BLUE BOY TUBE BENDER

SERVICE MANUAL

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YOUR BLUE BOY TUBE BENDER

The **Blue Boy Tube Bender** *is a product of over ten years of continuous research, development, and product improvement. Following the simple installation and maintenance instructions given herein will insure you long, efficient, and trouble-free service.*

Blue Boy Tube Benders *are manufactured with the finest materials and components available. They are equipped with rugged precision tooling, designed for day-to-day production in your shop.*

Though there are detail differences from model to model, the basic machine design is the same for all models. This manual covers the installation, maintenance, and use of all **Blue Boy Tube Benders.** *Skip over parts of the manual that tell about features your machine does not have.*

BASIC DESIGN

Blue Boy Tube Benders perform two functions:

(1) They bend tubing of diameters within their tooling capacity to specified angles and radii.

(2) They expand the ends of tubes to specified configurations.

Tube bending is done with a hydraulically-driven ram die and a matching pair of back shoes. Tubing is held in place prior to bending by **spring** pressure on the **ram** die. When the operator is sure the tubing is positioned properly, he actuates the machine.

The ram die moves smoothly forward. The back shoes swing smoothly back, continually exerting pressure against the ram die while allowing it to pass between them, making a uniform bend. The precision contours of the matching ram die and back shoes hold the tubing securely. They cause the tubing to maintain its round cross-section while bending it through the correct angle. After the desired depth of bend is reached, the ram die retracts, releasing the bent tubing.

The expanding and shaping capability is performed in two distinct ways. These are called, respectively, **swaging** and **hydra-sizing**. Both swaging and hydra-sizing capabilities are found on some models of **Blue Boy Tube Benders.**

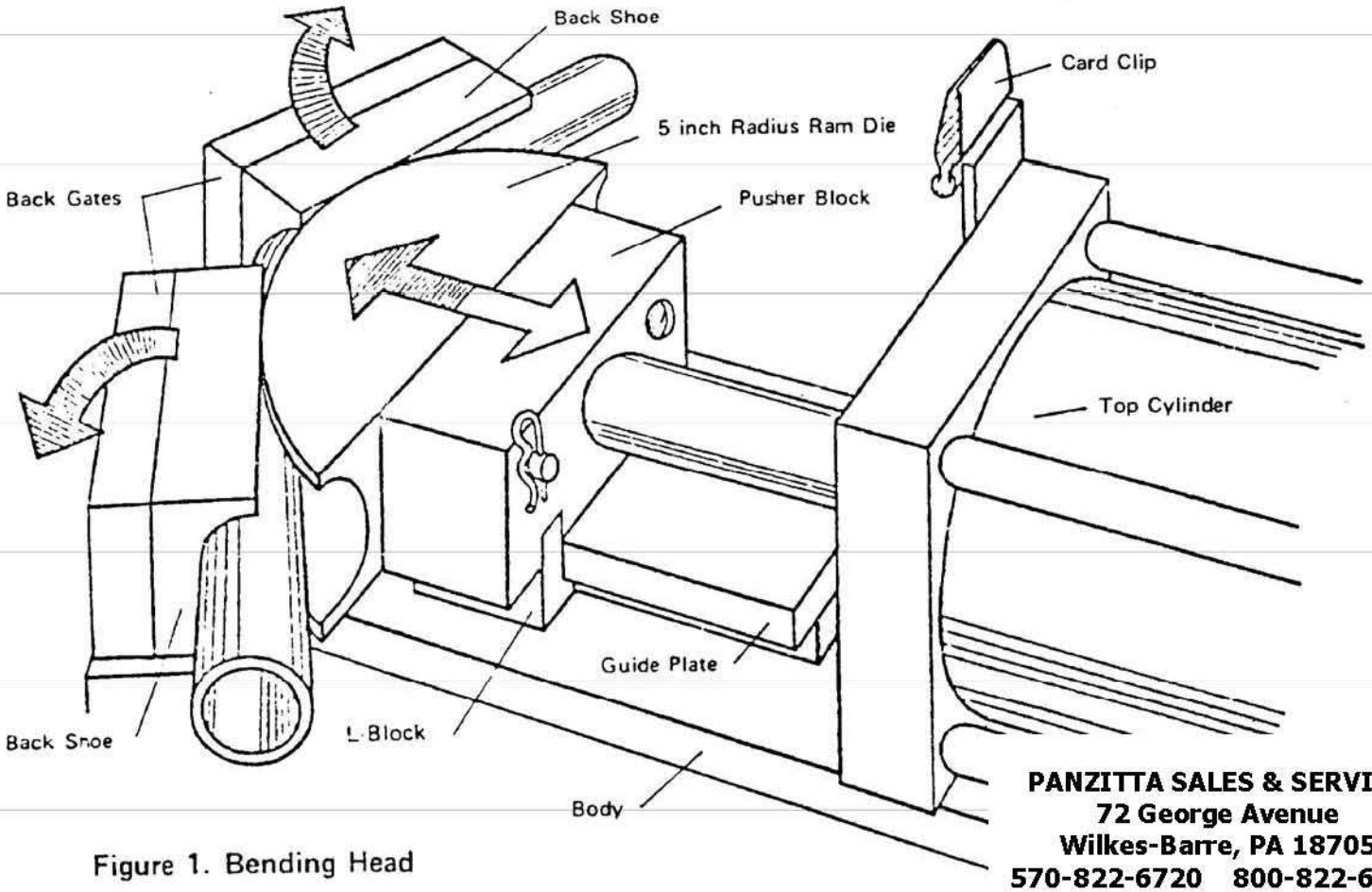
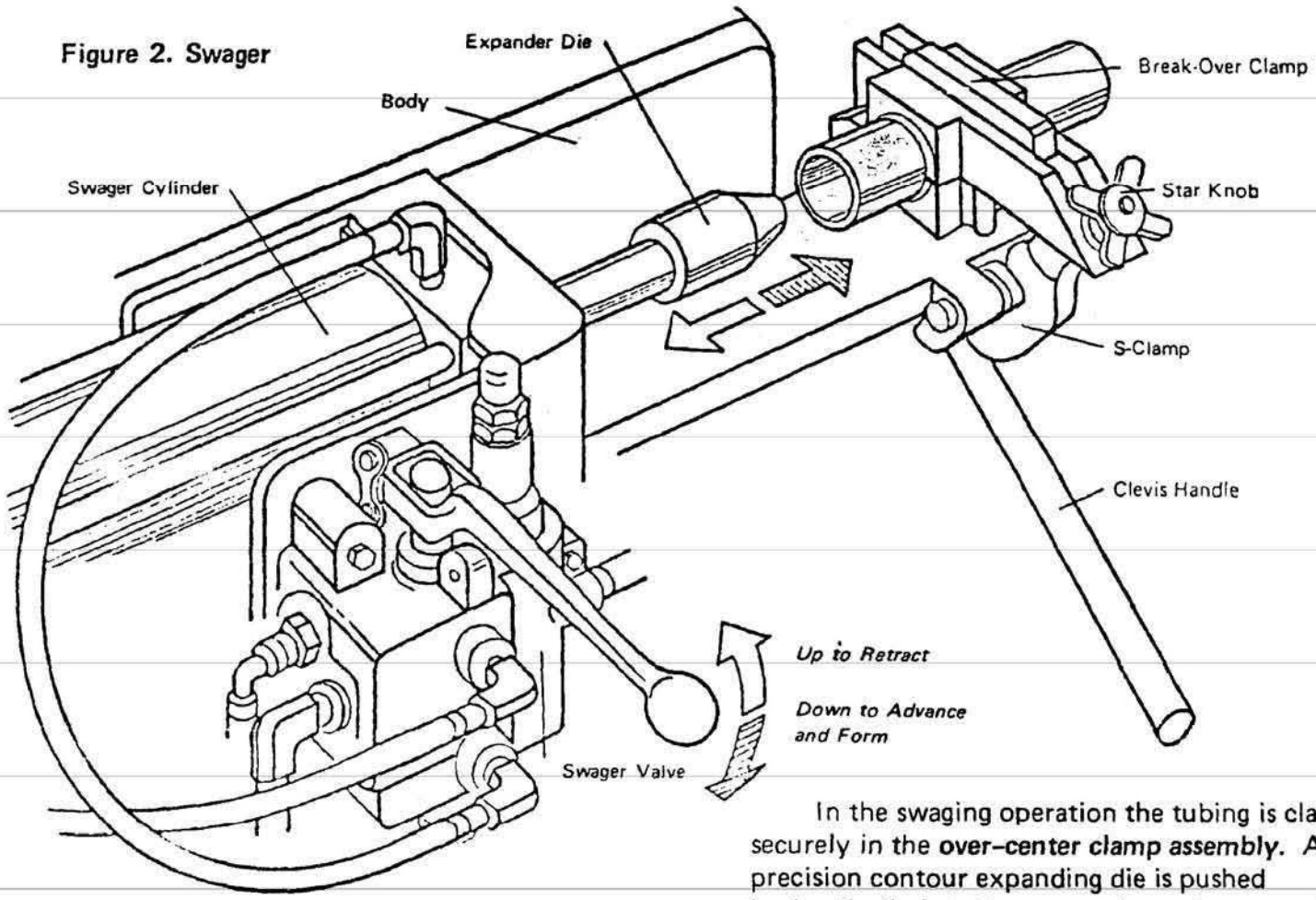
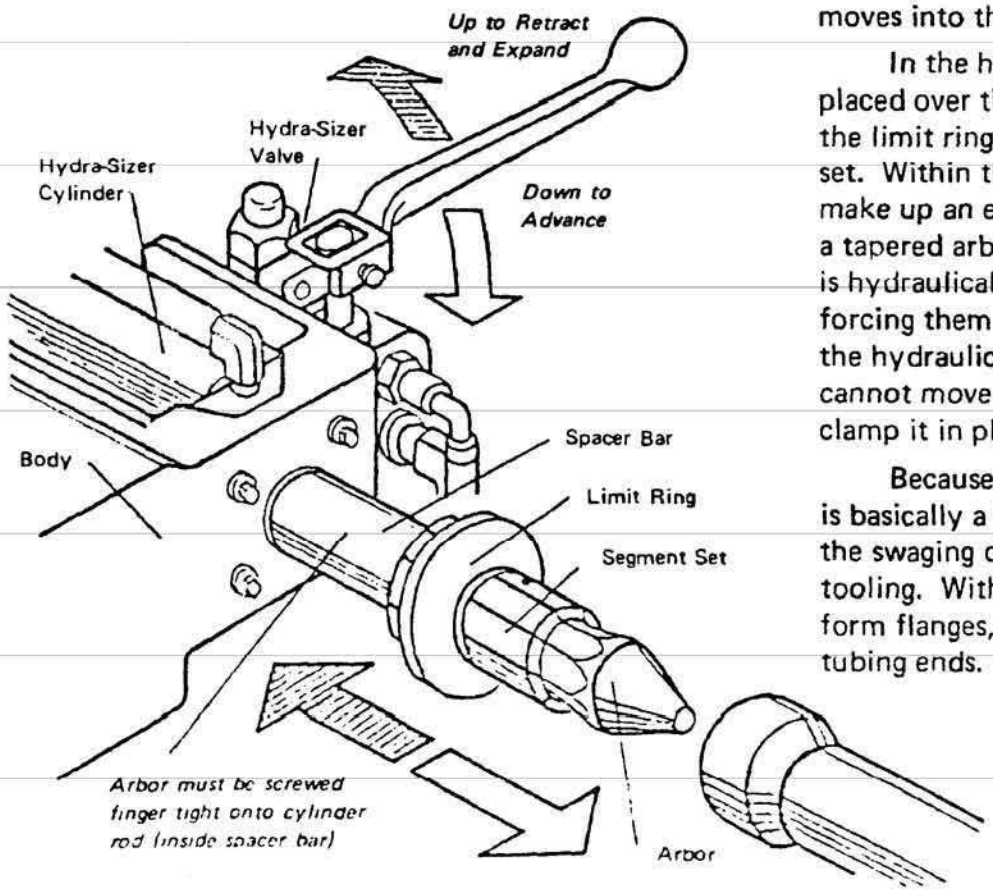


Figure 1. Bending Head

Figure 2. Swager



In the swaging operation the tubing is clamped securely in the **over-center clamp assembly.** A precision contour expanding die is pushed hydraulically into the open tube end to a specified depth, enlarging the tubing **inner** diameter as it moves into the tube.



In the hydra-sizing operation the tubing is placed over the hydra-sizing tool with its end flush to the limit ring, and the limit ring flush to the segment set. Within the limit ring are a set of segments which make up an expandable head. Inside the segments is a tapered arbor. With the tubing in place, the arbor is hydraulically withdrawn through the segments, forcing them outward to meet the limit ring. Since the hydraulic action is a pulling one, and the tubing cannot move past the limit ring, there is no need to clamp it in place for a hydra-sizing operation.

Because clamping is not needed, hydra-sizing is basically a faster operation than swaging. However, the swaging device makes use of a versatile set of tooling. With the swager you can flare tube ends and form flanges, ball joints, domes, and other special tubing ends.

Figure 3. Hydra-Sizer

DEFINITION OF TERMS

The front of the machine is the end with the single swivel caster (closely-mounted pair of casters on Model 214MS) where the operator customarily stands to do his bending work. This **front** end of the machine also carries the controls for the bending operation.

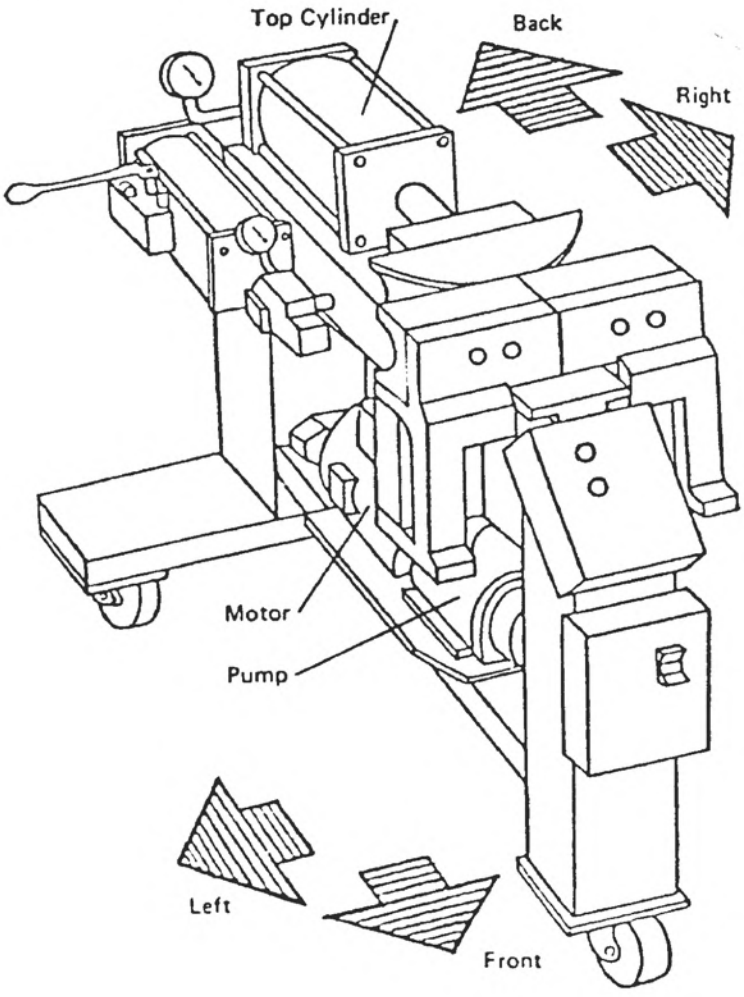
When you stand in front facing the machine, the **left** side of the machine is to your left, the **right** side of the machine is to your right, and the **back** of the machine is farthest away from you.

