Thermal 2 Exposure Head

Th1.x vs Th2: Monitor Commands and NVS Parameters

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1.0

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Revision History

Revision	Date	Author	Comments
Draft	30 May 2002	R Sherlock/ M Gill	Excerpted from Thermal 2 Interface Compatibility
1.0	05 May 2003	R Sherlock/ M Gill	Updated to reflect the NVS parameters and monitor commands that are supported by Thermal 2 firmware version 1.02+ based on Thermal 1.0 / 1.7x firmware version 1.90.

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1. MONITOR COMMANDS

To implement diagnostic capabilities for Thermal 1.0 / 1.7x, the MPE parsed monitor commands and executed a binary command to perform the diagnostic function. As a result, the firmware implementing diagnostic capabilities for Thermal 1.0 / 1.7x exists on the MPE and the head. While this was sufficient for the original project and head, this method becomes difficult to maintain when there are a dozen or more projects and four or more heads. Adding monitor commands or modifying existing monitor commands needs to be synchronized across all projects and all heads.

Thermal 2 has implemented a diagnostic port accessible from the head (and from the MPE / ICE / MCE using monitor redirection). As a result, the firmware implementing diagnostic capabilities for Thermal 2 exists only on the head! Adding monitor commands or modifying existing monitor commands only needs to be implemented on the head.

The tables below identify the focus, head, hotlink, laser, negotiate, plot, redirect, scorr, shutter, spot and stroke monitor commands and identify how they have been implemented in Thermal 2. The columns are as follows:

1. The first column, “Thermal 1.0 / 1.7x”, identifies all the monitor commands defined for Thermal 1.0 / 1.7x version 1.90.
2. The second column, “Thermal 2”, identifies the corresponding monitor command defined for Thermal 2. If the second column is blank, then a corresponding monitor command does not exist for Thermal 2. Note that the third column determines whether the corresponding monitor command exists on the head or the MPE / MCE / ICE.
3. The third column, “Support”, identifies the support for the monitor command.
4. The fourth column, “Comments”, provides additional information on the function and implementation of the monitor command.

Thermal 2 will support the monitor commands in the following ways:

1. If the support provided is “compatible”, then the monitor command exists on the MPE / ICE / MCE and will provide similar (but not necessarily identical) functionality.
2. If the support provided is “not compatible”, then the monitor command exists on the MPE / ICE / MCE but will not provide similar functionality.
3. If the support provided is “head only”, then a comparable monitor command exists on the head but is not accessible from the MPE / ICE / MCE (except through monitor redirection). Typically this will indicate a diagnostic command that is not required by the MPE / ICE / MCE.
4. If the support provided is “not applicable”, then the hardware functionality does not exist on the head.
5. If the support provided is “not supported”, then the firmware functionality does not exist on the head.
6. If the support is “Thermal 2 only”, then the monitor command is not supported by Thermal 1.0 / 1.7x.

Note: In the following tables, many commands are listed as "**head only**". This means that in order to use the command you must first type:

```
redirect enable

eng
```

Once the command is complete you must type:

```
redirect disable
```

1.1 Focus

Thermal 1.0 / 1.7x	Thermal 2	Support	Comments
focus cal [fshift|fhead|error|reflect]	foc cal …	head only	Diagnostic commands that will no longer exist on the MPE / ICE / MCE. Calibrates the focus.
focus (on|off)	focus (on|off)	compatible	Fully compatible. Turns the focus on / off.
focus hold	foc hold	head only	Diagnostic commands that will no longer exist on the MPE / ICE / MCE. Holds the focus.
focus init		not applicable	Compatible functionality does not exist.
focus laser (on|off)		not applicable	Compatible functionality does not exist.
focus learn	focus learn	compatible	Fully compatible. Learns the focus.
focus lpos (on|off)	foc locate (on|off)	head only	Diagnostic commands that will no longer exist on the MPE / ICE / MCE. Enables / disables the lens-position mode for z-stage calibration.
focus position		Thermal 2 only	Determines the head position for z-stage calibration.

