OPERATION, SAFETY AND MAINTENANCE MANUAL

CINCINNATI
90-350 AUTOFORM® CNC FORMING CENTER WITH PC CONTROL

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CINCINNATI

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AUTOFORM® PRESS BRAKE CONTENTS

SECTION 6 MACHINE CONTROLS (Continued)

SECTION 7 OPERATION

SECTION 8 OPTIONS

SECTION 9 MAINTENANCE & ADJUSTMENTS

SECTION 9 MAINTENANCE & ADJUSTMENTS (Continued)

SECTION 10 SERVICE AND PARTS

INTRODUCTION

CINCINNATI AUTOFORM®

The AUTOFORM is a hydraulically driven, servo-controlled press brake. Linear encoders constantly monitor the bed-to-ram position, feeding this information to the Control. The Control is a self-contained industrial PC with and integrated LCD touchscreen display, keyboard and pointing device, floppy disk drive, CD-ROM drive, Operator Control keyswitch and main drive START/STOP buttons. The program controls the vertical movement of the ram and movement of the backgage. After a program is entered either the machine can be run or the program stored in internal memory. The AUTOFORM PC Control allows an individual job to be quickly set-up and run as well as complicated, multi-bend parts or long run jobs. After a program is run, the program and related setup information can be saved for future use.

PART QUALITY

The following factors affect part quality:

- ✦ Press Brake condition and repeatability
- ✦ Operator ability
- ✦ Condition of tooling
- ✦ Quality of material

CINCINNATI machines are designed to be rugged and durable. However, improper adjustment or lack of maintenance can reduce the quality of parts produced on that machine. These factors may also affect the repeatability of the machine. A machine that will not consistently reverse at the same point or will drift out-of-level will not produce uniform parts.

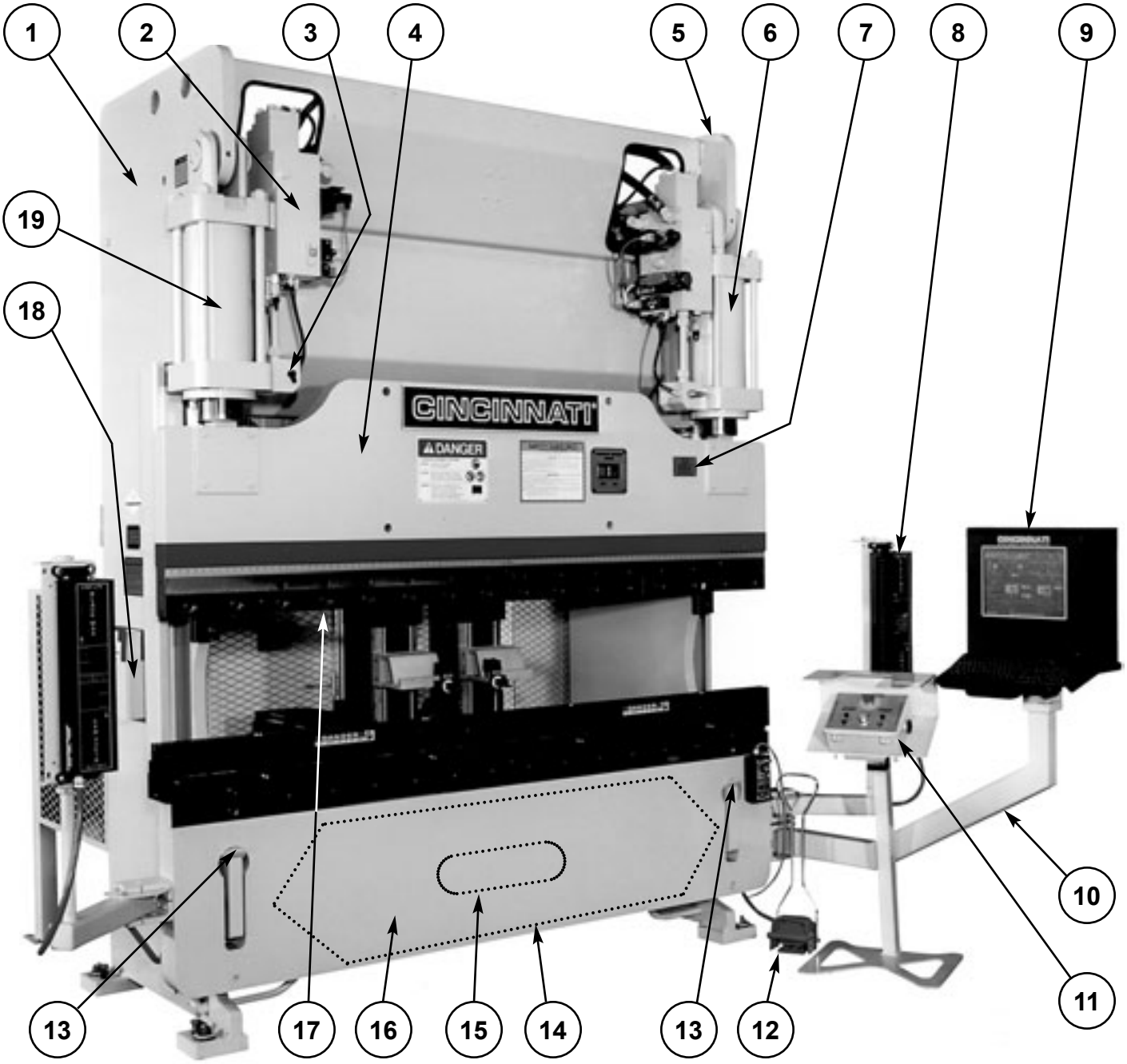
Operator ability obviously affects part quality and production rate. CINCINNATI INCORPORATED provides many design features in the machine and optional accessories to aid even the most inexperienced operator to produce consistent parts. The operator or setup person must select the best tooling from those available. The type of gaging, material supports or other special equipment will affect how the part is produced. Selecting the proper bend sequence is important to obtain quality parts and for operator safety. CINCINNATI offers both Operator and Maintenance training programs at our factory to address these problems. This training may cover subjects from the basics of forming to the use of the machine's microcomputer controls.

Worn, damaged or poor quality dies or filler blocks can directly affect part quality. Using good tooling, selecting the correct tooling for the job and setting them up properly can produce good part quality.

Quality of material can affect angular tolerances of the bend. This is due to normal material thickness variations found in commercial steels as well as hard and soft spots in the metal. Using a good grade of material and the proper tooling setup will minimize the variations.

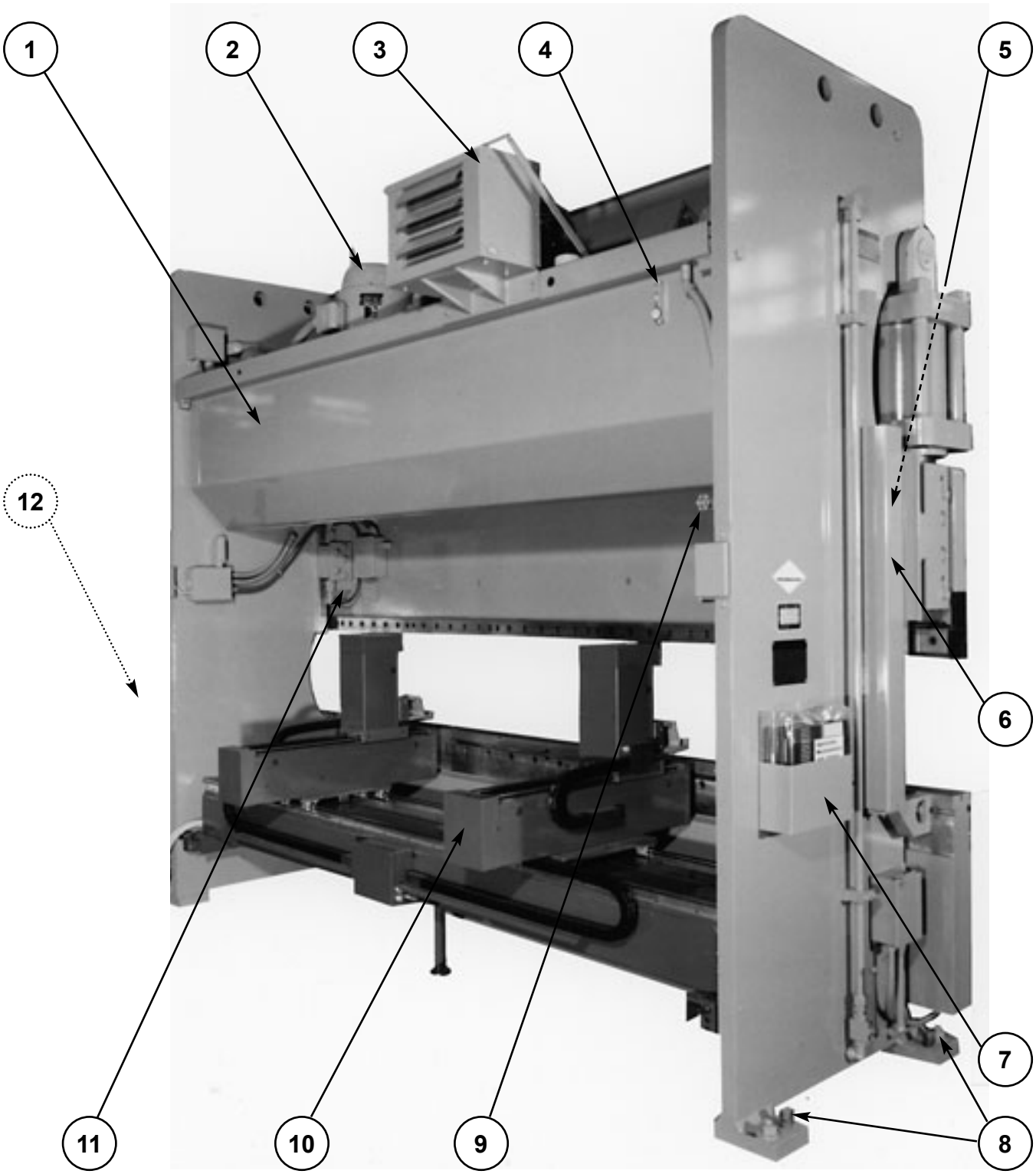
SECTION 1 IDENTIFICATION

AUTOFORM CNC FORMING CENTER



1. LEFT HOUSING
2. CYLINDER MANIFOLD & VALVES (2)
3. COUNTERBALANCE MANIFOLD & VALVES (2)
4. RAM
5. RIGHT HOUSING
6. RIGHT CYLINDER
7. CAPACITY PLATE
8. PRESENCE SENSING DEVICE (Optional)
9. AUTOFORM PC CONTROL
10. PENDANT ARM
11. PEDESTAL-MOUNTED PALMBUTTON STATION
12. FOOTSWITCH
13. BED SHOE (2)
14. LOCATION OF OPTIONAL AUTO CROWN AUXILIARY CROSS MEMBER
15. LOCATION OF OPTIONAL AUTO CROWN CYLINDER
16. BED
17. DIE CLAMPS
18. OPERATION / MAINTENANCE MANUAL POCKET
19. LEFT CYLINDER

FIGURE 1-1 Front View



1. HOUSING BRACE / HYDRAULIC RESERVOIR
2. DRIVE MOTOR AND PUMP
3. AIR-COOLED HEAT EXCHANGER (Optional)
4. OIL SIGHT GAGE AND THERMOMETER
5. LEFT RAM CLAMP (Behind Encoder Guard)
6. ENCODER GUARD COVER
7. OPERATION / MAINTENANCE MANUAL POCKET
8. LEVELING SCREW (4)
9. RESERVOIR DRAIN VALVE
10. CNC SIX-AXIS BACKGAGE (Optional)
11. TILT LIMIT SWITCH
12. ELECTRICAL ENCLOSURE & MAIN DISCONNECT SWITCH (Not Shown)

FIGURE 1-2 Rear View

SECTION 2 INSTALLATION

UNLOADING

After receiving your CINCINNATI AUTOFORM, carefully remove the contents of the one or more boxes shipped with the machine. All of the machine's optional accessories and small parts are in these boxes, such as wrenches and leveling shims. Check all of these parts with the packing list. Claims for shortages should be made within ten days.

Most machines are shipped assembled on skids. Some of the longer length machines are shipped with the bed removed and bolted to the rear of the housings and some are shipped disassembled.

Remove all shipping paper from the wrapped parts of the machine. Leave the shipping skids, bed and ram bracing attached to the machine until it has been moved to its final location.

LIFTING AND MOVING

The machine can be handled by a crane(s) of sufficient capacity with chains or cables of adequate size (refer to American National Standards Institute B30.9). Shipping weight of the machine is listed on the Bill of Lading for the shipment. Check this weight carefully before lifting or handling. Use chains or cables adjusted to the proper length for even lifting. The chains or cables should be long enough to minimize the side loading on the housings. If short cables are used, fit a spreader beam between the housings near the lifting holes. A typical hitch is shown in Figure 2-1.

FIGURE 2-1 Lifting the machine

If your crane does not have sufficient capacity, or no crane is available, rig the machine into final location. Leave the bed attached to the back of the housing when rigging the longer length machines into position.

! WARNING !

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. This is to guard against injury to personnel and prevent damage to the machine. 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 AUTOFORM must be provided with a rigid foundation to ensure that alignment of the housings and cross framing members is maintained. The foundation must support the weight of the machine without cracking or settling out-of-level.

For details of the foundation recommended for your machine refer to the certified 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 AUTOFORM on the foundation, see that the anchor bolts in your foundation match the bolt hole spacing in the housing feet. Check the width of the bed pit (when required) and the distance from the centerline of the front foundation bolts to the front edge of the bed pit. They should agree with the dimensions shown on the certified Foundation Plan drawing.

ERECTION

Open the shim packages shipped with the machine and remove the thickest shim from each package. Place one shim at each foundation bolt location. The top surfaces of the shims must be about level. Thinner shims can be used to obtain this level condition. Then place a 1/8" (3.2mm) thick shim at the front feet locations to deliberately make the front of

machine high. It is easier to raise the rear housing feet to obtain final leveling when the AUTOFORM is in position. As an option, it is recommended that a transit is used to establish that all four pads are in the same plane.

Lift the machine with a crane to remove skids. If no crane is available, **secure against tipping** as soon as the skidded machine is placed on the foundation and before skids are removed. To secure against tipping use a block and tackle. Run one from the housing lifting hole to the rear of the machine and secure to a solid anchor in the building. Run another block and tackle from the other housing lifting hole to the front and secure. To remove skids, raise the machine in about 2" (51mm) steps with the aid of blocking and jacks of sufficient capacity. The jacks should be placed under the front and rear of housings. Use leveling screws in housing feet for inserting and removing jacks. Block up housings, about 2" (51mm) at a time, until there is enough clearance to remove skids. Lower machine by removing the blocking about 2" (51mm) at a time from alternate housings. Temporarily bolt the machine in place on the foundation. Remove the block and tackle used to secure machine against tipping. Remove shipping blocks from between bed and ram.

MACHINES SHIPPED WITH BED REMOVED

! WARNING !

THE MACHINE IS TOP HEAVY TO THE REAR ON SOME MODELS WITH BED ATTACHED TO REAR OF HOUSINGS. USE EXTREME CAUTION AND ENSURE MACHINE IS SECURED AGAINST TIPPING BEFORE REMOVING SHIPPING SKIDS.

Remove the "X" type shipping braces bolted to the front of housings and thoroughly clean the protective grease from the front faces of the housings. Remove the grease with a clean rag soaked in solvent, such as mineral spirits. Wipe with clean rags. A stiff brush will get into the corners. Do not use an air hose because the pressure could drive grit and dirt into the bearing surfaces.

The front vertical bed mounting faces of the housings must be plumb. This can be checked with the level in squaring head of an ordinary machinist's square or with any level that can be used on a vertical surface. If the housings are not plumb, loosen the nuts on foundation bolts. Use leveling screws in housing feet to raise or lower machine. Do not allow machine to permanently rest on these screws. Insert flat steel shims under the housing feet as required. Lower housings and retighten foundation bolt nuts. Recheck the plumb on housing faces and repeat above procedure if necessary until the housings are plumb.

Remove the bed from rear of housings using a chain or cable of adequate capacity. **DO NOT USE HOUSING SLOT IN THE BED TO LIFT THE BED.** Remove the bed shoes and bed bolts from shipping box. Clean the bearing surfaces of the housings and the matching bed surfaces, and the bed shoes and bolts. Carefully lubricate all finished surfaces of the housings where the bed fits. Also lubricate top and bottom surfaces of bed shoes. Use EP #2 Lithium grease (C.I. grease H-2EP). Place bed shoes into position on the housings. Match the markings on housings and bed shoes. Place the bed into position on housings and insert bed bolts into bed. Loosen all foundation bolt nuts and tighten bed bolts securely. Retighten the foundation bolt nuts securely. See the following chart for bed bolt and foundation nut seating torques.

BOLT DIAMETER	SEATING TORQUES Ft.-Lbs. (Nm)	
	BED BOLT	FOUNDATION NUT
3/4	297	–
	(403)	–
1"	734	295
	(995)	(400)
1-1/4	1189	530
	(1612)	(719)
1-1/2	2033	–
	(2757)	–

Check your work with feeler gages. There should be **no clearance** between the bearing surfaces of the housings and bed. If there is clearance, either the bed bolts are not tight or there is grit between the bearing surfaces. There should also be **no clearance** between the bed shoes and the bed.

The encoder lower mounting brackets were removed for shipment. A CINCINNATI INCORPORATED Service Representative will install and adjust the encoders at start-up.

CLEANING

Thoroughly clean protective grease from all other parts of the machine. Remove the grease with a rag saturated in cleaning solvent and wipe with clean rags. A stiff brush will get into the corners. Do not use an air hose. The pressure could drive grit and dirt into bearing surfaces. After cleaning the machine thoroughly, wipe dry. Make sure no dirt or

grit is left, then lightly oil the bed and ram finished surfaces. Periodic cleaning of the machine after installation is recommended.

LEVELING

CINCINNATI AUTOFORM is leveled by placing flat steel shims (supplied with machine) of proper thickness under the housing feet as required. Use a precision level – not a carpenter's or machinist's level. Always wipe the level and bed surface clean and remove burrs before positioning the level.

The machine can be raised or lowered by using leveling screws in the housing feet. Use at least a two foot length of pipe on the wrench. The foundation bolt nuts must be loosened, not removed, before jacking the machine. Before checking the level of the machine, foundation bolt nuts must be securely tightened to the previously specified torque.

Start leveling by checking the setting of machine lengthwise. Place level in the center of bed parallel to edges of the bed. Level the machine lengthwise by placing the required metal shim under the low housing feet, both front and back. Lower the machine and recheck level. Repeat until machine is level lengthwise.

Level the AUTOFORM front-to-back with level crosswise on the bed as shown in Figure 2-2. Check first with the level at the right end of the machine and then at the left end. Add or remove shims under the front or back housing feet as required. Level readings on both ends of bed must be alike within .001" (.025mm). Recheck lengthwise level and repeat above procedure until machine is level in all directions.

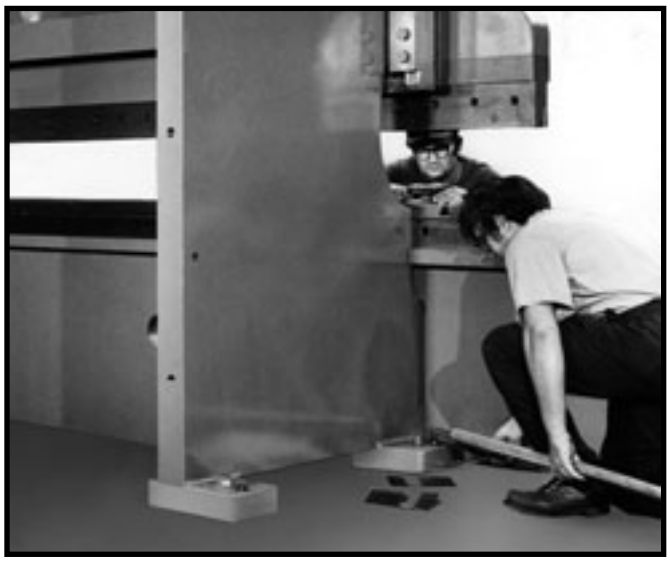


FIGURE 2-2 Leveling the Machine

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. Use clamp bolt heads to push against the back of the encoder mounting bar to pull clamps away from 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 2-3. Measure at both left and right guide. The top measurement is always given a plus (+) value and the bottom is always given a minus (-) value.

Example #1:

	Left Clearance	**Right Clearance**
At top	+.005" (.127mm)	+.000"
At bottom	-.020" (.508mm)	-.015" (.381mm)
Then total	-.015" (.381mm)	-.015" (.381mm)

Since the values are equal, the guides are in the same plane and there is no twist in the machine.

Example #2:

	Left Clearance	**Right Clearance**
At top	+.005" (.127mm)	+.020" (.508mm)
At bottom	-.015" (.381mm)	-.000"
Then total	-.010" (.254mm)	+.020" (.508mm)

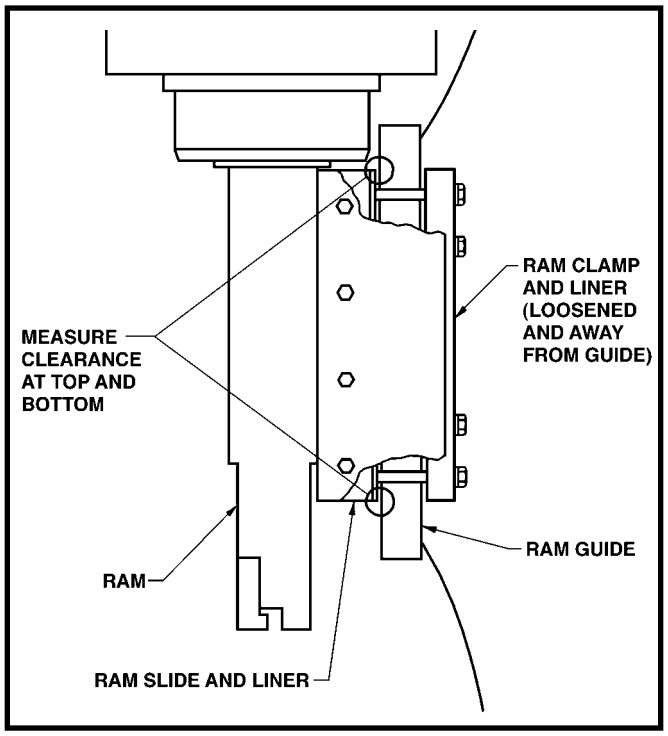


FIGURE 2-3 Ram slide and guide alignment

The amount of clearance is not important. However, the difference between the clearance of the left and right guide/slide indicates the amount of mis-

alignment. The maximum allowable difference is .004" (.102mm). In Example #2, the difference is .030" (.762mm), which indicates there is twist in the machine.

This condition is corrected by adding or removing shims under one of the rear housing feet. In Example #2 the excessive clearance was at the right guide and slide. Since this measurement was plus, the clearance was at the top. 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.

IMPORTANT: Before running the machine, tighten the guide clamp bolts to 60 ft.-lbs. (81.4Nm) and properly lubricate slide liners with light hydraulic oil. Use tool shown in Figure 2-4.

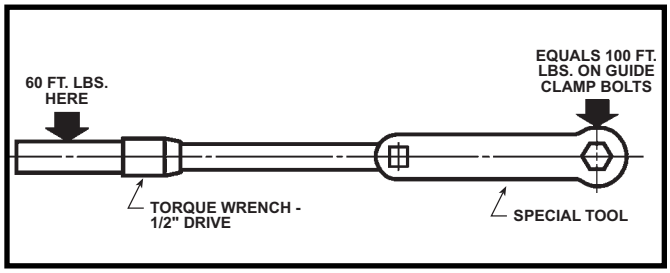


FIGURE 2-4 Tool for guide clamp bolts

IMPORTANT: After loosening and tightening guide clamp bolts for ram guide and slide alignments, the encoders must be reset per "Ram Encoder Adjustment" instructions in SECTION 9.

Alignment may not be permanent. Recheck level in a few weeks. Do not use any grouting around the machine. For machines where the bed goes below floor level, leave the bed pit empty and cover exposed pit opening with steel plate.

GAGE INSTALLATION

The CINCINNATI INCORPORATED AUTOFORM gages are usually shipped assembled to the machine and require no installation.

IMPORTANT: Do not make any electrical connections or final adjustments until a CINCINNATI INCORPORATED Service Representative is present.

In the event that the gage is not already assembled to the machine, remove the gage assemblies from their packing containers. Remove any protective wrapping and clean the parts.

IMPORTANT: Do not install the gage, rear guard or make electrical connections until a CINCINNATI INCORPORATED Service Representative is present.

For the final adjustments and installation of the gages, see the *MAINTENANCE & ADJUSTMENTS, SECTION 9*, of this manual.

HYDRAULIC RESERVOIR

The hydraulic reservoir is equipped with a drain valve. See Figure 1-2. Before starting machine, crack this valve open. Water may have collected in the tank during shipment. If no water comes out, or when oil starts coming out, close the valve securely. Repeat this check monthly.

LUBRICATION

Proper lubrication is of extreme importance to your machine. Carefully following all lubrication instructions will pay dividends in lower maintenance costs for your CINCINNATI AUTOFORM.

The following lubrication points should be checked before start-up and at regular intervals thereafter.

1. Hydraulic Reservoir: Before starting machine check for proper fluid level at the oil sight gage. See Figure 1-2.

CAUTION

Standard machines are designed for and shipped with petroleum based hydraulic fluid, which is flammable. Check applicable fire codes for special precautions.

2. Cylinder Clevis Pins: Lubricate while cycling ram under load, such as obtained with a bumping die. Lubricate once a month. Use a #2 lithium base grease with "moly" additive (C.I. grease H-2M). This must be done after electrical connections are made and the machine is running.

CAUTION

Keep clear of moving ram.

3. Ram Guides and Slide Liners: Wipe clean and flush with light hydraulic oil.

4. Gages: Clean and lubricate all exposed guide rails with a light coating of spray lubricant or #10 oil. The X-Axis, R-Axis (optional) and Z-Axis (optional) ballscrews should also be lubricated with a light coating of spray lubricant or #10 oil. These ballscrews are easily accessed by removing the protective covers. See *MAINTENANCE & ADJUSTMENTS, SECTION 9*, for more specific details.

5. Auto Crown® (Optional): There is a grease fitting at each of the pins through the bed and auxiliary plate. These grease fittings are on the front end of the pins in a hole through the pin retaining plates. The pins should be lubricated monthly. Use a No. 2 lithium base grease with a "moly" additive (C. I. grease H-2M).

ELECTRICAL CONNECTION

Suitable electrical leads must be brought to the machine as shown on certified Foundation Plan drawing. These leads are connected to the incoming side of electrical disconnect switch in the main electrical enclosure. Be certain that leads are of sufficient capacity and that proper voltage is fed to the machine. CINCINNATI INCORPORATED equipment requires that the incoming line supply at the machine does not vary more than plus or minus 10% from the nominal. Some installations may require additional line conditioning, other than supplied with the machine controls. Contact CINCINNATI INCORPORATED Service Department for further information.

Machine must be connected to a good earth ground. A ground lug on the line side of the machine main disconnect is provided for this purpose. Refer to local and state codes for acceptable grounding methods.

Note: *If a CINCINNATI INCORPORATED Service Representative is not present,* ***call before proceeding any further or starting machine.*** *Our Service Representative will complete all electrical connections and check motor rotation.*

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.

The AUTOFORM is essentially a hydraulic press brake with advanced microprocessor controls and automatic backgage. The press brake is a versatile and multi-purpose machine. We recommend evaluating 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.

LOCKOUT / TAGOUT - POTENTIAL HAZARDOUS ENERGY SOURCES

Lockout / Tagout is a term used to address practices and procedures that are necessary to disable machinery or equipment and to prevent the release of potentially hazardous energy while maintenance and servicing activities are being performed. These practices and procedures usually involve the devices on or near machinery or equipment that is used to turn the machinery completely off or drain down stored energy to a safe level. Some examples are a lockable electrical disconnect, which can shut down all electrical energy to a machine, or a lockable air valve that prevents shop air pressure from reaching the machines' air cylinders. Examples of hazardous energy sources on machinery are rotating flywheels, springs being compressed or stretched, hydraulic pressure (accumulators), air pressure (tanks), and machine rams that are up in their stroke and unblocked.

Your employer will have a Lockout / Tagout Program that you will learn about while being trained to run and work around this and other machines in your shop. In general, lockout / tagout requirements do not apply to daily checks during normal production operations (i.e., lubrication, cleaning, minor adjustments or simple tooling changes) as long as measures are taken to provide effective protection to workers.

Reading the *"OPERATION"* section of this OPERATION, SAFETY AND MAINTENANCE Manual will tell you what devices were furnished with the machine to protect you and your fellow workers from uncontrolled releases of energy. You should also check with your supervisor to learn about any other equipment or machinery placed at or near your machine which you may come in contact with. Make sure you know where these energy sources and protective devices are and how to use them.

Follow the instructions given in this manual closely while installing or removing tooling from this AUTOFORM Hydraulic Press Brake. Some energy sources cannot be completely shut down when this type of activity is being performed.

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 brake 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

Improper operation of a machine, whether caused by daydreaming or worrying about other problems, 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 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 lock it out. 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 AUTOFORM, 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 AUTOFORM 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. Consult the *Press Brake Capacities* bulletin for the load required to do the job. If this is less than maximum machine capacity, program the control not to exceed the required force by more than 10%.

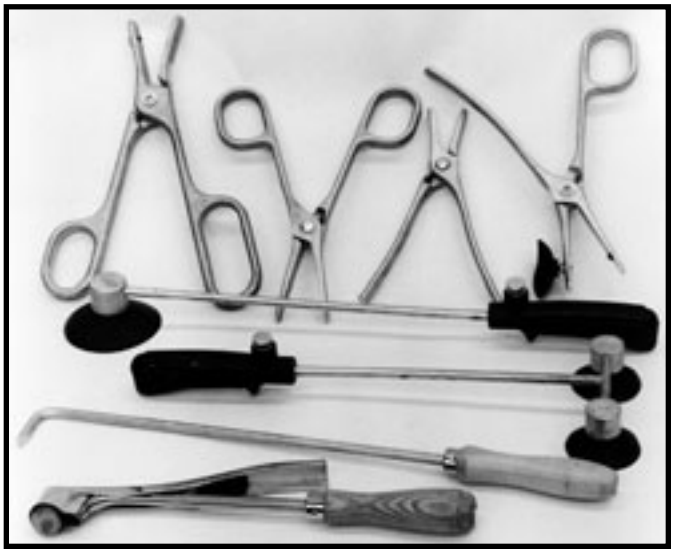
FOR THE SAFE OPERATION OF YOUR CINCINNATI AUTOFORM® FOLLOW THESE RULES:

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 AUTOFORM. 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 the 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. When you leave the machine, place the ram at the 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.

13. Have the routine scheduled maintenance and adjustments performed as shown on the Maintenance Checklist in *SECTION 9*.

14. Check the 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.

15. Report any cuts, bruises and all other injuries to your supervisor or the medical department immediately. They are the best judges of the seriousness of your injury.

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

Installing, removing and transferring tooling can be 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 (23kg), can be carried manually or transferred on a die truck.
   b. Dies weighing over 50 pounds (23kg), 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.

! ! DANGER ! !

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

2. When installing and setting-up dies:
    a. Clean machine and filler block surfaces to which the dies will be fastened. Always turn the machine OFF 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 “SETUP” position so the ram can only be moved by the use of palmbuttons, RAM UP button.
    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 machine control MODE selector in the “SET-UP” position so the ram can only be moved by use of the palmbuttons, RAM UP button.
    d. Never loosen the ram clamp bolts or select “UNCLAMPED”on the optional Power Clamp control unless the dies are in a closed position and the OPERATOR CONTROL selector is in the “OFF” position.

Detailed step-by-step instructions for installing and removing tooling are provided in the *SETUP AND USE* 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 *SETUP AND USE* section of this 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 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.

HAZARDOUS AREA (232913)

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.

DIE AREA (153725)

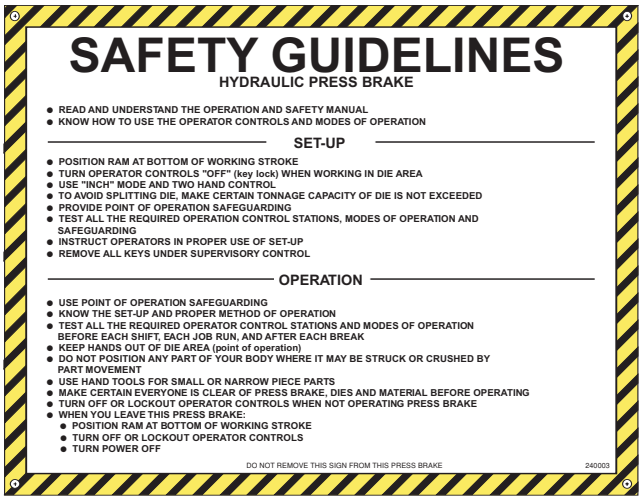
This DANGER sign warns the operator to keep his hands out of the die area (point-of-operation). The sign is usually attached to one end of CINCINNATI® dies and not on the press brake. These adhesive backed signs have been furnished in safety update packages and are available from CINCINNATI INCORPORATED.

DANGER (240008)

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.

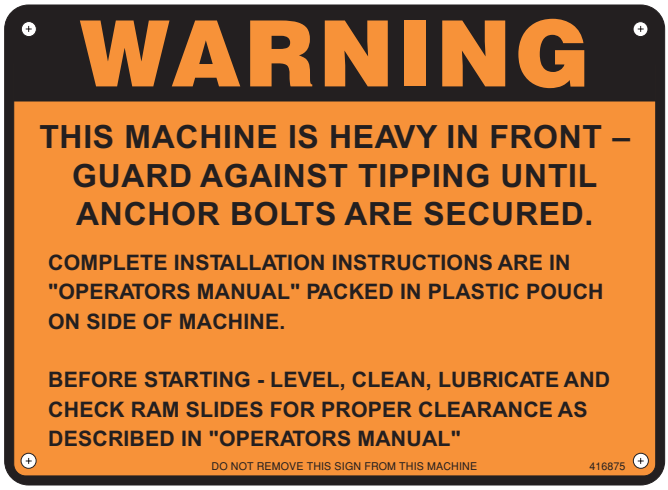
SAFETY GUIDELINES (240003)

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.



GUARD AGAINST TIPPING (416875)

The design of hydraulic press brakes is such that much of the weight is concentrated to the front of the machine. This sign warns 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 backgage 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 OPERATOR CONTROL to "OFF" and remove key**
  - **Turn MAIN DRIVE to "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.