INSTALLING YOUR MACHINE

Always use your **Blue Boy Tube Bender** on a solid, level floor, sturdy enough to support the weight of the machine properly.

Every **Blue Boy Tube Bender** is built using the same basic design. All machine frames (except Model 214MS) are equipped with three heavy duty casters which simplify leveling of the machine.

Figure 4. Terms



While all actions of **Blue Boy Tube Benders** are hydraulic, primary power is electric. The machine makes use of a hydraulic pump driven by an electric motor. The pump is always located on the cross channel, coupled to the motor shaft.

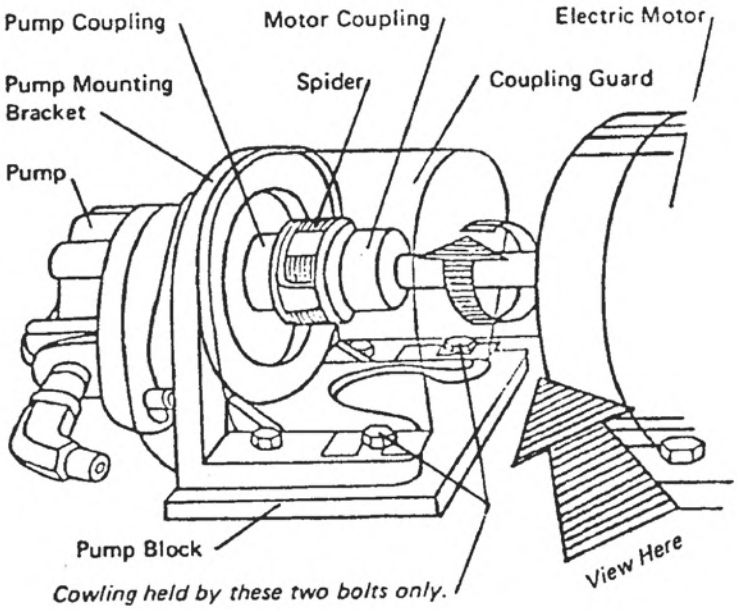
Two kinds of electric motors are available on customer specification: single-phase and three-phase.

ELECTRICAL HOOK-UP, SINGLE PHASE

All single-phase **Blue Boy Tube Benders** are factory pre-wired with a 3-prong "crow-foot" type plug. No receptacle is shipped with the machine. The standard receptacle for this plug is found in many commercial and industrial buildings. It is also readily obtained at hardware or electrical supply stores.

The receptacle should be wired into a junction box which supplies a **full** 220-volt, single-phase, 60-cycles, properly fused or breaker-protected. This receptacle hook-up is best done by a qualified electrician.

Figure 5. Checking Pump Rotation



CHECKING ROTATION DIRECTION – SINGLE-PHASE

Rotation is pre-set at the factory for all single-phase motors. No rewiring should be necessary. However, if, for any reason, motor wiring is adjusted, **immediately** check the motor shaft to insure **counter-clockwise rotation** as viewed facing the motor.

CAUTION: If the shaft turns in the wrong direction, **shut the machine off immediately!** Prolonged running in clockwise rotation will badly damage the pump shaft seals. Unplug the machine

and correct the internal motor wiring by referring to the motor schematic.

ELECTRICAL HOOK-UP, THREE-PHASE

Three-phase Benders are factory pre-wired with a standard bayonet-type plug. A receptacle for this plug is shipped with the machine. This receptacle should be wired into a junction box which supplies three-phase current, properly fused or breaker-protected. All **Blue Boy Tube Benders** must be wired to a full 220-volt, 60-cycle power source, unless special motors are specifically ordered. This receptacle hook-up is best done by a qualified electrician.

The bayonet plug can be put into the receptacle in only one position. You can determine the right position by matching the keyways on the plug and the receptacle. The three-phase plug must be turned after insertion into the receptacle to lock it into place. Turn it clockwise to lock it securely.

CHECKING ROTATION DIRECTION – THREE-PHASE

All **Blue Boy Tube Benders** are equipped with pumps which must rotate in a **counter-clockwise** direction as viewed by the operator while he is facing the motor. After electrical hook-up is complete and the machine reservoir has been checked for proper fluid level, start the machine momentarily by pushing the START switch. Immediately check the motor shaft for proper rotation direction.

CAUTION: If the shaft turns in the wrong direction, **shut the machine off immediately!** The pump does not lubricate itself when running backwards. **Prolonged running in clockwise rotation will badly damage the pump shaft seals.**

TO CORRECT REVERSE ROTATION – THREE-PHASE

First, make sure the machine is **unplugged** from wall receptacle. Direction of rotation in three-phase machines is determined by the relative lag of each phase. Open the starter box located on the front leg of the machine and reverse the leads to connections 1 and 3, located below the START-STOP switch. Do not alter any other wiring. Have your electrician do this if possible.

Restart the machine as above and again check the rotation which should now have correct direction.

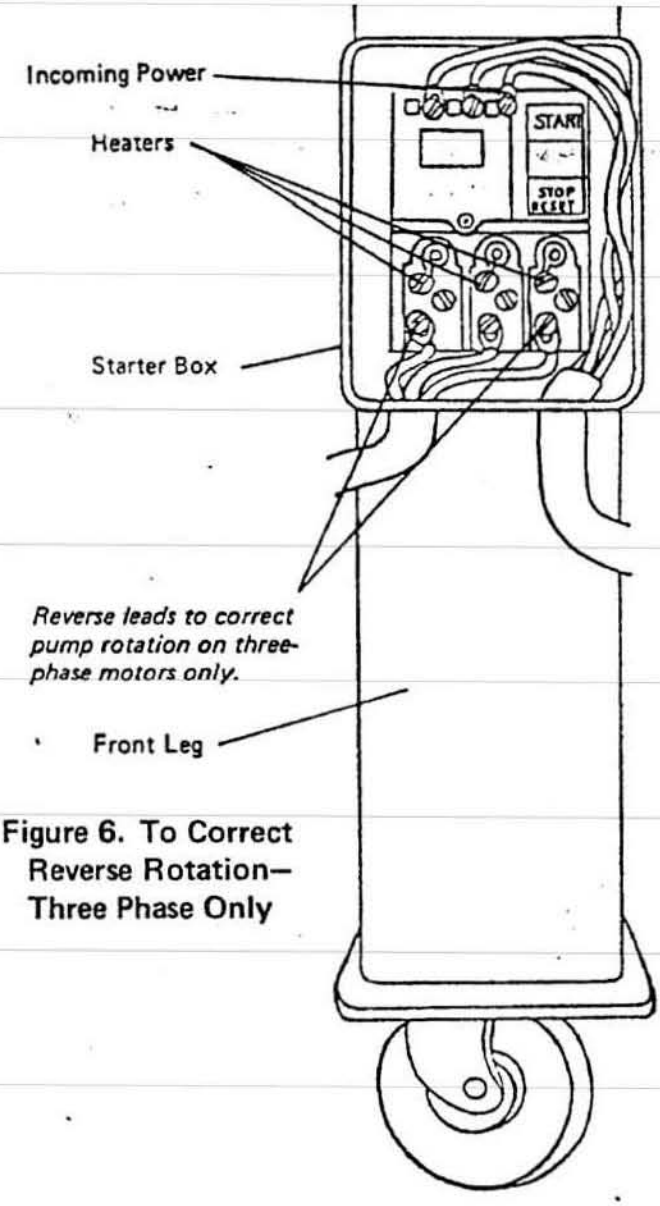


Figure 6. To Correct Reverse Rotation– Three Phase Only

OPERATING YOUR MACHINE FOR THE FIRST TIME

All **Blue Boy Tube Benders** make use of the rear pedestal of the machine as the hydraulic fluid reservoir. This reservoir is filled to the proper level at the factory.

Check the sight gauge on the rear pedestal to make sure that the reservoir is filled with fluid to the proper level. At any time that the level of fluid visible in the sight gauge is less than 1/2 of the way to the top of the gauge, refill the reservoir with one of the approved hydraulic fluids, listed on page 15. of this manual. NEVER start or operate the machine unless the hydraulic reservoir is filled to the proper level.

☐ MODEL FEATURES

The various models of the **Blue Boy Tube Benders** are similar in design and operation. But the hydraulics and controls vary somewhat from

model to model. It is important that you become familiar with the particular model you are using prior to checking out the hydraulic circuits and machine operation.

Models vary first of all in the bending capacity or size range of tubing which they can bend. They also vary by model in swaging or hydra-sizing equipment. Lastly, they vary in mode of operation.

The first, or numeric, part of the model number indicates the bending capacity and expanding units of the model. The second, or alphabetic, part of the model number indicates the mode of operation.

The characteristics of each available model of the **Blue Boy Tube Bender** are given in the chart of model numbers which follows on the next page. Determine the model number of your **Blue Boy** before proceeding, and write it here in the space provided: _____
You may also want to circle the number on the chart on the next page.

MACHINE FAMILIARIZATION & OPERATION

After you have completed electrical set-up and acquainted yourself with its particular model features, you are ready to check out the machine operation.

Your **Blue Boy Tube Bender** has been thoroughly factory tested. **All adjustments have been made for proper operation.** However, it is good practice to familiarize yourself with hydraulic system pressures and machine operation. While you do this you will assure yourself that your machine is set up correctly.

POWER-BEYOND VALVE

Every **Blue Boy Tube Bender** with expanding capability has a Power-Beyond valve mounted near the rear of the machine. All hydraulic fluid output of the pump is directed to this valve which regulates pressure for the entire hydraulic system.

The valve has five ports, each with a hydraulic connection. However, design and appearance of the valve will vary somewhat among various machines and models due to different component suppliers.

The Power-Beyond valve always has a pressure gauge associated with it. This gauge is mounted on the rear of the top cylinder of the machine. Since the Power-Beyond valve regulates pressure for the whole machine, its output is applied directly to the top cylinder. Hence its output pressure may be read there. This is the basic pressure beyond the valve, thus the name, "Power-Beyond" valve.

Full pressure will register on the gauge only with the top cylinder fully extended or "bottomed out" against the back shoes.

CHECKING POWER-BEYOND VALVE ADJUSTMENT

To check operation of the Power-Beyond valve, proceed as follows:

1. Install a 5" radius ram die (never a bumper die) in your machine. Install a matching set of back shoes.

2. If you have an automatic or semi-automatic model (SA, SAL, or MSA), move the depth-of-bend limit switch to its farthest position beyond the end of the scale.

3. Now actuate the bend control valve (on Model MSA depress the forward foot pedal). The ram should extend fully and smoothly until the top cylinder bottoms out. **NOTE: Do not stand in front of the machine.** Read the pressure gauge near the rear of the top cylinder. The gauge should read 2800 to 3000 P.S.I. For Models 153 and 214 only, the system pressure is set at 3[illegible] P.S.I.

If the gauge does not register correctly within plus or minus 50 P.S.I., adjust the pressure following these steps:

1. On or adjacent to the Power-Beyond valve there is a large acorn nut. This [illegible] cover

Figure 7. Power-Beyond Valve

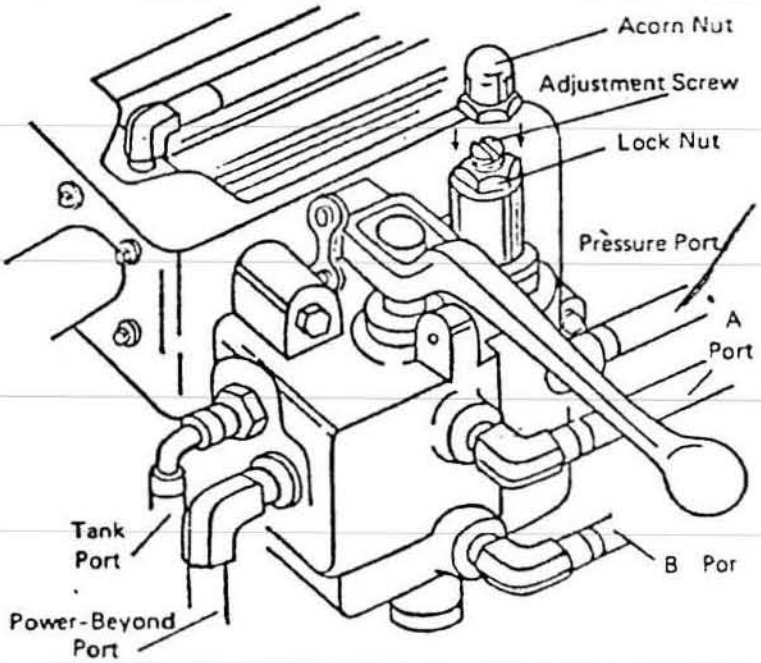


Table 1. Summary of Available Models and Options

MODE OF OPERATION \ TYPE OF EXPANDER	NONE	CLAMP-DOWN SWAGER ONLY	HYDRA-SIZER EXPANDER ONLY	TWO-WAY EXPANDER ONLY	BOTH SWAGER AND HYDRA-SIZER	BOTH SWAGER AND HYDRA-SIZER	CLAMP-DOWN SWAGER ONLY
MANUAL, HAND OPERATED	100MS	110MS	120MS	130MS	150MS	153MS	214MS
MANUAL, KNEE OPERATED	100ML	110ML	120ML	130ML	150ML	153ML	———
SEMI-AUTOMATIC, HAND OPERATED	100SA	110SA	120SA	130SA	150SA	153SA	———
SEMI-AUTOMATIC, KNEE OPERATED	100SAL	110SAL	120SAL	130SAL	150SAL	153SAL	———
FULLY AUTOMATIC	100MSA	110MSA	120MSA	130MSA	150MSA	153MSA	———
MAXIMUM BENDING CAPACITIES	2½"					3"	4"

MODEL XXX – XXX

OPERATING MODE
- MS – Manual, hand operated
- ML – Manual, knee operated
- SA – Semi-Automatic, hand operated
- SAL – Semi-Automatic, knee operated
- MSA – Fully Automatic

BENDING CAPACITY
- 0 = 2½" Diameter Maximum
- 3 = 3" Diameter Maximum
- 4 = 4" Diameter Maximum

TYPES OF EXPANDERS
- 0 – NONE
- 1 – K-100 Clamp-Down Swager
- 2 – P-100 Hydra-sizer Expander
- 3 – KP-100 Two-Way Expander
- 5 – Both K-100 Clamp-Down Swager and P-100 Hydra-sizer Expander

FRAME SIZE
- 1 – "BLUE BOY" Frame
- 2 – "BIG BERTHA" Frame

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for the pressure-adjusting screw. Remove the acorn nut.

