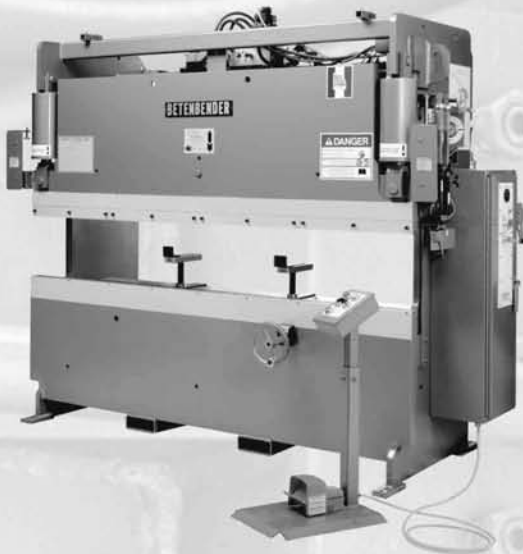


BETENBENDER

Manufacturing, Inc.

AMERICAN MADE WITH PRIDE AND DURABILITY

Press Brake Operators Manual & Parts Catalog



*The Betenbender Family of American-Made
Hydraulic Shears and Press Brakes
SINCE 1972*

On the Web at
www.betenbender.com



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SIZES / MODEL & SERIAL NUMBER

Betenbender Manufacturing, Inc.

Office: 319-435-2378

	Model	Weights*
50 TON	4'-50	5,800
	6'-50	6,800
	8'-50	8,000
	10'-50	11,000
	12'-50	12,500
70 TON	4'-70	7,500
	6'-70	8,000
	8'-70	11,000
	10'-70	13,000
	12'-70	14,500
95 TON	14'-70	15,500
	6'-95	13,000
	8'-95	18,000
	10'-95	20,100
	12'-95	21,000
120 TON	14'-95	23,000
	16'-95	24,000
	6'-120	17,000
	8'-120	19,000
	10'-120	22,000
160 TON	12'-120	24,000
	14'-120	26,000
	16'-120	28,000
	6'-160	17,000
	8'-160	19,000
190 TON	10'-160	22,000
	12'-160	24,000
	14'-160	26,000
	6'-190	17,000
	8'-190	19,000
240 TON	10'-190	22,000
	12'-190	25,000
	14'-190	27,000
	16'-190	
	6'-240	23,000
300 TON	8'-240	26,000
	10'-240	29,000
	12'-240	33,000
	14'-240	35,000
	16'-240	
350 TON	6'-300	29,000
	8'-300	31,000
	10'-300	34,000
	12'-300	37,000
	14'-300	38,000
350 TON	10'-350	35,000
	12'-350	37,000
	14'-350	39,000

Please have this information handy when calling our service department. 319-435-2378

Model _____

Serial# _____

(Located above electrical control panel on end plate.)

Date of Purchase _____

Capacities

Line Voltage _____

Control Voltage _____

Motor Hp _____

Hydraulic Oil Capacity _____

Type _____

Weight _____

* Weights may vary according to options included.

MANUFACTURERS WARRANTY

BETENBENDER MANUFACTURING, INC. guarantees our product against failure caused by defective workmanship or material which occurs after the product is properly installed within product specifications and during normal use and operation for the period of one year, and that the frame shall be free of manufacturer defect for a period of five years.

We will replace all parts, that our inspection shows to be defective, for one year after delivery date, but not installation or other charges. **Written permission** for warranty returns must be obtained before shipment. Ship all returns freight prepaid and include a complete explanation of the problem.

The only warranty extended to the buyer by BETENBENDER MFG., INC. is the above expressed warranty and there are no other warranties, expressed or implied, of merchantability, fitness for a particular purpose, or otherwise which extend beyond the face hereof. BETENBENDER MFG., INC. shall in no event be liable for labor or freight charges or for consequential or incidental damages including, but not limited to, injury to the person or property of buyer or any others, machine down time, and losses or expenses incurred by buyer, arising from the use of this equipment or from this agreement. This warranty constitutes the entire warranty of the manufacturer, BETENBENDER MFG., INC., and no oral representations; warranties or guarantee by any agent of manufacturer or seller shall be binding on BETENBENDER MFG., INC. and no part of this warranty may be modified or extended, except by written agreement executed by BETENBENDER MFG., INC.

It is our policy to improve its products whenever possible and practical to do so. We reserve the right to make changes, improvements and modifications at any time without incurring the obligation to make such changes, improvements and modifications on any equipment sold previously.

GUIDELINES FOR CONTROLS OF HAZARDOUS ENERGY LOCKOUT/TAGOUT ON THE BETENBENDER PRESS BRAKE

These guidelines address the servicing and maintenance of Press Brakes in which unexpected energizing or start-up of the machine or release of stored energy could cause injury to employees.

Affected employees are those whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout/tagout, or whose job requires him/her to work in an area which such servicing or maintenance is being performed.

MECHANICAL SHUTDOWN: Lowering ram into bottom of stroke, blocking ram at top of stroke, pinning ram at top of stroke, and chaining ram at top of stroke, are the common methods of controlling the release of stored energy in the system.

ELECTRICAL SHUTDOWN: Turn off the electrical power at the main or "START" switch is the normal shutdown before lockout. Then go to the main energy isolating device, and ensure that the energy isolating device, and the Press Brake being controlled, cannot be operated until the lockout device is removed. Place lockout at these points.

A prominent warning device such as a tag and a means of attachment which can be securely fastened to the energy isolating device and the Press Brake being controlled. Tagout devices shall warn against hazardous conditions if the Press Brake is energized and shall include a legend such as the following:

**DO NOT START, DO NOT OPEN, DO NOT CLOSE,
DO NOT ENERGIZE or DO NOT OPERATE.**

Following the application of lockout/tagout devices to energy isolating devices, all potential hazardous stored or residual energy shall be relieved, disconnected, restrained, and otherwise rendered safe.

Other potential energy sources to be concerned with are:

- Other electrical hazards besides the main power sources
- Battery back-ups (NC/CNC gauging)
- Pneumatics
- Capacitors
- Thermal energy of 113° F

Other items to be concerned with are:

- Do they create a hazard
- Can they be locked out
- Are there means to control the release of the stored energy
- Must employee's work in close proximity of this heat
- Are means available to bring the temperature within acceptable temperature range or is Personal Protective Equipment available for use

DURING LOCKOUT/RETURN TO SERVICE: Periodic inspection shall be performed by an authorized employee other than the person utilizing the energy control procedure being inspected during the time of lockout/tagout. After completion of work on the Press Brake, all affected employees shall be notified by an authorized employee of the application and removal of lockout/tagout devices. Notification shall be given before controls are applied and after they are removed from the Press Brake. Before lockout/tagout devices are removed and energy is restored to the Press Brake, authorized employees shall ensure the following: Work area is inspected to ensure that nonessential items have been removed and to ensure that Press Brake components are operationally intact. The work area shall be checked to ensure that all employees have been safely positioned or removed. Each lockout/tagout device shall be removed from each energy isolating device by employee who applied the device. When authorized employee who applied the lockout/tagout device is not available to remove it, that device may be removed under the direction of the employer, provided that specific procedures and training for such removal have been developed and making all reasonable efforts to contact the employee that his/her lockout/tagout has been removed. Zero energy state procedures forms shall be completed and on file for every lockout/tagout procedures.

THE USER OR OWNER OF THIS MACHINE HAS THE SOLE RESPONSIBILITY OF APPLYING EFFECTIVE LOCKOUT/TAGOUT PROCEDURES. ATTACHED DISCLAIMER DOES APPLY TO BETENBENDER MANUFACTURING, INC.

FOREWORD

Betenbender Manufacturing, Inc.

Office: 319-435-2378

FOREWORD

As owner of a multi-ton piece of modern technology, you are undoubtedly interested in hearing recommended installation, operation and maintenance procedure direct from its manufacturer. It's the best way to get the most from your equipment in performance, results and long-term service. You have already taken the logical first step by choosing a machine of proven quality in design, construction and durability.

The Betenbender Press Brake is a precision instrument used to bend mild steel and other sheet metals. Because of the extreme hydraulic pressure it is capable of exerting, a wide range of types and thicknesses of metals may be handled with ease.

Please read this manual carefully and understand all points of operation and care before installation and use. Each Betenbender Press Brake has been precision-built and regulated, and extreme care must be exercised in its use, adjustment and maintenance. Each machine has been thoroughly tested and inspected by the manufacturer prior to shipment: however, the possibility always exists that certain settings may be disturbed in transit and require readjustment.

Betenbender Manufacturing, Inc. assumes no responsibility for un-authorized attachments or alterations to the original equipment. Refer to the terms and conditions of the original sale for warranty information.

We feel confident that with proper installation, use and maintenance, your Betenbender Press Brake will serve your metal forming needs well into the future. Should you have further questions regarding any aspect or application of this machine, please contact Betenbender Manufacturing, Inc. before proceeding.



DANGER

TO REDUCE THE POSSIBILITY OF INJURY...

DO NOT PLACE YOUR HANDS IN THE DIE AREA



DO NOT POSITION ANY PART OF YOUR BODY WHERE IT MAY BE STRUCK OR CRUSHED BY PART MOVEMENT



ALWAYS READ AND UNDERSTAND THE OPERATION, MAINTENANCE AND SAFETY MANUAL BEFORE INSTALLING DIES, OPERATING OR SERVICING THE PRESS BRAKE



DO NOT REMOVE THIS SIGN FROM THIS PRESS BRAKE

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CINCINNATI PRECISION MACHINERY 513-860-4133

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319-435-2378

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INTRODUCTION

INTRODUCTION

This manual contains information on the Betenbender Press Brake. This includes instructions for installation, operation, preventive/corrective maintenance and safety precautions, as well as helpful illustrations, photos, tables and charts.

The Betenbender Press Brake is a precision instrument for use in bending mild steel and other sheet metals, including aluminum, brass, bronze, copper, duralumin, lead, monel metal, silver, carbon and stainless steel, tin, wrought iron and zinc. It will effectively bend metals of varying thickness (see page# 23 & 26, **Computing Bending Tonnages**).

SAFETY PRECAUTIONS / INSTRUCTIONS

Because the Betenbender Press Brake may be used for applications other than the standard uses specified in this manual, it is impossible for the manufacturer to equip each machine with a point-of-operations guard effective for all dies which might come into use --- nor is there a universal guard that can be put on a Press Brake at point-of-manufacture to accommodate the unlimited variety of uses and tooling to which the equipment can be adapted. Therefore, employers shall assume responsibility for selecting and installing effective point-of-operation guards for individual or customized applications.

SAFETY RECOMMENDATIONS

IF THIS MACHINE IS NOT IN PROPER WORKING CONDITION, DO NOT OPERATE, BUT REPORT IMMEDIATELY TO YOUR SUPERVISOR.

TO PROVIDE GREATER SAFETY FOR BOTH THE OPERATOR AND MACHINE, WE RECOMMEND EQUIPPING THIS MACHINE WITH SUITABLE SAFETY GUARDS.

KEEP ALL PARTS OF THE BODY CLEAR OF IMPACT OF WORKING AREA OF THE MACHINE.

SAFETY INSTRUCTIONS:

1. Read and understand this manual, taking note of all warnings and cautions.
2. **Electrical Danger:** Misuse or improper installation of machinery connected to a source of electricity may result in accidental shock that could cause injury or death. Installation must conform to **National Electric Code**. Electrical connections must be made by a qualified electrician. Electrical characteristics shown on motor plate and control panel must match the power source; and all electrical powered equipment must be grounded.
3. **Mechanical Danger:** Mechanical movement of the ram and backgauge assembly. Be aware of their movement and stay away from the points of operation. Never stand or sit on anything while feeding machine that could cause you to slip or fall into the braking area. Failure to comply may lead to bodily injury.
4. Perform all installation instructions before connecting power for electrical start-up.
5. The machine is to be operated by authorized personnel who have been trained, by a Betenbender trained representative or a trained supervisor on the working and safety features of the machine, and have read and understand the Operator's Manual.
6. Never eliminate or by-pass any safety devices.
7. Never make adjustments, repairs, replacements or leave machine unattended with the power "ON".
8. Avoid accidental start-up.
9. Do not use machine if servicing is required.
10. Use safety glasses, safety shoes and required protective tools.
11. Keep work areas clean and in proper order.
12. Be alert to all potential hazards. Never become careless or over confident.
13. Do not grasp metal sheet with fingers or thumbs on top. If wide sheets need support, keep hands below with open palms, and fingers and thumbs underneath. Remember that the material will travel upward--keep all parts of the body clear of this movement.
14. When inspecting or changing hydraulic components, make certain the ram is securely blocked or resting on a die, with pressure relieved from system.

