

# MD ImageXpress Confocal HT.ai (Irchel) - 1: Start up

Startup of the system

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# INTRODUCTION

Startup of the system

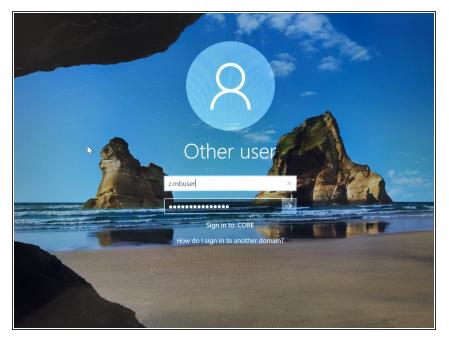
#### Step 1 — Hardware



- (i) All basic hardware components and computer should be on. If not, start the system following this sequence:
  - 1. Instrument
    - Optional : if environmental control is needed, turn on sample heater
- 2. Laser (press button powerstatus)
- 3. Turn key to on
- 4. Turn on computer

∧ Turn on computer always last

#### Step 2 — Log-in



• Log in with your ZMB credentials.

## Step 3 — Start software

→ · ↑ _		gramData > Microsoft > Windows >			v (			
		Name	Date modified	Туре	Size			
Quick access	12	n 20wi2pa10pa40wi	22.07.2021 12:25	Shortcut		2 KB		
Desktop	*	20wi20pa10pa40wi	22.07.2021 12:25	Shartcut		2 KB		
Downloads	1	🕦 20wi40pa10pa40wi 🛛 🛑 🏧	22.07.2021 12:25	Shortcut		2 KB		
🔋 u.ziegler	1	Documentation Files	21.10.2020 22:17	Shortcut		1 KB		
Pictures	*							
OneDrive								
This PC								
Network								

• Start the **20wi40pa10pa40wi** profile

(i) The other profiles can only be used if objectives in the system are / have been changed.

#### Step 4 — Login to the SQL database

Welcome to MetaXpress X Please select where you would like to connect. Only authorized users are permitted to use MetaXpress software. The Login Name and Password are those assigned to you by the database administrator. Data Source: MIDEStree ✓ Login Name: jdelpado	Database Connection         ×           Image: A connection of the selected database, MD CStore, is running on a size-limited database server. No further acquisition and analysis can be run when the database reaches capacity.	MetaXpress >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>	×
Password: Can't find your data source? Click here: New Data Source Click here to change your 'so' possword: Change Password OK. Cancel	recommended.	Group: Userjdelgado ~	

- Login to MDCStore
- username: use the username for the SQL database MDCStore.

*i* username is different from your windows username. Generally it is the windows username **without** the dot.

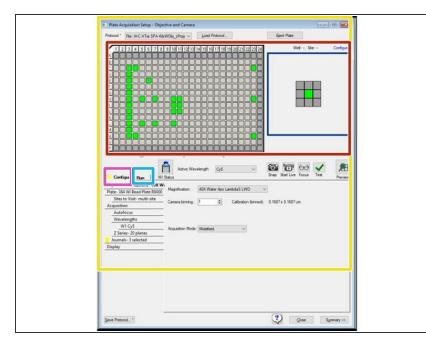
- password: use your SQL password
  - (i) The SQL password is different from the windows password. If you have forgotten it, the ZMB staff can help you.
- (i) Accept the two information messages popping up after you connect to the database.

# Step 5 — Accessing the Plate Acquisition Setup

6	Edit Control Measure	screening Window Help	
n: [	[None] V	Acquisition Setup	<b>F</b> .
-		Review Plate	-
	🕦 Mai 💿 🔍 🗾	Plate Utilities	
	Run a Plate	Plate Annotation	
	Side Scanning	Plate Acquisition	
	Analyze Images	Plate Acquisition and Control	
	System Maintenance	Add Custom Module To Database [DB]	
	Help	Add Analysis To Database [DB]	
		-	
	Run IX Taskbar Installer	Start Auto Run Mode [DB]	
Ľ		Auto Run Plate Statuses [DB]	

