vsmtsolutions

V Range

Training Schedule & Manual

Table of Contents

Versatronics Quick Check

System Start Up & Shut Down Procedure

1. Ensure that the machine is supplied with mains power via the 3-pin plug
2. Ensure the pick-up head is in the park position. (On the left hand side at rear)
3. Ensure the emergency stop button is in the out position (twist to check).
4. Ensure the feeders are turned on (red switch on each feeder)
5. Press the green button (all feeders will self test)
6. Open the door on the right hand side of the console
7. Turn on the computer (vacuum pump will run for approximately 2 seconds
8. Wait for Windows to fully load
9. Proceed to the card relating to the next operation required
10. Close the program in use (in RVPlace the arm will move to the park position)
11. Close down Windows (the PC will power down without any operator action
12. Press the red button

Basic Instructions
RVGerber

1. Start the RVGerber program by double clicking on the icon
2. Create a ““BOM”“ (bill of materials) as follows
3. Select “BOM”, Select Manual edit/create
4. Add components as required in the add/edit area
5. Click on add to add an item to the “BOM”
6. When completed click on save and name your “BOM”. Place in the “BOM” folder.

Notes:	*To create a new “CDF” simply type a new name in the “CDF” section. You will be promoted for details when the “BOM” is loaded during item 6.* *To edit a component in the list simply double click on its entry and it will be placed in the add/edit area for editing.*

7. Open the gerber “FILE”, select ““FILE”“, then select “open gerber”
8. Select the required “FILE” for the paste layer, scale as required
9. Open further gerber layers (track and/or ident) as required, scale as required

Notes:	*Ensure the layer to be opened is checked in the layer type box*

10. Open ““BOM”“ “FILE”, select “open”, then select “open “BOM”“
11. The cursor now displays the next components to be placed

Notes:	*to select a different component – right click and select desired component*

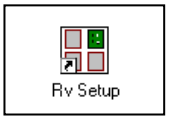
12. **NON-IDENT LAYER ONLY**. To place a component, place the mouse in the vicinity of the pads for the item, click and hold the left hand mouse button and drag the mouse across all pads required. Right click to place the component.

13. **IDENT LAYER IN USE**. Double click anywhere on the P.C.B. and answer, “yes” to the prompt. The ident layer will be scanned and components matched to the “BOM”. Double click will now zoom in on the ident. Select pads as in item 8 (if required) and right click to place.

Note:	*To deselect the incorrect pads, left click and drag around the pad to be deselected.*

14. Add references (fiducial points), select “program”, and select “add references”.
15. Select a pad at the desired location and a fiducial point will be inserted. Repeat as required.
16. Save the “FILE” as a transfer “FILE”. Select ““FILE”, select “save transfer “FILE””, name the “FILE” and save in the TRF folder.

Note:	*To delete reference points select “program” select “delete references” and click on a point to delete*



RVSetUp

1. Click on RVSetUp icon select ““FILE””, Select “open”.
2. Set up the step and repeat (if required). Select “setup”, Select “step and repeat”.
3. Complete the “number of panels” and “offset” sections and select “OK”.

Note:	*Steps 2 and 3 are only required on initial build. It is advisable to save your work, as a transfer “FILE”, at this point. Select ““FILE””, Select “save”. The next time the transfer “FILE” is opened the step and repeat*

4. Edit the References. Only two reference points are required. Select “references”, Select “select/edit refs”. Click on a reference point (highlighted) and uncheck the tick box (click on the tick) for all non-essential references.

Note:	*All non-used references appear as red; all in use references are displayed in green.*

5. Allocate the components to feeders. Select “feeders”, Select “allocate feeders”
6. Feeders are selected from the “available feeder units” area by double-clicking on the required type.
7. Components are placed on a feeder by selecting the required feeder in the “selected feeder units” area, Selecting the required lane in the “feeder lane” area and double-clicking on the desired component in the “unassigned components” area.

Note:	*To remove a feeder from the “selected feeder units” area or to remove a component from a lane. Double-click on the item to be removed. Repeat steps 4 through 7 until all required components are allocated to feeders*

8. Position the feeder units. All allocated feeders are displayed in the “feed unit positions” area. The outside columns relate to the 8 feeder positions available around the outside of the machine.

9. To move feeders between positions, click on the desired feeder; select “move lane” in the actions area and click on the required position. If a feeder is in the “target” location. The feeders will swap positions
10. Upon completion of feeder allocation, select “OK” and answer “Yes” when prompted to save changes.
11. Save the transfer “FILE”. Select ““FILE”“, Select “save”.
12. Export the job. Select ““FILE”“, Select “export as job”
13. Exit the program. (You will be prompted for a further save and export)

Note:	*The center column is used for the placement of passive feeders and waffle trays.*

Feeder Set-Up

1. Follow the instructions in RVPlace to step 7.
2. Select “setup”, Select “setup feeders”.
3. Click on the desired feeder.
4. Select the required operation “set 1st ref”, “set 2nd ref” or “edit biases”.
5. Move the placement head over each position in turn and adjust for X, Y, And height as required.
6. Repeat items 4 and 5 for each feeder.
7. Upon completion, select “OK”.

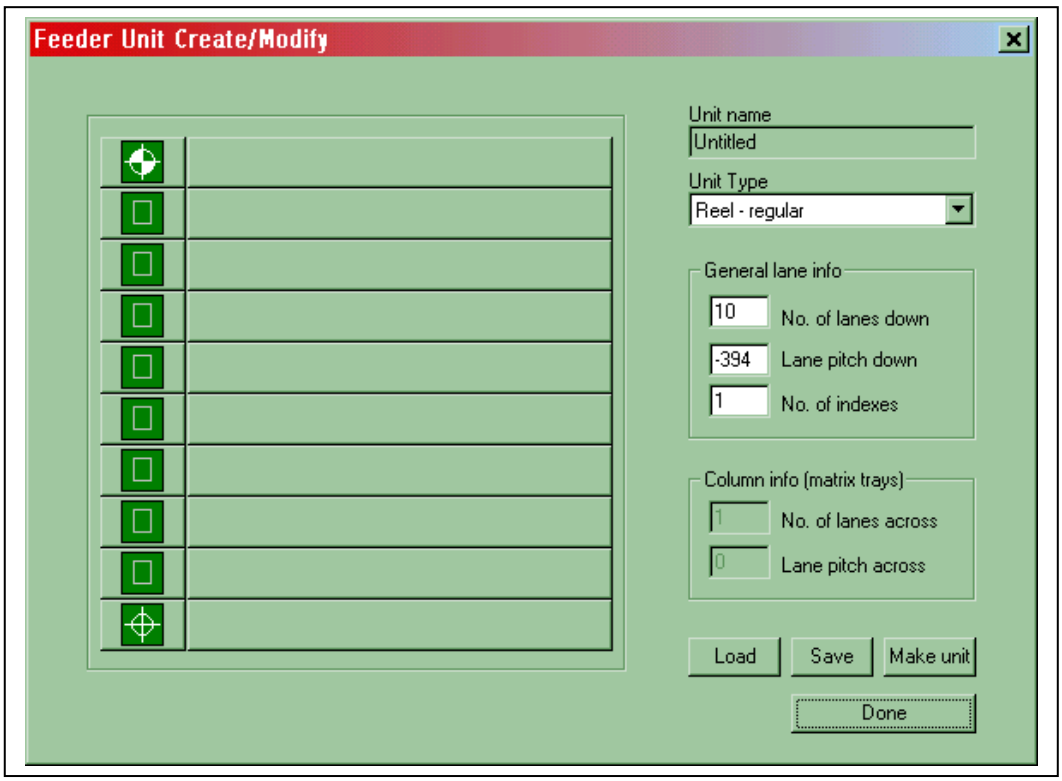
Note:	*Whilst it is possible to align the feeders using the fiducial camera, this should only be used as a rough alignment tool and not for fine adjustment. Correct alignment must be carried out using the tool installed on the pick-up head.*

