OPERATOR'S MANUAL

Metal Working

ROTARY DRAW BENDER
MODEL: RDB-050

Trick-Tools.com
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Pella, IA 50219
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Rev. 02/2021

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THANK YOU & WARRANTY

Thank you for your purchase of a machine from Baileigh Industrial Holdings LLC. We hope that you find it productive and useful to you for a long time to come.

Inspection & Acceptance. Buyer shall inspect all Goods within ten (10) days after receipt thereof. Buyer's payment shall constitute final acceptance of the Goods and shall act as a waiver of the Buyer's rights to inspect or reject the goods unless otherwise agreed. If Buyer rejects any merchandise, Buyer must first obtain a Returned Goods Authorization ("RGA") number before returning any goods to Seller. Goods returned without an RGA will be refused. Seller will not be responsible for any freight costs, damages to goods, or any other costs or liabilities pertaining to goods returned without a RGA. Seller shall have the right to substitute a conforming tender. Buyer will be responsible for all freight costs to and from Buyer and repackaging costs, if any, if Buyer refuses to accept shipment. If Goods are returned in unsalable condition, Buyer shall be responsible for full value of the Goods. Buyer may not return any special-order Goods. Any Goods returned hereunder shall be subject to a restocking fee equal to 30% of the invoice price.

Specifications. Seller may, at its option, make changes in the designs, specifications or components of the Goods to improve the safety of such Goods, or if in Seller's judgment, such changes will be beneficial to their operation or use. Buyer may not make any changes in the specifications for the Goods unless Seller approves of such changes in writing, in which event Seller may impose additional charges to implement such changes.

Limited Warranty. Seller warrants to the original end-user that the Goods manufactured or provided by Seller under this Agreement shall be free of defects in material or workmanship for a period of twelve (12) months from the date of purchase, provided that the Goods are installed, used, and maintained in accordance with any instruction manual or technical guidelines provided by the Seller or supplied with the Goods, if applicable. The original end-user must give written notice to Seller of any suspected defect in the Goods prior to the expiration of the warranty period. The original end-user must also obtain a RGA from Seller prior to returning any Goods to Seller for warranty service under this paragraph. Seller will not accept any responsibility for Goods returned without a RGA. The original end-user shall be responsible for all costs and expenses associated with returning the Goods to Seller for warranty service. In the event of a defect, Seller, at its sole option, shall repair or replace the defective Goods or refund to the original end-user the purchase price for such defective Goods. Goods are not eligible for replacement or return after a period of 10 days from date of receipt. The foregoing warranty is Seller's sole obligation, and the original end-user's exclusive remedy, with regard to any defective Goods. This limited warranty does not apply to: (a) die sets, tooling, and saw blades; (b) periodic or routine maintenance and setup, (c) repair or replacement of the Goods due to normal wear and tear, (d) defects or damage to the Goods resulting from misuse, abuse, neglect, or accidents, (f) defects or damage to the Goods resulting from improper or unauthorized alterations, modifications, or changes; and (f) any Goods that has not been installed and/or maintained in accordance with the instruction manual or technical guidelines provided by Seller.

EXCLUSION OF OTHER WARRANTIES. THE FOREGOING LIMITED WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED. ANY AND ALL OTHER EXPRESS, STATUTORY OR IMPLIED WARRANTIES, INCLUDING BUT NOT LIMITED TO, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE ARE EXPRESSLY DISCLAIMED. NO WARRANTY IS MADE WHICH EXTENDS BEYOND THAT WHICH IS EXPRESSLY CONTAINED HEREIN.

Limitation of Liability. IN NO EVENT SHALL SELLER BE LIABLE TO BUYER OR ANY OTHER PARTY FOR ANY INCIDENTIAL, CONSEQUENTIAL OR SPECIAL DAMAGES (INCLUDING, WITHOUT LIMITATION, LOST PROFITS OR DOWN TIME) ARISING FROM OR IN MANNER CONNECTED WITH THE GOODS, ANY BREACH BY SELLER OR ITS AGENTS OF THIS AGREEMENT, OR ANY OTHER CAUSE WHATSOEVER, WHETHER BASED ON CONTRACT, TORT OR ANY OTHER THEORY OF LIABILITY. BUYER'S REMEDY WITH RESPECT TO ANY CLAIM ARISING UNDER THIS AGREEMENT IS STRICTLY LIMITED TO NO MORE THAN THE AMOUNT PAID BY THE BUYER FOR THE GOODS.

Force Majeure. Seller shall not be responsible for any delay in the delivery of, or failure to deliver, Goods due to causes beyond Seller's reasonable control including, without limitation, acts of God, acts of war or terrorism, enemy actions, hostilities, strikes, labor difficulties, embargoes, non-delivery or late delivery of materials, parts and equipment or transportation delays not caused by the fault of Seller, delays caused by civil authorities, governmental regulations or orders, fire, lightening, natural disasters or any other cause beyond Seller's reasonable control. In the event of any such delay, performance will be postponed by such length of time as may be reasonably necessary to compensate for the delay.

Installation. If Buyer purchases any Goods that require installation, Buyer shall, at its expense, make all arrangements and connections necessary to install and operate the Goods. Buyer shall install the Goods in accordance with any Seller instructions and shall indemnify Seller against any and all damages, demands, suits, causes of action, claims and expenses (including actual attorneys' fees and costs) arising directly or indirectly out of Buyer's failure to properly install the Goods.

Work By Others; Safety Devices. Unless agreed to in writing by Seller, Seller has no responsibility for labor or work performed by Buyer or others, of any nature, relating to design, manufacture, fabrication, use, installation or provision of Goods. Buyer is solely responsible for furnishing and requiring its employees and customers to use all safety devices, guards and safe operating procedures required by law and/or as set forth in manuals and instruction sheets furnished by Seller. Buyer is responsible for consulting all operator manuals, ANSI or comparable safety standards, OSHA regulations and other sources of safety standards and regulations applicable to the use and operation of the Goods.

Remedies. Each of the rights and remedies of Seller under this Agreement is cumulative and in addition to any other or further remedies provided under this Agreement or at law or equity.

Attorney's Fees. In the event legal action is necessary to recover monies due from Buyer or to enforce any provision of this Agreement, Buyer shall be liable to Seller for all costs and expenses associated therewith, including Seller's actual attorney fees and costs.

Governing Law/Venue. This Agreement shall be construed and governed under the laws of the State of Wisconsin, without application of conflict of law principles. Each party agrees that all actions or proceedings arising out of or in connection with this Agreement shall be commenced, tried, and litigated only in the state courts sitting in Manitowoc County, Wisconsin or the U.S. Federal Court for the Eastern District of Wisconsin. Each party waives any right it may have to assert the doctrine of "forum non conveniens" or to object to venue to the extent that any proceeding is brought in accordance with this section. Each party consents to and waives any objection to the exercise of personal jurisdiction over it by courts described in this section. Each party waives to the fullest extent permitted by applicable law the right to a trial by jury.

Summary of Return Policy.

- 10 Day acceptance period from date of delivery. Damage claims and order discrepancies will not be accepted after this time.
- You must obtain a Baileigh issued RGA number PRIOR to returning any materials.
- Returned materials must be received at Baileigh in new condition and in original packaging.
- Altered items are not eligible for return.
- Buyer is responsible for all shipping charges.
- A 30% re-stocking fee applies to all returns.

Baileigh Industrial Holdings LLC makes every effort to ensure that our posted specifications, images, pricing and product availability are as correct and timely as possible. We apologize for any discrepancies that may occur. Baileigh Industrial Holdings LLC reserves the right to make any and all changes deemed necessary in the course of business including but not limited to pricing, product specifications, quantities, and product availability.

For Customer Service & Technical Support:
Please contact one of our knowledgeable Sales and Service team members at:
(920) 684-4990 or e-mail us at sales@baileigh.com

INTRODUCTION

The quality and reliability of the components assembled on a Baileigh Industrial Holdings LLC machine guarantee near perfect functioning, free from problems, even under the most demanding working conditions. However, if a situation arises, refer to the manual first. If a solution cannot be found, contact the distributor where you purchased our product. Make sure you have the serial number and production year of the machine (stamped on the nameplate). For replacement parts refer to the assembly numbers on the parts list drawings.

Our technical staff will do their best to help you get your machine back in working order.

In this manual you will find: (when applicable)

- Safety procedures
- Correct installation guidelines
- Description of the functional parts of the machine
- Capacity charts
- Setup and start-up instructions
- Machine operation
- Scheduled maintenance
- Parts lists

GENERAL NOTES

After receiving your equipment remove the protective container. Do a complete visual inspection, and if damage is noted, **photograph it for insurance claims** and contact your carrier at once, requesting inspection. Also contact Baileigh Industrial Holdings LLC and inform them of the unexpected occurrence. Temporarily suspend installation.

Take necessary precautions while loading / unloading or moving the machine to avoid any injuries.

Your machine is designed and manufactured to work smoothly and efficiently. Following proper maintenance instructions will help ensure this. Try and use original spare parts, whenever possible, and most importantly; **DO NOT** overload the machine or make any modifications.

Note: *This symbol refers to useful information throughout the manual.*

IMPORTANT

PLEASE READ THIS OPERATORS MANUAL CAREFULLY

It contains important safety information, instructions, and necessary operating procedures. The continual observance of these procedures will help increase your production and extend the life of the equipment.

SAFETY INSTRUCTIONS

LEARN TO RECOGNIZE SAFETY INFORMATION

This is the safety alert symbol. When you see this symbol on your machine or in this manual, **BE ALERT TO THE POTENTIAL FOR PERSONAL INJURY!**

Follow recommended precautions and safe operating practices.

UNDERSTAND SIGNAL WORDS

A signal word – **DANGER**, **WARNING**, or **CAUTION** – is used with the safety alert symbol. **NOTICE**, which is not related to personal injury, is used without a symbol.

DANGER: Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING: Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

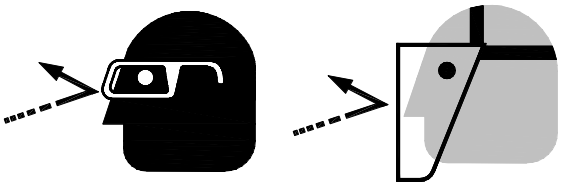
CAUTION: Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE: Indicates a situation which, if not avoided, could result in property damage.

