IN Cell Analyzer

Acquisition Software, Version 6.1

Release Notes

Introduction

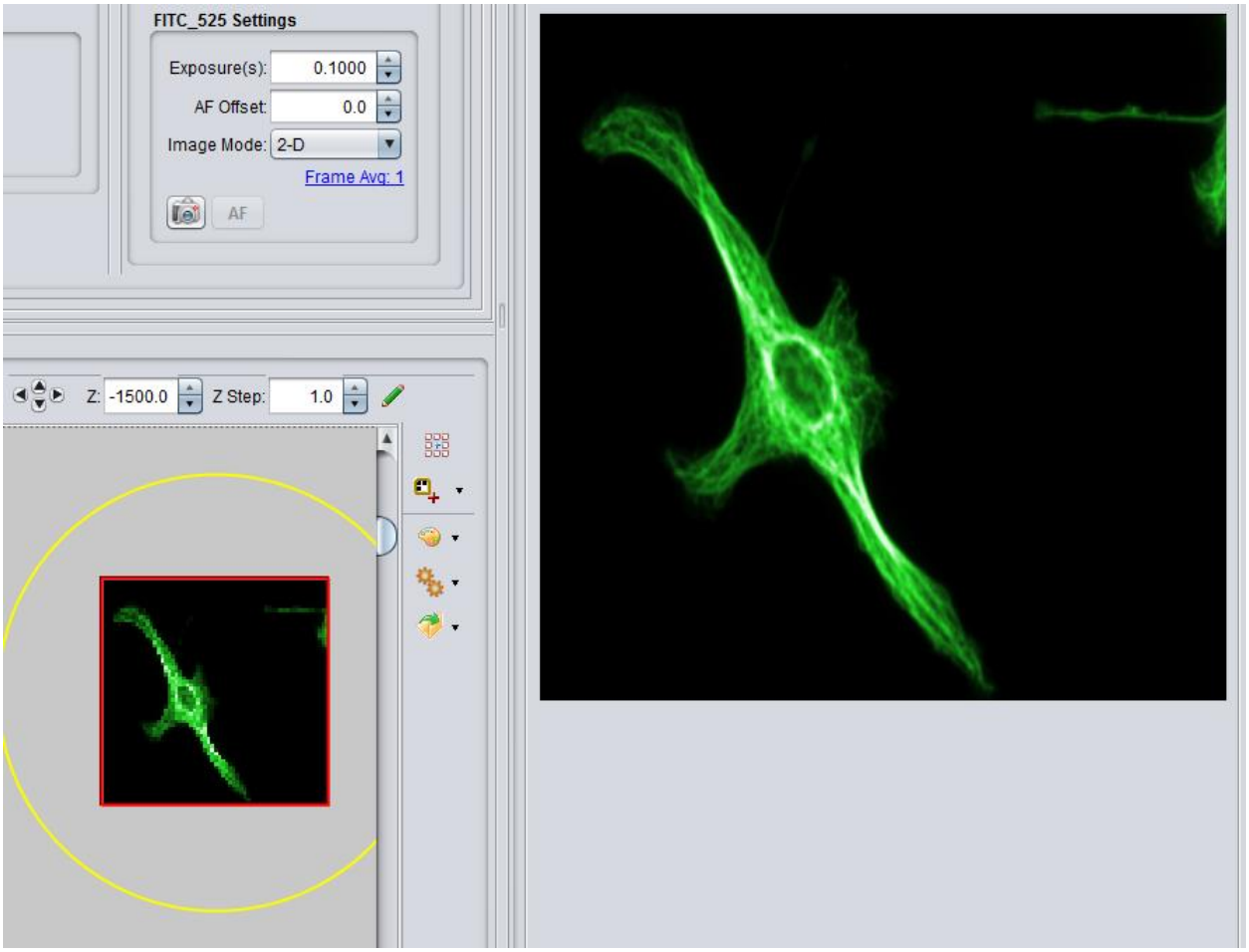
Version 6.1 of the IN Cell Analyzer software contains improvements, optimizations, and fixes over version 6.0.

Upgrading from previous versions should require only minimal training. The new features and interface changes should be intuitive for most users.

The following release notes describe the primary changes between versions 6.0 and 6.1 of the IN Cell Analyzer software. Additional information can be found in the release notes from previous versions of software, which are included within the 6.1 installers.

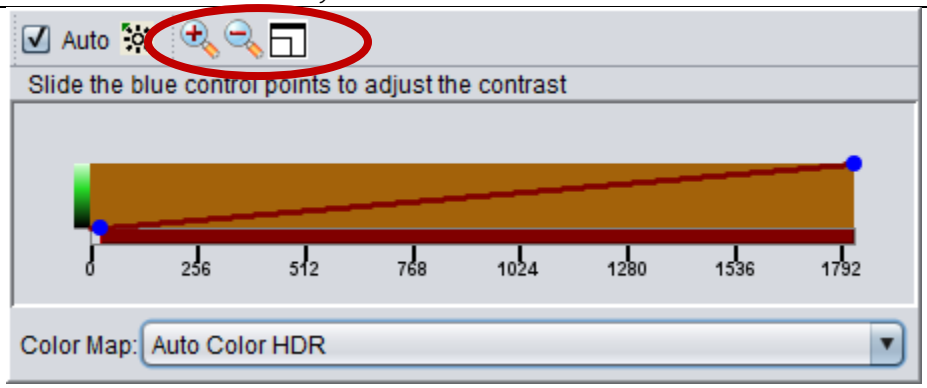
Improved Plate Viewing

Auto Color HDR Thumbnails (1753, 1735)
The colors and dynamic range of the thumbnails in the *PlateView* (left side) now match the full size images displayed in the *PanelView* (right side). The default look-up-table is "Auto Color HDR", and the bit depth has been increased from 8 to 16 bits in order to match the dynamic range of the INCell cameras. Prior versions of software used 8-bits per pixel, which was insufficient. The resulting thumbnails were often totally black or totally white.