RVPlace

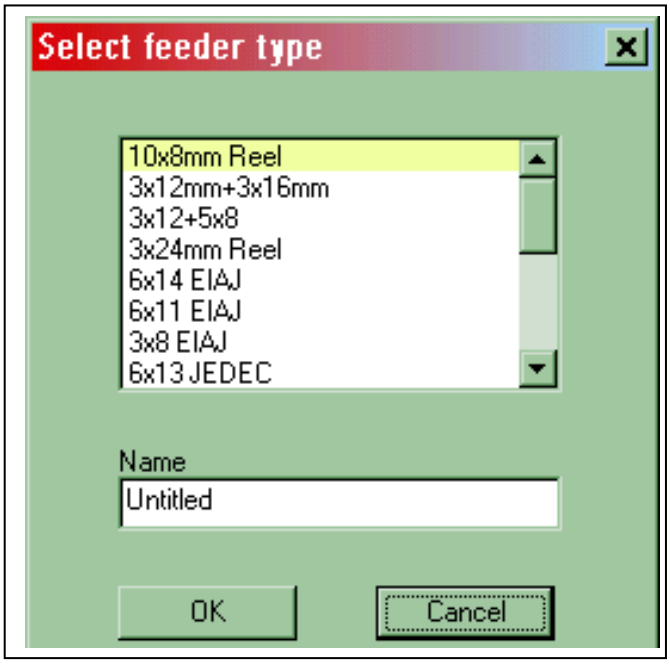
1. Double-click on the RVPlace icon.
2. Click on the “exit” button.
3. Select ““FILE”“, Select “Open Job”
4. From the Job folder select the required job “FILE”.
5. Wait for the arm to complete the start-up sequence.
6. If this is the first start-up of the day select “yes” when prompted for warm-up.
7. Ensure the feeders are set-up (see Feeders Quick start sheet).
8. Ensure the P.C.B. is installed in the correct position in the jigging.
9. Click on the place icon.
10. Select auto-fiducial correct as required.
11. Click on Place.

How to create a multi-Index Feeder.

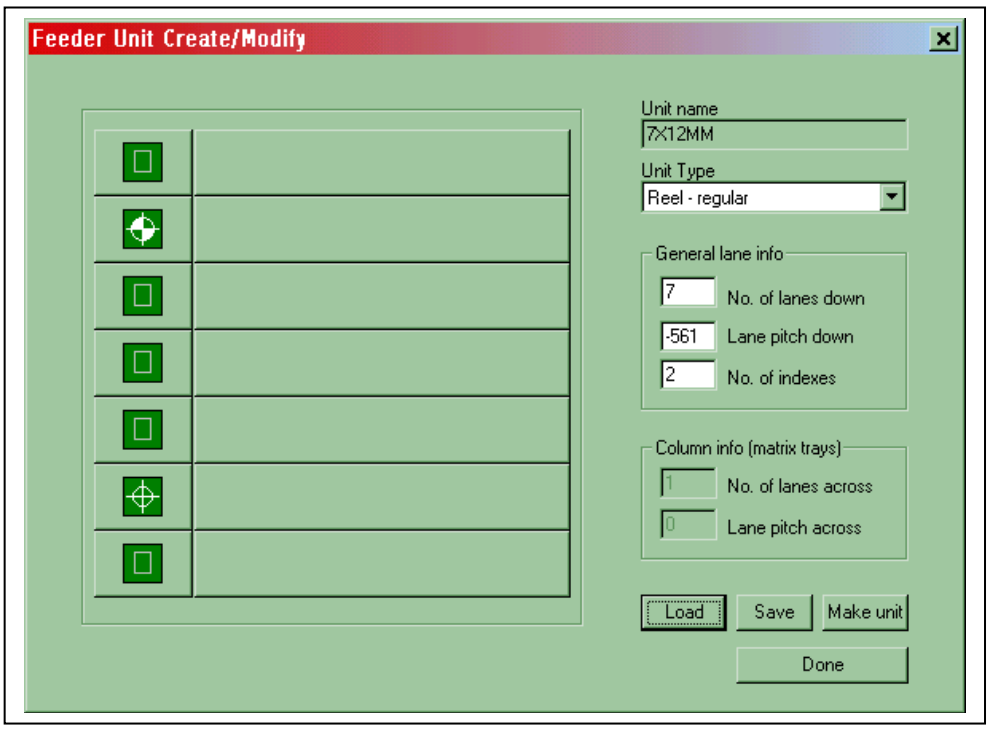
1. Start RVSetUp
2. Select FEEDERS
3. Select Create/Modify types (the following screen will be displayed)



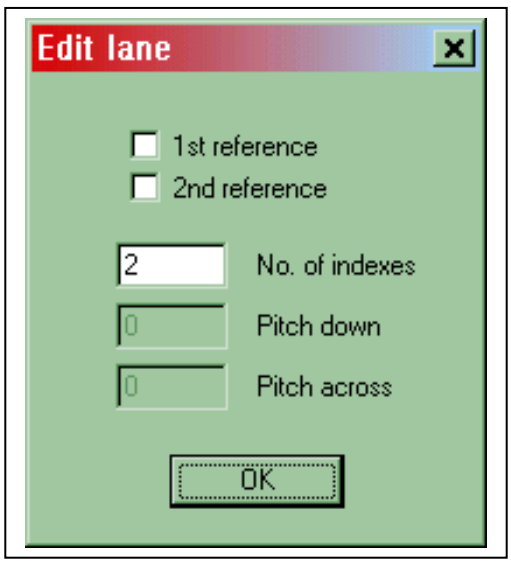
4. Load the type of feeder to be created (in your case it would appear to be a 7x12) by selecting load. (The following screen will appear)