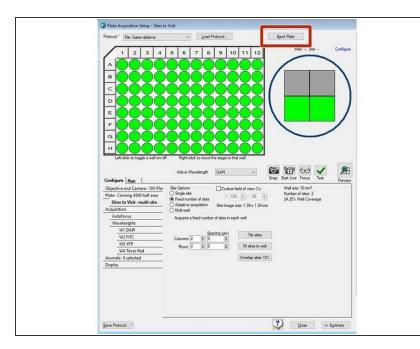
- Enter acquisition setup
- The Screening menu, which is used for protocol configuration and image acquisition.

# Step 6 — Plate Acquisition Setup dialog



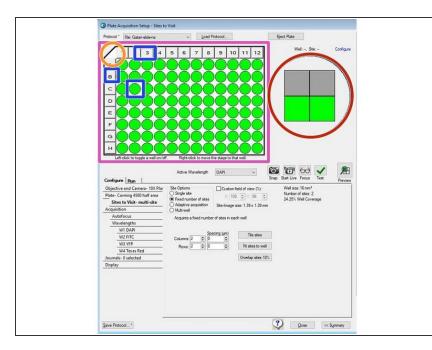
- (i) Use the Plate Acquisition Setup dialog to create protocols for acquiring images from plates.
- The Plate Acquisition Setup dialog provides three primary functions:
  - Configuration control for setting up plate acquisition protocols.
  - Run for doing a plate acquisition according to a selected protocol.
  - The Plate Map that displays the plate layout to control movable components of the system by simply right clicking.

#### Step 7 — Load a plate



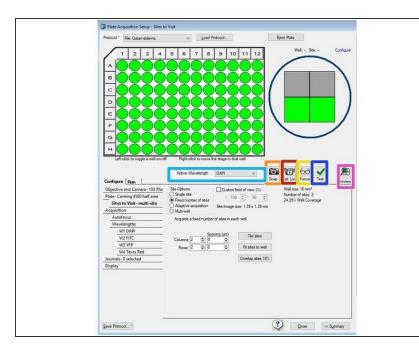
- The Eject Plate/Load Plate button switches between the following two options:
  - Eject Plate Opens the top door and plate clamp to load or remove a plate.
  - Load Plate Closes the top door and the plate clamp so that the instrument can acquire the plate.
- Note: The plate clamp closes within 2 minutes

#### Step 8 — Load a plate



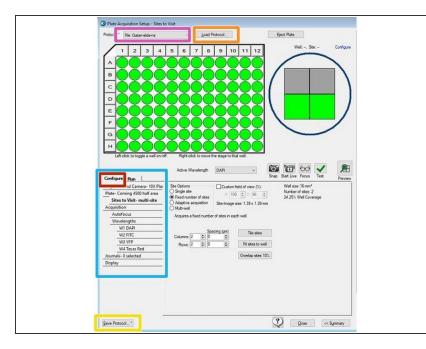
- Use the Plate Map to select the wells to acquire:
  - To exclude wells from the image acquisition, click on a well, click a row or column header, or drag the cursor over a section of wells.
     Excluded wells display in gray.
  - To include or exclude all wells, click the upper left corner triangle.
  - (i) To move the stage to a specific well, right-click a well.
  - The Site Map represents the number of sites in each well and the position of the sites to acquire for each well. Sites you select to acquire display green and sites you choose to not acquire display gray.

#### Step 9 — Shortcuts tools



- (i) Each shortcut icon performs the action at the well where the stage is currently located and in the wavelength that currently displays in the Active Wavelength field.
  - Use the Active Wavelength dropdown to select an acquisition wavelength.
  - Use the Snap icon to acquire an image without performing (or reperforming) an autofocus.
  - Use the Start Live icon to start and stop Live mode
  - Use the Focus icon to perform the Autofocus routine and then acquire an image
  - Use the Test icon to perform the Autofocus routine and then acquire a Z series and present the corresponding 2D projection when you set up a z acquisition.
  - Use the Preview icon to perform the Autofocus routine and then acquire a Z series at each of the wavelengths you set up in the protocol and present the corresponding 2D projection when you set up a Z acquisition.

