

0.4 mode 9 Nozzle 5 Camera 0 to calibration

0

ECM93 DATA INPUT

JULY 1997

Machine Run Y (Enter)

Machine homes up/down (U) and rotation (TH)

Homing OK? Press Enter. Machine homes to back left hand corner (X=0, Y=0).

Data Load. Select program name and press Enter.

ECM93 Main Menu

To check camera to pick-up offset:

1. Data List (Enter)
4. Nozzle changer (Enter)
2. Edit (Enter)
2. Change data (Enter)

Move cursor to POS 1, press F8 (move head). The bottom line indicates whether Camera, Nozzle or Eye sensor is at the Co-ordinate.

5 = Camera, 7 = Eye sensor (Red light), 9 = Nozzle. Press 9 for Nozzle and use cursor keys to demonstrate a point with the nozzle, (U = up/down) e.g. bring nozzle down into piece of Blu-tack. Press 5 for camera, and the machine uses the existing C-P offset to bring camera to same position. Press 0 to begin calibrating (computer beeps). Use cursor keys to teach correct position, then press C. Computer beeps and displays CALIB OK Y/N? Press Y (Enter) and new C-P offset is stored in memory. Press F2 to save to disk. Press ESC, Press Enter, press ESC. Press ESC again for Data List menu. Press ESC again for main menu.

If the nozzle needs to be changed in teach mode (after F8 is pressed), press N, then enter number of attached nozzle, e.g. 2 or 0, then enter number of nozzle required, e.g. 1, then machine automatically changes to nozzle (or bit).

From main menu,

2. Data input (Enter)

Start step number 1 (Enter)

Computer displays Bias point. This is the PCB origin, and is normally the corner of the board nearest to the machine origin. All the placing co-ordinates will be measured from the Bias point, and the Bias point is measured from the machine origin (X = 0, Y = 0).

Press F8 (Teach mode) and use cursor keys to demonstrate Bias point. The cursor keys can move the head in increments of 0.01 mm, 0.1 mm, 0.5 mm, 5 mm. \* = increase increment, / = decrease increment. When finished press ESC. Press Enter to confirm.

Then press F8 to demonstrate first placing position. Press U to move head down to touch PCB surface. Press ESC, Display asks stroke change? Y/N, press Y Enter. Move cursor to the right and type in feeder number for this part. Move cursor more to the right and type angle (e.g. 90.00, 180.00, 270.00). The part is rotated anti-clockwise by this amount after being picked up from a feeder. Also insert Part Type and index (number of tape advances between parts). The nozzle, or bit (NZZ) is determined by the part type. Press Enter to confirm, and line two is created. Press F8 and continue through all placements. At final placement, press ESC to end teach mode, press Enter to confirm, then press ESC again to end Data Input.

If Data Input is ended accidentally, then return to main menu (keep pressing ESC). Press 2, Data Input, and display asks step number? Enter number of next step to teach, and display goes to step before this one. Press Enter for new line, then press F8 and continue.

### **For Help Files:**

Press F1 for previous file. Press F1 again for menu of files. Move cursor to title required and press Enter. Press Page Down or ESC to return to program.

### **Data List**

#### 1. Tape feeder

48 tape feeder pick up positions are displayed. Stroke is demonstrated in teach mode. If the feeder is on the right hand side of the machine, the camera will not reach the co-ordinate, so display shows nozzle position (9). Eye sensor (7) may be used. U = head down in increments of 0.5 mm. Shift + U = head up in increments of 0.5 mm. R = head down to displayed stroke, SPACE bar = head up to home position.

#### 2. Tray Feeder

Grid 1, X and Y and strk is start position of grid tray (nearest to machine home).

Qty 1 is number of components in X and Y axis. Pitch 1 is pitch between components in X and Y axis.

### 3. Linear Feeder

X, Y and stroke is taught like tape feeders. The Rem column may be used in case of pick-up failure. If a part is missed, then the head will go to another feeder if the Remark is the same.

