Photron FASTCAM Analysis 2

for Image Analysis

User's Manual
Ver. 2.0.0.0 E

Photron

Introduction

Thank you very much for purchasing Photron FASTCAM Analysis 2, Photron's image analysis software.
This document describes the installation method, environmental settings, operating instructions, and precautions necessary to use Photron FASTCAM Analysis 2 (hereinafter referred to as "PFA2").
Please read this manual carefully before using PFA2.
Please note that the actual screen may differ from the screen shown in the manual depending on the version of software you are using.

If you have any questions or problems, please refer to "Chapter 3 Troubleshooting" and if the problem persists, contact Photron using the contact form.

Supported PFA2Version

This manual covers PFA2 Ver. 2.0.0.0.
If you are using a version other than the above and do not have the corresponding manual, please contact Photron using the contact form.

Manual Organization

◆ Chapter 1 Overview

This section provides a brief overview of PFA2's functions and software.
In addition, the recommended PC operating environment and file format for PFA2, and installation are explained.

◆ Chapter 2 Operation

This section describes how to operate PFA2.

◆ Chapter 3 Troubleshooting

Frequently asked questions, answers, and contact information are explained.

Manual Notation

Notations used in this manual have the following meanings.

Icon/Symbol	Description
 **IMPORTANT**	This symbol indicates content that should always be read.
 **CAUTION**	This symbol indicates instructions that should always be followed when using the software, or things to be careful of when using the software.
 **NOTE**	This symbol indicates supplementary items to be aware of when using the system.
 **REFERENCE**	This symbol indicates the location of a reference.

Contents

1

Chapter 1 Overview

This chapter provides a brief overview of Photron FASTCAM Analysis 2 and its functions.
It also describes the recommended PC operating environment.

1.1. What is Photron FASTCAM Analysis 2?

Photron FASTCAM Analysis 2 (hereinafter referred to as PFA2) is auxiliary software that enhances the functionality of Photron FASTCAM Viewer (hereinafter referred to as PFV), the camera control software for the Photron high-speed camera FASTCAM series.
With PFA2, you can import image data recorded by high-speed cameras, calculate the motion, velocity, and acceleration of objects in the images, and synchronize the calculation results with the image data for playback or export them as CSV data.

1.1.1. What PFA2 Does

■ PFA2 Function List

◆ Data Import
- High-speed camera data (.cihx, .cih, .graw)
- Video data (.avi, .wmv, .mp4, .mov)
- Sequential still image data (.bmp, .tiff, .jpg (jpeg), .png)
- Waveform data (.csv, .mme)

◆ Settings
- Scale settings
- Grid display
- Static coordinate system settings (origin settings, XYZ axis direction settings), dynamic coordinate system settings (origin settings, XYZ axis direction settings)

◆ Tracking & Measurement
- Correlation tracking
- Brightness tracking
- Brightness area ratio
- TLD
- Two points, Multi points

◆ Graph Display
- XT Graph
- Composite Graph
- Frequency Analysis Graph
- Displacement (X-direction, Y-direction, ABS), Velocity (X-direction, Y-direction, ABS), Acceleration (X-direction, Y-direction, ABS)
- Brightness area, brightness perimeter, brightness hole area
- Vertical Ferret diameter, horizontal Ferret diameter

◆ Save
- Snapshot
- Save tracking results (video + CSV)

◆ Others
- Image processing&editing
- Zoom/move
- Cross cursor

1.2. Recommended Environment

1.2.1. Recommended PC Specifications

The recommended operating environment of the PC for running PFA2 is as follows.

Item	Description
OS	Windows 11 Pro, Windows 11 Enterprise, Windows 11 Education * 64-bit version is essential.
CPU	Intel Core i5 or higher (Intel Core i7 or higher is recommended) * SSE2 is essential.
Memory	8GB or more (16GB or more is recommended)
Hard Disk or SSD	2GB or more free space (for installation)
Graphics	Intel HD Graphics or higher NVIDIA graphics card VRAM 4 GB or higher is recommended. * OpenGL3.0 or higher is essential. * AMD graphics cards are not supported.
Display Resolution	24-bit color or higher of Full HD (1,920 x 1,080) is recommended. * WXGA (1,280 x 768) is also available, but some items may not be displayed.
Others	A high-capacity hard disk or removable media drive for saving recorded image data

NOTE

- We do not guarantee the remote desktop operation of a PC running PFA2. However, it may work in some cases, so contact our technical personnel for assistance.
- The recommended operating environment represents a typical specification and does not guarantee the operating performance.
  Depending on the image to display, better operating environment than is recommended might be required. Contact Photron for support in selecting a PC.

1.2.2. Supported File Format

PFA2 supports the following file formats.

- High-Speed Camera data (.cihx, .cih, .graw)
- Movie data (.avi, .wmv, .m4p, .mov)
- Sequential Still Image data (.bmp, .tiff, .jpg(jpeg), .png)
- Waveform data (.csv, .mme)
- INF file (.ini)
- TSI data (.tsi)

NOTE

- PFA project files (.pfaproj) created with Photron FASTCAM Analysis (hereinafter referred to as PFA) are not compatible with PFA2.

1.3. Installation

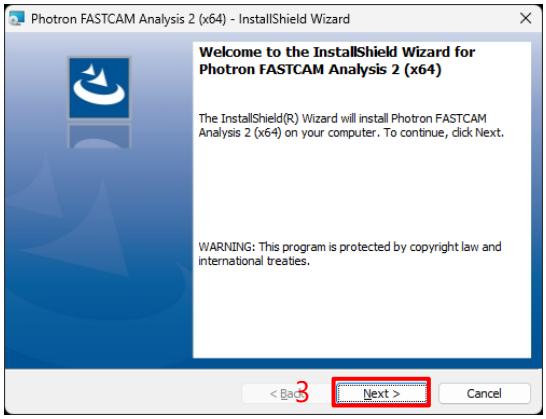
This section describes PFA2 installation.

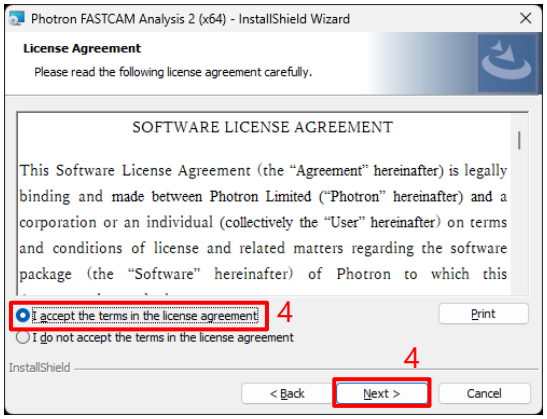
CAUTION

- At least 2 GB of free space on the PC's hard disk is required to install PFA2.

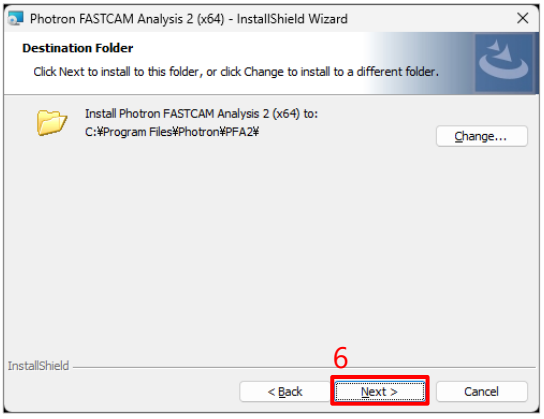
1.3.1. How to Install

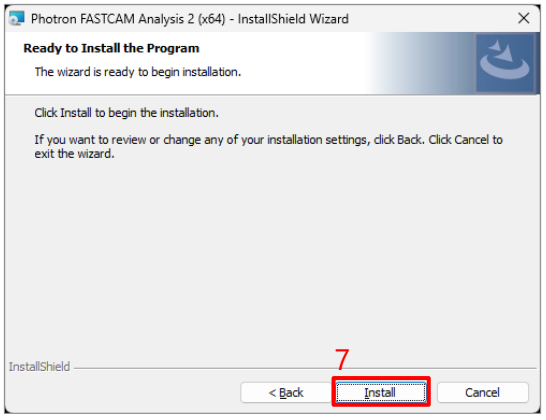
1. Double-click "PFA2_x64.exe" to start the setup program.
2. When the User Account Control confirmation screen appears, click [Yes].
3. Click [Next] to display the license agreement.
4. Confirm the contents, check "I accept the terms of the license agreement" checkbox and click [Next].



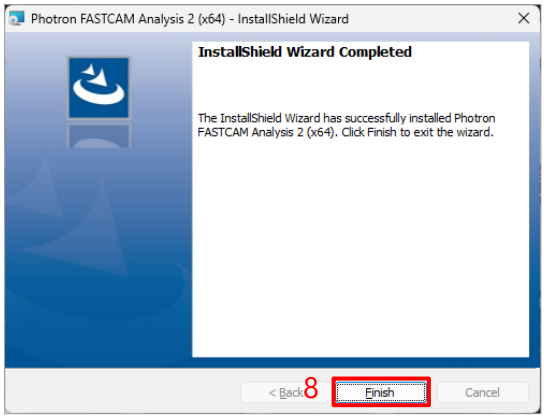


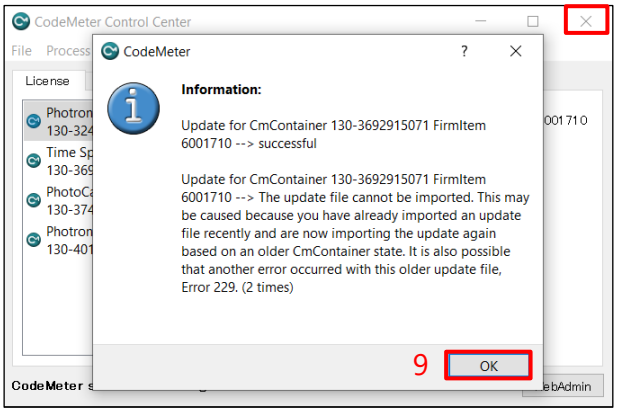
5. Specify the installation location. The default is "C:\Program Files\Photron\PFA2\".
   To change the installation location, click [Change] and specify the installation location.
6. Click [Next].
7. Click [Install]. The installation begins.





8. When installation is complete, the following screen appears. Click [Finish].
9. Click [OK] on the license message, then click [X] on the license management screen.
10. A PFA2 shortcut is created on the desktop. Double-click the shortcut to launch PFA2.





NOTE

- PFA2 is update-installable. To upgrade, double-click and run the installation program (PFA2_x64.exe) for the new version.

1.3.2. Dongle Authentification

A dedicated dongle is required to use PFA2. Please attach the dongle before starting PFA2.

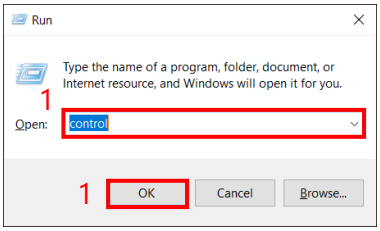
CAUTION

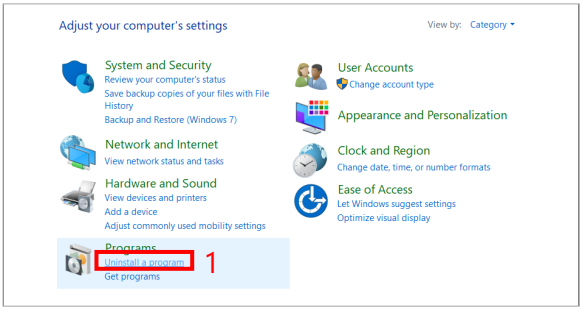
- If you start PFA2 without attaching the dongle, you can use PFA2 as a trial version. After 30 days, the trial version license will expire, and you will no longer be able to use PFA2.
  Please attach the dongle to continue using PFA2.

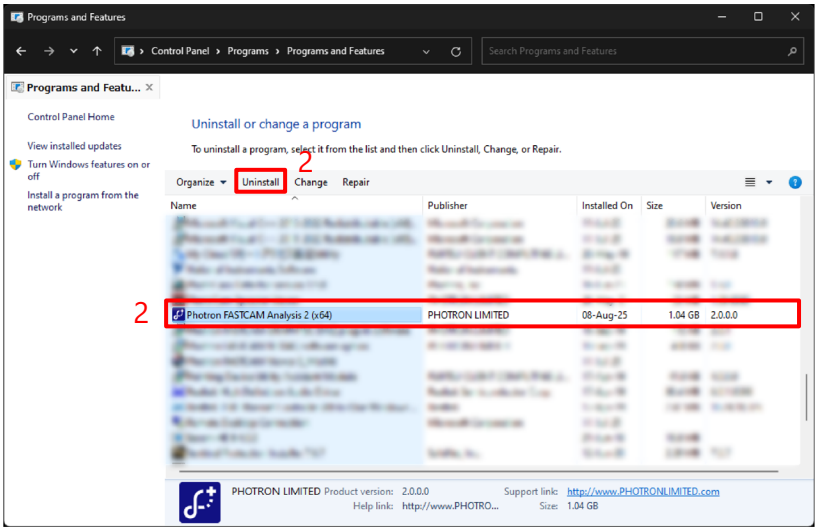
1.3.3. How to Uninstall

To uninstall, follow the steps below.

1. Press [Win] + [R] keys, enter “control”, and click [OK].
   Click [Uninstall a program].
2. Select “Photron FASTCAM Analysis 2 (x64)” from the list and click [Uninstall].
   Click [Yes] on the configuration message to uninstall.





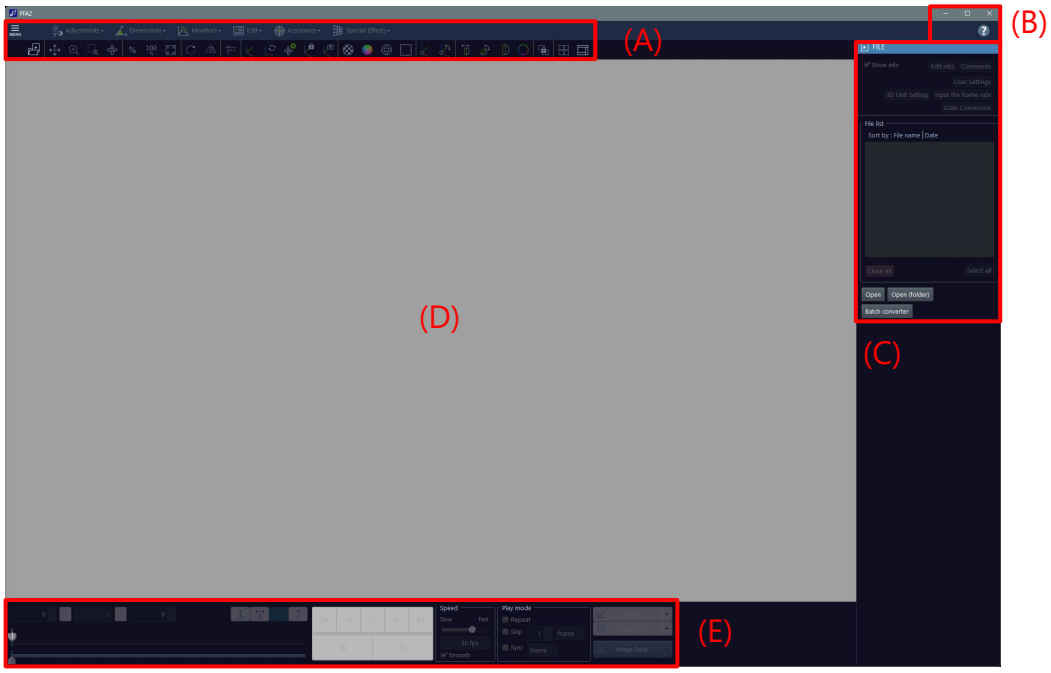


NOTE

- You can also uninstall PFA2 by right clicking on [Start], click [Settings] – [Apps].

1.4. Description of Screen

When PFA2 starts, the following screen is displayed. Here, names of parts of this screen are described.



Item	Name	Description
(A)	Menu area	Various settings can be made from the following menu. The items displayed will vary depending on the type of data selected. ・ Menu for software settings, etc. ・ Various adjustment menus for high-speed camera data ・ Quick Tools
(B)	Minimize/Maximize/ Restore button Close button Help button	Minimizes or maximizes the screen and exits the software. Clicking [?] button to display the PFA2 User's Manual (this manual).
(C)	File menu / Function panel	A list of open files and the measurement menu are displayed. You can open data by specifying files or folders, or convert data formats, and configure various measurement settings. See "2.1 Opening Files" on page 16 for how to open data.
(D)	View area	Area for displaying data.
(E)	Playback panel	Displays buttons and setting items related to playing and saving data.

2

Chapter 2 Operation

This chapter explains how to open files, playback/measure, and save data in PFA2.

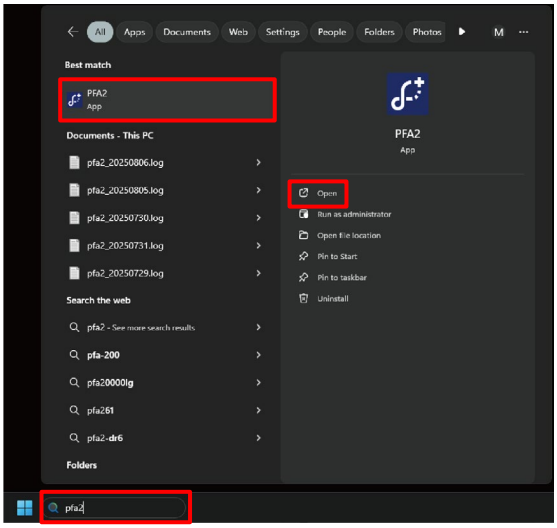
2.1. Opening Files

This section describes how to open files in PFA2.

2.1.1. Starting PFA2

Double click the “TimeSpaceView” icon on the desktop.

If there is no icon on the desktop, search for “pfa2” in the Windows search box and double click [PFA2] or click [Open].

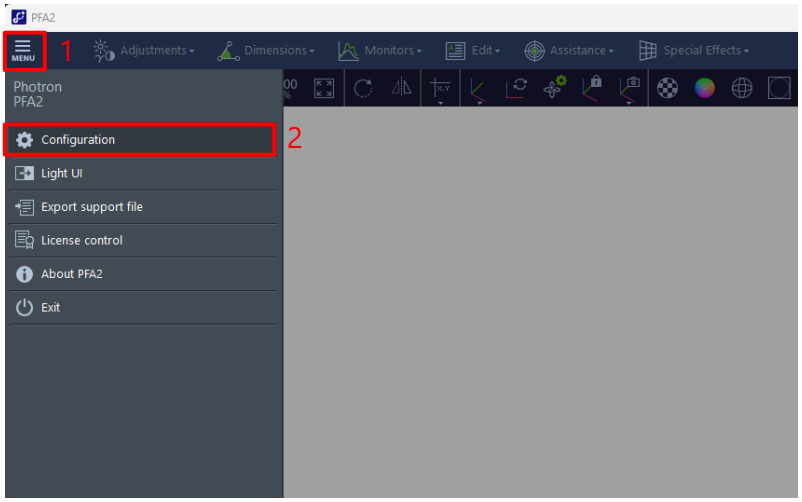


NOTE

- Double clicking a file (.tsi) output by PFA2 will launch PFA2 with the file open.

2.1.2. Check PFA2 Settings

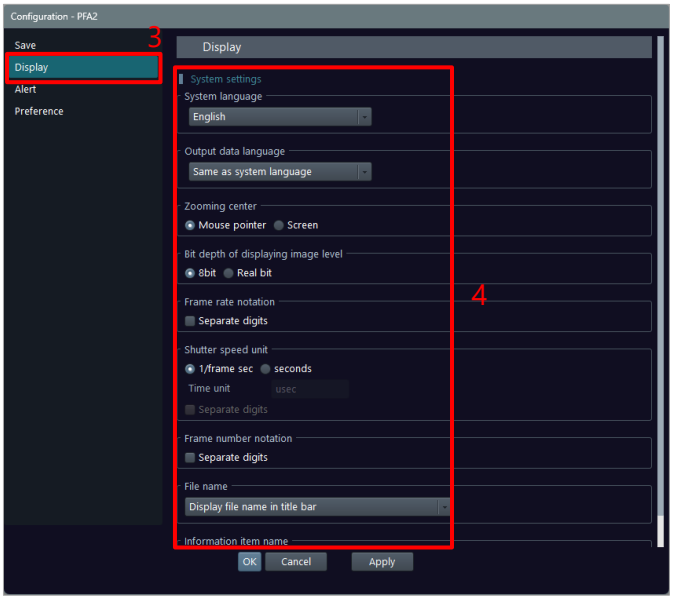
Move your mouse over [MENU] in the upper left corner of the screen and click [Configuration].
* Keyboard shortcut: [F10]



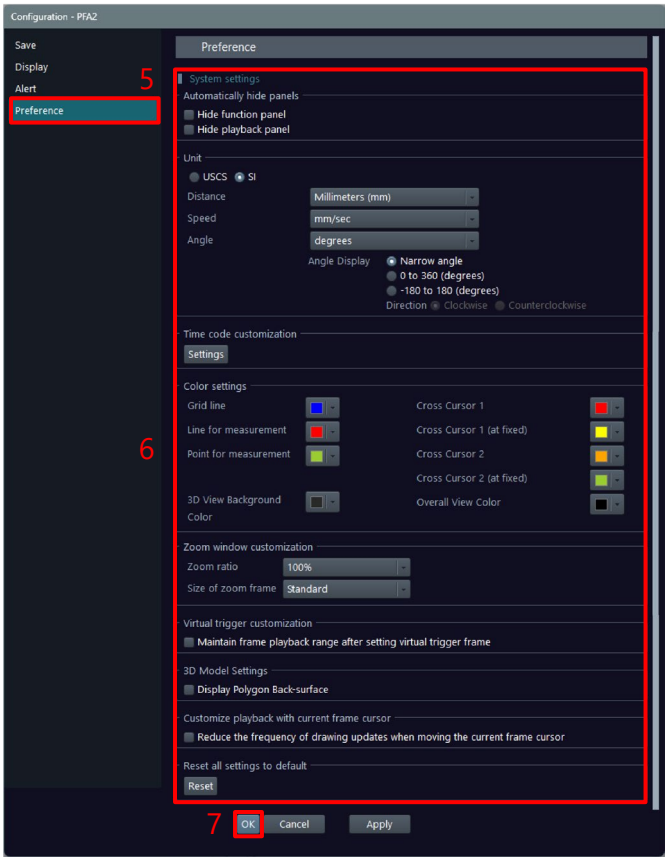
NOTE

- Click [Light UI] to switch to a light UI with a bright background.

Click [Display] and change the language settings, center setting for scaling, shutter speed unit, file name display settings, etc. as necessary. After making changes, click [Apply].



Then click [Preference] and change the panel display settings, unit settings, color settings, zoom factor settings, etc. as necessary. After making changes, click [OK].



NOTE

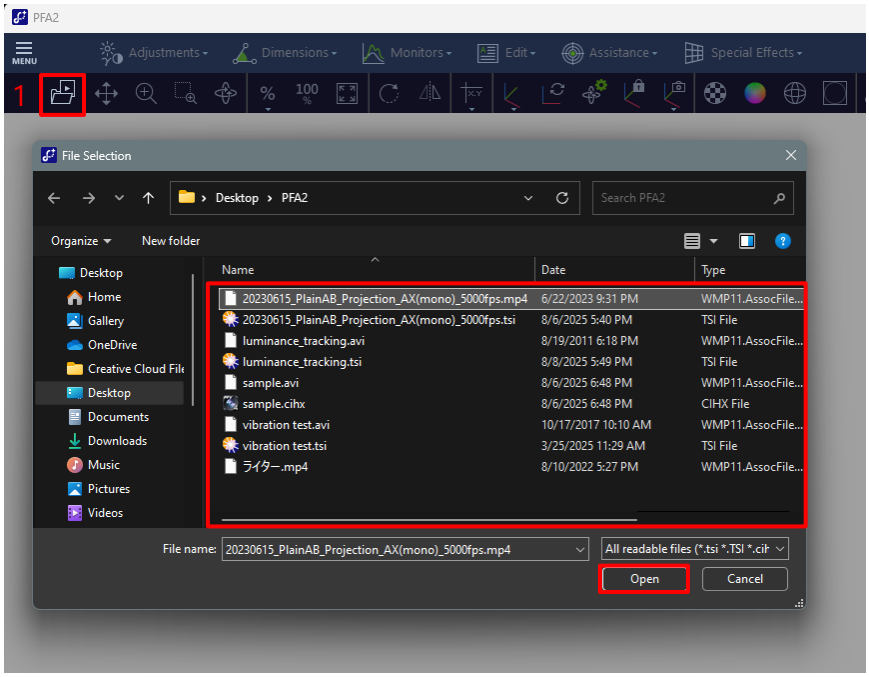
- Clicking [Reset] in “Restore all settings to default” will return all settings to their default values. A restart will take effect the changes.