SAVE THESE INSTRUCTIONS.
Refer to them often and use them to instruct others.

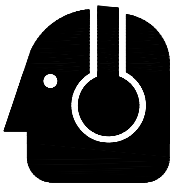
PROTECT EYES

Wear safety glasses or suitable eye protection when working on or around machinery.



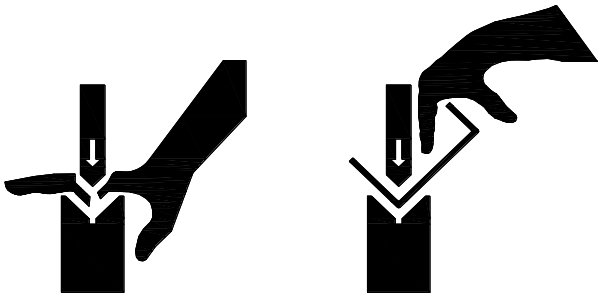
PROTECT AGAINST NOISE

Prolonged exposure to loud noise can cause impairment or loss of hearing. Wear suitable hearing protective devices such as ear muffs or earplugs to protect against objectionable or uncomfortable loud noises.



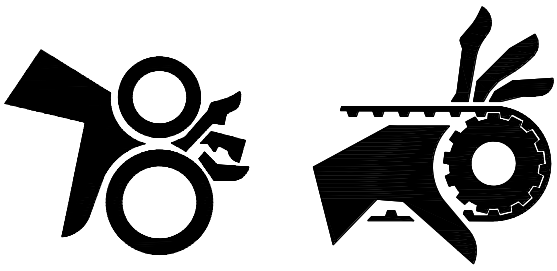
BEWARE OF CRUSH HAZARD

NEVER place your hands, fingers, or any part of your body in the die area of this machine. Be aware of the area on either side of the dies for crush points created by material movement.



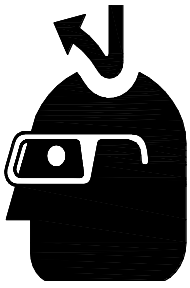
BEWARE OF PINCH POINTS

Keep hands and fingers away from the drive mechanisms, cylinders, ratchets, and other moving linkage while the machine is in operation.



KEEP CLEAR OF MOVING OBJECTS

Always be aware of the position of the material and the swing area in which the material will travel. The material will swing with significant force. This swing area will create pinch points and the force of the material movement may cause serious bodily injuries.



CALIFORNIA PROPOSITION 65

WARNING: Cancer and Reproductive Harm.
www.P65Warnings.ca.gov

SAFETY PRECAUTIONS

Metal working can be dangerous if safe and proper operating procedures are not followed. As with all machinery, there are certain hazards involved with the operation of the product. Using the machine with respect and caution will considerably lessen the possibility of personal injury. However, if normal safety precautions are overlooked or ignored, personal injury to the operator may result.
Safety equipment such as guards, hold-downs, safety glasses, dust masks and hearing protection can reduce your potential for injury. But even the best guard will not make up for poor judgment, carelessness or inattention. **Always use common sense** and exercise **caution** in the workshop. If a procedure feels dangerous, don't try it.
REMEMBER: Your personal safety is your responsibility.

WARNING: FAILURE TO FOLLOW THESE RULES MAY RESULT IN SERIOUS PERSONAL INJURY

Dear Valued Customer:

- All Baileigh machines should be used only for their intended use.
- Baileigh does not recommend or endorse making any modifications or alterations to a Baileigh machine. Modifications or alterations to a machine may pose a substantial risk of injury to the operator or others and may do substantial damage to the machine.
- Any modifications or alterations to a Baileigh machine will invalidate the machine's warranty.

PLEASE ENJOY YOUR BAILEIGH MACHINE! ....PLEASE ENJOY IT SAFELY!

1. **FOR YOUR OWN SAFETY, READ INSTRUCTION MANUAL BEFORE OPERATING THE MACHINE.** Learn the machine's application and limitations as well as the specific hazards.
2. **Only trained and qualified personnel can operate this machine.**
3. **Make sure guards are in place and in proper working order before operating machinery.**

4. **Remove any adjusting tools.** Before operating the machine, make sure any adjusting tools have been removed.
5. **Keep work area clean.** Cluttered areas invite injuries.
6. **Overloading machine.** By overloading the machine you may cause injury from flying parts. **DO NOT** exceed the specified machine capacities.
7. **Dressing material edges.** Always chamfer and deburr all sharp edges.
8. **Do not force tool.** Your machine will do a better and safer job if used as intended. **DO NOT** use inappropriate attachments in an attempt to exceed the machines rated capacity.
9. **Use the right tool for the job. DO NOT** attempt to force a small tool or attachment to do the work of a large industrial tool. **DO NOT** use a tool for a purpose for which it was not intended.
10. **Dress appropriate. DO NOT** wear loose fitting clothing or jewelry as they can be caught in moving machine parts. Protective clothing and steel toe shoes are recommended when using machinery. Wear a restrictive hair covering to contain long hair.
11. **Use eye protection**. Always wear ISO approved protective eye wear when operating machinery. Wear a full-face shield if you are producing metal filings. Eye wear shall be impact resistant, protective safety glasses with side shields which comply with ANSI Z87.1 specification. Use of eye wear which does not comply with ANSI Z87.1 specification could result in severe injury from breakage of eye protection.
12. **Do not overreach**. Maintain proper footing and balance at all times. **DO NOT** reach over or across a running machine.
13. **Stay alert**. Watch what you are doing and use common sense. **DO NOT** operate any tool or machine when you are tired.
14. **Check for damaged parts**. Before using any tool or machine, carefully check any part that appears damaged. Check for alignment and binding of moving parts that may affect proper machine operation.
15. **Observe work area conditions**. **DO NOT** use machines or power tools in damp or wet locations. Do not expose to rain. Keep work area well lighted. **DO NOT** use electrically powered tools in the presence of flammable gases or liquids.
16. **Keep children away**. Children must never be allowed in the work area. **DO NOT** let them handle machines, tools, or extension cords.
17. **Store idle equipment**. When not in use, tools must be stored in a dry location to inhibit rust. Always lock up tools and keep them out of reach of children.
18. **DO NOT operate machine if under the influence of alcohol or drugs**. Read warning labels on prescriptions. If there is any doubt, **DO NOT** operate the machine.
19. Keep visitors a safe distance from the work area.

TECHNICAL SPECIFICATIONS

Maximum Center Line Radius (CLR)*	7" (178mm)
Minimum Center Line Radius (CLR)*	3" (76mm)
Minimum OD	.75" (19mm)
Mild Steel Pipe (Schedule 40)	Call for Details
Stainless Steel Pipe (Schedule 40)	Call for Details
Mild Steel Round Tube (Wall)	2.5" (.120) (63.5mm [3mm])
Aluminum Round Tube (Wall)	2.5" (.120) (63.5mm [3mm])
Stainless Steel Round Tube (Wall)	2" (.120) (50.8mm [3mm])
Chromolly Round Tube (Wall)	2" (.120) (50.8mm [3mm])
Mild Steel Solid Rod	1" (25.4mm)
Mild Steel Square Tube (Wall)	1" (.125) (25.4mm [3.175mm])
Shipping Weight (Lbs.)	300lbs. (136kg)
Shipping Dimensions (L x W x H)	35.5” x 35.5” x 17” (900 x 900 x 430mm)

*CLR will vary based upon actual material and wall thickness.

TECHNICAL SUPPORT

Our technical support department can be reached at 920.684.4990 and asking for the support desk for purchased machines. Tech Support handles questions on machine setup, schematics, warranty issues, and individual parts needs: (other than die sets and blades).

For specific application needs or future machine purchases contact the Sales Department at: sales@baileigh.com, Phone: 920.684.4990, or Fax: 920.684.3944.

***Note**: The photos and illustrations used in this manual are representative only and may not depict the actual color, labeling or accessories and may be intended to illustrate technique only.*

***Note:** The specifications and dimensions presented here are subject to change without prior notice due to improvements of our products.*

UNPACKING AND CHECKING CONTENTS

Your Baileigh machine is shipped complete. Separate all parts from the packing material and check each item carefully. Make certain all items are accounted for before discarding any packing material.

WARNING: SUFFOCATION HAZARD! Immediately discard any plastic bags and packing materials to eliminate choking and suffocation hazards to children and animals.
If any parts are missing, DO NOT place the machine into service until the missing parts are obtained and installed correctly.

Cleaning

WARNING: DO NOT USE gasoline or other petroleum products to clean the machine. They have low flash points and can explode or cause fire.

CAUTION: When using cleaning solvents work in a well-ventilated area. Many cleaning solvents are toxic if inhaled.

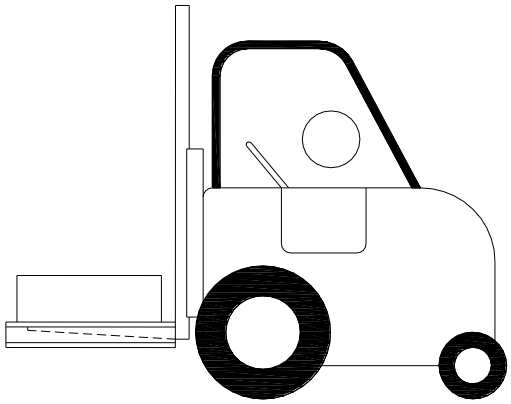
Your machine may be shipped with a rustproof waxy coating and/or grease on the exposed unpainted metal surfaces. Fully and completely remove this protective coating using a degreaser or solvent cleaner. Moving items will need to be moved along their travel path to allow for cleaning the entire surface. For a more thorough cleaning, some parts will occasionally have to be removed. **DO NOT USE** acetone or brake cleaner as they may damage painted surfaces.
Follow manufacturer's label instructions when using any type of cleaning product. After cleaning, wipe unpainted metal surfaces with a light coating of quality oil or grease for protection.

