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Autobend 6  
Programming and  
Operations Manual  
Revision D

# Programming and Operations Manual

## Autobend 6

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Hurco is committed to designing reliable, easy-to-operate gauging systems 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 Autobend System.

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 is explained in this ANSI publication which is available from:

American National Standards Institute  
1430 Broadway  
New York, NY 10018

These and other safety precautions are discussed in the European A type standards EN292 parts 1 and 2, "The Supply of Machinery (Safety) Regulations 1992." No. 3073 and "The Supply of Machinery (Safety Amendment) Regulations 1994." No. 2063. These and other publications are available from:

HMSO bookshops and accredited agents or HMSO publications centre (tel: 0171 873 9090, fax: 0171 873 8200) or DTI Business in Europe Hotline on (01779) 444888.

Refer additional questions or concerns to the local Health and Safety Officer.

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. Also review the manuals furnished by your press brake manufacturer for additional safety information and procedures that must be observed.

Please read all information for safe, efficient use of the Hurco Autobend 6 control and gauging system.



# Using this Manual

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The *Programming and Operations Manual* contains procedures for programming and operating the Autobend 6 gauging system (AB6) and connecting the optional communication port. This manual employs several conventions to explain the system concepts and to 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 - Quick Reference

Appendix

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.

The names of keys and buttons begin with capital letters within the text and in the index to help the reader identify the exact reference as it appears on the console.

## Standard Text Icons

This manual contains several icons to mark important sections:



### Caution

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



### Hints

The light bulb icon marks useful suggestions for the machine tool operator. These suggestions may show creative uses of the Autobend features or just helpful hints.



### Important

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



### Troubleshooting

The toolbox icon indicates steps that can be taken to solve potential problems. These sections contain information for Hurco Technical Service representatives and customers.



### Warning

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



### Where can we go from here?

This icon and heading indicate that at this point in the description the operator has several possible options which are then listed under the heading.

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# System Basics

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This chapter prepares the user to operate the Autobend 6 Control System (AB6) by covering the following topics:

- Press Brake and AB6 Control System
- Safety Precautions
- Service Department
- Power-up Procedure
- Blank Display Feature
- Shut-down Procedure
- Maintenance Schedule

## Press Brake and AB6 Control System

The AB6 is intended to be used by trained operators who create and run metal bending programs on the control console. While running the press brake and control, the operators must use their experience and training to make any necessary adjustments and improve the efficiency of their programs.

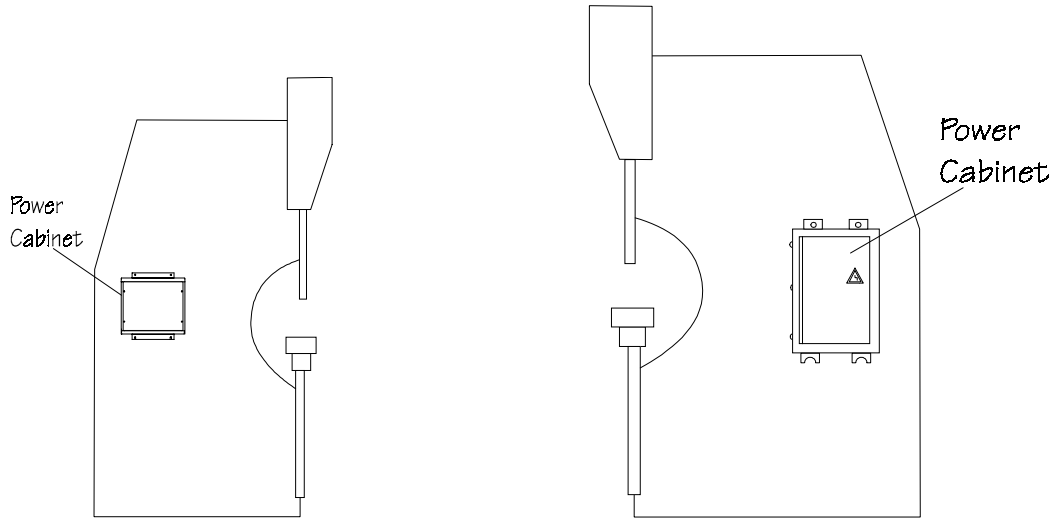
Before operating the press brake and the AB6 control console be familiar with safety issues regarding these components:

- Power cabinet and control console
- Gauges
- Axes' orientation
- Control console Stop key



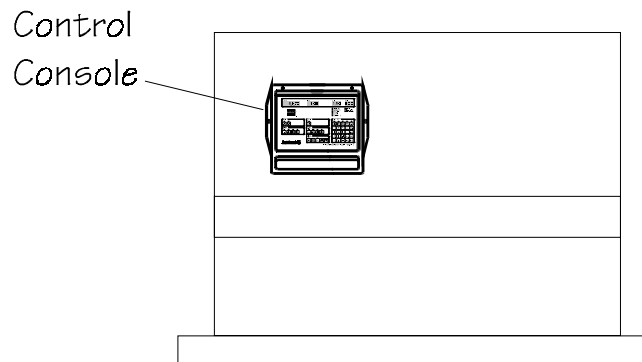
## Power Cabinet and Control Console

The figures below are examples that show *upacting* press brakes with the small and large AB6 power cabinets attached to the side:



*Figure 1-1. Side Views of Upacting Press Brake with Small and Large Power Cabinets*

The figure below shows an *upacting* press brake with the AB6 control attached directly to the press brake. An alternative method of attaching the control console is to attach it with the optional pendant arm. (Refer to the *Installation* manual for details.)



*Figure 1-2. Front View of Upacting Press Brake with AB6 Control Console Attached*

## Control Stop Key

The AB6 control console keypad and display areas are shown below. Users press the keys on the control console to interact with the AB6. Press the Stop key on the AB6 control any time an emergency situation arises involving the Autobend equipment. Refer to the “Programming and Operations” chapter for details about the control console.

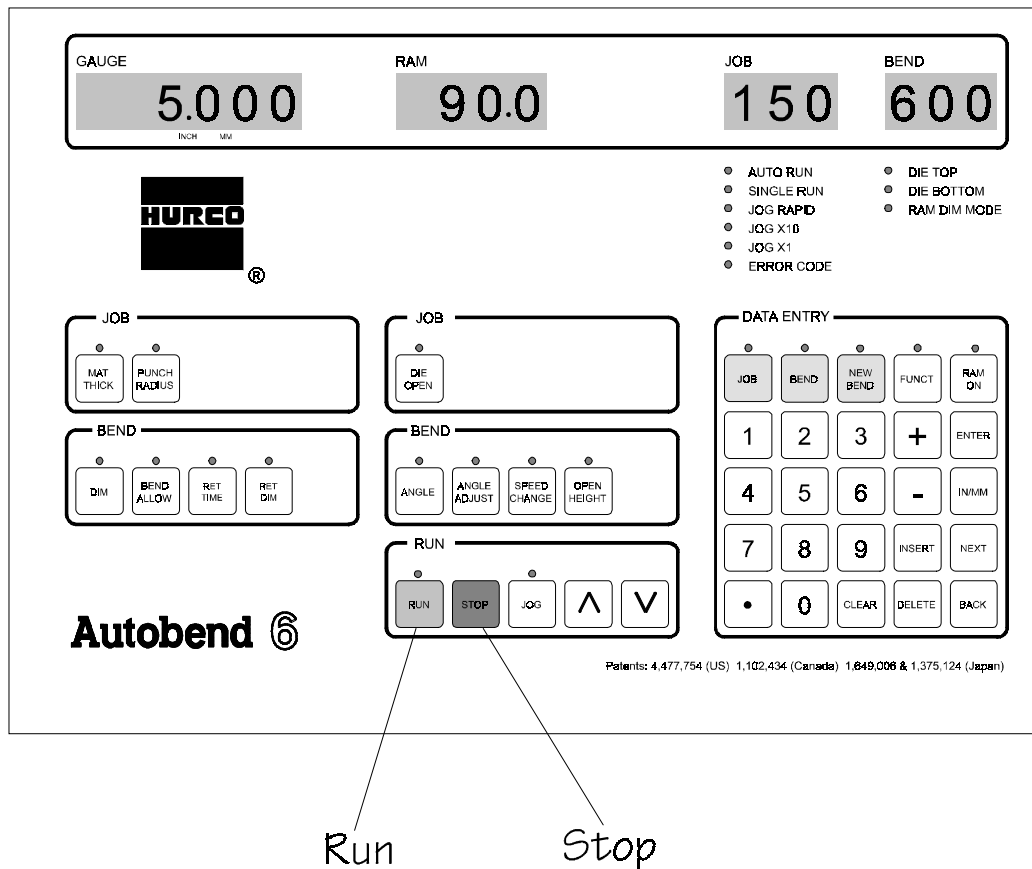


Figure 1-3. AB6 Control Console Keypad



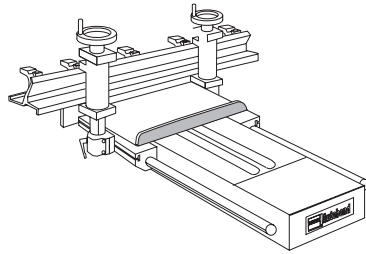
### Important

The AB6 Stop key does not force the press brake to stop unless an interlock is wired between the Ram Enable relay and the press brake logic.

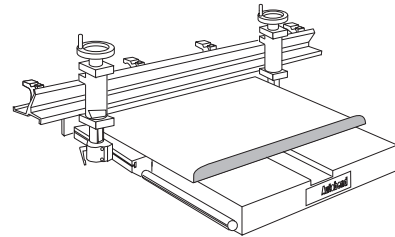
The press brake's Stop or E-Stop does not force the AB6 to stop unless an interlock is wired between the press brake logic and the AB6 logic.

## Gauges

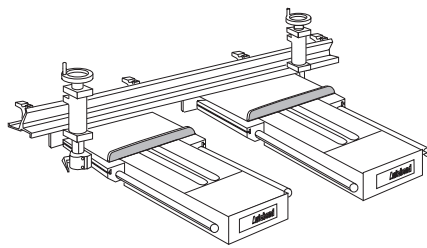
The AB6 control operates all S and LP models of Autobend gauges. These gauges are mounted to the rear of different types of press brakes as discussed in the *Installation* manual.



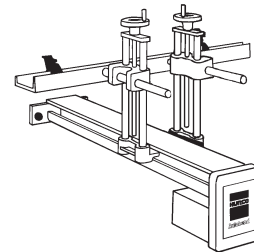
S6 Gauge Assembly



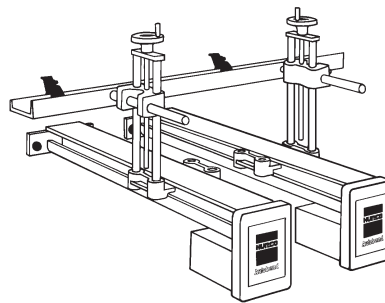
S7 Gauge Assembly



S8 Gauge Assembly



LP11 Gauge Assembly



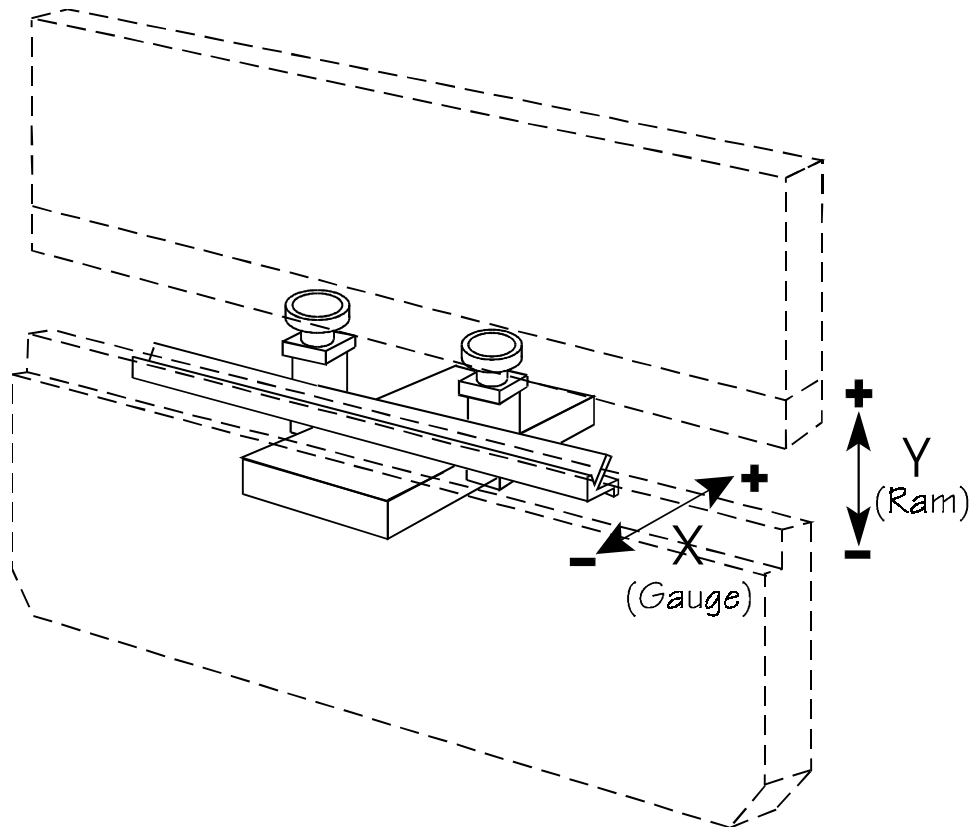
LP22 Gauge Assembly

*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. Positive movement is to the rear of the press brake, and negative movement is to the front of the press brake.
- The Y-axis controls the stopping point of the press brake's ram for the desired bend to occur. Positive movement is up, and negative movement is down.
- 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 AB6. This product is intended to be used by trained operators who create metal bending programs either on the control or an off-line system and then run the programs on the AB6. While running the AB6, the operators must use their experience and training to make any necessary adjustments and improve the efficiency of their programs.