#### Step 10 — Configure tab / create a new protocol



(i) Use the Configure tab to configure a plate acquisition protocol. The Configure tab is organized in a "top-to-bottom" tab structure that runs down the left side to guide you through the process ofsetting up the protocol configuration.

# Make sure to only modify your own protocols!

- Use the Protocol drop-down to select from the eight most recently used plate acquisition protocols.
- Use the Load Protocol button to select a protocol that you saved from a previous session for plate acquisition during the current session.
- If you want to generate a new protocol, save a protocol first before modifying it. Save protocols to file in your private folder and not to database.

Select the Save to File Rather Than Database check box.

#### Step 11 — Objective and Camera tab

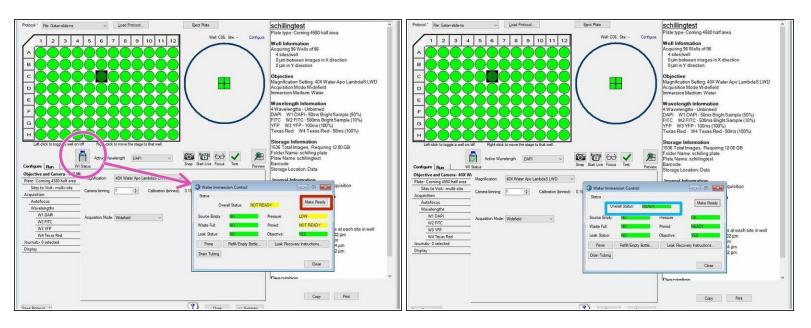
	Objectives Default installed objectives					Darken The CS, Bro Griefer  The CS, Bro Griefer
						YFP W3 YFP - 100ms (100%) YFP W3 YFP - 100ms (100%) Texas Red. W4 Texas Red. 50ms (100%)
	Name	Magnification	NA Immersion	WD (mm)		Storage Information
7 Left cick to togin a grant of the state of the state to the state to the state to the state.	Nikon LWD Lambda S 40XC WI	40x	1.15 Water	0.61-0.59	Laft-click to toggle a well on toff. Right-click to move the stage to that well.	1536 Total Images, Requiring 12.03 GB
🔥 Ar Wavelength Cy5 🗸 🔯 🔂 🗸 🙊	Nikon CFI Apo LWD Lambda S 20XC WI	20x	0.95 Water	0.99-0.9		2 TO V Plate Name: schlingtest
Configure Run William Strap Start Live Focus Test Prevent Objective and Camera- dis.	Nikon CFI Plan Apo Lambda 10X	10x	0.45 Air	4	Compare Hun Wisses	Storage Location: Data
Plate-304 WI Bead Plate 85000 Registration 40X Water Apo LambdaS LWO ~	Nikon CFI Plan Apo Lambda 2X	2x	0.10 Air	8.5	Objective and Camera- 40X Wi Flate- Coming 4500 half area Step to Vice woll- site	Water Immersion Control
Stes to Visit-multi-site amen bring [1 [2] Calibration (brines): 0.1637 x 0.1637 un	Optional objectives to be installed on request				Acquisition Camera binning: 1 (© Calibration binned):	Seta
Autobecis Wavelengths	Nikon CFI Plan Apo Lambda 40XC	40x	0.95 Air	0.25-0.17	Autofocus Wavelengths	Overall Status: NOT READY Make Ready
WI Cy5 Spenter Mode Indianal V	Nikon CFI Plan Apo Lambda 20X	20x	0.75 Air	1	W1 DAPI Acquisition Mode: Widefeld	Source Engly: ND
Lournals- 3 selected Display					W3 YFP	Wade Rut ND Prined: NOT READY s at each site in well
					W4 Texas Red	Leak Status ND Objective: YES 22 pm m Prese Relit Enstry Bottle., Leak Recovery Instructors., M
					Display	Dean Tuting
						Cost
						Description
						1 301 10000
Spine Protocol*						Copy Print
A fee Manual to					Gauss Restrood 1	(?) One whereas

- Click the Magnification drop-down and select the setting of the objective to use for the protocol.
  - For 20x and 40x water immersion: control the water immersion system and add water immersion by clicking on **Make Ready**.
- Change camera binning if a different resolution is required or to increase the signal to noise signalto-noise ratio.

