Thermal 3 New Commands – Command List by Subsystem – Field Access

Subsystem	Command	What it does	Description
ACT	**act info**	Display ACT information	Displays actuator information as follows: ACT: Shutter Status=<Shutter Status> The fast shutter status is determined from the monitor command act shutter (open|close). Shutter status will be one of the following: • Open • Close • Unknown
	act shutter (open|close)	Control the fast shutter	The monitor command act info will display the state of the fast shutter.
FBT	**load (boot|main)**	Load the firmware	Load firmware from the specified directory section (only while executing the boot-block recovery firmware). This is intended as a development tool and should not be used during normal operation.
	reset (bbr|boot|main)	Reset the hardware	Reboot firmware to the specified boot level. This is intended as a development tool and should not be used during normal operation.
FOC	**foc <on|off>**	Enable focus servo	Enables or disables the auto focus control system in one of two supported focus modes. The focus mode is determined by the 'focusmode' media parameter. The two possible focus modes are 'mode 0' (profile tracking) and mode 1 (fixed lens position). This provides minimum backward compatibility with Thermal 2 imaging heads. In mode 0, a 'focus on' command will cause the auto focus servo to 'track' the current plate profile table. The table will contain the profile created during the most recent 'foc learn <type>' command. If no foc learn command has been issued since the most recent system reset the plate profile will contain all zeros. In both cases the focus servo will continuously update the profile table with the newly detected plate profile data on each new drum revolution. The focus servo will automatically track the new data as it is received and incorporated into the profile table. In mode 1, a 'focus on command' will cause the auto focus servo to control the lens position at the value set by the focus 'lpos' parameter. In this case new position data is written to the profile table on each drum revolution but the servo continues to track the fixed lens position. Since this command initiates focus servo control, the following safety checks must be passed before allowing this command to proceed. • Focus laser calibrations performed at system initialization must have completed successfully • The Range Finder Electronics (RFE) board must be present and functioning • The Nose Piece Electronics (NPE) board must be present and functioning • Servo tracking must be allowed from the present ISR state. In either mode 0 or 1, a 'foc off' command will disable the focus servo and cause the focus lens to return to its 'park' state.
	foc cal demod	Calibrate range finder demodulation	
	foc cal eq	Calibrate equalizer phase	
	foc cal laser	Calibrate focus laser	
	foc cal lvdt	Calibrate lens position sensor	
	foc cal rcvrgain	Calibrate focus receiver gain	The auto focus system uses a modulated visible red laser to sense the relative position of the target media. This command sets the sensitivity of the focus beam receiver circuitry (also known as the position sensing device or 'PSD'). The light reflected off the media is measured to determine the necessary receiver gain value required to achieve a specific received signal strength. The optimal receiver gain value (in dB) is then written to the 'rcvrgain' parameter in the currently selected media. There are several servo control states from which this command is disallowed. If this command is attempted in any of these states the error message "Unsafe to execute command in the current state" will be displayed. The Range Finder Electronics (RFE) satellite must also be present and functioning with full integrity.
	foc cal rcvroffset	Calibrate focus receiver offset	
	foc cal svf	Calibrate feedback gain	
	foc idle	Idle focus servo	Causes the auto focus servo to enter the idle state with the focus lens actuator amplifier disabled. The focus lens will move to some random position due to the force of gravity. This will likely be against either one of the mechanical stops at each end of the lens tube travel. Further commands requiring and active focus servo will fail until the servo is reinitialized with a 'foc init' command or until after the next system reset or power up.
	foc ignore	Temporarily ignore focus learn errors	This command causes any focus learn errors occurring in the next plot to be ignored. After the completion of the plot (or if the plot is aborted for a reason other than focus errors) this mode completes and focus errors will again cause failed plots. This command is used for debugging purposes where there is difficulty with focus learning and it is desirable to view log data for an entire plot rather than have the plot stop on the first focus learn problem.