1.2 Head

Thermal 1.0 / 1.7x	Thermal 2	Support	Comments
head	head	compatible	Fully compatible. Displays head information.
head boot	head boot	compatible	Fully compatible serial

			bootloader command.
head bp [on|off|hold|<amps>]	bpd mode (on|update|hold|off)	head only	Diagnostic commands that will no longer exist on the MPE / ICE / MCE. Sets the beam-pointing mode.
head code <byte> …	head code <byte> …	compatible	Fully compatible. Generates a raw datalink packet.
head debug …			Diagnostic commands that will no longer exist on the MPE / ICE / MCE. Generic diagnostic commands to dump the heap, data memory, stack information, etc.
head edge (on|off)	head edge (on|off)	compatible	Fully compatible. Enables / disables edge detect mode.
head end	head end	compatible	Fully compatible serial bootloader command.
head erase (code|phc|lvd|bundle)	head erase (code|phc|lvd|bundle)	compatible	The selected bank is ignored, otherwise fully compatible serial bootloader command. Thermal 2 implements a bundle of firmware and Xilinx files. Thus, there is only one “bank” to erase.
head flatten …		not supported	The scanning routines to flatten the stroke do not exist.
head install (on|off)	head install (on|off)	compatible	Fully compatible. Enables / disables head install mode.
head interval <seconds>		not supported	Unsolicited system faults are generated once, not periodically.
head mask …	sys fault [<index> (on|off)]	head only	Configuration commands that will no longer exist on the MPE / ICE / MCE. Configures the masks for system faults.
head nvs	head nvs	compatible	Fully compatible. See section 2 for a description of the NVS parameters.
head power [pulse|full|off|all|sum]	bbs power (preset|calibrate|on|off)	head only	Diagnostic commands that will no longer exist on the MPE / ICE / MCE. Calculates the head power.
head program	head program	compatible	Fully compatible serial bootloader command.

head read <offset> <width>		not supported	The serial bootloader command is not supported.
head recal [on|off]		not applicable	Compatible functionality does not exist.
head reset (lvd|dtd|abort)		not applicable	Compatible functionality does not exist.
head sample edge	head sample edge	compatible	Fully compatible. Determines the edge detect state for the edge detect algorithm.
head sample (laser|bp|focus|lpos)	ldd sample bpd sample foc sample foc lpos	head only	Diagnostic commands that will no longer exist on the MPE / ICE / MCE. Acquires samples from the hardware.
head stats …	set bpd holdcurrent [<value>] bpd info set ldd laserontime [<value>] ldd info	head only	The beam-pointing hold current and the laser on time are implemented as NVS parameters (using EEPROM instead of flash). Special handling is required because the values are updated automatically.
head status …	bbs info bpd info ldd info lvd info foc info	head only	Diagnostic commands that will no longer exist on the MPE / ICE / MCE. Determines information about the state.
head stream (on|off)	foc stream (on|off)	head only	Diagnostic commands that will no longer exist on the MPE / ICE / MCE. Low-level command for the head install algorithm.
head stroke	bbs balance	head only	Diagnostic command that will no longer exist on the MPE / ICE / MCE. Low-level command for the beam-balance algorithm.
head test		not supported	The serial bootloader command is not supported.
head version	head version	compatible	Fully compatible. Returns values that are consistent with

			Thermal 1.0 / 1.7x. The Thermal 2 monitor command ver will display the correct version information.

1.3 Hotlink

Thermal 1.0 / 1.7x	Thermal 2	Support	Comments
hotlink (enable|disable)		Thermal 2 only	Enables / disables the built-in self-test of the hotlink. When enabling the built-in self-test, the built-in self-test is enabled by both Thermal 2 and the MPE / ICE / MCE. After a delay of one second, the hotlink counters are reset to clear initialization errors.
hotlink reset		Thermal 2 only	Reset the hotlink counters during the built-in self-test of the hotlink.
hotlink status		Thermal 2 only	Display the hotlink counters during the built-in self-test of the hotlink.

1.4 Laser

Thermal 1.0 / 1.7x	Thermal 2	Support	Comments
laser	laser	compatible	Only the laser state, laser power and laser current fields are supported. The laser power is returned if the laser state is “On”, the laser current is returned if the laser state is “Current” and all other fields are not supported.
laser current <amps>	ldd mode current <setpoint>	head only	Diagnostic command that will no longer exist on the MPE / ICE / MCE. Turns on the laser at the specified current.
laser idle	laser idle	not compatible	Laser idle mode has not been implemented. The laser is turned off.
laser (on|off)	laser (on|off)	compatible	The laser power cannot be

			returned, otherwise fully compatible. Thermal 2 cannot calculate the laser power on demand
laser standby	laser standby	not compatible	Laser standby mode has not been implemented. The laser is turned off.
laser test		not supported	The laser diagnostic routines have not been implemented.
laser ship		not supported	The laser diagnostic routines have not been implemented.

