OPERATOR'S MANUAL

Metal Working

HYDRAULIC TUBE BENDER

MODEL: EB-300

Baileigh Industrial Holdings LLC
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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.

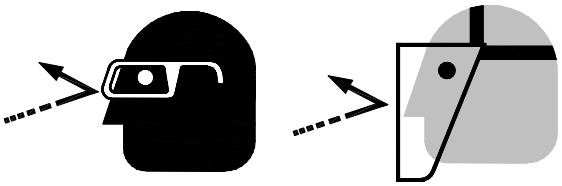
CAUTION: Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

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.

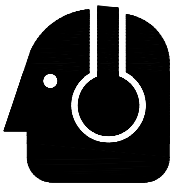
PROTECT EYES

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



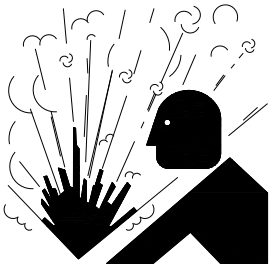
PROTECT AGAINST NOISE

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



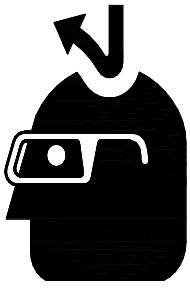
HYDRAULIC HOSE FAILURE

Exercise **CAUTION** around hydraulic hoses in case of a hose or fitting failure.



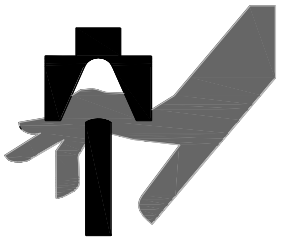
KEEP CLEAR OF MOVING OBJECTS

Always be aware of the position of the material during bending. The material will swing, possibly with great force, during bending causing serious body or head injuries.



BEWARE OF PINCH POINTS AND CRUSH HAZARD

NEVER place your hands, fingers, or any part of your body in the die area of this machine.



EMERGENCY STOP BUTTON

In the event of incorrect operation or dangerous conditions, the machine can be stopped immediately by pressing the **E-STOP** button. Twist the emergency stop button clockwise (cw) to reset. Note: Resetting the E-Stop will not start the machine.

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 machine's 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 appropriately. 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. Keep visitors a safe distance from the work area.
18. **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.
19. **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.
20. **Turn off** power before checking, cleaning, or replacing any parts.
21. Be sure **all** equipment is properly installed and grounded according to national, state, and local codes.
22. Keep **all** cords dry, free from grease and oil, and protected from sparks and hot metal.
23. Inspect power and control cables periodically. Replace if damaged or bare wires are exposed. **Bare wiring can kill! DO NOT** touch live electrical components or parts.
24. **DO NOT** touch live electrical components or parts.
25. **DO NOT** bypass or defeat any safety interlock systems.
26. Risk of Explosion. This equipment has internal arcing or sparking parts which should not be exposed to flammable vapors. This equipment should not be located in a recessed area or below floor level.
27. **Keep Hands Clear** when dies are in motion.
28. **NEVER** place your hands or other body parts between bending dies.
29. Use caution while removing and installing bending dies. They are heavy.
30. One hand should always be kept free to operate the control. **Never** use another part of your body to operate the controls, with the exception of the knee control plate.
31. There must be a "**SAFETY CIRCLE OF SWING**" around the bender. There should be at least ten feet of space on each side of the bender so tubing will not encounter any interference during the bend.
32. **NEVER** use hands to check for hydraulic leaks. Hydraulic oil under pressure can easily penetrate skin, causing serious injury.
33. **DO NOT** weld on bender or use bender as a fixture for welding. Damage to electrical components may result and warranty will be voided.

TECHNICAL SPECIFICATIONS

Motor Hp	4 hp (3kw)
Degree of Bend (Max)	179°
Capacity Round OD (Mild Steel)	1-1/2" up to 3" OD (for 2-1/4 to 3" OD tubing 12 gauge mild steel wall thickness is required) [38mm up to 76mm OD (for 57mm to 76mm OD tubing 2.6mm mild steel wall thickness is required)]
Max. Center Line Radius (CLR)	5" (127mm)
Power	220V / 1-phase
Shipping Weight	1640lbs (750kgs)
Shipping Dimensions (Inches)	69 x 32 x 53 (1750 x 813 x 1347mm)

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.

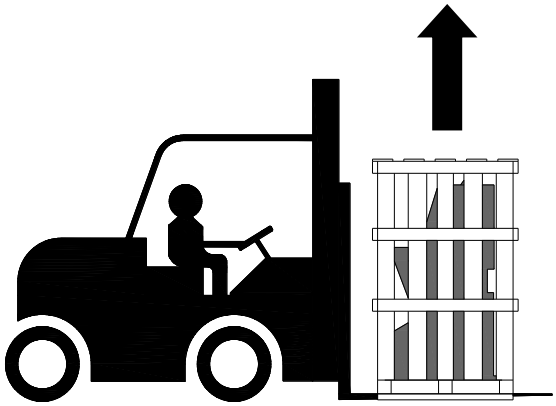
Important: *This waxy coating is **NOT** a lubricant and will cause the machine to stick and lose performance as the coating continues to dry.*

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 tubes 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.
- **POWER SUPPLY PLACEMENT:** The power supply should be located close enough to the machine so that the power cord is not in an area where it would cause a tripping hazard. Be sure to observe all electrical codes if installing new circuits and/or outlets.

Tank Filling

The hydraulic oil is the primary medium for transmitting pressure and also must lubricate the running parts of the pump.

After installation of the machine and before machine startup, bring the oil level up to 90% of capacity. Refer to any labels or marking affixed to the outside of the machine, If none exist, use SHELL BRAND #46 or #68 hydraulic oil or an equivalent with similar specifications. (Based upon location temperature and availability.)

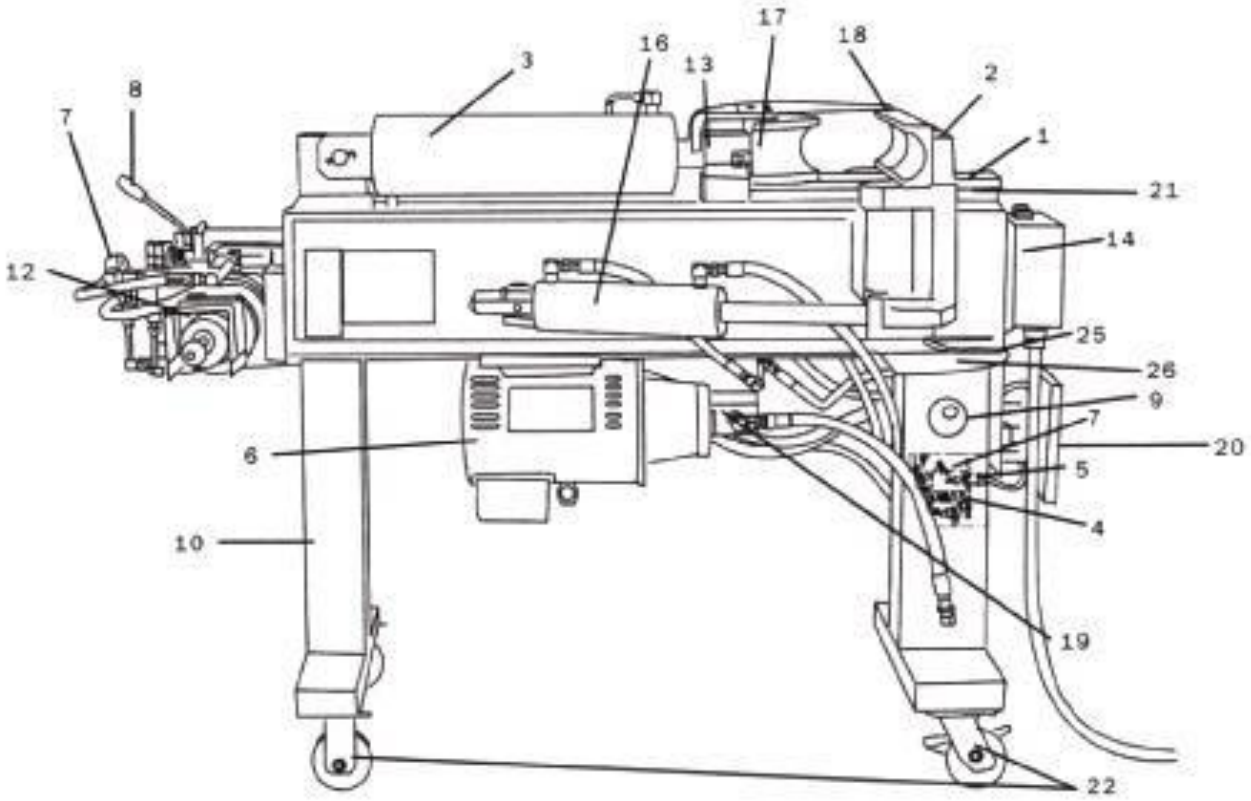
Verify that any cylinder rams are is in the retracted position to prevent overfilling of the tank. Recheck the oil level after the first few hours of operation and again after the first full week of operation.

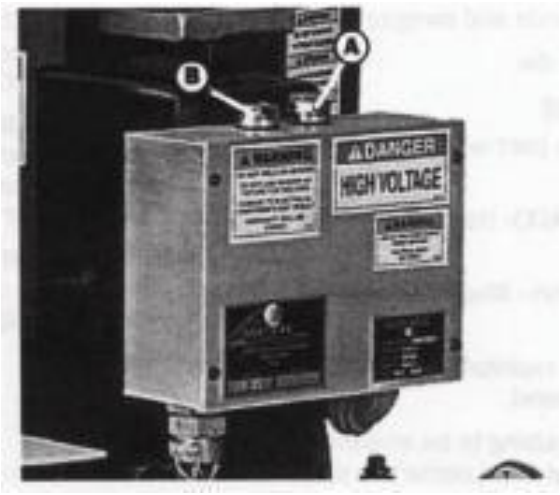
A shortage of hydraulic oil can cause hydraulic system breakdown and damage to major mechanical parts due to overheating.

GETTING TO KNOW YOUR MACHINE

Before using the bender, it is important to familiarize yourself with the terms / names and location of the components used on the bender. Review the illustration and read the terms and descriptions that apply to this machine.
The terms used will be used throughout the manual and this section of the manual may be referred to in order to clarify or illustrate a location.

Component Location





Item	Name
1	Guide Plate
2	Swing Gate
3	Main Cylinder
4	Directional Valve (Right Side)
5	Sequence Valve (Right Side)
6	Motor
7	Hydraulic Pressure Gauge (Right Side)
8	Swager Control Valve
9	Front Leg/Hyd. Reservoir W/Oil Filler Elbow
10	Rear Leg
12	Swager / Expander
13	Sled
14	Control Box (Button Box)
16	Side Cylinder
17	Radius Die
18	Back Shoes
19	Hydraulic Pump
20	Knee Control Pad
21	Riser
22	Casters
25	Manual Depth-Of-Bend Indicator (Left Side)
26	Manual Depth-Of-Bend Plate (Left Side)
A	Stop Control Button
B	Start Control Button

BENDER COMPONENT DESCRIPTIONS

This list of component descriptions is keyed to the illustrations on the preceding pages.

1. GUIDE PLATE – Track that the sled rides on.
2. SWING GATE – Hold shoes in place while bending.
3. MAIN CYLINDER-5” – cylinder that controls forward and backward motion of main bending die.
4. DIRECTIONAL VALVE – Electrical solenoid valve which controls forward and reverse motion of main cylinder.
5. SEQUENCE VALVE – Control pressure to booth side cylinder and can be adjusted from 0 to 1000 PSI.
6. MOTOR – Powers hydraulic pump to produce hydraulic pressures.
7. HYDRAULIC PRESSURE GAUGE – Measures the hydraulic pressure present while bending or swaging / expanding.
8. SWAGER CONTROL VALVE – Control pressure from the pump for the entire bender. Factory setting is approximately 300 PSI. Also control the swager/expander.
9. FRONT LEG/HYDRAULIC PRESERVOIR W/OIL FILLER ELBOW – Indicates the front of the machine and is also the hydraulic reservoir. The oil filler elbow is on the left side.
10. REAR LEG – Indicates the rear (swager/expender end) of the machine.
12. SWAGER/EXPANDER – Expands and swager tube.
13. SLED – Guides main bending die.

⚠ ***Important****: Do not operate or move this part without a die in position.*

14. CONTROL BOX (BUTTON BOX) – Houses controls and electrical components.
16. SIDE CYLINDERS – Cylinders maintain pressure on the swing gates to form the bend.
17. RADIUS DIE – Die allows the tubing to be stretched and “pulled” through the bend. Dies come in a variety of OD sizes and radii.

⚠ ***Important****: Radius die must be used with back shoe die in the same corresponding size.*

18. BACK SHOES – A clamping die used to hold the tube in position while bending.

⚠ ***Important****: Back shoe dies must be used with radius dies in the same corresponding size. Never use the machine as a vice or a press.*

19. HYDRAULIC PUMP – Driven by a motor to produce hydraulic pressure for bending and swaging operations.

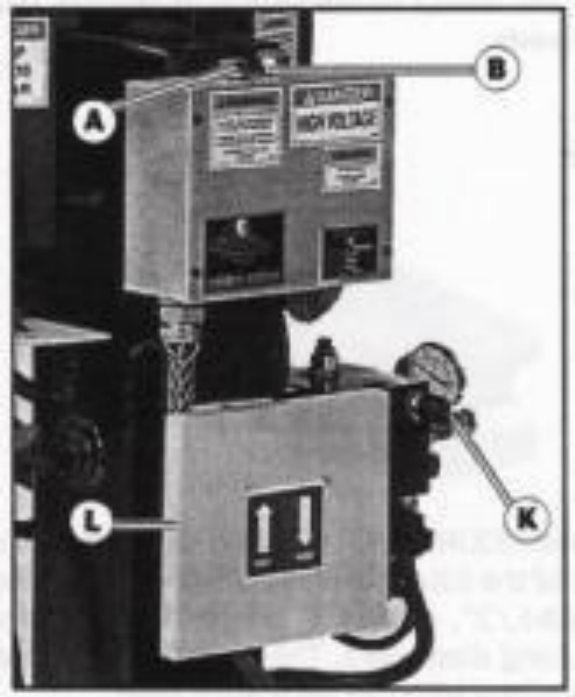
20. KNEE CONTROL PAD – Controls forward and reverse motion of main cylinder.
21. RISER – Supports guide plate off of main frame.
22. CASTERS – Wheel assemblies that allow the bender to be moved. Contain locking mechanism to prevent bender form rolling while in operation.

⚠ ***Important**: Be sure casters are locked while machine is in operation.*

25. MANUAL DEPTH-OF-BEND INDICATOR- Located on left side of bender. Indicates gate opening in degrees.
26. DEPTH-OF-BEND PLATE – Indicates degrees of bend. Used for both manual and auto bending.