PERFORMANCE AND RATINGS

SERIES	LENGTH Ft.-Nominal (m)	CLEAR DISTANCE BETWEEN HOUSINGS Ft.-In. (m)	TOTAL OVERALL DIE SURFACE Ft.-In. (m)	STD. TYPE BACK-GAGE	SHIPPING WEIGHT (1) AUTOFORM (WITH STD. BACKGAGE) Lbs. (kg)	SHIPPING WEIGHT (1) AUTO CROWN ADDITIONAL WEIGHT Lbs. (kg)	PIT REQD.	BED TOP ABOVE FLOOR In. (mm)	BED TOP WIDTH In. (mm)	BENDING CAPACITY (Mild Steel) (2) GA. x FT. (Ga. x m)	BENDING CAPACITY (Mild Steel) (2) VEE In. (mm)	MOTOR H.P. (kw)
90 AF	6	6'-6-1/2"	8'-0"	CNC BACK-GAGE	14,300	1,150	NO	34 (864)	3-1/2 (89)	12 Ga. x 12'	7/8	25 (19)
	(1.8)	(2)	(2.4)		(6486.5)	(522)				(12 Ga. x 4)	(22)	
	8	8'-6-1/2"	10'-0"		16,800	2,175				10 Ga. x 9'	1-1/8	
	(2.4)	(2.6)	(3.0)		(7620.5)	(987)				(10 Ga. x 3)	(29)	
	10	10'-6-1/2"	12'-0"	CNC HEAVY DUTY	19,300	3,000				1/4 X 5'	2	
	(3.1)	(3.2)	(3.6)		(8754.5)	(1361)				(1/4 x 1.5)	(51)	
	12	12'-6-1/2"	14'-0"		23,500	4,200	YES					
	(3.7)	(3.8)	(4.2)		(10660)	(1905)						
135 AF	6	6'-6-1/4"	8'-0"	CNC BACK-GAGE	15,800	1,700	NO	34 (864)	3-1/2 (89)	10 Ga. x 12'	1-1/8	25 (19)
	(1.8)	(2)	(2.4)		(7167)	(771)				(10 Ga. x 4)	(29)	
	8	8'-6-1/4"	10'-0"		18,000	3,050				3/16 x 10'-3"	1-1/2	
	(2.4)	(2.6)	(3.0)		(8165)	(1384)				(3/16 x 3)	(38)	
	10	10'-6-1/4"	12'-0"	CNC HEAVY DUTY	20,800	4,475			4-1/2 (114)	1/4 X 7'-6"	2	
	(3.1)	(3.2)	(3.6)		(9435)	(2030)				(1/4 x 2)	(51)	
	12	12'-6-1/4"	14'-0"		24,800	5,150	YES			1/2 x 4'-8"	5	
	(3.7)	(3.8)	(4.2)		(11249)	(2336)				(1/2 x 1)	(127)	
	14	14'-6-1/4"	16'-0"		30,000	–						
	(4.3)	(4.4)	(4.8)		(13608)	–						
	16	16'-6-1/4"	18'-0"		39,000	–						
	(4.9)	(5)	(5.4)		(17690)	–						
175 AF	6	6'-6-3/4"	8'-0"	CNC BACK-GAGE	19,500	2,250	NO	34 (864)	4-1/2 (114)	3/16 x 13'-4"	1-1/2	25 (19)
	(1.8)	(2)	(2.4)		(8845)	(1021)				(3/16 x 4)	(38)	
	8	8'-6-3/4"	10'-0"		22,000	4,525				1/4 x 10'-0"	2	
	(2.4)	(2.6)	(3.0)		(9979)	(2053)				(1/4 x 3)	(51)	
	10	10'-6-3/4"	12'-0"	CNC HEAVY DUTY	25,500	6,550				3/8 x 6'-3"	3	
	(3.1)	(3.2)	(3.6)		(11567)	(2971)				(3/8 x 2)	(76)	
	12	12'-6-3/4"	14'-0"		30,000	7,775	YES			1/2 x 6'-1"	5	
	(3.7)	(3.8)	(4.2)		(13608)	(3527)				(1/2 x 2)	(127)	
	14	14'-6-3/4"	16'-0"		35,000	11,150						
	(4.3)	(4.4)	(4.8)		(15876)	(5058)						
	16	16'-6-3/4"	18'-0"		43,500	–						
	(4.9)	(5)	(5.4)		(19732)	–						
230 AF	6	6'-6-1/2"	8'-0"	CNC HEAVY DUTY	23,500	5,000	NO	36 (914)	5-1/2 (140)	3/16 x 17'-6"	1-1/2	25 (19)
	(1.8)	(2)	(2.4)		(10660)	(2268)				(3/16 x 5)	(38)	
	8	8'-6-1/2"	10'-0"		26,300	6,500				1/4 x 12'-9"	2	
	(2.4)	(2.6)	(3.0)		(11930)	(2948)				(1/4 x 4)	(51)	
	10	10'-6-1/2"	12'-0"		30,200	7,625				3/8 x 8'-2"	3	
	(3.1)	(3.2)	(3.6)		(13699)	(3459)				(3/8 x 2.5)	(76)	
	12	12'-6-1/2"	14'-0"		34,500	8,900	YES			1/2 x 8'-0"	5	
	(3.7)	(3.8)	(4.2)		(15649)	(4037)				(1/2 x 2)	(127)	
	14	14'-6-1/2"	16'-0"		40,500	11,500						
	(4.3)	(4.4)	(4.8)		(18371)	(521)						
	16	16'-6-1/2"	18'-0"		51,000	–						
	(4.9)	(5)	(5.4)		(23134)	–						
350 AF	8	8'-6"	10'-0"	CNC HEAVY DUTY	35,300	7,525	YES	36 (914)	5-1/2 (140)	1/4 x 19'-4"	2	25 (19)
	(2.4)	(2.6)	(3.0)		(16012)	(3413)				(1/4 x 6)	(51)	
	10	10'-6"	12'-0"		39,600	9,700				3/8 x 12'-5"	3	
	(3.1)	(3.2)	(3.6)		(17963)	(4400)				(3/8 x 4)	(76)	
	12	12'-6"	14'-0"		45,000	12,400				1/2 x 12'	5	
	(3.7)	(3.8)	(4.2)		(20412)	(5625)				(1/2 x 4)	(127)	
	14	14'-6"	16'-0"		51,500	–				3/4 x 8'-6"	8	
	(4.3)	(4.4)	(4.8)		(23360)	–				(3/4 x 2.5)	(203)	
	16	16'-6"	18'-0"		59,400	–						
	(4.9)	(5)	(5.4)		(26944)	–						
	18	18'-6"	20'-0"		–	–						
	(5.5)	(5.6)	(6.1)		–	–						
	20	20'-6"	22'-0"		–	–						
	(6.1)	(6.2)	(6.7)		–	–						

SPECIFICATIONS

SERIES	MACHINE CAPACITY		(3) STD. STROKE LENGTH Inches (mm)	THROAT CLEARANCE FROM CENTER OF DIES Inches (mm)	DIE SPACE Inches (mm)		(4) RAM SPEED Inches/Min. (mm/Sec.)			OVERALL HEIGHT ABOVE FLOOR Inches (mm)
	MAX. SPEED AT FULL TONNAGE Inches/Min. (mm/Sec.)	MAX. TONNAGE AT FULL FORM. SPEED Tons (kN)			OPEN HEIGHT	CLOSED HEIGHT	HIGH APPROACH	VARIABLE FORMING	RETURN	
90	94	70	8	7	15	7	380	1 to 120	405	110
	(39)	(623)	(203)	(178)	(381)	(178)	(134)	(1 to 42)	(143)	(2794)
135	64	105	8	7	15	7	290	1 to 80	270	111
	(27)	(934)	(203)	(178)	(381)	(178)	(102)	(1 to 28)	(95)	(2819)
175	49	130	10	8	17	7	260	1 to 65	290	124
	(20)	(1157)	(254)	(203)	(432)	(178)	(92)	(1 to 23)	(102)	(3150)
230	37	190	10	8	17	7	230	1 to 45	250	127
	(15)	(1690)	(254)	(203)	(432)	(178)	(81)	(1 to 16)	(88)	(3226)
350	25	285	10	10	18	8	155	1 to 30	135	134
	(10)	(2535)	(254)	(254)	(457)	(203)	(55)	(1 to 11)	(48)	(3404)

(1) SHIPPING WEIGHTS DO NOT INCLUDE SPECIAL OPTIONS, SUCH AS AUTO CROWN, SIX-AXIS BACKGAGE, POWER CLAMPS, ETC.

(2) BENDING CAPACITIES ALLOW FOR 15% RESERVE OF RATED TONNAGE TO COVER POSSIBLE INCREASES IN MATERIAL THICKNESS, TENSILE STRENGTH AND YIELD STRENGTH.

(3) STROKE ADJUSTS TO ANY LENGTH UP TO MAXIMUM SHOWN.

(4) RAM SPEEDS ARE APPROXIMATE AND BASED ON 1800 RPM MOTOR.

PRINCIPLE OF OPERATION

The AUTOFORM Press Brake is a hydraulically driven, servo-controlled machine. A simplified diagram, Figure 4-1, shows the basic operating logic and components.

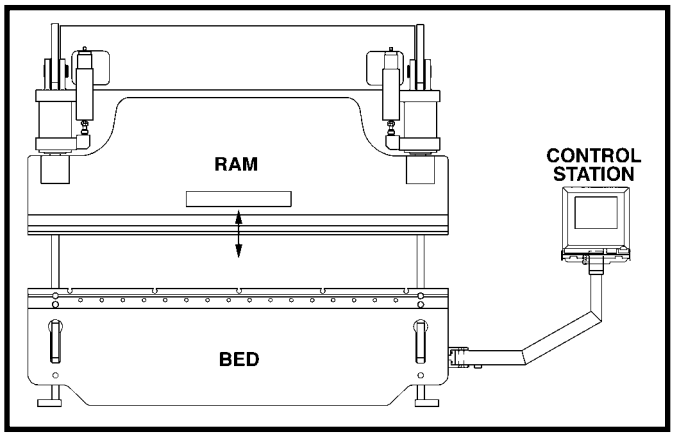


FIGURE 4 - 1 Simplified machine diagram

PUMP: A motor driven, variable volume, hydraulic piston pump provides the flow and pressure for advancing, retracting and loading the power cylinders. This pump is equipped with a "load sensing" control which precisely matches pump flow and pressure to load demands. This precise match provides **maximum system efficiency**.

SERVO VALVES: These are variable orifice valves with spool position feedback. The valves control both the direction and amount of flow from the pump to the cylinders. They provide precise flow/speed control of the cylinders.

LINEAR ENCODERS: Each end of the machine is equipped with a **bed referenced**, high resolution .0001" (.00254mm) linear encoder. These encoders continually monitor ram-to-bed position and speed at each cylinder and feed this information to the control. The encoders are shock-resistant and allow normal punching capacity on these machines.

CONTROL: The machine control provides the high speed processing logic for the servo-controlled ram position loop. The control is a self-contained industrial PC with an integrated LCD touchscreen display, keyboard and pointing device, floppy disk drive, CD-ROM drive, Operator Control keyswitch and MAIN DRIVE START/STOP buttons.

DEFINITION OF TERMS

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 standard stroke length for each series machine is shown in the preceding Specifications chart.

TONNAGE CAPACITY: The tonnage on AUTOFORM hydraulic press brakes is adjustable from approximately 1% of full tonnage (depending

upon ram speed selected) to full tonnage. The maximum full tonnage is determined by the cylinders, pistons and the limits of the frame design. The machine capacity plate and the preceding chart show the maximum tonnage capacity. Also see the *PRESS BRAKE CAPACITIES* booklet included with this manual.

DIE SPACE: Each size machine has a fixed amount of die space to accommodate the dies or tooling and filler block. **OPEN HEIGHT** is the maximum die space available. It is the distance from the 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 4-2.

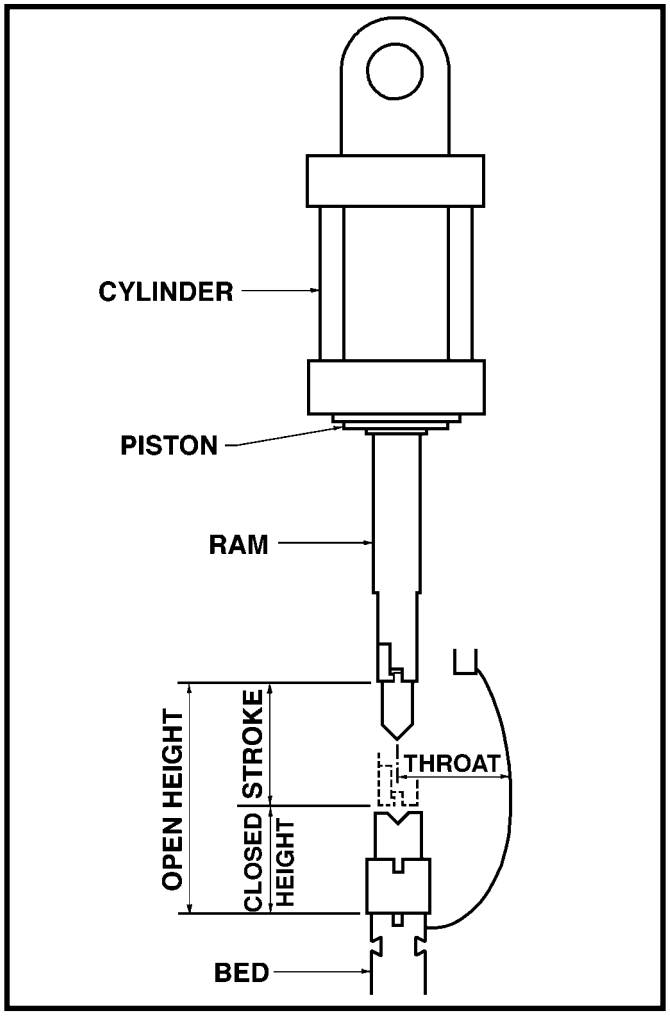


FIGURE 4-2 Die space

THROAT: 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. Details of the throat are found on the throat layout drawing.

CLOSED POSITION: This is the overall height of the dies when ram is at the bottom of the stroke and is adjusted to make the proper bend. See Figure 4-3.

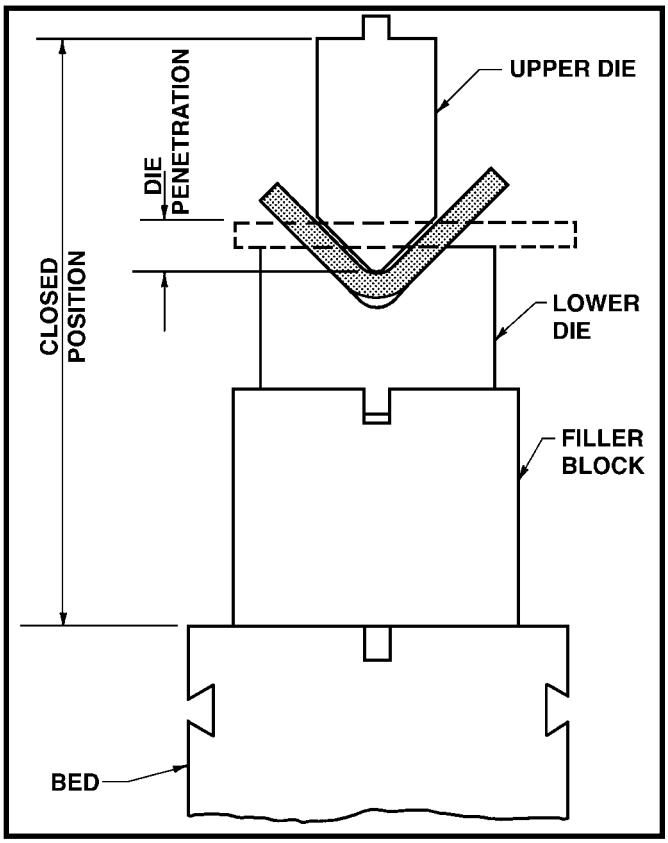


FIGURE 4-3 Closed position

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 vee 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 dimensions. The difference between this combined height and the open height is the maximum amount of stroke which can be used for a particular set-up.

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 crown is machined into the bed of each CINCINNATI Press Brake. It is designed so the bed and ram will be parallel at 1/2 to 2/3 of machine capacity with a load uniformly distributed over the nominal length of the machine. This feature improves bend accuracy under normal forming loads and minimizes

shimming of the dies. Machines furnished with the optional AUTO CROWN® system do not have microcrowned beds.

CAPACITIES

PUNCHING CAPACITY

CINCINNATI Hydraulic Press Brakes are rated to perform punching loads up to 66% of the maximum machine capacity at the center of the machine 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 (482636kPa) - material is to be processed, the punching capacity is reduced to 50% of the maximum machine capacity, Figure 4-4. Additional punching capacity can be obtained by stepping the punches (Figure 4-5) 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.

When punching, the POSITION mode of operation must be used. See *SECTION 6 - MACHINE CONTROLS*.

AUTO-FORM SERIES	MAXIMUM PUNCHING CAPACITY TONS/LEVEL (kN/LEVEL)	
	MILD	HI-TENSILE
90 AF	60	45
	(534)	(400)
135 AF	90	67.5
	(801)	(600.5)
175 AF	115	87.5
	(1023)	(778)
230 AF	150	115
	(1334.5)	(1023)
350 AF	230	175
	(2046)	(1557)

FIGURE 4-4 Maximum punching capacity

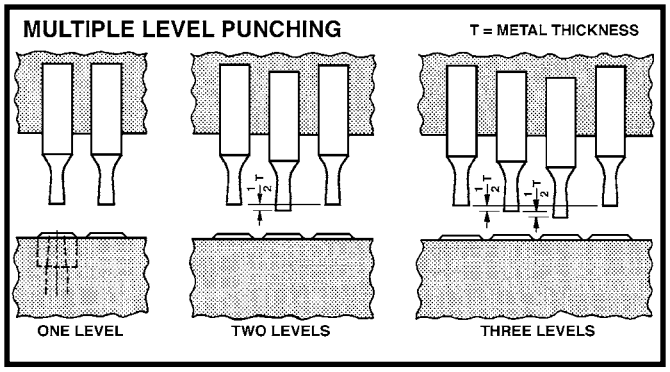


FIGURE 4-5 Multiple level punching

STRIPPING CAPACITY

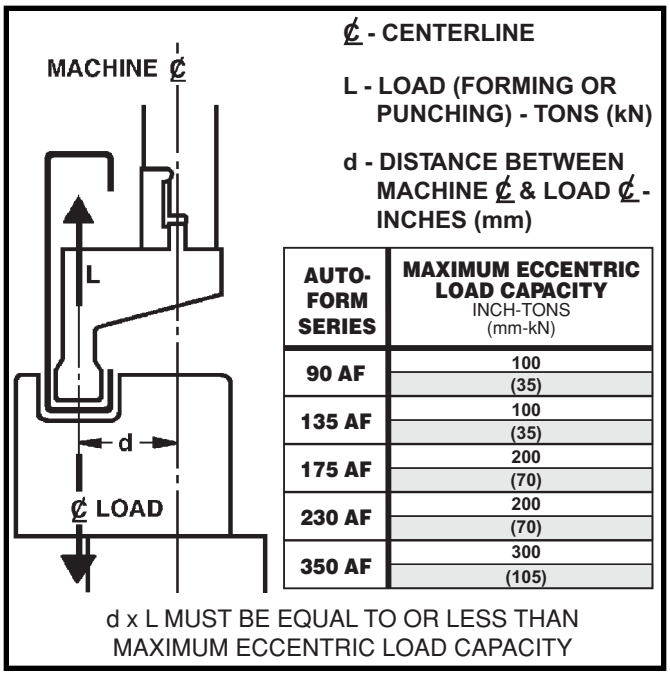
A stripping load is a force which occurs on the UP stroke of the ram. The direction of this type of load is down on the ram and up on the bed (the reverse of forming and punching loads). Figure 4-6 shows the maximum stripping load available at the center of the machine. See *PRESS BRAKE CAPACITIES, PI-50691*, for more information on controlling stripping load.

AUTO-FORM SERIES	MAXIMUM STRIPPING LOAD TONS (kN)
90 AF	9.0
	(80)
135 AF	13.5
	(120)
175 AF	17.5
	(156)
230 AF	23.0
	(205)
350 AF	35.0
	(311)

FIGURE 4-6 Stripping load

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 machine. See Figure 4-7.



AUTO-FORM SERIES	MAXIMUM ECCENTRIC LOAD CAPACITY INCH-TONS (mm-kN)
90 AF	100
	(35)
135 AF	100
	(35)
175 AF	200
	(70)
230 AF	200
	(70)
350 AF	300
	(105)

FIGURE 4-7 Eccentric load capacity

! WARNING !

EXCEEDING THE ECCENTRIC LOAD CAPACITY COULD OVERSTRESS UPPER BED AND DIE CLAMP BOLTS CAUSING THEM TO SHATTER AND POSSIBLY CAUSE SERIOUS INJURY TO PERSONNEL. DAMAGE COULD ALSO OCCUR TO THE SLIDES AND GUIDES AND SINK UPPER BED BOLTS INTO THEIR COUNTERBORES CAUSING THE BED TO BECOME LOOSE.

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 center of machine, only a portion of the total capacity is available as shown in Figure 4-8.

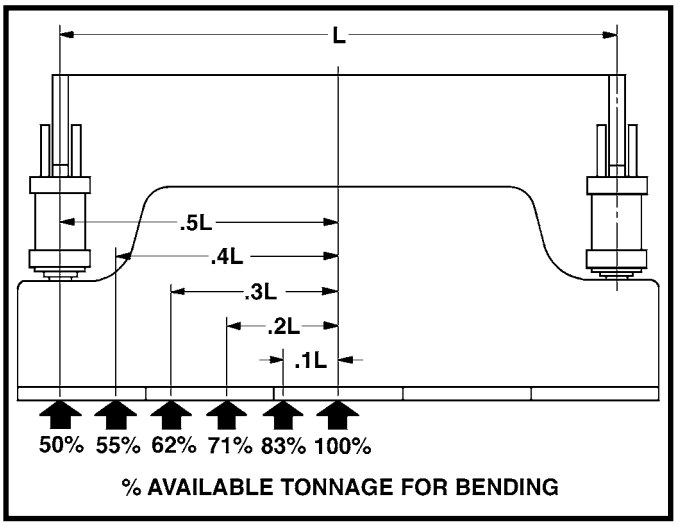


FIGURE 4-8 Off-center load capacity

For example, a 135AF Press Brake has 100% - 135 tons (1201kN) of its rating available for bending at the centerline of the machine. At either housing, regardless of length, only 50% of the tonnage - 67.5 tons (600.5kN) is available.

To determine the available tonnage at a point between the centerline and either housing, the ratios shown in Figure 4-8 can be used. For example, a 135AF x 10' Press Brake is approximately 128" (3251mm) from housing to housing (L). A point of .3 of this length is 38.4" (975mm) (.3 x 128"/3251mm). Then at 38.4" (975mm) from the centerline of the machine 62% (83.7 tons/745kN) of the tonnage is available.

TOOL INSTALLATION - SET-UP MENU

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 5-1.

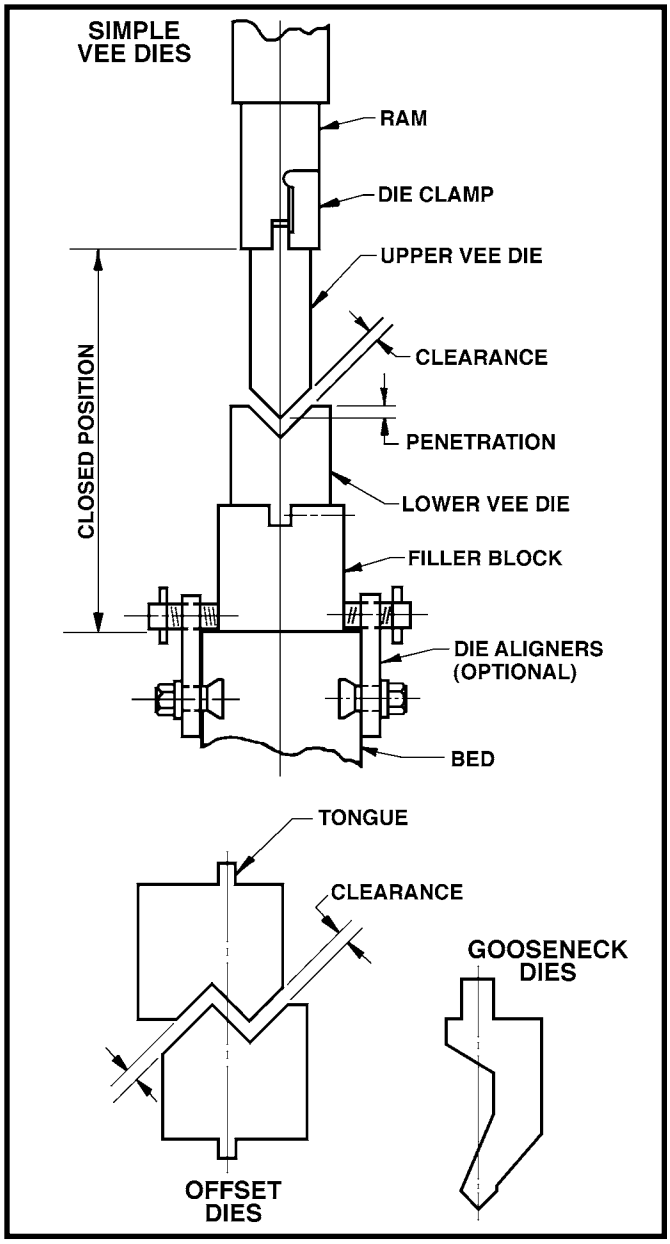


FIGURE 5-1 Vee Dies

These dies, being the most common and widely used, will be referred to in the following instructions.

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 nose of the upper die and the two radii of the lower vee die opening. See Figure 5-2. Thus, all of the ram force 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* booklet included with this manual for further air bending information.

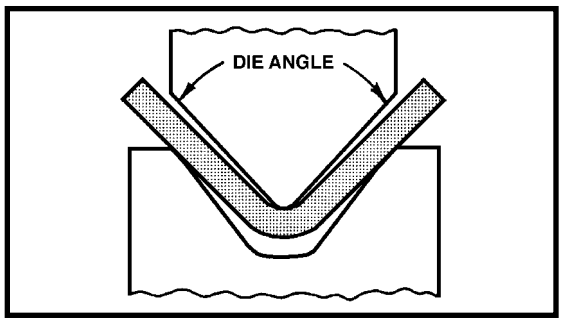


FIGURE 5-2 Air bend dies

BOTTOMING DIES: The primary purpose of bottoming dies is to provide greater part accuracy and special shapes. 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 5-3. These dies require three to ten times as much force 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. Do not use ANGLE mode when bottoming. Use POSITION or TONNAGE mode. See *SECTION 6* for a description of the available mode selections.

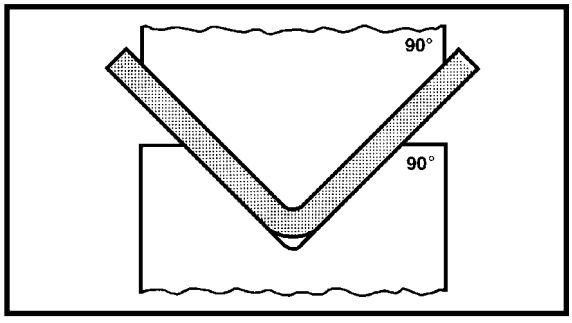


FIGURE 5-3 Bottoming dies

CINCINNATI INCORPORATED can provide many other types of standard and special dies, some of which are shown in Figure 5-4.

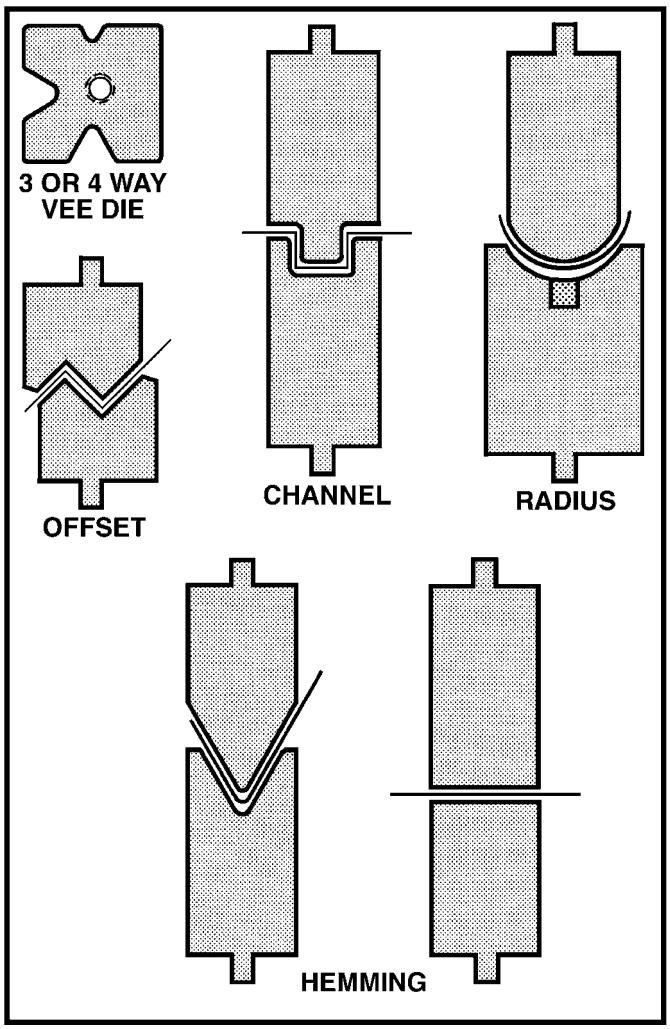


FIGURE 5-4 Types of dies

DIE SETS: Special care and precautions should be taken when operating die sets with guide pins and bushings. The AUTOFORM PC Control on this machine is designed to make a full up stroke when the machine is first turned on and ram is calibrated, or whenever ram recalibration is required.

Depending on the working height of the die set, this full stroke return may cause the die set guide pins and bushings to separate. Re-entry of the guide pins into the bushings may be difficult, if not impossible. Each die set application should be reviewed for this condition.

CINCINNATI INCORPORATED recommends that the working height of all die sets be such that the bushings never leave the guide pins when the ram makes a full up stroke.

TOOL INSTALLATION

To install the tooling, use the following procedure:

1. If the AUTOFORM is not already powered-up, turn ON the main disconnect switch on the electrical enclosure.
2. Depress the Main Drive START button on the AUTOFORM PC Control. Hold the button until the motor starts.

3. Log on to the AUTOFORM PC Control and verify that the palmbuttons are enabled for SETUP mode. To do this, press the OP STATION button in the toolbar.

Click on the SETUP mode tab of the Operator Stations dialog.

Ensure that the Station 1 checkbox is checked. If it is not already checked, click on the white box to the left of the "Station 1" label to enable it. Then press the OK button to accept the changes and close the dialog.

CAUTION

Before proceeding, read the guidelines in *SECTION 3 - SAFETY* for installing tooling.

4. Set the STROKE MODE SELECT button to SETUP mode.

In SETUP mode, use the Palmbutton Operator Station to move the ram down and use the RAM UP button to move the ram up.

Use the pulse wheel and the footswitch to accurately position the ram down or up. Even though the footswitch cannot be selected "ON", depress and hold down the footswitch while turning the pulse wheel and the ram movement will follow the pulse wheel.

5. Though SETUP mode is independent of which page is displayed on the AUTOFORM PC Control, the Job Setup page should be referred to first. Then many users prefer to set the control to the Run/Edit page or to Quick Bend. In addition to displaying the ram position, like the Run/Edit page, Quick Bend also allows quick retracting of the gages if necessary.

To view other diagnostic information, such as independent left and right ram position or actual gage position, use the Maintenance | Diagnostics | Encoders/Tonnage or Maintenance | Diagnostics | Gage Positions menu items.

6. Turn the CONTROL ON-OFF keyswitch to "ON".

7. Depress the RAM UP button on the Palmbutton Operator Station to raise the ram. The ram will move to the maximum up position and stop. When the ram stops, continue with the next step.

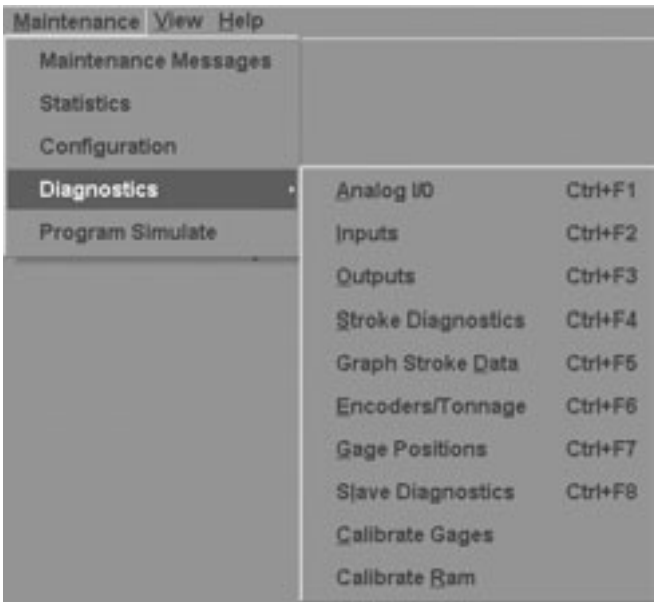
8. Depress the palmbuttons and lower the ram to its maximum down position and stop.

CAUTION

Make sure the area behind the machine is clear before calibrating the gage.

9. If the gages are in the way, either use the RETRACT button to the right of the X-Axis label on the QuickBend page or force a gage calibration using the Maintenance | Diagnostics | Calibrate Gages menu item.

- or -



10. Turn the CONTROL ON-OFF keyswitch to the "OFF" position and remove the key. Then actuating an Operator Station will not cause movement of the ram or backgage.

11. If the filler block has not already been installed, deburr, clean and lightly oil bed top. Place nuts for filler block screws in proper bed cross slots. Place filler block (die holder) on bed and lightly bolt in place. At this time, also install die aligners (3 front and 3 back) to the front and back of the bed. In some cases a filler block may not be required and die may be placed directly on the

bed. Deburr, clean and lightly oil the top of filler block. Loosen all of the filler block set screws. If machine is equipped with optional Power Clamps, turn LOWER selector switch to "UNCLAMP" position. See Figure 5-5.

If additional die space is required to install the filler block or lower die, turn the CONTROL ON-OFF keyswitch to "ON", use the RAM UP button to raise the ram so there is just enough space, turn the CONTROL ON-OFF keyswitch to "OFF" and remove the key.

FIGURE 5-5 CLAMP/UNCLAMP Switch

12. Insert lower die on the filler block. Leave it extended past end of bed several inches. Visually center filler block so lower die is aligned with slot in the ram nose.

13. Loosen all ram die clamps nuts about .125" (3.2mm). If the machine is equipped with optional Power Clamps for the upper die, use CLAMP/UNCLAMP selector switch located on main electrical enclosure (Figure 5-5) to open upper die clamp. Depress pushbutton while turning key to the "UNCLAMP" position. A red light will indicate the unclamped position. Turn the CONTROL ON-OFF keyswitch to "ON".

14. Move ram as necessary so there is just enough space for the upper die. Use palmbuttons to move ram down or the RAM UP button to move ram up. Turn the CONTROL ON-OFF keyswitch to "OFF" and remove the key.

15. 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 5-6. Then slide upper die into lengthwise position with the lower die. Slide the set of dies into a centered position on the machine. Tighten the filler block set screws or clamp the lower power die clamp to lock the lower die.

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

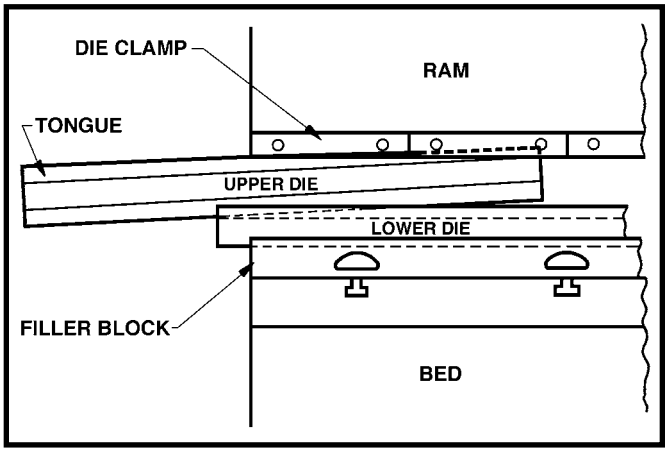


FIGURE 5-6 Die Positioning

16. Moderately tighten ram die clamp nuts or clamp optional upper power clamp to prevent the upper die from falling when the ram is raised. Turn CONTROL ON-OFF keyswitch to "ON".

17. Use the RAM UP button to raise the ram .125" to .25" (3.2 to 6.4mm). Turn the CONTROL ON-OFF keyswitch to "OFF" and remove key.

18. Visually align the upper and lower dies. Shift the filler block front-to-back using die aligners to obtain rough die alignment.

19. Turn CONTROL ON-OFF keyswitch to "ON".

20. Inch the ram down using palmbuttons until the upper die is seated. When seating dies, machine tonnage is limited to 10% of the machine's capacity. For example, for a 350 ton (3114kN) AUTOFORM the tonnage is limited to 35 tons (311kN).

IMPORTANT: When seating dies it may be advisable to place wood blocks or soft metal between the dies to prevent damage to the dies. Short dies must have sufficient shoulder area to prevent sinking into the ram, bed or filler block.

The hydraulic components and machine frame members are safeguarded against overload by both load cells and a relief valve in the hydraulic circuit. However, care must be taken to provide enough area under upper and lower dies to prevent them from sinking into the ram nose or bed top due to highly concentrated loads. This is the shad-

ed area shown in Figure 5-7. The minimum area (sq. in.) for each die to prevent sinking may be calculated by this formula:

Die Area = MAXIMUM TONNAGE / 15

An example for a 350 ton machine, the minimum die area for a capacity load is 350 divided by 15, or 23.3 square inches.

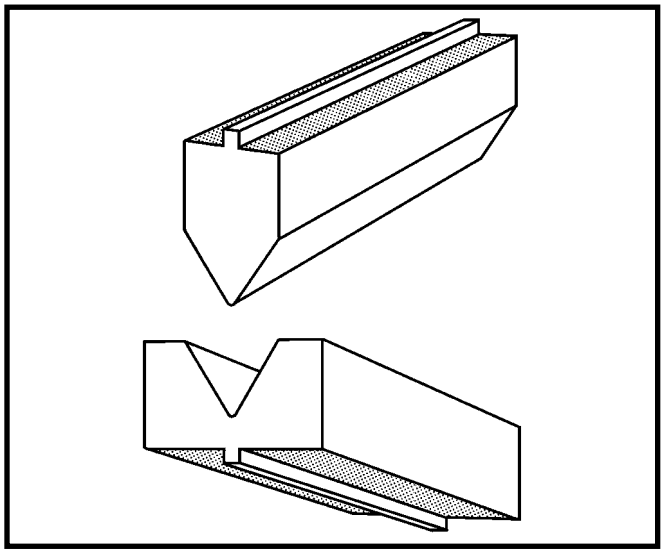


FIGURE 5-7 Seating Dies

21. Turn CONTROL ON-OFF keyswitch to “OFF” and remove key.
22. Fully tighten the die clamp nuts after seating the upper die. Check the shoulders of the die with a .002” (.05mm) feeler gage to make sure it is seated tightly. Turn CONTROL ON-OFF keyswitch to “ON”.
23. Run the ram upwards to provide clearance between dies. This clearance should be equal to at least the metal thickness. Turn CONTROL ON-OFF keyswitch to “OFF” and remove key. Check the front-to-back die alignment over the full length of the dies. Realign if necessary by moving the filler block with die aligners. For Adaptive Bending or other precision bending requirements, a more accurate alignment is required. Feeler gages should be used to measure front-to-back die clearances between the upper and lower dies at both ends and at the center of the dies.
24. Tighten the filler block to the bed.

GAGING - STANDARD BACKGAGES

There are two types of Standard Backgages, the CNC Backgage and the CNC Heavy Duty Backgage. These standard backgages have a 24" powered X-axis and an 8" manual R-Axis adjustment. The CNC Backgage is furnished on all 6' and 8' (1.8m and 2.4m) length 90AF, 135AF and 175AF machines. The CNC Heavy Duty Backgage is standard on all other AUTOFORMs. These Standard Backgages have an optional programmable power R-axis available.