Auto Color HDR Thumbnail - *DashBoard*

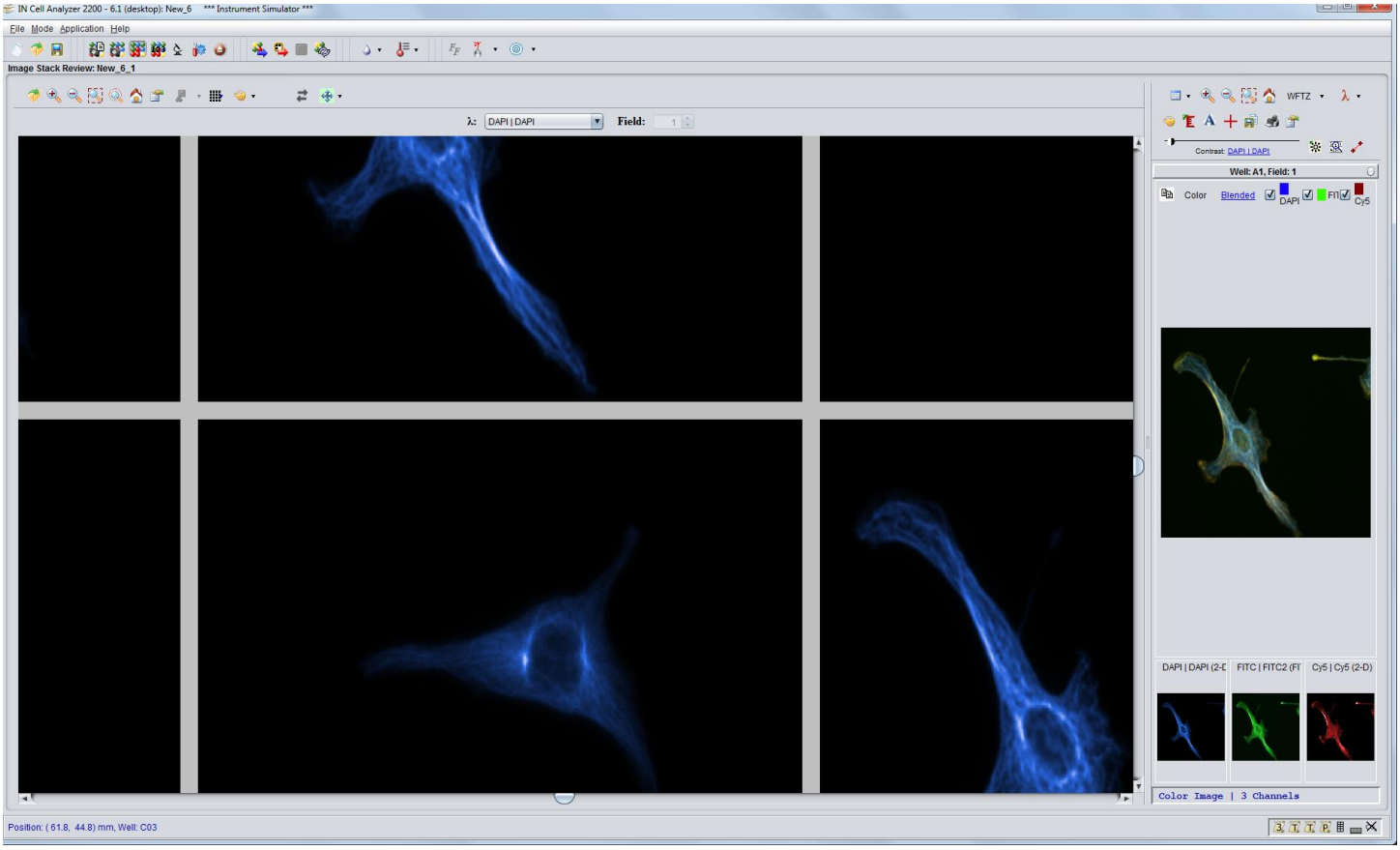
Three buttons have been added to help control the contrast settings: "Zoom In", "Zoom Out", and "Maximum Zoom".



Contrast Control with Adjustable Zoom and Selectable Color Map

Adaptive Resolution (1688)

