AMERICAN AUGERS ®
an Astec Company

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 American Augers.

Forward

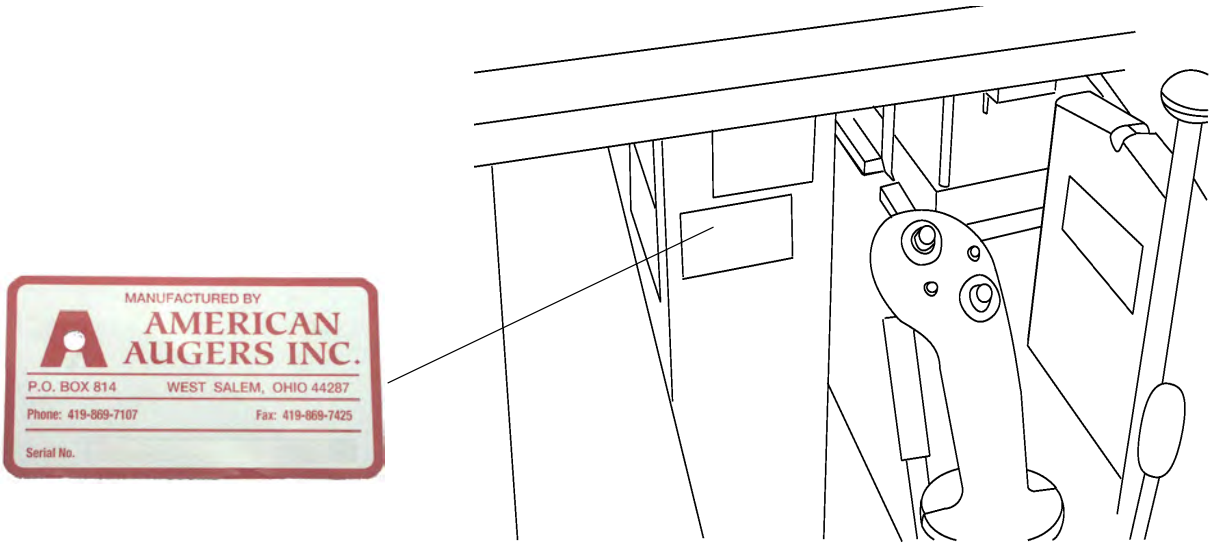
INTRODUCTION

American Augers was established in 1970 to provide a full line of modern equipment for the trenchless excavation construction industry. The company is organized in three product divisions to serve the full range of trenchless technology. American Augers is the division producing the leading line of Horizontal Earth Boring Machines. We are proud of our equipment and the job it can do. We encourage you to call us for any and all your boring needs. Every effort has been made to adequately cover the operation of all models of American Augers Boring Machines.

Boring machine specifications are subject to change without notice or obligation to retrofit units already in the field. This manual will be constantly updated to remain current with new operations. Please call if there are areas requiring further explanation or instruction.

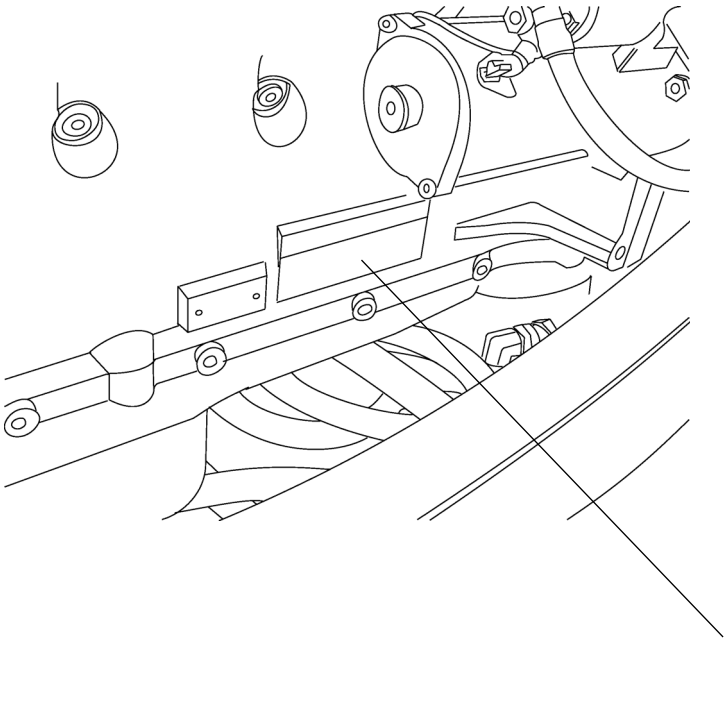
Manual Part Number BMNG10000
Released July 2009 Revision 06

Machine Serial Number Locations



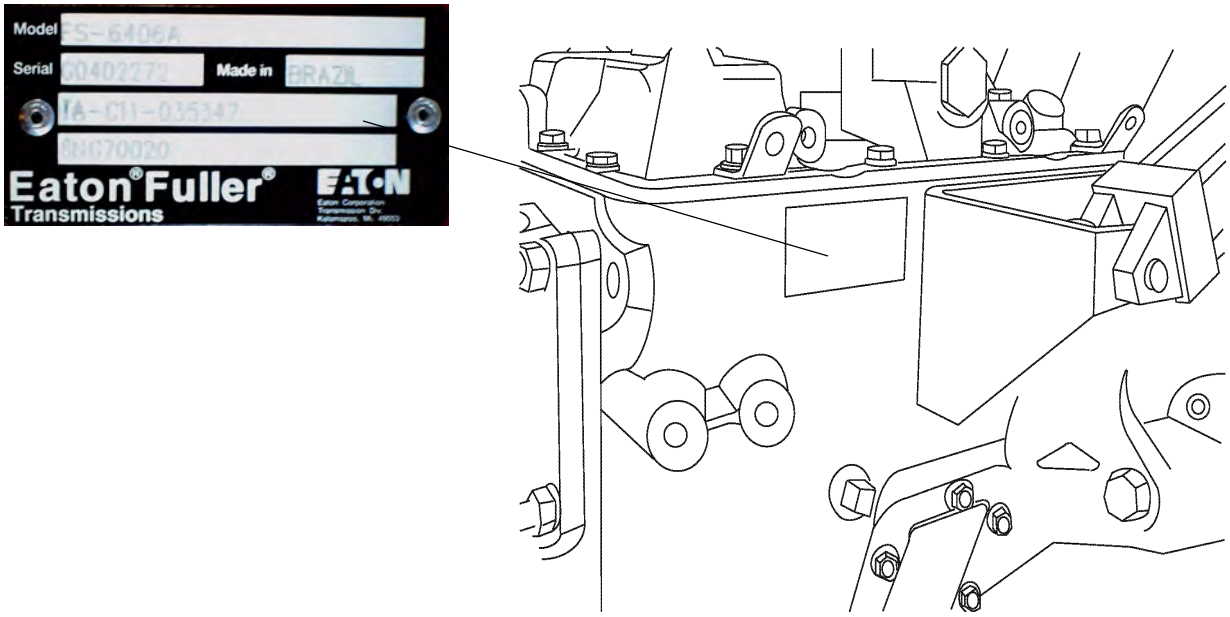
Location of Machine Serial Number Plate

Machine Serial Number



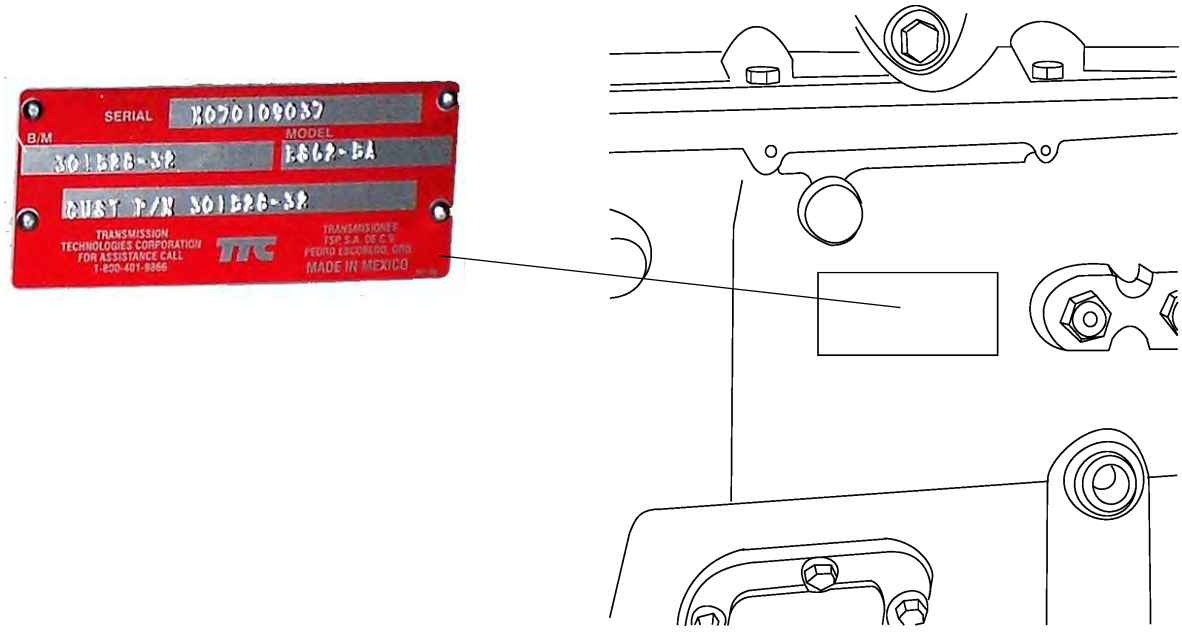
Location of Deutz Engine Serial Number Plate

Deutz Engine Serial Number



Location of Eaton Transmission Serial Number Plate

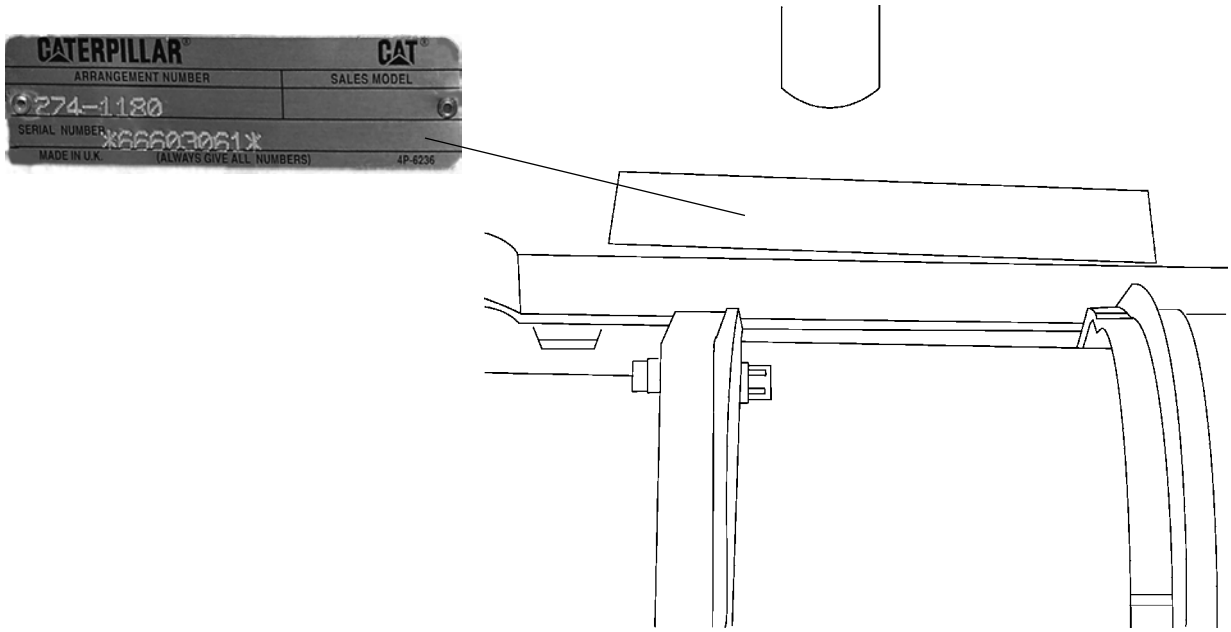
Eaton Transmission Serial Number



Location of TTC Transmission Serial Number Plate

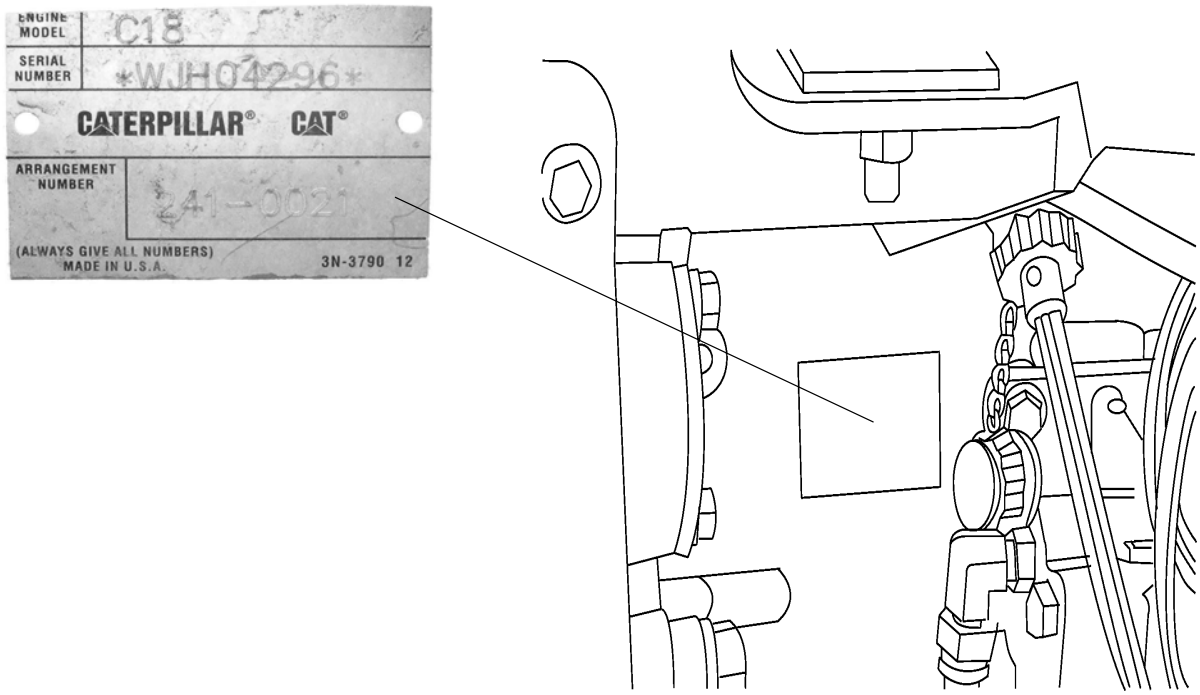
TTC Transmission Serial Number

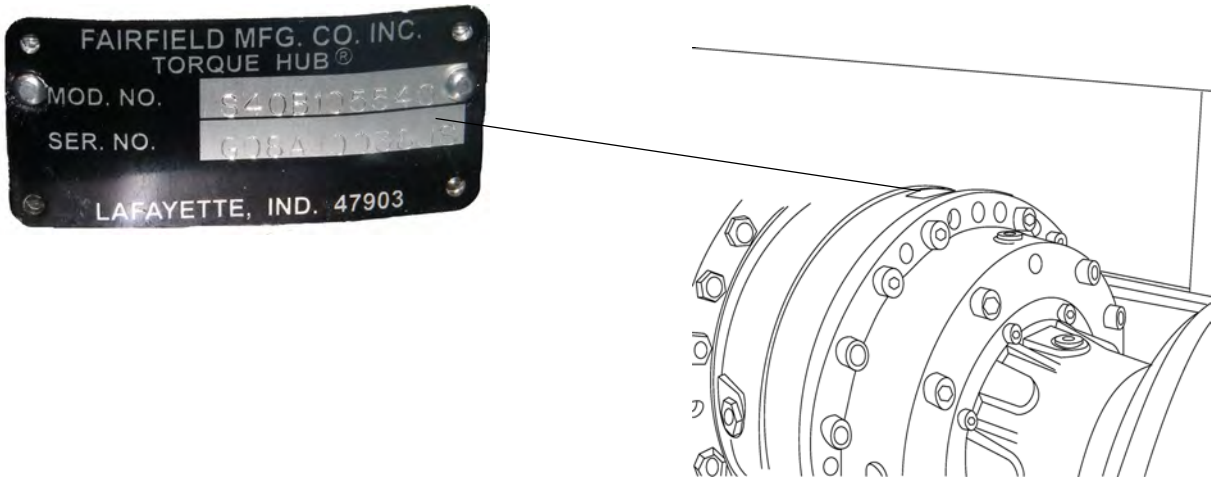
Machine Serial Number Locations



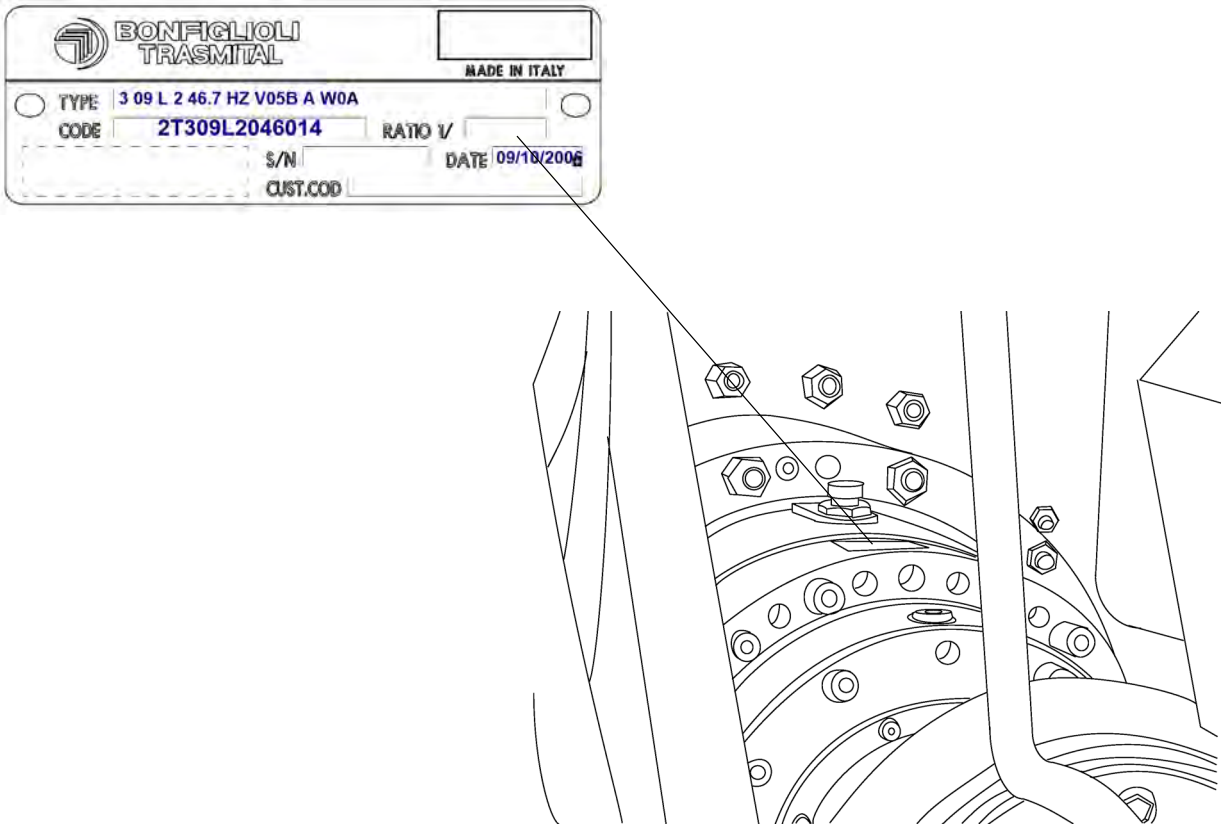
Location of Caterpillar Engine Serial Number Plate

Caterpillar Engine Serial Number





Location of Planetary Gearbox Serial Number Plate



Planetary Gearbox Serial Number

Revision Record

Revision to Manual

Revision Number	Description of Change	Date
00	Total rewrite and update. Includes old style and "NG" models	8/2/2007
01	Updated and reformatted.	9/30/2008
02	Added text about different methods of banding and updated specifications	11/7/2008
03	Revised text about Preventing Machine Upset, Page 27	2/4/2009
04	Revised Detail Controls for 36/42-600NG and 48/54-900NG Boring Machines in accordance with ECN's	2/11/2009
05	Updated Thrust Charts in the Appendix in accordance with ECN	4/24/2009
06	Added instructions about setting gear backlash	7/8/2009

Revision to Manual, Continued

Revision Number	Description of Change	Date

To The Owner

To The Owner

Thank you for your purchase of the American Augers 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 American Augers factory for changes, additions, or modifications that may be 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 American Augers factory to obtain additional manuals and for further information about/or assistance with your machine. Your American Augers 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 (page 15) and the Glossary of Terms.

American Augers 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 American Augers' 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.

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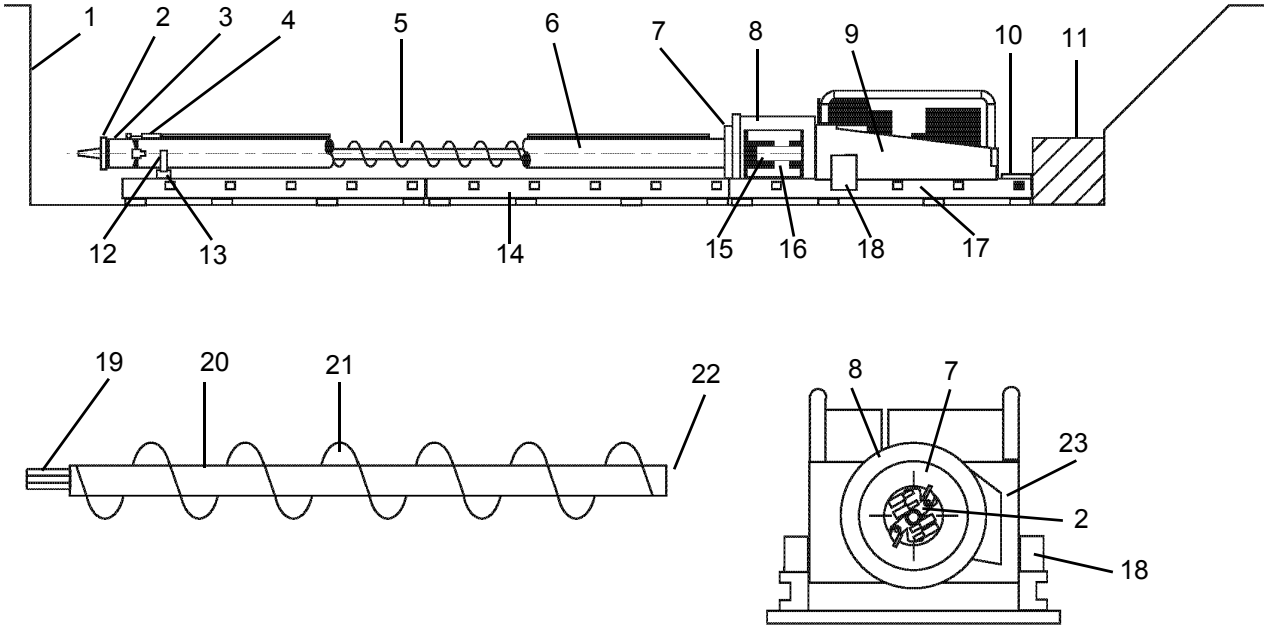
Overview

Boring Machine Components

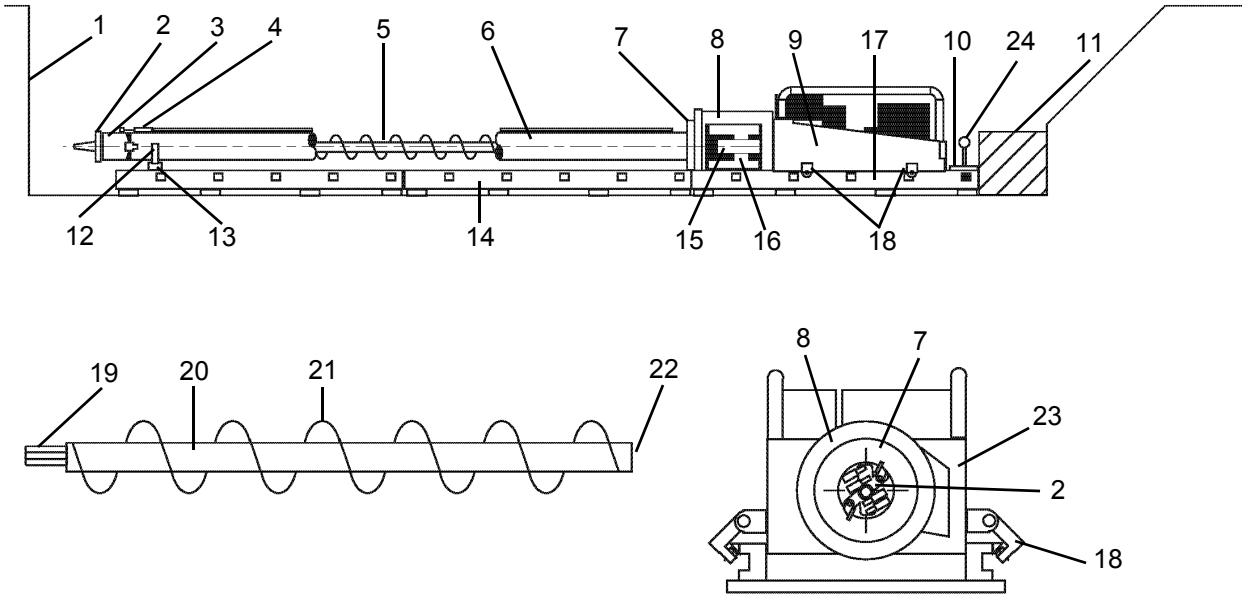
Current Design, NG Models



1) Pit Face
2) Cutting Head
3) Steering Head
4) Steering Knuckle
5) Auger
6) Casing
7) Casing Adapter
8) Casing Pusher
9) Boring Machine
10) Push Bar
11) Backstop
12) Saddle Adapter
13) Master Saddle
14) Extension Track
15) Drive Chuck (Front Drive)
16) Spoil Ejector
17) Master Track
18) Quik-Tran Drive
19) Male Hex Shank (Auger Shank)
20) Auger Tube
21) Auger Flite
22) Female Hex Bushing (Auger Bushing)
23) Spoil Ejector Door

Boring Machine Components (continued)

Pre NG Design



1) Pit Face
2) Cutting Head
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5) Auger
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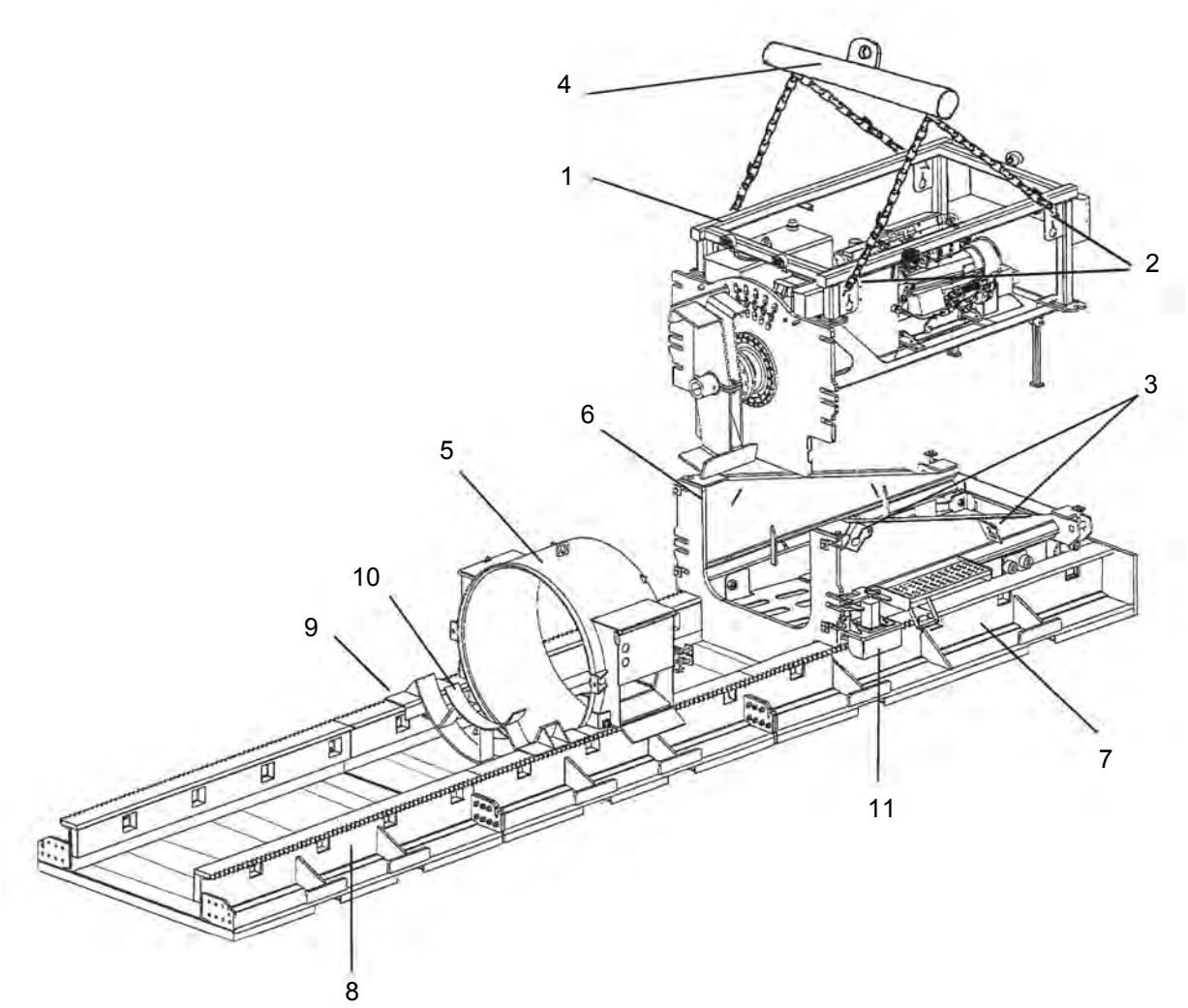
7) Casing Adapter
8) Casing Pusher
9) Boring Machine
10) Push Bar
11) Backstop
12) Saddle Adapter
13) Master Saddle
14) Extension Track
15) Drive Chuck (Front Drive)
16) Spoil Ejector
17) Master Track
18) Hook Rollers
19) Male Hex Shank (Auger Shank)
20) Auger Tube
21) Auger Flite
22) Female Hex Bushing (Auger Bushing)
23) Spoil Ejector Door
24) Brake

Overview

Location of Components, NG Models

Illustration does not reflect actual hardware only the location of hardware on assembly.



