# Thermal 2 Exposure Head

## Thermal 2 Firmware Version 1.03b Release Notes

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# Revision History

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# 1. SCOPE AND INTRODUCTION (PLEASE READ)

This document provides specific information for Thermal 2 firmware version 1.03b and general information for Thermal 2 exposure heads installed on host devices.

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

Thermal 2 firmware version 1.03b is a minor upgrade from thermal 2 firmware version 1.02, with only small changes between the two versions. We have elected to use a new version number, rather than adding a letter to the existing number, because of parameter changes contained in this release of firmware.

Due to some bugs in version 1.02, and some required enhancements to thermal 2 functionality, it is recommended that version 1.03b be used in all cases, rather than version 1.02.

The formatting conventions used in this document are as follows:

- All references to monitor commands are in **bold**. Note that monitor commands intended for the exposure head may be preceded by the "TH2 >" prompt and monitor commands intended for the host may be preceded by the ">>" prompt.
- All references to NVS parameters are in *italics*.
- All references to scripts are underlined.

# 2. LASER SAFETY PRACTICES

To use this document, the user **must** have attended an exposure head introductory course given either by the service-training department, the product specialist or the engineering support team and is therefore familiar with the 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.**

# 3. RELATED DOCUMENTS

- Thermal 2 Exposure Head Home Page, available at: **TechPlanet** > **Output** > **Heads** > **Thermal Head II** (http://techplanet.creo.com/output/heads/thermal_2/nav/index.htm)
- Thermal 2 Exposure Head Firmware, available at: **TechPlanet** > **Output** > **Heads** > **Thermal Head II > Control/settings > Firmware releases** (http://techplanet.creo.com/firmware/CTP/Head/Thermal2/versions.htm)
- Thermal 2 Controls and Settings, available at: **TechPlanet** > **Output** > **Heads** > **Thermal Head II > Control/settings** (http://techplanet.creo.com/output/heads/thermal_2/nav/control-set.htm)

- Thermal 2 Troubleshooting, available at: **TechPlanet** > **Output** > **Heads** > **Thermal Head II > Troubleshooting** (http://techplanet.creo.com/output/heads/thermal_2/nav/troubles.htm)
- Service Shell, available at: **TechPlanet** > **Output** > **Service Tools** > **Service Shell** (http://techplanet.creo.com/output/service_tools/service_shell/nav/v2-x/index.htm)

## 4. PRELIMINARY CHECKLIST (COMPLETE BEFORE YOU BEGIN!)

Before beginning the upgrade of the exposure head firmware, complete the following preliminary checklist:

1. ☐ **Verify the state of the host device.** If the device isn't functioning correctly before upgrading the exposure head firmware, it is unlikely that the device will function correctly after upgrading the exposure head firmware.
2. ☐ **Verify the hardware version of the exposure head** using the following monitor commands:

   >> **redirect pass**

   >> **th2 "ver"**

   If the "Control board" is less than 2, you must upgrade the hardware of the exposure head before the exposure head firmware can be upgraded.
3. ☐ **Determine if an upgrade of the host firmware is required.** Note that an upgrade of the host firmware is *not* required to upgrade the exposure head firmware. However, an upgrade of the host firmware may be required to take advantage of the new functionality of the exposure head.
4. ☐ **Ensure the following files are available**: Thermal 2 firmware version 1.03b (th2fmw103b.bin and/or th2fmw103b.hex).
5. ☐ **Ensure the following applications are *not* running**:
   - Allegro
   - Print Console
   - Prinergy

## 5. UPGRADE PROCEDURE

Upgrade the firmware of the exposure head using the following procedure:

1. Generate baseline plots "plot 1" and "inchgrid.ps". A comparison of plots generated before and after the upgrade will aid in resolving any issues regarding image quality, geometric correction and geometric positioning of the exposure head.
2. Verify the baseline NVS parameters on the exposure head using the following monitor commands:

>> **redirect enable** wait for "Redirect Mode=Enable"

TH2 > **prm diff**

For further information see Appendix D: Backing Up and Restoring NVS Parameters.

3. Save the baseline NVS parameters on the exposure head using the following monitor command:

   TH2 > **prm save**

   For further information see Appendix D: Backing Up and Restoring NVS Parameters.

4. Save a readable version of the NVS parameters on the exposure head using the monitor command:

   TH2 > **prm dump**

   For further information see Appendix D: Backing Up and Restoring NVS Parameters.