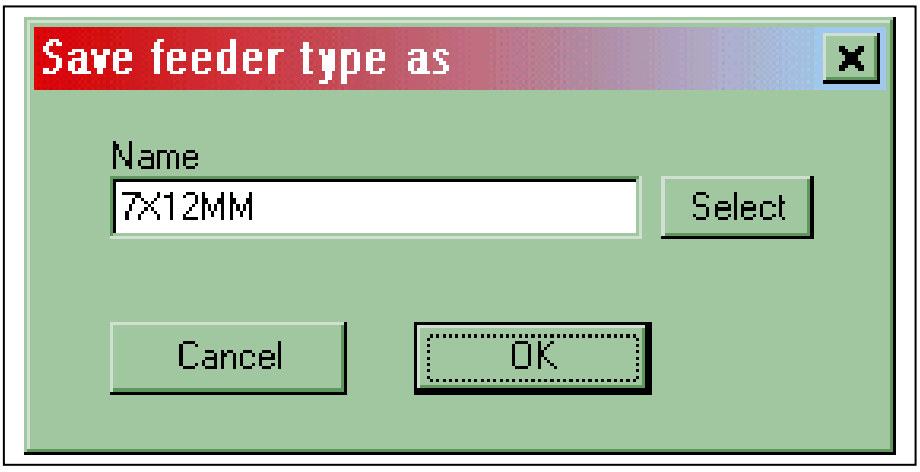
5. Scroll down the list and select the required feeder (the original display will now look like the following screen)



6. To enable multi-indexing replace the number in the box marked “No. Of indexes” with the number 0 (in the case displayed replace the number 2 with the number
7. To change the indexing properties of each individual lane, click on the green lane marker (lane 0 is the topmost box) The following screen will now be displayed.



8. In the box marked “No. Of indexes” replace the number displayed with a number corresponding to the number of indexes required for this individual lane. In your example lane 0 requires 1 index therefore select lane 0 and replace the existing number 2 with the number 1.
9. Select “OK” and carry out operations 7 and 8 for each lane within the feeder.
10. If there is a requirement to move the reference points for the feeder carry out the following operations.
11. Select the lane (as described in operation 7) where the first reference is required.
12. Click in the box to the left of the words “1st reference”. A check mark will appear.
13. Select “OK”
14. Select the lane (as described in operation 7) where the second reference is required.
15. Click in the box to the left of the words “2nd Reference”. A check mark will appear.
16. Select “OK”
17. Select the option to “save”. (The following screen will be displayed)



18. In the white area of this screen, enter a name for the TYPE of feeder you wish to create (I would suggest something along the lines of 7x12multi1).
19. Select “OK”
20. Select “make unit”
21. A standard Microsoft save screen will appear.
22. Select a name for this individual feeder. (I would suggest the job number and feeder position. i.e. 1234C)
23. The feeder creation is now complete and the feeder will be available for inclusion within any job programmed. Simply select “feeders” then select “allocate feeders”. The new feeder will be available in the listing in the top leftmost window marked “Available feeder units”. Selection of this feeder for inclusion within the job is by double-clicking on the feeder within this window, the feeder will move to the window marked “Selected feeder units” and will be available for loading of components.

Sequence of events during multi-index

During multi-index operations, it would sometimes appear to the casual observer that the machine is not carrying out the multi-index sequence correctly. Please refer to the following dialogue to gain a better understanding of the sequence of operations.

1. When a component is picked from a multi-index feeder, the feeder will index one time.
2. When the component has been checked for size and immediately prior to placement operation any further indexes required are carried out.
3. If the component is rejected by the system for any reason, the remaining indexes are not carried out. The reason for this apparent lack of action is to overcome any mismatch between component position and correct indexing sequence.
4. In the case outlined at item three, further pick operations will be carried out until the component is in the correct position and a successful pick is achieved.

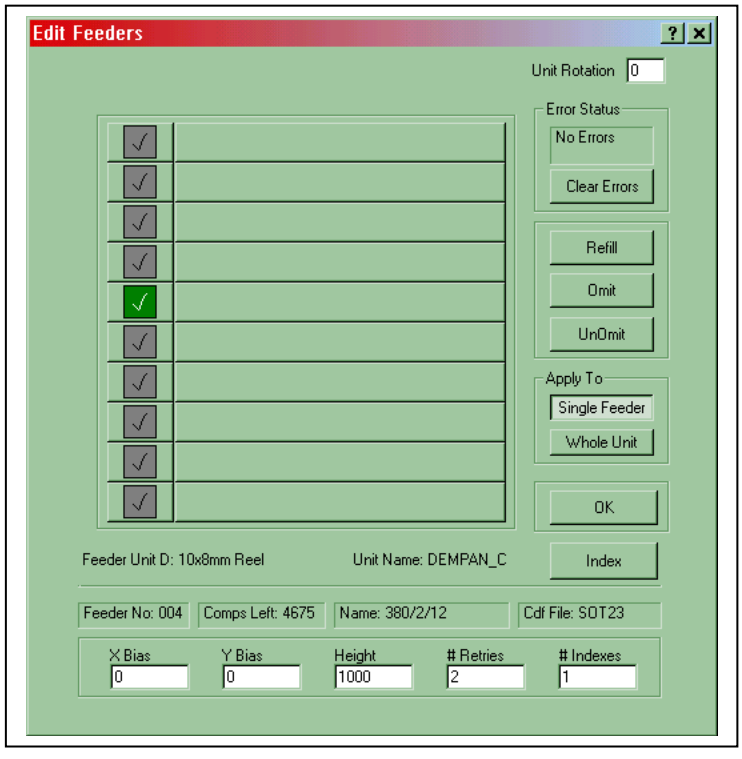
Note:	*The feeder will only index to the next component if the "number of retries" is set to either equal to or higher than the number of indexes required to bring the next component into a pick position*

