Technical Manual

SAFETY

The safety alert symbols displayed here, and throughout this manual, call attention to instructions concerning personal safety. Carefully read and follow these instructions and observe all CAUTION and DANGER placards mounted at various locations on the machine.

Be certain anyone servicing this machine is aware of these SAFETY SYMBOLS and their definition. In the event you question your ability to safely perform any of the enclosed maintenance and operational procedures contact your regional Bucyrus service representative or the factory.

The following defines distinctions between safety instructions. In all these definitions the safety alert symbols is used.

NOTE: Denotes required information pertaining to the equipment. A loss of time and assets, or a minor injury can result if the appropriate action is not taken.

CAUTION: Serves as a reminder of safety practices, or directs attention to specific safety practices which could prevent possible injury.

DANGER: Denotes an imminently dangerous hazard which could result in death, bodily injury, or serious damage to equipment if appropriate action is not taken.

DANGER: Denotes an imminently dangerous electrical hazard which can result in death, bodily injury, or serious damage to equipment if appropriate action is not taken.

Operating, maintaining or servicing this machine can be dangerous unless performed properly. Each person must satisfy himself and his employer that he is alert and has the necessary skills, knowledge, tools and equipment for the task at hand. It is critical that all the methods used are safe and correct. Bucyrus International Customer Service representatives and/or factory specialists are also available to provide additional information or technical assistance. In addition, the operator must be alert, physically fit, and free from the influence of alcohol, drugs, or any medications that might impair a person's eyesight, hearing or reaction time.

Safety must always be paramount!

Consult your supervisor when safety is in doubt.

8. Inspect the leveling jack spuds for proper lubricant coverage. Inspect the leveling jack pads for cracks, broken or missing hardware, 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 an approved safety harness 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.

11. Inspect the mast hoist cylinders for loose or missing pins or keepers, oil leaks, damaged hoses or structural damage. Repair or replace any missing or damaged components immediately.

12. Inspect the mast structure for bent or broken chords, lacings or plates; loose or broken components; proper rack lubrication or excessive rack wear. Inspect ladders, handrails and platforms for broken or missing parts. Repair or replace broken or missing components immediately.

13. Check the main air flex hose, lubrication lines, and electric lines running from the mast to the rotary drive/pulldown unit for damage, excessive wear or leaks.

14. Check the safety restraint device on the mast. Be certain that the cable or rod and supports are in good repair with no cracks, missing or loose hardware or any damage that could reduce their effectiveness.