### Warning

Errors in setup or programming can damage the press brake and cause severe personal injury. Hurco's AB6 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.

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 AB6 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 AB6 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 AB6 as it is intended to be used. The owner must be certain that the operator assigned to run the AB6 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 AB6. 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 AB6 was designed to meet a wide range of customer needs. If the owner feels that the AB6 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. Contact the press brake manufacturer for information about press brake modification.

If the owner modifies the AB6 in any way without Hurco's assistance and a written authorization, the warranty becomes invalid. In addition, such unauthorized modifications may cause safety hazards that may injure the operator and damage the AB6. The owner is fully responsible for any accidents resulting from unauthorized modifications.

## 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 AB6 with those modifications, such operation is extremely hazardous, a *foreseeable misuse*, 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 AB6 and prevent its use until it has been repaired. The owner must then contact a Hurco service representative for assistance in restoring the AB6 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 AB6 is installed as described in this manual. A Hurco Field Service Engineer or an authorized representative must install the AB6 in the prepared location. This location must not subject the AB6 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, and if it is necessary to remove the control console from the press brake, Hurco recommends that the owner call Hurco for assistance. Hurco recommends that the owner use a competent rigger with the necessary equipment to move the press brake to the desired location.

## Maintenance

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



## Warning

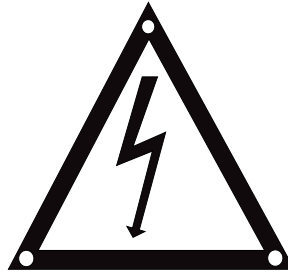
This AB6 must not be serviced, repaired, or maintained by unqualified or untrained personnel.

If at any time the operator or owner determines that the electrical cabinet must be opened, the power must be shut off to the AB6 and the press brake before the doors are opened. The only exception to this rule is when the AB6 or press brake is being serviced for electrical problems. Under those circumstances, Hurco Field Service should direct the person performing the work.



## Safety Signs

Safety-related signs pertaining to the AB6 are affixed to appropriate system components. A warning sign appears on the *safety decals* that must be affixed to specific areas on the Autobend components. (See the *Installation* manual for directions for affixing these decals.) The warning signs alert operators of the possibility of personal injury and damage to the AB6 and press brake if they do not follow the described procedure.



*Figure 1-6. Warning Decal*

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



*Figure 1-7. Caution Tape*

## **Operators' Responsibilities**

To avoid serious personal injury, damage to the AB6, and unproductive downtime, the operator must pay careful attention to safety precautions and proper maintenance of the AB6. 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 in order to operate an AB6. The operators who are going to run the press brake must be trained by Hurco or an authorized representative. Before attempting to run the AB6, the operator should study this manual and become familiar with the 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 AB6 and 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 AB6 and press brake.

### **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 AB6 and press brake 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 AB6, always follow these safety rules:



### Warning

- Review all safety information and operating instructions the press brake manufacturer provides before attempting any operation.
- Use the press brake's Emergency Stop circuits to control emergency situations involving the AB6 and the press brake.
- Use the AB6's Stop key to control emergency situations involving the AB6 and the press brake.
- Turn the operator control(s) to Off before attempting to adjust the system.
- Use proper point of operation safeguarding.
- Adjust the gauging system from the rear of the press brake.
- 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's point of operation.
- Check the installation of the carriage arrestor bars before operating the system.
- When testing the AB6, 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.
- When testing and running the AB6, never attempt to bend metal that requires tonnage beyond the capacity of the press brake or the tooling, whichever is less.

## System Operation (continued)

- 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.

### Note

This list does not include all of the possible hazards regarding the AB6 and the press brake.

## 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 that 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 system having the necessary work volume capability.

Operators must follow procedures for referencing the bending material before starting the AB6. Remember that loose objects, such as wrenches and chuck keys, can become flying projectiles if not removed from the gauge bar before the AB6 is started. Operators should also be aware of protruding machine members (such as hoses, piping, or ductwork) when working around the AB6 and the press brake.

## 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 AB6 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 AB6. A larger press brake should be used for such a part.

## Part Bending

Operators should always know the locations of the *Stop* key on the press brake and AB6 control. 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* key without knowing exactly what the AB6 and press brake will do!
- Never start the AB6 when the back gauge is in contact with the work piece.
- Never stand in the rear inside area between the back of the press brake bed and the gauge bar while the gauge is moving.
- **Never leave the AB6 or the press brake unattended.**

The operator must work within reach of the Stop keys and must be able to observe the operation of the gauge. If the operator is running a program and cannot reach a Stop key nor observe the gauge, that is considered *unattended operation* and is viewed as a *foreseeable misuse* of the AB6.

## 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.

### Electrical Systems

Clean electrical AC power source, as defined in the ANSI/NFPA 79 standard, is essential to the successful operation and continued reliability of the AB6. Therefore, the gauging system must be properly connected to its power source as described in detail in this manual. The AB6 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 AB6 system.



### Warning

If the AB6 is not properly connected to its power source, there may be electrical noise and fluctuations with the power source that will affect safety, performance, and the warranty. In addition, brownout conditions and surges may occur in the shop, and the AB6 electrical components may fail and require replacement.

## Electrical Safety Guidelines

Follow these electrical safety guidelines before operating the AB6:

1. Provide a clean source of electrical power with a separate dedicated incoming power line (hot, neutral, and ground wire).
2. Ensure that this source of electrical power is of proper voltage and is free of electrical sags, surges, spikes, and noise. This source must be free of inductive loads that might cause high-frequency electrical noise.
3. Prevent an unwanted ground loop. The electrical control systems are interconnected to terminate at the central point ground terminal located inside the AB6 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 AB6 power cabinet and the power cord).
4. Route all AB6 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 clothes, cartons, and other shop supplies that could catch fire.

If a fire does occur, the operator must press the Stop key on the control and on the press brake and activate the factory's 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 and all shop personnel 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. Worker's compensation carrier's loss prevention department
4. Press brake manufacturer

## Service Department

The goal of Hurco's Autobend Service Department is to provide customers with services necessary to help ensure success in their investment. If customers experience problems with the AB6 components such as screen errors, lack of power to the components, or gauge performance that are not solved by suggestions in the "Error Codes" section of the "Appendix," they should contact Hurco's Service Department. Call 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.

The AB6 serial number is located on the door of the AB6 power cabinet's data plate. Record the serial number here and on the cover page for reference:

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

1. company name and telephone number
2. name and extension
3. serial number
4. a brief, accurate description of the problem and its specific symptom(s)

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

Call (317) 298-2639 for Hurco's Autobend Service Department.

## Power-up Procedure

Follow these instructions to power up the AB6 system:

1. Turn on the power to the press brake and start the pump motor by following the manufacturer's instructions.
2. Turn on the power to the AB6. The AB6 control performs this power-up sequence:
  - a. All segments of the LEDs light up for approximately 3 seconds.
  - b. The software version number appears in the Gauge display.
  - c. The date appears in the Ram display.
  - d. The number of available Jobs and Bends appears in their displays.
3. Following the power-up sequence, data for the most recently operated job appears in the Job and Bend displays.
4. Press the Job key.
5. Select a job from memory by inputting a Job number, or program a new job. (Refer to the "Programming" section of this chapter for more information about programming steps.)

## Blank Display Feature

If the AB6 is left on without running a job for longer than 10 minutes, the LED's display lines instead of numbers. To activate the AB6 from this state, press the Job key. The values for the last job run or programmed appear in the displays.

## Shut-down Procedure

To shut-down the system, follow these steps:

1. Press Stop. This disables the servos and turns off the Run LED.
2. Block the press brake's ram and turn off the power to the press brake by following the manufacturer's instructions.

## Maintenance Schedule

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

### X-Axis

1. Wipe down the leadscrew and linear ways with a soft, lint-free cloth and apply a light film of S.A.E. #10 oil on a weekly basis. If the shop environment is dirty, clean them daily.
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 possible cuts in the cable 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 wipe down the linear way with a soft, lint-free cloth. Apply a light film of lithium grease.
3. Every six months inspect the Y-axis linear scale harness for possible cuts in the cable insulation or wires. Replace if damaged.

### Y-Axis Upacting

1. Wipe down the lead screw and carriageways with a soft, lint-free cloth. Apply a light film of S.A.E. #10 oil to the lead screw on a weekly basis; 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 possible cuts in the cable 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 possible cuts in the cable insulation or wires. Replace if damaged.

## **Control**

1. Clean the front panel with a mild soap detergent on a weekly basis. Clean it daily if the shop environment is dirty.
2. Every six months inspect the control harness for possible cuts in the cable insulation or wires. Replace if damaged.

# Programming and Operations

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The Autobend 6 (AB6) is a one or two axis control system capable of operating a back gauge (X axis) and the press brake's ram position (optional Y axis). The optional Y-Hydraulic axis controls the ram's open height and speed change. The memory is capable of storing 150 jobs and 600 bends.

This chapter describes the control functions, the programming process, referencing and calibration procedures.

## Display and Keypad Groups

The AB6 control contains a display group at the top of the control where programming entries or default values appear. There are also programming keys with dedicated LEDs (light emitting diodes).

Values for Gauge, Ram, Job and Bend appear in the displays. Single axis Job and Bend programming keys are located below the Gauge display, and two-axis Job and Bend programming keys are located below the Ram display.

The Data Entry keys are grouped together in the lower right-hand corner of the control. Use them to select tasks, scan job and bend lists, perform calculations, select special functions, and input numbers. Within this group of keys are the yellow Job, Bend, and New Bend programming keys.

The keys in the Run group are the operation keys. They are located in the bottom center portion of the control. Use them to select Auto or Single Run mode and to jog the selected axis.

Use the Master Save function to back up programs on a non-volatile Flash EPROM. This function saves all information in case of a battery backup failure during a power outage. Refer to the "Initial System Setup" section later in this chapter for these procedures.