2. Loosen the lock nut. With a screwdriver, turn the threaded relief valve shaft clockwise to increase pressure or counter-clockwise to decrease pressure.

3. Tighten the lock nut holding the threaded screw in position.

4. Check the adjustment with another retraction and bottoming of the ram. Readjust if necessary, beginning at step 2, to get the correct reading.

5. **Replace the acorn nut** when you have made the correct adjustment.

SEQUENCE VALVE ADJUSTMENT

The sequence valve regulates the amount of pressure in the bottom cylinder. This cylinder holds pressure on the back shoes through two chains attached to its piston rod.

The sequence valve is located in the center of the left side of the machine. The sequence valve pressure gauge is mounted on the valve itself and is supplied with a pressure adjustment knob. To check sequence valve pressure, take the following steps:

1. Read the sequence valve gauge while running the ram die out to a depth-of-bend between 40° to 60°.

2. The sequence valve pressure should be between 1100 and 1200 P.S.I. in order to bend tubing of 2-1/2" or less diameter.

3. If adjustment is required, turn the adjustment knob clockwise to increase pressure, or counter-clockwise to decrease pressure.

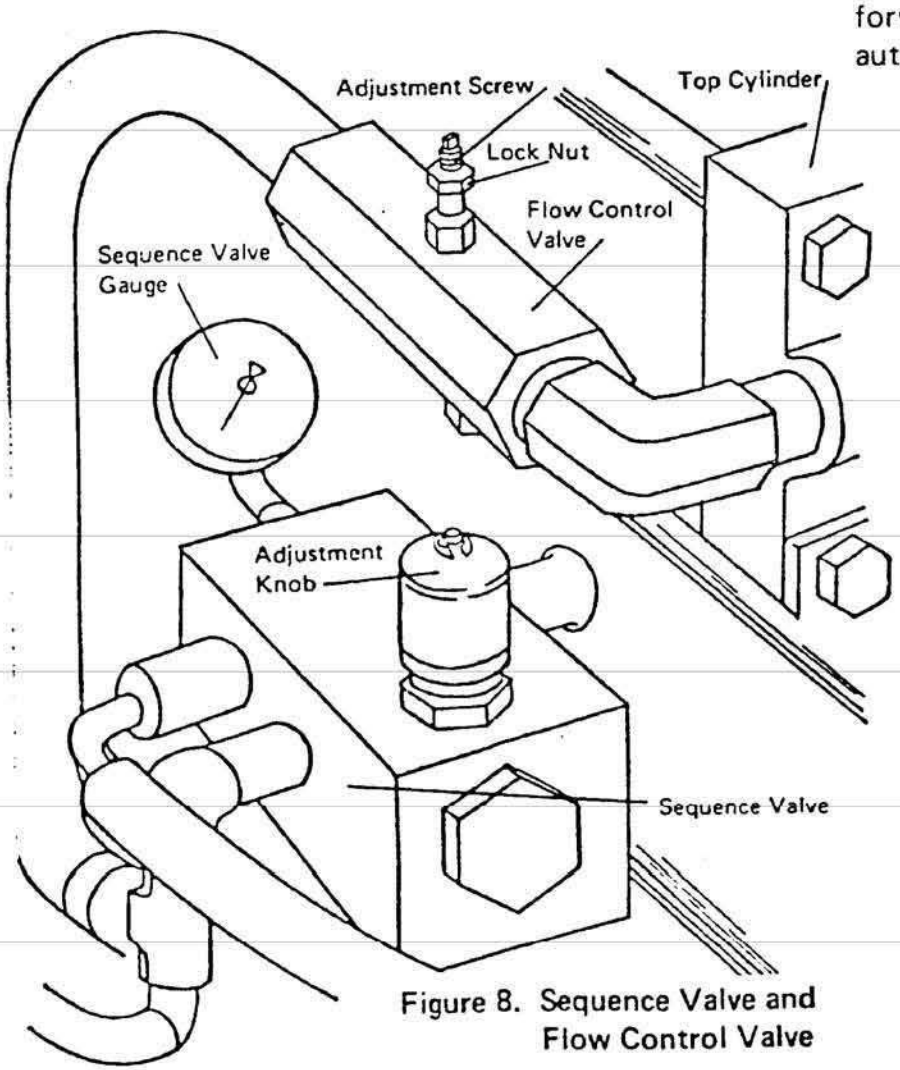


Figure 8. Sequence Valve and Flow Control Valve

3" TUBE BENDING PROCEDURE

High initial back gate pressure is required when bending 3" tubing in order to get good, uniform bends. Good bends will normally result only when 13 gauge (.095" wall thickness) tubing is used. 14 gauge may be used, but some tube damage or inconsistency may result.

When bending 3" diameter tubing, use the following special procedure. (**NOTE:** Use either the manually-operated front control valve or the forward and reverse foot pedals. **DO NOT USE** automatic push button controls.)

1. Install 3" bending dies. Set the sequence valve pressure between 1600 and 1800 P.S.I. by turning the adjustment knob clockwise to increase pressure. **CAUTION:** Do not attemp to turn beyond the jam nut position. Further adjustment may cause valve s kage.

2. Position the tubing in the bender and begin the bend. Be sure to use **only** the front control valve or the foot pedals.

3. At a depth of bend between 30° and 40° start to reduce sequence valv pressure by turning the adjustment knob counter-clockwise until you have a gauge reading of about 400 P.S.I.

4. If the bender bogs down, further reduce the sequence valve pressure on the back gates, and continue bending and reducing pressure until the desired depth of bend is reached (maximum depth of bend is 95°).

5. If further 3" diameter bends are required, repeat the procedure, starting with step one. Otherwise, set the sequence valve pressure between 1100 and 1200 P.S.I. which is normal setting for 2-1/2" and smaller diameter tubing.

FLOW CONTROL VALVE ADJUSTMENT

The flow control valve regulates gate return or back pressure on the bottom cylinder by creating a slight pressure differential between the top and bottom cylinders. This is the pressure that closes the back shoe gates after a bend. This valve is the metallic colored, hexagon shaped valve located on the center left side of the machine directly above the sequence valve. See figure 8. To set the gate return pressure:

1. Run the ram out until the ram die engages the back shoes and the gates open to between 40° and 50°.
2. Retract the ram.
3. At the instant the bottom cylinder bottoms out (about the moment when the ram die disengages from the back shoes) the pressure should register 250 to 400 P.S.I. on the sequence valve gauge.
4. If the pressure is not within these limits, loosen the lock nut.
5. Turn the screw clockwise to increase pressure, or counter-clockwise to decrease pressure.
6. If the back gates hesitate or remain open after disengaging, increase the flow control pressure.
7. If the back gates and ram hesitate when returning while still in contact, decrease the flow control pressure. If the back shoes dig into the tube when returning, decrease the flow control pressure.
8. After the proper setting is obtained, tighten the lock nut while holding the threaded shaft in position with your wrench.

SETTING SWAGER PRESSURE

Model 150 is equipped with a swager cylinder regulated by a four-port valve which has no associated pressure gauge. Pressure is set up on the swager cylinder from the standpoint of performance. To set pressure of the swager:

1. Install the flaring tool on the swager cylinder.
2. Select a pair of collar adaptors for 2-inch tubing. Place a collar adaptor in the stationary clamp block so that the flange is fully in its recess, and the adaptor collar is flush with the face of the clamp block.
3. Place a piece of 2-inch, 16 gauge (.065") tubing in the collar with 3 to 4 inches toward the expander cylinder.
4. Install the upper collar adaptor, making sure that it is aligned with the lower adaptor.

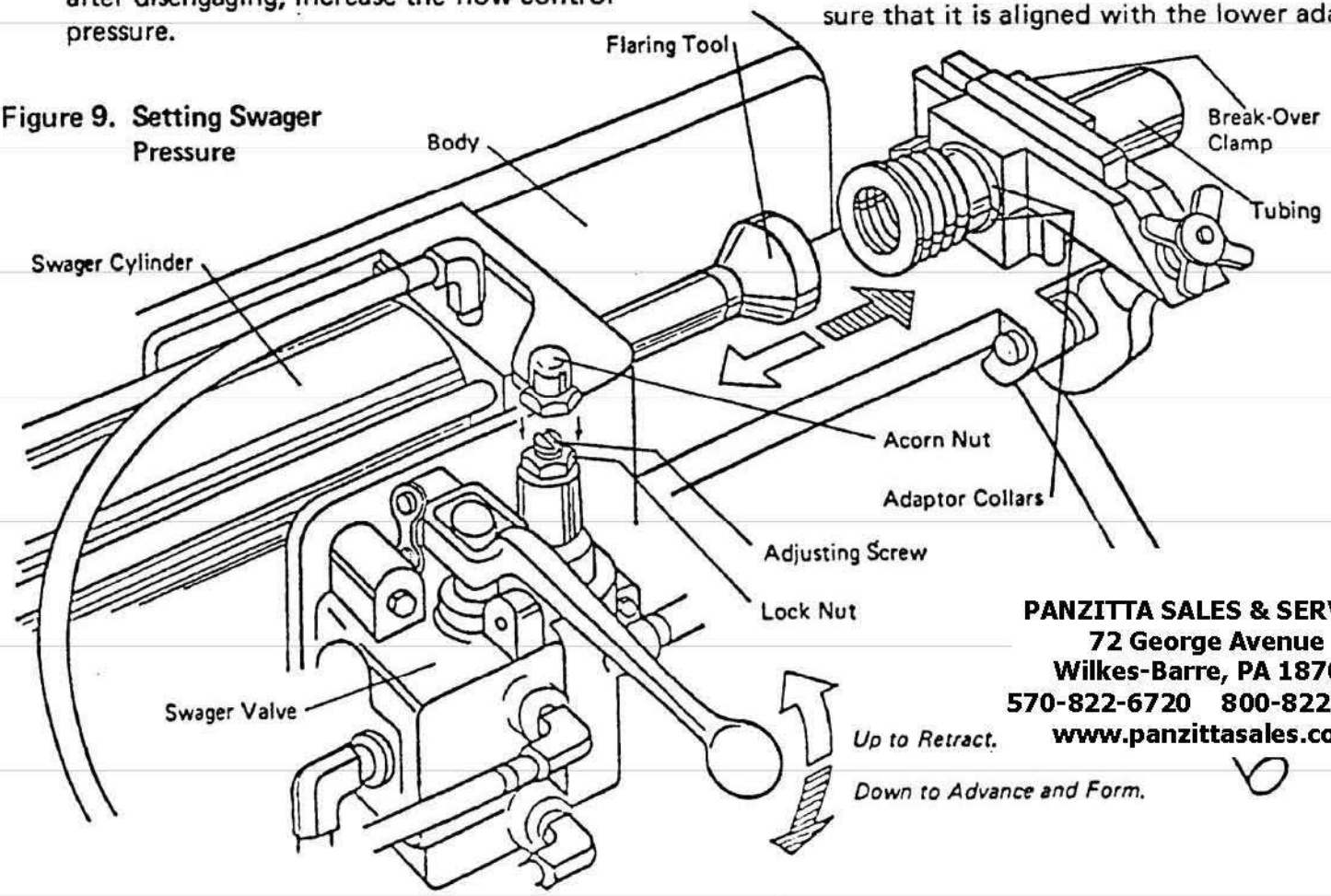


Figure 9. Setting Swager Pressure

5. Clamp the tube firmly in place.

6. Actuate the swager valve (right rear of the machine) and flare the tubing until you have made a 1/4-inch lip.

7. Retract the cylinder. Remove the flaring tool and reverse it, putting the flat side toward the tube.

8. Apply pressure to the tube end, causing the tube to collapse in an "accordion" pattern.

9. If pressure is not sufficient to collapse the tube in accordion fashion, remove the acorn nut cover and increase pressure by turning the relief valve shaft clockwise with a screwdriver until there is enough pressure just to collapse the tube. Not all tubing will give a uniform accordion design.

10. Tighten the lock nut while holding the adjustment. Replace the acorn nut.

SETTING TOP CYLINDER PRESSURE FOR MANUAL AND SEMI-AUTOMATIC MODELS

For manual and semi-automatic models (operating models MS, MA, SA and SAL) the front bending valve relief pressure is set as follows:

1. Remove the acorn nut and loosen the lock nut.

2. Using a screwdriver, turn the relief valve shaft clockwise until it bottoms.

3. Next turn the shaft counter-clockwise one quarter turn.

4. Holding the threaded shaft, tighten the lock nut.

5. Replace the acorn nut.

BACK GATE ALIGNMENT

The gates should be regularly checked to make sure they are level with each other and the guide plate, and are closing evenly. If the gates are not level with each other and the guide plate, tighten the shaft nuts as follows:

1. Seat shaft using a lead hammer.

2. Tighten shaft nut.

3. Clean Top Plate of dirt, grease, chips, burrs, hammer indentations, etc.

If the back gates do not close evenly, check tension on the two chains (located under the Body near the front) as follows to avoid severe bottom cylinder rod damage:

1. Fully retract and disengage the ram die from the back shoes.

2. If one of the chains has more slack, tighten the nut which fastens the chain connector to the tee-bar on the cylinder rod end. Both chains should be equally snug so that the gates work evenly.

