Thermal 2 Exposure Head

Firmware Version 1.05d Release Notes

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1. HOST/EXPOSURE HEAD COMPATIBILITY

Thermal 2 head firmware is distributed as part of a controlled release package or patch. This firmware has been qualified against certain versions of MPE and MCE firmware for each output device. Head firmware should only be loaded as part of a controlled release package. If you are installing a replacement head:

- Refer to **TechPlanet > Output > All CTP Devices Home Page > Controlled releases**, to determine whether or not your head is compatible with the device control software and firmware.
  If it is compatible, you can install the head without changing any firmware.
- If your head firmware is out-of-date, upgrade the head firmware to the version supported by the controlled release.
- If the device control software and firmware are out-of-date, determine if an upgrade path exists for a newer controlled release. If an upgrade path exists, upgrade the host to the correct controlled release. Otherwise, a head downgrade may be necessary.

2. GETTING STARTED

This document provides release information for thermal 2 firmware version 1.05d, which is a significant upgrade from version 1.04x. If you are upgrading from a version older than 1.04x, read the release notes for each intermediate version, to see all of the firmware changes that will occur for your upgrade.

Note: This document does not provide specific information about any host platform.

Formatting conventions used in this document:

- All references to monitor commands are in `courier font`. Monitor commands for the exposure head are preceded by the `TH2 >` prompt and monitor commands for the host are preceded by the >> prompt.
- All references to NVS parameters are in *italics*.
- All references to scripts are **bold**.

3. LASER SAFETY PRACTICES

To use this document, you *must* have attended an exposure head introductory course given by the Creo service-training department, product specialist, or engineering support team. You must be familiar with the necessary safety precautions when working with a thermal head.

DANGER: *Never operate the host device with the write laser beam on and a door open. Do not use the service bypass jigs to bypass the door interlocks.*

4. RELATED RESOURCES

- Thermal 2 exposure head firmware: **TechPlanet** > **Output** > **Heads** > **Thermal 2 Head > Control/settings > Firmware releases** (http://techplanet.creo.com/firmware/CTP/Head/Thermal2/versions.htm)

- Thermal 2 exposure head controls and settings: **TechPlanet** > **Output** > **Heads** > **Thermal 2 Head > Control/settings** (http://techplanet.creo.com/output/heads/thermal_2/nav/control-set.htm)
- Thermal 2 exposure head troubleshooting: **TechPlanet** > **Output** > **Heads** > **Thermal 2 Head > Troubleshooting** (http://techplanet.creo.com/output/heads/thermal_2/nav/troubles.htm)
- Service Shell: **TechPlanet** > **Output** > **Service Tools** > **Service Shell** (http://techplanet.creo.com/output/service_tools/service_shell/nav/v2-x/index.htm)
- Controlled Releases: **TechPlanet** > **Output** > **All CTP Devices** > **Control/settings** (http://techplanet.creo.com/output/computer_to_plate/all_ctp/nav/control-set.htm)

5. NEW FEATURES

The following features were implemented or modified in thermal 2 firmware version 1.05d.

5.1 Improve Error Messaging

Frequently, error messages in the head are translated from one message into another message. Translating error codes allows conformance to existing communication protocols between the head and the host. However, translating error codes from specific messages into more generic catch-all messages can result in confusion.

To facilitate easier debugging, the following changes have been implemented in firmware version 1.05d:

- When reporting errors on new MCE platforms, the original error is returned, instead of translating the message into a system-level error. For example, you will see the actual focus error, instead of 'Failure to configure focus driver.'
- When an error is translated, more detailed information is provided. Additional error translation details have always been provided when error-level verbosity was enabled in the new subsystem. Now, additional details are provided when error-level verbosity is enabled in either the old or the new subsystem. The original error message is also displayed in the TH2 monitor window.

5.2 Change Redirection Mode Reporting

The thermal 2 command `redirect info` displays the current redirection mode for the thermal 2 head. Redirection modes include `disable`, `enable`, and `pass`.

