

Thermal 1.0 Head

Installation Procedure

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Revision History

Revision	Date	Author	Comments
1	08 Jul 1997	Ian Williams, Glen Marks, Mark Devries	Released.
	09 Aug 1997		Changed footer to include full part number
	20 Aug 1998		Added info on new carriage mount procedure
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1. LASER SAFETY PRACTICES

To use this document the FSE (Field Service Engineer) *must* have attended and passed a thermal introductory course and be familiar with the safety precautions when working with a thermal output device.

Note: For consistent laser safety, it is recommended that the write laser always be further disabled before positioning the service key switch in the Laser Hazard position. Use the commands below to disable the write laser in the firmware, and to confirm that the write laser has been disabled.

Note for 24 volt: For thermal head 1.0, putting the key switch in the Laser Hazard position will re-energize both the write laser and focus laser.

Failure to perform this step using the commands listed below prior to using the service key switch in the Laser Hazard position and opening the access panels could result in permanent eye damage.



DANGER:
The output device must not be imaging when you enter these commands.

Allow the output device to finish imaging and unload any plates. If the output device is imaging, the message `Exposure Head is already reserved` appears. None of the commands will be effective and the write laser will not be disabled in firmware.

```
>>laser off
>>set head wenable 0
>>nvs save head
>>laser  (to verify the laser status)
```

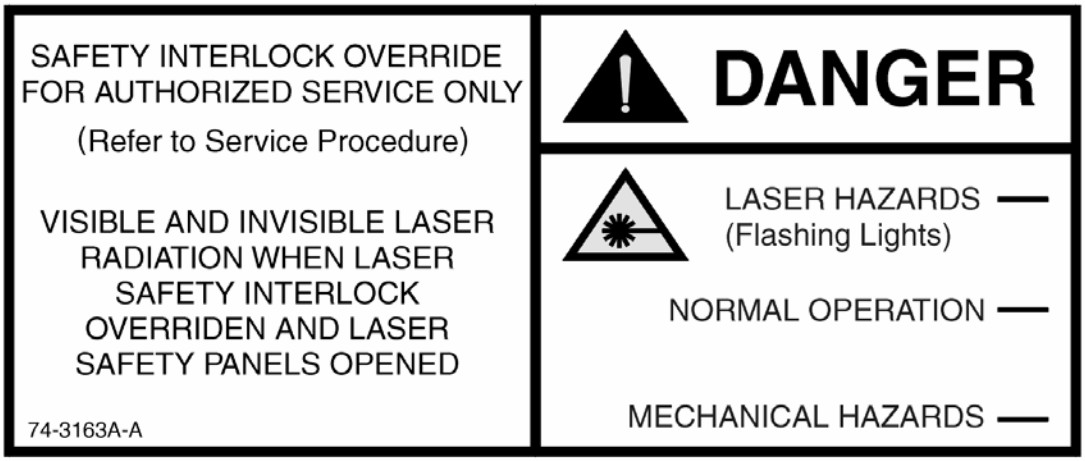


DANGER:
Do not proceed if the laser status is not `write laser state: disabled.`

The commands listed above not only disable the write laser in firmware but also save this disabled state as an added safety precaution in case the output device is reset. Several deliberate commands would have to be entered in order to re-enable the write laser.

The thermal head is equipped with 4 dual element LEDs (one on each side at the top of the head) that give a visual indication that the write laser is turned on. The LEDs should be off for this entire procedure and offer a visual indication that it is safe to proceed.

The safety label below is displayed beside the key switch and inside the power box on the output device:



To the right of the label is a key switch. Service personnel are issued a key (if you lose this key, you must order a replacement).

> **For devices that have not had FCO E040 applied:** There is a spare key under the key switch, fixed to the panel by a bolt, which can be removed using a 3-mm hex key. Remove this key and do not replace it.

The service key can only be removed from the key switch when it is in the middle position (key horizontal), which indicates that the interlock circuit is intact (normal operation). When the key is inserted in the key switch, it cannot be accidentally left in place, since it protrudes out of the enclosure and prevents the enclosure panel from being installed.

DANGER:
Do not tamper with the key switch. The key can only be removed from the key switch while in the middle position (key horizontal).

For thermal head 1.0 (24 Volt), when the key switch is turned to the upward position (45°), the complete access panel interlock circuit is overridden and all laser and mechanical functions are restored. In this position, the flashing LEDs mounted directly above the key switch are energized, indicating that the access panel safety interlock circuit has been overridden.

2. RELATED DOCUMENTS

- *Running and Interpreting Diagnostic Scripts*—in the Field Scripts zip files on the Splot site (http://techplanet.creo.com/output/service_tools/splot/nav/index.htm)
- Dehumidifier Unit FCO E246 information at: (http://techplanet.creo.com/output/heads/thermal/nav/fcos.htm#next_fail)
- Geometric Correction Parameter Structure: (http://techplanet.creo.com/output/computer_to_plate/trendsetter_3244/content/docs/MCE_Trendsetter_GC_Parameters.pdf)
- **inchgrid.ps**—available from the Test Files page of TechPlanet (http://techplanet.creo.com/common/test_files/test_files.htm#inchgrid)

- Media technical notes—available from the Media TechPlanet site (http://techplanet.creo.com/consumables/media/nav/index.htm)
- Thermal head firmware release notes—available from the Reference page of the Thermal 1/1.7x TechPlanet site http://techplanet.creo.com/output/heads/thermal/nav/reference.htm

The following procedures are available from the Procedures page of the Thermal 1/1.7 TechPlanet site (http://techplanet.creo.com/output/heads/thermal/nav/proced.htm)

- Adjusting Tilt on a Thermal Head
- Air Jet Plate Assembly (30-1163A)
- Chiller Maintenance
- Debris Removal Nozzle Cleaning Procedure
- Dehumidifier Unit Installation Procedure
- Lens Cleaning Procedure
- Micro-banding troubleshooting procedures (part number 77-0034A)
- Thermal head mounting conversion procedure (part number 77-0056A)
- Thermal 1.7 Head Installation Procedure

3. REQUIRED TOOLS

- 3-mm T-handle hex key
- 2-mm hex key (T-handle preferred)
- Standard field service toolkit
- NSK #1 grease
- Tilt viewing tool (lenticular) for 2400dpi (part number 690-00225A)

4. PROCEDURE OVERVIEW

This procedure describes how to install a thermal 1.0 exposure head in a Kodak output device. All commands listed are for MPE devices only. For MCE commands, see the Thermal 1.7 Head Installation Procedure.