BENDER CONTROLS DESCRIPTION LIST

(B) Stop Control Button – Depress this button to completely stop the bender.
(A) Start Control Button – Depress this button start the electrical motor and hydraulic pump.
(L) Forward Control (right side of knee pad) – Depress this side of the knee pad, to activate forward (extend) motion of the main cylinder. Hold the knee pad until the desired angle is met using the dial indicator.
(L) Reverse Control (left side of knee pad) – Depress this side of the knee pad to activate reverse (retract) motion of the main cylinder back to the open position to unload and load material.
(K) Sequence Valve Adjusting Knob – The sequence valve controls pressure to both side cylinders and the valve is adjustable from 0 to 1000 PSI with the use of the adjusting knob. To adjust the hydraulic pressure, turn the knob and read the pressure on the adjacent pressure gauge. Normal bending pressure should not exceed 1000 PSI.



Bending Tools

Three types of tools are used to bend tubing:

1. Radius Die
2. Back Shoes (1 pair)
3. Half Shoes or Three-quarter Shoes

All of the tools listed are called bending dies. These dies allow the tubing to be stretched and pulled through the bend.
Each die is machined and sized according to tubing diameters (O.D.) and the sizing is stamped on the surface of the dies. The dies come in a variety of O.D. sizes and radii.
Example: A radius die with a 5” radius = 10” diameter bend. A 4” radius = 8” diameter bend.

***Note**: The dies are made of hardened steel, but care should still be given to avoid damaging them.*

***Note**: The dies perform better if they are lightly oiled and are free from flaws and foreign material. EB-300 has a wide variety of tooling available as well as the ability to manufacture custom tooling to fit your needs.*

Radius Dies

***Important**: Radius dies are heavy-handle them with care.*

Radius dies are used to produce the inside diameter of the tubing that is being bent. The dies are available in 3-1/2”, 4” and 5” center line radii, and in a variety of tubing diameters. The dies are sold separately in combinations with the back shoe dies.

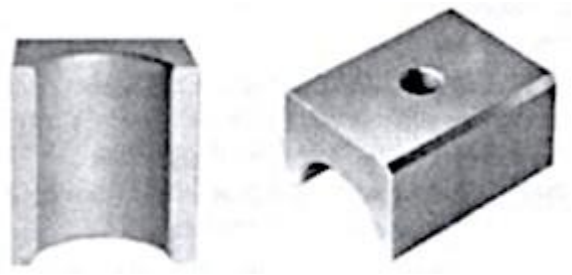
***Important**: Radius dies must be used with back shoe dies in the corresponding size. Never use the bender as a vice or a press, with or without the back shoes in position.*

Back Shoes

Back shoes mount to the swing gates. These dies are used to clamp the tubing into position while bending and they form the outside radius of the tubing that is being bent. The dies are available in a variety of tubing diameters. The dies are sold separately in combinations with the radius dies.

***Important**: Back shoe dies must be used with radius dies with the same corresponding size. Never use the machine with or without the back shoe dies in position as a vice or a press.*

Half Shoe and Three-Quarter Shoe Dies



Half shoe and three-quarter shoe dies mount to the swing gates. The half shoe dies are exactly 1/2 the size of a back shoe die. The three-quarter shoe dies are exactly 3/4” the size of a back shoe die. These dies are used only when one bend is less than ten inches from the previous bend. Its position is always on the same side as the last bend; normally, this will be on the left side.

The dies are available in a variety of tubing diameters. The dies are sold separately in combinations with the radius dies.

***Important**: Half shoe dies and three-quarter shoe dies must be used with radius dies with the same corresponding size.*

ELECTRICAL

WARNING: Baileigh Industrial Holdings LLC is not responsible for any damage caused by wiring up to an alternative 3-phase power source other than direct 3-phase. If you are using an alternate power source, consult a certified electrician or contact Baileigh Industrial Holdings LLC prior to energizing the machine.

CAUTION: HAVE ELECTRICAL UTILITIES CONNECTED TO MACHINE BY A CERTIFIED ELECTRICIAN!
Check if the available power supply is the same as listed on the machine nameplate.

WARNING: Make sure the grounding wire (green) is properly connected to avoid electric shock. DO NOT switch the position of the green grounding wire if any electrical plug wires are switched during hookup.

Power Specifications

Your machine is wired for 220 volts, 60hz alternating current. Before connecting the machine to the power source, make sure the power source is OFF.
Before switching on the power, you must check the voltage and frequency of the power to see if they meet with the requirement, the allowed range for the voltage is ±5%, and for the frequency is ±1%.

Considerations

- Observe local electrical codes when connecting the machine.
- The circuit should be protected with a time delay fuse or circuit breaker with an amperage rating slightly higher than the full load current of machine.
- A separate electrical circuit should be used for your machines. Before connecting the motor to the power line, make sure the switch is in the “OFF” position and be sure that the electric current is of the same characteristics as indicated on the machine.
- All line connections should make good contact. Running on low voltage will damage the motor.
- In the event of a malfunction or breakdown, grounding provides a path of least resistance for electric current to reduce the risk of electric shock. This machine is equipped with an electric cord having an equipment-grounding conductor and a grounding plug. The plug must be plugged into a matching outlet that is properly installed and grounded in accordance with all local codes and ordinances.

⚠ WARNING: In all cases, make certain the receptacle in question is properly grounded. If you are not sure, have a qualified electrician check the receptacle.

- Improper connection of the equipment-grounding conductor can result in risk of electric shock. The conductor with insulation having an outer surface that is green with or without yellow stripes is the equipment-grounding conductor. If repair or replacement of the electric cord or plug is necessary, do not connect the equipment-grounding conductor to a live terminal.
- Check with qualified electrician or service personnel if the grounding instructions are not completely understood, or if in doubt as to whether the machine is properly grounded.
- Repair or replace damaged or worn cord immediately.

Power cord connection:

1. Turn the main disconnect switch on the control panel to the OFF position.
2. Unwrap the power cord and route the cord away from the machine toward the power supply.
    a. Route the power cord so that it will NOT become entangled in the machine in any way.
    b. Route the cord to the power supply in a way that does NOT create a trip hazard.
3. Connect the power cord to the power supply and check that the power cord has not been damaged during installation.
4. When the machine is clear of any obstruction. The main power switch may be turn ON to test the operation.
5. Turn the switch OFF when the machine is not in operation.

OPERATION

CAUTION: Always wear proper eye protection with side shields, safety footwear, and leather gloves to protect from burrs and sharp edges.
When handling large heavy materials make sure they are properly supported.

Bending Operations

After you have determined and selected die sizes and have installed them into the machine, there are three basic elements to consider.

- Centerline of bend – measured in inches.
- Rotation – stated in degrees (change of plane).
- Depth-of-bend – stated in degrees.

First Bend

With the above elements in mind, proceed with the following steps to produce the first bend:

1. Select straight tubing of required O.D. size and sufficient length (12” longer than cutoff point).
2. Power the bender On.
3. Wipe tubing to remove excess oil. Place tubing in bender between back shoe and radius dies with the greater portion of the tubing extending out the left side of the bender.
4. Rotate tubing so the seam line is facing up. This provides a start reference point for the any rotation as well as consistency in dealing with the weld seam variation.
5. Press the knee pad to extend the ram until the die just engages the tube and the tube is held firmly with the greater portion of tubing extended from the left side of the bender.
6. Mark off in inches with a felt tip pen where each bend is to be made. Make your marks heavy and at least halfway around the tubing. The last mark you will make on the tubing is the final cutoff or overall length.

***Note**: Do not cut the tubing until after the final bend is made.*

7. Disengage the dies. Reposition the tubing in the dies so that the greater part of the tubing extends from the right side of the bender and is positioned on the first inch mark. Center inch mark between back shoes and engage the dies until the tube is held firmly in place.

***Note**: Tube bending is always done by feeding the tube from the right side of the bender to the left side.*

8. Place the rotation dial on the extreme right end of the tubing, at least 12 inches from the final bend, with the numbered side facing the bender. Rotate the dial until the indicator points to zero, which should line up with the seam line, and secure the dial.

***Note**: Do not remove the rotation dial until all bends are completed.*

9. Press the right side of the knee pad and bend until the manual depth-of-bend indicator, on the left side of the bender, indicates the desired bend.

Second and Subsequent Bends

For the second and subsequent bends proceed as follows:

1. Retract the dies until the tubing is free.
2. Slide tubing to the left until the next inch mark is lined up with the center of the back shoes.
3. Engage the dies until the tubing is snug, but movable.
4. Rotate the tubing until the desired setting is obtained on the rotation dial.
5. Refer to the manual depth-of bend indicator on the left side of the bender.
6. Press the right side of the knee pad.
7. After the bend is made, slide the tubing to the next mark and repeat the above operations until the last bend has been made.

***Note**: Half shoes – if a bend is required that would be close to the last bend, use the half shoe. Always place the half show on the side facing the previous bend.*

***Note**: Block of wood – some exhaust system applications required a "cushion" to accurately bend a tube. Use a piece of wood approximately 2" x 4" x 4". Remove on back shoe (normally the left one) and replace it with the appropriate O.D. size half shoe. Place the block of wood next to the half shoe and proceed to make the bend. The wood will crush as the bend is being made, but the tubing will not be affected.*

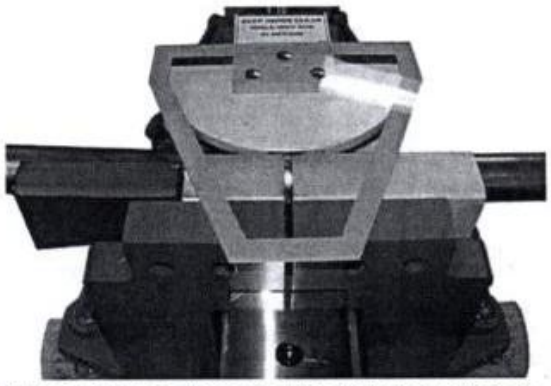


Figure 8-1: Block of wood being used with half shoe.

8. When all bends are complete, remove the rotation dial and cut the tubing at the cutoff line.
9. Complete the end finishing of the tubing as desired using the "Swaging and Expander".

Pattern Bending

You can bend tubing by using an existing tube as a master pattern, or you can make a wire pattern to replicate the tube.
The pattern bend, proceed as follows:

1. Select the proper tubing size and the die set to do the job.
2. Place tubing in the bender with the greater portion of the tubing protruding out the right side of the bender.
3. Place the master pattern, (tube or wire pattern) on the top of the back shoes so that the first bend is centered between the shoes.

***Note**: The tubing must fill the full cavity of the back shoe. It may be cut shorter after the tube is made.*

4. Extend the tubing out the left side of the bender so it matches in length with the master pattern. Secure the tubing. (see figure 9-1)
5. If the left end of the tubing does not fill the back shoe, extend the tubing to the left until it does.
6. Mark the first bend on the tubing where it meets the center of the back shoes.
7. Measure the distance from the end of the tubing to the center of the back shoes. This is the measurement to the first bend. (see figure 9-2)
8. Place the rotation dial over the far right end of the tubing so the numbered side faces the bender. Secure it in place when the indicator point to zero degrees. This reading is the rotation of tubing for each particular bend. The first bend is always 0 degrees.

FIGURE 9-1

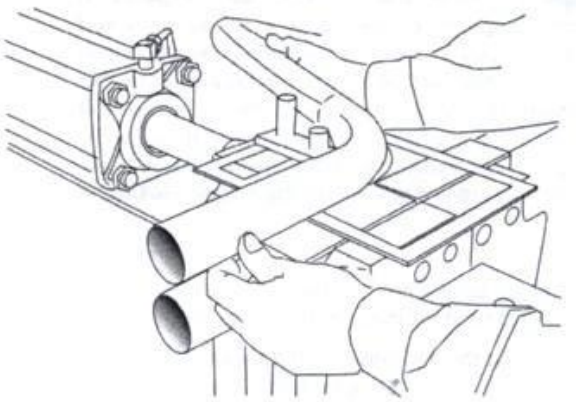
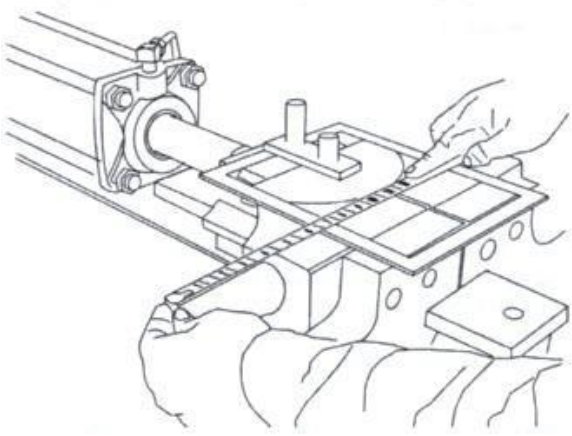
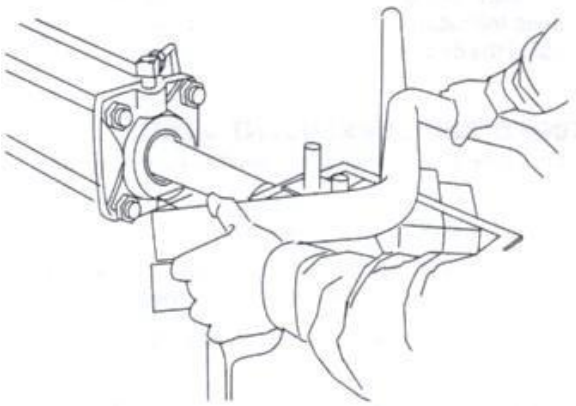


FIGURE 9-2



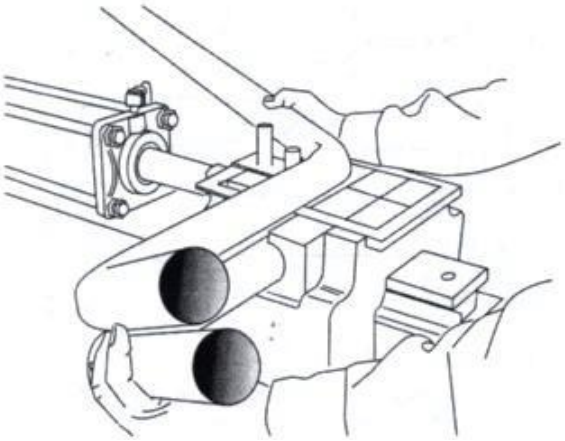
9. You are now ready to make your first bend. Place the first of the master pattern on the top of the back shoes or against the back side of the gates. Gradually extend the dies, opening the gates. Continue bending until the gate are parallel or open flush with the first bend of the master pattern. (see figure 9-3)
10. Look at the depth-of-bend gauge on the left side of the bender. This is the depth of the first bend.

