

Fine tuning the Epson SC-T head  
for StudioRIP DTP/DTF use

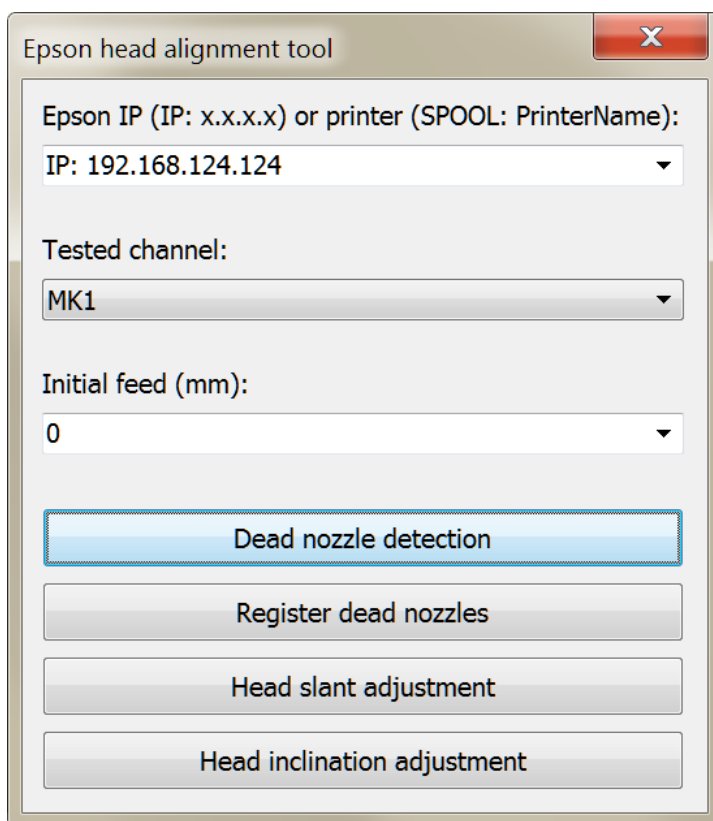
## Purpose

The purpose of this adjustment is to optimize the head alignment of the SC-T printer to the MK channel (which is the workhorse of the film and plate printing). This has two advantages:

- The quality will generally increase.
- The DTP job styles can be used on maximum speed without quality loss (while they are defaulted to 1.86x slower speed in order to correct for the mechanical inaccuracies).

## Software preparation

1. Start up the Epson SC-T printer, connect it to the network, and write down its IP address.
2. Start up the *EpsonHeadTest.exe* app from the StudioRIP program files folder (typically *C:\Program files (x86)\StudioRIP\EpsonHeadTest.exe*), and fill in the Epson's IP address preceded by 'IP: ', like below. If no network connection is possible, then you can access the printer by the Windows driver using the '*SPOOL: PrinterName*' syntax.



The screenshot shows a window titled "Epson head alignment tool" with a standard Windows window border (minimize, maximize, close buttons). Inside the window, there are three dropdown menus and four buttons. The first dropdown menu is labeled "Epson IP (IP: x.x.x.x) or printer (SPOOL: PrinterName):" and has the value "IP: 192.168.124.124" selected. The second dropdown menu is labeled "Tested channel:" and has the value "MK1" selected. The third dropdown menu is labeled "Initial feed (mm):" and has the value "0" selected. Below these dropdowns are four buttons: "Dead nozzle detection" (highlighted with a blue border), "Register dead nozzles", "Head slant adjustment", and "Head inclination adjustment".

Epson head alignment tool

Epson IP (IP: x.x.x.x) or printer (SPOOL: PrinterName):  
IP: 192.168.124.124

Tested channel:  
MK1

Initial feed (mm):  
0

Dead nozzle detection

Register dead nozzles

Head slant adjustment

Head inclination adjustment

## Head check

Lately EPSON printers come out with a much better head alignment from the factory, so there are good chances that no mechanical changes will be necessary. To check the head, do the following:

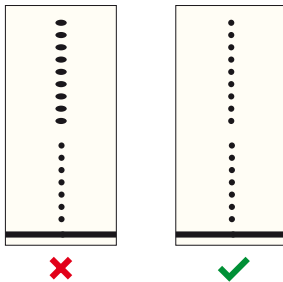
1. Load a DTP plate into the printer (or film, if you intend to use the printer with film only).
2. Set the tested channel to MK1 in the *Epson head alignment tool*.
3. Set the initial feed to approx. 200 mm.
4. Press the *Head inclination adjustment* button in the alignment tool application. A very short (about 1 mm long) page will be printed.
5. Analyze the printed pattern under the microscope.

