

Auger Boring Machine 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

ABM Operation Manual

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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 horizontal earth boring 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 horizontal earth boring 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 horizontal earth boring 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.

Your Machine Serial Number




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 puestos. •Conozca y obedezca todos los códigos y regulaciones.

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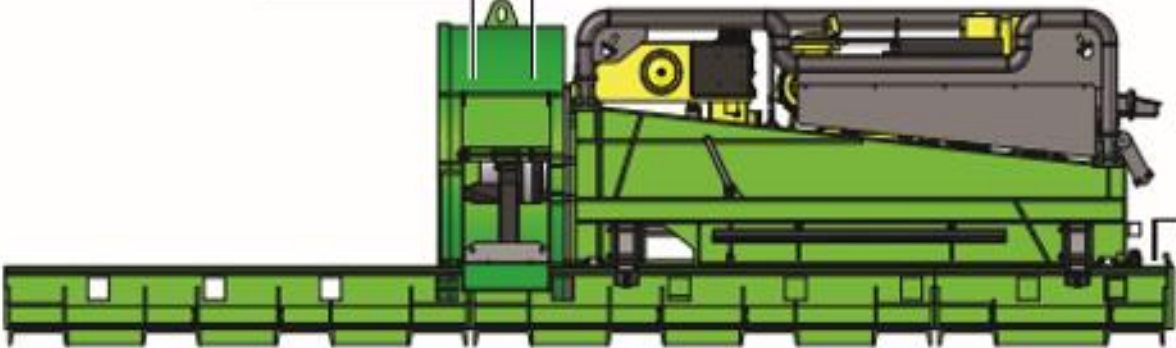
<p>⚠ DANGER</p> <p>Free boring and/or augering in previously installed casing can cause machine upset leading to death or serious injury.</p> <p>Use this machine for cased bores only.</p>		<p>⚠ PELIGRO</p> <p>La libre perforación o barrenado en una cubierta previamente instalada puede hacer que la máquina se desestabilice, lo que puede ocasionar la muerte o lesiones graves.</p> <p>Utilice esta máquina para perforados cerrados solamente.</p>
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<h2>START UP PROCEDURES</h2>	<h2>OPERATION PROCEDURES</h2>
<p>TO START:</p> <ol style="list-style-type: none"> 1. Turn the battery disconnect to the on position. 2. Clear all E-STOPS by twisting the red mushroom buttons counter clockwise. 3. Make sure the safety pull tether is connected to your belt and plugged in. 4. Turn the lock out key to the START position until the engine starts. <p>START FAULT: If fault should occur during engine start, cycle any E-STOP to clear.</p>	<p>1. Manual Mode: Press the manual mode button on the drillers screen. Throttle control buttons will appear on the right side of the screen. Use the hydraulic levers to operate all functions.</p> <p>2. Remote Mode: Manual mode must be OFF. Turn the transmitter on by pushing the POWER toggle to the ON position. Cycle the E-STOP on the transmitter to boot up the remote. To use the functions on the remote you must first push the ACTIVE button. ACTIVE button will time out after 60 seconds of non-use.</p> <p>LIMITING THRUST FORCE: Pressure limiter is located on the bottom right side of the drillers screen. To adjust simply push and hold the button beside the icon while using the up and down keys to raise or lower the set point value.</p>
<h2>SHUTDOWN PROCEDURES</h2>	<p>⚠ CAUTION</p> <p>Never turn off the engine during the regen cycle. Allow complete regen before shutting down the engine.</p>
<p>TO STOP:</p> <ol style="list-style-type: none"> 1. Turn the lock out key to the OFF position. 2. Turn the transmitter POWER toggle to the OFF position. 3. When the Def tank completes its purge cycle (indicated by the yellow light turning off) turn the battery disconnect to the OFF position. 	
<p>Barbco 1-800-448-8934 • Barbco.com</p>	

SAFETY STICKER LOCATION

⚠ DANGER		⚠ PELIGRO
Rotating auger and cutting head can cause death or serious injury. STAY AWAY. Do not wear loose clothing.		El taladro giratorio y el cabezal de corte pueden ocasionar la muerte o lesiones graves. MANTÉNGASE ALEJADO. No utilice ropa suelta.

⚠ DANGER		⚠ PELIGRO
Rotating blades will cause death or amputation. Keep door closed. Stay away from side of machine.		Las cuchillas giratorias pueden ocasionar la muerte o amputaciones. Mantenga la puerta cerrada. Manténgase alejado del lado de la máquina.



⚠ CAUTION		⚠ ATENCIÓN
Pinch point may cause serious injury. Stay clear of moving push bar.		Los puntos de atrapamiento pueden ocasionar lesiones graves. Manténgase alejado de la barra de empuje en movimiento.

⚠ WARNING	⚠ ADVERTENCIA
<p>TO AVOID DEATH OR SERIOUS INJURY, Read and understand operator manual and safety signs carefully before starting operation. Use only all personnel trained and follow safe operating procedures.</p> <p>Stop engine before: - Adjusting speed operator seat - Working on casing - Working on drill bit - Doing any maintenance</p> <p>Always wear safety harness - Always secure engine or casing before lifting - Use seat safety line, step by step - Always work with at least a second operator and a trained helper</p> <p>Always stop engine without warning while in operation. - Always proceed in full throttle system before starting - Use seat operator with safety harness. - Always and always all safety and regulations</p>	<p>PARA EVITAR LA MUERTE O LESIONES GRAVES, Lea y comprenda el manual de operación y los señales de seguridad cuidadosamente antes de comenzar la máquina. Utilice solo el personal entrenado y siga todos los procedimientos operativos de seguridad.</p> <p>Detenga el motor antes de: - Ajustar la altura del operador - Trabajar en la cubierta - Trabajar en el fondo de la cava - Hacer mantenimiento</p> <p>Siempre desenganche los cables de seguridad - Siempre asegure el motor o la cubierta antes de levantar - Siempre use cinturón de seguridad - Siempre trabaje con al menos un operador y un operador capacitado - Siempre trabaje con al menos un operador capacitado - Siempre trabaje con al menos un operador capacitado - Siempre trabaje con al menos un operador capacitado</p> <p>Al estar la máquina en la posición de trabajo, antes de salir - Siempre trabaje - Siempre trabaje la máquina en la posición de trabajo - Siempre y siempre trabaje con al menos un operador</p>

⚠ DANGER		⚠ PELIGRO
<p>Free boring and/or augering in previously installed casing can cause machine upset leading to death or serious injury. Use this machine for cased bores only.</p>		<p>La libre perforación o barrenado en una cubierta previamente instalada puede hacer que la máquina se desestabilice, lo que puede ocasionar la muerte o lesiones graves. Utilice esta máquina para perforados cerrados solamente.</p>



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<p>Free boring and/or augering in previously installed casing can cause machine upset leading to death or serious injury. Use this machine for cased bores only.</p>		<p>La libre perforación o barrenado en una cubierta previamente instalada puede hacer que la máquina se desestabilice, lo que puede ocasionar la muerte o lesiones graves. Utilice esta máquina para perforados cerrados solamente.</p>

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

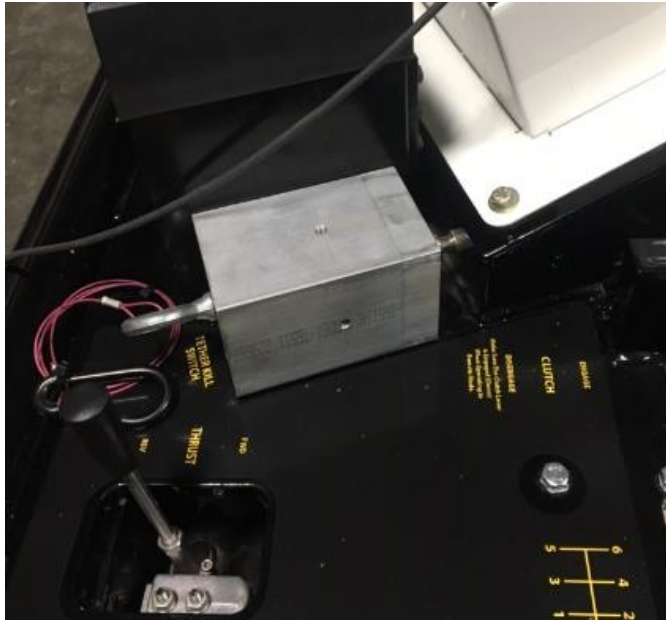
1. Must be at least 18 years old
2. Is physically and mentally capable
3. Has been trained in the operation and maintenance of the equipment
4. Has demonstrated capabilities (to a supervisor) to operate and maintain the equipment
5. Understands the controls and functions of this Barbco horizontal earth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

SAFETY COMPONENT IDENTIFICATION

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.



TETHERED EMERGENCY STOP- The carabiner attaches the operator to the kill switch located on the operators console of the Auger Boring Machine. If the tether is pulled the plug assembly will disengage from the body of the kill switch. The clutch will disengage and the engine will shut down.



ROLLOVER SHUT DOWN SWITCH- Senses forces on the Auger Boring Machine, monitors the angle and shuts down the engine while disengaging the clutch. All events are logged into memory.



RED MUSHROOM E-STOP BUTTON- Puts the Auger Boring Machine into a controlled, safe state. One on each corner of the machine. Engine will not turn off.



WIRELESS REMOTE CONTROL- The wireless remote allows the operator control of the Auger Boring Machine from a safe distance in or out of the pit.