1) Power Package - This portion of the machine contains the engine, clutch, transmission, and coupling half. It also includes the fuel tank, hydraulic oil tank, filters, hydraulic pumps and operating controls

2) Indicates lift points for the power package only, using the sling provided by American Augers

3) Indicates lift points for the base unit.

4) The sling provided by American Augers.

5) Master Casing Pusher - Contains the spoil chamber, spoil door, and casing adapter, as needed for smaller diameter casings.

6) Base Push Unit - Included in this section are the base frame unit, header wall, gearbox, final drive, spoil paddles, chuck, thrust cylinders, push bar, operators station.

7) Master Track - This section of track is furnished with the machine, and is always used as the rear most track section. It has a thrust plate bolted to the end of the track.

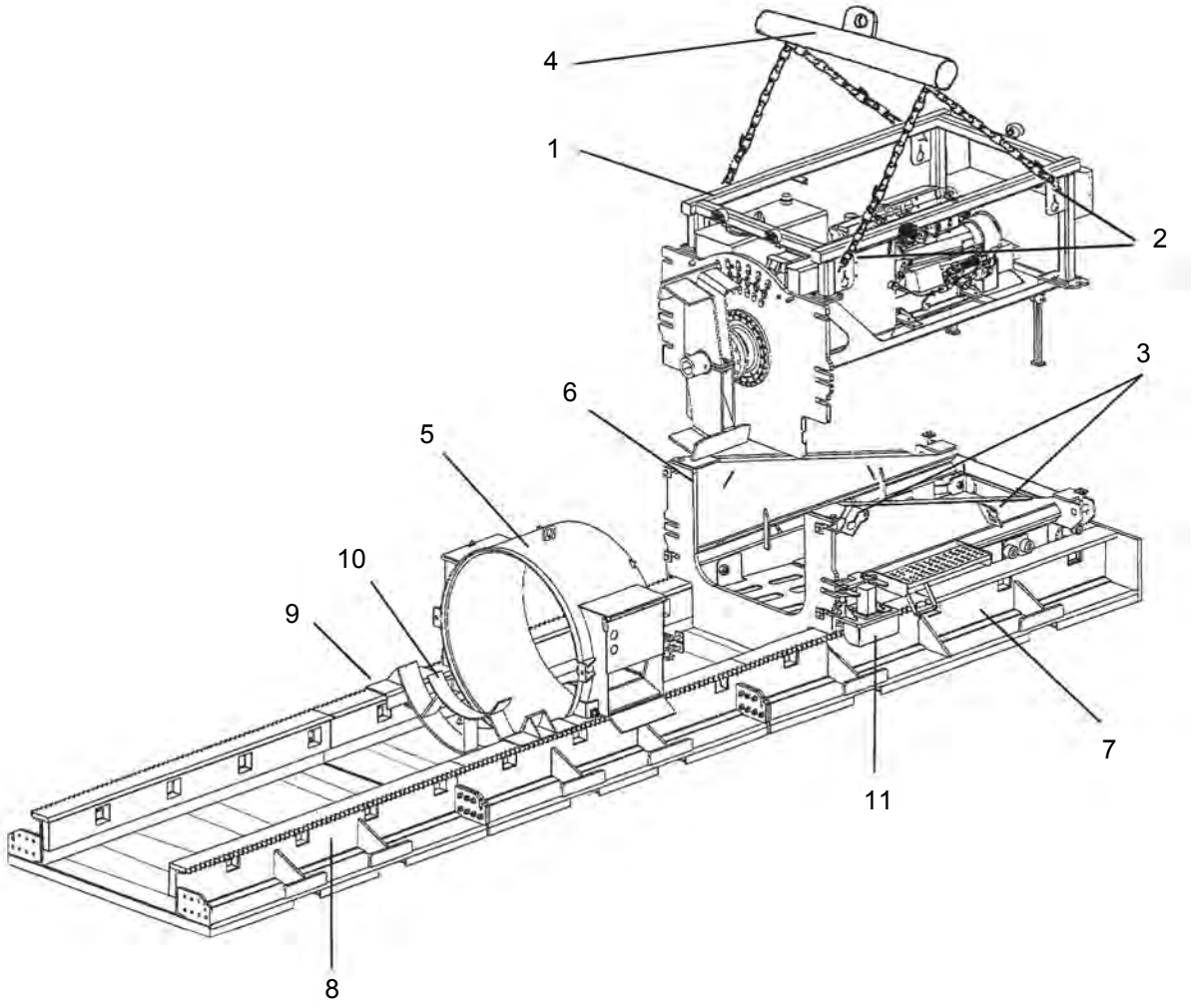
8) Extension Track - These are additional sections of track to be bolted to the master track and to each other to allow installation of longer casing sections. Two sections of extension track along with the master track are furnished with each machine.

9) Saddle - Rests on the track in front of the boring machine to carry casing and auger.

Overview

10) Saddle Adapter - This may be mounted on the saddle to carry smaller casings than the machine size.

11) Quik-Tran - Returns the boring machine to its starting position on the Master track. Normally there is one Quik-Tran assembly on each side.



General Information

Operation and Maintenance Manual

TITLE: Boring Machines Operation & Safety Instruction Manual
EDITION: 2008
Part number: BMNG10000

Operator

The operator must read and follow the manual.

Ownership of Information

American Augers, Inc. reserves all rights to the information in this manual.

The manual cannot be reproduced or photocopied in part or in whole without previous written authorization from American Augers, Inc. The use of the manual is restricted to the customer who received it and only for purposes of installation, use and maintenance of the relevant machine. American Augers declares that the information contained in this manual fits the technical and safety specifications of the machine. American Augers disclaims responsibility for direct or indirect damages to persons or property caused when the manual or the machine are used in violation of the information contained herein.

The information contained in the manual refers only to the machine mentioned in Paragraph, MACHINE IDENTIFICATION DATA. American Augers reserves the right to modify or improve the manual and the machines without notice.

Manufacturer Identification Data

AMERICAN AUGERS, INC.
135 U.S. Rt. 42, P.O. Box 814
West Salem, Ohio 44287 USA
Tel. 419-869-7107 • Fax 419-869-7425
Web Site: www.americanaugers.com

Machine Identification Data

Type:	Auger Boring Machine
Model:	Various
Serial number:	All
Year of manufacture:	All

Location of identification plates: See illustrations on pages 3 through 6.

Qualification of Personnel

If skilled personnel operate the machine according to the advice and instructions supplied in the manual, the machine will operate safely. All the operations of transport, use and maintenance must be carried out only by skilled and authorized personnel, after studying and understanding the instructions supplied by the manual.

NOTICE
American Augers disclaims any responsibility for damages to persons or property caused by the operation of the machine by untrained personnel.

EC-Declaration of Conformity

If required, the declaration of EC conformity is issued at consignment of the machine together with the manual and the CE mark will be applied. EC conformity is not required in North America.

Use of Personal Protective Equipment

WARNING

If personal protective equipment is not used, serious injury or death of personnel can occur.

The operator and all other personnel on the worksite should use proper protective equipment according to their duties.

Legal Disclaimer

NOTICE

American Augers disclaims any responsibility for damages to persons or property caused by the operation of the machine in violation of the instructions contained in this manual.

Purpose of Machine

The machine was designed for the purpose of horizontal boring through the earth.

Pit Preparation

See the appendix for the pit preparation requirements.

Ambient Conditions

Temperature limits: 5°F and 105°F [-15°C and +40°C] (with oils and coolants recommended). For temperature lower than 32°F [0°C] contact American Augers. For temperatures not included in the range 40°F AND +5°F [-40°C AND -15°C] contact American Augers.

Relative humidity : 100%

Maximum altitude: 6500 ft [2000 m] above sea level

Atmospheric conditions should allow adequate visibility within the operating area.

The machine should not be operated when lightning is likely.

Features of Transport

The machine should be transported by a truck tractor, in accordance with local transportation laws.

Machine Handling Procedures

Use

For safety reasons, it is recommended only one person operates the controls. Other trained personnel may work near the boring machine if they are wearing personal protective equipment.

General Information

Maintenance

During maintenance, with the machine running, be especially cautious to ensure the safety of all personell.

Warranty

General Conditions

Warranty is subject to the conditions specified in the warranty certificate.

Limitations of Warranty

The warranty for all the components purchased and not produced by American Augers directly are subject to the original warranty of suppliers/manufacturers and therefore defects in materials or workmanship are considered valid only if they are recognized by the same suppliers/manufacturers. In particular the warranty on the diesel engine is supplied by the diesel engine dealer in the area where the drill is sold.

Warranty Certificate

The warranty certificate is on the inside of the last page of this manual.

Request for Service/Support

For service support in or out of the warranty period, contact American Augers.

Provide model number, serial number of the machine, and working hours. The working hours can be read from the hour meter display set into the tachometer. Or, where a Caterpillar engine is used, from the hour meter in the Caterpillar engine display.

Warranty and Service for Diesel Engine

The local diesel engine dealer services the diesel engine. The diesel engine warranty is valid worldwide. Only diesel engine dealers are authorized to perform repairs under warranty and supply service and spare parts.

Instruction Manual

This manual is part of the safety system of the equipment. Use it during training of all personnel who will pariticipate in the operation of the equipment. Ensure that a copy is always available on the jobsite and that the operators have read it and have access to it. Carefully follow the instructions, advice, and procedures contained in this manual.

Notes

NOTES:

Safety Information

Safety

Safety Awareness Program

Understanding Operation Safety

All references throughout this manual are to current models of American Augers Boring Machines. Operating guidelines will generally apply to most models in each group. Please call American Augers if you encounter problems not addressed in this manual.

BE AWARE OF SAFETY INFORMATION.

This is the safety alert symbol. This symbol is placed in the manual to alert you to the potential for bodily injury or death.

UNDERSTAND SIGNAL WORDS

Signal words are used to identify safety information within the text of this manual, and are used on the hazard alert signs used on the machine.

DANGER
indicates an imminently hazardous situation which, if not avoided, will result in death or serious personal injury.

WARNING
indicates a potential hazard or unsafe situation which, if not avoided, could result in death or serious personal injury.

CAUTION
indicates a potential hazard or unsafe practice, which if not avoided may result in minor personal injury or product or property damage.

If you are the owner, operator, or the helper using an American Augers Earth Boring Machine, it is important that you recognize that your boring machine is a powerful piece of construction equipment. (IT MUST BE OPERATED WITH RESPECT AND CAUTION.)

All operators or trainees must carefully read and thoroughly understand this Operation Manual before starting or 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. In the United States, workplace safety is regulated by the Occupational Health and Safety Administration (OSHA). OSHA regulations are found in the *Code Of Federal Regulations.*, Chapter 29. This is known as 29CFR1910. Information can be obtained from your Regional U.S. Department of Labor Office.

Basic Safety Guidelines

The following is only an outline of good safety practices. It is the responsibility of each person working with boring machines to learn and follow all local, state and federal safety regulations. All operators must read and understand the Operation & Safety Instruction Manual before starting the machine. The meaning of the hazard alert signs is explained in the Operation & Safety Instruction Manual.

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 hard hat, steel toe boots or shoes, and eye protection.

Thorough training of the operator is essential for the safe operation of any boring machine. American Augers 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.

Safety Suggestions for Earth Boring Equipment

1. Each employer shall protect employees 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 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 turn the engine off before leaving the operator's station for any reason.
7. It is recommended that the exit pit be excavated at the beginning of the boring process. If this is not possible then the boring procedure should be stopped short of the exit pit location to allow the exit pit to be excavated and then the boring completed. This will minimize the risk to personnel and equipment.
8. Always remove machine from tracks before lifting, then lift machine and tracks separately. Before transporting, always secure machine to tracks with dogs engaged.

WARNING

Before doing any service on the machine, push the Emergency Stop button and remove the ignition key.

Basic Safety Guidelines

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 manufac turers 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.

Basic Safety Guidelines

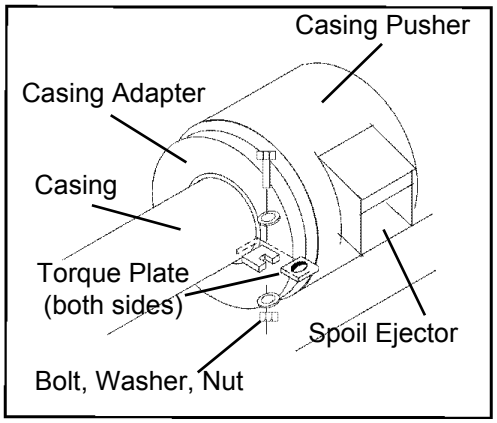
Preventing Machine Upset

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. All American Augers NG Boring Machines which have rack and pinion with Quik Tran are inherently captured into the track. Earlier gneration machines require the deployment of hook rollers. 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.

HTD Head

Basic Safety Guidelines

The operator must use care when operating a cutting head with wing cutters. These are designed to open in front of the casing and make a bore slightly larger than the casing itself. The ideal situation is to remove the cutting head in the exit pit before removing the auger sections. Otherwise, the auger is rotated backwards so the wing cutters can retract and the head can be pulled back into the casing. If the operator tries to operate the auger in the forward rotation with the head inside the casing, the wing cutters can snag on the inside of the casing.

If the cutting head becomes locked and cannot turn, the operator should move the joystick to neutral and continue to hold it with the clutch button pushed in, and then push the emergency stop button. Releasing the clutch can cause damage and injury.

Free-boring (boring without casing) exposes personnel to high-risk hazards of unprotected drill string and increased possibility of machine upset. All American Augers 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 Alerts

Please note the limited warranty included in this manual. If you have questions on the warranty or about any part of the machine operation, please contact American Augers.

Safety Alerts

Danger-Rotating Auger and Cutting Head

Rotating auger and cutting head present many shear points where the operator's limbs could be caught and injured. They are part of the drill 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 turned off 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

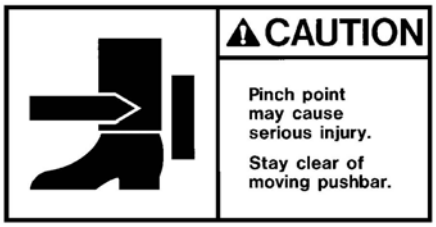
The spoil chamber encloses the rotating blades of the spoil paddles that push the spoil out of the chamber. The close tolerances of the paddles and chamber walls present a hazard. American Augers equips its Boring Machines with gravity activated spoil doors for a dual purpose. The spoil door shields the exit opening against accidental entry of tools or workers into the spoil chamber, while also protecting nearby personnel 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 to be opened only with the machine shut down in order to provide access during the pinning and unpinning of auger sections.

Danger-Machine Upset

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. It is important to 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, shut off the machine and always station the worker beside the casing, not the machine. Never allow unnecessary personnel forward of the operator when the machine is operating.

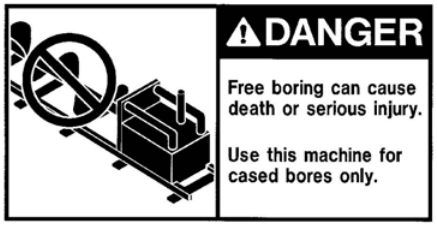
Caution-Pinch Points

During normal operation of the machine the operator must advance the push bar. The operator must be aware of the position of the push bar since it moves slowly into position. 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.



Danger-Free Boring

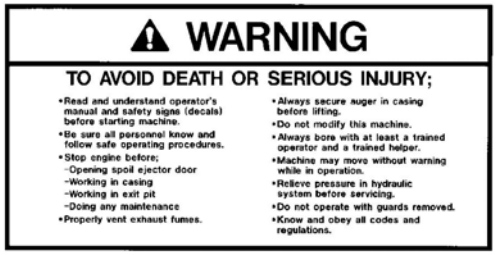
Free-boring exposes personnel to high-risk hazards of unprotected drill string and increased possibility of machine upset. All American Augers Boring Machines are designed and sold for cased bores only. When removing auger from the casing after a bore, keep all personnel away from the exposed rotating auger.



Safety Alerts

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

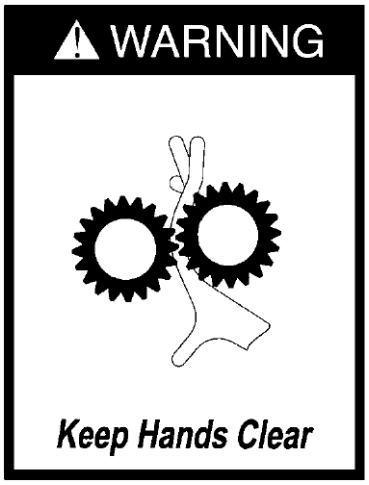
- Read and understand operator's manual and safety signs (decals) before starting the machine.
- Be sure all personnel know and follow safe operating procedures.
- Engine must be turned off before:
  - Opening spoil ejector door
  - Working in casing
  - Working in exit pit
  - Doing any maintenance.
- Properly vent exhaust fumes.
- Always secure auger in casing before lifting.
- Do not modify this machine.
- Always bore with at least a trained operator and a helper.
- Machine may move without warning while in operation.
- Relieve pressure in hydraulic system before servicing.
- Do not operate with guards removed.
- Know and obey all codes and regulations.

Danger-Fire Hazard

Never fuel your machine when the engine is hot or running. Fuel can be ignited by a hot muffler, a spark or an electrical short and can cause serious injury. Always use an approved container to store fuel.

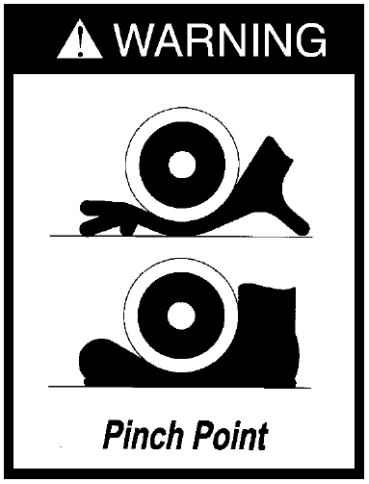
Warning-Keep Hands Clear

Rotating gears present many shear points where an operator's hands and fingers could be caught and injured. The gears are part of the Quik Tran system that moves the boring machine up and down the track. The machine must be turned off when servicing the Quik Tran system to prevent accidental rotation of the gears.

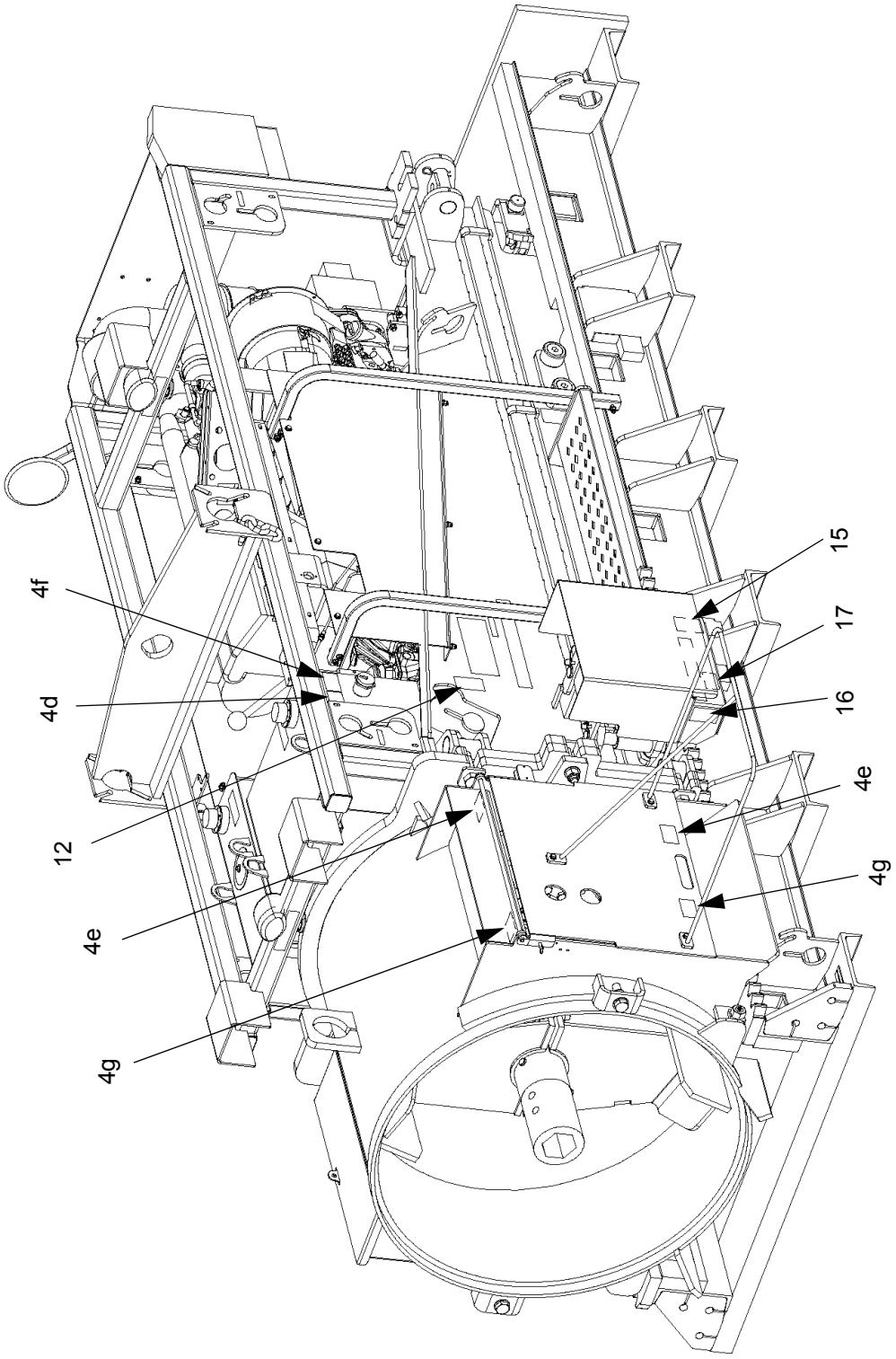


Warning-Pinch Point

When lowering the boring machine into the track, care must be taken to keep hands and feet clear of the gap between the cam followers on the machine and the top of the track. If a lifting device should fail and the machine should fall, hands and feet could be crushed between the cam follower and the top of the track.

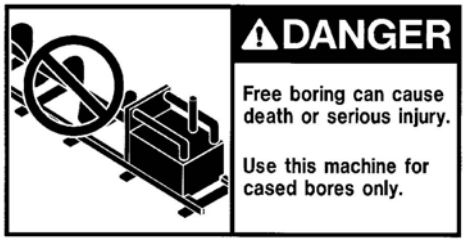


NOTES:


15
4f
17
4d
16
4e
12
4g
4e
4g

Safety Alerts

(4d) Precautions against free boring.



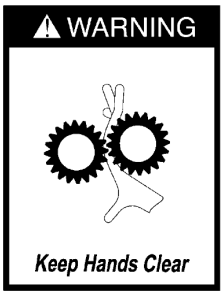
(4e) Precautions about rotating blades.

(4f) Precautions about machine upset.

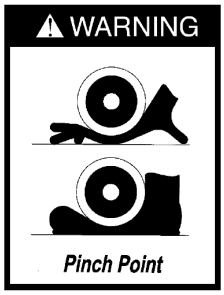
(4g) Precautions about rotating auger.

(12) Precautions about machine rollover.