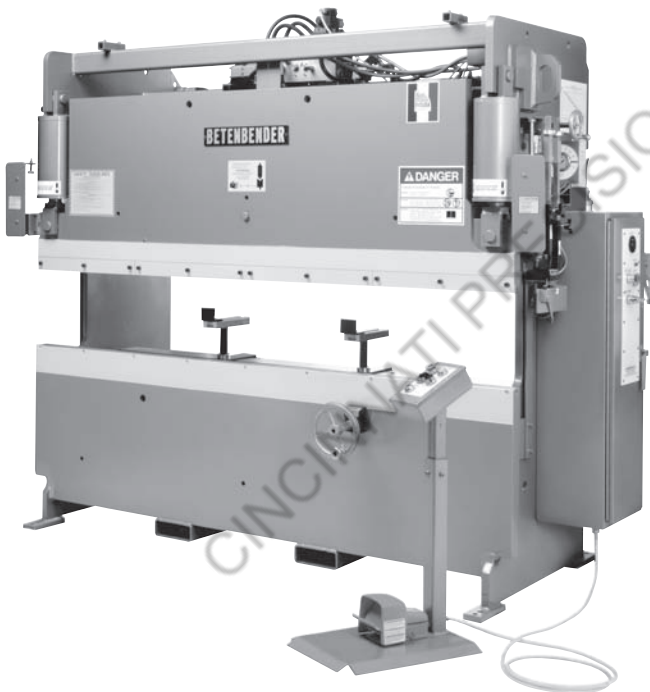
Betenbender Manufacturing, Inc.

Office: 319-435-2378

INTRODUCTION

Betenbender Manufacturing, Inc. offers a full range of machines from 50-350 Ton including Custom Designs to fit your specific needs.

Betenbender Manufacturing, Inc. assumes no responsibility for unauthorized attachments or alterations to the original equipment. Refer to the terms and conditions of the original sale for warranty information.



50-70 Ton



95-350 Ton



sales@betenbender.com

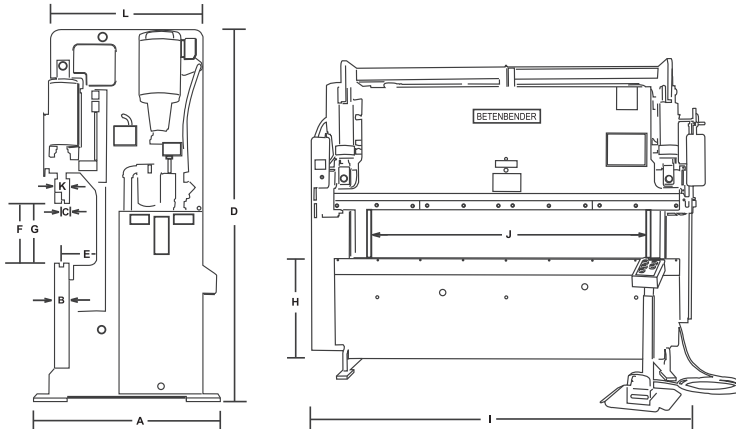
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SPECIFICATIONS CHART

Betenbender Manufacturing, Inc.

Office: 319-435-2378

PRESS BRAKE SPECIFICATIONS



Please note:
ALL measurements
and weights
can vary from the
figures given in this
Specification Chart

HP	AMPS	
	208/230	460
10	28	14
20	54	27
30	80	40
40	104	52

- All dimensions are in inches.
- Engineering data and dimensions in this graph are subject to change without notice, due to continuing product development.
- Upon request, foundation plans will be furnished.
- Die Blocks are not furnished.
- To Convert Horespower to KW, multiply by 0.746.

**** ESTIMATED WEIGHTS.** The weight of your machine may vary from the estimated weight listed here. Weights may vary according to options included.

A Overall Width	E Throat Depth	I Overall Length	L Width of Upper End Plates	O Return to Open (IPM)
B Width of Bed	F Open Height	J Distance Between Housing	M Press (IPM)	P 2-Speed Electric Shift
C Width of Upper Machined Ram	G Closed Height	K Width of Upper Ram	N Rapid Approach (IPM)	
D Overall Height	H Height of Bed			

MODEL	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	HP	Wts**
4'-17	54	2	1 3/4	72	7	14	6-10	29-33	54	30 1/2	2	50	0-66	66	92	Std.	5	2,500
4'-50	45	2	1 3/4	104	8	12	6	28	63	30 1/2	2	36	0-66	66	92	Std.	10	5,800
6'-50	45	2	1 3/4	104	8	12	6	28	87	54 1/2	2	36	0-66	66	92	Std.	10	6,800
8'-50	45	2	1 3/4	104	8	12	6	28	111	78 1/2	2	36	0-66	66	92	Std.	10	8,000
10'-50	45	4	1 3/4	104	8	12	6	28	135	102 1/2	2	36	0-66	66	92	Std.	10	11,000
12'-50	45	4	1 3/4	104	8	12	6	28	159	126 1/2	2	36	0-66	66	92	Std.	10	12,500
4'-70	45	2	1 3/4	104	8	12	6	28	63	30 1/2	2	36	0-44	44	63	Std.	10	7,500
6'-70	45	2	1 3/4	104	8	12	6	28	87	54 1/2	2	36	0-44	44	63	Std.	10	8,000
8'-70	45	2	1 3/4	104	8	12	6	28	111	78 1/2	2	36	0-44	44	63	Std.	10	11,000
10'-70	45	4	1 3/4	104	8	12	6	28	135	102 1/2	2	36	0-44	44	63	Std.	10	13,000
12'-70	45	4	1 3/4	104	8	12	6	28	159	126 1/2	2	36	0-44	44	63	Std.	10	14,500
14'-70	45	4	1 3/4	104	8	12	6	28	183	150 1/2	2	36	0-44	44	63	Std.	10	15,500
6'-95	56 1/2	4	2 1/4	103	8	14	6	37	100	54 1/2	2 1/2	50	50	114	168	Std.	20	13,000
8'-95	56 1/2	4	2 1/4	103	8	14	6	37	123	78 1/2	2 1/2	50	50	114	168	Std.	20	18,000
10'-95	56 1/2	4	2 1/4	103	8	14	6	37	135	102 1/2	2 1/2	50	50	114	168	Std.	20	20,100
12'-95	56 1/2	4	2 1/4	103	8	14	6	37	159	126 1/2	2 1/2	50	50	114	168	Std.	20	21,000
14'-95	56 1/2	4	2 1/4	103	8	14	6	37	183	150 1/2	2 1/2	50	50	114	168	Std.	20	23,000
16'-95	56 1/2	4	2 1/4	103	8	14	6	37	207	174 1/2	2 1/2	50	50	114	168	Std.	20	24,000
6'-120	56 1/2	5	2 3/4	103	8	14	6	37	100	54 1/2	3	50	40	87	115	Std.	20	17,000
8'-120	56 1/2	5	2 3/4	103	8	14	6	37	123	78 1/2	3	50	40	87	115	Std.	20	19,000
10'-120	56 1/2	5	2 3/4	103	8	14	6	37	135	102 1/2	3	50	40	87	115	Std.	20	22,000
12'-120	56 1/2	5	2 3/4	103	8	14	6	37	159	126 1/2	3	50	40	87	115	Std.	20	24,000
14'-120	56 1/2	5	2 3/4	103	8	14	6	37	183	150 1/2	3	50	40	87	115	Std.	20	26,000
16'-120	56 1/2	5	2 3/4	103	8	14	6	37	207	174 1/2	3	50	40	87	115	Std.	20	28,000
6'-160	56 1/2	5	2 3/4	103	8	14	6	37	100	54 1/2	3	50	31	68	86	Std.	20	17,000
8'-160	56 1/2	5	2 3/4	103	8	14	6	37	123	78 1/2	3	50	31	68	86	Std.	20	19,000
10'-160	56 1/2	5	2 3/4	103	8	14	6	37	135	102 1/2	3	50	31	68	86	Std.	20	22,000
12'-160	56 1/2	5	2 3/4	103	8	14	6	37	159	126 1/2	3	50	31	68	86	Std.	20	24,000
14'-160	56 1/2	5	2 3/4	103	8	14	6	37	183	150 1/2	3	50	31	68	86	Std.	20	26,000
6'-190	56 1/2	5	2 3/4	103	8	14	6	37	100	54 1/2	3	50	25	55	66	Std.	20	17,000
8'-190	56 1/2	5	2 3/4	103	8	14	6	37	123	78 1/2	3	50	25	55	66	Std.	20	19,000
10'-190	56 1/2	5	2 3/4	103	8	14	6	37	145	102 1/2	3	50	25	55	66	Std.	20	22,000
12'-190	56 1/2	5	2 3/4	103	8	14	6	37	159	126 1/2	3	50	25	55	66	Std.	20	25,000
14'-190	56 1/2	5	2 3/4	103	8	14	6	37	183	150 1/2	3	50	25	55	66	Std.	20	27,000
6'-240	56 1/2	5 1/2	3 3/4	111	8	14	6	37	100	54 1/2	4	60	25	50	70	Std.	30	23,000
8'-240	56 1/2	5 1/2	3 3/4	111	8	14	6	37	123	78 1/2	4	60	25	50	70	Std.	30	26,000
10'-240	56 1/2	5 1/2	3 3/4	111	8	14	6	37	135	102 1/2	4	60	25	50	70	Std.	30	29,000
12'-240	56 1/2	5 1/2	3 3/4	111	8	14	6	37	159	126 1/2	4	60	25	50	70	Std.	30	33,000
14'-240	56 1/2	5 1/2	3 3/4	111	8	14	6	37	183	150 1/2	4	60	25	50	70	Std.	30	35,000
6'-300	56 1/2	5 1/2	3 3/4	116	8	14	6	37	100	54 1/2	4	60	25	50	70	Std.	30	29,000
8'-300	56 1/2	5 1/2	3 3/4	116	8	14	6	37	123	78 1/2	4	60	25	50	70	Std.	30	31,000
10'-300	56 1/2	5 1/2	3 3/4	116	8	14	6	37	135	102 1/2	4	60	25	50	70	Std.	30	34,000
12'-300	56 1/2	5 1/2	3 3/4	116	8	14	6	37	159	126 1/2	4	60	25	50	70	Std.	30	37,000
14'-300	56 1/2	5 1/2	3 3/4	116	8	14	6	37	183	159 1/2	4	60	25	50	70	Std.	30	38,000
10'-350	56 1/2	5 1/2	3 3/4	119	8	14	6	37	135	102 1/2	4	60	25	50	70	Std.	30	35,000
12'-350	56 1/2	5 1/2	3 3/4	119	8	14	6	37	159	126 1/2	4	60	25	50	70	Std.	30	37,000
14'-350	56 1/2	5 1/2	3 3/4	119	8	14	6	37	183	159 1/2	4	60	25	50	70	Std.	30	39,000

Please call for specifications on 400 Ton machines

sales@betenbender.com

www.betenbender.com

* ALL SAFETY COVERS AND GUARDS MUST REMAIN ON THE PRESS BRAKE AT ALL TIMES.

INTRODUCTION

Betenbender Manufacturing, Inc.

Office: 319-435-2378

CINCINNATI PRECISION MACHINERY 513-860-4133

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319-435-2378

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INSTALLATION

Betenbender Manufacturing, Inc.**Office: 319-435-2378****RECEIVING**

Check the equipment immediately upon receipt for any loss of parts or damage incurred during shipment. All equipment is sold F.O.B. Betenbender Manufacturing, Inc. Coggon, Iowa. International Sale terms are Ex-Works, Coggon, Iowa. The manufacturer's responsibility for transit damage ends with the carrier's signature on the bill of lading attesting to arrival in good condition. If you later discover any damage or loss that occurred in shipping, report it promptly to the transport company in order to expedite the necessary claims.

Missing items not noted on the bill of lading, or discrepancies between items ordered and those received, should be reported promptly to

**Betenbender Manufacturing, Inc.
5806 Quality Ridge Road
P.O. Box 140
Coggon, Iowa 52218**

Phone (319) 435-2378 or FAX (319) 435-2262

NOTE:

The Press Brake can only be as accurate as the original setup. A few extra minutes spent in making sure that the setup is correct will always be a good investment. Setup instructions should be followed exactly.

CAUTION!