### 4. Nozzle Changer

Bit (nozzle) change must have angle = 45 degrees. Pos 1 is used for camera - nozzle offset. Dumping point is co-ordinate the head goes to on pick-up miss failure. Idle shot is dispenser head cleaning position.

### 5. PCB Parts.

List of placing co-ordinates etc.

If there are PCB copies, these are displayed at end of PCB parts.

To create copies, go to 5, PCB Parts. Press 2 to edit. Press C for copy (step & repeat).

# of copies in X = total number of boards in X axis in panel of boards.

X's pitch = distance (mm) from edge of board to edge of next board in X axis.

# of copies in Y = total number of boards in Y axis.

Y's pitch = pitch between boards in Y axis.

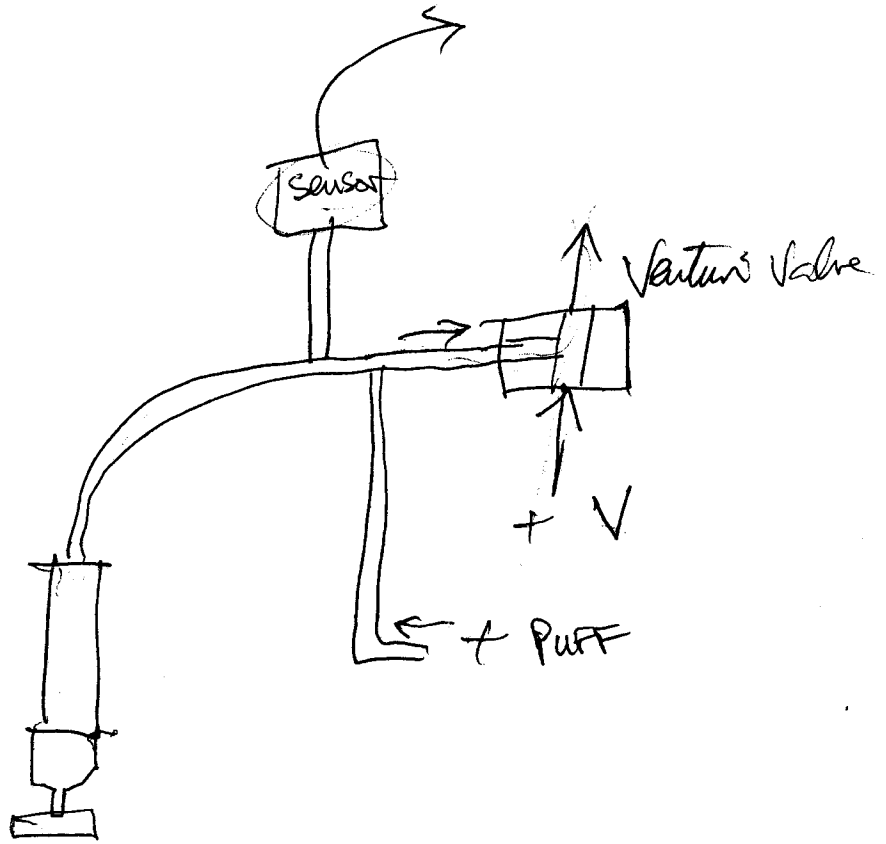
If PCB parts are displayed now, the top lines show number of parts per board, and number of copies per panel (copies = total number of boards less one).

The copy positions are displayed after PCB parts. The start position of the copies may be demonstrated precisely in teach mode (2 to edit, 2 to change, F8 to demonstrate).

**P.S. Remember, ESC key is used to go back a step in the program. But if Teach mode is ended with ESC key, then Enter must be pressed to confirm the new co-ordinates. Then press ESC again to end edit mode.**

(+)

(+)



