ECM93/96/97 INSTALLATION GUIDE

INSTALLATION CHECK LIST

MECHANICAL CALIBRATION:

- ☐ Checking belt tension
- ☐ Checking X/Y skew manually
- ☐ Checking UP/DOWN motion of shaft
- ☐ Checking THETA of shaft (HEAD TO Z SHAFT 9)
- ☐ Checking JAW assembly
- ☐ Checking FEEDERS

SOFTWARE CALIBRATION:

- ☐ Checking CPU speed
- ☐ Checking X/Y skew w/ software
- ☐ Calibration with gauge plate (Belt constants)
- ☐ Checking rotation of head (bit clip holder)
- ☐ Checking nozzle pick up
- ☐ Checking CAMERA to NOZZLE offset
- ☐ Checking 2nd HEAD offset (only ECM 96 dual head)
- ☐ Checking EYE to NOZZLE offset
- ☐ Checking Actuators
- ☐ Checking UP-POSITION of head
- ☐ Checking JAW offsets

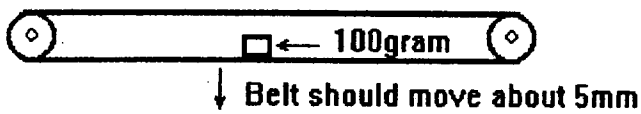
TRAINING CHECKLIST

- ☐ Showing the MAIN MENU
- ☐ Showing the DATA LIST
- ☐ Showing :
  - ☐ Tape Feeder
  - ☐ Tray Feeder
  - ☐ Linear Feeder
  - ☐ Nozzle Changer
  - ☐ PCB Parts
  - ☐ Part Type
  - ☐ Dispense Type
- ☐ Showing the EDIT menu
- ☐ Showing 2 for EDIT 2 for CHANGE DATA F8 for TEACH MODE
- ☐ List for key's in teach mode
- ☐ Showing how to program a board:
  - ☐ bias point
  - ☐ 2 fiducial
  - ☐ placements
- ☐ List of LV numbers
- ☐ Showing Vacuum Sensor
- ☐ Actuator adjustments
- ☐ Camera offset
- ☐ Eye offset
- ☐ Jaw offset

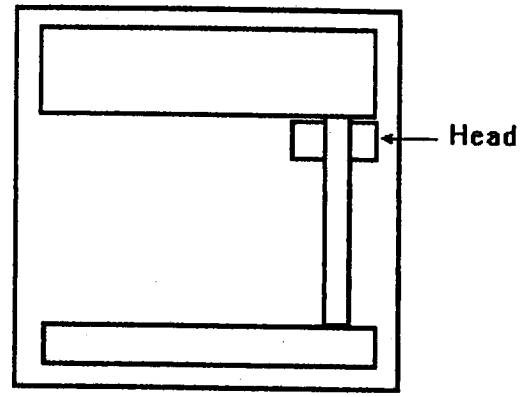
1.1 BELT TENSION

Should be tight, but not too tight.
Move the head all the way to the upper right corner of the machine.

If you put a 100 gram weight on the middle of the belt it should move about 5 millimeters.



Top view

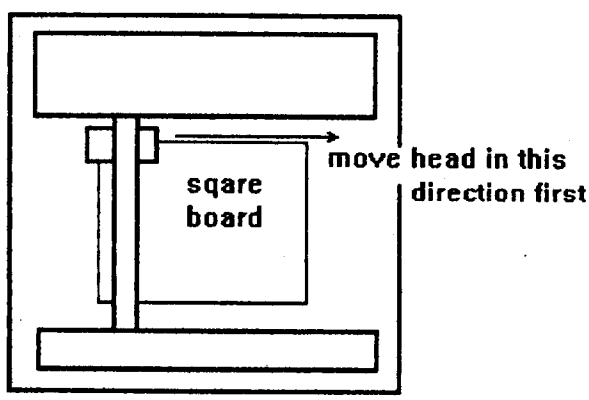


1.2 X / Y SKEW (mechanically)

Put a square board (gauge plate) in the PCB holder.
Make sure that the shaft of the head is in the up position.
Turn on control box and teaching monitor without computer.

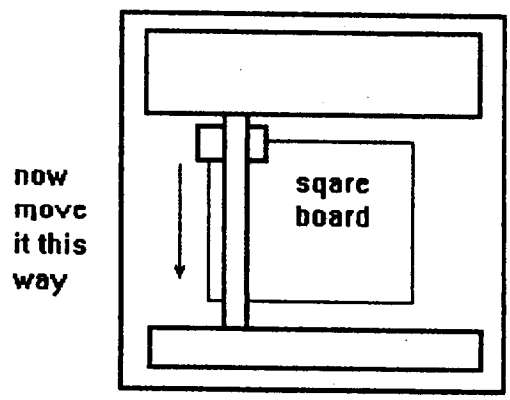
Move the head to the edge of the board holder so that you can see the edge on the monitor.
Secure the x movement and move the head manually along the y-axes. (See ***picture 1***)
If the crosshairs go off the square board when you move it along the y edge, you have to adjust the board holder. Loosen the 4 screws of the board holder and adjust it.

Top view



Picture 1

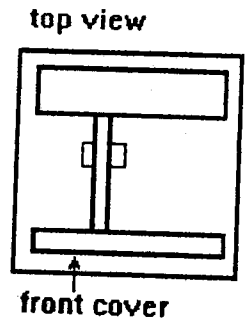
Top view



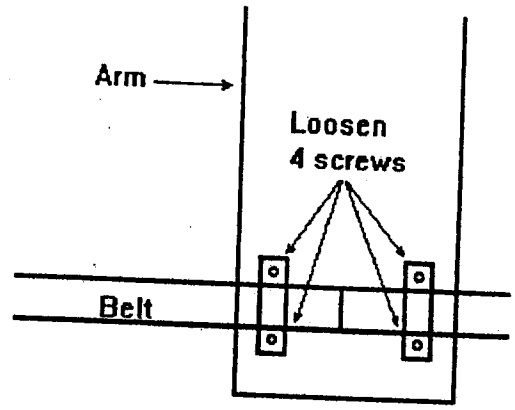
Picture 2

If your y-axis is straight, move the head along the x-axes. (See ***picture 2***)
If the crosshairs go off the board when you move the head in x, follow steps on next page.
If it goes a little bit off you can go on with the next step 1.3 SHAFT.

Remove the front cover of the machine, which covers the front belt. (*Picture 1*)



Picture 1



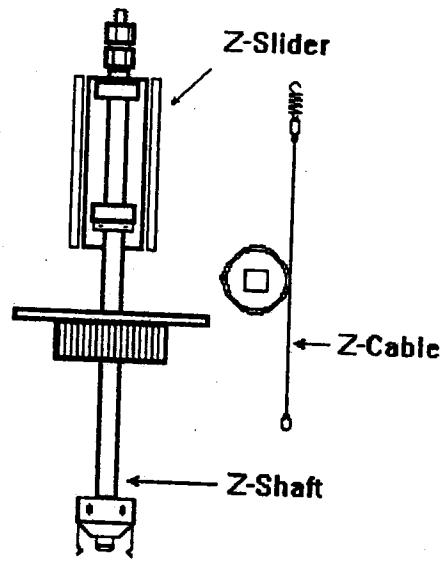
Picture 2

Open the four screws on top of the arm, which are holding the belt. (***Picture 2***)
After you opened the screws the arm will adjust by itself.
Now close the screws again tight.
Run the head again along the x-axes and see if it corrected the problem. If it is still off you have to remove the back cover and do the same procedure (***picture 2***) with the belt in the back.

1.3 SHAFT

1.3.1 UP / DOWN MOTION

Move the shaft up and down. Make sure that there is no play in the head.
Check if there is any defect on the Z-slider.
Check the Z-Cable for any defects (only ECM 93).



1.3.2 THETA MOTION

By holding the theta motor try to turn the shaft gently.

If there is any play see next page.

If you have play in the theta rotation, you have to unassemble the theta pulley.

Unassemble the Head Holder by loosing the two Hex-Wrench screws. (***Picture 1***)

Unscrew the two Phillips screws on the bottom side of the Theta Pulley and remove the cover. (***Picture 2***)

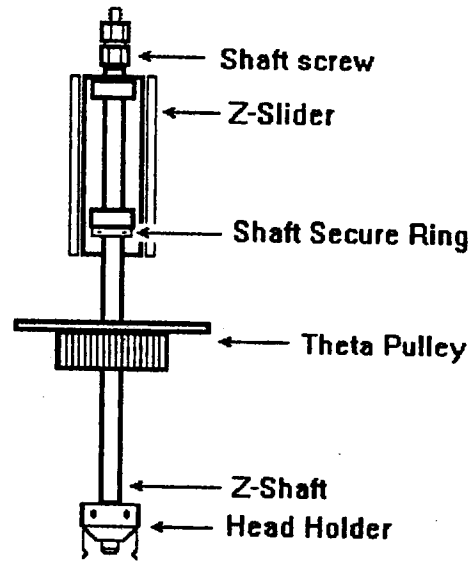
You will see another two Phillips screws, which you have to unscrew.

Remove the Homing Disc. (***Picture 2***)

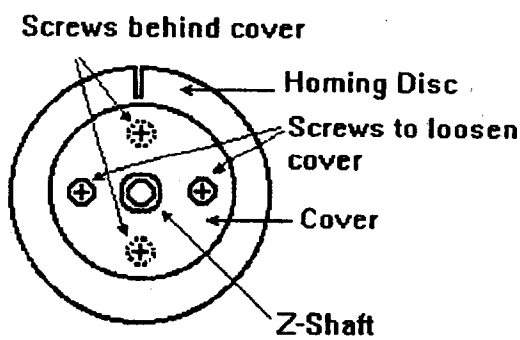
Now you will see four bearings around the head. (***Picture 3***)

Slide the bearings out of the shaft. (***Picture 4***)

Now you have to bend the metal ring closer together. Assemble everything back in the reversed order.