(i) Higher binning might improve the speed of the acquisition, but reduces image spacial resolution.

- Dual disk unit allowing selection between 3 modes:
  - Widefield imaging mode.
  - **50 micron pinhole** disk for your basic **confocal** requirements (better optical sectioning but less sensitive). Spacing between pinholes 500 um
  - **51 micron slit** for **high throughput** confocal requirements (faster acquisition but lower optical sectioning). Spacing between pinholes 250 um

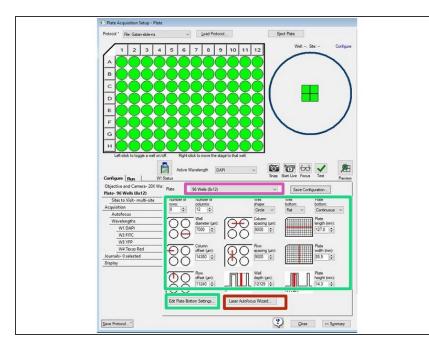
#### Step 12 — Water immersion control



- When you select a water immersion objective the WI Status icon displays. Click on the icon to access the water immersion control.
  - Create a water bolus by clicking on "Make Ready".
  - As soon as water bolus is created and objective is ready to use the overall status will turn green "ready".
- (i) When you switch from a water immersion objective to an air objective, the system drains the water and the software opens the instrument top door so that you can dry the bottom of the plate before using the air objective.

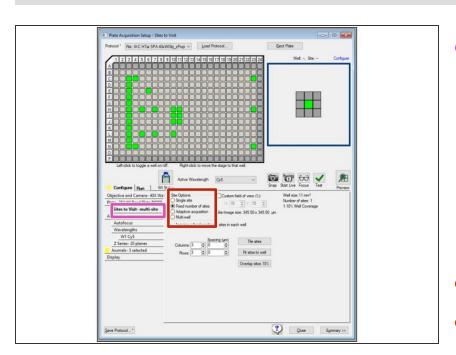
If you do not dry the plate bottom, you run the risk of getting water on the air objective and potentially into the instrument.

#### Step 13 — Plate tab



- (i) Use the Plate tab to configure the plate dimensions to accurately control the X, Y, and Z movements of the system. The plate dimensions you define also ensure that laser-based autofocusing is as accurate as possible.
  - The ZMB provides you with common plate types that are already configured, from which you can choose.
  - If the plate type is not available in the Plate Name list, you can enter the manufacturer's plate specifications including plate bottom settings (if available).
  - The manufacturer generally cannot provide values for the plate bottom settings, including optical thickness, which is not the same as physical thickness, and bottom variation. You must run the Laser Autofocus
     Wizard to measure the values to ensure proper focus.
    - Click Laser Autofocus Wizard and follow the instructions to calculate plate bottom measurements.

- (i) The wizard guides you step by step through the process of automatically calculating plate bottom dimensions and the focus laser exposure times that are required for each objective with your selected plate type.
- Do not use the Laser Autofocus Wizard for slides because this feature is not compatible with slides.



#### Step 14 — Sites to Visit Tab

- You configure the number of sites that are to be acquired for each well in a plate acquisition protocol on the Sites to Visit tab
  - Depends on the size of the well, the objective magnification, the distribution of sample material in the well, the type of plate, and the fluid content of the well.
- Click to acquire a **Single site**.
- Click to acquire a Fixed Number of Sites, configure the site layout, and then deselect the unwanted sites.