Important: *This waxy coating is **NOT** a lubricant and will cause the machine to stick and lose performance as the coating continues to dry.*

TRANSPORTING AND LIFTING

NOTICE: *Lifting and carrying operations should be carried out by skilled workers, such as a truck operator, crane operator, etc. If a crane is used to lift the machine, attach the lifting chain carefully, making sure the machine is well balanced.*

Follow these guidelines when lifting with truck or trolley:



- The lift truck must be able to lift at least 1.5 – 2 times the machines gross weight.
- Make sure the machine is balanced. While transporting, avoid rough or jerky motion, and maintain a safe clearance zone around the transport area.
- Use a forklift with sufficient lifting capacity and forks that are long enough to reach the complete width of the machine.
- Remove the securing bolts that attach the machine to the pallet.
- Approaching the machine from the side, lift the machine on the frame taking care that there are no cables or pipes in the area of the forks.
- Move the machine to the required position and lower gently to the floor.
- Level the machine so that all the supporting feet are taking the weight of the machine and no rocking is taking place.

INSTALLATION

IMPORTANT:

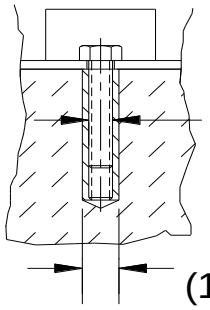
Consider the following when looking for a suitable location to place the machine:

- Overall weight of the machine.
- Weight of material being processed.
- Sizes of material to be processed through the machine.
- Space needed for auxiliary stands, worktables, or other machinery.
- Clearance from walls and other obstacles.
- Maintain an adequate working area around the machine for safety.
- Have the work area well illuminated with proper lighting.
- Keep the floor free of oil and make sure it is not slippery.

- Remove scrap and waste materials regularly, and make sure the work area is free from obstructing objects.
- If long lengths of material are to be fed into the machine, make sure that they will not extend into any aisles.
- **LEVELING:** The machine should be sited on a level, concrete floor. Provisions for securing it should be in position prior to placing the machine. The accuracy of any machine depends on the precise placement of it to the mounting surface.
- **FLOOR:** This machine distributes a large amount of weight over a small area. Make certain that the floor is capable of supporting the weight of the machine, work stock, and the operator. The floor should also be a level surface. If the unit wobbles or rocks once in place, be sure to eliminate by using shims.
- **WORKING CLEARANCES:** Take into consideration the size of the material to be processed. Make sure that you allow enough space for you to operate the machine freely.

Anchoring the Machine

- Once positioned, anchor the machine to the floor, as shown in the diagram. Use bolts and expansion plugs or sunken tie rods that connect through and are sized for the holes in the base of the stand.
- This machine requires a solid floor such as concrete at a minimum of 4” (102mm) thick. 6” (153mm) minimum is preferred.

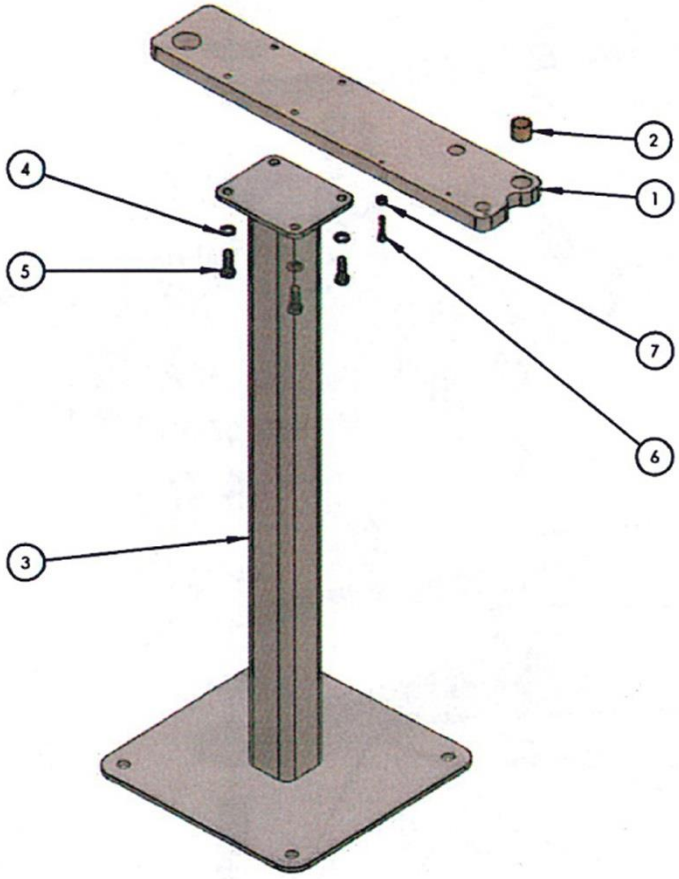


NOTICE: If the machine is not anchored to the floor, it will twist and rotate during bending. It will also be tippy when loaded with long material.

ASSEMBLY AND SET UP

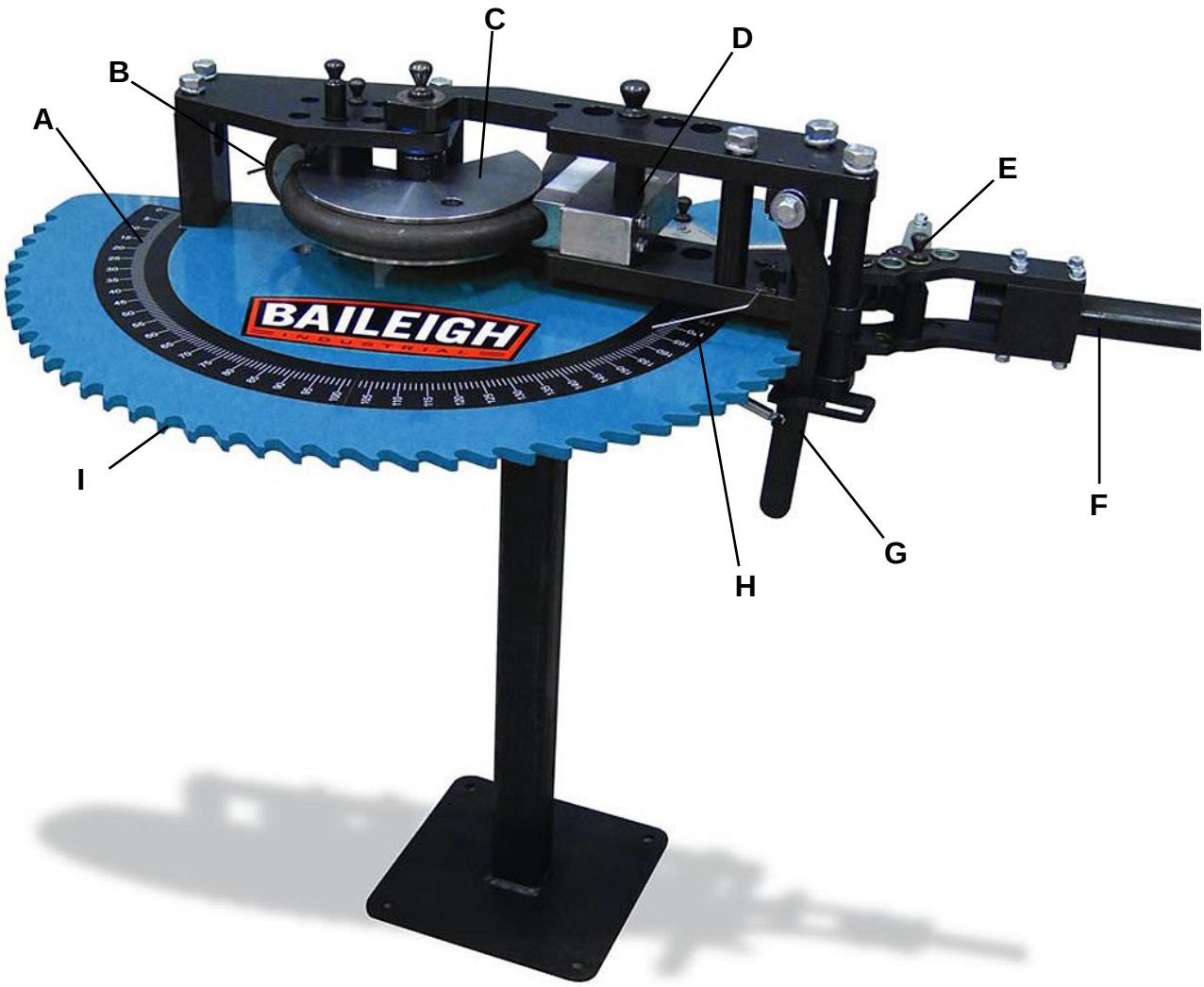
WARNING: For your own safety, DO NOT connect the machine to the power source until the machine is completely assembled and you read and understand the entire instruction manual.

1. Unpack and remove the machine from the crate it was shipped in.
2. Install the bender assembly (1, bottom plate) (full ratchet plate assembly not shown for clarity), onto the stand using the fasteners (4 and 5) shown.



3. Remove the pivot bolt and install the anti-springback lever into the latch plate and re-install and tighten the pivot bolt.
4. Connect the latch spring.
5. Read through the remainder of the manual and become familiar with the die installation and settings as well as normal operation.
6. Position the machine as desired following the installation guidelines.

GETTING TO KNOW YOUR MACHINE



Item	Description	Function
A	Bend Angle Scale	A graduated scale used to indicates the bend angle that the spindle is currently positioned at.
B	Sleeve Holder with Sleeve	Used to grip and hold the material during the bending process.
C	Forming Die (shown with a 180° forming die installed)	The Material is formed to the radius and contour of this die.
D	Counter Die	Presses the material into the forming die during bending. Must match the forming die.
E	Speed/Leverage Pin	Changes the leverage and the speed of the bending rotation for the ratchet plate. Closer to the plate equals slower speed with greater leverage.
F	Pull Handle Assembly	Supply the bending force to rotate the bending plate.
G	Anti-springback Lever	Disengages the lock pin from the locking teeth.
H	Bend Angle Pointer	Pointer indicated the bending degrees on the bend angle scale.
I	Ratchet Plate	Supports the bend tooling and frame. Rotates during the bending process.

GENERAL DESIGN DESCRIPTION

You have made a practical choice in purchasing the RDB-050 Manual Bending Machine. It has been carefully built of high quality materials and designed to give many years of efficient service. The simplicity of design and minimum effort required to operate the machine contributes towards meeting schedules and producing greater profits.

The RDB-050 is a manually powered “Rotary Draw” bending machine. To bend material, a bending die and hook sleeve are required. The material is hooked by the hook sleeve and is powerfully rotated in the clockwise direction. As the bending die rotates, the counter die forces the material to conform to the radius and shape of the bending die. This machine is capable of producing 180 degree bends (200 deg. max.) by continuing to pull release and pull the ratchet handle. Each pull of the ratchet handle produces approximately 4 degrees of movement.

