

Open Loop Controller MP SERIES

Reference Manual

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Introduction and Product Description

The AMS **MP300 SERIES** controller is a length control system used on roll formers and cut-to-length machines that produce sheet metal parts from coil stock. The **MP300 SERIES** controller is the most advanced control system available and will greatly enhance the performance and productivity of these machines. Other control systems use general-purpose electronic counters as the length control device. These systems can be difficult to use and offer little added benefit beyond material measurement and piece counting. The AMS controller is a custom designed microcomputer that is designed exclusively for cut-to-length machines, which enables the **MP300 SERIES** controller to offer many features not available on simple electronic counters.

In seeking to design a new generation electronic length control system, AMS Controls had the following goals in mind:

- Improve the length accuracy
- Improve the machine productivity
- Reduce the amount of material waste
- Provide in-line punching control (if using punching option)
- Easy for the operator to use
- Adaptable to a wide variety of machines

All of these goals have been achieved with the design of the **MP300 SERIES** Controller.

Accuracy

On most cut-to-length machines without servo drives, accuracy depends upon 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, accuracy is lost when machine fluctuations occur. The **MP300 SERIES** controller, however, 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 AMS controller in three ways. First, the improved accuracy with the **MP300 SERIES** 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 multiple order feature 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 AMS 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.

Easy to Use

The **MP300 SERIES** Controller is a sophisticated computer running a very complex program. This does not, however, mean that a computer expert is required to operate it. The controller has a liquid crystal display (LCD) that prompts the operator for information in plain English and with words that are familiar. On the "Status" display, the operator can see the order that is being run, his progress through the order, and the speed of the line.

Easy to Install

The **MP300 SERIES** Controller has logic built into it to handle most machine control functions. The user does not need to add Programmable Logic Controllers (PLCs) or relay logic circuits to get the correct machine sequence and safety features.

The AMS controller 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 it is connected to. It can then limit the list of parameters that must be programmed to only those that apply to this type of machine.

About this Manual

This manual gives detailed information on the installation, operation, and maintenance of the **MP300 SERIES** Controller. Instructions for installing the AMS Controller on most machine types are included. AMS engineers can help on installation conditions not covered by this manual. Instructions on how to operate the controller are included. This covers how to program orders and run them. It also covers the best way to handle a variety of special circumstances that can come up with most machines of this type. Another section of the manual includes a guide to follow if problems should arise.

The Setup sheet in Appendix A of this manual provides 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. If calling AMS 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 when the controller is turned on).

Note: AMS Controls reserves the right to change the operation and/or directions within the manual without notice or approval.

System Description

An Electronic Length Control System is the controlling mechanism for machines that produce individual parts from a coil of stock material. Block diagrams of some sample systems are shown in Figures 1-1 through 1-2. Many other configurations are also possible.

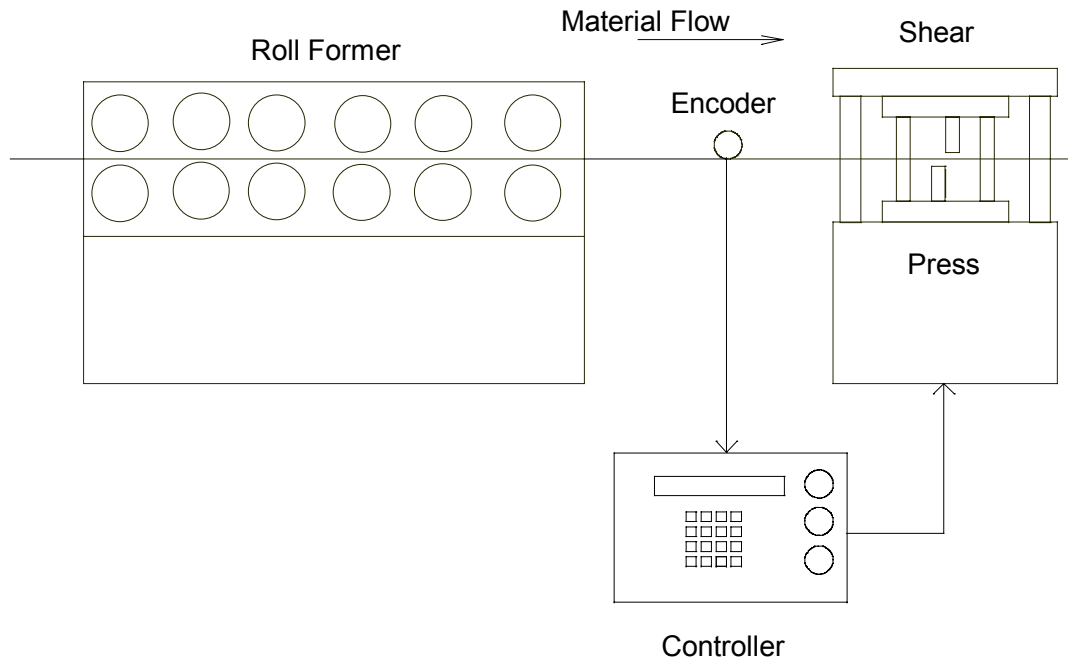


Figure 1-1. Electronic Length Control System Block Diagram

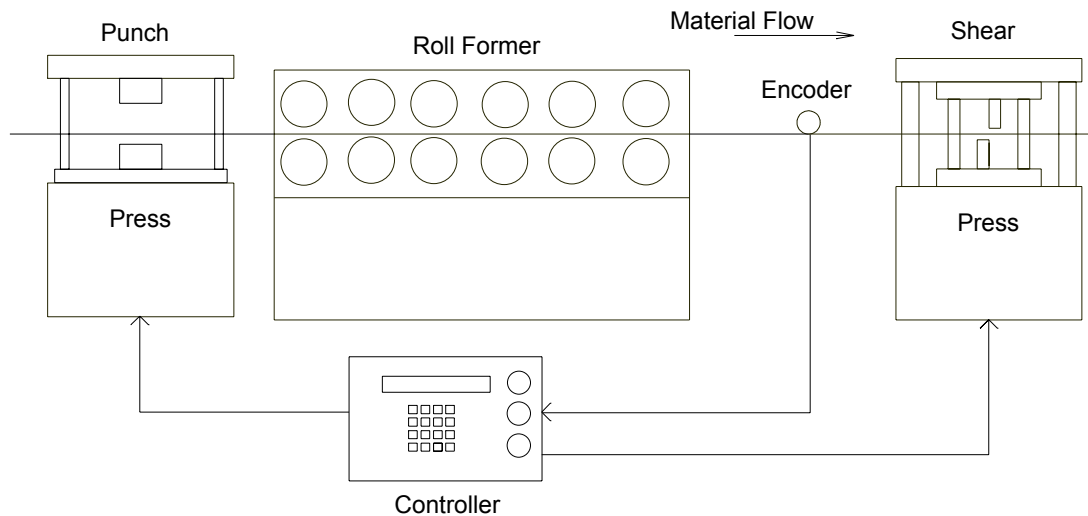


Figure 1-2. Control System with a Shear and a Punch

The controller performs the following functions:

- Controls the material movement through the machine.
- Measures the amount of material moving past the cutoff press.
- Cycles the punch presses at programmed points.
- Cycles the cutoff press at the programmed length.
- Stops the machine when the correct number of parts is produced.

The measuring device is an optical shaft encoder, also called a pulse generator. A wheel with a known circumference is attached to the encoder and rides on the material. As the material moves through the machine, the wheel rotates and the encoder generates electrical pulses proportional to the amount of material moved. The controller counts these pulses to determine how much material has moved through the machine. When the material reaches a point where a punch is needed, the controller cycles the punch press. When the material past the cutoff press is equal to the length of the part programmed, the controller cycles the shear press and increments the quantity that is DONE. When the quantity DONE is equal to the programmed quantity, the controller stops the machine, unless other items are programmed to run immediately.

There are two basic categories of automatic cutoff machines: flying cutoff machines and feed-to-stop machines. With flying cutoff machines, the material does not stop for each cut and the cutoff die moves along with the material during the shearing cycle. With a feed-to-stop machine, the controller stops the material for each cut and the cutoff die remains at a fixed location. The common practice for this type of machine is to shift into a creep speed just before the cutoff point to increase the precision of the cut and reduce the jolt that can occur if the material is abruptly stopped. The controller controls both the speed shift and the stopping action.

The **MP350P** controller provides similar control for an in-line punch press, which eliminates the need for secondary operations on the cut piece. The punch press may operate on the fly, or in a stopping mode, and may or may not be preceded by a shift of speed, independently of the shear configuration.

MP300 SERIES Controller Hardware Description

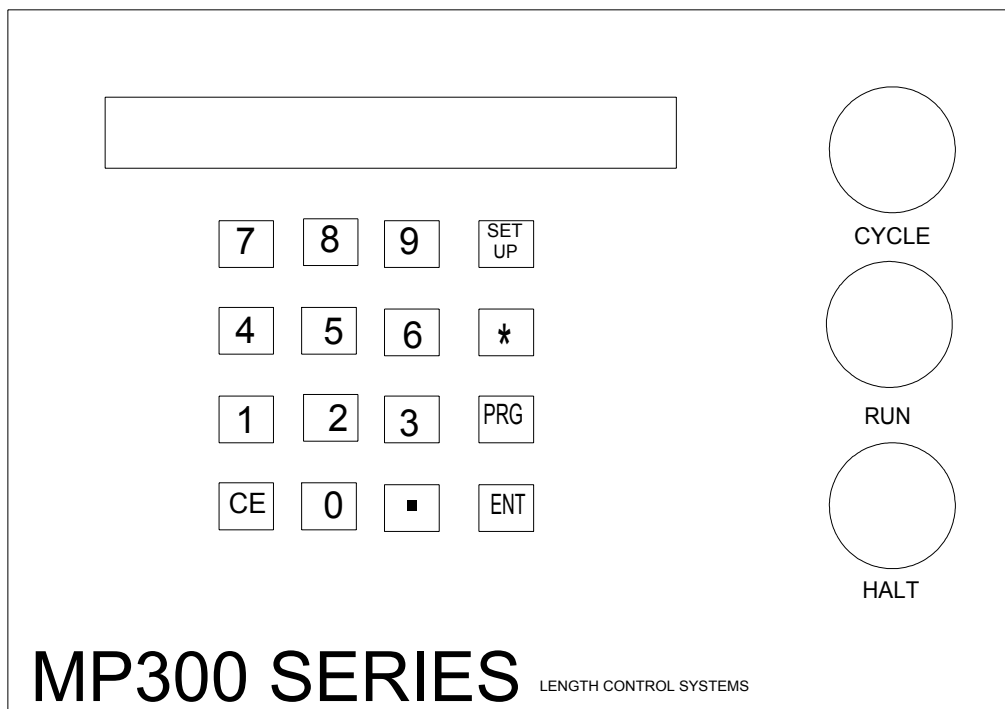


Figure 1-3. MP300 SERIES Front Panel

Microcomputer

The **MP300 SERIES** controller is the control 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 PROM (Programmable Read Only Memory) memory, instead of a disk. These programs were written by AMS to perform the specific task of length control. The PROM 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 **MP300 SERIES** controller, a battery maintains this memory when the controller is 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.

Operator Interface

Replacing the monitor and keyboard of a PC, the **MP300 SERIES** controller has an LCD (Liquid Crystal Display) screen and a small keypad. The LCD has two lines of display with 24 character positions on each line. The keypad, shown in Figure 1-4, has 16 keys for basic numeric entry. Any non-numeric data required is achieved by scrolling through the available options on the display and selecting the correct one. For example, units of measurement are displayed in inches, centimeters, or millimeters.

When selecting this parameter, pressing any number key will cause the display to toggle between "English", "Metric CM", and "Metric MM". Pressing the ENTER key when the correct variable is displayed will select that option. This method keeps the data entry simple and avoids spelling errors.

There are three control push button switches on the panel of the controller for CYCLE, RUN, and HALT functions. These are large industrial grade controls that activate machine functions. The CYCLE switch is used to cycle the SHEAR and to zero the length counter. This function is active in the manual mode on all types of installations. In the automatic mode, the CYCLE switch is only active on non-stopping machines to allow for the operator to cut out bad material without stopping the line.

The RUN switch is used to put the controller in the automatic mode and to start production. If the controller is configured for REMOTE RUN, the RUN push button will no longer be active (See RUN CIRCUIT in chapter two of this manual). The HALT

switch will stop production and place the controller in the manual mode and is active in both REMOTE and LOCAL modes.

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 will be given.

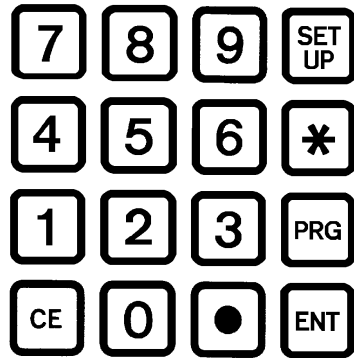


Figure 1-4. MP300 SERIES Keypad

SET UP

This key is used to select one of 2 or 3 menu's to access other items. Among them are: assign the next job to run, increment the quantity of an order to make another part, view the three footage totalizers, adjust the machine setup parameters, perform the Auto Calibrate procedure, perform the Calibrate Trim procedure, enter the Manual Calibrate data, and enter the Input / Output display screen.

Asterisk (*)

This key is a STATUS key which allows the operator to view the current job number in progress, the number of parts assigned to a job with the number left to run, and the current position of the material past the shear.

PRG (Programming)

The PRG key is used to assign a job number and define the quantity and length of parts to be run. If the machine has the punching capabilities, the type of punching option is also defined when programming a part.

CE (Clear Entry)

This is a “Clear Entry” key, the main use of this key 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. It is also used to clear any error messages.

ENT (Enter)

This key can be defined as a “take it” key. The data that is 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 1-5. 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 **MP300 SERIES** 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.

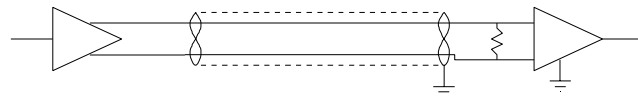


Figure 1-5. Simplified Encoder Channel Circuit

There are eight discrete inputs into the **MP300 SERIES** controller. They sense continuity between an input and a common connection. A typical diagram of a sinking input circuit is shown in Figure 1-6. This circuit requires a 24 VDC biasing circuit that is provided either by the user or by the AMS controller, depending on the controller configuration.

Note that no voltage source should be connected to any input. Doing so can severely damage the controller. Relay contacts, limit switches, or control switches are the most common inputs used. 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 milliamperes.

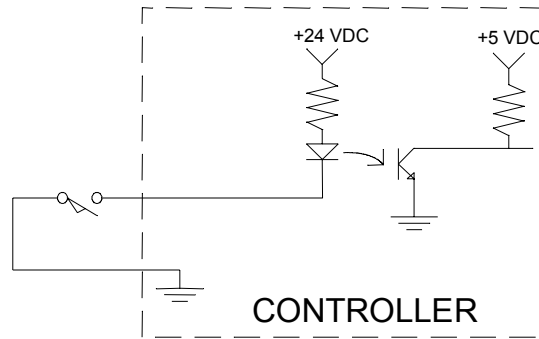


Figure 1-6. Typical Input Circuit

Outputs

The Standard DC output of the **MP300 SERIES** controller is a 4-Ampere open collector transistor. This is available in all configurations and for all outputs. A diagram of a sinking output circuit is shown in Figure 1-7. The biasing voltage for the load can be from 12 to 24 volts. If this voltage source comes from outside of the **MP300 SERIES**, the common of this supply must be connected to the common of the controller. The suppressing diode

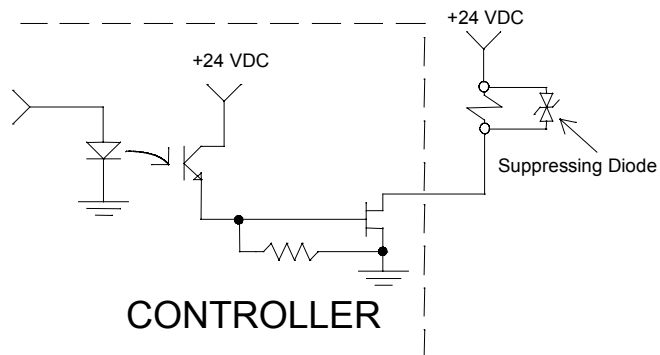


Figure 1-7. Standard DC Output

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.

AC Relay Output

The AC RELAY OUTPUT is a 5-ampere dry circuit relay contact. It is available on the first six outputs of the AC Consolette model and on the FORWARD output of the SL Consolette model. In both models, normally open contacts are available on all outputs and normally closed contacts are available on the FORWARD output.

Solenoid Driver

The SL Consolette model has two special solenoid driver circuits for the PUNCH and DIE BOOST outputs. These circuits provide a 60 VDC pulse to a 24 VDC solenoid for a short duration that greatly decreases the response time of the solenoid. On flying die applications, the response time of the valves directly affects the accuracy. This circuit, when directly connected to the valve solenoid, makes the valve more responsive and consistent. The circuit is designed to limit the duration of the high voltage pulse to avoid damage to the solenoid. This output should not be connected to relays that could be damaged by the high voltage.

Analog Speed Output

If the optional ANALOG SPEED OUTPUT is included, the **MP300 SERIES** controller will provide an analog voltage signal that will vary between 0 and 10 VDC. This output can drive loads as low as 1000 ohms. The signal produced is proportional to the desired machine speed. This voltage can be connected to an AC inverter, a DC drive system, a proportional hydraulic feed system, or any device that can vary the machine speed in proportion to a voltage level. See Chapter 7 for details on the **MP300 Series controller with Analog output**.

Special Features

The **MP300 SERIES** 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. The material, however, is actually cut at a time after the shear pulse (due to delays in the press). It takes time to energize valves, fill cylinders, and move dies. During this delay, the material moves a distance that is proportional to the speed of the material and the duration of this delay. The actual shearing operation is displaced from the point at which the counter activates the shear.

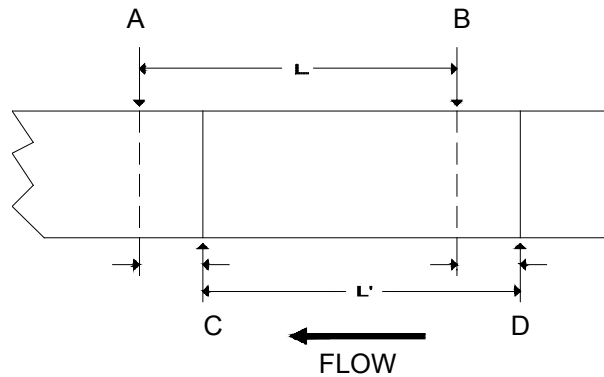


Figure 1-8. Typical Sheared Part Layout.