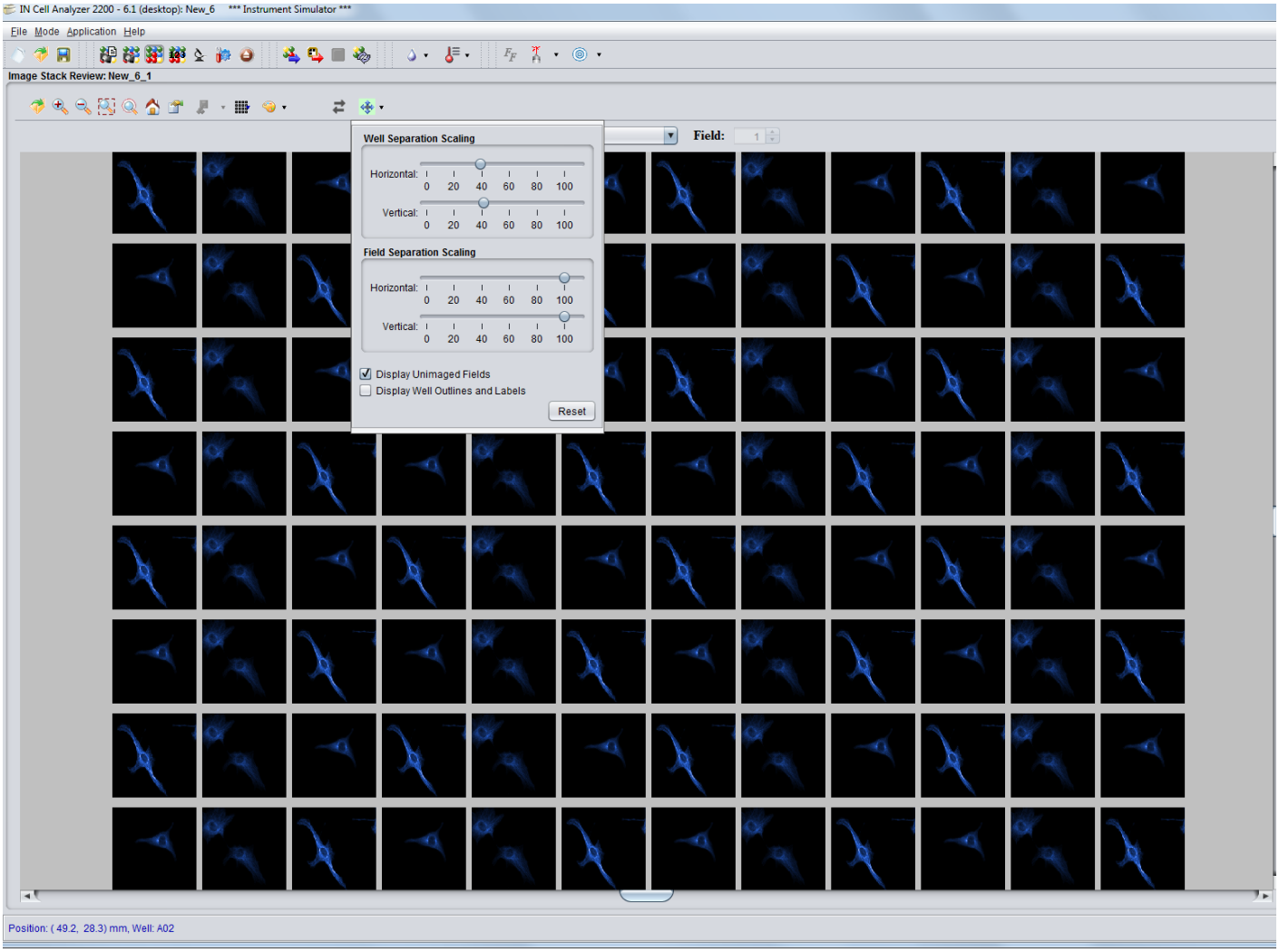
In the case of the *PlateView* displayed within the *DataReview* mode, the thumbnails resolution will dynamically adapt to the zoom level. At 1X zoom, the pixel resolution of the thumbnails will match the resolution of the original image.



High Resolution *PlateView*

Montage View (1413)

New controls have been added for the purpose of manually adjusting the horizontal and vertical spacing of the *PlateView* images during data review. By default, the images are positioned according to their well locations and/or XY coordinates. Reducing (or in some cases increasing) the spacing enables a montage view that is useful for quickly reviewing plate scan results. The montage view is compatible with zooming (see adaptive resolution), panning, and scrolling.

