MultiTroniKs LVX II

Windows 95™ Operating Software

OPERATIONS MANUAL AND PROGRAMMING GUIDE - REVISION 1.xx beta

Chapters at a Glance

Part One - Operations

Part Two - Programming

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List of Figures

Note: Most every screen image in this manual contains sample data and pictures. Your actual configuration may make the screen appear somewhat different. Never the less, the basic structure of the menus and buttons will be identical.

Chapter 1 Using the Manual

This manual is in two parts. The first, chapters one through seven, encompass the general machine operations. Chapters eight to eighteen cover the software programming guide.

The programming guide may be divided into two parts as well. The first, chapters eight to fourteen, go through the entire step by step procedure of everything you need to do to program a new job. The second half of the programming guide, chapters fourteen to eighteen, cover other topics that are not necessarily needed to program a new job.

As with any computer program, the user is advised to periodically save his work to disk. This manual does not always remind the user to do this for two reasons. First, all 'posted' data is saved to a temporary area on the hard disk. This will protect from power outages and computer lockups. Second, the question of whether to take the time to pause and save one's work depends on the situation. When a substantial amount of time has been put into a particular programming procedure the user should remember to save his work.

Chapter 2 Overview of the Machine

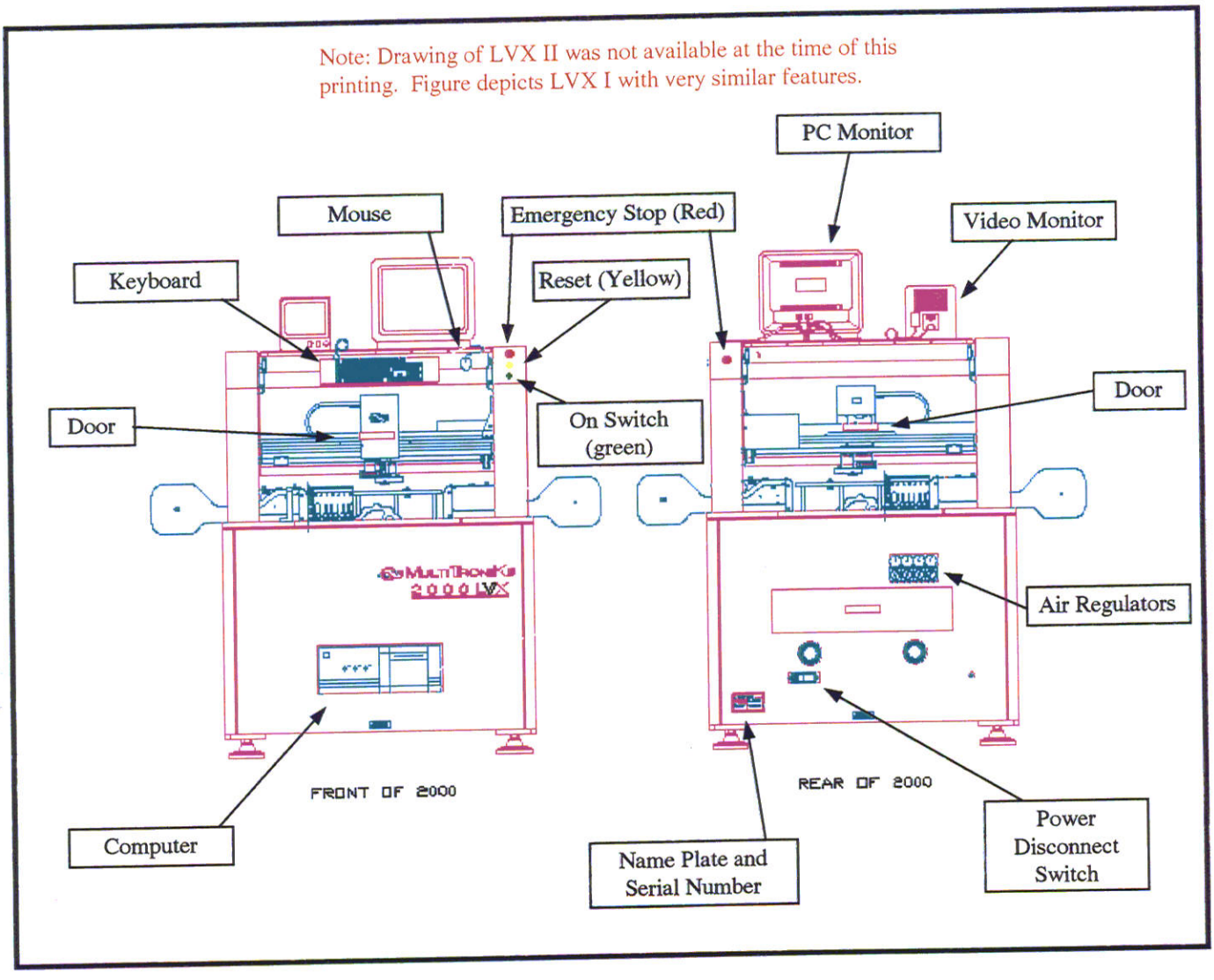

Figure Chapter 2 -1 Basic System

In Figure Chapter 2 -1 the main user operated devices are pointed out. The user should familiarize himself with the location and function of each device. This is especially true of the two emergency stop switches, located on either side of the machine. Anytime one of the switches is pressed the power to all servo drives will mechanically drop out. To reset the system turn (or pull) the tripped emergency switch and press the yellow reset button. Initialize the system by selecting Function from the menu line and clicking on Initialize Motors.

Opening either of the doors will cause any system motion to stop similar to the emergency stop switches. The difference, however, is the door exception is handled through software not hardware and will not require reinitialization of the motors. Opening the door is a slightly slower and less absolute shutdown of the machine.

Figure Chapter 2 -2 and Figure Chapter 2 -3 illustrate the axes orientation on the machine. Figure Chapter 2 -3 also shows the home and origin (X,Y coordinate 0,0) of the system. Home (coordinate 0) for Z is all the way up so you will notice that all Z coordinates are negative.

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Figure Chapter 2 -2 Orientation of X,Y,Z and θ Axes

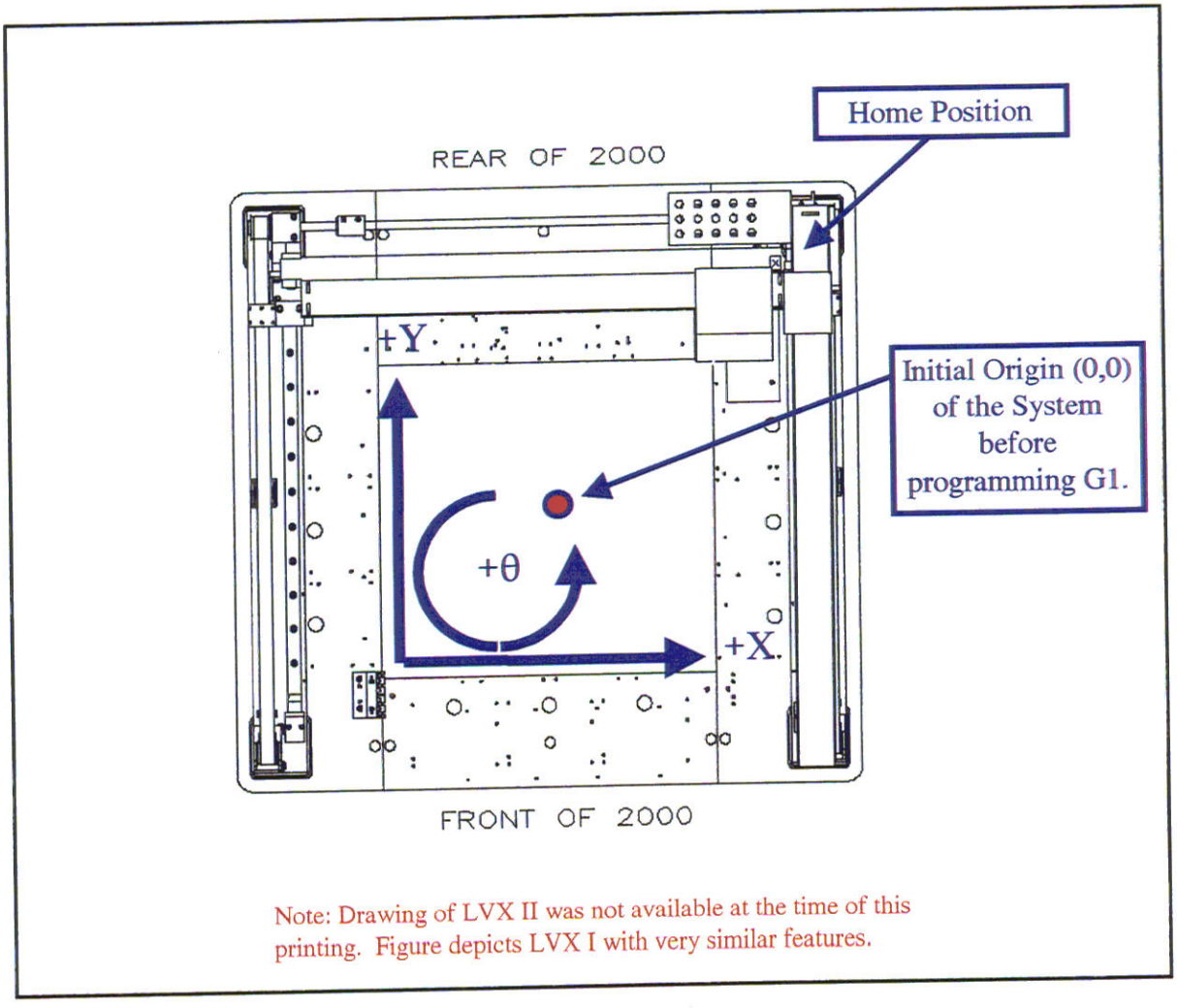


Figure Chapter 2 -3 View of Work Table Looking Down

Chapter 3 Preparing for a New Job

Required preparation before starting to program a new board:

Power-on sequence

Before starting the LVX, make sure that the following items are checked:

1. Verify that the air supply line and power cord is connected to their fittings in the rear of the machine.
2. Make sure that there are no obstructions inside the work area of the machine that the head would touch.
3. Close both the front and rear doors which will deactivate the safety switches.
4. Pull the emergency stop switches (some machine require you to turn the switches) to release any that have been pushed in.
5. Turn on the power to the LVX using the green power switch located on the front of the machine. The computer will automatically start the Windows 95 operating system.
6. Click on the LVX icon on the Windows 95 desktop to start the software. The machine will first move the head to the home position and then perform a brief self-alignment procedure. When this has finished, the head will move to the center of the machine and you will be shown the Main Menu, as shown below in Figure Chapter 3 -1.

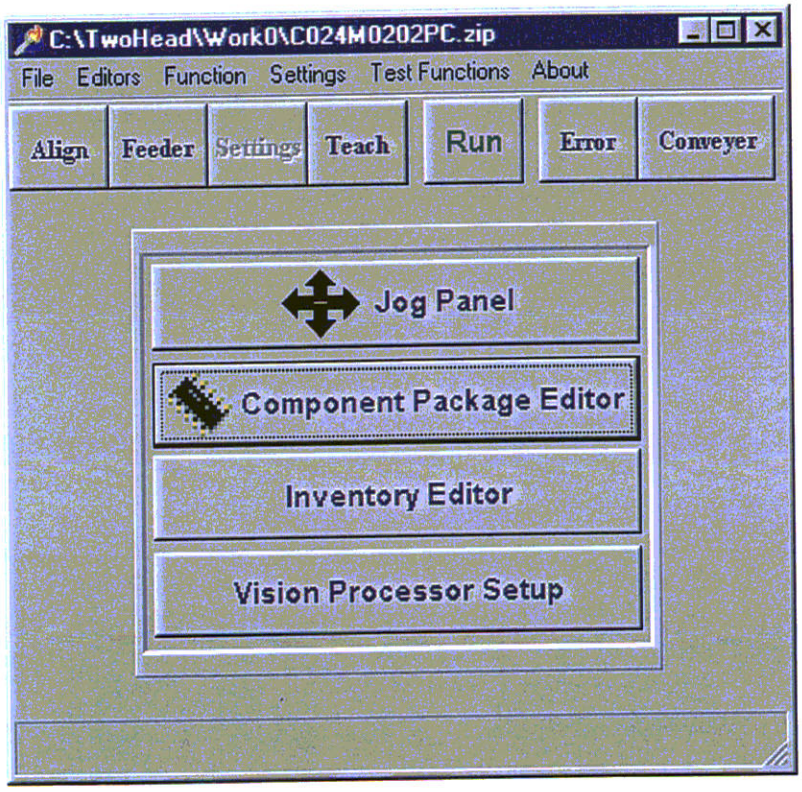


Figure Chapter 3 -1 Main Menu

Machine Calibration

Before you begin the creation of a new assembly program, you should be working with a calibrated machine. If you create a program on an uncalibrated machine, the entire program may have to be discarded and recreated because of incorrect information.

Note: The Calibration procedure can be found in the Installation and Maintenance manual.

Chapter 4 The Operating System

Notes for Experienced Users of Windows

Experienced users of Windows programs will notice that this software does not allow more than one window to be open at a time. This has purposely been done to prevent damage to the machine from conflicting software commands. This limitation will require you to close the active window before you will be allowed to open another one.

The exception to this rule is when you are using the Jog panel to program a coordinate. After you have finished centering the camera on the object that you are programming, selecting the Register Coordinate button will automatically close the jog panel for you.

Notes for New Users of Windows

1. When you are asked to 'select' an item, you should use the mouse to move the screen pointer to the item and then press the left mouse button. This will then 'click' on the selected item.

2. When you are asked to Exit a window, you must use the mouse to move the pointer to the small square box with an 'X' in it, located in the top right corner of the window you want to close or, if available, use the Exit button .

3. The user may move most windows to a new position by clicking and holding onto the dark blue bar atop the active panel . Drag the window to the new position and release. The window will remain in this position but will default to the original position when the software is booted up again.

Notes for users of the original 2000LX DOS Software

Users of the original 2000LX software should be aware of differences between the operation of the old and new software. These differences are described below:

1. To program the coordinates of the present location with the DOS version of the 2000LX software, a hand-held programmer was used to move the head and then to read the present location. On the LVX, the hand-held programmer has been eliminated, and the head is now moved using the Jog Panel, as described later in this manual. You will notice that the Jog Panel is organized differently than the hand-held programmer, but that the arrows and button labels are similar to those you are used to seeing.

2. To read the coordinate of the present location, you will see a button on the screen which will read either 'Get Coordinate' or 'Register Coordinate'. If no coordinates have been previously read for the item you are programming, then clicking this button will immediately display the present coordinates on the screen. If an existing location has already been programmed, you will first be asked if you want to discard the existing coordinates and replace them with the new ones.

Chapter 5 Software Basics

Name Conventions used in this Manual

Refer to Figure Chapter 5 -1 for names of features used throughout this manual.

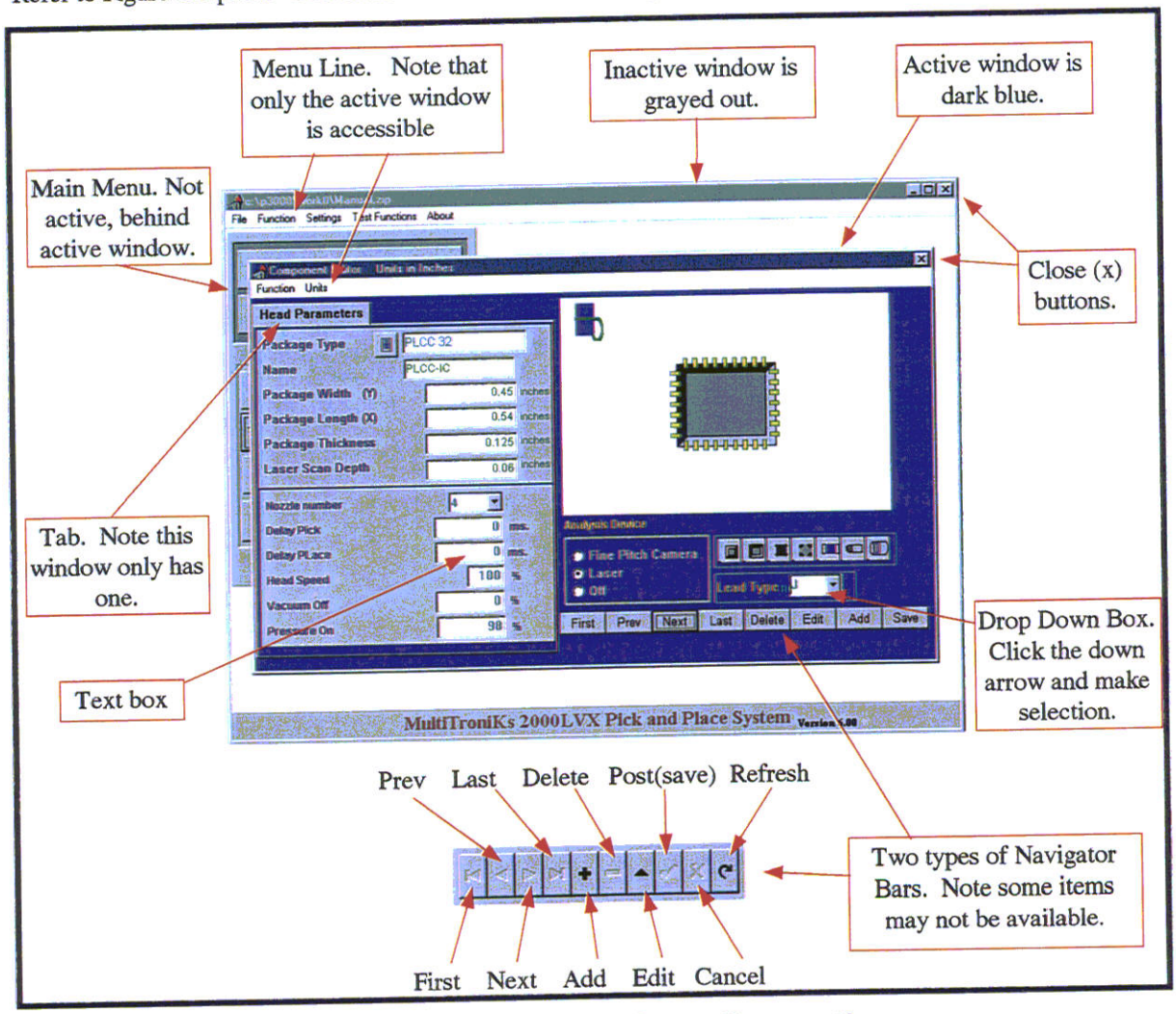


Figure Chapter 5 -1 Name Conventions

Be aware that some words are used interchangeably throughout this manual and the software. They are as follows:

- Post = Save
- Job = Program = File
- Cancel = Close
- QFP Tray = Matrix Tray
- Field = Text Box
- Cell = Pocket = Part

Manual motion of the Pick Head

The programming process will often require you to move the head under manual control so that the video camera shows you the object, pattern or part that you are programming. Whenever you are asked to move the head, you will be directed to click on the Jog Panel icon, which is the set of 4-directional black arrows. The Jog Panel is also accessible from the Main Menu (Figure Chapter 3 -1). If you click on the Jog panel icon, you will be shown the Jog Panel as shown below in. In most cases, you will use the Jog Panel to move the head so that the cross-hairs on the video camera display are centered on the object that you are looking for.

TIP: The Jog Panel is designed so that it will remain 'on top' of other windows. The user has the option of canceling this panel each time he has finished using it or leaving it on the side if he intends on using it again.

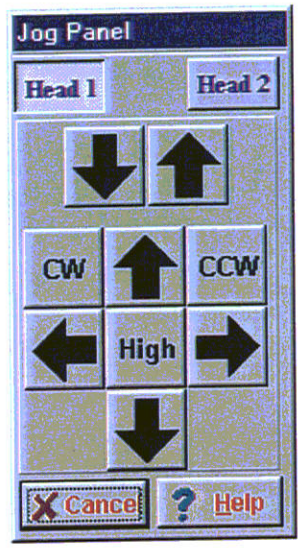


Figure Chapter 5 -2 Jog Panel

Note: That the center button of the Jog panel will change to a different level of motion control each time you click on it. There are 4 speeds available and after the fourth speed, clicking on the center button again will bring you back to the first speed. For long moves, you should have the speed set to High so that the head will get to the approximate area quickly. When you get close to the object you are looking for, clicking the center button will reduce the speed of the travel to Low. For even more precise centering you can click the center button again to set it to Fine. Another click of the center button will set the system into Step mode, where each click of an arrow button will only move the head one step (about .001") in the selected direction.

Multipoint Teaching

The Multipoint menu is used to find the center of parts or pads that are large. When the size of an object is beyond the limits of the B&W monitor then the Multipoint menu should be used. Using this feature will enable the user to find the average, or center, of two or four points. The user must remember to program points which are symmetrical. For examples of good and bad symmetry see the following illustration.

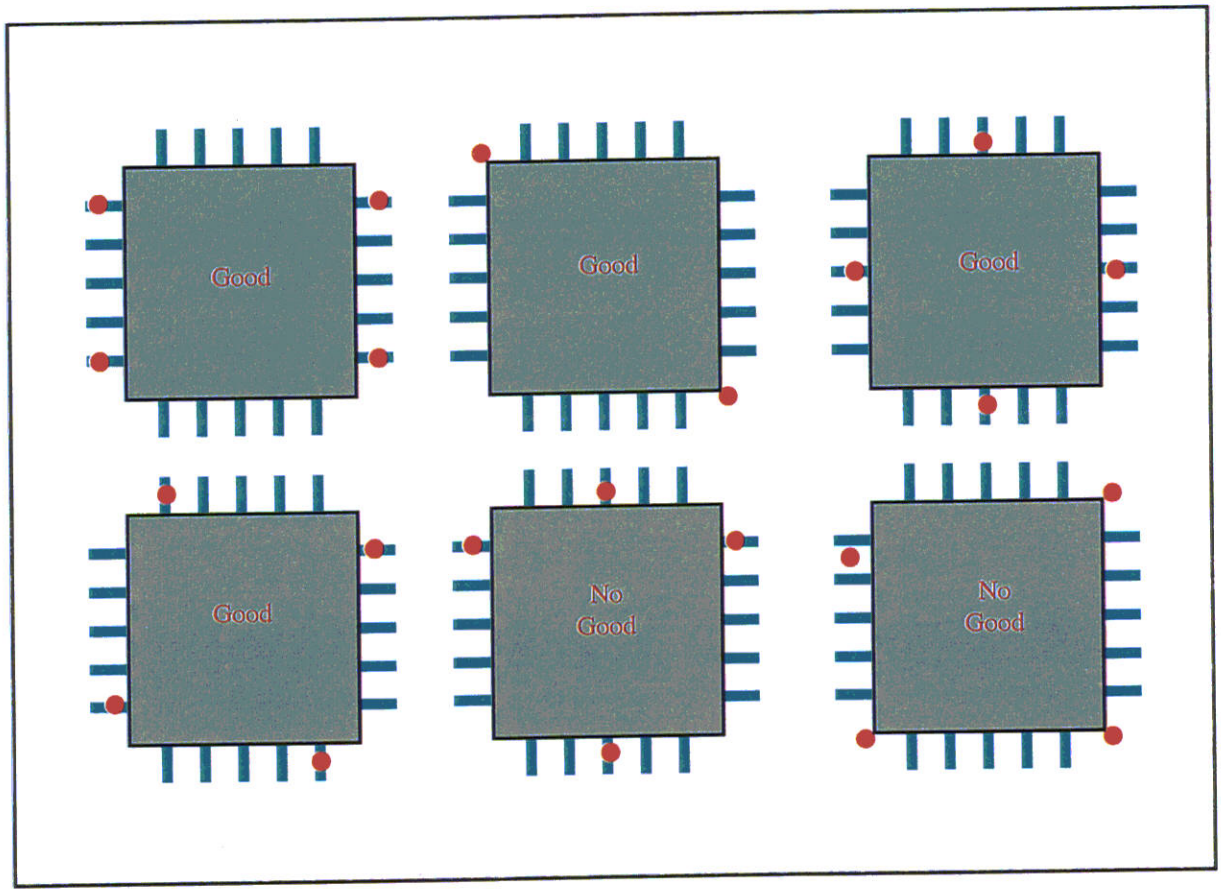


Figure Chapter 5 -3 Symmetry Examples

When asked to use the Multipoint feature do the following:

1. Click Multipoint. The window shown in Figure Chapter 5 -4 will be shown.
2. Choose Two or Four Point.
3. Click inside the Point 1 (or Point 2,3,4) field to make it active.
4. Using the Jog Panel, move the cross hair over the point you are teaching.
5. Click Get X,Y.
6. Repeat steps three to five for the remaining points.

