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**Programming and
Operations Manual
Autobend 7**
August, 1999 Revision D

Programming and Operations Manual

Autobend 7

This manual is for the Autobend 7 control system:

(Record Serial Number here)

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Hurco is committed to designing reliable, easy-to-operate machines which promote greater productivity. This system will provide a modern, efficient method of meeting metal forming needs. To prevent serious bodily injury, always observe the safety precautions listed in this manual when installing, operating, and servicing the Hurco press brake.

These and other safety precautions are discussed in the American National Standards Institute's "Standard for Machine Tools - Power Press Brakes - Safety Requirements for Construction, Care, and Use" (ANSI B11.3). The press brake operator's responsibility regarding his or her own safety, the safety of assigned helpers, and the safety of others affected by the press brake operator's acts are explained in this ANSI publication which is available from:

American National Standards Institute
1430 Broadway
New York, NY 10018

In preparing these instructions, we have attempted to recommend the most effective methods and cautions to warn against actions that could cause personal injury or make the equipment unsafe. It is important to understand that Hurco cannot anticipate or list all conceivable methods and warn of all possible hazards. In the interest of promoting safety, Hurco advises that service personnel and operators should always make sure that personal safety, the safety of the operator, and the safe operation of the machine will not be adversely affected by their actions. Review the list of safety precautions before attempting to service or operate the system.

Please read all information for safe, efficient use of the Autobend 7 control system.

Using this Manual

The *Programming and Operations Manual* describes how to program and operate the Autobend 7 control system. This manual employs several conventions to explain the system concepts and point out key concepts. These conventions are described in this section.

Sections of the Manual

This manual is divided into these chapters:

- Chapter 1 - System Basics
- Chapter 2 - Programming and Operations
- Chapter 3 - Programming Examples
- Chapter 4 - Communication Port
- Chapter 5 - Troubleshooting

There is also an index that cross-references the material presented in the manual.

Style Guide

Indexed terms are *italicized* within the text paragraphs that define them. Titles of books also appear in italic print to meet the English language convention for titles. References to chapter and section names within the text are set in quotation marks for the same reason.

Screen titles and button names begin with capital letters within the text and in the index to help the reader identify the exact reference as it appears on the system screen or on the console.

Standard Text Icons

This manual contains several icons to mark important sections:



Important

The information marked with this arrow icon must be carefully studied to ensure proper operation of the machine and/or the control.



Caution

A “Caution” message tells the operator that the machine may be damaged or a part ruined if the described procedure is not followed.



Warning

A “Warning” message indicates that the operator may be injured and the machine tool severely damaged if the described procedure is not followed.

References to Keys

Console keys are described by the name used on the console. For example, the operator may be instructed to press the Enter Adv key or the Run button. The capitalized words in the example indicate the names of the buttons as they are labeled on an Autobend 7 control.

Sample Screens

The sample screens in this manual were drawn as facsimiles from an Autobend 7 console. Here is a sample screen:

JOBS AVAILABLE 500	MODE FUNCTIONS	STAT. AVAILABLE 2000
<input type="text"/> HURCO <input type="text"/>	<ol style="list-style-type: none"> 1. MANUAL 2. AXIS CALIBRATION 3. SERIAL COMM. 4. MASTER CLEAR 5. MASTER SAVE 6. CONFIGURATION MENU 7. PUNCH 8. DIE 9. Y-AXIS: ACTIVE 	ENTER #

Figure 1-1. Mode Functions screen

The manual discusses fields on the screens and screen messages.

- A field is an area on an Autobend 7 screen that displays information and may also receive information that the operator enters through pressing console keys.
- Screen messages appear at the bottom of the screen and prompt the operator to verify choices or make decisions about entries.

A Figure List showing the titles of all of the illustrations is included after the following Table of Contents.

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Chapter 1

System Basics

This chapter prepares you to operate the Autobend 7 system by covering the following topics:

- Gauging System
- Safety Precautions
- Service Department
- Maintenance Schedule
- Autobend 7 Console Keypad Functions
- Calibration, Start-up, and Shut-down Procedures

Press Brake, Autobend 7 Control, and Gauges

The Hurco Autobend 7 Control system does not reduce or eliminate the need for its users to follow the safety and operating instructions the press brake manufacturer provides. Do not ignore safety policies and safeguarding circuits of the press brake's controls. Errors in setup or programming can damage the press brake and cause severe personal injury.

Be familiar with the following safety issues regarding the press brake and the Autobend 7 system:

- Control Console Stop Button
- Power Cabinet and Console Location
- Gauges
- Axes' Orientation

Console Stop Button

Always press the Stop button on the Autobend 7 console if a jam occurs between the gauging surface and the tooling, or any time an emergency situation arises involving the Autobend equipment.

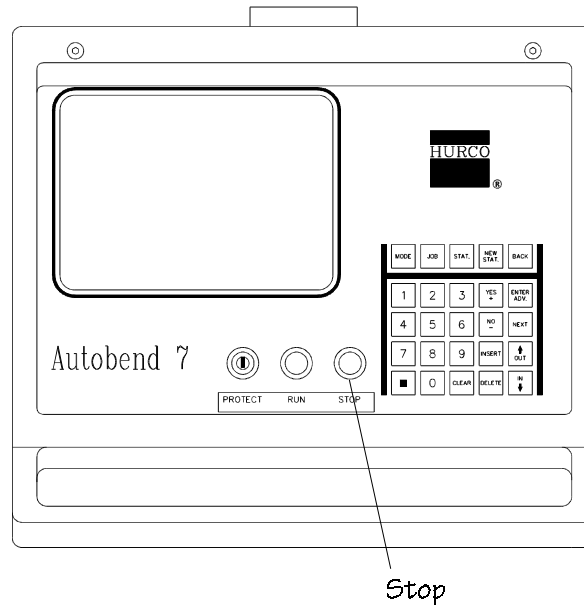


Figure 1-1. Autobend 7 Control Console



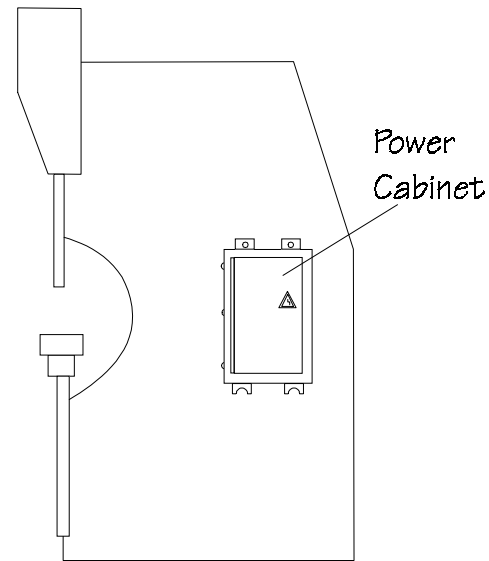
Important

The Stop button does not force the press brake to stop unless an interlock is wired from the Ram Enable relay (K1) to the press brake logic.

The press brake's Stop or E-Stop does not force the Autobend 7 to stop unless an interlock is wired from the press brake logic to the Autobend relay coil spare relay (K3).

Power Cabinet and Console Location

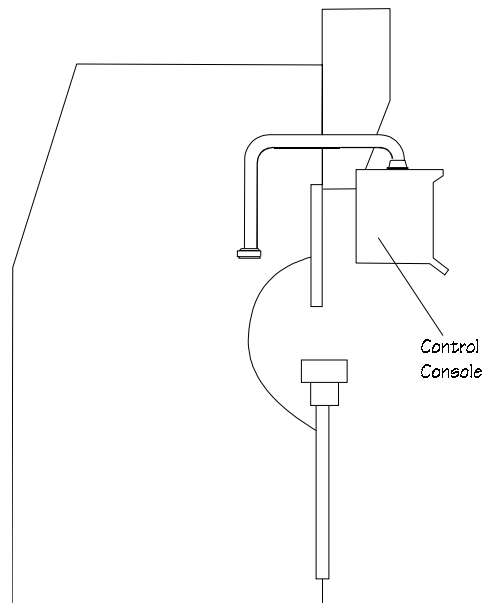
Before operating the gauging system on a press brake, become familiar with the machine's components. The figures below show press brakes with the Autobend power cabinet and the control console attached.



Right-hand Mounting of Power Cabinet

(Side View of the Press Brake)

Figure 1-2. Side view of press brake with Autobend power cabinet

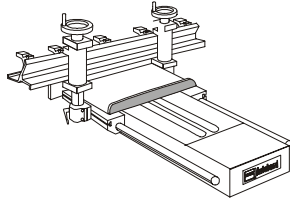


(Side View of the Press Brake)

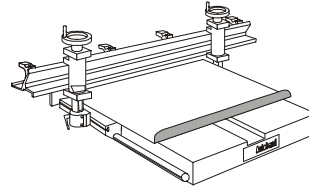
Figure 1-3. Side view of press brake with Autobend 7 console

Gauges

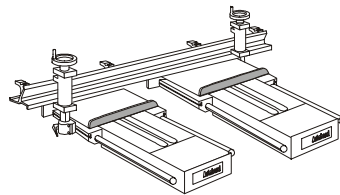
The Autobend 7 control operates all models of Autobend gauges. These gauges are mounted to the rear of different types of press brakes as discussed in the “Component Mounting” chapter of the *Installation and Upgrade* manual. The figure below illustrates several models. The gauge bar length and horizontal adjustment varies among the gauges. The S8 gauge can be mounted horizontally or vertically.



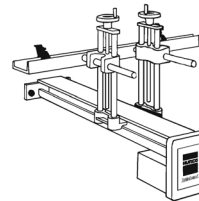
S6 Gauge Assembly



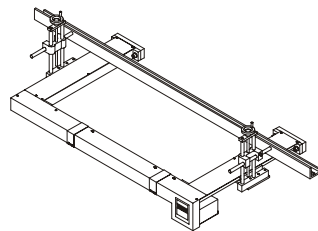
S7 Gauge Assembly



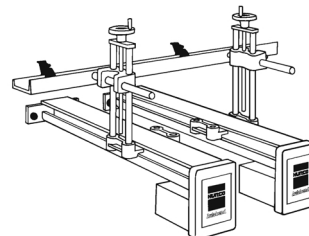
S8 Gauge Assembly



LP11 Gauge Assembly



LP21 Gauge Assembly



LP22 Gauge Assembly

Figure 1-4. Autobend Gauges

Axes' Orientation

The axes' orientation is best observed from the front of the press brake as shown below. The X-axis positions the gauge bar for the desired flange lengths. The R-axis controls the height of the gauge bar so the gauging surface can be positioned as needed. The Y-axis controls the stopping point of the press brake's ram for the desired bend to occur. For hydraulic downacting press brakes, the Y-axis can also control the ram's opening height and speed change point.

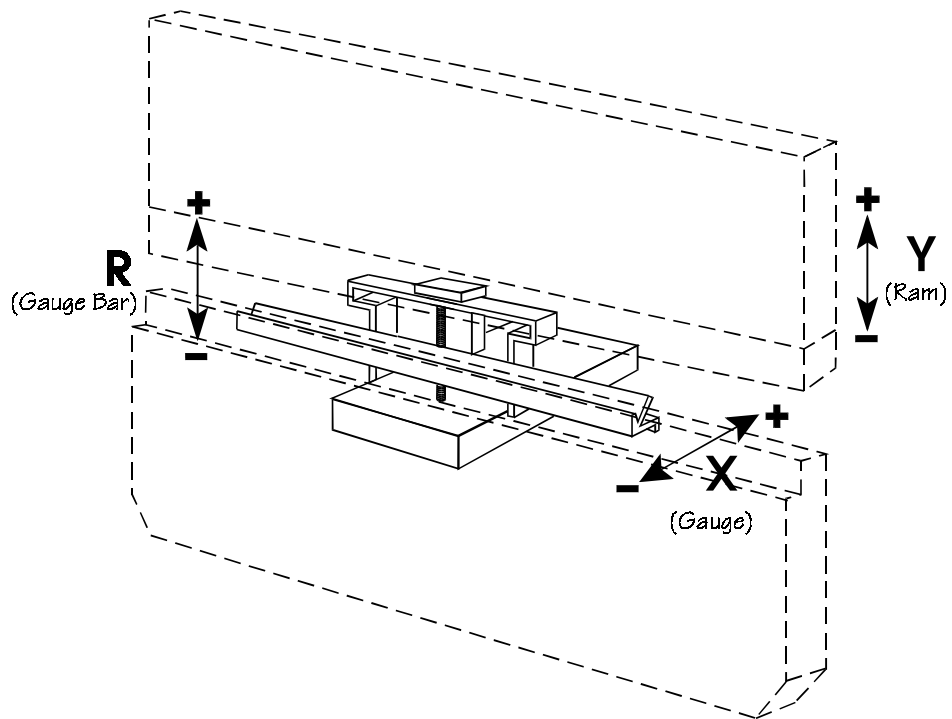


Figure 1-5. Typical Axes' Configuration

Safety Precautions

It is important to follow all of Hurco and the press brake manufacturer's safety precautions to avoid personal injury, damage to the machine, and unproductive downtime. Installers must also follow the safety regulations of their shops.

This section is included to address the safety hazards normally encountered with the intended use and the *foreseeable misuse* of the Autobend 7 system. This product was intended to be used by trained operators who create metal bending programs either on the console or an off-line system. These operators then run the programs to bend metal. While running the machines, the operators must use their experience and training to make any necessary adjustments and improve the efficiency of their programs.

This safety section describes common problems seen by Hurco Service representatives with suggestions for avoiding or dealing with the problems in a safe manner. However, this information is not an exhaustive description of all of the possible misuses of the machine nor is it a substitute for operator training, skill, and good judgment. Hurco does not accept any liability for *operator error*.

Owner's Responsibilities

The Autobend 7 system owner has several responsibilities regarding safety. First, the owner must read this section of the manual and implement the safety requirements described. Then the owner must be certain that the operators in the shop are properly trained and are using the machine as it was intended to be used. The owner must be certain that the operator assigned to run the Hurco Autobend 7 is trained by Hurco.

If the Hurco trained operator leaves the shop, the owner is responsible for providing training for the new operator assigned to run the machine. The owner may wish to send operators to Hurco training classes or classes held by distributors. Refer to the addresses and telephone numbers in the beginning of this manual for Hurco subsidiaries. If there are no training sites in the vicinity of the shop, call the nearest Hurco facility for information about on-site training or other special training opportunities.

The owner must also establish proper procedures to prevent fires and provide approved fire extinguishers to put out small fires. Of course, large fires must be extinguished by professional fire fighters. As a safety precaution, many shops have regular fire drills so that all employees know their responsibilities during an emergency situation.

Machine Modification

The Autobend 7 system was designed to meet a wide range of customer needs. If the owner feels that the machine needs to be modified in any way to meet the special needs of the shop, Hurco recommends that the owner call Hurco Technical Support or an authorized Hurco distributor for modification assistance and a written authorization to proceed.

If the owner modifies the machine in any way without Hurco's assistance and a written authorization, the machine warranty becomes invalid. In addition, such unauthorized modifications may cause safety hazards that may injure the operator and damage the machine. The owner is fully responsible for any accidents resulting from unauthorized modifications.

Safety Hardware and Software

If the owner or an operator modifies the hardware or software by removing, altering, disabling, or tampering with any safety circuit, safety switch, or any safety operation and then continues to operate the machine with those modifications, such operation is extremely hazardous, a *foreseeable misuse* of the machine, and voids the Hurco warranty. If the owner or an operator finds that such modifications have been made, that person must immediately switch off the machine and prevent use of the machine until it has been repaired. The owner must then contact a Hurco service representative for assistance in restoring the machine to safe operation.



Important

In many locales, machine hardware or software modification to override safety protections and continued operation of such a modified machine is illegal and punishable with a fine and/or imprisonment.

Installation

The owner is responsible for proper site preparation before the machine is installed as described in the *Installation and Upgrade Manual*. A Hurco Field Service Engineer or authorized distributor representative must install the machine in the prepared location. This location must not subject the machine to uncontrolled cabinet temperatures or unfavorable work environment conditions that could cause electronic component failure.

If the owner decides later to *move the press brake* from its installed location, Hurco recommends that the owner call Hurco for assistance. If this is not possible, Hurco recommends that the owner use a competent rigger with the necessary equipment to move the machine to the desired location.

Maintenance

The owner must be certain that the shop's press brake maintenance personnel are trained.



Warning

This machine must not be serviced, repaired, or maintained by unqualified and untrained personnel.

If at any time the operator or owner determines that the electrical cabinet must be opened, the power must be shut off to the machine before the doors are opened.

The only exception to this rule is when the machine is being serviced for electrical problems. Under those circumstances, only a competent electronics technician directed by Hurco Field Service should perform the work.

Safety Signs

Safety-related signs pertaining to the Hurco Autobend 7 system are affixed to appropriate system components. These signs are illustrated below. Customers may order replacements at no charge by contacting Hurco. Please have the serial number for the Autobend 7 system available when placing an order.

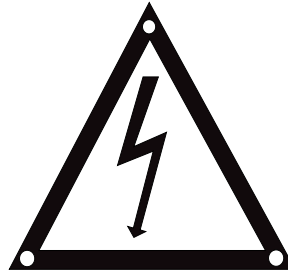


Figure 1-6. Warning Decal

A warning sign (Hurco Part No. 703-0006-049) must be affixed at the rear of the control console. It also appears on *safety decals* that must be affixed to specific areas on the Autobend components. The warning signs alert operators of the possibility of personal injury and damage to the press brake if they do not follow the described procedure.



Figure 1-7. Caution Tape

The yellow and black caution tape (Hurco Part No. 703-0003-009) must be applied across the top rear of the gauge carriage(s) and the gauge bar(s) alerting operators to a hazardous area.

Hurco ships safety-related decals like those illustrated below with each Autobend 7 system. It is important that these decals are affixed as illustrated below. They pertain to operator safety and must be affixed to the press brake as shown.

Customers may order replacements at no charge by contacting Hurco. Please have the Autobend serial number available when placing an order.

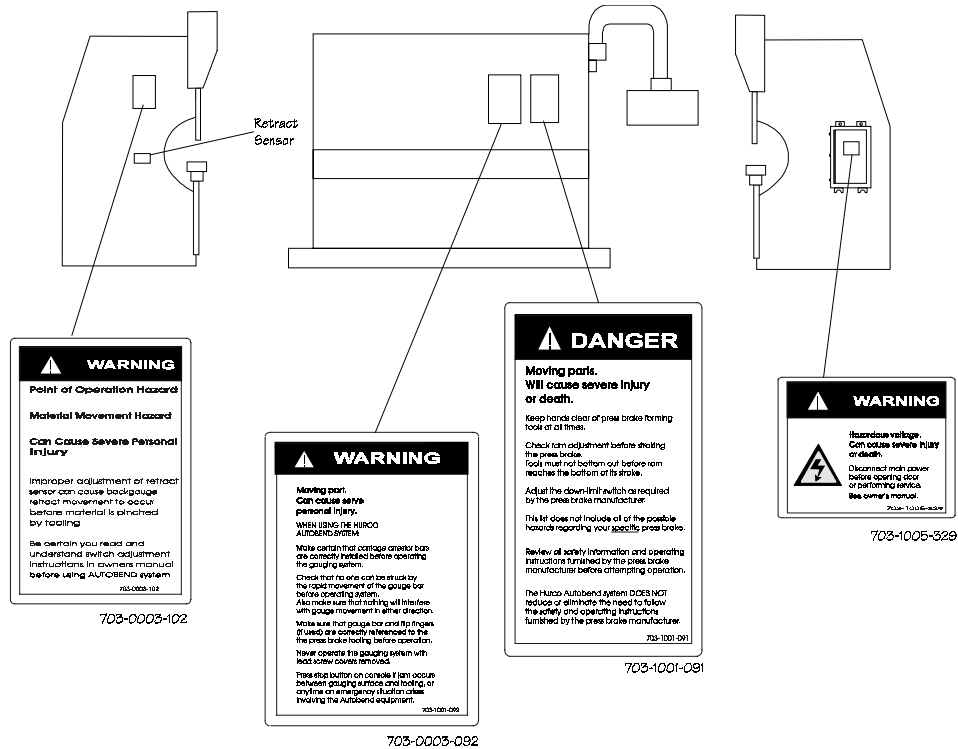


Figure 1-8. Warning and Danger Decals

Operators' Responsibilities

To avoid serious personal injury, damage to the machine, and unproductive down-time, the operator must pay careful attention to safety precautions and proper maintenance of the machine. Press brake operation is often a dangerous task, so operators must stay alert and be aware of potential hazards. Operators must also follow the safety regulations of their shops.

Training

All operators must be trained operators in order to operate an Autobend 7 system. The operators who are going to run the press brake must be trained by Hurco or a Hurco authorized distributor. Before attempting to operate the machine, the operator should study this manual and become familiar with the machine functions and safety features.

While studying the manual, the operator should make special note of the caution and warning messages in the manuals and all warning and instruction plates/decals on the press brake.

Clothing and Other Apparel

Operators should always wear eye protection and safety shoes while in the work area. Safety glasses with side shields are recommended. The operator should not wear items such as loose-fitting clothing, watches, necklaces, rings, and neckties that could become caught in the moving parts of the machine.

Personal Care

Operators must follow established working practices and personal hygiene standards. As part of this effort, they must avoid frequent or prolonged skin contact with fluids and oils on the sheet metal. Some operators wear gloves or use a special hand cream to protect their hands from these chemicals. If operators get chemicals on their hands, they must wash their hands immediately upon leaving the machine and before taking a break. They must also change clothing that has become contaminated with fluids and oils.

For complete information about handling industrial chemicals used in machining, refer to the international Control of Substances Hazardous to Health (COSHH) materials from the chemical suppliers.

System Operation

When operating an Autobend 7 system, always follow these safety rules:



Warning

- Review all safety information and operating instructions the press brake manufacturer provides before attempting any operation.
- Use proper point of operation safeguarding.
- Use the press brake's *Emergency Stop circuits* to control emergency situations involving the press brake.
- Check the installation of the *carriage arrestor bars* before operating the system.
- Adjust the gauging system from the rear of the press brake.
- When testing the Autobend 7 system, check the ram adjustment before stroking the press brake. Set the down limit switch as required per the press brake's manufacturer. Tooling must not bottom out before the ram reaches the low end of its stroke.
- Be sure that the gauge bar and flip fingers are correctly referenced to the press brake's tooling before attempting operation.
- Turn the operator control(s) to Off before attempting to adjust the system.

- Keep hands out of the point of operation and clear of the press brake's forming tools.
- Never reach across the press brake tooling to make any adjustment.
- Never attempt to make any adjustment to the system by reaching through the press brake point of operation.
- When testing and running the Autobend 7 system, never attempt to bend metal that requires tonnage beyond the capacity of the press brake or the tooling, whichever is less.
- Never operate a disassembled system.
- Disconnect the external power source before attempting to connect or make adjustments within the power supply box or the Autobend power supply cabinet. Only qualified personnel should service this equipment.
- **Before operating the system be sure that installers or operators will not be struck by the rapid movement of the gauge bar. Also make certain that nothing interferes with the gauge movement in either direction.**
- To prevent damaging the tooling and harming the operator, tooling dimensions must be accurate when configured with a Y axis.
- To prevent damaging the tooling and harming the operator, the Die Opening Measurement must be measured correctly.