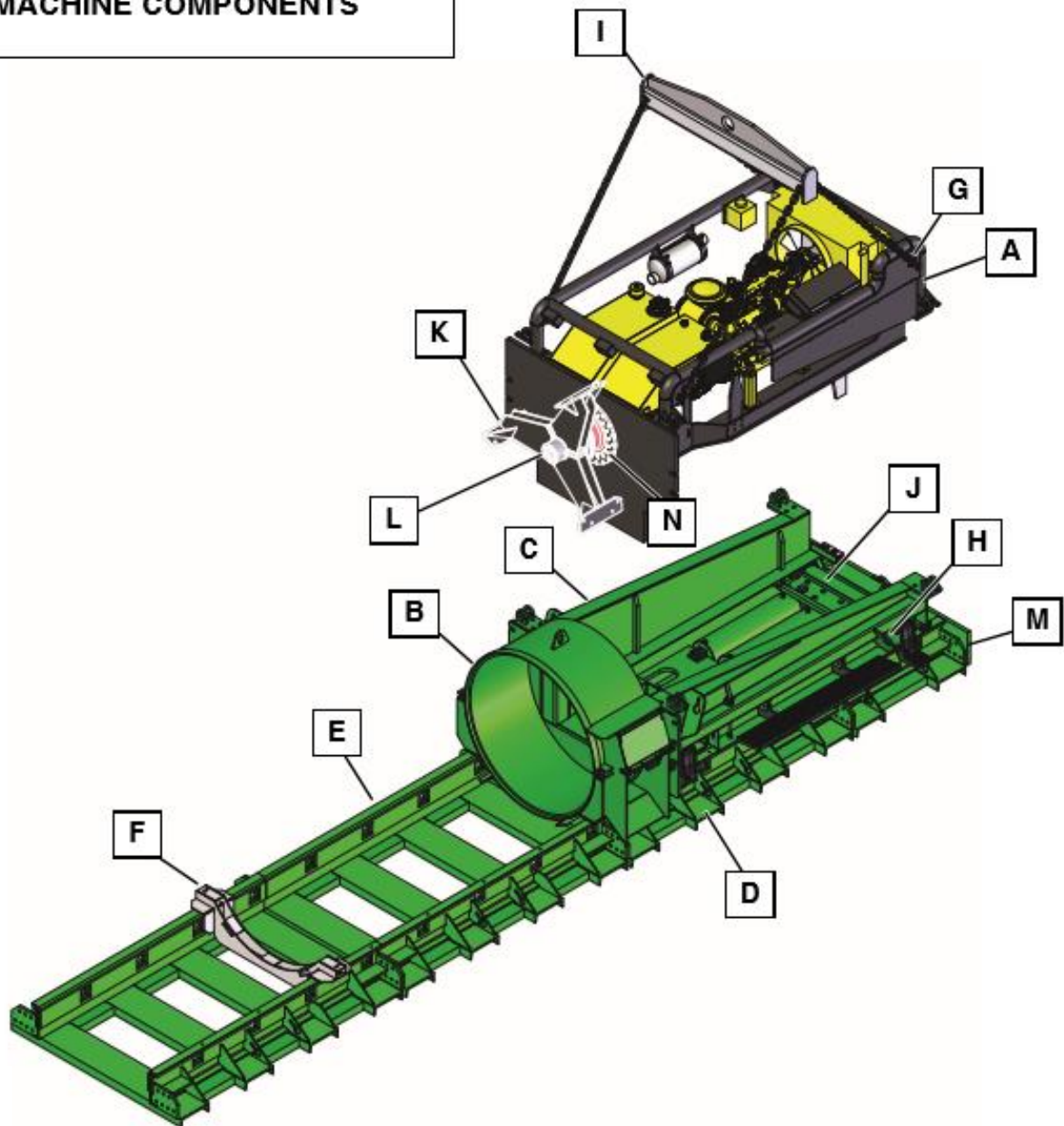
MASTER PUSHER SPOIL DOOR- Provides a shield to protect the operator from the rotating spoil ejector paddles. Keep door down/ shut during auger operation.



ROTARY BRAKE- When ON, and the clutch is disengaged. The brake keeps the spoil ejectors from rotating

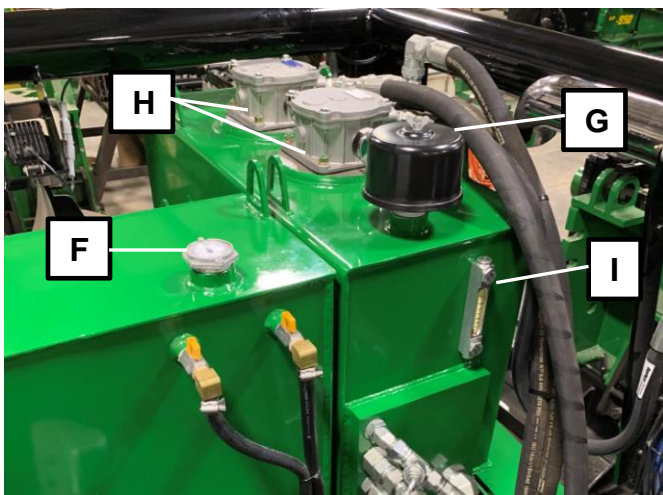
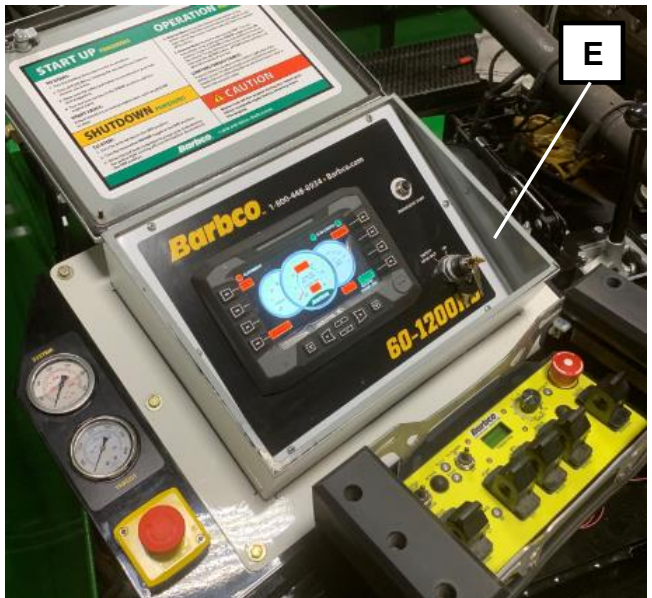
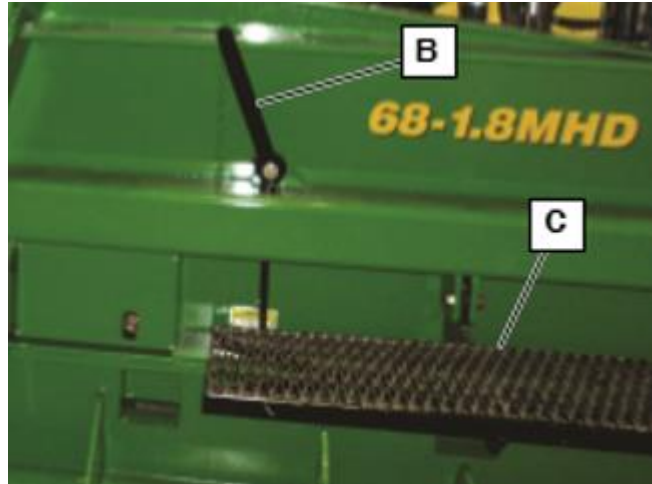
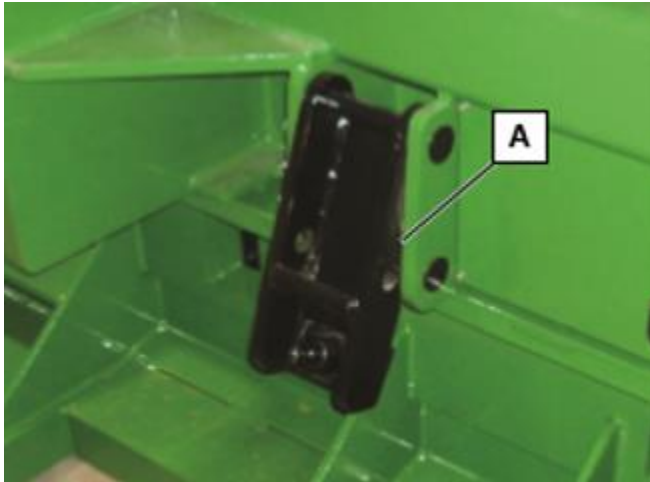
COMPONENT DISCRIPTION

