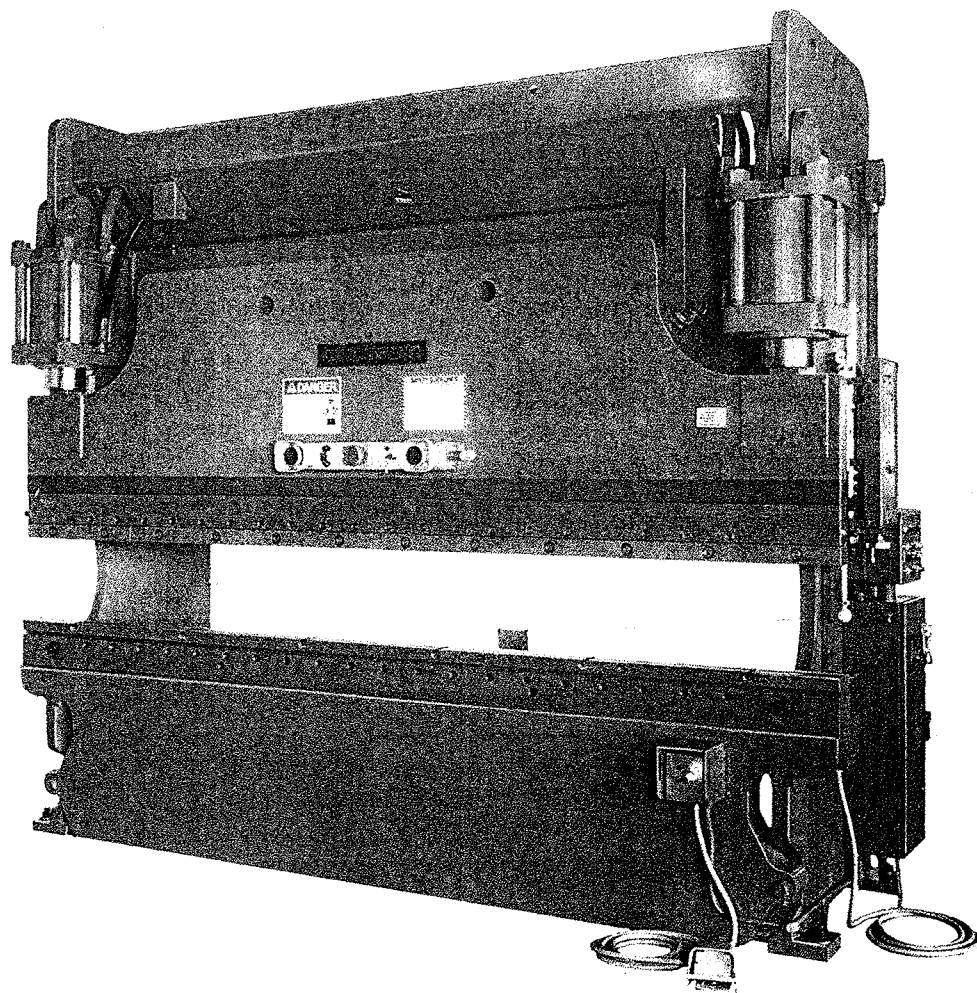


OPERATION, MAINTENANCE AND SAFETY MANUAL FOR

CINCINNATI

CB HYDRAULIC PRESS BRAKES



CINCINNATI

CINCINNATI INCORPORATED
CINCINNATI, OHIO 45211

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Upon receipt of your CINCINNATI Hydraulic Press Brake carefully remove the contents of the one or more packing boxes shipped with the machine. All of the machine options and loose parts, such as wrenches, will be in these boxes. Check all of the parts received with the packing list. Claims for shortages or damaged parts should be made within ten days. Remove all shipping paper from the wrapped parts of the press brake.

Leave the shipping skids attached to the machine until it has been moved to its final location.

LIFTING AND MOVING

CINCINNATI CB Hydraulic Press Brakes are readily handled by cranes of sufficient capacity with chains or cables adjusted to the proper length for even lifting. Use a timber brace between the top of the housings. A typical hitch is shown in Figure 1.

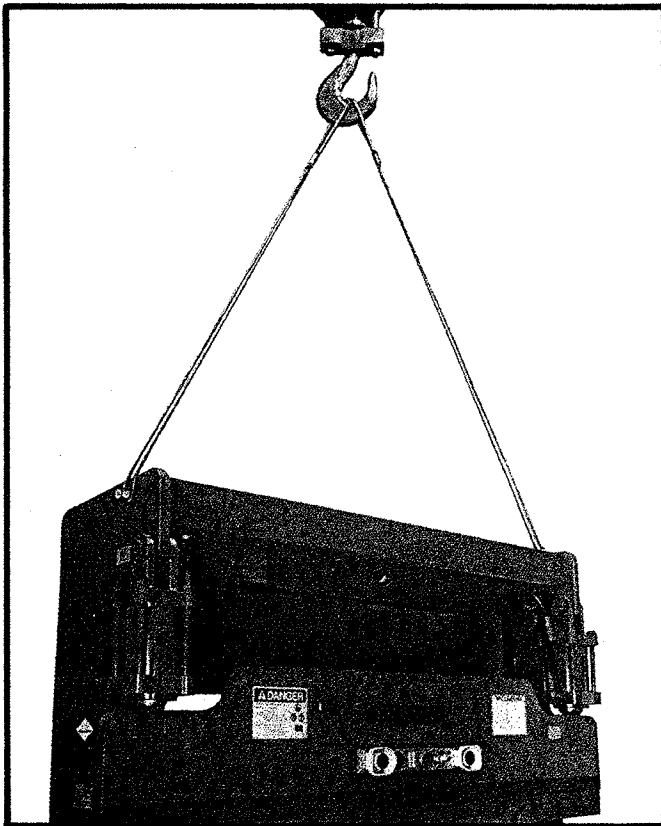


FIGURE 1

Where crane facilities are insufficient in capacity or are not available, rig the machine into final location. When rigging into position, be extremely careful to keep the machine supported evenly and to guard against tipping. CINCINNATI INCORPORATED recommends that professional riggers be employed to handle the machine to ensure against damage or injury to workers.

If jacks are used to lower the machine onto the foundation bolts, care should be taken to prevent twisting of the machine.

FOUNDATION

A CINCINNATI CB Hydraulic Press Brake is not a self-contained machine; that is, the machine must be provided with a rigid foundation to ensure the preservation of alignment of the housing and cross framing members. The foundation must support the weight of the machine without cracking or settling out-of-level.

For details of the foundation recommended for your press brake refer to the Foundation Plan drawing. It is advisable, particularly in localities where unusual soil conditions may exist, to have your foundation plan approved by a local registered civil engineer.

As a final check, before locating the press brake on the foundation, see that the anchor bolts in your foundation coincide with the bolt hole spacing in the housing feet.

CLEANING

Thoroughly clean protective grease from all parts of the machine with solvent. Go over the grease with a rag wet with solvent and allow to soak. Use rags instead of waste. A stiff brush will get into the corners. Do not use an air hose - pressure may drive dirt and grit into bearing surfaces. After cleaning thoroughly, wipe dry and make sure that no grease or grit is left.

With oil, clean and flush the ram guides and slides, wiping off all excessive oil.

Periodic cleaning of the machine after installation is advisable.

LEVELING

CINCINNATI Press Brakes are leveled by placing flat steel shims of proper thicknesses under the press brake housing feet as required. Use a precision level - not a carpenter's or machinist's level. See Figure 2. Always wipe level and surface clean before placing level. Give the bubble of the precision level a half minute to come to absolute rest.

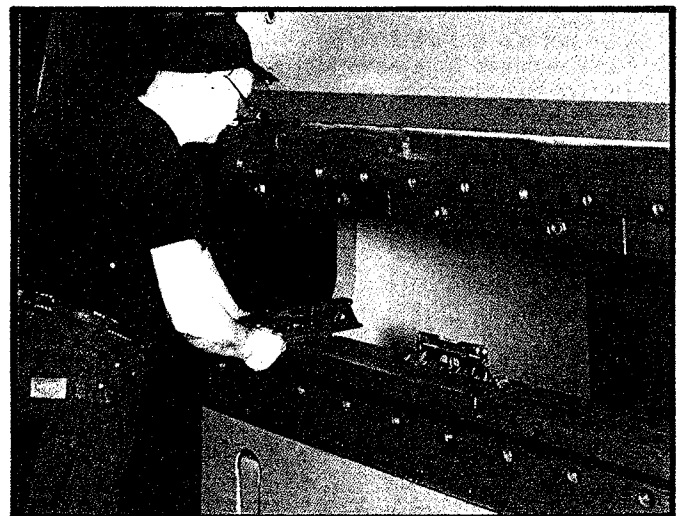


FIGURE 2

Level the machine lengthwise with the level placed parallel to the length of the bed and in the center. Raise the housings with leveling screw as shown in Figure 3. Place the required flat steel shims under the low housing, both at the front and at the back.

Let the machine down and recheck level. Repeat as often as necessary.



FIGURE 3

Level machine front-to-back with the level crosswise on the bed, first at the right end of the bed near the housing and then at the left end. Use jack screw to insert or remove flat steel shims under rear of both housings as required. Recheck and repeat until level.

IMPORTANT

Do not run the machine until the phenolic spacers are removed from each ram guide, and the ram liners have been installed and properly lubricated.

Check the ram guide and slide alignment to make sure there is no twist in the machine. This is done by loosening the ram clamp bolts until the ram hangs free of the guides. Measure with a feeler gage the clearance between the ram slide liner and the ram guide at the top and bottom. See Figure 4.

Clearance at the top of the right slide minus clearance at the bottom of the right slide, must be within .004 of clearance at the top of the left slide minus clearance at the bottom of the left slide.

EXAMPLE:	Left Clearance	Right Clearance
At top	.005	.020
At bottom	-.015	-.000
Difference	-.010	.020

Since the difference of .030 is greater than .004, there is a twist in the machine.

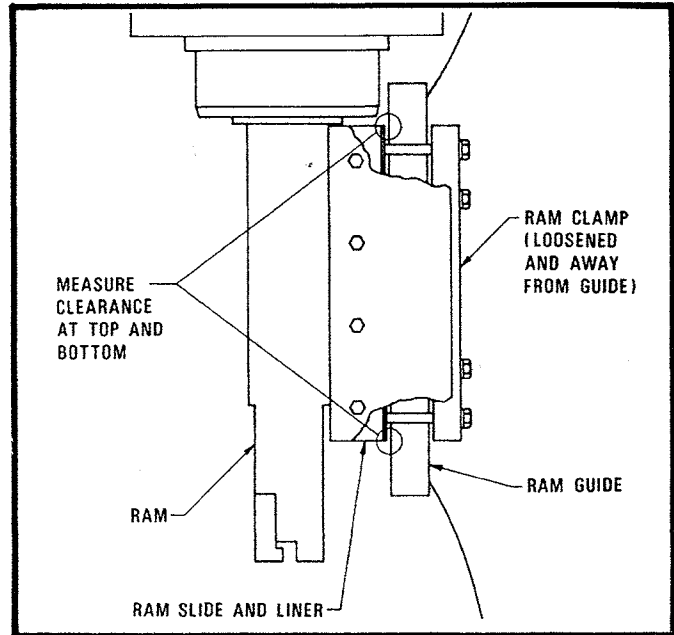


FIGURE 4

This condition is corrected by adding or removing shims under one of the rear housing feet. In the example, the excessive clearance was at the right guide and slide. To bring the alignment into tolerance, shims could be added under the right rear housing foot or removed from the left rear housing foot. The alignment must be corrected even if it causes the bed to be out-of-level.

After the machine is level, retighten foundation bolt nuts securely. Recheck guide and slide alignment. Do not remove shims. Alignment may not be permanent. Recheck level in a few weeks. Do not use any grouting around the machine. Leave the bed pit empty and cover with steel plate (175CB x 12, 230CB x 12, 350CB x 10, 12).

IMPORTANT

Before running the machine, tighten the guide clamp bolts to 100 ft.-lbs.

INITIAL LUBRICATION

Before starting your hydraulic press brake, the following lubrication steps should be taken:

1. Check hydraulic reservoir for proper fluid level (a sight gage is located on the rear of the tank).
2. The hydraulic reservoir is supplied with a valve. Before starting the pump, crack this open to drain any water that may have collected in the tank during shipment. If no water comes out, or when oil starts to come out, close this valve securely. Repeat this check monthly.
3. Remove the filler-breather neoprene shipping seal from under the cap.
4. Clean exposed portions of the leveling tape.
5. Place a few drops of oil on the bottom stroke stop adjusting screw and on the level adjusting screw.
6. Service clevis pin grease fittings. Complete lubrication specifications and schedules are specified in Section 6, MAINTENANCE AND ADJUSTMENTS.

CAUTION

STANDARD PRESS BRAKES ARE DESIGNED FOR AND SHIPPED WITH PETROLEUM BASED HYDRAULIC FLUIDS, WHICH ARE FLAMMABLE. CHECK APPLICABLE FIRE CODES FOR SPECIAL PRECAUTIONS.

ELECTRICAL CONNECTIONS

As shown on the Foundation Plan drawing, suitable leads must be brought to the machine into the electrical control panel on the right housing. This is the only electrical connection that is necessary. Be certain that proper voltage is fed to the press brake, that the lines are of sufficient capacity and that a suitable ground conductor is attached.

NOTE: CINCINNATI INCORPORATED CB Hydraulic Press Brakes are factory wired for 460V/3/60HZ service. If service is other than this, do not remove warning tag from the main disconnect or connect any power to the machine until a CINCINNATI INCORPORATED Service Representative inspects and services the machine.

Do not start the main drive motor until thoroughly reading the OPERATION section of this manual and a CINCINNATI INCORPORATED Service Representative is present.

P

SECTION 2

IDENTIFICATION

CB HYDRAULIC PRESS BRAKE MODEL 175CB SHOWN

- 1. FOOTSWITCH
- 2. BED
- 3. DIE CLAMPS
- 4. PALMBUTTON STATION
- 5. RAM
- 6. CYLINDER
- 7. SERVO LEVELING VALVE
- 8. LEVELING BAND -
- 9. RAM TILT ADJUSTMENT
- 10. MAIN CONSOLE
- 11. SET-UP LIGHT
- 12. STROKE CONTROL CAMS
- 13. FOOTSWITCH CONTROL
- 14. LEVELING SCREW

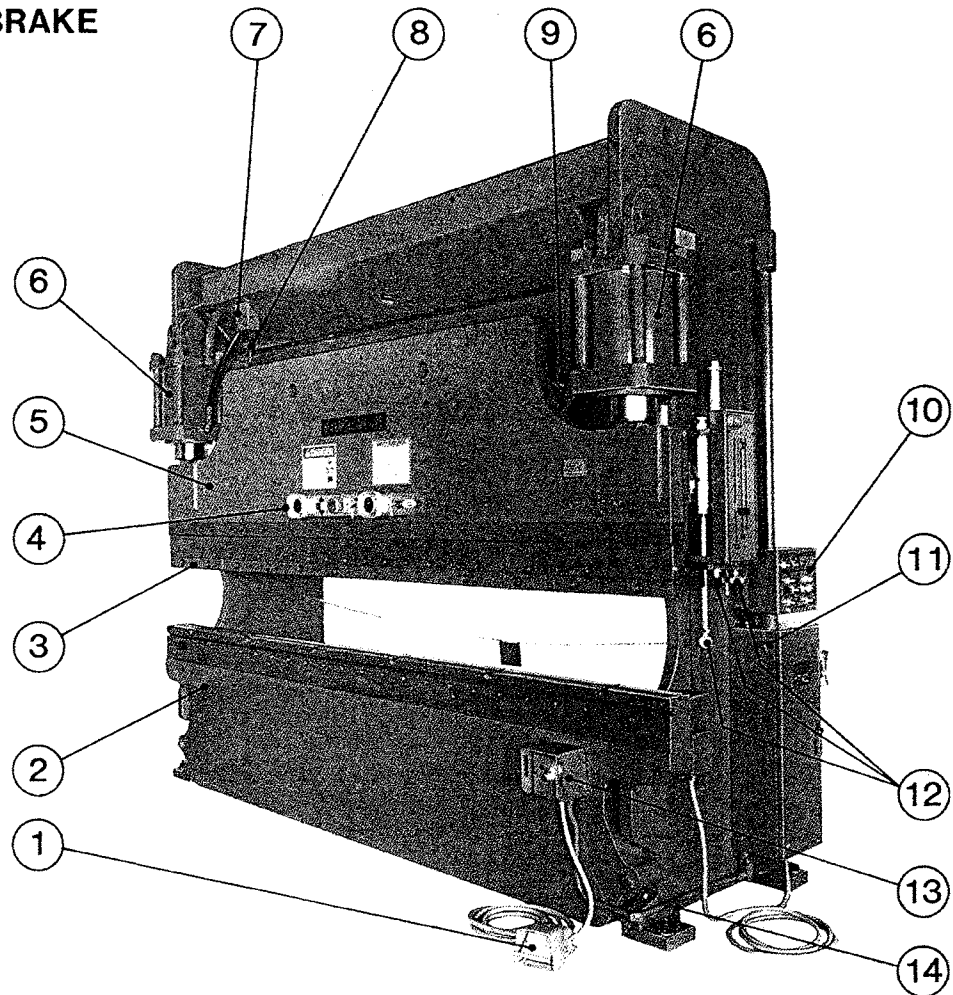


FIGURE 5

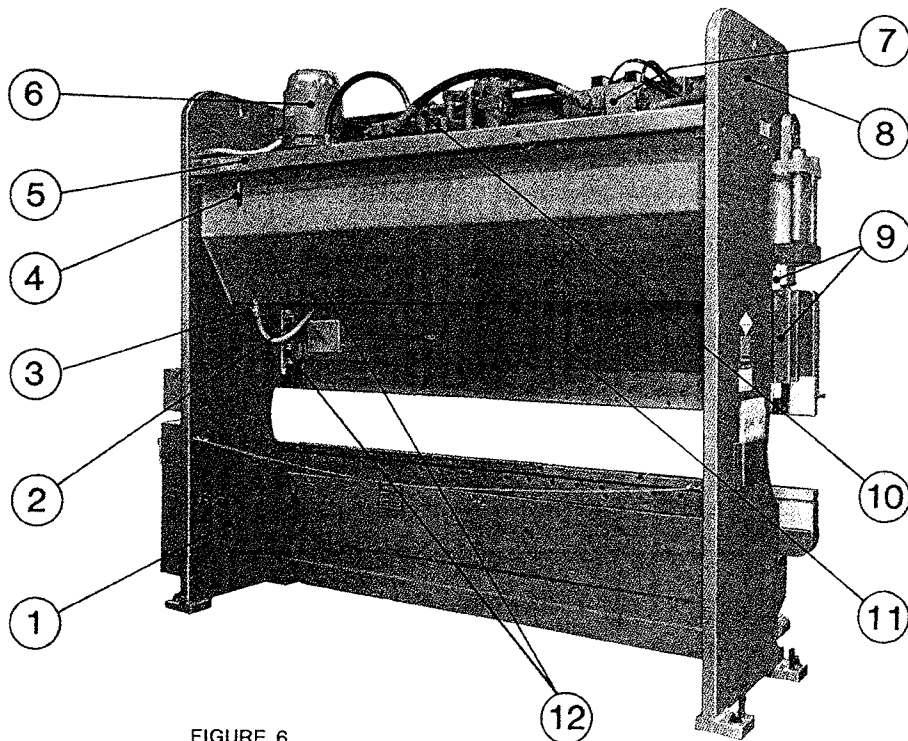


FIGURE 6

- 1. RIGHT HOUSING
- 2. SWIVEL END-GUIDE
- 3. DRAIN VALVE
- 4. FLUID LEVEL GAGE
- 5. FILLER-BREATHER
- 6. MAIN DRIVE MOTOR & PUMP
- 7. FLOW DIVIDER
- 8. LEFT HOUSING
- 9. SLIDE & GUIDE
- 10. HYDRAULIC MANIFOLD
- 11. HYDRAULIC RESERVOIR & HOUSING BRACE
- 12. TILT LIMIT SWITCHES

SAFETY RECOMMENDATIONS FOR HYDRAULIC PRESS BRAKE OPERATION:

Press brakes manufactured by CINCINNATI INCORPORATED comply with the construction requirements of the Occupational Safety and Health Act and the National Safety Standards of the American National Standards Institute. CINCINNATI INCORPORATED also offers update packages for older press brakes to assist you in your compliance and safety programs.