7. Click Find Center. The center (average) of the points will be calculated and displayed and the head will move to this coordinate.

TIP: Double clicking within the field of any point will make the machine move to that coordinate.

8. Click Cancel on the Jog Panel and Cancel on the Multipoint Window.

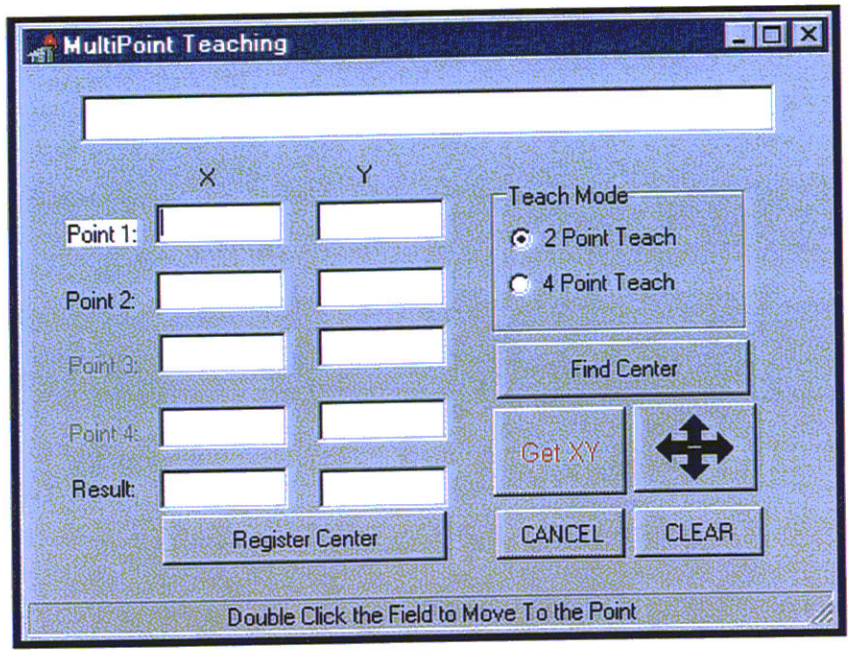


Figure Chapter 5 -4 Multipoint Panel

Chapter 6 Overview of the Program Creation Process

The program creation process requires accurate information in seven areas for you to build a complete circuit board. Each area is listed below in the recommended sequence that should be followed:

- The Package Editor
- The Inventory Editor
- The Feeder Editor
- The Fine Pitch Vision Processor (if applicable)
- Job Information Screen
- The Board Alignment Points
- The Component Placement Editor

The illustration in Figure Chapter 6 -1shows a graphical representation of the major functions of the machine. The hierarchy of each function is denoted by the location of the function's box. For example, in order to complete the Component Placement chapter you must first have your 'Feeders' and the 'Board Alignment' chapters completed. Moving one step in, to complete the 'Feeders' chapter you must have the 'Inventory' chapter done.

The one exception to this rule is Vision Analysis. Vision Analysis information is associated with a specific package as shown below in the illustration. However, you can not implement the vision analysis setup without first having a part and a feeder to supply the part. This is why the Vision Analysis chapter of this guide is placed after the Feeder chapter.

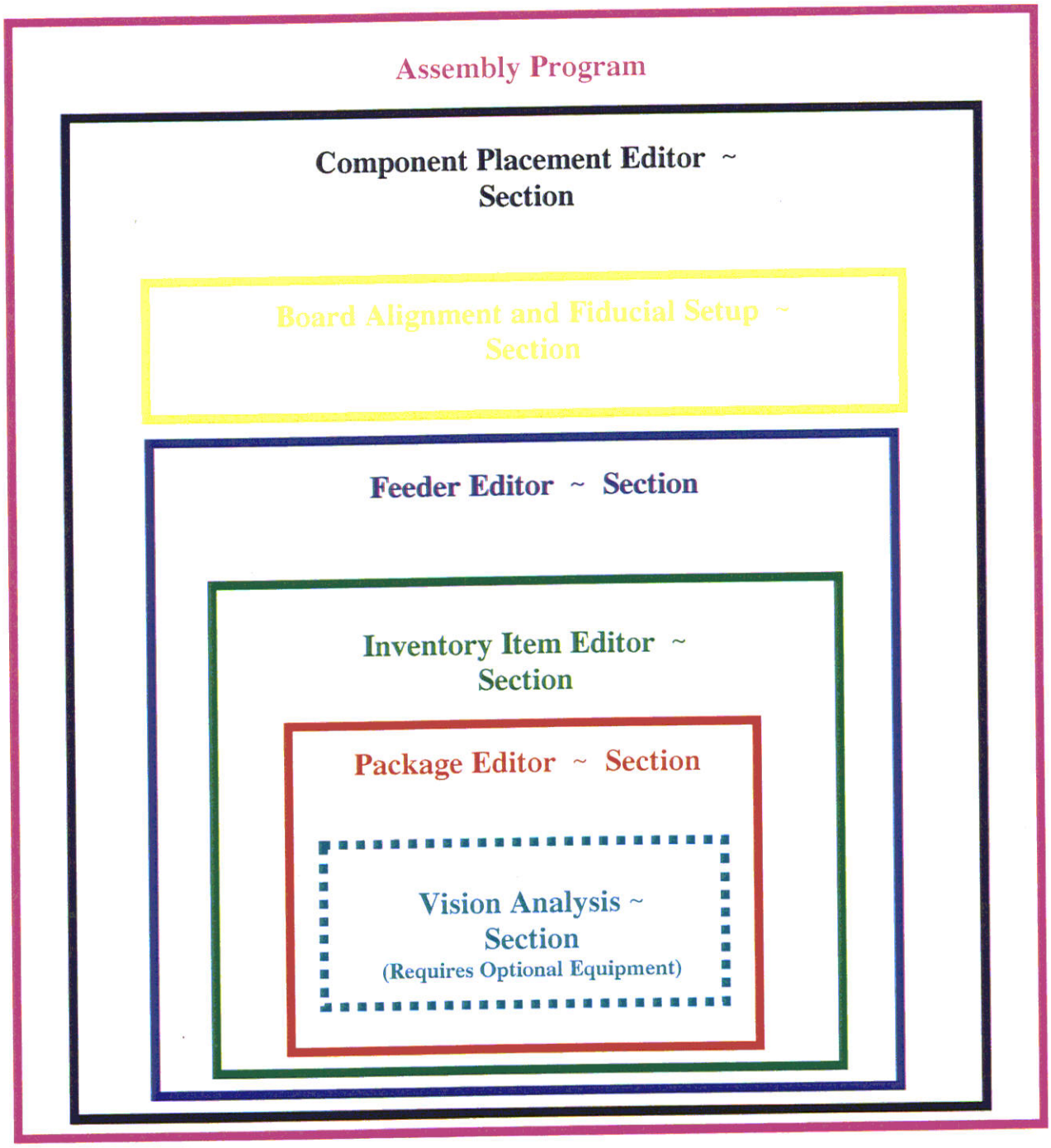


Figure Chapter 6 -1 Program Hierarchy

Chapter 7 The Component Package Editor

The Multitroniks LVX Component Package Library contains many of the commonly used surface mount packages that are currently available. If there is a part that you want to use which is not in the library, you can use the Component Package Editor to create a new package. Before starting the following process of entering in the information for a new part, we suggest that you first use the editor to search for an existing package that is similar to your new one and make a note of what the settings are for all of the various performance adjustments. You should then use these settings as a guide for your new package.
The following sections lists the steps that are used for creating new packages which are not yet in the library:

Selecting a Package

1. Select Component Package Editor from the Main Menu (Figure Chapter 3 -1). This will display the Component Editor screen. This screen is shown below in Figure Chapter 7 -1 with typical component information.

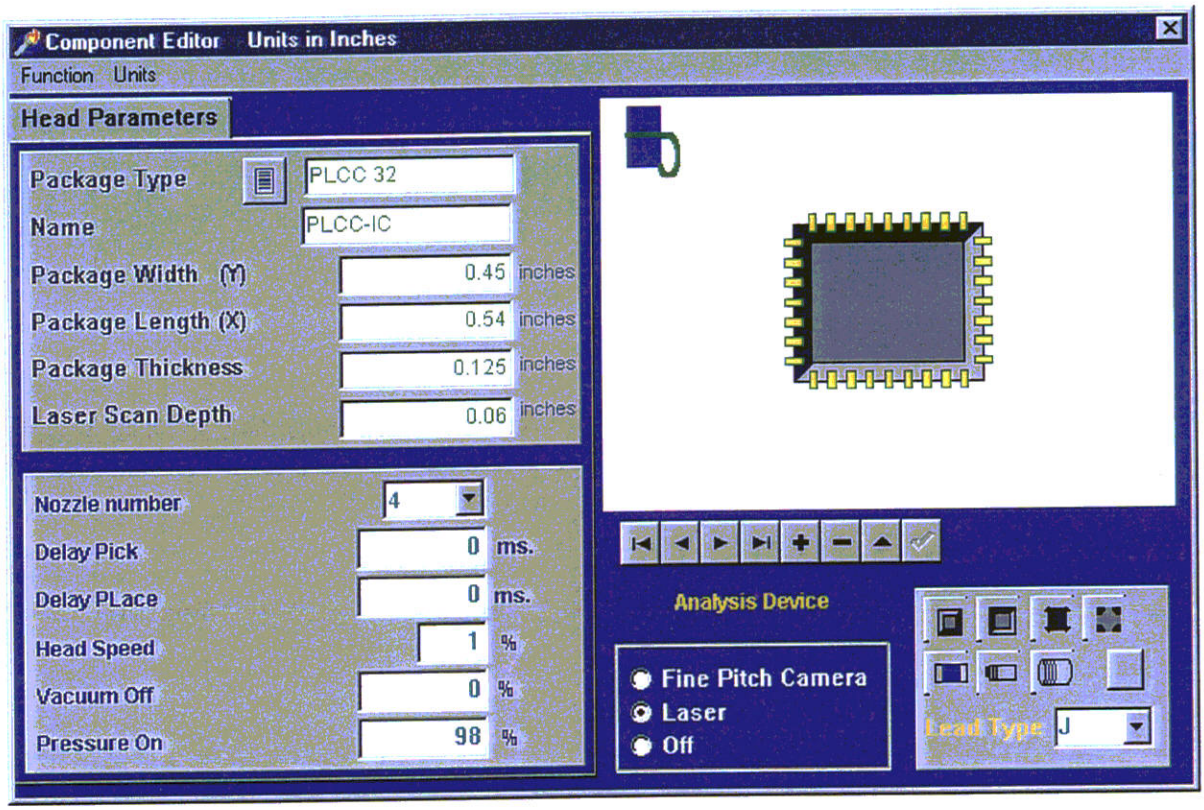


Figure Chapter 7 -1 Component Editor Screen

2. To search through the list of existing parts, click inside the square button on the line with the Package type label. You will be shown a list of the names of the existing Package types as shown below in.

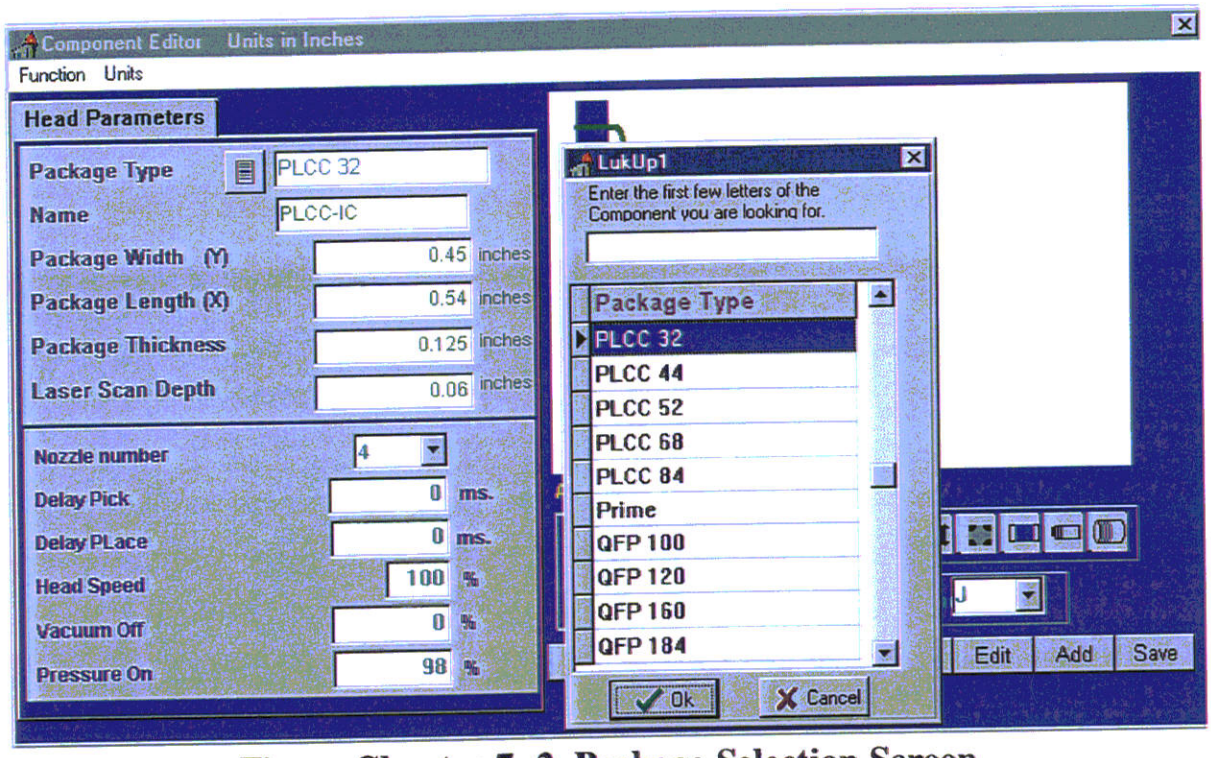


Figure Chapter 7 -2 Package Selection Screen

3. You can search either by using the scroll bar to highlight the name of the package you want to see, or if you know the name of the package you are looking for, you can type in the first few letters of the package name which will be displayed in the text field at the top of the look-up window. This will jump you to the first part that starts with those letters. You can then use the scroll bar to find the exact part and click on it to highlight it.

4. Click on the OK box at the bottom of the Look-up window to display that part.

5. Make a note of the present settings for this part.

Adding a New Part

1. To add a new part to the library, click on add (insert record) key located on the navigator bar. This will clear the data on the screen and you will be prompted to enter a package name.

2. Type in the text box a unique name and click OK or press Enter.

3. Click in the Name box and enter in a brief description of the part.

Package Parameters

1. Measure the Width, Length and thickness for one of these parts, and then enter these dimensions by first clicking in the appropriate text field, and then typing in the value.

2. Click in the Laser Scan Height field and enter in the desired value. For most parts, this value will be one-half of the part thickness. This number is used to determine where the laser measurement system should scan the part. The actual distance is measured in a downward direction starting at the point where the pick nozzle touches the top of the component. For further information on how to determine the proper laser scan height, see the section on Troubleshooting the Laser in the calibration section of the Installation and Maintenance manual.

3. Click in the Nozzle Number field and select the number of the nozzle that should be used to pick up this part. If you are not sure which nozzle should be used, refer to the Appendix which has drawings of each of the nozzles, and a chart indicating the types of parts usually picked with each nozzle.

4. Click in the Delay Pick and Delay Place fields to enter in delay times.

> **TIP:** The Pick Delay is increased to give the vacuum system extra time to get a better hold on the part before lifting the part up from the feeder. The Place Delay is increased to allow extra time for the vacuum to exhaust and for the nozzle to release the part before it lifts up away from the placed part. To add times in either of these fields, click in the appropriate box and type in the amount of delay time as measured in milliseconds.

5. Click in the Head Speed box and enter in the speed that the motion control system should operate at with this part. Small parts operate at 100% (Maximum) speed, while larger parts like QFP's may be set at 50% of full speed.

6. Click in the Vacuum Off box to change when the vacuum is turned off during the downward motion of the place cycle. For many parts, this value is set to 0% which indicates that the vacuum is turned off just as the head is beginning to make the downward place motion. As this number is increased, the vacuum is turned off at lower positions in the downward place motion. When set to 100%, the vacuum is turned off when the head has reached it's lowest point in the downward motion.

7. Click in the Pressure On box to change when the pressurized air blow-off is turned on during the downward motion of the place cycle. For most parts, this value is set to around 95% which indicates that the blow-off is turned on just before the head has reached it's lowest point in the downward motion. As this number decreases, the blow-off is turned on at higher positions in the downward place motion. When set to 0%, the blow-off is turned on just as the head is beginning to make the downward place motion.

8. Click on the specific type of device that you want to use to analyze this part. For most parts, the Laser is suggested because of the high speed of the laser measurement process. We suggest that you click on Fine Pitch Camera only for leaded devices with a lead pitch of less than 0.030 inches.

9. Click on one of the small icons that represents the type of package for this part. This group of icons are located in the lower right corner of this window, just above the words 'Lead Type'.

10. Click on the downward arrow at the right side of the Lead Type box and select the appropriate type of leads that are on this component or skip this if there are no leads.

11. You should then visually verify that you have selected the correct type by comparing an actual part with the example of the selected type of leads which is shown in the upper left corner of the image window. Note that at this time, no actual leads are displayed on the device that is shown.

12. Click the Save button (Post Button) on the navigator bar.
13. If this is a device which has leads, skip to the next section, Lead Definition.

14. If the part you are programming is a chip-type of device you have completed the package setup. Close the Component Editor window. This will return you to the Program menu.

Lead Definition

1. Select the word Function from the command line at the top of this window, and then select Lead Definition Editor from the pull-down menu. This will display the Lead Definition window as shown in Figure Chapter 7 -3.

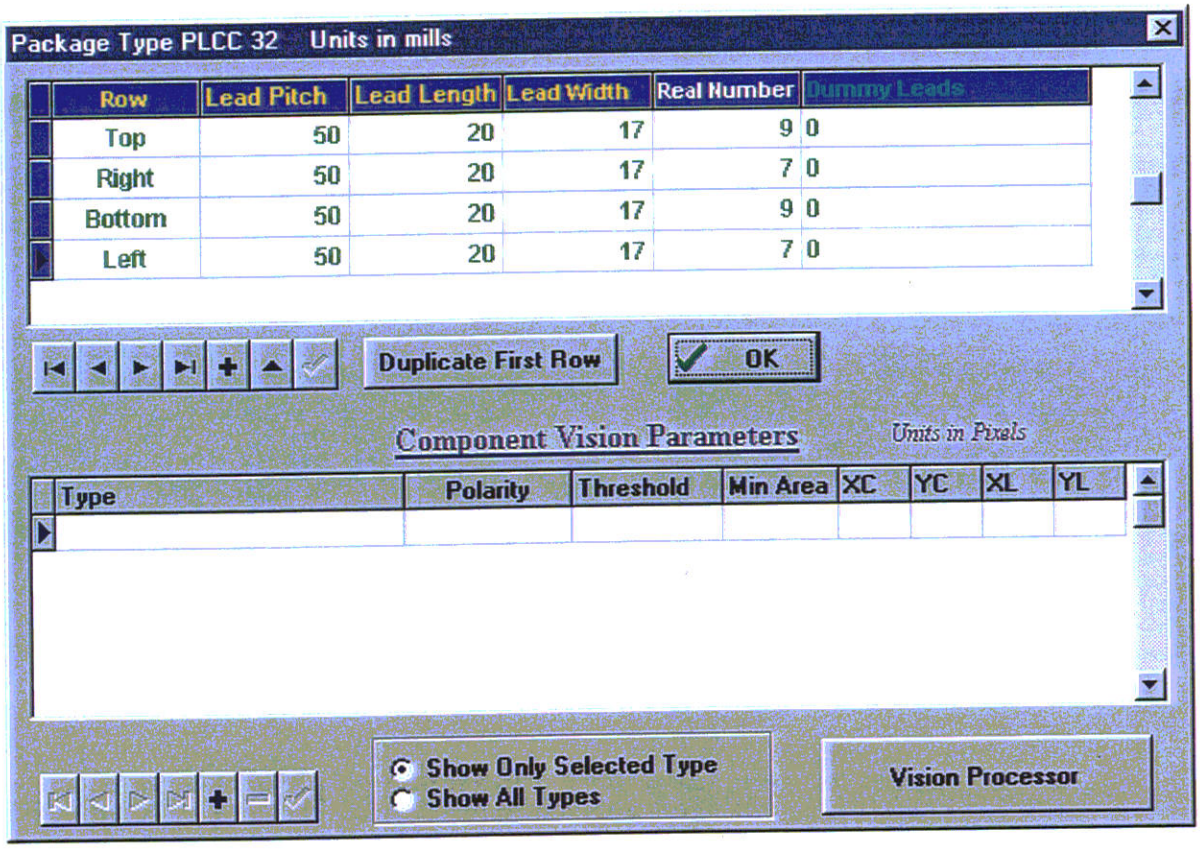


Figure Chapter 7 -3 Lead Definition Editor Screen

2. The first time you are shown this screen, you will only see an entry for line #1 which represents one side of the component. In the following steps, you will fill in the information for line 1 and then copy it into all of the other 3 lines that are shown.

3. Click in the Lead Pitch field and type in the Lead pitch, which is the distance from the center of one lead to the center of the next one (as measured in inches).

4. Click in the Lead Length field and type in the length of a part lead.

5. Click in the Lead Width field and type in the width of an individual lead.

6. Click in the Real Number field and type in the total number of leads that are on the top side of the component, as shown in the Component Editor image window

7. Click in the Dummy Leads field and type in the pin numbers of any leads which are normally missing on that side. Every pin on the entire package has it's own unique pin number. Please note that even though the sequence of the four sides of part proceeds in a clockwise direction, the actual direction of pin numbers do not follow this pattern on the bottom and left sides. When counting pin numbers, each side has a specific pin that is the continuation of the counting from the previous side. For the top and bottom sides,

the left pin is the lowest numbered pin. For the left and right sides, the top pin is the lowest number pin. See the following example and illustration.

8. Click on the button labeled Duplicate First Row. This will copy the information found on the first row into 3 more rows.