5. If the terminal program is Splot or Procomm Plus, download the serial bootloader from the host to the exposure head using the following monitor commands:

   TH2 > **redirect disable** wait for "Redirect Mode=Disable"

   >> **set head type 3** no wait required, ignore any errors

   >> **set hmgr type 3** no wait required, ignore any errors

   >> **head program** wait for "exposure head coming online (programming mode)", may require sixty seconds

   >> **head boot** wait for "EH Boot command (3) Complete", requires two minutes

   >> **fload head code** wait for "Begin ASCII transfer now ...", requires fifteen seconds

6. Initiate the firmware download to the exposure head using the following terminal commands:

| Splot | Procomm Plus |
|---|---|
| Select "Term", "Upload File" | Select "Data", "Send File" |
| Select "Text Files" as file type | Navigate to th2fmw103b.hex |
| Navigate to th2fmw103b.hex | |

7. Load the exposure head firmware using the following monitor command:

   >> **head end**

   For further information, see Appendix A: Terminal Program Setup, Appendix C: Downloading Firmware, and the host documentation.

8. If the terminal program is Service Shell, the firmware must be loaded from a local drive. Downloads from network drives, or remote locations, will fail. Initiate the firmware download to the exposure head using the following terminal commands:

   **Service Shell:** At the command prompt, enter "download <path>\th2fmw103b.bin"

   For further information see Appendix A: Terminal Program Setup, Appendix C: Downloading Firmware, and the host documentation.

**Note:** The exposure head will automatically upgrade the NVS parameters when the firmware initializes for the first time.

9. Generate plots "plot 1" and "inchgrid.ps". The quality of the "plot 1" and the geometric correction and geometric positioning of the "inchgrid.ps" should be unaffected.

10. After verifying the state of the host device, save the baseline NVS parameters on the exposure head using the monitor command:

    TH2 > **prm save**

    For further information see Appendix D: Backing Up and Restoring NVS Parameters for further information.

## 6. DOWNGRADE PROCEDURE

**CAUTION: It is never recommended to downgrade exposure head firmware. Newer versions of exposure head firmware include new algorithms, improved algorithms, bug fixes, and support for newer versions of hardware.**

When downgrading, the original firmware version of the exposure head should be treated as the minimum firmware version for that head. Exposure heads shipped from the factory have been integrated with specific versions of exposure head firmware. The firmware will ensure that all algorithms and NVS parameters are upgraded appropriately but the firmware cannot ensure that all algorithms and NVS parameters are downgraded appropriately.

If you still wish to downgrade exposure head firmware, it is acceptable to downgrade exposure head firmware to the previously installed version. Downgrade the firmware using the following procedure:

1. If the terminal program is Splot or Procomm Plus, download the serial bootloader from the host to the exposure head using the following monitor commands:

| | |
|---|---|
| TH2 > **redirect disable** | wait for "Redirect Mode=Disable" |
| >> **set head type 3** | no wait required, ignore any errors |
| >> **set hmgr type 3** | no wait required, ignore any errors |
| >> **head program** | wait for "exposure head coming online (programming mode)", may require sixty seconds |
| >> **head boot** | wait for "EH Boot command (3) Complete", requires two minutes |

>> **fload head code** wait for "Begin ASCII transfer now ...", requires fifteen seconds

2. Initiate the firmware download to the exposure head using the following terminal commands:

| Splot | Procomm Plus |
|---|---|
| Select "Term", "Upload File" | Select "Data", "Send File" |
| Select "Text Files" as file type | Navigate to the previous version |

3. Navigate to the previous version.

4. Load the exposure head firmware using the following monitor command:

   >> **head end**

   For further information see Appendix A: Terminal Program Setup, Appendix C: Downloading Firmware, and the host documentation.

5. If the terminal program is Service Shell, the firmware must be loaded from a local drive. Downloads from network drives, or remote locations, will fail. Initiate the firmware download to the exposure head using the following terminal commands:

   **Service Shell:**At the command prompt, enter "download <path>\<previous file>"

   For further information see Appendix A: Terminal Program Setup, Appendix C: Downloading Firmware, and the host documentation.

6. Save a readable version of the NVS parameters on the exposure head using the monitor command:

   TH2 > **prm dump**

   For further information see Appendix D: Backing Up and Restoring NVS Parameters.

7. Verify that there are no differences between the readable versions of the NVS parameters generated in section 5 step #4 and section 6 step #6.

# 7. ADDITIONAL FUNCTIONALITY

The following additional functionality has been implemented or modified in Thermal 2 firmware version 1.03b.