“CDF” Run Time Testing

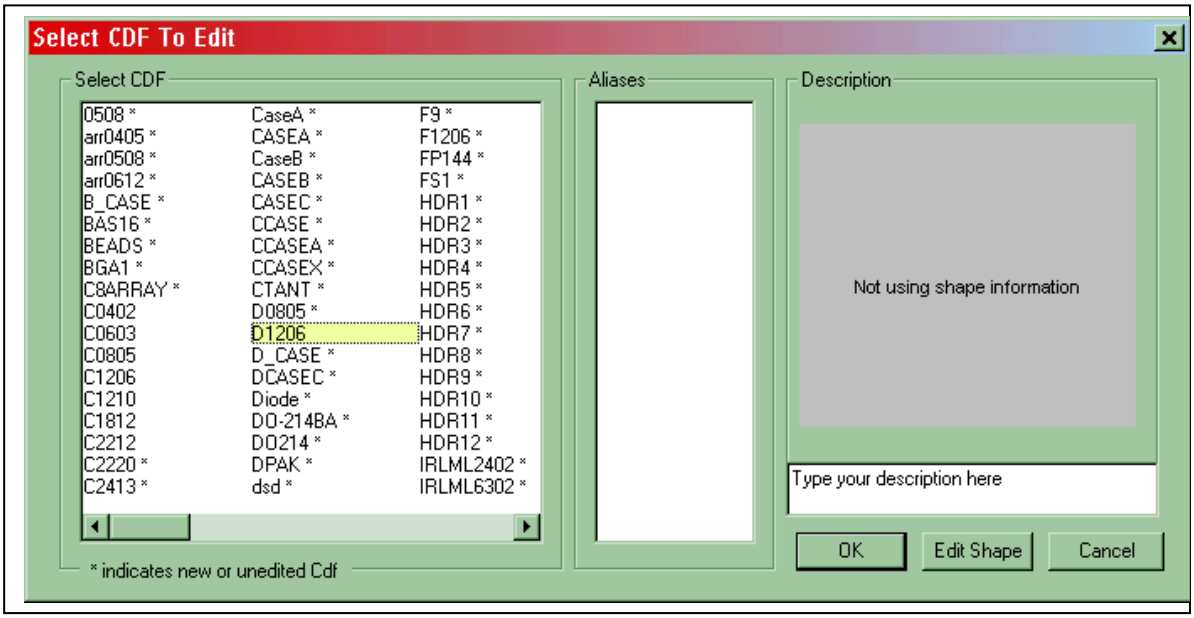
The run-time test is a facility offered by the software to enable the user to check image quality and sizing information. The system operates by selecting a single component of the type requested and offering this component for editing repeatedly until the operator is satisfied with the image quality and size. The component will then be placed and the remainder of the “PCB” will then be placed in the normal manner.

To assist you in carrying out run-time tests, please follow these instructions.

1. Start RVPlace
2. Open a job with the required component available for placement.
3. Carry out normal set-up procedures for the “PCB” to be placed.
4. Ensure you know the correct name of the component to be tested.
5. Select “edit”
6. Select “edit feeders”
7. In the window that appears, select a feeder containing the device to be tested (the following screen will be displayed)



8. Select the lane containing the device to be tested. (In the example above, lane 4 has been selected by clicking on the green check mark)
9. Check the box titled ““CDF” “FILE”:”. This box will contain the correct “CDF” name for the device to be tested. *(Don’t assume, check. Incorrect “CDF” name selection is the most common reason run-time testing not occurring as expected).*
10. Once identified click on “OK” to close the feeder window
11. Click on “OK” to close the edit feeder window
12. Select “Edit” from the toolbar
13. Select “Edit “CDF” “File’s” (the following screen will be displayed)



14. Select the required component type and click on “OK”
15. In the edit “CDF” window place a check mark in the box entitled “run-time test”
16. Click on “OK” to close the edit “CDF” window
17. Click on the “place all” icon.

18. Ensure that the “PCB” to be placed still has to place at least one of the component type to be tested (second most common reason for run-time test failure)
19. Ensure that the feeder lane containing the device to be tested is not in error from previous attempts to place the device (third most common reason for run-time test failure)
20. Carry out the normal operations to enable placement of the “PCB” to commence.
21. The device will be the first component picked for placement overriding the normal placement sequence. The device will be measured by the camera, moved to the placement position then returned to a position above the feeder.
22. Select options as required ensuring that the particular reason for carrying out the runtime test are fulfilled.
23. Continue as required.

