

# Photogrammetry System PSC-1

Instruction Manual



KONICA MINOLTA

## Safety Symbols

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The following symbols are used in this manual to prevent accidents that may occur as a result of incorrect use of the system.



Denotes a sentence regarding a safety warning or note. Read the sentence carefully to ensure safe and correct use.



Denotes a prohibited operation. The operation must never be performed.



Denotes an instruction. The instruction must be strictly adhered to.



Denotes a sentence regarding a warning on laser.  
Read the sentence carefully to ensure safe and correct use.

## Official names for applications mentioned in this manual

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Name given in this manual	Official name
Windows	Microsoft® Windows®
Windows 2000	Microsoft® Windows® 2000 Professional Operating System
Windows XP	Microsoft® Windows® XP Professional Operating System

## Trademarks

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- PhotoModeler is a trademark of Eos Systems Inc. and a registered trademark of Eos Systems Inc. in the USA.
- Company and product names appearing in this manual are trademarks or registered trademarks of their companies.







## Notes on This Manual

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- The VI-9i is model name for Europe and VIVID 9i is model name for other countries. This manual explains how to use this system with a model name “VIVID 9i”.
- Copying or reproduction of all or any part of the contents of this manual without KONICA MINOLTA SENSING and Eos Systems Inc.’s permission is strictly prohibited.
- The contents of this manual are subject to change without prior notice.
- Every effort has been made in the preparation of this manual. However, should you have any questions or find any errors or loss of contents, please contact a KONICA MINOLTA SENSING authorized service facility.
- KONICA MINOLTA SENSING will not take responsibility for any consequences arising as result of the use of this software.

## Safety Warnings and Notes

When using this software, the following points must be strictly observed to ensure correct and safe use. After you have read this manual, keep it in a safe place so that it can be referred to easily whenever it is needed.

 <b>WARNING</b> Failure to adhere to the following points may result in death or serious injury.		
	Before reading this manual, thoroughly read the instruction manuals for the VIVID 9i, computer and other devices you are going to use to ensure correct and safe use. Incorrect use may result in fire and electric shocks.	
	Never stare into the laser emitting window of the VIVID 9i.	
	Do not place a lens, mirror or optical element in the path of the laser beam. Doing so may converge the laser beam, resulting in damage to your eyes, burns or fire. To prevent the above accidents, make sure that a wall or similar object which can block the laser beam is located behind the object.	

## Software Restrictions

This system includes the photogrammetry software “PhotoModeler KM” and automatic registration tool “PSC-1”. Use of this software is restricted by the protect key for “PhotoModeler KM” and by key code (license code) for “PSC-1”. In addition, their usage requires license authorization and agreement with the license agreement that appears when the software is installed.

- \* In Polygon Editing Tool Ver.2.02 or higher, the license for use of PSC-1 Tool is licensed only by the purchase of Photogrammetry System PSC-1. It is not necessary to obtain and input a key code to use PSC-1 Tool.
- \* The software cannot be used if the license agreement is not accepted.
- \* It will be assumed when the software is installed or used that the user has accepted the license agreement.
- Copying or reproduction of all or any part of the contents of the software and manual for this system without KONICA MINOLTA SENSING and Eos System Inc’s permission is strictly prohibited due to copyright regulations.
- The specifications of the system are subject to change without prior notice.
- KONICA MINOLTA SENSING will not accept responsibility for any damage caused as result of the use of this manual.

## Notes on Use and Storage

The following points regarding use and storage of the software and equipment must be observed accordingly. In cases of malfunction of equipment or being damaged of software CD-ROM, contact the nearest KONICA MINOLTA SENSING-authorized service facility.

### <Software>

- The software is supplied on CD-ROM.
- When inserting the CD-ROM into the CD-ROM drive, make sure that it is placed straight in the right direction, and inserted gently.
- Keep the recorded side of the CD-ROM clean. Dirt on the recorded side may cause reading errors or breakdown of the equipment.
- Do not affix foreign matter, such as tag seals, to the recorded side and top side of the CD-ROM. In addition, do not expose the CD-ROM to water or solvent such as thinner. Failure to observe this may cause reading errors or breakdown of the equipment.
- Do not let the CD-ROM drop or be exposed to strong shocks.
- Take care not to allow the CD-ROM to be exposed to rapid temperature changes and condensation.
- Keep the CD-ROM away from direct sunlight and high-temperature objects like heaters.
- After the software is installed, the CD-ROM must be kept inside its case in a safe place.

### <Equipment>

The items used by this system include a set of PSC-1 system (calibration chart, scale bars, two kinds of markers, digital camera, flash light etc.) in addition to a computer and VIVID 9i.

- Take care not to damage or stain markers (two kinds: code marker, reference marker) on scale bars and calibration charts. Doing so may result in decreased measurement accuracy.
- Read this manual and the instruction manuals for each item to ensure correct and safe operation.

# Manual Structure

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This manual gives an overview of the photogrammetry system “PSC-1” and explains operating methods and procedures of the equipment and software used by the system.

The system consists of “pre-process”, in which 3D position information (3D coordinates) of each part of the object is obtained using photo data obtained by the digital camera, and “main-process”, in which automatic registration is performed using the obtained 3D coordinate data and scan data (3D shape data) obtained by the VIVID 9i. Since different equipment and software are used, explanation of the operation and work procedures for the system is divided into two blocks “pre-process” and “main-process”.

This manual mainly consists of the following sections.

## 1. Overview of Photogrammetry System PSC-1

Explains an overview of photogrammetry that is the basis for this system, and the purpose and application (what can be done) of the system. In addition, explanation of the equipment and software used by this system, and the operating conditions required for this system are also given.

## 2. Operating Method of this System

Explanation of the operating method of this software is given in two parts: pre-process and main-process, where different software and equipment are used.

### 2-1.Pre-Process (Obtaining the 3D Coordinate Data from the Photo Data)

Explains how to take shots of the object with a digital camera and how to use the photogrammetry software “PhotoModeler KM”.

In particular, points to note when taking shots of the object and technical know-how are also included in the explanation.

### 2-2.Main-Process (Automatic Registration of Data Scanned by VIVID 9i)

Explains how to use the automatic registration tool “PSC-1”.

### 2-3.Additional information on PSC-1 Tool

Explains parameters used in dialog boxes of the PSC-1 Tool and the method of license registration for the software.

## 3. Menu structure of “PhotoModeler KM”

Explains the menu of the photogrammetry software “PhotoModeler KM” and dialog boxes that appear as a result of menu selection.

# Related Manuals

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The following manuals relating to this system and manual are available.

- Instruction Manual for Non-Contact 3D Digitizer VIVID 9i  
Explains the functions, operating procedures and precautions regarding the non-contact 3D digitizer “VIVID 9i” designed for high-speed and high-accuracy acquisition of 3D shape data of various industrial products.
- Instruction Manual for Accessories of Non-Contact 3D Digitizer VIVID Series  
Some accessories (e.g. rotary stage, frame set) for VIVID Series have an instruction manual explaining the handling method and points on use.
- Instruction Manual for Polygon Editing Tool Software  
Explains how to install and operate the Polygon Editing Tool software as well as explaining all the functions it provides. The Polygon Editing Tool software is designed to control “VIVID Series” non-contact 3D digitizers, convert scan data into polygons, edit data and convert VIVID data to universal data formats. This manual can also be used as a command reference manual.
- Basic Operation Guide for Polygon Editing Tool Software  
Explains basic operations of the “Polygon Editing Tool” by using the “VIVID 910” non-contact 3D digitizer.

# Conventions Used in This Manual

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“PSC-1” is the name of this system as well as the name of a tool included in the system. To avoid confusion, “this system”, “PSC-1 system” or “photogrammetry system PSC-1” is used to indicate the PSC-1 as the system. To indicate PSC-1 as the tool, “PSC-1 Tool” or simply “PSC-1” is used.

# Contents

Safety Warnings and Notes .....	1
Software Restrictions.....	1
Notes on Use and Storage.....	1
Manual Structure .....	2
Related Manuals .....	2
Conventions Used in This Manual .....	2
<b>Contents .....</b>	<b>3</b>
<b>1. Overview of Photogrammetry System PSC-1.....</b>	<b>5</b>
<b>1-1. What is Photogrammetry?.....</b>	<b>5</b>
<b>1-2. What can the PSC-1 System do? .....</b>	<b>6</b>
1-2-1. Restrictions on Use of this System .....	6
<b>1-3. System Configuration (Equipment and Software) .....</b>	<b>7</b>
1-3-1. Specifications.....	8
1-3-2. Preparation of Equipment .....	9
1-3-3. Software Preparation.....	10
<b>2. Operating the System.....</b>	<b>15</b>
<b>2-1. Pre-Process (Obtaining the 3D Coordinate Data from the Photo Data) .....</b>	<b>17</b>
Pre-Process-1. Creation of Calibration Data (Calibration Parameters) .....	17
1) Taking shots of the calibration chart using the digital camera .....	17
2) Importing the photo data of the calibration chart to the computer .....	18
Pre-Process-2. Preparation of the Target Object.....	20
1) Reserving sufficient shooting space for the object.....	20
2) Attaching the markers to the object .....	20
3) Location of code markers and scale bars .....	21
Pre-Process-3. Obtaining the 3D Coordinate Data of the Markers.....	22
1) Take shots of the markers attached to the object.....	22
2) Obtain the 3D coordinates of the markers .....	24
<b>2-2. Main-Process (Automatic Registration of Data Scanned by VIVID 9i).....</b>	<b>29</b>
Main-Process-1. Importing the 3D Coordinate Data of the Markers.....	29
1) Prepare the VIVID 9i.....	29
2) Start PSC-1 .....	30
3) Import the 3D coordinate data of the markers .....	31
Main-Process-2. Scanning the Object by VIVID 9i .....	32
1) Scan the object by the VIVID 9i.....	32
Main-Process-3. Registering the Scan Data to the Polygon Editing Tool .....	34
1) Store the scan data .....	34
2) About registration of registration data to the Polygon Editing Tool .....	34
3) Save the registration data.....	34
<b>2-3. Additional Information on PSC-1 Tool .....</b>	<b>35</b>
2-3-1. Parameters for Dialog Boxes .....	35
1) [File – Import – Digitizer – PSC-1] Dialog Box and Its Parameters .....	35
2) Parameters for [Option] Dialog Box.....	37
2-3-2. License registration (obtaining a license code).....	38
<b>3. Explanation of PhotoModeler KM Work Menus.....</b>	<b>39</b>
Main Window .....	39
Work menu bar .....	40
[File] menu .....	41
[Edit] menu .....	43
[Marking] menu .....	45
[Referencing] menu .....	47
[Project] menu .....	48
[Window] menu .....	55
[Options] menu .....	57
[Help] menu .....	63

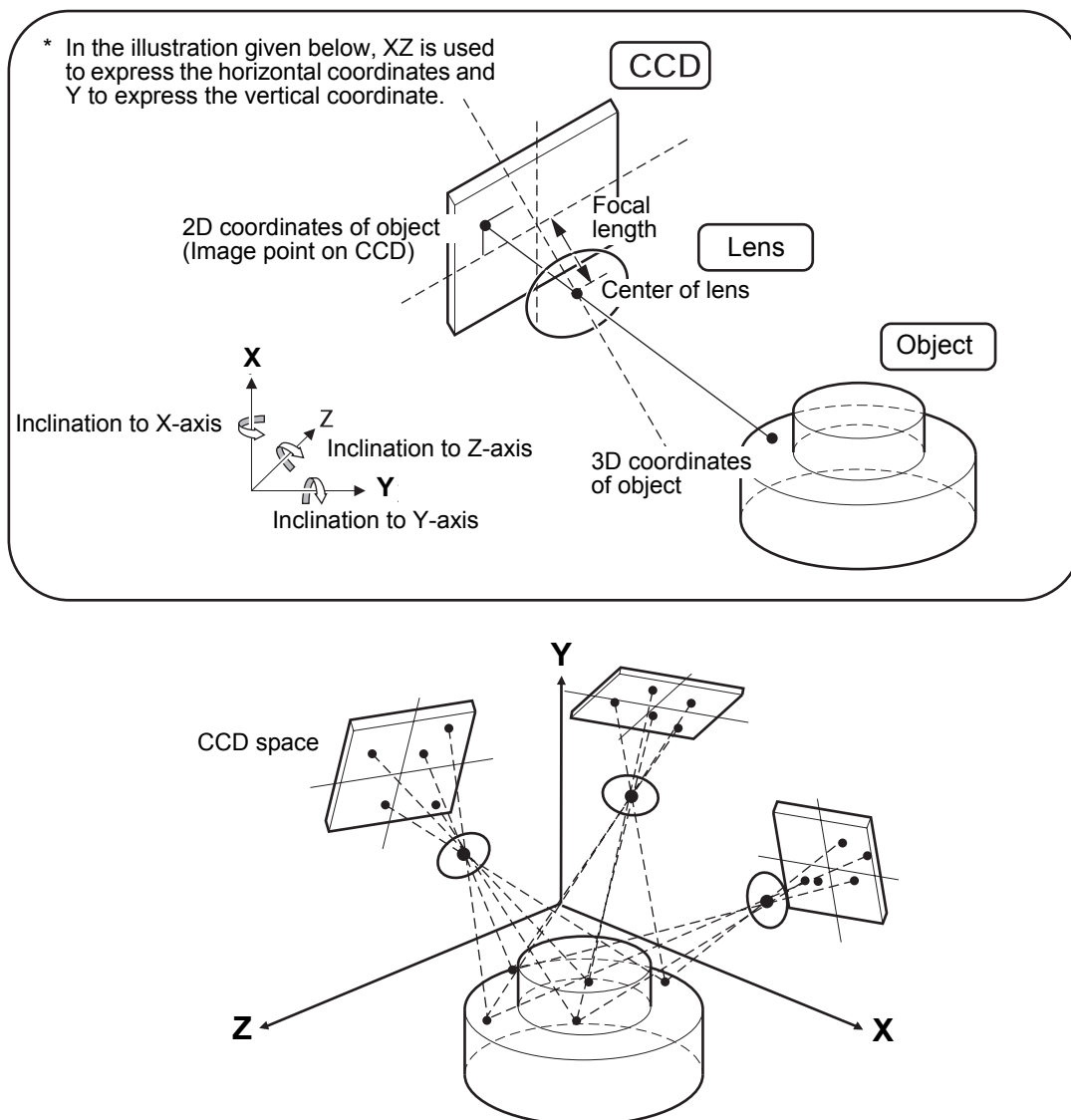


# 1. Overview of Photogrammetry System PSC-1

The photogrammetry system PSC-1 is a system that performs automatic registration using photogrammetry. First, 3D coordinate data of reference markers attached to the object is obtained from the photo data taken by a digital camera. The object is then scanned by the VIVID 9i and the marker positions on the scan data are compared with that 3D coordinate data to perform automatic registration.

## 1-1. What is Photogrammetry?

Photogrammetry is a technology for reproducing an accurate 3D model of the object using parallax based on the photos taken from various directions by a camera. Photogrammetry is not restricted by the type of object - it can capture models of objects that are difficult to access, cannot be touched by hand, or have a complex structure. Photogrammetry is used in various applications, such as making topographic maps from aerial photographs or recording architectural structures and cultural properties from ground-based photographs.



## 1-2. What can the PSC-1 System do?

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The photogrammetry system PSC-1 includes “PhotoModeler KM” software, which uses photogrammetry technology to obtain 3D coordinates of markers attached to the object from the photo data, and the PSC-1 Tool, designed to perform automatic registration of multiple 3D data obtained by the VIVID 9i based on the 3D coordinates. Using these software in conjunction enables easy registration with high accuracy.

Point: The photogrammetry used by the PSC-1 system is not intended to obtain 3D shape directly. The purpose is to obtain 3D coordinates of the markers attached to the object.

Point: The purpose of PSC-1 system is to perform automatic registration of 3D shape data obtained by the VIVID 9i. For this, it uses photogrammetry technology to obtain 3D coordinates of the markers. As a result, how accurately the 3D coordinates of the markers can be obtained is the key point.

### 1-2-1. Restrictions on Use of this System

#### <Software>

- This system includes the photogrammetry software “PhotoModeler KM” and automatic registration tool “PSC-1”. To use them, it is necessary to obtain a license or license code. In addition, a protect key is provided to avoid illegal use of these software.

#### **Memo**

In Polygon Editing Tool Ver.2.02 or higher, the license for use of PSC-1 Tool is licensed by the purchase of Photogrammetry System PSC-1. It is not necessary to obtain a license code to use PSC-1 Tool.

- The license code for PSC-1 is based on the serial number of the VIVID 9i. To use the PSC-1 Tool, VIVID 9i must be connected to a computer. Apart from the protect key provided for the Polygon Editing Tool (including PSC-1), a protect key is also provided for “PhotoModeler KM”.
- When installing “PhotoModeler KM” on Windows 2000 or Windows XP, the software must be used by someone with the “Administrators” authority.

#### <Equipment>

- To use this system, the middle lens must be used with the VIVID 9i.
- The computer to be used must have at least two USB ports for the protect keys for “Polygon Editing Tool” and “PhotoModeler KM” to avoid illegal use of the software.
- To use this system, use only the specified combination of digital camera body and lens supplied by KONICA MINOLTA SENSING, INC.

#### <Object>

- If the object is likely to bend or deform when it is moved, it must be placed at the same position throughout the entire operation, from the pre-process to main-process. Sufficient space must be reserved with not only the object but also the equipment and working space taken into account.



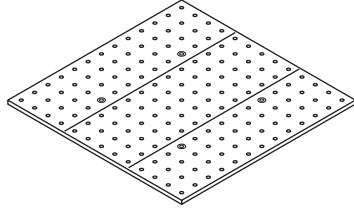
## 1-3. System Configuration (Equipment and Software)

To use the PSC-1 system, various pieces of equipment are required.  
They are listed below.

Digital camera set



Calibration chart



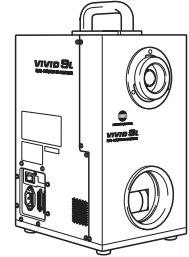
PhotoModeler KM



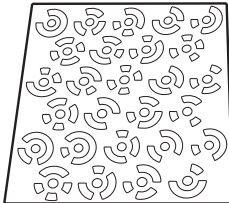
Computer



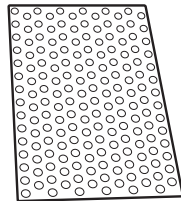
VIVID 9i



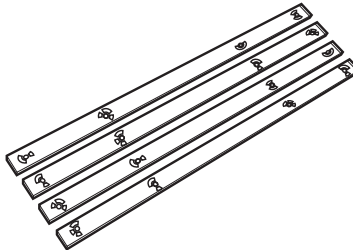
Code marker



Reference marker



Scale bar



PSC-1 (Polygon Editing Tool)



### 1-3-1. Specifications

The equipment and software required for use of this system are listed below.

#### <Items Required Throughout All Processes>

##### 1. Computer

To use this system, a computer with the following specifications is required.

- For the Polygon Editing Tool (Ver.2.01 or higher), two or more USB ports are also required.

CPU       Pentium 4 or higher (Intel only)

Memory   1024 MB or more (2048 MB or more recommended)

HDD       A minimum of 10 MB free space is required to install this software.

Graphic    A graphic board that enables 16-bit color display with a resolution of 1024 by 768 pixels or higher is required.

Other       • Two or more USB ports for the protect keys  
               • A CD-ROM drive to install the software

##### 2. Reference markers

#### <Items Required for Pre-Process Only>

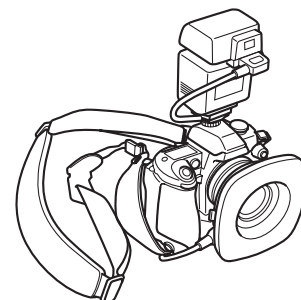
##### 1. Digital camera set (including lens and flash etc.)

To use this system, use only the specified combination of digital camera body and lens supplied by KONICA MINOLTA SENSING, INC.

The following specification and setting is required.

Digital camera	Kodak DCS pro	
	Shutter speed	1/125 sec.
	ISO	160
	White Balance	Flash light, standard
	CF Card (export format)	JPEG
	JPEG Resolution	13.5 MP (Mega Pixel)
	Image Resolution	4500 × 3000
	Long Exposure	Off
	Noise Reduction	Standard
	Sharpening Level	None
Lens	Nikkor lens (fixed focal length lens)	
	Focusing Distance	2.0 m
	Aperture	22
Flash	Ring light (with fixture)	
	Flash Mode	M (Manual mode)
	Power Ratio	1/8
	Film Speed Scale	ISO/DIN 15, ASA 25 or equivalent

\* Use the digital camera and the lens with our specified combination.



##### 2. Scale bar

##### 3. Code marker

##### 4. Calibration chart

##### 5. Photogrammetry software “PhotoModeler KM” and its protect key

#### <Items Required for Main-Process Only>

##### 1. Polygon Editing Tool Ver.2.01 or higher (including PSC-1 Tool) and its protect key

##### 2. VIVID 9i (including necessary accessories)

## 1-3-2. Preparation of Equipment

### <Computer>

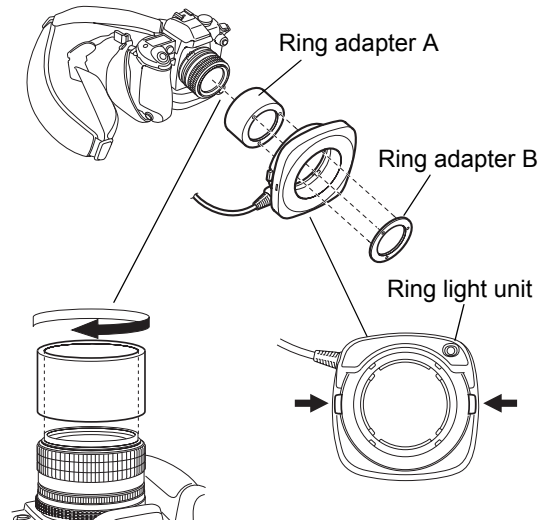
1. Connect the VIVID 9i to the computer.

For the connecting method, refer to the VIVID 9i Instruction Manual (page 16).

### <Digital camera>

Attach the ring light to the end of the digital camera lens.

1. Align the external threads on the ring adapter A with the filter mount threads on the lens end, and then turn it clockwise to secure it.
2. While holding down the buttons (on the right and left) on the rear of the ring light unit, attach the unit to the ring adapter A.
3. Attach the ring adapter B from the front side of the ring light unit, and secure with three screws.



### <Calibration chart>

The calibration chart consists of three plates. To use the calibration chart, these three plates need to be joined to form a single plate.