For controls on Hurco Press Brakes, the Die Measurement Point field of the Die Library List screen must be set to OSD or TSD depending on the tooling measurement. Refer to the "Die" section of the "Programming and Operations" chapter for details.

Note

This list does not include all of the possible hazards regarding the Autobend 7 system.

Part Dimensions and Fixturing

Operators should never bend a part on the gauging system that is larger than the working surface of the press brake or juts out on any side beyond the edges of the press brake. If a part requires a range that is greater than the guarding allows, the work must be performed on another machine having the necessary work volume capability.

Operators must follow procedures for referencing the bending material before starting the machine. Remember that loose objects, such as wrenches and chuck keys, can become flying projectiles if not removed from the gauge bar before the machine is started. Operators should also be aware of protruding machine members (such as hoses, piping, ductwork) when working around the machine.

Travel Limits

Safety *limit switches* provided for each system must not be removed or bypassed in order to obtain more travel or take short cuts. Serious damage to the machine and personal injury to the operator may result from such actions. It is also dangerous to bend a part that requires operation outside the limits of the machine. A larger press brake should be used for such a part.

Part Bending

Operators should always know the locations of the *Stop* button on the press brake and console. The operator must be very careful when working in the area of the gauge. To prevent injury, the gauge should be completely stopped before the operator attempts to make adjustments to a work piece or the gauging surface.



Warning

When running programs, operators should always follow these rules:

- Never press the Run button without knowing exactly what the machine will do!
- Never start the machine when the back gauge is in contact with the work piece.
- Never stand in the rear inside area of the press brake while the gauge is moving.
- Never leave the machine unattended.

The operator must work within reach of the Stop buttons and must be able to observe the operation of the gauge. If the operator is running a program and cannot reach a Stop button nor observe the gauge, that is considered *unattended operation* and is viewed as a *foreseeable misuse* of the machine.

Subsystem Failure

Maintenance personnel and trained operators need to understand the maintenance requirements and possible problems associated with the press brake subsystems. They can become familiar with the subsystem maintenance requirements by studying the press brake's *Maintenance Manual* and by attending a Hurco training class.

Electrical Systems

Clean AC source power, as defined in the ANSI/NFPA 79 standard, is essential to the successful operation and continued reliability of the machine. Therefore, the gauging system must be properly connected to its power source as described in detail in the *Installation and Upgrade Manual*. The machine must be attached to a dedicated, fused, and isolated line with incoming power that matches the specified, factory-wired, power cabinet voltages, and current requirements of the system.



Warning

If the machine is not properly connected to its power source, there may be noise on the line that will affect machine safety, performance, and the warranty. In addition, brownout conditions may occur in the shop, and the electrical components may fail and require replacement.

Use these electrical safety guidelines before operating the Autobend 7 system:

1. Always provide a clean source of electrical power with a separate dedicated incoming power line (hot, neutral and ground wire).
2. This source must be free of inductive loads that might cause high-frequency noise. Ensure that this source is free from high/low voltage, spikes, surges, and noise.
3. The machine's electrical control systems are interconnected to terminate at the central point ground terminal located inside the Autobend power cabinet. This single point ground must be connected to the ground circuit of the electrical power source so that it provides only one conducting path (between the machine and the extension cord). This method of grounding prevents an unwanted ground loop that may appear.
4. Route all Autobend 7 cables to prevent close contact (6" - 10", 150 mm. - 250 mm.) with any press brake control, voltage line, motor, or other noise-generating devices.
5. Attach all system cables properly to the press brake's frame. Loop cables with excessive length. Use the extra large tie wraps and 3/8" self-tapping screws provided to attach the cables to the frame.

Procedures for Handling Printed Circuit Boards

Static charges are present at all times and in all environments. Damage to sensitive electronics occurs at lower voltage levels than people can sense. Static damage may cause total failure or degrade the circuits' performance and can eventually lead to intermittent or total failure. Prevent component damage by discharging static electricity to a ground. Follow the procedures below.

Before touching, adjusting, or removing a printed circuit board (PCB), wear a wrist strap grounded to the cabinet or enclosure ground point. If a grounding wrist strap is not available, touch a grounded point within the enclosure each time before touching a PCB or electronic assembly. An example of a *grounding point* is the metal cabinet's screws.



Caution

Limit the direct handling of the PCB to reduce the chance of damage.

Keep the PCB in a protective bag until it is installed. Use static handling procedures before opening the bag and removing the circuit board. Return all replaced PCBs to the static protective bag.

Fire Prevention and Fighting

There are some obvious causes of fires that should be avoided in all shops:

- Storing or handling flammable materials near heat sources.
- Failing to keep the work area clear of debris such as shop cloths, cartons, and other shop supplies that could catch fire.

If a fire does occur, the operator must press the Stop button on the console and on the press brake and activate the factory fire alarm system to evacuate personnel who are not directly involved with extinguishing a small fire. Shop personnel may be able to put out small fires using extinguishers approved for the conditions in their shops. However if it is clear the fire is uncontrolled or too large for the shop extinguishers, professional fire fighters must be called after all shop personnel are evacuated.

If a fire has occurred and the shop personnel have extinguished it, it may still be wise to contact the fire department or fire prevention authorities for advice to be certain the fire has been completely extinguished and to help prevent future fires. Fire extinguishers should be tested for proper operation at least three times a year by a trained and certified inspector.

Additional Safety Information

For additional safety information Hurco recommends the following sources:

1. National Safety Council
444 N. Michigan Avenue
Chicago, Illinois 60611
2. State, provincial, and local safety codes.
3. Loss prevention department of a worker's compensation carrier.
4. Manufacturer of the press brake.

Service Department

The goal of Hurco's Service Department is to provide customers with services necessary to help ensure success in their investment. If customers experience problems with the Autobend 7 system components such as screen errors, lack of power to the components, or gauge performance that are not solved by suggestions in the "Troubleshooting" chapter, they should contact Hurco's Service Department by calling the appropriate phone number listed in the first section of this manual. The Service Department personnel will attempt to correct problems in an efficient and timely manner, saving the company downtime.

Please provide the following information when calling Hurco's Service Department:

1. The serial number of the machine is located on the door of the power cabinet's data plate.

Record the serial number here for reference:

2. Company name and telephone number.
3. Your name and telephone extension.
4. A brief, accurate description of the problem and its specific symptom(s).

The Hurco Service Department is committed to helping customers obtain the maximum benefits from investing in its products.

Maintenance Schedule

For best results in keeping the Autobend 7 system in good condition, follow this maintenance schedule:

X-Axis

1. Clean and lubricate the leadscrew and ways on a weekly basis; if the shop environment is dirty, clean them daily. Use lightweight oil to lubricate lead screw, and grease to lubricate the ways.
2. Every six months inspect belts, couplings, and pulleys for wear or looseness. Tighten as necessary.
3. Every six months inspect the gauge harness for cut insulation or wires. Replace if damaged.

R-Axis

1. Clean and lubricate the leadscrew and ways on a weekly basis; if the shop environment is dirty, clean them daily. Use lightweight oil to lubricate lead screw and grease to lubricate the ways.
2. Every six months inspect belts, couplings, and pulleys for wear or looseness. Tighten as necessary.
3. Every six months inspect the gauge bar's mounting bolts for looseness. Level the bar and tighten screws as required.
4. Every six months inspect the R-axis harness for cut insulation or wires. Replace if damaged.

Y-Axis Downacting Hydraulic

1. Every six months check the linear scale mounting bolts, linkage rod, rod mounting bolts, and bracket for looseness. Tighten as required.
2. Every three months remove the linear scale cover and clean and lubricate the linear way. Use lightweight oil.
3. Every six months inspect the Y-axis linear scale harness for cut insulation or wires. Replace if damaged.

Y-Axis Upacting

1. Clean and lubricate the leadscrew on a weekly basis using lightweight oil; if the shop environment is dirty, clean the lead screw daily.
2. Every six months inspect belts, couplings, and pulleys for wear or looseness. Tighten as necessary.
3. Every six months inspect the Y-axis harness for cut insulation or wires. Replace if damaged.

Y-Axis Positive Stop

1. Every six months inspect belts, couplings, and pulleys for wear or looseness. Tighten as necessary.
2. Every six months inspect the Y-axis harness for cut insulation or wires. Replace if damaged.

Control Console

1. Clean the front panel and screen with a mild detergent on a weekly basis; daily if the shop environment is dirty.
2. Master Save all part programs on a monthly basis.
3. Every six months inspect the control console harness for cut insulation or wires. Replace if damaged.

Console Keypad Functions

The illustration below shows the Autobend 7 console with its membrane keypad, Run and Stop buttons, and Protect keyswitch.

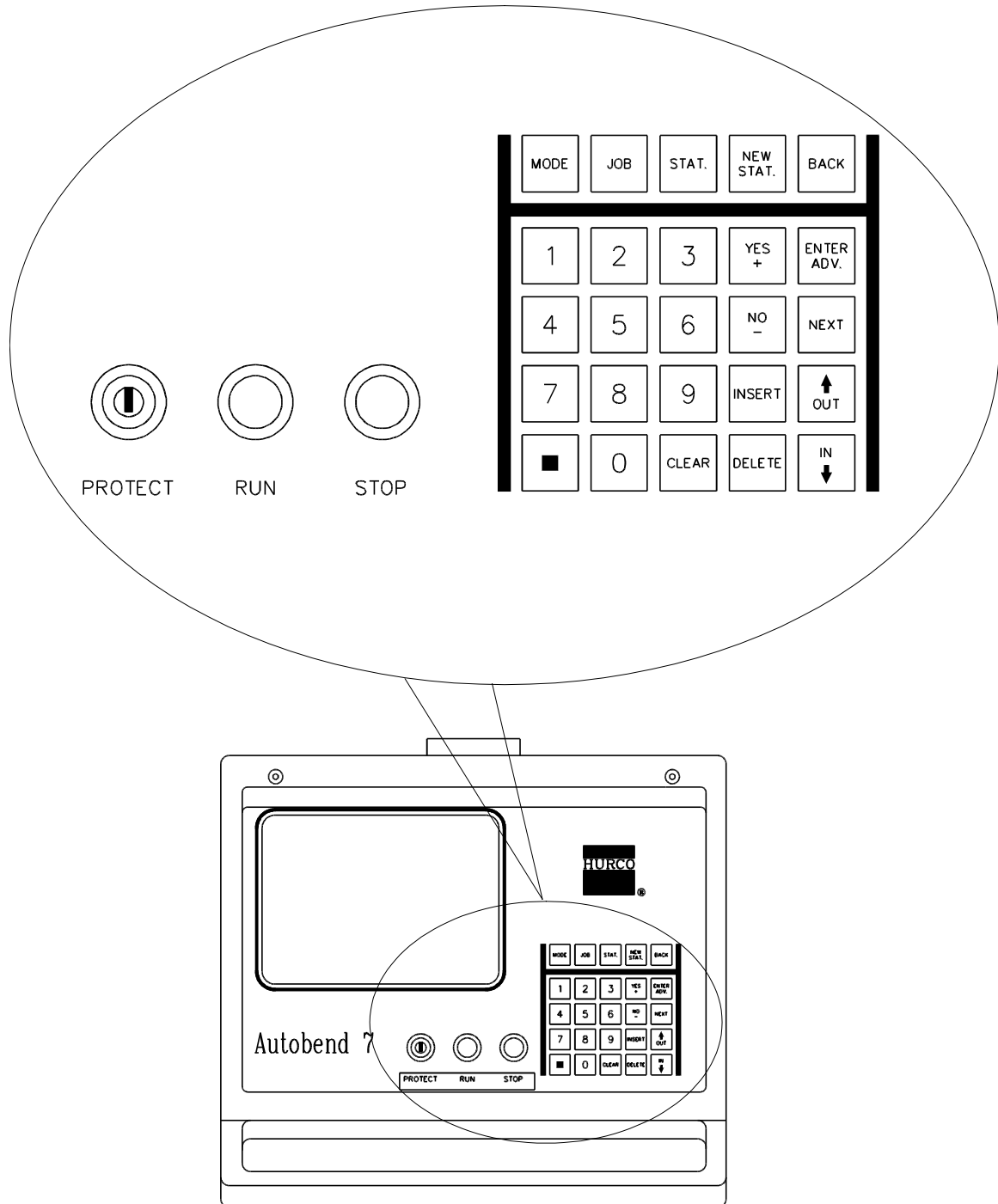


Figure 1-9. Autobend 7 Console

The membrane keys on the console keypad perform the following functions:

Key	Function
Mode	Displays the Mode Functions screen.
Job	Displays the Job List screen and advances the cursor to the next Job # field.
Stat	Displays the Station List screen and advances the cursor to the next Station # field.
New Stat	Creates a new station by duplicating the last station in the job presently selected. Adds this new station at the end of the list.
Back	Moves the cursor backwards one position until the cursor is at the top of the screen. Thereafter, moves back to the previously displayed screen.
Number Pad (0 through 9)	Contains numerical keys used for data entries requiring number values.
Yes +	Enters Yes for questions requiring a positive response and a “+” sign for prompts requiring number inputs. Positive numbers do not require a “+” sign.
No -	Enters No for questions requiring a negative response and a “-” sign for prompts requiring number inputs.
Enter Adv	Advances the cursor to the next prompt. Also advances the gauge to the next programmed station when in Single Run mode.
Next	Advances the cursor to the next programmed Station screen when in Station Setup.
Insert	In the Station List screen, inserts a new station at the location displayed in the Station # prompt.
Delete	Erases the selected Job # or Station # from memory.
Out ↑	Moves the gauge backwards when operating in Manual Jog.
In ↓	Moves the gauge forward when operating in Manual Jog.
Clear	Clears the input data for any entry requiring a numerical input.
•	Inserts a decimal point.

The Run and Stop buttons perform the following functions:

Button	Function
Run	Starts operations in Auto mode; press again and the operation runs in the Single mode.
Stop	Stops all axes operation; screen blanks.

The *Protect Keyswitch* limits access to programming functions and disables programming, but it allows operation of the gauges. The Protect Keyswitch must be in the vertical, Off position to enable programming functions.

Calibration

The axes automatically calibrate and position to the first station during start-up when a job is programmed and the Run button is pressed. There are additional calibration procedures to follow for upacting linear scale press brakes, rotary vane press brakes equipped with ram control, and for Tool 0 Job programming.

Standard Downacting Hydraulic Calibration

The following procedures apply to all downacting hydraulic press brakes:

1. Program the job. Refer to the “Programming and Operations” chapter for more information about job programming.
2. Press the Run button.
3. Verify that the tooling being used matches the tooling programmed.
4. Press the Run button.
5. Raise the ram to the Top of Stroke (T.O.S.).
6. Press the Back button.
7. Lower the ram downward until the calibration mark is located.

The calibration is complete when the calibration mark is passed. The system positions the axes for the displayed Station.

Upacting Linear Scale Calibration

The following procedures apply to Hurco PH Series upacting press brakes equipped with PLC software and a linear scale:

1. Program the job. Refer to the “Programming and Operations” chapter for more information about job programming.
2. Press the Run button.
3. Verify that the tooling being used matches the tooling programmed.
4. Press the Run button. All servo axes are calibrated before the linear scale is calibrated.
5. When the servo axes calibration is complete, this message appears on the screen:

Move Ram to Full Open Position

Press Back Key

6. Press the Back key. This message appears on the screen:

Move Toward Full Closed Position

to Calibrate

7. Raise the ram until the calibration mark is located. The calibration is complete when the calibration mark is passed. The system positions the axes for the displayed Station.



Important

If the marker pulse is not located, the ram moves up until the punch bottoms out into the die. Ensure that the tooling will withstand the available bending force.

Ram Calibration On Rotary Vane Press Brakes

When calibrating the ram on a rotary vane press brake, both the ram adjustment and stroke adjustment assemblies must be positioned to allow the ram to reach its maximum opening. The ram adjustment is made to allow the tooling to meet when the stroke adjustment is at the bottom of its travel. Calibrate the ram on a rotary vane press brake by following these instructions:

1. Start the press brake and the Autobend 7 following the directions in the previous section.
2. Using the ram adjustment assembly raise the ram to its highest opening position.
3. Position the indicator on the stroke control assembly to the side that is controlled by the Autobend 7 control.
4. Raise the ram so the stroke control is at the top of its travel.
5. Select a job on the console and press the Run button. Refer to the “Job Programming” section of the “Programming and Operations” chapter for more information about selecting jobs.
6. The axes move toward their calibration positions and the screen displays the message “Move Ram to T.O.S. and Press Back.”
7. When the console displays the message “Move Ram Down to Calibrate,” inch the ram down past the calibration mark.
8. After the ram is past the calibration mark, the Autobend 7 moves the axes to their programmed positions. Continue moving the ram down until it reaches the bottom of the indicator on the stroke control assembly.
9. Inch the ram down with the ram adjustment assembly until the punch is at the deepest penetration required.
10. Raise the ram to its programmed open height. If the job has more than one station, the axes advance to Station 2.
11. This completes the ram calibration procedure. Reset the job to Station 1 and operate.

Tool 0 Calibration

Before running a Tool 0 job, calibrate the axes if the system has not calibrated since powering up.

1. After completing the Die Information screen (refer to the “Programming and Operations” chapter for more Tool 0 Programming information), press the Run button to begin ram calibration. The Calibration screen appears with the cursor positioned at the Die Top field.

TOOL CALIBRATION		
>>>>	DIE TOP	****
	DIE BOTTOM	****
CALIBRATION:		7.296

Figure 1-10. Tool Calibration screen

2. Place a sample piece of material, the same thickness as programmed, on the die. Inch the ram down until the punch just touches the material without causing any deflection. Press the Cal Back key to load this position in the Die Top field.

If the value for Die Top in the Tool 0 screen is entered manually, do not press the Cal Back key; press the Enter Adv key to load that value in the Die Top field.

TOOL CALIBRATION	
DIE TOP	5.700
>>>> DIE BOTTOM	****
CALIBRATION:	5.700

Figure 1-11. Tool Calibration screen with Die Top entered

3. Remove the sample material

- The cursor advances to the Die Bottom field. Inch the ram down until the tooling bottoms out. Press the Enter Adv key to load this position in the Die Bottom field. OK appears in the Die Bottom field.

TOOL CALIBRATION	
DIE TOP	5.700
>>>> DIE BOTTOM	OK
CALIBRATION:	5.196
*** MOVE RAM UP TO T.O.S.***	
DEPRESS RUN	

Figure 1-12. Tool Calibration screen with Die Top and Die Bottom entered

- Once the “Move Ram to T.O.S.” message is displayed, raise the ram fully.
- Press the Run button to begin operation.
- The calibration is complete.

Re-Calibration

To clear the axes' calibration in the Mode Functions screen, perform the following steps:

1. Press the Mode key to display the Mode Functions screen.
2. Select the Axes Calibration screen. The present axes' calibration states are displayed.
3. Press the Clear key to clear all prior calibration values. The Mode Functions screen appears.
4. Press the Run button to start re-calibration.

Start-up Procedure

Follow these instructions to start up the Autobend 7 control:

1. Turn on the power to the control using the switch on the side of the Autobend power cabinet. The Job List display appears with the most recently programmed job on the screen.
2. Turn on the power to the press brake and start the pump motor by following the manufacturer's instructions.
3. Select a job from memory by entering a Job Number in the Job List screen. Program the job if it is not already programmed. (Refer to the "Programming and Operations" chapter for more information.)
4. The axes calibrate and then position to the first station.
5. The bending operation may begin.

Shut-down Procedure

To shut down the control, follow these steps:

1. Block the press brake's ram and turn off the power to the press brake by following the manufacturer's instructions.
2. Press the Stop button. This blanks the screen and de-energizes the axes.
3. For an extended shut-down, select Master Save from the Mode Functions screen, and turn off the power to the Autobend 7 and the press brake. The backup battery is rated for 15 days. The Flash EPROM memory device operates indefinitely. For more information refer to the "Master Save" section of the "Programming and Operations" chapter.

Programming and Operations

The Autobend 7 has multiple screens for auxiliary and programming functions. The mode functions screens are for auxiliary functions, and the main screens—Job and Station—are dedicated to programming and system operation.

Auxiliary functions not directly related to programming and running are contained in the Mode Functions screens. These functions pertain to the manual positioning of the gauge(s), calibration of the axes, management of the memory, and the system configuration.

The Autobend 7 uses prompt programming. Programs are referred to as jobs, and bends are referred to as stations. Tooling libraries are used to program punches and dies. Programming a job consists of two parts:

1. Programming the Job.
2. Programming the Stations.

The system has two Run modes: Auto and Single. In the Auto Run mode, the gauge advances automatically with each ram stroke. In the Single Run mode, the gauge remains stationary until the Enter Adv key is pressed regardless of how many ram strokes are made.

The fields on these screens vary depending on the axes or press brake configuration:

- For systems that only control a back gauge (X-axis), the Job and Station screens do not display information pertaining to ram control, tooling, and gauge height.
- For systems that only control the back gauge and gauge height, the screens do not display information pertaining to ram control.
- For systems on Hurco Press Brakes, screens contain fields for programming Part Length Compensation (PLC). Refer to the “Die,” “Two-Axis Station Setup,” “Die Programming,” and “Measuring Die Opening and Shoulder Radius” sections for details.

Programs can also be backed up on a non-volatile Flash EPROM by using Master Save in the Mode Functions screen. This saves all information in case of a battery backup failure during a power outage.

Initial System Setup

The Mode Functions screen, displayed by pressing the Mode key, allows initial system setup functions not included in the Job and Station operations.

Mode Functions Screen

From this screen the operator can select to manually jog the gauges, manage memory, calibrate the axes, and set the system configuration. Use the Up and Down arrow keys to move the cursor to highlight selections and press the Enter Adv key after making selections.



Important

The Protect keyswitch must be in the vertical, Off position to enable programming functions.

Below is a Mode Functions screen for a single-axis configuration:

MODE FUNCTIONS	
JOBS AVAILABLE 500	STAT. AVAILABLE 2000
<input type="text"/> HURCO <input type="text"/>	<ol style="list-style-type: none">1. MANUAL2. AXIS CALIBRATION3. SERIAL COMM.4. MASTER CLEAR5. MASTER SAVE6. CONFIGURATION MENU
	ENTER #

Figure 2-1. Single-Axis Mode Functions screen

Here is a Mode Functions screen for a two-axis configuration:

MODE FUNCTIONS	
JOBS AVAILABLE 500	STAT. AVAILABLE 2000
<input type="text"/> HURCO <input type="text"/>	<ol style="list-style-type: none">1. MANUAL2. AXIS CALIBRATION3. SERIAL COMM.4. MASTER CLEAR5. MASTER SAVE6. CONFIGURATION MENU7. PUNCH8. DIE9. Y-AXIS: ACTIVE
	ENTER #

Figure 2-2. Two-Axis Mode Functions screen

Manual Jog

Axes can be positioned manually by selecting Manual Jog from the Mode Functions screen.

1. To begin jogging the axes, press the Run button.
2. Press the Next key to select the axis to jog. The arrow cursor (>>>) toggles between the axis selections (X-Axis Dim, Y-Axis Dim, and R-Axis Dim).
3. Select the axis jog speed by pressing the Enter Adv key.
 - a. The arrow cursor toggles between Rapid Jog, Slow Jog, ± 0.100 in., ± 0.010 in., and ± 0.001 ".
 - b. If the axes have not been calibrated, the axis position displays Uncalibrated. The Y-axis has not been calibrated in the sample screen below.
 - c. There is no R-axis so no text message appears under that heading on the screen.

