TOPCON

Operation Manual

Image Master

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Introduction

Thank you for purchasing TOPCON Image Master Software.

To get the best use of the instrument, read carefully the On-line Instruction Manual of this software.

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VRML is an abbreviation for Virtual Reality Modeling Language, which is the standard format for expressing 3D graphics (CG).

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Overview of Image Master

Overview of Image Master

The Image Master is software to perform 3D measurement from stereo images, generate ortho-images and 3D models using the images taken by digital cameras – which is getting more pixels and economical price.

Moreover, Image Master makes it possible to perform TOPCON Image Total Station: IS remote-controlled capture of 3D data and image data of landforms, structures, etc.

This software conducts 3D measurement from stereo images - 2 images from different angles, a left and a right - of the object of measurement. For orienting the camera, it features an "aerial triangulation" function called the bundle adjustment, and it can also create panoramic 3D measurement data from multiple images. This function also has other advantages: it makes the precision of measurements uniform, and it is subject to few restrictions as regards the placement of the control points.

Particularly in close-range photogrammetry, there are many cases in which - due to, for example, problems with obtaining good footing for image capturing - it is difficult to photograph in a way that the photographic distance and the base length are fixed; and this bundle adjustment is extremely effective for making the precision of the data measured in each of the stereo images uniform.

Also Image Master has a function to create a model only with image coordinates of control points. If the ground coordinates of such control points are given the model can be scaled and fit in the ground coordinate system, or if some standard scale bar is pictured on the Stereo Images, a model in the real scale can be generated though it is in the local coordinate system.

As the Image Master of measuring functions using digital images, there are function to trace an outline of object, to automatically measures surface of the object aided by stereo matching, an image processing technique.

Such surface data is processed as TIN (Triangulated Irregular Network) and further processed to get such as, contour lines, section profiles, ortho-image and 3D model, and more.

Moreover, a 3D-model display/editing function that uses OpenGL has been adopted from the Image Master. With this function, which incorporates recent CG technology, 3D data measured with the Image Master can be converted to the TIN data, which can then be displayed as 3D image that, with images (textures) pasted onto it, can be seen from any visual point (direction). Using 3D model display, it is easy to carry out such operations as the all-around measurement of an imaged object and the checking and editing the data of complicated uneven surfaces.

Measured data and ortho-images can be output as DXF, JPEG or other graphic data, while 3D models can be output as VRML format.

As on Image Master, the data measured by the Imaging Total Station GPT-7000i and Scanned data by FC-100 "Field Scanning Software" measured in combination with Automatic Tracking Total Station GPT-8000A/8200A.

GPT-7000i is an integrated Total Station incorporating Reflector-less distance measurement and built-in 2 digital cameras for Wide-view Image and Telescopic-view Image.

It can store camera position coordinates as well aiming angle at the time the image is captured, and when these information is imported to Image Master in addition to image data and measured coordinates of control points, Orientation calculation can be automatically performed.

GPT-8200A is Automatic Tracking Total station has Reflector-less distance measurement of surface of the object in scanning motion. The scanned data (point cloud coordinates data) can be imported to Image Master and with separately taken image of the object , a 3D model with texture can be generated. If these scanned data are used as initial values for automatic processing of stereo images, more accurate and high density surface can be generated.

Image Total Station: IS has two cameras with different focus (wide-angle and telescope-angle) built into the Motor Driver Total Station.

The Image Master remote control uses a wireless LAN to switch camera images, observe the details of any point, and capture an image at that point.

Also, scanning is performed on the image in the collimated and observed area, and high-precision 3D data and panorama images are captured.

The Image Master can be connected to a color 3D monitor with a liquid crystal screen to which a film that has deflecting properties called μ-pole is attached; anyone can easily observe photographed images as 3D images. Switching between 2D and stereoscopic displays is also easy, being done with a single button. Moreover, since no special hardware is necessary, any changes in monitor specifications that might occur in the future can easily be dealt with. The left and right images displayed on a PC and measured 3D data can be observed - as is - as 3D color images; and, as a result, complicated, irregular shapes can be directly measured on 3D images, enabling the appropriateness of data to easily be checked.

Features of Image Master

■With the bundle adjustment, panoramic 3D data can be created from multiple images.

Use of the bundle adjustment function as the method of calculating orientation makes it possible to conduct 3D measurement from multiple images by connecting all of the data, even for expansive terrain.

With the bundle adjustment, moreover, each stereo image can be adjusted separately, and the mismatching of combined data can be eliminated.

■Automatic measurement of Tie points

With this function, you can automatically search, on the right image of a stereo pair, for the tie points of locations designated on the left image. Moreover, through a function that detects the corners of structures, etc., by image processing, it is possible to detect the locations of distinctive areas even when there are no special targets in them.

Furthermore, when you photograph using the system's circular target, it is possible to employ the automatic centering function and conduct measurement with sub-pixel accuracy. With this function, you can achieve highly precise, laborsaving measurements that do not vary with the individual making them.

■Creation of high-precision stereo images from any images desired

With this feature, you can create stereo images, viewable stereoscopically, from images photographed from any location desired. By accurately measuring the tie points, you can completely compensate for any lens distortion, etc., in the camera used for photographing, and form high-precision stereo images with a vertical parallax of less than 1 pixel. Using the dedicated 3D monitor and polarizing glasses, anyone can easily conduct 3D observation of the stereo images.

■Automatic measurement in plotting

When, from a stereo image, you convert the contours, etc., of an object to a diagram, this function makes it possible to automatically, and in real time, detect, in response to the movement of the left cursor, the corresponding location of the right cursor. Using a standard wheel-attached mouse of a PC, you can measure points and polylines with a simple operation that requires no particular dexterity.

■Highly reliable, automatic measurement of DSMs (digital surface models)

This function, called "stereo matching", automatically abstracts elevations from stereo images. It enables you to measure DSM data using the measurement intervals of your choosing.

■Image Total Station:IS Remote Control

Image Station: IS can be used for remote-controlled capture of 3D data of the measurement object and image data. IS has two cameras with different zoom factors (wide-angle and

telephoto) built-in. Camera images can be switched for detailed observation at any point and data acquisition at that location.

Scanning of the collimated and observed area on the image can be performed and high-precision point cloud (grid) data can be captured. Images shot with the IS cameras can be used to create a horizontal 360° and vertical 120° full-range panorama image.

■3D data-processing based on TINs (triangulated irregular networks)

With the Image Master, a TIN is directly output as a result of DSM measurement. A TIN can also be formed from 3D data imported from a file. Using these TINs, it is possible to create contour lines, cross sections, ortho-images and bird's-eye view images, and calculate surface areas calculate volumes and do other data processing.

In addition, the original images can be mapped as textures and accordingly, 3D model displays, described below, can easily be carried out.

■Display and editing of 3D models

With this function, 3D data measured from multiple images can be displayed as texture-mapped 3D model. To measure buildings, structures, cultural properties, and other such objects, it is necessary to photograph multiple images from around the object and conduct 3D measurement for each stereo model. In such a situation, it is necessary to be able to observe the measured 3D data from any visual point desired. Without using any special CG software, the Image Master, following measurement, immediately displays the data as a texture-mapped 3D model. Thus, the correlation between the 3D data and the actual object can easily be understood while, at the same time, measurement and data checking can be smoothly carried out.

■Registration

This function integrates point cloud data scanned with IS. The registration procedure is performed while associated with occupied point and backsight point, and tie point using the target. Integrated calculation uses Bundle Adjustment, which allows high-precision calculation.

■Data interchangeability through general-purpose formats

3D data can be input and output to and from files using the CSV, DXF formats. Thus, data can be transferred to and from other analytical software and CAD software.

With the VRML format, 3D model data can be output as data that is mapped as a texture onto a TIN.

Major Functions of Image Master

- IS control (remote control, instrument point setting, point measurement, scanning, panorama image creation)
- Point cloud, 3D model display
- Multiple model (station) management
- Orientation work (image coordinate measurement, fiducial mark measurement)
- Point measurement, polyline measurement, surface measurement
- TIN creation
- Contour lines creation, cross section creation
- Distance calculation, area calculation, volume calculation
- Ortho-image creation
- Layer control
- Drawing printing
- 3D model display and editing
- Registration (3D data integration)
- Export (point cloud data, TIN, VRML)

Operating Environment

Recommended Operating Environment

OS	Windows2000, XP, VISTA
	* Operation under Windows NT and Windows 9X is not supported.
CPU	Intel Pentium or equivalent
Memory	512 MB minimum
	* More memory improves processing capabilities and performance.
HDD	20 GB minimum
CDD	1 (for installer CD)
USB Port	1 (for protection key)
Mouse with Scroll Wheel	1 (For the control of 3D model screen)
Graphic Accelerator	OpenGL support

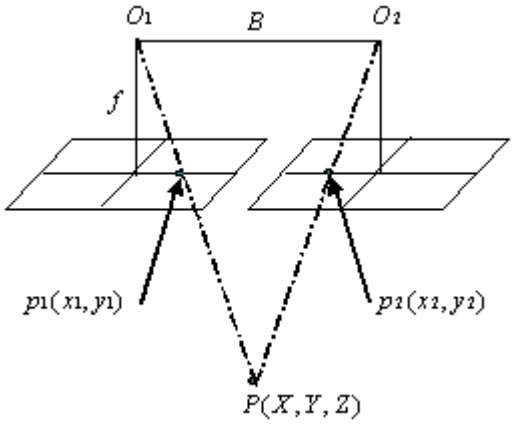
Overview of Image Master

Overview of 3D Image Measurement

Basics of 3D Image Measurement

Image Master performs 3D measurement using multiple original images inputted.

The basic concept for measuring three dimensions from the images is based on the stereo image method shown below.



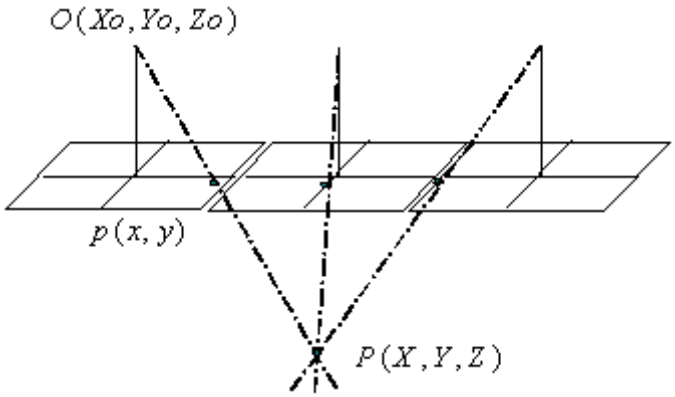
In the stereo image method, the object is photographed from different positions (right and left), and 3D measurement is done using the overlapped portions. By the principle of triangulation, 3D coordinates of the object are determined from corresponding points of the right and left images.

Orientation

To enable 3D measurement from images, it is necessary to previously determine the position and angles of the camera. This operation is called orientation and the computing operation is called orientation computation. Normally ground control points (known three-dimensional coordinates) are taken in frame, and orientation is done by measuring the position on the image. Or, it is also possible to determine relative position and angles of the camera by measuring corresponding points on the neighboring images. These points measured on images for orientation are called pass points or tie points. By doing orientation, the creation of a stereo image and 3D measurement are enabled.

Bundle Adjustment Method

On Image Master, orientation computation is done by using the bundle adjustment method to perform 3D measurement from multiple images.



In the bundle adjustment method, the position and angles of all cameras and 3D coordinates of all pass points are determined at the same time. Also, using coordinates of the ground control point, errors are adjusted on the whole. The bundle adjustment is evaluated as image measurement method with the highest accuracy.

3D Image Measurement on Image Master

On Image Master, orientation is done as preprocessing before the 3D image measurement and ortho-image creation. In the orientation, image coordinates of control points are measured with regard to images and stereo pairs, and orientation computation of the whole is done by bundle adjustment method. In the result of orientation computation, residual errors of each point are displayed. The quality of orientation is judged by checking the result. By doing the orientation computation, it is possible to output the high-accuracy 3D coordinates worked out by bundle adjustment method. This function can be used to do the high-accuracy coordinates measurement of the target position. Also, when orientation computation is done normally, it is possible to create the stereo images of right and left images with corrected vertical parallaxes and perform 3D measurement. In the stereo image measurement, it is possible to perform three-dimensional plotting (polyline measurement,etc,) of complicated boundaries and detailed measurement of surfaces.

* For conditions for control points on Image Master, see the description in "Locating Control Points"

Locating Control Points

There are several ways to capture image and to locate control points.

Chose appropriate method depends on the object type and purpose of measurement.

In this chapter, methods to located control points are explained for the typical cases.

Type of Point

Followings are the definitions on different types of point mentioned in the later explanations.

Control Point

Points to be used for orientation process of images.

This includes, Ground Control Point, Pass Point, Tie Point.

Ground Control Point

Points with known 3 dimensional terrain coordinates.

Normally these are measured by Surveying instruments.

Pass Point

Commonly pictured and identical points in two images (Left and Right images) of Stereo Pair.

Position within the images will be measured but 3 dimensional terrain coordinates are not necessary for these points.

* PassPoint is written as the tie point on Image Master.

Tie Point

Similar to the Pass Point, commonly pictured and identical point but between adjoined 2 Stereo Pairs.

These points are used to connect those adjoined Stereo Pairs.

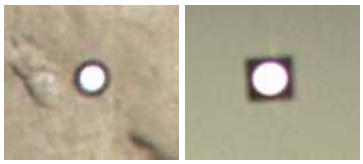
3 dimensional terrain coordinates are not necessary for these points.

About Target Mark

In order to perform the orientation accurately, it is recommended to put specific Target Mark at location of the Control Points.

If circular type target mark is used, center of such circle can be detected very accurately by image processing.

Measurement for the orientation is possible, without attaching such Target Mark, if the point is clearly identical as it is.



Location of Control Points

- The number of points indicated in the following explanations are minimum number based on the theoretical condition for orientation calculation.

  In order to secure orientation accuracy, it is recommended to place more control points than the minimum number.

- Also location of the control points to be spread sufficiently and not concentrated in the covered area.

  For example, if all control points are located in a line, the orientation calculation can not get the result.

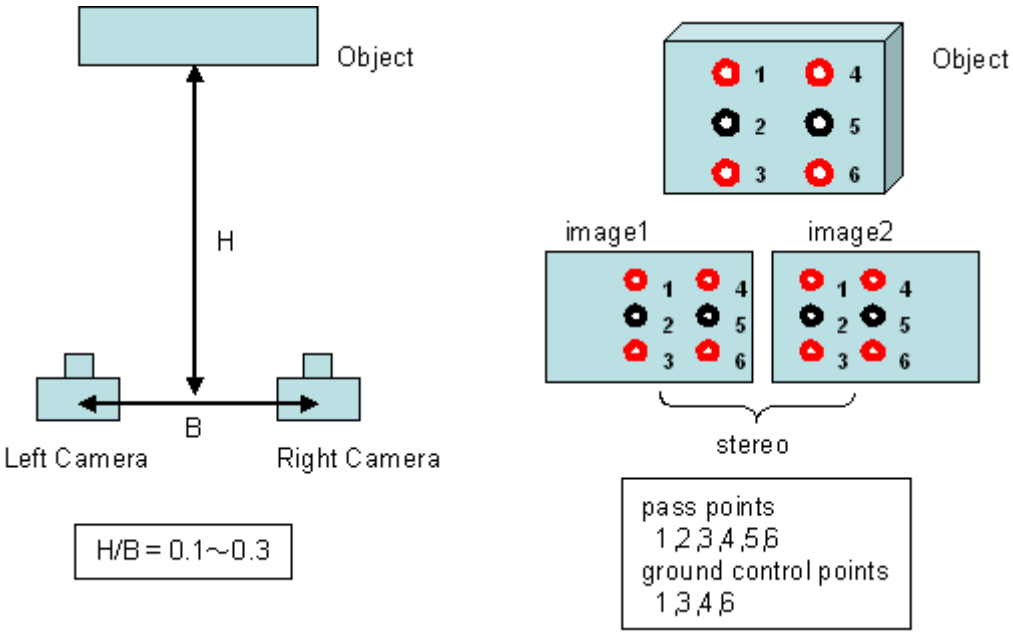
1. Capture Single set of Stereo Pair Image

Facing to the object area, take image (using digital camera) from 2 separate camera points, left side and right side. Using those left and right images, make a stereo pair (through orientation process), and then measure 3D coordinates from the paired images.

For this, locate more than 6 Pass points within the intended measuring area.

Among the 6 Pass points, in order to convert to terrain coordinates, more than 3 points should be Ground Control Points.

Following figure is showing method for capturing stereo images and location of the control points



Minimum number of the Control Points required

Pass Points : more than 6 points/pair

Ground Control Points : more than 4 points/pair

2. Capture Multiple Stereo Pair Image

In case of measuring on object in wider area, Stereo Pair image to be captured from multiple camera locations.

In such case, to use multiple set of stereo pair images, it is necessary to use Ground Control Points and Pass points also to get relationship between different stereo pairs and to get result in the same coordinates system.

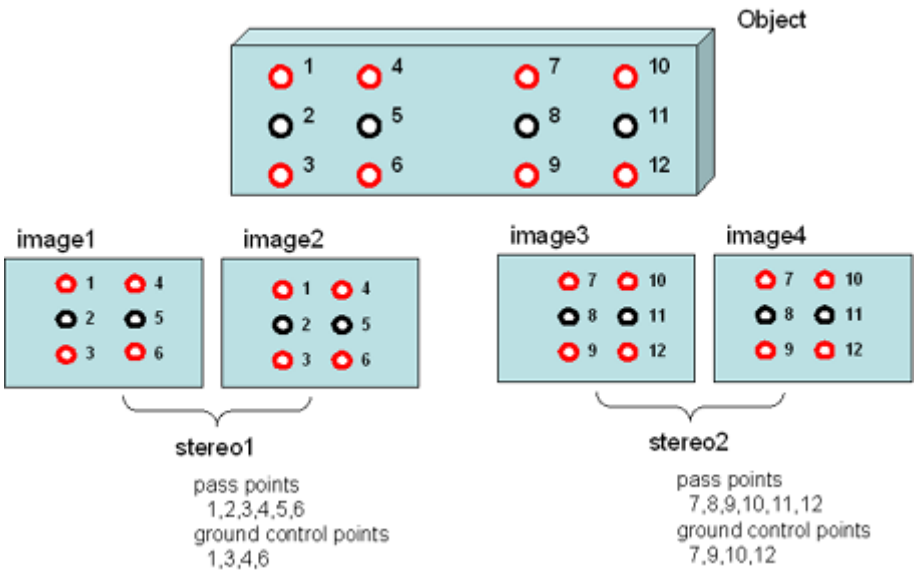
Following example explains method of capturing images and locating Control Points.

2-1. Connecting between sets of Stereo Pairs using Ground Control Points.

If each Stereo Pair can include more than 3 Ground Control Points, all Stereo Pair can be treated in the same coordinate system and also measured result from each Stereo Pair can be obtained in the same coordinate system.

In such case, method to capture the images are in the same way as one for the single set of Stereo pair.

Figure below is illustrating this case.



2-2 Continuously connected Images

Using only 1 set of digital camera, to cover wider area, shift the camera position (as well the pictured area on the object) bit by bit but to cover whole area.

In such case, pictures to be taken in such way that,

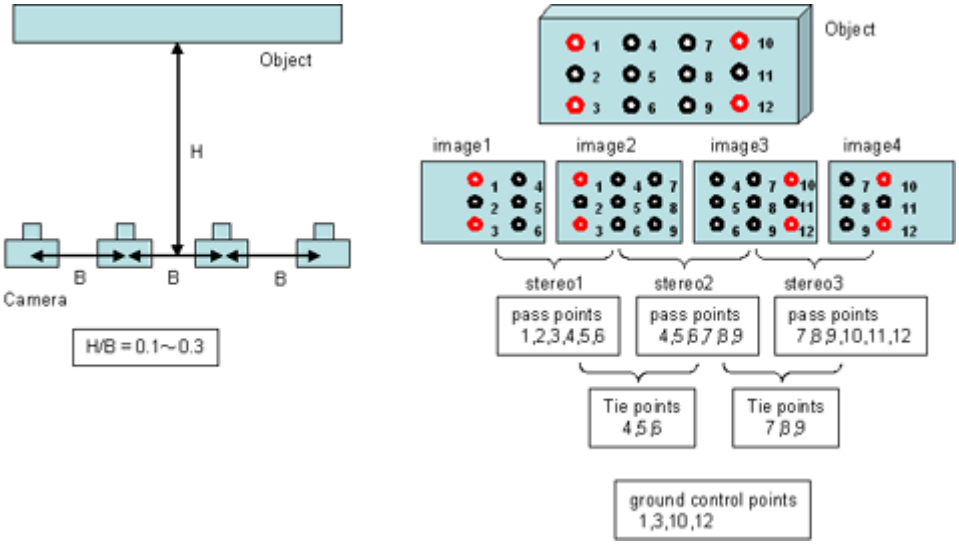
1. adjoined 2 images continued stereo pair (overlapped area in each stereo pair continues without gap)
2. each pair should have more than 6 pass points
3. adjoined 2 sets of stereo pairs (stereo 1 and stereo 2 in figure below) should have more than 1common pass point (pass points 4, 5 and 6 in figure below)

To convert the measured result in the terrain coordinate system, more than 3 points should be the Ground Control Points (# 1, 3, 10 and 12).

With this method, it is possible to cover wide area with limited number of Ground Control Points.

However, Ground Control Points to be located in an adequately even interval since connecting error may Increase, if the number of image tying increase, connecting error may increase, Figure below is showing relationship between the camera positions, image frame and locations of Control Points.

It is recommended to locate the Control Points in a even interval.



Minimum number of the Control Points required

Pass Points : more than 6 points/pair

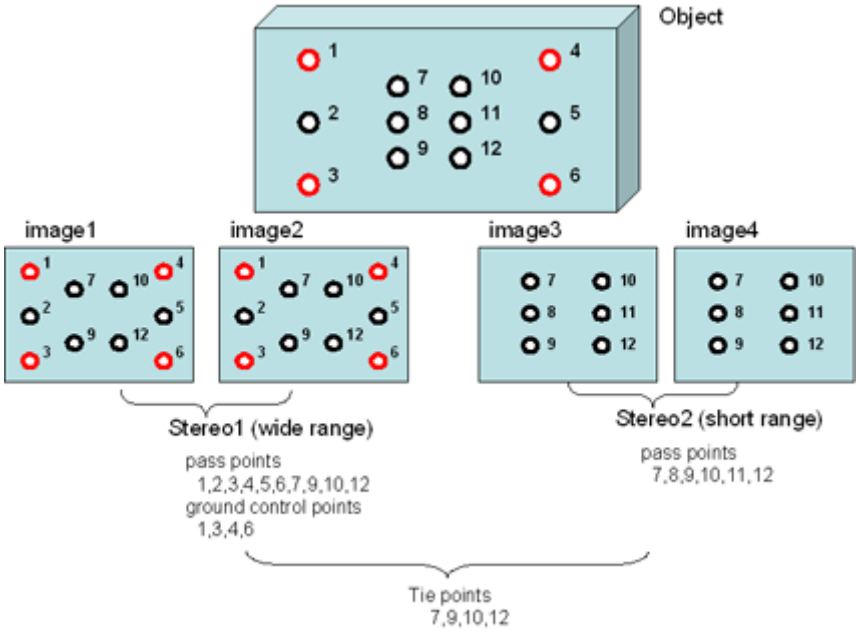
Tie Points : more than 1 point/ with previous and next stereo pairs

Ground Control Points : more than 4 points/ whole area

2-3 Other combination of Stereo Pairs

Two sets of Stereo Pair can be connected if more than 3 Tie points are included in both Stereo Pair.

Figure below is an example of Stereo Pair taken from far distance and one from closer distance to the object.



Minimum number of the Control Points required

Pass Points : more than 6 points/pair

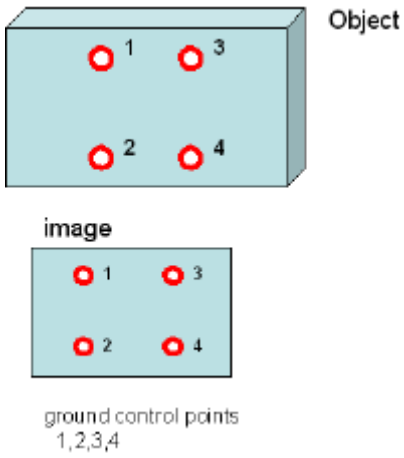
Tie Point : more than 3 points/ between pairs (commonly included in all 4 images)

Ground Control Points : more than 4 points/ in pair (either one)

3. Single Image

If an individual Single Image (not paired as Stereo Pair) includes more than 4 Ground Control Point (or pass point measured in other Stereo Pair), the camera position and aiming angle can be calculated.

Such individual image can not be used for 3D measurement using Stereo paired image, however, can be used for **Texture Mapping** and/or generating **Ortho Image**.



Minimum number of the Control Points required

Ground Control Points : more than 4 points/ image

4. DLT Method (direct linear transformation)

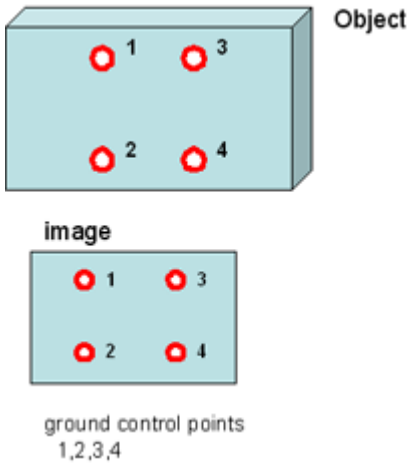
If camera calibration parameters are unknown, the DLT method can be used. If exact camera calibration parameters are given, please use the above-mentioned "Single Image" method.

In the DLT method, each image can not be used for 3D image measurement, however, can be used for **Texture Mapping** and/or generating **Ortho-Image**.

There are two patterns in the DLT method according to the number of ground control points as follows:

4-1. 2D-DLT

An image oriented by the 2D-DLT method can be used for Texture Mapping and/or generating Ortho-Image of planar objects.

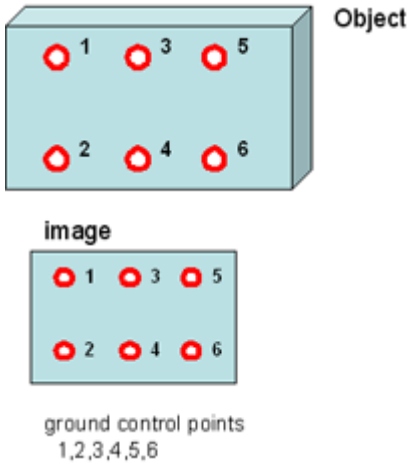


Minimum number of the Control Points required

Ground Control Points : more than 4 points/ image

4-2. 3D-DLT

An image oriented by the 3D-DLT method can be used for Texture Mapping and/or generating Ortho-Image of 3D objects.



Minimum number of the Control Points required

Ground Control Points : more than 6 points/ image

If all of the elevations of ground control points are even, the orientation method is switched into the 2D-DLT method.

Measuring Accuracy

The ground resolution of 3D image measurement is given by the following formulas.

$$\Delta XY = \frac{H}{f} \times \delta p$$

$$\Delta Z = \frac{H}{B} \times \Delta XY$$

Where, dXY: plane resolution, dZ: depth resolution, f: focal distance, dp: image resolution, H: photographing distance, B: base length.

Image Master is designed for an orientation accuracy of 1 pixel or less so that the measuring accuracy is about the same as the ground resolution. So, when the orientation accuracy is enough, namely when the result of orientation computation is totally good, the accuracy of stereo image measurement can be calculated by the above formulas.

In the bundle adjustment method, the accuracy can be further improved by using high-accuracy ground control points. Also, when the special target is photographed in good condition, it is possible to measure the target position with an accuracy of 1/10 - 1/30 pixel.

Measuring Method using Known Length

The orientation calculation can be performed without Ground Control Point, if some registered length between 2 points (for example some bar with fixed length) are used and then 3D coordinates can be obtained in real scale.

If such length is given not only in one direction, but in multiple direction, for instance, in vertical, lateral or inclined direction, coordinates system can be more accurately adjusted.

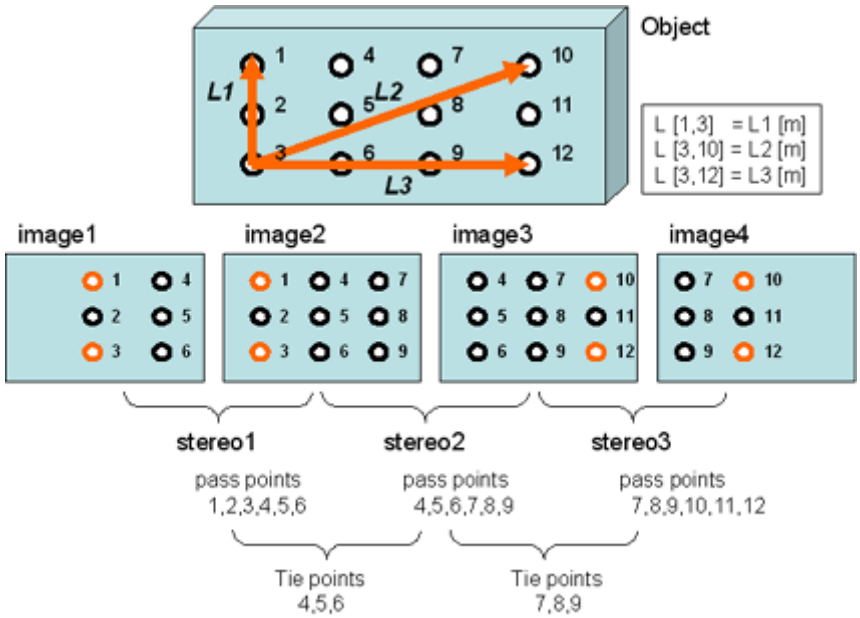
If object is not covered in one set of stereo pair but in 2 sets of stereo pair, each end point of the registered length to be included as a pass point in each set of stereo pair.

If one standard scale bar is used and is moved in order to be included in stereo pair taken from different location and/or location, put the different point name for end points from ones registered from the 1st position of the bar.

This method (using a bar with known length) can be applied for any method for Stereo Pair images explained before and method of capturing images and location of control points are the same.

Also, such known length can be used in orientation calculation combined with exposed Ground Control Point.

Figure below is an example showing relationship of image framing and location of control points.



Measuring Method without Ground Control Point

If Ground Control Points are not available in the images, still measurement is possible in local coordinates system (which is not scaled in real scale)

If no distance information is available, measurement result will be calculated in a scale assuming the base line length (distance between 2 camera positions) was at approx. 1m, and in XY axis is set so that the first image is XY plane.

1) In case of taking only 1 set of Stereo Pair images.

   Necessary to measure only pass points.

2) In case of taking multiple sets of Stereo Pairs.

   Basically follow the same method to capture images as described in the "**2-2 Continuously connected Images**" and "**2-3 Other combination of Stereo Pairs",** however, without including Ground Coordinate Points, to connect relationship between Stereo Pairs and to get measuring result in the common coordinatessystem.

   Please note that in this method without using Ground Control Points, measuring error will be accumulated if number of connecting images increases, and shape of whole model may be distorted.

   Also accuracy of connecting orientation can not be evaluated sufficiently.

   Therefore, recommended to include Ground Control Points or known distance between 2 points into to images, as much as possible, as described previous paragraph.

Screen Descriptions

Screen Configuration

Image Master has six screen listed below, and five work modes.

When working with Image Master , first enter the work mode appropriate for your task.

The menus and tool buttons available for use depends on the currently selected work mode.

Screen Configuration

・Initial Screen

・Model Screen

・Remote Screen

・Registration Screen

・Orientation Screen

・Stereo Screen

Work Modes

・Model Mode

・Remote Mode

・Registration Mode

・Orientation Mode

・Stereo Mode

All Screens include the following display elements.

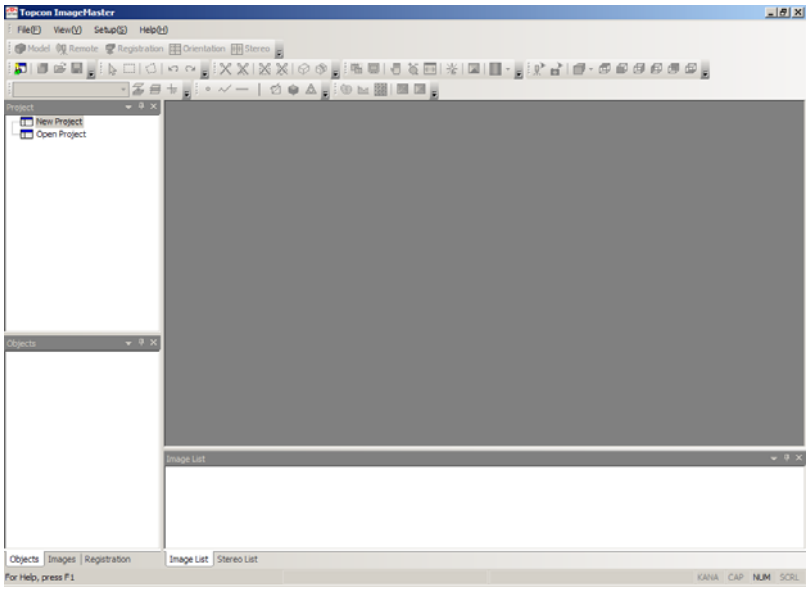
・Menu Bar

・Tool Bar

・Status Bar

Initial Screen

This screen appears first whenever Image Master is started up. This screen also appears when all project screens are closed. The initial screen can be used to create a project and to open an existing project. Also, the initial screen can be used to configure Image Master basic work environment settings.

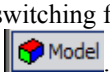


Model Screen

This screen is for creating a new model and for opening an existing model. Creating a new project adds one model automatically, and displays its model screen.

A model screen shows project-specific setting details and measurement data, and you can configure project-wide settings, perform calculations, and manage and edit measurement data.

The model screen can be used to view 3D data and polylines and TIN. The data editing screen can be used for free rotation of data with the mouse, and for viewing 3D forms and configurations from various views. You also can display TIN images (texture) in pasted form, for easy checking of measured 3D data.

The model screen allows switching from the remote mode or registration mode by clicking the mode selector tool button. 

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The model screen consists of the following five sections.

Project Tree View (Upper Left)

The project tree view lists the models included in the project.

A model is a set of data measured in the same coordinate system.

The tree view can be used to create a new model, and to select, add, delete, or copy a model.

Object Tree View (Lower Left)

The object tree view lists data included in the model, along with other display items.

Show or hide for the following can be specified with system items: coordinates, grid, camera arrangement, station (IS) arrangement, panorama image.

Show or hide for the following can be specified with object items: type-specified measurement data (scan data (point clouds), points, polylines, etc.), TIN created using measurement data, etc. Also the quantity of each data can be checked easily.

Layer items list created layers, and show or hide can be specified for each layer.

Station items list the locations where the IS positioned.checking for each station can be switched on or off, and show or hide can be specified for data measured by the IS.

Show/hide is performed for data sets captured at a specific location using IS.

The tabs under tree view can be used to switch between the object tree view and image tree view.

Image Tree View (Lower Left)

The image tree view shows a tree of camera and original image registration statuses. The tree view can be used for selection when you want to work on a particular camera, image, or stereo pair.

The tabs under the tree view can be used to switch between the object tree view and image tree view.

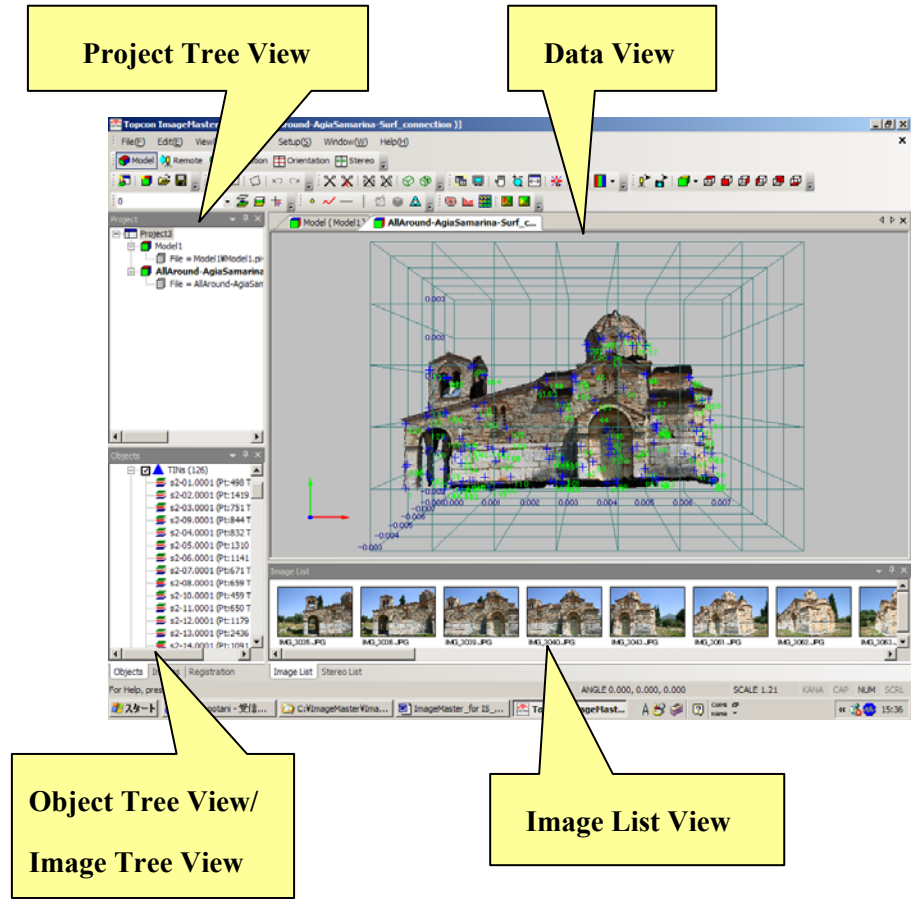
Image List View (Bottom)

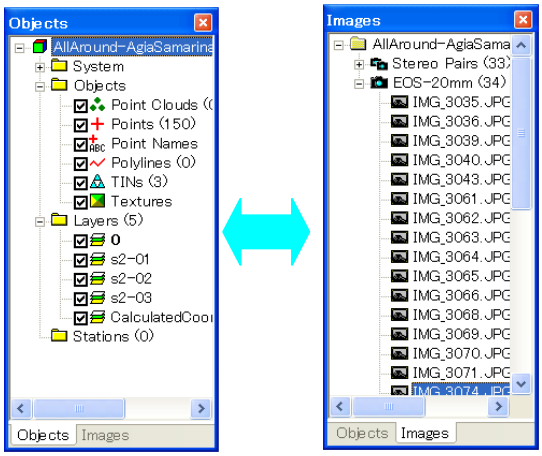
The image list view lists thumbnails of registered images. Double-click a thumbnail to open an image. Work on multiple images by selecting them from the image list. Thumbnail images can be rearranged freely, for selection of registered images.

Data View (Right Side)

The data view shows 3D data with an overlaid grid.

The 3D data can be rotated using the mouse, and its form and configuration can be viewed from any viewpoint. Use the data view when you need to perform intensive editing of 3D data.

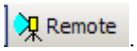




*The display changes into the Object tree view and the Image Tree View change with the button.

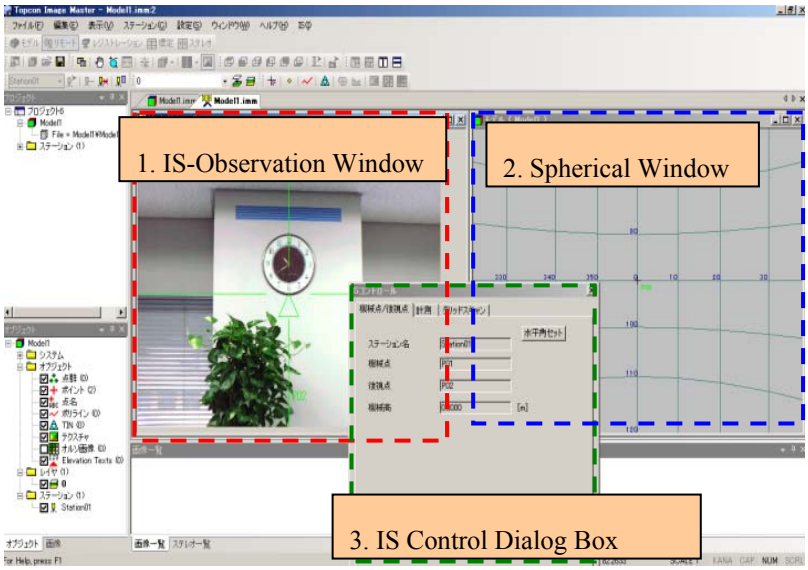
Remote Screen

The remote screen is a screen for IS remote control

The remote screen allows switching from model mode or registration mode by clicking a mode selector tool button. 

.

A remote screen is composed of the IS observation window, the spherical window, and the IS control dialog box as shown in the figure below.



1. IS-Observation Window

The internal camera of IS is displayed.

IS turns when it clicks on the screen.

IS turns continuously when dragging it while click the right mouse button.

- Quality: Image quality (Fine, Normal, Low) of the camera is selected.

  However, the frame rate slows when High is selected.

- Wide/Telescope: The camera is switched to the wide or telescope angle.

- Assist Focus: The assist focus is turned on and off.

*"Assist focus" is a function to do auto focus of the telescope camera.

