



XL220 HVAC

Operator's Manual

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Chapter 1: Introduction

About this Manual

This manual gives detailed information on the installation, operation, and maintenance of the XL220 Controller. Instructions for installing this controller on most machine types are included. AMS Support Technicians can help on installation conditions not covered by this manual.

Instructions on how to operate the controller are included in this manual. Instructions include how to program orders and run them. The manual also covers the best way to handle a variety of special circumstances that can come up with most machines of this type.

The last section of the manual includes a guide to follow if problems should arise.

The **Setup Sheets** at the end of the manual provide a place to record information about your particular installation. Be sure to record this information and keep this manual in a safe place for later referral. When calling AMS Controls for technical assistance, be sure to have this manual in front of you as well as the model number and serial number of the controller and software version number (displayed in the Setup Menu).

About the XL220 HVAC Controller

AMS Controls has over 30 years of experience with controls for roll formers. Much of this has been with multiple press machines that punch and notch prior to cutoff. The XL220 controller is specifically used for making ductwork for the HVAC industry. Unlike general purpose controllers, AMS controllers were designed specifically for the needs of the roll forming industry. When an AMS controller is installed on a roll forming line, many customers report a 20-30% increase in productivity due to the elimination of costly delays. Production can also be monitored with a PC from the office. The AMS controller will also stay in constant communications with other downstream controllers such as the MP338, MP342, and MP343.

With the AMS XL220 controller, parts are produced with a minimum amount of scrap. The powerful microprocessor can sequence from one size to another with no waste. This unique feature makes in-line punching practical for just-in-time (JIT) production systems.

Of equal importance to roll formers is the operator interface of the control system. Many machines are not used to their full potential because the controls are too complicated for the average production worker to understand. This is not the case with the XL220 controller. AMS strives to make programming as simple as possible without losing any capability.

When designing the controller, we sought the following objectives:

- Describe a part in finished part dimensions.
- Prompt for data with plain language prompts using standard industry terminology.

- Allow the user the flexibility to use the same controller on several machine configurations.
- Minimize the amount of data that must be entered.

The XL220 incorporates enough basic functionality of the **XL120** that it can be used as a drop-in replacement on existing machine applications.

Accuracy

On most cut-to-length machines without servo drives, accuracy depends on the repeatability of the machine to run at a constant speed and to delay the same amount of time for each operation. With electronic length controllers, however, accuracy is lost when machine fluctuations occur. The **XL220** Controller constantly monitors the performance of the machine and compensates for these variations resulting in improved accuracy. For flying cutoff machines, the exclusive **Speed Compensation** feature allows accurate punches and cuts at any line speed. For feed-to-stop machines, the **Adaptive Slowdown** feature and the **Overshoot Compensation** feature greatly improve machine accuracy.

Productivity

Productivity can be improved with the XL220 controller in three ways. First, the improved accuracy with the XL220 controller allows machines to be run at higher line speeds. Secondly, for feed-to-stop machines, the Adaptive Slowdown feature insures a minimum feed time for any length run and any hole spacing. Thirdly, for all types of machines, the controller allows many jobs to be programmed at one time (even while other orders are being processed and run) so delays between orders can be eliminated.

The XL220 Controller eliminates a large amount of material waste by only requiring a single manual cut at the beginning of a new coil. This cut can be made while the machine is stopped, as opposed to a flying crop cut, which further reduces waste.

The XL220 Controller includes an Ethernet port as well as an RS-485 communications port for connection to your office computer. With the optional **Eclipse production management software**, you can schedule orders and send them to the controller, as well as monitor machine performance so productivity is greatly increased.

Ease of Use

The XL220 Controller is a sophisticated computer running a very complex program. This does not mean that a computer expert is required to operate it. The controller has a large touch screen that prompts the operator for information in plain language and with words that are familiar. On one display, the operator can see the order that is being run, the progress through the order, and the speed of the line.

Installation Overview

The XL220 Controller has built in logic to handle most machine control functions. The user does not need to add Programmable Logic Controllers (PLC) or relay logic circuits to get the correct machine sequence and safety features.

The XL220 can control a variety of different machines. For each type of machine, a different set of machine parameters must be programmed into the controller. To simplify this procedure, the type of machine is programmed via a set of switches. The controller reads these switches to determine the type of machine to which it is connected. It can then limit the list of parameters that must be programmed to only those that apply to this type of machine.

When installing an XL220 controller, you must have certain specific information available concerning the controller and your line. Once you have that information, you can install the controller following the procedures outlined in this guide.

The following steps offer a high-level “bird’s-eye” view of the installation process. The location for further, detailed information is included for each step.

⚡ Warning: It is essential that the controller be configured and installed properly – *Improper installation or configuration can result in damage to the system!*

- Determine your **application type** – see *System Description*, page 8.
- Configure the controller model to your **specific application** - see *Configuration Switch Settings*, page 34.
- Install the **hardware** and perform all **wiring** – see *Hardware Configuration & Connections*, page 24 and *Installation*, Chapter 3.
- Apply power, then set **system parameters** - see *Setup Parameters*, Chapter 5 - and enter tool data – see *Tool Data Menu*, page 63.
- **Calibrate** the system – see *Initial Run & Calibration*, page 84.

System Description

Overview

The XL220 controller is a computerized device used to control HVAC machinery in production, including:

- Controlling the material movement through the front end of the HVAC machine.
- Measuring the amount of material moving past all the presses.
- Cycling the punch presses at programmed points.
- Cycling the cutoff press at the programmed length.
- Stopping the machine when the correct numbers of parts are produced.
- Alerting the operator of procedure errors and machine malfunctions.
- Providing built-in help messages and diagnostics.
- Changing part lengths on the fly.
- Programming finished part dimensions.
- Tracking of completed productivity, downtime, scrap, coil consumption, operating efficiencies, and more.
- Providing production data reporting—coil inventory, and good/scrap footage.

Categories

There are two basic categories of roll forming machines:

Feed-to-stop machines, where material stops for each press operation and the cutoff or punching die remains stationary relative to the material.

Flying cutoff machines, where material does not stop for press operations and the cutoff or punching die moves with the material during the press cycle.

Combinations

The XL220 controller can be configured to operate machines of each type, as well as numerous variations and combinations. Typical applications include:

- Open Loop Flying Presses
- Open Loop Feed-to-Stop Presses

Open Loop Flying Presses

In a flying die application, the punch press and cutoff move with the material, and the material is not stopped for press operation. A block diagram of a typical roll forming operation with a pre-notch and post-cut is shown in Figure 1.

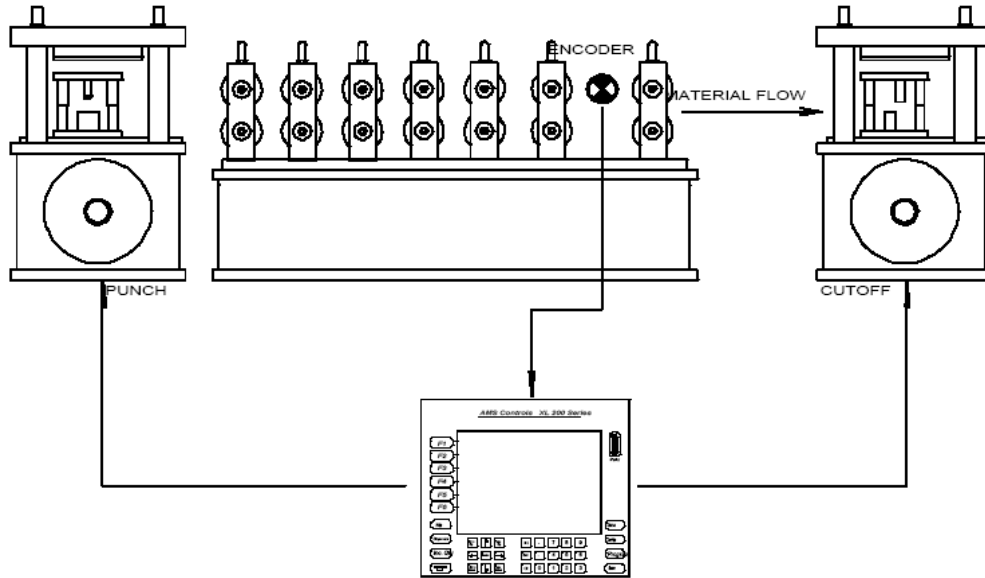


Figure 1: Roll Former with Flying Cut-off and Punch Press

Typical Operation

- Material is loaded through the entire machine.
- The cutoff press fires to reference the material's position.
- The controller is put into RUN to set the machine into motion.
- The encoder reports the material motion to the controller.
- The controller fires the punch and cutoff presses at the programmed location.
- The controller halts the machine motion at the end of the job, or as programmed by the relevant setup parameters.

Open Loop Feed-to-Stop Presses

Feed-to-stop machines stop the material for each press operation and the die remains at a fixed location. A simple feed-to-stop machine is shown in Figure 2 : Simple Feed-to-Stop Machine.

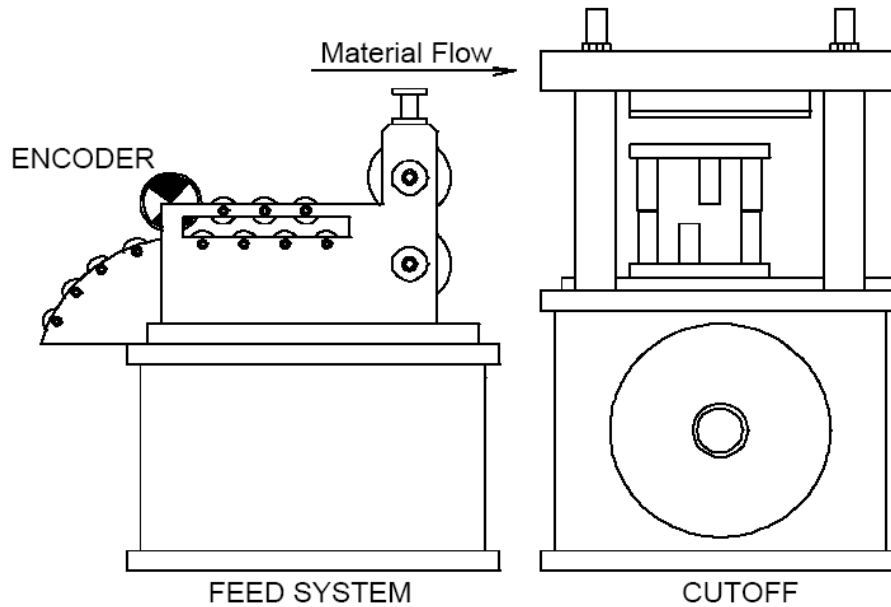


Figure 2 : Simple Feed-to-Stop Machine

Typical Operation

- Material is fed to the cutoff press.
- The cutoff press is fired to reference the material's position.
- The controller is put into RUN to set the machine into motion.
- The encoder reports the material motion to the controller.
- The controller halts the material at the programmed locations.
- The controller fires the cutoff press at the programmed locations.
- Controller puts material back into motion to continue production.
- The controller halts the machine motion at the end of the job, or as programmed by the relevant setup parameters.

Special Features

The XL220 Controller has been designed to offer advanced features for length control that are not available on simple electronic counters. These features offer better accuracy and reduce the amount of waste that can occur. They also eliminate the need for additional control circuits to control the machine.

Speed Compensation

An electronic counter in an electronic length control system produces an output on an exact interval of material movement by faithfully counting all of the encoder pulses. On an ideal machine, an electronic counter will produce accurate parts. However, an ideal machine does not exist and varying machine conditions will produce varying part lengths.

The best example of this would be a phenomenon that occurs on flying die machines. On such a machine, the counter produces a shear pulse at a regular interval of encoder pulses. However, due to delays in the press, the material is actually cut at a time after the shear pulse. It takes time for valves to energize, cylinders to fill, and dies to move. During this delay, material moves a distance that is proportional to the duration of this delay and the speed of the material during this delay. The actual shearing operation is displaced from the point at which the counter activates the shear.

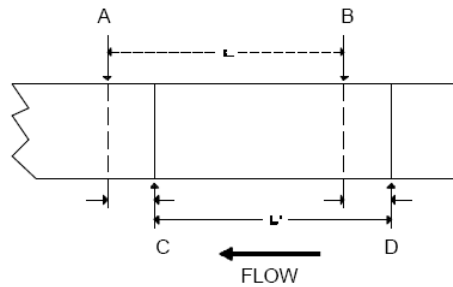


Figure 3: Typical Sheared Part Layout

Figure 3 shows what actually happens in a typical part sheared with a flying die. The counter activates the shear at an interval of the part length L at points A and B. Due to the press delay, the material is actually cut at points C and D. The resulting part length L' can be calculated as follows:

$L' = L - T1S1 + T2S2$, where:

- L is the programmed part length
- $T1$ is the delay time at the leading edge
- $S1$ is the line speed at the leading edge
- $T2$ is the delay time at the trailing edge
- $S2$ is the line speed at the trailing edge

If the speed and delay remain constant, then $T1S1$ will equal $T2S2$ and L' will equal L . If either parameter changes from one cut to the next then the resulting lengths will also vary.

For most pneumatic and hydraulic presses, the delay time is usually constant for constant applied pressure. However, speed variations are common and are a main source of inaccuracy on flying die machines.

The **XL220** controller eliminates this problem with its Speed Compensation feature. The controller constantly monitors the line speed and calculates a modified shear target in proportion to the line speed and a known delay time. Figure 4 shows an example of how Speed Compensation works with a varying line speed. The parts are at intervals of 1000 encoder counts. Instead of the normal shear outputs at 1000, 2000, 3000, etc., the XL220 calculates targets of 985, 1970, 2985, 3995, etc. in proportion to the changing line speed. If the delay remains constant, then the parts produced should be the correct length.

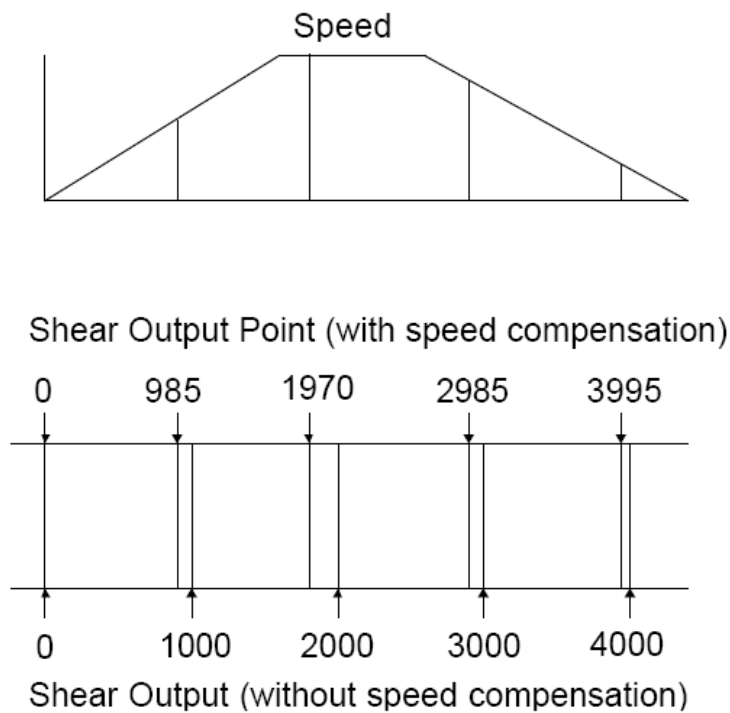


Figure 4: Speed vs. Speed Target

Adaptive Compensation for Stopping Machines

Feed-to-stop machines are used instead of flying die machines because the dies are simpler and the machines are normally more accurate. Higher accuracy is usually achieved by slowing the line speed down to a creep speed just before the target. This is done to minimize the effect of a delay in stopping that occurs when the stop signal is given by the controller.

Similar to the flying die situation, it takes a finite amount of time for valves to close, brakes to engage, and motors to stop turning. With simple counters, an overshoot past the target always occurs. Shifting into slow speed minimizes the amount of overshoot.

If the delay time and slow speed are constant, then lengths are accurate with the exception of the first piece, which is normally longer than the ones that follow. The distance from the end of the part where the machine needs to slow down is determined by the maximum line speed and how quickly the material decelerates from high to low speed.

The XL220 improves the performance of feed-to-stop machines by compensating for the stopping delay time and automatically setting the slowdown distance. With a technique similar to Speed Compensation, the controller uses the speed to calculate an advanced target to stop the machine so that it coasts into the exact shear point. The XL220 measures the amount of overshoot or undershoot on each move and adjusts its internal parameters to match the characteristics of the machine. A tolerance can be specified by the user so that accuracy is assured.

The XL220 also has a feature called Adaptive Slowdown that minimizes the feed time of feed-to-stop machines. Figure 6 shows the movement profile of a typical feed-to-stop machine. These systems use a fixed length slowdown distance that must be sized for the longest part length run. Short parts then spend a long time in slow speed because the material never reaches full speed when the slow shift point is reached. The controller with Adaptive Slowdown uses the measured line speed and deceleration characteristics of the machine to calculate the optimum point to shift into slow speed.

The result, shown in Figure 6, is less time spent in slow speed on short parts, which leads to more productivity. The controller continuously monitors machine parameters to automatically adjust for machine changes.

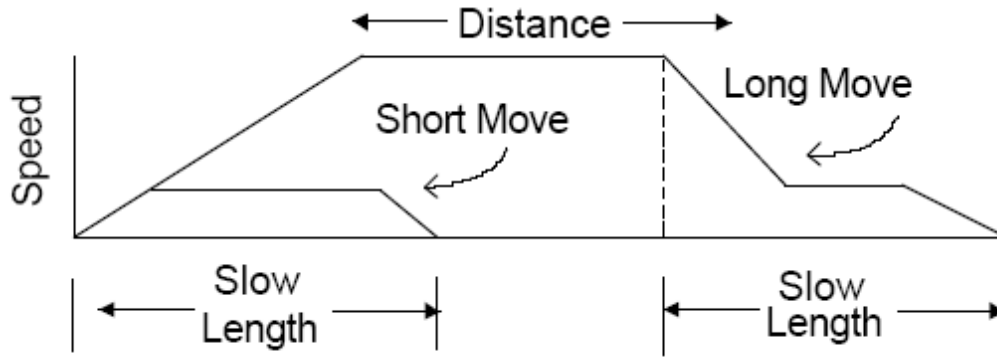


Figure 5: Speed Profile without Adaptive Slowdown

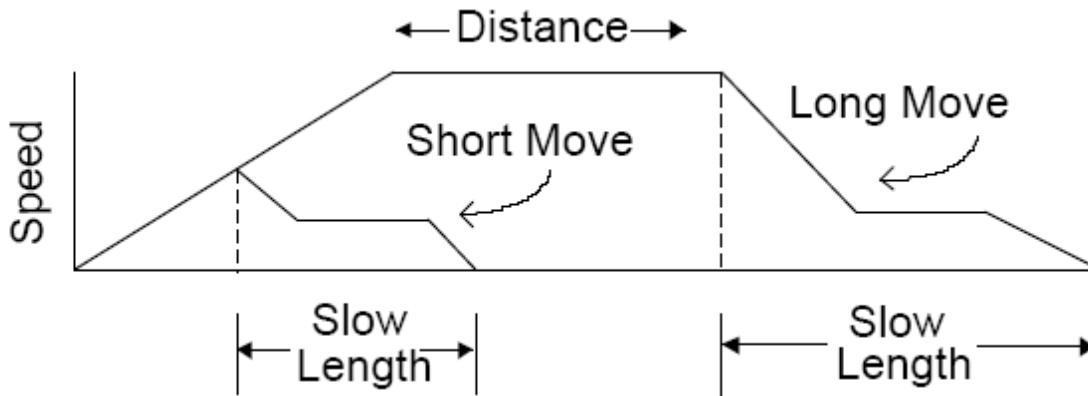


Figure 6: Speed Profile with Adaptive Slowdown

Material Change Point

Most post-cut roll former machines will waste material when a material change occurs and the old coil is returned to stock. If the order is run to the end, the roll former is full of material that cannot be backed out of the machine. The coil must be cut free at the entrance to the roll former. The piece left in the roll former is then fed through and becomes scrap if it cannot be cut into a useful part.

An alert operator can stop the line with a few pieces left and cut the coil free at the entrance to the roll former. If he guesses correctly, scrap can be minimized. If he makes a mistake and does not allow enough material, then the coil has to be re-threaded through the machine again. The XL220 solves this problem by automatically stopping the line when the trailing end of the last piece is at a predetermined point at the entrance to the roll former. The XL220 is always alert and never stops with too much or too little material to finish the order.

Punch Presses

All these accuracy enhancing features apply to the in-line punch presses as well as to the cutoff shear press.

Built-in Programmable Logic Controller

When designing a cut-to-length machine with an electronic counter for the length control device, a Programmable Logic Controller (PLC) or relay logic is normally added to generate the proper sequence of the machine and add standard safety features. AMS Controls has eliminated the need for a PLC by building comprehensive control logic into the XL220. This logic implements the following features:

- Four output configurations for speed control
- Run-Halt control by external contact
- Manual cycle of the Presses only in the Halt mode on feed-to-stop machines
- Manual crop allowed while running on non-stop machines
- Jog in manual only
- Automatic Shear or Press operation only in Run mode
- Halt on emergency stop or overload

The result is that the XL220 can be adapted to most machines with a minimum amount of external electrical components. The only “programming” that a user must do is to select the proper TYPE of machine through some switch settings. The controller then implements the appropriate logic based on the TYPE.

Chapter 2: Hardware

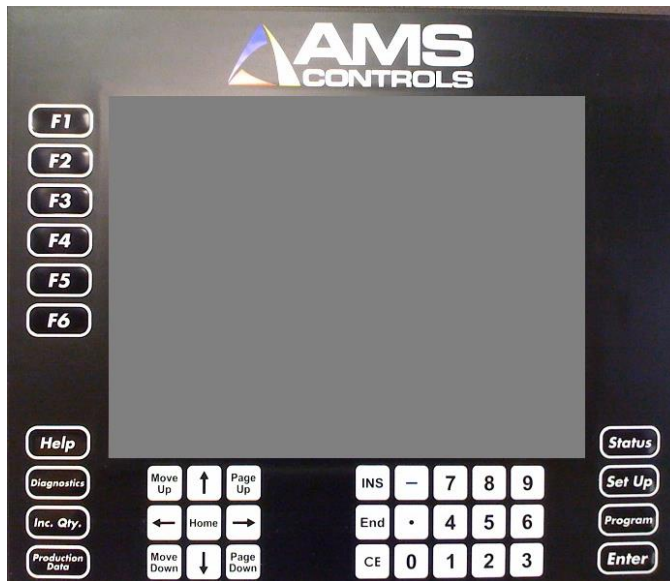


Figure 7: XL220 Controller

Microcomputer

The XL220 is the critical element of an advanced length control system. It is equivalent to a personal computer (PC) packaged in a rugged industrial enclosure. Programs are stored in EPROM (Erasable Programmable Read Only Memory) instead of on a disk. These programs were written by AMS Controls to perform the specific task of length control. The EPROM is factory programmed.

The user does not have to write programs for the controller and only has to enter data on what to produce. This data is stored in RAM (Random Access Memory). In a normal PC, this memory is erased when power to the PC is removed. In the XL220, a battery maintains this memory when off and user data does not have to be re-entered each time power is removed. RAM is used to store machine setup data and job information data.

Controller Keys and Functions

To help the operator become familiar with the keys on the controller, a brief description of the function of each key is provided. A more detailed description will be given in the Operating Procedure and Part Programming sections of the manual.



Figure 8: F1 - F6 Buttons

Located to the left of the display screen, these buttons are used for a number of operations depending on what screen you are on. The use of each button is always displayed at the bottom of the display screen and the job will vary on each menu screen.



Figure 9: Help, Diagnostics, Inc. Qty., Production Data Buttons

Help

Located at the bottom left of the display screen, the Help button can be used at any time to help explain the messages or prompts on the display.

Diagnostics

Located below and to the left of the display screen, the Diagnostics button is used to get to the diagnostics menu screen at any time.

Inc. Qty.

This button is located below and to the left of the display screen. Inc. Qty. is short for Increase Quantity and is used to create a part without counting against the completed part count (commonly used to replace a defective part).

Production Data

Located on the left below the display screen, the Production Data button can be used at any time to access the Production Data screen in the display.

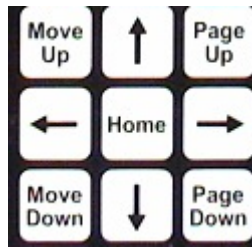


Figure 10: Arrow Keys

Arrow Keys ↓ → ↑ ←

Located on the left below the display screen, the arrow keys are used to move the cursor or highlighted item in the direction of the arrow pressed. Also used to scroll through the letters when entering alphanumeric data.

Move up, Move Down

Located on the left below the display screen, these buttons are used only in the Program Mode when editing orders. Pressing the Move Up or Move Down key will move the highlighted order in the indicated direction to change the sequence of operations.

Page Up, Page Down

Located on the left below the display screen, the Page Up button will move the highlighted line to the top of the display and Page Down button will move it to the bottom of the display screen. If there is more data that cannot fit on the current screen, pressing the Page Up or Page Down key a second time will move to the next page to be displayed.

Home

Located on the left below the display screen, the Home key will move the highlighted line to the first line of the current item being displayed, even if the display is currently showing a different page.



Figure 11: Numeric and Other Buttons

INS

Located below the display screen, it is used to “overtyping” other written text. This means you can type over something without having to delete.

End

Located below the display screen, the End button will move the highlighted line to the last line of the current item being displayed, even if the display is currently showing a different page.

CE

Located below the display screen, this is a **Clear Entry** button. The main use of this button is to correct the entered data when a mistake is made. Pressing this button will clear out the previously entered data so that the data can be entered again from the beginning. This key is also used when entering alphanumeric data to change from numbers to letters, and to clear controller errors.

Dash (-)

Located below the display screen, the Dash is used to put a dash in Order Numbers, Material Codes, etc. Example: Order Number 123-456-78. The Decimal Point on the number keypad will also provide the same function as the Dash.

Decimal Point, •

Located below the display screen, this key is used to place a decimal point when entering a number and it will also display a dash when entering alphanumeric data (for order and material numbers). A third use of this key is to produce the dividing line of a fraction when in the fractional mode, and entering fractions.

Number Keys, 0-9

Located below the display screen, the number keys used to enter numerical data.



Figure 12: Hot Keys

Status

Located at the bottom right of the display screen, the Status button is used to inform the operator which order is being processed, how much of the order is completed, and which orders are completed and/or waiting to be processed. Pressing this button opens the Status screen on the display.

Set Up

Located on the right below the display screen, the Set Up button is used to access machine setup parameters, define tool data, calibrate the machine, set the time clock, view the input/output screen, perform a memory test, enter printer information, perform die accelerator tests, access custom menus, and to setup the XL-Link program.

Program

Located on the right below the display screen, the Program key is used to define the dimensions of the parts to be produced.

Enter

Located below and to the right of the display screen, this key can be defined as a “take it” key, as the data that was entered into the display is not accepted by the controller until the Enter key is pressed.

Inputs

The main input into the controller is the group of signals from the encoder. A simplified diagram of this circuit is shown in Figure 13. The encoder outputs are differential line drivers that work well in electrically noisy environments. With the twisted pair cable, electrical noise is induced equally on both the normal and the complement signals. The differential line receiver in the controller looks at the difference in the two signals only. This causes the noise on the two lines to cancel each other and thus greatly increases the noise immunity of the encoder circuit.

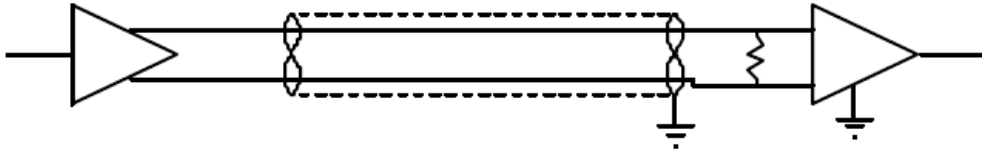



Figure 13: Simplified Encoder Channel Circuit

There are sixteen total discrete inputs into the controller. They sense continuity between an input and a common connection. A typical diagram of an input circuit is shown in Figure 14. This circuit requires a 24VDC biasing circuit that is provided either by the user or by the controller, depending on the controller configuration.

 **Note: No voltage source should be connected to any input. Doing so can severely damage the controller.**

Relay contacts, limit switches, or control switches are most common types of inputs. The input may also be the collector of an open collector NPN transistor that has its emitter connected to the common terminal. Current in each input circuit is limited to 15 mill amperes.

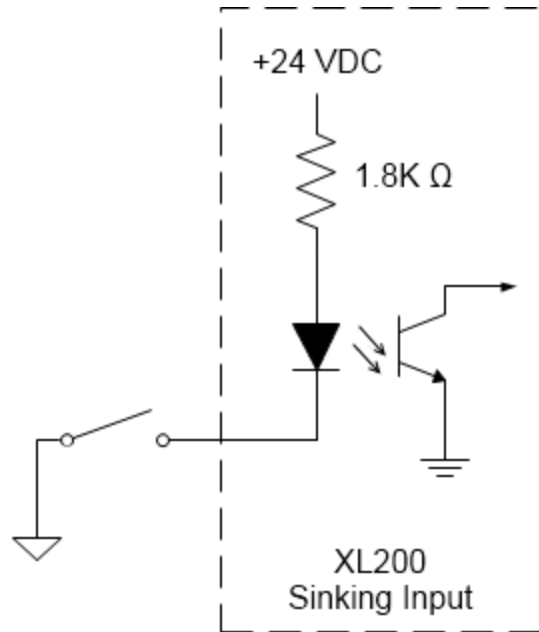


Figure 14: Standard Sinking Input Circuit

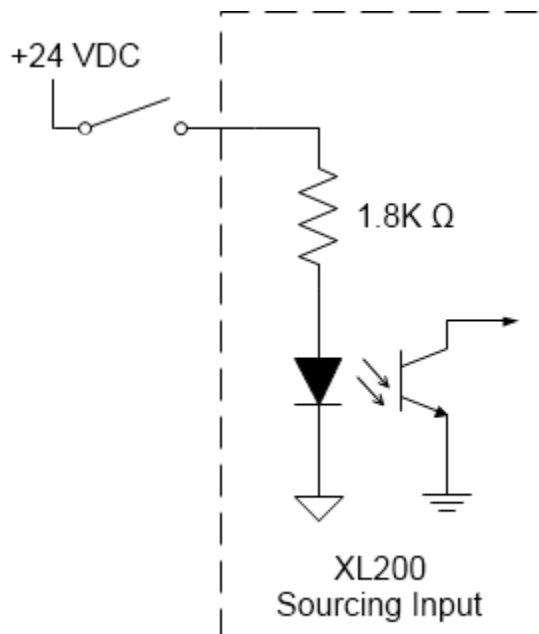


Figure 15: Standard Sourcing Input Circuit

Outputs

The Standard DC output of the **XL220** controller is a 4 Ampere open collector transistor. This is available in all configurations and for all outputs. A diagram of this circuit is shown in Figure 16: Standard Sinking Output. The biasing voltage for the load can be from 12 to 24 volts. If this voltage source comes from outside of the controller, the common of this supply must be connected to the common of the controller.

The suppressing diode shown reduces the noise generated by inductive loads when the transistor turns off. The load can be either a DC solenoid or a DC Relay.

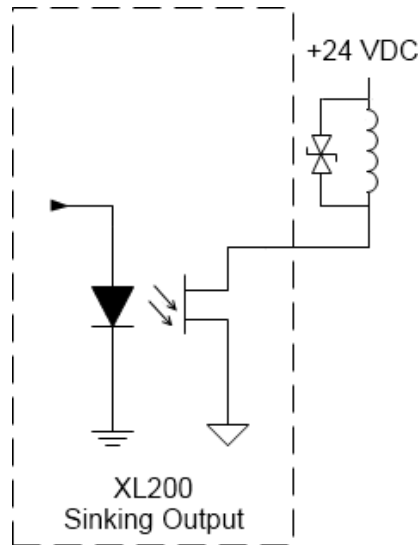


Figure 16: Standard Sinking Output

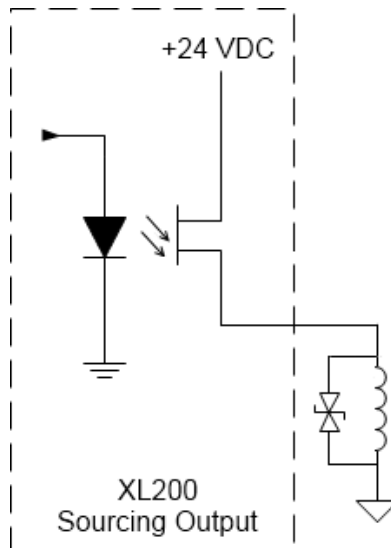


Figure 17: Standard Sourcing Output

Hardware Configuration & Connections

The XL220 controller is available in two hardware configurations:

- *Sinking Outputs with Sourcing Inputs (standard)* – identified with green connectors.
- *Sourcing Outputs with Sinking Inputs (optional)* – identified with black connectors.

The XL220 controller has six 16-pin terminal-style connectors on its back surface and several additional interface ports on its top surface. Figure 18: XL220 Controller – Back View through Figure 19: XL220 Controller – Top View show the controller's keypad and display, and the locations of all of the various connections.

Back Panel Connections



Figure 18: XL220 Controller – Back View

The six connectors on the back surface provide the following connection points:

- **Connector A** – 24 VDC CPU Power Supply input, Encoder 1 input, Encoder 2 input
- **Connector B** – 24 VDC I/O Power Supply input, Analog 1 output, Analog 2 output, Comm. Port-A (RS485), Comm. Port-B (RS485)

- **Connector C** – General Purpose Inputs 1-15
- **Connector D** – General Purpose Inputs 16-24, I/O Common, Comm. Port-C (RS422)
- **Connector E** – General Purpose Outputs 1-15, I/O Common
- **Connector F** – General Purpose Outputs 16-24, I/O Common, Comm. Port-D (RS422)
- **Connector G** – Encoder 3 Input
- **Connector H** – Encoder 4 Input

Three user-accessible fuses are provided to protect the controller's output circuits.

Additional Connections



Figure 19: XL220 Controller – Top View

The interface ports on top provide the following connection points:

- **DVI PORT** – Connects to AMS XL200 Remote Display.
- **ETHERNET** – Connects to Eclipse Production Management Software.
- **VGA PORT**– Connects to an industry-standard SVGA.
- **RS232 PORT** – Connects to an AMS-approved barcode scanner. This port is also used for updating the controller's firmware (a laptop computer with the appropriate software application is required).
- **MOUSE** – Connects to any industry-standard PS/2 keyboard.
- **KEYBOARD** – Connects to any industry-standard PS/2.
- **SERCOS TX and SERCOS RX** – Connects to servo drives and other devices on an industry-standard SERCOS fiber-optic communications network.

Display/Touch Screen

4/14/08		HALTED		OFPM				0.000"			
2:06 PM											
Order: ABC_Ind_0012398				Total: 677Ft		Done: 0Ft					
Material: GALV 018X024				PCode: P1							
Order-Material-PCode	Bundle	Qty	Done	Type	Height	Width	Lock	Vel	Conn	Status	
ABC_Ind_0012398	1	25	0	□	13.250"	9.750"	1	NO	1	Ready	
GALV 018X024	1	25	0	□	16.000"	20.000"	1	NO	1	Ready	
P1	1	25	0	—	20.000"	0.000"	1	NO	1	Ready	
DANCO_04776320	2	10	0	L	11.625"	17.250"	2	HI	1	Next	
GALV 016X022	2	10	0	L	11.625"	17.250"	2	HI	1	Ready	
P1	10	50	0	L	22.000"	24.000"	3	SP	1	Ready	
P1	10	50	0	L	24.000"	22.000"	3	SP	1	Ready	
Status F1-Next Window F2-Set to Next F3-Skip/Ready F4-Remake F5-Dec Qty											

Figure 20: Touch Screen

The XL220 controller is equipped with a touch screen in addition to the outside control buttons. The screen looks and functions as a regular personal computer does, with the addition of using your finger as the mouse (there is also the option of plugging in a mouse into the controller instead of using touch screen). Unlike a personal computer, the user is only able to navigate the screens predestined by the software set up in the XL220 controller. The screen options are Status, Setup, Program, Production Data, and Diagnostics, which are all explained in detail later in the manual. Every screen of the XL220 controller will have the same top and bottom bars, the bottom tool bar and the top information bar.

Tool Bar

The first feature of the tool bar is like that of a personal computer which is the drop up box found on the far left of the tool bar. When pressed it will give the options of:

Status – this selection displays the Status screen.

Setup – this selection displays the Setup screen.

Program – this selection displays the Program screen.

Prod. Data – this selection displays the Production Data screen.

Inc. Qty – this selection Increments the Quantity of the order.

Diagnostics – this selection displays the Diagnostics screen.

Help – this selection brings up the Help box which will show the last thing said by the software that you needed help with.

All of these selections are found in the form of buttons outside of the display screen and perform the same function. For a more detailed description of the selections refer to

Controller Keys and Functions on page 17.

The other feature of the tool bar is to the right of the drop-down box. Depending on what screen the user is currently on, there will be a set of options that are set to controller keys F1-F6. These options perform a specific job when on a certain screen. They can be operated by either pressing on them from the touch screen or by pressing the assigned controller key F1-F6. Each option will be described in detail later in the manual for each screen.

Information Bar

The information bar of the XL220 controller has five separate sets of information that will always be visible on the screen:

- Order
- Material
- Total
- PCode
- Done

Chapter 3: Installation

⚡ WARNING! This document is intended for users familiar with electrical control system wiring, cabinet layout, and component sizing, as well as local and national electrical codes. The procedures described in this handbook must be performed only by trained, certified industrial electricians in accordance with local, state, federal, and NEC codes and regulations. While AMS Controls has taken all reasonable care to develop safe procedures, it accepts no responsibility for injuries, damages, death, or destruction to persons or equipment caused as a result of not closely following these instructions. For specific controller questions, contact AMS Controls Inc.

Controller Power

CPU Power Supply


A high-quality, regulated supply is recommended for use with the XL220 controller.

24 Volts DC (+/- 10%)

2.5 Amps, minimum

I/O Power Supply

A separate, non-regulated power supply is sufficient for the Input/Output supply voltage.

 **Note:** Power supplies must not be shared—otherwise, there can be no optical isolation.

This power supply should be properly sized based on the load requirements for all output devices connected to the XL220 controller. Typical output devices include motor contactors, relays, and valve solenoids. Each device has its own power requirements that will determine the size requirements for the I/O power supply.

Encoder Installation

Mounting the encoder properly is the most important aspect of the XL220 controller installation because accurate material tracking is required for the controller to produce consistently accurate parts. Here are a few guidelines to consider when installing the material-tracking encoder with an XL220 controller:

Encoder Placement

AMS Controls recommends that the encoder be located in a position where the material is stable, free from excessive vibration, and not exposed to a large amount of liquid coolant. The distance from the encoder to the cut-off press must not fluctuate, and kept as short as possible. Locate the encoder on a flat section of material where the entire surface of the wheel makes contact with the material; avoid tracking on curved or arced surfaces.

Whenever possible, the encoder wheel should ride directly on the material. In some applications where space is limited, extra couplers, belts, or shaft extenders are required for the encoder wheel to reach the material. Extra care should then be taken to ensure that no slippage or backlash can occur in the coupling mechanism.

Encoder Mounting and Alignment

The encoder wheel should turn perfectly parallel to the direction of material flow. The face of the wheel should be mounted at a 90 degree angle from the surface of the material it is tracking. Figure 21 illustrates several examples of improper encoder mounting.

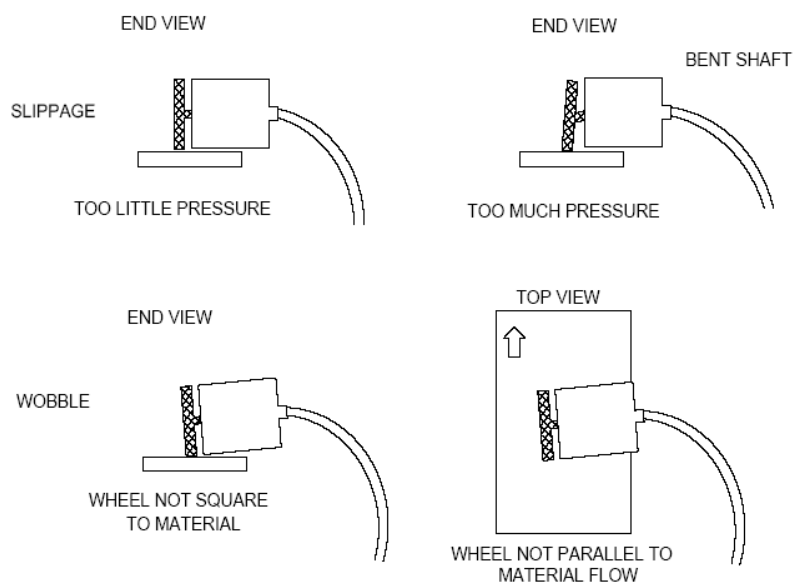



Figure 21: Improper Encoder Mounting

For best results, the encoder wheel should be able to float up and down with the material.

Mount the encoder wheel using a tensioning system (spring tension, pneumatic pressure, or a weighting device) to apply adjustable and controlled pressure between the encoder wheel and the material. This way, the encoder wheel can move with the material's fluctuations, yet continue to track the surface without slippage.

 **Note:** 7-10 pounds per square inch of pressure is recommended for proper material tracking—excessive pressure causes binding in the encoder bearing, or causes the shaft to bend over time.

Some applications may require special mounting hardware and special types of tracking wheels. The encoder wheel may need to be mounted onto the surface of a feed roll or straightener roll, or the encoder itself may need to be mounted onto the end of a roll. Tracking in this method may provide the desired results, but also creates potential for slippage between the rolls and the material, costing accuracy—appropriate precautions must be taken.

AMS Controls Encoders, Wheels, & Brackets

AMS Controls provides specially designed encoders, wheels, and mounting brackets for use with all XL220 controllers.

Emergency Stop Circuit

Every machine should have some type of emergency stop circuit for the safety of the operator and for the protection of equipment. A properly rated safety relay must be used. The circuit must be armed by pressing the RESET switch.

Power to the controller should not be interrupted by the emergency stop circuit. However, the controller must know when an emergency stop has occurred in order to drop the line out of RUN mode. This can be accomplished by breaking the Run circuit or taking away the E-stop input on closed-loop controllers. If an emergency stop condition occurs, power should be isolated from all output devices. This includes all 24 VDC devices as well as all 115 VAC devices.

Shear Control Circuit

Optimal performance of the shear circuit can be met by customizing the XL220 to a particular type of press and feed control by the appropriate setting of the “TYPE” setting switches. The controller can be configured to work with flying-cut or feed-to-stop applications. Outputs are available for **Shear Down** and **Shear Up** or **Shear Die Boost**.

XL220 Controllers are designed to connect directly to 24 VDC solenoids for optimal performance. A solenoid driving device, such as the AMS Solenoid Driver Module (also referred to as the 5840 or “Slammer”), can provide more accurate firing of the press.

If the solenoid for any of the shear outputs is 115 VAC, then an attempt should be made to replace the solenoid with a compatible 24 VDC type. If this is not possible, then a 24 VDC relay will have to be installed between the AMS output and the solenoid.

AMS controllers have a timed shear output with a switch input override feature. The duration of the **Shear Dwell** or **Shear Down** output is programmable from 0 to 9.999 seconds. Please refer

to timing diagram – Figure 22. If the controller detects a switch closure at the **Shear Complete** input during the dwell time, the shear output will turn off immediately as seen in Figure 23. This is especially useful on mechanical presses that will need the shear-complete switch mounted in a location that will return the press to top-dead-center. The **Shear Dwell Up** time will time out as programmed regardless of the complete input.