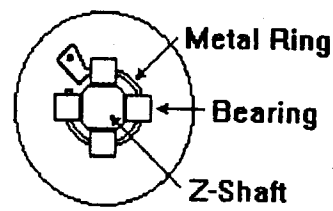


Picture 1

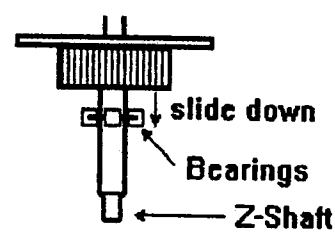


Bottom view of Theta Pulley

Picture 2



Picture 3

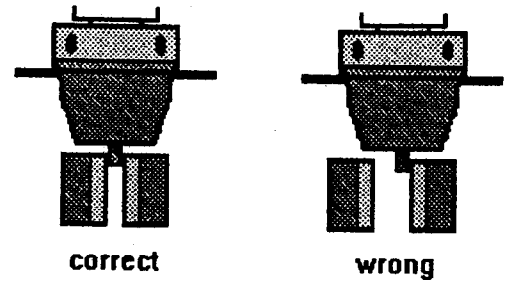


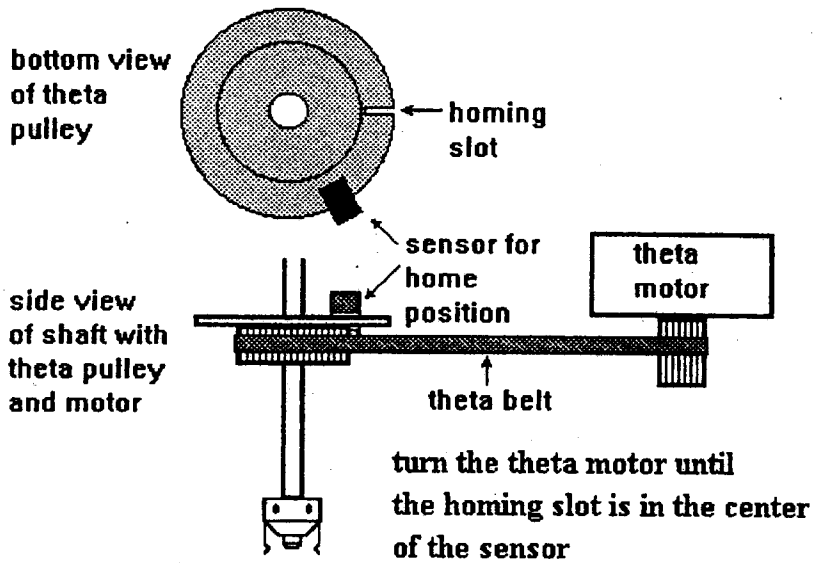
Picture 4

(Not on CM97WL)

1.4 JAW ASSEMBLY

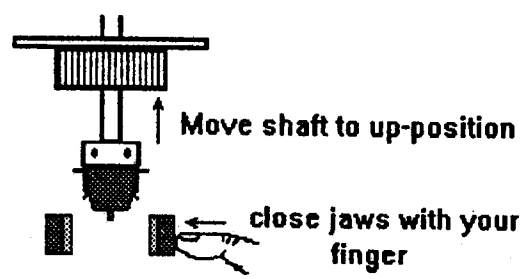
The mechanical calibration of the Jaws is very important. If the Jaws are not in the correct position the placements will not be as accurate and repeatable, as they should be.
To check the Jaw Assembly turn off the control box.
Put Nozzle #2 on the head.
Bring the shaft to the zero position in the rotation. (See ***picture 1***)





Picture 1

Move the shaft to the Up – Position and close the Jaws with your finger. (See ***picture 2***)



Picture 2

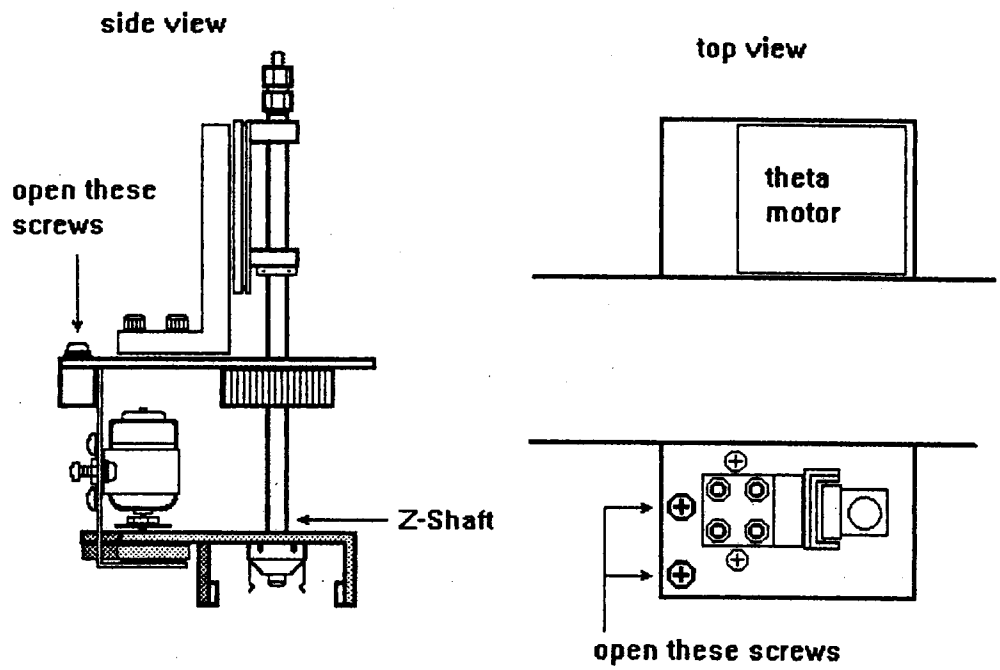
---------- *See next page* ----------

Now watch the Jaws when they hit the tip of the nozzle.
If both sides of the Jaws hit the nozzle at the same time, your mechanical jaw offset is correct.
If one side of the jaws hit the tip first, you have to adjust the jaws.

If you have to adjust the Jaws follow these steps:

ECM 93

If you have an ECM 93 you have to loosen the Jaw Assembly with two screws.
(See ***picture 1***)



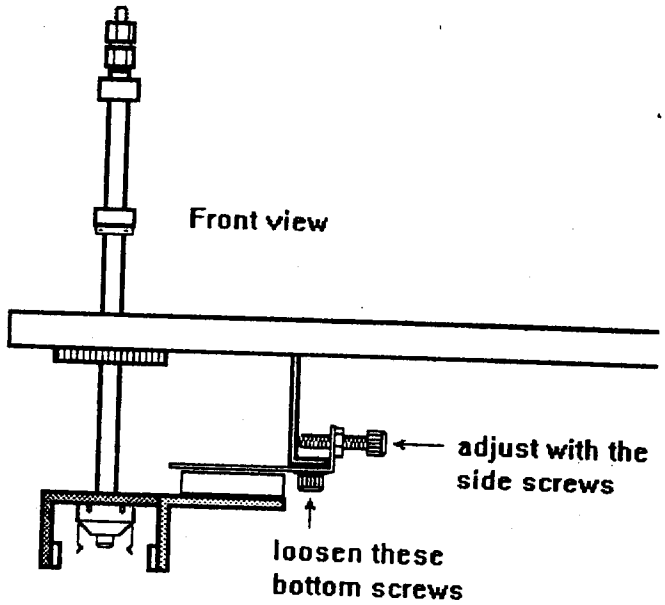
Picture 1

Open these screws just slightly. Then adjust the Jaw Assembly so that both sides of the Jaws hit the tip of the nozzle at the same time. Close the screws and check again

---------- *for ECM 96 see next page* ----------

ECM 96

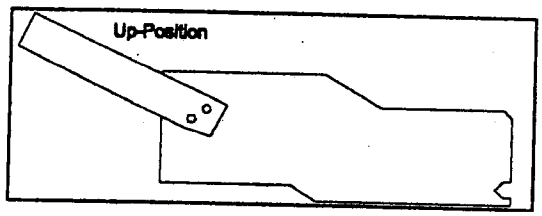
If you have an ECM 96 you have to loosen two screws at the bottom. Then you can adjust the jaws with two side screws. (See ***picture 1***)



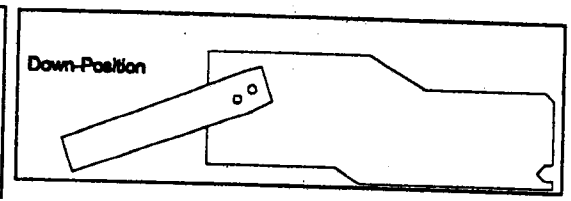
Picture 1

1.5 FEEDER

Unpack the feeders and install the reel extenders. There are two types of extender arms. One goes up and one goes down like shown in picture 1 and 2.



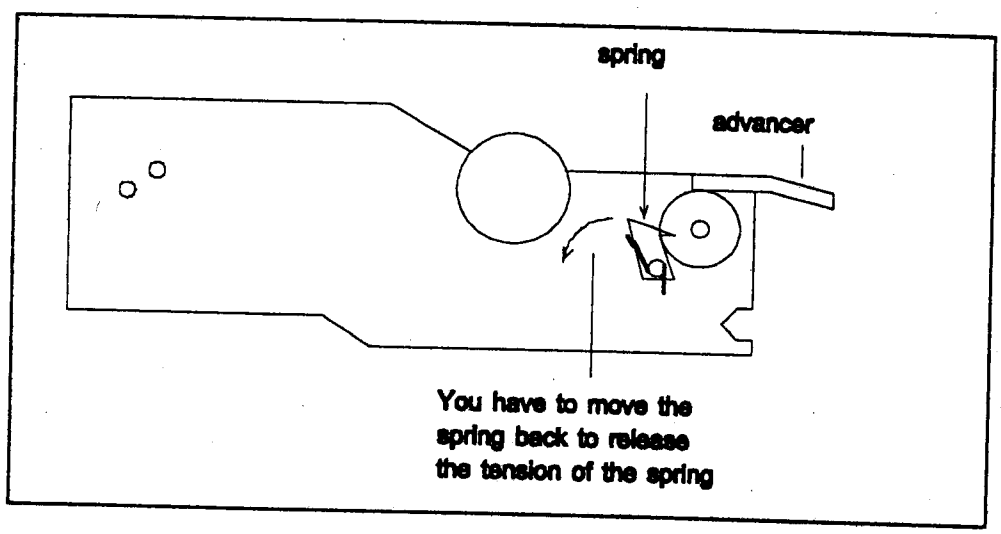
Picture 1



Picture 2

The reason for that is because the tape reels are thicker than the feeder. So when you put the feeder next to each other in the feeder base you have to mix them. One goes up the next one goes down, the next one up again and so on.

Now advance the feeder and see how it advances the reel.
If the feeder makes a "click" at the end, you have to adjust the spring shown in picture 3.



Picture 3

You have to move the spring back to release the tension of the spring a little bit.
After you've done that advance the feeder again and see the difference. If it is still not one smooth action you have to adjust the tension of the spring more.