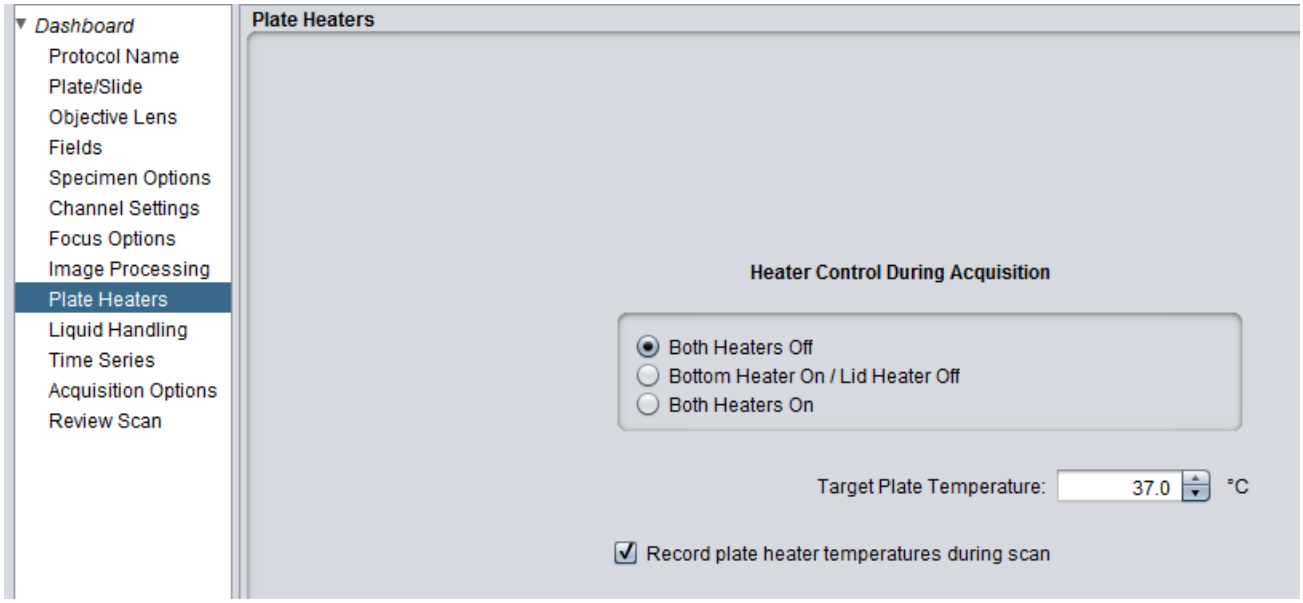


High Resolution Montage

New Features and General Improvements

Plate Heater Temperature Recording (1715)

A protocol setting has been added to enable logging of the plate heater temperature. When enabled, the bottom and top heater temperatures will be recorded in the XDCE file. Temperature logging should only be enabled in situations where top speed acquisition is not required. Measurement of the heater temperatures adds about 10 milliseconds to each field-of-view. Temperature logging is disabled by default, and is only available when the plate heating feature is licensed.



Temperature Recording Option

To review the heater temperatures from a scan, use the corresponding heat map, as shown below.

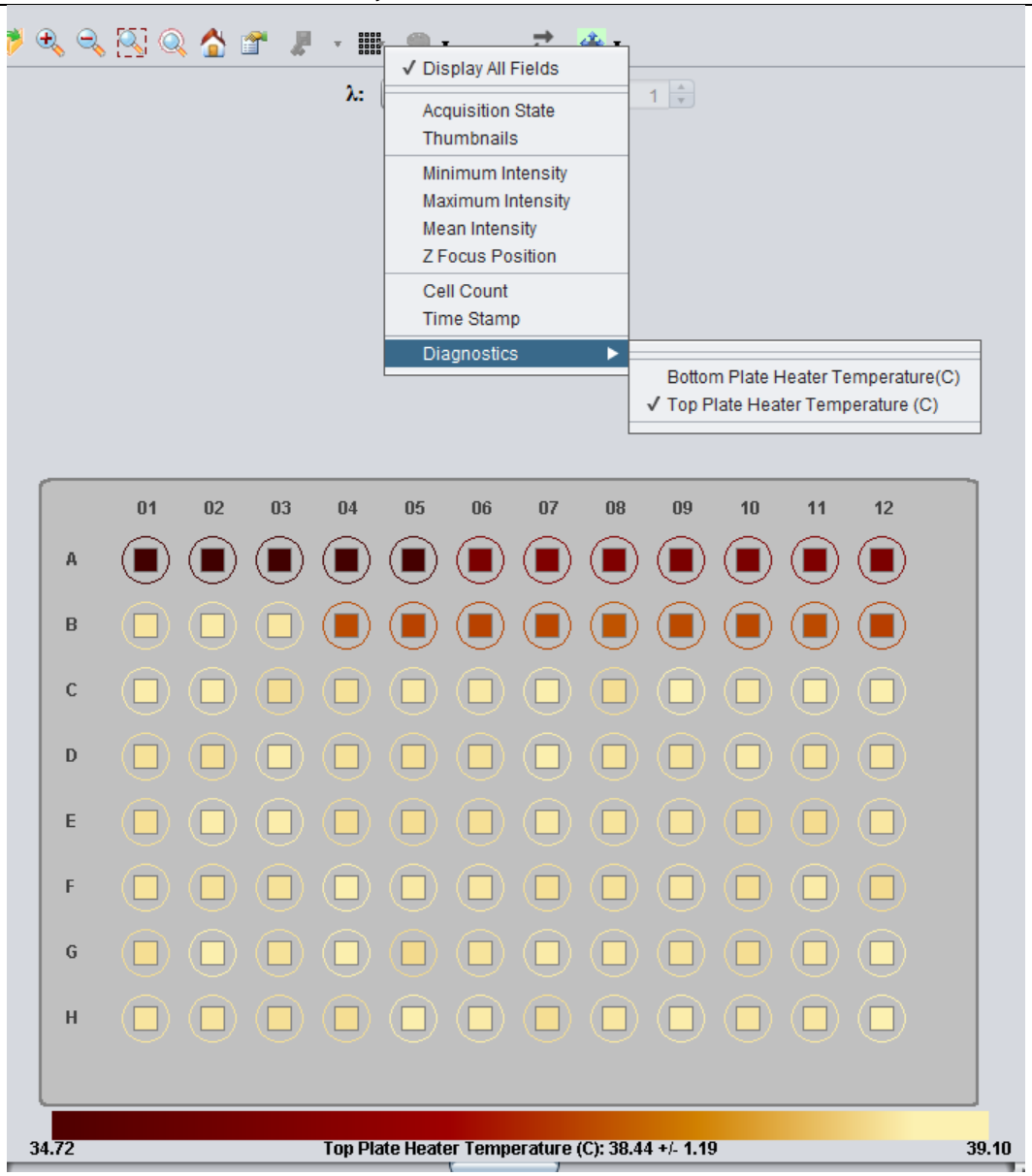


Plate Heater Temperature Measurements

Comments about the plate heater measurements shown above:

1. the temperature gradient along rows A and B shows that the scan was started before the temperature stabilized.