In the thermal 2 head, `redirect pass` functions in the same way as `redirect enable`. For this reason, previous versions of thermal 2 reported the redirection mode as `enable` for both `redirect pass` and `redirect enable`. To reduce confusion, firmware version 1.05d reports the actual redirection mode, `pass` or `enable`, in response to the `redirect info` command.

5.3 Add Correction to Reduce Head Creep

Head creep is a phenomenon that occurs in some heads, reducing the quality of the beam profile. Head creep occurs over time, and is linked to laser power and laser on time. You can reverse this effect and increase head life by applying beam correction when the laser is off.

To prevent creep, the head applies several seconds of beam correction for every second of laser on time. Because you need to apply so much beam correction, it is very important that the machine is powered on when not in use (for example, overnight and on weekends). Powering the device off may result in insufficient beam correction, which could lead to reduced head life.

5.3.1 Automatic Beam Correction

Three parameters control automatic beam correction—all are located in the LVD block.

- The first, *beamcorrfactor*, allows you to specify the number of beam correction seconds for each second of laser on time. The default value is 5. By setting *beamcorrfactor* to 0, you can disable automatic beam correction.
- The second, *beamcorrtime*, specifies the amount of accumulated beam correction time. You should never change this parameter during normal operation.
- The third parameter, *beamcorrvolts*, specifies the voltage to use during beam correction. The default value is 40. You should never change this parameter during normal operation.

5.3.2 Manual Beam Correction

When beam correction is enabled, some heads may continue to exhibit creep for the following reasons:

- Head usage is too high to allow adequate correction
- The type of images generated
- The device is powered down when not in use.

Manual correction mode has been implemented to facilitate beam correction on these heads. Manual correction mode is much faster than automatic mode. However, during manual correction the device is reserved, and the laser is turned on.

The *beamcorrpos* parameter, located in the BBS block, controls manual beam correction.

- The *beamcorrpos* parameter specifies which head pixel is used to evaluate the level of creep. The head will default to use the highest pixel in the beam. In some cases, creep may be more prevalent on another pixel. If other testing indicates that this is the case, then you should change *beamcorrpos* to the worst pixel. The pixel must be an even number, with a minimum value equal to stroke offset, and a maximum value equal to stroke width + stroke offset –2.

Note: If the head you're working on requires manual beam correction, it may take many hours. In extreme cases, it may take days. During a manual correction it is expected that the head will be left idle by the user.

1. To enable manual correction, type:

   ```
   TH2 > eng
   TH2 > sys correct on
   ```

   The head will begin by measuring the magnitude of the creep that is present. This takes approximately 5 minutes. If there is no creep present in the head, the head will return the following message:

   ```
   No correction required, exiting.
   ```

   Otherwise, the head will proceed with correction. This will take many hours. In extreme cases, it may take days. Every hour the head will return a progress message indicating how long the test has been running, and approximately how much time is remaining. When the correction is complete, the head will return the following message:

   ```
   Correction complete.
   ```

   The head will exit rapid correction.

2. At any time, you can exit manual correction by typing:

   ```
   TH2 > sys correct off
   ```

   During a manual correction it is expected that the head will be left idle by the user.

3. Following manual correction, reset the device and leave the device idle for approximately 15 minutes. This allows the head to recover from the correction and ensure that a beam balance is performed on each media before plotting. Beam balance is essential, because manual correction will cause the profile to change considerably.

Note: If the manual correction command is run on a head that does not have the correct hardware to support the feature, the command will fail and the head will display the following error message:

```
Hardware does not support beam correction.
```

5.4 Update Automatic Beam Balance

In order to ensure consistent high-quality plots, a beam balance is automatically performed before some plots. Typically, this is done every nine hours on each media, to ensure constant compensation for changes in the head profile. However, certain parameter changes also require a beam balance. In particular, changing power, slope, curve, stroke width, or stroke offset requires a beam balance.

Previous thermal 2 firmware versions initiated an automatic beam balance only on start-up, or after the nine-hour counter elapsed. Firmware version 1.05d initiates an automatic beam

balance on start-up, when any one of the relevant parameters is changed, or if nine hours or more have passed since the last beam balance on the active media.

