

MP100 SERIES

LENGTH CONTROL SYSTEMS

MODEL MP103

SHEAR & PUNCH CONTROLLER

REFERENCE MANUAL

20 BATCH
v2.3 & ↓

AMS APPLIED
MICROSYSTEMS

MODEL MP103 AND PUNCH SHEAR CONTROLLER

General Description

The MP103 is a microprocessor based controller designed to operate a wide variety of shear and punch lines. The front panel has two 12 key keypads and a 12 digit seven segment light emitting diode (LED) display for programming and displaying various parameters. One LED next to the display indicates if the controller is in the Decimal Inches or Feet, Inch, Thirty Seconds (when lit) mode of operation. Eight LED's across the bottom indicate the state of the various outputs.

Three connectors on the rear interface the unit with system. Connector J1 connects to the length encoder. 115 VAC and 5 to 24 VDC are brought in through J2. The following outputs also come from J2.

- 1 Forward
- 2 Fast Forward
- 3 Slow Forward
- 4 Reverse
- 5 Run
- 6 Shear
- 7 Punch

six inputs come in through J3. These are:

- Manual Punch
- Punch Complete
- Crop
- Shear Complete
- Run
- Setup Lockout

By programming, the controller can be set up to operate in decimal inches or feet, inch, thirty seconds as a flying die or slowdown-stop line. Other features include:

- 20 Batches
- Programming while running
- Total length counter
- 4 display modes
- 3 Programming modes
- Incrementing of current quantity
- Delay time between batches
- Delay time after shear
- Range of batches to be used
- Reset for restarting the line
- Battery backed up memory for retention of data for power loss
- Flashing reset light indicating autocrop when restarting

Locking lock out of setup mode thru external
switch
0 to 14 punches selectable per batch

The accuracy is 0.01 inches time the correction factor in both
Decimal Inches or feet, inch, thirty seconds.

PROGRAMMING

The three programming modes are Setup, Program and Set sequence.
These modes can be entered by depressing the Setup, Program and
Set Seq. keys. Note that the Setup and Sequence modes control
operational functions of the system. Changing these values when
the line is running would cause unpredictable operation. For
these reasons, these modes can only be entered when the line is
halted.

The Setup and Program are identical as to programming rules, and
are discussed below. The Sequence mode is different and will be
discussed in more detail under the sequence mode. When each
value is first displayed a message is displayed on the left hand
side of the display and the current value is displayed on the
right side with leading zero's blanked. When the first number or
decimal point is entered the right hand side of the display is
blanked and numbers are shifted in to the left. Pressing the
clear key (CE) restores the original value. Pressing the enter
key stores the value shown in the display and proceeds onto the
next value. All values have a range specified below. For
example, 0.00 to 99.99 indicates only four digits are allowed two
above and two below the decimal point. If too many digits are
programmed then an error message is produced. Zero's are added
in after an enter has been hit and a decimal point is
automatically entered after the maximum number of digits is
entered. This allows faster programming by minimizing the number
of keys which must be pressed.

When power is applied to the unit the memory is checked for data
retention. If an error is detected the memory is cleared and the
Setup mode is entered. After the Setup values are all entered
the Program mode is entered. If the data retention test passes,
then the Program mode is entered directly.

SETUP MODE

The following values are programmed in the order shown below.

DISPLAY	FUNCTION
SH. SEC.	Time of shear cycle. 0.00 to 99.99 seconds. If set to 0 then the shear output will stay on until the external shear complete switch is closed.
SH. SEC.	Time of punch cycle. 0.00 to 99.99 seconds.

If set to 0 then the punch output will stay on until the external punch complete switch is closed.

SH. PAU. Pause time after a shear cycle until the line restarts. Used only on slowdown stop type lines. 0.00 to 99.99 seconds.

BA. PAU. Pause time between batches. The run output turns off during this time if not set to zero. 00.00 to 99.99 seconds.

LE. S-P Distance between the shear and the punch dies. 0.01 to 999.99 inches or 99 feet 11 and 31/32 inches.

