

TFX Head

Head Firmware Version 1.14 Release Notes

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Revision History

Revision	Date	Author	Comments
A	5/31/02	Amber Strocel	First draft.
B	9/27/02	Amber Strocel	Updated links and terminal info.
C	11/08/02	Amber Strocel	Update Preliminary Checklist and Bug Fixes.

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TFX Head
Head Firmware Version 1.12 Release Notes

CONTENTS

1. Scope and Introduction (Please Read) 1

2. Laser Safety Practices 1

3. Related Documents 1

4. Common Acronyms 2

5. Preliminary Checklist (complete before you begin) 3

6. Upgrade Procedure 5

7. PRM Changes 5

8. Bug Fixes 5

9. New Functionality 6
   - 9.1 Support for Creo Exposure Head Application Program Interface 6
     - 9.1.1 System Faults 6
     - 9.1.2 System Parameters 7
   - 9.2 Gapless Imaging 8
   - 9.3 Data Logging 9
   - 9.4 CAUTION: Imaging and Current Limiting at High Power 9
   - 9.5 Marking Diodes ‘Dead’ 9

10. Appendix A: Terminal Program Setup 10
    - 10.1 ServiceShell Setup 10
    - 10.2 ProComm Setup 10
    - 10.3 SPlot Setup 11

11. Appendix B: Backing up and Restoring NVS Parameters 11
    - 11.1 What is the NVS? 11
    - 11.2 Backing up the NVS Parameters 11
    - 11.3 Restoring the NVS Parameters 12

12. Appendix C: Loading TFX Head Firmware 13
12.1 Loading Firmware using ServiceShell 13
12.2 Loading Firmware using ProComm 13
12.3 Recovering From Firmware Load Error (MPE ONLY) 14

13. Appendix D: TFX Head Version Information 15

1. SCOPE AND INTRODUCTION (PLEASE READ)

This document :

- describes important changes to the TFX Head firmware that come with version 1.14.
- outlines procedures for upgrading head and MPE firmware.

As of April 2002, only MPE-based Thermoflex® devices have been tested and made available to the field. Therefore, very limited procedures are available for MCE-based devices. The generic word 'host' is used when listed commands and procedures apply to both the MPE and the MCE.

The appendices provide a reference guide for backing up and restoring NVS parameters as well as the procedure for loading TFX Head Firmware.

This document uses the following formatting conventions:

- TFX commands contained within procedures that are to be typed are in `Courier font` and are preceded by `TFX >`. Exceptions are commands contained in an explanation of a new feature. These commands are in **bold**.
- MPE commands contained within procedures that are to be typed are in `Courier font` and are preceded by >>. Exceptions are commands contained in an explanation of a new feature. These commands are in **bold**.
- All nvs parameters are in *italics.*

2. LASER SAFETY PRACTICES

To use this document the FSE (Field Service Engineer) **must** have attended a Thermal introductory course given by the service-training department, the product specialist, or the engineering support team. The FSE must be familiar with the safety precautions when working with a Thermoflex device.

DANGER! Never operate the Thermoflex 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

- Firmware Commands and NVS Parameters, available at: **TechPlanet** > **Output** > **Heads** > **TFX Head** > **Control/settings** (http://techplanet.creo.com/output/heads/tfx/nav/control-set.htm)
- Service Shell program, available at the Service Shell TechPlanet site: **TechPlanet** > **Output** > **Service Tools** > **Service Shell** > **Downloads** (http://techplanet.creo.com/output/service_tools/service_shell/nav/v2-x/downloads.htm)
- Splot TechPlanet site: **TechPlanet** > **Output** > **Service Tools** > **Splot** (http://techplanet.creo.com/output/service_tools/splot/nav/index.htm)

- TFX Head homepage, available at: **TechPlanet** > **Output** > **Heads** > **TFX Head** (http://techplanet.creo.com/output/heads/tfx/nav/index.htm)
- Thermoflex Controlled Releases, available at: **TechPlanet** > **Output** > **Thermoflex** > **Control/settings** (http://techplanet.creo.com/output/computer_to_plate/thermoflex/nav/control-set.htm)
- Thermoflex TechPlanet site, available at: **TechPlanet** > **Output** > **Thermoflex** (http://techplanet.creo.com/output/computer_to_plate/thermoflex/nav/index.htm)
- TFX Firmware Releases, available at: **TechPlanet** > **Output** > **Heads** > **TFX Head** > **Downloads** > **Firmware Releases** (http://techplanet.creo.com/firmware/ctp/Head/TFX/versions.htm)