The press brake is a versatile and multi-purpose machine. We recommend you evaluate each press brake operation in order to determine the method of point-of-operation safeguarding which best meets that operation. The press brake, tooling, piece part and method of feed and removal must be evaluated for each job before deciding on the safeguarding to be used.

CINCINNATI INCORPORATED recommends you read and understand the safeguarding, use and care requirements of the American National Standard for Press Brakes, ANSI B11.3. This is available from the American National Standards Institute, 11 West 42nd Street, New York, New York 10036 and is included with this manual.

For additional safety information we recommend:

- Securing applicable safety data sheets from the National Safety Council, 1121 Spring Lake Drive, Itasca, Illinois 60143-3201.
- Determining your responsibilities under your state and local safety codes
- Requesting assistance from the loss prevention department of your workmen's compensation carrier

Personnel responsible for your press brake operator training program, tooling set-up, maintenance, and operations must read and understand this Operation, Safety and Maintenance manual. No one should set-up, operate or maintain this press brake until they thoroughly understand it and know how to do their job safely. This safety information is not intended as a substitute for the Operation and Maintenance sections of this manual.

FOR SAFE OPERATION OF YOUR CINCINNATI PRESS BRAKE**KEEP CLEAR OF THE POINT-OF-OPERATION**

The purpose of a press brake is to bend metal and it is obvious that this same capacity will sever arms, hands, fingers or any other part of the body that is in the point-of-operation when the ram is activated.

During operation, all parts of your body must be completely clear of the work area. **NEVER PLACE ANY PART OF YOUR BODY IN THE POINT-OF-OPERATION (Die area).**

If operation by more than one person is required, operator controls must be furnished for each person. If foot controls are used, and your evaluation of that specific operation indicates safeguarding is necessary, provide the necessary safeguarding before any work is performed. (See ANSI B11.3.)

If you use two-hand operator control station(s) as point-of-operation safeguarding, be certain that they comply with ANSI B11.3.

If operation by more than one person is required, one person should be responsible to see that not only his own body is clear of the point-of-operation and all moving parts, but also that his co-workers are clear and entirely visible in a safe location, before the press is operated.

During set-up, maintenance or other work on the machine which necessitates manipulation within the point-of-operation, either the ram should be at the bottom of the stroke or it should be blocked so the dies cannot close. The power supply should be disconnected and locked OFF.

CONCENTRATE ON YOUR JOB

Daydreaming, worrying about other problems or other improper operation of a machine could cripple you for life. Operating a press brake requires your complete attention. Talking, joking or participating in or watching horseplay could result in physical injury to you . . . and that is nothing to joke about. So watch what you are doing and concentrate on your job.

NEATNESS IS IMPORTANT

Keep the floor of your work area clear of scrap and trash that could cause you to stumble. Put scrap in

the proper containers and keep stock and finished work neatly arranged. Be sure slippery surfaces are cleaned up properly. Stumbling and slipping can result in painful and perhaps even fatal injuries.

Put all tools and equipment away when you are not using them. Only the part you are working with should be on the machine when it is operating. Even a screwdriver can be deadly if left on the press brake or lower die.

PROPER TOOLS ARE IMPORTANT

Use the proper tools when working on the press brake. An improper tool might slip and cause lacerations. When making repairs on the machine, disconnect the power source and be sure the ram is at the bottom of the stroke or blocked in place.

ELIMINATE LOOSE AND FLOWING CLOTHING

Loose or flowing clothes may be comfortable, but if they are caught on the machine, it could result in an injury to you. Keep jewelry to a minimum. That link I.D. bracelet you got for Christmas could cost you your hand or finger.

LOOK THINGS OVER CAREFULLY

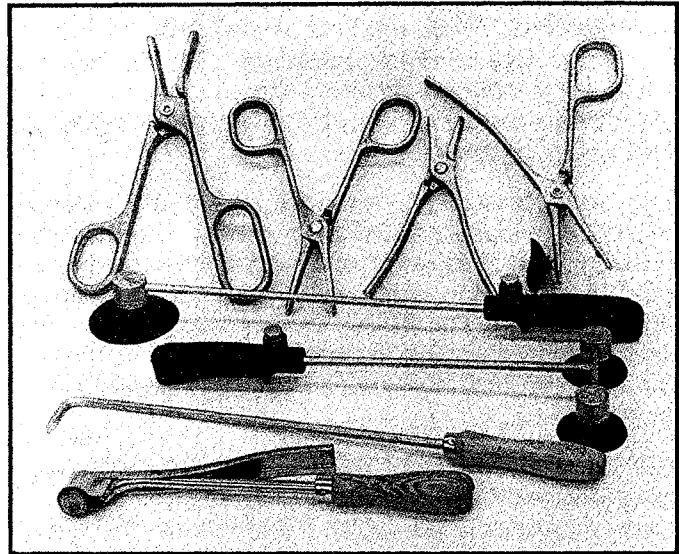
Before operating your CINCINNATI hydraulic press brake, look to see if your machine is in proper condition. Are the dies worn? Are the machine's covers and guards securely in place? Is the machine securely anchored to the floor? Are all nuts, bolts and screws tight? Is everything in proper operating condition? If not, report any unsafe condition or needed repair to your supervisor and be sure the problem is corrected before beginning operations.

The CINCINNATI hydraulic press brake you are operating will not produce a tonnage greater than the maximum rated machine capacity (see capacity plate). However, when using short or small area dies, the tonnage must be reduced to avoid damage to the tooling or the bed and ram of the machine. Too much tonnage may also cause a die to rupture and cause injury. If your machine is equipped with tonnage control, consult the *Press Brake Capacities* bulletin for the load required to do the job. If this is less than maximum machine capacity, set the control so not to exceed the required force by more than 10%.

FOR THE SAFE OPERATION OF YOUR CINCINNATI PRESS BRAKE, FOLLOW THESE RULES:

1. **Never place any part of your body in the point-of-operation (Die area).** Placing your hands or any part of your body in the point-of-operation may result in serious injury or amputation.

2. Evaluate each operation to determine the point-of-operation safeguarding to be used.
3. Use the point-of-operation safeguarding selected, or method of operation selected to minimize the exposure to potential hazards at the point-of-operation.
4. For small part insertion and removal, use a hand tool. **DO NOT** place your hands in the point-of-operation.



5. Know how to safely operate and adjust your CINCINNATI press brake. Review the Operation and Maintenance sections of this manual.
6. Maintain proper lighting levels and eliminate light glare to prevent eye strain and eye fatigue.
7. Protect your eyes from flying pieces of metal by always wearing your safety glasses.
8. Always wear safety shoes. A heavy or pointed piece of stock could fall and cause serious injury to your foot.
9. Wear snug fitting hand and arm protection when handling rough or sharp edged stock.
10. Keep die area free of loose tools and materials. When placing stock in the machine for forming, be certain the gages and stops are correctly set and the edge of the stock is against the gages.
11. Stand clear of the workpiece with your arms slightly extended to avoid being hit if the stock whips up or down as the bend is made. Be sure you know how the workpiece will react to the bend being made. If the workpiece whips-up, place your thumbs and fingers below the material. If the workpiece whips-down, use the clamp/stop feature of the machine control so

your hands can be removed from the workpiece when the bend is made. Set the forming speed to avoid excessive part "whip".

12. Releasing the footswitch of your CINCINNATI press brake will immediately stop or reverse (depending upon the mode selection) downward travel of the ram in case of emergency.
13. When you leave the machine, place the ram at bottom of the stroke or place safety blocks in position under the ram. Turn OPERATOR CONTROL selector to "OFF" and remove the key, even if you will be away for only a few minutes.
14. Have the routine scheduled maintenance and adjustments performed as shown on the Maintenance Checklist in Section 6.
15. Check alignment of the dies before operating the machine after the dies have been changed or if the machine has been idle overnight. Improper alignment could cause chipping and flying chips can cause lacerations and eye injuries.
16. Report any cuts, bruises and all other injuries to your supervisor or the medical department immediately. They are the best judges of how serious or minor the nature of your injury is.

GENERAL GUIDELINES FOR INSTALLING, REMOVING AND TRANSFERRING TOOLING (DIES)

Installing, removing and transferring tooling is hazardous and should be done with proper supervision by experienced set-up men. Improper handling techniques can cause muscle strains, hernias or serious disabling injuries.

1. Transfer dies using the proper techniques for the weight of the die(s) being handled:
 - a. Very light dies (up to 50 pounds) can be carried manually or transferred on a die truck.
 - b. Dies weighing over 50 pounds or those that are awkward to move should be handled by a hoist.

If the punch or die has tapped holes for lifting attachments, be sure the proper size bolts are used. A bolt smaller in diameter than the tapped hole will slip out and cause serious injury. If no lifting attachments are provided, use only approved rope slings so the dies will not be nicked or scratched.

Lift the dies high enough to clear any obstructions, but no higher.

CAUTION

STAY CLEAR OF DIES WHILE THEY ARE BEING TRANSFERRED, PARTICULARLY WHEN THEY ARE BEING LIFTED. IF A DIE SHOULD SLIP, SERIOUS INJURY, INCLUDING LOSS OF HAND, A FOOT OR EVEN YOUR LIFE, COULD RESULT.

2. When installing and setting-up dies:
 - a. Clean the machine and filler block surfaces to which the dies will be fastened. Always turn machine OFF and use safety blocks between the bed and ram when working in this area.
 - b. Inspect the dies for chips, cracks or other hazardous conditions. Wipe them off with a clean cloth.
 - c. Always place the machine control MODE selector in the "INCH" position so the ram can only be cycled by use of palmbuttons.
 - d. Never reach into or through the die area when aligning the dies or setting the gaging.
3. When removing dies from the press brake:
 - a. Clear the work areas of all stock, containers, tools and other equipment.
 - b. After placing safety blocks between the dies and turning OFF the machine, clean both upper and lower dies using a bench brush and finally wipe clean with a cloth.
 - c. Place the machine control MODE selector in the "INCH" position so the ram can only be cycled by use of the palmbuttons.
 - d. Never loosen the ram clamp bolts unless the dies are in a closed position and the drive motor has been shut "OFF".

Detailed step-by-step instructions for installing and removing tooling are provided in the KNOWING YOUR PRESS BRAKE section of this manual. These instructions should be followed for safe installation and removal of tooling from your CINCINNATI press brake.

Also included in the KNOWING YOUR PRESS BRAKE section of the manual are instructions for making bends, gaging, blank development and use of the machine controls.

SAFETY SIGNS

In order that press brake operators and maintenance personnel may be warned of certain potential hazards that may exist - unless specified procedures are followed - a number of warning signs are attached to CINCINNATI Hydraulic Press Brakes. Warning signs

are not intended to be a substitute for reading and understanding this Safety section and the machine Operation and Maintenance manual.

The warning signs are placed at strategic points on the press brake for the most effective use. It is intended that they become a permanent part of the equipment and, therefore, must not be removed, covered, hidden or defaced. All signs installed on the machine by CINCINNATI INCORPORATED are identified by a small six digit part number in the lower right corner. If any of these plates become damaged or defaced, new ones should be ordered by contacting the factory or the nearest CINCINNATI Sales and Service Office.

The following illustrations are of the warning signs most commonly used on the hydraulic press brakes. Some other signs may be furnished to cover possible hazards due to special equipment or machine features. The user management should also include additional warning signs to cover any hazards that may be presented by customer-added auxiliary equipment.

DANGER

This warning sign is attached to the press brake ram, which is the most visible location on the machine. The sign is a reminder to operators or maintenance personnel that certain procedures must be followed to prevent serious bodily injury.

DIE AREA

This DANGER sign warns the operator to keep his hands out of the die area (point-of-operation). Usually the sign is attached to one end of CINCINNATI dies, and not on the press brake. These adhesive backed signs have been furnished in safety update packages and are available from CINCINNATI INCORPORATED.

SAFETY GUIDELINES

This sign is also attached to the ram adjacent to the DANGER sign. It provides a checklist of safety considerations which should be observed before, during and after operation of the press brake.

HAZARDOUS AREA

This sign warns of a hazardous area between the machine housings at the rear of the press brake. The sign is attached to a steel restraining cable which spans the space between the housings. No one should enter this area while the machine drive motor is running or the control is energized.

GUARD AGAINST TIPPING

The design of hydraulic press brakes is such that much of the weight is concentrated to the front of the machine. This sign cautions that the machine should be guarded against tipping when moving or installing until it is anchored to the floor. The sign refers to the Operator's manual for complete installation instructions.



PRESS BRAKE OPERATOR SAFETY GUIDELINES

- Be sure you know your press brake - capacity, controls, operating modes, safeguarding
- Know and understand the job you are about to perform - material placement, feeding, movement of material being formed
- Never place your hands in the die area
- Make sure no one is in backage area at rear of machine
- Tooling, press brake and gaging properly set for the job
- Always cycle the press brake at least twice without a part in dies before each shift and each job
- Keep die area free of all unnecessary material and tools
- Do not hang tools on the ram
- Adequate safeguarding available and used
- Keep your body clear of workpiece
- Keep work area clean and orderly
- Keep alert - Keep your mind on the job
- Hand tools - personal protective devices available and used

- Make certain all persons are clear of machine and material before operating
- When you leave your press brake:
 - Place ram at bottom of stroke or block
 - Turn controls "OFF"
 - Turn power "OFF"

FAILURE TO FOLLOW SAFE PRESS BRAKE OPERATING PROCEDURES MAY RESULT IN SERIOUS INJURY TO YOU OR ANOTHER EMPLOYEE

SAFETY MAINTENANCE CHECK

- SAFEGUARDING at point-of-operation in proper adjustment and operating properly
- PINCH POINT guarding properly installed
- OPERATOR CONTROLS working O.K.
- OPERATING MODES functioning properly
- RAM starting and stopping properly
- WARNING PLATES clean and easily read
- ELECTRICAL WIRING in good condition
- CAUTION PAINTING in good condition
- AUXILIARY EQUIPMENT checked - working properly
- HAND TOOLS and personal protective equipment in good order - readily available
- SAFETY MANUALS and OPERATOR MANUALS attached to machine
- SCHEDULED NORMAL MAINTENANCE work completed

SAFETY IS PART OF YOUR JOB . . . THE MORE ATTENTION YOU PAY TO DEVELOPING SAFE HABITS, THE LESS THE CHANCES OF INJURY TO YOU AND YOUR FELLOW EMPLOYEES

Before starting your Press Brake the following controls and their functions should be thoroughly understood.

STANDARD CONTROLS

MAIN CONSOLE (FIGURE 8)

STROKE CONTROL Switch: This is a two position ("ON" - "OFF") key selector operator control. When in the "OFF" position the ram cannot be stroked.

GROUND CONNECTED Light: - When illuminated this light indicates that the low voltage A.C. control circuit is grounded. This is an internal chassis ground - it does not indicate that the machine is grounded.

OPERATION Switch: This is a two position ("RESET" - "ON") key selector supervisory control. The normal position of this switch is in the "ON" position. Whenever a power loss has occurred the switch must be turned to the "RESET" position and then to the "ON" position before the main drive motor can be energized.

READY Light: When this light is illuminated it indicates that the operation control has been reset and the main drive motor can be energized by depressing the START button.

MAIN DRIVE - START Button: This is a guarded pushbutton which is depressed to energize the main drive motor. When illuminated the main drive motor is energized.

MAIN DRIVE - STOP Button: This pushbutton, when depressed, will de-energize the main drive motor.