<table>
<tr><td>FOC Cont’d</td><td>foc init</td><td>Initialize focus servo</td><td>The foc init command attempts to move the lens tube to various positions at 'safe' velocities to determine the health of the lens position sensor and the approximate location of the hard limits stops. The command can fail for several reasons usually related to hardware malfunctions. The equivalent of a foc init command is done once at system initialization to ensure the integrity of the auto focus servo hardware. When the 'focus init' command completes the auto focus servo leaves the focus lens in the park position which is defined as against the negative limit stop. This is the fully retracted position of the lens.</td></tr>
<tr><td></td><td>foc laser <off|led|apc> [<power>] [<med|mon>] [<mod|bias>]></td><td>Select focus laser mode</td><td>power - Specifies the focus laser power.
med|mon - Specifies power target. 'med' = media surface,'mon' = laser power monitor.
mod|bias - Specifies modulation or DC biasing. 'mod' = modulated, 'bias' = dc biased.
Turns the focus laser off or on in either 'led' or 'apc' mode. Laser power is specified either 'on media' or 'at the laser power monitor'. The 'TransmitGain' NVS parameter scales focus power monitor to that which is incident on plate. Issuing the 'foc laser apc' command without specifying variables uses the media 'focuspower' parameter together with the focus 'transmitgain' to adjust the focus laser so the 'focuspower' NVS parameter indicates the power at the media surface. Other optional command arguments can override this default. These optional variables apply only to the 'foc laser apc...' form of the command. If 'med|mon' is not specified the default is 'med' (media) and the focus laser power will be scaled by the NVS parameter 'transmitgain' to ensure the specified power is that which is incident on plate. There are several servo control states from which this command is disallowed. If this command is attempted in any of these states the error message "Unsafe to execute command in the current state" will be displayed.</td></tr>
<tr><td></td><td>foc learn <type></td><td>Enable focus learn</td><td>type - Specifies either a 'learn 1' or 'learn 2' (adjust).
Initiates focus learn of a specified type. 'foc learn 1' cause the auto focus firmware to take an initial set of profile data. The 'foc learn 2' must be preceded by a 'foc learn 1' command. foc learn 2 takes a second set of learn data, extrapolates and interpolates that data with the learn 1 data and begins tracking the extrapolated profile data.</td></tr>
<tr><td></td><td>foc offset ramp <pedestal><slope><length><position></td><td>Set up focus ramp parameters for the next plot</td><td>pedestal - Initial lens position before ramp begins (um)
slope - slope of the focus ramp (um/mm)
length - length of the focus ramp (mm)
position - position of start of ramp (mm)
This command sets up a 'profile offset ramp' based on the command variables. On the next plot the firmware outputs the specified focus ramp. After the plot completes (or is aborted) focus ramping is cancelled until another 'foc offset ramp' command is issued. The best focus for a given head on a specific media is determined with empirical data when a head is manufactured and when a media is qualified. One of several useful tests for this kind of qualification is the 'focus offset ramp'. This puts the head in a mode where the focus offset is 'ramped' in a specific way along the main scan swath. The concept is to force a linear focus offset change as each swath of a plot is imaged. By measuring the distance along the swath from the start of the offset ramp to the point of ideal focus is possible to determine the offset in effect at that point and consequently the optimum focus offset value for the head. The effect of each command variable is shown below:
|<-----length---->|
| (mm) |
| _________
| /
| /
| /
| /
| / |
| / | <--- slope
| / ----' (um/mm)
pedestal (um) | /
___________________________________/

| |
|<------- position from ------->|
beginning of plate (mm)</td></tr>
</table>

FOC Cont'd	**foc park**	Select focus park state	This command puts the auto focus servo in the 'parked' state. This will move the focus lens to its negative mechanical limit. This means the lens tube is in its 'fully retracted' position which is located as far as possible from the media surface. This is the state of the lens tube at power up after the completion of a successful auto focus initialization. This command is typically used to move the lens tube from fixed position control mode back to the parked state. If an auto focus initialization has not been previously successful the 'foc park' command will fail. An auto focus initialization always occurs at system power up. There are several servo control states from which this command is disallowed. If this command is attempted in any of these states the error message "Unsafe to execute command in the current state" will be displayed.