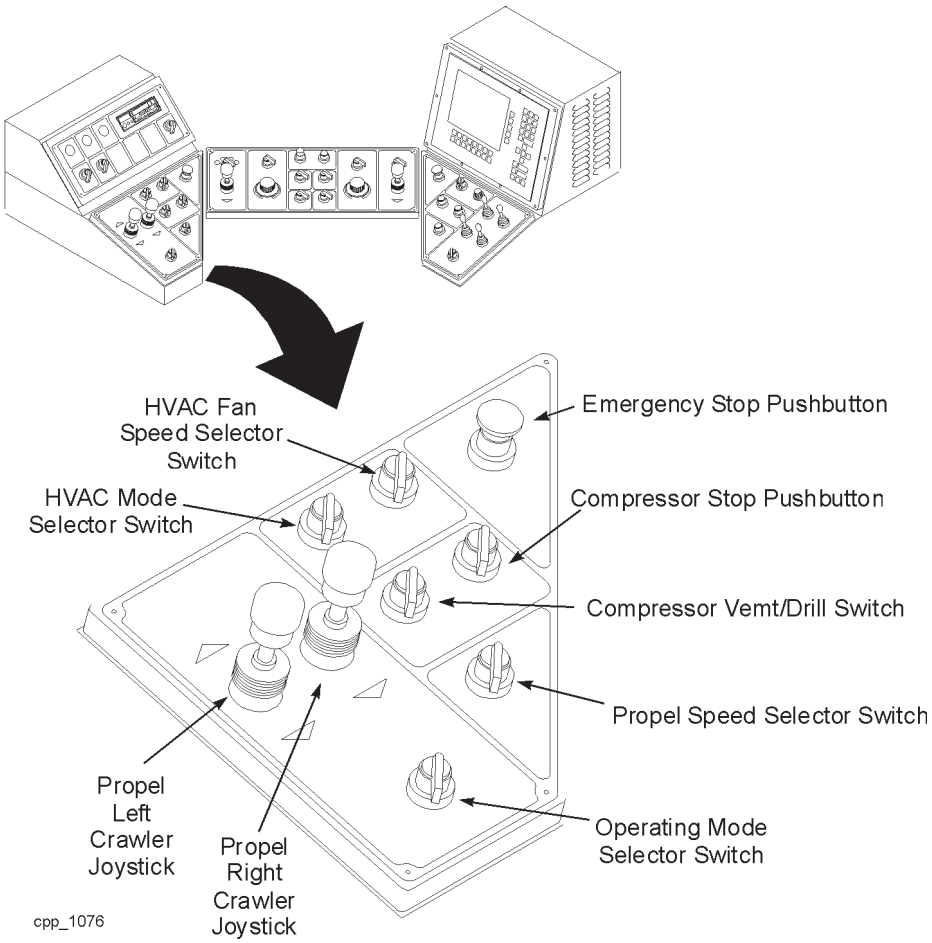
15. Every 160 hours inspect the upper auxiliary winch sheaves. All pins, keepers and hardware should be resecured.

16. Check the machinery house air filtering fan duct to see that it is clear of obstructions.

BIT VIEW HATCH SWITCH

This is a two-position switch that is used to move the hatch for viewing the drill bit on the ground. Moving the switch to the CLOSE position will close the hatch. Turning the switch to the OPEN position will open the hatch.