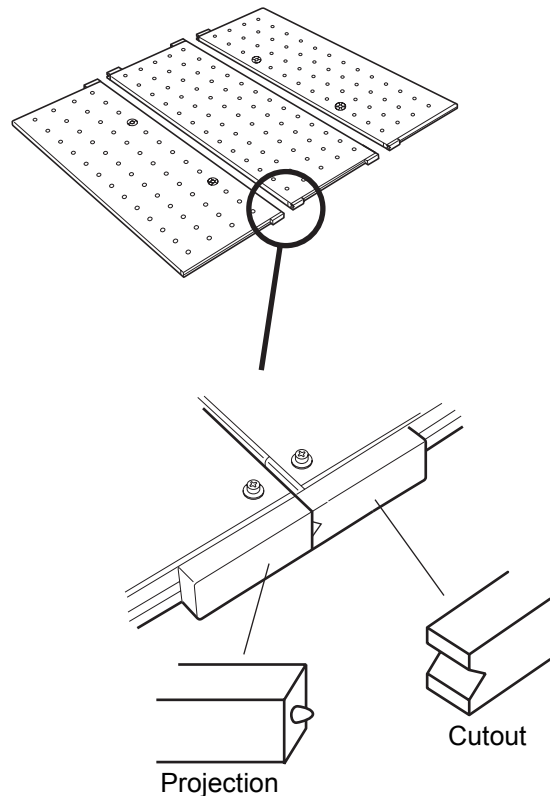
Since the plates can be joined tightly by magnets, make sure that they are aligned so that the projection on one plate fits into the slot on the other (projection and slot are provided at each end of the plates).

#### **Memo**

When joining the plates, lift the projection-side plate to more easily align the side of the plates.

#### **Note**

- After operation is complete, separate the calibration chart into three plates and keep them in a storage box.
- When separating the plates, lift the projection-side plate at the junction. This will enable you to separate them easily.
- When joining/separating the plates, take care not to let your fingers or hands get trapped in the joint edges or catches.



### 1-3-3. Software Preparation

#### <Polygon Editing Tool Ver.2.01 or higher>

Install the Polygon Editing Tool (Ver.2.01 or higher) to your computer.

For the installation method, refer to the Polygon Editing Tool Instruction Manual (page 11).

#### <PSC-1 Tool>

Authenticate the license for the PSC-1 Tool.

The PSC-1 Tool is supplied as a part of the Polygon Editing Tool (Ver.2.01 or higher), but license authentication is required to use it. For details on license authentication, refer to page 38 of this manual.

#### **Memo**

In Polygon Editing Tool Ver.2.02 or higher, the license for use of PSC-1 Tool is licensed only by the purchase of Photogrammetry System PSC-1. It is not necessary to obtain and input a license code to use PSC-1 Tool.

#### <PhotoModeler KM>

Install the photogrammetry software “PhotoModeler KM” to your computer.

#### **Memo**

After software installation is complete, installation of the protect key driver will start.

#### **Note**

*The protect key driver will be installed automatically at the end of installation of the photogrammetry software. Before installing the software, make sure that the protect key is not attached to the computer.*

### [Operating Procedure]

#### 1 Start Windows and insert the of CD-ROM of “PhotoModeler KM” into the CD-ROM drive.

The setup program will start automatically. Continue with Step 3.

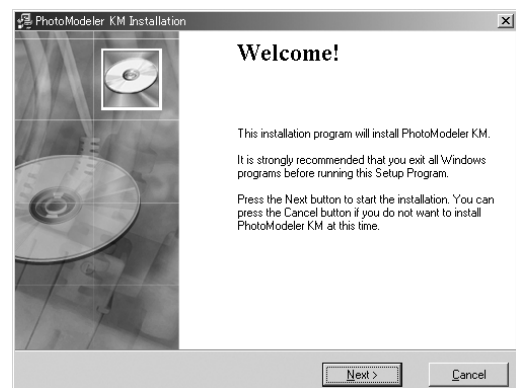
#### **Memo**

If the setup program does not start automatically, start it manually according to the method explained at step 2.

#### 2 From the [Start] menu of Windows, click [Run...].

The [Run...] dialog box will appear. Click the [Browse] button.

In the dialog box, specify the PhotoModeler KM software setup program on the CD-ROM. Click the [Open] box to return to the [Run...] dialog box again. Make sure that the setup program’s name and path are displayed in the [Name] field, and the click the [OK] button to start the setup program.



### 3 The “Important Information” dialog box will appear. Read the contents thoroughly.

If you agree with the contents, select [I agree] and click the [Next] button.

The PhotoModeler KM software can be installed only if the Licence Agreement is accepted. If not, it will neither be possible to install nor use the software.

#### **Note**

*It will be assumed when the software is installed or used that the user has accepted the license agreement.*

If your acceptance is not given, the software cannot be installed, so click the [Cancel] button to cancel installation.



### 4 A confirmation dialog box for the installation destination directory appears.

By default, the software will be installed in the “Program Files” directory on drive C (C:\Program files\PhotoModeler KM). If you want to install the software to another drive or directory, specify it.

Check that the installation directory is correct, and click the [Next] button.

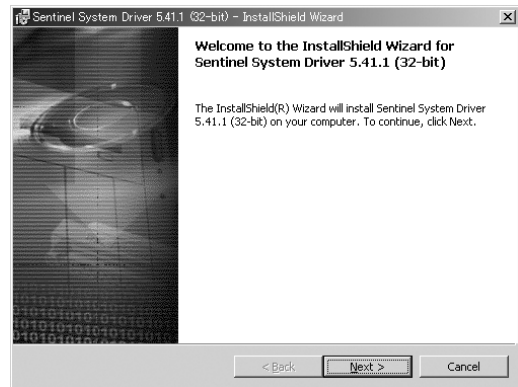


### 5 Installation of PhotoModeler KM will start.

Follow the instructions displayed on the screen to complete installation.

After software installation is complete, installation of the protect key driver will start.

Click the [Next] button to continue installation.



### 6 The License Agreement dialog box for the protect key driver appears.

Read the contents thoroughly, and if you agree, select [I accept the terms in the license agreement] and click the [Next] button.

The PhotoModeler KM software can be installed and used only if the contents are accepted. If not, it will neither be possible to install nor use the software.

#### **Note**

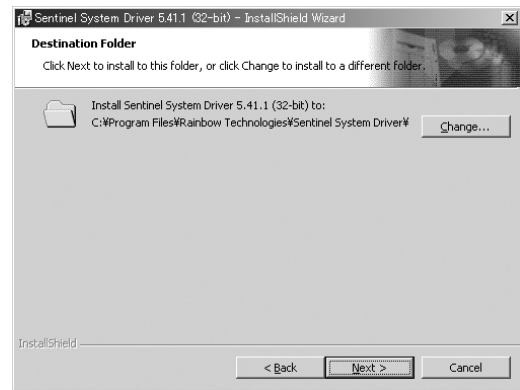
*It will be assumed when the driver is installed or used that the user has accepted the license agreement.*

If your acceptance is not given, the driver cannot be installed, so click the [Cancel] button to cancel installation.



## 7 A confirmation dialog box for the installation destination directory appears.

Check the contents and click the [Next] button.



## 8 A dialog box asking you to select the setup type will appear.

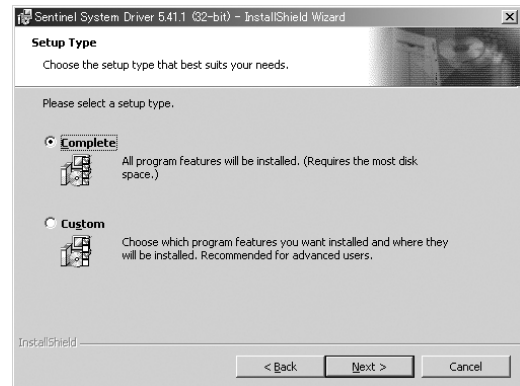
Select “Complete” or “Custom”, and click the [Next] button.

If “Complete” is selected, all the protect key drivers provided for PhotoModeler KM will be installed.

If “Custom” is selected, only the necessary drivers among “Parallel System Driver”, “USB System Driver” and “Sentinel System Driver” can be selected and installed.

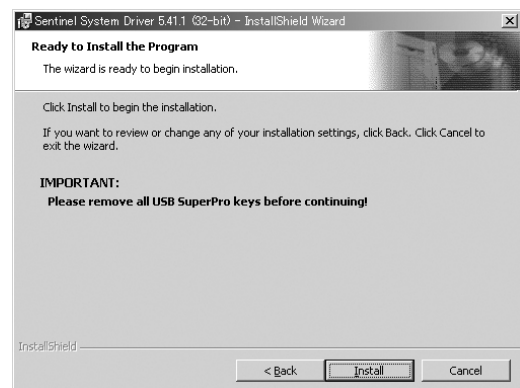
### Note

*Since a USB type protect key is supplied for PhotoModeler KM, make sure that “USB System Driver” is selected when selecting “Custom”.*



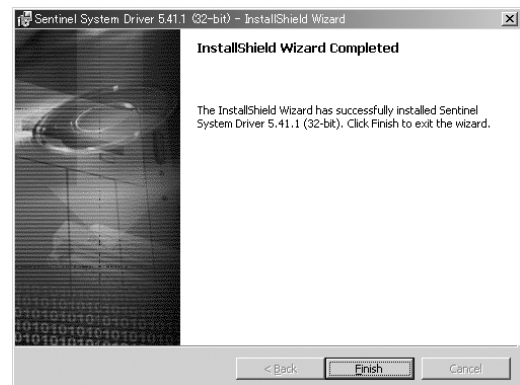
## 9 A dialog box informing you that installation is ready to start appears.

Check that the settings you made are correct, and click the [Install] button to start installation. Follow the instructions displayed on the screen to complete installation.



## 10 A dialog box appears to inform you that protect key driver installation is complete.

Click the [Finish] button.



# 11 A dialog box appears to inform you that entire installation of PhotoModeler KM is complete.

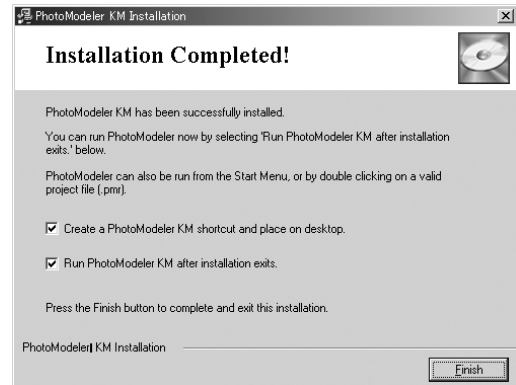
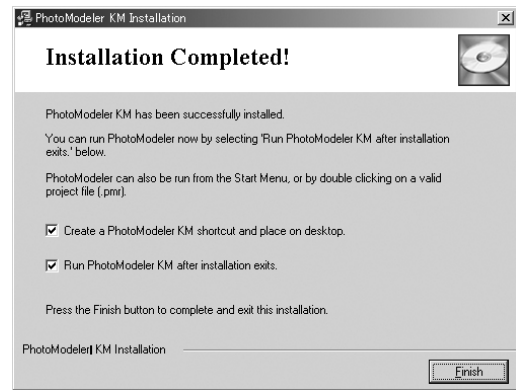
Uncheck [Run PhotoModeler KM after installation exists] checkbox, and then click the [Finish] button.

## Note

*If the [Finish] button is clicked without unchecking the [Run PhotoModeler KM after installation exists] checkbox, PhotoModeler KM will start immediately after the installation of the protect key driver. In this case, an error message “Hardware Lock Not Found on the Parallel or the USB Port. Aborting” will appear, since the protect key is not yet connected to a USB port at the time of completion of the protect key driver installation. So, click the [OK] button to exit PhotoModeler KM, attach the protect key to a USB port and then reboot the computer.*

## Ref.

For the starting method of PhotoModeler KM, refer to page 18 in this manual.







## 2. Operating the System

This section explains automatic registration method that uses this system.

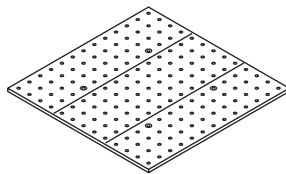
The following shows a sequence of operating procedures, from the “pre-process”, in which 3D coordinates are obtained, up to the “main-process”, where the data scanned by the VIVID 9i is registered automatically. The data used and data flow are also shown.

### Pre-Process

#### 1. Creation of calibration data (calibration parameters)



1) Take shots of the calibration chart using the digital camera.



2) Import the photo data to the computer.

Calculate by Photo-Modeler KM

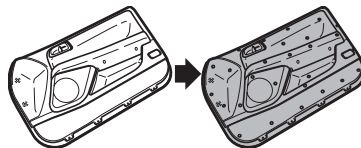


Calibration data

#### 2. Preparation of target object

1) Keep sufficient shooting space for the object.

2) Attach the reference marker to the object.



3) Set the code markers and scale bars in place.

#### 3. Acquisition of 3D coordinate data of the markers

1) Take shots of the markers attached to the object.



2) Obtain the 3D coordinate data of the markers.  
• Import the photo data to the computer.  
• Set parameters.

Calculate by Photo-Modeler KM

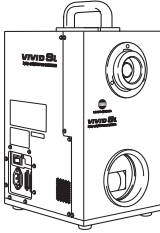


Obtain 3D coordinate data.  
3) Export the 3D coordinate data in CSV text format.

## Main-Process

### 1. Preparation for automatic registration

- 1) Prepare the VIVID 9i (e.g. required settings, warm-up, lens replacement, calibration).



- 2) Start PSC-1.



- 3) Import the 3D coordinate data (text file) of the reference markers.

### 2. Scanning the object

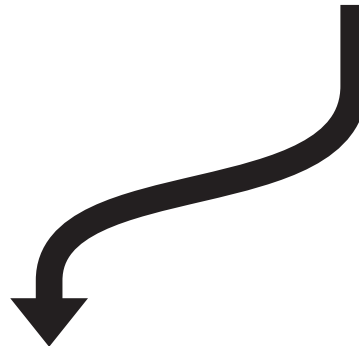
- 1) Scan the object by VIVID 9i.

### 3. Automatic registration and transfer to the Polygon Editing Tool

- 1) Store the scan data.  
Monitor the scan data in the Work window. If the scan data is satisfactory, store it. If not, scan the object again.

- 2) Store the registered scan data to the Polygon Editing Tool.  
The data is placed and displayed in the Polygon Editing Tool immediately when it is stored.

- 3) Save the scan data using the Polygon Editing Tool.



## 2-1. Pre-Process (Obtaining the 3D Coordinate Data from the Photo Data)

In the “pre-process”, photos of the markers on the object are taken by the digital camera, and the 3D coordinate data is obtained from the photo data. The photo data stored in the digital camera’s storage media (compact flash memory) can be imported to the computer, where it is processed using the photogrammetry software “Photo-Modeler KM” to obtain the 3D coordinate data of the reference markers, that will be required for the “main-process”.

### Pre-Process-1. Creation of Calibration Data (Calibration Parameters)

Take shots of the calibration chart using the digital camera to create calibration data (calibration parameters). This calibration data mainly consists of digital camera lens’s distortion, focusing distance and parameters used to correct the CCD principal position.

The calibration chart bears many reference markers that are attached at equal spacing horizontally and vertically, and four code markers near the center. By including the code markers in the target, the reference markers on the photo data taken from various angles can be cross-referenced. From the obtained 3D coordinate data and distance information, coefficients that match the actual 3D coordinate data and distance information are obtained. These coefficients will be used as the calibration data.

#### 1) Taking shots of the calibration chart using the digital camera

##### [Operating Procedure]

### 1 Keep sufficient space to take shots.

#### [Note]

*Shots of the calibration chart should be taken from four side directions.*

*The calibration chart is approx. 130 cm in both length and width, and space sufficient for the operators to take shots at a distance of approx. 2 m from the center of the chart must be provided.*

### 2 Assemble the calibration chart.

#### [Memo]

The calibration chart consists of three plates, and can be assembled.

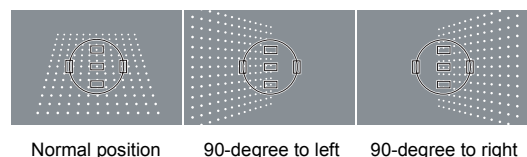
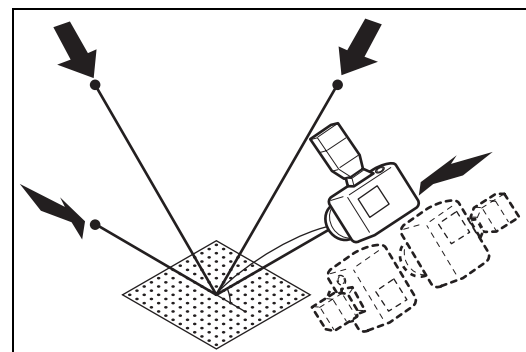
It can be assembled without using tools. For the assembly method, refer to page 9 in this manual.

### 3 Take shots of the calibration chart from the four side directions.

Three shots will be taken from each side direction (at normal position, at 90-degrees to right, and at 90-degrees to left), making a total of 12 shots.

#### [Note]

- *Shots must be taken inside a room.*
- *When holding the digital camera at the normal position, at 90-degrees to right, and 90-degrees to left, make sure that the reference marker on the chart is shown in the field angle as shown with the right figure.*
- *Make sure the calibration chart is placed on a plane background so that small shiny objects do not confuse the calibration marking.*
- *Ensure there is good coverage of the imaging CCD by all photos. Strive to ensure that when all 12 photos are complete that dots appear in every part of the imaging area across all photos.*



Normal position

90-degree to left

90-degree to right

## 2) Importing the photo data of the calibration chart to the computer

### [Operating Procedure]

- 1 Use a device like a media reader to import the calibration chart data from the digital camera's storage media (compact flash memory) to a directory on the computer's hard disk. For ease of use, place all the calibration photos into an initially empty disk directory.

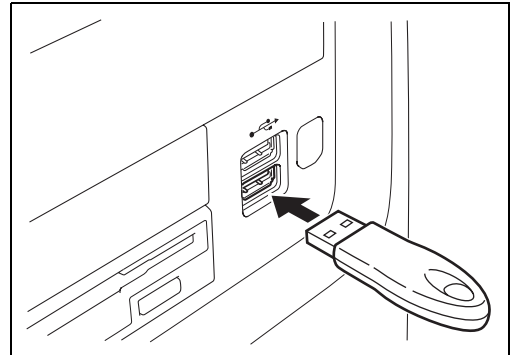
#### **Memo**

Instead of using a media reader, the digital camera can be connected to the computer directly to import the data from the digital camera. For details, refer to the digital camera's instruction manual.

## 2 Start PhotoModeler KM.

#### **Note**

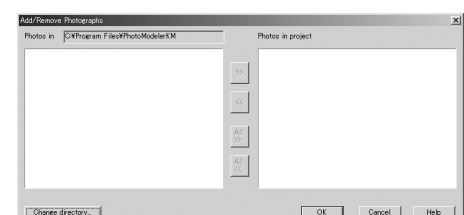
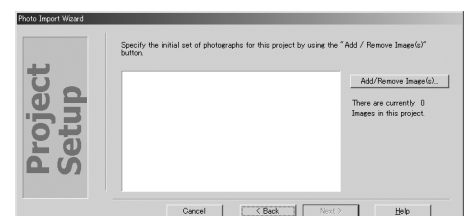
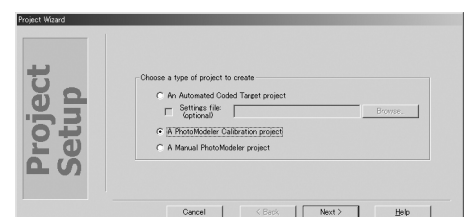
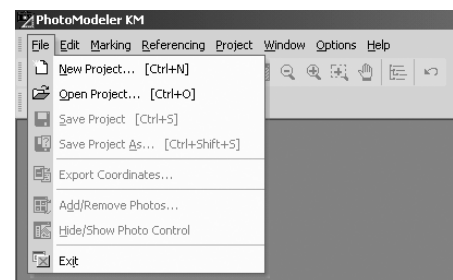
*"PhotoModeler KM" must be installed to your computer in advance. For the installation method, refer to page 10 in this manual.*



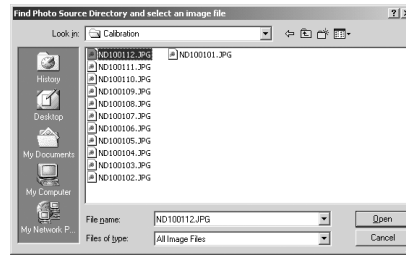
- 1) Make sure that the protect key is inserted into a USB port on the computer.
- 2) From the [Start] menu, select [Programs] - [PhotoModeler KM] and then select [PhotoModeler KM].

## 3 Import the photo data to PhotoModeler KM.

- 1) Select [New Project] from [File] menu.  
The [Project Wizard] dialog box will appear.
- 2) Select "A PhotoModeler Calibration project" as the project type and click the [Next] button.  
The [Project Import Wizard] dialog box will appear.
- 3) Click the [Add/Remove Image(s)] button.  
The [Add/Remove Photographs] dialog box will appear.  
Photo data stored in the directory (the directory that is designated by the initial setting) is displayed in the dialog box.
- 4) Click the [Change directory ...] button.

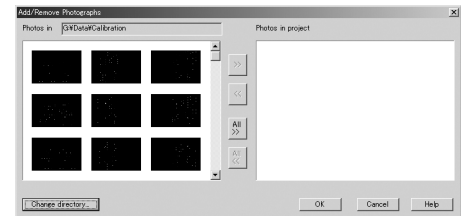


The [Find Photo Source Directory and Select an Image File] dialog box will appear.



- 5) Open the folder where the photo data obtained by the digital camera was stored at Step 1, and select one photo data and then click the [Open] button.

The [Add/Remove Photographs] dialog box will reappear, displaying all the photo data present in the same folder as the selected data in the left-side window.

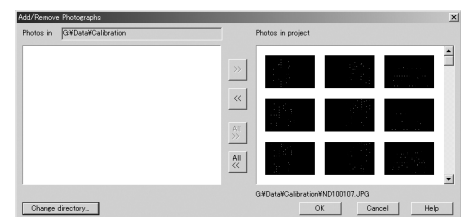


- 6) Add necessary photo data.

To add all the photos displayed in the left-side window, click the [All >>] button. All the photos will be added and displayed in the right-side window (Photos in project).