## 7.1 Mask the Focus SCLK Fault (No PR)

Thermal 2 head firmware allows the user to mask certain faults. The fault points and their mask state can be displayed by typing:

TH2 > **sys fault**

One of the faults that can be masked in the TH2 head is the Stroke Clock, or SCLK, fault. When masked, any SCLK errors will not be displayed. To mask the Stroke Clock fault, type:

TH2 > **sys fault 9 on**

Previously, masking the SCLK fault did not suppress SCLK errors in the focus subsystem. To eliminate problems on the flat panel device, the mask functionality was expanded to include focus-related SCLK errors.

## 7.2 Handle Improperly Coated Media (No PR)

Some media, particularly Spectratech media, are not coated all of the way to the home edge. The poor coating results in a lower surface reflectivity at the edge of the plate than in the center of the plate. In turn, the variation in surface reflectivity results in an incorrect edge position, and poor registration between plates.

In order to correct for the variation in surface reflectivity between the edge of the plate and the center, the *med <media index> edgesr* NVS parameter was added. During edge detection, we use the *edgesr* value to drive the focus laser, rather than the default *sr* value. At all other times, we use the default *sr* value to drive the focus laser. To correct for the lower surface reflectivity at the edge, we typically set *edgesr* to a value 20% lower than *sr*. However, we can set *edgesr* to be many times lower than *sr* in the case of very bad media, or to be the same as *sr* on media where we wish to disable overdriving of the focus laser.

The *edgesr* value is not used during featureless edge detection.

## 7.3 Add Carriage Return to User Prompt (No PR)

The TH2 head uses many user prompts to confirm that it should proceed with potentially dangerous commands. For example, when loading firmware through the head diagnostic port, the user is asked: `Erase flash and load firmware bundle (Y/N)?` The user must then enter a ‘y’ or an ‘n’ at the prompt to indicate whether or not to proceed.

In Service Shell, no monitor commands are displayed until a carriage return character is received. Previously, no carriage return was printed following the user prompt, so in some cases with Service Shell the user would not see the prompt, and the command would simply time out. By adding a carriage return character following the user prompt we ensure that the prompt is displayed immediately on all terminal programs.

## 7.4 Allow Flagging of P33 Heads through Redirection (No PR)

In the past, we only allowed firmware flagging of P33 heads through the host interface, when using a special build of host firmware. This model was devised specifically to prohibit flagging of P33 heads in the field. However, we have revised our model to allow flagging of P33 heads in the field, under specific circumstances. If you need to flag a P33 head in the field, contact your support specialist for details on how to perform the flagging.

## 7.5 Print Table when Focus Learn Fails (No PR)

In previous versions of firmware we printed the focus learn table when focus learn succeeded, but not when it failed. In retrospect, however, we feel that it is more important to see the focus learn table when focus learn fails, to provide us with debug information. Therefore, we now print the focus learn table when focus learn fails, as well as when it succeeds.

## 7.6 Add Flat Panel Registration Mode (No PR)

For registration and beam-finding purposes, the flat panel device required a special mode. In this mode, the focus is held at the nominal zero position, the laser is on, and the light valve has a configurable pattern. The exposure head treats the new registration mode in a similar way to plot mode or head installation mode. When you are in registration mode, you must explicitly turn registration mode off before running any un-related head commands.

# 8. BUG FIXES

The following bug fixes have been implemented or modified in Thermal 2 firmware version 1.03b.

## 8.1 Fix Clamp Shadow Handling (PR #773)

In Thermal 2 firmware version 1.02, clamp shadows one focus sample in length resulted in focus errors. This problem has been resolved in version 1.03b, and we can now handle clamp shadows of all sizes.

## 8.2 Fix Filter Flush on Bi-directional (No PR)

Our focus filtering was not working correctly for bi-directional. In particular, our flush position was incorrect, which resulted in focus problems on flat panel. This problem has now been resolved.

## 8.3 Fix Mismatch Errors in Gapless Mode (No PR)

Gapless images were consistently returning focus mismatch errors. We now handle focus sample counting correctly in gapless mode, and we no longer see these errors.

## 8.4 Turn off Fan During Initialization (PR #792)

In V1.02, we turned on the optics cavity fan during initialization. On some heads, when the fan was on the beam-pointing sensors returned very high values when the laser was off. To correct the problem, we now turn the optics cavity fan off during initialization.

