

CMP SERIES

**MODEL CMP11-10
MULTIPLE PRESS
CONTROLLER
REFERENCE MANUAL**

***AMS* APPLIED
MICROSYSTEMS**

St. Louis, Missouri

CMP11-10 CONTROLLER MANUAL

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INTRODUCTION

The Model CMP11-10 controller is a general-purpose unit designed to control a variety of sheet metal processing machines. The machine converts coils of stock sheet metal material into cut parts which can include up to six different punch patterns.

The CMP11-10 is designed for use with a non-stop line. It has the capability of programming 100 different batches (jobs) to be run.

The operation of the CMP11-10 itself is straightforward. The CMP11-10 uses an incremental shaft angle transducer to sense material movement. The transducer generates an exact number of pulses to the CMP11-10 which is equal to an exact amount of material movement. The CMP11-10 then counts the pulses and activates the appropriate outputs when the programmed movement has occurred.

The CMP11-10 is programmed using a CRT display and a keyboard located on the front panel. The CRT display allows the user to view an entire page of setup, batch, coil, or status information at one time. Data can be entered or changed by using the specified keys on the front panel.

When the CMP11-10 is installed, the key operator or maintenance person enters appropriate values into the computer using its Setup mode. These values will rarely need to be changed, and never by the regular operator of the machine, so a security lock has been provided to protect setup data.

After the Setup values are in place, parts are described to the CMP11-10 by using the Part Programming mode. Here, parts are put into a simple tabular form that lists each operation required to make a given part. Parts can be added, changed, or deleted when the security switch is unlocked.

INTRODUCTION

After a part has been programmed, it is actually produced by requesting in the Job mode the desired quantity to be made. As soon as that is done, the operator starts production by pushing the CMP11-10's RUN button. More part descriptions and jobs can be added at any time...even while the line is running. Since this is a function of the regular operator, jobs can be added or deleted with the security switch locked or unlocked.

SPECIFICATIONS

The following are general specifications for the CMP11-10. They include the general features of the system and dimensional size and weight.

Resolution	.012 in with a 12 inch wheel
Accuracy	Output turned on within .012 inch of operation excluding errors in machine tolerance
Maximum Machine Speed	200 feet per minute
Maximum Part Length	9999.99 inches
Maximum Batch Quantity	9999
Number of Batches	100
Pattern Types	7 (SH, P1, P2, P3, P4, P5, P6)
Input Power	115 VAC +/- 10%, 50-60 Hz @ 1 Amp 5 to 24 VDC @ 1 Amp
Outputs	Forward Shear Punch 1 Punch 2 Punch 3 Punch 4 Punch 5 Punch 6
Inputs	Remote Run Remote Halt Motor Starter Pattern 3 Type Pattern 4 Type Pattern 5 Type Pattern 6 Type
Physical Size	14 in x 17.25 x 7.25 with a 1 in flange on the front panel
Weight	30 pounds

FRONT PANEL

On the front panel of the CMP11-10 are 6 lighted pushbutton switches and 28 keys. Information is passed from the operator to the CMP11-10 thru these switches and keys. The functions of the pushbutton switches are as follows:

HALT

The HALT button is used to stop the machine from running material. The red lamp inside this button indicates that the controller is in the HALT mode.

RUN

The RUN button is used to put the CMP11-10 into the Run mode. The green lamp inside this button indicates that the controller is in the RUN mode.

MANUAL SHEAR

The MANUAL SHEAR button is used to manually cycle the shear output when the line is in the HALT mode. The yellow lamp indicates when the shear output is on in either the HALT or RUN mode. The shear also causes a reset condition to occur in the controller. A reset condition means that all of the parts in progress will be terminated and the controller will begin again, from the farthest press, to process the uncompleted parts over again. See the section titled 'RUN MODE' for more information.

THE THREE REMAINING BUTTONS ARE UNUSED IN THIS VERSION.

DATA ENTRY

Information is entered into the CMP11-10 using the keypad on the front panel. Data is entered at the point where the cursor resides on the CRT screen. The cursor is a shaded rectangular box which not only shows the operator where the next data item will be entered, but also shows how many digits may be entered for the particular data item. The CMP11-10 does this by making the cursor size the same size as the maximum number of characters that can be entered into the particular data space. Also note that for data items that require separators or a decimal point, that the required separator or decimal point will be automatically inserted when the maximum number of digits have been entered on the left side of the separator.

When entering numbers which have fewer digits than the maximum allowed, it is not necessary to enter leading or trailing zeroes. For example, suppose that the slowdown distance is to be programmed. The range of values for the slowdown distance is 0 to 999.99 inches. If the slowdown distance to be programmed is 5.7 inches, the needed keystrokes would be:

```
5
.
7
ENT
```

The CRT now shows 5.70 inches and the cursor has advanced to the next data item. Also, if only 5 inches were to be programmed, no decimal point is needed to indicate fraction separation, so the keystrokes needed to enter just 5 inches would be:

```
5
ENT
```

This form of data entry will reduce the number of keystrokes needed to enter the data required and also provides for a more 'user-friendly' controller. The functions of the 28 keys located on the keypad are as follows:

ADD LINE

The ADD LINE key is used in the job mode to insert a new line at the current cursor position. For further information on inserting lines, see the section titled 'RUN MODE'.