MAJOR MACHINE COMPONENTS



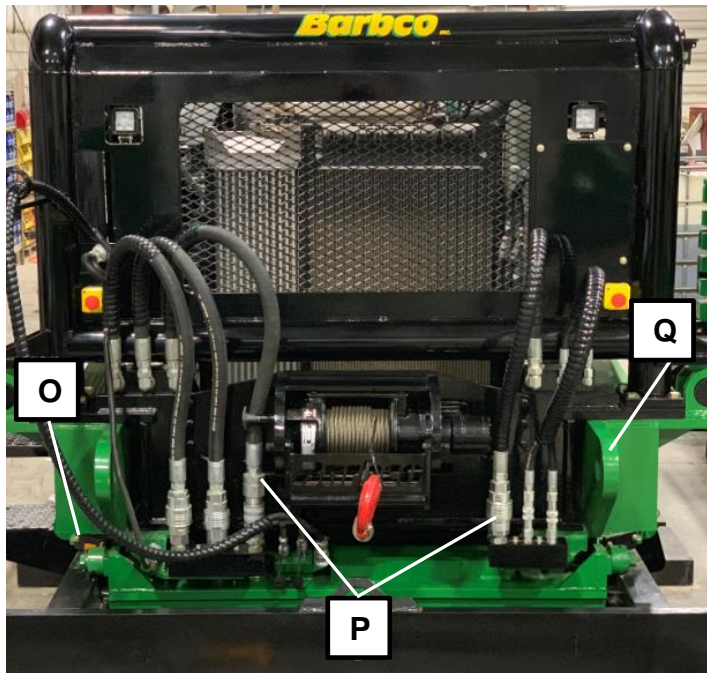
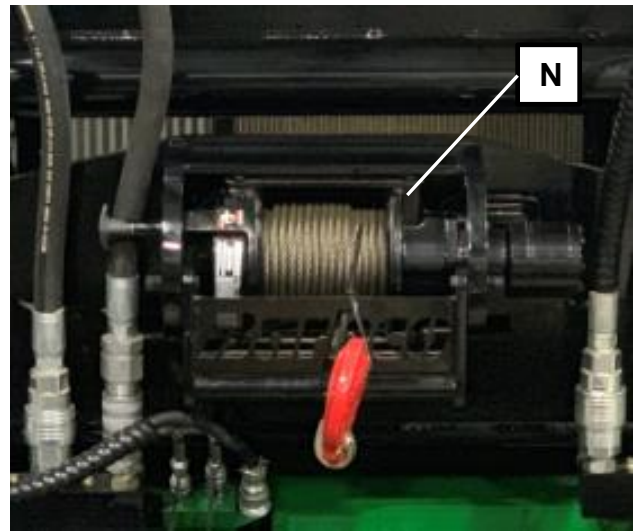
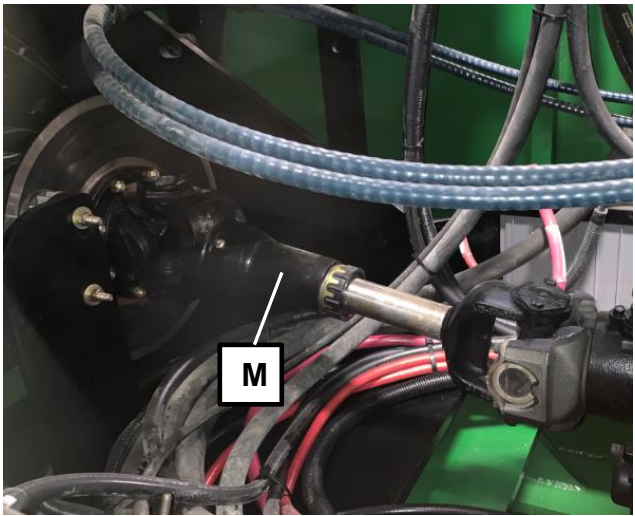
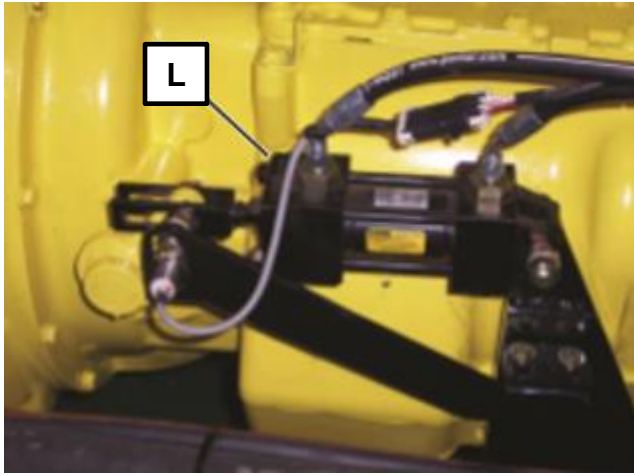
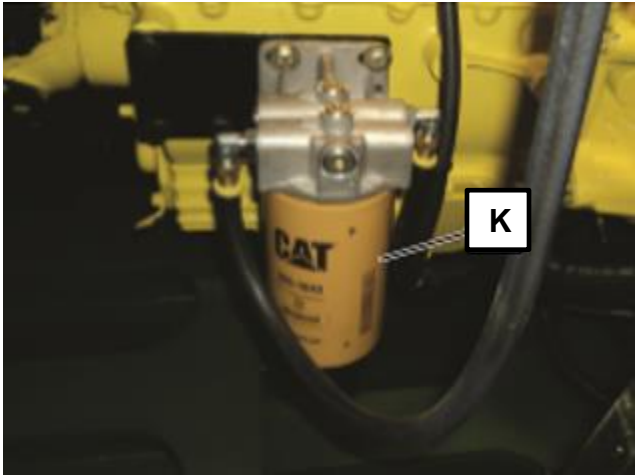
DESCRIPTION OF MAJOR MACHINE COMPONENTS OF HORIZONTAL EARTH BORING MACHINES

- A- POWER PACKAGE:** This portion of the machine contains the engine, clutch, transmission and torque hub. It also includes the fuel tank, hydraulic oil tank, filters, hydraulic pumps and operating controls, final drive and spoil paddles.
- B- MASTER CASING PUSHER:** Contains the spoil chamber, spoil door and casing attachment, as needed for smaller diameters of casing.
- C- BASE PUSH UNIT:** Included in this section are the base frame unit, thrust cylinders, push bar, hook rollers, operator's platform, winch and optional Rapid Travel Systems.
- D- MASTER TRACK:** This section of track is furnished with the machine and is always used as the rearmost track section. It has a thrust plate bolted to the end of the track. The master track is 18 ft. long and is comprised of a 10 ft. standard extension track and a 8 ft. pup track.
- E- EXTENSION 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 added to allow for the installation of longer casing sections.
- F- MASTER SADDLE:** Apparatus which rests on the track in front of the boring machine to cradle the casing and auger.
- G- LIFT POINTS (4) – POWER PACKAGE:** Used to attach lift sling chains and raise or lower the power package **ONLY! NEVER** use these points to lift the entire machine.
- H- LIFT POINTS (4) – BASE PUSH UNIT:** Used to attach lift sling chains and raise or lower the entire machine or Base Push Unit only.
- I- LIFT SLING:** Lifting apparatus used to raise or lower the Power Package, Base Push Unit or entire machine.
- J- 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.
- K- SPOIL EJECTORS:** Paddles bolted to the front drive used to expel spoil from the spoil chamber out the master casing pusher spoil door for removal.
- L- FRONT DRIVE:** Driveline component used to transmit power from the Power Package to the auger string and cutting head.
- M- PUSH PLATE:** Solid Steel cross member bolted to the 8 ft. pup track to stabilize track assemblies and provide support for thrusting.
- N- GEARBOX:** Torque increaser, driveline component.



DESCRIPTION OF MINOR MACHINE COMPONENTS OF HORIZONTAL EARTH BORING MACHINES

- A- HOOK ROLLER:** Device located at each corner of the base push unit used to support and anchor the machine to the track.
 - B- TRACK BRAKE:** Holds the machine on the track when the engine is idling and when non-boring operations are being done. The track brake should be used whenever the operator is away from the operator's station.
 - C- PLATFORM STEP:** Operations area for the machine operator to control and monitor boring operations. It is intended for the operator only.
 - D- TANK CLEANOUTS:** Maintenance friendly cleanouts.
 - E- CONTROL PANEL:** Location of control and gauges convenient to the operator.
 - F- FUEL GAUGE:** Displays fuel level in fuel tank.
 - G- HYDRAULIC TANK BREATHER/FILTER:** Allows tank to breath without allowing contaminants in.
 - H- RETURN FILTER:** Traps particles in return oil.
 - I- TEMP. & HYD. FLUID LEVEL GAUGE:** Displays Hydraulic Oil Temperature and Reservoir Fluid Level.
 - J- RAPID TRAVEL SYSTEM:** Direct rack and pinion drive propelling the Auger Boring Machine up and down the track. Designed to pull casing.
- RETURN FILTER SERVICE INDICATOR (not shown):** Displays condition of filter.



DESCRIPTION OF MINOR MACHINE COMPONENTS OF HORIZONTAL EARTH BORING MACHINES (Continued)

K- FILTER: Fuel filter, water separator.

L- HYDRAULIC CLUTCH CYLINDER: Electric over hydraulic operated clutch systems, prevents the clutch from being dumped.

M- DRIVE SHAFT: Drive connection from transmission to gearbox.

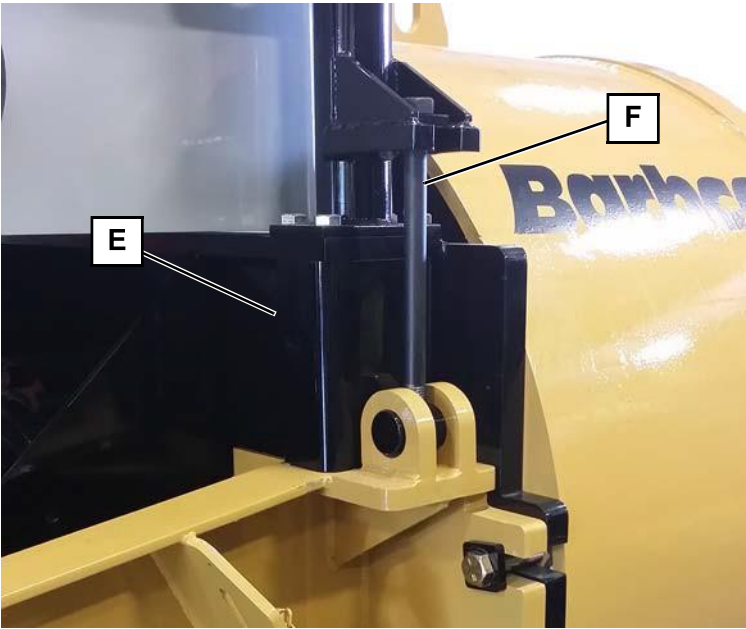
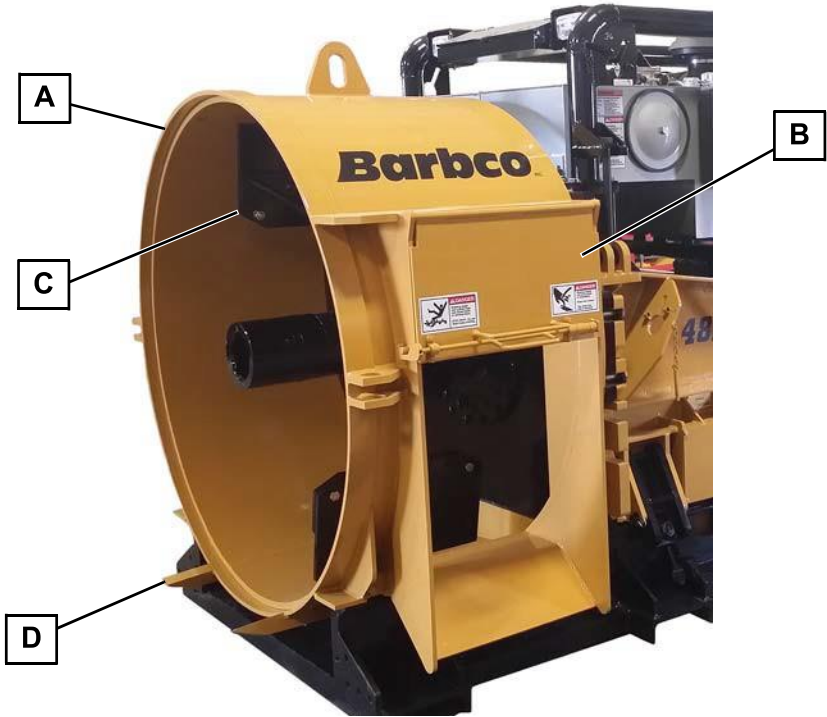
N- HYDRAULIC WINCH: Used to rapidly retract the machine once it is free from the auger string after pushing a piece of casing. It is NEVER to be used for any other purpose.