	foc stream <on|off>	Control focus data streaming	Enables / disables streaming of auto focus position servo and range finder information. Values are streamed to the monitor at 1 second intervals. Below is a typical example of 10 seconds of output after issuing the 'foc stream on' command: • Range finder sum (Sum) • Range finder difference (Diff) • Range finder error (Err) • Lens position (lpos) • Lens actuator current (Ia) Sum= 0.01mV Diff= 0.02mV Err= 475.0um lpos= 99.9um Ia= -0.1mA Sum= -0.20mV Diff= -0.13mV Err= 475.0um lpos= 100.1um Ia= 7.5mA Sum= -0.01mV Diff= 0.18mV Err= -525.0um lpos= 99.9um Ia= 17.9mA Sum= 0.11mV Diff= -0.22mV Err= -525.0um lpos= 99.9um Ia= 23.0mA Sum= 0.08mV Diff= -0.17mV Err= -525.0um lpos= 99.9um Ia= 8.7mA Sum= 0.05mV Diff= 0.08mV Err= 475.0um lpos= 100.1um Ia= -13.5mA Sum= 0.00mV Diff= -0.09mV Err= -525.0um lpos= 100.1um Ia= -19.6mA Sum= -0.08mV Diff= 0.14mV Err= -525.0um lpos= 100.0um Ia= 25.3mA Sum= -0.20mV Diff= -0.12mV Err= 475.0um lpos= 100.0um Ia= -7.3mA Sum= -0.22mV Diff= -0.04mV Err= 156.5um lpos= 100.0um Ia= 16.9mA In this example the auto focus servo is controlling lens position to an absolute position of 100 microns +/- 0.1 micron. The range finder values ('Sum', 'Diff' and particularly 'Err') indicate that the range finder is probably not receiving focus laser reflections from a media surface and therefore displaying meaningless values. The data display is stopped by issuing the 'foc stream off' command.
IBS	**ibs balance** [nocal]	Perform an internal balance	Perform an internal balance (blocking) and initialize the stroke table.
	ibs info	Display IBS information	For the first version of the internal beam-balance sensor board, displays internal beam-balance sensor information as follows: IBS: Sensor Gain=<Sensor Gain> IBS: Sensor Offset=<Sensor Offset> IBS: Permutation Name=<Permutation Name> For all other versions of the internal beam-balance sensor board, displays internal beam-balance sensor information as follows: IBS: Permutation Name=<Permutation Name> For the first version of the internal beam-balance sensor board, the internal beam-balance sensor gain and offset configure the internal beam-balance sensor. The permutation name defines the ordering used for calculation of the stroke profile.
	ibs profile [<increment>] [nocal]	Calculate the stroke profile	Perform a stroke profile and display the pulse heights. A stroke profile calculates the pulse height of all pixel(s) in the stroke. The pulse height is calculated by determining the pixel power when the pixel(s) are on and subtracting the pixel power when all pixels are off. For the first version of the internal beam-balance sensor board, the automatic internal beam-balance sensor configuration sets the pixel pair in the center of the stroke to provide a pixel power of 1000 counts at the configured pixel level. If required (for development purposes only), the automatic internal beam-balance sensor configuration can be disabled by the optional token nocal. For all other versions of the internal beam-balance sensor board, configuration of the internal beam-balance sensor gain and offset is not required. Note that the stroke profile will not configure the laser diode driver, beam-pointing driver or light valve driver.

LDD	**ldd cal (dual|a|b) <setpoint>**	Set the calibrate power (closed-loop)	**setpoint** - The setpoint power from 2.0 to 50.0 watts. The "Calibrate" laser diode control mode will enable the laser power supplies, enable the beam-pointing, set the laser current(s) to 120% of the threshold current(s), detect the write laser using the beam-pointing, ramp the laser current to the estimated setpoint, enable the laser power control loop and enable the calibrate power control loop. The calibrate power measured by the beam-balance sensor will be used to adjust the setpoint power for the laser power control loop. When both the laser power control loop and the calibrate power control loop settle to within 1% for 1 second, the write laser has settled. Thermal 1.0 / 1.7x equivalents: The monitor command ldd cal (dual|a|b) <setpoint> is comparable to laser on. Thermal 2 equivalents: The monitor command ldd cal (dual|a|b) <setpoint> is comparable to ldd mode calibrate <setpoint>.