Example: If an IC has six leads per side and the middle two leads are missing on the bottom side, you would determine the missing pin numbers by starting the counting with the top row, which would be pins 1 through 6. You would continue counting down the right side as pin #7 through #12. The next side would be the bottom counting. Count the bottom side pins in the same direction as the top: left to right. The missing pins would then end up as pins #15 and #16 (see Figure Chapter 7 -4). Multiple missing pin numbers are separated with a comma, so the entry in the Dummy Leads field for this example would be '15,16'.

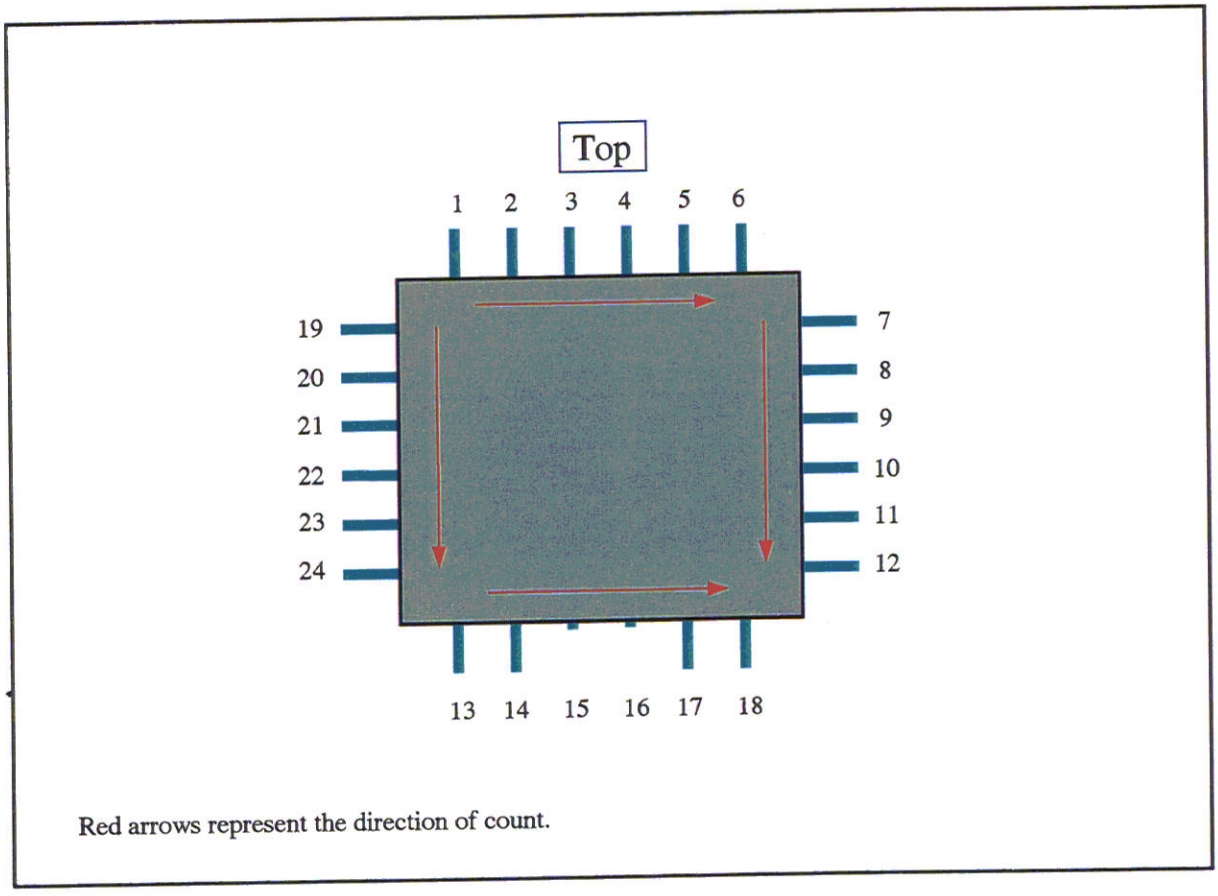


Figure Chapter 7 -4 Lead Count Illustration

9. If necessary, change the number of real leads as well as the pin numbers of the dummy leads for the other three sides of the component.

10. Click on OK when you are done. This will return you to the Component Editor window.

11. Close the Component Editor window. This will return you to the Program Menu.

Chapter 8 Inventory Editor

Each part that is used when running an assembly program must be entered into the Inventory Editor table. The Inventory Editor will allow you to create a list of these part numbers which can then be linked to a specific part type (or Component Package) that is in the Package Library. Multitroniks has provided you with most of the commonly used packages that are used with surface mount circuit boards, but you can also add your own special parts to the package library by using the Component Package Editor. If you have any parts which use packages that are not in the library, you must first define these in the Component Package Editor.

To proceed with making a new entry in the Inventory list, use the following steps:

1. Select Inventory Editor from the Main Menu (Figure Chapter 3 -1). This will display the Inventory Editing screen as shown below in Figure Chapter 8 -1.

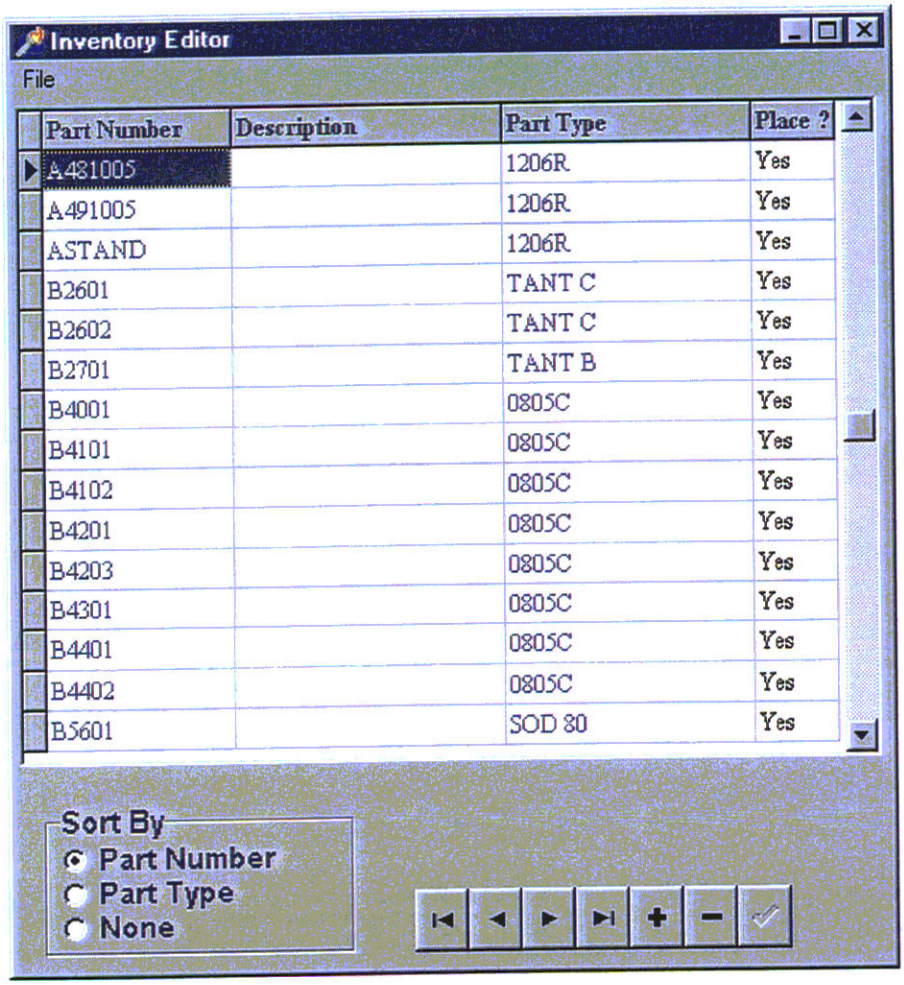


Figure Chapter 8 -1 Inventory Editor Screen

2. To Add a new item to the Inventory editor, click on the + key on the navigator bar.

3. The screen will show you a blank line, and the Stock Part Number field should be highlighted in blue. If it is not highlighted, move the mouse pointer there and click.

4. Type in your part number for this part.

5. The Component value is an optional description of this part which you may leave blank. If you want to fill in a description, click on the component value field and type in the description of this part.

6. Click on the part type field. You can either type in the package type if you know it, or you can select the package from the drop down box.

7. When all of the information has been correctly entered, click on the Post Button on the navigator bar.

8. Repeat this process for all new parts that will be used in this board assembly program.

9. Close the Inventory Editor window. This will return you to the Main Menu.

Chapter 9 Feeder Editor

The feeder editor is used to tell the system where to find each specific type feeder that is located on the machine. The location of tape, stick, and matrix tray feeders are all programmed on very similar screens, but since a matrix tray has multiple pick-up point, they require a slightly different teaching procedure than tapes or sticks. Refer to chapter eighteen for help on physically setting up any new feeders.

Tape and Stick Feeders

Use the following steps to program Tape and Stick Feeders:

1. Select Feeder from the Main Menu (Figure Chapter 3 -1). You will be shown a the current feeder setup in the Feeder Block Screen which is shown in Figure Chapter 9 -1.

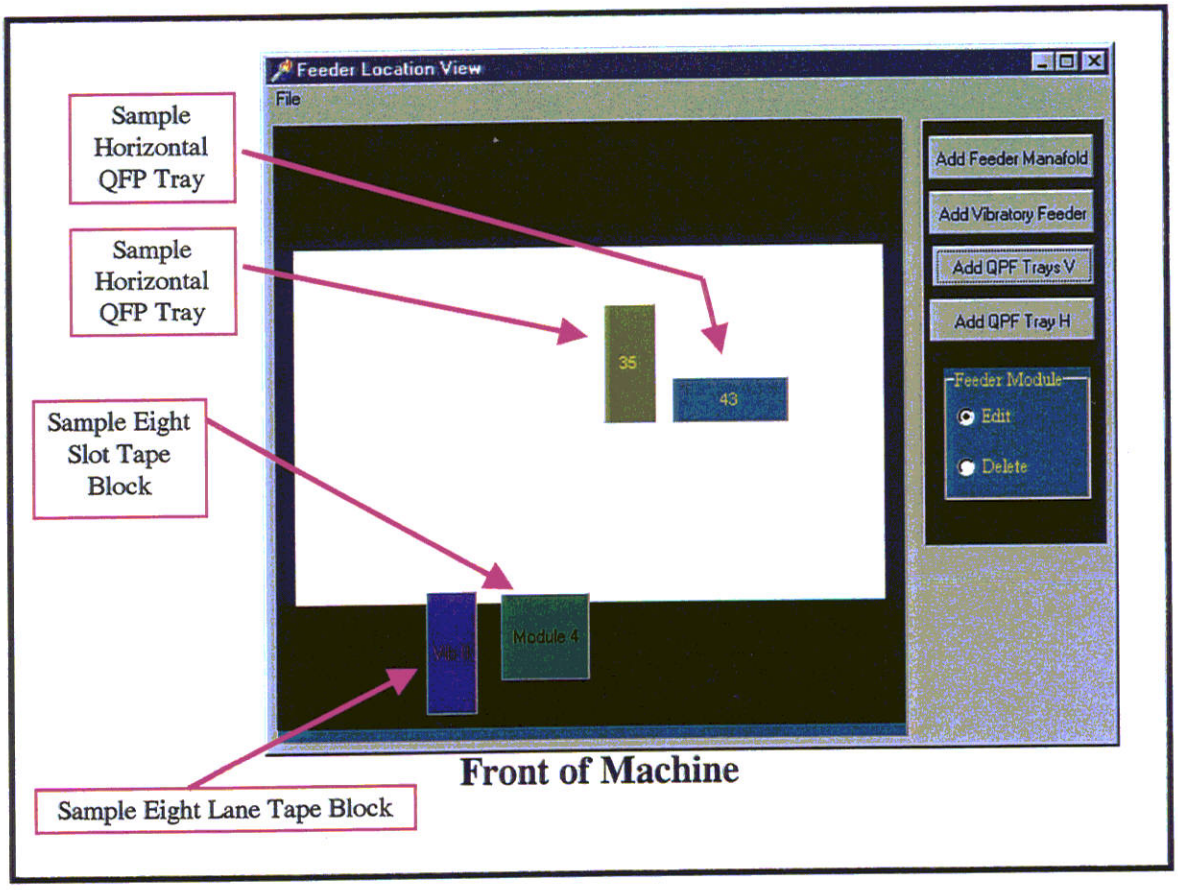


Figure Chapter 9 -1 Feeder Block Samples

2. Before adding a feeder block, determine if the tape or stick block that you want is already enabled. If the feeder block is present, simply click on that block to bring up the Feeder Programming screen and skip the next step.

Adding a New Feeder Block

1. To add a new feeder block, select the appropriate ADD button on the right side of the screen. You will be shown gray outlines of all available locations where the selected type of feeder can be located. Click on the desired block to activate it.

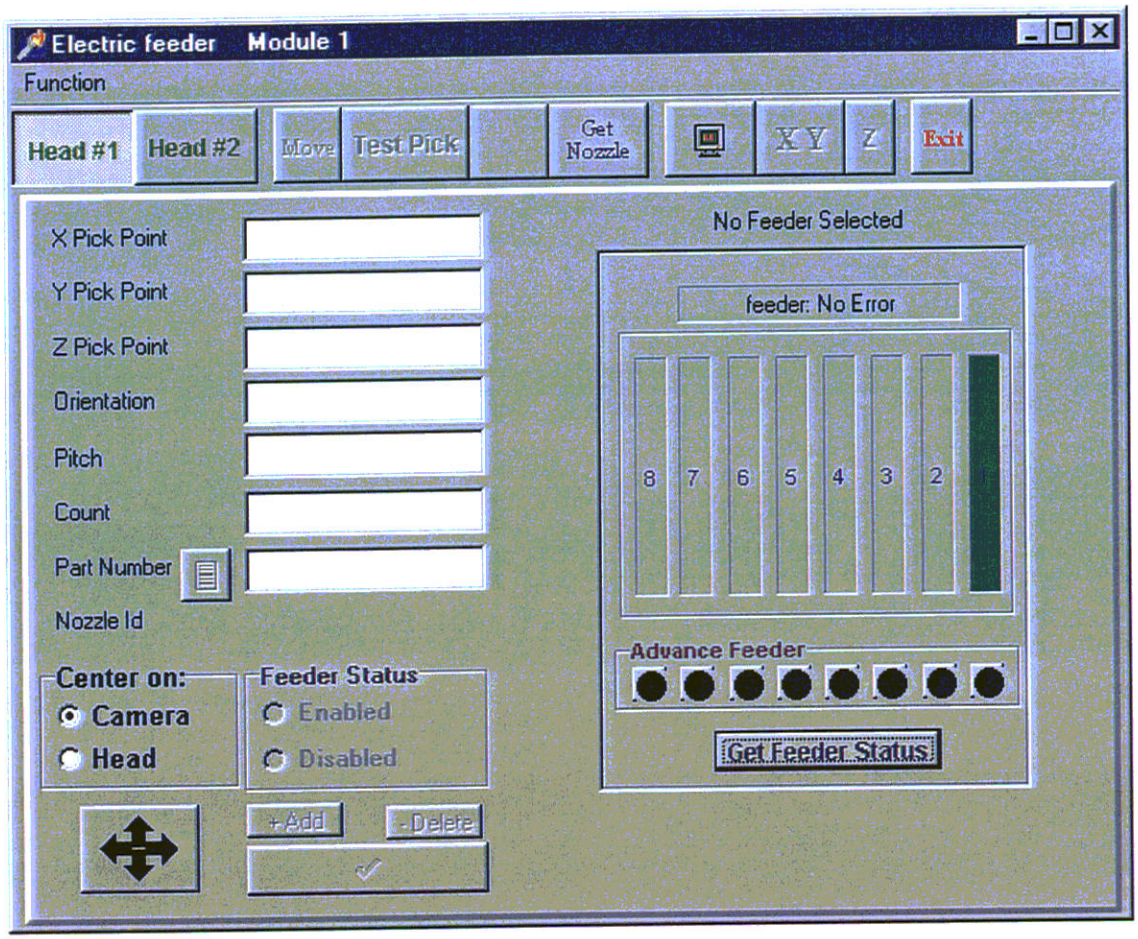


Figure Chapter 9 -2 Tape Feeder Editor Screen

2. For a tape feeder block, you will be shown the Feeder Programming screen as shown in The vibratory feeder programming screen is identical to this with the exception that it does not have the Feeder Advance, Feeder Status, and Pitch fields. Click on the feeder slot that you want to program. The selected feeder will be highlighted in gray.

Adding a New Feeder

1. Click on the +Add button. The slot will turn white activating it for programming.
2. Click on the square part list icon next to the word Part Number in the text entry field area.
3. Choose the part that will be used in the selected feeder from the inventory list that is shown.
4. Click on the OK button.

Teaching X,Y Coordinates

1. Click on the Camera button in the "Center On" box.

2. Use the Jog panel or the Multipoint panel to find the center of the part (for a stick feeder) or pocket (for a tape feeder).

3. Cancel the Jog panel or the Multipoint panel. Click on the XY button to save the current location as the pick up point for this part.

Feeder Parameters

1. Click in the Orientation box and type in the angle of the part.

Note: The angle of a part in a feeder is determined by first examining that package drawing for that part. The drawing always shows what the part would look like at zero degrees. You then compare the zero degree orientation with how the part is actually in the feeder, as seen from the front of the machine. Note that increasing angles correspond to a counter-clockwise rotation.

2. The default Pitch for all tape feeders is 1. If the part you are centering on requires more than 1 tape sprocket hole from a location near one component pocket to the same location on the next pocket, then the pitch value should be changed to this number.

3. Click in the Count box and fill in the total quantity of parts for this feeder. If you do not put a number in this box, the system will not be able to use this feeder because it will believe that the quantity of parts is zero.

4. If there is no part showing on a tape feeder or if you would like to test the feeder, you can advance the feeder by pressing the red advance feeder dot below the feeder number.

Note: The dot will be colored black if no feeder has been installed in this slot. If you install or remove a feeder in a block while you are programming that block, you will notice that the screen will not refresh. To force a screen refresh click the Get Feeder Status. This will update the red and black dots.

5. If you are programming a tape feeder, then the Z Pick Point has a default setting found in menu System Settings - Feeder Defaults. Assuming this value is correct the Z height does not need to be re-taught. If this is the case, skip ahead to step #7 of the Teaching Z Coordinate section.

Teaching Z Coordinates

1. Select the menu line option, Nozzle, and click Get Nozzle. The system will move over to the nozzle storage rack and pick up the nozzle.

2. Click on the Head button in the "Center On" box and then click Move To X,Y. The pick head will move so that the nozzle is directly over the part.

3. Click on the Jog Panel icon.

4. Use the up and down arrow keys located at the top of the Jog Panel to move the head up and down in the Z-axis until the pick nozzle is just touching the top of the part. Be very careful not move the head in the X and Y direction while the head is down.

5. When you have finished moving the head down, click on the Cancel button in the Jog Panel.

6. Press the Z button. The z value will be updated and the head will move up.

7. When you are done entering information into this window, click on the Post button.

TIP: If you want to test your pick point, click on the square Test Pick button under the selected feeder. After looking at the nozzle to verify that the part was picked up, click the Drop Part button.

8. If needed, select Nozzle from the menu line and click Put Nozzle. The system will move over to the nozzle storage rack and put the nozzle away.

9. Close the Feeder Programming window. This will return you to the Feeder Block Selection screen.

Matrix Tray Feeders

Use the following steps to program a QFP matrix tray:

1. Select Feeder from the Main Menu (Figure Chapter 3 -1). You will be shown the current feeder setup in the Feeder Block Screen as shown in Figure Chapter 9 -1.

Adding a New Feeder

1. To add a new matrix tray, select the appropriate ADD (either horizontal or vertical) button on the right side of the screen. You will be shown gray outlines of all available locations where that type of feeder can be located. To activate a feeder in a specific location, select that feeder block by clicking on it. You will then be shown the QFP Tray Editor Screen as shown below in Figure Chapter 9 -3.

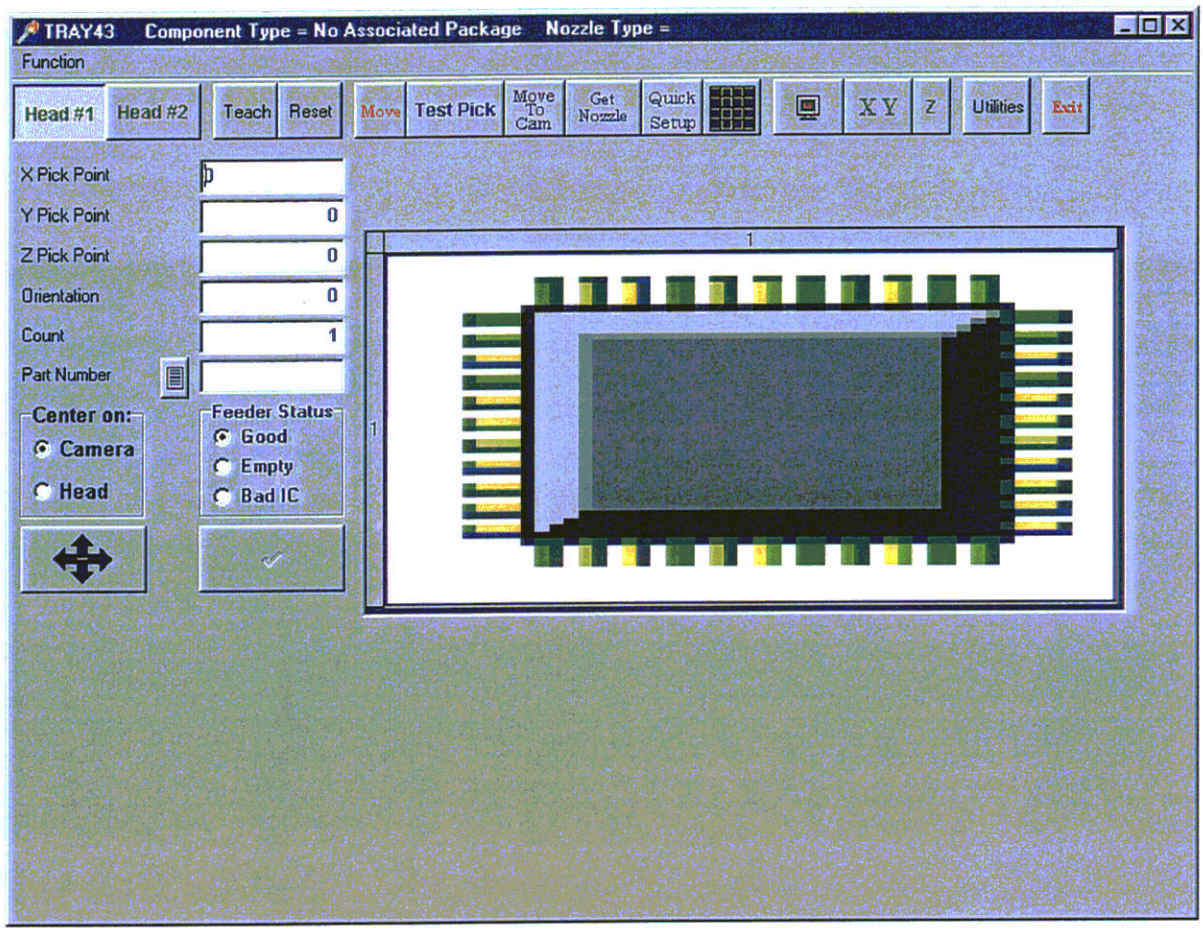


Figure Chapter 9 -3 Matrix Tray Editor Screen

Quick Tray Setup

1. Click on the Quick Tray Setup button. You will be shown the Tray Setup Configuration screen as shown below in Figure Chapter 9 -4.

