

SCANFLEX™

AUTOMATED SCANNING DEVICE

INSTRUCTION MANUAL

SCANFLEX 3.1.4

REVISION 3.2



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1. Introduction

1.1 Use of SCANFLEX™ Software with Tissue Train® Culture Plates

SCANFLEX™ software is designed to automate repetitive scanning processes. It was initially designed to scan 3D bioartificial tissue constructs fabricated using Flexcell's Tissue Train® Culture System. The SCANFLEX™ scanner and software enable the user to create scanning regimens so bioartificial tissues in 6-well or 24-well Tissue Train® culture plates can be scanned periodically to determine the rate of matrix compaction by cells overtime. Once the scanning is completed, the series of pictures can be analyzed for area measurement using Flexcell's XYFLEX™ software. The SCANFLEX™ software allows the user to create scanning regimens and save the scanned images to a preferred location in a desktop or laptop computer.

1.2 Use of SCANFLEX™ Software for Other Applications

SCANFLEX™ software can also be used for any other application requiring periodic scanning. The component to be scanned can be placed in a flat container or on the bed of the scanner. The distance between the scanner bed and the item(s) to be scanned should be no more than 29 mm. It is not recommended to keep extremely hot or cold items on the scanner bed as it could damage the glass.

2. Components

- SCANFLEX™ software V3.1.4
- Epson Perfection V300 scanner
- Frame for 6-well culture plates
- Frame for 24-well culture plates
- Plate Cover
- User manual
- Desktop computer or laptop computer (not provided). See **Table 1** for more details.

Table 1. Minimum system requirements for SCANFLEX™ and scanner operation

Minimum system requirements: USB 2.0/1.1	CPU	RAM	HDD
Microsoft Windows XP, Vista, and Windows 7 (32-bit)	1 GHz	1 GB	95 MB
Microsoft Windows XP, Vista, and Windows 7 (64-bit)	1 GHz	1 GB	95 MB
Minimum screen resolution	1024 × 768 pixels		

Note: The above are the minimum system specifications for the computer to operate the scanner. More memory will be needed depending on scanner frequency and image resolution (see **Table 3** for more information on image size corresponding to image parameter settings).

3. Installing the Scanner Software

The scanner software is provided with the scanner. Follow the instructions below to install the scanner software on the computer.

- 1) It is recommended to supply power to the scanner and connect the USB cable between the computer and scanner before installing the scanner software.
- 2) Insert the CD that came with the scanner into the CD-ROM drive of the computer.
- 3) The installation wizard will automatically open. Choose the desirable language.
- 4) Make sure that antivirus software is disabled. Click *NEXT* in the message screen (**Figure 1**).
- 5) Select the scanner model: Epson Perfection V300 Photo (**Figure 2**).
- 6) Click *INSTALL* on the module selection screen (**Figure 3**).
- 7) On the Epson license screen click *YES* to proceed with the installation (**Figure 4**).
- 8) The scanner installation will be completed in a few minutes.

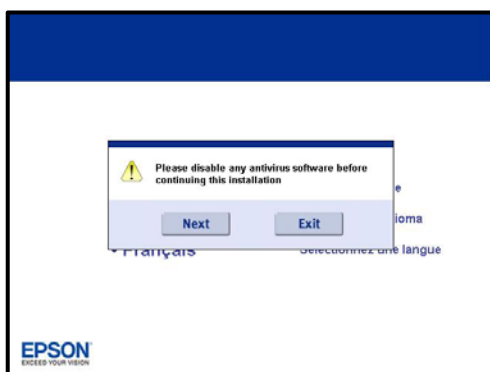


Figure 1. Antivirus software warning during scanner software installation



Figure 2. Selection of scanner model



Figure 3. Selection of modules

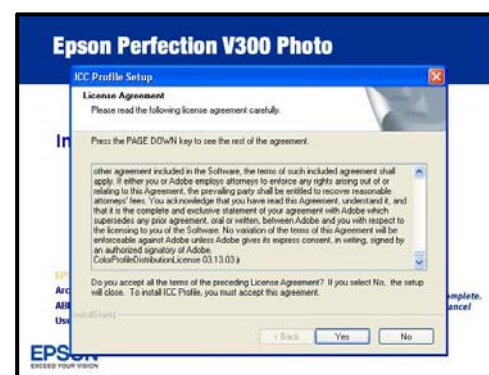


Figure 4. Epson license agreement

4. Installing SCANFLEX™ Software

- 1) Insert the SCANFLEX™ CD into the CD-ROM drive of the computer.
- 2) The SCANFLEX™ installation process should start automatically.
- 3) Select the destination directory to save all program files (**Figure 5**) and click *NEXT* to continue.
- 4) Click *NEXT* on the start installation screen (**Figure 6**).
- 5) Once installation is completed, click on *NEXT* in the “installation complete” screen (**Figure 7**).
- 6) In the NI activation wizard screen, select the first activation option (Automatically activate through a secure internet connection) and click on *NEXT* (**Figure 8**)
- 7) Enter the NI Vision Development Module Run-Time License number, which is included with the equipment documentation, in the white box and click *NEXT* (**Figure 9**).
- 8) Select language in the next screen and click *OK*.
- 9) The EZTwainX setup wizard will start installing. On the EZTwainX setup screen, click *NEXT* to proceed to installation (**Figure 10**).
- 10) On the EZTwainX license agreement screen, select “*I accept the agreement*” and click on *NEXT* (**Figure 11**).
- 11) Select destination location for the EZTwainX files to be saved (**Figure 12**).
- 12) Click on *INSTALL* on the next screen to start installation (**Figure 13**).
- 13) Once installation is completed, click on *FINISH*.

