Boring Machine  
Operation & Safety  
Instruction Manual

⚠️ WARNING  
Unsafe use of this equipment could result in serious injury or death.  
This manual contains important instructions for the safe operation and recommended maintenance of your earth boring machine. All who operate the boring machine must carefully read and understand this manual before starting the machine. Keep this manual available both as a reminder for your experienced operator and as a training aid for your new staff. Replacement manuals are available by calling Michael Byrne Mfg.
# Michael Byrne Mfg. Co.
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*MICHAEL BYRNE MFG. COMPANY-MANSFIELD,OHIO-U.S.A.-1-800-613-7206*
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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 Michael Byrne Mfg. Co. horizontal earth boring machine. Michael Byrne Mfg. Co. 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 Michael Byrne Mfg. Co. 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. Michael Byrne Mfg. Co. 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 Michael Byrne Mfg. Co.

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 Michael Byrne Mfg. Co. 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, Michael Byrne Mfg. Co.’s service department will be happy to assist you. Michael Byrne Mfg.’s office hours are 8:00 AM–5:00 PM, Monday through Friday. Michael Byrne Mfg.’s office is located in Mansfield, Ohio.

Michael Byrne Mfg. Co. Corporate Headquarters, Mansfield, Ohio
• Main Office................................................. (419) 525 - 1214
• Toll Free ..................................................... (800) 613 - 7206

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) .......................................... (419) 525 - 2386

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 left of the operators platform on the Base Push Unit. Write the serial number of your machine in the space provided below.

Atlantic Turner Underground Serial Number 90105
To The Owner
Thank you for your purchase of the Michael Byrne Mfg. Auger Boring Machine. This manual contains important information that will help you and your crew set up and safely operate the Auger Boring Machine. DO NOT operate or permit anyone to operate or service this machine until you have read this Manual. Use only trained operators who have demonstrated the ability to operate and service this machine correctly and safely.

DO NOT use this machine for any application or purpose other than those described in this Manual. Consult the Michael Byrne Mfg. factory for changes, additions, or modifications that maybe required for this machine to comply with various safety requirements. Unauthorized modifications could cause serious injury or death. Anyone making such unauthorized modifications is responsible for the consequences. Make sure this Manual is complete and in good condition. Contact the Michael Byrne Mfg. factory to obtain additional manuals and for further information about/or assistance with your machine. Your Michael Byrne Mfg. factory has approved service parts and technicians with special training that know the best methods of repair and maintenance for your machine.
NOTICE
Before using this manual, familiarize yourself with the Description Of Components and the Glossary of Terms.

Michael Byrne Mfg. encourages use of the One-Call system.

NOTICE
Horizontal earth boring machines have a number of hazards unique to their operation. A series of safety alert decals are provided on Michael Byrne Mfg. horizontal earth boring machines to alert the operator to hazards of the machines. The Safety Section explains the hazard alert signs.

PERFORMANCE
Actual machine, accessory, and component performance, capacity, and results can be adversely affected by or vary with such factors, as environmental conditions, weather, failing to exercise proper maintenance, machine functionality not being utilized within suggested operating levels, mechanical or component substitutions that may alter factory standards, operator experience, or other unforeseen limitations not previously listed.
Pay attention to all warning signs located at various places on machine.

- Push Block Pinch Point
- Machine Upset area on far side from operator's area.
- Dirt Ejector Door—Rotating Blades; Serious Injury or DEATH!!
- Operation Guide Warning
- Emergency Stop – Push to kill engine.
- Emergency Stop Button

!!!!!DO NOT OPERATE MACHINE WITHOUT PROPER DECALS
****PLEASE CONTACT MICHAEL BYRNE MFG. FOR REPLACEMENT DECALS FREE OF CHARGE.
Safety Rules
SAFETY AWARENESS PROGRAM
If you are the owner, operator or the helper using a Michael Byrne Mfg. 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).

All operators or trainees must carefully read and thoroughly understand this Operation Manual before using this machine. Thorough training of both operators and helpers is essential for the safe operation of this equipment. Never allow inexperienced personnel to operate or work near the machine unless they are carefully supervised during training.

We recommend that you become familiar with the requirements of OSHA Regulation CFR29 - a copy of which can be obtained from your Regional Department of Labor Office.

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.

⚠️ This is the safety symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠️ DANGER! Indicates an imminently hazardous situation which, if not avoided, WILL result in death or serious injury.

⚠️ WARNING! Indicates a potentially hazardous situation which, if not avoided, COULD result in death or serious injury.

⚠️ CAUTION! Indicates a potentially hazardous situation which, if not avoided, MAY result in minor or moderate injury.

⚠️ CAUTION! Used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

⚠️ WARNING! 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.
WARNING! Don’t 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.

WARNING! 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 Michael Byrne Mfg.

WARNING! Do not operate this unit until you have checked all systems. Visually inspect the machine daily. All safety equipment, shields, and decals must be in place and in good condition. If any are missing, incomplete, or damaged, they must be replaced or repaired.

WARNING! FALLING HAZARD! Mount or dismount the machine using the 3-point-rule (keep two hands and one foot or one hand and two feet in contact with a secure surface at all times).

CAUTION! FALLING HAZARD! Remove snow, ice, oil, or dirt from steps and platforms.

WARNING! Verify all personal protective devices are present and secure.

WARNING! Wear protective equipment for job conditions. Always wear hard hat, safety vest, safety glasses, gloves, and steel toed or protective boots.

WARNING! ELECTROCUTION HAZARD! CALL BEFORE YOU DIG!!!! Locate all underground utilities where you have to cross them. This includes hazards such as gas, water, sewer, fiber optic cables, etc. If in doubt, have utility company shut it Off before starting underground work.

WARNING! ELECTROCUTION HAZARD! Do not drive under low hanging electrical power lines. Verify clearance between power lines and equipment. Know the height of your equipment.

WARNING! COLLISION HAZARD! Verify clearance between overhead obstructions and equipment.

WARNING! INJURY HAZARD! SECURE 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! INJURY HAZARD! Keep spectators and children a safe distance from equipment.

DANGER! 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.

WARNING! ONLY QUALIFIED OPERATORS ARE ALLOWED TO OPERATE THE UNIT. A “qualified operator” is defined as someone who meets the following criteria:

a. is at least 18 years old,
b. is physically and mentally capable,
c. has been trained in the operation and maintenance of the equipment,
d. has demonstrated capabilities, to a supervisor, to operate and maintain the equipment,
e. can perform assigned duties in a reliable manner,
f. understands the controls and functions of this Michael Byrne Mfg. horizontal earth boring machine.

WARNING! You are responsible for the safety of all people in the operational area of the machine. You must understand the operation of the machine and the safety rules so safe actions will be taken in unexpected circumstances.

DANGER! Operator must maintain communication by radio, etc. with exit pit personnel.

WARNING! INJURY HAZARD! Wear protective clothing when operating the machine.

WARNING! INJURY HAZARD! Close and lock all covers, shields, and service flaps during operation.

DANGER! ELECTROCUTION HAZARD! Do not allow contact with a live power line. This is always dangerous and will be deadly.

DANGER! ELECTROCUTION HAZARD! Use extreme caution around high voltage! High voltage makes conductors out of materials that would normally not conduct! Wood, paper, fiberglass, nylon, tires, and dirt will conduct current from the 8000 volts to ground that is commonly found in residential areas. Higher voltages are typical at transmission lines.

DANGER! CRUSHING HAZARD! Never lift any objects over top of personnel. The load may shift or fall.
SAFETY

⚠️ WARNING! HEARING LOSS HAZARD! Wear ear plugs while standing near a working machine. Sound pressure levels may exceed OSHA standards for constant exposure.

⚠️ WARNING! CRUSHING HAZARD! Stay clear of rotating components. Do not wear loose clothing that could catch on rotating equipment.

