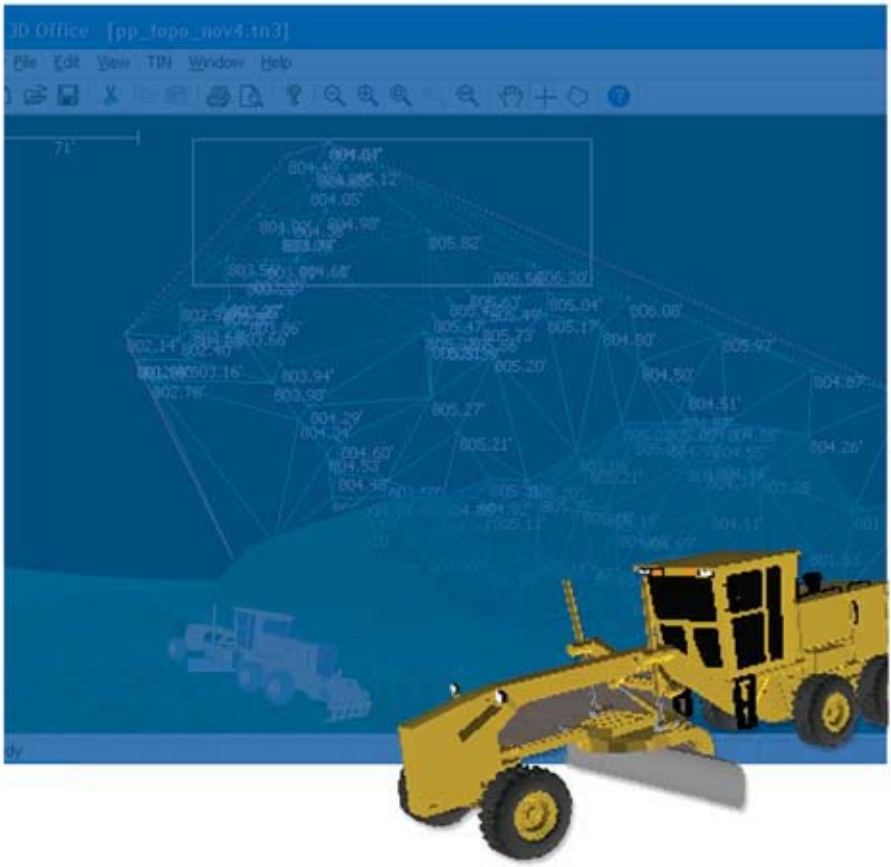
TOPCON

3D-Office

Office Software



User's Manual

TOPCON
POSITIONING SYSTEMS

3D-Office
User's Manual

Part Number 7010-0684
Rev B

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Preface

Thank you for purchasing your Topcon receiver, survey product or accessory (the “Product”). The materials available in this manual (the “Manual”) have been prepared by Topcon Positioning Systems, Inc. (“TPS”) for owners of Topcon products. This Manual is designed to assist owners with the use of software (the “Software”) to be used with the Product and its use is subject to these terms and conditions (the “Terms and Conditions”).

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Manual Conventions

This manual uses the following conventions:

Example	Description
File ▸ Exit	Click the **File** menu and click **Exit**.
Enter	Click the button labeled Enter.
Topo	Indicates the name of a dialog box or screen.
Notes	Indicates a field on a dialog box or screen, or a tab within a dialog box or screen.

Further information to note about the configuration, maintenance, or setup of a system.

Supplementary information that can help you configure, maintain, or set up a system.

Supplementary information that can have an affect on system operation, system performance, measurements, or personal safety.

Notification that an action has the potential to adversely affect system operation, system performance, data integrity, or personal health.

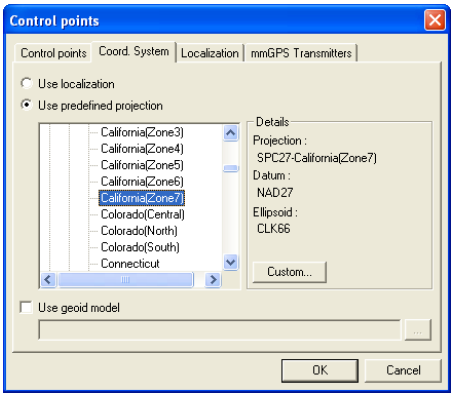
Notification that an action *will* result in system damage, loss of data, loss of warranty, or personal injury.