O- DOG ALIGNMENT SENSOR: LED illuminates when the push bar lines up with the dog holes in the track.

P- QUICK DISCONNECTS: Disconnects for all hydraulic components in the base unit.

Q- PULLING LUGS: Heavy duty pulling points built into the base unit. Designed for pulling casing.

OPTIONAL PUSH KIT An optional 60" Lift Kit is available for the Barbco 48 series horizontal earth boring machine. The kit increases the machine centerline for the installation of a 60" diameter master casing pusher and master saddle.



PUSH KIT COMPONENT DESCRIPTION

- A - MASTER CASING PUSHER:** Contains the spoil chamber, spoil door, and casing attachment as needed for smaller diameters of casing.
- B - LOCKING SAFETY DOOR:** Keeps door from flying open as rock and dirt are moved with spoil paddle.
- C - EXTENSION SPOIL PADDLES:** Bolt on plates which extend the original spoil ejectors to accommodate a larger spoil chamber.
- D - CASING GUIDES:** To help in casing installation.
- E - RISER BLOCKS:** Spacers affixed to each corner of the base push unit raising the machine centerline.
- F - SWIVEL HOLD DOWN EXTENSION BOLT:** Replaces the standard bolt to accommodate the increased centerline of the machine.
- MASTER SADDLE (not shown):** Apparatus which rests on the track in front of the boring machine to cradle casing and auger.
- BASE PUSH UNIT EXTENSION RAIL (not shown):** Tie the front and rear riser blocks together and extend the height of the base push unit providing more stability.

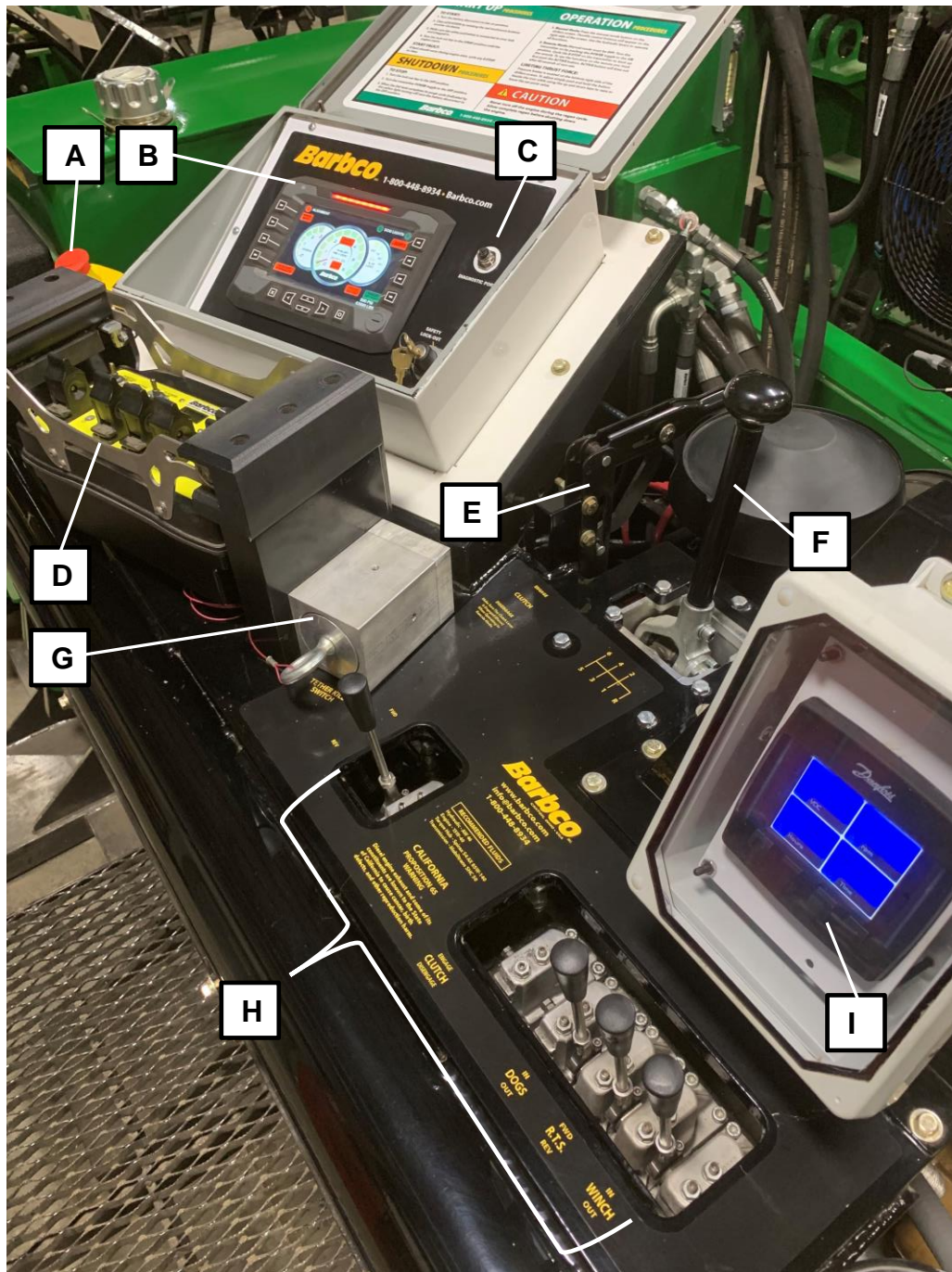
OPTIONAL VANDALISM SHIELD

An optional vandalism shield is available for the Barbco 48-1000 series horizontal earth boring machine. It is designed to protect the machine from damage from vandals when the equipment must be left unattended.

The Vandalism Shield will also help to keep the machine free of debris and protect it from inclement weather when the machine is not in use.



