

TRIBOR

Operation Manual



Corporate Philosophy and Mission

Barbco Inc. and its president, Jim Barbera are dedicated to not only the success of the organization but also to the growth and fulfillment of its employees and the surrounding community. To do both requires the company to be the “best that it can possibly be”. To achieve this end, Barbco recognizes that all members of the company must be focused on a common mission and set of shared goals. Thus in September 1990 the company established the following Mission Statement and Goals

Mission Statement

Barbco Inc. is dedicated to instilling in all segments of its organization a commitment to the production of high quality earth boring equipment and accessories. We seek to be recognized as the leader in our industry in terms of quality products, customer service, innovation, and serving the needs of earth boring contractors throughout the world supported by a management philosophy which seeks employee satisfaction and involvement, customer loyalty, and maximization of productivity and profitability.

Goal 1 A Commitment to Quality which

Develops a quality focus to consistently provide our customers with products and services which meet or exceed their expectations as to reliability, construction, precision and aesthetics.

Goal 2 A Commitment to Service which

Develops an organizational philosophy which is based on the concept that “We will Do whatever it takes” to provide quality service to our customers in the most efficient and effective manner.

Goal 3 A Commitment to Innovation which

Provides an organizational focus on creativity, encouraging the development of procedures and process which add value to our products and services.

Goal 4 A Commitment to Related Activities which

Expands into areas which complement our basic operations and strengthen our communities.

Goal 5 A Commitment to Employee Development which

Creates an organizational culture that recognizes the value of the individual employee, regardless of function, in the overall success of the company, and to provide all employees with opportunities for career development and education.

Goal 6 A Commitment to Profitability and Growth which

Expands the company in a controlled manner, enabling it to build earnings and a strong capital base so as to maximize its value to shareholders.

Mission Statement

Operation Manual

TriBor

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Introduction

Manufacturer's Statement

The information contained in this operation manual is necessary for the safe and proper setup, operation, maintenance, and servicing of your Barbco TriBor machine. Barbco Inc. has a long tradition of offering the best quality and most efficient to operate underground installation equipment in the world. Read and understand this manual completely before you use the Barbco TriBor machine and keep it with the unit at all times for quick reference.

The equipment described in this manual is subject to change. Barbco Inc. reserves the right to change equipment at any time as part of normal product improvement. Some improvements may have been made after this manual was printed. For the latest information on your equipment, contact Barbco Inc.

The illustrations contained in this manual are intended to clarify explanations in the text. The illustrations may look slightly different from your unit, but this has been allowed only if it does not fundamentally change the factual information. Some optional equipment may be illustrated that your machine is not equipped with.

The Barbco TriBor machine is capable of boring in various soils for long distance depending upon local conditions.

How to Reach Us

If you encounter a circumstance that is not covered in this manual, Barbco's service department will be happy to assist you. Barbco's office hours are 8:00 AM–5:00 PM, Monday through Friday. Barbco's office is located in East Canton, Ohio.

Barbco Corporate Headquarters, East Canton, Ohio

Main Office..... (330) 488 - 9400
Toll Free..... (800) 448 - 8934

How to Order Parts

To place an order for spare parts, you can call either of the above numbers. Parts department hours are Monday through Friday, 8:00 AM–5:00 PM (Eastern Time). Orders can also be accepted via fax, 24 hours a day. Next day service must be called in by 3:00 PM.

Spare Parts (fax)..... (330) 488 - 2022

When you call the factory for spare parts or service, have the model number and serial number of the machine. See ID tag located to the right of the operators platform on the Base Push Unit, also on the Power Pack. Write the serial number of your machine in the space provided below.




SAFETY

Safe Operation Practices for the Barbco Auger Boring Machine

If you are the owner, operator or the helper using a Barbco Inc. horizontal earth boring machine, it is important that you recognize that your boring machine is a powerful piece of underground construction equipment. (IT MUST BE OPERATED WITH RESPECT AND CAUTION).

The "Safety Rules" section of this manual provides safety rules for pre-start up, setup, operation and maintenance of the horizontal earth boring machine. It is written for operators, ground crew, and maintenance people.

DANGER: THIS EARTH BORING MACHINE IS CAPABLE OF AMPUTATION, THROWING OBJECTS, AND CRUSHING PERSONNEL. FAILURE TO OBSERVE THE FOLLOWING SAFETY INSTRUCTIONS COULD RESULT IN SERIOUS INJURY OR DEATH.

⚠ DANGER Rotating auger and cutting head can cause death or serious injury. STAY AWAY. Do not wear loose clothing.		⚠ PELIGRO El taladro giratorio y el cabezal de corte pueden ocasionar la muerte o lesiones graves. MANTÉNGASE ALEJADO. No utilice ropa suelta.
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⚠ DANGER Rotating blades will cause death or amputation. Keep door closed. Stay away from side of machine.		⚠ PELIGRO Las cuchillas giratorias pueden ocasionar la muerte o amputaciones. Mantenga la puerta cerrada. Manténgase alejado del lado de la máquina.
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⚠ CAUTION		⚠ ATENCIÓN
<p>Pinch point may cause serious injury.</p> <p>Stay clear of moving push bar.</p>		<p>Los puntos de atrapamiento pueden ocasionar lesiones graves.</p> <p>Manténgase alejado de la barra de empuje en movimiento.</p>

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⚠ DANGER	  	⚠ PELIGRO
<p>CALL BEFORE YOU DIG.</p> <p>Locate ALL underground utilities and have utility companies shut them off BEFORE starting underground work.</p> <p>Do NOT drive under low hanging electrical power lines.</p> <p>Verify clearance between power lines and equipment.</p> <p>Know the height of your equipment.</p>		<p>AVISE ANTES DE PERFORAR.</p> <p>Localice TODAS las instalaciones subterráneas y pida a los proveedores de servicios públicos que desactiven sus servicios ANTES de empezar el trabajo subterráneo.</p> <p>NO trabaje por debajo de líneas eléctricas que cuelguen muy cerca.</p> <p>Verifique el espacio libre entre las líneas eléctricas y el equipo.</p> <p>Conozca la altura de su equipo.</p>

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⚠ WARNING	⚠ ADVERTENCIA
<p>TO AVOID DEATH OR SERIOUS INJURY:</p> <ul style="list-style-type: none"> •Read and understand operation manual and safety signs (decals) before starting machine. •Be sure all personnel know and follow safe operating procedures. •Stop engine before: <ul style="list-style-type: none"> -Opening spoil ejector door -Working in casing -Working in exit pit -Doing any maintenance •Properly vent exhaust fumes. •Always secure auger in casing before lifting. •Do not modify this machine. •Always bore with at least a trained operator and a trained helper. •Machine may move without warning while in operation. •Relieve pressure in hydraulic system before servicing. •Do not operate with guards removed. •Know and obey all codes and regulations. 	<p>PARA EVITAR LA MUERTE O LESIONES GRAVES:</p> <ul style="list-style-type: none"> •Lee y comprenda el manual de operaciones y las señales de seguridad (calcomanías) antes de encender la máquina. •Asegúrese de que todo el personal conozca y siga todos los procedimientos operativos de seguridad. •Detenga el motor antes de: <ul style="list-style-type: none"> -Abrir la puerta expulsora de residuos -Trabajar en la cubierta -Trabajar en el hoyo de salida -Dar mantenimiento •Ventile debidamente los gases de escape. •Siempre asegure el taladro en la cubierta antes de levantar. •No modifique esta máquina. •Siempre taladre con al menos un operador y un ayudante capacitados. •La máquina se puede mover sin aviso mientras está en funcionamiento. •Libere la presión en el sistema hidráulico antes de cada mantenimiento. •No opere la máquina sin los protectores oculares. •Conozca y obedezca todos los códigos y regulaciones.

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GENERAL SAFETY STATEMENTS

- **DO NOT** operate the machinery unless you have read and understand the unit's operation manual. Lack of understanding proper operating procedures could result in unsafe operation. Operation manuals are issued with each new unit. If you haven't seen a copy, ask your supervisor for one. Replacements are available from Barbco, Inc.
- **DANGER: NEVER LIFT ANY OBJECTS OVER TOP OF PERSONNEL.** The load may shift or fall.
- **WARNING:** Verify clearance between overhead obstructions and equipment.
- **WARNING:** Secure the machine against unauthorized use when the machine is ready to operate! Stay with the unit or make sure no one can start it without you. Keep keys in your pocket when not in use.
- **WARNING:** DO NOT remove hydraulic hoses while machine is in operation!
- **WARNING:** DO NOT allow welding current to travel through bearings or hydraulic cylinders. Keep ground cable on component being welded.
- **CAUTION:** ELECTRONIC COMPONENTS CAN BE DESTROYED BY WELDING CURRENT. Disconnect battery cables and unplug any electronic devices before welding on the unit.
- **CAUTION:** Hearing Loss Hazard! Wear ear plugs while standing near a working machine. Sound pressure levels may exceed OSHA standards for constant exposure.
- **NEVER** arrive at work or work on, around, or near machinery when you are under the influence of drugs or alcohol. Beware of over-the-counter drugs, many contain specific warnings about operating machinery after taking medication.
- **DO NOT** bring personal problems to work. In an office setting a personal problem may be annoying to co-workers; but at the work site it can be deadly. The people around you depend on you for their safety.
- **REMOVE** snow, ice, oil, or dirt from steps and platforms.
- **USE THE 3-POINT RULE** to Mount or dismount the machine. (keep two hands and one foot or one hand and two feet in contact with a secure surface at all times).
- **WEAR PROTECTIVE EQUIPMENT** for job conditions. Always wear hard hat, safety vest, safety glasses, gloves and steel toed or protective boots.
- **KEEP SPECTATORS AWAY.** A safe distance from the equipment.
- **MAINTAIN COMMUNICATION.** Operator must maintain communication by radio, etc. with exit pit personnel.
- **KEEP THE MACHINE AND WORK AREA CLEAN.** Oil spills, grease, loose tools, and scattered accessories cause accidents.
- **REMIND YOUR CO-WORKER** ignoring safe practices about the dangers that could result. Safety is always in the hands of those on the job!

As an employer, it is required that you follow the rules and regulations set forth by the Department of Labor OSHA office.

For this piece of equipment, follow 29 CFR 1926 where required. Follow 1926.21(b)(2) regarding inspection of jobsites and 1926.20(b)(4) regarding the training required to operate this equipment

SAFE OPERATION OF EQUIPMENT

The operator is responsible for the operation of the machine. An operator is never to neglect safety. The operator is the only person on site who has the authority to ensure a safe setup.