4. COMMON ACRONYMS

MPE	Master Processor Electronics
MCE	Master Control Electronics
CEH	Creo Exposure Head
API	Application Program Interface
CTP	Computer to Plate
NVS	Non-Volatile-Storage
PRM	Head Non-Volatile Parameters

5. PRELIMINARY CHECKLIST (COMPLETE BEFORE YOU BEGIN)

☐ Have a terminal program running, with direct access to the diagnostic port on the TFX head. For information on properly configuring terminal programs, refer to Appendix A.

CAUTION: You cannot upgrade the TFX firmware using the redirect enable/disable feature.

☐ (MPE device only) Type the following command in the MPE window:

```
>> list version
```

Then record the following:

"MPE Firmware version": _____

"Thermal software version": _____

"MPE hardware version": _____

☐ Type the following command in the TFX window:

```
TFX > ver
```

Then record the following:

"Firmware": _____

"Build": _____

"Control board": _____

"Xilinx": _____

☐ **If you are performing a field upgrade to the TFX head firmware:** It is mandatory that the head firmware and the Thermal module (Thermal software version) be synchronized. Upgrade the MPE code first, and then upgrade the TFX head firmware to a version compatible with the Thermal module within the MPE firmware. To determine which firmware versions are compatible, refer to the Thermoflex controlled releases page (for details refer to the Related Documents section).

The upgrade procedure is as follows:

1. Upgrade MPE firmware (read all MPE release notes between versions to ensure you perform all necessary steps).
2. Reboot and ensure the system is functioning correctly.
3. Upgrade TFX head firmware (using this document).

☐ **If you are installing a new or replacement head:** It is mandatory that the TFX head firmware and the Thermal module (Thermal software version) within the MPE firmware be

synchronized. Prior to installing the head, the MPE firmware should be upgraded to a version so that the "Thermal module" within the MPE firmware is compatible with the replacement head. To determine which firmware versions are compatible, refer to the Thermoflex controlled releases page (for details refer to the Related Documents section).

Note: If it is still not clear after reading the MPE firmware release notes which versions may be skipped, call the Product Specialist for your Thermoflex model. Refer to the Escalation page of the Thermoflex TechPlanet site (for details refer to the Related Documents section).

☐ Have the TFX Head firmware version 1.14.bin file available (HT114R1901.BIN).

☐ Ensure "Allegro™", "PrintConsole", and "Prinergy®" software is not running.

6. UPGRADE PROCEDURE

For download information for the TFX head firmware, refer to the Related Documents section.

1. **If any field upgrade is required**, upgrade the host firmware first**,** then upgrade the head firmware. For version information, refer to the output device site on Tech Planet.
2. Back up the head NVS using ProComm. Refer to Appendix B for the procedure.
3. Load the new firmware. Refer to Appendix C for the procedure.
4. Generate some test plots to ensure that plot quality has not noticeably degraded because of the upgrade.

7. PRM CHANGES

The following table details which head parameters have changed in this release.

NVS Parameter	Comment	Description	See Section
set dio *limit*	changed	Default changed from 1800 to 1900.	9.4
set h1c *lrt*	changed	Default changed from 0 to 5.	
set h1c *brt*	changed	Default changed from 0 to 20.	
set h1c *redirectdelay*	deleted	H1C parameter “redirectdelay” deleted.	
set sys *swidth*	added	New read-only SYS parameter “swidth” added.	
set sys *soffset*	added	New read-only SYS parameter “soffset” added.	
set sys *faultmask*	added	New SYS parameter array “faultmask” added.	9.1.1
sys parm	added	User-configurable system parameters added.	9.1.2

8. BUG FIXES

The autofocus system filters the focus data it collects during normal focus operation. The filter requires 35 samples to filter correctly. Therefore, in order to guarantee plot quality, each imaged swath must contain at least 35 focus samples.