# 9. NVS PARAMETER CHANGES

The following NVS parameters have changed in Thermal 2 firmware version 1.03b:

| NVS Parameter | Comment | Description | See Section |
|---|---|---|---|
| *med <media index> edgesr* | new | A new NVS parameter *med <index> edgesr* has been added. | 7.2 |

# 10. REQUIRED ENHANCEMENTS / KNOWN DEFICIENCIES

The next release of Thermal 2 firmware will implement the following required enhancements and/or correct the following known deficiencies in Thermal 2 firmware version 1.03b:

1. Changes to prevent firmware from crashing have resulted in frequent overruns of the data logger.
2. In hotlink test mode, the number of symbols received on the hotlink should be periodically displayed on the monitor as positive feedback.
3. Additional diagnostic functions will be implemented to aid the media service tool.
4. Bi-directional focus is not working properly at the start of swath or end of swath (most of the swath is OK). This does not affect any production devices.

# 11. 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 2nd 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 25W. |
| Tfx | The Tfx exposure head is a 2nd 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 64W. |
| Thermal 1.0 / 1.7x | The Thermal 1.0 / 1.7x exposure head is a 1st generation thermal exposure head manufactured by Creo Inc. |
| Monitor Redirection | The Thermal 2 exposure head implements it's own diagnostic port. Monitor redirection allows the user to access the diagnostic port through the host. |
| NVS | Non-volatile storage. Note that non-volatile storage includes battery-backed up RAM, flash, EEPROM, etc. |
| NVS Parameters | NVS parameters allow the exposure head to permanently save calibration and configuration parameters. |

# APPENDIX A: TERMINAL PROGRAM SETUP

A terminal program is required to communicate with the host in order to upgrade firmware, save and/or restore NVS parameters and execute scripts. The terminal program may be run from either DOS (or a DOS window) or it may be used with a "Windows" style interface. It is assumed that the user will run either Service Shell, Splot, or Procomm Plus (Version 4.8) on the system workstation. The user may need to modify the instructions for other terminal programs and/or other PC's.

## Service Shell

Service Shell is the preferred terminal program for all Creo applications. You can find the latest version of Service Shell, along with documentation on how to set up and run Service

Shell, on the Service Shell TechPlanet page. For a link to the Service Shell page, see section 3: *Related Documents*.

## Splot

If Splot is functioning properly, a terminal prompt should appear when the Enter key is pressed. If the terminal prompt does not appear, execute the following steps to ensure the terminal program is set-up correctly:

1. Under "Term", ensure that a checkmark appears in front of "Input Mode". If a checkmark does not appear, click on "Input Mode".
2. Under "Term", select "Port…". Ensure that the correct serial port is selected.
3. Under "Term", select "Port Setting…". Ensure that the baud rate is set to the correct value for the host device, parity is none, data bits are 8, and stop bits is 1.

## Procomm Plus (Version 4.8)

### Set up the program

If Procomm Plus (Version 4.8) is functioning properly, a terminal prompt should appear when the Enter key is pressed. If the terminal prompt does not appear, execute the following steps to ensure the terminal program is set-up correctly:

1. Go to "Options", "System Options", "Modem Connection...".
2. Under "Current Modem/Connection", select "direct connect-Comx". Ensure that the correct serial port is selected.
3. Under "Modem/Connection Properties". Ensure that the baud rate is set to the correct value for the host device, parity is none, data bits are 8, and stop bits is 1.

### Configure the transfer protocol

Configure the transfer protocol for Procomm Plus (Version 4.8) as follows:

1. Go to "Options", "Data Options", "Transfer Protocol…". Under "Current Transfer Protocol", select "ASCII".
2. Under "CR options - upload", select "Don't translate CR".
3. Under "LF options - upload", select "Don't translate LF".
4. Under "CR options - download", select "Don't translate CR".
5. Under "LF options - download", select "Don't translate LF". Be sure to check the "Use" box and specify "~" for the line pace character.
6. Select "OK".

# APPENDIX B: MONITOR REDIRECTION

The exposure head includes a diagnostic port used during development and production of the exposure head. The advantages of a diagnostic port are as follows:

- Since all diagnostic routines are implemented within the exposure head, no support for the diagnostic routines is required in the host.
- Since no support for the diagnostic routines is required in the host, modification and / or enhancement of the diagnostic routines does not require synchronized upgrades of the host and the exposure head.
- The exposure head does not require a host for the majority of development and production.

The disadvantages of a diagnostic port are as follows:

- The exposure head diagnostic routines are not accessible from the host.
- The diagnostic port of the exposure is not accessible once the exposure head is closed.

To compensate for the disadvantages, monitor redirection will redirect the diagnostic port of the exposure head through the host to the diagnostic terminal of the host.

## redirect enable

Monitor redirection can be enabled using the following monitor command:

>> **redirect enable**

When monitor redirection is enabled, the host's diagnostic terminal will only display diagnostic information from the exposure head and all monitor commands will be handled by the exposure head.