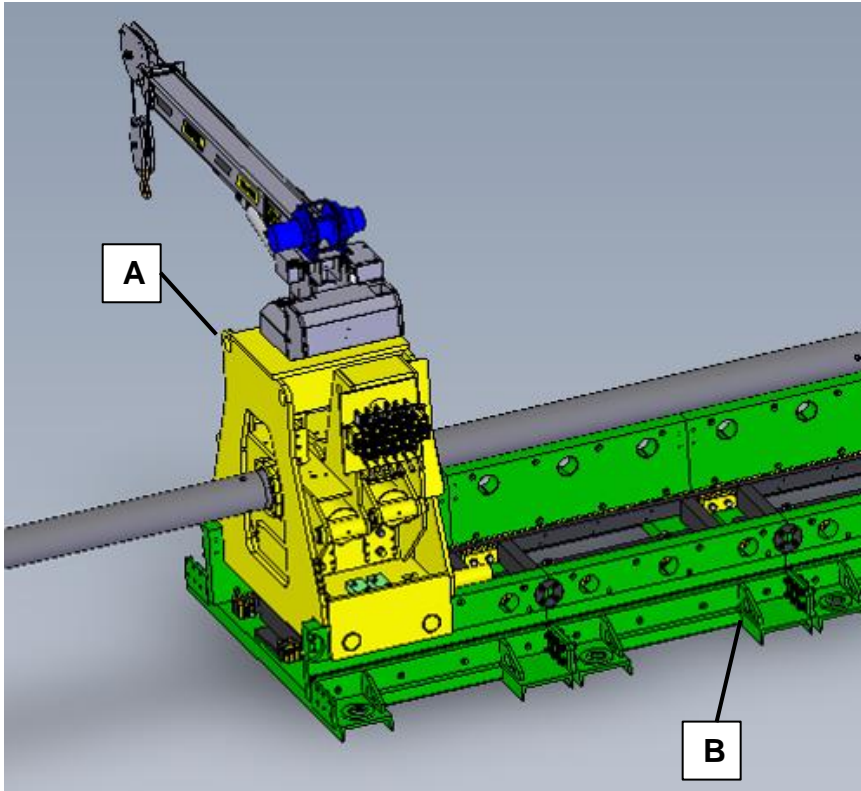
QUALIFIED OPERATORS ONLY ARE PERMITTED TO OPERATE THE UNIT

1. Must be at least 18 years old
2. Is physically and mentally capable
3. Has been trained in the operation and maintenance of the equipment
4. Has demonstrated capabilities (to a supervisor) to operate and maintain the equipment
5. Understands the controls and functions of this Barbco horizontal earth boring machine
6. Can perform assigned duties in a reliable manner

SAFETY INSPECTION OF EQUIPMENT

- Follow the operation manual and manufacturer's service bulletins regarding maintenance and inspection procedures and intervals.
- **WARNING: NEVER** make unauthorized modifications to structural members or hydraulic circuits.
- Inspect machine circuits and safety devices daily. Document inspection results. Correct problems before the unit is used. Report anything suspicious to Barbco, Inc. for consideration. Do not assume its okay.
- Report any problem found on the horizontal earth boring machine to the Barbco Inc. engineering department so proper repair procedures can be designed and used.
-
- Do NOT operate a machine that could cause an unsafe condition such as, unusual noises, vibrations, pressures, or oil leaks. Any problems must be corrected before using the machine.
- **CAUTION:** Use a piece of cardboard or wood to locate leaks. High pressure hydraulic oil leaks may not be visible and can penetrate the skin. If fluid penetrates the skin, it must be surgically removed within a few hours.
- Replace damaged hydraulic hoses or fittings.
- Replace safety decals immediately when they are faded, missing, damaged, or otherwise unreadable. Decals may be ordered individually or in sets by unit model and serial number.

MACHINE LIFT POINTS



A- BREAKOUT SYSTEM

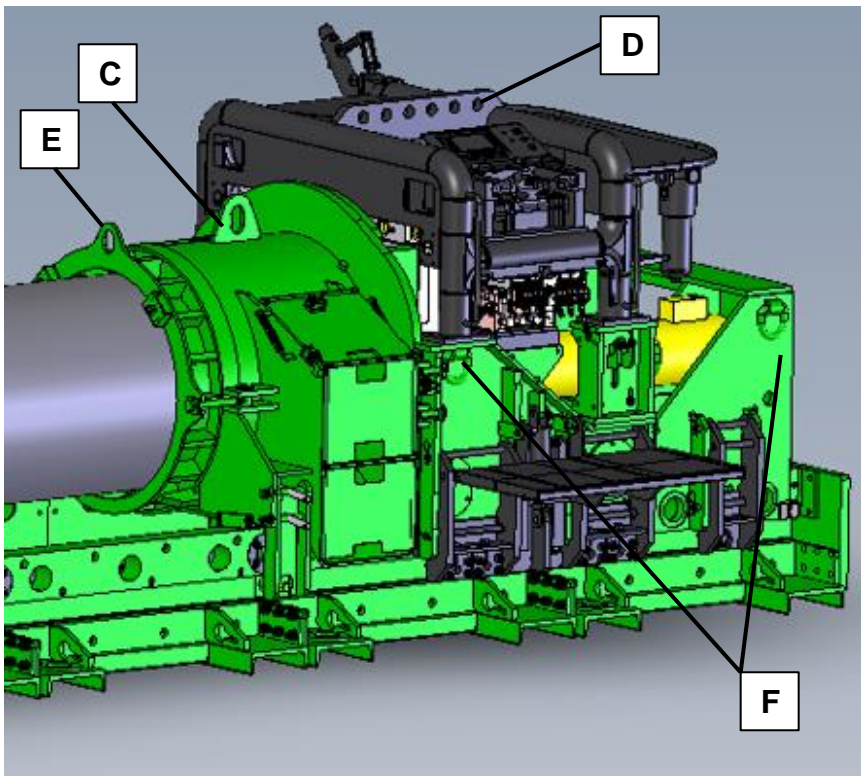
four eyelets, one on each corner. Manual track dogs must be retracted to lift out of the track.

B- TRACK SECTION

Four eyelets, one in each corner gusset.

C- 48" MASTER PUSHER

One eyelet located on top of assembly for balanced lift point.



D- ROTARY & ROLL CAGE

Lift bar with 6 eyelets to balance load.

E- CASING ATTACHMENT

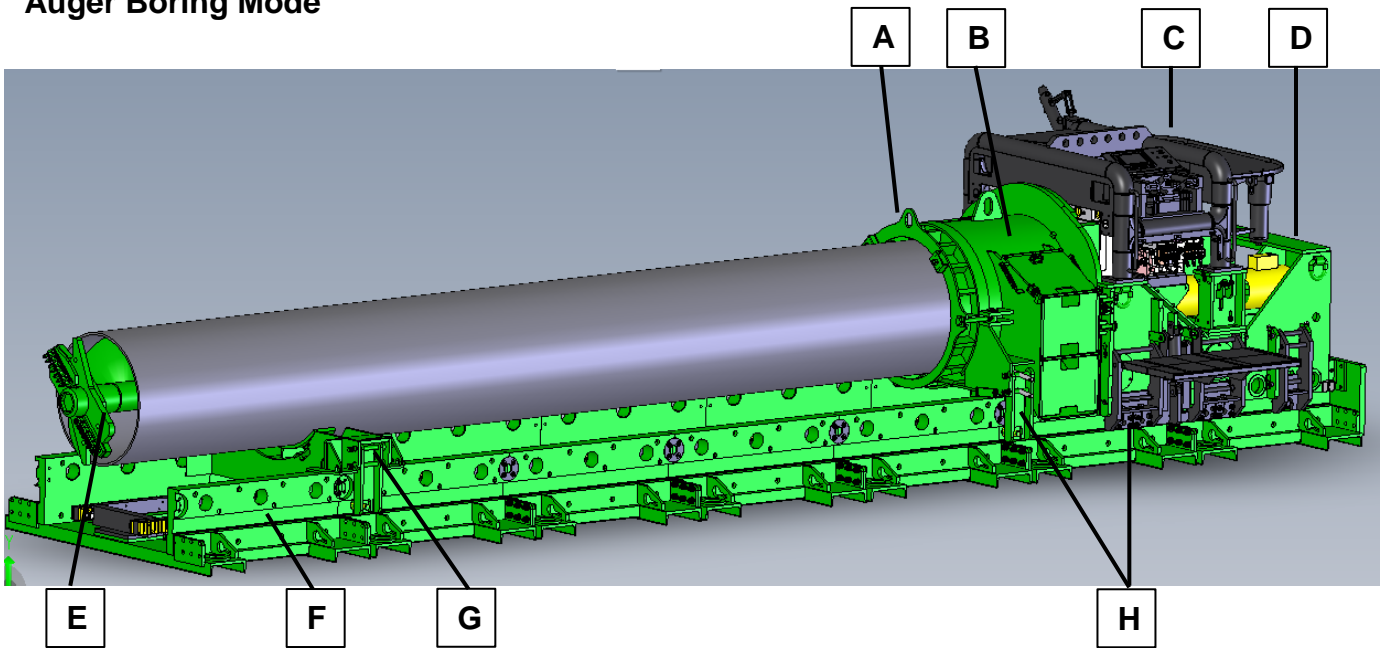
One eyelet located on top of the assembly. Total weight varies per size.

F- BASE UNIT

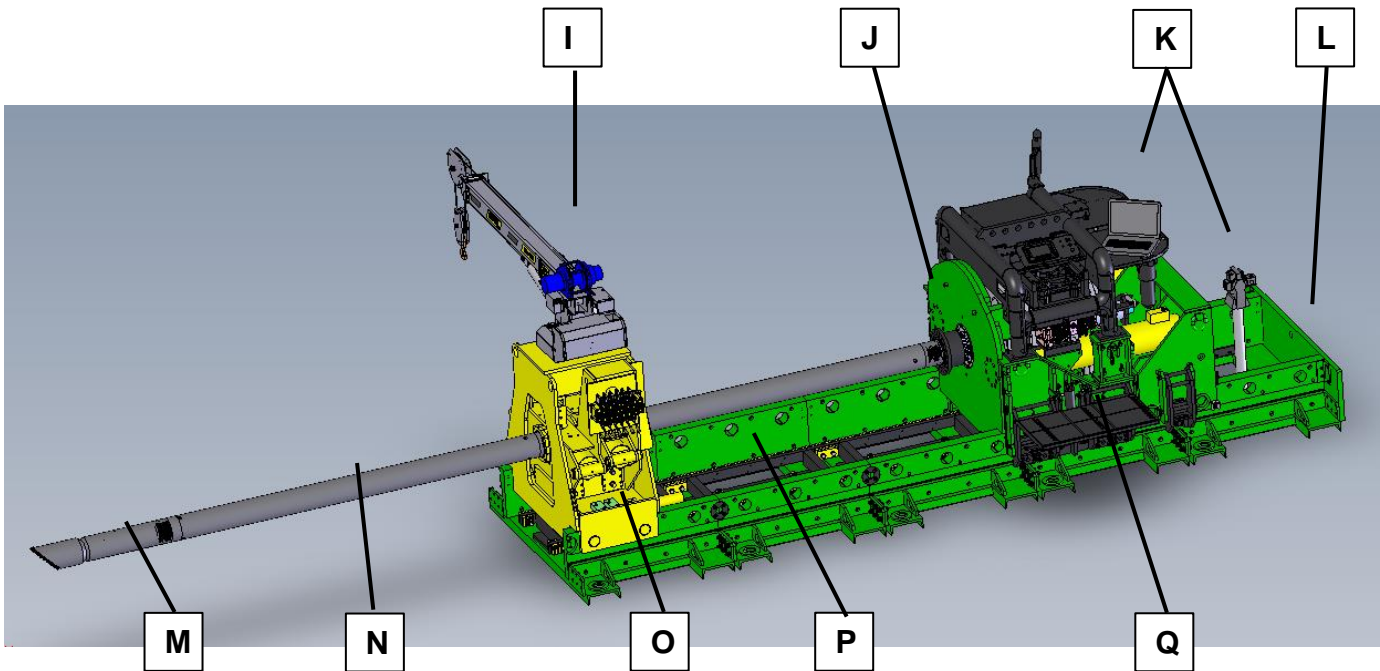
Two d-rings located on the push bar and two on the front corner of the base.