Figure 1-8 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:

$$L' = L - T_1S_1 + T_2S_2, \text{ where}$$

- L is the programmed part length
- T_1 is the delay time at the leading edge
- S_1 is the line speed at the leading edge
- T_2 is the delay time at the trailing edge
- S_2 is the line speed at the trailing edge

If the speed and delay remain constant, then T_1S_1 will equal T_2S_2 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 **MP300 SERIES** 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 1-9 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 **MP300 SERIES** 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.

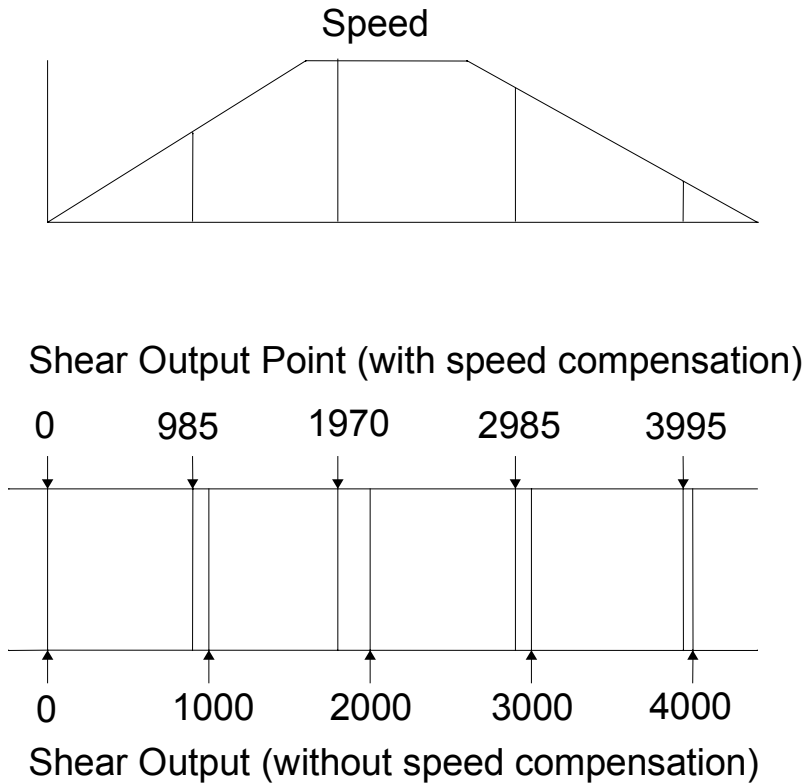


Figure 1-9. Speed Versus Shear Target

Adaptive Compensation for Stopping Machines

Feed-to-stop machines are often 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 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 amount in advance that the machine is set into slow speed is determined by the maximum speed of the machine and how quickly the material can decelerate from high speed to slow speed.

The **MP300 SERIES** controller 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 AMS controller measures the amount of overshoot or undershoot on each move and adjusts its internal parameters to match the characteristics of the machine. The user can specify a tolerance so that accuracy is assured.

The AMS controller also has a feature called Adaptive Slowdown that minimizes the feed time of feed-to-stop machines. Figure 1-10a 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 1-10b, is less time spent in slow speed on short parts which leads to more productivity. The **MP300 SERIES** controller continuously monitors machine parameters to automatically adjust for machine changes.

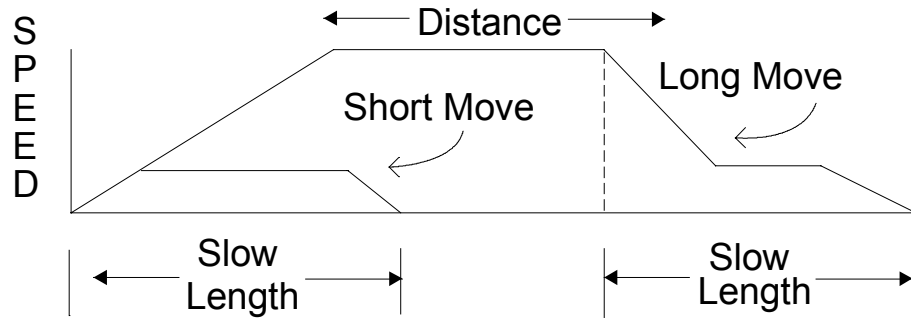


Figure 1-10a. Speed Profile without Adaptive Slowdown

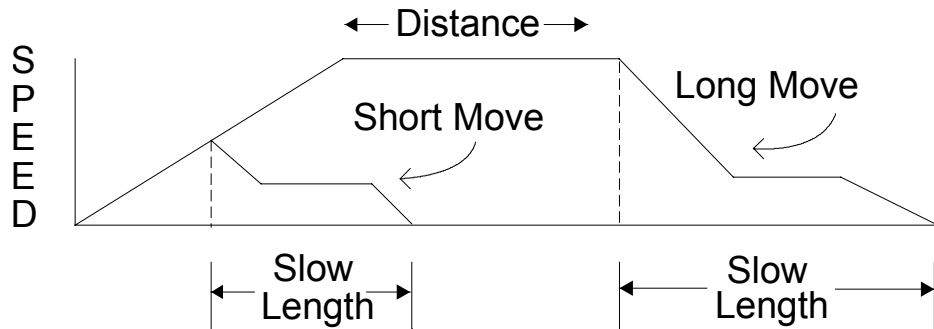


Figure 1-10b. Speed Profile with Adaptive Slowdown

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 has eliminated the need for a PLC by building comprehensive control logic into the **MP300 SERIES** controller. This logic implements the following features:

- Four output configurations for speed control
- Run-Halt control from either the front panel or an 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
- Motor starter interlock circuit
- Automatic Shear or Press operation only in Run mode
- Halt on emergency stop or overload

The result is that the **MP300 SERIES** controller can be adapted to most machines with a minimum amount of external electrical components. The only "programming" that a user must do is select the proper TYPE of machine by setting the configuration switches. The controller then implements the proper logic based upon the TYPE.

Installation

Controller Power

Depending on the model of the controller, an AMS controller may require 24VDC or 115VAC for input power. All input power should be within the specification limits.

Power to the controller should be switched independently of other devices through a separate OFF/ON switch. The emergency stop circuit should not interrupt this power. In an emergency-stop condition, the controller should be able to track any movement of the material, therefore allowing production to resume after the condition is reset without any loss in accuracy. See Figure 2.1.

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 typical emergency stop circuit using a control-reset function is shown in Figure 2.1. Pressing the RESET switch will arm the circuit. The E-stop relay will then pull in and latch in the circuit with a holding contact around the RESET switch. A momentary opening of any contact or safety switch will de-energize the circuit and cut the power to all devices. This circuit is easily expanded by adding contacts, switches or similar devices in series and is adaptable to existing systems.

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 RUN mode. This can be accomplished by breaking the run circuit or dropping the safety interlock input. 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 2.1.

5. The output energizes the “Run Latch” relay (CR3)
6. CR3 closes a set of contacts that latch in around the momentary “Run” switch that started the entire sequence.

LOCAL

In local mode the Remote Start/Stop circuit is not necessary. The RUN and HALT push buttons on the controller’s front panel are used. All other circuitry remains the same and the sequence of events should go as follows:

1. With the E-Stop circuit reset, the operator presses the green “RUN” push button on the controller.
2. The AMS controller detects the input providing the Safety Interlock Input is closed (CR1 at Input 3).
3. If a job is programmed, no errors exist, and all other pertinent items are present, the controller turns on the “Run” output.
4. The controller latches itself in until the red “Halt” push button on the front panel of the controller is pressed.

The Run output should also energize lights, buzzers or other safety devices to let personnel know that the machine is now in automatic mode.

Motion Outputs

The motion outputs available on the model **MP300** controllers are Forward, Fast, Slow, and Reverse. Not all outputs are available on all machines (see figures 2.2 and 2.3 for controller types and their outputs).

The “Forward” or “Fast” outputs should be used to put the material into motion when the controller is placed in the RUN mode.

The “Run” output should be used to latch in the remote run circuit.

Using the “Run” output to put the material into motion could cause some problems in the operation of the machine. First, some controllers will continue to shear or punch after a halt has been performed in order to catch targets as the line coasts to a stop. Second, a “Delay after Shear” feature is available to stop the material motion (Forward or Fast) after each cutoff.

Even though the motion is turned off, in both cases through the “Forward or Fast” output, the “Run” output remains on the entire time. If the “Run” output is used for motion in these cases, the line will not stop at the correct times!

Line Movement

The “Line Movement” parameter was added to the software to handle the situation where the run output is wired for material movement. If the Run output is wired to control the motion of the material, the setup parameter LINE MOVEMENT should be set to “Run”. With the parameter set to “Run”, the Run output turns off immediately after the Halt button is pressed. If the LINE MOVEMENT parameter is set to “Fast/Fwd”, the Run output remains on while the material coasts to stop as it always has.

On two-speed systems, Fwd/Slow or Fast/Slow speed logic, the “Forward” and “Slow” outputs will energize at different times depending on what speed logic is selected. Single speed systems will automatically have the Forward-Slow speed logic. The charts in Table 2.2 and 2.3 show the output logic for each selection.

Machine State					
	Run Fast	Run Slow	Jog Fwd	Halt	Jog Rev
Forward output	ON	ON	ON	OFF	OFF
Slow	OFF	ON	ON	ON	ON
Reverse	OFF	OFF	OFF	OFF	ON
Run	ON	ON	OFF	OFF	OFF

Table 2.2 Status of Outputs in Forward-Slow

Machine State					
	Run Fast	Run Slow	Jog Fwd	Halt	Jog Rev
Fast	ON	OFF	OFF	OFF	OFF
Slow	OFF	ON	ON	OFF	ON
Reverse	OFF	OFF	OFF	OFF	ON
Run	ON	ON	OFF	OFF	OFF

Table 2.3 Status of Outputs in Fast-Slow

Shear Control Circuit

Optimal performance of the shear circuit can be met by customizing the AMS controller 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.

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. See Figure 2.4 for wiring possibilities.

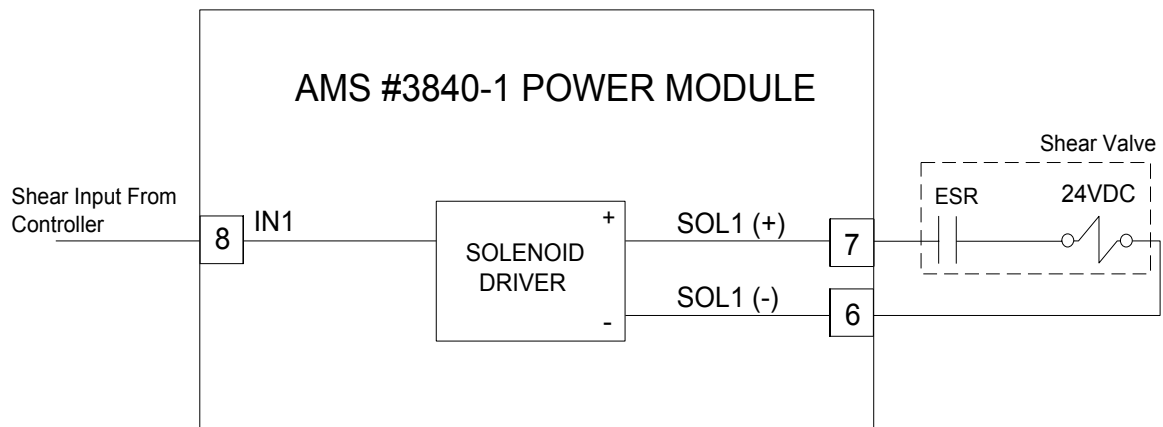


Figure 2.4

If the solenoid for the shear output is not 24VDC, then an attempt should be made to replace the solenoid one that is. 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 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 2.5. If the AMS controller detects a switch closure at the **SHEAR COMPLETE** input during the dwell time, the shear output will turn off immediately (Figure 2.6). 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.

In some applications, a 0.0-second Shear Dwell Time can be programmed if a SHEAR COMPLETE is used. If a shear complete is not detected within ten seconds, then the run output will

be turned off. The SHEAR DWELL UP time will time out as programmed regardless of the complete input.

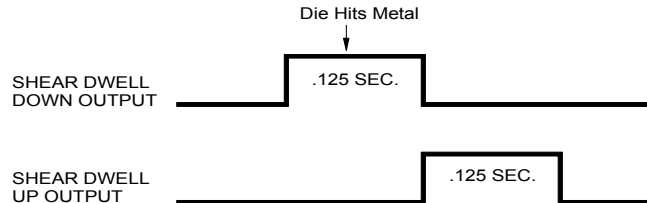


Figure 2.5

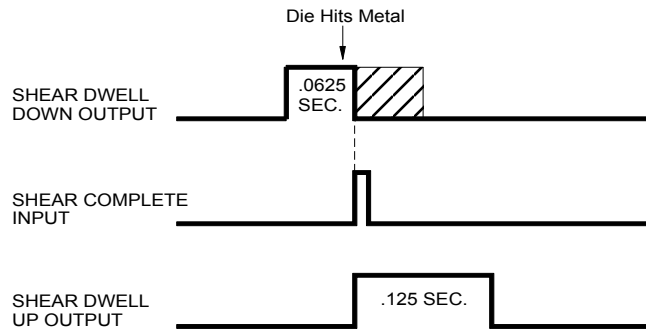


Figure 2.6

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. The press outputs can also signal the AMS 3840 power module or isolation relays for higher voltage solenoids.

Like the shear output, the **PRESS DWELL DOWN** can be programmed from .000 to 0.999 seconds. A PRESS **COMPLETE** input will override the presses timed output and turn off the output immediately upon detection.

In some applications, a 0.0-second time can be programmed if a PRESS COMPLETE is used. If a press complete is not detected within ten seconds, the run output will be turned off.

The **PRESS DWELL UP** will time out as programmed regardless of the press complete input. See Figures 2.5 and 2.6.

Machine Configuration

Initial Power Test

Before plugging in the connectors to the controller, turn on the power and check for the proper voltage at the connectors. For the panel mount version, be sure that the polarity of the 24 VDC is correct (Terminal 1 is +24 VDC and Terminal 2 is DC common). On the two console models (AC and SL), check for 120 VAC from pin J to both pins K and L. Also check for 0 VAC from pin K to pin L, this will ensure that the unit is properly grounded.

With the proper voltage checked at the connectors, turn the power off and plug in the connectors. Reapply power and look for the display to light up after a few second delay. The display should be similar to the one in figure 3-1, below.



Figure 3-1, Initial Display at Power Up.

Make a note of the Version Number that is shown in the lower right corner of the display. Write the software version number on the data sheet that is shown in the Appendix of this manual. If you call AMS Controls with problems or questions, you may be asked for this number.

Configuration Programming

Before the controller is initially powered up, the customization dip switches on the back of the controller must be set. Refer to Chapter 8 for a description of the switches for the model of controller to be installed. If the switches are changed with power on, the power must be cycled so the controller can recognize the new switch positions. Memory will be cleared at this time. If parameters and job data have been entered, record this data for re-entry before changing the switches.

In addition to setting the customization switches, the user can further customize the **MP300 SERIES** by programming parameters in the Configuration mode. If the customizing switches have been changed, the **MP300 SERIES** will erase all memory and go immediately into the Configuration mode.

The Configuration mode can be entered from the Status Screen by pressing the “SET UP” key until the following screen is displayed, and then by pressing the “4” key.

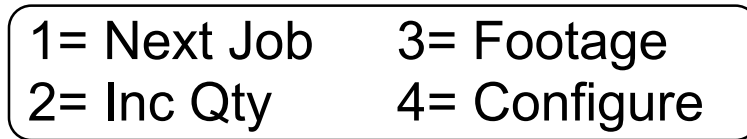


Figure 3-2. Next Job, Inc Qty, Footage, Configure Screen

Some of these parameters are general and apply to all switch settings while others apply only to certain switch settings and certain controllers. In this section, all of the possible setup parameters will be defined. Controller Model Types, in Chapter 8 of this manual, shows the specific parameters for each possible controller so you can see which parameters apply to your particular installation.

General Parameters

When the controller is first energized, the memory has been cleared, or the Configure option is selected, the Configuration Screen will be displayed on the controller. The setup parameters can then be edited and entered into the controller.



Figure 3-3. Configuration Screen

Any number key will toggle through the parameter selections. Press the “Enter” key to accept your selection and the next parameter will automatically be displayed. The “Setup” key will take you through the list in the other direction.

Halt Mode

(All Models except MP301 and MP301H)

The Halt Mode determines when the controller will execute an automatic line halt. The user has the choice of going from one item to the next without stopping, stopping after the completion of a bundle, or stopping after the completion of an order. The HALT MODE has three options

1. BUNDLE HALT (default)
2. AFTER JOB
3. DON'T HALT

In the BUNDLE HALT mode, the controller will not halt the machine at the completion of a job if the next consecutive job number has been programmed with a quantity and a length. This feature can be used to create automatic bundle stops by simply skipping a job number when a bundle stop is required.

When the AFTER JOB mode is selected, the controller will halt the machine after each batch is completed.

In the DON'T HALT mode, the controller will not halt the machine at the end of a batch as long as there is another batch ready to run. The batches need NOT be programmed with consecutive Job Numbers. The controller will not halt until ALL batches are done.

To toggle through the choices, press any number key and when the correct choice is visible, press ENT to record your selection.

Refresh Done Job?

If NO is selected here, when a job is finished its remaining quantity is left at zero; if YES is selected, the remaining quantity is reset to the quantity programmed so that the job can be run again without manually reprogramming it.

To select the desired mode of operation, press any number key to toggle the display between NO and YES. When the correct choice is visible, press ENT to record your selection.

Batching (MP301 and MP301H only)

Batching can be used as a convenience to users who wish to produce parts without ever stopping the line. If the setup parameter is set to "NO" the operator is only asked for a part length whenever he programs a job. There is no need to enter a quantity. On the next valid Run input, the **MP301** or **MP301H** will begin production on the programmed length and continue running until the line is manually halted.

Set Batching to "YES" for normal **MP301** operation. The controller will prompt for a quantity when programming and will halt automatically after they are completed. Press any number key to toggle the response from "YES" to "NO" then press ENT to record your selection.