2.1.3. Opening Files

Click the [Open] icon in Quick Tools.

* Keyboard shortcut: [Ctrl] + [O]

Double click on the file or click on the file and click [Open (O)].

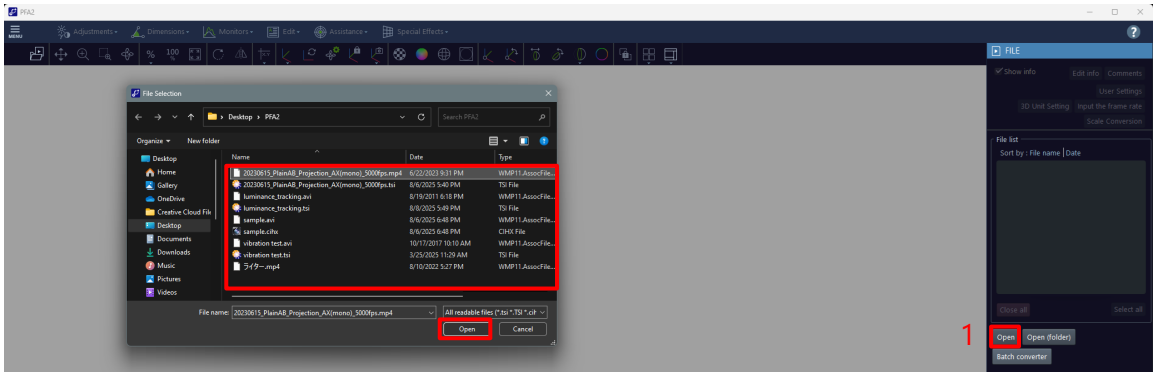


CAUTION

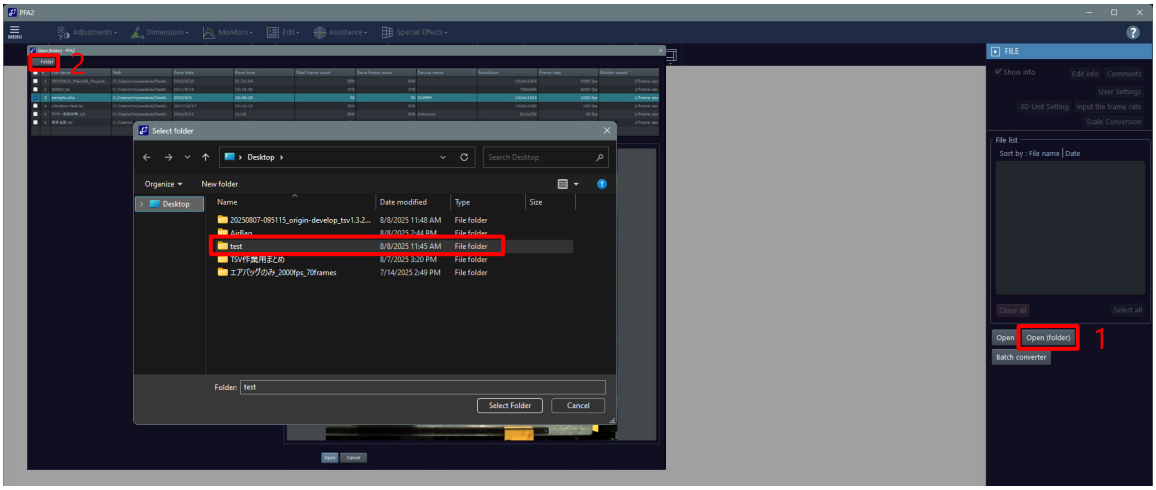
- RAWW and MRAW format files of high-speed camera data cannot be opened directly.
  To open the above files, select a CIH or CIHX file to open.

Click [Open] in the File menu on the right side of the screen.

* Keyboard shortcut: [Ctrl] + [O]



Click [Open (folder)] to open multiple files (TSI and CIHX formats only) by specifying a folder.



2.1.4. Opening TSI File

By opening a TSI file output by PFA2, the file can be opened with image processing settings, etc. applied.
See “2.4.1 Saving TSI File (Information File)” on page 62 to output a TSI file.

2.1.5. Show / Hide Files

Click the target file to be displayed in the file list.

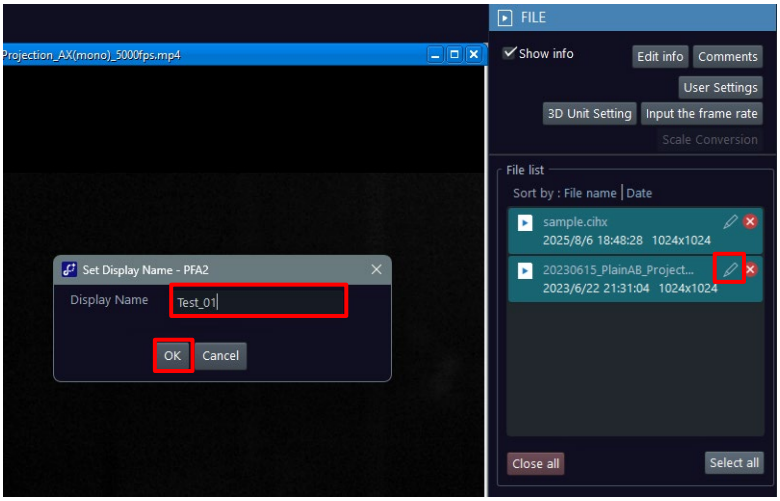
To show multiple files, hold down the [Ctrl] key and click on multiple files.

To show all files in the file list, click [Select all].

2.1.6. Change the File Display Name

Click [Edit] for the file to be changed in the file list.

Enter the file display name and click [OK]. * Only the name displayed in the file list will be changed.



2.1.7. Closing Files

Click [X] for the file to be closed from the file list.

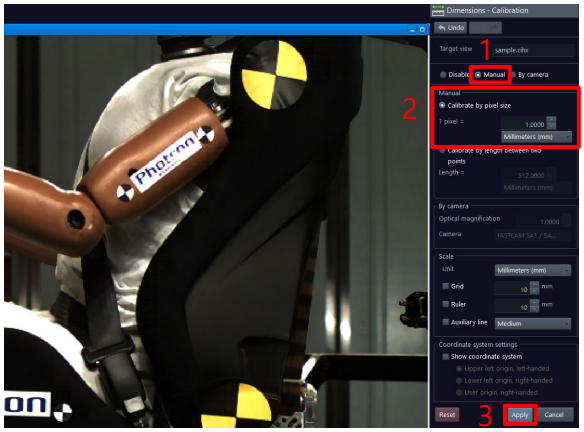
To close all files in the file list, click [Close all].

* Keyboard shortcut: [Ctrl] + [W]

2.1.8. Setup the Scale

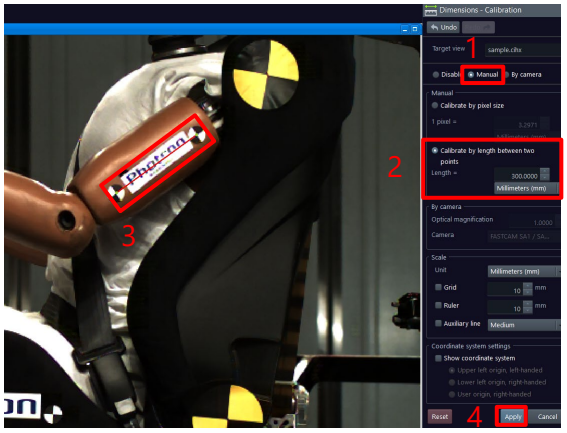
You can calibrate the scale setting from [Dimensions] - [Calibration].
Set the scale based on the size of a single pixel in the image data, the location where the actual distance is known, or the optical magnification of the lens.
The distance and acceleration units of the measurement results can be displayed in actual values.

■ Manual Calibration



- Calibrate from 1 pixel size.

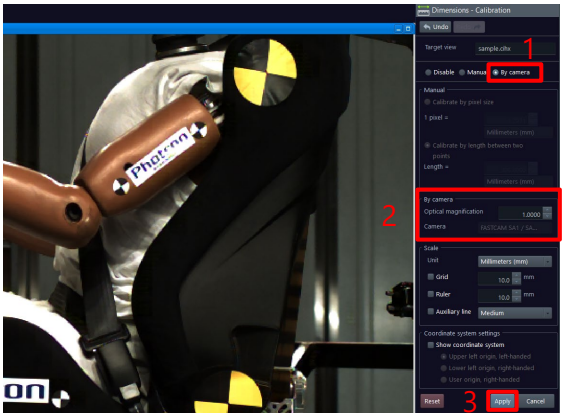
1. Check [Manual].
2. Check [Calibrate by pixel size], enter size, and set units.
3. Click [Apply].



- Calibration from distance between two points

1. Check [Manual].
2. Check [Calibrate by length between two points], specify two points for which you know the actual distance on the screen (e.g., between markers), enter the length, and set the units.
3. Click [Apply].

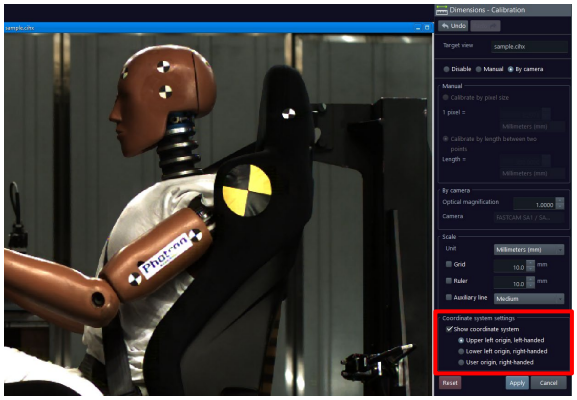
■ Calibrated by Optical Magnification



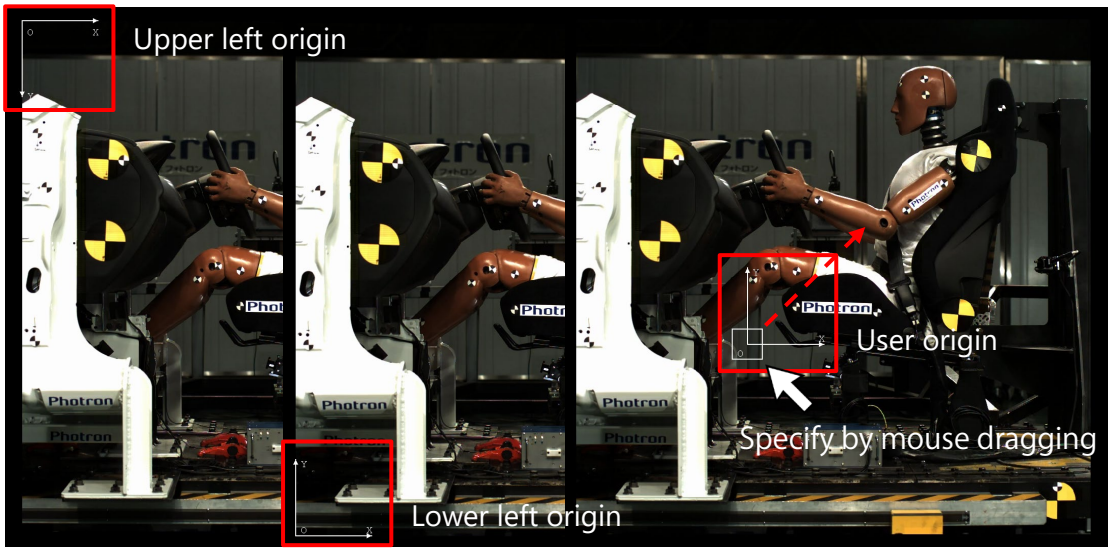
- Calibration from lens optical magnification

1. Check [By camera].
2. Enter the optical magnification rate.
3. Click [Apply].

■ Show Coordinate System



Check [Show coordinate system] and select the position.

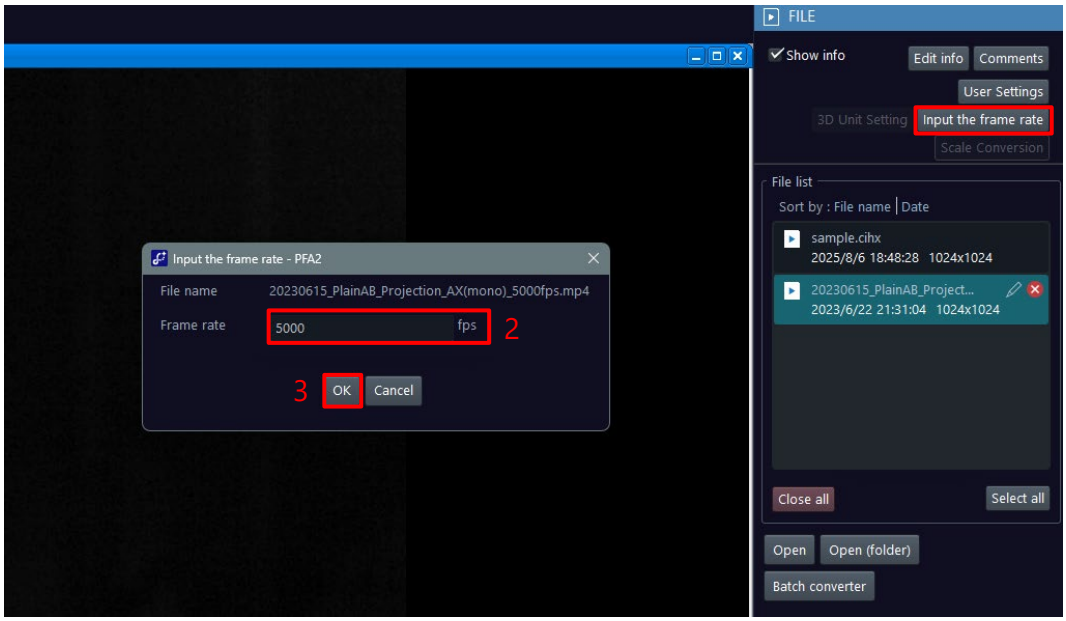


2.1.9. Set Frame Rate

Click [Input the frame rate] to set frame rate information to open files.

* To set individually, click each file individually in the file list.

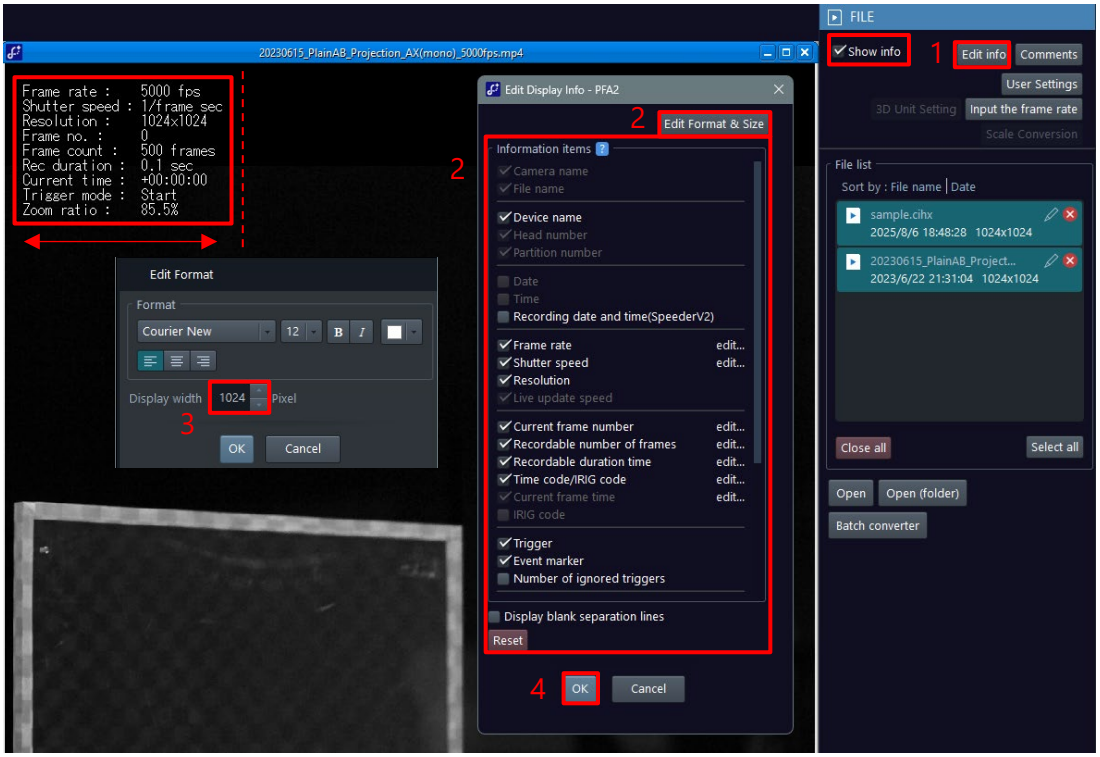
By setting the frame rate, it is possible to synchronize playback in time units and calculate the velocity of movement and acceleration in the measurement function.



2.1.10. Check the Information Display Settings

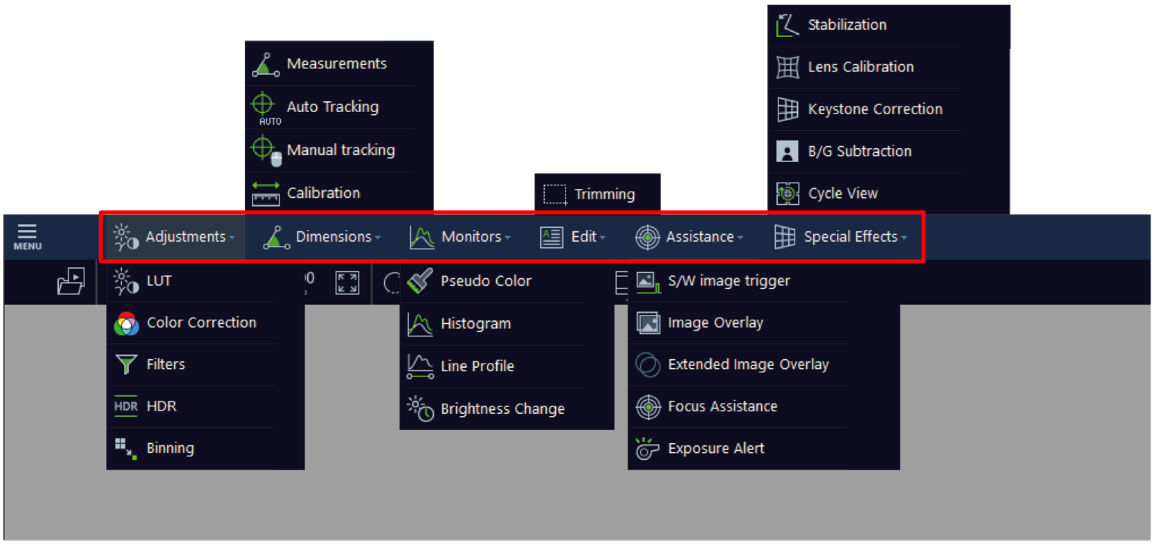
You can change the settings for frame rate and number of frames display.

- Uncheck [Show info] to hide the information display.
- Click [Edit info] to change the items displayed.
- Click [Edit Format & Size] to change the font, position, and width of the displayed items.



2.2. Image Processing and Adjustment Functions

From the tool menu, you can adjust image quality, display brightness, trim the save range, correct lens distortion, correct skew, remove backgrounds, and more for image.
The method is the same as PFV4. For details on procedures, refer to “Chapter 8 How to Use Tool Menu” in the PFV4 User’s Manual.

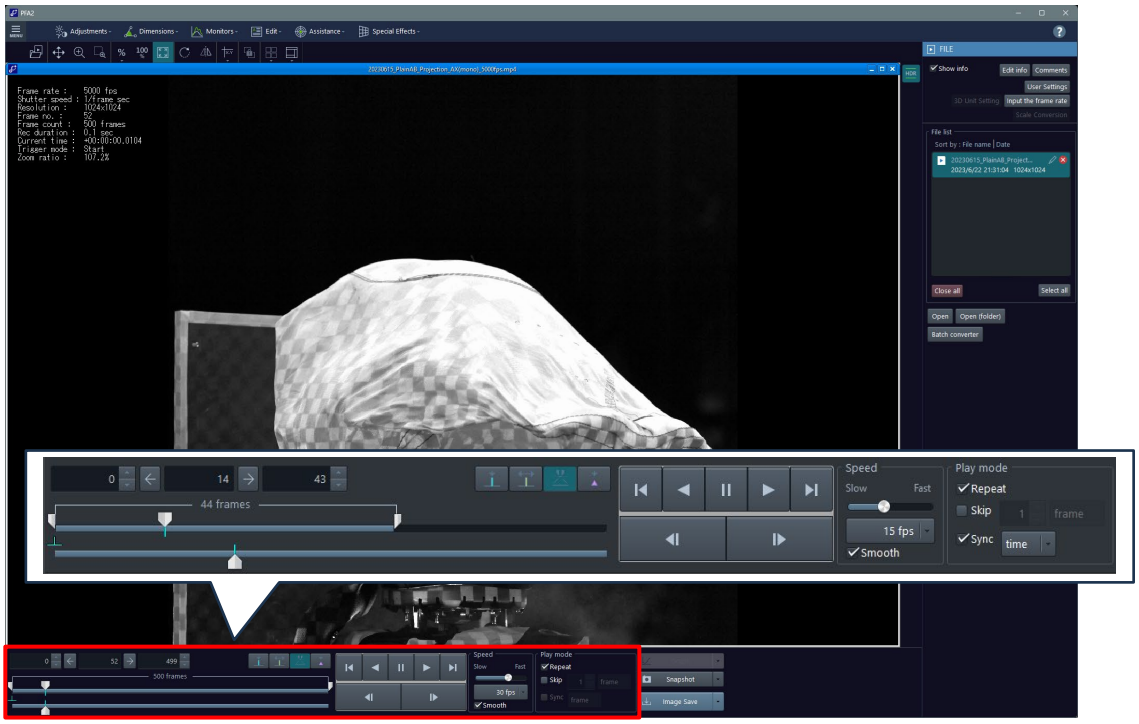


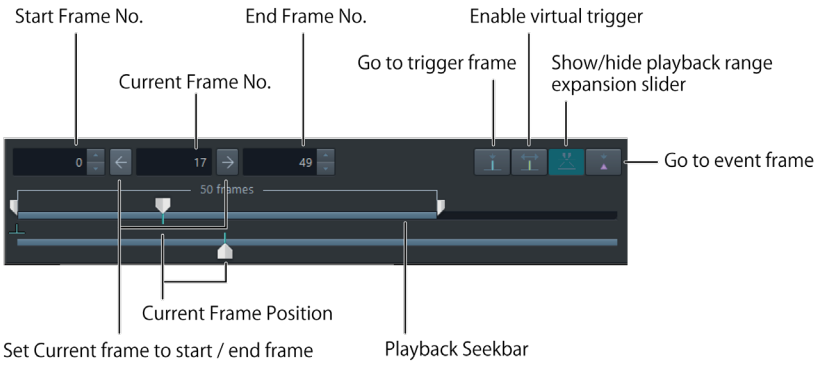
2.3. Playback Files / Measurement

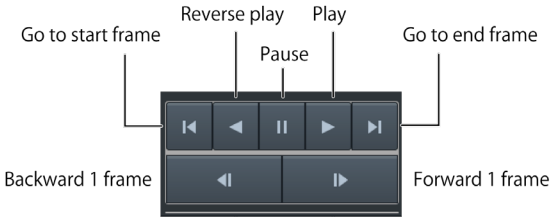
This section explains how to play and measure with PFA2.

2.3.1. Playback

Playback and playback settings can be made from the playback panel.