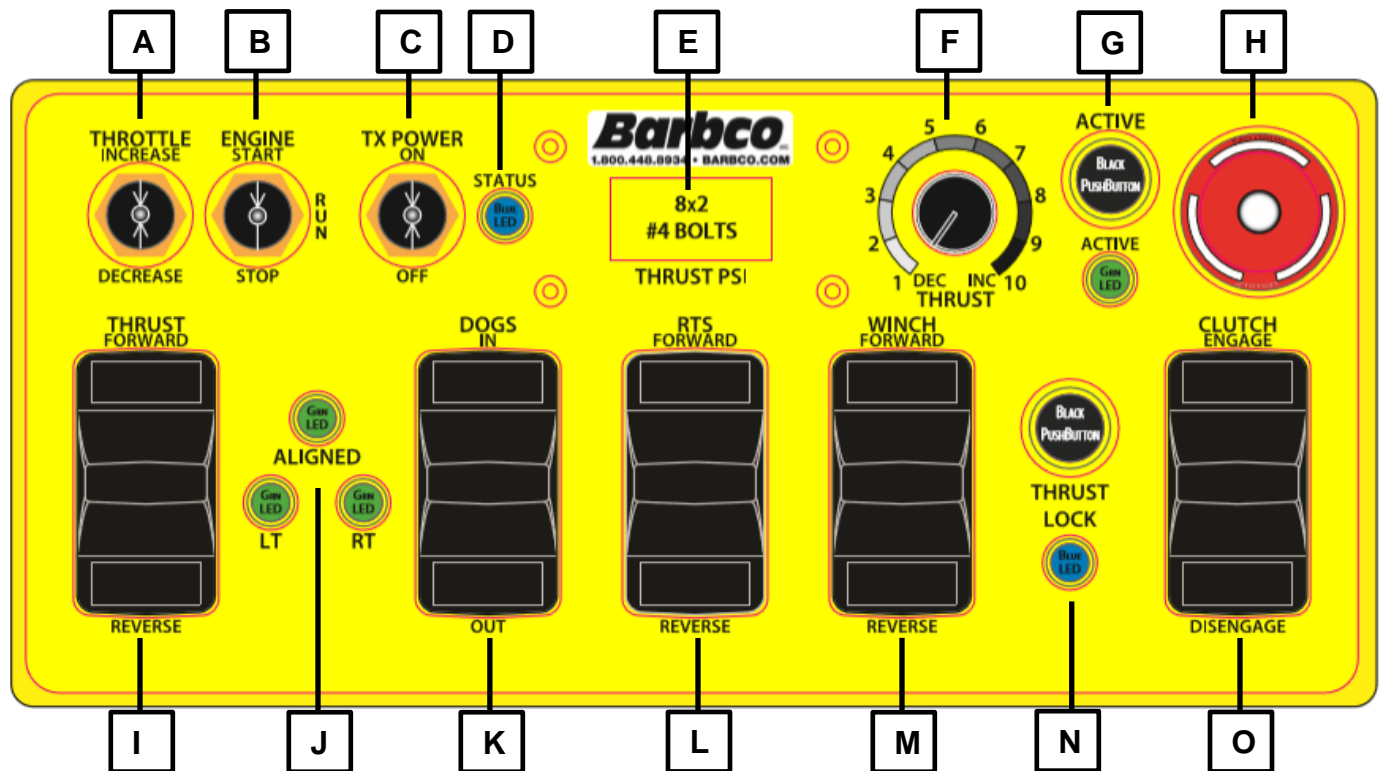
MAIN OPERATORS CONSOLE



- A- E STOP (EMERGENCY STOP SWITCH):** This is a red PUSH TO STOP control located at the operator's station and all four corners of the machine. The control must be pulled up/out to allow operation. The purpose of the switch is to place the machine in a controlled state in the event of an emergency. The hydraulic clutch will disengage and the hydraulic pump flow will divert to the hydraulic tank. When the E Stop is pushed. *See safety component identification.*
- B- DISPLAY:** Operator interface. Gives the operator feedback of all machine functions. *See screen descriptions.*
- C- DIAGNOSTIC PORT:** Barbco technician data port and program access.
- D- WIRELESS REMOTE:** allows the operator to control the machine from a safe distance. *See wireless remote identification.*
- E- CLUTCH ENGAGE/DISENGAGE LEVER:** Provides manual Engagement & Disengagement of clutch.
- F- REMOTE GEARSHIFT:** The shifting pattern is shown on a label in the operators view. Operation first through high gears will cause the auger to rotate FORWARD, or clockwise as viewed from the rear of the machine.
- G- TETHERED EMERGENCY STOP-** The carabiner attaches the operator and to the kill switch located on the operators console of the Auger Boring Machine. *See safety section.*
- H- MANUAL HYDRAULIC LEVERS:**
- Thrust- Controls the Forward and Reverse advancement of boring machines Clutch - Controls Engagement & Disengagement of Clutch.
 - Winch Lever - Controls operation of the hydraulic winch either in to wind the cable or out to unwind the cable.
 - RTS (Rapid Travel System) - Lever controls the Forward & Reverse rapid travel of boring machine. Push Bar Dogs will automatically retract in prior to propulsion. Designed for quick retraction of boring unit in track and pulling auger.
 - Dogs - Controls IN & OUT movement of push bar dogs.
- I- ENGINE DISPLAY:** Operator interface. Gives the operator feedback of all engine vitals.
- MAX THRUST SELECTOR, BALL VALVE (Not shown):** Controls the use of the center cylinder(s). This gives the operator more speed when more thrusting force isn't needed.

WIRELESS REMOTE IDENTIFICATION

Wireless control is the primary means of operation. This provides the most comfort and control of the auger boring machine. Allows the operator full control of the machine from a safe distance. Operation must always be done with full unobstructed site of the auger boring machine.



Transmitter can be docked at the operators console to allow full control of the auger boring machine from the operator's platform.

Transmitter Description:

- A- ENGINE THROTTLE TOGGLE:** When pushed the throttle will adjust in the corresponding direction.
 - B- ENGINE START TOGGLE:** After the transmitter is booted up the engine can be started and stopped thru the toggle.
 - C- POWER TOGGLE:** Turns the power to the transmitter ON/ OFF
 - D- STATUS LIGHT:** Illuminates when the transmitter is turned on. Blinking pattern changes with transmitter state.
 - E- DIGITAL READOUT:** displays the current thrust pressure.
 - F- THRUST SPEED DIAL:** Allows infinite control of the forward thrust speed. Reverse thrust speed is always set at full speed.
 - G- ACTIVE BUTTON & LIGHT:** To use the functions on the remote you must first push and hold the active button for 3 seconds. Active light will time out after 60 seconds.
 - H- EMERGENCY STOP:** Energize the emergency stop system. *See safety component identification.*
 - I- THRUST PADDLE:** Proportional forward and reverse control of the thrust cylinders in the base.
 - J- DOG LIGHTS:** Lights illuminate when the pushbar is horizontally aligned with the dog holes in the track and when the dogs are completely engaged or disengaged into the track.
 - K- PUSHBAR DOG PADDLE:** Actuates the dog engagement into the track.
 - L- RAPID TRAVEL PADDLE:** When moved the Push Bar Dogs will automatically retract from the track and the boring machine will quickly thrust in the corresponding direction via rack and pinion.
 - M- WINCH PADDLE:** When moved the winch will pull in the corresponding direction.
 - N- THRUST LOCK BUTTON AND LIGHT:** When the buttons pushed. The current thrust speed is set and locked. The light will begin to blink. Setting will kick out when the thrust paddle is moved again.
 - O- CLUTCH PADDLE:** Allows engagement and disengagement of Hydraulic Clutch.
- TETHER CONNECTOR not shown:** Allows operation of the transmitter without battery power.

DISPLAY SCREEN DESCRIPTIONS

DRILLERS SCREEN- When using the wireless transmitter.

MANUAL MODE-

Allows operation without the wireless remote.

DRIVELINE BRAKE-

Press to turn on the electro-magnetic brake which will keep the spoil ejectors from rotating when the clutch is pulled in.

X BUTTON-

Push to bring you back to the driller's screen.

UP& DOWN ARROWS-

Push to adjust up or down.

< > BUTTONS-

Push to turn to the next screen or to the previous screen.

O BUTTON-

Push to turn view trouble shooting page.

LIGHTS-

ON/ OFF control of the flood and engine area lights.

THRUST SET POINT-

Press and hold while using the up and down arrow to adjust the maximum force of the boring machine. Desired pressure/ force and displayed in lower right corner. Actual thrust force is displayed in the center of the screen. Actual pressure is displayed on the remote



ICONS ON THE SCREEN:

DOG LIGHTS- Green when the dogs are extended into the track or red when retracted into the pushbar.

DOG ALIGNMENT LIGHT- Green when the pushbar is in line with the track dog hole. Red when it's not.

MAIN GUAGES- Thrust: Displays the thrust force and pressure

DRILLERS SCREEN CONTINUED- When operating without the wireless transmitter. Manual mode is turned on.

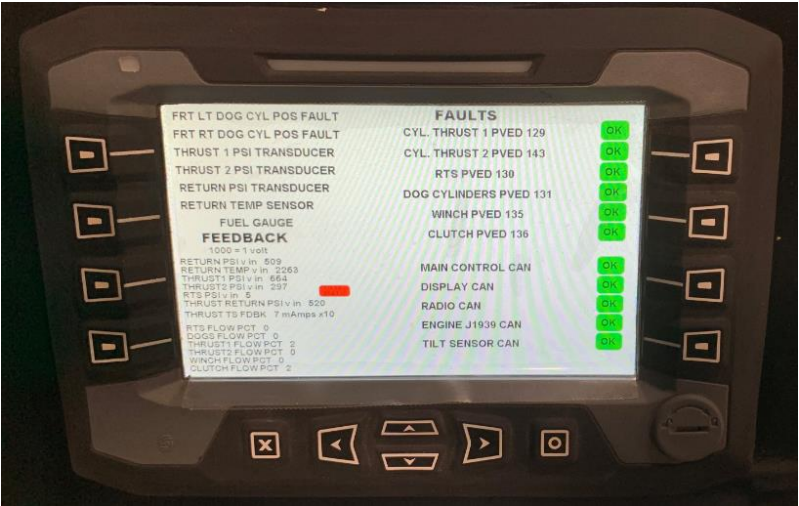


INFORMATION SCREEN



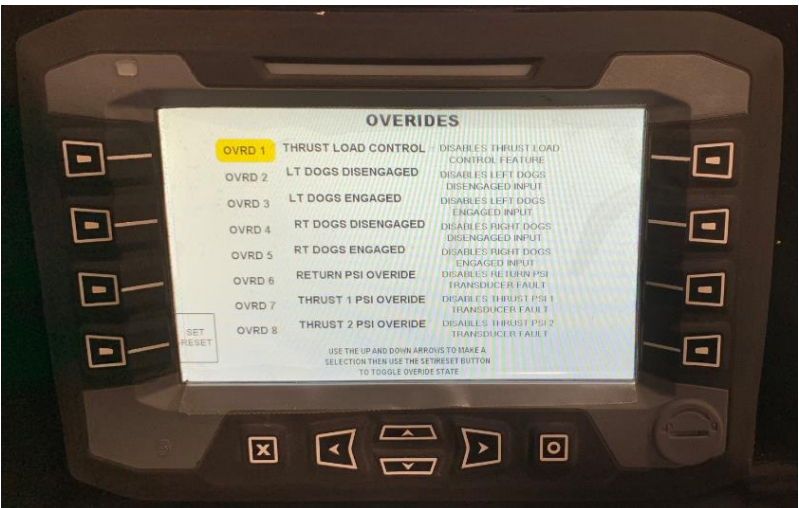
ENGINE VITELS SCREEN-

Gauge displays that apply to the operation of the engine and hydraulic return pressure and temperature.



FAULT SCREEN-

Displays the faults as they occur in the electrical system. Also displays actual feedback for voltage and hydraulic flow. Faults show up as red icons beside the item faulted.



OVERRIDE SCREEN-

Allows the operation of a function when an electrical fault is present.

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.