1.5 Negotiate

Thermal 1.0 / 1.7x	Thermal 2	Support	Comments
negotiate baud (9600|19200)		Thermal 2 only	Negotiate a baud rate with the head. The baud rate will be applied to the datalink between the MPE / ICE / MCE and head and the monitor of the MPE / ICE / MCE.

1.6 Plot

Thermal 1.0 / 1.7x	Thermal 2	Support	Comments
plot …		compatible	Plots are generated by the MPE / ICE / MCE. Any head dependencies for plot commands should be programmed into the MPE / ICE / MCE firmware.

1.7 Redirect

Thermal 1.0 / 1.7x	Thermal 2	Support	Comments
redirect (enable|pass|disable)		Thermal 2 only	Configure the redirection mode. Monitor redirection allows the user to access the head's monitor through the MPE / ICE / MCE monitor.
th2 "<string>"		Thermal 2	Thermal 2 monitor command

		only	to send a command to the head (only if the redirection mode is passthrough).

1.8 scorr

Thermal 1.0 / 1.7x	Thermal 2	Support	Comments
scorr	set med <copy> scorr	head only	The scorr table is implemented as an NVS parameter accessible only from the head.
scorr <sample> [<value>]	set med <copy> scorr <element> <value>	head only	The scorr table is implemented as an NVS parameter accessible only from the head.
scorr init [<value>] [<slope>]	set med <copy> scorr all <value>	head only	The scorr table is implemented as an NVS parameter accessible only from the head.
scorr save		not supported	The scorr table is implemented as an NVS parameter accessible only from the head. Modification of any NVS parameter is automatically saved.

1.9 Shutter

Thermal 1.0 / 1.7x	Thermal 2	Support	Comments
shutter (open|close) [mpe]	shutter (open|close) [mpe]	compatible	Fully compatible.

1.10 Spot

Thermal 1.0 / 1.7x	Thermal 2	Support	Comments
spot <offset> [<width>]	lvd (<offset> <width>|all) (off|on)	head only	Diagnostic command that will no longer exist on the MPE / ICE / MCE. Turn on spots. Note that Thermal 2 can turn on any combination of spots.
spot full	lvd all on	head only	Diagnostic command that will no longer exist on the MPE / ICE / MCE. Turn on all spots.
spot off	lvd all off	head only	Diagnostic command that will

			no longer exist on the MPE / ICE / MCE. Turn off all spots.

1.11 Stroke

Thermal 1.0 / 1.7x	Thermal 2	Support	Comments
stroke	set med <copy> stroke	head only	The stroke table is implemented as an NVS parameter accessible only from the head.
stroke <sample> [<value>]	set med <copy> stroke <element> <value>	head only	The stroke table is implemented as an NVS parameter accessible only from the head.
stroke cal [stats]	stroke cal	compatible	Statistics have not been implemented, otherwise fully compatible.
stroke init [<value>]	set med <copy> stroke all <value>	head only	The stroke table is implemented as an NVS parameter accessible only from the head.
stroke profile	bbs profile	head only	Diagnostic command that will no longer exist on the MPE / ICE / MCE. Calculates the stroke profile.
stroke save		not supported	The stroke table is implemented as an NVS parameter accessible only from the head. Modification of any NVS parameter is automatically saved.

2. NVS PARAMETERS

Note: All NVS Parameters have a detailed description available from the Control/Settings page of the Thermal 2 TechPlanet site, under Firmware NVS Parameters.

The MPE / ICE / MCE reads the NVS parameters from Thermal 2 at initialization and can be updated by the monitor command head nvs. Note that a parameter updated using the Thermal 2 diagnostic monitor is automatically updated in the MPE / ICE / MCE (providing the parameter handler is supported by the MPE / ICE / MCE).