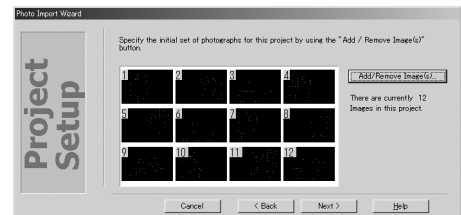
#### **Memo**

It is possible to individually select a photo displayed in the left- or right-side window (Photos in project) and click the [>>], [All >>], [<<] or [All <<] button to add/delete it.



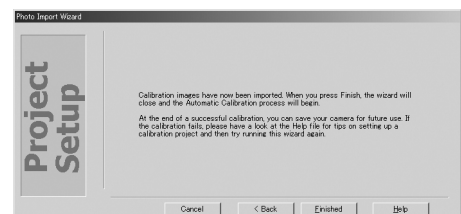
- 7) Check that the added photos are correct, and then click the [OK] button.

The added photo data images will be displayed in the [Project Import Wizard] dialog box.



- 8) Check that the photos are correct and click the [Next] button.

A message will appear inside the dialog box to indicate that some photos have been added to obtain calibration data.



- 9) Click the [Finished] button. Calculation of calibration data (calibration parameters) will start.

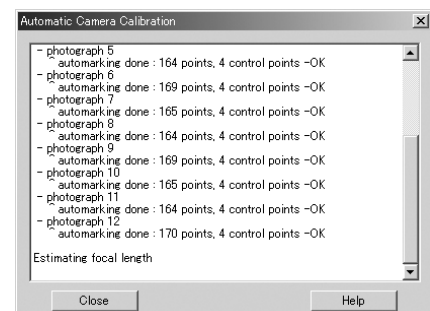
Calculation progress is indicated by four progress bars in the [Calibration Steps] dialog box.

#### **Memo**

To pause calculation, click the [Pause] button. To abort calculation, click the [Quit] button.



When calculation is complete successfully, calculation results will be displayed.



- 10) Click the [Close] button to close the report dialog box. The imported photo data images are displayed in the “Photos” area in the left side of the main window.

#### **[Memo]**

The images will not be displayed if the photo control function is not ON. To turn ON the photo control function, select [Show/hide photo control] from [File] menu.

#### **[Memo]**

Some photo data images displayed in the [Photos] area have a camera mark, and some have an “x” mark. A camera mark indicates that the image has been used for calculation of calibration data. An “x” mark indicates that the image has not been used for calculation of calibration data since the code markers were not recognized correctly.

#### **[Note]**

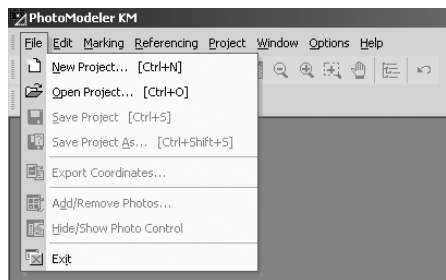
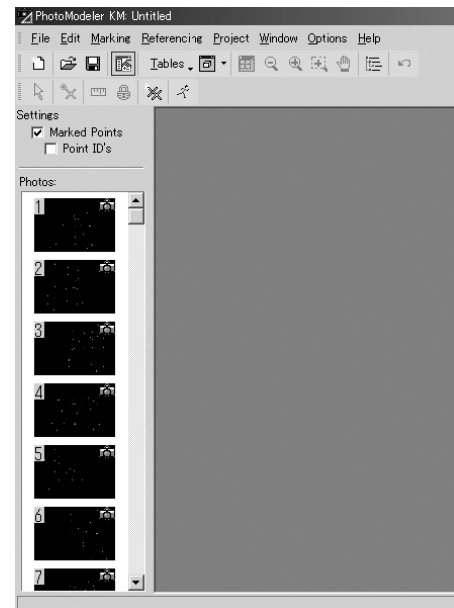
*If three or more photo data images have an “x” mark, right calibration may not be possible. Take shots of the calibration chart again and create calibration data again.*

- 11) Give a name to the obtained calibration data together with the photo data images used for calculation, and save them.

Select [Save As] from [File] menu to display the [Save Project As] dialog box. Select the directory in which you want to save the calibration data as a project, give an appropriate project name, and then click the [Save] button.

#### **[Note]**

*The calibration project must be saved for each sequence of operations, under the same file name in the same folder.*



## **Pre-Process-2. Preparation of the Target Object**

Now, you are ready to take shots of the target object. The purpose is to take shots of the reference markers attached to the object, and obtain the 3D coordinate position of each reference marker from the photo data. The method of installing the object and attaching the reference markers to the object as well as points to note when taking shots are explained below.

### **1) Reserving sufficient shooting space for the object**

Reserve sufficient space for taking shots of the object first and then position the object.

Basically, the same space reserved for the calibration chart is required. However, the space varies with the size of the object and how it is placed. The following spaces are required.

- Object space
- Scale bar installation space
- Photographer's working space

### **2) Attaching the markers to the object**

With this system, multiple 3D shape data scanned by the VIVID 9i are registered automatically in the main-process. What will be used for registration of the multiple 3D shape data are the 3D coordinate data of the reference markers attached to the object. So, when attaching the reference markers to the object, make sure that they are attached uniformly, not on certain areas only nor excessively scattered.

**Note**

The following points regarding the marker attachment areas must be observed when attaching the reference markers to the object.

- Attach them to gentle slopes on the object. Do not attach them to areas that bend or areas that change excessively. In addition, they should not be attached to areas on the extreme rear side or areas that can be seen from certain directions only.
- If the object is made of soft material that is easy to bend when it is relocated, sufficient space must be reserved so that affixing the reference markers, shooting the markers by the digital camera and scanning by VIVID 9i in the main-process can be carried out without relocating the object.

The reference markers have adhesive on their rear side. So they cannot be used on an object that is made of material that can be affected by adhesive or that cannot be affixed to the object with adhesive.

**Point:** The 3D coordinates of the reference markers are obtained by taking shots of the markers. This means that the points where the reference markers are attached will be the corresponding points to be used for automatic registration.

**Point:** In the main-process, the object is scanned by the VIVID 9i to perform automatic registration. For this, it is necessary that at least three reference markers (normally, five) are visible in the viewfinder of the VIVID 9i. In this case, the relationship between the distance from the VIVID 9i to the object and reference marker pitch shown in the table below will apply.

[Guideline for the distance from VIVID 9i to the object and reference marker pitch]

Distance from VIVID 9i	Reference marker pitch
600 mm	Approx. 100 mm
800 mm	Approx. 120 mm
1000 mm	Approx. 140 mm

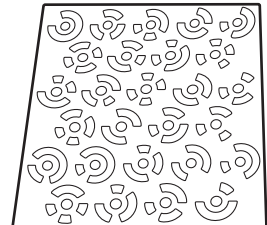
### 3) Location of code markers and scale bars

To obtain 3D coordinate data of the reference markers attached to the object using their photo data, code markers and scale bars are required as the reference.

#### What are Code Markers?

Code markers have their own ID number. Ring-shaped patterns are provided around reference markers to identify ID numbers. Like reference markers, code markers are supplied in the form of a sheet-formed seal, except that a different ID number is assigned to each sheet.

The role of the code markers is to provide the reference to establish a relationship among reference markers by allowing them to be included in the photo data of the reference markers taken from various directions and angles.

**Note**

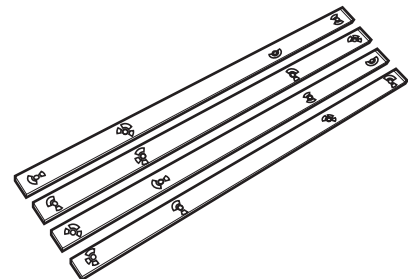
Do not use the same code markers for the same object. When using code markers, check their ID numbers to avoid duplication.

#### What are Scale Bars?

Four scale bars are supplied with this system. Scale bars are made of a material that is highly unlikely to change in length, and have two code markers on them as a pair to provide distance between the markers.

The role of the scale bars is to provide the reference scale information for the taken photo data.

It is necessary to include six or more code markers containing on the scale bars for each shot. The scale bars must be placed so that they enclose the object, with the object size and shape taken into account.





- Point: When taking shots of the object, the following rules regarding the reference markers must be observed. Each of them will be used as a condition required for calculation of 3D coordinates.
- Six or more code markers must be included for each shot.
  - At least three of the same code markers must be included in every photo data taken from various angles and directions.
- Point: Code markers are necessary when taking shots of the object, but not so in other processes. Therefore they can be attached to plates made of material that does not reflect black light, and then fixed to the object using double-sided adhesive tape. Doing so enables reuse of the code markers.

### **Pre-Process-3. Obtaining the 3D Coordinate Data of the Markers**

This section explains the method and procedure for taking shots of the object and obtaining 3D coordinate data of the markers based on the photo data. Before proceeding, make sure that the following have been completed.

- Calibration data has been created.
- Reference markers have been attached to the object appropriately.
- Code markers and scale bars have been placed appropriately.

#### **1) Take shots of the markers attached to the object**

Take shots of the object from various directions and angles while keeping a distance of approx. 2 m from the object.

#### **Note**

*Take care that the shape of the object remains unchanged when shooting with the digital camera and when scanning with the VIVID 9i. If the object is made of a material that bends or deforms when moved, consideration should be given to the installation site and working space to prevent the object from moving throughout the entire operation from the pre- to main-process.*

- Point: Take a sufficient number of shots (20 to 30 shots if the object is 1000 mm in each side), although the number varies with the object size and shape and how the object is placed.

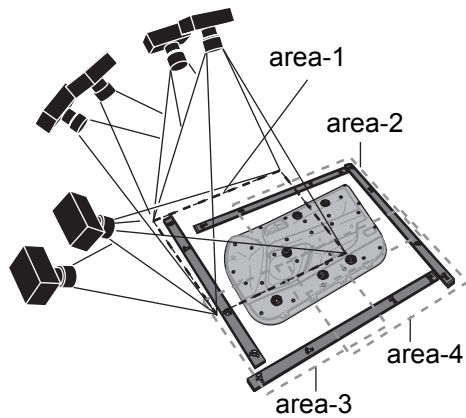


**[Shooting Imagings]**

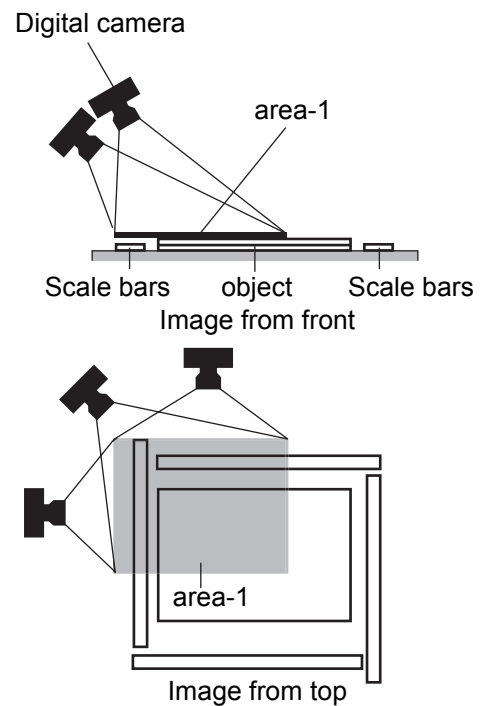
a. The object is placed on the ground horizontally.

- Take shots from outside directions and diagonally from four angles to fully cover the object and scalebars, at 30- and 45-degrees (6 shots per area, 24 shots in total).

Shooting example for area-1



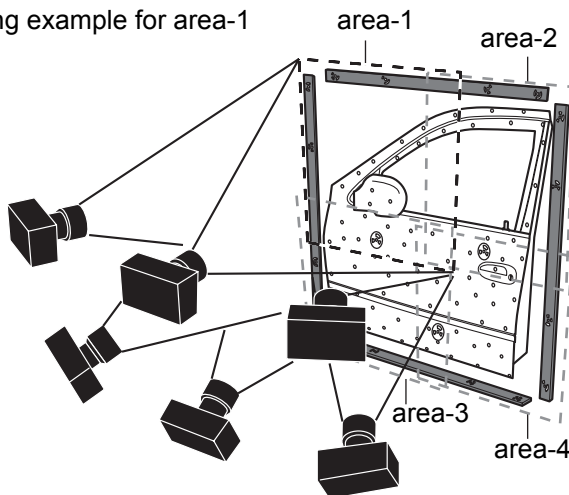
Shooting example for area-1



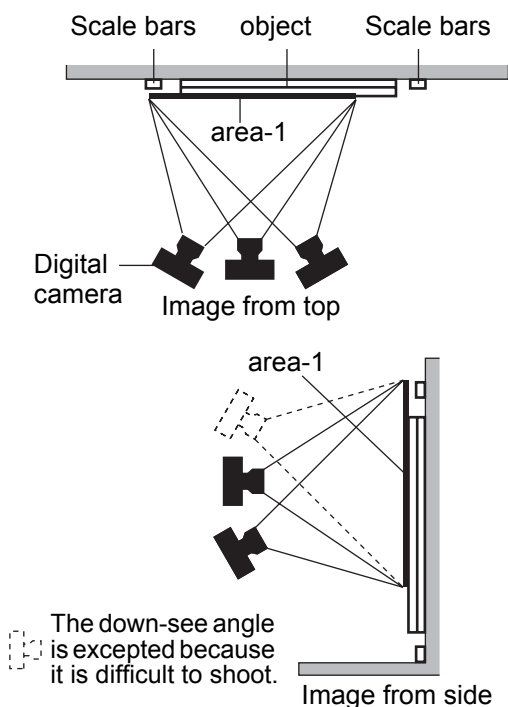
b. The object is learned against a wall or placed upright.

- Take shots from front, right side and left side from four angles to fully cover the object and scalebars, at 0- and 15-degrees (6 shots per area, 24 shots in total).

Shooting example for area-1



Shooting example for area-1



## 2) Obtain the 3D coordinates of the markers

Obtain the 3D coordinates of the markers using the photo data of the object and calibration data that has been prepared in advance.

### [Operating Procedure]

- 1 Use a device like a media reader to import the object's photo data from the digital camera's storage media (compact flash memory) to a directory on the computer's hard disk. Placing all photos from one projection in an initially empty directory makes the process easier later on.

#### [Memo]

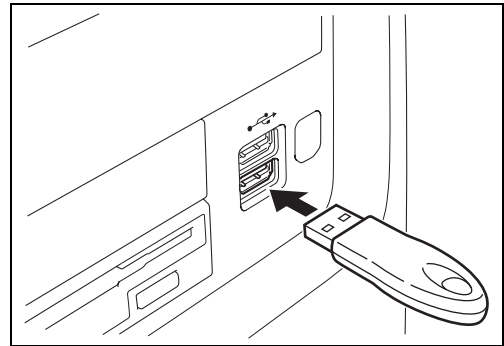
Instead of using a media reader, the digital camera can be connected to the computer directly to import the data from the digital camera. For details, refer to the digital camera's instruction manual.

## 2 Start PhotoModeler KM.

#### [Note]

*"PhotoModeler KM" must be installed to your computer in advance. For the installation method, refer to page 10 in this manual.*

- 1) Make sure that the protect key is inserted into a USB port on the computer.
- 2) From the [Start] menu, select [Programs] - [PhotoModeler KM] and then select [PhotoModeler KM].



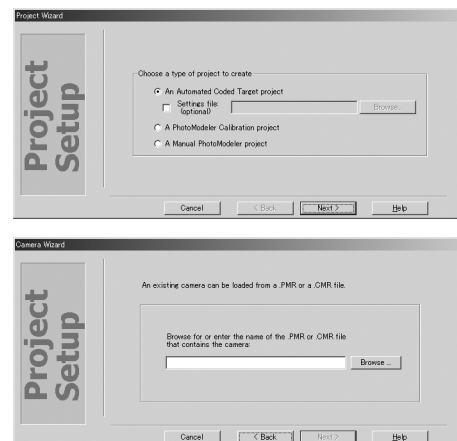
## 3 Set the conditions to obtain the 3D coordinates of the reference markers.

- 1) Select [New Project] from [File] menu.  
The [Project Wizard] dialog box will appear.
- 2) Select "An Automated Coded Target project" as the project type and click the [Next] button.  
The [Camera Wizard] dialog box will appear.

#### [Memo]

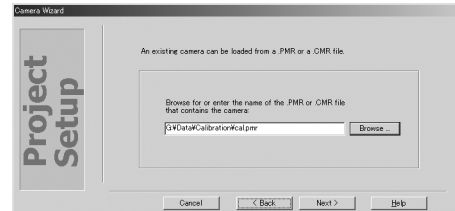
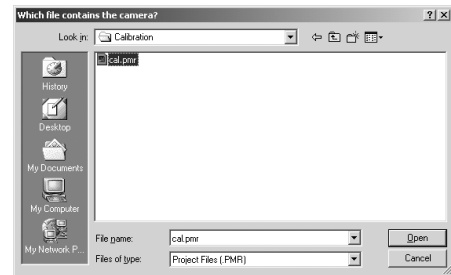
If a setting file already exists, it can be imported by checking the [Settings file] checkbox. If a setting file is imported, the subsequent condition setting procedures 10) to 11) can be skipped.

For the method of creating a setting file, refer to Step 12) on page 26 in this manual.



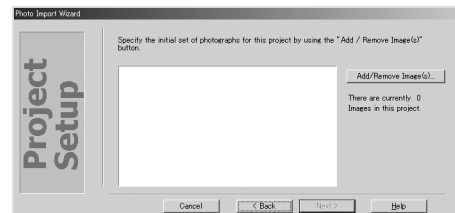
3) Select a calibration data file.

Click the [Browse...] button to display the file import dialog box. Select the directory where the calibration data project file is saved, select the desired setting file and click the [Open] button. The [Camera Wizard] dialog box will reappear.



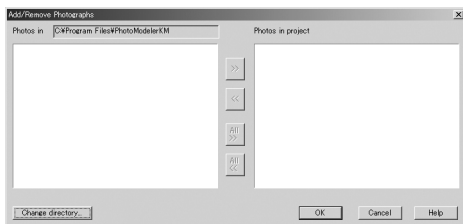
4) Make sure that the selected calibration data file is displayed together with its path name, and click the [Next] button.

The [Project Import Wizard] dialog box will appear.



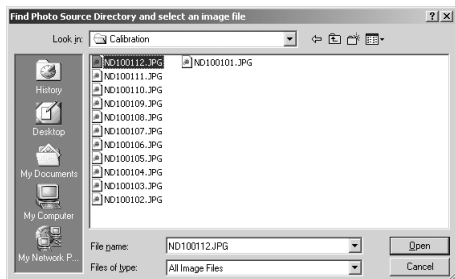
5) Click the [Add/Remove Image(s)] button.

The [Add/Remove Photographs] dialog box will appear. Photo data stored in the directory (the directory that is designated by the initial setting) is displayed in the dialog box.



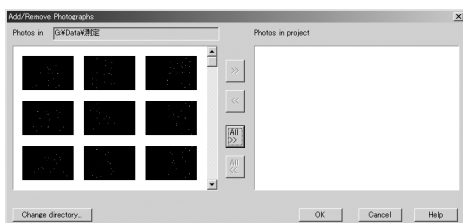
6) Click the [Change directory ...] button.

The [Find Photo Source Directory and Select an Image File] dialog box will appear.



7) Open the folder where the photo data obtained by the digital camera was stored at Step 1, and select one photo data and then click the [Open] button.

The [Add/Remove Photographs] dialog box will reappear, displaying all the photo data present in the same folder as the selected data in the left side of the window.



8) Add necessary photo data.

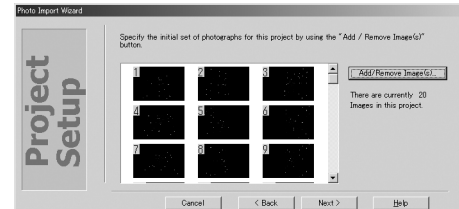
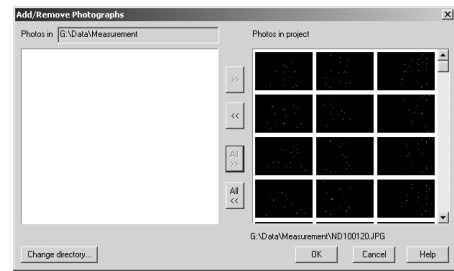
To add all the photos displayed in the left-side window, click the [All >>] button. All the photos will be added and displayed in the right-side window (Photos in project).

**[Memo]**

It is possible to individually select a photo displayed in the left- or right-side window (Photos in project) and click the [>], [All >>], [<<] or [All <<] button to add/delete it.

9) Check the added photos, and then click the [OK] button.

The added photo data images will be displayed in the [[Project Import Wizard] dialog box.



10) Check the photos and click the [Next] button.

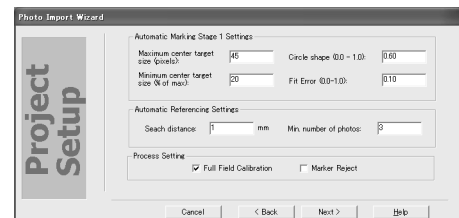
The currently set camera parameters will be displayed.

**[Memo]**

The settings displayed in the dialog box are the default value, not the settings made by the previous operation. Normally, they do not need to be changed, but they can be changed if necessary.

**[Ref.]**

For details of the settings, refer to Help of “PhotoModeler KM”.



Check the settings or change them if necessary, and click the [Next] button.

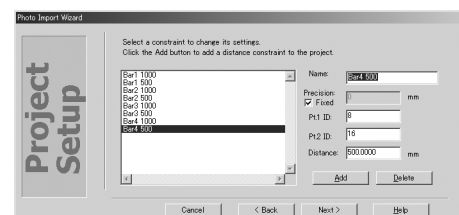
11) Now, enter scale bar parameters.

Enter preset parameters for the scale bars used for taking shots of the object. Select scale bars from the list one by one, and enter the preset settings in the edit boxes in the right side of the dialog box.

**[Memo]**

Settings must be made for every scale bar displayed in the list. Parameters are shown on the seal attached to the rear of each scale bar.

After all the parameters are entered, click the [Next] button.



**Seal sample**

1234567-1
②-⑩ 500.123
①-⑨ 1000.123

Serial number and number of scale bar

It means that the value “500.123” is set for the distance “500” between ID no. 2 and no. 10 on scalebar 1.

It means that the value “1000.123” is set for the distance “1000” between ID no. 1 and no. 9 on scalebar 1.

