Magnus VLF

Replacing a Thermal 2 Head on a Universal Carriage with Z-stage

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Revision History

Revision	Date	Author	Comments
1	05 June 2006	A.Blignaut	Initial release
2	15 June 2006	A.Blignaut	Calibration updates, parts corrections

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1. OVERVIEW

This document describes how to replace a Thermal 2 Head (TH2) on a universal carriage with Z-stage.

2. REFERENCE DOCUMENTS

Replacing a TH2 Carriage with a Universal Carriage with Z-stage (719-00439B)

3. PARTS/TOOLS NEEDED

- Micrometer (digital preferred)
- Hex keys
- Shims for universal carriage Z-stage – 52-7193
- Shims for fifth point adjustment:
  252-09699A (0.002 in.) – one hole
  252-09714A (0.003 in.) – two holes
  252-09715A (0.006 in.) – three holes
  252-09716A (0.012 in.) – four holes

4. REMOVING A THERMAL 2 HEAD

In this procedure the TH2 being removed will be referred to as the defective head; the replacement TH2 will be referred to as the new head.

Note: Wear an anti-static wrist strap when working with thermal heads.

1. If possible, load a plate and run a plot 28 to check and record the current head tilt.
2. Type `>>set mh` to record the current Z-stage nvs parameters.
3. Type `>> carriage moveto 1050` to move the carriage to the middle of the device.
4. Type `>>door unlock` to open the front hood.
5. Turn the device power off.
6. Turn off the air at the device shut off.
7. Remove the load table rails and unload table panels in center to allow access to the head area.
8. Remove the center front panel and the laser shroud panel.
9. Disconnect the cables and coolant hoses from the head.
10. Remove the debris removal nozzle.

11. Unplug the two air lines to the clamp cylinder on the z-stage—note the orientation of the tubes relative to the ports on the cylinder.

12. To loosen the cylinder's pull pin from the guide rod, use a hex key (4 mm or 5 mm) in the rod end of the cylinder as leverage.

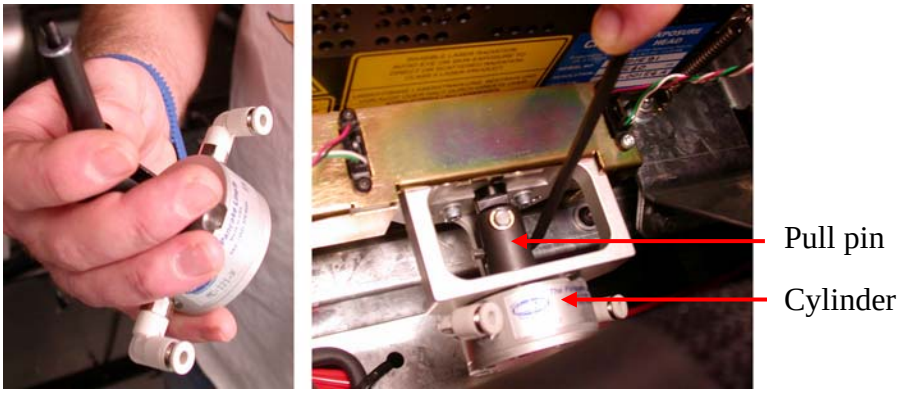


Figure 1: Removing the clamp cylinder

13. Undo the two M5 screws holding the cylinder to the Z-stage bracket.

14. Hold the end of the pull pin pointing upwards and unwind the air cylinder. Take care not to loose the shims on the pull pin.

15. Remove the shims and measure the total shim thickness—record this number.

16. Starting on the right side, undo the four springs holding the head to the spring hanger studs on the carriage—a ball hex key works well for this.