DEL LINE

The DEL LINE key is used in the job mode to delete the line that the cursor is currently on. For further information on deleting lines, see the section titled 'RUN MODE'.

NXT LINE

The NXT LINE key is used in the job mode to advance the cursor to the beginning of the next data line. It is used to terminate data entry of the current line and advance the cursor to the start of the next data line.

ASTERISK (*)

The ASTERISK key is used to view the system status and also allows the operator to clear all jobs, all programmed parts, or the computer's entire memory. By entering the code "1984" and pressing the ENTER key all setup and job data will be erased; all the data will then have to be re-entered to begin operation.

The System status mode also allows testing of punch outputs. The selected output will be turned on for the time set on page 2 of the Setup mode.

UP ARROW

The UP ARROW key is used in all modes of operation to move the cursor up one line. If the cursor is at the top of page 1 of a sheet of data, pressing the up arrow key will have no effect. Pressing the up arrow key in the job mode will cause the cursor to assume its present position in the previous data line.

RIGHT ARROW

The RIGHT ARROW key is used in the job mode to move the cursor right to the next data column. If the cursor is positioned at the end of the current line, pressing the right arrow key will advance the cursor to the start of the next line.

PAGE UP

The PAGE UP key is used in the setup and job modes to view the previous screen or page of data. In the setup mode, pressing the PAGE UP key with the current page being page 1, will show the setup data on page 2. In the job mode, pressing PAGE UP will show the previous page of job data with the cursor remaining in its respective place on the screen unless the top page has been reached. When the top page is reached, the cursor will be positioned at the top of page 1 in the job column.

STAT

The STAT key is used to view the status of the jobs currently stored in the CMP11-10. Pressing the STAT key will enter the job mode with the cursor positioned on the current job being processed.

DOWN ARROW

The DOWN ARROW key is used in all modes of operation to move the cursor down to the next data line. As with the up arrow key, the position of the cursor in respect to the data line is retained.

LEFT ARROW

The LEFT ARROW key is used in the job mode to move the cursor to the previous data column. If the cursor is currently at the beginning of a data line, pressing the left arrow key will cause the cursor to be positioned at the end of the previous data line.

PAGE DN

The PAGE DN key is used in the setup and job modes to view the next screen or page of data. In the setup mode, if the current page is page 2, pressing the PAGE DN key will cause the CMP11-10 to display page 1. In the job mode, pressing PAGE DN will cause the CMP11-10 to show the next page of job data unless the cursor is presently on the last page. If the cursor is presently on the last job data page, the cursor will be positioned at the bottom of the page in the job column.

SETUP

The SETUP key is used to enter the setup mode. If the security key located on the front panel is locked, data may be reviewed, but may not be changed.

PARTS DIR

The PARTS DIR key is used to display the directory of parts currently programmed, and the number of empty programming lines left for additional parts.

PROG PART

The PROG PART key is used to enter the parts programming mode. When this key is struck, the CMP11-10 prompts for the part number desired, and waits for the operator to respond. If a previously undefined part number is entered, the screen will show a null part (one with no operations defined). If an active part number is entered, the current configuration of that part is displayed, and it may then be edited. If the security switch is locked, parts may view, but not added, changed, or deleted.

JOB

The JOB key is used to enter the job mode. Pressing the JOB key will cause the screen to display the current job data and the cursor will be positioned at the first available job line.

ENT

The ENT key is the data enter key and it is used by the operator to indicate to the computer the end of a data item entry.

CLR

The CLR key is the data clear key and it is used to erase a data entry before the enter key is pressed. For example, suppose upon entering a data value, you press a wrong key. Pressing the CLR key will cause the CMP11-10 to display the data item's original value before you started to enter the new value. The CLR key is also used to clear any error messages from the screen.

NUMERIC ENTRY KEYS

The keys 0 thru 9 and the decimal point key are used in entering the numeric values required for a specific data item.

SECURITY LOCK

The security lock switch located on the CMP11-10 front panel is provided to prevent tampering with data values in the setup and parts programming modes. This feature was provided with the assumption that once the setup and parts data have been entered, there will be only occasional need to change the data in this mode. With the switch turned off, the setup and parts data may be reviewed, but cannot be changed. If an attempt is made to change this data with the security switch off, an error message will be displayed.

CONTRAST CONTROL

Also located on the front panel is a contrast control which the operator may adjust to suit the work environment in which the CMP11-10 is placed.

