

# Vision Offsets Calibration

(Overview) The camera offsets calibration procedure is used to compensate for normal tolerances in the camera and lead screw, probe angle along with camera to rail parallelism and table twist.

You should perform this procedure after replacing, calibrating or adjusting the camera assembly, any front rail movement or table adjustments.

Failure to complete this calibration after camera system repair or previous calibration, will result in poor prints and failure of the machine to auto align board to stencil and failure to find fids after they have been taught.

(Theory) The Vision offsets map the difference of camera vs sensed encoder inputs to a known field of coordinates.

It also offsets the probe angle, "stencil to board print" to compensate for camera and mirror angle along with table twist when dropping from contact to vision height.

During the process of aligning the PCB to the stencil using the vision system, the PCB\Table is located some distance below the stencil to allow the camera to move freely between the two.

When the alignment is complete the table will move up into the printing position.

This translation of position will not be perfect and the table will invariably twist, turn and rotate during its elevation.

The Offsets calibration combines the effects of this error and the above errors throughout the X and Y range of table movement.

Note: "Table Down height", "Vision Height" and "Light Meter" must be performed or verified prior to completing this procedure.

## (Tools Needed)

- Vision Cal Stencil (Test boards from Spring 2004 and newer have only 49 rows in Y)
- 20" X 20" Copper PCB
- 520mm Squeegees
- Solder paste

(Verification) There is no way to verify if the Vision cal is correct. The only thing we can do is notice:

Failure to find taught fids

Having to always use offsets in the board programs

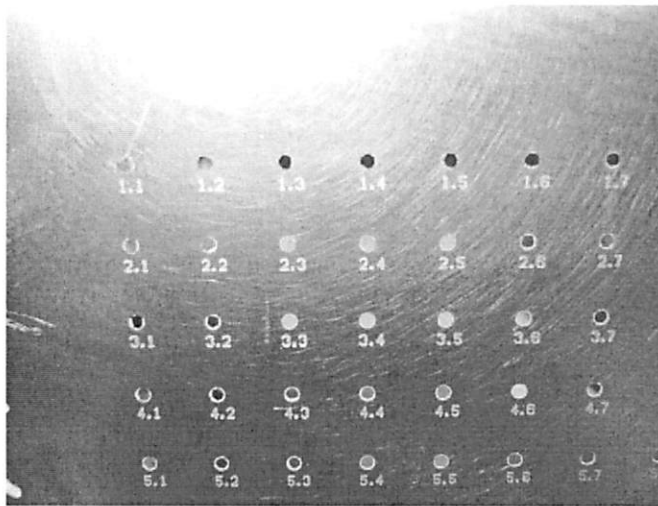
Lower "Fid Found" scores, Scores should be >90% on most PCB's

(Safety Warnings) The Accuflex is an automated printer that can be networked. Because of this, extreme caution must be used when working on the printer, to prevent injury from moving parts, energized circuits and chemicals.

(Procedure)

Machine setup

1. Check that the machine is level and clean.
2. Load the Vision Cal file and initialize the machine.
  - If you do not have an Offsets board file, create one now, insuring proper width and board thickness.
3. Check the rail position for correct width. Insure the board travels smoothly through the transfer rails.
4. Load the CALIBRATION stencil (low numbers to the front, located on the bottom of the stencil).
  - Select the printer utility icon.
  - Select Stencil and Load stencil.



5. Place tooling posts on the table in a 6 x 8 grid to support the board.
6. If the print head is at the front, use the **Swap Print Positions** icon to drive the Print carriage to the rear of the print head.
7. Click the camera icon on the toolbar.
8. Answer yes to "Convey the PCB to the alignment position for vision setup?"
  - Inspect the copper PCB to insure there are no marks or solder deposit rings. Use Saponifier to clean any marks from the PCB.
9. Select More and then Board to print.
10. Check that the board is centered from left to right on the stencil and that the rear row on the stencil is over the rail not the board.

- If not change the board X stop dimension in the tooling offsets, board stop offset X.
- Replace the stencil and manually move it to best fit the copper PCB.
- If the test board is per Spring 2004, you will be required to place scotch tape over the last two rows 50 and 51. This is to prevent solder from being pasted on the rear rail.
- Note: Test boards from Spring 2004 and newer have only 49 rows in Y.