MODE Selector: This is a three position key selector supervisory control consisting of:

INCH: This is a set-up mode that can only be operated by the use of a palmbutton operator's station. The ram will run when the operator's station is activated and stop either on the "DOWN" or "UP" stroke when the station is deactivated. The ram will automatically stop at top of the stroke. Release the palmbuttons and depress them again to start another cycle.

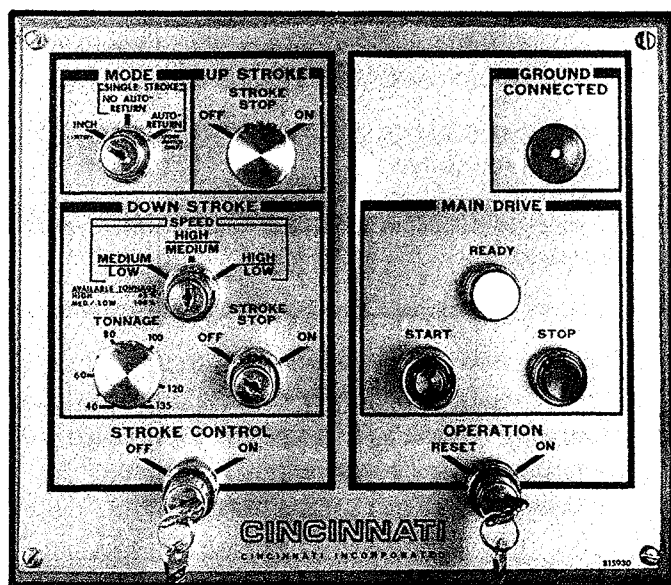


FIGURE 8

SINGLE STROKE - NO AUTO RETURN: This is a production mode and can be operated by the palm-button operator's station or the footswitch operator's station. Multiple palmbutton operator's stations or multiple footswitch operator's stations can be used in this production mode but a combination of palmbutton and footswitch operator's stations cannot be used. The ram will run when the operator's station is activated and stop either on the "DOWN" or "UP" stroke when the station is deactivated. If multiple operator's stations are in use, all operator's stations must be deactivated and then reactivated before the ram will resume "DOWN" stroking. The ram will automatically stop at the top of the stroke. All operator's stations must be deactivated and then reactivated to start another cycle.

SINGLE STROKE - AUTO RETURN: This is a production mode that can only be operated by use of the three position footswitch operator's station. Multiple footswitch operator's stations can be used in this production mode. On the "DOWN" or closing stroke, the ram will continue to run as long as the station or stations are depressed. Upon releasing the footswitch to the "CENTER" position, the ram will stop. Upon releasing the footswitch to the "UP" position, the ram will return to the top stroke control setting and stop. After the ram has passed through the bottom stroke control setting, with the footswitch fully depressed or completely released to the "UP" position, the ram will automatically return to the top of the stroke and stop. Releasing the footswitch to the "CENTER" position will stop the ram. All stations must be deactivated and then reactivated before the ram will start another cycle.

DOWN STROKE - SPEED Selector: This is a three position key selector supervisory control. The machine is provided with three "DOWN" or closing speeds (HIGH, MEDIUM and LOW). A combination of any two of the three speeds can be made with this selector. (NOTE: Full tonnage is available in MEDIUM or LOW speed and approximately 45% of maximum tonnage is available in HIGH speed.)

DOWN STROKE - STROKE STOP Switch: This is a two position ("ON"- "OFF") key selector supervisory control. With the STROKE STOP in the "ON" position the ram will descend when the operator's station is activated, automatically stopping at a preselected height above the bottom of the stroke. The operator's station must be deactivated and reactivated to complete the ram cycle.

PALMBUTTON OPERATOR STATION (FIGURE 9)



FIGURE 9

Two guarded palmbuttons, which must be depressed about the same time, are provided to activate the ram in either the "INCH" or "SINGLE STROKE - NO AUTO RETURN" modes. Releasing either palmbutton will stop the ram. Both buttons must be released and redepressed to restart ram motion.

EMERGENCY STOP Button: Depressing this push-button deactivates the main drive motor.

RAM UP Button: This pushbutton, when depressed, will cause the ram to go up regardless of the motion, position or previous direction of the ram. The ram will stop when the button is released or when the top stop position is reached.

RAM UP - RAM DOWN Directional Lights: These lights indicate the direction of motion (green-UP or red-DOWN) that the ram is moving or will move should an operator station be activated.

OPERATOR STATION Switch: This is a two position ("ON"- "OFF") key selector for activating the palm-buttons. When in the "OFF" position, ram cannot be cycled by pressing the palmbuttons.

STROKE CONTROL CAMS (FIGURE 10)

This control consists of limit switches and mechanically adjusted cams for controlling the top and bottom ram stroke limits and speed change point. The bottom stop or lower reversal point is set by turning hand crank "A" and its position is indicated by counter "B" and pointer "C". The counter indicates in inches and thousandths of inches the distance between the bottom reversal point of ram and the bed top, minus the closed height of the ram. The top stop or upper reversal point is set by adjusting cam rod "D" (with green knob). The speed change point is set by adjusting cam rod "E" (with yellow knob). The speed change point is also used for the down stroke stop point when selected. The top stop speed change cam rods are locked in position by levers "F".

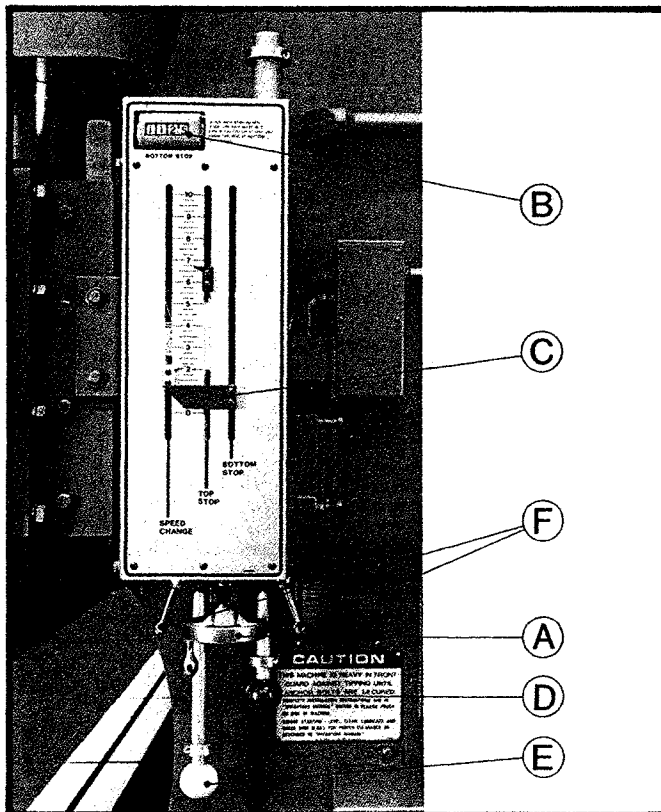


FIGURE 10

FOOTSWITCH (FIGURE 11)

This is a guarded, three position operator control which activates the ram motion in either the "SINGLE STROKE - NO AUTO RETURN" or "SINGLE STROKE - AUTO RETURN" modes.

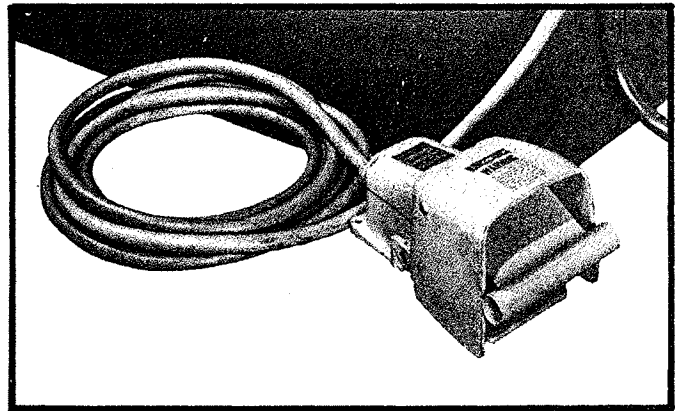


FIGURE 11

The footswitch is made active by turning ON a keylock selector switch. The FOOTSWITCH selector is located in a small electrical enclosure on front of bed (Figure 12). This selector can be locked OFF to prevent the ram from being cycled by the footswitch. The FOOTSWITCH selector must be OFF when the palmbutton controls are being used. A red indicator light indicates the switch is turned OFF and an amber light indicates that it is turned ON.

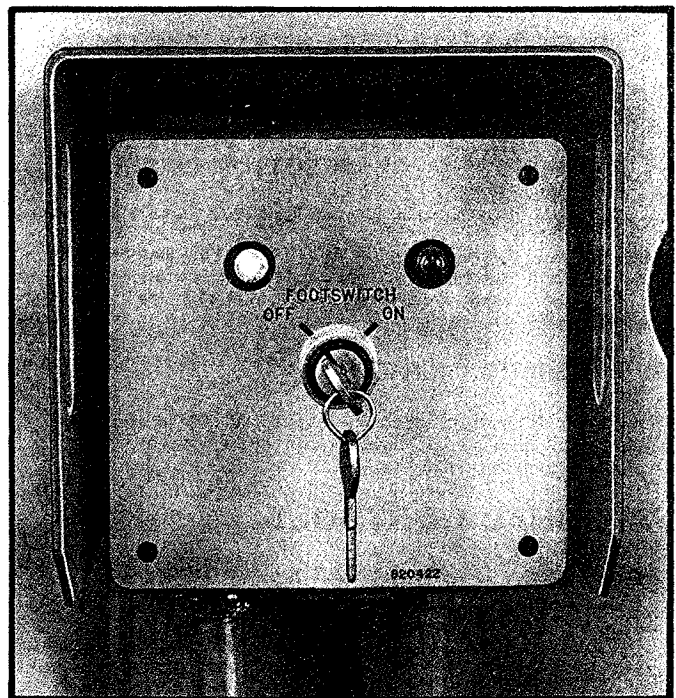


FIGURE 12

RAM TILT ADJUSTMENT (FIGURE 13)

The leveling control is entirely automatic, maintaining the ram either parallel to the bed or at a predetermined angle with respect to the bed. A manual control is provided to tilt the ram (1/2" maximum) in either direction. The amount of tilt (registered on a graduated collar and pointer) is the vertical distance that one end of the ram is above or below the other end at the points of attachment of the leveling band.

To operate the press brake with the bed and ram parallel, the graduated collar and pointer should be set to their "ZERO" marks. Servicing and adjusting the tilt control is covered in the MAINTENANCE section of this manual.

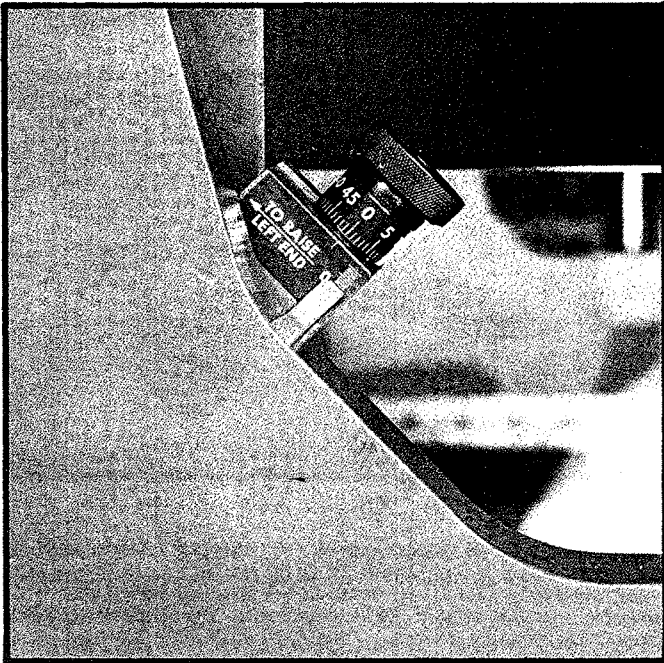


FIGURE 13

CAUTION

WHEN OPERATING AT THE EXTREME LIMITS OF STROKE, THE FULL LENGTH OF STROKE SHOULD BE REDUCED BY THE AMOUNT OF THE RAM TILT FOR OPERATION IN A TILTED POSITION TO PREVENT LEFT PISTON FROM STRIKING THE TOP OR BOTTOM OF THE CYLINDER.

The maximum allowable tilt is 1/2" in the length between the tape anchor points. If this tilt is exceeded, the out-of-level limit switches will stop the ram by de-energizing the main pump motor.

SET-UP LIGHTS (FIGURE 5)

This light is mounted on front side of the main electrical enclosure. The green light comes on whenever the ram is at the bottom reversal position.

OPTIONAL CONTROLS

UP STROKE - STROKE STOP Switch (FIGURE 14)

This is a two position ("ON"- "OFF") key selector supervisory control located on the main console. When in the "ON" position the ram will automatically stop immediately after passing through the bottom reversal point. All operator controls being used must be released and reactivated to restart the return stroke of the ram. This control can be used in all modes.

TONNAGE CONTROL

The tonnage control consists of an adjustable selector mounted on the main console. The maximum tonnage for "centered" loads is limited by the setting of this selector. Upon building up to the pre-selected tonnage, the ram will automatically reverse from a downward to an upward direction.

Actual forming tonnage in high speed is approximately 45% of the tonnage control setting.

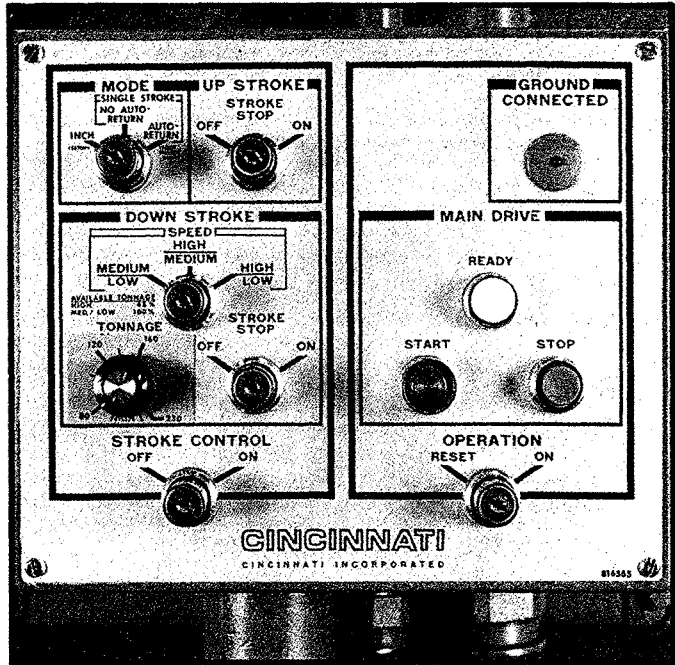


FIGURE 14

IMPORTANT

The hydraulic components and machine frame members are safeguarded against overload by both a pressure transducer and a relief valve in the circuit. However, care must be taken to provide enough area under upper and lower dies to prevent them from sinking into the bed top or ram nose due to highly concentrated loads. This is the shaded area shown in Figure 15. The minimum area (sq. in.) for each die to prevent sinking may be calculated by this formula:

$$\text{Die Area} = \frac{\text{MAXIMUM TONNAGE}}{15}$$

An example for a 135 ton machine: the minimum die area is 135 divided by 15, or 9 square inches.

ADDITIONAL FOOTSWITCHES AND/OR PALMBUTTONS

The operation of these controls is the same as the standard controls. Additional selector switches are provided for selecting left, right or both controls.

MULTIPLE DEPTH STOPS (FIGURE 16)

With this option a total of four distinct pre-set bottom reversal points are available. The No. 1 stop is the standard bottom stop. Stops No. 2, 3 and 4 are set by adjusting micrometer barrels which are added to the bottom stop cam on the right hand side of the machine. The press brake operator can select which of the four stops he wants by a portable selector switch, which can be moved any place along the front of the press brake.

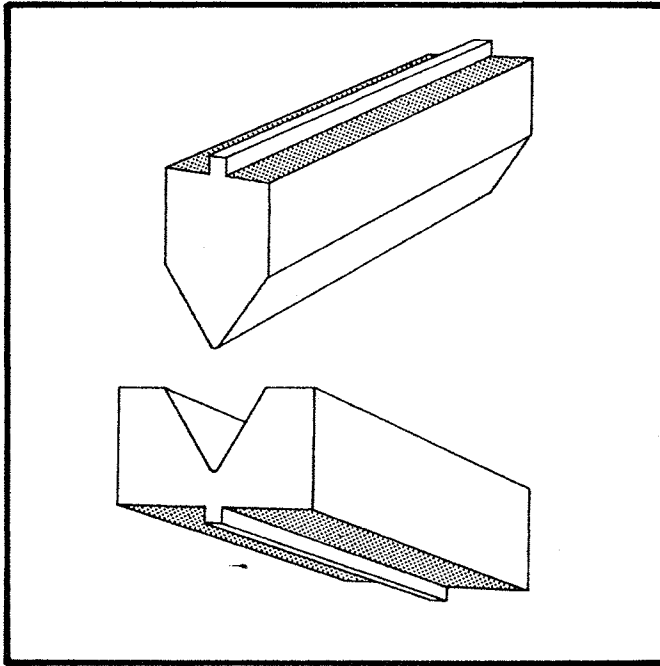


FIGURE 15

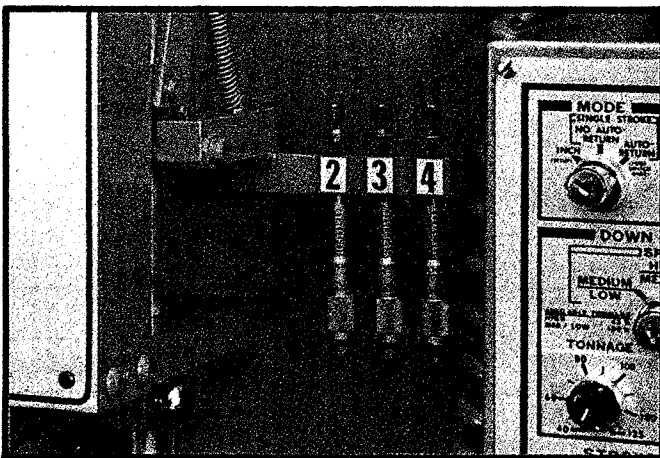


FIGURE 16

INITIAL START-UP OF NEW MACHINES

IMPORTANT

A CINCINNATI INCORPORATED Service Representative should be present during the initial start-up of your Press Brake. Before starting the drive motor the following checks should be made.