 Click to acquire an Adaptive
 Acquisition is a computational algorithm that counts the number of cells on the fly during sample acquisition. This increases the chances of collecting valid data in

every well. The number of sites the software acquires per well is based on the number of cells per well.

 Click multi-well acquisition to acquire high density plates faster. This option uses the size of the camera field of view to acquire several wells simultaneously while taking a single image, thereby reducing plate acquisition time. The software automatically calculates the number of wells in which a site can be simultaneously acquired.

# Step 15 — Acquisition Tab (Autofocus options)

Configure Run						
Objective and Camera- 40XWater Plate- 96 Wells (8x12)	Autofocus ontions					
Sites to Visit- single site						
Acquisition	Enable image-based focusing (for acquisition or laser recovery)					
Autofocus	Acquisition options					
Wavelengths	Acquire Time Series					
W1 DAPI						
W2 DAPI						
Timelapse- 2 time points						
Z Series- 5 planes	Run Journals During Acquisition					
Journals- 0 selected	Analyze Images After Acquisition					
Display	Allow Appending to Existing Plate					
	Directory for Stored Correction Images C.\					

- (i) Use the Acquisition tab to specify the autofocus options and additional acquisition options for the protocol.
  - The Acquisition tab provides two autofocus options:
    - Laser Based Focusing is generally set to find the bottom of the well, and then moves the objective a distance up from the well bottom. This method is the fastest and does not cause photo damage to your wells. This method might not be sufficient if the distance above the bottom of the well varies in your sample.

- Image Based Focusing uses a contrast-based algorithm to identify the best focus image. This option works best for experiments that use low-power objectives or when the sample distance above the bottom of the plate varies. Performance can be slower than Laser Based Focusing and focusing can fail if out-of-focus debris is in a sample.
- You can configure one or both autofocus options for a plate acquisition protocol. It is recommended primarily using Laser Based Focusing.
- Some samples can benefit from using both focus options including live organisms, suspension cells, tissue samples, and assays where the best focus position varies with the phenotype. When you select both focus options, the software uses LBF to move the objective to a position above the bottom of the well, and uses the IBF to fine tune the focus.

# Step 16 — Acquisition Tab (Acquisition options)

Configure Run		
Objective and Camera- 40XWater	Autofocus options	
Plate- 96 Wells (8x12)	Enable laser-based focusing	
Sites to Visit- single site	Enable image-based focusing (for acquisition or laser recovery)	
Acquisition	Acquisition options	
Autofocus	Acquire Time Series	
Wavelengths	Acquire Z Series	
W1 DAPI		
W2 DAPI		
Timelapse- 2 time points		
Z Series- 5 planes	Run Journals During Acquisition	
Journals- 0 selected	Analyze Images After Acquisition	
Display	Allow Appending to Existing Plate	
	Directory for Stored Correction Images C:\	

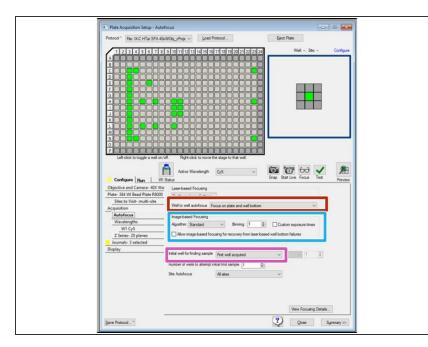
- The Acquisition tab provides two series acquisition options (you can select one or both):
  - Acquire Time Series acquires images at multiple time points. When you select this option, specify the set of images to acquire at each time point.
    - Continuous time series acquisition
    - With **discontinuous** time lapse acquisition, you can return the sample plate to the incubator in between time points, and you can read other plates in the interim.
  - Acquire Z Series acquires individual optical sections (planes) in sequence through a sample that can produce a 3-D image of the sample. When you select this option, specify the number of steps and the step size to move through the sample.