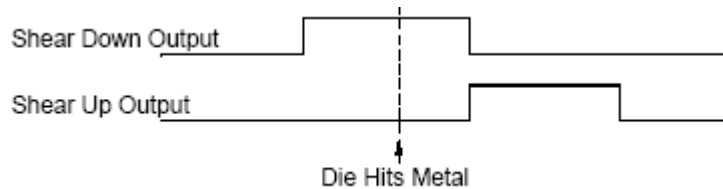


Figure 22: Timing Diagram

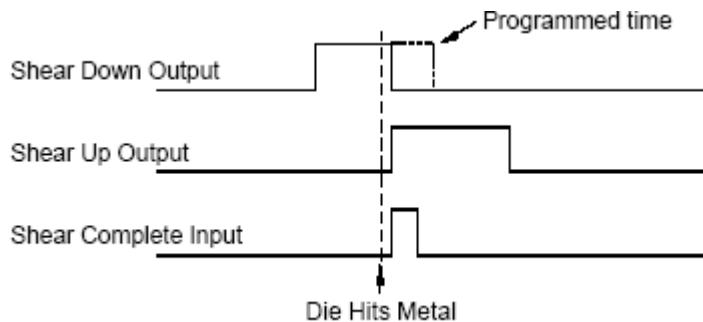


Figure 23: Shear Output Shutting Off After Detecting a Switch Closure

Press Control Circuit

The terms and definitions for the press control parameters are identical to its shear control counterparts. The press parameters will include **Press Dwell Down** and **Press Dwell Up** or **Press Die Boost** depending on the machine's configuration.

24 VDC Press solenoids can be directly driven by the 24 VDC outputs of the controller. The press outputs can also signal the Solenoid Driver Module (or "Slammer") or isolation relays for higher voltage solenoids.

Like the shear output, the **Press Dwell Down** can be programmed from .001 to 9.999 seconds. A **Press Complete** input will override the press's timed output and turn off the output immediately upon detection. In some closed loop applications, a 0.0 time can be programmed if a **Press Complete** is used. If a **Press Complete** is not detected within ten seconds, then the run output is turned off. The **Press Dwell Up** will time out as programmed regardless of the press complete input. See Figure 22 and Figure 23.

Downstream Controller Communications

The XL220 communicates with downstream controllers via an RS485 communications port. When two or more downstream controllers are used, they must be daisy-chained with the shields of the cables tied to the XL220 controller only. Refer to Figure 24.

If more than 10 feet of wire is used between the XL220 and the last downstream controller, a 330 Ohm resistor must be added in parallel to the TX/RX connections on the XL220 and the last controller in series. The suggested cable used for the communications is a Belden cable #9841, #9842, or CAT 5 cable.

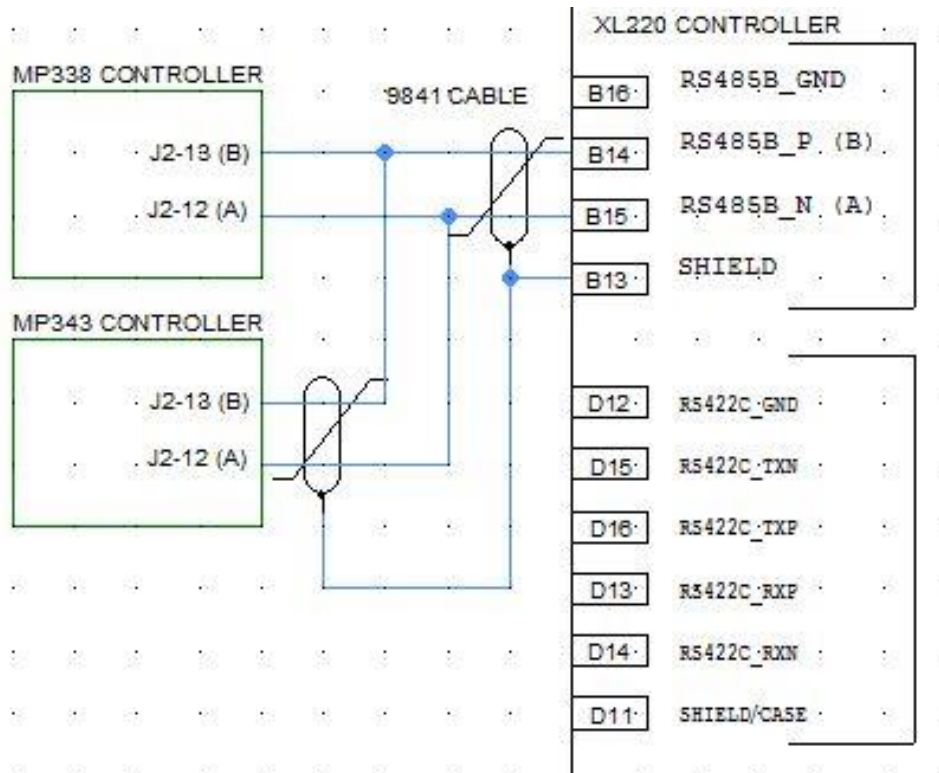


Figure 24: Communication Connections

Chapter 4: Customization

Software Models

The XL220 controller is factory-programmed with a specific software model. Hundreds of different software models are available to handle the large variety of machine types found throughout the roll forming industry. Additionally, each software model may be configured to operate in one of several different modes, depending on the machine's requirements. Some model configurations may require unique input and output definitions to handle a particular machine type.

The factors that influence which software model should be selected and how it should be configured for a particular application include:

- The number of presses on the machine that the XL220 controller must control.
- Whether the machine operates in a flying-cut or feed-to-stop.
- The presence of one or more peripheral devices interfacing with the XL220 controller.
- Notching presses before or after the shear.

Model Options

Auxiliary Controller (S)


Allows the controller to communicate with one or more auxiliary (slave) controllers. This option may be required for complex shear & punch machines requiring more than one AMS Controls controller. This option is available for most model types.

Analog Speed Logic (AA)

Enables the XL220 controller's analog output port and provides additional setup parameters. An analog voltage is provided by the controller that can be used to control the roll forming machinery's fast and slow speeds proportional to the current part length.


PLC Interface (I)

Allows the XL220 controller to communicate with a PLC using the industry-standard MODBUS interface. Several additional features are available when this option is enabled including controlling PLC inputs and outputs, displaying PLC diagnostics messages on the XL220 controller screen, and publishing high-level run-time data from the controller to the PLC. This option is available for most model types.

 **Note:** AMS Controls does not recommend communicating any time critical Inputs/Outputs over MODBUS. These include, but are not limited to, Press (n) Complete signals, Edge-Detect 1, Edge-Detect 2, and any Press Down inputs.

Configuration Switch Settings

The machine configuration switch settings are controlled by virtual onscreen dip switches. These switches give the options of several different operating modes, depending on the machine's requirements. There are 10 switches provided, each one can be set to ON or OFF. The following table defines how the configuration dip switches are used for the XL220 controller.

 **Note:** To access the virtual dip switches on the XL220, hold down the **Set Up** key (to the right and below the touch screen) while the controller is turning on.

Switch #	OFF	ON
1	Feed-to-Stop (All Presses)	Non-Stop (All Presses)
2	Die Boost outputs active ¹ (shear and all presses/notches)	Press Up outputs active (shear and all presses/notches)
3	Single-Speed (All Presses)	Two-Speed (All Presses)
4	Disable hole-punch press (for conduit reinforcement punching)	Enable hole-punch press (for conduit reinforcement punching)
7	No second sensor used	Enable second sensor ²
8	NOT USED – MUST BE OFF	NOT USED – MUST BE OFF
9	NOT USED – MUST BE OFF	NOT USED – MUST BE OFF
10	NOT USED – MUST BE OFF	NOT USED – MUST BE OFF
<hr/>		
Switch 5	Switch 6	Description
OFF	OFF	No vee-notches or end-notches
ON	OFF	One inline vee-notch & one inline end-notch
OFF	ON	One downstream vee-notch & one downstream end-notch ³
ON	ON	Two inline vee-notches & two inline end notches

¹ Die boost outputs are only allowed during non-stop mode.

² DIP switch 7 is only valid when the downstream notcher is enabled. The first sensor is for the end notches. The encoder is reset on both transitions of the sensor. The first end notch occurs relative to the OFF to ON transition and the trailing notch occurs relative to the ON to OFF transition. The encoder count for the end notches is reset on both transitions.

³ Downstream notches only allowed during non-stop mode.

Input/Output Assignments

Only after the XL220 controller's software model is identified and the configuration dip-switches have been set are the definitions for all inputs and outputs known. The following table defines how the configuration dip-switches are used.

I/O#	Inputs	Outputs
1	Jog Forward	Fast
2	Jog Reverse	Slow
3	Run	Reverse
4	Not Used	Run
5	Setup Lockout	Item Complete
6	Manual Shear	Forward
7	Manual Hole-Punch	Reserved (Print Flush)
8	Tail Out (Inverted Sheet Detect)	Reserved (Print Trigger)
9	Shear Press Complete	Shear Press Down
10	Vee-Notch Press 1 Complete	Vee-Notch Press Down
11	End-Notch Press 1 Complete	End-Notch Press Down
12	Vee-Notch Press 2 Complete	Hole-Punch Press Down
13	End-Notch Press 2 Complete	Shear Press Up Boost
14	Hole-Punch Press Complete	Vee-Notch Press Up Boost
15	Not Used	End-Notch Press Up Boost
16	Manual Vee-Notch	Hole-Punch Press Up Boost
17	Manual End-Notch	Notch Die Select (Gag)
18	Jog Forward (Downstream Notch)	Hole-Punch Center Die Select (Gag)
19	Jog Reverse (Downstream Notch)	Hole-Punch Outer Die Select (Gag)
20	Edge-Detect 2 (Downstream Notch)	Hole-Punch Offset Shift (Gag)
21	Reserved (A-sync Print Detect)	Hole-Punch Damper Die Select (Gag)
22	Not Used	Blank Sheet Indicator
23	Not Used	Forward Feed (Downstream Notch)
24	Edge-Detect 1 (Downstream Notch)	Reverse Feed (Downstream Notch)

Notes:

All inputs and outputs pertaining to the Vee-Notch and End-Notch presses, Downstream Notch presses, and the Hole-Punch press are only active when the corresponding functionality has been enabled via the machine configuration settings.

Input/Output Descriptions

Inputs

Jog Forward

Jog Forward jogs the material forward through the machine. The XL220 controller ignores this input if it goes active while the controller is in the run mode. The controller will turn on its Slow and Forward outputs for as long as the Jog Forward input is activated. This Jog Forward input is typically activated by a momentary push-button.

Jog Reverse

Jog Reverse jogs the material backward through the machine. The XL220 controller ignores this input if it goes active while the controller is in the run mode. The controller will turn on its Slow and Reverse outputs for as long as the Jog Reverse input is activated. The Jog Reverse input is typically activated by a momentary push-button.

Run

Run causes the XL220 controller to enter and exit the Run mode. When activated, the controller enters the Run mode as long as valid order data is programmed and no error conditions are detected. The controller exits the Run mode any time this input goes inactive. The Run input is typically initiated by a momentary push-button, but is latched-in (maintained) by a control relay tied to the controller's Run Output.

Shear Press Complete

The Shear Complete is an input that should go momentarily active when the shear is at the bottom of its stroke. Typically this input is wired to a limit switch, cam switch, proximity switch, or similar device. The use of the input is optional. Its function is to force the controller's Shear Down output to turn off before the programmed Shear Dwell Down time elapses. This can be used to prevent a hydraulic shear press from over-driving (bottoming-out) or to help a mechanical press to stop at top-dead-center following each cycle. If the Shear Down input is not used, the controller leaves the Shear Down output active for the entire Shear Dwell Down time during each shear cycle.

Setup Lockout

The Setup Lockout input is used to prevent personnel from accessing critical data in the XL220 controller. When active, the machine operator is not allowed to change most setup parameters and is restricted from performing certain functions. The Setup Lockout is typically wired to a key-switch and it is recommended that the key be held by a maintenance supervisor.

Manual Shear

The Manual Shear input causes the XL220 controller to cycle the shear press and manually crop off any material that is under the shear blade. This process also references the controller to the material encoder and sets the controller's encoder position to a known value. On some systems, the manual shear cycle must be executed twice to reference the encoder's position. The Manual

Shear input is not allowed while the controller is in the run mode (unless the controller is configured for a shear-only machine) but is always allowed while the controller is halted. The Manual Shear input is typically wired to a momentary push-button.

Manual Hole Punch

The Manual Hole Punch input causes the controller to activate one of its press outputs and execute a press cycle. Which press output turns on may depend on the value of a setup parameter **Tool Selected for Manual Press**. A manual press cycle is not allowed while the controller is in the Run mode. This input is typically wired to a momentary push-button.

Coil Tail-out (Inverted Sheet Detect)

The Coil Tail-out input detects the presence of material in the machine and “qualifies” the encoder signal. Its functionality can be thought of as an inverted sheet detect. It should be wired such that the input goes inactive when the leading edge of the material (coil) is loaded into the machine. The input should go active when the trailing edge of the material exits the machine (when the coil tails out). The use of this input is optional and if left unconnected the controller will think that there is always material present. Using this input along with the accompanying setup parameter **Shear-to-Encoder Distance** allows the controller to keep track of good and scrap material during the coil loading and tail-out processes. This input is typically wired to a photo-cell, and the sensor should be located just after the encoder.

Press (n) Complete


The XL220 controller provides a Press Complete input for each press on the machine based on the configuration dip-switch settings. Each Press Complete input functions similar to how the Shear Complete input works. The Press Complete input should go active momentarily when the corresponding press is at the bottom of its stroke. When the input goes active, it causes the controller to turn off the corresponding Press Down output before the programmed Press Dwell Down time has elapsed. Use of this input is optional, but it may be required on mechanical presses to cause the press to stop at top-dead-center after each cycle. See the description for the Shear Complete input for more details.

Outputs

Fast, Slow, Reverse, and Forward

These four outputs are referred to as the motion outputs of the XL220 controller. They are intended to control the motion of the machine. The table below describes the state of each of these outputs while the controller is in various operating modes:

Operating Mode	Fast Output	Slow Output	Reverse Output	Forward Output	Run Output
Halted	Off	Off/On*	Off	Off	Off
Jog Forward	Off	On	Off	On	Off
Jog Reverse	Off	On	On	Off	Off
Run (Fast Speed)	On	Off	Off	On	On
Run (Slow Speed)	Off	On	Off	On	On

 **Note:** *The Slow output may remain ON based on the value of setup parameter **Slow Output While Halted**.

Run

The Run output should be used only to latch in the controller's run input circuit and to activate safety devices such as horns or indicator lights to indicate when the controller is in the Run Mode. The output turns on after the controller's Run input has been activated only if there is valid job data entered and there are not error conditions that prevent the controller from entering the run mode. This output should NOT be used to control actual material motion.

Shear/Press Down

The Shear/Press outputs are connected directly or indirectly to solenoids that force a shear or punch press to move in the downward direction. This output is a timed output that remains active for the length of time specified by the controller's setup parameter **Shear Dwell Down** or **Press Dwell Down** unless over-ridden by the corresponding Shear/Press Complete input.

Shear/Press Up

The Shear/Press Up outputs may be available depending on the XL220 controller's configuration dip-switch setting. The output should be directly connected to a solenoid that drives the shear/punch press upward during the return stroke of its cycle. This is a timed output that remains on for the programmed **Shear/Press Dwell Up** time in the controller's setup parameter list.

Shear/Press Die Boost

The Shear/Press Die Boost outputs may be available depending on the XL220 controller's configuration dip-switch setting. It is applicable for shear/punch presses that activate on-the-fly (without the material stopping for the operation) and that require a device that boosts (or pushes) the die forward in the direction the material is moving. The output should be directly or indirectly connected to a solenoid that activates the boosting device. This is a timed output that remains on for the programmed **Shear/Press Boost Dwell time** in the controller's setup parameter list.

Item Complete

The XL220 controller activates the Item Complete output during the run mode each time a programmed line item has been completed. This is a timed output that remains active for the length of time specified by the setup parameter **Item Complete Dwell**. The output can be used for a variety of functions, but is typically connected to the input of a PLC that may be controlling some downstream packaging equipment or other processing.

Encoder Input Assignments

Encoder Input #	Description
1	Material (line) encoder for shear press and in-line notch/punch presses.
2	Reserved
3	Second material (line) encoder for downstream notch presses (optional, corresponds with edge detect 2 input).
4	First material (line) encoder for downstream notch presses (corresponds with edge-detect 1 input).

Signal Ports

Analog Output #1 (Proportional to Line Velocity)

A 0-10 Volt analog output signal is generated that is directly proportional to the current line speed as measured by the material encoder. The setup parameter **Velocity at Max Analog Voltage** determines the scaling factor for this proportional output voltage with respect to the current line velocity.

Analog Output #2 (Analog Speed Logic)

This function is only active when the Analog Speed Logic (AA) model option is enabled. A 0-10 Volt analog output signal is generated that is intended to control the speed of the roll former. Several additional setup parameters are provided when this model option is enabled that are used to set this analog output to specific voltage levels for fast, slow, and jog speeds. The voltage may also be set up so that it is proportional to the current part length being produced

(for applications where it is desirable to run the machine at a faster speed while making longer parts).

Comm. Port “A” (RS485 Eclipse Port)

This RS485 serial communication port is solely intended to be connected to an office computer running AMS Controls’ Eclipse production management software. See the Eclipse Technical Reference guide for more details.

Comm. Port “B” (RS485 Auxiliary Port)

This RS485 serial communication port can be connected to a variety of auxiliary devices including AMS Controls and Auxiliary Controllers.

Comm. Port “C” (RS422 Speed Port)

This RS422 High-Speed communication port can be connected to time-critical devices that comply with the AMS Controls High-Speed Bus specification. Such devices include the AMS Controls SERCOS-PC for use on multi-axis machine applications.

Comm. Port “D” (RS422 High Speed Port)

This RS422 High-Speed communication port can be connected to a PLC that complies with the industry-standard MODBUS serial communication specification.

Chapter 5: Setup Parameters

Once the XL220 controller has been customized with a specific software model and a unique configuration dip-switch setting, it still must be tailored to the machine's operation using Setup Parameters.

Most Setup Parameters are determined and entered during the controller installation process and are not usually changed during normal operation. This chapter provides a complete listing of all possible setup parameters in the XL220 controller; however not all parameters apply to each dip-switch configuration.

Setup Screen

The XL220 controller setup parameters are accessed from the Setup screen.

6/18/10	HALTED	0FPM	0.000"
1:41 PM			
Model: XL220 Created: 0/00/0012:00 AM Switch: 56 Version: 4.03.04			
Setup Menu	ID	Name	Value
Machine Parameters	121	Shear Dwell Down	0.000sec
Tool Data	123	Shear Boost Dwell	0.000sec
Lock Data	126	Shear Boost Enable Velocity	0FPM
Trim Correction	127	Expect Shear Complete	No
Controller Settings	131	Vee Notch 1 Dwell Down	0.000sec
License	133	Vee Notch 1 Boost Dwell	0.000sec
QuickSet Data	136	Vee Notch 1 Boost Enable Velocity	0FPM
	137	Expect Vee Notch 1 Complete	No
	141	End Notch 1 Dwell Down	0.000sec
	143	End Notch 1 Boost Dwell	0.000sec
	146	End Notch 1 Boost Enable Velocity	0FPM
	147	Expect End Notch 1 Complete	No
<small>Defines the time it takes for the press to move from the top of its stroke to the bottom. The Down output will turn on for this amount of time during manual or automatic press operations. SHEAR DWELL DOWN applies to the shear press. PRESS DWELL DOWN</small>			

Figure 25: Setup Screen

The Setup screen is divided into two sections. Menus are listed in the right-hand section, while the Parameters for the selected menu display in the right-hand section.

This section lists and describes the most commonly used menus and their parameters.

Machine Parameters Menu

Select the **Machine Parameters** menu to display the parameters that affect the operation of the machine, including press timing, machine layout dimensions, and run mode options.

6/18/10 1:46 PM	HALTED	0FPM	0.000"
Model: XL220		Created: 0/00/0012:00 AM Switch: 56	Version: 4.03.04
Setup Menu	Machine Parameters	ID	Name
Press Data	Run Mode Options	121	Shear Dwell Down
Machine Layout	Advanced Setup	123	Shear Boost Dwell
Tool Data		126	Shear Boost Enable Velocity
Lock Data		127	Expect Shear Complete
Trim Correction		131	Vee Notch 1 Dwell Down
Controller Settings		133	Vee Notch 1 Boost Dwell
License		136	Vee Notch 1 Boost Enable Velocity
QuickSet Data		137	Expect Vee Notch 1 Complete
		141	End Notch 1 Dwell Down
		143	End Notch 1 Boost Dwell
		146	End Notch 1 Boost Enable Velocity
		147	Expect End Notch 1 Complete
			** .***sec
			0.000sec
			0FPM
			No
			** .***sec
			0.000sec
			0FPM
			No
			** .***sec
			0.000sec
			0FPM
			No

Lists all parameters that the can be used to customize the controller's operation to match your machine's specific requirements.

Figure 26: Machine Parameters Menu

Press Data

Includes setup parameters that are related to the operation and timing of the shear and punch press or presses.

Shear Dwell Down

ID: 121
 Range: 0.001 to 30.000 Seconds
 Applies to: All Configurations
 Switch Configuration: All Configurations

The **Shear Dwell Down** parameter defines the length of time that the controller turns on the Shear Down output during a manual or automatic shear cycle. This may be set to the exact time necessary to move the shear die from the top of its stroke to the bottom, or it could be set to a value longer than necessary if the Shear Complete input is used to override the timer.

See Also: Shear Reaction, Shear Dwell Up, Expect Shear Complete.

Shear Dwell Up

ID: 122
 Range: 0.000 to 30.000 Seconds
 Applies to: Configurations with the Shear Boost output disabled
 Switch Configuration: Dip-switch 2 turned ON

The **Shear Dwell Up** parameter defines the length of time the controller turns on the Shear Up output during a manual or automatic shear cycle. This is typically the time necessary for the shear die to return from the bottom to the top of its stroke.

See Also: Shear Dwell Up, Shear Reaction, Expect Shear Complete

Shear Boost Dwell

ID: 123
Range: 0.000 to 9.999 Seconds
Applies to: Flying-Cutoff Configurations with Shear Boost enabled
Switch Configuration: Dip-switch 1 ON and Switch 2 OFF

The **Shear Boost Dwell** parameter defines the length of time the controller turns on the Shear Boost output during an automatic shear cycle.

See Also: Shear Dwell Down

Shear Reaction

ID: 124
Range: 0.000 to 1.000 Seconds
Applies to: Flying-Cutoff Configurations
Switch Configuration: Dip-switch 1 turned ON

The **Shear Reaction** parameter is used to compensate for the time delay between the instant that the controller's Shear Down output turns on and when the shear die makes contact with the material. The effect is that the Shear Down output turns on early by this amount of time during an automatic shear cycle before the programmed cutoff target is reached. Properly setting the **Shear Reaction** parameter helps to avoid the common problem of the first piece is too long following a standing (manual cut).

See Also: Shear Dwell Down

Shear Boost Reaction

ID: 125
Range: 0.000 to 1.000 Seconds
Applies to: Flying-Cutoff Configurations with Shear Boost enabled
Switch Configuration: Dip-switch 1 ON and switch 2 OFF

The **Shear Boost Reaction** parameter defines the amount of time by which the Shear Boost output turns on early with respect to the programmed cutoff target during an automatic shear cycle. It is often used to activate the boosting device BEFORE the Shear Down output is turned on in order to get the shear die moving before the cut cycle is initiated.

See Also: Shear Boost Dwell, Shear Reaction

Shear Boost Enable Velocity

ID:	126
Range:	0 to 1000 Feet/Min
Applies to:	Flying-Cutoff Configurations with Shear Boost enabled
Switch Configuration:	Dip-switch 1 ON and switch 2 OFF


The **Shear Boost Enable Velocity** parameter defines the lowest line velocity at which the Shear Boost output becomes functional. This parameter typically prevents the Shear Boost output from turning on during an automatic shear cycle if the line is running too slow. If the line speed is less than this value, the Shear Boost output will not turn on during the shear cycle. A value of 0 enables the Shear Boost functionality at any line speed.

See Also: Shear Boost Dwell, Shear Boost Output

Expect Shear Complete

ID:	127
Selections:	Yes/No
Applies to:	All Configurations
Switch Configuration:	All Configurations

Setting this parameter to Yes causes the controller to display an error message (and drop out of the run mode) if the Shear Dwell Down timer expires before the Shear Complete input goes active during a manual or automatic shear cycle. Using this functionality with a properly mounted Shear Complete switch provides a method to guarantee that the shear die completely cuts through the material during each cycle.

 **Note:** This functionality was provided in previous controller software versions by setting the **Shear Dwell Down** parameter to 0.000 seconds.

See Also: Shear Dwell Down, Shear Complete Input

Press (n) Dwell Down

ID:	131, 141, 151, 161, 171
Range:	0.001 to 30.000 Seconds
Applies to:	Configurations including one or more punch presses
Switch Configuration:	At least one of dip-switches 4, 5, or 6 must be ON

The XL220 controller provides one **Press (n) Dwell Down** setup parameter for each punch press on the machine based on the configuration switch setting. The functionality is very similar to that of the **Shear Dwell Down** parameter, only with respect to a punch press.

See Also: Shear Dwell Down

Press (n) Dwell Up

ID:	132, 142, 152, 162, 172
Range:	0.001 to 30.000 Seconds

Applies to:	Configurations including one or more punch presses when Press Boost outputs are disabled
Switch Configuration:	At least one of dip-switches 4, 5, or 6 must be ON and switch 2 must be ON

The XL220 controller provides on **Press (n) Dwell Up** setup parameter for each punch press on the machine based on the configuration switch setting. The functionality is very similar to that of the **Shear Dwell Up** parameter, only with respect to a punch press.

See Also: Shear Dwell Up

Press (n) Boost Dwell

ID:	133, 143, 153, 163, 173
Range:	0.000 to 9.999 Seconds
Applies to:	All configurations including one or more punch presses in non-stopping mode with Press Boost output(s) enabled
Switch Configuration:	At least one of dip-switches 4, 5, or 6 must be ON, switch 1 must be ON, and switch 2 must be OFF.

The XL220 controller provides one **Press (n) Boost Dwell** setup parameter for each punch press on the machine based on the configuration switch setting. The functionality is very similar to that of the **Shear Boost Dwell** parameter, only with respect to a punch press.

See Also: Shear Boost Dwell

Press (n) Reaction

ID:	134, 144, 154, 164, 174
Range:	0.000 to 1.000 Seconds
Applies to:	All configurations including one or more punch presses in non-stopping mode
Switch Configuration:	Dip-switches 1 and 4 must be ON

The XL220 controller provides one **Press (n) Reaction** setup parameter for each punch press on the machine based on the configuration switch setting. The functionality is very similar to that of the **Shear Reaction** parameter, only with respect to a punch press.

See Also: Shear Reaction

Press (n) Boost Reaction

ID:	135, 145, 155, 165, 175
Range:	0.000 to 1.000 Seconds
Applies to:	All configurations including one or more punch presses in non-stopping mode
Switch Configuration:	Dip-switches 1 and 4 must be ON

The XL220 controller provides on **Press (n) Boost Reaction** setup parameter for each punch press of the machine based on the configuration switch setting. The functionality is very similar to that of the **Shear Boost Reaction** parameter, only with respect to a punch press.

See Also: Shear Boost Reaction

Press (n) Boost Enable Velocity

ID:	136, 146, 156, 166, 176
Range:	0 to 1000 Feet/Min
Applies to:	All configurations including on or more punch press in non-stopping mode
Switch Configuration:	Dip-switches 1 and 4 must be ON

The XL220 controller provides one **Press (n) Boost Enable Velocity** setup parameter for each punch press on the machine based on the configuration switch setting. The functionality is very similar to that of the **Shear Boost Enable Velocity** parameter.

See Also: Shear Boost Enable Velocity

Expect Press Complete (n)

ID:	137, 147, 157, 167, 177
Selections:	Yes/No
Applies to:	All configurations including one or more punch presses
Switch Configuration:	Dip-switch 4 must be turned ON

The XL220 controller provides one **Expect Press Complete (n)** setup parameter for each punch press on the machine based on the configuration switch setting. The functionality is very similar to that of the **Expect Shear Complete** parameter, only with respect to a punch press.

See Also: Expect Shear Complete

Manual Notch Select

ID:	260
Selections:	1, 2
Applies to:	Configurations including inline vee notches and two inline end notches.
Switch Configuration:	Dip switches 5 and 6 must be on.

Determines which set of vee notch or end notch fires with a manual button.

Manual Hole Punch Select

ID:	266
Selections:	Center Hole / Outer Hole / Damper Hole
Applies to:	Configurations with hole punching enabled.
Switch Configuration:	Dip switch 4 must be on.

The **Manual Hole Punch Select** parameter defines the output that will be fired when a “Manual Hole Punch” input is actuated. For example, if the parameter is set for “Center Hole,” when the operator actuates the “Manual Hole Punch” input using an external pushbutton located on the operator panel, output #18 for “Hole-Punch Center Die Select (Gag)” will be turned on as well as output #12 for the amount of time as programmed in the parameter **Hole Punch Dwell Down**.

Punching Mode

ID:	267
Selections:	Synchronous / Sequential
Applies to:	Configurations with end notches and vee notches in two-speed mode.
Switch Configuration:	Dip switches 2, 3 must be on as well as 5 or 6.


The **Punching Mode** parameter defines how the machine presses will react when the material is stopped for a press operation. Some machines are capable of punching multiple presses at a time while some machines are not. Setting this parameter to “Synchronous” will allow multiple presses to be fired at the same time. Setting this parameter to “Sequential” will force the controller to actuate one press at a time.

Run Mode Options

Bundle Quantity Reload Value

ID:	300
Range:	0 to 9999 (Quantity of Parts)
Applies to:	All Configurations
Switch Configuration:	All Configurations

The **Bundle Quantity Reload Value** parameter forces the controller to exit the Run mode each time a pre-determined number of pieces are cut off, to allow the machine operator time to package a bundle. For example, if a production run requires a large number of parts to be run, and the operator wants the machine to stop after every 50 pieces, set this parameter to 50. After the controller cuts 50 pieces, the machine will stop and the Bundle Quantity Counter gets reloaded to 50. Entering a value of 0 (zero) disables the Bundle Quantity Counter feature.

 **Note:** The controller still exits the Run mode at other appropriate times, depending on the **Halt Mode** setup parameter.

See Also: Bundle Quantity Count, Halt Mode

Bundle Quantity Count

ID:	301
Range:	0 to 9999 (Quantity of Parts)
Applies to:	All Configurations
Switch Configuration:	All Configurations

Used in conjunction with the **Bundle Quantity Reload** parameter, the **Bundle Quantity Count** parameter creates additional bundle stops. The **Bundle Quantity Count** displays the running total (a decrementing counter) of parts remaining before the next bundle stop. As soon as the value decrements to zero, the machine halts and this counter is reloaded with the **Bundle Quantity Reload** Value.

See Also: Bundle Quantity Reload Value, Halt Mode

Item Complete

ID:	302
Range:	0.000 to 64.000 Seconds
Applies to:	All Configurations
Switch Configuration:	All Configurations


The **Item Complete** parameter defines the length of time that the Item Complete output turns on at the completion of each Item while the controller is in the Run mode. This output is often used to machinery running (an exit conveyor, for example) for a given length of time after the last part of an item has been produced the controller has exited the run mode.

See Also: Item Complete output

Delay After Shear

ID:	303
Range:	0.000 to 64.000
Applies to:	All Configurations
Switch Configuration:	All Configurations

The **Delay After Shear** parameter defines the length of time that the controller waits after each automatic shear cycle before turning on the motion outputs to start feeding the next part. This is typically used to create separation between parts and allows time for an exit conveyor to move the last cut part out of the way before a new part begins to feed.

 **Note:** The controller remains in the Run mode during this delay period and the Run output remains active.

Minimum Slow Distance

ID:	304
Range:	0.000 to 100.000 Inches
Applies to:	Any configuration configured for two-speed operation
Switch Configuration:	Dip-switch 3 must be turned ON

The **Minimum Slow Distance** parameter defines the minimum distance prior to each punch and cutoff target that the controller commands the machine to shift from fast to slow speed. The speed shift point may occur even earlier than this distance depending on the Deceleration Mode.

For best accuracy, the **Minimum Slow Distance** should be set large enough so that the machine is able to decelerate to a consistent, stable slow speed before the current punch or cutoff target is reached.

See Also: Deceleration Mode, Deceleration Factor

Scrap Part Length

ID:	305
Range:	0.000 to 1000.000 Inches
Applies to:	Any configuration that supports punching
Switch Configuration:	Dip-switch 4 must be turned ON

The **Scrap Part Length** parameter defines the length of shear-only scrap parts that will be made any time the controller enters the run mode and is unable to produce the currently programmed part. This scenario can occur after a new coil is loaded onto the machine, or after any time the controller's target queue is cleared if the currently programmed part requires a punch operation at a location which has already passed the punch press, the controller will automatically insert scrap parts of this length until the first good part can be made.

Entering a **Scrap Part Length** of zero instructs the controller to produce parts at the current programmed length, upon entering the run mode, even if some or all of the punch operations cannot be included in the part(s).

See Also: Clear Queue After, Tool Data, Part Programming

Halt Mode

ID:	306
Selections:	Item Halt / Bundle Halt / Order Halt / Never Halt
Applies to:	All Configurations
Switch Configuration:	All Configurations

The **Halt Mode** parameter determines when the controller will execute an automatic line halt (exits the run mode) during production. The Halt Mode has four available options:

1. Item Halt

The controller exits the Run mode after the completion of every line Item.

2. Bundle Halt


The controller exits the Run mode after the completion of a line Item only if the next item's Bundle Number is different from the previous line item or if it is the last Item of the current Order.

3. Order Halt

The controller exits the Run mode after the completion of a line Item only when it is the last Item of the current Order.

4. Never Halt

The controller exits the Run mode after the completion of a line Item only when it is the last Item of the current Order, and the next Order's Material or Product Code definition is different from the current Order.

 **Note:** There are several conditions that will cause the XL220 controller to drop out of Run Mode which supersede the **Halt Mode** parameter. These conditions include:

- If the next Item's Velocity Type, Lock Number or Connector Type changes. When support for slave controllers is added, and the XL220 controller is configured to allow slave controllers, these additional conditions will cause the line to halt after each item.
- If the next Item's Part Type, Width or Height changes.

See Also: Bundle Quantity Reload Value, Bundle Quantity Count, Order/Item Programming.

Halt No More Items to Run

ID:	307
Selections:	Yes/No
Applies to:	Any configuration that supports punching
Switch Configuration:	Dip-switch 4 must be turned ON

When set to Yes, this parameter causes the controller to exit the Run mode whenever it detects that there are no more punch or shear targets in its queue for the current Material or Product Code. A message is displayed to the machine operator, giving him the opportunity to program more parts at this time and possibly avoid producing extra scrap.

When set to No, the controller runs until the punch/shear target queue is empty without displaying the operator message.

Stopping Reaction Mode

ID:	309
Selections:	Automatic / Manual / Off
Applies to:	Any configuration configured for feed-to-stop operation
Switch Configuration:	Dip-switch 1 must be turned OFF

This parameter determines how the controller uses the **Stopping Reaction Time** to control the machine each time it stops for a shear or punch operation. The following Stopping Reaction Modes are available:

1. Automatic


The controller turns off its motion outputs prior to the actual shear or punch target, assuming the machine's inertia will allow the target to coast into the correct position. If the material stops such that the target is within the programmed Tolerance range, the shear or punch press is activated and a new Stopping Reaction Time is iteratively calculated to be used for the next target. The iteration is based on how close the machine was able to stop in reference to the programmed target location.

2. Manual

The controller turns off its motion outputs prior to the actual shear or punch target the same as in the Automatic mode; however, it does NOT calculate a new Stopping Reaction Time. The value entered for the Stopping Reaction Time remains constant while in Manual Mode.

3. Off

This mode is provided so that the Stopping Reaction Time calculation and compensation can be disabled altogether. The controller will turn off the motion outputs as soon as the programmed shear or punch target is reached. Typically the machine's inertia causes the material to coast beyond the programmed target location while in this mode. If the amount of this coast distance is consistent, the machine can still produce relatively accurate parts, however this often leads to a first part is long scenario following a standing cut.

 **Note:** The controller's tolerance test is not performed while the **Stopping Reaction Mode** is set to Off.

See Also: Stopping Reaction Time, Tolerance

Stopping Reaction Time

ID:	310
Range:	0.000 to 8.000 Seconds
Applies to:	Any configuration configured for feed-to-stop operation
Switch Configuration:	Dip-switch 1 must be turned OFF

This parameter represents the amount of time in advance of the each shear or punch target that the controller commands the machine to stop (unless the **Stopping Reaction Mode** is set to Off). It is a rough indication of how long it takes the machine to stop once the controller's motions outputs have been turned off.

See Also: Stopping Reaction Mode, Tolerance

Deceleration Mode

ID:	311
Selections:	Automatic / Manual / Off
Applies to:	Any configuration configured for two-speed operation
Switch Configuration:	Dip-switch 3 must be turned ON

This parameter determines how the controller uses the **Deceleration Factor** to control the machine each time it shifts from fast speed to slow speed. The following Deceleration Modes are available:

1. Automatic

The controller commands the machine to shift from fast to slow speed prior to the programmed Minimum Slow Distance before each shear or punch target. The controller detects whether or not a stable slow speed was reached prior to the Minimum Slow Distance target and iteratively calculates a new Deceleration Factor to be used for the operation.

If properly calibrated on a machine that demonstrates consistent behavior, the Automatic Deceleration Mode allows the controller to choose the optimum point at which to initiate the speed shift, allowing the machine to reach a consistently stable slow speed prior to each target, and maximizing the amount of time the machine is able to run in fast speed.

2. Manual

The controller commands the machine to shift from fast to slow speed prior to the programmed Minimum Slow Distance the same as in the Automatic mode; however, it does NOT calculate a new Deceleration Factor. The value entered for the Deceleration Factor remains constant while in Manual mode.

3. Off

This mode is provided so that the Deceleration Factor calculation and compensation can be disabled altogether. The controller will command the machine to shift from fast to

slow speed at the programmed Minimum Slow Distance before the programmed shear or punch target.

See Also: Deceleration Factor

Deceleration Factor

ID: 312
Range: 4.0 to 1000.0 Inches/Sec/Sec
Applies to: Any configuration configured for two-speed operation
Switch Configuration: Dip-switch 3 must be turned ON

This parameter represents the estimated deceleration rate of the machine calculated (depending on the **Deceleration Mode**) each time the controller commands the machine to shift from fast to slow speed. This value is used to adjust the point at which the controller commands the machine to shift from fast to slow speeds prior to each shear or punch target (unless the **Deceleration Mode** is set to Off).

See Also: Deceleration Mode

Tolerance

ID: 313
Range: 0.0005 to 10.0000 Inches
Applies to: Any configuration configured for feed-to-stop operation
Switch Configuration: Dip-switch 1 must be turned OFF

This parameter defines the maximum amount of position error the controller allows before activating a shear or punch press for a given target while in the run mode. Each time the machine stops for a programmed target location (and the **Stopping Reaction Mode** is not set to OFF) the XL220 controller performs a tolerance test by comparing the current encoder position to the programmed target location.

If the Current Encoder Position is:

Greater than (Programmed Target + Tolerance)

Or

Less than (Programmed Target – Tolerance)


Then the shear or punch press is not activated, and the controller displays an appropriate error message and exits the run mode.

See Also: Stopping Reaction Mode

Slow Output While Halted

ID: 318
Selections: Off / On
Applies to: All Configurations
Switch Configuration: All Configurations

This parameter determines whether the Slow output is turned On or Off while the controller is halted (i.e. not in the run, jog forward, or jog reverse modes).

 **Note:** Some hydraulic-driven machines may require the controller's Slow output to be left on while halted depending on the configuration of the hydraulic valves.

Use Coil Inventory

ID: 333
Selections: Yes / No
Applies to: All Configurations
Switch Configuration: All Configurations

Setting this parameter to No removes all references to the XL220 controller's Coil Inventory management and tracking features. The controller will not prompt the operator to enter any coil inventory numbers, and the Coil Inventory menu will no longer appear on the Production Data screen.

See Also: Allow Coil Override

Allow Coil Override

ID: 334
Selections: Always / Only With Key
Applies to: All Configurations, only when Use Coil Inventory is set to Yes
Switch Configuration: All Configurations

This parameter sets whether the controller will allow the machine operator to run an Order whose material definition doesn't match the material defined for the currently loaded coil. When set to Always the operator always has the authority to override this condition. When set to Only with Key, the operator does not have the authority to override this condition unless the Setup Lockout input is unlocked.

See Also: Use Coil Inventory

Bump Tolerance

ID: 338
Range: 0.000 to 10.000 Inches
Applies to: Stopping operations
Switch Configuration: Dip-switch 1 must be turned OFF

If the XL220 controller stops for a shear or punch target and is not within the programmed Tolerance, but is within the programmed **Bump Tolerance**, the controller will attempt to bump the material either forward or backward to try and achieve tolerance. A bump move is attempted by turning on the appropriate motion output(s) for the programmed Bump Time.

Entering a value of zero for this parameter disables the **Bump into Tolerance** feature.

See Also: Bump Time, Tolerance

Bump Time

ID:	339
Range:	0.000 to 1.000 Seconds
Applies to:	All Configurations
Switch Configuration:	All Configurations

This parameter defines the length of time the controller turns on its motion outputs while attempting to bump the material within the programmed tolerance.

Entering a value of zero for this parameter disables the **Bump into Tolerance** feature.

See Also: Bump Tolerance, Tolerance

PCode Change Stops Queue

ID:	343
Selections:	Always / Never
Applies to:	All Configurations
Switch Configuration:	All Configurations

This parameter determines if a product code (PCode) change will halt the machine. Selecting "Always" will stop the machine whenever the PCode changes. Selecting "Never" will not stop the machine when the PCode changes.

Machine Layout

Encoder Direction


ID:	352
Selections:	CW / CCW
Applies to:	All Configurations
Switch Configuration:	All Configurations

This parameter determines the counting direction for the material encoder. Set to CW if the material causes the encoder wheel to turn clockwise when moving in the forward direction. Set to CCW if the material causes the encoder wheel to turn counter-clockwise when moving in the forward direction.

Shear to Encoder Distance

ID:	355
Range:	0.000 to 10000.000 Inches
Applies to:	All Configurations
Switch Configuration:	All Configurations

This parameter detects leading edge of a coil, and accurately records scrap material when the coil tails out.

 **Note:** Always set this value to the measured distance between the tail-out sensor and the back edge of the shear die, depending on the orientation of the encoder and the sensor. For the best accuracy, the material encoder and the coil tail-out sensor should be positioned so that they are equidistant from the shear die.

See Also: Enable Shear Encoder Distance 2, Shear to Encoder Distance 2

Clear Queue After

ID:	372
Selections:	Double Shear / Single Shear
Applies to:	Any configuration that supports punching
Switch Configuration:	Dip-switch 4 must be turned ON

This parameter determines whether the XL220 controller clears all of the punch and shear targets from its queue following on manual shear (Single Shear) operation of two manual shear (Double Shear) operations.

Enable Shear Encoder Distance 2

ID:	373
Selections:	Yes / No
Applies to:	All Configurations
Switch Configuration:	All Configurations

Setting this parameter to Yes allows additional setup parameters, related to the use of a second material encoder and tail-out sensor, to appear in the list.

See Also: Shear to Encoder Distance 2, Coil Trim Distance

Shear to Encoder Distance 2

ID:	374
Range:	0.0000 to 10000.0000 Inches
Applies to:	All Configurations, whenever the setup parameter Enable Shear Encoder Distance 2 is set to Yes
Switch Configuration:	All Configurations

This parameter should be set to the measured distance between the second material encoder and the back edge of the shear die. The XL220 controller uses this parameter when a new coil is loaded, and uses the other **Shear to Encoder Distance** value whenever the coil tails out.

Using this parameter requires that a second tail-out sensor (and a second material encoder) be located on the machine upstream from the first sensor and encoder. The two sensors must be wired such that when either sensor detects the presence of material, the controller's tail-out input goes inactive.

See Also: Shear to Encoder Distance, Enable Shear Encoder Distance 2, Coil Trim Cut Distance

Coil Trim Cut Distance

ID:	375
Range:	0.0000 to 100.0000 Inches
Applies to:	All Configurations, whenever the setup parameter Enable Shear Encoder Distance 2 is set to Yes
Switch Configuration:	All Configurations

This parameter defines the length of the leading edge trim cut that the XL220 controller when it enters the run mode for the first time after a new coil is loaded. The automatic trim cut references the leading edge of the material and allows the controller to produce an accurate first part without requiring the machine operator to thread the coil all the way through the machine and perform a manual standing crop.