The values displayed are absolute, so tooling has no impact on them. Below is a sample Manual Jog screen:

MANUAL JOG	
>>> X-AXIS DIM. 24.000 R-AXIS DIM.	Y-AXIS DIM. UNCALIBRATED RAPID JOG >>> SLOW JOG ± 0.100 IN ± 0.010 IN ± 0.001 IN

Figure 2-3. Manual Jog screen

Axes Calibration

To check the axes' calibration status and the marker pulse position during calibration, select Axis Calibration from the Mode Functions menu. The screen below appears:

AXIS CALIBRATION		
JOBS AVAILABLE 499		STAT. AVAILABLE 1999
X1	UNCALIBRATED	158.4
Y1	UNCALIBRATED	179.4
R1	UNCALIBRATED	104.7
DEPRESS CLEAR TO RESET. . .		

Figure 2-4. Axes Calibration screen

In the first column on this screen, the back gauge appears as X1, X2, etc. Optional ram control is listed as Y1, and the optional automatic *gauge height* is listed as R1, R2, etc.

The calibration status appears in the middle column as Calibrated, Calibrating, or Uncalibrated. The encoder marker pulse position shows up under the third column as an angle. Obtain the proper spacing for the marker pulse to the calibration switch with this angle.

The numbers shown in the third column coincide with the amount of motor rotation from the calibration switch contact transition. For example, when 180 is listed, it signifies that the marker pulse occurs $\frac{1}{2}$ of a motor revolution from the switch. The acceptable range for the marker is 90° to 270° with 180° being the target value. An asterisk (*) signifies that the marker pulse location is outside the acceptable range.

To re-calibrate the axes press the Clear key. The axes uncalibrate and the Mode Function screen appears. The next time the Run button is pressed, the axes automatically re-calibrate.

Serial Communications

The entire memory may be transferred to or from a personal computer via the RS-232-C port located on the top of the Autobend 7 power cabinet. This feature is available when used with the optional Hurco software package. Refer to the “Communication Port” chapter for more information about the RS-232-C port.

Select Serial Communications from the Mode Functions menu. Communication direction is selected to perform one of the following functions:

- Write Program to PC** Transfers the entire memory from the Autobend 7 to the PC.
- Read Program From PC** Transfers an entire memory part program file from the PC to the Autobend 7.

The baud rate selection is displayed below the Write/Read fields on the screen. This rate is selected in the Configuration Menu. Refer to the “Configuration Menu” section later in this chapter for more information.

Select Write Program to PC or Read Program from PC, and the control waits until the PC commands it to begin transferring. The message “Writing” or “Reading” appears in the lower left-hand corner of the screen until the transfer is complete.

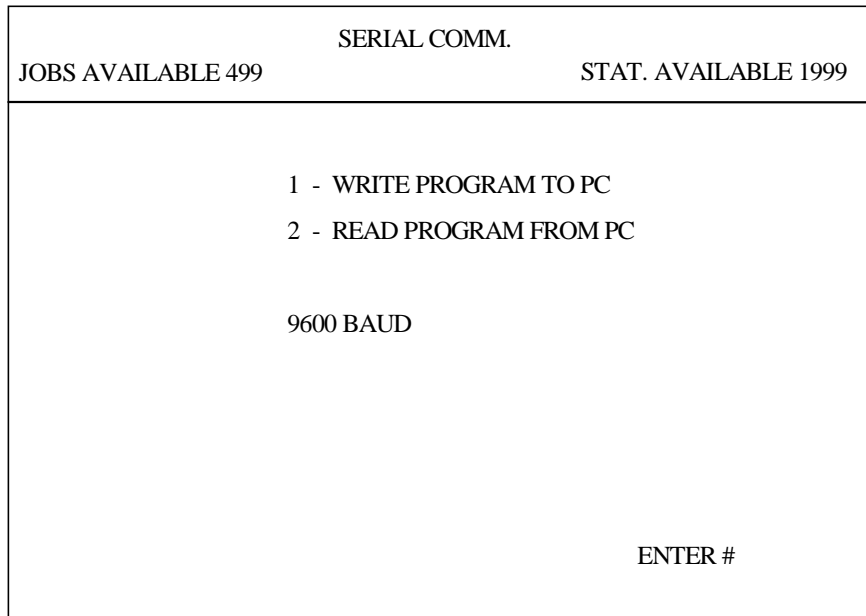


Figure 2-5. Serial Communications screen

Master Clear

Master Clear erases all battery-backed memory of the Autobend 7. Select Master Clear from the Mode Functions menu, and the message “Are You Sure? No” appears at the bottom of the screen. To enter a Yes response and erase the memory, press the Yes key.

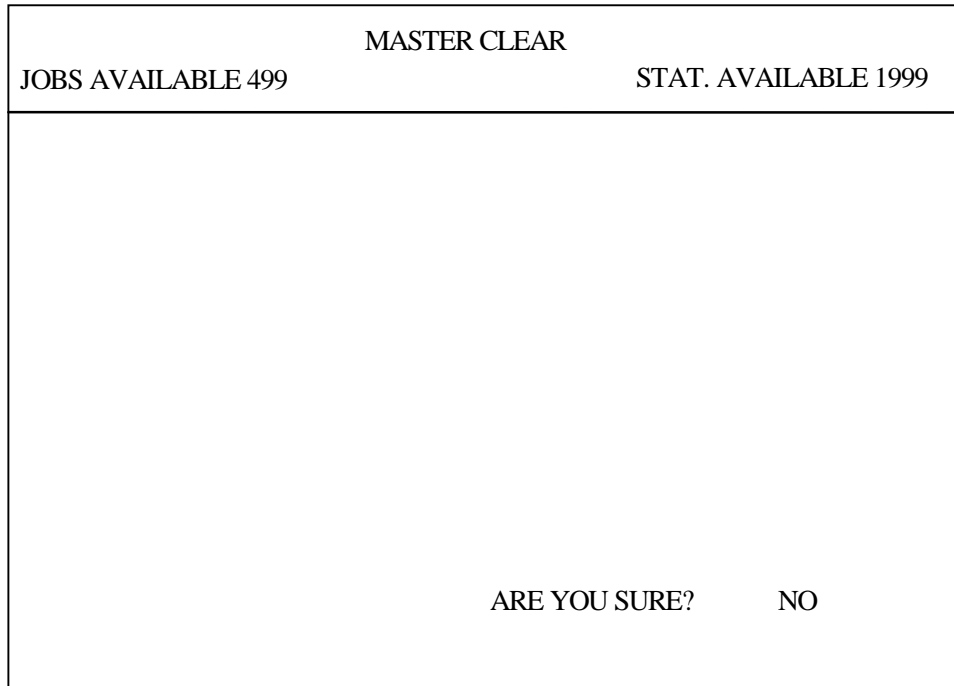


Figure 2-6. Master Clear screen

Master Save

To save the battery-backed memory in a non-volatile Flash EPROM device, select Master Save from the Mode Functions menu. The screen below appears with the “Saving Part Programs...” message.

Master save the memory regularly to reduce the possibility of memory loss due to a battery backup failure during a power outage.

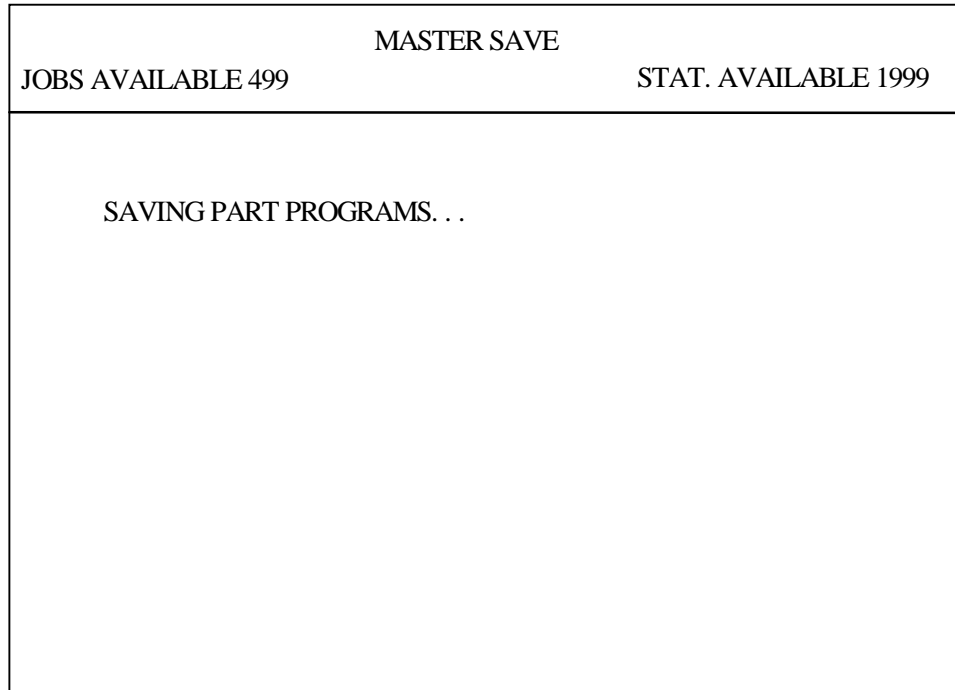


Figure 2-7. Master Save screen



Important

Memory is maintained with power Off, provided the battery is functional.

Configuration Menu

Although the Configuration Menu is set at the factory to suit most applications, changing some of the parameters may better suit a particular application. Below is a Configuration Menu with the factory-set parameters:

CONFIGURATION MENU	
MEASUREMENT UNITS	ENGLISH
LANGUAGE TYPE	ENGLISH
AUDIBLE BEEPER	DISABLED
START-UP SCREEN	HURCO LOGO
MODE OF OPERATION	NORMAL (RUN) MODE
RETRACT AT PINCH	DISABLED
BAUD RATE	9600
SAVE AND EXIT	
EXIT WITHOUT SAVING	
USE ARROWS, +, -, TO SELECT ITEM, USE (ENTER) TO SELECT ENTRIES	

Figure 2-8. Configuration Menu screen

To change the Configuration Menu parameters, follow these directions:

1. Press the Mode key to display the Mode Functions screen. Select the Configuration Menu.
2. Press the \hat{u} key to move the cursor up one field.
3. After selecting the field to be changed, press the Enter Adv key. The fields toggle between choices each time the Enter Adv key is pressed. These choices are listed on the following page.

The fields on the Configuration Menu screen perform the following functions:

Field	Function
Measurement Units	Selects the measurement units (English or metric) for programming.
Language Type	Selects the text language used by the Autobend 7.
Audible Beeper	When Enabled, every key pressed sounds a beeper to verify selection entry. Selecting Disabled turns Off the beeper.
Start-up Screen	Switches the logo displayed on the Mode Functions screen.
Mode of Operation	Selects whether the Autobend 7 operates in a Demo Mode or a Normal (Run) Mode. Normal (Run) Mode must be selected to operate gauges.
Retract at Pinch	Selects whether the gauge retracts at the material pinching point. Possible selections are Enabled or Disabled. The selections for systems with hydraulic downacting ram control are Disabled, Linear Scale @ 5%, Linear Scale @ 10% or Linear Scale @ 15%.
Baud Rate	Selects the communication rate for the RS-232-C port: 9600 or 19200 baud.
Save and Exit	Saves all changes made to the Configuration Menu. If changes are made, they must be saved prior to exiting the Configuration Menu or the previous values will be restored.
Exit Without Saving	Exits to the Mode Function screen without accepting any changes made in the Configuration Menu.

Punch

The Autobend 7 console can store up to 45 punches in memory for systems equipped with ram control. The stored information allows the Autobend 7 to recall the ram positioning information so parts can be made quickly without having to re-calibrate the ram. Select Punch in the Mode Functions menu and the Punch Library screen appears.

Punch Programming

Follow these steps to program a punch:

1. While in the Punch Library screen, press the Next key to list the next screen of punches.
2. Press the Back key to list the previous screen of punches.
3. Use the up or down arrow keys to navigate to the punch number.
4. Press the Enter Adv key to enter the punch number highlighted by the cursor. That punch can now be programmed or edited.

Note

The Punch Library is only displayed when the system is equipped with ram control (Y-axis).

PUNCH LIBRARY				
NUMBER:	RADIUS	HEIGHT	ANGLE	OFFSET
1	0.032	2.125	89.0	0.375
2	0.013	3.375	45.0	0.000
3	0.300	3.750	60.0	0.00
>>>4	0.015	3.250	75.5	0.100
5	0.025	2.500	90.0	0.000
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

+, - TO SELECT TOOL		NEXT - NEXT PAGE		CURRENT TOOL # 4
<ENTER> TO EDIT		BACK - PREV PAGE		ENTER # __

Figure 2-9. Punch Library screen

Here are definitions for the fields in the Punch Library screen:

Field	Definition
Number	Punch number.
Radius	The measurement of the punch tip's radius, which is used in bend allowance and ram position calculations.
Height	The measurement from the tip of the punch to its top edge. This field is used to identify the tooling and to calculate the ram position.
Angle	The tip angle of the punch measured as an inside angle. This field is compared to the programmed angle and the die angle to ensure that the bend can be made. It is also used to identify the tooling. The minimum angle that can be programmed is 14°.
Offset	The measurement of the punch's tip offset to the center of the ram, which is used to offset the dimension so the gauge does not require re-referencing when the tooling centerline changes.



Important

Accurate measurements and tooling parameter entries are important for the reliable operation of the Autobend 7 and press brake.

Return to the Punch Number

Press the Back key to step the cursor out of the Punch Parameters to the Punch Number column.

Delete a Punch

To delete a punch, enter that punch number and then press the Delete key. For example, press 3 and the Delete key to delete the information displayed with punch #3.

Die

The Autobend 7 can store 45 dies in memory for systems equipped with ram control. Select Die from the Mode Functions menu, and the Die Library List screen appears.

The control software for Hurco Press Brakes provides *Part Length Compensation* (PLC). This feature is used in conjunction with the precision tooling offered with Hurco press brakes. With PLC, the Die Library List contains an additional column, Die Measurement Pt, with fields that toggle between OSD and TSD. This column does not appear on screens for other press brakes.

Refer to the “Tool Qualification—Measuring Die Opening and Shoulder Radius” section for details about the methods used to measure the die opening.

Note

The Die Measurement Point column only appears on controls attached to Hurco Press Brakes.

DIE LIBRARY LIST							DIE MEASUREMENT POINT
NUMBER:	OPENING	HEIGHT	ANGLE	RADIUS	SAFETY		
1	0.500	4.250	89.0	0.031	1.000		OSD
2	1.000	2.125	60.0	0.090	1.125		TSD
3	0.750	3.500	30.0	0.060	0.750		TSD
4	0.250	2.000	88.0	0.031	0.300		OSD
>>>5	1.375	5.575	90.0	0.125	1.500		OSD
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

+, - TO SELECT TOOL		NEXT - NEXT PAGE		CURRENT TOOL # 5
<ENTER> TO EDIT		BACK - PREV PAGE		ENTER # __

Figure 2-10. Die Library screen

Die Programming

When the Die List screen appears, press the Next key to list the next screen of dies.

Press the Back key to list the previous screen.

Use the up or down arrow keys to navigate to the die number.

Press the Enter Adv key to enter the die number highlighted by the cursor. Information about this die can now be programmed or edited.

Note

The Die Library is displayed only when system is equipped with ram control (Y-axis).

Below are the definitions for the fields in the Die List screen:

Field	Definition
Number	The Die number.
Opening	The measurement of the opening at the top of the V-groove, which is used in ram position calculations when programmed by angles. Refer to the "Tool Qualification - Measuring Die Opening and Shoulder Radius" section in this chapter for instructions about making this measurement.

Note

The Die Openings may need to be adjusted, depending on the condition of the tooling. Generally, worn tooling does not have a consistent opening dimension.

Height	The measurement from the top of the die to its bottom edge. This field is used in the calculation of the ram position and also for tooling identification.
Angle	The inside angle measured at the bottom of the V-opening. This field is compared to the programmed angle and the selected punch angle to determine if the bend can be made. Also used in tooling identification.
Radius	The measurement of the die's shoulder radius. This field is used to calculate the ram position with programming angles.

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Field	Definition
Safety	This value limits the minimum programmable gauge dimension. Calculate this value by measuring the distance from the center of the die opening to the rear edge of the die, plus a recommended additional 0.100" (2.54 mm).
Die Measurement Point (This field is only available with PLC software on Hurco Press Brakes.)	<p>Select the die opening measurement points on a per die basis:</p> <ul style="list-style-type: none"> • Outside Shoulder Dimension (OSD) is the tangent point between the die radius and the top of the die. The default is OSD. • Theoretical Sharp Dimension (TSD) is the measurement between the inside of the shoulder radii. <p>Use the + or - key to toggle between the two choices.</p>



Important

Accurate measurements and tooling parameter entries are important for the reliable operation of the Autobend 7 control and press brake system.

Return to the Die Number

Press the Back key to return the cursor to the Die Number column.

Delete a Die

To delete a die, enter that die number and press the Delete key. For example, press 3 and the Delete key. This deletes die number 3. All information shown for die number 3 disappears.

Y-Axis Mode

The state of the ram control (Y-axis) is displayed as Active, Jog, or Standby Manual on the Mode Functions screen. The state is toggled by selecting Y-Axis Mode then pressing the Enter Adv key. When the state is changed from Active, re-calibration of the ram is required. The state returns to Active following a power shut down.

Note

The Y-Axis Mode is displayed only when the system is equipped with ram control (Y-axis).

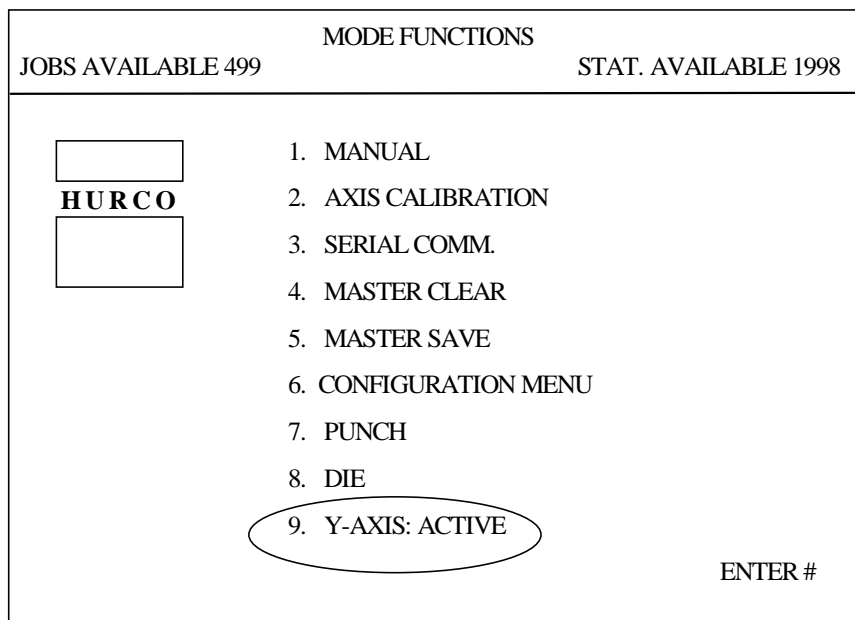


Figure 2-11. Mode Functions screen

Below are the definitions for the ram control states on the Mode Functions screen:

Ram Control State	Definition
Active	Ram control On; the Autobend 7 controls the ram positions.
Jog	Ram control Off; the Autobend 7 only controls the adjustment of the ram stop when the external jog box is installed.
Standby Manual	Ram control Off; the Autobend 7 has no control of the ram positions.

Job Programming

The Job List screen and the Job Setup screen contain specific parameters for each job programmed. Access jobs on the Job List screen. Program the setup parameters through the Job Setup screen.

Job List Screen

Press the Job console key and the Job List screen appears. The figure below shows the Job key on the Autobend 7 console:

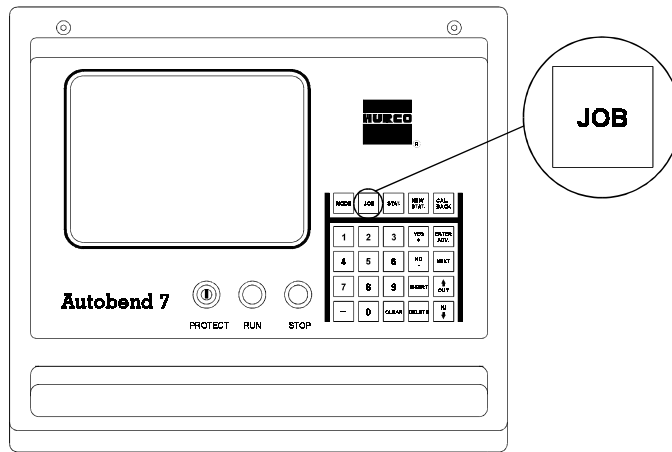


Figure 2-12. Job Key

This screen lists all jobs presently programmed in the Autobend 7. The list displays the job number and specific job parameters. Repeated pressing of the Job key increments the displayed Job # entry to the next number in the list.

If no jobs have been programmed in memory, the center area of the screen is blank and Jobs Available equals 600 with the standard software package. Up to 500 jobs are available with the Part Length Compensation (PLC) software package for Hurco Press Brakes. When the number of jobs programmed exceeds the amount that can be listed on the screen, a message at the bottom of the screen prompts the operator to use the Next key to list the next screen of jobs and the Back key to list the prior screen of jobs.

A job number can consist of up to 17 digits that do not have to be sequential. The – and • keys can be entered in the job number. If there is a possibility of using the Autobend Off-line Programming software (ABPC), the job number should contain a maximum of 8 characters because of MS-DOS filename limitations.

The Job List screen below is for a single-axis configuration:

JOBS AVAILABLE 599		JOB LIST		STAT. AVAILABLE 2398	
JOB #	COMPLETED PARTS	# STN'S	MAT. THICK		
1	25	2	0.125		
END OF JOB LIST		JOB #	1		

Figure 2-13. Single-Axis Job List screen

This Job List screen is for a two-axis configuration with the Part Length Compensation (PLC) software for Hurco Press Brakes.

JOBS AVAILABLE 499		JOB LIST		STAT. AVAILABLE 1998	
JOB #	COMPLETED PARTS	# STN'S	MAT. THICK	DIE #	PUNCH #
1	25	2	0.125	1	1
END OF JOB LIST			JOB #	1	

Figure 2-14. Two-Axis Job List screen with PLC software on Hurco Press Brake

Single-Axis Job List Fields

The following fields are displayed on the Job List screen for single-axis configurations and perform these functions:

Field	Function
Job #	The programmed job number.
Completed Parts	Displays the number of fully completed cycles made by the control. The value shown increments by one after the control cycles through all the stations programmed in the job. This value can be cleared by pressing the Clear key. It can also be programmed by entering a numerical value.
# Stn's	The number of stations (bends) programmed for the job.
Mat. Thick.	The actual thickness of the part to be formed. Used in automatic calculation of the bend allowance. In systems with ram control, it is also used in determining the stopping point of the ram for the programmed angle.

Two-Axis Job List Fields

The following additional fields are displayed on the Job List screen for two-axis configurations and perform these functions:

Field	Function
Die #	The die number programmed in the Die Library.
Punch #	The punch number programmed in the Punch Library.