2. allow at least one hour of warm up to ensure full temperature equilibrium. The bottom heater has a large amount of thermal mass.

3. temperature measurements reflect the overall temperature of the plate, as measured at the top and bottom heater locations. The measurements do not correspond to the temperatures at the well locations. Instead, the values indicate the heater temperatures at the time the images were acquired at each well. INCell does not have temperature sensors within the plate.

4. when enabled. a measurement is performed at each field-of-view

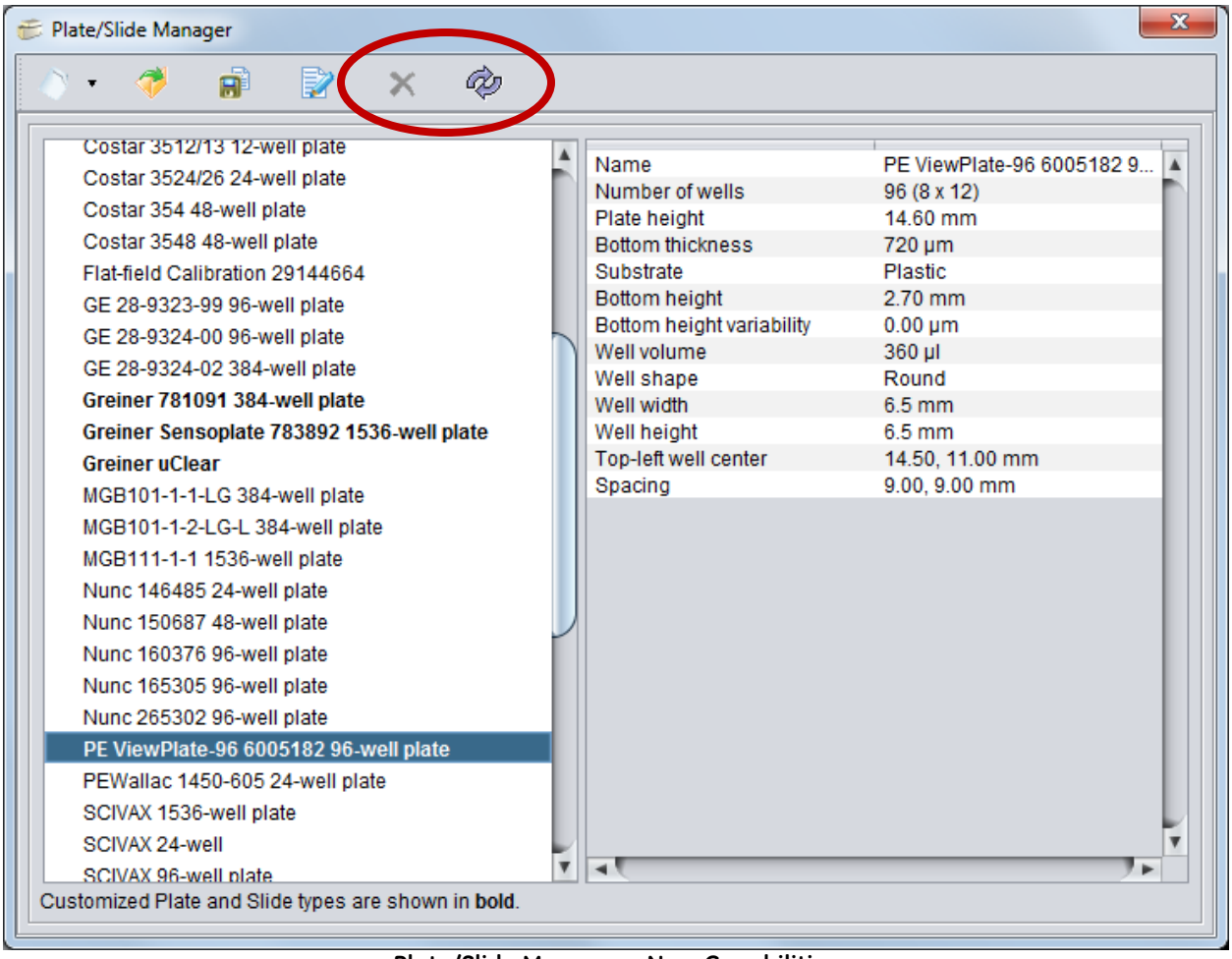
5. each measurement adds about 10 msecs to the scan time

Plate/slide type management improvements (1631, 1655, 1722, 1750)

Starting with V6.1, GE installed plate/slide types (XPLT files) will be stored in a new folder called "PLT_FactoryDefaults". The existing "PLT" folder will now be used for customized versions of GE types and also for operator created files. For improved backwards compatibility, the INCell software will remove unmodified (i.e. un-customized) XPLT files from the PLT folder. The PLT folder will then contain only the customized or new plate types.

New capabilities of the Plate/Slide manager:

- Delete. Enabled for operator created files only. See the "X" button shown below.
- Restore. Enabled for customized, but not renamed files. See the button consisting of circular arrows.
- Double-click to Edit. Double-clicking on the name of a plate type will automatically start the editor.