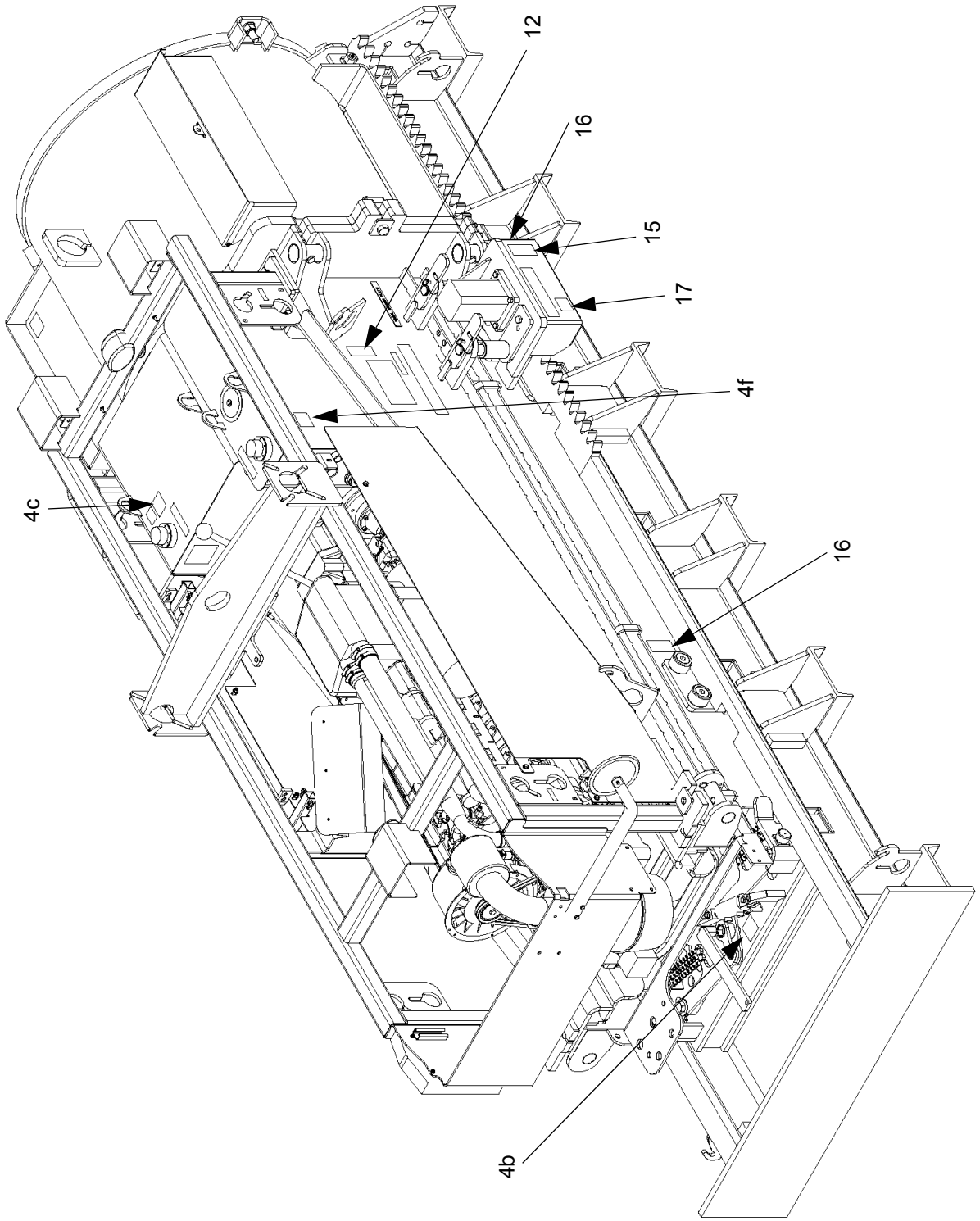
(15) Precautions about keeping hands clear.



(16) Precautions about pinch points.

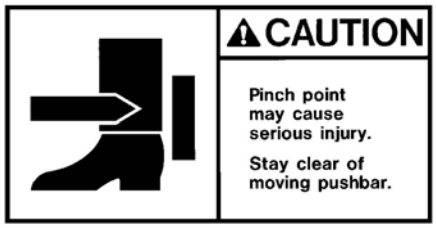


(17) Precautions about operating with Quik Tran motors disengaged.


12
16
15
17
4f
4c
16
4b

Safety Alerts

(4b) Precautions about pinch points.

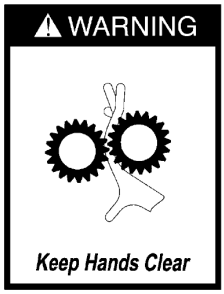


(4c) Precautions about fire hazard.

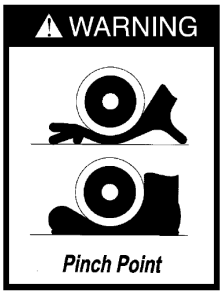
(4f) Precautions about machine upset.

(12) Precautions about machine rollover.

(15) Precautions about keeeping hands clear.

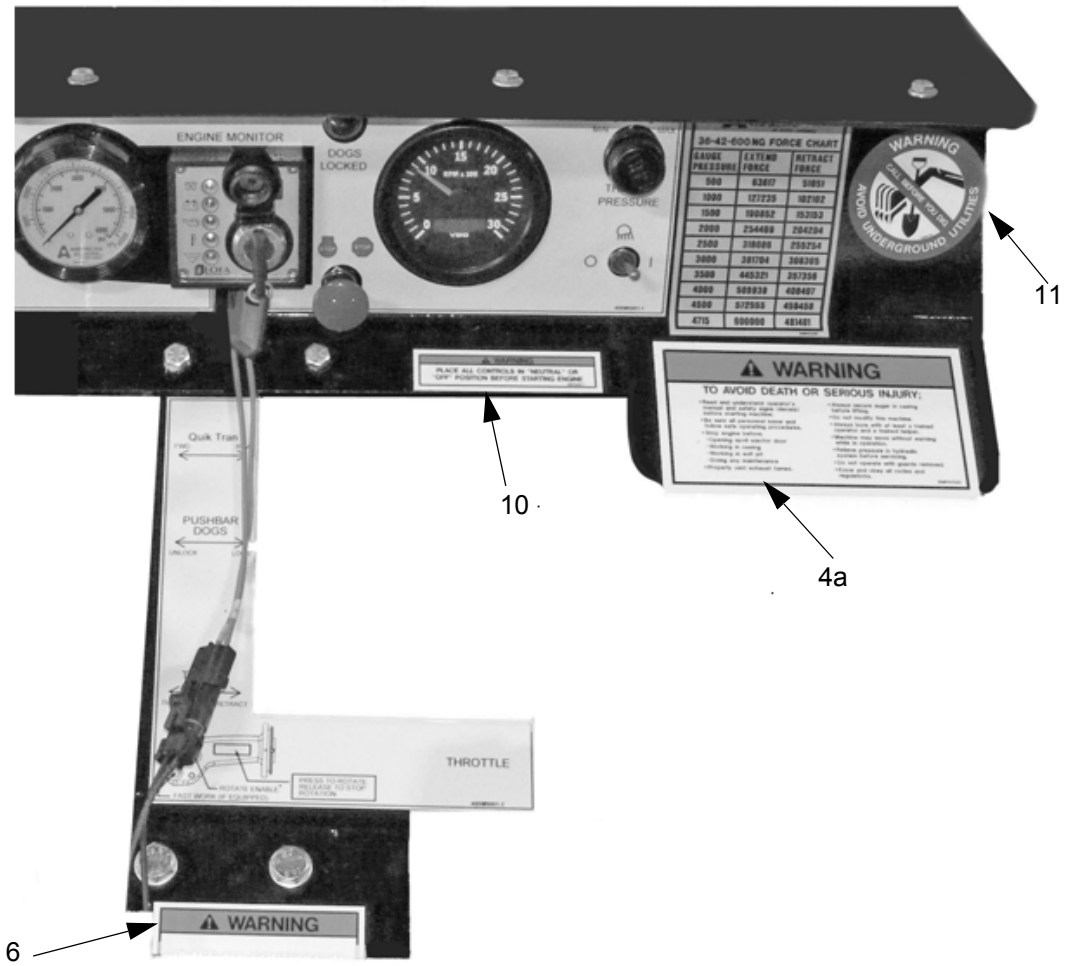


(16) Precautions about pinch points.



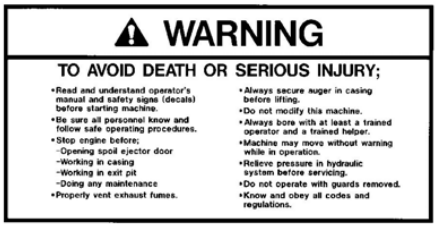
(17) Precautions about operating with Quik Tran motors disengaged.

Safety Alerts



Safety Alerts

(4a) Precautions death or injury.



(6) Precautions about putting controls in neutral.

(10) Precautions about putting controls in neutral.

(11) Precautions about calling before digging.

NOTE: The placement of the safety decals shown above may vary from model to model as well as the arrangement of the control area.

Notes

NOTES:

Operations

Guidelines For Use Of Boring Machines

The following pages outline the basic procedures for making a cased bore. The recommendations and suggestions offered throughout this manual are based upon years of field experience. They may not be valid for every job and every situation. The user employs them at his own risk. American Augers encourages you to contact the factory for technical assistance whenever there is a question about technique or the application of a particular machine on the job.

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 meter) sections of casing, are found in the Entrance Pit Chart, Appendix B. These dimensions will provide the most convenient and safest working conditions.

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. American Augers strongly recommends that the owner become familiar with the requirements of 29CFR1910. 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. We recommend the use of a concrete base with base of crushed stone to aid in removal of water. Contractors sometimes choose to place the track on planking on a crushed stone base. This technique is effective on short, non-critical bores.

The boring operation requires that a square, 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 two times the maximum thrust of the boring machine being used. American Augers, Inc. strongly recommends using the services of a competent engineer to assist in the pit base and 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, and/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 Appendix C for base and backstop recommendations.

The possibility of flooding always exists during the boring operation. The location of a pit sump for pumping should be considered during the design of the pit. The sump is placed on the right front or right rear, depending on the slope of the pit floor. This placement will move water away from ejected spoil on the left side of the machine.

Setting and Aligning the Track

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

NOTICE
The machine and the track sections are designed to be placed seperately.
Always use balanced lift points.

Instructions for the assembly and breakdown of split machines are contained in this manual. Note that there are two sets of lifting eyes on split machines. The upper set (1), located on the rack, is used to lift the power package out of the push package. It is NEVER used to lift the entire machine. A second set (2) is located on the push package and can be used to lift either the entire machine (without track) or the ***push*** package alone.

Lift and place the master track in the pit with the push plate against the backstop. Install the extension tracks by aligning the tops of the joints and bolting together using Grade 5 bolts in ALL holes. Note that the track sections are numbered at each end. Extension tracks are installed so that adjoining ends have the same number. Use a string and plumb bob to align the track sections with the line of the proposed bore, before setting the machine.

Detailed Controls

Safety Switches and Tethered Deadman Switch

Emergency Stop Push Buttons

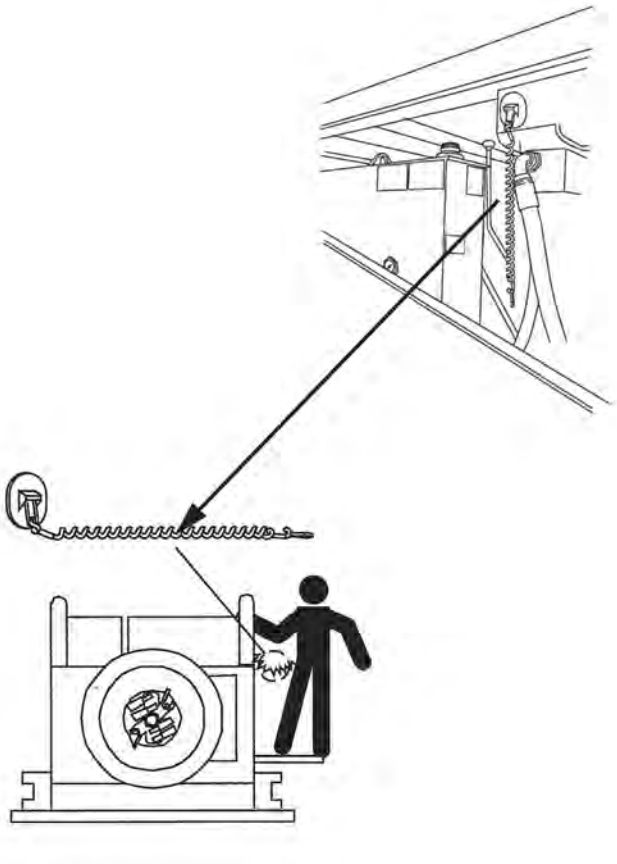
This is a red PUSH-to-STOP control, located at the operator's station. The control must be pulled up/out (PULL-to-RUN) before the engine will start. The purpose of the control is to provide a rapid means of shutting down the entire machine in the event of an emergency. The location of this control varies from machine to machine and will be shown when the control station for each machine is discussed.

Tethered Deadman Switch

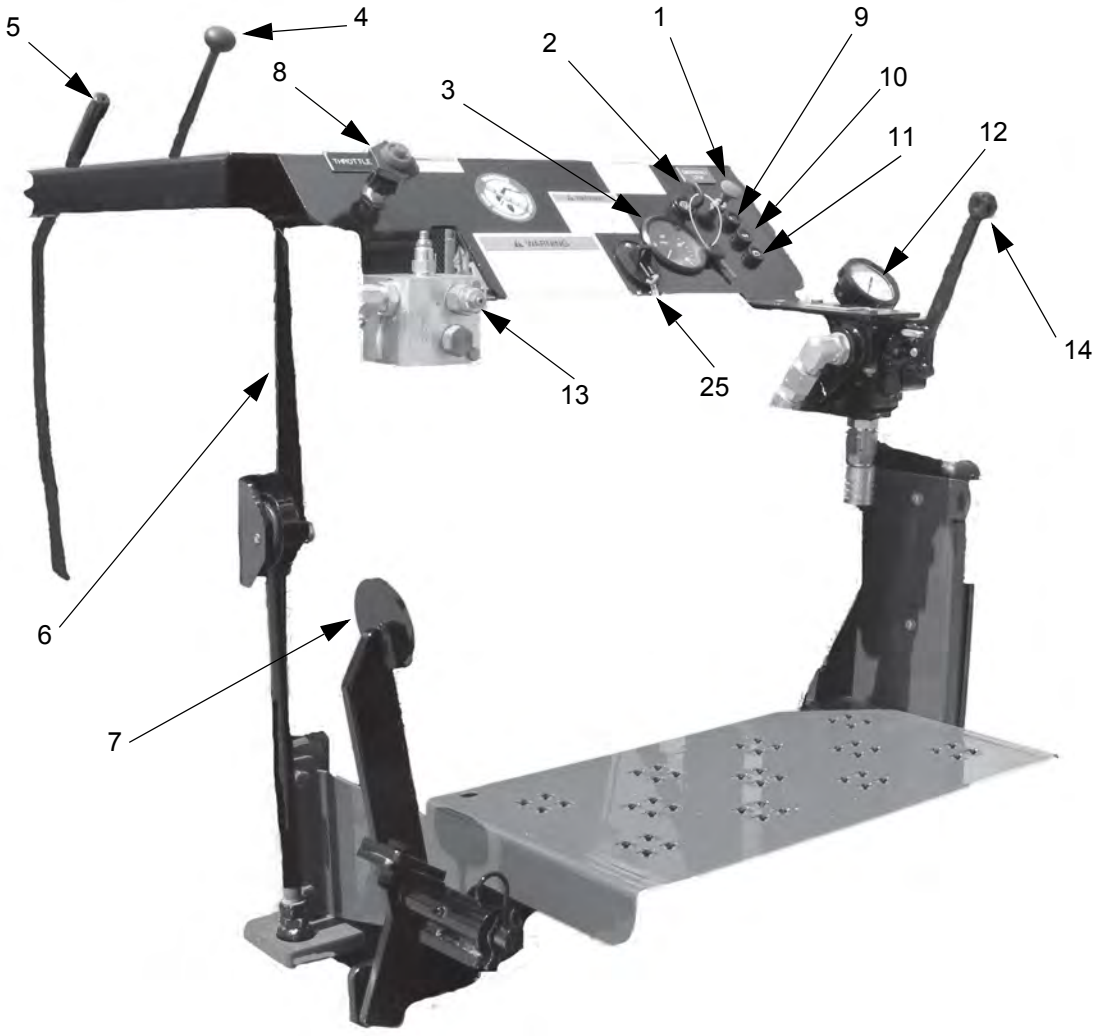
This is a flexible cord with a clip that attaches to the operator's uniform. If the operator leaves his station, the cord pulls a switch that stops the engine.

WARNING

Do not attempt to bypass the deadman control. Operation of the machine with the deadman control disabled can result in injury or death.



24/30-150 Boring Machine Controls



(1) Emergency Stop -- This is a red PUSH-to-STOP control, located at the operator's station. The control must be pulled up/out (PULL-to-RUN) before the engine will start. The purpose of the control is to provide a rapid means of shutting down the entire machine in the event of an emergency.

(2) Ignition Switch -- Starts the engine.

(3) Tachometer -- A tachometer shows engine speed. Also includes the hour meter display if not a Caterpillar engine.

(4) Gearshift --The boring machine is equipped with a 4 forward speed gearbox with reverse mechanical transmission. The shifting pattern is shown on a label in the operator's view. Operation in forward 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 machine torque is in first and reverse gears.

(5) Clutch -- The clutch is a mechanical automotive type that is disengaged by pulling the clutch lever toward the operator. The clutch lever must be held by the operator while shifting gears. Releasing the lever engages the clutch.

(6) Brake Lever

(7) Pushbar Dogs Foot Pedal -- This pedal extends or retracts the pushbar dogs. On the 24/30-150 machines it is spring loaded "out".

Detailed Controls

(8) Throttle -- Pull the throttle to increase the engine speed (RPMs). Most models have a positive throttle, which requires a center button to be depressed before the throttle can be pulled out (accelerate) or pushed in (decelerate). The throttle position (engine speed) and the gear selected control the auger rotation speed.

(9) Engine Oil Pressure indicator light.

(10) Engine Oil Temperature indicator light

(11) Alternator operation indicator light.

(12) Thrust Pressure Gauge -- The thrust pressure gauge is matched to the pump system pressure specified for each machine. Check the pressure rating decal on your machine and be aware of it throughout your operation. The forward thrust of the machine can be judged in relation to the thrust pressure gauge and the pressure rating decal. The pressure rating decals for the machines are shown in Appendix A.

(13) Thrust Pressure Adjust -- This control is found on the instrument panel. It allows the operator to limit the thrust of the boring machine to match its output to job conditions.

(14) Thrust Control -- Push forward on the handle to advace the boring machine and pull back on the handle to retract the boring machine.

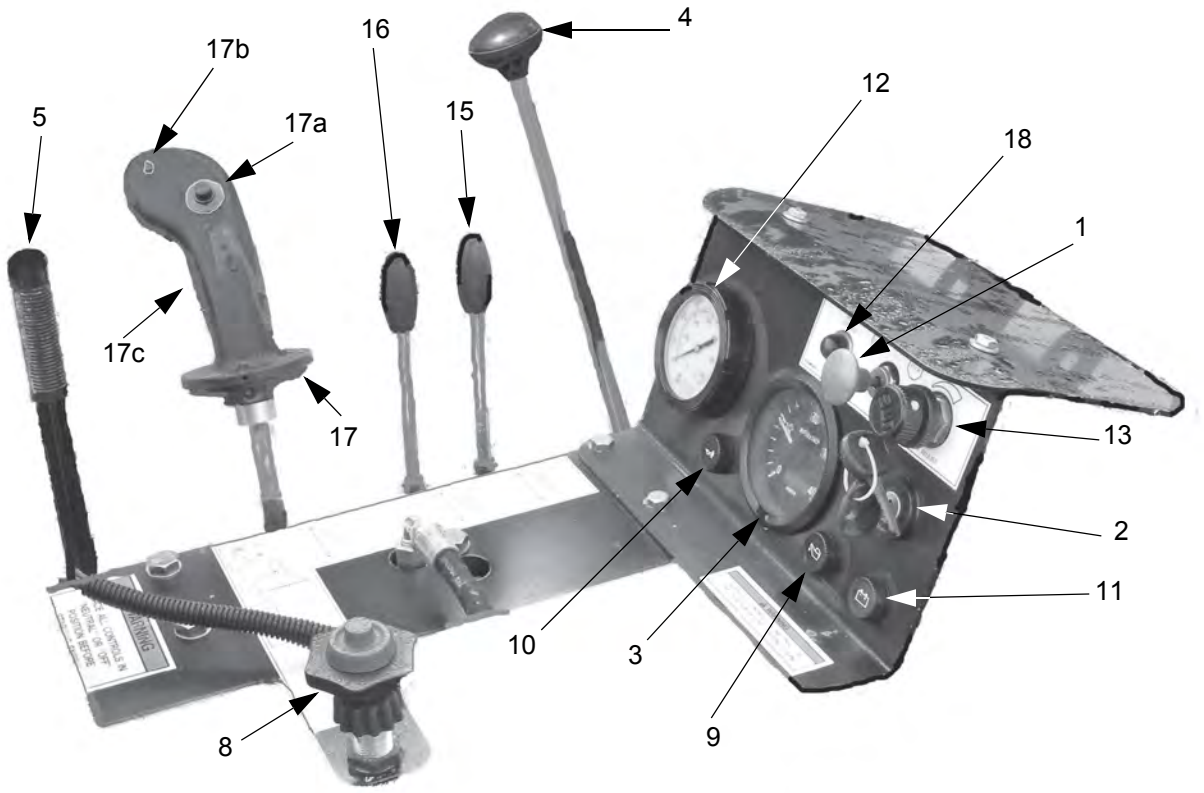
(25) Tethered Deadman Switch -- This is a flexible cord with a clip that attaches to the operator's uniform. If the operator leaves his station, the cord pulls a switch that stops the engine.

WARNING

Do not attempt to bypass the deadman control. Operation of the machine with the deadman control disabled can result in injury or death.

Each boring machine has a fuel gauge on the fuel tank and a sight gauge on the hydraulic tank.

36/42-440NG Boring Machine Controls



(1) Emergency Stop -- This is a red PUSH-to-STOP control, located at the operator's station. The control must be pulled up/out (PULL-to-RUN) before the engine will start. The purpose of the control is to provide a rapid means of shutting down the entire machine in the event of an emergency.

(2) Ignition Switch -- Starts the engine.

(3) Tachometer -- A tachometer shows engine speed. Also includes the hour meter display if not a Caterpillar engine.

(4) Gearshift --The boring machine is equipped with a 4, 5 or 6 forward speed gearbox with reverse mechanical transmission. The shifting pattern is shown on a label in the operator's view. Operation in forward 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 machine torque is in first and reverse gears.

(5) Electric/Hydraulic Clutch-- The clutch is power assisted. The trigger on the joystick engages the clutch. If the operator releases trigger, the clutch will automatically disengage.

(8) Throttle -- Pull the throttle to increase the engine speed (RPMs). Most models have a positive throttle, which requires a center button to be depressed before the throttle can be pulled out (accelerate) or pushed in (decelerate). The throttle position (engine speed) and the gear selected control the auger rotation speed.

(9) Engine Oil Pressure indicator light.

(10) Engine Oil Temperature indicator light

(11) Battery indicator light.

Detailed Controls

(12) Thrust Pressure Gauge -- The thrust pressure gauge is matched to the pump system pressure specified for each machine. Check the pressure rating decal on your machine and be aware of it throughout your operation. The forward thrust of the machine can be judged in relation to the thrust pressure gauge and the pressure rating decal. The pressure rating decals for the machines are shown in Appendix A.

(13) Thrust Pressure Adjust -- This control is found on the instrument panel. It allows the operator to limit the thrust of the boring machine to match its output to job conditions.

(15) Quik Tran Control -- Some early production models of NG boring machines used a winch and cable to retract the boring machine to its starting position on the master track. Recent production machines use the Quik-Tran system to retract to the starting position.

(16) Pushbar Control -- This lever controls a hydraulic circuit that extends or retracts the pushbar dogs. On the 36/42-440NG boring machine the pushbar dogs are retracted with this valve. The pushbar dogs are normally spring loaded “out”.

(17) Joystick -- Depending on the model, the joystick contains one or two push buttons and a trigger switch. Movement of the joystick toward or away from the operator controls the movement of the boring machine toward or away from the pit face.

(17a) ROTATE ENABLE push button switch, which enables the clutch circuit. Each push button is the “maintain contact” type. Once the button is pushed, the circuit stays energized even if the engine is stopped. The operator must push the button a second time to de-energize the circuit.

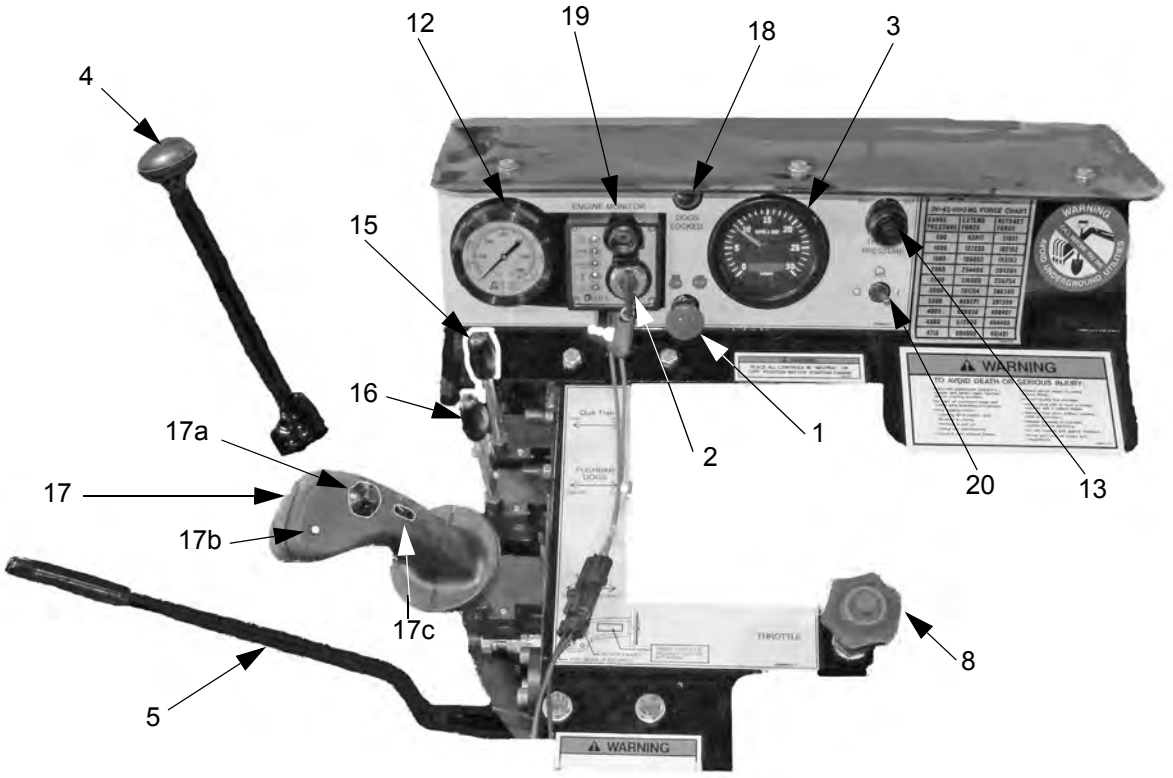
(17b) ROTATE ENABLE light.

(17c) ROTATE trigger switch that controls the electric clutch. The operator must hold the trigger to keep the clutch engaged.

(18) Dogs Latched Indicator -- Indicates that the Pushbar Dogs are latched.

Each boring machine has a fuel gauge on the fuel tank and a sight gauge on the hydraulic tank.

36/42-600NG Boring Machine Controls prior to S/N NG3660002841208



(1) Emergency Stop -- This is a red PUSH-to-STOP control, located at the operator's station. The control must be pulled up/out (PULL-to-RUN) before the engine will start. The purpose of the control is to provide a rapid means of shutting down the entire machine in the event of an emergency.

(2) Ignition Switch -- Starts the engine.

(3) Tachometer -- A tachometer shows engine speed. Also includes the hour meter display if not a Caterpillar engine.

(4) Gearshift --The boring machine is equipped with a 4, 5 or 6 forward speed gearbox with reverse mechanical transmission. The shifting pattern is shown on a label in the operator's view. Operation in forward 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 machine torque is in first and reverse gears.

(5) Electric/Hydraulic Clutch-- The clutch is power assisted. The trigger on the joystick engages the clutch. If the operator releases trigger, the clutch will automatically disengage.

(8) Throttle -- Pull the throttle to increase the engine speed (RPMs). Most models have a positive throttle, which requires a center button to be depressed before the throttle can be pulled out (accelerate) or pushed in (decelerate). The throttle position (engine speed) and the gear selected control the auger rotation speed.

Detailed Controls

(12) Thrust Pressure Gauge -- The thrust pressure gauge is matched to the pump system pressure specified for each machine. Check the pressure rating decal on your machine and be aware of it throughout your operation. The forward thrust of the machine can be judged in relation to the thrust pressure gauge and the pressure rating decal. The pressure rating decals for the machines are shown in Appendix A.