Previous firmware versions did not check the number of focus samples per swath. Since we cannot guarantee focus quality when our focus system is operating under non-optimal conditions, an error is generated if there are fewer than 35 focus samples per swath. To calculate the minimum mainscan length, use this equation:

$$\textit{min. length} = \frac{35 * \pi * \textit{drum diameter} * \textit{drum speed}}{\textit{focus rate} * 60 * 25.4}$$

The focus rate is printed out when FOC verbosity is set to 4 or higher. To set FOC verbosity, type:

```
TFX > vbs enable dio 4
```

For a 432 mm drum diameter, at a drum speed of 320 rpm, each plot or strip should be 5” or longer. For a 432 mm drum diameter at a drum speed of 440 rpm, each plot or strip should be 6.5” or longer.

9. NEW FUNCTIONALITY

9.1 Support for Creo Exposure Head Application Program Interface

Today, Creo produces several types of exposure heads, used with several hosts. Because each head type can be used with multiple host types, and vice versa, it is increasingly important that we have a standard application program interface (API) for all Creo exposure heads and hosts. This API provides a uniform set of functions, which any host can use to access and control the exposure head.

TFX head firmware version 1.14 implements the CEH API. Together with existing functionality, new API commands allow the host to access and control the head in new and different ways. The most significant new functionality includes system fault handling, and the implementation of configurable system parameters. These are discussed in the following sections.

9.1.1 System Faults

Amongst other functionality, the API is responsible for monitoring the TFX head voltage levels. If any of these voltage levels are out of range, the head may fail to function properly, and a fault state will be generated.

To view the system fault state and determine if any errors are present, type:

```
TFX > sys fault state
```

To view the monitored voltage points and all of their respective fault states, type:

```
TFX > sys fault
```

The CEH API recognizes two types of errors: warnings and fatal errors. Warnings indicate that something is not functioning properly, but that the head can continue to process commands and plot. Fatal errors indicate that the head must be shut down due to a more severe malfunction. To manually generate generic warnings and fatal errors type:

```
TFX > sys fault warning      OR
TFX > sys fault fatal
```

To manually generate a warning or fatal fault at a specific voltage point, type:

```
TFX > sys fault warning <index>      OR
TFX > sys fault fatal <index>
```

Sometimes you may wish to ignore specific voltage faults. To achieve that purpose, fault masks were added to the API. To ignore a specific voltage fault point, type:

```
TFX > sys fault <index> on
```

These fault masks are stored in NVS, in the sys *faultmask* parameter array. Therefore, any time that you mask, or ignore, a specific voltage point, that mask will be automatically saved, and must be manually cleared. To clear a mask, type:

```
TFX > sys fault <index> off
```

9.1.2 System Parameters

System parameters are passed between the head and host during normal operation. These parameters include details about the head and device configuration, such as media thickness and drum speed. Some parameters are passed from the head to the host, some parameters are passed from the host to the head, and some parameters are passed both ways.

Because the CEH API is the same for all exposure heads, not all system parameters are used in the TFX head. For example, parameters controlling write laser operation required for the Thermal 2 head are included in the system parameters, but are not implemented for the TFX head. The table below lists all system parameters, and whether or not they are read or written by the host. Parameters that are neither read nor written are not implemented in the TFX head.

Index	System Parameter	Read by Host	Written by Host
0	Stroke Width	Yes	No
1	Stroke Offset	Yes	No
2	Image DPI	Yes	Yes
3	Media Thickness	No	Yes
4	Drum Diameter	No	Yes
5	Drum Speed	Yes	Yes
6	Laser Power	No	No
7	Surface Velocity	No	No
8	Sensitivity	No	No
9	Sensitivity Adjust	No	No
10	Surface Reflectivity	Yes	Yes
11	Surface Depth	Yes	Yes
12	Overlap Flag	No	Yes
13	Orthog Flag	No	Yes
14	Invert Flag	No	Yes
15	Subscan Duplicate	No	Yes
16	Trailing Flag	No	Yes
17	Swaths to Learn	No	Yes
18	Total Swaths	No	Yes
19	Swaths to Hold	No	Yes
20	SCLK Revolution	No	Yes
21	SCLK Start	No	No

22	SCLK Length	No	No
23	SCLK Image	No	Yes
24	LEC Shadow	No	Yes
25	TEC Shadow	No	Yes
26	Write Laser Timeout	No	No
27	Stroke Cal Timeout	No	No
28	Focus Timeout	Yes	No
29	Lens Position	Yes	No
30	Sub-Scan Shift Adjust	Yes	No
31	Laser Ready Time	Yes	No
32	Balance Ready Time	Yes	No

To view the system parameters, type:

```
TFX > sys parm
```

To change a system parameter, type:

```
TFX > sys parm <index> <value>
```

Note: The user can only modify those parameters that are written by the host.