Note: The older-style cam mounting system uses a locking cam and has the squaring rod attached to the head. Procedures that relate to this system are in Appendix A: Cam Mounting System Procedures (see Figure 9). The latch mounting system uses three latches and the squaring rod is attached to the carriage (see Figure 1).

The main steps are:

1. Remove the existing thermal head (if required).
2. Mount the new head on the carriage.

3. Adjust the head.
4. Check and adjust image quality.
5. Back up the NVS parameters.

5. REMOVE THE EXISTING HEAD (IF REQUIRED)

Note: This procedure explains how to remove a thermal 1.0 head only.

1. Make a backup of the existing NVS parameters by typing `>>nvs dump diff` and saving the resulting file. You are also encouraged to create and save `>>nvs dump` and `>>fsaveall` files. See the latest thermal head firmware release notes for more information.
2. Turn off the device.
3. Make sure there is a static-safe, clean work surface for you to put the head on.
4. Put on an antistatic wrist strap.

WARNING: The autofocus laser diode is very static-sensitive. You must wear an antistatic wrist strap whenever you handle a thermal head.

5. Remove the sheet metal cover from the power distribution (PD) board of the head.
6. Unplug all the cables, including the home and away board cable and the leadscrew temperature sensor cable.
7. Disconnect the air jet from its fitting on the PD board support bracket.
8. Remove the screws that hold the cable track onto the bracket on the head (the screws may be standard rather than metric).
9. Disconnect the blower hose(s).
10. Release the head from the carriage:
    - Cam mounting system: Loosen and remove the locking cam securing the head to the carriage. For more detail, see Figure 9.
    - Latch mounting system: Release latches #2 and #3. Using a 3-mm t-handle hex key, fully loosen the shoulder screws that compress the springs that hold the head in position. Release latch #1. For more detail, see Figure 1.
11. Gently lift the head and remove it from the device. Place the head on a static-safe, clean work surface.

WARNING: Be careful not to bump the lens, shutter, or autofocus actuator.

6. MOUNT THE HEAD ON THE CARRIAGE

6.1 Prepare the Device

Note: Before you begin, determine if any conversion is required to ensure the mounting system of the head is compatible with the carriage. To identify the cam mounting system see Figure 9 and to identify the latch mounting system see Figure 1. If a conversion is required, see *Thermal Head Mounting Conversion Procedure* (part number 77-0056A).

1. If required, remove the away side air plenum from the head for Trendsetter 3230 or Trendsetter 3244 devices.
2. Turn off the device.
3. Put on an antistatic wrist strap.

WARNING: The autofocus laser diode is very static-sensitive. You must wear an antistatic wrist strap whenever you handle a thermal head.

4. Remove the sheet metal cover from the power distribution (PD) board of the head.
5. If you're installing a head with a cam mounting system, proceed to Appendix A: Cam Mounting System Procedures. If the head has a latch mounting system, proceed to section 6.2.