See Also: Shear to Encoder Distance, Enable Shear Encoder Distance 2

Machine Configuration

ID: 385
 Selections: Undefined / U-Shape / Z-Shape
 Applies to: All Configurations
 Switch Configuration: All Configurations

The machine setup parameter **Machine Configuration** determines whether the height or width dimension is produced first. If a "U" configuration is used, the width dimension will exit the machine first. If a "Z" configuration is used, the height dimension will exit the machine first. See Figure 27.

An exception is when the U-Shaped part type is produced; the height dimension will always exit the machine first.

 **Note:** Undefined is the default configuration. The XL220 will not allow the controller to enter the run mode until this parameter is changed to either U-Shape or Z-Shape.

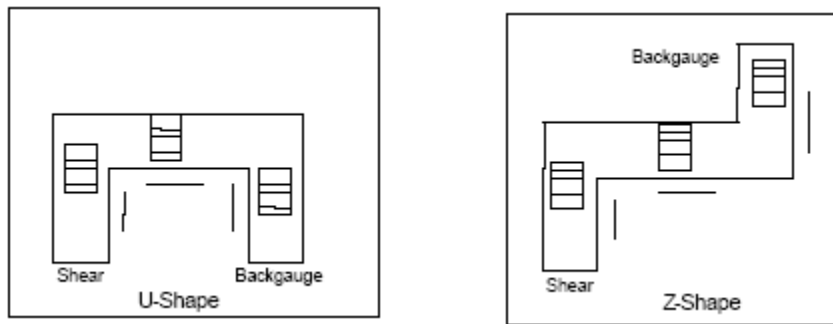


Figure 27: Machine Configuration Examples

Maximum Backup Distance

ID: 386
 Range: Determined by additional parameters
 Applies to: All Feed-to-Stop Machines
 Switch Configuration: Dip switch 2 must be on.

Leading Edge Lock Type

ID: 387
 Selections: Male / Female
 Applies to: All Configurations
 Switch Configuration: All Configurations

The machine setup parameter **Leading Edge Lock Type** determines whether the male or female lock goes on the leading edge of the part.

See Also: Lock Data

Maximum Part Length

ID:	388
Range:	0.000" to 119999.0000"
Applies to:	All Configurations
Switch Configuration:	All Configurations

The Maximum Part Length defines the length of the longest piece the XL220 controller will be allowed to make.

Leading Notch Adjust

ID:	398
Range:	-1000 to 1000 Inches
Applies to:	Configurations using a downstream press
Switch Configuration:	Dip-switch 6 must be turned ON

When using the downstream press, shorter parts don't go through the sensor the same way as longer parts. This can throw off the leading notch. The **Leading Notch Adjust** parameter defines that any short parts will have the leading notch adjusted by this amount.

Short Part Length

ID:	399
Range:	0 to 1000 Inches
Applies to:	Configurations using a downstream press
Switch Configuration:	Dip-switch 6 must be turned ON

The **Short Part Length** parameter defines any part less than this will be considered a short part.

Advanced Setup**Line Resolution**

ID:	450
Range:	0.0400000 to 0.0000400
Applies to:	All Configurations
Switch Configuration:	All Configurations

This parameter specifies the resolution for the XL220 controller's material encoder (also known as Line Encoder). The encoder's resolution is defined as the distance of material movement for every encoder count registered by the controller.

On a typical configuration where a measuring wheel is directly coupled to the shaft of the material encoder, and the wheel rides directly on the material surface, the resolution can be calculated using the following formula:

$$\text{Resolution} = \frac{\text{Wheel Circumference}}{\text{\# of Encoder Counts in one Revolution}}$$

Figure 28: Line Resolution Formula

Most commercially available encoders, including those supplied by AMS Controls, provide two channels of square wave pulses and are specified in pulses-per-revolution (PPR). The XL220 controller registers an encoder count on the rising and falling edge of each pulse on each channel. Thus the number of encoder counts per revolution is equal to the number of pulses-per-revolution times four (PPR x 4).

The following table lists the correct Line Resolution when using an AMS Controls encoder with a 12-inch circumference measuring wheel in the typical configuration described above:

Model	Counts/Rev (Quadrature)	Resolution
N256	1024	0.01171875
N500	2000	0.006
N1000	4000	0.003
N2000	8000	0.0015
N4000	16,000	0.00075

Figure 29: AMS Controls Encoders & Line Resolution

It is not necessary to precisely measure the wheel circumference. Nominal values can be used with accurate results achieved during the Trim Correction process.

See Also: Correction Factor, Trim Correction

Notcher Encoder Resolution

ID: 474
 Range: See **Line Resolution** parameter
 Applies to: Configurations with downstream notchers enabled
 Switch Configuration: Dip switches 1, 6 must be on.

See **Line Resolution** parameter description for more information.


Velocity at Max Analog Voltage

ID: 500
 Range: 0 to 1000 Feet/Min
 Applies to: All Configurations
 Switch Configuration: All Configurations

This parameter can be used to enable the Analog Voltage Proportional to Line Velocity feature of the XL220 controller. Whenever a non-zero value is entered for this parameter, the controller

provides an analog output voltage (on Analog Port #1) that is proportional to the current line velocity as measured by the material encoder.


This parameter specifies the minimum line velocity for which a 10 Volt output signal will be provided. The voltage output will be 0 Volts whenever the measured line velocity is 0 Feet/Minute and it will be linearly proportional for any velocity within this range.

 **Note:** This feature is active for any and all movement reported by the material encoder whether the controller is in the run mode or not. Entering a value of zero disables this feature.

Filter Constant

ID:	503
Range:	1.0 to 200.0 Hertz
Applies to:	All Configurations
Switch Configuration:	All Configurations

This parameter is used by the XL220 controller's velocity calculation. It can be adjusted to help improve the controller's responsiveness to changes in line velocity. Lower values should be used on machines with relatively stable velocities while higher values can be used on machines with fluctuating velocities.

 **Note:** The default value of 32.0 Hz has been experimentally determined as the optimum Filter Constant for most applications. Very rarely should it be necessary to change this value.

Controlling Analog Speed Logic

These four parameters are used to control the XL220 controller's Analog Speed Logic feature. They represent the analog voltage output produced (on Analog Port #2) by the controller during the run mode (Fast and Slow speeds) and during the jog mode.

Minimum Speed Voltage

ID:	504
Range:	0.0 to 10.0 Volts
Applies to:	Only when the Analog Speed Logic (AA) model option is enabled
Switch Configuration:	All Configurations

Minimum Speed Voltage defines the voltage produced while the controller is in the run mode, running at slow speed.

Maximum Speed Voltage

ID:	505
Range:	0.0 to 10.0 Volts
Applies to:	Only when the Analog Speed Logic (AA) model option is enabled
Switch Configuration:	All Configurations

Maximum Speed Voltage defines the maximum voltage produced while the controller is in the run mode, running at fast speed. The voltage produced during this mode may be scaled to value between Max and Min depending on the **Length at Maximum Speed** parameter.

Length at Maximum Speed

ID:	506
Range:	0.0000 to 3499.9999 Inches
Applies to:	Only when the Analog Speed Logic (AA) model option is enabled
Switch Configuration:	All Configurations

Length at Maximum Speed is used to scale the analog voltage produced during the Run mode (at fast speed) in proportion to the current part length being run. This provides the functionality of automatically being able to run the machine faster for long parts and slower for short parts. This parameter defines the shortest part length at which the maximum voltage (10 Volts) will be applied during the run mode, at fast speed. The voltage applied during this mode for parts shorter than this length will be linearly scaled between Min and Max.

Jog Speed Voltage

ID:	507
Range:	0.0 to 10.0 Volts
Applies to:	Only when the Analog Speed Logic (AA) model option is enabled
Switch Configuration:	All Configurations

Jog Speed Voltage defines the voltage produced while the controller is in the jog mode (forward or reverse).

Coast Mode Timeout

ID:	520
Range:	1 sec. – 10 sec.
Applies to:	All Configurations
Switch Configuration:	All Configurations

This parameter specifies the maximum timeout value for “Coast to Stop” mode. The default is 3 seconds.

Tool Data Menu

Tooling Terms

Press

A press is a device that closes a die set that is to punch, notch, or shear a given material. Air, hydraulics, or a mechanical flywheel may power the press. The Cutoff Press (Shear) is always considered press 0.

Tool


A tool is any section or combination of sections of a die set that can be engaged with one cycle of a single press. The tool may produce a single hole, single notch, group of holes or notches, or cut the part completely.

Die Set

A die set is a mechanical assembly containing any number of tools that punch, notch, or shear.

What is Tool Data

The Tool Data configuration lets the XL220 controller know where all of its tools are in reference to all of the others along with what outputs to turn on for a given tool. The controller uses this information to calculate when/where to turn on these outputs in order to make the desired part.

-  **Note:** For a machine that only cuts parts to length, the tool configuration is very simple. Only one tool needs to be defined, for the shear. Every field in the tool should be set equal to zero.

Determining the Machine Zero Reference Point

For each application, a Machine Zero Reference Point is required. It is usually most convenient to use the shear blade as the zero reference point but it can be any point that allows all measured offsets to be greater than or equal to zero. See Figure 30: Machine Zero Reference Offsets.

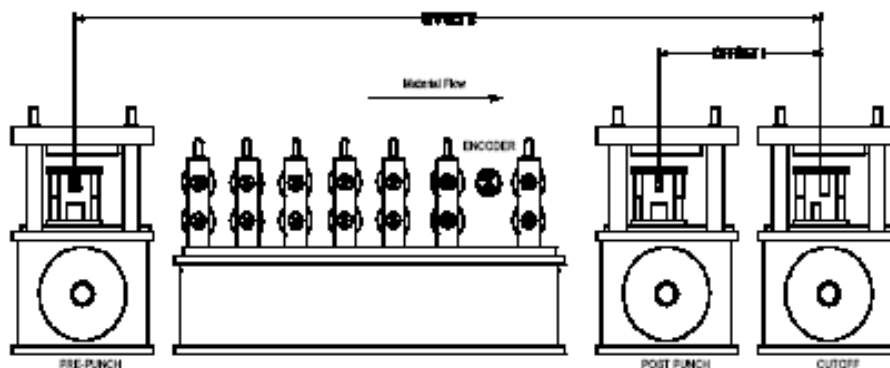


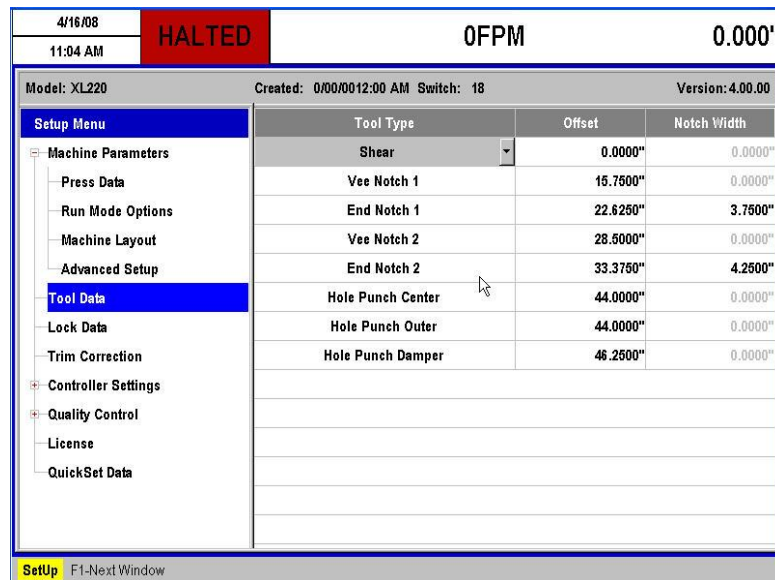
Figure 30: Machine Zero Reference Offsets

This example uses the shear blade as the machine zero reference point. Tool offsets can be measured by activating all dies, including the shear, with material loaded and clamped in a stationary position. The strip is then fed forward past the shear. The distance from the leading edge to the reference point on each die tool can now be measured. These dimensions should be used as the X-offset value of each tool.

Some machines may have tools that are downstream of the shear. In these cases, the shear cannot be used as the reference point. Any convenient reference point can be chosen that is even with or further downstream from the last tool. In this case, the tool for the shear will have a positive offset from the arbitrary reference point.

1. Press **[Set Up]** to display the setup menu selection list.
2. Highlight **Tool Data**, displaying the tool definitions in the right-hand window.
3. Press **[F1]** to tab over to the settings
4. Press **[F2]**. A new tool entry displays below the currently selected tool entry.

The tool data display is shown in Figure 31. Each entry contains a Tool Type, Offset, and Notch Width.



Tool Type	Offset	Notch Width
Shear	0.0000"	0.0000"
Vee Notch 1	15.7500"	0.0000"
End Notch 1	22.6250"	3.7500"
Vee Notch 2	28.5000"	0.0000"
End Notch 2	33.3750"	4.2500"
Hole Punch Center	44.0000"	0.0000"
Hole Punch Outer	44.0000"	0.0000"
Hole Punch Damper	46.2500"	0.0000"

Figure 31: Tool Data Menu

Tool Type

The Tool Type is a dropdown select list that describes all available tooling for the machine. Available selections are Shear, Vee Notch 1, End Notch 1, Vee Notch 2, End Notch 2, Hole Punch Center, Hole Punch Outer, Hole Punch Damper, and Undefined.

Offset

Offset is used to define the sensor-to-notch/punch-distance. Vee-Notch and Hole-Punch offsets should be measured relative to the center of the tool. End-Notch offsets should be measured relative to the tool edge closest to the sensor.

For downstream Vee-Notches and End-Notches, the Offset field is used to define the distance from the Edge-Detect 1 sensor and the tool. The Vee-Notch offset should be measured from the sensor to the center of the tool. The End-Notch offset should be measured from the sensor to the leading-edge of the tool.

Notch Width

The Notch Width defines the total measured width of the Notch tooling and is only available for End-Notch tool types.

Lock Data Menu

This screen is used to define the Lock Data definitions for making various pieces of ductwork seen in Figure 32.

4/16/08	HALTED	OFPM		0.000"
11:06 AM				
Model: XL220		Created: 0/00/0012:00 AM Switch: 18		Version: 4.00.00
Setup Menu	ID	Male	Female	Offset
Machine Parameters	1	1.250"	1.250"	0.500"
Press Data	2	1.750"	2.000"	0.625"
Run Mode Options	3	2.000"	2.000"	0.750"
Machine Layout	4	2.250"	2.250"	0.900"
Advanced Setup	5	3.000"	3.000"	1.250"
Tool Data				
Lock Data				
Trim Correction				
Controller Settings				
Quality Control				
License				
QuickSet Data				

Figure 32: Lock Data Menu

Before programming part dimensions in the XL220, the user should create a table of Lock Definitions. Once created, the Lock Definition table is maintained permanently by the XL220 controller.

The Lock Definition table can be accessed from the Setup Screen by selecting the Lock Data menu. Each lock definition is assigned an ID number, which can be recalled at a later time during

the process of defining the part's dimensions. This way, common lock sizes can easily be reused without having to re-enter the dimensions for each and every line item.

Each lock definition contains the following fields:

- **ID** – a value from 0-99 that serves as an identifier for each lock definition.
- **Male** – the dimension for the male lock of the ductwork section. This is an extra amount of material added to the length of the part for each section of the duct.
- **Female** – the dimension for the female lock of the ductwork section. This is an extra amount of material added to the length of the part for each section of the duct.

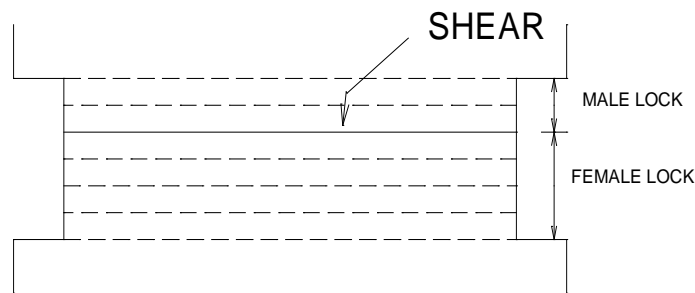


Figure 33: Male and Female Lock Definitions

- **Offset** – an additional field representing the length of material that needs to be accounted for by an optional downstream pin-spotter or back-gauge controller. It is typically a different value than the Male or Female lock dimension because it is sensed by an optical detector after the leading edge lock has been formed.

Create Lock Data

1. Press **[Set Up]** to display the setup menu selection list.
2. Highlight **Lock Data**, displaying the lock definitions in the right-hand window.
3. Press **[F1]** to tab over to the settings.
4. Press **[F2]**. A new lock entry displays below the currently selected lock entry.
5. Enter the ID number and press **[Enter]**.
6. Enter the Male dimension and press **[Enter]**.
7. Enter the Female dimension and press **[Enter]**.
8. Enter the Offset length and press **[Enter]**.
9. Repeat steps 5-8 until all locks have been created.

Edit an Existing Lock

1. Press **[Setup]** to display the setup menu selection list.
2. Highlight **Lock Data**, displaying the lock definitions in the right-hand window.
3. Press **[F1]** to tab over to the settings.
4. Select the lock definition to be edited.
5. Select the specific data to be edited.
6. Enter the value and press **[Enter]**.

Trim Correction Menu

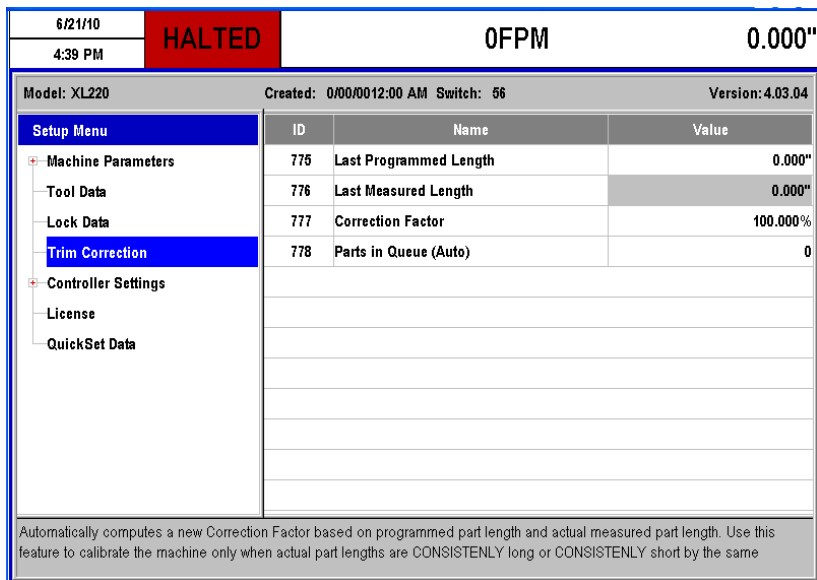


Figure 34: Trim Correction Menu

Last Programmed Length

ID: 775
 Range: 0.000 to 3500.000 Inches
 Applies to: All Configurations

This parameter is used in the automatic Correction Factor calculation described below.

See Also: Last Measured Length, Correction Factor

Last Measured Length

ID: 776
 Range: 0.000 to 3500.000 Inches
 Applies to: All Configurations

This parameter is used in the automatic Correction Factor calculation described below.

See Also: Last Programmed Length, Correction Factor

Correction Factor

ID: 777
Range: 95.000 to 105.000%
Applies to: All Configurations

This parameter is used by the XL220 controller to automatically scale all programmed part lengths (and punch locations) to be made longer or shorter. This is typically used to compensate for inaccuracies in determining the precise circumference of the material encoder's measuring wheel. The formula for calculating a new Correction Factor is described below:

$$\text{New CF} = \left(\frac{\text{Programmed Length}}{\text{Actual Measured Length}} \right) \times \text{Old CF}$$

where CF = Correction Factor

Figure 35: Formula for Calculating Correction Factor

For best results, AMS Controls recommends you take a sample of several measured parts and use the average length as the actual measured length.

The XL220 controller will automatically perform this calculation whenever values are entered for the **Last Programmed Length** and **Last Measured Length** parameters.

The **Correction Factor** parameter and Trim Correction feature should only be used when measured parts are coming out **consistently** long or **consistently** short. Varying part lengths typically indicates some other machine problem.

See Also: Last Programmed Length, Last Measured Length

Parts in Queue (Auto)

ID: 778
Applies to: Configurations with notching or punching

Displays the number of parts currently in the queue or loaded in memory ready to be produced. Correction Factor or Trim Correction updates will take effect after these parts are produced.

Notcher Correction Factor 1

ID: 779
Applies to: Configurations with notching

Compensates for errors in the size of the measuring wheel used on Notcher Encoder 1.

Notcher Correction Factor 2

ID: 780
Applies to: Configurations with notching

Compensates for errors in the size of the measuring wheel used on Notcher Encoder 2.

Controller Settings Menu

The **Controller Settings** menu populates the parameter list with parameters that affect the general operation and appearance of the XL220 controller such as time and date formatting, number formatting preferences, and language settings.

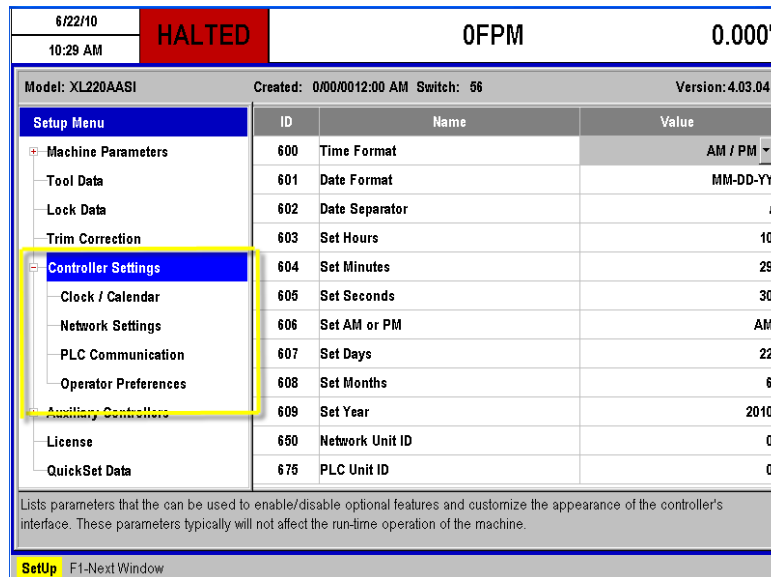


Figure 36: Controller Settings Menu

Clock / Calendar

Time Format

ID: 600
 Selections: AM-PM / 24-Hour
 Applies to: All Configurations

This parameter determines the format for the XL220 Controller's built-in real-time clock. AM-PM allows for a 12-hour style, while 24-Hour allows for military-style 24-hour readout. This format will be used when displaying the real-time clock (in the top right corner of the screen) and for any printed data that includes a time/date stamp.

Date Format

ID:	601
Selections:	MM-DD-YY / DD-MM-YY / YY-MM-DD
Applies to:	All Configurations

This parameter determines the format for the XL220 Controller's built-in real-time calendar. It allows the date to be displayed in the format that the machine operator is most familiar with.

MM = Month, DD = Day, YY = Year.

This format will be used when displaying the real-time calendar (in the top-right corner of the screen) and for any printed data that includes a time/date stamp.

Date Separator

ID:	602
Selections:	/ - or .
Applies to:	All Configurations


This parameter determines the character used to separate the month, date, and year when the XL220 controller displays its real-time calendar.

See Also: Date Format

Set Hours, Set Minutes, Set Seconds, Set AM or PM, Set Days, Set Months, Set Year


IDs:	603-609
Range:	Typical Clock/Calendar
Applies to:	All Configurations

These parameters allow the user to configure the XL220 controller's built-in real-time clock and calendar if necessary.

 **Note:** When the controller is networked to a PC running the AMS Controls Eclipse Production Management software, the real-time clock/calendar is automatically set to match the one on the Eclipse PC.


Set the Time Clock

1. Press **[Setup]**.
2. From the main menu (left pane), select **Controller Settings**.
3. Press **+** to expand the left pane's view.
4. Select **Clock/Calendar**. The right pane displays only the clock and calendar parameter fields.
5. Select a parameter to edit, enter its new value, and press **[Enter]**.
6. Repeat for each parameter until all are set as required.
7. Press **[Status]** to return to the Status Screen.

 **Note:** If connected to an Eclipse PC, the controller time is updated to match the Eclipse PC's time.

Network Settings

The Network Settings menu contains parameters that pertain to AMS Controls' Eclipse Production Management software. Up to thirty XL220 controllers can be connected on a single network for communicating with a computer running the Eclipse software. See the Eclipse Technical Reference Guide for more information.

 **Note:** Most of the parameters described below do not appear in the list until a valid Network Unit ID has been entered.

Network Unit ID

ID: 650
Range: 0 to 30
Applies to: All Configurations


This parameter specifies a unique identifier on the Eclipse network. Each XL220 controller on the network must have a unique Network Unit ID, and must have a matching Machine ID assigned for it at the Eclipse PC.

Entering a Network Unit ID of zero disables all Eclipse-related features.

Network Baud Rate

ID: 651
Selections: 460800, 230400, 115200, 76800, 57600, 38400, 28800, 19200, 9600, 4800 Bits/Second
Applies to: All Configurations

This parameter sets the data communications rate for the Eclipse network. The Network Baud Rate for each XL220 controller on the network must match the corresponding baud rate set on the Eclipse PC.

 **Note:** The network baud rate may be limited by the maximum rate supported by the PC and/or by any communication interface adapters installed on the network. Consult the Eclipse Technical Reference Guide for more information.

Halt Delay Minimum

ID: 652
Range: 0 to 99 minutes
Applies to: All Configurations

This parameter is used in cooperation with the Eclipse functionality of tracking machine downtime. This value specifies the minimum amount of time after which the XL220 controller has been halted (i.e. not in the Run mode) that it will prompt the machine operator to enter a delay

reason the next time he enters the Run mode. In other words, once the controller exits the run mode, if it is halted for a time longer than is specified by this parameter, the machine operator must provide a reason why the machine was stopped for so long.

Entering a value of 99 minutes disables this feature.

See Also: Delay Reasons, Eclipse Downtime Tracking

Auto-Request Order Footage

ID: 653
Range: 0 to 9999 feet
Applies to: All Configurations

This parameter is used in cooperation with the Eclipse functionality of automatic order scheduling. This value provides a threshold such that whenever the total remaining footage of all orders currently programmed in the XL220 controller drops below this number, the controller sends a request to the Eclipse PC or more orders to be sent down.

See Also: Eclipse Automatic Order Scheduling

Use Scrap Codes

ID: 654
Selections: Yes / No
Applies to: All Configurations

This parameter is used in cooperation with the Eclipse functionality of scrap material reporting. Setting this parameter to Yes causes the XL220 controller to prompt the machine operator to enter a scrap code for any event that the controller determines to be creating scrap material. Such events include: Using the Increment Quantity function or the Remake function.

See Also: Eclipse Material Usage Reporting

Manual Shear Scrap Length

ID: 655
Range: 0 to 1000 inches
Applies to: All Configurations

This parameter is used in cooperation with the Eclipse functionality of scrap material reporting and the XL220 controller setup parameter **Use Scrap Codes**. This value specifies the minimum amount of material that must be cut off by a manual shear operation which causes the controller to prompt the machine operator to enter a scrap code. All material removed by a manual shear operation is recorded by the controller as scrap, but by setting this parameter correctly the machine operator will not be prompted to enter scrap reasons for insignificant lengths of material.


Any material removed by manual shear operation which is less than this length, will be automatically assigned the scrap code of zero if Use Scrap Codes is enabled.

See Also: Eclipse Material Usage Reporting

Enforce Eclipse Coil Validation

ID: 656
Selections: Yes / No
Applies to: All Configuration


This parameter is used with the Eclipse coil inventory management feature. Setting this parameter to Yes prevents the XL220 controller from entering the Run mode after a new coil is loaded until the coil inventory number has been validated by the Eclipse PC. During the coil loading process, the controller sends the coil number to the Eclipse PC where it is verified to exist in the Coil Inventory database. If the coil number was invalid, the controller will not be allowed to enter the Run mode until the correct inventory number is entered.


 **Note:** For cases where the Eclipse network communications is temporarily unavailable, the coil validation process can be overridden by unlocking the controller's Setup Lockout input.

See Also: Eclipse Coil Inventory Database

PLC Communication

The PLC Communication menu appears only when the PLC Integration (I) model option is enabled. This menu contains parameters that pertain to the data transfer between the XL220 controller and a PLC that conforms to the MODBUS communications specification.

 **Note:** If the controller has the PLC Integration (I) option enabled, but the parameters are not set up, a pop-up will be displayed. You can check the box to "Never Show Again" if needed.

 **Note:** Most of the parameters described below do not appear in the list until a valid PLC Unit ID has been entered.

PLC Unit ID

ID: 675
Range: 0 to 247
Applies to: Only controllers with the PLC Integration (I) model option enabled


This parameter specifies a unique identifier for the MODBUS capable PLC that the XL220 controller communicates with.

Entering a PLC Unit ID of zero disables all communication between the controller and the PLC.

PLC Baud Rate

ID: 676
Selections: 460800, 230400, 115200, 76800, 57600, 38400, 28800, 19200, 9600, 4800 Bits/Second
Applies to: Only when the PLC Integration (I) model option is enabled

This parameter sets the data communications rate for communicating with the MODBUS-capable PLC. The PLC Baud Rate must match the corresponding baud rate set on the PLC.

 **Note:** The network baud rate may be limited by the maximum rate supported by the PLC and/or by any communication interface adapters installed on the network.

PLC Parity

ID: 677
Selections: None / Even / Odd
Applies to: Only when the PLC Integration (I) model option is enabled

This parameter sets the data communications parity setting for communicating with the MODBUS-capable PLC. The **PLC Parity** must match the corresponding parity setting on the PLC.

Configuration Register Address

ID: 678
Range: 0 to 999999999
Applies to: Only when the PLC Integration (I) model option is enabled

This parameter specifies the starting address for the PLC holding register where the configuration data is stored. The XL220 controller must be able to read valid configuration data at this address before any other communication can occur.

See Also: Using the PLC Integration (MODBUS) Option

PLC Stop Bits

ID: 679
Selections: 1 or 2
Applies to: Only when the PLC Stop Bits match the corresponding stop bits setting on the PLC

This parameter sets the number of stop bits used while communicating with the MODBUS – capable PLC. The **PLC Stop Bits** must match the corresponding stop bits setting on the PLC.

PLC Power Up Delay

ID: 680
Valid Range: 0-60 sec.
Applies to: Only when the PLC Integration (I) model option is enabled.

This parameter delays the full power up of the controller with the (I) option enabled to allow the PLC to power up completely and start communicating.

Operator Preferences

Language Select

ID: 700
Selections: English / Spanish / French / Italian / Russian
Applies to: All Configurations

This parameter determines the language for all text displayed by the XL220 controller's user interface.

Numeric Display Format

ID: 701
Selections: Decimal Inch / Feet-Fractional Inch / Feet-Decimal Inch / Decimal Feet / Metric mm / Metric cm / Metric M
Applies to: All Configurations

This parameter determines the format for displaying and entering all data values with units of length. Examples of each format are shown below:

Decimal Inch	126.500"
Fractional Inch	10' 6-1/2"
Feet-Decimal Inch	10' 6.500"
Decimal Feet	10.542'
Metric mm	3213.10mm
Metric cm	321.310cm
Metric M	3.213M

Auto-Delete Done Orders After

ID: 702
Range: 0 to 28 days
Applies to: All Configurations

This parameter determines how long complete orders remain in the controller's memory before they are automatically deleted. Orders & Items that have been run to completion assume a status of Done. These records are automatically deleted from the controller's memory at either noon or midnight after the specified number of days has elapsed. Of course, the machine operator may delete these records manually at any time.

Set Done Items to Ready

ID: 703
Selections: Yes / No
Applies to: All Configurations

This parameter, when set to Yes, causes the XL220 controller to automatically re-program each line item as soon as it is run to completion. This is useful for applications where the machine operator is not concerned with counting the number of parts produced, but may simply be running the same part length over and over again until his bin is full.

It is not recommended to enable this parameter when the controller is networked with an Eclipse PC.

Enable Virtual Keyboard

ID: 704
Selections: Yes / No
Applies to: All Configurations

This parameter, when set to Yes, causes the XL220 controller to display an on-screen virtual keyboard any time non-numeric data entry is required. The virtual keyboard must be used to enter non-numeric (or alpha-numeric) data for fields such as Order Numbers, Material Codes, Product Codes, and Coil Numbers. If no non-numeric data is required or if an external PS/2 keyboard is attached to the controller, the virtual keyboard may become an annoyance and can be disabled.



Figure 37: Virtual Keyboard

Show User Data – Program Screen

ID: 707
Selections: Disabled / One Line / Two Lines / Three Lines / Four Lines
Applies to: All Configurations

This parameter allows the XL220 controller to display the user data fields (optionally provided by the Eclipse PC) while in the Program screen. The machine operator can choose to view none of this data, or up to 4 lines of data (2 fields per line).

See Also: Eclipse User Fields

Show User Data – Status Screen

ID: 708
Selections: Disabled / One Line / Two Lines / Three Lines / Four Lines
Applies to: All Configurations

This parameter allows the XL220 controller to display the user data fields (optionally provided by the Eclipse PC) while in the Status screen. The machine operator can choose to view none of this data, or up to 4 lines of data (2 fields per line).

See Also: Eclipse User Fields

Show Help Preview – Setup Screen

ID: 709
Selections: Disabled / Enabled
Applies to: All Configurations

This parameter allows the XL220 controller to display a help message preview at the bottom of the screen while in the Setup Screen. The preview contains the first sentence of two of the help messages provided for each setup parameter. The full help message text can be viewed at any time by pressing the Help key.

License Menu

License Code

ID: 990
 Applies to: All Configurations

A license code can be used to disable a controller after a specified time period. This parameter allows you to enter a code that will extend your license or make your license permanent.

Remaining License Days

ID: 991
 Applies to: All Configurations

This parameter displays how many days remain on the current license. If this parameter is not shown, then the license is permanent.

Quickset Data

This menu provides a sub-set of other machine parameters that can be modified by the machine operator at any time, regardless of the state of the Setup Lockout input. The parameters have all been previously described in this chapter. The Quickset Data menu is simply a convenient location to access some of the parameters that are changed relatively often by many machine operators.

The parameters that appear in the Quickset Data list are shown below:

ID	Name	Value
700	Language Select	English ▾
701	Numeric Display Format	Decimal Inch
702	Auto-Delete Done Orders After	14.000Days
703	Set Done Items to Ready	No
704	Enable Virtual Keyboard	No
707	Show User Data - Program Screen	Disabled
708	Show User Data - Status Screen	Disabled
709	Show Help Preview - Setup Screen	Enabled

Figure 38: Quickset Data Parameter List

Chapter 6: Startup & Calibration

Initial Tests and Settings

Wiring Verification

The wiring of the machine should be thoroughly checked for shorts and mis-wires. Applying voltage to the controller's inputs or AC voltage to the controller's outputs will result in a damaged controller and an unsuccessful installation.

Powering the Unit for the First Time

It is recommended that a gradual power-up test be performed before beginning the setup routine:

- Disconnect the controller connectors (Connectors A-F) from the XL220 controller and any other sensitive devices from their power sources.
- Isolate the 110VAC supply from all input and output devices, power supplies, and incoming 3-phase supply voltage. This may be as simple as setting the power off/on switch to the OFF position and removing the 110VAC transformer input fuses.
- Before applying and verifying the 3-phase power, check the incoming 3-phase power supply at its factory source to verify the correct voltage level.
- Turn on the factory source (usually a disconnect or breaker) of power to the console. Verify that the proper 3-phase power is present at the control console.
- Turn off the 3-phase input and reconnect the 110VAC transformer to the incoming 3-phase supply lines. Re-apply 3-phase power and verify that the 110VAC is at proper levels at the transformer output. Transformer taps that are incorrectly connected could place low or high voltage across the system it supplies, resulting in possible damage.
- Turn the Power switch to ON to connect the 110VAC supply to the input/output devices. E-stop circuits may be able to be tested at this point also.
- The 24VDC supplies should now be functioning. Measure the output voltage of each supply and verify that they are at the right levels and polarity. Once the installer is satisfied that all supplies are of the correct value and polarity, the 110VAC should be turned OFF.
- Reconnect the controller connectors (connectors A – F) and all other sensitive devices that were disconnected the first step.
- Reapply power. The XL220 controller will power up. All systems should now be functional.

Initial Setup Parameters

A thorough understanding of the parameters should be gained by reading Chapter 5. Certain parameters will be reviewed in detail in this chapter for the purpose of installing the controller and producing good parts.

After the controller has been properly installed and all wiring has been double-checked, the basic controller parameters can be programmed.

Program the Shear Parameters:

Shear Dwell Down and Shear Dwell Up Parameters

AMS Controls controllers have a timed shear output with a switch input override feature. The duration of the Shear Down output is programmable from 0.001 to 30 seconds. Your Controller may have a Shear Boost output or a Shear Up output. The Shear Boost output will be covered later in the Flying Cutoff Calibration Section. The Shear Up output is programmable with a range of 0 to 30 seconds. Refer to the timing diagram on Figure 39; each parameter has a dwell time of .125 seconds.

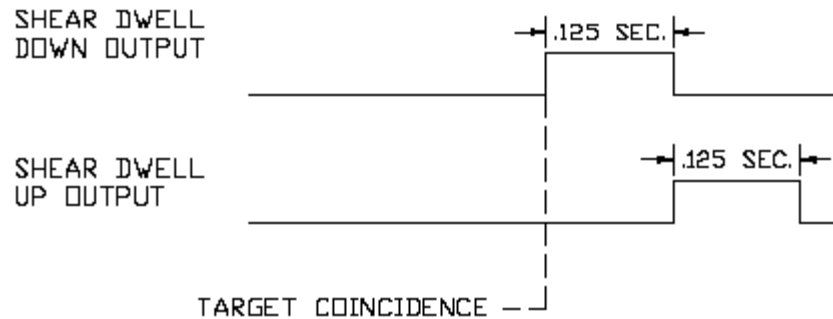



Figure 39: Timing Sequence of Shear Dwell Times

The controller has a Shear Complete input. If the controller detects a switch closure on this input during the shear dwell down time, the dwell time is overridden and the output will turn off immediately. See Figure 40.

This feature is especially useful on mechanical presses that require shear-complete switch return the press to top-dead-center after every cycle. This is simply done by adjusting the complete switch to the proper location on the press. The Shear Dwell Up time is not affected by the Shear Complete input.

 **Note:** On mechanical presses that do not have an electronic length controller, a Shear unlatch switch is typically mounted as a rotating cam switch or a dog-ear detector on the cam shaft. When retrofitting such a press with an AMS Controls controller, these switches can usually be used as the Shear Complete input. Care must be taken to isolate all power from the contact points and the installer will have to change the contact closure.

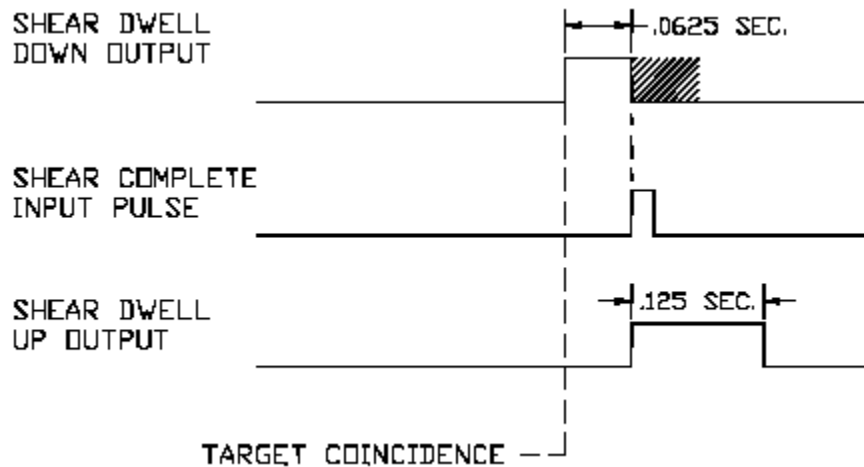



Figure 40: Shear Output/Dwell Time Relationship

 **Note:** If a shear-complete switch is used on a mechanical press, it may need to be moved in order for the press to stop at the right location. If the press stops short of top-dead-center, then move the switch so that it is triggered later in the rotation. If the press stops late (beyond top-dead-center), move the switch so that it is triggered earlier in the rotation.

Set the shear dwell times to an approximate value. Large mechanical presses may require .5 seconds or more. Air presses may only require .020 to .040 seconds to complete a cut. Fire the press by using the manual cycle input and adjust the shear dwell times until the press operates properly. If the press does not fire completely, make the dwell time longer. If the press hits too hard or stays on too long, make the dwell time shorter.

Program the Expect Shear Complete Parameter:

The **Expect Shear Complete** setup parameter can be set to Yes or No. Setting the parameter to Yes enables a test feature that will inform the user if the Shear Complete input or switch has failed. The controller will expect to see the Shear Complete input turn on at some point during the Shear Dwell Down time or it will exit the run mode, terminate the press cycle, and inform the user that the controller did not see a press complete input.

Program the Press Dwell Parameters (each Press will have similar, corresponding, setup parameters, inputs and outputs, to the Shear):

Press Dwell Down and Press Dwell Up Parameters

AMS Controls controllers have a timed press output with a switch input override feature. The duration of the Press Down output is programmable from 0.001 to 30 seconds. Your Controller may have a Press Boost output or a Press Up output. The Press Boost output will be covered later in the Flying Cutoff Calibration Section. The Press Up output is programmable with a range

of 0 to 30 seconds. Refer to the timing diagram Figure 39; each parameter has a dwell time of .125 seconds.

Expect Press Complete

The **Expect Press Complete** setup parameter can be set to Yes or No. Setting the parameter to Yes enables a test feature that will inform the user if the Press Complete input or switch has failed. The controller will expect the Press Complete input to turn on at some point during the Press Dwell Down time or it will exit the run mode, terminate the press cycle, and inform the user that the controller did not see a press complete input.

Program the Resolution Parameter:

The **Resolution** parameter informs the controller what each pulse from the material tracking encoder represents in length. If this value is off by even a slight degree, all subsequent measurements will be proportionally off during operation of the controller.

 **Note:** This parameter must be entered before any kind of testing is performed.

To calculate Line Resolution, divide the circumference of the encoder wheel by the number of PPR (Pulses per Revolution) of the encoder.

The circumference of the wheel is determined by measuring the diameter of the wheel and multiplying that number by pi (3.1416).

The PPR (Pulses per Revolution) is determined by multiplying the rated number of encoder counts by 4. The model number of an AMS Controls encoder represents the number of counts from one channel of that encoder.

For example, a 256-count encoder will provide 1024 PPR. Similarly, a 500-count encoder will provide 2000 PPR. Refer to the following formula.

$$\text{Resolution} = \frac{\text{Circumference}}{4 \times \text{Encoder Counts}}$$

Figure 41: Formula for Determining Resolution

For example, suppose a wheel 5 inches wide is mounted onto a model 1000 encoder. The formula shows how the resolution is calculated.

$$\text{Resolution} = \frac{5.00 \text{ in.} \times 3.1416}{4 \times 1000 \text{ count}} = \frac{15.708}{4000} = .00393$$

Figure 42: Example

Test the E-Stop Circuit

Before testing any functionality of the controller or machine, the Emergency Stop and Safety Circuits should be tested for proper operation. Not only may this save injury to personnel, but it may save equipment and material from getting damaged.

If the Emergency stop circuit is a latched circuit, make sure that it latches properly and that the latch is dropped by the loss of any E-stop button or other emergency stop switch, safety curtain, or other device.

⚡ Danger! Although AMS Controls provides wiring templates and wiring methods for customer use, each customer is responsible for designing, installing, and applying an adequate emergency stop circuit as well as necessary safety guards and enclosures for the protection of personnel and equipment.

When an emergency stop condition occurs, all output devices should be isolated from their power source. However, the AMS Controls CPU power (Terminal A1 & A2) should only lose power when the controller is turned off via a power switch. The controller's encoder input and DC inputs can still be active during an e-stop condition, and the display diagnostic information may assist the operator in the case of a problem.

⚡ Danger! Special care should be taken to ensure that an E-Stop condition unlatches all input circuits to prevent any automatic movement or functionality of the machine or controller from occurring after the E-Stop circuit is reset.

Test Inputs and Outputs

Test Jog Outputs

The jog inputs and motion outputs should be tested for proper operation and direction. If the outputs do not energize properly, the XL220 controller has an input/output screen with which to view the states of the inputs and outputs.