⚠️ WARNING! Do not operate the machine unless you are a qualified operator and the regular operator has released the responsibilities to you. “Qualified operator” is defined in the Safety Section. Supervise inexperienced operators.

⚠️ CAUTION! ELECTROCUTION HAZARD! Do not spray electrical components when cleaning the machine. The enclosures containing electrical components are splash-proof, but not waterproof. The fluids may conduct electricity.

⚠️ WARNING! INJURY HAZARD! Never use the high pressure spray gun to clean any part of your body or clothes. The pressure at the nozzle could penetrate the skin.

⚠️ CAUTION! INJURY HAZARD! Lift heavy objects with your legs not your back. Ask for assistance if needed.

⚠️ WARNING! Inspect machine circuits and safety devices daily. Document inspection results. Correct problems before the unit is used. Report anything suspicious to Michael Byrne Mfg. for consideration. Do not assume it’s okay. Report any problem found on the horizontal earth boring machine to the Michael Byrne Mfg. engineering department so proper repair procedures can be designed and used.

⚠️ WARNING! 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.
WARNING! INJURY HAZARD! Replace safety devices or shields that were removed for inspection purposes or servicing before the machine is used.

WARNING! Follow the operation manual and manufacturer’s service bulletins regarding maintenance and inspection procedures and intervals.

WARNING! INJURY HAZARD! 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.

WARNING! INJURY HAZARD! Do not remove hydraulic hoses while machine is in operation!

WARNING! INJURY HAZARD! Do not use hands to find leaks. 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.

WARNING! Do not put off scheduled maintenance. Do not treat it lightly. Do not alter results. The lives of the operator and crew depend on it.

WARNING! Keep the machine clean. Oil spills, grease, loose tools, and scattered accessories cause accidents.

WARNING! EXPLOSION HAZARD! DO NOT change the maximum relief valve setting on any hydraulic circuit.

WARNING! NEVER make unauthorized modifications to structural members or hydraulic circuits.

WARNING! Replace damaged hydraulic hoses or fittings.

WARNING! Use Michael Byrne Mfg. replacement parts to repair a machine.

CAUTION! 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.

WARNING! INJURY HAZARD! Do not attempt repairs until you have read and understand the operation manual of the machine. Incorrect repairs endanger operational safety.

WARNING! Use the correct tools for the job. Tools should be kept clean and in good condition.

WARNING! Remind a co-worker ignoring safe practices about the dangers that could result. Safety is always in the hands of those on the job!

WARNING! BURN HAZARD! Never work on a hydraulic system while the oil is hot.

WARNING! Do not operate the machine while making repairs unless you are a qualified operator.

WARNING! Remove the ignition key and place a “Do Not Operate” sign on the controls if you will be working in a hidden area. Carry the key with you.

WARNING! Never start the engine without checking if another worker is in a hidden position. Yell “Clear!” and allow time for response before starting the engine.

WARNING! Verify connections are tight and lines, pipes and hoses are not damaged before pressuring the system. Wear protective clothing and eye protection. Use a piece of cardboard or wood to check for leaks. Oil escaping from a very small hole is almost invisible.

WARNING! EXPLOSION HAZARD! Never use gasoline or diesel fuel as a cleaning solvent, especially when cleaning hydraulic oil reservoirs. Gas and diesel fuels are highly explosive. Traces left in the oil may ignite when compressed!

WARNING! HIGH PRESSURE! Always relieve pressure in hydraulic system before servicing. Even after the engine is shut down, hydraulic pressure can remain in the system. Jog the controls and break the connections with caution when servicing systems. Wear eye protection.
OPERATION SAFETY

Horizontal earth boring machines have a number of hazards unique to their operation. A series of safety signs, developed in conjunction with other manufacturers, are provided on Michael Byrne Mfg. horizontal earth boring machines to alert the operator to hazards of the machines. This section explains the hazard alert signs in detail.

DANGER - ROTATING AUGER AND CUTTING HEAD

Rotating auger and cutting heads present many shear points where the operator’s limbs could be caught and injured. They are part of the auger string, which is the combination of all rotating components that is attached to the final drive of the machine. It includes the spoil paddles, auger sections, and the cutting head. The machine must be shut down whenever work is being done on the auger string; such as installing and pinning auger, removing and unpinning auger, and installing, adjusting, or removing the cutting head. This is especially important when pinning or unpinning auger sections inside the spoil chamber.

DANGER - ROTATING BLADES

The spoil chamber encloses the rotating blades of the spoil paddles that push the spoil out of the chamber. The close tolerances of the paddles and chamber walls present a hazard. Michael Byrne Mfg. equips its earth boring machines with spring-loaded spoil doors for a dual purpose. The spoil door shields the exit opening against accidental entry of tools or workmen into the spoil chamber, and protects from flying rock chips. Keep the door closed whenever the machine is operating. Do not stand in front of the door while the machine is operating. The door is opened only with the machine shut down to provide access during the pinning and unpinning of auger.
DANGER - MACHINE UPSET

Earth boring machines “torque” as a normal reaction of the machine to resistance encountered by the rotating auger string. When operating in tough conditions certain combinations of factors can cause a severe, high torque machine reaction, which can cause an earth boring machine to upset. These factors include: 1) Operating a machine at full power in a low gear or reverse; 2) Auger or cutting head catching on an obstruction, and 3) Advancing into the face rapidly or erratically. Always securely attach the casing to the master casing pusher. The weight of the casing and the ground resistance add to the stability of the machine, deterring machine upset. For spoil removal from the master pusher area, always station the worker beside the casing - not the machine. Never allow unnecessary personnel forward of the operator when the machine is operating.

DANGER - FREE BORING

Michael Byrne Mfg. does not recommend free boring. Free boring exposes personnel to high-risk hazards of unprotected auger string and increased possibility of machine upset. All Michael Byrne Mfg. earth boring machines are designed and sold for cased bores only. When removing auger from the casing after a bore, keep all personnel away from the exposed rotating auger.
SAFETY

WARNING - “BILLBOARD”
A number of instructions for safe operation are listed on a “billboard” for the operator. Read and understand them before using the machine.

TO AVOID DEATH OR SERIOUS INJURY:
1. Read and understand operator’s manual and safety signs (decals) before starting machine.
2. Be sure all personnel know and follow safe operating procedures.
3. Stop engine before: Opening spoil ejector door
   Working in casing
   Working in exit pit
   Doing any maintenance
4. Properly vent exhaust fumes.
5. Always secure auger in casing before lifting.
6. Do not modify this machine.
7. Always bore with at least a trained operator and a trained helper.
8. Machine may move without warning while in operation.
9. Relieve pressure in hydraulic system before servicing.
10. Do not operate with guards removed.
11. Know and obey all codes and regulations.

CAUTION - PINCH POINTS
Normal machine operation requires the advance and retraction of the push bar, which moves slowly into position. The operator must be aware of the position of the moving push bar. Always operate the machine from the platform provided. When using a side-operated machine, the operator must keep personnel away from the push bar area at the rear of the machine.
SAFETY REGULATIONS FOR EARTH BORING EQUIPMENT
1. Each employer shall protect from falling into the entrance or exit pit by the placement of a
   guardrail or
   fence at ground level around the pits.
2. No crew shall consist of less than two persons.
3. No work shall be done on any part of the auger string while the power source is running.
4. Disengage rotation of the auger during spoil removal from entrance pit.
5. All engine exhaust must be vented to the open atmosphere.
6. Always shut down the machine before leaving the operator’s station for any reason.
7. The exit pit shall not be excavated while boring is in progress.
8. For machines with removable tracks, always detach machine from tracks before lifting, then
   lift machine
   and tracks separately. Before transporting, always secure machine to tracks with dogs engaged.