There are two aspects to consider:

1. **Whether head slant adjustment is needed or not.**

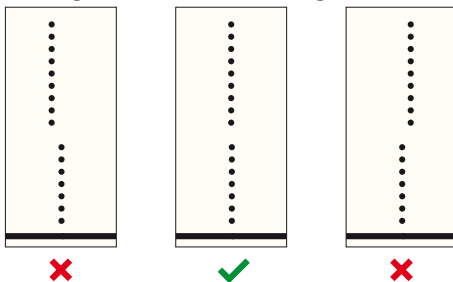
With good quality DTP plates, original EPSON MK ink and SC-T printers the dots at the bottom part should be always almost perfectly round (depending on the plate they may be slightly ovalized). However, with bad head slant adjustment, the dots in the upper part may have a significantly different shape (more ovalized).

If the upper dots have significantly similar shapes (like on the left images), do a head slant adjustment. If the upper and lower dots are fairly similar, no head slant adjustment is needed.



2. **Whether head inclination adjustment is needed or not**

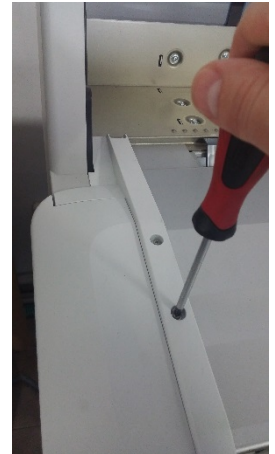
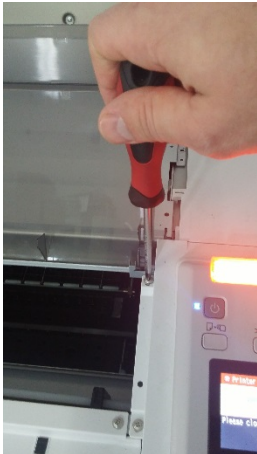
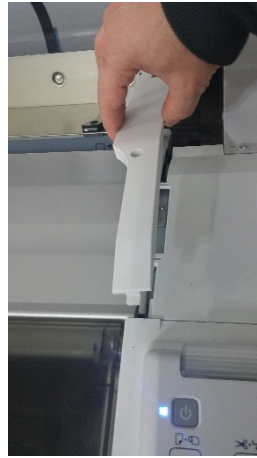
If the upper dots aren't aligned with the bottom dots (like on left or right images), do a head inclination adjustment. If the upper and lower dots are aligned, no head inclination adjustment is needed. Note that the pattern may not be uniform across the plate width, so look for an aligned average and for minimizing the misalignment.



If there are any mechanical adjustments to do, start with the *Hardware preparation* instructions below, then follow the appropriate instructions for the given adjustment, in the order indicated above.

## Hardware preparation

Remove the Epson top cover following the steps below. Be sure to remove the roll paper from the printer before this procedure, and store the screws and small parts in the roll paper compartment. Insert a piece of paper into the upper door sensor.