MAJOR DRILL UNIT COMPONENTS

Auger Boring Mode



Directional Drilling & Guided Pilot Mode

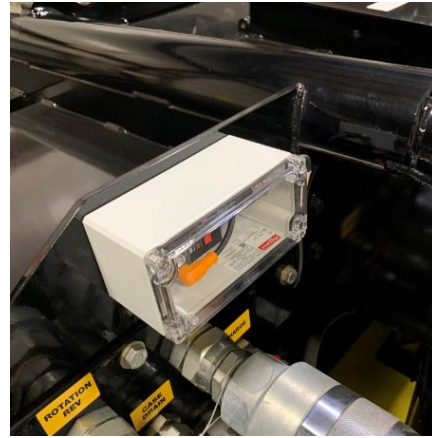


- A. **CASING ATTACHMENT:** Optional accessory used to reduce the size of the Master Casing Pusher to accommodate smaller casing diameters.
 - B. **MASTER CASING PUSHER:** Contains the spoil ejectors (not shown), spoil door and casing attachment, as needed for smaller diameters of casing.
 - C. **ROTARY ASSEMBLY:** Roll cage, and rotary box assembly all contained in this weldment.
 - D. **PUSH BAR:** Contains the push bar dogs and is attached to the thrust cylinders. It also receives the machine thrust transferring it to the track and into the push plate and backstop.
 - E. **AUGER CUTTING HEAD:** Type is subject to ground conditions.
 - F. **TRACK:** These are additional sections of track to be bolted to the master track and to each other to allow installation of casing sections. Two sections of extension track along with the master track are furnished with each machine. Optional extension tracks can be added to allow for the installation of longer casing sections. Track must be held down as needed during operation.
 - G. **MASTER SADDLE:** Apparatus which rests on the track in front of the boring machine to cradle the casing and auger. **SADDLE ATTACHMENT (not shown):** Optional accessory used in conjunction with the casing attachment to cradle smaller casing diameters and auger.
 - H. **HOOK ROLLERS:** Lock the drill unit to the track rail.
-
- I. **CRAIN:** Optional, on-board apparatus used to lift drill pipe or pilot rod.
 - J. **SUB/ LOCKING COLLET:** Anti-breakout collet. This unit is capable of adapting to any manufactures HDD pipe. Guided boring pipe shown is 7"OD.
 - K. **CAMERA SYSTEM:** Used for guided boring process. Tracks the LED target as the pilot is being installed into the ground.
 - L. **PUSH PLATE:** Solid Steel cross member bolted to the 2 ft. pup track to stabilize track assemblies and provide support for thrusting.
 - M. **STEERING ASSEMBLY:** Contains the steering shoe and LED target for the guided boring process.
 - N. **DRILL ROD/ PILOT TUBE:** Thread together pipe designed to be used during the pilot process.
 - O. **BREAKOUT ASSEMBLY:** Designed to make up and breakout all pipe connections. Adaptable to any manufactured pipe. Optional crane mounts on top for loading and unloading pipe.
 - P. **RACK AND PINION ASSEMBLY:** Located in the belly of the track to allow rapid drill unit travel up to 120,000 lbs. of force.
 - Q. **STEP:** Operators platform when operating while on the machine.

MINOR DRILL UNIT COMPONENTS



Push Bar Sensor- Locates the dog hole when the push bar is lined up.



Antenna- wireless system. One located on the drill and one on power pack.



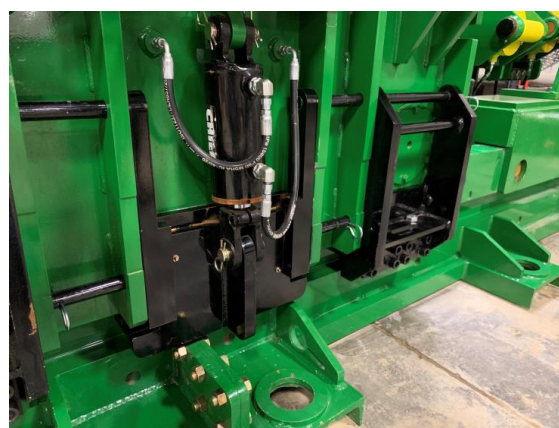
High Pressure Filter- in line open loop filter. Located on the drill unit.



Friction break adjustment- Controls the pressure the friction break delivers.



Laser- watches the push bar movement for the auto run function.



Friction Break- drag break for the drill unit. Located on the drill unit.



Breakout Control Valve- Controls all the breakout functions.



Guide Bearing- Breakout guide bearing can be adapted to any tool joint diameter.



Deadman connections- Hydraulic disconnects located on the front of the breakout.



Crane- Full function crane with wireless remote control

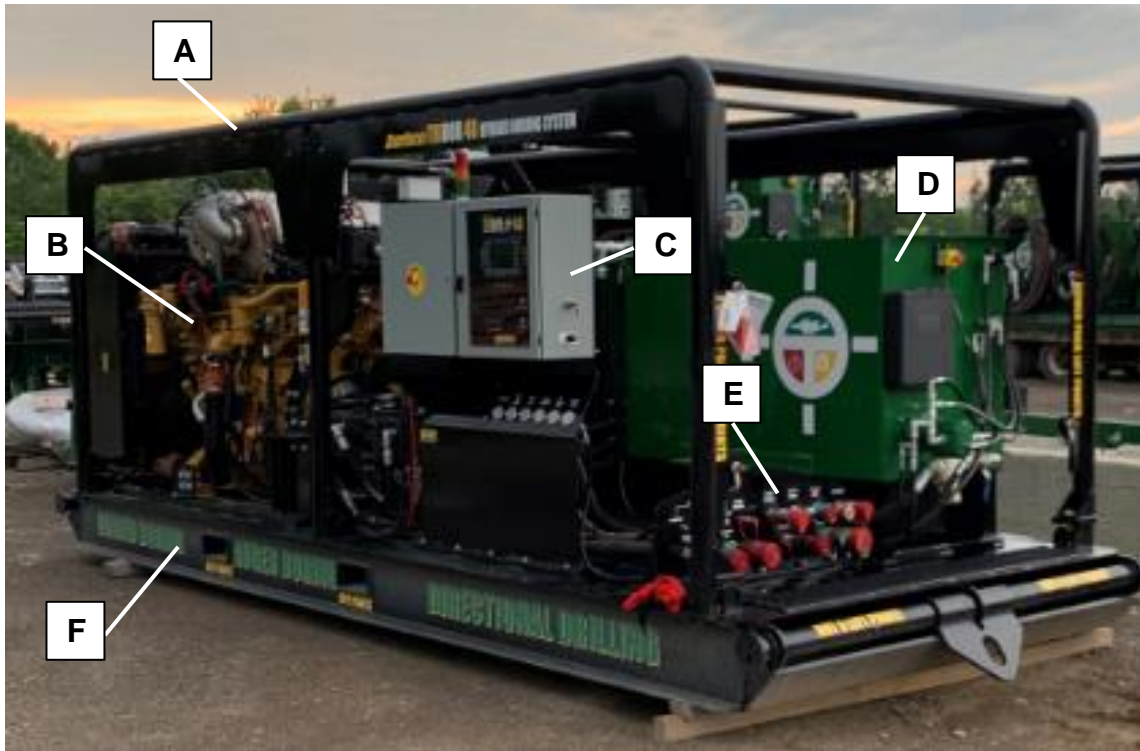


Hose Support- Adjustable bracket that supports all the hydraulic supply umbilical.



Dump Valve- Hydraulic controlled ball valve designed to dump off excessive pressure in the drill string.

MAJOR POWER PACK COMPONENTS



- A. ROLL CAGE:** Structure designed to protect the components of the power pack. Unit can be removed for maintenance.
- B. ENGINE ASSEMBLY:** Complete engine unit to power all functions on the TriBor.
- C. MAIN CONTROL STATION:** Operators station containing all functions available on the power unit.
- D. MIXING TANK:** Provides a station to mix drilling fluid additives as needed for some drilling operations.
- E. HYDRAULIC UMBILICAL CONNECTORS:** bulkhead providing hydraulic quick disconnects for all umbilical's.
- F. SKID:** Main base weldment. Contains all tanks, engine, and hosing
- G. HYDRAULIC TANK:** Not Shown, provides containment of all hydraulic fluid.
- H. FUEL TANK:** Not shown, provides containment of all diesel fuel.

MINOR POWER PACK COMPONENTS



Filter Station- Containing high pressure, and charge pressure hydraulic filters.



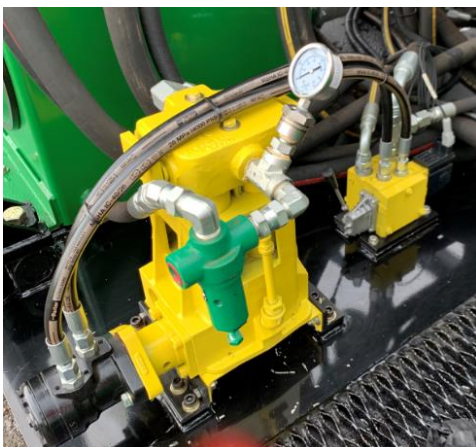
DEF Tank- Storage for diesel exhaust fluid.



Mixing Station- Control of the mixer prop speed. Containing the fluid pump in-line strainer.



Quick Disconnects- Hydraulic connections to quickly connect all umbilical lines.

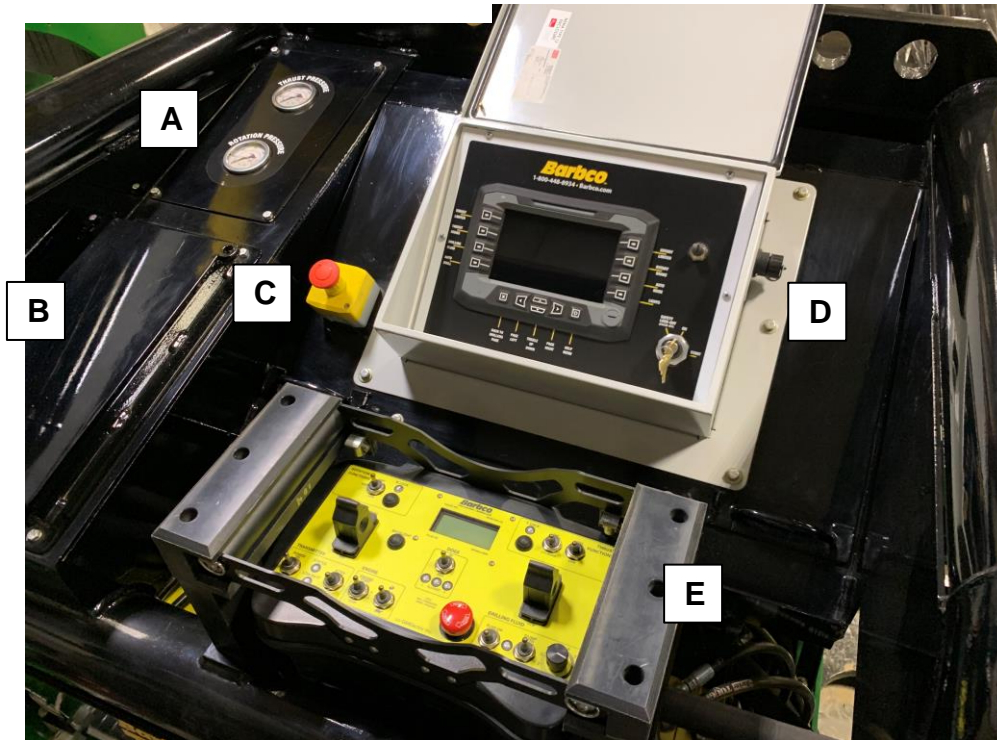


Fluid Pump- Pressure pump for drilling fluid.