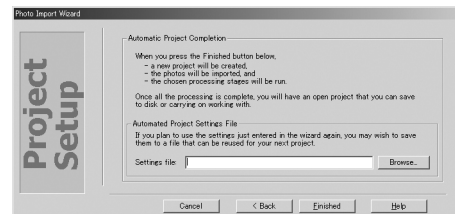
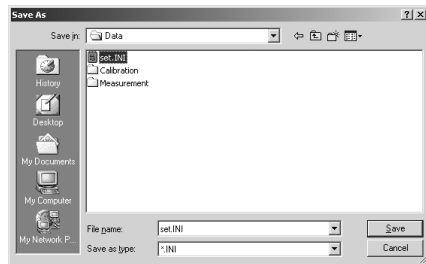
**Input value**

Name: Bar1 1000  
Precision: (Fixed)  
PT1 ID: 1  
PT2 ID: 9  
Distance: 1000.123

**Input value**

Name: Bar1 500  
Precision: (Fixed)  
PT1 ID: 2  
PT2 ID: 10  
Distance: 500.123

- 12) A message appears to inform you that it is ready to obtain the 3D coordinates of the markers.  
If you want to save the conditions (e.g. calibration data file, scale bar parameters) as a setting file, click the [Browse...] button, select a folder, specify a file name and save it.



## 4 Obtain the 3D coordinates of the markers.

- 1) Click the [Finished] button. Calculation of 3D coordinate data of the markers will start.  
Calculation progress is indicated by four progress bars in the [Automated Coded Target Project] dialog box.

### **Memo**

To pause calculation, click the [Pause] button. To abort calculation, click the [Quit] button.



When calculation is complete successfully, calculation results will be displayed.

- 2) Click the [Close] button to close the report dialog box.

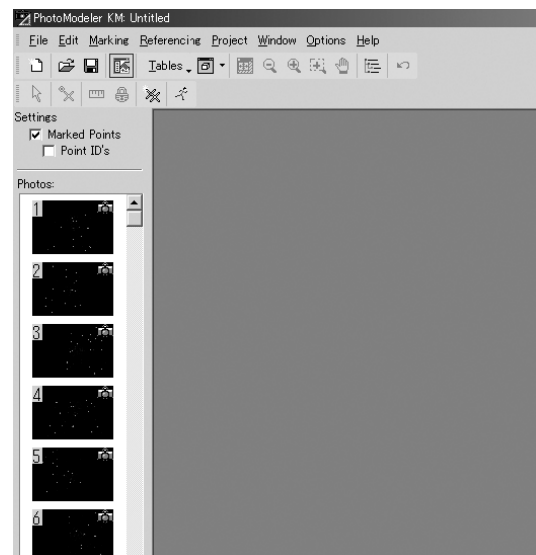
The imported photos are displayed in the “Photos” area in the left side of the main window.

### **Memo**

The photos will not be displayed if the photo control function is not ON. To turn ON the photo control function, select [Hide/Show Photo Control...] from [File] menu.

### **Memo**

Some photos displayed in the [Photos] area have a camera mark, and some have an “x” mark. A camera mark indicates that the photo has been used for calculation. An “x” mark indicates that the photo has not been used for calculation.

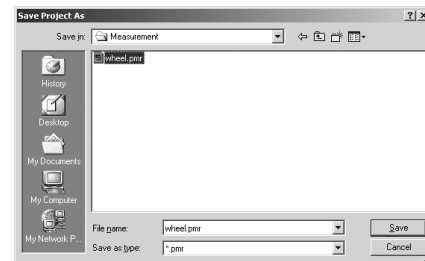
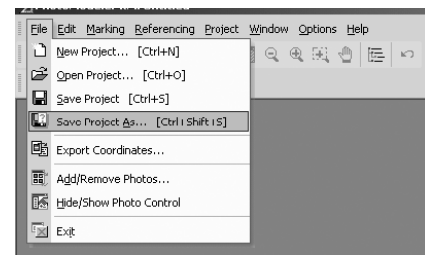


- 3) Give a name to the obtained 3D coordinate data of the markers together with the photo data images used for calculation, and save them.

Select [Save As] from [File] menu to display the [Save Project As] dialog box. Select the directory in which you want to save the data as a project, give an appropriate project name, and then click the [Save] button.

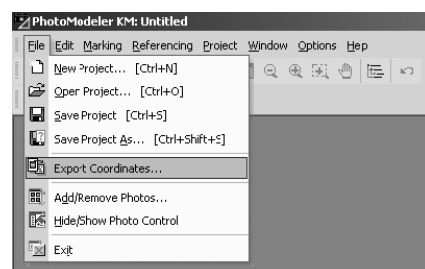
#### **Note**

*Do not give the same name as that of the calibration project file.*



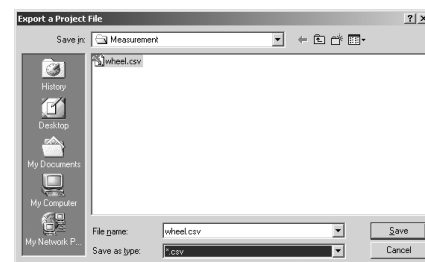
## 5 Export the obtained 3D coordinate data of the markers as a text file that can be handled by the PSC-1 Tool in the main-process.

- 1) Select [Export Coordinates] from [File] menu.  
The [Export a Project File] dialog box will appear.



- 2) Specify the directory to which the file is to be saved, specify the file name, then click the [Save] button.

The text file will be saved in "CSV" format that can then be imported to the PSC-1 Tool used in the main-process.



## 6 When all the steps are complete, exit PhotoModeler KM.

- 1) Select [Exit] from [File] menu.  
If there are projects that have not been saved, a message asking you whether to exit PhotoModeler KM without saving the projects will appear.  
To exit without saving the projects, click the [OK] button. To save them, click the [Cancel] button to return to the previous window, and then save them according to Step 4-3).

## 2-2. Main-Process (Automatic Registration of Data Scanned by VIVID 9i)

The “main-process” performs registration of the scan data of the object obtained by the VIVID 9i, by using the 3D coordinate data of the reference markers obtained in the “pre-process”. The 3D coordinate data of the reference markers is imported to the PSC-1 Tool of the Polygon Editing Tool, and compared with the data scanned by the VIVID 9i to confirm the 3D coordinate data of each part of the object. This enables automatic registration.

### Main-Process-1. Importing the 3D Coordinate Data of the Markers

Import the 3D coordinate data of the markers obtained in the “pre-process” to make preparation for automatic registration to be carried out when scanning the object by the VIVID 9i.

#### [Memo]

- Automatic registration is performed by the PSC-1 Tool of the Polygon Editing Tool.
- Before starting PSC-1, it is necessary ready the VIVID 9i for operation and obtain a license code for PSC-1 Tool.

#### 1) Prepare the VIVID 9i

Prepare to scan the object using the VIVID 9i. Perform necessary steps as explained below.

For operation of VIVID 9i, refer to the VIVID 9i Instruction Manual.

#### [Operating Procedure]

### 1 Place the VIVID 9i so that it faces the object.

For automatic registration of 3D shape data using this system and PSC-1 Tool, it is assumed that scanning is performed at a distance of 600 to 1000 mm by the VIVID 9i equipped with the middle lens. If necessary, use a tripod to place the VIVID 9i so that the distance to the center of the areas to be scanned is approximately 600 to 1000 mm.

#### [Note]

*Proper measurement will be impossible if the VIVID 9i moves or vibrates during scan. So when using a tripod, a tripod attachment must be used to place the VIVID 9i on a stable surface.*

### 2 Connect the VIVID 9i to the computer and turn ON the power.

To use the PSC-1 Tool, the VIVID 9i must be connected to the computer correctly. Connect the VIVID 9i to the computer with the SCSI cable, and make sure that the computer recognizes the VIVID 9i correctly.

#### [Note]

*Before connecting them, make sure that they are turned OFF. When turning them ON, make sure that the VIVID 9i is turned ON before the computer.*

#### [Memo]

Before using the VIVID 9i, it must be warmed up for approximately 10 minutes after it is turned ON.

### 3 Replace the lens with the middle lens.

For automatic registration of 3D shape data using this system and PSC-1 Tool, it is assumed that scanning is performed at a distance range from 600 to 1000 mm by the VIVID 9i equipped with the middle lens.

#### [Memo]

The lens can be replaced regardless of whether the VIVID 9i is ON or OFF. If the lens is replaced, make sure that it is calibrated using the user calibration system.

## 2) Start PSC-1

[Ref.]

For the operating method of VIVID 9i and Polygon Editing Tool, refer to their own instruction manuals.

### [Operating Procedure]

## 1 Connect the VIVID 9i to the computer and turn ON the power.

[Note]

*PSC-1 Tool cannot be used unless the VIVID 9i is connected correctly. In addition, the PSC-1 Tool needs the middle lens to be used among the three types of lens provided by the VIVID 9i (tele, middle, wide), so if a lens other than the middle lens is attached, replace it with the middle lens.*

## 2 Start the Polygon Editing Tool.

From the [Start] menu, select [Programs] - [KONICA MINOLTA] and then select [Polygon Editing Tool Ver.2.\*\*].

## 3 Select “VIVID 9i” as the digitizer to be used.

From [File] menu, select [Select Digitizer], and select “VIVID 9i” from the pull-down list in the dialog box that appears.

[Note]

*PSC-1 Tool is designed solely for the VIVID 9i. It cannot be used with any models other than the VIVID 9i.*

## 4 Start PSC-1.

From [File] menu, select [Import] - [Digitizer] - [PSC-1]. The license certification dialog box will appear, so enter the correct license code and click the [OK] button.

[Note]

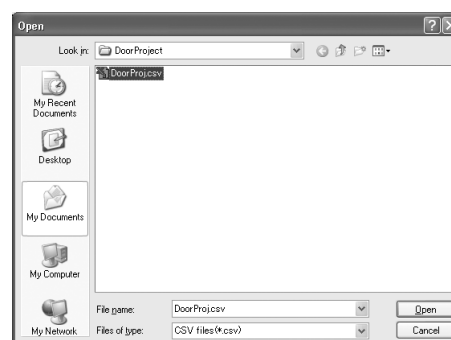
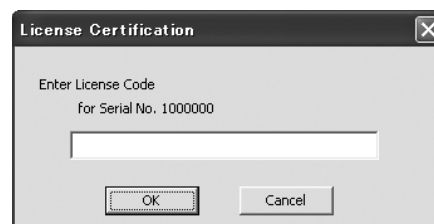
*The license code is a combination of alphanumeric characters provided according to the serial number of the VIVID 9i. So, enter the license code corresponding to the serial number of the VIVID 9i. License codes for wrong serial numbers cannot be used.*

*If the [OK] button is clicked after a wrong license code is entered or none is entered, a message informing you that the license code is incorrect will appear. If you click the [OK] button now, the PSC-1 Tool will not start and the dialog box will close.*

When license authentication is complete, the PSC-1 Tool will start and a dialog box to import the 3D coordinate data of the reference markers will appear.

[Memo]

In Polygon Editing Tool Ver.2.02 or higher, it is not necessary to obtain and input a license code to use PSC-1 Tool. The license for use of PSC-1 Tool is licensed by the purchase of Photogrammetry System PSC-1. In this case, when selecting [Import] - [Digitizer] - [PSC-1] from [File] menu, a dialog box to import the 3D coordinate data of reference markers will appear.



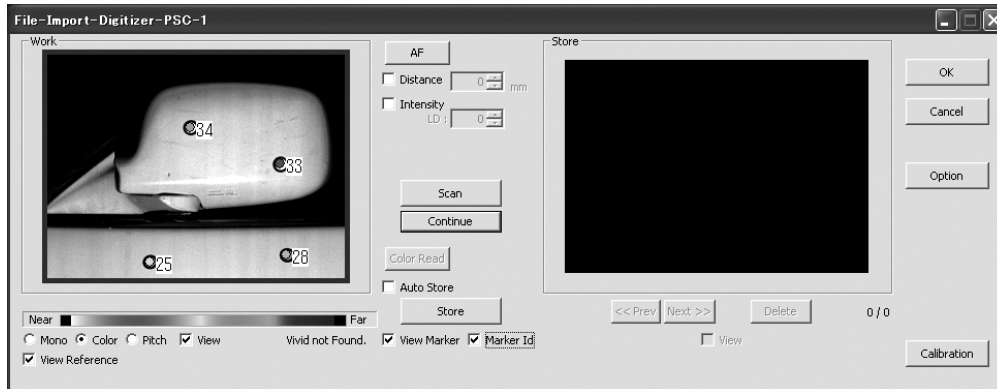


### 3) Import the 3D coordinate data of the markers

#### [Operating Procedure]

- 1** Select the text file of 3D coordinate data of the markers exported in CSV format at the end of the pre-process, and click the [Open] button.

The selected data will be imported, and the [PSC-1] dialog box will appear.



## Main-Process-2. Scanning the Object by VIVID 9i

Scan the object using the VIVID 9i to obtain the 3D shape data of the object.



Since the reference markers used to obtain the 3D coordinate data of the object are attached to the object, they will also be imported as the same location information to the 3D shape data obtained by the VIVID 9i.

In the final step, the location information on the 3D shape data is compared/cross-referenced with the reference marker 3D coordinate obtained in the “pre-process”, to enable automatic registration.

### 1) Scan the object by the VIVID 9i

Scan the object by the VIVID 9i. Scan can be performed via the PSC-1 Tool of the Polygon Editing Tool ([File – Import – Digitizer – PSC-1] dialog box). Before starting scan, it is necessary to import the 3D coordinate data of the markers obtained in the “pre-process”. The data can be selected in the [Open] dialog box that appears at the end of license authentication following start of the PSC-1 Tool. For details, refer to “Main-Process-1. Importing the 3D Coordinate Data of the Markers” on page 29 in this manual.

### ! WARNING

-  Never stare into the laser emitting window.
-  Do not place a lens, mirror or optical element in the path of the laser beam. Doing so may converge the laser beam, resulting in damage to your eyes, burns or fire. To prevent the above accidents, make sure that a wall or similar object which can block the laser beam is located behind the object.

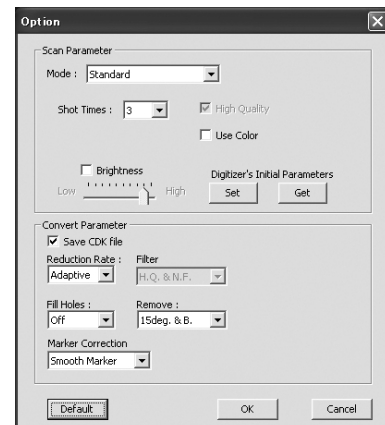
## [Operating Procedure]

### 1

#### Set parameters necessary to perform scan.

Click the [Option] button in the [File – Import – Digitizer – PSC-1] dialog box that appears at the end of import of the 3D coordinate data of the markers. The parameter changes will be set, the dialog box will close, and the previous window will reappear. To cancel the parameter changes and return to the previous window, click the [Cancel] button.

If the [Default] button is clicked, the default parameter settings will be restored, but the dialog box will remain open. So, click the [OK] or [Cancel] button to close the dialog box.



### [Ref.]

For details of the parameters, refer to page 37, in this manual.

### [Note]

*The default parameter settings that are restored when the [Default] button is clicked are the optimum settings for the PSC-1 system.*

### [Memo]

Set the “ReduceRate” of Convert parameter to “Adaptive” preferably.

It can be reduced the amount of main memory of the computer compared with “1/1” settings.

## 2 Turn ON the [Mono] radio button, and turn the VIVID 9i to obtain the best view angle while observing the monitor image.

Adjust the position of the VIVID 9i while viewing the monitor image so that approximately five reference markers are present in the image.

### **Note**

*At least three reference markers must be present inside the monitor image.*

## 3 Scan the object by the VIVID 9i.

Click the [Scan] button. Scan will start and 3D shape data of the object is obtained. At the same time, the reference markers are detected automatically, and displayed in the Work window (left-side of the dialog box).

### **Memo**

Since ID Nos. have been assigned to the automatically detected reference markers, they will be displayed. These ID numbers are those assigned to the reference markers by PhotoModeler KM in the pre-process.

### **Memo**

Registration status of the 3D shape data is judged, and the result is displayed as the frame color of the Work window. Three colors are available: blue indicates that registration is successful, red indicates that registration is not successful, and gray indicates that there are only two or less recognizable markers in the scan data.

### **Memo**

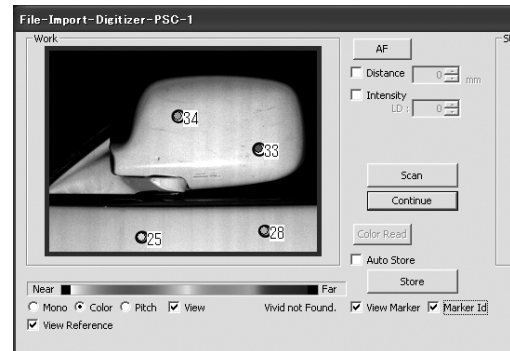
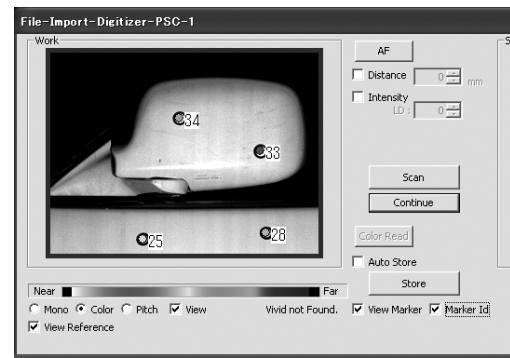
In the color image, areas that have no data are displayed in black.

### **Memo**

If the [Auto Store] checkbox above the [Store] button is checked, a series of operations from scan to “Store” (registration to the Polygon Editing Tool) will be carried out automatically if the registration judgement result is satisfactory.

### **Note**

*The red or gray Work window frame indicates that the scan data is not suitable for registration. In this case, change the view angle of the VIVID 9i and scan the object again.*



## Main-Process-3. Registering the Scan Data to the Polygon Editing Tool

### 1) Store the scan data

#### [Operating Procedure]

#### 1 Click the [Store] button in the [PSC-1] dialog box to register the registration data to the Polygon Editing Tool.

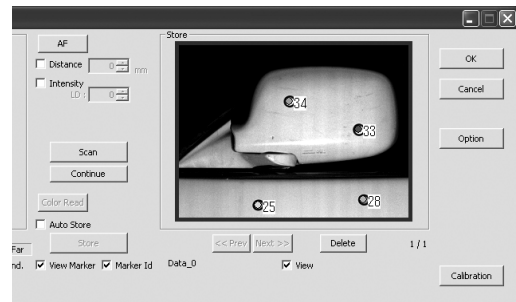
Check that the Work window frame is blue (i.e. acceptable result) and click the [Store] button. The scanned 3D shape data will appear in the Store window.

##### [Memo]

If the [Store] button is clicked, the scan data will be registered to the Polygon Editing Tool. If there are stored scan data, the [<<Prev], [Next>>] and [Delete] buttons located below the Store window will be active. The registered data can be reviewed or deleted when necessary.

##### [Memo]

If the [Auto Store] checkbox above the [Store] button is checked, a series of operations from up to registration to the Polygon Editing Tool will be carried out automatically if the judgement result for the scan data made at Step 2 in Main-Process-2 is satisfactory.



#### 2 Repeat steps 2-4) (Main-process-2) to 1-1) (Main-process-2) to perform necessary scans.

#### 3 When all the scans are complete, click the [OK] button to close the [PSC-1] dialog box.

### 2) About registration of registration data to the Polygon Editing Tool

When the [Store] button in the [PSC-1] dialog box is clicked, the scan data obtained by the VIVID 9i is registered to the Polygon Editing Tool.

To exit the PSC-1 Tool, click the [OK] button. If the [Cancel] button is clicked, all the registration data registered to the Polygon Editing Tool will be discarded, and the PSC-1 Tool will be exited.

### 3) Save the registration data

Storing the scan data in the PSC-1 dialog box just registers it into the memory of the Polygon Editing Tool. To save it as a file, it must be saved under a Polygon Editing Tool data name.

##### [Memo]

If the [Save CDK file] checkbox in the [Option] dialog box (page 37 in this manual) is checked, the data will be saved automatically as the data of the Polygon Editing Tool when the [OK] button in the [File – Import – Digitizer – PSC-1] dialog box is clicked to close the dialog box.

##### [Ref.]

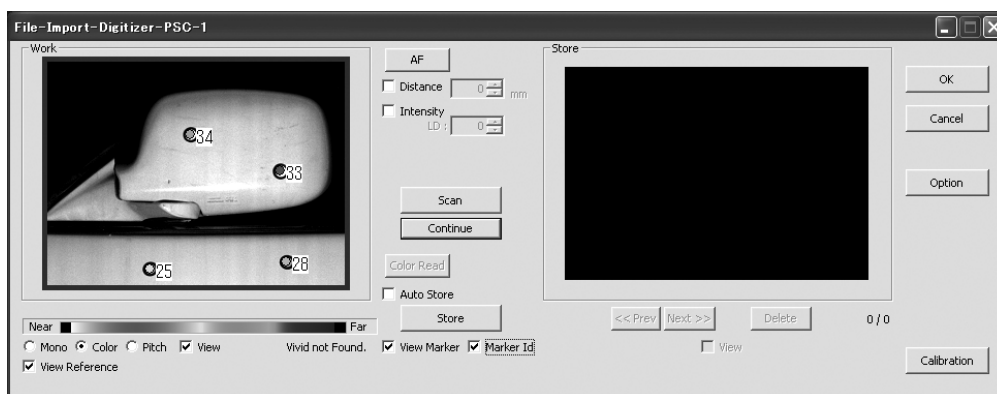
For details on saving scan data using the Polygon Editing Tool software, refer to the Polygon Editing Tool Instruction Manual.

## 2-3. Additional Information on PSC-1 Tool

This section explains parameters used in dialog boxes of the PSC-1 Tool, that performs automatic registration using the 3D coordinate data of the reference markers attached to the object and scan data obtained by the VIVID 9i, and also explains how to obtain a license.