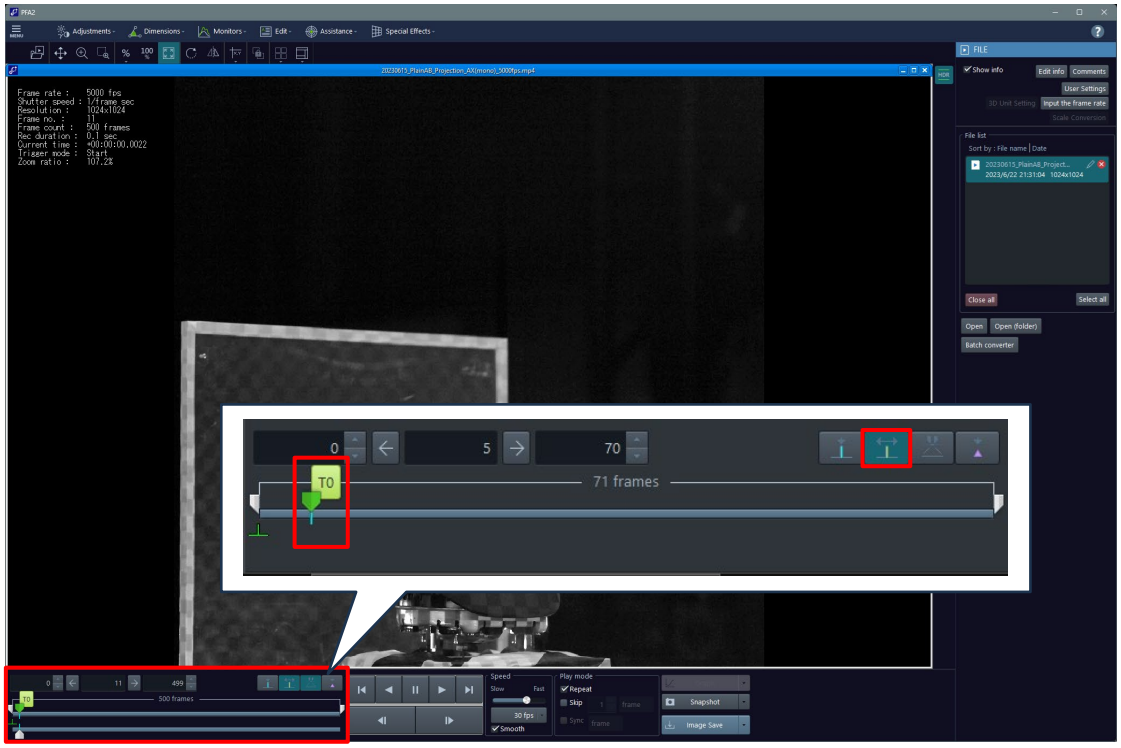




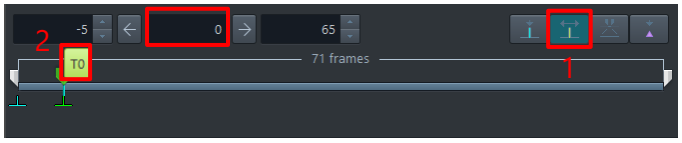


2.3.2. Place a Marker on Any Frame (Trigger Frame Setting)

Any frame can be set as a trigger frame (T0) to trim the playback range or move to the trigger frame.

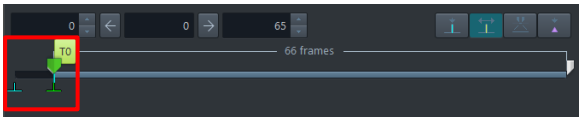


1. Click [Enable virtual trigger] to display “T0” in the playback seek bar.
   * Keyboard shortcut: [M]
2. In the playback panel, move to any frame (e.g., Move to the frame where the airbag opens) and click [T0]. (The frame number set to [T0] becomes “0”.)

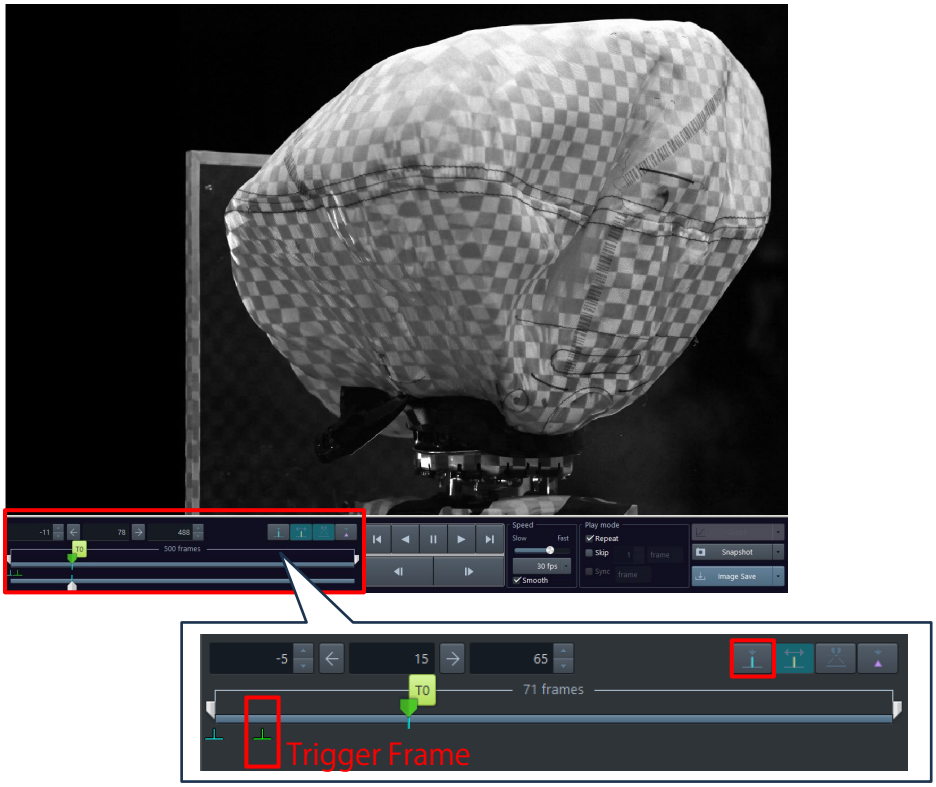


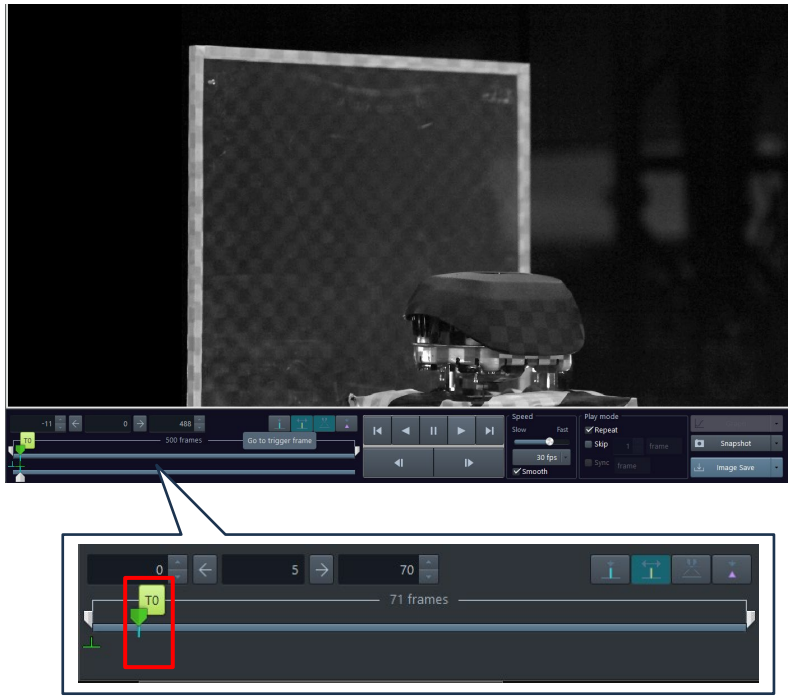
NOTE

- If [MENU] - [Configuration] - [Preference] and check [Maintain frame playback range after setting virtual trigger frame] under “Virtual trigger customization”, the frame set to [T0] will be set as the start frame.



3. Click [Go to Trigger Frame] to move to the trigger frame.
   * Keyboard shortcut: [N]

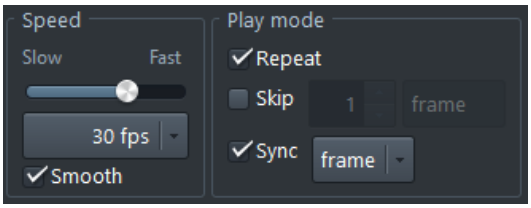




2.3.3. Changing Playback Speed and Mode

Playback speed can be changed from the speed setting bar or from the fps list.
From the play mode settings, you can select [Repeat], [Skip], or [Sync].

- [Repeat]: When playback reaches the end of the data, it automatically returns to the start frame and begins playback.
- [Skip]: Playback skips to the specified number of frames or seconds.
- [Sync]: Plays back multiple data in synchronized frames or time.
  For synchronized playback by time, refer to "2.1.9 Set Frame Rate" on page 25 and make sure the frame rate is set correctly.

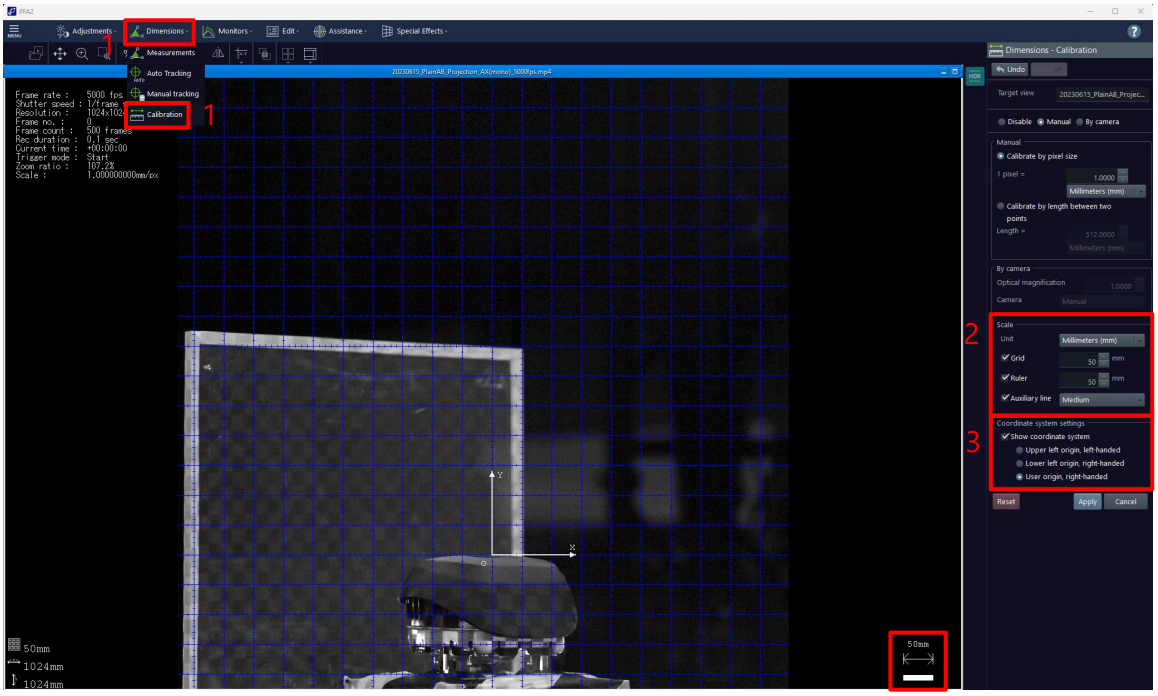


NOTE

- Depending on the set playback speed and video data compression status, video data playback may drop frames. When [Smooth] is checked, all frames are displayed and played back without dropping frames.
- Playback can be performed by specifying the range.
  Specify the start frame at the current frame position on the frame-by-frame playback or playback seek bar and click [Set current frame to start frame]. Similarly, specify the end frame and click [Set current frame to end frame]. Then click [Play] to play back the specified area.
- Even during skip playback, the trigger frame is played back without skipping.
- The relationship between the skip playback setting values and the frames displayed is as follows.
- When "frame" is selected
  Skip frame "1": The 1st frame, 2nd frame, 3rd frame... are displayed in that order without skipping.
  Skip frame "2": The 1st frame, 3rd frame, 5th frame... are displayed in that order.
  If "Playback Speed" is set to 30 fps, the 30th frame is displayed after 1 second, and after 10 seconds, the 300th frame is displayed. If skip frame is set to 10 [Frame], the 3,000th frame will be displayed after 10 seconds.
- When "msec" is selected (In case of "10")
  1,000 fps video: 0.001 sec per frame (= 1 msec) → 1 in 10 frames are displayed
  2,000 fps video: 0.0005 sec per frame (= 0.5 msec) → 1 in 20 frames are displayed
  If "Playback Speed" is 30 fps, the 30th frame (0.030 sec) is displayed after 1 second, and the 300th frame (0.300 sec) is displayed after 10 seconds. If skip frame is 10 [msec], the 3,000th frame (3.000 sec) is displayed after 10 seconds.

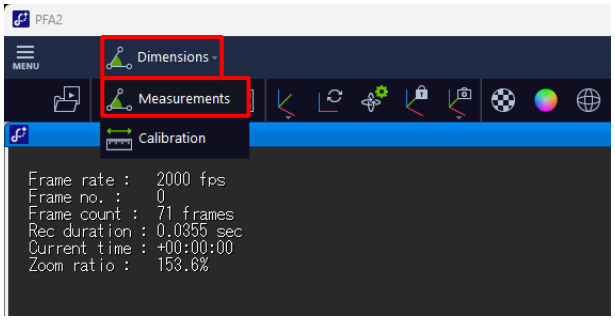
2.3.4. Display the Grid

You can display the grid and ruler from [Dimensions] – [Calibration].
The size of the grid spacing, and ruler can be specified.
The spacing of auxiliary lines can be selected from [Wide (2 divisions)], [Medium (5 divisions)], and [Narrow (10 divisions)].
The starting point of the grid coincides with the coordinate origin. To change the position, check [User origin] in [Coordinate system settings] and specify the coordinate origin.



2.3.5. Measurement (Dimensions - Measurements)

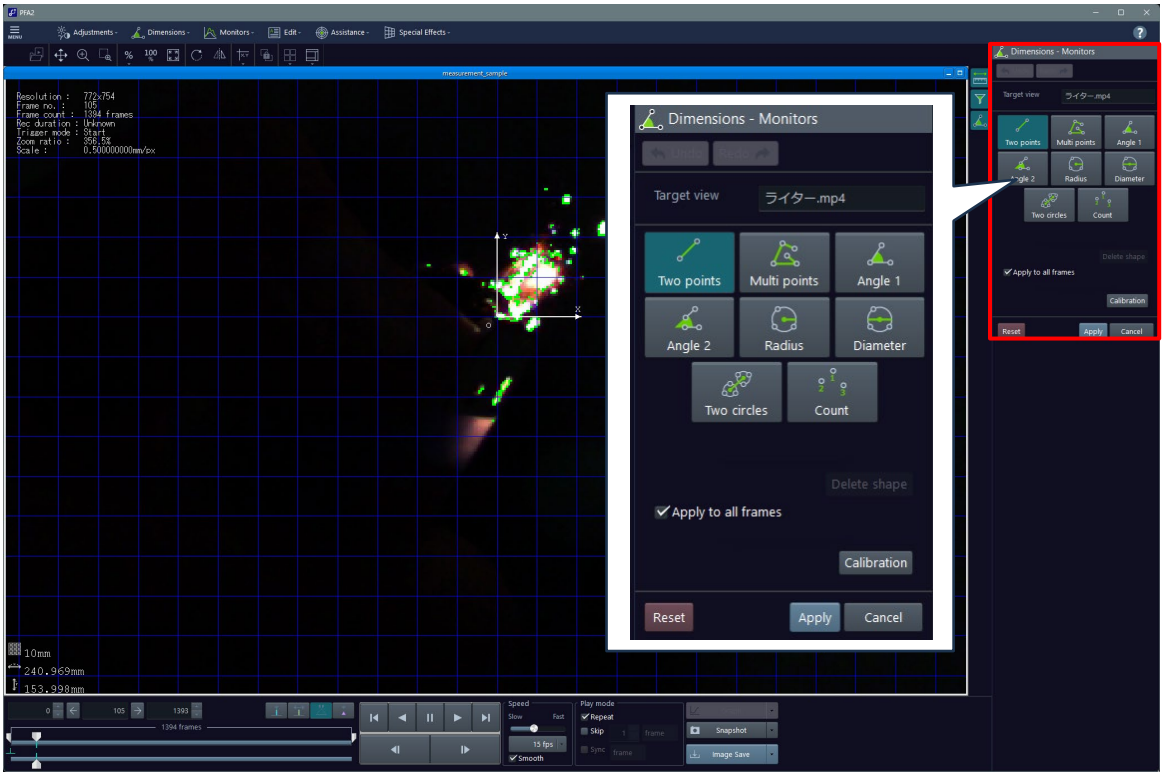
To measure the distance between two points (or between multiple points), angle, radius, diameter, or two circle center, click [Dimension] - [Measurements].



CAUTION

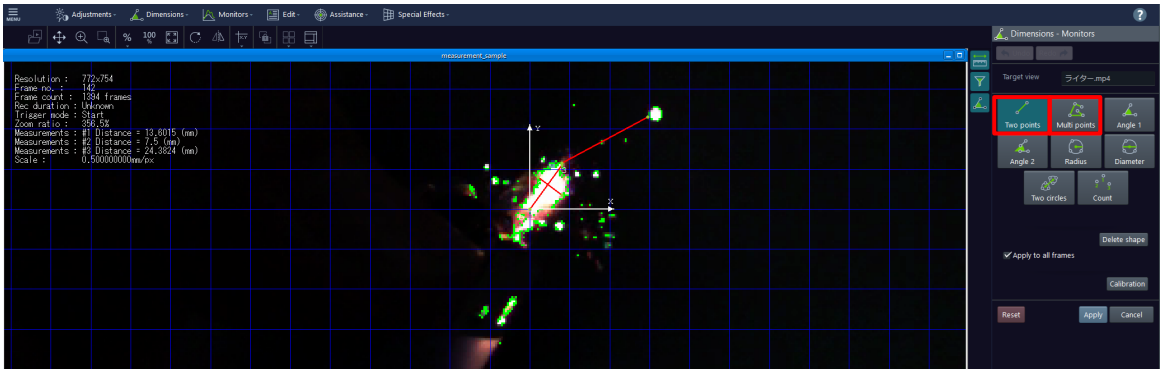
- To display the actual distance of the measurement results, calibrate the scale.
  Reference: “2.1.8 Setup the Scale” on page 23

The Measurements menu appears.



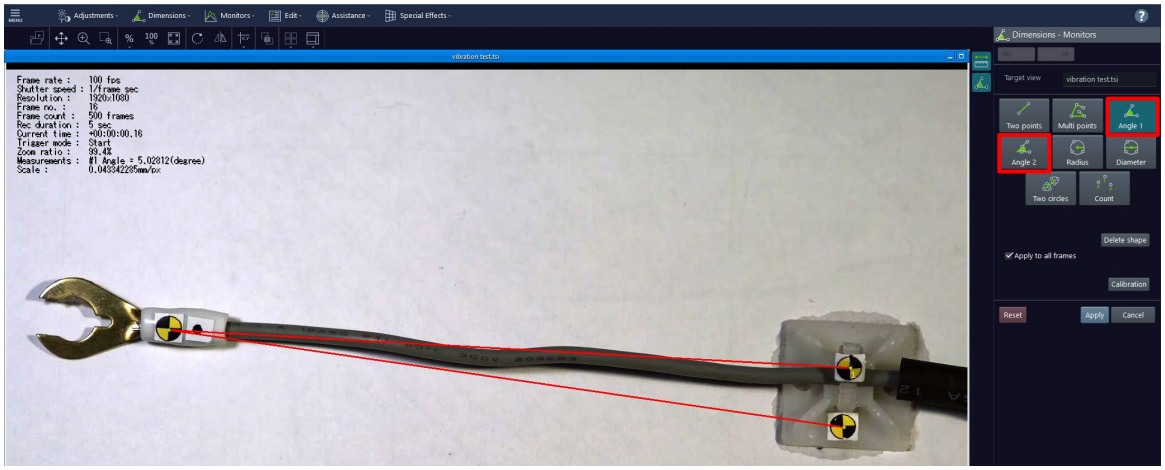
■ Two points, Multi points measurement

Click to measure the distance between two specified points or between multiple points.
Holding down the [Shift] key while moving the mouse allows you to move the mouse in 15-degree increments.
* To cancel operation, press [Ctrl] + [Z].
* To delete a line, select the line and press [Delete]. To delete all lines, click [Delete shape] in the Measurements menu.
* For multi point distance, right click or press [Esc] after specifying the final point.



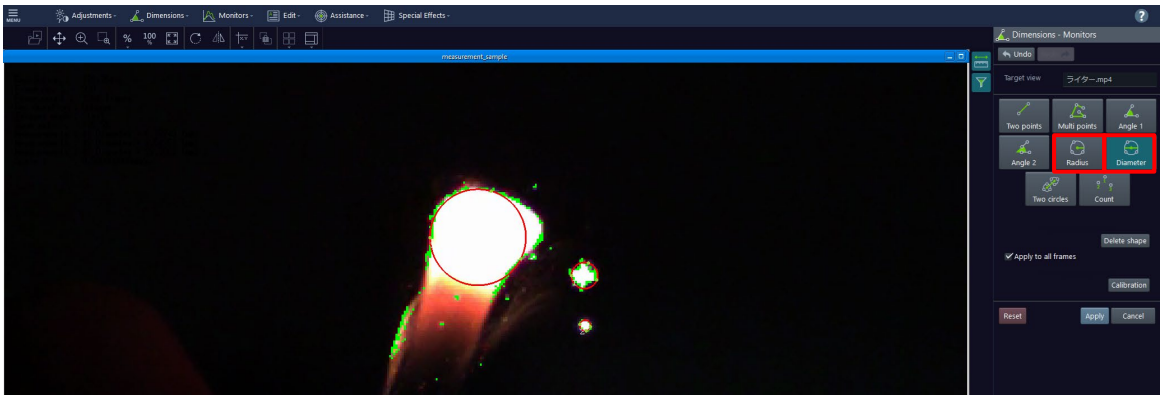
■ Angle measurement

Angle 1: Measures the angle between two lines by clicking at three points.
Angle 2: Measures the angle between two lines.
Holding down the [Shift] key while moving the mouse allows you to move the mouse in 15-degree increments.
* The angle range setting can be set in the angle display under [MENU] - [Configuration] - [Preference].



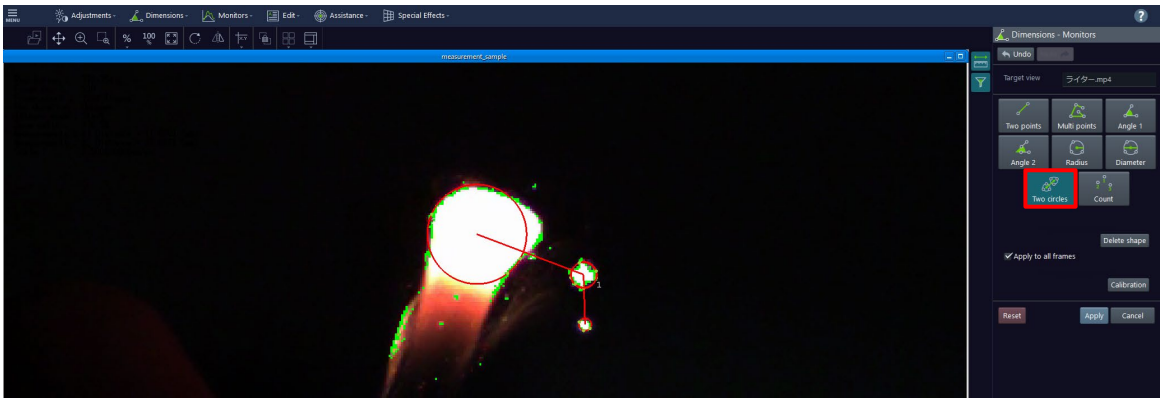
■ Radius, Diameter measurement

Measures the radius or diameter of a circle passing through the three clicked points. Holding down the [Shift] key while moving the mouse allows you to move the mouse in 15-degree increments.



■ Two circles measurement

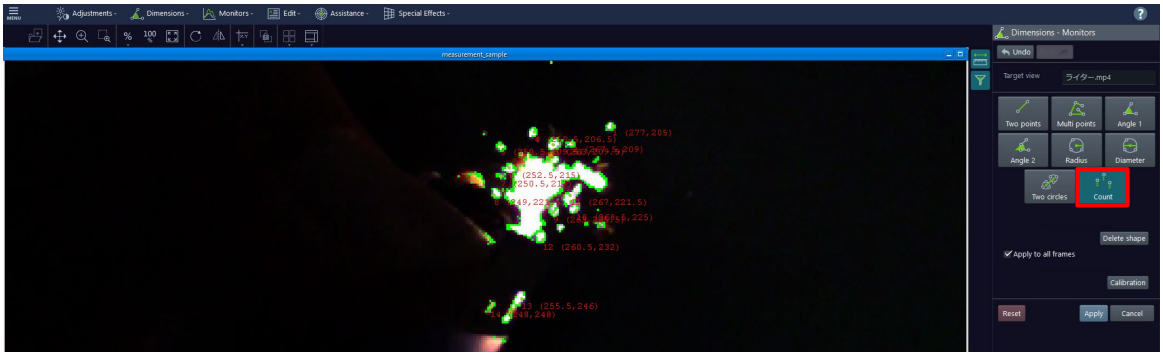
Measures the distance between two points connecting the centers of two circles. Holding down the [Shift] key while moving the mouse allows you to move the mouse in 15-degree increments.