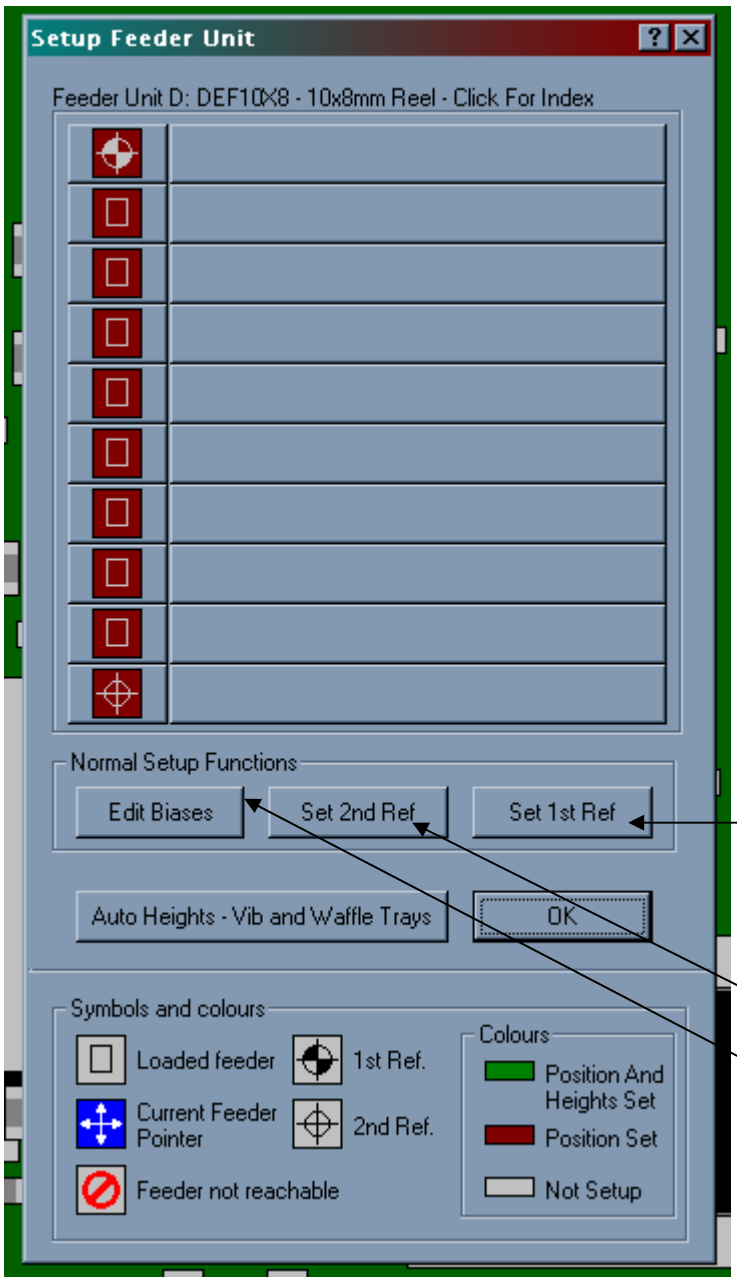
Quick Guide

System Set-Up

Action	Why	Typical result of getting this wrong
Place board on machine bed and ensure it is firmly supported and cannot move.	Boards can move and effect placement. They can bounce and flex.	Poor placement accuracy and variable results. Parts appear to have been dropped and are not straight
		If necessary tape the edge to the jigging to hold in place
Set up “PCB” reference points (using Fiducial marks)	This tells the machine where the board is. Use the Tool tip to locate the reference point.	Poor placement accuracy
1st ref	Usually at the front left corner of the board	
2nd ref	Usually at the back right corner	
		If 2nd ref is in wrong place placement accuracy will be affected.
Measure heights	This tell the machine the position to place parts relative to their height	Parts will be dropped on to the board or pushed “through” it. Both will make look like a mess.
	Enter – 5 in the Z Bias window. This takes up any bend in the board.	
Set up “PCB” refs (Using via holes)	This tells the machine where the board is. Use the Tool to locate the reference point.	Poor placement accuracy. This method is not going to give good placement repeatability on fine pitch devices.
1st ref	Usually at the front left corner of the board	
2nd ref	Usually at the back right corner	
		2nd ref is in wrong place placement accuracy will be affected.

Measure heights	This tells the machine the position to place parts relative to their height. Ensure that the tool does not go in to the hole. Place sheet of paper over hole.	Parts will be dropped on to the board or pushed “through” it. Both will look like a mess.
	Measure thickness of paper and enter this value and another 5 as a negative Z bias	
The Board position is now Set		
Set up Fiducial correction	This corrects inaccuracies of up to 40”thou in the outline of the “PCB”	
Types of mark		
Flat round pads		Best. Trim image window and use size reject to eliminate unwanted data from the image.
Via holes	Use via holes that have clearance round them	Via holes: can be used however if that are not flat (hot air leveled and tinned then the image can be unreliable and correction may have to be carried buy the operator
Via hole with tracks		Not suitable as the registration varies on the solder mask layer and this cause creeping. Will need operator intervention
Pads	Can be used but useless once pasted.	
Shapes	Any shape will work with fid correction. Not smaller than 10 thou.	

Feeder Set-Up



Lane 0

Lane 1

Lane 2

Lane 3

Lane 4

Lane 5

Lane 6

Lane 7

Lane 8

Lane 9

This sets the 1st ref position

This sets the second ref

Edit biases, this is used to set the component height. This MUST be done. It is also used to allow the pick up position to be central for all length of parts. Also allows for the tailoring of a pick up position.

Edit biases – different sizes and types of tape

If the feeder contains the same parts in all lanes then set 1st ref, set 2nd ref then edit biases and set the pick position height. Then heights apply to all feeders.

If you have parts that are different sizes set the lanes so the majority of sizes are located together, then set your heights. Edit biases from that part and apply to current feeder only. This saves time, as the majority of pick heights will not be affected.

Plastic tapes

The aim is to optimize picking repeatability buy reducing component bounce and retries. Plastics tapes are flexible and springy this means parts can bounce out. To prevent this set up the pick position on the 1st clear pocket past the stripper plate.

Then set the pick height to just touch the part then go up by 10thou. This effectively sucks the part from the tape and doesn't bend it making the following part bounce.

Also not using merge moves improves pick up as the tool comes straight down not at an angle and this also reduces tape movement.

In extreme case a light tension can be applied to the waste end of the tape which helps reduce flex during indexing.

Also changing the Z speed to medium and arm speed to medium can also help reduce mechanical movement on the system. Try to avoid close proximity of Vibratory feeder to a bank of plastic tapes.

All these steps make the picking operation smoother and reduce retries and lost time.

Paper Tapes

Set the height on paper tapes by touching the part, then going down by 10thou.

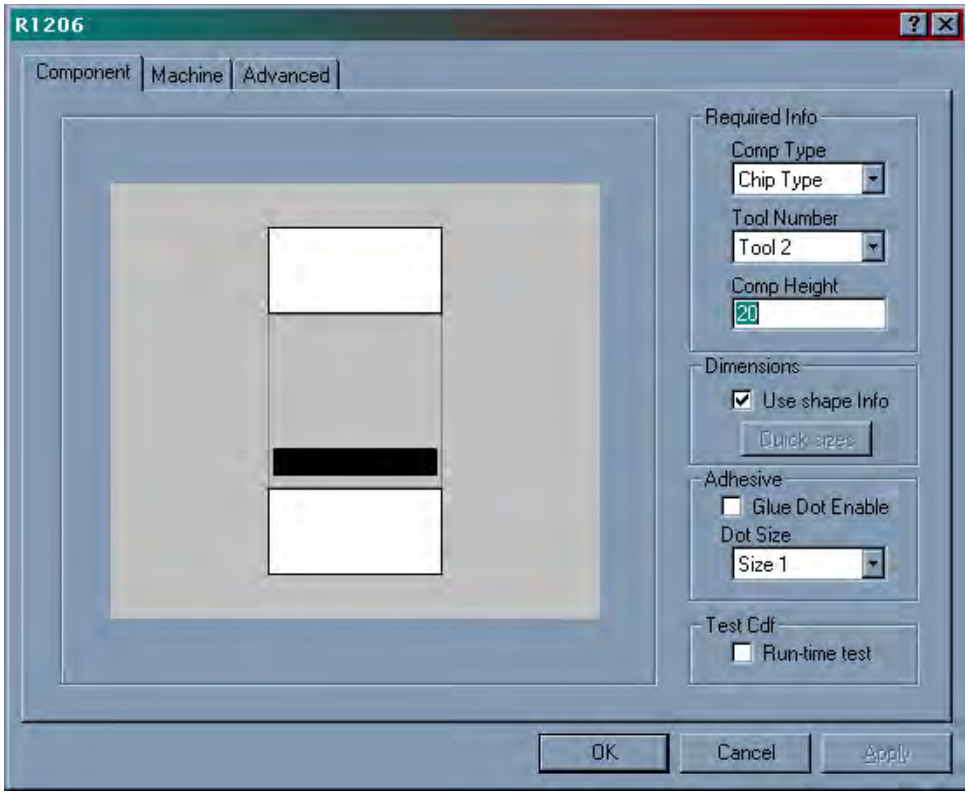
Pull off tension

The spring at the rear of the feeder alters the pull of tension for the cover tape. If doesn't pull back to clear the part then screw clock wise while indexing until the tape pulls off cleanly. Over adjusting will stop the tape indexing forward.

“CDF’s”

A “CDF” is a Component Description “FILE”. It is the cornerstone to machine operation. Understanding what the various fields do is paramount to getting the best from the machine.

Component page.



Required info

Comp type.

This drop down box shows the generic part type.

