

OPERATION AND SAFETY MANUAL

Models -

McL-20B, McL-24B,
McL-30/36B, McL-36/42C,
McL-36/42HD, McL-54/60



Toll Free 1-800-435-9340

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**54/60 SPECIFICATIONS ARE
ON THE LAST PAGE OF THE
MANUAL**

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TEAR ALONG DOTTED LINE

McLAUGHLIN WARRANTY VALIDATION

TEAR ALONG DOTTED LINE

Please provide the information requested on this Warranty Validation card and drop it in the mail within 30 days of the date you purchased your new McLaughlin Boring System. It is imperative that we have this information in order to expedite warranty service should it be required, and to properly identify orders for repair or replacement parts.

Upon return of this Warranty Validation card, you will be added to our mailing list to receive all future updates on the use and maintenance of your McLaughlin Boring System. In addition, you will receive a FREE McLaughlin coffee mug.

Name of Purchaser _____
 Company _____
 City _____ State _____ Zip _____
 Telephone No. _____
 Model No. _____ Ser. No. _____
 Purchased From _____
 Date of Purchase _____

What is your primary source(s) of business?

- Municipalities Water & Sewer Telephone/Fiber Optic
 Gas Distribution Cable TV General Utilities

How did you learn about this equipment?

- Dealer Advertising News Release Another User

What most influenced your decision to buy?

- Design Features Price HD Construction
 Dealer Salesperson McLaughlin Reputation for Quality

How frequently do you anticipate using equipment?

- Daily Weekly Monthly Other: _____

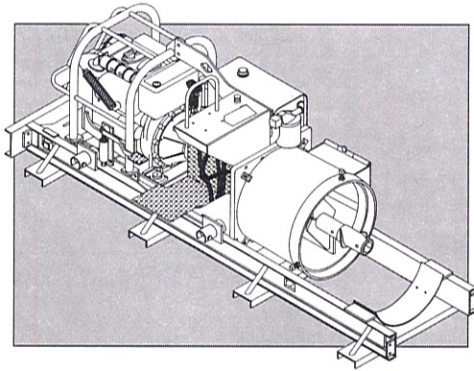
Do you presently own other underground equipment?

- Yes No If "Yes," what makes and models: _____

Do you anticipate purchasing additional horizontal boring equipment in the near future?

- Yes No If "Yes," when: _____

What type: _____



**Models -
McL-20B, McL-24B,
McL-30/36B,
McL-36/42B**

FOREWORD

McLaughlin has long been recognized as a leading manufacturer of functionally designed, highly serviceable horizontal boring equipment...A line of equipment that is as consistently dependable as the Company that stands behind it.

Over the decades, since its founding in 1921 as a manufacturer of augers and drilling tools, McLaughlin has developed a line of horizontal earth, shale, and rock boring machines that is unparalleled in the industry. And, every machine is complemented by a full range of compatibly designed augers, heads, bits, tools, and accessory items. These boring systems have performance capabilities which are superior to other equipment in their class and size range when used in accordance with recommended operational procedures.

Today, McLaughlin produces the most extensive line of horizontal boring systems available from a single manufacturer...Auger boring machines, ranging from 3" to 42" capacity, are furnished in diesel, gasoline, and hydraulic models; McLaughlin's Mighty Mole Boring System bores and reams holes from 1-1/4" to 4-1/2" using a unique moleing action. The Push N Mole will produce a 2" hole and expand the hole up to 6-5/8" during retraction, using a remote power source. McLaughlin's Hole Hammer's use pneumatic power to produce 2", 2-1/2", or 3-1/8" holes in compactable soils. We also serve the line location contractors with our SpotDtek Pipe & Cable Locators.

Your McLaughlin horizontal boring machine incorporates the finest in workmanship and materials. It has been field tested and job-proven by hundreds of utility companies and underground utility contractors, and will provide you with dependable service when it is operated and properly maintained according to the instructions contained in this manual.

Whatever your horizontal boring equipment needs, McLaughlin makes the system that will do the job quickly, accurately, and with total dependability. For additional information on any of the equipment described in this manual, see you local Authorized McLaughlin Dealer, or call us toll-free at (800) 435-9340.



ACCIDENT PREVENTION

Safety practices are VITALLY IMPORTANT in the use of auger boring machines. Careless or improper use can result in SERIOUS BODILY INJURY or DEATH.

McLaughlin Auger Boring Systems are engineered and constructed to provide safe, dependable performance when operated, serviced and maintained in accordance with the Operation and Safety Manual furnished with all new machines, and available FREE-OF-CHARGE to owners of used machines by calling 1-800-435-9340 toll free (call 803-277-5870 outside Continental U.S.).

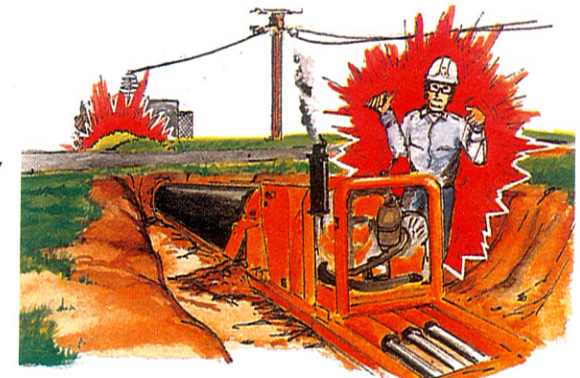
Every possible consideration has been given to operational safety, but the use of horizontal boring equipment is subject to hazards that cannot be protected against by mechanical means. Exercising intelligence, care and common sense is as fundamental to the prevention of accidents as the quality of design and workmanship used in producing McLaughlin Auger Boring Systems.

There is no substitute for having a thorough knowledge of the equipment and its potential hazards, then taking every possible safety precaution accordingly.



ALWAYS CONTACT UTILITY COMPANIES BEFORE BEGINNING THE JOB.

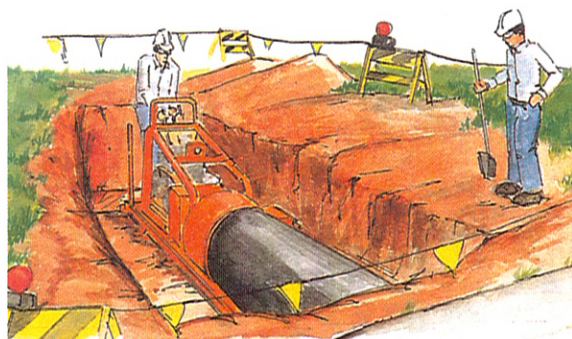
The exact location of underground services **must be** determined prior to excavating or boring. Inadvertent severing of telephone, fiber optic, or CATV transmission or damage to sewer pipe is costly; **RUPTURING OF GAS OR WATER LINES CAN RESULT IN SERIOUS BODILY INJURY OR DEATH. COMING IN CONTACT WITH BURIED POWER TRANSMISSION LINES CAN RESULT IN SERIOUS BODILY INJURY, SEVERE BURNS OR ELECTROCUTION.**





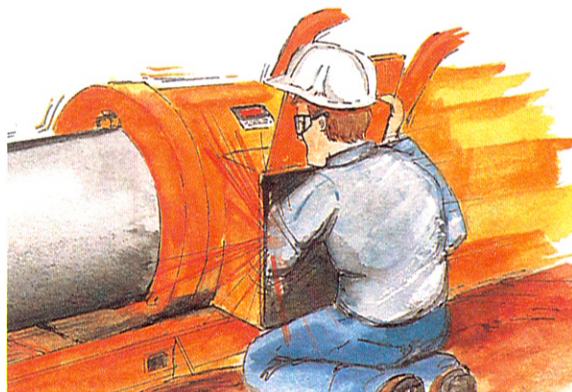
ALWAYS USE A MINIMUM OF 2 PERSONS TO OPERATE THE MACHINE

The machine operator **must** be at his station at all times during the bore, prepared to stop the engine in the event of an emergency; All McLaughlin gasoline or diesel-powered Auger Boring Systems are equipped with an Emergency Shut-off Control which will automatically stop the engine and auger rotation when depressed. Hydraulic Power Unit models McL-1000 and McL-2000, used to power hydraulic auger boring machines, are equipped with a remote operated Emergency Shut-Off Control which, when depressed, will automatically stop the Power Unit, hydraulic motor, and auger rotation. **The remote Emergency Shut-Off Control must be properly secured adjacent to the control console on the hydraulic Auger Boring System before starting the Power Unit or operating the boring machine.** Servicing the machine, auger, and removal of spoil (after stopping the engine) must be performed by a second person. **ATTEMPTING TO COMPLETE THE BORE WITHOUT ASSISTANCE CAN RESULT IN SERIOUS BODILY INJURY.**



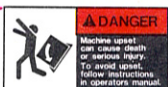
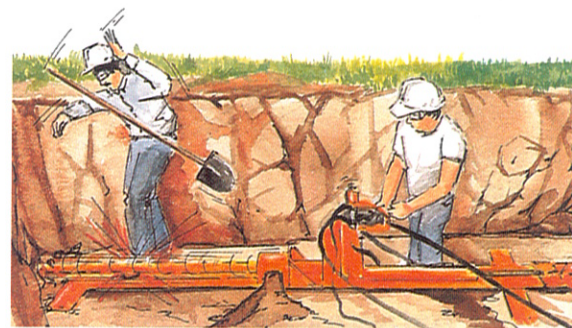
NEVER REACH INTO THE SPOIL CHAMBER WHEN THE ENGINE IS RUNNING.

Most Auger boring machines with casing pushers are equipped with gravity-closing spoil ejector doors to shield hands and feet from the extremely hazardous rotating paddles. **Never attempt to open the chute door, and never place hands, feet, or tools into the spoil chamber until the engine is shut-down and the paddles have ceased moving. ATTEMPTING TO SERVICE THE MACHINE OR REMOVE SPOIL BY REACHING INTO THE SPOIL CHAMBER WHEN THE ENGINE IS RUNNING CAN RESULT IN SERIOUS BODILY INJURY, DISMEMBERMENT OR DEATH.**



KEEP AWAY FROM EXPOSED AUGER AND THE TERMINAL SUMP DURING THE BORE

It is essential that all personnel keep clear of exposed auger in the entrance and exit pit. At no time shall personnel, including those associated with the bore, be in the entrance trench ahead of the machine, or in the terminal sump, unless the engine is stopped. In the event the auger drive is accidentally engaged with the engine running, physical contact can drag feet, legs or arms under or around the exposed rotating auger. **DO NOT WEAR LOOSE CLOTHING. BECOMING ENTANGLED IN EXPOSED AUGER WHEN THE ENGINE IS RUNNING CAN RESULT IN SERIOUS BODILY INJURY, DISMEMBERMENT OR DEATH.**



OBSTRUCTIONS ENCOUNTERED BY THE HEAD CAN CAUSE THE MACHINE TO UPSET.

Under normal use the machine is stable, but if the boring head or auger catches on an obstruction in the ground, rotation of the auger string can stop suddenly and upset the machine. It is essential that the operator be aware of the warning signals associated with torquing as described in the Operation & Safety Manual, and that all other personnel be kept away from the sides of the machine when the engine is running. **STANDING ON THE SIDE OPPOSITE THE OPERATOR STATION DURING THE BORING OPERATION CAN RESULT IN SERIOUS BODILY INJURY.**





USE OF THE OPERATOR PLATFORM IS ESSENTIAL DURING THE BORE

Movement of the carriage and dog-plate (or thrust-block) on the track presents a hazardous crushing or shearing force between the moving parts and stationary cross-members, auger and casing. It is essential that the machine operator be standing on the platform provided or in the designated operator area as the carriage or dog plate is moved laterally on the track, and that all other personnel be clear of the machine. **OPERATION OF THE MACHINE WHILE STANDING ON, OR BETWEEN THE TRACK MAY RESULT IN SERIOUS BODILY INJURY.**



THE BORING PIT MUST BE PROPERLY SIZED AND SHORED

It is essential that the excavation be prepared, sized, and shored in accordance with OSHA regulations. Consult your local OSHA office for current regulations. Sufficient clearance must be provided on both sides of the machine and extension tracks for the operator and attendant, and for proper spoil ejection. **The sidewalls must be adequately shored, regardless of the soil firmness, to prevent the possibility of cave-in. IMPROPER PIT PREPARATION CAN RESULT IN SERIOUS BODILY INJURY OR DEATH.**



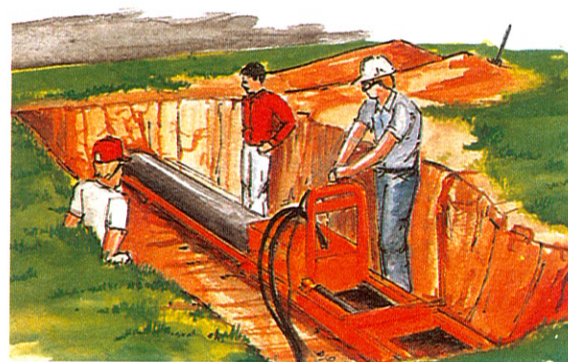
DO NOT FUEL MACHINE WITH THE ENGINE RUNNING.