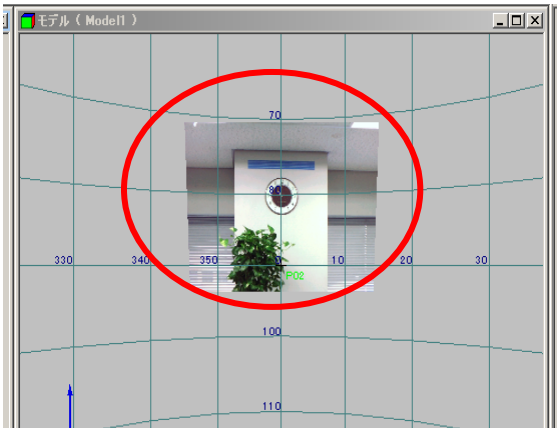
- N / F : The manual focus is adjusted.

*N means a near side and F means a far side.

- Capture: The image is taken of a picture when this button is pushed.

This image is displayed in the spherical window as shown in the figure below.

Moreover, it is possible to make the panorama image.



2. Spherical Window

It shows a spherical mesh with the IS occupied point as the origin, the horizontal axis as the horizontal angle, and the vertical axis as the vertical angle.

During measurement or scanning, work can be performed while viewing the data captured by IS.

3. IS Control Dialog Box

Please refer to "IS control dialog".

Registration Screen

Use the registration screen to compose model data registered in the project.

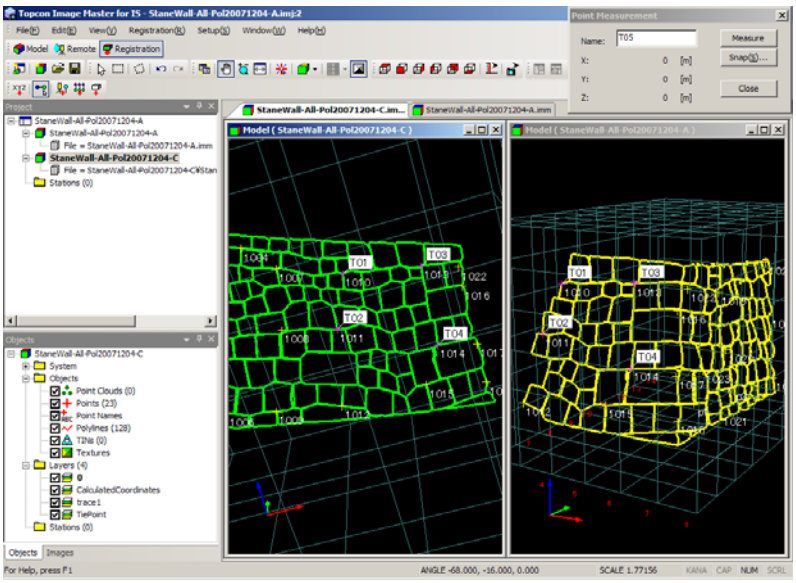
The registration screen performs transformation to arrange the models in the correct positions.

The methods used for transformation are the occupied point and backsight point method and the tie point method.

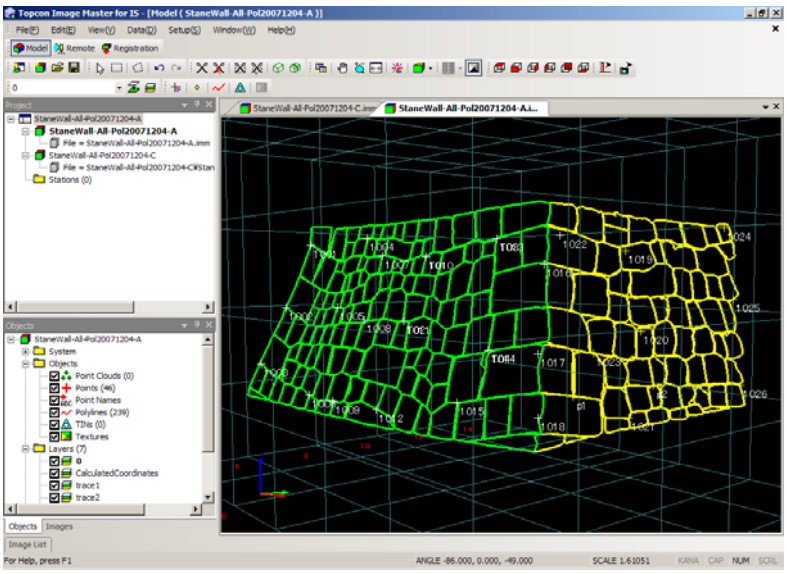
With the tie point method, a reference model is displayed next to the model to be registered as shown below, and the tie points of both models are specified.

The registration screen allows switching from model mode or remote mode by clicking a mode selector tool button. 

.



When the tie point is measured, and registration is calculated, two data is connected as shown in the figure below.

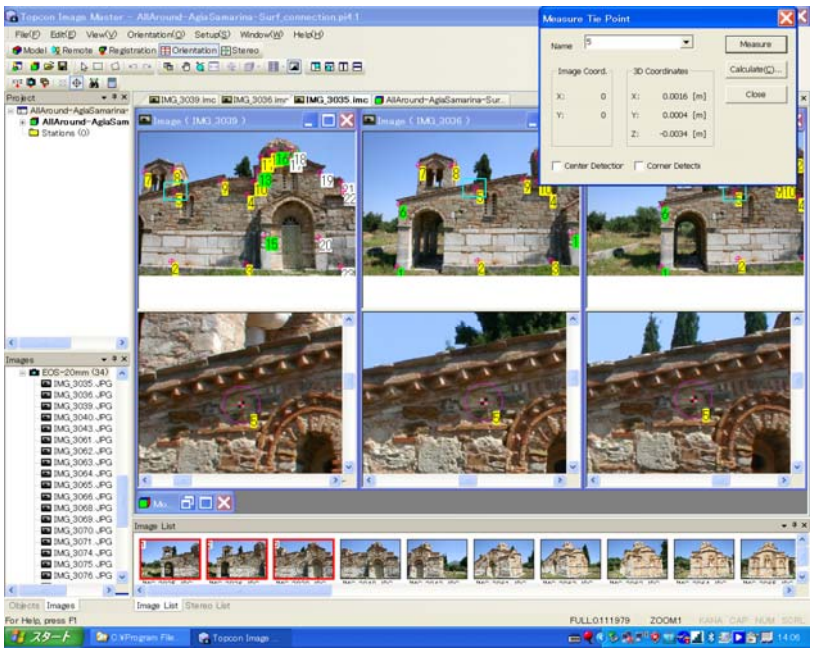

Topcon Image Master for IS - [Model (StaneWall-All-Pol20071204-A)]
File(F) Edit(E) View(V) Data(D) Setup(S) Window(W) Help(H)
Model Remote Registration
Project
StaneWall-All-Pol20071204-A
StaneWall-All-Pol20071204-A
File = StaneWall-All-Pol20071204-A.imm
StaneWall-All-Pol20071204-C
File = StaneWall-All-Pol20071204-C¥Stan
Stations (0)
Objects
StaneWall-All-Pol20071204-A
System
Objects
Point Clouds (0)
Points (46)
Point Names
Polylines (239)
TINs (0)
Textures
Layers (7)
0
CalculatedCoordinates
trace1
trace2
Objects Images
Image List
StaneWall-All-Pol20071204-C.imm
StaneWall-All-Pol20071204-A.i...
For Help, press F1
ANGLE -86.000, 0.000, -49.000
SCALE 1:61051
KANA CAP NUM SCRL

Orientation Screen

Here, about the specified images and stereo pairs, measurement and editing operations of control points are done.

The orientation screen can be switched by selecting the image or the stereo pair, and clicking the mode selection tool button. 

The orientation screen is displayed by dividing a screen into the total screen (at top) and the enlargement screen (at bottom). When a position is specified on the total screen, the enlargement image of the periphery is displayed on the enlargement screen. The position is exactly plotted and control points are measured on the enlargement screen.



Stereo Screen

This screen is used for stereo image measurement.

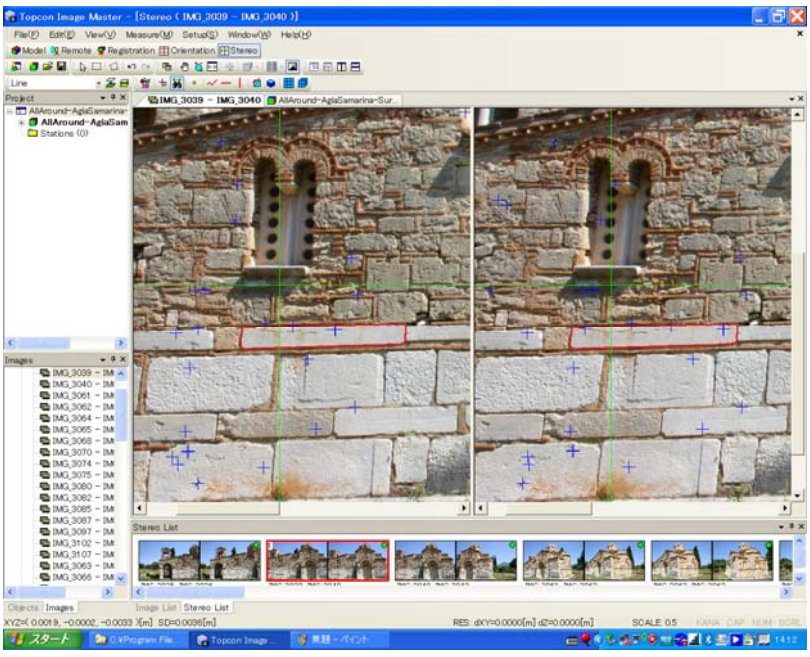
The stereo screen can be switched by clicking the mode selection tool button Stereo if the orientation work is completed.

On the stereo screen, stereo images can be viewed stereoscopically using special polarizing glasses. Also, it is possible to do 3D measurement and plotting by specifying positions on the stereo image.

On the stereo screen, work can be done by switching the L-R display mode and stereoscopic display mode, as needed.

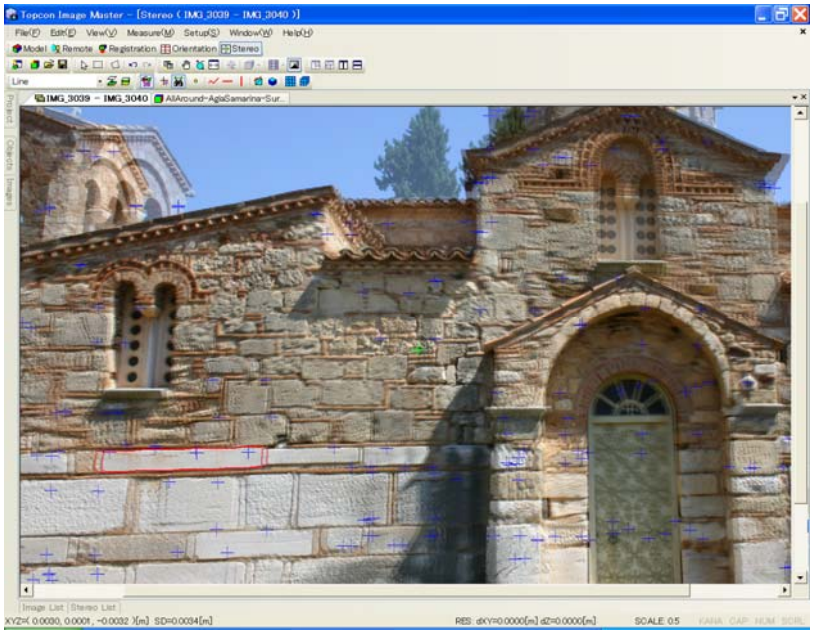
L-R display mode

Right and left images are displayed side by side. As it is possible to do measurement by confirming the positions of the corresponding right and left points, this is suitable for measuring a clear border line and objects to which stereoscopic observation is not easy. Under the L-R display mode, cursors are displayed on each of the right and left screens and move relative to one another. 3D measurement is done by aligning these cursors with the same right and left points.



Ssereoscopic display mode

It is possible to do measurement stereoscopically using special polarizing glasses. As measurement can be done while confirming in detail the contour, this is suitable for measuring complicated shapes. Especially, for measuring gently curved points, stereoscopic measurement is essential. Under the stereoscopic display mode, stereoscopically viewable cursors are displayed and can be moved three-dimensionally. Through stereoscopic viewing, 3D measurement is done by aligning the cursors with the height (depth) of the target surfaces. Practically, specifying the target surfaces through stereoscopic viewing means totally the same as specifying the same right and left points one by one.

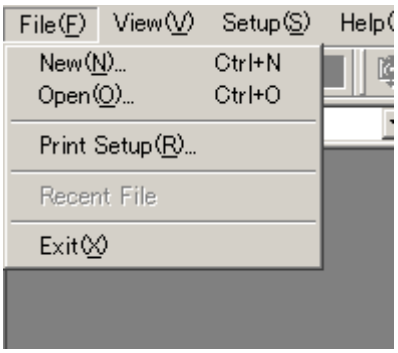


Under the stereoscopic display mode, right and left images are displayed alternately along each scanning line of the display. Thus, the substantial vertical resolution is 1/2 of the horizontal resolution. For example, when measured on the display without enlargement, the vertical resolution is 2 pixels. To secure a sufficient accuracy under the stereoscopic display mode, measurement should be done on a display at least twice enlarged. (Accuracy of area measurement is not affected by the display magnification.)

Menu Bar

All commands of Image Master are displayed and these can be executed by specifying the relevant menu items. The menu content differs by the work screen displayed at the front. Inactive menu items are displayed in gray.

Menu Key Operations



Menu items are each given alphabets in parentheses shown on their right. These letters indicates the keys used for operating the menu by key entry. For example, when executing [File (F)] and [New Project (N)] by key operations, press keys [Alt] -> [F] -> [N] in this order.

Or, press the [Alt] key and select items by pressing the arrow keys.

Shortcut Keys

Some of the menu items, such as [Ctrl+N], are displayed on the right side a little apart from the item name. These are shortcut keys.

Using shortcut keys, it is possible to shortly execute the commands by single key entry.

Shortcut keys especially of the frequently used commands will facilitate operations.

Toolbar

The toolbar provides a collection of buttons at the top of the screen.

The functions assigned to tool buttons correspond to the main commands of Image Master. The functions of most tool buttons correspond to menu command functions. Tool buttons help to make Image Maser operations more efficient. As with menu commands, the tool buttons that are available depend on the currently active window. Buttons that are unavailable appear dimmed on the toolbar.

The toolbar is divided into groups according to function.

The following explains the function of each toolbar button.

Mode Selectors

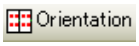
The mode selectors change the work mode. They include model mode, remote mode, and registration mode buttons.

Selecting a mode button will display the mode Screen and the menus for that screen.

Change the work mode to model mode.

Change the work mode to remote mode.

Change the work mode to registration mode.



Change the work mode to orientation mode

Change the work mode to stereo mode

Standard Toolbar


Create a new project. (New Project)


Create a new model.


Open an existing project.

 Save the project, replacing its previous version.

Selection Toolbar

 Select a figure.

 Select a rectangular range.

 Select a polygonal range.

 Undo a data creation, editing, or other operation.

 Redo an undone data creation, editing, or other operation.

Clipping Toolbar

 Toggle the currently configured clipping process on or off. (Clip)

 Clear the currently specified clipping area. (Clip Area Clear)

 Select a rectangular clipping area. (Clip Square Area)

 Select a polygonal clipping area. (Clip Polygonal Area)

 Select a 3D (XYX) clipping area. (Clip 3D Area)

 For displaying the clipping area sliced on each 3D axis. (Clip Slice)

Display Toolbar

 Refresh the screen.

 Pans (moves the display range of) the screen.

 Left-clicking zooms in, right-clicking zooms out.

 Fit the entire area of the data within the window.

 Specify a focus point on the currently displayed object.


Toggle between 3D and 2D display.


Display a TIN with shading.


Displays point cloud (scan) data in color.

This button is a toggle. You can click the button, or you can click the down arrow and then select one of the options shown below.


Display point cloud data with texture.


Display the intensities of laser scanner reflections as grayscales in group point data.


Display the intensities of laser scanner reflections as colors in group point data.


Display point cloud data elevation in colors.


Display point cloud data distance in color.


Display point cloud data in color.

* Reflection intensity cannot be applied to point cloud data captured by IS.

Rotation Toolbar


Display the data from the top view.


Display the data from the front view.


Display the data from the right side view.


Display the data from the left side view.


Display the data from the back view.


Display the data from the bottom view.


Display the elevation whose horizontal axis is two specified points.


Display an overlay of the data and image from the view of the selected image's camera.

Layer Toolbar

Select the current layer from the list.

Add a new layer.

Layer Settings.

Object Toolbar

For configuring snap settings.

Perform point operation measurement.

Perform polyline measurement.

Generate a TIN from existing data.

Mapping texture to a TIN or a point cloud.

Window Toolbar

Split the orientation window vertically.

Split the orientation window horizontally.

Tile multiple windows horizontally.

Tile multiple windows vertically.

Station Toolbar

Select the current station from the list.


Display the data from the current station's view.


Connect to a device.


Disconnect from the currently connected device.


List all station information.

Registration Toolbar

Imports coordinate data from a file.


Specify a tie point.


Register with OCC/BS.


Register with Tie points.


Register without transformation.

Orientation Tool Bar

Reads a 3D data file.


Registers original images.


Registers stereo pairs.


Measures fiducial mark coordinates. (Effective only when a film camera is used.)


Measures image coordinates of control points.


Switches the automatic correlation mode ON/OFF.


Calculates orientation.

Stereo Tool Bar

 Switches the display of the stereo image as L-R separated or 3D view.

 Sets the snap settings.

 Switches the automatic correlation mode ON/OFF.

 Measures points.

 Measures polylines.

 Measures horizontal lines (Z fixed).

 Measures vertical lines (XY fixed).

 Creates a surface from polylines.

 Creates a box-shaped surface.

 Automatically measures a surface.

 Automatically measures a surface in which it extends over multiple stereo images. (Batch Processing)

Status Bar

Status Bar

The status bar is displayed at the bottom part of the Image Master screen.

On the status bar, various messages and information are displayed according to work conditions.

When a button is selected, a brief description of each function is displayed.

Also, on each work screen, the following information is always displayed on the status bar.

Model Screen

ANGLE 0.000, 0.000, 0.000	Rotation angles omega,phi,kappa [deg]
SCALE 1000.000	Display magnification of data

Remote Screen

HORT:0.0000	Horizontal angle [deg]
VERT:0.0000	Vertical angle [deg]
SCALE 1/XXXX	Display magnification of data (Approximate value of scale on display)

Also, ON/OFF conditions of the following keys are displayed on the right side regard less of the condition of the work screen:

CAP	Displayed when the [Caps Lock] key is ON.
NUM	Displayed when the [Num Lock] key is ON.
SCRL	Displayed when the [Scroll Lock] key is ON.

When working on Image Master, set as NUM=ON and SCRL=OFF. If the condition is other than this, shortcut keys and others may not work normally.

Getting Started

IS Wireless Network Setting

Overview

IS can be connected to PC by following two modes of wireless network.

Infrastructure mode: Using wireless router / access point.

Ad-hoc mode: Peer-to-peer. Direct connection with PC and IS.

Range is around 10m – 30m.

A CF type wireless network card is needed for IS.

After the wireless network card is bought, it is necessary to set up the device driver of the card to IS.

Infrastructure mode

In the following explanations, the subnet mask is set to **255.255.255.0** as a setting example, and common IP address to the network is **192.168.0.XXX.**

Network parameters

	SSID	ISCONTROL
Router	IP address	192.168.0.1.
	Subnet mask	255.255.255.0
	DHCP	disable
	Encryption	No
	Mode	11g (or 11b)
	Channel	Auto
IS	IP address	192.168.0.2.
	Subnet mask	255.255.255.0
PC	IP address	192.168.0.3.
	Subnet mask	255.255.255.0

Change SSID and IP address of wireless router

It is necessary to set SSID and IP address of the router used like the above-mentioned.

Please refer to the manual of the router for details of the setting method.

Change IP address of IS

Please set up the device driver of the network card used to the IS.
IP address of the IS is set as shown in the above-mentioned table.
The set-up procedure is done with the IS as follows.

① **START** -> **Settings** -> **Network and Dial-up Connections**

② Double click " connected network " icon

③ Set **IP address** : **192.168.0.2**., and set **Subnet mask** : **255.255.255.0**, then press "**OK**" button.

Connect IS to the network "SSID : ISCONTROL"

①Double click " **Wireless Network Icon**" on task bar.

②Click "**Wireless Information**" tab.

③ Select " ISCONTROL " from list, and press "**Connect**" button. If connection is completed, it is displayed in Status as "Connected to ISCONTROL".

④Click "**OK**" button.

Change IP address of PC

First of all, the PC(personal computer) is connected with the network router with wireless or the cable.
IP address of the PC is set to 192.168.0.3 according to the following procedure.

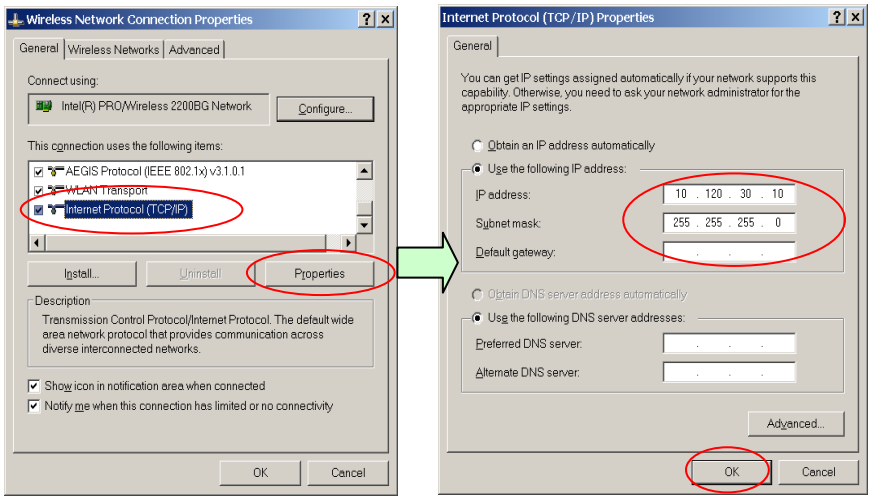
① Select "**Control panel**" from START menu, and double click "**Network connection**" icon.

② Right click on "**Wireless Network Connection**" icon, and select "**Properties**" from the menu.

③ Select "**Internet Protocol(TCP/IP)**" from the list, and click "**Properties**".

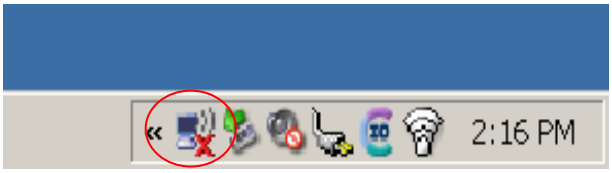
④ Enter **IP address : 192.168.0.3**, **Subnet mask : 255.255.255.0**, then click "**OK**" button.

⑤ Click "**OK**" button.

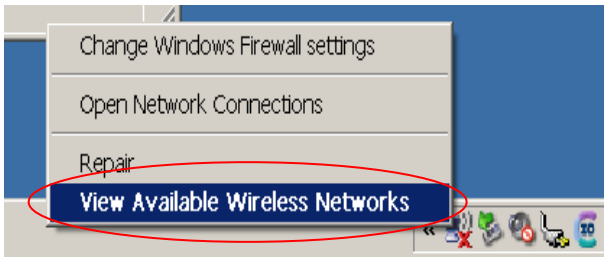


Connect PC to the network "SSID : ISCONTROL"

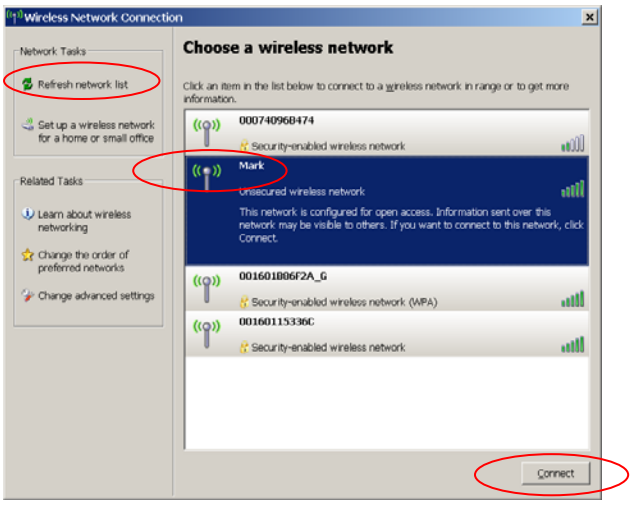
① Right click "**Wireless Network**" icon on task tray.



② Select "**View Available Wireless Networks**" from the menu.



③ Press "**Refresh network list**", and select " ISCONTROL " from the list, then click "**Connect**" button.



Ad-hoc mode

In the following explanations, the subnet mask is adjusted to **255.255.255.0** as an example, and common IP address to the network is **192.168.0.XXX.**

Network parameters

SSID	ISADHOC
IS IP address	192.168.0.2.
Subnet mask	255.255.255.0
PC IP address	192.168.0.3.
Subnet mask	255.255.255.0

Set up ad-hoc connection "SSID : ISADHOC " on IS

① Double click Wireless network icon on task bar.

② Click "**Wireless Information**" tab.

③ Double click "**Add New…**" from the list.

④ Set the following parameters.

Network name (SSID)	ISADHOC
This is an ad hoc network	**On (check)**
Authentication	**Open**
Encryption	**Disabled**

Press "**OK**" button

⑤ " ISADHOC " will be connected automatically.

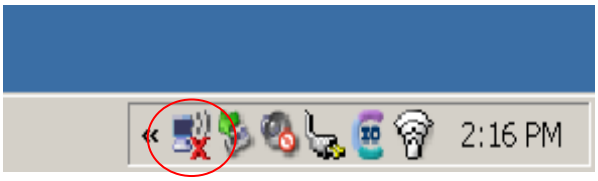
If not, select " ISADHOC " from the list and press "Connect" button.

⑥ Press "**OK**" button.

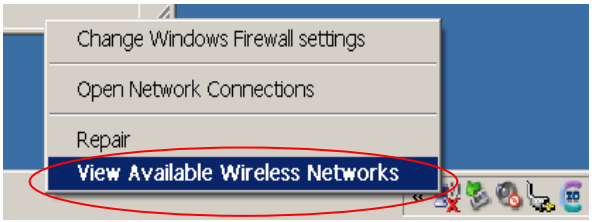
Setting up PC for ad-hoc mode and connect "SSID : ISADHOC"

You need to change wireless LAN mode to Ad-hoc mode.

① Right click "**Wireless Network**" icon on task tray.

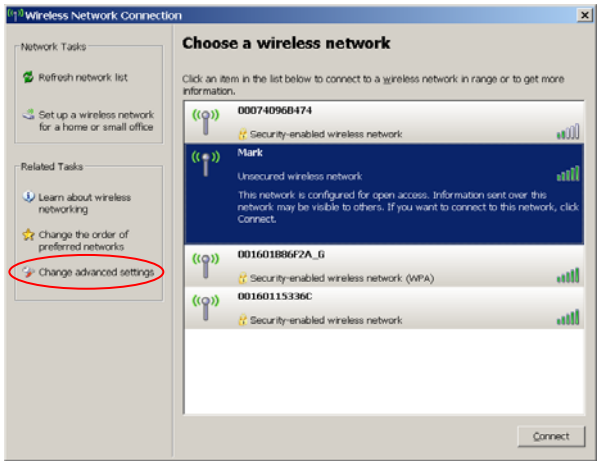


② Select "**View Available Wireless Networks**" from the menu.



③ Press "**Change advanced settings**".

"**Wireless Network Connection Properties**" dialog will be shown and select "**Wireless networks**" tab, and press "**Advanced**" button.



④ Select "**Computer-to-computer (ad-hoc) network only**", and press "**Close**" button.

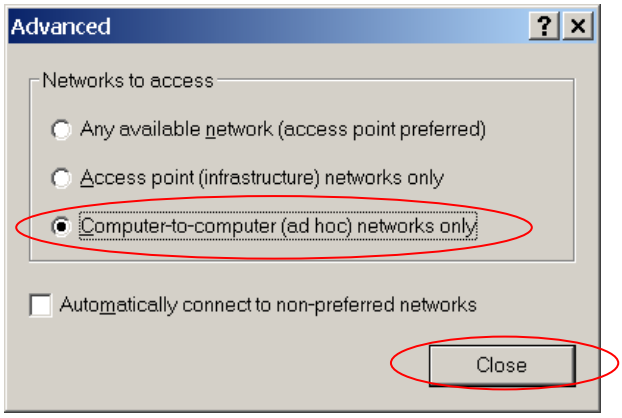
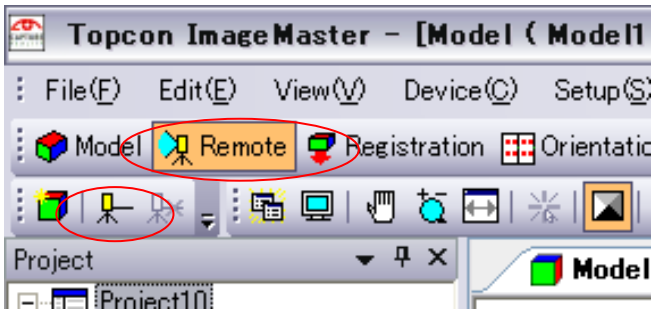


Image Master

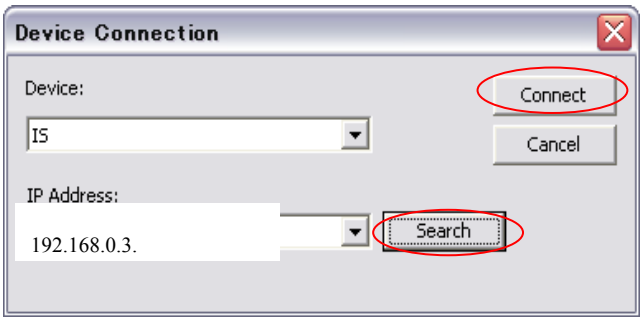
① Run Image Master and create new project.

② Press "**Remote**" button, and press "**Connect**" button.

"**Device Connection**" dialog will be shown.

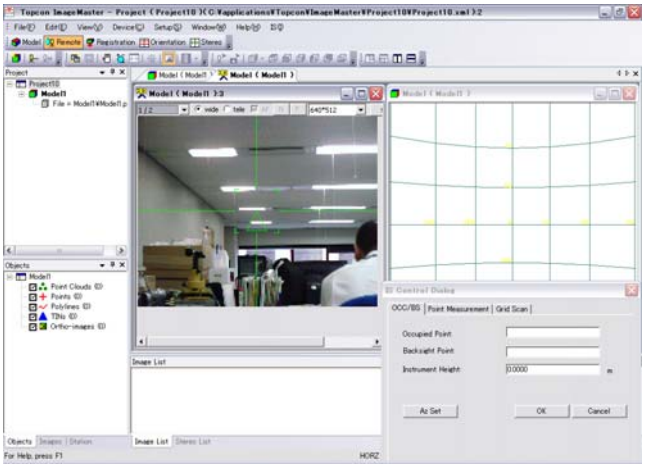


③ Press "**Search**" button, then the IP address of the target equipment (*e.g.*, 192.168.0.3.) will be shown.



④ Press "**Connect**" button.

If the image is shown on the display, connection is completed.



Reference
Initial Screen Menu

File

New Project (pro)(Std)(Lite)

Create a new project:

1. Select [File] and [New Project] from the menu.

2. On the "New Project" Dialog Box, set the project name and the place of the folder and click the [OK] button.

3. The new project is created, and the model screen of the empty project is displayed.

When the project is created, the "Project Name" folder is created in the specified place, and the project file "Project Name .imj" is created in the folder.

Open Project (pro)(Std)(Lite)

Open the file of existing projects:

1. Select [File] and [Open Project] from the menu.

2. On the "Open" Dialog Box, specify the project file name to read and click the [Open] button.

3. The model screen of the specified project is displayed.

Compatible project file type is as shown below:

Image Master project	extension : imj
PI-3000 project	extension : pi3,pi4
PI-2000 project	extension : piw
PI-1000 project	extension : isv

When the unit of imported Project data is different from the one required by the system, the data is converted to the system's unit system.

For the details of unit settings, please refer to the explanation of "Unit" Dialog Box.

Close Project (pro)(Std)(Lite)

Close the project being worked.

When changes are added to the content, the message is displayed asking whether to save the changes or not. If closed without saving, all the changed contents are lost.

Print Setup (pro)(Std)(Lite)

Select, connect and set the printer:

1. Select [File] and [Printer Setup] from the menu.
2. On the "Print Setup" Dialog Box, set the font and click the [OK] button.

Exit (pro)(Std)(Lite)

Finish work on Image Master and close all screens.

When changes added to the project are not saved yet, a dialog confirming whether to save these or not is displayed.

View

Toolbars (pro)(Std)(Lite)

Switch ON/OFF the toolbars.

For details about the toolbars, see the description of "Tool Bar".

Status Bar (pro)(Std)(Lite)

Switch ON/OFF the status bar.

For details about the status bar, see the description of "Status Bar".

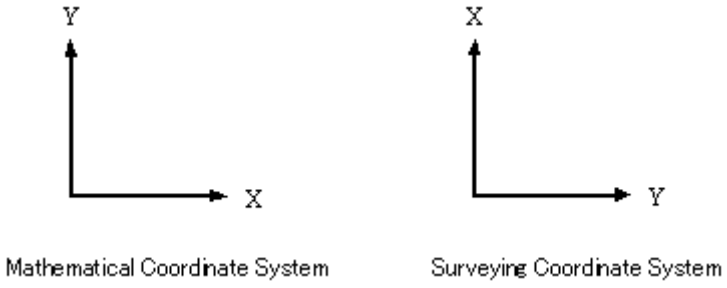
Setup

Coordinate System (pro)(Std)(Lite)

Set the coordinate system of the 3D data used for work on Image Master:

1. Select [Setup] and [Coordinate System] from the menu.
2. On the "Coordinate System" Dialog Box, set the font and click the [OK] button.

The coordinate system can be selected from the following 2 coordinate systems:



Mathematical Coordinate System

In connection with the XY plane, the right direction is +X, the upward direction is +Y and the front direction is +Z. This coordinates system is popularly used for CAD software.

Surveying Coordinate System

In connection with the XY plane (ground), the right direction is +X (North), the upward direction is +Y (East) and the front direction is +Z (Elevation). This coordinates system is popularly used for survey of Japan.

Unit (pro)(Std)(Lite)

Setting unit of 3D data to be used on Image Master.

1. Select menus, [Setup] - [Unit]
2. On the "Unit" Dialog Box, set the unit and click the [OK] button.

Fonts and Colors (pro)(Std)(Lite)

Set the font and color of the basic items displayed on Image Master Screens:

1. Select [Setup] and [Fonts and Colors] from the menu.
2. On the "Fonts and Colors" Dialog Box, select necessary items and click the [OK] button.

Auto Save (pro)(Std)(Lite)

Set the backup file on Image Master for IS:

1. Select [Setup] and [Auto Save] from the menu.
2. On the "Auto Save Setting" Dialog Box, set the interval time and click the [OK] button.

Help

Help Topics (pro)(Std)(Lite)

Open the Help screen.

A description of the item selected on Contents is displayed on the screen.

Also, it is possible to search the item to display by entering the keyword.

About Image Master (pro)(Std)(Lite)

The version of Image Master software is displayed.

Model Screen Menu

File

New Project (pro)(Std)(Lite)

Please refer to the “Initial Screen Menu, [File] – [New Project]”.

Open Project (pro)(Std)(Lite)

Please refer to the “Initial Screen Menu, [File] – [Open Project]”.

Close Project (pro)(Std)(Lite)

Please refer to the “Initial Screen Menu, [File] – [Close Project]”.

Model (pro)(Std)(Lite)

New Model

Use the following procedure to create a new model.

1. On the menu, select [File] - [Model] - [New Model].
2. In the New Model dialog box that appears, enter the name you want to assign to the model and then click the [OK] button.
3. This creates the new model and displays a blank model window.

Creating a new model creates a folder with the model name inside the project file, and creates a model file with the name [model name].imm inside the model file.

Open Model

Use the following procedure to display a model selected in the project tree.

1. In the project tree, select the name of the model you want to display.
2. On the menu, select [File] - [Model] - [Open Model].
3. This displays the model window of the selected model.

You also can open a model by double-clicking its icon in the project tree with your mouse.

Save Model

Use the following procedure to save a model, replacing its previous version.

On the menu, select [File] - [Model] - [Save Model].

Add Model

Use the following procedure to add an external model to a project.

1. On the menu, select [File] - [Model] - [Add Model].
2. In the Open File dialog box that appears, specify the file name of the model you want to import and then click the [Open] button.
3. This registers the specified model data in the project tree and displays its model window.

The following are the supported model file formats.

Image Master Model	File name extension: imm
PI-3000 Project	File name extensions: pi3, pi4
PI-2000 Project	File name extension: piw
DI-1000 Project	File name extension: isv

When you import a model file, a confirmation message will appear to ask whether it should be copied into the project folder. Select [Yes] to copy the model file into the project folder.

Selecting [No] will merely link to the data.

Importing a model file that uses different units from those of the system will cause the file's units to be converted to the system's measurements units. For information about measurement units, see the Unit Settings dialog box.

Copy Model

The procedure creates a copy of the model that is currently selected in the project tree and registers the copy in the project tree.

1. In the project tree, select the name of the model you want to copy.
2. On the menu, select [File] - [Model] - [Copy Model].

3. This copies the selected model and registers it in the project.

Delete Model

Use the following procedure to delete a model.

1. In the project tree, select the name of the model you want to delete.

2. On the menu, select [File] - [Model] - [Delete Model].

3. This deletes the selected model from the project tree.

* When the data file is within the project, you can select to delete the link only or to completely delete the data itself.

Rename Model

Use the following procedure to rename a model.

1. In the project tree, select the name of the model you want to rename.

2. On the menu, select [File] - [Model] - [Rename Model].

3. In the project tree, enter the new name of the model in place of its existing name.

Sort Model

Use the following procedure to sort models.

It rearranges models registered in the project tree putting their names in alphabetical order.

1. On the menu, select [File] - [Model] - [Sort Model].

2. This sorts the selected models in the project tree.

Close Model

Use the following procedure to close a currently open model.

1. In the project tree, select the name of the model you want to close.

2. On the menu, select [File] - [Model] - [Close Model].

3.This closes the currently selected model window.

Import

Point File (Pro)(Std)

Use the following procedure to import point data from a file.

1. On the menu, select [File] - [Import] - [Point File].
2. In the Open File dialog box that appears, specify the file name and file type and then click the [Open] button.
3. A Custom Import dialog box will appear if the file format is CSV or TXT. You can use the dialog box to sort the data and specify the delimiting character before importing the data.

The following point data file formats can be imported using Image Master.

CSV File (*.csv)

This is a general-purpose file format in which data is delimited by commas (,).

Data sorting can be freely configured on a dialog box before importing.

TXT File (*.txt)

This is a general-purpose file format in which data is delimited by commas (,), tabs, spaces, etc.

Data sorting and the delimiting character can be freely configured on a dialog box before importing.

APA File (*.txt)

This is a standard type of file for handling survey data.

The only information in this file that the Image Master reads is point name, X, Y, Z.

SIMA File (*.sim)

This is a standard type of file for handling survey data.

The only information in this file that the Image Master reads is point name, X, Y, Z.

GCP File (*.gcp)

This is a type of coordinates file used exclusively by the Topcon PI-2000 and DI-1000.

The only information in this file that is read is point name, X, Y, Z.

Point Cloud File(Pro)(Std)

Use the following procedure to import point cloud data from a file.

DXF File (*.dxf)

This is a file type for replacing AutoCAD drawings.

The Image Master reads only the points in this file.

CSV File (*.csv)

This is a general-purpose file format in which data is delimited by commas (,).

Data sorting can be freely configured on a dialog box before importing.

TXT File (*.txt)

This is a general-purpose file format in which data is delimited by commas (,), tabs, spaces, etc.

Data sorting and the delimiting character can be freely configured on a dialog box before importing.

CL3 File (*.cl3)

This is TOPCON original data format for point cloud data.

Shape File(Pro)(Std)

Use the following procedure to import point cloud data from a file.

DXF File (*.dxf)

This is a file type for replacing AutoCAD drawings.

The Image Master reads only the layers, points, polylines and TINs(3DFACE) in this file.

TIN File (*.tin)

This is a type of file used exclusively by the Image Master.

It can be used for reading and saving TIN data and texture.

Ortho image File (Pro)(Std)

Read ortho-image from the file:

1. Select [File], [Import] and [Ortho-image File] from the menu.
2. On the "Open" Dialog Box, select the file and click the [Open] button.
3. The read ortho-image is displayed in the data view of the main screen.

To read ortho-image, the ortho-image information file (*.ort) should be located in the same place.

Elevation Text File (Pro)(Std)

Read elevation text data from the file:

1. Select [File], [Import] and [Elevation Text File] from the menu.
2. On the "Open" Dialog Box, specify the file and click the [Open] button.
3. The read elevation data are displayed in the data view of the main screen.

The elevation text file (*.hei) is a special file type designed for Image Master.

Field-Scan File (Pro)(Std)

Import data obtained by optional "Field Scanning Software" for FC-100 (GPT-8200)

1. At [File] menu, select [Import] and [Field-Scan File]. "Open" Dialog Box will appear.
2. Select a data file of the Field Scanning software with extension ".csv".

Click [Open] button. The contained Coordinates data will be displayed.

If the image data is stored on the "Field scanning Software", also the list of

images will be registered in the Image list.

Filed-Orientation File (Pro)(Lite)

Import data obtained by optional "Field Orientation software" for GPT-7000i.

1. At [File] menu, select [Import] and Field-Orientation File]. "Open" Dialog Box will appear.
2. At "File Type", select file of either "Easy Measure Files(*.foe)", or "Standard Measure Files(*.csv)".
3. When any desired file is chosen, click [Open] button.