The RDB-050 Bending Machine you have purchased is built of solid steel ensuring maximum rigidity. Grade 8 bolts throughout provides very high rigidity and stability.

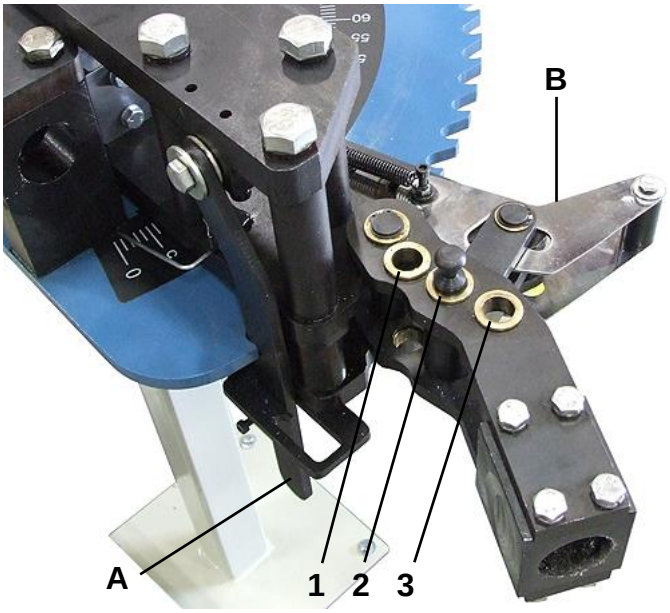
Throughout this manual are listed various safety-related descriptions for attention. These matters for attention contain the essential information to the operators while operating, and maintaining. Failure to follow these instructions may result in great damage to the machine or injury to the operator.

OPERATION

⚠ CAUTION: Always wear proper eye protection with side shields, safety footwear, and leather gloves to protect from burrs and sharp edges.

Bending

1. Before actually bending, several "dry runs" should be performed to familiarize yourself with all of the machine functions.
2. Keep hands away from the bending zone.
3. With the drive lever and the ratchet wheel in the home (0°) position, bending or dry running can take place.
4. Depending on the material size, you will need to choose bending speed 1, 2, or 3. Until you are familiar with the machine always start bending using speed 1. You can change speeds at any time during a bend. If it is easy for the user to pull on the bending handle, then the speed can be increased if desired.



5. Each pull of the handle equals the degrees listed below.
    a. 4 degrees per pull in speed 1
    b. 8 degrees per pull in speed 2
    c. 12 degrees per pull in speed 3
    d. Increasing speed increases pulling effort of the bending handle.
6. When the machine is in the home position, engage the anti-springback lever (A).
7. Next engage the ratchet release lever (B).
8. Without material in the machine. Pull on the ratchet wheel clockwise. You will hear a "click" every time the lever is cycled through one stroke in speed 1. Return the lever counter clockwise and you will hear another "click". You just engaged another tooth on the ratchet wheel. Continue though these cycles and you can "bend" or "ratchet" all the way to 200 deg.
9. If you select speed two, you will hear 2 clicks with each full stroke of the handle, and 3 clicks on speed three.

⚠ CAUTION: It is important to release pressure gently. If the anti-springback lever is released without caution, the handle assembly and ratchet wheel can violently whip around possibly causing injury.

10. When the desired degree position is reached, the anti-springback lever (A) needs to be deactivated to release the material. If the machine has a heavy bending load on it, you may have to pull the bending lever forward to relieve the pressure allowing you to release the anti-springback lever.
11. Now that the pressure is released, you can disengage the ratchet release lever (B).
12. The ratchet wheel is now free to rotate back to the home (0°) position.
13. To bend with material, go to the next section for instruction on how to choose and install the bending dies.
14. After the dies are installed, insert material through the hook sleeve aligning the start of bend with the "0" mark on the die.
15. Select a speed and follow the above steps and begin ratcheting the machine until you feel tension on the pull lever. As your tubing just begins to bend, position your pointer to the "0" on the decree dial. This will compensate for most of your "springback".

Die Selection

⚠ ***IMPORTANT:*** *Damaged or worn tooling should be replaced before attempting to bend material. This will ensure that bends are correct and provide a longer life to machine components.*

1. Before any bending can take place, the proper die set must be chosen to match the material being bent. Example; 1-1/2" diameter tubing requires a die set marked 1-1/2" tube.
2. Two different types of dies are available. 90 degree and 180 degree dies. The 180 degree dies allow you to bend to a full 180 degrees, and the 90 degree dies will allow you to bend to 90 degrees.
3. "Pipe" and "Tube" are not the same. All of the dies will be marked in actual outside diameter (OD) of the material. This will relate directly to "Tube" dimensions. For “Pipe” dimensions, refer to Table #1 near the back of the manual for the “Pipe Size Table” to find the standard pipe OD dimensions.

Caution: When installing large dies use another person to help load into the machine.

Die Installation

1. To install the die. Remove all of the pivot pins and install them in their storage area to the left of the ratchet wheel.
2. Choose either a 90 or 180 degree die set. Locate the dies center hole with the center of the machine.
3. Install the 1" diameter main die pin through the center and all the way until the snap ring bottoms out.
4. Next install the 7/8" die drive pin into the holes that line up with the respective machine hole.
5. Locate the proper hook sleeve holder and position it so the center of the assembly lines up with the centerline radius of the die and install the 3/4" hook pin. There are two different hook sleeve holders. One for whole number nominal CLR dies (ie: 4.0 clr) and one for fractional (0.5) increment dies (ie: 4.5 clr).
6. Choose a counter die that matches your bend die and install the 1-1/4" counter die pin so the gap between the die and the counter die is approximately 1/8". For dies under 3.5 clr, the 3/4" die counterdie pin supplied with the machine will be used.

Correct counter die position is approximately 1/8' away from the forming die.

IMPORTANT: *It is critical that ail of the pins are fully seated down to the snap ring. If you attempt to bend without making sure the pins are fully down machine damage will occur and this will not be covered under warranty.*

Material Insertion

1. Once the die set is properly installed, the material that matches the die can be inserted (I.E. 1-1/4”tube would go into a die mark DS-**-1250T-R***).
2. With the ratchet wheel in the home (0°) position insert the material through the counter die and forming die and into the hook sleeve so that the material extends at least 1/4" past the sleeve or until the until the material is at the position of the desired bend. The start of bend mark is engraved with an “O” on the top of the die. Once the material is placed properly, the counter die slide block assembly can be tightened.

***Important**: Liberally apply lubricant along the counterdie and the 1/2 of the material that contacts the counter die with a WD-40 style lubricant or equivalent. Do not lubricate the bending die or the hook sleeve. Lubricating the bending die and hook sleeve will encourage slipping of material during the bend.*

3. Follow the bending steps to bend the material to the desired degrees.

Material Insertion Limitations

- Using the Material Layout formula, calculate the amount of material that will be pulled through the die.
- Verify that the material is long enough to provide at least 80% coverage in the counter die at the end of the bend. This will provide enough material remaining in the counter die to be fully supported in plastic slide.
- Extreme care must be taken when bending material with an existing bend. There must be enough straight material to complete the bend. If there is not enough material the bent part of the material will crash into the counter die and damage the machine and tooling.

***IMPORTANT:** Orienting your material in this fashion will cause damage to your tooling and machine!! DO NOT pull bent material into the counter die! Make sure you have enough straight material on the draw side of the material to create your bend.*

UNDERSTANDING SPRINGBACK

Springback can be difficult to understand. As material is bent, the materials yield strength resists being formed. As a final degree is reached, the machine will have enough power to hold the bend at a set degree, but as the pressure of the machine is released, the material has a resistance built in, so it “springs back”
Springback will vary with every size, type and wall thickness, so it will never be consistent from size to size.
The best way to determine a materials springback is to do sample bends to 90 degrees until a perfect 90 is obtained.

- At that point document the actual machine degrees.
- Full manual mode is the best place to do these tests.
- Use the overbend amount and enter that value into the springback field.

MATERIAL SELECTION

⚠ CAUTION: It must be determined by the customer that materials being processed through the machine are NOT potentially hazardous to operator or personnel working nearby.

When selecting materials keep these instructions in mind:

- Material must be clean and dry. (without oil)
- Material should have a smooth surface so it processes easily.
- Dimensional properties of material must be consistent and not exceed the machine capacity values.
- Chemical structure of material must be consistent.
- Buy certificated steel from the same vendor when possible.

MATERIAL LAYOUT

In order to create accurate parts, you will have to layout the material in flat form. First you will need to determine how much material is used per degree of bend. Use the multiplier table on Table #3 to determine the arc lengths for the die in use. Or use the following formula:

Alternate arc length formula:

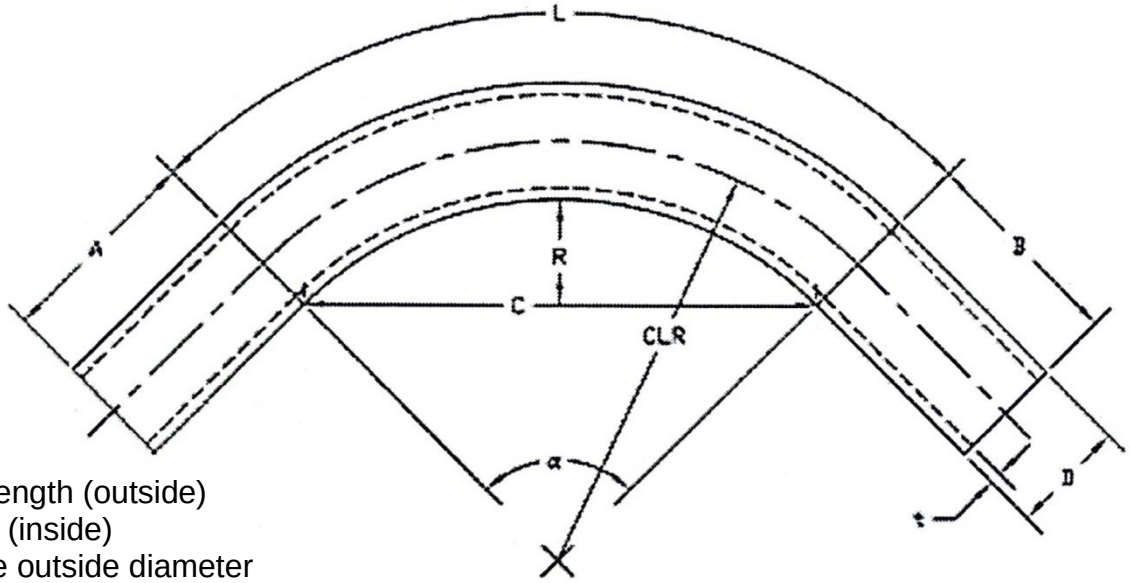
Example: 6.0 clr x2=12 12x3.14=37.699 37.699/360=0.1047” per degree
0.1047x 90 degrees =9.425” of material used for a 90 degree bend.