Occasionally, you may wish to restrict host access to system parameters. The host has access to all parameters that it writes by default. However, access can be manually disabled and enabled. Host access can be enabled or disabled by typing:

```
TFX > sys parm access <index> disable     OR
TFX > sys parm access <index> enable
```

The first command prevents the host from writing the system parameter, while the second command allows the host to write the system parameter. As stated, the host has access by default.

You can manually update the system parameter configuration. To configure the system parameters, type:

```
TFX > sys parm config
```

9.2 Gapless Imaging

The current build of firmware contains support for gapless imaging. Gapless imaging, on sleeve engines, is currently supported only on an MCE platform and is still in development. Therefore, while the TFX Head Firmware and Xilinx bundle contain support for basic gapless functionality, more testing must be done before we can guarantee faultless performance. In addition, not all advanced functionality is supported at this time. Staggered seam support, in particular, will not be available with this release of TFX firmware.

9.3 Data Logging

Data logging for diagnostic purposes is a powerful tool when debugging errors or evaluating head performance. Data logging allows you to collect sensor and other data from the head, while performing a range of functions. This data can then be read out, providing a picture of what happened inside the head while the functions were being performed.

Since the last TFX firmware release, some enhancements have been made to data logging. The 'Focus gate' sample point was added, and the 'Head power' sample point was removed. The sample point indices in the TFX firmware were modified to be in line with the Thermal 2 sample point indices.

In addition to the other changes, the access level of the data logging capability was changed to 'eng'. Therefore, before accessing data logging capabilities, you must type:

```
TFX > eng
```

9.4 CAUTION: Imaging and Current Limiting at High Power

Imaging at higher speeds demands an increase to the MED *stroke* values to keep the exposure at the media constant. As the maximum powers currently employed are exceeded, the diodes are pushed to operate at higher currents, pushing their performance to the limit.

The DIO *limit* value sets the firmware limit for diode current. In order to allow more heads to operate at high power, the default value for *limit* was increased to 1900 mA, which is still more than 5% the maximum safe operating current of 2000 mA.

It is possible to ignore the firmware-imposed current limit for individual diodes using the DIO *override* array. Previously, when *override* was set to 'TRUE' for any diode, no current limit whatsoever was imposed on the diode. This is a very dangerous situation, particularly when people, inadvertently or otherwise, attempt to drive a diode beyond its physical limits. To eliminate the possibility of overdriving diodes, particularly when operating at high powers, a maximum limit of 2000 mA has been added to the firmware.

Using TFX firmware version 1.14, when *override* is 'TRUE', if a given diode's current is set to a value higher than 2000 mA, the current will be limited and the diode will be set to 2000 mA. If DIO verbosity is set to 'debug', then a warning will be generated, informing the user that the diode current has been limited. To set DIO verbosity, type:

```
TFX > vbs enable dio 4
```

9.5 Marking Diodes 'Dead'

When diode power curves are generated using the **cal [pcurve]** command, diodes exceeding the current limit at any time are marked 'dead'. A 'dead' diode will not be powered up, and will be ignored whenever diode power or current settings are changed. Several diodes can be dead, and the head will still function properly when four times overwriting is used, if the diodes are non-adjacent and do not overwrite the same position.

No error is generated when a diode is marked ‘dead’. This is because a dead diode is not a cause for concern in and of itself. However, it is useful to know when a diode is marked ‘dead’, as well as how many diodes are marked ‘dead’.

To provide you with more detailed information, when DPC verbosity is set to ‘errors’, a warning message will be generated when a diode is marked dead. To set DPC verbosity, type:

```
TFX > vbs enable dpc 2
```

10. APPENDIX A: TERMINAL PROGRAM SETUP

10.1 ServiceShell Setup

ServiceShell version 2.4 or higher is required for the TFX head. ServiceShell is the preferred terminal utility for most applications on the TFX head.