FIGURE 9-3



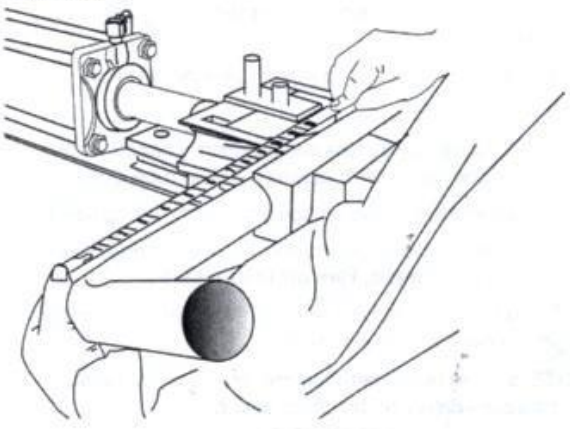
11. Release the tubing and feed it to the left through the dies. Place the pattern on top of the back shoes. Line up the center of the second bend of the master pattern with the center of the back gates. Be sure that the bend of the master pattern lies flat on top of that dies.
12. Line up the first bend of the new tube with the first bend of the pattern and rotate the new tube until it lies parallel with the master pattern. Be sure the pattern lies flat on the dies with the bend centered. Close the dies to secure the tubing.

FIGURE 9-4



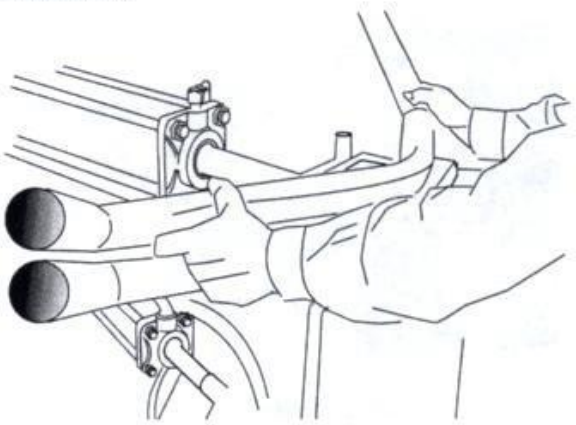
13. Your second bend is now correctly located. The measurement for the second bend should now be taken. Since bent tubing is difficult to measure, it is best to measure from the center of the first bend (between the back shoe dies marks) to the center of the second bend (between the back shoes). This measurement is added to the measurement of the first bend. (see figure 9-5)
14. Look at the rotation dial and take the reading of the tubing rotation for the second bend.

FIGURE 9-5



15. You are ready to make the second bend. Place the second bend of the master pattern on the back shoes or against the gates and gradually make your bend until the gates are parallel or open flush with the second bend of the pattern. (see figure 9-6)
16. Continue to make the necessary bends following these steps. When all the bends are completed, perform the needed end finishing and measure the cutoff length.

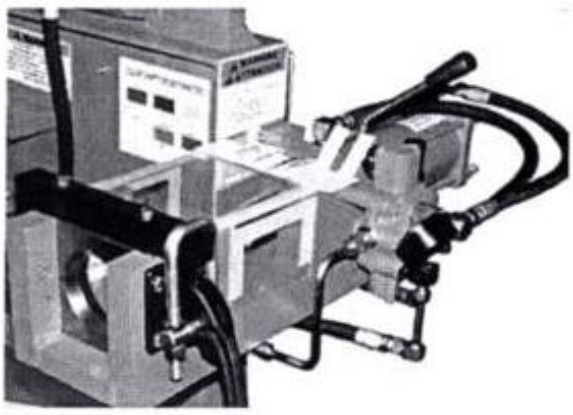
FIGURE 9-6



Swaging and Expanding

⚠ CAUTION: Be sure all safety guards are securely in position before operating the unit. Alteration or removal of any guards could result in injury. Safety is a must when using the swager/expander due to the high pressure used by this unit.

The attachment mounted on the rear of the bender is a swager/expander. It expands on one end and swages on the other. (see figure 10-1)



The swager/expander unit will end-finish all exhaust and tail tubes to original equipment specifications. This attachment is controlled manually by the operator at all times.

Swaggering Operations

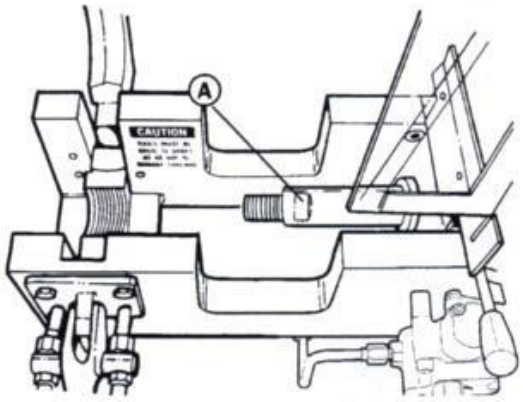
After the tubing has been bent, it may be necessary to finish the end of tubing. The swager portion of the swager/expander unit will make ball joints, flares and slip joints. In addition, it will expand tubing (swage up) and reduce tubing (swage down).
The following procedure is provided as a basic step-by-step process used to install the tooling and begin the swaging operation.
To produce a specific end finish refer to the appropriate topic. (for example: to produce a flare, read the basic swaging operation, then read the operation of the topic “flare”.)

To begin basic operation, proceed as follows:

⚠ ***Important:*** When swaging or expanding always lubricate tooling.

1. Turn the machine on.
2. Depress the swager control valve handle and extend the thread cylinder shaft (A) into the swager box approximately three inches. (see figure 10-2)
3. Turn the machine off.
4. Install the required tool, per tubing size or specification, onto the threaded cylinder shaft.
5. Install one-half of a collet set in the collet closer, threads facing up.

FIGURE 10-2



***Note**: Always use the correct O.D. size collets to match the O.D. tube size.*

6. Insert the end of the tubing at least three inches from the inside edge of the half-collet.
7. Install the other collet half over the tubing and close the collet holder.
8. Secure the collet clamp in the down position.
9. Turn the machine on.
10. Slowly, while jogging the swager control handle, move the cylinder shaft with tooling into the tube end.
11. See appropriate tope on specific tooling being used.
12. After tubing has been shaped and the cylinder shaft has been retracted, turn off the machine.
13. Raise the collet close handle. The collet will release and separate from the tubing.

***Important**: Should the collets not release from the tubing use a screwdriver to pry them apart.*
DO NOT beat the collets on the bender.
ALWAYS remove the tooling from the swager box after each usage to avoid damage when expanding on the expander side.

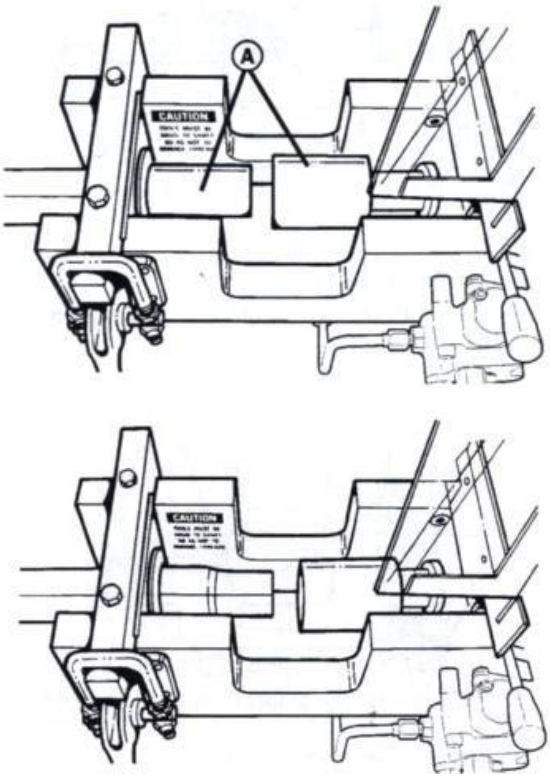
14. Remove the tooling and return it to the storage rack.

Reduce Swage (swage down)

To reduce swage (reduce the outside diameter of the tubing) proceed as follows:

1. Select and install the proper collet set tooling and reducing die (A). (see figure 10-3)
2. Follow steps 1 through 10 of “Swaging Operations”.
3. Move cylinder shaft forward slowly until tool is over the tube. Continue to move shaft until the tube has been formed.
4. Retract the cylinder shaft and tool. (see figure 10-4)
5. Follow steps 12, 13, and 14 of “Swaging Operations”.

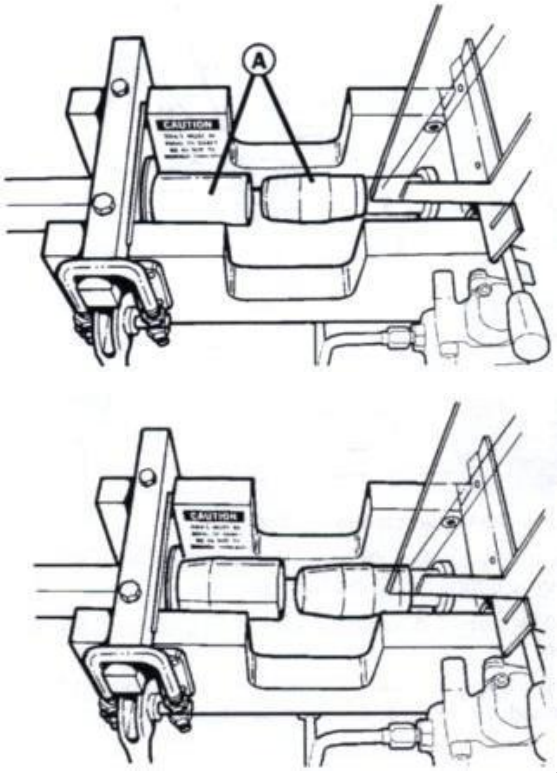
FIGURE 10-3



Internal Swage (swage up)

To internal swage (enlarge the outside diameter of the tubing), proceed as follows:

1. select and install the proper collet set tooling and swage die (A). (see figure 10-5)
2. Follow steps 1 through 10 of “Swaging Operations”.
3. Move cylinder shaft forward slowly until the tool enters the tubing. Continue to move the shaft forward until the tool reaches the marking ring on the end of swage die.
4. Retract shaft and tool. (see figure 10-6)
5. Follow steps 12 through 14 of “Swaging Operations”.



45° Flare

It is necessary to install a flange over the tube prior to finishing the ends.
To make a flare or flat the same tool is used – one side flares, the other side flattens.
The tools required to make a flare are:

1. Die holder #815 or #820 quick disconnect Flaring tool #853
2. Collet set (pair in matching O.D. size)
3. To make a flare proceed as follows: (see figure 10-7 and figure 10-8)

FIGURE 10-7

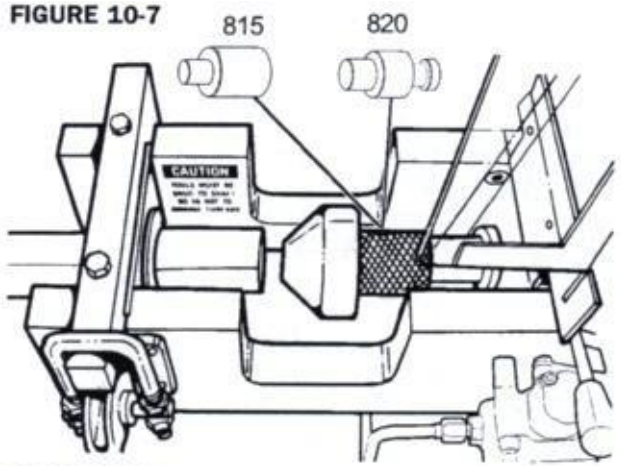
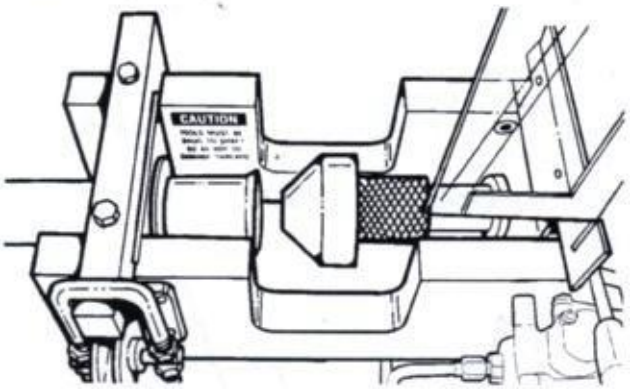


FIGURE 10-8

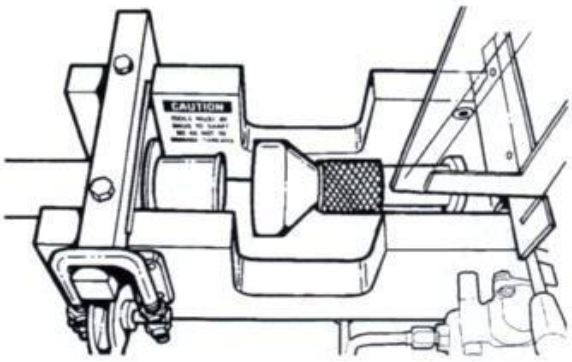


4. Install die holder on threaded shaft.
5. Insert flaring tool #853 on the die holder with 45 degree flaring facing the tubing.
6. Follow steps 1 through 10 of “Swaging Operation”.
7. When a desired flare is achieved, follow steps 12 through 14 of “Swaging Operation”.

Flat Flare

It is necessary to install the flange over the tube prior to finishing the ends.
To complete a flat flare, proceed as follows:

FIGURE 10-9

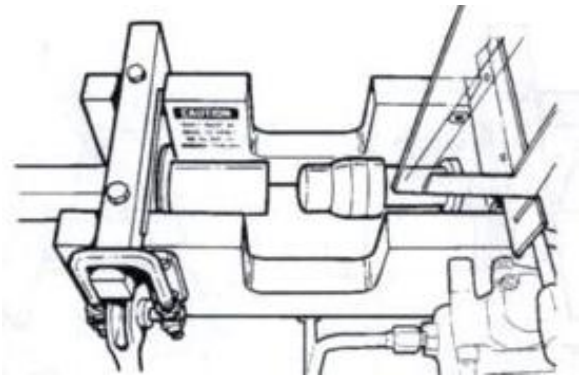


1. Complete the 45° flare process as described above.
2. After retracting the cylinder shaft, reverse the flaring tool #853 and install onto the die holder.
3. Extend the shaft forward until the tool meets the flared tube.
4. Slowly move the shaft forward until the flare forms a flat surface. (see figure10-9)
5. Follow steps 12 through 14 of “Swaging Operation”.

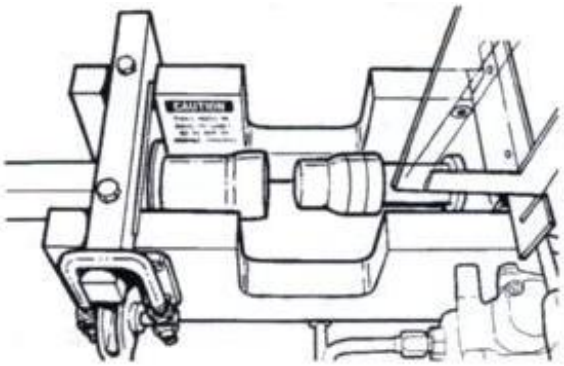
Male Ball Joints

A male ball and female socket are generally made at the same time. In each case, it is necessary to install the flange over the tube prior to finishing the ends.