LE. SLO. Length to run in slow. Set to zero to make a flying cutoff line. 0.00 to 99.99 inches or 0 to 9 feet 11 and 31/32 inches. ~~CANNOT HAVE~~ ~~FLY CUTOFF~~ ~~IF~~ ~~WANT TO RUN TO PUNCH~~

LE. Str. Minimum start up length. Defines a minimum length to be run when first starting the line to prevent scrap jam up. 0.00 to 99.99 inches or 9 feet 11 and 31/32 inches.

LE rest. Teat length for restart of the line. Defines a minimum length to be run to insure the line is at full speed before cycling a press. 0.00 to 99.99 inches or 9 feet 11 and 31/32 inches.

LE. Slu. Length of slug removed by shear. 0.00 to 99.99 inches or 0 to 9 feet 11 and 31/32 inches.

Corr. Correction Factor. 0.50000 to 1.50000.

Accu. Total length counter 0 to 999999 feet.

dirEction Direction flag (1 or 0) for CW/CCW rotation of the encoder.

PROGRAM MODE

There are twenty batches which can be programmed. To program a batch a batch number, quantity, and length are entered.

DISPLAY FUNCTION

BA. No. Number of batch to be programmed. 0 to 20. If zero is entered then an exit from the program mode is done. After batch 20 is programmed an exit is automatically done. The batch number is automatically incremented after each batch is programmed.

PC. XX Number of pieces to be run for batch number XX.

0 TO 9999. If set to zero the batch is skipped.

LE. XX Length of part for batch number XX. 0.01 TO 999.99 inches or 1/32 inch to 99 feet 11 and 31/32 inches.

PY. XX Length of PUNCH Y for batch number XX. 0.00 to 999.99 inches or 99 feet 11 and 31/32 inches
Up to 14 punches allowed where Y is 0 to 9, A, b, C, or d. Programming a punch to zero clears all remaining punch dimensions.

SEQUENCE MODE

To enter the Sequence programming mode press the SET SEQ Key. This allows a range of batch numbers to be programmed. If both numbers are the same then only one batch will be run. When entering the run mode the first batch number entered will be run first. All batches from first to last will be run until all quantities are zero. When entering the Sequence mode, the display will show:

FI.-LA. ff-11

where ff indicated the first batch no. 1 to 20.

11 indicates the last batch no 1 to 20.

If no numbers have been entered then hitting a clear will exit the Sequence mode. To program the first number, enter the one or two digit batch number desired. If only one digit has been entered press the (.) key to get a (-), indicating end of programming of the first batch no. Then program one or two digits for the second batch no. If a clear key is pressed after the numbers are being entered then a restart of the programming sequence is done. Press the enter key to save the numbers and exit the mode. If the first batch number is larger than the last, the sequence will run from the first up to batch 20 then from batch 1 to the last. For example, if 19-3 was programmed then the sequence would be 19, 20, 1, 2 and 3. If the "Set Sequence" mode is entered then the unit will start running at the first number of the sequence. If this mode is not entered, then the unit will start running at the batch that it was working on when it was halted.

OTHER FEATURES

Decimal inches of feet, inch, thirty seconds mode. Pressing the FT-IN/inch key will cycle from decimal inches to the feet, inch thirty second mode. The LED to the left of the display will be illuminated when in the feet, inch mode. When in the decimal mode all lengths programmed and displayed will enter feet followed by a decimal point and then inches followed by a second decimal point and then thirty seconds of an inch.

STATUS KEYS

The four status keys are CUR STAT, CUR PROG, FOOT COUNT and FPM. Pressing one of the keys sets the mode to display the information relating to each key. If not in a program mode the display will be continuous until another status or program key is entered. If in a program mode the information will be displayed for about 3 seconds and then the programming information will be redisplayed.

CUR STAT displays information about the current status of the batch being run. The information displayed from left to right is batch number currently being run, quantity remaining in batch, and current length run since last shear. To prevent the numbers from blurring together during a run the display is updated once every quarter of a second. If the metal is jogged in reverse past the last shear point the current length counter will become a negative number and will count in reverse. This feature allows the distance displayed to be easily related to the shear point. For example, a display of 2.00 inches indicates the leading edge of the metal is 2 inches past the shear point, and a display of -2.00 inches indicates the leading edge of the metal to be 2.00 inches behind the shear point. Under certain conditions the total number of digits to be displayed could be equal to 11 or 12. To maintain readability of the display a space is always left between batch number and quantity and between quantity and length. In order to insure this, one or two decimal digits for the length may not be displayed in some cases.