Halt No Parts to Run (With Punch Only)

If YES is selected, the controller will halt when all remaining parts have been loaded into the controller's memory. At this time it is desirable to program more orders so that scrap is not produced. If NO is selected the controller will not halt when all parts are loaded into memory and thus may produce scrap when more orders are run.

Shear Dwell Down

SHEAR DWELL DOWN is the time it takes for the shear to move from the top of the stroke to the bottom of the stroke. The range of time allowed is 0.000 to 9.999 seconds and can be set to the nearest millisecond. If a SHEAR COMPLETE switch is wired in, the shear dwell time should be long enough for the press to go past the shear complete switch. When the SHEAR COMPLETE switch closes, the SHEAR DWELL time will be overridden and the output will be turned off immediately.

Note: The shear dwell can be set to a value of zero as long as a shear complete switch is wired into the circuit.

To ensure that a feed-to-stop line is not restarted until the shear complete switch has closed, enter a SHEAR DWELL TIME OF ZERO. The controller will interpret this as "do not restart the line until the complete switch closes." If the complete input is not made within 10 seconds, then the line is halted.

A non-stop line with a SHEAR DWELL OF ZERO, will run normally as long as the shear complete is activated after a shear. If the shear complete is not activated the machine will continue to run for ten seconds, stop, and display and error (COMPLETE DETECT FAILURE).

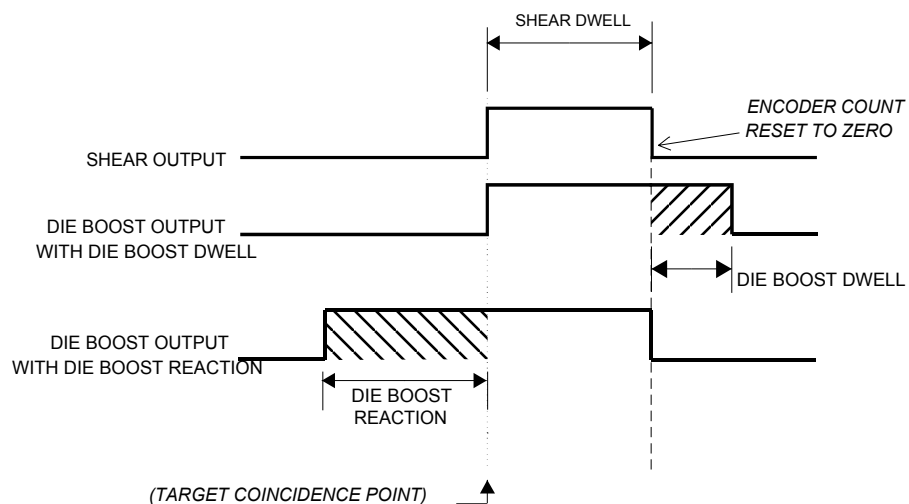
Shear Dwell Up

SHEAR DWELL UP is the time necessary for the shear to return from the bottom to the top of its stroke. The shear dwell up time and the shear dwell down time sum is the total press cycle time. On Flying Die machines, these parameters are combined into one called, SHEAR DWELL.

Boost Dwell (With Shear Boost Only)

The BOOST DWELL time is the time after the shear that the die continues it's forward velocity to keep from causing damage to the leading edge of the material while the die returns. Refer to figure 3-4 for a visual description of the boost parameters. The range of acceptable values is 0.000 seconds to 9.999 seconds. The total Die Boost output "on" time is the Die Boost Reaction time + Shear Dwell + Die Boost Dwell. With a zero Boost Dwell, the Boost output will still equal the Shear Dwell time.

Figure 3-4. Die Boost Timing



If the leading edge of the part gets caught on the die, the SHEAR BOOST DWELL time should be increased. If the die moves too far out causing the material to become misfed, the SHEAR BOOST DWELL time should be decreased.

Boost Comp (With Shear Boost Only)

Boost Compensation is the Length in inches that the die normally travels forward until it engages the metal during a shear cycle while in the run mode. This feature was added specifically for machines that operate with a SHEAR DIE BOOST device. Under normal operation, when a standing crop cut (manual shear) is performed, the shear cycles without the die boost device being activated. Ultimately, this results in the first part produced after a standing cut being short by the distance the die normally travels when the shear cycles under a RUN condition. BOOST COMPENSATION is a parameter designed to correct this problem. Enter the length in inches that the die normally travels during a shear cycle under a RUN condition. This value will automatically be added to the length of the first part produced after a standing crop. The BOOST COMPENSATION (BOOST COMP) parameter has an allowable range of 0.00 to 10.00 inches.

Shear Kerf

The SHEAR KERF is defined as the amount of material removed when the shear cycles. Some cutoff dies have two cutting edges that blank out a slug of material. Shears that have a cutting action similar to a pair of scissors would use a kerf value of zero. For other types of dies or saws, the SHEAR KERF should be set to the length of the slug removed. This length is added to the length of each part programmed so that the resulting part length will be correct. The maximum SHEAR KERF is 10.0000 inches.

Minimum Part

The MINIMUM PART defines the length of the shortest piece the **MP300 SERIES** controller will be allowed to make. For some applications short part lengths may cause problems for the roll former or other tooling. By setting a value for the MINIMUM PART, the user will not be allowed to program any items that make parts shorter than this length. Any value from 0 to 999.999 inches may be entered.

Delay After Shear

This parameter allows the operator to create a separation between parts. The line remains stopped for this amount of time after the shear has cycled. Increase this time to produce a longer pause between parts up to a maximum of 60.0 seconds. For no pause, enter zero. This parameter is not applicable when the LINE MOVEMENT parameter is set to RUN.

Important Notice:

The customer is responsible for adequate safety devices as well as visual and audible indicators to prevent personnel from potential hazards. The long

time delay that is allowed must not be confused for a machine-off condition.

Punch Dwell Down (With Punching Only)

This sets the time duration of the punch press cycle in seconds. PUNCH DWELL DOWN is the time it takes for the press to go from the top of its stroke to the bottom. The range of time allowed is 0.000 to 9.999 seconds, and can be set to the nearest millisecond. The PUNCH DOWN time will be overridden by the closure of a PRESS COMPLETE switch if used.

Punch Dwell Up (With More Than One Press)

PUNCH DWELL UP is the time it takes to return from the down position to the up position. On flying die machines these parameters are combined into one called PUNCH DWELL. The PUNCH DWELL time that is entered into the controller is actually the PUNCH DOWN time, and an equal amount of time is then allotted for the up time.

Punch Boost Dwell (With Boost Only)

The PUNCH BOOST DWELL is the time after the press that the die boost output remains on to further push the die forward. This ensures that the press die is out of the way before the boost returns. The die boost output turns on for the PUNCH BOOST REACTION time before the punch occurs and remains on the entire press cycle time plus the PUNCH BOOST DWELL time. The range of acceptable values is 0.000 seconds to 9.999 seconds.

Scrap Length (With Punching Only)

When a new coil is loaded with the material threaded through the shear, the **MP** controller may not be able to immediately produce the next order without incurring some scrap. The next potential part may be past a required punching station and therefore cannot be made. To solve this problem, the AMS controller will insert shear only parts until the next normal part is beyond the first required punch operation. The length of these shear only parts is determined by the SCRAP LENGTH parameter.

The user can set this parameter to produce usable parts or lengths that are at least easy to handle. For example, if your SHEAR TO PUNCH DISTANCE is 300" and the SCRAP LENGTH is set to 120", the **MP** controller will make 3 pieces that are 120" long, that you may sell without holes. If a SCRAP LENGTH of zero is entered, the controller will produce scrap pieces at the part length of the current order.

Shear-Punch (With Punching Only)

The SHEAR-PUNCH DISTANCE is the physical length between the shear press and the punch press. This distance can be

measured by performing a manual shear and a manual punch, jogging the material forward, and measuring from the cut edge to the center of the punch knock out. The largest acceptable value is 1000.0 inches.

Speed Logic (Two Speed Only)

The **MP300 SERIES** has four outputs that control the speed and direction of the machine. To accommodate more than one wiring possibility, the **MP300 SERIES** 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 3-1 and 3-2. 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	ON	ON	ON
Output 3 (Rev)	OFF	OFF	OFF	OFF	ON
Output 6 (Run)	ON	ON	OFF	OFF	OFF

Table 3-1. Status of Outputs in Forward-Slow

Machine State					
	Run Fast	Run Slow	Jog Fwd	Halt	Jog Rev
Output 1 (For)	ON	OFF	OFF	OFF	OFF
Output 2 (Slow)	OFF	ON	ON	OFF	ON
Output 3 (Rev)	OFF	OFF	OFF	OFF	ON
Output 6 (Run)	ON	ON	OFF	OFF	OFF

Table 3-2. Status of Outputs in Fast-Slow

Minimum Slow Distance (Two Speed Only)

A minimum amount of slow distance can be manually set by this parameter (if using two-speed logic). The value for this parameter is added to the calculated slow distance to extend the time that the material moves in slow speed (if the DECEL FACTOR is set to AUTO). The **MP300 Series** 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.

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.

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.

Tolerance (Feed-to-Stop Only)

This is the maximum allowable error in the positioning of an operation. You must be careful to set this value within the limits of the machine. TOLERANCE should be set small enough to get acceptable parts but wide enough to avoid production interruptions.

On feed-to-stop machines, the **MP300 SERIES** controller can check for the material to be within a specified tolerance before activating the press. If the material 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 shear must be equal to the programmed length plus or minus 0.03" before the shear will be cycled. The controller allows values from 0.0005 inches to 10.0000 inches. The default value for TOLERANCE is 0.1 inches.

Encoder Direction

Pressing any number key toggles between CW (Clockwise) and CCW (Counter-Clockwise) for the direction of the encoder. If you run the line forward 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:

<u>Model</u>	<u>Resolution</u>
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.

Line Movement

Used on flying die lines only, the LINE MOVEMENT parameter determines whether the forward output will be used to move the material or if the run output will be used to move the material. Pressing any number key will choose between Fst/Fwd and Run.

With the parameter set to “Run”, the Run output turns off immediately after the Halt button is pressed. **Warning.** Though the run output is turned off with a Halt, **presses will continue to fire as the material coast to a stop!**

If the LINE MOVEMENT parameter is set to “Fast/Fwd”, the Run output remains on while the material coasts to stop. During this coast-to-stop period, **presses will fire.**

If the Run output is wired to control the motion of the material, the setup parameter LINE MOVEMENT should be set to “Run”.

If the Forward output is wired to control the motion of the material, the setup parameter LINE MOVEMENT should be set to “FST/FWD”.

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 a proper value for stable lines. The **MP300 SERIES** controller will allow values from 1.0 Hz to 200.0 Hz.

Units

Length measurements can be programmed and displayed as either inches or millimeters. This parameter toggles between either ENGLISH for inches, METRIC mm or METRIC cm. The ENGLISH parameter will also measure in feet and feet/minute while the METRIC parameters will also measure in meters and meters/second. Press any number key to toggle through the choices, and then press ENT to record your selection.

Initial Machine Tests

Manual Shear

The shear can be manually activated using the CYCLE switch on the front panel. This causes the SHEAR output to turn on for the SHEAR DWELL time or until the SHEAR COMPLETE input switch closes. Make adjustments to the SHEAR DWELL time or the position of the SHEAR COMPLETE switch until the shear cycles properly.

Manual Press (With Punching Only)

The punch can be manually activated using the MANUAL PUNCH input. This causes the Punch output to turn on for the PUNCH DWELL time or until the PUNCH COMPLETE input switch closes.

Make adjustments to the PRESS DWELL time or to the position of the PRESS COMPLETE switch until the press cycles properly.

Jogging

If the jogging inputs are used, they can be verified using the I/O screen (Refer to INPUT/OUTPUT STATUS section in this manual). On two-speed machines, jogging is always done in slow speed (Refer to figure 3.1 and 3.2 for speed logic status).

Automatic Calibration

The **MP300 SERIES** controller has an AUTOMATIC CALIBRATION mode in which test parts are run and the resulting lengths are entered into the controller. The controller then uses these lengths to determine several machine parameters such as scaling factors and reaction times of the machine. This procedure should be run at the initial installation and whenever accuracy is in doubt.

AUTOMATIC CALIBRATION is initiated by pressing the SETUP key until the following screen appears.



Figure 3-5. Auto Cal, Trim Cal, Manual Calibration Screen

The controller will then prompt the operator for a calibration length to be run (default length is 120 inches).

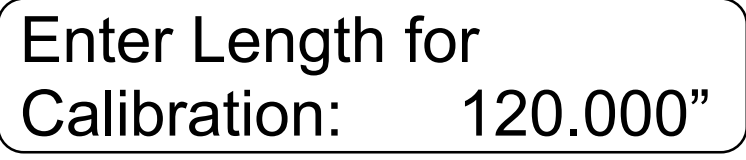


Figure 3-6. Enter Length Screen

The best results are when longer lengths are run. Results also depend upon the accuracy of the device that is used to measure the parts.

The **MP300 SERIES** controller can be no more accurate than the measuring device that you use. If short parts must be used, try to use a vernier caliper for the measurement. If parts longer than 4 feet are run, the only practical measuring device is a steel tape. Verify the accuracy of these devices by comparing several steel tapes measuring the same object. The ends of these tapes can be damaged and give bad readings. If this is questionable, have someone hold the tape carefully on the one-inch mark and subtract one inch from each measurement made.

After entering the calibration length, the controller will prompt the operator to load the material and press the CYCLE switch to trim the leading edge.

Cycle the Shear to trim leading edge of material

Figure 3.7. Cycle the Shear Screen

The controller will then prompt for the machine to be placed in the AUTOMATIC mode by pressing the RUN switch (either the front panel switch or the remote run switch).

Either one or two parts will be made depending upon the machine type. If two parts are made, be careful to note which is the first piece produced. Enter the lengths of the parts that were run, and the controller will then make the necessary calculations.

Manual Calibration

Manual Calibration mode can be entered by pressing SETUP, until the screen in figure 3-5 appears, and selecting the number for "Manual Calibrate". This is used to override the values and to review the values calculated by the **MP300 SERIES** for future reference.

Not all of the following parameters that are listed in the Manual Calibrate screens will be used on every machine type.

A generic configuration sheet can be found in the back of the manual under SETUP SHEETS, and lists all the manual calibration parameters regardless of whether they apply to your situation or not. When in the Manual Calibration mode press the ENT button to move to the next parameter and SETUP to move back to the previous parameter.

Shear Reaction Time

The SHEAR REACTION time is the time delay between the time that the shear signal occurs and the time that the die contacts the material. This factor is used on flying die machines only and must be set correctly to achieve consistent part lengths. The maximum value is 0.5000 seconds.

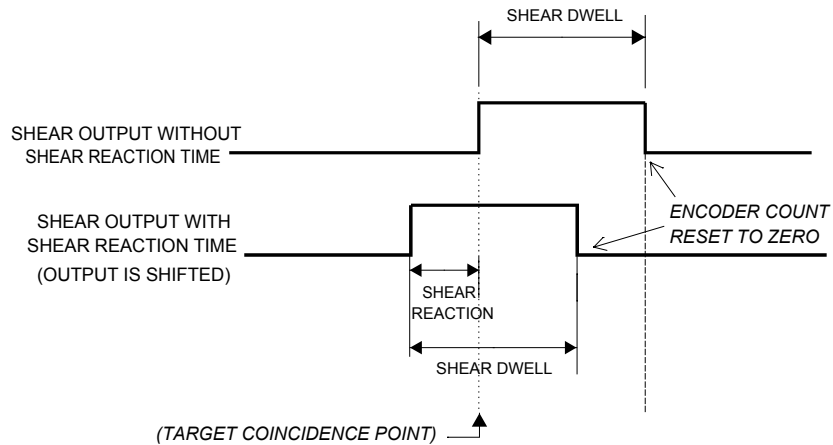


Figure 3-8. Shear Reaction Time

Calculate the SHEAR REACTION time using the following steps:

- 1) Set the SHEAR REACTION time to zero.
- 2) If there is a die boost on the shear die, disable it by disconnecting the wire on the output of the controller. **NOTE: If necessary, slow the line speed down to avoid the metal getting jammed up in the shear die.**
- 3) Cycle the shear.
- 4) Run two parts.
- 5) Mark the parts "1st Part" and "2nd Part."
- 6) Use the following formula for the new SHEAR REACTION time:

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

- 7) Enter the new SHEAR REACTION TIME into the controller and run two more parts.
- 8) Measure the two parts and verify their lengths (both parts should be the same length).
- 9) Once the Shear Reaction time is set, rewire in the die boost output.

The SHEAR REACTION time will compensate for the time it takes the shear to react to the shear signal. A SHEAR REACTION time will start the shear output prior to the target coincidence point and keep the shear on for the length of time of the SHEAR DWELL. This will effectively shift the shear output forward in time that causes the output to start and end earlier than if no SHEAR REACTION time is entered.

A DIE BOOST is sometimes used to move the die head forward during the cutting cycle. As shown in figure 3-9, the DIE BOOST will have an effect on both the beginning and the end of the shear output.

The DIE BOOST DWELL will push the die to allow the shear to retract without scraping the part (Refer to BOOST DWELL on page 3-5).

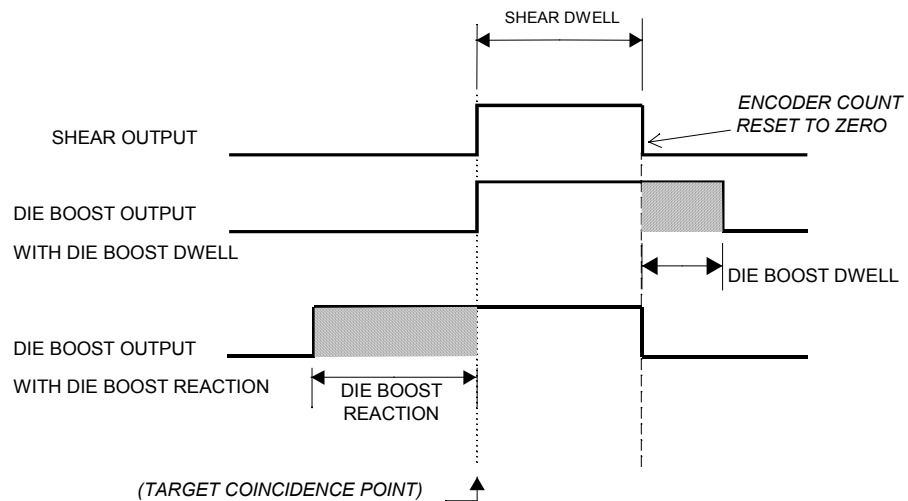


Figure 3-9. Die Boost Timing

BOOST REACTION TIME

The BOOST REACTION TIME is the time at which the DIE BOOST begins prior to the target coincidence. The BOOST REACTION TIME turns the BOOST on early to allow the die to match the speed of the material. Adjust this parameter so that the die speed is matched to the speed of the material at the time of the cut. If the leading edge of the part pushes the die, deforming its shape, the BOOST REACTION TIME should be increased. If the die causes the material to pull or tear apart, the BOOST REACTION TIME should be decreased.