CAPACITY

The CNC Backgage is designed for sheets, 3/16" (4.8mm) maximum thickness, that weigh less than 100 lbs. (45.4 Kg). The CNC Heavy Duty Backgage, CNC 4X Backgage and CNC Six Axis Backgage are designed for sheets 1/4" (6.4mm) maximum thickness that weigh less than 150 lbs. (68 Kg). The CNC Plate Backgage is designed for plates with a weight less than 500 lbs. (227Kg). Reasonable care should be used when positioning heavy sheets against these gages.

IMPORTANT: Heavy shock loads could damage parts of the gage.

Gaging surfaces are adjusted in the vertical direction within the limits shown in Figure 5-8. The standard horizontal (front-to-back) travel is 24" (610mm). It is power driven at 1200 in/min. (508mm/sec.) and is positioned and sequenced by the program entry in the AUTOFORM PC Control. The gage can be manually positioned by use of the gage pendant control.

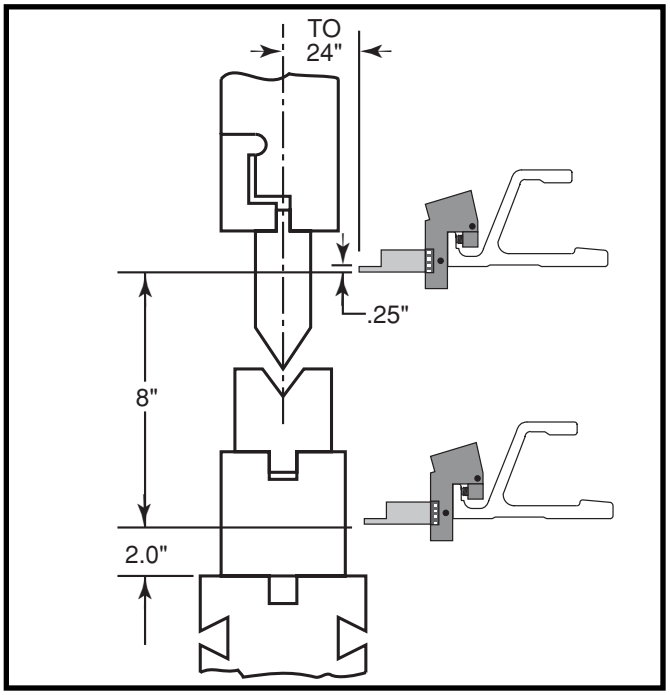


FIGURE 5-8 Adjusting gage surfaces

SELECT GAGE SURFACE

Standard gaging surfaces furnished with the AUTOFORM include two gage assemblies and four gage fingers. The fingers are manually positioned along the length of the gage bar using a special positioning tool. These are shown in Figure 5-9.

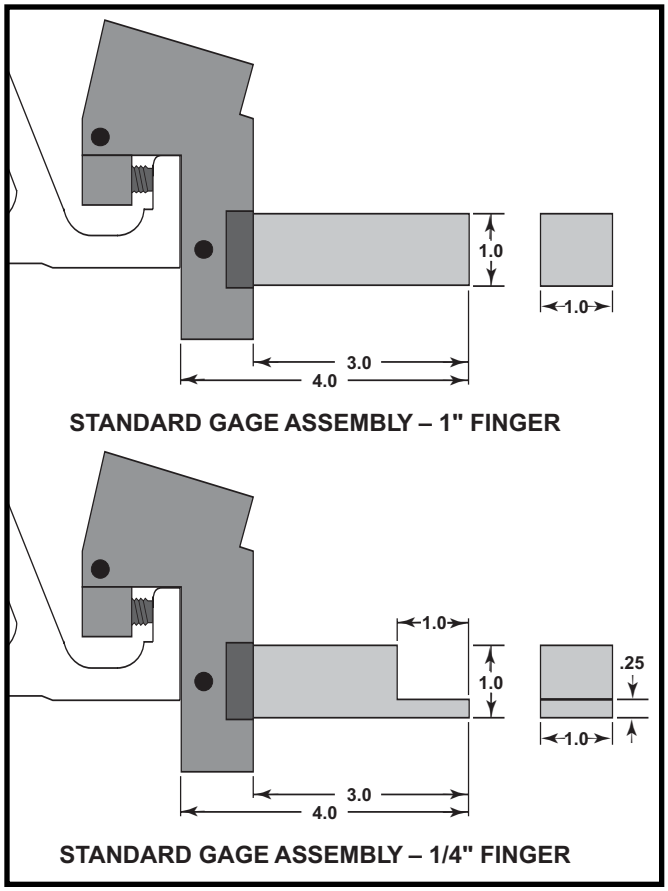


FIGURE 5-9 Standard gaging surfaces

IMPORTANT: Do not gage from the front surface of the aluminum gage bar due to wear and possible damage of this surface.

The standard 1/4" (6.4mm) gage fingers can be rotated in the gage assembly to provide either a one inch or a one-quarter inch high surface for short flanges. See Figure 5-11 for minimum flange dimensions. An optional 1/8" (3.2mm) gage finger can be furnished for smaller flanges. The one inch square finger should be used wherever possible, as it provides the largest gage target and contact area.

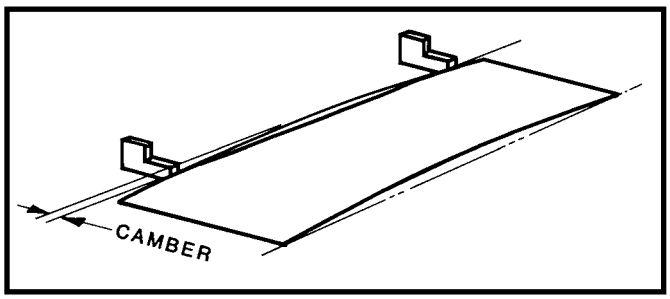
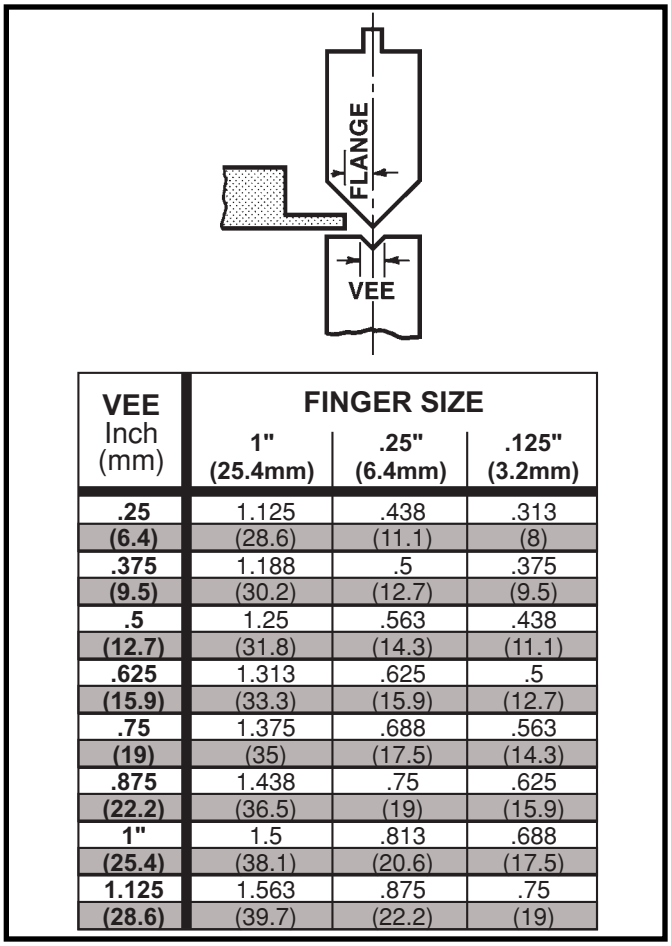


FIGURE 5-10 Two-point Gaging

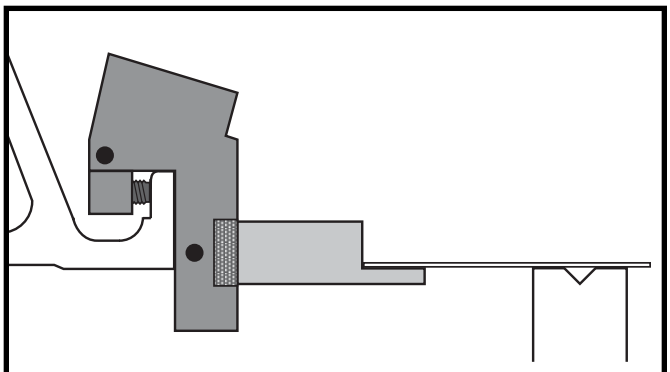


VEE Inch (mm)	FINGER SIZE 1" (25.4mm)	.25" (6.4mm)	.125" (3.2mm)
.25	1.125	.438	.313
(6.4)	(28.6)	(11.1)	(8)
.375	1.188	.5	.375
(9.5)	(30.2)	(12.7)	(9.5)
.5	1.25	.563	.438
(12.7)	(31.8)	(14.3)	(11.1)
.625	1.313	.625	.5
(15.9)	(33.3)	(15.9)	(12.7)
.75	1.375	.688	.563
(19)	(35)	(17.5)	(14.3)
.875	1.438	.75	.625
(22.2)	(36.5)	(19)	(15.9)
1"	1.5	.813	.688
(25.4)	(38.1)	(20.6)	(17.5)
1.125	1.563	.875	.75
(28.6)	(39.7)	(22.2)	(19)

FIGURE 5-11 Minimum flange size

IMPORTANT: The selected gage surface should be analyzed carefully to avoid interference with the tooling and yet provide a large enough target to ensure part contact.

The 1/4" (6.4mm) gage finger can also be used as a sheet support as shown in Figure 5-12, for lightweight sheets.



Note: *If the assembly is used as a sheet support, a Finger Offset value must be included in the program.*

FIGURE 5-12 Gage finger used as sheet support

ADJUST GAGE FINGER POSITION

Vertical position of the gage surfaces with manual "R" are adjusted by turning the hand cranks on each gage carriage (Figure 5-13).

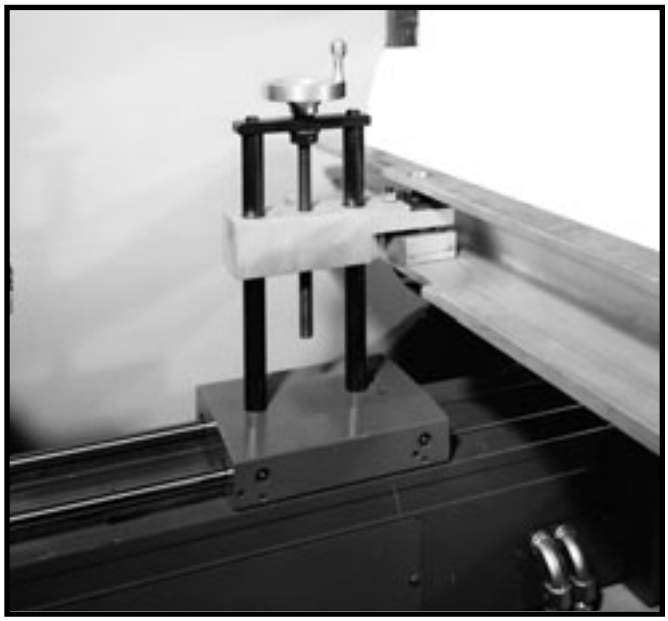


FIGURE 5-13 Adjusting vertical gage position

! ! DANGER ! !

NEVER ADJUST VERTICAL POSITION OF GAGE SURFACE BY REACHING BETWEEN DIES. MAKE THIS ADJUSTMENT FROM REAR OF MACHINE.

Vertical position of the gage surfaces with power "R" axis are adjusted with the program or they can be adjusted with pendant control. The best height for the gages will depend upon the shape of the part being formed.

CAUTION

If gage bar or fingers are to be positioned over the top of lower die, care should be taken to make this height adjustment before moving the gage forward. This will avoid a collision between the gage and tooling.

The gage finger assemblies should be positioned left-to-right to contact the part being formed at the desired gage points. Normally the two gage finger assemblies should be spread as wide as possible to provide the most accurate gaging. The gage finger assemblies are moved along the gage bar by using the finger assembly positioning tool (Figure 5-14). This tool releases the gage assembly clamp and holds the assembly while it is being moved.

! ! DANGER ! !

NEVER ADJUST GAGE FINGER POSITIONS BY REACHING BETWEEN DIES. USE THE TOOL PROVIDED.

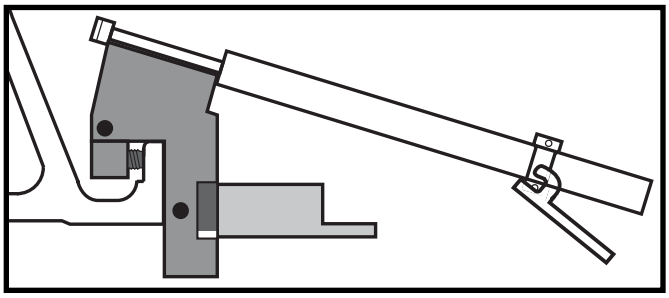


FIGURE 5-14 Finger assembly positioning tool

PROGRAM GAGE POSITION(S)

The actual position of the gage in relation to the tooling is selected when entering a program into the Control. This procedure is described in *SECTION 7, "GAGE PAGE"*. The actual gage dimension from the centerline of the tooling to the gage surface is determined by three program inputs: flange dimension, bend allowance and finger offset. See Figure 5-15.

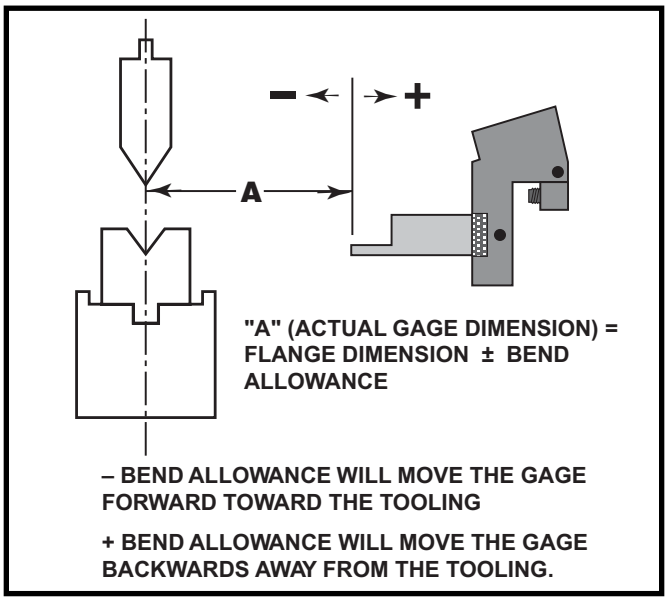


FIGURE 5-15 Figuring actual gage dimension

GAGE FINGER ADJUSTMENT

! ! DANGER ! !

THE FOLLOWING GAGE FINGER ADJUSTMENTS SHOULD NEVER BE MADE WHILE THE GAGE ASSEMBLY IS IN PLACE ON THE GAGE BAR. ALWAYS USE THE FINGER ASSEMBLY POSITIONING TOOL TO REMOVE GAGE ASSEMBLY.

Minor part flange differences (end-to-end) can be corrected by adjusting individual gage fingers forward (to shorten flange). First remove the gage assembly from the backgage bar with the positioning tool. Loosen the finger by pulling out the locking knob (Figure 5-16) and turning knob counterclockwise. The adjusting collar has a total range of .060" (1.5mm) adjustment.

Adjust the collar forward the desired amount. Reseat finger shoulder tightly against adjusting collar and tighten the locking knob. The locking knob spins freely unless it is pulled out. This allows the knob to rest against the backgage face, thus preventing the finger from being unlocked while the assembly is in place on the gage bar. All gages are shipped from the factory zeroed from the centerline of the ram with the gage assembly at .00" position.

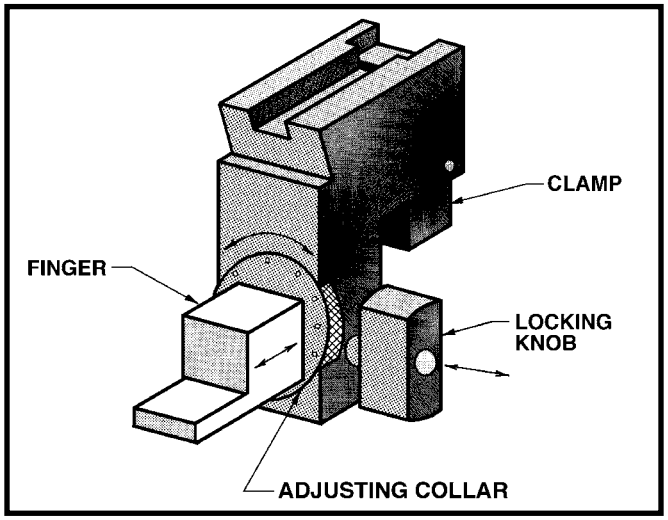


FIGURE 5-16 Gage assembly

WORK SUPPORTS

Two work supports for light gauge material are furnished with the CNC Heavy Duty and the optional CNC Plate backgages. They are intended to be used in the rear of the bed when long backpieces (which droop away from the gage surface) are formed. These supports attach to rear dovetail slots in the bed and should be positioned at same height as top of lower die. Figure 5-17 shows a typical work support setup.

Note: *1. If the power "R" option is installed it should be disabled in the GAGE PAGE of the Configuration dialog (see SECTION 7) after the fingers are at the proper height and the work supports are installed.*

2. These supports will not mount to the rear side of the bed in the area of the CNC Backgage housing.

3. Work supports are not recommended to be used in the rear with a Six-Axis Backgage unless both the "Z" and "R" axis are disabled.

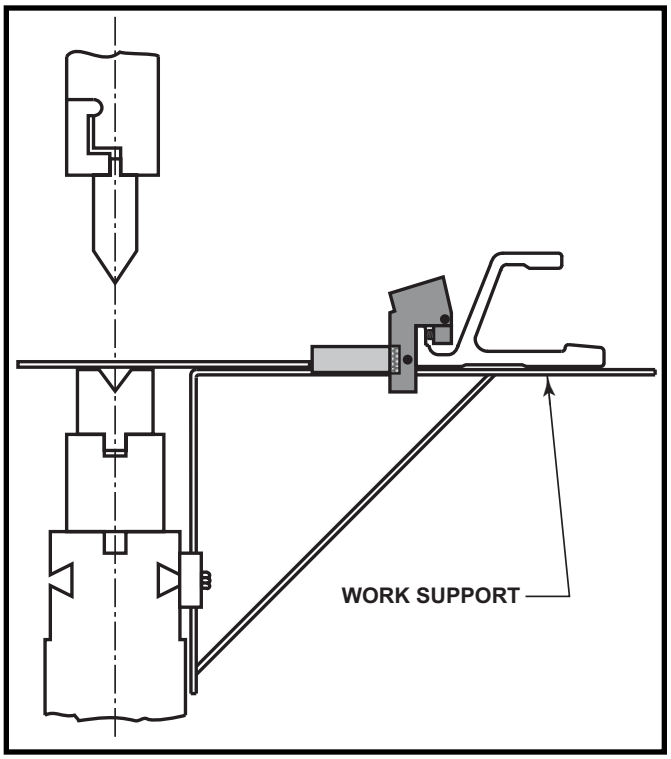


FIGURE 5-17 Typical work support set-up

OPERATING TECHNIQUES

The following guidelines will help the individual avoid operating problems, producing bad parts, causing injury to himself or damage to the tooling or machine.

TOOLING AND SET-UP

- **DO** use SETUP mode for all setup procedures.
- **DO** inspect the tooling carefully before starting any job. It may be impossible to compensate for badly worn dies and they could create a safety hazard.
- **DO** select tooling which is correct for the job and compatible with machine capacity. It is especially important to have the exact tooling when recalling a previously run program from storage.
- **DO** ensure that tooling shoulders are tightly seated against ram and filler block, and that upper and lower dies are aligned front-to-back.
- **DO NOT** attempt to bend a part to the same angle as the die when using ANGLE, ANGLE/DTC or ADAPTIVE modes forming of

operation. Dies must have sufficient allowance for springback so the part does not bottom in the dies. It may be necessary to use 75° (or less) dies when 90° air bending for certain materials with large “springback”. See Figure 5-18 and the *PRESS BRAKE CAPACITIES* booklet for more information on springback.

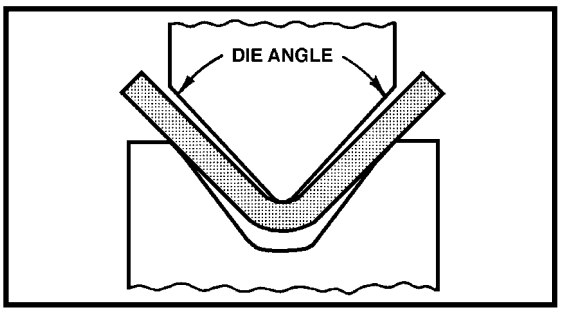


FIGURE 5-18 Air bend

- **DO NOT** attempt to air bend a part when TONNAGE reversal has been selected. Bottoming dies must be used when reversing on tonnage. See Figure 5-19.

  Note: *Either air bend or bottoming dies can be used when POSITION reversal has been selected. However, sufficient clearance in the dies is necessary to avoid excessive tonnage build-up.*

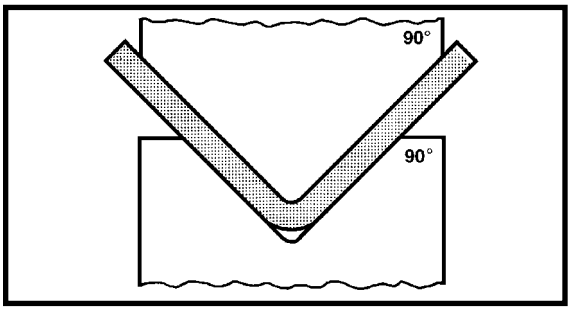


FIGURE 5-19 Bottoming

- **DO NOT** use ANGLE or TONNAGE reversal when punching. POSITION reversal should be selected for punching.
- **DO** use as large a vee die opening as possible when air bending. Larger vee openings are less sensitive to material thickness variations, deflections and tooling height variations.
- **DO** make ram tilt and die shimming adjustments as soon as possible when setting-up a program as they may affect program inputs.

RUNNING

- **DO NOT** start running a job until the proper methods and safeguards to protect the operator and others from injury are understood and are in place.
- **DO NOT** jog through the bend. Once ram has reached speed change position, motion should be continued through the bottom of the stroke.
- **DO** remove burrs or keep burrs up on material for more consistent bends.
- **DO** run production in same speed in which the setup part was made.
- **DO NOT** make angle corrections in the middle of a production run unless two or more consecutive bends are out-of-tolerance.
- **DO** store the changes which are made to a new or old program. The latest program must be stored to save the changes.
- **ALWAYS** block the ram or position the ram at bottom of the stroke and turn “OFF” CONTROL switch and remove the key whenever leaving the machine.

SPEED CHANGE/FORMING SPEED

- **DO** ensure that the forming speed selected is appropriate for the part being formed. Too high of a speed may cause "whip-up", which could be hazardous to the operator or cause part damage.
- **DO** ensure that the speed change position is compatible with the forming speed selected. If a high forming speed is programmed and the speed change point is close to the material (less than .25"/6.4mm), then inconsistent part forming motion and bend angle may occur.

  When using high forming speeds and short approach strokes, it is advisable to eliminate speed change by raising the speed change point above the top stop. In many instances this will provide more strokes per minute and smoother motion.

GAGES

- **DO** ensure that gaging surfaces will not interfere with the tooling or ram when setting-up or running a job.
- **DO** use the gaging surface which provides the largest possible gaging target.
- **DO** spread gage fingers as far as possible to achieve the best gaging accuracy.
- **DO** support workpiece in the gaging position, both in front and rear of the bed.

REMOVING TOOLING

To remove the tooling:

CAUTION

See *SECTION 3 - SAFETY* for proper removal of dies.

1. If the AUTOFORM is not already powered-up, turn ON the main disconnect switch.
2. Depress the Main Drive START button on the AUTOFORM PC Control. Hold the button until the motor starts.

3. Log on to the AUTOFORM PC Control and verify that the palmbuttons are enabled for SETUP mode. To do this, press the OP STATION button in the toolbar.

Click on the SETUP mode tab of the Operator Stations dialog.

Ensure that the Station 1 checkbox is checked. If it is not already checked, click on the white box to the left of the 'Station 1' label to enable it. Then press the OK button to accept the changes and close the dialog.

4. Set the STROKE MODE SELECT button to SETUP mode.

In SETUP mode, use the Palmbutton Operator Station to move the ram down and use the RAM UP button to move the ram up.

Use the pulse wheel and the footswitch to accurately position the ram down or up. Even though the footswitch cannot be selected “ON”, depress and hold down the footswitch while turning the pulse wheel and the ram movement will follow the pulse wheel.

5. Turn the CONTROL ON-OFF keyswitch to “ON”.

6. Depress the palmbuttons and lower the ram to a position where there is .06" to .12" (1.5mm to 3.1mm) clearance between the upper and lower dies.
7. Turn the CONTROL ON-OFF keyswitch to the “OFF” position and remove the key.

8. Loosen the ram die clamp nuts or unclamp the upper power clamps to release the upper die. Loosen the filler block set screws or unclamp the lower power clamp to release the lower die.

IMPORTANT: When loosening the clamps for upper die, be sure upper die will remain trapped between the lower die and the slot in ram nose. See Figure 5-20.

9. The dies can now be removed from the end of the machine. They may be removed either

together or individually, depending on their size and weight. Use proper material handling equipment and methods.

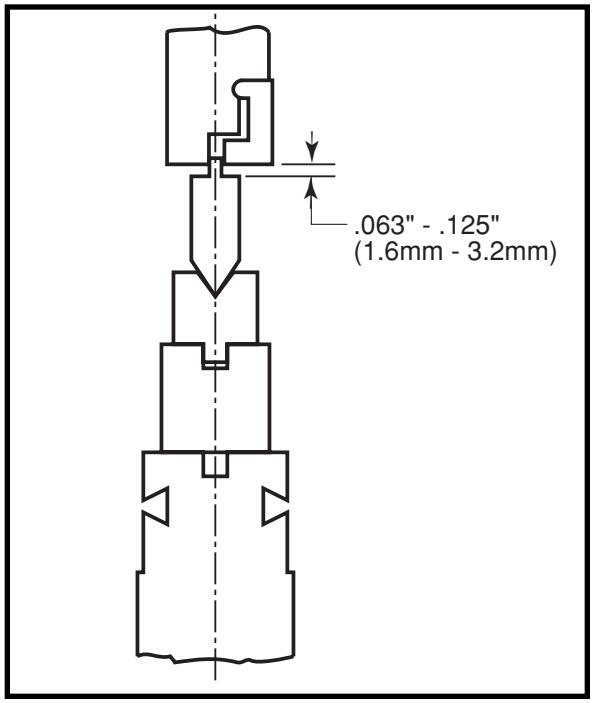


FIGURE 5-20 Removing tooling

MACHINE CONTROLS

PC CONTROL

The AUTOFORM PC Control is a self-contained industrial PC control with integrated LCD touch-screen display, keyboard and pointing device, floppy disk drive, CD-ROM drive, CONTROL ON-OFF keyswitch and MAIN DRIVE START / STOP buttons.

FIGURE 6-1 Pendant

LCD TOUCHSCREEN DISPLAY

The LCD Touchscreen display is the main user interface point of the AUTOFORM PC Control. Information is displayed on the flat LCD and user interaction is primarily accomplished with the touch-screen that is integrated with the LCD. Special controls have been added to the software to make user input quick and intuitive with the touchscreen.

KEYBOARD / POINTING DEVICE

A full-size keyboard with integrated pointing device is included as part of the AUTOFORM PC Control for use outside of the AUTOFORM application (i.e.: logging in to Windows) or for those who prefer to use a keyboard or track-point device.

FLOPPY DISK DRIVE

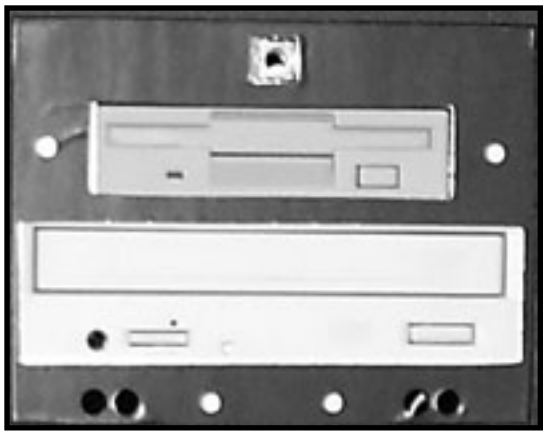


FIGURE 6-2 Floppy disk & CD-ROM drives

The AUTOFORM PC Control contains one 3.5" floppy disk drive. This 1.44 megabyte floppy drive can be accessed by opening the cover that protects the floppy drive and CD-ROM drive.

Files can be copied to or from the floppy drive using the Windows operating system using Windows Explorer or the “My Computer” icon.

IMPORTANT: The cover over the floppy disk and CD-ROM drive is provided to prevent contamination and should be kept closed except for changing floppy disks or CDs. Failure to keep the cover closed could result in damage to the drive assembly and/or loss of data.

! WARNING !

NEVER REMOVE A DISK FROM THE DRIVE WHILE THE DISK ACCESS LIGHT IS “ON”. THIS WILL RESULT IN LOSS OF DATA ON THE DISK. ALWAYS MAINTAIN PROPER BACKUP COPIES OF IMPORTANT DATA.

CD-ROM DRIVE

A CD-ROM drive is included for easy updating of software. The CD-ROM drive can be accessed by opening the cover that protects the floppy drive and CD-ROM drive.

To insert or eject a CD-ROM, press the button on the lower right-hand corner of the drive. The CD drawer will slide out, allowing the removal of the CD inside or the insertion of a different CD.

SWITCHES AND BUTTONS

The CONTROL ON-OFF keyswitch and the MAIN DRIVE START / STOP pushbuttons are located on the left side of the AUTOFORM PC Control.

CONTROL ON-OFF KEYSWITCH

This keylock switch must be turned ON to allow the active Operator Stations to cycle the ram.

In the "OFF" position, the Operator Stations are prevented from cycling the ram even though the main drive motors may be running. The ram cannot be moved with the RAM UP button on the Palmbutton Operator Station.

! WARNING !

THE OPERATOR SHOULD LOCK THIS SWITCH OFF AND REMOVE THE KEY WHEN AWAY FROM THE MACHINE OR WHEN PERFORMING ADJUSTMENTS TO PREVENT ANYONE FROM CYCLING THE MACHINE.

MAIN DRIVE START AND STOP PUSHBUTTONS

To start the main drive motor, the START pushbutton is held depressed. If the internal check indicates all components are operating properly, the motor will start. The START pushbutton will illuminate to indicate the drive motor is running.

When the STOP pushbutton is depressed, all power to main drive motor and valves is turned off. The main drive motor and hydraulic pumps will stop.

Note: *If a machine fault should occur during operation, it is recommended that power is turned off by pressing the EMERGENCY STOP button on the Operator Station.*

OPERATOR STATIONS

The standard Operator Station is a dual palmbutton station located on the front of the ram. In addition to this ram-mounted Palmbutton Operator Station, other Operator Stations may include pedestal-mounted Palmbutton Operator Stations, Footswitch and hand-held Pendant.

PALMBUTTON STATION

PALMBUTTON SWITCHES

Two guarded palmbutton switches are located on either end of the Palmbutton Operator Station (ram-mounted or pedestal-mounted). As a safety feature, they must be pressed at about the same time to start ram motion. The palmbutton switches will cycle the ram in all modes of operation except "FOOTSWITCH ONLY". Releasing either palmbutton switch will stop the ram. Both palmbutton switches must be released and then depressed again to start ram motion.

Note: *The above description refers to the individual palmbutton switches on a single Palmbutton Operator Station.*

PALMBUTTON OPERATOR STATION LIGHTS

When the Palmbutton Operator Station is made active from the AUTOFORM PC Control, the amber "ON"' light is illuminated. The ram can then be cycled with the palmbutton switches. When the Palmbutton Operator Station is turned "OFF" on the AUTOFORM PC Control, the red OFF light on the Palmbutton Operator Station is illuminated and the ram cannot be cycled with the palmbutton switches.

Note: *One light should always be lit when the machine is powered. If neither or both lights are lit, the Palmbutton Operator Station should be checked by a qualified electrician.*

RAM UP BUTTON

Depressing this pushbutton will cause the ram to go up, regardless of the motion or position of the ram. As long as the button is depressed, the ram will go up until it reaches full top of stroke position. The ram will stop if the RAM UP button is released. The active Operator Station must be released and depressed again to resume ram motion.

EMERGENCY STOP (E-STOP) BUTTON

When this red button is pressed, power is removed from the main drive motor and gages. The ram will stop on either the down or up stroke.

NEXT RAM MOVEMENT LIGHTS

These lights indicate the direction of movement that the ram is moving, or will move when an active Operator Station is depressed. Red indicates down movement and green indicates up movement, except in the case of the RAM UP button, which overrides these lights.

RAM-MOUNTED PALMBUTTON OPERATOR STATION

The palmbutton switches will actuate ram movement. The RAM UP button will move the ram up on either the down or up stroke. Lights are provided to indicate the direction of the next ram movement (except in the case of the RAM UP button).

FIGURE 6-4 Ram-mounted Palmbutton Operator Station

PEDESTAL-MOUNTED PALMBUTTON OPERATOR STATION

The pedestal-mounted Palmbutton Operator Station has palmbutton switches, RAM UP button and ram direction lights.

The palmbutton switches will actuate ram movement. The RAM UP button will move the ram up on either the down or up stroke. Lights are provided to indicate the direction of the next ram movement (except RAM UP button).

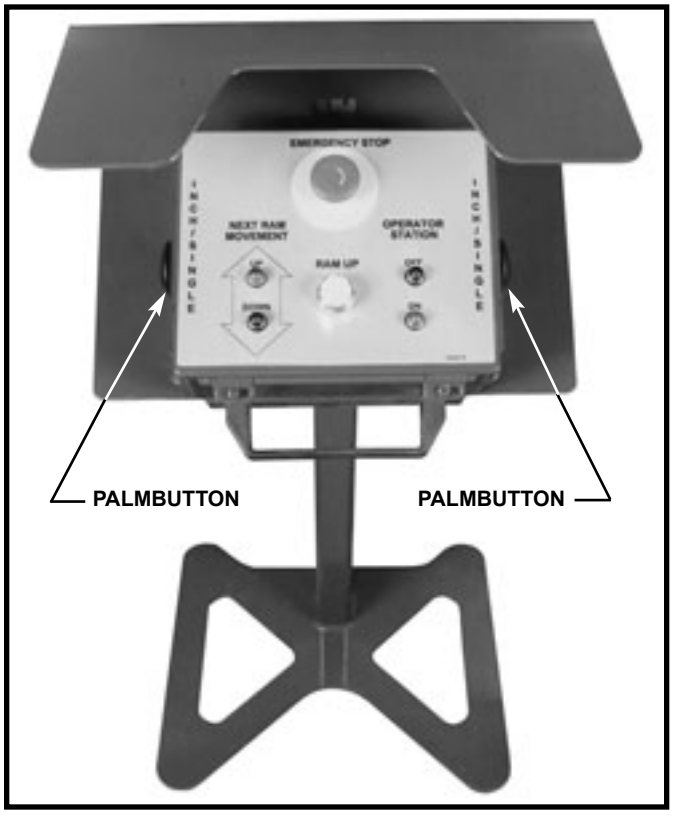


FIGURE 6-5 Pedestal-mounted Palmbutton Operator Station

FOOTSWITCH

A cable-connected Footswitch is provided to actuate ram movement. This is a guarded, three-position Operator Station which controls ram motion. A handle is included for ease of positioning.

When the Footswitch is made active on the AUTOFORM PC Control, an amber light on the Footswitch will indicate that it is turned ON and the ram can be cycled with the Footswitch.

If the Footswitch is not active on the AUTOFORM PC Control, a red light on the Footswitch will indicate that it is turned OFF and the ram cannot be cycled with the Footswitch.

Note: *One light should always be lit when the machine is powered. If neither or both lights are lit, the Footswitch should be checked by a qualified electrician.*

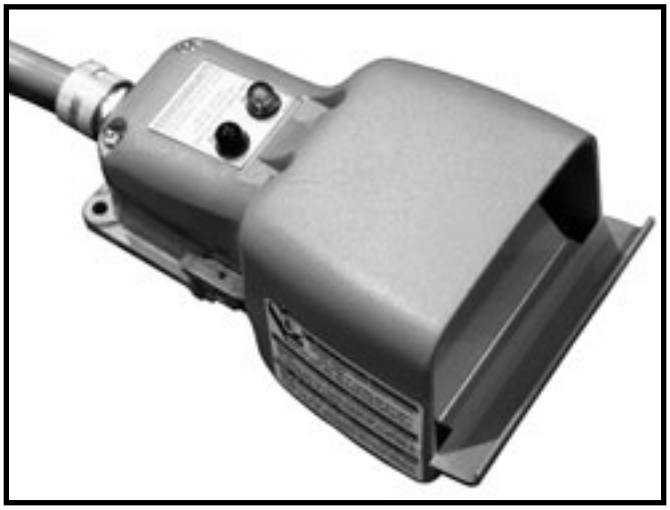


FIGURE 6-6 Footswitch *(Handle removed for clarity)*

HAND-HELD PENDANT

The hand-held pendant allows easy positioning of the ram and any installed gage axes. The Manual Ram Positioning wheel is used to precisely position the ram and MANUAL GAGE CONTROL pushbuttons are used to command the individual gage axes, if installed.