## 2.5 CAMERA OFFSET

Put test PCB into board holder. Go to PCB Parts.  
Go into edit mode (see pg. 35) and move the cursor to an location with an angle of zero degree (don't use fiducial)  
press <F8> to go into teach mode. Put a label on PCB.  
Move the camera with the arrow keys over the label.  
Press <9> to move the nozzle over this location.  
Put a piece of carbon paper between nozzle and label (face down).  
Press <R> four times to lower and raise the head twice (see pg. 36).  
Remove the carbon paper (don't move PCB).  
Press <5> to move camera over location. — Can press 7 to calibrate eye sensor / ~~cam~~/hd  
Press <0> (zero) to start calibration.  
Move the crosshairs in center of the mark.  
Press <C> for calibration. On the left bottom of the screen it will ask 'CALIBRATION OK?'.  
Press <Y> <Enter> if calibration is OK.  
Press <F2> to save the information.  
( After you adjusted the camera offset you have to check your pickups and your bias point)

## 2.6 2nd HEAD OFFSET

Before you do the 2nd HEAD offset, make sure that your camera to nozzle offset is correct!!  
Put test PCB into board holder. Go to PCB Parts.  
Go into edit mode (see teach mode) and move the cursor to an location with an angle of zero degree (don't use fiducial).  
press <F8> to go into teach mode.  
Put a label on PCB.  
Move the camera with the arrow keys over the label.  
Press <6> to move the 2nd HEAD over this location.  
Put a piece of carbon paper between nozzle and label (face down).  
Press <D> two times to lower the 2nd head twice (see pg. 36).  
Remove the carbon paper (don't move PCB).  
Press <5> to move camera over location.  
On the bottom of the screen you can see the X /Y coordinates of the head.  
Note the values of X and Y. This is now our X1 and Y1.  
Move the crosshairs with the arrow keys in the center of the mark.  
Note the X / Y values again. This is our X2 and Y2.  
Now calculate our X / Y offset with following formula.

$$X1 - X2 = X \text{ offset}$$

$$Y1 - Y2 = Y \text{ offset}$$

Add these offsets to k44 in the Constant Data.

Press <F2> to save the information.

See example on next page.

## 2.8 NOZZLE CHANGER

It is very important to teach the nozzle changer properly to make sure that you have no problems to change bits.

First you have to make sure that your head is straight (see pg. 9).

Put nozzle #2 on the head.

Remove all the nozzles out of the nozzle holder.

Go to Nozzle Changer in the Data List (see pg. 26).

Go into teach mode (see pg. 35).

Teach with the camera the center of the first nozzle pocket.

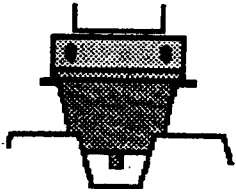
Make sure that CAM is shown at the bottom right corner of the computer monitor.

Press '9' to move the nozzle over the pocket.

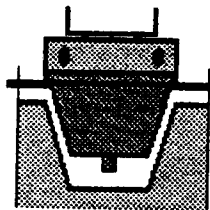
Lower the head with the 'U' key (see pg. 36).

If the head doesn't go smoothly into the pocket, make adjustments with the arrow keys.

It should look as follows:



*Picture 1*

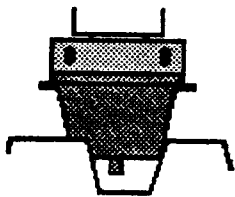


*Picture 2*

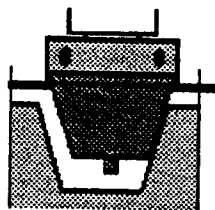
When you look from the front (*Picture 1*) the "wings" of the bit should go straight in.

If you look from the side (*Picture 2*) before you are all the way in the pocket you should see a small gap on both sides of the nozzle.

If it looks like *Picture 3* or *Picture 4* you have to make adjustments.