Extreme care and common sense must be used when fueling gasoline or diesel engines. Always use an approved fuel container to fill the tank, and take every precaution to avoid spilling fuel on a heated engine. **Never attempt to fuel an engine that is running, as a spark from the ignition can cause the fuel to ignite or explode. FUELING AN ENGINE THAT IS RUNNING, OR SPILLING FUEL ON A HOT ENGINE CAN RESULT IN SEVERE BURNS OR DEATH.**



KEEP UNAUTHORIZED PERSONNEL AWAY FROM THE WORK AREA.

The work area must be secured, posted and guarded to restrict all personnel from the area who are not directly associated with the bore. At no time shall personnel, including those associated with the bore, be in the entrance trench ahead of the machine, or in the exit trench, when the boring machine is running or the auger string rotating. **UNAUTHORIZED PERSONNEL MAY BECOME ENTANGLED IN ROTATING PARTS IN THE ENTRANCE TRENCH OR EXIT TRENCH WHEN THE MACHINE IS RUNNING WHICH CAN RESULT IN SERIOUS BODILY INJURY, DISMEMBERMENT OR DEATH.**





ADDITIONAL HAZARDS THAT MUST BE AVOIDED

Although the rotating auger string is considered by many boring machine operators to pose the greatest potential threat to serious bodily injury, dismemberment or death, there are numerous other hazards characteristic to boring machines that must not be overlooked. Laterally moving machine parts have the strength to sever a hand, foot or leg that is in a danger zone. Improper pit preparation can result in a crushing force capable of killing the unsuspecting operator or attendant. An instantaneous fire from the careless handling of fuel can cause severe burns or death. Improper handling of high-pressure lines on hydraulic boring systems can result in bodily injury. These potential hazards, and others, can be avoided, and the auger boring machine operated safely by adhering to the safety precautions provided in the Operation & Safety Manual furnished with each machine, and available FREE-OF-CHARGE to owners and/or operators of machines presently in use.

McLaughlin Auger Boring Systems are manufactured with consistently high quality materials and workmanship to insure safe, dependable performance, but the use of horizontal boring equipment that requires a rotating auger string and powerful thrust demands that every possible safety precaution be followed.

Hazards that must be avoided, in addition to those described herein, include: **DO NOT STAND UNDER OR NEAR THE BORING MACHINE, TRACK, AUGER OR CASING AS THEY ARE BEING HOISTED IN OR OUT OF THE BORING PIT. AVOID PLACING TOOLS OR OTHER OBJECTS WHERE THEY CAN FALL IN THE BORING PIT. NEVER REMOVE GUARDS FROM THE BORING MACHINE, AS THEY ARE DESIGNED TO PROTECT THE OPERATOR FROM MOVING OR POTENTIALLY HAZARDOUS PARTS. ALWAYS WEAR A HARD HAT, SAFETY GLASSES AND SAFETY SHOES ON THE JOB SITE. BE SURE THAT THE EQUIPMENT HAS BEEN SERVICED IN ACCORDANCE WITH THE MAINTENANCE INSTRUCTIONS IN YOUR OPERATION AND SAFETY MANUAL BEFORE STARTING THE MACHINE. USE ONLY REPLACEMENT AND REPAIR PARTS MANUFACTURED OR FURNISHED BY McLAUGHLIN. FAILURE TO COMPLY WITH THESE WARNINGS CAN RESULT IN SERIOUS BODILY INJURY, DISMEMBERMENT OR DEATH.**

McLaughlin Boring Systems Call Toll Free 800/435-9340

(Outside the Continental U.S. call 803/277-5870)

FAX: 803/235-9661

SPECIFIC HAZARD ALERTS

The Hazard Alert Signs use these words: **DANGER, WARNING, and CAUTION.**

DANGER means this kind of accident probably would kill you or leave you crippled for life.

WARNING means this kind of accident might kill you, but it probably would leave you crippled. You might be crippled for life.

CAUTION means this kind of accident probably would hurt you less, but sometimes you might be crippled.

There are specific hazards that are unique to the operation of earth boring machines, the shear point inside the casing pusher, exposure to pinch and snag points on the drill string, and the ability of some boring machines to upset under excessive load or to advance suddenly while free boring.



Most McLaughlin Earth Boring Machines for cased bores have a casing pusher at the front, enclosing two rotating paddles that push the spoil out of the spoil chamber. The McL-12H machine is equipped with a gravity spoil ejection system. **NEVER INSERT TOOLS OR ANY PART OF YOUR BODY INTO THE SPOIL CHAMBER WHILE THE AUGERS ARE ROTATING.**

The use of a Boring machine requires cutting heads, augers and hex drive chuck which rotate while the machine is operating. **STAY AWAY** from rotating parts. **ENTANGLEMENT WITH AUGERS, CUTTING HEADS OR OTHER ROTATING PARTS CAN CAUSE DEATH OR SERIOUS INJURY. DO NOT WEAR LOOSE CLOTHING.**

The power source engine **MUST BE SHUT DOWN** while auger sections are being pinned or unpinned, or workmen are in the exit pit removing the cutting head.



All earth boring machines "torque" when the machine is operating. The torque is the normal reaction of the machine to the rotating resistance of the drill string.

When the machine is being used in "tough" conditions, the reaction torque at the machine is more severe. If the drill string encounters an obstruction and stops suddenly, the reaction torque will try to upset the machine to the left. If the machine is being operated in reverse, the reaction torque will try to upset the machine to the right.

The following conditions increase the possibility of an upset.

1. Operating at full power.
2. Advancing rapidly or erratically.
3. Rotating a cutting head equipped with wing cutters in the FORWARD direction while it is inside the casing.
4. Free Boring
5. Turning the auger during removal.

There are advance warning signs that the operator must be aware of when using any boring machine. Engine lugging and slight lifting of the track, both indicate that the torque applied to the drill string has become excessive. At this point, the operator should stop advancing and wait for the auger to clean the casing, which reduces the torque required. It may be advisable to introduce water through the top of the casing directly behind the head to improve spoil removal and reduce auger friction. Re-entry into the face should always be done with caution.

INSTRUCTIONS

- 1) To rotate auger.
- 2) Unlock side switch by moving down.
- 3) Simultaneously depress palm switch and trigger.
- 4) When advancing and retracting machine without rotation, lock out rotation with side switch up.

Normal operation of the machine requires that the dog plate be moved frequently during the installation of casing and during the insertion and removal of auger sections.

When using rear operated machines, the operator must be aware of the slowly moving dog plate, and when using side operated machines, the operator must keep all personnel away from the dog plate area when the machine is operating.

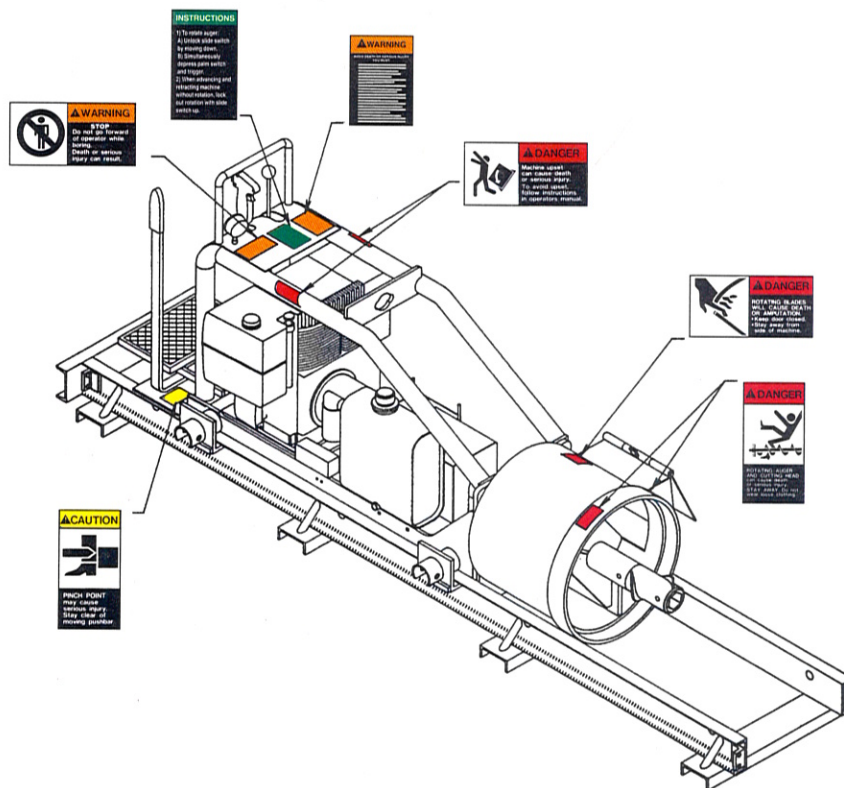
WARNING

READ OPERATOR MANUAL CAREFULLY FOR THIS MACHINE.

This hazard alert decal contains important safety warnings that must be followed in safe boring operations. Make sure the entire boring crew reads and understands the hazards associated with using this piece of equipment. All crew personnel should have experience working with this type of equipment and know the proper safety precautions necessary to avoid injury.

HAZARD ALERT DECAL POSITIONS

McL-20B

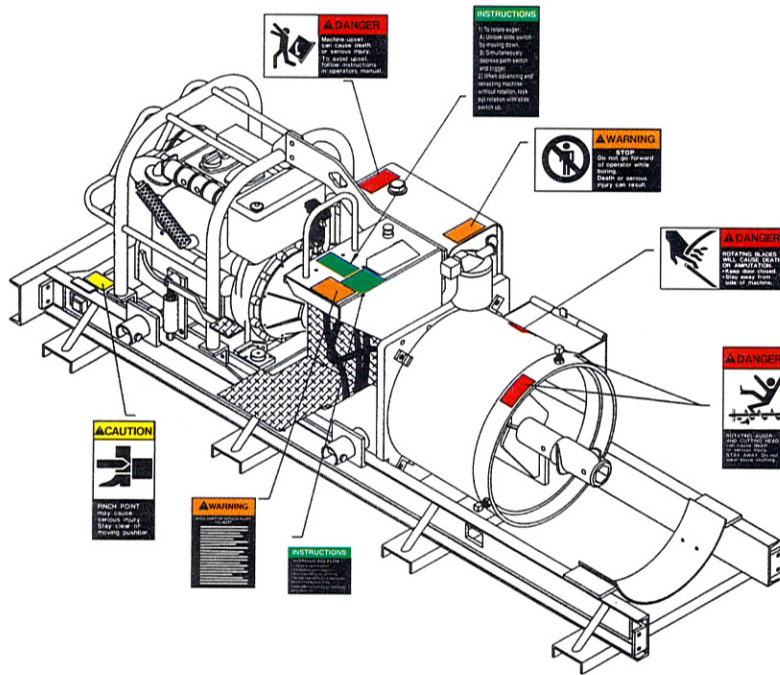


HAZARD ALERT DECALS ARE FOR YOUR SAFETY

Read, understand and follow all hazard alert decals. Your McLaughlin Boring Machine is equipped with the decals listed above. If your machine is missing decals or the decals have become illegible, call your nearest authorized McLaughlin dealer or McLaughlin Mfg. Company at 800/435-9340 to order replacements.