- A. Installation has been completed per the instructions given in Section 1 of this manual including:
 - . Foundation
 - . Cleaning
 - . Leveling
 - . Initial lubrication (including oil level and water in the tank)
 - . Electrical connections and service
- B. All options have been installed on the machine.

C. The tilt limit switches should be properly adjusted with the ram and bed parallel (see Section 6 - MAINTENANCE AND ADJUSTMENT).

D. A complete visual inspection of the machine has been made.

For the initial start-up of the press brake the main drive motor should be jogged with the START and STOP buttons to verify that the direction of its rotation agrees with the arrow. After this has been done, the START button can be depressed bringing the motor and pump up to full speed.

Before cycling the ram, a final check of the machine level should be made and adjusted as described in Section 1 - INSTALLATION.

Although the operating pressures (main relief and counter-balance) have been factory set, they should now be rechecked and adjusted if necessary, before further stroking of the machine. Detailed instructions for setting these pressures are given in Section 6 of this manual.

All controls, electrical functions, and safety features of the press brake should now be checked for satisfactory operation.

Check the level of the bed and ram with a dial indicator as described in Section 6 of this manual.

Before installing tooling and attempting to make bends, Section 5 - KNOWING YOUR PRESS BRAKE of this manual should be read and thoroughly understood.

DAILY START-UP

At beginning of a new shift, after every break, at start of a new job, or when machine is started after an extended off period (several hours or longer), the following procedure is recommended:

1. Check reservoir oil level.
2. Let the pump idle for 10 to 15 minutes to warm the oil.
3. Check controls for proper operation.
4. Verify that all required safety devices and procedures are being used and are operating properly.
5. Verify that all selectable or adjustable controls are positioned correctly for the set-up or job to be run.

NOTE: Before the main drive motor can be started, the main console OPERATION switch must be turned to "RESET" and back to the "ON" position. An illuminated READY light indicates that the motor will start when the START button is depressed.

The most common reason for inability to start the main motor is that the ram has tilted beyond its limits or that the tilt limit switches are improperly set. See Section 6 of this manual for releveling the ram and adjusting the tilt limit switches.

6. Check for tools, loose material or persons in point-of-operation or at rear of machine.
7. Know the machine. Thoroughly read this manual and become familiar with all of the controls and how they affect ram motion. Run the machine without tooling and become familiar with its "feel".
8. Be safety conscious. Always follow the safety precautions outlined in this manual.
9. Select proper tooling for the job. Make sure the dies are in good condition.
10. Never place any part of your body in the die area.

PERFORMANCE AND RATINGS

The following charts, graphs and illustrations emphasize the most important performance capabilities and limitations of the CB Hydraulic Press Brakes. They are important aids for safe and effective use of these machines.

CB SPECIFICATIONS																	
SERIES	LENGTH (FT. NOMINAL)	CLEAR DISTANCE BETWEEN HOUSINGS	TOTAL OVERALL DIE SURFACE	BENDING CAPACITY (MILD STEEL) *	VEE DIE OPENING	FULL TONNAGE (LOW OR MEDIUM SPEED)	TONNAGE IN HIGH SPEED	STANDARD STROKE LENGTH (INCHES)	THROAT CLEAR FROM CENTER OF DIES (IN.)	OPEN HEIGHT (INCHES)	CLOSED HEIGHT (IN.)	RAM SPEED (INCHES/MIN.)				MOTOR HORSEPOWER	DOMESTIC SHIPPING WEIGHT (LBS.-APPROX.)
												HIGH	MEDIUM	LOW	RETURN		
90 CB	8	8'-6"	10'	12 GA. X 12' 10 GA. X 9' 3/16" X 6'11" 1/4" X 5'	7/8 1-1/8 1-1/2 2	90	40	8	7	15	7	150	71	21	136	15	13,500
	10	10'-6"	12'														17,000
135 CB	8	8'-6"	10'	10 GA. X 13'6" 3/16" X 10'3" 1/4" X 7'6" 1/2" X 4'8"	1-1/8 1-1/2 2 5	135	60	8	7	15	7	136	65	16	122	25	16,000
	10	10'-6"	12'														19,500
175 CB	10	10'-6"	12'	3/16" X 13'4" 1/4" X 10' 3/8" X 6'3" 1/2" X 6'1"	1-1/2 2 3 5	175	75	10	8	17	7	132	65	18	127	30	24,000
	12	12'-6"	14'														28,000
230 CB	10	10'-6"	12'	1/4" X 12'9" 3/8" X 8'2" 1/2" X 8'	2 3 5	230	90	10	8	17	7	101	49	14	95	30	28,500
	12	12'-6"	14'														33,000
350 CB	10	10'-6"	12'	3/8" X 12'5" 1/2" X 12' 3/4" X 8'6"	3 5 8	350	140	10	10	18	8	65	33	9	67	30	37,500
	12	12'-6"	14'														44,000

* The above bending capacities allow for a 15% reserve of rated tonnage to cover possible increases in material thickness, tensile strength and yield strength. See PRESS BRAKE CAPACITIES bulletin for additional information on capacity.

MEDIUM SPEED TONNAGE - CB's can press full tonnage in MEDIUM speed up to six times per minute continuously. If the motor overheats while pressing in MEDIUM speed, shift to LOW speed during the working portion of the stroke.

HIGH SPEED TONNAGE - Use of TONNAGE CONTROL is recommended when pressing in HIGH speed.

Detailed machine dimensions are shown on the Foundation Plan drawing.

FIGURE 17

PRINCIPLES OF OPERATION

RAM STROKE: Hydraulic pressure from the motor driven pump forces the cylinder pistons down or up to move the ram. The stroke length is adjustable. The maximum stroke length for each series machine is shown in the chart above.

TONNAGE CAPACITY: The tonnage on machines is adjustable from approximately 16% of full tonnage (depending upon ram speed selected) to full tonnage. The maximum full tonnage is determined by the size of hydraulic pump, cylinders and pistons and the limits of the frame

design. The machine's capacity plate and the chart above show the maximum tonnage capacity. Also see PRESS BRAKE CAPACITIES bulletin included with this manual.

DIE SPACE: Each size machine has a fixed amount of die space to accommodate the dies or tooling. OPEN HEIGHT is the maximum die space available. It is the distance from bed top to the ram nose when the ram is at maximum up stroke position. CLOSED HEIGHT is the minimum die space available. It is the distance from bed top to ram nose when ram is at bottom of the stroke. See Figure 18.

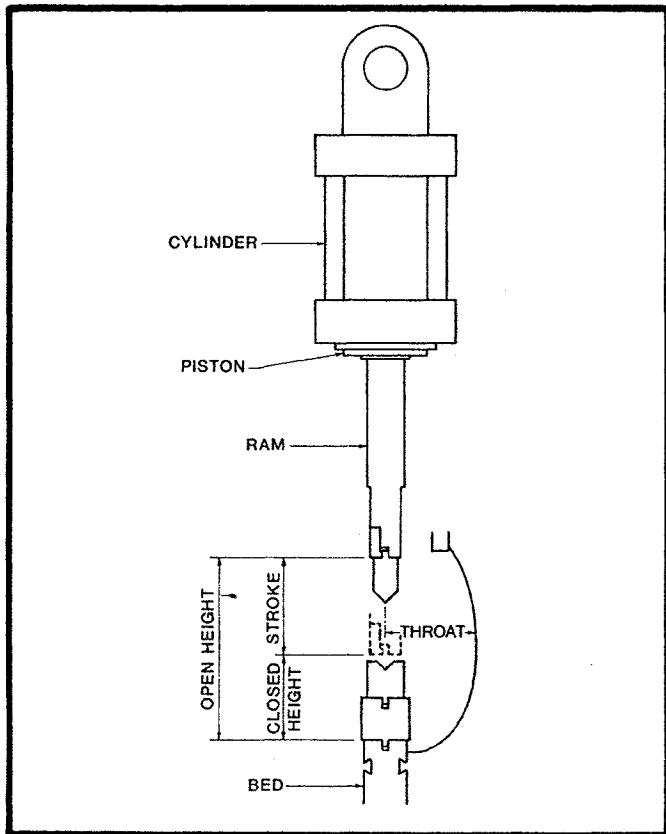


FIGURE 18

THROAT: Normally most forming on press brakes is done between the housings. However, when long materials or forming at one end of the machine is required, the housing throat provides space for the material. This space is limited by the depth of throat.

CLOSED POSITION: This is the overall height of the dies and filler block when ram is at the bottom of the stroke and is adjusted to make the proper bend. See Figure 19.

DIE PENETRATION: This is the distance the upper die penetrates the lower die. For a 90° air bend die the penetration is about 0.4 of the lower die opening.

The combined height of the dies and filler block when in the closed position must be more than the closed height but less than the open height dimension. The difference between this combined height and the open height is the maximum amount of stroke which can be used.

FILLER BLOCKS: Various types of filler blocks are available to hold the lower die. They provide a means of adjusting and clamping the lower die in position. Filler blocks are optional and should be selected to suit the machine tooling and type of bending.

MICROCROWNING: A carefully engineered crown is machined into the bed and ram of each CINCINNATI press brake. It is designed so the bed and ram will be parallel at 2/3 of machine capacity with a uniformly distributed load. This feature improves bend accuracy under normal forming loads and minimizes shimming of the dies.

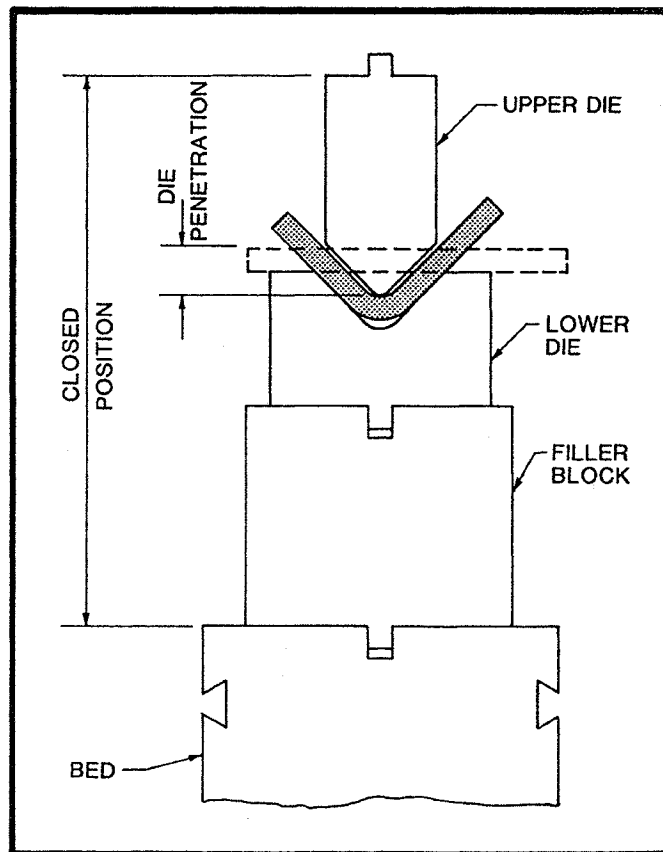


FIGURE 19

TYPES OF DIES

AIR BEND DIES: These dies are made with sharper angles than the angle to be formed. The metal being formed contacts only the point of the upper die and the two edges of the lower vee die opening. See Figure 20. Thus, all of the ram pressure is used in forming and none in squeezing the metal. Any greater angle than the die angle can be formed by adjusting the stroke reversal position upward as required. See the PRESS BRAKE CAPACITIES bulletin included with this manual for further air bending information.

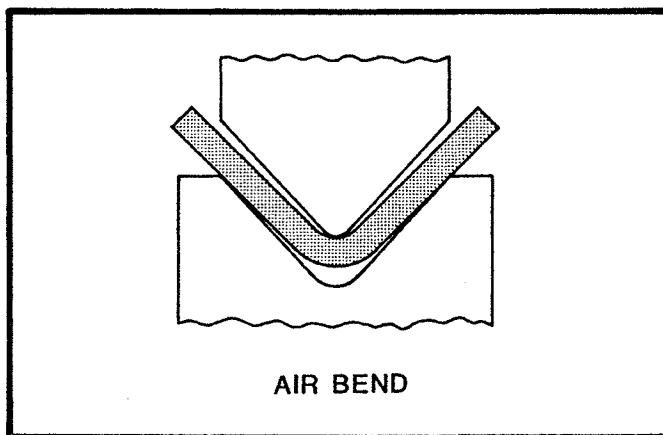


FIGURE 20

BOTTOMING DIES: The primary purpose of bottoming dies is to provide greater accuracy than air bend dies. They can also be used to obtain a relatively sharp inside corner. They are made in matched pairs, according to the thickness of the stock to be formed and radius required. See Figure 21. These dies require three to ten times as much pressure as air bend dies. Other types of bottoming dies are coining dies, used to obtain a sharp inside radius, multiple bend and channel dies, and radius bend dies.

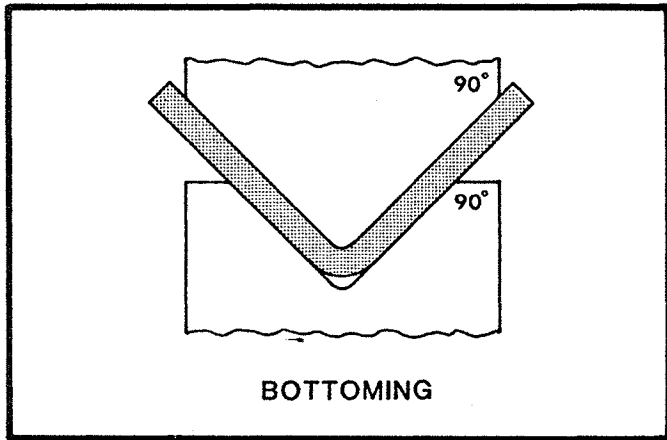


FIGURE 21

CINCINNATI INCORPORATED can provide many other types of standard and special dies, some of which are shown in Figure 22.

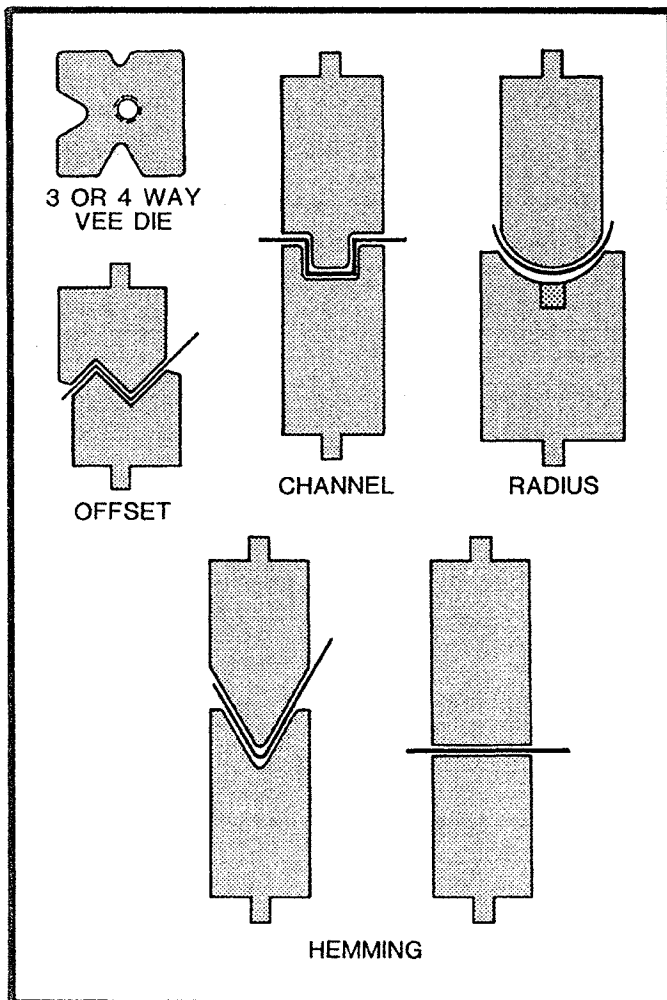


FIGURE 22

DIE SETS

Special care should be taken when operating die sets with guide pins and bushings. The top stop position should be set so the bushings never leave the guide pins when the ram makes an UP STROKE. Re-entry of the guide pins into the bushings may be difficult, if not impossible.

PUNCHING CAPACITY

CINCINNATI Hydraulic Press Brakes are rated to perform punching loads up to 66% of the maximum machine capacity when punching mild steel using self-contained units on an occasional basis. When punching is to be performed on a continuous production basis, with dedicated die sets or high tensile (70,000 PSI) material is to be processed, the punching capacity is reduced to 50% of the maximum machine capacity, Figure 23. Additional punching capacity can be obtained by stepping the punches (Figure 24) on multiple levels. For special punching applications, where die sets or special machine features (for example, wide bed, deep throat, etc.) are required, consult CINCINNATI INCORPORATED.