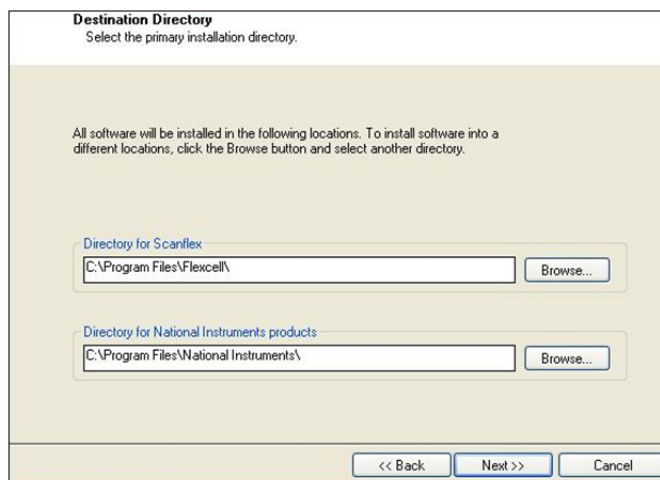


Figure 5. Selecting destination directory

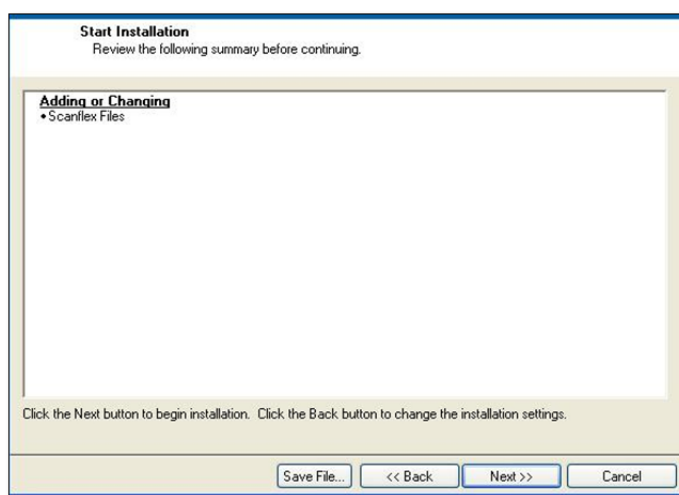


Figure 6. Installation start screen

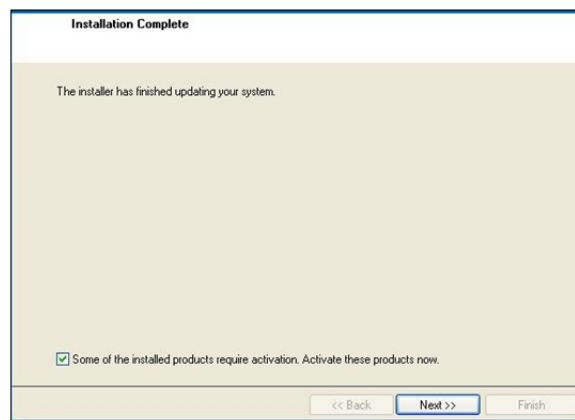


Figure 7. SCANFLEX™ installation complete screen



Figure 8. Options for vision module license activation

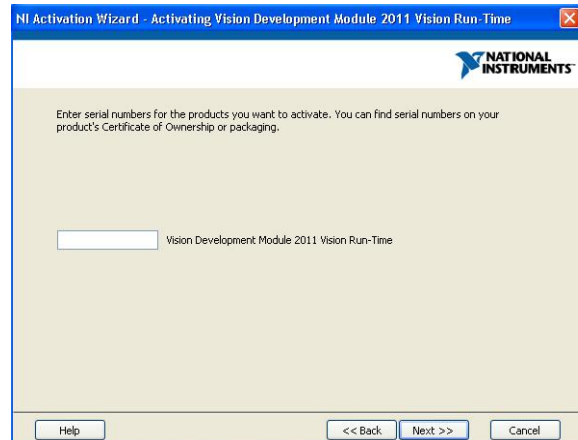


Figure 9. Screen for entering vision module license

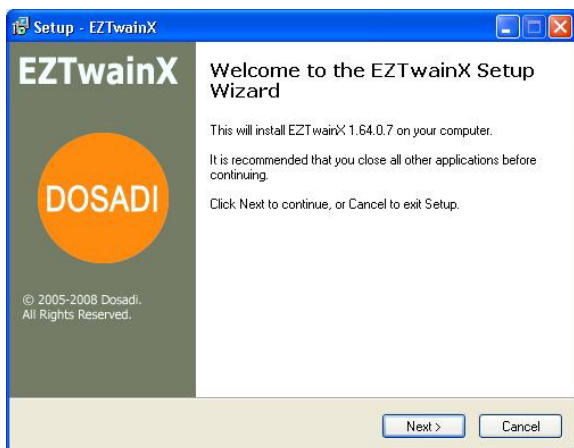


Figure 10. EZTwainX setup screen



Figure 11. EZTwainX license agreement

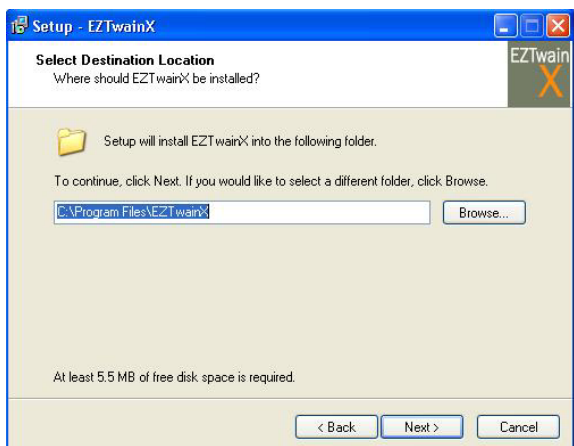


Figure 12. Selecting location to store the EZTwainX files

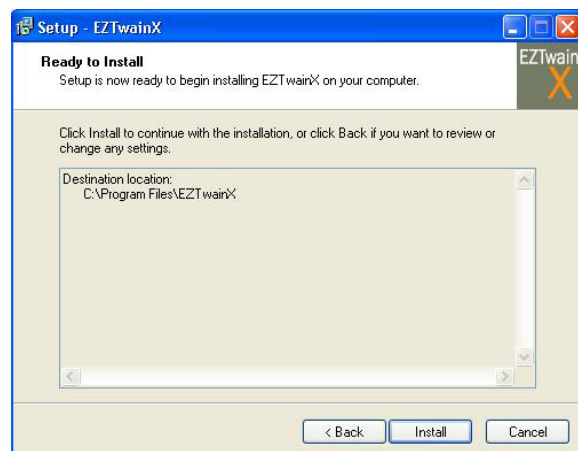


Figure 13. EZTwainX ready to install screen

5. Activation of SCANFLEX™ Software

- 1) Click on the SCANFLEX™ icon on the desktop or go to program files and open SCANFLEX™ software.
- 2) When the SCANFLEX™ activation screen opens up, select either *ACTIVATE SCANFLEX* or *EVALUATE SCANFLEX* (**Figure 14**).
- 3) If *ACTIVATION* is selected, two user codes will be displayed on the next screen (**Figure 15**). Call (1-800-728-3714 or 919-732-1591) or email (activation@flexcellint.com) Flexcell® International with the user codes to obtain an activation code.

Note: Do **NOT** close the SCANFLEX™ software until the activation codes have been received from Flexcell® International. Doing so will generate new user codes, voiding the previous user codes and the activation code.

- 4) Enter the activation code in *ACTIVATION CODE 1* box and click on *CONTINUE*.
- 5) If *EVALUATE SCANFLEX* is selected, you will have 30 days to use the SCANFLEX™ software after which it will automatically deactivate.

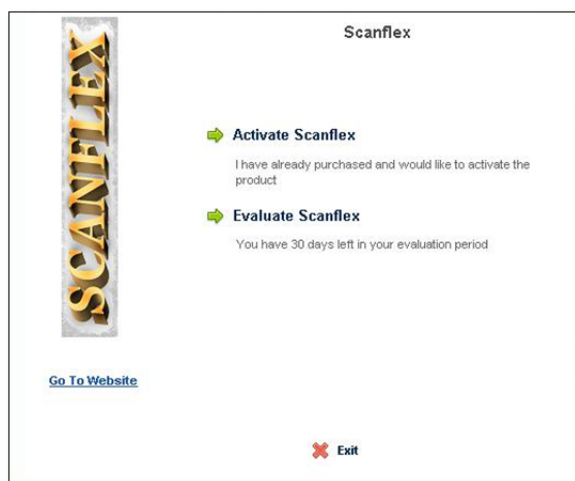


Figure 14. Options for activating SCANFLEX™ software



Figure 15. User code and activation code for SCANFLEX™ activation

6. Scanner Setup

6.1 General Settings