What's New with 3D-Office

The following list briefly describes new features and functions for the latest version of 3D-Office.

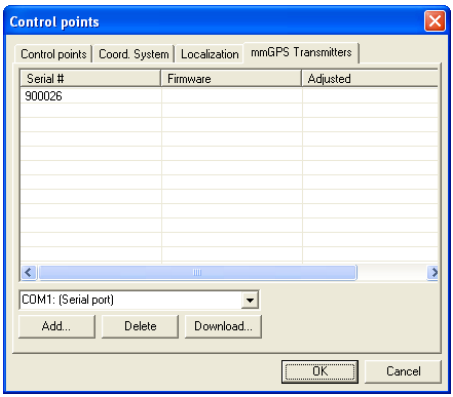
Projection, Datum, and Geoid Support

- A number of projections and geoids are included with the installation.
  See "Using Coordinate System Data" on page 9-13 for details.
- Custom projections and datums are supported via a 3D Project or 3D Control file.
  See "Creating a Custom Projection or Datum" on page 9-14 for details.



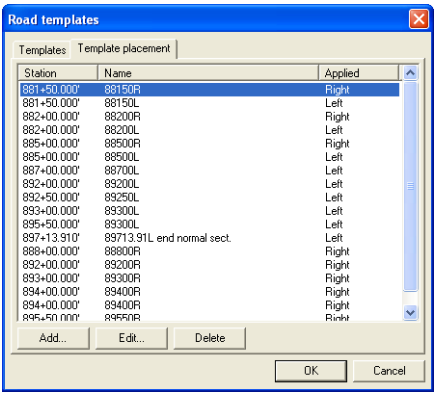
mmGPS Transmitter Support

- If a control point file included mmGPS transmitter information, this data can viewed.
- If the computer and mmGPS transmitter are connected, firmware and adjustment data can be uploaded.
  See "Viewing and Adding mmGPS Transmitter Information" on page 9-20 for details.



Template Placement Function Moved

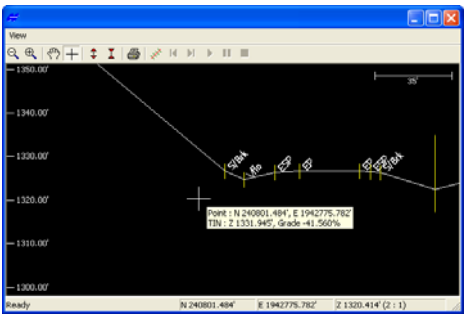
For alignments, the template placement function is now included as a tab on the Road templates dialog box.



Alignment Profile

A profile of the alignment can be viewed.

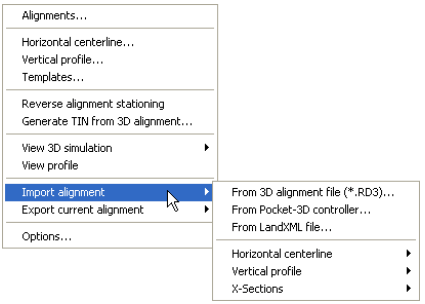
See "Viewing a Profile of the Alignment" on page 6-36 for details.



Alignment Elements Import

In a 3D Project file, horizontal centerlines, vertical profiles, and x-sections can be imported from various file formats.

See "Importing Alignment Features" on page 6-5 for details.



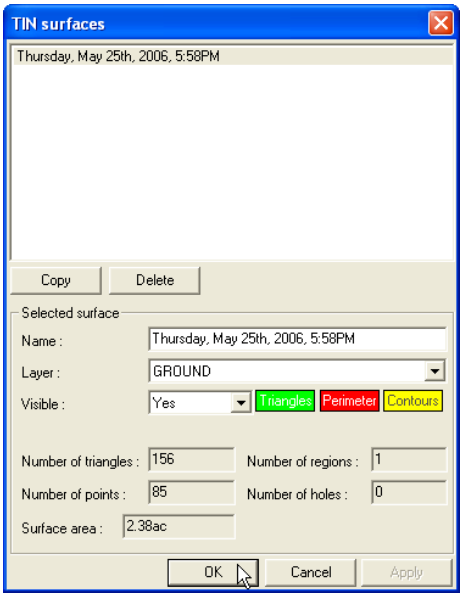
Surface Parameters

For TIN, Alignment, Plane and Grid surfaces, parameters are located/have been relocated on the corresponding surfaces dialog box.