CB SERIES	MAXIMUM PUNCHING CAPACITY TONS/LEVEL	
	MILD STEEL	HI-TENSILE
90 CB	60	45
135 CB	90	67.5
175 CB	115	87.5
230 CB	150	115
350 CB	230	175

FIGURE 23

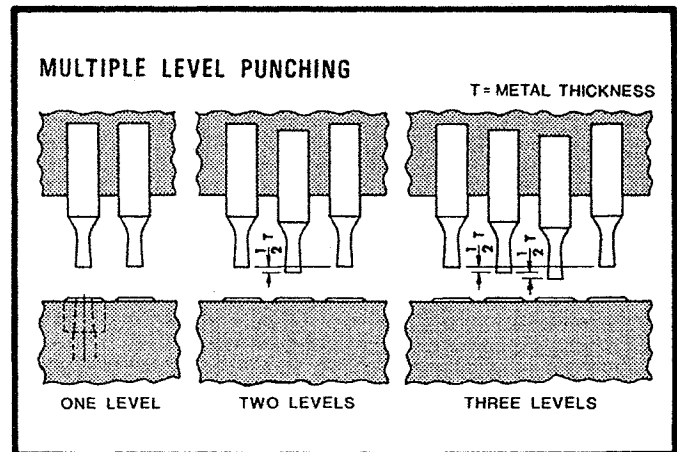


FIGURE 24

STRIPPING CAPACITY

A stripping load is a force which occurs on the up stroke of the ram. The direction of this type of load is down on the ram and up on the bed (the reverse of forming and punching loads). Figure 25 shows the maximum stripping load available at the center of the machine.

MACHINE SERIES	MAXIMUM STRIPPING LOAD (TONS)
90 CB	9.0
135 CB	13.5
175 CB	17.5
230 CB	23.0
350 CB	35.0

FIGURE 25

ECCENTRIC LOAD CAPACITY (FRONT-TO-BACK)

Occasionally special forming or punching set-ups are made which do not have their load centers located on the bed and ram centerlines. When this condition exists, care must be taken not to exceed the maximum eccentric (front-to-back) load capacity of the press brake.

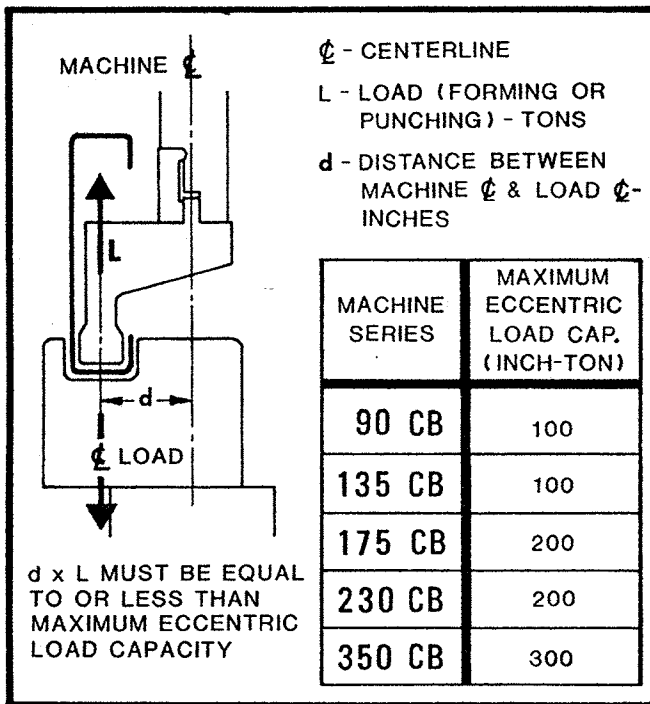


FIGURE 26

IMPORTANT

Exceeding the eccentric load capacity could damage the slides and guides, sink upper bed bolts into their counterbores causing bed to become loose, or overstress upper bed and die clamp bolts causing them to shatter and possibly causing injury to personnel.

OFF-CENTER LOAD CAPACITY (LEFT-TO-RIGHT)

Most forming and punching jobs are located on the centerline of the machine where the full rated machine capacity is available. When the load is not located at the center of the machine only a portion of the total capacity is available as shown in Figure 27.

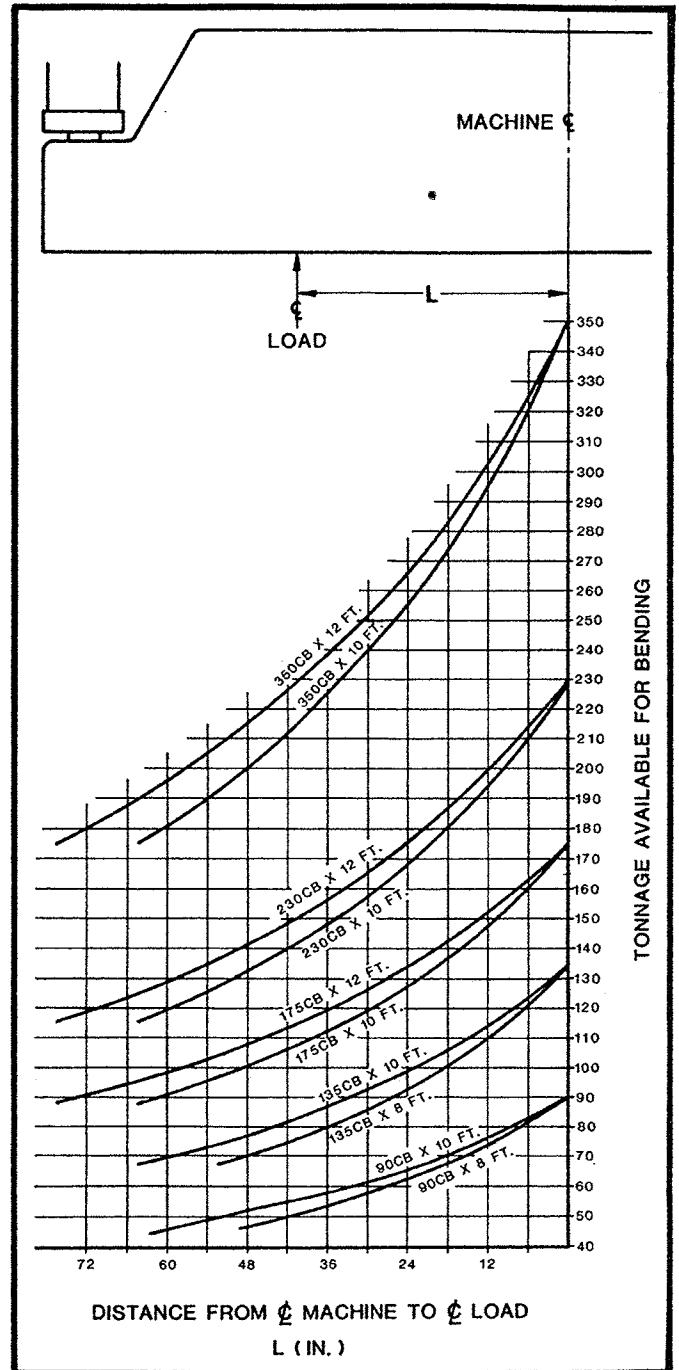


FIGURE 27

NOTE: The above tonnage ratings are for medium speed. Off-center load ratings in low speed are slightly lower for some models.

STROKE CYCLE TIME

When estimating the time to make production runs on a press brake, it is necessary to know the stroke cycle, material handling and gaging times. The stroke cycle time can be determined by using the following chart. If the DOWN STROKE STOP and/or UP STROKE STOP is used, their estimated time must be added to the stroke cycle time.

		STROKE LENGTH (INCHES)		
		90 CB	135 CB	175 CB
DOWN STROKE	HIGH	.40 x _____" = <input type="text"/>	.44 x _____" = <input type="text"/>	.45 x _____" = <input type="text"/>
	MED.	.85 x _____" = <input type="text"/>	.92 x _____" = <input type="text"/>	.92 x _____" = <input type="text"/>
	LOW	2.85 x _____" = <input type="text"/>	3.75 x _____" = <input type="text"/>	3.33 x _____" = <input type="text"/>
UP STROKE		.44 x _____" = <input type="text"/>	.49 x _____" = <input type="text"/>	.47 x _____" = <input type="text"/>
MACHINE CONSTANT TIME		<input type="text"/> 1.00 SEC.	<input type="text"/> 1.00 SEC.	<input type="text"/> 1.00 SEC.
OTHER HANDLING TIME		<input type="text"/>	<input type="text"/>	<input type="text"/>
TOTAL CYCLE TIME		<input type="text"/> SEC.	<input type="text"/> SEC.	<input type="text"/> SEC.

		STROKE LENGTH (INCHES)	
		230 CB	350 CB
DOWN STROKE	HIGH	.59 x _____" = <input type="text"/>	.92 x _____" = <input type="text"/>
	MED.	1.22 x _____" = <input type="text"/>	1.82 x _____" = <input type="text"/>
	LOW	4.28 x _____" = <input type="text"/>	6.67 x _____" = <input type="text"/>
UP STROKE		.63 x _____" = <input type="text"/>	.90 x _____" = <input type="text"/>
MACHINE CONSTANT TIME		<input type="text"/> 1.00 SEC.	<input type="text"/> 1.00 SEC.
OTHER HANDLING TIME		<input type="text"/>	<input type="text"/>
TOTAL CYCLE TIME		<input type="text"/> SEC.	<input type="text"/> SEC.

EXAMPLE: 135 CB

DOWN STROKE, HIGH - .44 x 2" = .88

DOWN STROKE, LOW - 3.75 x 1" = 3.75

UP STROKE - .49 x 3" = 1.47

MACHINE CONSTANT = 1.00

CYCLE TIME 7.10 SEC.

SET-UP AND USE

A hydraulic press brake is a very versatile bending machine. It is capable of exerting high forces between its bed and ram. These forces are applied and directed into the material to be formed by the use of tooling (dies).

The type and shape of the dies are the principle factors in establishing the shape of the part to be formed. There are many different types and shapes of press brake dies. Some have a very special and unique shape. However, most dies are members of a family of tooling called Vee Dies. See Figure 28. These dies, being the most common and widely used, will be referred to in the following instructions.

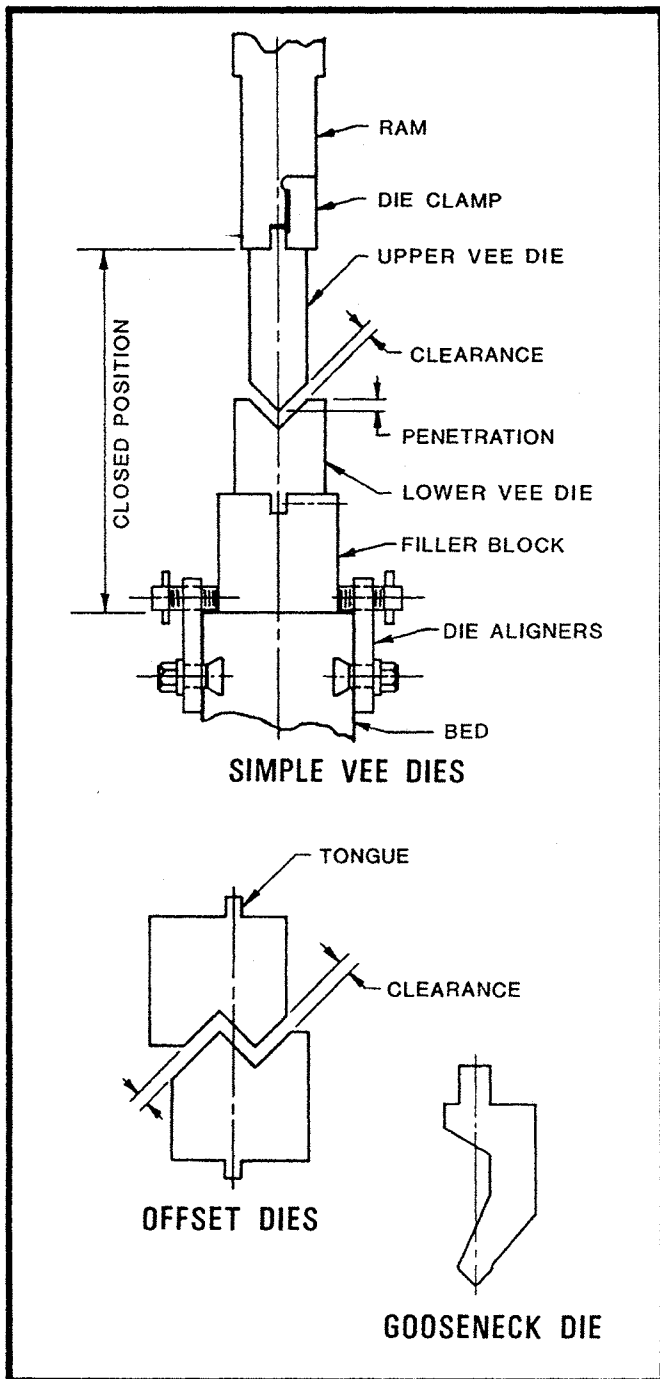


FIGURE 28

PRELIMINARIES - Before installing tooling in the Press Brake

1. Know the machine - thoroughly read this manual and become familiar with all of the controls and how they affect the ram motion. Run the machine and become familiar with its "feel".
2. Be safety conscious. Always follow the safety precautions outlined in this manual.
3. Select the proper tooling for the job. Make sure the dies are in good condition.
4. Whenever installing or removing tooling always place the MODE selector in the "INCH" position. When in this mode the ram can only be cycled by use of the dual palmbuttons.
5. Never place hands or arms between the dies.

INSERTING TOOLING

1. Set the machine controls:

MODE Selector -----	"INCH" (Palm-buttons only)
SPEED Selector -----	MEDIUM/LOW
Top Stop Cam -----	All The Way Up
Speed Change Cam -----	All The Way Up
Bottom Stop -----	All The Way Down (0.000")
TONNAGE Control (Optional) -----	Set on minimum tonnage
2. Run the ram to the bottom of the stroke and turn the STROKE CONTROL switch to the "OFF" position.
3. Place the filler block (die holder) on the bed and lightly bolt it in place. In some cases a filler block may not be required and the lower die may be placed directly on the bed. Deburr and lightly oil the top of the filler block and loosen all of the filler block set screws.
4. Insert lower die on the filler block leaving it extended past the end of the bed several inches. Visually center filler block so lower die is aligned with the slot in the ram nose.
5. Loosen all of the ram die clamps and run the ram upward so there is just enough space for the upper die. Turn the STROKE CONTROL switch to the "OFF" position.
6. Rest the upper die on extended portion of lower die. Make sure tongue of upper die is in the ram nose slot and that the upper die is trapped by the lower die and ram die slot. See Figure 29. Then slide upper die into lengthwise position with the lower die. Slide the set of dies into a centered position on filler block. Tighten the filler block set screws to lock lower die.

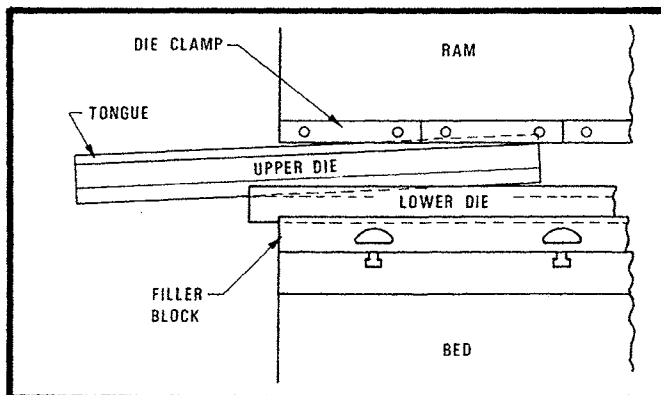


FIGURE 29

NOTE: Short, lightweight dies may be installed as a set and slid into position.

- Moderately tighten the ram die clamps to prevent male die from falling should the ram be raised. Align dies before seating upper die.
- Inch the ram downward until sufficient tonnage builds up to seat the upper die against the ram nose. Tighten the die clamps.

IMPORTANT

When seating some dies it may be advisable to place wood blocks or soft metal between dies to prevent damage to the dies. Short dies must have sufficient shoulder area to prevent sinking into the ram, bed or filler block. See TONNAGE CONTROL in Section 4.

- Adjust the bottom stroke stop cam upward until it contacts its limit switch and the "green" SET-UP light is lit (See Figure 5).
- Jog the ram upward to provide sufficient clearance between dies to check front-to-back alignment. Check alignment and tighten the filler block or lower die to the bed.
- Again jog the ram upward providing metal clearance between the dies. Raise the bottom stop, lighting the SET-UP light.

SET MACHINE CONTROLS

After inserting the tooling into the press brake, the machine controls should now be set for the particular tooling and job being run. Keeping records of these settings will save time for future repeat jobs.

MODE Selector: For production runs this selector should be placed in either the "SINGLE STROKE - NO AUTO RETURN" or the "SINGLE STROKE - AUTO RETURN" position. In general, the MODE selection and the palm-button - footswitch selection will be determined by the part being formed and the tooling used. Whenever possible it is recommended that the palmbuttons be used as they provide point-of-operation safety.

DOWN STROKE - SPEED Selector: This selector provides for a combination of any two of the three down speeds. Full tonnage is available in both LOW and MEDIUM speeds while 45% of full tonnage is available in HIGH speed. The forming speed selection is determined by the part to be formed and the required tonnage. Parts which have long front or back legs should be formed in LOW speed to prevent whip-up and back bending of the material.

BOTTOM STROKE STOP: This cam determines the bottom reversal point of the ram and is used for air bending. A counter readout is provided to allow positioning in thousandths of an inch. The bottom stop should initially be set so there is at least metal clearance between the upper and lower dies. The final position of this stop is determined by making trial bends. If bottoming dies are being used, the bottom stroke stop should be lowered far enough to prevent premature ram reversal.

TOP STOP: Adjust the top stop cam rod to provide sufficient space for inserting and removing the part from the die.

SPEED CHANGE: This position is usually set so the ram will shift into the selected forming speed, approximately 1/4" before contacting the workpiece.

DOWN STROKE - STROKE STOP: This selector will (when turned ON) automatically stop the ram on the down stroke at the speed change point. It may be used as a convenient stopping point to position a scribed line on the workpiece.

TONNAGE CONTROL: This is an optional machine feature which will limit the output tonnage of the machine as selected. It should be used whenever excessive tonnage could damage the tooling, part or machine. When using short dies it becomes very important to guard against excessive tonnage, which could sink the dies into the ram or filler block.