## Control Layout

Here is the AB6 control layout:

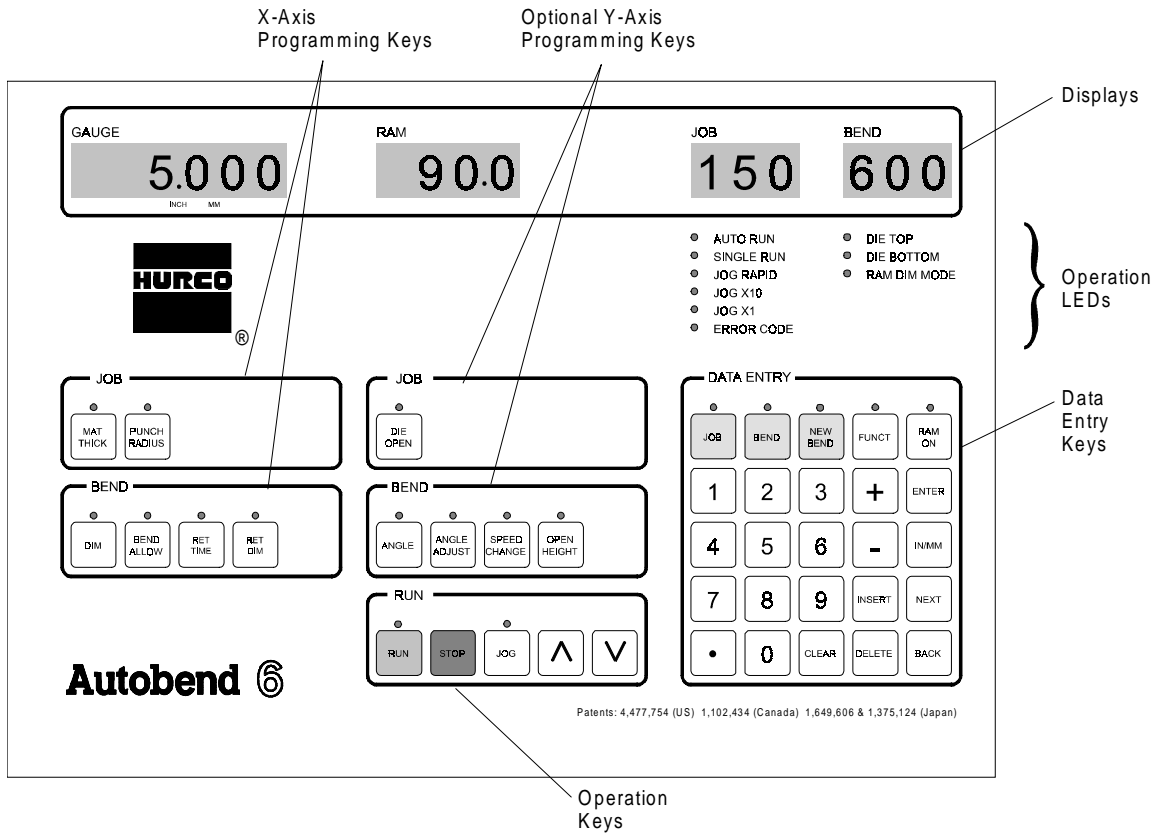


Figure 2-1. Autobend 6 Control Layout

## Programming and Data Entry Keys

The Programming keys are grouped with the Data Entry keys. Programming, Job, Bend, and Run keys have dedicated LEDs to show whether their state is Active (On) or Standby (Off). Use the Programming and Data Entry keys to perform these functions:

<b>Programming Key</b>	<b>Function</b>
------------------------	-----------------

Job	Activate the Job display and input new jobs.
Bend	Activate the Bend display and input bend number.
New Bend	Activate the Bend display and input a new bend number.
Funct	Used in conjunction with other programming and data entry keys to enable special functions.
Ram On	Select ram control status (Active: LED On; Standby: LED Off).

<b>Data Entry Key</b>	<b>Function</b>
-----------------------	-----------------

Enter	Enter selected data, move cursor the next prompt, transfer Die Top and Die Bottom positions, and transfer the Teach position.
IN/MM	Select measurement unit (inch or metric). This key is used with the Funct key.
Next	Select the next job parameter or bend parameter, depending on mode.
Back	Select the previous job parameter or bend parameter, depending on mode.
Insert	Insert a new bend.
Delete	Delete the displayed job or bend.
+	Input positive data entries or perform Calculator functions.
-	Input negative data entries or perform Calculator functions.
Clear	Clear displayed data.
0-9	Use the number keys to input numerical values, or to perform special functions when used in conjunction with the Funct key.



## Incremental/Absolute Adjustments

Some gauge and ram values (Dim, Bend Allow, Angle—Ram Dim mode, and Angle Adjust) may be modified incrementally or input in absolute form. They are noted in the next section.

To incrementally adjust the value currently shown, press the desired sign key (+ or -) before the numerical value.

- To subtract, use these keystrokes:
  1. Press the minus ( - ) key.
  2. Input the value to be subtracted.
  3. Press the Enter key.
- To add, use these keystrokes:
  1. Press the plus ( + ) key.
  2. Input the value to be added.
  3. Press the Enter key.

To replace the value currently shown with an absolute adjustment, press the desired sign key (+ or -) after the numerical value.

## Gauge and Ram Keys

The Job and Bend keys have dedicated LEDs to show whether their state is Active (On) or Standby (Off). The keys located under the Gauge and Ram displays perform functions related to either the Gauge or the Ram:

<b>Gauge Display</b>		<b>Ram Display</b>	
<b>Job Keys</b>	<b>Function</b>	<b>Job Keys*</b>	<b>Function</b>
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.	Die Open	The measurement of the die's V-opening is used to calculate the ram position needed for angle programming. Refer to the "Measuring Die Open" section later in this chapter.
Punch Radius	Measure and input the punch radius. The AB6 uses the Punch Radius value to calculate the bend allowance.		

\*For use with optional second axis.

Continued on the following page.

<b>Gauge Display</b>		<b>Ram Display</b>	
<b>Bend Keys</b>	<b>Function</b>	<b>Bend Keys*</b>	<b>Function</b>
Dim	The length of the flange to be bent.	Angle	<p>Determines the angle to be formed on the part; defines the <i>bottom stopping position</i> of the ram and is expressed in degrees.</p> <p><b>Angle Mode</b> When Angle is selected, the bottom position of the ram is expressed in degrees. The acceptable range is from 180° to 26°. Programming 180° results in no bending of the part.</p> <p><b>Ram Dim Mode</b> 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. A positive value results in the punch penetrating the die; a negative value stops the punch before reaching the die. This value can be modified incrementally or input in absolute form.</p>

\*For use with optional second axis.

Continued on the following page.

<b>Gauge Display</b>		<b>Ram Display</b>	
<b>Bend Keys</b>	<b>Function</b>	<b>Bend Keys*</b>	<b>Function</b>
Bend Allow	<p>The correction value added to the Dimension for the correct flange length.</p> <p>The bend allowance can be calculated automatically if the required information has been programmed.</p> <p>This value may be modified incrementally or input in absolute form.</p>	Angle Adjust	<p>A <i>correction value</i> added to the programmed Angle.</p> <p>This value may be adjusted incrementally or input in absolute form.</p>
Ret Time	<p>Defines the amount of time (0 - 15 seconds) the gauge remains at the <i>retract position</i>. The time units are in seconds and starts when the ram returns to the top of its stroke.</p>	Speed Change	<p>Program the slow-down position for downacting hydraulic press brake's ram.</p> <p>The actual speed of the ram depends on the press brake's control settings.</p> <p>The position is measured from the top of the material placed on the tooling.</p>
Ret Dim	<p>Defines the distance from its present position that 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>.</p> <p>Refer to the "Initial System Setup" section of this chapter.</p>	Open Height	<p>Defines the opening height of the ram after the bend is made.</p> <p>This position is measured from the top of the material placed on the tooling.</p>

\*For use with optional second axis.

## Operation Keys

The keys in the Run group operate the axis or axes:

<b>Operation Key</b>	<b>Function</b>
Run	Select Auto Run or Single Run mode.
Stop	Halt operation.
Jog	Jog the gauge. Jog the ram to stop position on motorized Y axis.
∧	Move the selected axis back or up in Jog mode.
∨	Move the selected axis forward or down in Jog mode.

## LED Group

A group of 9 LEDs located above the Data Entry keypad identify the operation mode, optional ram calibration, and optional ram angle or dimension programming mode.

<b>LED</b>	<b>Mode</b>
Auto Run	Operation
Single Run	Operation
Jog Rapid	Operation
Jog ×10	Operation
Jog ×1	Operation
Error Code	Error
Die Top	Calibration (Ram)
Die Bottom	Calibration (Ram)
Ram Dim Mode	Ram Programming (Angle or Dimension)

The Error Code LED warns that an error has occurred. Refer to the “Error Code” section in the “Appendix” for descriptions of the error codes.

## Initial System Setup

Although the Configuration Menu is set at the factory to suit most applications, changing some of the parameters may better suit a particular application. There are some parameters that need to be set up before programming. Procedures for inputting data for managing memory and setting the system configuration are described below.

The operator can jog the ram manually or with the arrow keys on the control. (Refer to the “Axis Jog” section later in this chapter for procedures for moving the gauge.)

### Master Clear

Master Clear erases all programmed Jobs and Bends (battery-backed part program memory) from the AB6.

1. Press the Funct key.
2. Press 7 0 2 and press the Enter key.
3. Press the  $\oplus$  key and the Enter key.
4. The 7 0 2 clears from the display momentarily. When it reappears, the Master Clear operation is complete.

### Master Save

Master Save the memory regularly to reduce the possibility of memory loss because of a battery backup failure during a power outage. To save the battery-backed memory in a non-volatile Flash EPROM device, select Master Save as follows:

1. Press the Funct key.
2. Press 7 0 3.
3. Press Enter.
4. The 7 0 3 clears from the display momentarily. When it reappears, the Master Save operation is complete.



### Important

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

## Y-Axis Mode

The Ram On key's LED indicates the state of the ram control (Y-axis) as Active when the LED is illuminated or Standby when the LED is off. Selecting the Funct key followed by the Ram On key toggles the state of the ram control. When the state is changed from Active, the ram must be re-calibrated. 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).

Below are the definitions for the ram control states:

<b>Ram Control State</b>	<b>Definition</b>
Active	Ram control On; the AB6 controls the ram positions. (Ram On key's LED illuminated)
Standby	Ram control Off; the AB6 has no control of the ram positions. (Ram On key's LED off)

## Die Safety

The Die Safety value limits the minimum programmable gauge dimension. To determine this value, measure the distance from the center of the die opening to the rear edge of the die and add an additional 0.100" (2.54 mm).

To enter the die safety value, use these keystrokes:

1. Press Funct.
2. Press 7 2 0.
3. Press the Enter key.
4. Input the calculated Die Safety value.
1. Press the Enter key.

### Note

The default value for Die Safety is 1" (2.54 mm).

## Jog/Teach Mode Setting

Select whether to manually adjust the ram (handwheel control) or to adjust the ram using the  $\wedge$  or  $\vee$  arrow keys with these keystrokes:

1. Press Funct.
2. Press 7 0 8.
3. Press Enter.
4. Select the mode:
  - For manual adjustments (handwheel control), press 1 followed by the Enter key.
  - For control adjustments (arrow keys), press 0 followed by the Enter key. Control adjustment (arrow keys) is the default.

## Inch or Metric Measurement Units

To select the measurement units (English or metric) for all programs, follow these steps:

1. Press Funct.
2. Press Clear. No value should be displayed in the Job display.
3. Press IN/MM. The decimal point appears above the selected measurement unit in the Gauge display.

## System Information

The software version number appears in the Gauge display, the date appears in the Ram display, and the number of available Jobs and Bends appear in their displays upon power up. To check these displays after power up, follow these steps:

1. Press the Funct key.
2. Press 7 0 1.
3. Press Enter.
4. To remove the software version number from the Gauge display, press the Funct key.



## Baud Rate Option

To select the communication rate for the optional RS-232-C port, use these keystrokes:

1. Press Funct.
2. Press 7 0 6.
3. Press Enter.
4. Make selection:
  - Press 1 for 9600 bps followed by the Enter key. (The default is 9600 bps.)
  - Press 2 for 19,200 bps followed by the Enter key.

## Serial Communications

The entire memory may be transferred to or from a personal computer via the RS-232-C port located on the left-hand side of the AB6 power cabinet. This feature is available as an option with the Hurco software package.

To select Serial Communications, follow these keystrokes:

1. Press the Funct key.
2. Press 7 0 5.
3. Press Enter.
4. Select the communication direction to perform one of the following functions:
  - Press the 1 key followed by the Enter key to **Write Program to PC** (transfers the entire part program memory from the AB6 to the PC).
  - Press the 2 key followed by the Enter key to **Read Program From PC** (transfers the entire part program memory from the PC to the AB6).