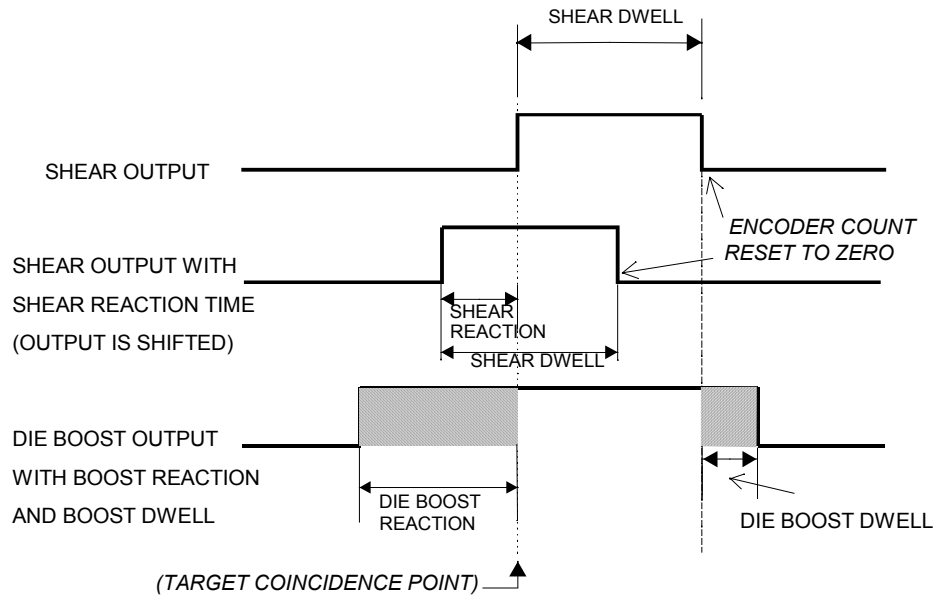


Figure 3-10. Die Boost Timing with Shear Reaction.

When SHEAR REACTION and DIE BOOST are added, this will turn the DIE BOOST output on before the time of the SHEAR REACTION. The DIE BOOST DWELL will still be added to the end of the SHEAR DWELL without the SHEAR REACTION effect. See Figure 3-10.

Press Reaction Time

The PRESS 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.

Note: Prior to using the procedure to calculate the PRESS REACTION, the SHEAR REACTION and CORRECTION FACTOR must be calculated.

Calculate the PRESS REACTION time using the following steps:
 1) Set the PRESS REACTION time to zero. 2) Program a 130"

part with holes at 60" and 120". 3) Cycle the shear and the press. 4) Run the line. 5) After the first part is cut, measure the leading edge to the first hole and the first hole to the second hole. 6) Use the following formula for the new PRESS REACTION time:

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

LE = Leading Edge of Part

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: 1) Set the SHEAR-PUNCH DISTANCE and the PRESS REACTION time to zero. 2) Program a 130" part with holes at 60" and 120". 3) Cycle the shear and the punch press. 4) Run the line. 5) After the first part is cut, jog the material out and measure the manually produced hole to the first hole when the line is run; and the first hole to the second hole. 6) Use the following formula for the new PRESS REACTION time:

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

MH = Manually Produced Hole

Stopping Reaction Time

On feed-to-stop machines, a STOPPING REACTION time parameter is used. This represents the time delay from when the controller turns off the movement outputs until the material actually stops. A larger reaction time will stop the line earlier, a smaller reaction time stops the line later. The user has a choice of three STOPPING MODES: AUTO, MANUAL, or OFF.

AUTO: The **MP300 SERIES** controller turns off the movement outputs prior to the actual shear or punch point to allow for the momentum and inertia of the machine. A new STOPPING REACTION time is calculated after each stop based on the average stopping time for several cycles. This parameter may be overridden in the Manual Calibration mode but the value will be modified on the next part that is run. The maximum value is 5.000 seconds.

MANUAL: The **MP300 SERIES** controller turns off the movement outputs prior to the actual shear or punch point as above. However, when in **MANUAL**, the controller does not recalculate a new **STOPPING REACTION** time after each stop. Whatever value is manually entered remains constant. The maximum value is again 5.000 seconds.

OFF: A **STOPPING REACTION** time is not calculated and is not used at all by the **MP300 SERIES** controller. The movement outputs are turned off when the material past the shear point is equal to the programmed length of the part. This should cause parts to come out long 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 **STOPPING REACTION** time is **AUTO** which is the recommended mode of operation.

Deceleration Factor

On two-speed machines, the **MP300 SERIES** controller uses a **DECELERATION (DECEL) FACTOR** when changing from fast to slow speeds. The **DECEL FACTOR** should be used in conjunction with the **MINIMUM SLOW DISTANCE** to determine the ideal time to change from fast to slow. The user has the option to select from three **DECEL FACTOR MODES**: **AUTO**, **MANUAL**, or **OFF**.

AUTO: The **MP300 SERIES** controller automatically maintains A **DECEL FACTOR**. 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 automatically update on the next movement.

MANUAL: A **DECEL FACTOR** may be manually entered into the 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 (shear or punch point) 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 too shift into slow too late, decrease the **DECEL FACTOR**. While in the **MANUAL** mode, the **MP300 SERIES** 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 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 4 inches before the shear or punch point. 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.

Correction Factor

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 parts to become longer and decreasing the value shrinks the parts.

Calculate the CORRECTION FACTOR 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 and dividing by ten.
- 4) Use the following formula for the new CORRECTION FACTOR, using the average of the ten parts for "actual measured length".

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

CF = Correction Factor

Calibrate Trim

The **MP300 SERIES'** CALIBRATE TRIM feature automatically computes a new CORRECTION FACTOR which is used in the controller's length calculations to adjust for errors in the size of the measuring wheel. The CALIBRATE TRIM mode can be entered by pressing SETUP until the screen in figure 3-5 appears and then by selecting the number for "Trim Cal".

Last Part	0.000"
Meas Part	0.000"

Figure 3-11. Calibrate Trim Screen.

The controller remembers the programmed length of the last part cut and prompts the user to enter the actual measured length. The controller then calculates a new CORRECTION FACTOR and asks the user if they would like to update the current value with the new value. CALIBRATE TRIM should be used any time part lengths are incorrect but in a consistent pattern (i.e. all parts 3/16" long, etc.).

Input/Output Status

This mode allows you to view the current status of all the **MP300 SERIES** inputs and outputs. This can be very helpful in troubleshooting the system during and after an installation. To view the I/O screen, press the SETUP key until the screen in figure 3-12 appears, then select the number for Input/Output.

1 = Input/Output
2 = Memory Test

Figure 3-12. I/O, Memory Test Screen.

The number of the active input and/or output will appear on the display.

In:	—	—	—	4	—	—	—	—
Out:	—	—	—	—	—	—	—	—

Figure 3-13. Input/Output Status Screen

Memory Test

This causes the **MP300 SERIES** to enter a self-test mode in which it verifies all internal memory "chains." If no errors are reported, all memory can be considered good.

CLEARING CONTROLLER MEMORY

You can clear all storage in the **MP300 SERIES** (including Setup and Order data) by following the sequence below.

- 1) Make sure that the Security switch is unlocked.
- 2) Turn off power to the controller.
- 3) Wait five seconds.
- 4) Press the '5' key while you
- 5) turn the controller's power back on.
- 6) Hold down the '5' key for at least five seconds after you turn the power on.

If you are experiencing controller problems, it is not recommended that you clear the memory unless you have made extensive troubleshooting checks (see the section in the back of the controller manual titled “**In case of a Problem**”). The steps listed include: making sure you have checked the encoder, the shear, the calibration procedure, rechecked setups, used the built-in diagnostic features, checked the incoming power, and cycled power off and on. Do not clear the memory unless you have written down all Setup, and Order information for re-entry.

Operating Procedure

Entering Orders

An order consists of a Job Number, a Quantity, a Length, and if a punch is used, a Punch Option. Depending upon the type of controller, one or several orders can be entered into the controller at one time. The ability to program more than one job at a time gives the user the potential to change sizes without stopping the machine. This saves time on short runs. The **MP301** controller is a single batch controller only. When programming this controller, the only parameters are Quantity and Length.

The efficiency of a multiple batch controller can be lost if the controller is not easy to program and understand. The AMS controller solves this problem with its clear and concise method of programming.

Programming the **MP300 SERIES** controller is a simple matter of keying in data in answer to a flashing prompt. The ENT key is a "take it" command from the operator to the controller, meaning the currently displayed value is stored into memory when the ENT key is pressed. The ENT key can also be used to move the cursor from one field to another when reviewing data already programmed. Note that you must use the ENT key to enter new or altered data into memory.

Changes are made by simply writing over the old value. Pressing the first numeric key causes the old value to be erased and the new numbers to shift in from the right. In case of a mistake during an entry, press the CE (Clear Entry) key to erase the entry and start over. A new correct value can then be keyed in. When the correct value is displayed, press the ENT key to move to the next field.

Job Number (Except MP301)

Enter the Programming Mode by pressing the PRG key. The first data item to enter is the Job Number, indicated by the flashing display. The controller will assume that you wish to program the next job number after the last one that was programmed. If Jobs 1 through 10 have been programmed, the Job Number displayed will be Job 11. This is merely a suggestion by the controller. You may enter any Job Number from 1-999. If you entered Job 1 through 10, you may review and correct jobs previously programmed. Press the ENT key to confirm the present Job Number.

The Job Number can be used to create bundle stops. The **MP300 SERIES** controller can be made to go from one job to the next without halting the line when the Halt Mode is set to Bundle Halt, provided the Job Numbers are consecutive. If you wish to insert bundle stops, skip a job number between bundles. In the following example, bundles have been set up on intervals of 10 jobs, even though there are fewer than 10 jobs per bundle. The machine will halt after completing jobs 5 and 13. Refer to the Setup parameter HALT MODE for more details on setting bundle stops.

Job	Quantity	Length
1	15	144.000
2	10	120.000
3	12	96.000
4	16	72.000
5	20	60.000
11	10	168.000
12	32	156.000
13	9	148.000

If a punching pattern is used, the punching option will be shown. In the punching example below the machine will halt after completing jobs 23 and 34.

Job	Quantity	Length	Option
21	2	180.000	Even
22	30	174.000	Rand
23	42	162.000	No P
31	25	150.000	No P
32	17	90.000	Rand
33	25	122.500	No P
34	50	135.000	Even

Quantity

After the Job Number is entered, the Quantity will be flashing. Simply key in the desired quantity and press ENT to confirm the number. If you enter a quantity of 0 on a previously programmed job, that job will be erased.

The Quantity can be set from 1 to 9999 pieces. If the quantity entered is **exactly** 9999, when this item is run, the controller will run this length until it is stopped manually, without decrementing quantity. This feature is provided for those who need to simply fill a bin with parts of a fixed length.

Length

After the Quantity is programmed, the Length field will be flashing. Enter here the finished length of the part to be made (do not count the shear kerf; the controller will automatically add in this amount, if any). Enter the length in whatever Unit format was selected when the **MP300 SERIES** controller was installed. The longest length the AMS controller will accept is 3500.000".

When entering lengths, no leading or trailing zeros are required. The following entries (in English mode) each produce the same 10-inch part:

10
010
10.
10.00
10.000

Punch Option (With MP350P Only)

After entering a length, the user is prompted to enter a Punch Option. Pressing any number key toggles between three options:

1. No P - No punches
2. Rand- A random punching pattern
3. Even- Evenly spaced punches

No P (No Punches)

Select this option to make shear only parts when no additional punches are required.

Rand (Random Punches)

Select Rand to make parts with one or more randomly spaced punches. The display will look similar to the one shown in figure 4-1.



Figure 4-1. Random Punching Display

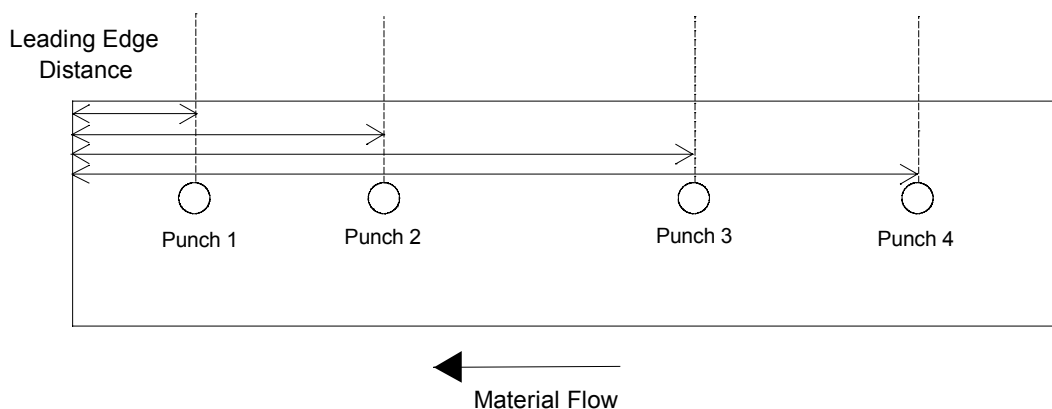


Figure 4-2. Random Punching Pattern.

Press ENT to confirm Punch #1 the first punching operation). Now enter the length at which the first punching operation should be made. The lengths, and all punch lengths, are measured from the leading edge of the part. For example, when entering the length for Punch #2 (the second punching operation), of 24 inches, the punch will occur 24 inches from the leading edge of the part, not 24 inches from Punch #1. Repeat for as many punches needed (up to 300) for this part length. When all of the punches have been entered, press the asterisk (*) key to enter more jobs.

Even (Evenly Spaced Punches)

Select Even to make parts which have evenly spaced punches throughout the part length. The display will look like the one shown in Figure 4-3

First	Spacing	Limit
12.000"	12.000"	10.000"

Figure 4-3 Even Spacing Display

While “First” is flashing, enter the length at which the first punching operation should occur. After pressing the ENT key, Spacing will start to flash. Enter the desired center to center punch spacing. For example, if 12 inches is programmed for Spacing, punches will automatically be placed on 12 inch centers. After Spacing is entered, “Limit” will start to flash. Enter the distance from the trailing edge on the part beyond which no punches are desired. For example, if 25 inches is programmed for the “Limit”, no punches will be placed within 25 inches from the end of the part.

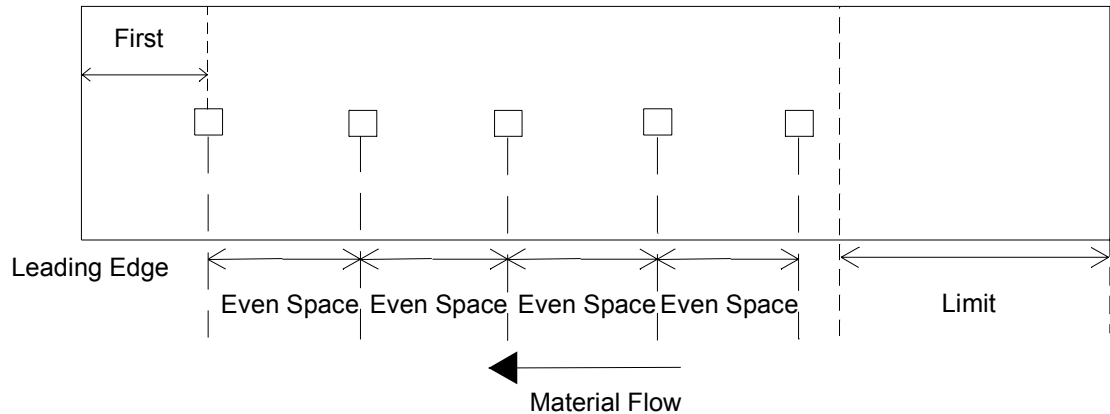


Figure 4-4. Even Space Punching Pattern

See figure above for a visual description of “Even Space” and “Limit”. After the Limit is entered press the (*) key to enter more jobs.

Reviewing Programmed Jobs

It is possible, at any time, to review the jobs that have been programmed. While in the PROGRAM MODE, PRESS the SETUP key to step through the jobs in descending order, or press the PRG key to step through the jobs in ascending order.

Exiting the Program Mode

The (*) key is used to exit the PROGRAM mode and revert to the normal running display. It is also used to exit the SETUP mode.

Referencing Controller to the Material

The **MP300 SERIES** controller measures relative movement of the material through the machine and has no way of measuring the absolute amount of material that is past the shear. In order to cut accurate lengths, the controller must know how much material is past the shear at some point in time and then it can make relative measurements thereafter. This is a process called referencing.

Referencing is simply loading material into the machine, past the shear, and closing the MANUAL SHEAR input switch. At the bottom of the shear stroke, for shear only parts, the length counter is set to zero and the controller is referenced. If there is a punching operation in the program, the shear must be cycled *twice* to reference the AMS controller. The controller will remain referenced as long as the encoder stays in contact with the material and the material does not move while the controller is turned off.

On some flying die machines, it is not possible to cycle the shear while the material is stopped. Some presses have mechanical "kickers" that push the die forward as the press comes down, refer to figure 4-7. Some mechanical presses push the die forward in addition to pushing down. For these machines, referencing must be done on the fly with a crop cut after the machine has been started. This is also done with the CYCLE switch.

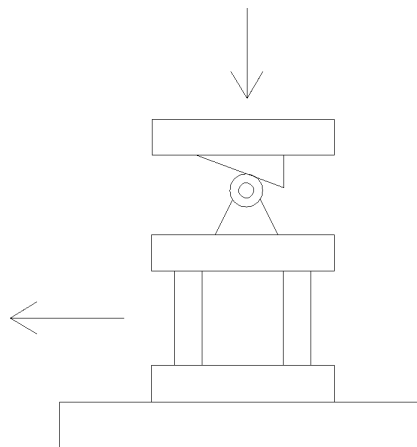


Figure 4-7. Flying Die with Mechanical Kicker

On Feed-To-Stop machines, the **MP300 SERIES** controller re-references itself to the material on each automatic cut at the bottom of the shear cycle. This is done to improve accuracy.