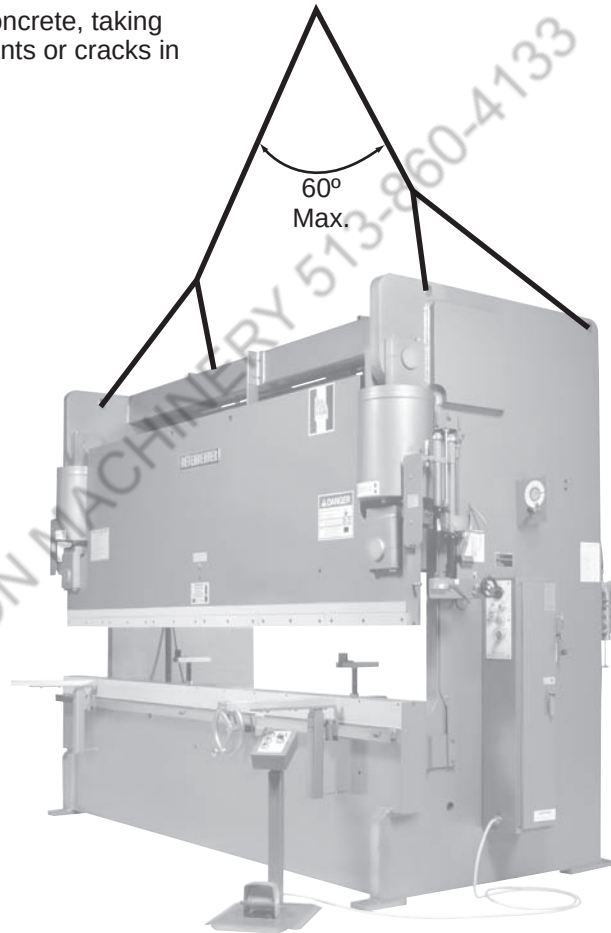
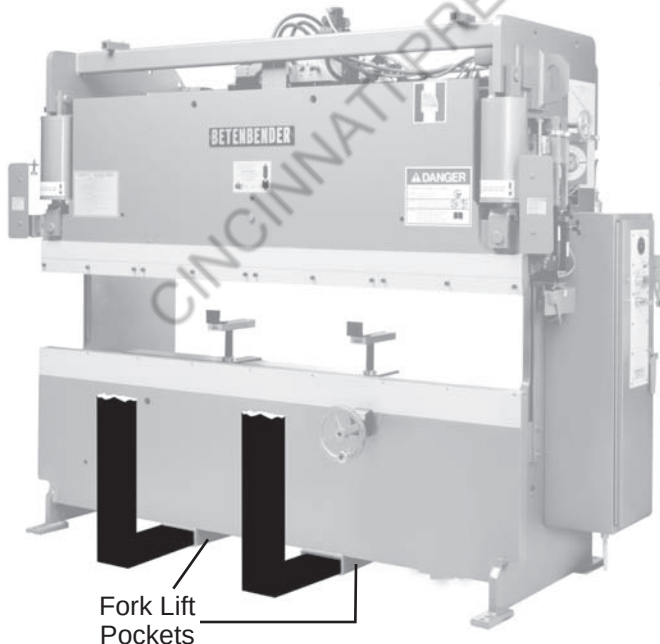
**Before installing the Press Brake,
read and understand this manual, taking
note of all warnings and cautions.**

The 4', 6', 8' x 50 Ton and 70 Ton Press Brake have fork lift pockets at the base of the machine. These machines require a fork lift with capacity for handling 3 to 5 tons, depending on the size of your particular machine, or the machine can be lifted with a crane. For larger machines a crane is required. For crane placement/removal, place sling and clevises into the lift holes provided at the top of each endplate.

NOTE: Chain should be at 60° angle for lifting Press Brake. A larger angle could damage the machine.

The Press Brake should be placed on 4" reinforced concrete, taking care that the machine is not placed over expansion joints or cracks in the concrete.

4', 6', 8', x 50T and 70T



10', 12', 14' x 50T and 70T
95T-350T

LEVELING

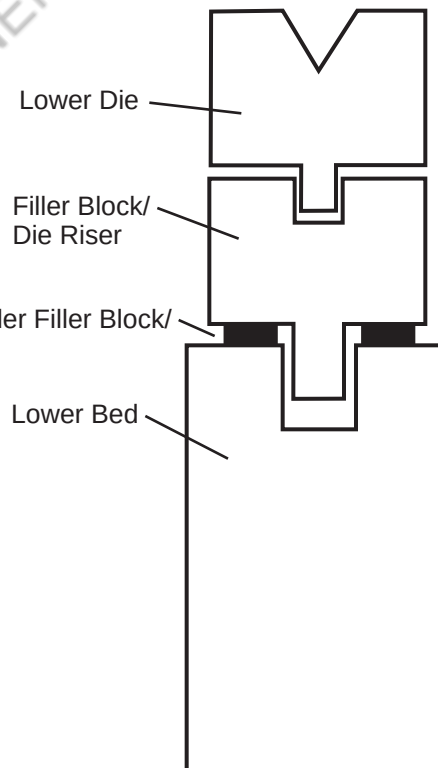
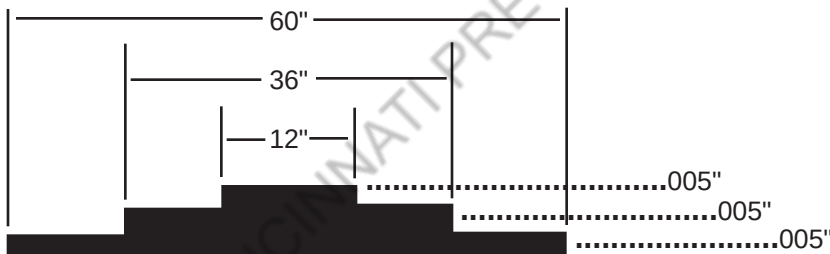
The first step in leveling is to determine that the Press Brake sits evenly length-wise (left to right). Simply use a machinist's level and insert any necessary shims under the appropriate feet to obtain a level reading.

Next, be certain the Press Brake is level front-to-back so that the ram sits in the gibs without cross-corner binding. If the end housings are set on different planes, the frame may twist and cause the ram to wobble from corner to corner.

Anchor bolts of 3/4" diameter should be used to secure machine to concrete. The customer is responsible for the construction of the concrete pads and bolt installation. In each foot of the machine, holes have been provided to anchor the machine to the floor. This is intended to prevent the Press Brake from moving after it has been properly leveled.

SHIMMING

TYPICAL SHIMMING CONFIGURATION



To obtain a uniform bend, tooling may need to be shimmed (when forming loads which require maximum capacity of the Press Brake). Good quality shim stock should be used when shimming. Brass is not recommended. Paper can be used in some cases. Keep all surfaces clean and free from nicks and dirt, which may affect the accuracy. The upper punch can also be shimmed. You must shim dies when air bending.

INITIAL CLEANING

In spite of precautions taken in preparing the Press Brake for shipment, dirt and foreign material may find their way into the ways and other parts during transit. This is a potential source of damage to the machine and must be removed before initial use. It is extremely important to inspect ways, cylinder rods, gauges, etc. and thoroughly clean any dirt and foreign material that may have accumulated. DO NOT attempt to blow out the dirt and/or foreign material with an air hose as this may force the dirt and/or foreign material into hard-to-reach areas. Remove rust proofing compound with an acceptable solvent. (Always use safety glasses to protect eyes and gloves to protect hands.)

ELECTRICAL SERVICES

Consult the wiring diagram attached inside the electrical control box and the electrical schematic included with your Press Brake. A single power connection is required to link the line side of the disconnect switch to a source of proper voltage, size, phase and hertz. It is necessary to use at least the same size service entrance cable as that used to connect the motor and starter.

CAUTION:

ELECTRICIANS: DO NOT operate the Press Brake to check motor rotation until it has been completely inspected, cleaned leveled and lubricated. RUN/JOG switch must be in JOG position when checking rotation. Make certain the motor rotates in the proper direction, as indicated by directional arrow on the pump.

WARNING!

Never use an air hose to blow dirt away. Such action may force particles into hard-to-reach areas of the Press Brake, causing considerable damage.

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PRE-OPERATION

FACTORS IN BENDING

The angle of a bend is determined by how far the ram goes into the female die. Accuracy is dependent on the type of metal being bent and how much it will spring back. Other factors include its density, grain, hardness and internal stress.

Five Things to Consider Before Bending:

1. Die Condition (Pitted dies ruin finish)
2. Straightness of Dies
3. Proper Capacity & Die Opening
4. Air Bending or Coining
5. Springback

CAUTION!

It is recommended that the relief valve be set for pressure needed to do your work, which will serve to increase the life of the components.

INSIDE RADIUS

The inside radius of the bend will equal approximately 15% of the vee die opening. Typically, a vee die eight (8) times the metal thickness is used to produce an inside radius approximately equal to the thickness of the metal. Sharper radii can be achieved with a smaller vee die opening; however, more tonnage will be required and the metal may crack.



POSITIONING/TONNAGE INFO.

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POSITIONING

If possible, all bends should be made at the center of the Press Brake to equalize the load. Care must be taken when bending short pieces of metal so material does not become embedded in the die.

TONNAGE CONVERSIONS

The tonnage requirement for bending metal is computed in proportion to the metal's length. Use the table to the right to determine settings for mild steel and other specified metals.

COMPUTING BENDING TONNAGES

Tonnages given on page 26 (top) are for air bends. The figures printed in white boxes are for die openings eight times the thickness of the metal. These are used for average work, and the inside radius formed is approximately equal to the thickness of the metal.

Bending tonnage required varies directly with tensile strength of the material. Conversion factors for a variety of materials other than mild steel are listed in the table to the right.

TONNAGE CAPACITY

The tonnage capacity of this Press Brake is _____ tons of hydraulic pressure for the total length of the stroke.

The main relief valve on 50T - 70T machines is located on the back side of the manifold block in the top left corner. The main relief valve is located on the end of the manifold block on 95T - 350T machines. It is port #1. Turn the relief valve in to raise pressure, out to lower it. Maximum pressure: 2,500 pounds p.s.i.

FACTORS FOR DETERMINING BENDING TONNAGES FOR OTHER MATERIALS Ultimate Tensile Strength*

MATERIAL	Pounds Per Square Inch	Conversion Factor
Aluminum -- Soft Sheet.....	15,000	.25
Half Hard Sheet.....	19,000	.35
Hard Sheet.....	28,000	.50
Brass -- Soft Sheet for Drawing.....	47,000	.80
Half Hard Sheet.....	60,000	1.00
Hard Sheet.....	85,000	1.40
Bronze -- Gun Metal.....	40,000	.70
Phosphor Soft Sheet.....	45,000	.75
Manganese.....	70,000	1.20
Copper -- Rolled.....	37,000	.60
Duralumin -- Soft Sheet.....	35,000	.60
Treated.....	55,000	.90
Treated and Cold Rolled.....	75,000	1.25
Iron -- Wrought.....	50,000	.85
Lead.....	3,000	.05
Monel Metal -- Rolled Sheet.....	95,000	1.60
Silver.....	38,000	.60
Steel -- 0.25 Carbon (Mild).....	60,000	1.00
S.A.E. 1040 (Cold Drawn).....	90,000	1.50
0.50 Carbon.....	95,000	1.60
S.A.E. 2330 (Cold Drawn).....	105,000	1.75
S.A.E. 3240 (Hot Rolled Annealed).....	105,000	1.75
0.75 Carbon.....	115,000	1.90
1.00 Carbon.....	130,000	2.20
1.20 Carbon (T. S. Annealed).....	150,000	2.50
Stainless (Low Carbon for drawing)..	80,000	1.30
Stainless 18.8.....	95,000	1.50
Tin -- Sheet.....	5,000	.08
Zinc -- Rolled.....	24,000	.40

*Tensile strength values taken from Engineering Handbook, "Condensed Practical Aids For the Experienced Die Engineer and Die Maker" (Date is approximate.)

PRE-OPERATION

PRESS BRAKE MULTIPLE BEND ALLOWANCES

RULE OF THUMB

Formula for making multiple bends on Press Brake. For shape as shown, in mild steel with radii equal the metal thickness unless otherwise noted.

Multiply Metal Thickness By Factor = Tons Per Ft.

SHAPE	DESCRIPTION	AIRFORM.	BOTTOMING
	VEE DIE	60	150
	WIPING	---	250
	OFFSET	150	300/600
	MT'L. THK. OFFSET	300	600
	CHANNEL	225	300
	VEE RIB	200	600
	W DIE	300	600
	OPEN HAT CHANNEL	300	450
	SQ. HAT CHANNEL	---	600
	PREFORM CURL	---	300
	PREFORM CURL	---	200
	CLOSE CURL	---	300
	RADIUS	---	180/300
SHAPE CONSIDERATIONS		Large Radii Angle Variation Concave or Convex Sides	Mat'l Thk. Radii Min. Angle Variation Maintain Flatness

Stainless Steel.....	(18-8 Annealed) Type 304.....	1.55
Aluminum.....	3303-H14 (1/2 Hard).....	35
	5052-H34 (1/2 Hard).....	65
	6061-T64.....	75
Brass.....	70/30 (1/2 Hard).....	1.10

PRESS BRAKE DEFLECTION

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PRE-OPERATION

SUBJECT: CROWNED BED VS. FLAT BED

CROWNED BED:

1. Application is for one tonnage of certain length part.
2. Need to shim under each end if less tonnage is required
3. If more tonnage is needed, must shim the center of the Press Brake.

FLAT BED:

1. To obtain a uniform bend, tooling may need to be shimmed (when forming loads which require maximum capacity of the Press Brake).

NOTE: Good quality shim stock should be used when shimming. Brass is not recommended for shimming. Paper can be used in some cases. Keep all surfaces clean and free from nicks and dirt, which may affect the accuracy.

FLAT BED - OPTIONAL EQUIPMENT:

1. Die holders can be crowned.
2. Quick change die holders are available. They can be adjusted to optimum crown by dial, for smooth continuous crown.
3. Sectional compensators are also available. They use a series of wedges adjusted by a turn of a screw. This allows for multi-station operations.

The start of the bend requires about 80-90% of the overall bending tonnage requirement.



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*ALL SAFETY COVERS AND GUARDS MUST REMAIN ON THE PRESS BRAKE AT ALL TIMES.

BENDING PROPERTIES OF DIFFERENT STEELS

TONNAGE CHART

Table II--Pressure In Tons Per Linear Foot
Required to Make 90 Degree Air Bend In Mild Steel
Tensile 58 ksi. Yield 32 ksi.