6.2 Install the Head

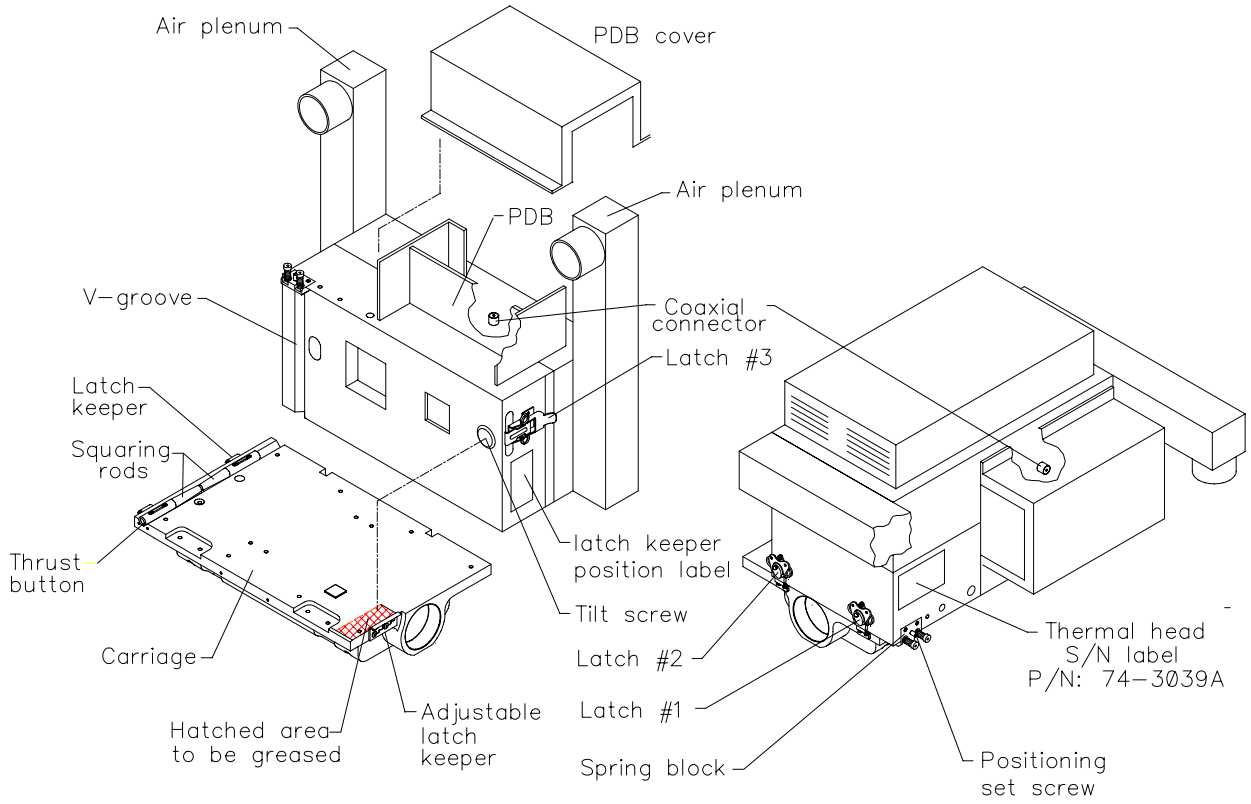


Figure 1: Thermal head mounting system components (latch mounting system)

1. The latch keeper for latch #3 (on the away side of the carriage) has three possible positions (see Figure 2). The latch keeper must be in the position indicated on the latch keeper position label on the head (see Figure 1). If necessary, using a 3-mm hex key, loosen the M5 screws that attach the adjustable latch keeper to the carriage and move it to the correct position.

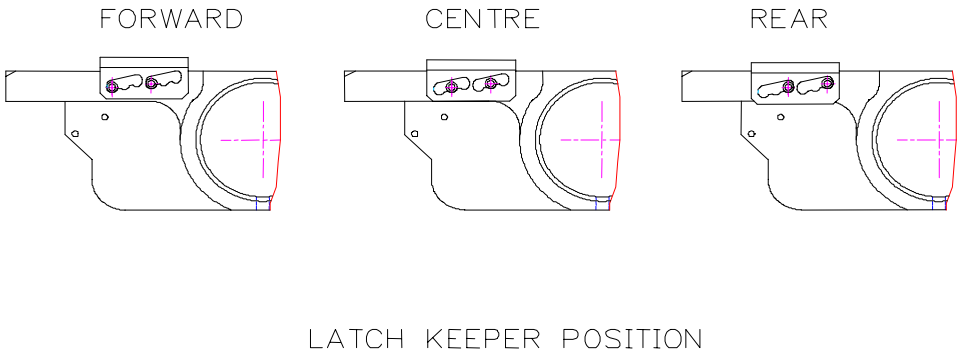


Figure 2: Adjustable latch keeper position

2. Check that there is a small amount of NSK #1 grease on the following areas (see Figure 3):
   - bottom of the tilt screw
   - V-groove

- hook of latch #1
- ball end of the focus adjustment screw

Note: If needed, excess NSK #1 grease can usually be found around the leadscrew nut.

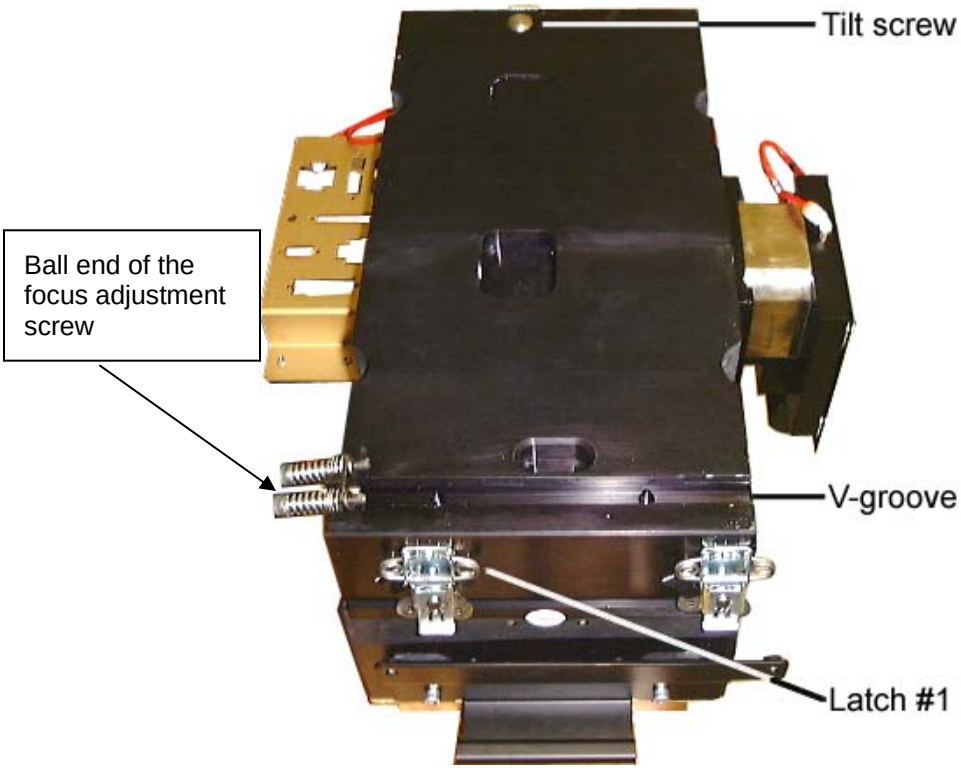


Figure 3: Applying grease to the bottom of head

3. Check that there is a small amount of NSK #1 grease on the following areas (see Figure 4):
   - Squaring rods
   - Keeper of latch #1 (do not apply grease to the other keepers)
   - Thrust button at the end of the squaring rod
   - Flat surface at the away end of the carriage (the surface against the new position of the tilt screw)

WARNING: This system will not work without grease; however, only a thin film of grease is required. High friction between parts of the head and carriage may skew the head.