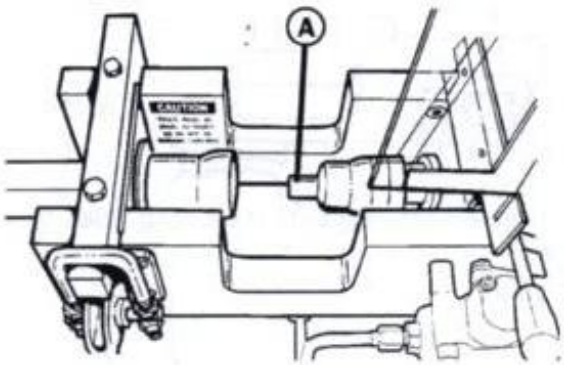
To make a ball joints, proceed as follows: (see figure 10-10)



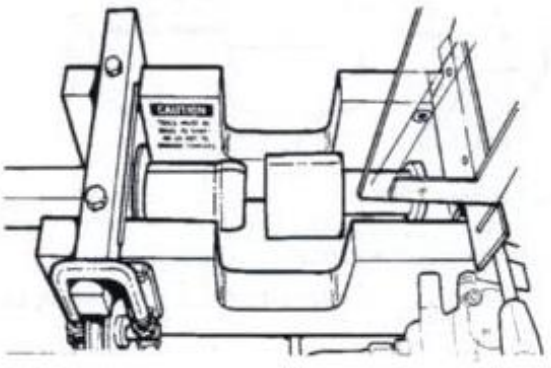
1. Select and install the proper tools.
2. Follow steps 1 through 10 of “Swaging Operation”.
3. Using the male ball joints tool, slowly insert it into the tube until it reaches the second marking ring on the end of tool. (see figure 10-11)



4. Retract the tool. Do not remove the clamp.
5. Install die holding pin #816 (A) into male ball tool. (see figure 10-12)



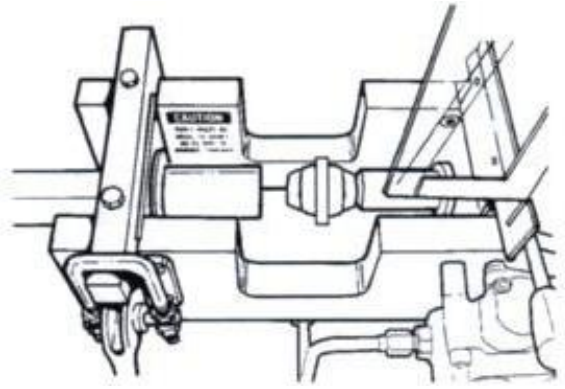
6. Install the domer die on pin #816. (see figure 10-13)
7. Move the shaft with the tool forward over the tube. Continue to move forward until a desired ball is formed. When it is achieved, retract the piston and turn off the bender. Remove the domer and the tube. (see figure 10-13)
8. This completes the male ball forming process. Do not remove any other tooling if a female ball socket is to be made. If a socket is not require remove tooling.



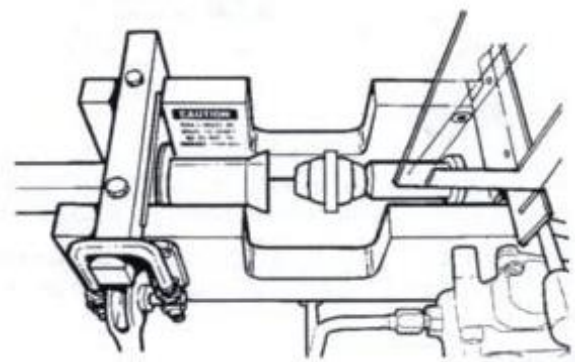
Female Ball Socket

It is necessary to install the flange over the tube prior to finishing the ends. To make the female ball socket, proceed as follows:

1. Install female ball tool on die holding pin #816. The tool is reversible for another size. (see figure 10-14)
2. Insert the tube section into the collet closer.
3. Follow step 1 through 10 of “Swaging Operations”.



4. Insert the tool slowly into the tubing, until the socket is formed. The tubing will meet flush with the stop on the tool. (see figure 10-15)
5. follow steps 12 through 14 of topic “swaging operations”.



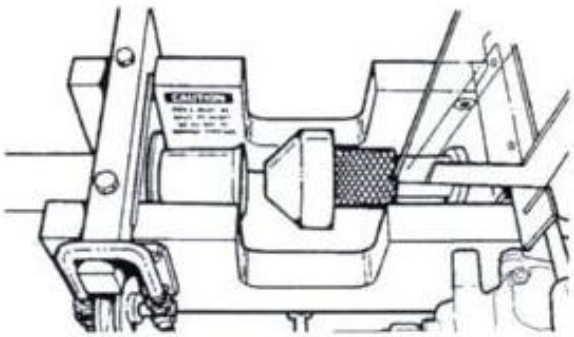
Flare Flange – for Manifold Gasket

It is necessary to install the flange over the tube prior to finishing the ends.
Certain finishing applications require a round manifold gasket. To make this application, it is necessary to use a scarp piece of tubing, approximately 1-1/2” long, in the next smaller O.D. size. This tubing scrap, or nipple, will be inserted into a formed tube end.

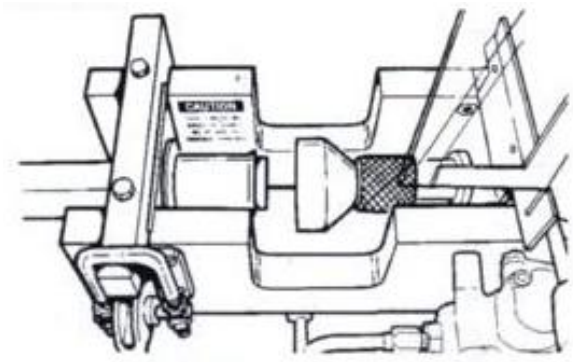
The tools required to make a flare flange are: Collet set (matching O.D. size), flanger tool - #853, Die holder - #815

To make a large flange, proceed as follows:

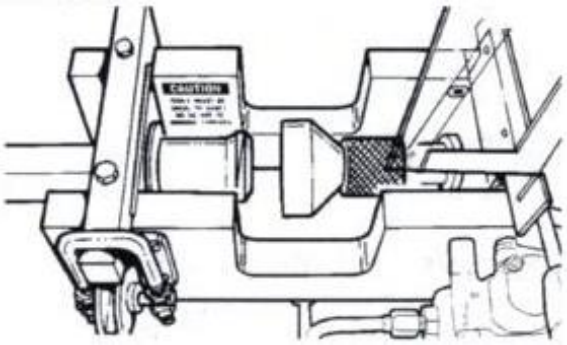
1. Follow steps 1 through 10 of “Swaging Operations”.
2. Slowly insert the tool into the tubing, making a flared shape. (see figure 10-16)



3. Retract the shaft and reverse the tool on the die holder so the flat side is facing tube. (see figure 10-17)
4. Insert (by hand) the scarp tube nipple into the flared tube. The nipple will hold itself into the tube opening.



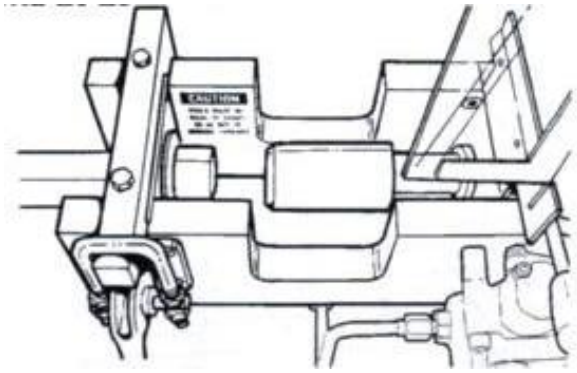
5. Remove your hands from the swager box and slowly move the tool forward, forcing the nipple into the tube until it protrudes 1/2". This forms the seat for the round gasket. (see figure 10-18)
6. Follow steps 12 through 14 of "Swaging Operations.



Auto Flare Flange – 2"

It is necessary to install the flange over the tube prior to finishing the ends.
An auto flange system which forms the flanges in one step, will produce a 2" flare flange and flat flanges in 1-1/2", 1-5/8" and 1-3/4" sizes.

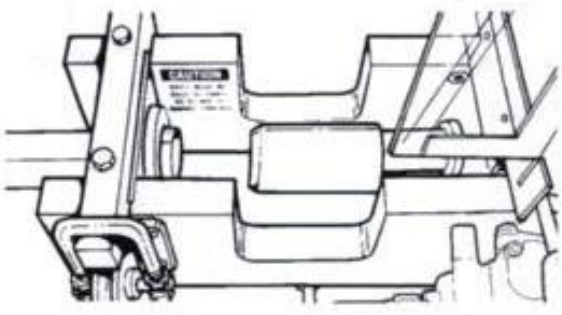
The tools required to make a 2" auto flare flange are:
Collet set 1720 D.F. Flare flange tool #518
To make an auto flare flange, proceed as follows.



1. Follow steps 1 through 10 of "Swaging Operations".
2. Slowly insert the tool onto the tubing. (see figure 10-19)
3. Make the flared flange by extending the cylinder shaft until tool is stopped by the collet. Apply full pressure for this operation and make no hesitations.
4. Follow steps 12 through 14 of "Swaging Operations".

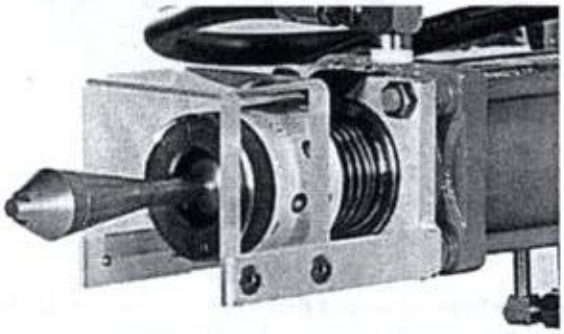
Flat Flanges

It is necessary to install the flange over the tube prior to finishing the ends, flat flanges can also be produced. The tools required are collet set (pair in matching O.D. and size) and flat flange tool (matching O.D. size).
To make a flat flange, follow the steps listed for “Auto Flare Flange 2 Inch”. (see figure 10-19 and 10-20.)



Expanding Operations

The EB-300 bender comes equipped with the Expanding Kit. The Expanding Kit needs to be installed into position on the back of the swager box cylinder. Once the Expanding Kit is installed, your bender will have additional capabilities of expanding tubing. To install the Expanding Kit on your bender, proceed as follows: Figure 11-21



1. Slip the adjustable collar guard assembly over the cylinder shaft and tie rod.
2. Secure the assembly to the cylinder using two 1/2” – 13 jam nuts which are provided. Locate these in opposite corners.
3. Screw the arbor securely onto the cylinder shaft. A wrench may be used to secure the arbor and tip. Do not over tighten.
4. Screw the large arbor tip onto the arbor.
5. Lightly grease the arbor and face of the adjustable collar.

The adjustable collar has been calibrated at the factory. Therefore, once is has been installed, you are ready to expand tubing.
The bender has an expanding chart (see figure 10-22) located on the side of the machine. To achieve the desired I.D. expansion, the chart should be read across, for example:
For a 2” I.D. expansion – set the adjustable collar so the 5 appears in the sight. Place the Red segment on the arbor with the Large tip.

***Note**: Should the calibration decal need to be replaced, see “machine repair” section.*

5 APPEARS FOR 2” I.D. EXPANSION

EXPANDING CHART

SETTING	SIZE	SEGMENT	TIP
2	1 1/2 ID	4	4
1	1 5/8 ID	7	9
3	1 3/4 ID	3	8
4	1 7/8 ID		
5	2 ID		
8	2 OD		4
9	2 1/8 OD		
10	2 1/8 ID		9
11	2 1/4 OD		
6	2 1/4 ID	4 7 5	9
7	2 1/2 ID		
12	2 3/4 ID	4 7 6	
13	3 ID		
13	3 1/2 ID	477	

***Note**: Always be sure the arbor and tips are securely screwed in place before expanding begins. The Small tip is only used for 1-1/2" – 1-3/4" expansion with the Yellow segment. All other expansion greater than 1-3/4" will use the Large Arbor tip.*

Using Expanding Tools

The following procedure is provided as a basic step-by-step process to install tooling and begin the expanding. To produce a specific end finish, it will be necessary to refer to the appropriate topic.
For example: to produce a flare, read the basic operation steps, then read the steps of the topic "flare".

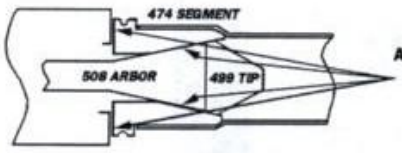
To begin the basic operation, proceed as follows.

1. Turn the machine on.
2. Lift the swager control valve handle and extend the cylinder shaft approximately 12".
3. Install the appropriate arbor, being certain it is threaded all the way onto the cylinder shaft.
4. Grease the arbor thoroughly.

***Note**: Arbor and face of adjustable collar should always be well lubricated with grease.*

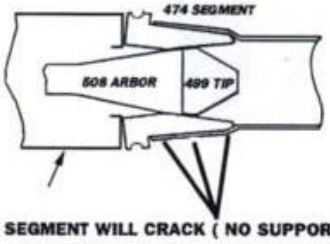
5. Install the appropriate segment set on the arbor by simply forcing the set over the end of the arbor. (see figure 10-23)

Correct



INCORRECT USAGE OF ARBOR AND SEGMENT COMBINATIONS WILL RESULT IN PREMATURE WEAR AND BREAKAGE OF SEGMENT SETS.

Incorrect

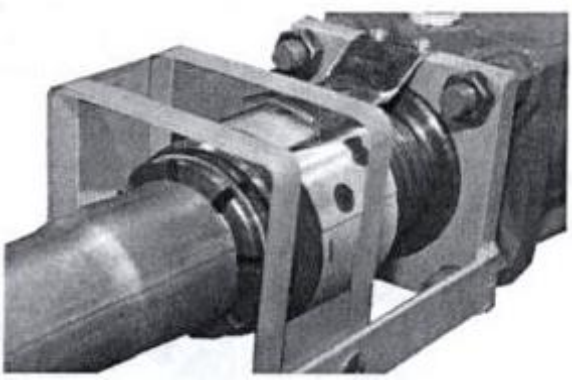


SEGMENT WILL CRACK (NO SUPPORT HERE). THIS IS CAUSED BY IMPROPER ADJUSTMENT OF ADJUSTABLE COLLAR.