SAFETY ON THE JOB SITE
Good safety practice dictates the following rules for each job.
1. Post the location and phone number of the nearest aid station or hospital.
2. Have at least one of your workers trained in first aid.
3. Have a complete first aid kit on site.
4. Keep a fire extinguisher on site.
5. Always wear proper personal safety equipment including hardhat, steel toe boots or shoes
   and eye protection.

Thorough training of the operator is essential for the safe operation of any earth boring machine.
Michael Byrne Mfg. recommends a SAFETY AWARENESS PROGRAM to aid in the training of
your operator.

Regular safety meetings with your crew will reduce confusion and make your job site a safer
place to work. Any employee that ignores or refuses to follow your safety rules should not be
allowed on the job site.

If an accident occurs, first take care of the victim. Then write down your own observations.
Include a drawing of the site, showing the location of all equipment at the time of the accident.
Have all other witnesses write down their observations as soon as possible, and keep a copy.
Record as many details including time, weather conditions and any unusual events that you can
recall. This record and the field log will greatly aid you in preventing another similar occurrence.

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. Michael Byrne Mfg. 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.
SAE Recommended Practice AA2305 AUG06
Operating Precautions for Horizontal Earth Boring Machines

1. Scope
These general operator precautions apply to horizontal earth boring machines as defined in SAE J2022. These should not be considered as all inclusive for all specific uses and unique features of each particular type of machine. Other more specific operator precautions not mentioned herein should be covered by users of this SAE Recommended Practice for each particular machine application.

1.1 Purpose—This SAE Recommended Practice is intended to be used as a guide for manufacturers and users of Horizontal Earth Boring Machines to improve the degree of personal safety for operators and others during normal operation and servicing. Avoidance of accidents also depends upon the care exercised by such persons. Inclusion of this practice in state, federal, or any laws or regulations where flexibility of revision is lacking is discouraged.

2. References
2.1 Applicable Documents—The following publication forms a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply.
2.1.1 SAE PUBLICATION—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001. SAE J2022—Classification, Nomenclature, and Specification Definitions for Horizontal Earthboring Machines

3. Personnel Precautions
3.1 Avoid loose fitting clothing, loose or uncovered jewelry.
3.2 Know and use the recommended protective equipment that is to be worn when operating this machine. Hard hats, protective glasses, protective shoes, gloves, reflector type vests, respirators and ear protection are examples of types of equipment that may be required.
3.3 Be sure all personnel know and follow safe operating procedures, including a complete understanding of all safety signs and avoidance procedures.
3.4 Know and use the hand signals required for particular jobs and know who has the responsibility for signaling.

4. Operator—General Precautions
4.1 It is the responsibility of the operator to read and understand the Operator’s Manual and other information provided and use the correct operating procedure. Machines should be operated only by qualified operators and trained helpers.
4.2 Make sure that all protective guards, doors, etc. are in place and secure.
4.3 Remove all loose objects stored in or on the machine. Remove all objects which do not belong in or on the machine and its equipment.
4.4 It is the operator’s responsibility to point out each of the safety signs on the machine and insure the crew understands the importance of adhering to each of the safety signs.
4.5 It is the operator’s responsibility to know that all underground utilities have been located before the bore is started, and to avoid them by using proper boring techniques.
4.6 In some instances venting of exhaust may be required. It is the operator’s responsibility to be sure that the exhaust fumes have been properly vented.
4.7 Know and obey all federal, state, and local codes and regulations.
4.8 Make sure all personnel know and stay in their prescribed areas to insure a safe operation.
5. Starting and Stopping Precautions
5.1 Do not start machine until all personnel are clearly away from any rotating or moving parts.
5.2 Check operation of all machine controls before using the machine.
5.3 Make sure all servicing as prescribed in the Operator's Manual has been completed.
5.4 Start and operate the machine only from the operator's station.
5.5 Make sure all fluid lines are securely connected before starting the machine.
5.6 When shutting down machine, follow manufacturer's recommended procedure.
5.7 Procedure for shut down. Shut power source down, relieve system pressure, and remove the starter key (if so equipped).

6. Operating Precautions
6.1 Make sure all operating personnel observe and use safe operating practices, including adhering to all safety signs.
6.2 Watch that all personnel and objects are clearly away from any rotating or moving parts.
6.3 Never leave operator station while machine is in operation.
6.4 Do not operate machine unless protective guards, doors, etc. are in place.
6.5 Shut down machine at first sign of malfunction or hazardous condition.

7. Maintenance Precautions
7.1 Shut down power source and relieve system pressures before doing any maintenance.
7.2 Observe manufacturer's recommended maintenance procedures.
7.3 Maintenance should be done by trained personnel.
7.4 Do not modify the machine in any way.
7.5 Repair or replace damaged or missing protective guards, doors, etc.
7.6 Replace all missing, illegible, or damaged safety signs. Keep all safety signs clean.
7.7 Use a piece of cardboard or wood to check for pressurized leaks to prevent fluid penetrating the skin. Hydraulic fluid escaping under pressure can have sufficient force to enter a person's body by penetrating the skin and cause serious injury and possibly death if proper medical treatment by a physician familiar with this injury is not received immediately.

8. Fuel Handling Precautions
8.1 Do not smoke or permit open flames (which includes welding) while fueling or near fueling operations.
8.2 Do not refuel while engine is running, or while the engine is hot.
8.3 Do not refuel to tank capacity. Allow room for fuel expansion.
8.4 Tighten the fuel tank cap securely. If cap is lost, replace it with only the original manufacturer's approved cap.
8.5 Always use the correct grade of fuel.
8.6 Prevent fuel spillage by maintaining control of the fuel filler nozzle when filling the tank.
8.7 Clean up spilled fuel immediately.
8.8 Never use fuel for cleaning purposes.
Preventing Machine Upset
Machines designed to cut into the earth or to bore rock can cause injury if used incorrectly. Designers always face the problem of making the machine safe to use without making it useless.

Auger boring machines present two major risks. One is the rotation of the auger. The other is machine upset. Both present serious danger because operators are in a pit with the boring machine. Machine upset occurs when the auger or cutting head gets caught and is unable to rotate. When the machine does upset, it can do so in the blink of an eye, and there is very little chance to jump out of the way. Since escape is unlikely, the operator must concentrate on prevention.

Boring machines “torque” as a normal reaction of the machine to resistance encountered by the rotating drill string. When operating in tough conditions, certain combinations of factors can cause a severe, high-torque machine reaction which can cause a boring machine to upset. These factors include: 1) Operating a machine at full power in a low gear or reverse; 2) auger or cutting head catching on an obstruction; 3) advancing into the face rapidly or erratically.

First, the operator must keep the boring machine firmly attached to the track. The track is usually much wider than the boring machine, which provides stability. Note that we don’t recommend staking the track to the ground, since some movement is necessary to keep the track tight against the backstop.

The casing must always be firmly attached to the boring machine during boring. This is done by welding “torque plates” to the casing. These “torque plates” are bolted to the master pusher or casing adapter. It prevents the casing from rotating, and in addition, the friction between the casing and the bank soil makes the boring machine less able to turn over. The casing and torque plates are part of the safety system. Never operate the rotation without being attached to the casing.
WARNING! Two sets of lift points are provided. The upper lift bail, located on the roll rack, is used to lift the top base drive package ONLY! It is NEVER to be used to lift the entire machine. A second set of lift points is located on the bottom base thrust unit. They can be used to lift the bottom base thrust base unit alone.

A – TOP BASE DRIVE PACKAGE: This portion of the machine contains the engine, clutch, transmission and Michael Byrne planetary drive. It also includes the fuel tank, hydraulic oil tank, filters, hydraulic pump and operating controls, drive adapter, dirt ejector and winch.

B - MASTER RING: Contains the spoil chamber, spoil door and casing adapter, as needed for smaller diameters of casing.