Job Setup Screen

From the Job List screen, type in a new job number and press the Enter Adv key. The Job Setup screen appears:

JOBS AVAILABLE 598	JOB #	2	STAT. AVAILABLE 2400
MAT. THICK	0.125	AUTO BEND ALL.?	NO
		COMPLETED PARTS	0

Figure 2-15. Single-Axis Job Setup screen

Here is a Job Setup screen for a two-axis configuration with the Part Length Compensation (PLC) software for Hurco Press Brakes.



Important

The standard software for a two-axis configuration does not contain the Material Type field.

JOBS AVAILABLE 498	JOB #	2	STAT. AVAILABLE 1997
PROGRAM RAM DIM?	NO	DIE #	1
PUNCH #	1	MAT. TYPE	STAINLESS STEEL
MAT. THICK	0.125	AUTO BEND ALL.?	YES
		COMPLETED PARTS	0

Figure 2-16. Two-Axis Job Setup screen with PLC software on Hurco Press Brake

Program the information pertaining to all the stations (bends) of this job as described in the “Station Programming” section. The fields displayed in the Setup screen vary with system configuration (X, X/R, X/Y or X/R/Y).

After advancing the cursor past the last field (Completed Parts), the message “Job Programmed” appears in the bottom left-hand corner of the screen. This signifies that the stations can now be programmed.

The Job Setup screen for the PLC software contains an additional field, Material Type.

Single-Axis Job Setup Fields

The following fields are displayed on the Job Setup screen for single axis configurations and perform these functions:

Field	Function
Mat. Thick.	The actual thickness of the part to be formed. Used in automatic calculation of the bend allowance. In systems with ram control, it is also used in determining the stopping point of the ram for the programmed angle.
Auto Bend All.?	Automatic Bend Allowance. When programmed Yes, the control automatically calculates an offset for all gauge dimensions. The offset is used for bending parts with outside dimensions. For systems without ram control, the calculation is always based on a 90° angle. For systems with ram control, this calculation is based on the programmed angle for each dimension.
Completed Parts	Displays the number of fully completed cycles made by the control. The value shown increments by one after the control cycles through all the stations programmed in the job. This value can be cleared by pressing the Clear key. It can also be programmed by entering a numerical value.
Punch Radius	This field appears when Auto Bend All? is programmed Yes. Measure and enter the punch radius, and the Autobend 7 control calculates the bend allowance.

Two-Axis Job Setup Fields

The following additional fields are present on the Job Setup screen when the system configuration has ram control (Y-axis):

Program Ram Dim?	Selects the manner in which the ram position is programmed. <ul style="list-style-type: none">• Enter No to toggle the control to Angle mode.• Enter Yes to toggle the control to Ram Dimension mode.
Die #	The die number programmed in the Die Library.
Punch #	The punch number programmed in the Punch Library.
Mat. Type (Only available with PLC software on Hurco Press Brakes.)	Select the type of material for bending. Choices are Mild Steel, Aluminum, and Stainless Steel. Use the + or – key to scroll through and select the material type.

Deleting a Single Job

To delete a job, follow these steps:

1. Press the Job key to display the Job List screen.
2. Select the job to be deleted in the Job # field by pressing the Job key until the number is displayed in the Job # field or by entering the number using the number keys.
3. Press the Delete key.
 - a. The job shown in the Job # field is now deleted from memory.
 - b. The Jobs Available count and the Stat Available count each increase.

Deleting All Jobs in Memory

Use the Master Clear screen to delete all jobs in memory as follows:

1. Press the Mode key to display the Mode Functions screen.
2. Select the Master Clear screen. The message “Are You Sure? No” appears on this screen to prevent accidental erasures.
3. Press the Yes key and then the Enter Adv key to erase all jobs.
 - a. All of the jobs are now erased from memory.
 - b. The Jobs and Stations Available counts return to their maximum numbers.

Station Programming

The Station Setup screen and the Station List screen contain specific station parameters for individual jobs.

Station Setup Screen

Program specific parameters of each bend through the Station Setup screen. Access stations to be edited or setup through the Station List screen.

If no stations have been programmed for the job, the Station Setup screen is displayed when the Stat key is pressed. The Station Setup screen shows all the parameters programmable for one bend. The parameters shown vary according to the axis configuration.

Press the Stat key to display the Station Setup screen for Station #1. The figure below shows the Stat and New Stat keys on the Autobend 7 console:

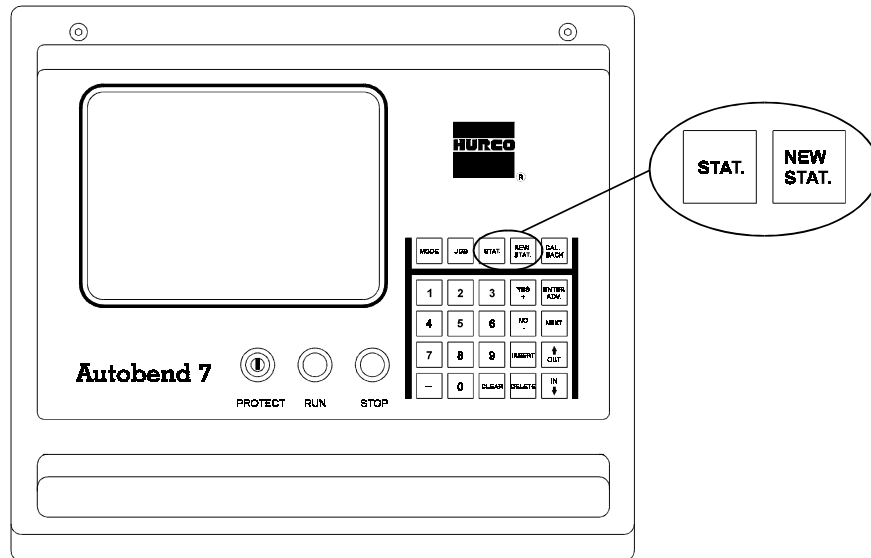


Figure 2-17. Stat and New Stat Keys

The fields displayed in the Station Setup screen vary according to the system configuration. Below is a sample completed single-axis Station Setup screen with standard software:

JOB #	1	STATION #	1	STAT. AVAILABLE	2399
DIMENSION	5.000	BEND ALL.		-0.051	
RET. TIME	5 SEC.	RET DIM		3.000	

Figure 2-18. Single-Axis Station Setup screen

This sample screen is a two-axis Station Setup screen with the Part Length Compensation (PLC) software for Hurco Press Brakes.



Important

The standard software for a two-axis configuration does not contain the Length Compensation and Part Length fields.

JOB #	1	STATION#	1	STAT. AVAILABLE 1999
DIMENSION	5.000	ANGLE	180.0 DEG.	
LENGTH COMPEN.	DISABLED	PART LENGTH	0.000	
BEND ALL.	-0.051	ANG. ADJ.	0 DEG.	
RET. TIME	5 SEC.	RET DIM	3.000	
RAM OPEN	2.000	RAM SPEED	0.5	

Figure 2-19. Two-Axis Station Setup screen with PLC software on Hurco Press Brake

After the cursor has advanced past the last field, the message “Station Programmed” is displayed in the lower left-hand corner of the screen. The message “No Stat Programmed” appears if values are not entered.

Press the New Stat key to display the Setup screen for Station #2. Values in each of the fields are carried over automatically from Station #1. Program the new values for Station #2. Only *changes* need to be entered.

Use the New Stat key for every new station required, and continue this sequence until all the stations are programmed.

Single-Axis Station Setup Fields

The following fields are displayed on the Station Setup screen for single axis configurations and are defined as follows:

Field	Definition
Dimension	The length of the flange to be bent.
Bend All.	<p>The correct value added to the Dimension for the correct flange length. The bend allowance can be calculated automatically if the required information has been programmed.</p> <p>This value may be modified incrementally or entered in absolute form.</p> <ul style="list-style-type: none">• To incrementally adjust the value currently shown, enter the sign key (+ or -) before the numerical value.• To replace the value currently shown with an absolute adjustment, enter the numerical value before the sign key (+ or -).
Ret. Time	Defines the amount of time (0 - 15 seconds) the gauge remains at the <i>retract position</i> . The time units are in seconds and start when the ram returns to the top of its stroke.
Ret. Dim	<p>Defines the distance the gauge moves away from the tooling. It waits at that location until the ram stroke is completed and the Retract Time has elapsed.</p> <p>The retract can be programmed either at the <i>pinch point</i> of the material or at the <i>top of the ram stroke</i>. Refer to the “Configuration Menu” section of this chapter.</p>

Two-Axis Station Setup Fields

The following additional fields are displayed on the Station Setup screen for systems with ram control (Y-axis) and are defined as follows:

Field	Definition
Angle or Ram Dim.	<p>Defines the <i>bottom stopping position</i> of the ram. The format (Angle or Ram Dimension) depends on the selection made in the job setup.</p> <p>When Angle is selected, the bottom position of the ram is expressed in degrees. The acceptable range is from 180° to the value shown in the Tooling Library. Programming 180° results in no bending of the part.</p> <p>When Ram Dimension is selected, the bottom position is defined in inch or metric values. The value programmed defines the amount of tooling penetration. The zero position is defined as the position where the tip of the punch pinches the material without beginning the bending process.</p> <p>A positive value results in the punch penetrating the die; a negative value stops the punch before reaching the die.</p> <ul style="list-style-type: none"> • To incrementally adjust the value currently shown, enter the sign key (+ or -) before the numerical value. • To replace the value currently shown with an absolute adjustment, enter the sign key (+ or -) after the numerical value.
Angle Adj.	<p>A <i>correction value</i> added to the programmed Angle. It is only displayed when the job setup selection for Program Mode is set to Angle. It may be adjusted incrementally or entered in absolute form.</p> <ul style="list-style-type: none"> • To incrementally adjust the value currently shown, enter the sign key (+ or -) before the numerical value. • To replace the value currently shown with an absolute adjustment, enter the sign key (+ or -) after the numerical value.

Two-Axis PLC Software Station Setup Fields

These fields are displayed on the Station Setup screen for systems with ram control (Y-axis) and the *Part Length Compensation (PLC)* software for Hurco Press Brakes.

Part Length Compensation is a control-calculated offset value added to the target position of the Y axis. The offset value compensates for press brake deflection, which occurs as a bend is made and increases with part length. To calculate the offset, the control uses previously measured data from test bends performed on different part lengths and three types of materials.

The Two-Axis Station Setup fields with PLC software are defined as follows:

Field	Definition
Length Compensation	See the definition of PLC software above. Use the + or – key to select Enable or Disable for this field. If this field is enabled, the control uses the PLC offset value.
Part Length	The measurement of the material from the left to the right as viewed from the front of the press brake.

Two-Axis, Upacting, Linear Scale, PLC Software Station Setup Fields

These fields are displayed on the Station Setup screen for systems with ram control (Y-axis), a linear scale, and the *Part Length Compensation (PLC)* software for Hurco Press Brakes.

For these systems, the Ram Open field appears for systems configured with a Ram Open limit valve. The Ram Speed field appears when the system is configured with a Ram Speed limit valve.

Field	Definition
Ram Open	Defines the <i>opening height</i> of the ram after the bend is made. This position is measured from the top of the material placed on the tooling.
Ram Speed	Defines the ram <i>slow down position</i> . The actual speeds of the ram depend on the press brake’s control settings. The position is measured from the top of the material placed on the tooling.

Two-Axis, Downacting, Hydraulic Ram Control Station Setup Fields

These fields are displayed on the Station Setup screen for systems with downacting hydraulic ram control (Y-axis).

Field	Definition
Ram Open	Defines the <i>opening height</i> of the ram after the bend is made. This position is measured from the top of the material placed on the tooling.
Ram Speed	Defines the ram <i>slow down position</i> . The actual speeds of the ram depend on the press brake's control settings. The position is measured from the top of the material placed on the tooling.

R-Axis Station Setup Fields

These additional fields are displayed on the Station Setup screen for systems with an R axis:

Two-Axis R-Axis Station Setup Field

This field is displayed on the Station Setup screen for systems with automatic gauge height (R-axis), and is defined as follows:

- R-Axis Dim. The value programmed defines the *gauge height*. The value may be changed incrementally or entered in absolute form:
- To incrementally adjust the value currently shown, enter the sign key (+ or -) before the numerical value.
 - To replace the value currently shown with an absolute adjustment, enter the sign key (+ or -) after the numerical value.

R-Axis Zero Position Setups

The following setups determine the *zero position* of the R-axis and are defined as follows:

Field	Definition
Ram Control	For systems configured with ram control, the zero position is defined as the dimension where the bottom of the gauge (fingers) is equal to the top of the programmed die.
No Ram Control	For systems configured without ram control, the zero position is defined as the dimension where the <i>gauge height</i> is at its lowest point of travel.

Multiple Depth Stop Ram Control Setup Field

The following field is displayed on the Station Setup screen for systems with multiple depth stop ram control. It is defined as follows:

- Depth Stop A value from 1 to 6 may be programmed to select which depth stop switches on the press brake will be activated to control the ram's *bottom stop position*.

Station List Screen

Press the Stat key to display the Station List screen for the job currently selected. The list shows all the stations for this particular job along with station fields. Verify that the station information is correct on the Station List screen. The parameters listed depend on the system's axes configuration. At the top right-hand corner of the screen is the Stations Available count. The maximum number of programmable stations is 2400 with the standard software. Up to 2000 stations can be programmed with the Part Length Compensation (PLC) software for Hurco Press Brakes.

When the amount of stations programmed in the job exceeds the amount that can be viewed on the screen, a message prompts you to use the Next key to list the next screen of stations and the Back key to return to the previous screen of stations.

Below is a single-axis Station List screen with standard software:

JOB #	STATION LIST		STAT. AVAILABLE 2397
1			
STATION #	DIMENSION	BEND ALL.	
1	1.375	-0.051	
2	5.580	-0.051	
END OF STATION LIST			STATION # 1

Figure 2-20. Single-Axis Station List screen

The screen below is a two-axis Station List screen :

JOB #		STATION LIST			STAT. AVAILABLE 1397
1					
STATION #	DIMENSION	BEND ALL.	ANGLE	ANG. ADJ.	
1	3.745	-0.051	90 DEG.	0 DEG.	
2	18.950	-0.051	90 DEG.	0 DEG.	
END OF STATION LIST				STATION #	1

Figure 2-21. Two-Axis Station List screen

Inserting a Station

Follow these steps to insert a station:

1. Select the station number to be inserted. If there are three stations currently programmed and a new station is to be inserted between Stations 2 and 3, enter 3 in the Station # field.
2. Press the Insert key.
 - This new Station 3 is inserted.
 - The remaining station moves down one number.
3. After programming the new information for Station #3, the operation is complete.

Deleting a Station

If Station #3 from the preceding example is not needed, follow these steps to delete it:

1. Press the Stat key to display the Station List screen.
2. Press 3 to load the number 3 in the Station # field.
3. Press the Delete key.
 - All information for Station #3 is removed.
 - The station below Station #3 moves up one number.

The figure below shows the Insert and Delete keys on the console:

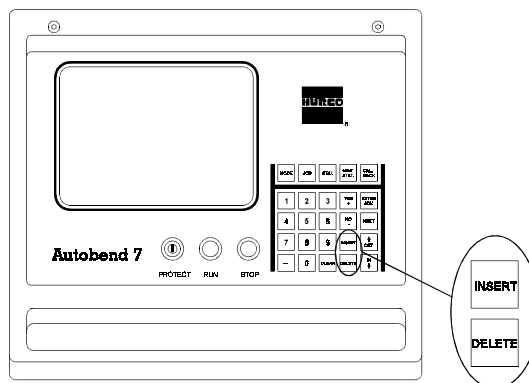


Figure 2-22. Insert and Delete Keys

Single Axis Quick Job Setup

The following setup is for single-axis systems only:

The Quick Job allows quick programming of the stations. This is accomplished by skipping the Job Setup programming. When programming a simple job, only the Job Number and Station Dimensions need to be programmed.

Program a quick job with one station as follows:

1. Press the Job key to display the Job List screen.
2. Type in the Job Number and press the Enter Adv key.
3. Press the Stat key to display the Station Setup for Station #1.
4. Program the required information.
 - a. For multiple station jobs, press the New Stat key to program the remaining stations.
 - b. Change values as necessary.
5. Press the Run button to begin the job.

Note

Because the Job Setup is not programmed, Off is entered for the Auto Bend All field (Automatic Bend Allowance).

Tool 0 Programming

For hydraulic downacting press brakes, it is possible to program without using the tooling libraries. Jobs programmed in this manner are called Tool 0 Jobs.

A Tool 0 Job is created by programming the Die and Punch numbers to 0 on the Job List screen and the Job Setup screen. This setting disables the tooling libraries for this Job. Only a few pieces of tooling information will now be needed for the job.

To operate a Tool 0 Job the ram must first be calibrated. The calibration consists of manually positioning the ram and entering the position into the control. Refer to the “System Basics” chapter for more information about calibration. The positions required are Die Top and Die Bottom.

Tooling Fields

The fields listed below appear on the Tool 0 Programming Setup screens which are discussed in this section. They are defined as follows:

Field	Definition
Punch Radius	The radius of the punch tip is used in calculating the bend allowance. This field is not displayed when No is programmed for the Auto Bend Allowance.
Opening	The die’s V-opening measurement is used to calculate the ram position needed for angle programming. This field is not displayed if Yes is entered for Program Ram Dimension. Refer to the "Tool Qualification - Measuring Die Opening and Shoulder Radius" section in this chapter for instructions about making this measurement.
Height	The die height measurement is used in positioning the R-Axis. This field is displayed only when an R-Axis is installed.
Die Top	This is the position where the material bending begins. The value can be manually re-entered the next time the Job is used.
Die Bottom	This is the position where the tooling bottoms out.
Calibration	This is a direct readout of the ram position and is useful for accurate positioning of the ram during tooling calibration.

Tool 0 Job Programming Procedures

In the screen below both the Die and Punch for Job 3-2494 are set at 0. This indicates a Tool 0 Job.

1. Enter a new Job Number in the Job List screen.

JOBS AVAILABLE 497		JOB LIST		STAT. AVAILABLE 1388	
JOB #	COMPLETED PARTS	# STN'S	MAT. THICK	DIE #	PUNCH #
1111	87	6	0.060	1	1
3-2494	6	2	0.035	0	0
10.01.93	42	4	0.050	23	12
END OF JOB LIST			JOB #	1034	

Figure 2-23. Job List screen

2. The Job Setup screen appears as shown below. Tool 0 is enabled by entering a 0 for both the Die and Punch fields.



Important

It is not possible to enter 0 for only one of these fields (Punch or Die #).

The Material Type field does not appear with standard software.

JOBS AVAILABLE 499	JOB #	1034	STAT. AVAILABLE 1997
PROGRAM RAM DIM?	NO	DIE #	0
PUNCH #	0	MAT. TYPE	STAINLESS STEEL
MAT. THICK	0.125	AUTO BEND ALL.?	NO
		COMPLETED PARTS	25

Figure 2-24. Job Setup screen with PLC software for Hurco Press Brakes

Note

An additional field, Punch Radius, is displayed only if Yes is entered in the Auto Bend Allowance field.

- After completing the Job Setup, program the Station for Tool 0 Jobs in the usual manner. Below is a Station Setup screen with the PLC software for Hurco Press Brakes (the Length Compensation and Part Length fields do not appear with standard software).

JOB #	1	STATION #	1	STAT. AVAILABLE	1389
DIMENSION	5.000	ANGLE	90.0 DEG.		
LENGTH COMPEN.	DISABLED	PART LENGTH	0.000		
BEND ALL.	-0.051	ANG. ADJ.	0 DEG.		
RET. TIME	0 SEC.	RET DIM	3.000		
RAM OPEN	2.000	RAM SPEED	0.5		

Figure 2-25. Station Setup screen with PLC software on Hurco Press Brake

Note

An additional field, R-Axis Dim, is displayed only when an R-axis is installed.

4. Press the Run button. The Need Die Information screen appears. This screen is used for entering the specific die parameters.



Important

The Die Top field should only be programmed when the correct value is known. Otherwise, leave it at 0.000.

JOB #	1034
NEED DIE INFORMATION:	
ENTER DIE PARAMETERS:	
>>>> OPENING0.500	
DIE TOP	

Figure 2-26. Need Die Information screen

Note

Opening is displayed only when No is entered for the Program Ram Dim? field (for angle programming) in Job Setup. An additional field, Height, is displayed only when an R-Axis is installed.

5. After programming these fields, press the Run button and this screen appears:

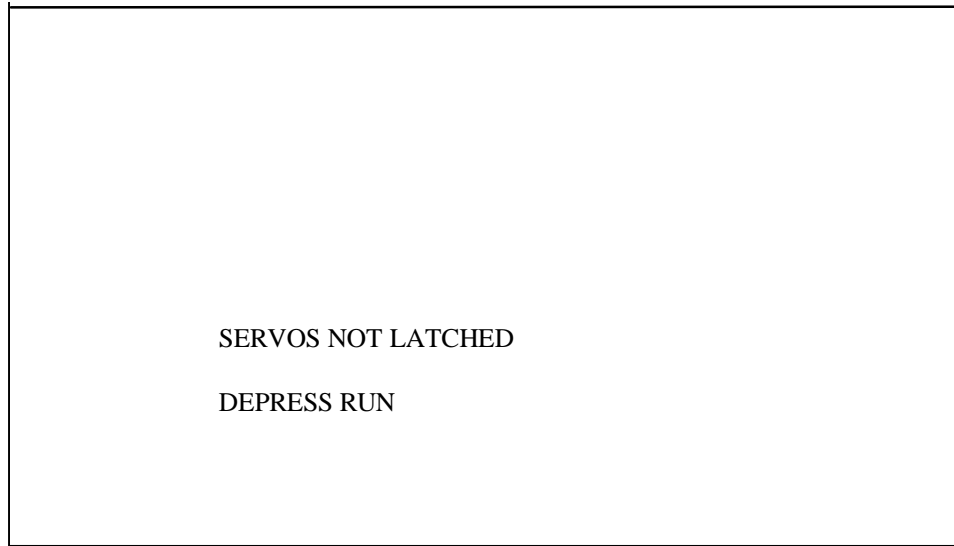


Figure 2-27. “Servos Not Latched Depress Run” message

6. Press the Run button and the Tool Calibration screen appears with the cursor at the Die Top field. Refer to the “Calibration” section of the “System Basics” chapter for information about calibrating the Tool 0 Job.

Because tooling used in Tool 0 Jobs is not stored in the tooling libraries, all information programmed for opening, height, and die top are erased whenever any of these actions occur:

- power to the Autobend 7 is turned Off
- another Job using the tooling libraries is loaded
- tooling calibration is verified

Below is the tool calibration verification screen that is displayed whenever any of these actions occur:

- another Tool 0 Job is loaded
- the Job Setup has been entered

TOOL VERIFICATION	
*** WARNING ***	
JOB 1034 CALIBRATED	
IS TOOL CAL. OK?	NO

Figure 2-28. Tool Calibration Verification Warning screen

Notice that the field “Is Tool Cal OK ?” defaults to No. If the same tooling and material is used as the previous job, press the Yes key and the Enter Adv key to begin operation. Otherwise, press the Enter Adv key to enter the tool calibration.

Selecting the Gauging Surface

The gauge bar provided with the Autobend 7 system provides various methods of referencing the material to be formed. For best results do not place material directly against the gauge bar's front edge or face. This surface should be used to hold the flip fingers and gauge blocks suited to this task. Ideally using two stops per bend is recommended since tooling centerlines and material edges are typically not straight.