The MPE / ICE / MCE can write a select few of the NVS parameters. Note that the parameter is not saved in a scratchpad but is saved in the flash. Thus the monitor commands nvs save head, nvs save hdp, nvs save hdm, nvs save servo_stat and nvs save hms do not have any affect on the head but do save the updated NVS parameters in the MPE.

- The NVS parameters from Thermal 1.0 / 1.7x can be broken into the head cal, head cfg, hdp cal, hdp cfg, hdm x cal, servo_stat cal and hms x cal NVS parameters. Note that hdp is an acronym for head dependent parameter, hdm is an acronym for head dependent media, servo_stat is an acronym for servo statistics, hms is an acronym for head media statistics, cal is an acronym for calibration and cfg is an acronym for configuration. The acronym hdp identifies parameters that are dependent on the head but used only by the MPE / ICE / MCE (no exceptions) while the acronym hdm identifies parameters that are dependent on the head and the media but used mostly by the MPE / ICE / MCE. The acronym cal identifies parameters that must be calibrated by integration, production and the field while the acronym cfg identifies parameters that configure a feature (this is what was intended but hasn't been followed very closely).
- The head cal and head cfg NVS parameters were mainly used by the head and this is reflected by the fact that most of these parameters will no longer be accessible from the MPE / ICE / MCE. The hdp cal and hdp cfg NVS parameters are used exclusively by the MPE / ICE / MCE (no exceptions) and this is reflected by the fact that most of these parameter are still accessible from the MPE / ICE / MCE. The hdm cal NVS parameters were mainly used by the MPE / ICE / MCE and this is reflected by the fact that most of the parameters are still accessible from the MPE / ICE / MCE. The servo_stat cal and hms cal NVS parameters are used exclusively by the head (no exceptions) and this is reflected by the fact that these parameters will no longer be accessible from the MPE / ICE / MCE.
- The cal and cfg identifiers were meant to identify parameters that could be set in the field and parameters that were set by production and / or integration. Thermal 2 implements this feature using parameter access levels; i.e. field access only displays and modifies NVS parameters that can be changed in the field.

The tables below identify the head cal, head cfg, hdp cal, hdp cfg, hdm x cal, servo_stat cal and hms x cal NVS parameters and identify how they have been implemented in Thermal 2. The columns are as follows:

1. The first column, "Thermal 1.0 / 1.7x", identifies all the parameters defined for Thermal 1.0 / 1.7x version 1.90.

2. The second column, “Thermal 2”, identifies the corresponding parameters defined for Thermal 2 version 1.02. If the second column is blank, then a corresponding parameter does not exist for Thermal 2.
3. The third column, “Support”, identifies the support for the NVS parameter.
4. The fourth column, “Comments”, provides additional information on the function and implementation of the NVS parameter.

Thermal 2 will support the NVS parameter in the following ways:

1. If the support provided is “read / written from the parameter key”, then the value is read and written by the MPE / ICE / MCE using the corresponding Thermal 2 parameter identified in the second column.
2. If the support provided is “read as xxx” without a parameter key in the second column, then the value is read by the MPE / ICE / MCE as a hardcoded default and writes by the MPE / ICE / MCE will result in an error.
3. If the support provided is “read as xxx” with a parameter key in the second column, then the value will be read by the MPE / ICE / MCE as a hardcoded default and writes by the MPE / ICE / MCE will result in an error. The corresponding Thermal 2 parameter identified in the second column is not accessed. This indicates that the MPE / ICE / MCE will not be provided access to the corresponding functionality.
4. If the support provided is “read as xxx, writes ignored” without a parameter key in the second column, then the value is read by the MPE / ICE / MCE as a hardcoded default and writes by the MPE / ICE / MCE will be ignored. Ignoring the write by the MPE / ICE / MCE allows the MPE / ICE / MCE to continue normally.