From here, the surface name, layer, and visibility can be edited. The surface's properties can be viewed or edited.

See one of the following sections for details.

- "Viewing and Editing TIN Surfaces" on page 5-10
- "Viewing and Editing Alignments" on page 6-12
- "Working with Plane Surfaces" on page 7-5
- "Viewing Grid Information" on page 8-6

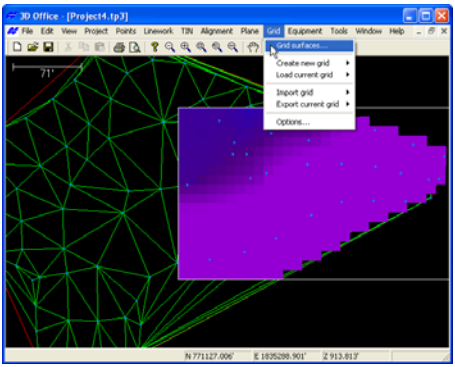


Grid Surface Support

Grid surfaces are now supported, and include the following functions:

- View, edit, copy, delete grids
- Create a grid
- Load grid data from a TIN surface
- Import/export grids
- View machine pass information

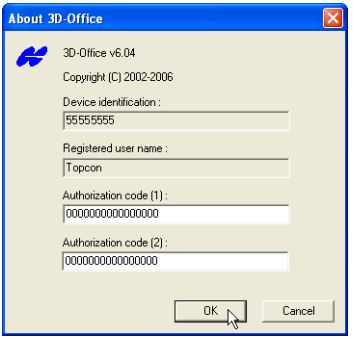
See Chapter 8 for details.



Update Authorization Codes

Occasionally, authorization codes can be purchased to upgrade or update a current copy of 3D-Office.

See "About 3D-Office" on page 1-21 for details.



Introduction

Welcome to 3D-Office™, Topcon's fully featured 3DMC software for machine control applications.

With 3D-Office, you can create, edit, import/export, design, and prepare files for any jobsite. Many of these files can be exported to the System Five-3D control box and Pocket-3D for immediate use in the field. 3D-Office imports files from the System Five-3D control box and Pocket-3D for office evaluation.

Installing 3D-Office

3D-Office comes on a CD to install on a computer. Table 1-1 lists the system requirements needed to properly use this software on a computer; optional accessories include CF card access to transfer files between the computer and System Five-3D control box.

Table 1-1. 3D-Office System Requirements

• Microsoft® Windows 98/NT/ 2000/XP	• 2MB of available hard-disk space (3MB recommended)
• 128MB of RAM	• CD-ROM drive

1. Insert the 3DMC Software CD into the CD-ROM drive of the computer.
2. Navigate to the CD-ROM drive's folder and double-click the **3D-Office folder** to open it.
3. Double-click the **Setup.exe icon** (Figure 1-1) to begin the installation process.

Figure 1-1. 3D-Office Setup.exe Icon

4. Select a new destination folder or keep the default folder in which to install 3D-Office, and click **Next** (Figure 1-2).
5. After reading the License Agreement, click “I accept...” and click **Next**. The installation process begins (Figure 1-2).

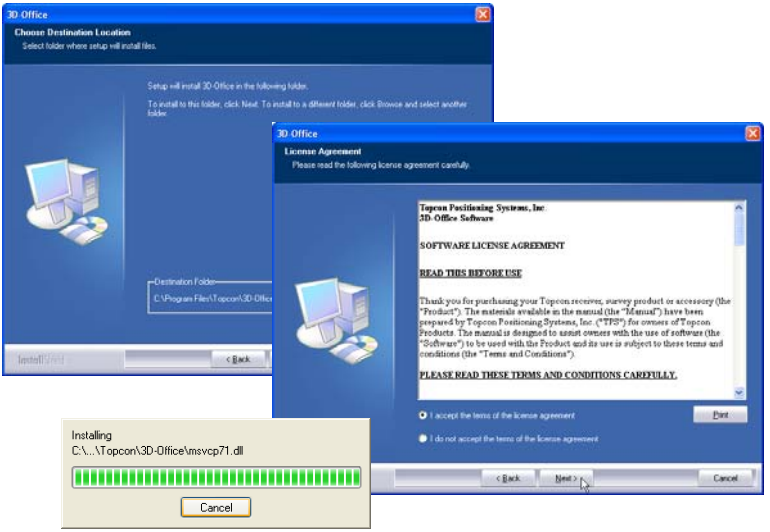


Figure 1-2. Install 3D-Office

6. Click **Finish** to exit the installation wizard. The wizard also creates a shortcut to 3D-Office (Figure 1-3), placing it on the computer’s Desktop.