The material can overshoot or undershoot the shear point on each feed. With simple electronic counters, an overshoot on one cut followed by an undershoot on the next cut will cause the second part to be short by the sum of the overshoot plus the undershoot. By re-referencing the controller during each cut, the controller will limit the error to either an undershoot or an overshoot which effectively cuts the error in half.

Running the Machine

Status Display

The Status Display will vary, depending upon which model AMS controller that you have. Figure 4-8 shows the display for the **MP301**.

	100 Pcs	128.000"
s120	63 Left	22.472"

Figure 4-8. Typical **MP301** Status Screen

The top row shows the programmed quantity of the current order and the length of the part to be made. The bottom row shows the machine speed in feet per minute (or meters per minute), the quantity remaining in the order, and the current length past the shear.

Figure 4-9 shows the display for the **MP350** and **MP350P** which have the capability of performing multiple jobs.

# 23	30 Pcs	90.000"
s 150	3 Left	30.100"

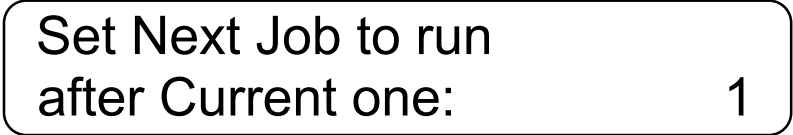
Figure 4-9. Typical **MP350** and **MP350P** Status Screen

The top row shows the current Job Number, the programmed quantity of the current order and the length of the part to be

made. The bottom row shows the machine speed in feet per minute (or meters per minute), the quantity remaining in the order, and the current length past the shear.

Setting the Next Job to Run (Except for MP301)

If the Job Number shown in the upper left hand corner of the Status Display is not the job that you wish to run next, press SETUP and then select the number for NEXT JOB. The controller will prompt the operator "Set Next Job to Run After Current One".



The image shows a rectangular screen with a black border. Inside the screen, the text "Set Next Job to run after Current one:" is displayed in a large, bold, black font. To the right of this text, the number "1" is displayed in a large, bold, black font.

Figure 4-10. Set Next Job to Run Screen

Enter the desired Job Number and press ENT. If the machine is halted when the NEXT JOB function is entered, then the new Job Number that was entered will begin as soon as the machine is placed in RUN.

If the machine has the punching option and the original Job Number is still displayed even though a new NEXT JOB number has been entered, one or more parts from the original job have already been stored in the controller's memory and must be made next to avoid making scrap. After these parts are made, the new NEXT JOB will be ready for production.

If the machine has the punching option and the operator desires to halt the current job that is running and immediately begin making parts from a different job, these steps must be followed.

1. Halt the machine.
2. Manually cycle the shear *TWICE* to eliminate the parts that have already been FILLED.
3. Set the NEXT JOB TO RUN as described above.
4. Press the RUN input switch.

Doing this may cause one or more scrap pieces to be generated.

If the machine is running at the time, the operator is asked to "Set the Next Job to Run after the Current Job." If the operator enters a valid Job Number, he/she will then be asked "Change

Job Now (YES/NO)". If NO is selected, the controller will complete the current job and then be ready to run the new NEXT JOB that the operator selected. If YES is selected, the controller will complete the parts from the current job which have already been loaded into the queue and then immediately change to the new NEXT JOB that the operator selected.

Starting the Machine

After the NEXT JOB is set, the machine is placed in the RUN mode by pressing the RUN switch on the front panel or by closing the external RUN contact if the REMOTE RUN option is selected. The **MP300 SERIES** controller will begin shearing parts to the programmed length and decrement the quantity remaining for each piece cut.

When the quantity remaining reaches zero, the controller may or may not begin production on the next consecutive job number, depending upon the HALT MODE parameter setting that was selected while configuring the machine. If the next sequential job is not programmed, the controller will halt the machine.

Halting Production

At any time, the operator can halt the line by opening the Run contact. Depending upon how the controller is installed, this may take the form of pressing any of a number of HALT buttons located on the machine. The movement outputs will be turned off immediately but the **MP300 SERIES** controller will remain in the RUN mode until the material has stopped. This allows for an automatic cut to be made as the material decelerates.

The controller will remain in the RUN mode until the material has stopped or 5 seconds have elapsed. Normally, the operator would halt the machine just after a shear is made and a cut would not occur during deceleration. If the RUN contact is opened while a press is operating, the movement outputs will remain on until the press has completed its cycle (SHEAR or PRESS DWELL time).

Monitoring Production

The **MP300 SERIES** controller has three footage totalizers available for monitoring production. The totalizers show the amount of footage that has gone past the shear as well as the total number of parts cut since the last time the totalizer was cleared.

To access the footage totalizers from the normal running display press SETUP, until the following display appears:

1 = Next Job	3 = Footage
2 = Inc Qty	4 = Configure

Figure 4-11. Next Job, Inc Qty, Footage, Configure Screen.

Pressing the number for FOOTAGE will allow the totalizer screens to be viewed and/or cleared. Pressing the ENT key steps the user through the three totalizers.

Press CE Key to Clear		
Tot1	50 Pcs	300Ft

Figure 4-12. Totalizer 1 Screen.

The three totalizers are independent of each other and can be used for any purpose. One suggestion for their use would be to use one for totalizing footage used on a coil, one for footage used on a customer's order, and one for the total footage run during a shift.

Clearing these totalizers back to zero at the proper time would be the responsibility of the operator. The controller will prompt the user to "Press CE key to Clear" as the totalizers are being displayed. If Metric units are being used instead of English, the totalizers will display the totals in meters.

Special Procedures

Changing Coils

The following procedure should be used when changing coils to ensure proper accounting of the material used on a coil and an accurate first part after the new coil is loaded:

- If the coil has been completely consumed or the material has been cut free of the stock reel, as is the case with most roll formers, feed the material through the shear in the forward direction and dispose of the scrap piece.

- On a cut-to-length machine with no roll former involved, all of the unused material can be rewound on the mandrel for later use. In this case, back the material out through the entrance end of the shear until it is out from under the encoder.
- After the machine is empty, press the CYCLE switch on the front panel. This registers all material used to the totalizers.
- Press SETUP and then the number for FOOTAGE. Press ENT to step through the totalizers used to record the amount of material used.
- Record the amount of material used.
- Press CE to clear the totalizer.
- Thread the next coil into the machine until a clean edge is past the shear and the material is under the encoder.
- Press the CYCLE switch to reference the new coil.

Handling Material Flaws

With most roll formers and cut-to-length machines, material problems are common. The **MP300 SERIES** controller has features that aid the operator when these flaws occur.

The best method of handling material flaws depends on when the flaws are detected and the duration of the flaw. If random small flaws occur, they are not likely to be detected until after the controller has cut the part. In this case, the only thing that the operator can do is make another part to replace it. This is easily done with the INCREASE QUANTITY function.

While viewing the Status Display, press SETUP and then the number for INC QTY. This will cause the quantity "LEFT" on the Status Display to stay the same (not decrease) when the next part is made.

If a small flaw is detected before the shear, the operator may wish to crop the flaw out to minimize the amount of scrap material. On flying die machines, the CYCLE switch is active while the machine is running. The crop starts the production of the part over again and the operator can repeat this process until the good material occurs. In the case of feed-to-stop machines, the machine must be halted before the CYCLE switch is active. The operator would most likely jog the material forward until the flaw is past the shear and then press the CYCLE switch twice.

There are times when material flaws can be extensive and last for a large portion of a coil. A user may find that this material is easier to handle if it is cut into short lengths rather than relying on the operator to crop repeatedly. There may also be secondary outlets for such material if they can be cut to standard lengths of perhaps 8, 10, and 12 feet. If this is the case, jobs for this purpose can be programmed at high lift numbers, such as 900 through 999 before hand, and the operator can switch production to these jobs when extensive flaws occur. After the flaw has been cleared, the operator can use the NEXT JOB function to resume normal production.

In Case of a Problem

The **MP300 SERIES** 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 is a “self help guide” for the user to help troubleshoot the system. Follow these suggestions in the order listed.

Troubleshooting Guide

When did the Problem Start?

Did the machine work properly at one time? If not, have you done the Calibration procedure?

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, or 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.

The encoder **wheel** must be at right angles to the material. The wheel must rotate exactly parallel to the direction of material movement.

The wheel must be in firm contact with the material. **No slippage** is allowed!

Re-run the length **Calibration** procedure after any changes to the encoder mounting.

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.

Check the **shear** (or punch) press to make sure that it returns fully to its home position after each cycle. The press will make accurate cuts **only** if it starts from a known position for each cycle.

Re-run the length **Calibration** procedure after any changes to either press.

Visually check **other** parts of the machine for loose fasteners, excessive wear, proper lubrication, proper material feed, and roll former adjustment.

Re-run the length **Calibration** procedure after any changes to the machine.

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. Also take note of the order in which the shear cut the parts.

Write down these measurements for possible later reference.

If length and punch 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, run the **Calibration** procedure.

Re-check Setups

Re-check Setup values with originally recorded values. When you installed the **MP300 SERIES** 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.

Run the Calibration mode

When you do the Calibration, take great care to make accurate measurements. Be sure that you know how to reduce measuring error as much as possible with the scale or steel tape you use. A loose tip on your steel tape can add a large error into your measurements.

Use Built-in Diagnostic features

The **MP300 SERIES** has a display mode Press SETUP until the screen shown below appears.

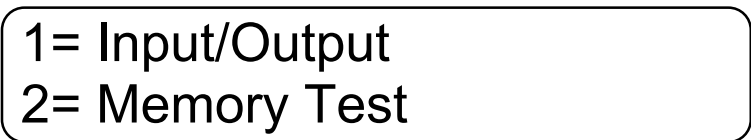


Figure 5-1. Input Output, Memory Test Screen.

Press the number for Input/Output and the screen that is shown in figure 5-2 will appear.

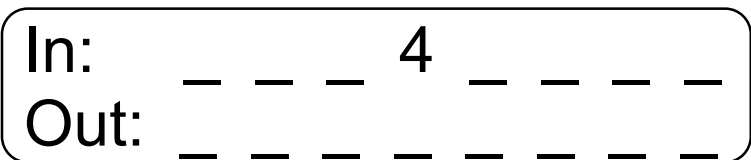


Figure 5-2. In / Out Screen.

This screen will allow you to monitor the controller's inputs and outputs. Watch this display while the machine is running to check for slowdown, stopping, die accelerator, and press actuation points.

On the main Status display, you can watch line speed and distance past the shear. Compare what you see here to what should be happening as the machine runs.

# 23	30 Pcs	90.000"
s150	3 Left	30.100"

Figure 5-3. **MP350** and **MP350P** Status Screen

Check incoming Power

Check incoming power for proper voltage. If you suspect fluctuations, watch the needle indication with an analog meter to see if they show up.

More advanced line monitors are available for stubborn cases that you can't see with 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 **MP300 Series'** memory.

Clear Memory

Clearing memory will erase all Setup, Pattern, and Order information in the **MP300 Series'** memory.

Do not clear the memory unless you have written down all Setup, Pattern, and Order information for re-entry, and you have tried everything else above.

You can clear all storage in the **MP300 SERIES** (including Setup and Order data) by following the sequence below.

1) Make sure that the Security switch is unlocked. **2)** Turn off power to the controller. **3)** Wait five seconds. **4)** press the '5' key

while you **5)** turn the controller's power back on. **6)** Hold down the '5' key for at least two seconds after you turn the power on.

Electrical Noise

The **MP300 SERIES** 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 suppressor 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.

Hole Counter Option

Hole Counters may be added as an option to the **MP301**, **MP350**, and **MP350P** controllers. When this option is added, the controller will take on the new model numbers of **MP301H**, **MP350H**, and **MP350PH**.

General Parameters

The controllers will all have the same general parameters, as the ones without the Hole Counter option (as listed in Section 3, Machine Configuration, plus the following parameters will also be available to be programmed.

Mode

MODE describes whether the controller is using the Hole Counter option. Select COUNT HOLE to run the controller as a hole detector or select STANDARD for normal **MP300 SERIES** operation. In the COUNT HOLE mode, the operator enters a number of holes instead of an actual part length. The **MP300 SERIES with Hole Counter** detects holes in the material and activates the cutoff press when the programmed number of holes has been counted.

In the STANDARD mode, the controller uses a part length (inches or millimeters) to control the cutoff press. It is, however, still counting holes in the material and keeping track of where they are. If necessary, the operator can change from STANDARD mode to COUNT HOLE mode at any time when the line is halted without losing track of holes that have already been counted but not yet cut off.

Press any number key to toggle the display between STANDARD and COUNT HOLE. When the correct choice is visible, press ENT to record your selection.

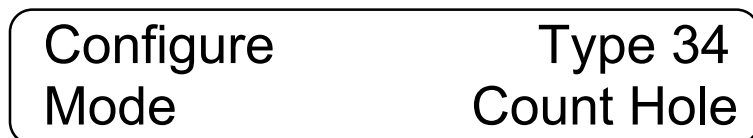


Figure 6-1. Mode Parameter Screen

Shear-Detect

SHEAR-DETECT is the physical distance between the shear press and the hole detector. The detector should be located as close as possible to the shear press to achieve the best accuracy. Although the detector must be close to the shear press, the detector must be far enough away (typically 10" to 15"), to allow the controller time to see the hole and activate the shear press. Units for SHEAR-DETECT are in inches, centimeters, or millimeters. Key in the length and press ENT to record your selection.

Minimum Hole Spacing

Enter a value slightly smaller than the minimum distance between holes in the material. When the **MP300 SERIES with Hole Counter** detects a hole in the run mode, the material must move the MINIMUM HOLE SPACING distance forward before another hole can be detected. This prevents the controller from accidentally reading the same hole twice on the leading and trailing edge. Units for MINIMUM HOLE SPACING are in inches, centimeters, or millimeters. Key in the length and press ENT to record your selection.

No-Hole Stop

This parameter defines the maximum length of material allowed to go beyond the shear press before enough holes are detected to make the current part. Operators may use this parameter to protect machinery in the case of a photo-detector failure. The **MP300 SERIES with Hole Counter** will halt the line and display an error message if the "Length Past Shear" + "Shear To Detector Distance" is greater than "No-Hole Stop Distance".

This function will be disabled if No-Hole Stop = 0 inches or if the operator chooses the standard operating mode. Key in the length in inches, centimeters, or millimeters and press ENT to confirm.

Programming

Standard Mode

Programming job data in the Standard mode of the **MP300 SERIES with Hole Counter** is identical to programming an **MP300 SERIES** controller. Refer to the Operating Procedures section of this manual (Section 4), for Standard Programming.

Count Hole Mode

Job

After pushing the PRG button, the first option will be flashing. If the controller is a multiple batch model (**MP350H or MP350PH**) the first option is programming the job number. Follow the procedure in the Operating Procedure section of this manual. If the controller is a single batch model (**MP301H**) the Job option will not be available.

Job	Qty	Cnt	Length
0	0	1	0.000"

Figure 6-2. Count Hole Mode Programming Screen.

Quantity

To program in a job total, simply key in the desired quantity and press ENT to confirm the quantity. The quantity can be set from 1 to 9998 pieces. The quantity 9999 is treated as a special case by the **MP300 SERIES**. When an order with a quantity of 9999 pieces is run, the quantity does not decrement when a piece is made. This is done for the convenience of users who produce parts until their storage bins are full and don't wish to count parts.

Count

Key in the number of holes per each part and press ENT to confirm. The **MP300 SERIES with Hole Counter** detects holes in the material and cycles the shear press when this number is reached. To cut on every hole detected, program a count of one. The maximum number of holes per part is 500.

Length

The next item to be programmed for a job is the Offset Length. Key in the number of inches, centimeters, or millimeters and press ENT to confirm. **THIS IS NOT THE OVERALL LENGTH OF THE PART.** The Offset Length is the distance from the leading edge of the last hole counted to the point where the shear occurs. See figure below.

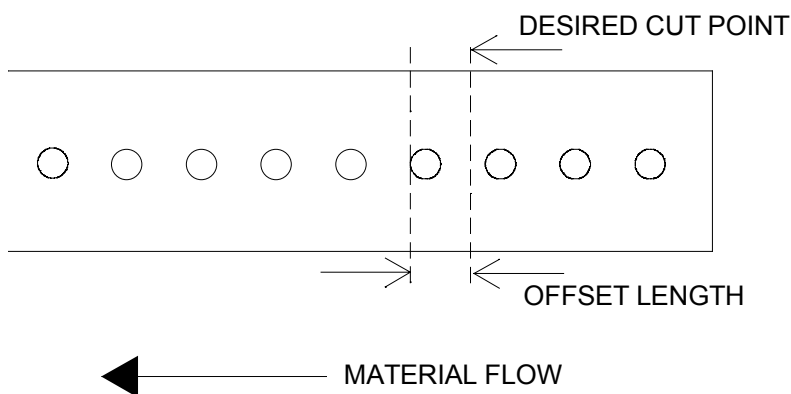


Figure 6-3. Offset Length

Exiting the Program Mode

The STAR (*) key is used to end the PROGRAM mode and revert back to the normal running display. It is also used to exit the SETUP mode.

Operation

The operation of the **MP300 SERIES with Hole Counter** in the Standard mode is identical to the operation of the **MP300 SERIES**. Refer to section 4 of this manual, Operating Procedures.

Note: An external manual shear input has been added on input # 8.

Status Display

	21Pcs	3 Hole
s100	8 Left	40.000"

A typical status display of the **MP300 SERIES with Hole Counter** in the Count Hole mode is shown above. The top row shows the programmed quantity of the current order and the number of holes that have gone past the shear. The bottom row shows the machine speed, in feet per minute (or meters per minute), the quantity remaining, and the current length past the shear.

Note: The above Status Screen is for the MP301H (a single batch unit), which means that there is no Job Number listed on the first line. Multiple batch units will include the Job Number on the Status Screen.

Running the Machine

After an order has been entered, the machine is placed in the RUN mode by either pressing the RUN switch on the front panel or closing the external RUN contact if the REMOTE RUN option is selected. The **MP300 SERIES with Hole Counter** will begin counting holes and shearing parts to the programmed hole count. It will decrement the quantity remaining after each piece is cut and halt the line automatically when the quantity remaining reaches zero.

Note: The operator can not manually cycle the shear when the machine is running while the controller is in the "Count Hole Mode".