Plug in the scanner power cable to a 100-240 VAC power outlet. Connect the USB cable that is provided with scanner between the scanner and the computer (**Figure 16**). A dedicated computer is recommended to use with the SCANFLEX™ software. The computer should also have the following settings turned OFF for long term experiments:

- Auto updates
- Virus scanning

- Sleep mode
- Automatic defragmentation

The screen saver *should* be turned ON such that a screen burn-in or ghost imaging will not occur if the scanner is used for especially long time periods. The maximum number of scans that can be generated by the SCANFLEX™ software is only limited by the memory capacity of the computer to store the scanned images. The program will give an error message and pause scanning if there is no longer space to store the scanned images. Always be certain that you have sufficient memory capacity for all scanned images. The maximum number of images that can be stored for a given amount of memory capacity can be increased by choosing a lower image resolution (see **Table 3**).

6.2 Scanning Tissue Train® Culture Plates

Two different plate frames, one frame for four 6-well plates and one frame for four 24-well plates, are provided with the SCANFLEX™ software package (**Figure 17**). Place the corresponding plate frame on the scanner making sure that it firmly fits within the scanner area. The frame has markings on its side to identify the location of each culture plate (see **Important: Note #1**). The culture plate location in the frame corresponds to the numbering of the plates and wells in the XYFLEX™ software. If the plates are placed according to the instructions, the wells will be named as shown in **Figures 18-21** in the XYFLEX™ software. See the Appendix for an illustration to identify the corresponding location of wells on the scanned image with reference to their physical orientation on the scanner bed.

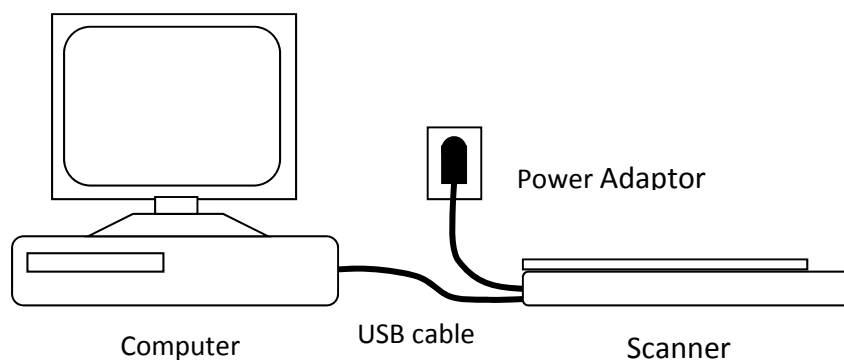


Figure 16. Scanner and computer setup.