This window is available through the **Diagnostic** screen of the controller and provides a handy means for troubleshooting.

Jogging forward should result in the material feeding device moving in the forward direction. Two speed machines should provide outputs for the slow velocity. Jogging reverse should provide the opposite feed at slow speed.

Test Encoder Direction

Initiating the jog forward input should cause the material feeding device to go in the forward direction. If material is in the machine, the material position on the controller should grow more

positive. Keep in mind that the number may be growing but in the negative direction. If the controller counts more negative while jogging forward, the parameter for **Encoder Direction** will need to be reversed. The choices are CW and CCW (Clockwise and Counter-Clockwise).

Test Shear Outputs

The press dwell time is simply set by manually cycling the press and adjusting the Shear Dwell Down and Up times until the press makes a full and complete cut. Large mechanical presses may require between .2 to .5 seconds typically. Air presses may only require 40 to 80 milliseconds (.040 to .080) to complete a cut.

Initiate the manual shear input to fire the press and adjust the shear dwell times until the press operates properly. If the press does not fire completely, make the dwell time longer. If the press hits too hard or stays on too long, make the dwell time shorter.

If a shear-complete switch is used on a press (usually mechanical presses) it may need to be moved in order for the press to stop at the right location. If the press makes less than a full rotation (short of top-dead-center), move the Shear Complete switch so that it is triggered later in the cycle. If the press over-rotates (beyond top-dead-center), move the switch so that it is triggered earlier in the cycle.

Initial Run & Calibration

Once the basic parameters are set and the emergency circuits are tested, the controller can be tested to see if the run input and run output are properly connected. The basic purpose of the test is to verify that the run circuit will latch-in with a Line Run command and un-latch when Line Halt is signaled. This is best done without material present in the machine.

Program a basic order of a given length. Use no patterns, materials, or other options, just a length such as 5 pieces at 72 inches. If possible, turn the line speed down to a slow feed. Initiate the run input. The run latch should turn on and hold the unit in a run state. The motion outputs should energize and begin feeding in the forward direction (with or without material). Press the halt button to verify that a manual halt will stop the line.

Initiate the run input again. If no material is loaded and it is safe to do so, turn the encoder wheel by hand in the forward direction to simulate material motion. If setting up a feed to stop line, the **Tolerance** parameter may need to be increased to a large value such as 10.000 inches to allow a non-steady hand to avoid tolerance errors when stopping at the programmed target distance. After the last part is made, the run latch should open, causing the run input to drop and the motion outputs to disengage.

The controller should now be ready for the initial run. The system can then be calibrated using the specific parameters for a flying-cutoff or a feed-to-stop. Each type of controller is setup in the next two sections.

Flying Cutoff Calibration

What is Shear Reaction?

Shear Reaction Time is the amount of time that it takes a press die to move from its rest position (once fired) to the point at which it impacts the material. This time lapse is a result of an accumulation of delays due to energizing relays & solenoids, filling cylinders with air or hydraulics, and the overcoming die inertia. Without compensating for these time lapses the actual shearing operation would be displaced for the desired cut point (Figure 43). By using the proper shear reaction time, the controller can more accurately cut on-target, most noticeably on the first piece made after a standing crop.

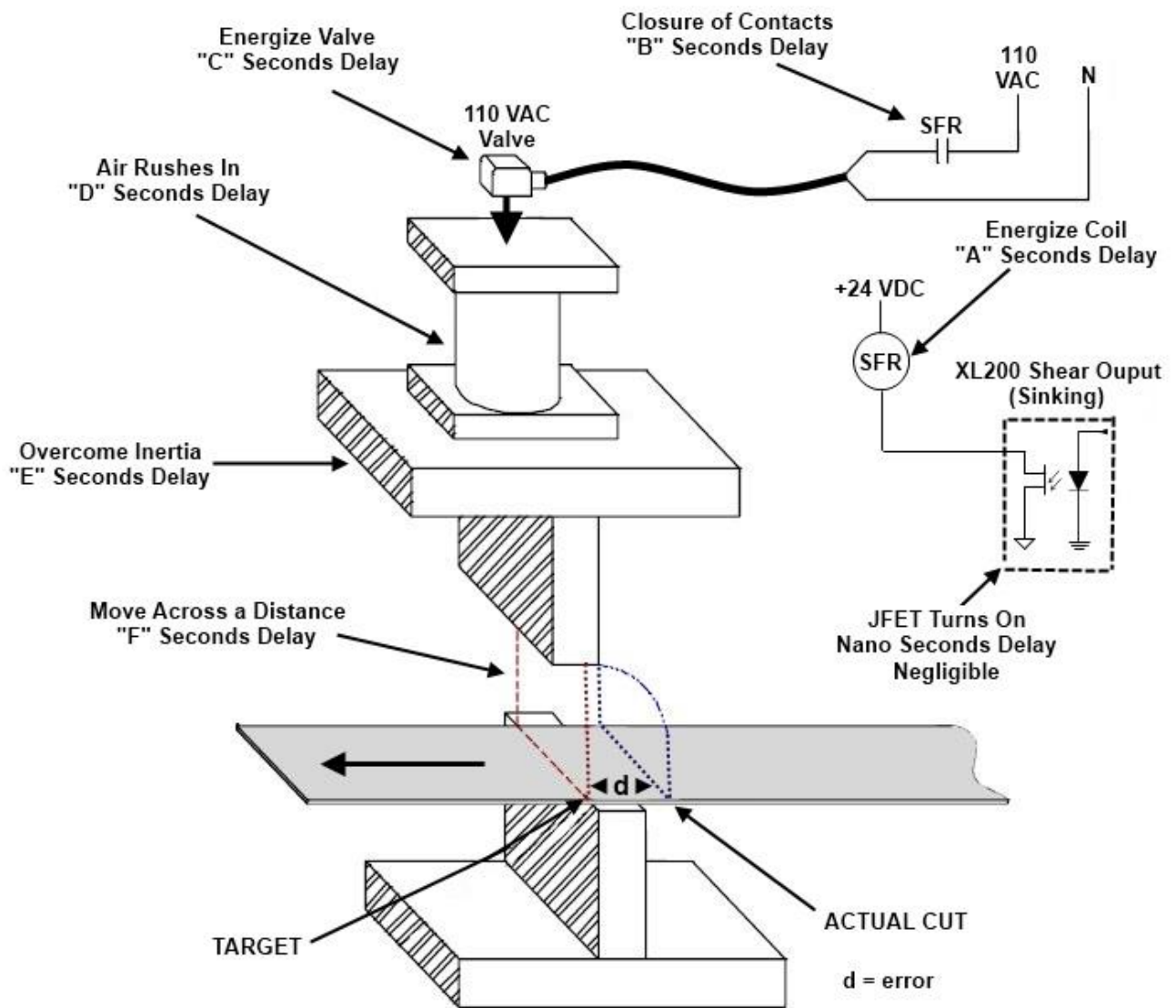


Figure 43: Delay Reactions that add up to the Shear Reaction

As Figure 43 shows, the delay reaction is actually caused by several factors. In this example, the Shear Reaction is the accumulation of delays A, B, C, D, E, and F. This causes the press to lag behind the target. If not compensated for, every piece made will include a similar amount of error.

Each piece has an equal amount of error if the line velocity and reaction delays remain constant; therefore parts appear to be good as long as conditions stay identical. If any of the reactions vary or if the speed of the material fluctuates even slightly from one cut to the next the resulting lengths will vary. For most pneumatic and hydraulic presses, the delay time is usually constant. Sometimes these constants drift over time due to heat, humidity, moisture, and friction variations. The result is loss of tolerance. Velocity variations on the material feed are common and are also a source of inaccuracy on flying die machines. The reason the first piece after a standing crop is the most noticeably affected by Reaction Time is because the change in velocity between the standing leading edge crop and the moving trailing edge crop is the greatest.

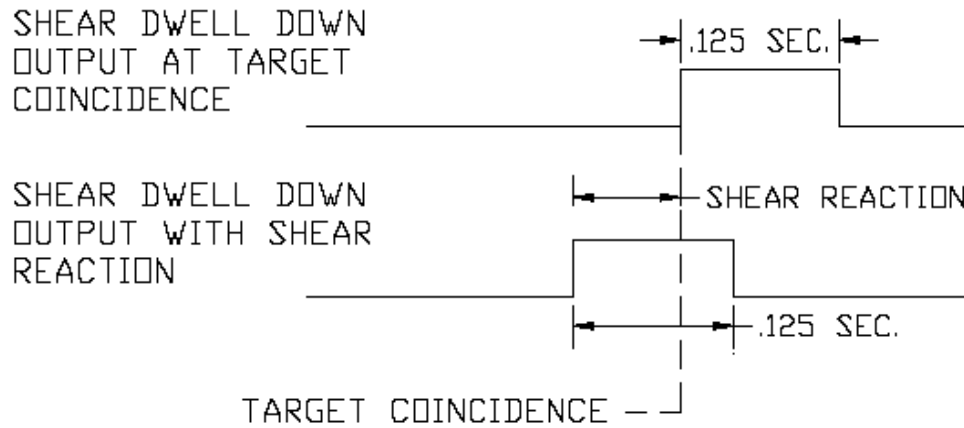





Figure 44: Timing Graph of Shear Reaction Time

Caution: A Shear Reaction time that is larger than the Shear Dwell time is unrealistic, as it would cause the shear completion time to occur prior to the target coincidence.

 **Note:** A Shear Reaction time turns on the shear output prior to the target coincidence point. It does not affect Shear Dwell.

Setting Shear and Boost Reaction Times

- 
Note: Before attempting to perform the procedures detailed in this section, the Trim Correction procedure at the end of this chapter should be performed. This will ensure that all of the calculations involved in this section will be as accurate as possible.
- 
Note: The procedures in this section should be performed from beginning to end in order to finish with a predictable result.

Shear Reaction is necessary on flying cut lines because of delays that occur during the shear cycle. These delays occur due to the time it takes for valves to energize, cylinders to fill, and for dies to move. Since the Shearing function is not instantaneous, the shear must be activated prior to the actual cut point, see Figure 45.

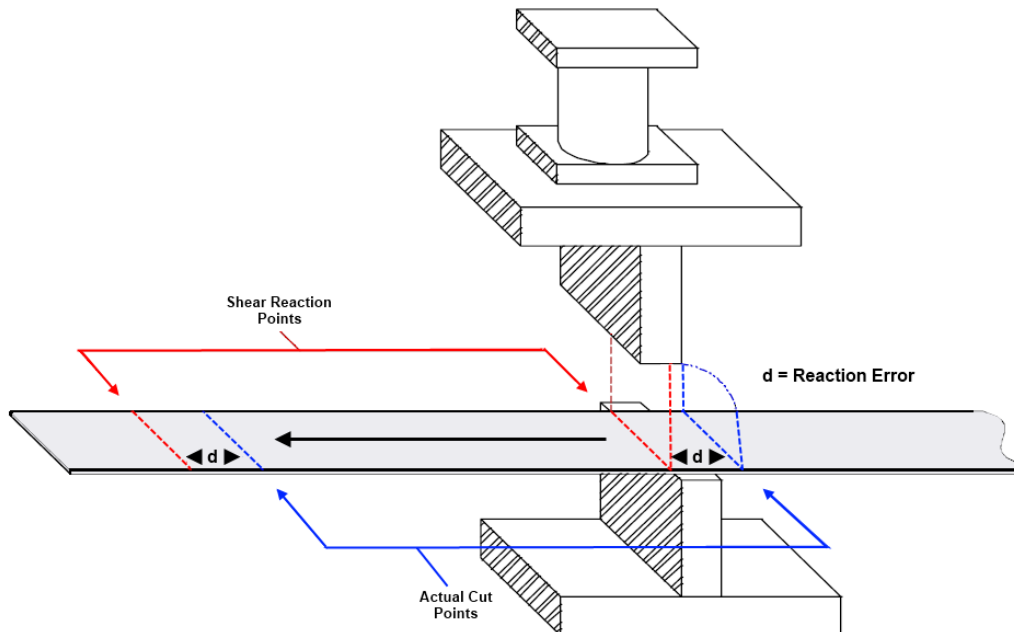


Figure 45: Shear Reaction vs. Actual Cut Point

To calculate the Shear Reaction time,

- Set the **Shear Reaction** time to zero
- Cycle the shear
- Run two parts that are long enough for the line to reach full velocity before firing the press.
- Note the line speed on the controller display (Top, Center).
- Mark the parts 1st Part and 2nd Part.
- Use the following formula for the new Shear Reaction time:

$$\text{Shear Reaction Time} = \left[\frac{(\text{1st Part} - \text{2nd Part})}{\text{Line Speed in FPM}} \right] \times 5$$

Figure 46: Shear Reaction Time Formula

Setting Shear Reaction with a Boost Attached

Boost cylinders and boost reaction can cause problems when trying to calculate shear reaction time. See the following example:

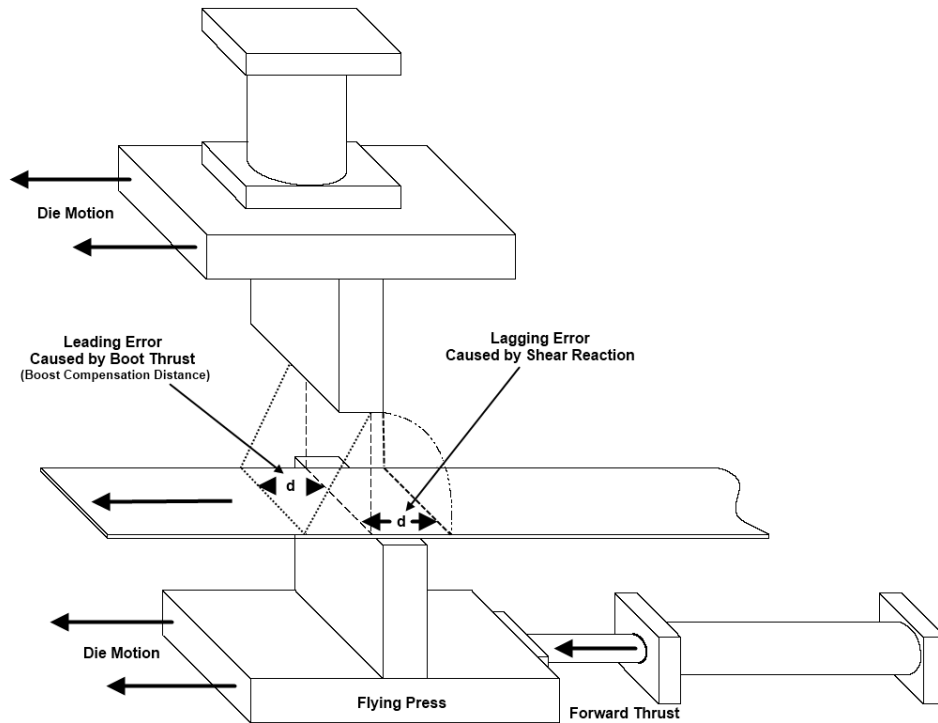


Figure 47: Boost Displacement of Die vs. Target Coincident Point

Notice that the die boost does not change the shear reaction itself, but it can cause the die to fire in a different location since the entire die is moved forward during the cut.

If possible, disconnect the die boost when setting shear reaction. This will allow you to use the above method for calculating the Shear Reaction time. Although you may have to run the line at a slower speed, this is the quickest and most accurate way of setting the shear reaction.

Another way to figure shear reaction with a boost is to test at two different speed ranges. For example, perform the standard reaction test at 100 FPM (feet per minute) and then again at 200 FPM, and then calculate the difference in the two speeds and the two errors to set your reaction times (the theory is that the boost compensation distance of the die is a constant value, but the shear reaction error will grow lineally as the line material moves faster).

For example, with First Speed at 100 FPM (20 In/Sec):

- Crop the leading edge of the material and run part #1.
- Part is 120.90 inches long.

Then with the Second Speed at 200 FPM (40 In/Sec):


- Crop the leading edge of the material and run part #2.
- Part is 121.80 inches long
- The difference in speed is 100 FPM (20 In/Sec)
- Now apply the shear reaction formula.

$$\frac{Part2 - Part1}{SecondSpeed - FirstSpeed} \times (5) = \frac{121.80" - 120.90"}{200FPM - 100FPM} (5) = .045 \text{ Reaction Time}$$

Figure 48: Shear Reaction Time Example

Boost Reaction Time

Many dies have a boost cylinder attached to them to push the die forward with the material. This causes less stress on the material as the die tool engages it. Optimally, the die would be moving at the same speed as the material for best cutting results.

 **Note:** Always keep in mind that the Boost Reaction is only for enhancing the **quality** of the cut, not for correcting the **length** of the part.

There are no formulas for calculating boost reaction times. It basically comes down to two rules:

1. If you are buckling or damaging the leading edge of cut or punch during the press operation, increase the boost reaction in order to cause the die to push forward earlier in time allowing the die to be moving faster at the cut point.
2. If you are pulling or tearing the material during a punch or cutting operation, the die is going faster than the material. Decrease the boost reaction time to cause the die to be moving slower at the cut point.

The **Shear Boost Dwell** sets the length of time that the Die Boost Output stays on.

The Die Boost Output is activated at the target coincidence point and left on for the value of time programmed into the **Shear Boost Dwell** time. See Figure 49. This is done to push the die forward in order to allow the shear press to cycle through the material without damaging the part.

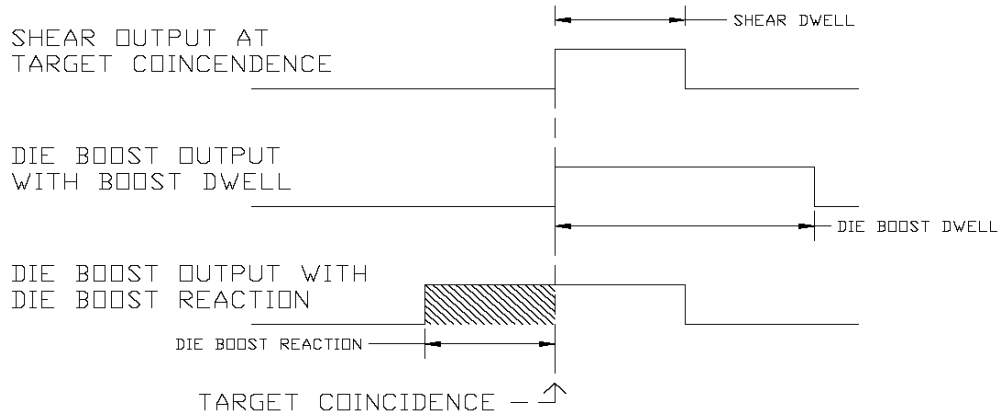


Figure 49: Die Boost Timing

When the Die Boost Reaction is added, the Die Boost output is advanced earlier in time as referenced to the Target Coincidence. See Figure 50. The reaction time shifts the entire pulse forward in time.

Note: The **Die Boost Reaction Time** is entirely independent of **Shear Reaction Time**. Die Boost Reaction is typically greater than or equal to the Shear Reaction.

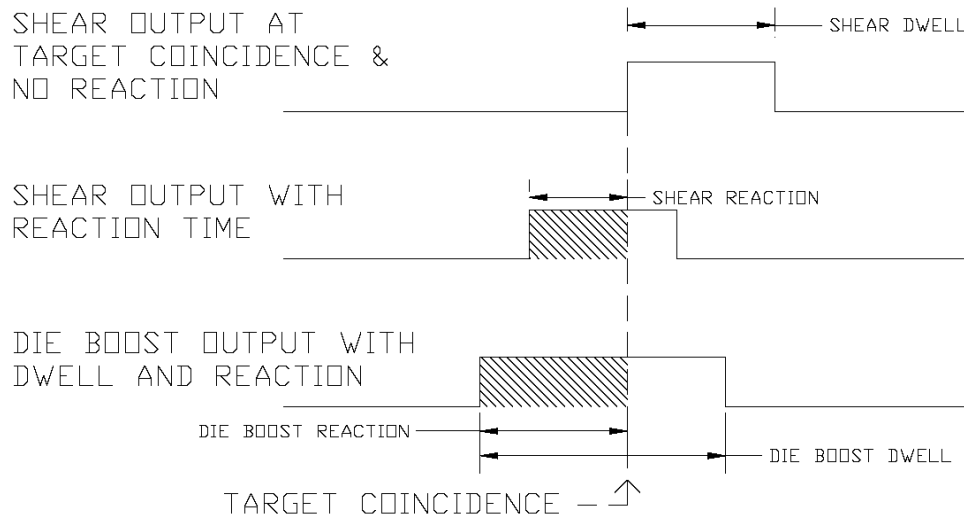



Figure 50: Die Boost Timing with Shear Reaction


If the leading edge of the part gets caught on the die (pushes the die), the Shear Boost Dwell time should be increased. If the die moves too far out causing the material to pull or tear, the Shear Boost Dwell time should be decreased.

Boost Compensation

The final step of calibrating the Shear should be setting the **Boost Compensation** parameter. After the Shear Reaction Time has been calculated by one of the two methods above, the first piece after a manual shear may still be short due to the Boost Comp. Dist. (See Figure 47). Setting the **Boost Compensation** parameter equal to the difference between the first part and second parts after a standing crop cut should resolve this issue by adding this distance to the first part.

 **Note:** Any changes to the Boost or Shear Reaction times may require changes to this parameter as well.

Press Reaction Time (Short Distances)

 **Note:** Prior to using the procedure to calculate the Press Reaction, the Correction Factor and Shear Reaction should be calculated.

The **Press Reaction Time** is the time delay that takes place between the time that the punch signal occurs and the time that the die contacts the material. This factor is used on flying die machines only. The maximum value is 1.000 seconds. There is a **Press Reaction Time** for each Press.

Calculate the Press Reaction time using the following steps:

- Set the Press Reaction time to zero.
- Program a 130" part with holes at 60" and 120". This may need modification to assure that the line is up to full speed before the first punch occurs.
- Cycle the shear.
- Run the line.
- After the first part is cut, jog the material out and measure the leading edge to the first hole to the second hole.
- Use the following formula for the new Press Reaction time:

$$\text{Press Reaction} = \left[\frac{(\text{MH to 1st Hole}) - (\text{1st to 2nd Hole})}{\text{Line Speed}} \right] \times 5$$

Figure 51: Press Reaction Formula

Press Reaction Time (Long Distances)

If there is a long distance between the shear and the press and a large amount of scrap would be produced, the following procedure could be used:

Calculate the Press Reaction time using the following steps:

- Set the Shear-Punch Distance and the Press Reaction time to zero.
- Program a 130" part with holes at 60" and 120".
- Cycle the Shear and the Press being tested.
- Run a single part.
- After the first part is complete, measure from the manually produced hole to the first hole and the first hole to the second hole.
- Use the following formula for the new Press Reaction time:

$$\text{Press Reaction} = \left[\frac{(\text{MH to 1st Hole}) - (\text{1st to 2nd Hole})}{\text{Line Speed}} \right] \times 5$$

Figure 52: Press Reaction Formula

MH = Manually Produced Hole

Both methods will calculate a good press reaction time. This same test must be repeated for all individual presses.

Feed-to-Stop Setup

Minimum Slow Distance (2-speed lines only)

The **Minimum Slow Distance** is the value used by the controller to determine how close to the end of the part that the controller shifts its output from fast speed logic to slow speed logic. The larger this value is, the sooner the line will shift into a slow velocity (creep speed) prior to press operation. This parameter needs to be set large enough so that the line is in the stabilized slow velocity before the controller tells it to stop for the operation. If this parameter is too small, the material may still be decelerating from the fast speed when it is told to stop, thereby producing poor tolerances.

This parameter is used in conjunction with the **Deceleration Factor** parameter. When the **Deceleration Mode** parameter is set to automatic or manual, an additional slow down length will occur depending on line speed and machine operation.

Deceleration Mode (2-speed lines only)

On two-speed machines, the XL220 uses a **Deceleration (Decel) Factor** when changing from fast to slow speed. The Decel Factor is used in conjunction with the **Minimum Slow Distance** to determine the ideal time to shift from fast speed to the slow speed. The user has the options:

Auto

The XL220 controller automatically maintains and updates the **Deceleration Factor** parameter. It is expressed in inches-per-second-per-second (In/Sec²) and is used in the Adaptive Slowdown

calculation. The parameter can be overridden but is automatically updated during the next speed shift or stop.

Manual

This allows the **Deceleration Factor** to be manually entered into the controller rather than being automatically updated. Some trial and error may be necessary when in the Manual mode to find a Decel Factor that works properly. Ideally, the machine should shift from fast to slow at some distance prior to the target (shear or punch point) and long enough so that it reaches a constant slow velocity before the motion outputs are turned off.

If the machine tends to shift into slow too soon, increase the Decel Factor. If the machine tends to shift into slow too late, decrease the Decel Factor.

While in the Manual mode, the XL220 controller will not calculate a new value for the Decel Factor after each speed shift or stop.

Off

The **Deceleration Factor** is not used and the controller will not make an Adaptive Slowdown calculation. The machine will shift from fast to slow when the material has reached the **Minimum Slow Distance** before the target. For example, if the **Minimum Slow Distance** has been set to four inches, the machine will shift from fast to slow four inches before each press operation. This may or may not be enough distance for the machine to decelerate properly.

The **Deceleration Mode** defaults to Off. Setting this parameter to Manual or Auto may increase productivity by running the line in slow for the minimal amount of time necessary.

Deceleration Factor (2-speed lines only)

A Decel Factor can be set to keep production optimized by minimizing the amount of time that the material is running in slow speed. Like the Stopping Reaction, the Decel Factor can be set manually, automatically or turned off in the Decel Mode parameter. When set to Automatic, the controller will continually calculate and adjust the optimum point at which to shift the line into slow speed so that material is moving at a steady, slow velocity just as it reaches the Minimum Slow Distance before the target.

If the Deceleration Factor is set to Off, the controller will use only the Minimum Slow Distance when determining the location to change the feed rate to a slow speed. The Decel Mode may also be set to manual. This will allow the operator to program the Deceleration Factor by hand. In this case the parameter will not be automatically updated and the controller will not make any adjustments for changes in line performance.

The controller with Adaptive Slowdown uses the measured line speed and deceleration characteristics of the machine to calculate the optimum point to shift into slow speed. The result, as seen in Figure 53, is less time spent in slow speed on short parts, which leads to increased productivity. The XL220 controller continuously monitors machine parameters and automatically adjusts for machine changes.

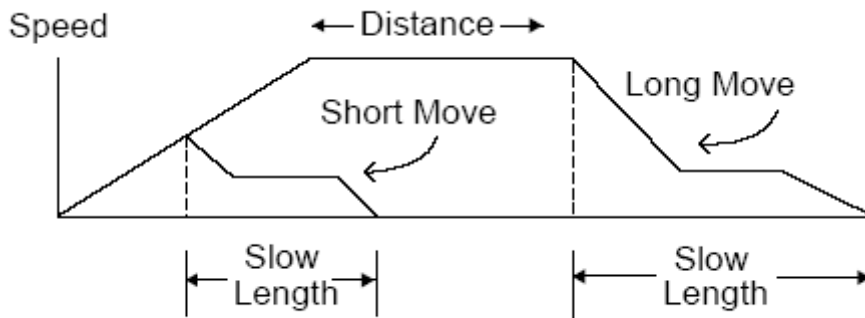


Figure 53: Speed Profile with Adaptive Slowdown

To increase productivity, on stopping lines, the controller will fire a shear or punch upon reaching a halted velocity. This halted velocity will allow a specific number of encoder counts to occur and still be considered halted. This allows the press tool to meet the metal just as it stops moving. The controller waits until tolerance is reached, then checks for the material to fall below halted velocity at which time it can fire the shear. This speed is calculated based on tolerance and shear dwell time. To calculate the halted velocity, use the following equation:

$$"T" / "D" = 5("S1") = "S2 \text{ FPM}"$$

Where:

S2	=	Line Speed in Feet per Minute
S1	=	Line Speed in Inches per Second
T	=	Tolerance in Inches that is Programmed into the Tolerance Parameter
D	=	Dwell Time of the Press in Seconds that is Programmed into the Shear Dwell or Press Dwell Parameter

To force the controller to use a smaller halted velocity, make the tolerance smaller.

Tolerance


The **Tolerance** parameter sets the acceptable measurement range the controller will be allowed to stop within in order to perform an operation.

If the controller stops for a press operation but detects that the target is further away from the target point than what the parameter is set to, the controller will not cycle the press.

If the target is missed by more than the **Tolerance** value, it will halt the line and post a warning to the operator that the part is **Out of Tolerance**.

This parameter should be set low enough that parts are within a window of acceptance, but large enough not to get repeated errors.

For example, suppose a 120-inch part is produced with a programmed **Tolerance** of .125 inches. If the controller stops for the operation and the target is between 119.875 and 120.125 inches, the controller will cycle and press and continue running. Anything outside this quarter-inch window (+/- .125) will cause the controller to halt and post the error.

 **Note:** The **Tolerance** parameter may need to be set to a larger value (3 or 4 inches) initially while calibrating the machine for the first time. Once calibration is complete, set the parameter for the required production value.

Stopping Mode

On feed-to-stop machines, a **Stopping Reaction Time** parameter is used. This represents the time delay from the time that the controller turns off the movement outputs until the material actually stops. The longer a machine takes to stop, the larger the reaction time will need to be. Knowing that the machine will require time to stop, the value from this parameter is used to stop the material before reaching the press target. The user has a choice of three Stopping Modes:

Auto

The XL220 controller turns off the movement outputs prior to the actual shear or punch point, allowing for the momentum and inertia of the machine and material to carry it to the correct stop point. The stopping reaction is monitored continually with a new **Stopping Reaction Time** being calculated after each operation stop. This parameter may be overridden in the Manual Calibration mode but the value will be again updated after the next operational stop. A tolerance check will be performed before firing the shear. The maximum value is 5.000 seconds.

The default mode for Stopping Reaction time is Auto. This is the recommended mode of operation.

Manual

This mode functions identically to Auto except that a new **Stopping Reaction** is not calculated after each stop. The controller will use the manually entered value.

Off

The value in the **Stopping Reaction** parameter is not calculated and is not used at all by the XL220 controller. The movement outputs are turned off when the material past the shear point is equal to the programmed length of the part. This is the least accurate mode and may cause all parts to come out long due to the momentum of the machine and material during stopping. When the **Stopping Mode** is set to Off a tolerance test is not performed.

Stopping Reaction

What is Stopping Reaction?

Feed-to-stop machines are used instead of flying die machines because the dies are simpler and the machines are normally more accurate. Higher accuracy is normally achieved by slowing the

line speed down to a creep speed just before the target. This is done to minimize the effect of a delay in stopping that occurs and to increase consistency when the stop signal is given by the controller.

Similar to the flying die situation, it takes a finite amount of time for valves to close, brakes to engage, and motors to stop turning. With a simple counter, an overshoot past the target always occurs. Shifting into slow speed minimizes the amount of overshoot.

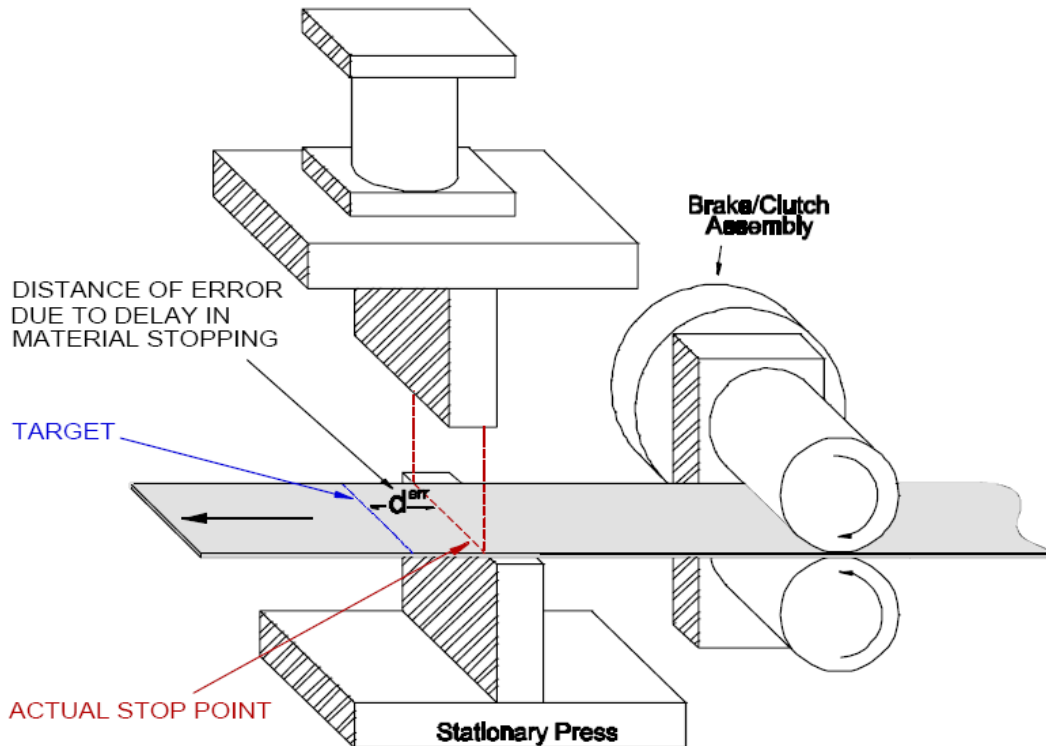


Figure 54: Feed-to-Stop System Showing a Delay in Stopping

If the delay time and slow speed are constant, the lengths are often consistent, but lack true accuracy.

The XL220 controller improves the performance of feed-to-stop machines by compensating for the stopping delay time and automatically setting the slowdown distance.

The controller uses its automatic parameters to calculate an advanced target to stop the machine so that it coasts into the exact shear point.

The controller measures the amount of overshoot or undershoot on each move and adjusts the **Stopping Reaction Time** to match the characteristics of the machine. The user can specify a tolerance so that accuracy is assured.

For example: Suppose you have a motor driven Feed Roll with a clutch/brake assembly running a line. The motor runs continuously and the clutch is engaged to put the material into motion. When the line is halted, the clutch is released and the brake is engaged to stop the line.


Several causes can delay the line from halting immediately:

- The momentum of the rolls and the material can continue feeding forward for a short duration after being disengaged.
- The time it takes to energize the solenoid valves that control both the brake and the clutch.
- The brake overcoming its inertia and distance before engaging the rolls to stop them.
- Slippage between the roll pad and the brake pad after the brake engages.

The XL220 controllers are programmed to handle this problem of overshoot automatically. The **Stopping Reaction Mode** and **Stopping Reaction Time** are in the Machine Parameters of the XL220 controllers.

The controller knows where the target is located via the line encoder. At the precise moment that the target is below the shear blade, the controller attempts to halt the line. Due to the reasons mentioned above, the target will coast a little further before it stops.

The controller senses (through encoder measurement) that the target is past the blade by given measurement. It knows that it was X inches away from where it should have been. It then uses a proprietary algorithm to calculate a reaction time to correct for the overshoot. In order to minimize issues with machines that have inconsistent stopping reaction times, the controller does not correct for the full X error amount every time but finds an average value that it adjusts over several parts.

 **Note:** During a new installation or a recalibration, it is recommended to run at least 7-10 short parts to allow for the automatic calculation of the Stopping Reaction time. This will allow it to reach its stable range. It is advisable to set the Tolerance parameter to a larger value until the stopping reaction parameter is stabilized.

The **Stopping Reaction** can be set manually, automatically or completely turned off through the **Stopping Mode** parameter. When set to automatic, the controller will compare the intended target position to where the target actually stopped.

The two positions should vary initially due to coasting of the material after the controller turned off its feed outputs. The error between the two positions will be integrated out over the next few parts. Since the first few parts may be substantially off-target until the reaction time is worked out, it may be best to set the **Tolerance** parameter to a larger number.

If the target stops outside the range programmed into the **Tolerance** parameter, the controller will automatically turn off the run output without firing the shear and post an error message on the display.

Once the **Stopping Reaction Time** is calculated, the **Tolerance** parameter can be set back to the required level. As long as the **Stopping Mode** is set to automatic, the controller will continually update any for any variations in how long the drive system takes to stop the line.

The **Stopping Reaction Time** can be manually set if manual is selected in the **Stopping Mode**. Manually entered settings in this parameter will not be automatically adjusted for if changes in the operation of the line occur. These parameters will be found on both single-speed and two-speed applications.

Inducing Automatic Values

Once the basic Configuration parameters and Manual Calibration parameters are set, you can begin to run the line and calibrate the lengths.

Initial Run

Widen the **Tolerance** parameter to allow for calibration of the **Stopping Reaction Time**. This may need to be several inches.

Set **Minimum Slow Distance** to a value conservatively larger than the distance it will take the material to shift from fast speed to a stable slow speed.

Program some short parts from 36 to 60 inches. Put the controller into run and watch the display. As each part is cut, the amount displayed as being cut should get closer to the actual programmed length. This is due to the automatic features of **Stopping Reaction** and **Decel Factor**. If these are not set to automatic, they must be set by hand using trial and error.

If the **Stopping Reaction Mode** is set to Automatic, watch the **Stopping Reaction** until it becomes a relatively stable value.

If the **Deceleration Mode** is set to Automatic, the line may shift into slow mode very early in the part during the first few pieces made. This will gradually become closer and closer to the **Minimum Slow Distance** parameter. Watch the **Decel Factor** until it becomes a relatively stable value. Once it has become stable you can shorten the **Minimum Slow Distance** to a smaller value. The **Minimum Slow Distance** must be larger than the distance it takes the material to stop from slow speed. If set to too small a value it can confuse the Stopping Reaction calculation and cause tolerance problems.

Now measure the sample that you just produced. You should notice that the first parts (probably long) eventually were corrected for and the last parts are a relatively consistent length.


Once the parts appear to be consistent (even though they may appear to be slightly shorter or longer than the target), you can move onto setting the Correction Factor.

Trim Correction

The **Correction Factor** adjusts for errors in the size and tracking of the measuring wheel and is expressed as a percentage, with 100% being no correction. Increasing the Correction Factor causes the parts to become longer and decreasing the value shrinks the parts.

The XL220 controller's Trim Correction feature automatically computes a new Correction Factor. The Correction Factor is used in the controller's length calculations. Trim Correction should be used any time part lengths are incorrect in a consistent manner (e.g., all parts 3/16" long, etc.).

The XL220 controller provides an easy method for making such corrections. Press the Setup button on the controller and highlight Trim Correction. The window on the right will display the Last Programmed Length, Last Measured Length, and the Correction Factor.

 **Note:** When calculating the Correction Factor, make several parts (6 to 10) and use the average of these parts for the part length. The first part produced should not be used in this calculation since it may be inaccurate due to shear reaction, boosts motion, or other variances.

The Last Programmed Length automatically displays, assuming that this is the length that is being corrected for. The Length displayed here can be edited to a different length for a part previously produced and the correction is adjusted according to the new value.

If a correction is desired, press **[F1]** to tab to the parameter window on the right side of the screen. Highlight the Last Measured Length field and input the actual part length being measured. Remember, it is best to take an average of the lengths being produced and input the averaged length in order to get the best results.

Once the length is Input, press **[Enter]**. A popup window displays and prompts the user to accept the new correction factor. Select **Yes** to accept the correction, or **No** to cancel it.

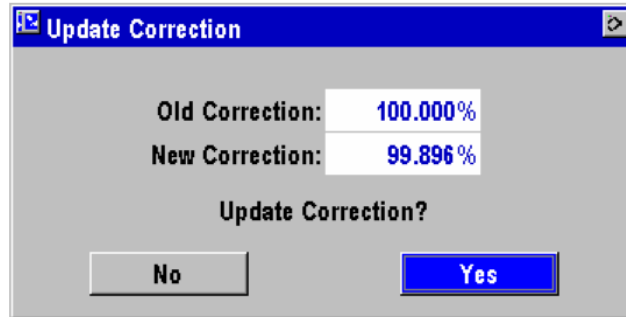


Figure 55: Update Correction Popup Window

As discussed in the Startup and Calibration chapter, the Correction Factor may also be manually calculated using the following steps:

1. Run ten parts of equal lengths, 120" for example.
2. Measure the ten parts.
3. Find the average length by adding up all ten parts (the last eight parts if Shear Reaction has not been set) and dividing by ten (eight if Shear Reaction is not set).
4. Use the following formula for the new Correction Factor. Use the average of the ten parts for "actual measured length".

$$\text{New CF} = \left(\frac{\text{Programmed Length}}{\text{Actual Measured Length}} \right) \times \text{Old CF}$$

Figure 56: Formula for New Correction Factor

 **Note:** CF = Correction Factor

- **Material Code** – an alpha-numeric value that serves as a description for the coil material's type for all parts produced which belong to this order record. The material Code can be up to 20 characters long.
- **Product Code** – an alpha-numeric value that serves as a description for the type of product being produced for this order record. The Product Code can be up to 5 characters long.

Any of the three fields may be left blank, but all Cut-list Items must belong to an order record.

Cut-list Items


Once these three fields have been entered for the order record, the user may create a list of Cut-list Items that belong to this order record. Each Cut-list Item contains the following additional fields:

- **Bundle Number (Bundle)** – used to identify items within an order. This field also serves as a packaging designation indicating which line items should be packaged (or grouped) together. Finished parts that are to be kept together and packaged as a unit should have their cut-list items programmed consecutively and with the same Bundle Number. The Bundle Number can take any value from 0-999.
- **Quantity (Qty)** – this field represents the number of parts to be produced by the machine for this item. It can take any value from 0-9999.
- **Quantity Done (Done)** – this field represents the number of parts already produced for this item. It is a read-only field that cannot be directly edited by the user.
- **Part Type (Type)** – this field allows the user to select from 5 different shapes that can be produced by the XL220 controller:
 - **4-Sided** – represents one section of a 4-sided duct. The Height or Width dimension must be specified, but not both.
 - **L-Shaped** – represents two sections of a 4-sided duct assuming one secondary bending operation will form an L-shaped part. Both the Height and Width dimensions must be specified.
 - **U-Shaped** – represents three sections of a 4-sided duct assuming two secondary bending operations will form a U-shaped part. Both the Height and Width dimensions must be specified. The Height dimension determines the length of the 1st and 3rd sections, while the Width dimension determines the length of the 2nd section.
 - **Full-Wrapper** – represents all four sections of a 4-sided duct assuming three secondary bending operations will form a complete rectangular-shaped part. Both the Height and Width dimensions must be specified. The Height dimension determines the length of the 1st and 3rd sections, while the Width dimension determines the length of the 2nd and 4th section.
 - **Shear-Only** – represents a single-sided blank sheet with no Vee or End notches and no extra material allocated for the male or female locks. Only the Height dimension may be specified for this part type, representing the length of the blank sheet.

For all part types except Shear-Only parts, Vee-notches will be automatically be inserted at the appropriate bending locations and End-notches will automatically be inserted on the leading

and trailing edge of the part if a non-zero Connector Type is specified. Extra material length will be allocated for the male and female lock dimensions if a non-zero Lock Identifier is specified.

- **Height** – specifies the height dimension of the duct for part types 4-Sided, L-Shaped, U-Shaped, and Full-Wrapper. Specifies the length of the blank sheet for part type Shear-Only.
- **Width** – specifies the width dimension of the duct for part types 4-Sided, L-Shaped, U-Shaped, and Full-Wrapper. Specifies the length of the blank sheet for part type Shear-Only.
- **Lock Identifier (Lock)** – specifies the identifier of the lock definition to use when producing parts for this cut-list item. The data in the lock definition includes the male and female lock dimensions. For more information refer to the Lock Data section on page 65.
- **Velocity Type (Vel)** – specifies the Velocity Type, None (NO), High (HI), Low (LO), or Special (SP), to be used for this part. This information is not used by the XL220 controller; it is only transferred to a down-stream Pin-spotter controller if one is available.
- **Connector Type (Conn)** – specifies whether or not to include Vee and End-notches for this ductwork part and which set of tooling to use if more than one set of notches is available.
 - **Conn = 1** causes the controller to utilize Vee-Notch 1 and End-Notch 1 tooling.
 - **Conn = 2** causes the controller to utilize Vee-Notch 2 and End-Notch 2 tooling.
 - **Conn = 0** instructs the controller to produce the part with no Vee-notches or End-notches.
- **P1** – specifies the hole-punching pattern for the height leg of the duct.
- **P2** – specifies the hole-punching pattern for the width leg of the duct.

 **Note:** P1 and P2 fields are included whenever the hole-punching option is enabled via the machine configuration dip-switches.