Clear Holes

During jogging operations, the **MP300 SERIES with Hole Counter** continues to count holes and records their positions in memory. If for any reason, the operator wishes to discard all of the hole locations which are currently in the controller's memory, he may do so by clearing the "Hole Queue." To clear the hole queue, the machine must be halted. Cycle the shear press TWICE by pressing the blue CYCLE push button on the controller's front panel.

Any holes, which have been counted but not yet cut off, will be cleared from memory. After the **MP300 SERIES with Hole Counter** is placed back into the RUN mode, it will begin a new count of holes after the first hole passes the photo-detector.

Analog Output Option

A single ended Analog output may be added as an option to the **MP301**, **MP350**, and **MP350P** controllers. When this option is added, the controller will take on the new model numbers of **MP301A**, **MP350A**, and **MP350PA**. The **MP350PAV** controller also has analog output, but works differently than the other three analog controllers. It will be discussed at the end of this chapter.

General Parameters

The controllers will all have the same general parameters as the ones without the Analog output option (as listed in Section 3, Machine Configuration), plus the following parameters will also be available to be programmed.

Min Volts

The MIN VOLTS parameter is used to set the analog voltage output when the controller is running in slow speed.

Max Volts

The MAX VOLTS parameter is used to set the analog voltage output when the controller is running in fast speed.

Length at Max

This parameter is used to keep the machine from going into full fast speed if the current part run is too short to fully achieve it. Any part programmed with a length shorter than the value entered for LENGTH AT MAX will result in the Analog output voltage to be decreased accordingly in order to be able to stop to accurately cut the part.

Programming

Programming job data in the **MP300 SERIES controller with Analog Output** is identical to programming an **MP300 SERIES** controller. Refer to the Operating Procedures section of this manual (Section 4), for Programming.

Operation

The operation of the **MP300 SERIES with Analog Output** is identical to the operation of the **MP300 SERIES** with the following exceptions. Refer to section 4 of this manual, Operating Procedures.

Jogging Material

When jogging the material forward or reverse, the Min Volts parameter is used to determine the speed to jog at. The forward / slow output is also turned on when jogging forward and the reverse output is turned on when jogging in reverse.

Running the Machine

After an order has been entered, the machine is placed in the RUN mode by either pressing the RUN switch on the front panel or closing the external RUN contact if the REMOTE RUN option is selected. The **MP300 SERIES with Analog Output** works identical to the standard **MP300 SERIES** controller with the addition of the analog output. The controller still turns on the forward and slow outputs plus supplies a single-ended 0 to +10 volt output. While the controller is in fast, the MAX VOLTS value is used. While in slow, the MIN VOLTS value is used.

If short parts will be run and the machine is unable to reach full fast speed on stopping lines, the LENGTH AT MAX parameter should be used. This length should be the shortest parts run that the machine is able to achieve full fast speed before shifting into slow and finally stopping. If any parts programmed are shorter than this length, the fast speed analog output would decrease according to the length of the part programmed. The output is determined by the following formula:

$$\left[\frac{MaxVolts - MinVolts}{LengthAtMax} \bullet PartLenth \right] + MinVolts$$

MP350PAV

The **MP350PAV** controller works exactly like the **MP350P** controller with one additional feature. The **MP350PAV** has an analog output that is proportional to the current line velocity. 1 Volt = 100 FPM. At line speeds of 1000 FPM or higher, the analog output will be 10 Volts. The output is active in both jog and run modes and always has a positive output.

During power up of the controller (approximately 2 to 4 seconds), the analog output will be undefined (0 to 10 volts). The programming and operation of the **MP350PAV** is other wise identical to the **MP350P**.

Setting the Customizing Switches

The **MP300 SERIES** controller is a universal device capable of controlling several types of “cut-to-length” machines. In order to do this, some outputs and inputs have different functions depending upon the type of machine on which the controller was installed. Also, each type of machine has its own unique set of machine parameters that must be programmed. Parameters for one type of machine may have no meaning for a different machine. For example, a “Feed-to-Stop” machine needs a **MINIMUM SLOW DISTANCE** when slowing down for a shear. This parameter would be useless on a single speed “Flying Cutoff” machine, and may confuse the operator.

In order to make the **MP300 SERIES** controller applicable to many types of machines and still be easy to use, a set of customizing switches are included which define the type of machine being controlled. Once the machine type has been determined, the function of the outputs and inputs is fixed and the machine parameters are limited to only those required for that type of machine. Although adding a step to the first part of the installation, this approach simplifies the controller thereafter.

Before applying power to the controller, the customizing switches must be set. These switches can be found on the back of a panel mount style controller or by removing the cover of a console style controller. The switches are located near the center of the of the printed circuit board. There are seven segments to the switch assembly numbered from 1 through 7 and are set to either the ON or OFF positions to match the requirements of the installation.

The chart that follows defines the purpose of each switch for every **MP300** model and a description of the switch settings follows the chart.

Model	SW 1	SW 2	SW 3	SW 4	SW 5	SW 6	SW 7
MP301	Speed Control	Speed Control	Run Mode	Machine Type	Machine Type	Manual Shear	N/A OFF
MP301H	Shear Type	Shear Boost	1 or 2 Speed	Run Mode	N/A OFF	N/A OFF	N/A OFF
MP350	Speed Control	Speed Control	Run Mode	Machine Type	Machine Type	Manual Shear	Single Batch
MP350H	Shear Type	Shear Boost	1 or 2 Speed	Run Mode	N/A OFF	N/A OFF	N/A OFF
MP350P	Shear Type	Shear Boost	1 or 2 Speed	Run Mode	Punch Type	Punch Boost	Punch Speed
MP350PH	Shear Type	Shear Boost	1 or 2 Speed	Run Mode	Punch Type	Punch Boost	Punch Speed

Speed Control (Switches 1 and 2, MP301, MP301A, MP350, and MP350A)

Switches 1 and 2 control the type of speed control that is to be used. The switch settings are as follows:

Switch 1	Switch 2	Speed Control Mode
OFF	OFF	Single Speed
ON	OFF	Dual Speed, Forward-Slow Logic
OFF	ON	Dual Speed, Fast-Slow Logic
ON	ON	Invalid Setting

Single Speed Mode

In the single speed mode, the SLOW output (#2) has no function. Material movement is controlled by the forward and reverse outputs. **NOTE: This mode uses Forward-Slow speed logic, which means the slow output is on while halted and while jogging. See below for a more thorough explanation of Forward-Slow logic.**

Forward-Slow Mode

The timing diagram of the Forward-Slow logic is shown in figure 8-1.

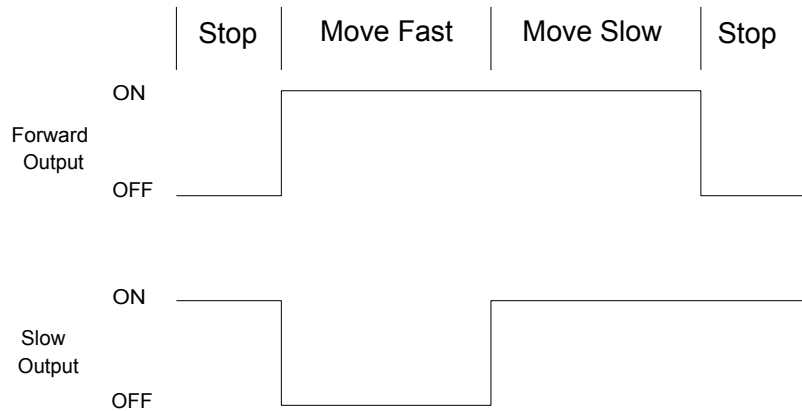


Figure 8-1. Forward Slow Timing Diagram

In this mode of operation, the FORWARD output (#1) is ON for any movement in the forward direction (which is the direction used in the RUN mode). The SLOW output (#2) is ON when a feed in slow speed is required and when the machine is halted.

An example of a machine that would use this type of logic is a hydraulic system with two valves connected in series, as shown in figure 8-2.

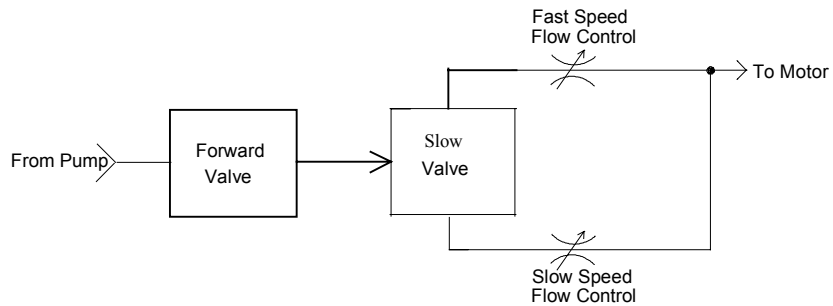


Figure 8-2. Forward-Slow Hydraulic System

One valve would control the flow of oil between FULL ON and FULL OFF. The FORWARD output would control this valve. The other valve would select between FULL FLOW and LIMITED

FLOW. This valve would be controlled by the SLOW output. The FORWARD output would have to be ON for any oil to flow. When the FORWARD output is ON, the SLOW valve selects between FULL SPEED and a SLOWER SPEED.

The SLOW output is kept ON when the FORWARD output is OFF. This ensures that all movements start in slow speed. Acceleration ramps can be used on most systems to ensure that a smooth transition to high speed occurs.

Fast-Slow Mode

A timing diagram of Fast-Slow logic is shown in figure 8-3.

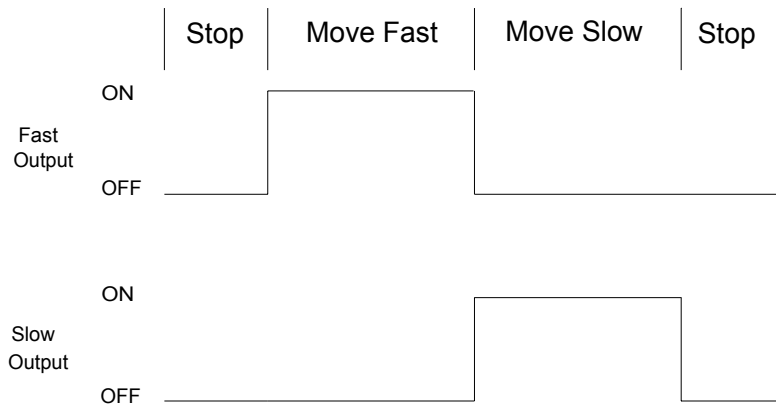


Figure 8-3. Fast-Slow Timing Diagram

In this mode, the FAST output (#1) is ON for any movement in FAST speed and the SLOW output (#2) is ON for any movement in SLOW speed. The outputs are never both ON at the same time and when both outputs are OFF, the machine is stopped.

An example of a machine using this type of speed logic would be a hydraulic system as shown in figure 8-4, where the two valves are connected in parallel.

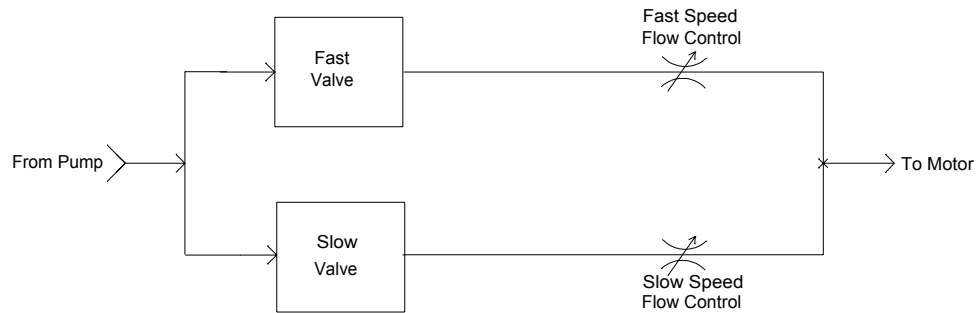


Figure 8-4. Fast-Slow Hydraulic System

Each valve would have its own flow control and would be set for different speeds. The FAST output would be connected to the valve set for HIGH speed and the SLOW output would be connected to the LOWER speed valve.

Shear Type (Switch 1, MP301H, MP350H, MP350P, MP350PA, and MP350PH)

OFF	Feed-to-Stop Shear
ON	Non-Stop Shear

Switch 1 should be set to the ON position for shears that operate on the fly (non-stopping). Set Switch 1 to OFF for shears that operate on Feed-to-Stop machines. When the Hole Counter option is used on the **MP301H, MP350H, or MP350PH**, it must be used on Non-Stopping lines, so Switch 1 must be ON. If the controller is used without the Hole Counting option, it may be operated on either Non-Stop or Feed-to-Stop lines.

Shear Die Boost (Switch 2, MP301H, MP350H, MP350P, MP350PA, and MP350PH)

OFF	Shear Die Boost Active
ON	No Shear Die Boost

Machines that do not stop for each shear and have a device to push the die forward as it is being cut would set Switch 2 to the OFF position. Set Switch 2 to ON for machines with Non-Stopping or Feed-to-Stop shearing operations that do not use a Die Boost.

With a HUMP TABLE machine, the shear is fixed but the material does not stop for the shear cycle; it forms a hump behind the

shear where it clamps. With the **MP301H, MP350H, or MP350PH**, this machine would require a setting for Flying Die with no Die Boost (both Switch 1 and 2 ON).

Run Mode (Switch 3, MP301, MP301A, MP350, and MP350A)

OFF	Front Panel Run With Safety Interlock
ON	Remote Run

Control over how the **MP301, MP301A, MP350, or MP350A** is placed in the RUN mode is determined by the state of Switch 3 of the customizing switch. In the LOCAL mode, the controllers are placed in the RUN mode by pressing the RUN switch on the front panel of the controller. In the REMOTE mode, the controller is placed in the RUN mode when the REMOTE RUN input (#3) closes and remains closed.

Local Mode (Switch 3 OFF)

With Switch 3 in the OFF position, the RUN switch on the front panel of the **MP300 Series controller** is active and will initiate the automatic sequence, if a valid job has been programmed and the material past the shear is not longer than the next size to be cut. Input #3 is defined as the SAFETY INTERLOCK that should be connected to the Emergency Stop circuit of the machine. This input will not start the machine when it closes. It must be closed, however, prior to pressing the RUN switch or closed within one second after pressing the RUN switch.

Remote Mode (Switch 3 ON)

With Switch 3 in the ON position, the RUN switch on the front panel of the **MP300 Series controller** is inactive. The automatic sequence is initiated when the REMOTE RUN input (#3) closes and remains closed, conditional on a valid job number specified and the material past the shear not being greater than the specified part length.

Single or Dual Speed (Switch 3, MP301H, MP350H, MP350P, MP350PA, and MP350PH)

OFF	Single Speed Shear
ON	Two Speed Shear

Machines that shift into slow speed prior to the shear require Switch 3 to be set to the ON position. Set Switch 3 to OFF for machines that operate at a single speed.

Machine Type (Switches 4 and 5, MP301, MP301A, MP350, and MP350A)

Switches 4 and 5 determine the basic type of machine that the **MP301** or **MP350** is being installed on. These types of machines are as follows:

Switch 4	Switch 5	Machine Type
OFF	OFF	Flying Die with Die Boost
ON	OFF	Flying Die without Die Boost
OFF	ON	Feed-to-Stop
ON	ON	Not Used

Flying Die with Die Boost

Machines that do not stop the material for each shear and have a device to push the die forward as it is being cut would be set to this type. In addition to running a non-stop sequence of outputs, parameters relating to the Die Boost will appear in the Configuration program.

Flying Die without Die Boost

Machines that do not stop the material for each shear and do not have a device to push the die forward for each cut would be set to this type. The non-stop sequence of outputs would be run, and no references to Die Boosts will appear which could confuse the operator.

Feed-to-Stop

Machines with fixed dies must stop for each shearing operation. The operation of the **MP301** or **MP350** is considerably different for this type of machine as opposed to the flying die type. The major difference is that since the material does stop, the controller can check the position of the material against a programmed

tolerance before activating the shear. If the machine is out of tolerance, the operator can be warned. This ensures that no bad parts will be made.

Hump Table Shears

With a HUMP TABLE machine, the shear is fixed, but the material does not stop for the shear cycle; it forms a hump behind the shear where it clamps. With the **MP301** or **MP350**, this machine should be set as a flying die with no die boost (Switch 4 ON and Switch 5 OFF).

Run Mode (Switch 4, MP301H, MP350H, MP350P, MP350PA, and MP350PH)

OFF	Front Panel Run With Safety Interlock
ON	Remote Run

Switch 4 determines how the controller enters the RUN mode. The position of this switch also determines the definition of the controller's input #3.

Local Mode (Switch 4 OFF)

With Switch 4 in the OFF position, the RUN switch on the front panel of the controller is active and will initiate the automatic sequence, if a valid job has been programmed and no punch or shear locations have gone past the appropriate presses. Input #3 is defined as the SAFETY INTERLOCK that should be connected to the Emergency Stop circuit of the machine. This input will not start the machine when it closes. It must be closed, however, prior to pressing the RUN switch.

Remote Mode (Switch 4 ON)

With Switch 4 in the ON position, the RUN switch on the front panel of the controller is inactive, and input #3 is defined as the REMOTE RUN input. The automatic sequence is initiated when input #3 is closed and remains closed, if a valid job has been programmed.

Punch Type (Switch 5, MP350P, MP350PA, and MP350PH)

OFF	Feed-to-Stop Punch
ON	Non-Stop Punch

Switch 5 should be set to the ON position for punch presses that operate on the fly (Non-Stopping). Set Switch 5 to OFF for punch presses that operate on Feed-to-Stop machines.

Manual Shear on Non-Stopping Lines (Switch 6, MP301, MP301A, MP350, and MP350A)

OFF	Manual Shear Allowed While Machine is Halted
ON	Manual Shear <u>Not</u> Allowed While Machine is Halted

Placing Switch 6 in the ON position disables the **MP301** or **MP350** from making a manual shear while the line is halted and also does not allow the Automatic Calibration function. With Switch 6 in the OFF position, a manual shear is allowed with the line halted. On a manual shear input (Blue CYCLE button), the LENGTH PAST SHEAR will be reset to 0.000 (or –shear kerf value) and the line will be ready to run.

Punch Die Boost (Switch 6, MP350P, MP350PA, and MP350PH)

OFF	Punch Die Boost Active
ON	No Punch Die Boost

Machines which do not stop the material for each punch and have a device to push the die forward as it is punching require

Switch 6 to be set to the OFF position. Set Switch 6 to ON for machines with Non-Stopping or Feed-to-Stop punching operations that do not use a Die Boost.