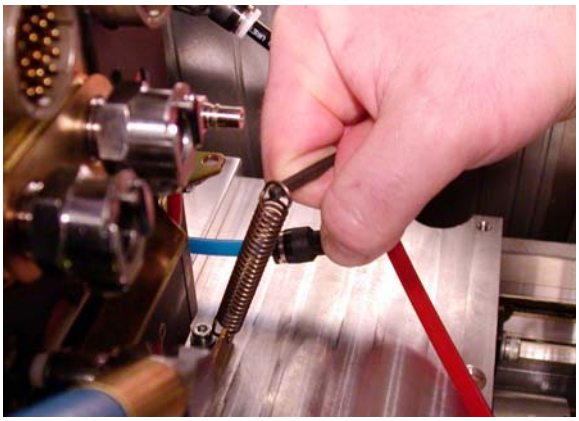


Figure 2: Removing the four springs

17. Carefully remove the head from the device and place it somewhere that you can safely work on it.

18. Remove the spring hanger studs from each side of the defective head and install them on the new head.

Note: Do not miss the spacer washers on the left side studs—these spacers help to align the carriage studs with the studs on the head.



Figure 3: Transferring the spring hanger studs

The mounting rod that is shipped with new thermal heads is not for z-stage carriages and must be exchanged with the rod on the defective head. To tell the difference between the two types of rods, look at the ends of the rod—the z-stage rod has a threaded hole on one end only, while the old style rods have threaded holes on both ends.

19. Remove the z-stage rod from the defective head, wipe it clean, and inspect it for major wear marks.

20. Remove the new head's rod and install the z-stage rod in its place in the same orientation as it was removed from the old head (the end with the threaded hole must face the clamp cylinder).

21. Install the other rod on the defective head before shipping it back to Kodak.

22. Check that the Z-stage plate's V-grooves are not too severely worn. Some wear is normal and actually needed. The wear should show line contact on all 4 V-blocks.

23. Clean up any debris using isopropyl alcohol and a lint free cloth.

5. INSTALLING A THERMAL 2 HEAD

Note: Wear an anti-static wrist strap when working with thermal heads.

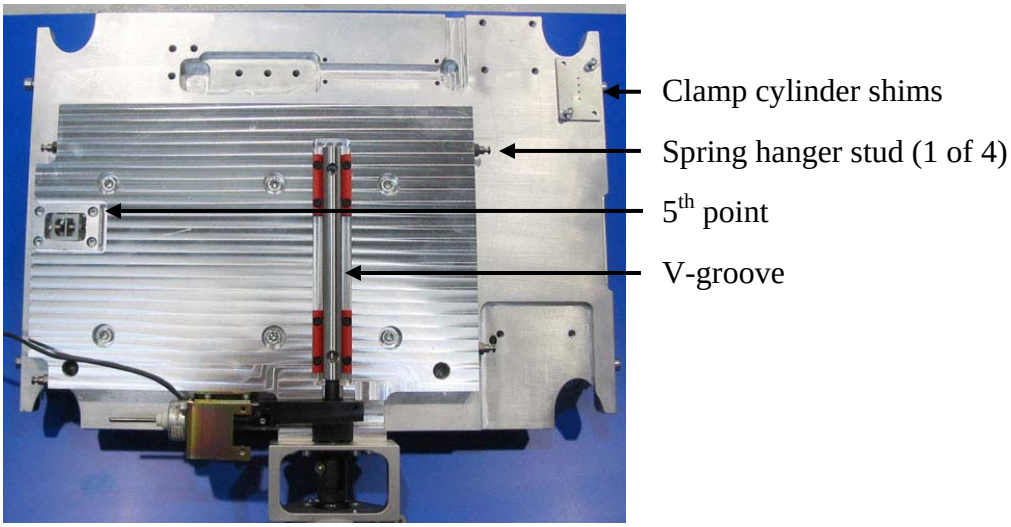


Figure 4: Universal carriage with Z-stage

1. Carefully place the head guide rod into the V-groove on the carriage and lower the 5th point support carefully onto the top of the 5th point assembly installed on the carriage Z-stage plate. As a reference when lowering the head, the 5th point side of the head should be in line with the half circle–shaped recess in the carriage as shown below.