HAZARD ALERT DECAL POSITIONS

McL-24B, McL-30/36B, McL-36/42B

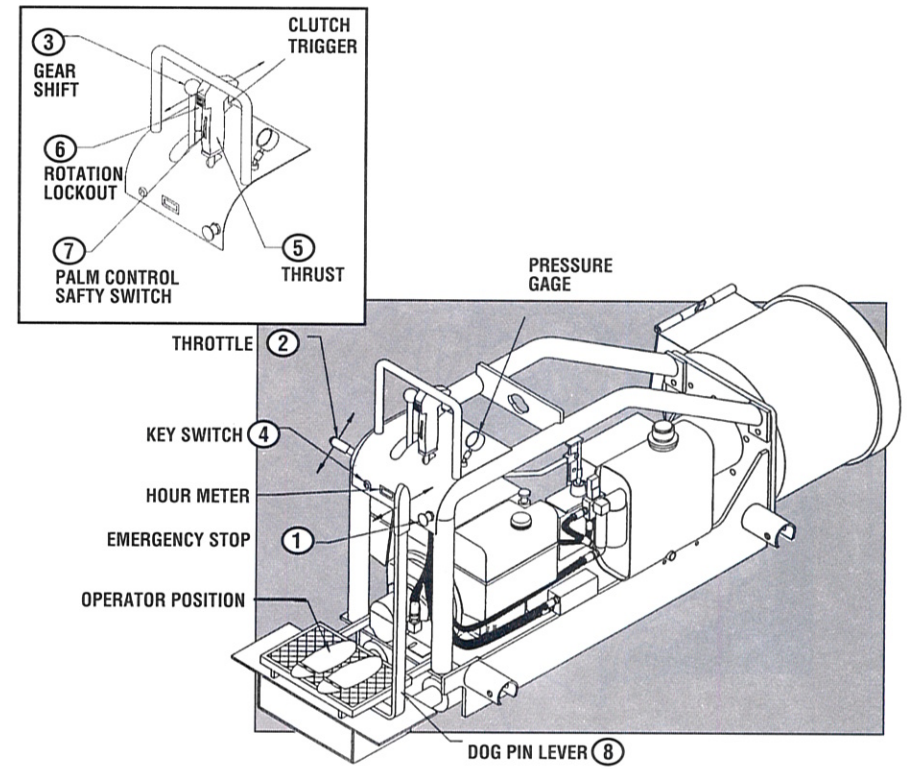


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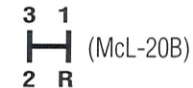
OPERATOR AND CONTROLS POSITION

McL-20B



1. EMERGENCY STOP (PUSH TO STOP, PULL TO RUN)
2. THROTTLE (FAST SLOW)

3. GEAR SHIFT



4. KEY SWITCH (OFF, RUN, START)

5. THRUST (ADVANCE, STOP, RETRACT)

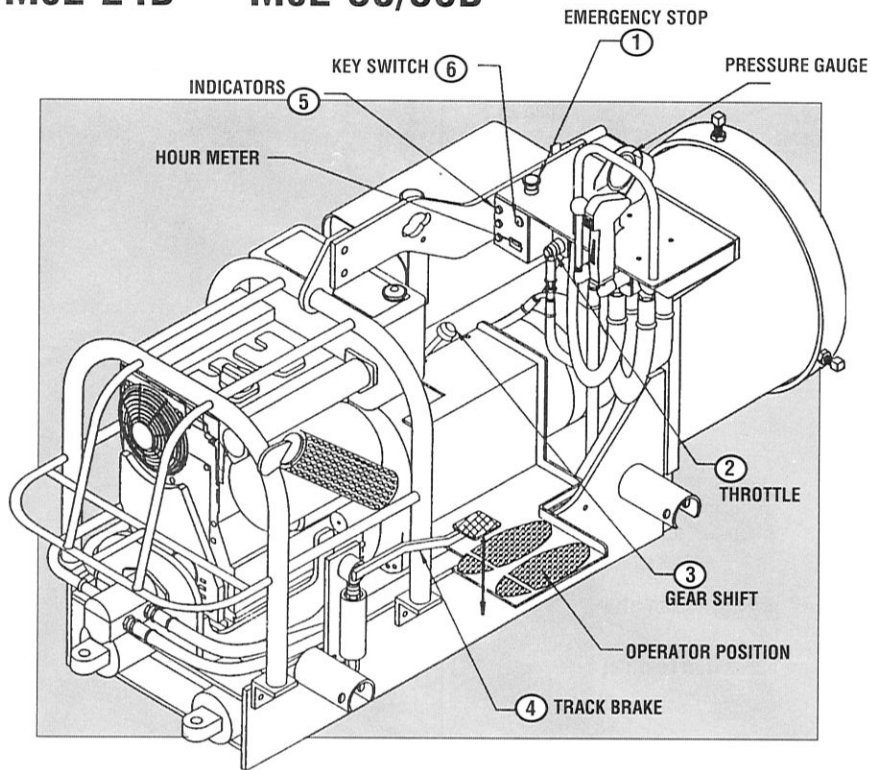
6. ROTATION LOCKOUT (UP: UNLOCK, DOWN: LOCK)

7. PALM CONTROL SAFETY SWITCH / CLUTCH TRIGGER (IN: ENGAGED, OUT: DISENGAGED)

8. DOG PIN LEVER (PUSH BACK TO LOCK, PULL FORWARD TO UNLOCK)

OPERATOR AND CONTROLS POSITION

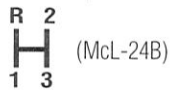
McL-24B — McL-30/36B



OPERATOR AND CONTROLS POSITION

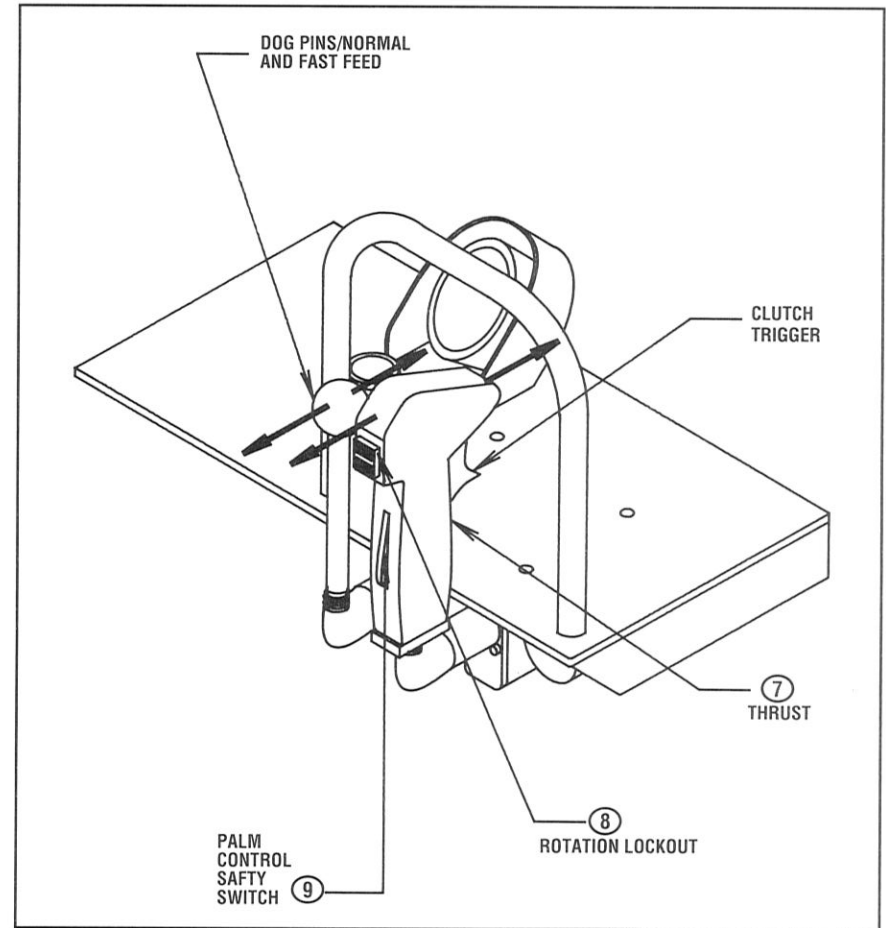
McL-24B — McL-30/36B

1. EMERGENCY STOP (PUSH TO STOP, PULL TO RUN)
2. THROTTLE (IDLE, RUN, MAX)
3. GEAR SHIFT
4. TRACK BRAKE (DOWN: ENGAGED)
5. INDICATORS (ENGINE OIL PRESS., ENGINE OIL TEMP., ALTERNATOR)
6. KEY SWITCH (OFF, RUN, START)
7. THRUST (ADVANCE, STOP, RETRACT)
8. ROTATION LOCKOUT (UP: UNLOCK DOWN: LOCK)
9. PALM CONTROL SAFETY SWITCH / CLUTCH TRIGGER (IN: ENGAGED, OUT: DISENGAGED)



OPERATOR AND CONTROLS POSITION

McL-24B — McL-30/36B

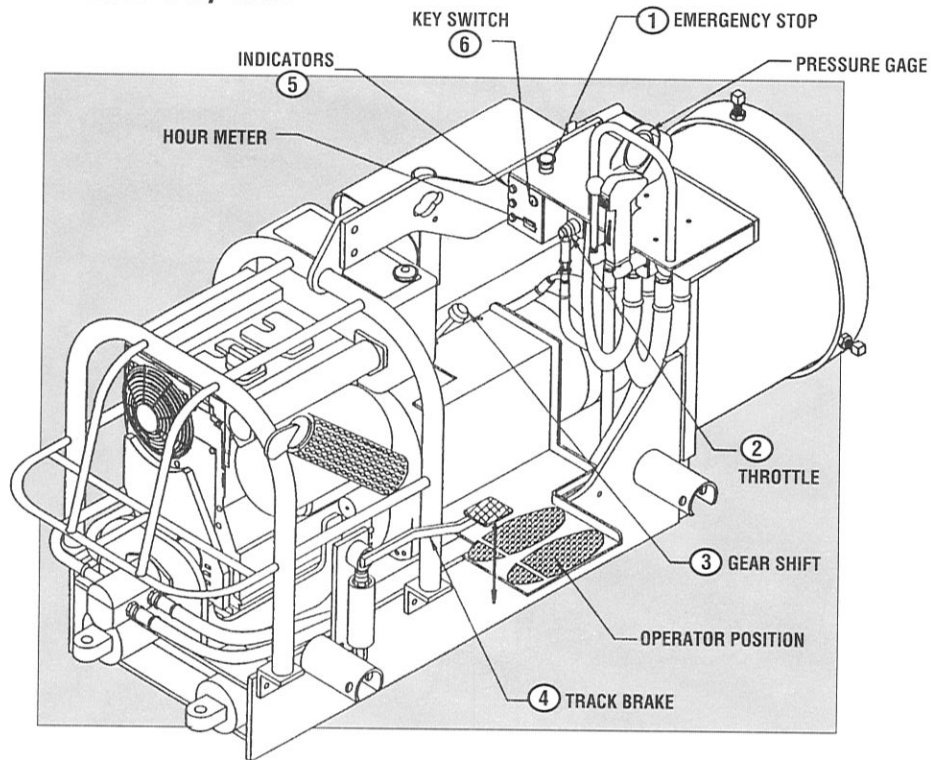


HYDRAULIC DOG PLATE Directions for use:

1. To disengage pins pull handle backward.
2. Check dog pins for complete disengagement.
3. Move dog plate until track pins are past track holes.
4. Move handle forward and hold until pins engage next set of track holes. This will also activate fast feed.
5. Release handle to neutral. Both track pins must be engaged before proceeding to bore.


OPERATOR AND CONTROLS POSITION

McL-36/42B



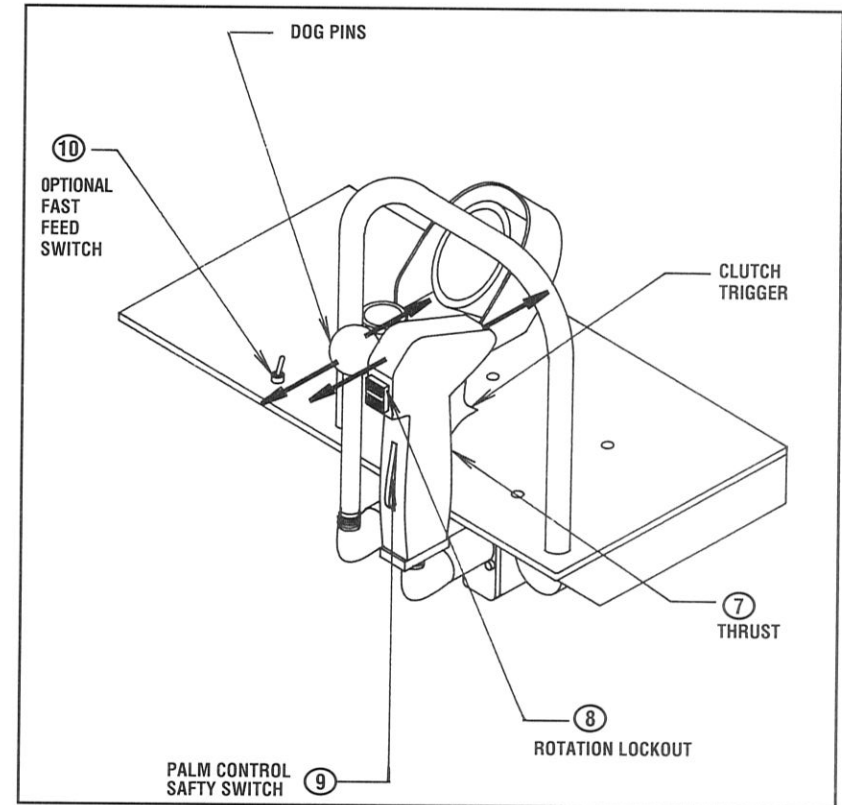
OPERATOR AND CONTROLS POSITION

McL-36/42B

1. EMERGENCY STOP (PUSH TO STOP, PULL TO RUN)
2. THROTTLE (IDLE, RUN, MAX)
3. GEAR SHIFT.....  (McL- 36/42B)
4. TRACK BRAKE (DOWN: ENGAGED)
5. INDICATORS (ENGINE OIL PRESS., ENGINE OIL TEMP., ALTERNATOR)
6. KEY SWITCH (OFF, RUN, START)
7. THRUST (ADVANCE, STOP, RETRACT)
8. ROTATION LOCKOUT (UP: UNLOCK, DOWN: LOCK)
9. PALM CONTROL SAFETY SWITCH / CLUTCH TRIGGER (IN: ENGAGED, OUT: DISENGAGED)
10. FAST FEED SWITCH (MOVE FORWARD TO ENGAGE FAST FEED - MOVE BACKWARD TO RETURN TO NORMAL DRILLING SPEED).