THICKNESS OF METAL		WIDTH OF FEMALE DIE OPENING																	
Gauge	Inches	1/4	5/16	3/8	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	5	6
20	.036	2.9	2.2	1.7	1.2	1.0													
18	.048		4.0	2.9	2.2	1.6	1.3												
16	.060			5.6	3.6	2.7	2.2	1.7											
14	.075				6.0	4.5	3.4	3.0	2.5	2.1									
13	.090					6.8	5.4	4.3	3.7	3.3	2.9								
12	.105					10.1	7.4	6.3	5.4	4.4	4.0	3.2							
11	.120							10.5	8.8	7.2	6.2	5.4	4.3	3.2					
10	.135								11.3	9.6	8.4	7.0	5.6	4.1					
9	.150								13.1	11.9	9.0	6.7	5.2	3.5					
7	.188								16.4	14.0	11.2	7.6	5.8	4.5					
1/4	.250									28.8	22.0	15.3	11.5	9.1	7.5	6.2			
5/16	.312										38.0	26.0	19.2	16.0	12.5	10.6	7.6		
3/8	.375											41.0	29.9	24.0	19.4	16.0	12.3		9.3
7/16	.437												45.2	35.0	28.0	24.0	17.0	14.6	
1/2	.500													47.9	39.0	33.1	24.0	19.0	

Pressures shaded are for dies with female openings approximately 8x metal thickness, with radius on male die equal to metal thickness, and are considered ideal for right angle bending.

Pressure Required For
Air Bending High-Tensile Low-Yield Steel

Tons per linear foot		Tensile 80-90 ksi.							Yield 30-40 ksi.			
Thickness Inches		Width of V-die opening, inches										
		2	2 1/2	3	3 1/2	4	5	6	7	8	10	12
1/4	0.250	18.5	13.7	10.8	8.9	7.3						
5/16	0.313	32.4	23.9	18.4	15.2	12.6	9.2					
3/8	0.375	50.8	37	29	23.5	19.5	14.8	11.4				
7/16	0.438		55	42.5	30.5	29.5	21	17.5	13.5			
1/2	0.500			59	47.5	40	29.5	23.5	19	15.5		
5/8	0.625				84	70	51.5	40	33	28	20	
3/4	0.750					112	83	64	52	43	33	25
7/8	0.875						125	97	77	64	48	38
1	1.000							136	110	92	68	53

V-opening is 8 times material thickness. Punch radius equal to material thickness.

Pressure Required For
Air Bending Medium-Tensile Medium-Yield Steel

Tons per linear foot		Tensile 60-75 ksi.								Yield 45-55 ksi.		
Thickness Inches		Width of V-die opening, inches										
		2	2 1/2	3	3 1/2	4	5	6	7	8	10	12
1/4	0.250	26	19.5	15.5	12.5	10.5						
5/16	0.313	46	33.5	26	21.5	18	13					
3/8	0.375			41	33.5	28	21	16				
7/16	0.438				48.5	41.5	29.5	23	19			
1/2	0.500					57	42	33	27	22		
5/8	0.625						74	57	47	40	29	
3/4	0.750							91	74	62	46	36
7/8	0.875								110	90	68	54
1	1.000								155	129	96	75

V-opening is 10 times material thickness. Punch radius is 1 1/2 times material thickness.

Plates Typical Properties

Properties shown for annealed and as rolled alloy plate are based on single test results. They will vary considerably dependent on thickness.

	Condition of Steel	Tensile Strength KSI	Yield Strength KSI	% Elong. in 2"	% Elong. in 8"	Approx. Brinell Hardness
GENERAL PURPOSE						
1015	As Rolled	50	29	—	—	133
1020 Mild Steel	As Rolled	58	32	—	—	143
1025	As Rolled	70	34	—	—	156
ASTM A36, ASME SA36	As Rolled	58 to 80	36 Min.	23	20	137

Bending Pressures Required For Other Metals As Compared To 60,000 P.S.I. Tensile Mild Steel On Chart:

- Soft Brass 50% of pressure listed
- Soft Aluminum 50% of pressure listed
- Aluminum Alloys (Heat Treated) Same as steel
- Stainless Steel 50% more than steel



LUBRICATION

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PRE-OPERATION

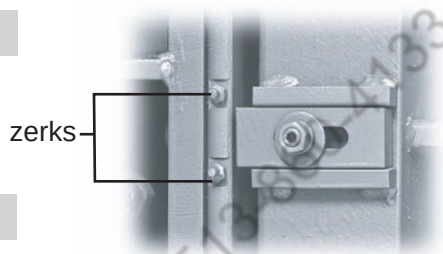
LUBRICATION

Proper lubrication extends the life of your Betenbender Press Brake. We offer three types of lubrication systems:

1. Manual Lubrication
2. One-Shot Lubrication
3. Automatic Lubrication

MANUAL LUBRICATION

Grease the two zerks on each end of the gibs at 8 hours of running time intervals.



ONE-SHOT LUBRICATION -- OPTIONAL

NORMAL USAGE: Using the grease pump attached to lube station, manually pump grease into the machine. This will supply lubrication to the gibs.

EXTENDED USAGE: The one-shot grease pump should be operated every 8 hours of running time.

AUTOMATIC LUBRICATION -- OPTIONAL

NORMAL USAGE: Each time the Press Brake is initially turned on, the auto lube provides grease to all points on the gibs that require lubrication.

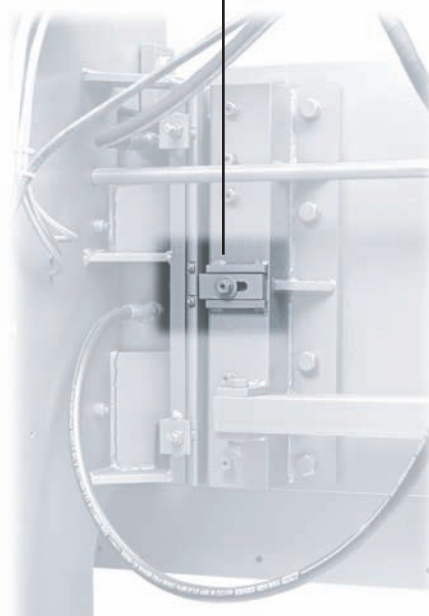
EXTENDED USAGE: After the initial start-up of the Press Brake, the gibs are greased at intervals controlled by a timer on the machine. This can be set to lubricate at any interval that is needed. It can be set to grease every few seconds to once every few hours depending on the environment the machine is being operated in.

LUBRICATION NOTE:

All zerk fittings should be checked and regreased as necessary when shutting off the Press Brake during extended running. Otherwise, once per 8 hour running time should be sufficient. Regreasing intervals will be dependent upon climatic conditions under which equipment is being operated.

NOTE: Backgauge screws should be *oiled* not greased.

Area Enlarged



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*ALL SAFETY COVERS AND GUARDS MUST REMAIN ON THE PRESS BRAKE AT ALL TIMES.

LUBRICATION CHART

COMPONENT	LUBRICATION	INTERVAL
Hydraulic Reservoir	*ISO 32 #10 Wt.	Change 2000 hrs/1 yr.
OIL FILTER	-----	Change 1000 hrs/1 yr.
GIBS	*Lubriplate 930AA	40 Hrs.
BACKGAUGE	Oil	Daily

*FOR REFERENCE - ANY EQUIVALENT IS ACCEPTABLE

SPECIFICATIONS AND TEST RESULTS

Product: Hyd. OIL SAE 5, 10, 20, 30	OIL# 0301-0 Weight:			
Characteristics:	SAE 5	SAE 10	SAE 20	SAE 30
API Gravity	29.4	28.7	28.2	27.3
Viscosity Index	80	80	80	80
SUS @ 100	105	210	310	510
SUS @ 210	39	48	53	63
Flash	385	524	445	485
Pour	-20	-18	-15	-10
Foam	Pass			
R & O	Pass	Pass	Pass	Pass
wt/gal.	7.32	7.35	7.38	7.42

No foam Hydraulic Oils are a blend of virgin base stocks which provide excellent natural seal swell characteristics. They possess anti-foaming and anti-rust properties. Excellent service is provided by these oils in light and medium duty hydraulic service.



HYDRAULIC OIL

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PRE-OPERATION

HYDRAULIC OIL

Betenbender Manufacturing, Inc. recommends that the hydraulic oil be analyzed by your local oil supplier to determine when it should be changed rather than make a change on an arbitrary time schedule. This procedure will often extend its useful life.

Certain oils and hydraulic fluids are not compatible with the hydraulic system of this press brake, their use will cause damage. Betenbender Manufacturing, Inc. recommends the use of SAE 10*.

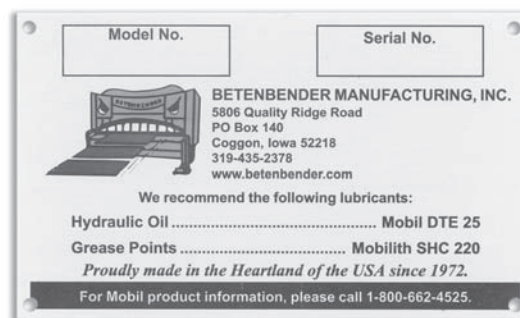
It is ESSENTIAL that the oil be clean and precautions should be taken to prevent its contamination with any foreign material. Dirt should be wiped away from the filler cap on the oil reservoir. When transferring oil always make sure that the container is clean before being used. When adding or refilling use only the recommended oil or its equivalent, use a fine metal strainer to filter it carefully when putting it into the reservoir.

The maximum safe operation temperature of hydraulic oil is 160° F. Under normal operating conditions this temperature will not be exceeded. Excessive oil temperature is generally an indication of potential trouble such as excessive pressure, clogged filters, worn pump or high ambient temperature.

OIL CAPACITY

Press Brakes Before April 2005-Machine Size	Gallons
4' x 17 Ton Press Brake	12.47 Gal.
50 or 70 Ton Press Brakes Side Mount Tank (4' - 12")	36.47 Gal.
95 through 350 Ton Press Brakes Side Mount Tank (4' - 12")	70.23 Gal.
4' - 50 or 70 Ton High Speed Press Brake	35.50 Gal.
6' - 50 or 70 Ton High Speed Press Brake	35.50 Gal.
8' - 50 or 70 Ton High Speed Press Brake	50.38 Gal.
10' - 50 or 70 Ton High Speed Press Brake	77.29 Gal.
12' - 50 or 70 Ton High Speed Press Brake	77.29 Gal.
Press Brakes After April 2005-Machine Size	Gallons
4' - 50 or 70 Ton Press Brake	21.76 Gal.
6' - 50 or 70 Ton Press Brake	33.50 Gal.
8' - 50 or 70 Ton Press Brake	25.30 Gal.
All sizes not listed above -Use following formula:	
Height x Length x Width of tank ÷ 231 = Gallons	

*Tank sizes vary according to how it is attached to the machine



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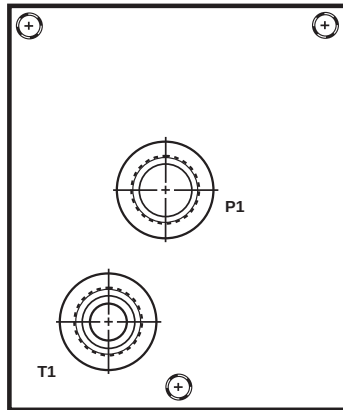


NOTE THREE SPEED USED ONLY ON 95 TON AND LARGER.