The setup mode is used to enter the machine parameters and other seldom-changed values. This data may vary from machine to machine and therefore cannot be permanently set into the CMP11-10. However, the computer has an internal battery that maintains power to its memory circuits so that this data can be retained when the power is off. The battery is automatically charged whenever the unit is on. If the battery should ever discharge, the CMP11-10 will automatically enter the setup mode when turned on to force the operator to re-enter the setup data. The setup mode is entered by pressing the SETUP key.

The setup data consists of two pages. The first page contains general data that the CMP11-10 needs to know about the machine. The second page contains information about the shear and punch presses.

The setup parameters for the CMP11-10 and their associated functions are as follows:

CYCLES PER REVOLUTION

The CMP11-10 uses an optical transducer which produces pulses that are counted by the controller. These pulses are then used to calculate the amount of material that has been moved. To do this properly, the exact number of pulses produced in one revolution of the transducer's wheel must be known. That value should be entered as the CYCLES PER REVOLUTION parameter; it defaults to a value of 256 if no value is entered.

DISTANCE PER REVOLUTION

The DISTANCE PER REVOLUTION parameter is equal to the circumference of the wheel attached to the length transducer. This value allows the operator to account for wear on the wheel with extended use. This wear will cause the wheel to become smaller and cover less distance in one revolution, thus causing miscalculations in distance. This value defaults to 12.00 in. if no other value is entered.

CORRECTION FACTOR

The CORRECTION FACTOR is a constant that is used to compensate for slight gear size errors that may be in the machine and wheel wear. With no correction required, the value would be 1.00000. A larger number would result in larger parts and a smaller number would result in smaller parts. For further information on the correction factor, see the section titled 'LENGTH CALIBRATION'.

FORWARD ENCODER ROTATION

The length transducer provides direction of flow information to the CMP11-10 but it can be mounted on the machine so that for a forward movement of the material, either a clockwise or counter-clockwise rotation of the transducer shaft will occur. The FORWARD ENCODER ROTATION parameter allows the operator to change the counting direction by pressing any numeric key and toggling the travel direction from right to left. If the CMP11-10 counts in the negative direction for a forward movement of material, the direction of travel parameter should be changed.

UNIT OF LENGTH

The UNIT OF LENGTH parameter allows the CMP11-10 to accept and display all of its various lengths and other parameters in the English system (inches) or the Metric system (millimeters). This parameter can be toggled back and forth by pressing any numeric key. Remember, if the unit of length setting is Metric, you must enter all lengths in millimeters.

POWER LINE FREQUENCY

The POWER LINE FREQUENCY parameter may be toggled between 60 and 50 Hz by pressing any numeric key, and should match that of the local power line to minimize screen flicker.

DATE

The DATE parameter is the current date and should be entered as:

month / day / year

The separators will be entered automatically if the month and/or day is a two digit number or can be manually inserted by using the decimal point key. For example, to enter the date of October 23, 1983 the necessary keystrokes are:

1 0 2 3 8 3 ENT

To enter the date of June 6, 1984 the necessary keystrokes are:

6 . 6 . 8 4 ENT

Once the date is set, it is automatically updated by the CMP11-10 and will not have to be changed unless a loss of memory condition occurs.

TIME

The TIME parameter is the current time and should be entered as:

hours / minutes / am or pm

As with the date, the separator is automatically inserted when entering a two digit hours or can be manually inserted if entering a single digit hour by pressing the decimal point key. After the hours and minutes have been entered, the am or pm selection can be made by pressing any numeric key to toggle the display tag from am to pm. As with the date, once the time is set, the CMP11-10 will automatically keep the time by means of on-board clock circuits.

SHEAR SLUG WIDTH

This parameter is used to inform the CMP11-10 how much material is wasted by the action of the cut-off press.

RESET SCRAP LENGTH

This parameter tells the CMP11-10 how large a scrap piece to make when starting the line from a reset condition. It should be large enough so that the machine's speed has stabilized before the first press operation occurs, in order to minimize length errors.

HALT BETWEEN BATCHES?

Normally the CMP11-10 stops the line at the completion of each batch. However, if a NO response is given to this YES/NO selection, there will be no halt between batches.

SHEAR "ON" TIME

The time set here by the operator determines how long the Shear output remains turned on for each Shear operation. The optimum value depends on the design of the machine and the line speed.

PUNCH #1 "ON" TIME

The time set here by the operator determines how long the Punch #1 output remains turned on for each operation of this press. The optimum value depends on the design of the machine and the line speed.

PUNCH #1 TO SHEAR DISTANCE

The operator should enter here the distance from the effective center of the Punch #1 pattern to the cutting edge of the shear.

PUNCH #2 "ON" TIME

The time set here by the operator determines how long the Punch #2 output remains turned on for each operation of this press. The optimum value depends on the design of the machine and the line speed.

PUNCH #2 TO SHEAR DISTANCE

The operator should enter here the distance from the effective center of the Punch #2 pattern to the cutting edge of the Shear.