■ Count

Clicking on the screen draws a point and displays the number in the order clicked.

* Measurement is not performed.



2.3.6. Measurement (Dimensions - Auto Tracking)

To add tracking points on image data and to automatically track and quantify the movement of the tracking points, click [Dimensions] - [Auto Tracking]. You can choose from the following three tracking algorithms.

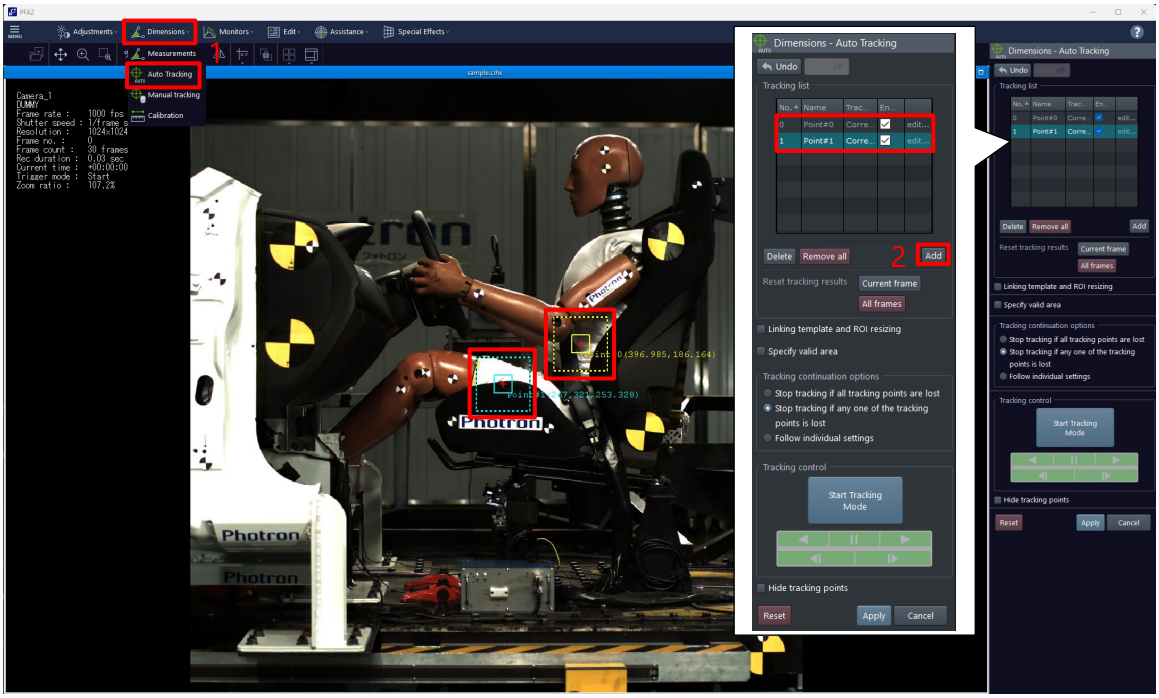
- Correlation tracking: An algorithm that performs template matching within a single frame.
- Brightness tracking: An algorithm that finds the center of gravity of the largest contour in a single frame and tracks its center. The specified range of tones is set to white, and the rest is set to black, and the contours of the white areas are extracted and the center of gravity is found and tracked.
- Brightness area ratio: An algorithm that measures the area that satisfies the set luminance threshold within the tracking range and the percentage it accounts for.
- TLD (Tracking Learning Detection): An algorithm that tracks while learning the image of the object to be tracked. Suitable for tracking rotating objects because it learns the tracking results and corrects them as necessary.
- Distance b/w 2-points, Distance b/w Multi-points: An algorithm that measures the total distance between two or more tracking points that have been set. The tracking points that can be set are the tracking points set in “Correlation tracking”, “Brightness tracking (Center of Gravity)”, and “TLD”.

CAUTION

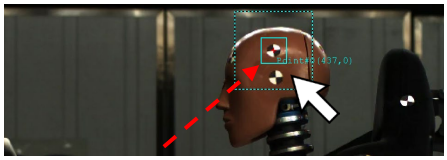
- To display the actual distance of the measurement results, calibrate the scale.
  Reference: “2.1.8 Setup the Scale” on page 23

■ Setup Procedure for Correlation Tracking, TLD, and Distance b/w 2-points / Multi-points

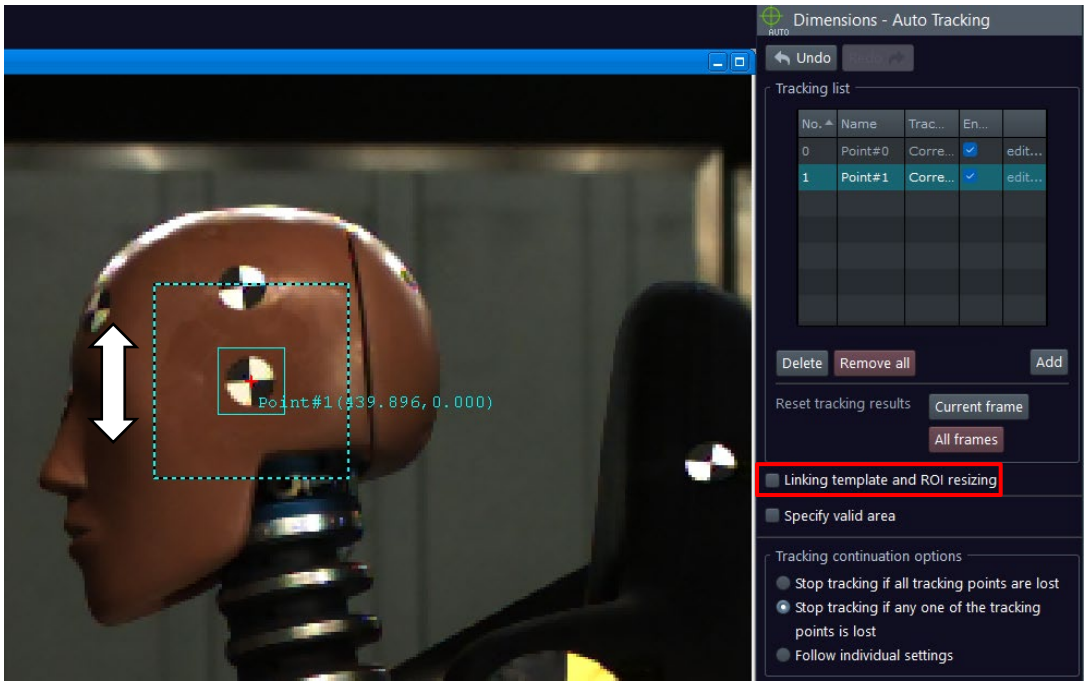
1. Open the image data and click [Dimensions] - [Auto Tracking].
2. Click [Add] in the tracking list. The tracking point will be added.



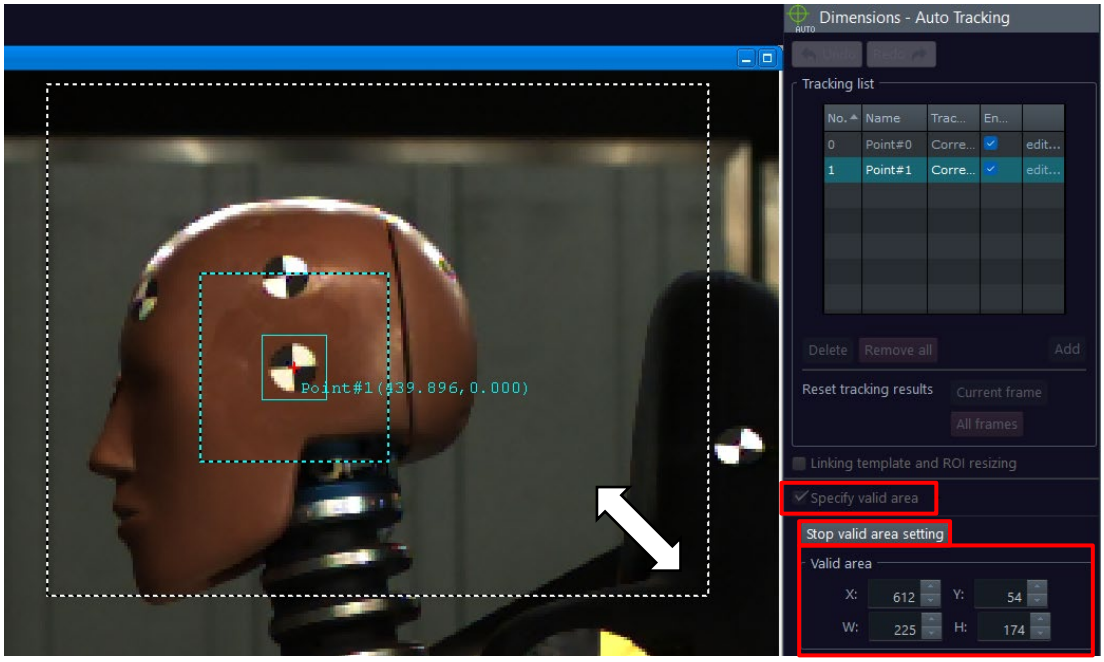
3. Move the tracking point by mouse dragging. * While dragging, use the crosshair to adjust in 1-pixel increments.



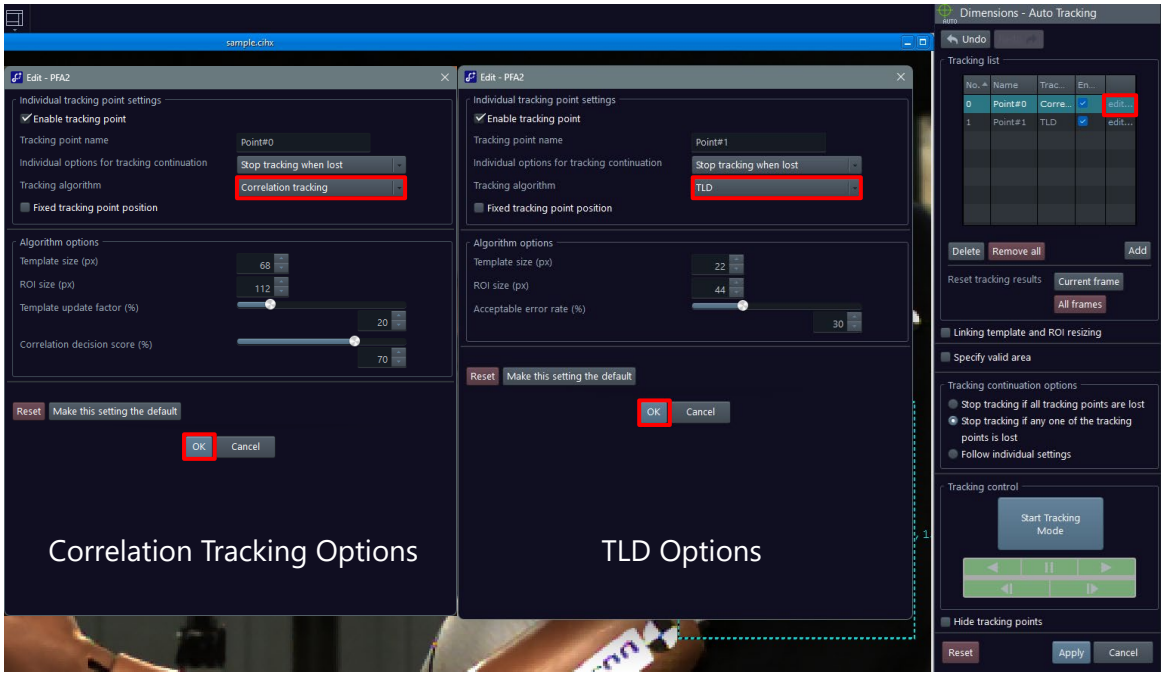
4. Resize the template and the tracking range as needed.
   Move the mouse over the template frame to resize it.
   If you wish to change the template size and the size of the tracking range respectively, uncheck the [Linking template and ROI resizing] checkbox in the Auto Tracking menu.



5. Set the range to be tracked as needed. * The default is the entire image as the tracking range.
   Check [Specify valid area] and click [Start valid area setting].
   Drag the frame with the mouse or change the values to set the range.



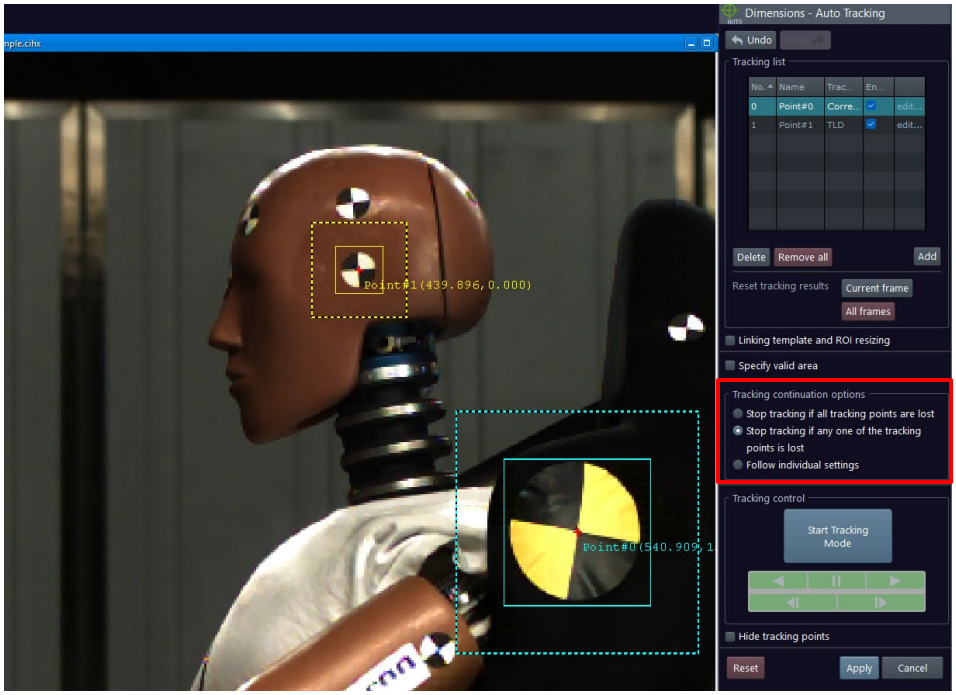
6. Check the tracking point settings. Click [edit] on the Tracking point list.
   - Individual tracking point settings: Tracking point name, Individual options for tracking continuation, Tracking algorithm (Correlation tracking or TLD)
   - Algorithm options: Template size, ROI size, Template update factor, Correlation decision score, Acceptable error rate



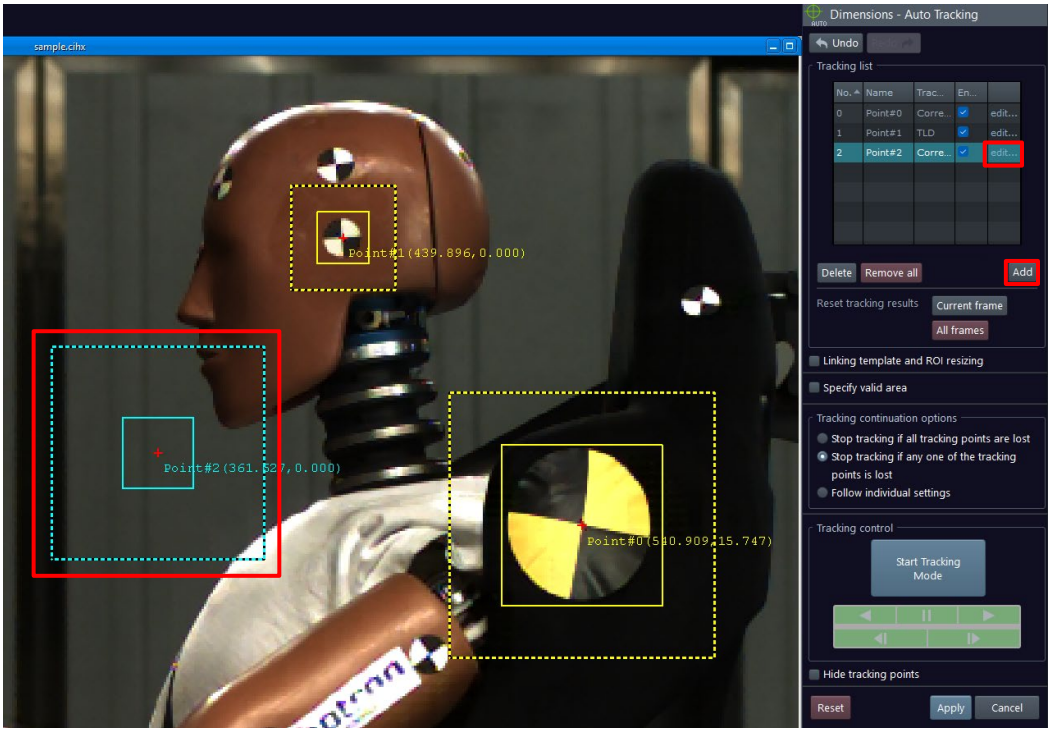
NOTE

- Template update factor (%): If the value is close to 0, tracking is performed based on the template information at the time the [Start Tracking Mode] is clicked, and if the value is close to 100, tracking is performed by updating the template information based on the template information of the previous frame.
- Correlation decision score (%): Set how much correlation is required to be considered a match. Higher values allow for more accurate tracking, but the match criteria will be more severe.
- Acceptable error rate (%): Sets the amount of error allowed when automatically determining tracking failures. Lower values allow for more accurate tracking, but makes the match determination more severe.

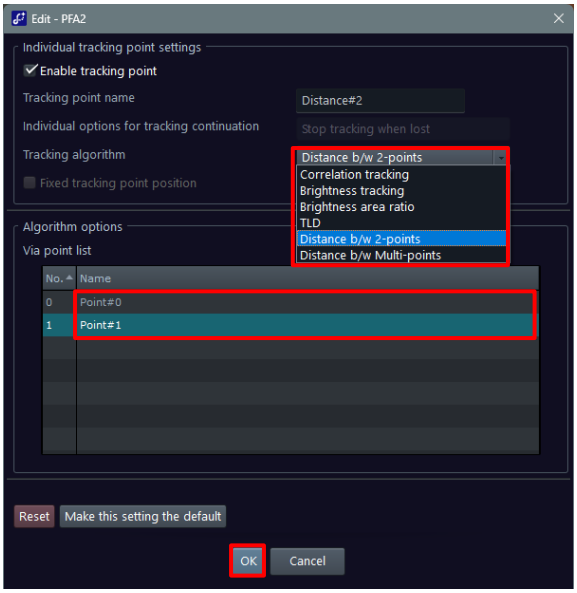
7. Change tracking continuity settings as needed.
   - Stop tracking if all tracking points are lost
   - Stop tracking if any one of the tracking points is lost
   - Follow individual settings



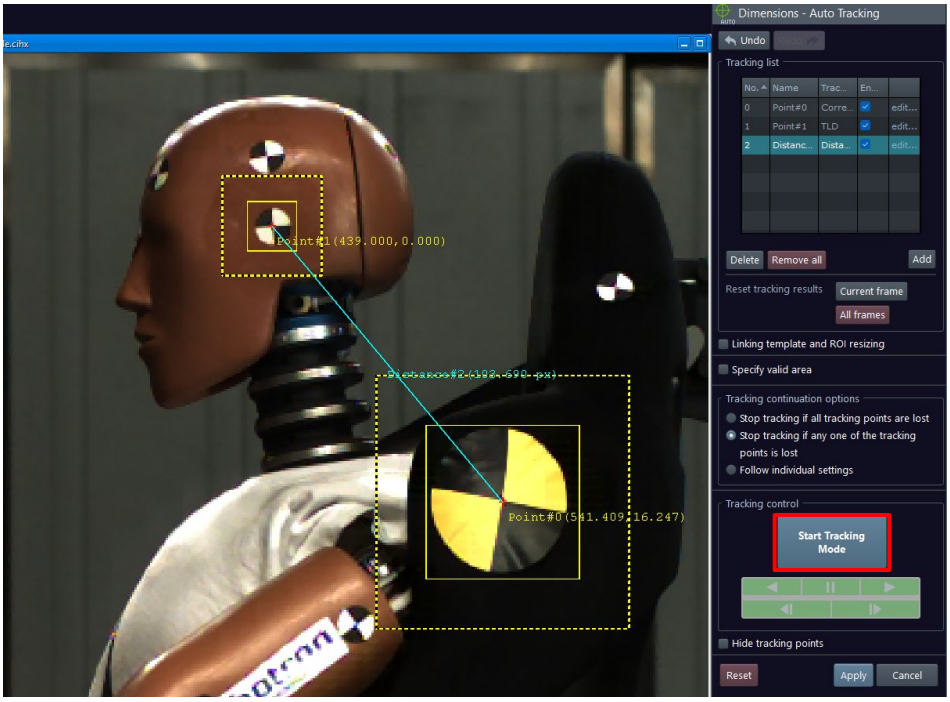
8. To measure the distance between tracking points, click [Add] in the tracking list.
   Select the added tracking point and click [edit] in the tracking list.



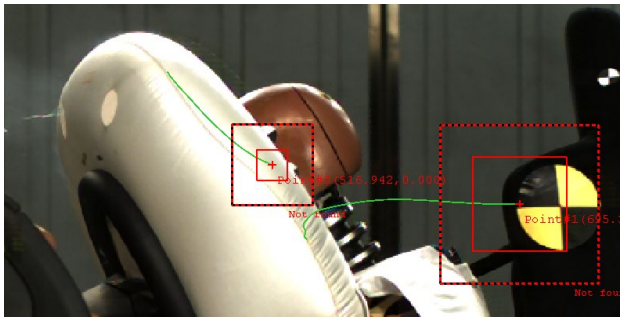
9. Select [Distance b/w 2-points] or [Distance b/w Multi-points] from the tracking algorithm. Double-click on the Via point list to specify the tracking points for measuring the distance. Rename the tracking points as necessary.

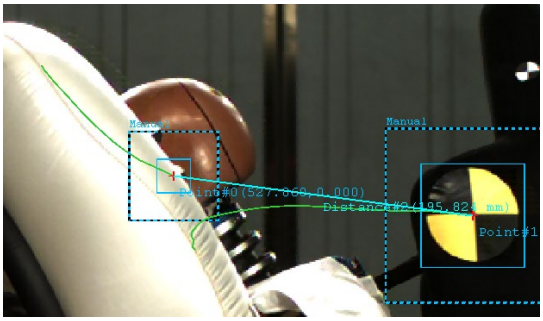


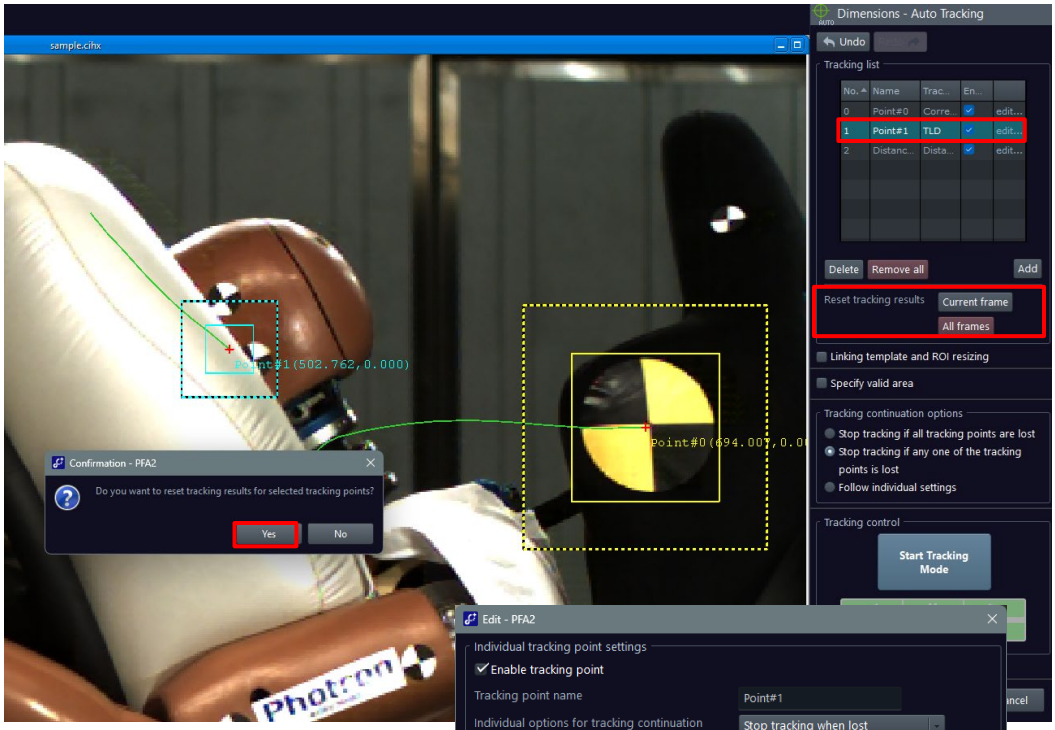
10. Click [Start Tracking Mode].