3. If gates hesitate when closing, increase the

Figure 10. Back Gate Alignment

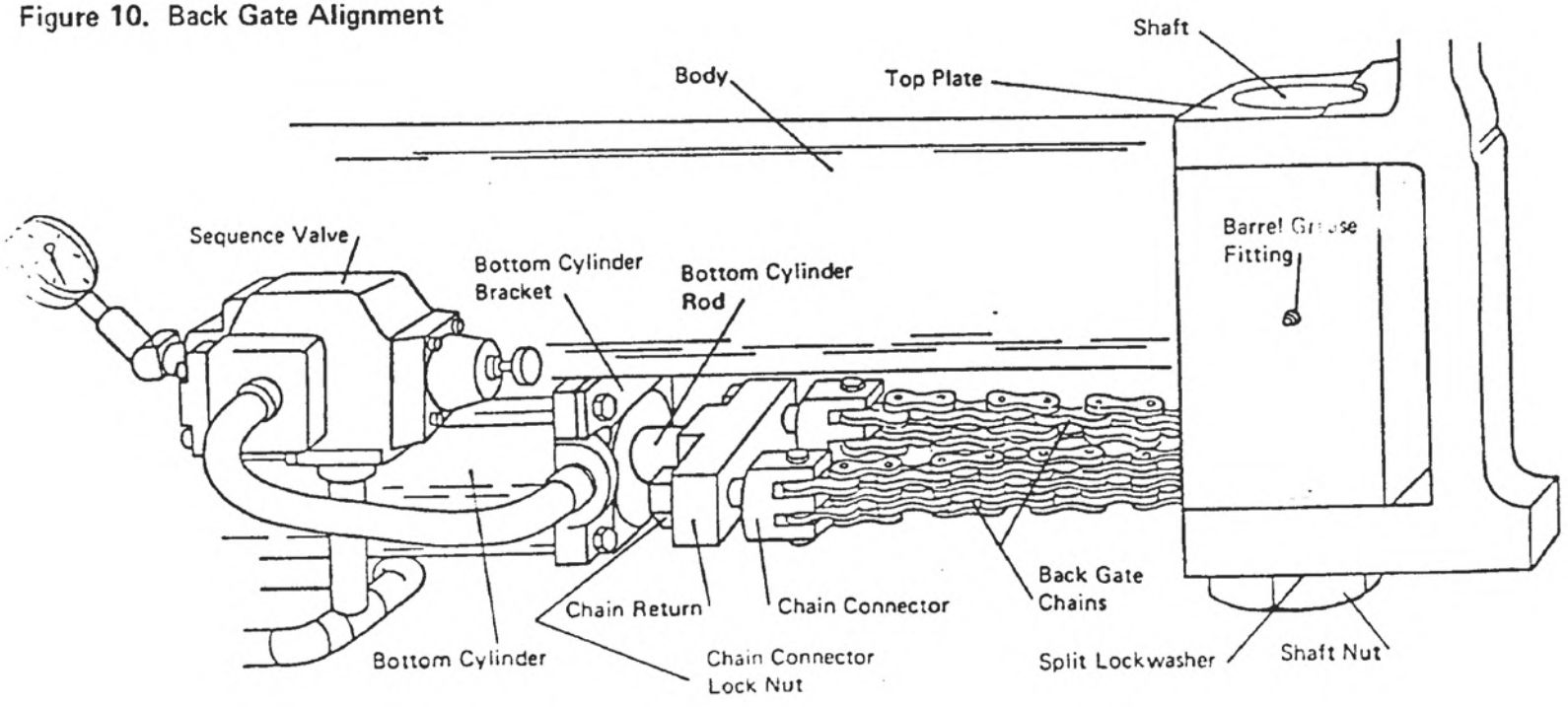
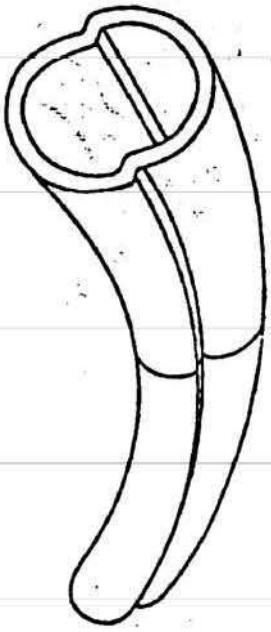


Figure 13. Die Mismatch



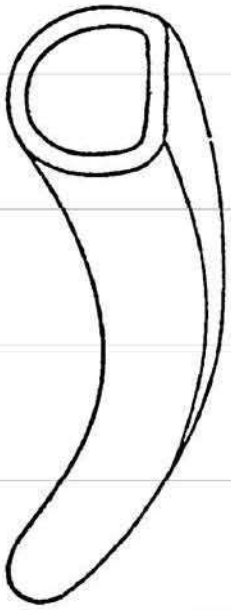


Figure 14. Flattening On Outside Diameter of Bend

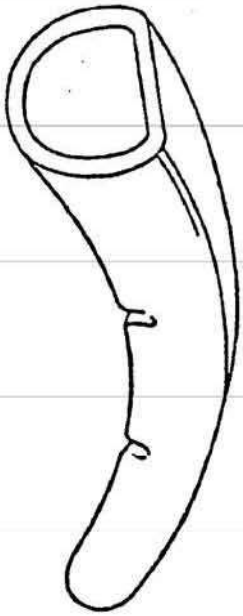


Figure 15. Crimping On Inside Diameter of Bend

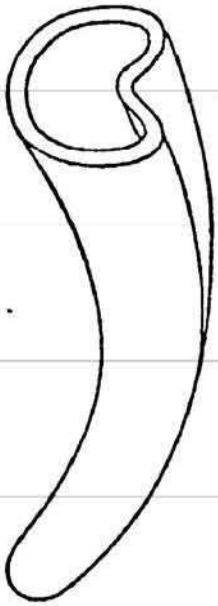


Figure 16. Sucking In On Outside Diameter of Bend

SWAGING

Always check to make sure you have a matched set of collars. Make sure you install the lower collar **parting edge flush** with the top of the fixed block. Install the upper collar to match. Misalignment of the collar slots with the block will result in broken collars. Be sure that the **front lip** on each collar is **flush against the block.** Space between the lip and the block will result in broken collars.

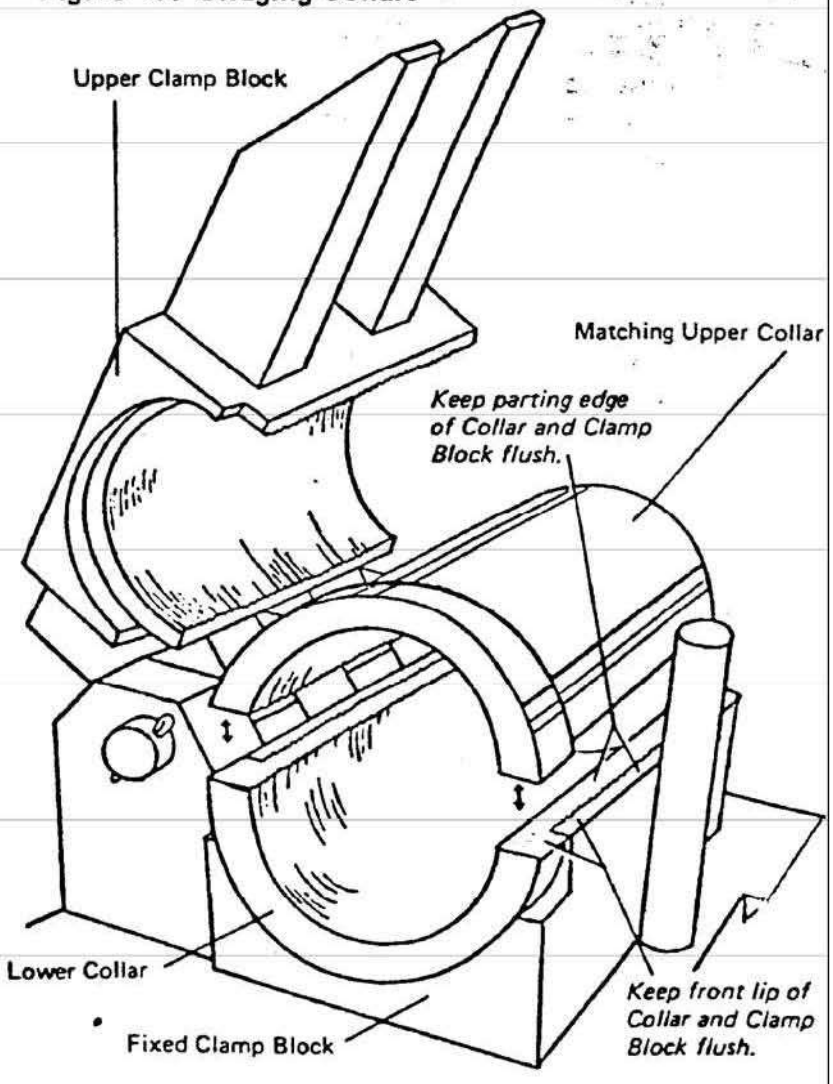
Thread all tooling securely on to the piston rod. Loose tooling will result in broken tools or stripped threads.

DO NOT expand into the collars. Expanding into the collars is the greatest single reason for broken collars. Make sure you have sufficient clearance.

HYDRA-SIZING

Be sure that you have the arbor screwed securely onto the piston rod. Check its tightness frequently during a series of operations. Because

Figure 17. Swaging Collars



2. If it does not, loosen the lock nut on the axis of the indicator arm, and move the arm until it is aligned with the 90° mark exactly.

3. Tighten the lock nut, holding the indicator arm in proper position relative to the depth-of-bend plate scale.

At the same time you adjust the depth-of-bend indicator, also adjust the return micro-switch as follows:

1. With gates and indicator arm both at 90°, swing the automatic stop pointer handle over until its limit-switch hits the striker plate. The pointer should read 90°.

2. Adjust the limit-switch, as required, by loosening the two screws which hold it in place. Slide it toward or away from the striker plate to get the proper position.

3. Now cycle the machine and check the operation of the limit switch.

4. If the limit-switch does not trip at exactly 90°, readjust it until it trips at the proper setting.

For Manual Machines

If you have a manual model (operating models MS and ML), adjust the depth-of-bend pointer as follows:

1. Check to insure the pointer is tightly bolted in the right back gate.

2. With the back gates set at 90° using a carpenter's square, tap the pointer lightly, if necessary, to read exactly 90° on the depth-of-bend plate.

☐ TROUBLE SHOOTING

Properly used, your **Blue Boy Tube Bender** will give you continuous and reliable service. There are minor problems which may occur from time to time which you can readily correct, as well as good operating practices which help you avoid problems.

Familiarity with the use and operation of your **Blue Boy** includes knowledge of good operating practices, and trouble-shooting minor problems:

BENDING

ALWAYS have a full set of dies in place whenever you operate the top cylinder. Operating without dies will cause severe damage.

NEVER extend the bending die beyond the back shoes. Such action can cause severe damage and may result in having to disassemble the gates in order to remove tubing. Avoid bending beyond the following depths with the bend radii given when possible:

130° with 3 1/2-inch bumper die

150° with 4-inch bumper die

160° with 5-inch ram die

If bends indicate die mismatch:

Check the back gate alignment as described on page 10.

If the Outside Diameter is flattened after bending:

The sequence valve bend pressure is too low. Adjust as described on page 8. NOTE: High sequence valve pressures can cause bottom cylinder rod damage if the chains do not have equal tension. Do not exceed recommended pressures and be sure to check chain tension weekly to avoid problems.

If the tubing is crimped on the bend inside diameter:

Check back gate alignment as described on page 10. Increase sequence valve pressures as described on page 8. If this does not solve the problem, check the thickness of the tubing you are using. Minimum thicknesses for consistently good bends are:

Up to 2 1/4-inch diameter:	16-gauge, (.065 inch)
2 1/4- to 2 1/2-inch diameter:	14-gauge, (.083 inch)
3-inch diameter:	13-gauge, (.095 inch)
3 1/2-inch diameter:	12-gauge, (.109 inch)
4-inch diameter:	11-gauge, (.120 inch)

If the tubing is sucked in on the bend outside diameter:

While this is almost always an indication that tubing wall is too thin, also check back gate alignment, sequence and flow control pressures.

If the back gates do not close evenly:

Check chain tension as described on page 10.

If the back gates hesitate when closing or back shoes dig into the tube when closing:

Adjust the flow control valve as described on page 9.

bottom cylinder pressure by adjusting the flow control valve as previously described.

DEPTH-OF-BEND ADJUSTMENT

To check depth-of-bend adjustment, use a carpenter's square, or equivalent 90° square. Proceed as follows:

1. Run the gates out manually, holding the square against the back of the gates.

2. Jog the gates back and forth (using the foot switches on automatic models) until the square rests flush against the back of each gate. The back gates are now set physically at 90°.

For Automatic or Semi-Automatic Machines

If you have an automatic or semi-automatic machine (operating models SA, SAL, and MSA), adjust the depth-of-bend indicator as follows:

1. Check the depth-of-bend indicator which should read exactly 90°.

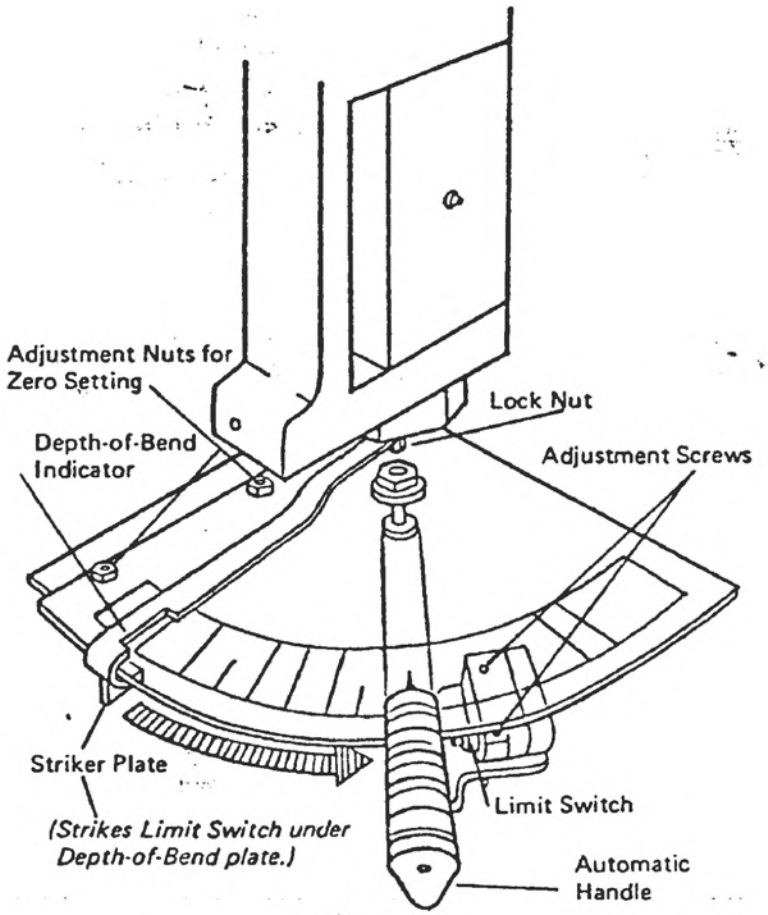


Figure 12. Depth-of-Bend Adjustment

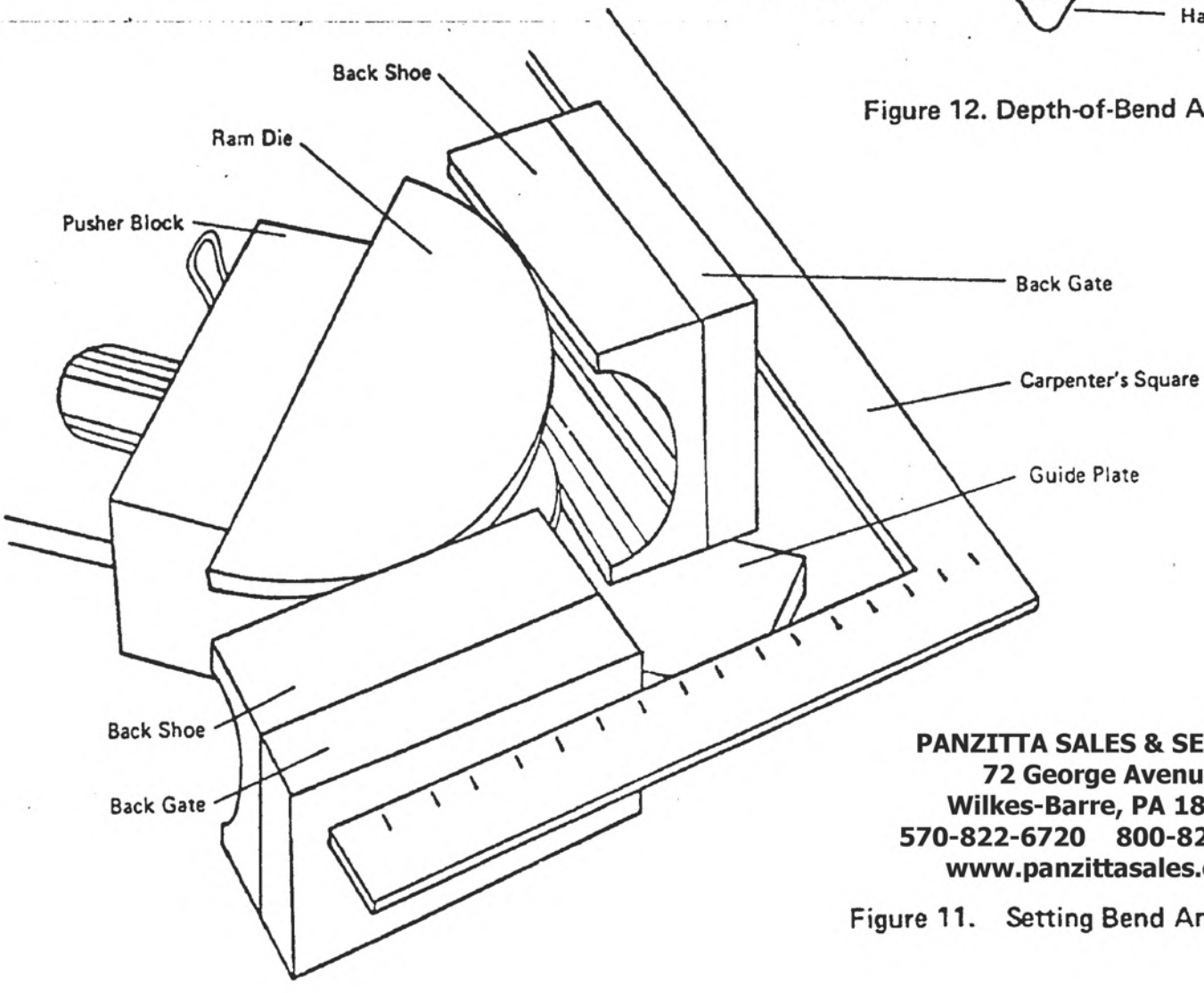


Figure 11. Setting Bend Angle

the action in hydra-sizing is a pulling one, the tool has a tendency to unthread itself. A loose arbor will result in broken tools or stripped threads. **ALWAYS KEEP YOUR ARBOR AND SEGMENTS LUBRICATED WITH LIGHT GREASE SPRAY.**

CAUTION: Whenever inspecting or repairing the electrical system, **UNPLUG YOUR BENDER.**

SOLENOID VALVE

The solenoid valve controls the direction of the bending operation for automatic and semi-automatic models. It is located near the rear of the machine behind the motor. If the solenoid fails to sequence properly, check as follows:

1. Operate the valve manually by using a pencil, or equivalent wooden or non-conducting rod to push the armature in. Manually operating the switch will often dislodge foreign particles which become trapped in the valve spool and may cause the spool to stick.

2. If the spool is free and the valve still does not sequence properly, check to see if the coil is short circuited by removing the protective cover.

3. If the spool is free and the coil is not shorted, check the automatic control box and limit-switches for loose or burnt wires.

AUTOMATIC CONTROL BOX

If one or more buttons do not work and you have already inspected the solenoid valve:

1. Operate the foot switch.

2. If the foot switch works, check inside the control box for loose wires and to insure the relays are completely plugged in.

3. If the foot switch does not work, check inside the foot switch for loose wires.

4. If there are no apparent loose or burnt connections in either the box or foot switch, check the limit-switches for loose connections.

5. With power off, repair and reinstall loose wires. If no loose or burnt connections are evident, then the circuits of the automatic box should be checked for continuity using the electrical schematic given on page 24. This is often best performed by a qualified electrician.

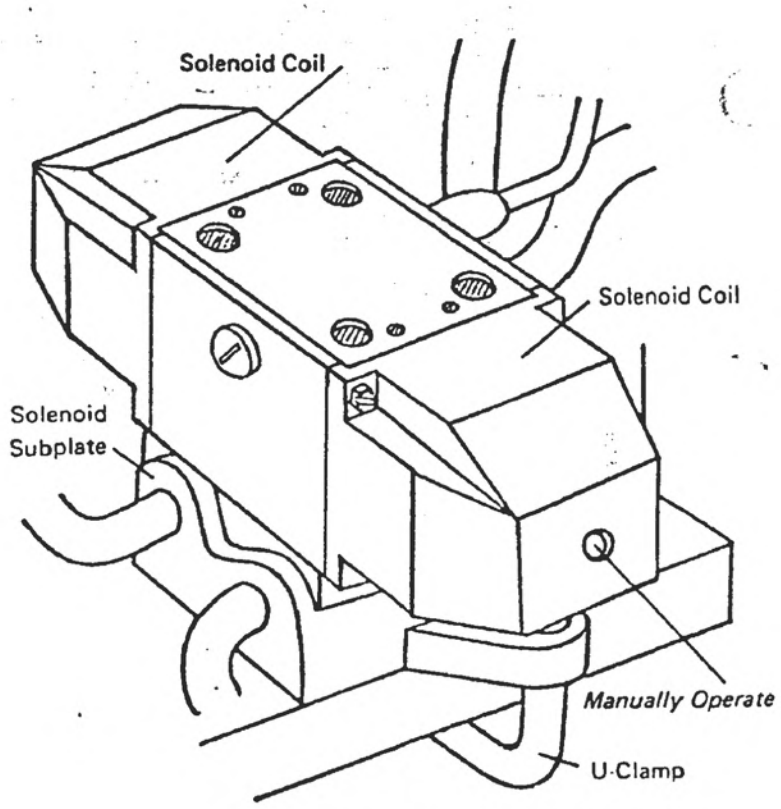


Figure 18. Solenoid Valve

NOISY MOTOR/PUMP COMBINATION

A whining or growling noise from the motor/pump can be indicative of a damaged pump. Continued operation can cause serious damage to all components in the hydraulic system. Always locate the source of unusual, new noises and correct them immediately for extended service life.

1. Check for counter-clockwise shaft rotation as described on pages 4 and 5.

2. Check the fluid level. Low fluid level will cause pump cavitation.

3. Check to insure that the motor, pump, and pump foot mount are securely fastened to the mounting plate. If any one of the above is loose, remove the coupling guard and align the motor and pump shafts within .010 inches. Misalignment will cause reduced life due to excessive motor and/or pump bearing wear. After aligning, secure all mounting bolts, recheck alignment, and replace coupling guard.

4. Check for leakage from the pump. If leakage is noted, the pump seals should be replaced immediately to prevent damage to the balance of the system.

5. If none of the above steps eliminate unusual noises, the motor and/or pump bearings may be damaged and require replacement.

SMOKE FROM THE MOTOR

Check the motor box for shorts, frayed insulation, or loose connections. Replace wires and connections as required. Always check pump rotation after any motor repairs. If smoke continues, or if obviously from motor main case, motor may be worn out and need rebuilding or replacement.

☐ SCHEDULED MAINTENANCE

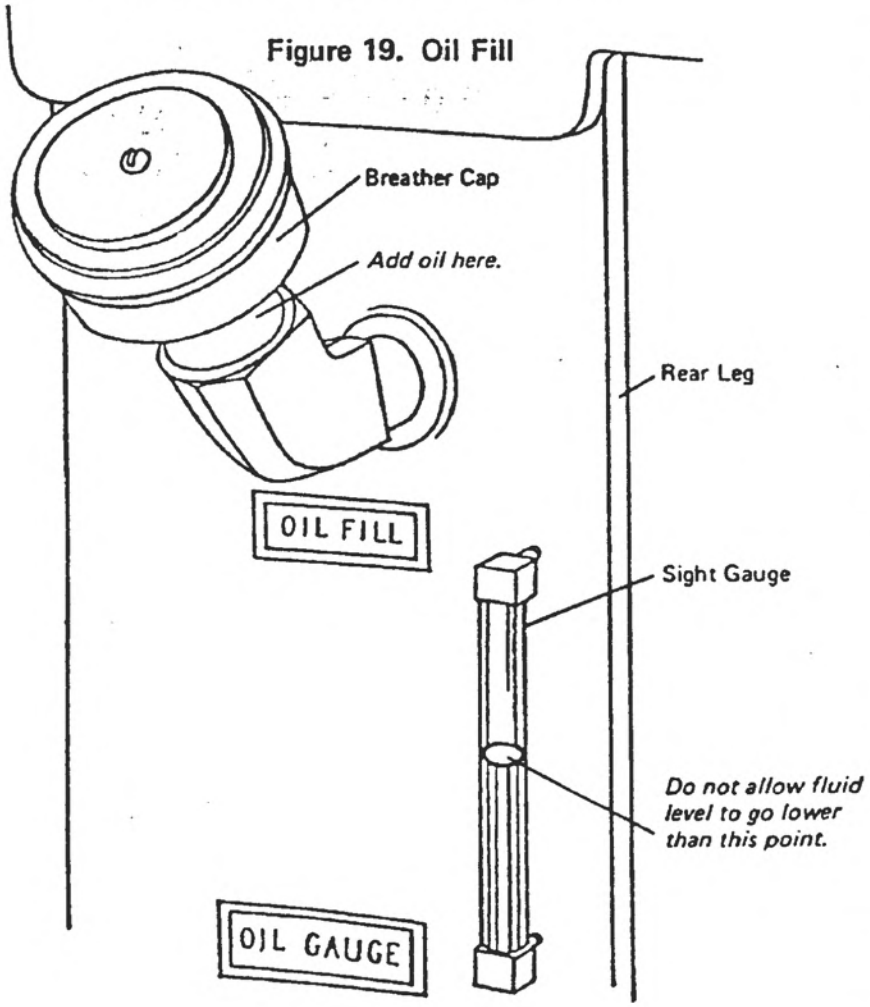
An important part of getting maximum use and long-term reliability from your **Blue Boy Tube Bender** is to set up and adhere to a regular schedule of [illegible]. It is a good idea to prepare a chart and a check-off list for regular maintenance functions. This may be kept at a conspicuous spot near the machine, such as on the wall adjoining the work area, and marked off by the person responsible as the maintenance functions are performed.

The following should be on the schedule:

WEEKLY

1. Apply light grease spray (WD40 or LPS) to the hydra-sizer segment set and arbor.

Figure 19. Oil Fill



2. Use a light grease on the top and sides of the guide plate.

3. Each manual valve has a rubber cap at the bottom of the valve. This cap collects the slight leakage from the valve. Remove each cap and wipe it clean, then replace it.

4. Check for even chain tension, gate alignment, sequence and flow control valve pressures and adjust as required.

5. Check depth-of-bend indicator arm accuracy.

MONTHLY

1. Grease the zirk fittings on the left barrel and the right barrel.

2. Grease the zirk fittings on each wheel caster (using SAE 90W in each instance).

3. Check the sight gauge and refill the reservoir as required.

DO NOT USE TRANSMISSION FLUID!

Transmission fluid often has additives which are harmful to the valve and the cylinder seals and often results in leaks. Use only one of the following approved oils in your machine's hydraulic system:

Mobil DTE 24

Arco Eagle Oil RSO-X light

Texaco Regal BR&O

Pennzoil Medium #10

Chevron OC Turbine 11

If there is a visual change in the color of your hydraulic oil, particularly if the oil develops a greyish appearance, completely drain the hydraulic system and reservoir, clean the filter, and refill the machine with fresh hydraulic oil.

4. Check all fittings for leaks and tighten as required. **CAUTION:** Teflon tape, known for its excellent lubricating properties, is also an excellent sealant. Unfortunately, because it lubricates so well, fittings sealed with teflon tape turn easily even after an effective seal has been accomplished. DO NOT attempt to bottom or effect a firm joint when using teflon tape. Overtightening will crack valve body and cylinder head castings causing costly repairs.

5. Spray lube the wear surfaces of all dies and shoes.

☐ Table 2. Parts List

(See pages 17 and 18 for reference numbers.)

	PART NUMBER	PART NAME
1.	100 114	Top Cylinder

(See figure 2.)

2.	100 158	Expander Cylinder
	153 108	Expander Cylinder (for 3" expanding)
3.	100 166	Pivot Pin, Medium
4.	100 160	Break-Over Clamp Assembly
5.	100 208	Upper Clamp Block Assembly
6.	100 215	Star Knob
7.	100 167	Pivot Pin, Long
8.	100 169	S-Clamp
9.	100 168	Pivot Pin, Short
10.	100 172	Clevis Handle Assembly
11.	100 176	4-Way Valve
12.	100 201	Oil Filter
13.	100 178	Single-Phase Electrical Motor

(See figure 5.)

14.	100 187	Coupling Guard
15.	100 222	Coupling Set (3 piece)
16.	100 223	Motor Coupling
17.	100 224	Pump Coupling
18.	100 225	Spider Insert
19.	100 185	Hydraulic Pump
20.	100 205	Pump Mounting Bracket
21.	100 196	Single-Phase Starter Box
	153 109	Three-Phase Starter Box
22.	100 220	Single-Phase Heaters (inside box)
	153 215	Three-Phase Heaters inside box)
23.	150 229	240 V Relay (inside box)
24.	150 226	Emergency Reverse Button
25.	150 228	Name Plate (Emergency Reverse)
26.	150 225	Automatic Button
27.	150 227	Name Plate (Automatic)
28.	150 201	Automatic Control Box Assembly

(See figure 12.)