MANUAL RAM POSITIONING WHEEL

The wheel on the upper half of the hand-held pendant can be used to manually jog the ram up or down. The wheel is turned clockwise to move the ram up, counterclockwise to move the ram down.

FIGURE 6-7 Hand-held Pendant

Note that the AUTOFORM PC Control must be in SETUP Mode and at least one footswitch must be pressed while turning the wheel to move the ram. For the most accurate transfer of ram position when using the Manual Ram Positioning wheel, press the TRANSFER button on the pop-up calculator while the footswitch is still pressed.

MANUAL GAGE CONTROL PUSH-BUTTONS

If the machine has power gages installed, the lower half of the hand-held pendant will have two pushbuttons and up to two rotary switches.

The two pushbuttons control whether the selected axis moves in one direction or the other. For example, if the X-Axis is selected, the left button will move the gage “in” toward the ram and the right button will move the gage “out” away from the ram. If the R-Axis is selected, the left button will move the gage “up” and the right button will move the gage “down”. Similarly, if the Z-Axis is selected, the left button will move the gage “left” and the right button will move it “right”.

For machines with more than one gage axis, a rotary switch will be present to select which of these axes to move. For example, for a CNC Backgage with powered R-Axis, the rotary switch will allow either “X-Axis” or “R-Axis”. The motion caused by pushing the pushbuttons will correspond to the selected axis.

If one or more installed axis allows independent right and left gage arms, another rotary switch will be present. This switch will permit the choice between Left, Right or both Gage arms. The motion caused by pushing the pushbuttons will correspond to the selected gage arm.

ELECTRICAL ENCLOSURE

MAIN DISCONNECT SWITCH

This switch controls the incoming electrical supply to the machine. When turning the main disconnect switch from "ON" to "OFF" and then back to "ON", wait 10-15 seconds before switching back to "ON".

IMPORTANT: This 10-15 second delay is required to allow machine functions to reset properly.

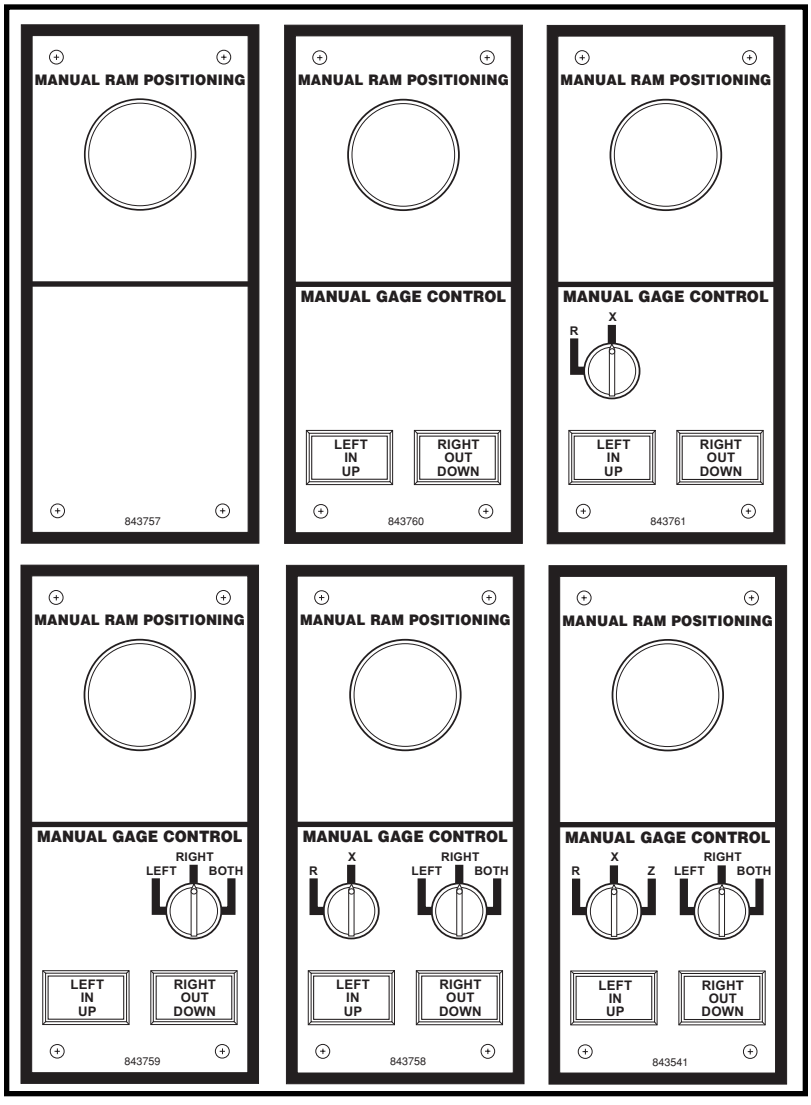


FIGURE 6-8 Hand-held Operator Station(s)

FIGURE 6-9 Electrical Enclosure

FIGURE 6-10 Main Disconnect Switch

! WARNING !

THE CONTROL CONTAINS AN UNINTERRUPTABLE POWER SUPPLY (UPS). VOLTAGE MAY BE PRESENT IN SOME CIRCUITS EVEN THOUGH THE MAIN DISCONNECT IS OFF.

GROUND CONNECTED LIGHT

The low voltage circuit is a grounded circuit. The illuminated light indicates that the ground is connected. This is an internal chassis ground - it does not indicate that the machine is grounded.

FIGURE 6-11 Ground connected light

POWER SUPPLIES OPERATIONAL LIGHT

This indicates that all internal power supplies are operating correctly when lit.

FIGURE 6-12 Power supplies operational light

ETHERNET CONNECTION

This connector on the side of the electrical enclosure is provided to allow easy connection of an Ethernet cable to add the AUTOFORM PC Control to a network. Cabling is provided internally which connects the external Ethernet connection to the pendant enclosure.

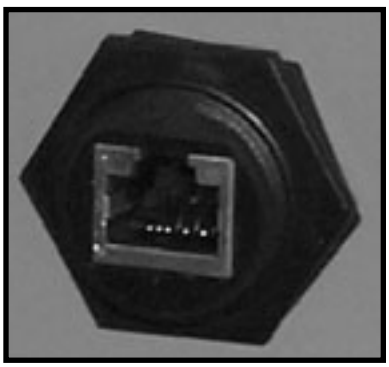


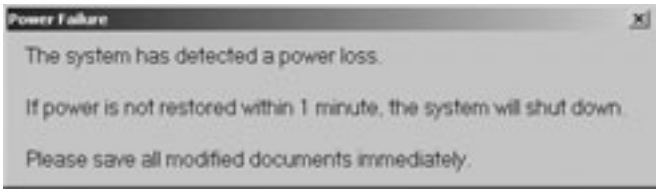
FIGURE 6-13 Ethernet connection

UPS (Uninterruptible Power Supply)

The UPS provides protection against sudden loss of power to the control and allows for an orderly shutdown of the AUTOFORM application and the Windows operating system.

FIGURE 6-14 UPS

In case of a power loss, including the normal shutdown of the machine with the Main Disconnect Switch, the UPS will begin beeping and the software will notify the user of the loss of power with a pop-up window.



After about one minute, assuming that power has not been returned in that time, the control will begin shutting down any running applications and the Windows operating system.

If power is restored within the first minute after power loss, shutdown will be aborted. A dialog will appear notifying the user of this event.

About two minutes after the actual shutdown procedure starts (or about three minutes after loss of power) the UPS will shut off power to the control.

Note: *Windows should be running when the Main Disconnect Switch is turned Off in order for the UPS to perform its shutdown procedure.*

If Windows is not running when power is lost, the UPS will attempt to keep power supplied to the system as long as possible. If this is the case, the UPS should be shut off manually using its power OFF button. At the next power-on following a manual power-off, the UPS will have to be manually turned ON before the control will power up.

! WARNING !

THE CONTROL CONTAINS AN UNINTERRUPTABLE POWER SUPPLY (UPS). VOLTAGE MAY BE PRESENT IN SOME CIRCUITS EVEN THOUGH THE MAIN DISCONNECT IS OFF.

SECTION 7 OPERATION

FOR ADDITIONAL SETUP AND OPERATION INFORMATION FOR THIS MACHINE, REFER TO EITHER THE ONLINE HELP INFORMATION THAT CAME WITH THE MACHINE SOFTWARE OR TO EM-499, "SECTION 7, OPERATION - AN OPERATION SUPPLEMENT MANUAL FOR THE CINCINNATI AUTOFORM CNC FORMING CENTER PC CONTROL", INCLUDED WITH THIS MANUAL.

SECTION 8 OPTIONS

ADDITIONAL OPERATOR STATIONS

One additional Palmbutton Operator Station and/or Footswitch can be installed on the AUTOFORM. See previous description of *"OPERATOR STATIONS"* in *SECTION 6 - MACHINE CONTROLS* for their operation.

AUTO CROWN®

The Auto Crown® option is a special bed with a variable proportional crown which automatically compensates for both bed and ram deflection for an applied centered load of any magnitude and length up to the nominal machine length. It causes the bed and ram to remain parallel in the loaded condition. With this device, the bend angle remains constant along the length of the bend.

A machine equipped with Auto Crown® does not have a microcrowned bed. The bed top and ram nose are machined straight.

The bed is sandwiched between two auxiliary cross members. All three are pinned together at two places near the end of the bed as shown in Figure 8-1. A hydraulic cylinder is mounted in slots in the center of these three members. The top of the piston contacts the top of the slot in the bed. The bottom of the cylinder contacts the bottom of slots in the auxiliary cross members.

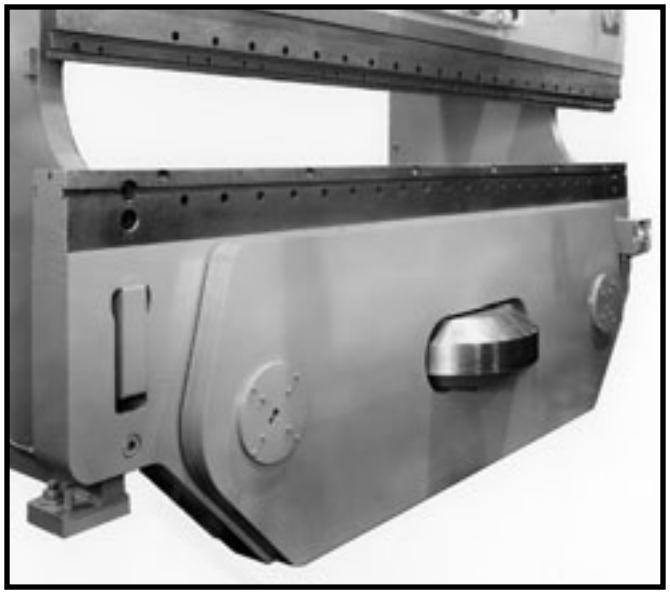


FIGURE 8-1 Auto Crown®

The force developed by Auto Crown® cylinder is proportional to the forming load. This force pushes up on the center of the bed. The cylinder is of such a size that its force is approximately twice as large as the forming load. The bed therefore deflects up an amount equal to the deflection of the ram. The result is that the bed and ram remain parallel and the upper die penetration is uniform along the bend length. Longer machines may have two Auto Crown® cylinders.

AUTOFORM® ADAPTIVE BENDING

Adaptive bending option (which requires and comes with the Auto Crown option) allows the AUTOFORM to adapt to a change in material strength and thickness by changing the ram reversal position when air bending parts. The feature includes a TEACH mode, which requires a series of test bends. From these test bends the Control determines the relationship between material strength, material thickness, ram position and bend angle. The test bends are made once for a set of dies, with the information stored in the Control's memory.

At the start of the bend the ram reversal point is unknown. The material thickness and material strength of the piece being bent are measured during the bend. The Control uses this information and the information from its memory, "learned" during the TEACH mode, to calculate a ram reversal point. When this point is reached, the ram reverses. All of these calculations occur during the actual bend cycle for every stroke.

It is important to read the Adaptive Bending operation described in EM-499 *SECTION 7, "ADAPTIVE BENDING"*.

BACKGAGES

Setup, programming and operating techniques for the optional backgages are described in the following procedures. Also described are the gage assemblies and fingers used with these backgages.

GAGE ASSEMBLIES

! WARNING !

THE FOLLOWING GAGE FINGER ADJUSTMENTS SHOULD NEVER BE MADE WHILE THE GAGE ASSEMBLY IS IN PLACE ON THE BACKGAGE. ALWAYS USE THE FINGER ASSEMBLY POSITIONING TOOL TO REMOVE THE GAGE ASSEMBLY.

The gage finger assemblies are installed or removed by using the finger assembly positioning tool (Figure 8-2). This tool releases the gage assembly clamp and holds the assembly while it is being moved. The finger assembly positioning tool can be used to position the gage assemblies from the front of the machine.

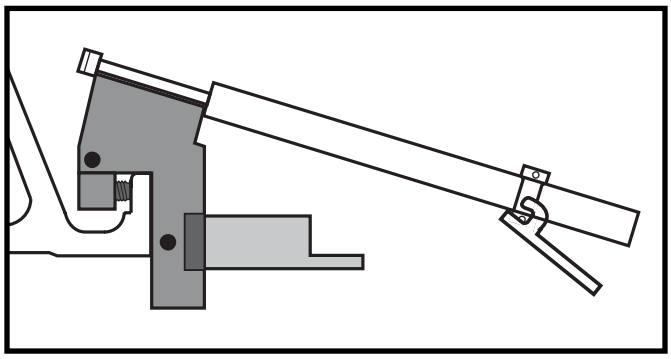


FIGURE 8-2 Finger assembly positioning tool

GAGE FINGERS

Several types of gage fingers are available for the AUTOFORM backgages. The 1" (25.4mm), 1/4" 6.4mm) and 1/8" (3.2mm) (optional) fingers are installed in the standard gage assembly. For gaging large or heavy material, the heavy duty gage block replaces the standard gage assembly. Refer to Figure 8-3.

The 1/4" (6.4mm) gage fingers can be rotated in the gage assembly to provide either a one inch or a one-quarter inch high surface for short flanges. See Figure 8-4 for minimum flange dimensions. The 1/8" (3.2mm) gage finger (optional) can be used for smaller flanges. The 1" (25.4mm) square gage finger or the heavy duty gage block should be used whenever possible, as these provide the largest gage target and contact area.

IMPORTANT: The selected gage surface should be analyzed carefully to avoid interference with the tooling.

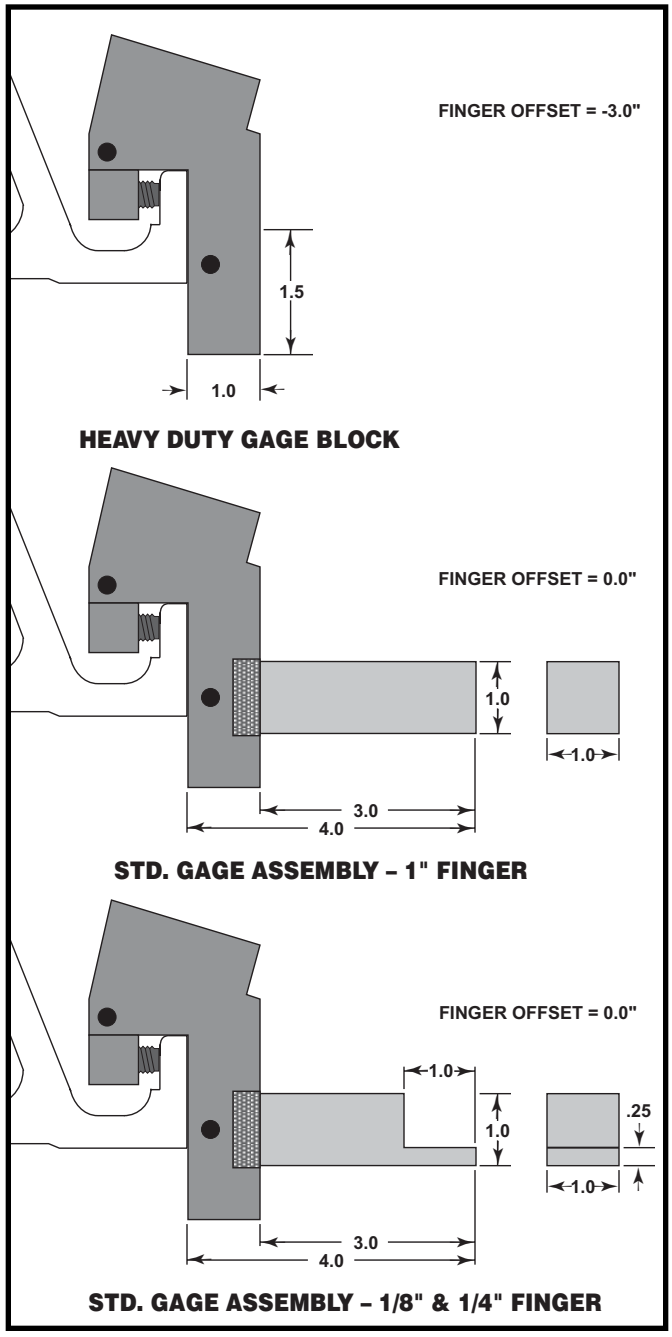
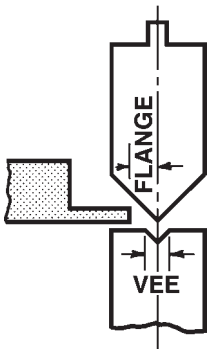


FIGURE 8-3 Gage/finger assemblies

The 1/8" (3.2mm) (optional) and 1/4" (6.4mm) gage fingers can also be used as a sheet support, as shown in Figure 8-5.



VEE	FINGER SIZE 1" (25.4mm)	.25 (6.4mm)	.125 (3.2mm)
.25	1.125	.438	.313
(6.4)	(28.6)	(11.1)	(8)
.375	1.188	.5	.375
(9.5)	(30.2)	(12.7)	(9.5)
.5	1.25	.563	.438
(12.7)	(31.8)	(14.3)	(11.1)
.625	1.313	.625	.5
(15.9)	(33.3)	(15.9)	(12.7)
.75	1.375	.688	.563
(19)	(35)	(17.5)	(14.3)
.875	1.438	.75	.625
(22.2)	(36.5)	(19)	(15.9)
1"	1.5	.813	.688
(25.4)	(38.1)	(20.6)	(17.5)
1.125	1.563	.875	.75
(28.6)	(39.7)	(22.2)	(19)

FIGURE 8-4 Minimum flange size

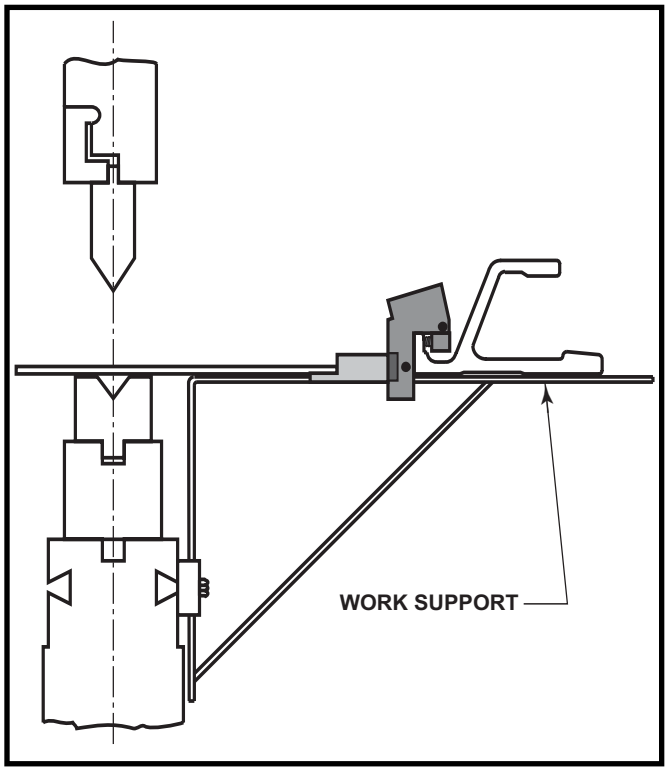


FIGURE 8-5 Gage finger used as sheet support

PROGRAM GAGE POSITION(S)

The actual position of the gage in relation to the tooling is selected when entering a program into the AUTOFORM PC Control. This procedure is described in *"SOFTWARE - GAGE PAGE"*, in EM-499, *SECTION 7*. The actual gage dimension from the centerline of the tooling to the gage surface is determined by flange dimension, bend allowance and finger offset program inputs. See Figure 8-6.

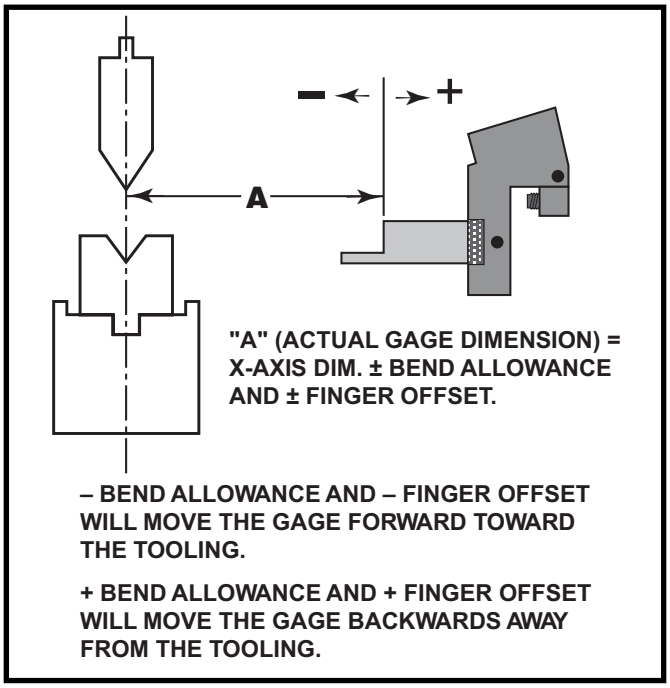


FIGURE 8-6 Actual gage dimensions

CNC PLATE BACKGAGE

Two types of gaging surfaces are furnished with Plate Gages. Heavy duty gage blocks are non-adjustable hardened steel assemblies, which are generally recommended for gaging large sheets or plates (over 100 lbs./45.4kg). Standard gage assemblies consist of an aluminum body with an adjustable finger holder, which can be used to mount a variety of gage fingers. See Figure 8-3.

The gage finger assemblies should be positioned left-to-right to contact the part being formed at the desired gage points. Normally, the two gage finger assemblies should be spread as wide as possible to provide the most accurate gaging. The gage finger assemblies are moved along the gage bar by using the finger assembly positioning tool (Figure 8-2). This tool releases the gage assembly clamp and holds the assembly while it is moved. The finger assembly positioning tool can be used to position the gage assemblies from the front of the machine.

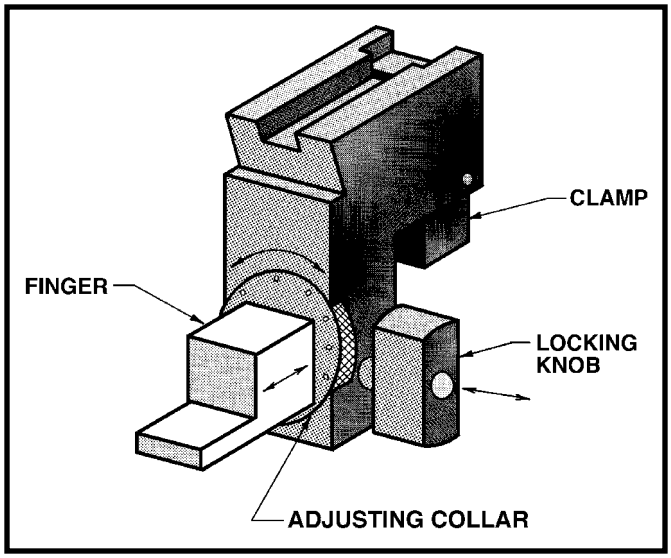


FIGURE 8-7 Gage assembly

Minor part flange differences (end-to-end) can be corrected by adjusting the individual gage fingers either forward (to shorten flange) or backward (to lengthen flange). First remove the gage assembly from the backgage bar. Loosen the finger by pulling out the locking knob (Figure 8-7) and turning knob counterclockwise. The adjusting collar has a total range of .060" (1.5mm).

Adjust the collar forward the desired amount. Reseat finger shoulder tightly against adjusting collar and tighten the locking knob.

Note: *The locking pin spins freely unless it is pulled out. This allows the knob to rest against the backgage face, thus preventing the finger from being unlocked while the assembly is in position on the gage bar.*

IMPORTANT: Do not use the standard gage finger assemblies when gaging plates or sheets that weigh over 100 lbs. (45.4kg). Damage to adjustable finger holder could result. Use Heavy Duty Gage Blocks for these applications. Never allow the workpiece to contact the aluminum gage bar. Bar damage could result.

Note that finger offset must be entered when using Heavy Duty Gage Blocks and other gage fingers which are not 3.000" (76.2mm) long. Procedure for entering FINGER OFFSET is described in EM-499, *SECTION 7, "SOFTWARE - GAGE PAGE, FINGER OFFSET"*. For Heavy Duty Gage Blocks, the offset is -3.000". Examples of finger offset values for some common applications appear in Figures 8-3 and 8-6.

Vertical position of the gage bar is controlled by AUTOFORM programs using the R-AXIS fields. The procedure for entering Bar Height into a program is described EM-499, *SECTION 7, "SOFTWARE - GAGE PAGE, R-AXIS"*. Sometimes it may be desirable to position the gage bar manually using the Remote Gage Pendant. Individual UP and DOWN switches on the pendant allow control of both ends of the gage bar.

The bar height will depend upon the shape of the part being formed. Care should be exercised when the gage bar is being positioned close to the dies or work supports to avoid interference.

The R-AXIS fields position the vertical height of the gage fingers. When the '"R" position is 0.000", the bottom of the Standard 1" (25.4mm) square finger will be 0.000" above the top of the lower die, except when using Unmeasured Tools. If non-standard fingers are normally used, consider modifying the Block Finger and/or Stop Finger objects in the CAD Dimensions tab of the Configuration dialog (see EM-499, *SECTION 7, "SOFTWARE"*. However, for special job setups, adjust the R-Axis fields the appropriate difference from Standard. Add to R-Axis positions any amount non-standard finger is lower than standard. Subtract any amount higher than standard.

The default position for R-Axis is 0.050" (1.27mm) above die.

IMPORTANT: Since the gage bar height on the Plate Gage is programmable, there is danger of collision between the gage bar and work supports. Special care should be taken when programming the gage with work supports.

CNC SIX-AXIS AND 4X BACKGAGES

Gaging surfaces furnished with the Six-Axis and 4X Backgages include two standard gage assemblies, and two-1" (25.4mm) and two-1/4" (6.4mm) gage fingers. These fingers are shown in Figure 8-3.

The gage assembly adjusting collar is normally not used for Six-Axis and 4X Backgage applications. The collar should adjusted to .00" and left in this position. Otherwise the programmed position could be off the amount the adjusting collar is turned out. See Figure 8-7. For Six-Axis Backgages, minor adjustments to the part flange dimensions can be made to X-AXIS right and left input dimensions using INDEPENDENT gage mode. for 4X Backgages, minor adjustments to the part flange dimension can be made to X-AXIS

Flange and Right Offset input dimensions doing STANDARD gage mode (only available with 4X Backgages).

The Six-Axis and 4X Backgages are programmed by X-Axis, R-Axis and Z-Axis inputs.

The actual position of the gage finger in relation to the tooling in the X-axis direction is determined by three program inputs. They are the X-Axis dimension, Bend Allowance and Finger Offset. See Figure 8-6. To enter X-Axis positions, refer to the EM-499, *SECTION 7, "SOFTWARE - GAGE PAGE, X-AXIS"*.

An R-Axis position is required for each step in a program. A dimensional value for each step of the program must be selected. The R-Axis position is illustrated in Figure 8-8.

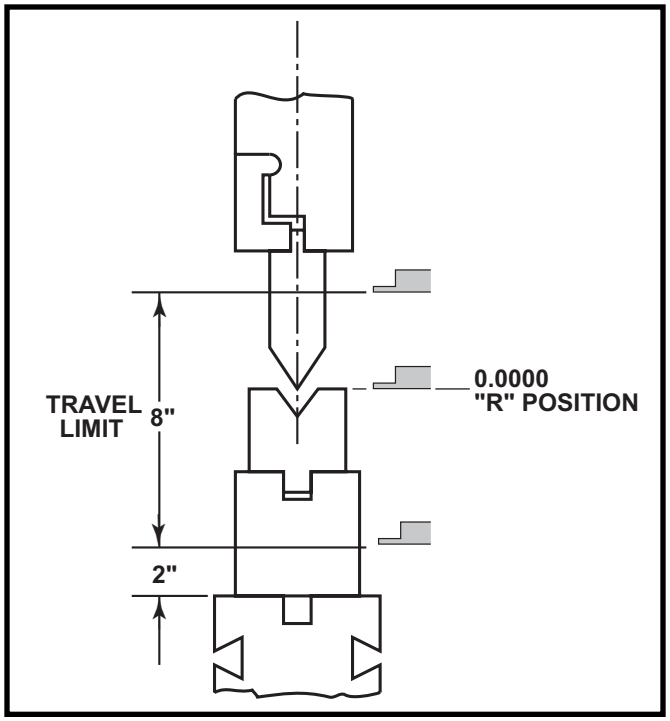


FIGURE 8-8 R-axis position

To enter R-Axis and Z-Axis positions, see EM-499, *SECTION 7, "SOFTWARE - GAGE PAGE, R-AXIS and Z-AXIS"*.

The Z-Axis fields position the gage fingers horizontally left-to-right. The default values for Z-AXIS LEFT and RIGHT are the maximum left and right positions. These depend on the length of the machine.

A Z-Axis position is required for each step of a program. A dimensional value for each step of the program can either be selected or manually transferred to the program step. At the 0.000 position the center of the finger is at the center of the machine. Negative (-) numbers are to the left of center and positive (+) numbers are to the right.

Note: *On CNC Six-Axis and CNC 4X Backgages, the 'center of the finger' is assumed to be 0.75" (19mm) over from the inside edge of the respective arm's gage bar.*

For each bend being made the fingers should be spread as far as possible to provide the most accurate gaging.

SPECIAL STEP PROGRAMMING

IMPORTANT: In some special machine set-ups when multiple dies or special die sets (i.e. punching die with guide pins) are used, it is necessary to take special precautions when programming to prevent gage finger interference with the tooling.

When direct line movement of gage finger(s) along the Z or R-axis would cause a collision between the gage and tooling (Figure 8-9), a "dummy" (extra) step(s) should be added to provide a motion path around obstacles for the gage finger to follow. Extra steps can be added by setting the REPEAT at "0" for that step. This will allow the gage to cycle through the extra step without cycling the ram.

As shown in Figure 8-9, when moving from position "A" to position "B" along the Z-axis, possible interference could occur at the step between the dies unless an extra (dummy) step(s) is added. The extra step would first move the fingers backward and upward away from the dies. The bending step would then move the gage sideways and finally back into position over the higher die. This step would eliminate the gage/tooling interference.

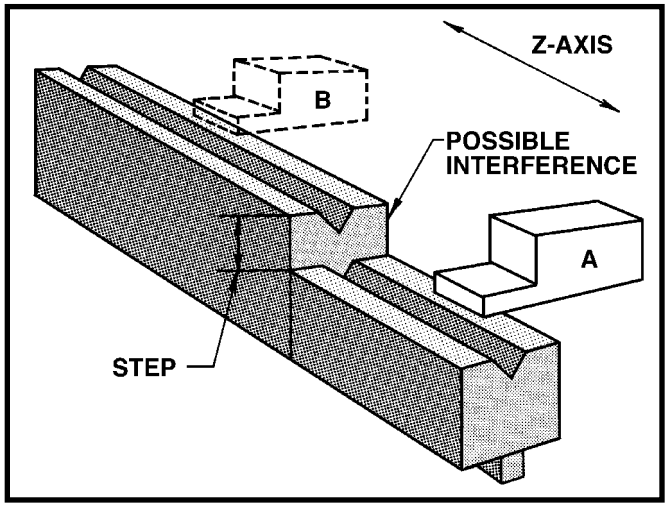


FIGURE 8-9 Special step programming

CONTINUOUS STROKE MODE

The STROKE MODE SELECT button may have an optional fourth position - CONT. This is operator maintained CONTINUOUS Run mode, a production mode that will continue to cycle through the program as long as the active Operator Station is depressed. The ram will not stop, even at the top of the stroke, until the active Operator Station is released.

CNC FRONTGAGE

The CNC Frontgage is designed to gage sheets up to 3/16"/4.8mm maximum thickness that weigh less than 400 lbs./181.4kg (200 lbs./90.7kg per unit). Heavier sheets may be gaged if additional work supports are used. Reasonable care should be used when positioning heavy sheets.

IMPORTANT: Heavy shock load could damage parts of the frontgage.

Each gage unit has a programmable gage range of 40" (1016mm). The absolute maximum and minimum programmable gage positions vary depending on the press brake bed width.

The carriage travel is limited to 10" (254mm) and the operator must select the proper finger to use during gaging.

The gage bar vertical range is 6" (152.4mm) and should accommodate most die heights.

The gage units can be positioned anywhere along the bed of the press brake. The maximum distance between gage fingers is the actual bed length minus 29" (736.6mm). The minimum distance between gage fingers is 5" (127mm). For example: A 135 x 10 Ft. AUTOFORM Press Brake has an actual bed length of 144" (3657.6mm). This means the maximum distance between fingers is 144" - 29" = 115" (3657.6 - 736.6 = 2921mm) and the minimum is 5" (127mm).

CNC FRONTGAGE SETUP

Based on the workpiece, determine where the gage units will be positioned along the press brake bed. The gage units should be positioned such that they adequately support the workpiece and are positioned as far apart as possible to provide accurate gaging. If a single gage unit with the squaring arm is to be used, the other unit should be positioned out of the way, near the end of the press brake with disabled command in the control.

To move the gage units, loosen the housing clamp handles (1/2 turn). Move the gage units to the desired positions along the front of the press brake. Tighten the housing clamp handles.

Note: *Failing to tighten the housing clamp handles could result in damage to the gage unit mounting track.*

To set the gage bar height, turn the vertical adjusting handles until the top of the gage bars are flush to 1/32" (.793mm) above the lower die.

After the frontgage units have been positioned and clamped, ensure that the correct units are enabled on the GAGE PAGE. See EM-499, *SECTION 7, "SOFTWARE - GAGE PAGE"*.

If the checkbox associated with the desired unit is checked, then the unit is disabled. In this case, the corresponding field's background will be grayed. If the checkbox is empty, the corresponding field's background will be white and the unit is enabled.

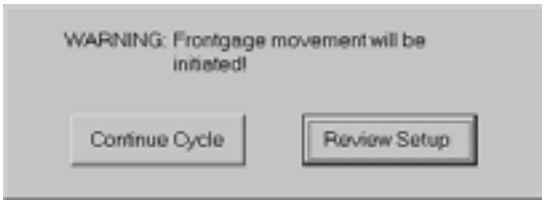
The frontgage has now been set up and is ready to program.

CNC FRONTGAGE OPERATION

Before operating the Frontgage, read and understand the safety guidelines starting on Page 8-7.

Note: *Frontgage mounting position and adjustment may interfere with point-of-operation safeguarding. Ensure safeguarding is not compromised and operator protection is maintained.*

Before the first cycle of the ram and if the frontgage needs to reposition, the operator will be prompted to initiate frontgage movement. A dialog box will open:



At this point, if the operator is unsure how the frontgage will reposition in the current setup, they can press the "Review Setup" button to review the setup and programmed frontgage values on the GAGE PAGE. To continue the cycle, the operator can press the "Continue Cycle" button.

! ! DANGER ! !

MAKE SURE YOU KNOW WHEN AND WHERE THE FRONTGAGE WILL MOVE BEFORE YOU PLACE THE FRONTGAGE IN OPERATION.

Based on the following criterion, the frontgage may or may not automatically reposition during the bend for the remaining program steps:

- If the next frontgage movement is away from the die, the frontgage will automatically reposition at the workpiece clamp point.
- If the next frontgage movement is towards the die, the frontgage will not reposition until the ram gets to a predetermined position below the clamp point, thus allowing front edge of the workpiece to clear the gage fingers.
- If the desired bend angle is shallow and the workpiece edge will not clear the gage finger, the frontgage will not reposition and the operator will be prompted to initiate the frontgage movement the same as before.

The operator must select the proper gage finger to use during gaging since there is a 40" (1016mm) gage range, but only a 10" (254mm) carriage travel.

The proper finger to use during gaging will be displayed on the RUN/EDIT PAGE on a status line. The fingers are numbered (1), (2), (3) and (4), with number (1) being closest to the die.

The following is a list of finger ranges for each press brake bed width:

3.50" Wide Bed

Finger #1	3.500" to 13.500"
Finger #2	13.501" to 23.500"
Finger #3	23.501" to 33.500"
Finger #4	33.501" to 43.500"

4.50" Wide Bed

Finger #1	4.000" to 14.000"
Finger #2	14.001" to 24.000"
Finger #3	24.001" to 34.000"
Finger #4	34.001" to 44.000"

5.50" Wide Bed

Finger #1	4.500" to 14.500"
Finger #2	14.501" to 24.500"
Finger #3	24.501" to 34.500"
Finger #4	34.501" to 44.500"

For example, if a 25.500" (647.7mm) frontgage bend was required on a 350AF (5.50" wide bed), the operator should use Finger #3 since 25.500" (647.7mm) is within the 24.501" to 34.500" (622.3mm to 876.3mm) finger range.

Note: *Be sure to retract the unused gage fingers to help reduce the possibility of injury as well as incorrect gaging.*

PROGRAMMING

The frontgage can be programmed in either the GAGE PAGE or in QUICK BEND.