## Programming and Operation

The AB6 is capable of storing 150 jobs and 600 bends. The valid range of jobs is 1 through 150. *Automatic prompting* guides the operator through the programming sequence on the AB6 control with flashing LEDs. *Quick Bend* is another method of programming with minimal keystrokes. The AB6 control also provides the *Jog/Teach programming* mode which stores positions set by the operator.

Input values for each Job and Bend field through *Direct Access programming*. Either program an entire Job or check specific fields with Direct Access. For instance, check the Dim value for each bend by pressing the Dim key followed by the Next or Back key. The bends' programmed dimensions appear in the Gauge display.

The LEDs flash during automatic prompting and remain constant with Direct Access programming.

The following sections describe specific programming steps.

## Default Values

These safe default values are automatically programmed by pressing Enter when the key's LED flashes:

### Gauge Defaults

<b>Gauge Job Keys</b>	Mat Thick	Punch Radius
	<b>Display Default</b>	0.000      0.000

<b>Gauge Bend Keys</b>	Dim	Bend Allow	Ret Time	Ret Dim
	<b>Display Default</b>	5.000	0.000	0      0.000

### Ram Defaults

<b>Ram Job Key</b>	Die Open
	<b>Display Default</b>

0.500  
-Or-  
most recently  
programmed  
job's value

<b>Ram Bend Keys</b>	Angle	Angle Adjust	Speed Change	Open Height
	<b>Display Default</b>	Angle Mode = 180.0 Ram Dim Mode = 0.000	0.0	0.500      2.000

## **Editing Functions**

Use the control to perform calculations, to clear input, and to make corrections during operation.

### **Calculator**

Use the data entry keys to perform calculations for the gauge Dimension and Bend Allowance:

1. Press the + or - key.
2. Input a value (incremental adjustment).
3. Press the Enter key.

### **Clear Data Input**

1. Press the Clear key.
2. The most recently input data clears from the display.

### **Make Correction During Run**

1. Press the Stop key.
2. Press the Bend key
3. Input the Bend number to be corrected.
4. Input data to adjust parameters.
5. Press the Run key.

## Automatic Prompting

Here is an example of X-Axis programming using automatic prompting. As the operator programs information, the subsequent key's LED flashes until Enter is pressed again.



### Important

Press a Job or Bend key directly during Automatic Programming to change to Direct Access Programming. Press Enter and the system returns to Automatic Programming.

## Single Axis Job Programming

### Program the Job

#### Press the Job Key

Input the Job Number and press Enter.

#### LED Flashes for the Mat Thick Key

Default (0.000) appears in the Gauge display.

Press Enter or input new value and press Enter.

#### LED Flashes for the Punch Radius Key

Default (0.000) appears in the Gauge display.

Press Enter or input new value and press Enter.

#### LED Flashes for the Bend Key

## **Program the First Bend**

### **Press the Bend Key**

Input the Bend Number and press Enter.

### **LED Flashes for the Dim Key**

Default (5.000) appears in the Gauge display.

Press Enter or input new value and press Enter.

### **LED Flashes for the Bend Allow Key**

Default (0.000) appears in the Gauge display.

Press Enter or input new value and press Enter.

**-Or-**

Press the Bend Allow key twice and press Enter for Auto Bend Allowance.

### **LED Flashes for the Ret Time Key**

Default (0) appears in the Gauge display.

Press Enter or input new value and press Enter.

### **LED Flashes for the Ret Dim Key**

Default (0.000) appears in the Gauge display.

Press Enter or input new value and press Enter.

The first bend in this job is programmed.

## **Program a New Bend**

### **LED Flashes for the New Bend key**

Press the New Bend key.

### **LED Flashes for the Dim key**

Default (5.000) appears in the Gauge display.

### **Program Additional Bends**

When a bend is programmed, the New Bend key's LED flashes. Either press the Enter key to review the information programmed for that bend, or press the New Bend key to begin programming a new bend.

With the New Bend key's LED flashing, press the New Bend key to duplicate the values programmed for additional bends. Press the Bend key and the Back or Next key to select bends and edit values.

The values from the most recently programmed bend are carried forward when additional bends are programmed. Either accept these values by pressing Enter, or input new values.

## Two-axis Job Programming—Upacting/M-Stop Press Brakes

For two-axis systems, program the actual material thickness to be formed and the punch tip radius measurement. For this optional second axis, program the *die opening* measurement for ram position calculations. Refer the “Measure Die Opening” section earlier in this chapter.

1. Select the Job number.
2. Press Enter. The Ram Dim LED flashes.
3. Choose Ram Dim or Angle mode:
  - Press the + key to program in Ram Dim mode.
  - Press the - key to program in Angle mode.



### Important

Once a job is programmed in Ram Dim or Angle mode, the only way to change modes for that job is to delete it and re-program the job in the other mode.

4. Press Enter. The Mat Thick key's LED flashes.
5. Input the value for Material Thickness.
6. Press Enter. The Punch Radius key's LED flashes.
7. Input the value for the Punch Radius.
8. Press Enter. The Die Open key's LED flashes.
9. Input the value for the Die Opening.
10. Press Enter. The Dim key's LED flashes.
11. Input the value for the Dimension.
12. Press Enter. The Bend Allow key's LED flashes.
13. Input the value for the Bend Allowance.
14. Press Enter. The Ret Time key's LED flashes.
15. Input the value for the Retract Time.
16. Press Enter. The Ret Dim key's LED flashes.



17. Input the value for the Retract Dimension.
18. Press Enter. The Angle or Ram Dim key's LED flashes depending on the chosen mode.
19. Input the value for the Angle or Ram Dim.
20. Press Enter.
21. Input the value for the Angle Adjust. (This key is only used in Angle mode.)
22. Press Enter.
23. Press New Bend to program additional bends. (Refer to the "Bend Programming" section that follows for information about programming bends.)

## Two-axis Job Programming—Y-Hydraulic

Y-hydraulic press brakes utilize the *Open Height* and *Speed Change* keys on the AB6 control. To program a new job with a Y-hydraulic press brake, use these keystrokes:

1. Press the Job key. The Ram Dim Mode LED flashes.
2. Choose *Ram Dim mode*:
  - Press the + key to activate Ram Dim mode.
  - Press the - key to select Angle mode.
3. The Mat Thick LED flashes.
4. Input the value for Material Thickness.
5. Press Enter. The Punch Radius key's LED flashes.
6. Input the value for Punch Radius.
7. Press Enter. The Die Open key's LED flashes.
8. Input the value for Die Opening.
9. Press Enter. The Bend key's LED flashes.
10. Press Enter. The Dim key's LED flashes.
11. Input the value for the back gauge Dimension.
12. Press Enter. The Bend Allow key's LED flashes.
13. Input the value for the Bend Allowance.
14. Press Enter. The Ret Time key's LED flashes.
15. Input the value for the Retract Time delay.
16. Press Enter. The Ret Dim key's LED flashes.
17. Input the value for the Retract Dimension.
18. Press Enter. The Angle key's LED flashes.

19. Input the value for Angle or Ram Dimension.
20. Press Enter. The Angle Adjust key's LED flashes if the mode is set for Angle.
21. Input the value for the Angle Adjustment.
22. Press Enter. The Speed Change key's LED flashes.
23. Input the value for the Speed Change position.
24. Press Enter. The Open Height key's LED flashes.
25. Input the value for the Open Height position.
26. Press Enter.
27. Press New Bend to program additional bends. (Refer to the "Bend Programming" section later in this chapter for information about programming bends.)

## Job Programming

For single- or two-axis systems, program the actual *material thickness* to be formed and the *punch tip radius* measurement. Refer to the “Two-axis Job Programming” section that follows for information about programming jobs for the optional second axis.

The available job numbers are between 1 and 150. The job numbers are always present. If a job is deleted, the job number remains, but the bend information is removed from memory. Here are instructions for specific Job Programming functions.

### Programming a New Job Number

1. Press the Job key.
2. Input the Job number.
3. Press the Enter key.

### Scanning the Job List for Programmed Job Numbers

1. Press the Job key.
2. Press the Next key, and each programmed job number is displayed in ascending order from the current number.
3. Press the Back key, and each programmed job number is displayed in descending order from the current number.

### Deleting a Job

1. Press the Job key.
2. Input the Job number.
3. Press the Delete key. The Job number remains, but the bend information is removed from memory.

## **Bend Programming**

Dimension and angle data are programmed for bends. Once the programming is complete, operate the job by pressing Run or review bend information by pressing the Next and Back key as appropriate.

Here are instructions for specific Bend Programming functions.

### **Programming the First Bend**

Start with the first bend in the program:

1. Press the Bend key.
2. Press Enter.

### **Creating a New Bend**

Insert a new bend at the end of the bend list:

1. Press the New Bend key.
2. Press Enter.

### **Bend Allowance**

The first time the Bend Allow key is pressed, the bend allowance is performed manually. The control performs the automatic calculation the second time the Bend Allow key is pressed.

#### Manual Bend Allowance

Manually input the flange length's correction value by following these steps:

1. Press the Bend Allow key.
2. Input the correction value to be added to the flange length.
3. Press Enter.

#### Automatic Bend Allowance

Use Automatic Bend Allowance with a programmed job.

1. Press the Bend Allow key.
2. Press the Bend Allow key again.

## Selecting a Bend Number

There are three ways to select programmed bend numbers:

### Method 1

1. Press the Bend key.
2. Input the number of the bend.
3. Press Enter.

### Method 2

Press the Bend key repeatedly to scroll through the programmed bend numbers.

### Method 3

Press the Bend key followed by the Next key or the Back key.

- Each time the Next key is pressed the programmed Bend numbers are displayed in ascending order.
- Each time the Back key is pressed the programmed Bend numbers are displayed in descending order.

## **Inserting a Bend**

Follow these steps to insert a bend:

1. Select the bend number to be inserted. If there are four bends currently programmed and a new bend is to be inserted between bends 2 and 3, input 3 in the bend field.
2. Press the Insert key. The new bend 3 is inserted. The remaining bends are renumbered in ascending order.
3. Program the information for bend 3, and the operation is complete.

## **Deleting a Bend**

Delete a Bend between programmed bends:

1. Press the Bend key.
  - Select the bend number to be deleted by inputting that number.
  - Press Enter if the number displayed is the one to be deleted.
2. Press the Delete key and the remaining bends decrease one position.

## Quick Bend Programming

Quick Bend programming uses the default parameters. Use Quick Bend for a one-bend job not previously programmed. Perform Quick Bend programming operations on either single- or two-axis systems.

### Single Axis

Follow these steps for Quick Bend programming on a single-axis system:

1. Press the Job key. Input the job number.
2. Press the Bend key. A “1” appears in the Bend display.
3. Press Dim and input desired flange length.
4. Press Run.

### Two Axis

Follow these steps for Quick Bend programming on a two-axis system:



### Important

The calibration sequence must be performed before Quick Bend programming on a two-axis system.

1. Press the Job key. Input the job number and press the Enter key.
2. Choose Ram Dim or Angle mode:
  - For Ram Dim mode press the **+** key.
  - For Angle mode press the **-** key.
3. Press the Enter key.
4. Press the Bend key.
5. Press the Dim key and input the flange length.
6. Press the Angle key and input the value.
7. Press the Run key three times.