When data file (*.foe) of "Easy Measure Mode" is imported, a Stereo Pair images are automatically displayed and 3D measurements can be started Instantly.

When data file (*.csv) of "Standard Measure Mode" is imported, images taken by

Separate digital camera to be imported and orientation measurement to be performed.

During the orientation measurement, image of each control point will be displayed to check accurate location of the control points.

Also, the images of each point can be viewed through menus, Orientation Screen Menu [Orientation] - [Control Point Image]

2 Measuring Modes in "Field Orientation Software"

Easy Measuring Mode

"Easy Measure Mode" is to perform 3D measurement on Image using the Wide-view

image of GPT-7000i.

The image data of GPT-7000i includes camera position and aiming direction data together, and 3D measurement can be started instantly without performing orientation measurement, which is required on the conventional method.

Standard Measure Mode

"Standard Measure Mode" is to measure control point coordinates together with image of the control point. These data will be used on Image Master for orientation measurement of Stereo Images taken by separated Digital Camera.

TopSURV Scanning (Pro)(Std)

Use the following procedure to import data using the TopSURV OnBoard scanning application for IS.

The 3D data measurement unit of imported data is transformed to the selected measurement system. For information about measurement units, see the Unit Settings dialog box.

1. On the menu, select [File] - [Import] - [TopSURV for IS Scanning].

2. On the Open File dialog box that appears, specify the file name and file type**(*.fsn)** and then click the [Open] button to import the data.

Export

Point File

Use the following procedure to save point data to a specified file format.

1. On the menu, select [File] - [Export] - [Point File].
2. On the Save As dialog box that appears, specify the save destination, file type, and file name, and then click the [Save] button.
3. On the Save 3D Data dialog box that appears, configure the required settings and then click the [OK] button.
4. A Custom Export dialog box will appear if the file format is CSV or TXT. You can use the dialog box to sort the data and specify the delimiting character before saving the data.

The following are the point data file formats that are supported for export with Image Master.

CSV File (*.csv)

This is a general-purpose file format in which data is delimited by commas (,).

If polyline or TIN is specified when saving the data, only vertex coordinates are saved.

APA File (*.txt)

This is a standard type of file in Japan for handling survey data.

The only information saved is point name, X, Y, Z. When polylines or TIN data are specified and saved, only the vertex coordinates are saved. The layer information for each point is not saved.

SIMA File (*.sim)

This is a standard type of file in Japan for handling survey data.

The only information saved is point name, X, Y, Z. When polylines or TIN data are specified and saved, only the vertex coordinates are saved. The layer information for each point is not saved.

Point Cloud File

Use the following procedure to save point cloud data scanned with Image Master to a file.

The only file format supported for saving with Image Master is [file name].cl3. The cl3 file name extension indicates a special TOPCON point cloud file format.

1. On the menu, select [File] - [Export] - [Point Cloud File].

2. On the "Export Point Cloud Files" dialog box that appears, select one of the following options: all point clouds, displayed point cloud only, selected point cloud, or clipped point cloud. You also can configure a decimation ratio setting (1 to 1/32). After the settings are configured, click the [OK] button.

3. On the Save As dialog box that appears, specify the save destination, file type (*.cl3), and file name, and then click the [Save] button.

Shape File

Shape data is the object data of points, polylines, TIN, textures, etc.

On the menu, select [File] - [Export] - [Shape File].

The following are the shape data file formats that are supported for export with Image Master.

DXF File (*.dxf)

This is a general-purpose file for recording CAD data.

Layers, points, polylines, and TIN data (as a set of 3DFACE entities) are saved.

TIN File (*.tin)

This is a type of file used exclusively by the Image Master.

It can be used for saving and reading TIN data and texture information.

VRML File (*.wrl)

This is a general-purpose file for recording 3D graphics.

It can store TIN data and texture information.

Ortho-image File

Save ortho-image in the file:

1. Select [File], [Export] and [Ortho-image File] from the menu.
2. On the "Save As" Dialog Box, select the place and file and click the [Save] button.

When the ortho-image file is saved, the following files are saved at the same time:

Ortho-image File (extension: bmp, jpg)

Image data of the ortho-image are saved.

Ortho-image Information File (extension: ort)

Positional information and additional information of the ortho-image are saved. This file is required when reading the ortho-image file on Image Master.

Positional information File (extension: txt)

Positional information of the ortho-image is saved. This file is required when reading ortho-image by TOPCON FC-10A.

World File (extension: bmpw, jpgw)

This is a positional information file for reading ortho-images using ArcView of ESRI.

Elevation Text File

Save elevation data in the file:

1. Select [File], [Export] and [Elevation Text File] from the menu.
2. On the "Save As" Dialog Box, specify the file name and place, and click the [Save] button.

The elevation text file (*.hei) is a special file type designed for Image Master.

Print (Pro)(Std)(Lite)

Prints the contents of the displayed 2D data view in the model window in accordance with the specified scale (zoom factor). Printing is not supported for the Perspective or Parallel projection methods.

When area selection (rectangular, polygonal) is applied in the data view, only the selected area is printed.

1. Select [File] and [Print] from the menu.
2. On the "Scale" Dialog Box, set the scale of the drawing and click the [OK] button.
3. On the "Print" Dialog Box, set necessary items and click the [OK] button.

Printing of Sectional View

When the sectional view window is equipped with a focus, it is possible to print sectional views.

In this case, the "Scale " Dialog Box is displayed. On the dialog, the scale can be set separately for the horizontal and vertical axes. The result can be printed like other usual cases.

Print Preview (Pro)(Std)(Lite)

Display the contents of the displayed 2D data view in the model window in the actual layout to be used for printing. Print preview is not supported for the Perspective or Parallel projection methods.

1. Select [File] and [Print Preview] from the menu.
2. On the "Scale" Dialog Box, set the scale of the drawing and click the [OK] button.
3. The print preview screen is displayed.

On the print preview screen, the following functions can be used:

Print

Start printing.

Next Page

Display the next page on the screen.

Previous Page

Display the previous page on the screen.

One/Two page

Switches the number of pages simultaneously displayed on the screen.

Zoom In

Enlarge the display of the print preview.

Zoom Out

Reduce the display of the print preview.

Close

Close the print preview screen.

Print Setup (Pro)(Std)(Lite)

Please refer to the “Initial Screen Menu, [File] – [Print Setup]”

Edit

Exit (Pro)(Std)(Lite)

Please refer to the “Initial Screen Menu, [File] – [Exit]”

Model Mode (Pro)(Std)(Lite)

Enters the model mode and displays the model window.

Remote Mode (Pro)(Std)(Lite)

Enters the remote mode and displays the remote window.

Registration Mode (Pro)(Std)(Lite)

Enters the registration mode and displays the registration window.

Orientation Mode (Pro)(Std)(Lite)

Enters the registration mode and displays the orientation window.

Stereo Mode (Pro)(Std)(Lite)

Enters the registration mode and displays the stereo window.

Undo (Pro)(Std)

Returns the last modified data to its original state.

On the menu, select [Edit] - [Undo].

Modification of the following types of data can be undone.

- Layers
- Points
- Polyline
- TIN
- Point Clouds
- Textures

Redo (Pro)(Std)

Redo an operation undone with [Undo].

On the menu, select [Edit] - [Redo].

Undo Setup (Pro)(Std)

Configure settings for [Undo] and [Redo].

1. On the menu, select [Edit] - [Undo Setup].
2. On the "Undo Settings" Dialog Box that appears, turn [Undo] on or off, specify the number of allowable undoing, and specify buffer initialization.

Select (Pro)(Std)

With this function, the data to be edited is designated and selected with the mouse.

If selected data is designated again, the selection will be canceled.

1. From the [Edit] menu, select [Select].
2. The "Selection" Dialog Box will appear. Designate the type of data to be selected.
3. Designate and select the desired data with the mouse, or cancel the selection.

Select Square Area (Pro)(Std)(Lite)

This function designates the range of squares. Moreover, all of the data in the designated range can be selected en bloc.

1. From the [Edit] menu, select [Select Square Area].
2. The "Selection" Dialog Box will appear. Designate the type of data to be selected.
3. On the screen, designate, in order, 2 places diagonally across from each other, then designate the range of the square.

Select Polygonal Area (Pro)(Std)(Lite)

This function designates the range of polygons. Moreover, all of the data in the designated range can be selected en bloc.

1. From the [Edit] menu, select [Select Polygonal Area].
2. The "Selection" Dialog Box will appear. Designate the type of data to be selected.
3. On the screen, designate the vertices of the polygon in order.
4. Finally, right click, determining the range of the polygon.

Select All (Pro)(Std)(Lite)

Select all the displayed data.

Select None (Pro)(Std)(Lite)

Cancel the selection of data.

On the menu, select [Edit] - [Select None].

Clipping (Pro)(Std)(Lite)

Clip On/Off

Use the following procedure to turn clipping on or off.

Clip Square Area

Use the following procedure to specify a rectangular clipping area.

Clip Polygonal Area

Use the following procedure to specify a polygonal clipping area.

Clip Area Clear

Use the following procedure to clear the currently specified clipping area.

Clip 3D Area

Use the following procedure to specify a 3D (XYZ) clipping area.

Clip Slice

Use the following procedure to display the clipping area sliced on each 3D axis.

Delete

Delete the selected data altogether.

View

Update Display (Pro)(Std)(Lite)

This command updates the display

With the model screen, there are situations where, because of high-speed drawing, the display will not automatically be updated for partial changes regarding texture, etc.

In such a case, you can update the screen by executing this command.

Displayed Items (Pro)(Std)(Lite)

This function sets the items to be displayed on the screen.

1. From the [View] menu, select [Displayed Items].
2. The "Displayed Items" Dialog Box will appear. For each item, select display or non-

display, then click the [OK] button.

Zoom (Pro)(Std)(Lite)

Zoom

Gradually enlarge the displayed cursor position by clicking the left button of the mouse, and gradually reduce by clicking the right button.

Full Display

Display all range of data within the screen.

Rotate (Pro)(Std)(Lite)

Angles

Display data by rotating at the specified angles to each axis:

1. Select [View], [Rotate] and [Angles] from the menu.
2. On the "Rotation Angles" Dialog Box, enter rotation angles to each axis and click the [OK] button.

Interval

Set the angle interval of rotation when using the Shortcut Keys of Rotation Display

1. Select [View], [Rotate] and [Interval] from the menu.
2. On the "Rotation Interval" Dialog Box, set the value and click the [OK] button.

Shortcut Keys of Rotation Display

omega (+)	press numerical key **2**, or **DOWN ARROW** key
omega (-)	press numerical key **8**, or **UP ARROW** key
phi (+)	press numerical key **6**
phi (-)	press numerical key **4**
kappa (+)	press numerical key **1**, or **LEFT ARROW** key
kappa (-)	press numerical key **3**, or **RIGHT ARROW** key
Resetting of Axis	press numerical key **5**

of Rotation

(Ground Plan)

*Here, omega(ω), phi(φ), and kappa(κ) mean the rotation around X, Y, and Z axis respectively.

Top View

Display the data from the top view (X-Y plane).

Front View

Display the data from the front view.

Right Side View

Display the data from the right side view.

Left Side View

Display the data from the left side view.

Back View

Display the data from the back view.

Bottom View

Display the data from the bottom view.

Elevation View - Two Points Specified

Display data from the view of the elevation whose horizontal axis is two specified points.

In the elevation, the horizontal axis is the horizontal distance from the first point in the direction of the second point. The vertical axis is always the Z-axis.

1. On the menu, select [View] - [Rotate] - [Elevation View (Two Points Specified)].

2. On the Elevation Setting dialog box that appears, select the two points for the horizontal axis and then click the [OK] button.

Camera View (Rotate)

Use this procedure to overlay and display the data and image from the view of the selected image's camera.

Pan (Pro)(Std)(Lite)

Drag and move the display range of data with mouse.

Focus to Object (Pro)(Std)(Lite)

The point specified with the mouse is set to the center of the rotation and the expansion or reduction.

Point Cloud Resolution (Pro)(Std)

1/1

Use this procedure to display a point cloud without decimation.

Shortcut: Assigned to number key [1].

1/2

Use this procedure to display a point cloud with 1/2 decimation.

Shortcut: Assigned to number key [2].

1/4

Use this procedure to display a point cloud with 1/4 decimation.

Shortcut: Assigned to number key [3].

1/8

Use this procedure to display a point cloud with 1/8 decimation.

Shortcut: Assigned to number key [4]

1/16

Use this procedure to display a point cloud with 1/16 decimation.

Shortcut: Assigned to number key [5].

1/32

Use this procedure to display a point cloud with 1/32 decimation.

Shortcut: Assigned to number key [6].

Point Cloud Color (Pro)(Std)

* Reflection intensity is laser scanner data only. This display cannot be adapted to IS.

Texture

Use the following procedure to display point cloud data with texture.

Intensity(Gray)

Use the following procedure to display point cloud data with the intensity of the laser scanner reflection in grayscale.

Intensity (Color)

Use the following procedure to display point cloud data with the intensity of the laser scanner reflection in color.

Elevation

Use the following procedure to display the elevation of point cloud data in color.

Distance

Use the following procedure to display the depth of cloud point data in color.

Layer Color

Use this procedure to display point cloud data in color.

Point Size (Pro)(Std)

Use the following procedure to specify the point size of Point Cloud Data.

You can use the dialog box to configure the following settings.

- Point size: Point cloud data display size
- Preview point size: Display size of moving point cloud data on a stereoscopic display

- Selected point size: Display size of selected point cloud data

Preview Settings (Pro)(Std)(Lite)

Use this setting to specify a display delay to keep all point cloud data and TIN data from gyrating on a stereoscopic.

On the menu, select [View] - [Preview Settings] to display the point cloud data and TIN draw setting dialog box.

Model Screen Setting (Pro)(Std)(Lite)

Projection (Perspective / Parallel / 2D Map)

On the model screen, the method of projecting data can be changed.

Each time this function is operated, the projection method switches to either **Perspective Projection**, **Parallel Projection** or **2D Map Projection**.

Perspective Projection

Data is displayed in perspective. A natural feeling of three-dimensionality can be obtained, as if one were looking at the actual objects. Distant objects are displayed small, and near objects are displayed large, making it possible to sensibly understand 3D shapes.

Parallel Projection

Data is displayed without perspective, as on drawings. Objects of the same size are always displayed with the same size, regardless of their distance. With parallel projection, the 3D-feeling is lost, but it is possible to visually confirm such things as the positional relationships and sizes of objects.

2D Map Projection

This setting is displayed when drawing output of measured data and editing data is displayed on the model window.

For drawing output, use perspective or parallel projection to rotate the data on the stereoscopic display to the orientation you want to output, and then switch to its 2D map.

Switching to the 2D map display enables the print function.

See [File] - [Print].

Rotation Axis (Fix Z Axis / Fix Y(X) Axis)

On the model screen, when data is rotated by dragging the mouse, the fixed coordinate axis changes. Each time this function is operated, the axis of rotation switches to either **Fix Z Axis** or **Fix Y Axis** (or, in the surveying coordinate system, **Fix X Axis**).

On the menu, select [View] - [Model Screen Settings] - [Rotation Axis (Fix Z Axis / Fix Y(X) Axis)].

Fix Z Axis

When the Z axis is fixed, moving the mouse up or down produces omega rotation, while moving it left or right produces kappa rotation.

It is appropriate for data in which Z Axis represents height, such as topographical data.

Fix Y Axis (Fix X Axis)

When the Y axis is fixed, moving the mouse up or down produces omega rotation, while moving it left or right produces phi rotation.

Data can be rotated with the same kind of feeling as when you put an object in the palm of hour hand and look at it.

Lighting (From Viewpoint / From Above)

On the model screen, it is possible to change the direction from which TIN surfaces are lighted by changing the location of the virtual lighting.

Each time this function is operated, the direction of the lighting switches to either **From Viewpoint** or **From Above**.

On the menu, select [View] - [Model Screen Settings] - [Lighting (From Viewpoint / From Above)].

From Viewpoint

Objects are displayed as if they were illuminated from the viewpoint by a light.

The surfaces facing the front are the brightest. The surfaces tilting away from the front are darker, their darkness varying with the degree of the tilt.

From Above

The ground surface is displayed as if it were illuminated from the sky.

Surfaces facing upwards (+ Z direction) are the brightest. Surfaces tilting away from that direction are darker, their darkness varying with the degree of the tilt. When displaying topographical data, this is a way of providing more natural shading.

Shading (Smooth / Flat)

On the model screen, the way of shading surfaces can be changed.

Each time this function is operated, the shading switches to either **Flat** or **Smooth**.

On the menu, select [View] - [Model Screen Settings] - [Shading (Smooth / Flat)].

Flat Shading

Triangles are displayed such that brightness varies with the triangle.

This type of shading is appropriate for checking the details of irregular surfaces while doing editing work.

Smooth Shading

Shading of TIN is displayed more smoothly than that of flat shading.

This type of shading is appropriate for naturally shading and representing final measuring results.

Texture Shading (On / Off)

On the model screen, the method of shading texture can be changed.

Each time this function is operated, the setting switches **ON** or **OFF**.

On the menu, select [View] - [Model Screen Settings] - [Texture Shading (On / Off)].

On

Texture is shaded and displayed according to the irregularities in surfaces.

Off

The colors of texture are displayed as is, regardless of any irregularities in surfaces.

Hide Back Side (On / Off)

On the model screen, triangles that have become backwards-facing can set on non-display.

Each time this function is operated, the setting switches **ON** or **OFF**

On the menu, select [View] - [Model Screen Settings] - [Hide Back Side (On / Off)].

On

Backwards-facing triangles are set on non-display.

Off

Backwards-facing triangles are displayed.

V Hidden Line Removal (On / Off)

On the model screen, the polylines in areas that are hidden by surfaces and cannot be seen can be set on non-display.

Each time this function is executed, the setting switches **ON** or **OFF**

On the menu, select [View] - [Model Screen Settings] - [Hidden Line Removal (On / Off)].

On

The polylines in areas hidden by surfaces are set on non-display.

Off

The polylines in areas hidden by surfaces are displayed.

Data Information (Pro)(Std)(Lite)

Display information about the images and data registered in the project.

Toolbars

Please refer to the “Initial Screen Menu [View] – [Toolbars]”.

Status Bar

Please refer to the “Initial Screen Menu [View] – [Status Bar]”.

Data

Point (Pro)(Std)(Lite)

Plot

Plot positions in the data view and enter the points. Inputted points are stored in the "Current Layer".

1. Select [Data], [Point] and [Plot] from the menu.
2. The "Point Measurement" Dialog Box is displayed.
3. Set the current layer. (This step can be skipped.)

4. Plot positions in the data view.
   The procedure for obtaining coordinates differs by the setting of the snap mode. For details, see the description of "Snap Setting" Dialog Box.

5. On the dialog, enter point name and click the [Measure] button.
   Point name can be omitted.

6. Repeat steps 3-5 and enter the necessary points.

7. To complete work, press the [Close] button on the dialog.

Input Coordinates

Manually enter point names and coordinate values and register the points to the project. The inputted points are stored in the current layer.

1. Set the current layer. (This step can be skipped.)

2. Select [Data], [Point] and [Input Coordinates] from the menu.

3. On the "Input Coordinates" Dialog Box, enter point names and coordinate values, and click the [OK] button.

4. Repeat step 3 and enter the necessary points.

5. To complete work, click the [Close] button on the dialog.

Coordinate List

Display the points registered to the project in the list form. The point data can also be edited on the dialog.

1. Select [Data], [Point] and [Coordinate List] from the menu.

2. On the "Coordinate List" Dialog Box, confirm and edit coordinate values.

3. To close the dialog, click the [Close] button.

Polyline (Pro)(Std)(Lite)

Polyline

Plot the positions in the data view and draw a polyline. The inputted polyline is stored in the current layer.

1. Select [Data], [Polyline] and [Polyline] from the menu.

2. The "Polyline" Dialog Box is displayed.

3. Set the current layer. (This step can be skipped.)

4. Plot the positions in the data view and draw a polyline.
   The procedure for obtaining coordinates differs by the setting of the snap mode. For details, see the description of "Snap Setting" Dialog Box.

5. To open end points of the polyline, press the [O] key. To close end points, press the [C] key. Or, on the dialog, click the [Open] and [Close] buttons, respectively.

6. Repeat steps 3-5 and draw the necessary polylines.

7. To complete work, click the [Exit] button on the dialog.

* If this function is executed after selecting a polyline, drawing of it can be continued.

Open

Open the end points (start, terminal) of the selected polylines.

On the menu, select [Data] - [Polyline] - [Open].

Close

Close the end points (start, terminal) of the selected polylines.

On the menu, select [Data] - [Polyline] - [Close].

Spline

Convert the selected polyline to a smooth curve. Or, returned the converted polyline to the previous condition.

1. Select the polylines.

2. Select [Data], [Polyline] and [Spline] from the menu.

3. On the "Spline Attribute" Dialog Box, set the spline attribute and click the [OK] button.

Combine

Connect the selected two or more polylines. The polylines having the same end point coordinates can be connected.

On the menu, select [Data] - [Polyline] - [Combine].

Divide

Divide the specified polyline by specifying a vertex or side. When the vertex is specified, the polyline is divided into two polylines having the same end point coordinates. When the side is specified, the polyline is divided into two polylines by deleting the side.

1. Select one polyline.
2. Select [Data], [Polyline] and [Divide] from the menu.
3. On the "Divide Polyline" Dialog Box, set the method for division and click the [OK] button.

Move Vertex

You can freely move polyline vertices.

Also, by specifying a position on a side, it is possible to do movement after adding a new vertex. When adjusting the layout of the created contour lines, you can use this function.

1. Select [Data], [Polyline] and [Move Vertex] from the menu.
2. Specify a polyline with the mouse.
3. Specify a vertex of the specified polyline with the mouse.
4. Plot the position to move the vertex with the mouse.
5. Repeat steps 2-4 and move the necessary vertices.
6. To complete work, click the [End] button on the dialog.

Switch Direction

While drawing polylines, switch the direction of adding vertices (start side, end side).

On the menu, select [Data] - [Polyline] - [Switch Direction].

TIN (Pro)(Std)(Lite)

Create (TIN)

Automatically create TIN, using the points and polylines registered to the project.

1. Specify the data to be used for creating TIN.

   Select [Display] and [Displayed Items] from the menu and turn the display of the data to ON. Turn the display of other data to OFF.

   To separately specify the points to be used, select [Data], [Point] and [Coordinate List] from the menu, and on the coordinates list, set TIN ON/OFF for each point.

2. Set the creation surface of TIN.

   Rotate the data and get the surface to the front view, as possible. When data are overhung on the screen, it is not possible to create TIN normally.

3. Select [Data], [TIN] and [Create] from the menu.

4. On the "TIN Creation" Dialog Box, set the method for creation and click the [OK] button.

When data are overhung on the screen, it is not possible to create TIN normally. Rotate the data and get the surface to the front view, as possible, so as not to cause overhanging.

Merge

Merge the selected TINs into one. Overlaps can be smoothed by averaging. Also, when merging TINs that are apart from each other, these can be made into one TIN by connecting gaps with triangles.

1. Select two or more TINs in the data view.

2. Set the creation surface of TIN.

   Rotate the data and get the surface to the front view, as possible. When data are overhung on the screen, it is not possible to create TIN normally.

3. Select [Data], [TIN] and [Merge] from the menu.

4. On the "TIN Merge Options" Dialog Box, set the method for merge and click the [OK] button.

5. On the "TIN Creation" Dialog Box, set the method for creation and click the [OK] button.

When data are overhung on the screen, it is not possible to create TIN normally. Rotate the data and get the surface to the front view, as possible, so as not to cause overhanging.

Make Elevations Even

This function is for setting the elevation (Z coordinate) of selected TIN vertices.

1. Select vertices of TINs.

2. From the [Data] menu, select [TIN], then [Make Elevations Even].
3. The "Set Elevation" Dialog Box will appear. Input the Z coordinate, then click the [OK] button.

Offset Elevations

This function is for offsetting the elevations (Z coordinates) of selected TIN vertices.

1. Select vertices of TINs.
2. From the [Data] menu, select [TIN], then [Offset Elevations].
3. The "Offset Elevation" Dialog Box will appear. Input the offset values, then click the [OK] button.

Cut

Triangles on lines pointed by mouse will be deleted.

1. At [Data] menu, select [TIN] -> [Cut].
2. On the screen, pick at points on a line to be deleted.
3. By Right button click of mouse, all triangles on the picked lines will be deleted.

Reverse Triangle

Use the following procedure to reverse the front and back (normal vector orientation) of the triangle selected with the mouse.

1. Use the mouse to select the triangle.
2. On the menu, select [Data] - [TIN] - [Reverse Triangle].

Select Triangle

Use this procedure to select acute triangles and long triangles tangent to a TIN contour.

This function can be used to batch delete long thin triangles created on the contour.

1. On the menu, select [Data] - [TIN] - [Select Triangle].
2. On the Select Triangle dialog box that appears, first select the angle method or length method.

   The following are the selection methods.

- Acute Triangles on Screen (Angle)
- Acute Triangles in 3D(Angle)
- Long Triangles(Length)

3. In the case of angle, enter the angle threshold value and then click the [OK] button.

   In the case of length, enter the length threshold value and then click the [OK] button.

4. Click the [Select] button to select all data that conforms to the threshold value and display it in red on the screen.

5. After selection is complete, click the [OK] button to close the dialog box.

* The triangles remain selected after you close the selection dialog box. To deselect, click the  tool button.

Delete All

Delete all TINs.

On the menu, select [Data] - [TIN] - [Delete All].

Rendering

This function is for shading and displaying TIN surfaces according to the irregularities in them.

On the menu, select [Data] - [TIN] - [Rendering].

If, on the model screen, the display of texture is turned on, the surfaces will be displayed with texture mapped to them. If this command is executed again, the display with the wire frame will reappear.

This function is useful for visually checking the situation regarding irregularities in the created TINs.Texture

Contour Lines (Pro)(Std)(Lite)

Create

Automatically create contour lines using existing TINs. As the reference plane of contour line creation, "X-Y Plane" or "Screen" can be specified. When "Screen" is specified, contour line data are created with the direction forward from the screen back as provisional elevation. The created data are registered as polylines to the project and can be edited using the functions of [Polyline] submenu.

1. When the reference plane of contour lines is taken to "Screen", rotate the data on the display for creation. When the reference plane is taken to "X-Y Plane", the condition of rotation display does not affect the creation of contour lines.

2. Select [Data], [Contour Lines] and [Create] from the menu.

3. On the "Reference Plane of Contour Lines" Dialog Box, specify "X-Y Plane" or "Screen" and click the [OK] button. (Under the ground plan display condition, always "X-Y Plane" is taken.

4. On the "Creation of Contour Lines" Dialog Box, set conditions for creation and click the [OK] button.

When TINs are overlapped, contour lines are created for each TIN. To develop contour lines of the overlapped portions clean, do TIN merge.

Delete All

Delete contour lines (data of layer names "MainContour" and "MinorContour") altogether.

Elevation Text (Pro)(Std)(Lite)

Text - Plot

Elevation text is inputted by plotting the position on the data view.

1. Select [Data], [Elevation Text] and [Plot] from the menu.

2. The "Input Elevation Text" Dialog Box is displayed.

3. In the data view, plot the position to enter the elevation value.
The method for obtaining coordinates differs by the setting of the snap mode. For details, see the description of the "Snap Setting" Dialog Box.

4. The elevation value of the specified position is displayed on the dialog.
Here, you can also enter the elevation value manually.

5. By pressing the [OK] button, the elevation text is inputted and displayed in the specified position of the data view.

6. Repeat steps 3-5 and enter the necessary elevation texts.

7. To complete work, click the [Close] button on the dialog.

This function is aimed to display the text string of elevation values on the screen. The entered elevation values do not affect the coordinate values and shapes of existing data.

Delete All

Delete all the existing elevation text data.

Cross Section (Pro)(Std)(Lite)

Create

Create the section data of the specified two points and display the sectional view.

The created sectional view can be printed by printer and plotter. Also, the created sectional data can be registered as polylines to the project.

1. Select [Data], [Cross Section] and [Create] from the menu.
2. The "Cross Section" Dialog Box is displayed.
3. In the data view, plot the positions of two points in sequence.
   Or, you can manually enter coordinate values of the two points on the dialog.

   The method for obtaining coordinates differs by the setting of the snap mode. For details, see the description of the "Snap Setting" Dialog Box.
4. The sectional view window is displayed at right on the main screen.
5. Repeat steps 3, 4 and update sectional view, as necessary.
6. To complete work, click the [Close] button on the dialog.

When TINs are overlapped, section data are created for each TIN. To develop contour lines of the overlapped portions clean, do TIN merge.

Axis of Sectional View

The horizontal axis of a sectional view is horizontal to the screen in the direction from 1st point (point A) to 2nd point (point B). Also, the vertical axis is in the direction from screen back forward. When axes of the sectional view agree with actual X, Y and Z axes, coordinates of the axes are displayed, as are.

Print and Print Preview of Sectional View

When [File] and [Print] are selected from the menu when the focus is on the sectional view window, it is possible to print the sectional view. Likewise, when [File] and [Print Preview] are selected from the menu, print preview of the sectional view is displayed.

Delete All

Delete the registered section data (data of layer name "CrossSection") of the project altogether.

Texture (Pro)(Std)(Lite)

Texture Mapping

This function is for mapping texture (an image) to a selected surface (TIN) on the model or registration screen.

1. On the model or registration screen, The Data View is rotated like seeing TIN from the front as much as possible.
2. Select a TIN.
3. Select image for texture mapping from Image List View.
4. From the [Measure] menu, select [Texture], then [Texture Mapping].
5. "Texture Creation" Dialog Box will appear and then enter ground resolution and click "OK". If want to color adjust, select "Color Adjustment" Check Box.

* To confirm that texture has been mapped to the TIN, display the model screen. In the settings for the display items, confirm that a check has been added to **TIN** and **Texture**, then click the  tool button.

* In certain cases, the change in texture may not immediately appear on the model screen. In such a case, click the  tool button to update the display.

Clear Texture

This function clears the texture information from the selected TIN.

On the menu, select [Data] - [Texture] - [Clear Texture].

Clear All Texture

This function clears the texture information from all TIN.

On the menu, select [Data] - [Texture] - [Clear All Texture].

Ortho-image (Pro)(Std)(Lite)

Preview

Preview ortho-image to be created.
By this command, coarse ortho-image is created quickly and displayed on the screen. Before creating a detailed ortho-image, you can briefly check and see whether the ortho-image is created correctly.

1. Rotate data and decide direction of ortho-image creation. When creating the ortho-image in connection with the ground plan (X-Y plane), set the ground plan view condition.
2. On the image list, select the original image to be used for ortho-image creation.

3. Select [Data], [Ortho-image] and [Preview] from the menu.
4. A preview of the ortho-image is displayed in the data view.

To execute this function, the following conditions should be met:

- Orientation is completed normally.
- Exact TIN data are created.

Create

Create ortho-image with the specified ground resolution.

Also, by creating ortho-image after rotation-displaying the data, it is possible to create ortho-image from various viewpoints.

The ortho-image is created by removing lens and projection distortion from the original image and converting to an orthogonal projection image. In the ortho-image creation, images are recomposed using TIN shape information and the result of orientation of each image. Also, when an ortho-image is created by specifying multiple images, the images are connected automatically.

1. Rotation-display data and decide the direction of ortho-image creation.
   When creating the ortho-image in connection with the ground (XY plane), set the ground plan view condition.
2. On the image list, select the original images to be used for ortho-image creation.
3. Select [Data], [Ortho-image] and [Create] from the menu.
4. On the "Ortho-image Creation" Dialog Box, set conditions for creation and click the [OK] button.
5. When "Color Adjustment" is set on the dialog, the "Image Selection" Dialog Box is displayed. On the dialog, select the image as the reference of color adjustment, and click the [OK] button.

To create ortho-image, the following conditions should be met:

- Orientation is completed normally.
- Exact TIN data are created.

Remake Inside

Remake the selected area of an already created ortho-image.

For example, it is possible to improve the image quality of an automatically created ortho-image by renewing a part by specifying another original image that shows the part more clearly.

1. By area selection (rectangle, polygon), specify the area to be remaked on the ortho-image.
2. On the image list, select the original image used for remake.
3. Select [Data], [Ortho-image] and [Remake Inside] from the menu.
4. On the "Ortho-image Creation" Dialog Box, set the necessary items and click the [Ok] button.

Clear Inside

On an already created ortho-image, clear inside of the selected area. When this function is executed, the inside of the selected area will become white.

1. By area selection (rectangle, polygon), specify an area of the ortho-image.
2. Select [Data], [Ortho-image] and [Clear Inside] from the menu.

Clear Outside

On an already created ortho-image, clear outside of the selected area. When this function is executed, the outside of the selected area will become white.

1. By area selection (rectangle, polygon), specify an area of the ortho-image.
2. Select [Data], [Ortho-image] and [Clear Outside] from the menu.

Delete Ortho-image

Delete the created ortho-image.

Distance (Pro)(Std)(Lite)

Specify Point Name

Display the distance of the two points specified by point names.

1. Select [Data], [Distance] and [Specify Point Name] from the menu.
2. The "Distance (Point Name Specified)" Dialog Box is displayed.
3. On the dialog, specify names of the two points and display the distance value.

Plot on Screen

Display the distance of the two points specified with the mouse on the screen.

1. Select [Data], [Distance] and [Plot on Screen] from the menu.
2. The "Distance (Specified by Mouse)" Dialog Box is displayed.
3. By plotting two points in the data view and display the distance value on the dialog.

The method for obtaining coordinates differs by the setting of the snap mode. For details, see the description of the "Snap Setting" Dialog Box.

Polyline Length

Display the total length of the selected polyline.

1. Select a polyline in the data view.
2. Select [Data], [Distance] and [Polyline Length] from the menu.
3. The "Polyline Length" Dialog Box is displayed and the total length of the polyline is displayed.

Area (Pro)(Std)(Lite)

Polygon(Project Area)

Display the projected area of an area surrounded by the selected polyline. The projection area is the area of a polygon projected on the screen.

1. Select a polyline in the data view.
2. Select [Data], [Area] and [Polygon (Projected Area)] from the menu.
3. The area in the polygon is displayed in red and the value of the projected area is displayed on the dialog.

TIN(Surface Area)

Display the surface area of the selected TIN. The surface area is the total of areas of triangles of selected TIN.

1. Select a TIN in the data view.
2. Select [Data], [Area] and [TIN (Surface Area)] from the menu.

3. The TIN area is displayed in red and the value of the projection area is displayed on the dialog.

Volume (Pro)(Std)(Lite)

Upper/Lower Volume

For the selected TIN, computes upper and lower volumes to the specified reference plane.

The volumes are the sum of polyhedrons witch formed by dropping perpendicular lines from vertices of a triangle onto the reference plane. Normally, the sign of the upper volume becomes plus (+), and the sign of the lower volume becomes minus(-). However, the sign becomes opposite when the surface has turned to the bottom. As a reference plane, a level plane or an arbitrary plane defined with three points can be used.

1. Select a TIN in the data view.
2. Select [Data], [Volume] and [Upper/Lower Volume] from the menu.
3. The "Volume Calculation Setting" dialog box is displayed, set the reference plane, then click the "OK" button.
4. The computation results are displayed.

Volume Difference

Computes the difference of volumes between the specified two TINs.

The difference of volumes is computed as follows:

First, the reference plane is set on the bottom of both TINs, then each volume V1 and V2 to the reference plane is computed. The difference of volumes defined as V2-V1.

1. Select [Data], [Volume] and [Volume Difference] from the menu.
2. The "Reference/Object Surface Selection" dialog box is displayed, specify surfaces, then click the "OK" button.
3. The computed result is displayed.

Add Layer (Pro)(Std)(Lite)

Add a new layer and set it as the current layer.

1. Select [Data] and [Add Layer] from the menu.
   (On the stereo screen, select [Measure] and [Add Layer].)
2. On the "Layer Information" Dialog Box, set the layer and click the [OK] button.

Change Layer (Pro)(Std)(Lite)

Change the layer of the selected data (point, polyline, TIN).

1. In the data view, select the data to change the layer.
2. Select [Data] and [Change Layer] from the menu.
3. On the "Change Data Layer" Dialog Box, set the layer and click the [OK] button.

Layer Setting (Pro)(Std)(Lite)

Set and edit layers.

1. Select [Data] and [Layer Setting] from the menu.
2. On the "Layer Setting" Dialog Box, set and edit the layer, and click the [OK] button.

Snap (Pro)(Std)(Lite)

Set the snap mode. The method for obtaining coordinates when specifying positions in the screen differs by the setting of the snap mode.

1. Select [Data] and [Snap] from the menu.
2. On the "Snap Setting" Dialog Box, select the method for snapping.
3. To close the dialog, click the [Close] button.

The coordinates obtained by plotting on the screen differ by the setting of the snap mode. For details, see the description of the "Snap Setting" Dialog Box.

Setup

Coordinate Transformation (Pro)(Std)(Lite)

Parallel Translation

This function moves 3D data in parallel.

When this function is operated, the original coordinates are changed.

1. From the [Setup] menu, select [Coordinate Transformation], then [Parallel Translation].

2. The "Parallel Translation" Dialog Box will appear. Set the desired amount of the move, then click the [OK] button.

Rotational Transformation

This function rotates 3D data.

When this function is operated, the original coordinates are changed.

1. From the [Setup] menu, select [Coordinate Transformation], then [Rotational Transformation].
2. The "Rotation Angles" Dialog Box will appear. Input the angle of rotation for each axis, then click the [OK] button.

* If this command is executed while the displayed image is being rotated in data view, the angle that is currently displayed in the "Rotation Angles" Dialog Box will initially be set. If the [OK] button is then clicked, the situation shown on the screen will become the XY plane.

Scale Transformation

This function enlarges or reduces 3D data according to the magnification that is input.

When this function is operated, the original coordinates are changed.

1. From the [Setup] menu, select [Coordinate Transformation], then [Scale Transformation].
2. The "Scale Transformation" Dialog Box will appear. Input the desired magnification, then click the [OK] button.

Scale Transformation - Two Points Specified

With this function, you set the distance between 2 points, thereby enlarging or reducing 3D data.

When this function is operated, the original coordinates are changed.

1. From the [Setup] menu, select [Coordinate Transformation], then [Scale Transformation - Two Points Specified].
2. The "Distance Setting" Dialog Box will appear. Input the distance desired between the 2 points, then click the [OK] button.

Axis Conversion

This function replaces the original coordinates of each axis in 3D data.

When this function is operated, the coordinates are changed.

1. From the [Setup] menu, select [Coordinate Transformation], then [Axis Conversion].
2. The "Axis Conversion" Dialog Box will appear. Set the method for replacing the axes, then click the [OK] button.

For example, if a CSV file in which the surveying coordinates system (N-E-H) has been entered is mistakenly read with the mathematical coordinates system (E-N-H), set the axes as follows.

Axis Before Change		Axis After Change
Y	->	**X** (Assign the original Y coordinates to the X coordinates.)
X	->	**Y** (Assign the original X coordinates to the Y coordinates.)
Z	->	**Z** (The Z coordinates do not change.)

Adjust Level Plane

Coordinates are transformed so that a plane specified by 3 points will be horizontal plane.

If more than 4 points are specified, the transformation is done in such way that off set of those 4 points are even from the calculated horizontal plane.

1. Check first if the selected plane is faced up on the model or registration screen, otherwise use rotating function to turn the plane to face up.
2. At [Edit] menu, select [Select].
3. "Selection" Dialog Box will appear.
4. Select "Point" on the dialog box, then click [OK] button.
5. On the screen, select more than 3 points.
6. At [Setup] menu, select menus, [Coordinate Transformation] - [Adjust Level Plane].

Adjust Vertical Axis

Transformation is made so that specified 2 points is on the vertical axis.

1. On the model or registration screen, rotate the coordinate system so that the coordinate system is viewed from top along with the vertical axis which is specified by 2 points.
2. At [Edit] menu, select [Select]. "Selection" Dialog Box will appear.
3. On the dialog box, select "Point" and click [OK] button.

4. Select 2 points on the screen.
5. At [Setup] menu, select menus, [Coordinate Transformation] - [Adjust Vertical Axis]

Grid Setup (Pro)(Std)

Set the grid displayed in the screen.

1. From the [Setup] menu, select [Grid Setup].
2. On the "Grid Setting" Dialog Box, set the grid and click the [OK] button.

Fonts and Colors

Please refer to the “Initial Screen Menu, [Setup] – [Fonts and Colors]”.

Window

Cascade (Pro)(Std)(Lite)

Display all windows overlapped. The screen being worked (screen with focus) is displayed at the front.

Tile Horizontally (Pro)(Std)(Lite)

Display all windows side by side. The project screen is displayed at the left end.

Tile Vertically (Pro)(Std)(Lite)

Display all windows top and bottom. The project screen is displayed at the top.

Close All (Pro)(Std)(Lite)

All open windows are closed now.

Help

Help Topics (Pro)(Std)(Lite)

Please refer to the “Initial Screen Menu, [Help] – [Help Topics]”.

About Image Master (Pro)(Std)(Lite)

Please refer to the “Initial Screen Menu, [Help] – [About Image Master]”.

Remote Screen Menu

File

New Model (Pro)(Std)

Please refer to the “Model Screen Menu, [File] – [Model] – [New Model]”.

Open Model (Pro)(Std)

Please refer to the “Model Screen Menu, [File] – [Model] – [Open Model]”.

Save Model (Pro)(Std)

Please refer to the “Model Screen Menu, [File] – [Model] – [Save Model]”.

Close Model (Pro)(Std)

Please refer to the “Model Screen Menu, [File] – [Model] – [Close Model]”.

Edit

Model Mode (Pro)(Std)

Enters the model mode and displays the model window.

Remote Mode (Pro)(Std)

Enters the remote mode and displays the remote window.