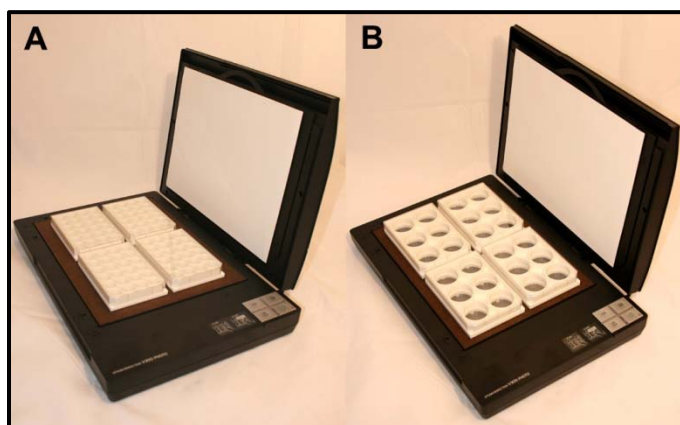


Figure 17. Arrangement of Flexcell's A) 24-well and B) 6-well culture plates on the scanner bed.

NOTE #1: THE POSITION OF THE PLATE FRAME TRIANGLES MUST BE POSITIONED CLOSEST TO THE POWER BUTTON ON THE SCANNER FOR THE WELL LOCATIONS DEFINED IN FIGURES 18 THROUGH 21 TO BE ACCURATE.

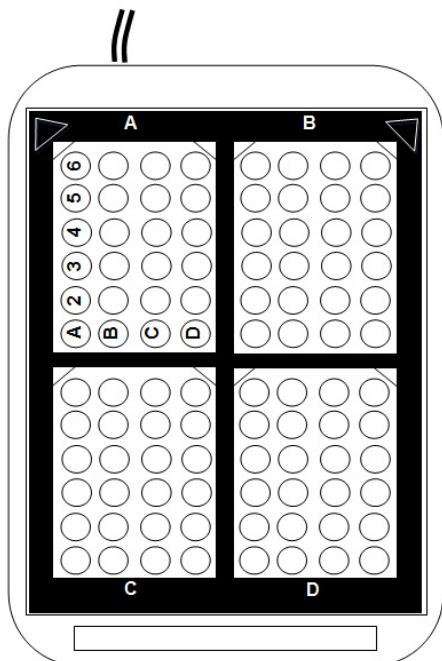


Figure 18. The orientation and numbering of 24-well culture plates on the scanner when the frame provided is used for placing the culture plates on the scanner. The black area is the frame used to hold the plates on the scanner surface.

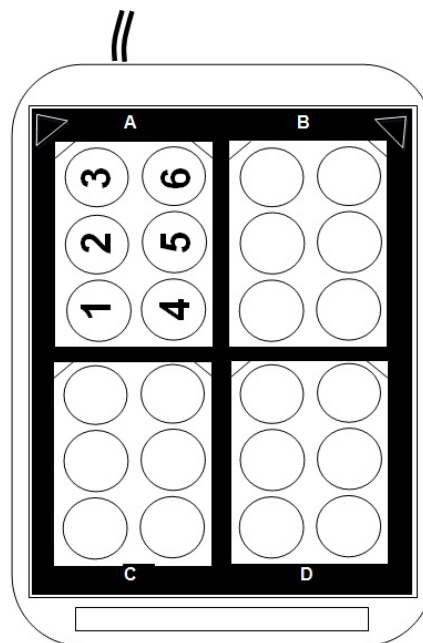


Figure 19. The orientation and numbering of 6-well culture plates on the scanner when the frame provided is used for placing the culture plates on the scanner. The black area is the frame used to hold the plates on the scanner surface.

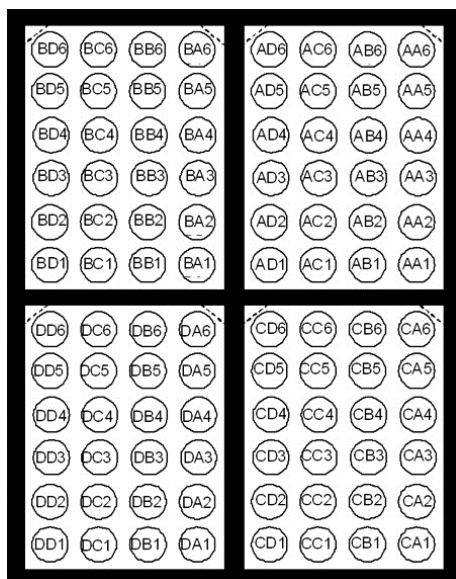


Figure 20. The orientation and numbering of 24-well culture plate wells in the scanned picture. The black area is the frame used to hold the plates on the scanner surface. This is the numbering system which is used in the XYFLEX™ software for identification of wells.

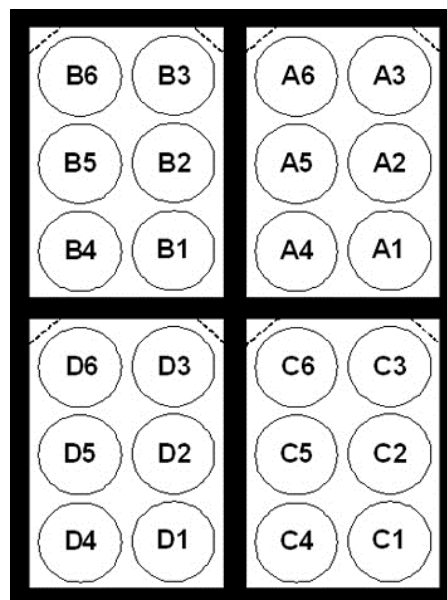


Figure 21. The orientation and numbering of 6-well culture plate wells in the scanned picture. The black area is the frame used to hold the plates on the scanner surface. This is the numbering system which is used in the XYFLEX™ software for identification of wells.

7. Setting up SCANFLEX™ Software

7.1 Opening SCANFLEX™ Software

When the SCANFLEX™ software is completely installed, the SCANFLEX™ icon (**Figure 22**) is displayed on the desktop. Click on the icon to open the SCANFLEX™ software. The SCANFLEX™ start-up screen (**Figure 23**) will open up.