# Step 17 — Acquisition Tab (Acquisition options)

Configure Run	
Objective and Camera- 40XWater	Autofocus options
Plate- 96 Wells (8x12)	Enable laser-based focusing
Sites to Visit- single site	Enable image-based focusing (for acquisition or laser recovery)
Acquisition	Acquisition options
Autofocus	Acquire Time Series
Wavelengths	Acquire Z Series
W1 DAPI	
W2 DAPI	
Timelapse- 2 time points	
Z Series- 5 planes	Run Journals During Acquisition
Journals- 0 selected	Analyze Images After Acquisition
Display	Allow Appending to Existing Plate
	Directory for Stored Correction Images C:\

- Journals: macro based complex tasks that should be run while acquiring (normally not selected).
- Analyze images after acquisition (normally not selected).
- Allow appending to existing plate: data will be added to an already acquired plate. Can be used e.g. for multiplexing experiments.

## Step 18 — Autofocus tab



- Adjust focusing routine with laser settings and where the focus will be acquired.
- Configure image based focusing (if selected in the previous step)
- Specify the finding of sample and where to focus

#### Step 19 — Wavelengths tab

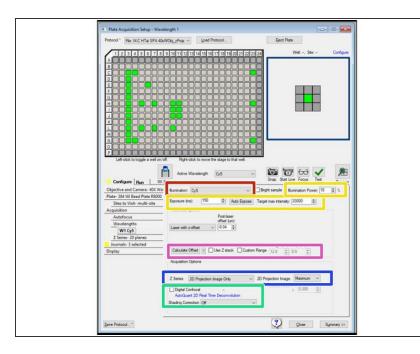
			Filter Set <sup>1</sup>	Wavelengths <sup>2,3,4</sup>	Common Fluorophores	Shading Correction Plate	Calibration Slide
onfigure Run ) Dejective and Camera- 10x Hate- Costar 96 Well	Number of wavelengths: 3	<b>₽</b>	DAPI	Excitation: 405/20 nm Emission: 452/45 nm Dichroic: FF409-Di03	DAPI, Hoechst, Alexa Fluor 350, BFP	Pink	Green (GP-8)
Sites to Visit- single site quisition Wavelengths	TL Legacy Shading Correction Refinement Level: 2	<u>+</u>	CFP	Excitation: 445/20 nm Emission: 483/32 nm Dichroic: ZT 445/520	CFP	Pink	Yellow (GP-11)
WI DAPI W2 FITC W3 TRITC splay	-		FITC	Excitation: 467.5/21 nm Emission: 520/28 nm Dichroic: ZT 405/470/555/640/730 or FF506-Di03	FITC, GFP, FAM, Alexa Fluor 488, BODIPY, Calcein, Fluo-4, MitoTracker Green	Pink	Yellow (GP-11)
	-		YFP	Excitation: 520/10 nm Emission: 562/40 nm Dichroic: ZT 445/520	YFP	Green	Red (GP-7)
			TRITC	Excitation: 555 nm Emission: 598/25 nm Dichroic: ZT 405/470/555/640/730	Cy3, TRITC, Alexa Fluor 532 & 546 & 555, Rhodamine, TAMRA, LysoTracker Yellow, MitoTracker Orange	Red	Red (GP-7)
			Texas Red	Excitation: 555 nm Emission: 624/40 nm Dichroic: FF593-Di03-25	Texas Red, mCherry, Alexa Fluor 568 & 594, Calcium Crimson, Cy3.5, HcRed, MitoTracker Red, Propidium Iodide	Red	Red (GP-7)
e Protocol*		Qose Summary >>	Cy5	Excitation: 638/17 nm Emission: 692/40 nm Dichroic: ZT 405/470/555/640/730	Cy5, Alexa Fluor 647 & 660, DRAQ5, APC (Allophycocyanin), BODIPY 650/665, DiD, SYTO Red, TOTO-3, and TO-PRO-3	Pink	Red (GP-7)
			Cy7	Excitation: 725/30 nm Emission: 794/32 nm Dichroic: ZT 405/470/555/640/730	Cy7	not supported	not supported

- Use the Wavelengths tab to specify the total number of acquisition wavelengths for an experiment.
- (i) You must specify at least one acquisition wavelength and you can specify up to eight.
- When you specify more than one wavelength, subtabs display below the Wavelength tab where you configure exposure time, autofocus, and time lapse settings for each acquisition wavelength.