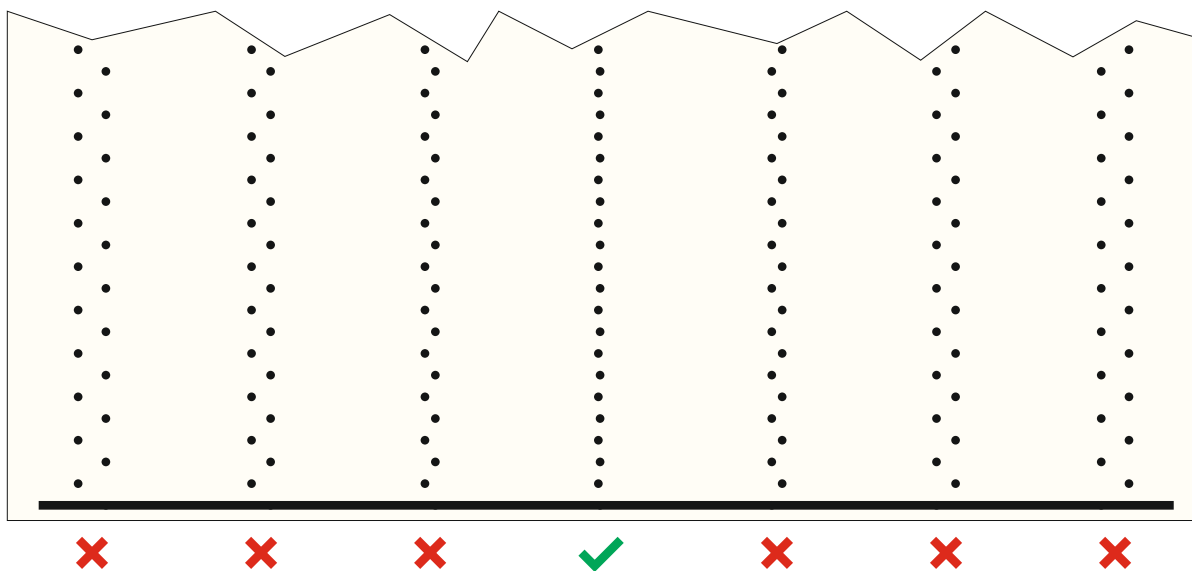
## Head slant adjustment – coarse version

If the head slant is very much off, we recommend the coarse version, as it indicates the direction in which to start the adjustment. However, in most cases it is enough to go for the fine version, which also has the advantage that gives feedback of the effect we need to achieve – uniform dot shapes across the nozzle array. Therefore, consider skipping this adjustment, and performing the fine version only.

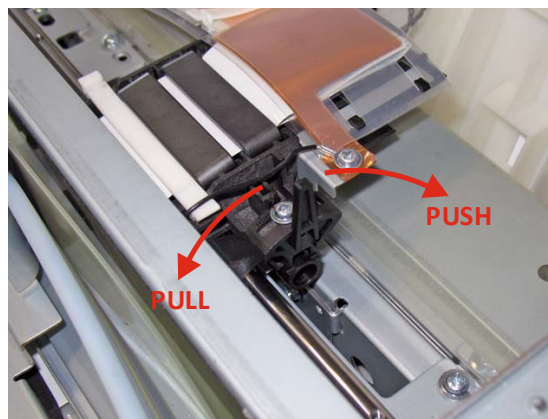
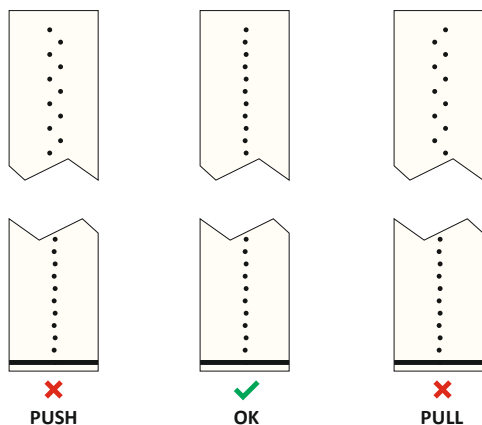
Note that an incorrect adjustment may result in head scuffing or even head damage, so start with small adjustments.

Follow the steps below:

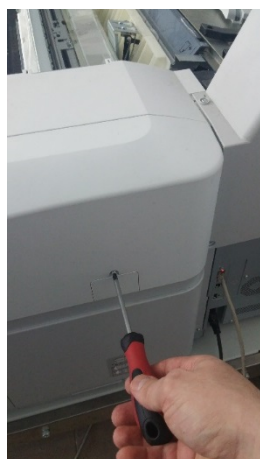
1. Load good quality proofing paper into the printer (note that paper is better for this purpose, as the droplets are sharper on it than on the plate). If you don't have paper, load plate or film.
2. Start up the alignment tool application, and for the first pattern specify an initial feed of approx. 200 mm (this way the pattern will be printed in the middle area of the plate, the first inches may be geometrically slightly different). If you use the same plate for subsequent tests, increase this by 5 mm for each test (that is, 205 mm, 210 mm etc.).
3. Set the tested channel to PK1 (but if the droplets aren't round enough, try MK1 too).
4. Press the *Head slant adjustment* button. A short (1 inch long) page will be printed.
5. On the printed page there will be around 150 vertical lines of 1 inch each, on one end closed by a horizontal line. The vertical lines are getting sharper and then blurrier in 'waves'. You can identify by eye about 4 areas where the lines get sharper. Inspect with the microscope the places where the horizontal line is intersected by the visually sharpest lines, and choose the one which under the microscope is the straightest (like the one marked with the green tick mark below).