Registration Mode (Pro)(Std)

Enters the registration mode and displays the registration window.

Orientation Mode (Pro)(Std)

Enters the registration mode and displays the orientation window.

Stereo Mode (Pro)

Enters the registration mode and displays the stereo window.

View

Update Display (Pro)(Std)

Please refer to the “Model Screen Menu, [View] – [Update Display]”

Displayed Items (Pro)(Std)

Please refer to the “Model Screen Menu, [View] – [Displayed Items]”

Zoom (Pro)(Std)

Zoom

Please refer to the “Model Screen Menu, [View] – [Zoom] – [Zoom]”

Full Display

Please refer to the “Model Screen Menu, [View] – [Zoom] – [Full Display]”

Rotate (Pro)(Std)

Angles

Please refer to the “Model Screen Menu, [View] – [Rotate] – [Angles]”

Interval

Please refer to the “Model Screen Menu, [View] – [Rotate] – [Interval]”

Top View

Please refer to the “Model Screen Menu, [View] – [Rotate] – [Top View]”

Front View

Please refer to the “Model Screen Menu, [View] – [Rotate] – [Front View]”

Right Side View

Please refer to the “Model Screen Menu, [View] – [Rotate] – [Right Side View]”

Left Side View

Please refer to the “Model Screen Menu, [View] – [Rotate] – [Left Side View]”

Back View

Please refer to the “Model Screen Menu, [View] – [Rotate] – [Back View]”

Bottom View

Please refer to the “Model Screen Menu, [View] – [Rotate] –[Bottom View]”

Elevation View-Two Points Specified

Please refer to the “Model Screen Menu, [View] – [Rotate] – [Elevation View-Two Points Specified]”

Camera View

Please refer to the “Model Screen Menu, [View] – [Rotate] – [Camera View]”

Pan (Pro)(Std)

Please refer to the “Model Screen Menu, [View] – [Pan]”.

Focus to Object (Pro)(Std)

Please refer to the “Model Screen Menu, [View] – [Focus to Object]”.

Point Cloud Resolution (Pro)(Std)

1/1

Please refer to the “Model Screen Menu, [View] – [Point Cloud Resolution] – [1/1]”.

1/2

Please refer to the “Model Screen Menu, [View] – [Point Cloud Resolution] – [1/2]”.

1/4

Please refer to the “Model Screen Menu, [View] – [Point Cloud Resolution] – [1/4]”.

1/8

Please refer to the “Model Screen Menu, [View] – [Point Cloud Resolution] – [1/8]”.

1/16

Please refer to the “Model Screen Menu, [View] – [Point Cloud Resolution] – [1/16]”.

1/32

Please refer to the “Model Screen Menu, [View] – [Point Cloud Resolution] – [1/32]”.

Point Cloud Color (Pro)(Std)

Texture

Please refer to the “Model Screen Menu, [View] – [Point Cloud Color] – [Texture]”.

Intensity(Gray)

Please refer to the “Model Screen Menu, [View] – [Point Cloud Color] – [Intensity(Gray)]”.

Intensity(Color)

Please refer to the “Model Screen Menu, [View] – [Point Cloud Color] – [Intensity(Color)]”.

Elevation

Please refer to the “Model Screen Menu, [View] – [Point Cloud Color] – [Elevation]”.

Distance

Please refer to the “Model Screen Menu, [View] – [Point Cloud Color] – [Distance]”.

Layer Color

Please refer to the “Model Screen Menu, [View] – [Point Cloud Color] – [Layer Color]”.

Point Size (Pro)(Std)

Please refer to the “Model Screen Menu, [View] – [Point Size]”.

Preview Settings (Pro)(Std)

Please refer to the “Model Screen Menu, [View] – [Preview Settings]”.

Model Screen Setting (Pro)(Std)

Projection (Perspective / Parallel / 2D Map)

Please refer to the “Model Screen Menu, [View] – [Model Screen Setting] – [Projection (Perspective/Parallel/2D Map]”.

Rotation Axis (Fix Z Axis / Fix Y(X) Axis)

Please refer to the “Model Screen Menu, [View] – [Model Screen Setting] – [Rotation Axis (Fix Z Axis / Fix Y(X) Axis)]”.

Lighting (From Viewpoint / From Above)

Please refer to the “Model Screen Menu, [View] – [Model Screen Setting] – [Lighting (From Viewpoint / From Above)]”.

Shading (Smooth / Flat)

Please refer to the “Model Screen Menu, [View] – [Model Screen Setting] – [Shading (Smooth / Flat)]”.

Texture Shading (On / Off)

Please refer to the “Model Screen Menu, [View] – [Model Screen Setting] – [Texture Shading (On / Off)]”.

Hide Back Side (On / Off)

Please refer to the “Model Screen Menu, [View] – [Model Screen Setting] – [Hide Back Side (On / Off)]”.

Hidden Line Removal (On / Off)

Please refer to the “Model Screen Menu, [View] – [Model Screen Setting] – [Hidden Line Removal (On / Off)]”.

Data Information

Please refer to the “Model Screen Menu, [View] – [Data Information]”.

Toolbars (Pro)(Std)

Please refer to the “Initial Screen Menu, [View] – [Toolbars]”.

Status Bar (Pro)(Std)

Please refer to the “Initial Screen Menu, [View] – [Status Bar]”.

Station

Connect (Pro)(Std)

Use the following procedure to connect to a device (TOPCON IS).

1. On the menu, select [Station] - [Connect].
2. On the Device Connection dialog box that appears, configure the IP address and station settings, and then click the [Connect] button.
3. An IS Control dialog box appears when a connection with the IS is successfully established.

In the IS control dialog, it is possible to measure it by using IS. Please refer to the IS control dialog.

Disconnect (Pro)(Std)

Use the following procedure to disconnected from the currently connected device (IS).

Station List (Pro)(Std)

Use the following procedure to display a list of all station information.

1. On the menu, select [Station] - [Station List].
2. On the Station List dialog box that appears, check the station occupied point, back sight point, instrument height, etc.

3. To close the dialog box, click the [Close] button.

Setup

Vertical Angle Type (Pro)(Std)

Set the vertical angle type (Zenith =0 or Horizon=0) of the IS data used for work on this software:

1. Select [Setup] and [Vertical Angle Type] from the menu.
2. On the "Vertical Angle Setting" Dialog Box, set the font and click the [OK] button.

Grid Setup (Pro)(Std)

Please refer to the “Model Screen Menu, [Setup] – [Grid Setup]”.

Fonts and Colors (Pro)(Std)

Please refer to the “Initial Screen Menu, [Setup] – [Fonts and Colors]”.

Window

Cascade (Pro)(Std)

Display all windows overlapped. The screen being worked (screen with focus) is displayed at the front.

Tile Horizontally (Pro)(Std)

Display all windows side by side. The project screen is displayed at the left end.

Tile Vertically (Pro)(Std)

Display all windows top and bottom. The project screen is displayed at the top.

Close All (Pro)(Std)

All open windows are closed now.

Help

Help Topics (Pro)(Std)

Please refer to the “Initial Screen Menu, [Help] – [Help Topics]”.

About Image Master (Pro)(Std)

Please refer to the “Initial Screen Menu, [Help] – [About Image Master]”.

*When the connection with IS is completed, the above-mentioned "IS" menu is displayed.

IS

OCC/BS (Pro)(Std)

Adjust the sighting to the backsight point through IS.

Measurement (Pro)(Std)

A single point is observed.

Grid Scan (Pro)(Std)

Scanning is done.

Movie Quality (Pro)(Std)

High

The image quality of movie is specified for High level.

Normal

The image quality of movie is specified for Normal level.

Low

The image quality of movie is specified for Low level.

Wide (Pro)(Std)

The camera is switched to the wide angle.

Telescope (Pro)(Std)

The camera is switched to the telescope angle.

Assist Focus (Pro)(Std)

The assistance focus is turned on and off.

Capture (Pro)(Std)

It takes a picture.

Re photograph (Pro)(Std)

It takes a picture again.

Shot Image Size (Pro)(Std)

1280×1024

The image size of taking a picture is specified for 1280×1024 pixels.

640×512

The image size of taking a picture is specified for 640×512 pixels.

Registration Screen Menu

File

New Project (pro)(Std)

Please refer to the “Initial Screen Menu, [File] – [New Project]”.

Open Project (pro)(Std)

Please refer to the “Initial Screen Menu, [File] – [Open Project]”.

Close Project (pro)(Std)

Please refer to the “Initial Screen Menu, [File] – [Close Project]”.

Model (pro)(Std)

New Model

Please refer to the “Model Screen Menu, [File] – [Model] – [New Model]”.

Open Model

Please refer to the “Model Screen Menu, [File] – [Model] – [Open Model]”.

Save Model

Please refer to the “Model Screen Menu, [File] – [Model] – [Save Model]”.

Add Model

Please refer to the “Model Screen Menu, [File] – [Model] – [Add Model]”.

Copy Model

Please refer to the “Model Screen Menu, [File] – [Model] – [Copy Model]”.

Delete Model

Please refer to the “Model Screen Menu, [File] – [Model] – [Delete Model]”.

Rename Model

Please refer to the “Model Screen Menu, [File] – [Model] – [Rename Model]”.

Sort Model

Please refer to the “Model Screen Menu, [File] – [Model] – [Sort Model]”.

Close Model

Please refer to the “Model Screen Menu, [File] – [Model] – [Close Model]”.

Import (pro)(Std)

Point File (Pro)(Std)

Please refer to the “Model Screen Menu, [File] – [Import] – [Point File]”.

Point Cloud File(Pro)(Std)

Please refer to the “Model Screen Menu, [File] – [Import] – [Point Cloud File]”.

Shape File(Pro)(Std)

Please refer to the “Model Screen Menu, [File] – [Import] – [Shape File]”.

Ortho image File (Pro)(Std)

Please refer to the “Model Screen Menu, [File] – [Import] – [Ortho-image File]”.

Elevation Text File (Pro)(Std)

Please refer to the “Model Screen Menu, [File] – [Import] – [Elevation Text File]”.

Field-Scan File (Pro)(Std)

Please refer to the “Model Screen Menu, [File] – [Import] – [Field Scan File]”.

Filed-Orientation File (Pro)(Lite)

Please refer to the “Model Screen Menu, [File] – [Import] – [Field Orientation File]”.

Export (pro)(Std)

Point File

Please refer to the “Model Screen Menu, [File] – [Export] – [Point File]”.

Point Cloud File

Please refer to the “Model Screen Menu, [File] – [Export] – [Point Cloud File]”.

Shape File

Please refer to the “Model Screen Menu, [File] – [Export] – [Shape File]”.

Ortho-image File

Please refer to the “Model Screen Menu, [File] – [Export] – [Ortho-image File]”.

Elevation Text File

Please refer to the “Model Screen Menu, [File] – [Export] – [Elevation Text File]”.

Print (Pro)(Std)

Please refer to the “Model Screen Menu, [File] – [Print]”.

Print Preview (Pro)(Std)

Please refer to the “Model Screen Menu, [File] – [Export] – [Print Preview]”.

print Setup (Pro)(Std)

Please refer to the “Initial Screen Menu, [File] – [Print Setup]”

Exit (Pro)(Std)

Please refer to the “Initial Screen Menu, [File] – [Exit]”

Edit

Model Mode (Pro)(Std)

Enters the model mode and displays the model window.

Remote Mode (Pro)(Std)

Enters the remote mode and displays the remote window.

Registration Mode (Pro)(Std)

Enters the registration mode and displays the registration window.

Orientation Mode (Pro)(Std)

Enters the registration mode and displays the orientation window.

Stereo Mode (Pro)

Enters the registration mode and displays the stereo window.

Undo (Pro)(Std)

Returns the last modified data to its original state.

Modification of the following types of data can be undone.

- Layers
- Points
- Polyline
- TIN
- Point Clouds
- Textures

Redo (Pro)(Std)

Redo an operation undone with [Undo].

Undo Setup (Pro)(Std)

Please refer to the “Model Screen Menu, [Edit] – [Undo Setup]”.

Select (Pro)(Std)

Please refer to the “Model Screen Menu, [Edit] – [Select]”.

Select Square Area (Pro)(Std)

Please refer to the “Model Screen Menu, [Edit] – [Select Square Area]”.

Select Polygonal Area (Pro)(Std)

Please refer to the “Model Screen Menu, [Edit] – [Select Polygonal Area]”.

Select All (Pro)(Std)

Select all the displayed data.

Select None (Pro)(Std)

Cancel the selection of data.

Clipping (Pro)(Std)

Clip On/Off

Use the following procedure to turn clipping on or off.

Clip Square Area

Use the following procedure to specify a rectangular clipping area.

Clip Polygonal Area

Use the following procedure to specify a polygonal clipping area.

Clip Area Clear

Use the following procedure to clear the currently specified clipping area.

Clip 3D Area

Use the following procedure to specify a 3D (XYZ) clipping area.

Clip Slice

Use the following procedure to display the clipping area sliced on each 3D axis.

Delete (Pro)(Std)

Delete the selected data altogether.

View

Update Display (Pro)(Std)

Please refer to the “Model Screen Menu, [View] – [Update Display]”.

Displayed Items (Pro)(Std)

Please refer to the “Model Screen Menu, [Edit] – [Displayed Items]”.

Zoom (Pro)(Std)(Lite)

Zoom

Gradually enlarge the displayed cursor position by clicking the left button of the mouse, and gradually reduce by clicking the right button.

Full Display

Display all range of data within the screen.

Rotate (Pro)(Std)

Angles

Please refer to the “Model Screen Menu, [View] – [Rotate] – [Angles]”.

Interval

Please refer to the “Model Screen Menu, [View] – [Rotate] – [Angles]”.

Top View

Display the data from the top view (X-Y plane).

Front View

Display the data from the front view.

Right Side View

Display the data from the right side view.

Left Side View

Display the data from the left side view.

Back View

Display the data from the back view.

Bottom View

Display the data from the bottom view.

Elevation View-Two Points Specified

Please refer to the “Model Screen Menu, [View] – [Rotate] – [Elevation View-Two Points Specified]”.

Camera View (Rotate)

Use this procedure to overlay and display the data and image from the view of the selected image's camera.

Pan (Pro)(Std)

Drag and move the display range of data with mouse.

Focus to Object (Pro)(Std)

The point specified with the mouse is set to the center of the rotation and the expansion or reduction.

Point Cloud Resolution (Pro)(Std)

1/1

Use this procedure to display a point cloud without decimation.

Shortcut: Assigned to number key [1].

1/2

Use this procedure to display a point cloud with 1/2 decimation.

Shortcut: Assigned to number key [2].

1/4

Use this procedure to display a point cloud with 1/4 decimation.

Shortcut: Assigned to number key [3].

1/8

Use this procedure to display a point cloud with 1/8 decimation.

Shortcut: Assigned to number key [4]

1/16

Use this procedure to display a point cloud with 1/16 decimation.

Shortcut: Assigned to number key [5].

1/32

Use this procedure to display a point cloud with 1/32 decimation.

Shortcut: Assigned to number key [6].

Point Cloud Color (Pro)(Std)

* Reflection intensity is laser scanner data only. This display cannot be adapted to IS.

Texture

Use the following procedure to display point cloud data with texture.

Intensity(Gray)

Use the following procedure to display point cloud data with the intensity of the laser scanner reflection in grayscale.

Intensity (Color)

Use the following procedure to display point cloud data with the intensity of the laser scanner reflection in color.

Elevation

Use the following procedure to display the elevation of point cloud data in color.

Distance

Use the following procedure to display the depth of cloud point data in color.

Layer Color

Use this procedure to display point cloud data in color.

Point Size (Pro)(Std)

Please refer to the “Model Screen Menu, [View] – [Point Size]”.

Preview Settings (Pro)(Std)

Please refer to the “Model Screen Menu, [View] – [Preview Settings]”.

Model Screen Setting (Pro)(Std)(Lite)

Projection (Perspective / Parallel / 2D Map)

Please refer to the “Model Screen Menu, [View] – [Model Screen Setting] – [Projection (Perspective / Parallel / 2D Map)]”.

Rotation Axis (Fix Z Axis / Fix Y(X) Axis)

Please refer to the “Model Screen Menu, [View] – [Model Screen Setting] – [Rotation Axis (Fix Z Axis / Fix Y(X) Axis)]”.

Lighting (From Viewpoint / From Above)

Please refer to the “Model Screen Menu, [View] – [Model Screen Setting] – [Lighting (From Viewpoint / From Above)]”.

Shading (Smooth / Flat)

Please refer to the “Model Screen Menu, [View] – [Model Screen Setting] – [Shading (Smooth / Flat)]”.

Texture Shading (On / Off)

Please refer to the “Model Screen Menu, [View] – [Model Screen Setting] – [Texture Shading (On / Off)]”.

Hide Back Side (On / Off)

Please refer to the “Model Screen Menu, [View] – [Model Screen Setting] – [Hide Back Side (On / Off)]”.

Hidden Line Removal (On / Off)

Please refer to the “Model Screen Menu, [View] – [Model Screen Setting] – [Hidden Line Removal (On / Off)]”.

Data Information (Pro)(Std)

Display information about the images and data registered in the project.

Toolbars (Pro)(Std)

Please refer to the “Initial Screen Menu [View] – [Toolbars]”.

Status Bar (Pro)(Std)

Please refer to the “Initial Screen Menu [View] – [Status Bar]”.

Registration

Add Tie Point (Pro)(Std)

Use the following procedure to measure the model data tie point.

1. Open the model data whose tie point you want to measure.

2. On the menu, select [Registration] - [Add Tie Point].

3. On the Point Measurement dialog box that appears, enter the tie point name after on-screen point measurement is complete, and then click the [OK] button.

At least three tie points of model data are required for registration. Measurement of a large number of tie points is recommended to ensure calculation accuracy.

Though tie point measurement can be performed for each individual model, you can increase efficiency by horizontally tiling two or more model data windows to perform measurement while viewing tie point positions.

Delete All Tie Points (Pro)(Std)

Use the following procedure to delete all the model data's tie points.

1. Open the model data whose tie points you want to delete.

2. On the menu, select [Registration] - [Delete All Tie Points].

3. On the dialog box with the message "Delete all the tie points in this model?" that appears, click the [OK] button to delete.

To delete a specific selected tie point, click the  tool button and then click the desired tie point to delete it.

In the registration mode, tie points are the only objects that can be selected.

Register Models with OCC/BS (Pro)(Std)

Use the following procedure to register models using the occupied point/backsight point.

This procedure registers a different model to the currently displayed "current model."

1. Open the model data to be registered and display it.

2. On the menu, select [Registration] - [Register Models with OCC/BS].

3. This displays the Registration dialog box.

The models and stations registered to the project are listed in the Source Model list on the left of the dialog box. If nothing appears, click the [...] button below and specify the location of the model folder.

The model that will be the destination of the registration is the "Current Model" displayed at the top.

From the Source Model list, select a model you want to register and then click the [>>] button to move it into the Registration Model list on the right. You can return a model to the Source Model list by clicking the [<<] button. Click the [OK] button to start registration.

4. This displays the OCC/BS Setting dialog box.

The dialog box includes a list that shows the selected model name, occupied point name, backsight point name, and instrument height.

You can change the occupied point name and backlight point name by clicking the down arrow button and selecting a name from the list that appears.

Check the contents of the list. If there is no problem, click the [OK] button.

5. This displays the Registration Result dialog box.

Transformation parameters (ω, φ, κ, x, y, z) are displayed as registration results. If there is no problem, click the [OK] button.

6. This displays a dialog box with the message, "Register these models?" Click the [OK] button to register.

7. This displays the Registered and Deleted Models dialog box, which shows a data view screen of registered model data.

Register Models Tie Points (Pro)(Std)

Use the following procedure to register models using tie points.

It registers a different model to the currently displayed "current model."

1. Open the model data to be registered to display it.

2. On the menu, select [Registration] - [Register Models with Tie Points].

3. This displays the Registration dialog box.

   The models and stations registered to the project are listed in the Source Model list on the left of the dialog box. If nothing appears, click the [...] button below and specify the location of the model folder.

   The model that will be the destination of the registration is the "Current Model" displayed at the top.

   From the Source Model list, select a model you want to register and then click the [>>] button to move it into the Registration Model list on the right. You can return a model to the Source Model list by clicking the [<<] button. Click the [OK] button to start registration.

4. This displays the Tie Point List dialog box.

   Reference points and tie points related to the selected model are shown in the list.

   Points required for calculation: Check to makes sure that there are at least three points, and then click the [Close] button.

5. This displays the Registration Result dialog box.

   The Registration Result dialog box consists of a "Transformation Parameter" page and a "Tie Point" page.

   Transformation Parameter Page

   Transformation parameters (ω, φ, κ, x , y , z) are displayed as transformation calculation results.

   Tie Points

   Tie point variations are displayed as transformation calculation results.

   If there is no problem, click the [OK] button.

6. This displays a dialog box with the message, "Register these models?" Click the [OK] button to register.

7. This displays the Registered and Deleted Models dialog box, which shows a data view screen of registered model data.

Register Models without Transformation (Pro)(Std)

Use the following procedure to register a model without transformation.

This procedure registers a different model to the currently displayed "current model."

1. Open the model data to be registered to display it.

2. On the menu, select [Registration] - [Register Models without Transformation].

3. This displays the Registration dialog box.

   The models and stations registered to the project are listed in the Source Model list on the left of the dialog box. If models are already registered, they are listed in the "Registered Models" list on the right.

If nothing appears, click the [...] button below and specify the location of the model folder.

From the Source Model list, select a model you want to register and then click the [>>] button to move it into the Registration Model list on the right. You can return a model to the Source Model list by clicking the [<<] button. Click the [OK] button to start registration.

4. This registers and deletes models without transformation. Then the Registered and Deleted Models dialog box appears, showing the results in a data view screen.

Registration Results (Pro)(Std)

The result of registration is displayed.

1. On the menu, select [Registration] - [Registration Results].

2. This displays the Registration Results dialog box.

Setup

Grid Setup (Pro)(Std)

Please refer to the “Model Screen Menu, [Setup] – [Grid Setup]”.

Fonts and Colors (Pro)(Std)

Please refer to the “Initial Screen Menu, [Setup] – [Fonts and Colors]”.

Window

Cascade (Pro)(Std)

Display all windows overlapped. The screen being worked (screen with focus) is displayed at the front.

Tile Horizontally (Pro)(Std)

Display all windows side by side. The project screen is displayed at the left end.

Tile Vertically (Pro)(Std)

Display all windows top and bottom. The project screen is displayed at the top.

Close All (Pro)(Std)

All open windows are closed now.

Help

Help Topics (Pro)(Std)

Please refer to the “Initial Screen Menu, [Help] – [Help Topics]”.

About Image Master (Pro)(Std)

Please refer to the “Initial Screen Menu, [Help] – [About Image Master]”.

Orientation Screen Menu

File

Open Image (Pro)(Std)

Open Original Image which selected on Image List.

Open Image (Pro)(Std)

Close the original image being worked.

When changes are added to image coordinates, a message asking whether or not to save the changes to the image coordinates file (*.imc) is displayed.

Import (Pro)(Std)

Point File

Please refer to the “Model Screen Menu, [File] – [Import] – [Point File]”.

Image Coordinate File

Read the image coordinates file (*.imc).

This function can be used for using the image coordinates data which were used by another project.

1. Select [File] and [Import] – [Image Coordinate File] from the menu.
2. On the "Open" Dialog Box, specify the file and click the [Open] button.

Export (Pro)(Std)

Image Coordinate File

Overwrite and save the image coordinates data which were measured on the orientation screen to the image coordinates file (*.imc).

Print (Pro)(Std)

Please refer to the “Model Screen Menu, [File] – [Print]”.

Print Preview (Pro)(Std)

Please refer to the “Model Screen Menu, [File] – [Print Preview]”.

Print Setup (Pro)(Std)

Please refer to the “Model Screen Menu, [File] – [Print Setup]”.

Edit

Model Mode (Pro)(Std)

Enters the model mode and displays the model window.

Remote Mode (Pro)(Std)

Enters the remote mode and displays the remote window.

Registration Mode (Pro)(Std)

Enters the registration mode and displays the registration window.

Orientation Mode (Pro)(Std)

Enters the registration mode and displays the orientation window.

Stereo Mode (Pro)

Enters the registration mode and displays the stereo window.

Undo (Pro)(Std)

Returns the last modified data to its original state.

Modification of the following types of data can be undone.

- Layers
- Points
- Polyline
- TIN

- Point Clouds
- Textures

Redo (Pro)(Std)

Redo an operation undone with [Undo].

Select (Pro)(Std)

Please refer to the “Model Screen Menu, [Edit] – [Select]”.

Select Square Area (Pro)(Std)

Please refer to the “Model Screen Menu, [Edit] – [Select Square Area]”.

Select All (Pro)(Std)

Select all the displayed data.

Select None (Pro)(Std)

Cancel the selection of data.

Delete

Delete the selected data altogether.

View

Update Display (Pro)(Std)

Please refer to the “Model Screen Menu, [View] – [Update Display]”.

Image List (Pro)(Std)

Row Display

Display the registered images horizontally in line in registering order.

Layout Display

You can freely move and arrange the registered images.

This facilitates the selection of registered images.

Rearrange

Change the sequence of the lineup display of original images:

1. Select original images on the image list in the desired order of arrangement.
   The sequence of selection is displayed at the top right of the original images.
2. Select [View], [Image List] and [Rearrange] from the menu.
3. The display is changed to the selected order.

Displayed Items (Pro)(Std)

Please refer to the “Model Screen Menu, [View] – [Displayed Items]”.

Scale (Pro)(Std)(Lite)

Zoom

Gradually enlarge the displayed cursor position by clicking the left button of the mouse, and gradually reduce by clicking the right button.

Full Display

Display all range of data within the screen.

Pan (Pro)(Std)

Drag and move the display range of data with mouse.

Histogram (Pro)(Std)

Display the concentration distribution of the original image by the histogram.

You can confirm whether the registered original image is photographed with a proper exposure.

When the waveform of histogram is locally concentrated, it may interrupt image processing, including automatic correlation processing and plane measurement.

By executing the command, the "Histogram" Dialog Box is displayed.

Image Information (Pro)(Std)

Display information about the images and data registered in the project.

Toolbars (Pro)(Std)

Please refer to the “Initial Screen Menu [View] – [Toolbars]”.

Status Bar (Pro)(Std)

Please refer to the “Initial Screen Menu [View] – [Status Bar]”.

Orientation

Orientation Settings (Pro)(Std)

Setting parameters for Orientation calculations.

1. At [Orientation] menu, select [Orientation Settings].
2. "Orientation Settings" Dialog Box will appear. Specify listed items and click [OK] button.

For details of each items, please refer to the descriptions of "Orientation Settings" Dialog Box.

Camera (Pro)(Std)

Add Camera

Add a new camera to the project.

1. Select [Orientation],[Camera] and [Add Camera] from the menu.
2. On the "Camera Setup" Dialog Box, set the camera and click the [OK] button.

Change Camera

Change the set contents of camera data registered to the project.

1. On the tree view of the main screen, specify the camera as a target of editing. (When the target is only one camera, this step can be skipped.)
2. Select [Orientation],[Camera] and [Change Camera] from the menu.
3. On the "Camera Setup" Dialog Box, set the camera and click the [OK] button.

Delete Camera

Delete camera data from the project.

When camera data are deleted, registration of the original images that are associated with the camera are also canceled.

Add Image (Pro)(Std)

Add original image to the project.

On the "Specify Place" Dialog Box, set the camera and click the [OK] button.

Add Stereo Pair (Pro)(Std)

Add stereo pait to the project.

Select pair image (Alt Key + Click) on the Image List View, and Click [Orientation] – [Add Stereo Pair].

Measure Fiducial Mark (Pro)(Std)

Specify the position on the image and measure the position of the fiducial mark.

When doing 3D measurements and preparing ortho-images using the images taken by film camera, the fiducial mark needs to be measured exactly.

1. Select [Orientation] and [Measure Fiducial Mark] and display the "Measure Fiducial Mark" Dialog Box.
2. On the total display screen, specify an approximate fiducial mark position. The periphery of the specified position is zoom-displayed on the enlargement screen.
3. On the enlargement screen, plot the fiducial mark exactly. The measurement position can be specified and re-specified as many times as needed.
   In order to secure the accuracy of measurement, display images in enlargement, as possible.
4. Enter the name of the fiducial mark. The name can be inputted either manually or by selection from the list.
5. Click the [Measure] button. Or, press the [Enter] key.
6. Repeat steps 2-5 and measure fiducial marks of 3 points at least (minimum requirement: 2 points).
7. Confirm the result of orientation.

By pressing the [Calculate] button, the "Orientation Results" Dialog Box is displayed.

Check the judgment of [Fiducial Mark] on the [Result List] page, and if OK is not given, do measurement again to raise the accuracy.

This function is effective only when images are taken by film cameras.

It is not possible to obtain sufficient computation accuracy unless exact camera calibration data are set. Do the orientation by setting exact camera calibration data of the camera used. Also, exact fiducial mark coordinates should be set in camera data.

Measure Tie Point (Pro)(Std)

This function is for measuring the image coordinates of tie points by designating locations on images.

In order to conduct 3D measurement and create ortho-images, using registered images, it is first necessary to measure the control points and complete the orientation calculations. This work can be done either for one image at a time or for multiple images simultaneously. Regarding the conditions for control points, please see the explanation in "Locating Control Points".

1. From the [Orientation] menu, select [Measure Tie Point]. The "Measure Image Coordinate" Dialog Box will appear.

2. On total display screen, designate the general location of the control point.
   On the enlarged screen, the area of the designated location will be shown enlarged.

3. On the enlarged screen, accurately plot the location of the control point.
   The designating of a measuring location may be redone any number of times.

   When measuring manually, in order to increase measuring precision, conduct measurement with the image displayed as enlarged as possible.

4. When measuring pass points on multiple images, carry out Steps 2 and 3, and designate the measuring locations, on all of the images.

5. Input the name of the control point.
   A point name can be entered manually or selected from the list.

   Also, if you designate the ground control point in data view, it will be easy to input a name for it.

   As for the method of naming points, please do as follows.
   - If you've measured the ground control point, name its point.
   - If you've measured a point other than the ground control point, give it a name other than the one which the ground control point will be given.
   - If you've measured the same place on multiple images, give all of them the same name.

6. Click the [Measure] button.
   Or, press the [Enter] key.

7. Repeating Steps 2 - 6, measure as many control points as necessary.

8. Check the orientation results.

   Click the [Calculate] button. The "Orientation Results" Dialog Box will appear. On the "Result List" Page, check the judgments for **Y-Parallax** and **Image Coordinates**. For those that are not marked **OK**, conduct remeasurement and improve the precision.

* If accurate camera calibration data has not been set, it will be impossible to obtain adequate precision in the calculations. Therefore, please conduct the orientation work after setting accurate camera calibration data for the camera used for the photography.

Auxiliary Measurement Functions

The Image Master is provided with automatic detection functions for which image processing has been used. By using these functions together, it is possible to conduct efficient, highly precise measuring work.

The following three automatic measuring functions can be used.

Center detection
If, when **Center detection** has been checked in the dialog box, the interior of a circular target on an enlarged screen is roughly designated, the precise center of that location will automatically be detected. If the circular target has an appropriate area (at least 5 x 5

pixels), and if the brightness inside and outside the circle is clearly different, the location can be detected with sub-pixel accuracy.

When using center detection, it is first necessary to place the circular target on the photographic object and photograph it.

Corner detection
If, when **Corner detection** has been checked in the dialog box, the area near a corner of an enlarged screen is roughly designated, the corner closest to that area will automatically be detected. It is necessary for the two borderlines forming the corner to be perpendicular to each other and for them to be clearly shown.

Match Tie Points
Tie points can be detected by comparing local patterns of light and dark on an image.

First, enlarge and display the area around a pass point on all of the orientation screens. Then, on one of the images, measure the precise location of the pass point. Then press the mouse's center button or the  tool button. The same pass point will automatically be detected on the other images.

The locations that have the most similar patterns will be detected. Thus, it may not be possible to accurately detect locations where there is little contrast between light and dark.

By increasing the magnification of the enlarged screen, it is possible to limit the range of the search and thus expedite detection.

* There are situations where, due to picture quality and the properties of the object photographed, the **Center detection**, **Corner detection** and **Tie point detection** functions may not be able to conduct detection normally. Therefore, when using these functions, be sure to check the location being detected for its suitability and, if necessary, modify it.

* Regarding the settings of the pass point detection, please see the [Matching Setup] of the [Orientation] menu.

Measure Tie Point (Pro)(Std)

This function is for remeasuring image coordinates of control points or fiducial marks.

When, as the result of orientation calculation, precision is inadequate (1 pixel or more) or a location other than the actual one has been measured, carry out remeasurement, thereby increasing the precision of the orientation calculation.

1. Right click near the point that you wish to modify, displaying the shortcut menu.

2. From the shortcut menu, select [Remeasure]. The "Remeasure Image Coordinate" Dialog Box or "Remeasure Fiducial Mark" Dialog Box will appear.

3. On the enlarged screen, accurately plot the location of the point.
   The designating of a measuring location may be redone any number of times.

4. Click the [Remeasure] button.
   Or, press the [Enter] key.

5. Check the orientation results.

   Click the [Calculate] button. The "Orientation Results" Dialog Box
   Check that each item on the "Result List" Page has been judged to be **OK**.

6. By repeating Steps 3 - 5, it is possible to conduct remeasurement any number of times.

7. If there is another point that you wish to remeasure, repeat the above procedure, beginning with Step 1, for that point.

8. When remeasurement is complete, click the [Close] button.

The **Center detection**, **Corner detection**, and **Tie point detection** functions may be used. For details, please see the explanations on the [Measure Image Coordinates] of [Orientation] menu.

Rename (Pro)(Std)

Change the point name of the specified point on the image.

If a wrong point name is given, the point name can be corrected by this function. Also, when you want to exclude the low-accuracy points from orientation computation, change the point names to ones different from others.

1. Right-click near the point to be corrected and display the shortcut menu.

2. Select [Rename] and display the "Change Point" Dialog Box.

3. On the dialog, enter the point name and click the [Change] button.

Tie Point Matching (Pro)(Std)

Matching Setup (Pro)(Std)

Matching is the automatic detection of corresponding point on images. The settings for this function are made as follows.

1. From the [Orientation] menu, select [Matching Setup].

2. The "Matching Setup" Dialog Box will appear. Set the necessary items, then click the [OK] button.

Tie Point List (Pro)(Std)

“Tie Point List” Dialog Box will appear.

Control Point Image(Pro)(Std)

To view image of Control Point.

Coordinates data of the Control Point measured by GPT-7000i with **"Standard Measuring Mode"** of the **"Field Orientation Software"** is attached with Wide-view Image and Telescopic-view Image of the control point captured when the measurement is made.

1. At [Orientation] menu, select [Control Point Image]. "Control Point Image" Dialog Box will appear.
2. Using the [<<],[>>] buttons, images can be changed to previous image or next image.

Also, by pointing a measured point on the screen, it's image can be displayed.

Calculate Orientation(Pro)(Std)

Execute orientation computation of all original images and stereo pairs and display the results.

The content of display differs by the method of orientation computation.

For the **Bundle Adjustment**, the "Orientation Results" dialog box will appear.

For the **DLT method**, the "Orientation Reulsts (DLT)" dialog box will appear.

Aim of Orientation Computation

Orientation computation is done mainly for the following purposes:

- **Create stereo images and do 3D measurement (point, polyline, surface).**
  By doing orientation about stereo pairs, stereo images for stereoscopic observation are created. Using these stereo images, point measurement, polyline measurement and area measurement can be done. This is suitable for performing complicated 3D measurements, such as plotting, modeling, the creation of contour lines and sectional drawings.
- **Work out 3D coordinates of pass points with high accuracies.**
  By doing orientation computation 'bundle adjustment", 3D coordinates of pass points are obtained. Compared with measurement using stereo images, more accurate results are obtained. This is useful for accurately measuring only specific points.
- **Create ortho-image.**
  Using TIN data and results of orientation, ortho-images can be created. Both TIN data, ones outputted as a result of plane measurement, and others created from existing data, can be used.

Camera Location List (Pro)(Std)

To view a list of camera position and aiming angles of each image.

For ordinary cases for images taken by digital camera, these factors are obtained

as result of orientation measurement.

In case of importing data measured by GPT-7000i with the "Field Orientation

Software", these factors are already included and included in the list.

Setup

Fonts and Colors

Please refer to the “Initial Screen Menu, [Setup] – [Fonts and Colors]”.

Window

Cascade (Pro)(Std)(Lite)

Display all windows overlapped. The screen being worked (screen with focus) is displayed at the front.

Tile Horizontally (Pro)(Std)(Lite)

Display all windows side by side. The project screen is displayed at the left end.

Tile Vertically (Pro)(Std)(Lite)

Display all windows top and bottom. The project screen is displayed at the top.

Close All (Pro)(Std)(Lite)

All open windows are closed now.

Help

Help Topics (Pro)(Std)(Lite)

Please refer to the “Initial Screen Menu, [Help] – [Help Topics]”.

About Image Master (Pro)(Std)(Lite)

Please refer to the “Initial Screen Menu, [Help] – [About Image Master]”.

Stereo Screen Menu

File

Open Stereo Image (Pro)(Lite)

Open specified stereo image on the Stereo List.

Close Stereo Image (Pro)(Lite)

Close displays stereo pair image.

Save (Pro)(Lite)

Overwrite and save the project without changing the file name and the place of storage.

Remake Stereo Image (Pro)(Lite)

Remake the stereo image and update the display.

Prev Stereo (Pro)(Lite)

Switch to the previous stereo image (in the order of registration)

Next Stereo (Pro)(Lite)

Switch to the next stereo image (in the order of registration)

Edit

Model Mode (Pro)(Lite)

Enters the model mode and displays the model window.

Remote Mode (Pro)(Lite)

Enters the remote mode and displays the remote window.

Registration Mode (Pro) Lite)

Enters the registration mode and displays the registration window.

Orientation Mode (Pro)(Lite)

Enters the registration mode and displays the orientation window.

Stereo Mode (Lite)

Enters the registration mode and displays the stereo window.

Undo (Pro)(Lite)

Returns the last modified data to its original state.

Modification of the following types of data can be undone.

- Layers
- Points
- Polyline
- TIN
- Point Clouds
- Textures

Redo (Pro)(Lite)

Redo an operation undone with [Undo].

Undo Setup (Pro)(Lite)

Please refer to the “Model Screen Menu, [Edit] – [Undo Setup]”.

Select (Pro)(Lite)

Please refer to the “Model Screen Menu, [Edit] – [Select]”.

Select Square Area (Pro)(Lite)

Please refer to the “Model Screen Menu, [Edit] – [Select Square Area]”.

Select Polygonal Area (Pro)(Lite)

Please refer to the “Model Screen Menu, [Edit] – [Select Polygonal Area]”.

Select All (Pro)(Lite)

Select all the displayed data.

Select None (Pro)(Lite)

Cancel the selection of data.

Delete (Pro)(Std)

Delete the selected data altogether.

View

Update Display (Pro)(Std)

Please refer to the “Model Screen Menu, [View] – [Update Display]”.

Displayed Items (Pro)(Lite)

Please refer to the “Model Screen Menu, [Edit] – [Displayed Items]”.

Zoom (Pro)(Lite)

Zoom

Gradually enlarge the displayed cursor position by clicking the left button of the mouse, and gradually reduce by clicking the right button.

Full Display

Display all range of data within the screen.

Pan (Pro)(Lite)

Drag and move the display range of data with mouse.

Scroll to Cursor (Pro)(Lite)

Scroll the stereo image so that the right and left cursor positions come to the screen center. When Stereoscopic display is on, the cursor positions will facilitate stereoscopic vision most.

Scroll to Near Stereo (Pro)(Lite)

Switch to stereo image which is at the most closest to the current location of cursor.

Init Parallax (Pro)(Lite)

nitialize horizontal parallax of the stereo image.

When stereoscopic vision is made difficult due to large variations of horizontal parallax, it can be made easier by initializing horizontal parallax using the function.

Stereoscopic Display (Pro)(Lite)

Switch the method for displaying stereo images between side by side display and stereoscopic display.

When stereoscopic display is set, images can be viewed stereoscopically using special 3D monitor and the polarized glasses.

Minimum Line Length (Pro)(Lite)

Set the minimum width to the lines displayed on the stereo screen.

By setting the minimum line width to 1 pixel, it is possible to display polylines and TIN sides exactly. When doing stereoscopic display, however, 1-pixel lines are cut on the display depending on the line direction. This can be avoided by setting the minimum line width to 2 pixels.

Toolbars (Pro)(Lite)

Please refer to the “Initial Screen Menu [View] – [Toolbars]”.

Status Bar (Pro)(Lite)

Please refer to the “Initial Screen Menu [View] – [Status Bar]”.

Measure

Point (Pro)(Lite)

Plot

Plot positions on the stereo image and do point measurement.

The measured points are stored to the current layer.

1. Select [Measure], [Point] and [Plot] from the menu and display the "Point Measurement" Dialog Box
2. Set the current layer. (This step can be skipped.)
3. Plot measurement positions with the mouse.

   L-R display mode
   Set the right and left cursors to the measurement position and plot it with the mouse. When the automatic correlation mode is ON, the right position is detected automatically.

   Stereoscopic display mode
   Set the cursor height to the measurement position and plot it with the mouse. When the automatic correlation mode is ON, the height is detected automatically.

4. On the dialog, enter the point name and click the [Measure] button.
   Point name can be omitted.
5. Repeat steps 2-4 and enter the necessary points.
6. To complete work, click the [Close] button on the dialog.

Polyline (Pro)(Lite)

Polyline

Plot the positions on the stereo image in sequence and measure the polyline. The measured polyline is stored in the current layer.

1. Select [Measure], [Polyline] and [Polyline] from the menu and display the "Polyline" Dialog Box.
2. Set the current layer. (This step can be skipped.)
3. Plot measurement positions in sequence on the stereo image with the mouse.