Plate/Slide Manager - New Capabilities

Performance optimizations (1589, 1749)

The laser autofocus performance has been optimized by reducing the amount of time spent moving the Z focus mechanism. The software will anticipate the next Z location, and thereby avoid unnecessary motion. The significance of this improvement will depend on the settings within the acquisition protocol. In a test case involving a 96 well, thick bottom plate and a 10X/0.45 objective lens, the time savings was approximately 0.25 seconds per well, or 24 seconds for all 96 wells.

Minimum Allowed Exposure Time - 6000 Brightfield (1551)

The lower limit for brightfield imaging with the transmission LED is not the same as the lower limit for line scanning fluorescence. The minimum allowed brightfield exposure time on the 6000 has been reduced from 0.06 seconds to 0.0001 seconds, a 600 fold reduction. Shorter exposure times are useful for avoiding saturation and for faster acquisition.

Remote Control Improvements (1711, 1723, 1739)

Two new RC commands have been added:

GetSerialNumber	Retrieve the instrument serial number.
GetVersionNumber	Retrieve the INCell software version number.

Both commands are additions to the remote control protocol and will not affect existing RC clients like Overlord. Existing commands have not been modified.

Previous versions of the RC protocol document did not contain information about the "Annotation" tag within the "ImageStack" command. The "Annotation" tag is used in the same way as the "Annotation" field within the GUI's Run scan dialog. The tag has always been supported by the software. Only the supporting document was incomplete.

CAD drawings with the outer dimensions of GE instruments (2000, 2200, 6000, and Cytell) have been added to the RC protocol document. The drawings are useful when configuring instruments at sites that use automation.

Preliminary Support for Windows 10 (1716)

Both the desktop and standard installers for V6.1 and V6.0 have been partially tested on Windows 10. Based on preliminary results (and a couple of small changes), V6.1 appears to be compatible with workstations running Windows 10. V6.0 mostly works, although there are some installation issues with the standard installers. Certain files do not get installed to the correct locations. The V6.0 desktop installers seem OK. Additional testing will be needed in order for GE to officially support Windows 10. Transitioning from Windows 7 to Windows 10 will take time due to the large variety of use cases, system configurations and site configurations.

For sites that require Windows 10 soon, GE recommends experimenting with a new, separate workstation and keeping the original, Windows 7 workstation. For information about configuring new workstations, see:

C:\Program Files\GE Healthcare\IN Cell Analyzer XX00\manual\INCell_Workstation_Setup.pdf (standard)

or

C:\Users\YOUR_USER_NAME\Desktop\GE Healthcare\IN Cell Analyzer XX00\manual\INCell_Workstation_Setup.pdf (desktop)

Known Issues and Usage Notes

Information about previously reported topics can be found in previous versions of the release notes, which are located in "C:\Program Files\GE Healthcare\IN Cell Analyzer XX00\manual". Only new or updated items are described here.

Significant Fixes

Only one of the items fixed in V6.1 qualifies as "severe". In brief, 5x5 binning on versions V5.2-V6.0 can cause the frame grabber board to lock. Power cycling the instrument is the only method of resetting the frame grabber. The issue was discovered by GE during internal testing. It is not known whether users have also experienced this bug. The workaround (with previous versions of software) is to use 4x4 or 6x6 binning instead of 5x5. For additional information, see item 1738.

For a full list of changes and fixes, see the table in the next section.

List of Changes Between 6.0-14420 and 6.1-14695

Items listed in this table have been fixed in version 6.1, unless otherwise discussed in the comments.

ID	Brief Description	Additional Comments
1413	Add a montage display for fields and wells.	A basic montage display is useful when reviewing scans.
1551	Brightfield imaging minimum exposure time on the 6000 should be 0.0001 seconds.	The minimum allowed exposure time was unnecessarily limited to 0.06 secs. The actual minimum for brightfield is 0.0001 secs (1/600 of the original setting). Correcting this limitation enables shorter exposures and helps avoid saturation. Reducing the exposure time also enables faster acquisition.
1559	*DataReview* channel toggles reset when incrementing Z section	
1573	Unexpected case sensitivity when calculating image stack destination directory	Fixed. The problem only occurred in situations where the capitalization of folder names was manually changed. A rare condition.
1585	Improved support for the quad band EM filter	Preliminary EM filter configuration scripts were added for both the 2200 and 6000.
1589	Optimize Laser Autofocus performance.	The time required to perform laser autofocus has been reduced by roughly 0.25 seconds. The actual improvement will depend on the acquisition conditions and the plate bottom height variability.
1631	Create a new PLT folder for factory default xplt files.	Factory default plate types are now installed to PLT_FactoryDefaults. The existing folder (PLT) is used for custom plate types.
1655	Improve access to the Plate/Slide editor	Double-clicking on plate types within the Plate/Slide manager will now launch the editor.
1661	Dialog Settings are different if opened from composite viewer or single channel viewer	The settings are now appropriate.
1662	Color maps not reinitialized in lookup mode when number of channels changes	The color maps are now reset to "Auto Color HDR" whenever the number of channels changes.
1664	Remember movie creation settings	The movie creation settings will now persist until the INCell software is restarted.
1672	Field image is not synchronized when the sync button is enabled in *DataReview*.	V6.0 synchronized the display when the well changed but not when the field changed. V6.1 synchronizes both the well and the field.
1681	Incorrect mouse handling on LH protocol page.	The list of operations and events on the LH protocol page did not filter correctly for the right mouse press. The popup menu appeared for all mouse clicks which was potentially annoying.
1682	Increase the 6000's maximum allowed binning from 8 to 16	The 2200 allows 16x16, whereas the 6000 only allows 8x8. There is no reason why these limits shouldn't be the same.
1684	Acquisition software doesn't check disk space prior to scan.	Fixed. The program will now report the amount of space that is needed and the amount of space that is available. The message will only appear when needed.
1688	Improve plate viewing methods in the *DataReview*	V6.1 adds a way to view the entire plate scan in a single view. The visual overview can provide researchers with essential information needed for their experiments.
1693	Improve LH priming tooltip - add information about priming with isopropanol	Priming LH pumps with isopropanol is the best way to remove small air bubbles that affect volumetric accuracy. Flushing with the bulk reagent (after priming) is essential to avoid contamination with alcohol.
1699	Confusing behavior when using XY buttons on the *PlateView*	The thumbnails and panel box position in the *DashBoard*'s *PlateView* were only updated when the first channel was being acquired. If any other channel was active, then the *PlateView* was unchanged (even