29.	100 217	Automatic Handle Assembly
30.	100 188	Depth-of-Bend Plate
31.	150 222	Limit Switch (forward)
32.	150 211	Striker Plate Arm Assembly

(Always sold as a set.)

33.	100 141	Right Hand Gate Assembly
	100 146	Left Hand Gate Assembly

(See figure 10.)

34.	100 182	Chain Assembly
35.	100 183	Back Gate Chain
36.	100 184	Chain Connector
37.	100 123	Chain Return
38.	100 209	Chain Connector Lock Nut
39.	100 122	Bottom Cylinder Bracket
40.	100 121	Bottom Cylinder
41.	150 223	Limit Switch (reverse)
42.	100 118	Top Cylinder Bracket
43.	100 218	Pressure Gauge
44.	100 179	Card Clip Assembly
45.	100 190	Flow Control Valve
46.	100 177	Sequence Valve

(See figure 1.)

47.	100 115	Pusher Block
48.	100 116	L-Block

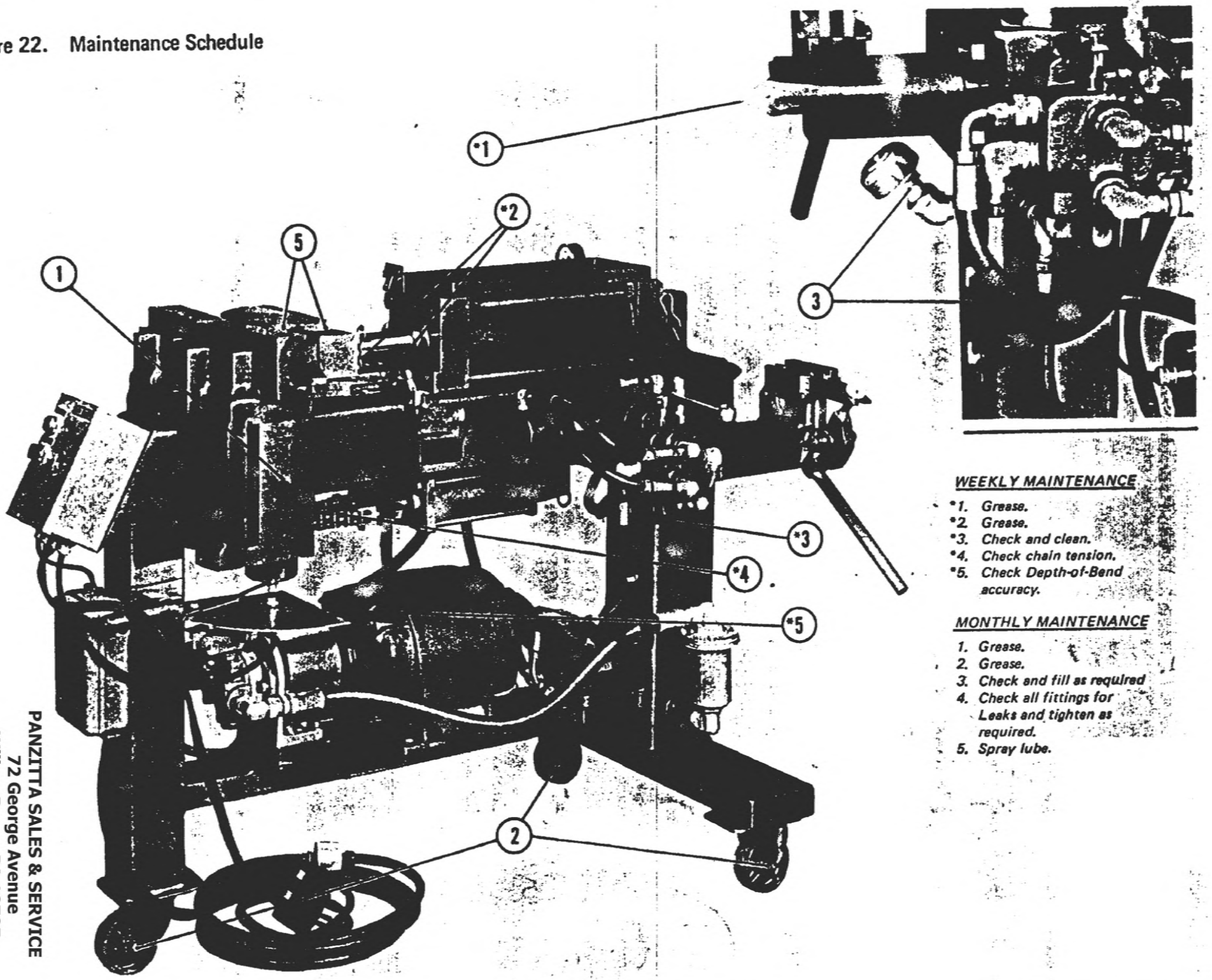
See figure 10.)

49.	100 159	Gate Shaft
50.	100 117	Shaft Key (inside barrel)
51.	100 204	Shaft Nut
52.	100 207	Split Lockwasher
53.	100 135	Swivel Caster
54.	100 198	Single-Phase Electrical Plu Male
	153-110	Three-Phase Electrical Plu Male
55.	153 111	Three-Phase Electrical Socket, Female
56.	100 200	Single-Phase Electrical Cor Assembly
	153 112	Three-Phase Electrical Cor Assembly
57.	150 221	Dual Foot Pedal

(See figure 18.)

58.	150 202	Solenoid Valve Assembly
59.	150 204	Solenoid Coil
60.	150 203	Solenoid Subplate
61.	150 205	U-Clamp
62.	100 131	Rigid Caster
63.	100 192	Sight Gauge Hose
64.	100 191	Breather Cap
65.	100 175	4-Way Power-Beyond Val

ure 22. Maintenance Schedule



WEEKLY MAINTENANCE

- **1. Grease.*
- **2. Grease.*
- **3. Check and clean.*
- **4. Check chain tension.*
- **5. Check Depth-of-Bend accuracy.*

MONTHLY MAINTENANCE

1. *Grease.*
2. *Grease.*
3. *Check and fill as required*
4. *Check all fittings for Leaks and tighten as required.*
5. *Spray lube.*

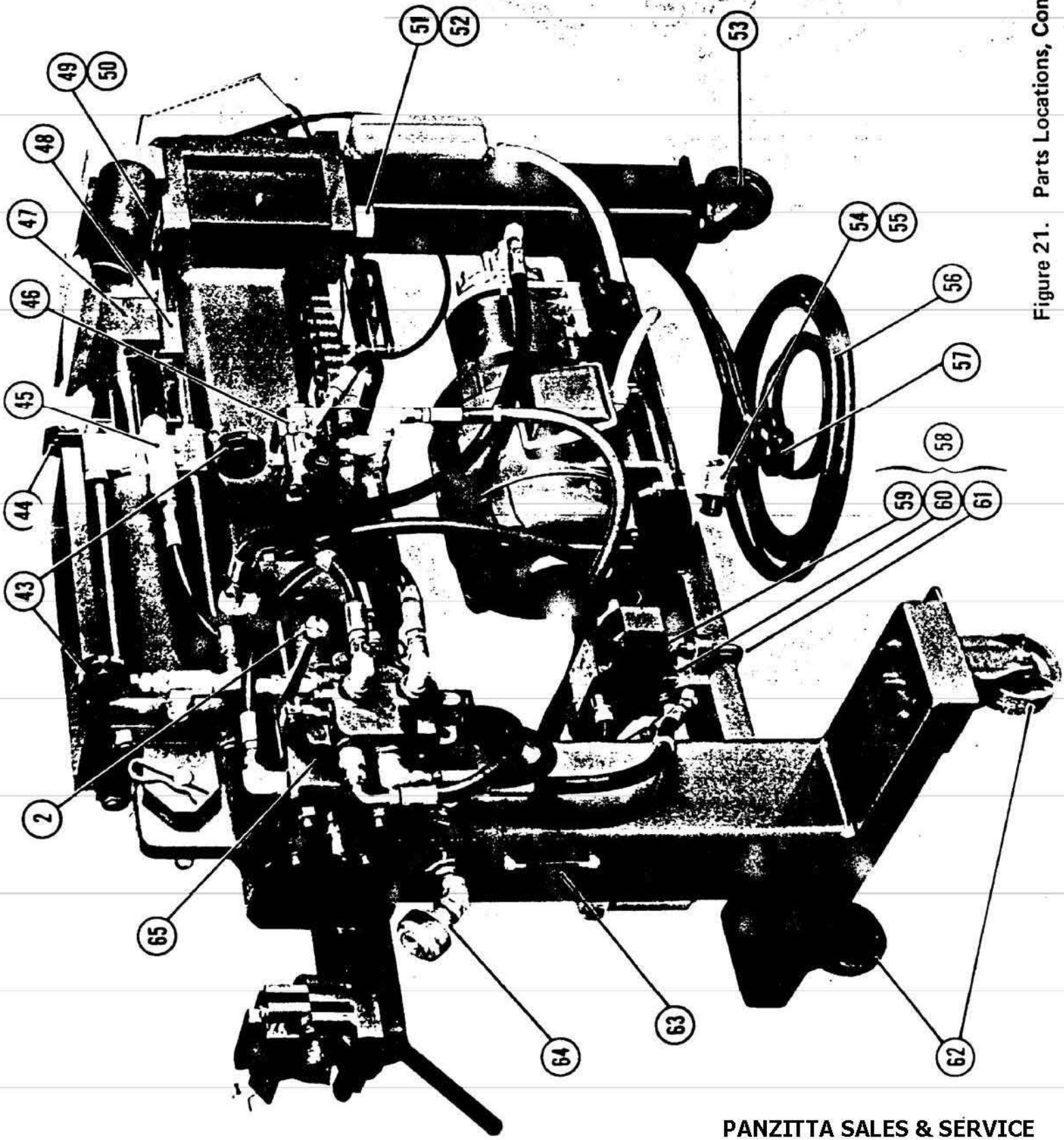


Figure 21. Parts Locations, Continued

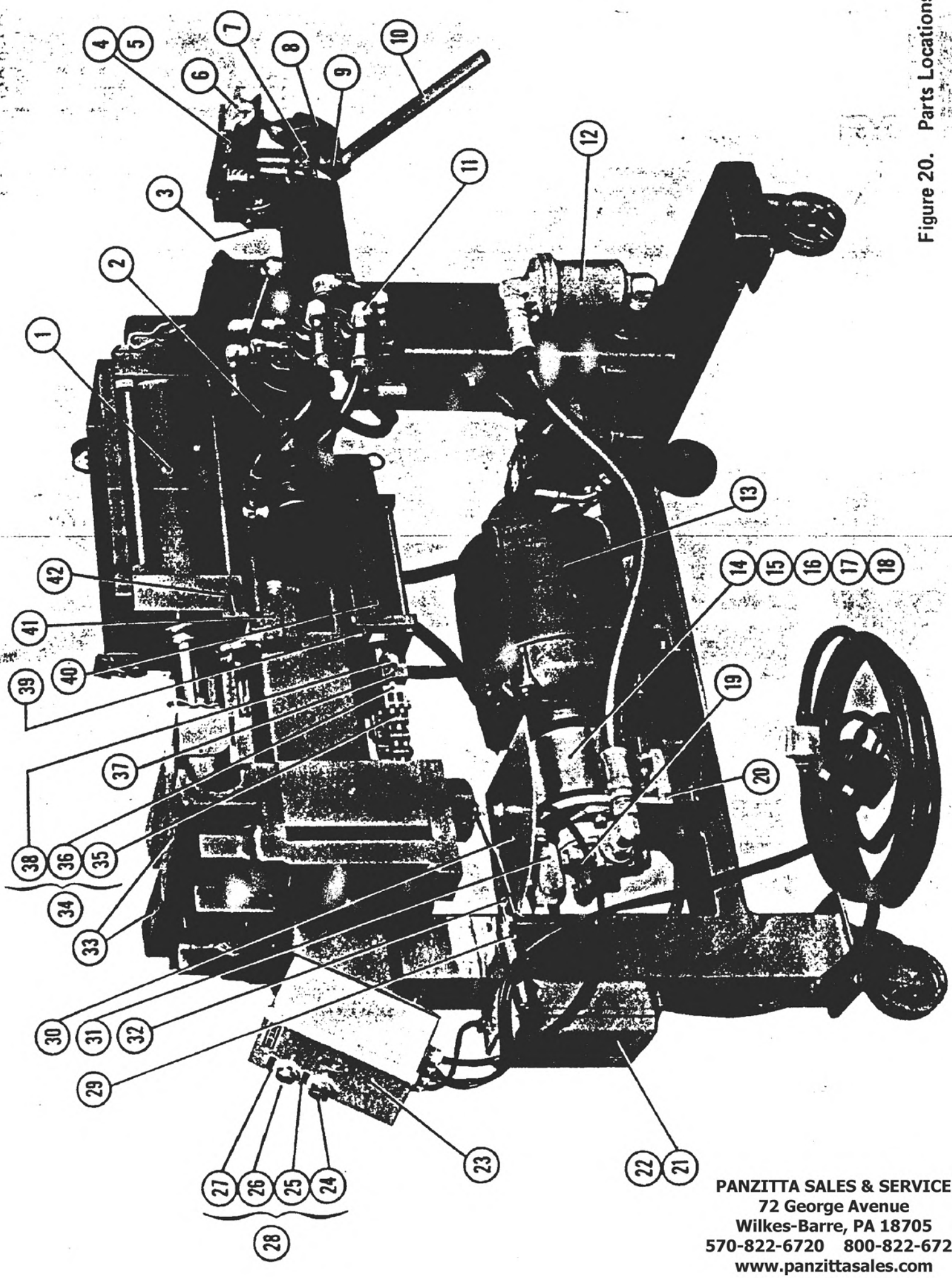


Figure 20. Parts Locations

PANZITTA SALES & SERVICE
72 George Avenue
Wilkes-Barre, PA 18705
570-822-6720 800-822-6720
www.panzittasales.com