   L-R display mode
   Set the right and left cursors to the measurement position and plot it with the mouse. When the automatic correlation mode is ON, the right position is detected automatically.

   Stereoscopic display mode
   Set the cursor height to the measurement position and plot it with the mouse.

When the automatic correlation mode is ON, the height is detected automatically.

4. To open end points of the polyline, press the [O] key. To close end points, press the [C] key. Or, on the dialog, click the [Open] or [Close] buttons, respectively.

5. Repeat steps 2-4 and draw the necessary polylines.

6. To complete work, click the [Exit] button on the dialog.

If this function is executed after selecting a polyline, drawing of it can be continued.

Horizontal Polyline

Plot positions on the stereo image in sequence and measure the horizontal line. The horizontal line is a polyline with Z coordinates set to be constant. The measured horizontal line is stored in the current layer.

1. Select [Measure], [Polyline] and [Horizontal Polyline] from the menu.
The "Horizontal Polyline" dialog box will appear.

2. On the dialog box, set the elevation of horizontal polyline to be drawn, then press the [OK] button.

3. Plot measurement positions in sequence on the stereo image with the mouse.

   If the "Measure on the screen" is selected on the dialog box, plot the first vertex on the stereo image with adjusting elevation with left and right cursors.

4. To open end points of the polyline, press the [O] key. To close end points, press the [C] key. Or, on the dialog, click the [Open] or [Close] buttons, respectively.

5. Repeat steps 3-4 and draw the necessary horizontal polylines.

6. To complete work, click the [Exit] button on the dialog.

* To change the elevation of horizontal polylines to be drawn, exit the dialog once, then repeat from step 1.

* If this function is executed while drawing a normal polyine or a vertical polyline, drawing of it can be continued with constant elevation.

* If this function is executed after selecting a polyline, drawing of it can be continued with constant elevation

Vertical Polyline

Plot positions on the stereo image in sequence and measure the vertical line. The vertical line is a polyline with XY coordinates set to be constant. The measured vertical line is stored in the current layer.

1. Select [Measure], [Polyline] and [Vertical Polyline] from the menu.

2. Plot measurement positions in sequence on the stereo image with the mouse.
   Plot the first vertex on the stereo image with adjusting XY position with left and right cursors.

3. To open end points of the polyline, press the [O] key. To close end points, press the [C] key. Or, on the dialog, click the [Open] or [Close] buttons, respectively.

4. Repeat steps 2-3 and draw the necessary vertical polylines.

5. To complete work, click the [Exit] button on the dialog.

* If this function is executed while drawing a normal polyine or a horizontal polyline, drawing of it can be continued with constant XY coordinates.

* If this function is executed after selecting a polyline, drawing of it can be continued with constant XY coordinates.

Surface (Pro)(Lite)

Create Surface

This function is for creating a surface (TIN) whose contours are formed by a selected polyline.

With this function, it is possible to create a TIN by dividing the polygon formed by the polyline into triangles.

1. Select the polyline that will form the contours of the surface.

2. From the [Measure] menu, select [Surface], then [Create Surface].

3. The "Surface Setting" Dialog Box will appear. Set the necessary items, then click the [OK] button.

Create Box

This function is for turning a selected polyline into the contours of an upper surface and then creating a box-shaped surface with vertical sides.

This function makes it possible to easily create 3D models of office buildings, houses, signs, etc., from aerial photographs, etc.

1. Select the polyline that will form the contours of the upper surface of the office building, etc., that is to be created.
2. From the [Measure] menu, select [Surface], then [Create Box].
3. Move the cursor to the height of the base (ground) and left click.
4. The "Surface Setting" Dialog Box will appear. Set the necessary items, then click the [OK] button.

Auto Surface Measurement

This function is for automatically measuring the surface of an area inside a selected polyline.

With this function, it is possible to automatically detect corresponding points by setting a grid on the selected measurement area and comparing the local patterns of light and dark for each grid point. From the detected corresponding points, it is then possible to created a detailed TIN.

1. Select the polyline that is to form the measurement range.

   If no polyline has been selected, the total range of data is set as the measurement range.
2. From the [Measure] menu, select [Surface], then [Auto Surface Measurement].
3. The "Auto Surface Measurement" Dialog Box will appear.
4. In the dialog box, set the various settings for surface measurement, then click the [OK] button.

* Display the shape of the created TIN using a stereoscopic display on the stereo screen, a revolving display on the model screen, etc., and confirm that the shape is correct.
* For locations with little contrast between light and dark, it may not be possible to conduct automatic measurement normally.
* Accurately align with the elevation of the polyline that will form the contour and measure it. If the elevation of the polyline is greatly different from the actual elevation, it may not be possible to conduct automatic measurement normally.
* If the y-parallax of stereo images is 1 pixel or more, automatic measurement cannot be conducted normally. In such a situation, correct the pass points or add one or more points and then calculate the orientation so as to improve the y-parallax of the stereo images.
* Regarding the function for automatically detecting corresponding points, please see the [Matching Setup] of the [Setup] menu.

Auto Surface Measurement(Batch Proccessing)

This function is for automatically measuring the surface of an area in which it extends over multiple stereo images. This function can be used when almost taking a picture from the front to the measurement surface in parallel. When the overhang is caused by the view point of the camera, it may not be able to measure it normally.

With this function, it is possible to automatically detect corresponding points by setting a grid on the selected measurement area and comparing the local patterns of light and dark for each grid point. From the detected corresponding points, it is then possible to created a detailed TIN.

1. Select the polyline that is to form the measurement range.

   If no polyline has been selected, the total range of data is set as the measurement range.

2. From the [Measure] menu, select [Surface], then [Auto Surface Measurement(Batch Processing)].

3. The "Auto Surface Measurement" Dialog Box will appear. In the dialog box, set the various settings for surface measurement, then click the [OK] button.

* Display the shape of the created TIN using a stereoscopic display on the stereo screen, a revolving display on the model screen, etc., and confirm that the shape is correct.
* For locations with little contrast between light and dark, it may not be possible to conduct automatic measurement normally.
* Accurately align with the elevation of the polyline that will form the contour and measure it. If the elevation of the polyline is greatly different from the actual elevation, it may not be possible to conduct automatic measurement normally.
* If the y-parallax of stereo images is 1 pixel or more, automatic measurement cannot be conducted normally. In such a situation, correct the pass points or add one or more points and then calculate the orientation so as to improve the y-parallax of the stereo images.
* Regarding the function for automatically detecting corresponding points, please see the [Matching Setup] of the [Setup] menu.

Insert Vertex

This function is for adding a vertex to the interior of existing surface data (TIN).

When a vertex is added, the triangles around it will be reconfigured. A vertex cannot be added outside a TIN.

1. From the [Measure] menu, select [Surface], then [Insert Vertex].

2. With the mouse, plot the additional vertex inside the triangle where you want to add it. When doing the plotting, be sure to accurately bring the cursor to the height or the locations on the left and right image.

3. When completing the work, select [Insert Vertex] again, then remove the checkmark from the menu.
Or, press the [Esc] key.

Texture (Pro)(Lite)

Texture Mapping

This function is for mapping texture (an image) to a selected surface (TIN) on the stereo screen.

1. Select a TIN.

2. From the [Measure] menu, select [Texture], then [Texture Mapping].

3. "Texture Mapping" Dialog Box will appear. Select images for texture mapping.

4. If "Combine Multiple Imagee" Check Box is set and click "OK" on the "Texture Mapping" Dialog Box. "Texture Creation" Dialog Box will appear. Enter ground resolution and click ‘’OK".

* To confirm that texture has been mapped to the TIN, display the model screen. In the settings for the display items, confirm that a check has been added to **TIN** and **Texture**, then click the  tool button.

* In certain cases, the change in texture may not immediately appear on the model screen. In such a case, click the  tool button to update the display.

Clear Texture

This function clears the texture information from the selected TIN.

Clear All Texture

This function clears the texture information from all TIN.

Add Layer (Pro)(Lite)

Please refer to the “Model Screen, [Data] – [Add Layer]”.

Change Layer (Pro)(Lite)

Please refer to the “Model Screen, [Data] – [Change Layer]”.

Layer Setting (Pro)(Lite)

Please refer to the “Model Screen, [Data] – [Layer Setting]”.

Snap (Pro)(Lite)

Please refer to the “Model Screen, [Data] – [Snap]”.

Correlation Mode (Pro)(Lite)

If the automatic correlation mode is activated, then, in the stereoscopic display mode, the height of the cursor will always be automatically detected; and in the L-R display mode, the cursor location on the right will always be automatically detected. In the L-R display mode, a green ring will be displayed if automatic detection is conducted normally, and a red ring will be displayed if detection is improperly conducted. By using the automatic correlation mode, point measurement and polyline measurement can easily be carried out.

The automatic correlation mode can be switched on and off in any of the following ways.

- Press the mouse’s center button.
- From the [Measure] menu, select [Auto Correlation Mode].
- Press the [Space] key.

* The performance of automatic correlation is affected by the quality of stereo images and by the way that objects are photographed.
  At the time of automatic correlation, be sure to visually check whether the detected height (right-side location) is correct.
* Regarding the settings for automatic correlation, please see the explanations in the [Matching Setup] of the [Setup] menu.
* If the y-parallax of stereo images is 1 pixel or more, automatic measurement cannot be conducted normally. In such a situation, modify the pass points, or add one or more points and then calculate the orientation so as to improve the y-parallax of the stereo images.

Matching Setup (Pro)(Lite)

Please refer to the “Orientation Screen, [Orientation] – [Matching Setup]”.

Setup

Stereoscopic Display Setup (Pro)(Lite)

Adjust the stereoscopic display.

1. Select [Setup] and [Stereoscopic Display Setup] from the menu and display adjustment patterns are displayed on the screen.
2. Wear polarized glasses and look at the screen from the front, taking the normal working position, as possible.
3. Adjust the display angle so that the whole screen is seen red when viewed with the left eye and green when viewed with the right eye.
4. When the screen is seen oppositely, red with the right eye and green with the left eye, check [Reverse Right and left] on the dialog.

When this adjustment is not done, stereoscopic vision may not be done correctly in stereoscopic display . This adjustment needs to be done only once.

Stereo Image Setup (Pro)(Lite)

Do the setting about stereo image creation.

On the "Stereo Image Setting" Dialog Box, do the setting about stereo images and click the [OK] button.

Fonts and Colors (Pro)(Lite)

Please refer to the “Initial Screen Menu, [Setup] – [Fonts and Colors]”.

Windows

Cascade (Pro)(Lite)

Display all windows overlapped. The screen being worked (screen with focus) is displayed at the front.

Tile Horizontally (Pro)(Lite)

Display all windows side by side. The project screen is displayed at the left end.

Tile Vertically (Pro)(Lite)

Display all windows top and bottom. The project screen is displayed at the top.

Close All (Pro)(Lite)

All open windows are closed now.

Help

Help Topics (Pro)(Lite)

Please refer to the “Initial Screen Menu, [Help] – [Help Topics]”.

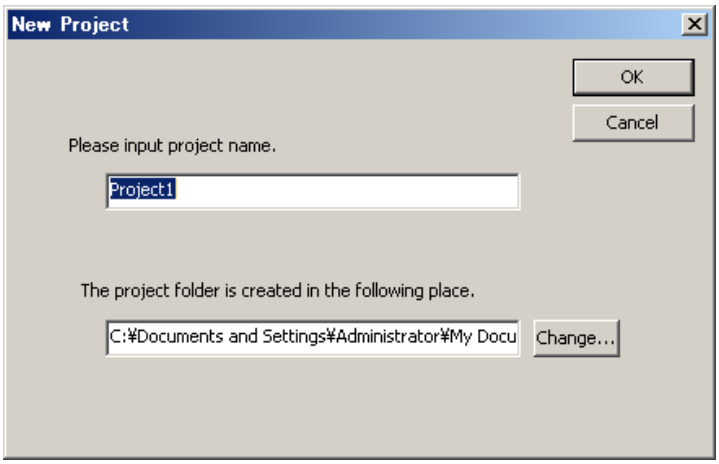
About Image Master (Pro)(Lite)

Please refer to the “Initial Screen Menu, [Help] – [About Image Master]”.

Dialog Box

"New Project"

Set the name of a project to be created and the place of folder creation.



Project Name

Enter the project name.

Place for Folder Creation

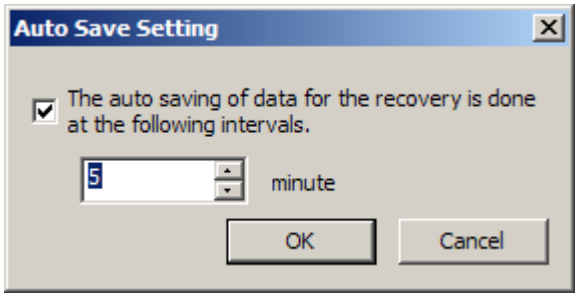
Enter the place for preparing the project folder.

[Change] Button

By clicking the button, the "Specify Place" Dialog Box is displayed. On the dialog, specify the place for preparing the project folder.

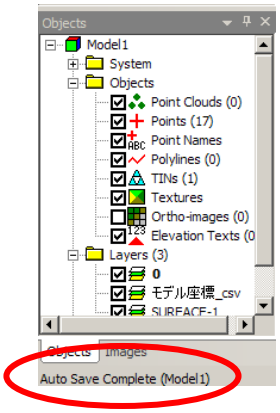
"Auto Save Setting"

This dialog box sets the interval of time to save the measurement data automatically (backup).



The auto saving of data for the recovery is done at the following interval.

If here is checked, the automatic saving function is turned on.



Interval time

The interval of time can be set in 1-120 minutes.

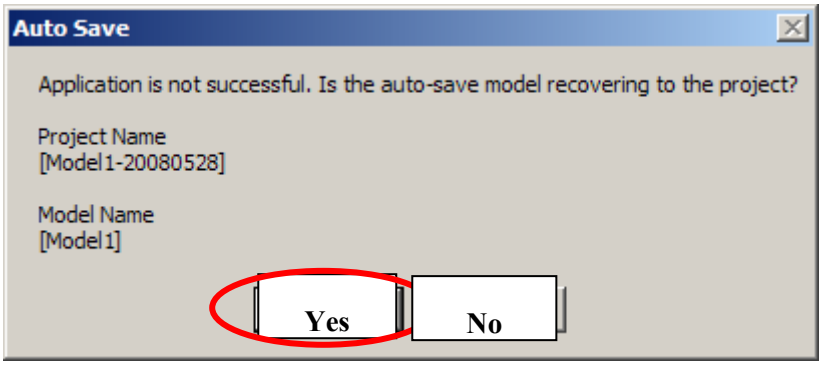
The setting of default is five minutes.

After time is set, the "OK" button is clicked.

For instance, it is displayed in the status bar (left the lower side) when setting it at five minutes, "Auto Saving -> Automatic saving complete (model **)".

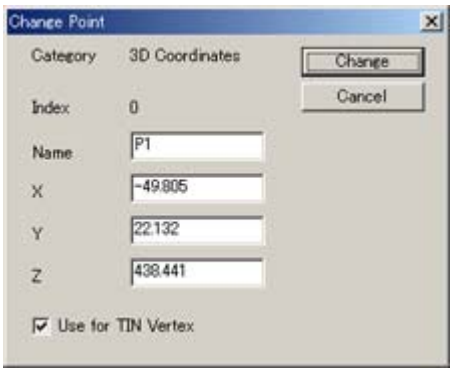
The data till then is preserved in the backup file when Image Master does Fatal Error, and when Image Master for IS is started again, the following dialogs are displayed.

To convert the backup file into data, "Yes" is clicked.



"Change Point"

Change existing points by setting contents of the points.



Name

Enter the point name. This can be omitted.

X, Y, Z

Enter coordinate values of the point. When entering, take care of the coordinates system.

Use for TIN Vertex

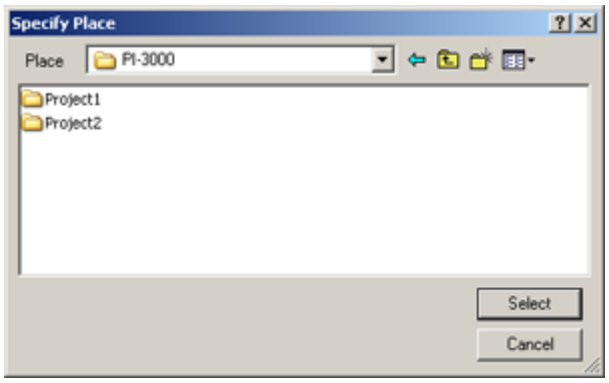
When checked, the point is used as vertex in TIN creation. Remove the check when entering coordinates that are not related to the shape of the target, such as occupied points and backsight points.

[Change] button

Changes the content of the point.

"Specify Place"

Select the place of files and folders.



The folders and files in the current place are listed in the center box of the dialog. In this dialog, only the file names related to the contents of work are displayed, and it is not possible to specify the files.

Place

The current place is displayed. It is also possible to select another place from the list.

 Returns to the folder displayed last.

 Move to the folders one layer above.

 Create a new folder at the specified place.

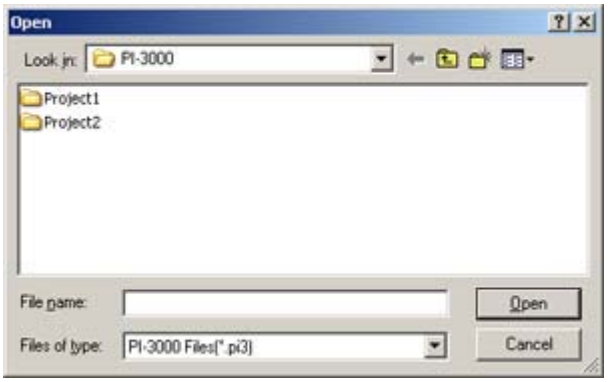
 Select the method for displaying the list of files and folders.

[Select] button

Fixes the selected place and close the dialog.

"Open"

Specify the name and place of the file to be opened.



List of Folders and Files

The folders and files in the current place are listed in the center box of the dialog.

Look in

The place to read the file is displayed. It is also possible to select another place from the list and change the place of the file.

File name

Enter the file name. By specifying the file on the "List of Folders and Files," the file is inputted automatically.

Files of type

Select the type of file to be read.

The type of file displayed in the list depends on the situation.

 Returns to the folder displayed last.

 Move to the folders one layer above.

 Create a new folder at the specified place.

 Select the method for displaying the list of files and folders.

[Open] button

Opens the specified file after completing the dialog.

"Print Setup"

Set the printer.

Name (Printer)

Display the printer name used. It is also possible to select the printer to be used from the list.

Size (Paper)

Specify the size of printer paper.

Source (Paper)

Specify the tray to be used (when the printer has more than one paper tray).

Orientation

Select the direction of paper to be printed.

[Properties] button

Set the selected printer. For details about setting, refer to the instruction manual of the printer to be used.

[Network] button

Connects the printer to the network and specifies a new drive name.

"Print"

Do the setting about printing.

Name

Display the printer name used. It is also possible to select the printer to be used from the list.

Page Range

Specify the page area to be printed.

Number of copies

Specify the number of prints.

Orientation

Select the direction of paper to be printed.

Print to file

Instead of outputting to the printer, output the contents to be printed to the file (*.prn).

Using this file, for example, it is possible to execute printing by entering the following on the command prompt:

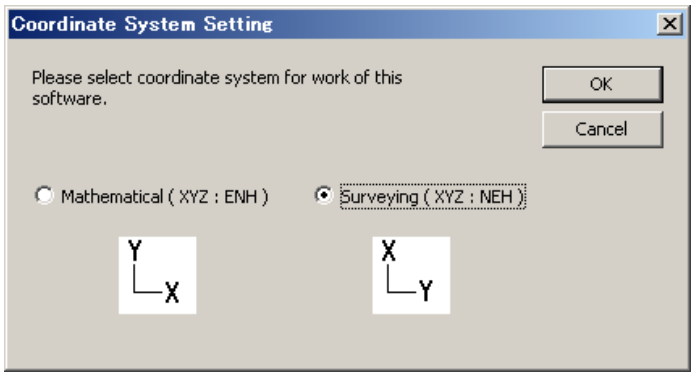
copy filename lpt1

[Properties] button

Set the selected printer. For details about setting, refer to the instruction manual of the printer to be used.

"Coordinate System"

Set the coordinates system of the 3D data used for work on Image Master.



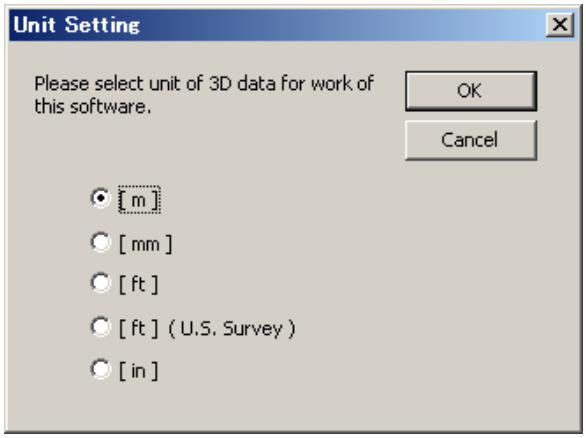
Mathematical (XYZ : ENH)

In front of the XY plane, the right direction is +X, the upward direction is + Y and the front direction is +Z. This coordinates system is popularly used for CAD software.

Surveying (XYZ : NEH)

In front of the XY plane, the upward direction is +X (North), the right direction is + Y (East) and the front direction is +Z (Elevation). In Japan, this coordinates system is popularly used for survey.

"Unit"



Through this dialog box, units can be set for 3D data to be used on Image Master.

Unit can be selected from following 5 units.

It is recommended to use [mm] or [in] for small size object.

[m]

Calculations are done in meter.

[mm]

Calculations are done in millimeter.

[ft]

Calculations are done in feet (International standard.

[ft] (U.S. Surveying)

Calculations are done in US feet.

[in]

Calculations are done in inch.

1. Select one among above 5 units, then put a check mark.
2. Press **[OK]** button.

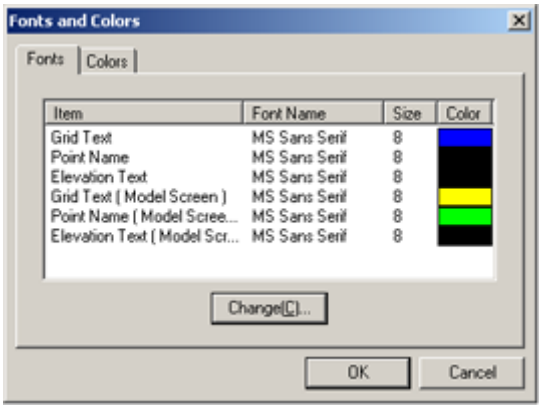
"Fonts and Colors"

This dialog box is used to set the fonts, colors and other basic items that are displayed on the screen of the Image Master.

Font page

If the **Font** tab at the top of the dialog box is clicked, the **Font** page will be displayed.

It is possible to set a font for each item displayed on the list.

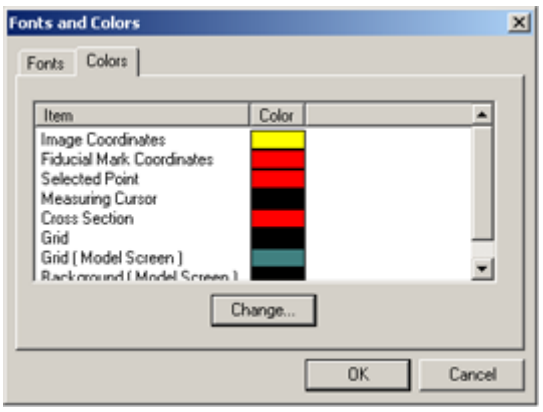


1. Select an item on the list, then click the [Change] button. The "Font" Dialog Box will appear.
2. In the dialog box, set a font, then click the [OK] button.

Color page

If the **Color** tab at the top of the dialog is clicked, the **Color** page will be displayed.

It is possible to set a color for each item displayed on the list.

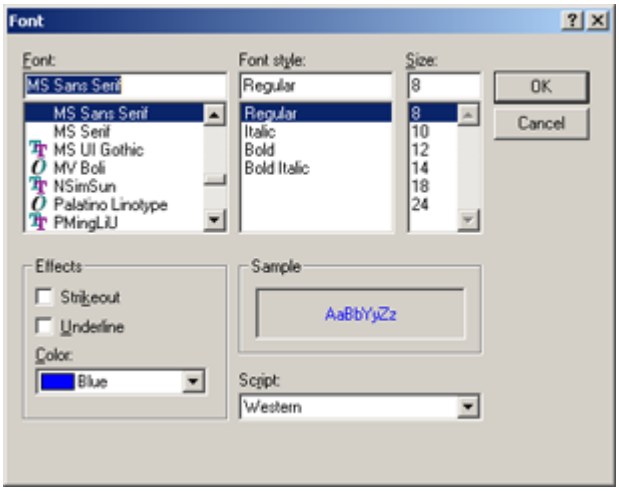


1. Select an item on the list, then click the [Change] button. The "Color" Dialog Box will appear.

2. In the dialog box, set a color, then click the [OK] button.

"Font"

Set fonts.



Font

Select the font name to be set from the list.

Font style

Select the font style to be set from the list.

Size

Select the font size to be set from the list, or enter the numerical value.

Effects

Specify effects, such as strikeout and underline.

Color

Select display colors of characters.

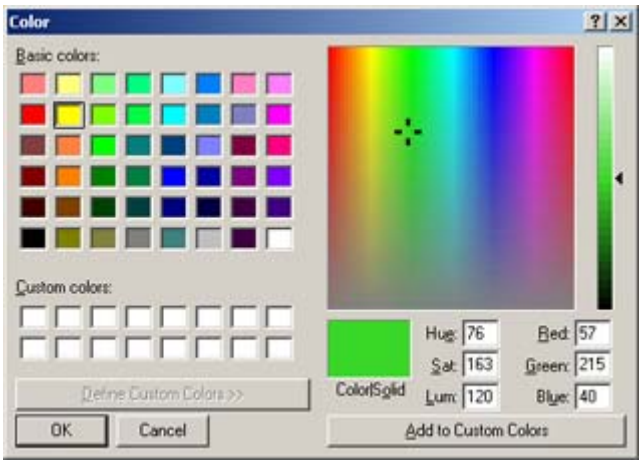
Script

Select the language script from the list.

"Color"

Set colors.

The contents of this dialog box may differ depending on the version of Windows.



Basic colors

Display usable basic colors. Click and select the color to use.

Custom colors

Display the originally created colors. Click and select the color to use.

[Define Custom Colors] button

Display the screen for defining original colors on the right.

Color Matrix

Here the color of the screen right is displayed. Click and select the original color to use.

Slider

Drag the slider at the rightmost of the screen and change the brightness of the specified color.

Hue, Sat, Lum, Red, Green, Blue

Enter and set the values of the specified colors.

[Add to Custom Colors] button

Add the original colors of the screen right to "Custom colors".

"New Model"

Set the name of a model to be created.

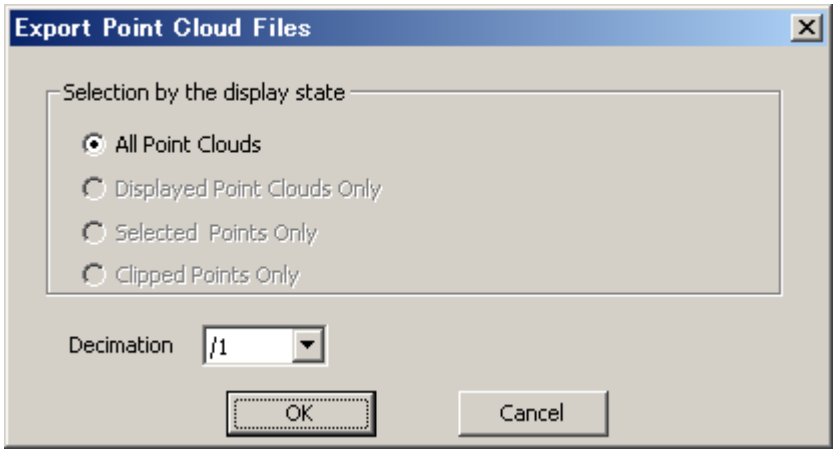
Model Name:

Enter the model name. Then click the [OK] button.

"Export Point Cloud Files"

Set the name of a model to be created.

The point cloud data scanned with IS is saved in the file.



Selection by the display state

It is possible to export by the following selection by the state of the display of the point cloud data.

- All Point Clouds
- Displayed Point Cloud Only
- Selected Points Only
- Clipped Points Only

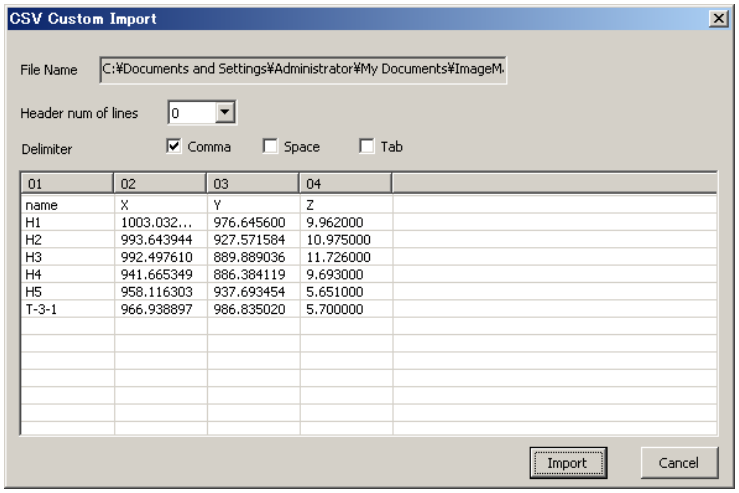
Decimation

You can configure a decimation ratio setting (1 to 1/32).

After the settings are configured, click the [OK] button.
On the Save As dialog box that appears, specify the save destination, file type (DXF Files, CSV Files, Test Files), and file name, and then click the [Save] button.

"CSV Custom Import"

This dialog box is for setting the method to import point data.



File Name

The import file name is displayed.

Header num of lines

The number of lines of the header (the first line that displays data) are set.

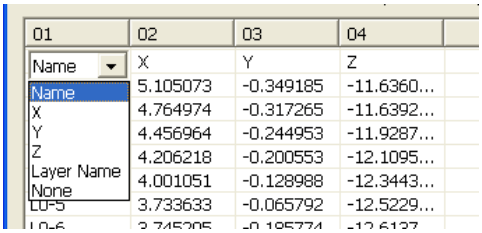
The numbers of items that can be set are from 0 to 20.

Delimiter

The delimitation of data (comma, space, and tab) is specified.

The arrangement of data is specified.

In this dialog, the arrangement of the data of the point name and coordinates, etc. can be changed by clicking the data item with the mouse.

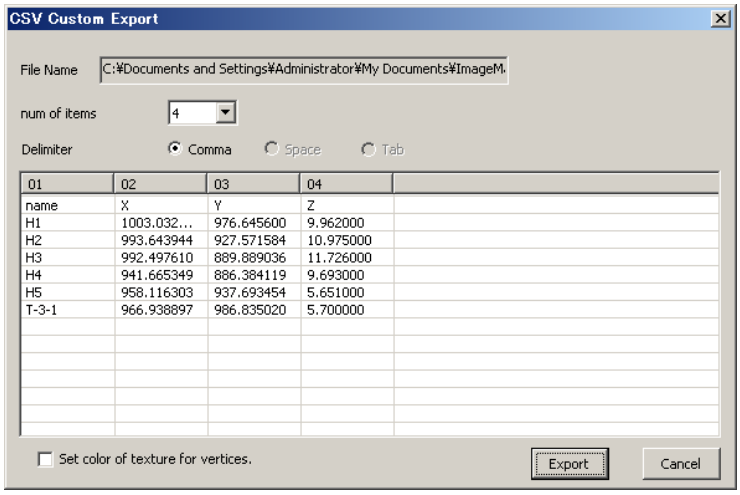


[Import] button

Click the [Import] button to import the data.

"CSV Custom Export"

This dialog box is for setting the method to export point data.



File Name

The export file name is displayed.

num of items

The number of items of data (row) is set.

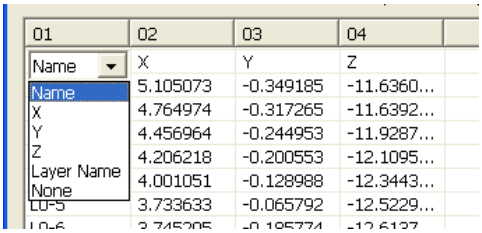
The numbers of items that can be set are from 0 to 20.

Delimiter

The delimitation of data (comma, space, and tab) is specified.

The arrangement of data is specified.

In this dialog, the arrangement of the data of the point name and coordinates, etc. can be changed by clicking the data item with the mouse.



Set color of texture for vertices.

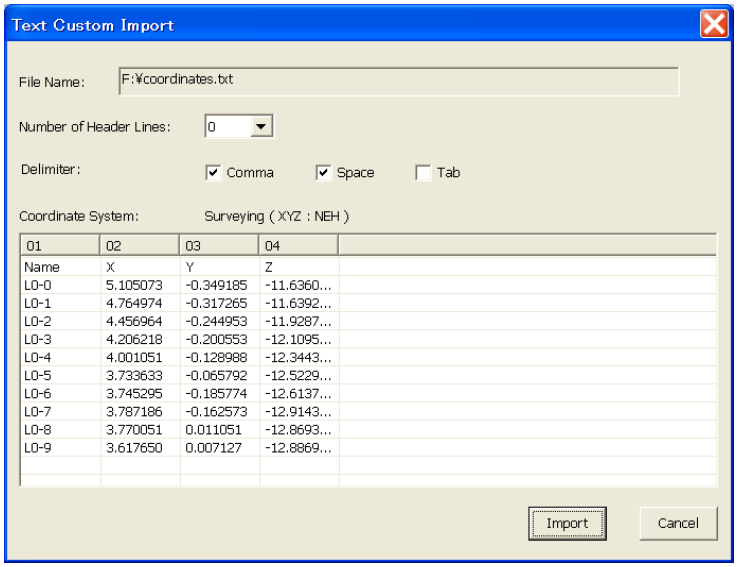
When the vertex of TIN is output by the CSV data, color information (RGB) on the texture is saved together.

[Export] button

Click the [Export] button to export the data.

"Text Custom Import"

This dialog box is for setting the method to import point data.



File Name

The import file name is displayed.

Header num of lines

The number of lines of the header (the first line that displays data) are set.

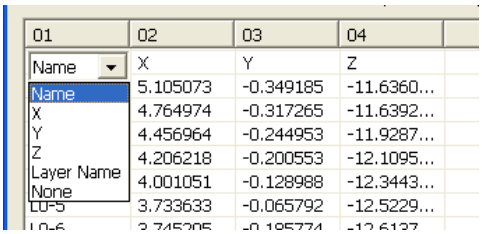
The numbers of items that can be set are from 0 to 20.

Delimiter

The delimitation of data (comma, space, and tab) is specified.

The arrangement of data is specified.

In this dialog, the arrangement of the data of the point name and coordinates, etc. can be changed by clicking the data item with the mouse.

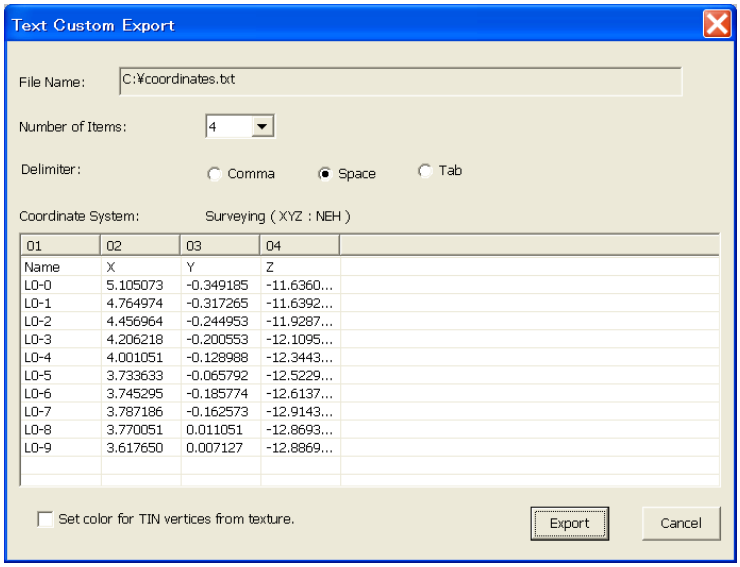


[Import] button

Click the [Import] button to import the data.

"Text Custom Export"

This dialog box is for setting the method to export point data.



File Name

The export file name is displayed.

num of items

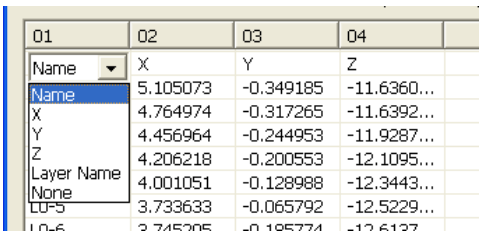
The number of items of data (row) is set. The numbers of items that can be set are from 0 to 20.

Delimiter

The delimitation of data (comma, space, and tab) is specified.

The arrangement of data is specified.

In this dialog, the arrangement of the data of the point name and coordinates, etc. can be changed by clicking the data item with the mouse.



Set color of texture for vertices.

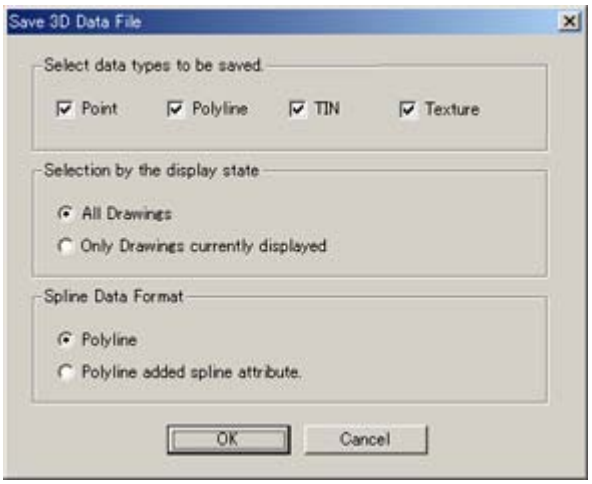
When the vertex of TIN is output by the CSV data, color information (RGB) on the texture is saved together.

[Export] button

Click the [Export] button to export the data.

"Save 3D Data File"

This dialog box is for setting the method of saving 3D data.



Select the data types to be saved

Here, the data to be saved in the file is selected.

The data that can be selected will vary with the type of file.

Selection by the display state

The data to be saved can be selected based on whether it is displayed or non-displayed.

If **All Drawings** is selected, all registered data will be saved, regardless of whether it is displayed or non-displayed. If **Only Drawings currently displayed** is selected, only the data displayed on the screen will be saved.

Spline Data Format

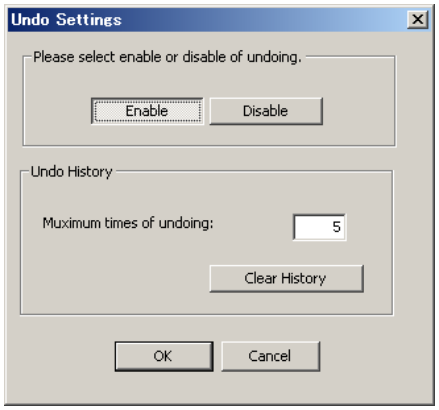
This setting can only be set when the data is to be saved in a DXF file format.

If p**olyline** is designated, data will be saved as an ordinary polyline that comprises the points of the spline vertex. In such a case, the data will be readable by most CAD software, but cannot be edited as spline data.

If p**olyline added spline attributes** is designated, it will be possible to edit the data as spline data with CAD software that supports the above-mentioned format.

"Undo Settings"

This dialog box is for setting the select(enable/Disable) and the history of UNDO.



[Enable] button

Select enable of undoing.

[Disable] button

Select disable of undoing.

Maximum times of undoing

Enter the maximum times of undoing.

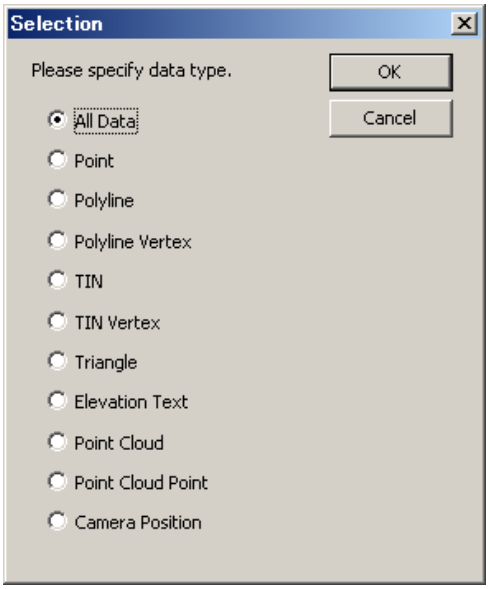
[Clear History] button

Clear the history of undoing. (Buffer initialization)

"Selection"

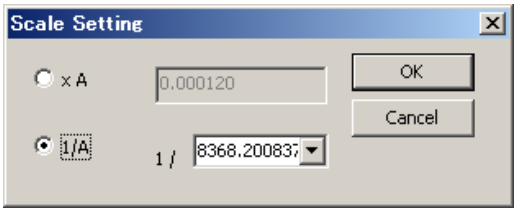
This dialog box is for designating the data form(s) to be selected.

If **All Data** is designated, the data forms that will be selected include point, polyline, TIN, and elevation text, but not polyline vertex, TIN vertex, or triangle.



"Scale Setting"

Set the magnification of the drawing to be printed.



x A

Enter the magnification value in the form of "xA".