(13) Thrust Pressure Adjust -- This control is found on the instrument panel. It allows the operator to limit the thrust of the boring machine to match its output to job conditions.

(15) Quik Tran Control -- Some early production models of NG boring machines used a winch and cable to retract the boring machine to its starting position on the master track. Recent production machines use the Quik-Tran system to retract to the starting position.

(16) Pushbar Control -- This lever controls a hydraulic circuit that extends or retracts the pushbar dogs. On the 36/42-600NG and 42-600NG boring machines the pushbar dogs are retracted with this valve. The pushbar dogs are normally spring loaded “out”.

(17) Joystick -- Depending on the model, the joystick contains one or two push buttons and a trigger switch. Movement of the joystick toward or away from the operator controls the movement of the boring machine toward or away from the pit face.

(17a) ROTATE ENABLE push button switch, which enables the clutch circuit. Each push button is the “maintain contact” type. Once the button is pushed, the circuit stays energized even if the engine is stopped. The operator must push the button a second time to de-energize the circuit.

(17b) ROTATE ENABLE light.

(17c) ROTATE trigger switch that controls the electric clutch. The operator must hold the trigger to keep the clutch engaged.

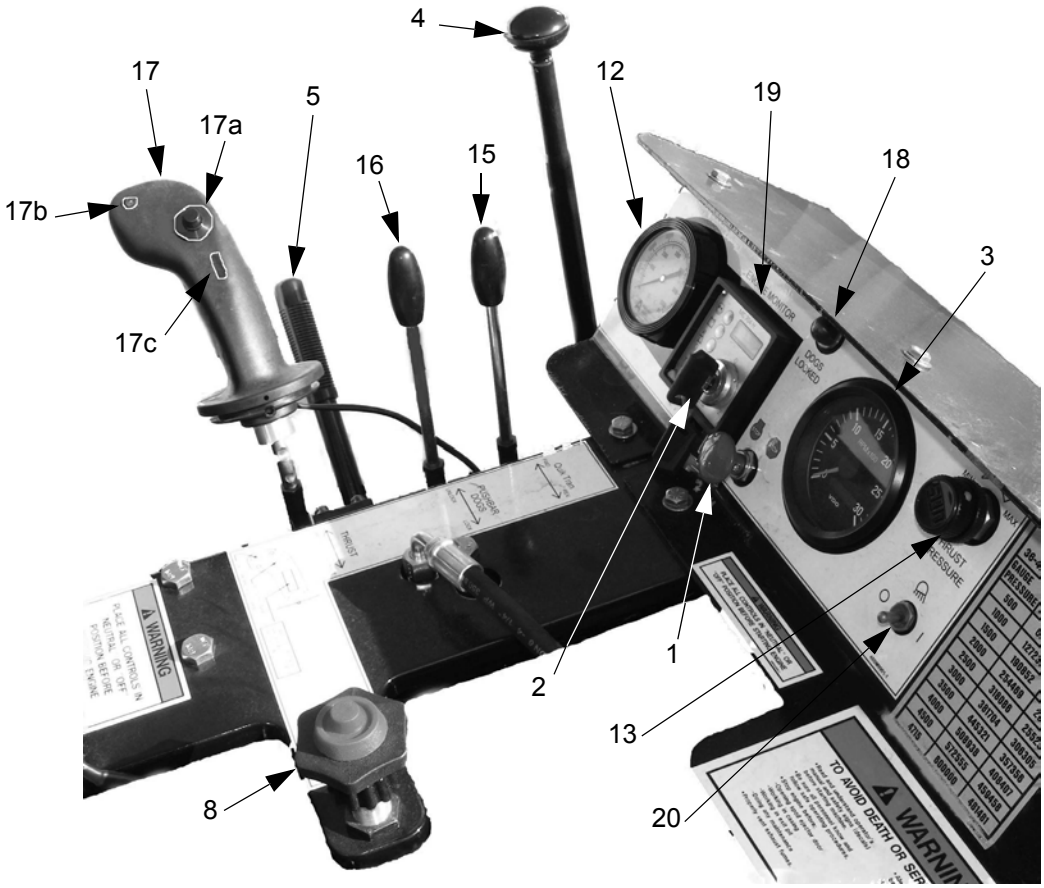
(18) Dogs Latched Indicator -- Indicates that the Pushbar Dogs are latched.

(19) Engine Monitor -- Lights indicate engine oil pressure, oil temperature and alternator operation. A tachometer shows engine speed.

(20) Light Switch.

Each boring machine has a fuel gauge on the fuel tank and a sight gauge on the hydraulic tank.

36/42-600NG Boring Machine Controls, S/N NG3660002841208 and higher



(1) Emergency Stop -- This is a red PUSH-to-STOP control, located at the operator's station. The control must be pulled up/out (PULL-to-RUN) before the engine will start. The purpose of the control is to provide a rapid means of shutting down the entire machine in the event of an emergency.

(2) Ignition Switch -- Starts the engine and activates the engine pre-heat.

(3) Tachometer -- A tachometer shows engine speed. Also includes the hour meter display if not a Caterpillar engine.

(4) Gearshift --The boring machine is equipped with a 4, 5 or 6 forward speed gearbox with reverse mechanical transmission. The shifting pattern is shown on a label in the operator's view. Operation in forward 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 machine torque is in first and reverse gears.

(5) Electric/Hydraulic Clutch-- The clutch is power assisted. The trigger on the joystick engages the clutch. If the operator releases trigger, the clutch will automatically disengage.

(8) Throttle -- Pull the throttle to increase the engine speed (RPMs). Most models have a positive throttle, which requires a center button to be depressed before the throttle can be pulled out (accelerate) or pushed in (decelerate). The throttle position (engine speed) and the gear selected control the auger rotation speed.

Detailed Controls

(12) Thrust Pressure Gauge -- The thrust pressure gauge is matched to the pump system pressure specified for each machine. Check the pressure rating decal on your machine and be aware of it throughout your operation. The forward thrust of the machine can be judged in relation to the thrust pressure gauge and the pressure rating decal. The pressure rating decals for the machines are shown in Appendix A.

(13) Thrust Pressure Adjust -- This control is found on the instrument panel. It allows the operator to limit the thrust of the boring machine to match its output to job conditions.

(15) Quik Tran Control -- Some early production models of NG boring machines used a winch and cable to retract the boring machine to its starting position on the master track. Recent production machines use the Quik-Tran system to retract to the starting position.

(16) Pushbar Control -- This lever controls a hydraulic circuit that extends or retracts the pushbar dogs. On the 36/42-600NGboring machines the pushbar dogs are retracted with this valve. The pushbar dogs are normally spring loaded “out”.

(17) Joystick -- Depending on the model, the joystick contains one or two push buttons and a trigger switch. Movement of the joystick toward or away from the operator controls the movement of the boring machine toward or away from the pit face.

(17a) ROTATE ENABLE push button switch, which enables the clutch circuit. Each push button is the “maintain contact” type. Once the button is pushed, the circuit stays energized even if the engine is stopped. The operator must push the button a second time to de-energize the circuit.

(17b) ROTATE ENABLE light.

(17c) ROTATE trigger switch that controls the electric clutch. The operator must hold the trigger to keep the clutch engaged.

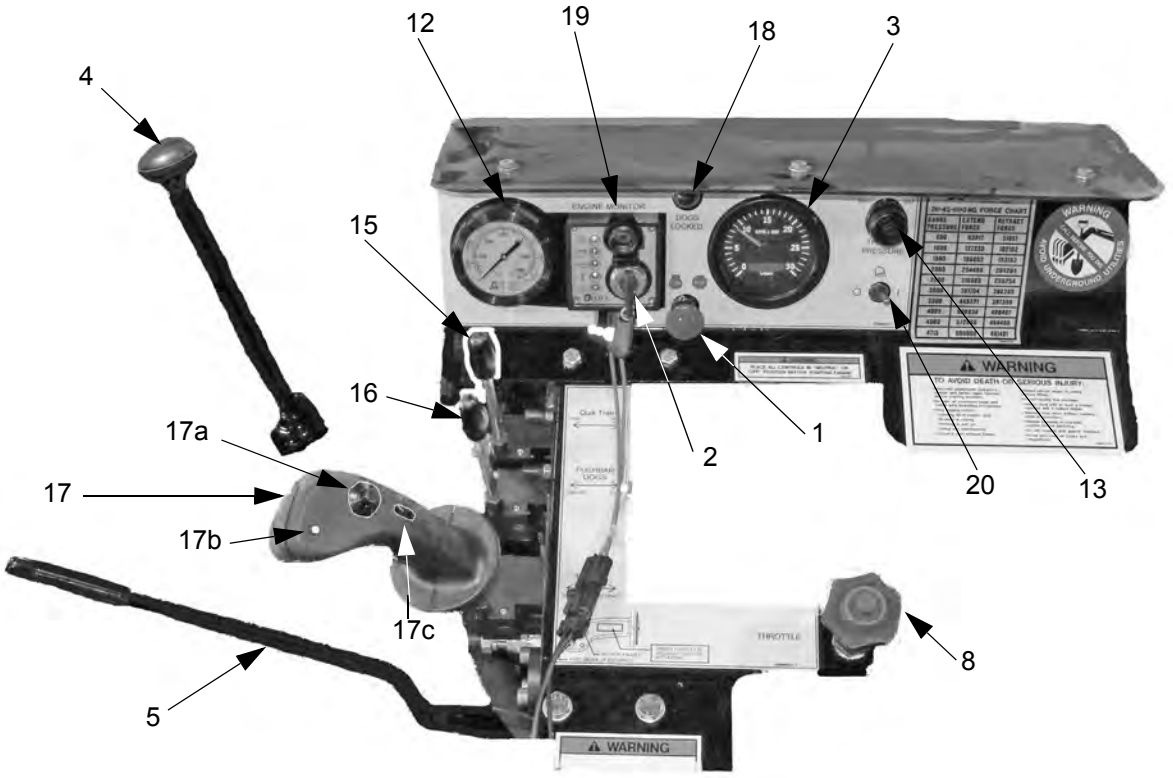
(18) Dogs Latched Indicator -- Indicates that the Pushbar Dogs are latched.

(19) Engine Monitor -- Lights indicate engine oil pressure, oil temperature, engine pre-heat and alternator operation. A tachometer shows engine speed. An hour meter displays the total running hours.

(20) Light Switch.

Each boring machine has a fuel gauge on the fuel tank and a sight gauge on the hydraulic tank.

42-600NG Boring Machine Controls



(1) Emergency Stop -- This is a red PUSH-to-STOP control, located at the operator's station. The control must be pulled up/out (PULL-to-RUN) before the engine will start. The purpose of the control is to provide a rapid means of shutting down the entire machine in the event of an emergency.

(2) Ignition Switch -- Starts the engine.

(3) Tachometer -- A tachometer shows engine speed. Also includes the hour meter display if not a Caterpillar engine.

(4) Gearshift --The boring machine is equipped with a 4, 5 or 6 forward speed gearbox with reverse mechanical transmission. The shifting pattern is shown on a label in the operator's view. Operation in forward 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 machine torque is in first and reverse gears.

(5) Electric/Hydraulic Clutch-- The clutch is power assisted. The trigger on the joystick engages the clutch. If the operator releases trigger, the clutch will automatically disengage.

(8) Throttle -- Pull the throttle to increase the engine speed (RPMs). Most models have a positive throttle, which requires a center button to be depressed before the throttle can be pulled out (accelerate) or pushed in (decelerate). The throttle position (engine speed) and the gear selected control the auger rotation speed.

(12) Thrust Pressure Gauge -- The thrust pressure gauge is matched to the pump system pressure specified for each machine. Check the pressure rating decal on your machine and be aware of it throughout your operation. The forward thrust of the machine can be judged in relation to the thrust pressure gauge and the pressure rating decal. The pressure rating decals for the machines are shown in Appendix A.

Detailed Controls

(13) Thrust Pressure Adjust -- This control is found on the instrument panel. It allows the operator to limit the thrust of the boring machine to match its output to job conditions.

(15) Quik Tran Control -- Some early production models of NG boring machines used a winch and cable to retract the boring machine to its starting position on the master track. Recent production machines use the Quik-Tran system to retract to the starting position.

(16) Pushbar Control -- This lever controls a hydraulic circuit that extends or retracts the pushbar dogs. On the 42-600NG boring machines the pushbar dogs are retracted with this valve. The pushbar dogs are normally spring loaded “out”.

(17) Joystick -- Depending on the model, the joystick contains one or two push buttons and a trigger switch. Movement of the joystick toward or away from the operator controls the movement of the boring machine toward or away from the pit face.

(17a) ROTATE ENABLE push button switch, which enables the clutch circuit. Each push button is the “maintain contact” type. Once the button is pushed, the circuit stays energized even if the engine is stopped. The operator must push the button a second time to de-energize the circuit.

(17b) ROTATE ENABLE light.

(17c) ROTATE trigger switch that controls the electric clutch. The operator must hold the trigger to keep the clutch engaged.

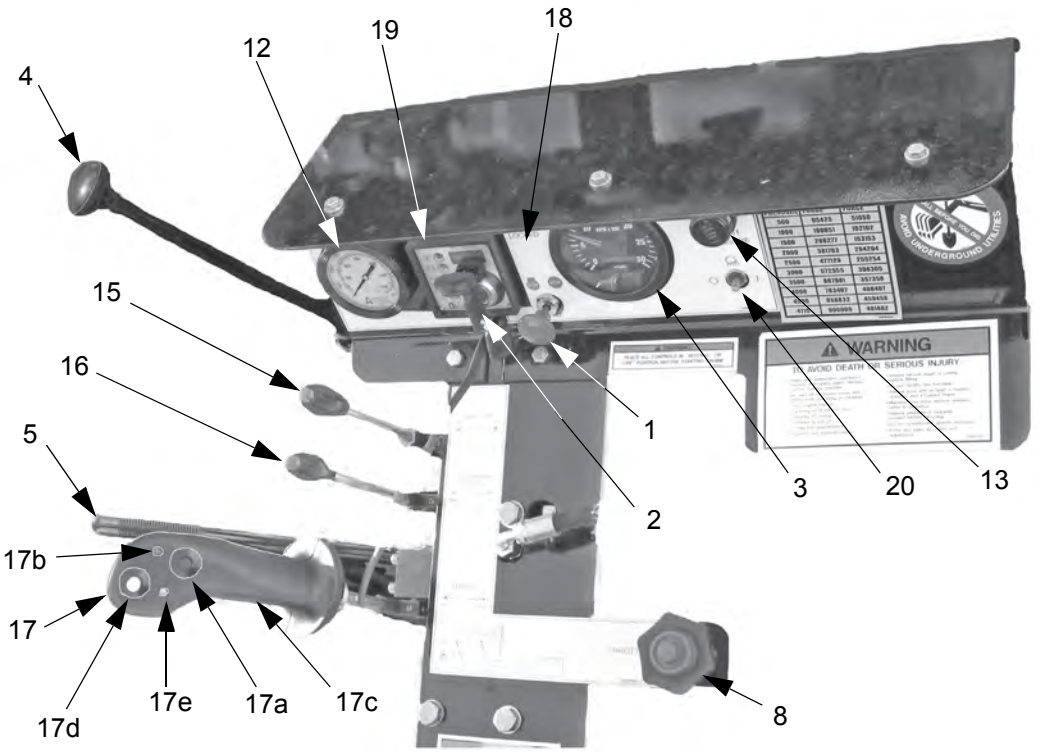
(18) Dogs Latched Indicator -- Indicates that the Pushbar Dogs are latched.

(19) Engine Monitor -- Lights indicate engine oil pressure, oil temperature and alternator operation. A tachometer shows engine speed.

(20) Light Switch.

Each boring machine has a fuel gauge on the fuel tank and a sight gauge on the hydraulic tank.

48/54-900NG Boring Machine Controls prior to S/N NG48549002281208



(1) Emergency Stop -- This is a red PUSH-to-STOP control, located at the operator's station. The control must be pulled up/out (PULL-to-RUN) before the engine will start. The purpose of the control is to provide a rapid means of shutting down the entire machine in the event of an emergency.

(2) Ignition Switch -- Starts the engine.

(3) Tachometer -- A tachometer shows engine speed. Also includes the hour meter display if not a Caterpillar engine.

(4) Gearshift --The boring machine is equipped with a 4, 5 or 6 forward speed gearbox with reverse mechanical transmission. The shifting pattern is shown on a label in the operator's view. Operation in forward 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 machine torque is in first and reverse gears.

(5) Electric/Hydraulic Clutch-- The clutch is power assisted. The trigger on the joystick engages the clutch. If the operator releases trigger, the clutch will automatically disengage.

(8) Throttle -- Pull the throttle to increase the engine speed (RPMs). Most models have a positive throttle, which requires a center button to be depressed before the throttle can be pulled out (accelerate) or pushed in (decelerate). The throttle position (engine speed) and the gear selected control the auger rotation speed.

(12) Thrust Pressure Gauge -- The thrust pressure gauge is matched to the pump system pressure specified for each machine. Check the pressure rating decal on your machine and be aware of it throughout your operation. The forward thrust of the machine can be judged in relation to the thrust pressure gauge and the pressure rating decal. The pressure rating decals for the machines are shown in Appendix A.

Detailed Controls

(13) Thrust Pressure Adjust -- This control is found on the instrument panel. It allows the operator to limit the thrust of the boring machine to match its output to job conditions.

(15) Quik Tran Control -- Some early production models of NG boring machines used a winch and cable to retract the boring machine to its starting position on the master track. Recent production machines use the Quik-Tran system to retract to the starting position.

(16) Pushbar Control -- This lever controls a hydraulic circuit that extends or retracts the pushbar dogs. On the 48/54-900NG boring machines the pushbar dogs are retracted with this valve. The pushbar dogs are normally spring loaded “out”.

(17) Joystick -- Depending on the model, the joystick contains one or two push buttons and a trigger switch. Movement of the joystick toward or away from the operator controls the movement of the boring machine toward or away from the pit face.

(17a) ROTATE ENABLE push button switch, which enables the clutch circuit. Each push button is the “maintain contact” type. Once the button is pushed, the circuit stays energized even if the engine is stopped. The operator must push the button a second time to de-energize the circuit.

(17b) ROTATE ENABLE light.

(17c) ROTATE trigger switch that controls the electric clutch. The operator must hold the trigger to keep the clutch engaged.

(17d) Fast Work Enable pushbutton.

(17e) Fast Work light.

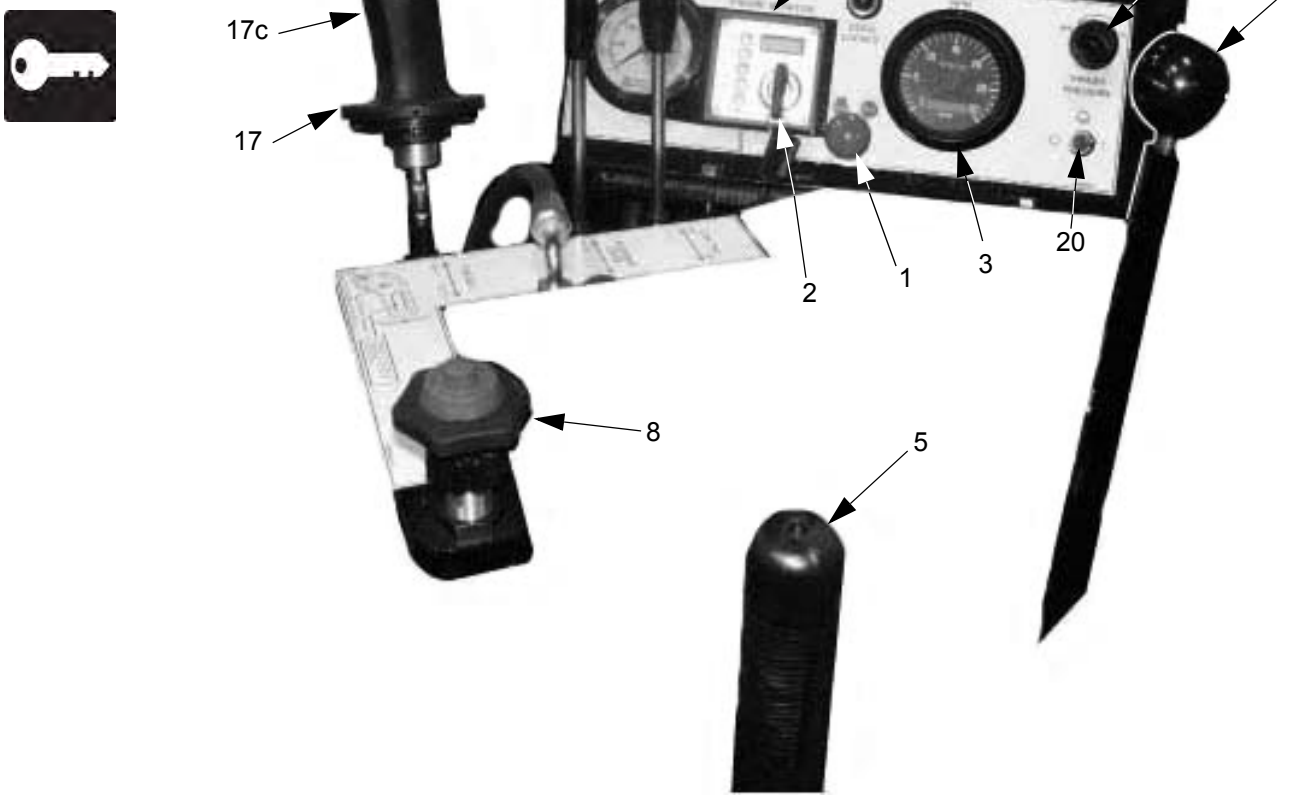
(18) Dogs Latched Indicator -- Indicates that the Pushbar Dogs are latched.

(19) Engine Monitor -- Lights indicate engine oil pressure, oil temperature and alternator operation. A tachometer shows engine speed.

(20) Light Switch.

Each boring machine has a fuel gauge on the fuel tank and a sight gauge on the hydraulic tank.

48/54-900NG Boring Machine Controls S/N NG48549002281208 and higher



(1) Emergency Stop -- This is a red PUSH-to-STOP control, located at the operator's station. The control must be pulled up/out (PULL-to-RUN) before the engine will start. The purpose of the control is to provide a rapid means of shutting down the entire machine in the event of an emergency.

(2) Ignition Switch -- Starts the engine and activates the engine pre-heat.

(3) Tachometer -- A tachometer shows engine speed. Also includes the hour meter display if not a Caterpillar engine.

(4) Gearshift --The boring machine is equipped with a 4, 5 or 6 forward speed gearbox with reverse mechanical transmission. The shifting pattern is shown on a label in the operator's view. Operation in forward 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 machine torque is in first and reverse gears.

(5) Electric/Hydraulic Clutch-- The clutch is power assisted. The trigger on the joystick engages the clutch. If the operator releases trigger, the clutch will automatically disengage.

Detailed Controls

(8) Throttle -- Pull the throttle to increase the engine speed (RPMs). Most models have a positive throttle, which requires a center button to be depressed before the throttle can be pulled out (accelerate) or pushed in (decelerate). The throttle position (engine speed) and the gear selected control the auger rotation speed.

(12) Thrust Pressure Gauge -- The thrust pressure gauge is matched to the pump system pressure specified for each machine. Check the pressure rating decal on your machine and be aware of it throughout your operation. The forward thrust of the machine can be judged in relation to the thrust pressure gauge and the pressure rating decal. The pressure rating decals for the machines are shown in Appendix A.

(13) Thrust Pressure Adjust -- This control is found on the instrument panel. It allows the operator to limit the thrust of the boring machine to match its output to job conditions.

(15) Quik Tran Control -- Some early production models of NG boring machines used a winch and cable to retract the boring machine to its starting position on the master track. Recent production machines use the Quik-Tran system to retract to the starting position.

(16) Pushbar Control -- This lever controls a hydraulic circuit that extends or retracts the pushbar dogs. On the 48/54-900NG boring machines the pushbar dogs are retracted with this valve. The pushbar dogs are normally spring loaded “out”.

(17) Joystick -- Depending on the model, the joystick contains one or two push buttons and a trigger switch. Movement of the joystick toward or away from the operator controls the movement of the boring machine toward or away from the pit face.

(17a) ROTATE ENABLE push button switch, which enables the clutch circuit. Each push button is the “maintain contact” type. Once the button is pushed, the circuit stays energized even if the engine is stopped. The operator must push the button a second time to de-energize the circuit.

(17b) ROTATE ENABLE light.

(17c) ROTATE trigger switch that controls the electric clutch. The operator must hold the trigger to keep the clutch engaged.

(17d) Fast Work Enable pushbutton.

(17e) Fast Work light.

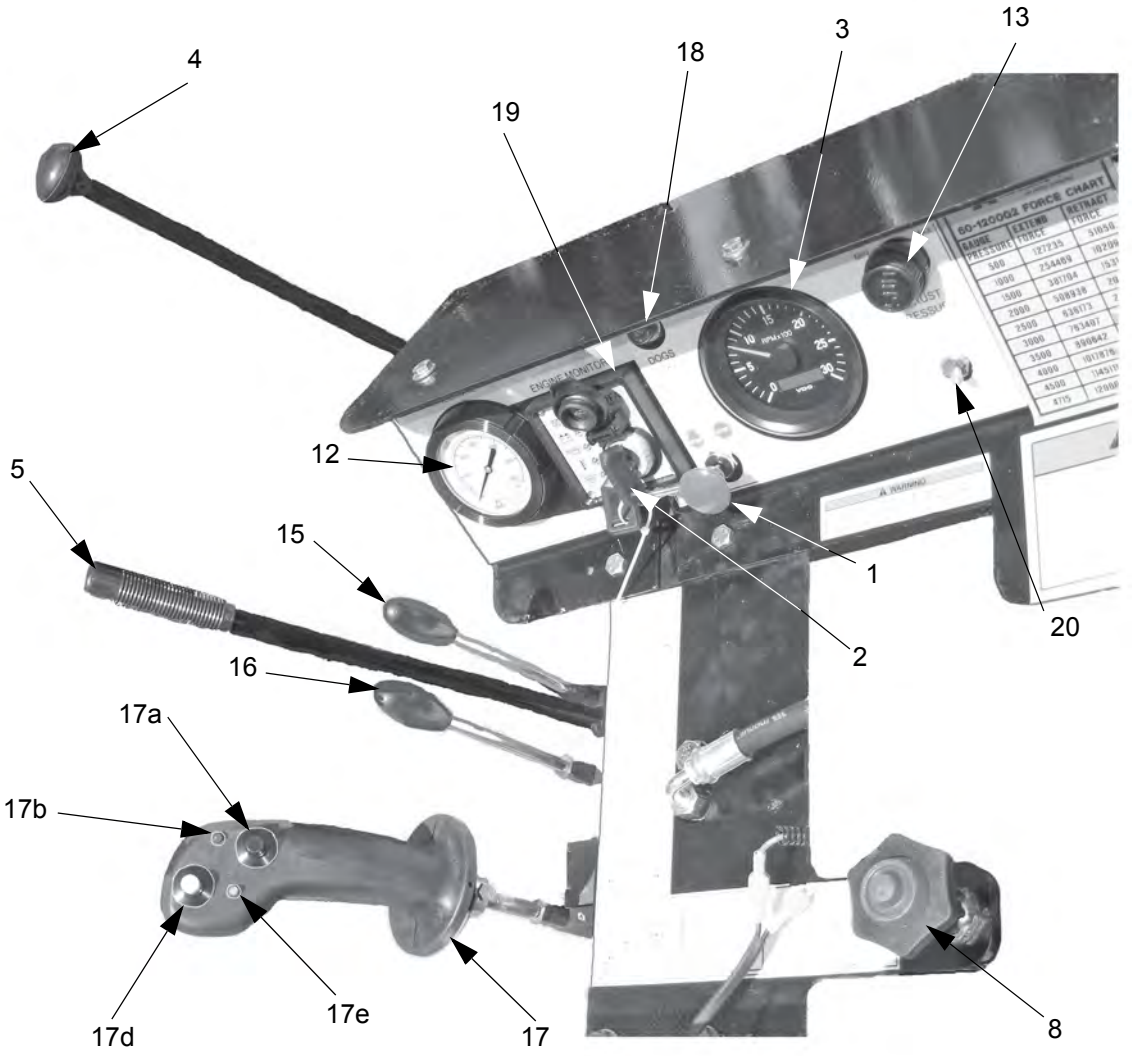
(18) Dogs Latched Indicator -- Indicates that the Pushbar Dogs are latched.