11. Click **Board to Vision** and close the vision setup page, and do not unload the PCB

- Any board movement may misalign the board to stencil that we just did.

12. Click the **Print Profile** icon and, Click the **Advanced** section and verify that Deposits are set to two.

13. Select the **Service** pull down menu then click on **Offsets calibration**. Select "No" to convey a PCB to alignment position.

#### Lower Left Corner Row

The calibration must be setup starting in the lower left corner, and taught left to right front to back.

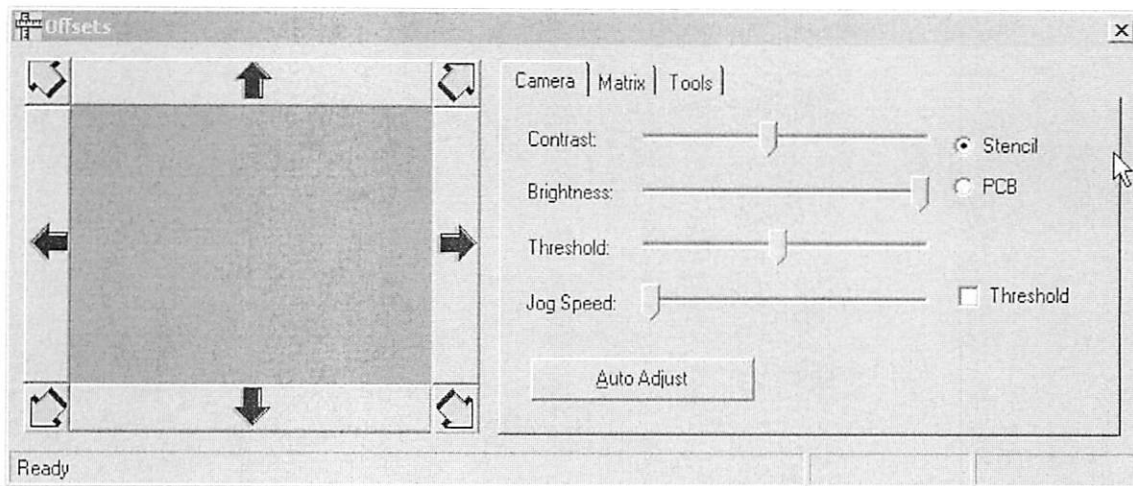
This is required because the mapping program is designed to start mapping in the lower left corner, left to right and front to back.

14. Select the **Camera** tab and Select **Stencil**. Adjust jog speed as needed, and Jog the camera to the lower left corner of the stencil, position 1.2 .

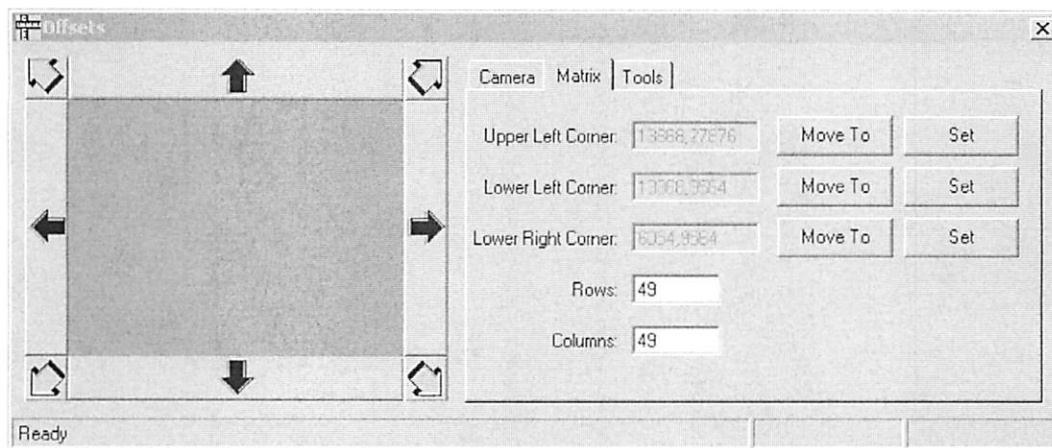
- A Row runs left to right, A Column runs front to back. So Row 1, Column 1 is at the Lower Left Corner of the machine.. (Row 1, column 2).