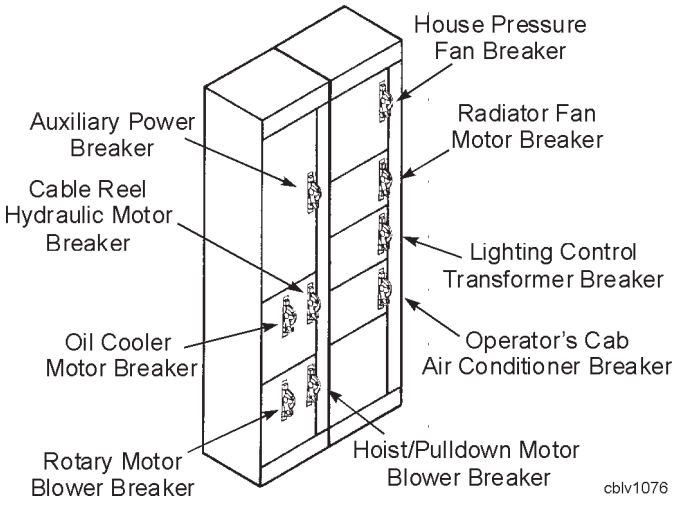
PROPEL CONTROL PANEL



EMERGENCY STOP PUSH-BUTTON

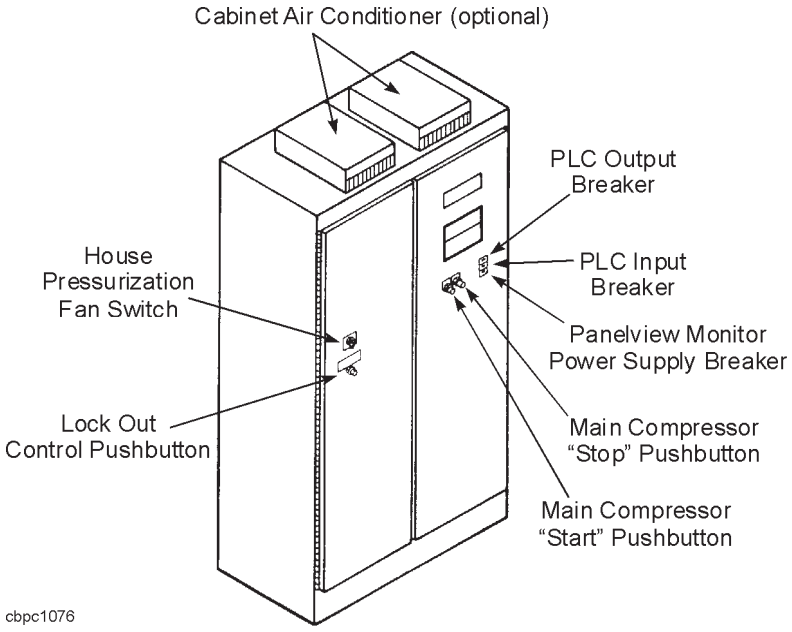
The Emergency stop push-button is a large red mushroom head push-button switch. Pressing the push-button will cause the power to the machine from the power source to be disconnected. The push-button is tied to the power source ground check circuit.

The low voltage cabinet contains most of the breakers for the auxiliary equipment on the drill. Because of the variations of equipment supplied on a particular drill, a list of typical controls which might appear on the cabinet is shown in figure.

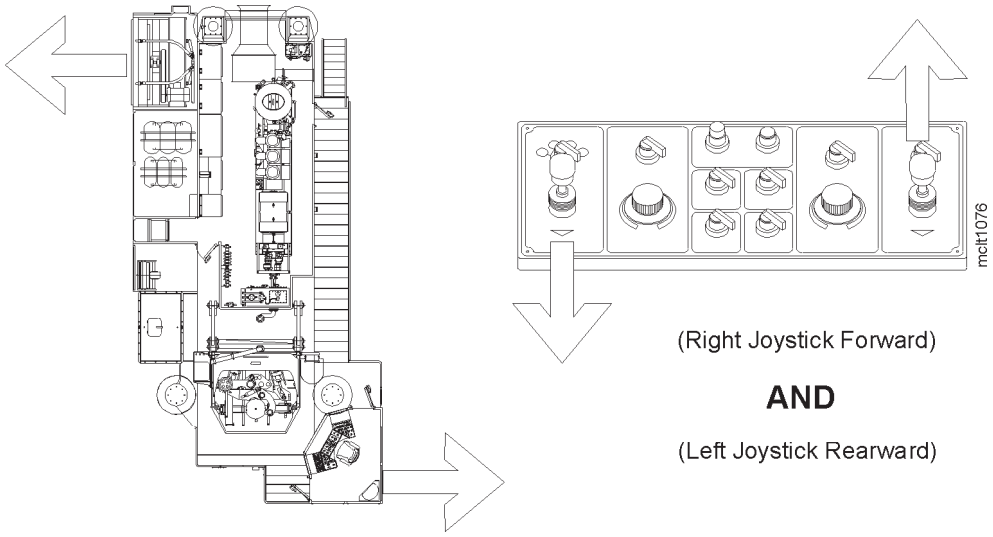


Low Voltage Cabinet

The typical programmable controller cabinet contains controls as shown.