	ldd current (dual|a|b) <setpoint>	Set the laser current	**setpoint** - The setpoint current from 0.0 to 83.0 amps. The "Current" laser diode control mode will enable the laser power supplies, enable the beam-pointing, set the laser current(s) to 120% of the threshold current(s), detect the write laser using the beam-pointing and ramp the laser current to the setpoint current. When the laser current has reached the setpoint current, the write laser has settled. Thermal 1.0 / 1.7x equivalents: The monitor command ldd current (dual|a|b) <setpoint> is comparable to laser current <current>. Thermal 2 equivalents: The monitor command ldd current (dual|a|b) <setpoint> is comparable to ldd mode current <setpoint>.
	ldd off	Turn the write laser off	The "Off" laser diode control mode will ramp the laser current to zero, disable the laser power supplies and ensure a pause is implemented before the laser power supplies are re-enabled. Thermal 1.0 / 1.7x equivalents: The monitor command ldd off is comparable to laser off. Thermal 2 equivalents: The monitor command ldd off is comparable to ldd mode off.
	ldd on (dual|a|b) <setpoint>	Set the laser power (closed-loop)	**setpoint** - The setpoint power from 1.0 to 100.0 watts. The "Power" laser diode control mode will enable the laser power supplies, enable the beam-pointing, set the laser current(s) to 120% of the threshold current(s), detect the write laser using the beam-pointing, ramp the laser current to the estimated setpoint and enable the laser power control loop. When the laser power control loop settles to within 1% for 1 second, the write laser has settled. Thermal 1.0 / 1.7x equivalents: The monitor command ldd on (dual|a|b) <setpoint> does not have an equivalent. Thermal 2 equivalents: The monitor command ldd on (dual|a|b) <setpoint> is comparable to ldd mode power.
LVD	**lvd stroke**	Display LVD information	Displays light valve driver information as follows: LVD: Stroke Offset=<Stroke Offset> LVD: Stroke Width=<Stroke Width> LVD: Blocker Offset=<Blocker Offset> LVD: Blocker Width=<Blocker Width> The NVS parameters med <media index> strokeoffset and med <media index> strokewidth configure the pixels that will be used for plotting. The NVS parameters lvd blockeroffset and lvd blockerwidth configure the pixels that are not physically blocked.

PLT	**plt image** (fiber|rs422|synthesizer) (fiber|tpg [<pattern>])	Update the image configuration	Variable: pattern. The TPG pattern from 0 to 46 or the TPG combination from 1000 to 1008. Configure the source for the image timing and the source for the image data for the "Image" plot control mode. The source of the image timing will be the gigabit fiber interface, the RS-422 connector or the internal engine synthesizer. The source of the image data will be either the gigabit fiber interface or the test pattern generator. The gigabit fiber interface is the default source for both the image timing and the image data. The gigabit fiber interface will be the interface used in the field. The RS-422 interface will augment development and testing of the exposure head by allowing MPE and MCE based machines to be used as a source for the image timing. The RS-422 interface is not expected to be used in the field. The engine synthesizer will augment development and testing of the exposure head by implementing an internal source for the imaging timing. The test pattern generator will augment development and testing of the exposure head by implementing an internal source for the image data. The configuration can be updated as required but only takes affect for the "Image" plot control mode. Note that the configuration will not be updated if a plot is already in progress.