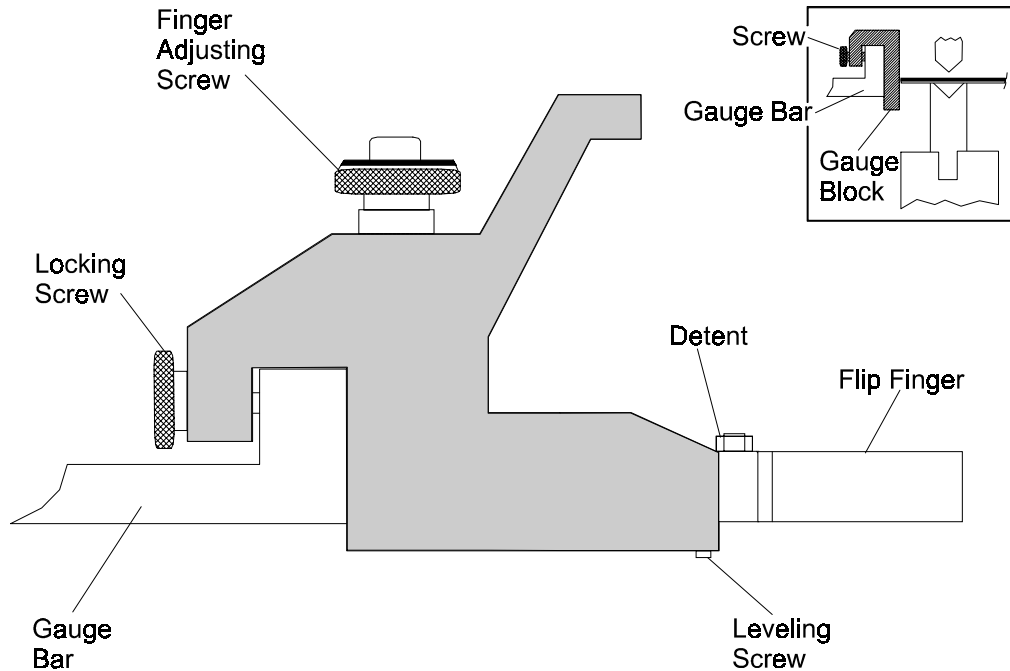
### Direct Access Single Axis Programming Example

If the operator chooses to input the values, these keystrokes and data entry can be used for programming.

<b>Key</b>	<b>Data Entry</b>
Job	2 (job number)
Mat Thick	.048 (thickness)
Punch Radius	.030 (radius)
Bend	(#1 automatically input for first bend)
Dim	1.75 (gauge dimension)
Bend Allow	-0.03 (bend allowance)
Ret Time	0 (retract time)
Ret Dim	0 (retract dimension)
New Bend	Repeat inputting data for bends until all bends are programmed.
Run	

## Selecting the Gauging Surface

The Autobend gauge bar provides various methods of referencing the material to be formed. For best results do not place material directly against the front edge or face of the gauge bar. 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 2-1. Flip Fingers and Gauge Block*

## 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.



### 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.

## Referencing the Gauging Surface

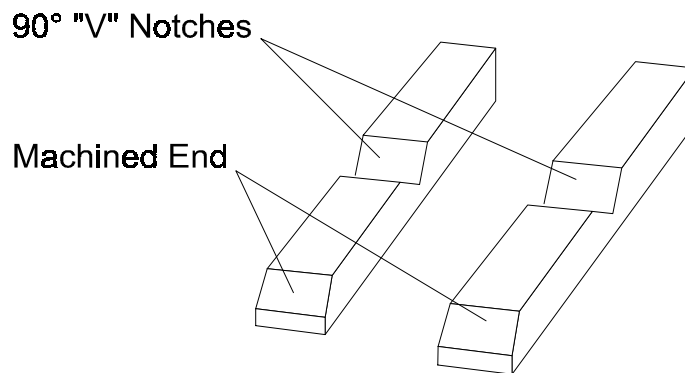
Prior to forming parts, the gauging surface must be referenced to the forming tools. The programmed dimension is the distance from the gauging surface to the punch centerline. This centerline changes for each set of tooling.

Two *zero reference bars* are provided with each Autobend 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 2-1. Zero Reference bars*

Follow these instructions to reference the gauge bar:



### **Important**

For AB6 systems equipped with Ram control, the Ram On key's LED should be off indicating the control is in Standby mode.

1. 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.
2. Loosen the clamp bolts on the lower part of the vertical supports. Slightly pull back the support.
3. Loosen the carriage arrestor bars.
4. Program a single bend job with a 5" (127 mm) dimension and 0 bend allowance.

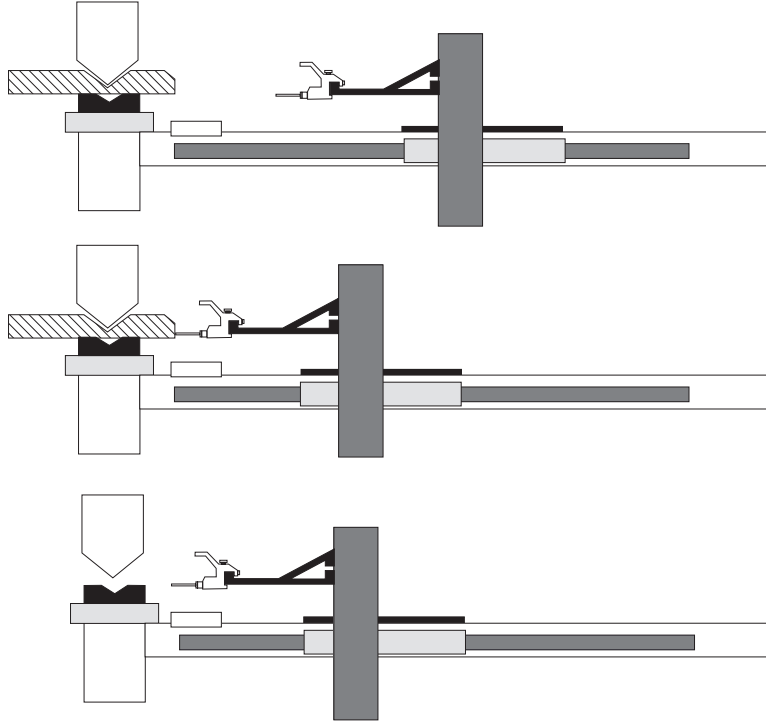
### **Note**

Refer to the "Job Programming" and "Bend Programming" sections of this manual for more information.

5. Press the Run button.
6. Insert the zero reference bars so the machined edges face the gauging surface with the "V" notches aligning with the punch centerline.
7. Carefully jog the ram until the tooling firmly clamps the zero reference bars. Lock the ram in this position.
8. Adjust the gauge bar's height so the gauging surface is aligned with the reference bars.
9. 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.
10. Lock the clamping bolts at the bottom of the vertical supports.
11. Return the ram to its open position. Remove the zero reference bars and store them in a safe place.
12. Press the console's Stop key.

13. Return the Y-Axis mode to Active.
14. Press the Ram On key.

The figure below illustrates the gauge referencing process:



*Figure 2-1. Gauge referencing*

## Retract at Pinch Option

The retract at pinch sensor is used for all Autobend 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.

Refer to the “Optional Retract Sensor” section in the *Installation* manual for more information about the assembly.

### Y-Axis Retract at Pinch—Upacting/M-Stop Press Brakes

To select whether the gauge retracts at the material pinching point, follow these steps:

1. Press **Funct.**
2. Press **7 0 7**.
3. Press **Enter**.
4. Make selection:
  - **Enable**—press **1** followed by the **Enter** key to enable Retract at Pinch.
  - **Disable**—press **0** followed by the **Enter** key to enable Retract at Top of Stroke. (Disable is the default.)
5. Press **Job** to exit the Function mode.
6. Load the appropriate tooling.
7. Place a sample part across the tooling.
8. 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.
9. 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**.
10. Lower the height of the sensor with the fine adjustment setting. Adjust the height until the moment the LED turns **Off**.

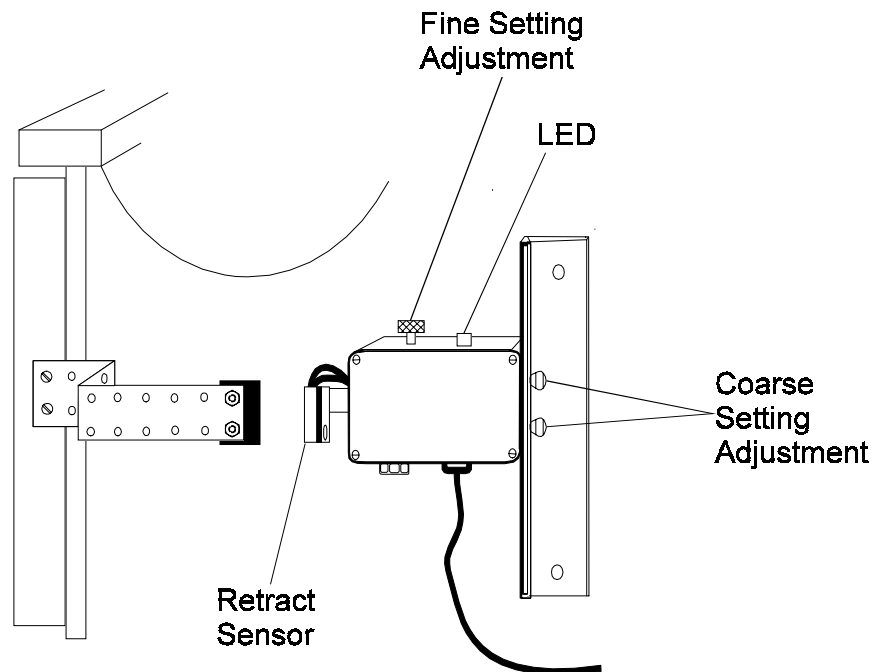
The sensor is now set for this particular tooling/material combination. Repeat this procedure whenever the tooling or material changes.



**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.

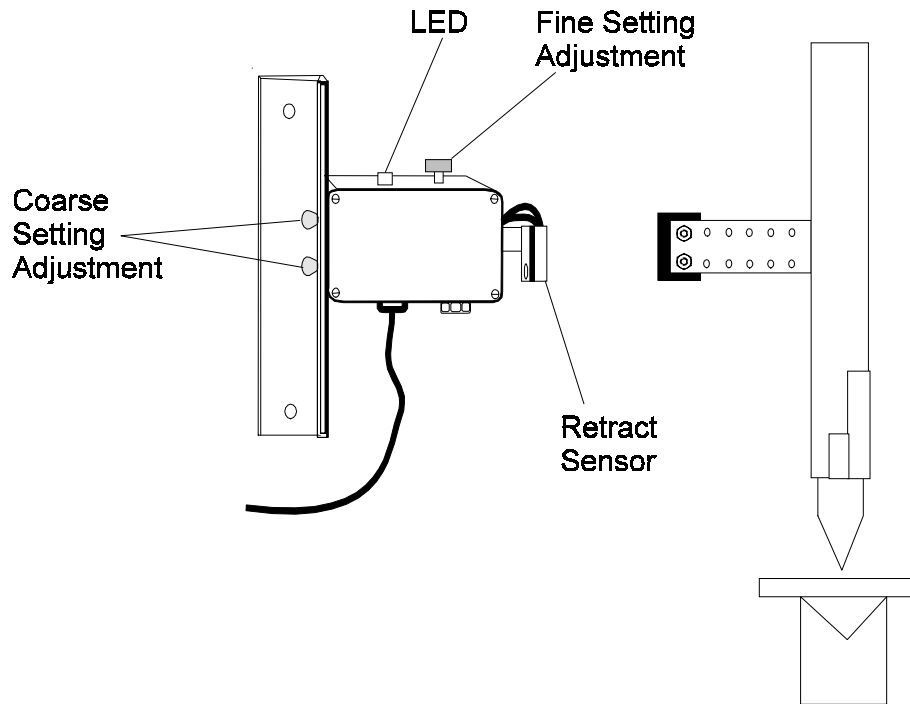
The figure below illustrates the fine and coarse setting adjustments on an upacting press brake:



*Figure 2-1. Retract Sensor mounted on an upacting press brake*



The figure below illustrates the fine and coarse setting adjustments on a downacting press brake:



*Figure 2-1. Retract Sensor mounted on a downacting press brake*



## 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.

## Retract at Pinch—Y-Hydraulic Press Brakes

Before setting the retract at pinch on a hydraulic press brake, make the appropriate selection for the Retract at Pinch. 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 materials' thickness. To turn Off the Retract at Pinch feature select (0) Disable. Any retract programmed then occurs only when the ram returns to the top of stroke.

To configure the system to allow for offset value corrections for downacting hydraulic press brakes, follow these steps:

1. Press Funct.
2. Press 7 0 7.
3. Press Enter.
4. Enter the offset value allowed (0, 5, 10, 15%). This offset value is the amount of material pinched before the gauge retracts to its programmed retract dim, based on the material thickness.
5. Press Enter to accept value. The value appears in the Ram display.
6. Press Job to exit the Function mode.

## Testing Retract at Pinch Setting—Y-Hydraulic

Set the percentage at 15% initially and test it. If the gauge retracts too late, lower the percentage 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 to start a calibrated job.
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 Die Top and Die Bottom values and Material Thickness.
  - 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.