Part Type Calculation

There are five types of parts that the XL220 will produce: Shear-only, Full-Wrapper, U-Shaped, L-Shaped, and 4-Sided.

- The **Shear-Only part type** produces a notch-less part whose length is the same as the programmed Height dimension. The other four types produce sheets for duct work.
- The **Full-Wrapper part type** has all four walls on one sheet that is bent by a secondary operation to produce a completely finished duct.

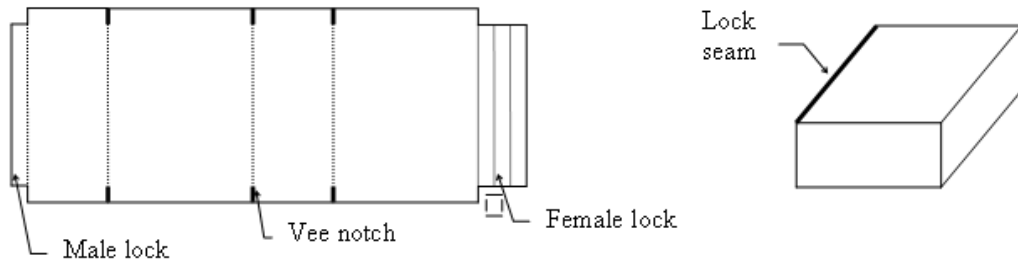


Figure 58: Full Wrapper Part Type

- The **U-Shaped part type** produces one piece that consists of three sections, with the 1st and 3rd sections' lengths determined by the Height dimension and the 2nd section's length determined by the Width dimension. The 4th section must be produced by programming a separate cut-list item specifying the Four-Piece part type.

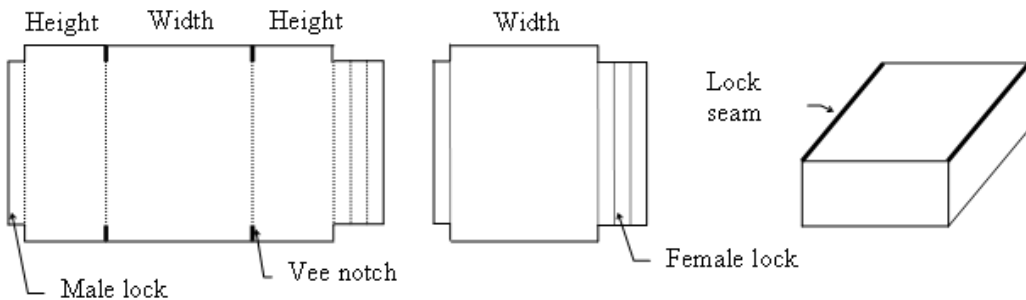


Figure 59: U-Shaped Part Type

- The **L-Shaped part type** produces one piece containing two sections, with the 1st section's length determined by the Height dimension and the 2nd section's length determined by the Width dimension. Assuming a secondary bending operation is performed, this section will produce half of a rectangular duct. To make a full piece of duct, twice the number of parts must be programmed.

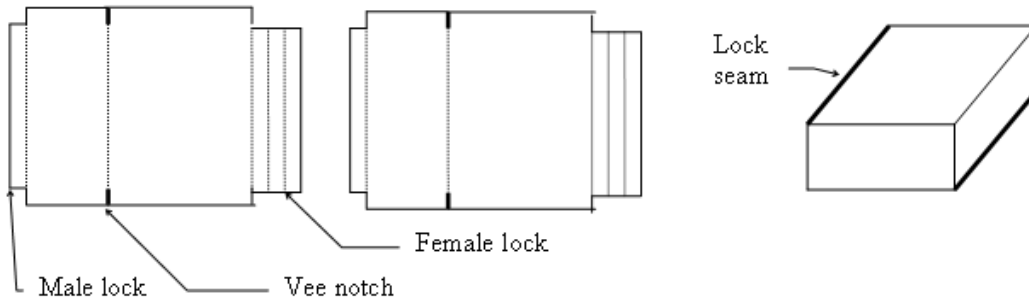


Figure 60: L-Shaped Part Type

- The **Four-Piece part type** will produce one section for every one programmed. To make a complete rectangular of duct, two separate cut-list items must be programmed with a quantity of 2 in each item, for each complete section of duct desired. One item should contain the Height dimension, while the other item should contain the Width dimension.

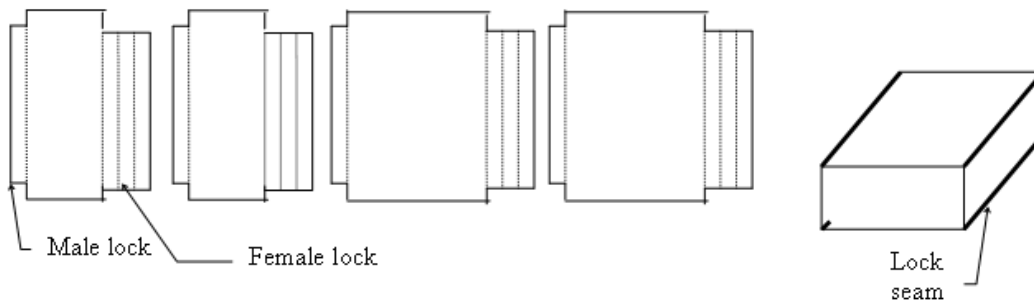


Figure 61: Four-Sided Part Type

Small duct-work sections are typically produced by programming one Full-Wrapper part type, whereas very large duct-work sections may be made out of 4-Sided parts.

Part Calculation Variations

The machine setup parameter **Machine Configuration** determines whether the height or width dimension is produced first. If a "U" configuration is used, the width dimension will exit the machine first. If a "Z" configuration is used, the height dimension will exit the machine first. An exception is when the U-Shaped part type is produced; the height dimension will always exit the machine first.

The machine setup parameter **Leading Edge Lock Type** determines whether the male or female lock goes on the leading edge of the part.

The size of the end notch may be larger or smaller than the combined dimensions for the male and female locks. If the combined lock dimensions are larger than the end notch tool's width, the XL220 controller will automatically insert multiple end-notch targets to notch out the extra material needed for the locks. If the combined lock dimensions are smaller than the end notch tool's width, the XL220 controller automatically inserts multiple shear targets to cut out the extra material from the locks. This is only practical of course with rectangular shaped notching tools.

Hole-Punching Options

If the XL220 controller is configured to include the optional hole punching feature, the following punch patterns are available in each cut-list item via the P1 and P2 fields:

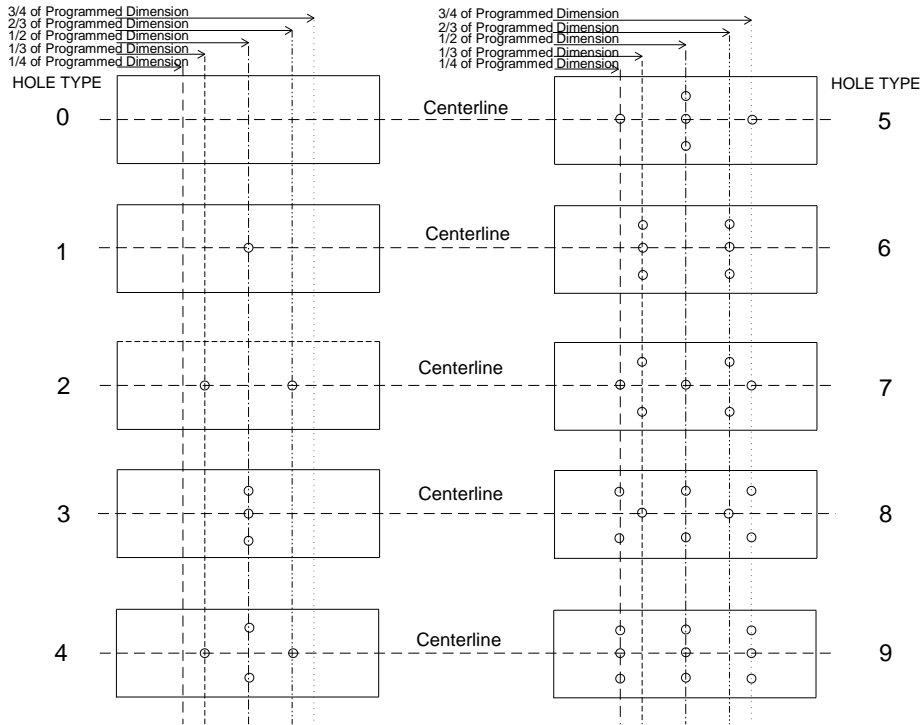


Figure 62: Conduit Hold Punch Patterns for the XL120/220

Program/Edit Order or Item

Program an Order

1. Press **[Program]**.
2. Select the Order-Material-PCode window (left pane) and press **[End]**.
3. Press **[F2]** to add an order.
4. Enter **Order Number** and press **[Enter]** or **OK** if the virtual keyboard appears.
5. (optional) Enter the **Material Number** and press **[Enter]** or **OK**.
6. (optional) Enter the **Product Code** and press **[Enter]** or **OK**.
7. Enter the **Bundle Number** (Bundle) and press **[Enter]**.
8. Enter the **Quantity** (Qty) and press **[Enter]**.
9. Select the **Part Type** from drop down box.
10. Enter the **Part Height** and press **[Enter]**.
11. Enter the **Part Width** and press **[Enter]**.
12. Enter the **Lock Identifier** (Lock) from the created **Lock Data** and press **[Enter]**.
13. Select the **Velocity Type** (Vel) from drop down box.

(optional)

1. Enter the **Connector Type** (Conn) and press **[Enter]**.
2. (if hole-punching option is enabled) Enter hole configuration choice for **P1** and press **[Enter]**.
3. (if hole-punching option is enabled) Enter hole configuration choice for **P2** and press **[Enter]**.
4. Repeat steps 7 – 16 until the entire cut list is entered.
5. Press **[Status]** to return to the Status Screen.

Edit Existing Order or Item

1. Press **[Program]**.
2. Select the **Order Number** (if used) from left pane to be edited.
3. Select the **Order Data** or **Cut List Item** from right pane to be edited.
4. Select the **Specific Data** to be edited.
5. Enter the **Value** and press **[Enter]**.
6. Press **[Status]** to return to the Status Screen.

Chapter 8: Running the Machine

Status Menu

The XL220 status screen is shown below:

4/14/08	HALTED	0FPM		0.000"						
2:06 PM										
Order: ABC_Ind_0012398		Total:	677Ft	Done:	0Ft					
Material: GALV 018X024		PCode: P1								
Order-Material-PCode	Bundle	Qty	Done	Type	Height	Width	Lock	Vel	Conn	Status
ABC_Ind_0012398	1	25	0	<input type="checkbox"/>	13.250"	9.750"	1	NO	1	Ready
GALV 018X024	1	25	0	<input type="checkbox"/>	16.000"	20.000"	1	NO	1	Ready
P1	1	25	0	—	20.000"	0.000"	1	NO	1	Ready
DANCO_04776320	2	10	0	<input type="checkbox"/>	11.625"	17.250"	2	HI	1	Next
GALV 016X022	2	10	0	<input type="checkbox"/>	11.625"	17.250"	2	HI	1	Ready
P1	10	50	0	<input type="checkbox"/>	22.000"	24.000"	3	SP	1	Ready
P1	10	50	0	<input type="checkbox"/>	24.000"	22.000"	3	SP	1	Ready
Status F1-Next Window F2-Set to Next F3-Skip/Ready F4-Remake F5-Dec Qty										

Figure 63: XL220 Status Screen

The status screen is the main screen the operator will see while the machine is running. It displays the information for the currently running order as well as data for the currently running cut-list item. All fields have the same functionality as described for the Program Screen, but they are **read-only** while in the Status Screen.

From this screen the operator can easily view upcoming orders and cut-list items, and select which cut-list item he'd like to run next on the machine.

Options During Production

Set the Next Line to Run

1. Halt the machine.
2. Press **[Status]**.
3. Cycle the shear twice to clear the target queue.
4. Select the desired **Bundle Item** to run (the item must have a status of READY or SKIP).
5. Press **[F2]**. The selected **Bundle Item** is set to be next.

Change the Sequence of Items within an Order


1. Press **[Program]**.
2. Select the **Order Number** (left pane) to be re-sequenced.
3. Select the **Bundle Item** (right pane) to be moved.
4. Press **[Move Up]** or **[Move Down]** to move the item.
5. Repeat for any other items.
6. Press **[Status]** to return to the Status Screen.

Remake an Item

1. Halt the line.
2. Press **[Status]**.
3. Select the desired done or partially-done **Bundle Item**.
4. Press **[F4]** to re-make the order. The Remake Item/Order popup window displays.
5. In the Number of Pieces Field, enter the quantity of pieces you want to remake (the field pre-fills with the quantity of the selected item already done).
6. Press **[OK]** to save the remake or press **[Cancel]** to stop the remake.


Delete a New or Done Order/Item

1. Press **[Program]**.
2. Select and **Order** or **Bundle Item** with a status of READY.
3. Press **[F3]**. The selected order or item is deleted.

 **Note:** All DONE orders/items are erased automatically after the number of days set in Auto-Delete Done Orders has elapsed.

Delete a Partially Completed Order or Item

1. Halt the machine.
2. Press **[Status]**.
3. Cycle the Shear Twice to clear the target queue.
4. Select the **Bundle Item** to produce next and press **[F2]**. Its status changes to NEXT.
5. Press **[Program]**.
6. Select the partially completed order or item.
7. Press **[F3]**. The line is deleted.

 **Note:** Deleting partially completed Orders or Items causes them to show as UNSCHEDULED in Eclipse.

Increment Quantity during Run Mode

1. Select the **Bundle Item** currently running.
2. Press [**Inc. Qty.**] (Increment Quantity).
3. (Eclipse users only) Select **Scrap Code** from the pop-up menu.
4. Select **OK** to accept the scrap code.
5. Press [**Inc. Qty.**] as many times needed to make the required number of additional parts.

Decrement Quantity

(Identifying Scrapped Parts as Good Parts)

1. Halt the line.
2. Highlight the **Bundle Item** to be decremented.
3. Press [**F5**]. The Decrease Quantity pop-up window displays.
4. In the **Number of Pieces** field, enter the number of pieces to decrement. Press [**Enter**].
5. In the **Coil to Adjust Footage** field, enter the number of the coil you're adjusting footage for and press [**Enter**].
6. Press **OK**. The pop-up closes and the quantity displayed in the **Done** field for the selected item is increased.

Skip an Item to be Run

1. Press [**Status**].
2. Select an **Order** or **Item** with a status of READY.
3. Press [**F3**]. The item's status changes to SKIP.

Production Menu

Footage Totals

6/24/10	HALTED	OFPM	0.000"
10:04 AM			
Coil:		Material:	
PCode:		Employee:	0
Production Menu	Footage Totals		
Footage Totals			
Coil Inventory			
	Good	Scrap	
Coil Totals:			
Job Totals:	0Ft	0Ft	
Shift Totals:	0Ft	0Ft	
Footage Meter:	0Ft	0Ft	
Prod. Data F1-None F2-Clear Job Totals F3-Clear Shift Totals			

Figure 64: Production Menu - Footage Totals

The Footage Totals screen contains two columns of information. The column for “Good” displays the amount of material that is considered good or usable material. The column for “Scrap” displays the amount of material that is considered scrap or unusable material.

There are four rows of information included on this screen:

1. **Coil Totals** – Shows the amount of Good and Scrap material produced with the current loaded coil. This can be cleared by loading a new coil.
2. **Job Totals** – Shows the amount of Good and Scrap material produced during the current job or order. Pressing the **F2 key** will clear job totals.
3. **Shift Totals** – Shows the amount of Good and Scrap material produced during the current shift. Pressing the **F3 key** will clear shift totals.
4. **Footage Meter** – Shows the amount of Good and Scrap material produced. This can be cleared by cycling power to the controller.

Diagnostics Screen

6/24/10	HALTED	0FPM		0.000"
11:12 AM				
Diagnostics Menu		System Information		
System Information				
+ Auxiliary Controllers				
High Speed Bus				
Press Information				
Input/Output				
		Model: XL220AASI	Version: 4.03.04	
		Switch: 56	Created: 0/00/0012:00 AM	
		Serial #: IBM PC	CPU ID: DEAD	
		Boot: IBM PC	Created: 0/00/0012:00 AM	
		Rts: 1.39		
		Keyboard:		
		Sys Mem: 1.000MB	Used: 0.537MB (53.68%)	
		Rec Mem: 2.000MB	Used: 0.006MB (0.29%)	
		Total Mem: *.***MB	Used: 0.708MB (2.96%)	
		Board1: 5386B	Serial #: IBM PC	
		Board2: 5387B	Serial #: IBM PC	
		IO Type: Sink	IO M. Fuse: Good	
		IN Fuse: Good	OUT Fuses: Good	
		UART Pwr: Good	Analog Pwr: Good	
Diagnostics F1-None F2-Memory Test F3-Set Defaults F4-Calibrate Touch-Screen				

Figure 66: Diagnostics Screen

System Information

The System Information screen offers a snapshot of information about the software and hardware properties of the controller.

Model	The current software model of the controller.
Version	The current software model revision of the controller.
Switch	The current configuration setting. This number represents the binary number of the configuration setting. For more information, see Configuration Switch Settings, page 34.
Created	The date the software was created.
Serial #	The serial number of the controller.
CPU ID	The CPU Identifier.
Boot	The current version of "Boot" software.
Created	The date the "Boot" software was created.
RTS	The current version of "RTS" software.
Keyboard	The current version of "Keyboard" software.
RS232 Port	The function of the RS232 port of the controller.
Sys Mem	The amount of controller System Memory.
Used	The amount of System Memory currently being used.
Rec Memory	The amount of controller Record Memory.
Used	The amount of Record Memory currently being used.
Total Mem	The amount of controller Total Memory.
Used	The amount of Total Memory currently being used.
Board1	The hardware revision of Circuit Board #1.
Serial #	The serial number of Circuit Board #1.
Board2	The hardware revision of the Circuit Board #2.
Serial #	The serial number of Circuit Board #2.
IO Type	The input and output configuration of the controller. This could be "Sink" or "Source."
IO M. Fuse	Status of the Main Fuse.
IN Fuse	Status of the Input Fuse.
OUT Fuses	Status of the Output Fuses.
UART Pwr	Status of the power detected at the UART hardware.
Analog Pwr	Status of the power detected at the Analog hardware.

Auxiliary Controllers

When the Auxiliary Controller model option is enabled and there is at least one auxiliary controller device online, the diagnostics data returned from that device will be displayed as follows:

4/16/08	HALTED	0FPM				0.000"
11:14 AM						
Diagnostics Menu		Auxiliary Controller Status				
System Information		Version:		Switch:		
Auxiliary Controllers		Position:	0.000"	Status:	UNKNOWN	
SL343 Unit ID:52		Inputs:	—	Outputs:	—	
SL343 Unit ID:53		Current Mode:	Local			
SL338 Unit ID:44						
SL328 Unit ID:46		Type	Height	Width	Offset	B/A
SL338DH Unit ID:40		L	12.000"	14.000"	0.500"	0.000"
SL342 Unit ID:48						NO
High Speed Bus						
Press Information						
Input/Output						
		Tx Count:	36	Err Count:	36	
Diagnostics		F1-None F2-Reference F3-Clear Memory F4-Program Data				

Figure 67: Auxiliary Controller Diagnostics Screen

The auxiliary controllers may be programmed remotely through the XL220's user interface via the following screen:

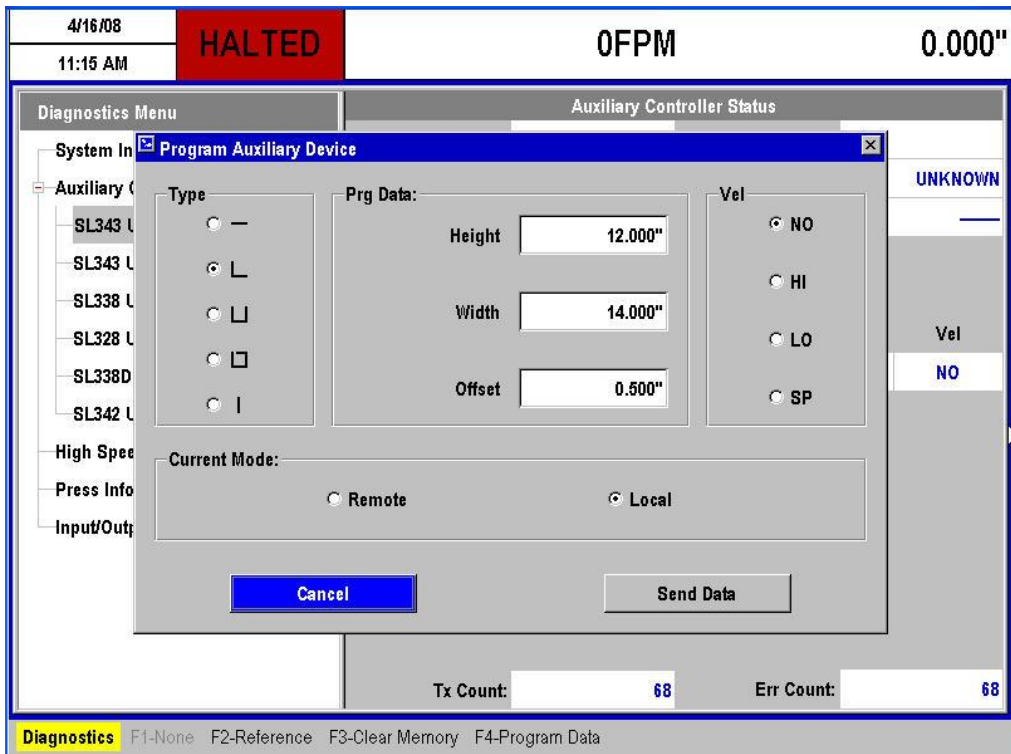
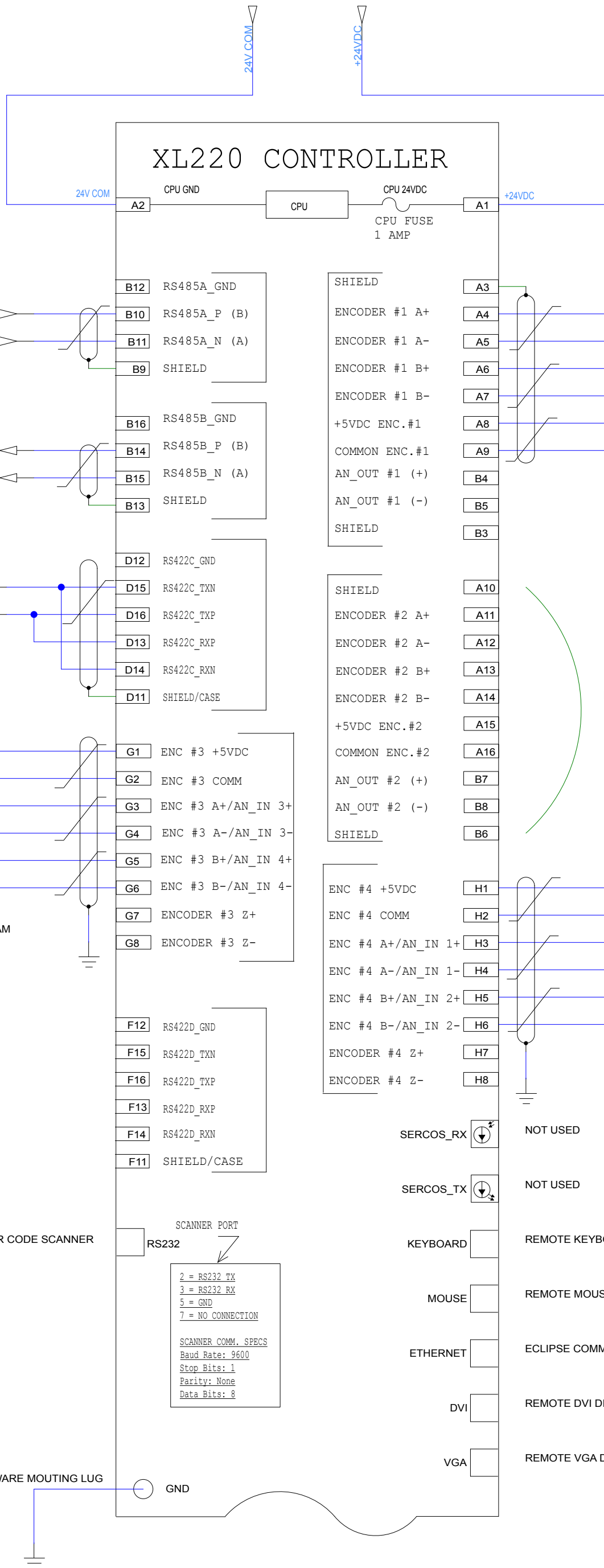


Figure 68: Program Auxiliary Device Screen

Appendix: Electrical Interface

FROM "UNGROUND" ISOLATED 24VDC POWER SUPPLY

100
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NOTE: ALL ENCODER PIN CONNECTIONS ARE FOR AMS CONTROLS ENCODERS ONLY! IF ANOTHER MFG ENCODER IS USED, THESE CONNECTIONS DO NOT APPLY

MATERIAL ENCODER FOR IN-LINE SHEAR AND PRESSES

NOT USED

MATERIAL ENCODER
1ST ENCODER FOR DOWNSTREAM NOTCH PRESSES
(OPTIONAL)

ECLIPSE COMMUNICATION VIA RS232

DOWNSTREAM CONTROL COMMUNICATIONS (SL343,SL338,SL342 ETC..)

PLC COMMUNICATION VIA MODBUS

MATERIAL ENCODER

2ND ENCODER FOR DOWNSTREAM NOTCH PRESSES (OPTIONAL)

PORT FOR BAR CODE SCANNER

HARDWARE MOUNTING LUG

SCANNER PORT RS232

2 = RS232 TX
3 = RS232 RX
5 = GND
7 = NO CONNECTION
SCANNER COMM. SPECS
Baud Rate: 9600
Stop Bits: 1
Parity: None
Data Bits: 8



Date	9/28/2012	Initials	JDB	Check 1	Check 2	Revision Date	By:	Cabinet	Serial Number
Order Number		Page	1	of 2					
Stage	Releases	Project	AMS Controls						
App'd		Project	XL220 Electrical Interface						

CUSTOMER IS RESPONSIBLE FOR INSTALLING ADEQUATE SAFETY DEVICES AND GUARDS FOR THE PROTECTION

COMPONENTS THAT APPEAR IN A DASHED BOX ARE CUSTOMER SUPPLIED COMPONENTS.



	Date	9/28/2012	Initials	JDB	Check 1	Check 2	Revision Date	By:	Cabinet	Serial Number	<p>CUSTOMER IS RESPONSIBLE FOR INSTALLING ADEQUATE SAFETY DEVICES AND GUARDS FOR THE PROTECTION</p> <p>COMPONENTS THAT APPEAR IN A DASHED BOX ARE CUSTOMER SUPPLIED COMPONENTS.</p>
	Order Number		Page	2	of 2						
	Stage	Releases	Project	AMS Controls							
	App'd		Project	XL220 Electrical Interface							

Appendix: MP343 Manual

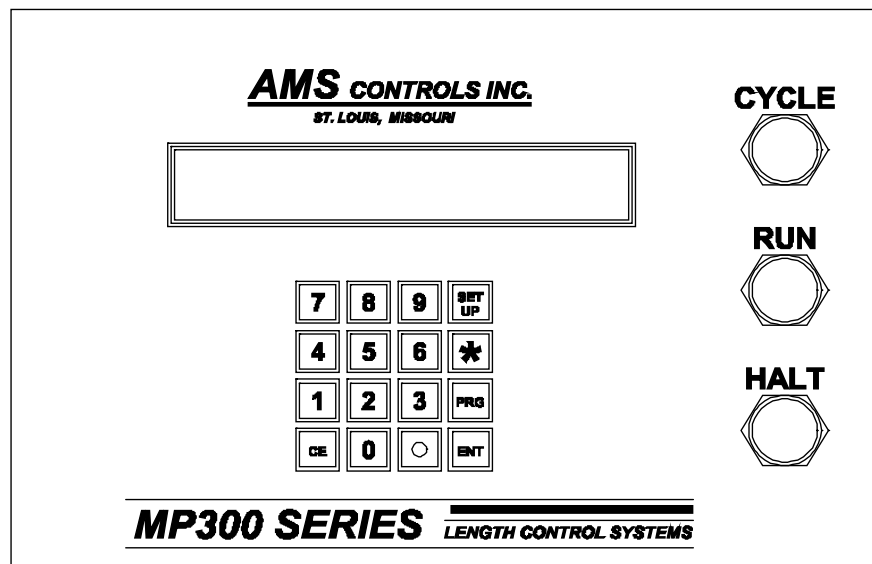
Model
MP343
Pin Spotter Controller
Reference Manual

<u>Chapter 1</u>	<u>Introduction</u>
<u>Chapter 2</u>	<u>Product Description</u>
<u>Chapter 3</u>	<u>Specification</u>
<u>Chapter 4</u>	<u>Installation</u>
<u>Chapter 5</u>	<u>Operating Procedure</u>
<u>Chapter 6</u>	<u>In Case of a Problem</u>
<u>Appendix A</u>	<u>Setup Data Sheets</u>
<u>Appendix B</u>	<u>Mounting Details</u>

Introduction

AMS Controls has been supplying length control systems to the metal fabricating industry since 1978 and has built a reputation of producing high quality and reliable controllers.

The **MP343** controller is used to run a pinspotting device for pinning insulation to the inside of HVAC ductwork. The controller has the capability to run the conveyor system feeding the material through the PINSPOTTER. Once the **MP343** is placed in RUN, the forward output turns on and stays on. The PINSPOTTER controller can be run at single speed or double speed.



Installation

Refer to pages 4-1 and 4-2 for recommended wiring of the Emergency Stop and Run circuits for the MP343 controller. Also refer to drawing numbers 4419 and 4447.

Inputs/Outputs

The MP343 controller has eight inputs and eight outputs. The controller also has seven dipswitches on the back of the controller (inside the controller on a console model) which are used to configure the controller to a certain machine type.

Inputs

Input 1 – Jog Forward

By pressing the “Jog Forward” button, the forward output (#1) will turn on.

Input 2 – Jog Reverse

By pressing the “Jog Reverse” button, the reverse output (#1) will turn on.

Input 3 – Sheet Detect

This input is a normally open switch that is closed by the presence of metal that is to be processed. The “Sheet Detect Switch” will give the signal to the controller that a part is present and will also reference the controller as to the position of the part. When the trailing edge of the part falls off of the “Sheet Detect Switch”, the controller will stop firing pins.

Input 4 – Run Enable

This input can be used two different ways.

1. If the controller does not have a front panel, the “Run Enable” input is used as a run input. In this case, the run output should be used to latch the run button used to engage the run relay. Refer to the figure on page 4-2.
2. If the MP343 does have a front panel, it may be wired the same as mentioned above or the front

panel run button may be used. If the front panel run is used, connect input 4 to DC Common.

Input 5 – Setup Lockout

With this input “ON”, the setups cannot be changed, but may be viewed. The exception to this is the “Units of Measurement” parameter. When the “Setup Lockout” input is “ON” the memory cannot be cleared by pressing the “5” key during power up. This is used to safeguard information within the controller.

Input 6 – Not Used

Input 7 – Not Used

Input 8 – Manual Cycle

This input will fire the pins if the “Run Enable” input is “OFF”. The input functions the same as pressing the blue “Cycle” button on the front panel of the controller.

Outputs

Output 1 – Forward/Fast

Output will vary depending upon what type of speed logic is used. If Forward-Slow speed logic is used, this output will be “ON” for any movement in the forward direction. If Fast-Slow speed logic is used, this output will be “ON” for any fast feeds in the forward direction. See page 4-8 and 4-9 for a complete description of speed logic operation.

Output 2 – Slow

Output will vary depending upon what type of speed logic is used. If Forward-Slow speed logic is used, this output will be “ON” while in slow speed or halted. If Fast-Slow speed logic is used, this output will be “ON” only while in slow speed. See page 4-8 and 4-9 for a complete description of speed logic operation.

Output 3 – Reverse

Turns “ON” whenever the machine is moving in the reverse direction.

Output 4 – Run

Turns on when the MP343 is in the “Run” mode. It is typically used to latch the run push-button when input 4 is used as a run input.

Output 5 – Fire

Used to fire the actual pin valves. It remains on for the programmed “Fire Dwell” time.

Output 6 – Load

Used to load a pin into the pin-spotter. The output remains “ON” for the programmed “Load Dwell” time.

Output 7 – No Liner

Turns “ON” when a part is running with “No Velocity” programmed. In other words, the pin-spotter is to ignore the upcoming parts because no liner is present.

Output 8 – Out of Spec

If a part is running and the MP343 has to leave out at least one row of pins in the part, output #8 will turn “ON”. This is to notify the operator that at least one row of pins will have to be put on the part manually to be within SMACNA specifications.

Dip Switch Settings

ON the back of a panel mount style controller or on the circuit board mounted to the lid of a console controller, seven small dips switches will be found on a small switch block. These switches are used to setup the proper Unit ID, which is used to define the controller as an MP343 standard backgauge controller and to establish proper communications with an XL120 controller, if applicable. The dipswitches also determine if the machine runs at one or two speeds and determines the encoder direction.

Switches 1, 2, 3, & 7 – Unit ID

Switches 1, 2, 3, and 7 determine the Unit Identification Number (ID) of the controller with the following three options

SW1	SW2	SW3	SW7
OFF	OFF	ON	ON
ON	OFF	ON	ON
OFF	ON	ON	ON

(*) Note: Unit ID C! will communicate with the CMP1000 only. It will not communicate with an XL120.

Switch 4 – Speed Logic

Switch 4 determines if the machine is to operate at a single speed or two speeds (fast and slow).

SW 4 "Off"	Single Speed
SW 4 "On"	Two Speed

Switch 5 – Encoder Direction

Determines the polarity of the encoder. If the encoder counts in the wrong direction, change the state of Switch #5.

Switch 6 – Not Used

Must be set to "OFF".

Specification

Parameter	Panel Mount	AC Console
-----------	-------------	------------

Mechanical

Size	8"X12.5"X2.25"	8"X12.5"X7.5"
Weight	7lbs.	15lbs.

Electrical

Input Voltage	24VDC \pm 5%	115VAC \pm 10%, 50-60Hz
Input Current	.5 Amp.	1 Amp.

Outputs

Forward/Fast	Std DC	Std DC, AC Relay
Slow	Std DC	Std DC, AC Relay
Reverse	Std DC	Std DC, AC Relay
Run	Std DC	Std DC, AC Relay
Fire	Std DC	Std DC, AC Relay
Load	Std DC	Std DC, AC Relay
No Liner	Std DC	Std DC, AC Relay
Out of Spec.	Std DC	Std DC, AC Relay
Analog	0 to +10VDC	0 to +10VDC

Inputs

Jog Forward	Yes	Yes
Jog Reverse	Yes	Yes
Sheet Detect	Yes	Yes
Run Enable	Yes	Yes
Security	External	Internal
Not Used		
Not Used		
Manual Cycle	Yes	Yes

(Note: The following parameters apply equally to all versions.)

Output Characteristics

Standard DC

Type	Open Collector Transistor
Maximum Current	4 ADC
Maximum Applied Voltage	35 VDC

AC Relay

Type	Form A Dry Circuit Relay
Maximum Current	5 Amp.
Maximum Applied Voltage	240VAC

Solenoid Driver

Type	High Voltage Internal Driver
Minimum Load Resistance	12 Ohms
Maximum Voltage Generated	65 VDC
Maximum Actuation Time	0.25 Seconds

Encoder Input

Type	Quadrature with Complements
Voltage	5VDC
Maximum Encoder Load	200 milliamperes
Maximum Pulse Rate	275,000 pulses/second

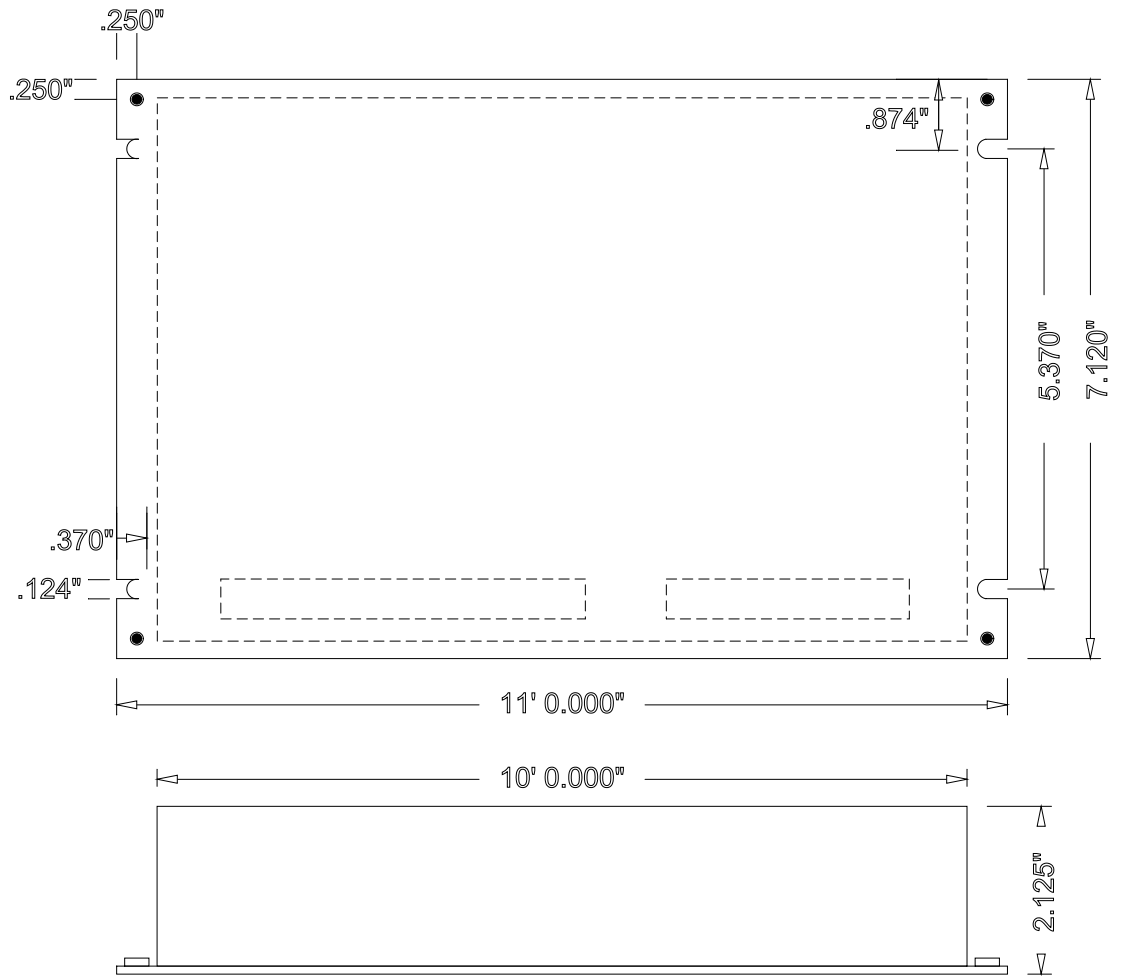
Operation

Maximum Part Length	9999.999 inches 254,000 millimeters
Units of Measurement	inches, centimeters, or millimeters

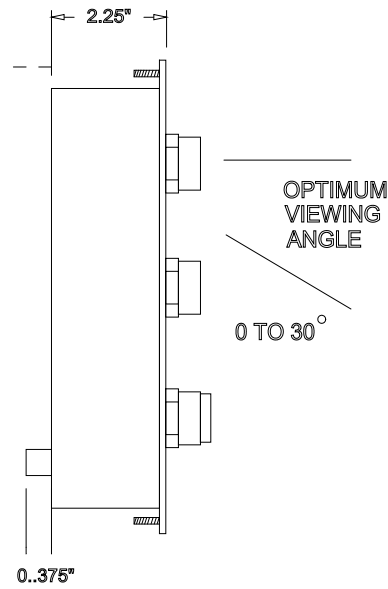
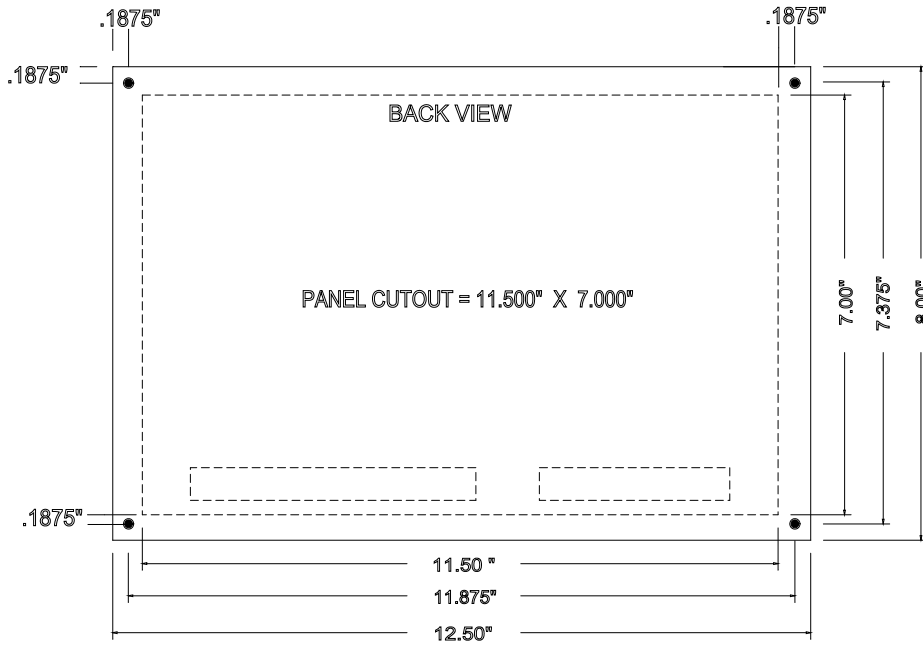
Features

Display	48 characters in 2 rows
Keys	16
Controls	3 (CYCLE, RUN, HALT)

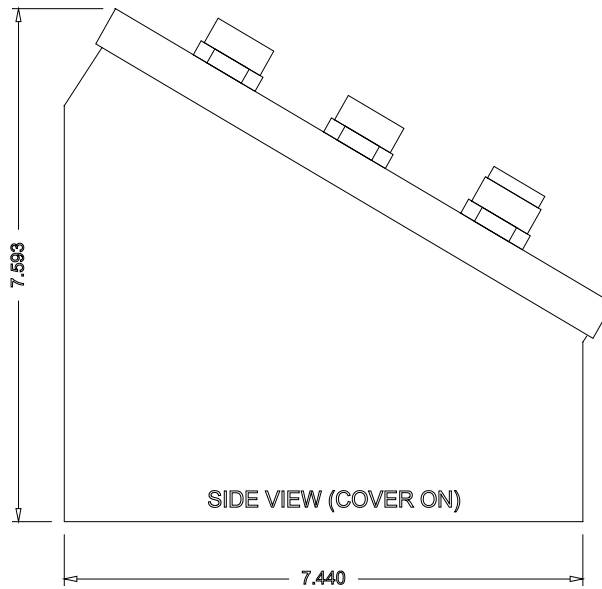
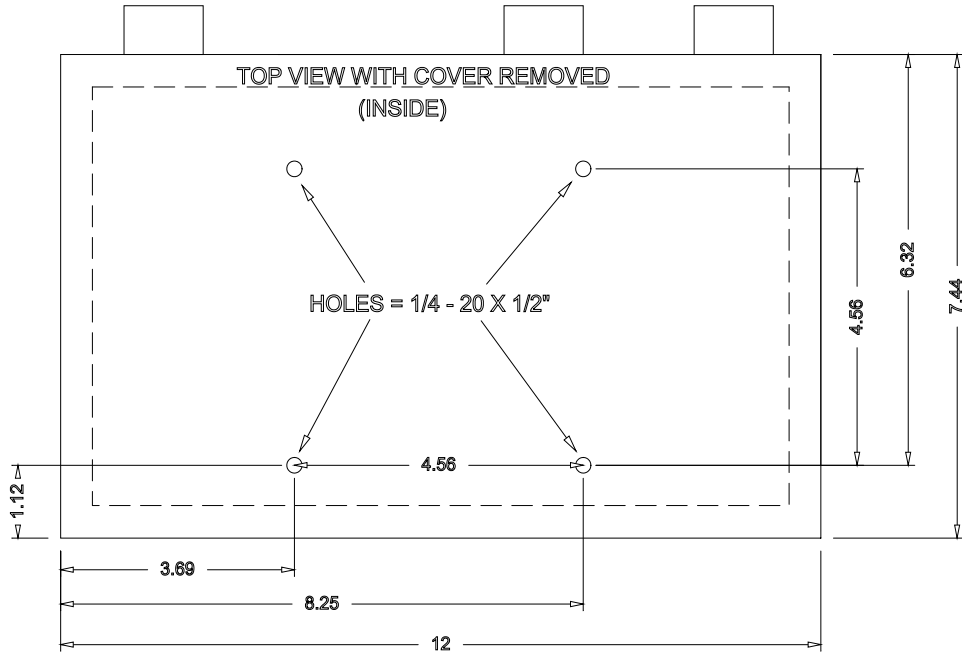
Mounting Dimensions



Auxiliary Controller Mounting Specifications



Panel-Mount Mounting Specifications

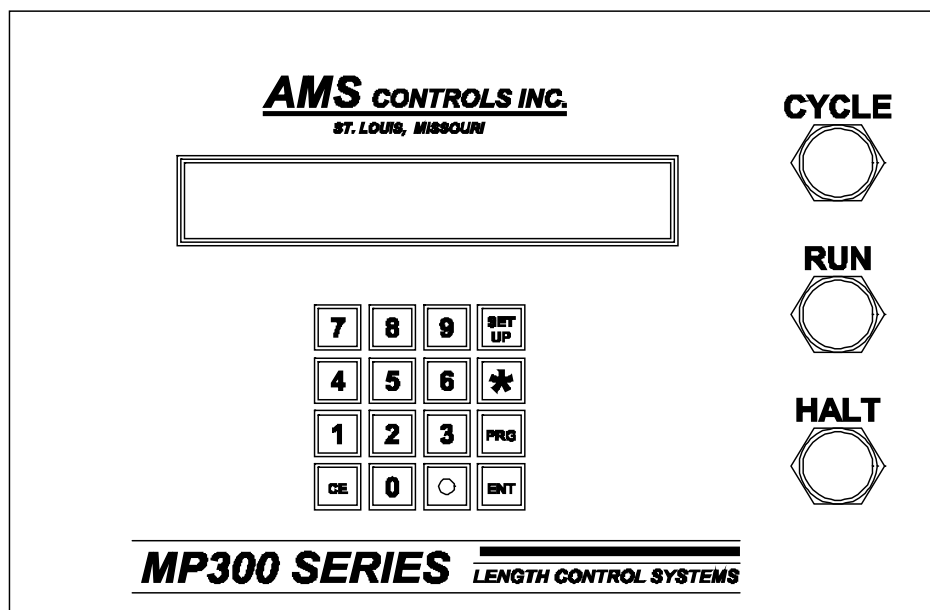


Consolette Mounting Dimension

Product Description

Front Panel Components and Description

The Model **MP343** front panel has three push button switches, a 16 key keypad, and a two line 48 character liquid crystal display.