2.1 head cal

Thermal 1.0 / 1.7x	Thermal 2	Support	Comments
head cal sn	sys serialnumber	read as 0	Configures the serial number for the head. Note that Thermal 1.0 / 1.7x implemented a 32-bit number while Thermal 2 implements a ten-character string.
head cal fshift	foc dmodsync	read as 55	An NVS parameter that configures the focus sensor demodulation synchronization. Thermal 2 handles the focus internally.
head cal wpwrcal		read as 0.0	An NVS parameter to convert write laser samples to power. This feature will not be supported by Thermal 2 (for the M8 sensor).
head cal lvbias	lvd hvbias lvd hvtrim	read as 4	An NVS parameter that configures the light valve bias voltage. Thermal 2 handles the light valve internally.
head cal onthresh		read as 1000	An NVS parameter that determines the on-

			plate threshold for edge detect. This parameter has been hardcoded in Thermal 2.
head cal offthresh		read as 0	An NVS parameter that determines the off-plate threshold for edge detect. This parameter has been hardcoded in Thermal 2.
head cal hsslope	bbs powerfactor[1]	read as 0.0	An NVS parameter to convert write laser samples to power. Thermal 2 handles the power conversion internally (for the beam-balance sensor).
head cal hsoffset	bbs powerfactor[0]	read as 0	An NVS parameter to convert write laser samples to power. Thermal 2 handles the power conversion internally (for the beam-balance sensor).
head cal ferrcal	foc errorcal	read as 3.0	An NVS parameter that calibrates the error in lsb's per micron. Thermal 2 handles the focus internally.
head cal fmod		read as -0.02	An obsolete NVS parameter for focus.
head cal lposcal	foc lposcal	read as 3.0	An NVS parameter that calibrates the lens position in lsb's per micron. Thermal 2 handles the focus internally.
head cal fsphase		read as 0	An NVS parameter that supports routines for plate scanning. This feature is not supported by Thermal 2.
head cal scanscale		read as 0	An NVS parameter that supports routines for plate scanning. This feature is not supported by Thermal 2.
head cal hpslope	bbs powerfactor[1]	read as 300.0	An NVS parameter to convert write laser samples to power. Thermal 2 handles the power conversion internally (for the beam-balance sensor).
head cal hpoffset	bbs powerfactor[0]	read as 0.0	An NVS parameter to convert write laser samples to power. Thermal 2 handles the power conversion internally (for the beam-balance sensor).
head cal nomlsrcur	ldd nominalcurrent	read as 27.3	An NVS parameter that determines the maximum laser current. The head will limit the laser current to %120 of this value. Thermal 2 handles the write laser current internally.
head cal casehigh		read as 25.0	An NVS parameter that configures the temperature range for chiller control. Implementation of chiller control will be a

			future enhancement of Thermal 2.
head cal caselow		read as 21.0	An NVS parameter that configures the temperature range for chiller control. Implementation of chiller control will be a future enhancement of Thermal 2.
head cal humidity		read as 30.0	An NVS parameter that configures the humidity range. Implementation of a humidity sensor will be a future enhancement of Thermal 2.

2.2 head cfg

Thermal 1.0 / 1.7x	Thermal 2	Support	Comments
head cfg fkp	foc fkp	read as 0.25	An NVS parameter to configure the focus control loop in PID mode. Thermal 2 handles the focus control loop internally.
head cfg fki	foc fki	read as 0.09	An NVS parameter to configure the focus control loop in PID mode. Thermal 2 handles the focus control loop internally.
head cfg fkd	foc fkd	read as 1.2	An NVS parameter to configure the focus control loop in PID mode. Thermal 2 handles the focus control loop internally.
head cfg lkp	foc learngain	read as 0.5	An NVS parameter to configure the focus learn control loop. Thermal 2 handles the focus learn control loop internally.
head cfg padvance	foc padvance	read as 6	An NVS parameter to compensate for the phase lag of the lens position control. Thermal 2 handles the focus internally.
head cfg lpkp		read as 6.0	An NVS parameter to configure the lens position control loop. Thermal 2 implements the lens position control using a different method.
head cfg lpki		read as 0.12	An NVS parameter to configure the lens position control loop. Thermal 2 implements the lens position control using a different method.
head cfg lpkd		read as 32.0	An NVS parameter to configure the lens position control loop. Thermal 2 implements the lens position control using a different method.
head cfg lpos	foc lpos	read / written from the parameter key	An NVS parameter that sets the lens position for the fixed lens-position mode. This NVS parameter can be read and