UP STROKE - STROKE STOP: This is an optional machine control which will (when selected) automatically stop the ram motion immediately after passing through the bottom of the stroke. This control enables the operator to gain control of a formed part before the ram returns to the top of the stroke position.

RAM TILT ADJUSTMENT: Normally the bed and ram should be set parallel to one another. Occasionally it may be necessary, because of the tooling or off-center loading, to "tilt" the ram for uniform bending.

CAUTION

BEFORE MAKING BENDS, MAKE SURE ALL SAFETY DEVICES ARE BEING USED AND ARE FUNCTIONING PROPERLY. EVALUATE EACH JOB FOR PROPER SAFEGUARDING. SEE ANSI STANDARD B11.3 - SAFETY REQUIREMENTS FOR THE CONSTRUCTION, CARE AND USE OF POWER PRESS BRAKES.

ALWAYS CYCLE THE MACHINE SEVERAL TIMES AT THE START OF A NEW JOB, AFTER EVERY BREAK, OR AT THE BEGINNING OF A NEW SHIFT TO VERIFY THAT THE CONTROLS ARE SET AND FUNCTIONING PROPERLY.

WHEN MAKING A BEND KNOW HOW THE PART WILL REACT ON THE FORMING STROKE AND ON THE RETURN STROKE.

REMOVING TOOLING

After the production run has been completed and the tooling is to be removed:

- Set the machine controls:

MODE Selector -----"INCH"
SPEED Selector -----MEDIUM/LOW
Speed Change Cam -----All The Way Up
TONNAGE Control (Optional) -----Set on minimum Tonnage

- Adjust the ram so the vertical clearance between the upper and lower dies is approximately 1/16" to 1/8" on the up stroke.
- Lower the bottom stop to its maximum down position (0.000"). Lower the top stop cam until it contacts its limit switch, changing the ram direction light from green to red.
- Shut OFF the power to the main drive motor.
- Loosen the die clamp nuts to free the upper die tongue. Loosen the filler block set screws to free lower die.

IMPORTANT

When loosening the ram die clamp nuts, be sure the upper die will remain trapped between the lower die and the slot in the ram nose. See Figure 30.

- The dies can now be removed endwise from the machine either together or individually.

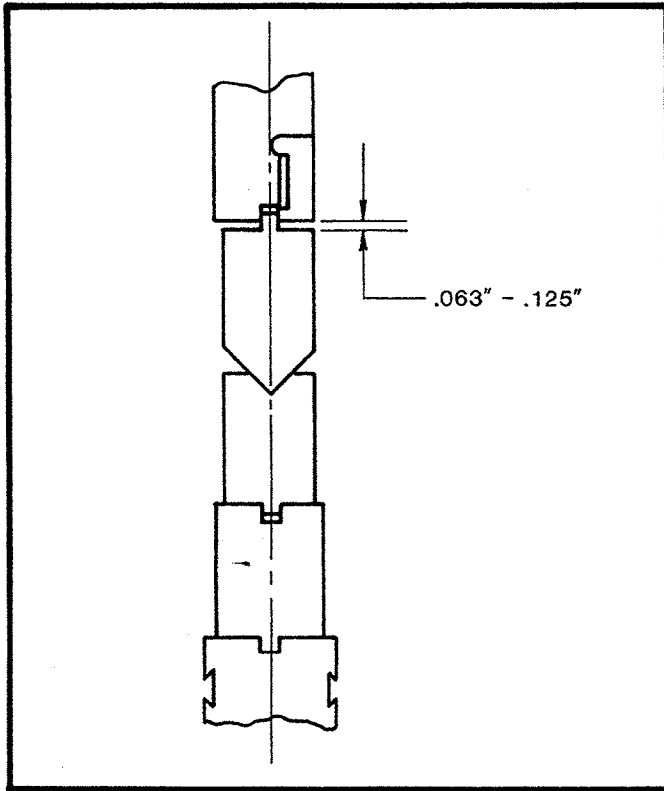


FIGURE 30

BENDING TIPS

Making good bends is an art. The following suggestions will help in making the best possible bends.

Whenever possible locate the tooling and the bend load on the front-to-back and left-to-right machine centerlines.

Some jobs may require shimming of the dies to correct for machine deflections or die wear. This is usually done by using thin metal or paper, .002 to .004 thick, starting with a long strip and then centering successively shorter ones on top. This "tapering" procedure may be used to produce very accurate bends. The recommended place to shim is under the filler block or lower die.

A bend difference between the two ends of the part usually indicates worn dies or die errors. This problem can easily be corrected by tilting the ram.

Always make sure the die shoulders are seated tightly against the ram nose and the filler block. Check for burrs when installing tooling.

Front-to-back die alignment is critical in producing uniform bends and in eliminating damaging thrust loads.

When forming with bottoming dies the amount of applied machine tonnage will affect the bend. If the machine is equipped with tonnage control it may be necessary to try different tonnages in establishing the best possible bend.

Selecting tooling which is correct for the job and compatible with the machine capacity is essential for making good bends.

Always inspect the tooling before starting a new job. It may be impossible to compensate for badly worn dies and they could create a safety hazard.

Two additional considerations for making good bends are gaging and blank development.

GAGING

Proper gaging is just as important as tooling and the press brake when attempting to make good parts. Each part should be individually analyzed for the best bend sequence method.

Selecting Proper Gage:

- Make a simple sketch showing the operation sequence of the bends.
- Determine the gage locations using the part edge or the previous bend to hold the best accuracy and part tolerance. Sometimes holes are used for gaging.
- When using backgages, provide a material stop of sufficient height and size to minimize the possibility of the workpiece passing beyond the backgage, which would allow your hands to enter the point-of-operation.
- Lot sizes, production requirements, shop methods and available \$\$\$ have also had a bearing on the selection of gages.
- PT sheets 601, 602, 603, 604, 605, 606, 608 and 609 give many examples of methods of gaging using CINCINNATI gages.

Figure 31 illustrates some examples of standard CINCINNATI gaging.

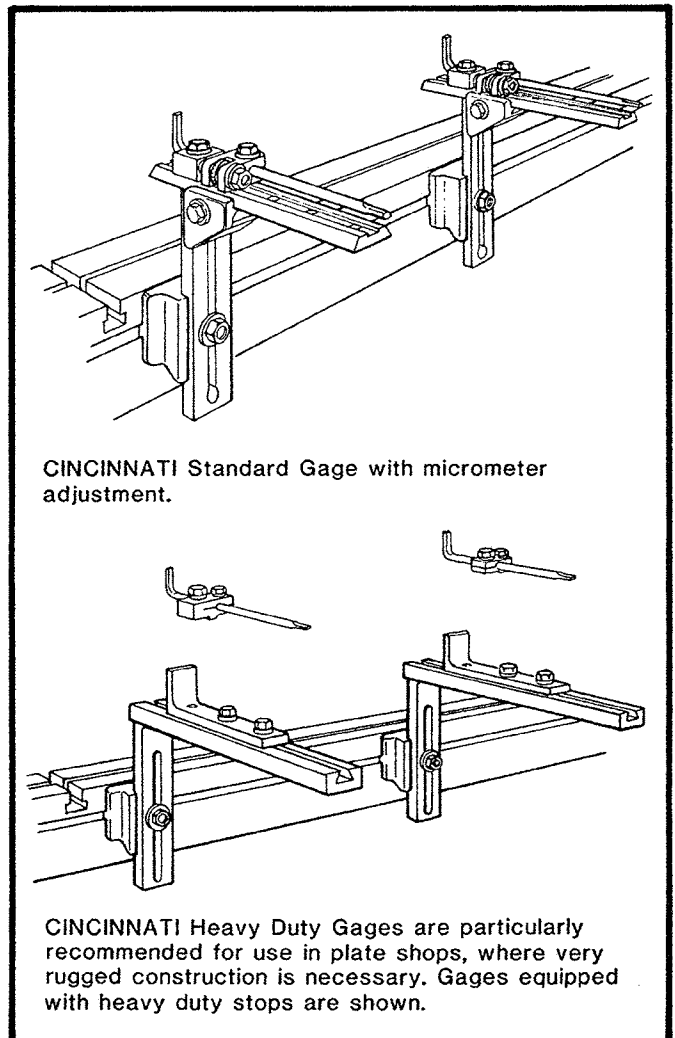
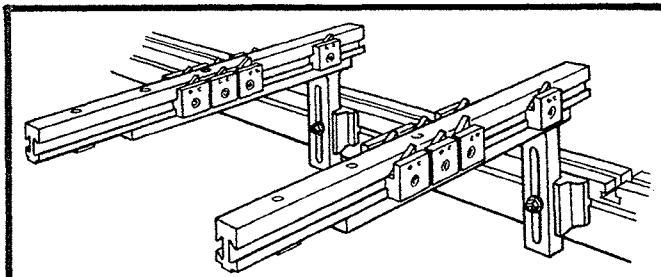
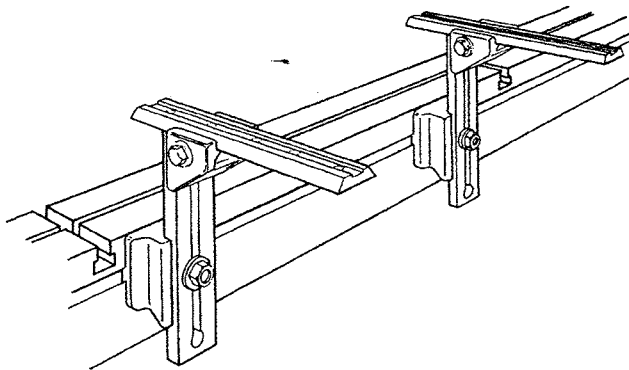


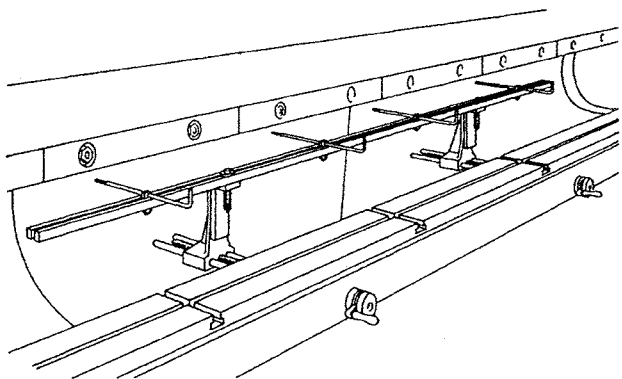
FIGURE 31



Adjustable Disappearing Gages provide multiple gaging positions with complete flexibility in vertical and horizontal positioning. These gages are easy to set-up, are accurate, and save many hours of work handling. Disappearing gage stop assemblies are located on either side of heavy duty gage bars. Any number of stops may be used.



CINCINNATI Standard Gage brackets without stops can be used for work supports.



CINCINNATI Front-operated, Dual Control Backgage is used for gaging light sheets. They are manually operated and have a 24" range. Adjustment of one screw will turn the other simultaneously.

FIGURE 31 (Continued)

BLANK DEVELOPMENT

This is not a gaging item but it is a necessary function to determine the gage location. Many users have developed their own methods and calculations. Information on blank development can be found in various handbooks.

See PRESS BRAKE CAPACITIES bulletin included with this manual for press brake bending capacities.

Until formulas, charts and bending operations are verified, it is always best to make up an actual part before cutting a lot of blanks.

Changing material, die opening, upper die radii, tonnage (hitting harder or lighter), and the sequence of bending are some of the things that affect blank calculations.

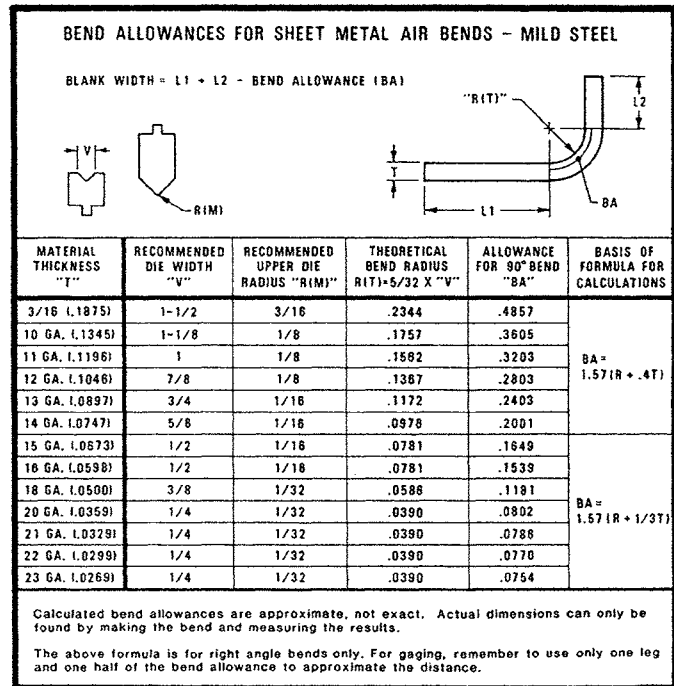


FIGURE 32

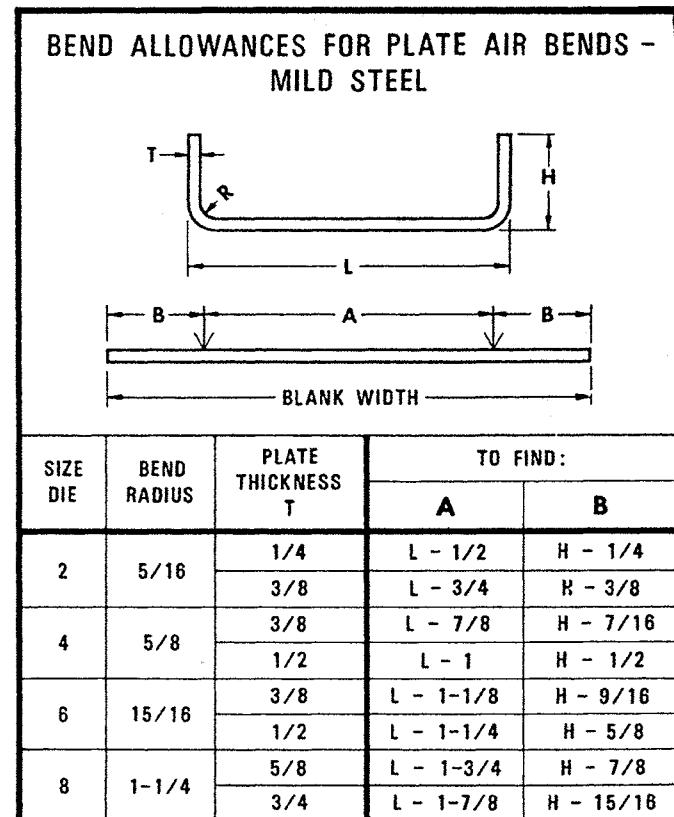


FIGURE 33

SECTION 6

MAINTENANCE AND ADJUSTMENTS

To maintain the exceptionally accurate performance of your CINCINNATI Hydraulic Press Brake there are certain maintenance practices that should be followed. This section of the manual will deal with the maintenance and adjustments of CINCINNATI CB Hydraulic Press Brakes.

LUBRICATION (FIGURE 34)

1. Clean the exposed portions of the leveling tape. (Weekly)
2. Place a few drops of oil on the bottom stroke stop adjusting screw and on the tilt adjusting screw. (Weekly)
3. Lubricate the clevis pin grease fittings while cycling ram under load, such as obtained with a bumping die. Use a No. 2 Lithium base grease with "moly" additive (C.I. grease H-2M). Lubricate once a week for first six weeks and once a month thereafter.
4. The ram guides should be wiped clean and flushed with oil. (Monthly or as required)

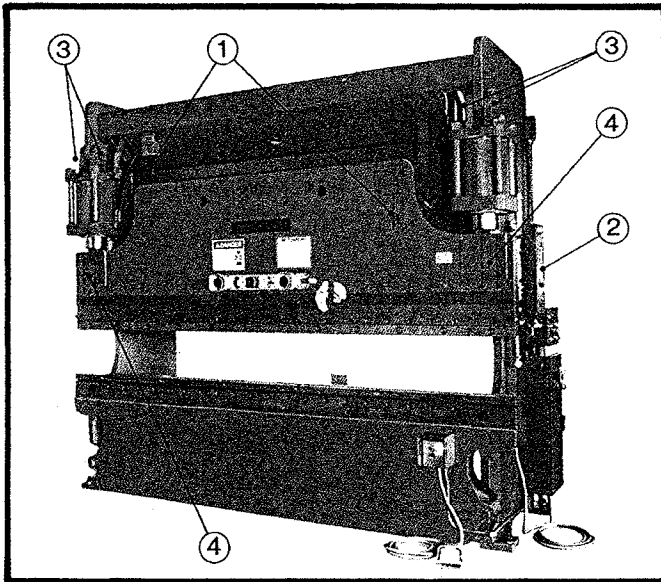


FIGURE 34

HYDRAULIC OIL

The hydraulic reservoir should be filled to the center of the oil level gage with the ram at the top of its stroke. Use light hydraulic oil, viscosity 150 seconds at 100° F with anti-rust, anti-oxidation and anti-wear additives (C.I. oil B-150). The capacity is 80 gallons for the 90 CB and 135 CB, and 175 gallons for the 175 CB and larger.

It is very important that the oil be clean. All precautions should be taken to keep the oil clean, free from chips, grit, water, sludge, coolants, cutting oils, etc. The oil should be filtered (10 micron) when put in the reservoir and replaced when sludge is evident. The oil level should be checked daily and check for water accumulation monthly. The oil should be drained and replaced after one year service or sooner if it becomes contaminated. The drain valve is located in the bottom of the reservoir.

New oil stored in drums is usually not clean as the filtered oil shipped with the machine. Oil should be pumped through a 10 micron filter or added through the return line filter. Do not remove the bypass check when adding oil

through the filter. When the oil is changed the machine should be run in idle for a few hours while filter indicator is watched. Change the filter element if required.

Refer to CINCINNATI INCORPORATED Recommended Lubricants sheet included with this manual for various manufacturer's brand names.