(19) Engine Monitor -- Lights indicate engine oil pressure, oil temperature, engine pre-heat and alternator operation. A tachometer shows engine speed. An hour meter displays total running hours.

(20) Light Switch.

Each boring machine has a fuel gauge on the fuel tank and a sight gauge on the hydraulic tank.

60-1200NG Boring Machine Controls



(1) Emergency Stop -- This is a red PUSH-to-STOP control, located at the operator's station. The control must be pulled up/out (PULL-to-RUN) before the engine will start. The purpose of the control is to provide a rapid means of shutting down the entire machine in the event of an emergency.

(2) Ignition Switch -- Starts the engine.

(3) Tachometer -- A tachometer shows engine speed. Also includes the hour meter display if not a Caterpillar engine.

(4) Gearshift --The boring machine is equipped with a 4, 5 or 6 forward speed gearbox with reverse mechanical transmission. The shifting pattern is shown on a label in the operator's view. Operation in forward 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 machine torque is in first and reverse gears.

Detailed Controls

(5) Electric/Hydraulic Clutch-- The clutch is power assisted. The trigger on the joystick engages the clutch. If the operator releases trigger, the clutch will automatically disengage.

(8) Throttle -- Pull the throttle to increase the engine speed (RPMs). Most models have a positive throttle, which requires a center button to be depressed before the throttle can be pulled out (accelerate) or pushed in (decelerate). The throttle position (engine speed) and the gear selected control the auger rotation speed.

(12) Thrust Pressure Gauge -- The thrust pressure gauge is matched to the pump system pressure specified for each machine. Check the pressure rating decal on your machine and be aware of it throughout your operation. The forward thrust of the machine can be judged in relation to the thrust pressure gauge and the pressure rating decal. The pressure rating decals for the machines are shown in Appendix A.

(13) Thrust Pressure Adjust -- This control is found on the instrument panel. It allows the operator to limit the thrust of the boring machine to match its output to job conditions.

(15) Quik Tran Control -- Some early production models of NG boring machines used a winch and cable to retract the boring machine to its starting position on the master track. Recent production machines use the Quik-Tran system to retract to the starting position.

(16) Pushbar Control -- This lever controls a hydraulic circuit that extends or retracts the pushbar dogs. On the 60 inch machine the pushbar is extended with this valve.

(17) Joystick -- Depending on the model, the joystick contains one or two push buttons and a trigger switch. Movement of the joystick toward or away from the operator controls the movement of the boring machine toward or away from the pit face.

(17a) ROTATE ENABLE push button switch, which enables the clutch circuit. Each push button is the “maintain contact” type. Once the button is pushed, the circuit stays energized even if the engine is stopped. The operator must push the button a second time to de-energize the circuit.

(17b) ROTATE ENABLE light.

(17d) Fast Work Enable pushbutton.

(17e) Fast Work light.

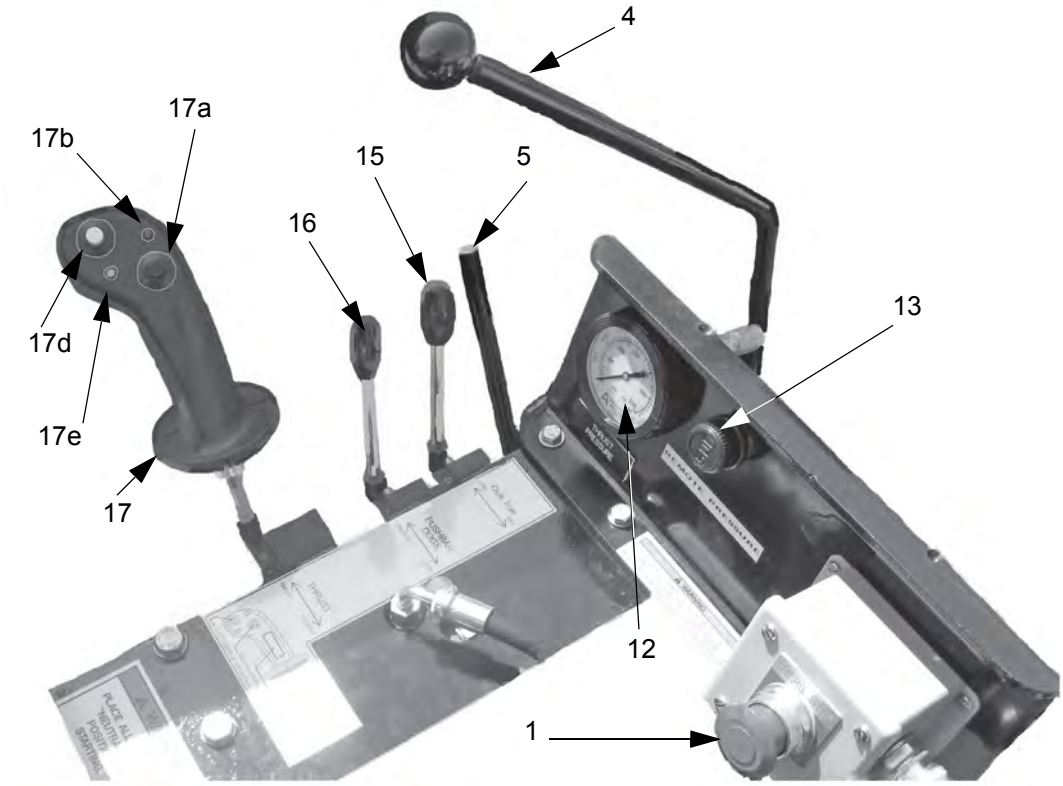
(18) Dogs Latched Indicator -- Indicates that the Pushbar Dogs are latched.

(19) Engine Monitor -- Lights indicate engine oil pressure, oil temperature and alternator operation. A tachometer shows engine speed.

(20) Light Switch.

Each boring machine has a fuel gauge on the fuel tank and a sight gauge on the hydraulic tank.

72-1200NG Boring Machine Controls



Detailed Controls

72-1200NG Boring Machine Controls

(1) Emergency Stop -- This is a red PUSH-to-STOP control, located at the operator's station. The control must be pulled up/out (PULL-to-RUN) before the engine will start. The purpose of the control is to provide a rapid means of shutting down the entire machine in the event of an emergency.

(4) Gearshift --The boring machine is equipped with a 4, 5 or 6 forward speed gearbox with reverse mechanical transmission. The shifting pattern is shown on a label in the operator's view. Operation in forward 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 machine torque is in first and reverse gears.

(5) Electric/Hydraulic Clutch-- The clutch is power assisted. The trigger on the joystick engages the clutch. If the operator releases trigger, the clutch will automatically disengage.

(12) Thrust Pressure Gauge -- The thrust pressure gauge is matched to the pump system pressure specified for each machine. Check the pressure rating decal on your machine and be aware of it throughout your operation. The forward thrust of the machine can be judged in relation to the thrust pressure gauge and the pressure rating decal. The pressure rating decals for the machines are shown in Appendix A.

(13) Thrust Pressure Adjust -- This control is found on the instrument panel. It allows the operator to limit the thrust of the boring machine to match its output to job conditions.

(15) Quik Tran Control -- Some early production models of NG boring machines used a winch and cable to retract the boring machine to its starting position on the master track. Recent production machines use the Quik-Tran system to retract to the starting position.

(16) Pushbar Control -- This lever controls a hydraulic circuit that extends or retracts the pushbar dogs. On the 72 inch machine the pushbar is extended with this valve.

(17) Joystick -- Depending on the model, the joystick contains one or two push buttons and a trigger switch. Movement of the joystick toward or away from the operator controls the movement of the boring machine toward or away from the pit face.

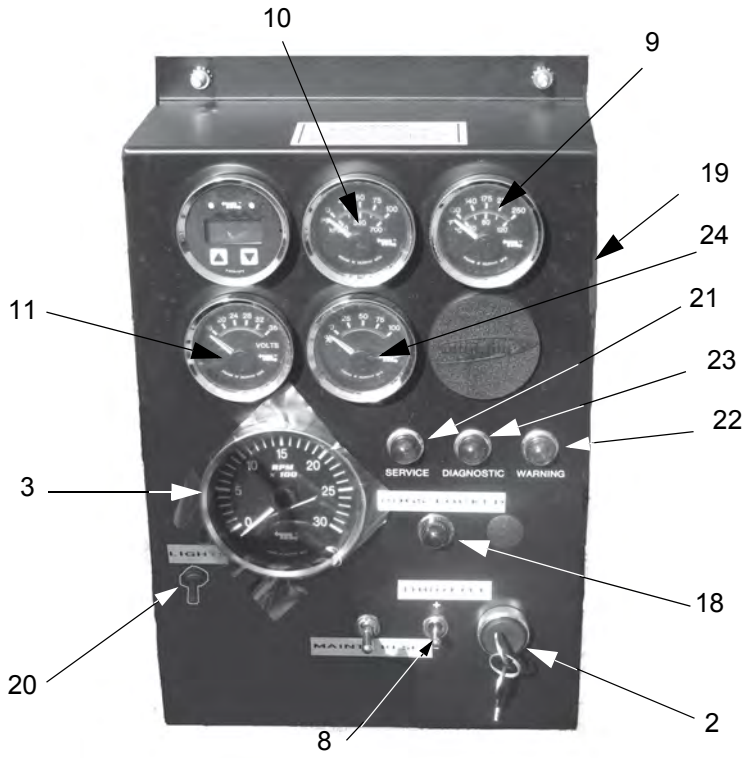
(17a) ROTATE ENABLE push button switch, which enables the clutch circuit. Each push button is the "maintain contact" type. Once the button is pushed, the circuit stays energized even if the engine is stopped. The operator must push the button a second time to de-energize the circuit.

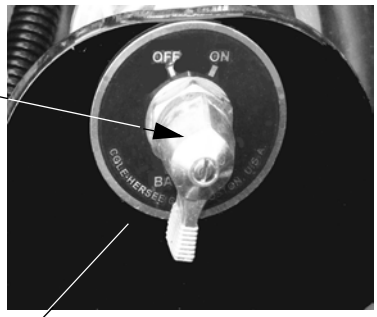
(17b) ROTATE ENABLE light.

(17d) Fast Work Enable pushbutton.

(17e) Fast Work light.(18) Dogs Latched Indicator -- Indicates that the Pushbar Dogs are latched.

72-1200NG Boring Machine Controls





Detailed Controls

72-1200NG Boring Machine Controls

(2) Ignition Switch -- Starts the engine.

(3) Tachometer -- A tachometer shows engine speed. Also includes the hour meter display if not a Caterpillar engine.

(8) Throttle -- Push the throttle up increase the engine speed (RPMs) and push the throttle down to decrease engine speed. The throttle position (engine speed) and the gear selected control the auger rotation speed.

(9) Oil temperature gauge.

(10) Oil pressure gauge.

(11) Alternator Voltage.

(19) Murphy System-- If the engine coolant gets too hot, or if the engine oil pressure gets too low, the Murphy System will stop the engine. The engine also has an electronic system that indicates when maintenance is due. Ths interval is indicated by the red light on the control panel.

(20) Light Switch.

(21) Service Light.

(22) Warning Light.

(23) Diagnostic Light.

(24) Percent engine loading gauge.

(25) Battery disconnect switch. Turn left to disconnect the batteries and turn right to connect the batteries. Do not use the Battery disconnect switch to turn off the boring machine. Use of the switch in this manner could result in damage to the boring machine.

Each boring machine has a fuel gauge on the fuel tank and a sight gauge on the hydraulic tank.

Set the machine on the master track and engage the push bar dogs in the rear most holes in the track. Install the slide rails or on earlier machines (Pre NG) clamp hook rollers then lower and secure the master casing pusher. Install casing adapters, master saddle, and saddle adapters as required to fit the bore casing. Before the first joint of casing and auger is installed, the fluid levels should be checked and the machine started and tested operationally.

Assembly of Split-Design Machines

Split-design feature: Refer to the drawing on Page 17. Two sets of lift points are provided on split machines. The upper set, located on the rack, is used to lift the power package out of the base push unit. It is NEVER used to lift the entire machine. A second set of lift points is located on the base push unit. It can be used to lift either the base unit alone or the entire machine. With either operation we recommend the use of a spreader bar as shown.

CAUTION

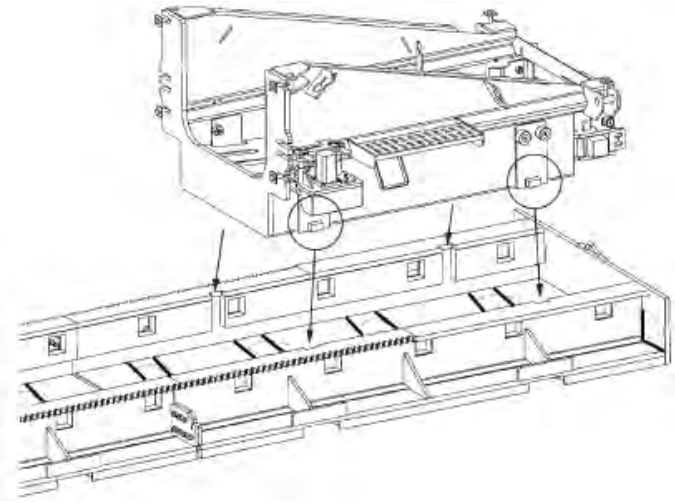
Never use the upper lift points to lift the entire machine.

To assemble a split machine:

Attach the spreader bar chains so that the base is level.

When inserting base into master track, Quik Tran mechanism must be in the open position to ensure no damage is done to the motor/pinion.

Align keys on the base with notches in the Master Track. Stay clear of shear and pinch points while guiding the base unit during assembly. Center the base assembly between the tracks. Measure from the corners of the base assembly to the inside of the gear rack. The distance should be equal at all four corners.



Once base is in place, swing Quik Tran mechanism into the closed position as shown in the following figures and install the last lock pin.

Installing the Boring Machine

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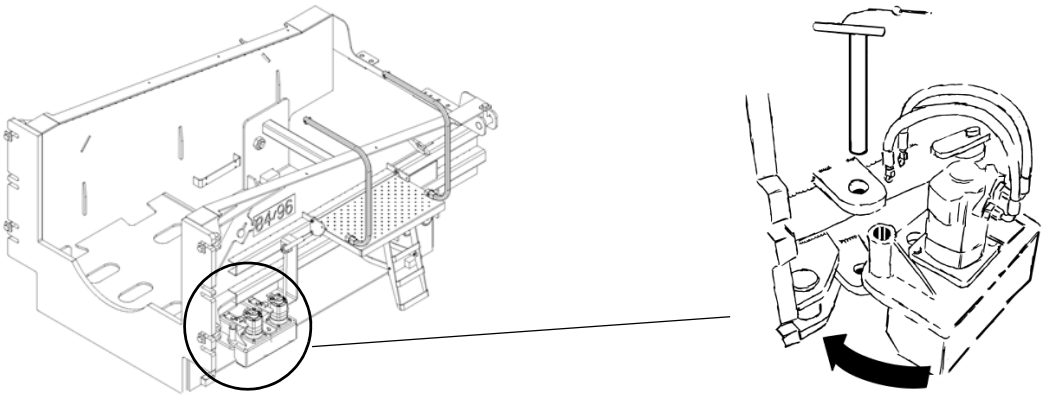
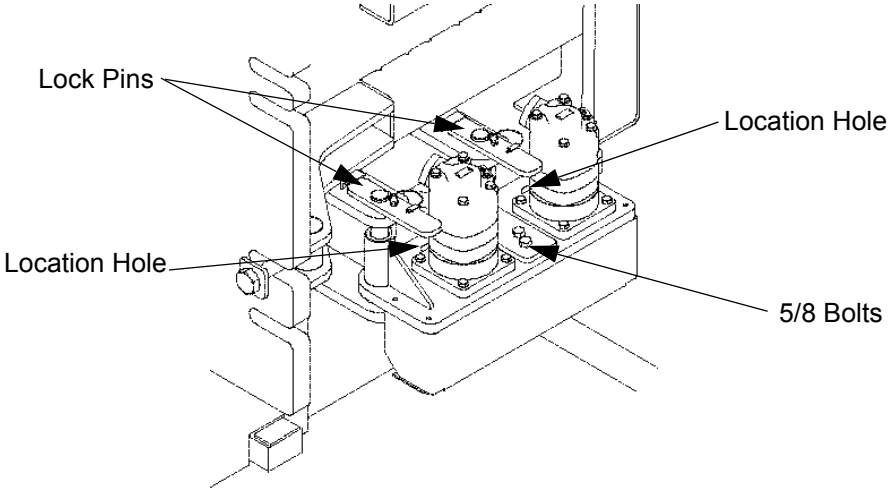
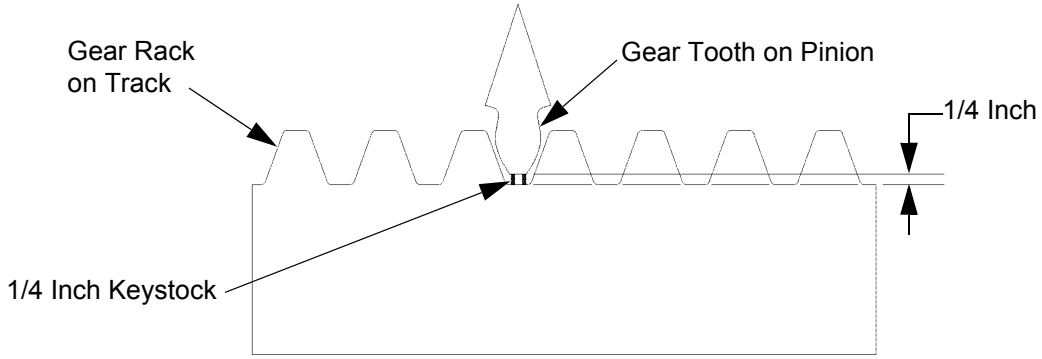


Loosen the 5/8 bolts. On Auger Boring Machines with a single Quik Tran motor there is one bolt and on Auger Boring Machines with dual Quik Tran motors there are two bolts.



Place a 1 piece of 1/4 inch key stock through the location hole and between the root of the teeth on the rack and the tip of the teeth on the pinion drive for single motor. Use 2 pieces of 1/4 inch key stock for dual motors, 1piece at each gear/rack combination. See illustration below.



Push in on the Quik Tran Assembly, while the key stock is in position, and torque the 5/8 bolts to 100 Ft-pounds for single motor Boring Machine and 125 Ft-pounds for dual motor

For Boring Machines with dual motors the process will have to be performed for each motor.

Repeat the adjustment on the opposite side of the base and track assembly

If mechanism will not engage properly the pinion is most likely not in time with the master track. To properly install the Quik Tran units the power package has to be installed.

Attach the spreader bar chains so that the power package is level.

Carefully lower and install the power package into the base unit. Stay clear of shear and pinch points while guiding the power package during assembly.

The power package will align itself as it is lowered into the base unit.

After the power package is seated, remove the spreader bar.

Clamp swivel bolts which hold master pusher to base unit.

Couple the hydraulic hoses and make electrical connections.

Latch and tighten all four corner swivel bolts.

Before Operating The Engine

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 maintenance and repair instructions are contained in the engine manufacturer's 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 with a minimum Cetane rating of 50. Never let the diesel fuel tank run dry! If the tank is dry, bleed the fuel system as outlined in the engine manual.
3. Check air filter indicator.

Starting Engine:

1. Make sure spoil chamber door is closed and the transmission is in neutral.
2. Pull emergency stop switch UP.
3. Set throttle at 1/2 speed position.
4. Turn ignition key switch to run position. Indicator lights will come on.
5. Reduce throttle setting to allow engine to warm up for one minute.

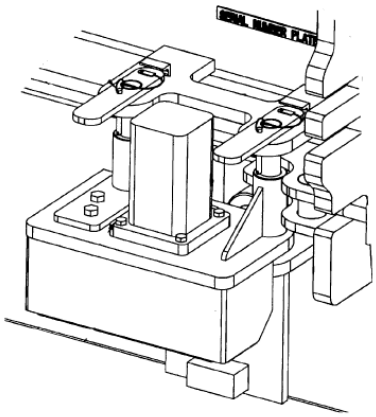
Start machine and engage pushbar with track.

Keep all people away from both Quik Tran motors.

Slowly activate Quik Tran function on control station to rotate motors into a position that will allow them to engage the track.

- Once motor is engaged into the track insert retaining pin and rotate to line up lanyard pin holes.
- Insert lanyard pin as shown in the following figure. The retaining pin is now locked in.

Installing the Boring Machine



• Repeat procedure for opposite side.
• Once both sides have been engaged start machine, disengage pushbar and run machine up and down track to ensure Quik Tran is operating normally.

Stopping Engine

1. When an engine has been operating under load, the engine should be allowed to idle to cool down before shutting it off.
2. Push emergency stop switch in. Turn ignition key switch to off position. Remove key for security.

The machine is ready for use.

Quik Tran

CAUTION

Under no circumstance remove or loosen any bolts on the mechanism, doing so will cause loss of backlash in gearing and cause damage to the mechanism.

Quik Tran operation

• Quik Tran function is not designed to be used in conjunction with rotating cutting head/auger.
• Before operating Quik Tran ensure that all quick disconnects and electrical connections are fully engaged and functioning properly.
• The control lever that operates the Quik Tran function is located furthest away from the thrust lever, the pushbar lever is located between the two functions.
• Before operating the Quik Tran function you must disengage the pushbar from the track.
• Activating the Quik Tran lever towards the master pusher will cause the machine to move forward (thrust). Activating the lever towards the pushbar will cause the machine to travel backward (retract).

Preparation of Casing

Improperly prepared or poor quality casing can make the job more difficult and introduce hazards that are unnecessary. Casing normally has a machine cut bevel on one end and is cut square on the other. Exact 20 foot (6.1 m) lengths will keep the head at the correct location relative to the casing. Smooth walls will reduce the push required and the tendency of the casing to rotate during the bore. Casing is normally coated with a bituminous coating on the outside only.

Preparation of the lead section of casing is best accomplished in the yard. Refer to the Cutting Heads, Appendix D, and Ground Conditions Chart, Appendix C, for selection of a cutting head. American Augers recommends that our steering head be used on long and/or critical bores.

Loading auger into casing is best done in the yard, then transported to the jobsite ready to use. The lead section of casing 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 chuck. The follow-up casings are loaded male 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 flight at the same end to simplify the unloading at the job site.

Banding the Casing

The use of a partial band at 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, but it is usually 3/8 x 6 inch (1 x 15 cm), rolled to fit the casing. A gap of approximately 10 inches (25.4 cm) is left at the bottom. Place the band so that it leads the casing by about 1/2 inch (1.2 cm). Weld securely front inside and rear outside. The inside chamfer of the front weld will provide a lifting action for the casing if the thrust is rapid. If wing cutters are used to overcut the casing, a falling action will occur.

The above method is typical for most applications. However, other approaches to banding the casing can be used and are determined by the application, soil conditions and user experience.

Constructing the Steering Head

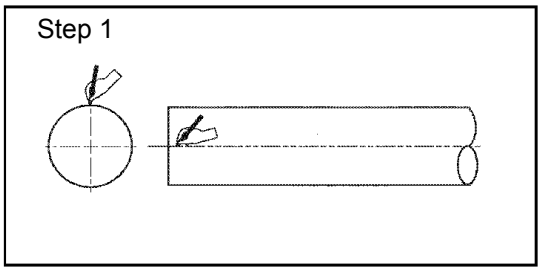
Materials

Materials listed below are for building a steering head using first 20 foot (6.1 m) piece of casing of bore. It is advisable when the cutting head is pulled inside of the casing to build a 4 foot (1.22 m) Steering head out of material at least 0.750 inch (1.95 cm) wall thickness casing. When using a 4 foot (1.22 m) Steering head, remember to cut first piece of casing off to allow for steering head length.

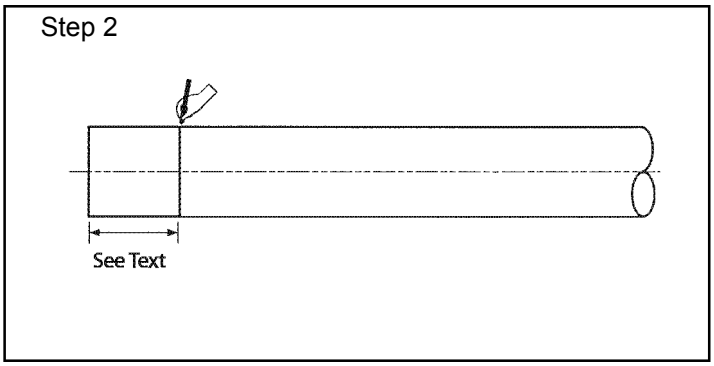
- o 1 piece casing, cut to length for 1-1/2 inch (3.8 cm) clearance from back of wing cutters to casing band.
  - For bores of 24 inch (61 cm) and larger, casing should be 20 foot 3-1/2 inch (6.19 m) in length.
  - For bores smaller than 24 inch (61 cm), casing should be 19 foot 10-1/2 inch (6.07 m) in length
- o American Augers steering head kit
- o Sensing head
- o Steering pipe (3/4 inch (1.9 cm) schedule 80 PE pipe). Schedule 80 pipe to be cut to 19 foot 8 inch (6.1 m) before welding on the steering pipe ends. The first steering pipe should be between 16 and 17 foot (4.9 and 5.2 m) length for the steering head.
- o 1 pc 1-1/2 inch (3.8 cm) schedule 40 T & C pipe. (Covers steering pipe and carries bentonite)
- o 2 pcs 1/2 inch (1.29 cm) schedule 40 T & C pipe (Dutch level line and gravity feed waterline)
- o 1 pc 1-1/2 inch (3.8 cm) pipe nipple 8 inch (20.3 cm) long
- o 1 pc 1-1/2 inch (3.8 cm) to 3/4 inch (1.9 cm) pipe tee
- o 1 pc 1-1/2 inch (3.8 cm) pipe cap
- o 3/8 x 6 inch (.95 x 15.2 cm) ring (can be cut off of same size casing as bore)

Layout Instructions

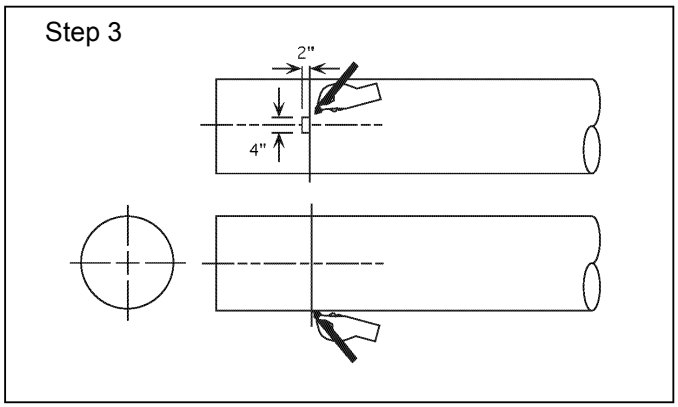
Step 1. Locate center lines on casing (one way to divide casing into 4 sections is to multiply diameter by 3.1416 then divide by 4.)