6. Inspect the other end (without the horizontal line) of the chosen line. If the two ends of the line are very similar (like in the one marked with the green tick mark), no head inclination adjustment is needed. If the other end of the line is visibly less aligned, then adjustment is necessary. The direction of the adjustment is given by the position of the top droplet relative to the column:



7. Unlock the carriage following the steps in the pictures below. The printer may be turned on during this, but you can also turn it off for safety reasons.



Remove the plastic cover from the right side of the printer.



Insert a PH3×150 mm Philips screwdriver (or similar) until it fits into the white shaft of the pump cap unit.



Turn it counterclockwise until you hear a loud click, then a second, less loud click. The carriage should become free.

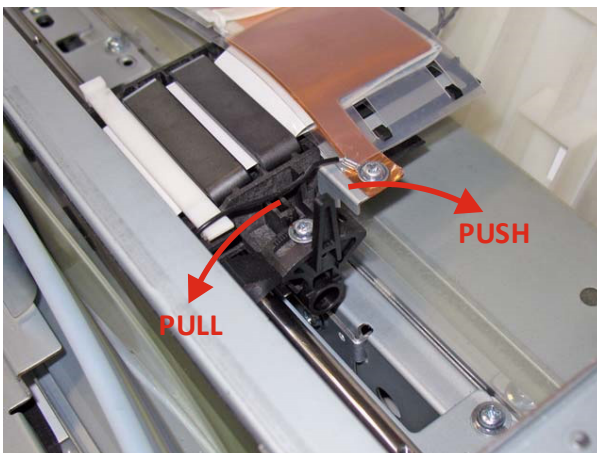
8. Pull out the carriage from its home position.



9. Loosen the screw that secures the adjustment knob.



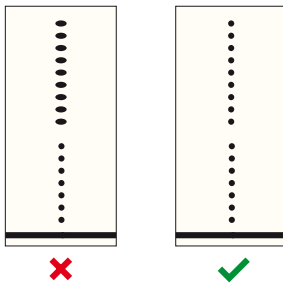
10. Adjust the knob as indicated by the test page. Start with a small amount of adjustment (of a few notches).



11. Tighten the screw, and push back the carriage into its home position. **WARNING!** Although the printer pulls back the carriage automatically if you print a page, the head may be damaged if you left the pump cap unit in the wrong position with the manual unlock, so better push it back yourself manually into its home position.
12. Print another test page and do further adjustments if necessary until the test page is satisfactory. **WARNING!** Although experienced servicemen do the adjustment with the machine turned on, it may be safer to do the adjustment with the machine turned off. **WARNING!** With the carriage unlocked, the ink dries quickly into the head. Be sure the head is parked properly by printing a test page or turning the printer on and off after the adjustment.

## Head slant adjustment – fine version

1. Load a DTP plate into the printer (or film, if you intend to use the printer with film only).
2. Start up the alignment tool application, and for the first pattern specify an initial feed of approx. 200 mm (this way the pattern will be printed in the middle area of the plate, the first inches may be geometrically slightly different). If you use the same plate for subsequent tests, increase this by 5 mm for each test (that is, 205 mm, 210 mm etc.).
3. Set the tested channel to MK1.
4. Press the *Head inclination adjustment* button in the alignment tool application. **WARNING!** Although you do a head slant adjustment, you have to press the *Head inclination adjustment* button – it's not a mistake!
5. A very short page will be printed containing a horizontal line intersected by approx. 150 short vertical lines. Each vertical line contains 8 + 8 droplets printed by the first and last 8 nozzles of the head (with a media feed of approx. 1 inch between the two head scans in order to join the two segments of the line). We're looking for having the upper droplets of the same (fairly round) shape as the bottom droplets (as on the right image) rather than elliptic (as on the left image).