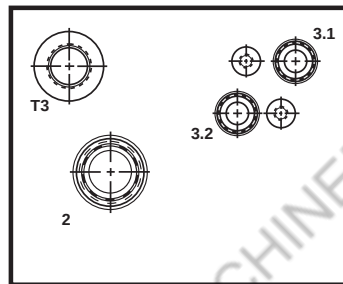


50-70T

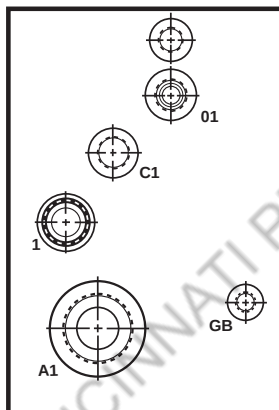
HYDRAULIC BLOCK without High-Speed



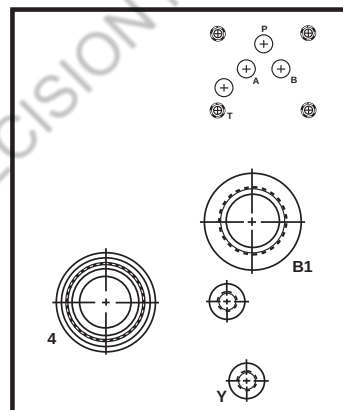
BOTTOM



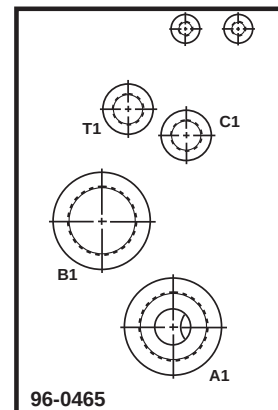
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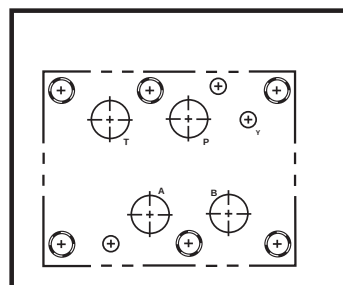
REAR



TOP



FRONT



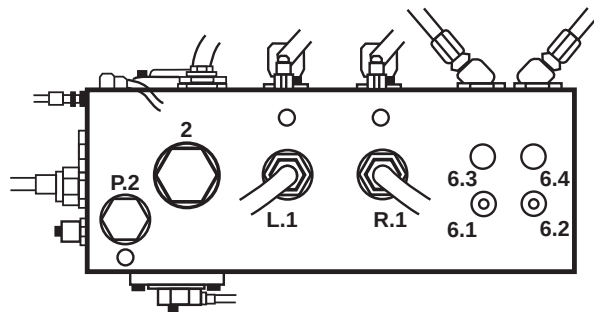
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PRE-OPERATION

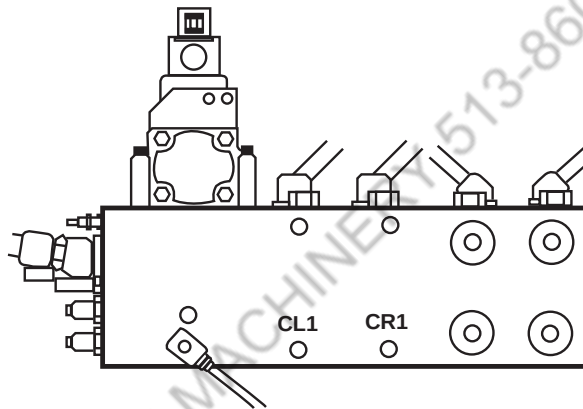


HYDRAULIC BLOCK 95-350T
& HYDRAULIC BLOCK 50-70T High Speed

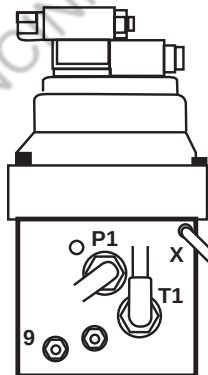
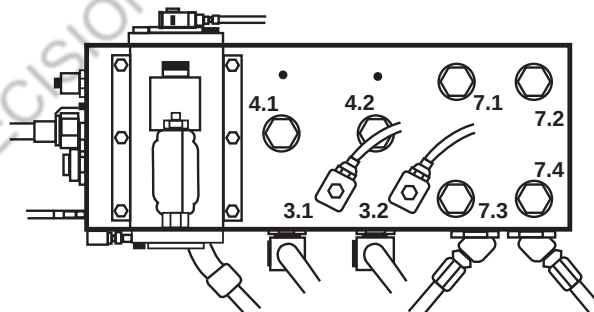
BOTTOM SIDE
VIEW



REAR SIDE
VIEW

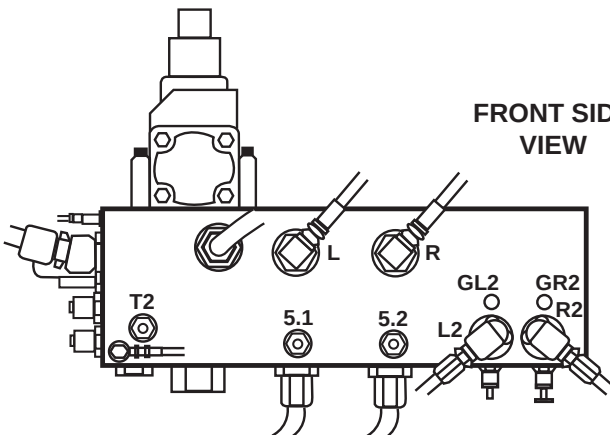


TOP SIDE
VIEW



LEFT SIDE
VIEW

FRONT SIDE
VIEW



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OPERATION INSTRUCTIONS

TONNAGE CAPACITY

The tonnage capacity of this Press Brake is _____ tons of hydraulic pressure for the total length of the stroke.

The main relief valve on 50T - 70T machines is located on the back side of the manifold block in the top left corner. The main relief valve is located on the end of the manifold block on 95T - 350T machines. It is port #1. Turn the relief valve in to raise pressure, out to lower it. Maximum pressure: 2,500 pounds p.s.i.

PRESS BRAKE SET-UP

1. Check to see if machine is setting on all four pads - shim if necessary. When level, lag to the floor.
2. Check and tighten set screws on cross shaft (total - 2 on each end). (Ref. Picture on Pg.36, Item H).

HYDRAULIC RESERVOIR

Before operation, be certain that the hydraulic reservoir has been filled to the proper level by checking to see if oil is in sight glass (#10 Wt., non-foaming oil).

INITIAL STARTING PROCEDURE

1. Place MAIN DISCONNECT switch in the ON position.
2. Place RUN/JOG selector switch in the JOG operation.
3. Start and stop main motor several times to lubricate pump and check rotation. (Start main motor by pulling START/STOP Button).
4. Place RUN/JOG selector switch on RUN to raise ram to top of stroke.
5. Remove ram support blocks.
6. Adjust bottom limit switch to approximately 2" stroke length.
7. Cycle Press Brake several times to automatically bleed system. If ram cycles without obvious see-sawing, adjust bottom limit switch for stroke and cycle for approximately five minutes.

Oil Capacity

Press Brakes Before April 2005-Machine Size	Gallons
4' x 17 Ton Press Brake	12.47 Gal.
50 or 70 Ton Press Brakes Side Mount Tank (4' - 12")	36.47 Gal.
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*Tank sizes vary according to how it is attached to the machine



50T - 95T

120T - 350T

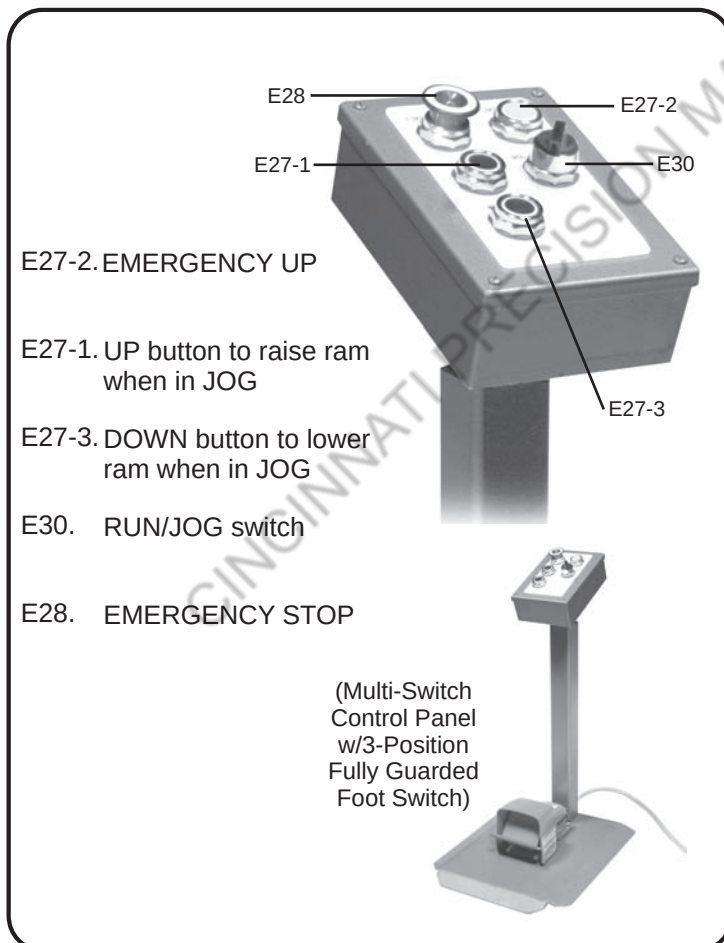
OPERATING CONTROLS

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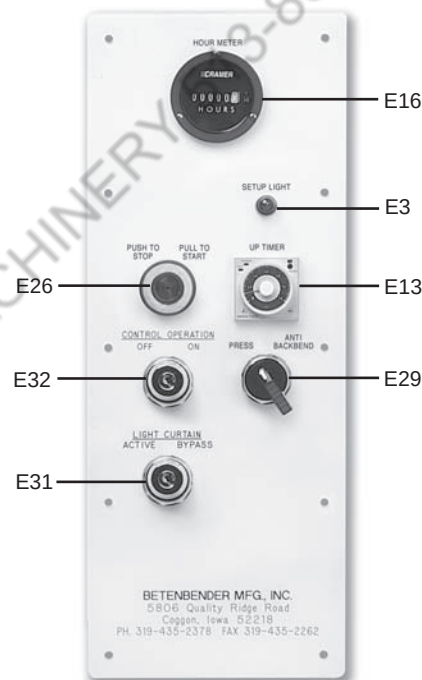
OPERATING CONTROLS

1. Pull START/STOP switch (E26) to start. (NOTE: To stop in an emergency, simply push the EMERGENCY STOP button (E28).
2. For manual operation use:
Button E27-1 = UP
Button E27-3 = DOWN
3. For automatic operation:
 - a. Switch to RUN (E30)
 - b. Use 3-Position Fully Guarded Foot Switch (UP-HOLD-DOWN)
4. Two speed:
To shift into low, a micro switch (see ill. page 38) is located on the right end above control switch. A control rod is adjustable to allow for changing where press brake shifts into press speed. Adjust two speed switch to approximately 1/4" above pinch point.



OPERATING CONTROLS

Front Face Plate shown with options



- E3. Set Up Light
- E13. Up Timer
- E16. Hour Meter
- E26. STOP/START Button; pull to start, push to stop
- E29. Press- Anti Back Bend Switch (95T - 350T Only)
- E31. Light Curtain / Active - By Pass
- E32. 2 Pos. Key Lock (Optional)

ALIGNMENT OF RAM

Your machine was shipped pre-set from the factory. The stresses of shipping and later usage can make realignment necessary from time to time.

The ram should travel perpendicular to the bottom die with as little end-to-end movement as possible and with the punch centered over the die. If front-to-rear adjustment should become necessary, the following steps should be followed:

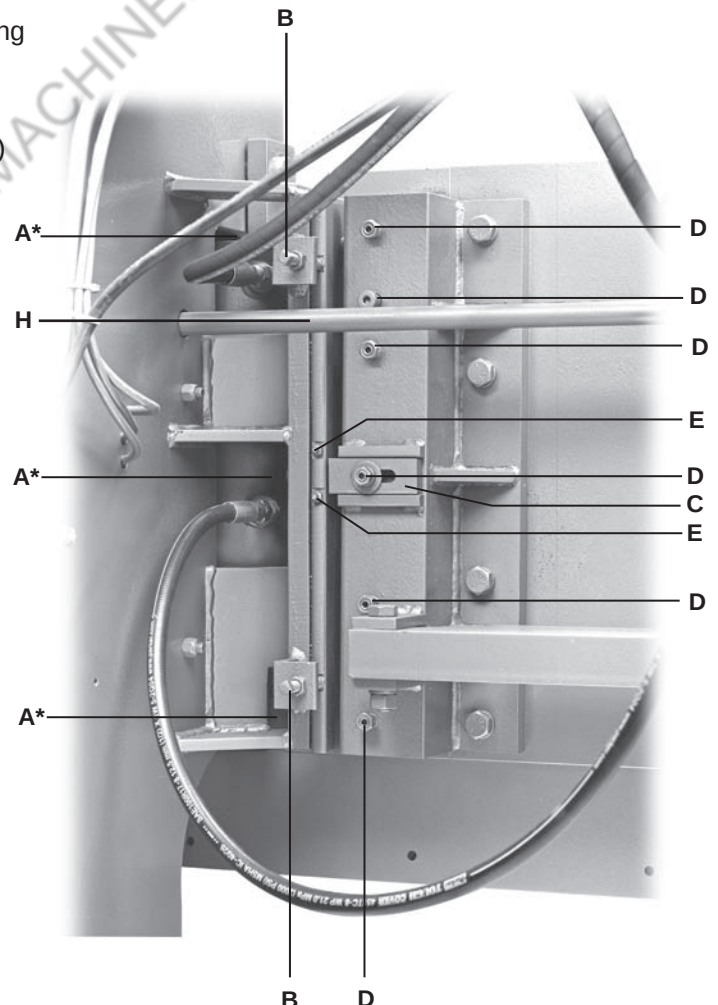
1. Loosen the three bolts on 50-70T Press Brakes (Item A) on one end of the machine. Four bolts on 95T and larger Press Brakes.
2. Using adjusters (Item B), move the ram in or out as needed to center it over the bed.
3. When centering has been completed, tighten bolts and lock nuts or adjusters.
4. If necessary, repeat Steps 1-3 on the other side of the machine.

End play can be kept to a minimum by occasionally adjusting the bronze rub block adjuster (Item C) to maintain gentle contact against the adjacent rails.

Set screws (Item D) are used to maintain firm (but not tight) contact between slides and gibs. The ram should travel as nearly perpendicular to the bottom die as possible.