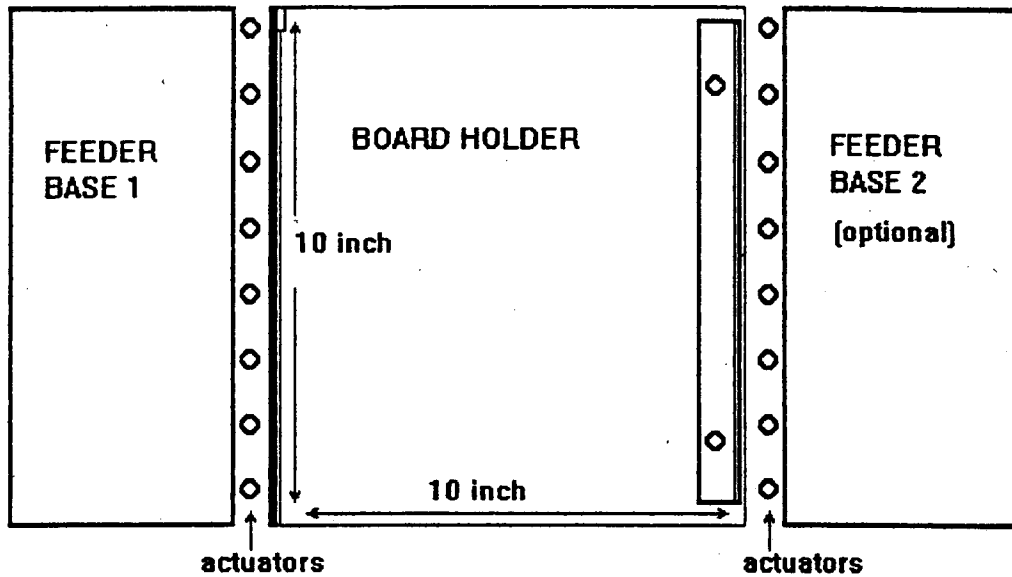
*Picture 3*



*Picture 4*

## 2.9 ACTUATORS

The actuators advancing the feeders. One actuator is for three feeders.



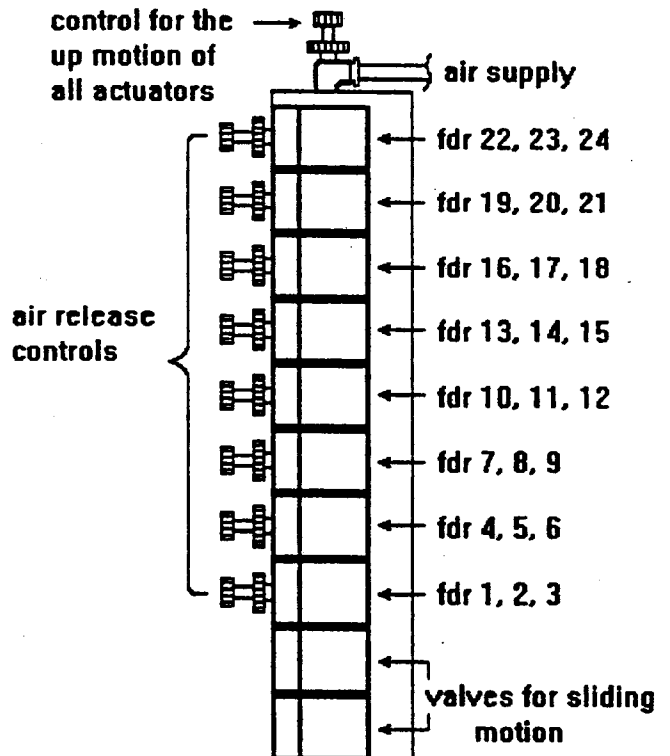
On the backside of the machine are the controls for the air driven actuators. The control on top is for the up motion of the actuators.

If you turn it clockwise, the air input is lowered and the actuators go slower up and with less strength. (If you close it to much, the actuators are not strong enough to advance the feeders!!)

Turning it counter clockwise increases the air input. It makes the actuators go up faster and stronger.

The air releases on the side are for each individual actuator. See picture on the right. If you turn it clockwise, the actuator stays up longer and goes down slower. Turning it counter clockwise makes them go faster down.

If it is too slow it may be insufficient for the two indexes needed on a 12mm feeder. If it is too fast it could cause the parts to be flipped in the pocket.



LASER

## 2.11 ~~JAW~~ OFFSET

Jaw Offset is responsible for accurate placement. You can't get good results if the Jaw Offset is wrong. For each rotation of the placement (0, 90, 180, 270 degrees) we have an individual offset.