## Calibration

The following sections describe procedures for single- and two-axis calibration and re-calibration.

To display the *calibration status* and the *marker pulse position* during calibration, use these keystrokes:

1. Press Funct.
2. Press 7 0 4.
3. Press Enter.

The number in the gauge display represents the amount of *motor rotation* from the calibration switch contact transition. For example, when 180 is displayed, it signifies that the marker pulse occurs 1/2 of a motor revolution from the switch. The acceptable range for the marker is 90° to 180° and -179° to -90° with 180° being the target value.

The number in the Bend display represents the axis number address as defined in the table below:

Number in Bend Display	Axis Connection
5	Main Board (normally a single-axis gauge)
1	First Position of Motion Module (normally a two-axis gauge)
2	Second Position of Motion Module (normally the second axis)

To view the next axis, press the + or - key.

To clear calibration after displaying, press the Clear key followed by the Enter key.

## Single-Mode Calibration

The axes automatically calibrate when the Run key is pressed. They do not require re-calibration unless power is disconnected.

## Second Axis Calibration

Die open, die top, and die bottom are second axis calibration parameters. The die open value appears in the Ram display when the Die Open key's LED is flashing. The default is 0.500 or the value for the most recently programmed job's die opening.



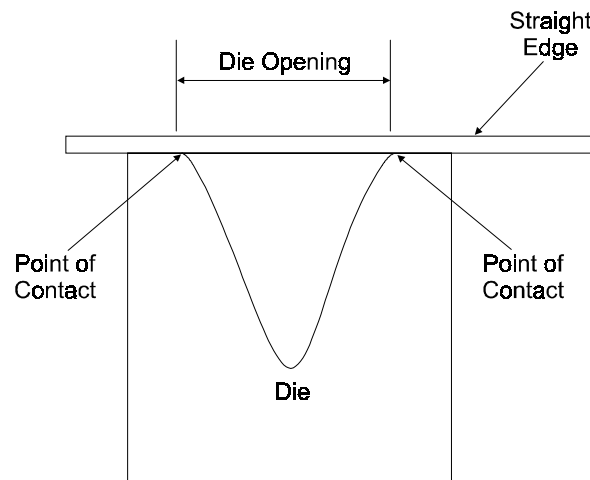
### Important

During second axis calibration, always approach the die top (sample material) and die bottom from above to avoid any backlash inaccuracies. Use the press brake's handwheel to adjust for small movements of the ram.

### Measure Die Open

Follow these steps to measure the die opening:

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 2-1. Measuring the Die Opening*

3. If the bend angles are uniformly opened or closed over the entire range of bends, the die opening needs to be adjusted.
  - a. If the actual die opening is larger than the value programmed, the bend angles will be open.
  - b. If the actual die opening is smaller than the value programmed, the bend angle will be closed.

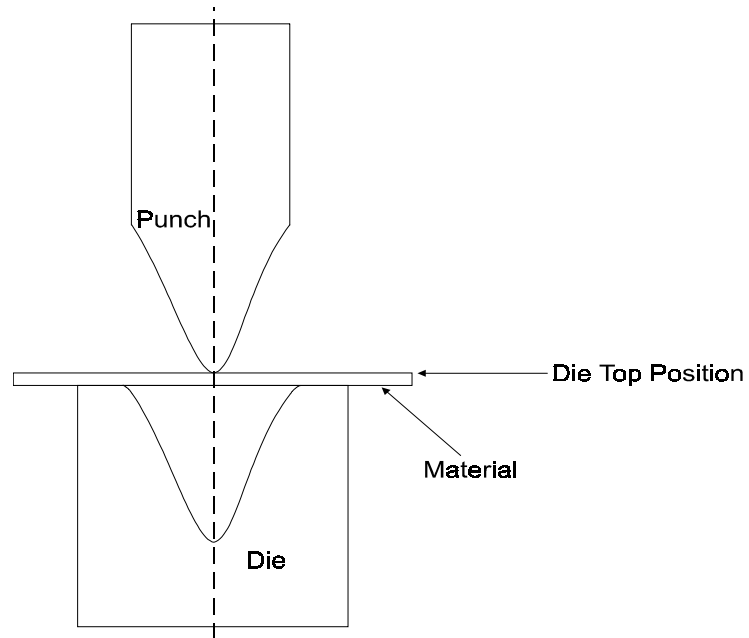
When adjusting the die opening, use increments no larger than 0.03". Change the die opening and perform another series of bends.

**Note**

Persistent angle corrections after die qualification indicate large amounts of springback or press brake deflection.

## Die Top

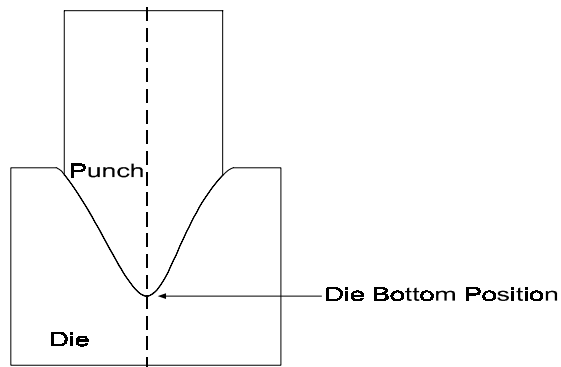
Die top is a programmed value representing the ram position when the punch touches the sample material placed on top of the die. When the die open value is accepted by pressing the Enter key, the Die Top LED flashes prompting for the operator to adjust the ram so the material is pinched between the Punch and Die. Pressing the Enter key programs the die top value into the control. The figure below illustrates die top:



*Figure 2-1. Die Top*

## Die Bottom

The Die Bottom LED flashes next. Die bottom is the programmed value of the maximum punch penetration into the die. This parameter prevents the control from moving the ram to a position larger than the die bottom value. Pressing the Enter key programs the die bottom value into the control. The figure below illustrates die bottom:



*Figure 2-1. Die Bottom*



## Manual Adjustments (Handwheel Control)

To calibrate press brakes with manual handwheel adjustment, follow these steps.

### Note

It is possible to *accept the current calibration* when changes are made to a job through Angle Adjust.

1. Ensure the Jog/Teach mode is set for handwheel control. (Refer to the instructions for selecting handwheel or system control in the “Jog/Teach Mode” section later in this chapter for more information.)
  - a. Press Funct.
  - b. Press 7 0 8.
  - c. Press Enter.
  - d. Select the mode by entering “1” for handwheel control.
2. Press the Job key to return to the programmed job.
3. Press Run.
4. The axis calibrates and the Die Open value appears in the Ram display.
5. Press Enter to accept the current Die Open value or change the value and press Enter.
6. The Die Top LED flashes. Adjust the ram so the material is pinched between the Punch and Die.
7. Press Enter.
8. Remove the material.
9. The Die Bottom LED flashes. Adjust the ram so the Punch is at the bottom of the Die.
10. Press Enter.
11. Press Run.
12. The axis moves to position.

### **Restart Jobs with Changes (Other than Tooling)**

If changes were made to the programmed job such as Angle Adjust, follow these steps to accept the current calibration:

1. Press Run to start the job.
2. Press Run to accept the Die Open value that appears in the Ram display.
3. Press Run to position the axis.

### **M-Stop Control Adjustments (Arrow Keys)**

Follow these steps to calibrate an M-Stop:

1. Ensure the Jog/Teach mode is set for control adjustments. (Refer to the instructions for selecting handwheel or system control in the “Jog/Teach Mode” section later in this chapter for more information.)
  - a. Press Funct.
  - b. Press 7 0 8.
  - c. Press Enter.
  - d. Select the mode by entering “0” for control adjustments.
2. The Ram On LED must be illuminated.
3. Set the Die Top value to 0.000.
  - a. Press Funct.
  - b. Press 7 2 9.
  - c. Press Enter and the Die Top LED flashes.
  - d. Press 0.0.
  - e. Press Enter.
4. Set the Die Bottom value to 0.000.
  - a. Press Funct.
  - b. Press 7 3 0.
  - c. Press Enter and the Die Bottom LED flashes.
  - d. Press 0.0.
  - e. Press Enter.

5. Program a new job or enter a programmed job number.
6. Press the Jog key followed by the Run key and the system calibrates.
7. Press the Run key to accept the Die Open value.
8. Press the Run key again to start the Jog/Teach operation. A minus sign (-) appears in the Ram display. Ignore this sign.
9. Press the Angle key and the LED illuminates.
10. Adjust the ram stop position using the  $\wedge$  and  $\vee$  keys until the Die Top value is determined by the material being pinched.
11. Record the Die Top value.
12. Adjust the ram stop position using the  $\wedge$  and  $\vee$  keys until the Punch meets the bottom of the Die, identifying the Die Bottom value.
13. Record the Die Bottom value.
14. Enter the Die Top and Die Bottom values:
  - a. Press Funct, input 7 2 9, Die Top, press the Enter key.
  - b. Press Funct, input 7 3 0, Die Bottom, press the Enter key.
15. Press the Job key followed by the Run key. The Die Open value is displayed.
16. Press the Run key to accept the Die Open value or change the value and press the Enter key.
17. Press the Run key.
18. Press the Run key a second time. The axes move to position.
19. To run a job with different tooling, repeat the steps in this section.

## Y-Hydraulic Calibration

Before calibrating a downacting hydraulic press brake in either Run or Jog/Teach mode, be familiar with these points:



### Important

Manually position the ram with the press brake's foot pedal or palm buttons.

The press brake must be set at jog settings for calibration.

The ram returns to top on auto return press brakes during Die Top and Die Bottom if not set properly.

Press the Stop key to abort the calibration sequence.



### Caution

The Speed Change relay (K6) is held energized to hold the ram at pressing speed during calibration.

Use the press brake's limit switches during calibration to avoid damage to tooling since the up and down limits are not enforced during calibration.

Follow these steps to calibrate a Y-hydraulic press brake:

1. Press the Run key.
  - The X axis calibrates and stops at the marker pulse position.
  - The Die Top and Die Bottom LEDs flash to signal top of stroke (TOS).
2. Raise the ram to its TOS. The ram needs to be at the press brake's TOS to be above the scale marker pulse.
3. Press the Enter key to indicate the ram's TOS.
  - The Die Opening is displayed in the Ram display.
  - The Die Open LED flashes.

4. Press the Enter key to accept the Die Open value or enter a new value and press the Enter key.
  - The Die Top LED flashes.
5. Lower the ram to calibrate the system.
  - The Speed Change and Ram Enable relays energize.
  - The Absolute Ram position appears in the Ram display when the marker pulse is found.
6. Pinch the material between the die and punch to adjust to the Die Top position. (Refer to the preceding “Die Top” section.)
7. Press the Enter key to store the Die Top position.
  - The Die Bottom LED flashes.
8. Remove the material.
9. Move the punch to the bottom of the die to determine the Die Bottom position. (Refer to the preceding “Die Bottom” section.)
10. Press the Enter key to store the Die Bottom position.
  - The Down Stop relay de-energizes.
  - The Die Top and Die Bottom LEDs flash.
11. Raise the ram to TOS.
12. Press the Enter key to start the job.
  - The gauge positions to the programmed Dimension.
  - The Ram is ready to move down.

## Re-Calibration

All axes are cleared together. To view each axis number in the Bend display, press the + or - key. To clear the axes' calibration, use this key sequence:

1. Press the Funct key.
2. Press 7 0 4 and press the Enter key.
3. Press the Clear key and the Enter key.

When the Run key is pressed for the next Job or Jog function, the axes automatically calibrate.

The number in the Bend display represents the axis number address as defined in the table below:

<b>Number in Bend Display</b>	<b>Axis Connection</b>
5	Main Board (normally a single-axis gauge)
1	First Position of Motion Module (normally a two-axis gauge)
2	Second Position of Motion Module (normally the second axis)

## Run Cycle Selection

The AB6 has two run cycles: Auto and Single. Auto operation advances the bends automatically with each ram stroke, while Single operation holds the axes at the bend displayed until the Enter key is pressed, then the axes advance to the next programmed bend.

### Note

For press brakes equipped with optional ram control, refer to the “Y-Axis Mode” section in the “Initial System Setup” section earlier in this chapter for information relative to this option.