Once the arc lengths are determined you can begin layout of the material using Diagram #1 as a reference.

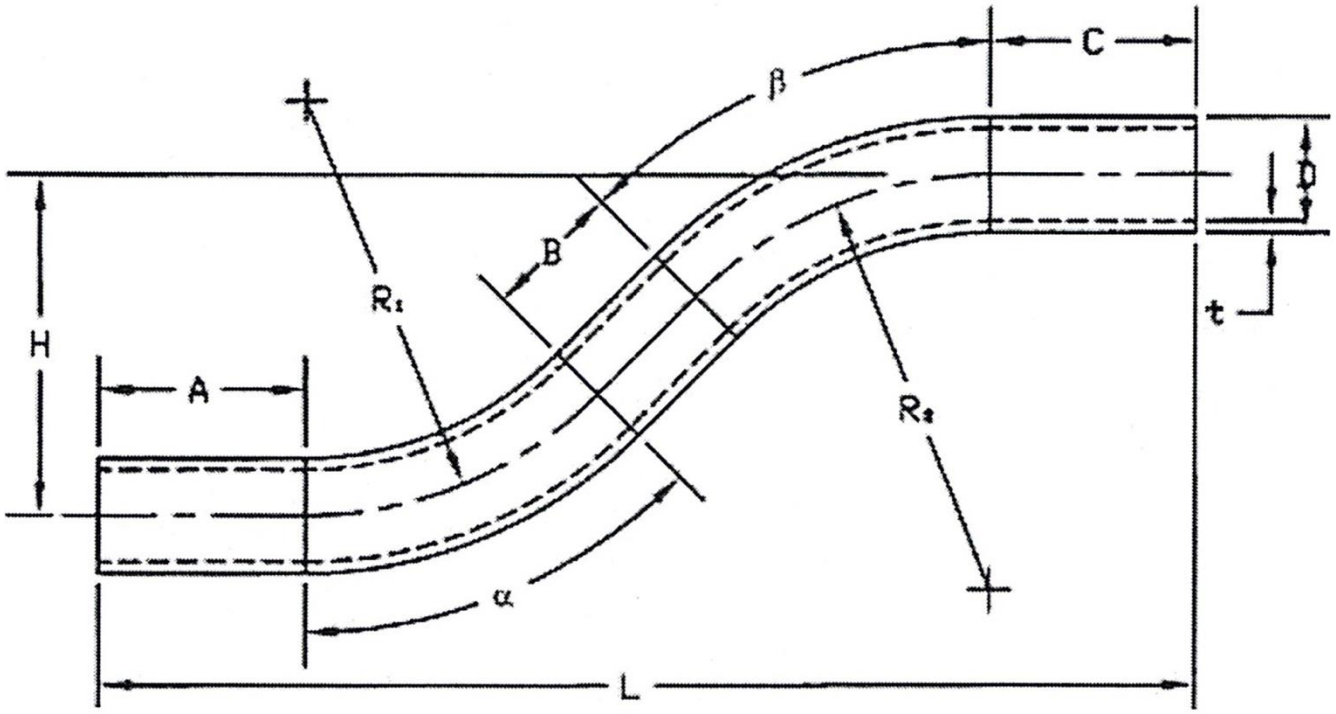
- Diagram #1 shows a simple part bent on the same plane in the same direction.
- Diagram #2 shows bending based off of a centerline in two directions.
- For symmetrical bends, centerline bending is easiest.
- For non-symmetrical bends, continuous one direction bending is best.

- Another way to layout material is to draw them in a 2D computer software program like Auto Cad. There are many free programs on the internet. In a 2D program you will draw the parts centerline only with corresponding clr’s. Then you will be able to list individual segments of the bent part. This data can be directly entered into the control.
- Another program available is BEND-TECH which is a program specifically designed for tube bending and will give you all of the required data to make a part. This software is available from Baileigh Industrial.
- Bending with a rotary draw bender requires determining the start of bend point which will line up with the “0” mark on the die. The portion of the tube toward the hook arm will be locked to the die, the portion toward the counter die is the draw side and will slide along the counter die and conform to the dies shape/radius.

PIPE AND TUBE BENDING DIAGRAMS



L = Arc length (outside)
R = Rise (inside)
D = Tube outside diameter
t = Tube wall thickness



a = First bend arc angle
b = Second bend arc angle
A = First tangent
B = Straight between bends
C = Second tangent
D = Tube outside diameter

H = Height of offset
L = Length of offset
R1 = First radius
R2 = Second radius
t = Tube Wall Thickness

BENDING GLOSSARY

Arc Length	The length of material along the centerline of the tubing
Centerline Radius (CLR)	Distance in inches from the center of curvature to the centerline axis of the tube bending or pipe bending bends. Abbreviated as CLR. See Tube Bending and Pipe Bending Diagram
Degree	Angle in degrees to which the tube/pipe bends are formed (i.e. 45 degrees, 90 degrees, 180 degrees, etc.)
Easy Way (EW)	Bending of a rectangular tube with its short side in the plane of the tube or pipe bend
Hard Way (HW)	Bending of a rectangular tube with its long side in the plane of the tube or pipe bend
I.D.	Inside diameter of the tube or pipe bends
Minimum Tangent	The minimum straight on the end of pipe bends required by the bending machine to form the bend
Neutral Axis	That portion of the pipe or tube that is neither in compression or tension.
O.D.	Outside diameter in inches of the tube or pipe
Out of Plane	The deviation of the horizontal plane of a single pipe bend between its tangent points, based on the theoretical center-line of the pipe bend
Ovality	The distortion or flattening of pipe or tube from its normal, round shape caused by the pipe bending process
Springback	Amount of degrees material will return after bending pressure is released
Tangent	The straight portion of material on either side of arc of bending bends. See Tube Bending and Pipe Bending Diagrams.
Tangent Point	The point at which the bend starts or ends. See Tube Bending and Pipe Bending Diagrams.
Wall	The thickness in inches of tubular pipe bending material.
Wrinkles	Waving or corrugation of pipe bending bends in the inner radius.

BENDING SUGGESTIONS

Aluminum Bending

If bending aluminum, lubrication is very important, if the results are less than desirable with WD-40 other lubricants can be used such as:

- Johnson Paste Wax (seems to work the best)
- High Pressure grease
- Highly rich dish soap
- The bronze counter die must be polished and have no aluminum deposits or it will continue to pick up metal.
- Some aluminum will crack as it is being bent, 6061-T6 is very hard and may need to be annealed or ordered in the “T-0” condition. Aluminum will age harden so if possible try to get freshly run material.

Heavy Wall DOM tubing

If heavy wall materials are bent to a tight radius, they can tend to slip in the hook arm causing a poor bend result, below are some suggestions

- Use a vise clamp on the outside of the hook arm to “lock” the material in place.
- Use a piece of two sided coarse emery cloth in between the hook arm and the material, this works very well.
- In only this application, high pressure grease applied to the DIE GROOVE also helps.

LUBRICATION AND MAINTENANCE

WARNING: Make sure the electrical disconnect is OFF before working on the machine.
Maintenance should be performed on a regular basis by qualified personnel.
Always follow proper safety precautions when working on or around any machinery.

- Check daily for any unsafe conditions and fix immediately.
- Check that all nuts and bolts are properly tightened.
- On a weekly basis clean the machine and the area around it.
- Lubricate threaded components and sliding devices.
- Apply rust inhibitive lubricant to all non-painted surfaces.

***Note**: Proper maintenance can increase the life expectancy of your machine.*

- There are two grease zerks on the machine, at the main spindle pivots. Grease these zerks every month with only two pumps from a standard grease gun.
- Check for any loose or worn parts

TABLES, CHARTS, & DIAGRAMS

Table 1 Standard Pipe Sizes and Schedules

PIPE SIZES	O.D.	Pipe Schedules and Wall Thickness					
		5	10	40	80	160	XX STRONG
1/8	0.405	0.400	0.050	0.068	0.095		
1/4	0.540	0.500	0.070	0.088	0.119		
3/8	0.675	0.500	0.070	0.091	0.126		
1/2	0.840	0.700	0.080	0.109	0.147	0.188	0.294
3/4	1.050	0.700	0.080	0.113	0.154	0.219	0.308
1	1.315	0.700	0.110	0.133	0.179	0.250	0.358
1-1/4	1.660	0.700	0.110	0.140	0.191	0.250	0.382
1-1/2	1.900	0.700	0.110	0.145	0.200	0.281	0.400
2	2.375	0.700	0.110	0.154	0.218	0.344	0.436
2-1/2	2.875	0.800	0.120	0.203	0.276	0.375	0.552

Table 2 ARC LENGTH TABLE

EXAMPLE: Arc Length = Constant x Bend Radius. Example: 90deg bend with 6” clr
EXAMPLE: 1.575 (from table) x 6” (clr) = 9.45” (Arc Length)
For bends more than 90deg, Constants can be added together.