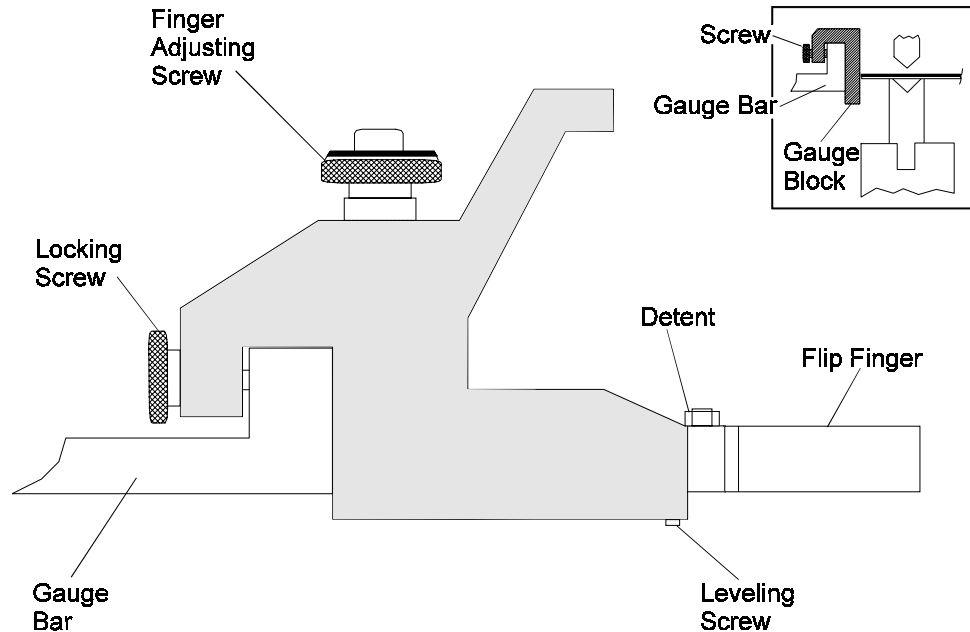


Figure 2-29. Flip Fingers and Gauge Block



Warning

Ensure that the *carriage arrestor bars* are correctly set on the gauge(s) to prevent any part of the gauge bar, finger(s), or block(s) from contacting the tooling in an unsafe manner. All adjustments should be made from the rear of the press brake. Do not reach across the tooling or in through the bed and ram.

Flip Fingers

Flip fingers permit closer gauge positioning to the tooling. The fingers' tilting action allows reverse bending, with the length of the reverse bend dependent on the type of part to be formed.

Fingers can be manufactured by customers to suit their individual forming needs. For the most accurate results, always reference the flip fingers prior to using them after changing the tooling setup. Refer to the "Referencing the Gauging Surface" section that follows.

Install the flip fingers at any location along the gauge bar to best suit the requirements of the part. These fingers allow approximately 0.090" of horizontal micro-adjustment for close-tolerance forming. Fingers rotate in 90° increments for narrow or wide target area selection. Each finger tilts on a leveling adjustment screw at the front bottom of the body. The locking screw at the end of the flip finger assembly is used to lock it in place along the gauge bar.

When two flip fingers are used, both must be set to the same length, as measured from the back of the body to the tip of the finger. Otherwise, the parts will not have equal flange lengths on both ends.

Gauge Blocks

Gauge blocks provide a large target area suited for work involving large-scale parts and long flanges.

Install gauge blocks at any location along the gauge bar to best suit the requirements of the part. The locking screw at the end of the gauge block is used to lock the block in place on the gauge bar. For the most accurate results, always reference the gauge blocks prior to using them after changing the tooling setup. Refer to the "Referencing the Gauging Surface" section that follows.

Referencing the Gauging Surface

Prior to forming parts, the gauging surface must be referenced to the forming tools. The programmed dimension is the distance from the gauging surface to the punch centerline. This centerline changes for each set of tooling.

Two *zero reference bars* are provided with each Autobend 7 to provide a quick and controlled method of squaring the gauge bar. Each zero reference bar has a 90° “V” notch in the center and a machined edge on one end. The distance from the center of the “V” notch to the machined edge is 5" (127 mm).



Warning

Do not use the reference bars if the rubber pad is damaged or missing. This pad is a safety feature to reduce the possibility of breakage from slight over-pressure. The pads will not prevent the bars from breaking in the event of severe over-pressure from the press brake.

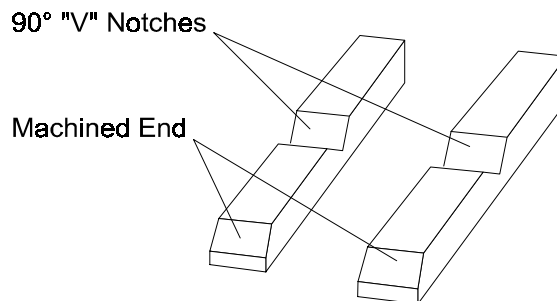


Figure 2-30. Zero Reference bars

Follow these instructions to reference the gauge bar:

1. For systems equipped with Ram control, enter the Mode Functions screen and toggle the Y-Axis Mode field to Standby Manual. For other systems, proceed as follows:
2. Place the flip fingers or gauge blocks on the gauge bars at the extreme ends of the tooling to ensure that the gauge bar is parallel to the tooling.
3. Loosen the clamp bolts on the lower part of the vertical supports. Slightly pull back the support.
4. Loosen the carriage arrestor bars.
5. Program a single station job with a 5" (127 mm) dimension and 0 bend allowance. Refer to the "Job Programming" and "Station Programming" sections for more information.
6. Press the Run button.
7. Insert the zero reference bars so the machined edges face the gauging surface with the "V" notches aligning with the punch centerline.
8. Carefully jog the ram until the tooling firmly clamps the zero reference bars. Lock the ram in this position.
9. Adjust the gauge bar's height so the gauging surface is aligned with the reference bars.

Note

For systems equipped with ram control, the Autobend 7 allows offset programming for each punch in memory. This offset is the difference from the punch tip to the machine centerline.

10. Push the vertical supports forward so the gauging surface is flush against the zero reference bars. For the most accurate results, use a 0.002" feeler gauge to verify that the gauge surface is flush with the machined edge of the zero reference bars.

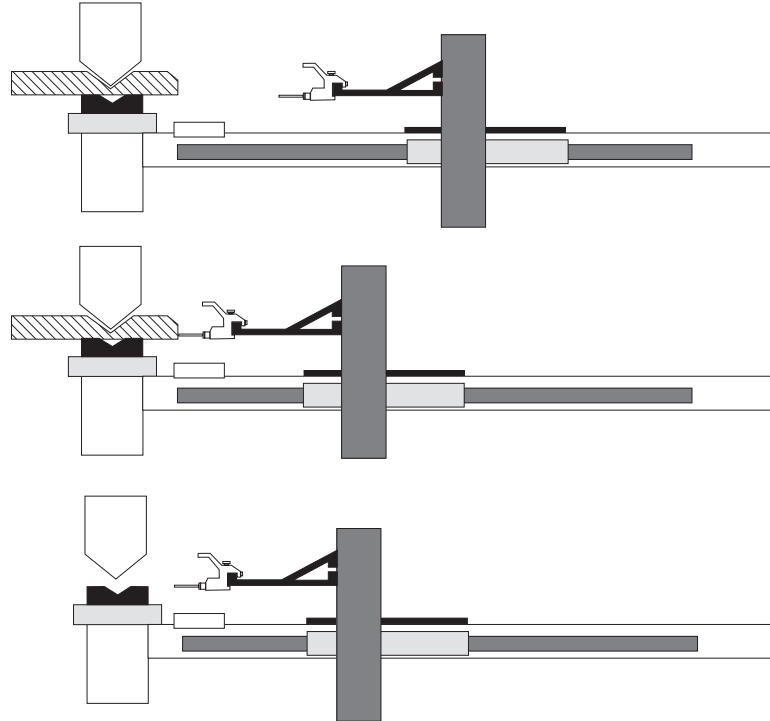


Figure 2-31. Gauge calibration

11. Lock the clamping bolts at the bottom of the vertical supports.
12. Return the ram to its open position. Remove the zero reference bars and store them in a safe place.
13. Press the Stop button on the Autobend 7 console.
14. Return the Y-Axis Mode field to Active.

Setting the Retract at Pinch Sensor

The retract at pinch sensor is used for all Autobend 7 Systems except downacting hydraulic press brakes with ram control, which do not have a sensor. Refer to the “Hydraulic Ram Control” section that follows for retract at pinch on ram control.

Upacting Press Brakes

Following are directions for setting the retract at pinch sensor on an upacting press brake:

The field for Retract at Pinch is found in the Configuration Menu. Two choices are possible, Disable and Enable. Select Enable. Save and Exit the Configuration Menu.

1. Load the appropriate tooling.
2. Place a sample part across the tooling.
3. Slowly raise the table until the part is firmly pinched in the tooling so that it cannot move. Hold the table in this position so the sensor can be adjusted.
4. Adjust the coarse setting on the retract sensor to position the sensor above the actuating magnet. The LED should remain On. If it turns Off, raise the sensor until it turns On.
5. Lower the height of the sensor with the fine adjustment setting. Adjust the height until the moment the LED turns Off.

The sensor is now set for this particular tooling/material combination. Repeat this procedure whenever the tooling or material changes.



Warning

For correct operation of the retract at pinch, the sensor must be positioned so that the gauge begins the retract after the part is firmly pinched by the tooling. Failure to do so might allow the gauge to retract before the part is firmly pinched, resulting in the part moving.

The figure below illustrates the fine and coarse setting adjustments on an upacting press brake:

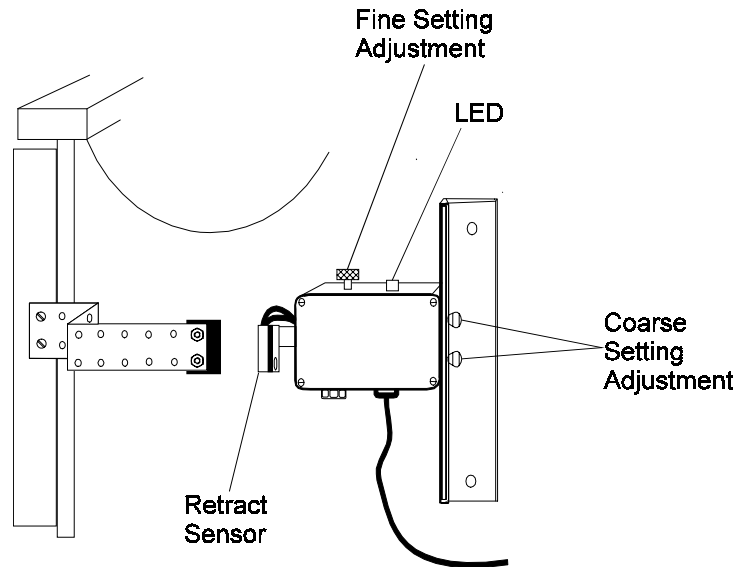


Figure 2-32. Retractor Sensor mounted on an upacting press brake

Downacting Press Brakes

Before setting the retract at pinch sensor on a downacting press brake, enable the Retract at Pinch field in the Configuration Menu screen by selecting Enable. Save and Exit the Configuration Menu. Follow these directions for setting the retract at pinch sensor on a downacting press brake:

1. Load the appropriate tooling.
2. Place a sample part across the tooling.
3. Slowly jog the ram until the part is firmly pinched in the tooling so it cannot move. Hold the ram in this position so the sensor can be adjusted.
4. Adjust the coarse setting of the retract sensor to position the sensor below the actuating magnet. The LED should remain On. If it turns Off, lower the sensor until it turns On.
5. Raise the height of the sensor with the fine adjustment setting. Adjust the height until the moment the Led turns Off.

The sensor is now set for this particular tooling/material combination. Repeat this procedure whenever the tooling or material changes.

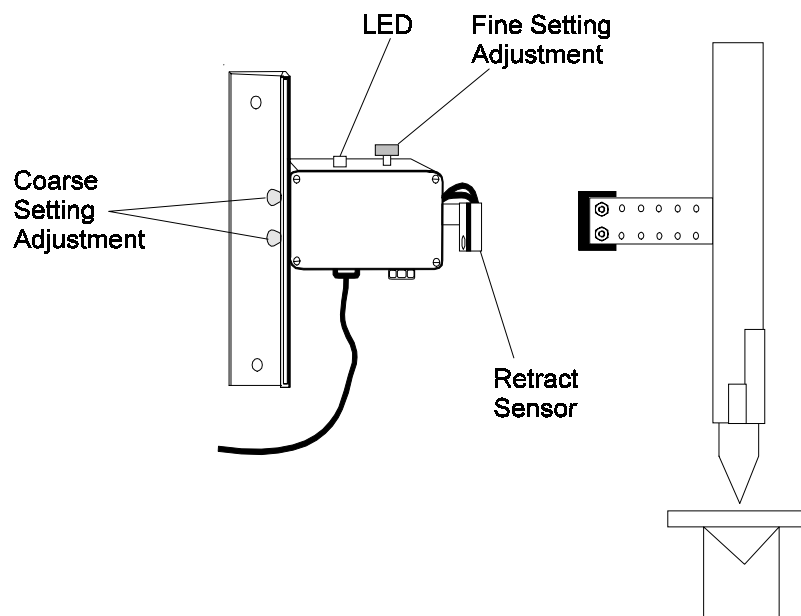


Figure 2-33. Retract Sensor mounted on a downacting press brake

Hydraulic Ram Control

Before setting the retract at pinch on a hydraulic press brake, make the appropriate selection for the Retract at Pinch field on the Configuration Menu screen. There are four possible choices: Disable, Linear Scale @ 5%, 10% and 15%. These percentages represent the amount the punch has penetrated the material before the gauge begins to retract. The greater the percentage, the larger the penetration. The retract point can be adjusted for various material thickness. To turn Off the Retract at Pinch feature select Disable. Any retract programmed then occurs only when the ram returns to the top of stroke.

Follow these directions for setting the retract at pinch:

1. Press the Mode key. The Mode Functions screen appears.
2. Select the Configuration Menu screen.
3. Move the cursor to the Retract at Pinch field.
4. Press the Enter Adv key until Linear Scale @ 15% appears.
5. Move the cursor to the Save and Exit field.
6. Press the Enter Adv key to exit the Configuration Menu.



Warning

Incorrect programming of the retract at pinch or tooling information may result in the gauge retracting before the material is firmly pinched between the tooling. Always ensure that the programming is correct before using retract at pinch.

Set the percentage at 15% initially and test it. If the gauge retracts too late, the percentage can be lowered until the gauge retracts at the proper time. To test the Retract at Pinch setting, follow these steps:

1. Load the appropriate tooling.
2. Program a job with a retract of 10" (254 mm) and a 5-second delay.
3. Press the Run button.
4. Place a sample part across the tooling.
5. Slowly jog the ram until the part is firmly pinched in the tooling. The gauge should begin to retract immediately as the material begins to bend.
 - a. If retract begins before the material is firmly pinched, check the tooling libraries for incorrect information.
 - b. If retract occurs too late, adjust Retract at Pinch setting and repeat the procedure.
6. Continue to adjust the percentage setting until the gauge retract is at the correct point.

The setup is correct for this particular tooling/material combination. Repeat this procedure whenever the tooling or material is changed.

Tool Qualification

Verify programming for tooling using the procedures below to ensure that the programmed values are correct. These are the steps to qualify a tool:

1. Verify height.
2. Verify die opening and shoulder radius.
3. Measure die opening.
4. Adjust die opening, if necessary.
5. Measure shoulder radius.
6. Adjust shoulder radius, if necessary.



Hints and tricks

Since it may be difficult to accurately measure the die opening and shoulder radius on frequently used dies, bend several pieces of material of a known thickness with shallow, medium, and deep bends. Record the angles after each bend.

Verifying Tool Height

To verify tool height, follow these steps:

1. Locate and install the tooling.
2. Locate and measure the sample material.
3. Program a job with the tool(s) to be qualified. Be sure to program the measured material thickness.
4. Program a ram dimension of 0 (angle 180°).
5. Press the Run button and insert the sample material.
6. Stroke the ram fully to the depth limit.
7. Verify that the material is only pinched by the tooling and not bent.
8. Adjust the tool height so the material is only being pinched.

If the material is being bent, increase the tool height. If the material is not making contact with the punch, decrease the tool height.

Verifying Die Opening and Shoulder Radius

After completing tool height verification as described in the previous section, follow these steps to verify the die opening and shoulder radius:

1. Program an angle that the tooling is capable of producing (i.e., 45°, 90°).
2. Form a sample part.
3. Measure the angle.



Important

If the result varies by more than 15° of the programmed value, confirm that the programmed die opening and shoulder radius are correct.

Measuring Die Opening

The die opening is measured depending on the software option installed. Outside Shoulder Dimension (OSD) applies to both standard software and to Part Length Compensation (PLC) software for Hurco Press Brakes. Theoretical Sharp Dimension (TSD) applies only to PLC software. The Die Library List shows which measurement type is used for each die with the PLC software.

The figure below illustrates the two different points to measure the die opening:

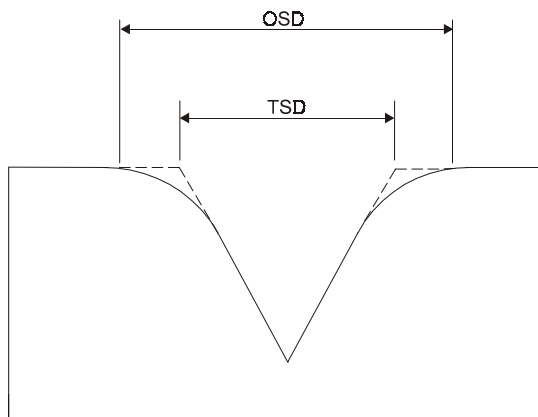


Figure 2-34. Methods of Measuring the Die Opening

TSD Measurement

The *Hurco Press Brake Tooling Catalog* contains the TSD measurements for die openings.



Important

Tooling specifications are subject to change without prior notice.

Perform the tool qualification procedure to ensure proper tooling setup.

To manually measure the die opening to determine TSD, follow these steps:

1. Determine the intersection of a line ascending from the inside of the die opening to the top with a line continuing from the flat area on the top of the die. (Refer to the previous figure.)
2. Measure the distance from these intersecting lines on both sides of the die opening.

The figure below illustrates the points for measuring the TSD die opening:

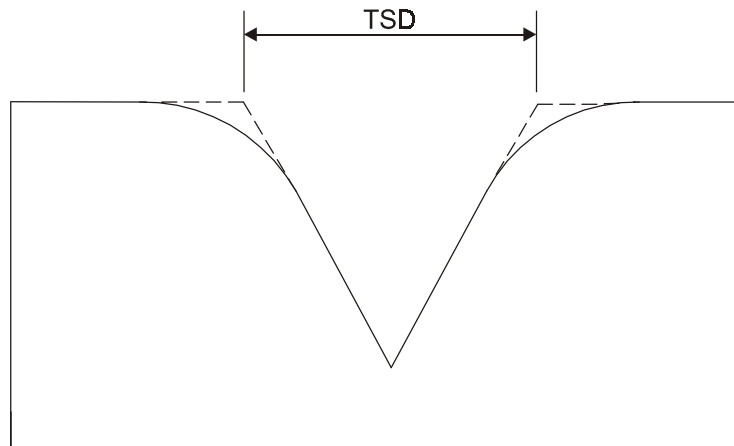


Figure 2-35. Measuring the TSD Die Opening

OSD Measurement

Follow these steps to measure the die opening and shoulder radius for the OSD measurement:

1. Lay a straightedge across the top of the die to measure the die opening.
2. Using calipers, measure between the points where the straightedge contacts the die as shown in the figure below.

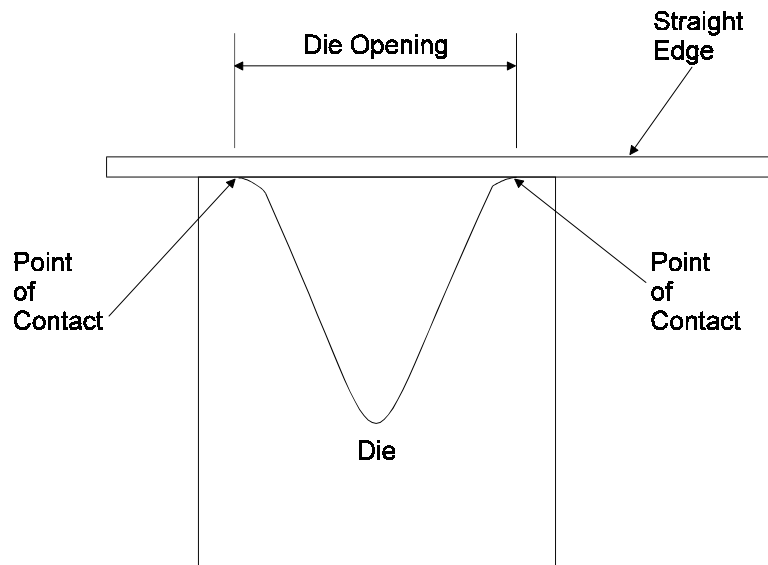


Figure 2-36. Measuring the Die Opening for standard software

Adjusting the Die Opening

If the bend angles are uniformly opened or closed over the entire range of bends, the die opening needs to be adjusted. Make adjustments to the programmed die opening on the Die Library List screen's Opening field.

- If the actual die opening is larger than the value programmed, the bend angles will be open. Increase the die opening.
- If the actual die opening is smaller than the value programmed, the bend angle will be closed. Decrease the die opening.

When adjusting the die opening, use increments no larger than 0.03". Change the die opening and perform another series of bends.

Measuring the Shoulder Radius

Use a radius guide set to measure the die radius. Select the guide that best fits the shoulder radius and enter the value of that guide.

Since it may be difficult to accurately measure the die opening and shoulder radius on frequently used dies, bend several pieces of material of a known thickness with shallow, medium, and deep bends. Record the angles after each bend.

Adjusting the Shoulder Radius

If the bend angles are uniformly opened or closed between the shallow and medium bends, but greater between the medium and deep bends, the shoulder radius needs to be adjusted. Make adjustments to the programmed shoulder radius on the Die Library List screen's Radius field.

- If the actual shoulder radius is larger than the value programmed, the bend angles will be closed. Increase the shoulder radius.
- If the actual shoulder radius is smaller than the value programmed, the bend angles will be open. Decrease the shoulder radius

When adjusting the shoulder radius, use increments no larger than 0.02". Change the shoulder radius and perform another series of bends.



Important

Persistent large angle corrections after tool qualification indicate a large amount of either springback or press brake deflection.

Run Cycle Selection

The Autobend 7 has two run cycles: Auto and Single. Auto operation advances the stations automatically with each ram stroke, while Single operation holds the axes at the station displayed until the Enter Adv key is pressed, then the axes advance to the next programmed station.

Note

For press brakes with optional ram control, refer to the “Y-Axis Mode” and “Punch and Die Tool Verification” sections for information relative to these options; otherwise, proceed to the “Adjusting Stations and Jobs” section.

Auto Run

Press the Run button to select the Auto Run mode. The axes calibrate and move to their programmed positions. Upon completion of a ram stroke, the control automatically advances the axes to their next programmed positions. To stop axes movement, press the Stop button. The axes de-energize and the screen blanks.