C – BOTTOM BASE THRUST UNIT: Included in this section are the bottom base frame unit, thrust cylinders, push block, base keepers, operators platform.

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 12 ft. long and is comprised of a 10 ft. standard extra track.
MACHINE COMPONENTS

E - EXTRA TRACK: These are additional sections of track to be bolted to the master track and to each other to allow installation of casing sections. Optional extension tracks can be 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 BAIL POINT (1) – TOP BASE DRIVE PACKAGE: Used to attach spreader bar chains and raise or lower the Top Base Drive Package ONLY! NEVER use this lift bail point to lift the entire machine.

H - LIFT POINTS (2) – BOTTOM BASE THRUST UNIT: Used to attach spreader bar chains and raise or lower Bottom Base Thrust Unit only.

I - LIFT SLING: Lifting apparatus used to raise or lower the Power Package, Base Push Unit or entire machine.

J - CASING ADAPTER: Optional accessory used to reduce the size of the Master Ring Pusher to accommodate smaller casing diameters.

K - TRACK PICK-UP LOCATIONS: Lift Points on the Master and Extra Tracks to allow the use of the spreader bar for raising or lowering.

L - SADDLE ATTACHMENT: Optional accessory used in conjunction with the casing attachment to cradle smaller casing diameters and auger.

M - PUSH BLOCK: Contains the push bar pins 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.

N - DIRT EJECTORS: Paddles bolted to the drive adapter used to expel spoil from the spoil chamber out the master ring pusher spoil door for removal.

O - FRONT DRIVE: Driveline component used to transmit power from the Top Base Drive Package to the auger string and cutting head.

P - DRIVE ADAPTER: Interchangeable replaceable Male Hex by Female Hex Component used to connect the Front Drive to the auger string which can also be used to increase or decrease auger hex sizes.

R - PUSH PLATE: Solid Steel crossmember bolted master track to stabilize track assemblies and provide support for thrusting.

S - PLATFORM STEP: Operations area for the machine operator to control and monitor boring operations. It is intended for the operator only.
MACHINE COMPONENTS

FF

GG

HH

JJ

II

MM

NN

KK

AA

BB

CC

LL

DD

EE
MACHINE COMPONENTS

DESCRIPTION OF MINOR MACHINE COMPONENTS OF HORIZONTAL EARTH BORING MACHINES

AA - FUEL GAUGE: Displays fuel level in Fuel Tank.
BB - RETURN FILTER SERVICE INDICATOR: Displays condition of filter.
CC - RETURN FILTER: Traps particles in return oil.
DD - HYDRAULIC TANK BREATHER/FILTER: Allows tank to breath without allowing contaminates in.
EE - TEMP. & HYD. FLUID LEVEL GAUGE: Displays Hydraulic Oil Temperature and Reservoir Fluid Level.
FF - GEARSHIFT: The earth boring machine is equipped with a 4-speed with reverse mechanical transmission. The shifting pattern is shown on a label in the operator's view. Operation in first through high gears will cause the auger to rotate FORWARD, or clockwise as viewed from the rear of the machine. Reverse gear will cause the auger to rotate in REVERSE, or counterclockwise as viewed from the rear of the machine. Drive torque is determined by the gear selected. The highest torque is in first and reverse gears. Remote linkage for operator comfort in lift kit modes.
GG – SYSTEM PRESSURE GAUGE - Pressure in Hydraulic System.
HH – ENGINE THROTTLE
II – PRESSURE FILTER: Traps particles in pressured oil.
JJ - PRESSURE FILTER SERVICE INDICATOR: Displays condition of filter.
KK - CONTROL PANEL: Location of control and gauges convenient to the operator.
LL – TANK MAGNET
MM - CLUTCH LEVER: Engages and disengages power to the drive-line. Pull and hold to disengage power.
NN – EMERGENCY STOP
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.

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

STARTING ENGINE:

1. Turn start switch to on position.
2. Verify all system lights are operable.
3. Depress the shut down override button.
4. Turn the start switch to Start position.
5. After engine starts release the start switch and override button.
6. 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.
OPERATION

The boring machine has one way of operation. 
2. A method. Most commonly used when boring rock formations. Using the hydraulic valve handle in conjunction with the thrust limiter simultaneously gives the operator infinite control of the forward advancement speed and force applied to the cutting face. (Note: Not Included on all models)
OPERATION

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 push pins in push block to align to track holes for engagement in holes.

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.

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 ring pusher has completely cleared the end of the last extension track.

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

**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 hydraulic valve. This valve is proportional.

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 ring 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.

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 D36/48 and larger 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.

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.
## LUBRICATION AND MAINTAINCE CHART

### MAINTENANCE SCHEDULE CHART - RECOMMENDED SERVICE INTERVALS

<table>
<thead>
<tr>
<th>Service Item</th>
<th>Daily</th>
<th>Weekly</th>
<th>Monthly</th>
<th>1st 100 Hours</th>
<th>Every 300 Hours</th>
<th>Every 1,000 Hours</th>
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</thead>
<tbody>
<tr>
<td><strong>Engine</strong></td>
<td>V</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>• Engine Oil Level</td>
<td>V,L,C</td>
<td></td>
<td></td>
<td>Change</td>
<td>Change</td>
<td></td>
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<tr>
<td>• Engine Oil Filter</td>
<td>L</td>
<td></td>
<td></td>
<td>Change</td>
<td>Change</td>
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<tr>
<td>• Clean Crank Case Vent Tube</td>
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<td>Clean</td>
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<tr>
<td>• Air Cleaner Gauge</td>
<td>V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Pump Coupling</td>
<td>V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>• Air Intake Hoses and Connections</td>
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<td></td>
<td>V</td>
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<tr>
<td>• Primary and Fuel Filter Elements</td>
<td>V,L</td>
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<td>Change</td>
<td>Change</td>
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<td>• Automatic Belt Tensions</td>
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<tr>
<td><strong>Drive Train 1</strong></td>
<td>V</td>
<td></td>
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<tr>
<td>• Adjust Clutch 1</td>
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<td></td>
<td></td>
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<td></td>
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<tr>
<td>• Transmission Oil Level</td>
<td>V,L</td>
<td></td>
<td></td>
<td>C</td>
<td>Change</td>
<td>Change</td>
</tr>
<tr>
<td>• Gear Coupling 1</td>
<td>V</td>
<td></td>
<td></td>
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<tr>
<td>• Gearbox Input Shaft</td>
<td>V,L</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>• Gearbox Oil Level</td>
<td>V,L</td>
<td></td>
<td></td>
<td>C</td>
<td>Change</td>
<td>Change</td>
</tr>
<tr>
<td>• Winch Gearbox Oil Level</td>
<td>V,L</td>
<td></td>
<td></td>
<td>C</td>
<td>Change</td>
<td>Change</td>
</tr>
</tbody>
</table>

* Refer to engine manual for operation and maintenance guide lines.