Degrees	Constant	Degrees	Constant	Degrees	Constant
1	0.0175	31	0.5410	61	1.0645
2	0.0349	32	0.5584	62	1.0819
3	0.0524	33	0.5759	63	1.0994
4	0.0698	34	0.5933	64	1.1168
5	0.0873	35	0.6108	65	1.1343
6	0.1047	36	0.6282	66	1.1517
7	0.1222	37	0.6457	67	1.1692
8	0.1396	38	0.6631	68	1.1866
9	0.1571	39	0.6806	69	1.2041
10	0.1745	40	0.6980	70	1.2215
11	0.1920	41	0.7155	71	1.2390
12	0.2094	42	0.7329	72	1.2564
13	0.2269	43	0.7504	73	1.2739
14	0.2443	44	0.7678	74	1.2913
15	0.2618	45	0.7853	75	1.3088
16	0.2792	46	0.8027	76	1.3262
17	0.2967	47	0.8202	77	1.3437
18	0.3141	48	0.8376	78	1.3611
19	0.3316	49	0.8551	79	1.3786
20	0.3490	50	0.8725	80	1.3960
21	0.3665	51	0.8900	81	1.4135
22	0.3839	52	0.9074	82	1.4309
23	0.4014	53	0.9249	83	1.4484
24	0.4188	54	0.9423	84	1.4658
25	0.4363	55	0.9598	85	1.4833
26	0.4537	56	0.9772	86	1.5007
27	0.4712	57	0.9947	87	1.5182
28	0.4886	58	1.0121	88	1.5356
29	0.5061	59	1.0296	89	1.5531
30	0.5235	60	1.0470	90	1.5705

Diagram 1

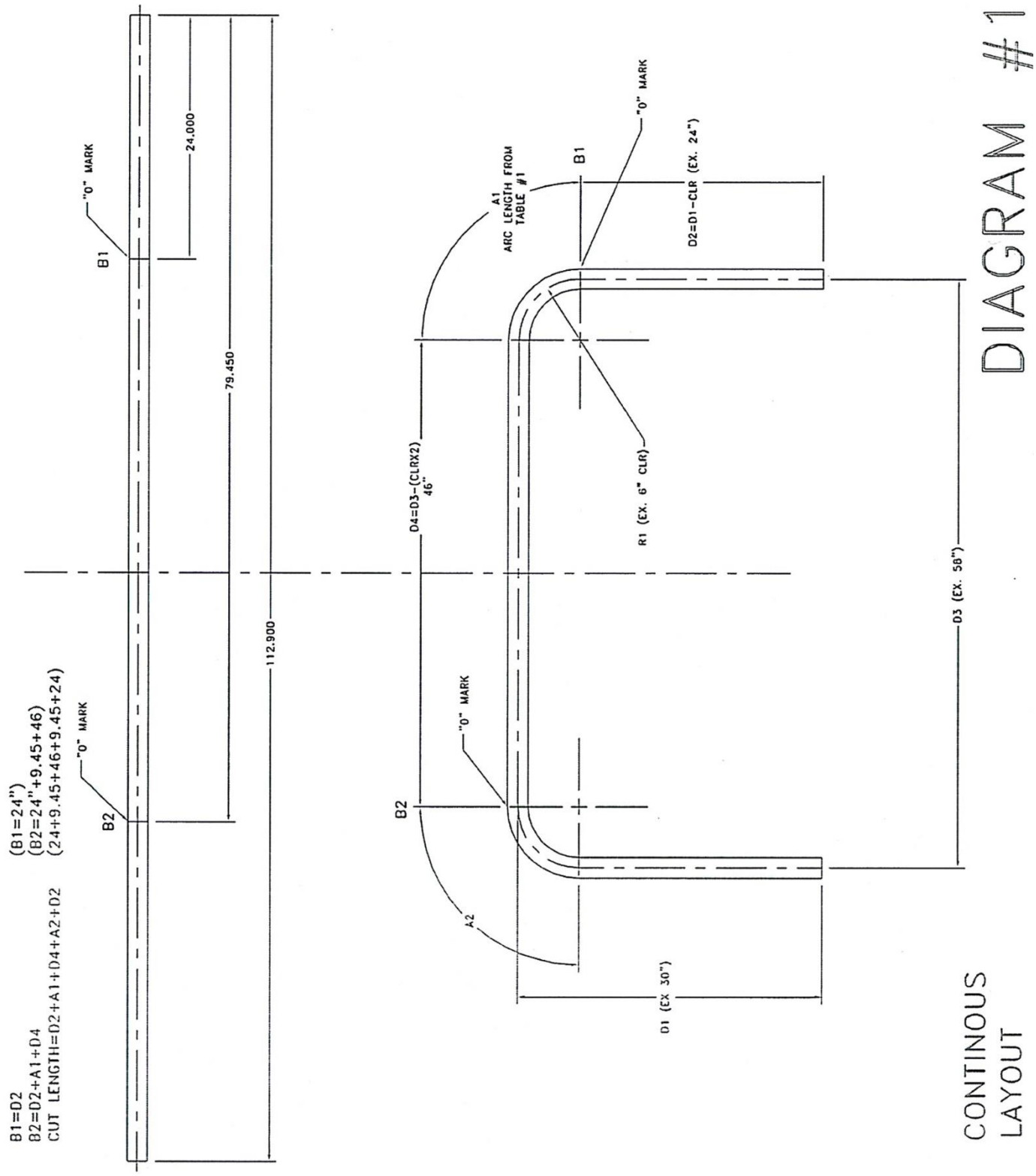


DIAGRAM #1
CONTINOUS LAYOUT
B1=D2
B2=D2+A1+D4
CUT LENGTH=D2+A1+D4+A2+D2
(B1=24")
(B2=24"+9.45+46)
(24+9.45+46+9.45+24)
"0" MARK
B1
B2
24.000
79.450
112.900
A1
ARC LENGTH FROM TABLE #1
D2=D1-CLR (EX. 24")
R1 (EX. 6" CLR)
D4=D3-(CLRX2)
46"
D3 (EX. 58")
A2
D1 (EX 30")

Diagram2

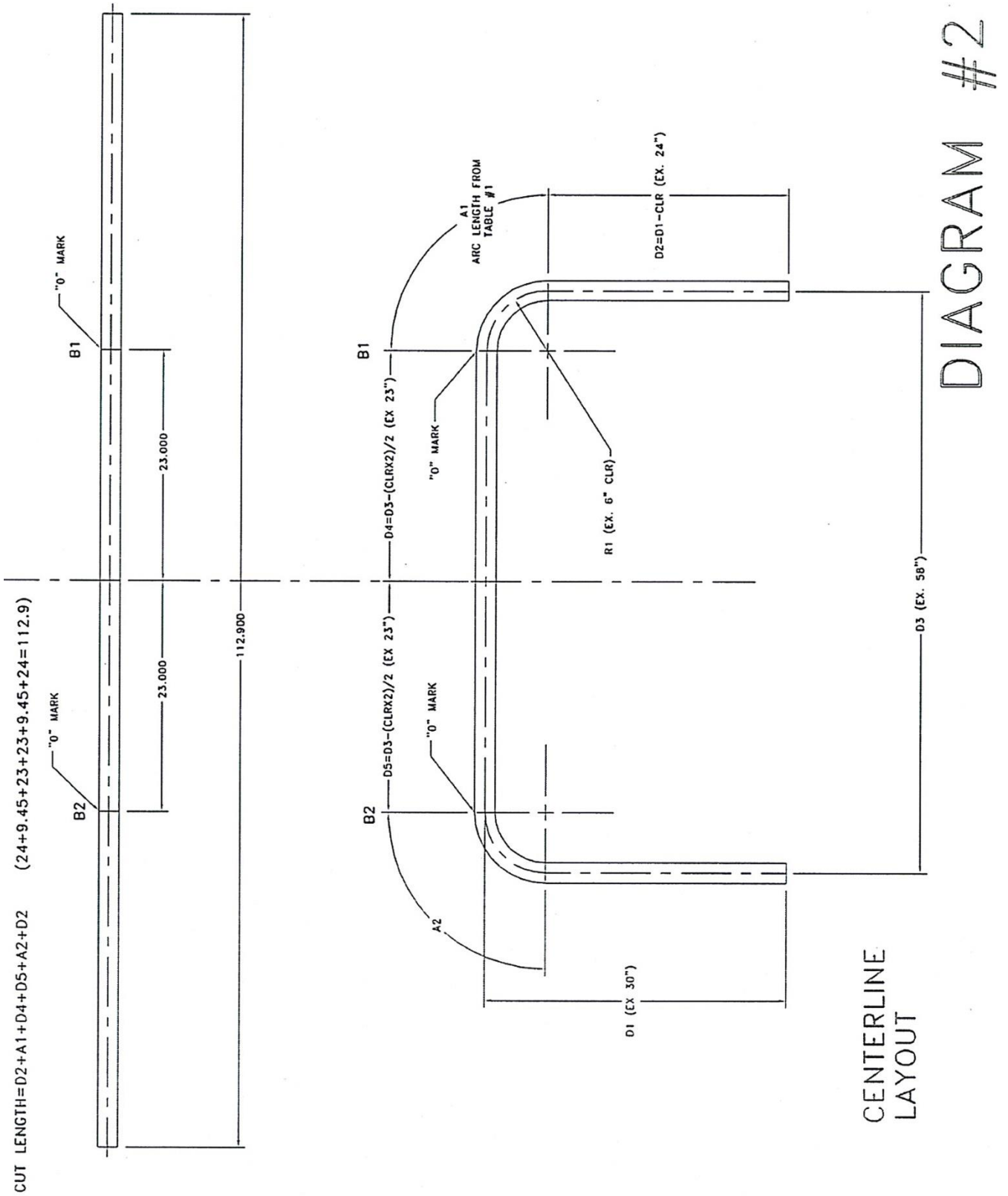
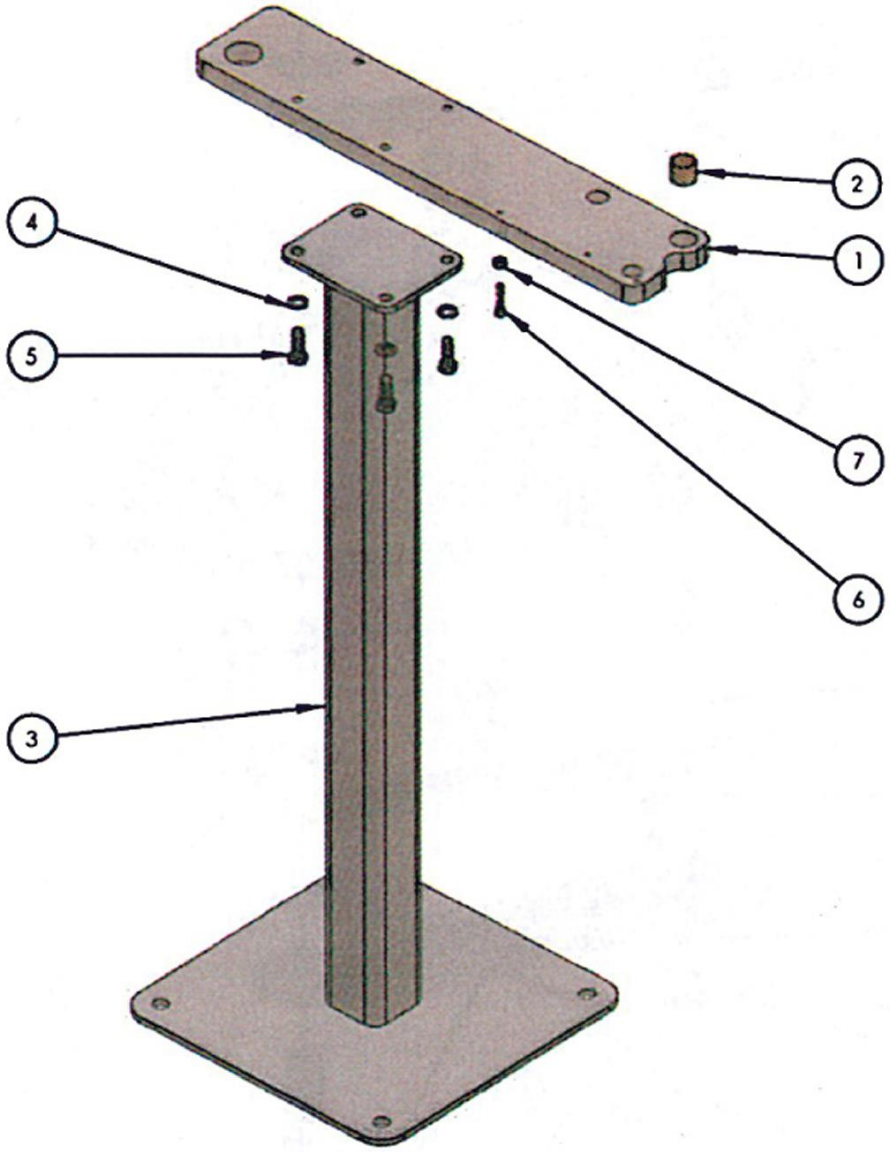