OPERATOR AND CONTROLS POSITION

McL-36/42B



HYDRAULIC DOG PLATE

Directions for use:

1. To disengage pins pull handle backward.
2. Check dog pins for complete disengagement.
3. Move dog plate until track pins are past track holes.
4. Move handle forward and hold until pins engage next set of track holes.
5. Release handle to neutral. Both track pins must be engaged before proceeding to bore.

A

- ADVANCE:** The motion of the machine toward the face wall of the entrance pit.
- AUGER:** A flighted drive tube, having hex couplings at each end, to transmit the torque of the cutting head and to transfer spoil back to the machine.
- AUGER DRIVE:** See Drive Chuck

B

- BACK STOP:** The 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.
- BORING:** An action of an earth boring machine that occurs when the auger is rotating clockwise as viewed from the machine end and the machine is advancing in a forward direction.
- BORING MACHINE:** A mechanism to simultaneously drill soil and push casing.
- BORING PIT:** See Entrance Pit.
- BOULDER:** A large, round rock.
- BUSHING:** See Hex Coupling.
- BY-PASS VALVE:** A manually operated hydraulic valve that will allow the flow of hydraulic oil from a high pressure line to a return line.

C

- CAM FOLLOWER:** See Track Roller.
- CARRIAGE:** The mechanical part of a boring machine that includes the engine or drive motor, the drive train, dog plate, and hydraulic cylinders, when referring to non-split boring machines.
- CASED BORING MACHINE:** A mechanical device, comprised of a local or remote power source, and having an integral thrusting mechanism, that moves along a track means, that will simultaneously dislodge and remove spoil while advancing a protective casing into the soil.

- CASING:** The pipe that encompasses the auger string and is to be, or is being, thrust into the soil by the earth boring machine.
- CASING ADAPTER:** See Casing Attachment.
- CASING ATTACHMENT:** A circular mechanism to provide axial and lateral support of a smaller casing than the Casing Pusher.
- CASING PUSHER:** The hydraulic cylinders to the casing, and forms the outside of the spoil ejection system.
- CENTERLINE:** The vertical distance between the center of the drive chuck and the horizontal ground plane.
- CHOKE:** The fuel enrichment device on a gasoline engine.
- CLEANING:** An action of an earth boring machine that occurs when the auger is rotating in a clockwise direction as viewed from the machine end, and the auger is axially stationary.
- CLUTCH:** A device that, when activated, will engage rotary torque from a power unit and drive coupling.
- COBBLES:** Small round rocks.
- COLLARING:** The initial entry of casing or a cutting head into the soil.
- CONTROL LEVER:** A handle that activates some function of the machine.
- CRADLE MACHINE:** See Saddle Machine.
- CROSS MEMBERS:** The lateral supports under the machine track.
- CUTTING HEAD:** An extension of the augers containing one or more bits to dislodge the soil.

D

- DEAD MAN:** A fixed anchor point used to advance a saddle or cradle type boring machine.
- DECK ASSEMBLY:** The drive train assembly for a split type boring machine.
- DEWATER:** A system of pumps and a ring of driven well-points to lower the water table in the area of the entrance pit and bore.
- DOG PLATE:** See Thrust Block.
- DOGS:** The movable protrusions in the thrust block that engage holes or blocks in the machine track.
- DRILL STRING:** The system of components: rods, cutting or compaction bit that are attached to the drive chuck.
- DRIVE CHUCK:** The female hex coupling located within the casing pusher. Also called the Auger Drive, Hex Drive or Front Drive.

E

- EMERGENCY STOP:** A red palm-operated push button that, when activated, stops the engine.
- ENTRANCE PIT:** An opening in the ground of specified length and width at the base, to place the boring machine on line and grade.
- EXIT PIT:** An opening of unspecified dimensions located at the actual or expected exit of the cutting head or casing.
- EXTENSION TRACK:** An additional section of track used in front of the master track.

F

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

FEED CONTROL: An adjustable hydraulic flow control valve that sets the advance and retract rate of the thrust cylinders.

FEMALE HEX COUPLING OR CONNECTOR: A hexagonal shaped socket.

FINAL DRIVE: A gear or chain reduction unit located in the drive-line at the machine side of the casing pusher.

FINES: Small crushed rock and rock dust.

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

FORWARD: Clockwise rotation of the auger or drill as viewed from the machine end.

FREE BORE: Boring without casing.

FRONT DRIVE: See Drive Chuck.

G

GEAR SHIFT: The mechanism on a multiple gear transmission that is used to select the gear ratio desired.

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

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

GUARD: A mechanical device that encloses a hazard and is securely bolted or attached to the machine.

H

HELICOID: A section of auger flight.

HEX DRIVE: See Drive Chuck.

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

HOOK ROLLERS: See Hold Down.

I

INVERT: The elevation at the bottom of the casing.

K

KEEPERS: See Hold Down.

L

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

M

MACHINE ROLLER: See Cam Follower.

MALE HEX COUPLING OR CONNECTOR: See Shank.

MASTER CASING PUSHER: See Casing Pusher.

MASTER PUSH RING: See Casing Pusher.

MASTER TRACK: Rear most track section.

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

MOLE: A mechanical device that is used to create a bore by compaction.

O

OPEN CUT: The method of digging an open trench for the installation of a casing or carrier pipe.

OPERATOR PRESENCE CONTROL: A control or mechanism designed so that operator presence is necessary to operate a particular function.

P

PIERCING TOOL: A small diameter air driven impacting compaction tool for piloting and reaming holes.

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

PIPE PUSHER: A mechanical device, having a power source, a thrusting mechanism, and a track means, that will advance and retract sections of pipe or solid rod while supporting a compacting head without removing spoil to produce an unsupported hole.

POWER PACKAGE: The engine and drive section of a split boring machine.

PUSH PACKAGE: See Thrust Package.

PUSH BAR OR BLOCK: See Thrust Block.

R

RECEIVING PIT: See Exit Pit.

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

REVERSE: The counter-clockwise rotation of the auger or drill stem as viewed from the machine end.

ROD: Small diameter steel sections used with Moles and Pipe Pushers.

S

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

SADDLE BORING MACHINE: A boring machine that is carried by a bulldozer, and uses winches to advance the casing.

SAFETY SIGN: A visual communication device which warns against hazards which can cause accidental injury or death, property damage or loss, and which may provide safety instruction or directions, or both.

SHANK: A hardened hex male bar, containing one or more transverse holes, to couple and hold in a hex coupling.

SHEET PILING: See Piling.

SHORING: See Piling.

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

SOCKET: See Female Hex Coupling or Connector.

SPEED REDUCER: See Final Drive.

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

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

SPOIL EJECTOR: A set of paddles, rotating in close proximity to the inside of the casing pusher, usually bolted to the drive chuck.

SPOIL EJECTOR DOOR: A device, usually hinged at the top of the spoil opening in the casing pusher, that partially or completely closes the spoil opening when at rest.

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

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

T

TEST BORE: Probing by small auger or coring tool, usually vertically, at the site to determine soil conditions and rock elevation.

THRITTLE: The control that sets the operating RPM of the engine.

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

THRUST BLOCK: A manual or remote locking mechanism located at the rod ends of the thrust cylinders, that engage stations in the machine track to provide a thrusting base for the machine to advance and retract.

THRUST BLOCK PINS: See Dogs.

THRUST CONTROL: The hydraulic valve that controls the direction and speed of the thrust cylinders used to advance and retract the machine.

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

TORQUE: The measure (usually in lb/ft) of the rotary power available at the drive chuck.

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

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

TRACK PINS: A set of steel pins to be driven through holes in the track into the base of the entrance pit to provide additional lateral security.

TRACK ROLLER: A small diameter bearing wheel assembly used to support the machine on the track.

TRANSMISSION: A selectable gear reduction unit located between the motor drive and the final drive.

TRENCH-BOX: A preconstructed set of side plates and adjustable cross members to prevent the walls of the pits 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.

U

UPSET: The inadvertent action of an earth boring machine caused by excessive drive torque, that rotates the machine and track from their 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

WASTE EJECTOR: See Spoil Ejector

WATER TABLE: The elevation of ground water at the area of the bore.

WING CUTTERS: Small rotary appendages on cutting heads that will open to cut a larger diameter than the head when turned in a clockwise direction, and close when turned in a counter-clockwise direction. See Bits.

SPECS & MAINTENANCE

Specifications of McL-20B Earth Boring Machine

TUNNEL DIAMETER	ENGLISH	METRIC
Free or Cased Bore	3" - 20"	7.5cm - 51cm
OPERATOR'S STATION See page 11		
PLANETARY FINAL DRIVE Hex Size		
	2-1/4"	5.7cm
Dimensions		
CARRIAGE AND PUSHER		
Centerline Height	14-1/4"	36.2cm
Width	22"	56 cm
Height	36"	91cm
Weight	1285#	584kg
MASTER TRACK		
Length	120"	305 cm
Weight	300#	136 kg
EXTENSION TRACK		
Length	120"	305cm
Weight	300#	136kg
Performance		
Power Unit	16 HP	12kW
ADVANCE THRUST @ 3,000 PSI @ 207 BAR		
	42,000#	19,000kg
DRIVE CHUCK SPEED @ 3600 engine RPM		
3rd Gear	100RPM	100RPM
2nd Gear	58RPM	58RPM
1st Gear	30RPM	30RPM
Reverse	30RPM	30RPM
DRIVE CHUCK TORQUE @ 2600 engine RPM		
3rd Gear	1012 ft lbs.	1373 NM
2nd Gear	1740 ft lbs.	2361 NM
1st Gear	3328 ft lbs.	4516 NM
Reverse	3328 ft lbs.	4516 NM

SPECS & MAINTENANCE

Specifications of McL-24B Earth Boring Machine

TUNNEL DIAMETER	ENGLISH	METRIC
Cased Bore	4" - 24"	10cm - 61cm
OPERATOR'S STATION See page 13		
PLANETARY FINAL DRIVE Hex Size		
	2-1/4"	5.7cm
Dimensions		
CARRIAGE AND PUSHER		
Centerline Height	16-7/8"	43cm
Width	39"	99cm
Height	51-1/2"	131cm
Weight	2800#	1273kg
MASTER TRACK		
Length	120"	305cm
Weight	565#	257kg
EXTENSION TRACK		
Length	120"	305cm
Weight	565#	257kg
Performance		
Power Unit	30 HP S.A.E.	22 kW S.A.E.
ADVANCE THRUST @ 3,000 PSI @ 207 BAR		
	115,000#	52,273kg
DRIVE CHUCK SPEED @ 2800 engine RPM		
3rd Gear	64RPM	64RPM
2nd Gear	37RPM	37RPM
1st Gear	20RPM	20RPM
Reverse	20RPM	20RPM
DRIVE CHUCK TORQUE @ 1800 engine RPM		
3rd Gear	2470 ft lbs.	3351 NM
2nd Gear	4255 ft lbs.	5773 NM
1st Gear	8139 ft lbs.	11056 NM
Reverse	8139 ft lbs.	11056 NM

SPECS & MAINTENANCE

Specifications of McL-30/36B Earth Boring Machine

TUNNEL DIAMETER	ENGLISH	METRIC
Cased Bore	10" - 36"	25cm - 91cm

OPERATOR'S STATION
See page 13

PLANETARY FINAL DRIVE	ENGLISH	METRIC
Hex Size	3"	7.6cm

Dimensions

CARRIAGE AND PUSHER

Centerline Height	24-1/8"	61cm
Width	50"	127cm
Height	56"	142cm
Weight w/30" Pusher	5,670#	2,572 kg
Weight w/36" Pusher	5,960#	2,704 kg

MASTER TRACK

Length	120"	305 cm
Weight	1,072#	487 kg

EXTENSION TRACK

Length	120"	305cm
Weight	965#	439kg

Performance		
Power Unit	43.5HP S.A.E.	32 kW S.A.E.