Information on ServiceShell, including downloads, is available on the ServiceShell page on TechPlanet (for details refer to the Related Documents section).

10.2 ProComm Setup

The PCPLUS terminal utility is one utility that can communicate with the TFX head. The instructions below apply to PCPLUS version 4.8.

Setting up PROCOMM Plus

System Options

1. From the **Options** menu select **System Options**>**System Options…**
2. Select the **Data** tab.
3. Select the **Path** tab.
4. On the **Download Path** entry line, set a path for downloaded files. For example, **e:\downloads** (this specifies only the download file path, not the filename itself).
5. Click **OK**.

Setup Files

1. From the **Options** menu select **Data Options**>**Setup Files…**
2. From the **Meta Keys** menu, select **None**.
3. From the **Translate Table** menu, select **None**.
4. From the **Capture** menu select **None**.
5. Select the **Setup** button (this brings up the **Capture File Options** window).
   In the **Capture File Options** window:
   a. Enable **Write text as it appears on screen**
   b. Disable **Write filtered text with no emulation escapes**

c. Disable **Write raw text including all escapes**
d. Enable **Overwrite existing capture file**
e. Enable **Query for file name when capture is started**

10.3 SPlot Setup

The SPlot terminal utility is one utility that can communicate with the TFX head.

Information on SPlot, including downloads, is available on the SPlot page on TechPlanet (for details refer to the Related Documents section).

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 that the terminal link is set-up correctly.

1. In the **Term** menu, ensure that a check mark appears in front of **Terminal File**. If no check mark appears, click **Terminal File**.

2. In the **Term** menu, ensure that a check mark appears in front of **Input Mode**. If no check mark appears, click **Input Mode**.

3. In the **Term** menu, select **Port…** and ensure that the correct input port is selected.

4. In the **Term** menu, select **Port Settings…** and ensure that the baud rate is 115200, parity is none, data bits is set to 8, and stop bits is set to 1.

11. APPENDIX B: BACKING UP AND RESTORING NVS PARAMETERS

Before upgrading the firmware of any machine, it is important to backup the current head parameters in case it becomes necessary to revert to the previously installed version of firmware.

11.1 What is the NVS?

The NVS provides storage for machine-dependent parameters that must remain intact between power cycles.

Saving individual NVS parameters is automatic in the TFX Head. Whenever a parameter is changed, it is updated in the head parameter subsystem.

11.2 Backing up the NVS Parameters

Complete the following steps in order to back up the head NVS parameters.

1. To create a baseline, capture the current state of the NVS. Type:

```
TFX > prm save
```

2. Ensure that the terminal script is set up properly to write a backup file. Specifically, check that **Protocol** is set to **Y-Modem**.

3. Back up the NVS parameters to a file by typing:

   ```
   TFX > parm send
   ```

   Wait for the head to respond with:

   ```
   Start receiving a Y-MODEM file now. Use CTRL-X's to cancel.
   ```

4. From the **Data** menu, select **Receive File**. The file will be automatically saved to the file headprm.prf in the default download path, set using the procedure in Appendix A.

5. Wait for the head to display:

   ```
   *** Command Success ***
   ```

   and then set **Protocol** back to Raw Ascii.

11.3 Restoring the NVS Parameters

If the head NVS parameters are corrupted, it may be necessary to restore them. To restore the parameters, complete the following steps.

1. Type:

   ```
   TFX > prm diff
   ```

   This will display the changes made in the NVS since the baseline was established. Look closely at the differences and see if you can spot the problem. If you can, make the necessary changes.

2. If you are unable to detect the problem, or if the changes are too numerous, ensure that the terminal script is set up properly to read a backup file. Specifically, check that **Protocol** is set to **Y-Modem**.

3. Restore up the NVS parameters to a file by typing:

   ```
   TFX > parm receive
   ```

   Wait for the head to respond with:

   ```
   Start sending a Y-MODEM file now. Use CTRL-X's to cancel.
   ```

4. From the **Data** menu, select **Send File**. The filename of the restore file will be headprm.prf, and it will be stored in the default download path, set using the procedure in Appendix A.