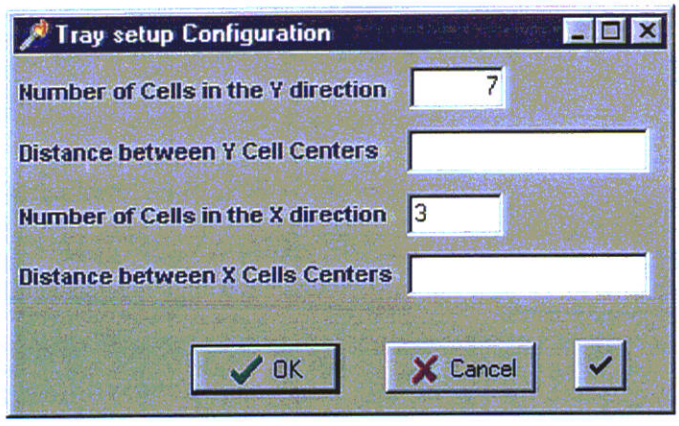


Figure Chapter 9 -4 Quick Tray Setup Screen

2. Click in each field shown and fill in the appropriate numbers. For the distance between cell centers, you can type in an approximate number.

3. Click on the OK box when you have completed this window. You will now be shown a drawing of the matrix tray.

Tray Teach Procedure

1. Click on the box which reads: Click to Start Tray Teach Procedure. You will see a red dot appear at the top left corner of the matrix tray. For an example see Figure Chapter 9 -5.

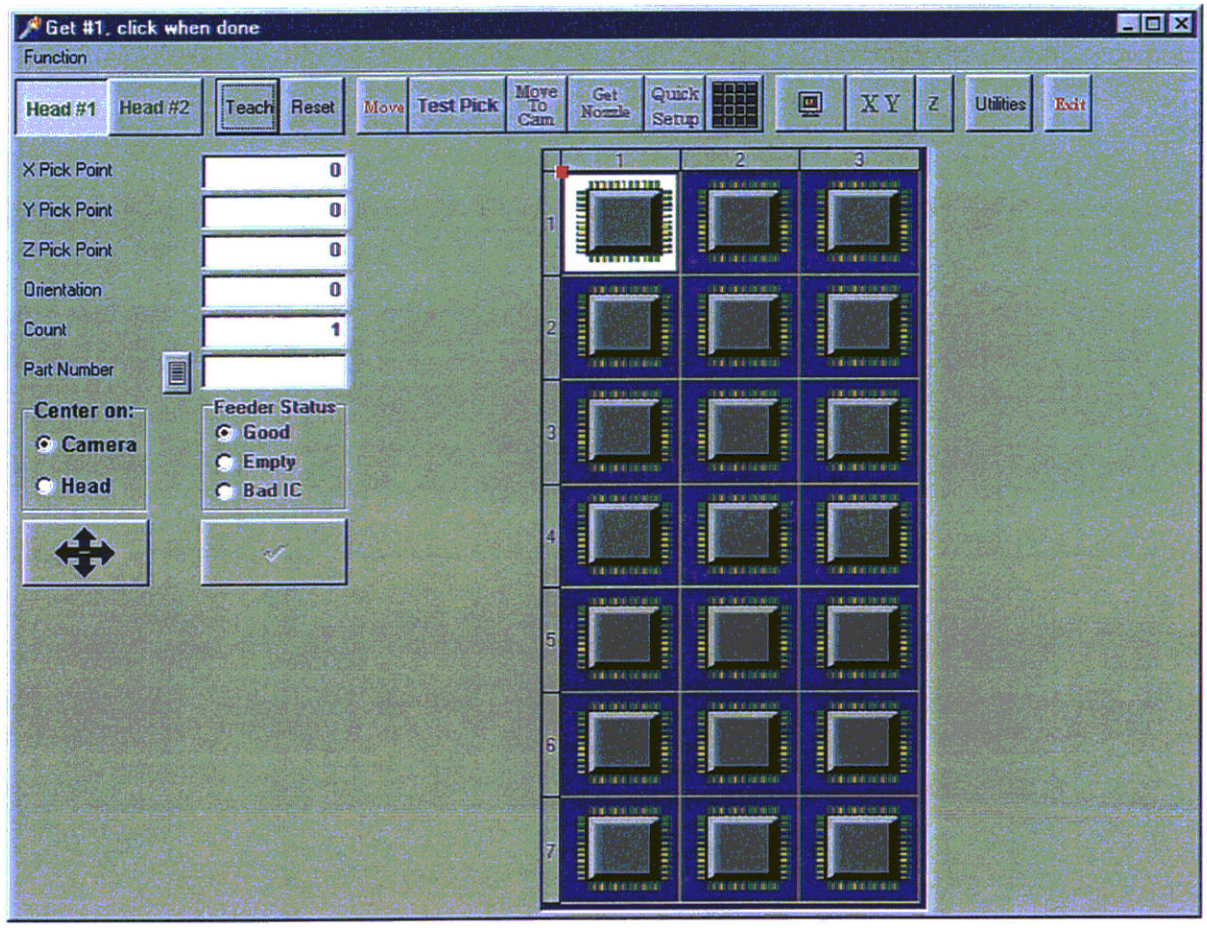


Figure Chapter 9 -5 Tray Teach Screen

Note: You may reset the tray teach, by pressing the Reset Teach button, at anytime if you have made a mistake.

2. Click on the Jog Panel icon and move the camera so that the cross-hairs are over the indicated corner of the tray.

3. Click on the button that now reads: Get #1 (or #2,#3,#4). You will now see a another red dot appear on the matrix tray.

4. Repeat steps #2 and #3 for the remaining points.

Feeder Parameters

1. Click on cell 1,1. You must program cell 1,1 first.

2. Click on the square part list icon next to the word Part Number in the text entry field area.

3. Choose the part that will be used in the selected feeder from the inventory list that is shown and click on the OK button.

4. Click in the Orientation box and type in the angle of the part.

Note: The angle of a part in a feeder is determined by first examining that package drawing for that part. The drawing always shows what the part would look like at zero degrees. You then compare the zero degree orientation with how the part is actually in the feeder, as seen from the front of the machine. Note that increasing angles correspond to a counter-clockwise rotation.

Teaching Z Coordinates

1. Select the menu line option, Nozzle, from and click Get Nozzle. The system will move over to the nozzle storage rack and pick up the selected nozzle.

2. Click on the Head button in the "Center On" box and then click Move. The pick head will move so that it is directly over cell 1,1.

3. Click on the Jog Panel icon.

4. Use the up and down arrow keys located at the top of the Jog Panel to move the head up and down in the Z-axis until the pick nozzle is just touching the top of the part. Be very careful not move the head in the X and Y direction while the head is down.

5. When you have finished moving the head down, click on the Cancel button in the Jog Panel.

6. Press the Z button. The z value will be updated and the head will move up.

Copying Cell 1,1 Information

Note: For Matrix Tray feeders, the Count box should remain at 1 for all cells. If you put in a number greater than 1, the system will behave as if there are parts stacked one on top of the other in that cell. Remember that just like a slot in a tape or stick feeder block, each cell of a matrix tray is considered a feeder unto itself. This is because each cell has its own X,Y coordinates, again, just like a tape or stick feeder. If you click on several different cells at this point in the programming phase, you will notice that only cell 1,1 is set up. To copy cell 1,1 information to the other cells proceed with the next three steps.

1. Click on the Utilities button and select Copy Part Number of cell 1,1. Click OK when prompted.

2. Click on the Utilities button and select Copy Z Height of cell 1,1. Click OK when prompted.

3. Click on the Utilities button and select Copy Theta rotation of cell 1,1. Click OK when prompted.

Setting Feeder (Cell) Status

1. If there are any known bad parts, bad locations or pockets that do not have any parts in them, click on that part in the tray diagram. Click on either the Bad IC or Empty buttons in the Feeder Status box, and then click on the Post (check mark) button. You will see a red X drawn over bad parts and for empty pockets, the part will be erased from the screen. To restore active parts to these pockets, click on the specific pocket and then click on the Good button.

2. When you are done entering information, click the Post button.

Note: If you want to test the pick points, click the cell you want to test and click on the Test Pick button under the selected feeder. After looking at the nozzle to verify that the part was picked up, click the Put Part Back button.

3. If needed, select Nozzle from the menu line and click Put Nozzle. The system will move over to the nozzle storage rack and put the nozzle away.

4. Close the Matrix Tray Programming window. This will return you to the Feeder Block Selection window.

5. When you have completed all feeder programming, close the Feeder Block Selection window.

Chapter 10 Component Analysis with Vision

Note: This chapter applies only to packages that have never been taught. Typically, a package needs to be set up for the vision processor only once.

To continue with this chapter you must have first defined the package parameters and lead information, the inventory item, and the feeder for this part.

1. Select Test Pick in the screen which shows the feeder for the part you are teaching. Then click on the Move to Camera button. The part will be moved over the camera and the vision processor screen will automatically come up.

2. Click on the Live Video button.

3. Select the Camera Setup menu tab located at the top of the screen. This screen is shown in Figure Chapter 12 -3.

Analysis Box Size

1. The button in the center of the red arrow buttons toggles between SIZE and MOVE. If it shows the word MOVE, click the button until it does show the word SIZE.

2. Use the red arrow buttons at the lower right side of the Camera Setup screen to stretch each side of the Analysis Box so that the size of the box is approximately 30% larger than the longest axis of the part. Because a part may be picked up and placed at various angles the window must be square. This will be the case even for a part that is rectangular in shape.

TIP: The right red arrow button will enlarge the box from left to right. The left red arrow button will reduce the size of the box from left to right. The top red arrow button will enlarge the box from top to bottom and the bottom red arrow button will reduce the size of the box from top to bottom.

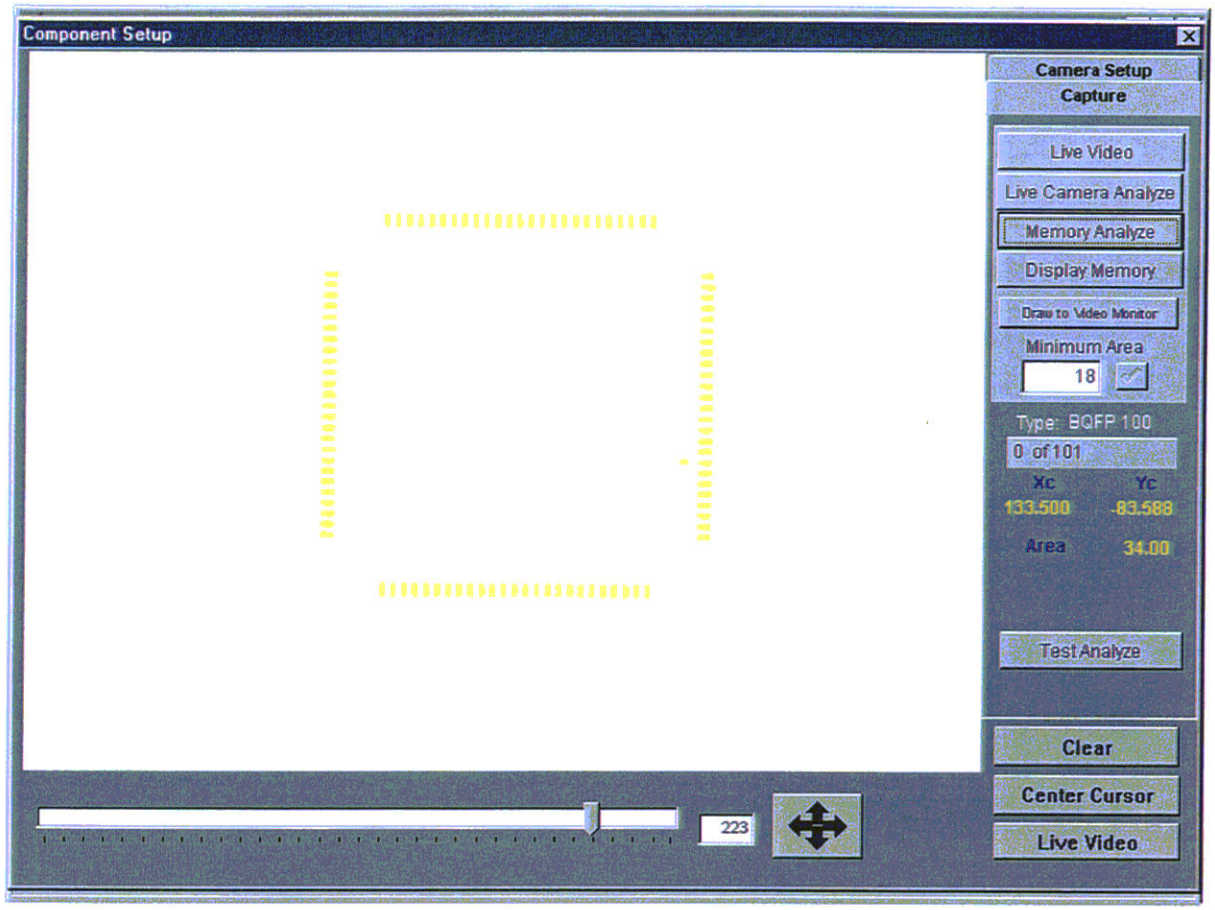


Figure Chapter 10 -1 Analyze Image

3. Click on the Capture menu tab located at the top of the screen.

Threshold and Analyzing

Note:	The Threshold Adjustment slide pointer that is described in the next step is found at the bottom of the Vision Processor window (See Figure Chapter 10 -1). It is a long white horizontal bar with a small pointer that you can move by clicking and holding the mouse button while you move the mouse. When you let go of the mouse button, the slider will stay at the new location.

1. Adjust the Threshold setting so that the video monitor shows clearly defined leads on a black background. Attention should be given so that two or more leads do not blend into each other (threshold set to low) or loose structure and even disappear (threshold set to high.)

TIP:	Click the Live Video button anytime you want to show the real time camera image.

2. Click on the Analyze Image button located in the upper right corner of the screen. You will be shown all items inside the Analysis Box that are equal to or greater than the number of pixels that are shown in the Min Area text box. See Figure Chapter 10 -1 for sample.

TIP: The minimum area setting depends very much on the part. As a suggestion, the user may click on what appears to be the smallest lead (this lead will turn red, see Figure Chapter 10 -2) and read the number of pixels displayed on the side-bar. Half of this number is often a suitable Minimum Area value for reliable analysis. If the Minimum Area is set too small, many small objects will fill the computer screen when the image is analyzed. If it is too large, some or all pins will be rejected when the image is analyzed.

3. Manipulate the Threshold setting and the Minimum Area setting and test with the Live Video Analyze button until all leads are displayed optimally.

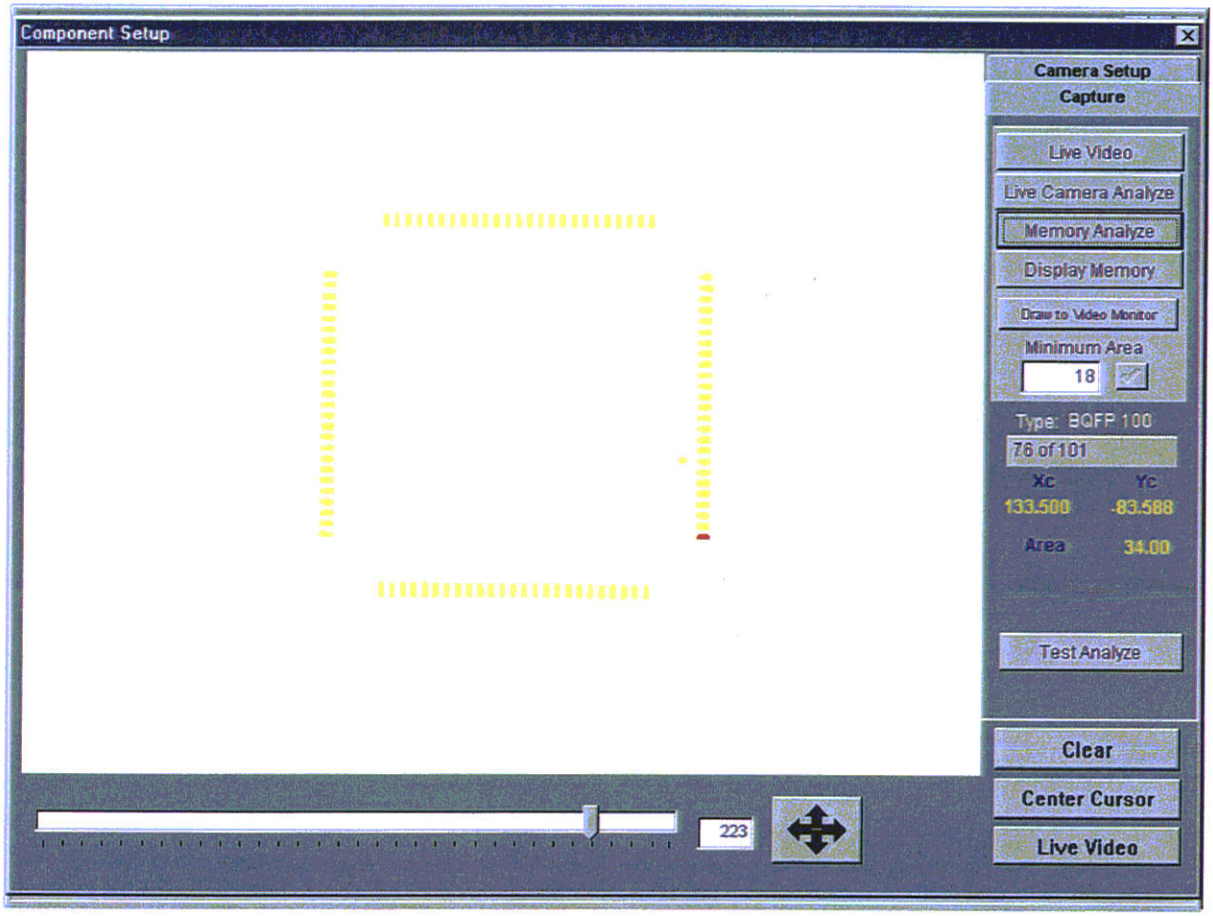


Figure Chapter 10 -2 Pad Area

4. Click on the Test Analyze button and the computer will calculate the center of the part.

Note: A cross-hair defining the calculated center of the part will be drawn over the part. Also, the upper left corner of the screen will show the angle *A*, the center coordinate *Xc* and *Yc*, and the reject status *R*. A

part that has passed inspection will be signified by the word Okay. Otherwise the side or sides with errors will be listed.

5. Close the Vision Processor. This will automatically save the threshold, save the box size, save the minimum area, and return you to the feeder editor screen where you can click on the Put Part Back button.

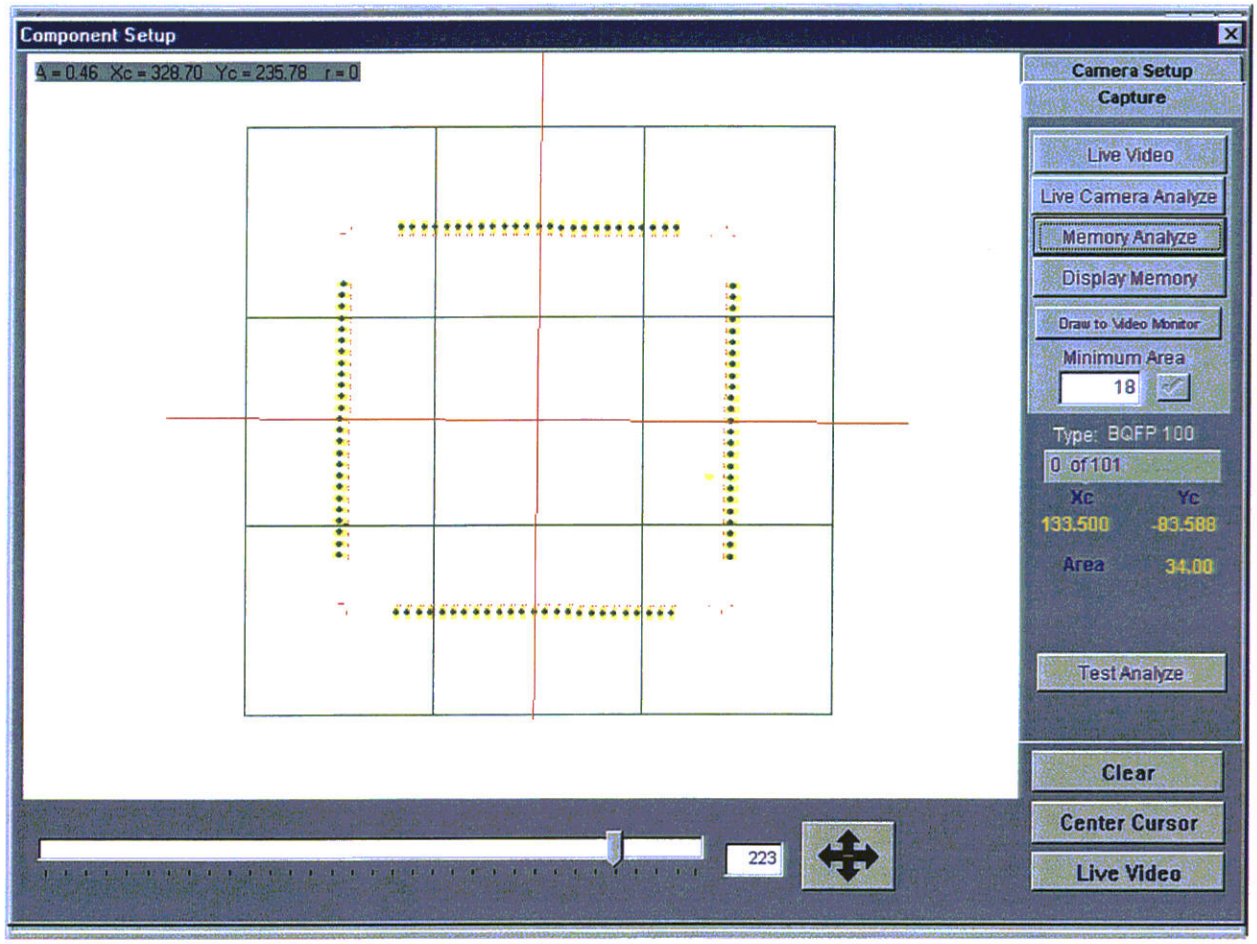


Figure Chapter 10 -3 Test Mode Analyze

Chapter 11 Job Information Screen

You have two options when you begin a new job. You can create a new job with a new feeder setup or take advantage of an existing feeder setup. Since the feeder table is not erased when you start a new job, you can use feeder data from an existing program by first opening the job and then creating a new placement program. To open an existing job follow the instructions in File Functions chapter and then continue with this section skipping instruction #1. Otherwise, to create new job with a new feeder table start with instruction #1.

1. To clear all feeder information click the menu line option, File, and then select New Feeder Table (see Figure Chapter 11 -1). When prompted click Yes.