***Important**: Always use the correct segment with the correct arbor and arbor tip. Failure to do so will result in tool breakage.*

***Important**: Segment will crack (no support here). This is caused by improper adjustment of adjustable collar.*

6. Place tube halfway over the segment and tap the control handle slightly. This will remove any burrs.
7. Close the segments and run the tube to the base of the segments.
8. Jogging the control handle up and down while rotating the tube clockwise at the same time will give a smooth, round expansion. (see figure 10-24)



9. segments may be removed from the arbor without disassembling the tool. Simply pull the segment off the arbor.

⚠ ***Important**: When performing an end finish other than a calibrated I.D., always begin with the adjustable collar located inward and advance it to make the desired finish. If the collar is left fully extended, prolonged use may distort the end threads and may lock up the collar.*

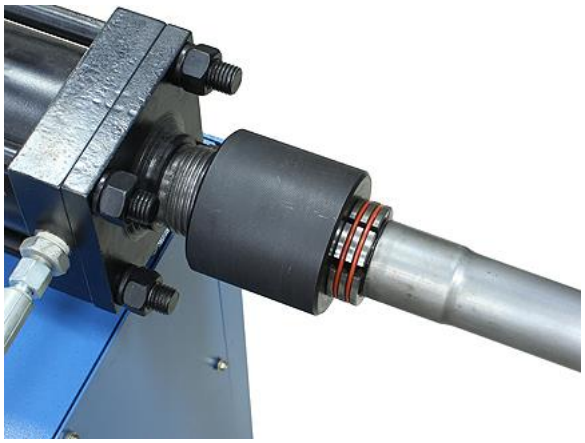
Segment Expanding Setup (alternative) and Operation

The following procedure Is provided as a basic step-by-step process to install tooling and begin the expanding.

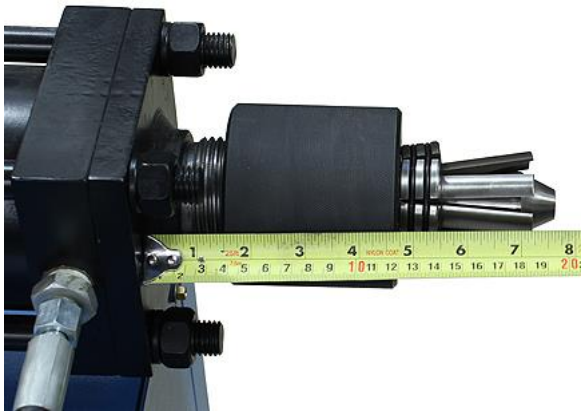
***NOTICE:** Verify that the swager box is empty. Remove the tooling from the swager ram end and remove any collet which may be in the collet clamp. This will allow the ram to extend and retract during segment operations without damaging the swager tooling.*

1. Power on the hydraulic and extend the segment end of the cylinder at least 1 inch.
2. Disconnect the machine from the power source.
3. Clean and lightly lubricate the segment arbor.
4. Install the arbor into the end of the cylinder rod until fully seated with shoulder to shoulder contact. Hand tight is Ok. If using wrenches, do not over tighten.
5. Install the knurled stop Collar onto the expander end of the cylinder threading it onto the cylinder at least 1/2 of the threads.
6. Grease the stop Collar surface and the arbor lightly but thoroughly.
7. Install the appropriate segment set on the arbor by simply forcing the set over the end of the arbor.
8. Press the segment set against the stop Collar and adjust the stop collar so that the end of the segment is even to not more that .25” (6mm) beyond the apex of the arbor tip.
9. Clean and lubricate the inside of the tube end.

10. Insert the end of the tubing into the segment until fully seated. Verify that all of the segments are inside of the tube.
11. Start the hydraulic pump and actuate the control lever to retract the cylinder pulling the arbor in toward the cylinder until cylinder movement stops. This will expand the tube creating flat surfaces with each segment.
12. Push the control lever in the opposite direction just enough to allow the tube to turn over the segments.



13. Turn the tube about 1/2 of the distance of a segment and then actuate the control lever to retract the cylinder a second time. This will reduce the flats to create a more rounded tube end.
14. Release the cylinder and remove the tube from the segments.
15. Use a scrap piece of material of the size that the expansion should slip over.
16. If the expansion is not large enough, turn the stop collar out 1/2 turn and repeat the expanding steps.
17. When the expansion is large enough to fit over the intended material, make a note of the stop collar position as a measurement from the cylinder to the end of the stop collar. This will become a repeatable setting for this size material.

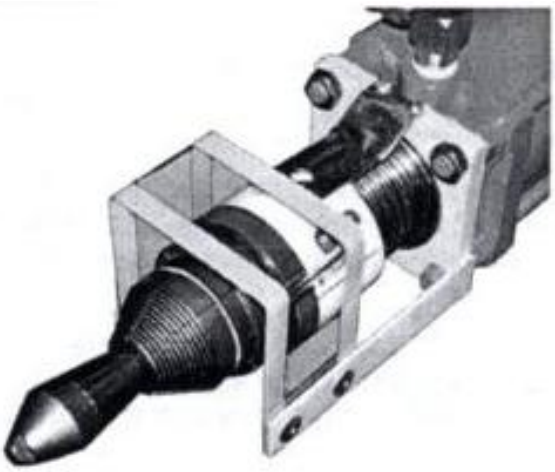


NOTICE: *Incorrect adjustment of the Stop Collar will cause to segments to extend over the arbor apex too soon. This will result in a tapered expansion as well as cause premature wear and breakage to the segments and the arbor.*

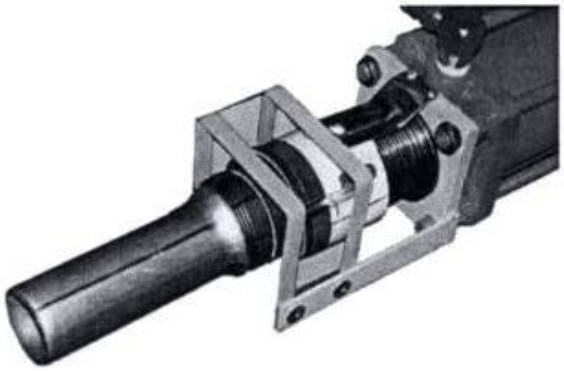
18. Remove the tooling and return it to the storage rack when not in use.

Flaring Segment Set

With a flaring segment set, flares from 1-1/2” to and including 2-1/2” can be completed quickly using the expander.
To produce a flare, proceed as follows:



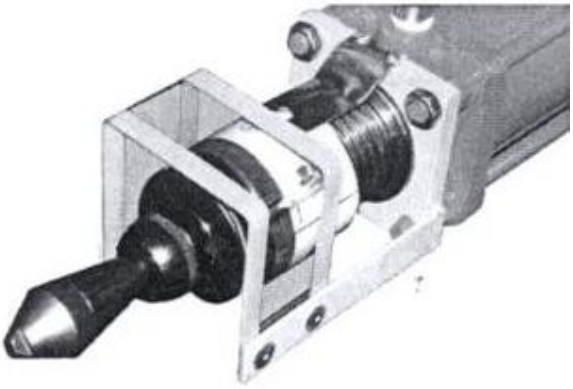
1. Install the arbor and large tip being sure they are securely tightened onto the cylinder shaft.
2. Slid the flaring segment set over the arbor. (see figure 10-25)
3. Place the tubing over the arbor and segment set, but do not place the end of the tubing past the last step (tooth) on the segment. (see figure 10-26)
4. Depress the control handle and rotate the tubing to produce the desired flare.



***Note**: Smaller diameter should be gradually worked up onto the segment set.*

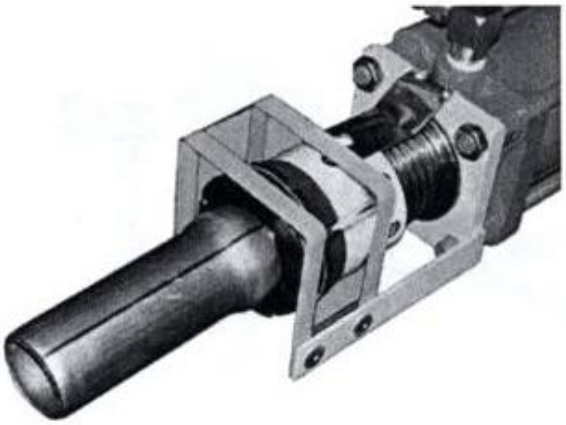
Ball Joint Segment Sets

Ball joint segment sets are used to produce male and female joints on tubing from 1-3/4” to and including 3”. The joints can be made quickly using the expander.
To produce a ball joint, proceed as follows:

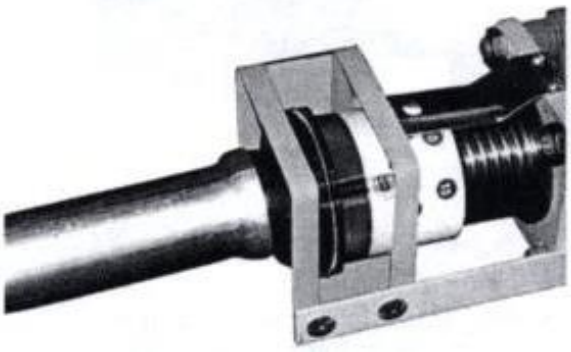


1. Install the arbor and large tip. Be sure they are secured tightly to the cylinder shaft.
2. Slide the ball joint segment over the arbor (see figure 10-27).

3. Place the tubing over the arbor and the segments set until the end of the tubing touches the base of the segment set.
4. Depress the control handle to form the ball, being careful not to distort the open end of the tubing. (see figure 10-28)



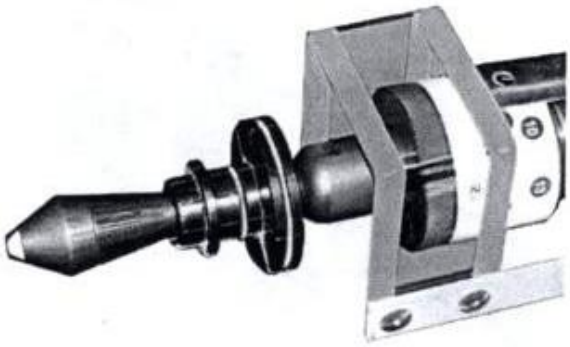
5. To make the female, place the tubing over the arbor and segment set until the end of the tubing is at the groove on the ball.
6. Depress the control handle and flare the end of the tubing to fit the mating ball joint. (see figure 10-29)



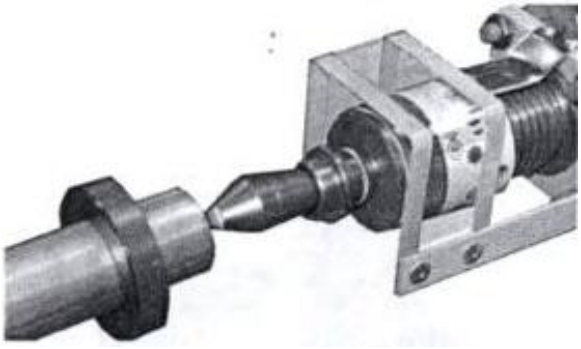
Flange Segment Sets

Expanding flange segment sets come in size 2” – 2-1/2” tubing with sizing rings for 2”, 2-1/4”, and 2-1/2”.
To produce a flange, select the correct segment set, flange ring and proceed as follows:

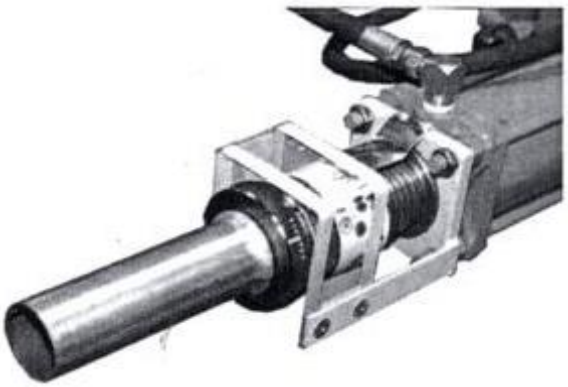
1. Place the segment set over the arbor. Secure into position, (see figure 10-30)



2. Place the flange ring over the end of the tubing.
3. Place the tubing over the arbor and segment set until it meets the base of the segment set. (see figure 10-31)



4. Push the sizing ring forward until it also touches the base of the segment set.
5. Press the swager control handle to form the flange. The flange will be formed when the tubing meets the inside of the flange ring. (see figure 10-32)

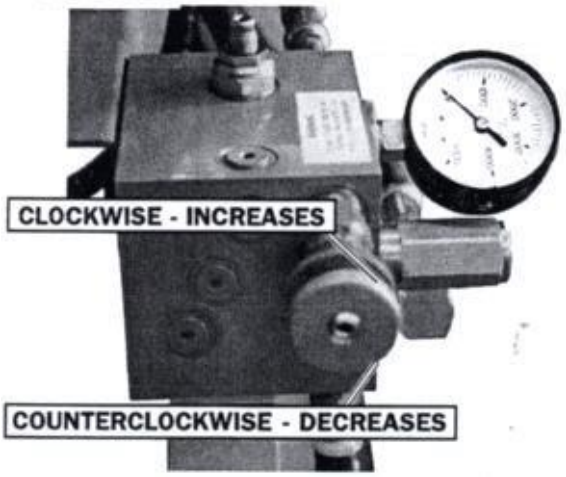


MACHINE ADJUSTMENTS

Bending Pressure Setting

1. Install a 5” radius die and appropriate back shoes on the bender.
2. Turn on the bender.
3. Advance the ram until the dies are engaged.
4. Read pressure from the gauge of the sequence valve. Normal bending pressure for tubing is between 500 and 700 psi. The pressure can only be read as the dies are being engaged. Never exceed 10000psi.
5. If the pressure is incorrect, adjust pressure using the pressure regulator dial knob of the sequence valve. Turning the knob clockwise increases the pressure. Turning it counter clockwise decreases the pressure. (see figure 11-1)
6. If your pressure gauge does not read zero when the dies are disengaged, replace the gauge.

FIGURE 11-1



Swaging / Expanding Pressure Setting

1. Turn on the bender
2. Press the sawger control handle down until the cylinder extends completely into the swager box (to the left). The pressure can only be read as the cylinder is completely engaged. When the pressure is relieved from the cylinder, the gauge should read 0 psi.
3. Read the pressure on the gauge. Pressure should be approximately 3000psi. Pressure should not exceed 3000 psi. If pressure exceed 3000 psi, release the valve lever immediately; pull the valve lever up to relieve pressure and reset the valve to a lower pressure.
4. If the pressure is incorrect, remove the acorn nut and loose the jam nut on the swager valve pressure stem. With an allen wrench, turn the pressure stem to adjust the pressure, turning it clockwise will increase the pressure. Turning it counterclockwise will decrease the pressure. Tighten the jam nut and replace the acorn nut to secure the pressure adjusting stem. (see figure 11-2)
5. After the pressure setting has been adjusted, recheck the pressure setting.