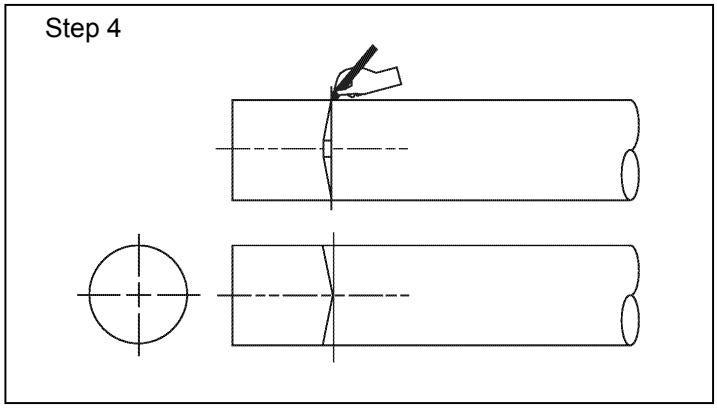
Step 2. Mark a line around casing a distance equal to the diameter of the casing. For 12 inch (30.5 cm) casing, mark at 12inch (30.5 cm). For 24 inch (61 cm) casing, mark at 24 inch (61 cm) and so on.



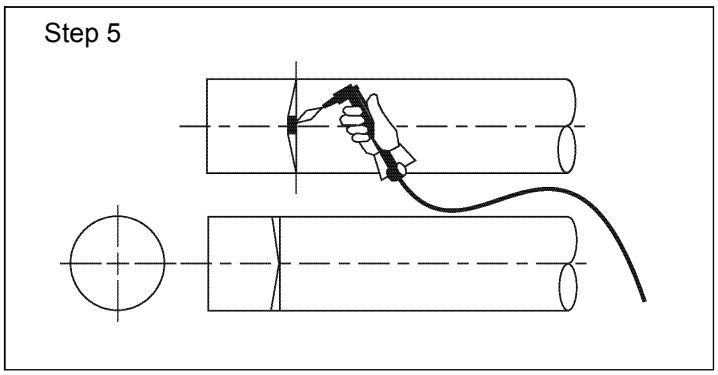
Step 3. Mark a 2 inch (5.1 cm) x 4 inch (10.2 cm) rectangle on center at top and bottom of the casing along the line you marked in Step 2



Step 4. Mark a line from the corner of to rectangle to the side on top and bottom of casing as shown.

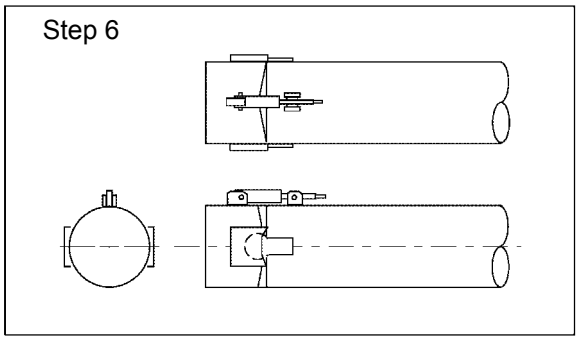


Step 5. Using the scribed lines as a guide, cut the casing from the rectangle to the side center point on both the top and bottom of the casing. Roll the casing and repeat the process on the opposite side.



Constructing the Steering Head

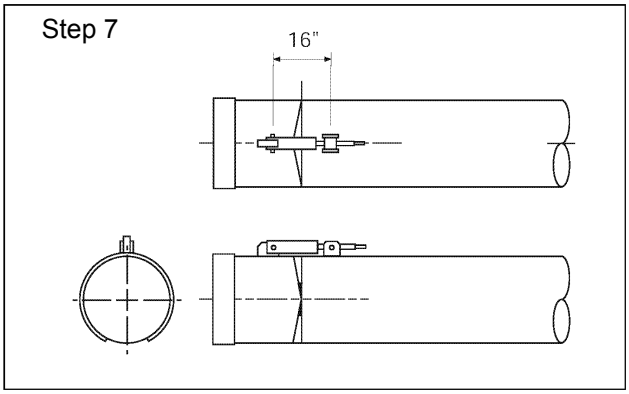
Step 6. After cutting the notches, position the hinge on the side center point so that the hinge cover and knuckle are centered and the back of the cover is even with the vertical line of the notches previously cut. Mark and cut out the place where the hinge will be attached. Insert the hinge so that it is flush with the inside of the casing and weld in place thoroughly.



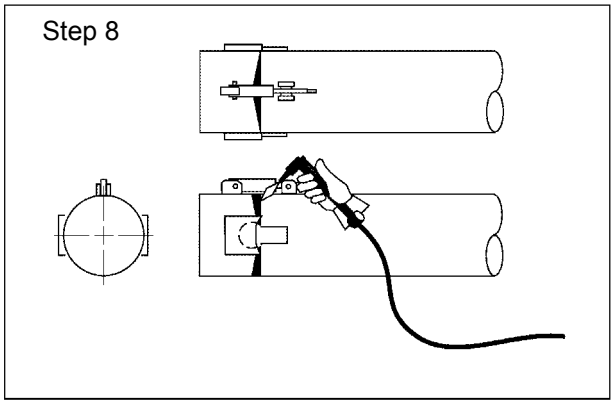
Note standard hinge sizes:

10 —14 inch (25.4 - 35.6 cm)casing 3-1/2 inch (8.9 cm) hinge
16 —34 inch (40.6 - 86 cm) casing 7-1/2 inch (19 cm) hinge
36 inch (91 cm) and larger casing 9 inch (23 cm) hinge

Step 7. Adjust the steering knuckle so it has an equal amount of turns in and out. (Normally there will be 23 turns each way when centered correctly.)



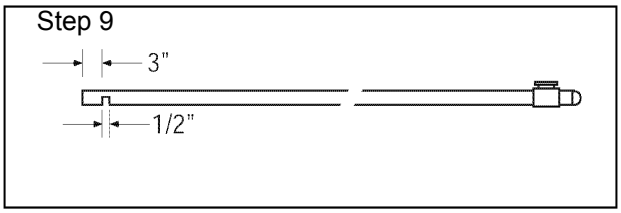
Step 8. After welding steering knuckle and hinges on, cut out remaining rectangle on top and bottom (beneath steering knuckle).



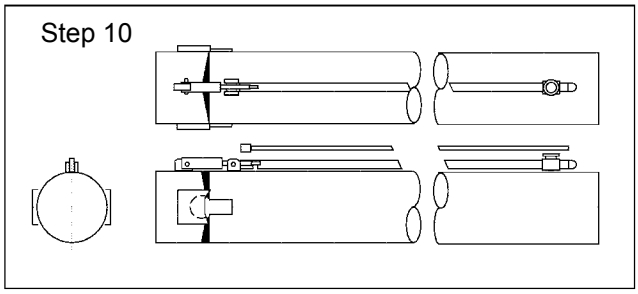
Step 9. (Optional) If lubrication is needed on the outside of the casing, there are two options

1) Cut a 1/2 inch (1.3 cm) slot in the piece of 1-1/2 inch (3.8 cm) pipe as shown. (The slot should only be cut if planning on pumping bentonite around the outside of casing for lubricating the pipe as it travels through the ground).

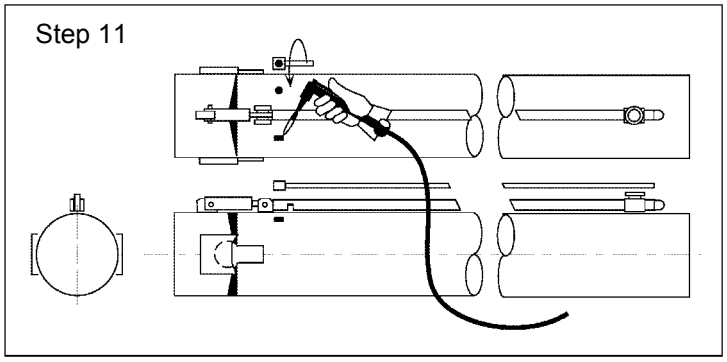
2) Set a separate 1/2 inch (1.3 cm) line parallel to the steering rods to lubricate the outside of the casing with drilling fluid.



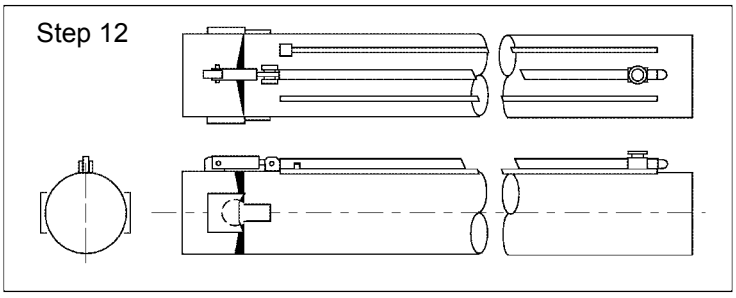
Step 10. Make a steering pipe to fit inside the 1-1/2 inch (3.8 cm) cover pipe. (This steering pipe will be shorter than all of the others. It will be between 16 -17 foot (4.9 - 5.2 m) in length).



Step 11. Pierce a 3/8 inch (.95 cm) hole in the casing as shown on the left. Cut a slot to the left only if able to pump water or bentonite inside the casing to facilitate spoil removal.

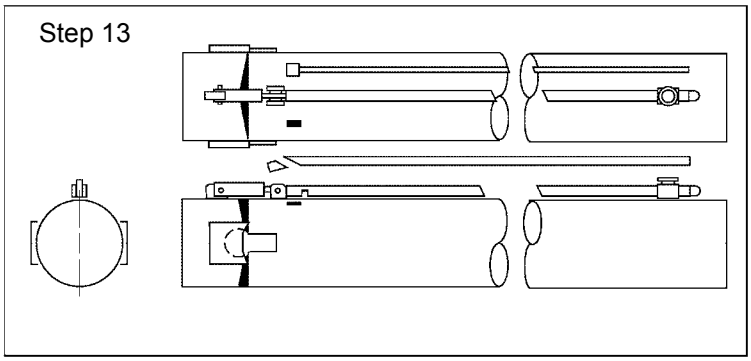


Step 12. Weld the sensing head over the 3/8 inch (.95 cm) hole so that both holes are lined up together.

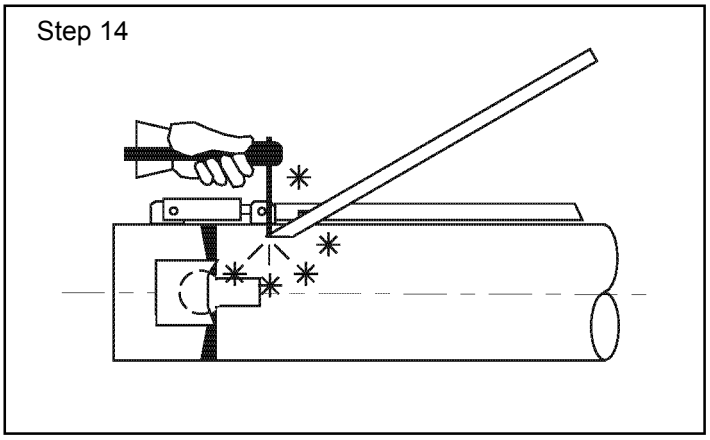


Constructing the Steering Head

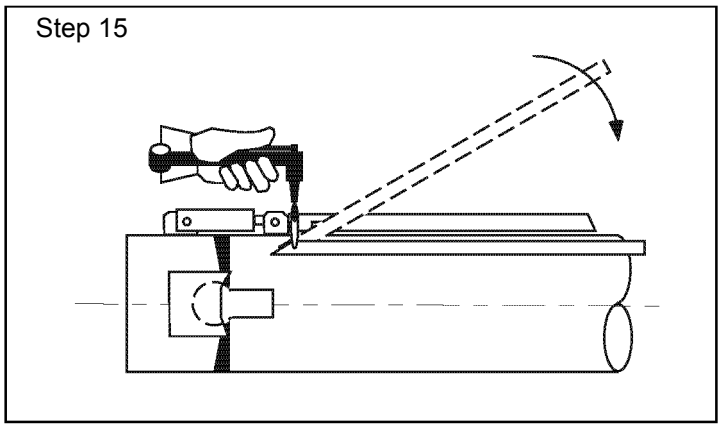
Step 13. Cut the end of the 1/2 inch (1.3 cm) pipe to form a bevel.



Step 14. Weld the bevel over the slot formed in Step 11.

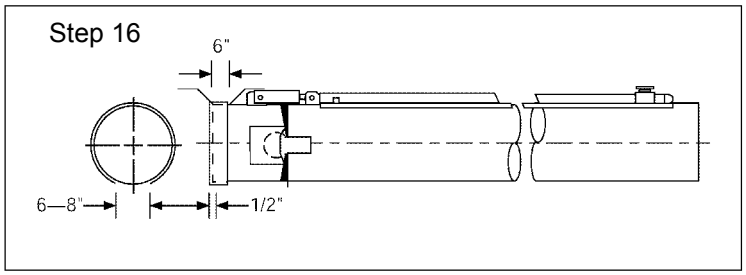


Step 15. Heat the pipe and bend it to the top of the casing.



Constructing the Steering Head

Step 16. Weld a 3/8 inch x 6 inch (.95 cm X 15.2 cm) ring around the front of the casing. (When running a plug in front of the cutting head, a 12 inch (30.5 cm) wide ring would strengthen the front of the steering head).



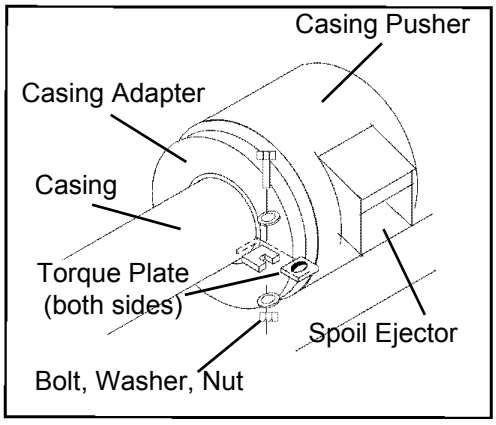
Installing the Lead Casing and Auger in the Pit

DANGER

The observer must keep his body clear of the spoil chamber anytime the machine engine is running. Rotating blades will cause amputation or death

Secure the auger in the casing before removing it from the truck. Lower the casing into the pit. Rest the lead end of the casing in the saddle and align the auger shank with the machine chuck.

1. SHUT DOWN the machine engine. Open the spoil door. From a safe location, observe the alignment of the hex coupling and the auger shank. Use of flashlight or mirror may help. Start the engine. Advance the machine until the coupling is almost touching.
2. Slowly rotate the drive until the holes for the connecting pin align. Then carefully advance the boring machine until the hex is fully seated and the casing is secure in the casing pusher. A cleaned, lubricated hex will make the job easier.
3. Slowly rotate the drive until the hole for the connecting pin is visible to the observer. SHUT DOWN the engine. For safety, remove the key from the ignition switch.
4. The observer can reach in through the spoil door and insert the connecting pin.
5. Start the engine and rotate the coupling 180° until the lower end of the connecting pin is visible.
6. SHUT DOWN the engine and remove the ignition key.
7. The observer installs a cotter pin in the lower end of the connecting pin to secure the pin during operation. CLOSE THE SPOIL DOOR.
8. Weld torque plates on the casing and secure them to the two bolt tabs on the master casing pusher or casing adapter.



Case Boring Procedure

American Augers recommends that the following items be checked before starting the bore.

Job Setup

A) Pit walls adequately sloped or sheeted for safety in accordance with OSHA (29CFR1910)?
B) Machine & Casing on Line?
C) Machine & Casing on Grade?
D) Dutch 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?

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

Boring Machine

A) Fluid levels in Machine
    1) Engine Crankcase Oil
    2) Transmission Gear Lube
    3) Gearbox Gear Lube
    4) Hydraulic Oil
    5) Fuel
B) Spoil Door Closed?

Job Safety

A) Crew have any questions regarding safety or procedures with equipment being used?

Case Boring Procedure

Collaring

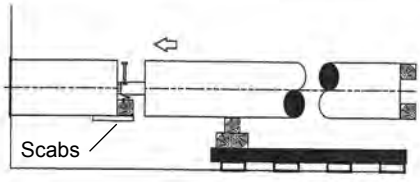
"Collaring" is the first operation in beginning a bore. The objective is to start the cutting head into the ground without lifting the casing out of the saddle. This is done by rotating at low RPMs and using a slow thrust advance. Let the saddle slip off the front of the track as the casing advances.When about 10 feet of casing has entered the ground, SHUT DOWN the engine and check the line and grade of the casing. If the casing is not running true, remove it 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 casing as this may create a void. Check the Ground Conditions Chart, in Appendix C, SHUT DOWN the machine and remove the auger pin in the spoil chamber. Never push machine past the header plate past the end of the track.

WARNING

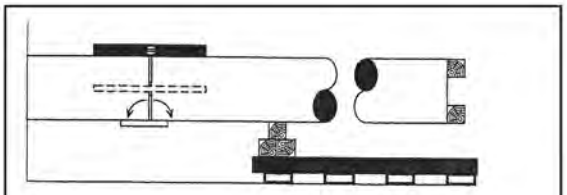
It is an absolute rule that the machine engine is to be shut down before the spoil door is opened to remove the pin from the auger drive. Rotating blades will cause death or amputation.

Reverse the auger and pull back approximately 8 inches to have room to make the connection. 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 "scabs" on the bottom of the installed casing at 4:00 and 7:00 o'clock positions (see drawing below.) Clear the area, and advance the casing over the auger with the boring machine. Use heavy wood blocking between the machine and the casing and DO NOT rotate the auger during this operation.

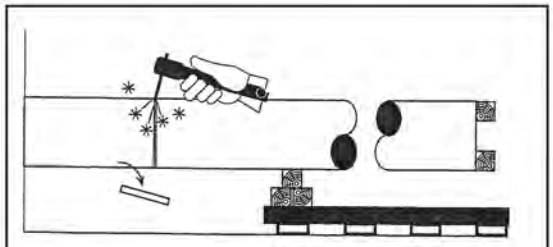


Lower new section of auger into pit. Do not connect it to the boring machine. Support the casing with blocking. Place the blocking between the casing sections and between the new casing and machine. Connect the auger sections.

Align the new casing with the installed casing by resting it on the "scabs". Use of scabs beneath aligns the inverts, which makes it easier to install carrier pipe later. Block the NEW casing at the machine end and relocate the lift point back to the machine end. Lift in a cradle mode. Align the two casings using 4 feet (1.2 m) minimum length straight edges along the top and sides.



First, align inverts of casing sections. Scabs help support new sections. Use 4 foot carpenters's level to align tops and both sides of casing.

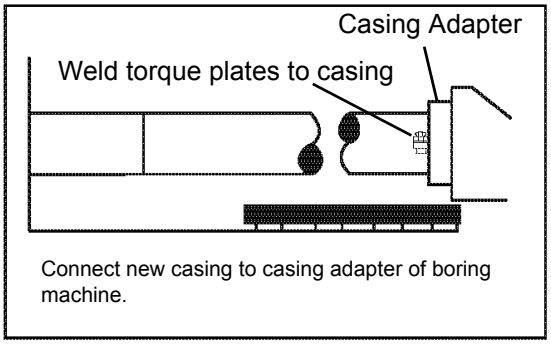


Weld section together. Remove scabs

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 it must be corrected. If this condition is not correct, 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 weld fully.

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 form the spoil chamber during the alignment.

DANGER
Before working inside the spoil chamber,
See safety information.



Connect new casing to casing adapter of boring machine.

SHUT DOWN the machine and install the auger pin.

Case Boring Procedure

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 Dutch 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 auger and head during the bore to remove an obstruction or to service the head — refer to the section “REMOVING AND INSTALLING AUGER WITH CUTTING HEAD ATTACHED,” (page 72).

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.

WARNING

Never allow a worker in the exit pit while the boring machine engine is running. The rotating auger and cutting head can cause serious injury or death. STAY AWAY.

The unexpected entry of the boring head into the pit can catch the worker and cause serious injury and, in addition, there is a 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 the casing increases the exposure of workers to a rotating part.
Rotating auger and cutting head can cause death or serious injury.
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:

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 normal direction, and RETRACT the auger until the coupling is well outside the casing.
6. SHUT DOWN the machine and remove the auger pin. Clear the area, start machine, back away from the auger a short distance.
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.

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.
Rotating auger and cutting head can cause death or serious injury.
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. Machine upset can cause death or serious injury. 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 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 machine, rotate the auger slowly in REVERSE at least 2 complete revolutions to collapse the wing cutters, then slowly back the machine up to pull the cutting head inside the casing.
4. Retract the auger WITHOUT ROTATION, until the auger coupling is well inside the casing.
5. SHUT DOWN the machine and remove the auger pin. Clear the area, start the machine and back away from the auger a short distance.
6. SHUT DOWN the machine and remove the auger section.

Removing the Auger at the Completion of the Bore

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 the head.
2. Clear the area, start engine, and ADVANCE until the coupling is one foot outside casing.

2a. It is not necessary to rotate in reverse unless one of the wing cutters has gotten caught on a weld inside the casing. In that case, rotating in reverse would close the wing cutter.

3. SHUT DOWN the machine and remove the auger pin at the chuck. 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.

To Split The Machine

1. Unclamp swivel bolts that hold master pusher to base unit. Back up base unit clear of master pusher.
2. Shut down the engine and remove the key.
3. Unclamp the four corner swivel bolts that hold the upper and lower sections together.
4. Toggle the thrust control valve to relieve any pressure. Uncouple the hoses at the rear.
5. Uncouple the front half of the detented or bolt connected drive coupler by sliding it towards the gear-box.
6. Attach the spreader bar chains to the upper set of lift points so that the lift will be level.
7. Gently remove the power package from the base unit by lifting vertically.

Storage and Transportation

Storage and Transportation

Minimum Storage Space Required

The space and load bearing capacity of the storgage area will vary with the size of the boring machine. See the included table Auger Boring Machine Weights, Page 78.

Boring Machine Storage Dimensions

Model	Track Length, feet/inches (m)	Height with sling, feet/inches (m)	Track Width, feet/inches (m)
24/30-150	31 feet 1 inch (9.5 m)	4 feet 7-5/16 inches (1.4 m)	4 feet 6 inches (1.4 m)
36/42-440	32 feet 7 inches (9.9 m)	5 feet 6 inches (1.7 m)	5 feet (1.5 m)
36-600	31 feet 7 inches (9.6 m)	5 feet 11 inches (1.8 m)	6 feet 3 inches (1.9 m)
42-600	31 feet 7 inches (9.6 m)	5 feet 11 inches (1.8 m)	6 feet 3 inches (1.9 m)
48-900	31 feet 7 inches (9.6 m)	6 feet 2-1/2 inches (1.9 m)	6 feet 3 inches (1.9 m)
48/54-900	35 feet 1 inch (10.7 m)	6 feet 2-1/2 inches (1.9 m)	5 feet 6 inches (1.7 m)
60-1200	34 feet 1-1/2 inches (10.4 m)	7 feet 6 inches (2.3 m)	7 feet 6 inches (2.3 m)
60-1200	35 feet 1-1/2 inches (10.7 m)	7 feet 6 inches (2.3 m)	7 feet 6 inches (2.3 m)
72-1200	35 feet 1-1/2 inches (10.7 m)	8 feet 4 inches (2.5 m)	8 feet 4 inches (2.5 m)

Storage and Transportation

Storage

- Clean all mud and other foreign materials off the machine.
- Position the machine on a level surface.
- Turn off the electrical system. On the 72-1200 Boring Machine turn off the electrical system by turning the Battery Disconnect Switch to the OFF position.

For periods longer than 30 days:

- Follow steps to prepare machine for transport.
- Place the machine in a covered and dry site, and follow the instructions* for storing the engine.
- Disconnect batteries and store them where the temperature will remain between 32°F and 105°F (0°C to 45°C).
- Eliminate sediment and water from the tanks (diesel fuel and oil). Top off all gear boxes.

Protect the machine from salty or acid environments, solvents, gas and flammable liquids and explosives.

*Refer to: Attachment 1, Engine Manufacturer Manual.

Transport

WARNING

Transport of the machine must be carried out by trained and authorized personnel only, after learning the information supplied in the manual.

Preliminary Operations for Transportation of the Machine

WARNING

Do not direct water spray inside the muffler or the air filter, against electric components or control panels.

Clean all mud and other foreign materials off the machine.

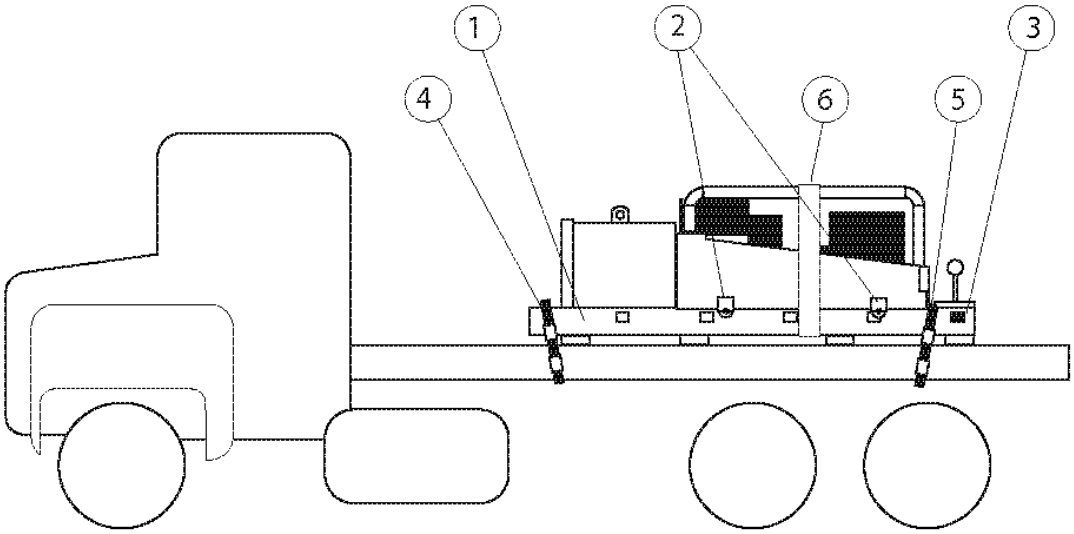
Lifting the Boring Machine

Refer to the drawing on Page 17. Two sets of lift points are provided on split machines. The upper set, located on the rack, is used to lift the power package out of the base push unit. It is NEVER used to lift the entire machine. A second set of lift points is located on the base push unit. It can be used to lift either the base unit alone or the entire machine. With either operation we recommend the use of a spreader bar as shown.

CAUTION

Never use the upper lift points to lift the entire machine.

Storage and Transportation



NOTICE

Consult table to find weights of components before lifting or transporting

1) Boring machine must sit on master track

2) All hook rollers or hold downs must be down and locked.

3) Thrust block dogs must be engaged.

4) Pass chain over master track.

5) Pass chain between pushbar and base. Chain must not chafe on cylinder rods.

6) Strap or chain holds machine to track.

Boring Machine Weights

Auger Boring Machine Weights

Model	Base Unit, lbs (kg)	Power Pack, lbs (kg)	Master Pusher, lbs (kg)	Master Track, lbs (kg)	Lifting Sling, lbs (kg)	Total Weight, lbs (kg)	Extension Track, lbs (kg)	Master Saddle, lbs (kg)
24/30-150	2400 (1088)	1800 (816)	425 (193)	1000 (454)	75 (34)	5700 (2586)	950 (431)	90 (41)
36/42-440	4100 (1860)	4300 (1950)	1100 (499)	3500 (1588)	200 (91)	13200 (5987)	2800 (1270)	105 (48)
36-600	3800 (1724)	6200 (2812)	900 (408)	2700 (1225)	175 (79)	13775 (6248)	2000 (907)	105 (48)
42-600	4100 (1860)	4300 (1950)	1100 (499)	3500 (1588)	200 (91)	13200 (5987)	2800 (1270)	105 (48)
48-900	4800 (2177)	6500 (2948)	1100 (499)	2800 (1270)	200 (91)	15400 (6958)	2000 (907)	120 (54)
48/54-900	5600 (2540)	6400 (2902)	1300 (590)	3700 (1678)	175 (79)	17175 (7790)	2800 (1270)	120 (54)
60-1200	9000 (4082)	8000 (3629)	2100 (953)	7600 (3447)	400 (181)	27100 (12292)	4800 (2177)	135 (61)
72-1200	9000 (4082)	12000 (5443)	2200 (998)	7700 (3493)	700 (318)	31600 (14334)	4900 (2223)	400 (149)

General Maintenance

Maintenance

It is impossible for a boring machine in poor condition to accomplish the same level of performance as a well maintained piece of equipment. The operator should record (on each job) any items on the machine that require repair. The operation of a boring machine that is in need of repair is discouraged by American Augers.