PUNCH #3 "ON" TIME

The time set here by the operator determines how long the Punch #3 output remains turned on for each operation of this press. The optimum value depends on the design of the machine and the line speed.

PUNCH #3 TO SHEAR DISTANCE

The operator should enter here the distance from the effective center of the Punch #3 pattern to the cutting edge of the Shear.

PUNCH #4 "ON" TIME

The time set here by the operator determines how long the Punch #4 output remains turned on for each operation of this press. The optimum value depends on the design of the machine and the line speed.

PUNCH #4 TO SHEAR DISTANCE

The operator should enter here the distance from the effective center of the Punch #4 pattern to the cutting edge of the Shear.

PUNCH #5 "ON" TIME

The time set here by the operator determines how long the Punch #5 output remains turned on for each operation of this press. The optimum value depends on the design of the machine and the line speed.

PUNCH #5 TO SHEAR DISTANCE

The operator should enter here the distance from the effective center of the Punch #5 pattern to the cutting edge of the Shear.

PUNCH #6 "ON" TIME

The time set here by the operator determines how long the Punch #6 output remains turned on for each operation of this press. The optimum value depends on the design of the machine and the line speed.

PUNCH #6 TO SHEAR DISTANCE

The operator should enter here the distance from the effective center of the Punch #6 pattern and the cutting edge of the Shear.

PART PROGRAMMING MODE

The CMP11-10's part programming mode allows the operator to enter a description of a part to be made, in terms of press operations and where they should occur in relation to the beginning of the part. Since punch-to-shear offset distances have already been established in the Setup mode, the CMP11-10 can deal with operations relative to the part to be made, and will automatically offset operations as needed to compensate for physical press locations.

The part programming mode is entered by pressing the PROG PART key; the CMP11-10 will then ask for the number of the part to be programmed: enter a number from 1 through 99999999.

If the part number entered is not already in use, you are then presented with a screen showing no operations entered. This screen consists of three columns of seventeen lines each, which allows for 51 operation descriptions. Each of these 51 descriptions can be at an absolute location (ABS), an incremental location (INC), or can be a repeat count (RPT).

For example, to produce a part 50 inches long with a holes at 20 and 30 inches from the leading edge of the part, these operations should be programmed:

MODE	LENGTH	P#	
ABS	20.000	1	(assuming Punch #1 is to be used)
ABS	30.000	1	
ABS	50.000	0	(pattern #0 is the shear)

PART PROGRAMMING MODE

If different punches are required, the P# is changed, for example:

```
MODE  LENGTH P#
ABS   20.000 1 (still assuming Punch #1)
ABS   30.000 2 (change to Punch #2)
ABS   50.000 0 (shear is the final operation)
```

If a series of punches is required at fixed spacing, use the INC (incremental) mode, for example:

```
MODE  LENGTH P#
ABS   24.000 1 (initial punch)
INC   12.000 1 (incremental spacing)
RPT                   2 (repeat count - 2 MORE times)
ABS   96.000 0 (shear at end)
```

would produce a 96" part with punches at 24", 36", 48", and 60" from the leading edge.

PARTS DIR

If at any time you wish to know if a particular part number is in use, hit the PART DIR key to see a list of the currently-defined numbers, along with the number of program lines left in the CMP11-10's memory.

The job mode is used to enter information about the parts the operator wants to run. A "job" is defined as a quantity of a particular part that is to be produced by the machine. With the CMP11-10, it is possible to program a maximum of 100 different jobs at any one time. Jobs may be programmed in either the halt or run modes. This enables the operator to program the first few jobs, put the machine in the run mode, and then program the rest of the jobs to be run while the CMP11-10 is running the first jobs entered. Table 2 shows a copy of the CRT screen as it appears in the job mode so that operators may make up job sheets. The CMP11-10 will run the jobs in the order that they appear on the job screen. If it is desired to add a job in the middle of the job list or delete a job entirely, the ADD LINE and DEL LINE keys may be used to accomplish these operations. A job may be run again by just re-entering the quantity, but only when the CMP11-10 is in a reset condition. By doing this, jobs that are run often need not be entered repeatedly if the quantity is updated.

The job mode is entered by pressing the JOB key. The CMP11-10 will point to the first available job line with the cursor being placed in the job number column. The job number can be any number the operator desires from 0 to 99999999. Different jobs may have the same job number though in practice the operator will usually want to assign each individual job to be run a different job number. To the computer, the job number has no meaning. Jobs are run in the order that they appear on the screen and not in numeric job number order. All data is entered on the job line by entering the appropriate numeric data and terminating the data entry by pressing the ENT key. The cursor will then automatically advance to the next data column.

The next data item is the quantity. The range of values for the quantity is 1 to 9999. A quantity of zero will cause the CMP11-10 to ignore the job entirely.