	plt info	Display plot information	Displays plot information as follows: PLT: Control Mode=<Control Mode> PLT: Image Timing=<Image Timing> PLT: Image Data=<Image Data> PLT: TPG Pattern=<TPG Pattern> PLT: Drum Speed=<Drum Speed> PLT: Swaths To Image=<Swaths To Image> PLT: SCLK Revolution=<SCLK Revolution> PLT: SCLK Image=<SCLK Image> PLT: Invert Flag=<Invert Flag> PLT: Overlap Flag=<Overlap Flag> The plot control mode is set by the monitor command plt mode (image|off). The plot control mode will be one of the following: • Image • Off The source of the image timing is set by the monitor command plt image (fiber|rs422|synthesizer) (fiber|tpg [<pattern>]). The source of the image timing will be one of the following: • Fiber • RS422 • Synthesizer The source of the image data is set by the monitor command plt image (fiber|rs422|synthesizer) (fiber|tpg [<pattern>]). The source of the image data will be one of the following: • TPG • Fiber The TPG pattern is set by the monitor command plt image (fiber|rs422|synthesizer) (fiber|tpg [<pattern>]). The drum speed, swaths to image, the number of pixels per revolution, the number of pixels in the image, the invert flag and the overlap flag configure the internal engine synthesizer and the test pattern generator and are set by the monitor command plt synthesizer <dd> <ds> <msz> <ssz> <dpi> [invert] [overlap]. The number of pixels in the image, the invert flag and the overlap flag configure the test pattern generator and are set by the monitor commands plt synthesizer <dd> <ds> <msz> <ssz> <dpi> [invert] [overlap] and plt tpg <msz> <dpi> [invert] [overlap].

PLT Cont'd	**plt label** <label>	Set the TPG label	Variable: label. The TPG label (maximum 180 characters). Set the TPG label. The TPG label will be displayed in the header of each plot with approximately 3.5 characters per swath (assuming the stroke width is 448). If there are insufficient swaths to display the entire TPG label, the TPG label will be truncated. Note that the character generator for the TPG label will use the standard EGA 8x14 character set (stretched by a factor of sixteen).
	plt list	List the TPG patterns	Lists the TPG patterns. The index of the TPG pattern is used to select the TPG pattern. The type of the TPG pattern is one of the following: • Configureable Pattern • Hardcoded Pattern • Configureable Combination • Hardcoded Combination Note that there are four configureable TPG patterns and four configureable TPG combinations that can be implemented as required. The name of the TPG pattern is used for identification purposes.
	plt mode (image|off)	Set the PLT control mode	Configure the control mode of the plot subsystem to "Image" or "Off". The "Image" plot control mode will configure the source for the image timing, configure the source for the image data and initialize the plot hardware. The source of the image timing will be the gigabit fiber interface, the RS-422 connector or the internal engine timing signal synthesizer. The source of the image data will be either the gigabit fiber interface or the test pattern generator. The "Off" plot control mode will reset the plot hardware.
	plt synthesizer <dd> <ds> <msz> <ssz> <dpi> [invert] [overlap]	Update the synthesizer configuration	Variables: • dd The drum diameter in mm. • ds The drum speed in RPM. • msz The image mainscan size in mm. • ssz The image subscan size in mm. • dpi The image mainscan DPI. Configure the internal engine synthesizer and the test pattern generator. The internal engine synthesizer is required to provide the newline, imaging and stroke clock signals and will need to know the number of swaths to image, the number of pixels per revolution, the number of pixels in the image and the stroke clock frequency. The test pattern generator is required to provide image data and will need to know the number of pixels in the image, whether or not the image data must be inverted and whether or not an extra scanline is required. Note the following special configurations of the internal engine synthesizer. If the image subscan size is zero, the internal engine synthesizer will generate an infinite number of swaths. If the number of pixels in the image is equal to the number of pixels per revolution, the internal engine synthesizer will generate a gapless image. The configuration can be updated as required but only takes affect for the "Image" plot control mode. Note that the configuration will not be updated if a plot is already in progress. Note that if the source of the image timing is the internal engine synthesizer and the source of the image data is the test pattern generator, this monitor command will configure both the internal engine synthesizer and the test pattern generator.
	plt tpg <msz> <dpi> [invert] [overlap]	Update the TPG configuration	Variables: • msz The mainscan size of the image in mm. • dpi The mainscan DPI of the image in mm. Configure the test pattern generator. The test pattern generator is required to provide image data and will need to know the number of pixels in the image, whether or not the image data must be inverted and whether or not an extra scanline is required. The configuration can be updated as required but only takes affect for the "Image" plot control mode. Note that the configuration will not be updated if a plot is already in progress. Note that if the source of the image timing is the internal engine synthesizer and the source of the image data is the test pattern generator, the monitor command plt synthesizer <dd> <ds> <msz> <ssz> <dpi> [invert] [overlap] will configure both the internal engine synthesizer and the test pattern generator.