Tool No.

This allows the selection of the most appropriate tool for the device. In general use the biggest tool on the device. For 1206 to 0805 tool 2, 0603 tool 1 and tool 6 for 0402. A good vacuum seal is essential for reliable and consistent placement.

Comp height

This is needed to ensure that the part is correctly focused on the vision systems. Measured in thousandths of an inch.

Dimensions

Use shape info / Quick sizes

By selecting the shape info box a graphical representation of the device is displayed when programming. This can aid in the correct placement of SOT type devices as the leads are shown.

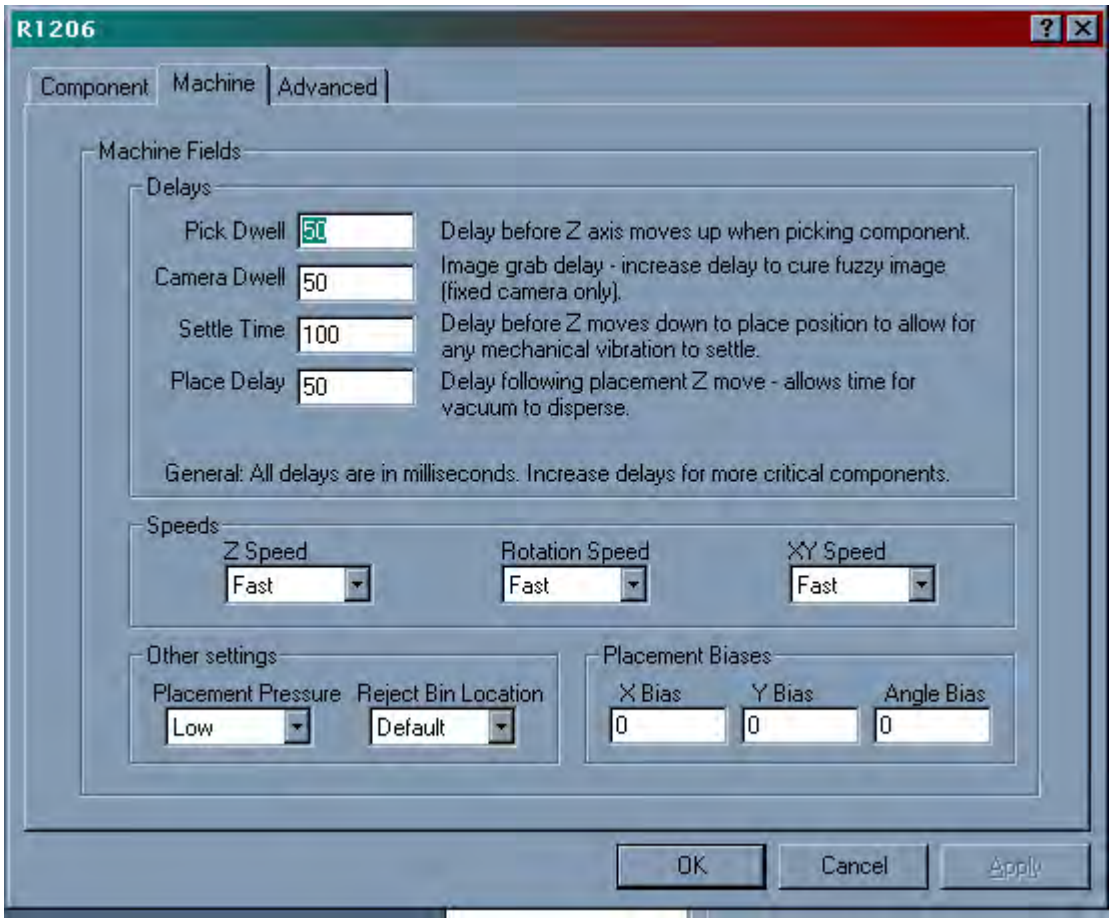
Also part numbers will be displayed on the device type with shape info selected in RVGerber

For simple devices the quick sizes allows entry of the x and y parameters to be entered (these can be measured using run time test).

Run Time test

This function allows a device to have the parameters adjusted by using the cameras to get an image.

Machine Settings.



Machine Fields

Pick delay.

This holds the tool over the part to allow the vacuum to pick the part

Min Value 25 (this is milliseconds)

Max Value 100

Camera Dwell

This holds the part over the camera to get a clear image

Min 25

Max 250 (greater than this has no effect)

Settle time

This is the delay over the place position to allow the arm to settle

Min 25

Max 100

Place delay

This how long the tool waits before leaving the component on the board?

Min 25

Max 250 If greater than this is needed there is likely to be another reason for the part not leaving the tool tip. Often poor condition paste will need to have higher than normal place delay.

Speeds

This field enables the arm speed in all axis to be controlled, this can improve placement performance and picking reliability for some parts.

In general for chip type parts these can all be set to fast? As tool gets bigger these setting move towards slow.

Slowing the Z-axis can improve picking from plastic tapes.

Slowing the rotation speed helps ensure good placement with larger heavier parts (QFP and D case capacitors

Slowing the X/Y again helps with fine pitch and heavy parts as the inertia in the device is reduced.

If parts are not placed at the correct angle it is usually because the device is moving on the tool.

Placement pressure

Controls the force with which the device is place. Useful if placing on to fragile surfaces.