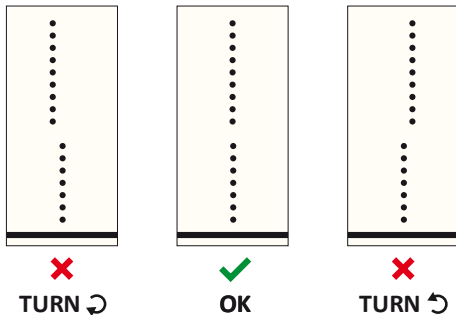
6. Perform steps 6 (unlock the carriage), 7 (pull out the carriage) and 8 (loosen the knob) of the previous chapter.
7. Adjust the knob by 2 notches towards the middle position (see step 9 of the previous chapter). **WARNING!** An incorrect adjustment may result in head scuffing or even head damage, so avoid too big adjustments.
8. Perform step 10 (tightening and parking) of the previous chapter.
9. Increase the initial feed by 5 mm (e.g. after the initial 200 use 205, 210, 215 etc. mm).
10. Load the same DTP plate again, then press the *Head inclination adjustment* button again.
11. Check the printed result under the microscope:
  - if the result of the new print is worse than the previous one (that is, the upper dots are even less round than before), you'll need to go back to the initial position and start adjusting the knob into the other direction;
  - if the result of the new print is better than the previous one (that is, the upper dots are rounder than before), go forward into the current adjustment direction;
  - if the result is good (that is, the upper dots are fairly round, similar to the bottom dots), stop the adjustment.
12. Repeat the procedure (steps 5-10) until you reach a good result.

If you feel lost with the adjustment (you don't know which direction to go), perform a coarse adjustment which should give an acceptable result.

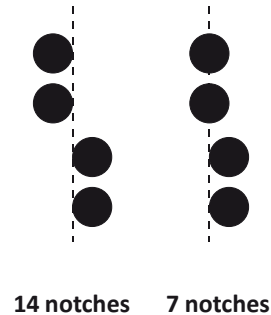
## Head inclination adjustment

1. Load a DTP plate into the printer.
2. Start up the alignment tool application, and for the first pattern specify an initial feed of approx. 200 mm (this way the pattern will be printed in the middle area of the plate, the first inches may be geometrically slightly different). If you use the same plate for subsequent tests, increase this by 5 mm for each test (that is, 205 mm, 210 mm etc.).
3. Set the tested channel to MK1.
4. Press the *Head inclination adjustment* button.
5. A very short page will be printed containing a horizontal line intersected by approx. 150 short vertical lines. Each vertical line contains 8 + 8 droplets printed by the first and last 8 nozzles of the head (with a media feed of approx. 1 inch between the two head scans in order to join the two segments of the line).
6. We're interested how much and in which direction the upper segment is shifted from the bottom one (the bottom segment is the one beside the horizontal line). We are NOT interested at this stage in the vertical gap between the lines, which will be later corrected by the feed adjustment. There may be a variation across the page, so choose the most representative item (that is the average of the others), and inspect it under a microscope.
7. If the two segments of the chosen item are horizontally aligned (as in the picture marked with the green tick mark), no head inclination adjustment is necessary. If the upper segment is shifted towards left, the adjustment dial will need to be turned clockwise; if the upper segment is shifted towards right, the adjustment dial will need to be turned counterclockwise.

In which direction to turn the dial:



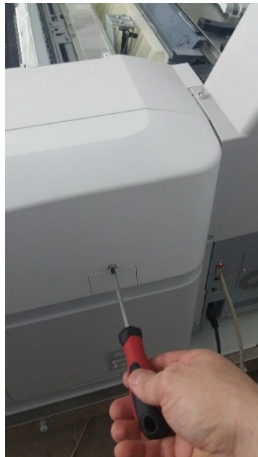
How much to turn the dial:



13. Remove the metal plate (secured by two screws) from the left end of the printer, in order to gain better access to the carriage screws.



14. Unlock the carriage following the steps in the pictures below. The printer may be turned on during this, but you can also turn it off for safety reasons.



Remove the plastic cover from the right side of the printer.



Insert a PH3×150 mm Philips screwdriver (or similar) until it fits into the white shaft of the pump cap unit.



Turn it counterclockwise until you hear a loud click, then a second, less loud click. The carriage should become free.