### 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.

Bend information is displayed in the Gauge and Ram displays and automatically updates as the job advances. To make *bend adjustments* while in the Auto Run mode, press the Bend key. The last bend used during the Run cycle is displayed in the Bend display. To select another bend, press the Next key until the desired bend number is displayed.

After making all required changes, press the Run button to return to Auto Run mode.

### Single Run

The Single Run mode runs only a specific bend in a job. Press the Run key while in the Auto Run mode to change to Single Run mode. The axes remain stationary at their current position until the Enter key is pressed. Press the Enter key and the bend displayed changes to the next bend programmed and the axes advance to their programmed positions. The bend cannot be advanced unless the Enter key is pressed.

To stop the axes' movement, press the Stop button. The axes will de-energize.

To return to Auto, press the Run button again.

### Note

Retract at pinch is not supported in Single Run mode.

## Axis Jog

Axes can be positioned manually by activating Axis Jog.

### Single-axis System

1. Press the Jog key.
2. Press the Run key.
3. The Dim key's LED illuminates.
4. Select the axis jog speed by pressing the Jog key. Toggle between Jog Rapid, Jog  $\times 10$ , or Jog  $\times 1$ .
5. Facing the front of the press brake, control the direction the gauges move with the direction keys:
  - the  $\wedge$  key moves the axis back
  - the  $\vee$  key moves the axis forward

### Two-axis System

1. Press the Jog key.
2. Press the Run key. The Jog LED flashes and the Die Open value is displayed in the Ram display.
3. Press Enter to accept the value or change the value by inputting a new value for Die Open.
4. The Die Top LED flashes and the Ram display shows the current real time position.
5. Use the handwheels on the press brake to manually adjust the position of the die top.
  - a. Move the ram until the material is pinched between the Punch and Die.
  - b. Accept the adjusted value by pressing Enter. Remove the material.
6. The Die Bottom LED flashes and the Ram display shows the current real time position.
7. Use the handwheels on the press brake to manually adjust the die bottom position.
  - a. Move the ram until the Punch is at the die bottom.
  - b. Accept the adjusted value by pressing Enter key.



## Jog/Teach Mode

Use the Jog/Teach mode to test bends before running large batch jobs, or for one-bend jobs. In order for the control to store angle values, the job must be in Ram Dim mode.



### Important

Once a job is programmed in Ram Dim or Angle mode, the only way to change modes for that job is to delete it and re-program the job in the other mode.

The Y-axis is active (controlled by the AB6) when the Ram On key's LED is illuminated.

The Y-axis is in standby (controlled manually, positioned by the operator, using the press brake's handwheels) when the LED is off.

### Note

Some upacting press brakes allow material to be bent as the handwheel for the down stop position is adjusted.

Jog the axes to position and store the positions. Use these keystrokes:

1. Press Job.
2. Input the job number for a programmed job.
3. Press Jog. The Jog LED flashes.
4. Press Run. The Die Open LED flashes and the value appears in the Ram display.
5. Press Enter to accept the value or change the value by inputting a new value for Die Open.



### Where can we go from here?

Proceed to one of the following sections:

“Ram Not Calibrated with Current Tooling”

**Or...**

“Ram Calibrated with Current Tooling”

## Ram Not Calibrated with Current Tooling

If the ram has not been calibrated with the current tooling in the press brake, follow the steps below:

1. The Die Top LED flashes and the Ram display shows the current real time position.
2. Use the handwheels on the press brake to manually adjust the position of the die top. (Refer to the “Die Top” section earlier in this chapter.)
  - a. Move the ram until the material is pinched between the Punch and Die.
  - b. Accept the adjusted value by pressing the Enter key. Remove the material.
3. The Die Bottom LED flashes and the Ram display shows the current real time position. (Refer to the “Die Bottom” section earlier in this chapter.)
4. Use the handwheels on the press brake to manually adjust the position of the die bottom.
  - a. Move the ram until the Punch is at the bottom of the Die.
  - b. Accept the adjusted value by pressing Enter.
5. Press Run. The Dim LED illuminates indicating the axis is ready for operation. The gauge position appears in the Gauge display and the ram position appears in the Ram display.
6. Adjust the back gauge using the arrow keys.
7. Press the Enter key to store the adjusted value.
8. Press Angle. Place the material between the Punch and Die and bend the material using the press brake’s handwheels or the up and down arrows.
9. When the desired bend occurs, press the Enter key to store the position.
10. Press the Bend key to change between bends to jog/teach the bends.

## Ram Calibrated with Current Tooling

If the ram has been calibrated with the current tooling in the press brake, use these keystrokes:

1. Press Job.
2. Input the job number for a programmed job.
3. Press Jog.
4. Press Run to display the Die Open value.
5. Press Run to accept the Die Open value.
6. Press Run to start Jog/Teach.

## Single-axis Jog/Teach Example

Follow these keystrokes and data entry for Jog/Teach:

<b>Key</b>	<b>Data Entry</b>
Job	job number
Bend	bend number
Dim	none
Jog	none
Run	none
Jog with direction keys (⤴ and ⤵) to desired DIM.	none
Enter (stores Dim)	none

## Two-axis Jog/Teach Example

The following programming example is for a two-axis Y-hydraulic press brake.



### Important

Y-hydraulic rams are not controlled by the jog keys ( $\wedge$  and  $\vee$ ). Move the ram to position with the press brake's foot pedal and palm buttons.

When the Jog key is selected, the Speed Change relay energizes to hold the ram at pressing speed. The operator manually positions the ram.

Use the up and down arrows to position the gauge. The gauge's position appears in the Gauge display.

1. Press Jog.
2. Press Run.
  - The X axis calibrates.
  - The Die Top and Die Bottom LEDs flash.
3. Raise ram to its top of stroke (TOS).
  - The Die Opening value appears in the Ram display.
  - The Die Open LED flashes.
4. Press Enter to accept the value or input a new value and press Enter. The Die Top LED flashes.
5. Move the ram down to calibrate it.
  - The Speed Change ram enable relay is energized.
  - The absolute ram position appears in the Ram display when the marker pulse is found.

6. Adjust the ram to Die Top until the material is pinched between the die and punch. (Refer to the “Die Top” section earlier in this chapter.)
7. Press Enter to store the Die Top value. The Die Bottom LED flashes.
8. Remove the material from the tooling.
9. Adjust the ram to Die Bottom by moving the punch to the bottom of the die. (Refer to the “Die Bottom” section earlier in this chapter.)
10. Press Enter to store the Die Bottom value.
11. To change the bend number, press the Bend key.
12. Position the gauge with the up and down arrows.
13. Press Enter to store the gauge position.
14. Press Angle to select Ram.
15. Press Enter to store the actual angle position.



### Important

Ram position can only be stored when Ram Dim is chosen for the programmed Job.

16. Move the hydraulic ram to position with the press brake’s foot pedal and palm buttons.
17. Select Jog and the Speed Change relay energizes to hold the ram at pressing speed.
18. Manually position the ram.
19. The relative ram position (Die Top equal to zero) appears in the Ram display. This position is taught to the control in Ram Dim mode.
  - **Above Die Top** - the relative ram position is a negative value.
  - **Below Die Top** - the relative ram position is a positive value.

# Quick Reference

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## AB6 Programming Quick Reference

Description	Keystrokes
<b>Legend</b>	
<i>Job or Bend Number</i>	#
<i>Job or Bend Data</i>	X.XXX
<i>Consecutive Strokes on the same Key</i>	<i>MULTIPLE</i>

<b>Job</b>	
Create or Edit Specific <b>Job</b>	JOB # ENTER
Edit Current Job	JOB ENTER
Select Next Job	JOB (JOB MULTIPLE)
Select Next Job	JOB NEXT
Select Previous Job	JOB BACK
Delete Specific Job	JOB # DELETE
Delete Current Job	JOB DELETE

Description	Keystrokes
<b>Bend</b>	
Create the First <b>Bend</b>	BEND ENTER
Edit Specific Bend	BEND # ENTER
Select Next Bend	BEND (BEND MULTIPLE)
Select Next Bend	BEND NEXT
Select Previous Bend	BEND BACK
Delete Specific Bend	BEND # DELETE
Delete Current Bend	BEND DELETE
Insert New Bend at Specific Location	BEND # INSERT
Insert New Bend at Current Location	BEND INSERT

<b>Auto Bend Allowance</b>	BEND ALLOW; BEND ALLOW
----------------------------	------------------------

<b>New Bend</b>	
Insert a <b>New Bend</b> at the End of the Bend List	NEW BEND

<b>Accept Current Data or Continue Automatic Prompting</b>	
<b>Accept</b> Current Data Input <b>or Continue</b> Automatic Prompting	ENTER

<b>Function</b>	
Execute <b>Function</b> Number	FUNCT # ENTER
Select Function Number	FUNCT NEXT
Select Function Number	FUNCT BACK

Description	Keystrokes
<b>Software Version/Available Jobs and Bends</b>	
Software Version / Jobs and Bend Available	FUNCT 701 ENTER

<b>Master Clear</b>	
Part Program <b>Master Clear</b>	FUNCT 702 ENTER + ENTER

<b>Master Save</b>	
Part Program <b>Master Save</b>	FUNCT 703 ENTER

<b>Calibration</b>	
<b>Calibration</b>	
Display Calibration Status	FUNCT 704 ENTER
View Next Axis	+ or -
Clear Calibration after displaying	CLEAR ENTER

<b>RS232</b>	
<b>RS232</b> Communications	FUNCT 705 ENTER
Write Part Programs to PC	1 ENTER
Read Part Programs from PC	2 ENTER

<b>Baud Rate</b>	
<b>RS232 Baud Rate</b>	FUNCT 706 ENTER
9600 (Default)	1 ENTER
19200	2 ENTER



Description	Keystrokes
<b>Retract at Pinch</b>	
Retract at <b>Pinch</b> Disable (Default) Enable Y-hydraulic press brake	FUNCT 707 ENTER 0 ENTER 1 ENTER 5, 10, or 15% ENTER

<b>Die Safety</b>	
<b>Die Safety</b> (Default = 1")	FUNCT 720 ENTER X.XXX ENTER

<b>Die Top</b>	
<b>Die Top</b>	FUNCT 729 ENTER X.XXX ENTER

<b>Die Bottom</b>	
<b>Die Bottom</b>	FUNCT 730 ENTER X.XXX ENTER

<b>Jog/Teach Mode</b>	
<b>Jog/Teach Mode</b> Control (Powered) Manual	FUNCT 708 ENTER 0 ENTER 1 ENTER
<b>Jog / Teach</b> Gauge Rapid Mode	JOG RUN ^ OR v
Change Rapid Mode While Jogging	(JOG MULTIPLE)
Select Gauge Axis in Jog Mode	DIM
Select Ram Axis in Jog Mode	ANGLE
Transfer Teach Data for Selected Axis	ENTER

Description	Keystrokes
<b>Inch/Metric Mode</b>	
Toggle <b>Inch / Metric</b> Mode	FUNCT CLEAR IN/MM

<b>Run Modes</b>	
<b>Run</b> Auto Mode	RUN
Toggle Auto Run / Single Run Mode	RUN (RUN MULTIPLE)
Stop	STOP
Advance to Next Bend in Single Run Mode	ENTER

<b>Quick Bend</b>	
<b>Quick Bend (Single Axis)</b>	JOB # BEND ENTER X.XXX RUN
<b>Quick Bend (Two Axis)</b>	JOB # ENTER + key (for Ram Dim mode) or - key (for Angle mode) ENTER BEND DIM X.XXX ANGLE X RUN RUN RUN

Description	Keystrokes
<b>Automatic Prompting</b>	
<b>Automatic Prompting</b> using Default Data - <b>Gauge (Single Axis)</b> Mat Thick Punch Radius Dim Bend Allow Ret Time Ret Dim	JOB # ENTER ENTER ENTER ENTER ENTER ENTER ENTER RUN
<b>Automatic Prompting</b> using Default Data - <b>Gauge (Two Axis)</b> Ram Dim LED flashes Mat Thick Punch Radius Die Open Bend LED flashes Dim Bend Allow Ret Time Ret Dim Angle Angle Adjust New Bend LED flashes	JOB # ENTER + for YES; - for NO; ENTER ENTER ENTER ENTER ENTER ENTER ENTER ENTER ENTER ENTER ENTER INPUT NEW BEND # or RUN