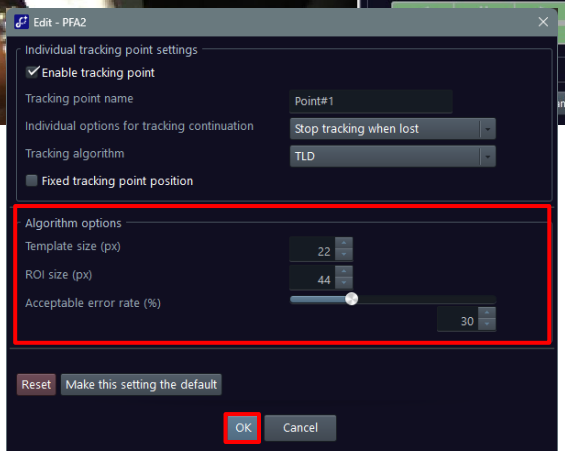


11. Playback in the tracking control panel will perform tracking.
    The tracking result is displayed as a green line. If the tracking point is off, manually move and register the tracking point (the template frame will turn blue), or click [Stop Tracking Mode], then select the tracking point, reset the tracking result, and change the tracking point settings (template update factor, correlation decision score, and acceptable error rate).

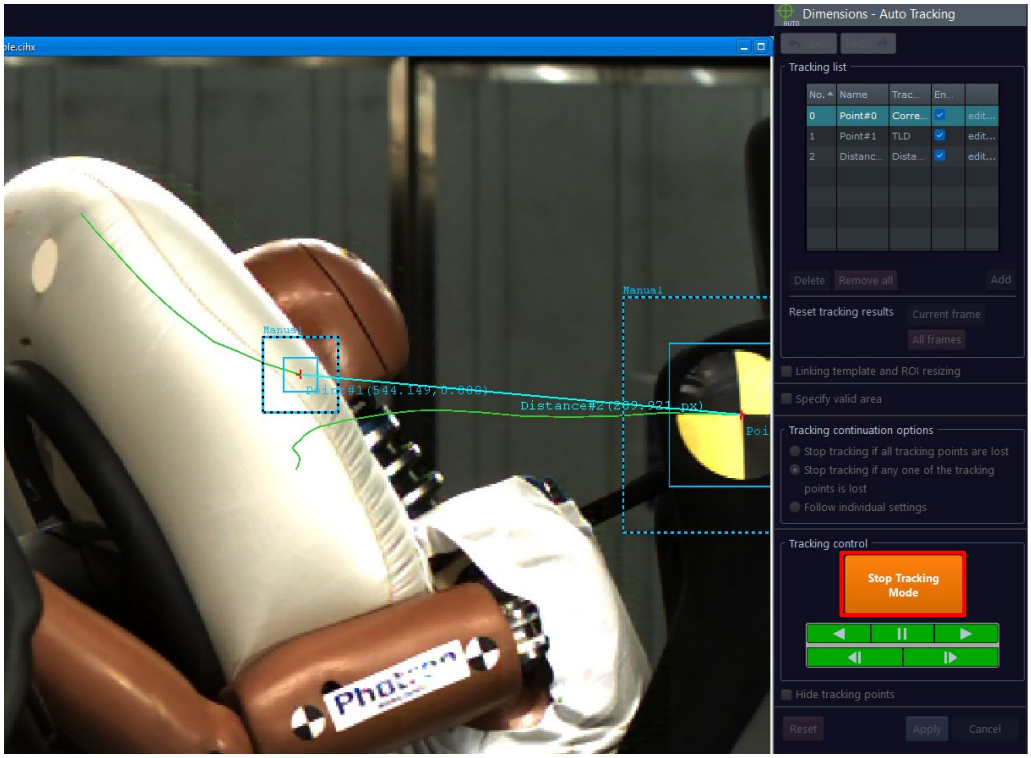






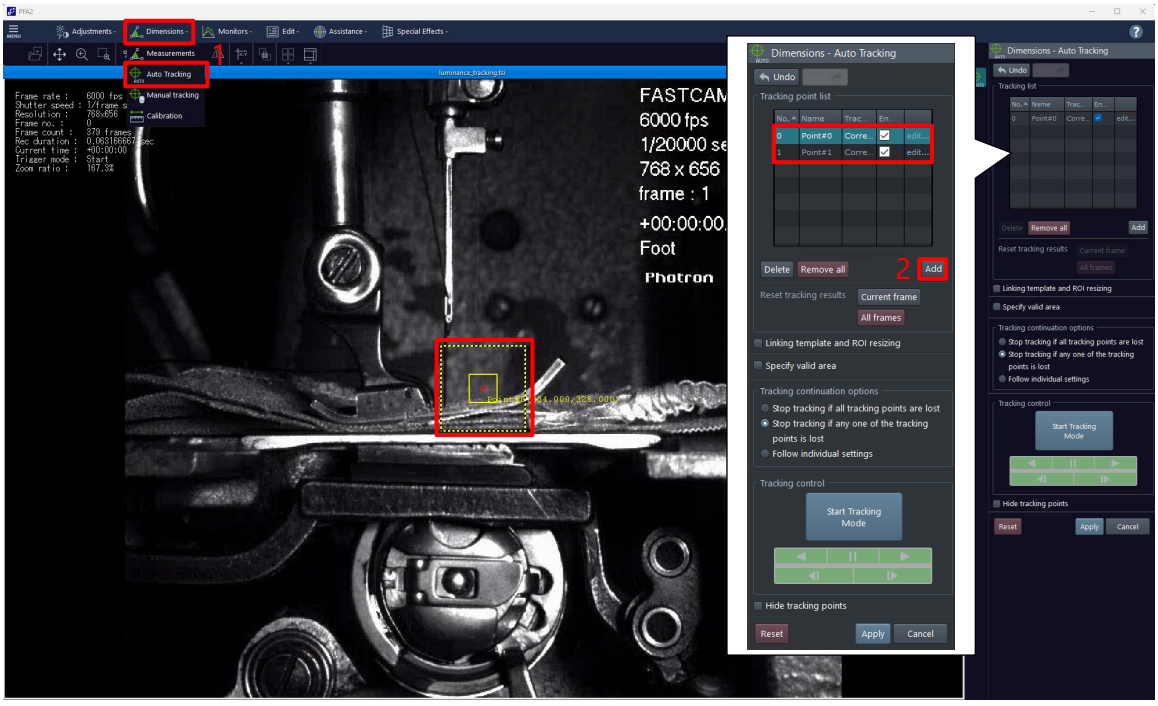


12. To end tracking, click [Stop Tracking Mode].

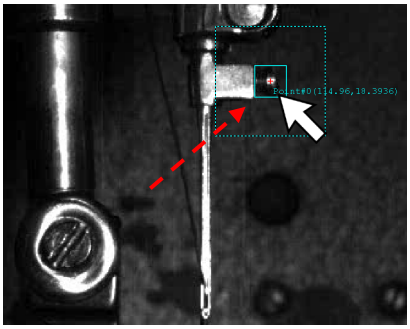


■ Setup Procedure for Brightness Tracking

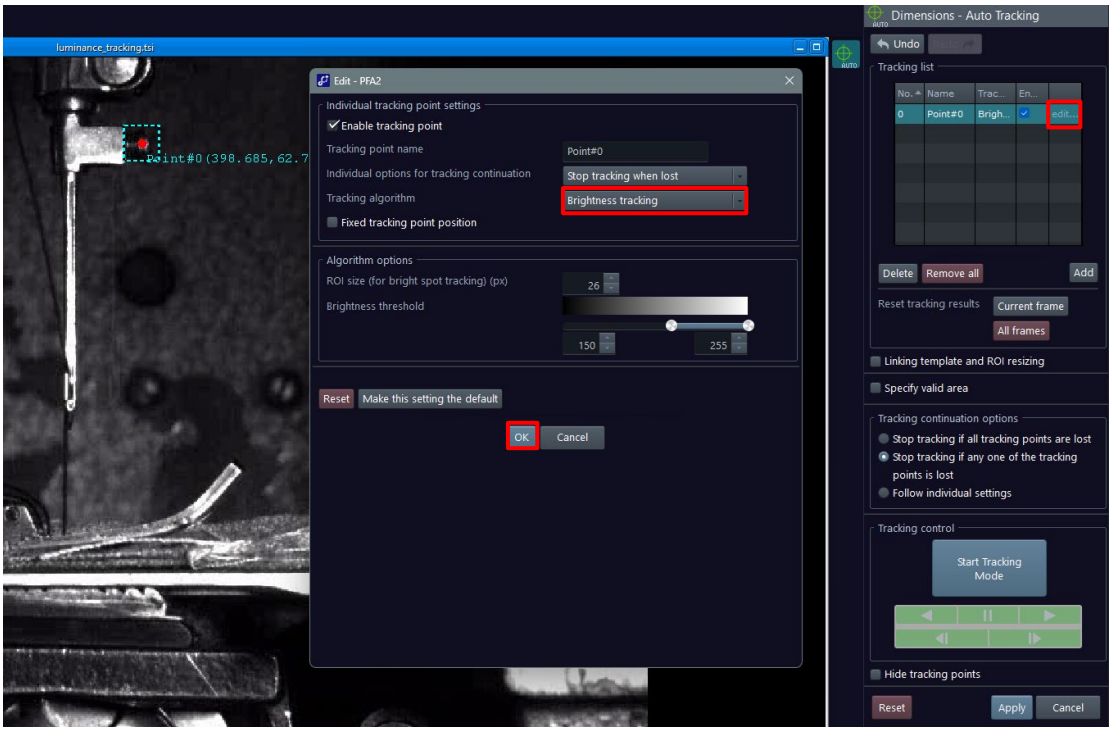
1. Open the image data and click [Dimensions] - [Auto Tracking].
2. Click [Add] in the tracking list. The tracking point will be added.



3. Move the tracking point by mouse dragging. * While dragging, use the crosshair to adjust in 1-pixel increments.



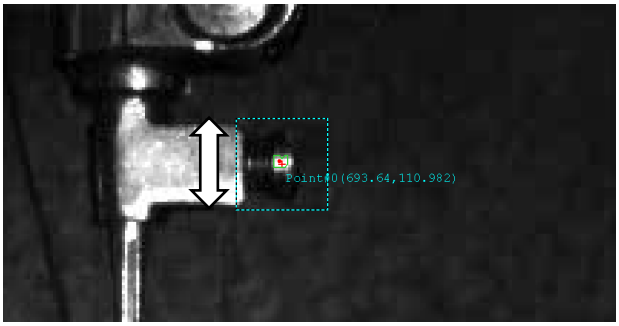
4. Check the tracking point settings. Click [edit] on the Tracking list.
   - Individual tracking point settings: Tracking point name, Individual options for tracking continuation, Tracking algorithm (Brightness tracking), Fixed tracking point position
   - Algorithm options: ROI size, Brightness threshold



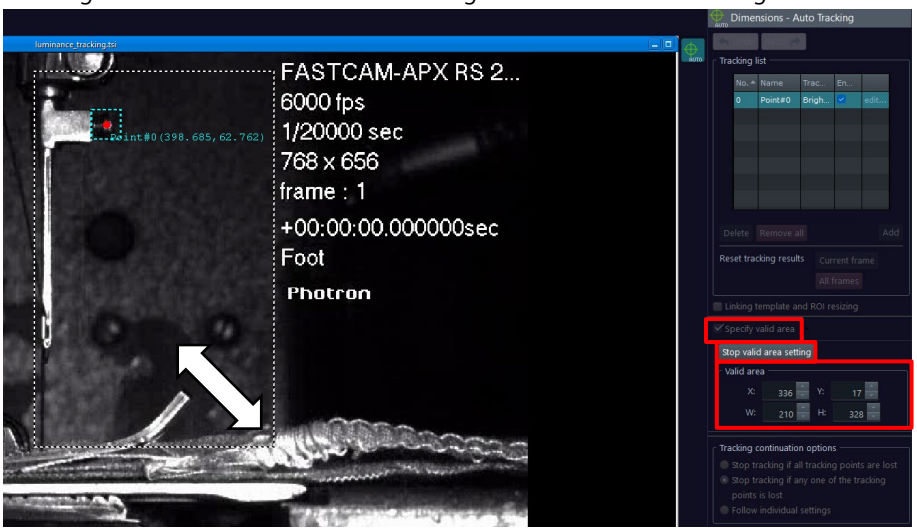
NOTE

- Fixed tracking point position: Check this box if you want to always analyze a specific area.
- Brightness threshold: Sets the luminance range for contour extraction. The range is recognized as “white” for inside and “black” for outside of the range.

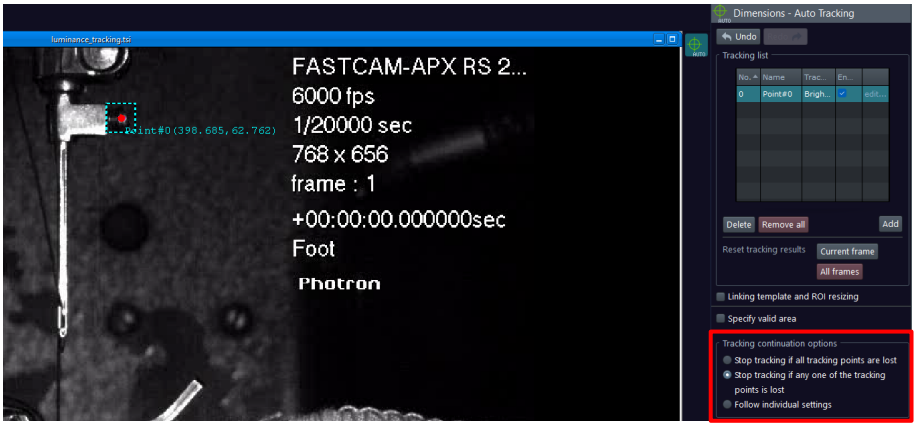
5. Resize the tracking range as needed. Move the mouse over the frame to resize it.



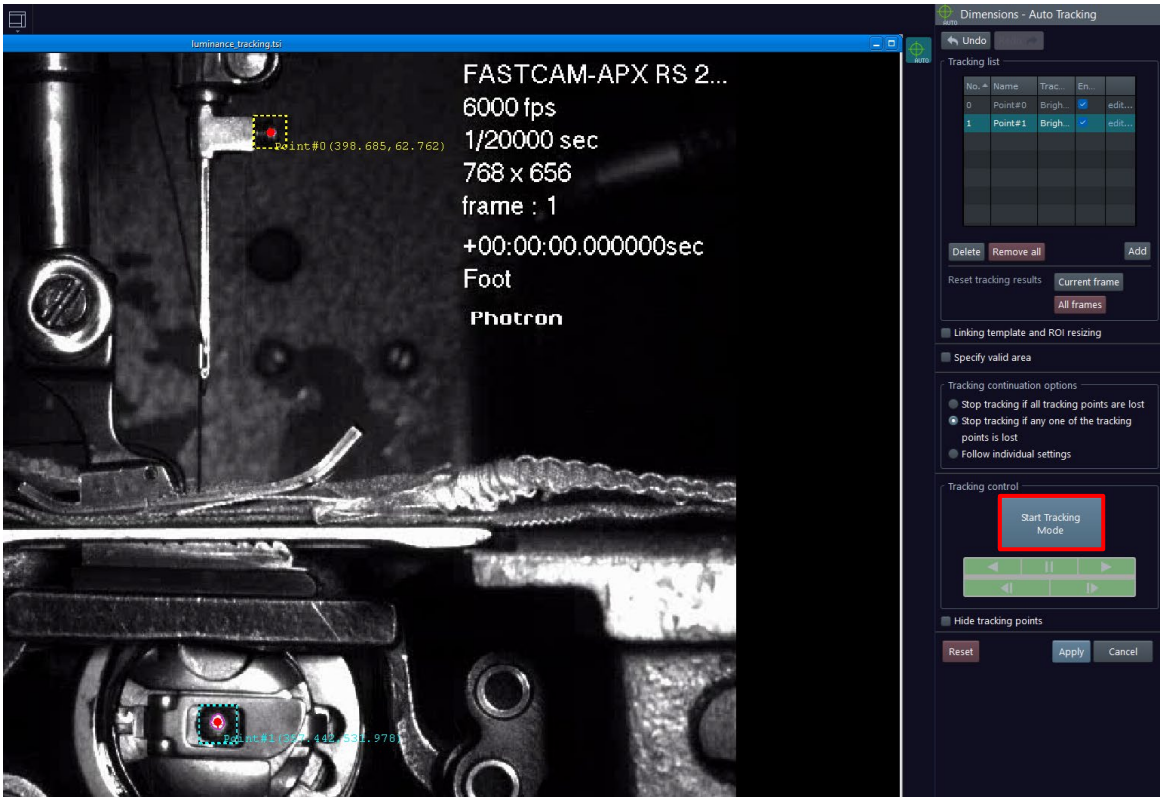
6. Set the range to be tracked as needed. * The default is the entire image as the tracking range.
   Check [Specify valid area] and click [Start valid area setting].
   Drag the frame with the mouse or change the values to set the range.



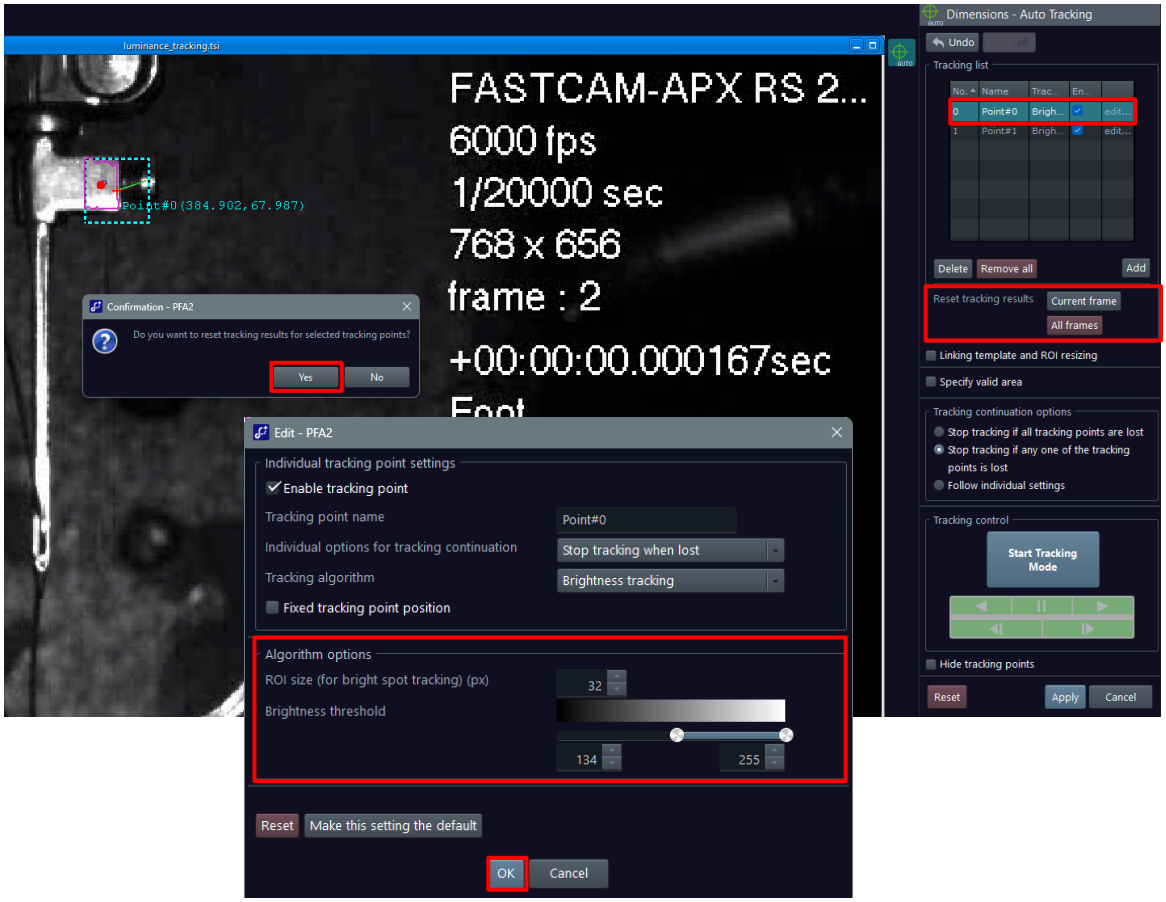
7. Change tracking continuity settings as needed.
   - Stop tracking if all tracking points are lost
   - Stop tracking if any one of the tracking points is lost
   - Follow individual settings



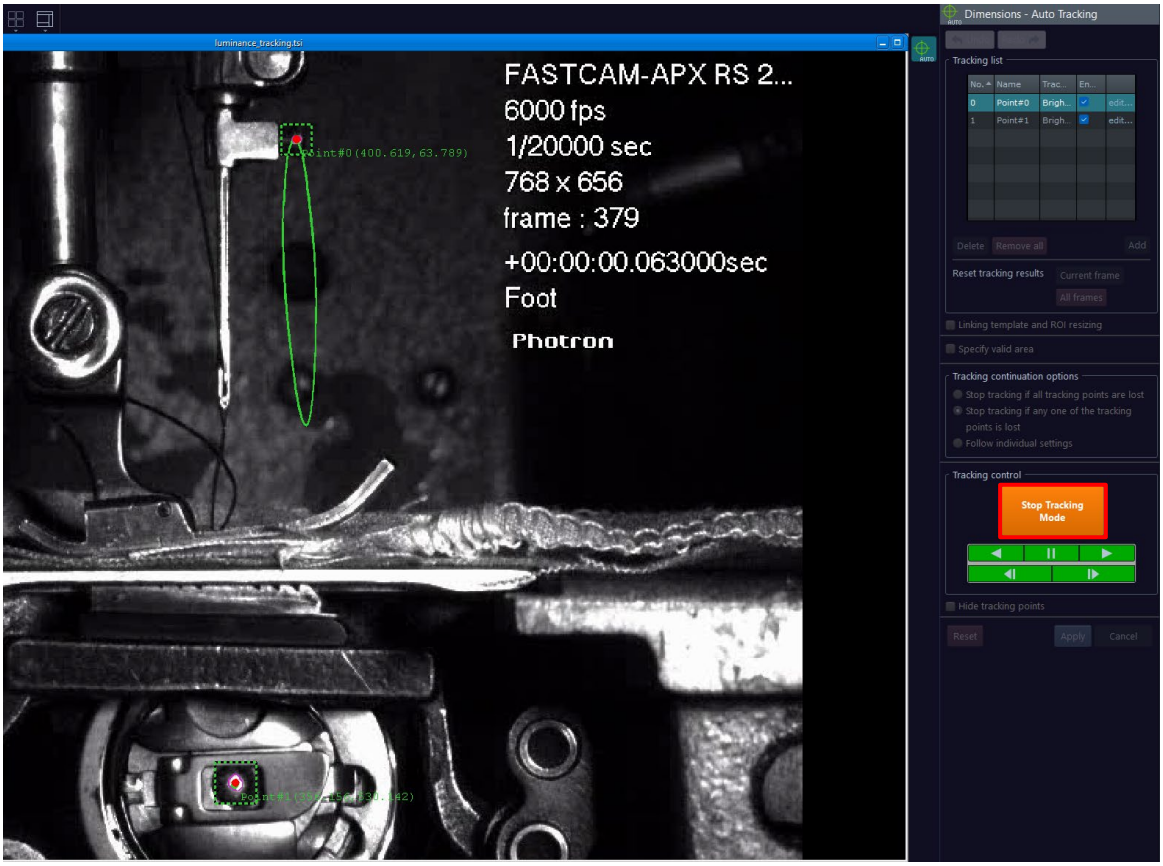
8. Click [Start Tracking Mode].