Figure 22. SCANFLEX™ icon

7.2 Configuring Scanner

- 1) To configure the scanner, click on the *CONFIGURE SCANNER* button in the SCANFLEX™ start-up screen (**Figure 23**).
- 2) If the scanner is not already displayed (**Figure 24**), click on the *SELECT* button to open-up the Select Source screen.
- 3) If the scanner is properly installed, it should be displayed in the Select Source screen. Click on the correct scanner and click *SELECT* (**Figure 25**).
- 4) If you do not see the scanner in the Select Source screen, check the USB cable for proper connection and power to the scanner. You may also have to reinstall the scanner software.
- 5) On the Select Scanner screen, click *SAVE* to save the selected scanner for scanning.



Figure 23. SCANFLEX™ start-up screen

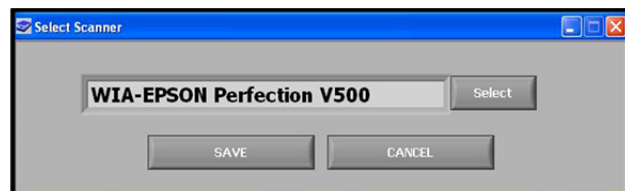


Figure 24. Scanner selection screen

7.3 Creating a User Login

- 1) To access the SCANFLEX™ User Login screen, click on *START* on the SCANFLEX™ Start-up screen (**Figure 23**).
- 2) Click on *CHOOSE USER* to open-up a drop down menu (**Figure 26**).
- 3) If a new user has to be added, select *ADD USER* from the drop down menu and type the user's name in the *USER NAME* box (**Figure 27**). Then click on *CONTINUE* to go to the setup screen.

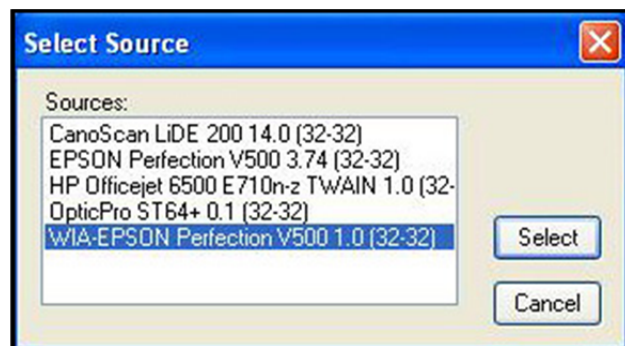


Figure 25. Selection of scanner model screen

- 4) If the user's name is already in the list, click on the user's name and then click *CONTINUE*. You will be directed to the folder which contains all previously created configuration files (regimens).

NOTE #2: Deleting a user from USER LIST

If a user's name needs to be deleted from the user list, click on the user name and then click *DELETE*. Click *YES* or *NO* on the popup warning message to select whether you want to delete all regimens that belong to this user. If you select *NO*, the user's name will not be deleted from the list. If *YES* is selected, all regimens saved under that user will be deleted with the user name.

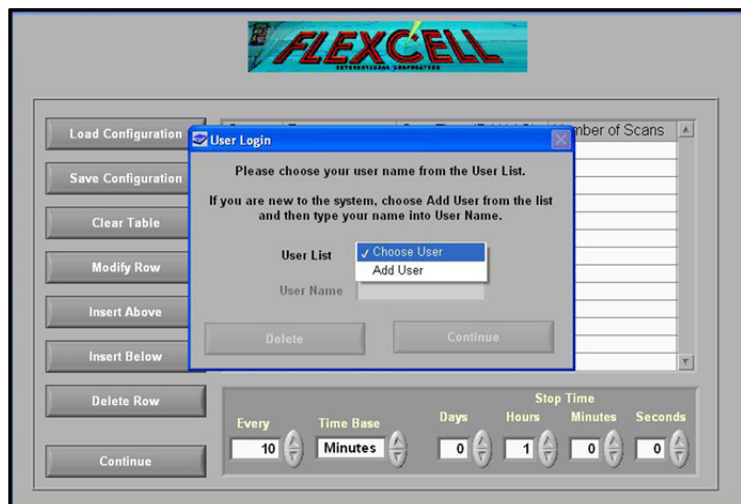


Figure 26. Choosing a user



Figure 27. Adding a new user

7.4 Creating Scanning Regimens

7.4.1 Creating a New Regimen for a New User

All new users will be directed to the SCANFLEX™ Setup screen. Follow the instructions below to setup a scanning regimen.

- 1) Set the scanning frequency time under *EVERY*, and select units in *TIME BASE* (**Figure 28, red circle**). **Important: The maximum scanning frequency is one scan per every 2 minutes. The minimum frequency is one scan per every 200 hours.**
- 2) Set *STOP TIME* by setting days, hours, minutes and seconds (**Figure 28, yellow rectangle**).
- 3) Click *INSERT BELOW* to insert frequency data to *Step #1* in the table.
- 4) If another step needs to be setup, enter the required parameters in *EVERY*, *TIME BASE* and *STOP TIME* and then click *INSERT BELOW*. The *Step #2* will be displayed in the table. Refer to **Note #2** below for explanation on *STOP TIME* calculation.

- 5) When all steps have been added, save regimen by clicking on **SAVE CONFIGURATION**. A folder with the user's name as the title will be opened (**Figure 29**).
- 6) Type the desired file name in the **FILE NAME** box and click on **OK**.
- 7) On the SCANFLEX™ Setup screen (**Figure 30**), click on **CONTINUE** to proceed to the image acquisition screen (**Figure 31**).

Refer to Note #4 to access the location where the configuration files are saved in the computer.