OIL FILLER-BREATHER

A combination of oil filler-air breather (Figure 6) is located in the top of the oil reservoir. As oil is pumped out of reservoir to the cylinders during operation, it is replaced by air. The filler cap has a 40 micron element which filters air entering the reservoir.

To clean oil filter strainer, remove six screws and lift out strainer unit. Backflush strainer with solvent. Allow to dry before replacing. To clean air breather, remove cap and back blow with low pressure air hose. Clean yearly.

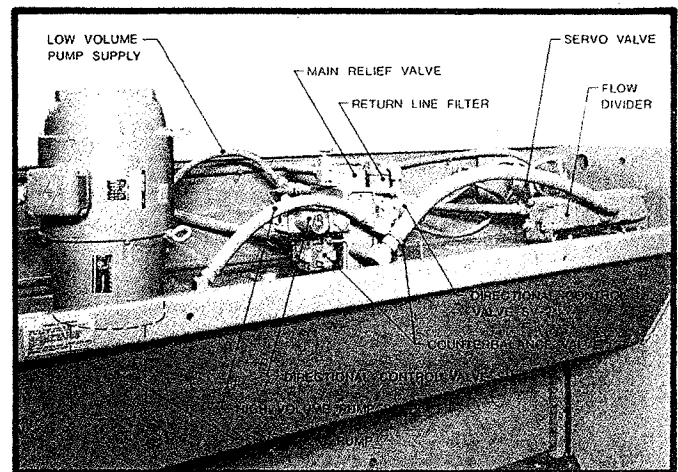


FIGURE 35

OIL FILTERS

An immersion suction strainer (Figure 36) is attached to the pump intake line. This strainer is accessible by removing the right reservoir cover plate. The suction strainer should be replaced every six months or after each 1,000 operating hours.

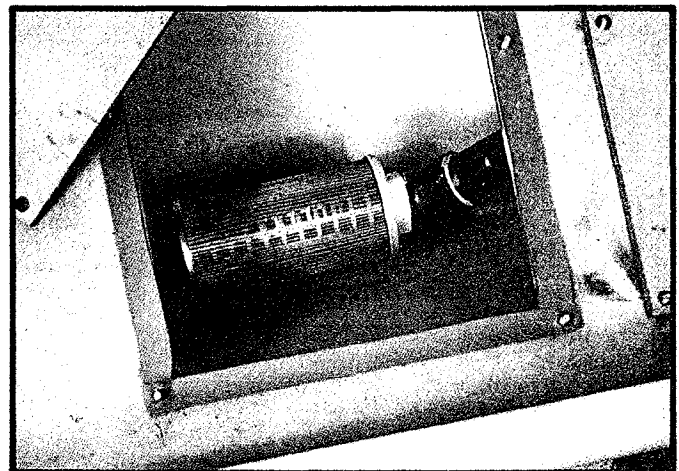


FIGURE 36

A return line micron filter (10 micron) is located adjacent to the hydraulic manifold, Figure 35. The filter cartridge should be replaced after each 1,000 operating hours, or when dirt indicator on filter is in the RED zone with main drive motor running. Failure to replace filter as specified could lead to erratic operation of the machine due to sluggish or sticking valve operation.

CHECKING AND SETTING HYDRAULIC PRESSURES

This hydraulic system is equipped with male quick-disconnect fittings at the most frequently checked pressure ports. Pressure gages with female quick disconnects are furnished with the machine.

1. Main Relief Pressure.

Adjust the ram parallel to bed. Turn OFF main drive motor. Install a 0-5000 PSI gage in the relief valve test port as shown in Figure 37. Restart the main drive motor and inch the ram upward by manually actuating solenoid SV1-A until the pistons bottom out on the upper cylinder heads. Actuate solenoid SV1-A again and read main relief pressure (do not keep SV1-A actuated for more than 5 seconds at a time). If the pressure is incorrect, see below, loosen locknut and turn socket head screw to adjust. Turn the adjusting screw clockwise to increase or counterclockwise to decrease the pressure. Retighten locknut after adjustment is complete. Turn motor OFF and remove pressure gage.

MAIN RELIEF PRESSURE	2500 PSI
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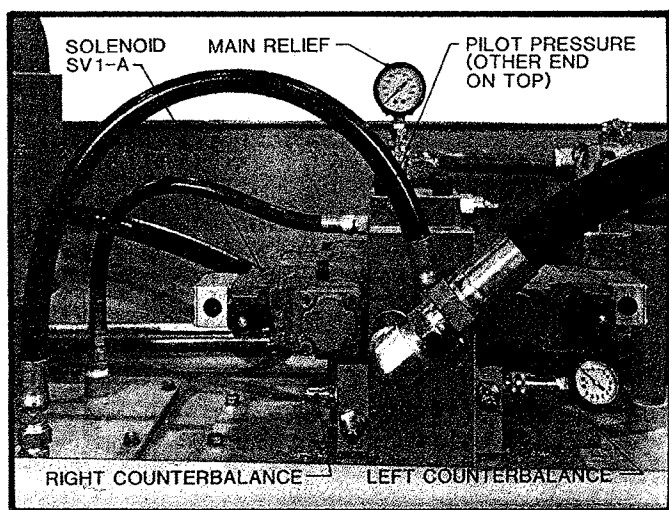


FIGURE 37

2. Counterbalance Pressure

Turn OFF main drive motor. Install a 0-600 PSI gage in either counterbalance valve test ports as shown in Figure 37. Set the machine to run a full length down stroke in low speed. Restart the main drive motor. The counterbalance pressure is checked while running in low speed down stroke (see below). If the pressure is incorrect, adjust by loosening locknut and turning hex head bolt on counterbalance valve. Turn the adjusting bolt clockwise to increase or counterclockwise to decrease the pressure. Check and adjust other counterbalance valve. It is more important to have both counterbalance valves set to the same pressure than it is to have the exact pressure setting specified below. Retighten locknut after adjustment is completed. Turn motor OFF and remove the pressure gage.

COUNTERBALANCE PRESSURE	200-250 PSI
-------------------------	-------------

3. Pilot Pressure

Turn OFF main drive motor. Install a 0-600 PSI gage in the manifold test port as shown in Figure 37. Start main drive motor and read pilot pressure. Pilot pressure is created by an orifice plug (1/4 pipe) in the manifold and is non-adjustable. Turn OFF main drive motor and remove gage.

PILOT PRESSURE	90 \pm 10 PSI
----------------	-----------------

CYLINDERS

Replacing Piston Rod Seal:

1. Run ram to the maximum down position. Block both ends of the ram.
2. Turn OFF machine and LOCK the electrical disconnect.
3. Remove ram pin cover plate on front of ram. Using extractor bar, Figure 38, remove the ram shoe, Figure 39.

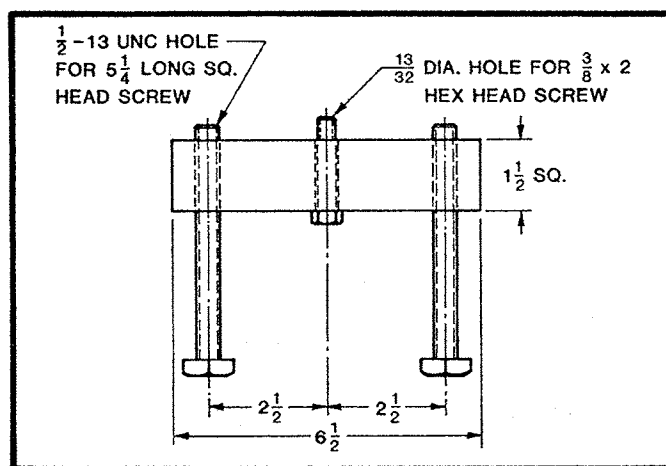


FIGURE 38

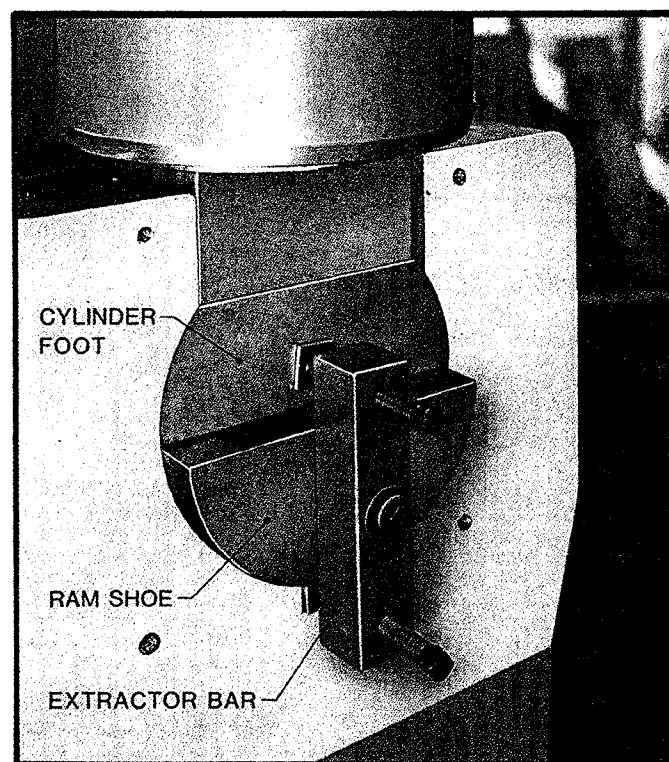


FIGURE 39

4. Swing cylinder out from ram. Insert wooden block between cylinder and housing so piston rod is clear of ram, Figure 40.
5. Remove 6 or 8 bolts from seal retainer. Insert 3 or 4 3/8" x 1" (or longer) set screws into tapped holes in retainer. Tighten set screws to back-off retainer. Support retainer to keep from falling free. Remove seal retainer.

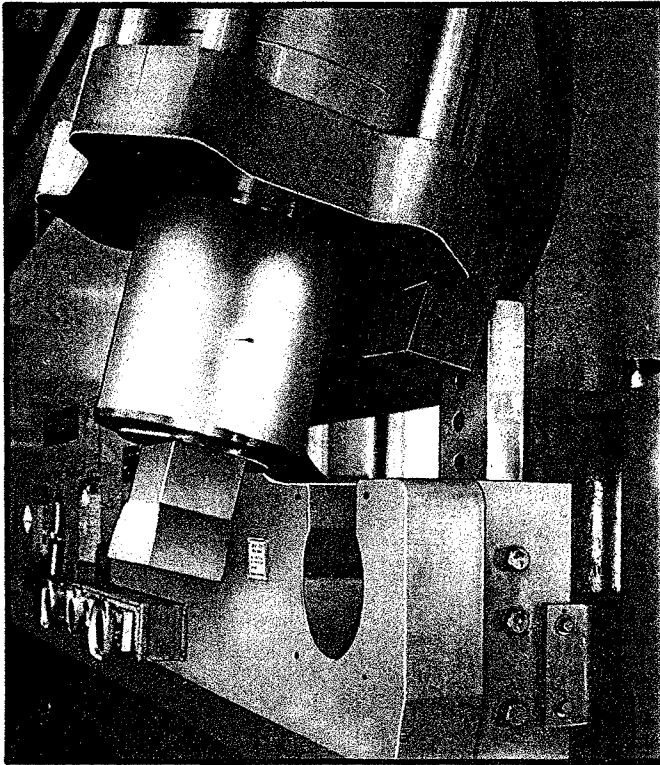


FIGURE 40

6. Remove seal from groove in bore of seal retainer. This seal has an energizing "o" ring to pre-load the seal. Replace with a new seal. Also inspect non-metallic bearing strip in bore of seal retainer and "o" ring seal in top face of retainer. Replace if necessary.
7. Using auto body slide hammer-puller, remove the piston rod seal, Figure 41. This seal has no energizing "o" ring. Be careful not to damage finished surface of piston rod or lower head seat.
8. Slide new piston rod seal over piston rod and push into lower head seat as far as possible. Replace piston rod seal retainer, gradually tightening bolts to seat new seal. See Cylinder assembly drawing included with this manual for proper seating torque of these bolts.
9. Remove wood block and swing cylinder back into position with ram. Replace ram shoe and ram pin cover plate.

Replacing Piston Seal Ring:

Because of high pre-load on cylinder tie rods, special equipment is required to disassemble and reassemble the cylinders. Contact CINCINNATI INCORPORATED Service Department for further information.

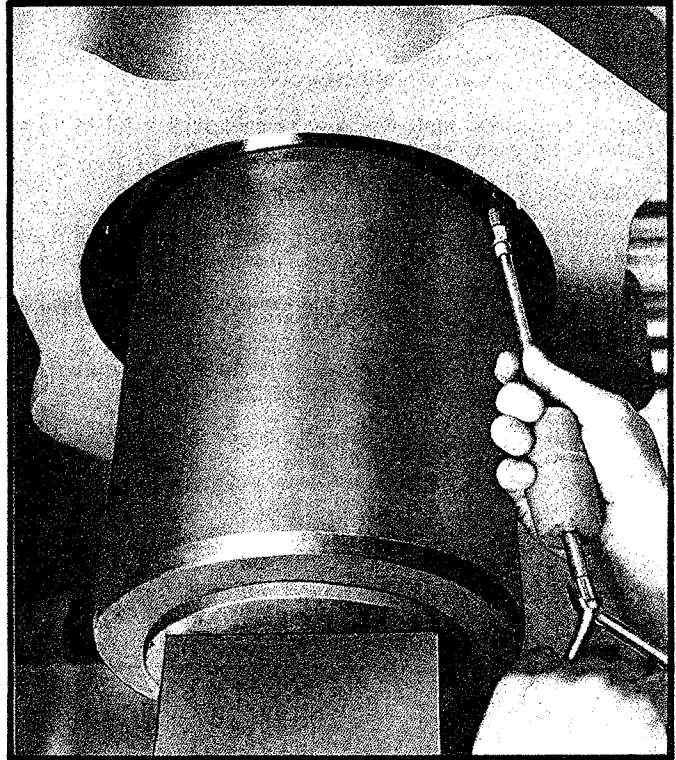


FIGURE 41

PUMP (FIGURE 42)

The pump used is a "Balanced Vane Type", high performance, fixed displacement double pump with high and low volume output sections. It is direct coupled and bolted to the drive motor end bell.

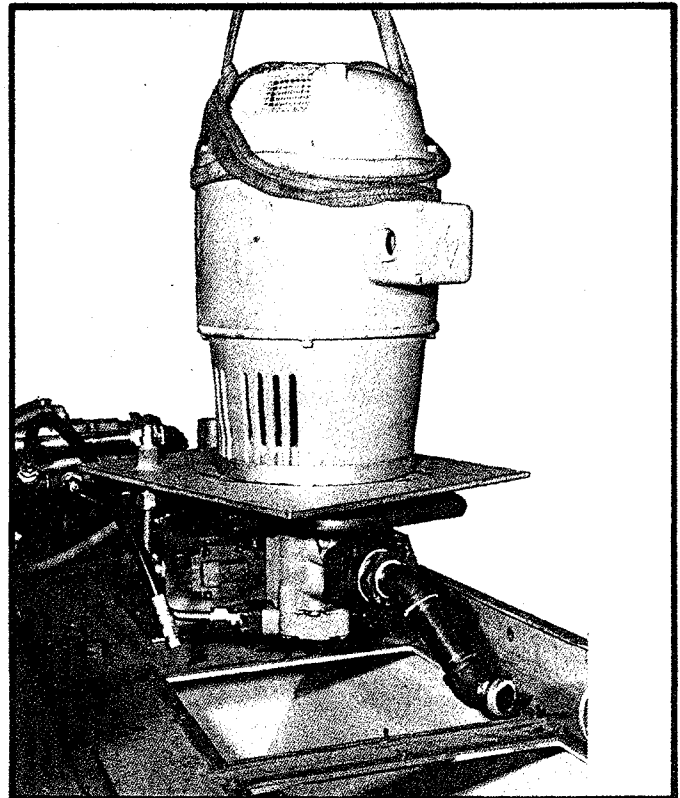


FIGURE 42

To service this pump:

1. Block both ends of the ram, turn OFF all power to the machine and lock the electrical disconnect.
2. Disconnect the high and low volume supply hoses from the motor-pump assembly plate.
3. Disconnect the motor leads.
4. Remove cover next to motor-pump assembly from tank top. Remove suction strainer from intake line to pump.
5. Remove all the nuts securing the motor-pump assembly plate to the tank top.
6. Lift the entire assembly from the hydraulic tank using care not to damage the intake strainer.
7. The pump can now be disassembled from the motor.

A detailed service bulletin for this pump is included with this manual.

IMPORTANT

After installing a motor/pump assembly in the machine, the motor rotation should be checked prior to full running.

VALVES

The hydraulic control valves are manifold mounted and can be easily removed for service or replacement. See Figure 35.

IMPORTANT

Whenever servicing these valves, the ram should be blocked, all power to the machine turned OFF and the electrical disconnect locked.

Detailed service bulletins are included with this manual.

LEVELING SYSTEM (FIGURE 43)

The leveling system of the CB Hydraulic Press Brake consists of a servo valve actuated by a leveling band. The leveling band passes over two sheaves on the rear of the ram and is anchored to the servo actuating mechanism at the left side of the housing brace and to the tilt adjusting mechanism at the right side of the brace. An out-of-level ram condition causes the leveling band to either tighten or slacken, which in turn allows the servo valve spool to shift and bleed oil from the top side of the leveling cylinder. Two limit switches are also provided so an excessive out-of-level condition will stop main drive motor. These switches are set to operate at a tilt of 1/2" either direction in the length between the vertical legs of the leveling band.

CHECK THE LEVEL OF THE BED AND RAM:

The leveling system is designed to maintain the ram either parallel to or at a preset angle with respect to the bed while cycling. The parallelism of the bed and ram is checked as the ram passes through the bottom of the stroke changing from a downward to an upward direction.