### 2-3-1. Parameters for Dialog Boxes

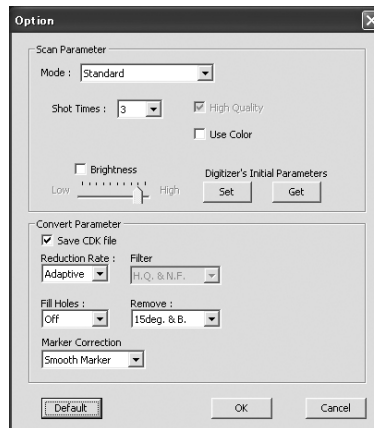
#### 1) [File – Import – Digitizer – PSC-1] Dialog Box and Its Parameters



Item	Explanation						
AF	Executes auto-focus. This parameter is enabled only when VIVID 9i is connected.						
Distance	<p>Checking this item enables distance setting.</p> <table border="1"> <thead> <tr> <th>Mode</th><th>Distance (mm)</th></tr> </thead> <tbody> <tr> <td>Standard</td><td>600 to 1000</td></tr> <tr> <td>Extend/User</td><td>500 to 2500</td></tr> </tbody> </table>	Mode	Distance (mm)	Standard	600 to 1000	Extend/User	500 to 2500
Mode	Distance (mm)						
Standard	600 to 1000						
Extend/User	500 to 2500						
Intensity	Checking this item enables LD setting. (0 - 255)						
Scan	<p>Performs a series of operations, starting from data scanning to marker recognition and registration.</p> <p>When this command is executed, a Good/NoGood judgment for registration data is made, and the result is displayed as the frame color of the Work window.</p> <ul style="list-style-type: none"> <li>• Blue: Measured data is appropriate for registration.</li> <li>• Red: Measured data is not appropriate for registration.</li> <li>• Gray: Failed to recognize three or more markers.</li> </ul> <p><b>[Memo]</b> This parameter is enabled only when VIVID 9i is connected.</p>						
ImportCDK	<p>Imports the saved CDK data. The markers are re-recognized during import to perform registration. A Good/NoGood judgment for registration data is also made, and the result is displayed as the frame color of the Work window.</p> <p>The name of this button will switch to “Continue” when this command is executed. Use of the [Continue] button allows you to import more data. When there is no more data, the name of the button will return to “Import CDK”.</p>						
Color Real	Clicking this button at the end of scan will take a color shot and display the updated color image. This button will be effective at the end of scan.						
Auto Store	<p>If this checkbox is checked, the data that causes the frame color of the Work window to turn blue will be stored automatically.</p> <p><b>[Memo]</b> The checkbox is not checked at start-up of this command.</p>						
Store	Registers the data shown in the Work window. The registered data is displayed in the Store window.						
View Marker	Shows/hides the markers in the Work and Store windows.						
Market ID	Shows/hides the marker IDs in the Work and Store windows.						

Item		Explanation
Mono/Color/Pitch		Switches display mode for the data currently displayed in the Work window.
	Mono	Displays the VIVID 9i monitor image in black and white.
	Color	Displays a color image of the scan data. <b>[Memo]</b> The data is displayed in black and white if the [User Color] checkbox in the [Option] dialog box is not checked.
	Pitch	Displays the distance data of the scan data using a contour image.
View (under the Work window)		Shows/hides the polygons of the data shown in the Work window.
View Reference		Shows/hides the 3D marker positions created by PhotoModelerKM.
Prev/Next		Switches from one stored data to another.
	Prev	Displays the previous data.
	Next	Displays the next data.
Delete		Deletes the stored data currently displayed in the Store window.
View (under the Store window)		Shows/hides the polygons of the data shown in the Store window.
OK		Stores the registered data and exits the PSC-1 Tool. <b>[Memo]</b> If the [Save CDK file] checkbox in the [Option] dialog box is checked, file save will also be performed.
Cancel		Discards the registered data and exits the PSC-1 Tool.
Option		Displays the [Option] dialog box. This dialog box allows you to set parameters for measurement.
Calibration		Executes the Calibration command and calibrates the VIVID 9i. Have the Field Calibration System ready. <b>[Ref.]</b> For details on the calibration procedure, refer to the VIVID 9i Instruction Manual.

## 2) Parameters for [Option] Dialog Box



Item		Explanation
Scan Parameter		
Mode		<ul style="list-style-type: none"> <li>• Standard: The Filter settings are fixed to H.Q. &amp; N.F. The settable distance range is from 600 to 1,000 mm.</li> <li>• Extend: The Filter settings are fixed to Noise Filter (N.F.). The settable distance range is from 500 to 2,500 mm.</li> <li>• User: The Filter settings can be user-defined. The settable distance range is from 500 to 2,500 mm.</li> </ul>
Number of Scans		Sets the number of shots to expand the dynamic range. Increasing the number of shots reduces data loss.
High Quality		Checking this checkbox displays low-reliability data. During display of the distance image (i.e. the [Pitch] radio button is ON), areas with excessively high laser power are displayed in light gray, and those with excessively low laser power are displayed in dark gray.
Use Color		Checking this checkbox takes a color shot when a scan is made.
	Log	Performs log correction for the color data if this checkbox is checked. This correction is used to make neutral colors brighter.
	Dark	Performs dark correction for the color data if this checkbox is checked. This correction is used when lines are noticeable in the color image.
Brightness		Checking this checkbox enables you to set the brightness of the image.
Digitizer's Initial Parameters		
	Set	Sets the displayed scan parameter settings to the VIVID 9i scan settings.
	Get	Imports the VIVID 9i scan settings to the scan parameter settings.
Convert Parameter		
Save CDK file		Checking this checkbox saves the registered data to the CDK file when the [OK] button in the [File – Import – Digitizer – PSC-1] dialog box is clicked to exit it.
Reduction Rate		Used to select the number of data points to be read from “1/1”, “1/4”, “1/9”, “1/16” and “Adaptive”.
Filter		<ul style="list-style-type: none"> <li>• None: Performs no correction for points when reading data. This can be set for User mode only.</li> <li>• Noise Filter (N.F.): Reduces noise in points when reading data.</li> <li>• High Quality (H.Q.): Deletes low-reliability data when reading data.</li> <li>• H.Q. &amp; N.F.: Reduces noise in points and deletes low-reliability data when reading data.</li> </ul>
	Fill Holes	If “ON” is selected, points are generated in the holes that were produced due to missing data so that the holes are filled.

Item	Explanation
Remove	Select the data to be deleted when reading data. <ul style="list-style-type: none"> <li>• None: Outputs the data without performing specific processing.</li> <li>• Boundary (B.): Outputs the data after deleting boundary points.</li> <li>• 5deg &amp; B./10deg &amp; B./15deg. &amp; B./20deg &amp; B.: Outputs the data after deleting the points present inside and at the boundary of the polygons that are angled within approximately 5, 10, 15 and 20 degrees to the vector of the line of view.</li> </ul>
Marker Correction	Corrects the marker areas of the measured data. <ul style="list-style-type: none"> <li>• None: No correction</li> <li>• Delete Marker: Converts the marker areas to holes.</li> <li>• Smooth Marker: Corrects the marker areas and then smoothes them.</li> </ul>
Default	Restores the default parameter settings.
OK	Closes the [Option] dialog box. The settings will be set.
Cancel	Closes the [Option] dialog box. The settings will be cancelled.

### 2-3-2. License registration (obtaining a license code)

The program for the PSC-1 Tool is built into the Polygon Editing Tool (Ver.2.01 or higher). However, before installing or using it, it is necessary to apply for license registration and obtain a license code.

For license registration, complete the necessary fields in the “License Registration Form” supplied with the product and send it by facsimile (the facsimile number is given on the form).

#### **Memo**

In Polygon Editing Tool Ver.2.02 or higher, the license for use of PSC-1 Tool is licensed by the purchase of Photogrammetry System PSC-1. It is not necessary to obtain and input a license code to use PSC-1 Tool.



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## 3. Explanation of PhotoModeler KM Work Menus

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PhotoModeler KM is a part of the photogrammetry system PSC-1, that utilizes photogrammetry, and is used in the pre-process where 3D coordinate data of the reference markers attached to the object are obtained. The 3D coordinate data plays the core role in automatic registration carried by the system.

This section describes each work menu displayed in the PhotoModeler KM to provide an explanation of the functions of PhotoModeler KM and windows that are displayed.

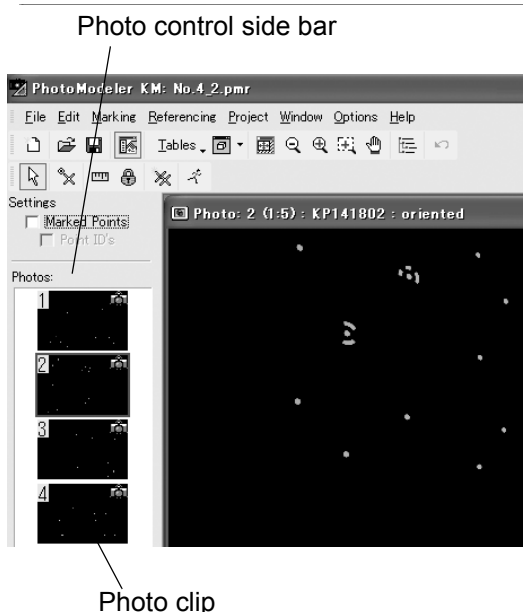
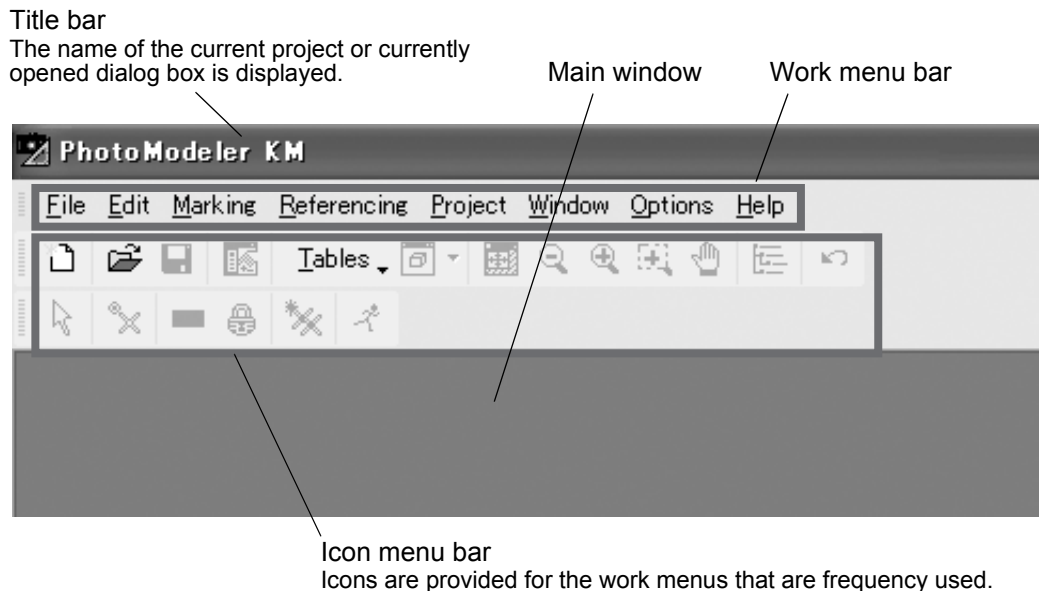
**[Ref.]**

For detail, please refer to HELP of PhotoModeler KM.

### Main Window

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The main window appears first when PhotoModeler KM is started up. Dialog boxes and windows that appear when menus are selected from the work menu bar are basically displayed in this main screen.



The photo control side bar can be displayed in the left side of the main window. To show/hide the photo control side bar, select [Hide/Show Photo Control...] from [File] menu.

On the photo control side bar, thumbnail images of photos (it is called “photo chips”) are displayed. Double-clicking on the “photo chip”, the photo is opened and displayed in the window frame.

**[Note]**

*Open the large number of photos at same time, there is possibility that the system is freezed or hanged up.*

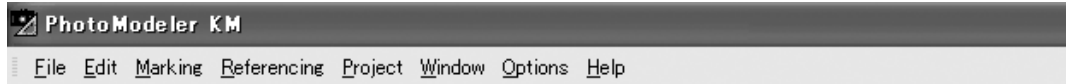
Only the work menus and icon menus that can be used currently are active, and the other menus will be inactive (displayed in gray).

With some windows, information regarding the currently displayed data (e.g. the number of selected points, distance information) may be displayed in icon menu space.

## Work menu bar

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Operations available by PhotoModeler KM are performed directly by selecting a menu from this work menu bar, or performed from the dialog box that appears when a menu is selected. Among submenus of work menus, only those for the currently usable functions and operations are active, and the other submenus are inactive (displayed in gray).



### [File] menu

This menu provides operations that are mainly carried out for projects, files and data.

### [Edit] menu

This menu provides operations mainly regarding data handling such as data editing. It also includes submenus regarding display of data currently in progress.

### [Marking] menu

This menu provides operations to detect markers in photo data imported to PhotoModeler KM.

### [Referencing] menu

This menu provides operations regarding referencing of markers detected from photo data.

### [Project] menu

This is the main work menu of the PhotoModeler KM. It is used for calculating 3D coordinates of markers and displaying the results.

### [Window] menu

This menu provides window display related operations.

### [Options] menu

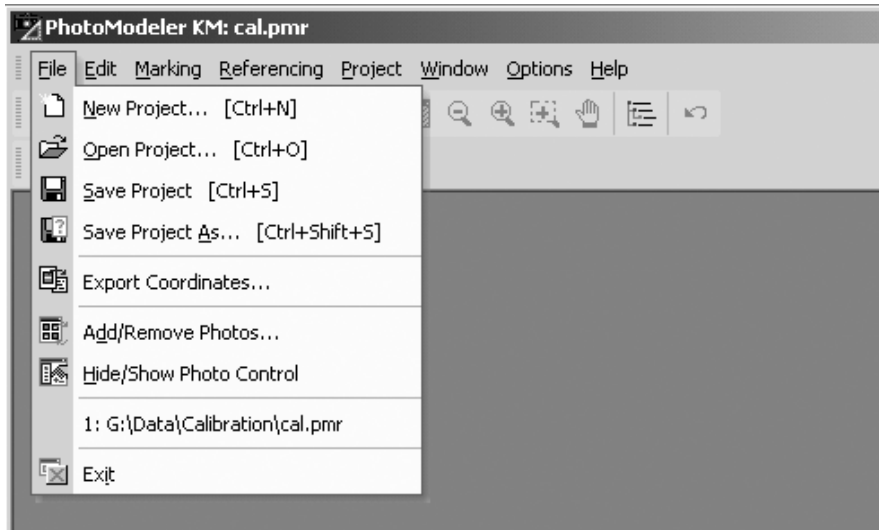
This menu provides operations regarding PhotoModeler KM parameter settings. It allows you to change the toolbar (icon menu bar) items and set shortcut keys.

### [Help] menu

This menu provides operations regarding display of information about the PhotoModeler KM. PhotoModeler KM operating methods, online help containing instructions, and version of the software are also displayed.

## [File] menu

This menu provides operations that are mainly carried out for projects, files and data.



### [New Project...] [Open Project...]

A group of data and settings used by PhotoModeler KM is called a project. Selecting [New Project] opens the [New] dialog box and selecting [Open Project...] opens the [Open] dialog box

#### [Memo]

These dialog boxes are OS-based. When creating a new project, enter the name of the project you want to create and click the [Create] button. When opening a project, select the project and click the [Open] button.

### [Save Project]

Saves the current project without changing its name.

#### [Memo]

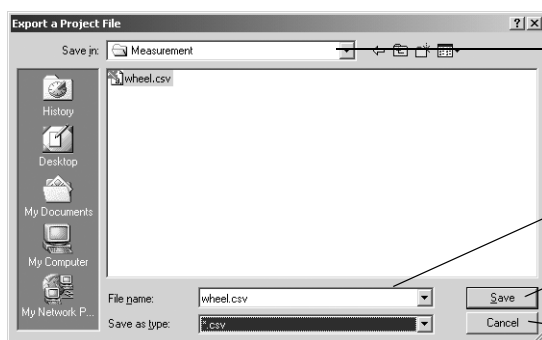
In [General] tab of [Preferences] dialog box, it is possible to set the backup saved version (0 or 1 to max. 5). If set this, saves project as the file name; "file name" + "ver N" (N=1 to 5) as like "sample.ver5.pmr".

### [Save Project As...]

Saves the current project under a new name. For instance, when settings are changed, using this submenu allows you to save the project under a new name without making changes to the original project.

### [Export Coordinates...]

Exports 3D coordinate data of the markers stored in the current project to a text file (.CSV).



Select the folder to which the exported file is to be stored.

Enter the name of the file to be exported.

Clicking this button exports the data under the specified file name to the specified folder.

Exits data export and closes the dialog box.

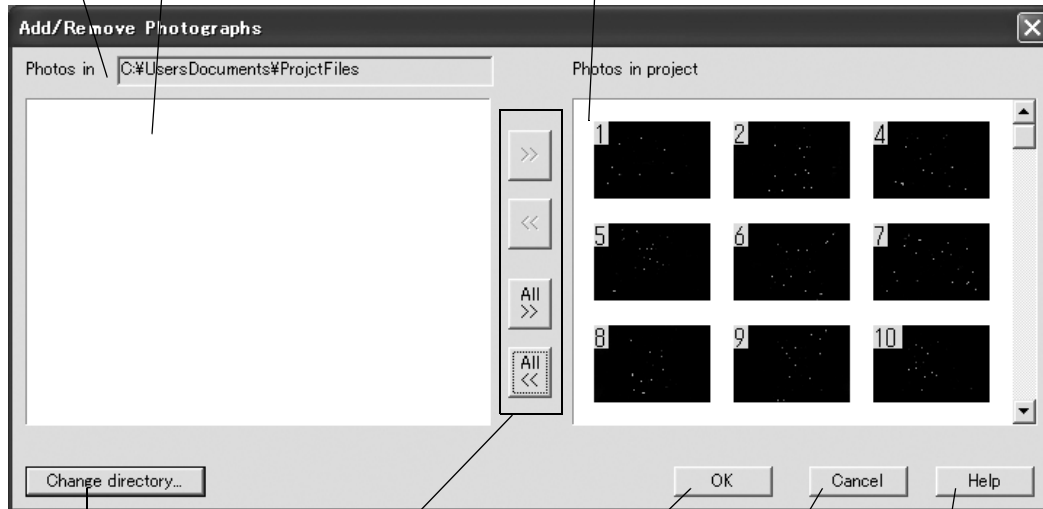
### [Add/Remove Photos...]

Opens a dialog box to add a new photo(s) to the current project or delete an unnecessary photo(s).

Directory path of the folder that contains the photo to be imported

All the photos present in the folder are displayed.

All the photos added to the project are displayed.



Click this button to change directory path of the folder for containing photos

[>>] Adds the selected photo(s).  
 [All >>] Adds all the photos.  
 [<<] Deletes the selected photo(s).  
 [All <<] Deletes all the photos.

Completes the operation and closes the dialog box.

Exits the operation and closes the dialog box.

Displays help regarding this dialog box.

### [Hide/Show Photo Control...]

Allows you to display the photo control side bar in the left side of the main window or hides it.

### [Memo]

Displaying or hiding the photo control side bar when the software start, set at the [General] tab of the [Preferences] dialog box.

### [1.C:\ .....\ \*\*\*.pmr]

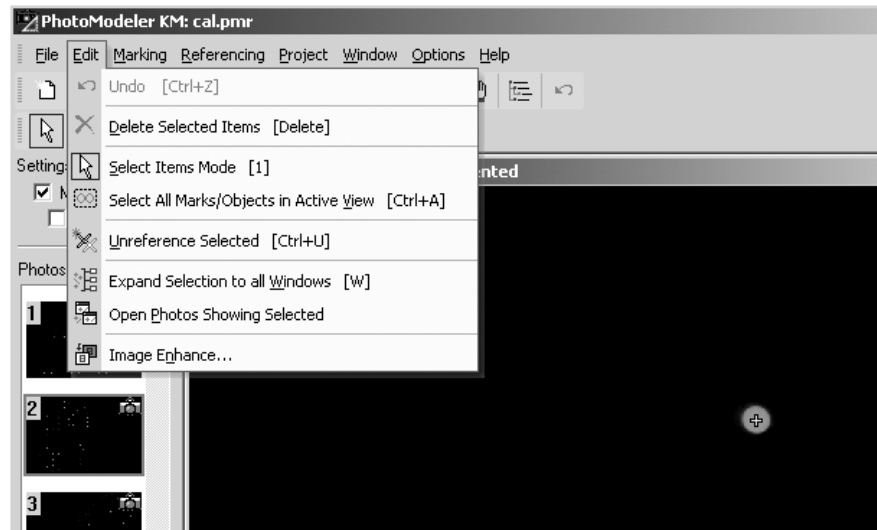
Displays a list of projects that have been opened or newly created up to now. Using this submenu enables you to open a project you have opened or created before. The project that was opened at the last is displayed at the top of the list (numbered "1").

### [Exit]

Exits PhotoModeler KM. If there are projects that have not been saved, a message box asking you whether to save them will appear.

## [Edit] menu

This menu provides operations mainly regarding data handling such as data editing. It also includes submenus regarding display of data currently in progress.



### [Undo (or Redo)]

If this submenu is active, it is possible to cancel the previous operation and restore the original state. Performing undo switches the name of this menu to “Redo”, allowing you to restore the operation you have cancelled previously.

### [Memo]

The previous operation for “Undo” or the canceled operation for “Redo” is shown at the next of menu item; as like “Undo Sub-pixel mark”.

### [Note]

- *It is not possible to undo/redo operations for which this menu is not active.*
- *It is not possible to undo/redo operations for data or file handling operations such as saving a project.*

### [Delete Selected Item]

Deletes the currently selected item (e.g. marker).

### [Select Item Mode]

Switches between selection/non-selection modes for items (e.g. markers).

### [Select All Markers/Objects in Active View]

Selects all the markers and objects present in the currently opened project, regardless of whether they are shown/hidden.

### [Unreference Selected]

Clears marker reference.

### [Expand Selection to all Window]

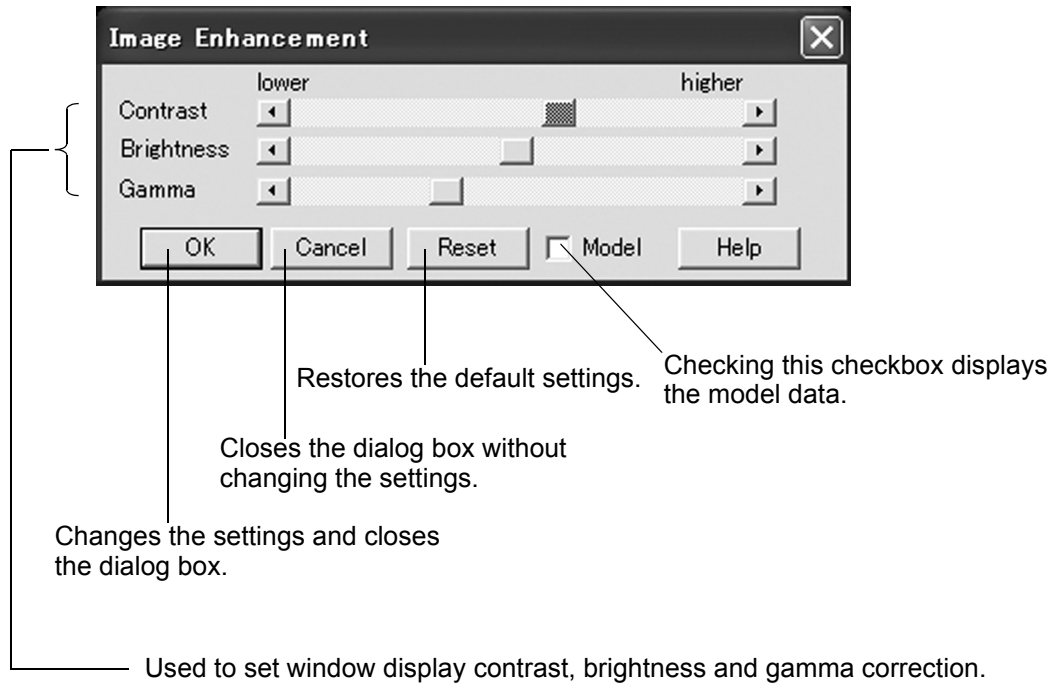
Select the same items that is selected on the current window on all opened windows, and display them.