Push Buttons

- **CYCLE** Press to fire the pins when NOT in the RUN mode
- **RUN** Press to initiate an automatic move sequence
- **HALT** Press to manually stop the guide movement

Key Inputs

- **SETUP** Press to enter the setup mode. The setup

mode is used to enter specific parameters

about the Pinspotter.

- ***** Press the asterisk key to exit the setup or

programming modes.

- **PRG** Press to program a new pin placement.

- **ENT** Press to store the values entered in the setup

and program modes.

- **CE** Press to clear an incorrect entry value before

the “ENT” key is pressed. Also used to clear

any errors reported by the controller.

Installation

Controller Power

The AMS controller requires a 24VDC supply for operating power. It is preferable to have two 24VDC supplies, one for the inputs and outputs and the other for the controller CPU power. Separate power supplies will isolate the input/output circuits from the Processor, reducing noise interference. The common of the supplies used must be connected to the common of the control, this circuit being grounded. The common of the supply will be switched into the inputs of the controller and the 24 VDC will be used in conjunction with the outputs to pull-in control relaying. All input power should be within the specification limits.

Power to the controller should be switched independent of other devices through its own circuitry. The emergency stop circuit should not interrupt power to the controller. In an emergency-stop condition, the controller will track any movement of the material with controller power still applied. This allows continued production to resume after the emergency stop condition, without loss in accuracy. See Figure 4-1.

Emergency Stop Circuit

An emergency stop circuit is required for each machine, giving operator safety and protection of system equipment. A typical emergency stop circuit is shown in Figure 4-1. Pressing the guarded push-button RESET switch arms this circuit. The relay remains energized after the RESET switch opens because of the hold-in contacts of the relay. The relay condition depends on current flow through the normally closed emergency stop switches and any other emergency stop contacts in series with the switches. A momentary opening of either switch or contact will cause the relay to de-energize which cuts off power to all load devices. Adding devices in series with the emergency stop contacts or switches easily expands the circuit.

A higher degree of safety is achieved by placing switches behind safety guards and in doors of electric panels. These are wired in the Emergency Stop Circuit, so when opened, the machine is shut down.

The emergency stop circuit should not interrupt power to the AMS controller; however the AMS controller must know when an emergency stop has occurred in order to drop the line out of the RUN mode. This can be accomplished by breaking the run circuit or by opening the safely interlock input to the control. If an emergency stop condition occurs, power should be isolated from all output devices. This would include all 24VDC devices as well as all 115VAC devices. Please refer again to Figure 4-1.

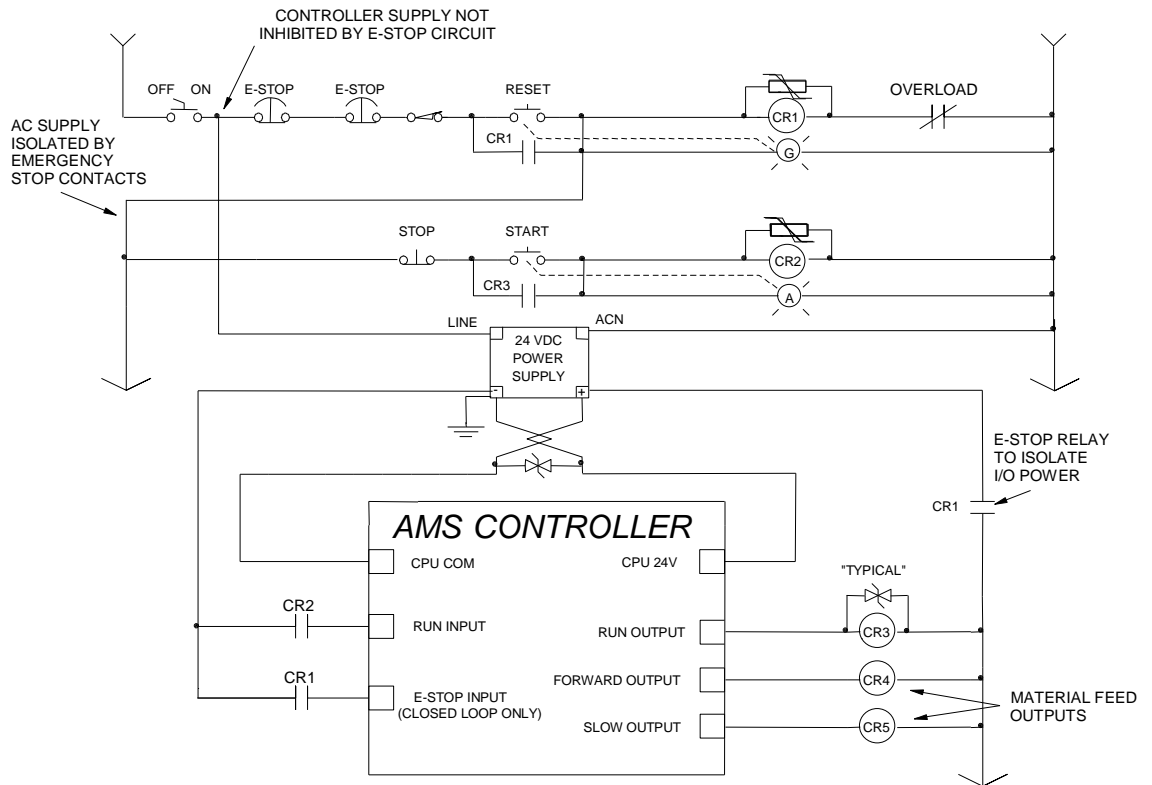


Figure 4-1 Circuit Example for Run and Estop

Pin Fire Circuit

Optimal performance of the pin fire can be met by customizing the AMS controller to a particular type of press and feed control. This is accomplished by changing the customer available switch settings. The switches are in a single package located on the back of the controller. The controller can be configured to work with single speed or two speed non-stop pin placement applications. Outputs are available for “Pin Fire” and “Pin Load”.

AMS controllers are designed to connect directly to 24VDC solenoids for optimal performance. A solenoid driving device, such as the AMS 3840 power module, can provide more accurate firing of the press.

If the solenoid for the pin-fire valve output is not 24VDC, then an attempt should be made to replace the solenoid with a compatible 24VDC type. If this is not possible, then a 24VDC relay will have to be installed between the AMS output and the solenoid.

AMS controllers have a timed “Pin Fire” output. The duration of the **PIN FIRE DWELL** or **PIN LOAD DWELL** output is programmable from 0.000 to 9.999 seconds. Please refer to timing diagram - Figure 4-2.

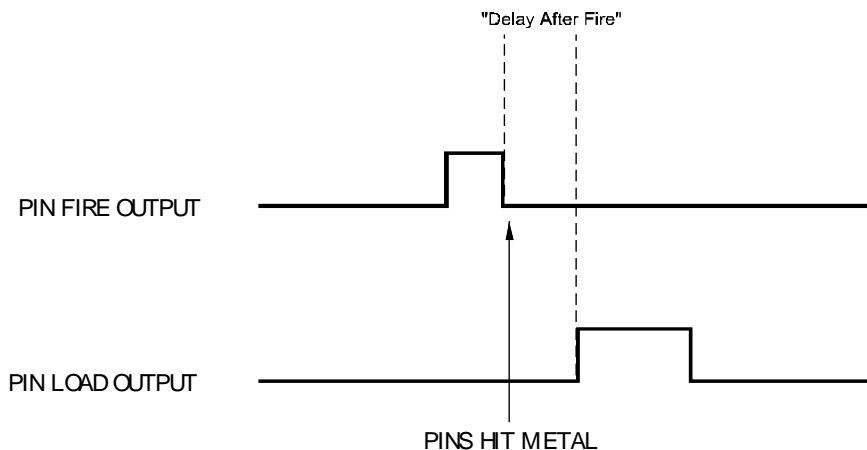


Figure 4-2 “Pin Fire” and “Pin Load” Timing

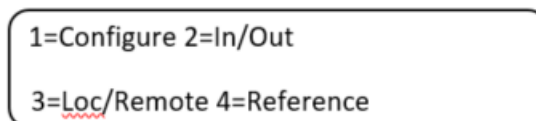
Setup Mode

Note: The following descriptions include all possible SETUP PARAMETERS and there are some parameters that are not used for every application. Only use the ones that apply for your particular machine. Make sure that the proper “dip switches” are set prior to entering setups. Refer to page A-1 for the proper dip switch settings.

The SETUP mode is used when the **MP343** is initially installed to configure it to the particular characteristics of the Pinspotter. The SETUP mode is entered by pressing the “Set Up” key and the mode can be exited by pressing the “*” key. When power is applied to the controller, the built-in diagnostics check the memory for data retention.

If an error is detected, the memory is automatically cleared and the SETUP mode is entered to indicate that this data should be reentered. The setup values are entered in the order shown below and an explanation of each parameter is given. A form is provided in the back of this manual for recording the setup parameters of your machine. This form should be completed after your machine has been installed and properly adjusted.

To enter the SETUP mode, press the “Set Up” key. The following display will appear.



1=Configure 2=In/Out
3=Loc/Remote 4=Reference

Selecting “1” will allow the operator to adjust the following parameters:

Detect-Fire

The DETECT-FIRE is the distance from the sheet-detect switch to the center of the pin fire mechanism. This distance should be as accurate as possible. The DETECT switch must be a normally open switch.

Fire Reaction

The FIRE REACTION time is the time delay between the time that the fire signal occurs, and the time that the pins enter the material. To calculate the FIRE REACTION time, use the following steps:

1) Set the FIRE REACTION time to zero. 2) Run a sheet of material through the Pinspotter. 3) Measure the distance from the leading edge of the part to the first row of pins minus any programmed offset distance. 4) Calculate the FIRE REACTION using the actual leading edge to pins distance and the programmed leading edge to pins distance as follows:

$$\text{Fire Reaction Time} = \left[\frac{\text{Actual Distance} - \text{Prog. Distance}}{\text{Line Speed (in FPM)}} \right] \times 5$$

Fire Dwell

The FIRE DWELL parameter sets the time duration of the PIN FIRE cycle, in seconds. The range of time allowed is 0.001 to 9.999 seconds and is set to the nearest millisecond.

Delay After Fire

The DELAY AFTER FIRE is the amount of time between the PIN FIRE output turning off, and the PIN LOAD output turning on. The range of time allowed is 0.00 to 9.99 seconds.

Load Dwell

The LOAD DWELL parameter sets the time duration of the PIN LOADING device to be activated. The range of time allowed is 0.001 to 9.999 seconds.

Hi Vel Distance

The HIGH VELOCITY DISTANCE parameter sets the maximum spacing between the pins when making High Velocity Ductwork. The **MP343** will place the pins between the MINIMUM SPACING DISTANCE and the HIGH VELOCITY DISTANCE. The default distance is 6.000 inches.

Lo Vel Distance

The LOW VELOCITY DISTANCE parameter sets the maximum spacing between the pins when making Low Air

Velocity Ductwork. The **MP343** will place the pins between the MINIMUM SPACING DISTANCE and the LOW VELOCITY DISTANCE. The default distance is 12.000 inches.

Sp Vel Distance

The SPECIAL VELOCITY DISTANCE parameter sets the maximum spacing between the pins when making Special Air Velocity Ductwork. The **MP343** will place the pins between the MINIMUM SPACING DISTANCE and the SPECIAL VELOCITY DISTANCE. The default distance is 6.000 inches.

Hi MaxEdge Dist

When making ductwork for High Velocity Airflow, the HIGH MAXEDGE DISTANCE is the farthest location away from an edge that the PINSPOTTER will place pins. The **MP343** will place the pins between the HIGH MAXEDGE DISTANCE and the HIGH MINEDGE DISTANCE. The default distance is 4.000 inches.

Hi MinEdge Dist

When making ductwork for High Velocity Airflow, the HIGH MINEDGE DISTANCE is the closest that the PINSPOTTER will place pins to an edge. The **MP343** will place the pins between the HIGH MAXEDGE DISTANCE and the HIGH MINEDGE DISTANCE. The default distance is 4.000 inches.

Hi Max Brk Dist

When making ductwork for High Velocity Airflow, the HIGH MAX BRK DISTANCE is the farthest location away from a bend that the PINSPOTTER will place pins. The **MP343** will place the pins between the HIGH MAX BRK DISTANCE and the HIGH MIN BRK DISTANCE. The default distance is 4.000 inches.

Hi Min Brk Dist

When making ductwork for High Velocity Airflow, the HIGH MIN BRK DISTANCE is the closest to a bend that the PINSPOTTER will place the pins. The **MP343** will place the pins between the HIGH MAX BRK DISTANCE and the HIGH MIN BRK DISTANCE. The default distance is 4.000 inches.

Lo MaxEdge Dist

When making ductwork for Low Velocity Airflow, the LOW MAXEDGE DISTANCE is the farthest location away from an edge that the PINSPOTTER will place pins. The **MP343** will

place the pins between the LOW MAXEDGE DISTANCE and the LOW MINEDGE DISTANCE. The default distance is 4.000 inches.

Lo MinEdge Dist

When making ductwork for Low Velocity Airflow, the LOW MINEDGE DISTANCE is the closest that the PINSPOTTER will place pins to an edge. The **MP343** will place the pins between the LOW MAXEDGE DISTANCE and the LOW MINEDGE DISTANCE. The default distance is 4.000 inches.

Lo Max Brk Dist

When making ductwork for Low Velocity Airflow, the LOW MAX BRK DISTANCE is the farthest location away from a bend that the PINSPOTTER will place pins. The **MP343** will place the pins between the LOW MAX BRK DISTANCE and the LOW MIN BRK DISTANCE. The default distance is 4.000 inches.

Lo Min Brk Dist

When making ductwork for Low Velocity Airflow, the LOW MIN BRK DISTANCE is the closest to a bend that the PINSPOTTER will place the pins. The **MP343** will place the pins between the LOW MAX BRK DISTANCE and the LOW MIN BRK DISTANCE. The default distance is 4.000 inches.

Sp MaxEdge Dist

When making ductwork for Special Velocity Airflow, the SPECIAL MAXEDGE DISTANCE is the farthest location away from an edge that the PINSPOTTER will place pins. The **MP343** will place the pins between the SPECIAL MAXEDGE DISTANCE and the SPECIAL MINEDGE DISTANCE. The default distance is 4.000 inches.

Sp MinEdge Dist

When making ductwork for Special Velocity Airflow, the SPECIAL MINEDGE DISTANCE is the closest that the PINSPOTTER will place pins to an edge. The **MP343** will place the pins between the SPECIAL MAXEDGE DISTANCE and the SPECIAL MINEDGE DISTANCE. The default distance is 4.000 inches.

Sp Max Brk Dist

When making ductwork for Special Velocity Airflow, the SP MAX BRK DISTANCE is the farthest location away from a

bend that the PINSPOTTER will place pins. The **MP343** will place the pins between the SP MAX BRK DISTANCE and the SP MIN BRK DISTANCE. The default distance is 4.000 inches.

Sp Min Brk Dist

When making ductwork for Special Velocity Airflow, the SP MIN BRK DISTANCE is the closest to a bend that the PINSPOTTER will place the pins. The **MP343** will place the pins between the SP MAX BRK DISTANCE and the SP MIN BRK DISTANCE. The default distance is 4.000 inches.

Minimum Spacing

The MINIMUM SPACING parameter is the minimum amount of space that will be between the rows of pins. This is a physical characteristic of the machine and is dependent upon how fast the Pinspotter can reload, and how fast the line speed is. The **MP343** will place the pins between the MINIMUM SPACING distance and the HI, LO, or SP VEL DIST. The default distance is 3.000 inches.

Missed Pin Mode

When a row of pins are fired and there is not enough time to load the Pinspotter before the next row of pins needs to be fired, the **MP343** will display a MISSED PUNCH error and stop the line (if the MISSED PIN MODE is set to NORMAL). With the MISSED PIN MODE set to IGNORE, the row of pins will be skipped and no error will be displayed.

With the MISSED PIN MODE set to FIRE, the **MP343** will fire a row of pins as soon as the FIRE DWELL TIME, DELAY AFTER FIRE, and LOAD DWELL TIME have elapsed

NOTE:

With this mode set to FIRE, the Max Edge, Min Edge, and Brake Distance are ignored, so the pins may be fired closer to bends and edges than preferred.

Speed Logic

The **MP343** controller has four outputs which control the speed and direction of the machine. To accommodate more than one wiring possibility, the controller may be run with one of two different SPEED LOGIC settings: FORWARD/SLOW or FAST/SLOW. The controller outputs are defined differently for

each logic setting. The outputs, their definitions, and their states in various conditions are shown in tables 1 and 2. Any number key toggles between FORWARD/SLOW and FAST/SLOW. Select the appropriate SPEED LOGIC to match your machine wiring configuration.

Machine State					
	Run Fast	Run Slow	Jog Fwd	Halt	Jog Rev
Output 1 (FOR)	ON	ON	ON	OFF	OFF
Output 2 (SLOW)	OFF	ON	OFF	ON	OFF
Output 3 (REV)	OFF	OFF	OFF	OFF	ON
Output 5 (RUN)	ON	ON	OFF	OFF	OFF

Table 4-1. Status of Outputs in Forward-Slow

Note: All Jogging and Referencing is performed at fast speed

Machine State					
	Run Fast	Run Slow	Jog Fwd	Halt	Jog Rev
Output 1 (FOR)	ON	OFF	ON	OFF	OFF
Output 2 (SLOW)	OFF	ON	OFF	OFF	OFF
Output 3 (REV)	OFF	OFF	OFF	OFF	ON
Output 5 (RUN)	ON	ON	OFF	OFF	OFF

Table 4-2. Status of Outputs in Fast-Slow

Note: All Jogging and Referencing is performed at fast speed

Min Slow Distance

This parameter is used on two speed lines and determines when to put the line into slow speed. The controller will automatically calculate when to start slowing down, and then this distance is added to it (if the DECEL MODE is set to AUTO). Increase this value for a longer slow distance. Decrease this value for a shorter slow distance.

A longer slow distance can improve part accuracy but too long a value can slow production. The distance should be set long enough that the material fully reaches the slow speed before stopping.

The **MP343** controller calculates the distance from the programmed position that the machine should shift into slow speed. This is based on the speed of the material and the deceleration characteristics of the machine.

A minimum amount of slow distance can be manually set by this parameter. It is added to the calculated slow distance to extend the time spent in slow speed (if the DECEL FACTOR is set to AUTO).

When the DECEL FACTOR AUTO setting is used, it is best to set this parameter to a few inches initially until the system has been calibrated and the controller has had a chance to get accustomed to the behavior of the machine. When the machine is running good parts repeatedly, reduce the MINIMUM SLOW DISTANCE as much as possible to increase the production rate, making sure that the material is at a constant velocity (slow speed) before stopping.

Decel Factor Mode

On two-speed machines, a DECELERATION (DECEL) FACTOR is used by the **MP343** controller when changing from fast to slow speeds. The user has the option to select from three DECEL FACTOR MODES: AUTO, MANUAL, or OFF.

AUTO: A DECEL FACTOR is automatically maintained by the controller. It is expressed in inches-per-second-per-second (In/Sec²) and is used in the Adaptive Slowdown calculation. The parameter can be overridden but will change on the next movement.

MANUAL: A DECEL FACTOR may be manually entered into the **MP343** controller. The value is used in the Adaptive Slowdown calculation. Some trial and error may be necessary when in the MANUAL mode to find a DECEL FACTOR which works properly. Ideally, the machine should shift from fast to slow at some distance prior to the target long enough so that it reaches a constant slow velocity before the movement outputs are turned off.

If the machine tends to shift into slow too soon, increase the DECEL FACTOR. If the machine tends to shift into slow too late, decrease the DECEL FACTOR. The DECEL FACTOR should be used in conjunction with the MINIMUM SLOW DISTANCE to determine the ideal time to change from fast to slow.

While in the MANUAL mode, the AMS controller will not calculate a new value for the DECEL FACTOR after each stop.

OFF: No DECEL FACTOR is used and the controller will not make an Adaptive Slowdown calculation. The machine will shift from fast to slow when the backgauge has reached the MINIMUM SLOW DISTANCE before the target. For example, if the MINIMUM SLOW DISTANCE has been set to four inches, the machine will shift from fast to slow 4 inches before the programmed position. This may or may not be enough distance for the machine to decelerate properly.

The DECEL FACTOR mode defaults to OFF but may be used in MANUAL or AUTO to increase productivity.

Decel Factor

This parameter is expressed in inches-per-second-per-second (In/Sec²) and is used in the Adaptive Slowdown calculation discussed in the DECEL FACTOR MODE above. There is no exact formula for this value so experimentation is necessary. Ideally the machine should shift from fast to slow at some distance prior to the target so that it reaches a constant slow velocity before the movement outputs are turned off. This value is automatically calculated by the controller if the DECEL FACTOR MODE is set to AUTO.

Resolution

The RESOLUTION parameter defines the length of material movement for each increment of the encoder. It is a function of the circumference of the measuring wheel and the number of counts per revolution of the encoder. The formula for calculating RESOLUTION is as follows:

$$\text{Resolution} = \frac{\text{Circumference}}{4 \times \text{Encoder Count}}$$

For an AMS encoder, the encoder count is the model number of the encoder. A Model 256 is a 256 count encoder. A Model 1000Z is a 1000 count encoder.

The most common wheel used has a circumference of 12 inches. For this size wheel, RESOLUTION would be as follows:

<u>Model</u>	<u>Resolution</u>
256	0.01171875
256Z	0.01171875
500	0.006
500Z	0.006
1000Z	0.003

It is not necessary to precisely measure the circumference or calculate the formula to any great precision. Nominal values can be used with precise results achieved during calibration.

Values between 0.00004000 inches and 0.04000000 inches are acceptable.

Correction

The CORRECTION FACTOR adjusts for errors in the size and tracking of the measuring wheel. It is expressed as a percentage, with 100% being no correction. Increasing the CORRECTION FACTOR causes the pins to be placed further apart and decreasing the value brings the pins closer together.

Filter Constant

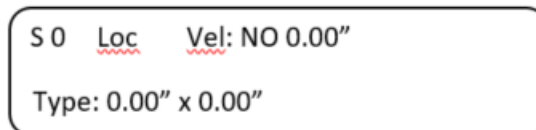
The FILTER CONSTANT can be adjusted in order to improve accuracy. A low value should be used on machines with very stable line speeds. A high value (greater than 50 Hz) should be used when rapid fluctuations in line speeds occur. Some trial may be necessary to achieve an accurate value. The default value is 32 Hz, which is considered to be on the high side of the low values. The controller will allow values from 1.0 Hz to 200.0 Hz.

Units

Length measurements can be programmed and displayed as either English inches, Metric millimeters, or Metric Centimeters. Press any number key to toggle through the choices.

Status Screen

Pressing the “*” key will show the current velocity, Local / Remote mode, velocity type, current position, type of part, part width and part height.



If the “Set Up” key is pressed again other options are available.

1=Configure 2=In/Out

3=Loc/Remote

If “2” is pressed, the INPUT/OUTPUT screen can be viewed. This can be helpful as a troubleshooting aid if the machine is not working properly.

In: -----

Out: __ 3 ____

Pressing the “Set Up” key will allow you to exit this screen.

Pressing 3 while viewing the SETUP screen enters the LOCAL/REMOTE function. If the programming for the machine is to be done with this controller, select the LOCAL mode. If another controller will program the machine, select REMOTE.

Operating Procedure

Pin Placement

The following are the rules that the **MP343** follows to determine where the rows of pins must be located based on the size and velocity of the duct.

1. Always put a row of pins between the min and max edge distance from the leading and trailing edges of the sheet of metal. Unless there is a conflict, put holes in the middle of these limits.
2. Never space rows of pins less than the minimum spacing (this is a machine limitation).
3. Never put a row of pins closer than the min edge distance from a brake line.
4. Never put rows of pins spaced greater than the specification spacing (i.e. High Velocity Distance) unless rules 1 through 3 would be violated.
5. Never put a row of pins greater than the max edge distance from a brake line unless it conflicts with rules 1 through 4.
6. Always try to put a row of pins the median edge distance from a brake line unless a row of pins

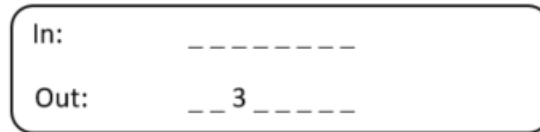
could be saved by putting the last row within the max edge distance from the brake line.

7. If rules 1 through 4 result in the specification spacing not being met, then make only one row of pins out of specification so that an extra row of pins can be put in by hand. If this happens, the “out of spec” output will turn on. If the pin locations can be programmed entirely within specification, the “out of spec” output will be off.

NOTE:

If the velocity is “none”, the Pinspotter is disabled and the “No Line” output will turn on.

If the “Set Up” key is pressed twice, the following screen appears:

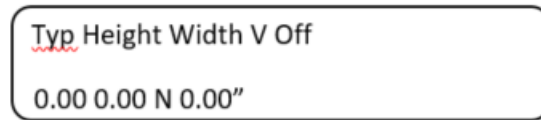


In: -----
Out: -- 3 ----

While in the second SETUP screen, pressing 1 will test the communications with another controller if they are interfaced together. If there is no communications, the messages “No Data Received” and “No Data Sent” will be seen.

Program Mode

The program mode is entered by pressing the “PRG” key.



The Type Part should be flashing steadily. This is the controller’s way of informing the operator that it is waiting for the operator to enter information.

TYP (T) Part Type - One of four options:

- Four piece

One piece is pinned from either the height or width dimension. If both are programmed, the height dimension is used.

L - “L” shaped

One piece is pinned that will be bent once to form an “L” shaped section of duct.

U - “U” shaped

One piece is pinned that will be bent two times to form a “U” section.

- 0 - Full wrapper

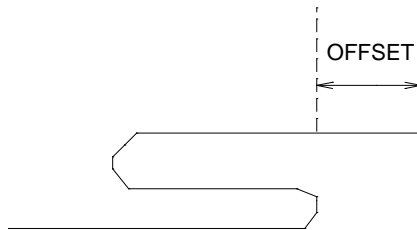
One piece is pinned that will be bent three times to form a complete section of duct.

Height The height of the duct.

Width The width of the duct.

V Velocity - Different velocities require different pin spacing for the insulation. Valid options: H (high), L (low), S (special), and N (none).

Off Offset - The lip that is added to some sheets' length when the lock is formed and is not counted toward the length of the part.



When the part programming has been completed, press the "ENT" key to accept the new program and to enter the STATUS screen.

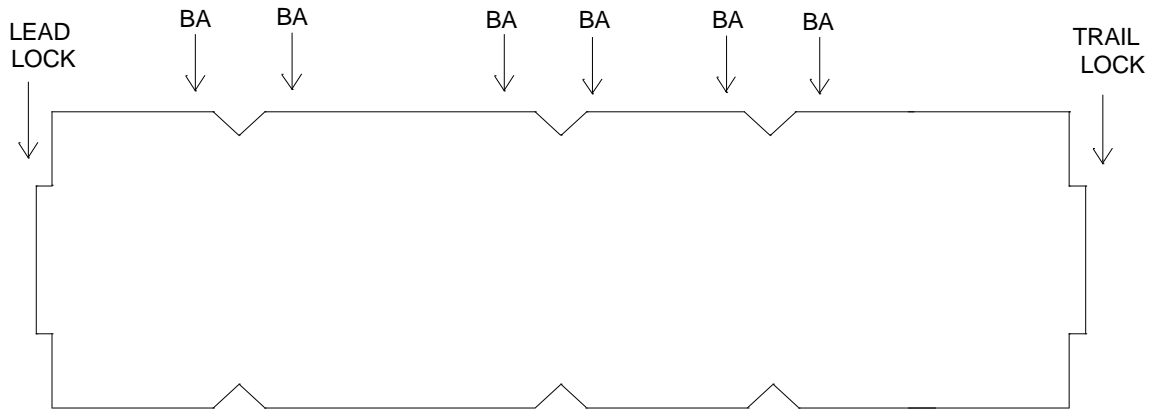
Typ Height Width V Off
0.00 0.00 N 0.00"

The status screen will show the line speed, the LOCAL / REMOTE mode, the Velocity type, current position, Type of part, part Width, and part Height.

To start the controller moving, the operator simply presses the "RUN" button. If the controller is already in the RUN mode, the Pincotter will move to the new position as soon as you press the "ENT" key.

Bend Allowance

“Bend Allowance” is the length that is subtracted from each side of the part. This is used to compensate for gain due to each bend and the difference between real and nominal measures. For example, when making a rectangle shaped part (wrap-around type), there will be three corner notches for the three bends. At each bend the **MP343** controller will subtract the BEND ALLOWANCE from both the height section and the width section. So on a part with three bends, the controller subtracts a total of 6 BEND ALLOWANCES from the overall part length. This is shown in figure below.



Velocity Different velocities require different pin spacing for the insulation. Valid options: H (high), L (low), S (special), and N (none).

Run Operation

Once the RUN ENABLE input (#4) is closed, the **MP343** will turn on the RUN and FORWARD outputs until the RUN ENABLE input opens, or the front panel HALT button is pressed. The **MP343** will only fire pins in the RUN mode when the sheet detect switch is closed.

Front Panel Run/ Remote Run Mode

If using the FRONT PANEL RUN button, jumper input 4 (Run/Enable) to DC common. Doing this will disable the Jog Forward and Jog Reverse inputs.

If using a REMOTE RUN/ HALT circuit, Input 4 is the Run input. The Run output (#4), should be used to latch the input, refer to the enclosed Electrical Interface Diagram for wiring. When using a REMOTE RUN, the HALT button on the front panel will still halt the operation.

MP343 Switch Settings

Switch	Description
1	Unit ID, must be OFF
2	Unit ID, must be OFF
3	Unit ID, must be ON
4	OFF = One Speed/ ON = Two Speed
5	Encoder Direction
6	Not Used, must be OFF
7	Unit ID, must be ON

The proper Unit ID switch setting for the **MP343** is: switch 3 and 7 ON. Some systems have the capability of having 2 **MP343s**, and the Unit ID switch setting for the second controller is: switches 1, 3, and 7 ON.

SW1	SW2	SW3	SW7	Unit ID
OFF	OFF	ON	ON	52
ONOFF	ON	ON		53

MP343 Inputs

Inputs	Description
1	Jog Forward
2	Jog Reverse
3	Sheet Detect
4	Run Enable
5	Setup/Lockout
6	Not Used

7	Not Used
8	Manual Cycle

MP343 Outputs

Outputs	Description
1	Forward/Fast
2	Slow
3	Reverse
4	Run
5	Fire
6	Load
7	No Liner
8	Out of Spec.
Pin 14	Analog +
Pin 15	Analog -

Pin 14 is labeled VAR + on the back of the controller

Pin 15 is labeled VAR - on the back of the controller.

In Case of a Problem

The **MP343** is a very reliable product, but things can go wrong.

The user can clear most problems, but AMS experts are always ready to help if needed.

We have many years of experience with all types of length controls and coil processing equipment. Our experience shows that problems are grouped into:

- **Machine problems** (most common)
- **Operator mistakes**
- **Incorrect Setup data**
- **Corrupted controller memory**
- **Cable damage**
- **Controller fault** (least common)

Troubleshooting is just a logical series of steps which leads to the likely cause of a problem. The only tools you need are an accurate scale or steel tape, and perhaps a multimeter.

This guide helps the user to help himself. Follow these suggestions in the order listed.

Troubleshooting Guide

When did the Problem Start?

Did the machine work properly at one time?

If the machine **did** work properly at one time, what has changed since then?

Did the problem start after routine maintenance? After electrical panel work? After a material change? After an operator change? Trace backwards in time to find out what's different.

Check the Machine

Check the **Encoder** to make sure it tracks the material perfectly.

Check the encoder **cable** connections. They may have worked loose from material movement or vibration. Make sure there are no nicks or cuts in the cable.

Visually check **other** parts of the machine for loose fasteners, excessive wear, proper lubrication, proper material placement, and proper operation of the Guide.

Collect Data

Often the problem is that the machine is making out-of-tolerance parts. To deal with this type of problem, carefully measure the parts made and compare these numbers with those that were programmed.

Write down these measurements for possible later reference.

If pin placement seem to vary at random, check the encoder mounting very carefully. The encoder must move with the material, and cannot

be allowed to slip. If dimensions are off in a consistent pattern, adjust the correction factor.

Re-check Setups

Re-check Setup values with originally recorded values. When you installed the **MP343** controller, you should have recorded the Setup values on the form provided in the manual for your machine TYPE. Make sure that none of these values has changed.

Use Built-in Diagnostic features

The **MP343** has a display mode (press SETUP, then press 2 for the Input/Output Status) that allows you to monitor the controller's inputs and outputs. Watch this display while the machine is running to check for enables and brake actuation points.

On the main Status display, you can watch line speed and Guide position. Compare what you see here to what should be happening as the machine runs.

Check Incoming Power

Check incoming power for proper voltage. If you suspect fluctuations, watch the indicator on an old-fashioned analog meter to see if they show up.

Fancier line monitors are available for stubborn cases that you can't see on ordinary meters. Use a recording line monitor to find problems that seldom show up. Your local power company may be able to help with this.

Cycle Power

Cycle power off and on. Try this if the controller "locks up" (won't respond to the keyboard). This **may** restore normal operation after an electrical surge. If not, clear the **MP343's** memory.

Clear Memory

Clearing memory will erase all Setups and Order information in the **MP343's** memory.

Don't try clearing memory unless you have written down all Setups and Order information for re-entry.

Don't try clearing memory unless you have tried everything else above.

You can clear all storage in the controller (including Setup and Order data) by following this sequence: **(1)** Make sure that the Security switch is unlocked; **(2)** Turn off power to the controller; **(3)** Wait five seconds; **(4)** Turn the controller back on; **(5)** Wait until the AMS Controls Inc. screen has disappeared and the words “**EPROM TEST**” appears on the screen, and a bar at the bottom of the screen starts moving from left to right; **(6)** Hold down the “5” key for at least two seconds and release the “5” key when you see the unit reset (the AMS Controls Inc. will reappear on the screen).

NOTE:

If the bar at the bottom of the screen makes it all the way across the screen, it may be too late to hit the “5” key. If this happens the memory was NOT cleared and you must return to step one of the clearing sequence.

Electrical Noise

The **MP343** should **not** lock up frequently. If it does, you should suspect that electrical noise is present.

Noise problems can be very hard to locate. The best way to avoid noise is by using good cable layout and wiring methods. Also, noise suppresser devices such as **varistors** are needed in some cases.

Refer to the AMS Application **Note "Noise Suppression Methods"** for details.

FAX Setup and Parts Data to AMS

FAX Setup and Parts data to AMS with a full description of the problem. Unless you think your problem is very simple, you might as

well FAX this information to us before you call. We'll probably ask you for it anyway.

Include the Model, Serial, and Software Version numbers.

Be sure to send a copy of the Setup Data Sheet, and all information about the problem. **FAX** us at **1-314-344-9996**.

Don't forget to include your name and phone number so we can call you back.

Call AMS

If you can't fix the problem without our help, call AMS and speak with our experts. Call us toll-free at **1-800-334-5213**. Have your Model, Serial, and Software Version numbers ready when you call.

Appendix: MP338 Backgauge Controller Manual

The **MP338** is a computer controller used to run a multibend BACKGAUGE positioner for bending metal for HVAC ductwork. The controller can be used independently to run the BACKGAUGE, or linked to an **XL120** controller via RS485 communications. The data is then automatically down loaded to the **MP338** as to what size part will be coming next.

If the BACKGAUGE SETUP is highlighted and ENTER is selected, the Backgauge setup screen can be seen. There will be a slight delay while this screen is being loaded.

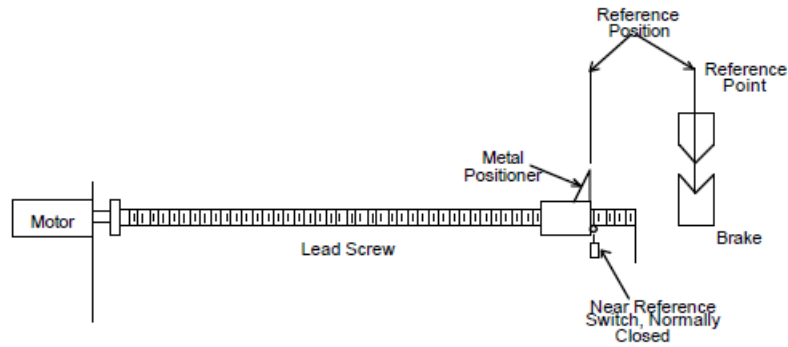
2:30PM 9/05/97 0FPM 0.000"	
ORDER 0Ft	
MATERIAL N/A% COMP.	
Parameters	Value
Reference Mode Near	
Ref. Pos.	0.000"
Position Delay 0.0000sec	
Multiple Brake No	
OverShoot Dist 10.0000"	
Tolerance 1.0000"	
Stopping Mode Auto	
Stop Reaction	0.0000sec
Move Delay 0.0000sec	
Resolution 0.0117187529"	
Correction 100.000%	

Figure 7b-1. Backgauge Setup Screen

Reference Mode

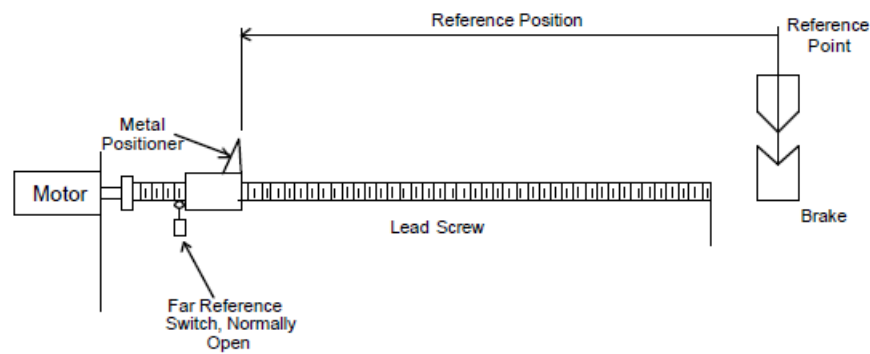
The REFERENCE MODE parameter tells the **MP338** where the reference switch or physical stop is located. The reference point is the center of the brake where the bend occurs. If the switch is close to the reference point and most of the moves of the backgauge occur "behind" the switch or physical stop, the REFERENCE MODE is NEAR. If the switch is behind the backgauge and most of the moves are in "front" of the switch or physical stop, the REFERENCE MODE is FAR. Use any number key to toggle the choices.

Near Reference Mode



The switch for a NEAR REFERENCE MODE must be normally closed and remain open as long as the backgauge is on the switch or closer to the reference point than the switch. The switch for a FAR REFERENCE MODE must be normally open and remain closed as long as the backgauge is on the switch or farther away from the reference point than the switch.

Far Reference Mode



The controller will automatically reference itself when it is placed in the RUN mode. The reference is always achieved when the controller is moving in the forward direction. If a physical stop with a NEAR REFERENCE is used, the controller will reference itself when the gauge hits the stop going forward. If a physical stop with a FAR REFERENCE is used, the gauge will hit the stop in the reverse direction and then reference when the first forward encoder count is seen.

Ref. Pos.

The REFERENCE POSITION is the distance from the reference point to the metal positioner after it has reached the physical stop or HOME SWITCH.

Position Delay

The POSITION DELAY parameter sets a delay time (in seconds), from when the Brake/Clamp complete input turns on, and the time the outputs turn on to move the backgauge. The limits of this parameter are 0.0000 to 9.9999 seconds

Multiple Brake

With MULTIPLE BRAKE set to NO, the Brake/Clamp Complete input is disabled so that the backgauge can make single bends only. Setting MULTIPLE BRAKE to YES enables the Brake/Clamp Complete input and allows the **MP338** to reposition the backgauge after every bend, if necessary.

Speed Logic

The **MP338** controller has four outputs which control the speed and direction of the machine. To accommodate more than one wiring possibility, the controller may be run with one of two different SPEED LOGIC settings (if set up as a two speed controller): FORWARD/SLOW or FAST/SLOW. The controller outputs are defined differently for each logic setting. The outputs, their definitions, and their states in various conditions are shown in tables 7b-1 and 7b-2. Any number key or the blue PICK key toggles between

FORWARD/SLOW and FAST/SLOW. Select the appropriate SPEED LOGIC to match your machine wiring configuration.

Machine State					
	Run Fast	Run Slow	Jog Fwd	Halt	Jog Rev
Output 1 (FOR)	ON	ON	ON	OFF	OFF
Output 2 (SLOW)	OFF	ON	OFF	ON	OFF
Output 3 (REV)	OFF	OFF	OFF	OFF	ON
Output 5 (RUN)	ON	ON	OFF	OFF	OFF

Table 7b-1. Status of Outputs in Forward-Slow

Note: All Jogging and Referencing is performed at fast speed

Machine State					
	Run Fast	Run Slow	Jog Fwd	Halt	Jog Rev
Output 1 (FOR)	ON	OFF	ON	OFF	OFF
Output 2 (SLOW)	OFF	ON	OFF	OFF	OFF
Output 3 (REV)	OFF	OFF	OFF	OFF	ON
Output 5 (RUN)	ON	ON	OFF	OFF	OFF

Table 7b-2. Status of Outputs in Fast-Slow

Note: All Jogging and Referencing is performed at fast speed

Min Slow Distance

This parameter is used to put the line into slow speed (if using two speed logic). The controller will automatically calculate when to start slowing down and then this distance is added to it (if the DECEL MODE is set to AUTO). Increase this value for a longer slow distance. Decrease this value for a shorter slow distance. A longer slow distance can improve part accuracy but too long a value can slow production. The distance should be set long enough that the material fully reaches the slow speed before stopping.