## redirect pass

Monitor redirection can be enabled in passthrough mode using the following monitor command:

>> **redirect pass**

When monitor redirection is enabled in passthrough mode, the diagnostic terminal of the host will display diagnostic information from both the host and the exposure head and all monitor commands will be handled by the host (although the host will passthrough monitor commands intended for the exposure head). Note that enabling verbose information on the host and/or the exposure head platforms will result in degradation of system performance in passthrough mode.

## th2 "xxx"

When monitor redirection is enabled in passthrough mode, the host will handle all monitor commands entered on the diagnostic terminal. However the host will recognize monitor commands intended for the exposure head using the following monitor command:

>> **th2 "xxx"**

In this example, the host will passthrough the monitor command xxx to be handled by the exposure head.

## redirect disable

Monitor redirection can be disabled using the following monitor command:

>> **redirect disable**

When monitor redirection is disabled, the diagnostic terminal of the host will only display diagnostic information from the host and all monitor commands will be handled by the host.

# APPENDIX C: DOWNLOADING FIRMWARE

Downloading firmware to the exposure head can be accomplished using various algorithms and configurations. Understanding the algorithms and configurations is best accomplished by understanding the exposure head. The exposure head consists of the following:

- The datalink port of the exposure head is used for communicating with the host.
- The diagnostic port of the exposure head is used during development and production of the exposure head. It is the most efficient method of accessing the exposure head; however the diagnostic port of the exposure head is not accessible when the exposure head is closed.
- The flash in the exposure head is used for permanent storage of the firmware bundle (and NVS parameters, test jig waveforms, and so on). The flash is not used during normal operation of the exposure head.
- The RAM in the exposure head is used to execute firmware. During initialization, the firmware bundle is loaded from flash into RAM.
- The bootloader ROM in the exposure head is used to download the serial bootloader stored in the host to the exposure head. The bootloader ROM and serial bootloader ensure that downloading firmware to the exposure head will succeed even if the flash in the exposure head is corrupt (or erased).
- The reset line from the host to the exposure head allows the host to reset the exposure head when required.
- The boot line from the host to the exposure head allows the host to select between the two bootstrap methods of the exposure head. The bootloader ROM in the exposure head will either boot from flash or prepare for a serial download from the host.

Note the following about downloading firmware to the exposure head:

- If the flash is corrupt (or erased), the host is required to download the serial bootloader stored in the host to the exposure head. As a result, only the default (and original) method used to download firmware to the exposure head will succeed.
- Once the flash is erased, the user is committed to successfully completing a firmware download. Since the firmware executes from the RAM in the exposure head, the firmware will continue to execute as normal. However if the exposure head is reset or power to the exposure head is cycled, the bootloader ROM in the exposure head will not be able to boot from flash.

## Closed Exposure Head, Monitor Redirection Disabled

In a closed head, the datalink port is accessible by the user through the host. This is the default (and original) method used to download firmware to the exposure head. Note that

since the algorithm will download the serial bootloader stored in the host to the exposure head, this algorithm will succeed even if the exposure head is non-functional.

**If using Splot or Procomm Plus**, perform the firmware download using an S-record file format and an ASCII protocol to the exposure head as follows:

1. Connect a PC with a terminal program to the diagnostic port of the host.
2. Configure the terminal program to use the correct serial port, the correct baud rate for the host device, no parity, eight data bits and one stop bit. The download protocol should be configured for an ASCII download using a '~' character for a pace character.
3. Download the serial bootloader from the host to the exposure head using the following monitor commands:

| | |
|---|---|
| TH2 > **redirect disable** | wait for "Redirect Mode=Disable" |
| >> **set head type 3** | no wait required, ignore any errors |
| >> **set hmgr type 3** | no wait required, ignore any errors |
| >> **head program** | wait for "exposure head coming online (programming mode)", may require sixty seconds |
| >> **head boot** | wait for "EH Boot command (3) Complete", requires two minutes |

Once the serial bootloader has been downloaded to the exposure head, the "closer" install LED on the exposure head will flash once per second (the "closer" install LED is used as a heartbeat).

**Note:** Completion of the next step requires that all remaining steps be completed successfully. If the user aborts the firmware download or the firmware download fails, the flash of the exposure head will be corrupt. If the exposure head is reset or power to the exposure head is cycled, the exposure head will not be able to load and execute firmware.