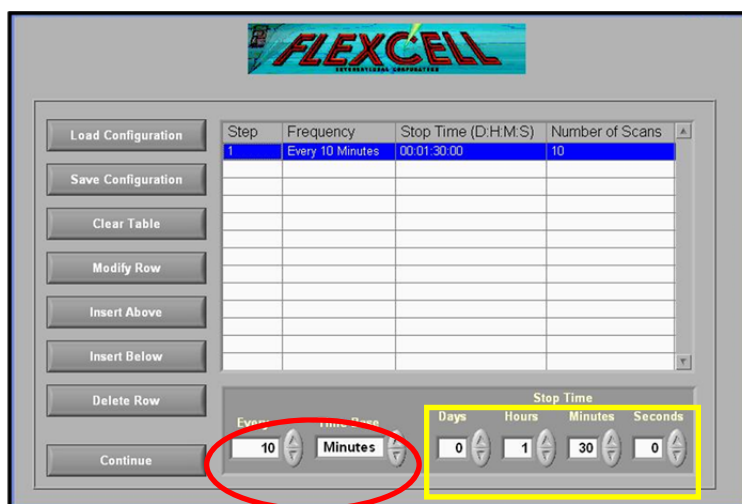


Figure 28. Creating a new regimen

NOTE #3: Calculating STOP TIME

The Stop Time in the table displays the cumulative time. To calculate the time parameters that need to be entered under STOP TIME, add the absolute time for the next subsequent step to the time displayed under the current step.

For example, assume that another step needs to be added in addition to the Step #1 shown in **Figure 28** with a scanning frequency of every 2 minutes and a stop time of 30 minutes. Since Step #1 has 1 hr and 30 minutes, the stop time that needs to be entered for Step #2 is 2 hrs (1 hr 30min + 30 min). There will be 15 scans for Step #2.

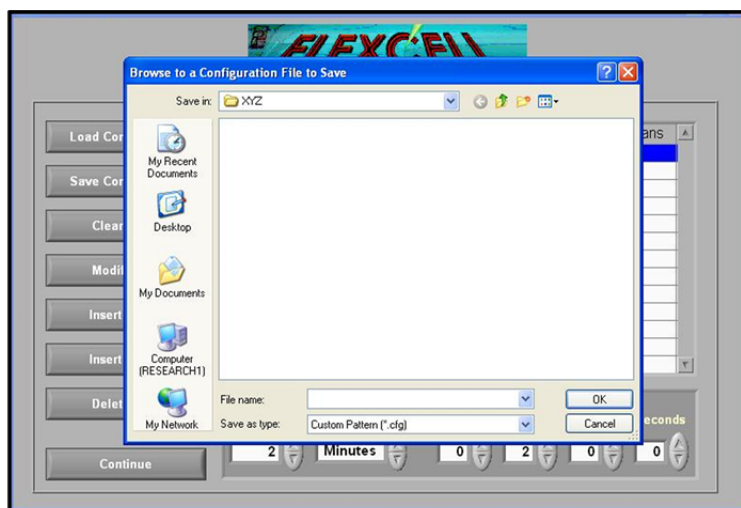


Figure 29. Saving a new regimen

NOTE #4: Access to configuration files

The configuration file is saved in the "config" folder in the C drive. You may use the following address to locate the configuration files. To access, click **START** on your desktop and click on "My Computer". In the top address bar type in the following address:

C:\Documents and Settings\All Users\Application Data\Flexcell_Scanflex\config

7.4.2 Creating a New Regimen for an Existing User

Use the following instructions to create a new regimen for an existing user.

- 1) When the user name is selected in the login screen (**Figure 27**), the folder containing saved regimen files (Configuration files) will be opened as a popup screen (**Figure 30**).
- 2) Click on *CANCEL* to exit from the popup screen.
- 3) Set the scanning frequency time under *EVERY*, and select units in *TIME BASE* (**Figure 28, red circle**).
- 4) Set *STOP TIME* by setting days, hours, minutes and seconds (**Figure 28, yellow rectangle**).
- 5) Click *INSERT BELOW* to insert frequency data to *Step #1* in the table.
- 6) If another step needs to be setup, enter the required parameters in *EVERY*, *TIME BASE* and *STOP TIME* and then click *INSERT BELOW*. The Step #2 will be displayed in the table. Refer to **Note#3** above for explanation on *STOP TIME* calculation.
- 7) When all steps have been added, save regimen by clicking on *SAVE CONFIGURATION*. A folder with user's name as the title will be opened (**Figure 31**).
- 8) Type the desired file name in the *FILE NAME* box and click on *OK*.
- 9) On the SCANFLEX™ Setup screen, click on *CONTINUE* to proceed to the image acquisition screen (**Figure 31**).

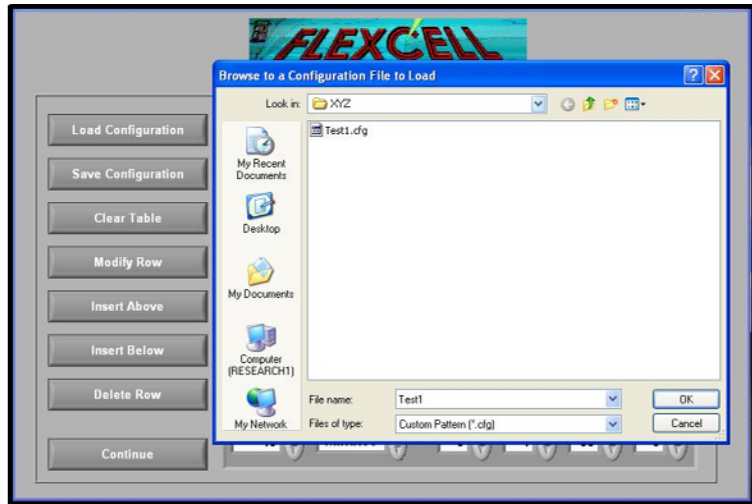


Figure 30. Opening existing regimen files

Refer to Note#4 to access the location where the configuration files are saved in the computer.