		though new images were presented in the *PanelView*). Skipping the thumbnail display in the *PlateView* makes sense, but the absence of any updates in the *PlateView* caused confusion. Solution: update the position of the field-of-view box, but not the thumbnail.
1704	MiniScan XYZ positioning bug leads to blurred images	Even though the final XYZ coordinates were correct, the instrument moved back and forth to a different position before acquiring images. Imperfect Z positioning (e.g. hysteresis) sometimes caused blurring and a small XY shift.
1706	Auto Color HDR of Brightfield should use Monochrome rather than Orange	Grayscale is more natural for brightfield imaging, regardless of the emission filter setting.
1709	Use absolute timestamps in instrument (ICS) log file	The format of the timestamps used in the instrument log files is now consistent with the format used in the Cytell log files.
1710	Report Generation doesn't work when saving to a network drive	CSV files were saved to the local drive, but were not copied to the network drive at the end of the scan.
1711	Add new remote control commands for retrieving the instrument serial number and the software version number.	The new commands are called: GetSerialNumber GetVersionNumber See the RC protocol document for details. Also see #1723.
1713	Avoid "Plate is Not in Scannable Area" warnings wherever possible.	The warnings often occurred immediately after loading a plate or after a scan. V6.1 will attempt to avoid this situation. For instance, the plate will be moved to A01 if necessary and appropriate.
1715	Add a method of logging the plate heater temperatures	Plate heater temperatures (bottom and top) can now be measured and recorded during plate scanning. A measurement is recorded for every field in the scan. The temperature values correspond to the time of measurement rather than the plate location at the time of measurement. The setting is off by default, because the measurements add about 10 msecs per image. The option is only enabled on systems that are licensed to use the plate heating feature.
1716	Develop compatibility (preliminary) with Windows 10 and evaluate performance.	Preliminary operation has been confirmed. The V6.1 installers (both standard and desktop) appear to work properly. Software operation also appears normal. GE does not yet officially support the use of Windows 10.
1717	Add row-delay dwell time to the 6000 exposure time ToolTip	The tooltip explains the definition of exposure times on the 6000. The exposure time is defined to be the time required for the line scan to traverse 2160 rows of the image sensor.
1720	2D & 2.5D deconvolution use incorrect pixel size when binning	The 2D and 2.5D deconvolution procedures did not consider binning when calculating the pixel size. The pixel size was always set to 1x1 binning. Even though deconvolution issues have not been reported from the field, the bug was likely to cause artifacts. Underestimating the pixel size (by 2X, 3X, 4X, etc.) will cause over-processing and lead to artifacts like halos and ringing around objects.
1722	Plate/Slide Manager doesn't display all rows of the plate/slide parameters	The last few rows of information presented on the right side of the Plate/Slide Manager GUI were not being displayed. More information is now visible.
1723	The "Annotation" tag is not mentioned in the Remote Control protocol document	The annotation tag is useful for recording the plate barcode. See the RC protocol document for details. Also

		see #1711.
1726	Absence of the default XPLT file causes the program to quietly fail during initialization.	The default XPLT file ("PE ViewPlate-96 6005182.xplt") must be present in order for older versions of software to start.
1727	Channel naming confusion - channel name doesn't match selected filters	Fixed.
1728	Allow 2D deconvolution when acquiring from *DashBoard* and Channel Settings card	The 2D deconvolution setting was previously honored only during plate scanning. There is probably no reason why it shouldn't be allowed when acquiring images from the *DashBoard* and from the Channel Settings card. Interactive imaging is useful.
1729	Clarify terminology used for the "Auto Offset" procedure	The terminology is now clearer. Only small changes were required.
1733	Refractive index of glass should be changed from 1.51 to 1.515	The refractive index is used to estimate the optical plate bottom thickness. Improving the precision of the internal constant used as the source of the index will provide a small benefit.
1734	Allow frame averaging for 2D deconvolution	The noise reduction provided by frame averaging is potentially useful for 2D deconvolution.
1735	Contrast control within the "Display Settings" histogram can be difficult.	Finer controls are now available in the histogram. The scale of the graph can be zoomed.
1737	Acquisition mode display issue(s)	
1738	Image acquisition fails for 5x5 binning	The ROI settings on the camera and frame grabber were invalid when 5x5 binning was used. A power cycle was required to recover from the firmware level failure.
1739	Add instrument dimensions to the remote control protocol document	Basic dimensions are now provided in the RC protocol document.
1740	LH operation for pump maintenance	The LH related tooltips now provide information about pump priming for best performance. Flushing with isopropanol removes small air bubble that affect performance.
1742	*DataReview* zoom problem on single channel panel	The zoom level was incorrect (always very large) when the main display panel contained a single color image. Multi-color images worked, but not single color.
1745	Cannot cancel large scans when saving data to network storage.	The problem was observed with protocols that acquired more than 1TB of image data. Cancellation works with smaller scans, but the exact size boundary is unknown.
1746	Increase the maximum allowed "Sanitize" volume from 5ml to 15ml	The "Sanitize" button is useful for priming the LH pump with isopropanol. 15 ml is the volume needed to prime the pump.
1749	Small performance improvement to motion control commands that request moves	A small optimization was made to the communication with the motion control system. Moving motors is now slightly faster. The improvement is roughly 1-2 msecs per move. The net effect on a typical scan time is difficult to predict.
1750	Slide/Plate editor condition leading to "Confirm Update" is always true	Fixed. The issue was created in V5.1.
1753	*PlateView* thumbnails are often black and/or white	The *DataReview* thumbnails were being stored in 8-bit JPEG images. The combination of limited bit-depth and lossy compression made it almost impossible to avoid losing contrast resolution. Many (or even all) of the essential data bits were often lost by the time the operator had an opportunity to adjust the min/max contrast settings.
1754	6000 EX laser band widths are configured to 0nm	The 6000's EX laser band widths in the instrument's template INI file were set to 0nm, rather than something reasonable like 1nm. Avoiding 0 is probably a good idea, in the event that any downstream software uses the bandpass. INCell was not affected by this configuration