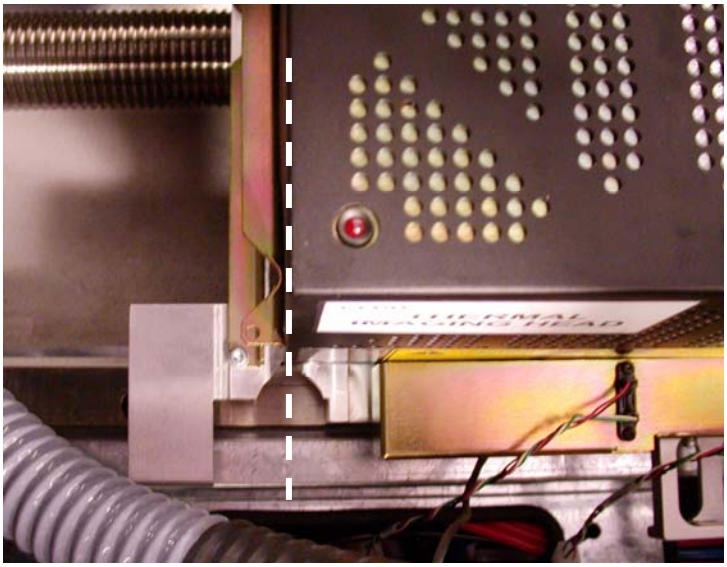


Figure 5: Head placement

The head should move forward and backward quite freely and should not rock when you push down on the 5th point side of the head. You should also not be able to twist the head on the carriage.

Note: The range of forward to backward motion for the head is only 1 mm to 1.5 mm. Do not push it too far or the 5th point support may fall off the carriage's needle roller assembly.

If you push the head backwards and release it, it should slide forwards under its own weight. If it does not, check for the following:

- Check that it is sitting on the 5th point properly.
- Check that it is seated in the V-groove.
- Check that no air lines or cables are stuck under the head.

2. Before installing the extension springs, use pliers to bend open the spring end loops a little. This will make installation of the springs easier.



Figure 6: Opening the extension spring end loop

3. Starting with the 5th point side, install the four spring hangers between the spring hanger studs on the head and the spring hanger studs on the carriage. The easiest way to do this is to use a 4 mm ball end hex key to pull the springs over the studs.

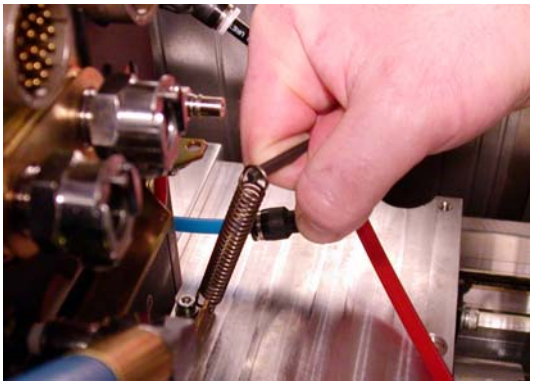




Figure 7: Spring installation

4. Check that the head still moves forward and backward with very little force.
5. Replace the O-rings on the coolant tubes and connect the head tubes and cables as you would in a normal head installation.

6. Install the debris removal nozzle.

7. Place five 0.1 mm shims onto the nose of the clamp cylinder's pull pin (measure the shim stack with calipers before placing them on the pull pin and record this for later use). The shim pack thickness may need to be adjusted later.
   The shims are stored on the upper right hand corner of the universal carriage (see Figure 4).