Battery Station- Contains all batteries and main battery disconnect.

MAIN OPERATORS CONSOLE

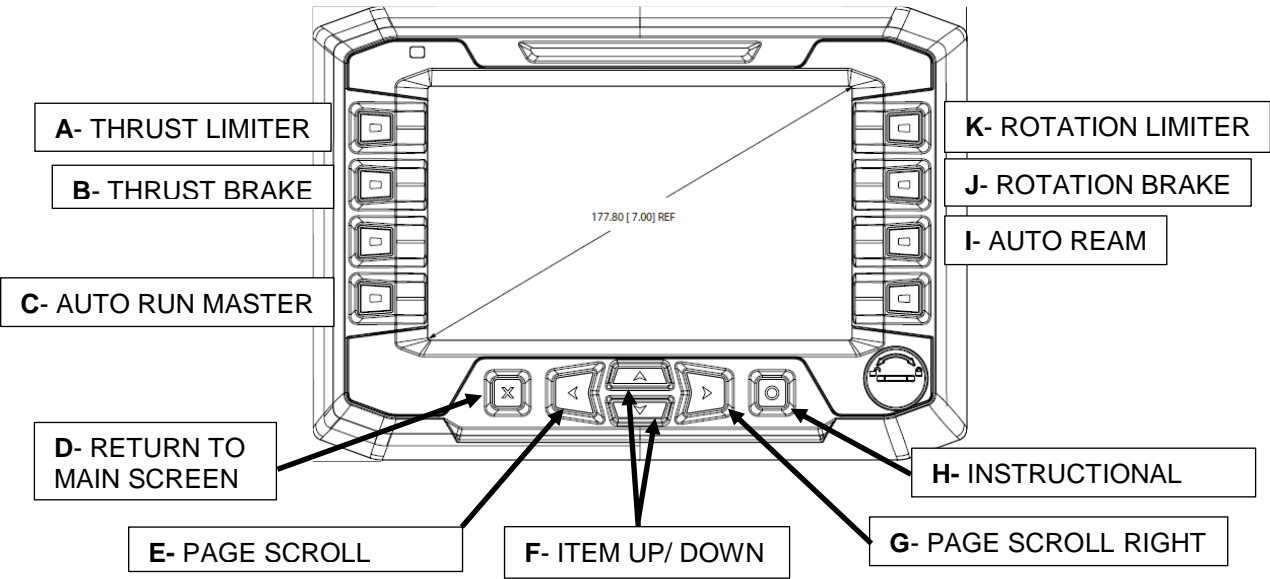


- A- Rotation and thrust hydraulic pressure gauges.
- B- Tool Box.
- C- Emergency stop button- puts the machine in a safe state. Will not shut down the engine.
- D- Control box- contains the drillers display, lock-out key, and the diagnostic port.
- E- Remote docking station.

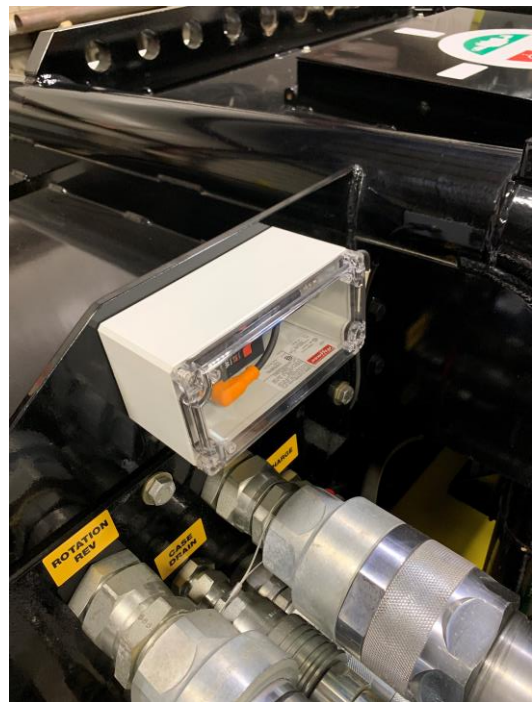
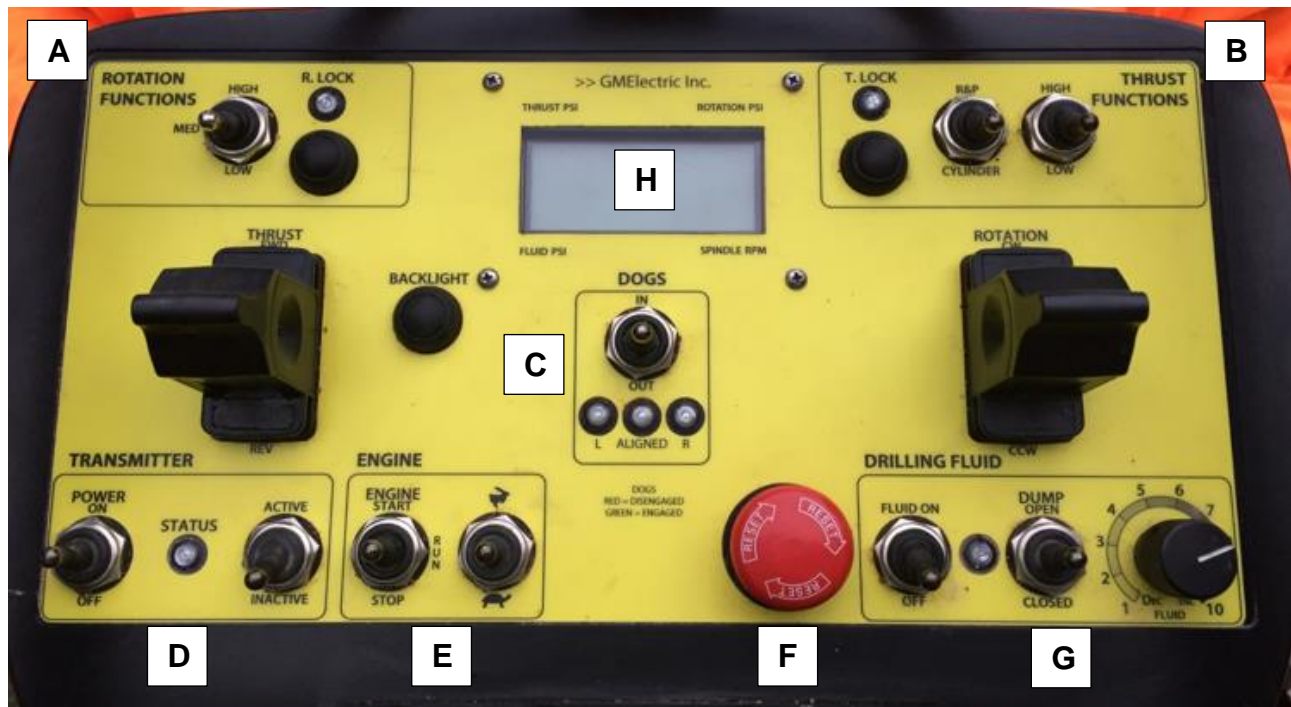


To lock the remote onto the operators station simply slide it into the plastic docking brackets. To remove push the spring clips on each side down and slide the remote out.

Button Identification:



WIRELESS REMOTE Functional Descriptions



The white boxes contain the antennas for the wireless remote system. The one on the power pack includes a magnetic base so it can be moved as needed to get better reception.

A - ROTATION FUNCTION:

- SPEED TOGGLE- high, medium and low spindle speed setting adjusts the maximum torque per speed range.
- R LOCK LIGHT & BUTTON- push the button to lock in the rotation speed. See auto drill mode.
- ROTATION PADDLE- proportional speed control of the rotary spindle.

B - THRUST FUNCTION:

- CYLINDER/ R&P TOGGLE- choose between cylinder or rack and pinion thrust.
- SPEED TOGGLE- high/ low rack and pinion speed setting adjusts the maximum force per speed range.
- T LOCK LIGHT & BUTTON- push the button to lock in the thrust speed. See auto drill mode.
- THRUST PADDLE- proportional speed control for thrust.

C - DOGS:

- IN/ OUT TOGGLE- steel blocks engage into the track to propel the machine forward or retracted from the track to operate the rack and pinion function.
- L&R LED- lights illuminate when the steel block is completely engaged into the track.
- ALIGNED LED- light illuminates when the push bar is aligned with the dog holes in the track.

D - TRANSMITTER:

- POWER TOGGLE- turn power to the transmitter on/ off.
- STATUS LED- displays the status of the transmitter.
- ACTIVE/ INACTIVE TOGGLE- active allows all functions to work on the transmitter.

E - ENGINE:

- START/ STOP TOGGLE- start and stop the engine from the remote.
- THROTTLE- When pushed the throttle will adjust in the corresponding direction.

F - E STOP: inactivates the transmitter and puts the machine in a controlled state.

G - DRILLING FLUID:

- ON/ OFF- turn the fluid pump on or off from the transmitter. Fluid master must be on.
- DUMP- releases the fluid pressure off the drill string thru the spindle connection.
- GPM REHOSTATE- increase or decrease the output gallons from the onboard fluid pump.

H – DISPLAY

- THRUST PSI- digital display of thrust pressure.
- ROTATION PSI- digital display of rotation pressure.
- FLUID PSI- digital display of the drilling fluid pressure.
- SPINDLE RPM- display of spindle rotations per minute.
- BACKLIGHT- lights up the digital display

MACHINE SET UP

DESIGNING THE JOB AND PREPARATION OF THE ENTRANCE PIT

When the job is in the planning stage, provide enough room for safe loading and unloading of equipment, and for spoil removal. Accidents are less likely to occur at sites that are open and kept clear of debris.

In most instances, an entrance pit will be required at the approach side of the bore. The dimensions of the pit floor required to install 20 feet (6.1 m) sections of casing, are found in the following illustrations. These dimensions will provide the most convenient and safest working conditions. They can be reduced but at the expense of efficiency and production.

It is the responsibility of the owner to make a safe pit that is in accordance with the rules set forth in the (OSHA) Code of Federal Regulations 29. There are specific requirements for pit construction, protection, barricades, traffic control, installation and type of ladders used in the pit and personal safety equipment. Barbco, Inc. recommends that the owner become familiar with the requirements of the (OSHA) Regulations CFR29. Information can be obtained from your Regional Department of Labor Office.