2.1 CPU SPEED

CPU speed is for the correct communication between computer and control box.
The program is able to check the speed of your CPU.

From the MAIN MENU
Press 8 for CALIBRATION
Press 4 for CPU

The screen shows following message:

TESTING CPU. IT MAY TAKE A FEW MINUTES

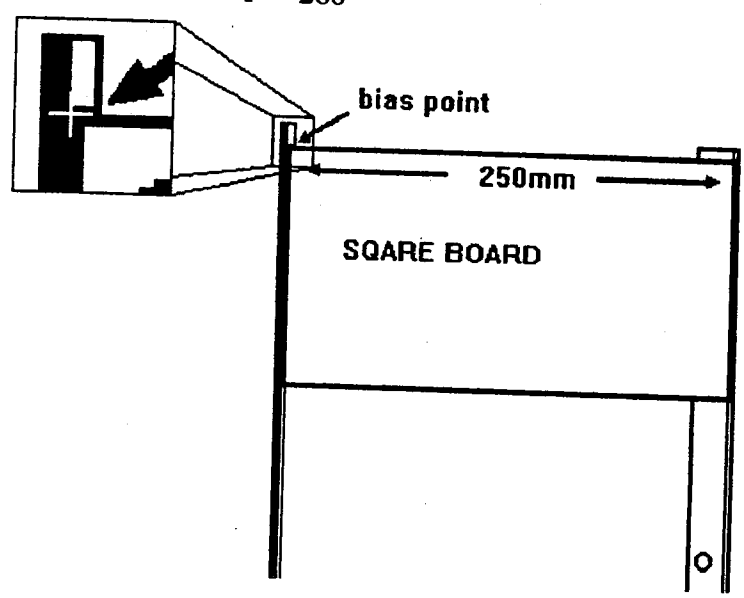
NOTE: If you have a slow computer it could really take a few minutes!!
(This routine will adjust k23 in the constant data.) Press 'F2' to save the change.

2.2 X / Y SKEW (SOFTWARE)

Make (or load) a program named "XY-SKEW_.SEQ". The program looks as follows:

```
== # = Fdr == X ==== Y === A Prt Nzl Indx Strk ===== Rem******+++=
bias   (the bias should be taught on the upper left corner of the board holder)
1       1     250.00     0.00    .00 1   2    1   260
2       2       0.00   250.00    .00 1   2    1   260
```

Go into teach mode (see pg. 35) on the bias point.
Adjust crosshairs to the point shown in the picture.

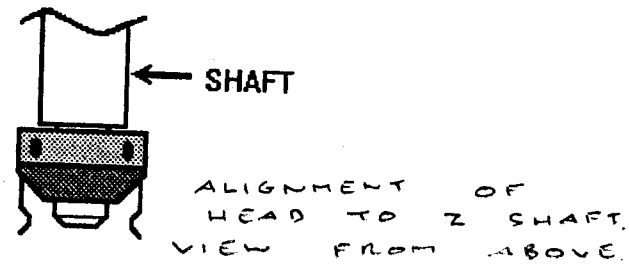


Press 'Esc' and 'Enter'.
Your Cursor is now on the first line.
Press 'F8' to go into teach mode. The head moves now in X direction 250 millimeters. The crosshairs should be still on the edge of the board holder. If not, you have to adjust the X/Y SKEW in the Constant Data.
See how many increments you have to move to correct the skew and put this number under K36 in the Constant Data. Now go to the second line into teach mode. The head travels now in Y direction. The crosshairs should be still on the edge of the square board. If not, correct the offset in the constant data.

2.3 BELT CONSTANTS

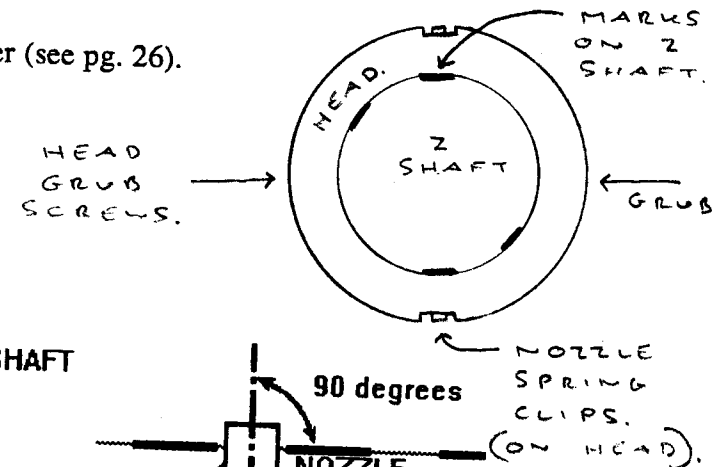
The Belt Constants are important to make sure that the head is travelling the correct distance between two points.
The adjustments are made in the Constant Data. k1 for X travel and k2 for Y travel .
It is checked with a gauge plate.
See pg. 9a.

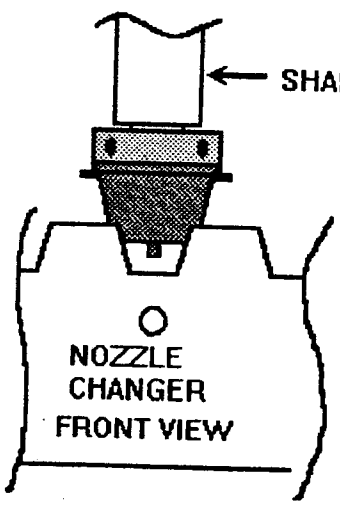
2.4 HEAD HOLDER



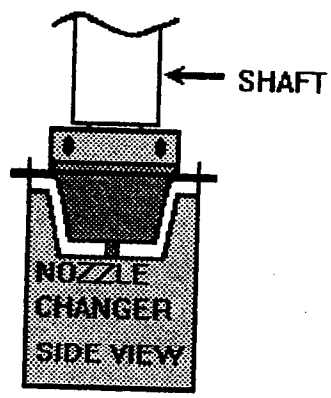
The head holder has to be in the correct rotation to assure nozzle changes without problems.

To check the correct position, go to Nozzle Changer (see pg. 26).
Go to nozzle #2 and into teach mode (see pg. 35).
Press '9' to move the nozzle over the pocket.
Put nozzle #2 on head.
Lower the head with 'U' - key (see pg. 36).
Don't lower the nozzle all the way!

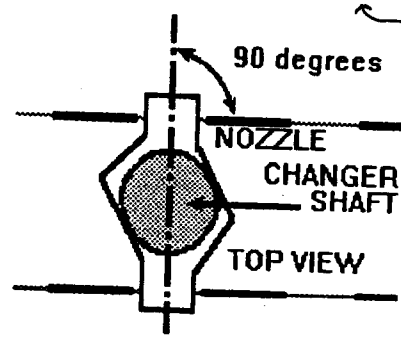




Picture 1



Picture 2



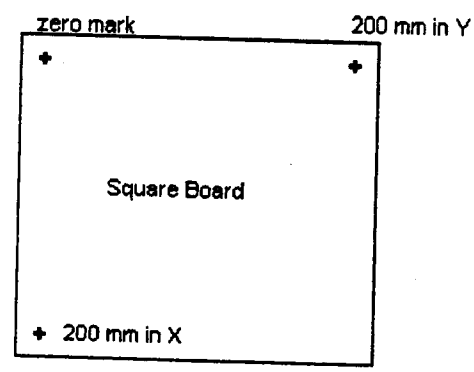
Picture 3

In picture 1 through 3 you see how the head should look like in relation to the nozzle changer.
The two "wings" of the nozzle should be 90 degrees in relation to the nozzle (***Picture 3***).
If they are not, open the two little hex wrench screws on the head holder and correct the rotation.
Tighten the screws and try again.

2.3a BELT CONSTANTS

You can calibrate the belt constants automatically with a gauge plate.
You put the gauge plate into the board holder. Then from the Main Menu you choose '8' for calibration. Then you choose '1' for calibration. It will ask:
"Do you have gauge plate?"
Hit 'Y' (not 'Enter'). The machine will ask you now for the distance from the first mark to the next mark. Put in this number and press 'Enter'. The head will now go to the home position. After the head finished homing, move the Eye Sensor over the first mark and press 'Esc'. The head will now go to the second mark. You may have to adjust the Eye Sensor into the center of the mark.
Press 'Esc' and the machine will start the test in X-direction. It will show you the results on the computer monitor. Let the machine run until you see 5 or 6 lines and then press spacebar. It will ask: "Check OK?"
Press 'Y' and then do the same procedure with the Y-axis.
After the check of the Y-axis it will ask: "Calibration OK?"
Hit 'Y' and this will automatically adjust the constant k1 and k2.

If you don't have a gauge plate you can use a square board with distance marks on it. Build another program with the distance marks. (i.e. If your distance marks go from 0 to 200 mm build the program with the bias point on the zero mark. The first part line should have zero zero in the x/y coordinates. The second line should read 200.00 for X and zero for Y. The third line should read zero for X and 200.00 for Y.)
Go into PCB parts.
Press <2> for edit.
Press <2> for change data.
Go to first line.
Press <F8> to go into teach mode. (Are the crosshairs right in
the middle of zero mark ? If not adjust bias point.)
Press <Esc>.
Go to second line.
Press <F8>.
Are the crosshairs all the way traveling to the 200mm mark ?
If not how far is it off ? (Make a note)



If the crosshairs went **not** far enough use following formula:

k1 old * (200-offset) / 200=k1 new

If the crosshairs went to far, use this formula.

k1 old * (200+offset) / 200=k1 new

The adjustment for X is in the constant data the first number of k1.
The adjustment for Y is in the constant data the first number of k2.

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.
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)

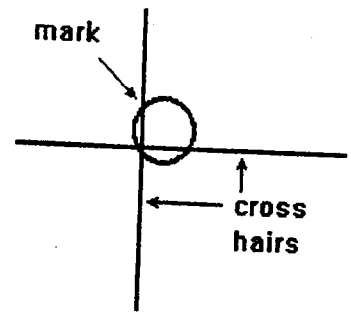
2.6 2nd HEAD OFFSET

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 offset Y1 - Y2 = Y offset

Add these offsets to k44 in the Constant Data.
Press <F2> to save the information.
See example on next page.

EXAMPLE (all values are just an example!)