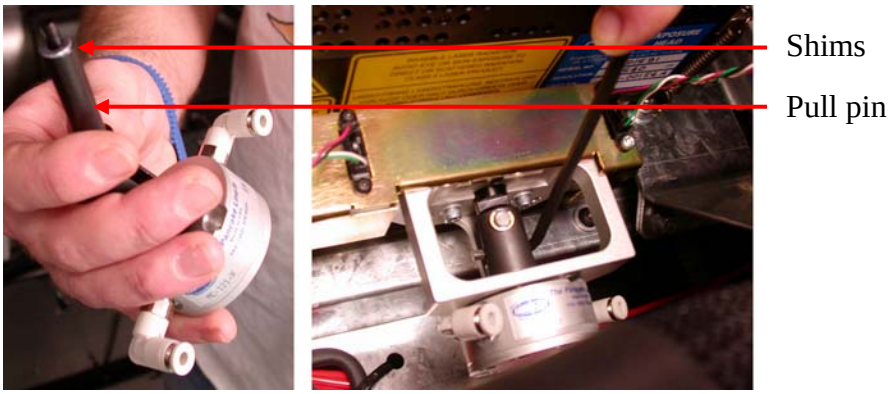


Figure 8: Clamp cylinder installation

8. Carefully put the clamp cylinder into place without losing or moving the shims and screw the pull pin into the end thread on the head's guide rod (the whole clamp cylinder will spin). To tighten the pull pin, use a hex key (4 mm or 5 mm) in the rod end of the cylinder as leverage. The pull pin should be as tight as possible, but take care not to break off the M4 thread.

9. Install the two M5 screws holding the clamp cylinder.

10. On the clamp cylinder, plug in the two air tubes from the Z-stage unlock cylinder. Make sure that it is safe to do so and temporarily turn on the air supply to check that the clamp cylinder is in its normal state—rod extends and moves the head towards the drum. If not, change the orientation of the tubes and turn off the air supply again.

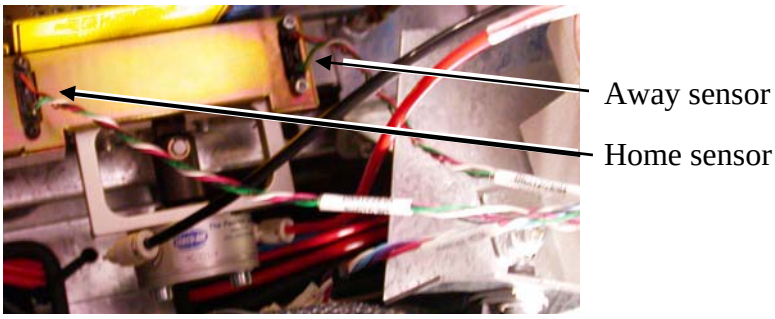


Figure 9: Home and away sensors

Tip: The label on the clamp cylinder is usually on top with the black tube on the left and the red tube on the right.

11. Plug in the motor cable and the home/away sensors to their respective cables—home sensor is on the left side.

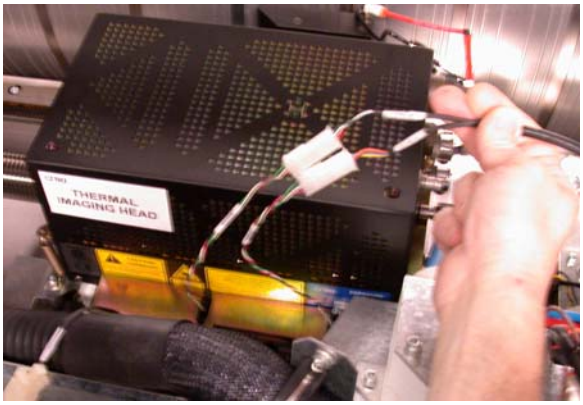


Figure 10: Z-stage cable connections

12. Install the debris removal nozzle assembly.
13. Slowly spin the drum by hand to make sure it does not interfere with the head in any way. You may need to release the leading edge clamps (LECs) manually at the engine manifold to spin the drum.
14. Neatly secure all cables and tubes in place with cable ties to prevent interference with any moving parts. The debris hose must be secured to the handle on the home side of the TH2 with a cable tie.
15. Install all panels, install the load and unload tables, close the front and rear hoods, reposition the drum vacuum unit, and lower the ejector table and top panel.

6. CALIBRATION AND SETUP

6.1 Calibrating the Z-stage

When a thermal head has been replaced, the shim pack on the clamp cylinder may need to be readjusted to correct the focus offset. **Ideally, we want to set the head focus to +50**. This will allow for any abnormalities or bubbles in the plates. The greater the positive number, the further the head is from the plate. For example, a focus error of –18 means the head is closer to the plate than a focus error of +18.