WARNING
Do not modify your boring machine. This may make the machine unsafe and will void the warranty.

When performing field or shop maintenance, it is important that the casing pusher and spoil paddles be removed if the drive train is being tested. The shear point between the spoil paddles and the casing pusher still presents the same hazard to a workman as it does when the machine is boring. Keep all guards in place when possible, and keep all unnecessary personnel away from the machine during maintenance.

Inspection of the machine, augers, and cutting heads is impossible if the equipment is dirty. American Augers recommends that the machine and equipment be cleaned with a high pressure washer after each job so that an adequate inspection can be made. The American Augers Bentonite Pump is ideally suited for this job. A clean machine can be inspected for damage. Repairs can be made immediately and much easier in the shop rather than in the pit on the next job.

The Value of a Preventive Maintenance Program

a) Detecting problems early so minor problems can be repaired before they become major failures.

b) Monitoring maintenance schedules and practices in order to verify that maintenance is being done and on time.

c) Scheduling downtime to fit into your work schedule.

d) Monitoring “positives” as well as “negative” so money isn’t wasted on early preventive maintenance.

e) Fluid analysis testing is quick and easy to do. Simply put, fluid analysis is one of the easiest and most economical methods available to you to help prevent costly repairs and unscheduled downtime.

f) In addition, unplanned repairs, early replacement, and costly downtime need to be avoided.

g) Repair all hydraulic leaks once they are experienced or seen.

WARNING
Perform maintenance when there is no power to the machine and the controls. Clean the machine and lock movable parts.

DANGER
Make sure personnel keep a safe distance during maintenance operations.

Hydraulic oil, gearbox oil, diesel engine oil, pin and bearing greases, diesel engine cooling liquid, battery liquids and fuel should be handled with care. Consult Material Safety Data Sheets. Dispose of spent fluids according to EPA and appropriate state and local regulations.

Engines, muffler, gearboxes and the hydraulic system can reach very high temperatures. Do not attempt maintenance immediately after stopping work. Wait until the parts are cool.

Qualification of the Technician

The maintenance technician must be trained in boring machine operations. The maintenance technician is responsible for conducting maintenance with suitable test and repair equipment, personal protective equipment and attention to safety hazards. Any special repairs that cannot be made by the maintenance technician should be reported to appropriate management personnel for prompt attention.

Welding

WARNING

Do not perform welding near the tanks and flammable liquids.

CAUTION

Failure to follow welding procedure can cause damage to electric and mechanical components. Damage to components due to improper procedures is not covered under warranty.

CAUTION

Disconnect ground terminal first.
Reconnect ground terminal last.

Welding must be done with the ground wire connected directly to the component where the weld is made. Failure to follow the above instructions could damage electric and hydraulic components, cylinders, gears and bearings due to internal arcing.

Cleaning

Cleaning Plastic and Resin Parts

Avoid using gasoline, kerosene, paint thinner and similar materials when cleaning the instrument cluster, gauges, console, plastic windows, etc. These materials will cause discoloration, cracking or deformation of the part being cleaned. Use ONLY water, mild soap and a soft cloth when you clean these parts.

General Maintenance

Pressure Washing the Machine

CAUTION

Don't direct the water spray inside the muffler or the air filter or against electric components or control panels.

Approved Replacement Fluids

(Ambient temperature 0 Degree F to 110 Degree F [-18 Degree C to 44 Degree C])
Consult factory for specifications at low temperatures

Engine Oil	Shell Rotella™ T	AA Specification 401
Hydraulic Oil	Shell Tellus™ T ISO 46	AA Specification 202
Grease	Shell Retinax™ LC-2	AA Specification 301
Gear Lubricant	80W-140 Synthetic Gear Lubricant	API GL-5/AGMA-5EP
Engine Antifreeze	Shellzone™ 60%, Water 40%	AA Specification 601

To order fluids from other suppliers, consult the American Augers Lubrication Specifications.

Maintenance Schedule

Boring Machine Maintenance Schedule

Function	After each job	10* hours	50* hours	500* hours	1000* hours
Check Fuel Level		X			
Check for Leaks		X			
Electrical Systems		X			
Gauges and Instruments		X			
Check Emergency Stop and Safety Switches		X			
Check Battery Water Level		X			
Check Engine Crankcase Oil Level		X			
Check Radiator Coolant Level		X***			
Inspect Air Filter Stoppage Indicator		X**			
Check Hydraulic Tank Oil Level		X			
Check Hydraulic Oil Filters		X**			
Tighten Tie Down Bolts on Split Machines		X			
Lubricate Cam Followers		X			
Check Transmission Fluid Level		X			
Check Final Drive Fluid Level		X			
Lubricate Push Bar moving parts			X		
Tighten Bolts, Final Drive to Frame			X		
Tighten Bolts, Transmission to Final Drive			X		
Inspect Hoses			X		
Lubricate Clutch Linkage				X	
Change Transmission Fluid				X	
Change Final Drive Fluid				X	
Drain Hydraulic Tank and Replace Oil				X	
Change Engine Oil and Filters					X,E
Perform Engine Maintenacne					X,E
Inspect Push Bar	X				
Inspect Hydraulic Tank	X				
Inspect and Lubricate Auger Couplings	X				
Inspect Auger Sections	X				
Inspect Cutting Heads	X				
Check Operation of Controls	X				

NOTES:
E, Consult engine manual on methods and materials.
K, Consult pump manual on methods and materials
* Do not exceed the indicated number of hours without performing the required maintenance
**, Unless filter indicator shows change required at a more frequent interval
***, Not all Boring Machines have engines with radiators.

Scheduled Maintenance

10 Hour Inspection and Maintenance

After 10 hours or before beginning operations, inspect and perform maintenance items as indicated on the Maintenance Schedule.

Check fuel tank level. Tank should be full before starting operations.
Check all hydraulic hoses for frayed areas or damage and connections for leaks and repair as required.
Check electrical system for broken wires or connectors and repair as required.
Inspect gauges and instruments. Wipe the faces of gauges with a cloth moistened with water. Replace cracked or missing glass. Fluid filled (shock resistant) gauges should be replaced if the glass is cracked.
Check emergency stop and safety switches. They should function perfectly.

WARNING

Machine batteries contain acid. Use proper precautions and follow the instructions listed below.

Check the level of the electrolyte in the batteries and add distilled water if the level is too low.
Check the battery cables and verify that there are no abrasions or indentations; if necessary, replace the battery cables. Check that the battery terminals are not corroded. Clean and replace them if necessary. The voltage of the battery is 12 volts.
Clean corrosion off battery terminals. A paste made of sodium bicarbonate and water is normally enough to clean terminals and battery box. After cleaning, rinse thoroughly with clean water. Coat the terminals with grease in order to prevent future corrosion.
The batteries contain sulfuric acid. Protect eyes, face, and hands during maintenance work. Do not pour battery acid on clothes, skin, or eyes. If the acid reaches the skin, flood with water. If the acid reaches the eyes, wash with plenty of water and go to the doctor immediately. In case of ingestion, drink water or milk and seek medical attention immediately.
Batteries can produce explosive gas. Do not smoke near a battery: keep away ignition source, sparks, or flames. Charge the batteries only in well ventilated areas.

WARNING

Before checking or changing engine crankcase lube oil wait for the engine to cool.

Check oil levels in Engine Crankcase. Fill with grade oil recommended in engine manual provided. Refer to: Attachment 1, Engine Manufacturer Manual and follow recommendations for operation and maintenance to maintain your engine warranty.

WARNING

Before checking or changing coolant wait for engine to cool.

Check Radiator coolant level. Not all boring machine engines have radiators. However, on those engines that do have radiators the coolant level should be checked. Fill with coolant recommended in engine manual provided.

10 Hour Inspection and Maintenance

WARNING
Wait for engine to cool

Inspect air filter stoppage indicator. Change filter when indicated.

Check Hydraulic Reservoir oil level daily. Check with cylinders retracted. Fill to 2” of top with Premium grade, antiwear hydraulic oil, with a viscosity index of 135 or higher.

WARNING
Wait for engine to cool

Check hydraulic oil filter gauge daily and change when gauge shows a pressure increase.

Several different types of hydraulic oil filters will be found in American Augers Boring Machines, depending on size and type of pump system. All will have an indicator, pressure gauge, or vacuum gauge to monitor the oil flow and signal when the filter should be replaced or cleaned. The filter must be checked with the oil at normal operating temperature.

(A) Suction Line: Vacuum gauge, 0-30 inches. At 8 inches Hg vacuum, the element should be discarded and replaced with a new element.

(B) Return Line: Pressure gauge, 0-60 psi. At 12 psi, the element should be discarded and replaced with a new element.

Check and tighten all tie down bolts on split machines before starting. Make periodic checks of tie down bolts during operation.

Grease all cam followers daily with Shell Retinax™ LC-2.

WARNING
Wait for engine to cool

Check Transmission lube level. Fill to level plug with 80W-140 synthetic gear lubricant, meeting API GL-5/AGMA-5EP.

Check Final Drive lube level. Fill to level plug with 80W-140 synthetic gear lubricant, meeting API GL-5/AGMA-5EP.

NOTICE
Consult factory for recommended oil for operating in extreme low or high ambient temperature

Scheduled Maintenance

50 Hour Inspection and Maintenance

Perform 10 hour inspection and maintenance items, plus:

During Use:
Tighten all bolts holding the final drive to the frame.
Tighten all bolts in the coupling between the transmission and final drive.
Oil all Push Bar parts, including track dogs, weekly when in continuous use. A light machine oil is recommended. The push bar should be disassembled and cleaned periodically, especially after use in sticky clay conditions.

500 Hour Inspection and Maintenance

Perform 10 and 50 hour inspection and maintenance items, plus:

Grease the linkage on both sides of clutch with Shell Retinax™ LC-2.

Drain old transmission oil into a proper container of appropiate size. Fill to level plug with with 80W-140 synthetic gear lubricant, meeting API GL-5/AGMA-5EP.

Drain old Final Drive oil into a proper container of appropiate size. Fill to level plug with with 80W-140 synthetic gear lubricant, meeting API GL-5/AGMA-5EP.

Drain hydraulic oil tank into a proper container of appropiate size. Refill to 2” of top with Premium grade, antiwear hydraulic oil, with a viscosity index of 135 or higher. Draining and filling should be done with the cylinders retracted. Hydraulic oil must also be replaced during year if it appears milky, indicating water in the system.

Scheduled Maintenance

1000 Hour Inspection and Maintenance

Perform 10, 50 and 500 hour inspection and maintenance items, plus:

Change engine oil and filters. Refer to: Attachment 1, Engine Manufacturer Manual for procedures.
Perform engine maintenance. Refer to: Attachment 1, Engine Manufacturer Manual for procedures.

After Each Use

Wash down machine and inspect for damage.

Clean the Push Bar and disassemble. Inspect all parts and repair or replace as needed. Reassemble and coat with a light machine oil.

Drain hydraulic oil tank into a proper container of appropiate size. Refill to 2” of top with Premium grade, antiwear hydraulic oil, with a viscosity index of 135 or higher. Draining and filling should be done with the cylinders retracted.

Clean and coat auger couplings with light grease after each use. Inspect shanks for twisting, replace if there is evidence of failure.

Examine the auger sections after use for bent or broken flighting. Straighten and reweld as necessary.

Examine all teeth on the cutting heads and replace as necessary before each use. Inspect all bullet bits on rock heads to insure they are firmly seated. Inspect condition of wing cutters; check for cutting diameter and freedom of movement, as well.

Inspect operation of all controls, including Emergency Stop Control.

Specifications

Specifications

24/30-150 Specifications

Machine Dimensions / Weight

Length:	11 feet (3.4 m)
Width:	4 feet 6 inches (1.4 m)
Height:	4 feet 6 inches (1.4 m)
Estimated Weight:	5700 pounds (2586 kg)

Power Train

Engine:	Deutz F3L1011F Air-cooled, Diesel with electric start
Rating:	45 HP (34 kW)
Engine Speed:	2800 RPM
Engine Torque:	89 ft-lbs (121 N-m) @ 1800 RPM
Fuel Capacity:	10 U.S. Gallons (38 liters)
Transmission:	T-18, 4 Speed, Constant Mesh
Battery:	One, Deka 634MF, 12 volt, 690 CCA

Hydraulic System

Hydraulic Capacity:	14.5 U.S. Gallons (55 liters)
Maximum Thrust:	150,000 lbs (667 kN)

Torque and Speed

Torque Requirements: 1st Gear 26,268 ft-lbs (35,615 N-m)@2800 RPM Maximum Speed 60 RPM in 4th gear.

Miscellanous Performance Data

Working Range:	4 - 30 inch (102 - 762 mm) Casing Diameter
Hex Drive:	3 inch (76.2 mm) Hex

Spoil Door

With a Safety-First commitment, all American Augers horizontal earth boring machines are equipped with a spring loaded-manual spoil door, which deflects thrown debris from the spoil chamber.

36/42-440 Specifications

Machine Dimensions / Weight

Length:	12 feet 6 inches (3.8 m)
Width:	5 feet 3 inches (1.6 m)
Height:	5 feet 6 inches (1.67 m)
Estimated Weight:	13,200 pounds (5987 kg)

Power Train

Engine:	Deutz BF3L2011F Turbo Diesel
Rating:	57 HP (76 kW)
Engine Speed:	1600 RPM
Engine Torque:	129 ft-lbs (175 N-m) @ 1600 RPM
Fuel Capacity:	20 U.S. Gallons (76 liters)
Transmission:	T-18, 4 Speed, Constant Mesh
Battery:	One, Deka 634MF, 12 volt, 690 CCA

Hydraulic System

Hydraulic Capacity:	25 U.S. Gallons (95 liters)
Maximum Thrust:	440,000 lbs (1,512 kN)

Torque and Speed

Torque Requirements: 1st Gear 40,710 ft-lbs (55,195 N-m) @ 2800 RPM Maximum Speed 46.5 RPM in 4th gear.

Miscellanous Performance Data

Working Range:	12 - 42 inch (305 - 1067 mm) Casing Diameter
Hex Drive:	4 inch (101.6 mm) Hex

Spoil Door

With a Safety-First commitment, all American Augers horizontal earth boring machines are equipped with a gravity activated manual spoil door, which deflects thrown debris from the spoil chamber.

Specifications

36-600 Specifications

Machine Dimensions / Weight

Length:	13 feet (4 m)
Width:	6 feet 4 inches (1.9 m)
Height:	5 feet 3 inches (1.6 m)
Estimated Weight:	13,200 pounds (5987 kg)

Power Train

Engine:	Deutz D914L06 Turbo Diesel, Tier III
Rating:	115.9 HP (86 kW)
Engine Speed:	2300 RPM
Engine Torque:	276 ft-lbs (374 N-m) @ 1600 RPM
Fuel Capacity:	18.5 U.S. Gallons (70 liters)
Transmission:	Spicer 5-Speed, Constant Mesh
Battery:	One, Deka 634MF, 12 volt, 690 CCA

Hydraulic System

Hydraulic Capacity:	22.6 U.S. Gallons (86 liters)
Maximum Thrust:	600,000 lbs (2,669 kN)

Torque and Speed

Torque Requirements:1st Gear 88,604 ft-lbs (120,131 N-m)@2300 RPM/Maximum Speed 42 RPM in 5th gear

Miscellanous Performance Data

Working Range:	12 - 42 inch (305 - 1067 mm) Casing Diameter
Hex Drive:	4 inch (101.6 mm) Hex

Spoil Door

With a Safety-First commitment, all American Augers horizontal earth boring machines are equipped with a gravity activated manual spoil door, which deflects thrown debris from the spoil chamber.

42-600 Specifications

Machine Dimensions / Weight

Length:	13 feet (4 m)
Width:	6 feet 4 inches (1.9 m)
Height:	5 feet 3 inches (1.6 m)
Estimated Weight:	13,200 pounds (5987 kg)

Power Train

Engine:	Deutz D914L06 Turbo Diesel, Tier III
Rating:	115.9 HP (86 kW)
Engine Speed:	2300 RPM
Engine Torque:	276 ft-lbs (374 N-m) @ 1600 RPM
Fuel Capacity:	18.5 U.S. Gallons (70 liters)
Transmission:	Spicer 5-Speed, Constant Mesh
Battery:	One, Deka 634MF, 12 volt, 690 CCA

Hydraulic System

Hydraulic Capacity:	22.6 U.S. Gallons (86 liters)
Maximum Thrust:	600,000 lbs (2,669 kN)

Torque and Speed

Torque Requirements:1st Gear 88,604 ft-lbs (120,131 N-m)@2300 RPM/Maximum Speed 42 RPM in 5th gear

Miscellanous Performance Data

Working Range:	12 - 42 inch (305 - 1067 mm) Casing Diameter
Hex Drive:	4 inch (101.6 mm) Hex

Spoil Door

With a Safety-First commitment, all American Augers horizontal earth boring machines are equipped with a gravity activated manual spoil door, which deflects thrown debris from the spoil chamber.

Specifications

48-900 Specifications

Machine Dimensions / Weight

Length:	13 feet (4 m)
Width:	6 feet 4 inches (1.9 m)
Height:	5 feet 3 inches (1.6 m)
Estimated Weight:	15,400 pounds (6958 kg)

Power Train

Engine:	Deutz TCD914L6 Turbo Diesel
Rating:	174 HP (130 kW)
Engine Speed:	2500 RPM
Engine Torque:	291 ft-lbs (395 N-m) @ 1600 RPM
Fuel Capacity:	18.5 U.S. Gallons (70 liters)
Transmission:	Eaton FS5205A
Battery:	Two, Deka 634MF, 12 volt, 690 CCA

Hydraulic System

Hydraulic Capacity:	22.6 U.S. Gallons (86 liters)
Maximum Thrust:	900,000 lbs (4,004 kN)

Torque and Speed

Torque Requirements: 1st Gear 113,087 ft-lbs (153,323 N-m) Maximum Speed 8 RPM

Miscellanous Performance Data

Working Range:	12 - 42 inch (305 - 1067 mm) Casing Diameter
Hex Drive:	4 inch (101.6 mm) Hex

Spoil Door

With a Safety-First commitment, all American Augers horizontal earth boring machines are equipped with a gravity activated manual spoil door, which deflects thrown debris from the spoil chamber.

48/54-900 Specifications

Machine Dimensions / Weight

Length:	15 feet (4.5 m)
Width:	5 feet 7 inches (1.7 m)
Height:	6 feet 2 inches (1.8 m
Estimated Weight:	17,175 pounds (7790 kg)

Power Train

Engine:	Deutz TCD914L6 Air-cooled Diesel
Rating:	174 HP (143 kW)
Engine Speed:	2300 RPM
Engine Torque:	373 ft-lbs @ 2300 RPM (506 N-m)
Fuel Capacity:	39 U.S. Gallons (148 liters)
Transmission:	Eaton FS-5205A
Battery:	Two, Deka 634MF, 12 volt, 690 CCA

Hydraulic System

Hydraulic Capacity:	22 U.S. Gallons (83 liters)
Maximum Thrust:	900,000 lbs (4,004 kN)

Torque and Speed

Torque Requirements: 1st Gear 108,832 ft-lbs (147,556 N-m)@ 2300 RPM Maximum Speed 59 RPM in 5th gear.

Miscellanous Performance Data

Working Range:	24 - 54 inch (607 - 1372 mm) Casing Diameter
Hex Drive:	4 inch (101.6 mm) Hex

Spoil Door

With a Safety-First commitment, all American Augers horizontal earth boring machines are equipped with a gravity activated manual spoil door, which deflects thrown debris from the spoil chamber.

Specifications

60-1200 Specifications

Machine Dimensions / Weight

Length:	13 feet (4 m)
Width:;	7 feet 3 inches (2.2 m)
Height:	6 feet 2 inches (1.8 m)
Estimated Weight:	27,100 pounds (12,292 kg)

Power Train

Engine:	Deutz TCD914L6 Turbo Diesel, water-cooled with electric start
Rating:	174 HP (130 kW)
Engine Speed:	2300 RPM
Engine Torque:	468.1 ft-lbs (635 N-m) @ 1600 RPM/373 ft-lbs (506 N-m) @ 2300 RPM
Fuel Capacity:	30 U.S. Gallons (118 liters)
Transmission:	Eaton 5205A
Battery:	Two, Deka 634MF, 12 volt, 690 CCA

Hydraulic System

Hydraulic Capacity:	66 U.S. Gallons (250 liters)
Maximum Thrust:	1,200,000 lbs (5,338 kN)

Torque and Speed

Torque Requirements: 1st Gear 108,832 ft-lbs (147,557 N-m) Maximum Speed 59 RPM in 5th gear

Miscellanous Performance Data

Working Range:	12 - 60 inch (305 - 1529 mm) Casing Diameter
Hex Drive:	5 inch (125 mm) Hex

Spoil Door

With a Safety-First commitment, all American Augers horizontal earth boring machines are equipped with a gravity activated manual spoil door, which deflects thrown debris from the spoil chamber.

72-1200 Specifications

Machine Dimensions / Weight

Length:	13 feet 9 inches (4.3 m)
Width:	8 feet 6 inches (2.6 m)
Height:	7 feet 5 inches (2.28 m)
Estimated Weight:	31,600 pounds (14,334 kg)

Power Train

Engine:	Caterpillar C7 ACERT, Tier III Diesel, water-cooled with electric start
Rating:	250 HP (186 kW)
Engine Speed:	2100 RPM
Engine Torque:	625 ft-lbs (847 N-m) @ 2100 RPM
Fuel Capacity:	58 U.S. Gallons (219 liters)
Transmission:	Eaton FS-6406A
Battery:	Two, Deka 634MF, 12 volt, 690 CCA

Hydraulic System

Hydraulic Capacity:	48 U.S. Gallons (181 liters)
Maximum Thrust:	1,200,000 lbs (5,338 kN)

Torque and Speed

Torque Requirements: 1st Gear 200,641 ft-lbs (271,868 N-m) @2100 RPM Maximum Speed 59 RPM in 6th gear.

Miscellanous Performance Data

Working Range:	24 - 84 inch (610 - 2282 mm) Casing Diameter
Hex Drive:	5 inch (125 mm) Hex

Spoil Door

With a Safety-First commitment, all American Augers horizontal earth boring machines are equipped with a gravity activated manual spoil door, which deflects thrown debris from the spoil chamber.

Appendix

Appendix

The appendix contains information that we believe the operator of the Horizontal Earth Boring Machine will find useful to have available for reference during the operation of the Horizontal Earth Boring Machine. The information is placed in the appendix because it is of general interest or it supplements the information in the body of the manual.

Notes

NOTES:

Appendix A: Boring Machine Force Charts

Appendix A

English Units

24/30-150 Force Chart

AMERICAN AUGERS ®
an Astec company

24/30-150 FORCE CHART

GAUGE PRESSURE	EXTEND FORCE	RETRACT FORCE
500	18850	11486
1000	37699	22973
1500	56549	34459
2000	75398	45946
2500	94248	57432
3000	113097	68919
3500	131947	80405
3979	150000	91406

36/42-440 Force Chart

AMERICAN AUGERS ®
an Astec company

36/42-440NG FORCE CHART

GAUGE PRESSURE	EXTEND FORCE	RETRACT FORCE
500	63617	51051
1000	127235	102102
1500	190852	153153
2000	254469	204204
2500	318086	255254
3000	381704	306305
3458	440000	353086

36/42-600 Force Chart

AMERICAN AUGERS ®
an Astec company

36/42-600NG FORCE CHART

GAUGE PRESSURE	EXTEND FORCE	RETRACT FORCE
500	63617	51051
1000	127235	102102
1500	190852	153153
2000	254469	204204
2500	318086	255254
3000	381704	306305
3500	445321	357356
4000	508938	408407
4500	572555	459458
4715	600000	481481

42-600 Force Chart

AMERICAN AUGERS ®
an Astec company

42-600NG FORCE CHART

GAUGE PRESSURE	EXTEND FORCE	RETRACT FORCE
500	63617	51051
1000	127235	102102
1500	190852	153153
2000	254469	204204
2500	318086	255254
3000	381704	306305
3500	445321	357356
4000	508938	408407
4500	572555	459458
4716	600000	481481

English Units, Continued

48/54-900 and 48-900 Force Chart

AMERICAN AUGERS ®
an Astec company

48/54-900NG FORCE CHART

GAUGE PRESSURE	EXTEND FORCE	RETRACT FORCE
500	95426	76576
1000	190852	153153
1500	286278	229729
2000	381704	306305
2500	477129	382882
3000	572555	459458
3500	667981	536034
4000	763407	612611
4500	858833	689187
4716	900000	722222

60-1200 Force Chart

AMERICAN AUGERS ®
an Astec company

60-1200NG FORCE CHART

GAUGE PRESSURE	EXTEND FORCE	RETRACT FORCE
500	127235	102102
1000	254469	102093
1500	381704	306305
2000	508938	408407
2500	636173	510509
3000	763407	612611
3500	890642	714712
4000	1017876	816814
4500	1145111	918916
4716	1200000	962963

72-1200 Force Chart

AMERICAN AUGERS ®
an Astec company

72-1200NG FORCE CHART

GUAGE PRESSURE	EXTEND FORCE	RETRACT FORCE
500	127235	102102
1000	254469	204204
1500	381704	306305
2000	508938	408407
2500	636173	510509
3000	763407	612611
3500	890642	714712
4000	1017876	816814
4500	1145111	918916
4716	1200000	962963

Appendix A: Boring Machine Force Charts

Metric Units

24/30-150 Force Chart, Metric Units

AMERICAN AUGERS ®
an Astec company

24/30-150 FORCE CHART

GAUGE PRESSURE	EXTEND FORCE (kN)	RETRACT FORCE (kN)
34	84	51
69	168	102
103	252	153
138	335	204
172	419	255
207	503	307
241	587	358
274	667	407

36/42-440 Force Chart, Metric Units

AMERICAN AUGERS ®
an Astec company

36/42-440NG FORCE CHART

GAUGE PRESSURE	EXTEND FORCE (kN)	RETRACT FORCE (kN)
34	283	227
69	566	454
103	849	681
138	1132	908
172	1415	1135
207	1698	1363
238	1957	1571

36/42-600 Force Chart, Metric Units

AMERICAN AUGERS ®
an Astec company

36/42-600NG FORCE CHART

GAUGE PRESSURE	EXTEND FORCE (kN)	RETRACT FORCE (kN)
34	283	227
69	566	454
103	849	681
138	1132	908
172	1415	1135
207	1698	1363
259	2122	1703
276	2264	
310	2547	
325	2669	

42-600 Force Chart, Metric Units

AMERICAN AUGERS ®
an Astec company

42-600NG FORCE CHART

GAUGE PRESSURE	EXTEND FORCE (kN)	RETRACT FORCE (kN)
34	283	227
69	566	454
103	849	681
138	1132	908
172	1415	1135
207	1698	1363
259	2122	1703
276	2264	
310	2547	
325	2669	

Metric Units, Continued

48/54-900 and 48-900 Force Chart, Metric Units

AMERICAN AUGERS ®
an Astec company

48/54-900NG FORCE CHART

GAUGE PRESSURE	EXTEND FORCE (kN)	RETRACT FORCE (kN)
34	424	341
69	849	681
103	1273	1022
138	1698	1363
172	2122	1703
207	2547	2044
259	3184	2555
276	3396	
310	3820	
325	4003	

60-1200 Force Chart, Metric Units

AMERICAN AUGERS ®
an Astec company

60-1200NG FORCE CHART

GAUGE PRESSURE	EXTEND FORCE (kN)	RETRACT FORCE (kN)
34	566	454
69	1132	908
103	1698	1363
138	2264	1817
172	2830	2271
207	3396	2725
259	4245	3406
276	4528	
310	5094	
325	5338	