Note: *All gage distances are from the centerline of the upper die slot.*

To program from the GAGE PAGE, see EM-499, *SECTION 7, "SOFTWARE - GAGE PAGE, AUX-AXIS (FRONT AXIS)"*.

To move the frontgage from Quick Bend, use the fields to the right of the"Aux-Axis" button. See EM-499, *SECTION 7, "SOFTWARE - TOOLBAR BUTTON DESCRIPTION, QUICK BEND"*.

To actually move the frontgage, press the button labeled "Aux-Axis". This initiates motion to the positions in the fields. In Quick Bend, the left and right gage units are not independently programmable.

Note: *If the main drive motor is off, the frontgage will not move.*

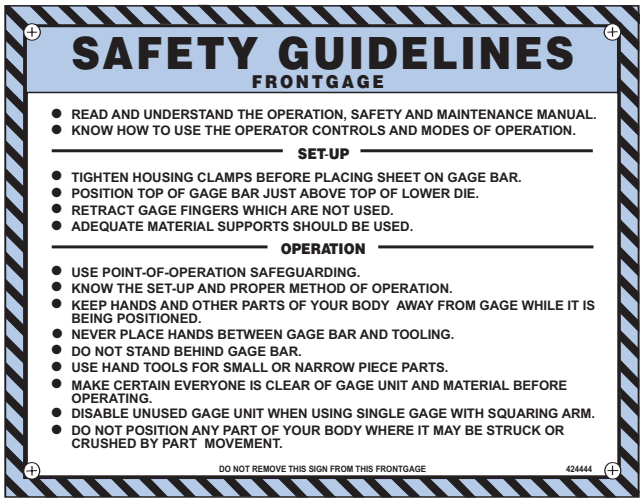
CAUTION

When programming frontgage and backgage, the programmer should guard against workpiece being trapped between the frontgage and backgage. It is recommended the operator retract all frontgage fingers when using the backgage, and program backgage to its maximum value when using frontgage.

CNC FRONTGAGE SAFETY SIGNS

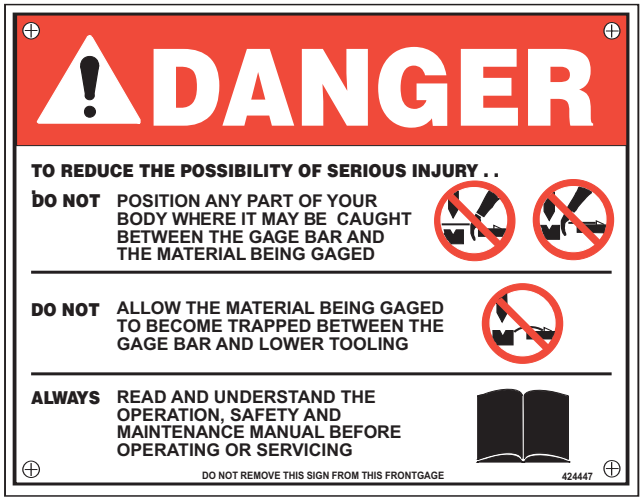
SAFETY GUIDELINES (424444)

This sign is also attached to the frontgage housing near the Danger sign. It provides a checklist of safety considerations which should be observed before and during operation of the frontgage.



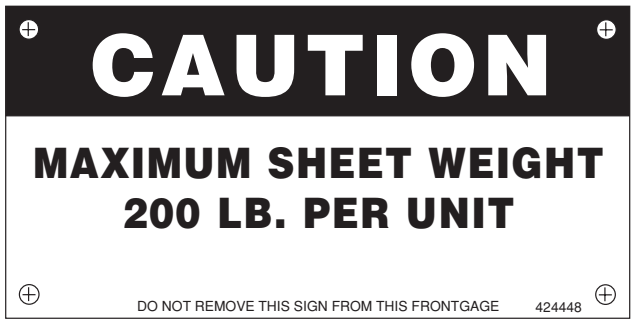
DANGER (424447)

This warning sign is attached to the most visible location on the frontgage housings. The sign is a reminder to operators or maintenance personnel that certain procedures must be followed to prevent serious bodily injury.



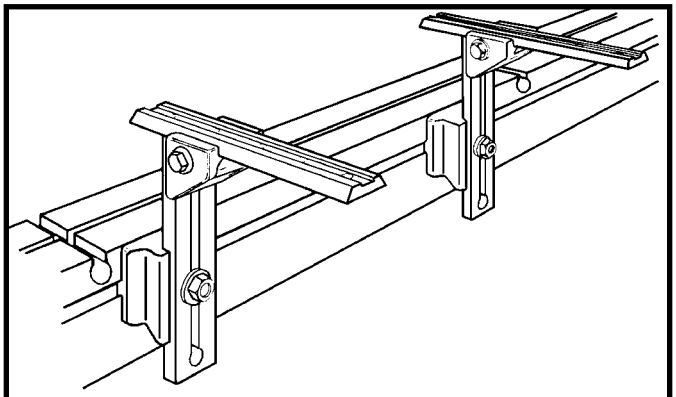
WEIGHT LIMIT CAUTION (424448)

This caution sign is attached to the frontgage housing. It provides a reminder to the operator not to exceed the maximum sheet weight limit of 200 lbs. (90.72kg) per gage unit.

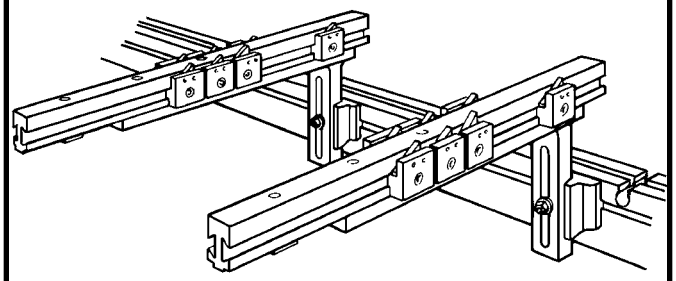


MANUAL FRONTGAGES

Fixed frontgaging and material supports are available for the AUTOFORM. Gage brackets and gage stops are manually set to position material for forming. Frontgage brackets without gage stops can also be used to support material. See Figure 8-10.



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



Adjustable Flip Finger 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. Flip Finger gage stop assemblies are located on either side of heavy duty gage bars. Any number of stops may be used.

FIGURE 8-10 Frontgage supports

BEND SIMULATION MODULE

The Bend Simulation Module is a (offline) software package that will allow creating (or revising) part programs, adding new tools to the tooling

library, and graphical part design and simulation on a personal computer totally independent of the AUTOFORM PC Control.

The Bend Simulation Module user interface is nearly identical to the AUTOFORM PC Control user interface. Personnel familiar with the AUTOFORM PC Control can operate the Bend Simulation Module with a minimum of additional training. Program files, tooling files, CAD/graphics files, etc. can then be transferred to the AUTOFORM by the built-in Ethernet network connection or by copying the desired files to a floppy disk.

Differences between the AUTOFORM PC Control software and the Bend Simulation Module are explained in a separate supplement manual (EM-503).

POWER CLAMP

Power Clamp eliminates the need to loosen and retighten die clamp nuts when changing dies. Hydraulic power is used to unclamp the die holders. Once the dies are installed and POWER CLAMP is deactivated, powerful springs hold the dies in place. Power Clamps are available for the ram, bed or on both. See Figure 8-11. Operation is described in *SECTION 5 - SETUP & USE*.

FIGURE 8-11 Ram Power Clamp

PRESENCE SENSING SAFE-GUARDING INTERFACE

This is a hardware/software package to interface the AUTOFORM PC Control with a customer supplied presence sensing device. The interface allows the customer's installed presence sensing device to interrupt a down stroke in STROKE mode when a person or an object is detected in the protected area, until the Guard Mute Position is reached. See EM-499, *SECTION 7, "SOFTWARE - RAM PAGE, GUARD MUTE POSITION" and "SOFTWARE - TOOLBAR BUTTON DESCRIPTION, QUICK BEND"*.

The Guard Mute Position is the position in the ram's down stroke at which the presence sensing device is muted. At that point, the presence sensing device is no longer providing the point-of-operation guarding. When the device is muted (disabled), the operator can enter the guarded area to position or hold the workpiece.

The Interface option for presence sensing device includes pedestal mounting of the standard palm-button operator station and mute indicator light. When the red GUARD OFF lights are illuminated, the presence sensing device is muted. See Figure 8-12.

Some presence sensing devices are programmable and allow a blanking window of variable size to be programmed from step-to-step. The AUTOFORM has an output available which can be configured as a step advance output to a programmable presence sensing device to take advantage of this feature.

FIGURE 8-12 Mute Indicator Light for Presence Sensing Device

PROGRAMMABLE FOOTSWITCH

The Programmable Footswitch feature is used to select which footswitch must be pressed to cycle the ram when two or more footswitches are installed and turned on (active).

As opposed to selecting multiple footswitches in the Operator Stations dialog, the Programmable Footswitch option makes footswitch selection step-wise programmable. Any combination of footswitches may be selected for each step. See EM-499, *SECTION 7, "SOFTWARE - RAM PAGE, PROGRAMMABLE FOOTSWITCH"* for details on use and programming.

SECTION 9 MAINTENANCE & ADJUSTMENTS

To maintain the accurate performance of your CINCINNATI AUTOFORM CNC Forming Center, there are maintenance practices that should be followed. This section deals with the maintenance and adjustments of the Press Brake.

LOCKOUT / TAGOUT PROCEDURE

Note: *This procedure only covers the typical energies of an AUTOFORM CNC Forming Center. Special options, tooling and add-ons may have energy states that this procedure does not cover. It is the responsibility of your supervision to verify and establish the appropriate Lockout / Tagout Procedure for your specific machine.*

Before maintaining the machine, read and understand this OPERATION, SAFETY AND MAINTENANCE Manual. Refer to "SECTION 1 - IDENTIFICATION", Figure 1-1, "SECTION 6 - MACHINE CONTROLS", Figure 6-10, and this section, "MAINTENANCE & ADJUSTMENTS", Figure 9-11 and 9-12, for item callouts.

1. Using SETUP mode of operation, carefully run the ram down until the ram is resting on support blocks. The ram supports must be able to withstand a minimum of 10% of the machine capacity without damaging the machine bed or ram.

2. Turn OFF the main drive motor by depressing the MAIN DRIVE STOP pushbutton on the AUTOFORM PC Control (Figure 1-1, Item 9).

3. Turn OFF and padlock the main disconnect switch (Figure 6-10).

4. Locate Test Port #4 on the main manifold (Figure 9-11). Install a 0-5000 PSI range pressure gage with a female quick-disconnect and check for any hydraulic pressure trapped in the main manifold. Locate bleed valves on the counterbalance manifolds (Figure 9-12). Loosen locking nuts and open bleed valves for 5 seconds. Close bleed valves and tighten locking nuts. Allow the machine to sit for 5 minutes to let any internally trapped pressure bleed down.

5. **After maintenance is complete,** make certain that all pressure gages are removed from test ports (Figure 9-11 and 9-12). Check that the counterbalance bleed valves are closed and the locking nuts are tightened.

6. Remove the padlock and turn the main disconnect switch ON (Figure 6-10).

7. Turn ON the main drive motor by depressing the MAIN DRIVE START pushbutton on the AUTOFORM PC Control (Figure 1-1, Item 9).

8. Using the RAM UP button on the palmbutton operator station (Figure 1-1, Item 11), carefully run the ram up until any ram supports can be removed from the machine.

LUBRICATION

Refer to Figure 9-1 for machine lube point locations.

- **Cylinder Head Clevis Pins:** Lubricate grease fittings while cycling the ram under load, such as obtained with a bumping die. Use No. 2 Lithium base grease with "moly" additive (C.I. grease H-2M). Lubricate once a month.

- **Ram Guides:** Wipe clean and flush with light hydraulic oil once a month.

- **Auto Crown® (Optional)**: There is a grease fitting at each of the pins through the bed and auxiliary plate. These grease fittings are on the front end of the pins in a hole through the pin retaining plates. The pins should be lubricated monthly. Use a No. 2 lithium base grease with a "moly" additive (C.I. grease H-2M).

GAGES

Note: *The references to 'spray lubricant' means to use "LPS #1" aerosol spray (C.I. #420924) or to spray a SAE #10 oil. All grease applications use No. 1 EP grease (C.I. grease H-1EP).*

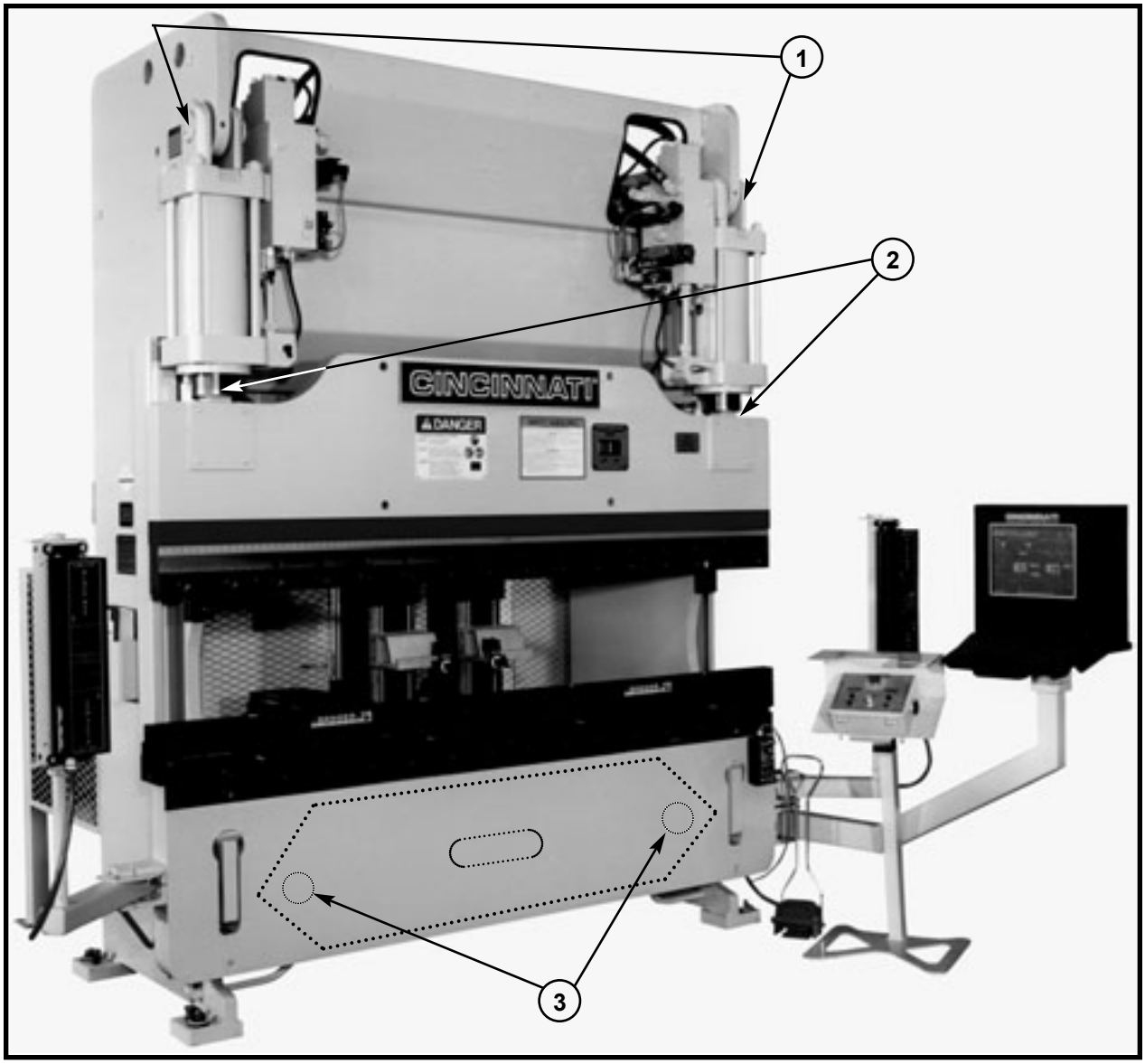


FIGURE 9-1 Lubrication points

CNC BACKGAGE (Standard on 6 and 8 Feet – 90, 135 and 175 Ton AUTOFORM®)

The following lubrication and cleaning should be performed every 200 hours of usage:

- Lube the X-axis screw located inside the main housing with spray lubricant. The screw may be accessed through a slot in the bottom of main housing or it may be accessed from the top by removing the screws and top cover.
- Clean and apply spray lubricant to the pair of X-axis guide rods on the sides of the main gage housing.
- Raise the R-axis to the maximum up position. Clean and use spray lubricant on the exposed portions of both shafts.
- *Optional Power R-axis.* Remove the 12 screws and the cover on the bottom of the movable housing. This gives access to the grease fitting on the center bearing and on each of the two jack screws. Apply only one pump of grease from a grease gun to each fitting. ***Do not*** over lubricate.

  The R-axis screws on Manual R-axis gages are packed with grease at the factory. Disassembly of the gage is required for lubrication. If, for any reason, lubrication becomes necessary, contact the CINCINNATI INCORPORATED Service Department.
- *Optional Power R-axis.* Raise the R-axis to the maximum up position. This will expose a lubrication access hole in the back of the vertical guide tube. The R-axis ballscrew will be visible through the access hole. Spray lubricant through the access hole to lubricate the ballscrew.

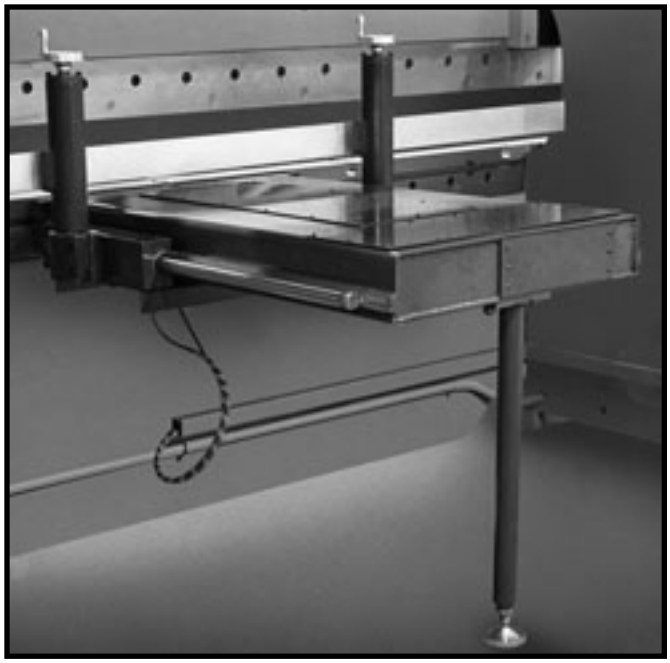


FIGURE 9-2 CNC Backgage Manual R-axis

FIGURE 9-3 CNC Backgage Power R-axis

CNC PLATE BACKGAGE (Optional)

- Clean gage and lubricate the two horizontal guide rails on each gage assembly with a thin coating of spray lubricant.
- Lubricate the X-axis ballscrews inside the gage assembly by applying the spray lubricant through the slot in the side of each "X" housing.
- Clean and lubricate the pair of horizontal guides on the right end of the gage bar (viewed from rear) with spray lubricant.
- Grease vertical guide bushings using the fitting on the back of each casting.

  The R-axis screws are packed with grease at the factory. Disassembly of the gage is required for lubrication. If, for any reason, lubrication becomes necessary, contact CINCINNATI INCORPORATED Service Department.

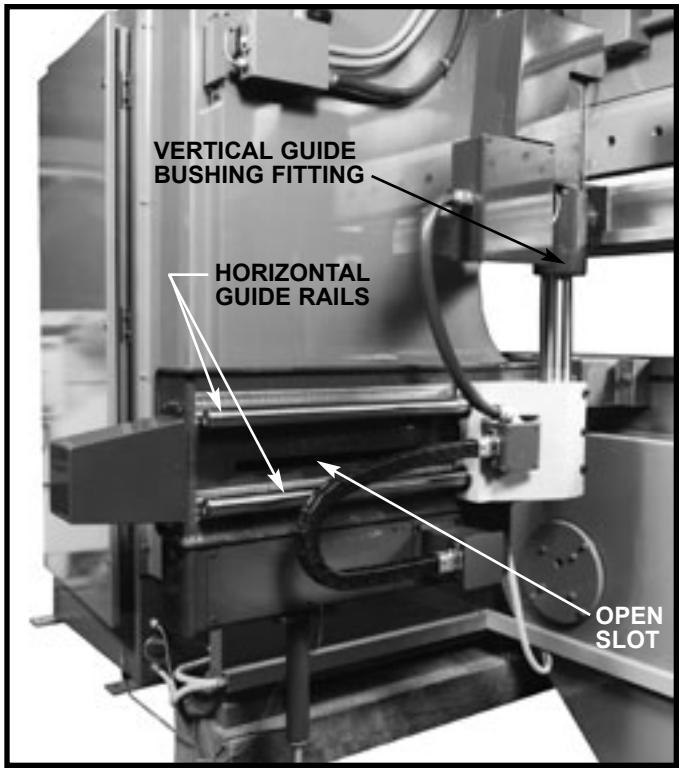


FIGURE 9-4 Lubrication points

CNC HEAVY DUTY BACKGAGE (Standard on 10 Feet and Longer – 90, 135, 175 Ton, and all 230 and 350 Ton AUTOFORM® Machines)

- Clean and apply spray lubricant to the X and R-axis guide rods. See Figure 9-5.
- Grease the X and R-axis guide bearings using the fittings on the side of each carriage. See Figure 9-5.
- Apply grease under the channel tapering carriage leveling foot. See Figures 9-5 and 9-6.
- Grease the channel tapering carriage/guide rods using the fitting on the side of the tapering carriage. See Figure 9-6.
- Grease the channel support arm spherical bearing joints using the fittings provided. See Figure 9-5 or 9-6.
- *Manual R-axis.* Apply spray lubricant to the R-axis drive screws.
- *Power R-axis.* Remove two screws from the top cover and remove top R-axis cover. Remove two screws from the front R-axis cover and remove the front R-axis cover. Apply spray lubricant to the R-axis ballscrews.
- Remove two screws from the end cover, two screws from the X-axis ballscrew cover and remove cover. Apply spray lubricant to the X-axis ballscrews.

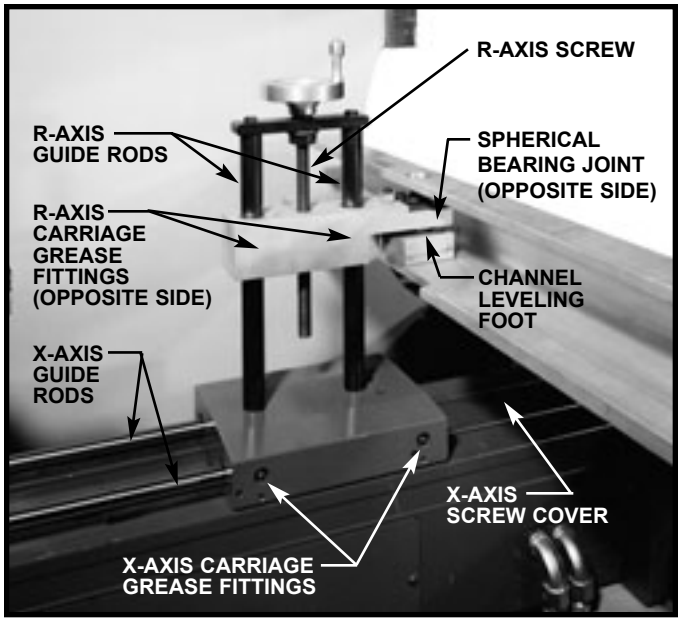


FIGURE 9-5 CNC Heavy Duty Backgage Manual R-axis

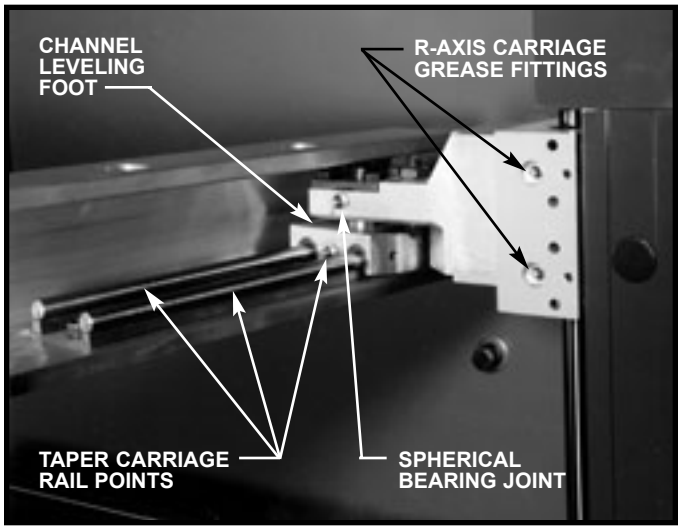


FIGURE 9-6 CNC Heavy Duty Backgage Power R-axis

CNC SIX-AXIS & 4X BACKGAGES (Optional)

- Clean and apply spray lubricant to the X, R and Z-axis guide rods.
- Grease the X, R and Z-axis carriages using the fittings on the side of each carriage. There are a total of 24 fittings.
- Remove two screws from the top cover and remove the top R-axis cover. Remove two screws from the front R-axis cover and remove the front R-axis cover. Apply spray lubricant to the R-axis ballscrews.
- Remove two screws from the end cover, two screws from the X-axis ballscrew cover and remove cover. Apply spray lubricant to the X-axis ballscrews.
- Remove the screws and the covers protecting the Z-axis ballscrews. Apply grease to the fittings on the two ballscrew nut blocks.
- Apply spray lubricant to Z-axis ballscrews.

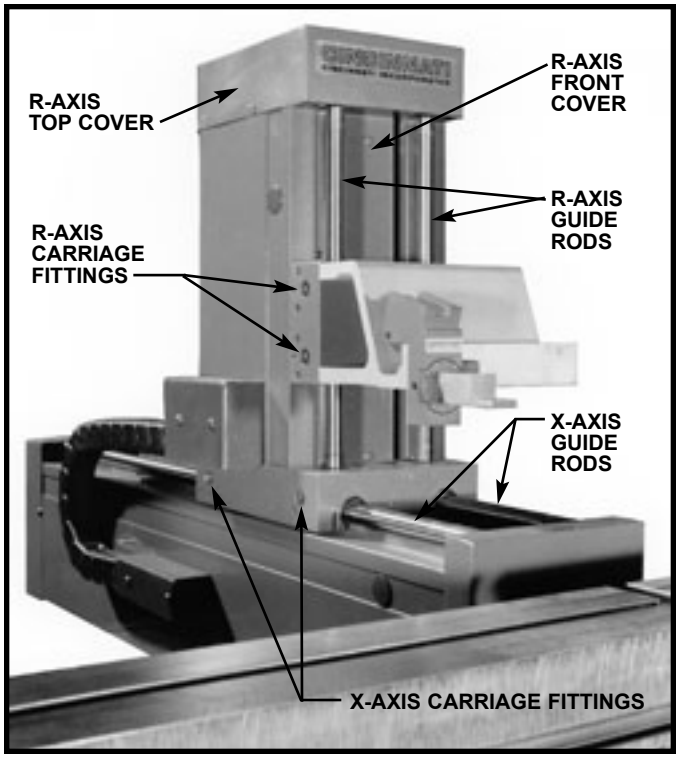


FIGURE 9-7 CNC Six-Axis Backgage *(Front view)*

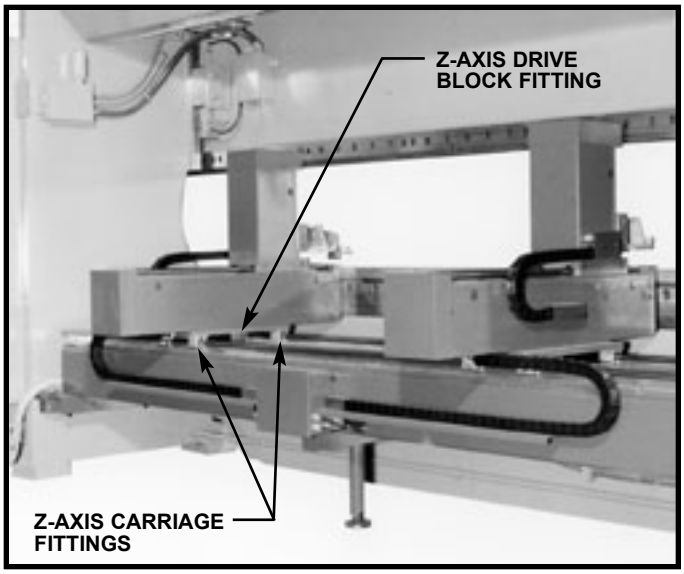


FIGURE 9-8 CNC Six-Axis Backgage *(Rear view)*

CNC FRONTGAGE (Optional)

- Clean and apply spray lubricant to the pair of F and vertical axis guide rods.
- Grease the F-axis carriages using the fittings on the top and bottom of each carriage.

- Apply spray lubricant to the vertical axis screws.
- Remove two screws from F-axis end cover and remove the end cover. Remove two screws from the F-axis ballscrew cover and remove the cover. Apply spray lubricant to F-axis ballscrew.
- Clean and apply spray lubricant to the camroll surfaces of the bed mounting bar.

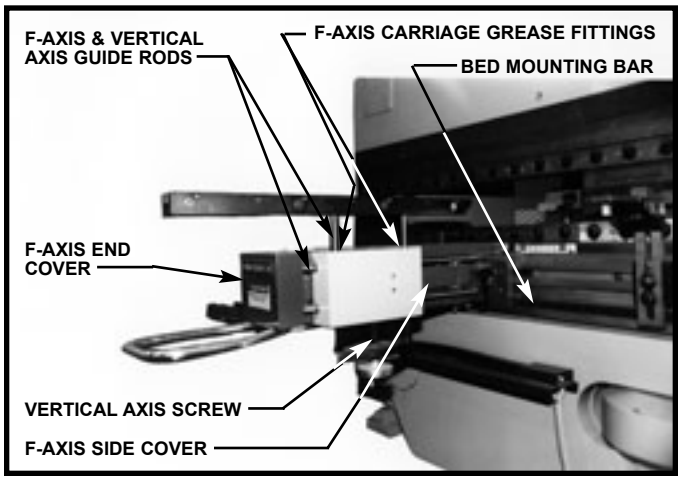


FIGURE 9-9 CNC Frontgage

HYDRAULIC OIL

The hydraulic reservoir should be filled to the center of the oil sight gage located at the rear of the reservoir. The filler cap is located on motor/pump mounting plate. The ram should be at the top of its stroke. Use a light hydraulic oil, viscosity 150 seconds at 100°F (37.8°C) with anti-rust, anti-oxidation and anti-wear additives (C.I. oil B-150).

! WARNING !

STANDARD PRESS BRAKES ARE DESIGNED FOR AND SHIPPED WITH A PETROLEUM BASED HYDRAULIC FLUID. THIS IS FLAMMABLE. CHECK APPLICABLE FIRE CODES FOR SPECIAL PRECAUTIONS.

The Lubrication Recommendation chart included with this manual lists brand names and numbers which meet CINCINNATI specifications. Extreme shop temperatures may require lighter or heavier oil than shipped with the machine and normally recommended. The allowable range of oil temperatures for different viscosity oils are shown in the following chart. Whenever the ambient room temperature is below 40°F (4.4°C), we recommend installing an oil heater in the reservoir.

VISCOSITY GRADE AT 100°F (38°C)	START-UP 4000 SUS (860 cST)	RUNNING 250 SUS (54 cST) MAX.	RUNNING 70 SUS (13 cST) MIN.
150 SUS (32 cSt)	11°F (-12°C)	80°F (27°C)	143°F (62°C)
215 SUS (46 cSt)	22°F (-6°C)	94°F (34°C)	159°F (71°C)
315 SUS (68 cSt)	32°F (0°C)	108°F (42°C)	177°F (81°C)

The following chart shows the reservoir capacity of CINCINNATI AUTOFORM Hydraulic Press Brakes.

MACHINE LENGTH	RESERVOIR CAPACITY GALLONS (LITERS)
6 FT.	125 (473)
8 FT.	170 (643)
10 FT.	215 (814)
12 FT.	260 (984)
14 FT.	305 (1154)
16 FT.	260 (984)

It is very important to **keep the oil clean**. All precautions must be taken to keep the oil clean, free of chips, grit, water, sludge, etc. The oil should be drained and replaced after one year of service. Replace the oil sooner if sludge or other contamination is present. The drain valve is located in the bottom of the reservoir. This valve should be cracked once a month to remove any accumulated moisture. Check the oil level daily.

New oil stored in drums is usually not as clean as the filtered oil shipped with the machine. Oil should be pumped through a 3 micron filter. After the oil is changed the LCD display should be checked periodically to see if a dirty filter error message appears in the status area. Change the filter element if required.

OIL FILTER

The high pressure filter is located on the top of the main manifold, which is on top of the main reservoir. See Figure 9-10. When the ram is moving, oil flows from the variable volume pump through the high pressure filter.

When the filter has reached its dirt holding capacity, an error message will appear in the status area of the LCD display. The message will remain until the dirty element is replaced. The filter has a 3 micron (absolute) disposable element. To replace the filter, turn OFF the main drive motor and the disconnect switch on the main electrical enclosure and install a safety lockout. Remove the top cap on the filter and the dirty filter element. Install a new element and replace the top cap.

FIGURE 9-10 High pressure filter

CHECKING & SETTING HYDRAULIC PRESSURES

The hydraulic system is equipped with male quick-disconnect fittings at the most frequently checked pressure test ports. Identification of the hydraulic system components is shown on Figure 9-11.

MAIN RELIEF PRESSURE

This pressure is preset at the factory and should not require adjustment under normal operating conditions. Special tooling is required to check and adjust main relief pressure. Contact a CINCINNATI INCORPORATED Service Representative to have this pressure checked or adjusted.

COUNTERBALANCE PRESSURE

Two test ports (#3) are provided in the circuit for checking counterbalance pressure. See Figure 9-12. No dies should be installed in the machine for this check.

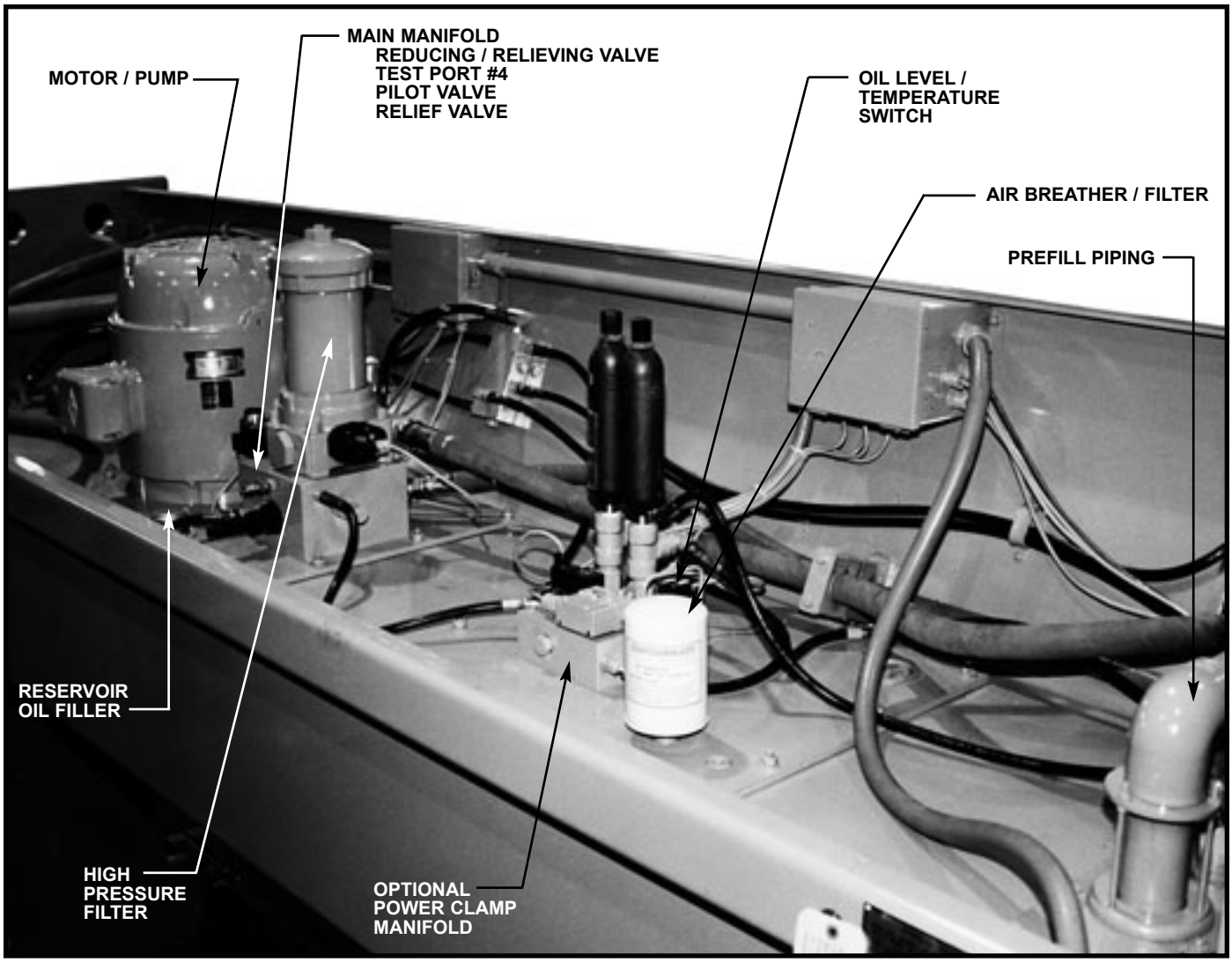


FIGURE 9-11 Hydraulic reservoir components

1. Install 0-600 PSI range pressure gage with a female quick-disconnect into either left or right test port #3. **Both must be checked**.
2. Set the machine controls:

PALMBUTTON OPERATOR STATION 1	**ON**
PALMBUTTON OPERATOR STATION 2	**OFF**
FOOTSWITCH STATION 1	**OFF**
FOOTSWITCH STATION 2	**OFF**
MODE SELECT Selector	**STROKE**
OPERATOR CONTROL Selector	**ON**

3. Start machine by turning main disconnect ON and pressing MAIN DRIVE "START" button.
4. Select QUICK BEND by selecting the "Quick Bend" button.
5. Enter a program in QUICK BEND as follows:

TOP STOP	**max. value**
SPEED CHANGE	**max. value**
REVERSAL POS.	**min. value**
REVERSAL MODE	**POSITION**
REVERSAL TONS	**5.0**
FORMING SPEED	**15**
TILT	**0.0000**
DWELL	**0.0**
UP STOP	**OFF**
DOWN STOP	**OFF**

6. To start a cycle, press the "Cycle Start" button. "RAM MUST BE CALIBRATED" will be displayed on the display.
7. Cycle the ram upwards with the Palmbutton Operator Station to calibrate the ram.