### [Open Photos Showing Selected]

Displays the image of the photo data to which the currently selected item belongs, so that the same item is selected.

### [Image Enhance...]

Displays a dialog box to adjust the active image.

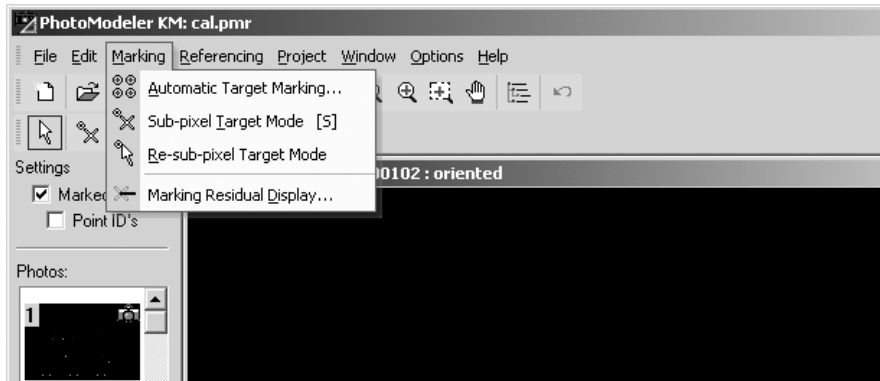


#### Memo

These settings are for PhotoModeler KM display only.  
They will not affect the settings of the monitor used.

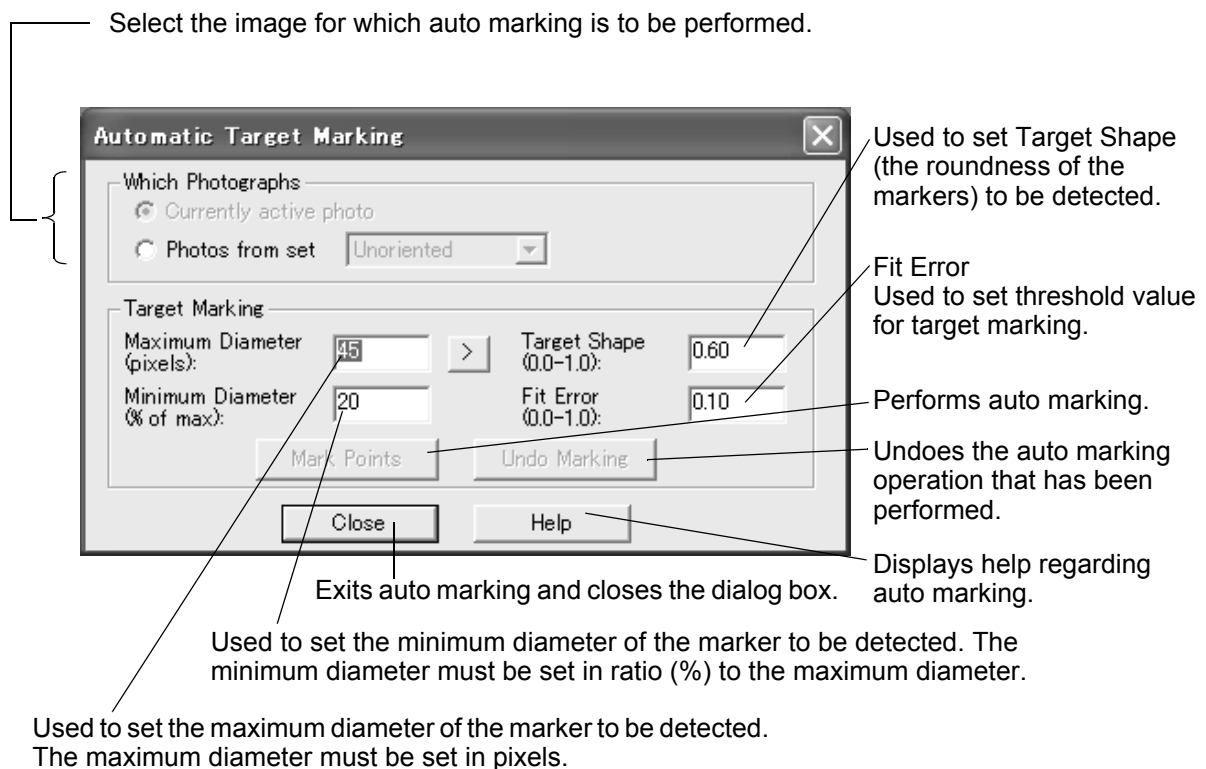
## [Marking] menu

This menu provides operations to detect markers in photo data imported to PhotoModeler KM.



### [Automatic Target Marking...]

Displays a dialog box to set conditions to be used for automatic detecting of individual markers.



### [Sub-pixel Target Mode]

Detects markers present in the rectangle area drawn by the pointer.

### [Re-Subpixel Target Mode]

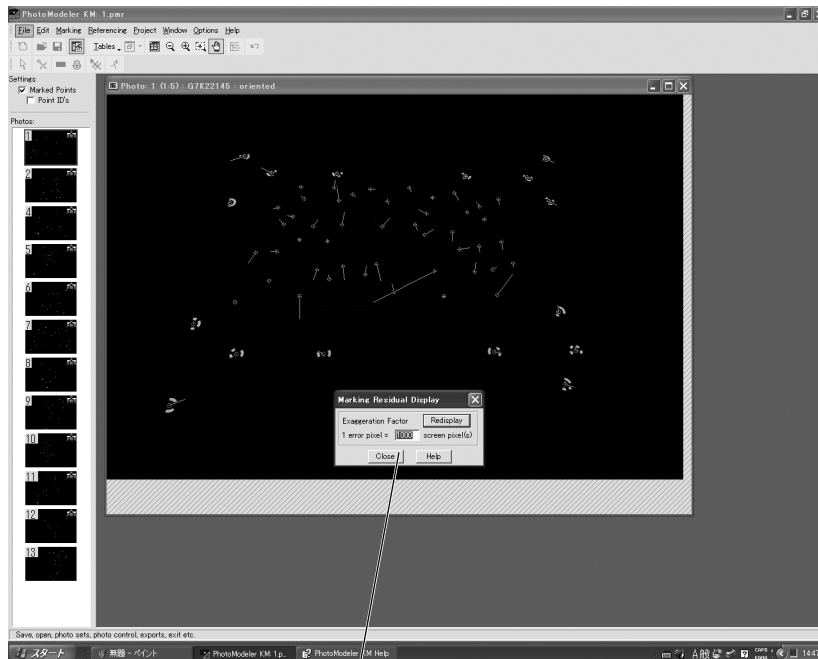
Re-edits the positions of the markers detected in the sub pixel target mode and detects markers present in a new rectangle area drawn by the pointer.

## [Marking Residual Display...]

Displays the residual error of the currently displayed marker. The residual error is displayed in line length and direction.

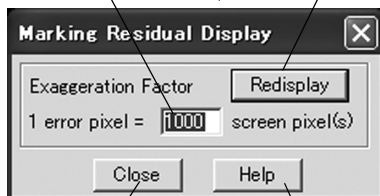
### [Note]

*The residual error is an error that occurs when obtaining the 3D positions from the photo data statistically, and it indicates data dispersion.*



Used to set the length of the line for which residual error is to be displayed (in pixels).

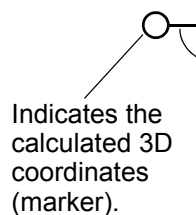
Re-displays the residual error based on the specified line length.



Exits residual error display.

Displays help regarding residual error display.

### [Display Example of Residual Error]

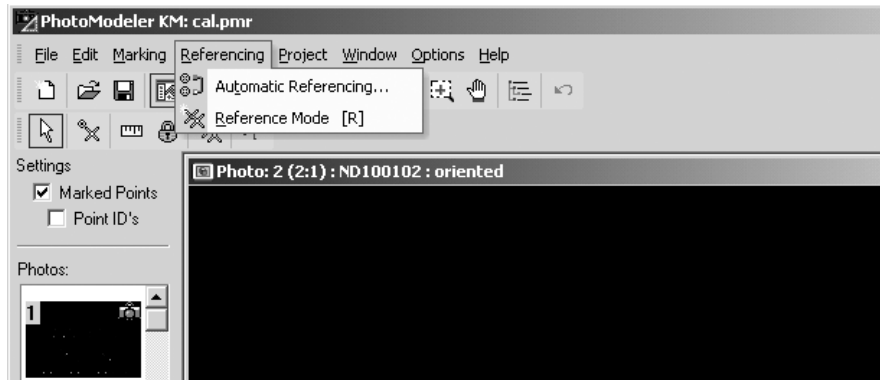


Displays the residual error as line length based on the settings.



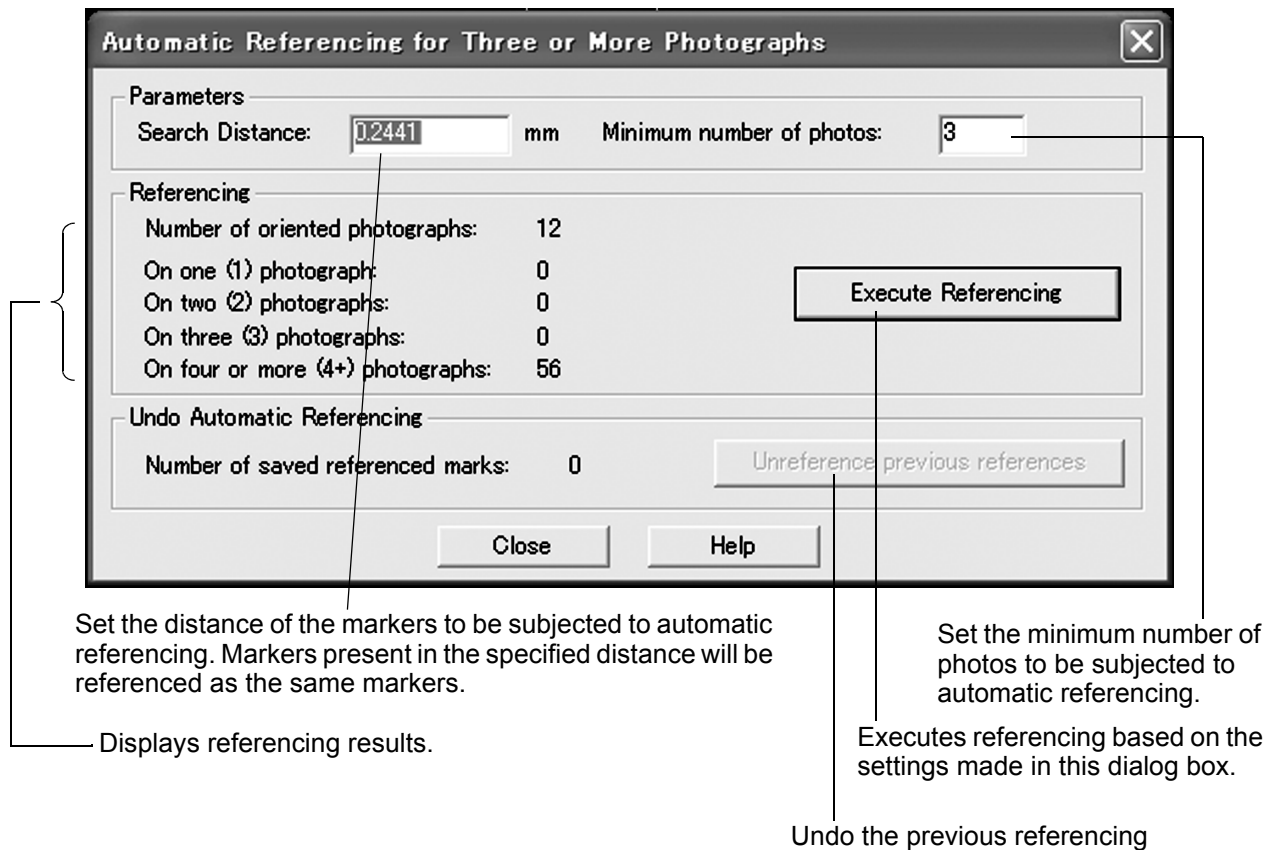
## [Referencing] menu

This menu provides operations regarding referencing of markers detected from photo data.



### [Automatic Referencing...]

Used to make settings to perform automatic referencing of individual reference markers present in the currently selected multiple photos.

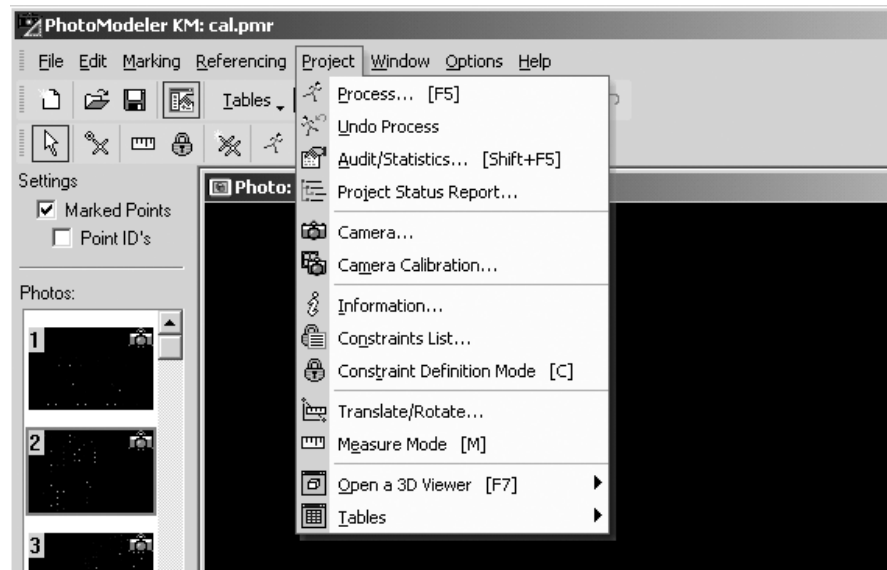


### [Reference Mode]

Select this submenu to perform referencing manually.  
For details, refer to Help of "PhotoModeler KM".

## [Project] menu

This is the main work menu of the PhotoModeler KM. It is used for calculating 3D coordinates of markers and displaying the results.



### [Process...]

Used to calculate 3D coordinates of each marker using photo data that allows photogrammetry calculation, analyze the results of the calculating and display them in the [Processing] dialog box.

The [Processing] dialog box is divided into two parts (right and left).

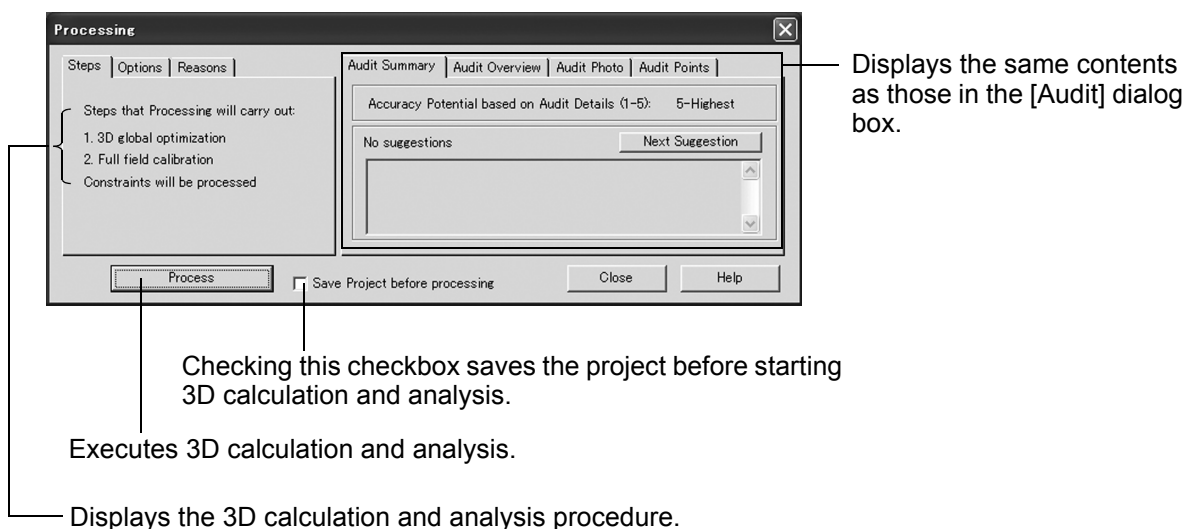
The 3D calculation settings can be set in the left part. The results of the calculation set in the right part.

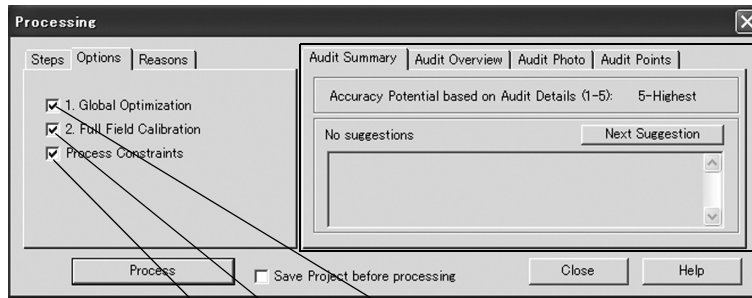
The settings and results are divided into three groups (Steps, Options, Reasons). To view them, select the corresponding tab.

### [Memo]

The right side of the dialog box displays the same contents as those in the [Audit] dialog box (see “[Audit/Statistics...]”).

### [Steps]



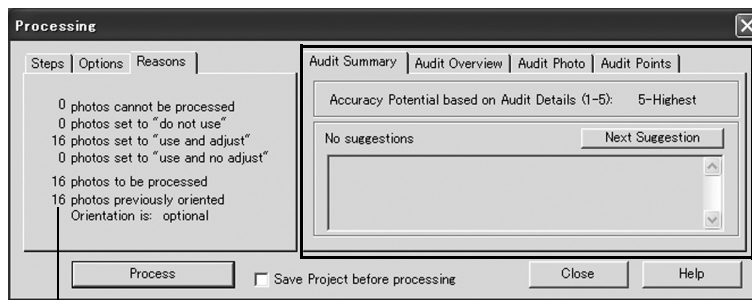
**[Options]**

Displays the same contents as those in the [Audit] dialog box.

Performs optimization to minimize the calculation error of camera positions and 3D coordinates of the markers that have been subjected to 3D calculation and analysis.

Performs optimization of calibration parameters to minimize the calculation error occurring after the 3D calculation and analysis.

Performs scaling after 3D calculation using multiple scale bars.

**[Reasons]**

Displays the same contents as those in the [Audit] dialog box.

Displays the information regarding photo data during analysis.

**[Undo Process]**

This submenu is active at the end of 3D analysis. Selecting this submenu allows to cancel 3D analysis that has been performed.

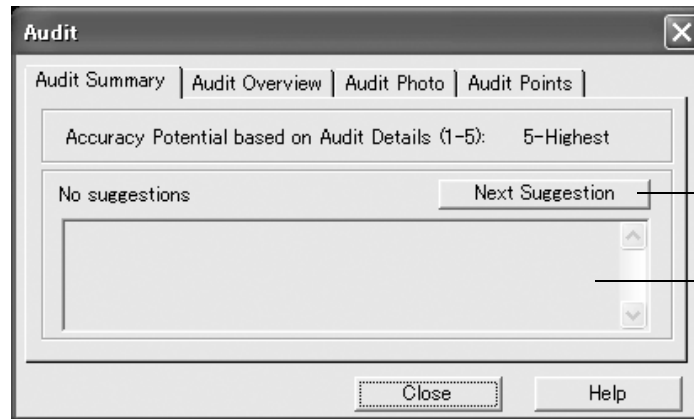
### [Audit/Statistics...]

This submenu is used to display analysis results of the project for which calculation and analysis of 3D coordinates have been performed. The results are displayed in the [Audit] dialog box.

The analysis results are grouped into “Summary”, “Overview”, “Photos” and “Points” according to the analysis method and target. To view the results, click the corresponding tab.

### [Summary]

Displays a summary of calculation/analysis results of 3D coordinates for the project.

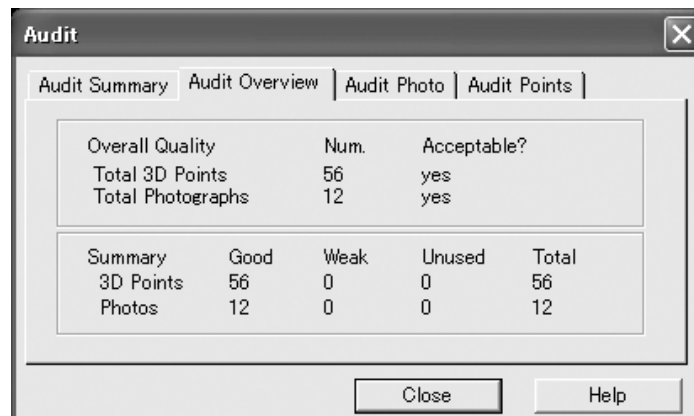


Click it to display the next suggestion.

In the case of error occurred, the suggestions or hints to solve is displayed.