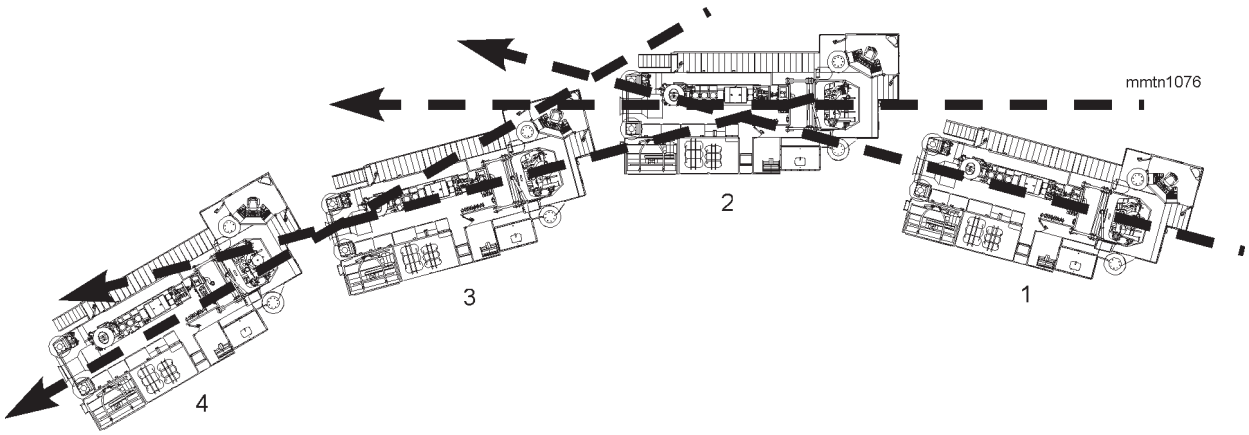


Programmable Controller Cabinet



Propel - Counter-Rotation Left Turn

9. To make a sharp right (counter-rotation) turn, push the left joystick forward and pull the right joystick to the rear. To make a sharp left turn, push the right joystick forward and pull the left joystick to the rear.

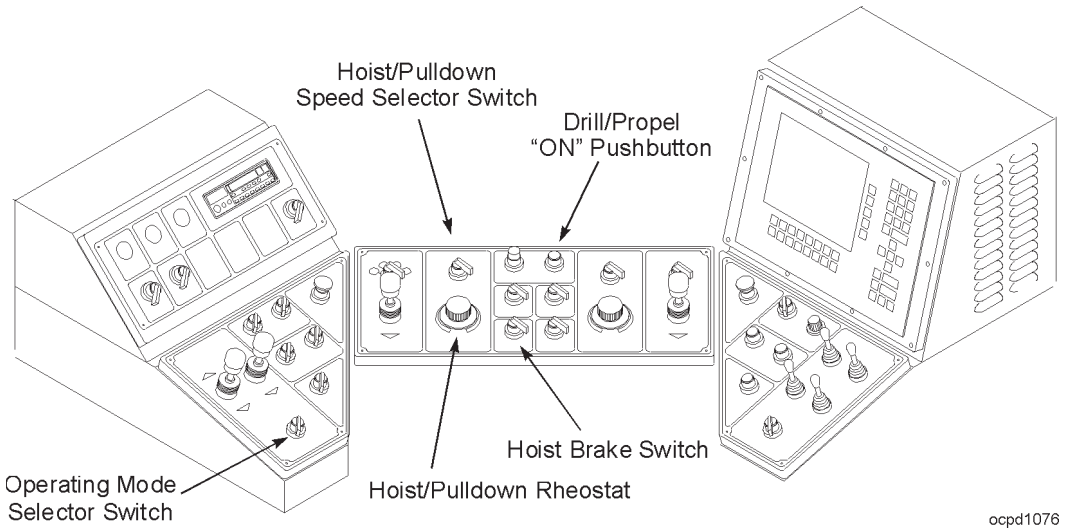


Gradual Turns - 15˚ Increments

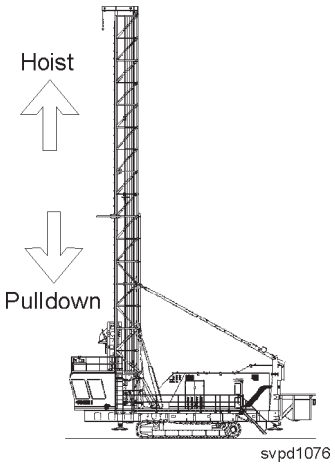
CAUTION: ENSURE THAT THE TURN IS STOPPED EVERY 15 DEGREES AND THAT THE MACHINE IS PROPELLED FORWARD (OR REARWARD) AT LEAST TEN FEET PRIOR TO RESUMING THE TURN. Making gradual turns will greatly extend the service life of the tracks.