9. Playback in the tracking control panel will perform tracking.
   The tracking result is displayed as a green line.
   If the tracking point is off, manually move and register the tracking point (the template frame will turn blue), or click [Stop Tracking Mode], then select the tracking point, reset the tracking result, and change the tracking point settings (ROI size and brightness threshold).

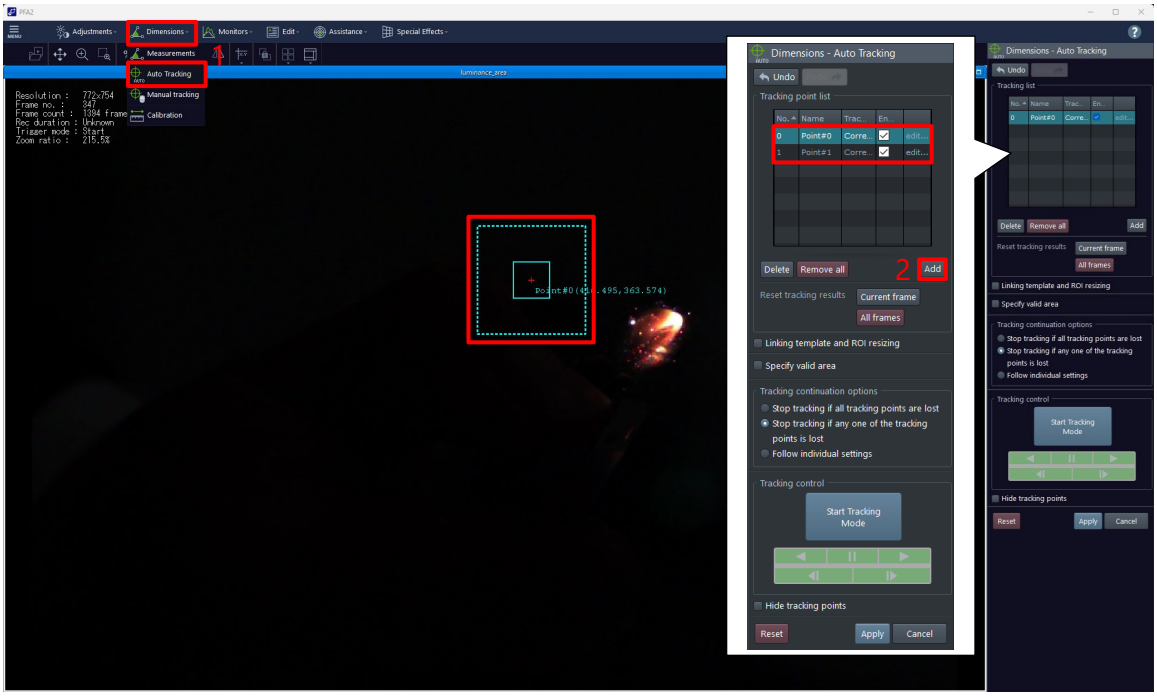


10. To end tracking, click [Stop Tracking Mode].



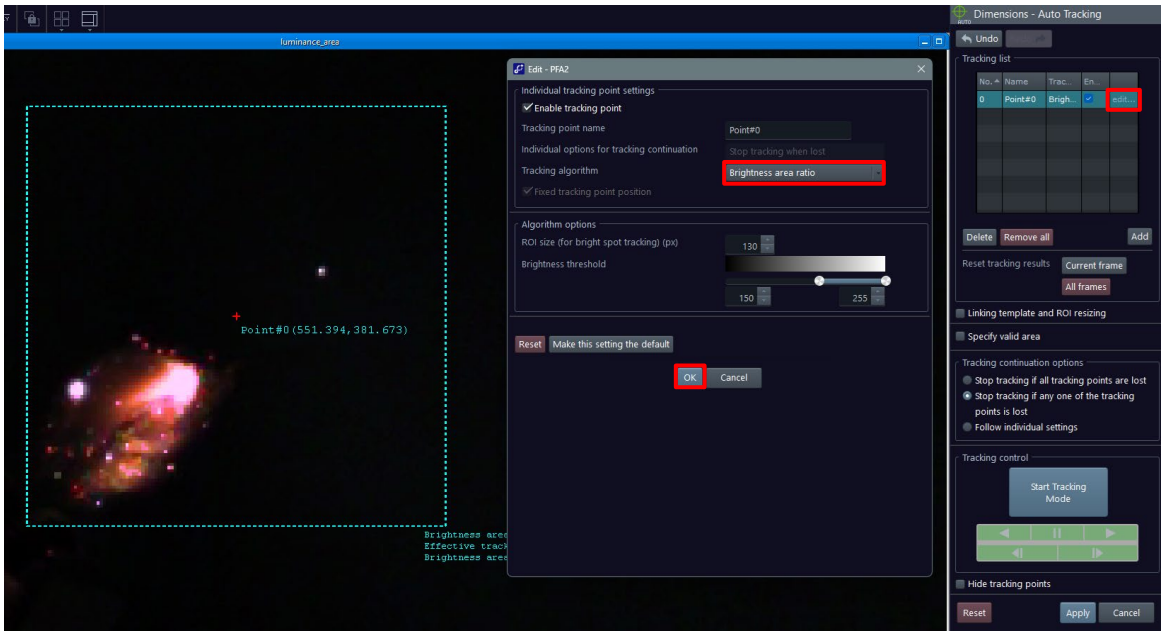
■ Setup Procedure for Brightness Area Ratio

1. Open the image data and click [Dimensions] - [Auto Tracking].
2. Click [Add] in the tracking list. The tracking point will be added.



3. Move the tracking point by mouse dragging. * While dragging, use the crosshair to adjust in 1-pixel increments.

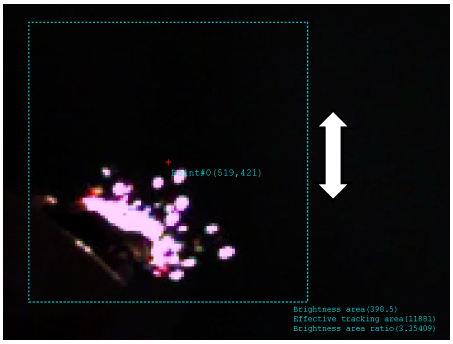
4. Check the tracking point settings. Click [edit] on the Tracking list.
   - Individual tracking point settings: Tracking point name, Individual options for tracking continuation, Tracking algorithm (Brightness area ratio)
   - Algorithm options: ROI size, Brightness threshold



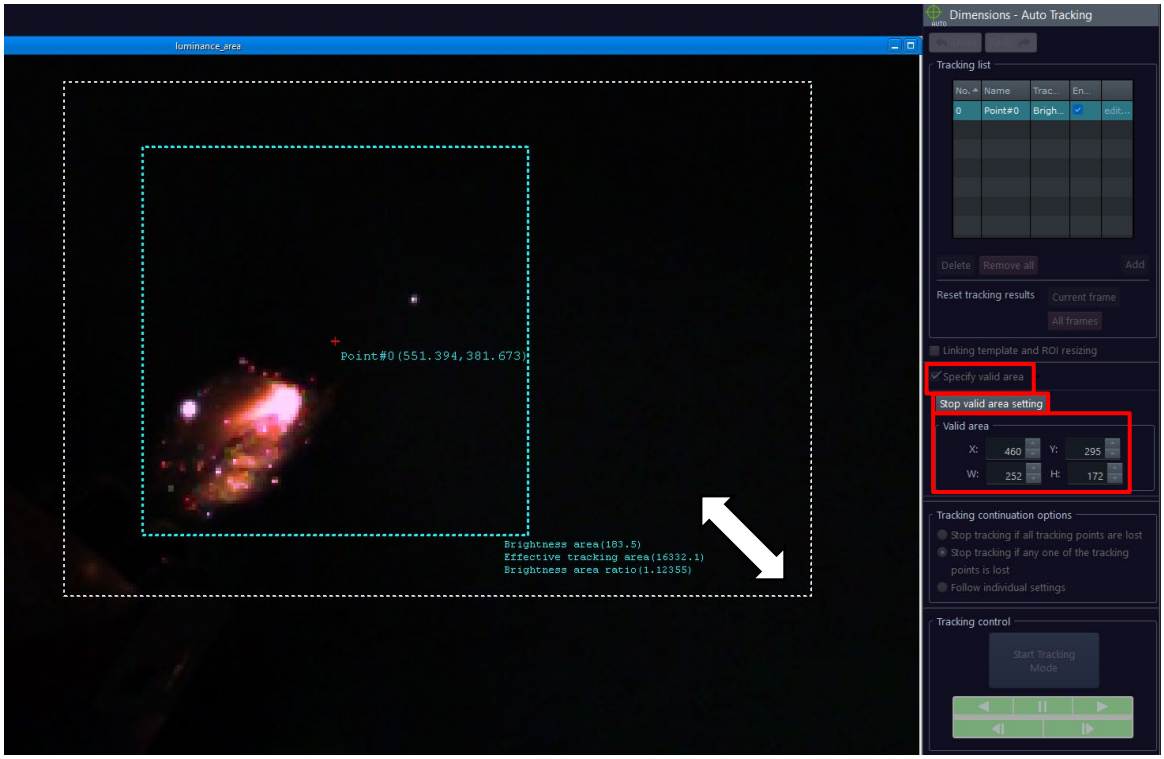
NOTE

- Brightness threshold: Sets the luminance range for contour extraction. The range is recognized as "white" for inside and "black" for outside of the range.

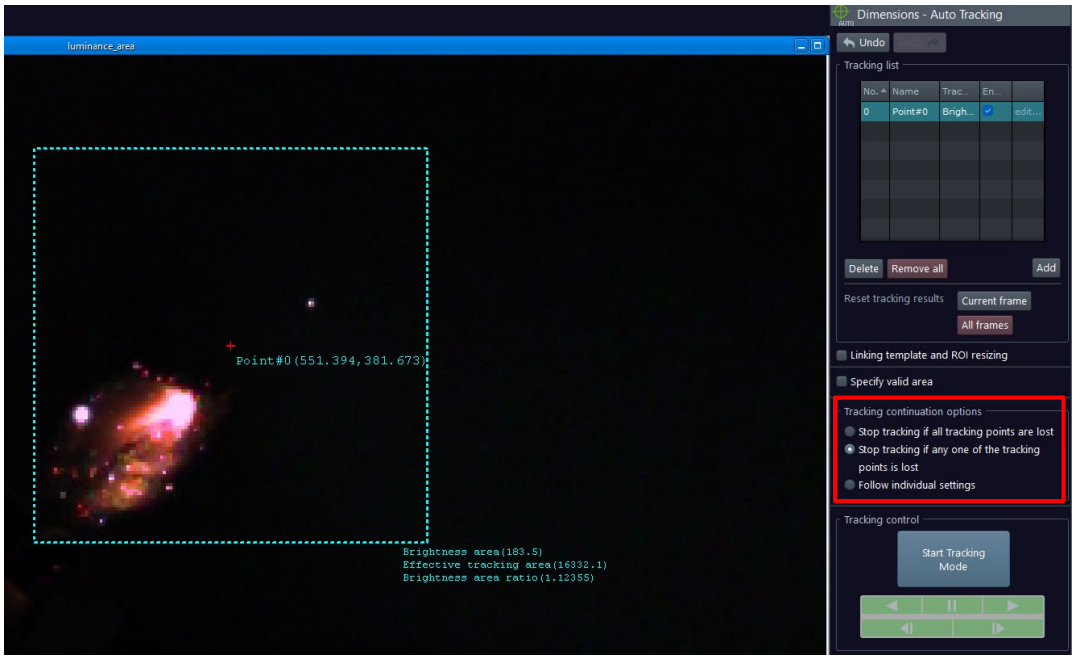
5. Resize the tracking range as needed. Move the mouse over the frame to resize it.



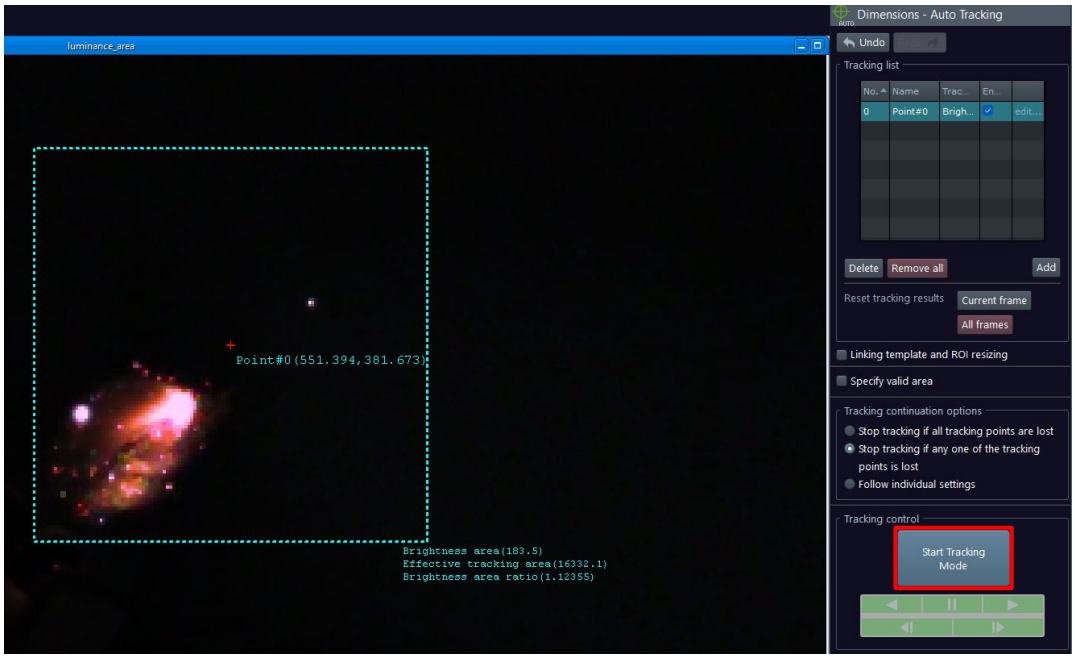
6. Set the range to be tracked as needed. * The default is the entire image as the tracking range.
   Check [Specify valid area] and click [Start valid area setting].
   Drag the frame with the mouse or change the values to set the range.



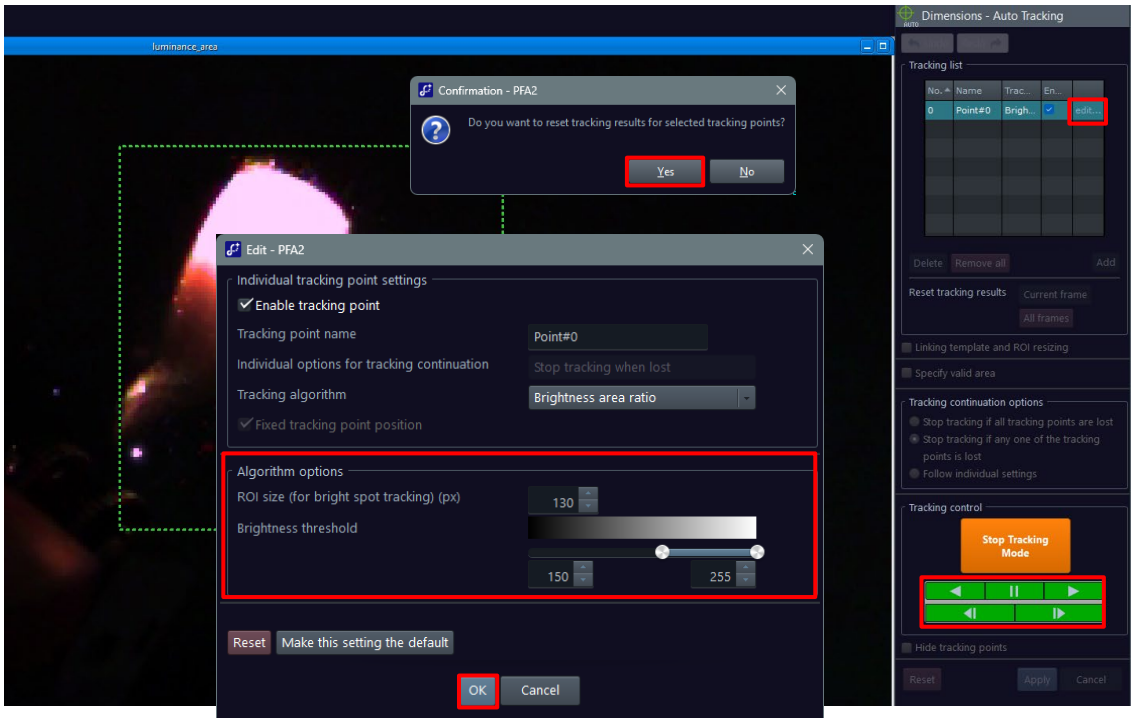
7. Change tracking continuity settings as needed.
   - Stop tracking if all tracking points are lost
   - Stop tracking if any one of the tracking points is lost
   - Follow individual settings



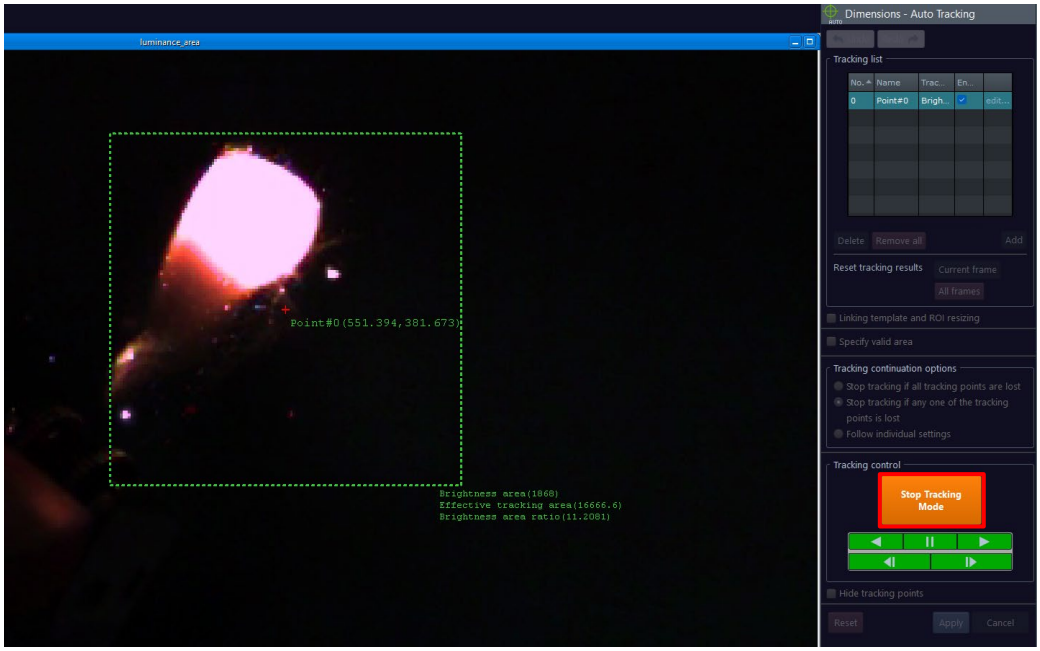
8. Click [Start Tracking Mode].



9. Playback in the tracking control panel will perform tracking.
   To adjust the tracking area, click [Stop Tracking Mode], then select the tracking point, reset the tracking result, and change the tracking point settings (ROI size and brightness threshold).



10. To end tracking, click [Stop Tracking Mode].



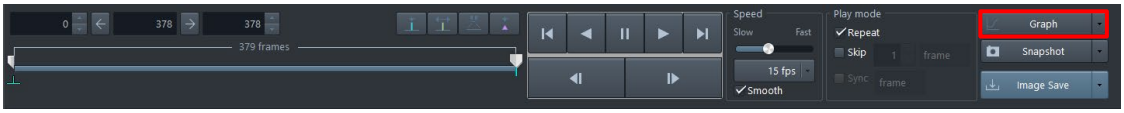
2.3.7. Graph Display Procedure

The following three types of graphs can be displayed.

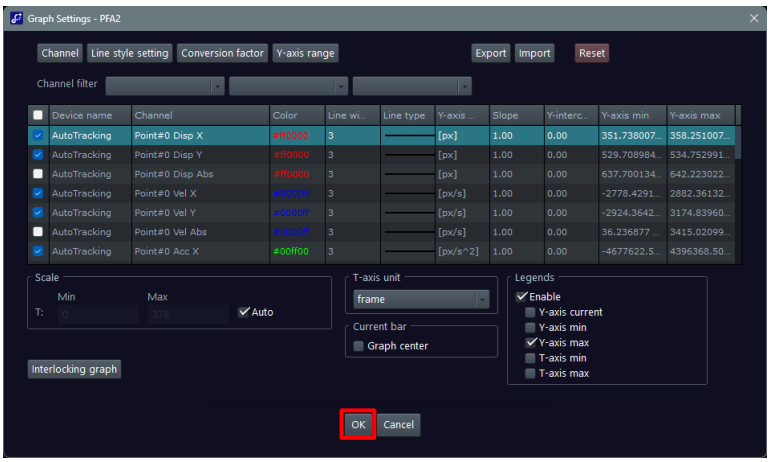
- XT graph: Displays selected values for displacement, velocity, acceleration, etc. on the horizontal axis and time on the vertical axis.
- Composite graph: Displays selected various values on the horizontal and vertical axes.
- FFT graph: FFT analysis is performed on the fixed pattern as a frequency, and displays the frequency and amplitude (automatic tracking only).

■ The procedure for creating an XT graph

1. Click [Graph].



2. The Graph Settings window appears. Check the settings and click [OK]. * Settings can be changed later.
   - Channel: You can change the name of the channel to be displayed.
   - Line style setting: You can change the color, thickness, and type of lines.
   - Conversion factor: You can apply conversion factors and create graphs of velocity and acceleration.
   - Y-axis range: You can change the display range of the vertical axis.
   - T-axis unit: You can change the unit for the horizontal axis to frame, sec, msec, usec, or custom.
   - Current bar: You can make the current bar position to always be displayed in the center of the graph.
   - Legends: You can make various information displayed at the top of the graph.
   - Reset: You can reset the settings to their default values.



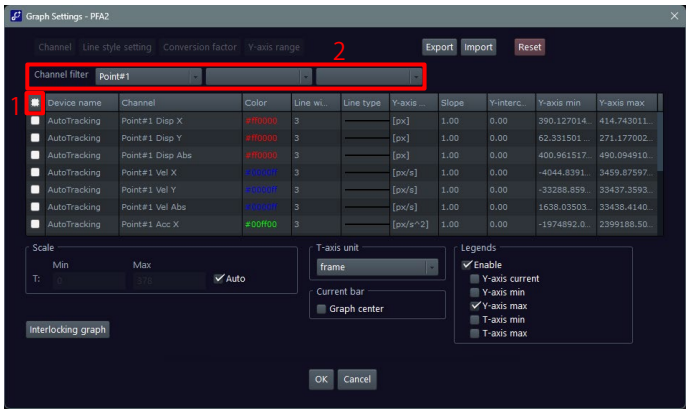
The number of graphs created by the tracking algorithm differs.

* The display can be switched by using the checkboxes.

- Displacement X-direction, Displacement Y-direction, Displacement ABS (vector magnitude)
- Velocity X-direction, Velocity Y-direction, Velocity ABS (vector magnitude)
- Acceleration X-direction, Acceleration Y-direction, Acceleration ABS (vector magnitude)
- Brightness area, Brightness perimeter length, Brightness area excluding holes, Brightness perimeter length including holes
- Vertical feret diameter, Horizontal feret diameter

NOTE

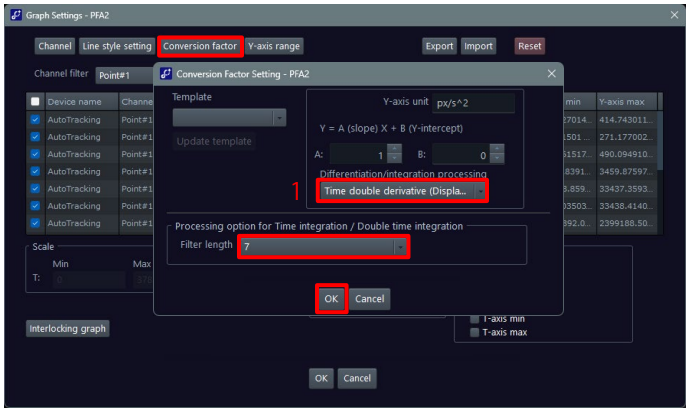
- Click [Interlocking graph] to create a composite graph.
- Click [Export] to export specified range of waveform data.
- Click [Import] to import waveform data.
- You can filter the displayed items by setting the channel filter.
  You can easily filter by adding a common word (e.g. graph) to the channel name you want to display in the graph.