			written from the MPE / ICE / MCE.
head cfg foffset	foc offset	read / written from the parameter key	An NVS parameter that adjusts the focus setpoint to compensate for mechanical errors. This NVS parameter has also been used to compensate for surface depth. This NVS parameter can be read and written from the MPE / ICE / MCE.
head cfg acurrent		read as 0	An obsolete NVS parameter for focus.
head cfg fsample		read as 1	An NVS parameter to enable / disable the focus control loop. This feature will not be supported by Thermal 2.
head cfg fthresh		read as 150	An NVS parameter that configures the focus error threshold for in-focus detection. This parameter has been hardcoded in Thermal 2.
head cfg ferrdur		read as 50	An NVS parameter that configures the focus error duration for out-of-focus detection. This parameter has been hardcoded in Thermal 2.
head cfg fsettle		read as 6	An NVS parameter that configures the number of rotations for in-focus detection. This parameter has been hardcoded in Thermal 2.
head cfg fpower		read as 1.0	An obsolete NVS parameter for focus.
head cfg bkp	bpd kp	read as 1.0	An NVS parameter to configure the beam-pointing control loop. Thermal 2 handles the beam-pointing control loop internally.
head cfg bki	bpd ki	read as 0.05	An NVS parameter to configure the beam-pointing control loop. Thermal 2 handles the beam-pointing control loop internally.
head cfg bkd	bpd kd	read as 0.0	An NVS parameter to configure the beam-pointing control loop. Thermal 2 handles the beam-pointing control loop internally.
head cfg bposn	bpd beamposition	read as 0	An NVS parameter to configure the beam position (set to provide maximum contrast). Thermal 2 handles the beam position internally.
head cfg bsample		read as 24	An NVS parameter to enable / disable the beam-pointing control loop. This feature will not be supported by Thermal 2.
head cfg wkp	ldd calibratekp ldd powerkp	read as 0.2	An NVS parameter to configure the write laser control loop. Thermal 2 handles the write laser control loop internally.

head cfg wki	kdd calibrateki ldd powerki	read as 0.11	An NVS parameter to configure the write laser control loop. Thermal 2 handles the write laser control loop internally.
head cfg wkd	ldd calibratekd ldd powerkd	read as 0.0	An NVS parameter to configure the write laser control loop. Thermal 2 handles the write laser control loop internally.
head cfg wenable	sys laserenable	read / written from the parameter key	An NVS parameter to enable / disable the write laser. This NVS parameter can be read and written by the MPE / ICE / MCE.
head cfg wsample		read as 49	An NVS parameter to enable / disable the write laser control loop. This feature will not be supported by Thermal 2.
head cfg bpgain		read as 40	An NVS parameter to configure the beam-balance sensor gain. Thermal 2 auto-calibrates the sensor when calculating the stroke profile and performing a beam-balance and thus doesn't require the parameter.
head cfg bpmaxerr	bbs maximumerror	read / written from the parameter key	An NVS parameter that configures the maximum beam-balance error. This NVS parameter can be read and written by the MPE / ICE / MCE.
head cfg scanlpos		read as 200	An NVS parameter that supports routines for plate scanning. This feature is not supported by Thermal 2.
head cfg scands		read as 10.0	An NVS parameter that supports routines for plate scanning. This feature is not supported by Thermal 2.
head cfg nlpwm		read as 0	An NVS parameter to enable / disable compensation for non-linear light valves. This feature is not supported by Thermal 2 (and is not used by Thermal 1.0 / 1.7x).
head cfg vb		read as 0	An NVS parameter to enable / disable verbose information. Thermal 2 implements diagnostics commands and an NVS parameter to display verbose information on the diagnostic monitor.
head cfg hpwrgain		read as 50	An NVS parameter to configure the beam-balance sensor gain. Thermal 2 auto-calibrates the sensor when calculating the head power and thus doesn't require the parameter.
head cfg lsrmode		read as 0, writes ignored	An NVS parameter to configure the laser mode. This feature is not supported by

			Thermal 2.
head cfg flpos		read as 0	An obsolete NVS parameter for focus.
head cfg diag0		read as 0	An NVS parameter for temporary testing purposes. This feature is not supported by Thermal 2.
head cfg diag1		read as 0	An NVS parameter for temporary testing purposes. This feature is not supported by Thermal 2.
head cfg diag2		read as 0	An NVS parameter for temporary testing purposes. This feature is not supported by Thermal 2.
head cfg diag3		read as 0	An NVS parameter for temporary testing purposes. This feature is not supported by Thermal 2.
head cfg diag4		read as 0	An NVS parameter for temporary testing purposes. This feature is not supported by Thermal 2.
head cfg diag5		read as 0	An NVS parameter for temporary testing purposes. This feature is not supported by Thermal 2.
head cfg type		read as 3	An NVS parameter to determine the type of head as follows: • 0 is Thermal 1.0 • 1 is Thermal 1.7x • 2 is Tfx • 3 is Thermal 2