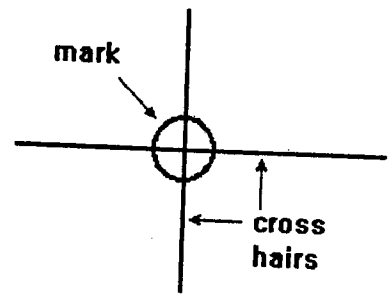


This is what you could see in the teaching monitor after you made the mark with the 2nd head and pressed F5 to move the camera over it.
You will see the following line on the bottom of the computer monitor.

X= 50.25 Y= 78.54 A= .0 U= 0

CAM

Note for X1 = 50.25 and for Y1 = 78.54



Now move the crosshairs into the center of the mark.
You will see that your values of X and Y changed after you made the corrections.
The bottom of the computer monitor will show you following line.

X= 49.84 Y= 78.79 A= .0 U= 0

CAM

Note for X2 = 49.84 and for Y2 = 78.19

We calculate our offset:

50.25 - 49.84 = 0.41 (X offset)
78.54 - 78.79 = -0.25 (Y offset)

Go into the Constant Data to k44 (see pg. 40 ff.). It will look like follows:

k43 . . .
k44 12432 / 5 2nd HEAD OFFSET 2

The first number before the forward slash is the X offset and behind the slash the Y offset.
The numbers are shown without the floating point. So the real values are:
for X 124.32 for Y 0.05

Now we add our calculated offset to these values as follows.

124.32 + 0.41 = 124.73 (New X offset)
0.05 + -0.25 = -0.20 (New Y offset)

Now you can change k 44 to the new offset. k44 will look as follows.
k43 . . .
k44 12473 / -20 2nd HEAD OFFSET 2

2.7 EYE OFFSET

Put in a board with a clear fiducial mark (minimum 2 millimeters [0.08 inch] diameter).

Make (or load) a program named "FID-CAL_.SEQ". The program looks like the following:

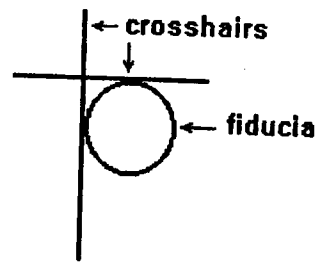
```
== # = Fdr == X ==== Y === A Prt Nzl Indx Strk ===== Rem******+++=
bias    (the bias should be taught in the center of the fiducial)
1       251      0.00      0.00     .00 1   2    1   260
```

To make sure that the bias point is in the center of the fiducial teach it as follows.

Go into teach mode on the bias point (see pg. 35).

Teach the bias point with two "corners" as follows.

Move the crosshairs to the position shown in ***picture 1.***
Press '1'.



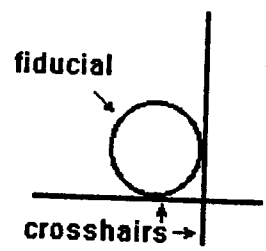
Picture 1

Move the crosshairs to the position shown in ***picture 2.***

Press '2'.

Press 'C' for Center.

The crosshairs are now in the center of the fiducial.
Press 'Esc' and 'Enter'.



Picture 2

The cursor is now in the first line.
Press 'F8' to go into teach mode.
Press 'Esc' **once** to go out of teach mode.
The EYE is now checking the fiducial mark.
After the check there might be a value under your X and Y like the example below.

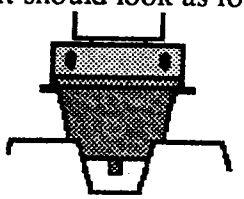
```
== # = Fdr == X ==== Y === A Prt Nzl Indx Strk ===== Rem******+++=
bias            35.91     78.12   (values are just an example!!)
1       251      0.23      -.15     .00 1   2    1   260
```

Press 'F8' to go into teach mode again.
Press '7' to move the EYE over the fiducial mark.
Press '0' (zero) to start the calibration.
Move the EYE with the arrow keys the same amount as shown under X and Y in your line under the bias point. In the example you would go 0.23 mm in positive X and 0.15 mm in negative Y.
Press 'C' for calibration. Press 'Y' and 'Enter for calibration OK.

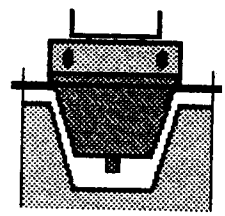
2.8 NOZZLE CHANGER

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:

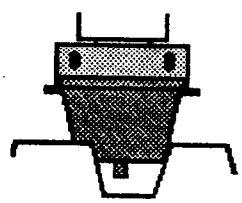


Picture 1

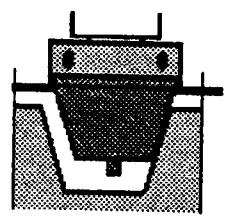


Picture 2

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.



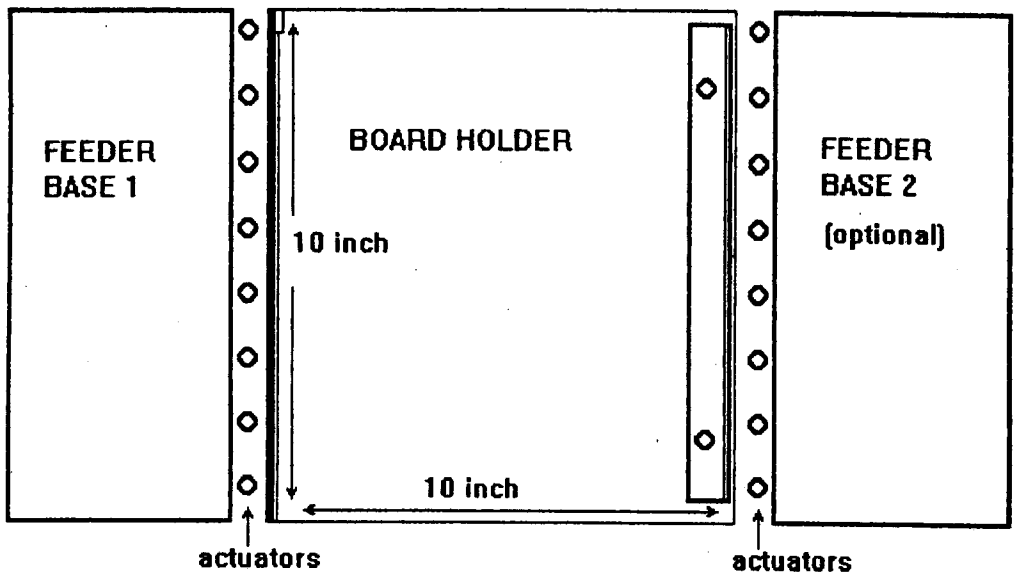
Picture 3



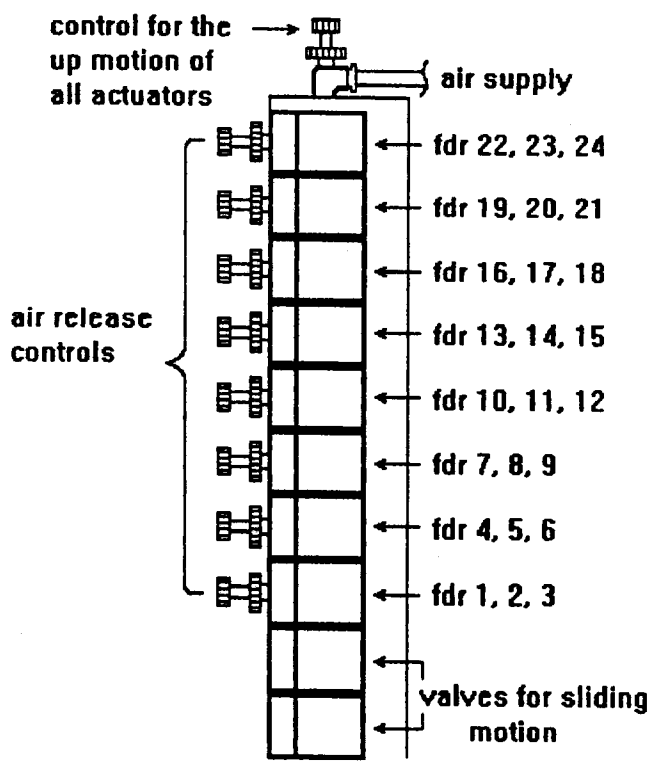
Picture 4

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.



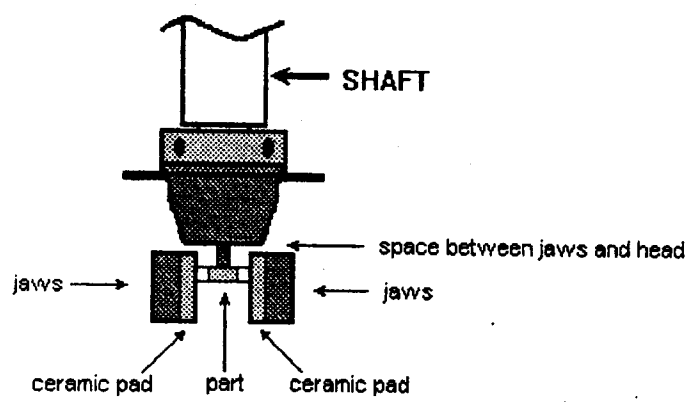
The air releases on the side are for each individual actuator. See picture on the right. If you turn it clockwise, the actuator stays up longer and goes down slower.
Turning it counter clockwise makes them go faster down.
If it is too slow it may be insufficient for the two indexes needed on a 12mm feeder. If it is too fast it could cause the parts to be flipped in the pocket.

2.10 UP-POSITION

The Up-Position is very important for squaring the parts with the jaws.
The head goes up to this position so that the jaws can square the part on each side without interfering with the head.
To check the Up-Position go to Tape Feeders (see pg. 23).
Go into Teach Mode at a loaded feeder (see pg. 35).
Pick up a part (see pg. 36 ff.).
Raise the head to the position -160 with 'Shift' - 'U' (see pg. 36 ff.).
The bottom of the computer monitor will show you the Up-Position of the head.

X= 50.25 Y= 78.54 A= .00 U= -160 CAM

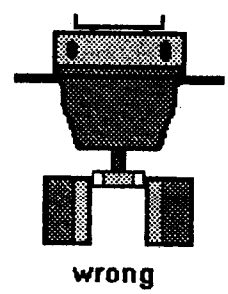
Now look at the head itself.
Close the jaws manually with your fingers.
It should look like ***picture 1*** on the right.
There should be a space between the jaws and the head. The jaws should hit the whole component with the ceramic pads.