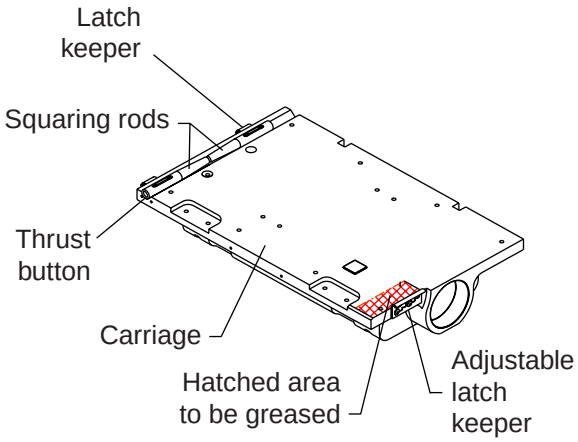


Figure 4: Applying grease to the carriage

4. Pick up the head by the air plenums, keeping the head tilted slightly backwards so the positioning rod stays to the rear against the set screw. Gently lower the head onto the carriage.

WARNING: Be careful not to bump the lens, shutter, or autofocus actuator. Do not allow the head to drop down on the carriage. An impact can shift the optical components inside the head and cause misalignment.

Note: The head may rock a little on the carriage, but the head is fully supported by the squaring rod and the tilt screw.

5. Ensure that the hook of latch #3 is resting on the outside of the adjustable latch keeper and that the tilt screw is resting on the carriage.

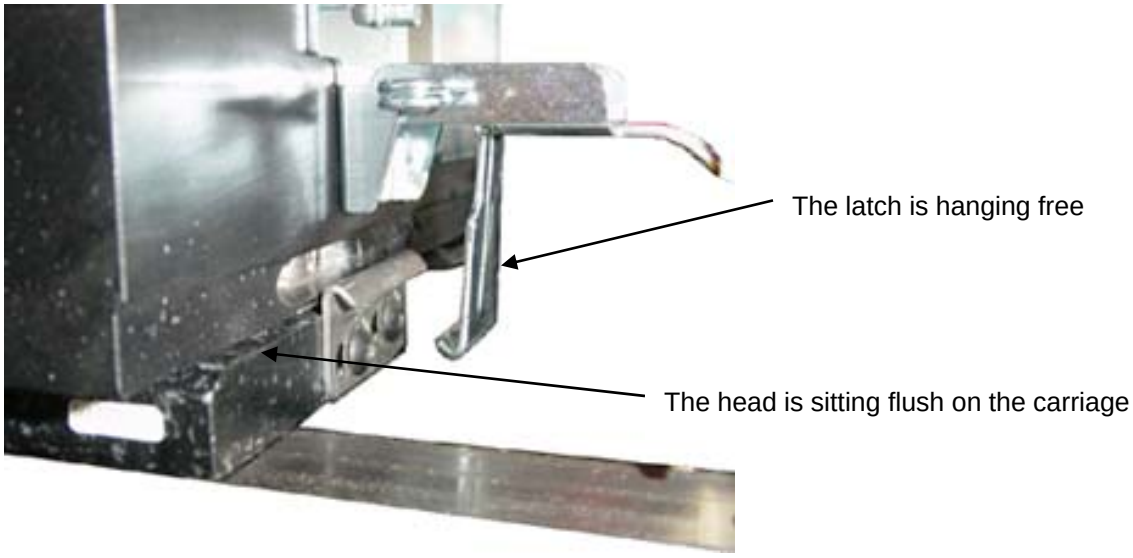


Figure 5: Latch 3 in the correct position



Figure 6: Latch 3 in an incorrect position

6. Keeping the head square on the carriage, gently push the head towards the drum until the head positioning set screw comes into contact with the squaring rod thrust button on the carriage (see Figure 1).

7. Turn the drum once by hand to ensure that the clamps on the drum do not collide with the head. If necessary, adjust the head back with the positioning set screw.

WARNING: If you do not check that there is enough clearance between the clamps and the head, both the head and the clamps can be severely damaged.

8. Lock latch #1 by rotating the handle of the latch one turn clockwise.

9. Tighten the two shoulder screws (beside the set screw) to compress the springs. You might need to push the screws toward the drum to engage the first threads in the threaded holes of the carriage.

6.3 Connect the Cables

1. Connect the following:
   - Cable track, with the two hex screws (may be standard rather than metric)
   - Leadscrew temperature sensor cable
   - Home/away cable to the home/away board on the carriage
   - Air hose to the air fitting on the PD board side covers
   - Coaxial cable

2. Connect the following cables to the PD board (see Figure 7):

WARNING: Avoid flexing the PD board—it is easily damaged. Brace the board with your hand while you connect the cables.