15. Double click on the fiducial at position 1.2, and the camera will center it in the field of view.

- Select **Auto Adjust** to automatically adjust Contrast, Brightness and Threshold for the object centered in the field of view.
  - ❖ These **Auto Adjust** settings will be used for all points on the stencil.



16. Now select the Matrix tab, and Select Set on the Lower Left Corner row.



#### Lower Right Corner Row

17. Now jog the camera up to position 1.50 (Row 1, column 50).

- Selecting Move To in the Lower Left Corner row, will take you to the general area. From there you can jog the camera as needed.
- We use column 50 even though we are only counting over 49. Why? We didn't use Column 1 in line 14.

18. Double click on the fiducial at position 1.50, and the camera will center it in the field of view.

19. Select the Matrix tab again, then select Set in the Lower Right Corner row.

#### Upper Left Corner Row

20. Now jog the camera up to position 49.2 (Row 49, column 2).

- Selecting Move To in the Upper Left Corner row, will take you to the general area. From there you can jog the camera as needed.

21. Double click on the fiducial at position 49.2, and the camera will center it in the field of view.

22. Select the **Matrix** tab again, then select **Set** in the Upper left Corner row.

23. Then Select 'Set Camera Scaling'. This will calculate all 3 positions for squareness.

#### Applying paste

Do not use an aggressive flux paste as it will mark the copper board, damaging it for future calcs.

24. Apply paste to the stencil and install the 520mm squeegee blades.

25. Select the **Tools** tab, and then **Print stroke**.

- Watch the PCB closely during the print to ensure there is no movement of the board.

26. Observe the quality of the print and, if necessary, repeat the print operation.

- **Note: DO NOT REMOVE THE BOARD FROM THIS POSITION**
- Any movement of the board will require the board to stencil alignment to be re-done!

#### Teaching PCB deposits

With the PCB selected we will now teach the matrix points for the PCB. We will click the same buttons that we did in the Stencil Matrix teach.

27. Select **Camera** tab and Select **PCB**

28. From the **Matrix** Tab, move to each site by using the **Move To** button.

29. Double Click each deposit on the PCB to center it in the camera's field of view and select **Set** in each of the matrix fields we just set for the stencil.

- The **Set** button will store the data for the selected camera mode, either **Stencil** or **PCB**.

#### Mapping the Vision System

30. After all the sites have been taught select **Begin Mapping** from the **Tools** tab

- If there is more than 10 missed alignment points the calibration will fail.

31. After the test is complete, the new vision offsets (offset.txt) file will be placed into the **Accupro** folder, overwriting the old file.

32. Clean the paste off the board, stencil, squeegee blades, and the machine

- Use proper safety precautions when handling solder paste.

**Using an Excel spread sheet Print out an Offsets graph.**

Click Start, programs, Windows Explorer, under the c drive find and open the Sigpro folder, then copy the offsets.txt file from sigpro to a back up disk. Label the disk with machine serial number.

- a. A Select 'File Open' (At the bottom of the screen select 'Files of type:' select \*.txt).
- b. Open file offsets.txt. from 3 ½ Floppy (:A)
- c. The text import wizard opens. Choose file type 'Delimited', select NEXT.
- d. Remove check mark from 'Tab'. Check 'Space' or 'Commas' (whichever is applicable), then NEXT
- e. Column data format General (1st column will be highlighted) select Finish.
- f. Move cursor to the letter at the top of column (for example: C) and select (entire column will be highlighted).
- g. Select Chart Wizard from the toolbar. Choose chart type Line.
- h. Select chart sub-type 'Line. Displays trend over time or categories' (upper left corner).
- i. Select NEXT, then, NEXT to enter chart label.
- j. Select the 'Titles' folder and enter a chart label X Offsets for (machine s/n).
- k. Select the 'Legend' folder and un-check Show Legend.
- l. Select the 'Axes' folder and un-check 'Category (X) Axis', then Next and Finish.
- m. Repeat steps g through m for column D and label chart Y Offsets for (machine s/n).
- n. Select one of the graphs and select Print Preview on the toolbar.
- o. Select Print if the graph looks the way you want it to.
- p. Select Close. Select the second graph and repeat procedure to Print.