CUR PROG displays information about the original values of the batch being run. From left to right the display shows current batch number, original quantity and total length of part to be run. As described above the number of digits displayed could be 11 or 12. Unlike the above mode it may not be desirable to shift the decimal digits off of the display. Therefore, the data is packed together with the space between the batch number and quantity eliminated first.

FOOT COUNT displays the total length of "good" material run since it was last cleared. The total length counter only counts material that has been sheared off by the processor and considered a valid part. It does not count any material run as scrap, any material removed by the operator by a manual crop while running or any material in front of the shear when starting up after a RESET has been done.

FPM displays the current line speed in Feet/minute. This value is averaged over 1/4 second.

INCREMENT QUANTITY

During a run parts may, for various reasons, be determined to be unusable. To make up the difference an increment quantity key has been provided. Pressing the INC QTY key will add one to the current quantity of the batch in progress. This key can be used at any time and in any mode. When using the key the CUR STAT mode

is entered as described above. This key does not change the original quantity shown under the CUR PROG mode.

RESET

Pressing the reset key while halted will force the line to reset and restart when the Run mode is entered.

EXTERNAL INPUTS

When SETUP LOCKOUT CONTACT is closed the setup mode cannot be entered. Instead an error message is displayed.

Crop causes a shear cycle to start and clears the length counter. It can be used any time.

Shear Complete turns the shear output off and indicates a completed cycle to the controller.

PUNCH causes a punch cycle to start. It can be used any time except if the line is setup as a slowdown-stop-line and the line is running.

PUNCH COMPLETE turns the punch output off and indicates a completed cycle to the controller.

When the RUN/HALT switch is closed the run mode is entered if the following conditions are met. The operator cannot be in any of the three programming modes. The jog inputs must be off and the shear output must be off. At least one of the batches in the range programmed must have a non zero quantity. If all of the conditions are met, a run is started. If the reset key has been depressed the line will restart at the first non zero batch programmed. If not reset a test is done. If the length of the part plus the slug length is less than the current counter length plus the scrap length then an automatic reset is done. Otherwise the line restarts at a point it was halted. The line will continue to run until all batches in the range specified are zero or until the run switch is opened.

FRONT PANEL INDICATORS

Eight LED's across the bottom of the front panel show the status of the outputs. Defining them from left to right as LED 1 TO LED 8 they have the following correspondence to the outputs.

LED 1	Fast Fwd.
LED 2	Slow Fwd.
LED 3	Reverse
LED 4	Punch
LED 5	Shear
LED 6	Forward
LED 7	Run
LED 8	Auto Crop Indication (flashing)

ERROR MESSAGES

An error message will be displayed when an illegal operation is tried. The display will show;

Error X

where X is a number relating to the type of error performed. To clear an error message press the clear key. The error numbers used are:

- 1 Correction factor not in the range of 0.50000 to 1.50000
- 2 Batch number not in the range of 1 to 20.
- 4 Too many numbers entered.
- 5 Too many decimal points entered.
- 6 Zero length is not allowed.
- 7 A run was attempted with all batches at zero quantity.
- 8 Setup key was depressed when locked out.
- 9 Illegal Punch sequence programmed or direction

OPERATING CONSIDERATIONS

At the end of a run the controller will turn all outputs off and wait for the run switch to open. If the run switch is left closed the controller will not accept any key board inputs until the run switch is opened.

There are limitations on programming the batch that currently is being run. For the shear only mode, the quantity that is being run cannot be changed. This is not allowed because of the difficulty in trying to program an accurate number while shearing is going on. The length can be changed, but the new length will not be used until the current part is finished.

The auto crop LED will flash on and off when ever a crop will automatically be done when the line is restarted. This will flash if the shear or punch point is within the current length minus the scrap length. If the line is reversed past this point the LED will quit flashing and crop will not be done. If the reset key is depressed or when the controller is first powered up the line will always do an auto-crop.

Programming the SHEAR-TO-PUNCH distance to zero will set the machine up as a SHEAR ONLY machine. Punches will not be asked for in the batch programming mode.