Red indicates that you have yet to configure the acquisition wavelengths.

- Enter the refinement level.
  - Increasing this value slows the acquisition routine. The single value that you enter applies to each acquisition wavelength for which you select Auto Correction for TL Legacy as the shading correction method.

#### Step 20 — W# tabs



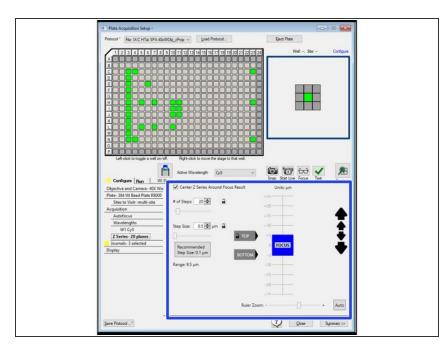
- (i) Use the W# tabs below the Wavelength tab to configure acquisition wavelengths.
  - Click the Illumination drop-down and select the illumination setting; for example, FITC.
- Specify the exposure and illumination power.
- Calculate Offset to calculate the offset for all subsequent wavelengths.
- Specify the z-series (3D, projection) and how the projection should be calculated
- Digital confocal is a deconvolution computation. Normally this is not selected

## Step 21 — Timelapse tab

Objective and Camera- 10x		1				
Plate- Costar 96 Well plate-1389	Number of timepoints:	1 🚖				
Sites to Visit- single site	Perform time series for:	One well then	the next	2		
Acquisition	Approximate minimum	n time interval 200	ms			
Autofocus	Interval:		sec =			
Wavelengths		· •	sec +			
W1 DAPI	Duration:		sec 🔻			
W2 FITC						
Timelapse- 1 time points						
Z Series- 5 planes						
Display Settings						
				1000		
ave Protocol*				(?)	Close	Summary >>

 Use the Timelapse tab to configure time series acquisitions (if activated previously).

### Step 22 — Z-Series tab



 Use the Z Series tab to configure Z series options (only if activated previously).

#### Step 23 — Journal tab

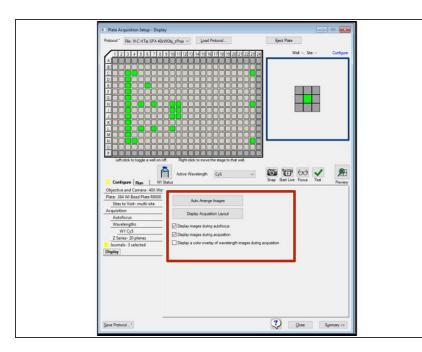
Plate Acquisition Setup - Journals			Option	Description
			End of Z	Runs after a Z series acquisition completes. The journal runs when the Z motor is at the highest step in the series and after any projection images are generated. The journal runs once for each wavelength that you configure to us the Z series.
	Option	Description	Start of Site	Runs during the acquisition loop, before any images are acquired from each site.
	Before Each	Runs during the acquisition loop, after the illumination is set and focusing is	End of Site	Runs during the acquisition loop, after all images have been acquired from eac site.
	Image After Each	complete. Runs during the acquisition loop, after the shutter closes and before images	Start of Well	Runs during the acquisition loop, at the beginning of each well, before any images are acquired from a well.
Central transfer a well with an information of the stage information.	Image	save.	End of Well	Runs during the acquisition loop, at the end of each well, after all images have been acquired from a well.
Ojjetive and Carway - MCWy Voadkin Day Junia Pare Jacobia Cardeatoon Disforma cationage Bin Brood Jest table models - Brood Indeatoon Disformation Cardinal Bin Brood	Before Focusing	Runs during the acquisition loop, just before the focus step begins.	Start of Time Point	Runs during the acquisition loop, at the beginning of each time point, before any images are acquired for each time point.
Acquisition         Interference         Interference           Interference         Date of a         Interference           Interference         Date of a         Interference           Interference         Date of a         Interference	Start of Z	Runs before a Z series is acquired. The journal runs when the Z motor is at the	End of Time Point	Runs during the acquisition loop, at the end of each time point, after all images have been acquired for each time point.
Z Sene Stateman - Senet at an Bir Ford Annual Judictal Constant & Dirol Depty Dept		lowest step in the series and before an image is acquired. The journal runs once for each wavelength that you configure to use the Z series.	Start of Plate	Runs before the initial find sample step is performed. Cannot be used to modif the Find Sample location.
End of well INF Provid Stat of time part INF Provid			End of Plate	Runs after the last image acquisition for a plate is complete.
Client drawpart III Rovid Client drawpart III P2-Start Rev and/Cli Client drawpart Client drawpart Client drawpart Devent and physical bases are none between the client drawpart and and physical bases postering.			Prevent Asynchronous Hardware Moves	(Optional) Select this option only if a journal moves hardware, such as changing filters, or moving focus. This option ensures that the journals run correctly. Note: Do not select this option without the use of a journal because it can slow