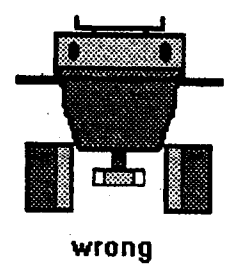
Picture 1

If it looks like ***picture 2*** or ***picture 3*** you have to adjust the head.
If it looks like ***picture 2*** you have to press 'U' to lower the head until it looks in ***picture 1***.
If it looks like ***picture 3*** you have to press 'Shift' + 'U' to raise the head more.

After you've adjusted this, look again on the bottom of your computer screen and note the value of "U".



Picture 2



Picture 3

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

In this case U would be -160. So you note 160 for your Up-Position (Disregard the minus sign).

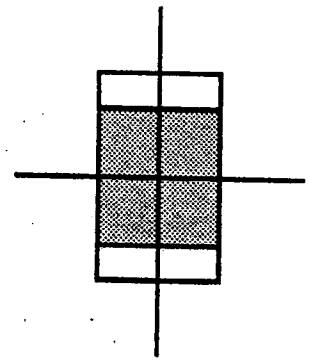
After that you go into the Constant Data (see pg. 40 ff.).
Press '2' for Edit and go to line "k6".
Change the first and the second number to 160.

```
k5    . . .
k6    160/ 160      UP POSITION
k7    . . .
```

The first number is for chips and the second number is for IC's, which is usually the same.

2.11 ~~JAW~~ LASER OFFSET

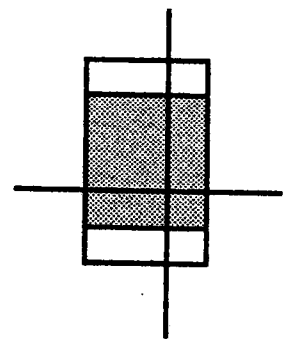
Jaw Offset is responsible for accurate placement. You can't get good results if the Jaw Offset is wrong.
For each rotation of the placement (0, 90, 180, 270 degrees) we have an individual offset.



Picture 1

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***.



Picture 2

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'.

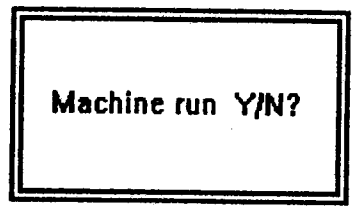
Now go to a placement with a rotation of 90 degrees and do the same procedure.
After that do the same on 180 and on 270 degrees.

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

NOTE: * 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'.

3.1 START UP

When you turn on the computer the program will load automatically.
From the C:\ prompt type 'ECM' and 'Enter'.
The program comes up with following question:



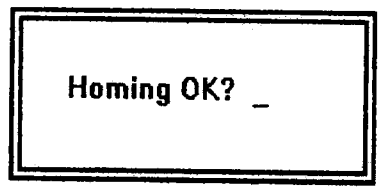
Type 'Y' to run the machine.

(If you type 'N' you are in the off line mode. That means that there are no signals going from the computer to the control box).

In the upper right corner of the computer monitor you'll now see:

Homing U	(Head up position homes to zero)
Homing Theta	(Head rotation homes to zero)

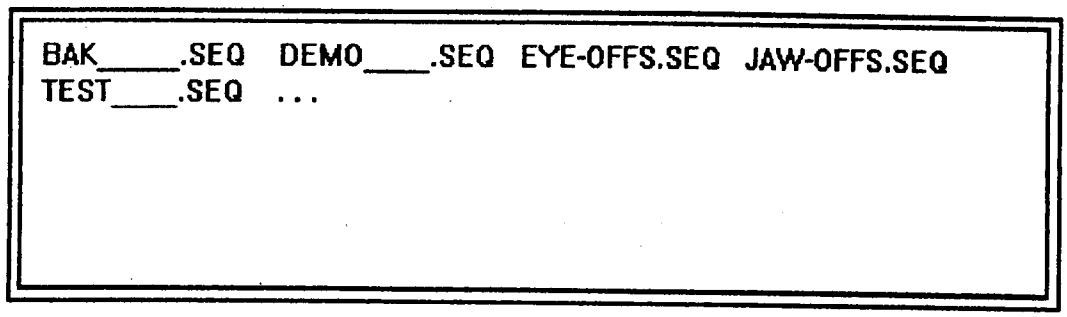
After the homing of U and Theta a window will appear:



It will ask Homing OK? The machine just wants to make sure that nothing is in the travel area of the head.
After you make sure that there is nothing in the area that the head could hit, press 'Enter'.
The head will now do the homing in X and in Y.

You will now see a list of programs.

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



These are all the programs you have up until now in your program list.
After you have finished a new program and have assigned it a new name, it will appear on that list the next time you go to Data Load (see next page: 3.2 Main Menu -Data Load).

Press 'Enter' to load the highlighted program.
That will bring you to the Main Menu (see next page: 3.2 Main Menu)

NOTE: Don't press 'Esc'. You have to load a program in order to work the machine properly!

3.2 MAIN MENU

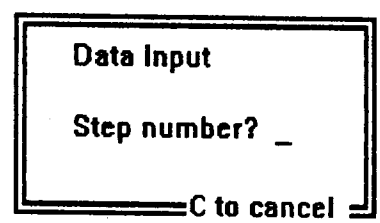
The Main Menu is the start menu.
It contains following options:

1 Data List
2 Data Input
3 Data Load
4 Down Load (RS 232 C)
5 Assembly
6 Back to Menu
7 Diagnostic
8 Calibration
9 Quit
A File maintenance

Explanations:

1 **Data List** is the List of all locations of the machine. That means every pick up point and every placement point is under the Data List. (see pg. 23)

2 You use **Data Input** to program a new board.
After you hit '2' for Data Input you will see a window as follows:



It will ask for a step number.
For a new program you will always start with step number **1**.

If you want to extend an existing file that already has for example 143 placements, you would start with step number **144**.
After you have put in the step number and hit 'Enter' you can start to program your board.

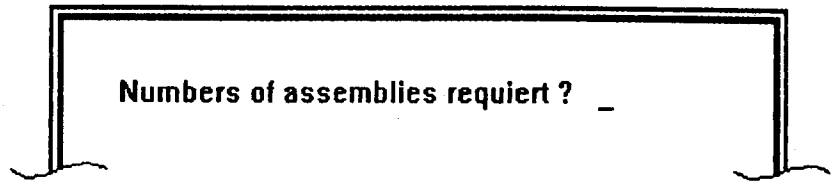
3 **Data Load** will bring you back to the window where you can load another program for a different board.

4 **Down Load** is not functional in this program. To download CAD Data you have to have a separate program called CADDOWN.

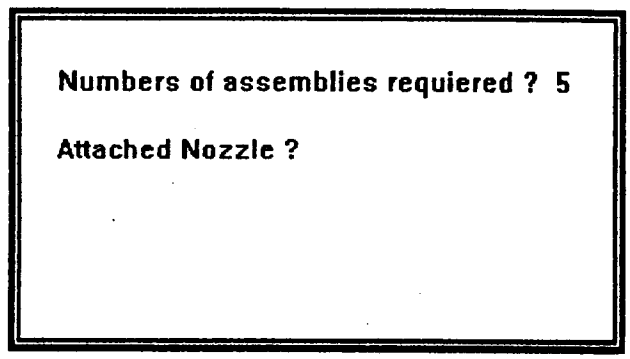
5 When you are finished with programming you go to **Assembly**.

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

You will see the following window on the computer monitor:



It asks how many assemblies are required. That means how many boards or (in case of panelized boards) how many panels you want to build.
For example if you want to build 5 boards, press 5 and then 'Enter'.



After that it will ask "Attached Nozzle ?". It asks which nozzle is attached on the head right now. So if nozzle 2 is on the head, you have to put in 2. If no nozzle is on the head you put in 0.

If you use a waffle tray in the program it will ask another question.
"Tray 1 start with 1 ?"
It asks if it should start picking up the components from pocket #1. If there is no part in pocket #1 of the tray, you can put in 2 and it will start at pocket #2.

6. **Back to Menu** brings you back to the screen where it asks "Machine run Y/N" (see pg. 18).

7. **Diagnostic** is used to check the communication between computer and control box. You can check inputs and outputs from computer and control box.

8. **Calibration** is used to calibrate the machine with a gauge plate.
Under menu selection 2, you can change your system from millimeters to inches.

If you hit '2' it will say:	"Unit is metric by mm " "Change unit Y/N ?"
If you hit 'Y' you have the choice:	"1=millimeters" "2=inches"
If you hit '2' it will say:	"Unit is imperial by inch" "Change unit Y/N ?"

Then you hit 'N' and your system will work with inches.

It is recommended to run the machine in metric because Imperial is rounded off and less accurate.

9. **Quit** brings you out of the program and back to the DOS-Shell.

A. With **File Maintenance** you can make copies of your programs on a floppy disk.
You have following choices:
1. Format disk (only HDD)
2. Copy from HD to FD
3. Copy from FD to HD
4. Back to Main Menu

If you press '1' you can format a disk but only HDD's (High Density Disk).

If you press '2' you will see the list with all the programs you have. You can choose one and copy it to your A: Drive.

If you press '3' you can copy a program from Floppy Drive to Hard Drive.

'4' brings you back to the Main Menu.

3.3 DATA LIST

1	Tape Feeder	(Locations of all the tape feeders)
2	Tray Feeder	(Locations of all the tray feeders)
3	Linear Feeder	(Locations of all the linear feeders)
4	Nozzle Changer	(Locations of all different nozzles, the tilt(squaring)station[pos.1], the bottom vision camera [pos. 2], the extender arm[pos.3], the dumping point, the idle shots)
5	PCB Parts	(Locations of the placements on the PCB)
6	Part Type	(List with information of different parts)
7	Dispense Type	(List for location and size of the dots)
8	Main Menu	(Brings you back to the Main Menu)
9	Go to Home	(Moves the head to the home position or dumping point)
A	Data Save	(Saves your data)

3.3.1 TAPE FEEDER

Here are the locations of all your tape feeder. Usually from Tape #1 to Tape #48 (may vary with different configurations).
One line in the list looks as follows (values are just an example not a reference):

== Type = # ====== X ====== Y ===== A ===== Strk === Rem*********+++==

tape	1	23.10	7.65	.00	270	R 10k

This line shows you the default location of tape feeder #1. It is the X/Y location in reference to the Home Position of the head.
It is **not** the exact pick up location of the part. The exact pick up location may vary with different types of parts or tapes.
It is necessary to adjust this location every time you change tapes.

Under 'A' is the pick up angle. This angle is usually set to zero so that the head doesn't rotate before the pick up. Only in very few cases you have to rotate the head before the pick up.
For example for Melf- Components (cylindrical) as shown in the picture on the left.