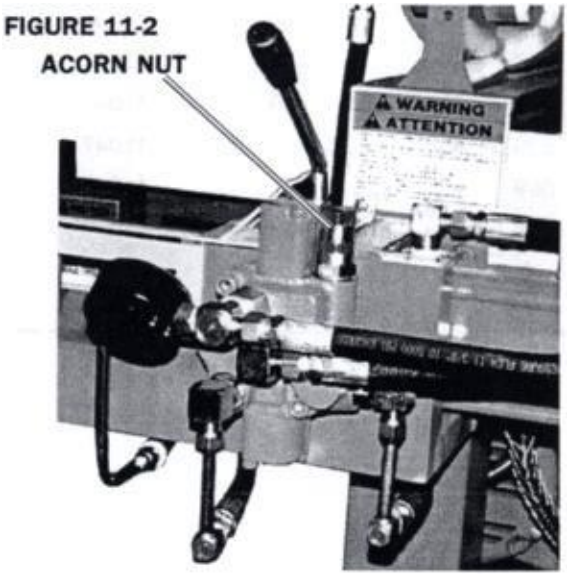


FIGURE 11-2
ACORN NUT

Manual depth-of-bend calibration

You may notice that the degree pointer connected to the left side gate may read 1 degree below zero on the depth-of bend plate. This is set at the factory to compensate for the “spring back” in tubing and should be checked occasionally as follows:

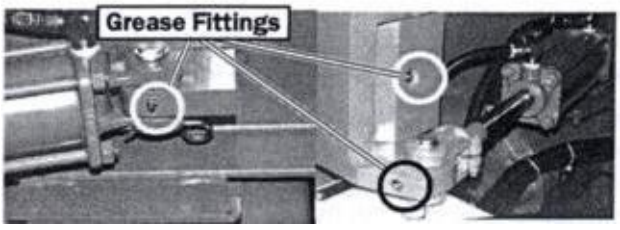
1. Using a 5” radius die and appropriate back shoes, engage the dies and extend the ram die until the pointer on the depth-of-bend plate reads 90 degrees.
2. Using a carpenter’s square, check the alignment of the back gates to ensure a true 90 degree reading.
3. Set the pointer to 90 degree by tapping gently on the depth-of-bend plate or loosing the bolts and nuts.

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.

Daily

- 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.
- Clean and lubricate the guide plate – lubricate with general purpose grease. Remove any nicks or burrs.
- Clean and lubricate the sled – keep clean at all times. Never move the sled without a die in position on it.
- Clean and lubricate the riser – guide plate – clean any dirt and grit from around the riser – guide plate to allow free movement of the sled.
- Clean dirt and oil from the bending dies and remove any burrs.
- Check the cylinder shafts for nicks or burrs and remove them using emery cloth.
- Inspect the segment sets for cracks or damage. Replace if necessary.
- Inspect hose and fittings for leaks. Tighten as required. Hose fittings are made of soft metal. Overtightening may damage the fittings and cause leaks.
- Check for bolts or buts that may have loosened.
- Inspect all the electrical components, i.e. plug, receptacle, cord, foot pedal, conduit, etc. replace any damaged electrical components immediately.
- Grease the six grease fittings as shown using a medium weight, all-purpose grease.



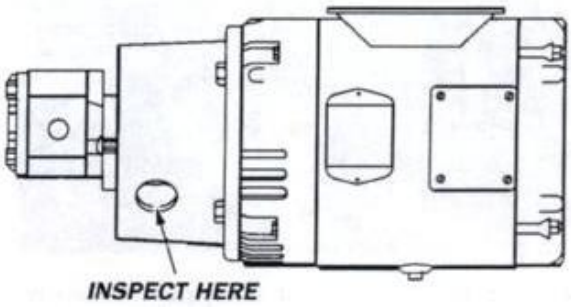
- Ensure that the bolts in the guide plate are tight.
- Check that the depth-of-bend indicate plate(s) are tight. If a plate is loose, tighten it so that it is parallel to the bender's main beam. Recalibrate the bender using the procedure explained in the section titled "depth-of-bend calibration".

Monthly

- Check the oil level of the bender. The bender contains approximately 4 gallons of hydraulic fluid. To check the oil level:
    - Reduce the pressure on the sequence valve to 0 psi.
    - Using a 5” radius die and back shoes, advance the ram die until the main cylinder is fully extended and stop the bender.
    - Visually check the oil level in the filler elbow located on the left side of the machine under the depth-of-bend indicator plate. Oil should appear in the filler elbow or can be felt by inserting your fingertip into the elbow.

***Note**: If oil must be added to the system frequently, check for leaks.*

    - You can use SHELL BRAND #46 or #68 hydraulic oil or an equivalent with similar specifications. (Based upon location temperature and availability.)
- Clean all tooling to remove old grease and nicks and burrs. A light application of lubricating oil is recommended for bending dies and back shoes. Swage and expanding tools should be lightly greased.
- Inspect the coupling between the pump and the motor to ensure the allen set screw have not loosened. (see figure 11-6). Make sure the two halves of the coupling are separated by the rubber spider. Check and tighten any loose connections in the hose leading from the reservoir to the pump.



***Note**: A loose connection on this hose may not always show a leak, but it will suck air and cause aeration in the system, causing the bender to react with uneven operation.*

Hydraulic Oil

The hydraulic oil is the primary medium for transmitting pressure and also must lubricate the running parts of the pump.
After installation of the machine and before machine startup, bring the oil level up to 90% of capacity. A shortage of hydraulic oil can cause hydraulic system breakdown and damage to major mechanical parts due to overheating.

4. Use SHELL BRAND #46 or #68 hydraulic oil or an equivalent with similar specifications. (Based upon location temperature and availability.)
5. Keep hydraulic reservoir filled to 90% of capacity.
6. **DO NOT** rely totally on the oil gauge as they can sometimes indicate an incorrect level reading. Do a visual inspection with the oil fill cap removed as well.

7. A shortage of hydraulic oil will cause hydraulic system breakdown to major mechanical components due to overheating.
8. Change the hydraulic oil every 6 months along with the oil filter.

Oil Change and Disposal

Change the oil in the hydraulic tank after the first 6 months, and every 12 months after that. Clean the filter basket located under the fill cap before refilling the tank. Used oil products must be disposed of in a proper manner following your local regulations.

TROUBLESHOOTING

⚠ WARNING: Make sure the electrical disconnect is OFF before working on the machine.

There are two basic section: electrical troubleshooting and hydraulic troubleshooting. After identifying the problem, proceed with the appropriate corrective action. The chart is organized from the most simple to the more difficult procedures. Be certain the person performing the work has the necessary ability and skills. Observe all safety rules when working on the bender.

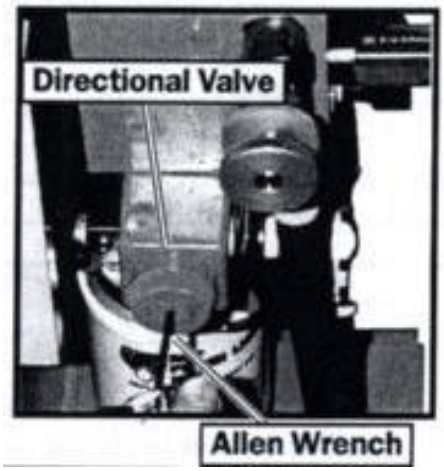
Electrical Troubleshooting

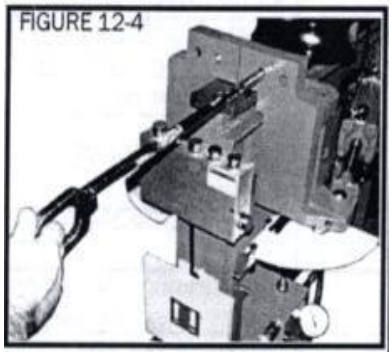
Problem	Possible Cause	Corrective Action
Motor does not run	Circuit breaker is off	Turn breaker on
	Incorrect wiring	Check voltage supply, phase and wiring
	Poor connection at plug	Check wiring
	Cut in power cord	Check and replace at once
	Defective start/stop switch	Test and replace if needed
	Motor defective	Test motor-check with local electrical motor supplier for service center. Replace if need.
	Overload tripped at contactor	Reset overload
	Internal wiring has become disconnected	Check wiring at contactor and buttons
Motor smokes	Centrifugal switch sticking in open position	Remove motor-service at local service center

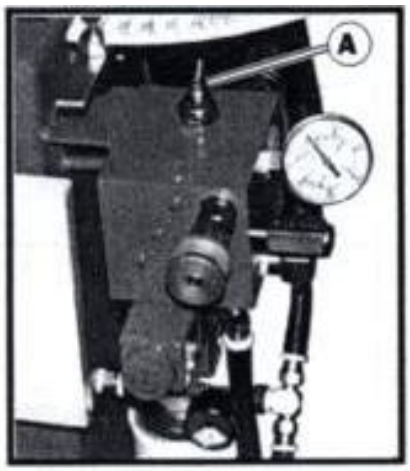
Problem	Possible Cause	Corrective Action
Motor shuts off	Overload safety turning motor off	Reset overload switch and restart. If problem persists, check wiring for short circuits.
	Overload amp setting is too low	Check to determine if motor is overloaded
		Compare to amp draw of motor on Motor's specification tag
	A poor connection at plug or a cut in the power cord exists	Repair or replace
	Motor starter defective	Replace starter
	Motor capacitors defective	Replace
Bender emits shocks	Lost ground connection	Check plug-to-receptacle fit
		Check plug wiring
		Check cord for damage
		Check the ground connection at control box. The bender or tubing being bent must not come in contact with any other object.
Buttons do not activate functions	Directional valve problem	Check wiring
		Check for bad coils
		See "power at swager control valve but not at main cylinder" in hydraulic troubleshooting section
	Wiring problem	Check wiring and connections
	Contact block loose	Re-secure block to back of button

Hydraulic Troubleshooting

Problem	Possible Cause	Corrective Action
Loss of power on either end of bender	Low pressure	Adjust pressure.
	Pump not functioning properly	Key sheared on coupling/coupling loose. Test pump. See topic “loss of power to entire machine”.
	Bender low on oil	Fill tank.
	Hose from tank to pump loose, sucking air	Secure hose
	Aeration of oil	Check all hoses and fittings. Stop all leaks
	Filter in front leg clogged	Remove, clean and replace
	Swager control valve leaks internally-will not build pressure	Check oil flow to valve. Replace valve
Bender stops after bending a few degrees or swaging can not be done; motor bogs down	Low voltage	Check fuse
		Check that bender has its own circuit breaker
		Check incoming voltage
		Ensure plug and receptacle make good contact
		Check cord
	Bender low on oil	Fill tank.
	Filter in front leg clogged	Remove, clean and replace
	Back shoe pressure too high	Lower back pressure
Direction valve chatters	Low voltage	Check fuse
		Check that bender has its own circuit breaker
		Check incoming voltage
		Ensure plug and receptacle make good contact
		Check cord
		Check internal wiring and conduit for breaks
Power at swager control valve, but not at the main cylinder	Seals in main cylinder are bad	With a 5” radius die in place, extend the main cylinder as far as possible. Remove the hose from the front of the main cylinder. Place the end of the hose in a bucket and press the forward button. If the seals are

Problem	Possible Cause	Corrective Action
		good, no oil will come out of the hose.
	Sequence valve PSI set too high	See maintenance
	Swager control valve leaking internally	Replace valve
	Sequence valve by passing internally	Replace vale
Power at swager control valve, but not at the main cylinder	Directional valve not operating properly.  	Operate valve manually by using an allen wrench. Push the small button on the end of the coil. Left coil retracts cylinder; right coil extends it. Main cylinder should move. If button will not move, the valve is defective. Replace valve. If manual operation is possible, check for voltage at coil on valve. If voltage is present, the coil is bad. Replace valve.
Hydraulics are “jumpy” or erratic	Air in hydraulic system	Ensure that all hoses and fittings are tight
	Air in hydraulic pump	Proceeds as follows: top off oil level in reservoir with fresh oil. Run bender through its cycle several times until the entire system is purged of air bubbles.
	Oil in reservoir is low	Add oil.
Gates do not return correctly	Pressure setting at sequence valve is incorrect	Reset pressure.
	Dirt or grease buildup on gate bearing pins	Clean and lubricate using the following procedures: Remove depth-of-bend plate. Remove degree pointer. Remove clevis pin and move cylinder out of the way. Remove snap ring from swing gate bearing pin.