Before turning on the power and air to the Magnus VLF, all panels must be installed or closed and the device must be safe to operate.

1. Turn on the power to the device. Turn on the device air supply at the regulator unit.
2. To enable the Z-stage option, type `>>access dev`.
3. Change the option status by typing `>>option zstage enable`.
4. Load a plate of the same size and batch as the first plate you used at the beginning of the procedure.

5. Type `>>cassette validate off` to speed up the initialization sequence.
6. Type `>>init` to initialize the device.
7. To get the laser on the plate surface, type:
   ```
   >>drum move 30
   >>carriage moveto 1100
   ```
8. Type `>>zstage init` .
9. After the message **command complete**, type `>>zstage` to ensure that the home sensor is tripped and it is at the 0 position.
10. Type `>>zstage unlock` .
11. After the message **command complete**, type `>>zstage move 0.280` where 0.280 was the plate thickness measured before the Z-stage upgrade.
12. After the message **[Engine] ZStage: 'Move' Complete**, type **`>>`**`zstage lock` .
13. Type `>>zstage` and record the new value.
14. After the message **command complete**, move the carriage to approximately the middle of the plate.
15. Type `>>head install on` and record the focus error.
16. If the focus error is between +199 and –199, go to step 18. If it is not, proceed to the next step.
17. Repeat steps 9 to 15, but increase the plate thickness entered in step 11 by 0.100 mm.

    For example, type `>>zstage move 0.380`. If it is still out of range, then reposition the head to 0.480 mm and so on until the focus error is within range. If you get to a high plate thickness like 0.680 mm and the error is still out of range, then try decreasing the plate thickness to 0.180 mm or 0.080—but not below zero. If that does not work, check for the following possible problems:

    - Check that the auto focus laser is actually on the plate and not on the drum or clamps.
    - Check that the head is moving correctly and that the clamp cylinder is properly screwed into the head guide rod.
    - Check that the clamp cylinder is working properly.

- Check that the wedges are correctly installed—to see the wedges you must remove the sensor bracket and home/away sensor tab that is attached to the top of the slider wedge.

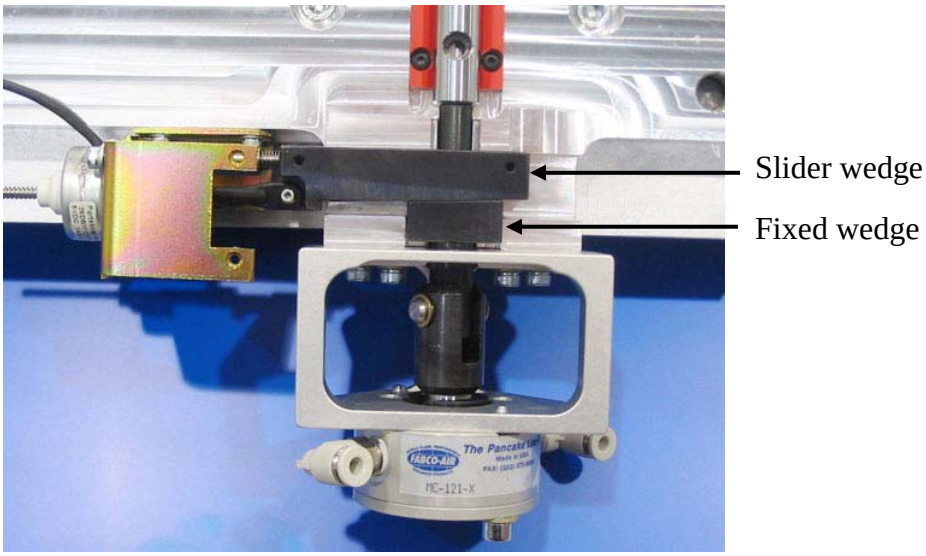


Figure 11: Z-stage sensor bracket and sensor tab removed to show wedges

18. Calculate what the actual shim stack should be using the following formula (ensure you use the correct + and – sign convention):

    (actual plate thickness – Z-stage position) + (signal focus error) = adjustment

    Example 1, if the actual plate thickness = 0.280 mm, the Z-stage position = 0.380 mm, and the signal focus error = –0.130 mm, the shim adjustment will be (0.280 mm – 0.380 mm) + (–0.130 mm) = –0.230 mm. Because (–0.230 mm) is negative, you must remove two shims to move the head away from the plate surface (each shim is 0.1 mm thick).