The minimum amount of data required to fabricate a part includes a job number, quantity, and length. After this data has been entered, the rest of the data items make up the operator selectable options. After the minimum data requirements are entered, the word READY will appear in the STATUS column indicating that the job is ready to run. For more information concerning the status prompts, see the section titled 'RUN MODE'.

If the job stack is full, new parts may be entered only after a job has been completed or an existing job deleted. If a job has been completed and the JOB key is pressed, the completed job will be deleted from the top of the job list to make room for the new entry and the cursor will be positioned in the job number data column for entry of a new job.

The run mode is used to actually produce the parts programmed. The mode is entered by pressing the RUN button (or by closing the Remote Run input) and is exited when the HALT button is pressed (or by opening the Remote Halt input) or at the completion of a batch.

There are two conditions in which the run mode can be entered. The first is a reset condition which means that the computer will begin processing the material from the furthest required press and that the material from that point to the shear will be scrapped. When the CMP11-10 is in the reset condition, the fourth line of the CRT will display the message, "SYSTEM RESET". The second condition is a non-reset condition in which the computer will pick up from where it last left off and no scrap material will be generated. A reset condition occurs under any of the following conditions:

1. Controller turned on.
2. Manual cycle of the shear.
3. All programmed batches have been run.

Once set running, batches will be run in the order that they appear in the job list. The job order may be altered by inserting or deleting batches using the ADD LINE or DEL LINE key respectively. To insert a batch, position the cursor anywhere on the line where you want the line to be inserted and press the ADD LINE key. The CMP11-10 will move the data in the job list down one line starting with the current line until the end of the job list is encountered. If the job stack is full of ready to run batches (indicated by the word READY in the STATUS data column), it is not possible to insert a job line and an error message will be displayed. Note that if the CMP11-10 is not in a reset condition, no lines may be added above the current line being processed by the machine. If a job is completed, and the operator wishes to run the same job again, the quantity need only be

entered again; this will restore the job to the 'READY' status. This can only be done when the CMP11-10 is in the reset condition.

To delete a job line, place the cursor anywhere on the line to be deleted and press the DEL LINE key. The CMP11-10 will delete the line and move the entire job list up on line starting at the current line. If the job to be deleted is currently in work, the job cannot be deleted since it is being processed by the unit. An attempt to delete a job currently in work will result in no action taken on the job list.

When the CMP11-10 enters the run mode, it searches the job list looking for a job with a "READY" status. If a ready job is not found a "NO VALID ORDERS TO PROCESS" message will displayed indicating to the operator that the job stack is empty or all pre-programmed jobs have been completed. When the CMP11-10 finds a job with a "READY" status, it begins processing that job starting, depending on the factors listed above, in either a reset or non-reset condition. During the processing of a batch, the status column of the batch will contain the word "WORK", indicating that the batch is currently in work. After a batch is totally completed, the CMP11-10 will automatically change the batch status word to "DONE" to indicate that the batch has been completed. If the run mode is exited by pressing the HALT key, the batch status will still be "WORK" unless something is done to cause a reset condition to occur. Therefore, the current batch may not be deleted unless the controller is first reset.

After a batch is completed, the CMP11-10 will exit the run mode and enter the halt mode. To run the next batch in the job list, all that is required is to press the RUN button again to enter the unit into the run mode again.

The current controller status may be seen in any mode by observing the first three lines of the CRT screen. This information lines contain the following data:

1. Job number being processed
2. Part number being processed
3. Quantity left to be made
4. Distance moved since the last shear
5. Line speed in feet per minute
6. Current date and time

This section of the CRT screen is automatically updated by the CMP11-10 regardless of the mode of operation.

After completion of a batch and entry into another batch, the CMP11-10 checks several parameters to see if a reset condition is needed.

SYSTEM STATUS DISPLAY MODE

The system status display mode is entered by pressing the '*' key on the CMP11-10's front panel. The display screen will then show a number of items related to the general operation of the controller.

The model number, software version number, and engineering release date are displayed at the top of the screen. This information will be important if you need to communicate with us about the controller.

Just below, the status of the CMP11-10's eight inputs is shown for testing purposes. Note that the '*' key must be pressed to update the system status display; the switch status is not continuously updated.

ERASE ALL JOBS?

Hit any numeric key to toggle YES/NO response to this question. If YES is entered, all Jobs currently programmed will be erased from the CMP11-10's memory. Note that Parts and Setup information is not altered by this option.

ERASE ALL PARTS?

Hit any numeric key to toggle YES/NO response to this question. If YES is entered, all Parts currently programmed will be erased from the CMP11-10's memory. Note that Job and Setup information is not altered by this option. However, since there will then be no valid parts in memory, any parts called for by scheduled Jobs must be programmed before attempting to Run.

CLEAR ALL MEMORY?