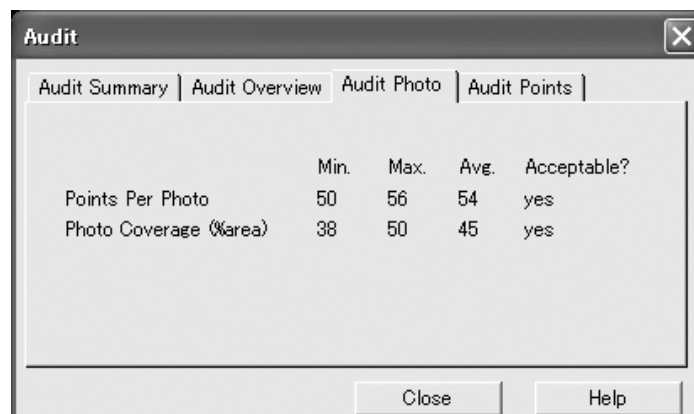
### [Overview]

Displays an overview of the analysis results regarding 3D coordinates of markers obtained by 3D coordinate calculation, and photo data used for the calculation.



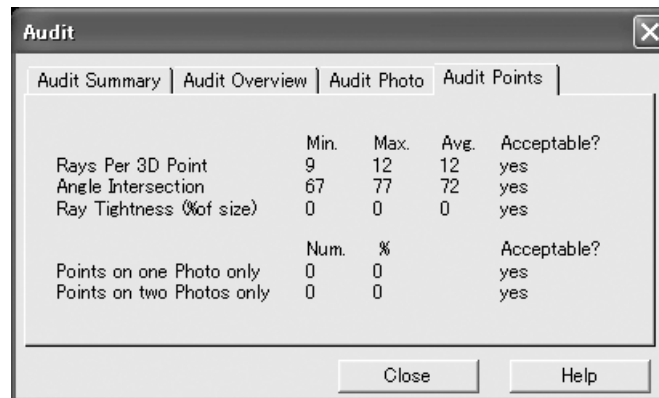
### [Photos]

Displays the analysis results regarding the photo data used for 3D coordinate calculation.

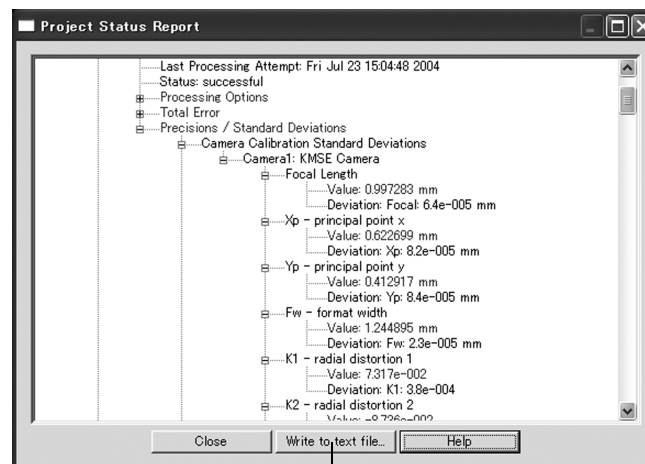


**[Points]**

Displays the analysis results regarding 3D coordinates of markers obtained by 3D coordinate calculation.

**[Processing Report]**

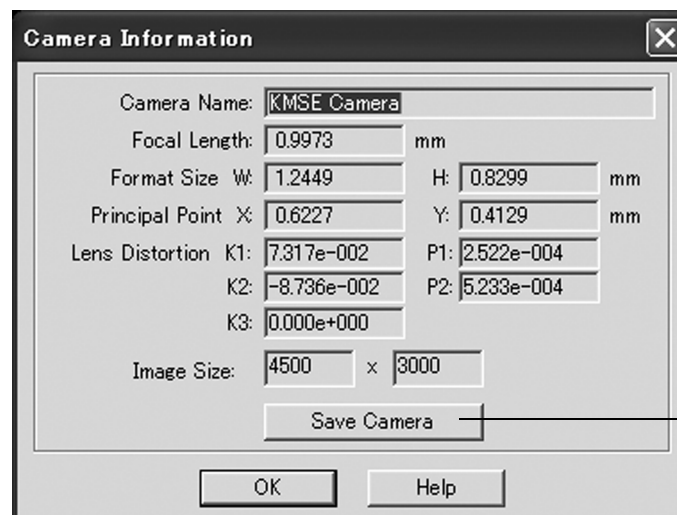
Displays a list of current status including parameters, settings, 3D coordinate calculation and analysis results for the project.



Exports the contents of the dialog box to a text file.

**[Camera...]**

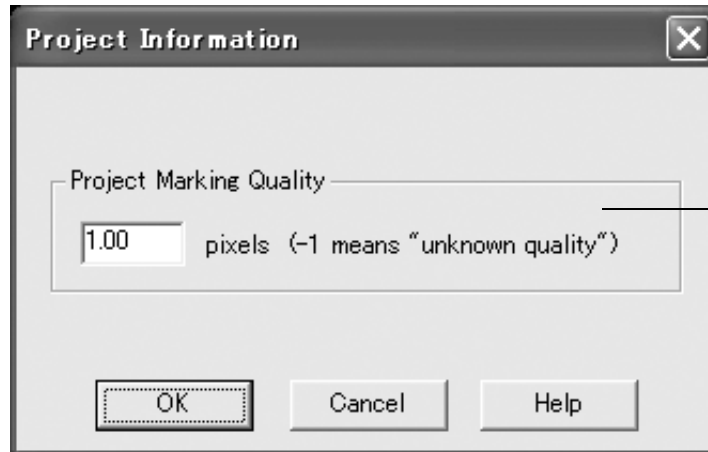
Displays the camera parameters used for the current project.



Saves the camera parameters in CMR format.

### [Information...]

Used to set marking quality for the project.



Use to set the quality of the target marking. If it is unknown, set a value "-1" to execute processing without setting of marking quality.

### [Constraints List...]

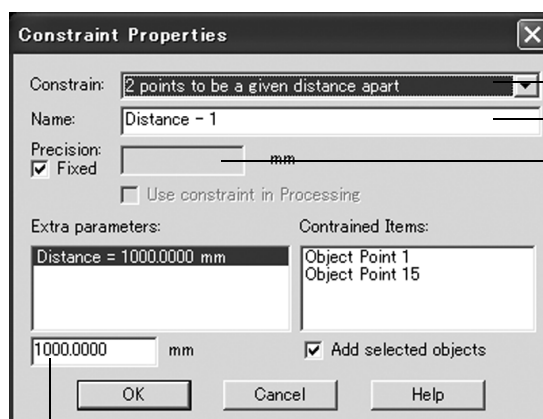
Displays a list of constraint properties defined/set in constraint definition mode. Constrain properties in the list can be edited.



### [Constraint Definition Mode]

Allows you to set constraint properties to multiple markers in the project. 3D coordinate calculation is performed under the specified constraint properties.

Select 2 markers displayed in the window, and then select "Add New Constraint" menu by clicking right-button of mouse or click the "Add New Constraint" tiil icon to open the Constraint Properties dialog box.



Constraint property type

Constraint property name

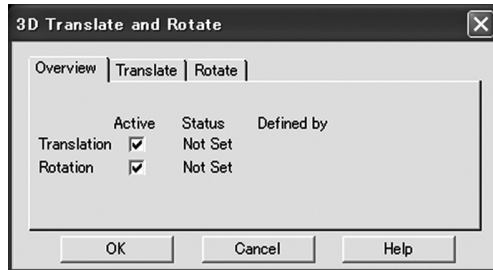
Constraint property precision

Constraint value

**[Translate/Rotate...]**

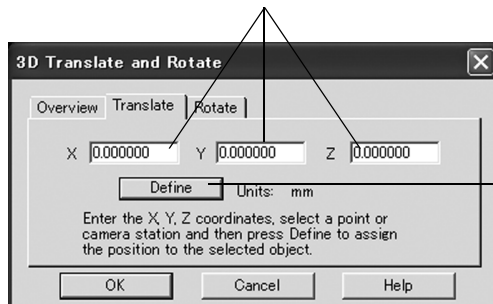
Displays the [3D Translate and Rotate] dialog box to perform parallel translation for data in the project. The selected items are used to perform parallel translation.

The settings are organized into three groups (“Overview”, “Translate”, “Rotate”). To set them, select the corresponding tab.

**[Overview]****[Translate]**

Executes parallel translation according to the settings made in this dialog box.

Set the coordinates (X, Y, Z) of the selected item.

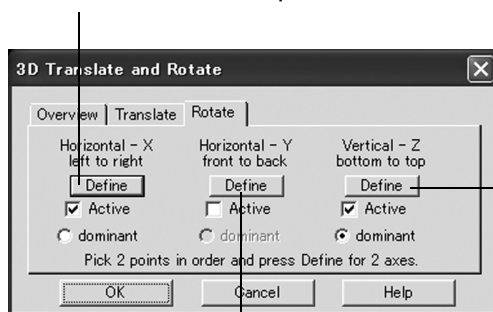


Parallel translation will be performed so that the 3D coordinates of the selected item match the specified coordinates (X, Y, Z).

**[Rotate]**

Executes rotational translation according to the settings made in this dialog box.

Sets the selected two point to the X-axis.

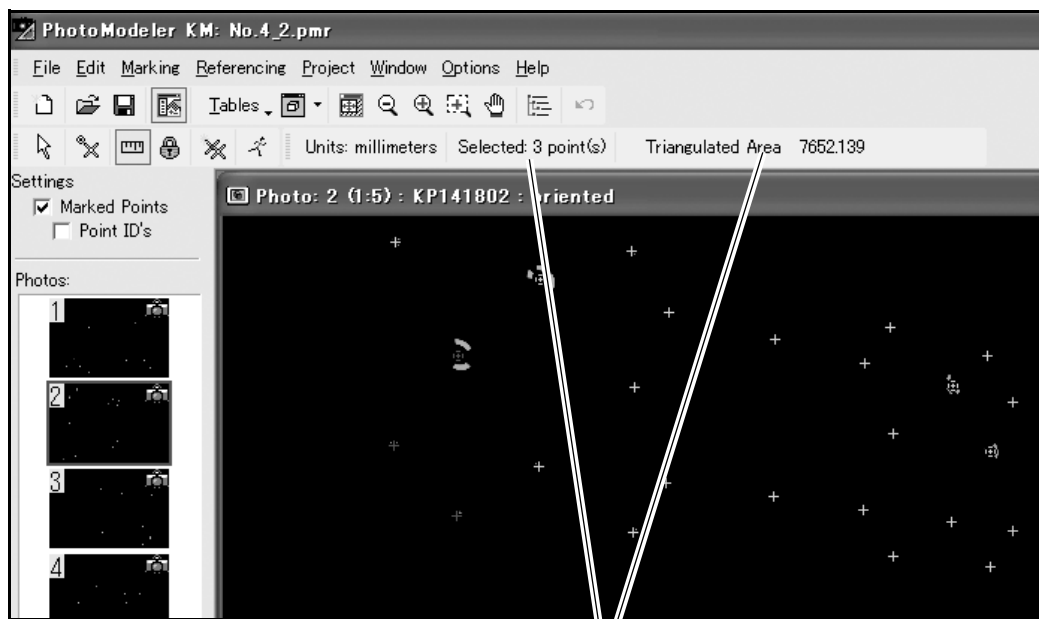


Sets the selected two point to the Z-axis.

Sets the selected two point to the Y-axis.

### [Measure Mode]

Used to switch to the measurement mode provided to display the distance of the selected item.



Displays measurement results for the selected item.

### [Open a 3D Viewer]

Opens the [3D Viewer Options] dialog box. 3D viewer is displayed according to the settings made in this dialog box.

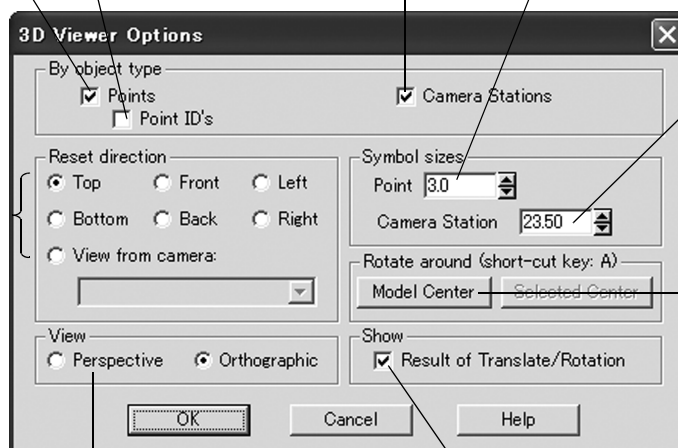
Checking this checkbox displays the marker position.

Checking this checkbox displays the marker ID.

Checking this checkbox displays the camera position.

Set the marker display size.

Set the camera display size.



Set the rotation center when the viewer is rotated.

Checking this checkbox reflects the coordinate transformation in the display.

Select the viewer display method.

Specify the view point when resetting

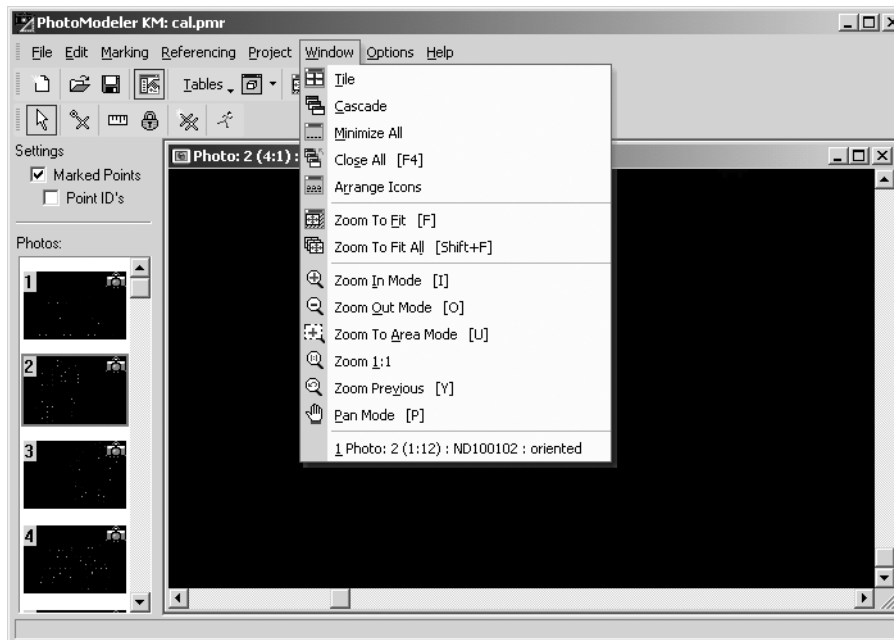
### [Tables]

Displays photo data and marker data present in the currently selected project in table format.



## [Window] menu

This menu provides window display related operations.



### [Tile] [Cascade] [Minimize All] [Close All] [Arrange Icons]

For the currently displayed windows

- Arrange: Locates the windows uniformly in the main window.
- Cascade: Cascades the windows.
- Minimize All: Minimizes all displayed windows into icons.
- Close All: Closes displayed windows.
- Arrange Icons: Displays the minimized window icons in order.

### [Zoom To Fit] [Zoom To Fit All]

For the currently displayed windows

- Zoom To Fit: Resize the active image appropriately according to the window frame size.
- Zoo To Fit All: Resize all displayed images according to each frame size and cascades them.

### [Zoom In Mode] [Zoom Out Mode]

For the currently displayed windows

- Zoom In Mode:  
Selecting this submenu switches the mouse cursor to “+”. The image in the window is scaled up each time the mouse is clicked. The window frame size remains unchanged.
- Zoom Out Mode:  
Selecting this submenu switches the mouse cursor to “-”. The image in the window is scaled down each time the mouse is clicked. The window frame size remains unchanged.

### [Zoom to Area Mode]

This menu is effective for the active window only, and enlarges the area enclosed by the mouse pointer and displays it fully in the window frame.

### [Zoom 1:1]

This menu is effective for the active window only, and displays the photo image in its original size.

**[Zoom Previous]**

This menu is effective for the active window only, and restores the previous zoom setting.

**[Pan Mode]**

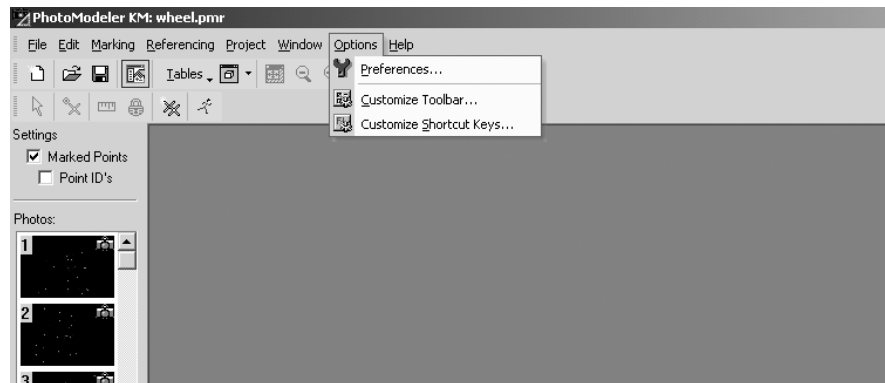
This menu is effective for the active window only, and allows you to move the display position.

**[1 Photo:2 (1:5):\*\*\*:oriented]**

Displays the information (e.g. zoom ratio) of the currently displayed window. Selecting this makes the window active.

## [Options] menu

This menu provides operations regarding PhotoModeler KM parameter settings. It allows you to change the toolbar (icon menu bar) items and set shortcut keys.



### [Preferences...]

Displays the [Preferences] dialog box to make PhotoModeler KM system settings.

The setting items are organized into seven groups (“General”, “Colors”, “3D Viewer”, “Image”, “Process”, “Camera Calibrator” and “Target Marking”). They can be set by selecting their corresponding tabs.

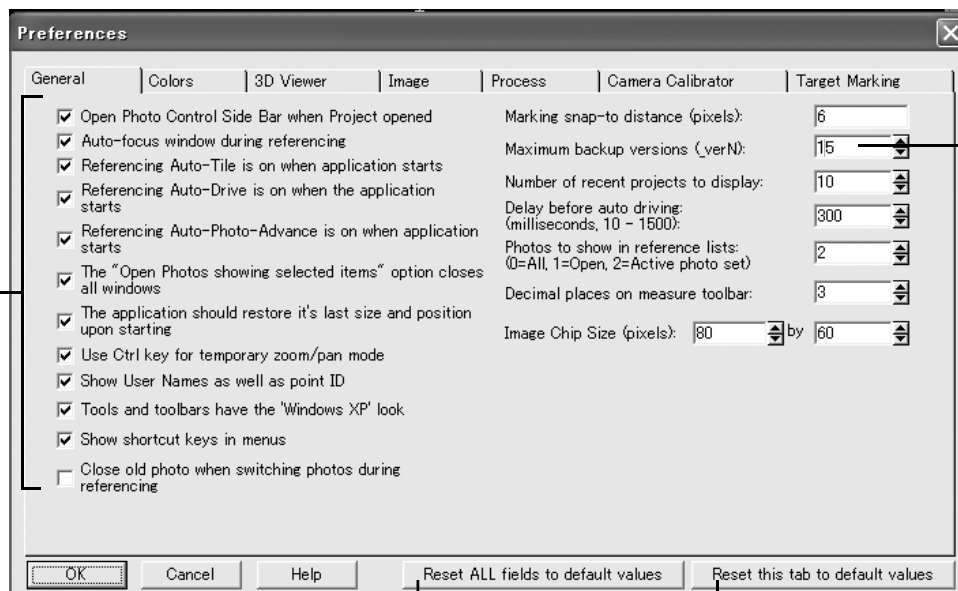
### [Memo]

In general, it is not necessary to change the default settings.

### [General] tab

Used to make general settings regarding PhotoModeler KM.

Use to set the default setting when the software start; for example wheather displaying or hiding the photo control side bar.



Use to set how much backup version file is saved when the project file save type of overwriting is selected.

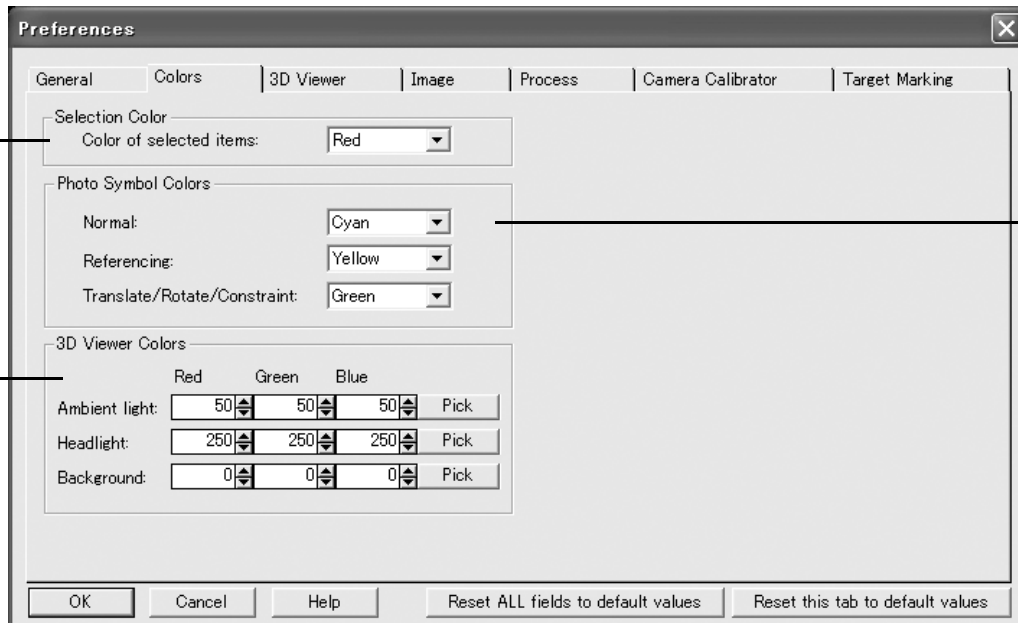
Use to reset all of the setting on this dialog to the default value.

Use to reset all of the setting at this tab of the dialog to the default value.

## [Colors] tab

Used to make window display colors for PhotoModeler KM.

Use to set colors of the selected item.