2.3 hdp cal

Thermal 1.0 / 1.7x	Thermal 2	Support	Comments
hdp cal fmsl		read as 20, writes ignored	An NVS parameter that defines the number of stripes in an automated series. Automated series will be a future enhancement of Thermal 2 and will not use NVS parameters.
hdp cal fmsw		read as 1.0, writes ignored	An NVS parameter that defines the width of stripes in an automated series. Automated series will be a future enhancement of Thermal 2 and will not use NVS parameters.

hdp cal sssa	h1c sssa	read / written from the parameter key	An NVS parameter used to specify the location of the head for edge detects and plots. This NVS parameter can be read and written from the MPE / ICE / MCE.
hdp cal rt		read as 1	An NVS parameter used to define the recalibration time of the light valve. Recalibration of the light valve is not supported by Thermal 2 (and is not used in Thermal 1.0 / 1.7x).
hdp cal dpi	sys dpi	read / written from the parameter key	An NVS parameter used to define the head dpi. This NVS parameter can be read and written from the MPE / ICE / MCE.

2.4 hdp cfg

Thermal 1.0 / 1.7x	Thermal 2	Support	Comments
hdp cfg lrt	h1c lrt	read / written from the parameter key	An NVS parameter that prevents the workstation from launching plots until the laser ready time has elapsed. This NVS parameter can be read and written from the MPE / ICE / MCE.
hdp cfg brt	h1c brt	read / written from the parameter key	An NVS parameter that delays the beam balance until the beam-balance ready time has elapsed. This NVS parameter can be read and written from the MPE / ICE / MCE.
hdp cfg fnm		read as 0	An NVS parameter that would force narrow mode for testing purposes. Note that the head defines one set of NVS parameters for both wide mode (standard) and narrow mode (Staccato). As a result, this NVS parameter is not supported.

2.5 hdm x cal

Thermal 1.0 / 1.7x	Thermal 2	Support	Comments
hdm x cal name	med x name	read / written from the parameter key	An NVS parameter that defines the media name. This NVS parameter can be read and written from the MPE / ICE / MCE.
hdm x cal colour	med x colour	read / written from the	An NVS parameter that defines the media colour (proofing only). This NVS

		parameter key	parameter can be read and written from the MPE / ICE / MCE.
hdm x cal bmcurve	med x beamcurve	read / written from the parameter key	An NVS parameter that defines the beam curve for wide mode (standard). Note that the head defines one set of NVS parameters for both wide mode (standard) and narrow mode (Staccato). This NVS parameter can be read and written from the MPE / ICE / MCE.
hdm x cal bmslope	med x beamslope	read / written from the parameter key	An NVS parameter that defines the beam slope for wide mode (standard). Note that the head defines one set of NVS parameters for both wide mode (standard) and narrow mode (Staccato). This NVS parameter can be read and written from the MPE / ICE / MCE.
hdm x cal fmode	med x focusmode	read / written from the parameter key	An NVS parameter that defines the focus mode. This NVS parameter can be read and written from the MPE / ICE / MCE.
hdm x cal sv	med x surfacevelocity	read / written from the parameter key	An NVS parameter that defines the surface velocity for wide mode (standard). Note that the head defines one set of NVS parameters for both wide mode (standard) and narrow mode (Staccato). This NVS parameter can be read and written from the MPE / ICE / MCE.
hdm x cal svn	med x surfacevelocity	read / written from the parameter key	An NVS parameter that defines the surface velocity for narrow mode (Staccato). Note that the head defines one set of NVS parameters for both wide mode (standard) and narrow mode (Staccato). This NVS parameter can be read and written from the MPE / ICE / MCE.
hdm x cal ds	med x drumspeed	read / written from the parameter key	An NVS parameter that defines the drum speed for wide mode (standard). Note that the head defines one set of NVS parameters for both wide mode (standard) and narrow mode (Staccato). This NVS parameter can be read and written from the MPE / ICE / MCE.
hdm x cal wpower	med x laserpower	read / written from the parameter key	An NVS parameter that defines the laser power for wide mode (standard). Note that the head defines one set of NVS parameters for both wide mode (standard) and narrow mode (Staccato). This NVS parameter can be read and written from the MPE / ICE / MCE.