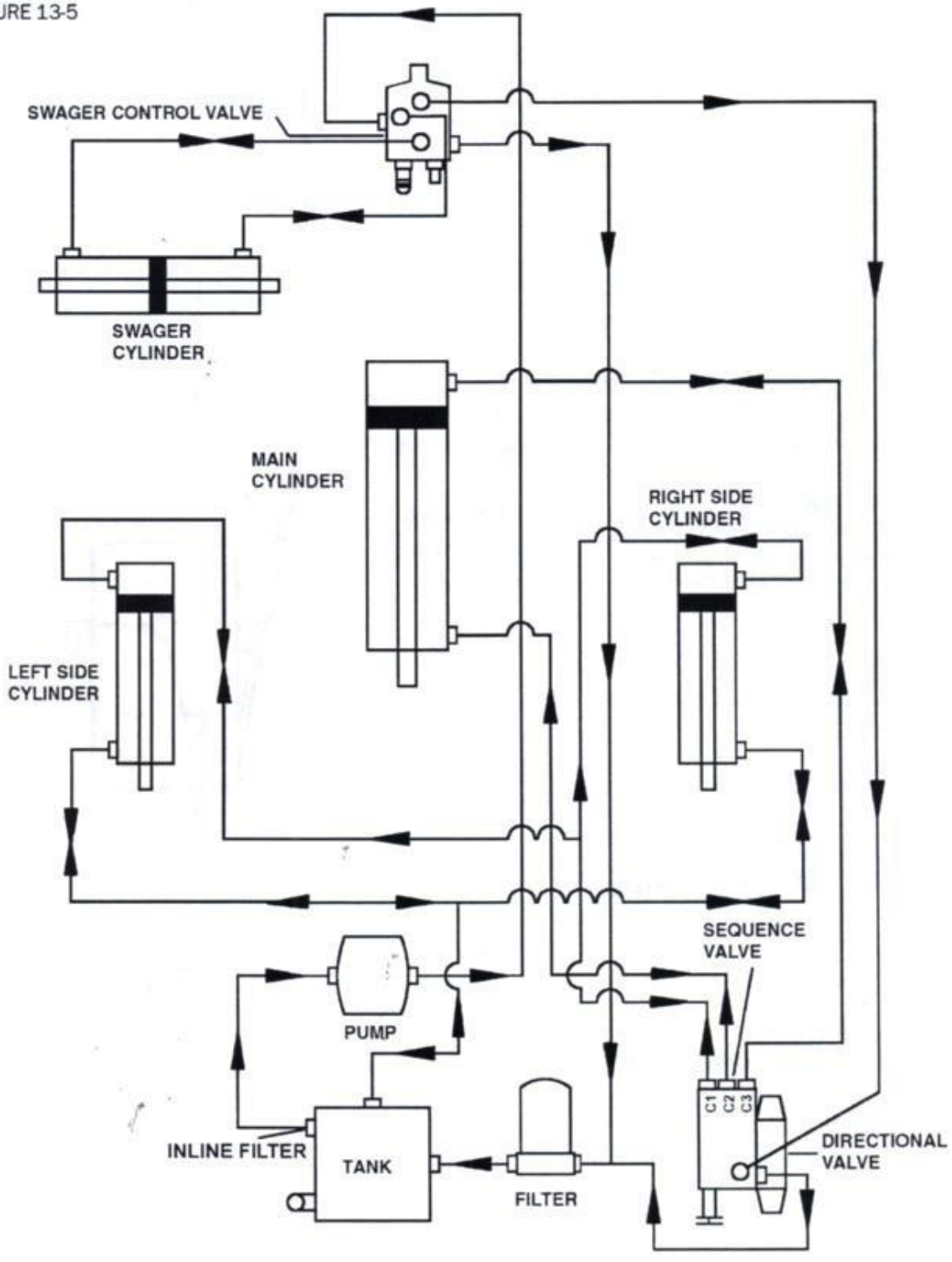
Problem	Possible Cause	Corrective Action
		Press out bearing pin. Remove gate. Clean parts, lubricate and reassemble.
	Sequence valve out of adjustment	See problem “tube collapses”
	Air in system	See “hydraulic are “jumpy‟ or “erratic”
	Side cylinder seals are bad	See “gate move slowly” (below)
Gates move slowly	Pressure setting incorrect	Adjust pressure.
	Side cylinder are worn.  FIGURE 12-4	Set sequence valve to 100 psi. with gates closed and power off. Pry the gates open. If the gates open, the seal in the side cylinder are worn and should be replaced. Test seals (PSI set above 100). With a 5” radius die in place, extend the main cylinder as far as possible. Remove the hoses from the front (shaft end) of the side cylinder. (if the hoses drop they will drain the tank.) depress the forward button. The machine can not move. If the seal leak, oil will come from the fittings
Hydraulic pressure drops	Pump defective	Test pump. See problem “loss of power to entire machine”
		Check coupler
		Replace pump
Hydraulic pump noisy	Motor-to-pump coupling loose	Tighten coupling
	Key on motor or pump shaft is sheared	Replace key; inspect motor/pump shaft for damage; replace coupling if damages
	Spider on coupling is worn	Replace coupling or spider
	The pump is bad	See “loss of hydraulic power to entire machine”
Pressure reads 3000psi at swager but there is a loss of bending power	Main cylinder seals bad	See “power at swager, not at main cylinder”
Tube collapses	Setting on sequence valve is incorrect. (travel time of sled	If extension and retraction travel times are not equal:

Problem	Possible Cause	Corrective Action
	and die extension and retraction should be the same) 	Loosen jam nut on top of sequence valve. Using an allen wrench, turn the adjustment screw (A) on top of valve. When the extension and retraction speeds match, tighten the locknut to lock adjustment screw in place.
	Side cylinder are worn	See problem “gates move slowly”

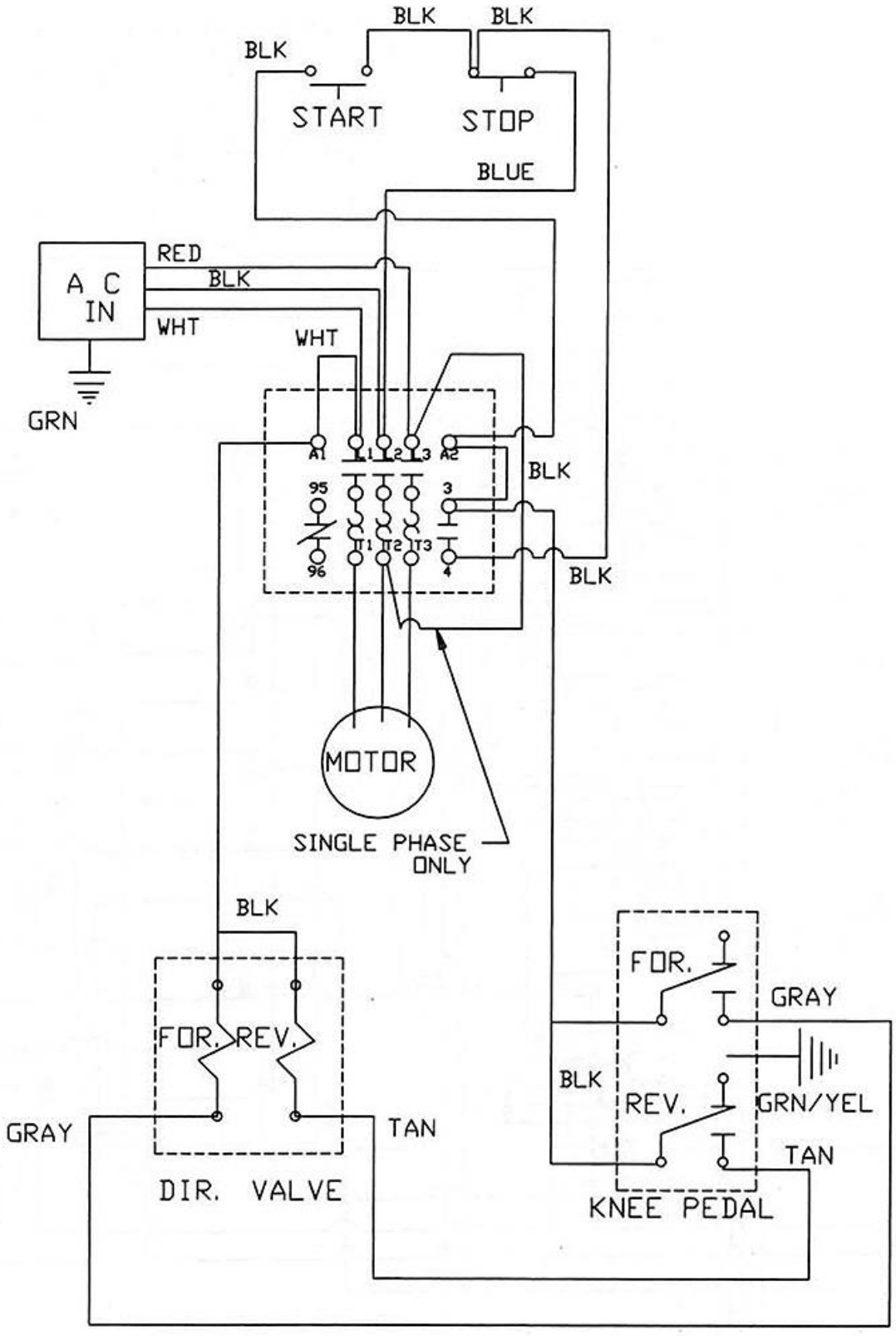
HYDRAULIC FLOW SYSTEM

There is no pressure in the hydraulic system when work is not being done on the bender. All valves are open center and hydraulic fluid flows through the system until the dies are engaged. On the following pages, you will find the hydraulic flow diagrams. Use these diagrams as a diagnostic tool to aid in trouble shooting and bender hydraulic trouble.

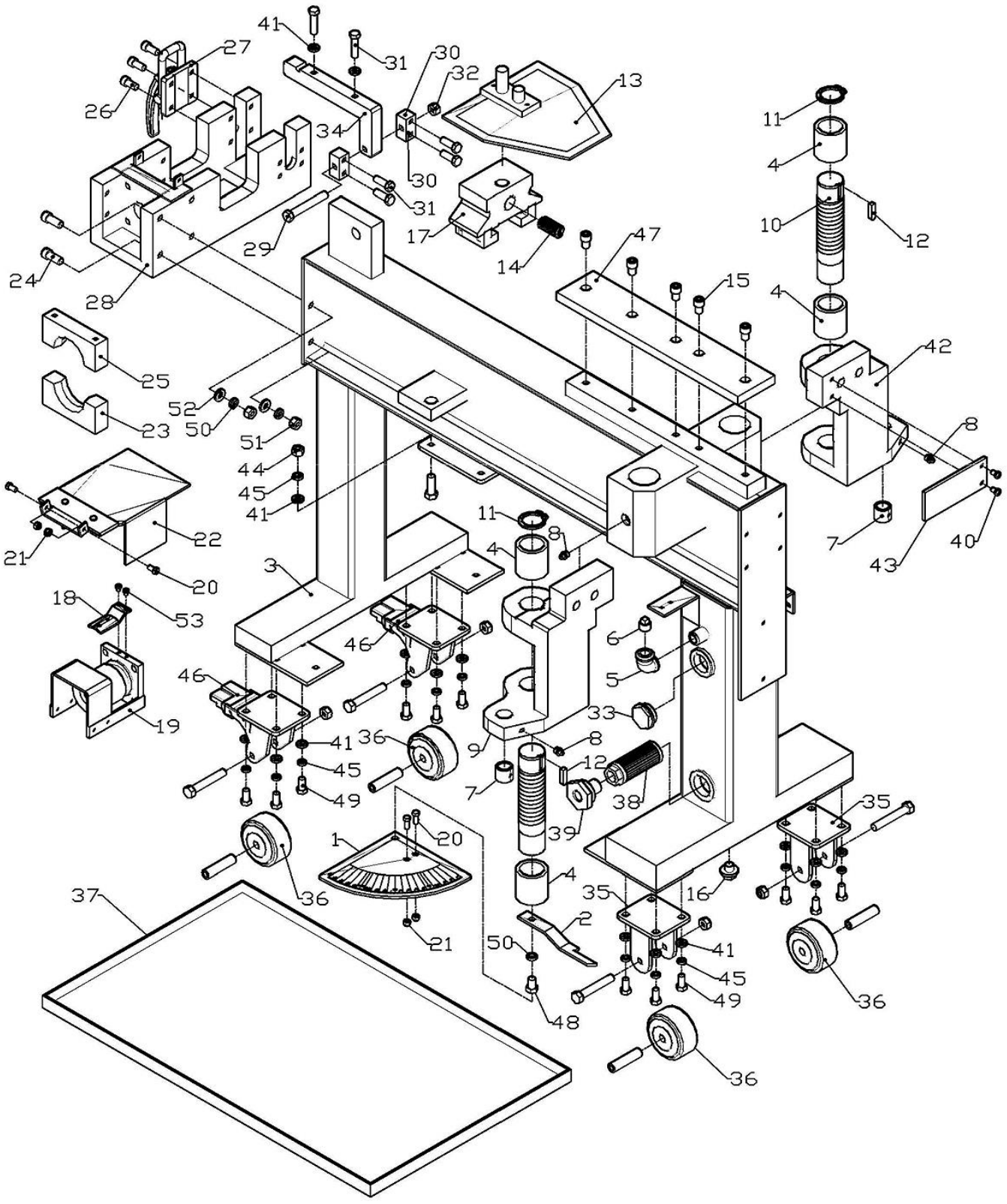
FIGURE 13-5



ELECTRICAL WIRING DIAGRAM



FRAME PARTS DIAGRAM – A

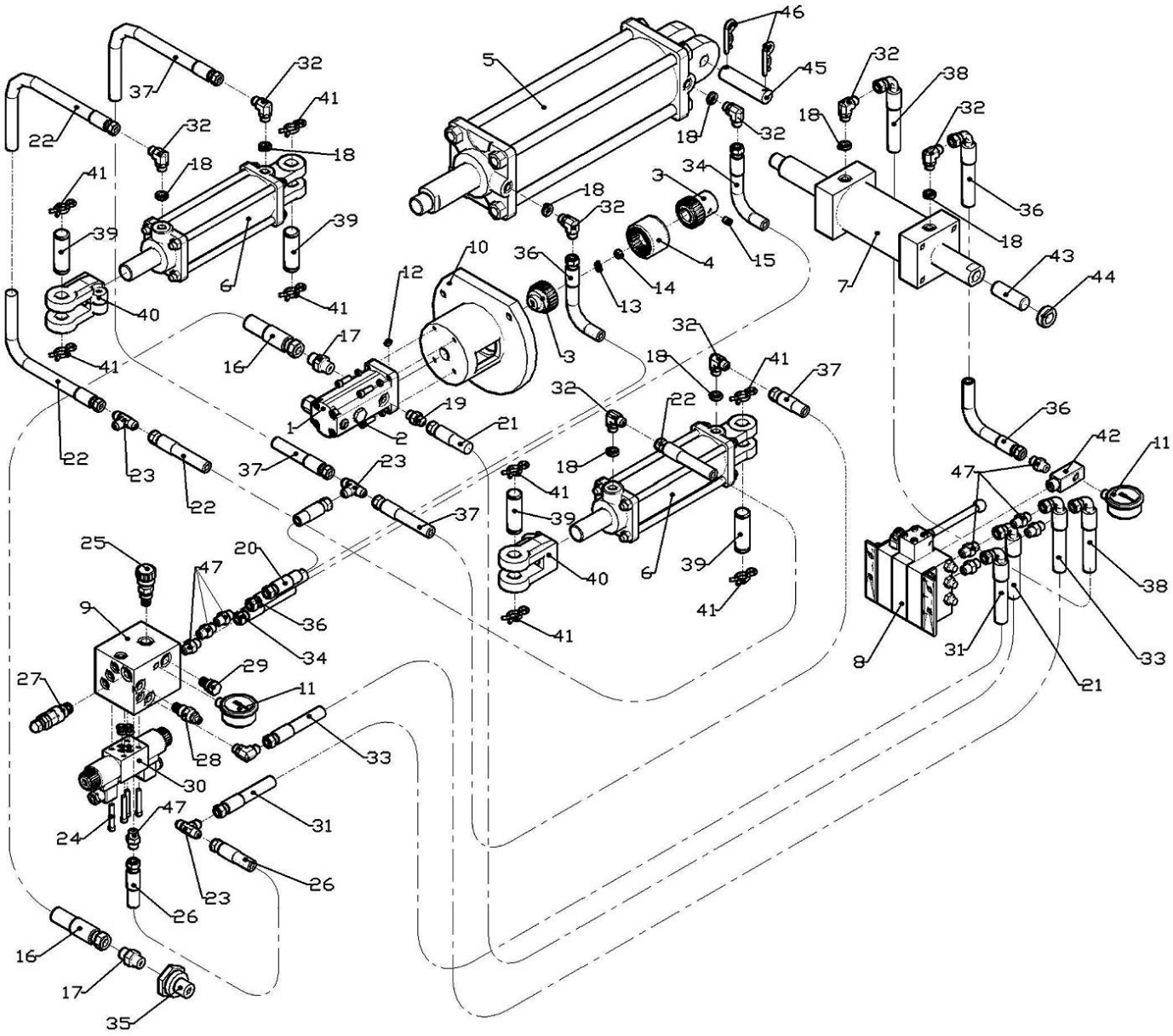


Frame Parts List – A

Item	Part No.	Description	Qty.
1	EB300-A1	Depth of Bend Scale	1
2	EB300-A2	Scale Pointer	1
3	EB300-A3	Main Frame	1
4	EB300-A4	Bushing, Gate Pivot	4
5	EB300-A5	90° Street Elbow Fitting	1
6	EB300-A6	Pipe Plug	1
7	EB300-A7	Bushing, Gate Cylinder Pivot	2
8	EB300-A8	Grease Fitting	4
9	EB300-A9	Gate, Left	1
10	EB300-A10	Gate Pivot Pin	2
11	EB300-A11	Retaining Ring	2
12	EB300-A12	Key, 5/16 x 5/16	2
13	EB300-A13	Guard / Radius Die Retainer	1
14	EB300-A14	Spring	1
15	EB300-A15	Socket Head Cap Screw 1/2-13x1”	5
16	EB300-A16	Drain Plug	1
17	EB300-A17	Sled	1
18	EB300-A18	Collar Setting indicator	1
19	EB300-A19	Adjustable Collar Assembly	1
20	EB300-A20	Hex Bolt 1/4”-20x3/4"	4
21	EB300-A21	Hex Lock Nut 1/4”-20	4
22	EB300-A22	Swager Box Guard	1
23	EB300-A23	Collet Holder Half	1
24	EB300-A24	Socket Head Cap Screw 1/2-13x1-1/2	4
25	EB300-A25	Collet Holder Half	1
26	EB300-A26	Socket Head Cap Screw 3/8-16x1	4
27	EB300-A27	Swager Arm Clamp	1
28	EB300-A28	Swager Frame	1
29	EB300-A29	Hex Bolt 1/2-13x4	1
30	EB300-A30	Hinge Block	2
31	EB300-A31	Hex Head Cap Screw 3/8-16x1-3/4	6
32	EB300-A32	Hex Lock Nut 1/2”-13	1
33	EB300-A33	Sight Gauge	1