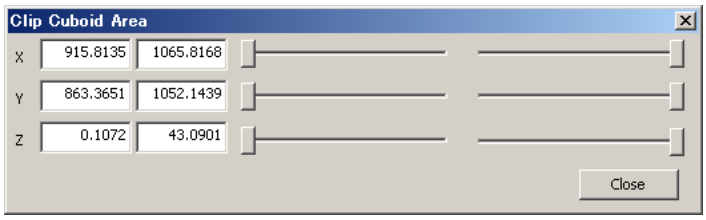
1 / A

Enter the magnification value in the form of "1/A".

"Clip Cuboid Area"

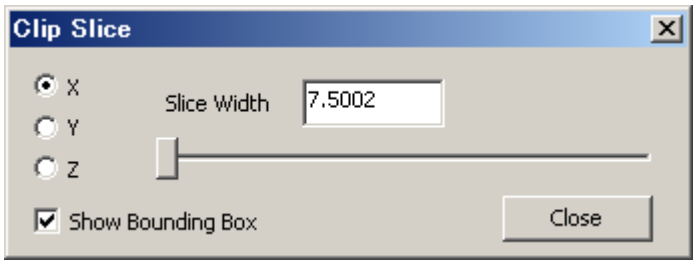
This dialog box sets the range of the display of 3D data by using the slider of the XYZ axis.

Moreover, XYZ coordinates can be input respectively.



"Clip Slice"

This dialog box does the slice display to the XYZ axis by using the slider.



XYZ

Check the axis to be displayed.

Slice Width

Enter the slice width.

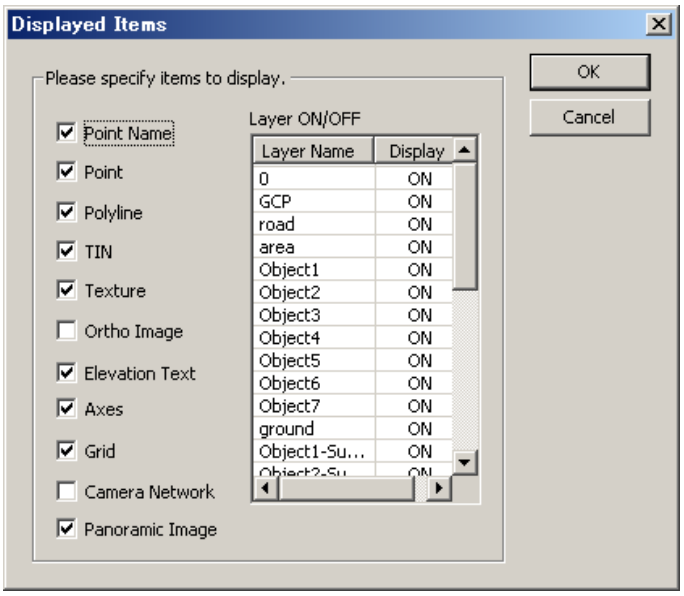
Show Bounding Box

When checked, displays the bounding box.

"Displayed Items"

Set the items to be displayed in the model screen and the registration screen.

The contents set here are applied to both screen display and printing.



Items to be displayed

It is possible to set display/non-display to each data type.

Check the items to be displayed and uncheck the items to be not displayed.

Layer ON/OFF

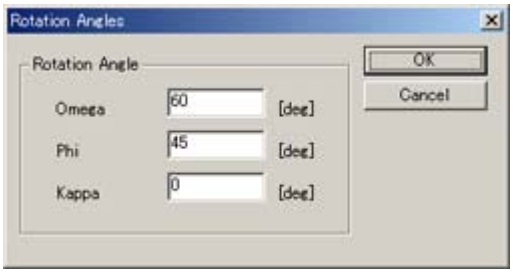
It is possible to set display/non-display layer by layer.

To switch ON/OFF the layer, click the ON/OFF part of the list, as needed.

For points, polylines and TINs, only the data with the data item ON and the layer ON are displayed on the screen.

"Rotation Angles"

This dialog box is for setting the angles of rotation for each axis.



Omega

Enter the angle of rotation for the X axis (with the survey coordinates system, the Y axis).

Phi

Enter the angle of rotation for the Y axis (with the survey coordinates system, the X axis).

Kappa

Enter the angle of rotation for the Z axis.

"Scale Transformation"

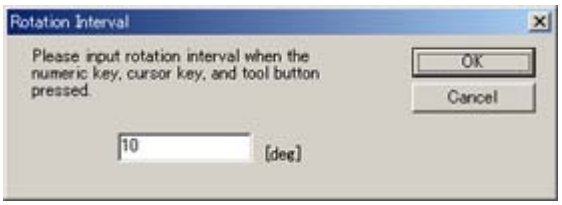
Enter the magnification for scale transformation.

Scale

Enter the magnification value.

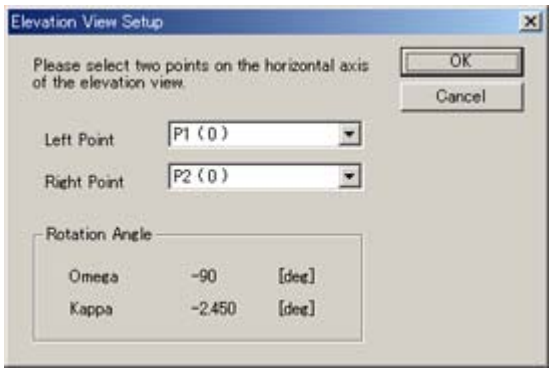
"Rotation Interval"

Enter the step of rotation angle of the numerical key, arrow key and rotating button when pressed.



"Elevation View Setup"

This dialog box is for entering the settings of elevation views.



Left Point

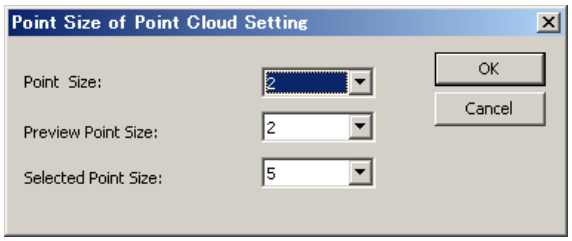
Designate the point, on the left side of the elevation view that will be one of the two points demarcating the horizontal axis.

Right Point

Designate the point, on the right side of the elevation view that will be one of the two points demarcating the horizontal axis.

"Point Size of Point Cloud Setting"

This dialog box sets the size of the point of the point cloud data.



Point Size

The size of the point of the point cloud data is specified.

Preview Point Size

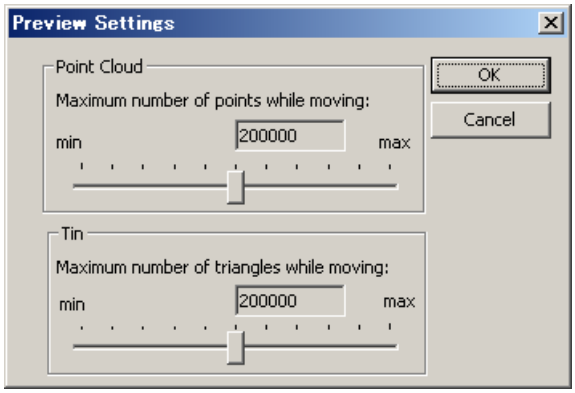
The point size at the preview is specified.

Selected Point Size

The point size when the point cloud data is selected is specified.

"Preview Settings"

This dialog sets the number of data when the preview of the point cloud data and the TIN data is displayed. The preview means the display control of the movement and the rotation of ３D data on the model screen.



Point Cloud

The maximum point displayed while moving the point cloud data is specified by using the slider.

(Minimum: 1000 points, Maximum: 100000000 points)

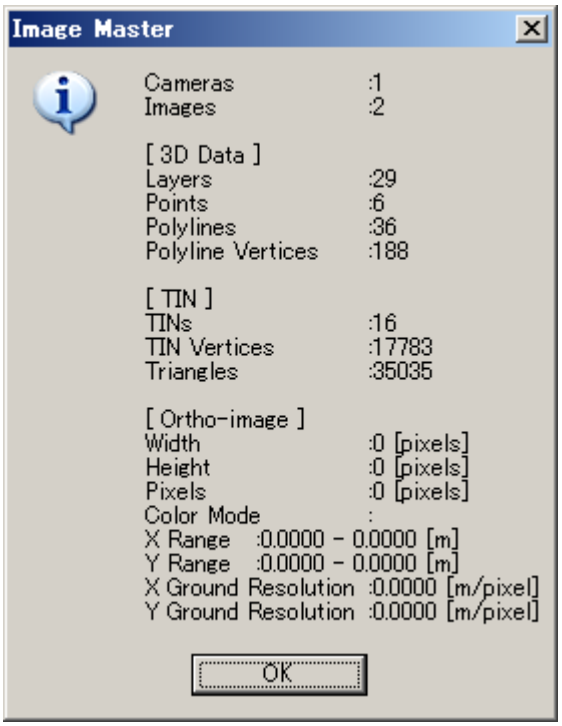
TIN

The maximum point displayed while moving the TINs data is specified by using the slider.

(Minimum: 1000 points, Maximum: 100000000 points)

"Data Information"

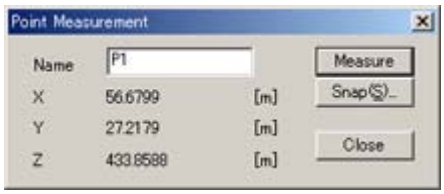
This dialog displays data information.



"Point Measurement"

Displayed at point measurement.

Enter the point name and execute measurement. Snap setting can also be done.



Name

Enter the point name. This can be omitted.

[Measure] button

Execute measurement at the specified position.

[Snap] button

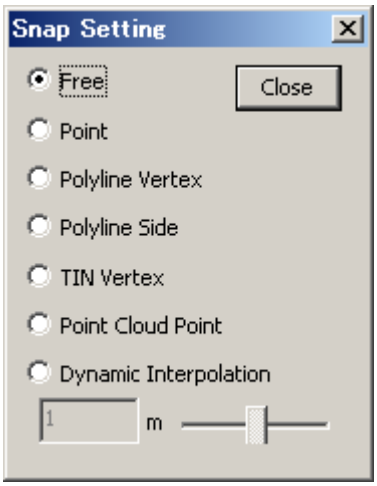
Display the "Snap Setting" Dialog Box for snap setting.

[Close] button

Closes the dialog and completes work.

"Snap Setting"

This dialog box is for entering the snap settings.



Free

This setting acquires the coordinates of the location designated on the screen.

The coordinates of the elevation (depth) acquired will be as follows.

When TIN doesn't exist	Elevation = 0.0
When TIN exists	(Inside the TIN)
	The elevation (depth) on the surface of the TIN
	(Outside the TIN)
	The elevation (depth) on the outline of the nearest TIN

Point

This setting acquires the coordinates of the point closest to the location designated on the screen.

Polyline Vertex

This setting acquires the coordinates of the polyline vertex closest to the location designated on the screen.

Polyine Side

This setting acquires the coordinates on the polyline side closest to the location designated on the screen.

TIN Vertex

This setting acquires the coordinates of the TIN vertex closest to the location designated on the screen.

Point Cloud Point

This setting acquires the coordinates of the point of the point cloud data closest to the location designated on the screen.

Dynamic Interpolation

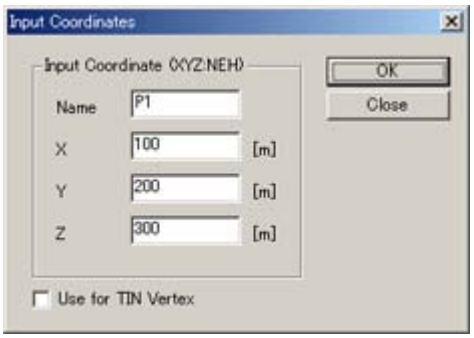
This setting is used for the single photograph plotting making by the use of the point cloud data.

Dynamic Interpolation is done within the range of the point specified with the mouse.

The range is set by the slider.

"Input Coordinates"

Set the contents of points and register to the project.



Name

Enter the point name. This can be omitted.

X, Y, Z

Enter coordinate values of the point. When entering, take care of the coordinates system.

Use for TIN Vertex

When checked, the point is used as vertex in TIN creation. When entering coordinates which are not related to the shape of the target, such as occupied points and backsight points, remove the check.

[OK] button

Registers the point with the set contents to the project.

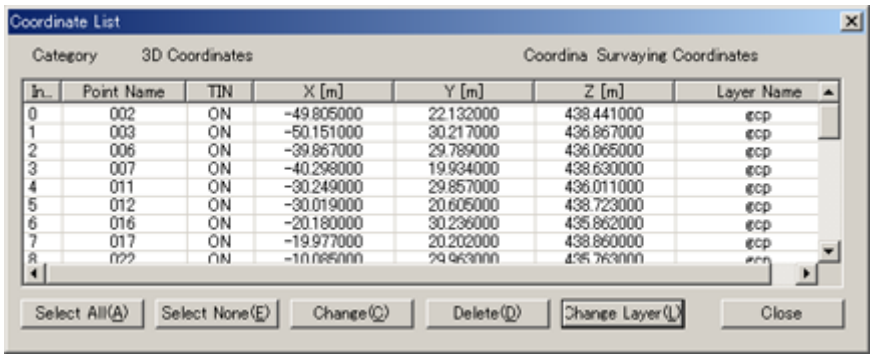
[Close] button

Closes the dialog and completes work.

"Coordinate List"

The points registered to the project are displayed in a list.

Operations like the confirmation of coordinate values and point editing, are done.



Coordinates List

A list of points is displayed. By clicking the mouse on each item, points are sorted and displayed by the content.

The items are described below:

Index

Point indices are displayed.

Point Name

Point names are displayed.

TIN

Conditions whether used as vertices in TIN creation are displayed by ON/OFF. The ON/OFF condition can be switched by selecting the point from the list and clicking on the item.

X, Y, Z

Coordinate values of the point are displayed.

Layer Name

The layer name of the point is displayed.

[Select All] button

Selects all points.

[Select None] button.

Cancels the selection of points.

[Change] button

Changes the content of the selected point. By selecting a point and clicking the button, the "Change Point" Dialog Box is displayed. Set items and click the [OK] button.

[Delete] button

Deletes the selected points altogether. By selecting a point and clicking the button, the "Change Data Layer" Dialog Box is displayed. Set a layer and click the [OK] button.

[Change Layer] button

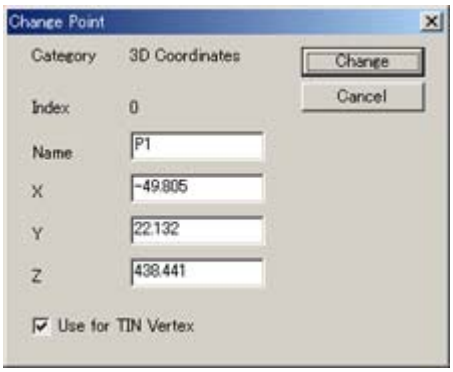
Changes the layer of the selected point.

[Close] button

Close the dialog.

"Change Point"

Change existing points by setting contents of the points.



Name

Enter the point name. This can be omitted.

X, Y, Z

Enter coordinate values of the point. When entering, take care of the coordinates system.

Use for TIN Vertex

When checked, the point is used as vertex in TIN creation. Remove the check when entering coordinates that are not related to the shape of the target, such as occupied points and backsight points.

[Change] button

Changes the content of the point.

"Change Data Layer"

Change the data layer.

Layer Name

The current layer name is displayed. Existing layer names can be selected from the drop down list.

[New Layer] button

It is possible to add a new layer and set it for data. When clicked, the "Layer Information" Dialog Box is displayed. Set the contents of the layer and click the [OK] button.

"Layer Information"

Set the content of a layer.

Layer Name

Enter the layer name. When the item is unchecked, the set content is set aside.

Color

Select the display color of the layer. When the item is unchecked, the set content is set aside.

Line Style

Select the line type. When the item is unchecked, the set content is set aside. The line type is applied only to polylines.

Line Width

Select the line thickness of the layer. When the item is unchecked, the set content is set aside. The thickness is applied to the thickness of polylines and the size of points.

Display

Select display/non-display of the layer. When the item is unchecked, the set content is set aside.

"Polyline"

This dialog is displayed at polyline measurement.

Do the end point processing of drawn polylines, change of the drawing direction, snap setting, etc.

[Open] button

Completes the drawing of a polyline with end points left open.

[Close] button

Completes the drawing of a polyline with end points closed.

[Reverse] button

Switches end points to add vertices (start, terminal).

[Snap] button

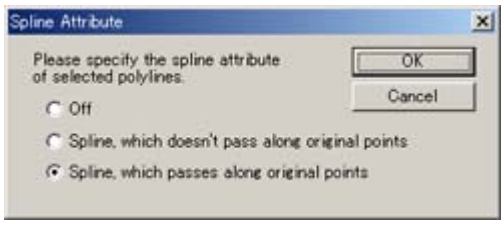
Displays the "Snap Setting" Dialog Box and change the snap setting.

[Exit] button

Completes work and closes the dialog.

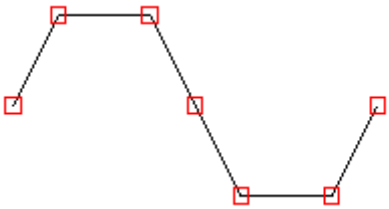
"Spline Attribute"

Set the spline attribute of polylines.



Off

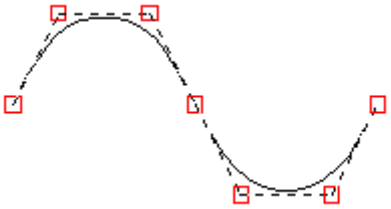
Reset the polyline to an ordinary polyline.



Spline, which doesn't pass along original points

Convert the polyline to a smooth curve passing near the original points.

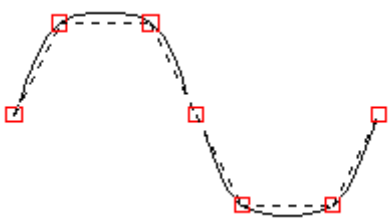
A smoother and more natural curve is resulted. When [Spline] is set in contour creation, this attribute is set to contour data.



Spline, which passes along original points

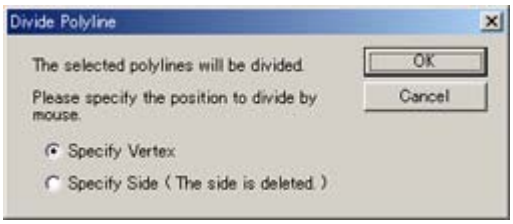
Convert the polyline to a smooth curve passing the original points.

Compared to a plotted polyline, smoother and more natural curve is resulted.



"Divide Polyline"

Set the method for dividing polylines.



Specify Vertex

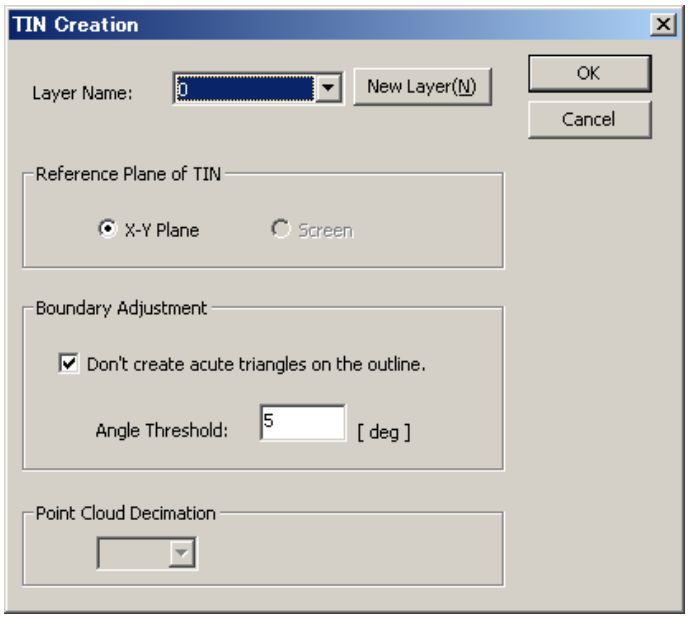
Divide the polyline at the specified vertex position. In this case, the polyline looks as if one polyline.

Specify Side

Divide the polyline by deleting the specified side.

"TIN Creation"

Set the method of TIN creation.



Layer Name

Select the layer of the TIN to be created.

[New Layer] button

Set the new layer as the layer of the TIN to be created. When clicked, the "Layer Information" Dialog Box is displayed. Set items and click the [OK] button.

Reference Plane of TIN

Select the reference plane of TIN creation. When "XY plane" is selected, triangulation is done based on the coordinate arrangement projected on the XY plane. On the other hand, when "Screen" is selected, triangulation is done based on the coordinate arrangement projected on the screen. Select a suitable procedure taking into consideration the direction of the input data plane.

Don't create acute triangles on the outline

When checked, acute triangles are not created on the outline.

Angle Threshold

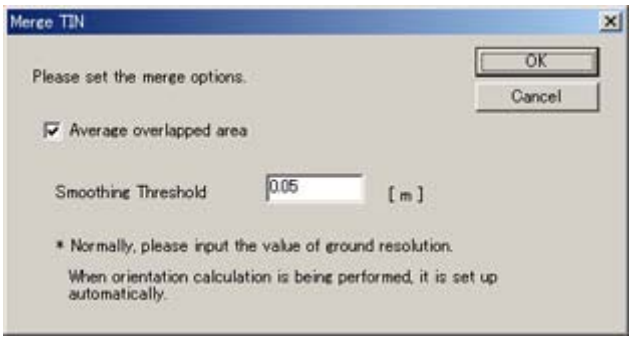
When "Don't create acute triangles on the outline" is checked, enter the angle control value.

Point Cloud Decimation

The decimation rate of the point cloud data is specified.

"TIN Merge Options"

Do the setting about merging of TINs.



Average overlapped area

Do the averaging of overlapped areas of multiple TINs.

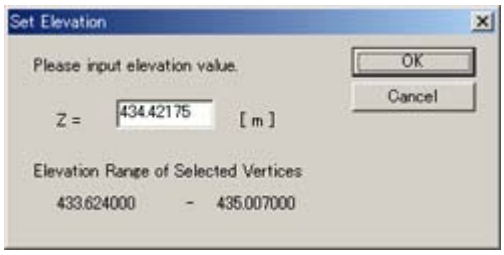
Smoothing Threshold

When doing the averaging of overlapped areas, limit the amount of movement of vertex coordinates. When the value is taken large, overlapped areas a smoothed but the measurement accuracy of coordinates may be lowered.

Normally, set the value of ground resolution of the orientation result. When the ground resolution is inputted, smoothing can be done without lowering measurement accuracy. The value is set automatically by executing orientation computation.

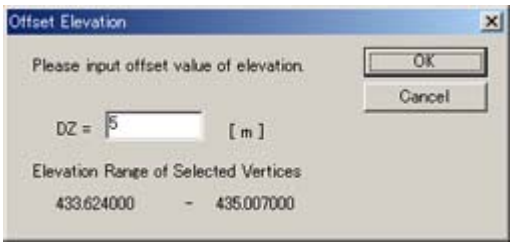
"Set Elevation"

This dialog box is for entering the elevation (Z coordinate) of selected TIN vertices.



"Offset Elevation"

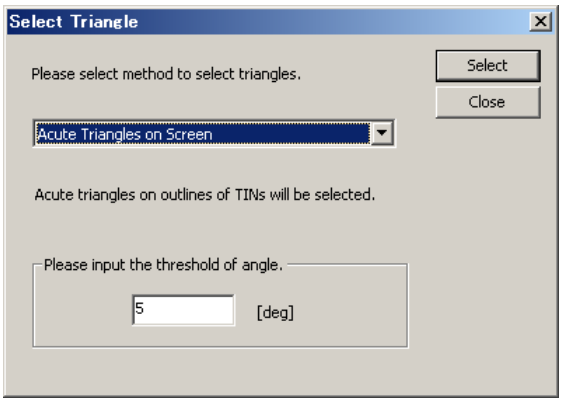
This dialog box is for entering the offset for the elevation of selected TIN vertices.



"Select Triangle"

This dialog selects acute triangles and long triangles tangent to a TIN contour.

This function can be used to batch delete long thin triangles created on the contour.



Acute Triangles on Screen

Enter the angle. The target of deletion is the acute triangles on screen tangential to the outline with angles smaller than the inputted angle.

Acute Triangles in 3D

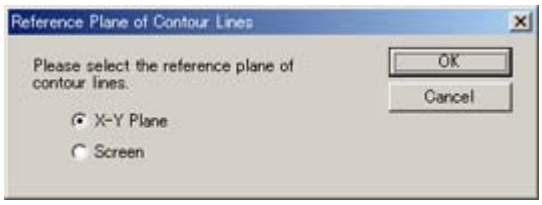
Enter the angle. The target of deletion is the acute triangles in 3D tangential to the outline with angles smaller than the inputted angle.

Long Triangles

Enter the length. The target of deletion is the triangles tangential to the outline with sides longer than the inputted length.

"Reference Plane of Contour Lines"

Select the reference plane of contour lines to be created.



X-Y Plane

Create contour lines in the direction of Z axis.

Screen

Create contour lines in the direction from back to front of the screen, taking it as a provisional elevation.

"Creation of Contour Lines"

Set the method of creation of contour lines.

Creation Range

Enter the range of elevation (depth) to create contour lines.

Minor Contour

Set the interval and color of intermediate contour lines.

Major Contour

Set the interval and color of index contour lines. Normally it is set to be five times the interval of intermediate contour lines.

Vertex Sampling

When TIN is very dense, thin vertices of contour lines (polylines). When combined with spline function, smoother contour lines can be created. Also, contour data can be lightened.

Minimum Interval

When "Vertex Sampling" is checked, enter the minimum value of interval for vertex thinning. Two or more vertices which are closer than the value inputted here are taken as one point.

When a large value is inputted here, contour lines may cross each other. In this case, do the editing using functions of [Polyline] submenu of [Data] menu.

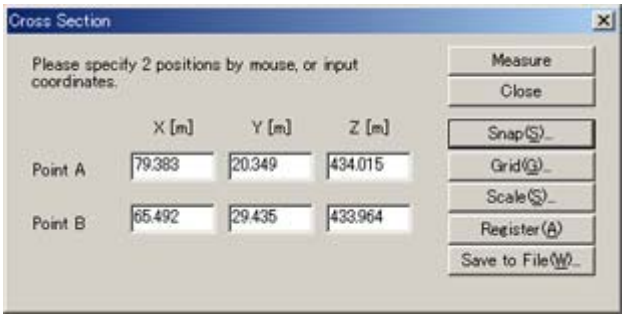
Spline

When the item is checked, contour lines are created as smooth curves. When unchecked, contour lines are outputted in the original data condition (polygon, broken line).

"Cross Section"

This dialog box is displayed during the measurement of cross sections.

It is for measuring cross-section data and entering the display settings for cross-section diagrams.



[Measure] button

After entering the coordinates for the two points, click this button to update the cross-section diagram.

[Snap] button

Clicking this button displays the "Snap Setting" Dialog Box, where the snap settings can be changed.

[Grid] button

Clicking this button displays the "Grid Setting (Cross Section)" Dialog Box, where the grid settings can be entered.

[Scale] button

Clicking this button displays the "Scale (Cross Section)" Dialog Box, where the magnification for each axis can be set.

[Register] button

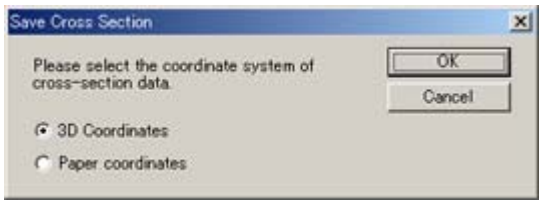
Clicking this button records the current cross-section data as a polyline in the project. The layer name of the recorded polyline will be set in "CrossSection".

[Save to File] button

This button is for saving current cross-section data in DXF format in a file. When it is clicked, the "Save Cross Section" Dialog Box appears. In this dialog box, set the method of saving the data, then click the [OK] button. The "Save As" Dialog Box will then appear. There, enter a file name, then click the [Save] button.

"Save Cross Section"

Select the method for saving section data.



3D Coordinates

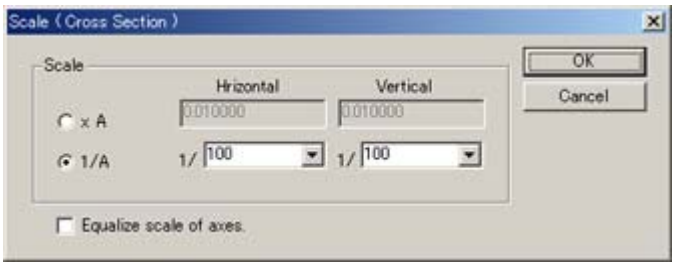
Save section data by 3D coordinates system. Saving by this method will enable overlapping with other 3D data, with correct positional relationship, on other CAD.

Paper Coordinates

Save section data by the coordinates system of the sectional view. Saving by this method will enable displaying the same condition as in the sectional view on other CAD. (Grid lines and characters are not saved in the file.)

"Scale (Cross Section)"

Set the magnification of horizontal/vertical axes of the sectional view.



x A

Selecting this item, enter magnification values to the horizontal and vertical axes in the form of "xA".

1 / A

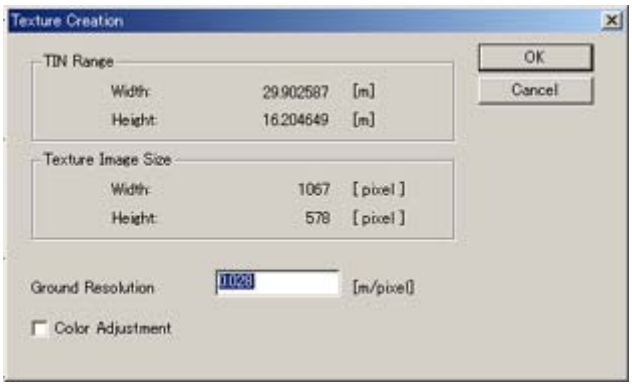
Selecting this item, enter magnification values to the horizontal and vertical axes in the form of "1/A".

Equalize scale of axes

Apply the same magnification ratio to the horizontal and vertical axes.

"Texture Creation"

Do the setting about the texture image to be created.



Ground Resolution

Enter the ground resolution of texture image. When the value is taken large, coarse image are created and vice versa.

Color Adjustment

When the item is checked, boundaries are made indiscreet by adjusting the ting of the whole image when connecting multiple images.

"Ortho-image Creation"

Do the setting about the ortho-image to be created.

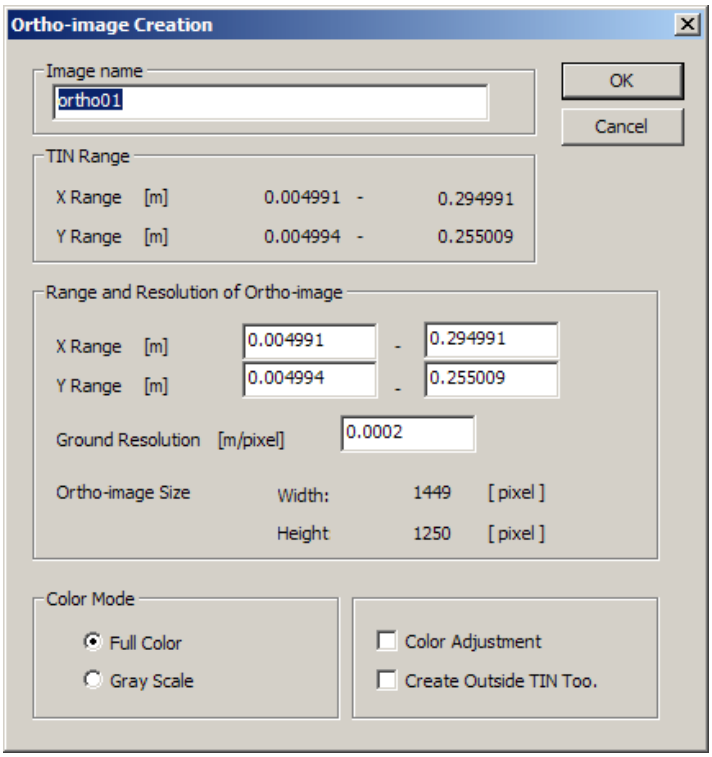


Image name

Enter the ortho-image name.

The image name set here is registered under the ortho-image of the object tree view.

In Image Master, two or more ortho-images can be made.

X/Y Range

The range of ortho-image creation is displayed. Normally the TIN range is set. The range can also be inputted manually.

Ground Resolution

Enter the ground resolution of ortho-image. When the value is taken large, coarse image are created and vice versa.

Color Mode

Set the color mode of the ortho-image to be created. When "Full Color" is selected, full-color (RGB, 24bit/pixel) ortho-image is created. When "Gray Scale" is selected, gray-scale (monochrome 256 gradation, 8bit/pixel) ortho-image is created.

Color Adjustment

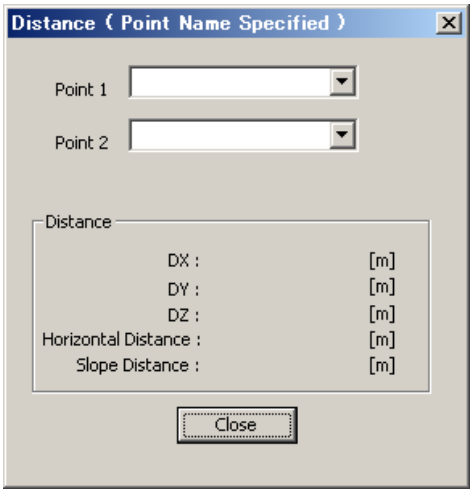
When the item is checked, boundaries are made indiscreet by adjusting the tint of the whole image when connecting multiple images.

Create Outside TIN Too

When the item is checked, ortho-image is created about the outside of TIN, too. However, since the shape of the outside of TIN is unknown, it is not possible to create exact ortho-image. On Image Master, work is done supposing that the elevation along the TIN outline is continued to the outside of TIN. When displayed by rotation, work is done in the same way taking the direction from screen back to front as virtual elevation. Note that unnatural ortho-images may be resulted about the outside of TIN.

"Distance (Point Name Specified)"

Display the distance of the two points specified by the name.



Point 1, 2

Select point names of the 1st and 2nd points from the list. The layer name of the point is displayed in the parentheses following the point name.

DX, DY, DZ

Distance components of each axial direction are displayed.

Horizontal Distance

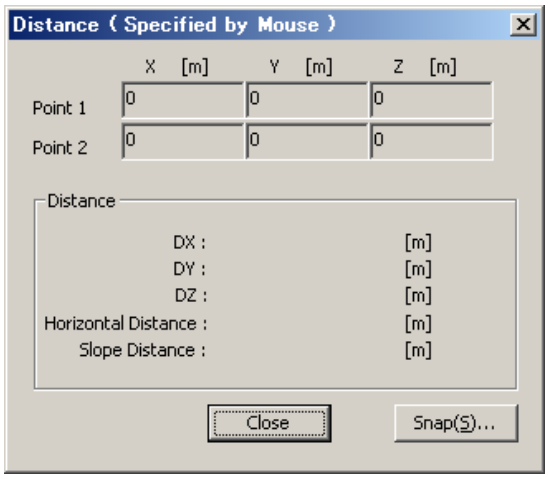
The horizontal distance of the line segment projected on the screen is displayed.

Slope Distance

The slope distance of two points is displayed.

"Distance (Specified by Mouse)"

Display the distance of the two points specified on the screen by mouse.



DX, DY, DZ

Distance components of each axial direction are displayed.

Horizontal Distance

The horizontal distance of the line segment projected on the screen is displayed.

Slope Distance

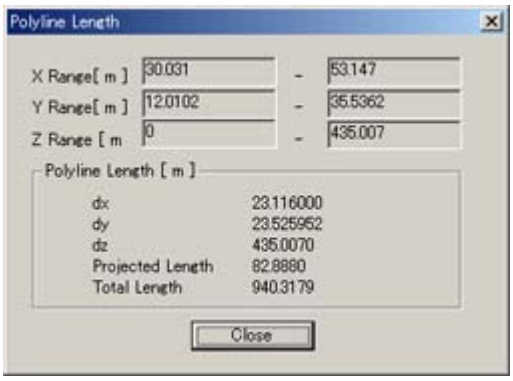
The slope distance of two points is displayed.

[Snap] button

Clicking this button displays the "Snap Setting" Dialog Box, where the snap settings can be changed.

"Polyline Length"

Display the total length of the specified polyline.



X/Y/Z Range

Coordinates ranges of specified polyline in each axial direction are displayed.

dx, dy, dz

The width in each axial direction is displayed.

Projected Length

The total length (total plane distance) of the polyline projected on the screen is displayed. When the ground plan (omega=0,phi=0,kappa=0) is displayed, it is equal to the total horizontal distance.

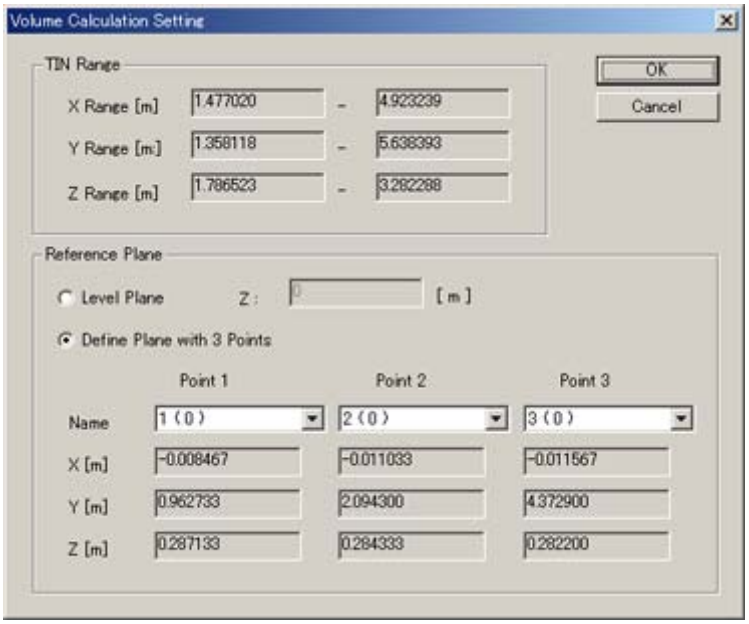
Total Length

The total length of the polyline (total slope distance) is displayed.

"Volume Calculation Setting"

This dialog box is for set up the reference plane for volume calculation.

A level plane or an arbitrary plane defined by three points can be set.



TIN Range

The range of specified TIN is displayed.

Level Plane

A level plane is used as the reference plane of volume calculation.

Input the elevation (z-coordinate) in the edit box.

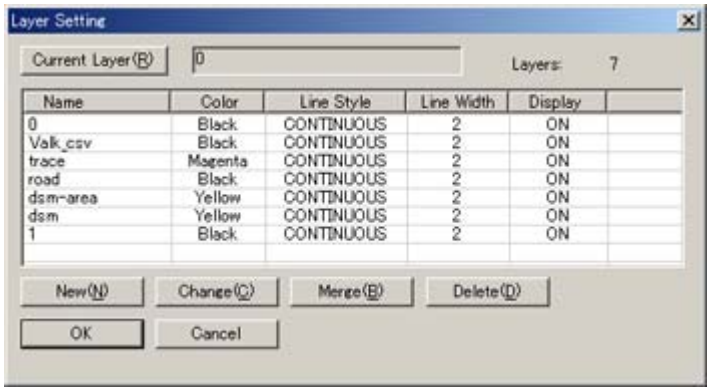
Define Plane with 3 Points

A plane which defined by three points is used as the reference plane of volume calculation.

Select the point names from the list.

"Layer Setting"

Do the setting and editing of layers.



Layer List

Layers registered to the projects are listed at the dialog center. It is possible to select layers on the list. Also, the display can easily be switched ON/OFF by specifying "Display" items.

[Current Layer] button

Sets the selected layer to the current layer.

[New Layer] button

Adds a new layer. When clicked, the "Layer Information" Dialog Box is displayed. Set the layer and click the [OK] button.

[Change] button

Change the content of the selected layer. When clicked, the "Layer Information" Dialog Box is displayed. Set the content and click the [OK] button.

[Merge] button

Merges the selected multiple layers into one.

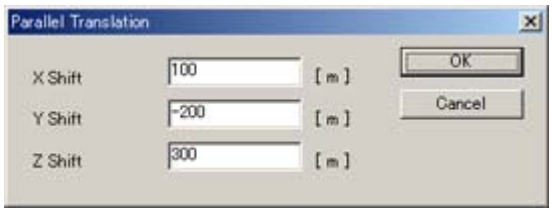
Of the selected layers, information of the layer with the smallest index is set to the layer after merging.

[Delete] button

Deletes the selected multiple layers. When data are stored in the layers selected for deletion, a message asking whether to delete the data is displayed.

"Parallel Translation"

Set the amount of movement in each axial direction.

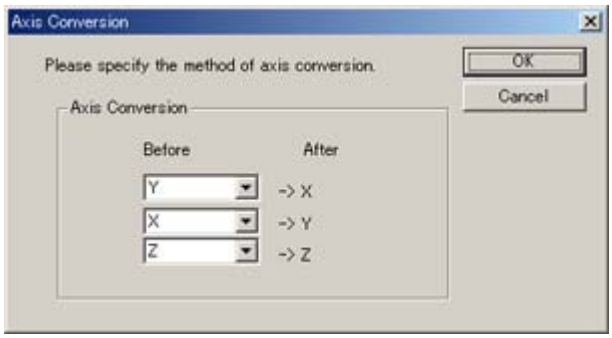


X/Y/Z Shift

Enter the amount of movement in each axial direction.

"Axis Conversion"

Set the method for converting coordinate axes.