V - Visual Inspection: Structure Failure, Loose Hardware, Any Defects, Wear, or Fatigue.
L - Leaks: Oil or Hydraulic.
G - Grease: Refer to Lubrication Chart
P - Check Pressure
C - Check Fluid Levels
# LUBRICATION AND MAINTAINCE CHART

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<th>1st 100 Hours</th>
<th>Every 300 Hours</th>
<th>Every</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electrical System</strong></td>
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<td>• Batteries 12 Volt</td>
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<td>• Harnesses</td>
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<td>• Cable Connections</td>
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<tr>
<td>• Work Lights</td>
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<td>• Gauges</td>
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<td><strong>Hydraulic System</strong></td>
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<tr>
<td>• Suction Strainer</td>
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<td>Clean</td>
<td>Clean</td>
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</tr>
<tr>
<td>• Change Hydraulic Oil</td>
<td>P,L</td>
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<td>Change</td>
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<tr>
<td>• Pump Thrust System</td>
<td>P,L</td>
<td></td>
<td></td>
<td>Clean</td>
<td></td>
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</tr>
<tr>
<td>• Tank Return Filter</td>
<td>P,L</td>
<td></td>
<td>Change</td>
<td>Change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Pump Auxiliary</td>
<td>P,L</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>• Hydraulic Pressure Filter</td>
<td>L</td>
<td>P</td>
<td>Change</td>
<td>Change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Oil Reservoir Sight Glass</td>
<td>V,C</td>
<td></td>
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<tr>
<td>• Fittings &amp; Hoses</td>
<td>V,L</td>
<td></td>
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<tr>
<td>• Valves</td>
<td>V,L</td>
<td></td>
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<tr>
<td>• Hydraulic Cylinders</td>
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<tr>
<td>• Hydraulic Motors</td>
<td>V,L</td>
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</tr>
</tbody>
</table>

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HYDRAULIC SYSTEM MAINTENANCE

A fluid ounce of prevention
The basic prescription for hydraulic maintenance is prevention. If you keep contaminants out of hydraulic systems, you will avoid nearly all common problems and failures. However, some contaminants inevitably do enter the system and scratch close-fitting surfaces in the components. Therefore, follow these guidelines to keep your hydraulic fluid in top condition.

- **Keep contaminants out of your hydraulic system.** Clean the area around dipsticks, fill plugs and hydraulic filters before removing them to check or change the hydraulic fluid. Keep all fluid containers tightly sealed when stored and pour directly from the container into the system.

- **Change the fluid and filter after the initial 50 hours of use.** Often, the manufacturing process allows contaminants to enter the hydraulic system. A fluid change after 50 hours will eliminate these particles. Thereafter, change hydraulic fluid and filters at regular intervals as recommended in the owner’s manual.

- **Check oil before each use.** Verify that fluid levels are adequate and that the fluid is in good condition. An inadequate amount of oil can cause severe damage to pumps. If your oil appears foamy or milky, you may have a leak that is causing air to enter the system. Air will cause jerky and slow operation of the hydraulics. Locate and seal the source of any leak.

Also, air within the system holds moisture. When the system cools down after operation, the moisture can condense and mix with the hydraulic fluid. Water in the hydraulic fluid looks similar to the milky appearance resulting from air contamination. To confirm that it’s water, pour 1/8 cup of hydraulic fluid into a metal can and heat it with a propane torch. If you hear popping or crackling, then the fluid has water in it and you should change it immediately.

- **Regularly check the temperature of the hydraulic fluid during operation.** Is the fluid too hot to touch? Does it smell burnt? Your cooling system may be not working properly or you may have pressure-related problems. Check the hydraulic oil cooler or reservoir. They must be kept clean. Remove any dirt or other debris that inhibits airflow around them. If the fluid remains hot for extended periods, it can break down and lose its ability to lubricate adequately.

Pumps
Aside from inspecting the pump for any obvious external wear and damage, you should listen for cavitation. It results when the pump does not receive the proper amount of fluid from the reservoir. Follow these steps every 50 hours or so to check for cavitation.

1. Listen to the pump when the hydraulics are operating. If it rattles or sounds like it is full of marbles or rocks, then cavitation is occurring and the system should be shut down immediately.
2. Check the fluid level and filter to determine if they could be limiting or restricting flow.
3. Next, determine if any previous modifications have been made to the reservoir, inlet lines or pump. If any of the components are altered, the pump inlet flow may be affected.
4. Check inlet lines for any leaks, bends, pinching or other discontinuities that may restrict flow. Also, many systems have inlet strainers that act as a second filter to keep damaging contaminants from reaching the pump. If your system has a strainer, regularly clean it to maintain the needed inlet flow.

Most important, maintain clean fluid and filters. Pumps have check valves, vanes, pistons and gears that can be scoured and damaged by contaminants. This will result in inefficient pumping and cause wear on other parts of the equipment.
HYDRAULIC SYSTEM MAINTENANCE

Cylinders and motors

- Cylinders have seals and rings that can be damaged by excess pressure and contaminants in the fluid. Once again, be sure that your hydraulic fluid is clean. Check the points where the cylinder rod moves in and out of the cylinder housing for leaks. Check the length of the cylinder rods for any dings, dents or other damages that could allow fluid and pressure to escape.

A cylinder is designed to take loads along its axis only. Side loads can decrease cylinder life by causing excess wear on seals and the rod.

- With hydraulic motors, as with pumps, your primary maintenance consideration is clean hydraulic oil. The gears, vanes and pistons can be abraded by contaminants, resulting in pressure loss. Before each use, check the drive shaft of the motor for any damage or leakage. Be sure that motors are started and operated at the correct rpm. The owner’s manual will provide this information.

Valves

Valves consist of tight-fitting components that block or direct flow. These can be abraded and leak (internally), resulting in low hydraulic pressure. Contaminants can lodge in valves and restrict flow. Again, maintain clean hydraulic fluid to keep valves in good working order.

Other components

The next aspect of routine maintenance is checking the hoses, lines, fittings and couplers. Inspect these components to determine if they have been damaged and ensure they are in good condition and in the right location.

- Inspect hoses and lines. Metal lines may be dented from falling tools, contact with other equipment or myriad other reasons. Inspect lines for cracking, cuts or dents that restrict flow or cause pressure leaks. Hoses can be damaged in the same manner, as well as from overheating, extended wear and defective manufacturing. Look for crimped or collapsed hoses that could be restricting flow. The hose could be internally damaged, causing pieces of the hose to enter the hydraulic system and contaminate it.

- Check the hose routing. Sometimes brackets break and hoses and lines end up where they are not supposed to be. They can be pinched, kinked, overstretched or chafed.

- Inspect hoses at flex points. Operate the hydraulic system and observe the flex point for kinking or stretching.

- Check all fittings on hoses to make sure they are snug. If you notice leakage at a fitting, tighten it. Be careful to not overtighten or thread damage will result.

- Check couplings. Always keep these points clean, they are a major source of contamination. Make sure that caps are in place when the couplings are not used and replace any caps that do not fit tightly. Before connecting any lines, thoroughly clean each coupling.

- Keep the hoses clean by washing machinery on a regular basis. This will also help to reduce hydraulic fluid temperatures.

If a hose or line is damaged, make sure that any replacements are of the same length, size and wall thickness. Refer to the service manual for specifications.

Regular preventative inspection

It is time-consuming to thoroughly check the hydraulic system before and after each use. However, most hydraulic systems are not checked until the operator complains of poor performance. By this time, it may be too late to prevent a major repair. Aside from regular maintenance described in the owner’s manual, follow these basic procedures every 50 hours or so to determine the health of your system and prevent costly failures. Once you have located a
HYDRAULIC SYSTEM MAINTENANCE

problem, contact a professional hydraulic technician to do most repair work. They can ensure that all of the specifications and tolerances within the system are maintained.

Inspecting for restricted flow
Slow hydraulics are the result of restricted flow. Low oil level, restricted hoses and lines, and damaged valves, pumps, cylinders and motors are all possible causes.

1. Activate the hydraulic system and determine which individual system components are operating slowly. If, for instance, the bucket on your skid-steer loader does not raise or lower at the normal speed, but other hydraulic attachments do, then the restriction is in the lines and components that service the bucket. Visually inspect these components for leaks. Pay particular attention to connecting points.

2. If no external restriction is obvious, then the obstruction may be internal. Large contaminants may be blocking a valve or have become lodged in part of a cylinder or motor.

3. If you cannot isolate the obstruction and the entire system is operating slowly, then check the pump. If you hear the sound of cavitation, then the pump is not getting enough flow. Determine that the fluid levels are adequate and the all filters and strainers are clean. If the problem persists, check the inlet line to make sure that there is no blockage or kinking. Also, verify that the pump shaft is operating and not damaged.