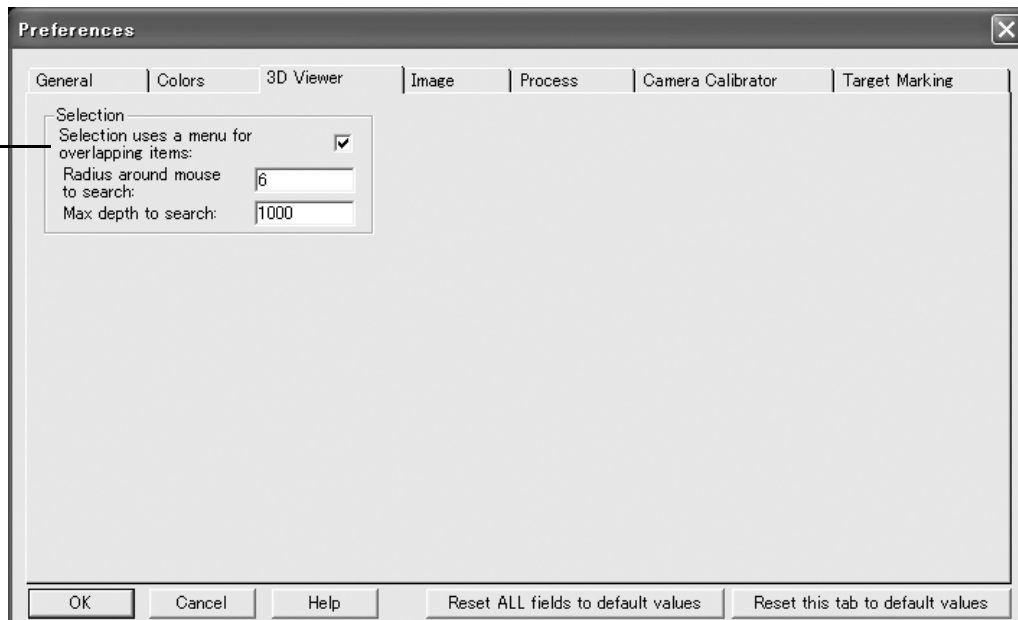
Use to set colors of the marks on the photos.

Use to set colors for "Ambient light", "Headlight" and "Background" in RGB color value.

## [3D Viewer] tab

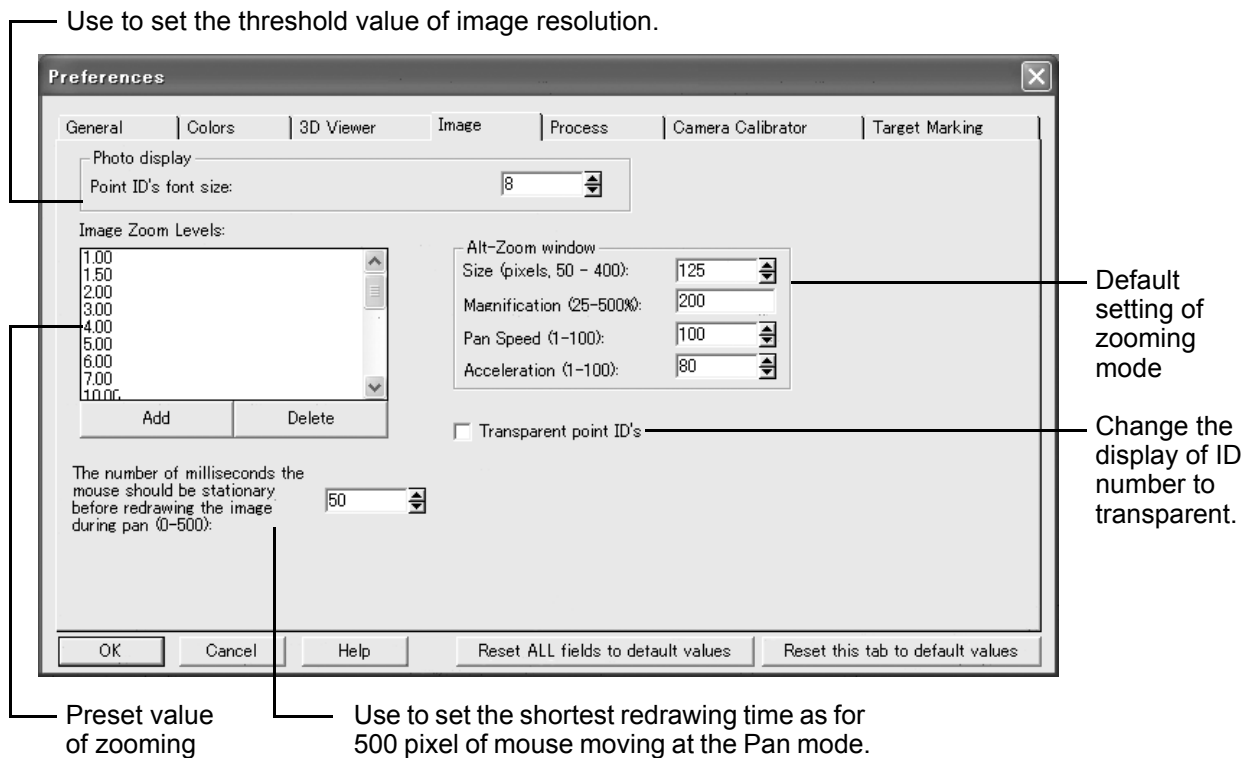
Used to make settings regarding selection operations for "PhotoModeler KM" 3D viewer.

Use to set values about selecting items in the 3D viewer window.

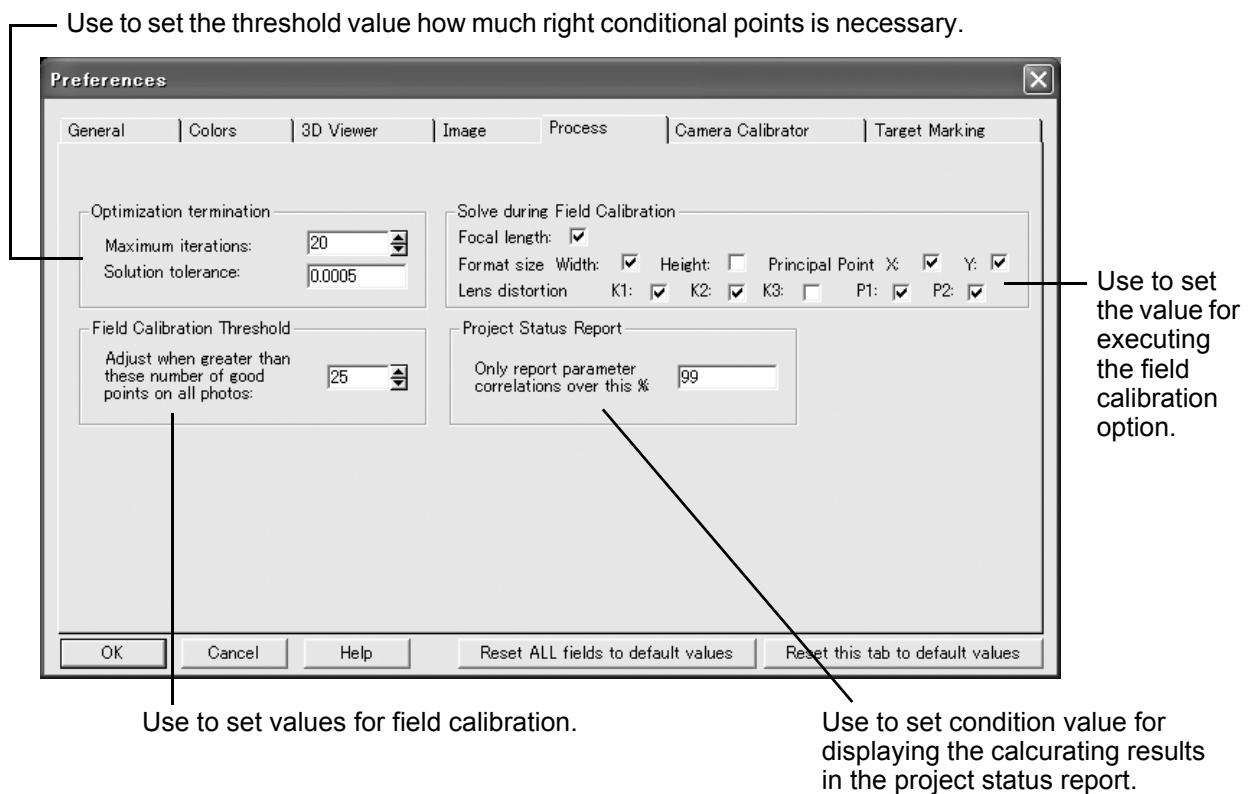


**[Image] tab**

Used to make image display settings for PhotoModeler KM.

**[Process] tab**

Used to make 3D coordinate calculation/analysis settings for PhotoModeler KM.



## [Camera Calibrator] tab

Used to set conditions under which calibration projects are to be executed by PhotoModeler KM.

Use to set the distance between 2 code markers on the calibration chart.

Preferences

General | Colors | 3D Viewer | Image | Process | Camera Calibrator | Target Marking

Custom Calibration Control Positions

Control Point 1: X: 0 Y: 0.57

Control Point 2: X: 0.57 Y: 0.57

Control Point 3: X: 0 Y: 0

Control Point 4: X: 0.57 Y: 0

Parameters to Calibrate

Focal length: ☒ Fiducial Camera Pixel Aspect: ☒

Format size: Width: ☒ Height: ☐

Principal Point: X: ☒ Y: ☒

Radial Lens Distortion: K1: ☒ K2: ☒ K3: ☐

Decentering Lens Distortion: P1: ☒ P2: ☒

Targets and Sub-pixel Marking

Ratio of largest target in image to image size: 0.025

Ratio of smallest target in image to image size: 0.002

Target circularity shape threshold: 0.6

Auto-referencing

Required number of photos to be referenced for each point in stage one: 8

OK Cancel Help Reset ALL fields to default values Reset this tab to default values

Use to set the marker size for referencing.

Use to set items for necessary to calculating the calibration parameters.

Use to set minimum number of photos to execute automatically referencing.

## [Target Marking] tab

Used to set conditions under which auto marking is to be executed by PhotoModeler KM.

Use to set the threshold value of the edge of markers on the photos.

Preferences

General | Colors | 3D Viewer | Image | Process | Camera Calibrator | Target Marking

Automarking Automatic Segmentation Settings

Edge Filter Sigma (pixels): 2

Allowable Edge Gap (pixels): 4

Edge Strength High Threshold (0.01-1.0): 0.2

Edge Strength Low Threshold Ratio (0.01-1.0): 0.15

Whole image automatic marking

Ignore a border around the image (% of smallest image dimension, 0 - 45%): 2

Ignore a border around the image during calibration (% of smallest image dimension, 0 - 45%): 0.5

Manual sub-pixel marking

Sub-pixel method threshold size (pixels): 150

Point removal

Remove non-CT points within a disk around CT points. Disk height (mm): 5 Radius (mm): 20

Weld coded points if they project on all images to within 2 pixels.

OK Cancel Help Reset ALL fields to default values Reset this tab to default values

Use to set marker size for target marking at the sub-pixel target mode.

Use to set the pitch value for non-missing target marking.

Remove non-CT points... Disk height/Radius

Use to set the range by the disk height and radius of disk to delete the coded part of code markers.

Weld coded points...

Use to set value at pixel range for weld the missing ID number to right number.

**[Customize Toolbars...]**

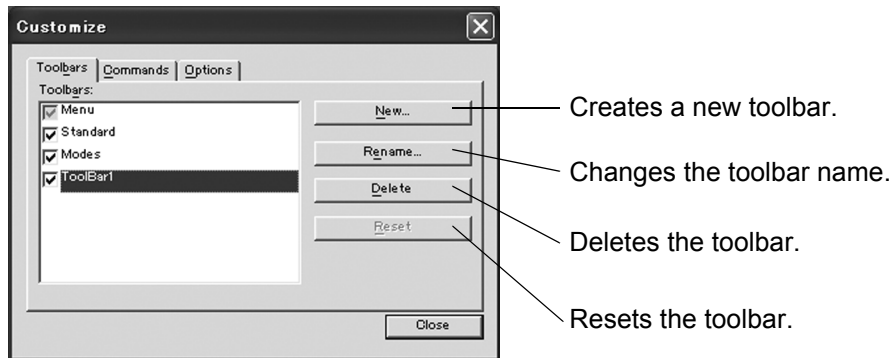
Displays the [Customize] dialog box to make settings regarding the toolbar of PhotoModeler KM.

The settings are organized into three groups (“Toolbars”, “Commands”, “Options”). To set them, select the corresponding tabs.

**[Toolbars] tab**

Allows you to add a new toolbar to the main window of PhotoModeler KM.

Predefined work icons can be set freely.

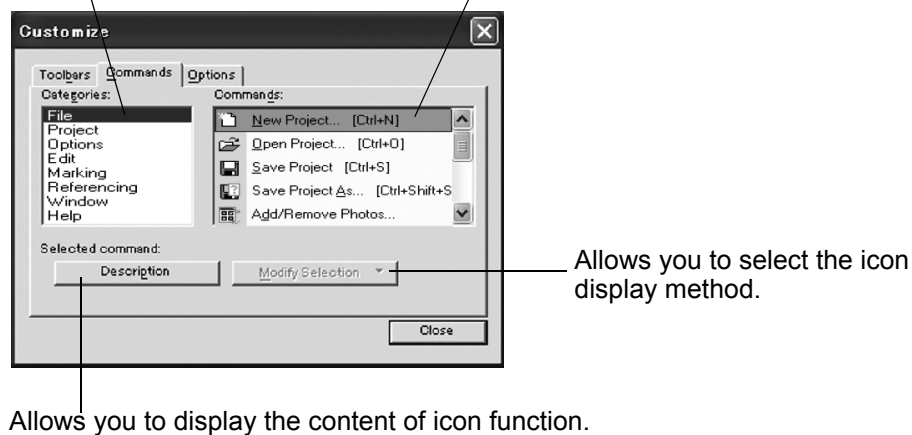
**[Commands] tab**

Allows you to check/change the content of commands that can be set to PhotoModeler KM toolbars.

An icon can be added by dragging it from the commands list and dropping it onto a toolbar.

Select the menu to which an icon is to be added.

Displays the icon to be added and its function.

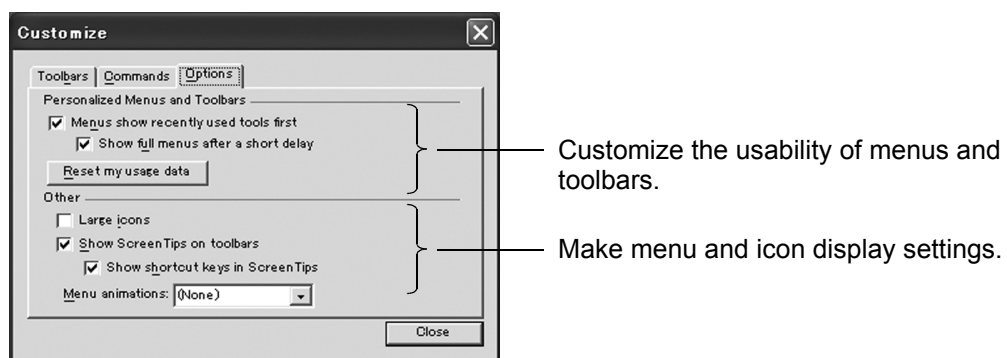


Allows you to select the icon display method.

Allows you to display the content of icon function.

**[Options] tab**

Used to make settings regarding how the work menus and toolbar icons should look.



Customize the usability of menus and toolbars.

Make menu and icon display settings.

### [Customize Shortcut Keys...]

Displays a dialog box to customize shortcut keys of PhotoModeler KM.



Select the menu to which a shortcut is to be added.

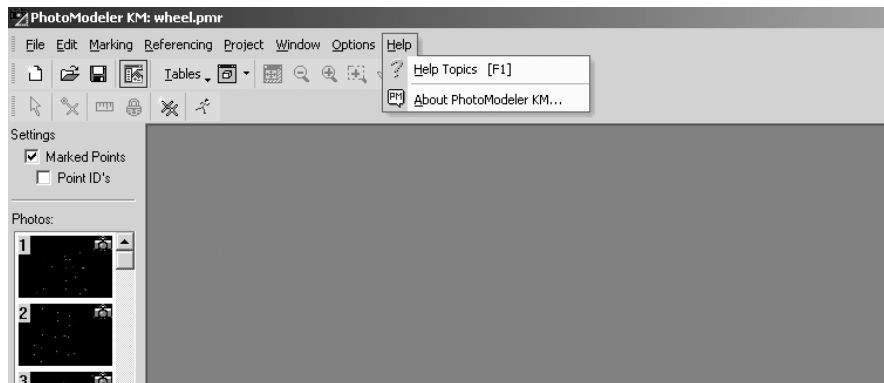
Restores the default settings.

Set the functions and keyboard keys to be used for the shortcut key to be added.



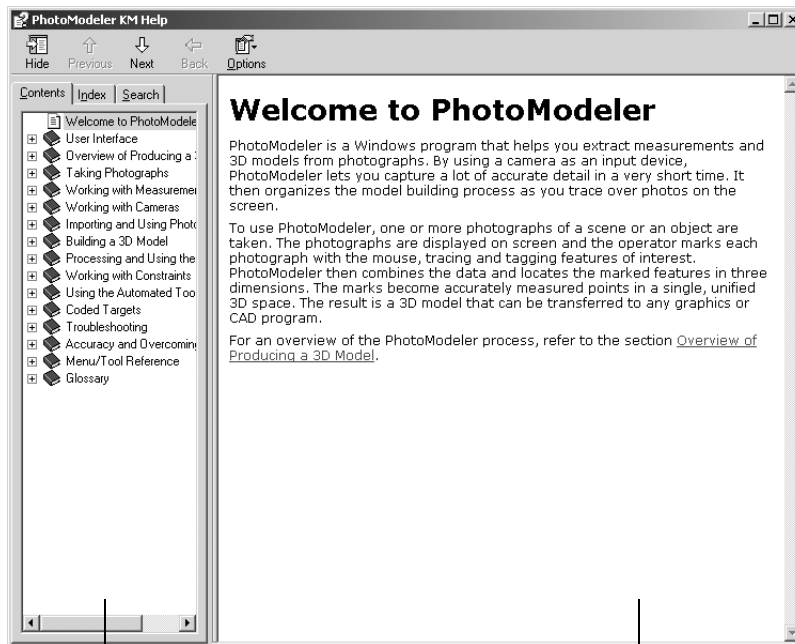
## [Help] menu

This menu provides operations regarding display of information about the PhotoModeler KM. PhotoModeler KM operating methods, online help containing instructions, and version of the software are also displayed.



## [Help Topics]

Displays help regarding PhotoModeler KM operating methods and command details.

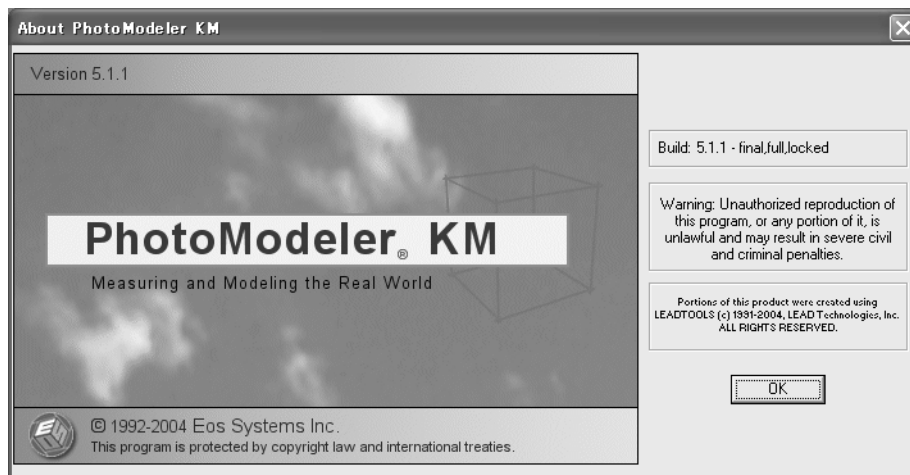


The [Contents] tab not only displays the help index, but also allows you to display a list of help items by selecting a keyword and searching it.

Displays the content of the help item selected in the [Contents] tab.

**[About PhotoModeler KM...]**

Displays information such as version number and serial number of PhotoModeler KM.



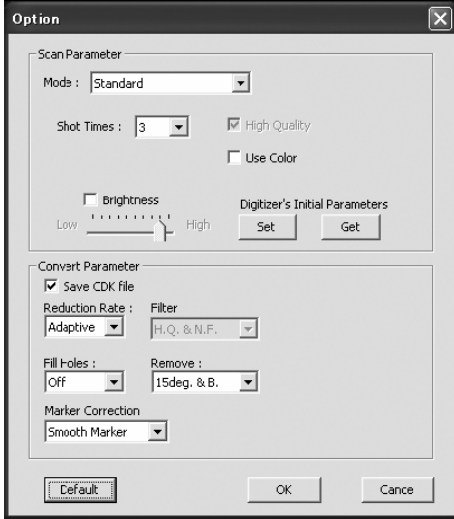
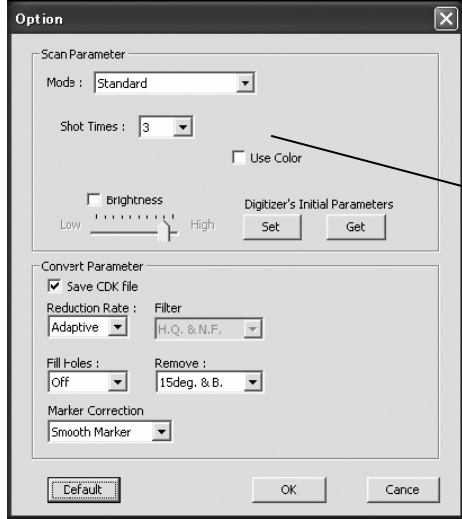




KONICA MINOLTA

## The information of specifications change

Some specifications of Photogrammetry System PSC-1 have been changed. The descriptions in this instruction manual should be read as follows:

	Description in manual:	Read as:
Back of the cover Line 14	Windows XP    Microsoft®    Windows®    XP    Professional    Operating System	Windows XP    Microsoft®    Windows®    XP Professional Operating System (32 bit)
Page 6 Line 22 and 23	<ul style="list-style-type: none"> <li>When installing “PhotoModeler KM” on Windows 2000 or Windows XP, the software must be used by someone with the “Administrators” authority.</li> </ul>	<ul style="list-style-type: none"> <li>“PhotoModeler KM” can be installed just on Windows 2000 or Windows XP. The software must be installed by someone with the “Administrators” authority.</li> </ul>
Page 32 and 37		 <p>(The [High Quality] checkbox has been deleted.)</p>
Page 37 The 5 <sup>th</sup> row in the table	<p>High Quality    Checking this checkbox displays low-reliability data. During display of the distance image (i.e. the [Pitch] radio button is ON), areas with excessively high laser power are displayed in light gray, and those with excessively low laser power are displayed in dark gray.</p>	< edited out >