A minimum amount of slow distance can be manually set by this parameter. It is added to the calculated slow distance to extend the time spent in slow speed (if the DECEL FACTOR is set to AUTO). The **MP338** controller calculates the distance from the programmed position that the machine should shift into slow speed. This is based on the speed of the material and the deceleration characteristics of the machine.

When the DECEL FACTOR AUTO setting is used, it is best to set this parameter to a few inches initially until the system has been calibrated and the controller has had a chance to get accustomed to the behavior of the machine. When the machine is running good parts repeatedly, reduce the MINIMUM SLOW DISTANCE as much as possible to increase the production rate. This value should be set long enough that the material fully reaches the slow speed before stopping.

Overshoot Dist

The **MP338** will always move the backgauge toward the target in a forward direction (toward the reference point). When moving away from the reference point to make a bend, or a FAR REFERENCE, the backgauge will overshoot the target by the OVERSHOOT DISTANCE and approach the target in a forward direction. This is done to keep any machine “slop” behind the backgauge.

The allowable range is 0.0 to 50.0 inches. The distance that is entered should be large enough so that the backgauge can get up to full speed before stopping. The default value is 10.0000 inches.

Tolerance

The controller can check for the backgauge to be within a specified TOLERANCE. If the machine has not stopped within this TOLERANCE, the controller will halt and an error will be displayed.

The TOLERANCE should be set small enough to get acceptable parts but wide enough to avoid production interruptions. The controller allows values from 0.0005 inches to 10.0000 inches. The default value for TOLERANCE is 1.0000 inches.

Stopping Mode

The STOP REACTION time represents the time delay from the time that the controller turns off the movement outputs until the backgauge actually stops. The user has a choice of three STOPPING MODES: AUTO, MANUAL, or OFF. Use any number key to toggle through the choices.

AUTO: The controller turns off the movement outputs prior to the actual brake point to allow for the momentum and inertia of the machine. A new STOP REACTION time is calculated after each stop based on the average stopping time for several cycles. This parameter may be overridden, but the value will be modified on the next part that is run. The maximum value is 9.9999 seconds.

MANUAL: The controller turns off the movement outputs prior to the actual brake point as above. However, when in MANUAL, the controller does not recalculate a new STOP REACTION time after each stop. Whatever value is manually entered remains constant. The maximum value is again 9.9999 seconds.

OFF: A STOP REACTION time is not calculated and is not used at all by the controller. The movement outputs are turned off when the backgauge position is equal to the programmed length of the bend. This should cause bends to come out short due to the momentum of the machine and material during stopping. Also, when the STOP MODE is set to OFF a tolerance test is not performed.

The default mode for STOP REACTION time is AUTO which is the recommended mode of operation.

Stop Reaction

The time it takes for the backgauge to come to a stop after the outputs are turned off. It is adjusted automatically after every stop by the controller if the STOPPING MODE has been set to AUTO.

Decel Factor Mode

On two-speed machines, a DECELERATION (DECEL) FACTOR is used by the **MP338** controller when changing from fast to slow speeds. The user has the option to select from three DECEL FACTOR MODES: AUTO, MANUAL, or OFF.

AUTO: A DECEL FACTOR is automatically maintained by the controller. It is expressed in inches-per-second-per-second (In/Sec²) and is used in the Adaptive Slowdown calculation. The parameter can be overridden but will change on the next movement.

MANUAL: A DECEL FACTOR may be manually entered into the **MP338** controller. The value is used in the Adaptive Slowdown calculation. Some trial and error may be necessary when in the MANUAL mode to find a DECEL FACTOR which works properly. Ideally, the machine should shift from fast to slow at some distance prior to the target long enough so that it reaches a constant slow velocity before the movement outputs are turned off.

If the machine tends to shift into slow too soon, increase the DECEL FACTOR. If the machine tends to shift into slow too late, decrease the DECEL FACTOR. The DECEL FACTOR should be used in conjunction with the MINIMUM SLOW DISTANCE to determine the ideal time to change from fast to slow.

While in the MANUAL mode, the AMS controller will not calculate a new value for the DECEL FACTOR after each stop.

OFF: No DECEL FACTOR is used and the controller will not make an Adaptive Slowdown calculation. The machine will shift from fast to slow when the backgauge has reached the MINIMUM SLOW DISTANCE before the target. For example, if the MINIMUM SLOW DISTANCE has been set to four inches, the machine will shift from fast to slow 4 inches before the programmed position. This may or may not be enough distance for the machine to decelerate properly.

The DECEL FACTOR mode defaults to OFF but may be used in MANUAL or AUTO to increase productivity.

Decel Factor

This parameter is expressed in inches-per-second-per-second (In/Sec²) and is used in the Adaptive Slowdown calculation discussed in the DECEL FACTOR MODE above. There is no exact formula for this value so experimentation is necessary. Ideally the machine should shift from fast to slow at some distance prior to the target so that it reaches a constant slow velocity before the movement outputs are turned off. This value is automatically calculated by the controller if the DECEL FACTOR MODE is set to AUTO.

Move Delay

When the RUN input of the **MP338** is enabled, there should be a delay entered before the backgauge starts to move to its new position. This delay is included for safety purposes and allows for notification of personnel of the intended move. The delay can be programmed under the MOVE DELAY parameter. The acceptable range of this parameter is 0.0 to 5.0 seconds.

Resolution

The RESOLUTION parameter defines the length of the backgauge movement for each increment of the encoder. It is a function of the lead screw lead (the distance the metal positioner travels for one revolution of the screw), and the number of counts per revolution of the encoder. For a directly coupled encoder/lead screw installation, the formula for calculating RESOLUTION is as follows:

$$\text{Resolution} = \frac{\text{Lead Screw Lead (in inches)}}{4 \times \text{Encoder Count}}$$

For an AMS encoder, the encoder count is the model number of the encoder. A Model 256 is a 256 count encoder. A Model 1000 is a 1000 count encoder.

Common lead screws have a $\frac{1}{4}$ " lead, so for this lead screw, the RESOLUTION would be as follows:

Model	Resolution
256	0.00024414
256Z	0.00024414
500	0.000125
500Z	0.000125
1000Z	0.0000625

It is not necessary to precisely measure the lead or calculate the formula to any great precision. Nominal values can be used with precise results achieved during calibration. Values between 0.00004000 inches and 0.04000000 inches are acceptable.

Slow Volts

This parameter allows the operator to control the speed of the movement of the backgauge in the SLOW SPEED mode if analog outputs are being used. Increasing this value will cause a faster movement and decreasing this value slows the movement.

The controller provides an analog voltage signal that varies between 0 V and + 10 VDC. This output can drive a 1000 ohm load. The voltage is proportional to the speed of the movement.

Fast Volts

This parameter allows the operator to control the speed of the movement of the backgauge in the FAST SPEED mode if analog outputs are being used. Increasing this value will cause a faster movement and decreasing this value slows the movement.

The controller provides an analog voltage signal that varies between 0 V and + 10 VDC. This output can drive a 1000 ohm load. The voltage is proportional to the speed of the movement.

Correction

The CORRECTION FACTOR adjusts for errors in the backgauge movement. It is expressed as a percentage, with 100% being no correction. Increasing the CORRECTION FACTOR causes the backgauge movement to become longer and decreasing the value shrinks the backgauge movement.

Calculate the CORRECTION FACTOR using the following steps: 1) Force the Backgauge to perform a reference. 2) Program the Backgauge to move to a position at the opposite end of the table. 3) Measure the distance that the Backgauge moved. 4) Use the following formula for the new CORRECTION FACTOR.

$$\text{New CF} = \frac{\text{Programmed movement of the Backgauge}}{\text{Actual Measured movement of the Backgauge}} \times \text{Old CF}$$

CF = Correction Factor

Filter Constant

The FILTER CONSTANT can be adjusted in order to improve the line speed display. If the line speed on the display fluctuates, a lower FILTER CONSTANT value will stabilize the display. The default value is 32 Hz, which is considered to be on the high side of the low values. The controller will allow values from 1.0 Hz to 200.0 Hz.

Units

Length measurements can be programmed and displayed as English inches, Metric millimeters, or Metric centimeters. Press any number key or the PICK key to toggle through the choices.

To exit the BACKGAUGE SETUP screen push the SETUP key.

Backgauge Status

To view the BACKGAUGE STATUS you must first be in the DOWN STREAM MACHINES CONFIGURATION SCREEN, figure 7-3. Highlight the DOWN STREAM MACHINES line and hit ENTER. Highlight the BACKGAUGE STATUS line and hit ENTER to view the status screen.

```
2:59PM 9/05/97 0FPM 0.000"  
ORDER 0Ft  
MATERIAL N/A% COMP.  
MP338 Version:14.01 Unit:44 Type: 2  
Position: 0.000" Status: Stopped  
Inputs:----- Outputs:-2-----  
Device: Offline  
  
Type Height Width Offset BendAllow  
0.00 0.00 0.00 0.00  
  
Press Enter for Program Page
```

Figure 7b-2. BackGauge Status Screen

If no parts are programmed, the screen will have the information shown above. When parts are programmed, this screen will show the characteristics of the programmed part.

The information shown on the Status Screen includes the current **MP338** version, unit and type number, the part position, the controller status, input and output status, on line and off line status, as well as the current part information.

The controller status options are Stopped, Moving, Jog Fwd, Jog Rev, and Enabled.

Pressing the Enter key will take you to the Program page as shown in figure 7b-3.

```
3:03PM 9/05/97 0FPM 0.000"  
ORDER 0Ft  
MATERIAL N/A% COMP.  
MP338 Version:14.01 Unit:44 Type: 1  
Device Off Line  
Part Type  
Part Height 0.00"  
Part Width 0.00"  
Offset 0.00"  
Bend Allowance 0.00"  
Command Send Program
```

Figure 7b-3 Backgauge Program Screen

The first function of this screen is to set the downstream machine into the “Local” or “Remote” mode. This is done with the “Device” parameter. Pressing the “Pick” key will toggle between the choices of ON LINE and OFF LINE. After the proper mode is selected, use the “Enter” key to lock the choice into the controller.

If ON LINE is chosen, the downstream device will be in the “Remote” mode and controlled by the **XL120**. When the Device is “ON LINE” the part information is sent to the downstream controller. This information will include the Part Type, Part Height, Part Width, Offset, and Bend Allowance parameters.

If OFF LINE is chosen, the downstream device will be in the “Local” mode and is designed to operate independently, without using the **XL120** as a controlling device. In this mode parts can be programmed with the downstream controller.

The Command line allows the operator to send a new set of dimensions to the **MP338** controller for bending sheets not made by the **XL120** controller. The Command line may also be used to clear the **MP338’s** memory, if necessary. By highlighting the Command line and pressing the PICK key, the Clear Memory or Reference command will be shown on the display. Pressing ENTER will send the specified command to the **MP338**. The command options are “Send Program”, “Reference”, and “Clear Memory”.

To exit this screen hit the SETUP button.

Operating Procedure

Referencing

The controller must be referenced to a known position each time power is removed and restored to the unit. The fixed reference position may be one of two items: 1) A home (reference) switch, or 2) A positive stop. Each type of referencing sequence is described below.

Near Referencing With A Home Switch:

NOTE: Referencing is performed at fast speed.

1. The **MP338** determines the state of the Home Switch. If the switch is CLOSED, the **MP338** moves the gauge in the forward direction until the Home Switch is OPEN. It then skips to step # 6.
2. If the Home Switch is OPEN, the **MP338** moves the gauge in the reverse direction until the Home Switch is CLOSED.
3. It continues the reverse move for the Overshoot Distance.
4. Wait for the gauge to stop.
5. The **MP338** moves the gauge in the forward direction until the Home Switch is OPEN.
6. At the CLOSED -> OPEN transition of the Home Switch, the encoder interrupt captures the encoder count and sets it equal to the reference position.

Near Referencing With A Positive Stop:

NOTE: Referencing is performed at fast speed.

1. The **MP338** moves the gauge in the forward direction until it hits the positive stop (Velocity < 1 count/sec).
2. The encoder interrupt captures the encoder count and sets it equal to the reference position.

Far Referencing With A Home Switch:

NOTE: Referencing is performed at fast speed.

1. The **MP338** determines the state of the Home Switch. If the switch is OPEN, skip to step # 3.
2. If the switch is closed, the controller moves the gauge in the forward direction until the Home Switch is OPEN, and waits for the gauge to stop.
3. The **MP338** moves the gauge in the reverse direction until the Home Switch is CLOSED.
4. The controller continues the reverse move for the Overshoot Distance.
5. It waits for the gauge to stop (Velocity < 1 count/sec).
6. The **MP338** moves the gauge in the forward direction until the Home Switch is OPEN.
7. At the CLOSED -> OPEN transition of the Home Switch, the encoder interrupt captures the encoder count and sets it equal to the reference position.

Far Referencing With A Positive Stop:

NOTE: Referencing is performed at fast speed.

1. The **MP338** moves the gauge in the reverse direction until it hits the positive stop (Velocity < 1 count/sec).
2. It then moves the gauge in the forward direction until 1 encoder count is generated.
3. The encoder position is then set to the reference position distance.

NOTES:

- All referencing moves are made in fast speed.
- If near referencing is used, the home switch must be wired N/C (normally closed). Far referencing requires that normally open contacts be used.
- If the operator changes from near to far (or back), he or she must toggle the home switch input before the change takes effect.

Programming

The programming of parts is done with the **XL120** controller. Refer to the Parts Programming section of the manual for the proper procedure.

A second method of programming the parts for the **MP338** is by using the Backgauge Status Screen, figure 7b-2 on page 7b-11.

Type Part Type - One of four options:

Single sheets that will not cause the Backgauge to move

L "L" shaped, single bend duct

U "U" shaped, double bend duct

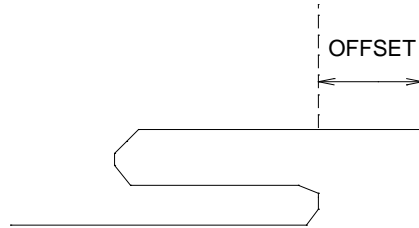
0 Wraparound, triple bend duct

Shear only sheets which will not cause the Backgauge to move

Height The height of the duct.

Width The width of the duct.

Offset The lip that is added to some sheets' length when the lock is formed and is not counted toward the length of the part.



Run Operation

Once a new set position is programmed in, the controller moves to the target while following the rules below.

1. If $\text{Current Position} > (\text{Set Position} + \text{Overshoot Distance})$, it will move in the forward direction to the target.
2. If $\text{Current Position} < \text{Set Position}$, it will move in the reverse direction until condition # 1 is true, then move in the forward direction to the target.

All targets must be approached from the forward direction so that any backlash in the system can be minimized.

If a new set position is programmed in before the controller has been referenced, the reference sequence will be performed before the controller moves to the target.

Note: In order for the MP338 to automatically receive parts data from the XL120, it must be put "on line". To do this, go to the Backgauge Status Screen by highlighting "Downstream Machines" in the Setup Menu and pressing "Enter". Highlight "Backgauge Status" and press "Enter". Press "Enter" again to go to the Backgauge Program Screen. Highlight the top row labeled "Device" and press the "Pick" key to toggle the option to "On Line". It can also be done at the MP338

controller, if it has a front display panel. Press the “Setup” key and press the number “3 = Loc / Remote”. Local or Remote mode is indicated on the Status Screen, top row, next to the line speed indicator.

Front Panel Run/ Remote Run Mode

If using the FRONT PANEL RUN button, jumper input 4 (Run/Enable) to DC common. Doing this will disable the Jog Forward and Jog Reverse inputs as well as the Auto Calibrate function.

If using a REMOTE RUN/ HALT circuit, Input 4 is the Run input. The Run output (#4), should be used to latch the input, refer to the enclosed Electrical Interface Diagram for wiring. When using a REMOTE RUN, the HALT button on the front panel (if available), will still halt the operation.

Part Reset Operation

Circumstances may arise when you may need to start the Part Bend process over, i.e. if a part gets damaged and the remaining bends cannot be completed.

In order to reset the position of the Backgauge back to the first bend in the part, simply close the Part Reset input (#8). If the Backgauge is moving to a new position when the input is initiated, the Backgauge will finish the move before returning to the first bend position. To stop the Backgauge from moving, and to immediately go to the first bend position, halt the motor by removing the Run Enable input. This will result in an “Out of Tolerance” error due to the fact that the motor did not reach the programmed target. Clear the error and momentarily close the Part Reset input (#8) and then close the Run Enable input. The Backgauge will now move to the first bend position.

Specification

Parameter	Panel Mount	AC Console
-----------	-------------	------------

Mechanical

Size	8"X12.5"X2.25"	8"X12.5"X7.5"
Weight	7lbs.	15lbs.

Electrical

Input Voltage	24VDC \pm 5%	115VAC \pm 10%, 50-60Hz
Input Current	.5 Amp.	1 Amp.

Outputs

Forward/Fast	Std DC	Std DC, AC Relay
Slow	Std DC	Std DC, AC Relay
Reverse	Std DC	Std DC, AC Relay
Run	Std DC	Std DC, AC Relay
Part Complete	Std DC	Std DC, AC Relay
Part Type Low Bit	Std DC	Std DC, AC Relay
Part Type High Bit	Std DC	Std DC, AC Relay
Not Used		
Analog (Optional)	0 to +10VDC	0 to +10VDC

Inputs

Jog Forward	Yes	Yes
Jog Reverse	Yes	Yes
Home	Yes	Yes
Run Enable	Yes	Yes
Setup/Lockout	External	Internal
Not Used		
Brake/Clamp Complete	Yes	Yes
Part Reset	Yes	Yes

(Note: The following parameters apply equally to all versions.)

Output Characteristics

Standard DC

Type	Open Collector Transistor
Maximum Current	4 ADC
Maximum Applied Voltage	35 VDC

AC Relay

Type	Form A Dry Circuit Relay
Maximum Current	5 Amp.
Maximum Applied Voltage	240VAC

Solenoid Driver

Type	High Voltage Internal Driver
Minimum Load Resistance	12 Ohms
Maximum Voltage Generated	65 VDC
Maximum Actuation Time	0.25 Seconds

Encoder Input

Type	Quadrature with Complements
Voltage	5VDC
Maximum Encoder Load	200 milliamperes
Maximum Pulse Rate	275,000 pulses/second

Operation

Maximum Part Length	999.99 inches 9999.9 millimeters
Units of Measurement	inches, or millimeters

MP338 Switch Settings and I/O

MP338 Switch Settings

Switch	Description
1	Unit ID, see switch settings below
2	Unit ID, must be OFF
3	Unit ID, must be ON
4	OFF = One Speed/ ON = Two Speed
5	Encoder Direction
6	Not Used, must be OFF
7	Unit ID, must be OFF

The proper Unit ID switch setting for the **MP338** is: switch 3 ON.
 Switches 1 and 3 ON is also a valid Unit ID number for the **MP338**.

SW1	SW2	SW3	SW7	Unit ID
OFF	OFF	ON	OFF	44/81
ON/OFF	ON	OFF		45/82

MP338 Inputs

Inputs	Description
1	Jog Forward
2	Jog Reverse
3	Home

4	Run Enable
5	Setup/Lockout
6	Not Used
7	Clamp Detect
8	Part Reset

MP338 Outputs

Outputs	Description
1	Forward/Fast
2	Slow
3	Reverse
4	Run
5	Part Complete
6	Part Type Low Bit
7	Part Type High Bit
8	Not Used
Pin 14	Analog + (Optional)
Pin 15	Analog - (Optional)

To exit the Backgauge Status screen hit the SETUP button

Appendix: MP338DH Dual Backgauge Controller Manual

The **MP338DH** Backgauge controller is a cost effective controller designed to position a guide (or a stop) on a press brake, or as an edge forming tool. The unit controls a variable speed electric drive or hydraulic system that turns a lead screw. The position of the gauge is sensed by an optical shaft encoder that is coupled to the lead screw. The **MP338DH** controls the drive unit and counts the pulses from the encoder until the desired position is sensed.

The **MP338DH** can also be used as a Backgauge Positioner for a single or a multi-bend brake. The Unit ID number configured by the dip switches will give the **MP338DH** its specific identity. If the DUAL BACKGAUGE SETUP is highlighted and ENTER is selected, the Dual Backgauge setup screen can be seen. There will be a slight delay as this screen is being loaded.

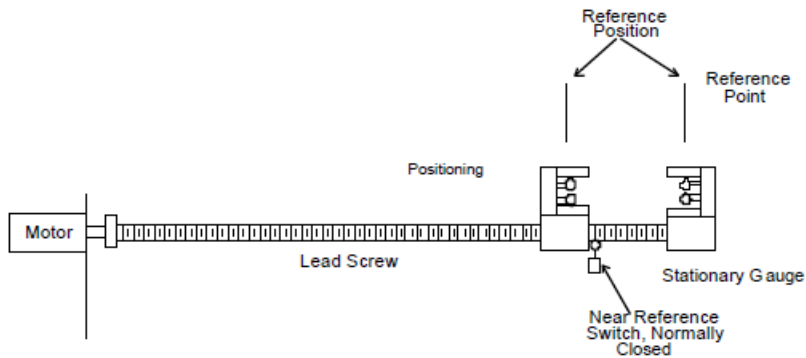
3:07PM	9/05/96	0FPM
0.000"		
ORDER		
0Ft		
MATERIAL		N/A%
COMP.		
Parameters		Value
Ref. Mode		
Near		
Ref. Pos.		0.000"
OverShoot Dist		
10.0000"		
Tolerance		
1.0000"		
Stopping Mode		
Auto		
Stop Reaction		0.0000sec
Move Delay		
0.0000sec		
Resolution		
0.0117187529"		
Correction		
100.000%		
Filter Const		
32.0HZ		
Units		
English		

Figure 6c-1. Dual Backgauge Setup Screen

Reference Mode

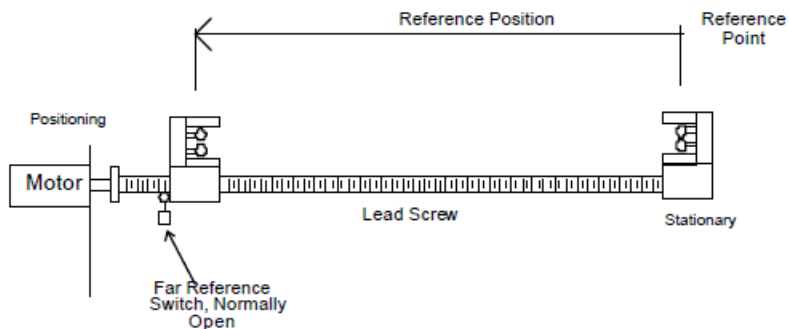
The REFERENCE MODE parameter tells the **MP338DH** where the reference switch or physical stop is located. The reference point is the center of the brake where the bend occurs, or the inside limit of the stationary tools. If the switch is close to the reference point and most of the moves of the backgauge occur "behind" the switch or physical stop, the REFERENCE MODE is NEAR. If the switch is behind the backgauge and most of the moves are in "front" of the switch or physical stop, the REFERENCE MODE is FAR. Use any number key to toggle the choices.

Near Reference Mode



The switch for a NEAR REFERENCE MODE must be normally closed and remain open as long as the backgauge is on the switch or closer to the reference point than the switch. The switch for a FAR REFERENCE MODE must be normally open and remain closed as long as the backgauge is on the switch or farther away from the reference point than the switch.

Far Reference Mode



If the controller is not already referenced, the controller will automatically reference itself when it is placed in the RUN mode. The reference is always achieved when the controller is moving in the forward direction. If a physical stop and a NEAR REFERENCE is used, the controller will reference itself when the gauge hits the stop going forward. If a physical stop and a FAR

REFERENCE is used the gauge will hit the stop in the reverse direction, and then reference when the first forward encoder count is seen.

Ref. Pos.

The REFERENCE POSITION is the distance from the reference point to the metal positioner after it has reached the physical stop or caused a transition of the HOME SWITCH.

Speed Logic

The **MP338DH** controller has four outputs that control the speed and direction of the machine. To accommodate more than one wiring possibility, the controller may be run with one of two different SPEED LOGIC settings: FORWARD/SLOW or FAST/SLOW. The controller outputs are defined differently for each logic setting. The outputs, their definitions, and their states in various conditions are shown in tables 6c-1 and 6c-2. Any number key toggles between FORWARD/SLOW and FAST/SLOW. Select the appropriate SPEED LOGIC to match your machine wiring configuration.

Machine State					
	Run Fast	Run Slow	Jog Fwd	Halt	Jog Rev
Output 1 (FOR)	ON	ON	ON	OFF	OFF
Output 2 (SLOW)	OFF	ON	OFF	ON	OFF
Output 3 (REV)	OFF	OFF	OFF	OFF	ON
Output 5 (RUN)	ON	ON	OFF	OFF	OFF

Table 6c-1. Status of Outputs in Forward-Slow

Note: All Jogging and Referencing is performed at fast speed.

Machine State					
	Run Fast	Run Slow	Jog Fwd	Halt	Jog Rev
Output 1 (FOR)	ON	OFF	ON	OFF	OFF
Output 2 (SLOW)	OFF	ON	OFF	OFF	OFF
Output 3 (REV)	OFF	OFF	OFF	OFF	ON
Output 5 (RUN)	ON	ON	OFF	OFF	OFF

Table 6c-2. Status of Outputs in Fast-Slow

Note: All Jogging and Referencing is performed at fast speed.

Min Slow Distance

This parameter is used on two speed lines and determines when to put the line into slow speed. The controller will automatically calculate when to start slowing down and then this distance is added to it (if the DECEL MODE is set to AUTO). Increase this value for a longer slow distance. Decrease this value for a shorter slow distance. A longer slow distance can improve part accuracy but too long a value can slow production. The distance should be set long enough that the material fully reaches the slow speed before stopping.

A minimum amount of slow distance can be manually set by this parameter. It is added to the calculated slow distance to extend the time spent in slow speed (if the DECEL FACTOR is set to

AUTO). The **MP338DH** controller can calculate the distance from the programmed position that the machine should shift into slow speed. This is based on the speed of the material and the deceleration characteristics of the machine.

When the DECEL FACTOR AUTO setting is used, it is best to set this parameter to a few inches initially until the system has been calibrated and the controller has had a chance to get accustomed to the behavior of the machine. When the machine is running good parts repeatedly, reduce the MINIMUM SLOW DISTANCE as much as possible to increase the production rate, making sure that the material is at a constant velocity (slow speed) before stopping.

Overshoot Dist

The **MP338DH** will always move the backgauge toward the target in a forward direction (toward the reference point). When moving away from the reference point to make a bend, or a FAR REFERENCE, the backgauge will overshoot the target by the OVERSHOOT DISTANCE and approach the target in a forward direction. This is done to keep any machine “slop” behind the backgauge.

The allowable range is 0.0 to 50.0 inches. The distance that is entered should be large enough so that the backgauge can get up to full speed before stopping. The default value is 10.0000 inches.

Tolerance

The controller can check for the backgauge to be within a specified TOLERANCE. If the machine has not stopped within this TOLERANCE, the controller will halt and an error will be displayed.

The TOLERANCE should be set small enough to get acceptable parts but wide enough to avoid production interruptions. The controller allows values from 0.0005 inches to 10.0000 inches.

The default value for TOLERANCE is 1.0000 inches.

Stopping Mode

The STOP REACTION time represents the time delay from the time that the controller turns off the movement outputs until the backgauge actually stops. The user has a choice of three STOPPING MODES: AUTO, MANUAL, or OFF. Use any number key to toggle through the choices.

AUTO: The controller turns off the movement outputs prior to the actual brake point to allow for the momentum and inertia of the machine. A new STOP REACTION time is calculated after each stop based on the average stopping time for several cycles. This parameter may be overridden, but the value will be modified on the next part that is run. The maximum value is 9.9999 seconds.

MANUAL: The controller turns off the movement outputs prior to the actual brake point as above. However, when in MANUAL, the controller does not recalculate a new STOP REACTION time after each stop. Whatever value is manually entered remains constant. The maximum value is again 9.9999 seconds.

OFF: A STOP REACTION time is not calculated and is not used at all by the controller. The movement outputs are turned off when the backgauge position is equal to the programmed

length of the bend. This should cause bends to come out short due to the momentum of the machine and material during stopping. In addition, when the STOP MODE is set to OFF a tolerance test is not performed.

The default mode for STOP REACTION time is AUTO, which is the recommended mode of operation.

Stop Reaction

The time it takes for the backgauge to come to a stop after the outputs are turned off. It is adjusted automatically after every stop by the controller if the STOPPING MODE has been set to AUTO.

Decel Factor Mode

On two-speed machines, a DECELERATION (DECEL) FACTOR is used by the **MP338DH** controller when changing from fast to slow speeds. The user has the option to select from three DECEL FACTOR MODES: AUTO, MANUAL, or OFF.

AUTO: A DECEL FACTOR is automatically maintained by the controller. It is expressed in inches-per-second-per-second (In/Sec^2) and is used in the Adaptive Slowdown calculation. The parameter can be overridden but will change on the next movement.

MANUAL: A DECEL FACTOR may be manually entered into the **MP338DH** controller. The value is used in the Adaptive Slowdown calculation. Some trial and error may be necessary when in the MANUAL mode to find a DECEL FACTOR that works properly. Ideally, the machine should shift from fast to slow at some distance prior to the target long enough so that it reaches a constant slow velocity before the movement outputs are turned off.

If the machine tends to shift into slow too soon, increase the DECEL FACTOR. If the machine tends to shift into slow too late, decrease the DECEL FACTOR. The DECEL FACTOR should be used in conjunction with the MINIMUM SLOW DISTANCE to determine the ideal time to change from fast to slow.

While in the MANUAL mode, the AMS controller will not calculate a new value for the DECEL FACTOR after each stop.

OFF: No DECEL FACTOR is used and the controller will not make an Adaptive Slowdown calculation. The machine will shift from fast to slow when the backgauge has reached the MINIMUM SLOW DISTANCE before the target. For example, if the MINIMUM SLOW DISTANCE has been set to four inches, the machine will shift from fast to slow 4 inches before the programmed position. This may or may not be enough distance for the machine to decelerate properly.

The DECEL FACTOR mode defaults to OFF but may be used in MANUAL or AUTO to increase productivity.

Decel Factor

This parameter is expressed in inches-per-second-per-second (In/Sec²) and is used in the Adaptive Slowdown calculation discussed in the DECEL FACTOR MODE above. There is no exact formula for this value, so experimentation is necessary. Ideally, the machine should shift from fast to slow at some distance prior to the target, so that it reaches a constant slow velocity prior to the movement outputs are turned off. This value is automatically calculated by the controller if the DECEL FACTOR MODE is set to AUTO.

Move Delay

When the RUN input of the **MP338DH** is enabled, there should be a delay entered before the backgauge starts to move to its new position. This delay is included for safety purposes and allows for notification of personnel of the intended move. The delay can be programmed under the MOVE DELAY parameter. The acceptable range of this parameter is 0.0 to 5.0 seconds.

Resolution

The RESOLUTION parameter defines the length of the backgauge movement for each increment of the encoder. It is a function of the lead screw lead (the distance the metal positioner travels for one revolution of the screw), and the number of counts per revolution of the encoder. For a directly coupled encoder/lead screw installation, the formula for calculating RESOLUTION is as follows:

$$\text{Resolution} = \frac{\text{Lead Screw Lead (in inches)}}{4 \times \text{Encoder Count}}$$

For an AMS encoder, the encoder count is the model number of the encoder. A Model 256 is a 256 count encoder. A Model 1000 is a 1000 count encoder. Common lead screws have a 1/4" lead, so for this lead screw, the RESOLUTION would be as follows:

Model	Resolution
256	0.00024414
500	0.000125
1000	0.0000625

It is not necessary to precisely measure the lead or calculate the formula to any great precision. Nominal values can be used with precise results achieved during calibration. Values between 0.00004000 inches and 0.04000000 inches are acceptable.

Slow Volts

This parameter allows the operator to control the speed of the movement of the backgauge in the SLOW SPEED mode if analog outputs are being used. Increasing this value will cause a faster movement and decreasing this value slows the movement. The controller provides an analog voltage signal that varies between 0 V and + 10 VDC. This output can drive a 1000 ohm load. The voltage is proportional to the speed of the movement.

Fast Volts

This parameter allows the operator to control the speed of the movement of the backgauge in the FAST SPEED mode if analog outputs are being used. Increasing this value will cause a faster movement and decreasing this value slows the movement.

The controller provides an analog voltage signal that varies between 0 V and + 10 VDC. This output can drive a 1000 ohm load. The voltage is proportional to the speed of the movement.

Correction

The CORRECTION FACTOR adjusts for errors in the backgauge movement. It is expressed as a percentage, with 100% being no correction. Increasing the CORRECTION FACTOR causes the backgauge movement to become longer and decreasing the value shrinks the backgauge movement.

Calculate the CORRECTION FACTOR using the following steps: 1) Make the backgauge move to the same position ten times and take an accurate measurement of this value. 2) Find the average length by adding up all ten measurements and dividing by ten. 3) Use the following formula for the new CORRECTION FACTOR, using the average of the ten moves for "actual measured position."

New CORR. FACTOR = (Programmed Position ÷ Actual Measured Position) x Old CORR. FACTOR

Filter Constant

The FILTER CONSTANT can be adjusted in order to improve the line speed display. If the line speed on the display fluctuates, a lower FILTER CONSTANT will stabilize the display. The default value is 32 Hz, which is considered to be on the high side of the low values. The controller will allow values from 1.0 Hz to 200.0 Hz.

Units

Length measurements can be programmed and displayed as English inches, Metric millimeters, or Metric centimeters. Press any number key to toggle through the choices.

To exit the DUAL BACKGAUGE SETUP screen push the SETUP key.

Dual Backgauge Status

To view the DUAL BACKGAUGE STATUS you must first be in the DOWN STREAM MACHINES CONFIGURATION SCREEN, figure 4-3. Highlight the DOWN STEAM MACHINES line and hit ENTER. Highlight the DUAL BACKGAUGE STATUS line and hit ENTER to view the status screen.

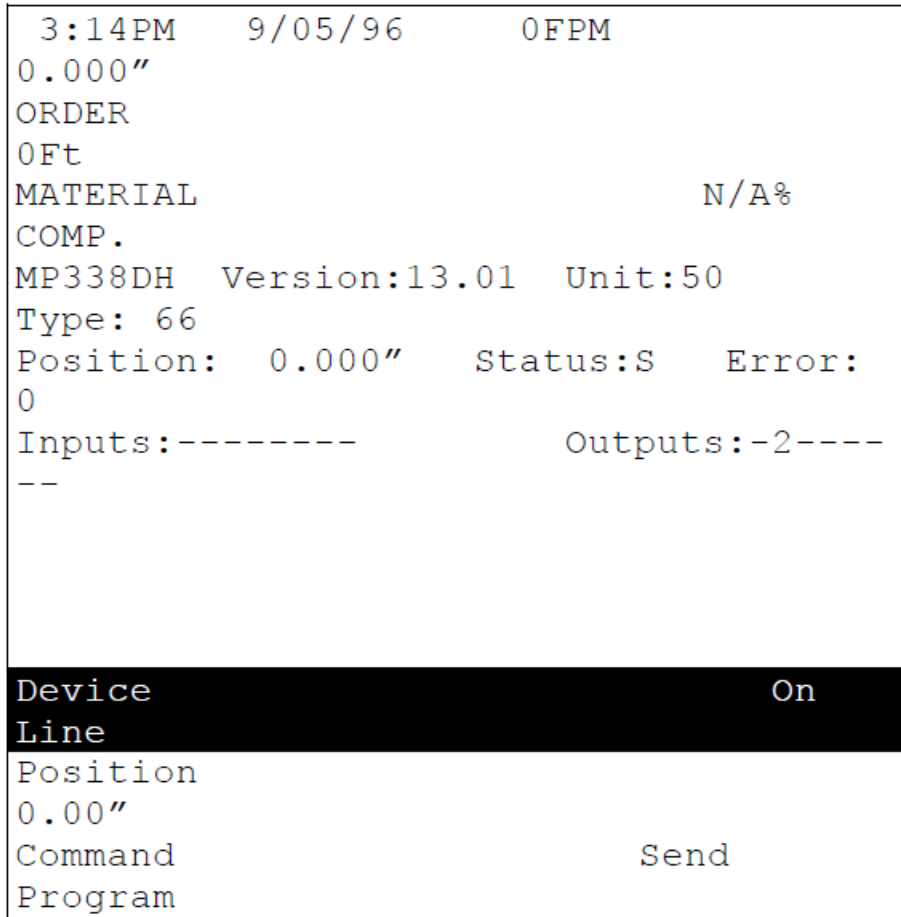


Figure 6c-2. Dual Backgauge Status Screen

If no parts are programmed, the screen will have the information shown in figure 6c-2. When parts are programmed, this screen will show the characteristics of the programmed part. The Command line allows the operator to send a new set of dimensions to the **MP338DH** controller for pinning sheets not made by the **XL120** controller. The Command line may also be used to clear the **MP338DH's** memory, if necessary. By highlighting the Command line and pressing the PICK key, the Clear Memory command will be shown on the display. Pressing ENTER will send the Clear Memory command to the **MP338DH**.

To exit this screen hit the SETUP button.

Operating Procedure

Referencing

The controller must be referenced to a known position each time power is removed and restored to the unit. The fixed reference position may be one of two items: 1) A home (reference) switch, or 2) A positive stop. Each type of referencing sequence is described below.

Near Referencing With A Home Switch:

NOTE: Referencing is performed at fast speed.

1. The **MP338DH** determines the state of the Home Switch. If the switch is CLOSED, the **MP338DH** moves the gauge in the forward direction until the Home Switch is OPEN. It then skips to step # 6.
2. If the Home Switch is OPEN, the **MP338DH** moves the gauge in the reverse direction until the Home Switch is CLOSED.
3. It continues the reverse move for the Overshoot Distance.
4. Wait for the gauge to stop.
5. The **MP338DH** moves the gauge in the forward direction until the Home Switch is OPEN.
6. At the CLOSED -> OPEN transition of the Home Switch, the encoder interrupt captures the encoder count and sets it equal to the reference position.

Near Referencing With A Positive Stop:

NOTE: Referencing is performed at fast speed.

1. The **MP338DH** moves the gauge in the forward direction until it hits the positive stop (Velocity < 1 count/sec).
2. The encoder interrupt captures the encoder count and sets it equal to the reference position.

Far Referencing With A Home Switch:

NOTE: Referencing is performed at fast speed.

1. The **MP338DH** determines the state of the Home Switch. If the switch is OPEN, skip to step # 3.
2. If the switch is closed, the controller moves the gauge in the forward direction until the Home Switch is OPEN, and waits for the gauge to stop.
3. The **MP338DH** moves the gauge in the reverse direction until the Home Switch is CLOSED.
4. The controller continues the reverse move for the Overshoot Distance.
5. It waits for the gauge to stop (Velocity < 1 count/sec).
6. The **MP338DH** moves the gauge in the forward direction until the Home Switch is OPEN.

7. At the CLOSED -> OPEN transition of the Home Switch, the encoder interrupt captures the encoder count and sets it equal to the reference position.

Far Referencing With A Positive Stop:

NOTE: Referencing is performed at fast speed.

1. The MP338DH moves the gauge in the reverse direction until it hits the positive stop (Velocity < 1 count/sec).
2. It then moves the gauge in the forward direction until 1 encoder count is generated.
3. The encoder position is then set to the reference position distance.

NOTES:

- All referencing moves are made in fast speed.
- If near referencing is used, the home switch must be wired N/C (normally closed). Far referencing requires that normally open contacts be used.
- If the operator changes from near to far (or back), he or she must toggle the home switch input before the change takes effect.

Programming

The programming of parts is done with the XL120 controller. Refer to the Parts Programming section of the manual for the proper procedure.

A second method of programming the parts for the MP343 is by using the Pin Spotter Status Screen, figure 5b-2 on page 5b-11.

Type Part Type - One of four options:

Single sheets that will not cause the Backgauge to move

L “L” shaped, single bend duct

U “U” shaped, double bend duct

O Wraparound, triple bend duct

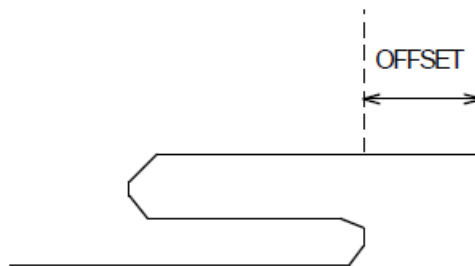
Shear only sheets which will not cause the Backgauge to move

Height The height of the duct.

Width The width of the duct.

Offset The lip that is added to some sheets’ length when the lock is formed and is not counted toward the length of the part.

The status screen will also show the **MP338DH** version, unit, and type number, the part position, the controller status, input and output status, and command option.



The codes for the controller status are:

S = Stopped

M = Moving

C = Calibrating

F = Jogging Forward

R = Jogging Reverse

P = Program (Run Enable)

The command options are “Send Program” and “Clear Memory”.

Run Operation

Once a new set position is programmed in, the controller moves to the target while following the rules below.

1. If Current Position $>$ (Set Position + Overshoot Distance), it will move in the forward direction to the target.
2. If Current Position $<$ Set Position, it will move in the reverse direction until condition # 1 is true, then move in the forward direction to the target.

All targets must be approached from the forward direction so that any backlash in the system can be minimized.

If a new set position is programmed in before the controller has been referenced, the reference sequence will be performed before the controller moves to the target.

Front Panel Run/ Remote Run Mode

If using the FRONT PANEL RUN button, jumper input 4 (Run/Enable) to DC common. Doing this will disable the Jog Forward and Jog Reverse inputs as well as the Auto Calibrate function.

If using a REMOTE RUN/ HALT circuit, Input 4 is the Run input. The Run output (#4) should be used to latch the input, refer to the enclosed Electrical Interface Diagram for wiring. When using a REMOTE RUN, the HALT button on the front panel (if available), will still halt the operation.

Specification

Parameter	Panel Mount	AC Console
-----------	-------------	------------

Mechanical

Size	8"X12.5"X2.25"	8"X12.5"X7.5"
Weight	7lbs.	15lbs.

Electrical

Input Voltage	24VDC \pm 5%	115VAC \pm 10%, 50-60Hz
Input Current	.5 Amp.	1 Amp.

Outputs

Forward/Fast	Std DC	Std DC, AC Relay
Slow	Std DC	Std DC, AC Relay
Reverse	Std DC	Std DC, AC Relay
Run	Std DC	Std DC, AC Relay
Not Used		
Not Used		
Not Used		
Not Used		
Analog (Optional)	0 to +10VDC	0 to +10VDC

Inputs

Jog Forward	Yes	Yes
Jog Reverse	Yes	Yes
Home	Yes	Yes
Run Enable	Yes	Yes
Setup/Lockout	External	Internal
Not Used		
Brake/Clamp Complete	Yes	Yes

(Note: The following parameters apply equally to all versions.)

Output Characteristics

Standard DC

Type	Open Collector Transistor
Maximum Current	4 ADC
Maximum Applied Voltage	35 VDC

AC Relay

Type	Form A Dry Circuit Relay
Maximum Current	5 Amp.
Maximum Applied Voltage	240VAC

Solenoid Driver

Type	High Voltage Internal Driver
Minimum Load Resistance	12 Ohms
Maximum Voltage Generated	65 VDC
Maximum Actuation Time	0.25 Seconds

Encoder Input

Type	Quadrature with Complements
Voltage	5VDC
Maximum Encoder Load	200 milliamperes
Maximum Pulse Rate	275,000 pulses/second

Operation

Maximum Part Length	9999.999 inches 254,000 millimeters
Units of Measurement	inches, centimeters, or millimeters

MP338DH Switch Settings

Switch	Description
1	Unit ID, see switch settings below
2	Unit ID, must be ON
3	Unit ID, must be OFF
4	OFF = One Speed/ ON = Two Speed
5	Encoder Direction
6	Not Used, must be OFF
7	Unit ID, must be ON

The proper Unit ID switch setting for the **MP338DH** is switches 2 and 7 ON. Some systems have the capability of having 2 **MP338DHs**, and the Unit ID switch setting for the second controller is switches 1, 2, and 7 ON.