CAUTION

All dies must be removed from the press brake.

8. To cycle the machine, press the "Cycle Start" button. "CYCLE ACTIVE" will be displayed on the display.
9. The counterbalance pressure is checked while running the ram **down**. The proper pressure can be found in Figure 9-13. If the machine has a wide ram, extension(s) or very heavy upper dies, consult CINCINNATI INCORPORATED for information to set the counterbalance pressure.
10. To adjust the pressure, loosen the locknut and turn adjusting screw on counterbalance valve. Turn adjusting screw clockwise to increase and counterclockwise to decrease pressure. Tighten the locknut.
11. After setting the pressure, cycle ram a number of strokes and then recheck both counterbalance pressures.
12. Turn OFF motor/pump and remove pressure gage.

CAUTION

Do not leave gage permanently attached to test port.

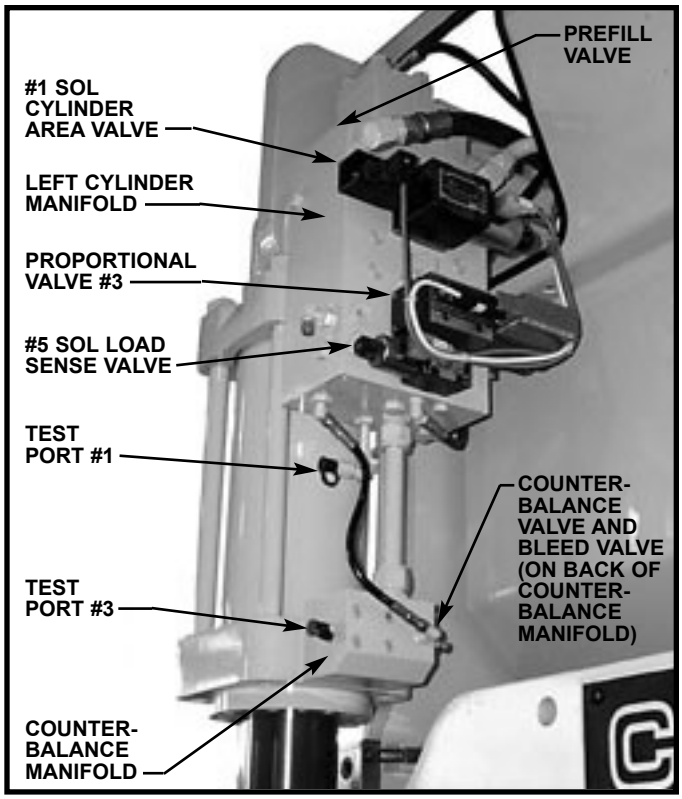


FIGURE 9-12 Counterbalance pressure check

MACHINE SIZE	COUNTERBALANCE PRESSURE
90 x 6	234 PSI (1613kPa)
90 x 8	285 PSI (1965kPa)
90 x 10	380 PSI (2620kPa)
135 x 6	215 PSI (1482kPa)
135 x 8	245 PSI (1689kPa)
135 x 10	285 PSI (1965kPa)
135 x 12	335 PSI (2310kPa)
175 x 6	215 PSI (1482kPa)
175 x 8	260 PSI (1793kPa)
175 x 10	290 PSI (2000kPa)
175 x 12	365 PSI (2517kPa)
230 x 6	210 PSI (1448kPa)
230 x 8	250 PSI (1724kPa)
230 x 10	305 PSI (2103kPa)
230 x 12	350 PSI (2413kPa)
350 x 8	215 PSI (1482kPa)
350 x 10	250 PSI (1724kPa)
350 x 12	300 PSI (2068kPa)
350 x 16	385 PSI (2655kPa)

FIGURE 9-13 Counterbalance pressure

AIR FILTER / BREATHER

See Figure 9-11. The disposable, canister-type filter/breather should be replaced about every 2000 hours of machine operation.

OIL LEVEL / TEMPERATURE SWITCH

If the oil drops to the minimum allowable level, an error message appears on the display. This will turn OFF the main drive motor. The cause for the low oil level should be found and corrected. Fill reservoir to the proper level.

If the operating temperature reaches the maximum level, an error message appears on the display. Stop machine operation as soon as possible and locate the cause of the excessive heat.

HYDRAULIC UNIT OPTIONS

OIL COOLER

The oil cooler is an air-type heat exchanger. The heat exchanger is equipped with a thermostatically controlled electric fan which is operable only when the motor/pump is running. The thermostat is set to start the heat exchanger motor at approximately 130°F (54°C). A furnace-type air filter is installed between the fan and the core of the exchanger. The filter should be changed as required. See Figure 9-14.

FIGURE 9-14 Oil cooler

OIL HEATERS

Oil heaters are recommended for cold start-ups and cold running conditions (see temperature chart in HYDRAULIC OIL Section). They are immersion-type, thermostatically controlled, and may be used independently of the motor drive.

CYLINDERS

Cylinders on the CINCINNATI AUTOFORM Press Brake have an inner and outer piston. See Figure 9-15. The inner piston is attached to the fixed upper cylinder head and does not move. The outer piston is attached to the ram, moving in the cylinder and in relation to the inner piston. For information to replace piston rod seals, contact CINCINNATI INCORPORATED Service Department.

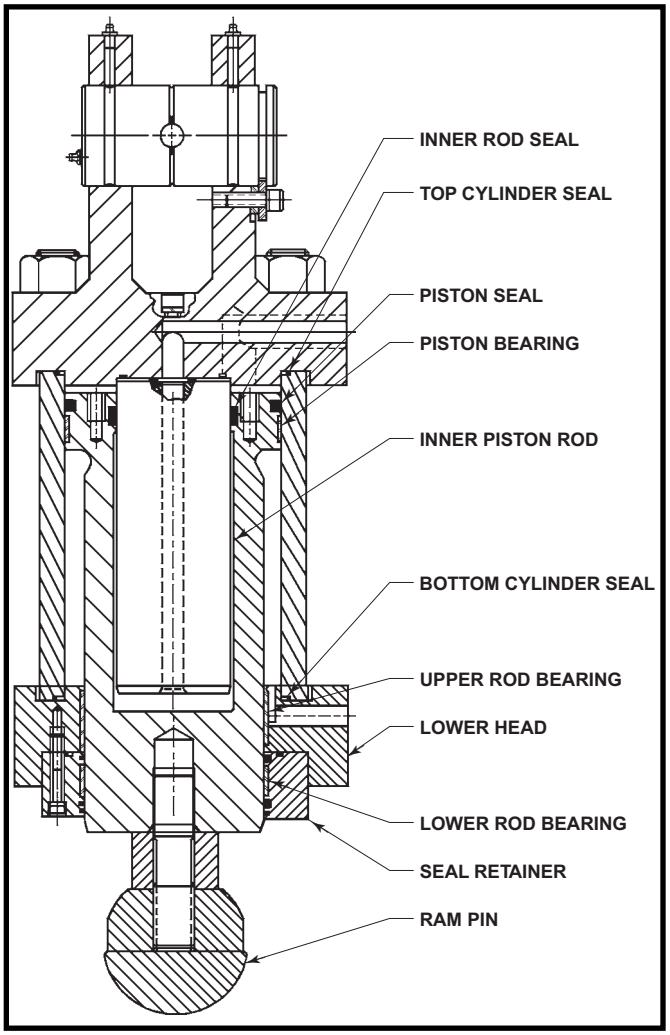


FIGURE 9-15 Cylinder assembly

MOTOR / PUMP

The motor/pump combination is vertically mounted on the reservoir top with the pump submerged in the hydraulic oil. The pump is a variable volume,

pressure compensated piston pump with a load sensor control. The compensating and load sensor pressures are factory-set and no adjustments are required.

VALVES

The hydraulic control valves are manifold mounted on the reservoir (Figure 9-11) and on both cylinders (Figure 9-12). The valves can be easily removed for service or replacement.

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

TILT LIMIT SWITCHES

Two limit switches shown in Figure 9-16 are mounted on the right ram slide (back side of ram) for limiting the ram tilt to1" maximum. Should the ram exceed its allowable tilt, these switches will shut off the drive motor. To set the tilt limit switches, the bed and ram should be parallel (plus or minus 1/16" / 1.6mm) to one another. The tripping point of the switches is measured by passing a feeler gage past the rollers and holding it against the side of the ram guide.

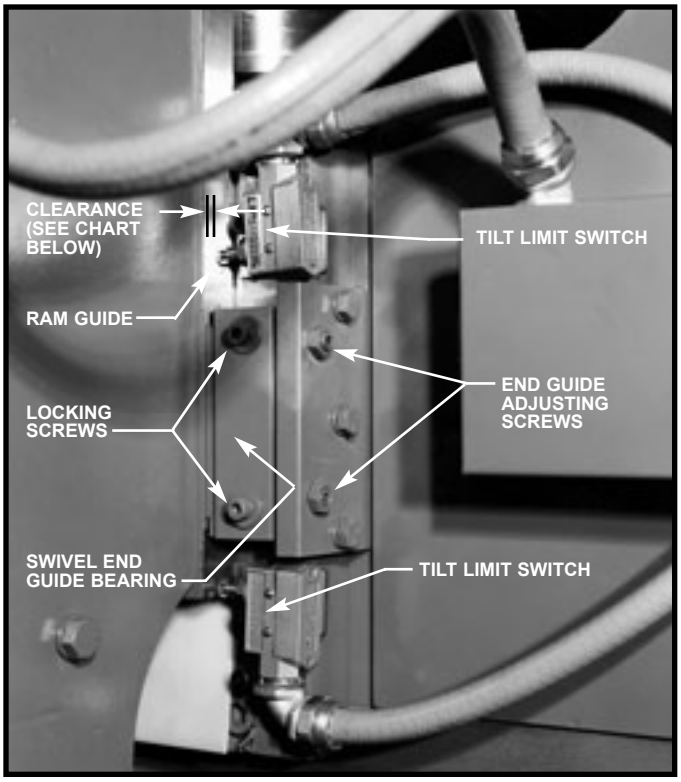


FIGURE 9-16 Limit switches & end-guide bearing

The limit switches should be set with feeler gages as shown in the following chart:

TILT SWITCH SETTINGS		
MACHINE NOMINAL LENGTH	BELOW THIS AMOUNT WILL NOT TRIP SWITCH	THIS AMOUNT MUST TRIP SWITCH
6 FT.	.060"	.064"
8 FT.	.045"	.049"
10 FT.	.036"	.040"
12 FT.	.030"	.034"
14 FT. & UP	.027"	.031"

SWIVEL END-GUIDE BEARING

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 to obtain a .003" (.076mm) clearance between the bearing and the ram guide. Then tighten the locknuts and the locking screws. See Figure 9-16.

RAM ENCODER ADJUSTMENT

IMPORTANT: This procedure must be done whenever the ram clamp bolts are loosened on machines that have encoders mounted to the ram clamp.

1. Set a dial indicator to read “0” (with a .020” touch) at a height of 12.0000”. To obtain this height, use a precision height gage or job blocks.
2. Set the machine controls and stations:

PALMBUTTON OPERATOR STATION 1	**ON**
PALMBUTTON OPERATOR STATION 2	**OFF**
FOOTSWITCH STATION 1	**OFF**
FOOTSWITCH STATION 2	**OFF**
STROKE MODE Selector	**STROKE**
CONTROL Key	**ON**

3. Start machine by turning main disconnect ON and pressing MAIN DRIVE “START” button.
4. Select QUICK BEND by selecting the "Quick Bend" button.
5. Enter a program in QUICK BEND as follows:

TOP STOP	**max. value**
SPEED CHANGE	**max. value**
REVERSAL POSITION	**12.0000**
REVERSAL MODE	**POSITION**
REVERSAL TONS	**5.0**
FORMING SPEED	**7**
TILT	**0.0000**
DWELL	**3.0**
UP STOP	**OFF**
DOWN STOP	**OFF**

6. To start a cycle, press the “Cycle Start” button. “RAM MUST BE CALIBRATED” will be displayed on the display.

7. Cycle the ram upwards with the Palmbutton Operator Station to calibrate the ram.

CAUTION

All tooling, including filler block and lower power clamp (if equipped), must be removed from the press brake.

8. Clean bed top and place the dial indicator (set at 12.0000” in Step 1) between the bed and ram, in-line with the encoder rods. Do not indicate from ram die clamp. **Both ends must be checked.**

9. To cycle the machine, press the “Cycle Start” button. “CYCLE ACTIVE” will be displayed on the display.

   Note: *Two people are required to do the next steps – one to press and* ***hold*** *the Operator Station, and the other to adjust the encoder.*

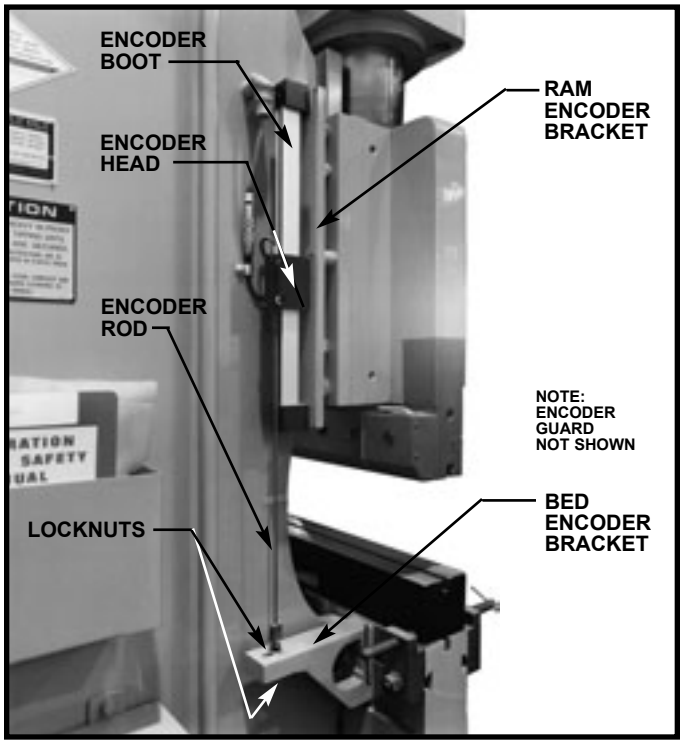


FIGURE 9-17 Linear encoder

10. Cycle the ram with the Palmbutton Operator Station and read the dial indicator at reversal. The dial indicator should be at the zero position within plus or minus .0005” at ram reversal.

11. If adjustment is required, stop the ram on the dial indicator and remove linear encoder guard. With the machine in idle, loosen the adjusting screw locknuts and adjust the threaded stud up or down the required amount.

12. Tighten the adjusting screw locknuts and repeat Step 10.

13. Turn “OFF” main drive and then main disconnect switch. Repeat Steps 3 through 10. Adjust if necessary.

14. Re-install the guard removed in Step 11.

15. Repeat above procedure for encoder at other end of machine.

Note: *It is important that both ends are the same.*

RELEVEL RAM

If the ram goes out-of-level enough to actuate the tilt limit switches, the main drive motor will turn OFF and an error message appears on the status line of the display.

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.

There are two methods to relevel the ram. One is by using the RAM UP button and the other is to relevel the ram mechanically using jacks and bleed valves.

RELEVEL RAM USING RAM UP BUTTON

Clear faults displayed on the machine control. Start main drive motor. Push RAM UP button.

IMPORTANT: Do not try to raise low end of ram with a jack or hoist. Damage could result to bed, ram or hydraulic system.

RELEVELING RAM MECHANICALLY

1. Turn OFF all power to machine and lock disconnect switch on main electrical enclosure.

2. Place a jack between bed and ram at each housing. Protect bed and ram nose with wood or soft metal. Do not place jack under ram die clamps. Apply enough pressure to support weight of ram, ram slides and pistons.

3. Lower the high side of the ram by gradually lowering its respective jack and opening the counterbalance bleeder valve. See Figure 9-12 for appropriate valve location. When ram is parallel to the bed, close valve. The tilt limit switches will

no longer deactivate the electrical circuits and the main drive motor can be started. **DO NOT** remove jacks. The cause for out-of-level condition may allow ram to continue to drop.

Note: *Special care must be taken to ensure that the bleed valve is completely closed before the jam locknut is tightened.*

4. Find cause for machine going out-of-level. Possible causes are incorrect counterbalance pressure, damaged or broken linear encoder(s). Make necessary repairs or adjustments. When troubleshooting it may be necessary to relevel ram several times.

CLOSED HEIGHT ADJUSTMENT

Closed height, which is the distance from the bed top to the ram nose at the **maximum down** position of the stroke, is controlled by two adjustments. The reference limit switches provide coarse adjustment and the linear encoder provides fine adjustment.

The closed height can be measured by programming a stroke reversal position of 12.0000" in QUICK BEND mode. Cycle the ram for one complete stroke with a forming speed of 7 inches per minute and 3.0 dwell at reversal point. This measurement should be within plus or minus .0005". See linear encoder adjustment for procedure to measure and adjust.

Note: *When cycling the ram, the Operator Control must be held down when in dwell.*

MACHINE LEVEL

The level of the machine should be checked every three months and adjusted if necessary. See *SECTION 2* for details of this adjustment.

ELECTRICAL

There are no customer serviceable parts in the main electrical enclosure. Contact a Service Representative from CINCINNATI INCORPORATED for detailed information.

GAGE INSTALLATION

CNC BACKGAGE

This is a standard backgage for 90, 135 and 175 x 6' and 8' AUTOFORM Press Brakes. It consists of two gage fingers attached to a gage bar positioned by a drive assembly. The drive assembly can be programmed and positioned in two directions: X = front-to-back, R = up and down. The X-axis is powered by a DC motor/ball screw drive. R-axis can be either a manual or optional power drive. See Figure 9-18.

This gage is usually shipped assembled to the machine. If not, remove the major components from their crates and clean.

IMPORTANT: Do not install the gage or make electrical connections until a Service Representative of CINCINNATI INCORPORATED is present.

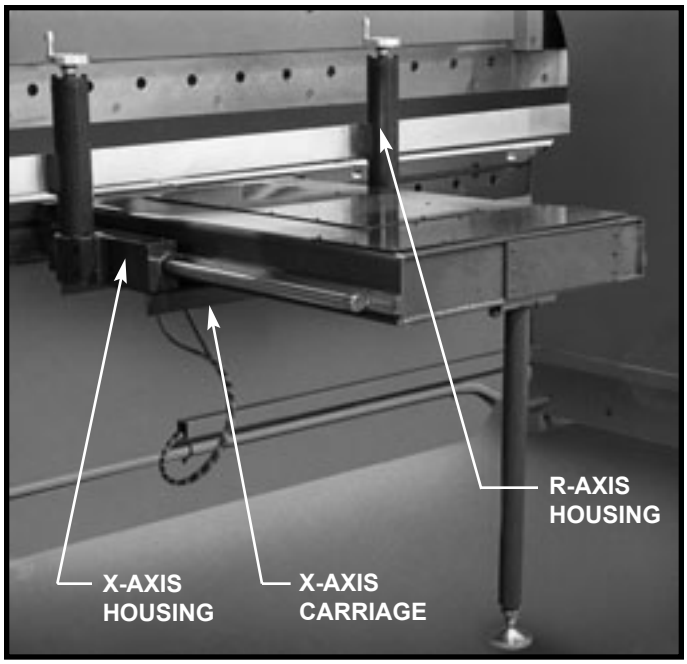


FIGURE 9-18 CNC Backgage

Install the backgage drive assembly to the rear dovetail slots of the press brake bed. Install gage bar to R-axis arm assemblies. Center the gage bar between the housings by sliding the backgage drive assembly along the bed. Install support leg to backgage drive assembly. Level backgage drive assembly guide rails front-to-back by adjusting gage support leveling foot.

After start-up of the machine, the X-axis gage finger position and control readout should be checked. When the control displays 3.000" (76.2mm), the front edge of the fingers are 3.000" (76.2mm) ± .001" (.025mm) from the centerline of the ram die slot. Check in front of both R-axis housings. If a parallel adjustment is required, loosen the four screws bolting the X-axis carriage to the ballnut. If a skewed adjustment is required, also loosen the six screws bolting the X-axis carriage.

Remove covers as required to get access to carriage drive bolts. Position the gage finger against the 3.000" gage block as shown in Figure 9-23. Holding this position, retighten carriage drive bolts. Replace covers.

CNC HEAVY DUTY BACKGAGE

This backgage is standard for 90, 135, and 175 x 10' and longer, and all 230 and 350 AUTOFORM Press Brakes. It consists of two gage fingers attached to a gage bar positioned by two independently positioned drive assemblies. Each drive assembly can be programmed and positioned in two directions: X = front-to-back, R = up and down. Each powered by a DC motor/ball screw drive. Only X is powered as standard. See Figure 9-19.

Each of the major backgage components (the gage drive assemblies and gage bar) may have been removed from the machine at the factory and shipped in their own containers. Remove these items from their containers and clean.

Install the backgage drive assemblies to the rear dovetail slots in the bed as shown in Figure 9-19. Install the gage bar to the R-axis arm assemblies. It may be necessary to move the backgage drive assemblies in the dovetail slots to attach the gage bar. Center the gage bar between the housings by sliding the right hand drive assembly along the bed. Position the drive assemblies as shown in Figure 9-20. The left hand drive assembly should be positioned such that the 1-1/4" diameter hole in the gage bar is centered over the 3/4" diameter shoulder screws on the pivot arm.

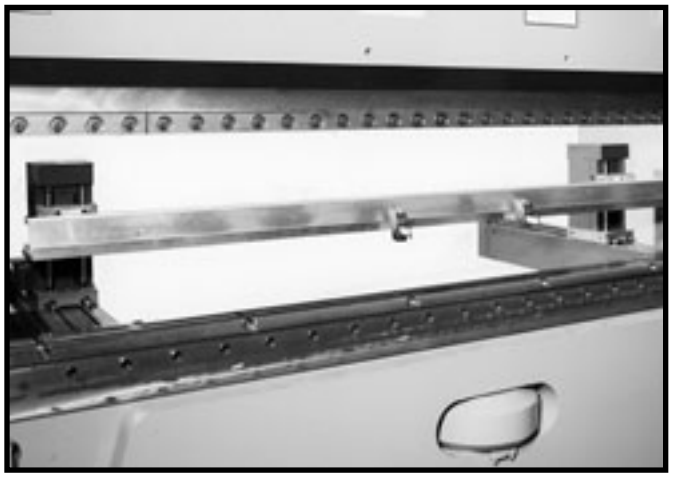
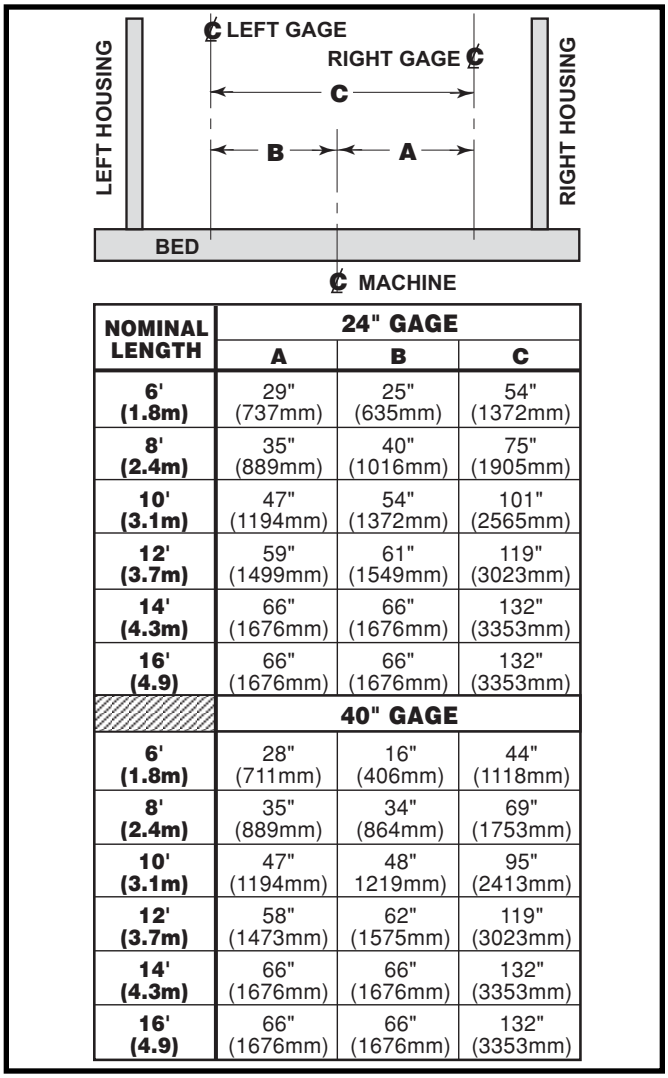


FIGURE 9-19 CNC Heavy Duty Backgage



NOMINAL LENGTH	24" GAGE		
	A	B	C
6' (1.8m)	29" (737mm)	25" (635mm)	54" (1372mm)
8' (2.4m)	35" (889mm)	40" (1016mm)	75" (1905mm)
10' (3.1m)	47" (1194mm)	54" (1372mm)	101" (2565mm)
12' (3.7m)	59" (1499mm)	61" (1549mm)	119" (3023mm)
14' (4.3m)	66" (1676mm)	66" (1676mm)	132" (3353mm)
16' (4.9)	66" (1676mm)	66" (1676mm)	132" (3353mm)
	40" GAGE		
6' (1.8m)	28" (711mm)	16" (406mm)	44" (1118mm)
8' (2.4m)	35" (889mm)	34" (864mm)	69" (1753mm)
10' (3.1m)	47" (1194mm)	48" 1219mm)	95" (2413mm)
12' (3.7m)	58" (1473mm)	62" (1575mm)	119" (3023mm)
14' (4.3m)	66" (1676mm)	66" (1676mm)	132" (3353mm)
16' (4.9)	66" (1676mm)	66" (1676mm)	132" (3353mm)

FIGURE 9-20 CNC Heavy Duty Backgage drive assembly positions

After the start-up of the machine, the Heavy Duty Backgage final alignment should be made. Gage finger positions and control readouts should be checked and adjusted as follows.

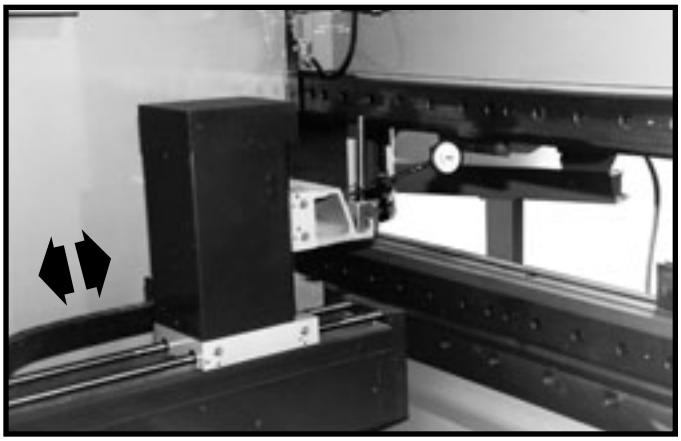


FIGURE 9-21 X-axis travel front-to-back

(Select Maintenance/Diagnostics/Gage Positions to view control display)

1. X-axis - Front edge of fingers are 3.000" (76.2mm) ± .001" (.025mm) from the centerline of the ram die slot when the control displays 3.000" (76.2mm). Adjust X-axis position by loosening carriage drive bolts (as shown in Figure 9-22). Position the gage finger against the 3.000" (76.2mm) gage block as shown in Figure 9-23. Holding this position, retighten carriage drive bolts.

FIGURE 9-22 Loosen X-axis carriage drive bolts

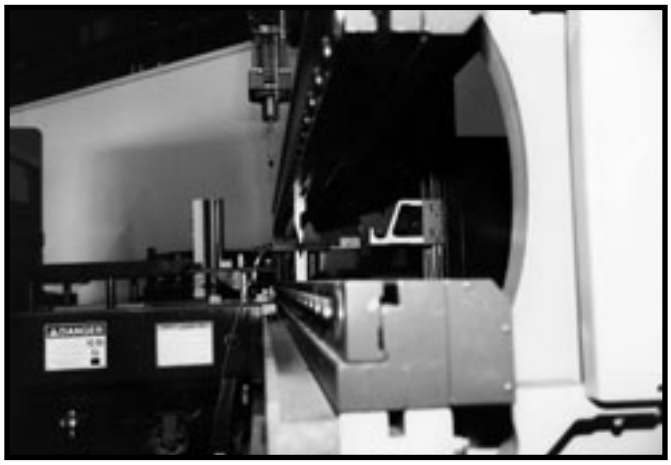


FIGURE 9-23 Gage finger against 3.000 gage block

2. Optional Powered R-axis (See Figure 9-24) - Bottom of the fingers are 10.000" (254mm) ± .005" (.13mm) above the bed when control displays 10.000" (254mm). R-axis position can be adjusted by loosening the 3/8"-16 hex bolts which attach the R-axis carriage to the ballscrew nut. These bolts are accessible through the 7/8" diameter holes near the top of the R-axis housings. Using the R-axis adjustment tool (#430100-C), rotate the handle until the proper height is determined, retighten the drive bracket hex bolts.

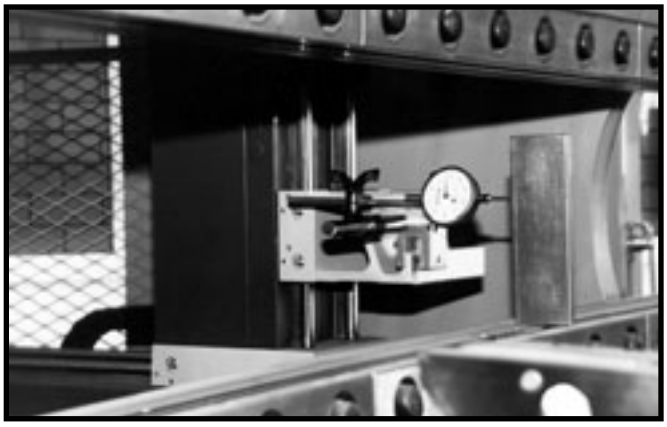


FIGURE 9-24 R-axis travel up and down

CNC SIX-AXIS & 4X BACKGAGES (Optional)

This is a CINCINNATI INCORPORATED AUTOFORM option consisting of two independently positioned gage fingers. Each finger can be programmed and positioned in three directions: X = front-to-back, R = up and down, and Z = left-to-right. Each axis is powered by a DC motor/ball screw drive as shown in Figure 9-25. Each of the major backgage components (the gage assembly, control enclosure and the rear guard) may have been removed from the machine at the factory and shipped in their own containers. Remove these items from their crates and clean.

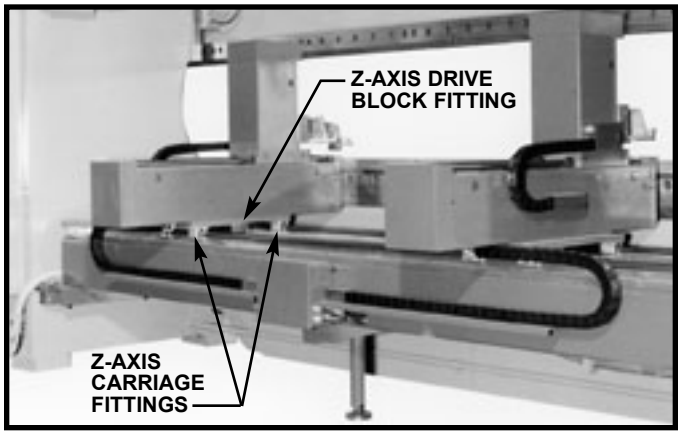


FIGURE 9-25 CNC Six-Axis Backgage

IMPORTANT: Do not install the gage, rear guard or make electrical connections until a CINCINNATI INCORPORATED Service Representative is present.

The gage assembly is installed between the machine housings by setting it on the mounting block level screws. Tighten the front-to-back and left-to-right alignment screws and tighten hold-down bolts as shown in Figure 9-26. Final alignment of the gage to the machine should be made after electrical connections have been completed and the gage is operable.

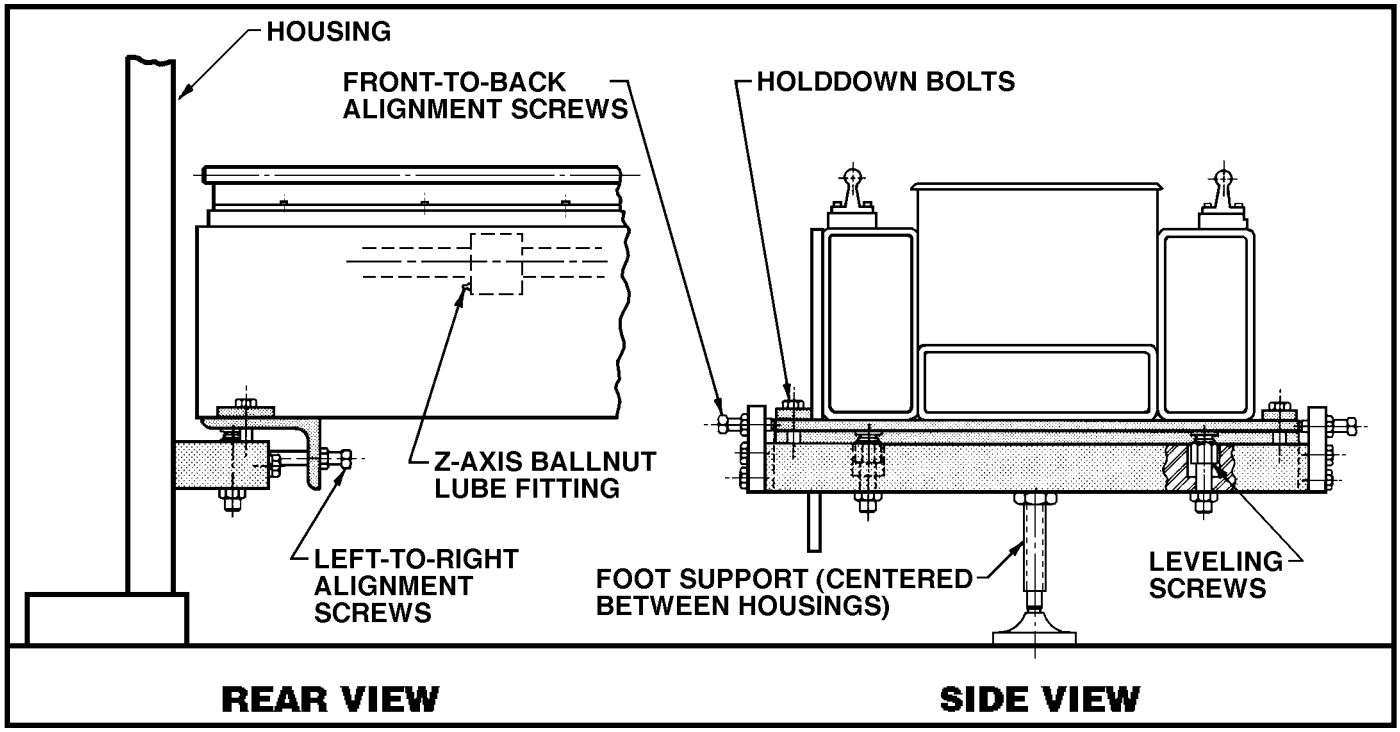


FIGURE 9-26 CNC Six-Axis Backgage Installation

Clean the Z, R and X-axis ball bushing guide rails and lubricate with a spray lubricant.

After start-up of the machine the following CNC Six-Axis and 4X Backgage final alignments should be made.

1. Z-axis travel should be parallel to the bed top within .004" (.102mm) as shown in Figure 9-27.

2. Z-axis travel should be parallel to the ram die seat (front-to-back) within .002" (.051mm) at both ends as shown in Figure 9-28. For machines equipped with Power Die Clamps, use the finished surface on the front of ram nose above die clamps.