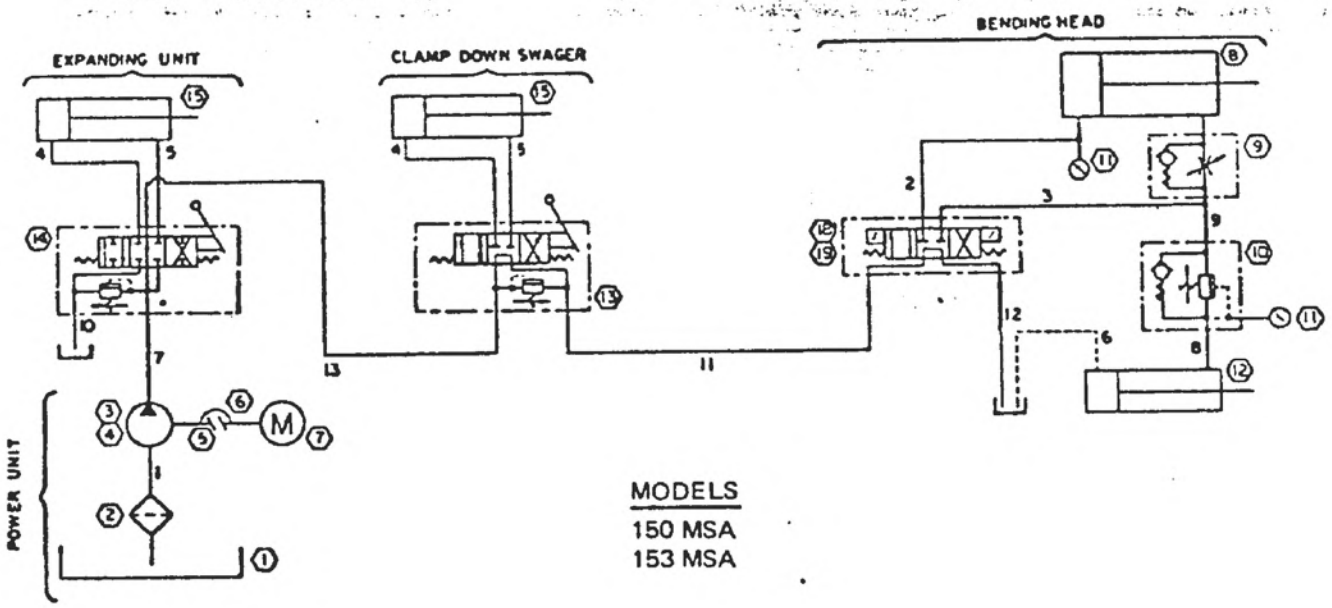
☐ Table 3. Key to Hydraulic Schematics

PANZITTA SALES & SERVICE
72 George Avenue
Wilkes-Barre, PA 18705
570-822-6720 800-822-6720
www.panzittasales.com

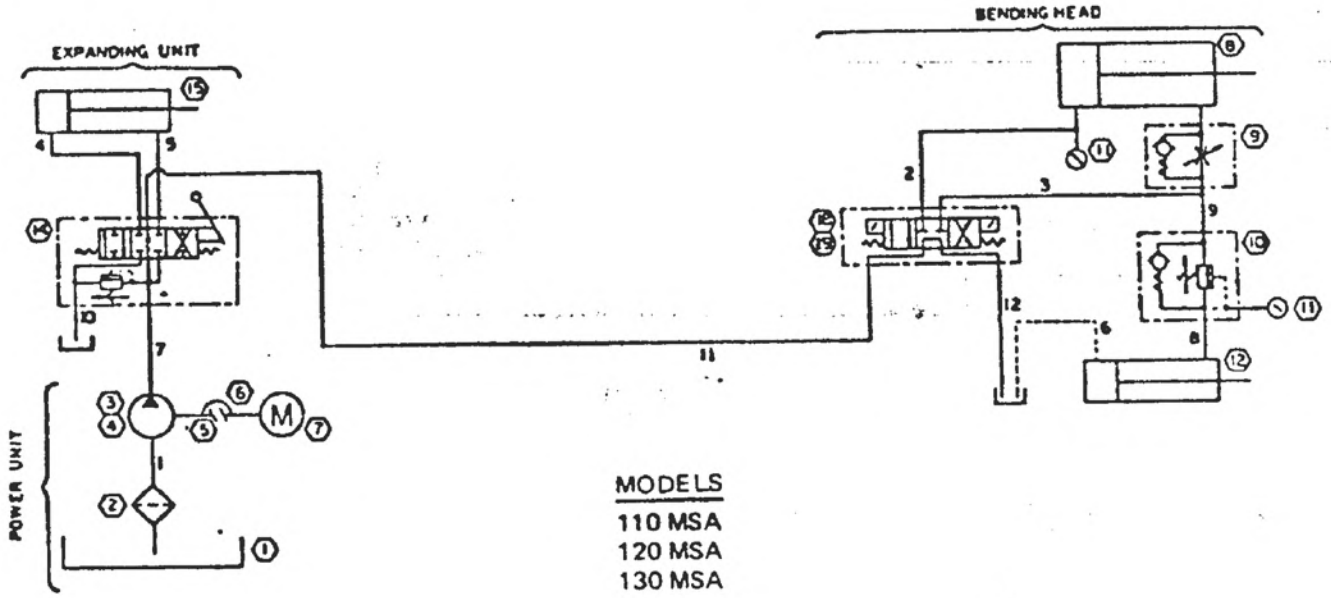
ITEM.	DESCRIPTION	ITEM	DESCRIPTION
1	Reservoir	11	Pressure Gauge
2	Suction Filter	12	Bottom Cylinder
3	Hydraulic Pump	13	4-Way Valve
4	Pump Mounting Bracket	14	4-Way Power-Beyond Valve
5	Pump/Motor Coupling	15	Expander Cylinder
6	Coupling Guard	16	2-Way Solenoid Valve
7	Open Drip-Proof Electric Motor	17	2-Way Subplate
8	Top Cylinder	18	4-Way Solenoid Valve
9	Flow Control Valve	19	4-Way Subplate
10	Sequence Valve	20	Relief Valve

HOSE NUMBER	CONNECTS THESE PARTS	
1.	Suction Filter	Pump Inlet
2.	Bending Control Valve, "A" Port	Top Cylinder, Blind End
3.	Bending Control Valve, "B" Port	Sequence Valve, Inlet Port
4.	Expander Control Valve, "A" Port	Expander Cylinder, Blind End
5.	Expander Control Valve, "B" Port	Expander Cylinder, Rod End
6.	Bottom Cylinder, Blind End	Reservoir Tank
7.	Pump Outlet	1st Valve in System
8.	Bottom Cylinder, Rod End	Sequence Valve, Cylinder Port
9.	Flow Control Valve	Sequence Valve, Inlet Port
10.	Power-Beyond Valve, Tank Port	Reservoir Tank
11.	Power-Beyond Valve, Power-Beyond Port or Swager Control Valve, Tank Port	Bending Control Valve, Inlet Port
12.	Bending Control Valve, Tank Port	Reservoir Tank
13.	Power-Beyond Valve, Power Beyond Port	Swager Control Valve, Inlet Port
14.	2-Way Solenoid Valve, Inlet Port	Top Cylinder, Blind End
15.	2-Way Solenoid Valve, Tank Port	Reservoir Tank
16.	Bending Control Valve, "A" Port	Top Cylinder, Blind End (Semi-Automatic Models Only)
17.	Relief Valve	Bending Control Valve, Inlet Port

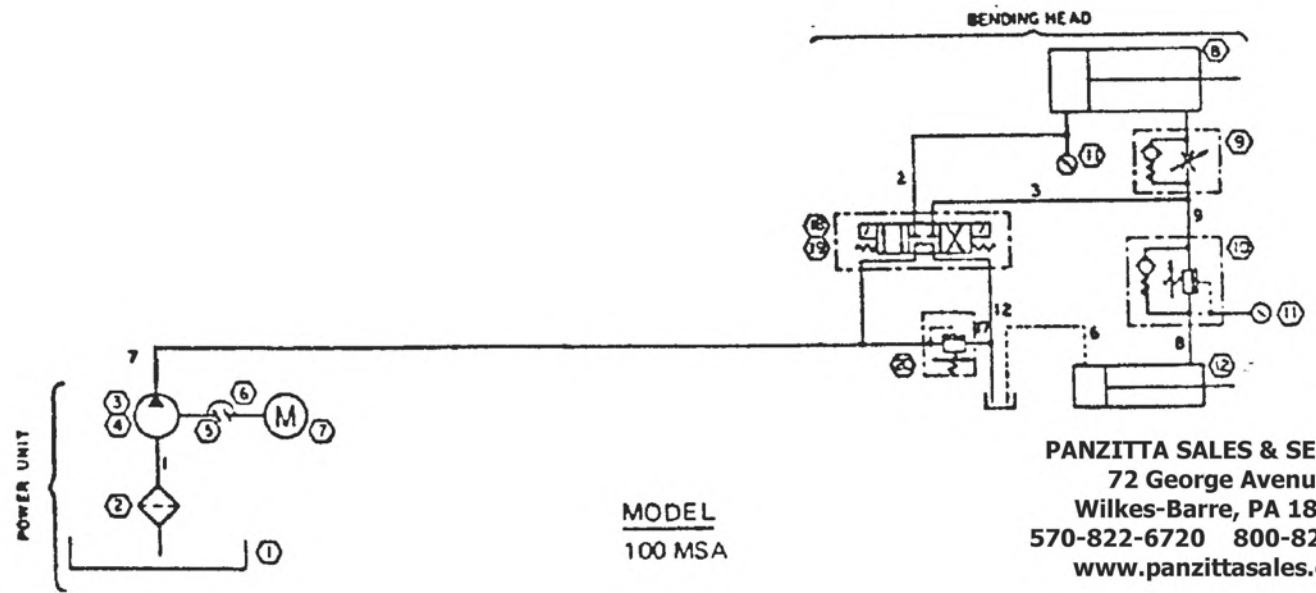
Figure 23. Hydraulic Schematics
Automatic Models



MODELS
150 MSA
153 MSA



MODELS
110 MSA
120 MSA
130 MSA



MODEL
100 MSA

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Wilkes-Barre, PA 18705
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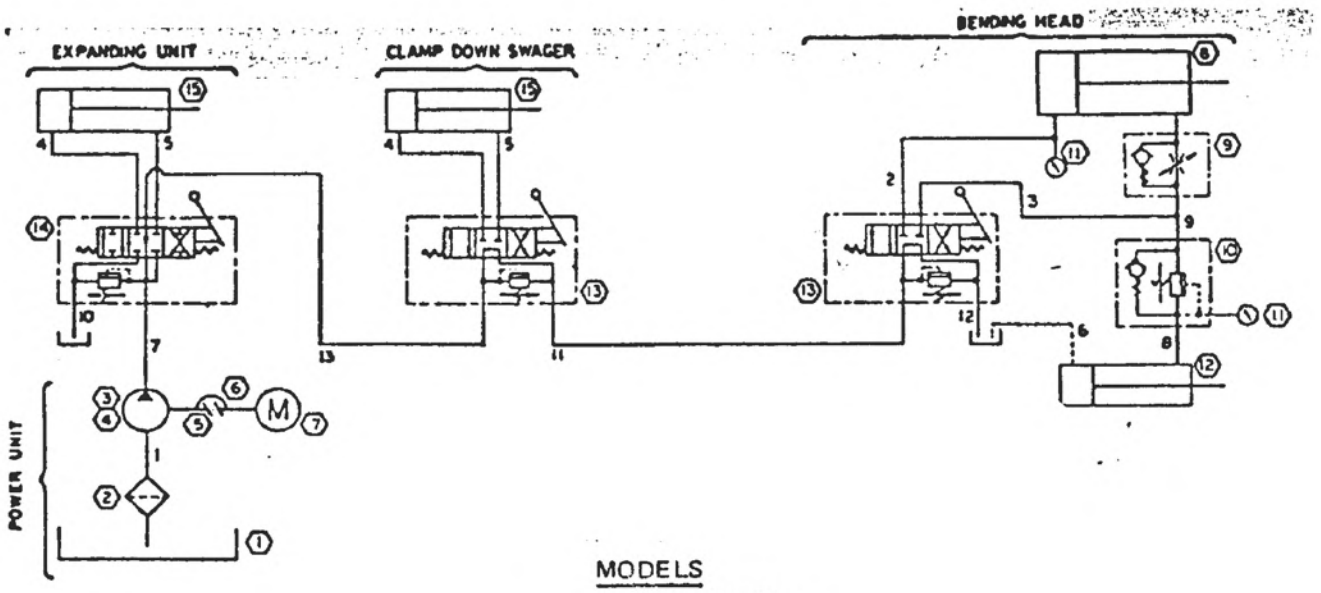
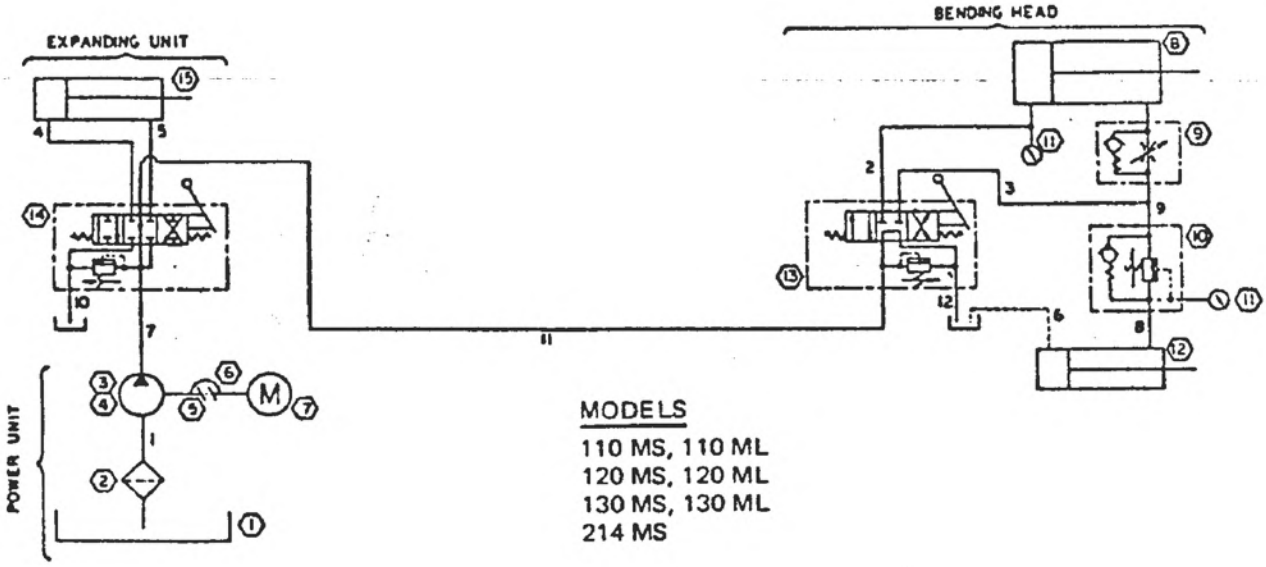
www.panzittasales.com