4. Erase the flash on the exposure head using the following monitor command:

| | |
|---|---|
| >> **fload head code** | wait for "Begin ASCII transfer now ..." |

5. Initiate the firmware download to the exposure head using the following terminal commands:

| Splot | Procomm Plus |
|---|---|
| Select "Term", "Upload File" | Select "Data", "Send File" |
| Select "Text Files" as file type | Navigate to th2fmw103b.hex |
| Navigate to th2fmw103b.hex | |

While downloading the firmware to the exposure head, the "further" install LED on the exposure head will flash (the "further" install LED is used as a receive indicator). The

firmware download typically requires ten to twenty minutes depending on the efficiency of the terminal program, PC and host.

6. Load the exposure head firmware using the following monitor command:

   >> **head end**

**If using Service Shell**, perform the firmware download using a binary file format and a binary protocol as follows:

1. Connect a PC with a terminal program to the diagnostic port of the host.
2. Configure the terminal program to use the correct serial port and the correct baud rate for the host device. Note that the binary file should be sent "as is"; there should be no additional characters transmitted and no translations of any characters within the binary file.
3. If the terminal program is Service Shell, the firmware must be loaded from a local drive. Downloads from network drives, or remote locations, will fail. Initiate the firmware download to the exposure head using the following terminal commands:

   **Service Shell:** At the command prompt, enter "download <path>\th2fmw103b.bin"

   Once the serial bootloader has been downloaded to the exposure head, the "closer" install LED on the exposure head will flash once per second (the "closer" install LED is used as a heartbeat). While downloading the firmware to the exposure head, the "further" install LED on the exposure head will flash (the "further" install LED is used as a receive indicator). The firmware download typically requires five to ten minutes depending on the efficiency of the terminal program, PC and host. Note that Service Shell will automatically perform all of the steps performed manually when using Splot or Procomm Plus.

## Closed Exposure Head, Monitor Redirection Enabled

In a closed head, the diagnostic port is not accessible by the user. However, monitor redirection allows the user to access the diagnostic port of the exposure head through the host. A firmware download to the exposure head is not supported using this configuration since this configuration does not provide any additional benefits.

## Closed Exposure Head, Break-out Card

In a closed head, the diagnostic port is not accessible by the user. However, a break-out card allows the user to swap the datalink and diagnostic ports of the exposure head. Note that since the algorithm will not download the serial bootloader stored in the host to the exposure head, this algorithm will succeed only if the exposure head is functional. If the flash in the exposure head has been corrupted or has been erased, see the section "Closed Exposure Head, Monitor Redirection Disabled".

Swap the datalink and diagnostic ports and download the firmware:

1. Turn off the power to the host device and the exposure head.

2. Disconnect the exposure head and connect the break-out card. The break-out card will convert the serial port from RS-485 to RS-232 and hold the reset and boot lines in the appropriate state. This allows the user to connect a standard PC to the exposure head.

3. Connect a PC with a terminal program to the datalink port of the exposure head.

4. Configure the terminal program to use the correct serial port, the correct baud rate for the host device, no parity, eight data bits and one stop bit.

5. Turn on the power to the host device and the exposure head.

6. Wait for the exposure head to initialize (approximately ten seconds, there is no feedback).

7. Send the following sequence of raw bytes to the exposure head (not the string, the hexadecimal values):

   0x10, 0x01, 0x22, 0x00, 0x6E, 0x6F

   The raw bytes form a command packet to request the exposure head swap the datalink and diagnostic ports.

8. Configure the terminal program to use the correct serial port, 115.2K baud, no parity, eight data bits and one stop bit. The download protocol should be configured for a binary download with no pace characters. Note that the binary file should be sent "as is"; there should be no additional characters transmitted and no translations of any characters within the binary file.

**Note:** If the terminal program drops characters at 115.2K baud, reduce the exposure head baud rate using the following monitor command:

TH2 > monitor baud 57600

After reducing the baud rate of the exposure head, reduce the terminal program baud rate accordingly. Note that the exposure head supports baud rates of 9600, 19200, 38400, 57600 and 115200.

9. Initiate the firmware download to the exposure head using the following monitor command:

   TH2 > **fload bundle**

**Note:** Completion of the next step requires that all remaining steps be completed successfully. If the user aborts the firmware download or the firmware download fails, the flash of the exposure head will be corrupt. If the exposure head is reset or power to the exposure head is cycled, the exposure head will not be able to load and execute firmware.

10. The exposure head will display "Erase flash and load firmware bundle (Y/N)?" to query for confirmation from the user. Confirm the firmware download using the following terminal commands:

| Splot | Procomm Plus |
|---|---|
| 'y' | 'y' |
| 'shift' and 'enter' | |

11. The exposure head will display “Erasing the flash ...” and initiates erasing the flash in the exposure head. When the exposure head has erased the flash and is ready to initiate the firmware download (approximately 15 seconds), the exposure head will display “Begin loading the firmware bundle ...”.