- 20-pin header cable EH-BP (J10): This cable carries serial communications between the head and the MPE (the datalink). Double-check that the 20-pin header cable is plugged into the connector J10 on the PD board next to J9 (9-pin connector), and not into the J17 connector next to the SMA connector.
- DB-9 connector for EH/LE-BPTS (J9)
- 1x6 mate'n lock connector for LAS-PWR (J1)
- 2x3 mate'n lock connector for EH-PDB (J2)

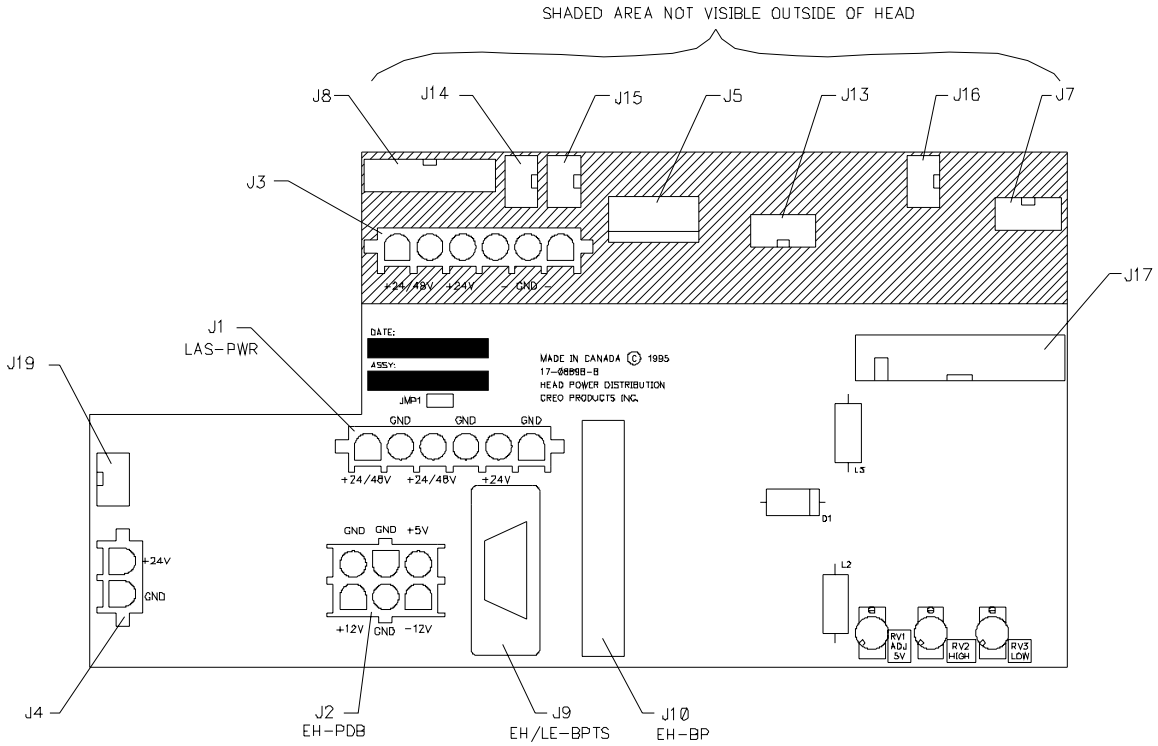


Figure 7: PD Board

6.4 Initialize the Head

1. Close all access panels.
2. Turn on the device and monitor the boot-up sequence on the diagnostic terminal. Wait for these two messages to appear:

   ```
   Datalink: exposure head coming online

   Head initialized successfully
   ```

   - If these messages do not appear, turn off the device, open the access panels, and inspect all cable connections. Check that they are properly connected.
   - If this message appears:

     ```
     incompatible head firmware detected
     ```

     Type the command `>>list version` and identify the cause of the incompatibility.

3. Check the serial data communications with the head by typing the commands:

```
>>head status
>>laser
```

4. Save all the head data to the MPE nvs by typing the commands:

```
>>nvs save head
>>nvs save hdm or >>nvs save hdp
```
(if below thermal software version 2.05)

Note: This is required when the head is connected to the MPE for the first time (for example, during an MPE board replacement or field swap of a thermal head), because the `HEAD`, `HDP`, and `HDM` NVS parameters saved in the MPE will not match those saved in the head.

7. ZERO THE HEAD

7.1 Adjust the NVS Settings

Note: Opening or removing an access panel from the output device trips the access panel safety interlock. This interlock disables the shutter and turns off the 24V power supply to the write laser diode and the autofocus actuator driver.

1. Disable the write laser by typing:

```
>>laser off
>>set head wenable 0
>>nvs save head
>>laser
```
(verify that the write laser is disabled)

2. Override the access panel safety interlock circuit by turning the key switch to the Laser Hazard position. The override LEDs on the panel start flashing.

3. Remove the relevant access panels of the output device to gain access to the head and make sure that the LED's on the thermal head are off.



DANGER! Close the access panels immediately if the red LEDs on the thermal head are flashing.

4. Adjust the media dependent parameters.

   See the appropriate media technical note on TechPlanet (http://techplanet.creo.com/consumables/media/nav/medialist.htm) for details on setting up the following media dependent settings for the customer's media:

   `escan` (extra_scanlines)

   `sr` (surface_reflectivity)

   `sd` (surface_depth)

5. Type:

`>>mode media N` (where `N` is the media type being loaded on the drum)

6. Load a plate on the drum.

7. Type:

   `>>set state plate_loc d` and check the following parameters to ensure they are correct for the loaded plate:

   `thk` (plate_thickness in microns)

   `type` (media_type, a number from 1 to 8)

   `msz` (mscan_size, main scan size of plate in mm)

   `ssz` (sscan_size, sub scan size of plate in mm)

7.2 Zero the Focus Error

All thermal heads are designed and built to operate optimally at a single specific measurement between the head and the drum. If this critical measurement is not correct, the performance of the thermal head can be adversely affected. Correctly zeroing the head ensures that this optimum performance will be achieved over the required range of plate thickness.

Note: You must have access to the diagnostic monitor while making the following adjustments (your laptop is ideal).