To check the Jaw Offset go to PCB Parts (see pg. 27 ff.). Go into Edit Mode (see pg. 35). Go to a placement, which is placed at 0 (zero) degrees. Press 'F6' for Partial Assembly. The machine will now assemble only this part on zero degrees. Press 'F8' to go into Teach Mode.

On your teaching monitor you should see that the crosshairs are in the center of the component like in *picture 1*.

If the crosshairs are not in the center of the part like in *picture 2*, your jaws need to be calibrated.

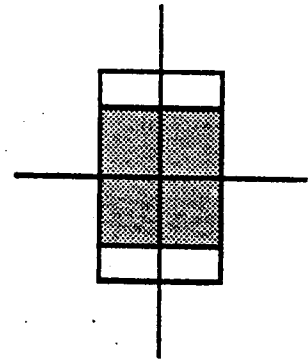
Press the '.' period button to start the calibration. Move the crosshairs with the arrow keys into the center of the component. Press 'C' for Calibration. On the bottom of the computer screen you will now see:

OFFSET OK? Y/N \*

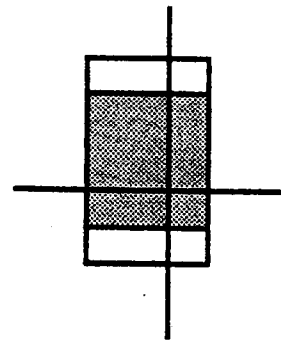
Press 'Y' for Yes and 'Enter'.

Now go to a placement with a rotation of 90 degrees and do the same procedure. After that do the same on 180 and on 270 degrees.

After you calibrated all rotations press 'F2' to save this information.



*Picture 1*



*Picture 2*



\* If you have a dual head machine (ECM 96) you will see:

OFFSET OK? #1 or #2

Press '1' if you placed this part with head #1 and then 'Enter'.

Press '2' if you placed this part with head #2 and then 'Enter'.



### 3.4 EDIT MENU

#### 1 Back to list menu

Brings you back to the data list.

#### 2 Change data

Brings you into 'Edit Mode' to change data of your current program (see pg. 35).

#### 3 Delete data

You can delete lines out of your program. After you hit '3' for delete data it will ask you at the bottom left of the computer monitor :

"Delete Seq # - #"

You can delete one line by inputting the sequence number of that line or you can delete a block by putting in the first sequence # and the last sequence # of the block.

#### 4 Quit and save

Brings you out of the 'PCB Parts' Data and saves the data.

#### 5 Return to main menu

Brings you back to the main menu.

#### 6 Print out data

If you hook up a printer to the computer, it will print out the data of your current program plus the system constants.

#### 7 Add data

Will add data to the end of your program. If you hit '7' for add data it will ask in the bottom left corner of the computer monitor : "Add #".

That means how many lines you want to add. So if you have 4 more components to place and you want to add 4 lines, you put in '4'.

#### 8 Insert data

Inserts one line into the program. It will ask in the bottom left corner of the computer monitor : "Insert to Seq #"

i. e. If you press '5' it will add a line to sequence 5.

#### 9 Go to PCB step #

You can go directly to a certain line in your placement program, so you don't have to go through all pages if you want to go to Seq # 400 of your program.

1 Back to list menu
2 Change data
3 Delete data
4 Quit and save
5 Return to main menu
6 Print out data
7 Add data
8 Insert data
9 Go to PCB step #
A Sorting data
B Exchange data
C Step & repeat
D Extend copy data
E Skip placement
F Unskip

----- see next page -----

#### A Sorting data

After programming it will sort your data to make the assembly as fast as possible. ?

#### B Exchange data

You can exchange lines of your placement program if you want to modify it.

#### C Step & repeat

If you have a panel, you only have to program the first board of the panel. Then you do a step and repeat to copy the placement data to the other boards on the panel. When you start programming the board you should teach the bias point on the first board of the panel since the step and repeat routine copies only the bias point to the other boards of the panel. (see "Programming a Panel")

#### D Extend copy data

In a normal step & repeat program you only see the placements of the first board and the copies of the bias point. With 'Extend copy data' you can see all the placements on the panel.