Figure 24. Hydraulic Schematics

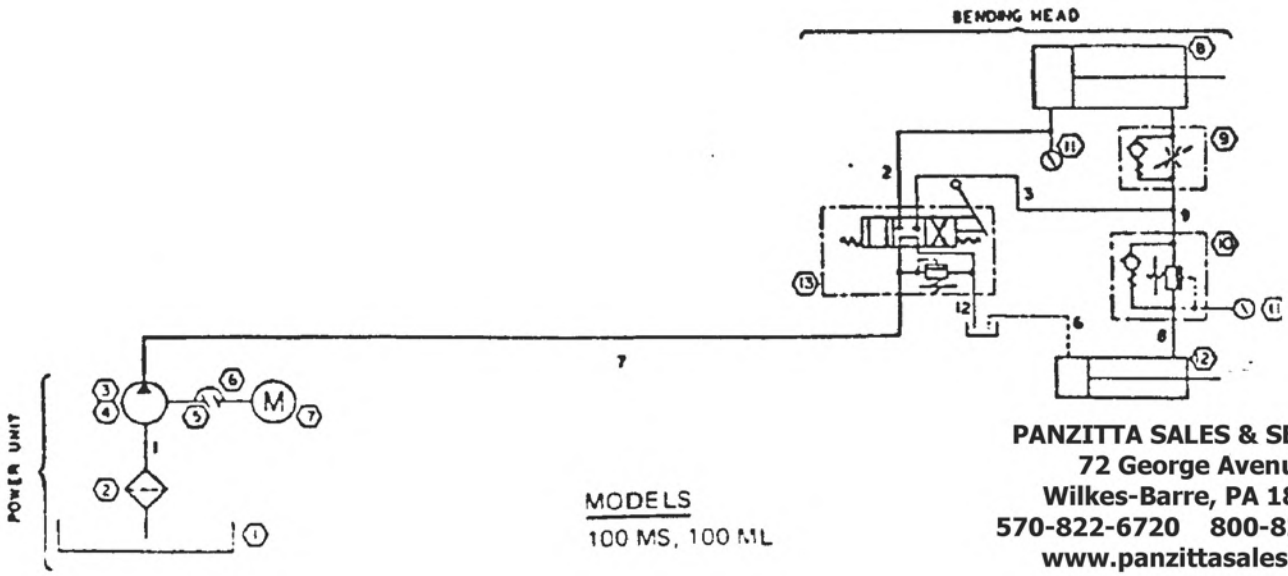
Manual Models



MODELS
150 MS, 150 ML
153 MS, 153 ML

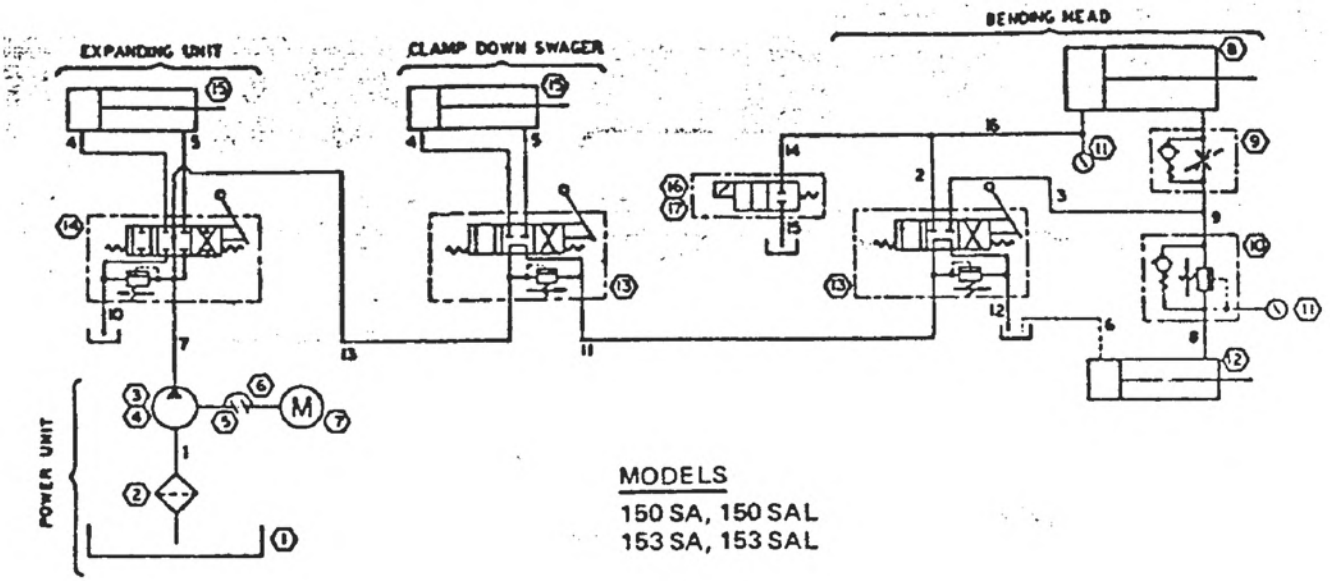


MODELS
110 MS, 110 ML
120 MS, 120 ML
130 MS, 130 ML
214 MS

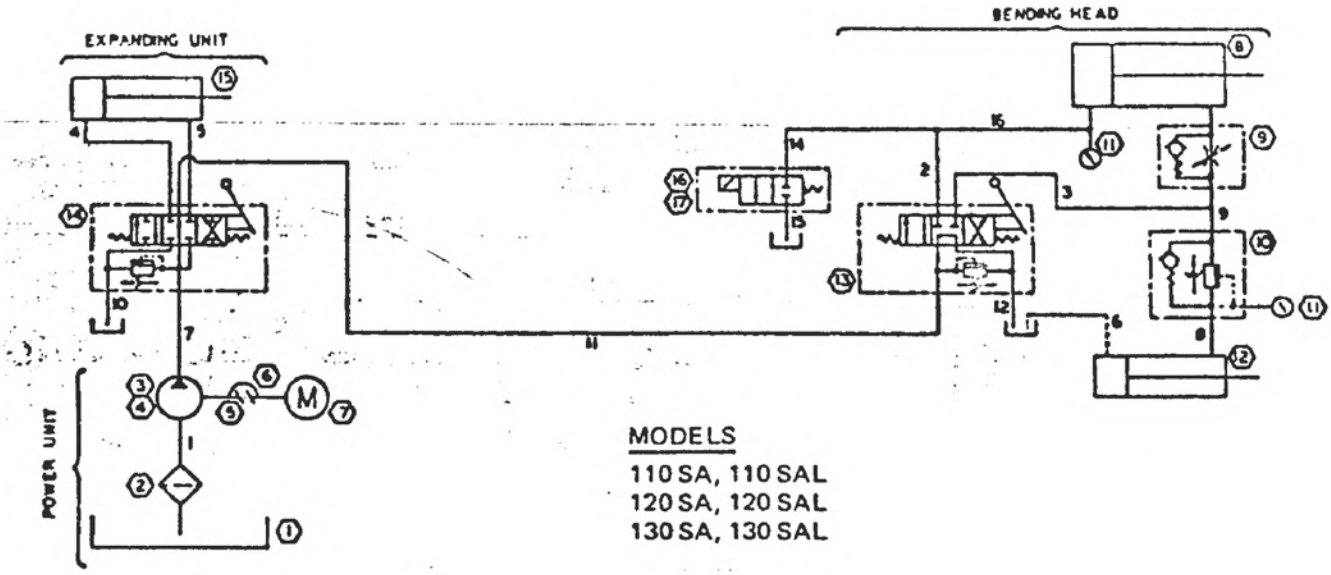


MODELS
100 MS, 100 ML

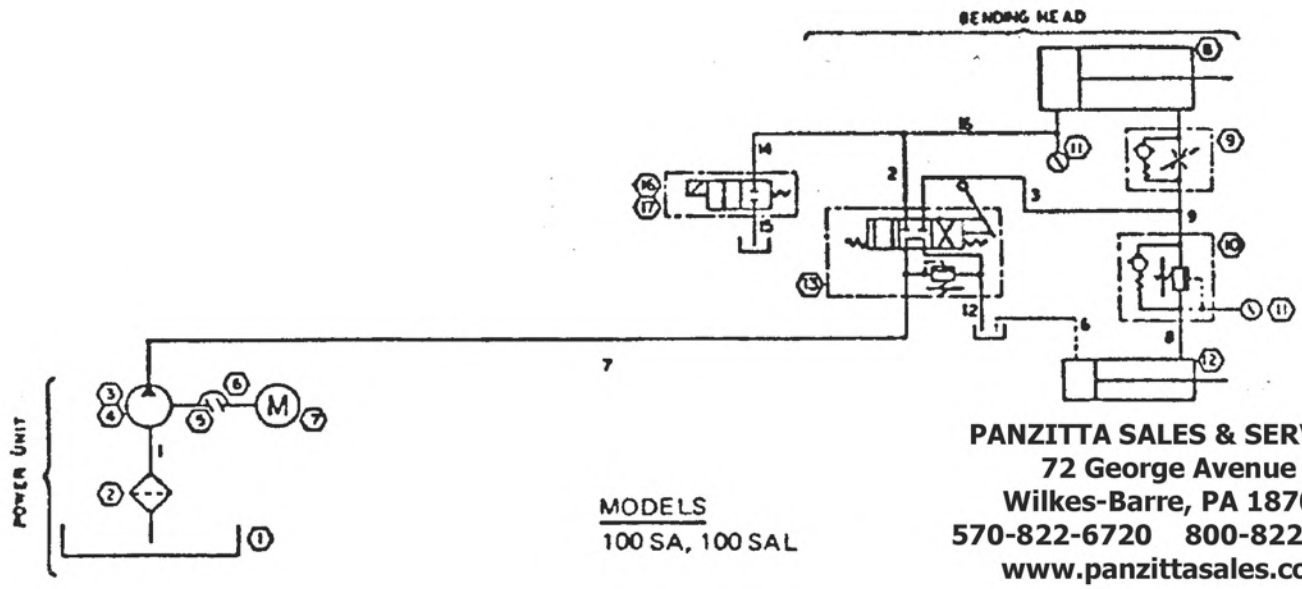
Figure 25. Hydraulic Schematics
Semi-Automatic Models



MODELS
150 SA, 150 SAL
153 SA, 153 SAL



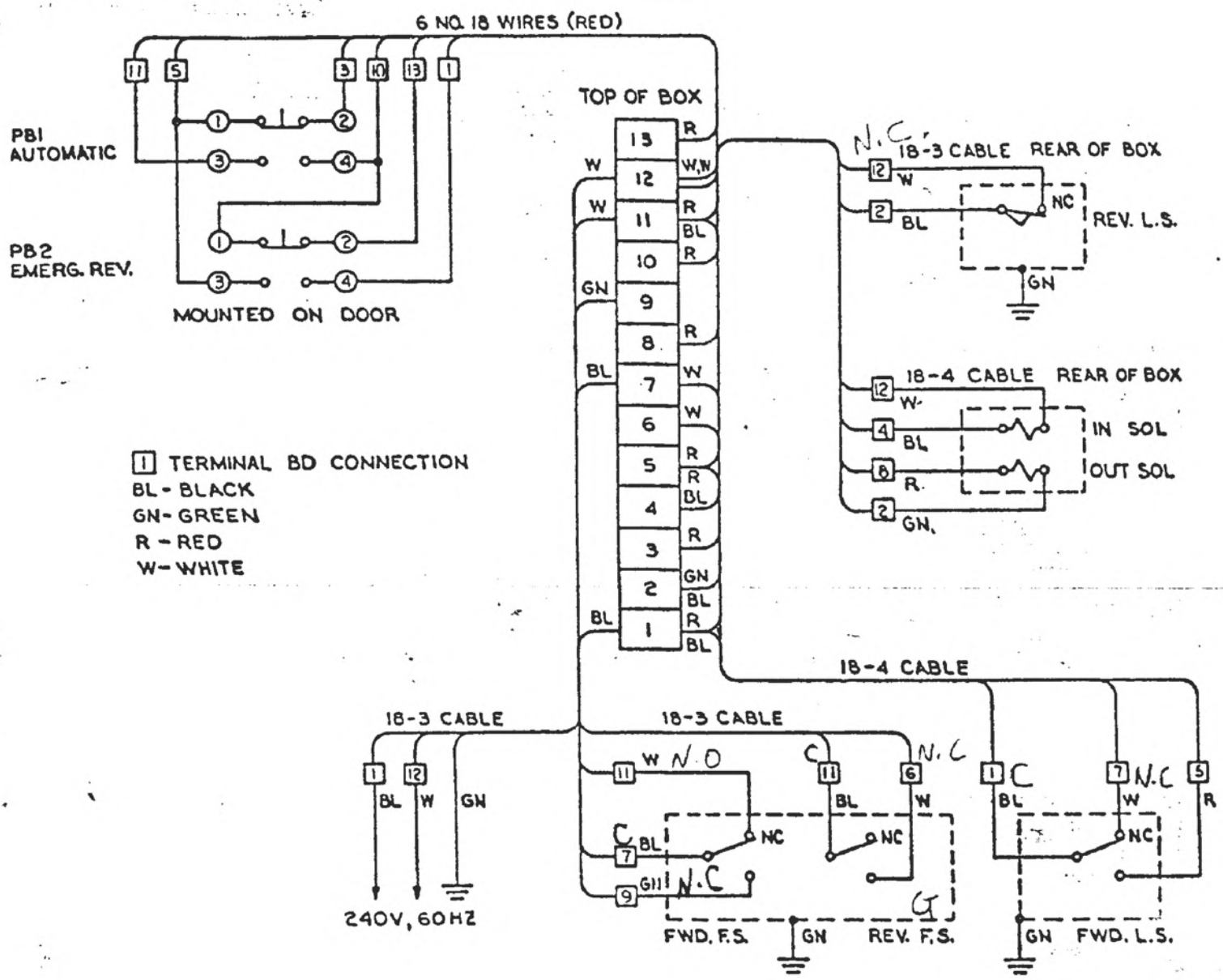
MODELS
110 SA, 110 SAL
120 SA, 120 SAL
130 SA, 130 SAL



MODELS
100 SA, 100 SAL

☐ Figure 26. Electrical Schematic

Automatic Models



⚠ PART OF PC BOARD ASSY

	CABLE CLAMP, REAR CABLES	1
	STRAIN RELIEF LIMIT SWITCH	2
	STRAIN RELIEF LOWER CABLES	4
	18 MTW RED	AR
	CABLE 18-4	AR
	CABLE 18-3	AR
F.S.	FOOT SWITCH TWIN SPDT	1
FWD LS	LIMIT SWITCH SPDT	1
REV L.S	LIMIT SWITCH, INC ROLLER	1
	ENCLOSURE NEMA 1 8"x6"x4"	1
⚠	RELAY SOCKET	2
⚠	TERM BLOCK	1
PB2	IND INC RED MUSHROOM PB SW	1
PB1	IND INC BLUE GUARDED PB SW	1
	PC BOARD ASSY	1
	RELAY 240V PLUG IN 3PDT	2
SYM	DESCRIPTION	QTY

PARTS LIST

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