72-1200 Force Chart, Metric Units

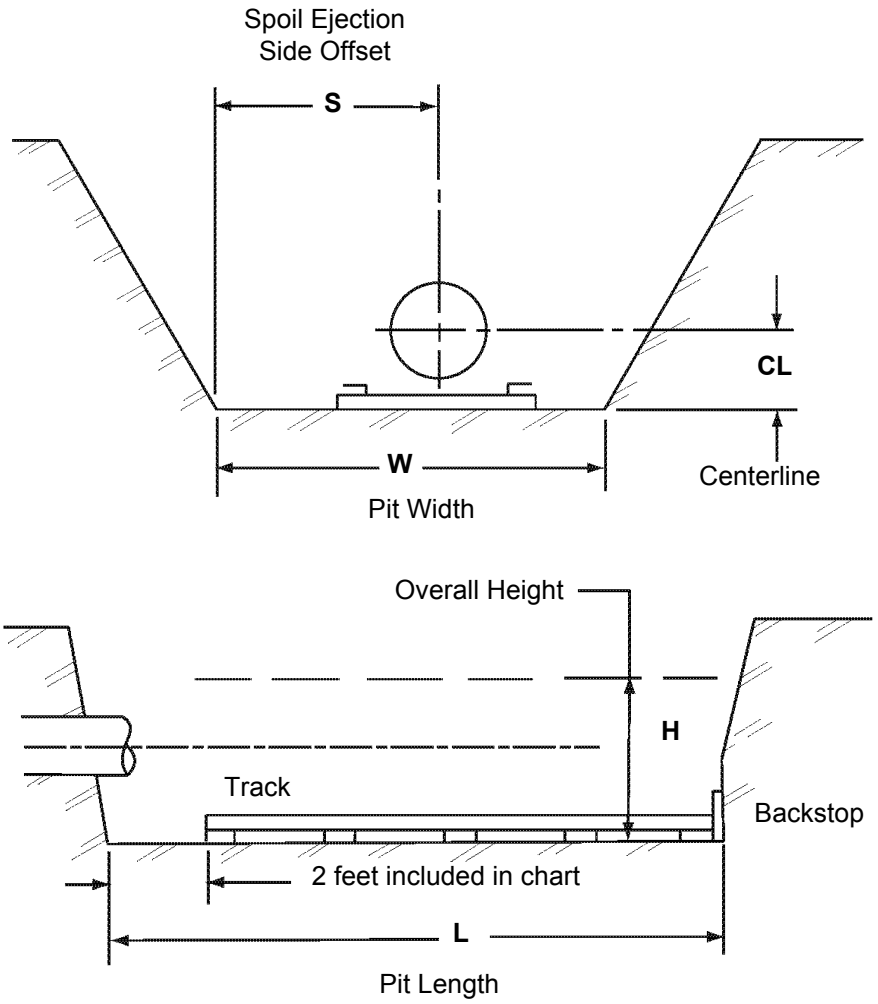
AMERICAN AUGERS ®
an Astec company

72-1200NG FORCE CHART

GAUGE PRESSURE	EXTEND FORCE (kN)	RETRACT FORCE (kN)
34	566	454
69	1132	908
103	1698	1363
138	2264	1817
172	2830	2271
207	3396	2725
259	4245	3406
276	4528	
310	5094	
325	5338	

Appendix B: Entrance Pit

Appendix B



Entrance Pit Chart

Minimum Dimensions for Installation of 20-Foot Length of Casing

Model	CL, inch (cm)	W, ft (m)	L, ft (m)	H, ft (m)	S, ft (m)
24/30-150	18.12 (46)	12'-0" (3.6)	35'-0" (10.4)	4'-9.25" (1.5)	7"-8" (2.3)
36/42-440	27 (76.7)	12'-0" (3.6)	35'-0" (10.4)	4'-9.25" (1.5)	7"-8" (2.3)
42-600	29.25 (83.1)	12'-6" (3.6)	35'-0" (10.4)	5'-2" (1.6)	8'-0" (2.4)
48-900	29.25 (83.1)	12'-6" (3.6)	35'-0" (10.4)	5'-2" (1.6)	8'-0" (2.4)
48/54-900	34 (96.6	12'-6" (3.6)	35'-0" (10.4)	5'-4.5" (1.6)	8'-0" (2.4)
60-1.2M	36.125 (102.6)	14'-0" (4.3)	35'-0" (10.4)	6'-2" (1.9)	9'-0" (2.7)
72-1.2M	36.125 (102.6)	15"-0" (4.6)	35'-0" (10.4)	6'-2" (1.9)	9'-0" (2.7)

These dimensions should be understood as general guidelines for pit dimensions. Use your engineering discretion for the final entrance pit size.

Appendix C: Ground Conditions Chart

Appendix C

Ground Conditions Chart

	Wet Runny Sand	Wet Stable Sand	Dry Sand	Dry Clay	Wet Clay	Small Gravel	Hard Pan	Large Gravel	Small Boulders	Soft Solid Rock	Hard Solid Rock	Land Or Railroad Fill
Auger Speed	Slow	Fast	Slow	Fast	Medium	Medium	Slow	Slow	Slow	Slow	Contact American Augers For Advice	Cautious
Rate of Pentration	Fast	Fast	Fast	Fast	Fast	Fast	Medium	Low	Low	Low		Low
Cutting Head	HTD	HTD	HTD	HTD	HTD	HTR	HTR	HTR	HTR	HTR		HTR
Wing Cutters	No	No	No	Yes	Optional	Yes	Yes	Yes	Yes	Yes		Yes
Head Positon	Inside	Inside	Inside	Flush	Flush	Outside	Outside	Outside	Outside	Outside		Outside
Bentonite	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No		No
Water Inside	No	No	No	Yes	Yes	Yes	Yes	No	No	No		Yes
Band	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes
Bore Continuous	Yes	Yes	Yes	Optional	Optional	Optional	Optional	Optional	Optional	Optional		Optional
Clean Casing	Pack	Pack	Pack	Clean	Clean	Clean	Clean	Clean	Clean	Clean		Clean
Pit Base*	Concrete	Stone	Optional	Optional	Stone	Optional	Optional	Optional	Stone	Optional		Concrete
Backstop*	Concrete	Concrete	Concrete	Steel	Steel	Steel	Steel	Steel	Steel	Concrete		Concrete

*American Augers strongly recommends using the services of a competent engineer for the pit base/backstop design

Appendix D: Cutting Heads

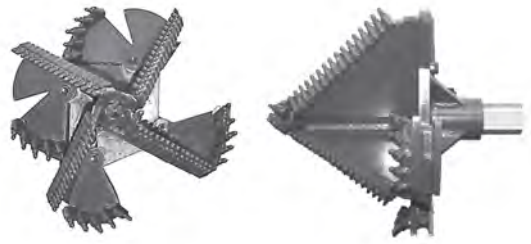
Appendix D

American Augers manufactures Earth 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

EFFECT OF WING CUTTERS

The function of wing cutters on a head is to overcut the tunnel, allowing the casing to enter more easily. Wing cutters are used only in stable conditions as noted in the Ground Conditions Chart, Appendix C. American Augers wing cutters are preset to cut one inch (2.54 cm) larger than the nominal casing diameter. Large diameter heads cut 1.5 inches (3.8 cm) over. 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.

HTD Head



Heavy Duty Rock Head ("Christmas Tree") can be used in place of the HTR head at the users preference.

HTR Head

Appendix E

AUGER WEIGHT CHART POUNDS PER FOOT

Casing Size in inches	HEX SHANK SIZE in inches					
	1 3/8 (1/4 plt)	1 5/8 (1/4 plt)	2 1/4 (3/8 plt)	3 (3/8 plt)	4 (3/8 plt)	5 (1/2 plt)
4	7.0					
6	7.5	7.9				
8	8.5	8.9	17.8			
10		10.8	19.7	37.3		
12		11.9	22.1	39.9		
14		12.7	24.1	41.7		
16		15.5	27.2	45.1	57.0	
18		17.7	31.3	48.8	60.7	
20		20.7	35.7	52.1	65.1	
24			45.0	62.4	74.8	96.5
30			61.2	79.5	90.8	116.5
36			79.2	95.9	106.7	139.8
42				117.1	127.7	167.9
48				142.4	152.6	199.1
54					181.0	236.7
60					212.6	278.7
72					286.0	375.7

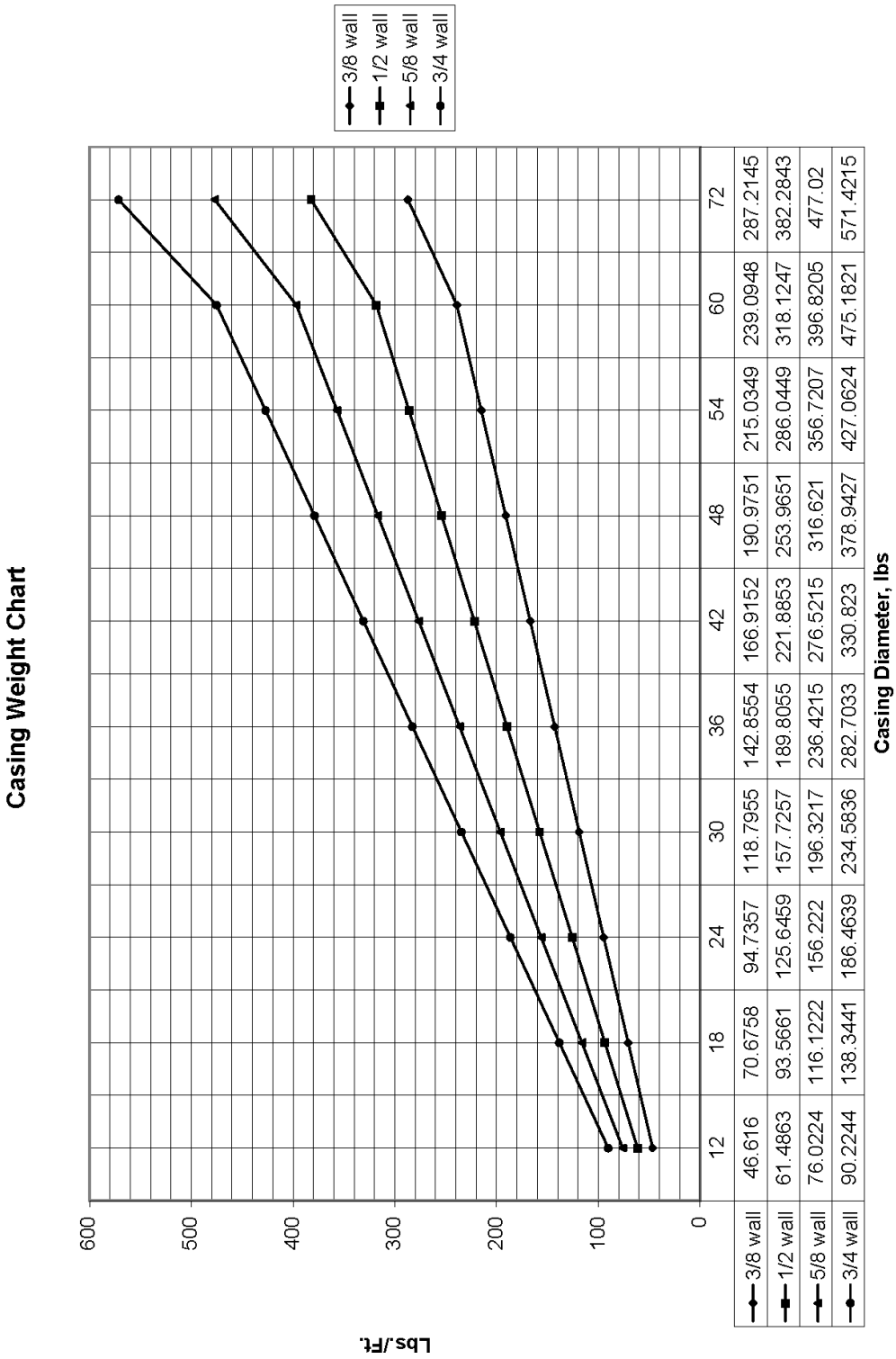
Appendix E: Auger Weight Charts

AUGER WEIGHT CHART KILOGRAMS PER METER

Casing Size in mm	HEX SHANK SIZE in millimeters					
		41.3	57.1	76.2	101.6	127.0
300		17.6	33.0			
400		22.5	39.7	61.0		
500			52.1	76.8		
600			65.6	93.3		
700				108.2	125.6	161.5
800				116.8	140.9	181.5
900				132.7	157.9	203.9
1000				160.6	176.5	230.7
1100					198.1	258.9
1200					222.2	288.7
1400					278.0	363.1
1800					415.2	552.1
1829					425.6	565.8

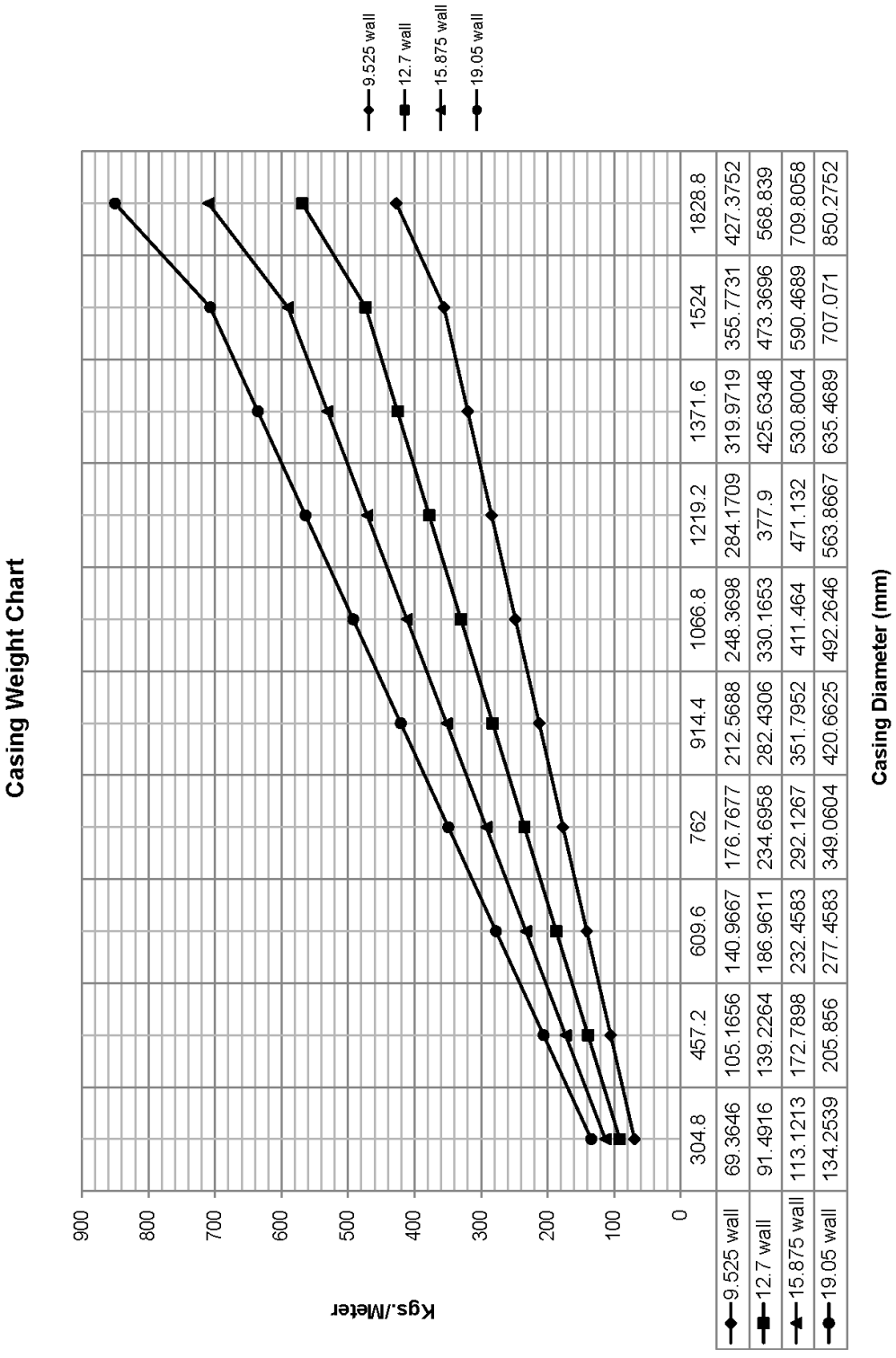
Appendix F: Casing Weight Charts

Appendix F



	12	18	24	30	36	42	48	54	60	72
3/8 wall	46.616	70.6758	94.7357	118.7955	142.8554	166.9152	190.9751	215.0349	239.0948	287.2145
1/2 wall	61.4863	93.5661	125.6459	157.7257	189.8055	221.8853	253.9651	286.0449	318.1247	382.2843
5/8 wall	76.0224	116.1222	156.222	196.3217	236.4215	276.5215	316.621	356.7207	396.8205	477.02
3/4 wall	90.2244	138.3441	186.4639	234.5836	282.7033	330.823	378.9427	427.0624	475.1821	571.4215

Appendix F: Casing Weight Charts



	304.8	457.2	609.6	762	914.4	1066.8	1219.2	1371.6	1524	1828.8
9.525 wall	69.3646	105.1656	140.9667	176.7677	212.5688	248.3698	284.1709	319.9719	355.7731	427.3752
12.7 wall	91.4916	139.2264	186.9611	234.6958	282.4306	330.1653	377.9	425.6348	473.3696	568.839
15.875 wall	113.1213	172.7898	232.4583	292.1267	351.7952	411.464	471.132	530.8004	590.4689	709.8058
19.05 wall	134.2539	205.856	277.4583	349.0604	420.6625	492.2646	563.8667	635.4689	707.071	850.2752

Appendix G: Boring Machine Glossary of Terms

Appendix G

A

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: See DRIVE CHUCK.

B

BACKSTOP: Reinforced area of the entrance pit directly behind the track.

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 TRACK: See MASTER TRACK.

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 or auger.

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

BORING MACHINE: A mechanism to drill earth.

BORING PIT: See ENTRANCE PIT.

BOX : See FEMALE HEX CONNECTOR.

BUSHING: See FEMALE HEX CONNECTOR.

C

CAM FOLLOWER: A small diameter bearing wheel assembly.

CARRIAGE: The mechanical part of a non-split boring machine that includes the engine or drive motor, the drive train, thrust block and hydraulic cylinders.

CASED BORING: The process of installing a 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 casing whose diameter is smaller than that of the casing pusher.

CASING ATTACHMENT: See CASING ADAPTER.

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

CENTERLINE: The vertical distance between the center of the drive chuck and the ground plane (bottom of the track.)

CETANE: A measure of the ignition quality of diesel fuel.

CHIPPERS: See BITS.

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.

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.

D

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

DECK ASSEMBLY: Drive train assembly for a split design boring machine.

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

DOGS: Movable protrusions in the push bar that engage holes or blocks in the track.

DOG PLATE: see THRUST BLOCK.

DRILL PIPE: System of pipes used with cutting bit or compaction bit attached to the drive chuck.

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

Appendix G: Boring Machine Glossary of Terms

E

EMERGENCY STOP: A manually operated push button that when pushed stops all functions of the machine.

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

EXIT PIT: An opening located at the expected exit of the cutting head or casing.

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

F

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

FAST RESET: A hydraulic circuit which uses higher flow and lower pressure to reposition the thrust cylinders.

FAST WORK: A hydraulic circuit that redirects flow to the thrust cylinders to increase the speed of extension.

FEMALE HEX CONNECTOR: A hexagonal shaped socket.

FINAL DRIVE: The final rotary speed reduction unit.

FLIGHT: The spiral plates surrounding the tube of an auger.

FLOW CONTROL: A hydraulic valve that regulates oil flow to the cylinders to change the speed of advance.

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

FREE BORING: The extremely dangerous practice of boring without casing.

FRONT DRIVE: See DRIVE CHUCK.

G

GEAR BOX: Planetary speed reduction. See FINAL DRIVE.

GEAR SHIFT: A lever for selecting transmission range.

GRADE: The specified rise or fall of the proposed bore from a horizontal plane. Calculated as rise ÷ run x 100%.

GROUND PLANE: The surface upon which the machine is placed.

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

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

H

HELICOID: A section of auger flight.

HEX DRIVE: See DRIVE CHUCK.

HOLD DOWN: A hinged or removable assembly that secures the boring machine to the track.

I

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

INVERT: The elevation at the bottom of the casing.

K

KEEPERS: See HOLD DOWN.

L

LINE: The specified direction of the proposed bore in a horizontal plane.

M

MACHINE ROLLER: See CAM FOLLOWER.

MALE HEX CONNECTOR: See SHANK.

MASTER CASING PUSHER: See CASING PUSHER.

MASTER TRACK: The rear most track section.

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

O

Appendix G: Boring Machine Glossary of Terms

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.

P

PIERCING TOOL: An impact type of compacting device for boring with drill pipe.

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

PINS: see SHANK.

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

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

PUSH BAR: See THRUST BLOCK.

PUSH BLOCK: See THRUST BLOCK.

PUSH PACKAGE: See THRUST PACKAGE.

Q

QUICK CONNECT FITTING: A type of fitting that allows making a hydraulic connection without the use of wrenches.

QUIK TRAN: A rack-and-pinion drive system for moving the boring machine up and down the track quickly.

R

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.

S

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

SADDLE ADAPTER: An attachment which fits on the saddle to support smaller casing.

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.

SCAB: A piece of metal attached temporarily to aid with alignment.

SHANK: A hardened male hex bar containing of track used in front of the master track one or more transverse holes to couple and hold in a female hex connector.

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.

SPEED REDUCER: See FINAL DRIVE.

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

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

SPOIL CHAMBER: See CASING PUSHER.

SPOIL EJECTOR: A set of paddles rotating in close proximity to the inside of the casing pusher.

SPOIL EJECTOR DOOR: A safety guard that partially or completely covers the spoil opening in the casing pusher.

STEERING HEAD: A movable section of the lead casing that can be adjusted to steer the bore.

SUMP: A depression in the pit to allow the installation of a pump for water removal.

Appendix G: Boring Machine Glossary of Terms

T

TEETH: See BITS.

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

THRUST: The force which causes the boring machine to advance.

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

THRUST BLOCK: A manual or remote operated locking mechanism that engages stations in the track to provide a thrusting base for the machine advance and retraction.

THRUST BLOCK PIN: See DOGS.

THRUST PACKAGE: The bottom section of a split boring machine containing the cylinders and thrust block.

THRUST PRESSURE GAUGE: The guage that displays the amount of hydraulic pressure used to thrust the boring machine forward.

TORQUE: The measure of the rotary force available at the drive chuck.

TORQUE PLATE: Steel plates welded to casing and bolted to casing adapter to prevent the casing from spinning.

TORQUE WINDUP: The energy stored when metal parts are held in a twisted condition. Release of this energy can cause unexpected rotation of the auger.

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. See also FLOW CONTROL.

U

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.

W

WALE, WALER: Heavy planks used as a brace.

WASTE EJECTOR: See SPOIL EJECTOR.

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.

WIND UP: See TORQUE WINDUP.

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

Notes

NOTES:

Limited Warranty

Limited Warranty

This warranty is extended by American Augers, Incorporated in respect of equipment & products sold. American Augers warrants to the initial purchaser that this Equipment will be free of defects in material and/or workmanship for a period of 365 days after the factory shipment date to the initial purchaser, or 1000 hours of operation, whichever occurs first. Once the equipment is placed into service as a retail sale, rental or lease, a properly completed Warranty Registration Certificate must be submitted to American Augers to start and validate warranty coverage.

- The Limited Warranty does not include (1) batteries, lamp bulbs, fuses, various types of gaskets, and packing, filter elements, oil lubricants, fluids, track chain, track drive sprockets, Drill Pipe, Auger sections, die holders, wrench wear parts, guide bushings, shaft seals, mud swivel assemblies, valves, piston liners, centrifugal pumps, shaker screens, and other normal wearing or aging parts, (2) engines, and (3) transmissions not manufactured by American Augers, (4) down hole tools & accessories. American Augers extends to the initial purchaser the benefits of any warranty (if any) of the manufacturers or suppliers of any of the excluded items.

- Claims for defects in material and workmanship shall be made in writing by the initial purchaser to American Augers within ten days of defect discovery. American Augers reserves the right to send a service representative, contract an authorized representative, or request that the equipment is returned to the factory for product inspections. Failure on the behalf of the purchaser to permit such above action can cause a voiding of warranty coverage.

- Within the warranty period, American Augers will repair or replace, at its option, free of charge any portion of parts of the new Equipment, which are found by American Augers to be defective in material or workmanship. Replacement or repaired parts provided under the terms hereof are guaranteed in like fashion for the remainder of the warranty period. Any parts replaced under the terms of this warranty become the property of American Augers and upon written request, must be returned, transportation prepaid, to American Augers.

- In no event shall American Auger's liability exceed the purchase price of the Equipment. American Augers reserves the right to fully satisfy its warranty obligation by refunding to the Buyer the full purchase price of the Equipment upon the return of the Equipment by the Buyer, transportation prepaid, to American Augers.

- This warranty applies only if the alleged defective Equipment has been properly maintained and operated as specified by American Augers. This warranty will not apply if the alleged defect is attributable to an unauthorized modification or service repair made, a component part installed, improper equipment storage, neglect or abuse of the equipment on the behalf of the purchaser or their representatives, improper product operation or use of the product exceeding the design limitations, or an attachment supplied, by a party other than American Augers or its subsidiaries, or the authorized representative of any of the forgoing.

- If any tests are conducted to ascertain or demonstrate defects in material or workmanship, such test shall be conducted after reasonable notice to American Augers and upon conditions mutually agreed upon in advance of the test, and American Augers may be represented at any test that shall be made. American Augers, at its option may charge the Customer for any tests performed by American Augers at the request of the Customer in respect to the merchandise sold hereunder.

- The remedies in this warranty shall be exclusive and sole remedies of the Buyer. There are no other Warranties, expressed or implied, of any kind, including but without limitation, any warranty that the Equipment is of merchantable quality or that the Equipment is fit for any particular purpose. American Augers will have no monetary liability whatsoever for any damage, loss costs, or expense (whether general, special, incidental, or consequential) suffered by the Buyer as a result of or connection with the Equipment. In no event shall American Augers be liable for incidental or consequential damages including, but not limited to, freight charges, transportation charges, downtime, or other parts incidental to the removal and replacement of parts repaired or replaced under this warranty.

- American Augers reserves the right to modify, alter, and improve any product or pats without incurring any obligation to replace any product or parts previously sold with such modified, altered or improved product or parts.

- No person is authorized to alter or extend this warranty unless made in writing and signed by an officer of American Augers.

- Used products and equipment delivered by American Augers or picked up by American Augers are sold without conditions or warranties, express or implied, "as is, where is", unless there is a clear agreement with the Customer in writing to the contrary. The Customer agrees to inspect and all such equipment before purchase is completed and to accept same with out any warranty of merchantability or fitness for a particular purpose.

By acceptance hereof, the Customer covenants and agrees that in the event any products purchased hereunder are resold either in their original form or as a component of another system, the LIMITED WARRANTIES provision set forth above will be included in all sales documents by which the Customer resells any such products. In all such cases, the sales documents by which a purchaser from the Customer purchases and accepts delivery of the products sold here under will include from such LIMITED WARRANTIES and prior to any such sale or delivery and authorized representative of the subsequent purchaser will be made aware of the limitations on the warranty of American Augers or other manufacturer of the products and that the disclaimers of American Augers apply to the resale of such products. The Customer agrees to indemnify and hold harmless American Augers from any such loss, claim or damage. Including attorney's fees and expenses resulting from a breach of the foregoing covenant.

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Always include machine serial number when order parts
Due to our continuing product improvement, machine specifications are subject to change without notice.

Manual Part Number BMNG10000
Released July 2009 Revision 06