5.5 Allow Comment Lines in the Head Monitor

On many Creo platforms, you can enter a comment using the format `;comment`. The device interface ignores all of the text following the semi-colon. This allows two users connected simultaneously via Service Shell to communicate. It also allows you to enter comments in a log, without generating an error message from the host platform.

Thermal 2 head firmware version 1.05d includes a comment option. When entering a comment, start the line with a semi-colon, and all subsequent text will be ignored by the head. When you wish to enter a regular thermal 2 command, omit the semi-colon, and the head will function normally.

5.6 Change *edgesr* Default Value

The MED parameter *edgesr* was introduced in thermal 2 firmware version 1.03x. This parameter is used to overdrive the focus laser during edge detection. Since the introduction of the parameter, the default value has changed from 0.1 to 0.011, to allow overdriving the focus laser as much as possible.

5.7 Add Support for High Addressability Heads

The head firmware is now compatible with regular TH2 heads and High Addressability (HA) heads. With respect to firmware, the main difference between the two head types is the power output. New NVS parameters have been created to allow for this difference.

The range of expected output power for the HA head is 25% of TH2 output power. Maximum and minimum values are stored in the parameters *maximumpower* and *minimumpower* in the LDD module.

The beam balance sensor must receive a minimum amount of light before the algorithm can accurately balance the beam. To account for the drop in power output on HA heads, the NVS parameter *groupsize* was created in the LVD module. This parameter indicates how many pixels are grouped together when doing a beam balance. Valid values for this parameter are 2, 4, and 8. All other values will cause system errors.

These new parameters will be initialized when upgrading to this build. The firmware will decide the head type based on the *dpi* parameter in the SYS module.

6. PROBLEMS FIXED

This section lists problems that have been fixed in thermal 2 firmware version 1.05d.

6.1 Light Valve Lockup

In thermal 2 firmware version 1.05c a defect was introduced that caused the light valve to lock during a plot. The result of this lockup is solid stripes running the entire length of the plate. Firmware version 1.05d fixes this defect.

6.2 Update Power Limits and Scale with Stroke Width

The head has internal laser power limits, to ensure that it is operating safely. However, head performance does change with stroke width. The head can safely operate at a lower laser power when the stroke width is lower, and can safely operate at a higher laser power when the stroke width is higher. Previous versions of head firmware did not take stroke width into account when checking the laser power against the limits.

In version 1.05d firmware, laser power limits are corrected for stroke width. Minimum laser power has been updated from 2W to 4W, at a stroke width of 240.

6.3 Improve Error Checking at the Laser Sensor

Previous versions of firmware did not report an error to the user when the laser sensor was saturated, or when no beam was detected. Version 1.05d firmware now reports errors for these conditions.

6.4 Check Signals when Powering off the Focus Laser

When the head is not receiving all of the signals from the host that it expects, it does not properly monitor focus laser current. This can result in an erroneous error message stating that the focus laser is not powering off, when it fact it has. Firmware version 1.05d checks that the head is receiving all necessary signals when shutting off the focus laser. If all signals are not present, the head returns a signaling error instead of a focus laser error.

6.5 Enforce Strict Image Mode Matching

Thermal 2 heads do not use narrow mode for Staccato imaging. Instead, if any images require different parameter settings, different media slots are used. The MED *imagemode* parameter is used to distinguish between two otherwise identical slots with the same name and color. When matching media slots with the host, firmware version 1.05d looks for slots with the same name, color, and image mode value. Previously, the host and head slots were not forced to have the same image mode. Starting in version 1.05d, strict compatibility between the host and head is enforced.

6.6 Always Initialize Focus Buffers before Focus Learn

Before starting focus learn, data from the most recent successful focus learn is copied into the focus buffers. This optimizes focus learn and allows starting from a known good profile.

In previous versions of firmware, this initialization did not happen for all startup sequences. This was corrected in firmware version 1.05d, so that you are always starting from a known good profile, if such a profile exists.