    Example 2, if the actual plate thickness = 0.280 mm, the Z-stage position = 0.180 mm, and the signal focus error = 0.145 mm, the shim adjustment will be (0.280 mm – 0.180 mm) + (0.145 mm) = 0.245 mm. Because (+0.245 mm) is positive, you must add two shims to move the head closer to the plate surface (each shim is 0.1 mm thick).

19. Remove the clamp cylinder and add or subtract the calculated shim amount. These shims are nominally 0.100 mm thick, but measure the whole shim stack to be sure, as they will vary a bit.

20. Carefully replace the clamp cylinder.

21. Repeat steps 5 to 15. The focus error should now be between –100 and +100. The remaining error can be removed by using the NVS parameter **set mh zstagezero** to the amount that is left.
    For example, if the focus error is –18 microns (-0.018 mm), type `>>set mh zstagezero +0.068` to move the head further away from the plate to achieve the ideal setting of +50 microns.

22. Type `>>zstage init`

23. Type `>>zstage position`. The Z-stage position command automates the whole moving of the head to the correct position. It uses the value of the thickness of the loaded plate plus the Z-stagezero parameter to position the head to the correct place.

24. The focus error should now be +50 (±10) microns. Move the carriage over a few hundred millimeters and repeat steps 5 to 15. Record the focus error measurement.

Note: It is acceptable and not uncommon to get slightly different focus errors at different points on a plate.

25. Type `>>set focus basethickness`. This parameter must be set to **"0"** for heads that are installed with a Z-stage. Failing to do so will result in an error with multiple plates detected on the drum.

6.2 Adjusting the Head Tilt

The allowable tilt on the swath is roughly 2 microns at the end of the swath—this equates to approximately 0.28 mm (0.011 in.) at the 5th point support. Therefore, if the 5th point is within 0.28 mm, the tilt error should not be visible. Because this is difficult to measure, we run a plot 28 pattern (2-pixel (20-micron) horizontal lines) and view the edges of the swath with a 100x microscope to see if there is a saw tooth pattern.

The distance between the guide rod and 5th point is 175 mm and half of the swath width is 1.25 mm—a ratio of 175/1.25 or 140:1. This means that 0.002 mm (2 µm) at the swath equates to 0.002 mm*140 = 0.28 mm (0.011in.) at the 5th point support. Take note which direction the saw tooth pattern is leaning to avoid going the wrong way when adjusting the shim pack.

1. Set the current loaded plate thickness back to the actual thickness (0.280 mm in these examples).

2. Type `>> zstage init`.

3. Type `>>zstage position`.

4. Type `>>carriage init`.

5. Run a diagnostic plot 28.

6. Unload this plate and process it.

7. Check the plate using a 100x microscope (or the tilt checking tools) at the edges of the swath for tilt as outlined in the paragraph above.
   2400 dpi tilt viewing tool – 690-00225A
   2540 dpi tilt viewing tool – 690-00226A

8. If necessary, adjust the shims underneath the 5th point support assembly (the shims supplied are 0.002 in., 0.003 in., 0.006 in., and 0.012 in.). Take care during the removal and installation of the head.

Repeat steps 1 to 8 until the tilt has been set adequately.

7. FINAL TESTING

Ask the customer to send some of their real files through their workflow. Run several different thicknesses of their plates to force the Z-stage to move. Check in service shell that the Z-stage is moving to the correct locations and that no errors are reported.

If possible, ask the customer to run some of the newly imaged plates on press to make sure there are no imaging problems with the replacement head.