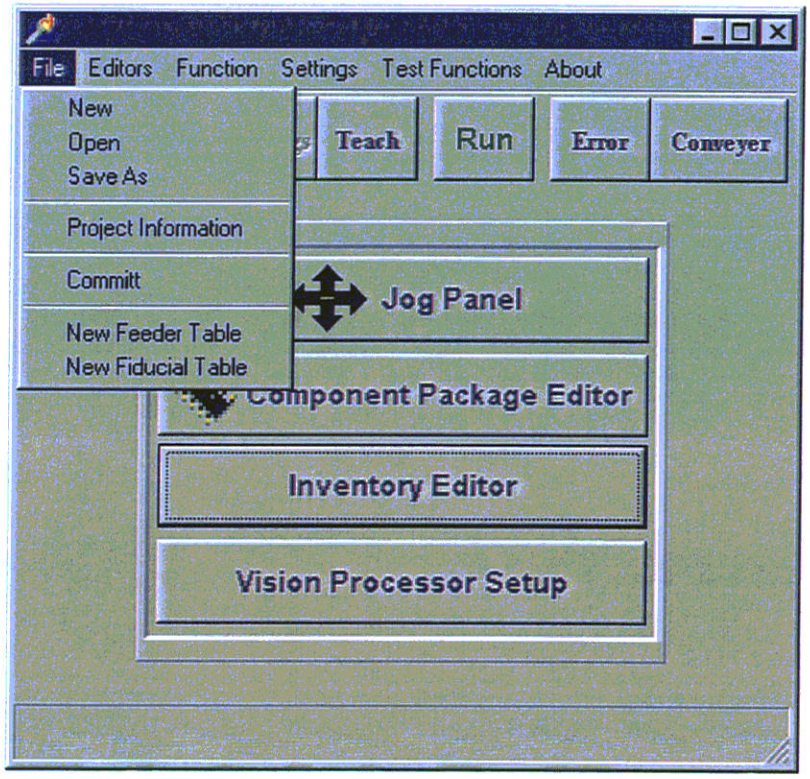


Figure Chapter 11 -1 File Menu

2. To start a new program, click the menu line option, File. Select New Job from the file menu.

3. The system will remind you to save the current file. Click on the Yes or No button.

4. A dialog box will appear asking the user to type a file name. Each assembly program, or job, must be given a unique name to identify it from other jobs that are stored on the machine. Try to use a meaningful name for ease of identification in the future.

Project Information

1. Click the menu line option, File. Select Project Information from the menu..

2. Type a short name or number into the Job Number field of the Customer information form that is shown below in Figure Chapter 11 -2.

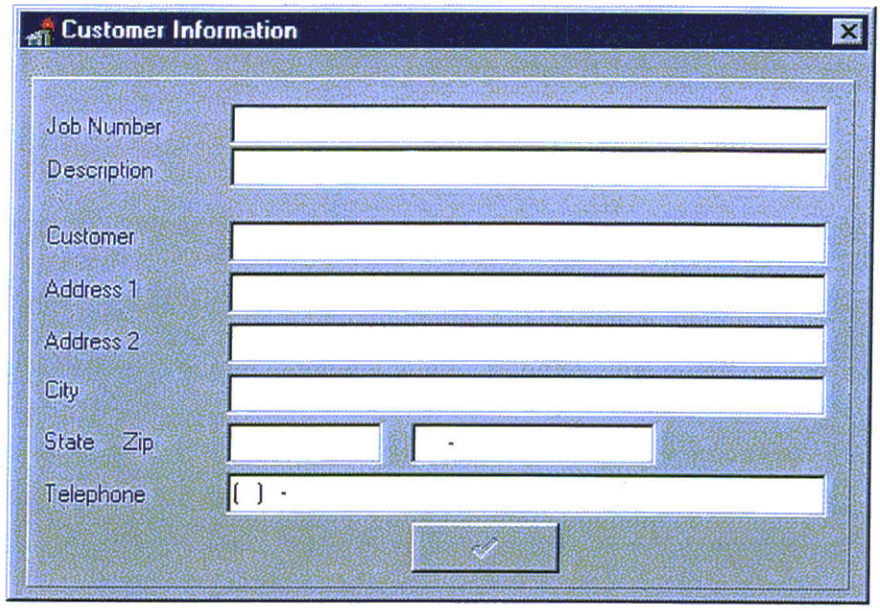


Figure Chapter 11 -2 Customer Information Data Screen

3. Click the mouse on any other field that you feel would be helpful for you to identify this job, and then type in the appropriate information.

4. When you are done entering information into the Customer information form, click the Post button (check mark) located at the bottom of this form.

Chapter 12 Board Alignment

This chapter goes over how to teach the machine the present location of the board, as well as the angle of rotation that the board is at with reference to the machine's X axis. To properly proceed with this chapter you will need to identify four points on the board, two for alignment point locations and two for fiducial mark locations. The programming of these locations is required before programming parts into the component list or reading in data that has been converted from a CAD system. Refer to the SMEMA Fiducial Mark Standards in the Appendix.

Alignment Points

Software uses the board alignment points to square itself to the board. You should pick two points that would accurately describe one of the board axes. The board must be oriented on the machine so that this axis is approximately parallel with the x-axis of the machine. For the most accurate angle measurement, these points should be as far apart as possible. We recommend that you use either component pads or fiducial marks for the board alignment points. If you do not have any marks which can be used for alignment, then use a long trace. Avoid using the edge of the PC board since board edges are usually not parallel with the printed circuit patterns on the board. You should also avoid using drilled holes since they also are not exactly parallel with the printed circuit patterns on the board.

Use the following steps to program the board alignment points:

1. Select Alignment from the Button Menu.

2. You will now be shown the Board Alignment setup screen as shown below in Figure Chapter 12 -1.

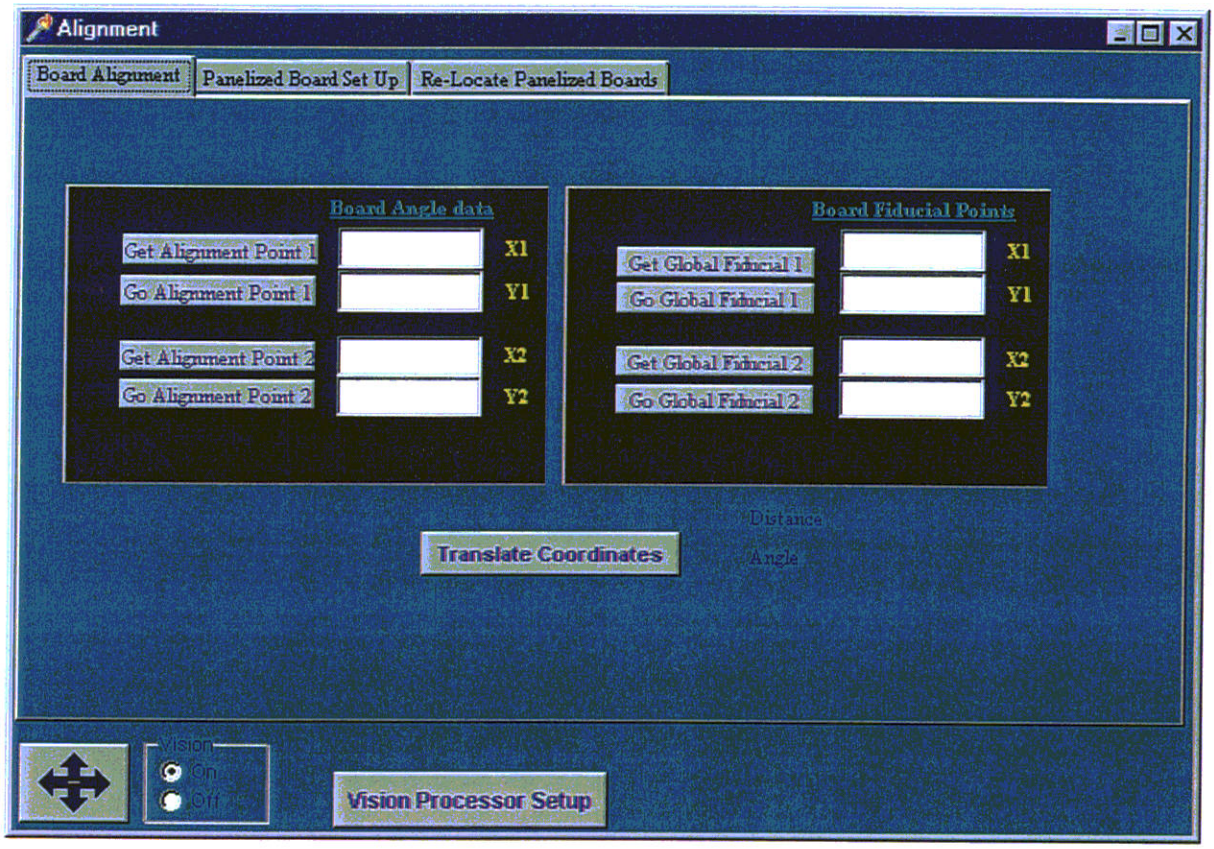


Figure Chapter 12 -1 Board Alignment Screen

3. When this screen is first shown, the automatic vision centering process is turned ON which is indicated by the dot in the ON button of the Vision box located at the bottom of this window. If the alignment mark is a visual pattern that can be recognized by the vision system, then leave the dot in the ON button and proceed to the Automatic Alignment section of this Chapter. If you will be manually locating the cross-hairs on the center or along the edges of an object, then click the OFF dot in this box to disable the automatic vision centering system and continue with next step.

Manual Alignment

1. With the vision turned off, click on the Jog Panel icon and move the camera so that the cross-hair is on the center or along the edge of the left-most object that you want to use for board alignment.

Note: The first alignment point must always be on the left side of the board, and the second alignment point must always be on the right side of the board.

2. Click Get Alignment Point 1. The current head position will be recorded.

3. Click on the Jog Panel icon and move the camera so that the cross-hair is on the center or along the edge of the right-most object that you want to use for board alignment.

4. Click Get Alignment Point 2. The current head position will be recorded.

5. The alignment points have now been taught. You can check them by clicking Move To. Proceed to the Global Fiducial Marks section of this chapter.

Automatic Alignment

1. With the vision turned ON, click on the Vision Processor Setup button located at the bottom of the Board Alignment window. You will be shown the Fiducial Reference screen as shown in Figure Chapter 12 -2.

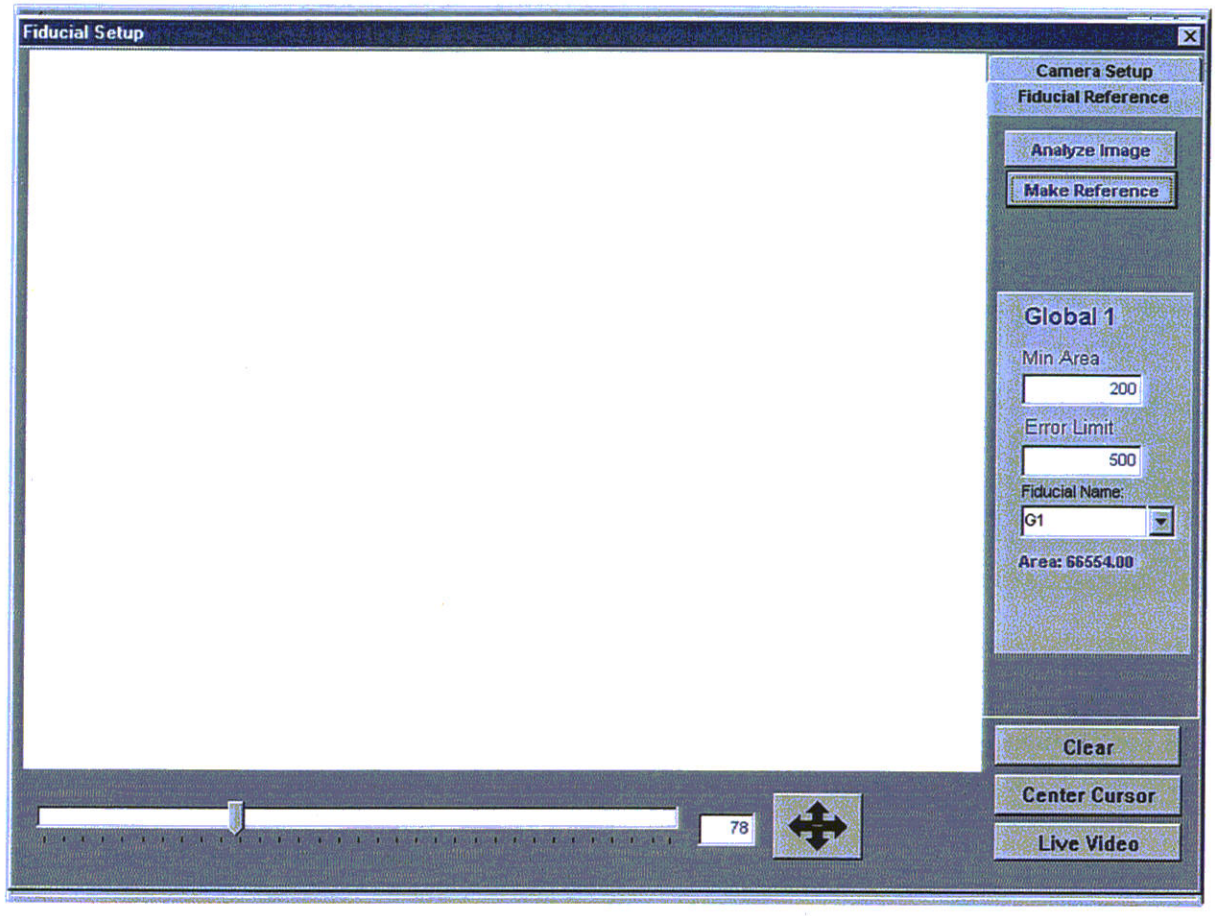


Figure Chapter 12 -2 Fiducial Reference Setup Screen

2. Select Alignment 1 (or Alignment 2) from the drop down box labeled Fiducial Name.

3. Click on the Live Video button located at the bottom of the Fiducial Setup window.

4. Click on the Jog Panel icon and use the Jog panel to move the camera so that cross-hair is approximately centered on the left-most mark that you want to use for board alignment.

Note: The first alignment point must always be on the left side of the board, and the second alignment point must always be on the right side of the board.

Analysis Box Setup

1. Click on the Camera Setup tab located at the top of the screen. This screen is shown below in Figure Chapter 12 -3.

Figure Chapter 12 -3 Camera Setup Screen

2. The button in the center of the red arrow buttons toggles between SIZE and MOVE. If it shows the word MOVE, click the button until it does show the word SIZE.

3. Use the red arrow buttons at the lower right side of the Camera Setup screen to stretch each side of the Analysis Box so that it is about twenty percent larger than the fiducial.

TIP: The right red arrow button will enlarge the box from left to right. The left red arrow button will reduce the size of the box from left to right. The top red arrow button will enlarge the box from top to bottom and the bottom red arrow button will reduce the size of the box from top to bottom.

4. For a standard fiducial made of a plated pad on a dark background, select Normal Video Polarity. For a dark fiducial on a bright background, select Inverted Video Polarity.

Threshold and Analyzing

1. Click on the Fiducial Reference tab located at the top of the screen.

2. Click on the Live Video button.

> **Note:** The Threshold Adjustment slide pointer that is described in the next step is found at the bottom of the Fiducial Setup window (See Figure Chapter 12 -2). It is a long white horizontal bar with a small pointer that you can move by clicking and holding the mouse button while you move the mouse. When you let go of the mouse button, the slider will stay at the new location.

3. Adjust the threshold so that the video display monitor shows a white mark on a black background. The alignment mark should ideally show a solid white pattern with sharp, well defined edges, and the background should have a minimum of scattered white dots.

> **TIP:** Click the Live Video button anytime you want to show the real time camera image.

4. Make the Minimum Area setting equal to approximately 100. If this number is set too small, many small objects will fill the computer screen when the image is analyzed. If this number is set too large, your selected object will be rejected when the image is analyzed.

5. Click on the Analyze Image button located in the upper right corner of the screen. You will be shown all individual items that are inside the Analysis Box, and are equal to or greater than the number of pixels that are shown in the Min. Area box.

6. Click on the object that you want to use as the alignment mark. The color of that object will turn red. If you have accidentally chosen the wrong object, just move and click on the new object to be used as the fiducial mark. The old mark will turn blue and the currently selected object will turn red. Note also the object area in pixels is displayed.

7. Click on the Make Reference button.

8. Close the Vision Processor window. This will save all the information you just programmed and return you to the Fiducial Alignment Setup window.

Get X,Y Coordinate

1. Click on Get Alignment Point.

2. Repeat the following sequence two or three times until the X and Y values stabilize:

   - Click on Go Alignment Point
   - Click on Get Alignment point
   - Click on the YES button when asked if you wish to overwrite existing data.

> **Note:** The repeated GO and GET sequence described above is to correct for the camera lens which is curved and causes incorrect coordinate readings. The closer the object is to the center of the camera lens, the more accurate the readings will be. Usually by the second or third time through this sequence, the

object is exactly centered in the camera lens and the coordinate that is displayed is correct. Remember that during the initial programming stage it is important to be as accurate as possible.

3. Repeat this entire process, beginning with the Automatic Alignment heading for Alignment Point 2.

Global Fiducial Marks

The Global Fiducial Marks are usually circular solder-plated copper pads located near the corners of the circuit board which are used to find the exact location of each new blank board that is loaded into the machine for assembly.

The same programming process that was just used for the alignment points should be followed for the fiducial marks. If the board that you are using does not have two fiducial marks available, you will be required to turn the vision system off for that particular fiducial mark and manually locate the head exactly at the center or along the edges of some repeatable printed object or other visual pattern.

Use the following steps to program the Fiducial Marks for automatic alignment:

1. With the vision turned ON, click on the Vision Processor Setup button located at the bottom of the Board Alignment window. You will be shown the Fiducial Reference screen as shown in Figure Chapter 12 -2.

2. Select Fiducial 1 (or Fiducial 2) from the drop down box labeled Fiducial Name.

3. Click on the Live Video button located at the bottom of the Fiducial Setup window.

4. Click on the Jog Panel icon and use the Jog panel to move the camera so that cross-hair is approximately centered on the mark.

Analysis Box Setup

1. Click on the Camera Setup tab located at the top of the screen. This screen is shown in Figure Chapter 12 - 3.

2. The button in the center of the red arrow buttons toggles between SIZE and MOVE. If it shows the word MOVE, click the button until it does show the word SIZE.

3. Use the red arrow buttons at the lower right side of the Camera Setup screen to stretch each side of the Analysis Box so that the box is about twenty five percent larger than the fiducial.

TIP: The right red arrow button will enlarge the box from left to right. The left red arrow button will reduce the size of the box from left to right. The top red arrow button will enlarge the box from top to bottom and the bottom red arrow button will reduce the size of the box from top to bottom.

4. For a standard fiducial made of a shiney pad on a dark background, select Normal Video Polarity. For a dark fiducial on a bright background, select Inverted Video Polarity.

5. Click on the Fiducial Reference tab located at the top of the screen.

6. Click on the Live Video button.

Threshold and Analyzing

Note: The Threshold Adjustment slide pointer that is described in the next step is found at the bottom of the Fiducial Setup window (See Figure Chapter 12 -2). It is a long white horizontal bar with a small pointer that you can move by clicking and holding the mouse button while you move the mouse. When you let go of the mouse button, the slider will stay at the new location.

1. Adjust the threshold so that the video display monitor shows a white mark on a black background. The mark should ideally show a solid white pattern with sharp, well defined edges, and the background should have a minimum of scattered white dots.

TIP: Click the Live Video button anytime you want to show the real time camera image.

2. Make the Minimum Area setting equal to approximately 100. If this number is set too small, many small objects will fill the computer screen when the image is analyzed. If this number is set too large, your selected object will be rejected when the image is analyzed.

3. Click on the Analyze Image button located in the upper right corner of the screen. You will be shown all items that are inside the Analysis Box, and are equal to or greater than the number of pixels that are shown in the Min. Area box.

4. Click on the object that you want to use as the fiducial. The color of that object will turn red. If you have accidentally chosen the wrong object, just move and click on the new object to be used as the fiducial mark. The old mark will turn blue and the currently selected object will turn red. Note also the object area in pixels is displayed.

5. Click on the Make Reference button.

TIP: When set correctly, the error limit will help detect a poor fiducial or a major misalignment of the board. If this number is set too low, then the vision system will reject all fiducial marks except those that are almost a perfect match in both size and shape to the original mark. In most cases you will find that printed patterns will vary slightly from board to board. If this number is set too large, then almost any object that the camera sees could accidentally be mistaken for the object that you really want.

6. Before leaving this screen, you have the option of changing the fiducial error limit. Normally, a value of one quarter to one half of the programmed fiducial's area will work well.

7. Close the Vision Processor window. This will save the information you entered and return you to the Fiducial Alignment Setup window.

Get X,Y Coordinate

1. Click on Get Global Fiducial.

2. Repeat the following sequence two or three times until the X and Y values stabilize:

   - Click on Go Global Fiducial
   - Click on Get Global Fiducial
   - Click on the YES button when asked if you wish to overwrite existing data.

Note: The repeated GO and GET sequence described above is to correct for the camera lens which is curved and causes incorrect coordinate readings. The closer the object is to the center of the camera lens, the more accurate the readings will be. Usually by the second or third time through this sequence, the object is exactly centered in the camera lens and the coordinate that is displayed is correct. Remember that during the initial programming stage it is important to be as accurate as possible.

3. Repeat this entire process, beginning at the Global Fiducial Marks heading for Global Fiducial 2.

4. When you are sure that the Alignment Points and the Global Fiducials are set correctly (note that you may use the Goto XY button to check your work), press the Translate Coordinates button.

Note: Global Fiducial #1 will now become the origin (0,0) of the X,Y plane.

5. Close the Fiducial Alignment Setup window. This will return you to the Program Menu.

Chapter 13 Component Placement Editor

The Component Placement list contains the information for each individual part that is to be placed on the circuit board. The most efficient use of this editor would be to enter in this information last, after the inventory list has been created. If you have not yet entered in the inventory list for this program, it is suggested that you should first complete the instructions outlined in the chapter on the Inventory Editor.

Manually teaching a program step

The following list of steps is used when you manually create a program on the LVX:

1. Select Teach button from the tool bar. The Place Table data entry screen will be displayed, and is shown below in Figure Chapter 13 -1.