1. Put on an antistatic wrist strap.

2. Position the autofocus laser on the plate by typing:

   ```
   >>carriage moveto zzz

   >>drum move xxx h

   >>drum soft
   ```

   Choose values for `xxx` and `zzz` that position the head in the center of the plate. These values are dependent on the output device model and the plate size loaded on the drum. Values of `xxx` = 12000 and `zzz` = 22000 work well for a 3244 output device.

3. Type:

   ```
   >>head install on
   ```

   This command gives continuous readings from the autofocus system. For example:

   ```
   >>head install on
   s=1063 d=-79 e=-2
   s=1065 d=-79 e=-5
   s=1064 d=-77 e=4
   ```

   Typical values are:

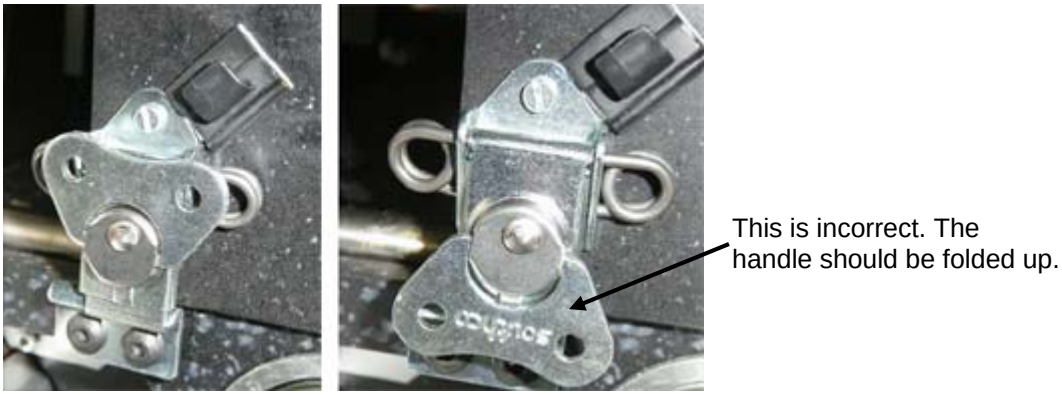
- `s` (sum signal): represents the amount of light reaching the autofocus sensor. The value is ideally 1000 if the value for `media n sr` is correct.
- `d` (difference): Difference value; not important for this procedure
- `e` (error): ideally as close to zero as possible; between –25 and +25 is acceptable

4. Check that the shutter is open and that the autofocus laser diode beam emerges from the final lens and hits the plate.
5. Lock and then unlock latches #2 and #3 to ensure that the head is seated properly.

WARNING:
Never try to turn the positioning set screw when latches #2 or #3 are locked—it will damage the ultra-fine thread of the set screw. When adjusting the head position, only latch #1 should be locked.

6. While monitoring the `head install on` readout, turn the set screw using a 2-mm hex key. Your goal is to maximize the sum signal and minimize the error. Adjust the set screw until the error is as close to zero as possible.
7. Lock latch #2 and note the change in the error value. It is normal for the focus error to decrease slightly (to approximately –50) when latch #2 is locked.
8. Unlock latch #2 and adjust the set screw so that the sum value compensates for the change in value noted in step 7. For example, if the error value went from 0 to –50 after locking latch #2, unlock latch #2 and move the head to +50.
9. Re-lock latch #2. Observe the error value and ensure that it is between –25 and +25. If the error value is out of this range, unlock latch #2 and repeat steps 7 and 8.

WARNING: Always fold the handle on latch #2 into the up position. If you do not, it may contact the leadscrew bearing housing at the home end of the engine and prevent full carriage movement.



Correct and incorrect positions for latch # 2

10. Lock latch #3. The error value may change very slightly, but should still be within the allowable tolerance.

11. Turn off the data streaming by typing:

```
>>head install off
```

12. Type:

```
>>focus cal reflect
```

13. Note the `sr` value and type `>>set hdm x  sr y` (where `x` = the media number and `y` = the `sr` value). If this media is being used by the customer, save this value by typing `>>nvs save hdm`.

14. Type:

```
>>head install on
```

15. Check the sum and error values. The head is correctly positioned if the following conditions are met:
    - Sum: approximately 1000
    - Error: as close to zero as possible, between –25 and +25 is acceptable

16. Unload the plate from the drum.

7.3 Complete the Head Installation

1. If required, install the debris removal nozzle.
2. Load a fresh plate on the drum.
3. Check the edge detection by typing:

```
>>plot edge
```

4. Watch the head while it does the edge detect. When the shutter opens, the focus laser should be within a few millimeters of the edge of the plate and the head should find the edge quickly during a narrow search.
5. Unload the plate from the drum.
6. In the power box on the output device, enable the access panel safety interlock circuit by turning the key switch on the panel to the middle position (key horizontal), and remove your key.
7. Close all access panels.
8. Restore the head parameters back to the factory settings and enable the write laser using these commands:

```
>>reset

>>set head wenable 1

>>nvs save head
```

8. CHECK AND ADJUST THE IMAGE QUALITY

8.1 Check Processor and Media Settings

1. To check the processing line settings, see the appropriate media technical note on the Media site of TechPlanet (http://techplanet.creo.com/consumables/media/nav/thermal_plates.htm).
2. Ensure that all media settings are correct for the specific device and media. Setup information is available in the appropriate media technical note on the Media site of TechPlanet (http://techplanet.creo.com/consumables/media/nav/thermal_plates.htm).
3. Complete all procedures in the media technical note. This makes sure that the head is properly tuned for the media and screen set the device is qualified for.

Note: In general, it should *not* be necessary to change the `bmslope`, `bmcurve` and `foffset` parameters from the values set during integration. Small changes in `wpower` maybe required due to slight differences in the processing line.

8.2 Check for Debris Artifacts

Image a plot 1 and examine the plate for signs of tick or whisker marks.