15. Pull out the carriage to the left of the printer from its home position.

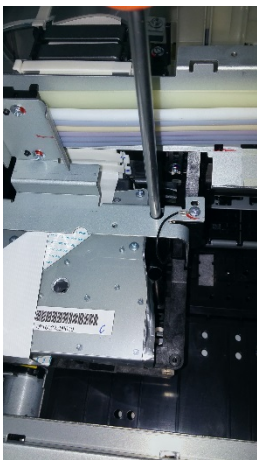
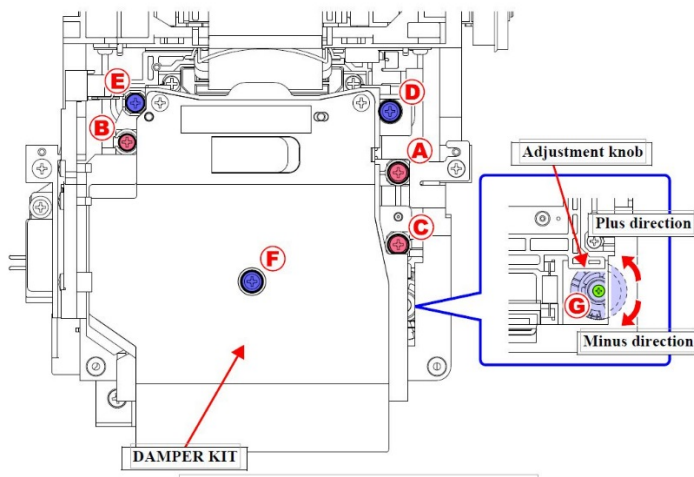


16. Remove the plastic cover of the head.

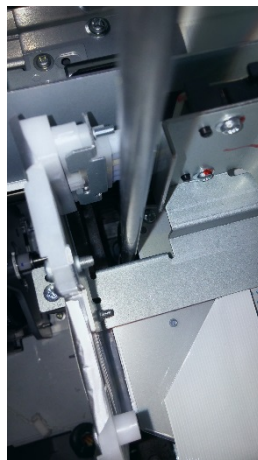


17. Loosen the screws of the head in the order indicated below (starting with A and ending with G).

**WARNING!!!** Do not remove the screws, just turn them with the screwdriver about 1 full turn. Then adjust the dial in the right direction according to the measurements of step 6. Turn the dial gently, this way you can feel and hear the click for each turn of one notch.



Loosen screw A



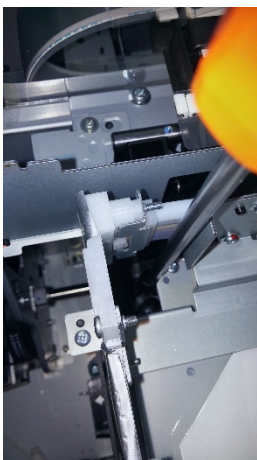
Loosen screw B



Loosen screw C



Loosen screw D



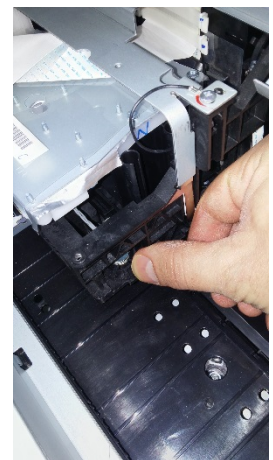
Loosen screw E



Loosen screw F



Loosen screw G



Turn the dial

18. Tighten the screws that were loosen in step 12 but in the opposite order.

**WARNING!** If you do the procedure with the printer turned off, leave the carriage in the position you adjusted it: when you turn on the printer, it will take care to pull it back safely to the home position. However, if you did the procedure with the printer turned on, then it's safer if you push the head manually into its home position, as the head may be damaged if you left the pump cap unit in the wrong position with the manual unlock.

19. Print another test page and do further adjustments if necessary until the test page is satisfactory. Note that the result may not be consistent across the media width, so look for the average pattern to be horizontally aligned.

**WARNING!** Although experienced servicemen do the adjustment with the machine turned on, it may be safer to do the adjustment with the machine turned off.

**WARNING!** With the carriage unlocked, the ink dries quickly into the head. Be sure the head is parked properly by printing a test page or turning the printer on and off after the adjustment.

## Feed adjustment

Apparently the feed adjustment is only about getting accurate job lengths. However, the feed adjustment has also a huge influence on the print quality, especially when printing 150-175 lpi halftones. A typical feed adjustment error is 1 mm on 300 mm (that is, 300 mm prints as 299 mm), which on one inch (the length of the nozzle row in the head) means an error of 85 microns – therefore droplets misplaced by up to 85 microns can appear on the print. Taking in account that this is almost 60% of the distance between two halftone dots, the damage caused by such misplaced dots is huge, resulting in poor quality halftones.