1. Set tilt control adjusting knob and pointer to their "zero" positions.
2. Adjust the speed control cams so the ram approaches the bottom of the stroke in low speed.
3. Mount a dial indicator on the extreme right end of the bed so it indicates the bottom reversal point of the ram. Figure 44. (Do not indicate off the ram die clamps.)

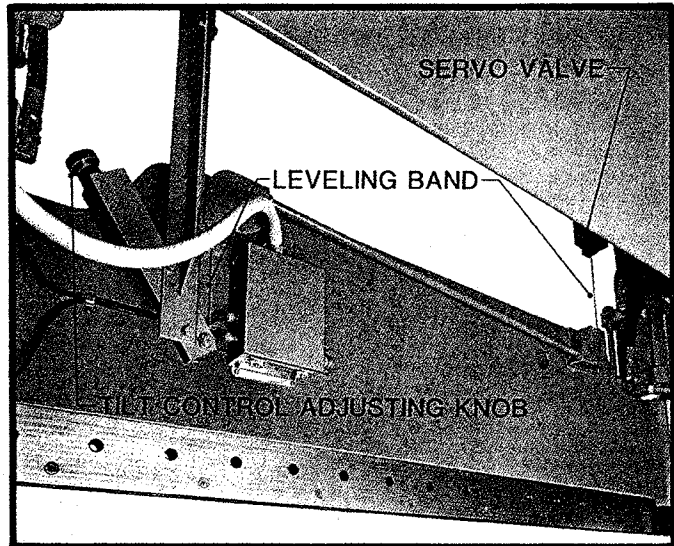


FIGURE 43

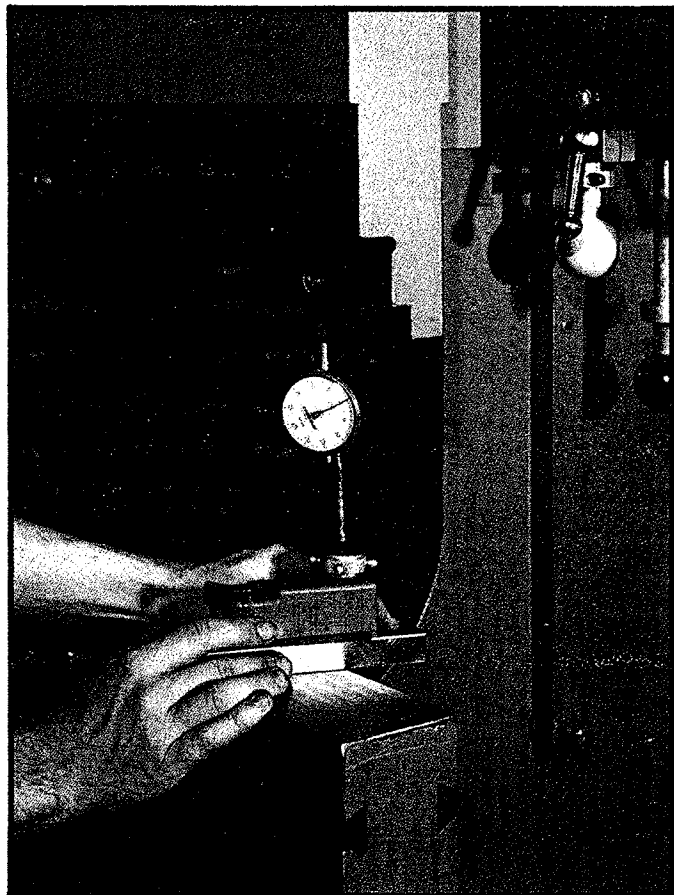


FIGURE 44

4. Run a number of strokes to verify that the ram is reversing consistently to the same indicator setting.
5. Without changing the indicator or bottom stroke stop setting, reposition the dial indicator at the extreme left end of the bed.
6. Run a number of strokes, adjusting the tilt control knob to raise or lower the left end of the ram, until the indicator reads the same as it had at the right end of the machine.

7. Repeat Steps 4, 5 and 6 until both ends of machine have the same indicator reading at the ram reversal point.
8. If necessary, replace the tilt adjusting knob graduated decal aligning its zero position. Also adjust the tilt pointer to its zero position.

REPLACING THE LEVELING BAND:

1. Block the ram so it is parallel to bed.
2. Turn OFF all power to the machine and lock the electrical disconnect.
3. Remove the old leveling band and cut the new band to the same length as the old one.
4. Attach the new leveling band to the anchor point on the adjusting knob screw.
5. Pass the leveling band over the sheaves and through the protective tube on the rear of the ram.
6. Attach the left end of the leveling band to the servo valve anchor, pulling the band as tight as possible.
7. Tighten the band by turning the tilt adjusting knob (clockwise) until .040" clearance is provided between the servo valve anchor collar and the bottom of the servo valve mounting block. This is the zero point or neutral position for the servo valve.
8. The tilt adjusting knob screw should be recessed approximately 5/8" (+1/8") from the end of the knob when the servo valve is in the neutral position. Repeat Steps 6 and 7 until this dimension is obtained.
9. Check the level of the bed and ram per the previous instructions.

REPLACING SERVO VALVE:

1. Block ram at both ends. Turn OFF all power to machine and LOCK disconnect switch on main electrical enclosure.
2. Remove cover and old servo valve from servo valve housing.
3. Place .040" feeler gage between servo valve anchor collar and servo valve housing.
4. Install locknuts on servo valve stem located at bottom of servo valve. Bolt new servo valve in place.
5. Adjust position of valve spool with adjusting nuts to obtain .188" ±.005" dimension. See Figure 45.
6. Check parallelism of bed and ram as previously described. Adjust if necessary to obtain parallelism.
7. Replace servo valve cover.

RELEVELING THE RAM:

Should the ram go out-of-level far enough to actuate the out-of-level limit switch, it must be releveled mechanically.

IMPORTANT

The Tilt Limit Switches must not be bypassed or readjusted to restore electrical circuits. If machine is operated with excessive tilt, the slides and guides may be damaged.

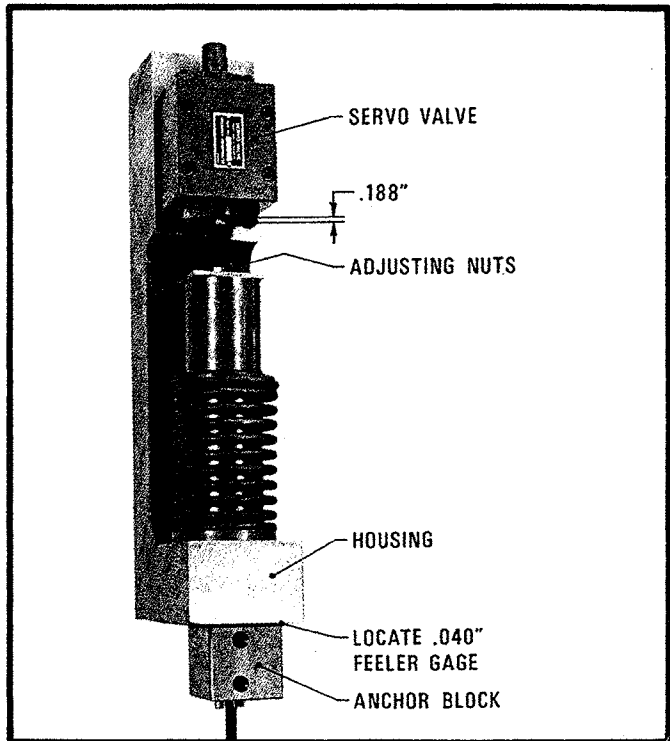


FIGURE 45

1. Turn OFF all power to the machine and lock the electrical disconnect.
2. Place two jacks between the bed and ram. Locate one near each end of the ram. Apply sufficient pressure on each jack to support the weight of the ram, slide and piston. Be sure to protect the ram nose so the jack does not damage it.
3. Remove female quick-disconnect fitting from a pressure gage. Attach a shut-off valve with a flexible hose on its outlet to the quick-disconnect. Install this assembly to counterbalance check port on side of machine where ram is the highest. The hose should be long enough to reach the reservoir oil fill opening.
4. The lower area of the cylinder can now be drained by opening the valve. The high side of the ram should be bled down until the ram is parallel with the bed. As this is done, it will be necessary to lower the corresponding jack. When the ram is back in a parallel position, the tilt limit switch will activate the electrical circuit and the drive unit can be started.

TILT LIMIT SWITCHES (FIGURE 46)

Two limit switches are mounted on the right ram slide (back side of ram) for limiting the maximum ram tilt. Should the ram exceed its allowable tilt, these switches will shut off the drive motor. To set these switches the bed and ram should be parallel (+1/16") to one another. The tripping point of the switches is measured by passing a feeler gage past the rollers holding it flat against the side of the ram guide. The limit switches should be positioned so a .028/.032" feeler gage trips the switches.

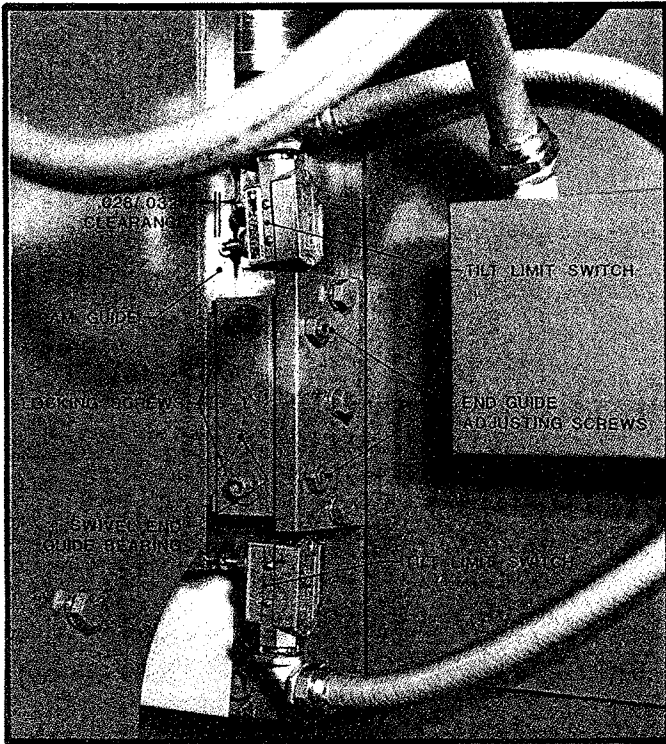


FIGURE 46

MACHINE LEVELNESS

The machine levelness should be checked every three months and adjusted if necessary. See Section 1 - INSTALLATION for details of this adjustment.

SWIVEL END-GUIDE BEARINGS

To adjust for wear in the swivel end-guide bearings, loosen the locking screws. Adjust ram shoe clamp by tightening the adjusting screws evenly until they are snug. Back-off slightly to obtain a clearance of .003" between guide and swivel end guide bearing. Tighten the locknuts. See Figure 46.

ELECTRICAL

The logic control is a printed circuit board designed for long life. If for any reason there is a problem in this board, it should be replaced as a unit.

A logic diagram and board layout drawing is included with this manual for reference.

TROUBLESHOOTING

Effective troubleshooting is usually acquired with experience and by a thorough knowledge of your machine and its operation. The assembly drawings, including hydraulic and electrical schematics included with this manual should be used as troubleshooting aids. The following chart has been developed to present typical effects which indicate trouble spots in the machine system.

TROUBLE	PROBABLE CAUSE	WHAT TO DO
A. Pump motor will not start.	<ol style="list-style-type: none"> Ram has tilted beyond limits contacting 1LS or 2LS. Blown fuse 440V - FU 1, 2 & 3 110V - FU 4 Power supply - FU 5 & 6 Motor heaters. 	<ol style="list-style-type: none"> Re-level ram, Section 6 - if condition repeats see C, K, L or Q below. Replace fuse - if fuse continues to blow, check for unwanted grounds or shorts. Reset heaters - if heaters continue to kick out, check motor for abnormal loading.
B. Upon reaching the top stop position the pump motor stops (top drift failure).	<ol style="list-style-type: none"> Piston seals leaking. Faulty counterbalance valve. 	<ol style="list-style-type: none"> Replace seals - Section 6. Repair or replace.
C. Ram drifts downward rapidly when in idle resulting in a "tilt" condition. (Motor shuts off).	<ol style="list-style-type: none"> Counterbalance setting too low. Faulty counterbalance valve. Piston seals leaking. 	<ol style="list-style-type: none"> Reset counterbalance pressure - Section 6 Repair or replace. Replace seals - Section 6.
D. Ram will only run in "FAST" down speed and will not return to the top.	<ol style="list-style-type: none"> SV1 solenoid valve remains in center position. 	<ol style="list-style-type: none"> 1.1 Check electrical connections and signal. 1.2 Shift valve with manual override several times. Repair or replace valve if problem continues.
E. Ram will only run in "LOW" speed (up and down).	<ol style="list-style-type: none"> SV2 solenoid valve remains in center position. 	<ol style="list-style-type: none"> Same as D.

TROUBLE	PROBABLE CAUSE	WHAT TO DO
F. Ram speeds are lower than normal.	1. Worn pump section(s).	1. Overhaul or replace.
G. Ram stalls during bend and will not reverse or reach maximum capacity.	1. Main relief pressure set too low. 2. Worn pump section(s).	1. Reset main relief pressure - Section 6 2. Replace pump cartridge(s).
H. Ram stalls during bend and will not reverse, but does reach maximum capacity.	1. Solenoid valve SV1 remains in the "B" position. 2. Solenoid valve SV2 remains in the "A" position.	1. Check electrical connections and signal to valve(s) and pressure switches. 2. Shift valve(s) with manual override several times. Repair or replace valve if problem continues.
I. Ram reverses before building up proper tonnage or completing the bend.	1. Defective pressure switch(s) (1PS or 2PS) 2. Defective tonnage control pressure transducer. 3. Bottom stop set too high.	1. Isolate defective component & by alternately disconnecting from circuit and replace. 2. Lower bottom stop.
J. Tonnage reaches maximum capacity but the ram reverses before completing the bend.	1. Attempting to make "over" capacity bends. 2. Load not centered left-to-right on machine.	1.1 Tensile and yield of part are too high. 1.2 Improper dies for material and/or bend. 2. Center the load and see Section 5 of this manual.
K. Ram goes out-of-level during bend and shuts off drive motor.	1. Piston seal leaking. 2. Internal leakage in flow divider.	1. Replace seal - Section 6. 2. Overhaul or replace.
L. Erratic leveling of the ram - inconsistent from bend to bend.	1. Leveling tape. 2. Servo valve. 3. Flow divider.	1. Check tape, protective tube and sheaves for damage and free movement. 2. Remove and inspect servo valve - clean or replace. 3. Overhaul or replace.
M. On return stroke the ram continues up past the top stop and pistons top out in cylinders.	1. Top stop limit switch 3LS. 2. Solenoid valve SV1 remains in the "A" position.	1. Check electrical connections and signal. Adjust limit switch cam arm. Replace defective switch. 2. Shift valve with manual override several times. Repair or replace valve if problem continues.
N. On down stroke ram will not shift speeds.	1. Speed change limit switch 4LS. 2. Solenoid valve SV1 remains in the "A" position.	1. Same as M. 2. Same as M.
O. With pump drive motor running, ram will not cycle.	1. Improper selector switch(s) or stroke control cam settings. 2. Footswitch or palmbutton.	1. Check all selector switch and stroke control cam settings. 2. Check electrical connections and signal. Check actuators - repair or replace.
P. Ram will not reverse on bottom limit switch but continues downward reversing on tonnage.	1. Bottom stop limit switch 5LS.	1. Check electrical connections and signal. Replace defective switch.

TROUBLE	PROBABLE CAUSE	WHAT TO DO
Q. Pump motor stops whenever ram is stopped and will not re-start.	1. Tilt limit switch(s) 1LS or 2LS are being tripped.	1.1 Tilt switch trip point is set too close. Adjust to specifications. 1.2 Slow acting counterbalance valve - repair or replace.
R. Noisy pump.	1. Cavitation. 2. Worn pump. 3. Air in fluid.	1.1 Clogged inlet line. 1.2 Low fluid level. 1.3 Contaminated fluid - replace. 2. Overhaul - replace. 3.1 Loose connections. 3.2 Pump shaft seal.

Solenoid valves - The 4-way directional control valves used on this machine are pilot operated with DC solenoids and manual overrides. A service parts information bulletin is contained with the assembly drawings in this manual. When a control valve is suspect of faulty operation the following should be verified before replacing the valve:

- A. Is valve receiving control signal?
- B. Is valve receiving pilot pressure?

Three simple maintenance procedures which have the greatest effect on hydraulic system performance, efficiency and life are:

- A. Maintaining a clean sufficient quantity of hydraulic fluid of the proper type and viscosity.
- B. Changing filters and cleaning strainers.
- C. Keeping all connections tight, but not to the point of distortion, so air is excluded from the system.

MAINTENANCE CHECK LIST - CB HYDRAULIC PRESS BRAKES											
LUBRICATION SCHEDULE						DAILY	WEEKLY	MONTHLY	3 MONTHS	6 MONTHS	YEARLY
1	Check reservoir oil level	X									
2	Clean leveling band		X								
3	Lubricate stroke adjustment and tilt adjustment screws		X								
4	Lubricate cylinder clevis pins			X							
5	Clean and flush ram guides with oil			X							
6	Check for water in reservoir			X							
7	Drain, clean and refill hydraulic reservoir										X
CHECK OR ADJUSTMENT											
1	Check entire machine for loose fasteners-tighten if necessary	X									
2	Wipe entire machine clean			X							
3	Check leveling system			X							
4	Check machine levelness				X						
5	Check ram guide clearance - relevel if necessary				X						
6	Adjust swivel end guide bearings				X						
7	Replace oil return line filter element							X			
8	Replace pump suction filter										X
9	Clean reservoir oil filler-breather										X
10	Check hydraulic pressures										X

ABOVE INTERVALS ARE BASED ON ONE SHIFT AND NORMAL PRESS OPERATION. DETAILED INSTRUCTIONS FOR SERVICING THE MACHINE CAN BE FOUND IN THIS MANUAL.