PULLDOWN MACHINERY OPERATION

The pulldown machinery is used during the tool handling and the drilling procedures. The pulldown machinery supplies power to either raise or lower the rotary/pulldown unit. Power is supplied to the pulldown gearcase by an electric motor.



Controls for Hoist/Pulldown



To operate the hoist/pulldown machinery proceed as follows;

1. Move the operating mode selector switch to the DRILL position.

2. Turn the hoist/pulldown selector switch to either PULLDOWN, HOIST HIGH, HOIST LOW, or PIPE RACK/JOINT.

For this procedure, turn the switch to the PULLDOWN position. For a review of each switch position, refer to *HOIST/PULLDOWN SPEED SELECTOR SWITCH*.

6. Turn the rotary rheostat clockwise until the rotary drive unit coupling begins to turn at approximately 35 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 coupling contacts the drill pipe. Allow the rotary/pulldown unit to lower under gravity while the coupling is threading onto the pipe.

7. When the drill pipe begins to turn with the rotary coupling, stop the rotary motion and check the joint between the coupling and the pipe. The shoulders on the pipe and coupling must be together. If there is clearance between the shoulders, it will be necessary to tighten the joint some more before the pipe is removed from the rack. If the shoulders of the pipe and coupling are contacting, the joint is made up.

CAUTION: The threads on the drill pipe are tapered to make assembly and disassembly of the pipe easier. The threads are designed to disengage after only a few revolutions of the pipe. Failure to have the pipe shoulders contacting may result in the pipe joint uncoupling and the pipe falling from the rotary/pulldown unit.

There is no provision made for holding the pipe stationary in the rack while the joint is tightened. If the joint does not tighten using the above procedure it may be necessary to apply a small amount of hoist power to the rotary/pulldown unit to lift it slightly to remove the pressure from the drill threads.

CAUTION: Do not lift the drill pipe. Lift the rotary/pulldown unit only enough to relieve the pressure on the threads. Lifting the unit enough to lift the pipe will not only put pressure on the other side of the threads, but may also allow the pipe rack upper gate to open. Should the joint uncouple at this point, the drill pipe may fall out of the rack, causing death, serious injury or serious machine damage.

If the pipe joint does not make up by relieving the weight of the drive unit from the threads, it will be necessary to inspect and/or repair the threads on the rotary coupling and the drill pipe. Inspect the threads for rough surfaces and burrs and apply a liberal coat of thread compound to them. The threads should have a smooth finish and no burrs or dirt that will hinder joint make-up. The joint shoulders should also be clean and smooth and should have compound applied.

After cleaning and repairing the threads, try making the joint again. If the joint cannot be made, either the drill pipe or the coupling is defective. Replace the pipe or coupling as necessary.

8. Once the joint is made up between the coupling and the pipe, the pipe is now ready to be lifted out of the pipe rack pocket. Lift the pipe approximately a foot above the top of the pocket to allow the pipe rack to swing out of the way. Set the hoist brake.

9. Once the pipe has been lifted clear of the pipe rack, swing the pipe rack to the STORED position by lifting and pushing the joystick forward to the STORED position.

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.

NOTE: The bar graphs on the operator's screen on the operator display terminal shows the condition of each function. If a function operates beyond its normal operating range, especially for rotary current and hoist/pulldown force, the bar graph color will change from green to yellow or red when the graph valve raises into that particular range. For details, refer to the Operator Display Manual.

STARTING THE HOLE (COLLARING)

Since the first few feet of a hole are usually in unconsolidated material, the procedure for drilling through this material will be different than for the remainder of the hole. This procedure is commonly referred to as collaring the hole.