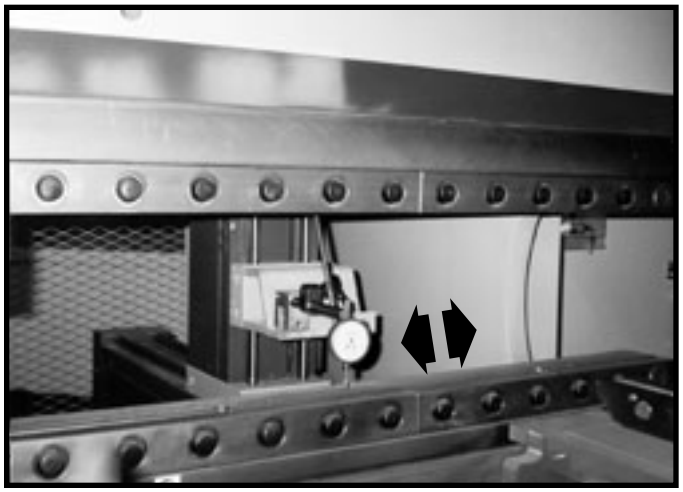


FIGURE 9-27 Z-axis travel left-to-right

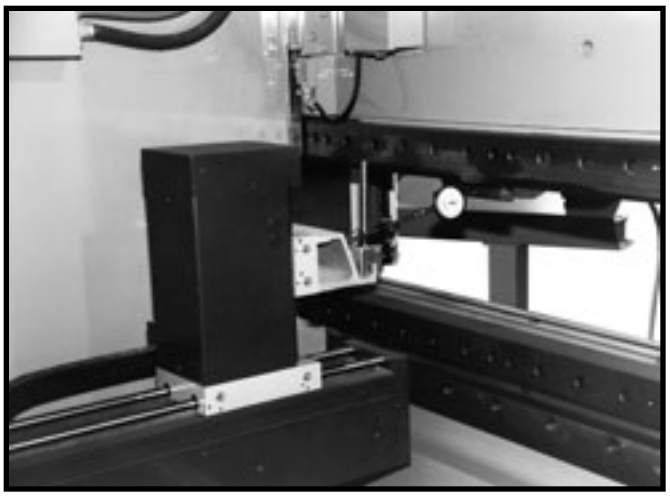


FIGURE 9 - 28 Z-axis parallel to ram die seat

3. R-axis travel should be perpendicular to the bed top within .002" (.051mm) over 8" (203.2mm) of travel as shown in Figure 9-29.

FIGURE 9-29 R-axis travel up and down

These settings are changed by adjusting the left-to-right and front-to-back leveling screws and the center foot support as shown in Figure 9-26.

Gage finger positions and control readouts should be checked and adjusted as follows. (Select Maintenance/Diagnostics/Gage Positions to view Control displays.)

1. R-axis - Bottom of the fingers are 10.000" (254mm) ± .005" (.13mm) above the bed when control displays 10.000" (254mm). R-axis position can be adjusted by loosening the 3/8"-16 hex bolts which attach the R-axis carriage to the ballscrew nut. These bolts are accessible through the 7/8" diameter holes near the top of the R-axis housings. Using the R-axis adjustment tool (#430100-C), rotate the handle until the proper height is determined, retighten the drive bracket hex bolts.

2. X-axis - Front edge of fingers are 3.000" (76.2mm) ± .001" (.025mm) from the centerline of the ram die slot when the control displays 3.000" (76.2mm). Adjust the X-axis position by loosening carriage drive bolts as shown in Figure 9-22. Position the gage finger against the 3.000" (76.2mm) gage block as shown in Figure 9-23. Holding this position, retighten carriage drive bolts.

3. Z-axis - center of gage fingers should be within .010" (.25mm) of machine centerline when control displays 0.000" and gage finger is positioned on R-axis mounting channel as shown in Figure 9-30. Move finger along channel to adjust position.

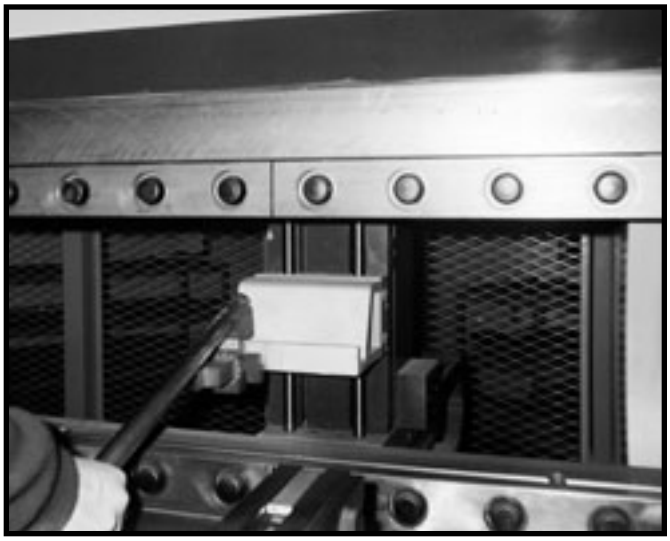


FIGURE 9-30 Z-axis, align center of gage fingers

The rear guarding (fence) should be attached to the rear of the housings and the floor, before any further programming or tool installation is made. See Figure 9-31. Level the fence and anchor with four 3/8" bolts.

IMPORTANT: An interrupt switch is attached to the rear guard gate. Opening the gate stops ram and gage operation. Check the operation of this switch.

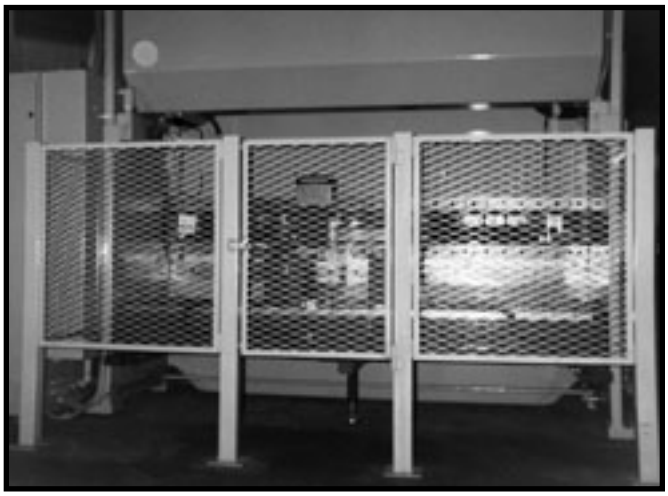


FIGURE 9-31 Rear guarding

CARRIAGE ADJUSTMENT

The X-axis, R-axis and Z-axis carriage ball bushings should be checked periodically for looseness. Each ball bushing has a preload adjusting screw (Figure 9-32). These screws should be snug, **never tight**.

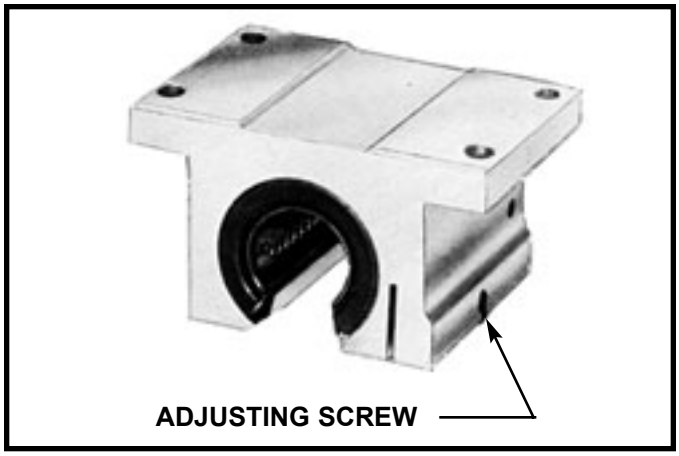


FIGURE 9-32 Backgage carriage ball bushing

CNC PLATE BACKGAGE (Optional)

The CNC Plate Backgage is an optional feature which provides AUTOFORM control capability for plate forming applications.

This gage is shipped disassembled from the machine. Remove backgage guide assemblies, bed adapters and gage bar from packing boxes. Remove any protective wrapping and clean the parts.

As viewed from the front, the right backgage guide assembly has a flat plate for a rigid mounting to the gage bar (see Figure 9-4). The left assembly has a bearing block for a sliding mount to the gage bar. Identify the right and left bed adapter by matching the number stamped on the adapter with the number stamped on the top of the guide assembly front flange. Use the roll pin holes in bed to locate bed adapters. Assemble adapters on dovetail bolts, tighten nuts and install roll pins.

Bolt each guide assembly to the bed adapter stamped with the same number. These units are heavy and a lifting device must be used to position them. The guide assembly must be leveled and the support leg adjusted for each unit. Place precision level on upper guide rail and adjust leveling screw on support leg to raise or lower rear of backgage guide assembly as required. Tighten leveling screw locknuts when finished.

Install gage bar by inserting horizontal guides into left mounting block. Mount right end of bar to mounting plate using cap screws provided.

Do not make any electrical connections. This will be done by a CINCINNATI INCORPORATED Service Representative.

Clean the horizontal guide rails and lubricate with a light coat of spray lubricant.

CNC FRONTGAGE (Optional)

The frontgage mounting track bolts to the front of the press brake bed. Clean the front of the bed and position dovetail nuts in the dovetail slot on 12" (305mm) spacings. Bolt mounting track to the bed with socket head cap screws.

FIGURE 9-33 Power Frontgage

After the mounting track is securely fastened to the bed, slide one of the frontgage assemblies onto the mounting track. Place the gage unit spacer into the tee slot and then slide the other gage unit onto the mounting track. Put the 1/2"-13 x 1/2" long bolts into the tee slot at each end of the mounting track and tighten securely. This will keep the gage units from rolling off the mounting track.

Clean the carriage guide rails and vertical guide rods and lubricate with a light coat of spray lubricant. Mount the cable carrier supports to the bed or deflection beam with 1/4"-20 bolts. Make the required electrical connections to each frontgage assembly.

CNC BACKGAGE

The X-axis carriage ball bushings should be checked periodically for looseness. Each ball bushing has a preload adjusting screw (Figure 9-2). These screws should be snug, but **never tight**.

MAINTENANCE CHECKLIST – AUTOFORM® CNC FORMING CENTER

	LUBRICATION SCHEDULE	DAILY	WEEKLY	MONTHLY	3 MONTHS	6 MONTHS	YEARLY
1	Check reservoir oil level.	X					
2	Lubricate cylinder clevis pin.			X			
3	Clean and flush ram guides with oil.			X			
4	Check for water in reservoir.			X			
5	Lubricate backgage guide rails, bearings and drive screws.			X			
6	Lubricate Auto Crown® pins (optional).			X			
7	Drain, clean and refill hydraulic reservoir.						X
8	Lubricate gage bar leveling foot.				X		
	CHECK OR ADJUSTMENT						
1	Check entire machine for loose fasteners – tighten if necessary.	X					
2	Wipe entire machine clean.			X			
3	Check machine levelness.				X		
4	Check ram guide clearance – relevel if necessary.				X		
5	Adjust swivel end-guide bearings.				X		
6	Replace oil pressure line filter element.	**WHEN INDICATED**					
7	Clean strainer in water line to heat exchanger (if so equipped).					X	
8	Replace filter in air-cooled heat exchanger (optional).					X	
9	Replace reservoir air filter – breather.						X
10	UPS battery should be replaced every two (2) years.						

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

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. Most problems, however, can be more efficiently diagnosed by contacting your local CINCINNATI Field Service Representative or through telephone support with a Technical Service Specialist. Having the following information ready before making contact with a CINCINNATI Representative will help to diagnose the problem faster.

- Company Name
- Machine Model
- Machine Serial Number
- All error messages (exactly as displayed)
- Have this manual and prints available for reference
- Describe the symptoms of the problem from the following list. Problem diagnosis will go quickly if you can answer the questions associated with each symptom.

LCD DISPLAY ERROR MESSAGES

Adaptive Reversal Mode not permitted in tandem operation.
'Adaptive' is not a valid option when operating a machine in TANDEM mode.

All Adaptive bends in program must use the same upper and lower tools.
All bends using ADAPTIVE REVERSAL mode in a particular program must utilize the same tools.

All footswitches must be enabled to use programmable footswitches.
All installed footswitches must be enabled when using PROGRAMMABLE FOOTSWITCH mode. Enable footswitches by pressing the OP STATION button in the toolbar and selecting the checkboxes in the “Footswitches” section of the Run Mode tab.

Amplifier current limit.
The motor current being output by the motor amplifier has remained at a predetermined maximum value for an extended period of time. This could be caused by excessive material force against the gage or by an obstruction.

Amplifier fault.
The motor amplifier’s built-in logic has sensed an internal fault such as over-temperature, overcurrent or a logic error. If the fault cannot be reset by removing power to the machine control, the amplifier may need to be replaced.

Amplifier temperature.
The motor control amplifier has overheated due to excessive load. Allow the amplifier to cool for several minutes, then try again.

An error occurred during the encryption process. Check that the hardlock is securely attached to the computer and try again.
This program could not communicate with the hardlock for encryption. Check that the hardlock is firmly attached to the local PC's parallel port or USB port, or that the network hardlock is attached and the network communications are running.

An error occurred while attaching to the hardlock. Please verify that the hardlock is properly connected.
This program could not communicate with the hardlock. Check that the hardlock is firmly attached to the local PC's parallel port or USB port, or that the Network hardlock is attached and the network communications are running.

Angle is too small for Lower Die
Angle is too small for Upper Die
Angle cannot be achieved with tool. Check angle input, check angle for vee die in tooling library and material thickness.

Auxiliary Left axis calculated dimension exceeds travel limits
Auxiliary Right axis calculated dimension exceeds travel limits
Auxiliary gage axis (typically the Frontgage axis) dimension is too large or too small. Check the programmed values and / or Configuration settings for the axis.

Auxiliary limit switch.
The limit switches (when used) are all set outside of the normal travel limits. They should never be actuated during operation. Check that the switches are actuated at the proper position.

Axis is not calibrated.
This is a Kermit Remote Host command response. The gage axis has not been calibrated. If calibration is not automatic, the gages can calibrated by the menu bar through Maintenance | Diagnostics | Calibrate Gages.

Back limit switch.
The limit switches (when used) are all set outside of the normal travel limits. They should never be actuated during operation. Check that the switches are actuated at the proper position.

Bad packet received from slave.
This may indicate a communication problem between the Master and Slave boards.

Bad position report.
The gage responded as "In Position" but the reported position is different from the commanded position. This indicates an error in the messaging between the gage module and the slave. Clear the error and try again.

Bad request.
This is a Kermit Remote Host command response. The Slave CPU is responding that the Master has made an invalid request.

Bend line is outside of part.
When defining a bend line for a part, it must be internal to the part.

Bend lines are not allowed to intersect each other.
Bend lines for a part may not intersect.

Bend Lines do not connect any flanges.
A bend line must connect two planes.

Bend sequence ___ not found.
The reported bend sequence number could not be found.

Bumping option not enabled, bumping mode can't be used.
The program is attempting to use bumping mode, but the current control does not have this option enabled.

Calculated gage dimension __ exceeds gage travel limit __. Gage flange and/or inside radius must be decreased.
This is a bumping mode error. If the generated flange dimensions exceed the capabilities of the gage, this error will be displayed. The flange length or inside radius may be decreased to fix this problem.

Calibrate limit switch.
The limit switches (when used) are all set outside of the normal travel limits. They should never be actuated during operation. Check that the switches are actuated at the proper position.

Cannot convert 3D drawing files. Tool cross sections must be drawn in 2D.
In order to convert Tools, the drawing file must be a 2D cross-section.

Cannot delete flange with multiple bends.
A flange containing multiple bends cannot be deleted since the program cannot know how to reconnect the remaining flanges. Start at an outer flange (with a single bend) and delete the necessary flanges until the desired flange can be deleted.

Cannot delete last flange of part.
The last flange of a part cannot be deleted.

Cannot delete the current configuration, only 1 file exists. Create a new configuration before deleting the current.
If only one configuration file remains in the list, it may not be deleted. Either create a new configuration file using the NEW button in the configuration dialog or edit the existing file.

Cannot locate any flanges from geometry, check for connection between line segments.
The application cannot detect any flanges. Some line segments may not be connected properly.

Cannot start application. This program requires a screen resolution setting of at least ___ x ___.
The application detected a screen resolution less that that necessary to run. It may be possible to increase the resolution in Windows to correct this.

Cannot start cycle if light guard is blocked.
This is a Kermit Remote Host command response. Ensure that nothing is blocking the light guard prior to starting the cycle.

Cannot use this reversal mode with un-measured tools.
The step's reversal mode requires tools to be chosen from the Tooling Library.

Cannot use Unmeasured Tools
Automatic tonnage calculations cannot be made on a step with Unmeasured Tools. Choose tooling in the Tooling Library, if desired.

Can't find default program 'default.pgm'. Standard New mechanism will be implemented.
The 'Use default program' option has been set in the User Preferences tab of the Configuration, but the application cannot find the default program on the hard drive. To discontinue use of the default program option, uncheck the checkbox in the configuration. To set up the default program, create a new, one-step program with the desired values and use the menu item File | Save As Default to save the new default program.

Check 24V power supply.
The control has detected that there has been a loss of 24 volt power. Turn the main disconnect OFF for a full minute, then apply power. If the problem persists, check the 24/48 volt power supply levels. ***Note:*** *This error may also be displayed if the input board has failed. The control infers this error if all inputs on the first input board are off. During normal operation at least one input on the first board is always on.*

Check HC output board #2.
Check HC output board.
Check input board #1.
Check input board #2.
Check input board #3.
Check LC output board.
Check optional low current output board.
During power-up, the control reads an ID code from each of the I/O boards to verify they are installed properly and working. If any of the boards do not return the correct code, then an error will be issued. Since the boards are connected in series fashion, a failed board may prevent downstream boards from working properly thereby issuing false errors. These errors may be caused by a failed board, improper cable connections, or a loss of 24 volt power. This error may also result if the configuration for the machine indicates that it has more boards than are actually installed. It is possible that the board will report an improper code and still work normally otherwise. These errors are treated as warnings and will not prevent the control from attempting to operate the machine. The checks are only performed at power-up, so once the error is acknowledged by the operator, the warning will not be repeated.

Check oil filter.

A sensor on the oil filter unit has indicated that the oil filter must be replaced. ***Note:*** *This error may falsely indicate a bad filter if the oil is cold and the ram is moved at the rapid advance speed. If the error persists after the oil has warmed up, then replace the filter.* The filter sensor measures the pressure drop across the filter element as the oil flows through it. A high pressure drop indicates a dirty filter or viscous (cold) oil.

Checksum error in file ___. Make sure it is the correct format.

This error indicates that the reading of the file was aborted because the file was determined to be corrupt. This may occur when the file has been corrupted or when the wrong type or format of file is trying to be read.

Clamp Position is higher than Speed Change Down

This error indicates that the Clamp Position is too high or the Speed Change Down position is too low. Speed Change must be reached in the down stroke prior to hitting the Clamp Position.

Comm error

This is a generic communication error with the Slave board.

Communications watchdog expired.

The slave control will disable motion if it does not receive communications from the PC on a regular basis. A configuration value sets the maximum time allowed between communications. This error could occur if the AUTOFORM application is terminated then restarted, or if the communications cable was disconnected.

Config memory altered.

Same as 'Config memory corrupt' error, but indicates three or fewer parameters were affected.

Config memory corrupt.

This indicates that more than three configuration values were found to be out-of-range during power-up. This could be caused by a software update, replacement of the slave board, or a bad battery on the slave board. Closing the AUTOFORM application and restarting it will rectify the situation.

Config value out of range.

The PC control has sent a configuration file to the Slave with one or more parameters that are out-of-range. Contact the Service Department.

Configuration file is corrupt. Default values will be used.

The application attempted to load the configuration file, but found the file corrupt. The application will load all default values instead. This error can occur if a configuration was set up on a newer version of the application than the current version being run.

Configuration file was created offline and cannot be used on machine control. Default values will be used.

A configuration file from an offline version of the application will not run on an AUTOFORM control. The application will load all default values instead. Choose the correct configuration file from the General tab of the Configuration dialog.

Could not clear errors.

This is a Kermit Remote Host command response. The Slave was unable to clear the errors.

Data collection exceeded for down stroke.

This is an Adaptive / DTC mode error indicating that the ram speed was too slow or an extremely large vee die is being used. Contact CINCINNATI INCORPORATED if this error occurs.

Data out-of-range.

This is an Automatic Gage Allowance calculation error. One of the inputs is either out-of-range, not numeric, or invalid.

Die top is out-of-range with previous bend.

This is an Adaptive / DTC mode error indicating that the die top of the current bend is out of the defined valid range with the previous bend.

Down stroke data not correct, Bend Terminated.
This is an Adaptive / DTC mode error. The material was not at the expected location (i.e. incorrect thickness entered, material partially bent or bowed, bend angle too shallow).

Down stroke stop must be on to use hand/foot sequence.
In order to use Hand/Foot sequence, the Down Stop must be turned on.

Dump valve sensor not on.
Dump valve sensor stuck on (left).
Dump valve sensor stuck on (right).
This valve provides a redundant safety mechanism. Periodically, a test is done to verify the functionality of the valve. If the spool position sensor does not indicate that the valve is operating properly, one of the above messages will be displayed. Check for proper operation of the valve and sensor. Check the output that drives the coil. Check the 6CR relay that interrupts current to the coil. Check the input used for the spool position sensor.

Emergency Stop was pressed.
This indicates one of the EMERGENCY STOP buttons is held down or the gate around the backgage is open. Unlatch or pull out any latched buttons or close the gate to continue using the press.

Emergency stop.
If the gage module receives a command when the interlock (E-stop) input is open, then this error will be displayed. The slave CPU mutes this error if it knows the interlock is open, however this could show up if the interlock wiring is incorrect, or the main drive input is stuck on.

Error occurred during rise data calculation.
This is an Adaptive / DTC mode error. Contact CINCINNATI INCORPORATED if this occurs.

Error occurred while scanning for material, check thickness.
This is an Adaptive / DTC mode error. This error is displayed if the ram is cycled and with no material in the die.

Error occurred while scanning for reversal.
This is an Adaptive / DTC mode error. Stroke was interrupted or part may have bottomed in die.

Error reading file ____. Make sure it is the correct format.
The application attempted to load file, but found it corrupt. This error can occur if a file is of the wrong type or was saved from a newer version of the application than the current version being run.

Error Reading Quick Bend Data -- Wrong Version. Default values used.
The Quick Bend data that was saved was from a different version and cannot be read. Default values will be used instead.

Error. This number cannot be converted.
The application attempted to convert the given number string, but could not complete the conversion.

Error: Data Overflow.
The computation requested has overflowed the available display space or data range in the calculator.

Excessive tilt.
The tilt error is set when the tilt switches indicate that the ram is not sufficiently level to operate. When the tilt fault is initially detected, the main drive motor will be shut off to prevent further motion. If the motor is restarted, the control will attempt to relevel itself when the RAM UP button, palmbutton or footswitch is activated. During the releveling process, the tilt switches will be ignored. The tilt switches will continue to be ignored until the releveling process is complete. When restarting the drive after a tilt fault, be ready to shut it down again in case a hard failure causes the ram to go further out-of-level.

Fatal Error! - Could not create machine communication object.
The application could not create the proper communication object. Contact the CINCINNATI INCORPORATED Service Department.

Fatal error: Serial communications thread not running!

The Kermit serial communications did not start. Contact the CINCINNATI INCORPORATED Service Department.

File ____ is not a BATCH file.
File ____ is not a Lower Tool file.
File ____ is not a Program file.
File ____ is not a Teach file.
File ____ is not an Upper Tool file.

The file type that was selected to be opened was not the correct file type. Select the correct file and try again.

File Contains no Data.

The file to be opened was an empty file and contained no data. Select another file and try again.

Footswitch or Palmbutton only.

If a Footswitch and Palmbutton station are both selected and the down stop is not turned on, this message will be displayed. Palmbuttons and footswitches cannot be selected simultaneously unless the "Hand/Foot Sequence" mode is used. This slave error does not normally occur since the PC software enforces this rule.

Front limit switch.

The limit switches (when used) are all set outside of the normal travel limits. They should never be actuated during operation. Check that the switches are actuated at the proper position.

Gage position unknown, gage is not calibrated or is in motion.

This error indicates that the gage's position could not be read because the gage is either not calibrated or is currently in motion.

Gages are not enabled.

This is a Kermit Remote Host command response indicating that the gage is not yet enabled.

Gate or die block interlock.

This indicates that the optional interlock for a side gate or die safety blocks is not satisfied (gate not closed or die blocks not in safe position). The press will not run any mode but SETUP unless the interlock input is on. The press will run in SETUP regardless of the state of the input.

Hand/Foot Mode is not allowed in Adaptive.

Hand / Foot sequence is not allowed when using Adaptive mode.

High battery voltage on CPU board.

This warning will be displayed if the batteries on the slave CPU show more than 3.6 volts. This could indicate a missing battery or a problem with the battery circuit on the CPU.

Invalid axis number.

This is a Kermit Remote Host command response indicating that the command contained an incorrect axis number.

Invalid IGES Directory Section
Invalid IGES Global Section
Invalid IGES Parameter Section
Invalid IGES Start Section
Invalid IGES Terminate Section

These errors indicate problems loading an IGES format file.

Invalid K-Factor value

This is an error from the automatic gage allowance calculation dialog indicating that an out-of-range K-Factor value was input.

Invalid Material Thickness value

This is an error from the automatic gage allowance calculation dialog indicating that the input Material Thickness value was out-of-range.

Invalid mode.
This is a Kermit Remote Host command response indicating a bad mode.

Invalid palmbuttons.
This is a Kermit Remote Host command response indicating that the palmbuttons do not exist or not stations have been selected.

Invalid Ram Reversal value
This is an error from the automatic gage allowance calculation dialog indicating that the input Ram Reversal value was out-of-range.

Invalid reply from gage.
This error does not normally occur. It indicates an improperly formatted message from a gage control module.

Invalid step number received from slave.
The Master reported receiving an invalid program step number from the Slave.

Invalid step number.
This is a Kermit Remote Host command response. The Slave reported receiving an invalid program step number from the Master.

Left dump valve sensor not on.
Left dump valve sensor stuck on.
These messages indicate problems with the dump valves (1-H-SOL & 10-H-SOL) or sensors on machines equipped with cylinder mounted manifolds (AUTOFORM hydraulics). Check valve and sensor operation. Check the outputs, the drive, the coils, and the inputs that sense the spool position switches. Also check the operation of 6CR which interrupts current to the solenoids.

Left pot failure.
For machines equipped with linear potentiometers instead of incremental encoders. If the analog signal indicates the voltage from the POT is less than 0.01 volt or greater than 9.99 volts then the control assumes the POT is not working properly. Check the wiring to the POT. Replace and recalibrate the POT if necessary.

Left strain cell faulted.
If the analog signal indicates the voltage from the strain cell is less than -9.99 volts or greater than +9.99 volts then the control assumes the strain cell is not working properly. Check the wiring to the strain cell. Replace and recalibrate if necessary.

Left zero pulse error.
The incremental encoders used to measure the position of the ram contain a marker pulse (Z-pulse) at every even inch mark. When the control detects a Z-pulse the counter value is checked to make sure the count value is near an even inch mark. If this error occurs, check the setting of the "zero pulse tolerance" configuration value. This is normally set to 200 (0.02 inches). Check encoder wiring and cables. Replace the encoder if necessary.

Light guard did not interrupt.
This error indicates that the light guard self check did not pass, or that the beam was not interrupted manually on guards without self-checking feature. After reversal the control turns off the light guard transmitter and waits for the light guard input to turn off, to verify that the system is working. If the input does not turn off in the allotted time, then the error is issued and operation with the light guard will be disabled. If the machine does not have a self-checking light guard, then the beam must be interrupted manually before the press can be stroked. Usually this happens naturally when the workpiece is handled. If this error occurs on a self-checking light guard, check all connections to the light guard and check the light guard unit for proper operation. Also check for a failed light guard enabled output (low current output board #1 output #15), or a stuck light guard input (input board #1 input #5).

Light guard is interrupted.

If the light guard is interrupted while the guard is enabled and the ram is moving, or a footswitch or palmbutton is pressed while the guard is enabled and interrupted, this message will be displayed. This message is only a warning and is intended to inform the operator that something is blocking the light guard. If the beam is not blocked and the message persists, check the alignment and functioning of the light guard.

Light Guard Mute Position must be less or Equal To Speed Change Down Position.

This error indicates that the Speed Change down position is less than the Guard Mute position. The Guard Mute position must be less than or equal to the Speed Change down position.

Log File was not received properly

This is an Adaptive / DTC mode error indicating that the Adaptive log file was not received at the Master.

Low battery on slave CPU board.

There are two 3 volt lithium battery cells on the 555 Slave board. The battery voltages are monitored every 5 seconds. If both of the batteries are below 2.25 volts, this warning message will be displayed. The batteries may be replaced with the power on to prevent any data loss.

Low oil level.

If the oil drops below the minimum level, this error message will be displayed and the main drive will be shut down. Fill the hydraulic reservoir until the oil is centered in the sight glass.

Lower tool must be selected before bumping parameters can be calculated.

This is a bumping mode error indicating that the lower tool has not been chosen.

Machine.DAT file is corrupt. Default values will be used.

The Machine.DAT file was found but is invalid. This Machine.DAT file may have been saved using a newer version of the application than the application that is currently trying to load the file. The Machine.DAT file contains important information about the AUTOFORM control. Call CINCINNATI INCORPORATED Service Department if this error occurs.

Main drive is off.

This is a Kermit Remote Host command response indicating that the main drive is off.

Main drive must be on to unclamp.

These warnings just remind the operator that the main drive must be on and the mode selector in SETUP to operate the power clamps.

Material bottomed in die, increase minimum angle or select proper vee die.

This is an Adaptive / DTC error indicating that the limit has been reached with the angle / die / material combination. The material bottomed in the die with this combination.

Material Thickness is outside valid range.

The input material thickness for the computation is out-of-range, typically too large.

Maximum tonnage exceeded on left side.
Maximum tonnage exceeded on right side.

When forming material the control will issue these errors if the force on either frame exceeds 55% of the maximum rated machine load. Full load operation is only available if the work is centered between the housings. Check the left to right centering of the workpiece.

Maximum travel limit error.

The commanded position to the gage module is greater than the maximum position. This indicates a calculation error on the PC, or incorrect configuration of the PC or the gage module.

Measured angle for bend is not valid, please enter.

This is an Adaptive / DTC error indicating that the Measured Angle is out-of-range.

Minimum travel limit error.

The commanded position to the gage module is less than the minimum position. This indicates a calculation error on the PC, or incorrect configuration of the PC or the gage module.

Mode is Edit, Toggle Mode button to Teach before starting bend
This is an Adaptive / DTC error indicating that the mode must be switched to Teach to actually begin a bend.

Mode selector is OFF
This warning is displayed if a palmbutton or footswitch is activated when the mode selector is set to “OFF”.

Motion error.
This error will be displayed if the gage is forced out of position by the material. Make sure the Clamp and Retract feature is used if the workpiece will push against the gage during forming.

Must be in SETUP mode to unclamp.
These warnings just remind the operator that the main drive must be on and the mode selector must be in SETUP to operate the power clamps.

No automatic calculation was made:
This is the start of an error indicating that the automatic gage allowance calculation could not be performed. Following this text should be the reason why the calculation was not finished.

No bend lines have been defined. Part cannot be created.
This error indicates that the 2D conversion could not be performed because no bend lines were defined for the part. Insert bend lines or select existing bend lines in the part.

No Data was Transferred.
This error indicates that the attempt to copy the last bend's ram reversal position data was unsuccessful. It will typically be following by more text further identifying the cause (i.e. no data available).

No motion error. (Gage)
The "No Motion Error" indicates the gage could not complete its move. This could be caused by a physical obstruction, such as the gage fingers striking the tooling.

No motion error. (Ram)
This error will be displayed and the HPU shut down if the control asks for motion and the press does not move at least half as fast as commanded.

No operator controls enabled.
There must be at least one operator control on to cycle the machine. Open the Op Station dialog with the button in the toolbar and enable the correct operator control.

No palmbuttons enabled.
The current mode of operation requires palmbuttons and none are enabled. Open the Op Station dialog with the button in the toolbar and enable the correct operator control.

No response from gage.
The backgage controller is not responding in a reasonable amount of time. Press the "Cycle Start" button to try the operation again. If the error returns, turn the disconnect OFF, wait 1 minute, then restore power. Turn on the main drive and press "Cycle Start". If the problem persists, check the 48 volt power supply, check the gage communications connections from the CPU board to the backgage wiring, check the switch positions on board 841652 (gage communications distribution block).

No teach file specified.
This is an Adaptive error indicating that the Teach filename has not be input.

No tools specified for bend.
In order for the Bend Simulation to perform its computations, tools must be selected for each bend.

No valid Gage Positions found.
The Bend Simulation routines did not find any valid gage positions.

No valid stoke data.
The Slave does not have any valid stoke data. After powering on the machine, there must be at least one completed cycling of the ram to gather stroke data.

Not enough parameters.
This is a Kermit Remote Host command response indicating that the command required more input parameters.

Not idle.
This error is generated by the gage module if a motion command is received while the axis is in motion.

Not in position.
If the gage failed to reach its desired position within the set tolerance, this error will be displayed.

Oil temperature sensor failure.
The oil temperature sensor is indicating a value less than zero degrees Fahrenheit. This indicates that the sensor or interface has failed, or there is a problem with the wiring. The heater output will be disabled to prevent overheating of the oil (caused by loss of temperature feedback). The main drive will be disabled to prevent damage to the pump.

Oil temperature too high.
This warning message will be displayed when the temperature increases above the normal operating range. If the temperature continues to rise, the main drive will be shut down and cannot be restarted until the oil cools to an acceptable temperature.

Operator control keyswitch is off.
This is a Kermit Remote Host command response. This message is issued if a control is activated (palmbutton, footswitch, RAM UP button or power clamp switch) when the operator control switch is turned off. All of these functions are disabled unless the switch is on.

Palmstations or hand/foot sequence must be used when light guard is disabled.
Only palmbuttons or hand/foot sequence are valid if the light guard has been disabled. Use the OP STATIONS button in the Toolbar to open the dialog to select the correct operator controls.

Parameter 1 has not been calculated, please repeat bend.
This is an ADAPTIVE mode error. When verifying the Teach data, Parameter 1 was found to be invalid. Repeat the bend.

Parameter 2 has not been calculated, please repeat bend.
This is an ADAPTIVE mode error. When verifying the Teach data, Parameter 2 was found to be invalid. Repeat the bend.

Part does not meet minimum tonnage, Bend Rejected!
This is an ADAPTIVE mode error. Teach bends require a minimum tonnage. The bend may require a longer piece or thicker material.

Please define a horizontal mounting line for the tool before continuing.
Conversion requires a mounting line to be defined. Insert a mounting line or select an existing one.

Please define a vertical center line for the tool before continuing.
Conversion requires a center line to be defined. Insert a center line or select an existing one.

Power conservation.
The main drive was shut down due to lack of activity. The power conservation time can be set in the configuration or disabled by entering zero.

Power supply tolerance.
This indicates the gage has detected that its 5 volt power supply is out of tolerance.

Pressure not building in clamp.
When releasing the power clamps, the control allows 10 seconds for the pressure switch to indicate that sufficient pressure has been obtained to release the clamps. If the pressure switch does not activate in time, the clamps will be closed and the error issued. Check the setting and operation of the pressure switch and the operation of the hydraulic values used for the power clamps. Also, check the high current outputs used to fire the valves and the operation of the input used to read the pressure switch.

Programmable footswitch state does not match first step.
If programmable footswitches are being used in a program, they must be used in all steps of the program.

R-Left axis calculated dimension exceeds travel limits.
R-Right axis calculated dimension exceeds travel limits.
The R-Axis value that was calculated at run-time is too large or too small. R-Axis values, unless using Unmeasured Tools in that step, are calculated using the input value plus stackup of filler block, lower tool, etc.

Ram completed stroke while scanning for final reversal
This is an ADAPTIVE / DTC mode error. Ram reversed due to tonnage or operator interruption.

Ram completed stroke while waiting for Ramp Down
This is an ADAPTIVE / DTC mode error. Ram reversed due to tonnage exceeded for dies, prior to reversal.

Ram is not calibrated.
This is a Kermit Remote Host command response. The Slave reported that the ram is not calibrated. In most cases, this is informational only and pressing the currently active Operator Station will cause the ram to calibrate automatically.

Ram too low, raise ram above speed change pos and restart cycle.
Ram too low, raise ram above speed change position and restart cycle.

Redundancy fault.
The redundant interlock is monitored continuously by the control. If the control detects a fault, the main drive will be shut down. Check palmbutton and footswitch wiring. Check the wiring and operation of relay 6CR. Check the function of input #4 on input board #1.

Remote host packet too long, not sent.
The message that the Master is attempting to send to the Slave has too many parameters or is too long. Contact the CINCINNATI INCORPORATED Service Department.

Requested Gage Axis is Disabled.
This error message indicates that the requested axis is either not installed or not enabled. Check that the axis is enabled on the Gage tab of the Configuration.

Reversal Position is higher than Speed Change Down
The requested position for the ram to reverse is above the requested position for the ram speed to slow to approach speed.

Reversal Position is too high
The requested reversal position is beyond the maximum open height of the machine.

Reversal Position is too low
The requested reversal position is below the closed height of the machine.

Reversal Tonnage too high for dies
The calculated reversal tonnage based on bend length and tool ratings is too high.

Reversed on position.
When operating in TONNAGE forming mode, if the ram reaches the reversal position before achieving the programmed reversal tonnage, then this error will be issued. Make sure the reversal position is set properly.

Reversed on tonnage.
When operating in a position forming mode (ANGLE, ADAPTIVE, ANGLE/DTC, ABSOLUTE POSITION) if the pressing load exceeds the maximum tonnage programmed for the step before reaching the reversal position, then this error will be issued. Make sure the bend length of the part is set properly. Make sure the tons/foot values for the tools are set properly.

Right dump valve sensor not on.
Right dump valve sensor stuck on.

These messages indicate problems with the dump valves (1-H-SOL & 10-H-SOL) or sensors on machines equipped with cylinder mounted manifolds (AUTOFORM hydraulics). Check valve and sensor operation. Check the outputs the drive the coils and the inputs that sense the spool position switches. Also check the operation of 6CR which interrupts current to the solenoids.