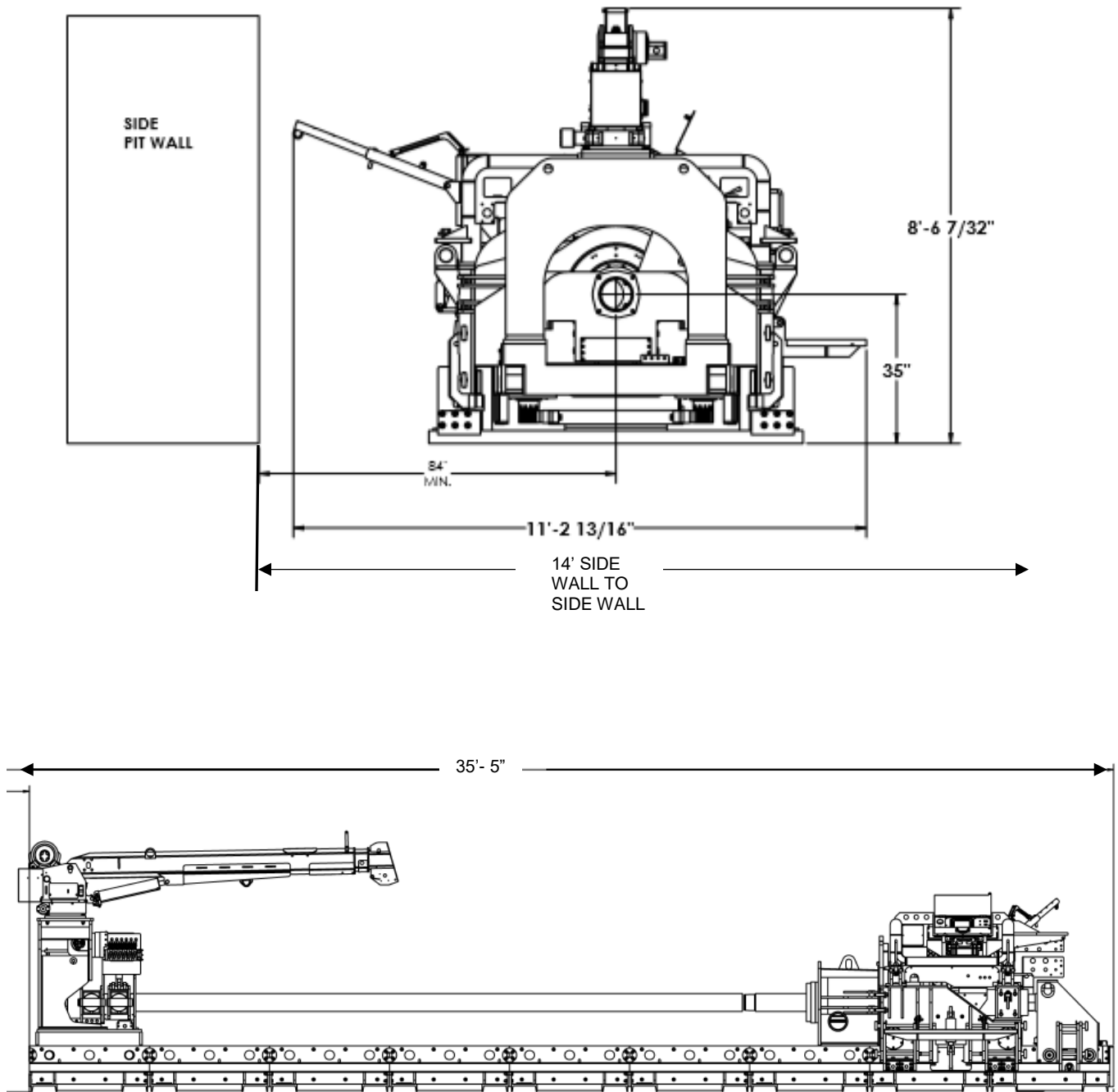
The floor of the pit must be aligned with the proposed casing grade. It must also be solid enough to support the equipment being used without settling. A base of crushed stone should be used to prevent settling. The use of concrete under the tracks is required and should be allowed for when bringing the floor up to grade. The use of a concrete base is required on all bores.

The boring operation requires that a square and secure backstop tied into the pit floor be provided for the track push plate. The thrust for the entire bore is transferred through the track to the backstop. Should the backstop fail during the bore campaign, valuable time will be lost in rebuilding. The backstop should be designed to withstand 1-1/2 to 2 times the maximum thrust of the boring machine being used. Barbco, Inc. strongly recommends using the services of a competent engineer to assist in the pit floor, anchoring and backstop design.

A SECURE BASE, ANCHORING SYSTEM AND BACKSTOP ARE ESSENTIAL FOR ALL BORES.

The possibility of flooding always exists during the boring operation. The location of a pit sump pump for dewatering should be considered during the design of the pit.

**ALL MINIMUM DIMENSIONS ARE FOR THE INSTALLATION OF
20 FT CASING LENGTHS.**



SETTING AND ALIGNING THE TRACK

The most critical part of the bore is the setting of the machine track on line and grade. If the alignment is not right when you start, it is not likely to improve.



CAUTION! EQUIPMENT HAZARD! You must hold the track down! Allowing the track to lift will cause damage to the cylinders, pinion gears and other driveline components!



CAUTION! EQUIPMENT HAZARD! Always set single track sections. Never lift more than one track section at a time. Damage to end gussets will occur.



 **NEVER WELD
ON TRACK RAIL!**
THIS WILL DAMAGE
MACHINE ROLLERS
AND SENSORS
WILL ACCURE



WARNING! Always use correct lifting devices and NEVER hoist or transfer loads over personnel!

Lift and place the master track in the pit with the push plate against the backstop. Use a string and plumb bob to align the master track with the line of the proposed bore. Note that the track sections are not numbered. They are symmetrical and can be connected from either end.

TRACK ASSEMBLY

The use of this machine requires a concrete pad to be poured.

Make sure to add hold down provisions to the middle, and both ends of the track. Failure to do so will result in damage to the ends of the track, cylinders, pinion gears and other driveline components!

To install the extension tracks, follow the steps below.

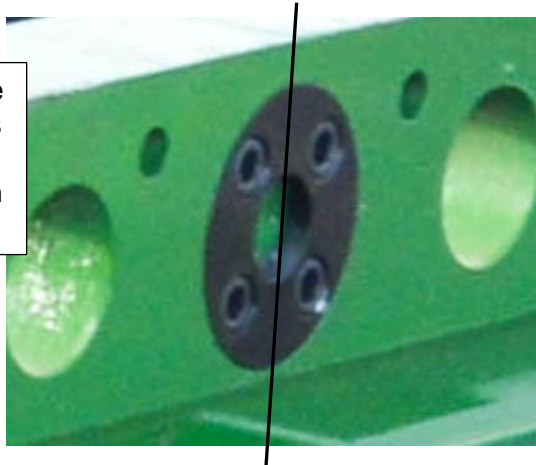
1. Place the master track up against the backstop.
2. Place the consecutive track sections up against the master track. One after the other, tight against each other.
3. Aligning the top of the joints and bolting them together loosely. Use all bolt holes.

Do not tighten the end gusset bolts at this step



4. Start all four bolts thru the doughnut line up brackets on each side of the track. Starting with the piece of track up against the master first.

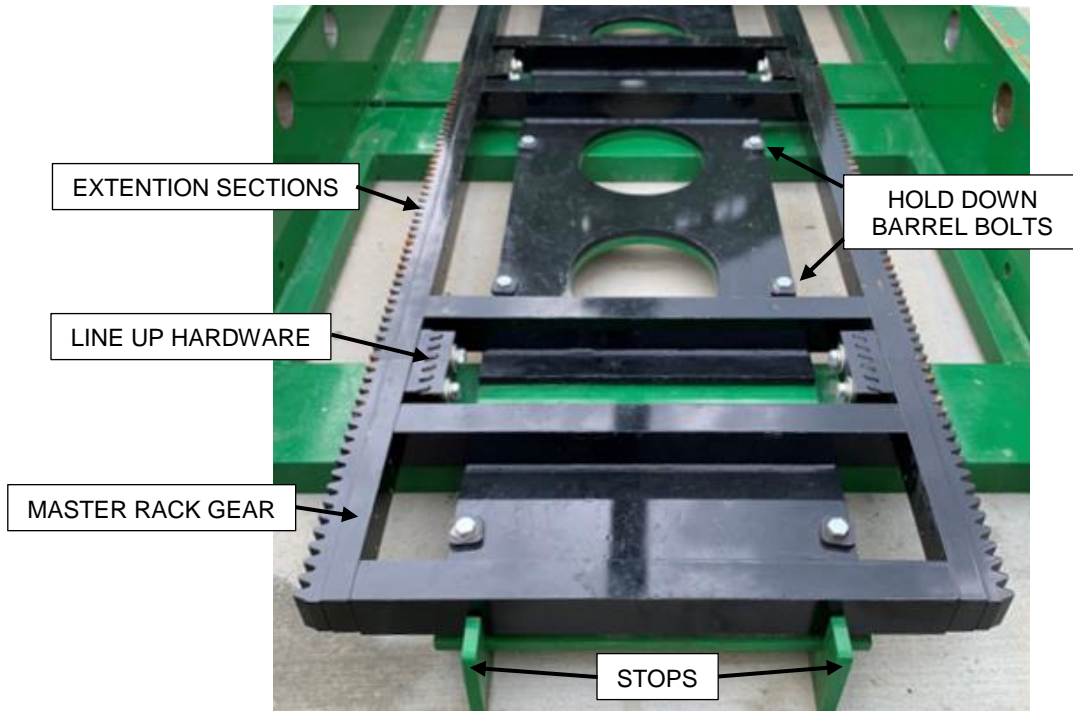
Tighten both bolts on the right side then both bolts on the left side. The track rails will align when tightened.



5. Tighten all end gusset bolts.
6. Repeat steps 2 thru 5 for each consecutive track section.
7. Before setting the machine, make a final check of the line and grade the track. Making sure it's consistent with the drilling method and bore path.
8. Secure the track in place as needed.

Rack Gear Assembly

9. Place the master rack gear on top of the master track and back against the stops.



10. Place extension sections down the length of the track assembly, up against each other.
11. Place the lineup gear against the inside seam. Match up the gear teeth with the holes as shown in the photo above and tighten bolts. Do this for every section.



12. Measure the distance from the rack gear to the inside of the track rail. Make sure both ends of the assembled rack gear are centered up with the track. Flip up the barrel bolt and tighten the ends down.
13. Measure the center of the rack gear. Pry over as needed to center and tighten the remaining barrel bolts.
14. **Secure the track to the pit floor.**

*The track is ready for the machine assembly.

MACHINE ASSEMBLY



DANGER! Always use correct lifting devices and NEVER hoist or transfer loads over personnel!

15. Attach the spreader chains to the lifting eyes on the base push unit making sure that the two longer chains are attached to the push bar end of the machine. Be sure that the 4-hook roller assemblies are pinned in the upright position and that the push bar dogs are retracted into the push bar and pinned into place.
16. Gently and slowly lift the base push unit. Adjustment of the spreader chains may be necessary to keep the machine at the same angle as the track.
17. Slowly lower the base into the bore pit and master track. Keeping the pinion gears lined up with the rack rear mounted in the track



CAUTION! EQUIPMENT HAZARD! Do not slam or drop the base push unit into the master track. Pinion gear damage may result.