hdm x cal bmcurven	med x beamcurve	read / written from the parameter key	An NVS parameter that defines the beam curve for narrow mode (Staccato). Note that the head defines one set of NVS parameters for both wide mode (standard) and narrow mode (Staccato). This NVS parameter can be read and written from the MPE / ICE / MCE.
hdm x cal bmslopen	med x beamslope	read / written from the parameter key	An NVS parameter that defines the beam slope for narrow mode (Staccato). Note that the head defines one set of NVS parameters for both wide mode (standard) and narrow mode (Staccato). This NVS parameter can be read and written from the MPE / ICE / MCE.
hdm x cal dsn	med x drumspeed	read / written from the parameter key	An NVS parameter that defines the drum speed for narrow mode (Staccato). Note that the head defines one set of NVS parameters for both wide mode (standard) and narrow mode (Staccato). This NVS parameter can be read and written from the MPE / ICE / MCE.
hdm x cal wpowern	med x laserpower	read / written from the parameter key	An NVS parameter that defines the laser power for narrow mode (Staccato). Note that the head defines one set of NVS parameters for both wide mode (standard) and narrow mode (Staccato). This NVS parameter can be read and written from the MPE / ICE / MCE.
hdm x cal sens	med x sensitivity	read / written from the parameter key	An NVS parameter that defines the sensitivity. This NVS parameter can be read and written from the MPE / ICE / MCE.
hdm x cal sensadj	med x sensitivityadjust	read / written from the parameter key	An NVS parameter that defines the sensitivity adjust. This NVS parameter can be read and written from the MPE / ICE / MCE.
hdm x cal wpowere		read as 10.0, writes ignored	An NVS parameter that maintains the laser power calibration. Thermal 2 calculates the laser power when required and thus doesn't require the parameter.
hdm x cal wpowers		read as 0.0	An NVS parameter that defines the standby power. This feature will not be implemented in Thermal 2 and has not been used in Thermal 1.0 / 1.7x.
hdm x cal sr	med x sr	read / written from the	An NVS parameter that defines the surface reflectivity. This NVS parameter can be

		parameter key	read and written from the MPE / ICE / MCE.
hdm x cal sd	med x sd	read / written from the parameter key	An NVS parameter that defines the surface depth. This NVS parameter can be read and written from the MPE / ICE / MCE.
hdm x cal swidth	med x strokewidth	read / written from the parameter key	An NVS parameter that defines the stroke width for wide mode (standard). Note that the head defines one set of NVS parameters for both wide mode (standard) and narrow mode (Staccato). This NVS parameter can be read and written from the MPE / ICE / MCE.
hdm x cal soffset	med x strokeoffset	read / written from the parameter key	An NVS parameter that defines the stroke offset for wide mode (Staccato). Note that the head defines one set of NVS parameters for both wide mode (standard) and narrow mode (Staccato). This NVS parameter can be read and written from the MPE / ICE / MCE.
hdm x cal swidthn	med x strokewidth	read / written from the parameter key	An NVS parameter that defines the stroke width for narrow mode (Staccato). Note that the head defines one set of NVS parameters for both wide mode (standard) and narrow mode (Staccato). This NVS parameter can be read and written from the MPE / ICE / MCE.
hdm x cal soffsetn	med x strokeoffset	read / written from the parameter key	An NVS parameter that defines the stroke offset for narrow mode (Staccato). Note that the head defines one set of NVS parameters for both wide mode (standard) and narrow mode (Staccato). This NVS parameter can be read and written from the MPE / ICE / MCE.
hdm x cal imode	med x imagemode	read / written from the parameter key	An NVS parameter that defines the imaging mode. This NVS parameter can be read and written from the MPE / ICE / MCE.
hdm x cal fheadcal	med x rcvrgain	read as 5.0	An NVS parameter that determines the focus receiver gain. Thermal 2 handles the focus internally.

Note: All of the servo_stat cal and hms cal NVS parameters are “read as 0” or “read as 0.0”.