Hit any numeric key to toggle YES/NO. If YES is entered, all Jobs, Parts, and Setup information will be cleared, and the CMP11-10 will be restored to its initial state. The system clock will be set to noon on the software release date. Obviously, this option should not be taken lightly, and should be used only when the CMP11-11's memory has been scrambled by electrical component failure or severe environmental disturbance. Make sure that you record on paper all the Setup, Parts, and Job information before clearing memory.

As a precaution against accidental clearing of memory, the security switch must be unlocked and a password is required before this operation can take place. The password is '1984'.

ERROR MESSAGES

The CMP11-10 is capable of detecting certain programming errors and will report these errors by flashing an error message on the fourth line of the CRT screen. These errors must be acknowledged and cleared by pressing the CLR key. A list of possible errors and an explanation of each are as follows:

COUNT RANGE: 100 TO 1000

This error occurs when an attempt is made to enter an invalid number of CYCLES PER REVOLUTION into the CMP11-10. The number must be between 100 and 1000.

DISTANCE RANGE: .25" TO 25"

This error occurs when a number outside this range in inches or its equivalent in millimeters is entered into the DISTANCE PER REVOLUTION parameter.

CORRECTION RANGE: 90% TO 110%

This error occurs when an attempt is made to program the CORRECTION FACTOR parameter outside its range of 90% to 110%.

ILLEGAL DATE ENTERED

This error occurs when an attempt is made to program a date which exceeds one of the following limits:

1. Month out of range of 1 to 12
2. Day out of range of 1 to 31 or 31 days programmed for month with only 30 days

ILLEGAL TIME ENTERED

This error occurs when an attempt is made to program a time which exceeds one of the following limits:

1. Hours out of range of 1 to 12
2. Minutes out of range of 0 to 59

PUNCH CODE RANGE: 1 TO 6

This error occurs when an attempt is made to program the punch pattern code outside of the valid range of 1 to 6.

SECURITY SWITCH LOCKED

This error occurs when an attempt is made to change the setup data with the security key in the off position.

NO VALID JOBS TO PROCESS

This error occurs when the operator attempts to start the line without having at least one READY job programmed.

PART NUMBER NOT FOUND

This error occurs when a Job is programmed to produce a part which has not been defined. After clearing this error, use a valid part number or enter PROG PART to define the part needed.

MOTOR STARTER NOT ENGAGED

This error is reported when the motor starter contact does not close within one second of the time at which the controller turns its Forward output on.

NOT ALLOWED WHILE RUNNING

Clearing of all Jobs, all Parts, all memory, or the testing of punch outputs is not allowed while the line is running.

NO ROOM FOR THIS PART

The CMP11-10's memory is full; the part just programmed does not fit. To make room for a needed part, others may be deleted by editing out operations in PROG PART mode.

PART CAUSED INTERNAL OVERFLOW

This is a catastrophic error message that should never be seen. It is the CMP11-10's way of responding to an unknown and invalid condition. The line is halted immediately, but no Parts or Jobs are cleared. After clearing this error, try re-starting the line with the RUN button.

The CMP11-10 is equipped with three switch inputs:

Remote RUN

When the Remote RUN switch is closed, the CMP11-10 behaves just as it does when the front-panel RUN button is pressed: if a valid job is programmed, the line will start. Note that the Remote RUN input is a momentary contact which needs to be closed only for a short time in order to start the line.

Remote HALT

When the Remote HALT switch is closed, the CMP11-10 behaves just as it does when the front-panel HALT button is pressed: the line is immediately stopped, and all press operations are inhibited.

Motor Start

The Motor Start input is used to let the CMP11-10 know that the drive motor has turned on as instructed. If the Motor Start input is not closed within one second after the CMP11-10's Forward output turns on, the line will be halted and an error message displayed.

PAT 3 - PAT 6

These three inputs will be used to control Punch patterns 3, 4, 5, and 6 in future versions of this controller. In the CMP11-10 they are unused, and must be left unconnected.

The CMP11-10 is equipped with eight outputs:

FORWARD

The FORWARD output is used to signal the machine to move in the forward direction. The output remains on as long as the CMP11-10 wants the line to run. When this output is turned off, the line should stop.

SHEAR

The SHEAR output is used to cycle the machine's cut-off press. This output will remain on for the time programmed on page two of the CMP11-10's Setup mode.

PUNCH #1

The PUNCH #1 output is used to cycle the first of up to six punch presses. This output will remain on for the time programmed on page two of the CMP11-10's Setup mode.

PUNCH #2

The PUNCH #2 output is used to cycle the second of up to six punch presses. This output will remain on for the time programmed on page two of the CMP11-10's Setup mode.

PUNCH #3

The PUNCH #3 output is used to cycle the third of up to six punch presses. This output will remain on for the time programmed on page two of the CMP11-10's Setup mode.

OUTPUT DESCRIPTION

PUNCH #4

The PUNCH #4 output is used to cycle the fourth of up to six punch presses. This output will remain on for the time programmed on page two of the CMP11-10's Setup mode.