In order to check the feed adjustment, print on the given media the *Inkjet feed alignment.pdf* job from the *Proof charts* folder of the StudioRIP install kit (**WARNING!** It is very important to print the ruler in *vertical* position), and measure it with an accurate ruler.

If you don't have an accurate ruler, print the same file in *horizontal position* on plate, and use that as an accurate ruler.

Having the test page printed and measured against an accurate ruler, open the job style(s) you work with on the given media type, select the *Engine setup* task, click the *Edit values* button, then the *Adjust* button of the *Mechanical settings* tab. Enter the expected length (e.g. 300) to the *Printed length* box, and the physically measured length (e.g. 299.2) to the *Measured length* box, then click OK.

Repeat the procedure until the printed chart matches the ruler (note that the feed adjustment value will be calculated taking in account the old value, so subsequent measurement will fine tune the result).

Enter the calculated value to all job styles using the given media type and size. Note that plates of different size may need slightly different feed adjustment values.

Certain printers have a bug in the firmware, and refuse receiving the feed adjustment value from the printer. If you find that changing the feed adjustment from the RIP doesn't have any effect, do it from the printer control panel until you get a firmware update with the bug fix.

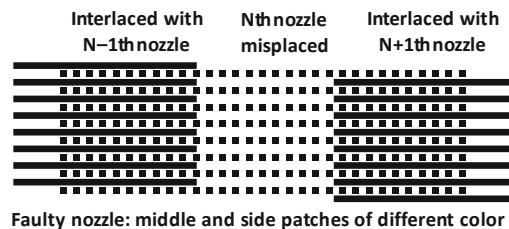
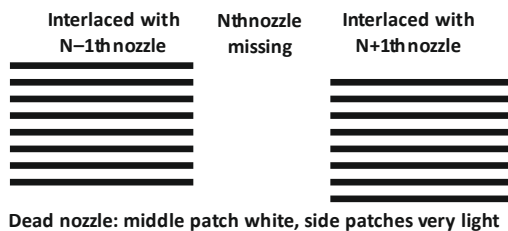
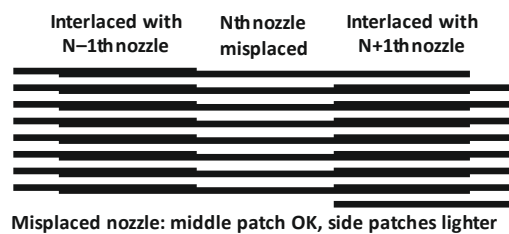
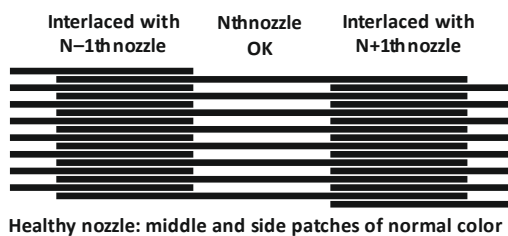
## Registering the dead nozzles

StudioRIP has its internal system of registering dead nozzles. If a nozzle is registered as dead, the StudioRIP's algorithm will build the interlacing in a way to compensate the dead nozzle with a healthy one. Normally a few missing nozzles don't have any negative influence, the speed and quality remains the same (while more or unluckily placed nozzles may slow down the printer).

However, nozzles can appear as working in the Epson's nozzle check page, but still causing banding or moiré on the final print. Using the *Dead nozzle detection* utility of the *Head alignment tool* can help identifying the nozzles that are causing such problems.