Specify the journals that should be run.

(i) Only available if you previously selected Run Journals during acquisition in the Acquisition tab.

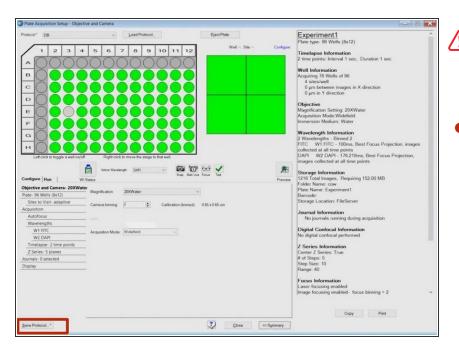
Note: The Journal function is the only way to **combine time-series** and **Z-series** with each other in one acquisition for this system

#### Step 24 — Display images



 Specify how and if images should be displayed during data acquisition

#### Step 25 — Saving Plate Acquisition Protocols



- You should save a plate acquisition protocol to a file (and not to database).
  - Click Save Protocol to display the Save Acquisition Protocol dialog.
    - Select the Save to File Rather Than Database check box.
    - Navigate to the location to save the file in your private data folder (transfer server will be deleted wihtin 7 days).

# Step 26 — Running Plate Acquisition Protocols

Protocol *	File: IX-C HTai SPA 40xWObj_zProje ~	Load Protocol	Eject Plate	
	2 3 4 5 6 7 8 9 10 11 12 13		Wel: -, Ste: -	Configure
BCD				
M N				
P	t click to toggle a well on/off. Right-cli	ck to move the stage to that well.		
		avelength Cy5 ~	Snap Statt Live Focus Teet	舥
	Name KM WI System Performance Assa			
	Name 40x Water SPA with zProjection	Description     40x WI 384-Well	Bead Plate Test	Pote
	Exposure Time			
			Focus Offset (um)	
Cys	Auto Expose		Focus Offset (µm) Calculate 0.04	
Cys				
Cys				
Cy5				
Cys				
Cy5	Ans Spone		Calculate 0.04 0	Symmay >>

- (i) Use the Run tab in the Plate Acquisition Setup dialog to run the plate acquisition protocol and acquire the plate data.
  - Specify folder and plate names for organizing the data within the database.
    - (i) Names become part of the image file paths. If the overall path length is too long, it causes errors.
    - Please include your Core user name in the "Folder Name" eg. d.duck\_test1
    - Click to snap an image.
    - Click to test your settings.
    - Click Acquire Plate to acquire images from a plate based on the settings for the loaded protocol.
- Images are saved to the MD database. Please export and mark your files for deletion no longer than 1 month after acquisition. Once marked, we need to manually remove them and thus space is not available immediately. Once exported, tiff files will be available in your data folder for additional 180 days.