PUNCH #5

The PUNCH #5 output is used to cycle the fifth of up to six punch presses. This output will remain on for the time programmed on page two of the CMP11-10's Setup mode.

PUNCH #6

The PUNCH #6 output is used to cycle the sixth of up to six punch presses. This output will remain on for the time programmed on page two of the CMP11-10's Setup mode.

LENGTH CALIBRATION

The CMP1000 detects the movement of material through the machine by means of an optical shaft encoder which is also called a rotary pulse generator or rotopulser. It is a device that generates electrical pulses as the shaft is rotated. It can also detect the direction of rotation and it generates a precise number of pulses for each revolution of its shaft. The CMP1000 detects these pulses and counts the net number of up and down pulses in order to know the material position.

The computer only knows the angular displacement of the shaft. In order to translate this angular movement into actual material movement, a precision measuring wheel is attached to the shaft of the encoder. The wheel rides on the material and is carefully aligned so that in one revolution of the shaft, an amount of material equal to the circumference of the wheel moves through the machine.

The resolution of the system (smallest measurable increment) is equal to the circumference of the wheel divided by the number of counts generated in one revolution of the encoder shaft. If the circumference of the wheel is 10 inches and there are 1000 pulses per revolution on the encoder, then the resolution would be 10 inches/1000 counts per revolution or .01 inches. If a 12 inch wheel is used then the resolution would be .012 inches.

The CORRECTION FACTOR is used to compensate for errors in the measuring wheel diameter and gear size errors in the machine. The initial value of the correction factor should always be 1.00000 if the correct values are entered for CYCLES PER REVOLUTION and DISTANCE PER REVOLUTION.

LENGTH CALIBRATION

Using this initial value of correction factor, the system can then be fine tuned in order to give optimum accuracy. Length inaccuracies consist of two distinct elements - the repeatability error and the linearity error. The repeatability error results from variations in the mechanics of the machine from one operation to the next. This variation would be the same for 1 inch long parts or 100 inch parts. The linearity error is due to slight errors in the size of the measuring wheel or drive gears. This error grows as the length of the part grows. It is not noticeable on short parts and can be quite significant on long parts. These two error elements must be clearly separated in order to properly calibrate the CMP1000 system.

The repeatability error can be determined by running a large number of short parts and measuring the total variation in length from the shortest part to the longest part. This total variation should be within the machine's specified tolerance. Further tests should not be attempted until this variation tolerance is met. Once the variation is determined, a part as long as possible should be run and its length carefully measured. A new correction factor can be calculated as follows:

$$NCF = OCF \times PL/AL$$

Where NCF is the new correction factor
OCF is the old correction factor
PL is the programed length
AL is the actual measured length

As an example, with the old correction factor at 1.00000, a 100 inch part was programed with the result being a 100.25 inch part being made. The new correction factor would be:

$$NCF = 1.00000 \times 100/100.25 = .99751$$

This new value for correction factor should be entered into the computer. If the resultant error was less than the allowable

LENGTH CALIBRATION

tolerance, the previous step should not be done.

At this point, the machine should be reasonably well calibrated. However, a portion of the linear error detected could have been due to a repeatability error. Further calibration can be done by running a large sample of long parts and carefully measuring each part and finding the mean value. The previous calculation can be repeated using the mean value as the measured length to further refine the correction factor. If in the previous example, the correction factor of .99751 were entered and a new run of 100 inch parts resulted in a spread of 100.00 to 100.06, the mean value would be 100.03 and the new calculation would be:

$$\text{NCF} = .99751 \times 100/100.03 = .99721$$

This would then yield parts that are within the specified allowable length variation, centered around the length programmed. Further adjustments can be made using this same procedure should the wheel begin to wear.