34	EB300-A34	Swager Clamp Arm	1
35	EB300-A35	Rigid Caster Assembly	2
36	EB300-A36	Wheel	4
37	EB300-A37	Tooling Tray	1
38	EB300-A38	Screen Filter	1
39	EB300-A39	Filter Adaptor Fitting	1
40	EB300-A40	Screw	2
41	EB300-A41	Flat Washer 3/8”	20
42	EB300-A42	Gate, Right	1
43	EB300-A43	Shoe Opening Guard	1
44	EB300-A44	Lock Nut 3/8-16	2
45	EB300-A45	Lock Washer 3/8”	20
46	EB300-A46	Swivel Caster w/Brake	2
47	EB300-A47	Slide Plate	1
48	EB300-A48	Socket Head Cap Screw 1/2-13x1-1/2”	1
49	EB300-A49	Socket Head Cap Screw 3/8-16x1	16
50	EB300-A50	Lock Washer 1/2”	5
51	EB300-A51	Flat Washer 1/2”	5
52	EB300-A52	Hex Lock Nut 1/2”-13	4
53	EB300-A53	Screw	2

HYDRAULIC PARTS DIAGRAM – B

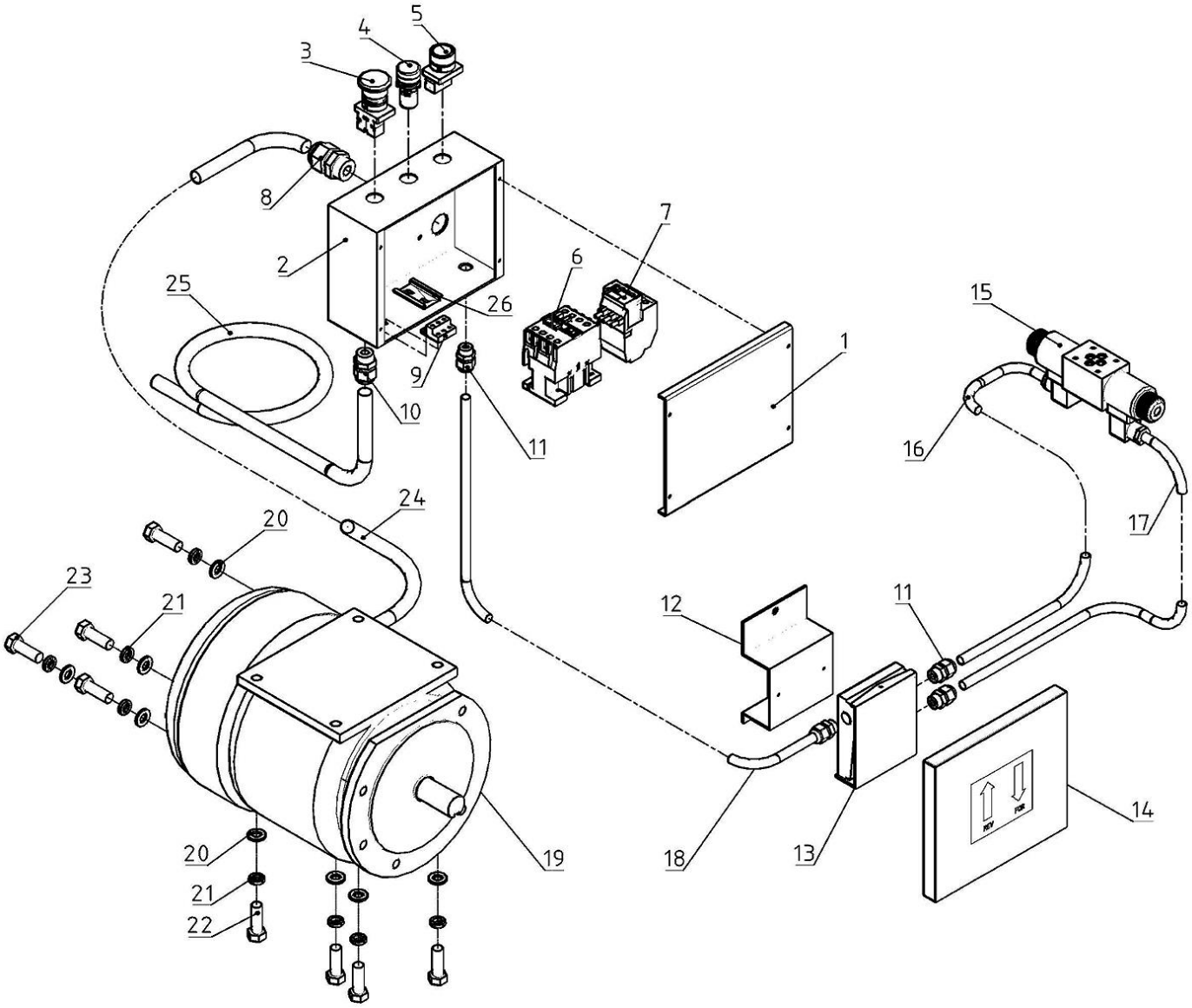


Hydraulic Parts List – B

Item	Part No.	Description	Qty.
1	EB300-B1	Pump, hydraulic	1
2	EB300-B2	Bolt, Hex Hd.3/8”-16x1”	3
3	EB300-B3	Coupler	1
4	EB300-B4	Spyder, rubber	1
5	EB300-B5	Cylinder, main welded, Includes pin	1
6	EB300-B6	Cylinder, side welded, Includes pin	2
7	EB300-B7	Cylinder, double end, Ag.3-1/2”	1
8	EB300-B8	Valve, swager	1
9	EB300-B9	Valve Block, Sequence	1
10	EB300-B10	Adaptor Plate, Pump to Motor	1
11	EB300-B11	Gauge, pressure	2
12	EB300-B12	Key	1
13	EB300-B13	Set Screw	1
14	EB300-B14	Spacer	1
15	EB300-B15	Set Screw	1
16	EB300-B16	Hose, Pump to Tank	1
17	EB300-B17	Connector Fitting	2
18	EB300-B18	Seal Ring	8
19	EB300-B19	Str, 3/8 ML JIC X 1/2ML SAE O"R	1
20	EB300-B20	Hose, Return, #6, 13” Lg.	1
21	EB300-21	Hose, #6, 41” Lg.	1
22	EB300-B22 Hose	Hose, return, #6, 24” Lg.	2
23	EB300-B23	Branch, T FTG, 3/8x3/8x1/4 JIC	3
24	EB300-B24	Socket Head Cap Screw	4
25	EB300-B25	Sequencing (Speed) Valve	1
26	EB300-B26	Hose, Return, #6, 13” Lg.	1
27	EB300-B27	Pressure Valve, Side Cylinders	1
28	EB300-B28	Pressure Valve, Main Cylinders	1
29	EB300-B29	Check Valve	1
30	EB300-B30	Valve, directional, 220V	1
31	EB300-B31	Hose, return, #6, 56” Lg.	1
32	EB300-B32	90 FTG, 1/2ML NPTx3/8ML JIC	8
33	EB300-B33	Hose, #6, 58” Lg.	1

Item	Part No.	Description	Qty.
34	EB300-B34	Hose, #6,50” Lg.	2
35	EB300-B35	Str FTG, 1/2ML NPTx1/4FM NPT Includes filter, head & gauge	2
36	EB300-B36	Hose, #6, 23-1/2” Lg	2
37	EB300-B37	Hose, #6, 15-1/2Lg.	2
38	EB300-B38	Hose, #6, 19” Lg.	1
39	EB300-B39	Pin, side cylinder	4
40	EB300-B40	Side Cylinder Clevis	4
41	EB300-B41	Hair Pin	8
42	EB300-B42	Fitting, Special 90 FTG, 1/2ML NPT x 3/8ML JIC, DT	1
43	EB300-B43	Stud, thread 1-14	1
44	EB300-B44	Nut, knurl	1
45	EB300-B45	Pin, main cylinder	1
46	EB300-B46	Hair Pin	2
47	EB300-B47	Str FTG, 1/2ML SAE O"R x 1/2FM NPT	7

ELECTRICAL PARTS DIAGRAM – E



Electrical Parts List – E

Item	Part No.	Description	Qty.
1	EB300-E-1	Electrical Box Cover	1
2	EB300-E-2	Electrical Box	1
3	EB300-E3	Stop / Emergency Stop switch	1
4	EB300-E4	Power On Indicator Lamp	1
5	EB300-E5	Start/Run Push Button	1
6	EB300-E6	Motor Contactor	1
7	EB300-E7	Thermal Overload	1
8	EB300-E8	Cord Grip Strain Relief	1
9	EB300-E9	Ground Block	1
10	EB300-E10	Cord Grip Strain Relief	1
11	EB300-E11	Cord Grip Strain Relief	4
12	EB300-E12	Mounting Bracket, Knee Switch	1
13	EB300-13	Knee Switch Assembly, Includes 11-14	1
14	EB300-E14	Knee Switch Rocker Pad	1
15	EB300-10	Directional Valve	1
	EB300-30-Coil	Solenoid Coil	
16	EB300-E16	Harness, Switch to Valve, 16-3	2
17		Same as EB300-E16	
18	EB300-E18	Harness, Electrical Box to Switch, 16-3	1
19	EB300-Motor	Motor, 5hp, 220V, 1ph	1
20	EB300-E20	Flat Washer 1/2"	8
21	EB300-E21	Lock Washer 1/2"	8
22	EB300-E22	Bolt, Hex 1/2-13x1	4
23	EB300-E-1	Bolt, Hex 1/2-13x3/4	4
24	EB300-E24	Harness, Electrical Box to Motor, 12-3	1
25	EB300-E25	Harness, Power Cord, 12-3	1
26	EB300-E26	DIN Rail	1

EB-300 STANDARD TOOLING LIST

Product Number	Description	Qty.
EB300-4001	1-1/2" Round Tube Die, 3" Radius	1
EB300-4002	1-3/4" Round Tube Die, 3" Radius	1
EB300-4003	2" Round Tube Die, 4" Radius	1
EB300-4004	2-1/4" Round Tube Die, 4" Radius	1
EB300-4005	2-1/2" Round Tube Die, 5" Radius	1
EB300-4006	2-1/4" Round Tube Die, 5" Radius	1
EB300-4007	3" Round Tube Die, 5" Radius	1
EB300-4008	2" Round Tube Die, 5" Radius	1
EB300-Die Pins	Die Alignment Pins	38
EB300-Half Shoe Spacer	Spacer for Half Bending Shoes	1
EB300-Full Shoe Spacer	Pacer for Full Length Bending Shoes	2
EB300-4009	1-1/2" Round Tube Full Length Bending Shoe	2
EB300-4010	1-3/4" Round Tube Full Length Bending Shoe	2
EB300-4011	2" Round Tube Full Length Bending Shoe	2
EB300-4012	2-1/4" Round Tube Full Length Bending Shoe	2
EB300-4013	2-1/2" Round Tube Full Length Bending Shoe	2
EB300-4014	3" Round Tube Full Length Bending Shoe	2
EB300-4015	2-1/4" Round Tube Half Length Bending Shoe	1
EB300-4016	2-1/2" Round Tube Half Length Bending Shoe	1
EB300-4017	1-1/2" Round Tube Half Length Bending Shoe	2
EB300-4018	1-3/4" Round Tube Half Length Bending Shoe	2
EB300-4019	2"Round Tube Half Length Bending Shoe	2
EB300-4020	Expander Tip for 1-1/2" to 1-3/4"	1
EB300-4021	Expander Tip for 1-3/4" to 3-1/2"	1
EB300-4022	Die Holder	1
EB300-4025	Pipe Flanger 1-1/2" to 3"	1
EB300-4026	Expander Arbor for 1-3/8" to 3-1/2"	1
EB300-4027	2-1/2" Round Tube Clamp Collet (2 Halves)	1
EB300-4028	2-1/4" Round Tube Clamp Collet (2 Halves)	1
EB300-4029	1-1/2" Round Tube Clamp Collet (2 Halves)	1
EB300-4030	2" Round Tube Clamp Collet (2 Halves)	1
EB300-4031	1-3/4" Round Tube Clamp Collet (2 Halves)	1
EB300-4032	Segment Expander 1-3/4" to 2-1/8" (Red)	1
EB300-4033	Segment Expander 2-1/8" to 2-1/2" (Black)	1

Product Number	Description	Qty.
EB300-4034	Segment Expander 2-1/2" to 3" (Green)	1
EB300-4035	1-1/2" Swage Die	1
EB300-4036	1-3/4" Swage Die	1
EB300-4037	1-1/2 Male Ball Die, 2" Swage	1
EB300-4038	2" Male Ball Die, 2-1/4" Swage	1
EB300-4039	2-1/4" Male Ball Die, 2-1/2" Swage	1
EB300-4040	2-1/2" Male Ball Die, 2-3/4" Swage	1
EB300-4041	Female Ball Die, 1-3/4" to 2"	1
EB300-4042	Female Ball Die, 2-1/4" to 2-1/2"	1
EB300-4043	Domer Die 1-3/4" to 2-1/2"	1
EB300-4044	Domer Die 2-5/8" to 2-3/4"	1

NOTES

NOTES

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