How to use

1. Uncheck “Show all channels”.
2. Selecting items from the channel filter.

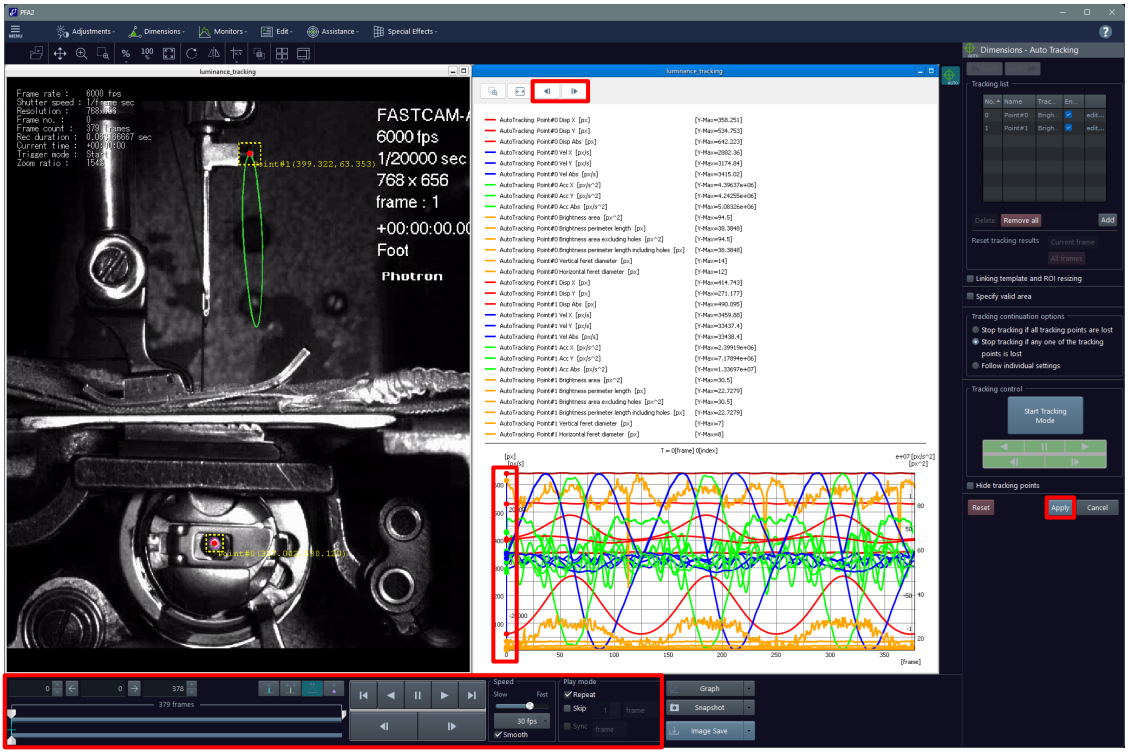
- You can change the parameters of the speed and acceleration calculation algorithm (filter length: number of frames used in the calculation).

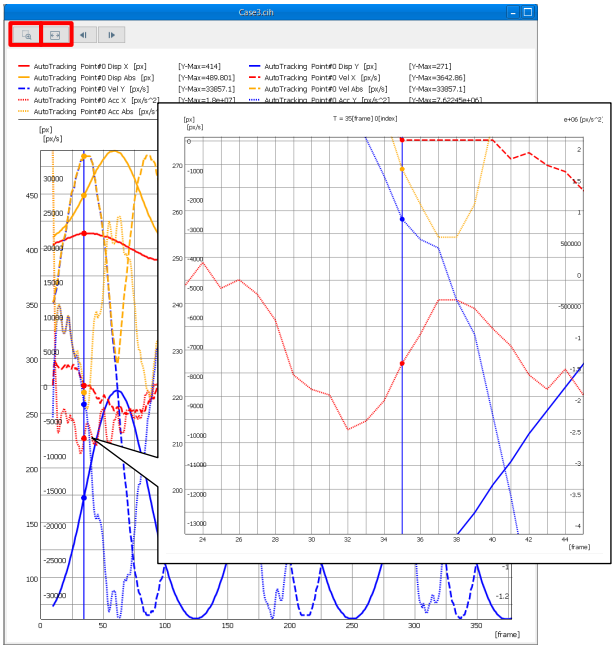


How to use

1. Set up the differential and integral processing and change the filter length (this will change it for all channels).

3. Graphs are displayed. You can playback via the [Backward/Forward 1 frame] at the top of the graph, the current bar (blue) on the graph, and the playback panel. To close the Auto tracking menu, click [Apply].





To zoom in on a specific area of the graph, click  .

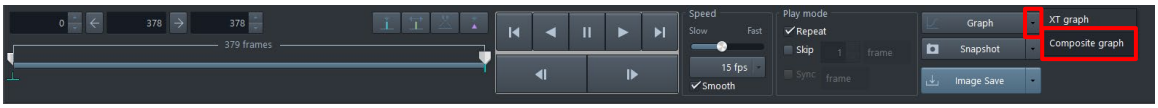
To return to viewing the entire graph, click  .

NOTE

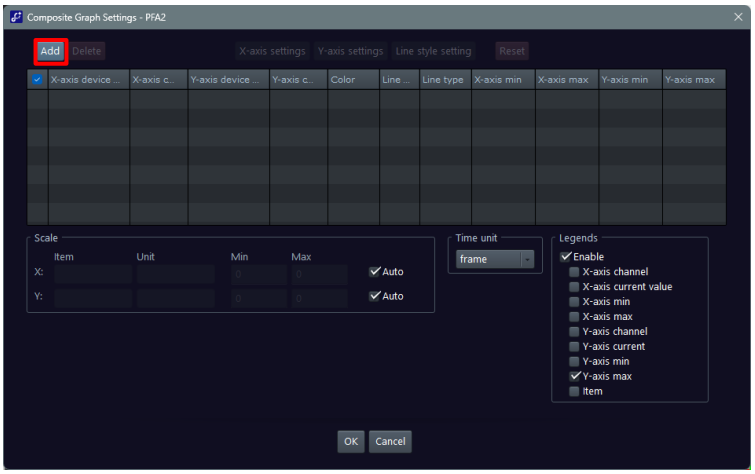
- By right-clicking on the graph, you can display the graph settings window and show/hide the buttons above the graph.

■ The procedure for creating a Composite graph

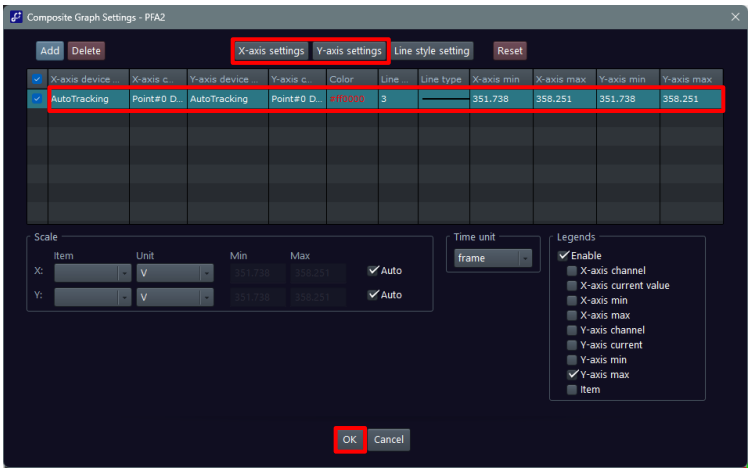
1. Click the ▼ to the right of [Graph] and click [Composite graph].

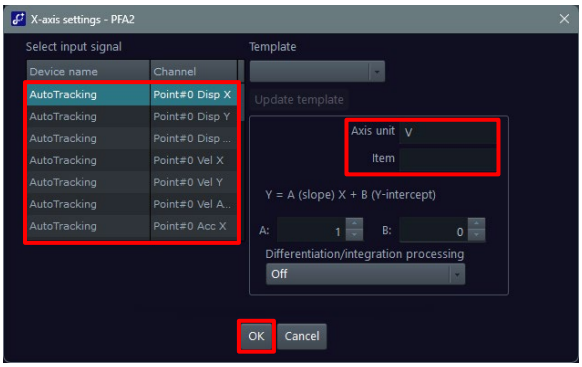


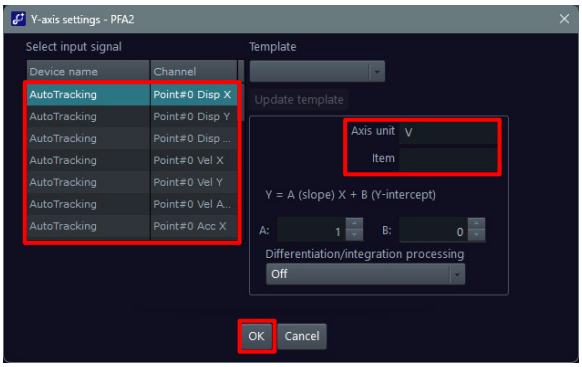
2. The Composite Graph Settings window appears. Click [Add].



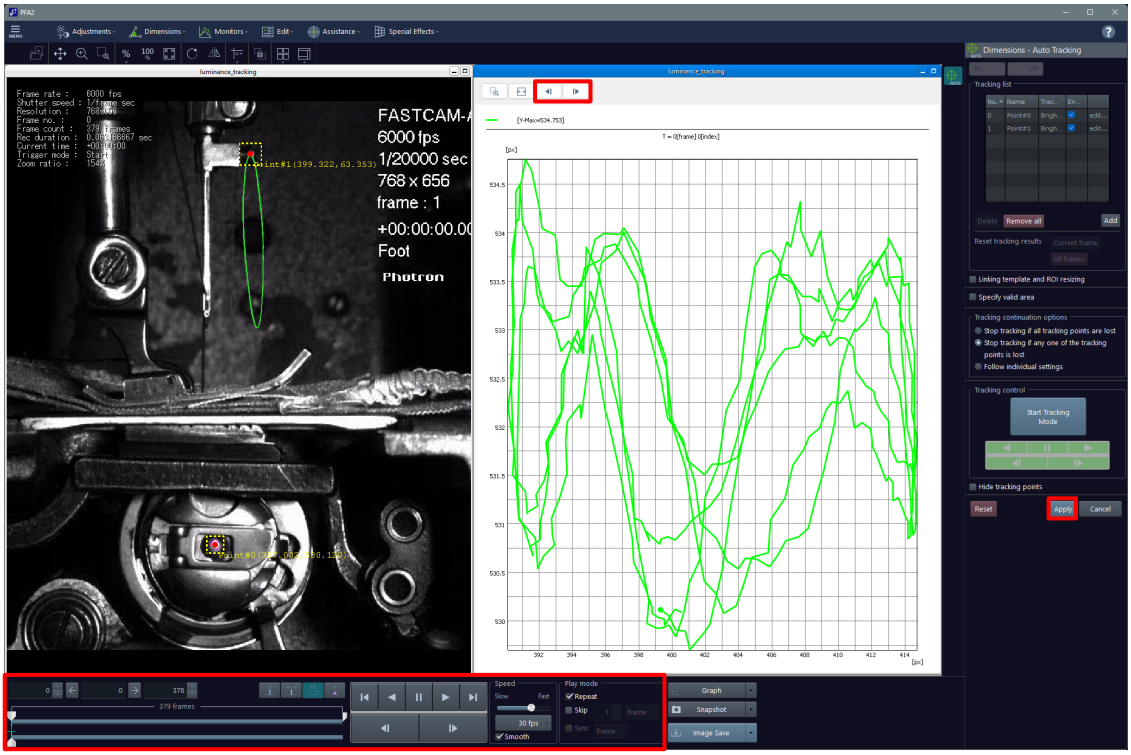
3. An item will be added. Select an item and click [X-axis settings] or [Y-axis setting] to set it.

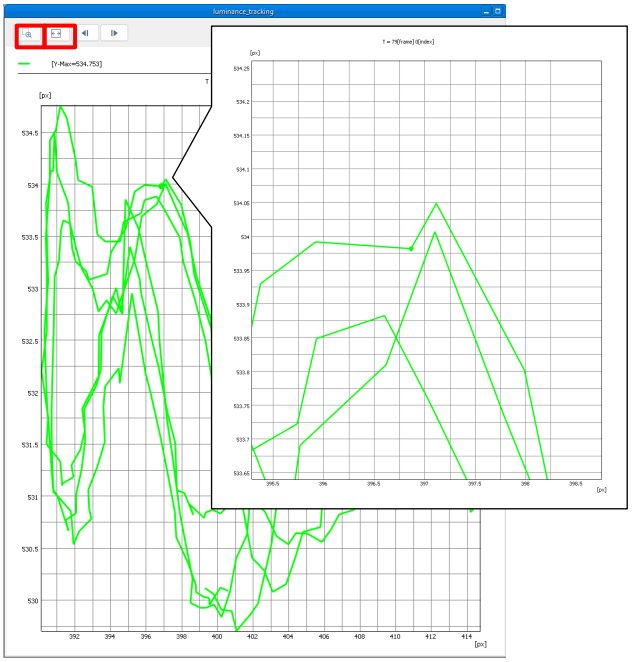






4. Graphs are displayed. You can playback via the [Backward/Forward 1 frame] at the top of the graph and the playback panel. To close the Auto tracking menu, click [Apply].





To zoom in on a specific area of the graph, click  .

To return to viewing the entire graph, click  .

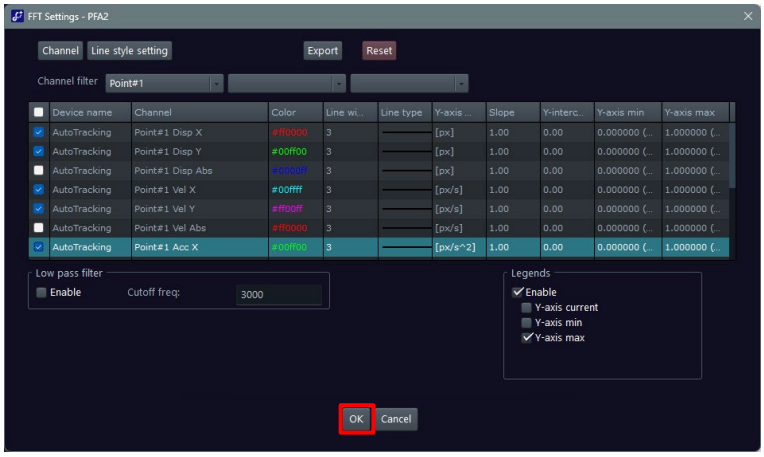
NOTE

- By right-clicking on the graph, you can display the graph settings window and show/hide the buttons above the graph.

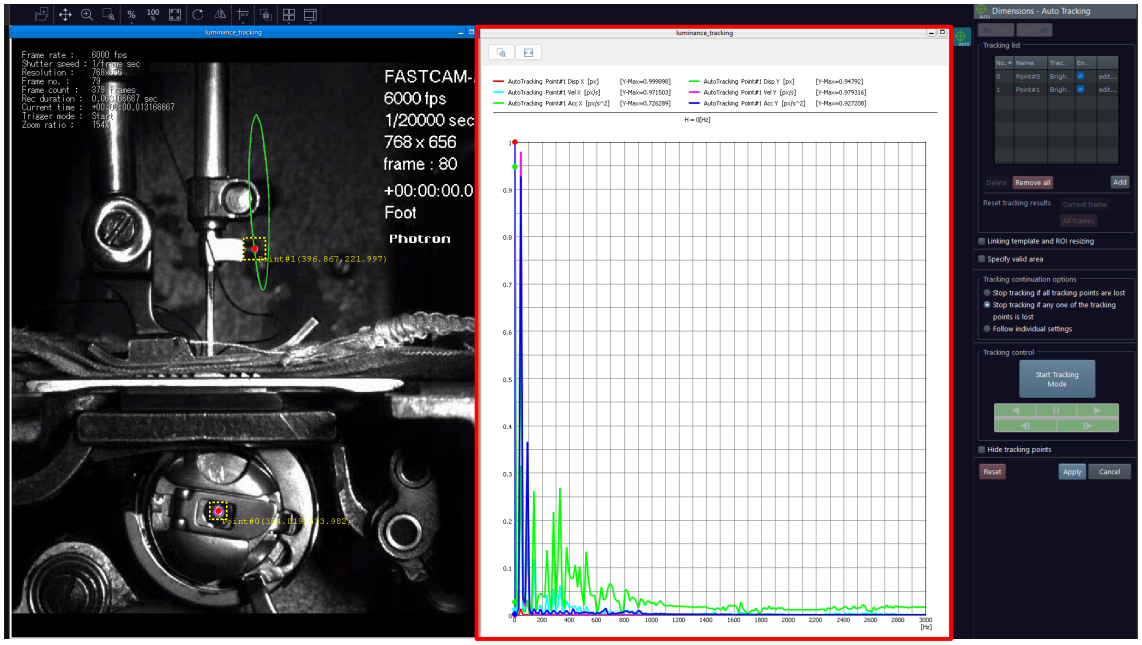
■ The procedure for creating an FFT graph

1. Click the ▼ to the right of [Graph] and click [FFT graph].

2. The Graph Settings window appears. Check the settings and click [OK]. * Settings can be changed later.
   - Channel: You can change the name of the channel to be displayed.
   - Line style setting: You can change the color, thickness, and type of lines.
   - Export: You can output the analysis results in CSV format.
   - Low pass filter: If checked, you can set the cutoff frequency to be applied before analysis.
   - Legends: You can make various information displayed at the top of the graph.
   - Reset: You can reset the settings to their default values.

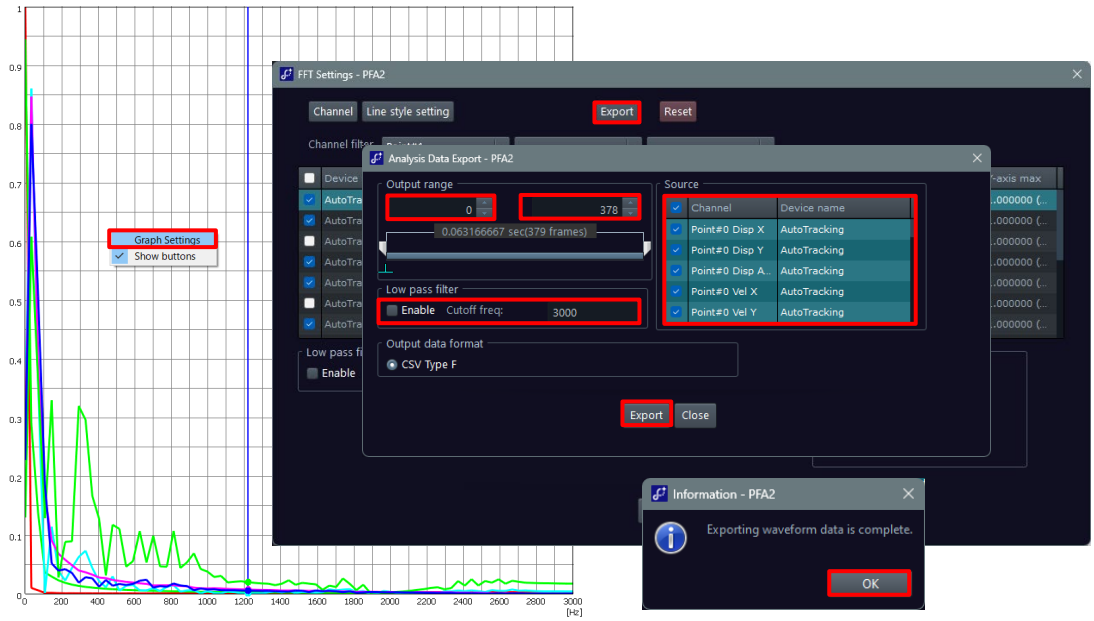


3. The results of the frequency and amplitude analysis are displayed.



4. If you change the playback range in the playback panel, the analysis results will also change accordingly.

5. To output the analysis results in CSV format, right-click on the graph and click [Graph Settings]. Click [Export] on the FFT Settings window.
   On the Analysis Data Export window that appears, set the range to be exported, the channels to be exported, whether or not to use a low pass filter, and the value of the filter, and then click [Export]. Specify the destination for the CSV file. A message will appear when the export is complete.



CSV output format

#PHOTRON WAVE DATA		
#SheetType		Frequency Analysis
#Date		YYYY/MM/DD
#Time		HH:MM:SS
#CameraType		
#CameraID		0
#FrameRate(fps)		6000
#SaveStep		1
#ShutterSpeed(sec)		1/6000
#ImageWidth		768
#ImageHeight		656
#TriggerMode		Start
#NumberOfFrames		379
#FrameRange		0 to 378
#SamplingRate(sps)		6000
#Sampling/Frame		1
##NumberOfIndex		191
##FrequencyRange(Hz)		0 to 3000
IndexNo	IndexFreq(Hz)	Point#0 Disp X
0	0	0.999786
1	15.7895	0.000518573
2	31.5789	0.000439538
3	47.3684	0.0143134
4	63.1579	0.000667149
5	78.9474	0.00067241
6	94.7368	0.00129112
7	110.526	0.000634995
8	126.316	0.000673095
9	142.105	0.000994454
…	…	…

2.4. Saving Data

2.4.1. Saving TSI File (Information File)

To save image data with image processing settings, etc., save a TSI file.
When a TSI file is opened, the image data can be opened with the various settings restored.

CAUTION

- To restore the overlaid settings, open the TSI file after opening the overlaying data.

1. Right click the file to be saved in the file list and click [Save TSI file].
2. Specify a file name and click [OK].
   The progress screen appears and the TSI file is saved in the same folder as the original data.

■ Example of TSI File Information

- Viewpoint (Set view, Saved view)
- Viewpoint lock
- Texture display
- Wireframe display
- Bounding box display
- Polygon color
- Origin coordinates
- Orientation of origin X or origin Y
- Cross-section coordinates
- Cross-section X and Y orientation
- Cross-section line color
- Cross-section display mode
- Extended image overlapping mode
- Still image file name list
- Display name
- Scale conversion setting
- Grid setting
- Ruler setting
- Auxiliary line setting

<Overlapping of the same file>

- Frame interval, Number of overlapped frames
- Opacity

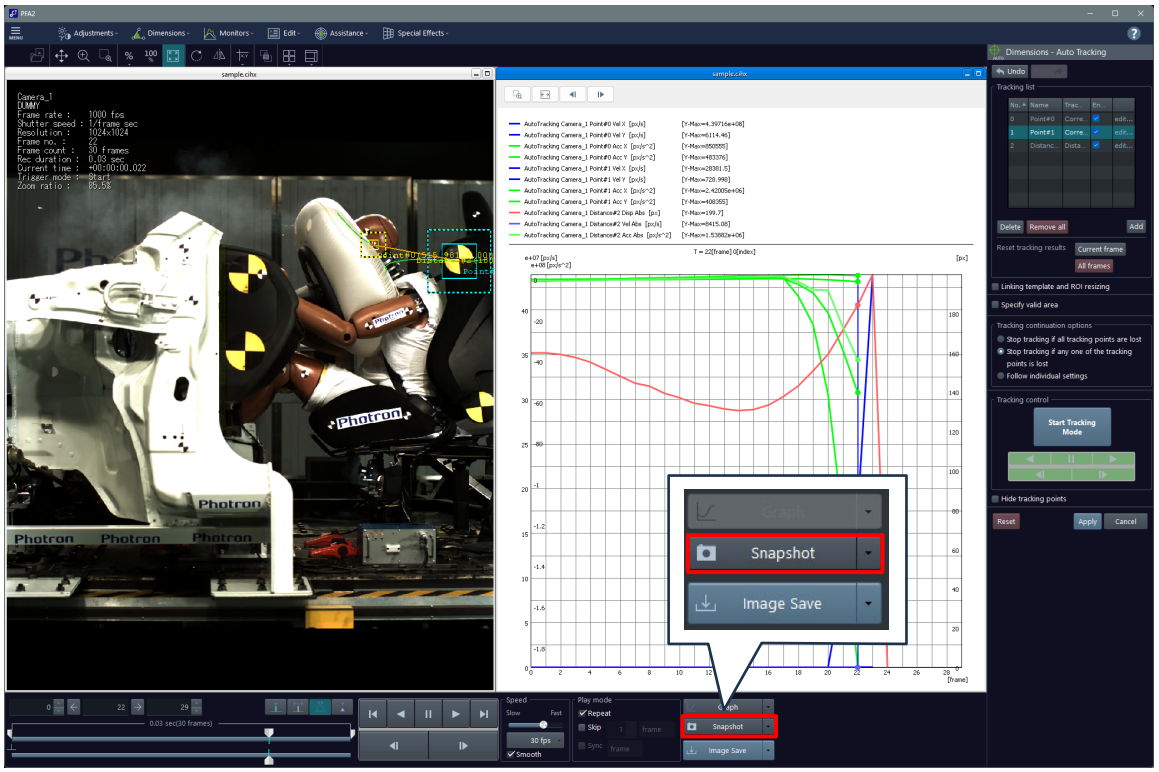
<Overlapping of the different file>

- Overlapping file paths
- Relative paths of files to be overlapped
- Display name of the overlapped file
- Frame number of the file to be overlapped
- Whether the image to be overlapped is inverted
- Start/end coordinates for scaling/rotation of overlapped image
- Whether the 2-point adjustment of overlapped image is valid

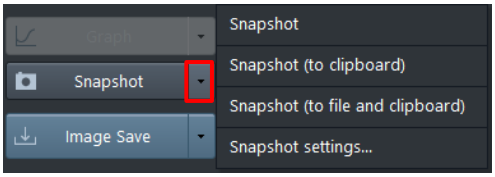
2.4.2. Saving Snapshot

Click [Snapshot] to save the displayed image to a file.