For more details on identifying and correcting tick and whisker marks, see *Air Jet Plate Installation Document* (PN 30-1163C).

8.3 Check Tilt

To check the tilt, inspect the 3-pixel horizontal line section of a plot 1 using a loupe or the lenticular tool. The horizontal bars should line up at the swath boundaries.

For instructions on adjusting tilt and using the lenticular tool, see *Adjusting Tilt on a Thermal Head*.

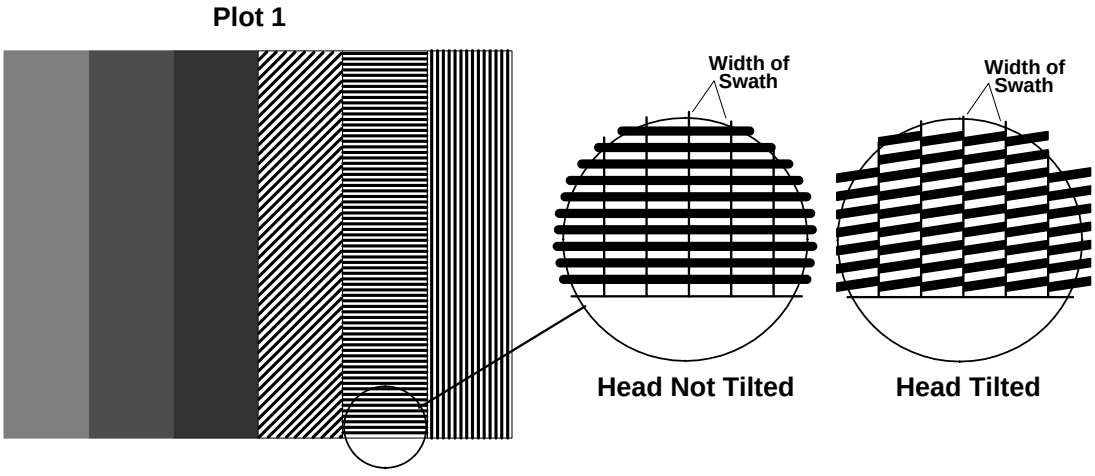


Figure 8: Head tilt

8.4 Confirm Geometric Correction

1. Check the registration by plotting **inchgrid.ps** from the workstation or internal plot 100.
2. Using the inchgrid alignment tool, check that the plot is 1 inch from the LEC edge of the plate. If it's not, make note of the original setting of the parameter `mssa` and adjust it as necessary. Type:

   ```
   >>set gc mssa xxxx
   ```

   For more details, see Geometric Correction Parameter Structure: (http://techplanet.creo.com/output/computer_to_plate/trendsetter_3244/content/docs/MCE_Trendsetter_GC_Parameters.pdf)
3. Repeat steps 1 and 2 until the registration is accurate.

   For detailed information on the calculations used to adjust GC parameters, see *Geometric Correction* (http://techplanet.creo.com/output/computer_to_plate/trendsetter_3244/content/docs/72-3511b-a-pr01.pdf)

Note: Use *Geometric Correction* if the device is to be aligned with another *Kodak SQUAREspot*-equipped platesetter at the customer site.

4. Save the `mssa` parameter by typing:

   ```
   >>nvs save gc mssa
   ```

   After this step you should not see any focus glitches near the LEC edge of the plate.

Note: **inchgrid.ps** is available from the Test Files page of TechPlanet (http://techplanet.creo.com/common/test_files/test_files.htm#inchgrid).

8.5 Back Up NVS Parameters

Back up the NVS parameters when the head installation is complete and you are satisfied with the image quality.

1. Run the script **savecfg.spt** (available in Service Shell).

   If this script is not available, back up the parameters using the following method:
2. Back up the NVS parameters by typing `>>nvs dump`
3. Save the backup file on the workstation in a service directory, and name the file TH*nnn.dd.mm.yyyy*.cfg where *nnnn* is the head serial number.

APPENDIX A: CAM MOUNTING SYSTEM PROCEDURES

Installing the Head On the Carriage

1. Install the shims (shipped with the head) under the pre-load block on the carriage. The tilt adjust screw of the head is set at the factory to ensure that the swath is horizontally aligned on the drum. Please use the shims provided, which are matched to the position of the tilt screw, to ensure that the clamping force holding the head to the carriage is correct.
2. Apply removable *Loctite* 242 to the screws holding the pre-load block (this prevents engine vibrations from shaking the screws loose). Failure to do so can result in the head moving on the carriage, causing imaging artifacts on-plate.
3. Tighten the screws fully to compress the spring washers under the screws, then loosen them a quarter turn.
4. Remove the locking cam from the base of the head
5. Apply a little grease to the surfaces on the head that contact the carriage:
   - Bottom of the tilt screw
   - Squaring rod
   - Shaft of the locking cam

Note: Use NSK grease #1. If you do not have a tube of grease in your toolkit, use some of the excess found around the leadscrew nut.

6. Apply a little grease to the surfaces on the carriage that contact the head:
   - Inside of the pre-load block
   - V-groove
   - Tilt pad
7. On the bottom of the head, check that the positioning rod is pushed back against the set screw. Otherwise it may interfere with the carriage's alignment pin when the head is placed on the carriage.