Gib Adjustment Bolts

- A.* Bolts (Not Pictured)
- B. Ram Alignment Settings
- C. Rub Block Adjuster
- D. Set Screws - Tighten till snug. Tighten lock nut.
- E. Grease Zerks
- H. Cross Shaft



WARNING!

DO NOT LOOSEN BOLTS ON BOTH SIDES OF THE MACHINE AT THE SAME TIME.

SETTING OF RAM PARALLELISM/STOPS

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SETTING RAM PARALLELISM

1. Cut 6" square coupons of thickness correct for die opening being used (1/8 of die width).
2. Lay one coupon 6" in from each end of lower die with grain of material going the same direction on each coupon.
3. With machine in JOG, bring ram down to lower limits. Hold DOWN button while cranking down lower limit switches until coupons are bent approximately 45°F.
4. Let RAM back up and insert two new coupons.
5. Cycle ram down to stops and return.
6. Slide coupons to center and compare. Goal is to have coupons with equal bend. To reach this goal, adjust the micrometer on right side of machine. Adjust up to get more bend, adjust down for less.

SETTING RAM STOPS - see page 38

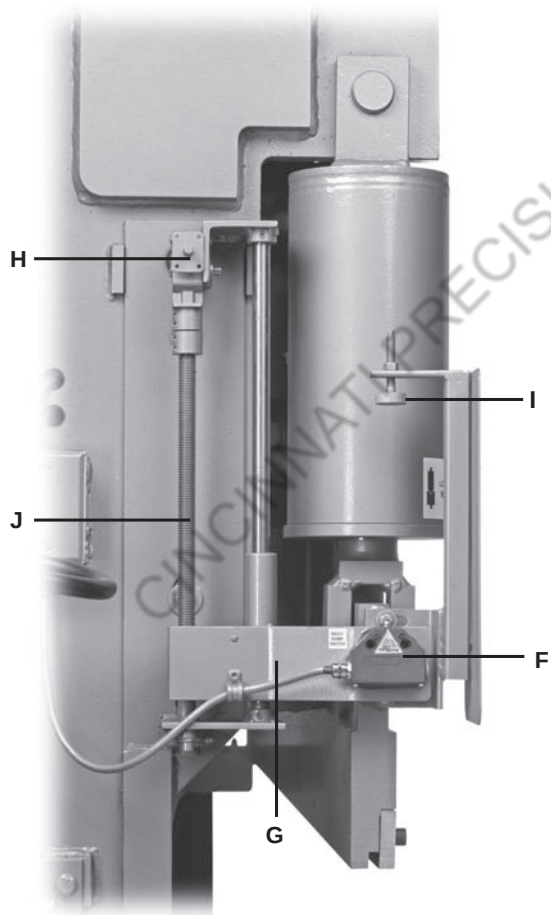
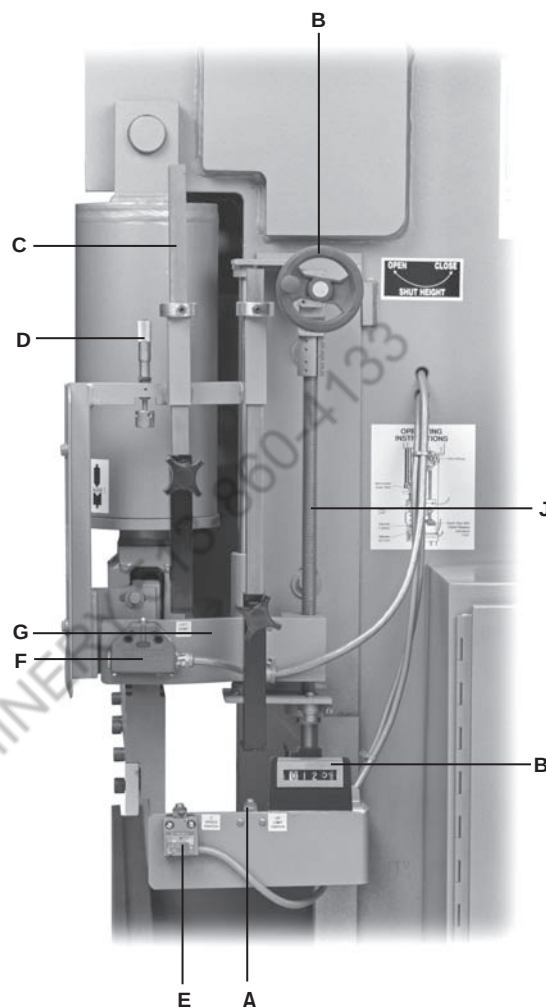
To adjust ram heights for different degrees of bend, turn handwheel to raise or lower the micro-switches, telling the ram where to stop. The analog indicator can be used to set different degrees of bend.

OPERATING INSTRUCTIONS

Betenbender Manufacturing, Inc.

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- A. Up Limit Switch
- B. Analog readout unit and hand wheel for adjustment of degrees of bend
- C. Depth stop for UP control of ram
- D. Adjuster for ram tilt in .001" allowing for tilt of ram or making ram and bed parallel (micrometer stop).
- E. 2 Speed Limit Switch
- F. Micro Switch Assy.
- G. Limit Switch Carrier
- H. Right angle gearbox
- I. Thumb screw for Crosshead (Ram) Stop
- J. Adjustment screw for Crosshead (Ram) Stop



ADJUSTING RAM TIMING

Betenbender Manufacturing, Inc.

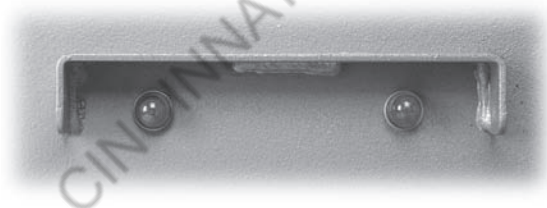
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ADJUSTING RAM TIMING

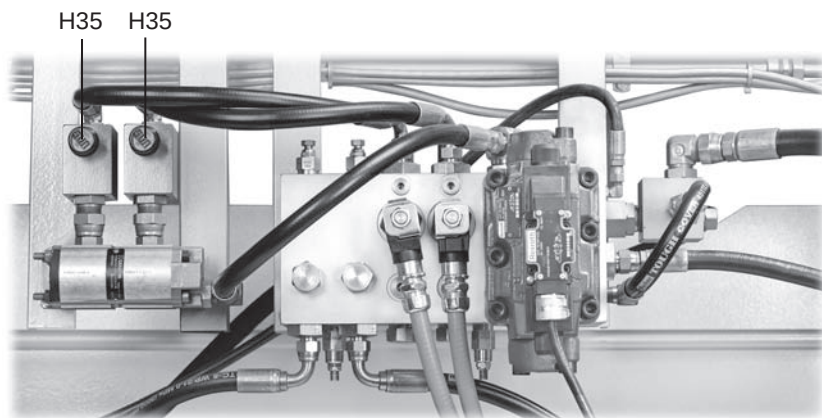
1. After Ram Parallelism has been set and the ram is stopping at the same position on both ends, check to ensure the ram is coming down at the same speed at both ends.
2. Turn RUN/JOG switch (see page 35) to RUN position.
3. While watching the indicator lights, located on the back of the control box, cycle the machine two to three times, noting which light comes on first. If both lights blink at the same time, the ram is timed correctly. ***If not proceed to next step.***
4. If lights do not blink together: Loosen lock nuts on the adjustment knobs.
5. Turn both adjustment knobs, out to stops. Tighten lock nuts.
6. Cycle the machine two or three times, noting which light comes on first
7. Turn only the adjustment knob that corresponds with the light that comes on last, 1/4 turn. Tighten lock nut. Cycle the machine and re-check the lights.
8. If indicator lights become closer to the same, continue to adjust that knob 1/4 turn at a time, to fine tune, until the lights come on together, then **lock** lock nuts. ***If not proceed to next step.***
9. If indicator lights become further apart turn the knob back out and go to the other knob and turn it a 1/4 turn. Tighten lock nuts. Cycle the machine and re-check the lights.
10. If indicator lights become closer to the same, continue to adjust that knob 1/4 turn at a time, to fine tune, until the lights come together, then **lock** lock nuts.

Note: The adjustment knobs on the 95 Ton & larger machines are located on the bottom side of the block. The adjustment knob on the 50 & 70 Ton machines are located on the flow divider.
(for location of the adjustment knobs, please reference page 40)

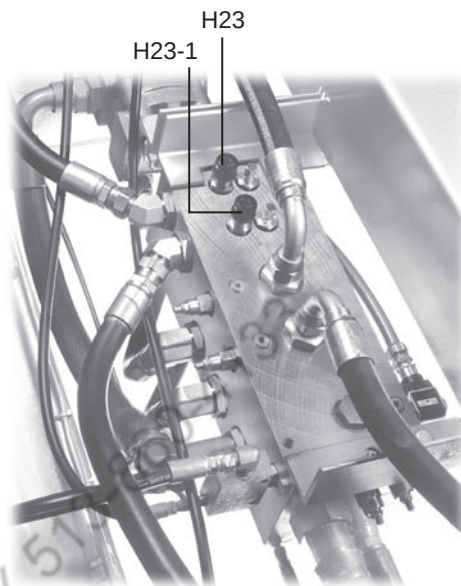
CAUTION: -- Never adjust both knobs in, at the same time. One knob is always out.



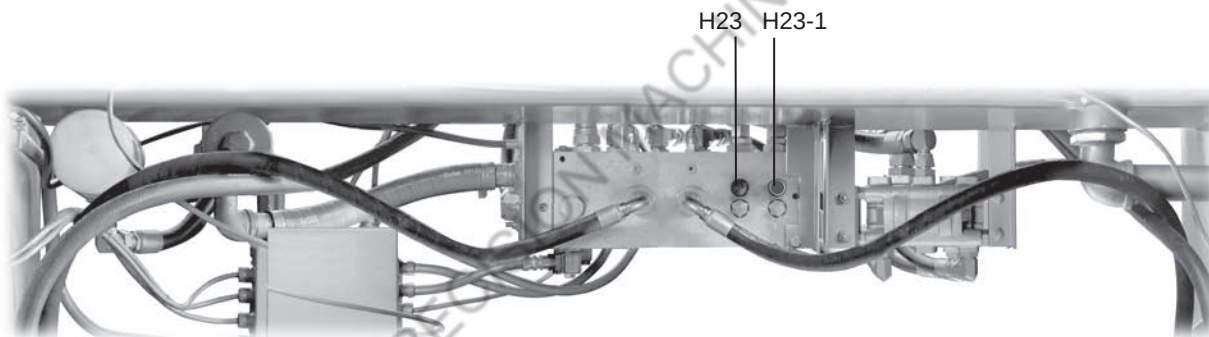
For the location of adjustment knobs, please reference part numbers listed.



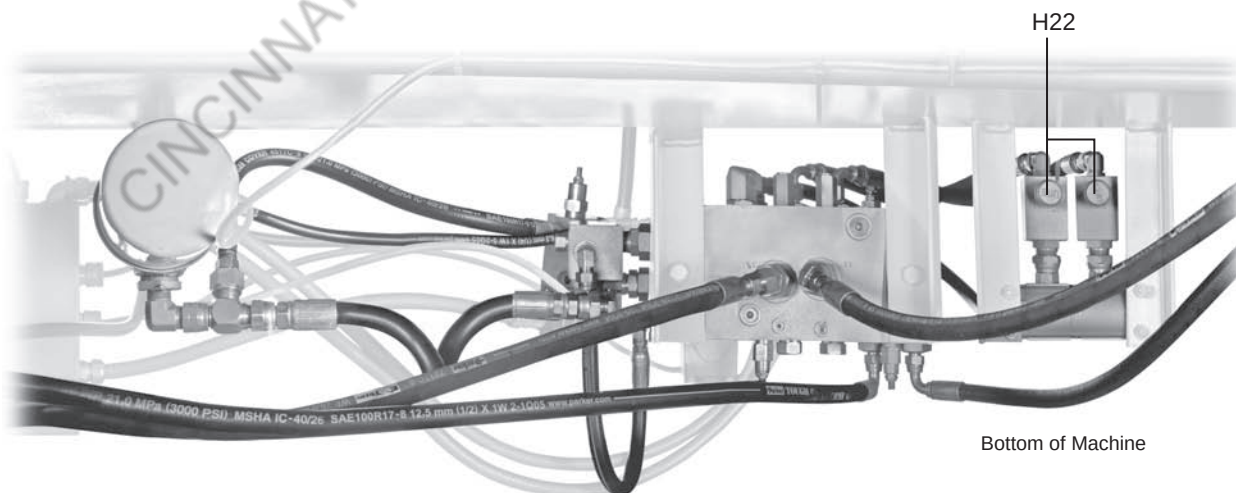
50 - 70 TON SIDE TANK



95 - 350 TON



50 - 70 TON HIGH SPEED



Bottom of Machine

50 - 70 TON TOP TANK

TONNAGE ADJUSTMENT (OPTIONAL)

To Adjust Tonnage

1. Remove upper die (punch)
2. Lower Limit Switches
3. Turn machine to JOG position
4. JOG ram down to the bottom of the stroke. Hold switch, read pressure.
5. Maximum pressure is 2,500 psi.
6. To increase pressure, screw in the main relief valve 1/4 turn at a time. Re-check.