#### E Skip placement

You can skip placement lines of your placement. It will ask in the bottom left corner of the computer monitor : "Skip Seq # - # "

i. e. If you want to skip sequence 5 to sequence 10, you put in '5 - 10' and 'Enter'.

It will put a '\*' in front of the feeder number so you can recognize the skipped parts.

#### F Unskip

*a sequence*

Will unskip ~~every line~~ in the program. *Seq # - # .*



If you want to unskip only certain lines in the program, you can do this in 'Edit Mode' by erasing the '\*' in front of the feeder number with the space bar.

### 3.5 EDIT & TEACH MODE

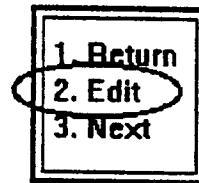
In Teach Mode you teach your entire pick up locations and your placement locations.

You can go into Teach Mode in following sections of the program:

1. Tape Feeder
2. Tray Feeder
3. Linear Feeder
4. Nozzle Changer
5. PCB Parts

If you are in one of these lists, you see a little window at the right bottom of the computer monitor (see *picture 1*).

Press '2' for 'Edit'.



*Picture 1*

Another window will appear.

(See *picture 2*)

This is the Edit Menu where you have different options to edit your program. (See page 33)

Press '2' for 'Change data'.

The Edit Menu disappeared again and you see a cursor blinking in your first line.

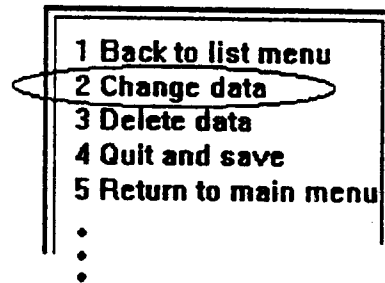
You are now in the 'Edit Mode'.

From here you can go into Teach Mode.

Press 'F8' and the head will move to the existing X/Y location in this line.

You are now in the Teach Mode.

On the next page you will see different keys you can use when you are in the teach mode.



*Picture 2*

### 3.6 KEY's IN TEACH MODE

- A** To change the rotation (angle) of the head. If the increments are 500 the head will turn 45 degrees counter clockwise with one keystroke.
- Shift+A** Turns the head clockwise
- C** Is used for two operations:  
1. If you use the 2corner centering method, C is used to move the crosshairs to the center of the two corners.  
2. C is used to end and confirm the calibrations.
- D** To move the 2nd head or the dispenser down. Depends on machine configuration.
- I** To advance tape feeders. If you hit 'I' you will see a line on the bottom of the computer monitor where it asks: Tape #, Index. You have to put in the tape number you want to advance and how often you want to advance that feeder. For example. If you want to advance tape feeder number 9 two times you have to put in following line: 9,2 and press 'Enter'
- J** To close and open the jaws.
- M** (for Vision System only) To take a picture of a fiducial mark. Used with the fiducial code 261 and 262.  
When you press 'M' it will ask on the bottom of the monitor: Mark (1-4).  
For the first fiducial you put in '1' and 'Enter'. Now you will see a box on the teaching camera monitor. You can adjust this box with the arrow keys (make it bigger or smaller). Press 'Enter' and the system will take a picture and stores it on the hard drive. (It may take a little time).
- N** To change nozzles automatically.  
When you press 'N' it will ask " Attached Nozzle ". Put in the # of the nozzle, which is on the head at that moment. If nozzle #2 is on the head put in 2, if no nozzle is on the head put in '0'. Press 'Enter'.  
Then on the bottom of the screen it will ask "Nozzle 0-6". Put in the nozzle you want on the head. If you want nozzle #5 put in '5' and press 'Enter'.
- P** (for Vision System only) To check if the bottom camera recognizes QFP components.