18. Attach the spreader chains to the lifting eye of the power package. Use a shackle in the appropriate lifting hole to lift the sub frame on the same angle as the track and base.



19. Once the power package angle is adjusted, slowly lower it into the bore pit over the track and base unit.
20. Carefully lower the sub frame into the base unit. The power package will align itself as it is lowered into the base unit. Pay attention to all hosing as the two come together.



DANGER! Stay clear of shear and pinch points while guiding the power package during assembly.

21. Once the sub frame is seated, disconnect the chains from the lifting eye and remove the spreader bar from the bore pit.
22. Connect the hydraulic quick disconnects and dog LED electrical cord at the rear of the machine and on the power pack.



CAUTION! EQUIPMENT HAZARD! Never disconnect any of the hoses when the engine is running!



CAUTION! EQUIPMENT HAZARD! Make sure all hoses are connected completely! Quick disconnects that screw together will not pass fluid if there not screwed together completely!



23. Strap the hoses to the support arm. The arm is adjustable to accommodate the way the hoses approach the drill.



24. Unpin and latch the 4-hook rollers into the down and locked position and secure with hitch pin. The lower pins are also used to hold the friction break in place. Make sure the pins are in place correctly.



25. Latch and tighten all four corner swivel hold-down bolts.



26. Bolt in the header wall cover.



The machine is now ready for startup!

ENGINE OPERATING INSTRUCTIONS AND CONTROLS

A factory instruction manual for each specific engine is supplied with the Tribor. Operation and maintenance information is included in the engine manual. The following instructions cover only the starting and stopping procedures. All other engine-operating instructions are contained in the factory manual.

BEFORE STARTING:

1. Check engine oil level. Fill as needed with the oil required for your engine.
2. Check the DEF level. Fill as needed.
3. Check fuel level. Diesel engines use #2 diesel fuel. NEVER LET THE DIESEL FUEL TANK RUN DRY! If the tank is dry, bleed the fuel system as outlined in the engine manual.
4. Check air cleaner gauge. Service if required.



DANGER! Clear all unauthorized personnel from the machine area and bore pit.

STARTING ENGINE:

1. Turn battery disconnect switches to the ON position. One located on the power pack and one on the drill unit.



2. Turn the key on the engine panel to the ON position.
3. Verify all system lights are operable.
4. Turn the key switch to START position. After engine starts release the key.
5. Verify all system gauges are working.



WARNING! Only use ESTOP in case of an emergency. Do not use to turn engine OFF.



WARNING! Lower engine idle and allow system to cool down before engine shut down.



WARNING! Never shut down the engine during the regen cycle.

TURNING THE REMOTE TRANSMITTER ON:

1. Turn the master switch on the drill unit operator station to the ON position.



2. Push the transmitter power toggle to the ON position. The status light will illuminate and the screen will display "Control Reset Required"
3. Cycle the e-stop. Press and then twisting it to the right to release. This will put the remote thru a boot up cycle and internal safety check. The transmitter is now communicating with the receiver.



4. Place the Active toggle to the ACTIVE position to allow all functions. All functions are turned off when the transmitter is in the INACTIVE state.

ENGINE SHUTDOWN:

1. Turn the transmitter to the INACTIVE state.
2. Turn the transmitter power switch to OFF position.
3. Turn the master switch on the drill unit operator station to the LOCKOUT position.
4. Turn the engine key to OFF position. The engine will shut down.
5. Allow the DEF to purge from the engine. Yellow LED will illuminate during the purge cycle.
6. Turn the battery disconnect on the power pack to the OFF position.
7. Turn the battery disconnect on the drill unit to the off position.



WARNING! Never turn off the engine when the regen operation is on.

BASIC OPERATING INSTRUCTIONS

(Machine is already set up. Engine is running. Ready to bore.)

TURNING ON AND ACTIVATING THE REMOTE-



- 1- Turn the transmitter power to the ON position. "Control System required" will appear on the digital display.
- 2- Cycle the e-stop to clear by simply pushing it in and twisting it to the right to release it. The Transmitter process thru a self-diagnostic check during this time. Active toggle must be in the Inactive position.
- 3- Put toggle switch to the Active position. The transmitter is now online. All controls are active.

TURNING ON/ OFF THE MASTER BRAKES-



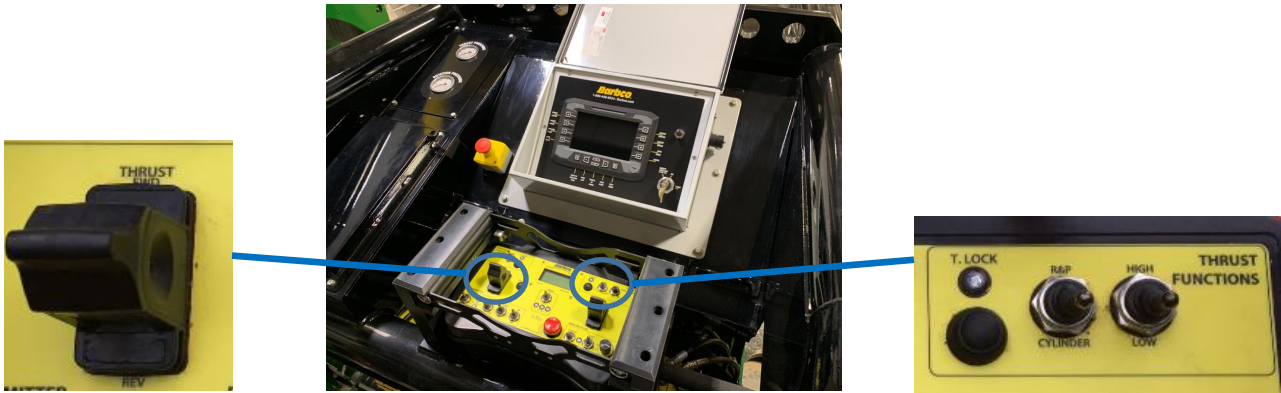
To enable the thrust or rotation functions you must first release the brakes. Push the soft keys marked Thrust Brake or Rotation Brake to release. The icon will turn from red to white and the function be available on the transmitter.

ROTATION CONTROL- The transmitter is ON and Active. The Master Rotation Brake is off.



- 1- Paddle Operation- once the master break is off the Rotation paddle is live. Push the paddle forward for clockwise rotation. Pull the paddle back for counter-clockwise rotation. The paddle delivers variable control of the spindle.
- 2- Rotation Speed- three speed control of the spindle:
 - a. Low Speed Range- will produce 100% of rotary torque. Contingent on value placed in the rotation limiter. See *Pressure Limiters*. Allows for 30-40% of max speed.
 - b. Medium Speed Range- will produce 50-60% of rotary torque. Allows for 60-70% of max speed.
 - c. Hi Speed Range- will produce 30-40% of rotary torque. Allows for 100% of max speed.
- 3- R Lock- see “Auto Run”

THRUST CONTROL- The transmitter is ON and Active. The Master Thrust Brake is off.



1- Thrust Paddle Operation- once the master break is off the Thrust paddle is live. Push the paddle forward for forward travel. Pull the paddle back for reverse travel. The paddle is proportional, the farther you push or pull it, the faster the drill will travel.

2- Thrust Setting toggle- choose between Cylinder Thrust and Rack and Pinion.

INTERLOCK-

Cylinder Thrust will not be allowed if the push bar dogs are not completely extended or retracted from the track.

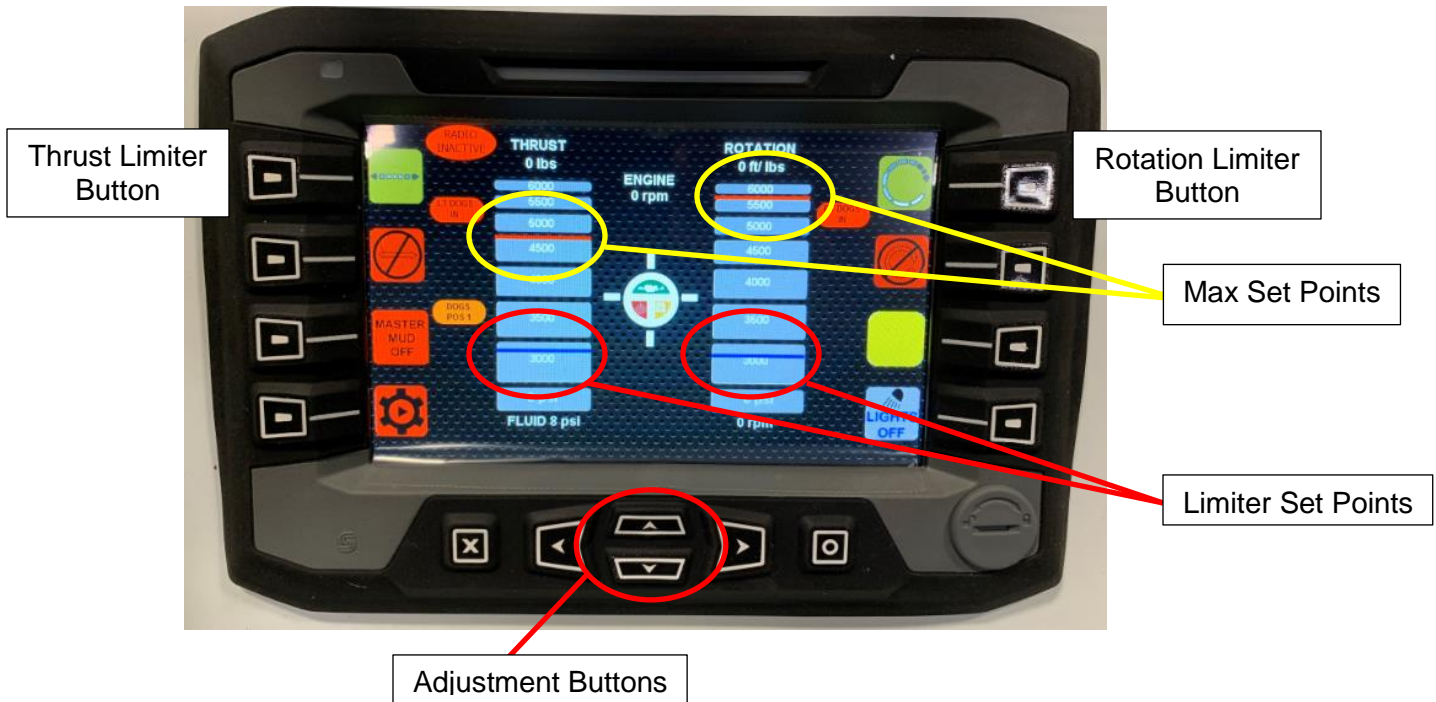
Pack and Pinion Thrust will not be allowed if the dog are not retracted from the track.

3- Thrust Speed- two speed control in rack and pinion mode only:

- a. Low Speed Range- will produce 100% of the rack and pinion power. Contingent on value placed in the rotation limiter. See *Pressure Limiters*. Allows for 50% of max speed.
- b. Hi Speed Range- will produce 50% of the rack and pinion power. Allows for 100% of max speed.

4- T Lock- see "Auto Run"

PRESSURE LIMITERS- The transmitter is ON and Active. Master Thrust and Rotation Brakes are off.