NOTE: The main relief valve on 50T - 70T machines is located on the back side of the manifold block in the top left corner. The main relief valve is located on the left end of the manifold block on 95T - 350T machines, port #1. Once the proper pressure is set, tighten the jam nut on the relief valve. (Ref. pg. 32)

On machines equipped with variable tonnage control. Follow steps 1-5, then adjust pressure using the valve located just below the pressure gauge on the control side of the Press Brake. Screw the valve in to increase pressure and out to reduce pressure. Once pressure is set, tighten the thumb-lock nut on the valve.

TIMER

This is used to give a time of hold that may be required to reduce spring back, .00 - 10 second. The timer setting should be a minimum of .02 seconds for accurate timing of the shifting of the valves in the machine.

PRESSURE CHECK

1. Remove upper punch & set aside
2. Crank limit switches to the lowest position.
3. Put machine in JOG and press DOWN button until cylinders bottom out.
4. Pressure should be 2,500 PSI.
5. Turn machine to RUN to re-adjust limit switches.
6. Replace upper punch
7. Check for leaks. Tighten as necessary.
8. Turn off machine

TILT CONTROL

An adjustment for ram tilt allows for tilting of ram or making the ram and bed parallel. There is a micrometer stop for raising and lowering tilt (**Page 38, Item D**).

PUNCH ON A PRESS BRAKE

Punching capacity equals 2/3 rated tonnage. Consult the manufacturer for recommendations when applications involve high production and/or brittle material where breakthrough shock is severe.

SHUT-DOWN PROCEDURE

Betenbender Manufacturing, Inc. recommends that the upper ram first be lowered into the die or be blocked up. The machine is turned off by pushing the START/STOP button (**see Operating Controls, page 34 & 35**) and then the MAIN DISCONNECT button is shut down and locked.

STORAGE

When not in use for extended periods of time, it is recommended that wooden blocks be placed in the ram to block it in an UP position.

Remove the breather cap located on the hydraulic reservoir and replace it with the plug.

Grease all exposed bearing surfaces and areas in the die clamp, upper ram and lower bed areas.

START-UP AFTER EXTENDED STORAGE PERIOD

1. Have oil tested for contamination.
2. Replace plug with breather cap on hydraulic reservoir.
3. Clean and lubricate all working surfaces and bearings.
4. Follow normal start-up procedures found earlier in Operating Instructions, starting on page 34.

HYDRAULIC COMPONENTS

Betenbender Manufacturing, Inc.

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DUMP VALVES

The dump valves are normally closed and energize only when the ram reaches the bottom of its stroke in order to stop its downward travel.

PILOT CHECK VALVES

The check valves prevent upward ram travel caused by natural spring-back of the metal being bent.

FLOW DIVIDER

The flow divider diverts a single stream of oil into two equal flows, one to each cylinder.

COUNTERBALANCE VALVE

This valve stops flow of oil from the cylinder's rod-end until the set pressure is exceeded.

ADDED WEIGHT

If extra tooling has been added to the Press Brake, the pressure setting may need to be increased. It has been set by the manufacturer to withstand the weight of the ram and normal tooling. If extra weight is present, set the pressure at 50 p.s.i. (1/4 turn) above the setting originally required for normal ram and tooling weight.

OPERATING INSTRUCTIONS

TO CALIBRATE GO-TO BACKGAUGE

1. Move Backgauge to approximately four inches.
2. Bend a piece of material.
3. Measure piece. Note this dimension.
4. Press "FUNCTION", "ENTER".
5. Enter your 5-digit password.
6. Press "ENTER, 65, ENTER".
7. Enter the dimension of material.
8. Press "ENTER", "START/STOP".
9. Backgauge is now set.



TO SET GO-TO STATION

1. Press station number (1-5).
2. Press "ENTER"
3. Enter the desired dimension. Make sure decimal is in correct place.
4. Press "ENTER".
5. Station is now set.

TO MOVE BACKGAUGE TO PRESET STATION

1. Press station number (1-5).
2. Press "START/STOP" button.
3. Backgauge will move to proper position.

SETTING "GO-TO" RAM POSITIONER (OPTIONAL EQUIPMENT)

1. Place a piece of the thickest material you will be forming into brake.
2. On pedestal, turn RUN/JOG selector switch to "JOG".
3. Press "DOWN" button until upper punch touches material.
4. On Ram positioner (located on pendant arm), press and hold "JOG"- (9) button until switch brackets stop moving. (Switches will stop automatically).
5. Press "FUNCTION", "ENTER".
6. Enter your 5-digit password.
7. Press "ENTER". "65". "ENTER".
8. Press 0
9. If readout has a - (minus) sign, press "DWELL" button.
10. Press "ENTER". "START/STOP".
11. Ram is now set.



**EXPLANATION OF FUNCTIONS ON "GO-TO" POSITIONER
Function**

1. 6 digit numeric display. Displays all numeric information.
2. Move indicator. Amber LED is lit when a move is displayed. Flashes on and off during loading of new move, indicating additional keystrokes are required.
3. Run indicator. Amber LED is lit when in RUN mode.
4. Position indicator. Amber LED is lit when unit is displaying current position.
5. Dwell indicator. Amber LED is lit whenever dwell is displayed.
6. + and dwell key. Gray key has two purposes.
 1. Press key for dwell register to be displayed.
 2. Enter the sign of a move register value or function.
7. Function key. Blue key causes the unit to enter program mode. After pressed, a function code may be entered.
8. Start/Stop key. Orange key causes unit to switch back and forth between run and stop mode.
In Stop mode, used to clear display.
In Program mode, used to sequentially stop through function codes.
9. Numeric keys. Gray keys used for numeric data entry when loading move, dwell, function codes, of function values.

Keys 1-4 (Move) used to select move registers 1-4 respectively.

Key 5 (Home) selects the home position register.

Key 6 (Recall) causes unit to display number of move or dwell register that was most recently accessed.

Keys 7 (Fast), 8 (Jog+), and 9 (Jog-) maybe operated only when the manual operation feature is enabled.

When this feature is enabled, Jog+ or Jog- will produce slow forward or backward movement.

When pressed simultaneously with Fast key, these keys will produce rapid movement.

Key 0 (Position) commands unit to display current position.



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MAINTENANCE



To ensure smooth operation, efficiency and greatest accuracy, The Press Brake must be properly maintained.

CLEAN

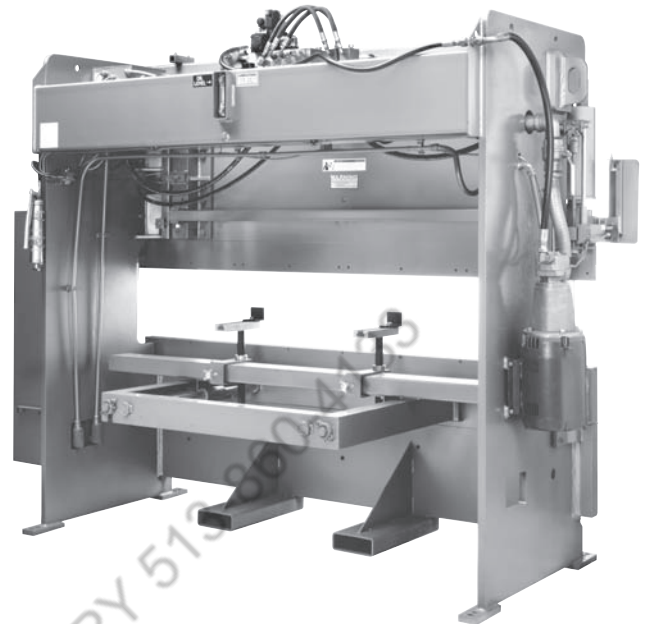
Clean the Press Brake regularly with an approved solvent and clean rags.

INSPECT

Inspect the Press Brake periodically. In order to detect improper operation early, be aware of how the machine is supposed to perform at its best.

REPLACE

To prevent damage, regularly check fittings, nuts and bolts for looseness or wear, and replace any worn parts immediately.



WARNING!

**WHEN CLEANING, NEVER USE
AN AIR HOSE OR WASTE CLOTH
OF ANY KIND.**

FIRST DAY

- Check for oil leaks. Some fittings may have loosened in shipping.

DAILY

Start-Up...

- Turn on machine.
- Observe all operational parts (including each "Stop" function) for proper performance.
- Monitor oil level in reservoir, making sure oil is visible in sight glass.
- Check electrical foot switch before use. When not in use switch should be removed from operating area.

AFTER SEVERAL HOURS OF USE

- Check oil temperature. Temperature should not exceed 160° F. In environments where temperature is high, an oil cooler may be necessary.

END OF DAY

- Check oil temperature.

Recommendation: Block up Ram

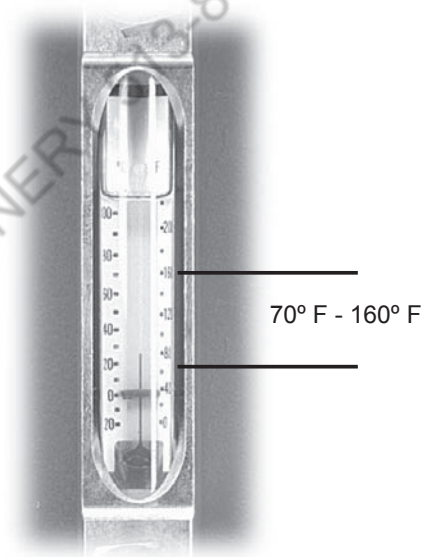
MONTHLY

- Hydraulics – Inspect all lines and fittings for leaks. Repair or replace any defective components.
- Cylinders – Inspect piston rods for leaks or scoring of surface. Replace rod packing if leaks are present; polish surface thoroughly where scored.
- Manifold – Inspect manifold block and replace any leaking "O" rings.
- Electrical System – Turn off power; turn off and lock MAIN DISCONNECT switch. Inspect all connections for any loose connections and repair or replace as necessary for a tight fit. Inspect all electrical control relays and push buttons for damage. Inspect foot switch cable for damage, fraying or deterioration in insulation; repair or replace immediately, if needed.

WARNING!

Hydraulic Components

When inspecting or changing hydraulic components, make certain the ram is securely blocked or resting in the bottom of the die.



SIX MONTHS: In addition to the above checkpoints:

- Drain a pint of oil from the reservoir after several hours of operation. If foam is present, check the pump's suction lines for air leakage.
- Take sample to your local supplier for assessment as to whether a complete oil change is needed.

YEARLY: In addition to the above checkpoints:

- Examine cap screws and nuts for any looseness; repair or replace as necessary for tight fit.
- Change return line filter if not done during previous year.
- Remove suction line strainer. Flush clean and reinstall.

HYDRAULIC SYSTEM MAINTENANCE

When making the periodic oil change, flush the tank thoroughly to completely remove old oil. Remove the suction line strainer from the tank and flush (Does not pertain to 50-70T). Install a new return filter cartridge before adding new oil.

Replace return line filter at least yearly (with heavy use check more frequently).

Fill the hydraulic reservoir with 10W ISO 32, non-foaming oil.

The hydraulic system is self-bleeding. After oil has been replaced in tank, all filters replaced, and strainer is cleaned, the Press Brake should cycle for 5 minutes at a maximum stroke to rid the system of trapped air. If air remains in the system, you may manually bleed the system by loosening the fitting on the pressure gauge and allowing air to escape. (You will lose a small amount of oil if you are forced to manually bleed the system).

SUCTION LINE STRAINER: 95-350T ONLY!

The suction line strainer is submerged in the Press Brake reservoir. The 100 mesh wire strains efficiently and should require attention only during regular oil changes.

During oil change, remove strainer by unscrewing coupling. The strainer should be free from any contamination. Clean strainer with some sort of solvent, making sure to let it dry completely before replacing strainer in tank. This is a good time to remove any residue in tank as well.

RETURN LINE FILTER: 95-350T ONLY!

The return line filter is mounted on the outside of the Press Brake tank, and contains a disposable cartridge capable of filtering down to ten (10) microns. A spare cartridge is included to replace the original after the first 30 hours of operation.



HYDRAULIC OIL

Betenbender Manufacturing, Inc.

Office: 319-435-2378

MAINTENANCE

HYDRAULIC OIL TEMPERATURE

Hydraulic oil serves to lubricate and cool component friction points. For optimum operation, a reservoir temperature of 120° F is recommended. For maximum efficiency of oil and hydraulics, **do not exceed 160° F.**

Excessively high oil temperature may mean oil flow is being blocked. When oil overheats, it loses its viscosity and may leak into valves, hampering operation of the Press Brake. Oil will also decompose and form varnish at high temperatures, losing its lubrication power. This is to be avoided. Heaters and coolers should be installed in the hydraulic system if necessary to maintain an ideal range between 70° F and 160° F.

HYDRAULIC OIL

Betenbender Manufacturing, Inc. recommends that the hydraulic oil be analyzed by your local oil supplier to determine when it should be changed rather than make a change on an arbitrary time schedule. This procedure will often extend its useful life.

Certain oils and hydraulic fluids are not compatible with the hydraulic system of this Press Brake, their use will cause damage. Betenbender Manufacturing, Inc. recommends the use of SAE 10* Wt.