Punch and Die Tool Verification

For systems equipped with optional ram control, when the Run button is pressed, the Tool Verification screen appears to verify that the tooling loaded in the press brake matches the tooling programmed in the Autobend 7 control.

1. Press the Run button.
 - a. The Tool Verification screen appears. See the sample screen below.
 - b. Verify that the tooling installed matches the tooling programmed before proceeding.

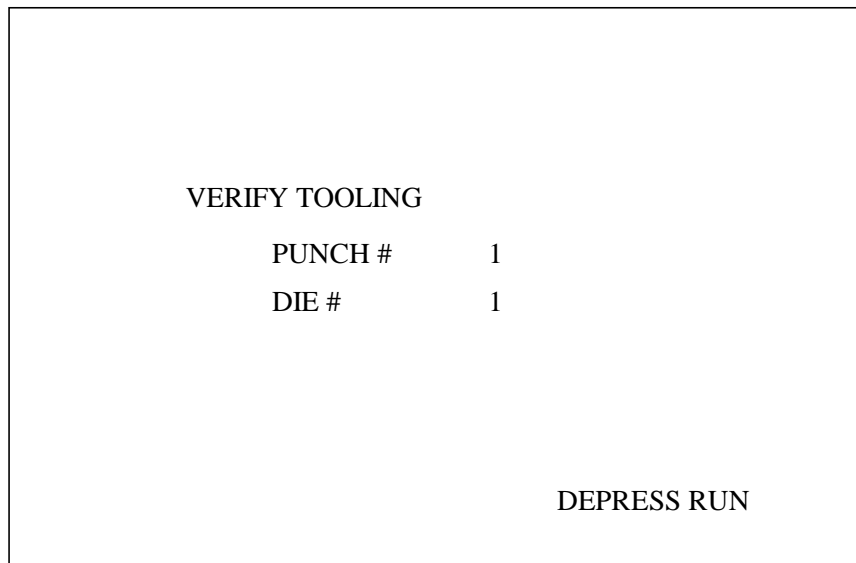


Figure 2-37. Tool Verification screen

2. If the tooling matches, press the Run button. The axes automatically calibrate and position to the first station. If the tooling does not match, make the appropriate corrections and press the Run button.
3. After the axes calibrate, the bending operation may begin.

Adjusting Stations and Jobs

Station information is displayed in double-height characters on the screen and automatically updates as the job advances.

To make station adjustments while in the Auto Run screen, press the Stat key. The Station Setup screen for the station currently displayed appears. To select another station, press the Next key until the desired station number is displayed. To display the Station List screen, press the Stat key again.

If job setup or parts count need adjustment while in the Auto Run screen, press the Job key once and the Job Setup screen for the current job appears. Press it again to display the Job List screen. After making all required changes, press the Run button to return to Auto Run Mode.

Here is a single-axis Auto Run screen:

MODE:	AUTO	JOB #	222
	STATION #		1
	DIMENSION		5.000
	BEND ALL.		0.000
	COMPLETED PARTS		0

Figure 2-38. Single-Axis Auto Run screen

Here is a two-axis Auto Run screen:

MODE:	AUTO	JOB #	222
	STATION #		1
	DIMENSION		5.000
	BEND ALL.		0.000
	ANGLE		0 DEG.
	ANG. ADJ.		0 DEG
	COMPLETED PARTS		0

Figure 2-39. Two-Axis Auto Run screen

Single Run

The Single Run screen provides a method of running only a specific station in a job. Press the Run button while in the Auto Run mode to select the Single Run mode. The axes remain stationary at their current position until the Enter Adv key is pressed. Press the Enter Adv key and the station displayed changes to the next station programmed and the axes advance to their programmed positions. The station cannot be advanced unless the Enter Adv key is pressed.

To stop the axes' movement, press the Stop button. The axes de-energize and the screen blanks.

To return to Auto, press the Run button again.

Note

Retract at pinch is not supported.

The sample screen below is a single-axis Single Run screen:

MODE:	SINGLE	JOB #	222
	STATION #		1
	DIMENSION		5.000
	BEND ALL.		0.000
	COMPLETED PARTS		0

Figure 2-40. Single-Axis Single Run screen

The sample screen below is a two-axis Single Run screen:

MODE:	SINGLE	JOB #	222
	STATION #		1
	DIMENSION		5.000
	BEND ALL.		0.000
	ANGLE		0 DEG.
	ANG. ADJ.		0 DEG.
	COMPLETED PARTS		0

Figure 2-41. Two-Axis Single Run screen

Programming Examples

Gauge Dimension Programming

The following example pertains to gauge dimension programming. The part shown in the figure below requires four bends. The bending order is shown by the circled numbers.

The sections that follow describe how to program the required dimensions. To advance the cursor through the fields, press the Enter Adv key after entering a value in each field.

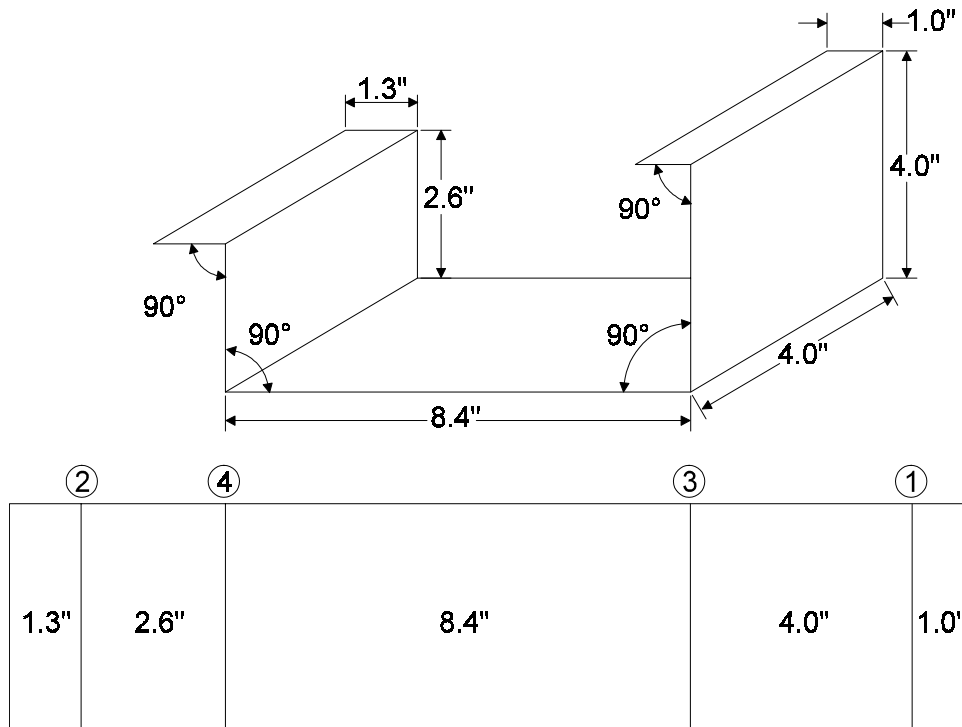


Figure 3-1. X-Axis Programming Example Part

Note

The dimensions in the figure above are for reference only and should not be used to calculate blank length.

Enter a Job Number

To program the four-bend part for this example, perform the following procedures:

1. Press Job. The Job List screen appears.
2. Enter the job's number (1 2 3 in this example).

JOB LIST			
JOBS AVAILABLE 500			STAT. AVAILABLE 2000
JOB #	COMPLETED PARTS	# STN'S	MAT. THICK
END OF JOB LIST		JOB #	123

Figure 3-2. Job List screen

3. Press the Enter Adv key. The Job Setup screen appears.

Program the Job Setup

Follow these steps to program the job setup:

1. Press the Yes key at the Auto Bend All? field.
2. Enter .031 in the Punch Radius field.
3. Enter .06 in the Material field.
4. Leave the value at zero for the Completed Parts field since this is a new program.
5. Press the Enter Adv key and the message “Job Programmed” appears as shown in the screen below, signifying that all the fields have been programmed.

JOBS AVAILABLE 499		JOB SETUP		STAT. AVAILABLE 2000	
AUTO BEND ALL?	YES	PUNCH RADIUS	0.031		
MATERIAL	0.060				
COMPLETE PARTS	0				
JOB PROGRAMMED					

Figure 3-3. Job Setup screen

Program the First Station

The numbers shown circled in the drawing of the sample part designate the selected bend sequence. For station 1, program the 1" dimension as follows:

1. Press the Stat key. The Station Setup screen appears.
2. Enter 1 in the Dimension field.
3. Notice that the value -0.051 in the Bend All field is automatically calculated by the control. If during trial bending the flange length needs additional correction, this value is adjusted automatically.
4. Program the Ret Time fields (delay after the gauge has retracted) and Ret Dim (distance to move the back gauge) if a retract is required.

JOB #	1	STATION #	1	STAT. AVAILABLE 1999
DIMENSION	1.000	BEND ALL.	-0.051	
RET. TIME	0 SEC.	RET DIM	0.000	

Figure 3-4. Station #1 Setup screen

Program the Remaining Stations

Follow these steps to program the remaining stations:

1. Press the New Stat key. The Station #2 Setup screen appears. Notice the values shown for the fields are the same as those programmed for Station #1.
2. Re-program only entries requiring new values.
3. Enter 1.3 in the Dimension field to change Bend 2's dimension.
4. Press the New Stat key since the rest of the fields do not require new values. The Station Setup screen for Station #3 appears.
5. Enter 4 in the Dimension field to change Bend 3's dimension.
6. Press the New Stat key since the rest of the fields do not require new values. The Station Setup screen for Station #4 appears.
7. Enter 2.6 in the Dimension field to change Bend 4's dimension.
8. This last bend requires a retract to allow Bend 2's flange to clear the gauge.
 - a. Enter 5 in the Ret Dim field to program a 5" retract.
 - b. Enter 3 in the Ret Time field to program a 3 second delay.
9. The message "Station Programmed" appears in the lower left-hand corner of the Station Setup screen.

10. Press the Stat key to display a list of all stations for review.

JOB #	1	STATION LIST		STAT. AVAILABLE 1996
STATION #		DIMENSION	BEND ALL.	
1		1.000	-0.051	
2		1.300	-0.051	
3		4.000	-0.051	
4		2.600	-0.051	
END OF STATION LIST				STATION # 1

Figure 3-5. Station List screen

Before Making a Trial Bend

Follow these steps:

1. Load the correct tooling into the press brake.
2. Select and reference the gauging surface to the tooling as described in the “Selecting the Gauging Surface” and the “Referencing the Gauge Surface” sections in the “Programming and Operations” chapter of this manual.
3. Adjust the ram stroke to achieve the desired angle.
4. Adjust the gauge bar’s height so the material touches the gauging surface.
5. Adjust the Retract at Pinch sensor as described in the “Setting the Retract at Pinch Sensor” section in the “Programming and Operations” chapter of this manual.

Making a Trial Bend and Forming Parts

Follow these steps:

1. Press the Run button twice. The display shows the Single Run screen. In this mode the control advances the gauge to the next programmed station when the Enter Adv key is pressed.
2. When the gauge has positioned to the dimension for Station #1, square the material to the gauging surface. Adjust the gauge height if necessary.
3. Stroke the ram to form the flange.
4. Measure the flange.
5. Adjust the Bend All value to achieve the desired flange length, if necessary. Press the Stat key to return to the Station List screen. Press 1 and the Enter Adv key to edit Station #1.
6. If the angles and flange lengths for all the bends are the same, enter the same Bend All adjustment for the remaining bends.

7. Press the Run button twice and form another flange. Check and re-adjust if necessary.
8. Press the Enter Adv key to advance the gauge.
9. Form the flange and check the part.
10. Repeat the previous two steps until all flanges are formed correctly.
11. Press the Run button one time to enter the Auto Run mode with Station #1 displayed.
12. Form parts.
13. When production is complete, press the Stop button to de-energize the gauge and blank the screen.

X- and Y-Axes Programming Example

This example is for a two-axis system. The axes programmed are the back gauge(s) and ram control. Multiple angles and flanges are programmed in this example. The part shown in the figure below requires 8 bends to form the part. Determine the bending sequence before forming this part. The order selected for this example is shown by the circled numbers next to the angles.

After determining the bend sequence, program the required dimensions, allowances, and angles for each bend. First program the tooling to form this part. Depending on the type of press brake additional parameters, ram opening heights, and ram speed change point may also be programmed. Last, program any required retracts.

To advance the cursor through the fields, press the Enter Adv key after entering values in each field.

The sample screens in this example are from the Optional Part Length Compensation software.

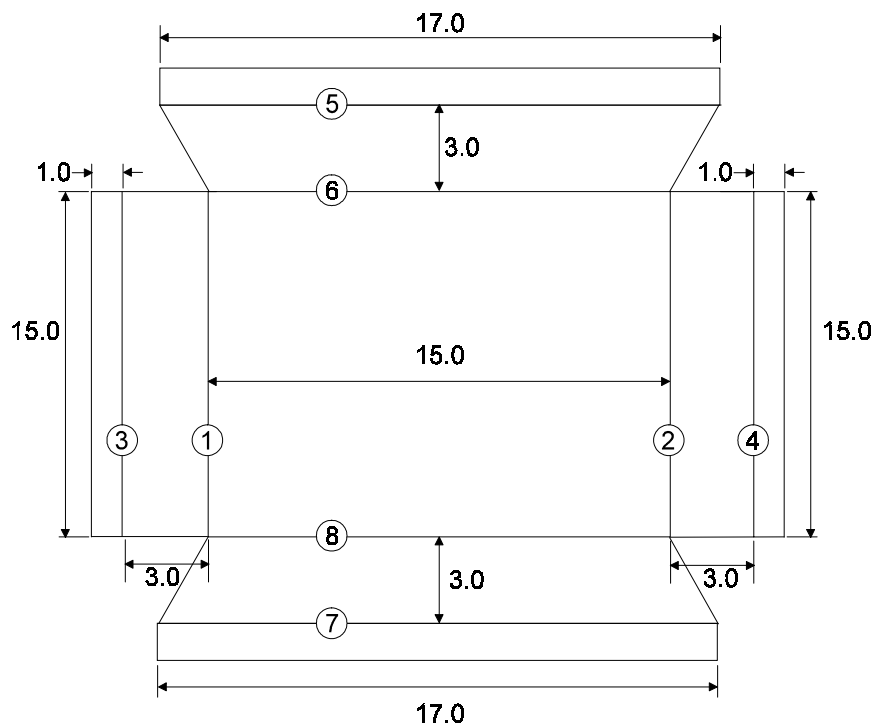


Figure 3-6. X- and Y-Axes Example Part Bend Sequence

Note

The dimensions in the figure above are for reference only and should not be used to calculate blank length.

Here is an isometric view of this example part:

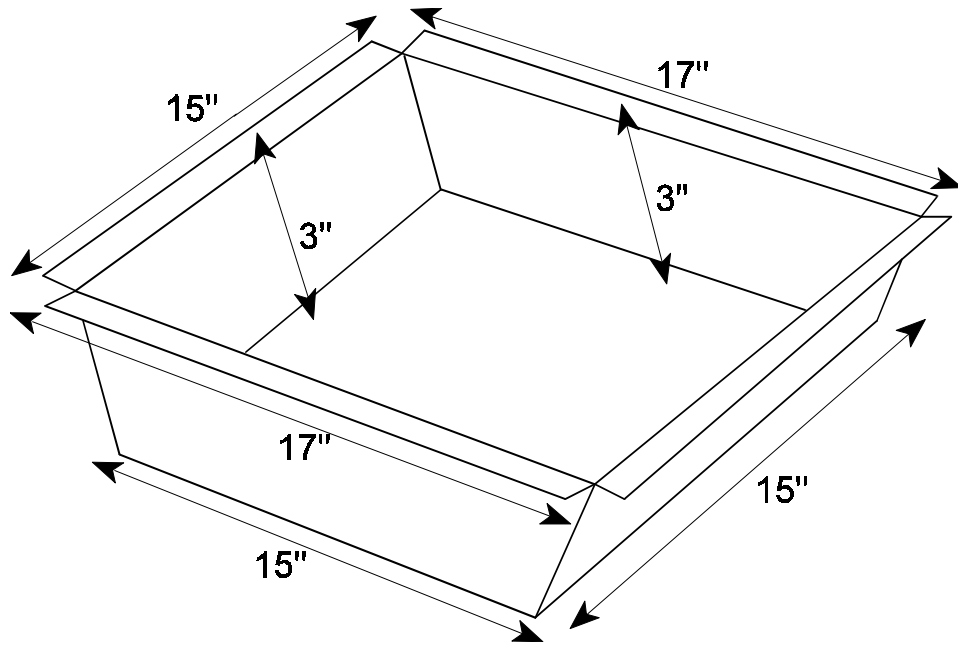


Figure 3-7. Isometric View of X- and Y-Axes Example Part

Program the Punch

Follow these steps to program the punch:

1. Press the Mode key. The Mode Functions screen appears.
2. Select Punch. The Punch Library screen appears.
3. Press the \downarrow key until the cursor appears at punch number 3.
4. Enter .031 in the Radius field.
5. Enter 3.7 in the Height field.
6. Enter 30 in the Angle field.
7. Enter 0 in the Offset field.

Here is the punch described in this example:

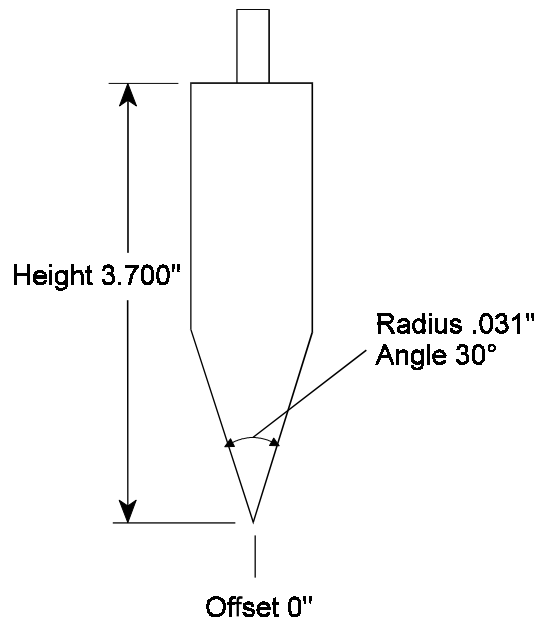


Figure 3-8. Punch measurements

Here is a completed Punch Library screen for this example:

PUNCH LIBRARY				
NUMBER:	RADIUS	HEIGHT	ANGLE	OFFSET
1	0.032	2.125	89.0	0.375
2				
>>3	0.031	3.700	30.0	0.000
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				

+, - TO SELECT TOOL		NEXT - NEXT PAGE		CURRENT TOOL # 3
<ENTER> TO EDIT		BACK - PREV PAGE		ENTER # __

Figure 3-9. Punch Library screen

Program the Die

Follow these steps to program the die;

1. Press the Mode key. The Mode Functions screen appears. (See the Mode screen figure previously shown in this section.)
2. Select Die. The Die Library List screen appears.
3. Press the \Downarrow key until the cursor appears at the die number 3 field.
4. Enter .5 in the Opening field.
5. Press 2 in the Height field.
6. Enter 30 in the Angle field.
7. Enter .047 in the Radius field.
8. Enter .6 in the Safety field.

The figure below shows this die's measurements:

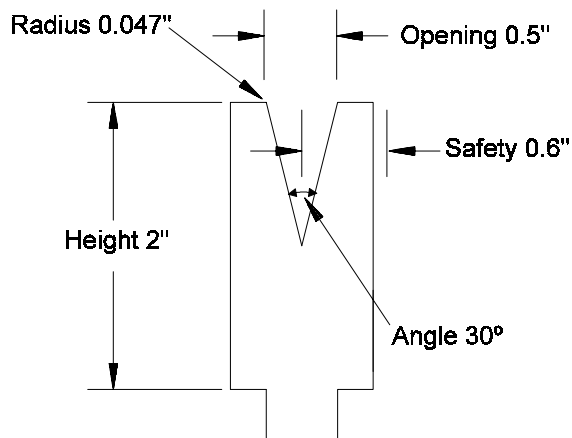


Figure 3-10. Die measurements

Here is a Die Library List screen with the die's measurements programmed:

DIE LIBRARY LIST					
NUMBER:	OPENING	HEIGHT	ANGLE	RADIUS	SAFETY
1	0.500	4.250	89.0	0.012	1.000
2					
>>>3	0.500	2.000	30.0	0.047	0.600
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					

+, - TO SELECT TOOL		NEXT - NEXT PAGE		CURRENT TOOL # 3
<ENTER> TO EDIT		BACK - PREV PAGE		ENTER # __

Figure 3-11. Die Library List screen

Enter a Job Number

Follow these steps to enter a job number:

1. Press the Job key to display the Job List screen.
2. Enter 456 for the Job Number and press the Enter Adv key to display the Job Setup screen.

JOBS AVAILABLE 499	JOB #	456	STAT. AVAILABLE 2000
PROGRAM RAM DIM? NO		DIE #	1
PUNCH #	1	AUTOBEND ALL?	NO
MAT. THICK	0.000	COMPLETED PARTS	0

Figure 3-12. Job Setup screen

Program the Job Setup

Follow these steps to program the Job Setup:

1. Press the No key at the Program Ram Dim? Field to select the angle format.
2. Enter 3 in the Die # field. This selects die number 3 from the die library.
3. Enter 3 in the Punch # field. This selects punch number 3 from the library.
4. Enter .06 in the Mat Thick field. For best results, always enter the actual measured material thickness.
5. Press the Yes key at the Auto Bend All? field. The control automatically calculates bend allowances.
6. Press the Enter Adv key at the Completed Parts field so the message “Job Programmed” appears at the bottom of the screen as shown below:

JOBS AVAILABLE 499	JOB #	456	STAT. AVAILABLE 2000
PROGRAM RAM DIM? NO	DIE #	3	
PUNCH #	3	AUTOBEND ALL? YES	
MAT. THICK	0.060	COMPLETED PARTS 0	
JOB PROGRAMMED			

Figure 3-13. Job Setup screen

Program the First Station

The numbers circled in the drawing for this example designate the selected bend sequence. For Station #1 the dimension and angle to program are 4.00" and 110°.

1. Press the Stat key; the Station #1 Setup screen appears.
2. Enter 4 in the Dimension field.
3. Enter 110 in the Angle field.
4. At the Bend All field, the control has automatically calculated a compensation value of -0.051". If further adjustment is required, this value will be changed automatically.
5. Program any angle adjustment required in the Angle Adj field.
6. Program the Ret Time and Ret Dim fields when a gauge retract is required. Remember that the retract is selectable so it can occur at either the material pinching point or at ram top of stroke. This selection is made in the Configuration Menu as discussed in that section of the "Programming and Operations" chapter.
7. For downacting hydraulic ram control only, enter 4.3 in the Ram Open field, and enter 5 in the Ram Speed field.