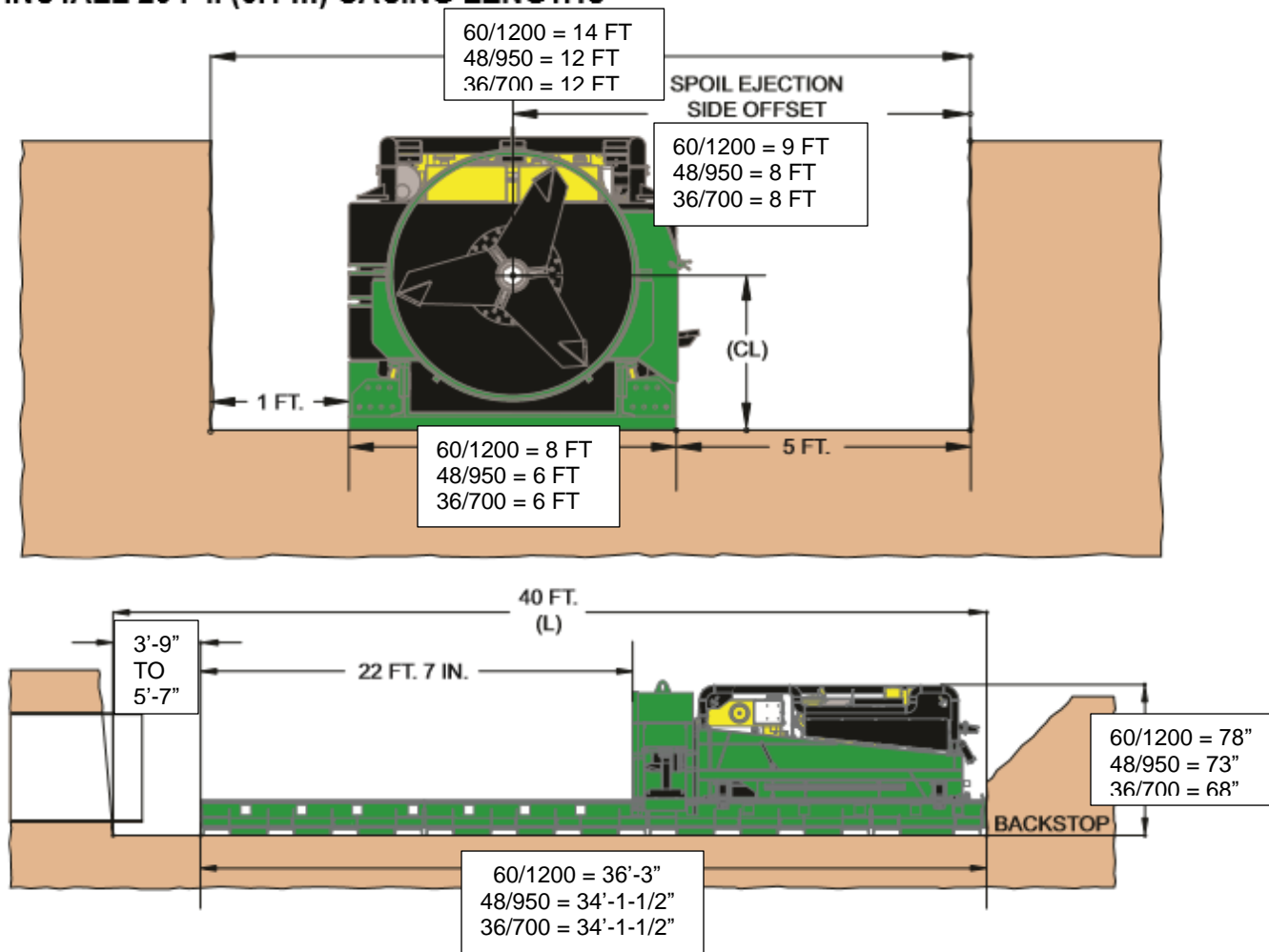
The floor of the pit must be aligned with the proposed casing grade. It must also be solid enough to support the equipment being used without settling. A base of crushed stone should be used to prevent settling. The use of planking under the tracks is recommended and should be allowed for when bringing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

The boring operation requires that a square and secure backstop 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 base/backstop design.

On all bores, it is recommended that a steel plate be used between the track push plate and the backstop. For larger diameter and longer bores, driven sheeting, or a poured concrete pad should be considered. Experience and soil conditions will dictate the best method. **A GOOD BASE AND A SECURE BACKSTOP ARE ESSENTIAL FOR ALL BORES.** Refer to the GROUND CONDITIONS CHART in the Appendix section for base and backstop recommendations.

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.

**ENTRANCE PIT DIMENSION MINIMUMS:
TO INSTALL 20 FT. (6.1 m) CASING LENGTHS**



SETTING AND ALIGNING THE TRACK

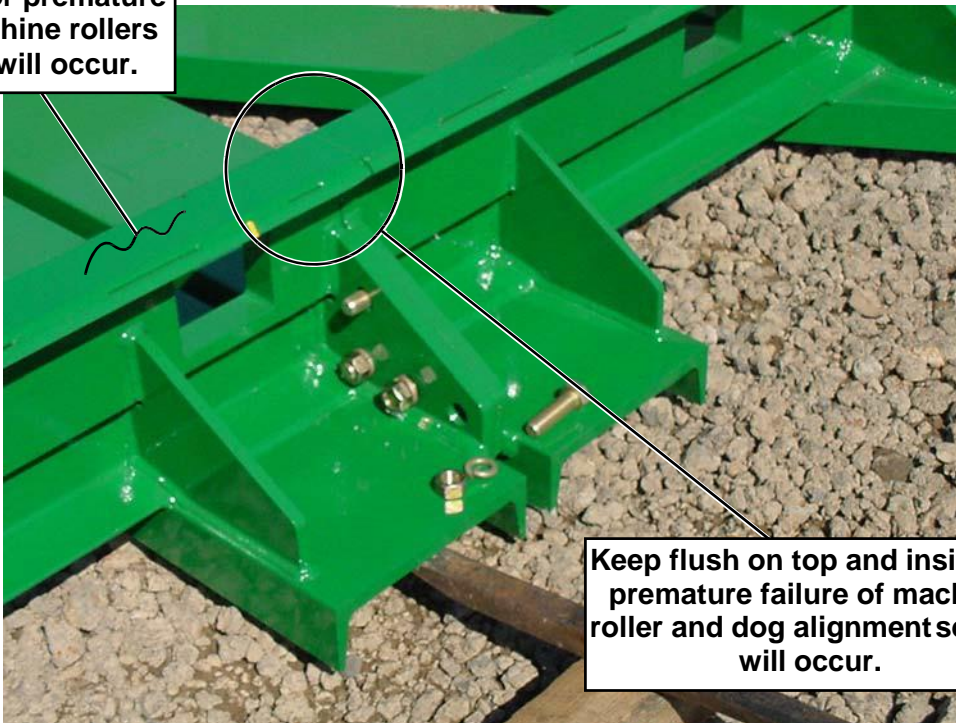
The most critical part of the bore is the setting of the machine track on line and grade. If the alignment is not right when you start, it is not likely to improve.

THE MACHINE AND THE TRACK SECTIONS ARE DESIGNED TO BE PLACED SEPARATELY. ALWAYS USE BALANCED LIFT POINTS.



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

Keep from welding to top of track rails or premature failure of machine rollers and sensor will occur.



Keep flush on top and inside, or premature failure of machine roller and dog alignment sensor will occur.

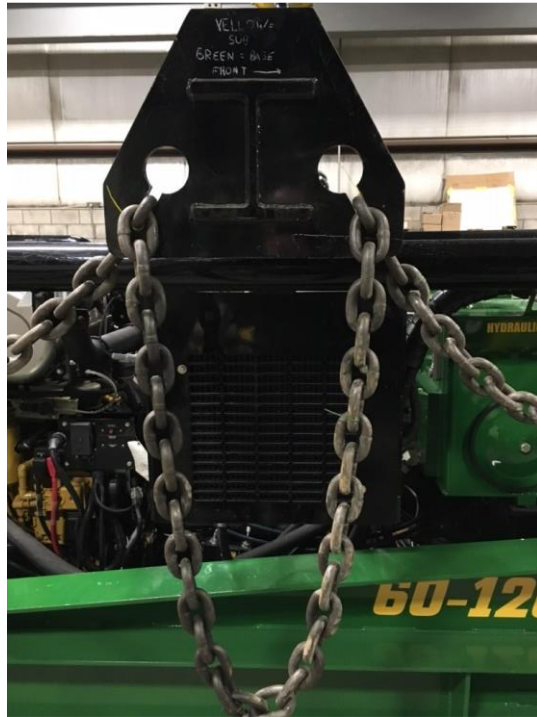
Lift and place the master track in the pit with the push plate against the backstop. Use a string and plumb bob to align the master track with the line of the proposed bore. Note that the track sections are numbered at each end. Extension tracks are installed so that adjoining ends have the same number. Install the extension tracks, aligning the top of the joints and bolting them together using bolts in ALL holes. Before setting the machine, make a final check of the line and grade.

MACHINE ASSEMBLY



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

Lift sling adjustment- The chains are adjustable thru the eyelets in the sling as shown.



1. Attach the spreader bar 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.
2. Gently and slowly lift the base push unit. Adjustment of the spreader bar chains may be necessary to keep the machine in a level position.
3. Slowly lower the base into the bore pit and master track. Keep the base push unit hydraulic push bar as close to the master track push plate as possible.



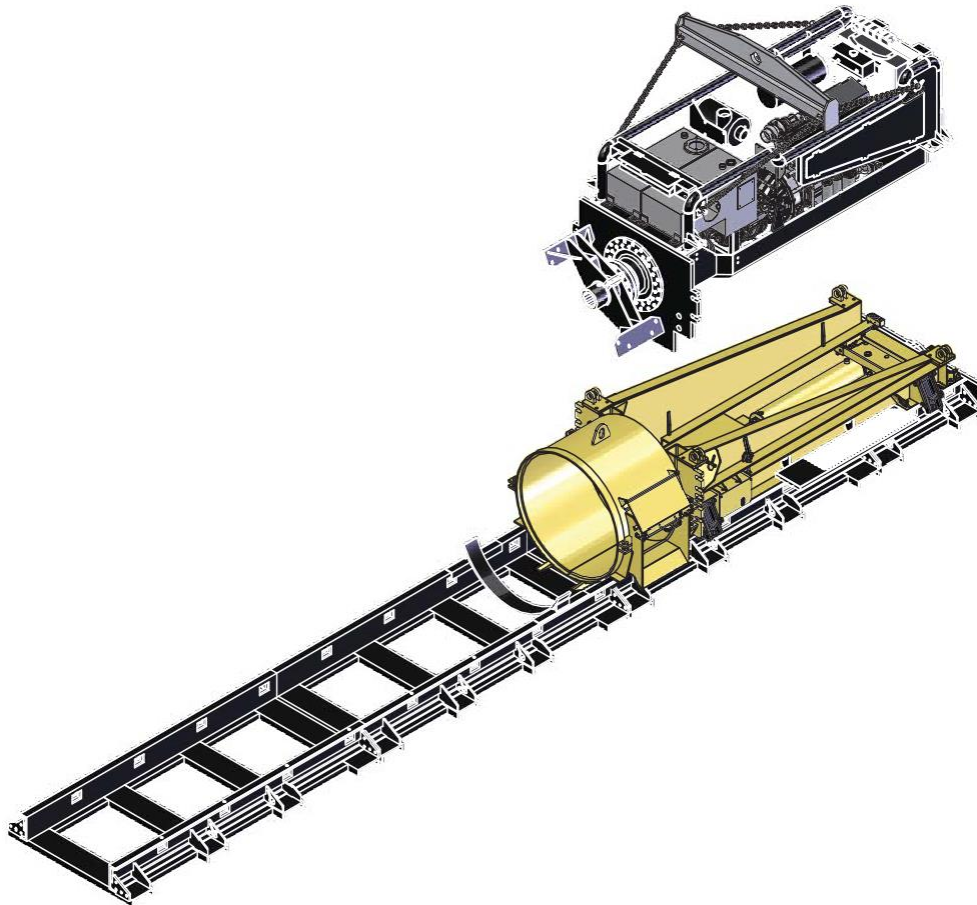
CAUTION! EQUIPMENT HAZARD! Do not slam or drop the base push unit into the master track. Cam follower damage may result.