It is ESSENTIAL that the oil be clean and precautions should be taken to prevent its contamination with any foreign material. Dirt should be wiped away from the filler cap on the oil reservoir. When transferring oil always make sure that the container is clean before being used. When adding or refilling, use only the recommended oil or its equivalent. Use a fine metal strainer to filter it carefully when putting it into the reservoir.

The maximum safe operation temperature of hydraulic oil is 160° F. Under normal operating conditions this temperature will not be exceeded. Excessive oil temperature is generally an indication of potential trouble such as excessive pressure, clogged filters, worn pump or high ambient temperature.



Lubrication Chart

COMPONENT	LUBRICATION	INTERVAL
Hydraulic Reservoir	*ISO 32 #10 Wt.	Change 2000 hrs/1 yr.
OIL FILTER	-----	Change 1000 hrs/1 yr.
GIBS	*Lubriplate 930AA	40 Hrs.
BACKGAUGE	Oil	Daily

*FOR REFERENCE - ANY EQUIVALENT IS ACCEPTABLE

Specifications and Test Results

Product: Hyd. OIL SAE 5, 10, 20, 30	OIL# 0301-0		Weight:	
Characteristics:	SAE 5	SAE 10	SAE 20	SAE 30
API Gravity	29.4	28.7	28.2	27.3
Viscosity Index	80	80	80	80
SUS @ 100	105	210	310	510
SUS @ 210	39	48	53	63
Flash	385	524	445	485
Pour	-20	-18	-15	-10
Foam	Pass	Pass	Pass	Pass
R & O wt/gal.	7.32	7.35	7.38	7.42

No foam Hydraulic Oils are a blend of virgin base stocks which provide excellent natural seal swell characteristics. They possess anti-foaming and anti-rust properties. Excellent service is provided by these oils in light and medium duty hydraulic service.



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*ALL SAFETY COVERS AND GUARDS MUST REMAIN ON THE PRESS BRAKE AT ALL TIMES.

LUBRICATION

Proper lubrication extends the life of your Betenbender Press Brake. We offer three types of lubrication systems:

1. Manual Lubrication
2. One-Shot Lubrication
3. Automatic Lubrication

MANUAL LUBRICATION

Grease the two zerks on each end of the gibs at 8 hours of running time intervals.

ONE-SHOT LUBRICATION -- OPTIONAL

NORMAL USAGE: Using the grease pump attached to lube station. Manually pump grease into the mainline. This will supply lubricant to the gibs.

EXTENDED USAGE: The one-shot grease pump should be operated every 8 hours of running time.

AUTOMATIC LUBRICATION -- OPTIONAL

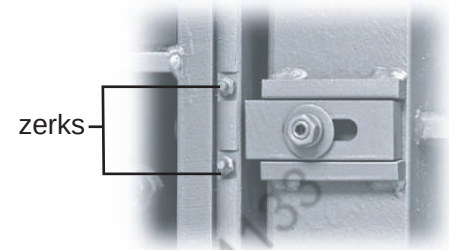
NORMAL USAGE: Each time the Press Brake is initially turned on, the auto lube provides grease to all points on the gibs that require lubrication.

EXTENDED USAGE: After the initial start-up of the Press Brake, the gibs are greased at intervals controlled by a timer on the machine. This can be set to lubricate at any interval that is needed. It can be set to grease every few seconds to once every few hours depending on the environment the machine is being operated in.

LUBRICATION NOTE:

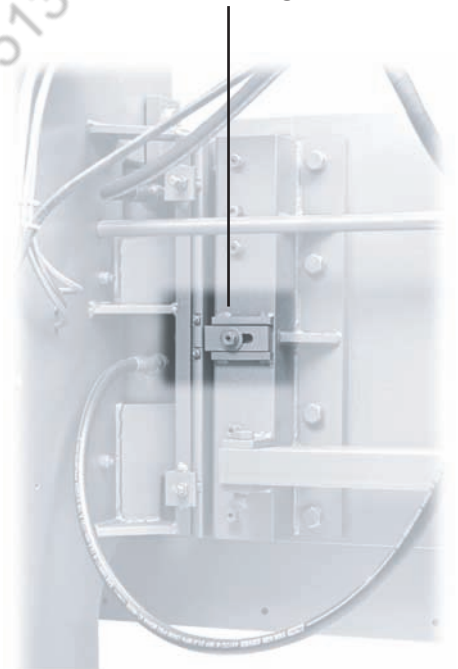
All zerk fittings should be checked and regreased as necessary when shutting off the Press Brake during extended running. Otherwise, once per 8 hour running time should be sufficient. Regreasing intervals will be dependent upon climatic conditions under which equipment is being run.

NOTE: Backgauge screws should be *oiled* not greased.



zerks

Area Enlarged



COLD WEATHER STARTING

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STARTING IN COLD WEATHER

In cold weather, start the motor 15-20 minutes earlier than normal;
OR bottom the dies and build up pressure for 5 minutes to heat the oil.
Cold oil may cause inaccurate performance.

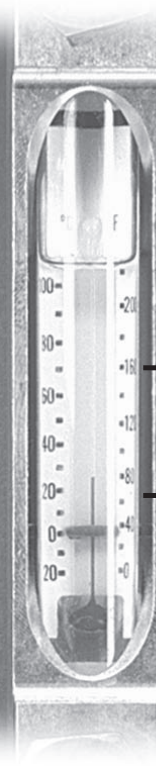
Minimum operating oil temperature: 70° F
Recommended operating oil temperature: 120° F

WARNING!

Hydraulic Oil Temp.

When hydraulic oil temperature varies from a normal range of 70° F to 160° F, performance may be hampered. Heaters or coolers should be installed in the hydraulic system if necessary to maintain an ideal range.

MAINTENANCE



70° F - 160° F
Normal Operating
Range

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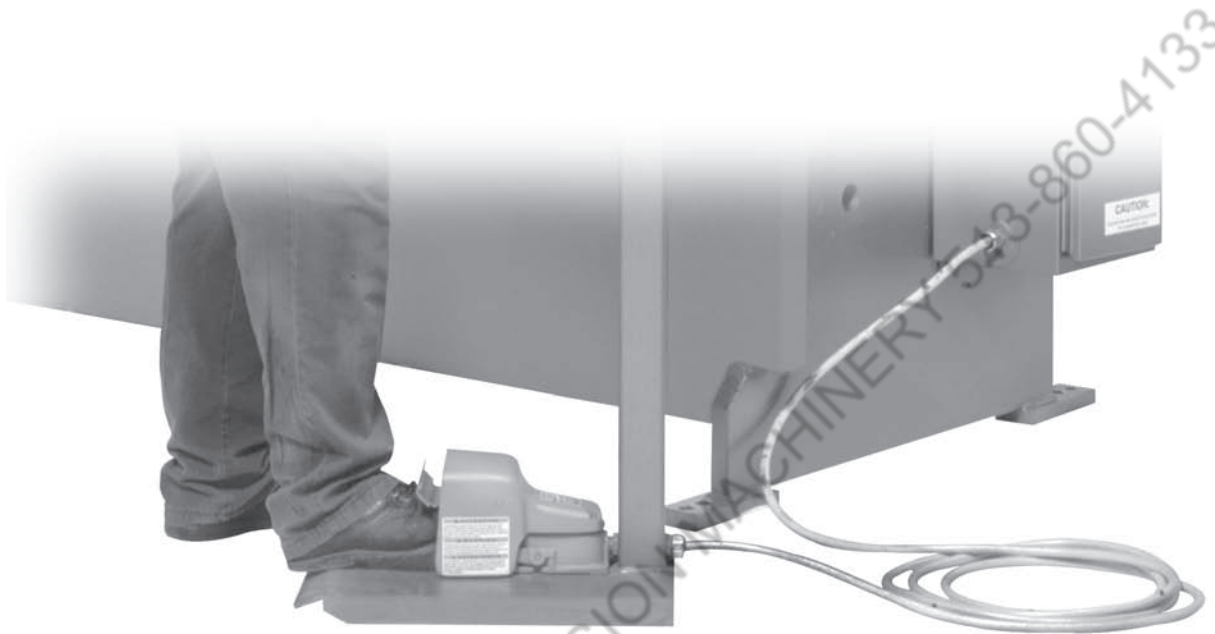
*ALL SAFETY COVERS AND GUARDS MUST REMAIN ON THE PRESS BRAKE AT ALL TIMES.



ELECTRICAL SYSTEM MAINTENANCE

Follow a regular and systematic maintenance program to protect the electrical system of the Press Brake.

Foot Switch: Each day, check the foot switch for performance before using the Press Brake. Take care to protect the cable from damage by falling objects or other machinery. It is recommended to remove the foot switch from operating area when machine is not in use.



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TROUBLE-SHOOTING

TROUBLE-SHOOTING

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In the event of operational problems, consult the following chart and double check before taking further action:

MACHINE DOES NOT START

1. Main disconnect switch is not closed.
2. Main or transformer fuses are blown.
3. Main motor thermal overload relays are tripped.

MAIN MOTOR OVERLOAD

1. Check thermal overload relays.

MACHINE DOES NOT BEND CORRECTLY, ACCURATELY OR EVENLY

1. Check to make sure that the set screws on the cross shaft are tight
2. Check tooling for wear, damage, dings or wash outs. Damaged tooling can greatly affect the bending accuracy of the Press Brake.

RAM DOES NOT TRAVEL DOWN

1. Transformer fuses blown.
2. Directional Control Valve is not energizing or shifting. Check coil with a volt meter; if not energizing or shifting, replace it. If coil energizes but valve does not shift, valve must be replaced or serviced.
3. 125 p.s.i. check valve is not allowing free flow to the cylinders.
4. Main relief valve has failed or is backed too far out.
5. Dump valves are open.
6. Ram limit switches are crushed.

RAM DOES NOT RETURN TO TOP

1. Check that machine is in RUN position.
2. Check for bad solenoid coil.
3. Main relief valve has failed or is backed too far out.

RAM DOES NOT STOP AT TOP OR DOES NOT STOP AT BOTTOM

1. Top-of-stroke limit switch has failed and must be replaced.
2. If ram moves up after having been stopped by the top-of-stroke limit switch, the directional control valve has failed to shift. Check solenoid coil or for stuck valve.
3. Counter balance valve may be sticking or stuck open.
4. Bottom limit failed.
5. Ram control set too low.



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SETTING RAM PARALLELISM

1. Cut 6" square coupons of thickness correct for die opening being used (1/8 of die width).
2. Lay one coupon 6" in from each end of lower die with grain of material going the same direction on each coupon.
3. With machine in JOG bring ram down to lower limits and hold down button while cranking down lower limit switches until coupons are bent approximately 45°F.
4. Let RAM back up and insert two new coupons.
5. Cycle ram down (in rear) to stops and return.
6. Slide coupons to center and compare. Goal is to have coupons with equal bend. To reach this goal, adjust the micrometer on right side of machine. Adjust up to get more bend, adjust down for less.
7. Fine adjustment can be made with micrometer on right side of machine. Any future adjustments must be made by using the micrometer on the right side. Using touch up spray can of paint repaint the left side adjusting screw to help identify whether or not this side has been tampered with during operation.

ADJUSTING RAM TIMING

1. After Ram Parallelism has been set and the ram is stopping at the same position on both ends, check to ensure the ram is coming down at the same speed at both ends.
2. Turn RUN/JOG switch (see page 35) to RUN position.
3. While watching the indicator lights, located on the back of the control box, cycle the machine two to three times, noting which light comes on first. If both lights blink at the same time, the ram is timed correctly. **If not proceed to next step.**
4. If lights do not blink together: Loosen lock nuts on the adjustment knobs.
5. Turn both adjustment knobs, out to stops. Tighten lock nuts.
6. Cycle the machine two or three times, noting which light comes on first
7. Turn only the adjustment knob that corresponds with the light that comes on last, 1/4 turn. Tighten lock nut. Cycle the machine and re-check the lights.
8. If indicator lights become closer to the same, continue to adjust that knob 1/4 turn at a time, to fine tune, until the lights come on together, then **lock** lock nuts. **If not proceed to next step.**
9. If indicator lights become further apart turn the knob back out and go to the other knob and turn it a 1/4 turn. Tighten lock nuts. Cycle the machine and re-check the lights.
10. If indicator lights become closer to the same, continue to adjust that knob 1/4 turn at a time, to fine tune, until the lights come together, then **lock** lock nuts.

Note: The adjustment knobs on the 95 Ton & larger machines are located on the bottom side of the block. The adjustment knob on the 50 & 70 Ton machines are located on the flow divider. (for location of the adjustment knobs, please reference page 40)

CAUTION: -- Never adjust both knobs in, at the same time. One knob is always out.

ZERO DIGITAL READOUT ON ADJUSTING SCREW

1. Loosen backing set screw.
2. Rotate to 0000.
3. With machine in JOG lower and bottom punch into widest deepest die being used and stop (this may require lowering limit switches).
4. After verifying that readout still indicates 0000, tighten locking set screw.
5. Readout will now give operator reference from bottom to repeat bends later.

FINAL CHECK FOR OIL LEAKS

1. Check hoses for signs of leaks. Tighten as necessary.

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