		setting. The changes will only affect future systems that are configured with the template INI file.
1756	Status message should indicate when frame averaging is in effect	The status message will now indicate how many frames are being averaged.
1758	Slide/plate editor "Offset to A1" max allowed value is too small	The previous maximum was set to 100mm, which is smaller than the width of a plate (~120mm). Increasing the maximum allowed value to 120mm allows the A1 well to be located on the right side of the plate, which might be useful in some situations.
1762	Add a tooltip to explain the LH needle position when aspirating fluid from a compound plate.	The LH needle is positioned 1mm above the bottom of the compound plate. The basic formula: LHZ = BottomHeight + BottomThickness + 1mm For proper control of the LH needle position, be sure to check the compound plate's parameters. GE recommends checking and adjusting these values frequently. The physical properties of plastic plates can be highly variable. Customized plate types (i.e. XPLT files) are usually needed.
1767	Don't use frame averaging when acquiring images with the FocusFinder	The FocusFinder needs to be fast. Frame averaging is not appropriate when searching for focus.
1772	Honor 2D Deconvolution settings after AF procedures in the GUI.	If appropriate, images will now be deconvolved after AF procedures (software and laser based). The channel settings will be honored.
1773	Honor 2D Deconvolution settings during the multi-channel "MiniScan" in the GUI	If appropriate, images will now be deconvolved during the multi-channel "MiniScans". The 2D acquisition settings for each channel will be honored. (3D deconvolution and Z stacks, however, will not be performed by MiniScan.)
1774	Predefined channels (wavelength manager) should only be presented if the corresponding EX and EM filters actually exist in the instrument.	The wavelength_manager.xml configuration file contains predefined channels for convenience. In the event that the EX and/or EM filters do not exist for a predefined channel, then the channel should not be presented in the GUI. For example, the quad band channels should only be displayed on instruments that have a quad band EM filter (see #1585).
1775	Enable trajectory logging for Z axis motors.	Trajectory logging has been enabled by default. In the event of an encoder error, the instrument controller will record a log of the last motion profile. The instrument will pause for about 30 seconds while the information is being recorded. The following configuration setting has been added to the controller's INI file: [Z Axis Motor] Save Error Trajectory = 1 The new controller RPMs will: 1. update the active INI file. 2. install an updated template INI file.
1776	XDCE file loading problem with thumbnail display is pre-enabled in the *DataReview*.	Under some circumstances, the graphics in the *PlateView* were incomplete if the thumbnail was enabled while loading XDCE files.
1781	Simplified hot pixel measurement method for manufacturing	A simplified hot pixel measurement was implemented for manufacturing. The improvements do not affect normal users.
1783	Save As JPEG problems - channels are sometimes missing.	The "channel enabled" state was not fully controlled within the procedure that saves JPEG images. In certain situations, the channel was accidentally disabled due to an uninitialized variable.

1784	Add channel information to the summary page in *DataReview*	The EX channel, EM channel, exposure time, and imaging mode have been added to the summary page.
1789	Rapid, sequential presses of MiniScan button causes software failure when "Save to disk" is enabled.	When the "Save to disk" option was enabled, it was possible to launch more than one MiniScan at the same time by repeatedly pressing the button. The bug was introduced in V6.0.
1797	Field positioning shifts are too coarse, especially at high mag.	The field position moved in large jumps when dragged by the cursor. The jumps were larger when using high magnification objective lenses; at 20X, the field positioning shifts were about 1/8 the field-of-view. Centering fields on specific objects of interest was difficult.
1798	MiniScan sometimes moves to a different XY location before scanning when "Save" is enabled.	The acquisition location wasn't always calculated correctly when the "Save" toggle was enabled. The bug was introduced in V6.0, along with the first release of the "Save" feature. The XY position was always being moved (relative to current location) by the amount of the field position offset from the center of the well.

Notice to purchaser
IN Cell instruments are intended for research use only. The instruments are not for use in diagnostic procedures.

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