DIAGRAM #2
CENTERLINE LAYOUT
CUT LENGTH=D2+A1+D4+D5+A2+D2 (24+9.45+23+23+9.45+24=112.9)
B1
B2
"0" MARK
23.000
23.000
112.900
A1 ARC LENGTH FROM TABLE #1
D2=D1-CLR (EX. 24")
D4=D3-(CLRX2)/2 (EX 23")
D5=D3-(CLRX2)/2 (EX 23")
R1 (EX. 6" CLR)
D3 (EX. 58")
A2
D1 (EX 30")

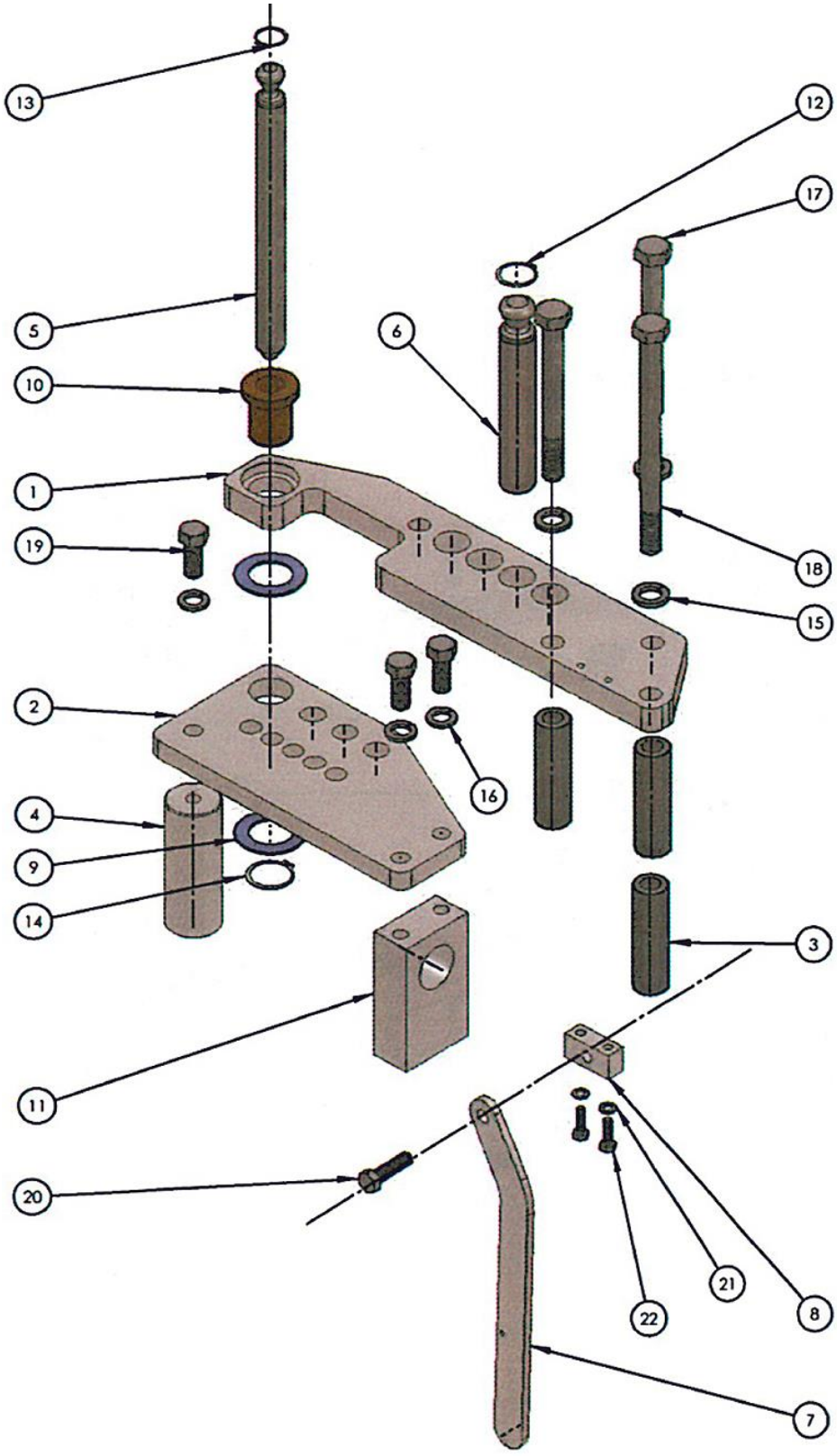
STAND ASSEMBLY PARTS DIAGRAM



Stand Assembly Parts List

Item	Part No.	Description	Qty.
1	M050-6A002	Bottom Plate	1
2	AA-838-16	Sleeve Bushing	1
3	M050-5A005	Stand Weldment	1
4	LW 0.375	3/8” Lockwasher	4
5	0.375-16 x 1.00 HHCS	3/8”-16 x1” Hex Head Cap Screw	4
6	0.250”-20 x 1.00 SHCS	1/4"-20 x 1” Socket Head Cap Screw	1
7	0.250-20 Hex Nut	18/4”-20 Hex Nut	1