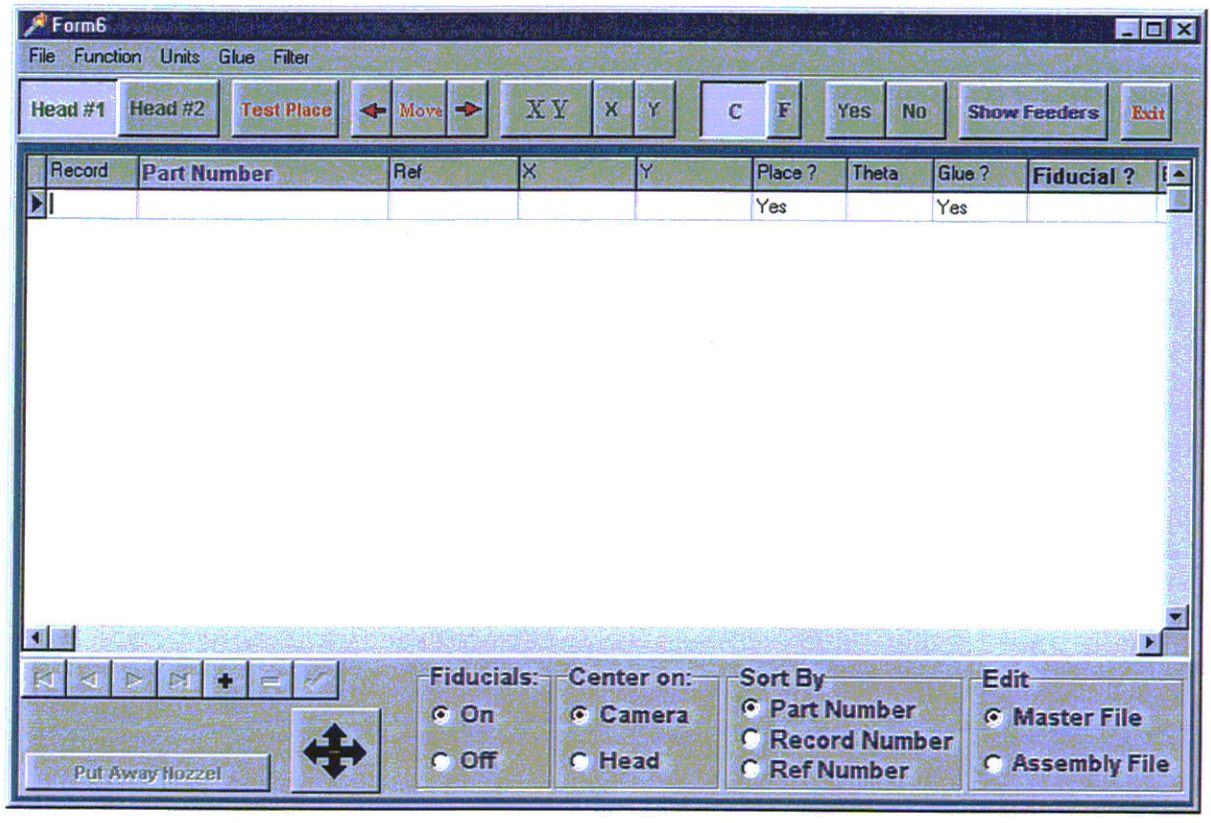


Figure Chapter 13 -1 Component Placement Editor Screen

2. Click on the Sort by Record Number button. The Record Number is simply a number that is assigned to each component, or record, that is programmed. It begins with one and increments for each record added.

Adding a Component

1. Click the add record button (+) and then click in the Part Number field of the active record.

2. Click on the ellipsis button which is displayed at the right edge of the Part Number field of the first step that is displayed on the screen. (The ellipsis button is the square box with 3 dots in it.) Select the part for this program step from the part inventory list that is displayed. See Figure Chapter 13 -2.

3. Click on the Ref field and type in the reference designator for this step. The Reference is an optional field usually used for giving a unique name to each component. For example, resistors are usually called R1, R2, R3 and capacitors are C1, C2, C3, etc.

Get X,Y Coordinate

1. Using the Jog panel or the Multipoint panel find the center of the part (for a stick feeder) or pocket (for a tape feeder).

2. Click on the XY button to save the current location as the pick up point for this part.

Theta Orientation

1. Click on the Theta field and type in the rotation angle. This rotation is with respect to the package editor.

Note: The angle is determined by first examining that package drawing for that part. The drawing always shows what the part would look like at zero degrees. You then compare the zero degree orientation with how the part should be placed, as seen from the front of the machine. Note that increasing angles correspond to a counter-clockwise rotation.

TIP: At any time, completed placement records may be checked by clicking the Test Place button.

2. For each additional program step, repeat this process beginning at the Adding a Component heading.

3. When you have completed programming all of the steps in this program, exit the Teach window. This will return you to the Main Menu.

4. Select File from the top menu line to bring up the File Menu (Figure Chapter 11 -1).

5. Click on the Save button.

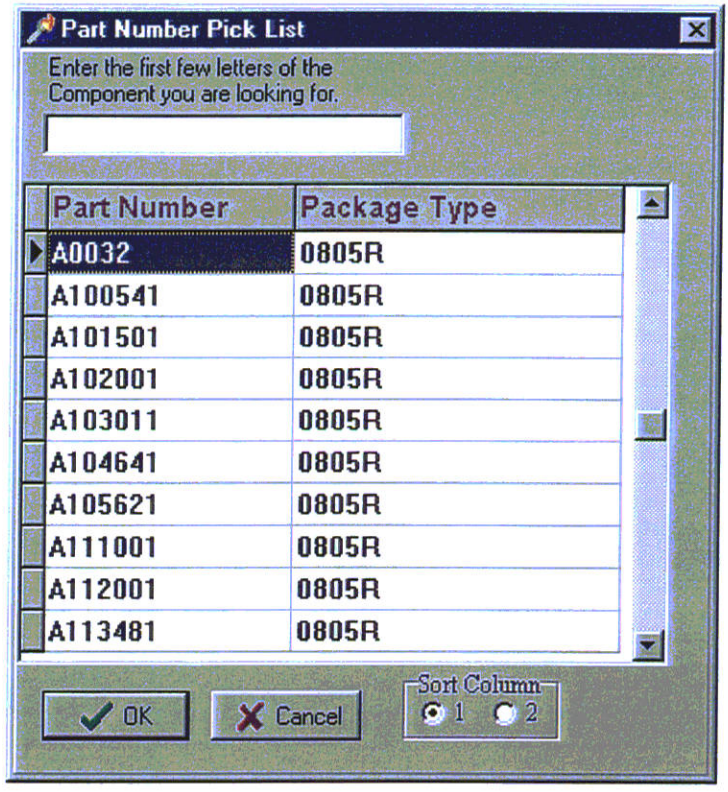


Figure Chapter 13 -2 Component Placement Editor's Parts List

Reading a CAD Generated Component List

To reduce or eliminate the time that is spent creating a component list on the machine is to read in data that has been prepared on another computer. The LVX stores the component list in a dBASE IV revision 2.0 database format. For each assembly program, this file is called PLACE.DBF. If you do not have your placement data in this format, Multitroniks can provide you with a conversion program. Please contact your Multitroniks sales representative for further information.

When the board alignment chapter has been finished and the cad data in the .DBF file format, place the file onto a floppy disk and use the following instructions to read in the component list:

Note: The X,Y coordinates are all referenced from Global Fiducial 1. This can be clearly shown by viewing the board alignment table. After the Translate button has been pressed, you will notice that G1's coordinate is 0,0. Therefore, all cad data to be imported should use G1 as its origin.

1. Select Component Placement Editor from the Program menu. The Place Table data entry screen will be displayed, and is shown in Figure Chapter 13 -1.

2. Click File from the menu line and select Import Place File.

3. Click once on the name of the .DBF file that you want to import.

4. Click on the Open Button.

5. Many data files that are created from CAD systems will not have any part numbers. If your data is displayed with no part numbers, Click on the Part Number field for each step and click on the ellipsis button to select a part number from the Inventory List (see Figure Chapter 13 -2). If you have not yet entered in the inventory list for this program, you must go back to the chapter on the Inventory Editor and complete the list before proceeding with this step.

6. When you have completed programming all of the steps in this program, close the component placement editor window and then close the Program Menu.

7. Select FILE from the top menu line to bring up the File Menu (Figure Chapter 11 -1).

8. Click on the Save button.

Chapter 14 Running a Program

Note: At this point in the sequence, all programming for the board should be completed. The steps that follow from this point are used to run the assembly program, which will pick and place parts on the board.

1. Click on Run Program from the main Menu. The Run program menu will be displayed as shown below in Figure Chapter 14 -1.

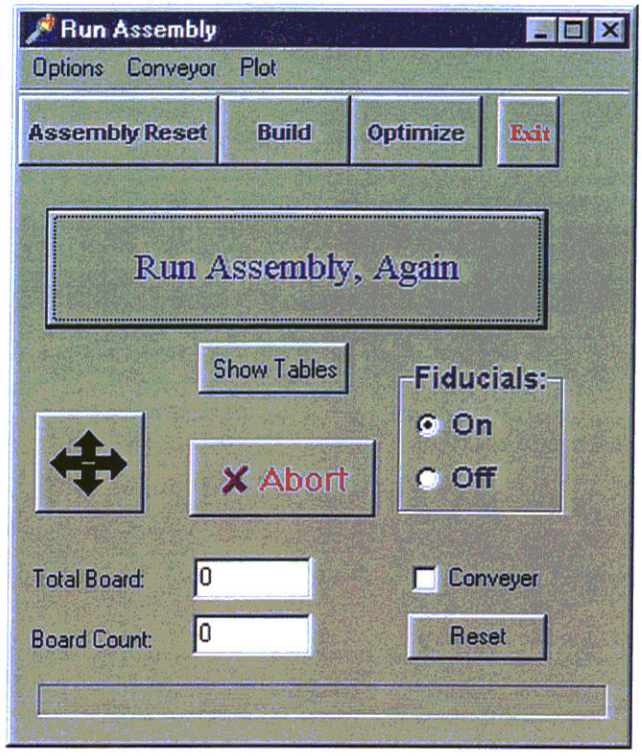


Figure Chapter 14 -1 Run Program Screen

For the First Time

1. Click on Build to create a new assembly list based on the current Component Placement list.
2. Click on Optimize.
3. Click on Run Assemble to start the machine picking and placing.

Note: After the assembly has run, a table will show all parts that were not placed and the reason they were not placed. After you fix any problems, finish the board by simply clicking on Assemble.

After File is Built

1. To place another board, first switch the finished board out with a blank. Then click Reset Assembly and then Run Assembly. If you have made changes in the component editor you will must repeat the previous section of Build, Optimize, and Run Assembly.

Chapter 15 File Functions

Saving a Job

After you have completed creating all of the information for this program, you will need to save it before creating a new program. This is done by using the following sequence:

1. From the Main Screen, select File from the menu line to bring up the File Menu as shown in Figure Chapter 11 -1.

2. Select Save.

> **Note:** When saving files, the system automatically collects together all of the files that are associated with this program and compresses them together into a single file. The name of this file can be anything that you choose, but the system will always add an extension to the name of .ZIP. All of the .ZIP files are stored in a sub-directory named WORK0 on the hard drive.

Opening an Existing Job

This section describes the procedure to open an existing job. Even though the system may warn you if you have not saved your current job you should get into the habit of using the File-Save function before you change jobs (unless of course you don't want to save the file).

1. Select File from the top menu line to bring up the File Pull Down Menu as shown in Figure Chapter 11 -1.

2. Select Open Existing Job from the File Menu (Figure Chapter 11 -1). You will now be shown the Open File dialog box as shown below in Figure Chapter 15 -1. Select the file you want and then click on the Open button at the bottom of the box.

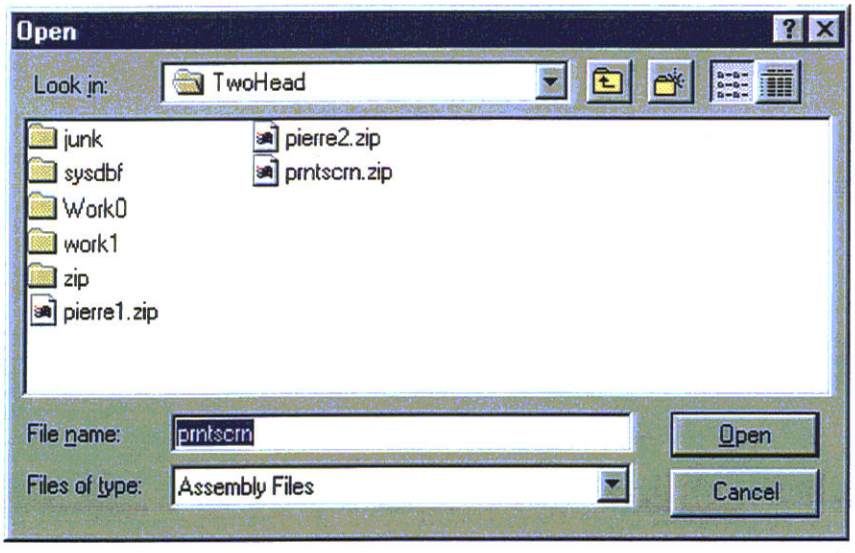


Figure Chapter 15 -1 Open Existing Job Screen

Editing an Existing Job

If you need to make changes in a job you must first open the job (see the Open command above). You can make changes at will in any of the functions listed below without having to realign the board. Refer to this manual's Table of Contents (or as noted) to find instructions on programming any of these functions.

- Package Editor (global)
- Inventory Editor (global)
- Job Name
- Job Description
- Vision Analysis (global)
- Error Preferences (global)
- Feeders
- System Settings (global, refer to calibration manual)
- limited fields in the Component Placement Editor (see below)

Note: Those items listed as global are not job specific. Any changes in these areas will affect all jobs.

When making changes in the Component Placement Editor, you may change at will the Part Number, the Reference Number, the Angle, and the Description. If you intend to make changes in the component placement coordinates you must first realign the system to the board fiducials. An accurate alignment is very important for accurate placement coordinates.

To realign proceed as follows:

1. If you haven't already done so, open the job you would like to edit and mount a board on the machine.

2. From the Main Menu click Alignment

3. The board alignment window will appear with the Panelized Board Set-up tab active (use this to realign a single board). If you are editing a panelized board click the Realign Panelized Board tab and skip to the Relocating a Panelized Board section.

Relocating a Single Board

1. Using the Jog panel move the camera over Global Fiducial 1 (or 2) and click Get X,Y. Answer Yes to overwrite data.

2. Repeat the following sequence two or three times until the X and Y values stabilize:

   - Click on Go Alignment Point
   - Click on Get Alignment point
   - Click on the Yes button when asked if you wish to overwrite existing data.

3. Repeat steps #1 and #2 for Global Fiducial 2.

4. Close the Board Alignment - Fiducial window. The system is now ready to have the component coordinates edited.

Relocating a Panelized Board

1. With the Relocate Panelized Board tab selected, make certain panel one is active by click a field within record one.

2. Using the Jog panel move the camera over Global Fiducial 1 (or 2) of panel one and click Get X,Y. Answer Yes to overwrite data.

3. Repeat the following sequence two or three times until the X and Y values stabilize:

    - Click on Go Alignment Point
    - Click on Get Alignment point
    - Click on the Yes button when asked if you wish to overwrite existing data.

4. Repeat steps #2 and #3 for Global Fiducial 2 for panel one.

5. Click Realign Fiducials.

6. Close the Board Alignment - Fiducial window. The system is now ready to have the component coordinates edited.

Chapter 16 Programming Guides

The following three illustrations outline the steps to complete a given task. They are:

- To Assemble an Existing Job see the flow diagram in Figure Chapter 16 -1.
- To Assemble a New Job see the flow diagram in Figure 16-2.
- To Edit and Assemble an Existing Job see the flow diagram in Figure 16-3.

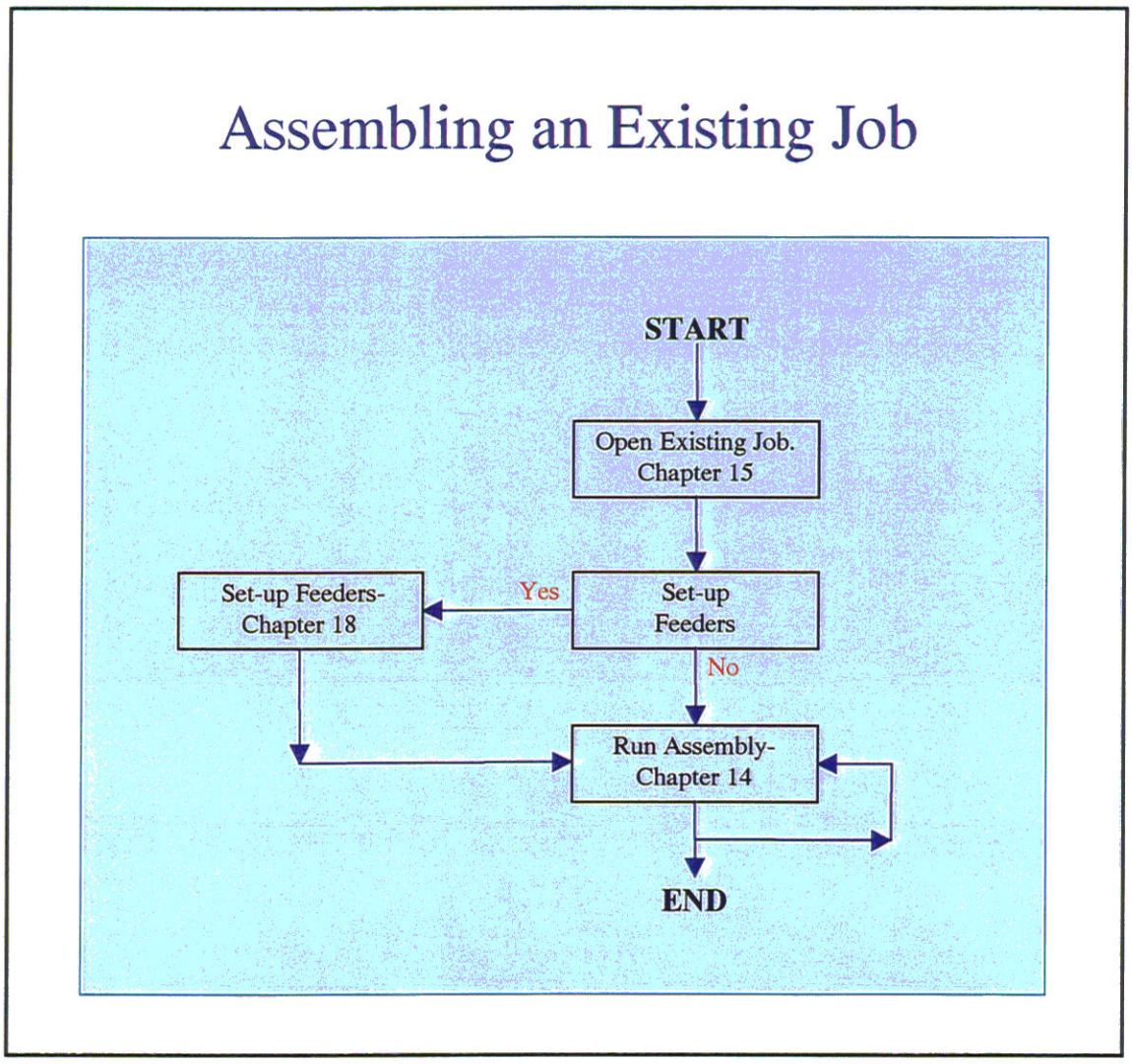


Figure Chapter 16 -1

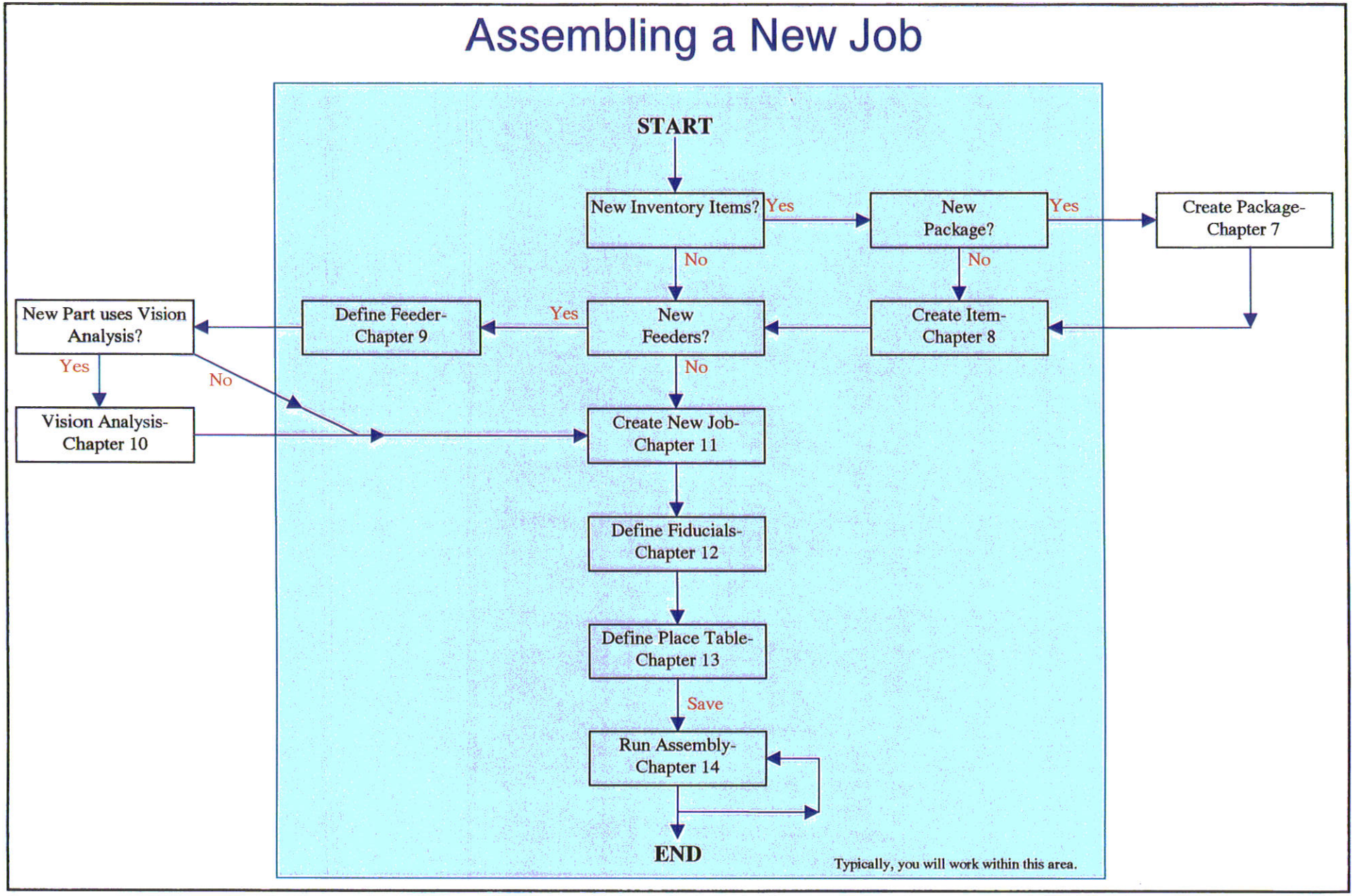

Assembling a New Job
START
New Inventory Items?
Yes
New Package?
Yes
Create Package- Chapter 7
No
No
New Part uses Vision Analysis?
Define Feeder- Chapter 9
Yes
New Feeders?
Create Item- Chapter 8
Yes
No
No
Vision Analysis- Chapter 10
Create New Job- Chapter 11
Define Fiducials- Chapter 12
Define Place Table- Chapter 13
Save
Run Assembly- Chapter 14
END
Typically, you will work within this area.