Melf component

To pick up this component you need a special nozzle where the tip is round like the component as shown in the picture on the right.

Now it depends how the component is in the tape feeder. In some cases you have to rotate the head 90 degrees to pick up the component correctly with the round tip.
'Strk' determines how far the head goes down to pick up the component.

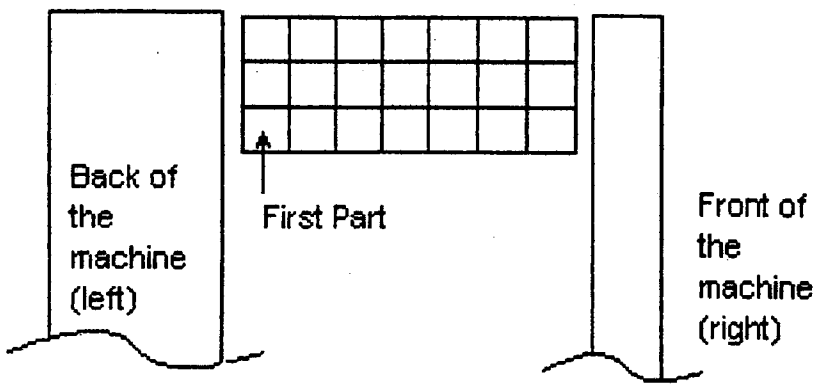
3.3.2 TRAY FEEDER

Tray feeder locations need three lines to locate every component on the tray.
It looks like the following:

== Type = # ====== X ====== Y ===== A ===== Strk === Rem*********+++==

grid	1	99.79	214.48	.00	160	QFP 100
qty	1	8	4			
pitch	1	27.50	25.00			

The first line is the location of the first part of the tray.



Under 'A' is the pick up angle which should be always zero.

'Strk' determines how far the head goes down to pick up the component.

The second line is the quantity of the tray. In this case it would be 7 pockets in X and 3 pockets in Y.

The third line is the distance between the first and second part in X (in this case 27.50mm) and the first and the second part in Y (in this case 25.00mm).

With all this information the machine knows the location of every part in the tray.

Under the 'Rem' (Remark) you can put the information about the type of the component. (optional).
In this case it is an QFP 100 pin.

3.3.3 LINEAR FEEDER

The Linear feeders have the same structure like the tape feeders.
The machine comes with a default X and Y position for each feeder.
Since you can mount the linear feeders wherever you want, you have to teach this position for your configuration.

Other than in Tape feeder and Tray feeder the 'Rem'(remark) has a meaning.
If you put in the same remark under two feeders then the machine will automatically go to the second feeder if the first one is empty.
Note: If you put nothing under the remark for each feeder the machine will think you have the same component in each lane!!!

Example:

```
== Type = # ====== X ====== Y ===== A ===== Strk === Rem*********+++==

 feeder   1      26.43    264.32     .00      170      14pin SOIC
 feeder   2      43.43    264.32     .00      170      14pin SOIC
 feeder   3      68.43    264.32     .00      170      16pin SOIC
 feeder   4      26.43    264.32     .00      170      24pin SOIC
```

In this case the machine knows that in feeder #1 and feeder #2 is the same part. As soon as feeder #1 is empty the machine will pick up the component from feeder #2. If feeder #2 is also empty the machine will stop and display a window which says:

Pickup miss at feeder 121.

If your linear feeder list looks as follows with no remark at all:

```
== Type = # ====== X ====== Y ===== A ===== Strk === Rem*********+++==

 feeder   1      26.43    264.32     .00      170
 feeder   2      43.43    264.32     .00      170
 feeder   3      68.43    264.32     .00      170
 feeder   4      26.43    264.32     .00      170
```

In this case the machine would think in every feeder is the same component. As soon as feeder #1 is empty the machine goes to feeder #2. If feeder #2 is empty it will go to feeder #3 and so on.
So if you have different parts in the lanes you have to put in different remarks under 'Rem'.

The machine will only compare the first three letters under the 'Rem'.
So if you would put in SOIC 14 in the first feeder and SOIC 16 in the second feeder, the machine would still think it is the same part!!!

3.3.4 NOZZLE CHANGER

Under Nozzle Changer are the positions of all the different nozzles you use for different parts. Here are also the positions for the squaring station (if you have a waffle tray with squaring station), for the bottom vision camera (if you have a machine with vision system), for the extender arm (if you have an extender arm to pick up from a waffle tray), for the dumping point and for the idle shots (if you have a dispenser).

== Type = # ======	X ======	Y =====	A =====	Strk === Rem*********+++==
Bit 1	226.43	34.32	45.00	270
Bit 2	226.43	43.32	45.00	270
Bit 3	226.43	52.32	45.00	270
Bit 4	226.43	61.32	45.00	270
Bit 5	226.43	70.32	45.00	270
Bit 6	226.43	79.32	45.00	270
Pos 1	38.59	264.03	.00	100
Pos 2	26.43	4.66	.00	100
Pos 3	28.23	213.72	.00	100
dumping_P.	234.12	34.51		
idle shot	21.00	50.91		

This is how the Nozzle Changer list should look. (All values are just an example not a reference).

You see all the X/Y locations of the different bit's (nozzles) in reference to the home position of the head. Once the nozzles are taught you don't have to change them again. Only when you calibrate the machine with the gauge plate (see pg. 9a) or if you have problems with the changing of the nozzles.
To teach the nozzle changer see pg. 13.

To teach Pos 1 (squaring station) see Programming.

To teach Pos 2 (bottom vision camera) see Programming.

To teach Pos 3 (extender arm) see Programming.

To teach the dumping point go into teach mode (see pg. 35) and choose a point where you can put a bin to save the dumped components.

The idle shot (if you have a dispenser) is the position where the dispenser puts some test dots before it goes to the actual dispensing. You should choose this point on the edge of your PCB. You can teach this point by going into teach mode and teach with the camera

3.3.5 PCB PARTS

The first line you see under PCB Parts is the bias point. The bias point is the origin, or X,Y 0.0 coordinate of the PCB. Every location on the board is in reference to the bias point and not to the home position of the head. You determine this point on your PCB. It should be a point you always can remember. Recommended is a corner of a pad (you should not use the corner of the PCB or any printing on the PCB. Also not a center of a hole because it is very difficult to find the exact center of a hole)
(see Programming)
The next two lines should be used as fiducial marks. With the fiducial marks the machine will check if the board is aligned before it goes to the actual assembly. (see Programming)

Each following line is to place the parts on the board.

In one line you put all the information together which the machine needs to place the components. You determine where to pick up the component (fdr), where to place the component (X/Y), in which angle you want to place the component (A), which part it is in reference to the part type list (Prt), how many advances the tape feeder needs to feed the next part (Indx) and how far the head goes down to the PCB to place the component (Strk).

PCB Parts for single head machine

== # =	Fdr ==	X ====	Y ===	A	Prt	Nzl	Indx	Strk =====	Rem******+++=
bias		56.82	42.98						
1	251	10.32	5.34	.00					
2	252	12.10	250.72	.00					
3	7	5.37	22.98	.00	1	2	1	260	R23
4	10	7.21	12.43	90.00	1	2	1	260	R12
5	7	23.87	5.34	90.00	1	2	1	260	R24

. . .

PCB Parts for dual head machine

== #	=Hd =	Fdr ==	X ====	Y ===	A	Prt	Nzl	Indx	Strk ====	Rem****+++=
bias			56.82	42.98						
1	1	251	10.32	5.34	.00					
2	1	252	12.10	250.72	.00					
3	1	7	5.37	22.98	.00	1	2	1	260	R23
4	1	10	7.21	12.43	90.00	1	2	1	260	R12
5	1	7	23.87	5.34	90.00	1	2	1	260	R24

. . .

As you can see the first line is marked as the bias point. The next lines starts with an sequence number followed either by the head #(dual head) or the Fdr #(single head).
In the example above, sequence #1 and #2 are automatic fiducials. We determine that by using a code number under the 'Fdr' column.

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

Automatic fiducials have the code number '251' for the first and '252' for the second fiducial. Codes '261' and '262' are used for fiducials recognized by the vision system. Code numbers '271' and '272' tell the system to use manual fiducials (see Programming).

Sequence #3 is our first part placed on the board.
In this case the first part is picked up at feeder #7 (Fdr) and placed at the taught X/Y location (X/Y). It is placed in an angle of zero degree (A) and it is part type number 1 (Prt) which is picked up with nozzle #2 (Nzl). Feeder #7 will be advanced one time (Indx) and the head goes down to the PCB 26.0 mm (Strk). The remark 'R12' is the designator on the PCB (Rem).

Sequence #4 is our second part placed on the board.
In this case the second part is picked up at feeder #10 (Fdr) and placed at the taught X/Y location (X/Y). It is placed in an angle of 90 degrees (A) and it is part type number 1 (Prt) which is picked up with nozzle #2 (Nzl). Feeder #10 will be advanced one time (Indx) and the head goes down to the PCB 26.0 mm (Strk). The remark 'R23' is the designator on the PCB (Rem).
The same with the following parts.

3.3.6 PART TYPE

In this list you will find different part types and the specifications of these parts.
Example:

=P# = Nzl=L# = Btm = Rgt = Lft == X ==== Y ==== Pt == W == Thk = lv = Rem*******

x 1	2	2	0	1	1	2.00	1.25	.0	.0	.50	1	CHIP
x 2	6	100	30	20	20	21.50	18.20	.67	.70	4.20	12	QFP100

. . .

P# = Part type number (the number you put under the 'Prt' column in PCB Parts)
Nzl = Nozzle number (choose nozzle as big as possible)
L# = Total number of leads (Chip = 2 leads; QFP 100 = 100 leads)
Btm = Number of leads at the bottom
Rgt = Number of leads at the right
Lft = Number of leads at the left
X = Size of the component in X (measured with the leads)
Y = Size of the component in Y (measured with the leads)
Pt = Pitch between the leads (necessary for vision and lv 2 and 3)
W = Length of the leads (only for vision system)
Thk = Thickness of the part (measured with leads)
lv = Method of centering the part (lv 1-6 = mech. centering; lv 10-12 vision centering)
Rem = Type of part (CHIP; SOP; QFP)

P# The part type number is the number you put under the "Prt" column in PCB parts.

Nzl Here you put in the nozzle number you want to use for that component. You should use the biggest nozzle you can use for that component.

L# Here you put in the total number of leads. i. e. for a QFP 100 which has a total count of 100 leads, you put in 100 for "L#".