----- see next page -----

For example: If your part type is 8 for the component you have on the nozzle and it is on 90 degrees you put in following line:

"8,1"

After you hit 'Enter' it will build the line in the center of the component. It checks the component until you hit space bar.

- R** "Repeat" means, it lowers the head all the way down determined by the stroke you have in this line you are in. If you press 'R' again the head will raise again to the zero position.  
For example: If your stroke (Strk) to the board is 260 and you press 'R', the nozzle goes all the way down to the board in one move.
- S** "Search" stands for searching the fiducial mark. (Only for automatic fiducials). That means if you are in Teach Mode on your first fiducial and you hit 'S', it will ask at the bottom of the computer screen: "Mark 1 or 2".  
You press '1' and 'Enter' and it will scan the fiducial and see if it can read it.
- T** (For Automatic Tray Changers only) If you hit 'T' it will ask which tray is on the Slider right now. If you have no tray on the slider you press '0' and 'Enter'. After that it will ask for which tray you want on the slider. If you want tray #1 you press '1' and 'Enter'. The machine will now automatically put tray #1 on the slider.
- U** Lowers the head in increments of 1 millimeter.
- Shift + U** Raises the head in increments of 1 millimeter.
- V** Turns the vacuum on and off. (Toggles).
- Shift + V** Turns the vacuum of the second head on and off (for machines with 2 heads).
- X** Calibration for the Vision System.  
If you hit 'X' you will get following options on the top of the computer monitor:  
1 = low camera    2 = up camera    3 = commands  
'3 = commands' are for factory use only.  
If you press 1 it will start with the lower camera calibration. You have to put a small part on the head (for example a chip resistor). You will see a window on the teaching monitor.

----- see next page -----

You have to move the head with the component into the center of that window. After that you press 'Enter' and you will see another window in the upper left corner of the monitor. Now you have to move the component in the center of that window and press 'Enter' again. The head will move back to the center and your lower camera is calibrated.

If you press '2' it will start with the upper camera calibration. You have to find a pad on a PCB and move it into the window of the teaching monitor.

You press 'Enter' and you see another window in the upper left corner of the monitor. You move the pad to the center of that window and press 'Enter' again. The pad will move back to the center and you upper camera is calibrated.

0 (Zero) Zero starts the Camera or the Eye calibration (see pg. 10, 12).

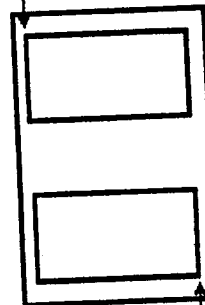
1, 2, 3, 4 For teaching the center of a component using 2 corners or 4 edges of the component.

For example:

First you go with the crosshairs to the first corner. You press '1'. Then you go to the second corner and you press '2'. Then you press 'C' and the crosshairs will move to the center of the pads.

It works the same with the 4 edges. You first go to the upper edge and press '1' and then to the lower edge and press '2'. Then you go to the left edge and press '3' and to the right edge and press '4'. Then 'C' and the crosshairs will move to the center of the pads.

first corner



second corner

5 It moves the Camera over the location you want to teach.

6 It moves the second head or Dispenser (depends on configuration of the machine) over the location.

7 It moves the Eye Sensor over the location.

9 It moves the first head over the location.

Starts the <sup>laser offset</sup> ~~new~~ calibration. (p. 17)

You can make global changes of the X, Y, Angle and Stroke.

For example: If your Stroke is 260 in the PCB Parts and you found out that your stroke is only 230, you can make a global change with '\'  
(backslash).

If you hit '\ ' you will see following message on the bottom of the computer screen: "increment X/ increment Y"

To make a global change you have to put in a ' + ' (plus sign) first. Then you put in what you want to change.

S for Stroke; A for Angle; X for X-offset; Y for Y-offset

Then you have to put in the value you want to add or subtract.

In this case here you would put in: +S-30

After you press ' Enter ' it will change each Stroke from 260 to 230.



You also can change an individual block of your data by putting the sequence numbers in. It would look as follows.

+13:40S-30

This line would only change the stroke from Seq 13 to Seq 40.