7.4.3 Using an Existing Regimen

- 1) For an existing user, when the name of the user is selected from the User list (**Figure 27**), the folder containing all regimen files (**Figure 31**) that belong to the user will open automatically.
- 2) To load the desirable regimen file onto the SCANFLEX™ setup screen, click on the desired Regimen File and then click on *OK*.
- 3) The selected regimen data should then be displayed in the parameter table.
- 4) If the displayed data needs to be changed or more data needs to be added, use the appropriate buttons displayed on the left and bottom of the setup screen. A description of button functions is shown in **Table 2**.
- 5) If another regimen file needs to be uploaded, click on the *LOAD CONFIGURATION* button on the setup screen.

- 6) In the popup user folder screen, select the appropriate file and click *OK* or double click on the appropriate file.
- 7) Click on *CONTINUE* to proceed to the image acquisition screen (**Figure 31**).

Refer to Note #4 to access the location where the configuration files are saved in the computer.

Table 2. Functions of the buttons in SCANFLEX™ setup screen

Button	Function
<i>Load Configuration</i>	Opens a regimen (configuration) file from a user specified location
<i>Save Configuration</i>	Saves a regimen file in the user configuration folder
<i>Clear Table</i>	Clears all data in the regimen table
<i>Modify Row</i>	Modifies current data in the regimen table according to the frequency and stop time data set in the current setup screen
<i>Insert Above</i>	Inserts regimen data above the selected row in the table
<i>Insert Below</i>	Inserts regimen data below the selected row in the table
<i>Delete Row</i>	Deletes the selected row in the table
<i>Continue</i>	Continues to the next screen which is the image acquisition screen

7.5 Image Acquisition

The image acquisition screen (**Figure 31**) enables the user to set several parameters such as *image file type, quality, color scheme, and resolution*. It also displays real time scanning information such as the *number of scans completed, next scanning time, and elapsed time*. The image of the last scan is displayed on the right side of the screen. Follow the instructions shown below to set each parameter.

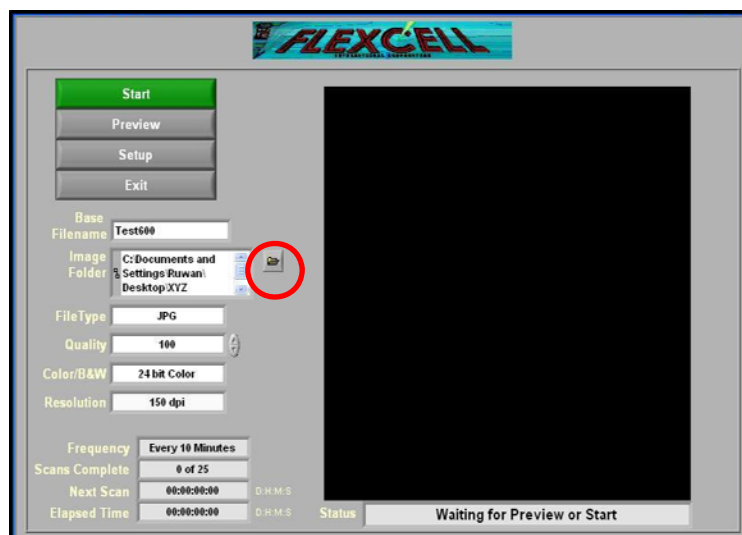


Figure 31. Image acquisition screen

1) *Base file name*

Enter a file name that will be used as the base file name for all your stored images. The images will be named using this text as the base with a time stamp. For example, if the base file name is *Test*, all images will be saved in the format “*Test-0000hr00min*” sequentially according to the scanned time.

NOTE: A new image folder needs to be opened if the same base file name needs to be used for images in a new scanning regimen. Change the base file name if the new images need to be stored in the same folder. Otherwise, the images will not be stored, and the SCANFLEX™ software will display an error message.

2) *Image folder*

Click on the image folder icon (**Figure 31, red circle**) to specify a location for the scanned images to be stored. The file path of the selected location will be displayed in the *image folder* box.

3) *File type*

Click on the *FILE TYPE* box to select either *BMP* or *JPG* for the file type of the scanned image.

4) *Quality*

The quality of the image can be varied from 0 to 100 in increments of 5. The higher the quality of the image, the larger the file size will be. The relationship between the quality setting and image file size is shown in **Table 3**. Use the *up/down* buttons to set the quality of the image.

Table 3. Relationship between image file size and image parameter setting.

Image file type	Resolution setting (dpi)	Quality setting (%)	Image size (MB)
BMP	600	N/A	102
JPG	600	100	19.2
		75	2.96
		50	1.96
		25	1.29
BMP	300	N/A	25.6
JPG	300	100	5.53
		75	0.93
		50	0.62
		25	0.39
BMP	150	N/A	6.4
JPG	150	100	1.44
		75	0.28
		50	0.19
		25	0.13

5) *Color scheme*

The color scheme of the images can be set to one of the following:

- 1 bit B&W
- 8 bit Grayscale
- 24 bit color

Click on the box and choose the desired color setting.

6) *Resolution*

The resolution of the scanned image can be set to one of the following:

- 150 dpi
- 300 dpi
- 600 dpi

The size of the image file and the scan time will depend on the selected resolution (see **Tables 3 and 4**). Click on the box to choose the desired image resolution.

7) *Frequency*

The scanning frequency set in the SCANFLEX™ setup screen will be displayed in the frequency display.

8) *Scans complete*

This box will display the total number of scans and the number of scans completed at a given time.

9) *Next scan*

This box will display the time left for the next scan. This time is based on the scanning frequency value set in the setup screen. It will count down the time for the next scan once the *START* button is activated. *NOTE: The timer will also count the time spent for scanning. **Table 4** illustrates the scan time for different image resolution settings.*

Table 4. Scan time for different image resolutions

Image resolution (dpi)	Scan time (sec)
150	27
300	33
600	57

10) *Elapsed time*

The box will display the amount of time passed, counting up from the first scan. It will also take into account the time spent on scanning the image. If multiple steps are setup in the regimen table, the elapsed time will display the total time passed once the *START* button is activated.