To begin the hole proceed as follows:

1. Verify that the tool wrench and breakout wrench are retracted fully. Clear the drill deck of personnel and material which is not necessary for the drilling procedure (i.e. oil drums, tools, spare bits, etc.).

2. Place the operating mode selector switch in the DRILL position. Press the drill/propel control ON push-button. Release the hoist brake. Place the hoist/pulldown speed selector switch in the PULLDOWN position, allowing the tool string to lower so that the guide bushing is firmly seated in the hole in the drill deck. Make sure that the slots in the bushing align with the lugs on the drill deck. Reset the hoist brake.

3. Turn the rotary speed selector switch to LOW position. Turn the rotary rheostat clockwise until the rotary speed bar graph on the operator's display terminal screen indicates that the tool string is turning at approximately 45 RPM.

4. Lower the dust curtains and turn on the dust control system. Place the main compressor vent/drill switch in the DRILL position to supply bailing air to the bit.

NOTE: While the bit is passing through the unconsolidated material laying on the top of the formation, the pulldown speed sufficient to cause penetration of the bit is provided by turning the hoist/pulldown rheostat slightly in the pulldown direction.

5. Release the hoist brake and allow the drill bit to contact the ground. Monitor the vibration coming from the tool string. To reduce vibration slow the rotary speed with the rotary rheostat. Keep the vibration to a minimum. As the vibration lessens, increase the rotary speed and the pulldown speed while monitoring the rotary current and the air pressure bar graph on the operator's display terminal screen.

The objective is to penetrate the formation as fast as possible without damaging the machine or plugging the hole with cuttings. Monitoring the rotary current, and keeping the load in the lower portion of the bar graph (green) will eliminate damage to the rotary motor. Reducing the load on the

After the above start-up procedure has been initiated, the automatic controls will take over the actual drilling of the hole. Water injection (if so equipped) will be shut off at preset depth. When the total depth of the hole is reached (as preset) the tool string will be automatically hoisted. The operator should now take over control of the machine and start reaming and cleaning the hole as described in *ENDING THE HOLE~SINGLE PIPE SECTIONS.*

If problems arise in the P.D.C. functions, the system will have to be corrected by a qualified electrician. In most cases, if a malfunction occurs in the automated system, the automated system can be turned off and the drilling completed manually.

PREPARING TO MOVE THE MACHINE

Once the hole has been completed and the tool string is removed from the hole, it is necessary to move the machine to the next hole location. Preparing to move the machine consists of proper storage of the tool string, lowering the machine to the ground, and inspection of the machine and travel route prior to propelling.

To prepare to move, proceed as follows:

1. Upon completion of the current hole, hoist the tool string from the hole. If using multiple pipe sections, remove and store all pipe necessary to remove the entire tool string from the hole. Turn off the dust control system and raise the dust curtains.

2. Clamp the stabilizer with the tool wrench to prevent movement of the tool string during propel.

CAUTION: Do not propel with the tool string in a position where it will be struck against the ground while propelling. Should the tool string hit the ground while propelling, damage to the machine and tool string will result.

3. Turn the automatic leveling switch to the RETRACT position to raise the jacks and lower the machine. Hold the switch in the RETRACT position until the jacks are fully retracted. Refer to the auto-leveling screen on the operator's display terminal to verify all four jacks are fully retracted.

NOTE: If the machine is to be lowered manually, refer to steps 4, 5 and 6 and operator's display terminal auto leveling screen.

4. Using the manual leveling jack controls, lower the machine, so that it remains level, until it is touching the ground. Use the leveling jack controls in pairs (i.e. either both side controls, or both end controls simultaneously) to reduce the twisting loads on the drill frame.

5. Once the machine is touching the ground, first lower the uphill side or end of the machine to the ground, then lower the downhill side or end to the ground. It is important that the machine