ADVANCE THRUST

@ 3,000 PSI	230,000#	104,545kg
@ 207 BAR		

DRIVE CHUCK SPEED

@ 2800 engine RPM		
High Gear	71RPM	71RPM
3rd Gear	42RPM	42RPM
2nd Gear	23RPM	23RPM
1st Gear	11RPM	11RPM
Reverse	11RPM	11RPM

DRIVE CHUCK TORQUE

@ 1800 engine RPM		
High Gear	3286 ft lbs.	4459 NM
3rd Gear	5553 ft lbs.	7535 NM
2nd Gear	10154 ft lbs.	13777 NM
1st Gear	20767 ft lbs.	28178 NM
Reverse	24440 ft lbs.	33172 NM

SPECS & MAINTENANCE

Specifications of McL-36/42C Earth Boring Machine

TUNNEL DIAMETER	ENGLISH	METRIC
Cased Bore	12" - 42"	30cm -107cm

OPERATOR'S STATION
See page 15

PLANETARY FINAL DRIVE	ENGLISH	METRIC
Hex Size	3"	7.6 m

Dimensions

CARRIAGE AND PUSHER

Centerline Height	26-1/4"	67cm
Width	62"	158cm
Height	54.75"	139cm
Weight w/36" Pusher	7,400#	3,357 kg
Weight w/42" Pusher	7,500#	3,402 kg

MASTER TRACK

Length	108"	274cm
Weight	1,100#	499 kg

EXTENSION TRACK

Length	60"	152cm
Weight	600#	272 kg

Performance		
Power Unit	75 HP S.A.E.	55.9kW S.A.E.

ADVANCE THRUST

@ 3,500 PSI	400,000#	181,818 kg
@ 241 BAR		

DRIVE CHUCK SPEED

@ 2,800 engine RPM		
4 th Gear	71RPM	71RPM
3 rd Gear	42RPM	42RPM
2 nd Gear	23RPM	23RPM
1 st Gear	11RPM	11RPM
Reverse	11RPM	11RPM

DRIVE CHUCK TORQUE

@ 1,800 engine RMP		
4 th Gear	6048 ft. lbs.	8207 NM
3 rd Gear	10221 ft. lbs.	13869 NM
2 nd Gear	18688 ft. lbs.	25357 NM
1 st Gear	38221 ft. lbs.	51860 NM
Reverse	44996 ft. lbs.	61052 NM

Specifications of McL-42HD Earth Boring Machine

	ENGLISH	METRIC
TUNNEL DIAMETER Cased Bore	16" – 42"	41cm -107cm
OPERATOR'S STATION See page 15		
PLANETARY FINAL DRIVE Hex Size	4"	10cm
<i>Dimensions</i>		
CARRIAGE AND PUSHER		
Centerline Height	29-3/8"	75 cm
Width	68"	173cm
Height	68"	173cm
Jacking Station	5,200#	2,360 kg
Carriage	6,650#	3,017 kg
Casing Pusher	1,150#	522kg
MASTER TRACK		
Length	108"	274cm
Weight	1,400#	635 kg
EXTENSION TRACK		
Length	60"	152cm
Weight	750#	341 kg
Push Plate	440#	200 kg
Performance		
Power Unit	106 HP ISO Max 96 HP Cont.	79kW ISO Max 72 kW cont.
ADVANCE THRUST @ 5,000 PSI @ 345 BAR	633,333#	2817 KN
DRIVE CHUCK SPEED @ 2,500 engine RPM	5 th Gear 46RPM 4 th Gear 31RPM 3 rd Gear 19RPM 2 nd Gear 11RPM 1 st Gear 6RPM Reverse 6RPM	46RPM 31RPM 19RPM 11RPM 6RPM 6RPM
DRIVE CHUCK TORQUE @ 1,600 engine RPM	5 th Gear 14,141 ft. lbs. 4 th Gear 20,928 ft. lbs. 3 rd Gear 34,645 ft. lbs. 2 nd Gear 61,512 ft. lbs. 1 st Gear 113,833 ft. lbs. Reverse 113,833 ft. lbs.	19,173 NM 28,375 NM 46,972 NM 83,399 NM 154,337 NM 154,337 NM

REPAIR AND MAINTENANCE/GENERAL

CARRIAGE/TIGHTNESS OF NUTS & BOLTS

Check bolts that mount chuck to the drive shaft flange of the machine initially than check each week when in continuous use. Each bolt should have lock washer. Tighten as needed.

Check all hydraulic fittings initially then check each week when in continuous use. Tighten as needed, taking care not to twist hoses from original positions.

Check locknuts (4) on cam rollers initially then once each month when in continuous use. Tighten as needed. Check and torque all bolts in engine mounts, transmission, planetary, flexible coupling and pump mount every 50 hours. See parts and service manual for proper bolt torque specifications.

CARRIAGE/MISCELLANEOUS

Once a month, inspect the hitch pins (also called auger pins, R. clips, R. pins) that hold the clevis pins in place. Replace if worn or damaged.

Also, check hitch pins that hold machine down in place. Replace if worn or damaged.

After each boring operation is completed, clean the carriage to remove dirt and mud. Use water if available. Always clean the unit before storage

TRACK/GENERAL MAINTENANCE

Check the rolling surfaces of the track for dirt or contamination. Clean as required. Tighten push plate bolts periodically. Always inspect bolts before boring begins.

Inspect the track for fractures and reweld as necessary.

ENGINE/GENERAL MAINTENANCE

Review the engine manual supplied before starting and operating the engine. Follow manufacturer's recommendations for operation and maintenance to maintain your engine warranty.

Check fluid levels as follows:

ENGINE - Check oil level daily, fill with seasonal grade oil as recommended in manufacturers manual provided. Change oil per engine manufacturers recommendation.

TRANSMISSION - Fill to check point with EP 90 gear oil, change after first 50 hours of use, then every 1000 hours or annually.

FINAL DRIVE - Fill to check point with EP 90 gear oil, change after first 50 hours of use, then every 1000 hours or annually.

HYDRAULIC RESERVOIR - Fill to high level mark on sight gage (with cylinders retracted) with 300SSU oil, change oil after first 1000 hours of use, then annually. Recommended Hydraulic Oils, Mobile Fluid 350 or 423, Shell Tellus 29, Sunoco Sunvis 831-WR.

HYDRAULIC FILTER - Replace with every oil change and every 750 hours or three months.

DOG PLATE - Oil all members, including dogs, initially and then weekly when in continuous use. A light machine oil or spray lubricant is recommended. It is also recommended that the dog plate be disassembled and cleaned periodically, especially after use in sticky clay conditions or sand.

FUEL - Refer to engine manual supplied for gasoline or diesel grade recommendations.

AUGER COUPLINGS - Clean and coat with light oil after every use.

CUTTING HEADS - Examine all teeth and replace as necessary before use. Check all conical bits on rock heads for rotary freedom. Check condition and freedom of wing cutters.

AUGER - Examine after use for fractures and reweld as necessary.

OPERATION OF MACHINE

Your boring machine is a powerful piece of equipment, and must always be operated with respect and caution, and only by an experienced operator. **NEVER ALLOW INEXPERIENCED PERSONNEL TO OPERATE THIS MACHINE.** All operators must read and fully understand this manual before starting or using the machine. Refer to the parts manual for your machine for specific instructions on machine maintenance and to the engine manual supplied with the unit, for specific startup, operating, and maintenance procedures.

SETTING UP THE BORE

Before the entrance pit is constructed, all utility companies are to be contacted to determine the location of existing services in the path of the proposed tunnel. The working area at the site must be closed to all personnel not directly associated with the job. All crew personnel should be instructed in job safety and what their responsibilities on the crew will be.

PIT PREPARATION

All excavations on the job site must be constructed in accordance with Federal and local regulations. OSHA regulations concerning excavation change from time to time. Make sure your excavation is in accordance with the CURRENT OSHA regulations. Copies of OSHA regulations are available free of charge by writing:

**OFFICE INFORMATION & CONSUMER AFFAIR
US DEPT OF LABOR - OSHA
ROOM N-3637
WASHINGTON, DC 20210**

The width of the pit used must be governed by the desired depth of the bore, soil conditions and current OSHA trench excavation requirements on sloping and shoring.

The machine will require the minimum pit BASE size listed in the table below. The tunnel should be located in the center of the face wall to allow working space on both sides of the machine. Add 10 feet to the length for each track extension used.

MACHINE	LENGTH	CENTERLINE
McL-20B	12 feet	14-1/4"
McL-24B	12 feet	16-7/8"
McL-30/36B	12 feet	24-1/8"
McL-36/42B	14 feet	26-1/4"

After the pit entrance has been opened, the base of the pit must be made firm and carefully leveled to the grade (slope) of the proposed tunnel, with the centerline of the proposed tunnel correctly located above the finished base at the face. This is an important step, since the grade of the pit base will determine the grade of the finished bore. A compacted layer of crushed stone is recommended to prevent any change in the track position due to settling during the boring operation. A concrete pad may be necessary when an extremely critical grade is necessary. A substantial backstop is always required against the rear of the pit. The backstop must be perpendicular to the track grade and capable of withstanding the full thrust of the machine.

PREPARING TO BORE

This machine is equipped with an EMERGENCY STOP BUTTON located at the operator's station. This button must be pulled up (out) before the engine will start. The engine can be quickly shut down during use by simply hitting the red mushroom cap. The EMERGENCY STOP BUTTON should also be down (in), even when the key has been removed from the START switch, to provide an additional safety factor whenever personnel are working on the machine or near the drill string.

The operator station on the McL-20B is on the rear of the carriage. A platform is provided to prevent the operator from stepping between the carriage and dog plate. The operator station on the McL-24B, McL-30/36B and McL-36/42B is located on the right side of the carriage as you face the direction of the bore. A platform is provided for convenience and to avoid obstacles in the pit. Operation from any other position may expose the operator to unnecessary hazards.



WARNING!

ALWAYS CHECK THAT THE VALVES ARE OPERATING PROPERLY AND SELF CENTERING TO NEUTRAL BEFORE BEGINNING THE BORE. IF THE VALVE HANDLES STICK IN EITHER DIRECTION, SHUT DOWN POWER SOURCE, RELIEVE HYDRAULIC PRESSURE AND HAVE THE UNIT INSPECTED BY AN AUTHORIZED SERVICE TECHNICIAN.

The auger rotation speed is controlled by the engine throttle regulator and the gear selected. The chart shown in the specifications lists the speed and torque ranges for each machine.

The direction of the rotation (FORWARD-REVERSE) is controlled by the transmission. 1st, 2nd, 3rd and HIGH gears will cause the auger to rotate FORWARD, or clockwise as viewed from the rear of the machine, and REVERSE will cause the auger to rotate REVERSE, or counterclockwise as viewed from the rear of the machine. Note that the torque available at the drive chuck is a function of the gear selected. The highest torque is in 1st and REVERSE gears. A hydraulic CLUTCH is provided to ENGAGE and DISENGAGE the final drive from the engine. A NEUTRAL gear is provided to allow the engine to run without turning the drive chuck.



DANGER!

ROTATING AUGER AND CUTTING HEAD will cause death or serious injury. STAY AWAY. Do not wear loose clothing.



WARNING!

THIS MACHINE IS EQUIPPED WITH A HYDRAULIC CLUTCH OPERATOR PRESENCE CONTROL. READ AND UNDERSTAND OPERATING INSTRUCTIONS BEFORE USING. FAILURE TO COMPLY CAN RESULT IN SERIOUS INJURY OR DEATH.

The hydraulic clutch uses compressed hydraulic oil within a hydraulic cylinder to sandwich steel discs and fiber plates together to join a drive train. This action takes place in less than one second.

Conversely, when the hydraulic system is depressurized, the plate and discs separate in the same time-frame.