Follow the steps below to register dead nozzles:

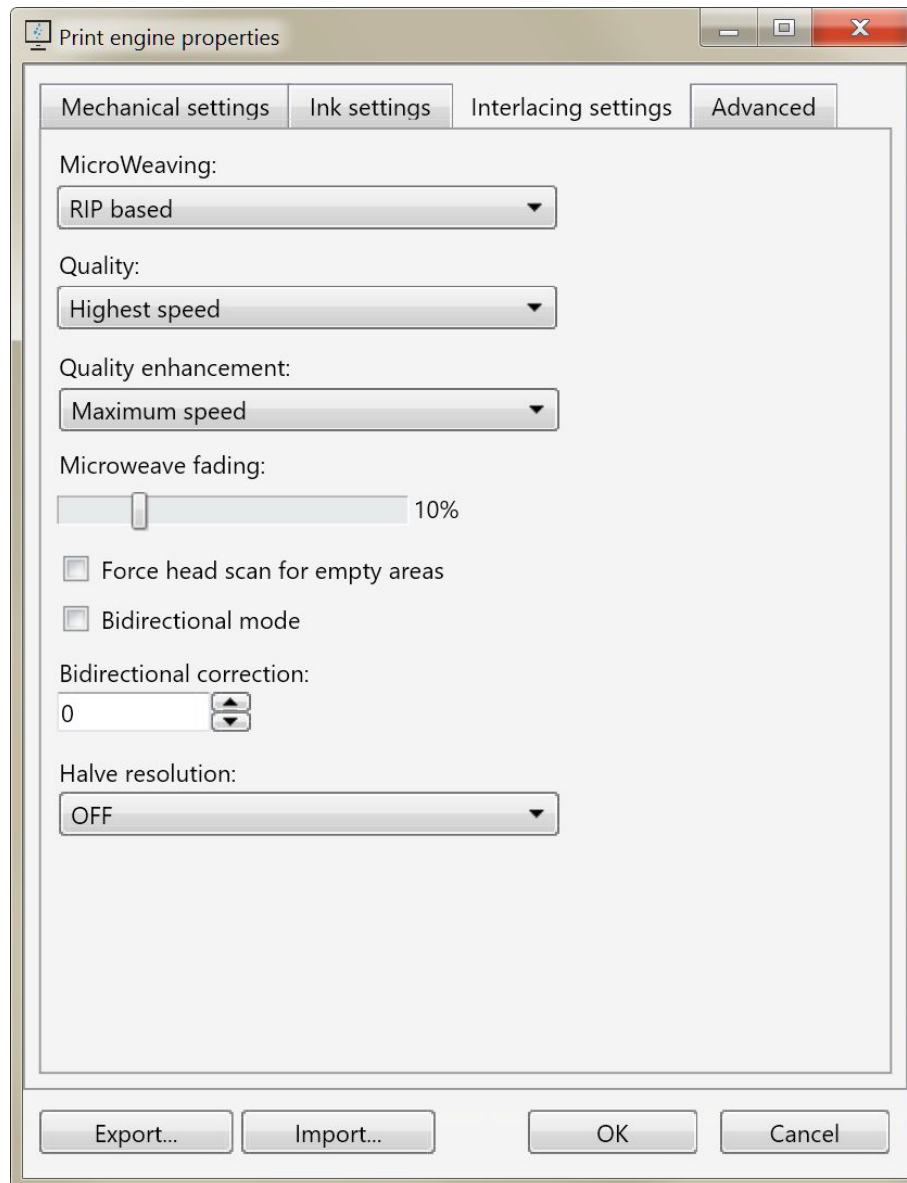
1. Load good quality photo/proofing paper into the printer.
2. Start the *Head alignment tool*, and press the *Dead nozzle detection* button.
3. Check the page not just against missing patches, but also against any slight color deviations of the patches:



4. If any of the patches (either the middle patch or the interlaced side patches) have any slight color deviation, identify the nozzle causing the problem, and register it as a dead nozzle.  
**WARNING!** A faulty nozzle spoils the patches shared with its two neighbors. Therefore a shared patch with wrong color typically only indicates that *one* of the two contributing nozzles is faulty, and faulty nozzles are typically identified as having *both* their shared nozzles are faulty. Use a microscope in case of confusion.
5. Dead nozzles are registered by pressing the *Register dead nozzles* button, then pressing the *Add* button in the *Dead nozzle list* window, and specifying the channel, row and column of the nozzle identified as faulty. Restart StudioRIP Print manager for the registration to take effect.

## Last steps

Having all 3 adjustments (2 mechanical and 1 software) done, you can use the job styles marked as 'fast' on the StudioRIP web site or pre-installed to DTP systems. As an alternative, you can manually increase the speed of the StudioRIP DTP job styles as below:



You may compare the quality of the original and the modified job styles. If all adjustments were done correctly, you shouldn't be able to see any difference neither under the microscope nor by the naked eye (looking at difficult patterns such as flat 50% tint).