Inspecting for weak hydraulics
Weak hydraulic response is the result of low pressure. The system may be delivering the amount of flow desired, but due to pressure leaks, the system does not efficiently use the flow to perform work. Pressure problems can result from damaged pumps, worn valves and worn components in motors and cylinders. If, for example, your bucket does not lift as much weight as it should, then there is a leak in the path of flow that is allowing pressure to be lost. To check a bucket attachment, perform the following steps (or comparable steps for other components).

1. Raise the bucket to full height and shut off the engine. Remove pressure from the line by moving the control lever back and forth once or twice. Then look carefully to see if the bucket begins to creep downward. If it does, the leak could be in the cylinder, or a valve that controls flow to the bucket, or both.

2. Block the raised bucket and disconnect the hose that is not under pressure from the cylinder. Now, unblock the bucket. If you notice oil seeping from the port, the cylinder is leaking. If no leak is noticed at the cylinder, then a valve may be defective.

3. Do this to all attachment points on the hydraulic system. If you cannot pinpoint the leak to a specific location, then the pump or one of the primary valves may be leaking.

4. To verify that internal leaks are occurring, check the oil for excess heat. If internal leaks are present, oil is forced through small spaces where the leak is. This increases friction and causes the oil to heat up.

The first step in preventative maintenance is to become familiar with your hydraulic system. The key is to know where the oil flows and how each component functions. Study the layout and determine where the components are and how the hoses and lines are routed. Determine which valves service each cylinder and motor. Once you know your system, regular maintenance and preventative inspections will be easy.

Essentially your hydraulic system is the heart of your boring machine. Please take all of the above and follow through with maintaining your system. The following is the recommended maintenance of the system.
HYDRAULIC SYSTEM MAINTENANCE

Tank Maintenance

Filler Cap. It allows tank to breathe and filters incoming air (Change every oil filter change)

Fill Strainer (Clean every oil change)

Tank Magnet (Clean Once Daily)

Suction Strainer (Clean 1st 100 Hours & every 300 Hours after)

Site Gauge
Return Filter

Change 1st 100 Hours & every 300 Hours after
Pump Coupling  
(Tighten Set Screws to a  
minimum of 150- Ft-Lbs.)  

**Note:** If not tighten  
properly, could cause  
serious damage to pump  
shaft and coupling.
See Cat engine operational manual for more detail about operation and maintenance.
Planetary Gearbox

Oil Level (Check once a day.)
(Fill to oil runs out plug hole.) Use
AGMA #4 EP Lubricant or Equivalent
Synthetic and fill to proper level.
Change every 1,000 hours or once a
year which ever comes 1st.

Oil Drain

Oil Fill
Transmission

Oil Drain

Oil Level (Use 80-90W Gear Oil)

Grease once a week

Relube gear coupling once a year.
Cam Rollers

Cam Roller (Bottom Base)
Grease once a day.

Cam Roller (Push Block)
Grease once a day.
"Collaring" is the first operation in beginning a bore. The objective is to start the cutting head into the ground without lifting the casing out of the saddle. This is done rotating at low RPM’s and using a slow thrust advance. When about four feet of casing has entered the ground, SHUT DOWN the engine, remove the saddle, and check the line and grade the casing. If the casing is not running true, back it out and start again. The success of the bore depends upon the line and grade of the first section of casing.

After the first section of casing has been installed in the ground, stop advancing and clean the casing by rotating the auger until all the spoil is removed. (Exception: In sandy conditions or other runny materials, DO NOT clean the casing as this may create a void. Check the Ground Conditions Charts.) SHUT DOWN the machine and remove the auger pin from the spoil chamber. IT IS AN ABSOLUTE RULE THAT THE MACHINE IS TO BE SHUT DOWN BEFORE THE SPOIL DOOR IS OPENED TO REMOVE THE PIN FROM THE AUGER DRIVE. Unbolt and remove the torque plates, then move the machine back to the rear of the track and SHUT IT DOWN.

Lower the next section of casing and auger into position. Hold and align the casing until the augers at the face are “timed”, flight-to-flight, and couple the hex joint. Block under the casing for support and relax the lifting cables so there is no tension. Block the opening between the casing, and install the auger pin. When the coupling has been secured, remove the blocking, then weld tabs on the new casing at 11 and 1 o’clock positions. Clear the area, and advance the casing over the auger with the boring machine. Use a heavy wood blocking between the machine and the casing and DO NOT rotate the auger during this operation.

Align the new casing with the installed casing by resting the tabs on top of the installed casing. Block the new casing at the machine end and relocate the lift back to the machine end. Align the two casing using 4’ (1.2 m) minimum length straight edges along the top and sides. If the new casing is in line with the installed casing and seriously out of line at the machine end, the problem is in the installed casing and must be corrected. Continuing the bore will probably result in poor or unacceptable alignment of the completed casing installation. The new section of casing is NEVER installed in the machine until the welding is complete.

Tack the two casings together and fully weld. Start the machine and align the drive coupling with the auger hex and couple the drive. The operation may require the spoil door to be open and a worker to direct the operator to align the hex coupling. The use of a flashlight or mirror will allow the worker to be well away from the spoil chamber during the alignment. SHUT DOWN the machine and install the auger pin.

Secure the casing at the machine by welding torque plates to the casing and bolting to the Master Casing Pusher. Add the water and bentonite lines if being used. It is important that each new section of casing be secured at the master casing pusher. This not only prevents the casing from turning, (which maintains the accuracy of the Water Level), it also reduces the hazard of the machine upsetting if the auger or head hangs up while boring. The weight of the casing and the added resistance in the ground, will add to the stability of the machine. Clear the area, start the machine, and install the casing. Continue the process until the bore has been completed. If it becomes necessary to remove the cutting head during the bore to remove an obstruction or to service the cutting head – refer to “REMOVING AND INSTALLING AUGER WITH CUTTING HEAD ATTACHED”.

MICHAEL BYRNE MFG. COMPANY-MANSFIELD,OHIO-U.S.A.-1-800-613-7206
- 45 -
MAINTAINING LINE AND GRADE
If grade is critical, a steering mechanism should be used and the grade monitored. Grade correction can be made continually as required. Contact your Michael Byrne Mfg. Co. Sales Rep for a complete line of steering systems available.

REMOVING AND INSTALLING AUGER WITH CUTTING HEAD ATTACHED

WARNING! Rotating the auger while removing it from the casing increases the exposure of workers to a rotating part. KEEP THE AREA IN FRONT OF MACHINE CLEAR OF PERSONNEL WHEN REMOVING AUGER.

WARNING! Rotating a head with wing cutters inside the casing increases the possibility of an upset. NEVER ALLOW PERSONNEL, OTHER THAN THE OPERATOR, TO BE ON EITHER SIDE OF THE MACHINE DURING THIS PROCEDURE.

THE FOLLOWING PROCEDURE IS TO BE USED WHEN REMOVING AUGER WITH THE CUTTING HEAD ATTACHED:
1. Clear the area, start the machine and clean the casing.
2. SHUT DOWN the machine and remove the torque plates.
3. Start the engine, rotate the auger slowly in REVERSE at least two (2) complete revolutions to collapse the wing cutters, then STOP ROTATION.
4. Retract the auger WITHOUT ROTATION, until the hex auger coupling is well exposed outside of the casing.
5. SHUT DOWN the machine and remove the auger pins at the hex auger coupling and front drive adapter. Clear the area, start the machine and back the machine away from the auger a short distance.
6. SHUT DOWN the machine and remove the auger section.
7. Clear the area and start the machine. ADVANCE the machine and couple to the auger. SHUT DOWN the machine and install the auger pin. Clear the area, and repeat steps 4 – 7 until all auger sections have been removed.