Here is the Station #1 screen for this job:

JOB #	1	STATION #	1	STAT. AVAILABLE 1999
DIMENSION	4.000	ANGLE	110.0 DEG.	
BEND ALL.	-0.051	ANG. ADJ.	0 DEG.	
RET. TIME	0 SEC.	RET DIM	0.000	
RAM OPEN	4.300	RAM SPEED	0.5	

Figure 3-14. Station Setup screen

Program the Remaining Stations

Follow these steps to program the remaining stations:

1. Press the New Stat key. The Station #2 Setup screen appears. Notice that all the fields have the same values as those programmed for Station #1. Only the fields that require new values need to be programmed.
2. Press the New Stat key since no fields require re-programming to complete this bend. The Station #3 Setup screen appears.
3. Enter 1 in the Dimension field.
4. For downacting hydraulic ram control only: enter 1.5 in the Ram Open field.
5. Press the New Stat key since no other fields require re-programming to complete this bend. The Station #4 Setup screen appears.
6. Press the New Stat key since no fields require re-programming to complete this bend. The Station #5 Setup screen appears.
7. Enter 90 in the Angle field.
8. Press the New Stat key since no other fields require re-programming to complete this bend. The Station #6 Setup screen appears.
9. Enter 3 in the Dimension field.
10. Program a retract because a bend flange is referenced at the gauge.
 - a. Enter 5 in the Ret Dim field and press the Enter Adv key.
 - b. Enter 2 in the Ret Time field and press the Enter Adv key.
11. For downacting hydraulic ram control only: in the Ram Open field enter 3.5.
12. Press the New Stat key since no other fields require re-programming for this bend. The Station #7 Setup screen appears.
13. Enter 1 in the Dimension field.
14. Enter 0 in the Ret Dim field.

15. Enter 0 in the Ret Time field.
16. For downacting hydraulic ram control only: enter 1.5 in the Ram Open field.
17. Press the New Stat key since no other fields require re-programming to complete this part. The Station #8 Setup screen appears.
18. Enter 3 in the Dimension field.
19. Program a retract because a bend flange is referenced at the gauge.
 - a. Enter 5 in the Ret Dim field.
 - b. Enter 2 in the Ret Time field.
20. For downacting hydraulic ram control only: enter 3.5 in the Ram Open field.
21. Press the Stat key to list all 8 stations, review information programmed, and correct any errors in programming.

Before Making a Trial Bend

Follow these steps:

1. Load the correct tooling into the press brake.
2. Select and reference the gauging surface to the tooling as described in the “Selecting the Gauging Surface” and “Referencing the Gauge Surface” sections of the “Programming and Operations” chapter.
3. In the Mode Functions screen, set the Y-Axis Mode field to Active by pressing the Stat key until Active appears.
4. Press the Run button. The screen displays the “Verify tooling” message. Confirm that the tooling installed matches the tooling programmed before proceeding.
5. Press the Run button. The Y-axis automatically calibrates on upacting and positive stop press brakes. For downacting hydraulic, raise the ram to the top of stroke and then lower the ram to calibrate.
6. Adjust the gauge height so the material hits the gauging surface.
7. Adjust the Retract at Pinch sensor described in the “Setting the Retract at Pinch Sensor” or “Setting the Retract at Pinch on Hydraulic Ram Control” sections in the “Programming and Operations” chapter. For downacting hydraulic ram control, adjust Retract at Pinch as described in the “Start-up” section in the “System Basics” chapter.

Making a Trial Bend and Forming Parts

Follow these steps:

1. Press the Run button twice to display the Single Run screen. The gauge advances to the next programmed station after the Enter Adv key is pressed.
2. When the gauge has positioned to the dimension for Station #1, insert the material squarely to the gauging surface.
3. Stroke the ram to form the flange.
4. Measure the flange and angle.
5. Press the Enter Adv key. The gauge advances to Station #2.
6. Insert the material for the second bend. Stroke the ram to form the flange.
7. Measure the flange and angle.
8. Repeat the previous three steps until the part is completely formed.
9. If corrections are necessary, return to the Station Setup screens and adjust the Bend All and Angle Adj values to achieve the desired flange lengths and angles.
 - a. Press the Stat key to return to the Station List screen.
 - b. Press 1 and the Enter Adv key to edit Station #1.
 - c. Press the Next key to display the next station screen.
10. Press the Run button to form another part. Check all flanges and angles; adjust if necessary.
11. Form parts.
12. When production is complete, press the Stop button to de-energize the axes and blank the screen.

X-, Y-, and R-Axes Programming Example

This example is for programming a three-axis system. The axes programmed are the back gauge(s), gauge bar height, and ram control. Multiple angles and flanges are programmed in this example. The part shown in the figure below requires six bends to form the part. Determine the bending sequence before forming this part.

After determining the sequence, program the required dimensions, allowances, retracts and angles for each bend. Example tooling to form this part will be programmed first. Depending on the type of press brake, additional parameters, e.g., ram opening heights and ram speed change points, may also be programmed.

The sample screens in this example are from the Optional Part Length Compensation software.

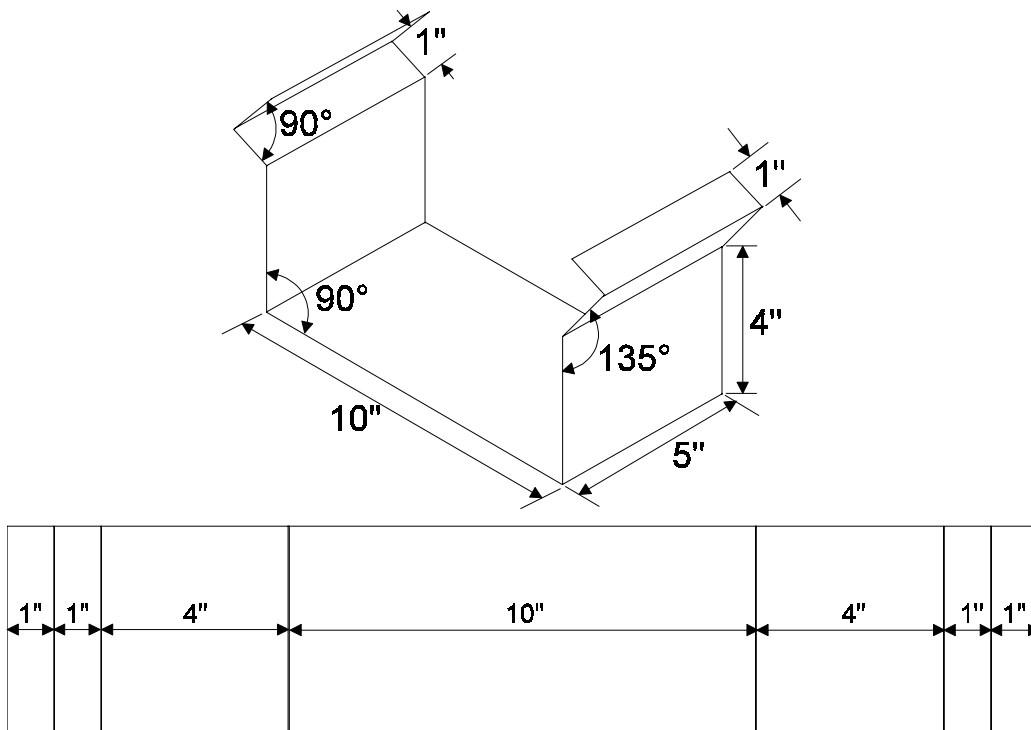


Figure 3-15. X-, Y-, and R-Axes Example Part

Note

The dimensions illustrated above are for reference only and should not be used to calculate blank length.

Program the Punch

To program this punch follow these steps:

1. Press the Mode key; the Mode Function screen appears.
2. Select Punch. The Punch Library screen appears.
3. Press the \downarrow key until the cursor appears at punch number 3.
4. Enter .031 in the Radius field.
5. Enter 3.75 in the Height field.
6. Enter 30 in the Angle field.
7. Enter 0 in the Offset field.

Here is the punch with the measurements discussed in this example:

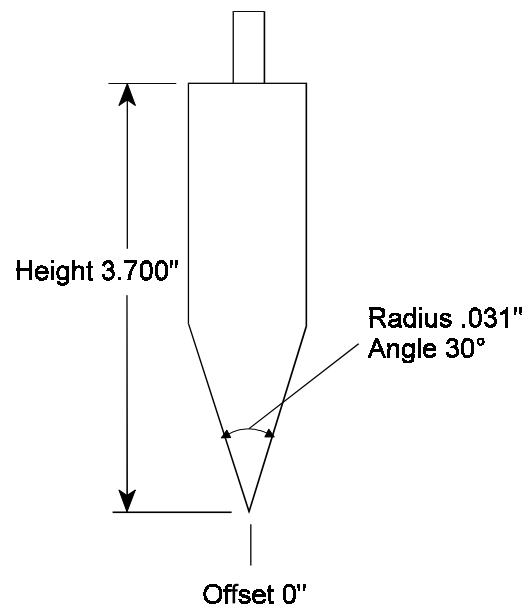


Figure 3-16. Punch

Here is the completed Punch Library screen:

PUNCH LIBRARY				
NUMBER:	RADIUS	HEIGHT	ANGLE	OFFSET
1	0.032	2.125	89.0	0.375
2				
>>3	0.031	3.750	30.0	0.000
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				

+, - TO SELECT TOOL		NEXT - NEXT PAGE		CURRENT TOOL # 3
<ENTER> TO EDIT		BACK - PREV PAGE		ENTER # __

Figure 3-17. Punch Library screen

Program the Example Die

Follow these steps to program the die:

1. Press the Mode key, and the Mode Functions screen appears. (See the Mode screen figure previously shown in this section.)
2. Select Die, and the Die Library List screen appears.
3. Press the \Downarrow key until the cursor appears at die number 3.
4. Enter 5 in the Die Opening field.
5. Enter 2 in the Height field.
6. Enter 30 in the Angle field.
7. Enter .031 in the Radius field.
8. Enter .7 in the Safety field.

Here is a die with the measurements discussed in this example:

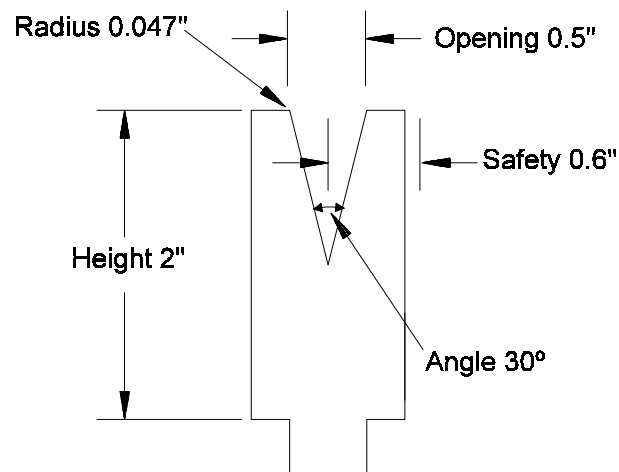


Figure 3-18. Die

Here is the completed Die Library List screen:

DIE LIBRARY LIST					
NUMBER:	OPENING	HEIGHT	ANGLE	RADIUS	SAFETY
1	1.500	4.250	89.0	0.112	1.000
2					
>>>3	0.500	2.000	30.0	0.031	0.700
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					

+, - TO SELECT TOOL		NEXT - NEXT PAGE		CURRENT TOOL # 3
<ENTER> TO EDIT		BACK - PREV PAGE		ENTER # __

Figure 3-19. Die Library List screen

Enter the Job Number

Follow these steps to program the job:

1. Press the Job key to display the Job List screen.
2. Enter 789 for the Job Number.

JOBS AVAILABLE 499		JOB LIST		STAT. AVAILABLE 2000	
JOB #	COMPLETED PARTS	# STN'S	MAT. THICK	DIE #	PUNCH #
1	25	2	0.125	1	1
END OF JOB LIST			JOB #	789	

Figure 3-20. Job List screen

3. Press the Enter Adv key to display the Job Setup screen.

Program the Job Setup

Follow these steps to program this job:

1. Press the Enter Adv key to advance the cursor. At the Program Ram Dim? field the No does not need to be changed since angle format is desired.
2. Enter 3 in the Die # field to select example die number 3 from the die library.
3. Enter 3 in the Punch # field. This selects example punch number 3 from the punch library.
4. Enter .06 in the Material Thickness field. For best results, always enter the actual measured material thickness.
5. Press the Yes key at the Auto Bend All? field. The control automatically calculates bend allowances.
6. Press the Enter Adv key at the Completed Parts field so the message "Job Programmed" appears in the lower left-hand corner of the screen.

Here is the Job Setup screen for job number 789:

JOBS AVAILABLE 499	JOB #	789	STAT. AVAILABLE 2000
PROGRAM RAM DIM? NO		DIE #	3
PUNCH #	3	AUTOBEND ALL?	YES
MAT. THICK	0.060	COMPLETED PARTS	0
JOB PROGRAMMED			

Figure 3-21. Job Setup screen

Program the First Station

The circled numbers in the drawing for this example designate the selected bend sequence. For Station #1, the dimension and angle to program are 1" and 90°.

1. Press the Stat key, and the Station #1 Setup screen appears.
2. Enter 1 in the Dimension field.
3. Enter 90 in the Angle field.
4. The control automatically calculates the compensation value of -0.051" at the Bend All field. If further adjustment is required, this value will be changed automatically.
5. Any adjustment to the angle of the part is programmed at the Angle Adj field.
6. When a gauge retract is required, program the Ret Dim and Ret Time fields. Remember that the retract is selectable so that it can occur at either the material pinching point or at the ram's top of stroke. This selection is made in the Configuration Menu as discussed in that section in the "Programming and Operations" chapter.
7. For downacting hydraulic ram control only, enter 1.3 in the Ram Open field.
8. Enter .5 in the Ram Speed field.
9. Enter 0 in the R-Axis Dim field.

Here is the Station Setup screen with the first station programmed:

JOB #	789	STATION #	1	STAT. AVAILABLE 1999
DIMENSION	1.000	ANGLE	90.0 DEG.	
BEND ALL.	-0.051	ANG. ADJ.	0 DEG.	
RET. TIME	5 SEC.	RET DIM	3.000	
RAM OPEN	1.300	RAM SPEED	0.5	
R-AXIS DIM	0.000			

Figure 3-22. Station #1 Setup screen

Program the Remaining Stations

Follow these steps to program the remaining stations:

1. Press the New Stat key; the Station #2 Setup screen appears. Notice that all fields have the same values as those programmed for Station #1. Only the fields that require new values must be re-programmed.
2. Enter 5 in the Dimension field.
3. Enter 4.5 in the Ram Open field.
4. Enter .5 in the R-Axis Dim field. This raises the gauge surface 0.5" above the die.
5. Press the New Stat key since no other fields require re-programming for this bend, and the Station #3 Setup screen appears.
6. Enter 1 in the Dimension field.
7. Enter 135 in the Angle field.
8. For downacting hydraulic ram control only, enter 4.3 in the Ram Open field.
9. Enter .5 and press the - key in the R-Axis Dim field. This lowers the gauging surface 0.5" below the die.
10. Press the New Stat key since no other fields require re-programming for this bend. The Station #4 Setup screen appears.
11. Enter 90 in the Angle field.
12. For downacting hydraulic ram control only, enter 1 in the Ram Open field.
 - a. Enter 0 in the R-Axis Dim field.
 - b. Since no other fields require re-programming for this bend, press the New Stat key. The Station #5 Setup screen appears.
13. Enter 135 in the Angle field.
14. Enter .5 and press the - key in the R-Axis Dim field.

15. Since no other fields require re-programming for this bend, press the New Stat key. The Station #6 Setup screen appears.
16. Enter 10 in the Dimension field.
17. Enter 90 in the Angle field.
18. For downacting hydraulic ram control only, enter 4.5 in the Ram Open field.
19. Enter 1 in the R-Axis Dim field. This raises the gauging surface 1" above the die.
20. Press the Stat key to list all 6 stations as shown in the sample screen below. Review all the information on the screen and correct any errors that may have been made during programming.

JOB #		STATION LIST			STAT. AVAILABLE 1994
789					
STATION #	DIMENSION	BEND ALL.	ANGLE	ANGLE ADJ.	
1	1.000	-0.051	90	0.000	
2	5.000	-0.051	90	0.000	
3	1.000	-0.018	135	0.000	
4	1.000	-0.051	90	0.000	
5	1.000	-0.018	135	0.000	
6	10.000	-0.051	90	0.000	
END OF STATION LIST					STATION # 1

Figure 3-23. Station List screen

Before Making a Trial Bend

Follow these steps:

1. Load the correct tooling into the press brake.
2. Select and reference the gauging surface to the tooling as described in the “Selecting the Gauging Surface” and the “Referencing the Gauge Surface” sections in the “Programming and Operations” chapter.
3. On the Mode Functions screen, set the Y-Axis Mode field to Active. Press 9 until Active appears.
4. Press the Run button. The screen displays the “Verify Tooling” message. Confirm that the tooling matches the tooling programmed before proceeding.
5. Press the Run button. The Y-axis calibrates on upacting and positive stop press brakes. For downacting hydraulic press brakes, raise the ram to the top of stroke and then lower the ram.
6. Adjust the gauge height so the material hits the gauging surface.
7. Adjust the Retract at Pinch sensor as described in the “Setting the Retract at Pinch Sensor” section in the “Programming and Operations” chapter.
8. For downacting hydraulic ram controls, adjust the Retract at Pinch as described in “Setting the Retract at Pinch on Hydraulic Ram Control” section in the “Programming and Operations” chapter.

Making a Trial Bend and Forming Parts

Follow these steps:

1. Press the Run button again. The display shows the Single Run screen. The gauge only advances to the next programmed station when the Enter Adv key is pressed.
2. When the gauge has positioned to the correct dimension for Station #1, insert the material squarely to the gauging surface.
3. Stroke the ram to form the flange.
4. Measure the flange and angle.
5. Press the Enter Adv key. The gauge advances to Station #2.
6. Insert the material for the second bend. Stroke the ram to form the flange.
7. Measure the flange and angle.
8. Repeat the previous three steps until the part is completely formed.
9. If corrections are necessary, return to the Station Setup screens and adjust the values to achieve the desired flange lengths and angles.
 - a. Press the Stat key to return to the Station List screen.
 - b. Press 1 and the Enter Adv key to edit Station #1.
 - c. Press the Next key to display the next Station screen.
10. Press the Run button and form another part. Check the flanges and angles. Adjust if necessary.
11. Form parts.
12. When production is complete, press the Stop button to de-energize the axes and blank the screen.

Communication Port

The RS-232-C serial communication port is a standard feature on the Autobend 7 control system (AB7).

Optional RS-232-C Serial Port

The RS-232-C serial port provides uploading or downloading of the entire memory block between the AB7 control and a personal computer. For best results, be familiar with the following information concerning location, connector types, cables, and pins before operating the system with this option.

Port Location

RS-232-C connection to the AB7 is located on the power cabinet. Connect the port to a computer to download or upload files.

Connector Types

Since the communications industry standard for connectors has changed over the years, Hurco has adapted its controls to incorporate these changes. The RS-232-C serial port on the Hurco control uses a 9-pin D-type connector.

A 9-pin D-type connector (DB-9) is illustrated in the figure that follows this section. Refer to the table on the following page for additional information pertaining to DB-9 serial port connections.

Note

While the signals listed in the table on the following page conform to the RS-232-C standard, it should be noted that not all standard RS-232-C signals are available at this port. Some peripheral devices may have provisions for RS-232-C control signals not available at the ports described here. However, such devices can usually be adapted to these ports. In some cases, it may be necessary to add jumpers to the connector for the peripheral device.

9-Pin D-Type Port Specifications

The table below shows pin signal definitions for the 9-pin port. The figure on the following page illustrates the pin assignments of the 9-pin port in the AB7 power cabinet. The RS-232-C DB-9 connector in the AB7 is wired as a DTE device. When using a PC with a DB-9 connector, wire the cable using the diagram shown in the 9-pin to 9-pin Cable Connections figure at the end of this chapter. Typically, the RTS and CTS pins are not used.

RS-232-C Signals Available at 9-Pin Serial Ports	
Pin 1 - DCD	This pin connection is not used by the machine control.
Pin 2 - RXD (Receive Data)	Data received by the control in serial format from peripheral device on this line.
Pin 3 - TXD (Transmit Data)	Data transmitted by the control to peripheral device in serial format on this line.
Pin 4 - DTR (Data Terminal Ready)	This pin connection is not used by the machine control.
Pin 5 - SG (Signal Ground)	Line establishing the common ground reference potential for all interface.
Pin 6 - DSR (Data Set Ready)	This pin connection is not used by the machine control.
Pin 7 - RTS (Request-to-Send)	This pin connection is not used by the machine control.
Pin 8 - CTS (Clear-to-Send)	This pin connection is not used by the machine control.
Pin 9 - RI (Ring Indicator)	This pin connection is not used by the machine control.

Note

Consult the manual of the peripheral device being connected to the Autobend control and determine whether it is a Data Terminal Equipment (DTE) or Data Communication Equipment (DCE) device. Different connections are used between DTE and DCE devices. All Autobend controls are considered DTE devices.

Pin Assignments

The figure below illustrates the pin assignments of the 9-pin port in the AB7 power cabinet:

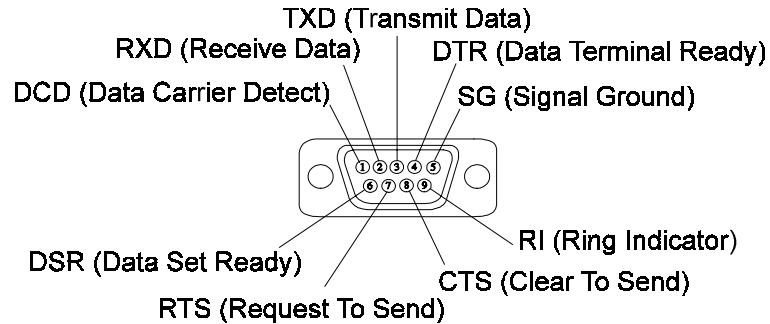


Figure 4-1. Male 9-Pin D-Type (DB-9) Connector

Cable Recommendations

Follow these cable recommendations:

1. Use double-shielded low capacitance cable designed for this purpose.
2. Use six-conductor cable for connectors.
3. Use 22-gauge stranded wire, minimum size.
4. Do not use cable lengths over 100 feet.
5. Connect cable shield(s) only to the PG pin (protective/frame ground) at the Hurco machine. Do not connect shield(s) to the opposite end of cable (peripheral device).
6. Route cables away from fluorescent lighting fixtures or other possible sources of electrical noise (i.e., power cables, contactors, transformers, arc welders, etc.).

Cable Diagrams

The cable configuration diagrams define the required connections between the AB7 and IBM or compatible PC. Refer to the 25-pin to 9-pin and the 9-pin to 9-pin figures that follow. Note that all cables use the TXD, RXD, and SG signals, and only those computers that use hardware handshaking require the additional RTS and CTS signals.

Note

If a standard cable is purchased, it can be inter-connected with a null modem.

25-Pin to 9-Pin Cable Diagram

Follow the cable diagram below when making a cable to connect an AB7 to a computer (25-pin port).

Note

Connect CTS and RTS signals if using CTS/RTS Protocol.