11) Once all scanner parameters are correctly set, click on *PREVIEW* to generate a preview scan of the items. Make sure the items to be scanned are in the correct orientation on the scanner bed, and the scanner lid is placed on the items prior to generating a preview.

- 12) Review the preview image. If the image is correct, click on *START* to begin the scanning process. The scanner will start generating images according to the set regimen.
- 13) If a preview is not necessary, click *START* to begin the scanning process
- 14) If any changes need to be done to the scanner parameters once the scanning process has started, click on *STOP* and then make necessary changes to the parameters. Repeat steps 11-13 to restart scanning process.
- 15) If any changes need to be done to the scanning regimen, click on *STOP* and then *SETUP* to go back to the SCANFLEX™ setup screen. Repeat procedures shown under Section 7.4.1, 7.4.2, or 7.4.3 as necessary to setup a scan regimen. Recheck the scanner parameters on the image acquisition screen prior to starting scanning.

8. Appendix

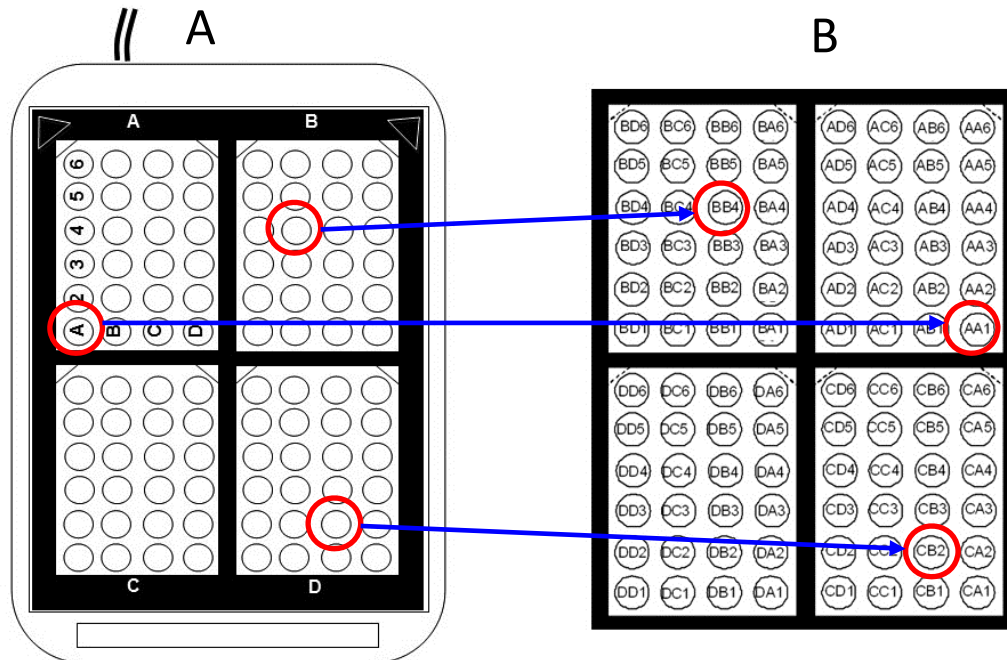


Figure 32. Physical orientation of the wells in Flexcell's 24-well plates on the scanner bed (A) and their corresponding locations in the scanned image (B),

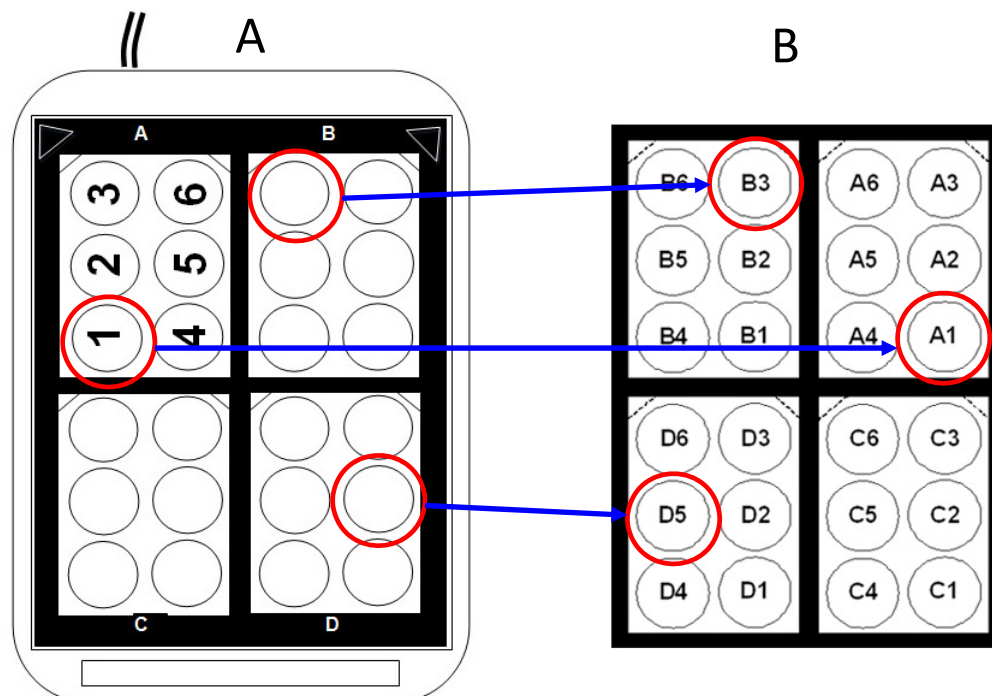


Figure 33. Physical orientation of the wells in Flexcell's 6-well plates on the scanner bed (A) and their corresponding locations in the scanned image (B),