5. Wait for the head to display:

   ```
   *** Command Success ***
   ```

   and then set **Protocol** back to **Raw Ascii**.

12. APPENDIX C: LOADING TFX HEAD FIRMWARE

WARNING: Do NOT load head firmware via the MPE using `redirect enable`. This will cause the machine to crash and the firmware will not load successfully.

You can load TFX firmware using ProComm or ServiceShell. Refer to Appendix A for information on how to set up these utilities.

12.1 Loading Firmware using ServiceShell

ServiceShell version 2.4 or higher is required for loading TFX firmware. When using ServiceShell, the ht114r1901.bin file **must** be on a local drive, and the name **must not** be changed. Follow these steps to load TFX firmware using ServiceShell:

1. Ensure that you have access to the diagnostic port on the TFX head and that the terminal program is running correctly. For more detailed instructions on the terminal program, refer to the ServiceShell page on TechPlanet (for details refer to the Related Documents section).
2. Load the firmware bundle by typing:

   ```
   TFX > download <filename>
   ```

   Note that <filename> must contain the full path and filename of the .bin file.
3. Repeat step 2 until you have uploaded the firmware successfully. Do not reset the head, as this will result in a non-functioning head. Reloading the firmware will be much more difficult.

12.2 Loading Firmware using ProComm

When using ProComm, follow these steps to load TFX firmware:

1. Ensure that you have access to the diagnostic port on the TFX head and that the terminal program is running correctly. For more detailed instructions on how to do this, refer to Appendix A.
2. Back up the NVS parameters, using the procedure outlined in Appendix B.
3. Prepare to load the head firmware by typing:

   ```
   TFX > fload bundle
   ```

   Wait for the head to respond with:

   ```
   Erase flash and load firmware bundle (Y/N)?
   ```

   Then type:

   ```
   TFX > Y
   ```

   Then wait for the prompt:

   ```
   Begin loading the firmware bundle ...
   ```

4. Load the firmware by selecting **Send File** from the **Data** menu.
5. Wait for the following head message:

   ```
   Downloaded ________ of ________ words.
   *** Command Success ***
   ```

   If the number of words downloaded agrees with the total number of words, the upload is complete. Otherwise, proceed to the next step.
6. Repeat steps 3 to 5 until you have uploaded the firmware successfully. Do not reset the head, as this will result in a non-functioning head. Reloading the firmware will be much more difficult.
7. Once the head firmware has loaded successfully, reset the head by typing:

   ```
   TFX > reset soft
   ```

12.3 Recovering From Firmware Load Error (MPE ONLY)

If a problem occurs during a firmware load and the head stops communicating through the serial port, the firmware will need to be reloaded using the head bootstrap. In order to load the firmware using the bootstrap, follow these steps:

1. Open an MPE terminal window using the procedure outlined in Appendix A.
2. Prepare to load the head firmware by typing:

   ```
   >> head program
   ```

   Wait for the MPE to respond with:

   ```
   Head Data link: exposure head coming online
   ```

   This will take roughly 30 seconds.
3. Enable the bootstrap by typing:

   ```
   >> head boot
   ```

   Wait for the MPE to respond with:

   ```
   EH Boot Command Complete
   ```

   This will take several minutes.
4. Ensure that the bootstrap is functioning in the head window. Check for the '`SBT>`' prompt to make sure.
5. Once the bootstrap is functioning, you can load the firmware using the standard procedure outlined in the previous section.
6. After the load has successfully completed, reset the head from the MPE by typing:

```
>> head end
>> reset
```

13. APPENDIX D: TFX HEAD VERSION INFORMATION

The following table lists the TFX Head firmware versions, along with any relevant data. Version entries displayed in **bold** are the supported releases.

TFX Head Firmware Version	Build Number	Notes
0.20	1238	Pre-release version.
0.21	1244	Pre-release version.
0.22	1249	Pre-release version.
0.30	1261	Pre-release version.
0.32	1314	Pre-release version.
0.33	1339	Pre-release version.
0.34	1340	Pre-release version.
0.41	1421	Pre-release version.
0.42	1422	Pre-release version.
0.43	1423	Pre-release version.
0.50	1477	Pre-release version.
1.04	1568	First release of TFX Head Firmware.
1.14	1901	Updated API, support for high-power and gapless imaging.