Before

Assign the current coordinate axes to converted axes.

After

Converted coordinate axes are displayed.

"Scale Transformation"

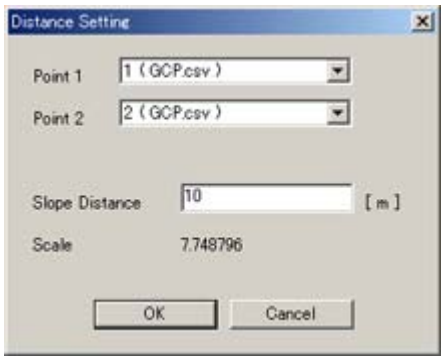
Enter the magnification for scale transformation.

Scale

Enter the magnification value.

"Distance Setting"

Set the distance of the two points specified by name.



Point 1,2

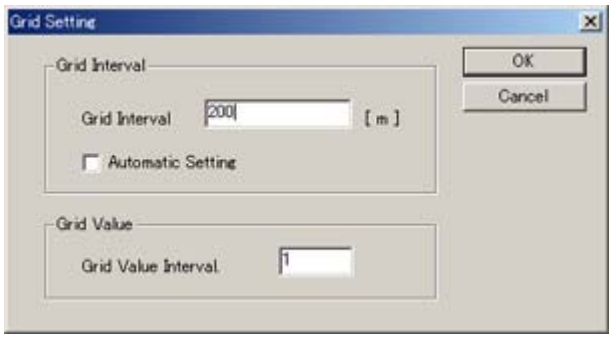
Select the point name of the 1st and 2nd points. The layer name of the point is displayed in the parentheses following the point name.

Slope Distance

Enter the distance of the specified two points.

"Grid Setting"

Do the grid setting.



Automatic Setting

Set the grid interval automatically according to the data range.

Grid Interval

When "Automatic Setting" is unchecked, it is possible to manually enter the grid interval here.

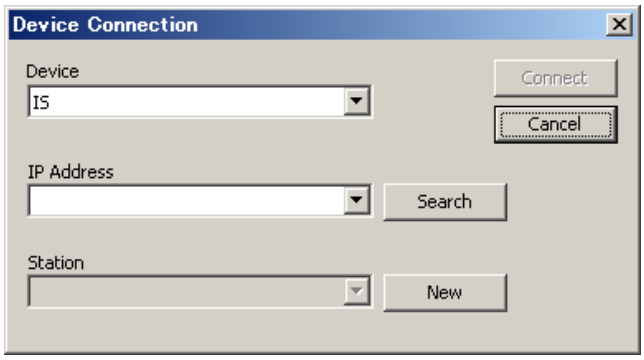
Grid Value Interval

Set the interval for displaying grid values.

"Device Connection"

In this dialog, the device, Internet Protocol address, and the station

are set. After these are set, it connects with IS.



Device

This setting is fixed as "IS" (TOPCON Image Station) and cannot be changed.

IP Address

Enter the IP address assigned to the IS unit being used.

[Search] Button

Click this button to search for an address automatically. Normally you should use the [Search] button to set the IP address.

Station

Shows the name of the station starting the job.

[New] Button (Station)

Creates a new station. Clicking this button displays the New Station dialog box.

See step 2-A for information about configuring the settings in the dialog box.

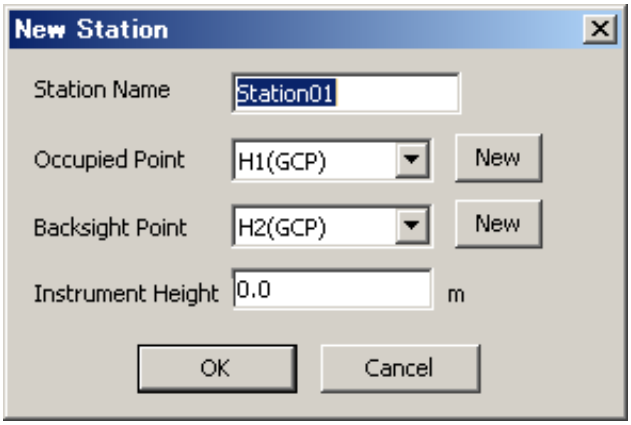
[Connect] Button

Clicking this button establishes communication with the IS unit in accordance with the settings.

* Please set "Station". If the station is not set, it is not possible to connect with IS.

"New Station"

In this dialog, a new station is set.



Station Name

Enter the name of the station you are creating.

Occupied Point

Click the down arrow button and select an occupied point name from the list that appears.

[New] Button (Occupied Point)

Adds new coordinate data and assigns it to the occupied point.

Clicking this button displays an Input Coordinates dialog box for entering the point name, and X, Y, and Z coordinates.

Backsight Point:

Click the down arrow button and select a backsight point name from the list that appears.

*The occupied point and backsight point cannot set the same coordinates value.

[New] Button (Backsight Point):

Adds new coordinate data and assigns it to the backsight point.

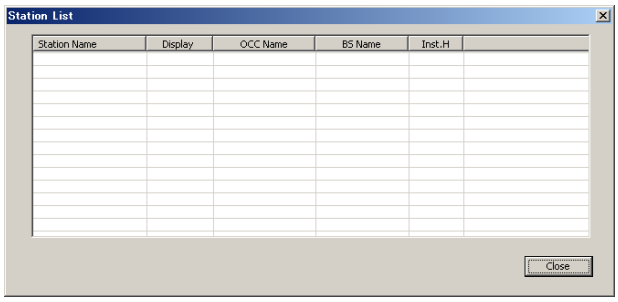
Clicking this button displays an Input Coordinates dialog box for entering the point name, and X, Y, and Z coordinates.

Instrument Height

Enter the instrument height of the IS installation.

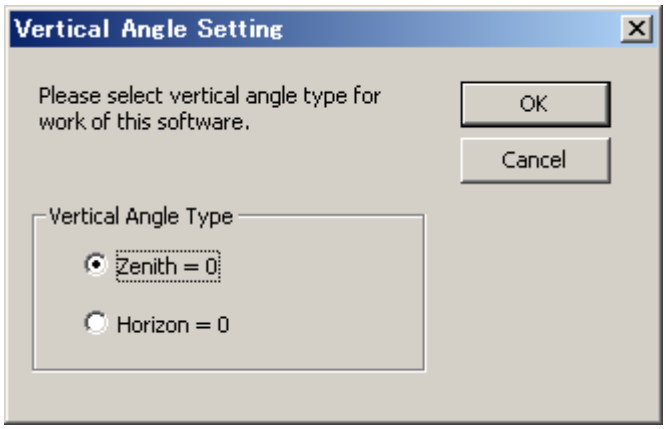
"Station List"

A list of station information is displayed.



"Vertical Angle Setting"

Set the vertical angle type (Zenith =0 or Horizon=0) of the IS data used for work on this software:



Vertical Angle Type

In this dialog, Zenith=0 or Horizon=0 is selected as an angle setting of Vertical, and the "OK" button is clicked.

"IS Control"

In this dialog, there are the following three pages.

"OCC/BS" Page

"Measurement" Page

"Grid scan" Page

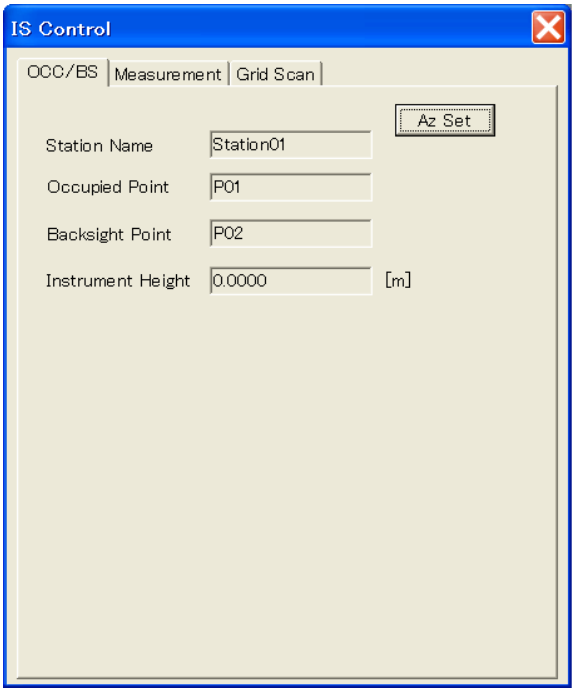
Moreover, it controls remotely by using a remote screen in the IS control.

(Refer to a remote screen.)

"IS Control" - OCC/BS

[OCC/BS] Page

In this page, backsight point is sighted in the IS observation window, and make Horizontal Angle 0 setting.



Station Name

The station being set now is displayed.

Occupied Point

The occupied point name is displayed.

Backsight Point

The backsight point name is displayed.

Instrument Height

The instrument height is displayed.

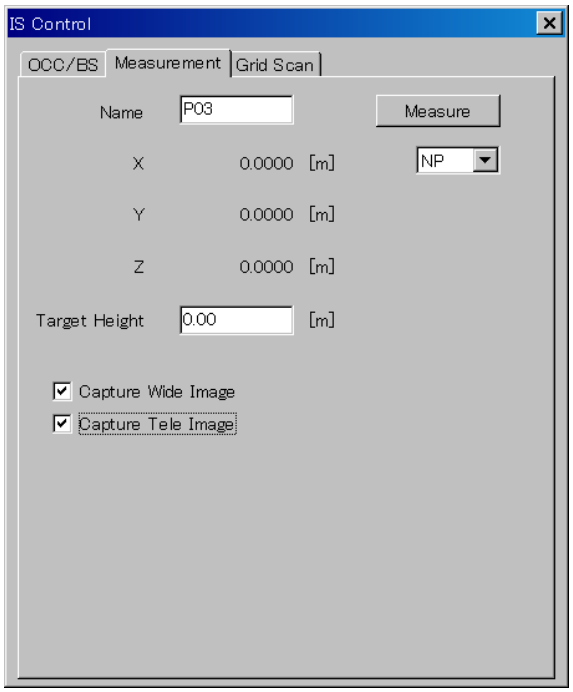
[Az Set] button

Please click [Az Set] button after observing backsight point.

"IS Control" - Measurement

[Measurement] Page

This page executes point measurement by using IS.



Name

Enter the point name.

XYZ coordinates

Measured coordinates are displayed.

When coordinates cannot be measured, it is not displayed.

Target Height

Enter the height of the prism.

Capture Wide Image

Check it when taking a picture of a wide angle image.

Capture Tele Image

Check it when taking a picture of a telescopic image.

EDM mode combo box.

Set the NP mode.

[Measure] button

Execute point measurement by using IS.

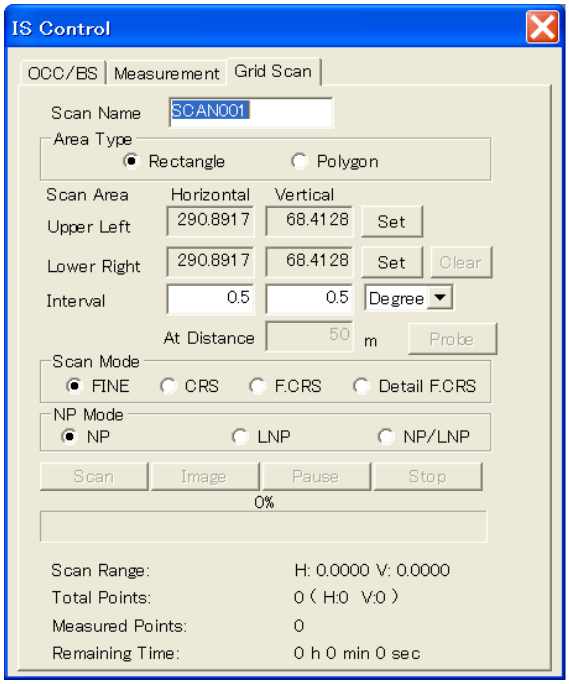
"IS Control" – Grid Scan

[Grid Scan] Page

This page sets the grid scanning.

In the method of specifying the area, there are **"Rectangle scanning"** and **"Polygon scanning"**.

1. Rectangle scanning



Scan Name

Enter the scan(point cloud data) name.

Area Type

Select the **"Rectangle".**

Scan Area - Upper Left - Lower Right - [Set] button

The range of the scanning observes on the "Upper Left" and " Lower Right ".

After the range of the scanning is set, and then click the "Set" button.

[Clear] button

Clear the currently specified scan area.

Interval

Enter the scan interval.

The scanning interval can be set by the angle, the distance, and the number of

points.

Probe

"Probe" is used to set the scanning interval by the distance.

The distance to the object is measured when " Probe" button is clicked, and the scanning interval is calculated.

Scan Mode

Select the scan mode. The scan mode has the following stop modes and the non-stop modes.

・Stop mode: FINE,CRS

・Non-stop mode: F.CRS, Detail F.CRS

*As for F.CRS, the scanning of 20Hz or less is possible. However, because the scanning speed is fast, data might not be able to be acquired.

Detail F.CRS changes the scanning speed based on the reflectivity of the object, and acquires data as much as possible.

NP Mode

Select the NP mode.(NP,LNP,NP/LNP)

The non-stop mode can select only NP.

When the measurement failure is done with NP, NP/LNP is measured with

LNP again.

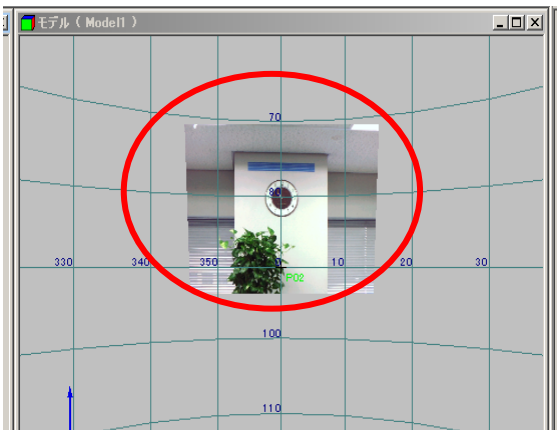
	NP	LNP	NP/LNP
Fine	Yes	Yes	Yes
CRS	Yes	Yes	Yes
F.CRS	Yes	No	No
Detail F.CRS	Yes	No	No

[Scan] button

Execute scanning by using IS.

[Image] button

It takes a picture of the set range and the panorama image is made.



*The panorama image and the scanning data shift a little.

Please use the display of the panorama image as a standard.

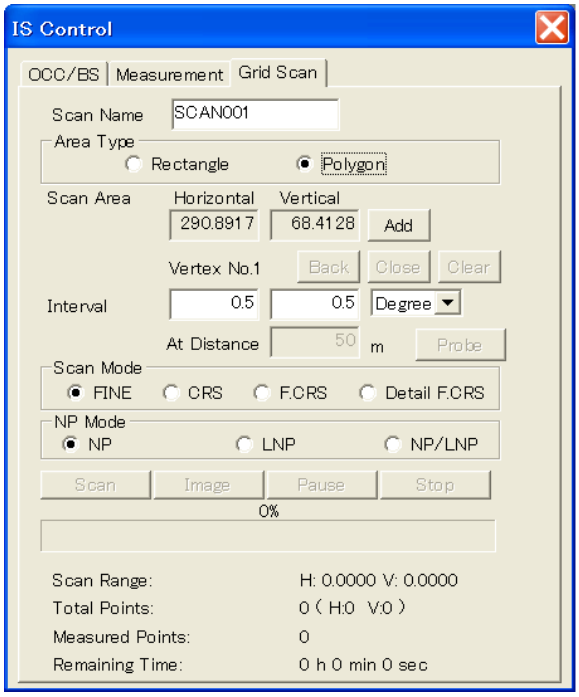
[Pause] button

It stops temporarily. It is possible to restart.

[Cancel] button

Cancel the scanning.

2. Polygon scanning



[Add] button

The vertex of the polygon is added, and the range of the scanning is set.

[Back] button

The last vertex of the polygon is deleted..

[Close] button

The polygon is close, and the scanning setting is completed.

[Clear] button

Clear the specified scan area.

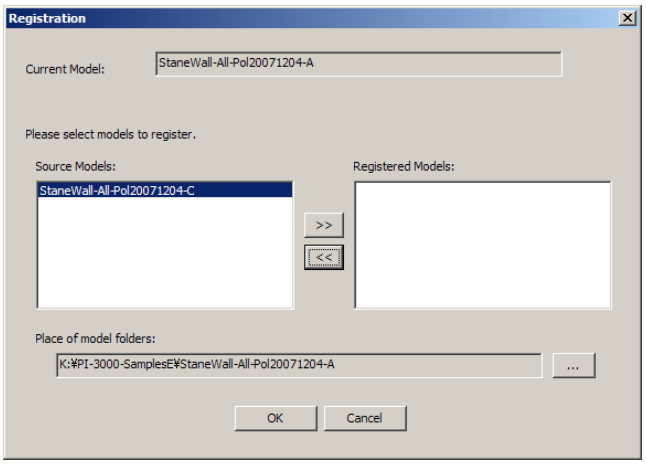
3. Limitation value

・Scanning interval: 0.01 degree or more ten degrees or less

・Range of scanning: Within the horizontal 360 degrees

"Registration"

In this dialog, the model of registration is selected.



Current Model

It is set to this "Current Model" that the model displayed on the model screen is selected .

The model selected here is registered in a "Current Model".

Source Models

The models and stations registered to the project are listed in the Source Model list on the left of the dialog box.

Registered Models

The models and stations selected to do registration are listed in the Registered Model list on the right of the dialog box. If models are already registered, they are listed.

Place of model folders

The place of **Source Model** folder is specified.

Please specify the place where the model folder exists clicking the [...] button.

[>>] button

From the **Source Model** list, select a model you want to register and then click the [>>] button to move it into the **Registered Model** list on the right.

The selection of the list selects the model or the station name with the mouse. It selects it while pushing the Ctrl key when two or more lists are selected at a time.

[<<] button

From the **Registered Model** list, select a model you want to return and then click the [<<] button to move it into the **Source Model** list on the left.

[OK] button

Click the [OK] button to start registration.

"OCC/BS Settings"

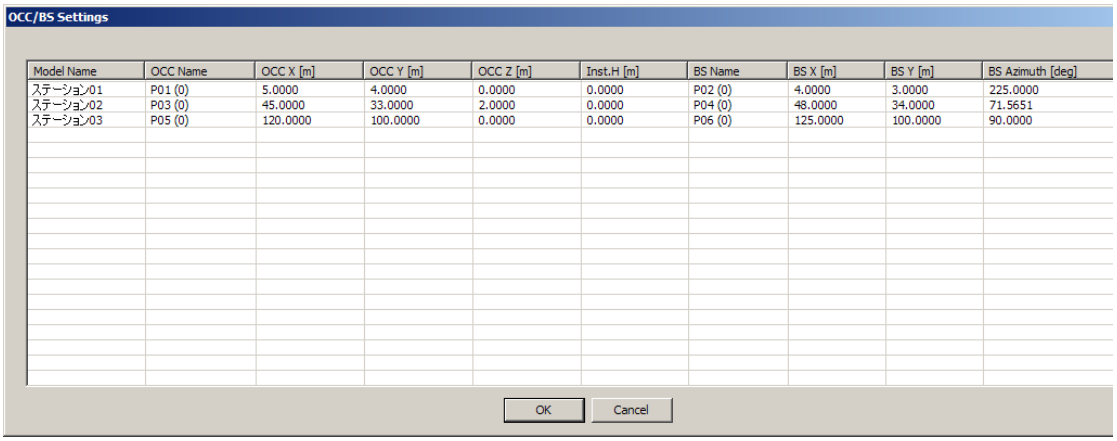
The dialog box includes a list that shows the selected model name, occupied point , backsight point , and instrument height.

You can change the occupied point name and backlight point name by clicking the down arrow button and selecting a name from the list that appears.

Additionally, the occupied point coordinates, the backlight point coordinates, and

backlight angle can be input directly.

Check the contents of the list. If there is no problem, click the [OK] button.



*OCC and BS cannot select the same point. Error is displayed in BS Azimuth.

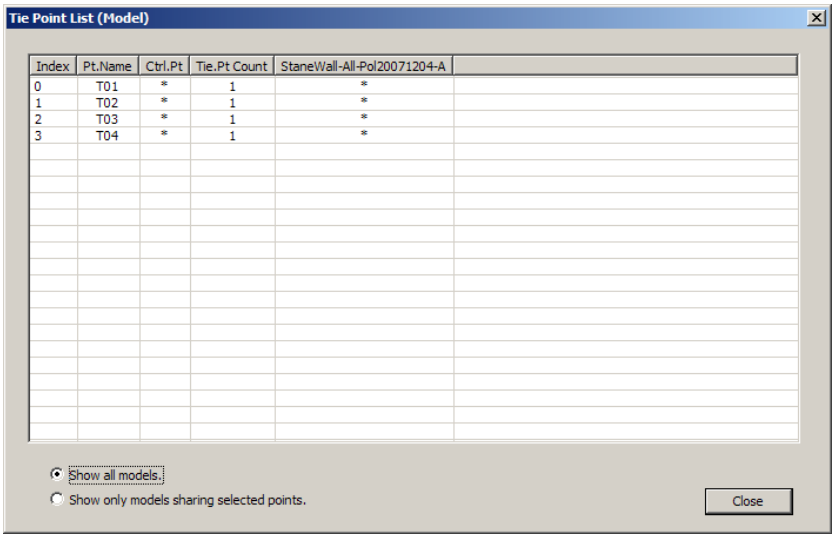
"Tie Point List(Model)"

This dialog box displays the Tie Point List.

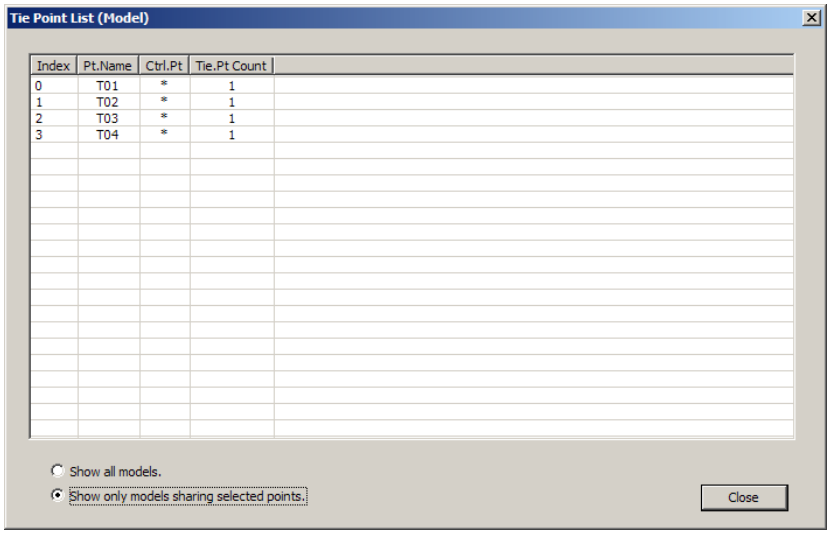
Reference points and tie points related to the selected model are shown in the list.

Points required for calculation: Check to makes sure that there are at least three points, and then click the [Close] button.

Show all models



Show only models sharing selected points



"Registration Result"

The Registration Result dialog box consists of a "Transformation Parameter" page and a "Tie Point" page.

"Transformation Parameter" Page

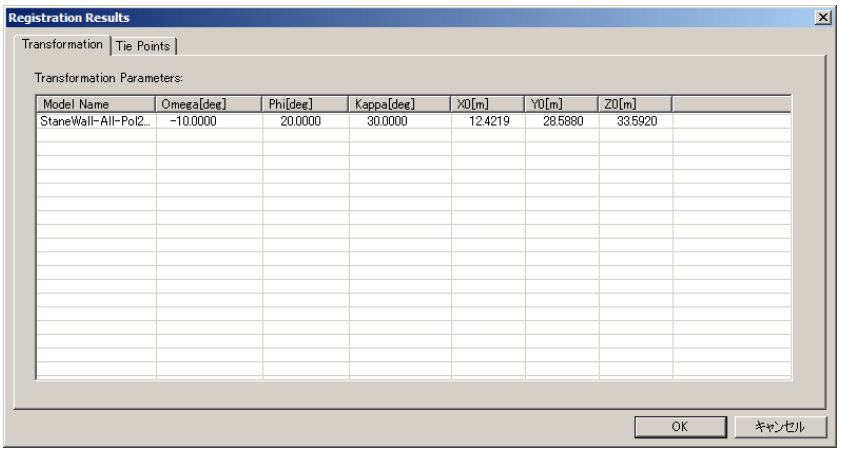
"Tie Points" Page

"Registration Result " – Transformation Parameter

[Transformation Parameter] Page

Transformation parameters (ω, φ, κ, x , y , z) are displayed as transformation calculation results.

If there is no problem, click the [OK] button.

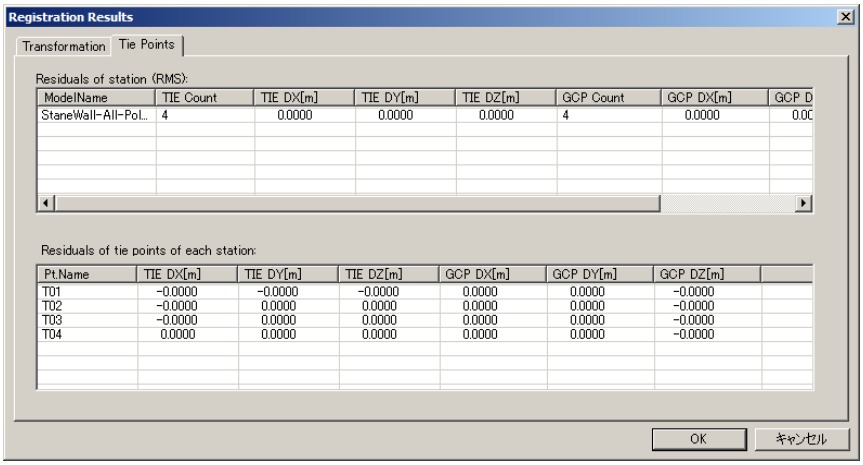


"Registration Result " – Tie Points

[Tie Points] Page

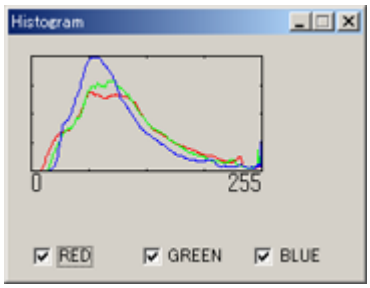
Tie point variations are displayed as transformation calculation results.

If there is no problem, click the [OK] button.



"Histogram"

The histogram of concentration distribution of the image is displayed.



RED

When checked, displays the histogram of red component.

GREEN

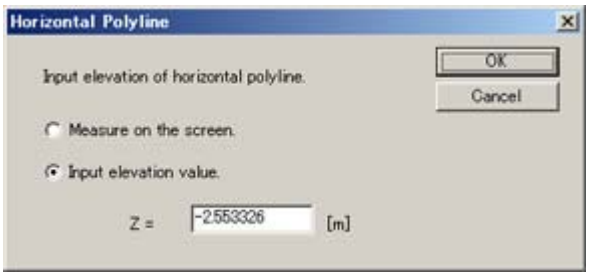
When checked, displays the histogram of green component.

BLUE

When checked, displays the histogram of blue component.

"Horizontal Polyline"

This dialog box is for entering the elevation of horizontal polyline to be drawn.



Measure on the screen

Plot the first vertex on the stereo screen with adjusting the elevation with left and right cursors.

Input elevation value

Input the elevation value for horizontal polyline to be drawn.

"Image Registration"

Select the image file and camera to be registered to the project.

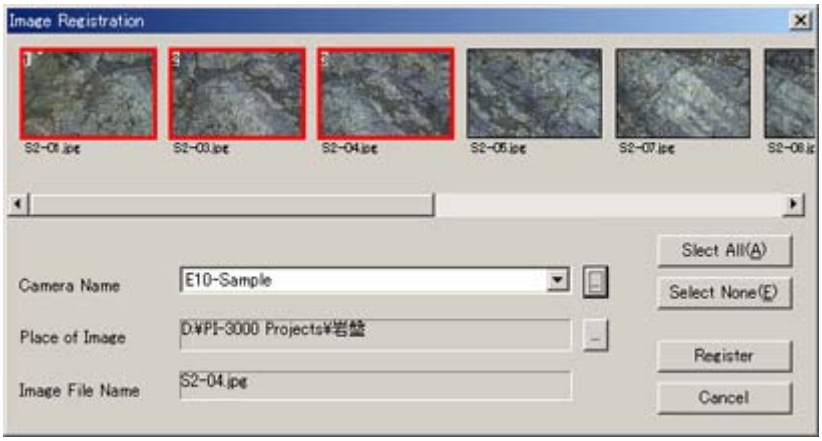


Image List

The image list is displayed at the top of the dialog screen.

Specify images and select selection/non-selection on the list.

Camera Name

Select the camera that took the images to be registered from the list.

Press the button located on the right of this item and display the [Place Specifying] dialog. On the dialog, specify the place of the camera data file.

Place of Image

The place of the listed image files is displayed.

Press the button located on the right of this item and display the [Place Specifying] dialog. On the dialog, change the place of image files.

[Select All] button

Selects all images.

[Select None] button.

Cancels the selection of images.

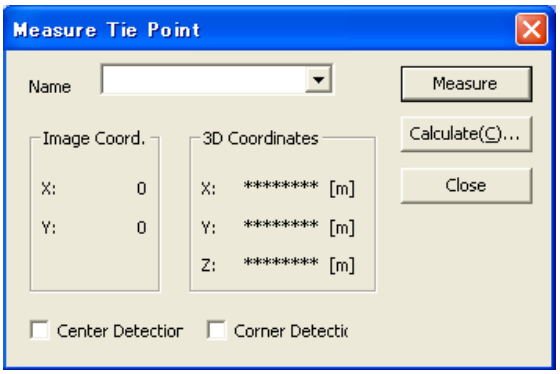
[Register] button

Registers the selected images file and camera data, in connection with each other, to the project.

"Measure Tie Point"

This dialog box is displayed at the time of image coordinates measurement of tie point.

It is for naming and measuring the image coordinates of control point. It can also be used for calculating the orientation and displaying the results.



Name

Enter the name of the control point to be measured. You can also choose a name from the list.

Image coord.

The image coordinates of the location to be measured will be displayed.

3D Coordinates

The coordinates of the ground control point for the point name that was entered will be displayed.

For the ground control point, point data in the layer set in **Layer of Control Points** will be used. Regarding the control point settings, please see the explanation in the function [Orientation Setup].

Center Detection

If, when **Center Detection** is check-marked, the interior of a circular target on an enlarged screen is roughly designated, the precise center of that location will automatically be detected. If the circular target has an appropriate area (at least 5 x 5 pixels), and if the brightness inside and outside the circle is clearly different, the location can be detected with sub-pixel accuracy.

When using center detection, it is first necessary to place the circular target on the photographic object and photograph it.

Corner Detection

If, when **Corner Detection** is check-marked, the area near a corner of an enlarged screen is roughly designated, the corner closest to that area will automatically be detected. It is necessary for the two borderlines forming the corner to be perpendicular to each other and for them to be clearly shown.

[Measure] button

This button executes the measurement of the designated location.

[Calculate] button

This button executes the calculation of orientation and displays the results.

"Input Elevation Text"

Enter elevation values.

Elevation

Elevation value (Z coordinate) of the position specified on the screen is displayed. The method for obtaining elevation value differ by snap setting. It is also possible to manually enter elevation value to this item.

[Snap] button

Display the "Snap Setting" Dialog Box and changes snap settings.

"Orientation Results"

When bundle adjustment is taken as the method of orientation computation, the result of orientation computation is displayed.

For details about the "Orientation Results" dialog box, see the following:

"Result List" Page

"Fiducial Mark" Page (Displayed only for film camera)

"Y-Parallax" Page

"Image Coordinates" Page

"Calculated Coordinates" Page

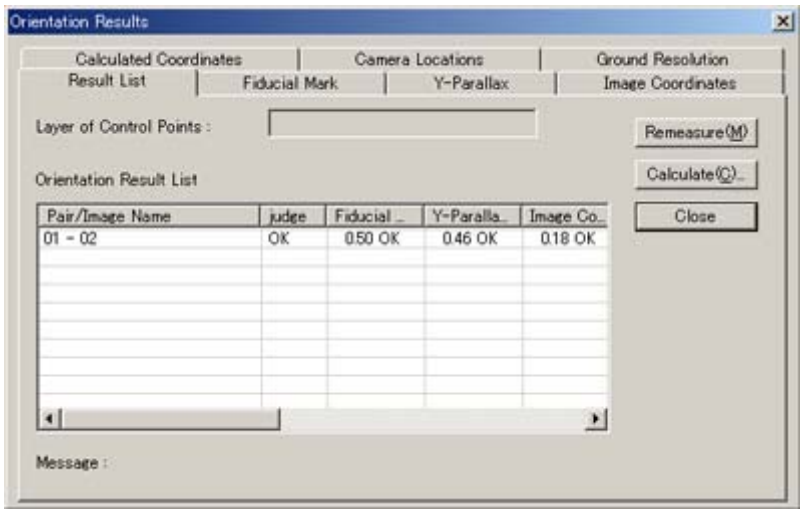
"Distance" Page

"Camera Locations" Page

"Ground Resolution" Page

"Orientation Results" - Result List

[Result List] Page



Results of orientation are listed on this page.

When orientation is under way, results are displayed mainly on this page. If the stereo pair/image being worked is not given [OK], display relevant pages and confirm details.

Layer of Control Points

The layer name of control point coordinates is displayed. For the setting of the control point layer, see the description of [Orientation Setup].

Pair / Image Name

Stereo pair names or image names are displayed.

Judge

About stereo pairs or images, display a general judgment whether the result of orientation is sufficient or not.

The judgment conditions are shown below:

[OK]	The accuracy of orientation is sufficient (within 1 pixel).
[ ](blank)	The accuracy of orientation is insufficient (1 pixel and larger).
[NG]	Orientation computation was not done correctly.

The condition for the "OK" judgment is that all the items "Fiducial Mark (film camera)", "Y-Parallax" and "Image Coord." are OK'd. If "OK" is not given, solve the problem in the sequence of "Fiducial Mark (film camera)" -> "Y-Parallax" -> "Image Coord.".

Fiducial Mark (Displayed only for film camera)

Residual errors of fiducial marks and the judgment result are displayed for each stereo pair or image. If "OK" is not given to this item, display the "Fiducial Mark" page and specify poor-accuracy points. Start the orientation screen and do the re-measurement, as necessary.

Y-Parallax

Residual vertical parallax (y-parallax) errors and the judgment result are displayed for each stereo pair. For the images not registered as stereo pairs, this item is left blank (irrelevance).

If "OK" is not given to this item, display the "Y-Parallax" page and specify poor-accuracy points. Start the orientation screen and do the re-measurement, as necessary.

When the item is OK'd, it means that the positional relationship of the right and left images is determined exactly. If not OK'd, the created stereo image is distorted and the 3D measurement cannot be done correctly.

Image Coord.

Residual errors and the judgment result are displayed for each stereo pair or image. If "OK" is not given to this item, display the "Image Coordinates" page and specify poor-accuracy points. Start the orientation screen and do the re-measurement, as necessary.

When the item is OK'd, it means that the positional relationship of all images is determined exactly. If not OK'd, deviations occur when composing the 3D data measured using multiple stereo images. This will also result in distortion in the created ortho-image or positional deviation.

Message

When orientation computation is not done correctly, a brief message for solving the problem is displayed.

[Remeasure] button

Displays the orientation screen about the stereo pair or image selected from the list.

On the orientation screen, the positions of control points can be confirmed and re-measurement can be done.

[Calculate] button

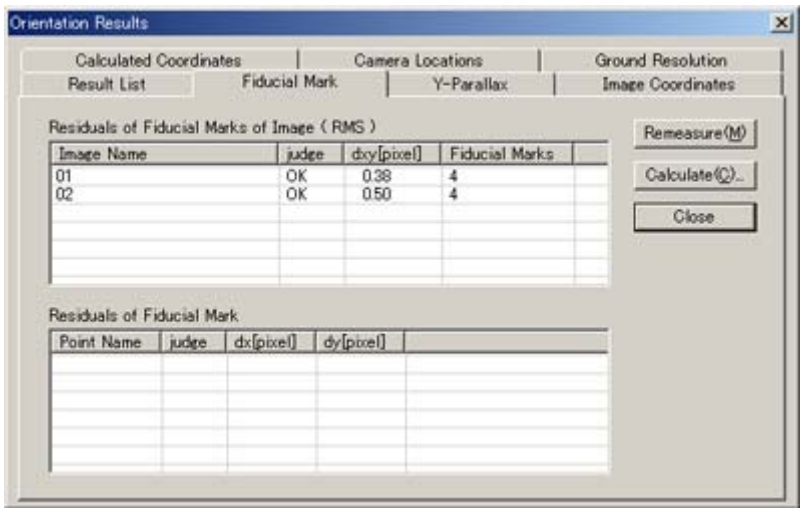
Performs orientation computation and updates the displayed result.

[Close] button

Closes the dialog.

"Orientation Results" - Fiducial Mark

[Fiducial Mark] Page (Displayed only for film camera)



Residual errors of all fiducial marks can be checked here.

This page is used when specifying fiducial marks of poor accuracies.

[Residuals of Fiducial Marks of Image (RMS)] list

The standard deviation of residual errors of fiducial marks of each image and the result of judgment are listed.

Items of the list are described below:

Image Name

Registered image names are displayed.

Judge

For each image, whether the residual of fiducial marks is small enough is displayed.

Judgment conditions are shown below:

[OK]	The accuracy of orientation is sufficient (within 1 pixel).
[ ](blank)	The accuracy of orientation is insufficient (1 pixel and larger).
[NG]	Orientation computation was not done correctly.

dxy

The standard deviation of fiducial mark residuals is displayed in [pixel] units.

Fiducial Marks

The number of measured fiducial marks is displayed.

[Residuals of Fiducial Mark] list

The residual of fiducial mark of the image selected from the "Residuals of Fiducial Marks of Image (RMS)" list are displayed in the list form.

Items of the list are described below:

Point Name

Point names of the fiducial marks are displayed.

Judge

For each fiducial mark, whether the residual error is small enough is displayed. Judgment conditions are the same as the judgment conditions of images described above.

dx, dy

Values of residual error of each fiducial mark are displayed in [pixel] units.

[Remeasure] button

When pressed by selecting an image and fiducial mark on the list, the orientation screen is displayed and the periphery of the specified fiducial mark is displayed in enlargement.

On the orientation screen, measurement positions can be confirmed and re-measurement can be done.

[Calculate] button

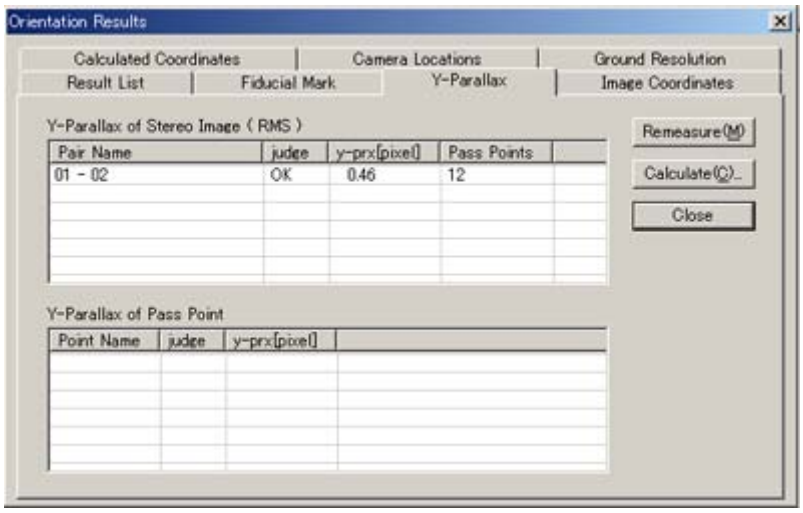
Performs orientation computation and updates the displayed result.

[Close] button

Closes the dialog.

"Orientation Results" - Y-Parallax

[Y-Parallax] Page



The vertical parallax (y-parallax) of all pass points can be checked here. This page is used when specifying fiducial marks of poor accuracies.

[Y-Parallax of Stereo Image (RMS)] list

The standard deviation of y-parallax of each stereo pair and the result of judgment are listed.

Items of the list are described below:

Pair Name

Registered pair names are displayed.

Judge

For each stereo pair, whether the vertical parallax errors of pass points are small enough is displayed.

Judgment conditions are shown below:

[OK]	y-parallax of pass points are sufficient (within 1 pixel).
[ ](blank)	y-parallax of pass points are insufficient (1 pixel and larger).
[NG]	Computation was not done correctly.

y-prx

The standard deviation of vertical parallax errors is displayed in [pixel] units.

Pass Points

The number of pass points measured in the stereo pair is displayed.

[Y-Parallax of Pass Point] list

Vertical parallax errors of pass points of the stereo pairs selected from the "Y-Parallax of Stereo Image (RMS)" list are listed.

Items of the list are described below:

Point Name

Pass point names are displayed.

Judge

For each pass point, the judgment whether the vertical parallax error is small enough is displayed.

Judgment conditions are the same as judgment conditions of the stereo pair described above.

y-prx

The vertical parallax error of each pass point is displayed.

[Remeasure] button

When pressed by selecting stereo pairs and pass points on the list, the orientation screen is displayed and the periphery of the specified pass points is displayed in enlargement. On the orientation screen, measurement positions can be confirmed and re-measurement can be done.