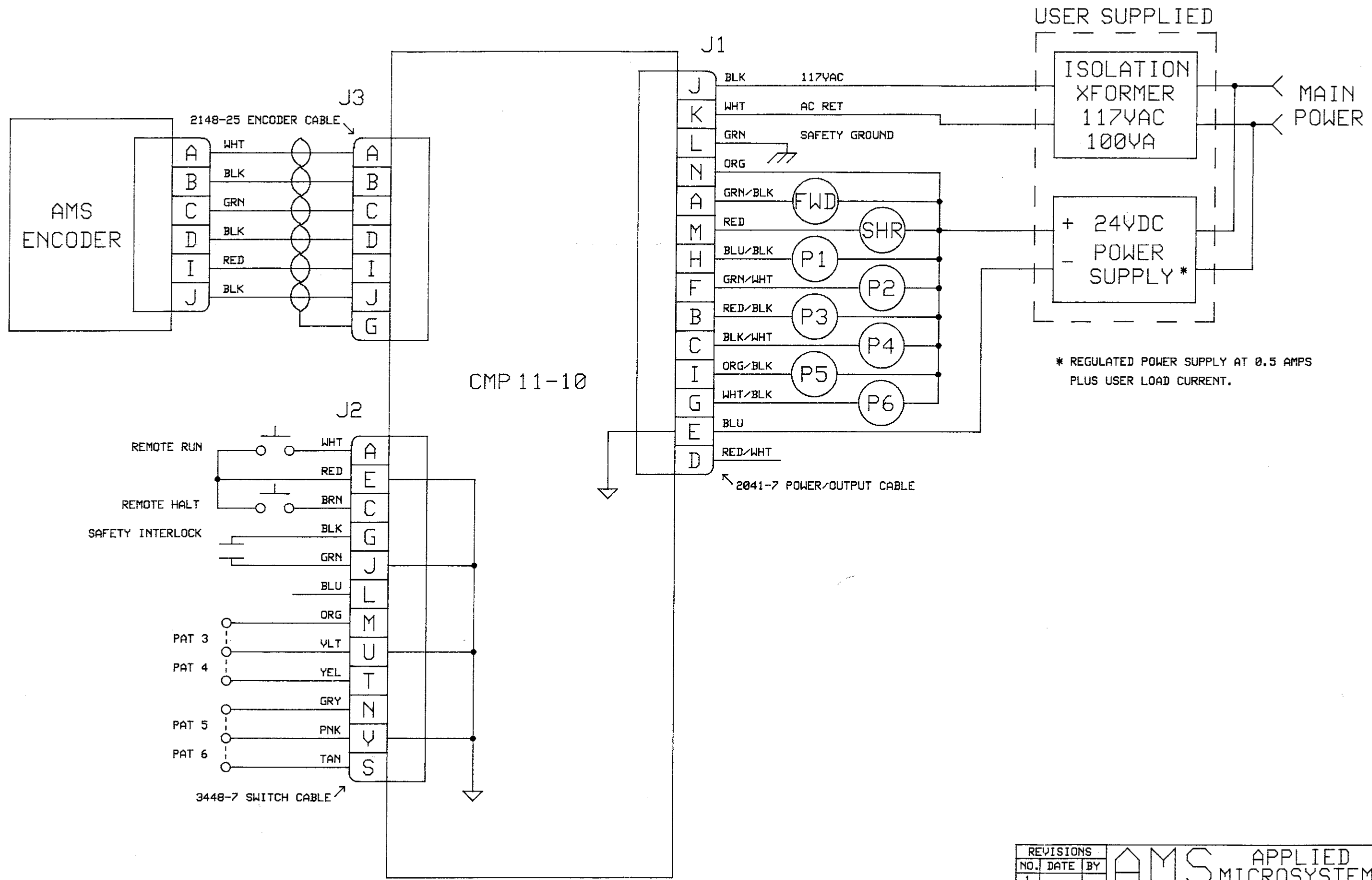
SETUP DATA

PAGE 1 OF 2

RANGE

CURRENT COIL FOOTAGE	-----	0 - 999999
CYCLES PER REVOLUTION	---	100 - 1000
DISTANCE PER REVOLUTION	---.---	.25 - 20.00
CORRECTION FACTOR	-.-----	.90 - 1.1
FORWARD ENCODER ROTATION	-----	RIGHT - LEFT
UNIT OF MEASURE	-----	ENGLISH - METRIC
POWER LINE FREQUENCY	--	50 - 60 HZ
DATE MONTH / DAY /YEAR	___/___/___	
TIME	__:__	AM - PM
SHEAR SLUG WIDTH	---.---	0 - 999.999 IN
RESET SCRAP LENGTH	---.---	0 - 999.999 IN
HALT BETWEEN BATCHES?	-----	YES - NO

SHEAR "ON" TIME	---.---	SECONDS
PUNCH #1 "ON" TIME	---.---	SECONDS
PUNCH #1 TO SHEAR DISTANCE	----.----	INCHES
PUNCH #2 "ON" TIME	---.---	SECONDS
PUNCH #2 TO SHEAR DISTANCE	----.----	INCHES
PUNCH #3 "ON" TIME	---.---	SECONDS
PUNCH #3 TO SHEAR DISTANCE	----.----	INCHES
PUNCH #4 "ON" TIME	---.---	SECONDS
PUNCH #4 TO SHEAR DISTANCE	----.----	INCHES
PUNCH #5 "ON" TIME	---.---	SECONDS
PUNCH #5 TO SHEAR DISTANCE	----.----	INCHES
PUNCH #6 "ON" TIME	---.---	SECONDS
PUNCH #6 TO SHEAR DISTANCE	----.----	INCHES



* REGULATED POWER SUPPLY AT 0.5 AMPS PLUS USER LOAD CURRENT.

REVISIONS			AMS APPLIED MICROSYSTEMS			
NO.	DATE	BY				
1						
2						
3						
4						
5						

CMP 11-10 MACHINE INTERFACE			
DRAWN BY	DATE	SCALE	DRAWING NO.
JJB	5-25-88		11-10