Btm The number of leads at the bottom of the component. Bottom means the bottom of the camera monitor when it checks a part.

Rgt Number of leads at the right of the component.

Lft Number of leads at the left of the component.

X The size of the component in X-direction measured with the leads. X is from the left to the right of the camera monitor when it checks the component.

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

Y The size of the component in Y-direction measured with the leads. Y is from the top of the camera monitor to the bottom.

REMEMBER !! If you use "lv 2" or "lv 3" (scrub alignment) for components picked up from stick feeders, X and Y are **NOT** the dimensions of the component but the amount of scrub.
If you use 'lv 2' or 'lv 3' with the QFP-Squaring station X and Y are the dimensions of the part.
(see "LV Numbers")

Pt The pitch (lead spacing) between the leads of the component.

REMEMBER !! If you use 'lv 6' Pt is **NOT** the lead spacing but the amount of squaring the component or rotating the component out of the Jaws. i.e. if you put in 0.1 under Pt it will square the part on the first side. Then the head moves down, out of the Jaws to rotate the part and then it goes back in the Jaws to square it on the second side.
If you put in 0.3 under Pt it will square the part 3 times on the first side, 3 times on the second side with the Jaws.
If you use 'lv 2' or 'lv 3' with the tilt squaring station, Pt determines the scrub amount.
(see "LV Numbers")

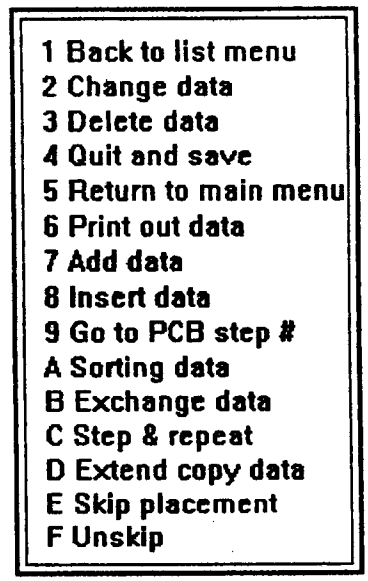
W Is the length of the leads.

lv Is the type of centering the component. 1-6 = mechanical centering; 10-12 = vision centering. (see "LV Numbers)

Rem The remark should start with 3-digit part abbreviation.
CHI= for chips (resistors, capacitors). The machine runs in normal speed.
SOP= for SOIC's. The machine runs with time delays for more accuracy.
QFP= for QFP components. Slows the machine down more for maximum accuracy.

+++ The plus signs at the end of the Rem column are for special features of the machine.
VAC = If you have an optional vacuum sensor for 0402 components.
ROT = If you use 'lv 4' it will make the squaring after the part is rotated 90 degrees.

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.

---------- *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

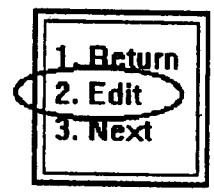
In Teach Mode you teach your entire pick up locations and your placement locations.

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'.

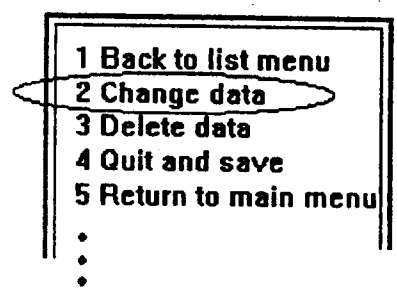


Picture 1

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.



Picture 2

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.

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: Go to ' Pos 2' under 'Nozzle Changer' in the 'Data List'
Go into ' Teach Mode '
Now the head moves to the bottom camera and you can see the nozzle in the teaching monitor.
Press ' V ' to turn on the vacuum.
Now put the part you want to check on the nozzle manually.
You should see now the part from the bottom in the teaching monitor.
Press ' P ' and you will see following message in the bottom left corner of the computer monitor.

" ID,Mode / Angle"

Type in the part type you use for that component.
Then you type in the mode: Mode 0 = lv 10
Mode 1 = lv 11
Mode 2 = lv 12

Then the rotation.
Rotation: 0 = Zero degree
1 = 90 degrees
2 = 180 degrees
3 = 270 degrees

So if you put a QFP 100 on Zero degree on the nozzle and the part type for that component would be 14 (part type could be different), you would put in following line.

"14,20"

The Mode and the Angle are not separated by anything, so 2 stands for the Mode and 0 for the Angle. If you have the component on 90 degrees you would put in:

"14,21"

As soon as you hit ' Enter ' the system will take pictures of the component until you hit the space bar.
It will build a square box around the component and you see two bars on each side of the component. If the box is not square, that means that the camera catches light from somewhere around the component. In that case you have to find out where the light comes from and then you have to cover it with black cloth.

Shift + P Is the check for SOIC's. It works like ' P '. The difference is, it doesn't build a box around the component. It just puts a line in the center of the component. And you don't have to put a Mode in the command line. Just the part type and the angle separated by a comma.

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 determent 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 1milimeter.

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

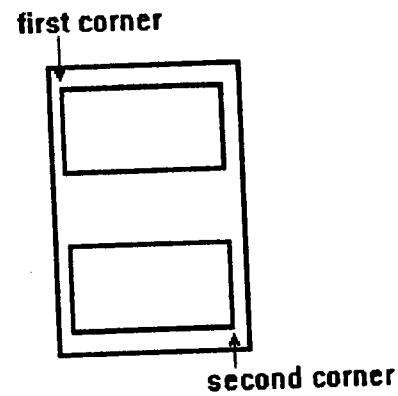
'3 = commands' are for factory use only.
If you press 1 it will start with the lower camera calibration. You have to put a small part on the head (for example a chip resistor). You will see a window on the teaching monitor.

---------- *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.



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 Jaw calibration.

\ 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.

3.7 CONSTANT DATA

WARNING This data is used to control the machine. Changing this data will void all Service Agreements, and may cause damage to the machine. Consult Manncorp's Service Department before making **any** changes.

NOTE ! Each constant has two numbers and a remark column. The numbers are not always related to each other and the remark (Rem) column is not only a remark. So everything you change in the constant data could have effect to the performance of the machine.

k1 The **first** number is the X-axis belt tension constant. It calibrates the travel distance in X-direction.
i. e. If you have two points 200 millimeters apart, this constant makes sure that the head travels 200 millimeters and not 199.7 millimeters.
The number should be around '200000'. If you have a finer resolution the number will be around '100000'.

The **second** number indicates the systems unit of measure. If you have the system in metric this number will be '100'. If the system is imperial this number will be '2540'.

NOTE !! It is recommended to run the machine in Metric because Imperial is rounded off and less accurate.

The **Rem** is a constant for the theta resolution. The number '100' is for the normal operation of the machine. 'DEMO' and 'FINE' are finer resolutions for vision machines.

NOTE !! Don't change the remark column. It would affect the theta rotation of the head and it would not work properly.

k2 The **first** number is the Y-axis belt tension constant. It calibrates the travel distance in Y-direction.
The number should be around '200000'. If you have a finer resolution the number will be around '100000'.

The **second** number is the identification for the system unit of measure.
1 = Metric, 2 = Imperial.

The **Rem** shows the machine which drive letter is used for the Ramdrive. If you load the Ramdrive it creates a drive letter which is the next letter available on your computer. So if you only have a Floppy Drive with the letter A: and a Hard Drive with the letter C: in your computer, the computer would create the letter D: for your Ramdrive. In that case the Rem has to be 'D RAMDRIVE'. If you have an additional CD Drive with the letter D:, the computer would create the letter E: for the Ramdrive. In that case the Rem has to be 'E RAMDRIVE'.

k3 The **first** number is the maximum travelling limit in X-direction.

NOTE !! Changing this number could cause machine damage.

The **second** number is a setting for the theta resolution. Normally it is set to '100'. For finer resolution this number goes up to '1000'. This number has to match the theta motor settings.

NOTE !! If you change this number without having the correct motor settings, the theta motor will not work correct.

The **Rem** has no meaning if you have the normal theta resolution. If you have the number '1000' for theta resolution, the remark has to start with the number '40' to make the theta motor work properly.

k4 The **first** number is the maximum travelling limit in Y-direction.

NOTE !! Changing this number could cause machine damage.

The **second** number is the Z-Motor constant. It should always be '40'.

The **Rem** has no special meaning.

k5 The **first** number is the number of pick-up attempts before an error message alerts the operator to check the pick-up position. It should be set between 1 and 3.

The **second** number is the "EYE" sensor detection for fiducials and Bad Board scan.
If it is set to '**0**' it will detect shiny (reflective) marks.
If it is set to '**1**' it will detect holes or dull marks with shiny edges.
REMEMBER ! The marks must have good contrast to work properly.

The **Rem** has no special meaning.

k6 The **first** number is the Up-Position of the head when it squares a chip.
(see UP-POSITION)

The **second** number is the Up-Position of the head when it squares a SOIC. Usually it has the same value like the first number. (see UP-POSITION)

The **Rem** has no special meaning

k7 The **first** number is the magnification level of the bottom camera. This value is set during the calibration of the bottom camera. (For vision systems only)
(see CAMERA CALIBRATION for VISION SYSTEMS)

The **second** number is the magnification level of the upper camera. This value is set during the calibration of the upper camera. (For vision systems only)
(see CAMERA CALIBRATION for VISION SYSTEMS)

The **Rem** has no special meaning.

k8 The **first** number is the X-Offset from head #1 to the "EYE" sensor. This value is set during the "EYE" calibration.
(see EYE OFFSET)

The **second** number is the rotation offset of 180 degrees. (30 = 1 degree). A positive number will correct the rotation of the part counter clockwise.

The **Rem** has no special meaning.

k9 The **first** number is the Y-Offset from head #1 to the "EYE" sensor. This value is set during the "EYE" calibration.
(see EYE OFFSET)

The **second** number is the rotation offset of 270 degrees. (30 = 1 degree). A positive number will correct the rotation of the part counter clockwise.

The **Rem** has no special meaning.

k10 The **first** number is the stroke of the tilt station. It determines how far the head has to go down, to touch the bottom of the tilt station.

The **second** number is the LOCAMFOC for vision systems only. It determines how far the head goes down at the bottom camera to align a part. This is useful to have a better picture of the component during the alignment.

The **Rem** has no special meaning.

k11 The **first** number is a correction factor for chips. It is used only by the vision system. The value is usually set to 50. The lower the number the more it will correct the part.

The **second** number is the correction factor for IC's and QFP's. It is used only by the vision system. The value is usually set to 2.

The **Rem** has no special meaning.

k12 The **first** number is the X-offset between dispenser and head #1.