Single or Dual Speed (Switch 7, MP350P, MP350PA, and MP350PH)

OFF	Single Speed Punch
ON	Two Speed Punch

Machines that shift into a slow speed prior to each punching operation require Switch 7 to be set to the ON position. Set Switch 7 to OFF for single speed machines.

Single Batch Operation (Switch 7, MP350 and MP350A)

OFF	Multiple Batch Mode
ON	Single Batch Mode

Placing Switch 7 in the ON position disables the multiple-batch capability of the **MP350**. Only one job at a time may now be programmed. This feature was added to simplify part programming for users who continuously make pieces at the same length and have no need to enter multiple jobs.

Controller Model Types

There are many different types of controllers available from AMS controls. The factors that will influence the model selected include whether the machine is a “Feed-To-Stop” line or “Flying Cut”, and if presses that perform punching are to be controlled.

Each individual controller will have its own unique set of parameters based upon the type machine used and the number of presses. Many parameters are common to all controllers, while some parameters are used under specific conditions, for example, the Hole Counter option requires certain parameters not used by the other controllers.

The following section deals with each individual controller and gives a brief description of each of the open loop controllers, the proper position for the configuration switches, a list of the inputs and outputs, and a list of the machine setup parameters for that model.

In the back of the manual there is a generic setup data sheet that includes all possible setup parameters. Please fill in the appropriate data for your individual controller on this sheet, as it will help the AMS Customer Service Department troubleshoot your machine in the event it is not performing at the required standards.

The numbers shown are the numbers of the basic controller with and without the Hole Counter and Analog output options. The letter H is used for the hole counter and the letter A is used for the Analog option.

MP301 = Has no options
MP301A = Has Analog output option
MP301H = Has Hole Counting option
MP350 = Has no options
MP350A = Has Analog output option
MP350H = Has Hole Counting option
MP350P = Has no options
MP350PA = Has Analog output option
MP350PAV = Has Proportional Analog output
MP350PH = Has Hole Counting option

MP301

General Description

The **MP301** is capable of controlling a single press (cutoff) and it will control machines with stationary or flying dies. The **MP301** will continually monitor position, speed, and velocity, while automatically compensating for any changes that occur on the line. This controller is a single batch controller and as such, only one job may be entered at a time.

Switch Settings and I/O

SW1	SW2	
OFF	OFF	Single Speed
ON	OFF	Dual Speed, Forward-Slow Logic
OFF	ON	Dual Speed, Fast-Slow Logic
ON	ON	Not a valid setting
SW3	OFF	Local Mode
	ON	Remote Mode
SW4	SW5	
OFF	OFF	Flying Die with Die Boost
ON	OFF	Flying Die without Die Boost
OFF	ON	Feed-To-Stop
ON	ON	Not Used
SW6	OFF	Manual Shear allowed while machine is halted
	ON	Manual Shear <u>not</u> allowed while machine is halted
SW7		Not Used

<u>NO.</u>	<u>INPUTS</u>	<u>OUTPUT</u>
1	Jog Forward	Forward/Fast
2	Jog Reverse	Slow
3	Safety Interlock/Remote Run	Reverse
4	Shear Complete	Shear
5	Setup/Lockout	Shear Boost/Shear Up
6	Not Used	Run
7	External Manual Shear	Batch Complete

Shear Up available when Shear Boost is not used.

General Parameters

The following is a list of the machine setup parameters for the **MP301**. For detailed description of the parameters see section 3 "Machine Configuration."

- **Refresh Done Job**
- **Batching**
- **Shear Dwell Down**
- **Shear Dwell Up**
- **Boost Dwell**
- **Boost Comp**
- **Shear Kerf**
- **Minimum Part**
- **Delay After Shear**
- **Minimum Slow Distance**
- **Tolerance**
- **Encoder Direction**
- **Resolution**
- **Filter Constant**
- **Units**
- **Stopping Mode**
- **Stopping Reaction**
- **Decel Factor Mode**
- **Decel Factor**
- **Shear Reaction**
- **Boost Reaction**
- **Correction**

MP301A

General Description

The **MP301A** is capable of controlling a single press (cutoff) and it will control machines with stationary or flying dies and uses the Analog output option. The **MP301A** will continually monitor position, speed, and velocity, while automatically compensating for any changes that occur on the line. This controller is a single batch controller and as such, only one job may be entered at a time.

Switch Settings and I/O

SW1	SW2	
OFF	OFF	Single Speed
ON	OFF	Dual Speed, Forward-Slow Logic
OFF	ON	Dual Speed, Fast-Slow Logic
ON	ON	Not a valid setting
SW3	OFF	Local Mode
	ON	Remote Mode
SW4	SW5	
OFF	OFF	Flying Die with Die Boost
ON	OFF	Flying Die without Die Boost
OFF	ON	Feed-To-Stop
ON	ON	Not Used
SW6	OFF	Manual Shear allowed while machine is halted
	ON	Manual Shear <u>not</u> allowed while machine is halted
SW7		Not Used

<u>NO.</u>	<u>INPUTS</u>	<u>OUTPUT</u>
1	Jog Forward	Forward/Fast
2	Jog Reverse	Slow
3	Safety Interlock/Remote Run	Reverse
4	Shear Complete	Shear
5	Setup/Lockout	Shear Boost/Shear Up
6	Not Used	Run
7	External Manual Shear	Batch Complete

Shear Up available when Shear Boost is not used.

Analog out = 0 to 10 VDC, Analog + = pin 14/Analog - = pin 15

General Parameters

The following is a list of the machine setup parameters for the **MP301A**. For detailed description of the parameters see sections 3 "Machine Configuration" and 7 "Analog Output Option".

- **Refresh Done Job**
- **Batching**
- **Shear Dwell Down**
- **Shear Dwell Up**
- **Boost Dwell**
- **Boost Comp**
- **Shear Kerf**
- **Minimum Part**
- **Delay After Shear**
- **Minimum Slow Distance**
- **Tolerance**
- **Encoder Direction**
- **Resolution**
- **Min Volts**
- **Max Volts**
- **Length at Max**
- **Filter Constant**
- **Units**
- **Stopping Mode**
- **Stopping Reaction**
- **Decel Factor Mode**
- **Decel Factor**
- **Shear Reaction**
- **Boost Reaction**
- **Correction**

MP301H

General Description

The **MP301H** is capable of controlling a single press (cutoff) and it will control machines with flying dies and uses the Hole Detect option. The **MP301H** will continually monitor position, speed, and velocity, while automatically compensating for any changes that occur on the line.

Switch Settings and I/O

SW1	OFF	Not a valid setting
	ON	Non-Stop Shear
SW2	OFF	Shear Die Boost Active
	ON	No Shear Die Boost
SW3	OFF	Single Speed Shear
	ON	Two Speed Shear
SW4	OFF	Front Panel Run
	ON	Remote Run (Input 3)
SW5		Not Used
SW6		Not Used
SW7		Not Used

<u>NO.</u>	<u>INPUTS</u>	<u>OUTPUT</u>
1	Jog Forward	Forward/Fast
2	Jog Reverse	Slow
3	Safety Interlock/Remote Run	Reverse
4	Shear Complete	Shear
5	Setup/Lockout	Not Used
6	Not Used	Run
7	Hole Detector	Shear Boost/Shear Up
8	External Manual Shear	Not Used

Shear Up available when Shear Boost is not used.

General Parameters

The following is a list of the machine setup parameters for the **MP301H**. For detailed descriptions of the parameters see section 3 “Machine Configuration.”

- **Refresh Done Job**
- **Batching**
- **Mode**
- **Shear Dwell Down**
- **Shear Dwell Up**
- **Boost Dwell**
- **Shear Kerf**
- **Shear-Detect**
- **Minimum Hole Spacing**
- **No-Hole Stop**
- **Minimum Part**
- **Delay After Shear**
- **Speed Logic**
- **Minimum Slow Distance**
- **Encoder Direction**
- **Resolution**
- **Filter Constant**
- **Units**
- **Shear Reaction**
- **Boost Reaction**
- **Decel Factor Mode**
- **Decel Factor**
- **Correction**

MP350

General Description

The **MP350** is capable of controlling a single press (cutoff) and it will control machines with stationary or flying dies. The **MP350** will continually monitor position, speed, and velocity, while automatically compensating for any changes that occur on the line.

Switch Settings and I/O

SW1	SW2	
OFF	OFF	Single Speed
ON	OFF	Dual Speed, Forward-Slow Logic
OFF	ON	Dual Speed, Fast-Slow Logic
ON	ON	Not a valid setting
SW3	OFF	Local Mode
	ON	Remote Mode
SW4	SW5	
OFF	OFF	Flying Die with Die Boost
ON	OFF	Flying Die without Die Boost
OFF	ON	Feed-To-Stop
ON	ON	Not Used
SW6	OFF	Manual Shear allowed while machine is halted
	ON	Manual Shear <u>not</u> allowed while machine is halted
SW7	OFF	Multiple Batch Mode
	ON	Single Batch Mode

<u>NO.</u>	<u>INPUTS</u>	<u>OUTPUT</u>
1	Jog Forward	Forward/Fast
2	Jog Reverse	Slow
3	Safety Interlock/Remote Run	Reverse
4	Shear Complete	Shear
5	Setup/Lockout	Die Boost/Shear Up
6	Not Used	Run
7	External Manual Shear	Batch Complete

Shear Up available when Die Boost is not used.

General Parameters

The following is a list of the machine setup parameters for the **MP350**. For detailed descriptions of the parameters see section 3 “Machine Configuration.”

- **Halt Mode**
- **Refresh Done Job**
- **Shear Dwell Down**
- **Shear Dwell Up**
- **Boost Dwell**
- **Boost Comp**
- **Shear Kerf**
- **Minimum Part**
- **Delay After Shear**
- **Minimum Slow Distance**
- **Tolerance**
- **Encoder Direction**
- **Resolution**
- **Filter Constant**
- **Units**
- **Shear Reaction**
- **Boost Reaction**
- **Stopping Mode**
- **Stopping Reaction**
- **Decel Factor Mode**
- **Decel Factor**
- **Correction**

MP350A

General Description

The **MP350A** is capable of controlling a single press (cutoff) and it will control machines with stationary or flying dies and uses the Analog output option. The **MP350A** will continually monitor position, speed, and velocity, while automatically compensating for any changes that occur on the line.

Switch Settings and I/O

SW1	SW2	
OFF	OFF	Single Speed
ON	OFF	Dual Speed, Forward-Slow Logic
OFF	ON	Dual Speed, Fast-Slow Logic
ON	ON	Not a valid setting
SW3	OFF	Local Mode
	ON	Remote Mode
SW4	SW5	
OFF	OFF	Flying Die with Die Boost
ON	OFF	Flying Die without Die Boost
OFF	ON	Feed-To-Stop
ON	ON	Not Used
SW6	OFF	Manual Shear allowed while machine is halted
	ON	Manual Shear <u>not</u> allowed while machine is halted
SW7	OFF	Multiple Batch Mode
	ON	Single Batch Mode

<u>NO.</u>	<u>INPUTS</u>	<u>OUTPUT</u>
1	Jog Forward	Forward/Fast
2	Jog Reverse	Slow
3	Safety Interlock/Remote Run	Reverse
4	Shear Complete	Shear
5	Setup/Lockout	Die Boost/Shear Up
6	Not Used	Run
7	External Manual Shear	Batch Complete

Shear Up available when Die Boost is not used.

Analog out = 0 to 10 VDC, Analog + = pin 14/Analog - = pin 15

General Parameters

The following is a list of the machine setup parameters for the **MP350A**. For detailed description of the parameters see

sections 3 “Machine Configuration” and 7 “Analog Output Option”.

- **Halt Mode**
- **Refresh Done Job**
- **Shear Dwell Down**
- **Shear Dwell Up**
- **Boost Dwell**
- **Boost Comp**
- **Shear Kerf**
- **Minimum Part**
- **Delay After Shear**
- **Minimum Slow Distance**
- **Tolerance**
- **Encoder Direction**
- **Resolution**
- **Min Volts**
- **Max Volts**
- **Length at Max**
- **Filter Constant**
- **Units**
- **Shear Reaction**
- **Boost Reaction**
- **Stopping Mode**
- **Stopping Reaction**
- **Decel Factor Mode**
- **Decel Factor**
- **Correction**

MP350H

General Description

The **MP350H** is capable of controlling a single press (cutoff) and it will control machines with flying dies and uses the Hole Detect option. The **MP350H** will continually monitor position, speed, and velocity, while automatically compensating for any changes that occur on the line.

Switch Settings and I/O

SW1	OFF	Not a valid setting
	ON	Non-Stop Shear
SW2	OFF	Shear Die Boost Active
	ON	No Shear Die Boost
SW3	OFF	Single Speed Shear
	ON	Two Speed Shear
SW4	OFF	Front Panel Run
	ON	Remote Run (Input 3)
SW5		Not Used
SW6		Not Used
SW7		Not Used

<u>NO.</u>	<u>INPUTS</u>	<u>OUTPUT</u>
1	Jog Forward	Forward/Fast
2	Jog Reverse	Slow
3	Safety Interlock/Remote Run	Reverse
4	Shear Complete	Shear
5	Setup/Lockout	Not Used
6	Not Used	Run
7	Hole Detector	Shear Boost/Shear Up
8	External Manual Shear	Not Used

Shear Up available when Die Boost is not used.

General Parameters

The following is a list of the machine setup parameters for the **MP350H**. For detailed descriptions of the parameters see section 3 “Machine Configuration.”

- **Halt Mode**
- **Refresh Done Job**
- **Mode**
- **Shear Dwell Down**
- **Boost Dwell**
- **Shear Kerf**
- **Shear-Detect**
- **Minimum Hole Spacing**
- **No-Hole Stop**
- **Minimum Part**
- **Delay After Shear**
- **Speed Logic**
- **Minimum Slow Distance**
- **Encoder Direction**
- **Resolution**
- **Filter Constant**
- **Units**
- **Shear Reaction**
- **Boost Reaction**
- **Decel Factor Mode**
- **Decel Factor**
- **Correction**

MP350P

General Description

The **MP350P** is capable of controlling a single press (cutoff) and a punch press, and it will control machines with stationary or flying dies. The **MP350P** will continually monitor position, speed, and velocity, while automatically compensating for any changes that occur on the line.

Switch Settings and I/O

SW1	OFF	Feed-To-Stop Shear
	ON	Non-Stop Shear
SW2	OFF	Shear Die Boost Active
	ON	No Shear Die Boost
SW3	OFF	Single Speed Shear
	ON	Dual Speed Shear
SW4	OFF	Front Panel Run
	ON	Remote Run (Input 3)
SW5	OFF	Feed-To-Stop Punch
	ON	Non-Stop Punch
SW6	OFF	Punch Die Boost Active
	ON	No Punch Die Boost
SW7	OFF	Single Speed Punch
	ON	Dual Speed Punch

<u>NO.</u>	<u>INPUTS</u>	<u>OUTPUT</u>
1	Jog Forward	Forward/Fast
2	Jog Reverse	Slow
3	Safety Interlock/Remote Run	Reverse
4	Shear Complete	Shear
5	Setup/Lockout	Punch
6	Punch Complete	Run
7	External Manual Shear	Shear Up/Die Boost
8	External Manual Punch	Punch Up/Die Boost

Shear Up and Punch Up are available when Die Boosts are not used.

General Parameters

The following is a list of the machine setup parameters for the **MP350P**. For detailed descriptions of the parameters see section 3 "Machine Configuration."

- **Halt Mode**
- **Refresh Done Job**
- **Halt No Parts to Run (With Punch Only)**
- **Shear Dwell Down**
- **Shear Dwell Up**
- **Boost Dwell**
- **Shear Kerf**
- **Minimum Part**
- **Delay After Shear**
- **Punch Dwell Down**
- **Punch Dwell Up**
- **Punch Boost Dwell**
- **Scrap Length**
- **Shear-Punch**
- **Speed Logic**
- **Minimum Slow Distance**
- **Tolerance**
- **Encoder Direction**
- **Resolution**
- **Filter Constant**
- **Units**
- **Shear Reaction**
- **Boost Reaction**
- **Punch Reaction**
- **Punch Boost Reaction**
- **Stopping Mode**
- **Stopping Reaction**
- **Decel Factor Mode**
- **Decel Factor**
- **Correction**

MP350PA

General Description

The **MP350PA** is capable of controlling a single press (cutoff) and a punch press, and it will control machines with stationary or flying dies and uses the Analog Output Option. The **MP350PA** will continually monitor position, speed, and velocity, while automatically compensating for any changes that occur on the line.

Switch Settings and I/O

SW1	OFF	Feed-To-Stop Shear
	ON	Non-Stop Shear
SW2	OFF	Shear Die Boost Active
	ON	No Shear Die Boost
SW3	OFF	Single Speed Shear
	ON	Dual Speed Shear
SW4	OFF	Front Panel Run
	ON	Remote Run (Input 3)
SW5	OFF	Feed-To-Stop Punch
	ON	Non-Stop Punch
SW6	OFF	Punch Die Boost Active
	ON	No Punch Die Boost
SW7	OFF	Single Speed Punch
	ON	Dual Speed Punch

<u>NO.</u>	<u>INPUTS</u>	<u>OUTPUT</u>
1	Jog Forward	Forward/Fast
2	Jog Reverse	Slow
3	Safety Interlock/Remote Run	Reverse
4	Shear Complete	Shear
5	Setup/Lockout	Punch
6	Punch Complete	Run
7	External Manual Shear	Shear Up/Die Boost
8	External Manual Punch	Punch Up/Die Boost

Shear Up/Punch Up are available when Boosts are not used.
Analog Out = 0 to 10 VDC, Analog + = pin 14/Analog - = pin 15

General Parameters

The following is a list of the machine setup parameters for the **MP350PA**. For detailed description of the parameters see sections 3 “Machine Configuration” and 7 “Analog Output Option”.