[Calculate] button

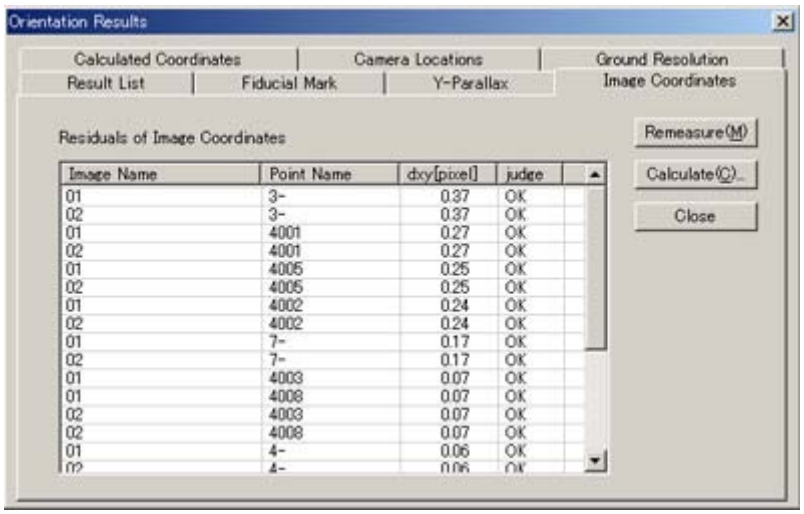
Performs orientation computation and updates the displayed result.

[Close] button

Closes the dialog.

"Orientation Results" - Image Coordinates

[Image Coordinates] Page



Residual errors of all image coordinates can be checked here. This page is used when specifying image coordinates of poor accuracies.

Image Name

The image names of which points are measured are displayed. By clicking this item, image names are sorted and listed. This is convenient when confirming residuals for each image.

Point Name

Point names are displayed. By clicking this item, point names are sorted and listed. This is convenient when confirming residuals for each point name.

dxy

Residual errors of points on the images are displayed in pixel units. By clicking this item, residual values are sorted and listed. It is possible to immediately find a point with the maximum residual error (Normally this condition is displayed.)

Judge

Whether the residual errors of image coordinates are small enough is displayed.

Judgment conditions are shown below:

[OK]	Residual errors of points are sufficient (within 1 pixel).
[ ](blank)	Residual errors of points are insufficient (1 pixel and larger).
[NG]	Computation was not done correctly.

[Remeasure] button

When pressed by selecting a point on the list, the orientation screen is displayed and the periphery of the specified point is displayed in enlargement. On the orientation screen, measurement positions can be confirmed and re-measurement can be done.

[Calculate] button

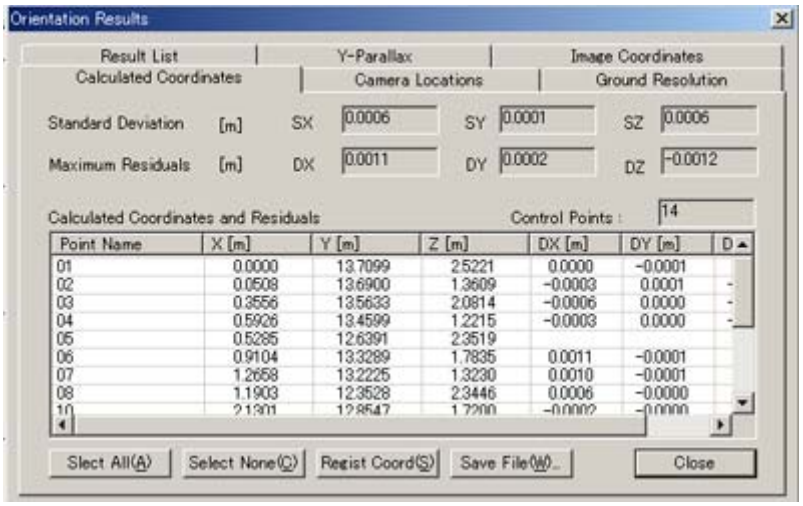
Performs orientation computation and updates the displayed result.

[Close] button

Closes the dialog.

"Orientation Results" - Calculated Coordinates

[Calculated Coordinates] Page



Here the camera coordinates and 3D coordinates of control points worked out by orientation computation (bundle adjustment) are displayed on a list. Residual errors of the computed coordinates of control points can be checked.

Values of the residual errors of this page show a comparison of the coordinates computed by bundle adjustment and control points. Substantial accuracy of stereo image measurement is not improved more than the ground resolution no matter how the values of residual errors are deduced. For the ground resolution, see also "Camera Locations" Page and "Ground Resolution" Page

Standard Deviation

The standard deviation of residual errors of the computed coordinates of control points is displayed.

Maximum Residuals

The maximum residual errors of the computed coordinates of control points are displayed.

Control Points

The number of ground control points used for orientation computation is displayed.

[Calculated Coordinates and Residuals] list

Computed 3D coordinates and residual errors of control points are listed.

[Select All] button

Selects all the computed coordinates.

[Select None] button.

Cancels the selection of computed coordinates.

[Regist Coord] button

Registers the selected computed coordinates to the project. The layer name of the registered coordinates is automatically set to "CalculatedCoordinates" and "CameraPosition". If there are computed coordinates registered in the past, a message asking whether to update or not is displayed. When additionally registering the new computed coordinates while leaving the existing computed coordinates, change the layer name of the existing computed coordinates.

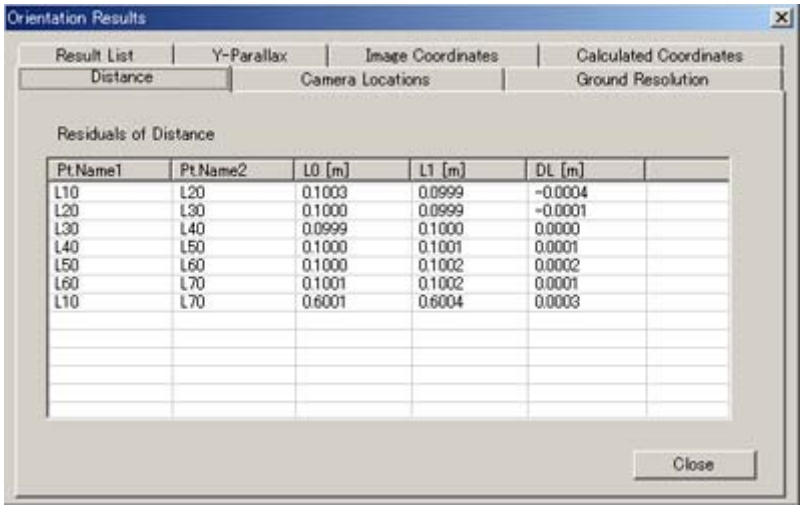
[Save File] button

Saves computed coordinates to the specified coordinates file (CSV, APA, SIMA).

1. When clicked, the "Save As" dialog box is displayed. Specify the file name and file style, and click the [Save] button.
2. As the "Coordinate File" dialog box is displayed, do the necessary setting and click the [Save] button.

"Orientation Results" - Distance

[Distance] Page



Residual of distance adjusted by Orientation calculation compared to the entered distance can be shown.

This page can be shown only in case distance data is registered at menus,

[Orientation]- [Orientation Setup]

Pt.Name1

Registered Name of the 1st end point of the entered distance.

Pt.Name2

Registered Name of the 2nd end point of the entered distance.

L0

Distance those 2 points entered and registered at menus, **[Orientation] – [Orientation Setup]**

L1

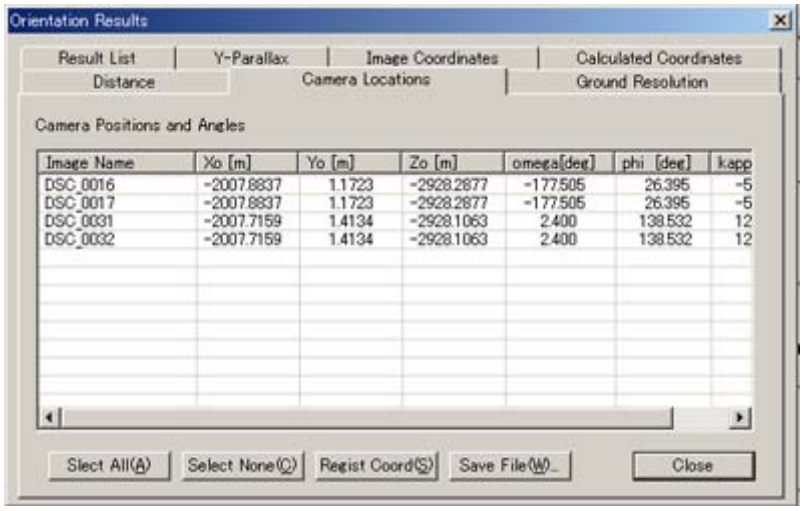
Distance between those 2 points calculated and adjusted by Orientation calculation.

DL

Residual between Entered distance and Adjusted distance (L1-L0).

"Orientation Results" - Camera Locations

[Camera Locations] Page



On this page, the Camera position and aiming angle for each image, calculated by Orientation calculation for image are listed.

Image Name

Name of Image

Xo, Yo, Zo

Mathematical Coordinates of camera position when image is taken.

omega, phi, kappa

Inclination(Aiming angles) of camera when image is taken.

Each factors are, rotation angles from X-axis, Y-axis and Z-axis in mathematical coordinates system.

[Select All] button

All camera position coordinates are listed.

[Select None] button

Clear selection.

[Regist Coord.] button

Camera position coordinates selected on the list will be registered as a point in the project.

[Save File] button

The calculated coordinates can be stored in coordinates files (CSV, APA, SIMA)

1.When the **[Save File]** button is clicked, **"Save As "** Dialog Box will appear.

Enter file name and file type then click **[Save]** button.

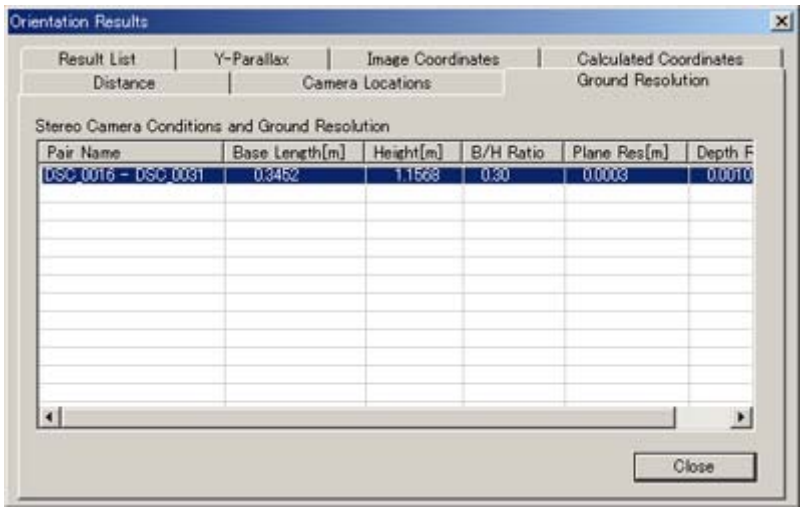
2. When saved, **"Coordinate File "** Dialog Box will appear.

Specify necessary settings and click **[Save]** button.

The camera point coordinates will be saved.

"Orientation Results" - Ground Resolution

[Ground Resolution] Page



On this page, factors when Images are captured and Resolution on Plane and Depth

are indicated for each stereo pair.

Especially those Resolutions on Plane and Depth are indicating optimal measuring accuracy of 3D measurement achievable on the stereo paired images, please check these values at the end of Orientation calculation.

* Even the Standard Deviation values, which is shown at [Calculated Coordinates] Page, are smaller than these Resolution values, achievable 3D measuring accuracy on the stereo image can not be better than the Resolution values. If the standard deviation values are bigger than the resolution values, then the Achievable accuracy of 3D measurements are practically at the level of the Standard Deviation.

Pair Name

Name of Stereo Paired Images.

Base Length

Distance between Left and Right side camera positions.

Height

Averaged distance between Left side camera position to the Object surface.

B/H Ratio

Ratio between Base Length / Height (Averaged distance from left side camera position to the object surface)

If this factor is too small (less than 0.1), 3D measurement on the stereo images may not be able to give the calculation result.

Plane Res

Resolution in two dimensions on the ground coordinates scale.

This will be optimal accuracy in 2 dimensions when 3D measurement is performed on this Stereo Paired images.

However, in case Orientation Accuracy is more than 1 pixel, accuracy of the 3D measurement (in 2 dimensions) will be worth than this Resolution value.

Depth Res

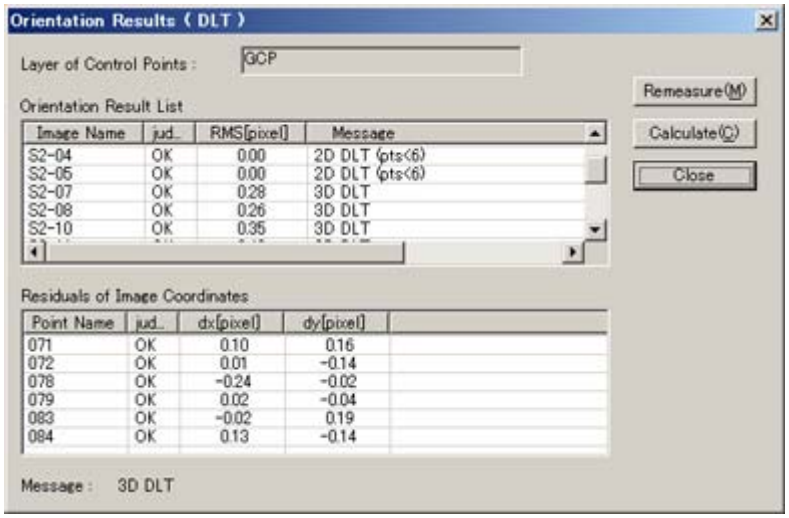
Resolution in depth direction on the ground coordinate scale.

This will be optimal accuracy in depth when 3D measurement is performed on this Stereo Paired images.

However, in case the Orientation Accuracy is more than 1 pixel, accuracy of the 3D measurement (in depth) will be worth than this resolution value.

"Orientation Results (DLT)"

When the DLT method is taken as the method of orientation computation, the result of orientation computation is displayed.



Layer of Control Points

The layer name of control point coordinates is displayed. For the setting of the control point layer, see the description of [Orientation Setup].

[Orientation Result] list

The standard deviation of residual errors of control points of each image and the result of judgment are listed.

Items of the list are described below:

Image Name

Registered image names are displayed.

Judge

For each image, whether the residual of control points is small enough is displayed.

Judgment conditions are shown below:

[OK]	The accuracy of orientation is sufficient (within 1 pixel).
[ ](blank)	The accuracy of orientation is insufficient (1 pixel and larger).
[NG]	Orientation computation was not done correctly.

RMS

The standard deviation of residuals of control point is displayed in [pixel] units.

Message

When orientation computation is not done correctly, a brief message for solving the problem is displayed.

[Residuals of Image Coordinates] list

The residuals of control point of the image selected from the "Orientation Result" list are displayed in the list form.

Items of the list are described below:

Point Name

Point names of the control points are displayed.

Judge

For each control point, whether the residual error is small enough is displayed. Judgment conditions are the same as the judgment conditions of images described above.

dx, dy

Values of residual error of each control point are displayed in [pixel] units.

[Remeasure] button

When pressed by selecting an image and control point on the list, the orientation screen is displayed and the periphery of the specified point is displayed in enlargement.

On the orientation screen, measurement positions can be confirmed and re-measurement can be done.

[Calculate] button

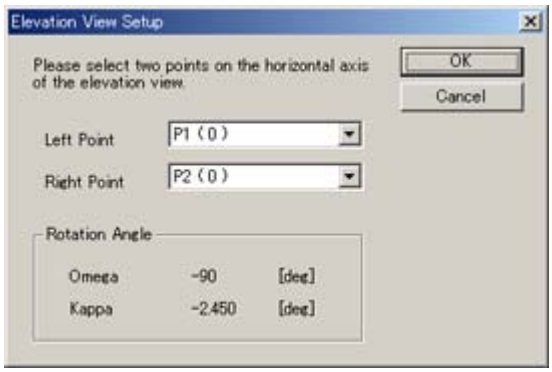
Performs orientation computation and updates the displayed result.

[Close] button

Closes the dialog.

"Elevation View Setup"

This dialog box is for entering the settings of elevation views.



Left Point

Designate the point, on the left side of the elevation view, that will be one of the two points demarcating the horizontal axis.

Right Point

Designate the point, on the right side of the elevation view, that will be one of the two points demarcating the horizontal axis.

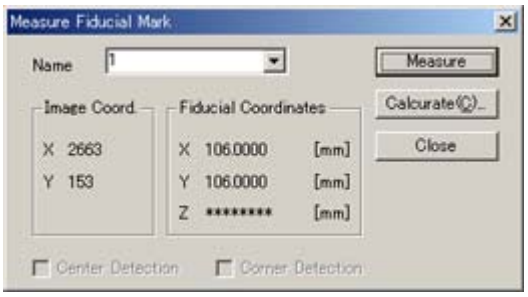
"Image Selection"

Specify the reference Image for color adjustment.

"Measure Fiducial Mark"

Displayed when measuring fiducial marks.

Enter the name of the fiducial mark to be measured and execute measurement. Also, the result can be checked by doing orientation computation.



Name

Enter the name of the fiducial mark to be measured, or select it from the list.

Image Coord.

Display image coordinates of the measurement position.

Fiducial Coordinates

Fiducial mark coordinates of the inputted name are displayed. If no fiducial mark corresponds, "****" is displayed. Data of fiducial mark coordinates are defined in camera calibration data.

[Measure] button

Execute measurement at the specified position.

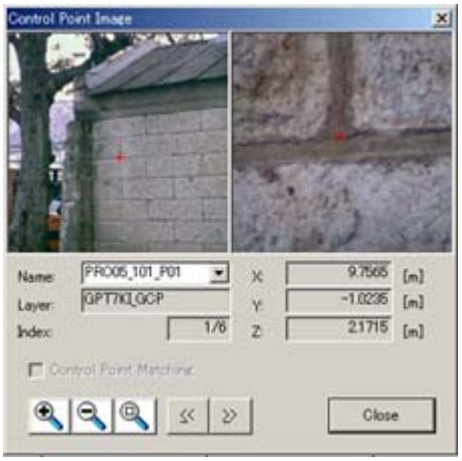
[Calculate] button

Executes orientation computation and display the result.

"Control Point Image"

Display image of Control Point with image.

Wide-view Image on the left side of screen and Telescopic-view image on the right Side on the screen.



[+] button ----Zoom-IN the Wide-view Image.

[-] button ---- Zoom-Out the Wide-view Image

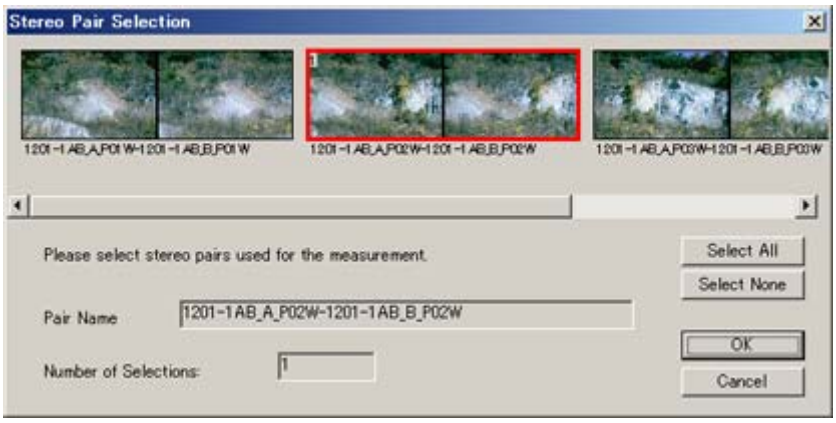
[?] button -- Display whole Wide-view Image

[<<] button ---- Display the image of previous point.

[>>] button ---- Display the image of the next point.

"Stereo Pair Selection"

Select the stereo pair used for the measurement from the image list.



[Select All] button

Selects all stereo pairs.

[Select None] button

Cancels the selection of stereo pairs.

"Camera Setup"

Do the setting about camera data.

For details about "Camera Setting" dialog, see the following:

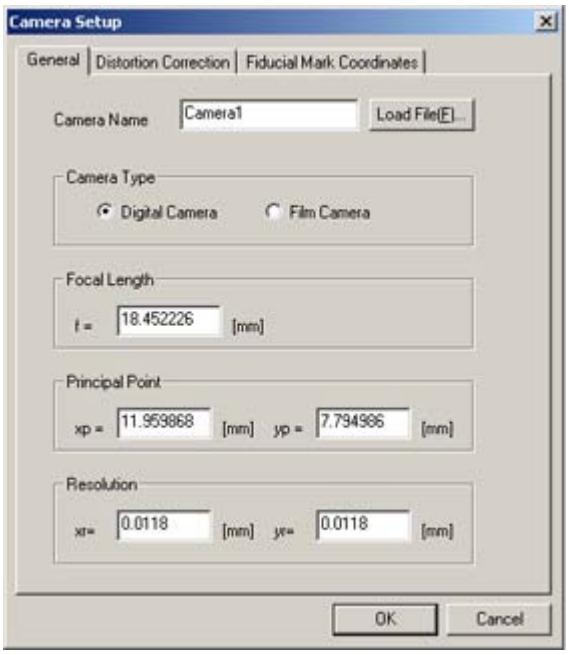
"General" Page

"Distortion Correction" Page

"Fiducial Mark Coordinates" Page

"Camera Setup" - General

[General] page



Here, the basic setting of camera data is done.

Camera Name

Enter the camera name.

[Load File] button

Reads the camera calibration file (*.cmr). When clicked, the "Open" Dialog Box is displayed. Select the file and click the [Open] button.

Camera Type

Select the digital camera or film camera.

Focal Length (f)

Enter the focal distance of the lens.

Principal Point (xp, yp)

Enter the coordinates of principal point position of the lens. Normally it is located in the near center of the image.

The coordinates system is described below:

Digital camera:	Of the image, the left top corner is (0,0), right direction is +x, and downward direction is +y.
Film camera:	Of the fiducial mark coordinates, the origin is (0,0), right direction is +x, and upward direction is +y.

Resolution (xr, yr)

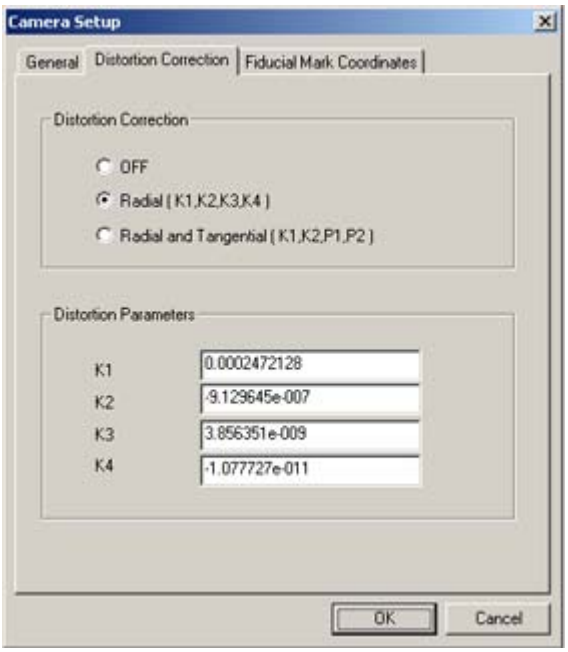
Enter the image resolution.

In the case of the digital camera, the image resolution is the actual size of 1 pixel on CCD. In the case of the film camera, it is calculated from the value of resolution when the image is taken by scanner (unit: dpi).

We recommend to obtain a Camera Calibration File (*.cmr) available (for a fee) from Topcon's Camera Calibration Service or resulted by performing camera calibration procedure using Camera Calibration Software "PI-Calib" and read this file through [Load file] button to use settings included in the file as they are, in order to avoid input mistakes that may affect accuracy of measuring result.

"Camera Setup" - Distortion Correction

Distortion Correction Page



On this page you can enter the settings for correcting lens distortion.

Distortion Correction

Here, the method of correcting lens distortion is selected. If a Camera Calibration File (*.cmr) is

read, the method will automatically be set. Normally the setting should not be changed.

Distortion Parameters

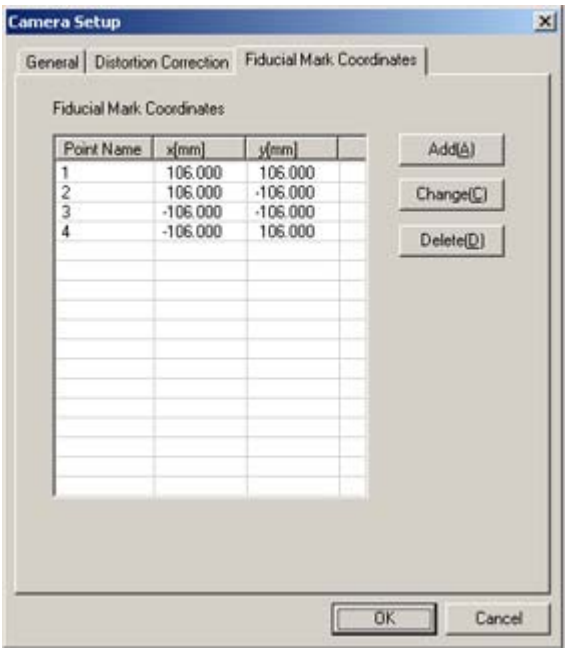
If a Camera Calibration File (*.cmr) is read, the distortion coefficients will automatically be set.

Normally the settings should not be changed.

We recommend to obtain a Camera Calibration File (*.cmr) available (for a fee) from Topcon's Camera Calibration Service or resulted by performing camera calibration procedure using Camera Calibration Software "PI-Calib" and read this file through [Load file] button to use settings included in the file as they are, in order to avoid input mistakes that may affect accuracy of measuring result.

"Camera Setup" - Fiducial Mark Coordinates

[Fiducial Mark Coordinates] page



On this page, enter and edit fiducial mark coordinates.

Fiducial Mark Coordinate List

The list of the entered fiducial mark coordinates are displayed at the center of the dialog. On the list, select the point to edit.

[Add] button

Adds fiducial mark coordinates. When clicked, the "Fiducial Mark Coordinates" Dialog Box is displayed. Enter the point name and coordinate values and click the [OK] button.

[Change] button

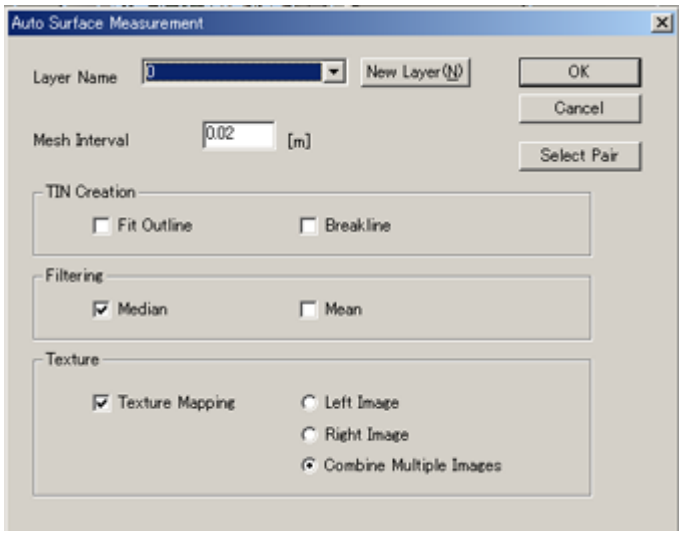
Changes the contents of fiducial mark selected on the list. When clicked, the "Fiducial Mark Coordinates" Dialog Box is displayed. Enter the contents and click the [OK] button.

[Delete] button

Deletes the fiducial marks selected on the list.

"Auto Surface Measurement"

This dialog box is for entering the settings for automatically measuring a surface.



Layer Name

Select the layer of the TIN to be created.

[New Layer] button

This button is for setting a new layer in the TIN to be created. If it is clicked, the "Layer Information" Dialog Box will appear. There, enter the various settings, then click the [OK] button.

[Select Pair] button

This button is for selcting stereo pairs for surface measurement. If it is clicked, the "Stereo Pair Selection" Dialog Box will appear.

Normally, all stereo pairs are used for surface measurement.

Mesh Interval

Enter the measurement interval.

Fit Outline

If this setting is check-marked, the outline of TIN to be created that accurately fits the selected polyline. If the check mark is removed, a TIN will be formed from just the automatically measured points inside the selected polyline.

Breakline

If this setting is check-marked, the polylines crossing the measuring area will be used as the break line. When the break line is made effective, it is possible to bend the TIN along the break lines. In order to create TIN for uneven surface, it is necessary to use the break lines.

The polylines that will be used as a break line must be measured in advance.

Median filter

This function sorts the elevations around the designated point by ascending order, determines the median value, then replaces the elevation with the median value.

With this filter, outlying, noise-like points can be removed. Another feature is that some uneven places can be retained. In order to increase the precision of each point, it is necessary to narrow the measurement interval and measure many points.

Mean filter

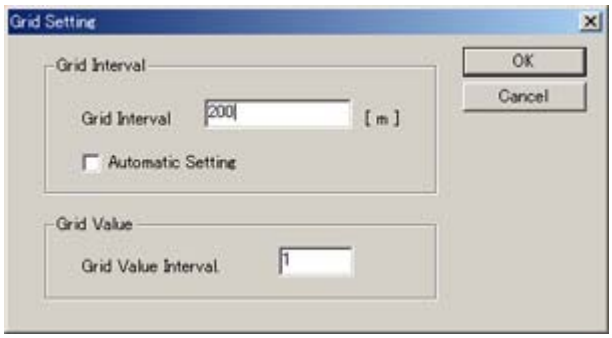
This function determines the average of the elevations around the designated point and then replaces those elevations with that average value. It can be used to make an entire surface smooth. In order to increase the precision of each point, it is necessary to narrow the measurement interval and measure many points.

Texture Mapping

If this setting is check-marked, texture (an image) will be mapped to the created surface. The image to be pasted on can be selected from the left image or the right image. Moreover, the texture combined from multiple images can be mapped.

"Grid Setting"

Do the grid setting.



Automatic Setting

Set the grid interval automatically according to the data range.

Grid Interval

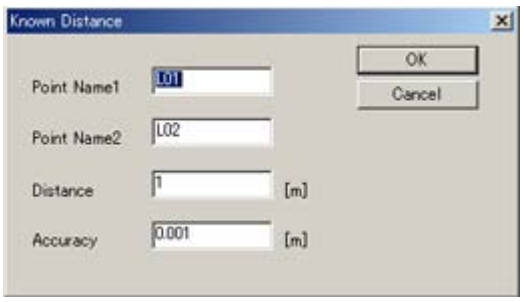
When "Automatic Setting" is unchecked, it is possible to manually enter the grid interval here.

Grid Value Interval

Set the interval for displaying grid values.

"Known Distance"

To register distance between two points.



Point Name1

Enter Point Name of the 1st Point.

Point Name2

Enter Point Name of the 2nd point.

Distance

Enter distance between those 2 points.

Accuracy

Enter accuracy of the entered distance.

Normally, actual measured distance accuracy to be entered.

If this value is smaller, the coordinates would be adjusted more accurately in the orientation calculation.

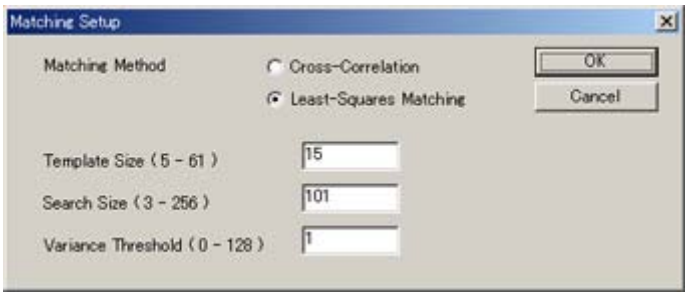
However, in case multiple distance information are registered or the distance is registered together with control point coordinates, the Orientation calculation may not be completed depending on the discrepancy between the entered accuracy and one of actual measurement.

In such case re-enter a larger value.

"Matching Setup"

This dialog box is for entering the settings for image matching.

The corresponding point of two or more images can be detected with the image matching method. The settings of this dialog box affect the functions "Pass point detection, "Auto Correlation Mode", and "Auto Surface Measurement".



Matching Method

Choose one of the following two types of matching methods.

Cross-Correlation

This method evaluates the degree of similarity between local areas of images by means of correlation coefficients. In the specified search range, it detects as corresponding points those places that have the highest correlation coefficient. The cross correlation method has two distinct advantages: it processes at high speed, and it is not readily affected by differences in brightness between the images being compared. On the other hand, it is not very effective with regard to differences in magnification or deformation of image resulting from differences in elevation between the images being compared.

Least-Squares Matching

Based on the method of least squares, this type of matching changes the shapes of the local areas being compared while searching for the locations that have the least difference in brightness. The advantages of least-squares matching are that it can be used effectively with regard to differences in photographic magnification, the rotation of images, and deformation of image resulting from differences in elevation. On the other hand, it requires clear patterns of brightness and is easily affected by noise.

Template Size

This function sets the size of the templates (local areas) of an image that will be compared as to their degree of similarity. Template size should be set so that the templates contain adequate patterns of brightness.

Search Range

This function sets the range in which corresponding points will be searched. If the search range is made small, processing will be fast. However, if the range does not contain the correct point, accurate detection cannot be carried out. Make sure to set the range large enough to contain the corresponding point.

The search range that is set will only affect the function [Auto Correlation Mode] of the stereo screen menu.

Variance Threshold

With matching processing, normal measurement results cannot be obtained for places with little variation in brightness, such as a white wall. The Image Master checks the brightness variance of local areas and, if they are lower than the set value, it judges that the local areas do not contain enough information and that measurement cannot be carried out.

"Orientation Settings"

Setting various parameters for Orientation calculation.

For details about the "Orientation Settings" dialog box, see the following:

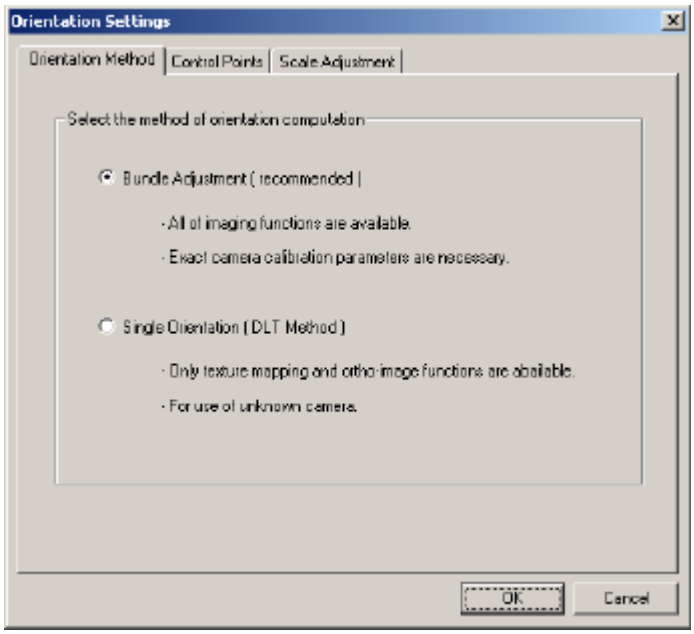
"Orientation Method" Page

"Control Points" Page

"Scale Adjustment" Page

"Orientation Settings" - Orientation Method

[Orientation Method] Page



Select the method of orientation calculation.

Bundle Adjustment

If exact camera calibration parameters are given, always select the Bundle Adjustment. If the Bundle Adjustment is selected, all of the imaging functions such as calculation of 3d coordinates, stereo image measurement, generating Ortho-Image and Texture Mapping can be used.

Single Orientation (DLT Method)

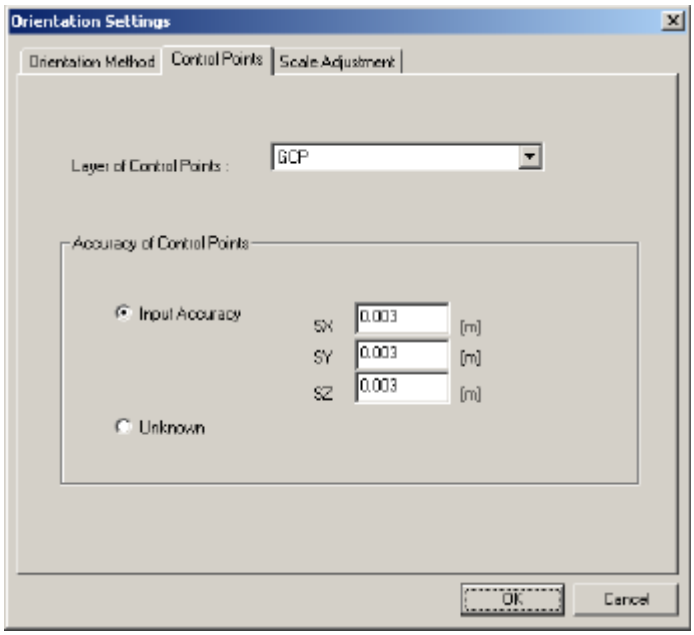
If camera calibration parameters are unknown, the Single Orientation (DLT Method) can be used. If the DLT method is selected, only generating Ortho-Image and Texture Mapping functions can be used.

The DLT method is used only when the camera calibration parameters are unavailable. It is recommended to use the bundle adjustment with exact camera calibration parameters.

* For about locating control points for each orientation method, see the "Locating Control Points" of the chapter "Overview of 3D Image Measurement".

"Orientation Settings" - Control Points

[Control Points] Page



Enter coordinates of the Control Point to be used for the Orientation calculation. To use this Control Point in the Orientation calculation, the same point on the Image to be specified.

Layer of Control Points

Set the layer in which the coordinates of control points are stored.

For the Orientation calculation, coordinates stored in the control points layer will be used.

Input Accuracy

Enter accuracy of the Control Point. Normally, actual measured accuracy should be entered.

If this value is smaller, the coordinates would be adjusted more accurately in the orientation calculation.

However, if this value is smaller than actual measured accuracy, orientation calculation may not be completed, due to measurement errors are exceeding the limit.

In such case re-enter a larger value.

Unknown

Select this in case the measured accuracy is unknown.

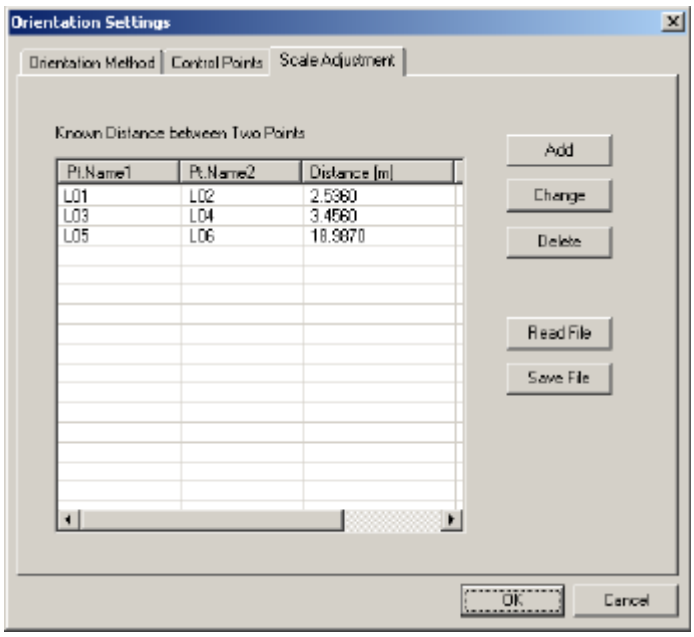
If this is selected, coordinate system will be adjusted so that residual of point location is within one pixel.

Because of this, error of ground coordinates of the measured points may be increased.

Therefore, recommended to enter actual measured accuracy as much as possible.

"Orientation Settings" - Scale Adjustment

[Scale Adjustment] Page



Register a distance between two known points which to be used for the Orientation calculation.

If a standard scale bar is used and imaged in the different set of stereo pairs, give different point names for both end point for each set.

To apply the entered distance data to the Orientation calculation, those both end point to be measured on the image as pas-points.

[Add] button

To add distance information. When this button is clicked, "Known Distance" Dialog Box will appear. Enter necessary information and click [OK] button.

[Change] button

Change already registered distance information by selecting on the list.
When this button is clicked, "Known Distance" Dialog Box will appear.
Change data on the dialog box then, click [OK] button.

[Delete] button

To delete distance information selected on the list.

Distance Accuracy

Normally, actual measured distance accuracy to be entered.

If this value is smaller, the coordinates would be adjusted more accurately in the orientation calculation.

However, in case multiple distance information are registered or the distance is registered together with control point coordinates, the Orientation calculation may not be completed depending on the discrepancy between the entered accuracy and one of actual measurement.

In such case re-enter a larger value.

"Stereo Image Setting"

Do the setting about the range of stereo image creation.

Full Range of Original Images

Create a stereo image about the total range of the original image. When pass points gather in a part of the image, the vertical parallax (y-parallax) may increase outside the pass points. Also, when photographed at an extremely large angle, the capacity of the stereo image may become very large.

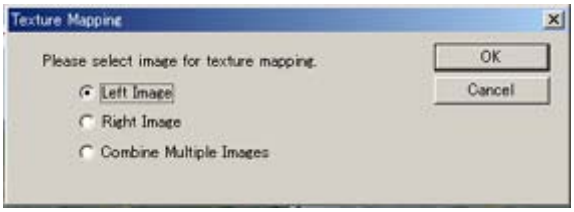
Range of Pass Points

Create a stereo image about the peripheral area of pass points. Since the unnecessary parts outside the pass point is excluded from the created stereo image, the stereo image can be created quickly. Also, data capacity can be minimized. Normally this condition is set.

"Texture Mapping"

This dialog box is for selecting the image from which the texture to be mapped onto a TIN will be cut out.

You can select the left image or the right image of stereo images. Moreover, the texture combined from multiple images can be mapped.



Operation Manual

Image Master

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