THE FOLLOWING PROCEDURE IS TO BE USED WHEN INSTALLING AUGER WITH CUTTING HEAD ATTACHED:
1. SHUT DOWN the machine and examine and retool head.
2. Clear the area, start the engine, slowly rotate the auger in REVERSE, and ADVANCE until the hex auger coupling is one foot outside the casing.
3. SHUT DOWN the machine and remove the auger pin at the front drive adapter. Clear the area, start the machine and back the machine away from the auger. SHUT DOWN the machine and install the next auger section.
4. Repeat steps 2 and 3 until all auger sections are installed.
CASING INSTALLATION

PREPARING THE EXIT PIT
In most instances, an exit pit will be required at the end of the bore. The safety requirements for the exit pit are the same as for the entrance pit.

If it is necessary to open the exit pit while the boring operation is being carried on, the entire perimeter of the pit must be protected in the same manner as the entrance pit. NEVER ALLOW A WORKMAN IN THE EXIT PIT WHILE THE BORING MACHINE ENGINE IS RUNNING. The unexpected entry of the boring head into the pit can catch the workman and cause serious injury and, in addition, there is real danger of pit collapse as the casing approaches the exit pit.

When utility services have to be avoided, expose them and station an observer outside the protective barrier to watch for the cutting head. A pair of two-way radios is recommended for clear signaling. When hand signals are used, make sure that both parties understand the signals and that traffic will not interfere with the operation. When the head has entered the pit or has been located, the machine is to be SHUT DOWN and the key removed. Again, never allow personnel in the exit pit while the engine is running!

REMOVING THE AUGER AT THE COMPLETION OF THE BORE

WARNING! Rotating the auger while removing it from casing increases the exposure of workers to a rotating part.

KEEP THE AREA IN FRONT OF MACHINE CLEAR OF PERSONNEL WHEN REMOVING AUGER. THE FOLLOWING PROCEDURE IS TO BE USED WHEN REMOVING AUGER FROM THE CASING WITHOUT CUTTING HEAD ATTACHED:
1. SHUT DOWN machine and remove key.
2. Remove the cutting head.
3. Clear the area, start the machine and clean the casing.
4. SHUT DOWN the machine and remove the torque plates.
5. Start engine, slowly rotate in the forward direction, and RETRACT the auger until the hex auger coupling is well exposed outside of the casing.
6. SHUT DOWN the machine and remove the auger pins at the hex auger coupling and front drive adapter. Clear the area, start the machine, and back it away from the auger section.
7. SHUT DOWN the machine and remove the auger section.
8. Clear the area and start the machine. ADVANCE the machine and couple to the auger. SHUT DOWN the machine and install the auger pin. Clear the area and repeat steps 5 – 8 until all auger sections have been removed.
CASING INSTALLATION

CASING SET UP

WARNING! Read and understand the complete safety section of this manual before proceeding further! Death or serious injury could result!

1. Start the boring machine (see Engine Start Up Procedure).
2. Once the machine is running align the push bar dogs with the track dog holes closest to the Master Track push plate and engage the push bar dogs into the track dog holes.

3. Retract the Hydraulic Thrust Cylinders completely and turn off the machine.
4. Slowly lower the Master Saddle into the front of the bore pit and place it in the center of the last piece of extension track. Do not weld to track, welding to the top rail of track will result in premature failure of base rollers and dog alignment sensor.

5. If the use of a casing and saddle attachment is required, assemble the casing and saddle attachment at this time.
6. Shut off the machine and remove the key.
7. The bore pit is now ready for the installation of the first piece of casing, auger and cutting head.
CASING INSTALLATION

CASING OPERATON
Improperly prepared or poor quality casing can make the job more difficult and introduce hazards that are unnecessary. Machine cut beveled ends will assure casing alignment, exact lengths will keep the head at the correct location relative to the casing, and smooth walls will reduce the push required and the tendency of the casing to rotate during the bore.

Preparation of the lead section of casing is best accomplished in the yard. Refer to the Appendix Section Ground Conditions Chart for selection of a cutting head. Michael Byrne Mfg. recommends that our steering head be used on long and/or critical bores.

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

Loading auger into casing is usually done in the yard, then transported to the job site ready to use. The lead section is cut to determine the head position listed in the Ground Conditions Chart. This section is loaded with the head flush or inside the casing so the male hex shank is exposed for the ease of coupling to the machine front drive adapter. The follow-up casings are loaded male hex end first so that the female hex socket is exposed for ease of coupling the auger joint at the job site.

When the sections of casing and auger are loaded on the truck, stack the auger with the exposed female hex socket at the same end to simplify the unloading at the job site.

Michael Byrne Mfg, recommends that all bores be done with the complete string of full size auger sections. However, under ideal soil conditions where the auger loading will be light and the spoil moves easily in the casing, lead sections of full size auger can be followed with smaller sections. Smaller diameter auger is never used in the lead section of casing. The smallest auger used is not to be less than 3/4 of the casing diameter.

The primary factor in the use of smaller auger in this string is torque. The smaller auger will have more windup from the same torque loading than the full size auger. Torque windup pulls the cutting head back toward the casing and could cause the wing cutters to contact the casing, further increasing torque and causing even more damage.

BANDING THE CASING
The use of a partial band at or near the head end of the casing is recommended when boring in most soil conditions. The band compacts the soil and relieves pressure on the casing. Placement of the band is a matter of personal experience. A band, usually of 3/8 x 6 inch steel (1 x 15 cm) is rolled to fit the casing. A gap of approximately 10 inches is left at the bottom. Place the band so that it leads the casing by about 1/2 inch (1.2 cm). Weld securely the front inside and rear outside seams. The inside chamfer of the front weld will provide a lifting action for the casing if the thrust is applied rapidly. If wing cutters are used to over cut the casing, a falling action will occur.
CASING INSTALLATION

INSTALLING THE LEAD CASING

⚠️ **DANGER!** Always use correct lifting devices NEVER hoist or transfer loads over personnel.

Secure the auger in the casing before removing it from the truck. Rest the cutting head end of the casing in the master saddle and align the auger shank with the machine front drive adapter. Station an observer well back from the master casing pusher, and start the machine. See Engine Operating Instructions and Controls. Advance the machine until the front drive adapter is almost touching the male hex auger shank. Rotate the front drive adapter until the hex joint is aligned hole-to-hole. Cautiously advance the machine until the hex auger coupling is joined and the casing is secure in the master casing pusher. Shut down the machine, and install the auger pin in the spoil chamber. A cleaned and lubricated hex coupling will make the job easier.

Weld torque plates on the casing and secure them to the two bolt tabs on the master casing pusher or weld the torque plates to the casing and casing attachment if in use.
ACCESSORIES

CUTTING HEADS

Michael Byrne Mfg 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;

Hard Core Christmas Tree Rock Cutting Head

- Replaceable carbide bits
- Designed for Hard Rock
- Extreme heavy duty fabrication

All Purpose with Wing Cutters

- High Strength Wing Cutters to over cut your bore for a smooth push
- Folds back in place for easy pull back of augers.