When used in a horizontal boring machine application, the clutch is pressurized to activate the rotation of the machine's drill string. The machine operator does this by actuating an electric solenoid-operated hydraulic valve that sends the pressurized oil to the clutch. HE MUST BE PRESENT AT THE CONTROL CONTINUOUSLY DURING THE DRILLING OPERATION. If it becomes necessary to disengage the drive, releasing the control will deactivate the machine. Thrust and Rotation functions are controlled by a single lever, eliminating the performance of dual operations by the operator.



DANGER!

OPERATOR CONTROL DEVICE - DO NOT ALTER, MODIFY, OR DEFEAT. FAILURE TO COMPLY WILL RESULT IN SERIOUS INJURY OR DEATH.

TESTING THE HYDRAULIC CLUTCH

Before beginning the bore, check to make sure that the Hydraulic Clutch is functioning properly.

1. Start the engine on the boring machine and set the throttle at low idle.
2. Move the LOCK/UNLOCK switch to the UNLOCK position.
3. Place the transmission into one of the forward gears.
4. Grasp the Control Handle, making sure to engage the Palm Safety Control located on the rear of the handle.
5. Press the Rotation Control Trigger Switch and observe the movement of the paddles in the clockwise direction.
6. Release the trigger and observe that the chuck has stopped turning.
7. Move the Handle both forward and reverse and observe the movement of the Thrust Cylinders in the two directions.
8. Place the transmission into reverse gear and repeat steps 4-6 above.

NOTE: The rotation of the paddle will now be in counterclockwise direction.

ONCE THE SYSTEM HAS BEEN SATISFACTORILY TESTED, THE BORING OPERATION CAN BEGIN. IF THE HYDRAULIC CLUTCH DOES NOT FUNCTION PROPERLY, SHUT DOWN THE UNIT AND HAVE THE MACHINE SERVICED BY A QUALIFIED MECHANIC.

When operating this machine, always be aware of any slight tipping of the machine, or engine "lugging". Whenever these conditions occur, stop both advance and rotation IMMEDIATELY. RETRACT the machine and then cautiously ADVANCE while rotating FORWARD until the obstruction has been passed. Proceed with caution since it is likely that the condition may continue.



DANGER!

**Machine upset will cause death or serious injury.
To avoid upset, follow instructions in operating manual.**

The machine is moved on the track by hydraulic cylinders located in the carriage base. The rod ends of the cylinders are connected to a dog plate, located at the rear of the machine, containing two movable dogs that LOCK into holes on the track. The dogs are positioned by the DOG RELEASE lever. Dogs on the McL-24B and larger are controlled hydraulically by a valve and cylinder. The direction and speed of the cylinder motion are controlled by a, spring return to neutral, THRUST control. Operating the control in the ADVANCE mode will cause the cylinders to extend when the dogs are LOCKED in the track and the machine to ADVANCE toward the face. If the dogs are UNLOCKED, the dog plate will move away from the machine. The rate of ADVANCE is controlled by how far the control is moved from neutral. Operating the control in the RETRACT mode will cause the machine to RETRACT if the dogs are LOCKED, or the dog plate to move TOWARD the machine if the dogs are UNLOCKED. On the McL-24B and larger a track brake is supplied to prevent machine movement when the dog plate is being moved.

The thrust cylinders are powered by a hydraulic oil pump located at the rear of the machine. The pump is directly connected to the engine and is always operating when the engine is running. The Model 20B is equipped with a single section gear pump and the speed of the cylinders is controlled by the displacement of the THRUST control. Models McL-24B and McL-30/36B are equipped with a dual section gear pump and the speed of the cylinders is controlled by the displacement of the THRUST control and the FAST FEED control. The FAST FEED control selects one or both sections of the pump. SLOW FEED is always used when boring. The FAST FEED position is provided to allow rapid motion of the cylinders for repositioning the machine by moving the dog plate.

The Model McL-36/42B is equipped with a pressure sensing pump that de-strokes at a preset pump system pressure of 3500 psi. The speed of the cylinders is controlled by the displacement of the THRUST control, and limited by the setting of a "T" BAR FEED CONTROL located under the thrust control. Rapid cylinder travel is accomplished by rotating the feed control COUNTERCLOCKWISE and fully displacing the thrust control. The McL-36/42B may be equipped with an optional Fast Feed feature. To use Fast Feed, move the Fast Feed toggle switch to the Forward position for fast feed. Note: Fast Feed is for repositioning the machine and cylinders only. DO NOT use Fast Feed for boring.

The primary system relief on all McLaughlin machines is factory set to protect the components of the particular machine. Operation at settings that exceed the factory value will damage the thrust cylinders and cause unnecessary engine stall-outs. Do not readjust relief.



WARNING!

ALWAYS CHECK THAT THE VALVES ARE OPERATING PROPERLY AND SELF CENTERING TO NEUTRAL BEFORE BEGINNING THE BORE. IF THE VALVE HANDLES STICK IN EITHER DIRECTION, SHUT DOWN POWER SOURCE, RELIEVE HYDRAULIC PRESSURE AND HAVE THE UNIT INSPECTED BY AN AUTHORIZED SERVICE TECHNICIAN.

BORING WITHOUT CASING

INSTALLING AND USING THE MODEL McL-20B

The practice of free boring with a horizontal earth boring machine increases the possibility of upset and presents an additional hazard to personnel in the form of an exposed rotating auger.



DANGER!

ROTATING AUGER AND CUTTING HEAD will cause death or serious injury. STAY AWAY.
Do not wear loose clothing.



DANGER!

Machine upset will cause death or serious injury.
To avoid upset, follow instructions in operating manual.

FREE BORE RESTRICTIONS

Free bores with the McL-20B are limited to 40 feet length, two thru 12 inch diameter, to be attempted ONLY IN STABLE SOILS where no rocks are present. The wing cutters must be removed from the cutting head. Only the Master Track is to be used, and the practice is limited to the installation of a SINGLE section of 4 foot auger at a time. FREE BORES WITH AUGERS LARGER THAN 12" OR WITH McLAUGHLIN MODELS LARGER THAN THE McL-20B ARE EXPRESSLY PROHIBITED.

ADDITIONAL HAZARDS TO BE AWARE OF WHEN FREE BORING

1. The machine is more likely to upset without the added weight and resistance of a secured casing.
2. The exposed auger flighting in the ground may catch on an obstruction and the screw action can cause the machine to advance unexpectedly.
3. The practice of free boring can lead to soil failure since the exposed auger can bring back more soil than the head is cutting. Careful attention should be paid to the soil condition and amount of soil being removed. With any increase or decrease in the amount of spoil being removed the operation should immediately stop the bore. Shut down the remote power source and investigate possible causes.
4. The exposed auger can cause an entanglement hazard. Guard by distance. Do not wear loose clothing.

INSTALLING THE MASTER TRACK AND MACHINE FOR FREE BORING

Remove the casing pusher, spoil ejector assembly and chuck extension from the McL-20B before attempting a free bore. Before lifting the machine, check to make sure that the dog pins are UNLOCKED in the track and the track hold downs removed.

THE MACHINE AND MASTER TRACK ARE DESIGNED TO BE LIFTED SEPARATELY.

Always use the lift point provided on the machine carriage. Always use a four point lift for the track sections. Install the Master Track so that the thrust plate at the rear rests squarely against the pit backstop. If the track does not fit the backstop, shim with steel plates. Lower the carriage onto the track and secure with track hold downs, engage dog pins in the track holes.

COLLARING

Manually dig a starting hole in the face of the pit to support the cutting head and auger during collaring. When all preparations have been completed, clear the area and start the engine. Make sure the LOCK/UNLOCK switch is positioned in the LOCK mode. Push the Control slowly in the FORWARD DIRECTION until the cutting head has reached the face wall. Then slide the LOCK/UNLOCK switch to the unlock position. Put the transmission in 2nd gear and with low RPM, engage the TRIGGER SWITCH to begin the rotation. As the cutting head is rotating, advance the machine into the face by moving the control lever in the forward direction. IN ALL CASES, THE OPERATOR MUST FULLY GRASP THE CONTROL LEVER TO ENGAGE THE PALM SWITCH. FAILURE TO DEPRESS THE PALM SWITCH WILL RENDER THE CONTROL LEVER INOPERABLE. Always use a coupling pin at the chuck to prevent the auger from self-advancing out of the drive. Check the level of auger after you have advanced the head into the face. If the level is not correct, retract and start over.

BORING

Increase the auger speed and continue to ADVANCE the machine, with the auger rotating FORWARD, until the chuck is at the end of the track. This will allow space to couple the next auger section. Slide the LOCK/UNLOCK switch to lock and shut down the engine. Then uncouple the auger at the face. AT NO TIME IS THE ENGINE TO BE RUNNING DURING THE PINNING OR UNPINNING OPERATION. After clearing the area, start the engine and retract the machine from the auger hex. Remove the machine to the rear of the track. Clear the spoil from the face and couple the next auger section. Clear the area, restart the engine, unlock the clutch and engage the drive train. Rotate the auger and advance the machine into the face. Repeat the operation until all augers have been installed.

REMOVING THE AUGER UPON COMPLETION OF THE BORE

When the bore has been completed, shut down the engine, and position all controls in the off position. All hydraulic controls should be "toggled" to relieve any system pressure. The operator should SHUT DOWN THE ENGINE and personally supervise the opening of the exit pit and removal of the cutting head. The exit pit must be constructed according to current OSHA regulations. Information can be obtained from your Regional Department of Labor Office. After the head has been removed, either guard the pit or back fill it.



WARNING!

NEVER ALLOW PERSONNEL IN THE EXIT PIT WHEN THE UNIT IS RUNNING.

DEATH OR SERIOUS INJURY MAY OCCUR IF YOU BECOME ENTANGLED IN CUTTING HEAD OR AUGER.

Clear the area, start the engine and remove the auger. Use slow FORWARD rotation to clean the tunnel and reduce the pulling load on the drive coupling, and the possibility of an upset. Guard the exposed rotating auger by safe distance. Keep all personnel away from the rotating auger. Retract the machine until the auger coupling is exposed at the face. Shut down the engine and remove the pin at the chuck. Support the exposed auger with a sling, clear the area, start the engine and RETRACT the machine until at least 8" of space exists between the end of the auger shank and the chuck. Shut down the power unit, remove the pin from the front of the auger, and remove the supported auger section. Continue until all auger is removed.

BORING WITH CASING

INSTALLING AND USING THE MACHINE FOR CASE BORING

THE MACHINE AND TRACK SECTIONS ARE DESIGNED TO BE LIFTED SEPARATELY. Always use a four point lift for the track sections and the lift hook provided on each machine.

Install the Master Track so that the thrust plate at the rear rest squarely against the pit backstop. Use a transit or string and plumb bob to align the center of the track with the line of the proposed tunnel. If the track does not fit the backstop, shim with steel plates.



WARNING! NEVER ALLOW UNAUTHORIZED PERSONNEL IN THE BORING PIT.

Install extension tracks as needed. Use bolts in ALL holes and tighten them securely so that the tops and sides of the track sections are in alignment. Before setting the machine on the track, make a final check of the line and grade of the track. Set the machine in the track, and install the hold-down pins and keepers in all four carriage hold-downs. Start the engine and with the hydraulic clutch in the LOCK position, move the carriage to the rear of the master track. Install the appropriate casing adapter and saddle/shoe to match the casing to be installed.

PREPARATION OF THE LEAD SECTION OF CASING

Mark the lead, or first, section of casing so that it is equal to the length of the auger sections plus the length of the EXTENSION or ADAPTER.

1. If the head is to be run inside the casing, ADD the length of the head plus the recessed distance of the head. Cut the casing and band it.
2. If the head is to be run flush with the casing, SUBTRACT two inches , cut the casing and band it.
3. If the head is to be run in front of the casing, SUBTRACT two inches plus the distance the head is to be extended. Cut the casing and band it.

Install the auger sections and head in the lead casing so that the SHOULDER of the shank (male) end is inside the casing a distance equal to the length of the EXTENSION or ADAPTER. Check and record the head position at the other end, then push the head end of the auger back into the casing so that the flight is exposed about 1" at the machine end.

When a flush or extended head is used with wing cutters, remember that the auger can NEVER be turned FORWARD when pinning or unpinning auger sections. Check the wing cutters for freedom and make sure that they collapse enough to fit inside the casing. Secure the auger into the casing and using a two point lift, secure the casing by means of two chokers set 5' from each end of the casing. **MAKE SURE THE AUGER IS SECURED AND THE CASING BALANCED BEFORE LOWERING IT INTO THE PIT.**

INSTALLING THE LEAD SECTION

The pit area should be cleared and the section of casing lowered in with two guide ropes used for control.