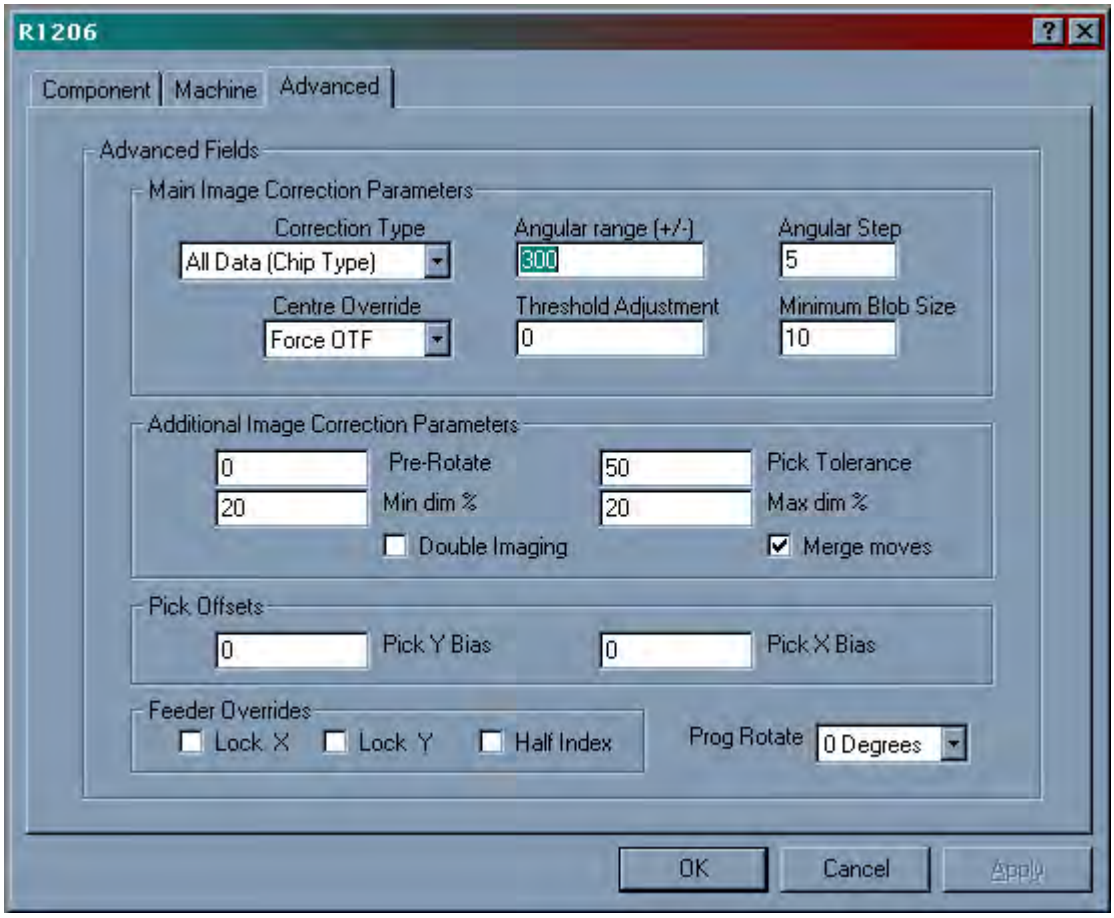
Reject bin location

This enables a device type to be placed in a pre assigned area if not placed. Useful for separating expensive parts from low cost items.

Placement biases.

These fields allow for any placement biases to be applied to all devices of this type, this is useful for devices where the image centre is not the physical centre and allows the off set to be built in (Power devices). Also if a device tends to place with a rotation this can be offset in the Angle field.

Advanced



Main image correction parameters

Correction type.

The options are

All data (chip type)

The all data takes the overall viewed size to calculate the device centre, this also works well if there is very little contrast between the device and the pads notably ceramic type devices.

Lead ends (SOIC QFP)

Leads ends is for IC's and sots where there is a high contrast black device with multiple leads. Also for large case capacitors.

Lead centres (PLCC)

Lead centres are for PLCC and takes into account the fact that the lead is bent under the body.

No correction

No correction!

Centre override.

This actually chooses the camera that it uses and how the device is imaged. By using automatic the system decides which camera to use and whether multiple images are needed to get a full picture.

Force OTF

Uses the on the fly camera and this is suitable for chip parts and up to SO14 IC's and SOT23. D case type caps or devices more the 3 mm thick are not suitable because the focus height exceeds the axis travel.

Force Fixed

Uses the static camera and this can sometime be better where a device has low lead to body contrast.

Angular range

This is the amount in 10ths of degrees that the system will rotate the device to square it before placing. This should be as small as possible to prevent over rotation. Typically with SOT23 when 130 is optimum

Angular step

This is the interval at which the device is rotated.

Threshold adjustment and Minimum blob size.

These are the key to successful placement. To optimise these setting an understanding of their relationship is essential.

First set the Blob size to get eliminate extraneous data from the image e.g. if the leg width of and IC is 15 thou then set blob size at 10.

If the size is increased beyond that of the size of the device then no image is displayed.

Once this is set the threshold can be altered to effectively give greater detail to the image by entering a – number or reduce by a + number.

Additional Image Parameters

Pre Rotate

This rotates the device over the camera. Will improve image on devices like case type capacitors. The cameras are in landscape format so if a device is large the pre rotate will get more of the device imaged.

Pick Tolerance

This allows modification of the image size when using multiple images to construct the overall picture. With QFP's it will move the corners of the device in with relation to the centre of the camera.

Min and Max Dims

This is the size tolerance. Should not be over 20%. Should be reduced for complex devices.

Double Imaging

Takes 2 images for improved accuracy as the data is averaged out.

Merge Moves.

This combines the x,y, z and r movements. Generally turn off for devices in plastic tape or fine pitch devices.

Pick Biases.

This allows devices to be picked off centre.

Pick lock

Can be used to lock the picking position. Other wise the system tunes the pick position during placement. It can stop creeping on odd form devices. Pick Lock position for devices in Vibratory lanes.

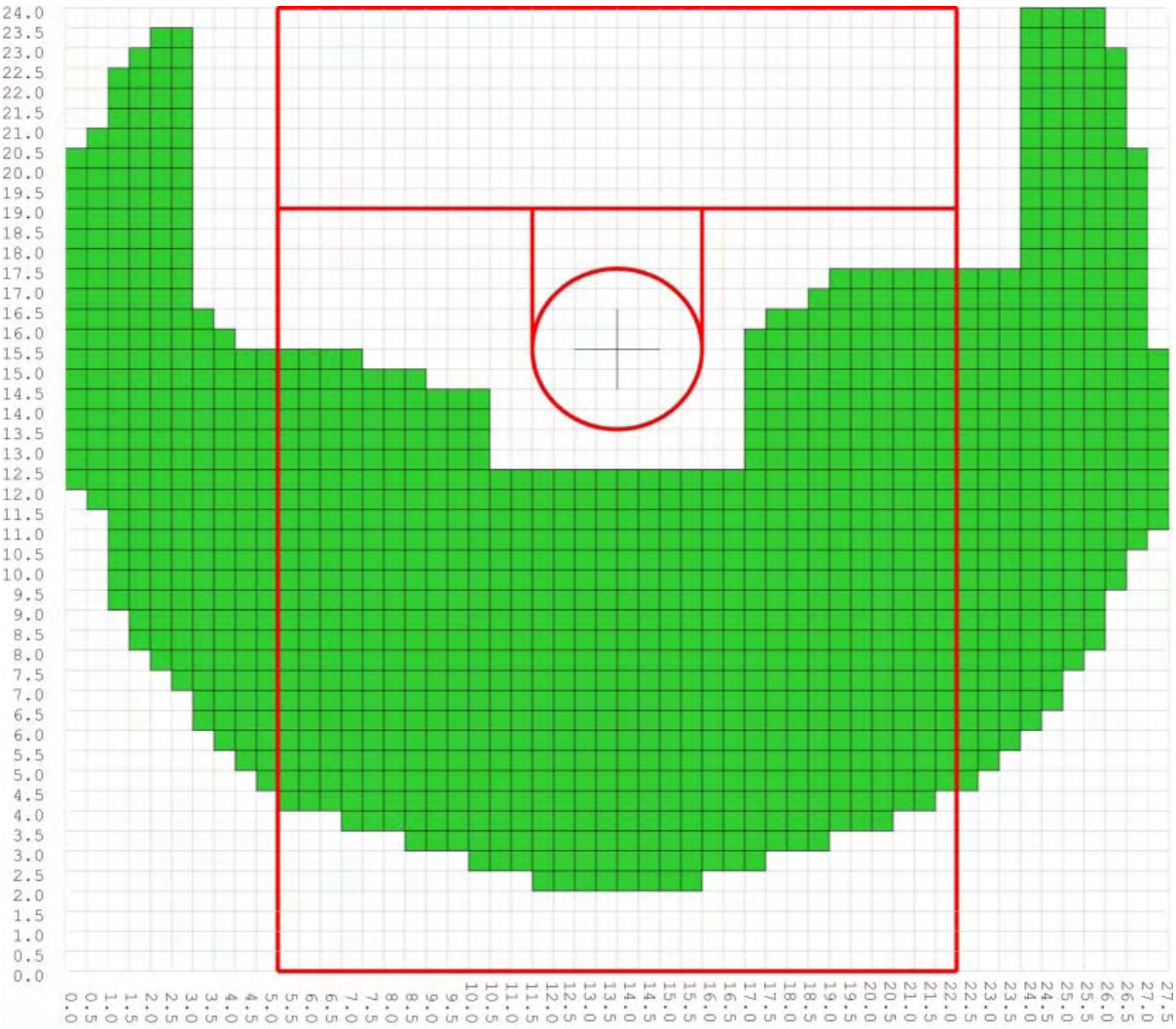
Half index.