The **second** number is the Y-offset between dispenser and head #1.

The **Rem** has no special meaning.

k13 The **first** number is the rotation offset of 0 degrees. (30 = 1 degree). A positive number will correct the rotation of the part counter clockwise.

The **second** number is the rotation offset of 90 degrees. (30 = 1 degree). A positive number will correct the rotation of the part counter clockwise.

The **Rem** has no special meaning.

k14 The **first** number is the wait time before the next motion after finishing an X/Y-movement.

The **second** number is the pick up wait time. It determines how long the head stays down to pick up a component.

The **Rem** has no special meaning.

k15 The **first** number is the time how long the squaring jaws stay closed. If this time is too short, the jaws will not close all the way and you will have a poor alignment. If this time is to long the jaws will stay closed to long and the head may rotate before the jaws are completely open.

The **second** number is the constant to shut off the vacuum when it places a part. If the vacuum shuts off to early, it will drop the part before it can place it. If it shuts off to late it will suck the part back off the board. The average value is 20. If you put in a higher number it will shut off the vacuum **earlier.**

The **Rem** has no special meaning

k16 The **first** number is the maximum speed of the X-motor. The value goes from 1 to 255. 255 is the maximum speed of the X-motor.

The **second** number is the slope to the maximum speed of the X-motor. The larger this number the faster the X-motor accelerates from minimum speed to maximum speed.

The **Rem** has no special meaning.

k17 The **first** number is the minimum speed of the X-motor. The value goes from 1 to 255. This number should not be bigger than 100.

The **second** number is the pick point of a special automatic waffle tray.

The **Rem** has no special meaning.

k18 The **first** number is the slope to the minimum speed of the X-motor. The larger this number the faster the X-motor accelerates from zero to the minimum speed.

The **second** number is the QFP maximum speed of the X-motor. This number should not be to high to assure accurate placements for QFP's.

The **Rem** has no special meaning.

k19 The **first** number is the maximum speed of the Y-motor. The value goes from 1 to 255. 255 is the maximum speed of the Y-motor.

The **second** number is the slope to the maximum speed of the Y-motor. The larger this number the faster the Y-motor accelerates from minimum speed to maximum speed.

The **Rem** has no special meaning.

k20 The **first** number is the minimum speed of the Y-motor. The value goes from 1 to 255. This number should not be bigger than 100.

The **second** number is the assembly position of a special automatic waffle tray.

The **Rem** has no special meaning.

k21 The **first** number is the slope to the minimum speed of the Y-motor. The larger this number the faster the Y-motor accelerates from zero to the minimum speed.

The **second** number is the QFP maximum speed of the Y-motor. This number should not be to high to assure accurate placements for QFP's.

The **Rem** has no special meaning.

k22 The **first** number is the maximum speed of the theta motor. The normal value is 19.

The **second** number is the matching factor of the vision system. If you use vision fiducials (261 and 262), this factor determines what percent the pictures have to match to accept the fiducial mark. The range is from 500 to 1000, which means 50% to 100%.

The **Rem** has no special meaning.

k23 The **first** number is the minimum speed of the theta motor. The normal value is 16.

The **second** number is the CPU speed constant. This constant is set during the CPU check during the calibration. You can lower this number to make the machine run faster. If you lower this number you have to raise the numbers in the constants k14 and k15. Otherwise the machine will loose its accuracy.

The **Rem** has no special meaning.

K24 The **first** number is the slope to the maximum speed of the theta motor. The normal value is 1.

The **second** number is the strength of the jaws. The normal value is 1. A lower number will increase the strength of the jaws. (You can use negative numbers)

NOTE! If you make the jaws to strong, it could push the part out of place. The result would be inaccurate placement.

The **Rem** has no special meaning.

k25 The **first** number is the maximum speed of the Z-motor. The value goes from 1 to 255. 255 is the maximum speed of the Z-motor.

The **second** number is the maximum speed of the Z-motor for QFP's. This number should not be to high to assure accurate placements for QFP's.

The **Rem** has no special meaning.

k26 The **first** number is the minimum speed of the Z-motor. The value goes from 1 to 255. This number should not be bigger than 110.

The **second** number is the minimum speed of the Z-motor for QFP's.

The **Rem** has no special meaning.

k27 The **first** number is the slope to the maximum speed of the Z-motor. The larger this number the faster the Z-motor accelerates from zero to the minimum speed.

The **second** number is the slope to the maximum speed of the Z-motor for QFP's.

The **Rem** has no special meaning.

k28 The **first** number determines if there is a loader installed or not. 0 (zero) means that there is no loader installed. 1 = loader installed. If you put in 10 it would change the direction of the cursor keys on the computer keyboard.

The **second** number is a nozzle choke test. If you put it to 1 it would check if the nozzle is clocked. (optional).

The **Rem** has no special meaning.

k29 The **first** number is a wait time for larger IC's. It will add time to the placement of the IC to prevent the dropping of a component.

The **second** number is the dumping point of a QFP component. If you put this number to 1 it would drop the component at the dumping point. If it is 0 (zero) it will put the QFP back into the tray.

The **Rem** has no special meaning.

k30 The **first** number is used to turn the dispenser on or off.

0 = dispenser off
1 = dispenser on and temperature setting is in degree C
2 = dispenser on and temperature setting is in degree F

The **second** number is the temperature setting for the dispenser.
NOTE! Do not set the temperature higher than 50 degree C or 122 degree F.

The **Rem** has no special meaning.

k31 The **first** number is a jaw-offset in X direction for components placed on 90 degrees.

The **second** number is a jaw-offset in Y direction for components placed on 90 degrees (see pg. 17)

The **Rem** has no special meaning.

k32 The **first** number is a jaw-offset in X direction for components placed on 180 degrees.

The **second** number is a jaw-offset in Y direction for components placed on 180 degrees (see pg. 17)

The **Rem** has no special meaning.

k33 The **first** number is a jaw-offset in X direction for components placed on 270 degrees.

The **second** number is a jaw-offset in Y direction for components placed on 270 degrees (see pg. 17)

The **Rem** has no special meaning.

k34 The **first** number is a contrast level for the grayscale vision system. The range is from 0 to 150. The higher the number the more contrast you get.

The **second** number is not used.

The **Rem** has no special meaning.

k35 The **first** number is a jaw-offset in X direction for components placed on 0 degree.

The **second** number is a jaw-offset in Y direction for components placed on 0 degree (see pg. 17)

The **Rem** has no special meaning.

k36 The **first** number is the X-offset from camera to head #1. This value is set during the camera calibration. (see pg. 10)

The **second** number is the Y-offset from camera to head #1. This value is set during the camera calibration. (see pg. 10)

The **Rem** has no special meaning.

k37 The **first** number is the X-skew of the PCB-holder. This number should be adjusted during the installation. (see pg. 8).

The **second** number is the Y-skew of the PCB-holder. This number should be adjusted during the installation. (see pg. 8).

The following constants are only for dual head machines!

K38 The **first** number is the rotation offset of 0 degrees for the second head. (30 = 1 degree). A positive number will correct the rotation of the part counter clockwise.

The **second** number is the rotation offset of 90 degrees for the second head. (30 = 1 degree). A positive number will correct the rotation of the part counter clockwise.

The **Rem** has no special meaning.

K39 The **first** number is the rotation offset of 180 degrees for the second head. (30 = 1 degree). A positive number will correct the rotation of the part counter clockwise.

The **second** number is the rotation offset of 270 degrees for the second head. (30 = 1 degree). A positive number will correct the rotation of the part counter clockwise.

The **Rem** has no special meaning.

k40 The **first** number is a jaw-offset for the second head in X direction for components placed on 90 degrees.

The **second** number is a jaw-offset for the second head in Y direction for components placed on 90 degrees (see pg. 17)

The **Rem** has no special meaning.

k41 The **first** number is a jaw-offset for the second head in X direction for components placed on 180 degrees.

The **second** number is a jaw-offset for the second head in Y direction for components placed on 180 degrees (see pg. 17)

The **Rem** has no special meaning.

k42 The **first** number is a jaw-offset for the second head in X direction for components placed on 270 degrees.

The **second** number is a jaw-offset for the second head in Y direction for components placed on 270 degrees (see pg. 17)

The **Rem** has no special meaning.

k43 The **first** number is a jaw-offset for the second head in X direction for components placed on 0 degrees.

The **second** number is a jaw-offset for the second head in Y direction for components placed on 0 degrees (see pg. 17)

The **Rem** has no special meaning.

k44 The **first** number is the X-offset between head #1 and head #2. This offset is calibrated during the installation. (see pg. 11, 12)

The **second** number is the Y-offset between head #1 and head #2. This offset is calibrated during the installation. (see pg. 11, 12)

The **Rem** has a meaning in this case. The last number of this remark is the number of the bit (nozzle) which is attached on the second head. With this information the program knows when to use either heads or only one head. If you don't want to use the second head you have to change the first number in this remark to 1.

HD411/HD422 COMPARISON OF MOTOR CONSTANTS

HD411	HD422	PULSE RATE PPS		HD411	HD422	SLOPE PPS/S
0	0	23		0	***	1414
5	1	141		5	***	1511
10	3	258		10	***	1621
20	6	492		20	***	1898
30	10	750		30	***	2188
40	16	1219		40	***	2457
50	22	1688		50	***	2801
60	29	2203		60	***	3205
70	41	3141		70	***	3676
80	54	4078		80	***	4310
90	68	5109		90	***	5076
100	93	6984		100	***	5988
110	118	8859		110	***	7299
120	144	10828		120	61928	8929
130	181	13641		130	50870	10870
140	219	16453		140	39810	13890
150	258	19359		150	31518	17544
160	308	23109		160	25997	21270
170	358	26859		170	20460	27026
180	409	30703		180	16313	33895
190	471	35391		190	13547	40815
200	534	40078		200	10782	51285
210	603	45234		210	8016	68982
220	728	54609		220	5256	105205
230	853	63984		230	3317	166655
235	915	68672		235	2766	199913
240	981	73594		240	2214	249756
245	1059	79453		245	1656	333913
250	1137	85313		250	1104	500870
255	1215	91172		255	552	1001739
	1500	112500			500	1105922
	2000	150000			450	1228802
	2500	187500			400	1382403
	3000	225000			350	1579889
	3500	262500			300	1843204

HD422(KP422) VALUE LIMIT
MAX SPEED 0-4096 LARGER>HIGHER
LOW SPEED 0-4096 MAX>=L
SLOPE 300-65535 LARGER>SLOWER