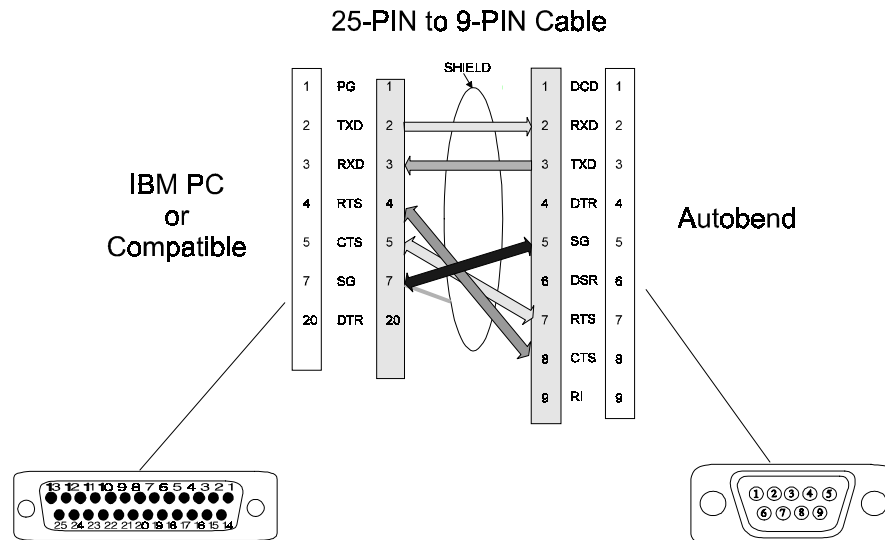


Figure 4-2. 25-pin to 9-pin Cable Connections

9-Pin to 9-Pin Cable Diagrams

Follow the cable diagrams in the figures below when making a cable to connect an AB7 control to a computer (9-pin port) or to another AB7 control. There are two options for RTS and CTS connections with 9-pin to 9-pin cables:

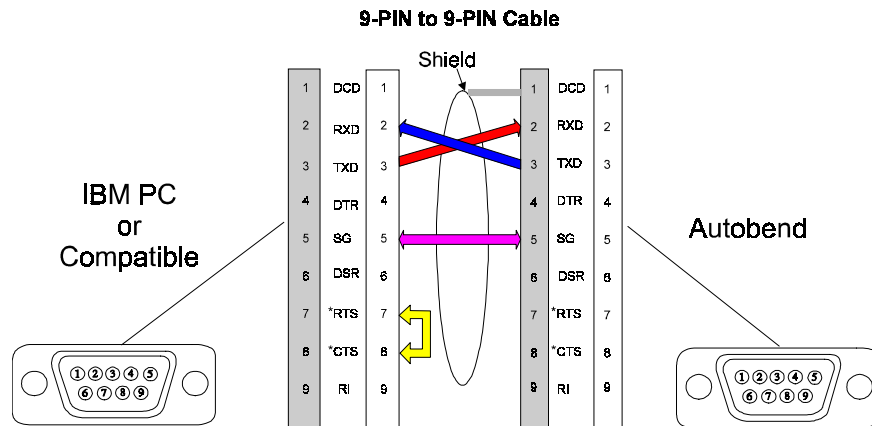


Figure 4-3. 9-pin to 9-pin Cable Connections

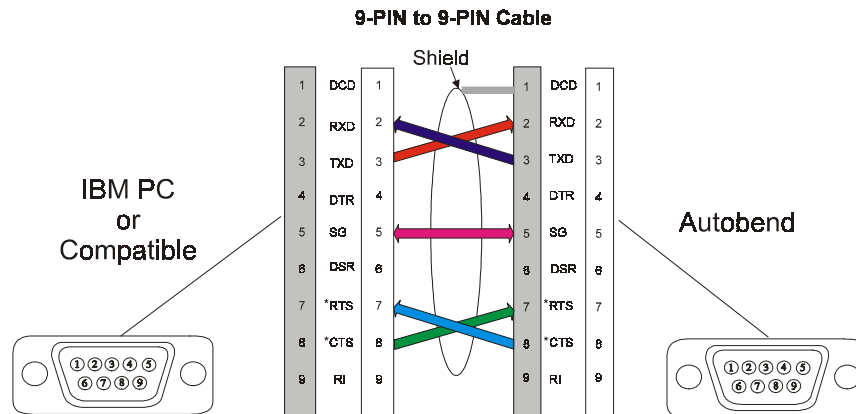


Figure 4-4. 9-pin to 9-pin Cable Connections

Note

Connect CTS and RTS signals if using CTS/RTS Protocol.

Cable Configurations

Because of the variety of connectors used at the PC and the Autobend (AB) control, there are several cable configurations. These cables follow the standard RS-232-C wiring configuration. Make or buy the cable to match the configuration.

25-Pin to 9-Pin Cable Configuration			
PC, 25-Pin Connector		AB, 9-Pin Connector	
Signal	Pin	Pin	Signal
Transmit Data (TX)	2	2	Receive Data (RX)
Receive Data (RX)	3	3	Transmit Data (TX)
Clear To Send (CTS)	5	7	Request To Send (RTS)
Signal Ground (GND)	7	5	Signal Ground (GND)
Request To Send (RTS)	4	8	Clear To Send (CTS)
Shield	7		(Shield not connected)

9-Pin to 9-Pin Cable Configuration (RTS to CTS Option 1)			
PC, 9-Pin Connector		AB, 9-Pin Connector	
Signal	Pin	Pin	Signal
Transmit Data (TX)	3	2	Receive Data (RX)
Receive Data (RX)	2	3	Transmit Data (TX)
Clear To Send (CTS) Jumpered to PC 7	8		Request To Send (RTS) (Not connected)
Signal Ground (GND)	5	5	Signal Ground (GND)
Request To Send (RTS) Jumpered to PC 8	7		Clear To Send (CTS) (Not connected)
Shield	5		(Shield not connected)

9-Pin to 9-Pin Cable Configuration (RTS to CTS Option 2)			
PC, 9-Pin Connector		AB, 9-Pin Connector	
Signal	Pin	Pin	Signal
Transmit Data (TX)	3	2	Receive Data (RX)
Receive Data (RX)	2	3	Transmit Data (TX)
Clear To Send (CTS)	8	7	Request To Send (RTS)
Signal Ground (GND)	5	5	Signal Ground (GND)
Request To Send (RTS)	7	8	Clear To Send (CTS)
Shield	5		(Shield not connected)

Troubleshooting

This chapter provides information about hardware, application, and tooling diagnostics for troubleshooting, screen messages, and a glossary of terms. Refer to this chapter to help determine solutions to problems should they occur.

Troubleshooting Guide

Here is a guide to follow while troubleshooting.



Warning

Turn Off the power whenever possible during troubleshooting. Use extreme caution when working in or around equipment that is powered.

Review these procedures and questions to evaluate the problem:

Procedures
1. Recognize symptoms.
2. Elaborate symptoms.
3. List probable faulty functions.
4. Localize the faulty function.
5. Localize trouble to the circuit.
6. Perform failure analysis.

Questions
• What is really wrong?
• How is the problem apparent?
• Is it always that way?
• If intermittent, under what conditions?
• Was there any abuse? (heat, vibration, contamination, etc.)
• Did the problem occur suddenly or gradually?
• Did the problem occur during operation?
• Does the problem affect other functions?
• Any additional details?
• Has anyone tried to fix it? If so, how?

Hardware Diagnostics

The following table lists possible difficulties and procedures to follow to correct each one:

Problem	Possible Cause	Correction
No console display or partial console display.	Incoming power not turned on.	Turn power on.
	Power not applied according to voltage tag.	Correct per voltage tag.
	Incoming power fuse blown.	Replace fuses.
	Control cable not correctly plugged into the connector on the Mainboard located in the power cabinet or to the Console Interface board.	Correct if wrong.
	Power Supply is defective.	If the CRT is fluctuating or looks like it is “breathing,” check for $\pm 10\%$ of 12 volts on the power supply. Also, check for the following voltages at these Mainboard test points: TP2 for +5 VDC $\pm 10\%$ TP3 for +12 VDC $\pm 10\%$ TP4 for -12 VDC $\pm 10\%$ (Use TP1 for Ground Reference.) Replace if necessary.
	Display/CRT is defective.	Select an existing program in the control and run it. If the gauge functions, the CRT is defective. If gauge does not function, unplug display/CRT and re-run program. If the gauge now works, display/CRT is defective.
Mainboard is defective.	Check the Mainboard to see that the Run LED is on. If not, replace Mainboard.	

Problem	Possible Cause	Correction
<p>When Run is pressed, the gauge does not move.</p> <p>“Motion error” fault may also be displayed.</p>	<p>Servo control relay, K1 is not being energized on the Mainboard.</p>	<p>Check the servo enable signal on the Mainboard at connector J4 pin 12. If not present, check that K1 relay circuit on the Mainboard is energizing. If not, replace Mainboard.</p>
	<p>Gauge cable is damaged.</p>	<p>Inspect and replace if damaged.</p>
	<p>The motor is damaged.</p>	<p>Check for damage by:</p> <ol style="list-style-type: none"> 1. disconnecting power to the Autobend power cabinet 2. using DVM (Ohmmeter) for ohms. 3. checking motor contacts for ohm reading. Rotate every 20 to 30°. Look for similar readings. 4. looking for inconsistent measurements and replacing MTE. 5. using DVM on low (20 VDC) scale. 6. placing leads on motor contacts and manually moving the carriage. A 2-3 VDC reading should be measured (depending on carriage speed). If not, replace motor.

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Problem	Possible Cause	Correction
When Run is pressed, the gauge does not move. “Motion error” fault may also be displayed. (Continued)	Servo amplifier damaged.	1. Check for 45 to 65 VDC at the servo amplifier. If not, check fusing and connections. 2. Check for servo enable input. When servo enable is active, input should be low. Trace signal back to Mainboard. If signal is not present, replace Mainboard. 3. Check for limit switch input. When switches are not actuated, input should be low. Trace input to switches then to motion module, replace if necessary. If these steps have been tried and everything checks out OK, replace the drive amplifier.
	DAC signal not present at amplifier due to damaged motion module or cable.	Trace signal to motion module. If not found, replace motion module.

Problem	Possible Cause	Correction
Control display is Locking-up	Incoming power source is incorrect	Ensure incoming power source is a three-wire system (hot, neutral, and ground) and that the voltage rate is correct for the unit on a dedicated line for the Autobend. Correct if not.
	Power supply is defective.	Check test points on mainboard. <ul style="list-style-type: none"> • TP2 for +5VDC \pm10% • TP3 for +12VDC \pm10% • TP4 for -12VDC \pm10% If voltages are missing, check power supply outputs.
Gauge moves only when Run button is pressed.	Defective latching relay K1 on the Mainboard.	Check for cold solder joints around the relay. If none are found, replace the Mainboard.
	Defective Run or Stop buttons.	Check the continuity of the Run and Stop keys. Replace if defective.

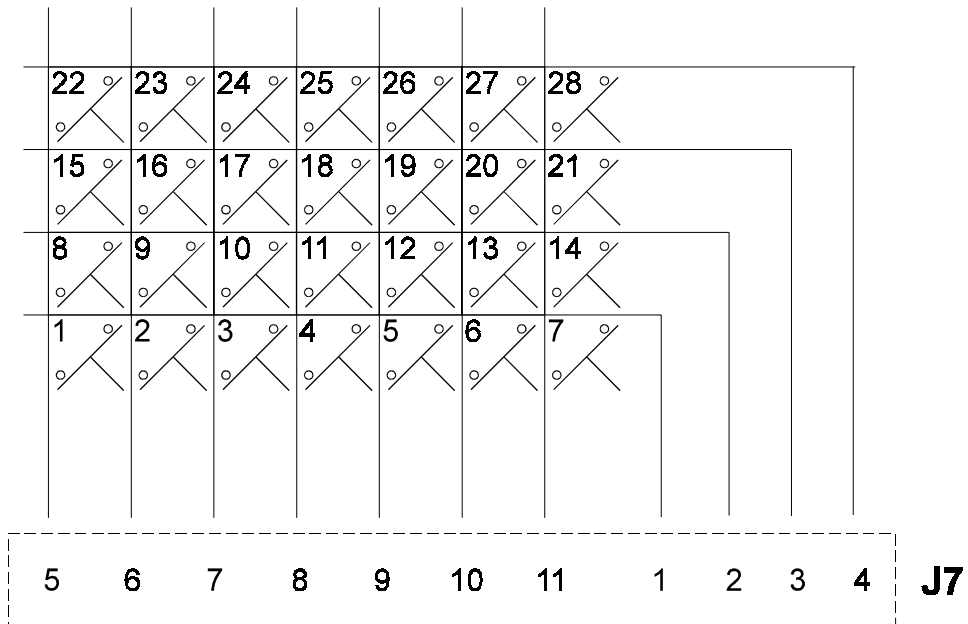
Problem	Possible Cause	Correction
Gauge drifts out of position or oscillates.	Balance pot on servo amplifier needs adjustment.	Adjust if necessary.
	Motor needs cleaned.	Remove the motor, check the brushes, and clean carbon from the motor. Re-balance pot on servo amplifier.
	Defective Encoder.	Check encoder signals. Replace if necessary.
	Servo amp defective.	If problem remains, replace servo amp.
Gauge not positioning correctly.	Defective Encoder.	Check encoder signals. Replace if necessary.
	Cables damaged or connections loose.	Check cables for damage. Replace if necessary. Tighten any loose connections.
	Drive belt loose or damaged.	Check drive belt. Make sure it is tightened properly and is not worn. Replace or tighten if necessary.
	Mechanical binding or drag.	Check linear ways and leadscrew for obstructions. Replace worn parts if necessary.
	Calibration incorrect.	If, after calibration, the gauge positions ¼" off, re-position the marker pulse in relationship with the calibration switch. Loosen the drive belt and turn motor pulley (without moving the leadscrew pulley) approximately ¼ - ½ turn; tighten belt.

Problem	Cause	Correction
<p>During calibration, the gauge moves to the rear and stays.</p>	<p>Calibration switch or cable is damaged or loose.</p>	<p>Complete a continuity check of the switch with the cable unplugged. Replace if damaged. Check continuity of the cable. Replace if damaged. Tighten any loose connections.</p>
	<p>Motion module is defective.</p>	<p>Check for proper outputs from the motion module. If not, replace the motion module board.</p>
	<p>Servo amplifier is damaged.</p>	<p>Check for valid enable signals. If present, replace servo amplifier.</p>
<p>The Run cycle is interrupted or does not occur. One of the following error messages is displayed:</p>	<p>Dimension error.</p>	<p>The back gauge has a programmed dimension greater than 24". Check the program to be sure it is correct.</p>
	<p>Missing encoder counts or missing marker pulse.</p>	<p>Check encoder signals. Replace if necessary.</p>
	<p>Motion error.</p>	<ol style="list-style-type: none"> 1. Check gauge travel for binding. Repair if necessary. 2. Check for 45 to 65 VDC at the servo amplifier. Replace fuse or power supply if not present. 3. Check for enable signals at amplifier. Replace motion module or Mainboard if not present. 4. If above checks out, replace servo amplifier.
<p>Keyboard does not function.</p>	<p>Keyboard is damaged.</p>	<p>Check keyboard per the keyboard test procedure outlined in the Keyboard Test Chart that follows this section. Check all the keys in question. If defective, replace the keyboard. If the keyboard passes, replace the Mainboard. Check keyboard wiring.</p>

Keyboard Test

Follow these steps to test the keyboard:

1. Disconnect the keyboard connector J7 at the Control Console Connection Board.
2. With an ohmmeter, measure across the pins on J7, verifying the operation of each key according to the chart. As each key is depressed the meter should read 0 ohms, and as each key is released the meter should read infinite ohms.



1. Mode	8. Stat.	15. N/A	22. Job
2. #1	9. #4	16. #7	23. decimal(.)
3. #2	10. #5	17. #8	24. #0
4. #3	11. #6	18. #9	25. Clear
5. Yes	12. No	19. Insert	26. Delete
6. Next	13. Out	20. N/A	27. In
7. Enter Adv.	14. Back	21. N/A	28. New Stat

Figure 5-1. Keyboard Test Chart

Application and Tooling Diagnostics

Problem	Cause	Correction
Angle programmed is not obtained with <math><10^\circ</math> of correction	Wrong tooling (die opening, die radius, punch radius, etc.) programmed.	Check that the tooling installed is the same as specified in the Job Setup screen for the active job. Verify measurements and correct if necessary.
	Material thickness varies	Check material being used does not vary from blank-to-blank. Verify measurements and correct if necessary.
	Tooling not appropriate for operation.	Check that tooling installed is appropriate. Verify measurements and correct if necessary.
	Tooling in poor condition or installed incorrectly.	Check that the tooling is in good condition and properly installed.
	Ram tilt not level.	Form parts on each end of machine. Level machine.
	Inadequate die crowing.	Shim tooling to obtain consistent angle along bend length.
	Press brake control switches improperly set.	Verify that press brake control switches are set so they cannot be actuated (when Y-axis is Active). Try other settings for Ram Speed selection, Stop, On, Speed Change, etc., to improve press brake reliability. Refer to the press brake manufacturer's manual for instructions.
	Insufficient stroke length.	Raise the open height of the ram by increasing the Ram Open parameter.

Screen Messages

There are two types of screen messages. One type of message verifies programming and operation functions. Error messages alert the operator of potential problems. The system can still be operated normally under these conditions. Error messages are cleared by pressing the Stop button.

Programming and Operation Messages	Definition
Are You Sure	Question used to qualify a previous response, allowing an operator to be certain that the selections are correct.
Auto	Run cycle that advances the stations automatically with each ram stroke.
Calibrating	Message to indicate that gauge(s) are establishing an electronic reference position, prior to operation. Do not confuse this with referencing the gauge bar.
Cleared	Indicates selected input was erased from the system memory.
Deleted	Indicates selected job or station was removed from the system's memory.
Depress Run	Message for operator to enable axes.
End of Job List	Indicates the last job available in the system memory.
End of Station List	Indicates the last station available in the selected job.
Manual Jog	Method to manually move the axes.
New Job	Notification that a new job number was created.
No Job Programmed	Indicates no jobs exist in memory.
No Stat Programmed	Indicates no stations exist in memory for the job selected.
Not Available	Indicates there is not enough memory available to continue programming.
Not Found	Indicates a non-existent job or station requested.
Protected Access	Programming disabled; the control's keyswitch locked in Operation Only mode and unable to accept programming.

Programming and Operation Messages (continued)	Definition
Servos Not Latched	Indicates that the servo relay did not latch.
Single	Run cycle that holds the axes at the station displayed until the Enter Adv key is pressed. Then the axes advance to the next programmed station.
Station Programmed	Indicates the completion of programming for the current station.
Uncalibrated	Indicates operation is selected and the axes have not been calibrated.
Verify Tooling	Confirms tooling loaded in program is actually the tooling used.

Error Messages	Definition
Amplifier Fault	An error signal from the amplifier shows that the amplifier is not operational.
Configuration Error	The system setup is not correct.
Dimension Error	Programmed dimension exceeds maximum travel limits.
Entry Error	Improper data input or command.
Dim + Tool Height > Max	The ram dimension and tool height exceeds the Y maximum parameter.
Dimension < Tool Safety	The gauge dimension is less than the safety programmed in the die library.
IO Task	Indicates that an I/O command is incorrect. Indicates a potential hardware problem. Contact Hurco.
Illegal Angle	Angle is below minimum (die/punch library).
Illegal Depth Stop	The Depth Stop number is not 1 through 6.
Illegal Die Top	The Tool 0 calibration is incorrect.
Illegal Die Bottom	The Tool 0 calibration is incorrect.
Illegal Ram Open	The value programmed for Ram Open is not between 0 and the Y-maximum value.
Illegal Ram Stroke	The ram was stroked while the other axes were still positioning.

Error Messages (continued)	Definition
Illegal Speed Change	The value programmed for Speed Change is not between 0 and the Y-maximum value.
Illegal State	Specifies the type of I/O task error. Contact Hurco.
Invalid Entry	Improper selection or command.
Invalid Message	Command to change states is incorrect. Contact Hurco.
Job Not Fully Programmed	The job programming is not complete.
Keystroke Termination Error	An error created because of a possible hardware problem.
Limit Switch	Reports an unexpected limit switch operation during operation.
Marker Not Found	The electronic pulse from the encoder was not detected during calibration.
Missing Cal Switch	Displayed when the limit switch input is not detected during calibration.
Missing Limit Switch	Displayed when the limit switch input is not detected during calibration.
Missing Encoder Counts	The electronic pulses from the encoder are not detected.
Missing Marker	Displayed when the electronic calibration signal was not detected during calibration.
Motion Error	Axis movement has occurred incorrectly or not at all.
Net Gauge Dimension	The sum of the gauge parameters (dimension, bend allowance, retract dimension) exceed the maximum dimension limit.
Punch Angle > Die Angle	Angle of punch is greater than the die's angle.
Run Task	Indicates that an operation command was not handled properly.
Warning: Low Battery	Message displayed at power up indicating battery is low.

Glossary

Angle	The desired programmed bend of a part, measured as an inside angle. Used when equipped with ram control.
Axis	The term used to describe the system's control of the gauge (X-axis), ram (Y-axis), and gauge height (R-axis).
Bend Allowance	Programmable offset to the gauge position that compensates for material growth or shrinkage due to bending. Can be manually entered or calculated automatically by the control.
Configuration Menu	The system setup screen used to configure the control for the specific axes.
Cursor	The flashing line or arrows on the screen that indicate the data entry point.
Dimension	The programmed position of the gauging surface.
Flash EPROM	Memory storage device.
Job Number	Numerical sequence of up to 17 digits that identifies the jobs programmed.
Jobs Available	The number of new jobs that may be programmed. After programming a new job, this number decreases by one.
Manual Jog	Provides a method to manually move the axes.
Master Clear	Erases the entire memory.
Master Save	Stores the entire memory in Flash EPROM.
Measurement Units	Global selection of inch or metric measurement.
Mode Functions	The screen that allows auxiliary functions to be performed.
Outside Shoulder Dimension (OSD)	The tangent point between the die radius and the top of the die used for measuring die opening.
Part Length Compensation Software	Software offered with the Hurco Press Brake that handles Part Length Compensation. With Part Length Compensation, the length of the part is programmed by the software to compensate for angle adjustment on longer parts. This software includes a field for selecting the type of metal used.
Pinch Point	The point of operation where the part is firmly clamped by the press brake's tooling.
Programming	The process of entering data in the Autobend 7 control.
Protected Access	A keyswitch lock disables programming when switched Off.
R-Axis	Describes the control of the gauge bar's height.
Ram Control	The ability to control the press brake's ram stroke position. Referred to as second-axis control and Y-axis.
Ram Dimension	The programmed depth of the punch into the die.

Continued on next page.

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Ram Open	The position of the punch above the die at the completion of the bend.
Ram Speed	The position where the punch changes speeds.
Read Program	Transfers an entire memory block from a personal computer to the Autobend 7 via the RS-232-C port.
Retract Dimension	The programmed gauge(s) movement away from the press brake's tooling. Activated either at the pinch point of the tooling or at the top of stroke.
Retract Delay	The programmed timer delay when the gauge has retracted. The timer begins when the ram has returned to the top of stroke. After completion of the delay the gauge(s) move to the next programmed dimension.
Second Axis	The term used to control the press brake's ram positions. Referred to as ram control and Y-axis.
Serial Communications Station	Provides the uploading/downloading of the entire memory block of the Autobend 7 and a personal computer via the RS-232-C port. A bend programmed within a job.
Stations Available	The number of new stations that can be programmed into the system. Programming a new station decreases this number.
Theoretical Sharp Dimension (TSD)	The measurement between the inside of the shoulder radii used for measuring die opening. The <i>Hurco Press Brake Tooling Catalog</i> contains the TSD measurements for die openings.
Write Program	Transfers an entire memory block from the Autobend 7 to a personal computer via the RS-232-C port.
X-Axis	The term used to describe the control of the gauge.
Y-Axis	The term used to describe the control of the press brake's ram. Also referred to as ram control and second axis.

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