The machine should already be at the rear of the track, and the CHUCK EXTENSION should be secured in the machine with a bolt and lock nut, never to be removed during the boring operation.

Rest the front of the lead section in the saddle/shoe and rotate the chuck extension until the hole is aligned with the hole in the auger shank, ADVANCE the machine to couple the hex joint, SHUT DOWN the engine and install an auger pin while working in the exposed space in FRONT of the casing pusher. Clear all personnel and tools from the area, start the engine and ADVANCE the machine without rotation until the casing has seated in the casing pusher or adapter. SHUT DOWN the machine and tighten three centering bolts. Check the position of the head at the front.

The sides of the casing must be parallel with the track. Make a final line and grade check of the CASING. When boring in stable ground conditions and using a cutting head with wing cutters, the lead section of casing must be prepared so that the wing cutters are positioned beyond the end of the casing. All other casing sections trailing the first piece should have casing lengths matched exactly to auger length. This will ensure correct wing cutter position.

COLLARING

When all preparations have been completed, clear the area and start the engine. Make sure the LOCK/UNLOCK switch is positioned in the LOCK mode. Push the Control slowly in the FORWARD DIRECTION until the cutting head has reached the face wall. Slide the switch to the UNLOCK position. Put the transmission in 2nd gear and with low RPM engage the TRIGGER SWITCH to begin the rotation. As the cutting head is rotating, advance the machine into the face by moving the control lever in the forward direction. IN ALL CASES, THE OPERATOR MUST FULLY GRASP THE CONTROL LEVER TO ENGAGE THE PALM SWITCH. FAILURE TO DEPRESS THE PALM SWITCH WILL RENDER THE CONTROL LEVER INOPERABLE.



DANGER! ROTATING AUGER AND CUTTING HEAD will cause death or serious injury. STAY AWAY. Do not wear loose clothing.

After about two feet of the casing has been installed in the soil, stop the engine and recheck line and grade. The casing should still be resting in the saddle/shoe. A gap between the casing and the shoe indicates that the casing has started to climb. If the results are not acceptable, clear the area, start the engine, remove the casing and collar it again. If the lead section of casing is not installed on line and grade, it is unlikely that the completed tunnel will meet specifications.



DANGER! Machine upset will cause death or serious injury. To avoid upset, follow instructions in operators manual.

BORING

The auger should turn free in the casing and spoil should be coming out of the master pusher. BE ALERT for binding of auger or engine lugging. If an unexpected object is encountered, release clutch trigger, retract unit, lower RPM and carefully re-engage clutch. Advance into obstruction at a slow rate until you are past it. If the auger is binding, remove it out of the pit and determine the problem before continuing.

If the hole is properly collared, continue to advance the machine and rotation by moving the control handle in the forward direction while engaging the trigger switch to control the rotation. Once the hole has been collared, the transmission can be moved to a higher gear for faster rotation and better spoil removal.

When the installation of the section of casing is complete, stop advancing and allow the auger to rotate forward for a few minutes to clean the casing. This is done by engaging the trigger switch on the control handle.

Shut down the engine and move the LOCK/UNLOCK switch to the LOCK position. This makes it impossible for the rotation to function while a new section of casing is being added to the string. Loosen the three centering bolts on the casing pusher or the adapter ring. Start the engine and UNLOCK the switch on the control lever. Put the transmission into reverse gear and activate the trigger switch to produce reverse rotation thus causing the wing cutters to collapse and allow the head to be pulled back into the casing about 8" by moving the control lever in the reverse direction. This operation will place the auger pin in a convenient position for removal. NO ONE, EXCEPT THE OPERATOR, SHOULD BE ON EITHER SIDE OF THE BORING MACHINE DURING THE BORE WHEN THE MACHINE IS RUNNING. A sudden encounter with an obstruction during the bore or when reversing auger could cause the machine to upset opposite the auger rotation. Clean spoil after the section is installed and the machine is removed to the master track.



DANGER! DO NOT REMOVE CASING PUSHER DOOR. DO NOT MODIFY THIS MACHINE. CONTACT WITH ROTATING PADDLES CAN CAUSE TRAUMATIC AMPUTATION OR DEATH.

Shut down the engine and LOCK the control lever. Carefully remove the pin joining the auger and the machine. Restart the engine and slowly retract the machine by moving the lever in the reverse direction without rotation until the joint is free. Then move the machine to the rear of the pit. Be Alert for catching of the wing cutters on the casing, snagging the casing with the wing cutters could cause the augers to stop suddenly. If this occurs, release the clutch trigger and advance the machine without turning until the head is past the front of the casing. Engage the clutch in reverse gear and again retract the head.

COUPLING AT THE FACE

Place the next section of casing with the socket (female) end of the auger extending about 8" out of the casing at the face end. Couple the joint using the crane, block the gap and install an auger pin. Remove the block, clear the area and push the casings together with the machine. Use wood blocking between the casing pusher and the casing. Watch that the block is placed so that it will clear the auger as it comes out of the casing section.

In order to assure that the casings are properly aligned for welding, do not couple the auger at the machine or install the casing until welding has been completed. With the casing supported by a sling, align the two casings and weld fully. A pair of guide scabs, welded at the top quarter of the new casing will aid in the alignment. After the welding has been completed, the coupling can be made at the machine.

COUPLING AT THE MACHINE

With the casing still supported by the crane, start the engine and rotate the chuck extension until the holes are aligned, then ADVANCE to couple the auger. SHUT DOWN the engine and install the auger pin at the machine using the exposed space in FRONT of the casing pusher. Clear the area, start the engine, and push the auger into the casing, without rotation, until the casing has seated in the casing pusher or the casing adapter. Tighten the three centering bolts, remove the crane sling, and proceed with the boring.

REMOVING THE AUGER UPON COMPLETION OF THE BORE

When all of the casing sections have been installed, stop advancing and turn the auger forward until no spoil is ejected from the spoil door. At this time the machine is shut down and the exit pit opened to locate the casing end for a check of line and grade. Position all controls in the off position. All hydraulic controls should be "toggled" to relieve any system pressure. The operator should remove the key from the control panel and personally supervise the opening of the exit pit and the removal of the cutting head. The exit pit must be constructed in accordance with current OSHA requirements. After the head has been removed, either guard the exit pit or back fill it.

Clear the area, start the engine and remove the auger. If the head has been removed from the drill string, the auger can be rotated SLOWLY in the FORWARD direction to clean the casing and reduce the pulling load on the drive coupling. Use a low throttle setting to reduce the possibility of an upset if the auger catches in the casing. Guard the exposed rotating auger by safe distance. Keep all personnel away from the rotating auger. If the head has not been removed, the auger must not be rotated.

Retract the machine until the auger coupling is exposed at the face. Shut down the machine and remove the auger pin at the chuck extension. Support the center of the exposed auger with a sling, clear the area, start the engine and retract the machine away from the auger until sufficient space exists to remove the auger section. Shut down the engine, remove the pin from the front of the auger and remove the supported auger section. Continue this procedure until all augers have been removed.

SUGGESTIONS FOR CASED BORES

Always use good quality casing pipe. Cut the first section to length, to position the cutting head. Cut the trailing casing lengths to exact auger lengths (flight to flight). Prepare the casings with beveled, square cut ends. Build up the lead auger section, or shim the auger within the encasement to maintain centered cutting head position, unless Grade Maintenance Devices are to be used.

1. Select the correct diameter cutting head to match the diameter of casing that is to be installed. The cutting head should have positioned wingcutters that open to cut clearance for the pipe, when the head is rotated in a clockwise fashion. When the head is reversed (counterclockwise), the wingcutters retract within the diameter of the head, enabling the auger and head to be removed for inspection, or retooling. This is particularly advisable in rocky conditions. Wingcutters should be inspected for wear, to insure that cutting clearance is always provided.

2. Carefully locate and maintain the position of the cutting head with respect to the front of the casing. The location chosen for the cutting head depends upon the stability of the soil.

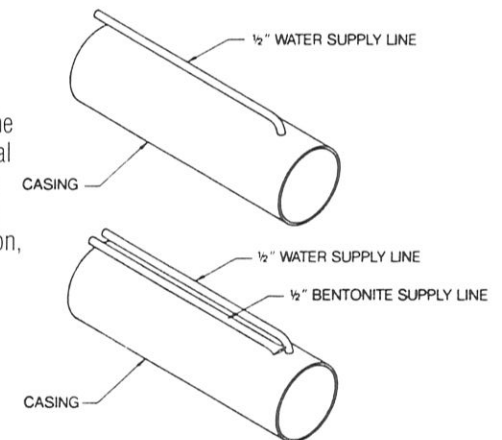
3. Always use a complete string of full sized augers (matching the casing diameter), when drilling in rocky conditions or unstable soils. In stable soils, smaller diameter augers than the lead sections may be used on the trailing end of the drill string, but at least 1/2 of the bore length should contain full sized augers. Never "stage" larger diameter augers behind trailing sections. Care must be taken when using undersized augers within the casing, to not allow the augers to "wind up" with excess torque.

4. If rock is encountered, reduce auger speed and advance with care. This will reduce the possibility of "wind up", producing undue stress on the drill string.

5. If the auger suddenly becomes harder to turn, stop advancement of the machine, and allow the auger to clean the casing until it rotates freely within the sleeve.

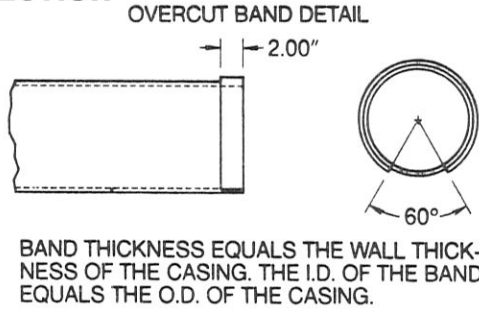
6. When advancing the machine, use either a fine advancement feed, or a "Bite and Clean" method for thrust. Continuous, rapid advance while boring can result in inadequate spoil removal, creating excess torque loads.

7. A small diameter steel water line can be positioned on the top exterior of the casing, to introduce water into the pipe, directly behind the cutting head. This facilitates easier soil removal and reduced torque loading. Bentonite may be dispensed on the exterior surface of the casing through another steel line, to reduce skin friction, and thrust loads required.



BANDING THE LEAD CASING SECTION

When boring in unstable soil conditions, where the use of wingcutters is not feasible or desired, the use on an "overcut band" will provide for soil compaction as the casing is thrust through the soil. The slightly increased diameter created by the band will provide for clearance for the casing and will reduce skin friction loading. Both the leading edge of the casing, as well as the band, must be square with the casing pipe.



SUGGESTIONS FOR CASED BORES IN TYPICAL SOIL CONDITIONS

STABLE AND CLAY SOIL

Position the cutting head in front of the casing and use wingcutters. Band the lead section of the casing, if desired. Attach a water course, if required. Rotate the augers at a fast rate, after the pipe is supported by the earth. Advance intermittently (bite and clean). The rate of advancement should be governed by the rate of spoil ejection by the machine.

ROCKY SOIL

Position the cutting head in front of the casing and check to make sure that wingcutters cut sufficient clearance, open and retract fully. Band the lead section of casing, if desired. Attach a water course, if required. When rock is encountered, decrease rotation and advancement speed. Maintain adequate thrust pressure so that the rock may be excavated.

Retract and remove the drill string for inspection and retooling, if penetration rates decrease considerably. Pay careful attention to the wingcutters and replace if necessary. If the wingcutters fail in their function of overcutting for the casing, thrust overloads may occur, along with the possibility of seizure of the pipe.

UNSTABLE AND SANDY SOIL

Remove the wingcutters from the head and position the head back in the casing, a distance equal to 1/2 the diameter of the pipe. If the cutting head is allowed to precede the casing, excess material may be removed, creating a void. Band the lead casing section. Attach a water course, if required. Advance steadily and rotate slowly, to create earth pressure balance. Stop rotation of the augers when repositioning the machine's dog plate. NOTE - excess thrust pressure at shallow depths can cause heaving of the road surface.

The suggestions listed above are for your consideration in designing and constructing a crossing. McLaughlin recommends that you should research and review any federal or state safety regulations that may cover your excavation & crossing.