SW1	SW2	SW3	SW7	UNIT ID
OFF	ON	OFF	ON	50
ON	ON	OFF	ON	51

MP338DH Inputs

Inputs	Description
1	Jog Forward
2	Jog Reverse
3	Home
4	Run Enable
5	Setup/Lockout
6	Not Used
7	Not Used
8	Not Used

MP338DH Outputs

Outputs	Description
1	Forward/Fast
2	Slow
3	Reverse
4	Run
5	Not Used
6	Not Used
7	Not Used
8	Not Used

Optional

Pin 14 Analog +

Pin 15 Analog -

SETUP DATA SHEET

Down Stream Machines

Dual Backgauge

Ref. Mode _____

Ref. Pos. _____

Speed Logic _____

Min Slow Dist _____

OverShoot Dist _____

Tolerance _____

Stopping Mode _____

Stop Reaction _____

Decel Factor Mode _____

Decel Factor _____

Move Delay _____

Resolution _____

Slow Volts _____

Fast Volts _____

Correction _____

Filter Constant _____

Units _____

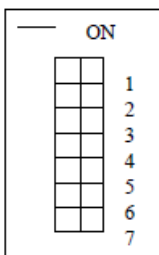
MODEL MP338DH CONTROLLER

For assistance call 1-800-334-5213 and ask for customer service

Note: Use this sheet to fill in the machine setup values. This list includes all possible parameters and not all controllers have every parameter. Only fill in the values for your machine. Use the switch drawing below to show your switch setting.

Serial Number _____

Version Number _____



Appendix: MP342 Notcher Controller

If the NOTCHER SETUP is highlighted and ENTER is selected, the Notcher setup screen can be seen.

3:21PM 9/05/96 0FPM 0.000"	
ORDER 0Ft	
MATERIAL N/A% COMP.	
Parameters	Value
End Dwell Dn	0.000sec
End Dwell Up	0.000sec
Vee Dwell Dn	0.000sec
Vee Dwell Up	0.000sec
LE End-Detect	0.0000"
TE End-Detect	0.0000"
Vee-Detect	0.0000"
Tolerance	1.0000"
Stopping Mode	Auto
Stop Reaction	0.0000sec
Encoder Direction	CW

Figure 6d-1. Notcher Setup Screen

End Dwell Dn

The END DWELL DOWN time is the time it takes the press to go from the top of its stroke to the bottom. The range of time allowed is 0.001 to 9.999 seconds that can be set to the nearest millisecond.

End Dwell Up

The END DWELL UP time is the time necessary for the press to return from the bottom to the top of its stroke.

End Notch Reaction

The END NOTCH REACTION time is the time delay between the time that the punch signal occurs and the time that the die punches the material. This factor is used on flying die machines only. The maximum value is 0.5000 seconds. There is a REACTION time for each Press.

Once the Shear Reaction time and Vee Notch Reaction time is correct, the END NOTCH REACTION time can be easily calculated. Measure the amount that the notch is lagging its correct position (amount of error). Then use the following formula of the new END NOTCH REACTION TIME:

$$\text{End Notch Reaction Time} = \left(\frac{\text{Error}}{\text{Line Speed in RPM}} \right) \times 5$$

Vee Dwell Dn

The VEE DWELL DOWN time is the time it takes the press to go from the top of its stroke to the bottom. The range of time allowed is 0.001 to 9.999 seconds that can be set to the nearest millisecond.

Vee Dwell Up

The VEE DWELL UP time is the time necessary for the press to return from the bottom to the top of its stroke.

DR Vee Notch Reaction

The DR VEE NOTCH REACTION time is the time delay between the time that the punch signal occurs and the time that the die punches the material. This factor is used on flying die machines only. The maximum value is 0.5000 seconds. There is a REACTION time for each Press.

Once the Shear Reaction time and Correction Factor are set calculate the VEE NOTCH REACTION time using the following steps: 1) Set the VEE NOTCH REACTION time to zero. 2) Program a "U" shape 30" x 30" part. 3) Cycle the shear. 4) Run the line. 5) Stop after the second vee notch is punched. 6) Jog the material out and measure the leading edge to the first notch (minus any programmed Leading Edge Notch size. This value can be found in the Edit Lock Data, and may be the Male or Female Lock depending upon the actual die configuration). 7) Measure the first notch to the second notch. 8) Use the following formula for the new VEE NOTCH REACTION time:

$$\text{Reaction Time} = \left[\frac{(\text{LE to 1st Vee}) - (\text{1st to 2nd Vee Notch})}{\text{Line Speed in RPM}} \right] \times 5$$

LE to 1st Vee = Leading Edge to 1st Vee Notch minus any programmed Leading Edge Notch size.

LE End-Detect

The LE END-DETECT is the physical distance from the detect switch to the leading edge of the End Notch die.

TE End-Detect

The TE END-DETECT is the physical distance from the detect switch to the trailing edge of the End Notch die.

Vee-Detect

The VEE-DETECT is the physical distance from the detect switch to the center of the Vee Notch die.

Speed Logic

The **MP342** controller has four outputs that control the speed and direction of the machine. To accommodate more than one wiring possibility, the controller may be run with one of two different SPEED LOGIC settings (if set up as a two speed controller): FORWARD/SLOW or FAST/SLOW. The controller outputs are defined differently for each logic setting. The outputs, their definitions, and their states in various conditions are shown in tables 6d-1 and 6d-2. Any number key or the blue PICK key toggles between FORWARD/SLOW and FAST/SLOW. Select the appropriate SPEED LOGIC to match your machine wiring configuration.

Machine State					
	Run Fast	Run Slow	Jog Fwd	Halt	Jog Rev
Output 1 (FOR)	ON	ON	ON	OFF	OFF
Output 2 (SLOW)	OFF	ON	OFF	ON	OFF
Output 3 (REV)	OFF	OFF	OFF	OFF	ON
Output 5 (RUN)	ON	ON	OFF	OFF	OFF

Table 6d-1. Status of Outputs in Forward-Slow

Note: All Jogging and Referencing is performed at fast speed

Machine State					
	Run Fast	Run Slow	Jog Fwd	Halt	Jog Rev
Output 1 (FOR)	ON	OFF	ON	OFF	OFF
Output 2 (SLOW)	OFF	ON	OFF	OFF	OFF
Output 3 (REV)	OFF	OFF	OFF	OFF	ON
Output 5 (RUN)	ON	ON	OFF	OFF	OFF

Table 6d-2. Status of Outputs in Fast-Slow

Note: All Jogging and Referencing is performed at fast speed

Tolerance

On feed-to-stop machines, the controller can check for the material to be within a specified TOLERANCE before activating the punch press. If the machine has not stopped within this TOLERANCE, the controller will halt and an error will be displayed. If the TOLERANCE is set at 0.03 inches, the length past the press operation must be equal to the programmed length plus or minus 0.03 before the press will be cycled. The TOLERANCE should be set small enough to get acceptable parts but wide enough to avoid production interruptions. The controller allows values from 0.0005 inches to 10.0000 inches. The default value for TOLERANCE is 0.1000 inches.

Min Slow Distance

This parameter is used to put the line into slow speed (if using two speed logic). The controller will automatically calculate when to start slowing down and then this distance is added to it (if the DECEL

MODE is set to AUTO). Increase this value for a longer slow distance. Decrease this value for a shorter slow distance. A longer slow distance can improve part accuracy but too long a value can slow production. The distance should be set long enough that the material fully reaches the slow speed before stopping.

A minimum amount of slow distance can be manually set by this parameter. It is added to the calculated slow distance to extend the time spent in slow speed (if the DECEL FACTOR is set to AUTO). The **MP342** controller calculates the distance from the programmed position that the machine should shift into slow speed. This is based on the speed of the material and the deceleration characteristics of the machine.

When the DECEL FACTOR AUTO setting is used, it is best to set this parameter to a few inches initially until the system has been calibrated and the controller has had a chance to get accustomed to the behavior of the machine. When the machine is running good parts repeatedly, reduce the MINIMUM SLOW DISTANCE as much as possible to increase the production rate.

This value should be set long enough that the material fully reaches the slow speed before stopping.

Stopping Mode

On feed-to-stop machines, a STOP REACTION time parameter is used. This represents the time delay from the time that the controller turns off the movement outputs until the material actually stops. The user has a choice of three STOPPING MODES: AUTO, MANUAL, or OFF.

AUTO: The controller turns off the movement outputs prior to the actual notch point to allow for the momentum and inertia of the machine. A new STOP REACTION time is calculated after each stop based on the average stopping time for several cycles. This parameter may be overridden, but the value will be modified on the next part that is run. The maximum value is 9.9999 seconds.

MANUAL: The controller turns off the movement outputs prior to the actual notch point as above. However, when in MANUAL, the controller does not recalculate a new STOP REACTION time after each stop. Whatever value is manually entered remains constant. The maximum value is again 9.9999 seconds.

OFF: A STOP REACTION time is not calculated and is not used at all by the controller. The movement outputs are turned off when the material past the notch point is equal to the programmed length of the part. This should cause the notches to lag on the part due to the momentum of the machine and material during stopping. Also, when the STOPPING MODE is set to OFF a tolerance test is not performed.

The default mode for STOP REACTION time is AUTO, which is the recommended mode of operation.

Stop Reaction

The STOP REACTION is the time it takes for the line to come to a stop after the outputs are turned off (measured in seconds). It is adjusted automatically after every stop by the **MP342** if the STOPPING MODE has been set to AUTO.

NOTE: STOPPING REACTION should be adjusted prior to attempting to set the CORRECTION FACTOR.

Decel Factor Mode

On two-speed machines, a DECELERATION (DECEL) FACTOR is used by the **MP342** controller when changing from fast to slow speeds. The user has the option to select from three DECEL FACTOR MODES: AUTO, MANUAL, or OFF.

AUTO: A DECEL FACTOR is automatically maintained by the controller. It is expressed in inches-per-second-per-second (In/Sec²) and is used in the Adaptive Slowdown calculation. The parameter can be overridden but will change on the next movement.

MANUAL: A DECEL FACTOR may be manually entered into the **MP342** controller. The value is used in the Adaptive Slowdown calculation. Some trial and error may be necessary when in the MANUAL mode to

find a DECEL FACTOR that works properly. Ideally, the machine should shift from fast to slow at some distance prior to the target long enough so that it reaches a constant slow velocity before the movement outputs are turned off.

If the machine tends to shift into slow too soon, increase the DECEL FACTOR. If the machine tends to shift into slow too late, decrease the DECEL FACTOR. The DECEL FACTOR should be used in conjunction with the MINIMUM SLOW DISTANCE to determine the ideal time to change from fast to slow.

While in the MANUAL mode, the AMS controller will not calculate a new value for the DECEL FACTOR after each stop.

OFF: No DECEL FACTOR is used and the controller will not make an Adaptive Slowdown calculation. The machine will shift from fast to slow when the backgauge has reached the MINIMUM SLOW DISTANCE before the target. For example, if the MINIMUM SLOW DISTANCE has been set to four inches, the machine will shift from fast to slow 4 inches before the programmed position. This may or may not be enough distance for the machine to decelerate properly.

The DECEL FACTOR mode defaults to OFF but may be used in MANUAL or AUTO to increase productivity.

Decel Factor

This parameter is expressed in inches-per-second-per-second (In/Sec^2) and is used in the Adaptive Slowdown calculation discussed in the DECEL FACTOR MODE above. There is no exact formula for this value so experimentation is necessary. Ideally the machine should shift from fast to slow at some distance prior to the target so that it reaches a constant slow velocity before the movement outputs are turned off. This value is automatically calculated by the controller if the DECEL FACTOR MODE is set to AUTO.

End Boost Dwell

The END BOOST DWELL is the time after the End Notch press fires that the die boost output remains on to continue pushing the die forward. This ensures that the press die is out of the way before the boost returns. The die boost output is turned on at a specific time period before the punch occurs and remains on the entire press cycle time plus the END BOOST DWELL time. The press cycle time is defined as the END DOWN DWELL time plus the END UP DWELL time. If the controller parameter is a END DWELL time, the cycle time is defined as twice the END DWELL time. The range of acceptable values is 0.000 seconds to 9.999 seconds.

End Boost Reaction

The END BOOST REACTION time is the time delay between the time that the press signal occurs and the time that the die contacts the material. This factor is used on flying die machines only. The maximum value is 0.5000 seconds. There is a PRESS REACTION time for each Press.

Calculate the PRESS REACTION time using the following steps: 1) Set the SHEAR-PUNCH DISTANCE and the PRESS REACTION time to zero. 2) Program a 130" part with notches at 60" and 120". 3) Cycle the shear. 4) Run the line. 5) After the first part is cut, jog the material out and measure the leading edge to the first notch and the first notch to the second notch. 6) Use the following formula for the new PRESS REACTION time:

$$\text{Reaction Time} = \left[\frac{(\text{LE to 1st Notch}) - (\text{1st to 2nd Notch})}{\text{Line Speed in RPM}} \right] \times 5$$

LE to 1st Notch = Leading Edge to 1st Notch

Vee Boost Dwell

The VEE BOOST DWELL is the time after the Vee Notch press fires that the die boost output remains on to continue pushing the die forward. This ensures that the press die is out of the way before the

boost returns. The die boost output is turned on at a specific time period before the punch occurs and remains on the entire press cycle time plus the VEE BOOST DWELL time. The press cycle time is defined as the VEE DOWN DWELL time plus the VEE UP DWELL time. If the controller parameter is a VEE DWELL time, the cycle time is defined as twice the VEE DWELL time. The range of acceptable values is 0.000 seconds to 9.999 seconds.

Vee Boost Reaction

The VEE BOOST REACTION time is the time delay between the time that the punch signal occurs and the time that the die contacts the material. This factor is used on flying die machines only. The maximum value is 0.5000 seconds. There is a PRESS REACTION time for each Press.

Calculate the PRESS REACTION time using the following steps: 1) Set the SHEAR-PUNCH DISTANCE and the PRESS REACTION time to zero. 2) Program a 130" part with notches at 60" and 120". 3) Cycle the shear. 4) Run the line. 5) After the first part is cut, jog the material out and measure the leading edge to the first notch and the first notch to the second notch. 6) Use the following formula for the new PRESS REACTION time:

$$\text{Reaction Time} = \left[\frac{(\text{LE to 1st Notch}) - (\text{1st to 2nd Notch})}{\text{Line Speed in RPM}} \right] \times 5$$

LE to 1st Notch = Leading Edge to 1st Notch

Encoder Direction

Pressing any number key or the PICK key toggles between CW (Clockwise) and CCW (Counter-Clockwise) for the direction of the encoder(s). If you run the line and the display counts negative, change the ENCODER DIRECTION.

Resolution

The RESOLUTION parameter defines the length of material movement for each increment of the encoder. It is a function of the circumference of the measuring wheel and the number of counts per revolution of the encoder. The formula for calculating RESOLUTION is as follows:

$$\text{Resolution} = \frac{\text{Circumference}}{4 \times \text{Encoder Count}}$$

For an AMS encoder, the encoder count is the model number of the encoder. A Model 256 is a 256 count encoder. A Model 1000Z is a 1000 count encoder.

The most common wheel used has a circumference of 12 inches. For this size wheel, RESOLUTION would be as follows:

Model	Resolution
256	0.01171875
500	0.006
1000	0.003

It is not necessary to precisely measure the circumference or calculate the formula to any great precision. Nominal values can be used with precise results achieved during calibration. Values between 0.00004000 inches and 0.04000000 inches are acceptable.

Correction

The CORRECTION FACTOR adjusts for errors in the size and tracking of the measuring wheel. It is expressed as a percentage, with 100% being no correction. Increasing the CORRECTION FACTOR causes the notch pattern to become longer and decreasing the value shrinks the notch pattern.

NOTE: The STOPPING REACTION must be adjusted prior to attempting to calculate the CORRECTION FACTOR.

Calculate the CORRECTION FACTOR using the following steps: 1) Use a long part for the test, (144" for example). 2) Use a notch pattern to place a notch near both ends of the part, (at 12" and 132:, for

example). 3) Measure the actual distance between the two notches.
4) Use the following formula for the new CORRECTION FACTOR, using the programmed distance between the notches (in this case 132" - 12" = 120") for the "Programmed Length" and the measured distance between the notches as the "Actual Measured Length".

$$\text{New CF} = \frac{\text{Programmed Length}}{\text{Actual Measured Length}} \times \text{Old CF}$$

CF = Correction Factor

The CALIBRATE TRIM procedure can be used to automatically calculate this value.

Filter Constant

The FILTER CONSTANT can be adjusted in order to improve accuracy. A low value should be used on machines with very stable line speeds. A high value (greater than 50 Hz) should be used when rapid fluctuations in line speeds occur. Some trial may be necessary to achieve an accurate value. The default value is 32 Hz, which is considered to be on the high side of the low values. The controller will allow values from 1.0 Hz to 200.0 Hz.

Units

Length measurements can be programmed and displayed as English inches, Metric millimeters, or Metric Centimeters. Press any number key or the "PICK" key to toggle through the choices.

To exit the NOTCHER SETUP screen push the SETUP key.

Notcher Status

To view the NOTCHER STATUS you must first be in the DOWN STREAM MACHINES CONFIGURATION SCREEN, figure 4-3. Highlight the DOWN STEAM MACHINES line and hit ENTER.

Highlight the NOTCHER STATUS line and hit ENTER to view the status screen.

```
3:38PM 9/05/96 0FPM 0.000"
ORDER 0Ft
MATERIAL N/A% COMP.
MP342 Version:13.01 Unit:48 Type: 64
Position: 0.000" Status:S Error: 0
Inputs:----- Outputs:-----
Type Height Width Offset
0.00" 0.00" 0.00"
Device On Line
Part Type
Part Height 0.00"
Part Width 0.00"
Offset 0.00"
Command          Send Program
```

Figure 6d-2. Notcher Status Screen

If no parts are programmed, the screen will have the information shown above. When parts are programmed, this screen will show the characteristics of the programmed part.

The Command line allows the operator to send a new set of dimensions to the **MP342** controller for pinning sheets not made by the **MP342** controller. The Command line may also be used to clear the **MP342's** memory, if necessary. By highlighting the Command line and pressing the PICK key, the Clear Memory command will be shown on the display. Pressing ENTER will send the Clear Memory command to the **MP342**.

To exit this screen hit the SETUP button.

MP342 Switch Settings

Switch	Description
1	Unit ID, OFF = Unit 48/ON = Unit 49
2	Unit ID, Must be OFF
3	Unit ID, Must be OFF
4	OFF = One Speed/ ON = Two Speed
5	Not Used, Must be OFF
6	OFF = No Boost/ ON = Boost
7	Unit ID, Must be ON

MP342 Inputs

Inputs	Description
1	Jog Forward
2	Jog Reverse
3	Sheet Detect
4	Run Enable
5	Setup/Lockout
6	Not Used
7	Manual End Notch
8	Manual Vee Notch

MP342 Outputs

Outputs	Description
1	Forward/Fast
2	Slow
3	Reverse
4	Run
5	End Notch
6	Vee Notch
7	End Notch Up / Boost
8	Vee Notch Up / Boost

Appendix: MP343 Pinspotter Controller

The **MP343** is a computer controller used to run a pinspotting device for pinning insulation to the inside of HVAC ductwork. It can be used independently to run the PINSPOTTER or linked to an **XL120** controller via RS485 communications. The data is then automatically downloaded to the **MP343** as to what size part will be coming next.

The **MP343** has the capability to run the conveyor system feeding the material through the PINSPOTTER. Once the **MP343** is placed into RUN, the forward output turns on and stays on. The PINSPOTTER controller can be run in a single speed mode or in a two speed mode.

If the PINSPOTTER SETUP is highlighted and ENTER is selected, the PinSpotter setup screen can be seen. There will be a slight delay while this screen is being loaded.

11:45AM 9/05/97 0FPM 0.000"	
ORDER 0Ft	
MATERIAL N/A% COMP.	
Parameters	Value
Detect-Fire	0.000"
Fire Reaction	0.0000sec
Fire Dwell	0.000sec
Delay After Fire	0.0sec
Load Dwell	0.000sec
Hi Vel Distance	12.000"
Lo Vel Distance	6.000"
Sp Vel Distance	12.000"
Hi MaxEdge Dist	4.000"
Hi MinEdge Dist	4.000"
Hi Max Brk Dist	4.000"

Figure 7a-1. PinSpotter Setup Screen

Detect-Fire

The DETECT-FIRE is the distance from the sheet-detect switch to the center of the pin fire mechanism. This distance should be as accurate as possible. The DETECT switch must be a normally open switch.

Fire Reaction

The FIRE REACTION time is the time delay between the time that the fire signal occurs, and the time that the pins enter the material. To calculate the FIRE REACTION time, use the following steps:

1) Set the FIRE REACTION time to zero. 2) Run a sheet of material through the Pinspotter. 3) Measure the distance from the leading edge of the part to the first row of pins minus any programmed offset distance. 4) Calculate the FIRE REACTION using the actual leading edge to pins distance and the programmed leading edge to pins distance as follows:

$$\text{Fire Reaction Time} = \left[\frac{\text{Actual Distance} - \text{Prog. Distance}}{\text{Line Speed (in FPM)}} \right] \times 5$$

Fire Dwell

The FIRE DWELL parameter sets the time duration of the PIN FIRE cycle, in seconds. The range of time allowed is 0.001 to 9.999 seconds and is set to the nearest millisecond.

Delay After Fire

The DELAY TIME is the amount of time between the PIN FIRE output turning off, and the PIN LOAD output turning on. The range of time allowed is 0.00 to 9.99 seconds.

Load Dwell

The LOAD DWELL parameter sets the time duration of the PIN LOADING device to be activated. The range of time allowed is 0.001 to 9.999 seconds.

Hi Vel Distance

The HIGH VELOCITY DISTANCE parameter sets the maximum spacing between the pins when making High Velocity Ductwork. The **MP343** will place the pins between the MINIMUM SPACING DISTANCE and the HIGH VELOCITY DISTANCE. The default distance is 6.000 inches.

Lo Vel Distance

The LOW VELOCITY DISTANCE parameter sets the maximum spacing between the pins when making Low Air Velocity Ductwork. The **MP343** will place the pins between the MINIMUM SPACING DISTANCE and the LOW VELOCITY DISTANCE. The default distance is 12.000 inches.

Sp Vel Distance

The SPECIAL VELOCITY DISTANCE parameter sets the maximum spacing between the pins when making Special Air Velocity Ductwork. The **MP343** will place the pins between the MINIMUM SPACING DISTANCE and the SPECIAL VELOCITY DISTANCE. The default distance is 6.000 inches.

Hi MaxEdge Dist

When making ductwork for High Velocity Airflow, the HIGH MAXEDGE DISTANCE is the farthest location away from an edge that the PINSPOTTER will place pins. The **MP343** will place the pins between the HIGH MAXEDGE DISTANCE and the HIGH MINEDGE DISTANCE. The default distance is 4.000 inches.

Hi MinEdge Dist

When making ductwork for High Velocity Airflow, the HIGH MINEDGE DISTANCE is the closest that the PINSPOTTER will place pins to an edge. The **MP343** will place the pins between the HIGH MAXEDGE DISTANCE and the HIGH MINEDGE DISTANCE. The default distance is 4.000 inches.

Hi Max Brk Dist

When making ductwork for High Velocity Airflow, the HIGH MAX BRK DISTANCE is the farthest location away from a bend that the PINSPOTTER will place pins. The **MP343** will place the pins between the HIGH MAX BRK DISTANCE and the HIGH MIN BRK DISTANCE. The default distance is 4.000 inches.

Hi Min Brk Dist

When making ductwork for High Velocity Airflow, the HIGH MIN BRK DISTANCE is the closest to a bend that the PINSPOTTER will place the pins. The **MP343** will place the pins between the HIGH MAX BRK DISTANCE and the HIGH MIN BRK DISTANCE. The default distance is 4.000 inches.

Lo MaxEdge Dist

When making ductwork for Low Velocity Airflow, the LOW MAXEDGE DISTANCE is the farthest location away from an edge that the PINSPOTTER will place pins. The **MP343** will place the pins between the LOW MAXEDGE DISTANCE and the LOW MINEDGE DISTANCE. The default distance is 4.000 inches.

Lo MinEdge Dist

When making ductwork for Low Velocity Airflow, the LOW MINEDGE DISTANCE is the closest that the PINSPOTTER will place pins to an edge. The **MP343** will place the pins between the LOW MAXEDGE DISTANCE and the LOW MINEDGE DISTANCE. The default distance is 4.000 inches.

Lo Max Brk Dist

When making ductwork for Low Velocity Airflow, the LOW MAX BRK DISTANCE is the farthest location away from a bend that the PINSPOTTER will place pins. The **MP343** will place the pins between the LOW MAX BRK DISTANCE and the LOW MIN BRK DISTANCE. The default distance is 4.000 inches.

Lo Min Brk Dist

When making ductwork for Low Velocity Airflow, the LOW MIN BRK DISTANCE is the closest to a bend that the PINSPOTTER will place the pins. The **MP343** will place the pins between the LOW MAX BRK DISTANCE and the LOW MIN BRK DISTANCE. The default distance is 4.000 inches.

Sp MaxEdge Dist

When making ductwork for Special Velocity Airflow, the SPECIAL MAXEDGE DISTANCE is the farthest location away from an edge that the PINSPOTTER will place pins. The **MP343** will place the pins between the SPECIAL MAXEDGE DISTANCE and the SPECIAL MINEDGE DISTANCE. The default distance is 4.000 inches.

Sp MinEdge Dist

When making ductwork for Special Velocity Airflow, the SPECIAL MINEDGE DISTANCE is the closest that the PINSPOTTER will place pins to an edge. The **MP343** will place the pins between the SPECIAL MAXEDGE DISTANCE and the SPECIAL MINEDGE DISTANCE. The default distance is 4.000 inches.

Sp Max Brk Dist

When making ductwork for Special Velocity Airflow, the SP MAX BRK DISTANCE is the farthest location away from a bend that the PINSPOTTER will place pins. The **MP343** will place the pins between the SP MAX BRK DISTANCE and the SP MIN BRK DISTANCE. The default distance is 4.000 inches.

Sp Min Brk Dist

When making ductwork for Special Velocity Airflow, the SP MIN BRK DISTANCE is the closest to a bend that the PINSPOTTER will place the pins. The **MP343** will place the pins between the SP MAX BRK DISTANCE and the SP MIN BRK DISTANCE. The default distance is 4.000 inches.

Minimum Spacing

The MINIMUM SPACING parameter is the minimum amount of space that will be between the rows of pins. This is a physical characteristic of the machine and is dependent upon how fast the Pinspotter can reload, and how fast the line speed is. The **MP343** will place the pins between the MINIMUM SPACING distance and the HI, LO, or SP VEL DIST. The default distance is 3.000 inches.

Missed Pin Mode

When a row of pins are fired and there is not enough time to load the Pinspotter before the next row of pins needs to be fired, the **MP343** will display a MISSED PUNCH error and stop the line (if the MISSED PIN MODE is set to NORMAL). With the MISSED PIN MODE set to IGNORE, the row of pins will be skipped and no error will be displayed.

With the MISSED PIN MODE set to FIRE, the **MP343** will fire a row of pins as soon as the FIRE DWELL TIME, DELAY AFTER FIRE TIME, and LOAD DWELL TIME have elapsed.

NOTE: With this mode set to FIRE, the Max Edge, Min Edge, and Brake Distance are ignored, so the pins may be fired closer to bends and edges than preferred.

Speed Logic

The **MP343** controller has four outputs which control the speed and direction of the machine. To accommodate more than one wiring possibility, the controller may be run with one of two different SPEED LOGIC settings: FORWARD/SLOW or FAST/SLOW. The controller outputs are defined differently for each logic setting. The outputs, their definitions, and their states in various conditions are shown in tables 1 and 2. Any number key toggles between FORWARD/SLOW and FAST/SLOW. Select the appropriate SPEED LOGIC to match your machine wiring configuration.

Machine State					
	Run Fast	Run Slow	Jog Fwd	Halt	Jog Rev
Output 1 (FOR)	ON	ON	ON	OFF	OFF
Output 2 (SLOW)	OFF	ON	OFF	ON	OFF
Output 3 (REV)	OFF	OFF	OFF	OFF	ON
Output 5 (RUN)	ON	ON	OFF	OFF	OFF

Table 7a-1. Status of Outputs in Forward-Slow

Note: All Jogging is performed at fast speed

Machine State					
	Run Fast	Run Slow	Jog Fwd	Halt	Jog Rev
Output 1 (FOR)	ON	OFF	ON	OFF	OFF
Output 2 (SLOW)	OFF	ON	OFF	OFF	OFF
Output 3 (REV)	OFF	OFF	OFF	OFF	ON
Output 5 (RUN)	ON	ON	OFF	OFF	OFF

Table 7a-2. Status of Outputs in Fast-Slow

Note: All Jogging is performed at fast speed

Min Slow Distance

This parameter is used on two speed lines and determines when to put the line into slow speed. The controller will automatically calculate when to start slowing down, and then this distance is added to it (if the DECEL MODE is set to AUTO). Increase this value for a longer slow distance. Decrease this value for a shorter slow distance.

A longer slow distance can improve part accuracy but too long a value can slow production. The distance should be set long enough that the material fully reaches the slow speed before stopping.

The **MP343** controller calculates the distance from the programmed position that the machine should shift into slow speed. This is based on the speed of the material and the deceleration characteristics of the machine.

A minimum amount of slow distance can be manually set by this parameter. It is added to the calculated slow distance to extend the time spent in slow speed (if the DECEL FACTOR is set to AUTO).

When the DECEL FACTOR AUTO setting is used, it is best to set this parameter to a few inches initially until the system has been calibrated and the controller has had a chance to get accustomed to the behavior of the machine. When the machine is running good parts repeatedly, reduce the MINIMUM SLOW DISTANCE as much as possible to increase the production rate, making sure that the material is at a constant velocity (slow speed) before stopping.

Decel Factor Mode

On two-speed machines, a DECELERATION (DECEL) FACTOR is used by the **MP343** controller when changing from fast to slow speeds. The user has the option to select from three DECEL FACTOR MODES: AUTO, MANUAL, or OFF.

AUTO: A DECEL FACTOR is automatically maintained by the controller. It is expressed in inches-per-second-per-second (In/Sec²) and is used in the Adaptive Slowdown calculation. The parameter can be overridden but will change on the next movement.

MANUAL: A DECEL FACTOR may be manually entered into the **MP343** controller. The value is used in the Adaptive Slowdown calculation. Some trial and error may be necessary when in the MANUAL mode to

find a DECEL FACTOR which works properly. Ideally, the machine should shift from fast to slow at some distance prior to the target long enough so that it reaches a constant slow velocity before the movement outputs are turned off.

If the machine tends to shift into slow too soon, increase the DECEL FACTOR. If the machine tends to shift into slow too late, decrease the DECEL FACTOR. The DECEL FACTOR should be used in conjunction with the MINIMUM SLOW DISTANCE to determine the ideal time to change from fast to slow.

While in the MANUAL mode, the AMS controller will not calculate a new value for the DECEL FACTOR after each stop.

OFF: No DECEL FACTOR is used and the controller will not make an Adaptive Slowdown calculation. The machine will shift from fast to slow when the backgauge has reached the MINIMUM SLOW DISTANCE before the target. For example, if the MINIMUM SLOW DISTANCE has been set to four inches, the machine will shift from fast to slow 4 inches before the programmed position. This may or may not be enough distance for the machine to decelerate properly.

The DECEL FACTOR mode defaults to OFF but may be used in MANUAL or AUTO to increase productivity.

Decel Factor

This parameter is expressed in inches-per-second-per-second (In/Sec²) and is used in the Adaptive Slowdown calculation discussed in the DECEL FACTOR MODE above. There is no exact formula for this value so experimentation is necessary. Ideally the machine should shift from fast to slow at some distance prior to the target so that it reaches a constant slow velocity before the movement outputs are turned off. This value is automatically calculated by the controller if the DECEL FACTOR MODE is set to AUTO.

Resolution

The RESOLUTION parameter defines the length of material movement for each increment of the encoder. It is a function of the circumference of the measuring wheel and the number of counts per

revolution of the encoder. The formula for calculating RESOLUTION is as follows:

$$\text{Resolution} = \frac{\text{Circumference}}{4 \times \text{Encoder Count}}$$

For an AMS encoder, the encoder count is the model number of the encoder. A Model 256 is a 256 count encoder. A Model 1000Z is a 1000 count encoder.

The most common wheel used has a circumference of 12 inches. For this size wheel, RESOLUTION would be as follows:

Model	Resolution
256	0.01171875
256Z	0.01171875
500	0.006
500Z	0.006
1000Z	0.003

It is not necessary to precisely measure the circumference or calculate the formula to any great precision. Nominal values can be used with precise results achieved during calibration.

Values between 0.00004000 inches and 0.04000000 inches are acceptable.

Correction

The CORRECTION FACTOR adjusts for errors in the size and tracking of the measuring wheel. It is expressed as a percentage, with 100% being no correction. Increasing the CORRECTION FACTOR causes the pins to become further apart and decreasing the value reduces the distance between the pins.

Filter Constant

The FILTER CONSTANT can be adjusted in order to improve accuracy. A low value should be used on machines with very stable line speeds. A high value (greater than 50 Hz) should be used when rapid fluctuations in line speeds occur. Some trial may be necessary to achieve an accurate value. The default value is 32 Hz, which is considered to be on the high side of the low values. The controller will allow values from 1.0 Hz to 200.0 Hz.

Units

Length measurements can be programmed and displayed as either English inches or Metric millimeters. Press any number key or the PICK key to toggle through the choices.

To exit the PINSPOTTER SETUP screen push the SETUP key.

PinSpotter Status

To view the PINSPOTTER STATUS you must first be in the DOWN STREAM MACHINES CONFIGURATION SCREEN, figure 4-3. Highlight the DOWN STEAM MACHINES line and hit ENTER. Highlight the PINSPOTTER STATUS line and hit ENTER to view the status screen.

```

1:46PM 9/05/97 0FPM 0.000"
ORDER 0Ft
MATERIAL N/A% COMP.
MP343 Version:13.01 Unit:52 Type: 68
Position: 0.000" Status: Stopped
Inputs:----- Outputs:-2-----
Device: Offline

Type Height Width Offset BendAllow
0.00 0.00 0.00 0.00
Velocity
NO

Press Enter for Program Page
  
```

Figure 7a-2. Pinspotter Status Screen

If no parts are programmed, the screen will have the information shown above. When parts are programmed, this screen will show the characteristics of the programmed part.

The information shown on the Status Screen includes the current **MP343** version, unit and type number, the part position, the controller status, input and output status, on line and off line status, as well as the current part information.

The controller status options are Stopped, Moving, Jog Fwd, Jog Rev, and Enabled.

Pressing the Enter key will take you to the Program page as shown in figure 7a-3.

```
2:03PM 9/05/97 0FPM 0.000"  
ORDER 0Ft  
MATERIAL N/A% COMP.  
MP343 Version:13.01 Unit:52 Type: 68  
Device Off Line  
Part Type  
Part Height 0.00"  
Part Width 0.00"  
Offset 0.00"  
Bend Allowance 0.00"  
Velocity NO  
Command Send Program
```

Figure 7a-3. Pin Spotter Program Page.

The first function of this screen is to set the downstream machine into the “Local” or “Remote” mode. This is done with the “Device” parameter. Pressing the “Pick” key will toggle between the choices of ON LINE and OFF LINE. After the proper mode is selected, use the “Enter” key to lock the choice in.

If ON LINE is chosen, the downstream device will be in the “Remote” mode and controlled by the **XL120**. When the Device is “ON LINE” the part information is sent to the downstream controller. This information will include the Part Type, Part Height, Part Width, Offset, Bend Allowance, and Velocity parameters.

If OFF LINE is chosen, the downstream device will be in the “Local” mode and is designed to operate independently, without using the **XL120** as a controlling device. In this mode sheets can be programmed with the downstream controller.

The Command line allows the operator to send a new set of dimensions to the **MP343** controller for pinning sheets not made by the **XL120** controller. The Command line may also be used to clear the **MP343’s** memory, if necessary. By highlighting the Command line and pressing the PICK key, the Clear Memory or Reference command will be shown on the display. Pressing ENTER will send the specified command to the **MP343**. The command options are “Send Program”, “Reference”, and “Clear Memory”. The “Reference” command is used only on the Backgauge controller and is ignored by the **MP343**. To exit this screen hit the SETUP button.

Operating Procedure

Pin Placement

The following are the rules that the **MP343** follows to determine where the rows of pins must be located based on the size and velocity of the duct.

1. Always put a row of pins between the min and max edge distance from the leading and trailing edges of the sheet of metal. Unless there is a conflict, put holes in the middle of these limits.
2. Never space rows of pins less than the minimum spacing (this is a machine limitation).
3. Never put a row of pins closer than the min edge distance from a brake line.
4. Never put rows of pins spaced greater than the specification spacing (i.e. High Velocity Distance) unless rules 1 through 3 would be violated.
5. Never put a row of pins greater than the max edge distance from a brake line unless it conflicts with rules 1 through 4.
6. Always try to put a row of pins the median edge distance from a brake line unless a row of pins could be saved by putting the last row within the max edge distance from the brake line.
7. If rules 1 through 4 result in the specification spacing not being met, then make only one row of pins out of specification so that an extra row of pins can be put in by hand. If this happens, the “out of spec” output will turn on. If the pin locations can be programmed entirely within specification, the “out of spec” output will be off.

NOTE:

If the velocity is “none”, the Pinspotter is disabled and the “No Liner” output will turn on.

Programming

The programming of parts is done with the **XL120** controller. Refer to the Parts Programming section of the manual for the proper procedure.

A second method of programming the parts for the **MP343** is by using the Pin Spotter Program page, figure 7a-3 on page 7a-12.

Type Part Type - One of four options:
Single sheets which will not cause the Backgauge to move

L “L” shaped, single bend duct

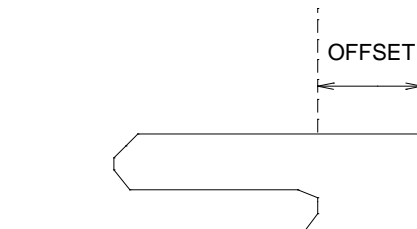
U “U” shaped, double bend duct

0 Wraparound, triple bend duct

Height The height of the duct .

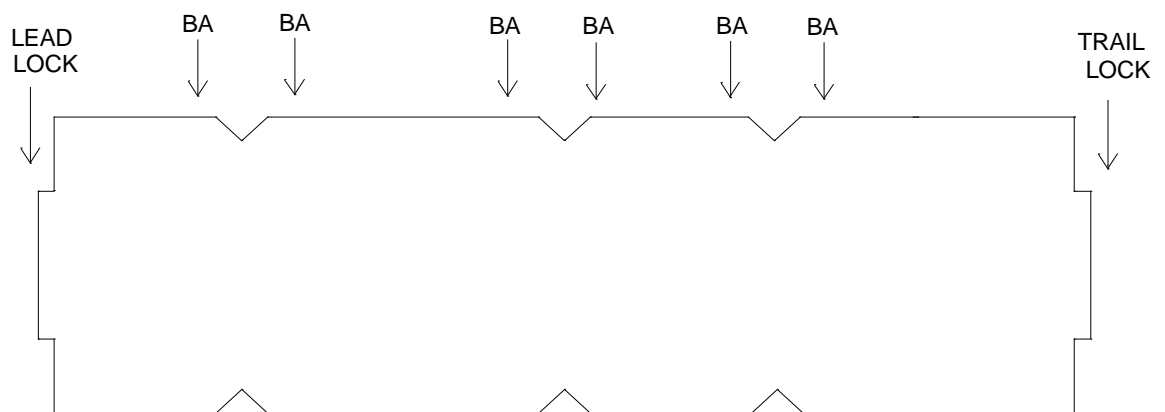
Width The width of the duct.

Offset The lip that is added to some sheets' length when the lock is formed and is not counted toward the length of the part.



Bend Allowance

“Bend Allowance” is the length that is subtracted from each side of the part. This is used to compensate for gain due to each bend and the difference between real and nominal measures. For example, when making a rectangle shaped part (wrap-around type), there will be three corner notches for the three bends. At each bend the **MP343** controller will subtract the BEND ALLOWANCE from both the height section and the width section. So on a part with three bends, the controller subtracts a total of 6 BEND ALLOWANCES from the overall part length. This is shown in figure below.



Velocity Different velocities require different pin spacing for the insulation. Valid options: H (high), L (low), S (special), and N (none).

Run Operation

Once the RUN ENABLE input (#4) is closed, the **MP343** will turn on the RUN and FORWARD outputs until the RUN ENABLE input opens, or the front panel HALT button (if available), is pressed. The **MP343** will only fire pins in the RUN mode when the sheet detect switch (input #3) is closed.

Note: In order for the MP343 to automatically receive parts data from the XL120, it must be put "on line". To do this, go to the Backgauge Status Screen by highlighting "Downstream Machines" in the Setup Menu and pressing "Enter". Highlight "Backgauge Status" and press "Enter". Press "Enter" again to go to the Backgauge Program Screen. Highlight the top row labeled "Device" and press the "Pick" key to toggle the option to "On Line". It can also be done at the MP343 controller, if it has a front display panel. Press the "Setup" key and press the number "3 = Loc / Remote". Local or Remote mode is indicated on the Status Screen, top row, next to the line speed indicator.

Front Panel Run/ Remote Run Mode

If using the FRONT PANEL RUN button, jumper input 4 (Run/Enable) of the **MP343** controller to DC common.

If using a REMOTE RUN/ HALT circuit, Input 4 is the Run input. The Run output (#4), should be used to latch the input, refer to the enclosed Electrical Interface Diagram for wiring. When using a REMOTE RUN, the HALT button on the front panel of the **MP343** (if available), will still halt the operation.

Specification

Parameter	Panel Mount	AC Console
-----------	-------------	------------

Mechanical

Size	8"X12.5"X2.25"	8"X12.5"X7.5"
Weight	7lbs.	15lbs.

Electrical

Input Voltage	24VDC \pm 5%	115VAC \pm 10%, 50-60Hz
Input Current	.5 Amp.	1 Amp.

Outputs

Forward/Fast	Std DC	Std DC, AC Relay
Slow	Std DC	Std DC, AC Relay
Reverse	Std DC	Std DC, AC Relay
Run	Std DC	Std DC, AC Relay
Fire	Std DC	Std DC, AC Relay
Load	Std DC	Std DC, AC Relay
No Liner	Std DC	Std DC, AC Relay
Out of Spec.	Std DC	Std DC, AC Relay

Inputs

Jog Forward	Yes	Yes
Jog Reverse	Yes	Yes
Sheet Detect	Yes	Yes
Run Enable	Yes	Yes
Security	External	Internal
Not Used		
Not Used		
Manual Cycle	Yes	Yes

(Note: The following parameters apply equally to all versions.)

Output Characteristics

Standard DC

Type	Open Collector Transistor
Maximum Current	4 ADC
Maximum Applied Voltage	35 VDC

AC Relay

Type	Form A Dry Circuit Relay
Maximum Current	5 Amp.
Maximum Applied Voltage	240VAC

Solenoid Driver

Type	High Voltage Internal Driver
Minimum Load Resistance	12 Ohms
Maximum Voltage Generated	65 VDC
Maximum Actuation Time	0.25 Seconds

Encoder Input

Type	Quadrature with Complements
Voltage	5VDC
Maximum Encoder Load	200 milliamperes
Maximum Pulse Rate	275,000 pulses/second

Operation

Maximum Part Length	9999.99 inches 9999.99 millimeters
Units of Measurement	inches, or millimeters

MP343 Switch Settings and I/O

MP343 Switch Settings

Switch	Description
1	Unit ID, see settings below
2	Unit ID, must be OFF
3	Unit ID, must be ON
4	OFF = One Speed/ ON = Two Speed
5	Encoder Direction
6	Not Used, must be OFF
7	Unit ID, must be ON

The proper Unit ID switch setting for the **MP343** is: switches 3 and 7 ON. Switches 1, 3, and 7 ON is also a valid Unit ID number for the **MP343**.

SW1	SW2	SW3	SW7	Unit ID
OFF	OFF	ON	ON	52
ON/OFF	ON	ON		53

MP343 Inputs

Inputs	Description
1	Jog Forward
2	Jog Reverse
3	Sheet Detect

4	Run Enable
5	Setup/Lockout
6	Not Used
7	Not Used
8	Manual Cycle

MP343 Outputs

Outputs	Description
1	Forward/Fast
2	Slow
3	Reverse
4	Run
5	Fire
6	Load
7	No Liner
8	Out of Spec.