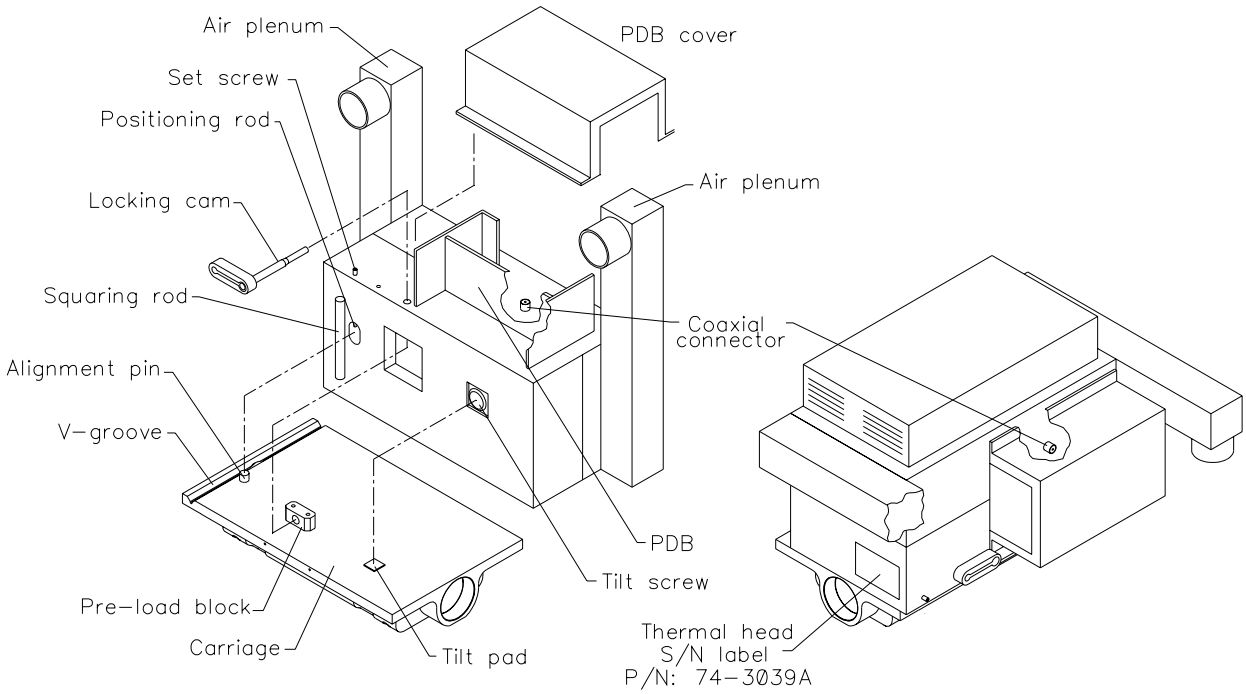


Figure 9. Thermal head mounting system components (cam mounting system)

8. Pick up the head by the air plenums, keeping the head tilted slightly backwards so the positioning rod stays to the rear against the set screw. Gently lower the head onto the carriage. The head may rock a little, but as long as the head is fully supported by the squaring rod and the tilt screw, this is OK. If the head's positioning rod interferes with the carriage's alignment pin, push the positioning rod back against the set screw.

WARNING: Be careful not to bump the lens, shutter, or autofocus actuator. Do not allow the head to drop down onto the carriage. Any impact can shift the components inside the head and cause misalignment.

9. Keep the head square to the carriage and gently push the head towards the drum until the head's positioning rod contacts the carriage's alignment pin.

10. Insert the shaft of the locking cam with the handle in the vertical position, and rotate 90° counterclockwise to the horizontal position to lock the head in place. It should take considerable pressure applied with your thumb to move the locking cam handle to the horizontal position.

Note: If the clamping action is too weak or too strong, remove the head and adjust the number of shims under the pre-load block on the carriage. The shims provided with the head should be very close to the actual thickness required. Also check that the screws that hold the pre-load block are correctly tightened.

11. Turn the drum by hand once to ensure that the clamps on the drum do not collide with the head. If necessary, adjust the head back with the positioning set screw.

WARNING: Failure to check the clearance between the clamps and the head can result in severe damage to the head and the clamps.

12. Proceed to Section 6.3.

Adjusting the Position of the Head

1. Using one hand to keep steady pressure down on the head just above the V-groove, unlock the head by rotating the locking cam handle 90° clockwise into the vertical position.
2. Move the head closer to the drum by turning the set screw counterclockwise using a 3-mm hex key in quarter-turn increments.
3. With your hand positioned at the base of the head, gently push the head forward so it is directly over the set screw. Maintain pressure with the palm of your other hand on the top of the head directly above the carriage's V-groove, to ensure that the head moves in a straight, linear track without rotation, until the positioning rod contacts the carriage's alignment pin to stop the motion.
4. Try to maximize the sum signal by moving the head away from the drum. Turn the set screw clockwise using a 3-mm hex key. Ensure that the head remains seated properly as it moves. If you overshoot the desired value, move the head toward to the drum and repeat this step until the sum signal is maximized.

Adjusting the Focus Error

1. Slowly turn the adjustment screw clockwise to move the head away from the drum. The error value will get larger (more positive). When the error value reaches –400, turn the set screw in very small increments. Move the head until the error reading is between –150 and –100. This number will likely increase (move closer to 0) when the head is clamped.
2. Clamp the head in position by rotating the locking cam handle 90° counterclockwise to the horizontal position.

It is normal for the focus error to increase slightly (move closer to 0) as the head is clamped. However, if the error change is more than 150, the head probably shifted out of position as it was clamped because it was not seated properly in the V-groove. If this is the case, unclamp the head, back off the set screw 1/8 turn, push the head forward against the pin, and repeat steps 1 and 2.

Adjusting the Tilt

Check tilt as described in section 8.2.

Note: The tilt adjustment screw on the cam-mount head is not accessible when the head is mounted, so you the head must be removed to adjust the screw. You must then re-install the head to test the adjustment.

The pitch of the tilt adjustment screw on a cam-mount head is such that 1 turn = 1mm = 1 pixel adjustment in the height of the head, at full width of 240 pixels.