CASED BORING SUGGESTIONS BASED ON SOIL CONDITION

AUGER SPEED	SLOW		MEDIUM		SLOW		HAND TUNNEL		CAUTION		GROUND CONDITIONS USE EXTREME CAUTION DIGRATE METHODS YES					
	FAST	FAST	FAST	FAST	LOW	CONTINUOUS	MCL. C=ROCK		LOW	OPT.						
	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	LARGE BOULDERS	LAND FILL	RAILROAD FILL	RIVER CROSSINGS
PENETRATION RATE																
HEAD TYPE																
WING CUTTER																
HEAD POSITION																
BENTONITE																
WATER INSIDE																
BANDING																
CONTINUOUS BORE																
SPOIL VOLUME IN AUGER																
PIT BASE																
BACKSTOP																

INDICATES HIGHLY RECOMMENDED

CASING DIMENSION AND WEIGHTS

PER LINEAL FOOT (approximate)

NOMINAL SIZE	ACTUAL O.D.	WALL THICKNESS								
		.188"	.250"	.312"	.375"	.438"	.500"	.625"	.750"	1.00"
4"	4 1/2"	—	10.79	14.98	—	—	—	—	—	—
6"	6 5/8"	—	18.97	—	—	28.57	—	—	—	—
8"	8 5/8"	—	22.36	28.55	—	—	43.39	—	—	—
10"	10 3/4"	21.21	28.04	—	40.48	—	54.74	—	—	—
12"	12 3/4"	25.22	34.71	—	49.56	—	65.42	—	—	—
14"	14"	—	36.71	45.61	54.57	63.44	72.09	89.29	106.1	—
16"	16"	—	42.05	52.28	62.58	72.80	82.77	102.61	122.1	—
18"	18"	—	47.39	58.94	70.59	82.15	93.45	116.01	138.2	—
20"	20"	—	52.73	65.60	78.60	91.51	104.1	129.3	154.2	—
24"	24"	—	63.41	78.93	94.62	110.2	125.5	156.0	186.2	—
30"	30"	—	—	98.93	118.6	138.3	157.5	196.1	234.3	—
36"	36"	—	—	118.9	142.7	166.4	189.6	236.1	282.4	—
42"	42"	—	—	—	166.7	194.4	221.6	276.2	330.4	—
48"	48"	—	—	—	190.7	222.5	253.6	316.2	390.5	502.0

ALL WEIGHTS GIVEN IN LBS.

NOTE: WALL THICKNESS AND WEIGHT MAY VARY SLIGHTLY DEPENDING ON CASING SIZE

METRIC CONVERSION: 1" = 2.54 cm. 1 lb. = .454 kg.

FORMULA FOR DETERMINING CASING OR PIPE WEIGHT STEEL CASING

$$\text{WEIGHT} = 2.67 (\text{OD}^2 - \text{ID}^2) \times \text{LENGTH}$$

CAST IRON PIPE

$$\text{WEIGHT} = 2.45 (\text{OD}^2 - \text{ID}^2) \times \text{LENGTH}$$

EXAMPLE: 20"OD X 19"ID X 10'-0" LONG

STEEL CASING

$$\text{WEIGHT} = 2.67 (20^2 - 19^2) \times 10'$$

$$= 2.67 (400 - 361) \times 10'$$

$$= 2.67 (39) \times 10'$$

WEIGHT = 1,041 LBS.

AUGER DIMENSION AND WEIGHTS

PER LINEAL FOOT (approximate)

NORMAL SIZE	ACTUAL SIZE	HEX SHANK SIZE						
		1"	1 1/8"	1 3/8"	1 5/8"	2 1/4"	3"	4"
3"	3"	4.5	—	—	—	—	—	—
4"	3 3/4"	—	5.5	—	—	—	—	—
4"	4"	—	6.25	—	—	—	—	—
6"	5"	—	—	9	10.75	—	—	—
8"	7"	—	—	—	15	18.25	—	—
10"	9"	—	—	—	18	19.75	—	—
12"	11"	—	—	—	21.75	25.75	39	—
14"	13"	—	—	—	24	27.5	43	—
16"	15"	—	—	—	22.75	29.75	46	—
18"	17"	—	—	—	—	35	51	—
20"	19"	—	—	—	—	37	53	—
24"	23"	—	—	—	—	49	58	63
30"	29"	—	—	—	—	—	65	69.5
36"	35"	—	—	—	—	—	82.5	87
42"	41"	—	—	—	—	—	95	101.5
48"	47"	—	—	—	—	—	112.5	120.5

ALL WEIGHTS GIVEN IN LBS.

METRIC CONVERSION: 1" = 2.54 cm. 1 lb. = .454 kg.

WARRANTY RETURN GOODS POLICY

WARRANTY

The Manufacturer warrants its products to be free from defects in material and workmanship for a period of six months from the date of shipment from the factory. The Manufacturer shall not be responsible for any damage resulting to or caused by its products by reason of installation, improper storage, unauthorized service, alterations of its products, neglect or abuse, or use of the product in a manner inconsistent with its design. This warranty does not extend to any component parts not manufactured by Manufacturer; however, Manufacturer's warranty herein shall not limit any warranties made by manufacturers of component parts which may extend to Buyer.

Claims for defects in material and workmanship shall be made in writing to Manufacturer within ten days of discovery of defect. Manufacturer may either send a service representative or have the product returned to its factory at Buyer's expense for inspection. Upon notification of defect, Manufacturer will issue a return goods authorization number to Buyer. The return goods authorization number must accompany the product returned. If judged by Manufacturer to be defective in material or workmanship, the product will be replaced or repaired at the option of Manufacturer, free from all charges except authorized transportation. Buyer shall be responsible for all maintenance services consisting of lubrication and cleaning of equipment, replacing expendable parts, making minor adjustments and performing operating checks, all in accordance with procedures outlined in Manufacturer's maintenance literature.

THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES AND NO REPRESENTATIONS, GUARANTEES, OR WARRANTIES, EXPRESS OR IMPLIED, (INCLUDING, BUT NOT LIMITED TO, A WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE,) ARE MADE BY THE MANUFACTURER IN CONNECTION WITH THE MANUFACTURE OR SALE OF ITS PRODUCTS. NO EMPLOYEE, DISTRIBUTOR, OR REPRESENTATIVE IS AUTHORIZED TO CHANGE THIS WARRANTY IN ANY WAY OR GRANT ANY OTHER WARRANTY ON BEHALF OF MANUFACTURER.

THE REMEDIES OF BUYER SET FORTH HEREIN ARE EXCLUSIVE AND ARE IN LIEU OF ALL OTHER REMEDIES. THE LIABILITY OF MANUFACTURER WHETHER IN CONTRACT, TORT, UNDER ANY WARRANTY, OR OTHERWISE SHALL NOT EXTEND BEYOND ITS OPTION TO REPAIR OR REPLACE, AT ITS OPTION ANY PRODUCT OR PART FOUND BY MANUFACTURER TO BE DEFECTIVE IN MATERIAL OR WORKMANSHIP. MANUFACTURERS SHALL NOT BE LIABLE FOR COST OF INSTALLATION AND/OR REMOVAL OR BE RESPONSIBLE FOR DIRECT, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES OF ANY NATURE.

GENERAL RETURNS OF MERCHANDISE

1. All Material returned to McLaughlin Mfg. Company must have a return authorization number. This number can be obtained by calling the dealer from whom the material was originally purchased.
2. All returned material must be shipped PREPAID.
3. Material without a material authorization number or returned collect will be refused at our dock.
4. All material ordered incorrectly or new material returned for no valid reason will be subject to a 20% restocking charge.
5. In the case of warranty claims, a letter explaining the problem or requesting repair must accompany the material.
6. On warranty consideration, all material shipped by McLaughlin will be invoiced until the defective material is returned for inspection. After inspection, credit will be issued for all parts deemed defective.
7. All return authorization numbers expire 30 days after issue. After this time, warranty claims and material returns are void, and merchandise must be paid in full.
8. McLaughlin must be notified and authorize all warranty work performed by your service personnel. This authorization must be obtained PRIOR to any work being performed for proper warranty consideration. Credit will not be issued for unauthorized service work performed.

Specifications of McL-54-60 Earth Boring Machine

	ENGLISH	METRIC
TUNNEL DIAMETER Cased Bore	16" - 54"	41cm -137cm
OPERATOR'S STATION See page 15		
PLANETARY FINAL DRIVE Hex Size	4"	10cm
Dimensions		
CARRIAGE AND PUSHER		
Centerline Height	32.5"	82.6 cm
Width	74"	188cm
Height	64"	163cm
Jacking Station	9,750#	4,422 kg
Carriage	4,200#	1,905 kg
Casing Pusher	1,300#	590kg
MASTER TRACK		
Length	108"	274cm
Weight	1,500#	680 kg
EXTENSION TRACK		
Length	60"	152cm
Weight	800#	363 kg
Push Plate	440#	200 kg
Performance	162 HP ISO Max	121kW ISO Max
Power Unit	139 HP Cont.	104 kW cont.
ADVANCE THRUST		
@ 5,000 PSI	950,000#	4228 KN
@ 345 BAR		
DRIVE CHUCK SPEED		
@ 2,500 engine RPM	5 th Gear 46RPM	46RPM
	4 th Gear 31RPM	31RPM
	3 rd Gear 19RPM	19RPM
	2 nd Gear 11RPM	11RPM
	1 st Gear 6RPM	6RPM
	Reverse 6RPM	6RPM
DRIVE CHUCK TORQUE		
@ 1,600 engine RPM	5 th Gear 21,564 ft. lbs.	29,236 NM
	4 th Gear 31,913 ft. lbs.	43,269 NM
	3 rd Gear 52,830 ft. lbs.	71,628 NM
	2 nd Gear 93,800 ft. lbs.	127,175 NM
	1 st Gear 173,584 ft. lbs.	235,349 NM
	Reverse 173,584 ft. lbs.	235,349 NM

MCLAUGHLIN LIMITED WARRANTY

The Manufacturer warrants its products to be free from defects in material and workmanship for a period of six months from the date of shipment from the factory. The Manufacturer shall not be responsible for any damage resulting to or caused by its products by reason of installation, improper storage, unauthorized service, alterations of the products, neglect or abuse or use of the product in a manner inconsistent with its design. This warranty does not extend to any component parts not manufactured by Manufacturer; however, Manufacturer's warranty herein shall not limit any warranties made by manufacturers of component parts which may extend to Buyer.

Claims for defects in material and workmanship shall be made in writing to Manufacturer within ten days of discovery of defect. Manufacturer may either send a service representative or have the product returned to its factory at Buyer's expense for inspection. Upon notification of defect, Manufacturer will issue a return goods authorization number to buyer. The return goods authorization number must accompany the product returned. If judged by Manufacturer to be defective in material or workmanship, the product will be replaced or repaired at the option of Manufacturer, free from all charges except authorized transportation. Buyer shall be responsible for all maintenance services consisting of lubrication and cleaning of equipment, replacing expendable parts, making minor adjustments and performing operating checks, all in accordance with procedures outlined in Manufacturer's maintenance literature.

THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES AND NO REPRESENTATIONS, GUARANTEES, OR WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, A WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE MADE BY THE

Model No. _____ Ser. No. _____
 Purchased From _____
 Date of Purchase _____



MCLAUGHLIN

1006 Perimeter Rd., Greenville, S.C. 29605
 (803) 277-5870 • Telefax (803) 235-9661

FOR SERVICE OR ASSISTANCE, SEE THE AUTHORIZED MCLAUGHLIN DEALER IN YOUR AREA, OR CALL TOLL-FREE 800 435-9340

MANUFACTURER IN CONNECTION WITH THE MANUFACTURE OR SALE OF ITS PRODUCTS. NO EMPLOYEE, DISTRIBUTOR, OR REPRESENTATIVE IS AUTHORIZED TO CHANGE THIS WARRANTY IN ANY WAY OR GRANT ANY OTHER WARRANTY ON BEHALF OF MANUFACTURER. THE REMEDIES OF BUYER SET FORTH HEREIN ARE EXCLUSIVE AND ARE IN LIEU OF ALL OTHER REMEDIES. THE LIABILITY OF MANUFACTURER WHETHER IN CONTRACT, TORT, UNDER ANY WARRANTY, OR OTHERWISE SHALL NOT EXTEND BEYOND ITS OBLIGATION TO REPAIR OR REPLACE AT ITS OPTION ANY PRODUCT OR PART FOUND BY MANUFACTURER TO BE DEFECTIVE IN MATERIAL OR WORKMANSHIP. MANUFACTURER SHALL NOT BE LIABLE FOR COST OF INSTALLATION AND/OR REMOVAL, OR BE RESPONSIBLE FOR DIRECT, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES OF ANY NATURE.

DETACH AND RETURN POSTPAID CARD IN BACK OF BOOK. RETAIN WARRANTY PORTION ABOVE FOR YOUR RECORD.