4. Disconnect the spreader bar chains from the lifting eyes of the base push unit and check that the 4 swivel bolt hold-downs are in the down position.
5. Hoist the spreader bar out of the bore pit and over the power package.
6. Attach the spreader bar chains to the lifting eyes of the power package making sure that the two shorter chains are attached to the auger end of the power package.



7. Gently and slowly lift the power package. It is very important that the power package is as level as possible. Adjustment of the spreader bar chains may be necessary.
8. Once the power package is level, slowly lower it into the bore pit.

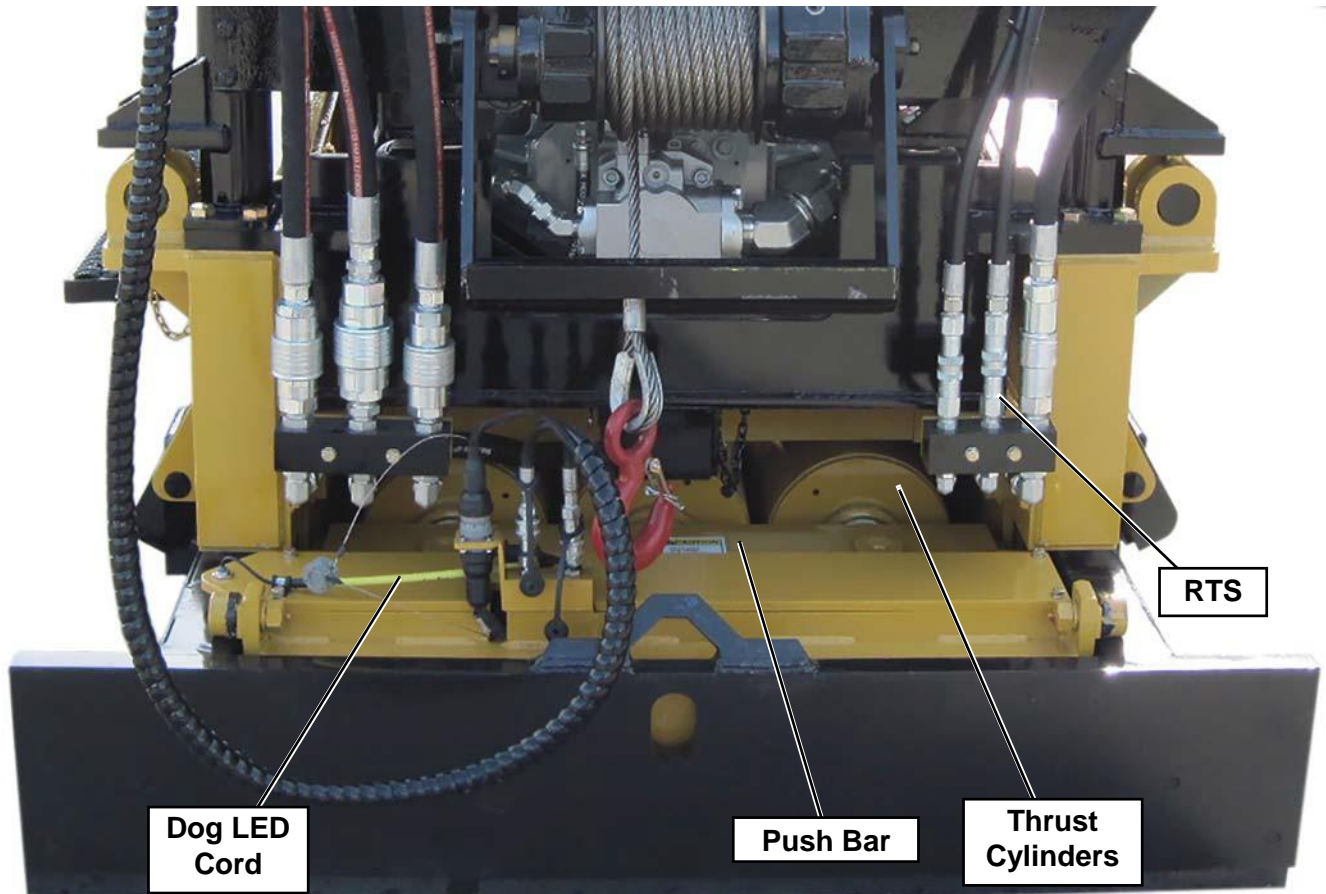
9. Center the power package over the base push unit.



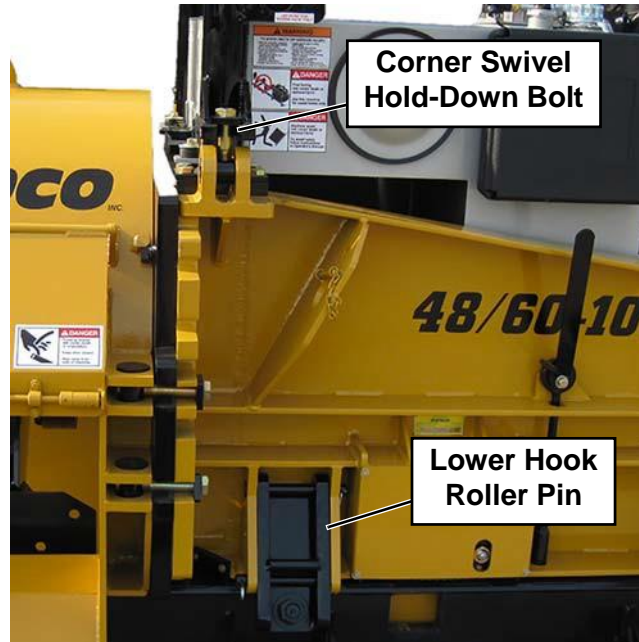
DANGER! Stay clear of shear and pinch points while guiding the power package during assembly.

10. Carefully lower the power package into the base push unit. The power package will align itself as it is lowered into the base push unit.
11. Once the power package is seated, disconnect the spreader bar chains from the lifting eyes and remove the spreader bar from the bore pit.

12. Connect the hydraulic quick disconnects and dog LED electrical cord at the rear of the machine.



13. Unpin and latch the 4-hook rollers into the down and locked position and secure with hitch pin.
14. Latch and tighten all four corner swivel hold-down bolts.



15. Slowly lower the master casing pusher into the bore pit and align the spoil chamber over the spoil ejectors.
16. Once the master casing pusher is in place, remove the lifting device from the lifting eye of the master casing pusher.
17. Latch and tighten the two swivel hold-down bolts on the master casing pusher.



The machine is now ready for start up!

ENGINE OPERATING INSTRUCTIONS AND CONTROLS

A factory instruction manual for each specific engine is supplied with the boring machine. 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 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.
3. 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 switch to ON position.
2. Clear all e-stops
3. Connect yourself to the safety pull tether
4. Make sure the transmission is in natural. **Engine will not start in gear!**
5. Turn the lock-out key to the start position until the engine starts.

Start fault- If fault should occur during engine start. Cycle any e-stop to clear.

6. Verify all system gauges are working.



WARNING! Only use ESTOP in case of an emergency. ESTOP WILL NOT SHUT DOWN THE ENGINE.



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

BORING MACHINE OPERATING INSTRUCTIONS

(Machine and casing are already set up. Ready to bore.)

1. Refer to engine operating instructions and start the engine.
2. Disengage or pull the clutch lever toward the operator and select the desired transmission gear.



3. Slowly engage or release the clutch lever and begin rotation of the auger and cutting head.
4. Slowly increase engine RPM to desired engine speed.
5. Monitor the L.H. and R.H. Dog LED's at the control panel to ensure the push bar dogs are completely engaged into the dog holes of the track.
6. Once Dog engagement has been verified using the hydraulic thrust valve lever slowly advance the machine, cutting head, auger and casing forward.



CAUTION! Make certain dogs are engaged into dog holes of track. Thrusting without correct engagement will cause serious damage to the machine.

7. Once the hydraulic thrust cylinders have reached their maximum stroke of travel it will be necessary to engage the next set of dog holes.
8. Disengage the clutch and shift the transmission to neutral.
9. Slightly retract thrust cylinders to relieve any load on the push bar dogs.
10. Disengage or Retract the push bar dogs into the push bar and hold the dog valve lever in while retracting the hydraulic thrust cylinders.
11. Once the dogs have cleared the dog hole release the dog valve lever and continue retracting the hydraulic thrust cylinders until the dog alignment indicator corresponds with the next available set of dog holes.



12. Pull or dog out the dog valve lever and verify correct dog engagement with the dog LED's.
13. Disengage the clutch and select the desired transmission gear.
14. Slowly engage the clutch and begin rotation of cutting head and auger string. Be positive the cutting head and auger are rotating freely before beginning further casing advancement.
15. Using the hydraulic thrust valve lever slowly begin advancement of cutting head, auger, and casing forward.
16. Repeat steps 5 through 15 until the master casing pusher has completely cleared the end of the last extension track.



CAUTION! Never thrust the front cam followers and hook rollers off the end of the last extension track. Serious damage will result.

NOTE: The rotation speed of the cutting head and auger string is determined and adjusted by the selection of the transmission gear and engine RPM.

NOTE: The advancement speed of the cutting head, auger and casing is controlled by the proportional remote paddle or hydraulic valve handle. The wireless remote paddle is proportional in the forward direction only. Max thrust speed is controlled by the rheostat setting and can be locked in by pressing the thrust lock button. This is very helpful when drilling rock formations.