Figure 16-2

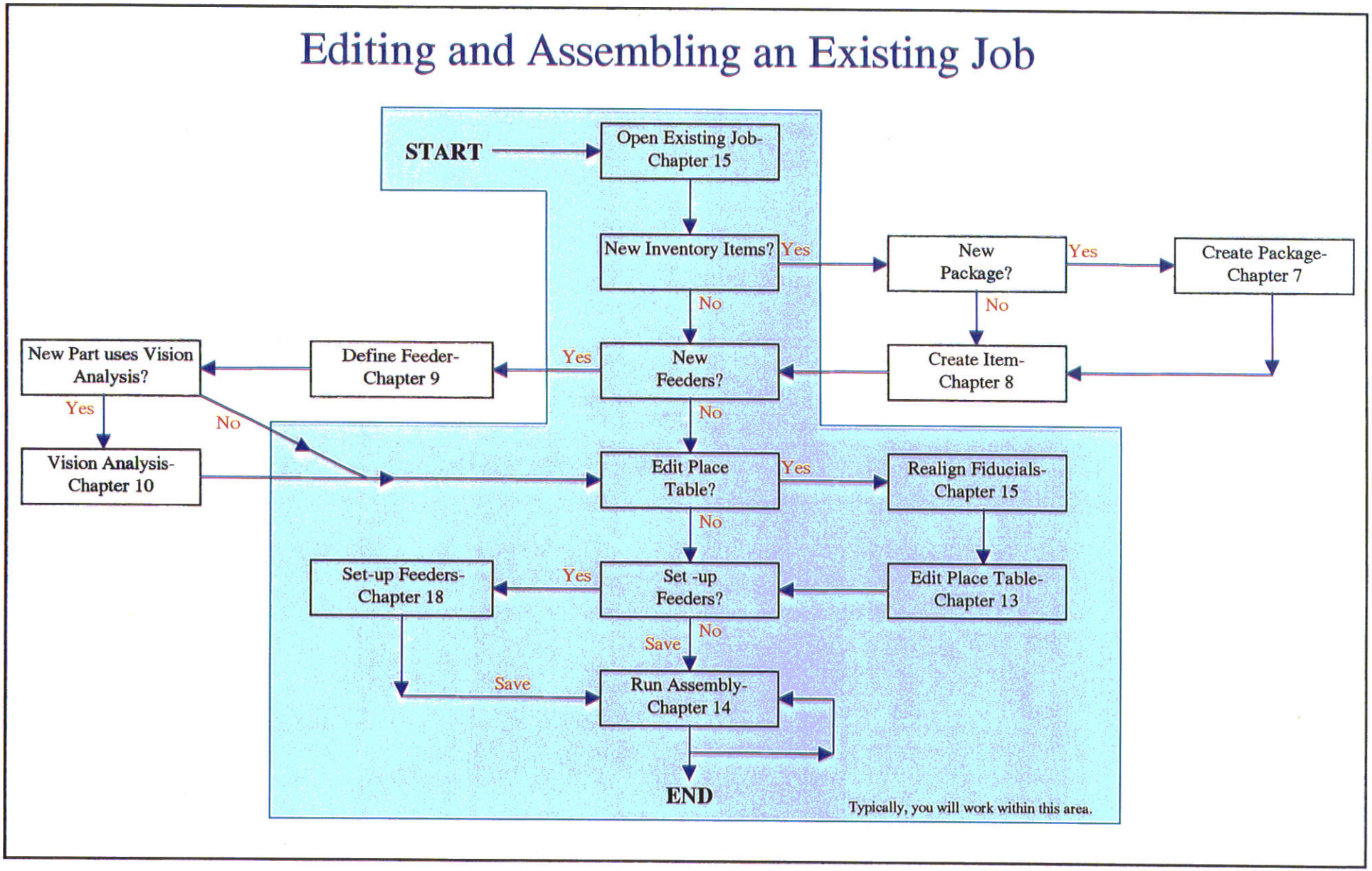

Editing and Assembling an Existing Job
START
Open Existing Job- Chapter 15
New Inventory Items?
Yes
New Package?
Yes
Create Package- Chapter 7
No
No
New Part uses Vision Analysis?
Define Feeder- Chapter 9
Yes
New Feeders?
Create Item- Chapter 8
Yes
No
No
Vision Analysis- Chapter 10
Edit Place Table?
Yes
Realign Fiducials- Chapter 15
No
Set-up Feeders- Chapter 18
Yes
Set -up Feeders?
Edit Place Table- Chapter 13
No
Save
Save
Run Assembly- Chapter 14
END
Typically, you will work within this area.

Figure 16-3

Chapter 17 Panelized Board Set-up

Panels may be setup using one of the two techniques listed below.

- with local fiducial (recommended)
- with offsets

Using local fiducials is a much more reliable method when compared to offsets. In fact, on many boards, this method is necessary for quality placement.

Panels Using Local Fiducials

To teach a panelized board using local fiducials, it is recommended that you first teach panel one as if it is a single board (you can even Assembly it alone to check the placement). After you have setup panel one, click Program - Board Alignment from the Main menu. The screen shown in

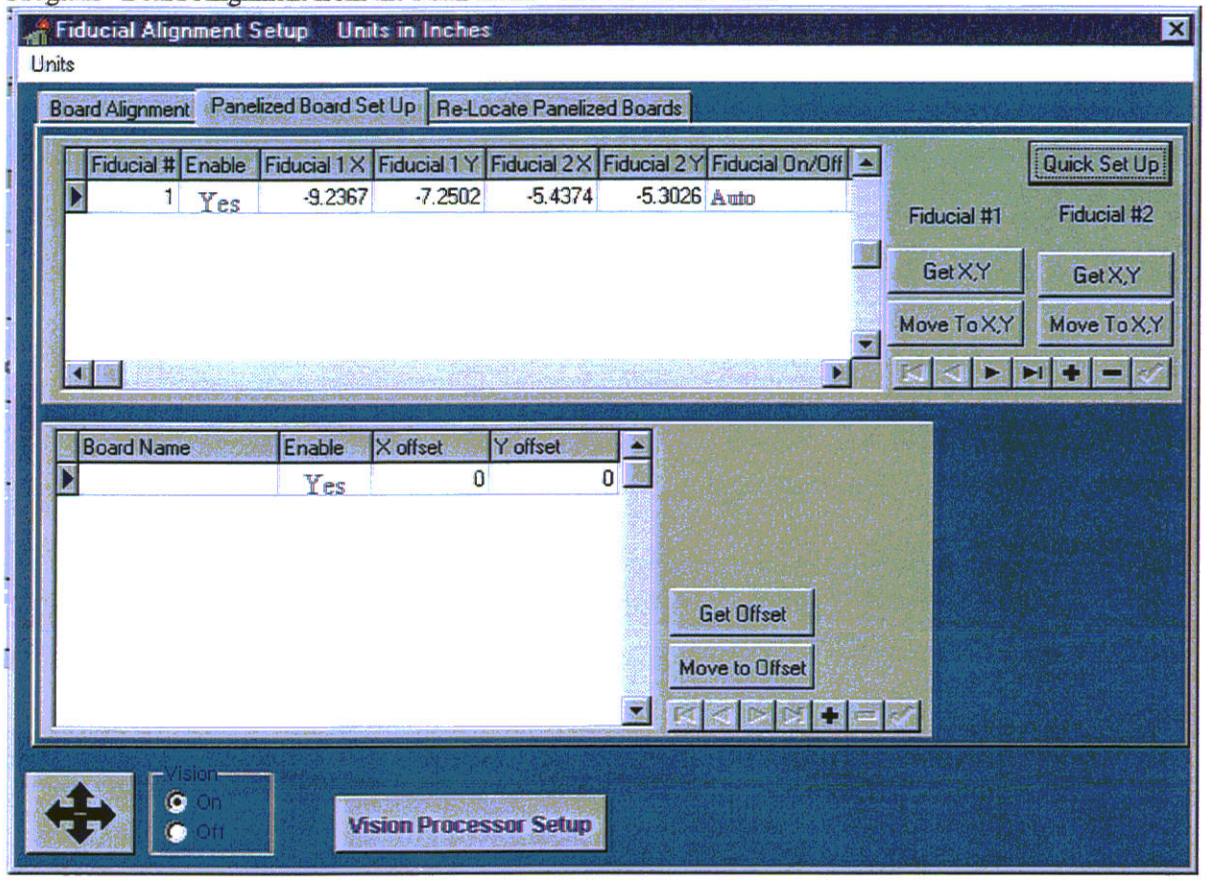


Figure Chapter 17 -1 will be shown. Notice that panel one's G1 and G2 coordinates will already be shown in the upper table.

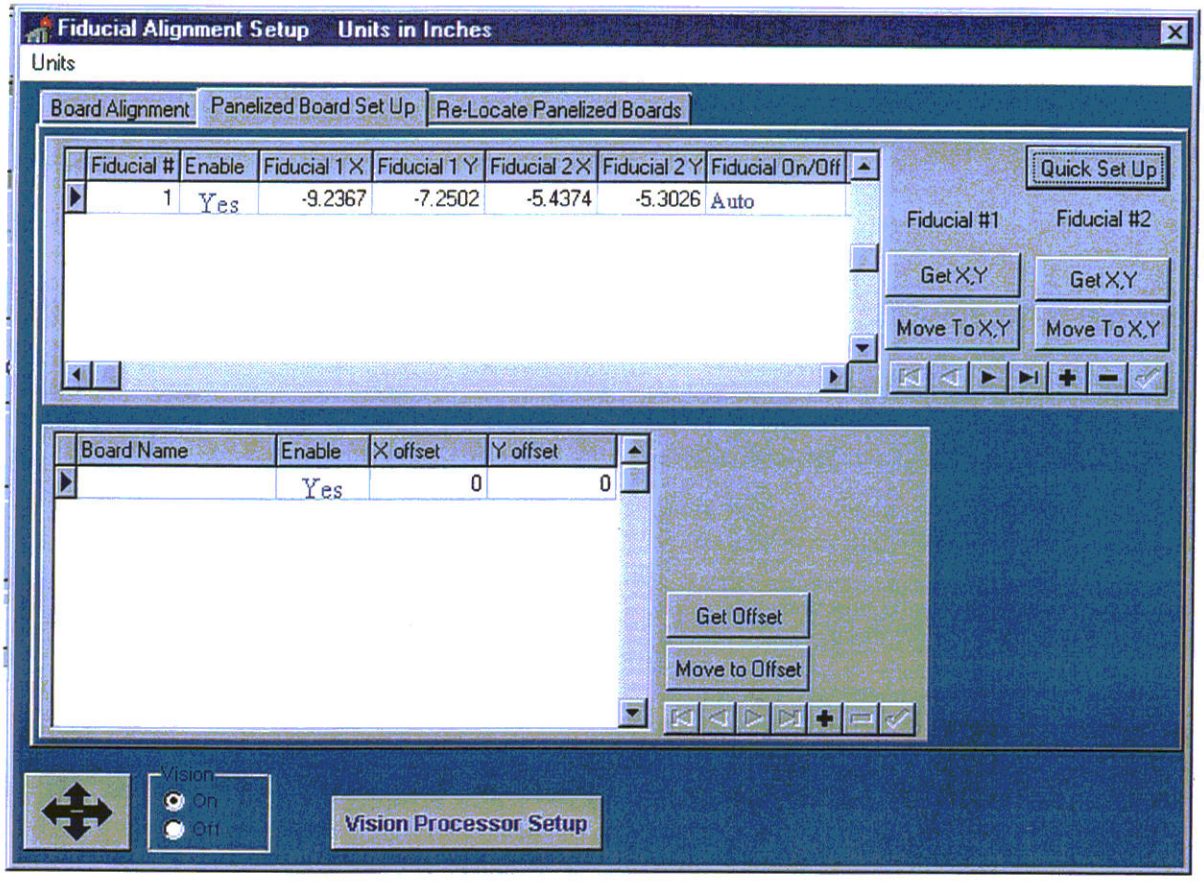


Figure Chapter 17 -1 Panelized Board Setup Screen

Quick Setup

1. Click the Quick Setup button to see the screen shown in.

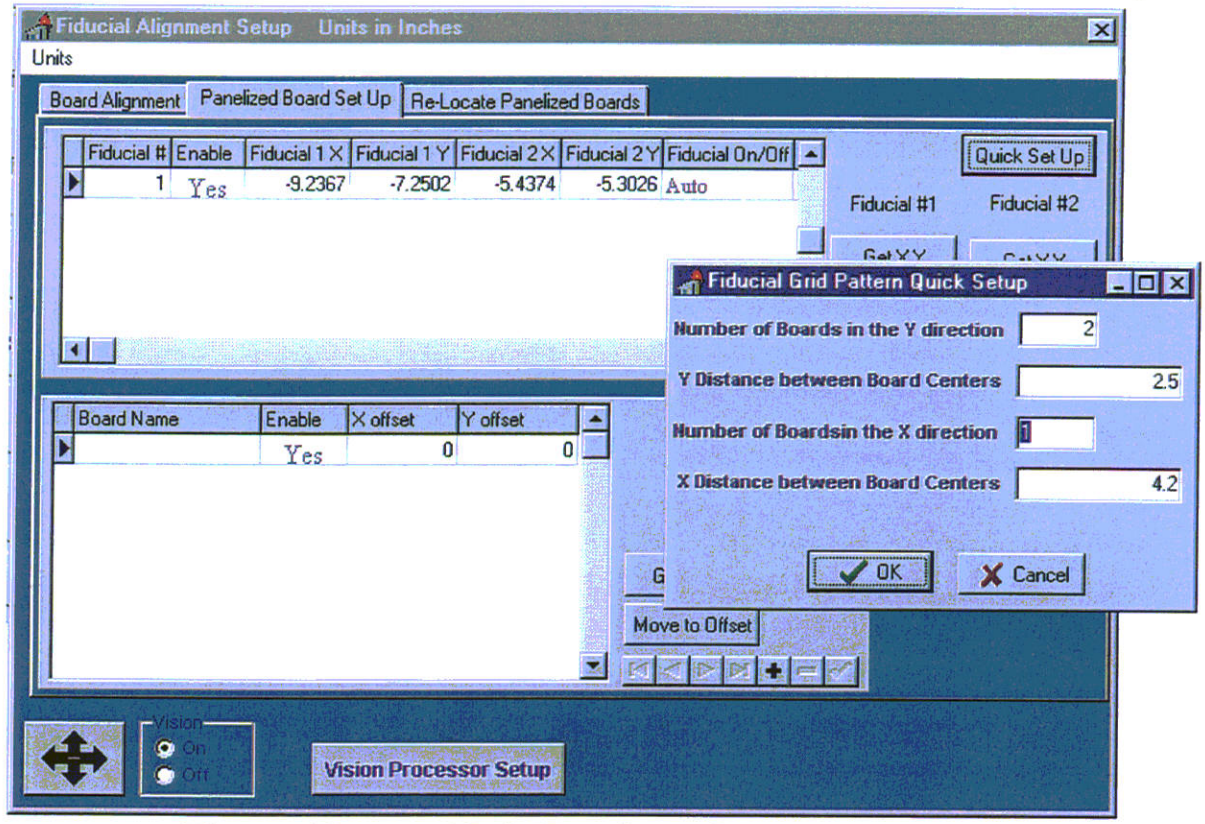


Figure Chapter 17 -2 Panelized Quick Setup Screen

2. Fill in the information as needed. The X and Y dimensions do not have to be exact but the closer they are to the actual dimensions the easier the next few steps will be.

3. Click the OK button to return you to the Panelized Board Setup tab. The computer has now calculated the panel positions based on the information you entered in the quick tray setup.

4. Click the First Record button on the navigator bar.

Teaching Each Panel

1. Click the Next Record button on the navigator bar.

2. Click Move To X,Y #1 to move over G1 of the current panel.

3. If the fiducial is not entirely inside the box use the Jog Panel to make it so.

TIP: If your offsets in the Quick Setup are off substantially, you may want to adjust them so that you don't have to use the jog panel to adjust every fiducial. To do this click the First Record button on the navigator bar and then click Quick Setup. Adjust your old X and Y values as needed. Remember that you will have to go back to step #4 of the Quick Setup section .

4. Click Get X,Y #1

5. Click Move To X,Y #2 to move over G2 of the current panel.

6. If the fiducial is not entirely inside the box use the Jog Panel to make it so.

7. Click Get X,Y #2

8. Repeat this section, steps #1 to #7, for the remaining panels.

Panels Using Offsets

Offsets use a pair of global fiducials and X and Y offset to translate a pattern to each panel. The problem with using this method is that it does not compensate for any angular difference between panels. However, in certain cases, using offsets will work adequately. To set up offsets, begin by teaching the board alignment points and fiducial points. Then proceed as follows:

1. From the Main menu, click Alignment. The screen shown in

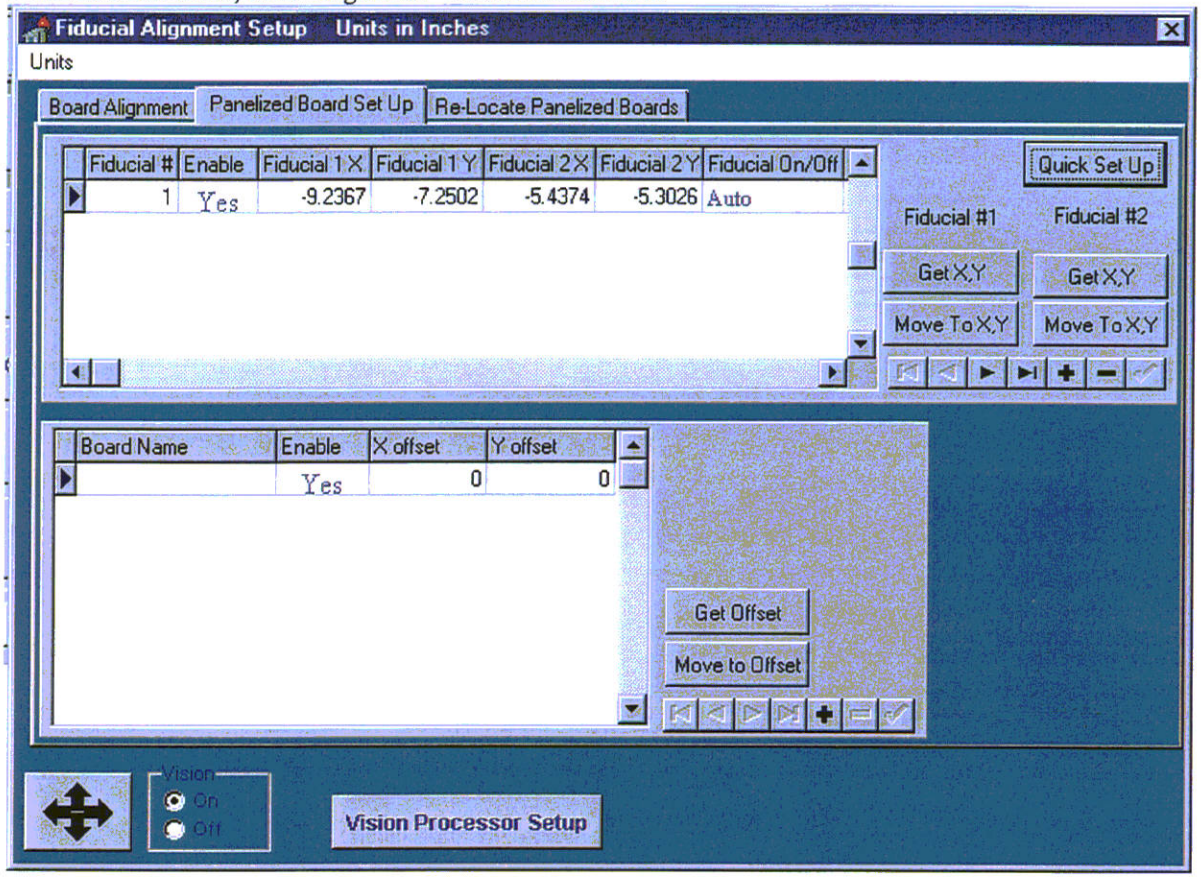


Figure Chapter 17 -1 will be shown. Notice that G1 and G2 coordinates will be shown in the upper table. The lower table (the offset table) will be blank.

2. Using the Jog Panel move over a reference point (any point of your choice that you can replicate on all panels) on panel one.

Adding Offsets

1. Click the Add button on the offset table's navigator board.

2. Click in the Board Name field of the active record and enter a short name like 'P1' for panel 1.

3. Click the Get Offset button.

4. Using the Jog Panel move over the reference point on the next panel.

5. Click the Add button on the offset table's navigator board.

6. Click in the Board Name field of the active record and enter a short name like 'P2' or 'P3', etc..

7. Click the Get Offset button.

8. Repeat this section, steps #1 through #7 for each of the other panels.

Programming Panel One

1. Click the First Record button on the navigator bar to switch to panel one.

2. Close the Panelized Board Setup window and proceed to program the board with components (see the chapter on Component Placement). In this case, be careful to program panel one only.

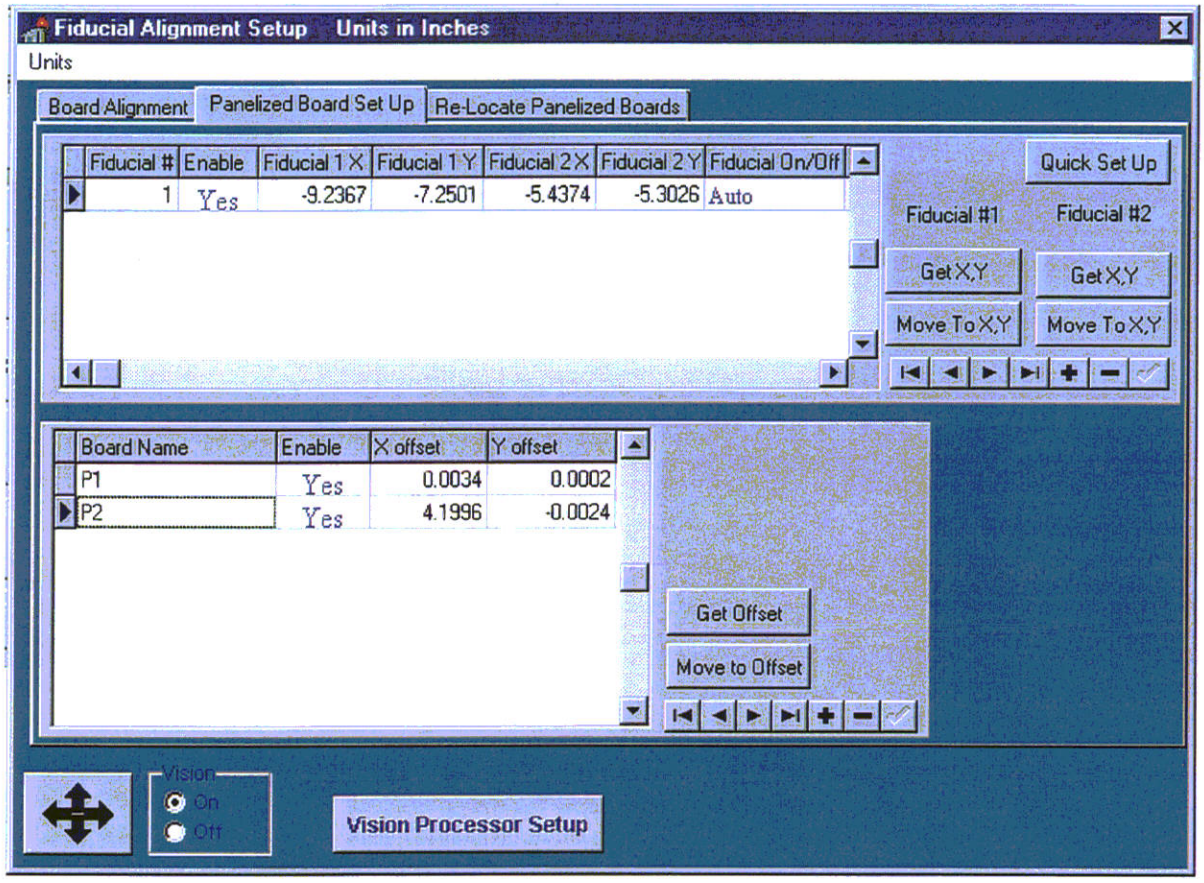


Figure Chapter 17 -3 Offset Table Screen

Chapter 18 Loading Feeders

Loading a Feeder

The LVX accepts components in three different package types: Tape, Stick and Tray. The loading for each type is described below.

Tape Feeder

The LVX must be equipped with an 8 position feeder block in order to be able to use tape feeders. The tape widths that can be used are 8, 12, 16, 24 and 32 millimeters using a maximum reel diameter of 13 inches.