Flat Face Rock Head

- Replaceable Carbide bits and holders
- Extreme heavy duty base and fabrication
- Excellent for Rock with a mixed face
ACCESSORIES

Flat Face Dirt/Rock Cutting Heads

- Replaceable bits and holders
- Excellent loose material flow

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. Michael Byrne Mfg. 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
Michael Byrne Mfg. 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
Michael Byrne Mfg. 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 Michael Byrne Mfg.
Set Up

SUGGESTIVE JOB SITE START UP CHECK LIST
Michael Byrne Mfg. Co. recommends that the following items be checked before starting the bore.
1) JOB SETUP
A) Pit walls adequately sloped or sheeted for safety in accordance with (OSHA) CFR29
B) Machine & Casing on Line
C) Machine & Casing on Grade
D) Water Level located with enough chart to accommodate grade for length of bore
E) Pit Sump Pump installed and operating properly
F) Pit Area cleaned up

2) CUTTING HEAD & CASING
A) Measure and Record Outside Cutting Diameter Over Wing Cutters
B) Measure and Record Collapsed Head Clearance inside Casing
C) Cutting head teeth in condition for job
D) Start Bentonite Pump-flow at leading end OK
E) Mark casing in one foot increments starting at leading end

3) BORING MACHINE - Refer to Maintenance Section
A) Fluid levels in Machine
B) Engine crankcase Oil
C) Transmission Gear Lube
D) Gearbox Gear Lube
E) Winch Gear Oil
F) Hydraulic Oil
G) Diesel Fuel
H) Winch locked out and cable wound
I) Hook Rollers Down & Locked
J) Spoil Door Closed

4) JOB SAFETY
A) CREW HAVE ANY QUESTIONS REGARDING SAFETY OR PROCEDURES WITH EQUIPMENT BEING USED
B) Refer to Safety Section of this Manual and Read and Understand it Completely
BORING 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 Entrance Pit Dimensions Chart. 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. Michael Byrne Mfg. 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. Michael Byrne Mfg. 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.
TO INSTALL 20 Ft. CASING LENGTHS

ENTRANCE PIT DIMENSIONS CHART

<table>
<thead>
<tr>
<th>MODEL</th>
<th>CL</th>
<th>S</th>
<th>W</th>
<th>L</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>D36/48-750</td>
<td>24&quot;</td>
<td>7.5 Ft.</td>
<td>12 Ft.</td>
<td>34 Ft.</td>
<td>69&quot;</td>
</tr>
</tbody>
</table>
D36/48-750 HD BORING SPECIFICATIONS

**Power Train System**

Engine:  Cat 97Hp @ 2200 Rpm **Water cooled.**

**Fuel Capacity:**  11 U.S. Gallons

**TRANSMISSION: T-18**

RATIOS

- 1<sup>st</sup> Gear 6.32:1
- 2<sup>nd</sup> Gear 3.09:1
- 3<sup>rd</sup> Gear 1.69:1
- 4<sup>th</sup> Gear 1.00:1
- Reverse 7.44:1

**Planetary Gearbox Ratio**  90-110-150s Extreme Heavy Duty Triple Planetary 84 : 1 Ratio With Push Pull Thrust Bearing Package.

Auger Drive: 3" or 4" Hex
Working Range: 12" to 36" Earth Boring ; Pipe Jacking
Optional : Lift Package to do 48" Bores

**Machine Torque and Speed Max**

<table>
<thead>
<tr>
<th>Gear</th>
<th>Torque</th>
<th>Speed RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&lt;sup&gt;st&lt;/sup&gt; Gear</td>
<td>116,788 Ft-Lbs (1,401,464 In-Lbs)</td>
<td>4.14</td>
</tr>
<tr>
<td>2&lt;sup&gt;nd&lt;/sup&gt; Gear</td>
<td>57,100 Ft-Lbs (685,209 In-Lbs)</td>
<td>8.47</td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt; Gear</td>
<td>31,230 Ft-Lbs (374,759 In-Lbs)</td>
<td>15.49</td>
</tr>
<tr>
<td>4&lt;sup&gt;th&lt;/sup&gt; Gear</td>
<td>18,479 Ft-Lbs (221,751 In-Lbs)</td>
<td>26.19</td>
</tr>
<tr>
<td>Reverse</td>
<td>137,485 Ft-Lbs (1,649,724 In-Lbs)</td>
<td>3.52</td>
</tr>
</tbody>
</table>

**Hydraulic System**

Pressure  5,000 PSI
Pump Type  Piston Pump with Load Sensing
Gallon per Minute  38 GPM
Cylinders  Four 7" Bore x 36" Stroke
Ball valve provided to shut-off 2 cylinders for faster operation.

**4 Cylinder Max Thrust 770,000 Lbs/2 Cylinder Max Thrust 385,000 Lbs**

- Pressure Filter  10 Micron Replaceable Element
- Return Filter  10 Micron Replaceable Element
- Suction Strainer  100 Washable Wire Mech

Heavy Duty Hydraulic Oil Cooler: Oil cooling provided to allow optimize performance of machine in Extreme Conditions.

**Weights (Approx.)**

- Bottom Base Assembly 4,300 Lbs.
- Top Base Assembly 4,150 Lbs.
- Master Ring Assembly 1,024 Lbs.
- Master Track 1,808 Lbs.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Measurement</th>
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</thead>
<tbody>
<tr>
<td>Centerline of Bore to Bottom of Track</td>
<td>24&quot;</td>
</tr>
<tr>
<td>Machine Height</td>
<td>69&quot;</td>
</tr>
<tr>
<td>Machine Width</td>
<td>58&quot;</td>
</tr>
<tr>
<td>Base Track Length</td>
<td>12’ 1 ½&quot;</td>
</tr>
</tbody>
</table>

Centerline of Bore to Bottom of Track (48” Spacer Kit) : 29 ½"
## Appendix

### Ground Conditions Chart

<table>
<thead>
<tr>
<th>Wet Runny Sand</th>
<th>Wet Stable Sand</th>
<th>Dry Sand</th>
<th>Dry Clay</th>
<th>Wet Clay</th>
<th>Small Gravel</th>
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</thead>
<tbody>
<tr>
<td>Auger Speed</td>
<td>Slow</td>
<td>Fast</td>
<td>Slow</td>
<td>Optional</td>
<td>Optional</td>
</tr>
<tr>
<td>Rate of Penetration</td>
<td>Fast</td>
<td>Fast</td>
<td>Slow</td>
<td>Optional</td>
<td>Optional</td>
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</table>

<table>
<thead>
<tr>
<th>Cutting Head</th>
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</thead>
<tbody>
<tr>
<td>Wing Cutters</td>
</tr>
<tr>
<td>Head Position</td>
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</tbody>
</table>

<table>
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<tr>
<th>Bentonite</th>
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<tbody>
<tr>
<td>Water Inside</td>
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<tr>
<td>Band</td>
</tr>
</tbody>
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<tr>
<th>Bore Continous</th>
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<tbody>
<tr>
<td>Clean Casing</td>
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<tr>
<td>Pit Base</td>
</tr>
<tr>
<td>Backstop</td>
</tr>
</tbody>
</table>

### Ground Conditions Chart

<table>
<thead>
<tr>
<th>Hard Pan</th>
<th>Large Gravel</th>
<th>Small Boulders</th>
<th>Soft Solid Rock</th>
<th>Hard Solid Rock</th>
<th>Land or Railroad Fill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auger Speed</td>
<td>Slow</td>
<td>Fast</td>
<td>Slow</td>
<td>Optional</td>
<td>Optional</td>
</tr>
<tr>
<td>Rate of Penetration</td>
<td>Medium</td>
<td>Slow</td>
<td>Slow</td>
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</table>
Appendix

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.

FRICTION RING(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(BOTTOM BASE) 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(TOP BASE) 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 ADAPTER A circular mechanism to provide axial and lateral support of a smaller diameter casing than that of the casing pusher.
Appendix

CASING PUSHER (MASTER RING) 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 (PUSH BLOCK PINS) 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 (DRIVE ADAPTER) 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.

EXTRA 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 (PLANETARY DRIVE) The final reduction unit in the drive line.
Appendix

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(DRIVE ADAPTER) 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.

HELCOID 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 RING 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 push 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.
Appendix

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.
Appendix

SPOIL CHAMBER  The inside area of the casing pusher(master ring) 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(Push) 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.

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 preconstructed 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.
Appendix

**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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