12. Initiate the firmware download to the exposure head using the following terminal commands:

| Splot | Procomm Plus |
|---|---|
| Select “Term”, “Upload File” | Select “Data”, “Send File” |
| Select “Binary Files” as file type | Navigate to th2fmw103b.bin |
| Navigate to th2fmw103b.bin | |

When the exposure head has completed the firmware download (approximately 45 seconds at a baud rate of 115.2K), the exposure head will display “*** Command Success ***”.

13. Load the exposure head firmware using the following monitor command:

TH2 > **reset**

**Note:** The Splot scripts getdiagport.spt and upload.spt will perform the required steps.

**If using Service Shell**, see the section Closed Exposure Head, Monitor Redirection Disabled. Service Shell does not support firmware downloads to the exposure head using the diagnostic port. Service Shell only supports firmware downloads to the exposure head through the host.

Downloading firmware using the break-out card on the datalink port is the quickest method to download firmware to a closed exposure head. Unfortunately, non-standard hardware, non-standard cables and complex sequences are required.

## Open Exposure Head

In an open exposure head, the diagnostic port is accessible to the user. Note that since the algorithm will not download the serial bootloader stored in the host to the exposure head, this algorithm succeeds only if the exposure head state is valid (the flash must be valid). Note that since the algorithm will not download the serial bootloader stored in the host to the exposure head, this algorithm will succeed only if the exposure head is functional. If the flash in the exposure head has been corrupted or has been erased, see the section “Closed Exposure Head, Monitor Redirection Disabled”.

**If using Splot or Procomm Plus**, perform the firmware download to the exposure head as follows:

1. Connect a PC with a terminal program to the diagnostic port of the exposure head.

2. Configure the terminal program to use the correct serial port, 115.2K baud, no parity, eight data bits and one stop bit. The download protocol should be configured for a binary download with no pace characters. Note that the binary file should be sent “as is”; there should be no additional characters transmitted and no translations of any characters within the binary file.

**Note:** If the terminal program drops characters at 115.2K baud, reduce the exposure head baud rate using the following monitor command:

TH2 > monitor baud 57600

After reducing the baud rate of the exposure head, reduce the terminal program baud rate accordingly. Note that the exposure head supports baud rates of 9600, 19200, 38400, 57600 and 115200.

3. Initiate the firmware download to the exposure head using the following monitor command:

   TH2 > **fload bundle**

**Note:** Completion of the next step requires that all remaining steps be completed successfully. If the user aborts the firmware download or the firmware download fails, the flash of the exposure head will be corrupt. If the exposure head is reset or power to the exposure head is cycled, the exposure head will not be able to load and execute firmware.

4. The exposure head will display "Erase flash and load firmware bundle (Y/N)?" to query for confirmation from the user. Confirm the firmware download using the following terminal commands:

| Splot | Procomm Plus |
|---|---|
| 'y' | 'y' |
| Shift + enter | |

5. The exposure head will display "Erasing the flash ..." and initiates erasing the flash in the exposure head. When the exposure head has erased the flash and is ready to initiate the firmware download (approximately 15 seconds), the exposure head will display "Begin loading the firmware bundle ...".

6. Initiate the firmware download to the exposure head using the following terminal commands:

| Splot | Procomm Plus |
|---|---|
| Select "Term", "Upload File" | Select "Data", "Send File" |
| Select "Binary Files" as file type | Navigate to th2fmw103b.bin |
| Navigate to th2fmw103b.bin | |

   When the exposure head has completed the firmware download (approximately 45 seconds at a baud rate of 115.2K), the exposure head will display "*** Command Success ***".

7. Load the exposure head firmware using the following monitor command:

   TH2 > **reset**

**Note:** The Splot script upload.spt will perform the required steps.

**If using Service Shell**, see the section Closed Exposure Head, Monitor Redirection Disabled. Service Shell does not support firmware downloads to the exposure head using the diagnostic port. Service Shell only supports firmware downloads to the exposure head through the host.

Downloading firmware using the diagnostic port is the quickest and easiest method to download firmware to an open exposure head. Unfortunately, the diagnostic port is not available once the head is closed for shipping.

# APPENDIX D: BACKING UP AND RESTORING NVS PARAMETERS

NVS parameters allow the exposure head to permanently save calibration and configuration parameters. Before upgrading the firmware of exposure head, it is important to backup the NVS parameters in the event it becomes necessary to revert to the previously installed version.