Description	Keystrokes
<b>Direct Data Access</b>	
<b>Direct Data Access - Gauge (Single Axis)</b> Mat Thick Punch Radius Dim Bend Allow Ret Time Ret Dim	JOB # ENTER MAT THICK X.XXX ENTER PUNCH RADIUS X.XXX ENTER DIM X.XXX ENTER BEND ALLOW X.XXX ENTER RET TIME X ENTER RET DIM X.XXX ENTER RUN
<b>Direct Data Access - Gauge (Two Axis)</b> Ram Dim LED flashes Mat Thick Punch Radius Die Open Bend LED flashes Dim Bend Allow Ret Time Ret Dim Angle Angle Adjust New Bend LED flashes	JOB # ENTER + for YES; - for NO; ENTER MAT THICK X.XXX ENTER PUNCH RADIUS X.XXX ENTER DIE OPEN X.XXX ENTER ENTER DIM X.XXX ENTER BEND ALLOW X.XXX ENTER RET TIME X ENTER RET DIM X.XXX ENTER ANGLE X.XXX ENTER ANGLE ADJUST X.XXX ENTER INPUT NEW BEND # or RUN

Description	Keystrokes
<b>Quick Data</b>	
<b>Quick Data Review</b>	MAT THICK NEXT (or BACK)
	PUNCH RADIUS NEXT (or BACK)
	DIM NEXT (or BACK)
	BEND ALLOW NEXT (or BACK)
	RET TIME NEXT (or BACK)
	RET DIM NEXT (or BACK)
	ANGLE NEXT (or BACK)
	ANGLE ADJUST NEXT (or BACK)
<b>Quick Data Edit</b>	MAT THICK X.XXX NEXT (or BACK)
	PUNCH RADIUS X.XXX NEXT (or BACK)
	DIM X.XXX NEXT (or BACK)
	BEND ALLOW X.XXX NEXT (or BACK)
	RET TIME X NEXT (or BACK)
	RET DIM X.XXX NEXT (or BACK)
	ANGLE XX.X NEXT (or BACK)
	ANGLE ADJUST X.X NEXT (or BACK)

# Appendix

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## Main Board LED Indicators

Name	LED #	Color	Description
CPU RUN	1	Green	State is on with main board power.
UIF Active	2	Green	Keyboard input. Should turn on with power.
Error	3	Red	422/Communication error between main board and console. (On with error/off with normal state.)
Save	4	Red	Flash storage in process. (On with state in process.)

## Error Codes

If an error occurs in the AB6, the Error Code LED flashes and the code appears in the Job display to indicate the type of error. Press the Stop key to clear the Error Code.

The table below describes the Error Codes.

<b>Error Code</b>	<b>Description</b>
802	Too many bends; trying to program beyond 600 bends with the New Bend key or the Insert key
803	No jobs defined; the run mode was attempted without a programmed job
804	Positive(+) limit switch; the positive limit switch has been interrupted during the Run mode
805	Negative (-) limit switch; the negative limit switch has been interrupted during the Run mode
808	Following error; the axis motion has not reached the target position within the defined time of movement or movement has been interrupted
809	Marker pulse not found; the marker pulse has not been found during Calibration sequence
825	Low Battery warning
830	Illegal angle; the programmed angle is not with the possible range
843	Y-hydraulic marker not found
877	Missing Marker Pulse, Y-servo (second axis)
878	Missing Marker Pulse, Y-hydraulic (second axis)
883	Illegal ram stroke; ram moved before gauge in position.
893	Net angle out of range; the combined angle is beyond the possible bend allowed
894	RS-232 termination; the RS-232 was not able to complete communication startup
895	RS-232 key interrupt; a console key has been pressed during a RS-232 control communication
897	Bend out of range; the combined bend is not in the possible range Beyond the limit of the travel for the axis

## Optional RS-232-C Serial Port

The RS-232-C serial port provides uploading or downloading of the entire memory block between the AB6 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 AB6 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 AB6 power cabinet. The RS-232-C DB-9 connector in the AB6 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.

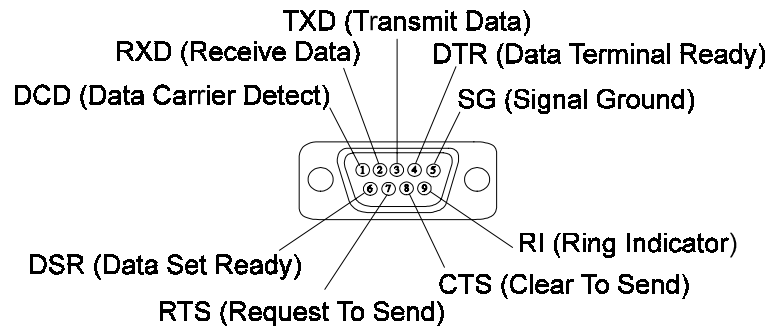
<b>RS-232-C Signals Available at 9-Pin Serial Ports</b>	
Pin 1 - DCD	This pin connection is not used by the machine control.
Pin 2 - RXD (Receive Data)	Data received by the control in serial format from peripheral device on this line.
Pin 3 - TXD (Transmit Data)	Data transmitted by the control to peripheral 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 AB6 power cabinet:



*Figure A-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 AB6 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 AB6 to a computer (25-pin port).

### Note

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

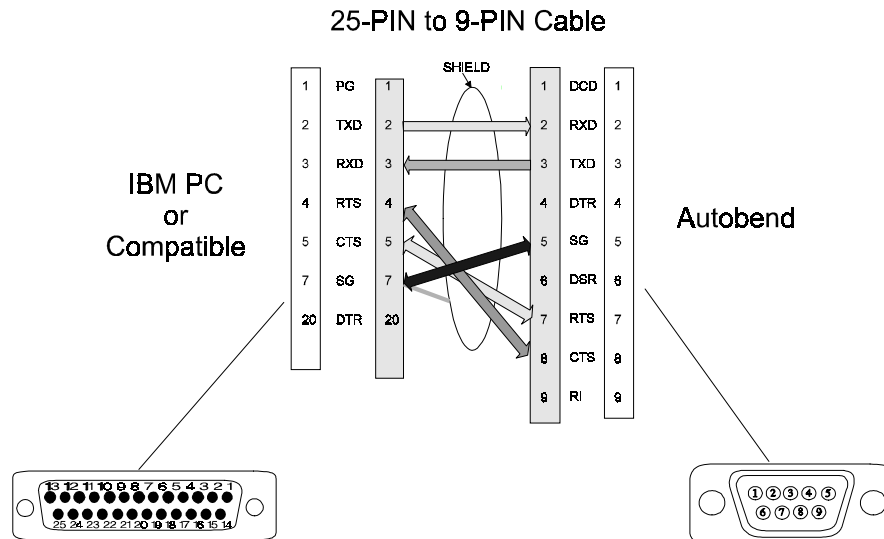


Figure A-2. 25-pin to 9-pin Cable Connections

## 9-Pin to 9-Pin Cable Diagrams

Follow the cable diagrams in the figures below when making a cable to connect an AB6 control to a computer (9-pin port) or to another AB6 control. There are two options for RTS and CTS connections with 9-pin to 9-pin cables:

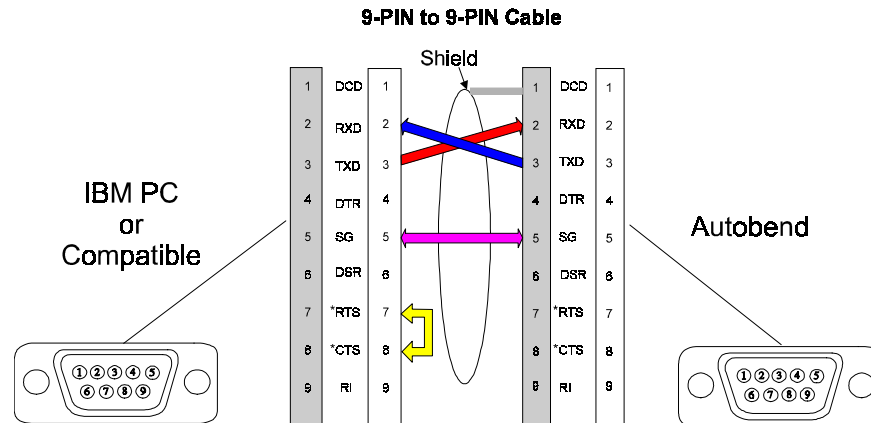


Figure A-3. 9-pin to 9-pin Cable Connections

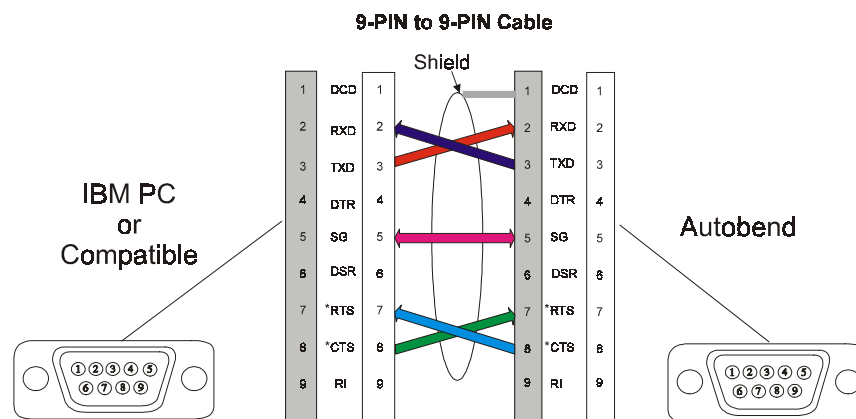


Figure A-4. 9-pin to 9-pin Cable Connections

### 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.

<b>25-Pin to 9-Pin Cable Configuration</b>			
<b>PC, 25-Pin Connector</b>		<b>AB, 9-Pin Connector</b>	
<b>Signal</b>	<b>Pin</b>	<b>Pin</b>	<b>Signal</b>
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)

<b>9-Pin to 9-Pin Cable Configuration (RTS to CTS Option 1)</b>			
<b>PC, 9-Pin Connector</b>		<b>AB, 9-Pin Connector</b>	
<b>Signal</b>	<b>Pin</b>	<b>Pin</b>	<b>Signal</b>
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)

<b>9-Pin to 9-Pin Cable Configuration (RTS to CTS Option 2)</b>			
<b>PC, 9-Pin Connector</b>		<b>AB, 9-Pin Connector</b>	
<b>Signal</b>	<b>Pin</b>	<b>Pin</b>	<b>Signal</b>
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)

## AB6 Spare Parts

The following table contains descriptions and part numbers for AB6 spare parts:

<b>Description</b>	<b>Part Number</b>
Main board	415-0264-001
Main board battery	413-8001-012
Motion module 2-channel	415-0260-001
Motion module 4-channel	415-0260-002
Power Supply	413-0008-018
Copley servo amp (x/y-axis)	402-5001-063
Copley servo amp (positive stop y-axis)	402-5001-053
Relay, DPDT, 24vdc coil	403-2001-019
Relay, DPDT, 120vac coil	403-4001-006
Console Front panel ass'y	001-2104-001
MTE (motor/tach/encoder) 254 line	001-2009-003
MTE (motor/tach/encoder) 300 line	001-2009-004
Motor/Tach (must order 609-0001-010 key)	401-4002-002
254 line encoder	416-0248-054
300 line encoder	416-0248-050
X-axis harness (300 inches)	423-0201-021
Console interface harness (control cable)	423-0200-003
Leadscrew (S6/S8)	001-1458-002
Leadscrew (S7)	001-1436-002
Leadscrew (LP11/LP22 w/old carriage)	001-1517-003
Leadscrew LP11/LP22 w/new carriage)	001-1517-005
Leadscrew (LP11-54)	001-1517-004
Calibration switch (S6)	404-5202-005
Calibration switch (S7)	404-5202-010
Calibration switch (LP series)	404-5202-012

Continued on next page.

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<b>Description</b>	<b>Part Number</b>
Drive belt (S6/S8 gauges)	204-0002-007
Drive belt (S7 gauge)	204-0002-006
Drive belt (LP11, LP11-54, LP22)	204-0002-003
Flip finger ass'y	001-1425-004
Finger (replacement for ass'y above)	801-0761-005
Reference bars	001-1207-004
Warning label	703-1001-092
Danger label	703-1001-091





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