Check this for 0402 devices to use only 1 index for 2 device picks

Prog Rotate.

Allows devices to be rotated if the program is wrong.

XY Travel Limits



Training Record Appendix
Basic Programming Training Agenda and Record for

_____

GERBER 2.8

1. Loading layers

I know how to load layers and which ones I need and how to edit them and create a TFR file, this includes;

Function		Full Understanding	Partial Understanding	No Understanding
Layer conversion				
Aperture modification				
Ident scan				
Layer transformation				

My TFR file is called _____

2. Making up a BOM

I know how to make a BOM and how to edit it, this includes;

Function		Full Understanding	Partial Understanding	No Understanding
Selecting a CDF				
Editing entry details				
Creating a New CDF				
Making changes to a BOM				

My VBM file is called _____

3. Programming parts on to the board

I know how to make a program and how to edit it, this includes;

Function		Full Understanding	Partial Understanding	No Understanding
Using the ident scan				
Editing entry details				
Adding references				

My TFR file is called _____

Training Record Appendix

Basic Programming Training Agenda and Record for

_____

RVSETUP

1. Allocating the components - I know how to load the components and which feeders I need. How to edit them and create a new feeders, this includes;

Function		Full Understanding	Partial Understanding	No Understanding
Allocation of parts				
Loading feeder units				
Creating new feeders				
Setting up indexing				

My TFR file is called _____

2. Setting up the Step and repeat - I know how to do this and modify the spacing, this includes;

Function		Full Understanding	Partial Understanding	No Understanding
Step & repeat				
Which references to use				

My TFR file is called _____

3. Exporting a job - I know to make a JOB file that will place the parts, this includes;

Function		Full Understanding	Partial Understanding	No Understanding
Exporting the JOB				
Checking parts				
Creating new feeders				
Setting up indexing				

My JOB file is called _____

Training Record Appendix

Basic Programming Training Agenda and Record for

_____

RVPLACE

1. Starting the Machine

Function		Full Understanding	Partial Understanding	No Understanding
Switch the machine & PC on & off				

2. Set-up the PCB - I know how to set-up the PCB position on the machine. This includes

Function		Full Understanding	Partial Understanding	No Understanding
Clearing Errors				
Moving the arm				
Setting up the references				

3. Set-up the Feeders - I know how to set-up the feeder positions on the machine. This includes

Function		Full Understanding	Partial Understanding	No Understanding
Setting up the references				
Edit biases				
Setting the heights for all tape types				
Locking the pick position				
Understanding Merged moves				

My JOB file is called _____

4. Set-up the Fid cam - I know how to set-up the fidcam. This includes

Function		Full Understanding	Partial Understanding	No Understanding
Setting up the thresholds and bit sizes				
Using useable fiducial marks				

My JOB file is called _____

Trouble Shooting
Questions & Answers

Setting up CDF parameters

"It's throwing the bits away!"
This one needs a little thought. Basically the RV system uses a high quality image recognition system. The parameters for each device type are contained in the CDF (component description file). If parts are picked but then not placed its because they fail to meet the settings in the CDF (or the camera isn't on)

"What do I do then?"
Well the first thing is to use the runtime test to see what the image looks like. From there look at the data window and read what it says (like "size reject <") this is a big clue. Are you using quick sizes or Shape information? Are the correct dimensions entered and are the tolerances realistic, please not much more than 20% on size else it will place an SO16 when it's supposed to be a SO14.

Ok size seems to be right but no image, so if the screen shows a picture of the device instead of an image you have the threshold to high (more than 60 typically). When its this high no image generation takes place and it throws the part away. So set that threshold to 0 as start.

" I got a image but the legs are missing"
Were getting there but let's think again. The box next to threshold is key now. Called "blob size" it controls the size of the data bits that the image system uses, nifty heh. So set it to a small number like 5.

"Ok I got all the legs now but there's legs showing that aren't there!"
Not exactly. Now as the blob size is so small anything bigger than 5 thousandth of an inch because that's what we just entered, all that dust that you haven't cleaned of off the camera is standing out like a sore thumb. Give it a clean and we will carry on.

"Alright done that"
Good, now increase the blob size until the graphical image goes away and don't worry it will unless you are placing golf balls. Right what's the biggest number?

"30"
Excellent, so set the blob size to typically a third of that figure, lets try 10 as that then ensures the leads (that you want) show up and the dust (which you don't) doesn't

" Right I can see all the legs, but there's gaps"
That's right it's the bend in the lead frame, it appears darker than the lead ends as that light is reflected away from the camera. So to get more of the leads lower the threshold. Try steps of –10. Not too low else your will get a great image of the nozzle and the system placement head too. Also you can see the image degrade to a mass of black dots if you go to far (typically –80). One trick is to go as low as you can whilst still retaining a clear image, then as high as you can before the image is not produced. Then take the variation and divide it by 2, so if the lowest figure is –50, highest is +30 we get a difference of 80. 80/2 is 40 so set the threshold to -10. This will the give a good image and allows for variation in the lead brightness.

"It's now saying size ok and placing"
Phew we got there.