The Pressure Limiters are always on when the drill is active. Limiter set points are displayed with the blue bars on the pressure scales as shown above. Maximum pressure are identified by red bars.

1- Adjusting the thrust and rotation set points-

- a. Push the Rotation Limiter Button in and hold.
- b. Use the Up and Down Arrow Buttons at the bottom of the display in the corresponding direction until the desired pressure setting is obtained.
- c. Pressure limiters are set.
- d. To set the thrust limiter repeat steps a. thru c.

AUTO RUN- The transmitter is ON and Active. Master Thrust and Rotation Brakes are off.



- 2- Turning on Auto Run- Push the master button on the display. The Auto Run icon will turn green and the option of Auto Ream will appear next to the Auto Mode button.
- 3- Selecting Auto Mode- Push the Auto Mode button to select the Auto Ream function.
NOTE- the T Lock and R Lock lights on the remote will illuminate, indicating the auto functions are active.
- 4- Verify Set Points- Confirm Pressure limiter set points are adjusted as needed. See “Pressure Limiters”.
- 5- Locking in the thrust and rotation-



CAUTION! EQUIPMENT HAZARD! Always lock in the rotation paddle first. To avoid burring the cutting head into the formation downhole.

- a. Rotate the spindle by pushing the Rotation Paddle in the forward direction until the desired speed is obtained.
- b. Operator will push and hold the R Lock button on the remote. The R Lock LED will begin to flash. The Rotation paddle is now locked in.
- c. Release the R Lock button.
- d. Repeat steps a. thru c. for the thrust function.

NOTE- Operator can choose one or both drilling functions to lock in as desired.

NOTE- Stop/ remove rotation lock by moving the rotation paddle. If rotation is stopped then thrust, if locked in will also stop.

Stop/ remove thrust lock by moving the thrust paddle. Rotation will continue to operate.

OPERATION OF THE FRICTION BRAKE:

The TriBor drill is equipped with a friction brake. The brake is designed to drag against the track rail to help prevent a runaway condition as the assembly can be set up on a positive or negative grade up to 12%.



CAUTION! EQUIPMENT HAZARD! The friction brake is not to be used as a safety brake. It may or may not stop the movement of the drill unit when set up on a grade. Turn the master thrust brake ON before walking away from the unit. See- *“Turning ON/ OFF the Master Brake”*



The brake is controlled thru programming. ON and OFF cycles are dependent on the thrust mode selected.

- 1- Rack and Pinion- The friction brake is ON when the thrust paddle is in the neutral position only. Automatically turn OFF when the thrust paddle is use to move the drill.
- 2- Cylinder Thrust- The friction brake is ON when the Push Bar Dogs are completely retracted into the Push Bar. Automatically turned OFF when the dogs are extended into the track rail.

Adjusting the break pressure-

- 1- Put the drill unit in cylinder thrust mode. See *“Thrust Control”*
- 2- Retract the dogs into the Push Bar. Friction brake will come ON and the set pressure will be displayed on the hydraulic gauge.
- 3- Turn the pressure adjustment knob clockwise to increase the pressure. Turn the knob counter-clockwise to decrease the pressure.

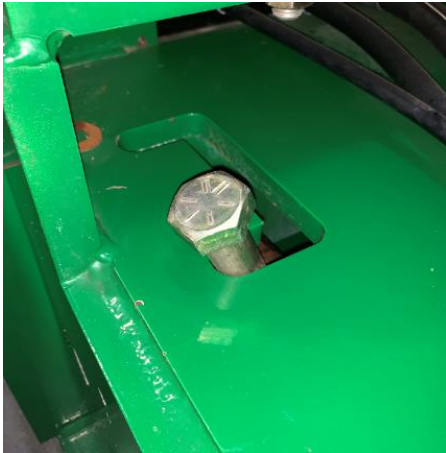
NOTE- You may need to have the brake OFF to make an adjustment.

OPERATION OF BREAKOUT ASSEMBLY:

- 1- Make sure the Breakout assembly is properly locked into the track. All four pins are engaged.
- 2- Connect all umbilical hoses between the power pack and breakout assembly.



CAUTION! EQUIPMENT HAZARD! To start the engine either all the hoses must be connected or all the hoses must be disconnected. Never make umbilical connections when the engine is running.



- 3- The front and rear clamping valve sections have friction hold capabilities. This allows for constant pressure against the tool joints.



Adjusting the clamping pressure-

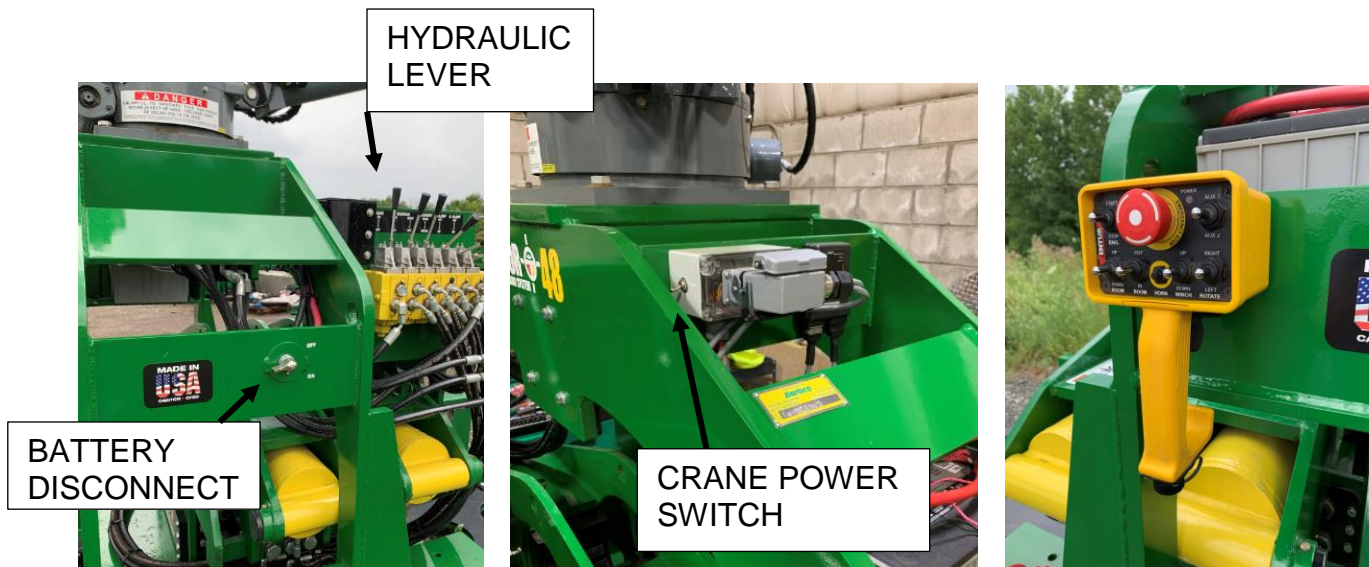
- 4- Close one of the clamp sections. The set pressure will be displayed on the hydraulic gauge.
- 5- Turn the pressure adjustment knob clockwise to increase the pressure. Turn the knob counter-clockwise to decrease the pressure.

NOTE- You may need to place the valve in the neutral position to make an adjustment.

OPERATION OF CRANE ASSEMBLY:



The TriBor has an optional full function crane assemble. Unit is located above the breakouts. Perfect for loading and unloading drill pipe or pilot rod.



Powering up the crane- The umbilicals are connected and the engine is running.

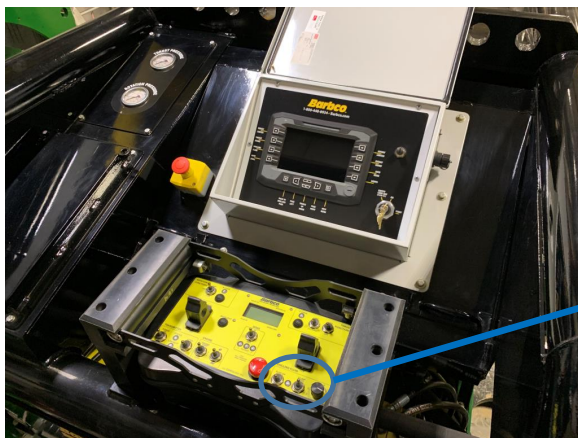
- 1- Turn the battery disconnect switch to the ON position.
- 2- Turn the crane power switch to the ON position.
- 3- Turn the hydraulic valve for the crane to the ON position.
- 4- Push the e-stop in and then twist it clockwise to release it. This will boot up the remote.

The crane is ready to operate.

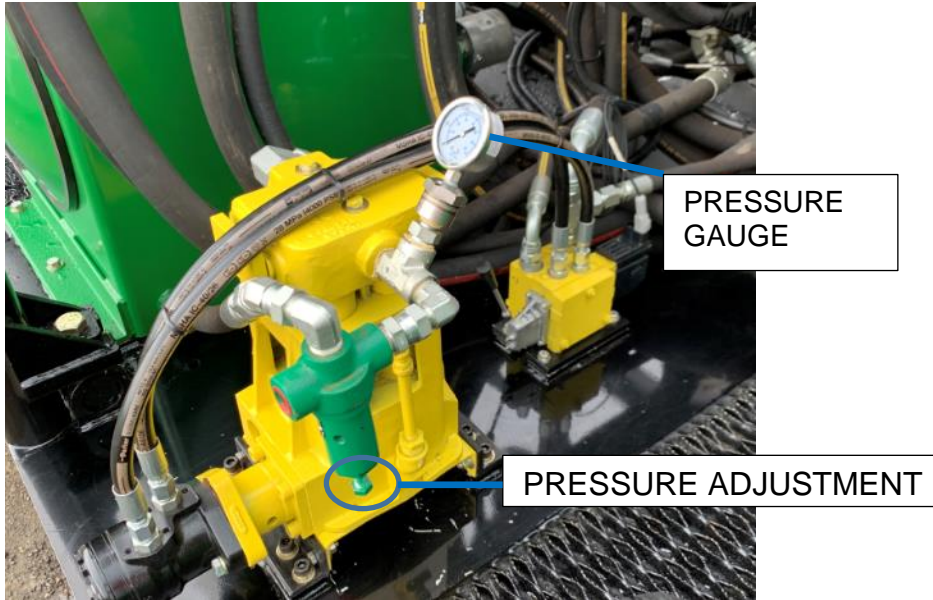
OPERATION OF THE DRILLING FLUID SYSTEM: the remote must be ON and ACTIVE for the drilling fluid functions to work.