6.7 Handle Large Plots at High Resolution

Previous versions of firmware could not complete high-resolution plots for larger drum sizes. This issue is resolved in firmware version 1.05d.

6.8 Allow Higher Error for Beam Balance

In some cases, head performance degrades over time, causing beam balance to fail. In these cases, a head replacement is often necessary. However, by relaxing error margins, the head can sometimes be allowed to function until a replacement is possible. This allows plotting to continue, at lower quality, for a limited time. The BBS parameter *maximummae* has been added to facilitate this functionality. This parameter should only be changed under the supervision of a thermal specialist.

6.9 Improve Parameter-Handling

Previously, Service Shell timeouts and communications problems between the head and the host caused slow script responses and occasional head resets when executing `prm diff` and `prm write` commands. These issues have been resolved in firmware version 1.05d.

6.10 Data Path Error

Previous versions of firmware had a very small probability of getting a data path error. This error would freeze the data path and print out the error,

```
[00222] BBS insufficient signal @ max gain
```

This issue has been resolved in firmware version 1.05d.

6.11 Remove the Shutter Glitch

When the shutter opens on a thermal 2 head vibrations are seen on an internal laser sensor. This sensor is used to monitor the write laser power. In earlier firmware versions these vibrations could cause the following laser unstable error,

```
[02334] LDD The laser power is unstable
```

Unstable errors resulting from the shutter have been removed in firmware version 1.05d.

6.12 Allow a Small Gap Time

The current thermal 2 specification states that the time between the end of one swath to the beginning of the next can be a little as 500 microseconds. Previous versions of head firmware would not focus correctly with such small gaps. Version 1.05d fixes this problem.

7. KNOWN ISSUES

The FPGA build that is bundled with 1.05d has a defect in the Hotlink Test module. This causes the following hotlink–not–detected error to be masked.

```
[02516] LVD The data cable is not detected
```

When installing a head with 1.05d, be certain that the hotlink cable is connected since an error message will not alert you to a disconnected cable.

8. NVS PARAMETER CHANGES

The following NVS parameters have changed in thermal 2 firmware version 1.05d:

NVS Parameter	Comment	See Section
lvd beamcorrfactor	new	5.3
lvd beamcorrtime	new	5.3
lvd beamcorrvolts	new	5.3
lvd groupsize	new	5.7
bbs beamcorrpos	new	5.3
bbs maximummae	new	6.8
med edgesr	default changed	5.6
ldd maximumpower	new	5.7
Ldd minimumpower	new	5.7

9. GLOSSARY OF COMMON TERMS

Host	Generic term referring to any output device on which an exposure head is installed.
Exposure Head	Generic term referring to any Creo exposure head.
Thermal 2, TH2	The thermal 2 exposure head is a second-generation thermal exposure head manufactured by Creo Inc. The TH2 exposure head has a maximum of 240 pixels and can deliver a maximum of approximately 18.5 to 23W power on plate.
High Addressability, HA	The High Addressability exposure head is a second-generation thermal exposure head manufactured by Creo Inc. The electronics of the HA exposure head are identical to the TH2. Optically the HA head has a maximum of 240 pixels but is one quarter the width of a traditional TH2 head. The HA head can deliver a maximum of approximately 4.6 to 5.75W power on plate.
Tfx, TFX	The Tfx exposure head is a second-generation thermal exposure head manufactured by Creo Inc. The Tfx exposure head has a maximum of 64 pixels and can deliver a maximum of approximately 60W power on plate.
Thermal 1.0 / 1.7x	The thermal 1.0 / 1.7x exposure head is a first-generation thermal exposure head manufactured by Creo Inc.
Monitor Redirection	The thermal 2 exposure head implements its own diagnostic port. Monitor redirection allows you to access the diagnostic port through the host.
NVS	Non-volatile storage. Note that non-volatile storage includes battery-backed up RAM, flash, EEPROM, and so on.
NVS Parameters	NVS parameters allow the exposure head to permanently save calibration and configuration parameters.