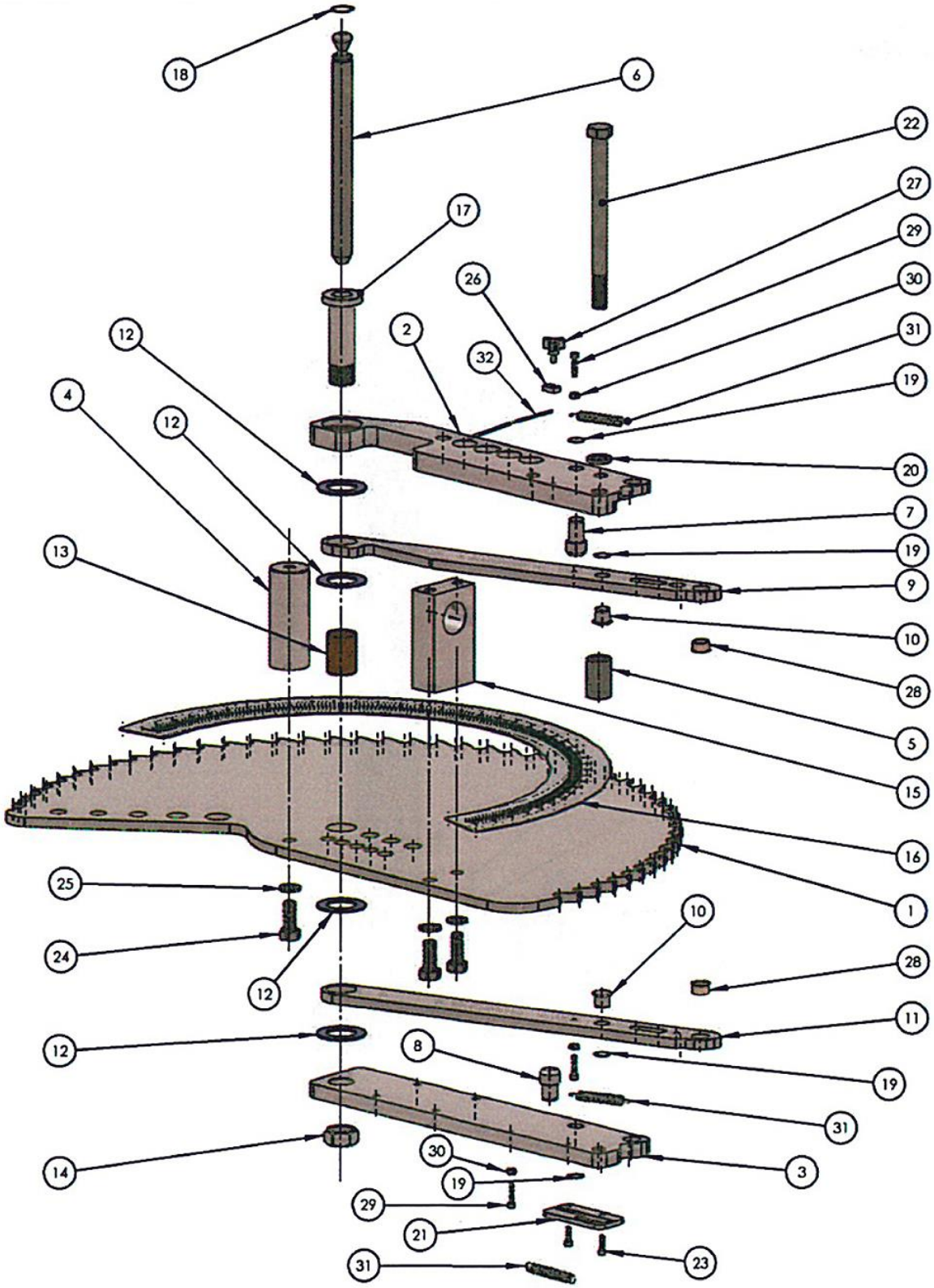
TOP FRAME ASSEMBLY PARTS DIAGRAM



Top Frame Assembly Parts List

Item	Part No.	Description	Qty.
1	M050-6A004	Top Plate	1
2	M050-6A005	Pin Plate	1
3	M050-7A002	Spacer Tube	3
4	M050-7A016	Plate Spacer	1
5	M050-7A003	Main Die Pin	1
6	M050-7A005	Counter Die Pin (Large)	1
7	M050-6A010	Spring Back Lever	1
8	M050-6A009	Lever Pivot Block	1
9	M050-7A007	Thrust Washer 1/8”	2
10	M050-7A008	Top Bushing	1
11	M050-6A025	Rectangular Spacer	1
12	1250 Snap Ring	1-1/4” Snap Ring (External)	1
13	1000 Snap Ring	1” Snap Ring (External)	1
14	1500 Snap Ring	1-1/2” Snap Ring (External)	1
15	LW 0.75	3/4" Split Ring Lockwasher	3
16	LW 0.625	5/8" Split Ring Lockwasher	3
17	0.75-10 x 6.50 HHCS	3/4"-10 x 6-1/2” Hex Head Cap Screw	2
18	0.75-10 x 9.00 HHCS	3/4"-10 x 9” Hex Head Cap Screw	1
19	0.625-11 x 1.50 HHCS	5/8"-11 x 1-1/2” Hex Head Cap Screw	3
20	0.500-13 x 1.75 HHCS	1/2"-13 x 1-3/4” Hex Head Cap Screw	1
21	LW 0.3125	5/16" Split Ring Lockwasher	2
22	0.313-18 x 1.00 HHCS	5/16"-18 x 1” Hex Head Cap Screw	2

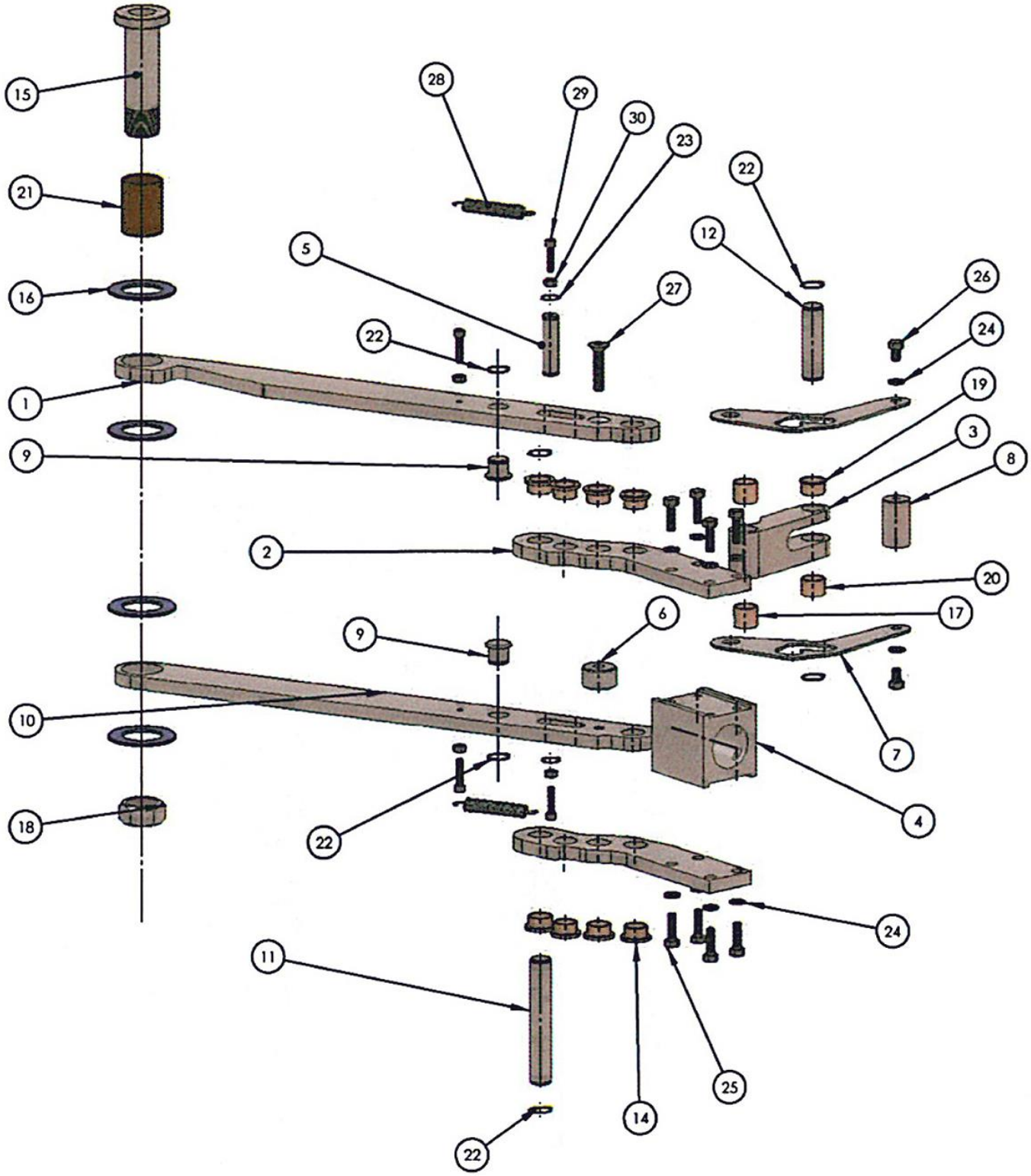
RATCHET WHEEL ASSEMBLY PARTS DIAGRAM



Ratchet Wheel Assembly Parts List

Item	Part No.	Description	Qty.
1	M050-6A001	Ratchet Wheel	1
2	M050-6A003	Middle Plate	1
3	M050-6A002	Bottom Plate	1
4	M050-7A016	Plate Spacer	1
5	M050-7A017	Short Tube Spacer	1
6	M050-7A003	Main Die Pin	1
7	M050-7A011	Bumper Pin (Long)	1
8	M050-7A012	Bumper Pin (Short)	1
9	M050-6A013	Latch Drive Bar (Thin)	1
10	M050-7A020	Bumper Pin (Thin)	2
11	M050-6A017	Latch Drive Bar (Lower)	1
12	M050-7A007	Thrust Washer 1/8”	4
13	M050-7A025	Lower Pivot Sleeve	1
14	M050-7A026	Special Hex Nut	1
15	M050-6A025	Rectangular Spacer	1
16	M100-6A019	Degree Sticker	1
17	M050-7A024	Lower Bushing	1
18	1000 Snap Ring	1” Snap Ring (External)	1
19	0750 Snap Ring	3/4” Snap Ring (External)	4
20	LW 0.75	3/4” Split Ring Lockwasher	1
21	M050-6A011	Latch Plate	1
22	0.750-10 x 9.00 HHCS	3/4"-10 x 9” Hex Head Cap Screw	1
23	0.250-20 x 0.75 SHCS	1/4"-20 x 3/4” Socket Head Cap Screw	2
24	0.625-11 x 1.50 HHCS	5/8"-11 x 1-1/2” Hex Head Cap Screw	3
25	LW 0.625	5/8” Split Ring Lockwasher	3
26	M050-6A026	Pointer Block	1
27	DK-1216	Hand Knob	1
28	FF-838-1	Flanged Sleeve Bushing	2
29	0.250-20 x 1.00 SHCS	1/4"-20 x 1” Socket Head Cap Screw	3
30	0.25-20 Hex Nut	1/4"-20 Hex Nut	3
31	PP-1073	3” Spring	3
32	M050-6A027	Pointer	1

DRIVE LEVER ASSEMBLY PARTS DIAGRAM



Drive Lever Assembly Parts List

Item	Part No.	Description	Qty.
1	M050-6A013	Latch Drive Bar (Upper)	1
2	M050-6A014	Drive Link	2
3	M050-6A015	Connecting Block	1
4	M050-6A012	Shaft Block	1
5	M050-7A021	Drive Pin	1
6	M050-7A018	Spacer	1
7	M050-6A016	Lock Tab	2
8	M050-7A019	Release Spacer	1
9	M050-7A020	Bumper Pin (Thin)	2
10	M050-6A017	Latch Drive Bar (Lower)	1
11	M050-7A022	Pivot Pin	1
12	M050-7A023	Pivot Pin (Short)	1
13	M050-7A030	Die Drive Pin	1
14	FL-75-4	Flanged Sleeve Bushing	8
15	M050-7A024	Lower Bushing	1
16	M050-7A007	Thrust Washer 1/8”	4
17	AA-838-16	Sleeve Bushing	2
18	M050-7A026	Special Hex Nut	1
20	FF-838-1	Flanged Sleeve Bushing	1
21	AA-838-25	Sleeve Bushing	1
22	M050-7A025	Lower Pivot Sleeve	1
23	0750 Snap Ring	3/4” Snap Ring (External)	6
24	0625 Snap Ring	5/8” Snap Ring (External)	2
25	0.313-18 x 1.00 HHCS	5/16"-18 x 1” Hex Head Cap Screw	8
26	0.313-18 x 0.50 HHCS	5/16"-18 x 1/2” Hex Head Cap Screw	2
27	0.375-16 x 1.75 FHCS	3/8"-16 x 1-3/4” Flat Head Cap Screw	1
28	PP-1073	3” Spring	2
29	0.250-20 x 1.00 SHCS	1/4"-20 x 1” Socket Head Cap Screw	4
30	0.25-20 Hex Nut	1/4"-20 Hex Nut	4

NOTES

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