Note the following about NVS parameters in the exposure head:

- The exposure head automatically saves changes to the NVS parameters.
- If the user upgrades exposure head firmware, upgrades of the NVS parameters will occur automatically when the firmware is executed for the first time.
- If the user downgrades exposure head firmware to the previously installed version, it is not necessary to restore the NVS parameters.

## Monitor Commands

### prm dump

The NVS parameters can be displayed using the following monitor command:

TH2 > **prm dump**

Note that all NVS parameters are displayed; the only exceptions are NVS parameters that are not accessible using monitor commands and are intended for engineering usage only.

## Baseline NVS Parameters

The exposure head implements baseline NVS parameters to allow the user to save a "snapshot" or "baseline" of the NVS parameters. The advantage of baseline NVS parameters is that the user can quickly and easily manipulate and compare NVS parameters without any additional tools. The disadvantage of baseline NVS parameters is that the user is dependent on the exposure head firmware and hardware functioning normally. Thus baseline NVS parameters are a useful tool but do not replace the readable versions or backups of NVS parameters.

For example, if the user encounters problems after upgrading the exposure head firmware, the baseline NVS parameters can be used to determine what, if any, differences there are in the NVS parameters as follows:

- Before upgrading the exposure head firmware, the user saves the baseline NVS parameters (section 5 step #2).
- After the user completes the upgrade of the exposure head firmware, problems are encountered with the host.

- The user can compare the NVS parameters with the baseline NVS parameters to determine what, if any, changes have been made to the NVS parameters.

### prm diff

The NVS parameters can be compared to the baseline NVS parameters using the following monitor command:

TH2 > **prm diff**

The baseline NVS parameters are verified and then the NVS parameter are compared to the baseline NVS parameters. The following differences are displayed:

- Any NVS parameters that differ from the baseline NVS parameters are displayed.
- Any NVS parameters that do not exist in the baseline NVS parameters are displayed.

Note that a small number of NVS parameters that do not exist in the baseline NVS parameters typically results when the exposure head firmware is upgraded. A significant number of NVS parameters that do not exist in the baseline NVS parameters typically results when the baseline NVS parameters have never been saved.

### prm save

The NVS parameters can be saved to the baseline NVS parameters using the following monitor command:

TH2 > **prm save**

The NVS parameters are verified, the baseline NVS parameters are erased and then the NVS parameters are saved to the baseline NVS parameters.

### prm restore

The NVS parameters can be restored from the baseline NVS parameters using the following monitor command:

TH2 > **prm restore**

The baseline NVS parameters are verified and then the NVS parameters are restored from the baseline NVS parameters. Any NVS parameters that do not exist in the baseline NVS parameters are ignored (presumably the user has done a compare and is aware of the differences).

## Service Shell Scripts

The Service Shell script nvsdump.spt will dump a readable version of the NVS parameters and the Service Shell script nvsrestore.spt will restore the readable version of the NVS parameters. Further information about Service Shell scripts is beyond the scope of these release notes.

# APPENDIX E: HOST / EXPOSURE HEAD COMPATIBILITY

Exposure head firmware is backwards compatible. As a result, an upgrade of the host is *not* required to upgrade the exposure head firmware. However, an upgrade of the host firmware may be required to take advantage of the new functionality of the exposure head.

Note that host/exposure head compatibility is no longer a major issue for the following reasons:

- The exposure head includes a diagnostic port used during development and production of the exposure head. Since all diagnostic routines are implemented within the exposure head, no support for the diagnostic routines is required in the host. The host only needs to provide a generic implementation of monitor redirection.
- The exposure head defines the errors strings associated with the error codes. The host only needs to implement a generic algorithm to retrieve the error string associated with the error codes.
- The exposure head defines and manages the NVS parameters required by the exposure head. However, the host implements the *head*, *hdp* and *hdm* NVS parameters which will vary as required by Thermal 1.0 / 1.7x. Note that when using Application Protocol 1+ on MCE platforms, the *head, hdp* and *hdm* parameters will not be accessible through the MCE interface.

Thus the only compatibility issue involves the handling of the *head*, *hdp* and *hdm* NVS parameters. The exposure head firmware compatibility with Thermal 1.0 / 1.7x is defined in the following table:

| Thermal 2 Firmware Version | Thermal 1.0 / 1.7x Firmware Version |
|---|---|
| 0.30x | 1.38 |
| 0.31x | 1.70 |
| 1.00x | 1.70 |
| 1.01x | 1.80 |
| 1.02 | 1.91 |
| 1.03b | 1.91 |