- **Halt Mode**
- **Refresh Done Job**
- **Halt No Parts to Run (With Punch Only)**
- **Shear Dwell Down**
- **Shear Dwell Up**
- **Boost Dwell**
- **Shear Kerf**
- **Minimum Part**
- **Delay After Shear**
- **Punch Dwell Down**
- **Punch Dwell Up**
- **Punch Boost Dwell**
- **Scrap Length**
- **Shear-Punch**
- **Speed Logic**
- **Minimum Slow Distance**
- **Tolerance**
- **Encoder Direction**
- **Resolution**
- **Min Volts**
- **Max Volts**
- **Length at Max**
- **Filter Constant**
- **Units**
- **Shear Reaction**
- **Boost Reaction**
- **Punch Reaction**
- **Punch Boost Reaction**
- **Stopping Mode**
- **Stopping Reaction**
- **Decel Factor Mode**
- **Decel Factor**
- **Correction**

MP350PAV

General Description

The **MP350PAV** is capable of controlling a single press (cutoff) and a punch press. It will control machines with stationary or flying dies and uses an analog output proportional to the current line speed. The **MP350PAV** will continually monitor position, speed, and velocity, while automatically compensating for any changes that occur on the line.

Switch Settings and I/O

SW1	OFF	Feed-To-Stop Shear
	ON	Non-Stop Shear
SW2	OFF	Shear Die Boost Active
	ON	No Shear Die Boost
SW3	OFF	Single Speed Shear
	ON	Dual Speed Shear
SW4	OFF	Front Panel Run
	ON	Remote Run (Input 3)
SW5	OFF	Feed-To-Stop Punch
	ON	Non-Stop Punch
SW6	OFF	Punch Die Boost Active
	ON	No Punch Die Boost
SW7	OFF	Single Speed Punch
	ON	Dual Speed Punch

<u>NO.</u>	<u>INPUTS</u>	<u>OUTPUT</u>
1	Jog Forward	Forward/Fast
2	Jog Reverse	Slow
3	Safety Interlock/Remote Run	Reverse
4	Shear Complete	Shear
5	Setup/Lockout	Punch
6	Punch Complete	Run
7	External Manual Shear	Shear Up/Die Boost
8	External Manual Punch	Punch Up/Die Boost

Shear Up/Punch Up are available when Boosts are not used.

Analog Out = 0 to 10 VDC, Analog + = pin 14/Analog - = pin 15

General Parameters

The following is a list of the machine setup parameters for the **MP350PAV**. For detailed descriptions of the parameters see section 3 "Machine Configuration."

- **Halt Mode**
- **Refresh Done Job**
- **Halt No Parts to Run (With Punch Only)**
- **Shear Dwell Down**
- **Shear Dwell Up**
- **Boost Dwell**
- **Shear Kerf**
- **Minimum Part**
- **Delay After Shear**
- **Punch Dwell Down**
- **Punch Dwell Up**
- **Punch Boost Dwell**
- **Scrap Length**
- **Shear-Punch**
- **Speed Logic**
- **Minimum Slow Distance**
- **Tolerance**
- **Encoder Direction**
- **Resolution**
- **Line Movement**
- **Filter Constant**
- **Units**
- **Shear Reaction**
- **Boost Reaction**
- **Punch Reaction**
- **Punch Boost Reaction**
- **Stopping Mode**
- **Stopping Reaction**
- **Decel Factor Mode**
- **Decel Factor**
- **Correction**

MP350PH

General Description

The **MP350PH** is capable of controlling a single press (cutoff) and a punch press, and it will control machines with flying dies and uses the Hole Detect option. The **MP350PH** will continually monitor position, speed, and velocity, while automatically compensating for any changes that occur on the line.

Switch Settings and I/O

SW1	OFF	Not a valid setting
	ON	Non-Stop Shear
SW2	OFF	Shear Die Boost Active
	ON	No Shear Die Boost
SW3	OFF	Single Speed Shear
	ON	Dual Speed Shear
SW4	OFF	Front Panel Run
	ON	Remote Run (Input 3)
SW5	OFF	Not a valid setting
	ON	Non-Stop Punch
SW6	OFF	Punch Die Boost Active
	ON	No Punch Die Boost
SW7	OFF	Single Speed Punch
	ON	Dual Speed Punch

<u>NO.</u>	<u>INPUTS</u>	<u>OUTPUT</u>
1	Jog Forward	Forward/Fast
2	Jog Reverse	Slow
3	Safety Interlock/Remote Run	Reverse
4	Shear Complete	Shear
5	Setup/Lockout	Punch
6	Punch Complete	Run
7	Hole Detector	Shear Up/Die Boost
8	External Manual Punch	Punch Up/Die Boost

Shear Up and Punch Up are available when Die Boosts are not used.

General Parameters

The following is a list of the machine setup parameters for the **MP350PH**. For detailed descriptions of the parameters see section 3 "Machine Configuration."

- **Halt Mode**
- **Refresh Done Job**
- **Halt No Parts to Run (With Punch Only)**
- **Hole Mode**
- **Shear Dwell Down**
- **Shear Dwell Up**
- **Boost Dwell**
- **Shear Kerf**
- **Shear-Detect**
- **Minimum Hole Spacing**
- **No-Hole Stop**
- **Minimum Part**
- **Delay After Shear**
- **Punch Dwell Down**
- **Punch Dwell Up**
- **Punch Boost Dwell**
- **Scrap Length**
- **Shear-Punch**
- **Speed Logic**
- **Minimum Slow Distance**
- **Encoder Direction**
- **Resolution**
- **Filter Constant**
- **Units**
- **Shear Reaction**
- **Boost Reaction**
- **Punch Reaction**
- **Punch Boost Reaction**
- **Decel Factor Mode**
- **Decel Factor**
- **Correction**

SETUP DATA SHEET

Machine Data

Halt Mode? _____

Refresh Done Job? (Yes/No) _____

Batching? (Yes/No) _____

Hole Mode (Standard/Count Hole) _____

Halt No Parts to Run (Yes/No) _____

Shear Dwell Down (Time) _____

Shear Dwell Up (Time) _____

Boost Dwell (Time) _____

Boost Comp (Length) _____

Shear Kerf (Length) _____

Shear-Detect (Length) _____

Minimum Hole Spacing (Length) _____

No Hole Stop (Length) _____

Minimum Part (Length) _____

Delay After Shear (Time) _____

Punch Dwell Down (Time) _____

Punch Dwell Up (Time) _____

Punch Boost Dwell (Time) _____

Scrap Length _____

Shear-Punch (Length) _____

Speed Logic (Fwd-Slow/Fast-Slow) _____

Minimum Slow Distance _____

Tolerance (Length) _____

Encoder Direction (CW/CCW) _____

Resolution (Length) _____

Line Movement _____

Min Volts _____

Max Volts _____

Length At Max _____

Filter Constant (Hz) _____

Units (English/Metric) _____

MANUAL CALIBRATION

Shear Reaction (Time) _____

Die Boost Reaction (Time) _____

Stopping Mode (Auto,Man,Off) _____

Stopping Reaction (Time) _____

Decel Factor Mode (Off,Man,Auto) _____

Decel Factor (In/Sec²) _____

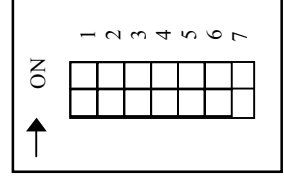
Punch Reaction (Time) _____

Punch Boost React (Time) _____

Correction (Percentage) _____

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.

TYPE



Serial Number _____

Version Number _____

• _____

• _____

• _____

Appendix A

Model MP3 _____

Setup Data Sheet

Model MP3_____

Setup Data Sheet

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.

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

Output Characteristics

Std 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

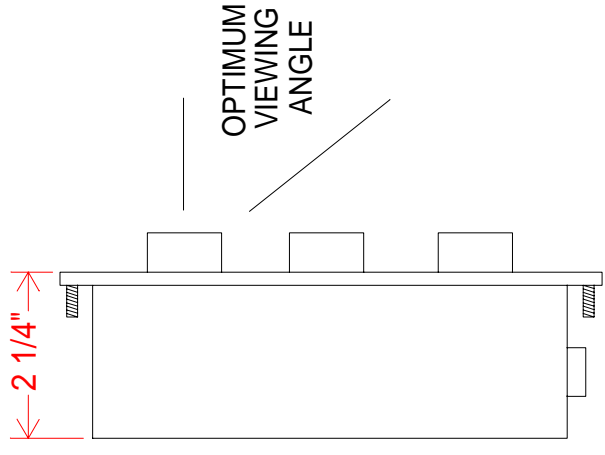
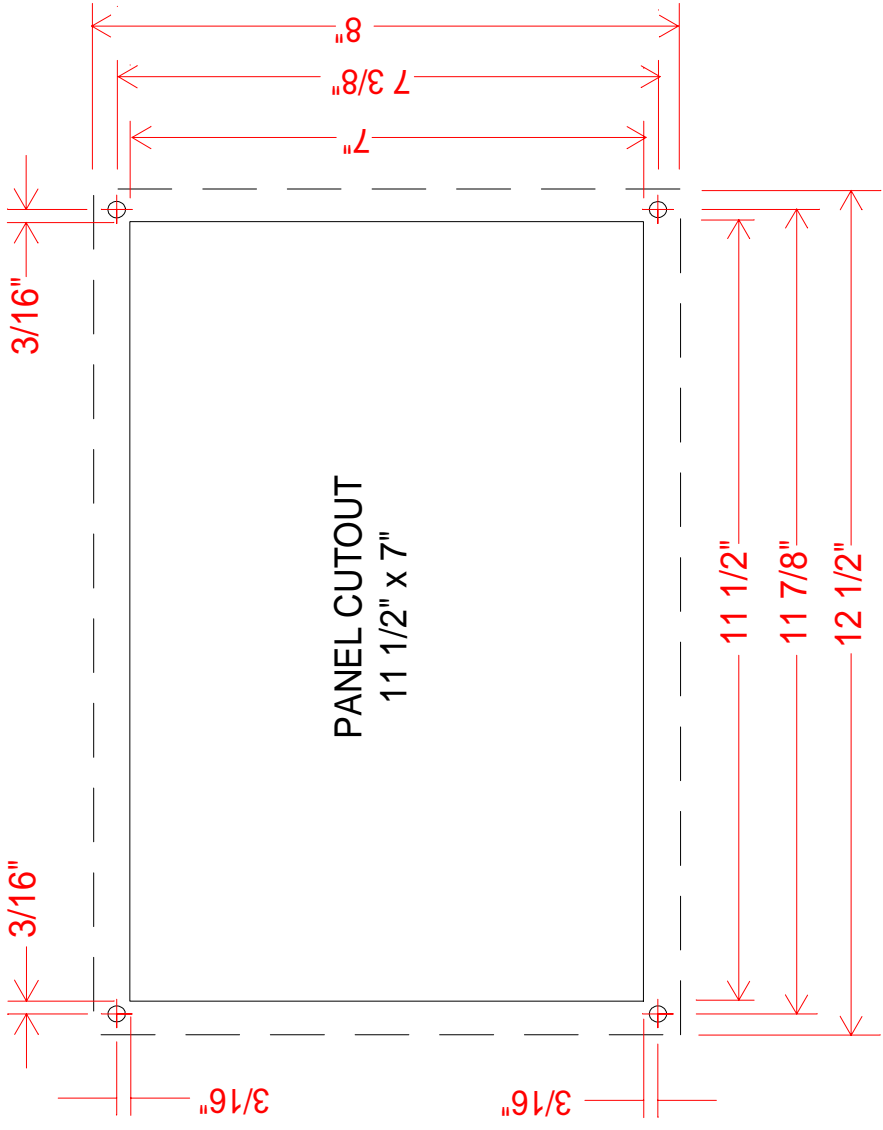
Type	Quadrature with Complements
Voltage	5VDC
Maximum Encoder Load	200 milliamperes
Maximum Pulse Rate	275,000 pulses/second

Operation

Number of Batches	1 or 999, depending on model
Maximum Part Length	9999.999 inches 25,400 centimeters 254,000 millimeters
Maximum Parts/Batch	9999
Units of Measurement	inches, centimeters, or millimeters
Footage Totalizers	3
Maximum Footage/Totalizer	1,000,000 feet 1,000,000 meters

Features

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



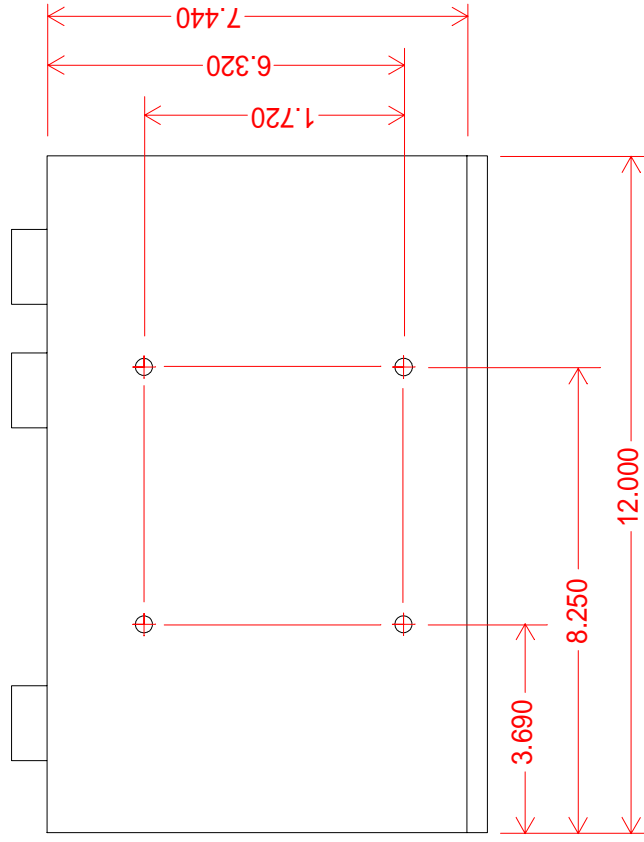
DASHED LINE IS EDGE OF PANEL
(REFERENCE)

⊕ DRILL 1/4" HOLE

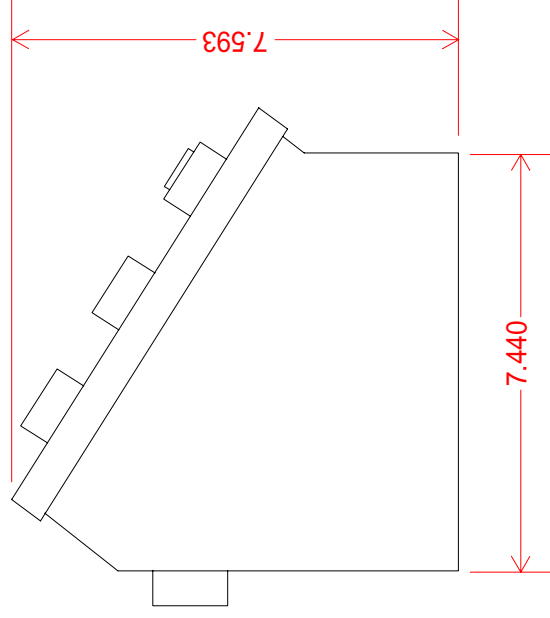
NOTES:

REVISIONS		AMS CONTROLS, INC.			
NO.	DATE	BY	TITLE		
A			MP300 MOUNTING DIMENSIONS		
B			DRAWN BY	DFK	MATERIAL
C			CHKD	1-15-97	DRAWING NO.
D			FILE	3804.dwg2	APPD
E					3804

Top View With Cover Removed



Side View



⊕ Mounting holes are 1/4-20 X 1/2

REVISIONS		AMS CONTROLS, INC.			
NO.	DATE	BY	TITLE		
A			MP300 MOUNTING DIMENSIONS		
B			DRAWN BY	DFK	MATERIAL
C			CHKD	DATE	DRAWING NO.
D			FILE	3804_2.dwg2	3804_2
E			APPD		

Changes to the MP OL Software

The following is a list of the software changes and procedures that have been made to the AMS Controls MP Series Open Loop controllers. This document will just be a list of the changes that have been made. The switch from Version 13.XX to Version 14.XX indicates a change in hardware of the controller. Version 14.XX software runs at a faster clock speed.

Software Changes For All MP300OL Series Controllers

Occasionally during the controller's initial power up, the LCD would not initialize itself properly resulting in both lines of text being displayed on the top line of the LCD (SCN 427).

The Auto Calibrate procedure was added to the MP301H and MP350H when the controller is setup to run in standard mode. (SCN 471)

An error was found and corrected where the Run output would stay on until the CE key was pressed if a Missed Shear or Missed Punch error occurred. (SCN 486)

From a memory cleared condition, the controller would fire the shear without a dwell time being entered, the shear would fire for an internally set default time of 10 seconds. The internal default was changed so the shear can not be fired without a shear dwell time being entered (SCN 487).

The MP350PH would clear the queue when the line was halted, throwing out any remaining punch operations on the current part. This problem was corrected. (SCN 507)

Added new setup parameter, "Line Movement {FWD/FST / RUN}" (SCN 521).

A new model was created called the MP350PAV. (SCN 526)

The controller software was modified to auto-detect and run with more RAM (values between 32-kByte and 128-kByte). (SCN 537)

	MP301	MP301A	MP301H	MP350	MP350A	MP350H	MP350P	MP350PA	MP350PAV	MP350PH
SCN 427	Ver 13.08	N/A	N/A	Ver 13.22	N/A	Ver 13.03	Ver 13.16	Ver 13.01	N/A	Ver13.02
SCN 471	N/A	N/A	N/A	N/A	N/A	Ver 13.03	N/A	N/A	N/A	N/A
SCN 486	Ver 13.10/ Ver 14.00	Ver 13.01/ Ver 14.00	Ver 13.01/ Ver 14.00	Ver 13.24/ Ver 14.00	Ver 13.01/ Ver 14.00	Ver 13.04/ Ver 14.00	Ver 13.17/ Ver 14.00	Ver 13.02/ Ver 14.00	N/A	Ver 13.03/ Ver 14.00
SCN 487	Ver 13.10/ Ver 14.00	Ver 13.01/ Ver 14.00	Ver 13.01/ Ver 14.00	Ver 13.24/ Ver 14.00	Ver 13.01/ Ver 14.00	Ver 13.04/ Ver 14.00	Ver 13.17/ Ver 14.00	Ver 13.02/ Ver 14.00	N/A	Ver 13.03/ Ver 14.00
SCN 507	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Ver 13.03/ Ver 14.00
SCN 521	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Ver 14.00	N/A
SCN 526	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Ver 14.00	N/A
SCN 537	Ver 13.10/ Ver 14.00	N/A	Ver 13.01/ Ver14.00	Ver 13.24/ Ver 14.00	N/A	Ver 13.04/ Ver 14.00	Ver 13.17/ Ver 14.00	Ver 13.02/ Ver 14.00	N/A	Ver 13.03/ Ver 14.00

The above chart shows which software versions the listed Software Change Notices take effect on.