will not vibrate greatly, due to the small size of the material. Large material will cause the tool string to be shocked every time a lobe on the bit strikes the block.

To recover the tool string from a hole plugged with smaller material hoist the bit until it runs into the plug and stops hoisting. With rotary motion turning at approximately 50-60 RPM keep high hoist loading on the bit and allow the bit to work its way through the plug. Monitor the rotary motor loading (current) and reduce the hoist loading (force) to keep the load in the lower portion of the bar graph. Once the plug is passed, clean the hole and return to drilling. The main air pressure may or may not exceed the safety valve setting and cause the main air compressor to overheat. If the safety valve opens when the hole is plugged, continue to attempt to free the tool string. The safety valve will close when the plug has been removed. If the compressor overheats and shuts down continue to attempt to free the tool string without the compressor. Allow the compressor to cool for a few minutes and restart it. Continue this procedure until the tool string is free.

7. Remove the air compressor from the machine and store in an attended heated building.

8. Close and completely seal all electrical cabinets.

9. Close and completely seal the operator's cab.

10. Close and completely seal the machinery house. Completely seal the filter fan unit.

11. Completely drain the compressor coolant system.

12. Propel the machine onto blocks to prevent the crawler belts from rusting. Coat the entire crawler belts with a rust preventative oil. Coat the propel chains with a rust preventative oil.

13. Block the leveling jacks in the full retracted position.

14. Manually grease every lube point (including auto lube points).

TOOL RECOVERY

Normally the drill tools are always either connected to the rotary drive unit or are held by the tool wrench. Mistakes, however, do happen and the drill tools may be dropped down the hole. Tool recovery (or tool fishing) is the procedure used to recover these tools.

There are two situations where the tool recovery procedures are necessary and each situation dictates the procedure to be used. The first situation is when the tools have been uncoupled and have fallen below the guide bushing. It is possible in this situation to recover the tool string and, if no damage was done, return to drilling. The other situation is where the drill pipe has broken and has either fallen below the guide bushing or cannot be handled normally.

If the tools have uncoupled and the upper end of the tool string is still above the guide bushing, recouple the tools as would normally be done for tool joint make-up. Clamp the tool string with the tool wrench to aid in making the joint. When the tools are coupled, remove the tool string from the hole, remove the bit and turn the main air on momentarily to clean the inside of the drill pipe. Clean and reinstall the bit and return to drilling.