* Keyboard shortcut: [Ctrl] + [C]



Click the ▼ to the right of [Snapshot] to set the destination and file format.



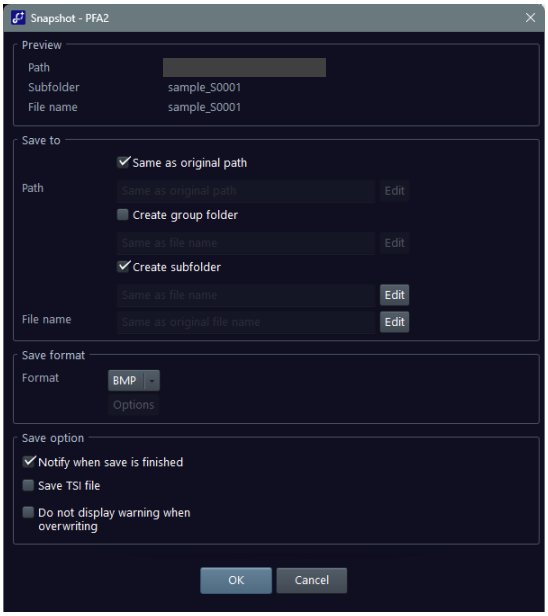
Snapshot: Save to file.

Snapshot (to clipboard): Save to clipboard.

Snapshot (to file and clipboard): Save to file and clipboard.

Snapshot Settings: Sets the destination, save format, and save options.

Click [Snapshot Settings] to display the following window.



You can change the destination, folder creation, and file name settings.

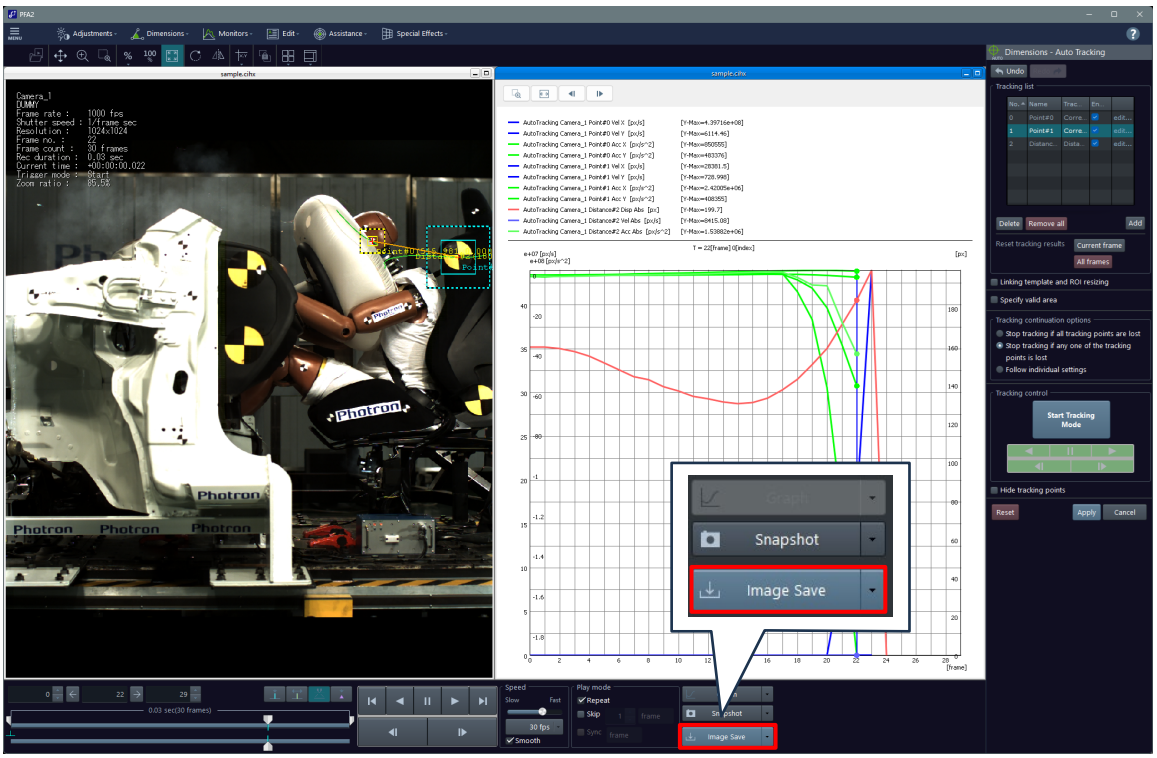
You can change the save format.

You can change the saving options.

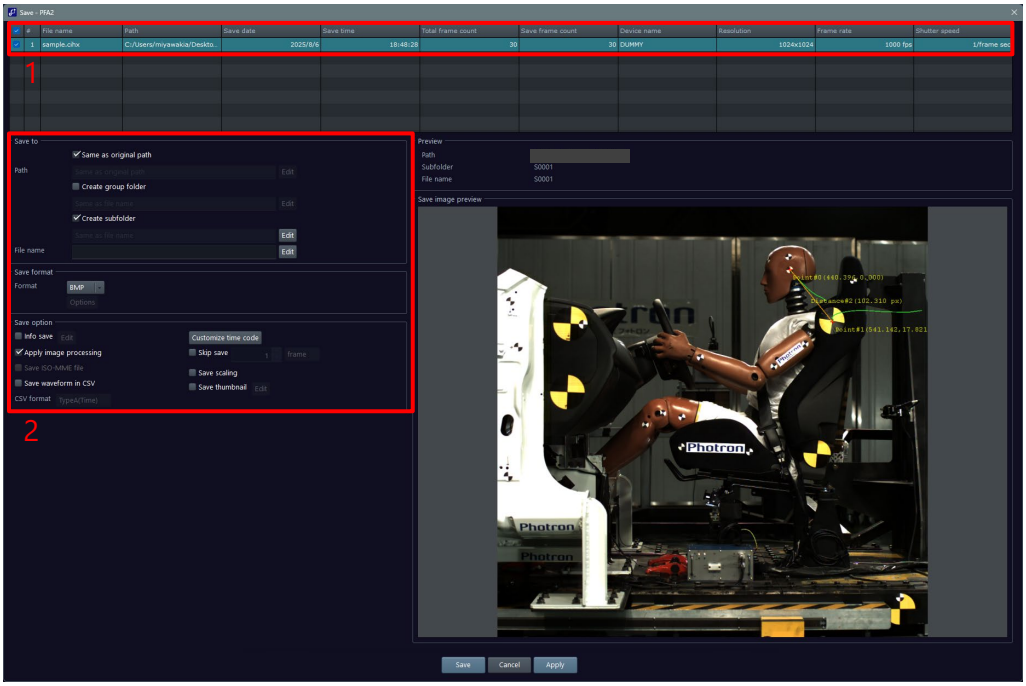
2.4.3. Saving in Video Format

Click [Image Save] to display the save window.

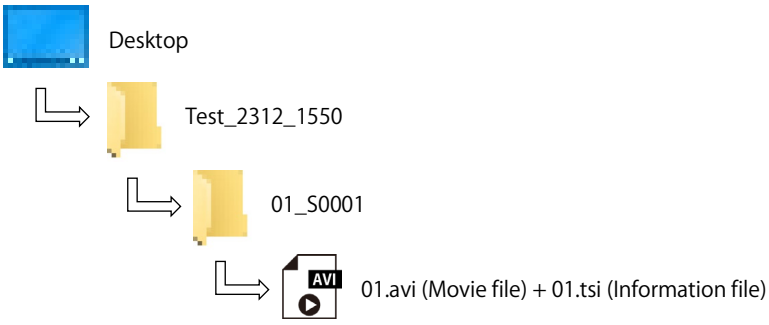
* Keyboard shortcut: [Ctrl] + [S]



Specify the file to be saved and set the destination, save format, and save options.

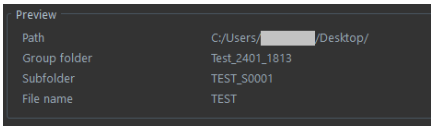


e.g., Creating a group folder (Test_yyMM_HHmm) and a subfolder (session number) on the desktop, file name "01", saved in AVI format.

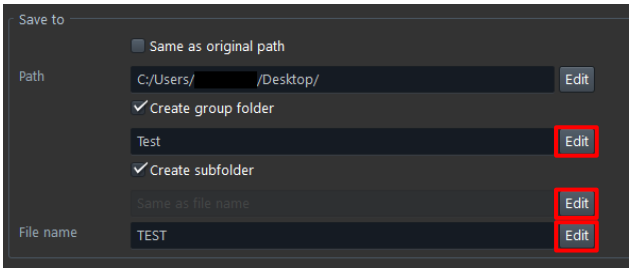


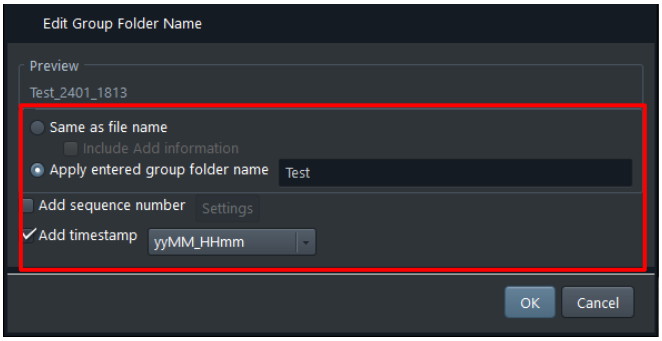
NOTE

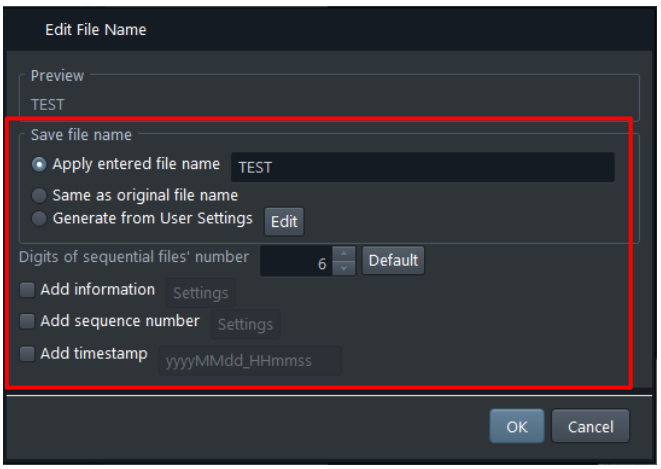
- You can check the save path, folder name, and file name in the preview.



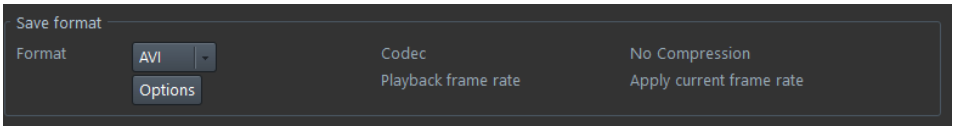
Group folder and subfolder settings can be changed from [Edit].

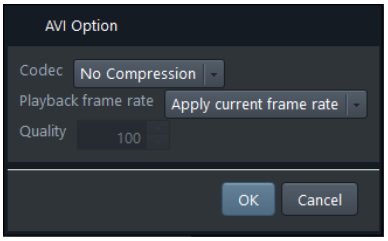






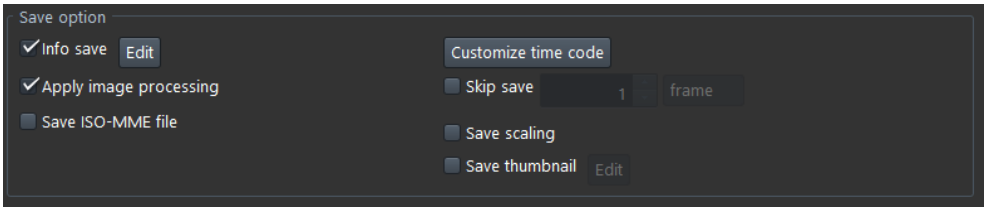
From “Save format” and “Save option”, you can change the format and codecs, etc.





* Save options depend on the format.

From the “Save option”, you can set options such as whether or not to apply image processing.



* The save options depend on the file to be saved.

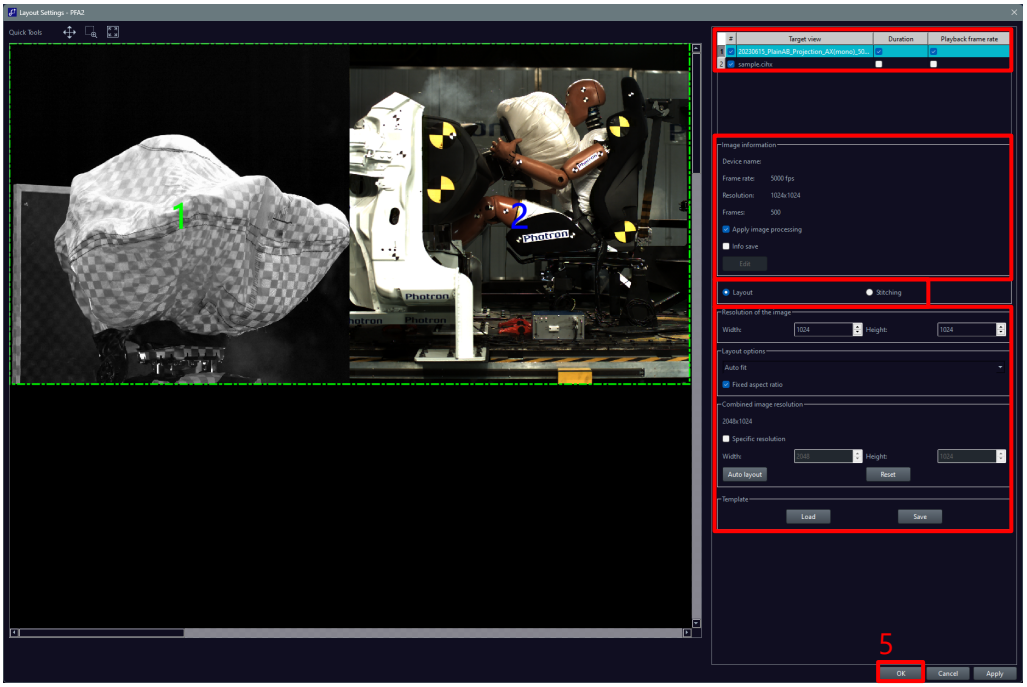
2.4.4. Saving Multiple View Data as One Data (Layout Save)

Multiple data can be combined and saved in one file.

Click the ▼ to the right of [Image Save] and click [Layout save].

* Keyboard shortcut: [Ctrl] + [L]

1. Select the file to be saved and specify the file as the basis for movie length and playback speed.
2. If necessary, edit whether image processing is applied or not, and the information save items.
3. Select the merging method from “Layout” or “Stitching”.
4. Change the resolution of the individual files by entering a value or dragging ■ on the file.
   Change the resolution after merging by entering a value or dragging the file.
5. Click [OK].



NOTE

- The current layout settings can be saved and loaded as a template.
  By saving a template in advance, settings can be restored smoothly, for example, if you often save with fixed settings.
- In the stitching method, images are pasted together to create a panoramic composite.

2.4.5. Exiting PFA2

Confirm that data saving and report output are complete, then move your mouse over [MENU] and click [Exit] or the [Close] button in the upper right corner.

* Keyboard shortcut: [Ctrl] + [Q]

3

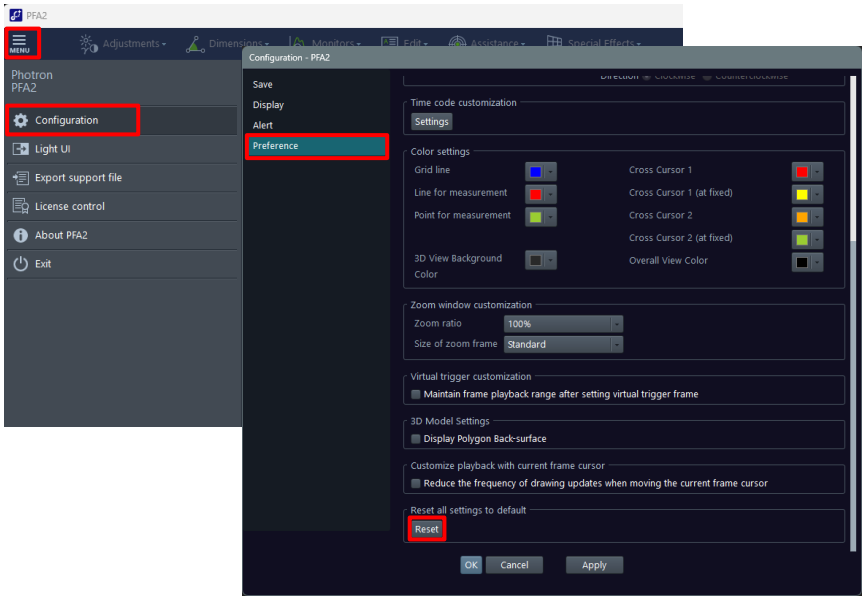
Chapter 3 Troubleshooting

This chapter provides answers to frequently asked questions and answers about PFA2, as well as contact information.

3.1. Frequently Asked Questions and Answers

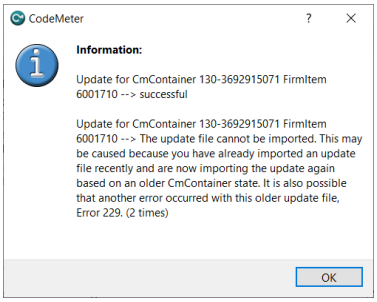
Q1. I want to return PFA2 settings to default.

[MENU] - [Configuration] - [Preference] - [Reset all settings to default]
Click [Reset]. After rebooting, PFA2 settings will return to their default values.



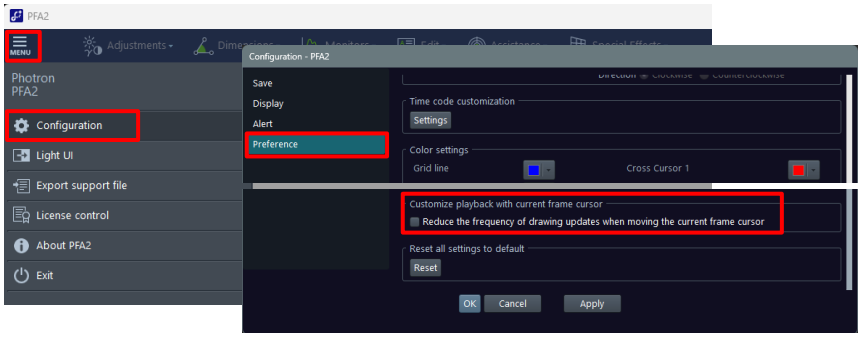
Q2. When I installed PFA2, a license message appeared.

If the message appears, you can still use PFA2 without any problems. Click [OK].
The following message appears if you have uninstalled and reinstalled the PFA2.



Q3. Data loading speed and rendering during playback is very slow.

Depending on the main memory capacity of your PC, loading speed and rendering during playback may be overloaded when the number of files (frames) to be loaded is large.
By selecting and loading only the necessary number of frames or clicking [Stop] on the loading progress screen, loading time and load during playback can be reduced.
Also, if drawing is slow when playing back multiple files by moving the current frame cursor, you can reduce the load and improve the drawing speed by checking [MENU] - [Configuration] - [Customize] - [Reduce the frequency of drawing updates when moving the current frame cursor].

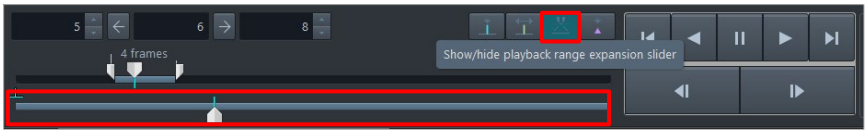


Checked: The image will be updated 0.2 seconds after you stop dragging the cursor.
Unchecked: The image is updated immediately after you stop dragging the cursor.

Reference "2.1.2 Check PFA2 Settings" on page 17
"2.1.3 Opening Files" on page 19

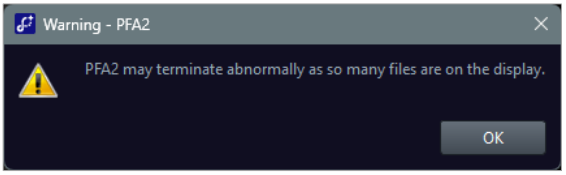
Q4. It is difficult to operate the slider bar when playing back data.

If the start and end frames of the playback range are close together, it may be difficult to move the current frame using the slider cursor in the playback panel. In this case, click [Show/hide playback range expansion slider] in the playback panel to display the playback range expansion slider and perform the operation.



Reference "2.3.1 Playback" on page 28

Q5. Every time I open a file, a warning appears.



Depending on the memory usage of your PC, the above warning may appear when opening files.
If the model is displayed normally and a warning message appears, you can set it not to appear by unchecking “Show alert when too many files are on the display” in the [System] column of [MENU] - [Configuration] - [Alert].

If you have any questions other than those listed above, or if you are unable to solve a problem, or if you notice any other problems not listed above, please contact Photron using the contact form.

3.2. Contact Information

3.2.1. PFA2 Support

For inquiries about PFA2, please contact Photron using the contact form.
When making an inquiry, please have the following items ready.

■ Items to be prepared

◆Contact information: company name/school name/customer name/phone number, etc.

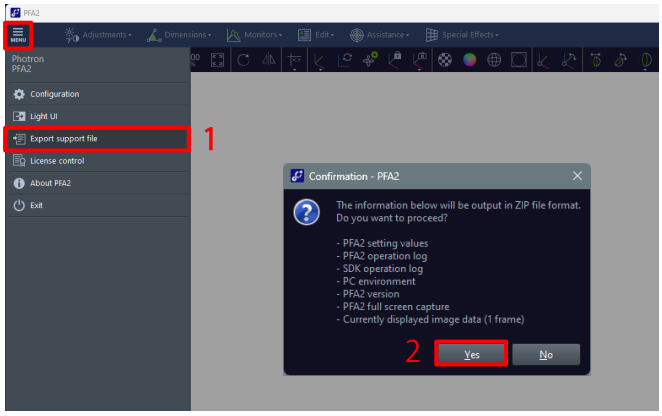
◆Details of your inquiry

◆Support File

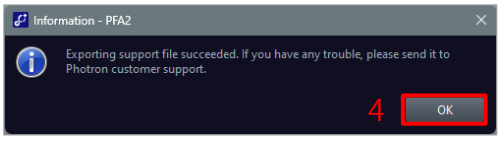
3.2.2. Outputting Support File

To respond to your inquiry as quickly as possible, please output the support file (.zip) and contact Photron.
The procedure for exporting the support file is as follows.

1. Move your mouse over [MENU] and click [Export support file] on the side menu.
2. Click [Yes] on the confirmation message.



3. Specify the support file output destination and file name, then click [Save].
4. A message appears when the output is complete. Click [OK].



Support files include the following.

- pfa2.ini
  Configuration information for the entire PFA2

- pfa2_yyyymmdd.log (“yyyy mm dd” indicates year, month, and date)
  Log information

- environment.txt
  PC configuration information

- version.txt
  Version information

- screenshot.png
  Image of the PFA2 screen at the time of exporting support files (saved as a screenshot)

- Capture file (.mraw)
  Image capture

- pdclib_ yyyymmdd.log (“yyyy mm dd” indicates year, month, and date)
  SDK log information

- pdclib.xml
  SDK configuration information

- *.tsi
  Information file to open the capture file

Photron FASTCAM Analysis 2

for Image Analysis

User's Manual Ver. 2.0.0.0 E

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