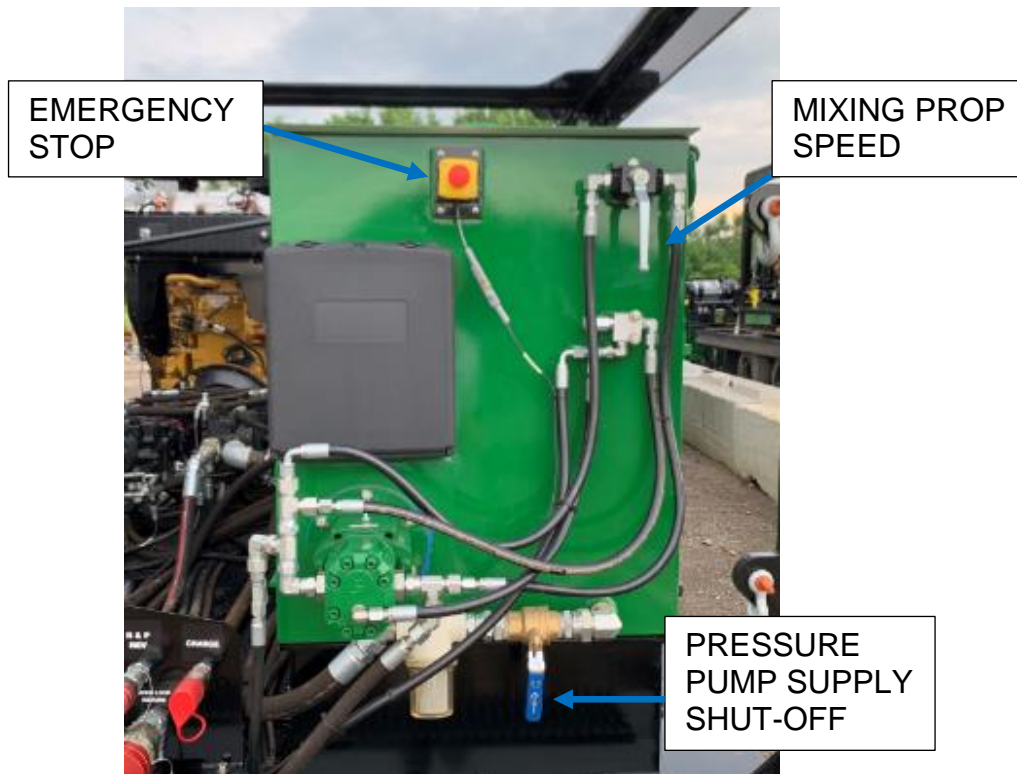
- 1- Turn the drilling fluid system ON by pushing the master button on the display. The icon will turn from red (OFF) to green (ON). The blue light on the transmitter will turn ON.
- 2- The controls on the transmitter are now ready to use.



- 3- Controls on transmitter- Make sure the fluid tank is full and the fluid supply valve is open.
 - a. Fluid Pump ON/ OFF toggle powers the valve that controls the pressure pump.
 - b. Fluid Rheostat controls the gallons per minute that the pressure pump delivers.
 - c. Dump toggle releases the pressure in the fluid course or drill rod prior to breaking a tool joint.



- 4- The fluid pump is located on the power pack. Increase the pressure by screwing the ½" bolt CW. Turn the bolt CCW to decrease the pressure.



- 5- Fill with fresh water.
 6- Open the fluid supply valve.
 7- Pour additives into the hopper assembly under the tank lid. Adjust the mixer prop speed as needed.

GLOSSARY OF TERMS

ADAPTER A short section of tubing with a male hex connector on one end and a female hex connector on the opposite end used to increase or decrease hex sizes and transmit power from the front drive to the auger and cutting head.

ADVANCE The motion of the machine in a direction toward the face wall of the entrance pit.

AUGER A flighted drive tube having hex couplings at each end, to transmit torque to the cutting head and transfer spoil back to the machine.

AUGER DRIVE The female hex connector that is bolted directly to the gearbox of the boring machine and transmits power from the machine to the auger.

AUGER STRING A series of auger sections coupled together to form the length of the bore.

BACKSTOP Reinforced area of the entrance pit directly behind the track and push plate.

BAND A ring of steel welded at or near the front of the lead section of casing to cut relief and strengthen the casing.

BASE PUSH UNIT The bottom section of a split boring machine containing the thrust cylinders and push bar transmitting machine thrust to the push bar and casing pusher.

BENTONITE A colloidal clay sold under various trade names that forms a slick slurry or gel when water is added. Also known as driller's mud.

BITS Replaceable cutting tools on the cutting head.

BORING The dislodging or displacement of spoil by a rotating auger or drill string to produce a hole called a bore.

BORING MACHINE A mechanism to drill earth.

BORING PIT see **ENTRANCE PIT**

BUSHING A female hexagonal shaped socket machined to a close tolerance to accept a male hexagonal shaped pin of a comparable size.

CAM FOLLOWER A small diameter bearing wheel assembly.

CARRIAGE The mechanical part of a boring machine that includes the engine or drive motor, the drive train, push bar and hydraulic cylinders.

CASED BORING The process of installing casing in the earth while boring.

CASING The steel pipe that is thrust into the earth by the boring machine.

CASING ATTACHMENT A circular mechanism to provide axial and lateral support of a smaller diameter casing than that of the casing pusher.

CASING PUSHER The front section of a boring machine that distributes the thrusting force of the hydraulic cylinders to the casing and forms the outside of the spoil ejection system.

CENTERLINE The vertical distance between the center of the front drive and the ground plane.

CLEANING An action of a boring machine that occurs when the auger is rotating while axially stationary.

CLUTCH A mechanical device that engages or disengages rotary torque from a power source.

COLLARING The initial entry of casing or a cutting head into the earth.

CONTROL LEVER A handle that activates or deactivates a boring machine function.

CRADLE MACHINE A boring machine typically carried by another machine that uses winches to advance the casing.

CROSS MEMBERS The lateral supports under the track.

CUTTING HEAD An extension of the auger containing one or more bits to cut or dislodge earth.

DEAD MAN A fixed anchor point used in advancing a saddle or cradle type boring machine.

DEWATER Any method used to lower the water table in the vicinity of the bore.

DOG's Movable protrusions in the push bar that engage holes or blocks in the track.

DRILL STRING System of rods used in conjunction with a cutting bit or compaction bit attached to the front drive.

DRIVE CHUCK The female hex connector located within the casing pusher.

ENTRANCE PIT An opening in the earth of specified length and width for placing the machine on line and grade.

ESTOP (EMERGENCY STOP) A red manually operated push button that, when activated, stops all functions of the machine.

EXIT PIT An opening in the earth located at the expected exit or end of the bore.

EXTENSION TRACK An additional section of track used in front of the master track.

FACE Wall of the entrance pit into which the bore is made.

FEMALE HEX CONNECTOR A hexagonal shaped socket.

FINAL DRIVE The final reduction unit in the drive line.

FLIGHT The spiral plates surrounding the tube of an auger.

FORWARD The clockwise rotation of the auger as viewed from the machine end.

FREE BORING Boring without casing.

FRONT DRIVE The female hex connector bolted directly to the gearbox of the boring machine and transmits power from the machine to the auger.

GRADE The specified rise or fall of the proposed bore from a horizontal plane.

GROUND PLANE The surface upon which the machine is placed.

GROUT A material such as a cement slurry, sand pea gravel that is pumped into voids.

GUARD A protective device fitted to the machine to minimize the possibility of inadvertent contact with hazards.

HELICOID A section of auger flight.

HEXAGONAL Of or having six sides or angles.

HOLD DOWN A hinged or removable assembly that secures the boring machine components together.

HOOK ROLLERS Devices used to latch or anchor the boring machine to the track.

INADVERTENT CONTACT Contact between a person and a hazard resulting from the person's unplanned actions during normal operation or servicing the machine.

INVERT The elevation at the bottom of the casing.

MALE HEX CONNECTOR A solid steel hexagonal pin machined to a close tolerance to engage a female hexagonal shaped socket of comparable size.

MASTER CASING PUSHER see **CASING PUSHER**

MASTER TRACK The rear most section of track including the push plate used to stage the boring machine and transmit the machine thrust into the thrust block.

MIXED FACE A soil condition that presents two or more different types of material in the path of the bore.

OPEN CUT The method of digging a trench.

OPERATOR PRESENCE CONTROL A control or mechanism designed so that operator presence is necessary to activate a specific function.

PIERCING TOOL An impact type of compacting device for boring.

PILING Rigid supports, driven vertically to provide wall support in the pit.

PIPE PUSHER A mechanical device used to produce a bore by means of compaction without rotation or impact.

POWER PACKAGE The engine and drive line section of a split boring machine or the remote engine and hydraulic pumps of a power unit.

PUSH BAR A manual or remote operated locking mechanism that engages stations in the track to provide a thrusting base for advancement and retraction of the machine.

PUSH PACKAGE see **BASE PUSH UNIT**

RECEIVING PIT see **EXIT PIT**

RETRACT The motion of the machine away from the face of the entrance pit.

REVERSE The counterclockwise rotation of the auger as viewed from the machine end.

SADDLE A vertical support mechanism to hold the casing in position while starting (collaring) the bore.

SADDLE MACHINE see **CRADLE MACHINE**

SAFETY SIGN A notice attached to the machine which advises the nature and severity of a potential hazard which can cause injury or death. It can also provide instructions to reduce or eliminate the hazard.

SENSING HEAD A small device used in conjunction with a water level and mounted to the lead section of casing to provide constant monitoring of casing elevation.

SHEET PILING see **PILING**

SHIELD A guard that, alone or with other parts of the machine, provides hazard protection from the area covered.

SHORING see **PILING**

SKIN FRICTION Resistance to thrust caused by earth pressure around the casing.

SOCKET see **FEMALE HEX CONNECTOR**

SPLIT DESIGN A boring machine having the capability of being broken down into two or more elements to reduce the lifting weight.

SPOIL Earth, rock and the like removed when making a bore.

SPOIL CHAMBER The inside area of the casing pusher containing the spoil ejectors.

SPOIL EJECTOR A set of paddles, rotating in close proximity to the inside of the casing pusher that extrude spoil from the spoil chamber.

SPOIL EJECTOR DOOR A door that partially or completely closes the spoil ejector opening of the casing pusher.

STEERING HEAD A movable lead section of casing that can be adjusted to steer the bore on a proposed grade.

SUMP A depress installation of a pump for water removal.

TEETH see **BITS**

TEST BORE Probing by auger or coring tool, usually vertically, at the site to determine the earth conditions.

THRUST BEARING An external bearing used to isolate the final drive from the thrusting force of the machine.

THRUST BLOCK A section of steel plate, concrete or a combination of steel and concrete located between the master track push plate and rear pit wall to provide stability and accept the thrusting force of the boring machine.

THRUST PACKAGE The bottom section of a split boring machine containing the cylinders and push bar.

TORQUE The measure of the rotary force available at the front drive.

TORQUE LIMITER A rotary slip clutch used to protect the final drive.

TRACK A set of longitudinal rails mounted on cross members that support and guide a boring machine.

TRACK BRAKE A mechanical device to provide a limited resistance to movement between the machine and the track.

TRACK PINS Steel pins to be driven through holes in the track into the base of the pit.

TRACK ROLLER see **CAM FOLLOWER**

TRANSMISSION A gear reduction unit located between the power source and final drive.

TRENCH BOX A pre-constructed set of side plates and adjustable cross members to prevent the walls of the pit from collapsing.

TWO SPEED CONTROL A hydraulic valve that increases the flow of oil to the cylinders to provide rapid low power motion of the machine.

UPSET The inadvertent action of a boring machine that rotates the machine and track from its normal upright position to another position.

UNDERGROUND UTILITY Active or inactive services or utilities already in the ground in the area of the proposed bore.

WATER LEVEL An instrument that uses a tube filled with water to indicate the elevation of the lead section of casing.

WATER TABLE The elevation of the ground water.

WING CUTTERS Appendages on cutting heads that will open to increase the cutting diameter of the head when turned in a forward direction, and close when turned in a reverse direction.

WIPERS see **WING CUTTERS**



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