1. The tape containing the parts must be properly prepared before you can load it into a feeder. If you have a new reel, there is usually at least 12 inches (30 centimeters) of blank pockets before the first component. If this amount of empty tape is available, then peel back 8 inches of cover tape and cut the pocket tape so that the cover tape will be 8 inches longer than the component pocket tape. (see Figure Chapter 18 -1) If components are loaded to the end of the tape you may choose to either peel 8 inches of cover tape off and cut off the exposed component pocket tape, discarding the tape and the components, or you can extend the cover tape by attaching a length of previously used cover tape to the current end with adhesive tape.

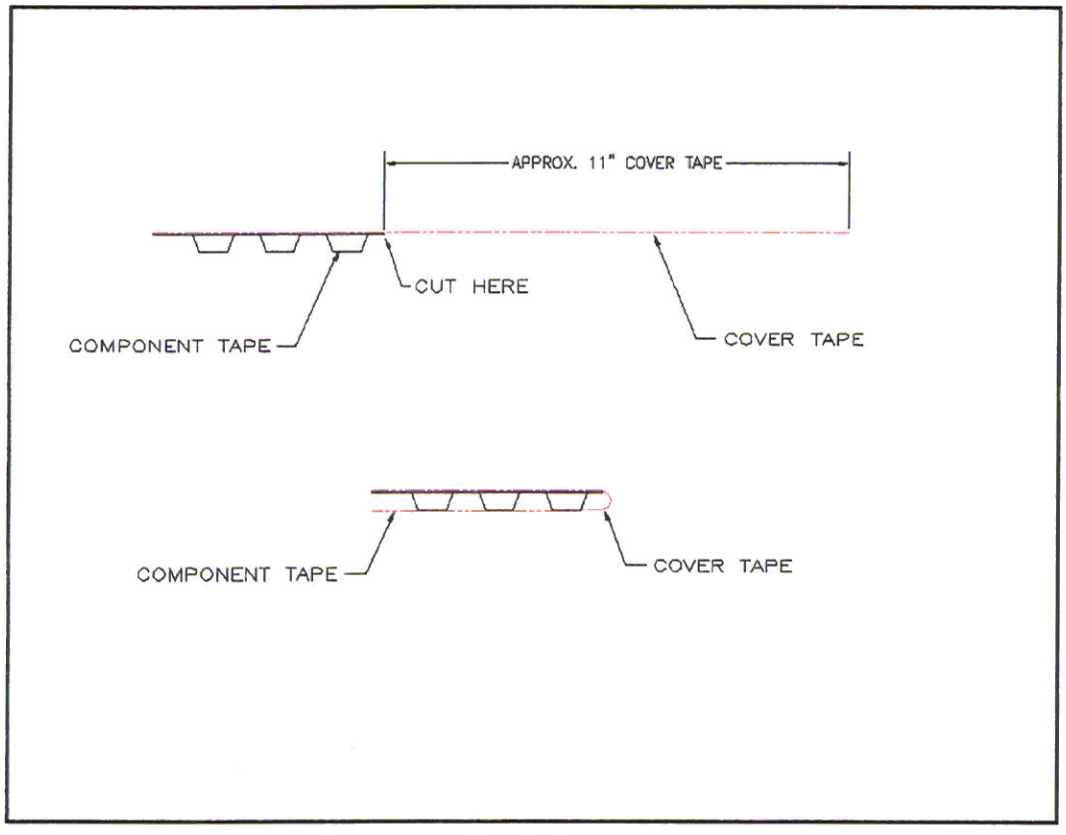


Figure Chapter 18 -1 Tape Preparation

2. The component tape must have a cleanly cut end for it to properly slide into the feeder.

3. Attach the component reel support to the reel hub by pushing the hub through the center hole of the reel. The tape should feed off of the top of the reel, with the sprocket holes on the side that is closest to the metal plate which supports the reel hub. (see Figure Chapter 18 -2)

4. Fold the cover tape around the end of the component pocket tape so that it is on the bottom of the component pocket tape.

5. Slide the tape stabilizing spring mechanism all of the way back to expose the feeder sprocket teeth.

6. Insert the end of the tape into the tape entry slot located at the rear of the feeder, near the red and green push buttons. Push the tape in until it is pushed out of the front of the feeder approximately 1 inch.

7. Pull the cover tape out from under the bottom of the component tape and then push the component tape back into the feeder so that it's end is at the front of the feeder.

8. Align the feeder sprocket teeth with the sprocket holes in the component tape and then slide the tape stabilizing spring mechanism fully forward.

9. Thread the cover tape so that it changes direction and heads toward the back of the feeder. The cover tape should feed over the top of the cover tape guide. (see View A of Figure Chapter 18 -2)

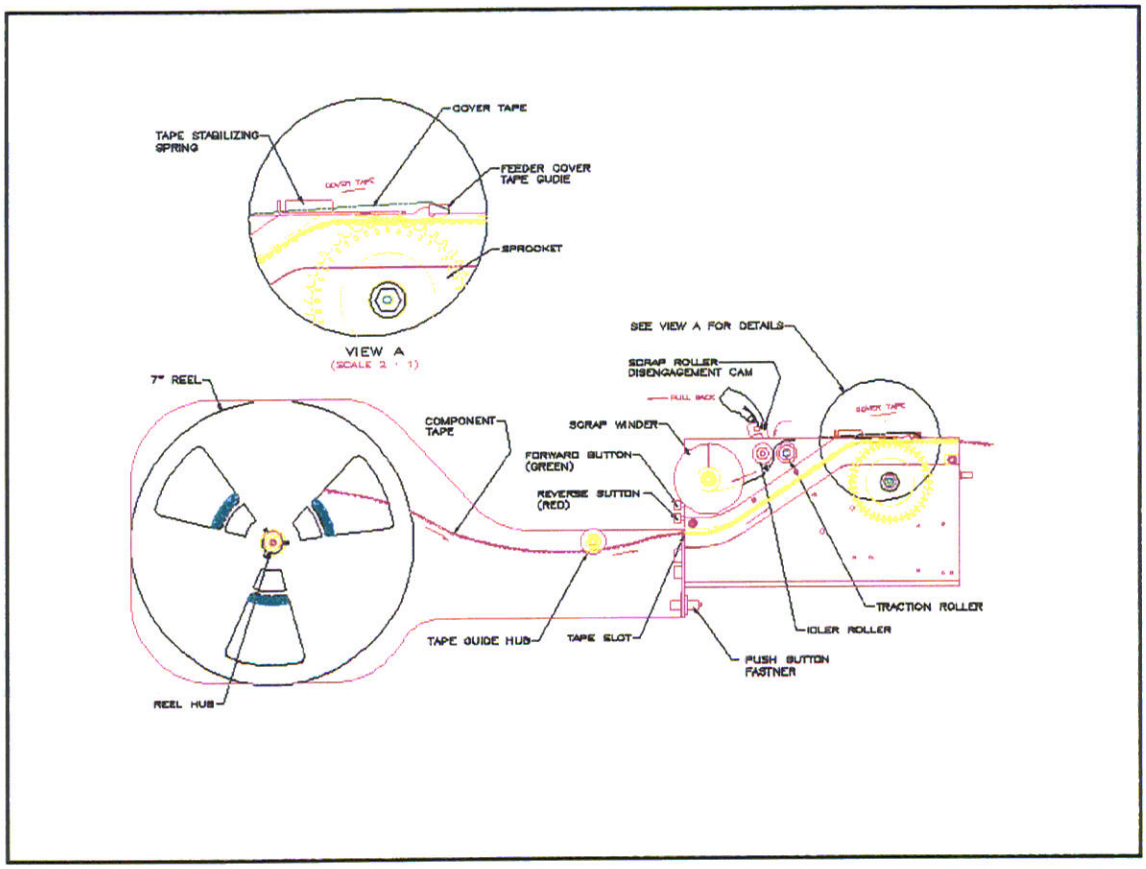


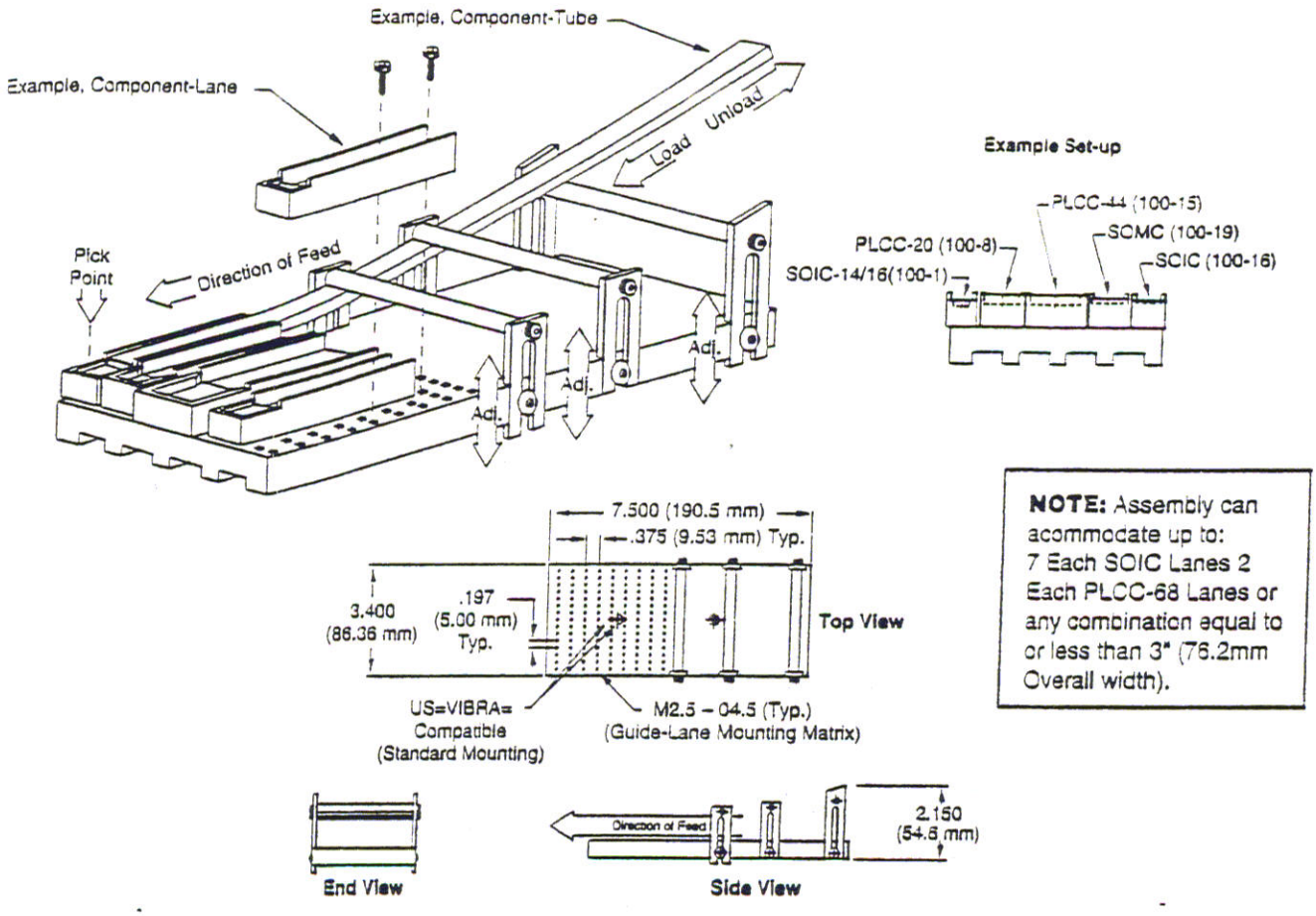
Figure Chapter 18 -2 Loading Tape onto Feeder

10. Pull back the disengagement cam for the scrap tape roller to open up a space between the rubber and steel rollers. Guide the scrap tape through this space.

11. While keeping the cover tape taut, release the cam so that it pinches the tape.

12. Turn the tape winder clutch so that the slot is facing up. Wrap the cover tape around the bottom of the winder and so that it is pulled partly through the slot. If you have enough cover tape, turn the tape winder clutch one full turn so that the cover tape is securely attached to the winder, then cut off the excess. If you

Series 2000 Vibratory Feeders



NOTE: Assembly can accommodate up to: 7 Each SOIC Lanes 2 Each PLCC-68 Lanes or any combination equal to or less than 3" (76.2mm Overall width).

MULTITRONIKS

2000 Series
Vibratory Lanes

Multitroniks Part Number	Component Name	Escape Width "A"	Escape Length "B"	Track Width "C"	Price
46830-2	SOIC-14/16	.252	.500	.330	60.00
46830-9	SOLIC	.422	.750	.596	95.00
46830-4	PLCC-20	.400	.482	.500	60.00
46830-5	PLCC-28/32	.505	.736	.610	60.00
Blank	Blank	-	-	-	95.00
46830-3	PLCC-18	.338	.650	.422	95.00
46830-11	SOJ-20/26	.345	.920	.470	60.00
46830-7	PLCC-68	1.005	1.236	1.086	95.00
46830-14	PLCC-84	1.209	1.484	1.300	95.00
46830-10	PLCC-44	.706	.860	.790	95.00
46830-1	SOIC-8	.252	.250	.330	60.00
46830-6	PLCC-52	.810	.992	.914	95.00
46830-15	PLCC-100	1.410	1.736	1.526	95.00
46830-8	SOMC	.320	.510	.446	95.00

MX261000-1 Vibratory Feeder: $2,195.00

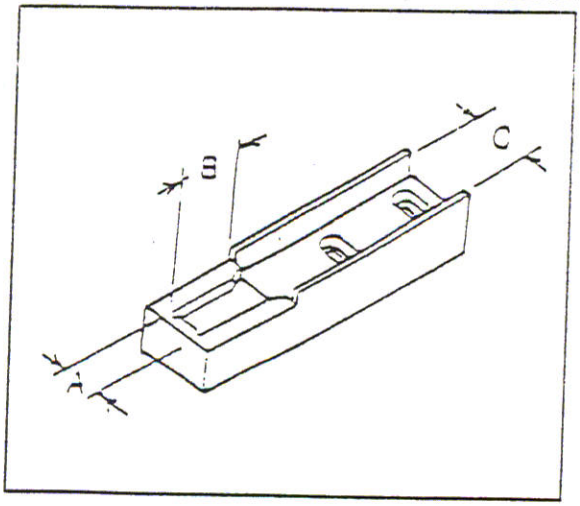
Lanes Not Listed Above Are Special Lanes.

All Special Lanes: $225.00

★ Please Include The Following Information When Ordering :

- ✔ Width Of Component Including Leads
- ✔ Length Of Component
- ✔ Width Of Stick
- ✔ Height Of Stick

★ We Recommend Sending Samples



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Phone: 908-561-4200 • Fax: 908-461-1184

have insufficient cover tape to hold in place as just was described, you can attach the cover tape to the outside surface of the tape winder clutch with adhesive tape.

13. Slide the feeder into a slot until it makes contact with the feeder base vertical manifold and push in the push-button fastener to secure it to the feeder base.

14. You can now move the tape manually using the red and green buttons located on the back of the feeder. a Brief press of the green button will advance the feeder by one sprocket hole (one pitch). Pressing the green button continuously will advance the tape until the button is released. Pressing the red button continuously will retract the tape until the button is released. You should set the tape so that the pocket that is showing is the last empty pocket before the components appear.

Vibratory Stick Feeder

To use the vibratory stick feeder, you must first turn the amplitude control on the feeder to its minimum setting. There are several vibratory bases available and each has the amplitude and frequency controls in different locations. If there is only an amplitude control available, then ignore the following notes which refer to the frequency control.

For each tube used, determine which end should be opened. Each tube should contain the same component and all should be oriented so that the printing or reference marks are in the same direction for each part.

Begin by turning the amplitude down to the minimum setting. Remove the end plug from a tube, cover the end of the tube with your finger, and slide the tube against the tube stop near the inside portion of the feeder. When all tubes have been put in place, adjust the frequency to the maximum setting. Now, Increase the amplitude to the maximum setting and begin to decrease the frequency setting until the parts in the tubes make the most noise and show the most amount of vibration. Finally, reduce the amplitude so that all of the parts exit each tube and slide into the feeder part slots.

Tray Feeder

The LVX can accommodate standard JEDEC matrix trays which are supported in a tray holding fixture.

Re-Loading your Feeders

When you have changed your physical feeder setting between jobs (and even if you haven't) you may need to reset up your feeders. The following points will need to be checked.

Tape Feeder

Reposition the physical tape feeders in their respective slots. To use the software to aid in the set-up of the feeders use the following procedure:

1. Click Feeder from the Program menu. Choose a starting position (maybe the front right).

2. Click on a block.

3. Click a green slot to make it active and then click Move To.

4. Get a feeder containing the item listed and, using the camera position as a guide, load the feeder in the slot.

5. Update the Counts for that feeder as needed

6. Repeat steps three to five for each green slot in the block.

7. Close the block and repeat steps two through six for the remaining blocks.

Vibratory Stick Feeder

Stick feeder counts will need to be edited assuming the parts have been used on other jobs. Similar to the tape feeders you can use the software to aid setting the physical feeders up. The difference is moving the camera over the feeder will not allow good access to the vibratory unit so skip this step.

Tray Feeder

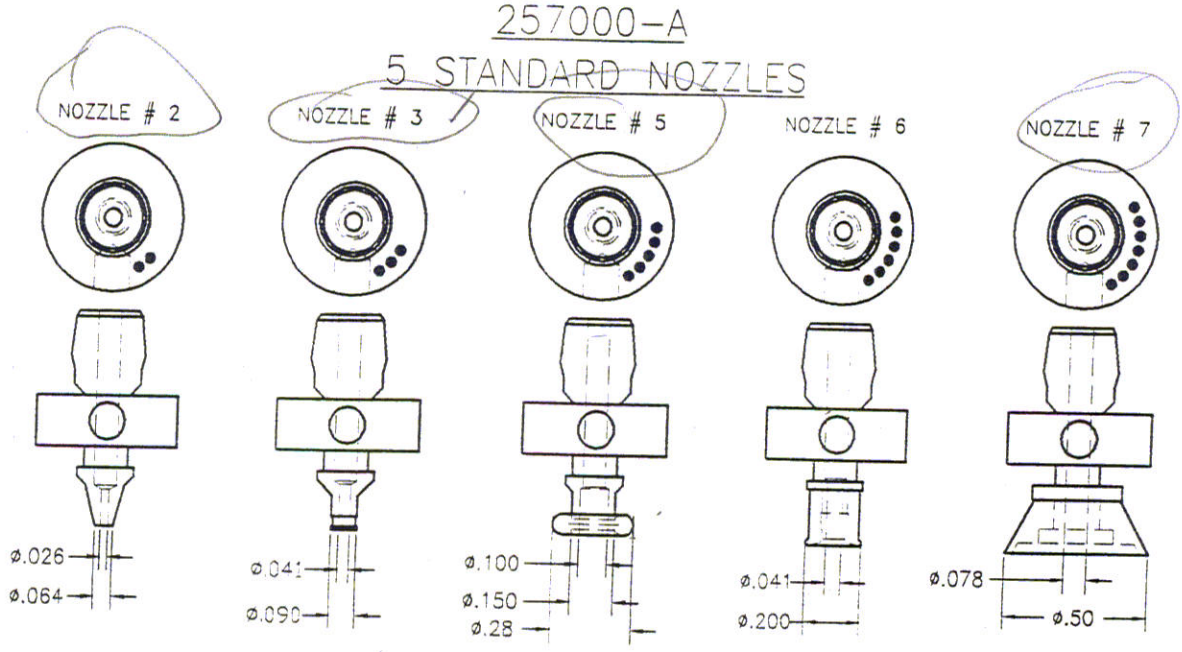
Matrix trays have to be positioned in nearly exactly the same location they were programmed. Again use the software to aid in this process but without moving the camera over the tray. If you cannot properly line the tray up for whatever reason, simply align the software to its new position using the Tray Teach feature (see the chapter on Feeders for help). Available parts in a matrix tray feeder may need to be edited (good, bad, or empty). A quick way to reset a tray is to click the Replace Tray button in the tray editor screen.

BALL DETENT NOZZLES

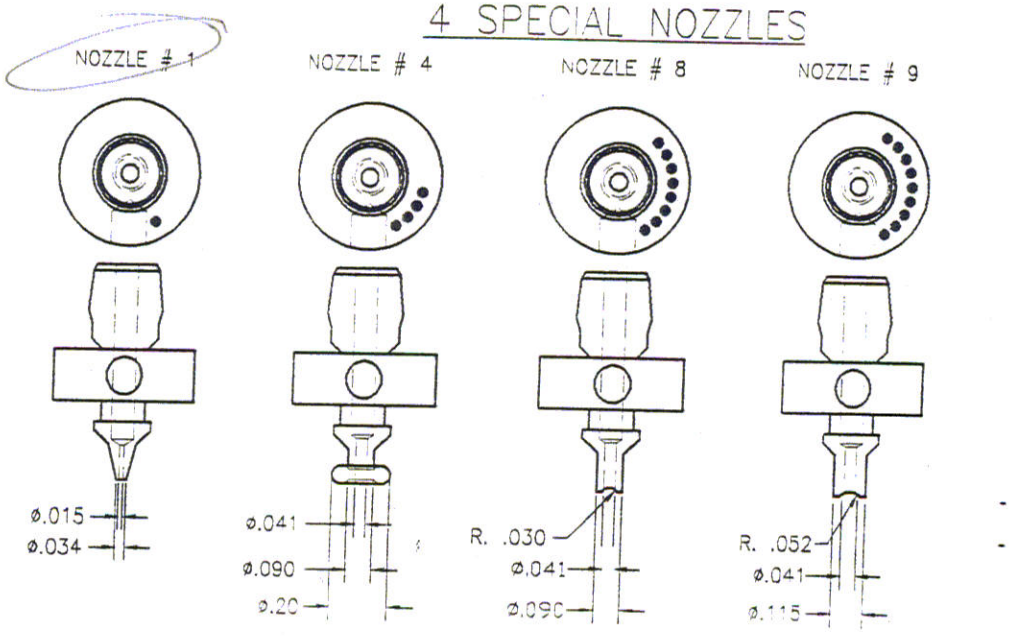
USED ON MACHINES WITH 213000-B & 213000-C HEAD ASSEMBLIES:

257000-A

5 STANDARD NOZZLES



4 SPECIAL NOZZLES



NOZZLE #	MULTITRONIKS ORDER #	MULTITRONIKS SUCTION CUP #	RECOMMENDED FOR USE WITH THESE COMPONENTS	SELLING PRICE
1	257018	NONE	0402 AVAILABLE SPECIAL	$90.00
2	257019	NONE	0603, 0504, 0805, 1206, 1005	$60.00
3	257016	NONE	1210, 1805, 1808, 1812, 1825, SOT23	$60.00
4	257016-B	O-RING #40921	2218, 2220, SO8 — SO20 AVAILABLE SPECIAL	$65.00
5	257017-B	O-RING #40922	SO8L, SO28, VSO40 — VSO56, PLCC18 — PLCC32	$75.00
6	257025	SUCTION CUP #46914 (MOD.)	2218, 2220, SO14 — SO20, SO16M, SO8L — SO20L, PLCC20, PLCC28	$90.00
7	257020	QFP SUCTION CUP #EA043039	PLCC44 — PLCC84, QFP44 — QFP256	$115.00
8	257021	NONE	MINI-MELF (RADIUS IN LINE WITH MAGNET) AVAILABLE SPECIAL	$90.00
9	257022	NONE	MELF IN (RADIUS LINE WITH MAGNET) AVAILABLE SPECIAL	$90.00
257000-A SET OF 5 STANDARD NOZZLES (INCLUDE: #2, #3, #5, #6, & #7)				