Right pot failure.

For machines equipped with linear potentiometers instead of incremental encoders. If the analog signal indicates the voltage from the POT is less than 0.01 volt or greater than 9.99 volts, then the control assumes the POT is not working properly. Check the wiring to the POT. Replace and recalibrate the POT if necessary.

Right strain cell faulted.

If the analog signal indicates the voltage from the strain cell is less than -9.99 volts or greater than +9.99 volts, then the control assumes the strain cell is not working properly. Check the wiring to the strain cell. Replace and recalibrate if necessary.

Right zero pulse error.

The incremental encoders used to measure the position of the ram contain a marker pulse (Z-pulse) at every even inch mark. When the control detects a Z-pulse, the counter value is checked to make sure the count value is near an even inch mark. If this error occurs, check the setting of the "zero pulse tolerance" configuration value. This is normally set to 200 (0.02 inches). Check encoder wiring and cables. Replace the encoder if necessary.

Selected segmented tool does not have any unused segments available.

The operation that is being attempted on the tool cannot be completed because all of the available segments have already been allocated. If there are physically more segments available, the segment quantities can be modified in the Tool Library by editing the tool and adding segments.

Sheet Support calculated dimension exceeds travel limits
Sheet Support Left calculated dimension exceeds travel limits
Sheet Support Right calculated dimension exceeds travel limits

The sheet support value that was calculated at run-time is too large or too small. Sheet support values, unless using Unmeasured Tools in that step, are calculated using the input value plus stack-up of filler block, lower tool, etc.

Sheet Support too close to gage bar

The calculated sheet support position will put it too close to the gage bar.

Slave communication error - Bad break packet.
Slave communication error - Bad checksum.
Slave communication error - Bad EOF packet.
Slave communication error - Bad host command.
Slave communication error - Bad packet.
Slave communication error - File not found.
Slave communication error - File system write.
Slave communication error - Invalid file header packet.
Slave communication error - Timeout.
Slave communication error - User abort.
Slave communication local error
Slave communication remote error
Slave communications are busy
Slave communications are not running

These errors are Kermit communications errors.

Slave Config file is corrupt. Default values will be used.

There was a failure when opening the CFIG.SLV file. If this is the first time startup of the machine, this is not a problem.

Spd Chg must be Greater Than Reversal Pos.
The requested position for the ram to reverse is above the requested position for the ram speed to slow to approach speed.

Speed Change Down cannot be less than 0.25"
If using ADAPTIVE or ANGLE/DTC forming mode, the Speed Change Down position must be 0.25 inches or larger.

Stroke mode is off.
This is a Kermit Remote Host command response indicating that the stroke mode is set to OFF.

Teach file did not verify, review teach file for errors.
Verification of the Teach file failed. Check the values for errors.

Teach Values were not received correctly from slave
The Master's request for the Teach values from the Slave failed. Retry, if possible. Contact the CINCINNATI INCORPORATED Service Department if failure persists.

Temperature sensor not installed.
This is a Kermit Remote Host command response.

Thickness is out of tolerance for bend, please check.
This is an ADAPTIVE mode error. The workpiece failed the thickness tolerance check. Check the material for excessive thickness variation.

This Software requires a minimum Operating System of Win98 or NT4.0, Service Pack 4.
The PC running the application must be running an operating system as new or newer than NT4 with SP4 or Windows 98 (i.e. Windows 98, Windows NT4 SP5, or Windows 2000 are all OK for offline software).

Tilt LS error (both tripped)
On machines equipped with tilt switches (machines with incremental encoders), both tilt switches must be on for normal operation. If one switch turns off, it indicates an out of tilt situation and the control can determine which direction to move. If both inputs are off, then the switches are not set properly or the press is extremely out-of-tilt. Check the wiring and adjustment of the switches. Re-level the machine using the bleed down valves if necessary.

Tonnage detected in rapid speed.
The press brake is not intended to do forming work in the rapid advance mode. If the strain cells indicate more than 10% of rated machine load on either press frame, then the rapid advance motion will stop and this error will be issued. Raise the speed change point to make sure the load is not contacted until the press is in the forming portion of the stroke.

Too many pages to print. Last pages may be lost.
The requested print job contains too many pages to complete.

Tool clamp pressure switch stuck on.
On machines equipped with power clamps, a pressure switch is used to verify that the clamps are operating properly. When unclamping, hydraulic pressure is used to release spring clamps. A valve on the HPU is fired until the pressure switch indicates sufficient unclamping pressure has been obtained. If the pressure switch stays on for more than 60 seconds after clamping, it indicates the switch is stuck on or not set properly. A switch that is stuck on will prevent the HPU from building enough pressure to release the clamps.

Tool stackup between upper tool ____ and lower tool ____ exceeds open height of machine.
The selected upper and lower tool combination of tools will not fit in the machine.

Tools have not been selected
No tools have been selected for the program's step. If tools have already been added and they show in the tool layout display, then select the correct tools for the current step by clicking on them in the tool layout display on the Run/Edit page.

Tools used in program do not match those used in Teach file
A program using a given Teach file must use the same tools as those used to develop the Teach file.

Top of Dies must be recalibrated if tools have changed
If loading a new program containing different tools than that for which Top of Dies (or Top of Material) had been set, a new Top of Dies (or Top of Material) position must be set. Use the SET TOP OF DIES button on the Job Setup page to set the correct position for the different tooling.

Top of Material must be set.
When using Unmeasured Tooling, Top of Material or Top of Dies must be set from the Job Setup page.

Top Stop must be Greater Than or Equal to Spd Chg and Spd Chg must be Greater Than Reversal Pos.
Top Stop must be Greater Than or Equal to Spd Chg.
There are multiple errors in the positions specified. The Top Stop position must be at least as high as the Speed Change position. Also, the Reversal position must be lower than the Speed Change position. The positions of the fields in Quick Bend are placed on the dialog in a column to make this clearer: a field placed above another field should be as large or larger than one below it and vice versa.

Unable to break line segments, check CAD file.
The CAD software attempted to separate lines and was unable to do so.

Unable to complete Tool Outline conversion.
The application was unable to complete the conversion of the tool. If the PC's memory is very limited, this may be the problem.

Unable to create default CFIG.SLV file
The application was unable to open the CFIG.SLV file. This may happen if the file is being used by another application or the directory structure or permissions have changed.

Unable to create slave data file.
The application attempted to create a file of data for the Slave but was unable to open or save it. This may happen if the file is being used by another application or the directory structure or permissions have changed.

Unable to find any closed geometry defining a tool
The conversion of the tool could not be completed because the tool geometry must be define a closed entity. Check that the lines defining the tool are connected at the endpoints.

Unable to find tool segments equal to exact length
Unable to find tool segments greater than or equal to length
The algorithm to find tool segments could not fulfill the request. The tool segments may not be available or the correct combination may not be possible.

Unable to load Quick Bend file. File exists, but is corrupt. Default values will be loaded.
The Quick Bend file is corrupt. The file may have been saved on a newer version of application software than the one currently trying to read it.

Unable to open associated part file.
The part file associated with the program could not be opened. The part file may have been moved, deleted, or had its permissions changed.

Unable to open batch program.
Unable to open configuration file. Default values will be used.
Unable to open file ____.
The requested file could not be opened. The file may have been moved, deleted, or had its permissions changed.

Unable to open Machine.DAT file. Default values will be used.
The Machine.DAT file could not be opened. This Machine.DAT file may have been moved, deleted, or had its permissions changed. The Machine.DAT file contains important information about the AUTOFORM control. Call CINCINNATI INCORPORATED Service Department if this error occurs.

Unable to open one or more tool files. Check tool names before running program.
The tools used in creating the program cannot be found. If the program was generated on a different PC, then the location may need to be changed. If the program was created on this machine, the tool files may have been moved, deleted, or had their permissions changed.

Unable to open Quick Bend file. Default values will be loaded.
The Quick Bend file could not be opened. It may have been moved, deleted, or had its permissions changed.

Unable to open the file ____. The file will not be saved.
The requested file could not be opened. The file may have been moved, deleted, or had its permissions changed.

Unable to open the specified Teach File.
The specified Teach file cannot be opened. If the program was generated on a different PC, then the location may need to be changed. If the program was created on this machine, the Teach file may have been moved, deleted, or had its permissions changed.

Unexpected ram motion.
The slave CPU will shutdown the HPU and issue this error if it detects ram motion when it is supposed to be stopped. The test for motion is 6 consecutive velocity measurements greater than a configurable threshold velocity.

Unknown error from slave.
This error should never occur. Try the operation again, if the problem recurs, then call CINCINNATI INCORPORATED Service Department.

Unrecognized command.
This is a Kermit Remote Host command response indicating that the Slave did not understand the command.

Up stroke data not correct, Bend Terminated.
This is an ADAPTIVE / DTC mode error. Error occurred at reversal, possibly due to bottoming the tooling in the die. Verify die angle allows enough springback.

Upper tool ____ and lower tool ____ will crash at the lowest reversal position.
Checks performed on the tools and the given Reversal position indicate that the tools will hit at this reversal position.

Vee Opening is not within valid range
The input tooling Vee Opening for the computation is out-of-range.

Wrong operator control.
This message is issued if a program specifies a specific control (palmbutton, footswitch, RAM UP button or power clamp switch) should be used, but the operator presses a different control.

X Axis calculated horizontal offset is too large
The horizontal bar skew is too large for this step. Check the offset for the step. If that is within limits, check the Horizontal Bar Skew field on the Gages tab of the Configuration.

X Left axis calculated dimension is too large
X Left axis calculated dimension is too small
X Right axis calculated dimension is too large
X Right axis calculated dimension is too small
The X-Axis value is too large or too small. It may be helpful to check the Maintenance | Program Simulate item from the Menu bar to see what the actual calculated values are. The limits may be checked on the Gages tab of the Configuration.

Z Axis conflict! Left and Right arms would collide
The input values for Z-Left and Z-Right would cause the two to collide. The minimum separation between the left and right arms is shown in the Gages tab of the Configuration under 'Z Left/Right minimum'.

Z Left axis calculated dimension exceeds travel limits
Z Right axis calculated dimension exceeds travel limits

The Z-Axis value is too large or too small. It may be helpful to check the Maintenance | Program Simulate item from the Menu bar to see what the actual calculated values are. The limits may be checked on the Gages tab of the Configuration.

Z-Axis cannot be mirrored. Other Axis' Original value will be kept.

The Mirror Axis option was selected for this field in the Pop-up Calculator and the opposite axis value could not be set. The attempt is made to mirror the setting about the center position. If this is not possible, this error will be shown.

Zero pulse error.

This indicates a failed position encoder. Try the operation again, if the problem recurs, then call CINCINNATI INCORPORATED Service Department.

OTHER PROBLEMS

Certain machine problems pertaining to ram motion or control operation may be intermittent or prohibit the machine from displaying an error. By providing the information below prior to scheduling a service call or consulting with a Technical Service Specialist, the Troubleshooting process can be significantly reduced.

RAM / MOTION *(Select the current problem from this list.)*

NO RAM MOTION \ RAM IS NOT MOVING
RAM IS MOVING OR WENT OUT-OF-LEVEL
RAM WILL NOT CALIBRATE
ONLY ONE SIDE MOVES
RAM MOVING SLOW / RAM MOVING SLOW ON RETURN STROKE
UNEVEN RAM MOTION
MOTION FAULT AT SPEED CHANGE
REVERSAL / REPEATABILITY / ANGLE PROBLEMS
RAM OSCILLATES AT REVERSAL
RAM LEVEL PROBLEM
RAM DRIFT PROBLEM
TONNAGE PROBLEM

ADAPTIVE PROBLEM

BEND SIMULATION PROBLEM

DTC (DYNAMIC THICKNESS COMPENSATION) PROBLEM

MACHINE WILL NOT START

GAGE DIAGNOSTICS

NO DISPLAY FROM THE FLAT LCD ON THE AUTOFORM PC CONTROL

RAM / MOTION

- **<u>NO RAM MOTION \ RAM IS NOT MOVING:</u> The ram did *not* move when you used the footswitch or operator station to operate the machine.**

  1. Check the Footswitch / Palmbutton Operator station inputs. Go to Maintenance / Diagnostics / Inputs (Ctrl + F2). Refer to the Input Diagnostics and the electrical print to check both the footswitch(es) and palmbutton operator station(s). Turn ON the footswitch and check the inputs when you depress the footswitch. Turn OFF the footswitch and turn ON the palmbutton operator station and check the inputs when you depress the palmbutton operator station. Also check to ensure there are no "ON" or "OFF" errors.
     - If either one does not light up the proper lights or has an error, check the wiring to the footswitch or palmbutton operator station and check the device.
     - If they both test without any problems, proceed to the next step.

2. Check the relay(s) and sol valve(s) outputs. Go to Maintenance / Diagnostics / Outputs (Ctrl + F3). Refer to the Output Diagnostics and the electrical print to ensure the proper relays and sol valves are energized. Also check to ensure there are no "ON" or "OFF" errors.
   - If the proper relays or sol valves are not energized or has an error, check the wiring to the device and the device.
   - If all lights are proper, proceed to the next step.
3. Does the machine have a light guard?
   - If it does not, proceed to the next step.
   - If it does, check the INPUT DIAGNOSTICS window to verify it is working. (Refer to electrical schematic.)
4. Refer to the electrical schematic and check the 5VDC input voltage to the encoders.
   - If above 4.6VDC, proceed to the next step.
   - If it is less then 4.5VDC, replace the Analog board (843579 or 832179).
5. Refer to the electrical schematic and check the output of the encoder signals. A, A NOT, B, B NOT, Z and Z NOT. The A's and B's should occur every .001 (.025mm). The Z's should occur every inch. These signals will change from 0 volts to 5 volts when a pulse occurs. Do you have all signals on both encoders?
   - If you have all signals, proceed to the next step.
   - If you do not have all signals, order a new ram encoder.

   Note: *Signals may be checked using a digital logic probe.*
6. Check the hydraulic idle pressure at TP #4. Use a 600 PSI (4137 kPa) or 1000 PSI (6895 kPa) gage. Is there 300 to 500 PSI (2068 to 3447 kPa) there? (Refer to hydraulic schematic.)
   - If you have 300 to 500 PSI (2068 to 3447 kPa), proceed to the next step.
   - If you do not have 300 to 500 PSI (2068 to 3447 kPa), contact CINCINNATI Service.
7. Switch the cables on the Analog board (843579 or 832179). Both servo outputs and encoder inputs cables must be switched as pairs. How does the ram move now?
   - Ram not moving. BLOCK THE RAM and switch the proportional valves. Remove the block and press the RAM UP button. What does the ram do now?
     a. If ram went out-of-level, replace proportional valve on the side that is not moving.
     b. If the ram did not move, contact CINCINNATI Service.
   - Ram went out-of-level. Replace the Analog board (843579 or 832179).
8. Check the LEDs on the valve plugs of the load sense valves while trying to move the ram up. (Refer to the electrical schematic.) Do both LEDs come "on"?
   - If they are "on", proceed to the next step.
   - If not, check the OUTPUT DIAGNOSTICS window to verify they are both turned "on".
     a. If LEDs are turned "on" check the wiring to the valve. (Refer to electrical schematic.)
     b. If LEDs are "off", check the high current output board #1 run LED (green) and the cable to the output board.
9. Manually fire the load sense valves, Solenoids #5 and #6, while using the footswitch or palmbutton operator station to command motion. If the ram starts to move, try moving the ram without firing the valves manually. How does the ram move now?
   - Ram moving now. Manually fire the load sense valves (Solenoids #5 and #6) a couple more times to ensure that they are no longer stuck.
   - Still no ram motion. Replace the load sense valves.

✦ **RAM IS MOVING OR WENT OUT-OF-LEVEL**

1. Refer to the electrical schematic and check the 5VDC input voltage to the encoders.
   – If above 4.6VDC, proceed to the next step.
   – If it is less then 4.5VDC, replace the Analog board (843579 or 832179).

2. Refer to the electrical schematic and check the output of the encoder signals. A, A NOT, B, B NOT, Z and Z NOT. The A's and B's should occur every .001 (.025mm). The Z's should occur every inch. These signals will change from 0 volts to 5 volts when a pulse occurs. Do you have all signals on both encoders?
   – If you have all signals, proceed to the next step.
   – If you do not have all signals, order a new ram encoder.

   Note: *Signals may be checked using a digital logic probe.*

3. Check hydraulic idle pressure at TP #4. Use a 600 PSI (4137 kPa) or 1000 PSI (6895 kPa) gage. Is there 300 to 500 PSI (2068 to 3447 kPa) there? (Refer to hydraulic schematic.)
   – If you have 300 to 500 PSI (2068 to 3447 kPa), proceed to the next step.
   – If you do not have 300 to 500 PSI (2068 to 3447 kPa), contact CINCINNATI Service.

4. Switch the cables on the Analog board (843579 or 832179). Both servo outputs and encoder inputs cables must be switched as pairs. How does the ram move now?
   – Ram not moving. BLOCK THE RAM and switch the proportional valves. Remove the block and press the RAM UP button. What does the ram do now?
      a. If ram went out-of-level, replace proportional valve on the side that is not moving.
      b. If ram did not move, contact CINCINNATI Service.
   – Ram went out-of-level. Replace the Analog board (843579 or 832179).

✦ **RAM WILL NOT CALIBRATE**: **The ram moved, but did not calibrate.**

1. Refer to the electrical schematic and check the 5VDC input voltage to the encoders.
   - If above 4.6VDC, proceed to the next step.
   - If it is less then 4.5VDC, replace the Analog board (843579 or 832179).

2. Refer to the electrical schematic and check the output of the encoder signals. A, A NOT, B, B NOT, Z and Z NOT. The A's and B's should occur every .001 (.025mm). The Z's should occur every inch. These signals will change from 0 volts to 5 volts when a pulse occurs. Do you have all signals on both encoders?
   - If you have all signals, proceed to the next step.
   - If you do not have all signals, order a new ram encoder.

   Note: *Signals may be checked using a digital logic probe.*

3. Check hydraulic idle pressure at TP #4. Use a 600 PSI (4137 kPa) or 1000 PSI (6895 kPa) gage. Is there 300 to 500 PSI (2068 to 3447 kPa) there? (Refer to hydraulic schematic.)
   - If you have 300 to 500 PSI (2068 to 3447 kPa), proceed to the next step.
   - If you do not have 300 to 500 PSI (2068 to 3447 kPa), contact CINCINNATI Service.

4. Switch the cables on the Analog board (843579 or 832179). Both servo outputs and encoder inputs cables must be switched as pairs. How does the ram move now?
   - Ram not moving. BLOCK THE RAM and switch the proportional valves. Remove the block and press the RAM UP button. What does the ram do now?
      a. If ram went out-of-level, replace the proportional valve on the side that is not moving.
      b. If the ram did not move, contact CINCINNATI Service.
   - Ram went out-of-level. Replace the Analog board (843579 or 832179).

5. Is bed top to ram nose measurement more than machine open height?
   – If it is not, proceed to the next step.
   – If it is, TOP CAL limit switches are faulty or out of adjustment. Check wiring and the switches. Contact CINCINNATI INCORPORATED for proper switch adjustment procedure.

6. Release and reactivate the active Operator Station and hold activated long enough for ram to complete calibration procedure. How does ram react now?
   - Ram does not move. Go to NO RAM MOTION instructions.
   - Ram moves but does not calibrate. Check TOP CAL limit switches and wiring. Contact CINCINNATI INCORPORATED for proper switch adjustment procedure.

✦ **ONLY ONE SIDE MOVES: When the ram moves, only one side moves.**

1. Refer to the electrical schematic and check the 5VDC input voltage to the encoders.
   - If above 4.6VDC, proceed to the next step.
   - If it is less then 4.5VDC, replace the Analog board (843579 or 832179).
2. Refer to the electrical schematic and check the output of the encoder signals. A, A NOT, B, B NOT, Z and Z NOT. The A's and B's should occur every .001 (.025mm). The Z's should occur every inch. These signals will change from 0 volts to 5 volts as a pulse occurs. Do you have all signals on both encoders?
   - If you have all signals, proceed to the next step.
   - If you do not have all signals, order a new ram encoder.

   Note: *Signals may be checked using a digital logic probe.*
3. Check the hydraulic idle pressure at TP #4. Use a 600 PSI (4137 kPa) or 1000 PSI (6895 kPa) gage. Is there 300 to 500 PSI (2068 to 3447 kPa) there? (Refer to hydraulic schematic.)
   - If you have 300 to 500 PSI (2068 to 3447 kPa), proceed to the next step.
   - If you do not have 300 to 500 PSI (2068 to 3447 kPa), contact CINCINNATI Service.
4. Switch the cables on the Analog board (843579 or 832179). Both servo outputs and encoder inputs cables must be switched as pairs. How does the ram move now?
   - Ram not moving. BLOCK THE RAM and switch the proportional valves. Remove the block and press the RAM UP button. What does the ram do now?
     a. If ram went out-of-level, replace the proportional valve on the side that is not moving.
     b. If the ram did not move, contact CINCINNATI Service.
   - Ram went out-of-level. Replace the Analog board (843579 or 832179).

✦ **RAM MOVING SLOW / RAM MOVING SLOW ON RETURN STROKE: Ram appears to be moving slower than normal.**

Stroke Test: Put the machine in Quick Bend. For the 2" (51mm) stroke test, set the Top Stop at 1" (51mm) from the maximum "up" position. Set the Speed Change at 1-1/2" (38mm) down from Top Stop. Set the Reversal Point at 1/2" (13mm) down from Speed Change point. ***Example:*** Top Stop 16" (406mm), Speed Change 14.5" (368mm), Reversal 14" (356mm). Count the number of strokes made in one minute. For the 3" 76mm) stroke test, lower the Speed Change and the Reversal Point by 1" (25.4mm). ***Example:*** Top Stop 16" (406mm), Speed Change 13.5" (343mm), Reversal 13" (330mm). (***Note:*** Do not use CONTINUOUS RUN mode for these tests.) Contact CINCINNATI Service with both count numbers.

✦ **UNEVEN RAM MOTION: Ram appears to be moving uneven at the start of the stroke.**

1. Refer to the electrical schematic and check the 5VDC input voltage to the encoders.
   - If above 4.6VDC, proceed to the next step.
   - If it is less then 4.5VDC, replace the Analog board (843579 or 832179).
2. Refer to the electrical schematic and check the output of the encoder signals. A, A NOT, B, B NOT, Z and Z NOT. The A's and B's should occur every .001 (.025mm). The Z's should occur every inch. These signals will change from 0 volts to 5 volts when a pulse occurs. Do you have all signals on both encoders?
   - If you have all signals, proceed to the next step.
   - If you do not have all signals, order a new ram encoder.

   Note: *Signals may be checked using a digital logic probe.*

3. Check the hydraulic idle pressure at TP #4. Use a 600 PSI (4137 kPa) or 1000 PSI (6895 kPa) gage. Is there 300 to 500 PSI (2068 to 3447 kPa) there? (Refer to hydraulic schematic.)
   - If you have 300 to 500 PSI (2068 to 3447 kPa), proceed to the next step.
   - If you do not have 300 to 500 PSI (2068 to 3447 kPa), contact CINCINNATI Service.
4. Switch the cables on the Analog board (843579 or 832179). Both servo outputs and encoder inputs cables must be switched as pairs. How does the ram move now?
   - Ram not moving. BLOCK THE RAM and switch the proportional valves. Remove the block and press the RAM UP button. What does the ram do now?
     a. If ram went out-of-level, replace the proportional valve on the side that is not moving.
     b. If the ram did not move, contact CINCINNATI Service.
   - Ram went out-of-level. Replace the Analog board (843579 or 832179).

✦ **MOTION FAULT AT SPEED CHANGE: The ram stopped or had a very uneven speed change.**

1. Does the machine have the AUTO CROWN option?
   – If the machine has AUTO CROWN, manually turn "OFF" the AUTO CROWN valve. Does the problem still exist?

     Yes. Check the prefill valve and pipes for damage or air leaks. If there are no air leaks, switch the right and left prefill valves.

     a. If the problem switches sides, install a new prefill valve.
     b. If it did not switch, contact CINCINNATI Service.

     No. Remove the air from the AUTO CROWN cylinder. Remove the plug on top of the AUTO CROWN cylinder and install a test stand with a line going back to the tank fill. Open the test stand a little and cycle the machine. This may take 200 strokes or more. ***Note:*** *If the test stand is opened too much, the machine will stall.*
   – If the machine does not have AUTO CROWN, check the prefill valve and pipes for damage or air leaks. If there are no air leaks, switch the right and left prefill valves.
     a. If the problem switches sides, install a new prefill valve.
     b. If it did not switch, contact CINCINNATI Service.

✦ **REVERSAL / REPEATABILITY / ANGLE PROBLEMS: The ram appears to have a reversal, repeatability or angle problem (part not within tolerance).**

1. Stroke Repeatablility Test: Go to Maintenance / Diagnostics / Stroke Diagnostics (Ctrl + F4). Cycle machine for 11 strokes with the same reversal position. Is each side's command position within +/- .0004" (.0102mm) of it's desired position on all strokes displayed?
   – If it is within +/- .0004" (.0102mm), contact CINCINNATI Service.
   – If it is not within +/- .0004" (.0102mm), switch the cables on the Analog board (843579 or 832179). Both servo outputs and encoder input cables must be switched as pairs. Did the problem switch?

     Yes. Refer to *SECTION 7, EM-499* and check or adjust the counterbalance pressure to within 10 PSI.

     No. Proceed to the next step.
2. Refer to the electrical schematic and check the 5VDC input voltage to the encoders.
     a. If it is above 4.6VDC, proceed to the next step.
     b. If it is less than 4.5VDC, replace the Analog board (843579 or 832179).
3. Refer to the electrical schematic and check the output of the encoder signals. A, A NOT, B, B NOT, Z and Z NOT. The A's and B's should occur every .0001 (.0025mm). The Z's should occur every inch. These signals will change from 0 volts to 5 volts as a pulse occurs. Do you have all signals on both encoders?

   Yes. Order a new Analog board (843579 or 832179).

   No. Order a new ram encoder.

✦ **RAM OSCILLATES AT REVERSAL: Ram appears to oscillate at reversal or has a rough reversal.**

1. Does the machine have the AUTO CROWN option?
   – If the machine has AUTO CROWN, manually turn "OFF" the AUTO CROWN valve. Does the problem still exist?

     Yes. Check the prefill valve and pipes for damage or air leaks. If there are no air leaks, switch the right and left prefill valves.

     a. If the problem switches sides, install a new prefill valve.
     b. If it did not switch, contact CINCINNATI Service.

     No. Remove the air from the AUTO CROWN cylinder. Remove the plug on top of the AUTO CROWN cylinder and install a test stand with a line going back to the tank fill. Open the test stand a little and cycle the machine. This may take 200 strokes or more. ***Note:*** *If the test stand is opened too much, the machine will stall.*

   – If the machine does not have AUTO CROWN, check the prefill valve and pipes for damage or air leaks. If there are no air leaks, switch the right and left prefill valves.

     a. If the problem switches sides, install a new prefill valve.
     b. If it did not switch, go to REVERSAL/REPEATABILITY/ANGLE PROBLEMS instructions.

✦ **RAM LEVEL PROBLEM: The ram does not stay level on the down stroke.**

1. Stroke Repeatablility / Level Test: Go to Maintenance / Diagnostics / Stroke Diagnostics (Ctrl + F4). Cycle machine for 11 strokes with the same reversal position. Is each side's command position within +/- .0004" (.0102mm) of its desired position on all strokes displayed?
   – If it is within +/- .0004" (.0102mm), contact CINCINNATI Service.
   – If it is not within +/- .0004" (.0102mm), switch the cables on the Analog board (843579 or 832179). Both servo outputs and encoder input cables must be switched as pairs. Did the problem switch?
2. Refer to the electrical schematic and check the 5VDC input voltage to the encoders.
   a. If it is above 4.6VDC, proceed to the next step.
   b. If it is less than 4.5VDC, replace the Analog board (843579 or 832179).
3. Refer to the electrical schematic and check the output of the encoder signals. A, A NOT, B, B NOT, Z and Z NOT. The A's and B's should occur every .0001 (.0025mm). The Z's should occur every inch. These signals will change from 0 volts to 5 volts as a pulse occurs. Do you have all signals on both encoders?

   Yes. Order a new Analog board (843579 or 832179).

   No. Order a new ram encoder.

✦ **RAM DRIFT PROBLEM: The ram appears to be drifting down when the machine is at idle.**

1. Refer to the manual and check or adjust the counterbalance pressure to within 10 PSI (69 kPa).
   – If it is within 10 PSI (69 kPa), proceed to the next step.
2. Check to ensure that the bleeder valve is closed.
   – If it is closed, proceed to the next step.
   – If not, close the bleeder valve.

   Note: *Ram must be blocked before valves are removed.*

   Check the following with the CONTROL ON-OFF keyswitch turned "off".
3. Switch the counterbalance valves from side-to-side. Did the problem switch sides?
   – If yes, order new counterbalance valve.
   – If no, proceed to the next step.
4. Switch the counterbalance bleeder valves from side-to-side. Did the problem switch sides?
   - If yes, order new counterbalance bleeder valve.
   - If no, proceed to the next step.

5. Switch the counterbalance check valves from side-to-side. Did the problem switch sides?
   - If yes, order new counterbalance check valve.
   - If no, proceed to the next step.
6. Switch the Servo valves from side-to-side. Did the problem switch sides?
   - If yes, order new Servo valve.
   - If no, order new cylinder seals.

✦ **<u>TONNAGE PROBLEM:</u> Machine does not reverse, a tonnage error occurs, or the ram stalls during the bend sequence.**

1. Are the Reversal Position, Reversal Tonnage and the Reversal Mode entered correctly?
   - If yes, proceed to the next step.
   - If no, reset the Reversal Position, Reversal Tonnage and Reversal Mode.
2. Check the tilt information in the program. Is it correct?
   - If yes, proceed to the next step.
   - If no, reset the tilt information.
3. Check the machine closed height. See this Section, "CLOSED HEIGHT ADJUSTMENT". Are the encoders set correctly?
   - If yes, proceed to the next step.
   - If no, reset the closed height.
4. Check the tilt when the machine has the problem. Is the machine out-of-tilt? Refer to the electrical schematic and check the 5VDC input voltage to the encoders.
   - If above 4.6VDC, proceed to the next step.
   - If it is less then 4.5VDC, replace the Analog board (843579 or 832179).
5. Refer to the electrical schematic and check the output of the encoder signals. A, A NOT, B, B NOT, Z and Z NOT. The A's and B's should occur every .0001 (.0025mm). The Z's should occur every inch. These signals will change from 0 volts to 5 volts as a pulse occurs. Do you have all signals on both encoders?
   - If yes, order a new Analog board (843579 or 832179).
   - If no, order a new ram encoder.
   - If the problem still exists, proceed to the next step.
6. Check the configuration data. Does it match the configuration sheets?
   - If yes, proceed to the next step.
   - If no, contact CINCINNATI Service.
7. Switch the cables for the strain gages on the Analog board. Did the problem change from side-to-side?
   - If yes, check the wiring from the questionable strain gage to the plug at the Analog board (843579 or 832179). (Refer to electrical schematic.) Is the wiring good?
   - If no, check the 10 VDC terminal in the junction boxes inside the right and left housings. (Refer to electrical schematic.)
     a. Check voltage between the + sig to com and the - sig to com. It should be 5 +/- .250VDC. Is voltage present? Contact CINCINNATI Service with this information.
     b. Check the wiring to the plug on the Analog board. Is the wiring good?

        <u>Yes</u>. Order new Analog board (843579 or 832179).
        <u>No</u>. Order or repair the cable.

ADAPTIVE PROBLEM

Refer to EM-499, *SECTION 7, "ADAPTIVE BENDING - ERROR MESSAGES"*.

BEND SIMULATION PROBLEM

Refer to EM-499, *SECTION 7, "AUTOFORM BEND SIMULATION"*.

DYNAMIC THICKNESS COMPENSATION (DTC) PROBLEM

Refer to EM-499, *SECTION 7, "ANGLE DYNAMIC THICKNESS COMPENSATION FORMING"*.

MACHINE WILL NOT START

Machine will not start when you push the START pushbutton.

1. Is the Ground Connected Light "on"?
   - If it is "on", proceed to the next step.
   - If it is not "on", push in on the Ground Connected Light. Does it come "on"?If it does not, check the light, socket or wiring. If it does come on, check the wiring to the socket.

2. Is the Power Supplies Operational Light "on"?
   - If it is "on", proceed to the next step.
   - If it is not "on", push in on the Power Supplies Operational Light. Does it come "on"? If it does not, check the light, socket or wiring. If it does come on, check the LED's on the power supply monitor board. If the following LEDs are "on", check these:
     - 5 VDC LED, check and adjust the 5 VDC power supply.
     - 15 VDC LED, check and adjust the 15 VDC power supply.
     - -15 VDC LED, check and adjust the -15 VDC power supply.
     - 120 VAC LED, check the 120 vac power line.

GAGE DIAGNOSITCS

1. Gage Error messages.
   - If there are no error messages, proceed to the next step.
   - Refer to the Display Error messages.

2. If the gage did not complete move (no error displayed), power down the machine for 40 seconds. Turn the power back "on". Will the machine calibrate?
   - *No*, proceed to the next step.
   - *Yes*, try to restart the program.

3. Remove access panels on the gage arm(s) and check the CPU332 Board(s) (Part #829620) to see if the "race track" display is lit.
   - If the CPU332 Board does not have the "race track" display lit, proceed to the next step.
   - If the "race track" display is lit, contact CINCINNATI Service.

4. Check the 48VDC supply. Refer to the electrical print. Do you have 50VDC to 60VDC?
   - *No*, proceed to the next step.
   - *Yes*, proceed to Step 7.

5. Check the 120VAC wire #1 and wire #7. Do you have 120VAC?
   - *Yes*, order new 48VDC power supply (842333).
   - *No*, refer to electrical prints and check fuses.

6. Check the 5VDC at TP1 and TP2 on the CPU 332 board (#829620). Is there 4.8VDC or above?
   - *No*, replace SRV332 board (829626).
   - *Yes*, proceed to the next step if you have a two gage arms or contact CINCINNATI Service if you only have one gage arm.

7. If you have more than one gage arm, switch the CPU 332 boards. Before you switch the boards mark each board with the arm number. Left hand side is 51 and Right hand side is 52.

   Does the CPU332 Board have the "race track" display lit on it?
   Note: *When switching boards switch the total board with the two small boards on it.*
   - *No*, check the cable between the CPU 332 board (#829620) and the SRV 332 board (#829626). If faulty, order or repair the cable.
   - *Yes*, switch the small boards on the CPU 332 board (#829620) one at a time to determine it the problem is the CPU 332 board (#829620), Ram board (#829622) or the Eprom board (#829624).

8. If the CPU 332 Boards have the "race track" display lit, retest the machine. Does it still have the problem?
   - *No*, ordered parts fixed the problem.
   - *Yes*, switch the small boards on the CPU 332 board (#829620) one at a time to determine it the problem is the CPU 332 board (#829620), Ram board (#829622) or the Eprom board (#829624).

9. If the gage problem is still there, contact CINCINNATI Service.

NO DISPLAY FROM THE FLAT LCD ON THE AUTOFORM PC CONTROL

1. Check the 115 VAC supply to the flat panel LCD in the AUTOFORM PC Control (wires # 7A & 1A). Is there 115 VAC?
   - *No*, proceed to Step # 4.
   - *Yes*, proceed to the next step.

2. Check the 5 & 12 VDC from the AUTOFORM PC Control power supply. Is there 5 & 12 VDC?
   - *No*, order a 5 & 12 VDC power supply # 844535.
   - *Yes*, proceed to next step.

3. Check all plugs and boards to ensure they are plugged in. Are they plugged in?
   - *Yes*, contact CINCINNATI Service.
   - *No*, reinstall plugs and boards.

4. Check the UPS to ensure it is turned "ON" and the green LED is "ON". Is it "ON"?
   - *Yes*, check the wiring from the UPS to the AUTOFORM PC Control.
   - *No*, check the power to the UPS, if good replace the UPS.

ORDERING REPAIR PARTS

When ordering repair parts be sure to give this information:

1. Serial number of the AUTOFORM Press Brake. This is located on the machine's capacity plate and on the right end of the bed.
2. The part number and part name, obtained from assembly drawings included with this manual.
3. As complete a description of the part as possible.
4. Delivery required.
5. It is sometimes necessary to furnish subassemblies instead of single parts. In such cases, we reserve the right to ship and to invoice accordingly.

RETURNING PARTS FOR CREDIT

1. No item is to be returned without prior authorization. Please write or call (513-367-7100) the factory for instructions and the returned goods authorization number.
2. Returned goods authorization number must be shown on the **outside** of the package being returned. Unauthorized shipments will be returned to the sender freight collect.

SERVICE

CINCINNATI INCORPORATED Service includes:

1. Established field service having numerous local offices for prompt service assistance. Factory trained servicemen are available to assist you with any service problems you might be having. This includes service ranging from minor repairs and adjustments to major reconditioning jobs.
2. Planned Maintenance Service (PMS). This is a program designed to give you comprehensive inspections and recommendations concerning the condition of your equipment. PMS is specifically tailored to your needs to give you timely inspections, qualified recommendations and expert field assistance with repairs to your equipment.

TECHNICAL TRAINING

CINCINNATI INCORPORATED offers a variety of Operator and Maintenance Training Programs to assist our customers in obtaining maximum value from your investment in metal fabricating equipment. With today's sophisticated CNC controls, operator knowledge and proficiency have a significant effect on overall productivity. These training programs also review many of the basics of metal fabricating, which may enhance the abilities of your newer employees. Please contact our customer Technical Training Department for further information.