17. After the cutting head, auger and casing section are installed in the ground; the machine should be readied for return to the launch position.
18. Turn off the engine and open the spoil door of the master casing pusher.



19. Remove the front drive pin joining the front drive adapter and auger shank.



DANGER! NEVER allow someone to open the spoil chamber door with the machine running. Death or serious injury will occur!

20. Close the spoil door and start the engine.
21. Slowly retract the machine from the casing and auger using the hydraulic thrust cylinders.
22. Once the master casing pusher is free from the auger and casing, the hydraulic winch or rapid travel system can be used to expedite the machine to the launch position.



DANGER! The hydraulic winch is designed and affixed to the machine for the retrieval of the machine ONLY! NEVER use the winch to remove auger, casing or in any manner other than machine retrieval.



DANGER! The rapid travel system is designed to move the machine ONLY! NEVER use the rapid travel system for any other purpose.

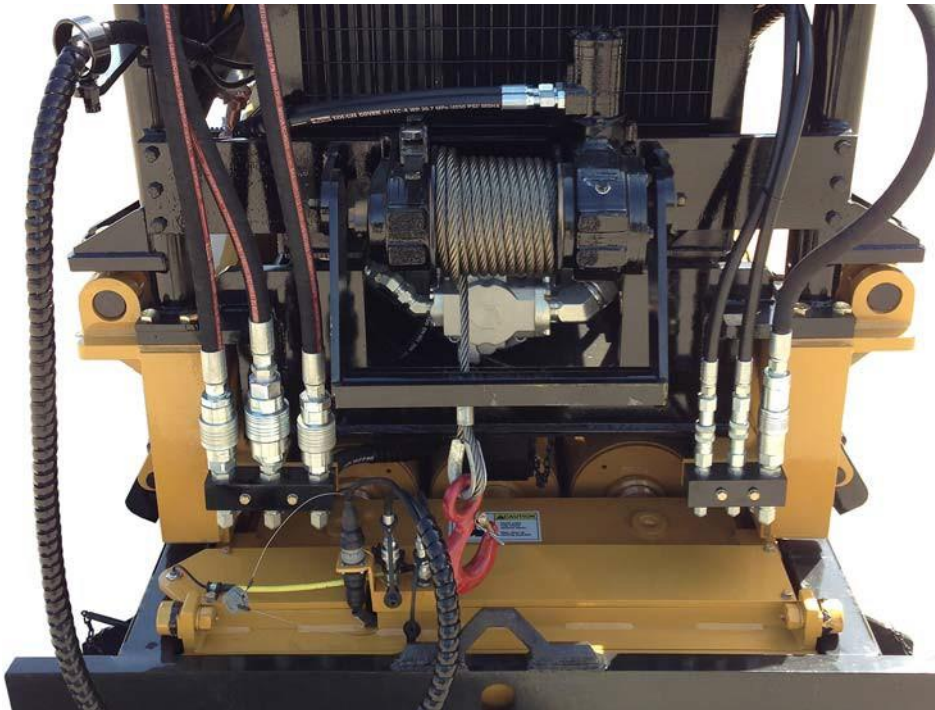
23. Once the machine is returned to the launch position, the next section of auger and casing can be positioned for installation.

Refer to **CASING INSTALLATION** in the **Casing Review** section of this manual.

OPERATION OF WINCH:

The optional winch is available for the horizontal earth boring machines. The winch is located at the rear of the boring machine. The winch is used to rapidly move the boring machine to the rear of the track when installing casing sections. It is not designed to pull auger or to move the machine forward.

To use the optional winch, the hydraulic selector valve at the rear of the machine must be activated to select winch operation. Keep all personnel clear of the track when using the winch. Use a careful feed of the control valve so that the machine does not overrun the winch cable.



WINCH CONTROL:

The control to activate the winch is the lever control located at the operator's station. The control valve is a spring return to neutral. Pushing the control away from the operator causes the winch to wind in a power mode. Moving the control back toward the operator causes the winch to unwind. Winch speed is determined by the RPM of the engine.

WINCH MODE:

A mechanical clutch control is located on the winch. Pull the spindle up to change mode. Rotating the control lever toward the drum will engage the winch for power operation. Rotating the control lever away from the drum will disengage the winch for free spool.

OPERATION OF RAPID TRAVEL SYSTEM:

The optional Rapid Travel System (RTS) is available for Model Series 36-500 and larger horizontal earth boring machines. The RTS is a direct drive rack and pinion system located at the front of the base push unit of the machine. The RTS is used to rapidly move the boring machine to the front or rear of the track with a maximum force of 20,000 lbs. It is only to be used when the machine is free from the auger string, casing and any other obstructions in the bore pit. NEVER attempt to use the RTS for any other purpose.



RTS CONTROL:

The control to activate the RTS is the lever control located at the operator's station or wireless remote. The control valve is a spring return to neutral. Pushing the control away from the operator causes the machine to roll forward or advance. Moving the control back toward the operator causes the machine to roll back-ward or retract. The RTS speed of operation is determined by the RPM of the engine. When the control is in the NEUTRAL position the RTS will "free wheel" and not interfere with normal operations.

CUTTING HEADS

Barbco, Inc. manufactures Soft Ground and Rock Cutting Heads - with and without wing cutters. Stock heads are carried for general soil conditions. Special heads are available for specific conditions. See the GROUND CONDITIONS CHART for cutting head recommendations for specific soil conditions. A general category listing is;

Sand, Light Dirt	BBC-25	Shale, Soft Rock	BBC-35
Heavy Dirt, Clay	BBC-25	Rock to 5,000 psi	BBC-45
Hard Compacted Clay, Light Shale and Cobble	BBC-26	Rock to 12,000 psi	BBC-50
Hard Compacted Soil, Tree Roots	BBC-75	Wet, Running	BBC-Sand

EFFECT OF WING CUTTERS

The function of wing cutters on a head is to over cut the bore, allowing the casing to enter more easily. Wing cutters are used only in stable conditions as noted in the GROUND CONDITIONS CHART. Barbco, Inc. wing cutters are preset to cut one and a half inches (3.81 cm) larger than the nominal casing diameter. The use of new or built up auger in the lead section of casing is essential to maintain the proper centering of the head. Worn auger in the lead section will allow the head too much freedom and the wing cutter pattern will be erratic. Wing cutters can of course be removed for operation of a head inside or outside of the casing.

WATER LEVEL

Barbco, Inc. offers a specialized form of water level for monitoring grade during a bore. Specific instructions for its use are found in the Manual supplied with each unit. A sensing head is installed at the head end of the casing. 1/2" std. steel pipe is used along the entire length of installed casing to connect to the Water Level Indicator in the entrance pit. The sensing head must be securely welded to the casing. In rock conditions, the sensing head must be recessed into the casing and the auger flight trimmed for clearance.

BENTONITE PUMP

Barbco, Inc. manufactures a pumping system to mix and dispense a Bentonite slurry to the head end of the casing. As a result, less thrust pressure is required to push the casing through the ground. Full instructions on the use of Bentonite are contained in the Manual supplied with each unit. Placement of the head to dispense the Bentonite is discussed in the Manual.

FIELD LOG

Keeping a routine field log of the job will not directly improve safety on the job, but the analysis of the progress will become a valuable asset in bidding future jobs. When the field log shows that a similar job done in the past required a given number of days to complete, it is unlikely that the present job will be done in a shorter time. Bidding is tight and trying to shorten the time without making some other change will increase the possibility of an accident due to taking shortcuts.

Simple graphs of the progress on a number of jobs will indicate to you the maximum capability of your machine, and help you to determine if a larger machine will be required to successfully bid and complete a job. Overextending a boring machine, either in diameter or length, will almost always get you in trouble in trying to complete the bore. When you are in doubt about a particular application, contact Barbco, Inc.

Appendix

GROUND CONDITIONS CHART

	Wet Runny Sand	Wet Stable Sand	Dry Sand	Dry Clay	Wet Clay	Small Gravel
Auger Speed	Slow	Fast	Slow	Optional	Optional	Optional
Rate Of Penetration	Fast	Fast	Slow	Optional	Optional	Optional
Cutting Head	BBC-25 Sand	BBC-25	BBC-25	BBC-25	BBC-25	BBC-35
Wing Cutters	No	No	No	Yes	Optional	Yes
Head Position	Inside	Inside	Inside	Flush	Flush	Outside
Bentonite	Yes	Yes	Yes	Yes	Yes	Yes
Water Inside	No	No	No	Yes	Yes	Yes
Band	Yes	Yes	Yes	Yes	Yes	Yes
Bore Continuous	Yes	Yes	Yes	Optional	Optional	Optional
Clean Casing	Pack	Pack	Pack	Clean	Clean	Clean
Pit Base	Concrete	Stone	Optional	Optional	Stone	Optional
Backstop	Concrete	Concrete	Concrete	Steel	Steel	Steel

GROUND CONDITIONS CHART

	Hard Pan	Large Gravel	Small Boulders	Soft Solid Rock	Hard Solid Rock	Land or Railroad Fill
Auger Speed	Slow	Slow	Slow	Slow	Slow	Cautious
Rate of Penetration	Medium	Slow	Slow	Slow	Slow	Slow
Cutting Head	BBC-75 BBC-CT2	BBC-35	BBC-75	BBC-35 BBC-95	BBC-45 BBC-50	BBC-35
Wing Cutters	Yes	Yes	Yes	Yes	Yes / No	Yes
Head Position	Outside	Outside	Outside	Outside	Outside	Outside
Bentonite	No	No	No	No	No	No
Water Inside	Yes	No	No	No	Yes	Yes
Band	Yes	Yes	Yes	Yes	Yes	Yes
Bore Continuous	Optional	Optional	Optional	Optional	Optional	Optional
Clean Casing	Clean	Clean	Clean	Clean	Clean	Clean
Pit Base	Optional	Optional	Optional	Optional	Concrete	Concrete
Backstop	Steel	Steel	Steel	Concrete	Concrete / Steel	Concrete

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 drillers 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.

DOGS 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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