Figure 1-3. 3D-Office Shortcut

Uninstalling 3D-Office

1. Navigate to the computer's ***add/remove programs*** dialog box (click the Start button ▸ Settings ▸ Control Panel ▸ Add or Remove Programs) and remove the Topcon 3D-Office program.
2. Click **Yes** at the confirmation (Figure 1-4).

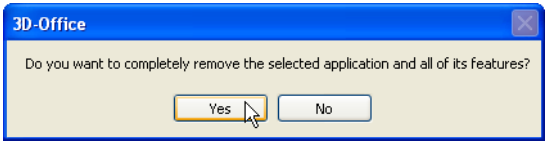


Figure 1-4. Remove 3D-Office?

The ***Setup Status*** dialog box briefly displays, showing the uninstall progress.

3. Click **OK** to acknowledge the removal of 3D-Office (Figure 1-5).

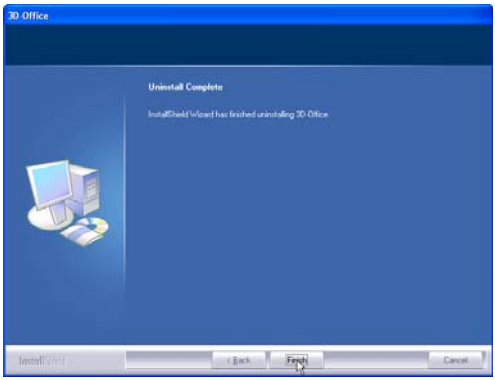


Figure 1-5. 3D-Office Successfully Removed

Starting 3D-Office

To start 3D-Office, click one of the following:

- **Start ▸ Programs ▸ Topcon ▸ 3D-Office**
- **Topcon 3D-Office shortcut**

Upon initial startup, 3D-Office requires authorization codes to start (Figure 1-6). Record the device identification number and contact your Topcon Dealer with the following information to receive authorization codes:

- Device identification
- Company name
- Contact name
- Company address
- Contact phone number
- Contact email address
- Software Type (3D-Office)

Once you receive the authorization codes, enter them and click **OK** to open 3D-Office (Figure 1-6). When opening for the first time, a new project file displays. See “File Operations” on page 1-16 for details on creating, opening, and saving projects.

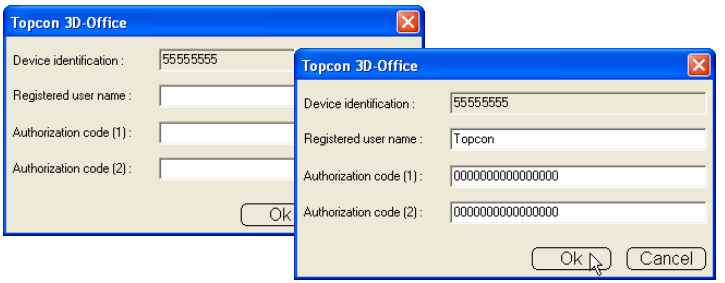


Figure 1-6. Enter Access Code

Once entered, the authorization codes can be located and changed on the ***About 3D-Office*** screen. See “About 3D-Office” on page 1-21 for more details on viewing/changing authorization codes.

Getting Acquainted

This section introduces the various menus, buttons, and windows used for viewing, managing, and editing project files.

Main Screen

The 3D-Office main screen (Figure 1-7) has the following components:

- Title bar – displays the name of the file
- Menu bar – contains drop-down menus for the various functions, and depends on type of file being displayed
- Toolbar – contains shortcut buttons to frequently used functions
- System buttons – minimizes, maximizes, and closes windows and dialog boxes
- Status bar – displays informative messages about the program's status, as well as cursor/selection-tool coordinates
- Plan View – shows a graphical representation of the data available in the current file

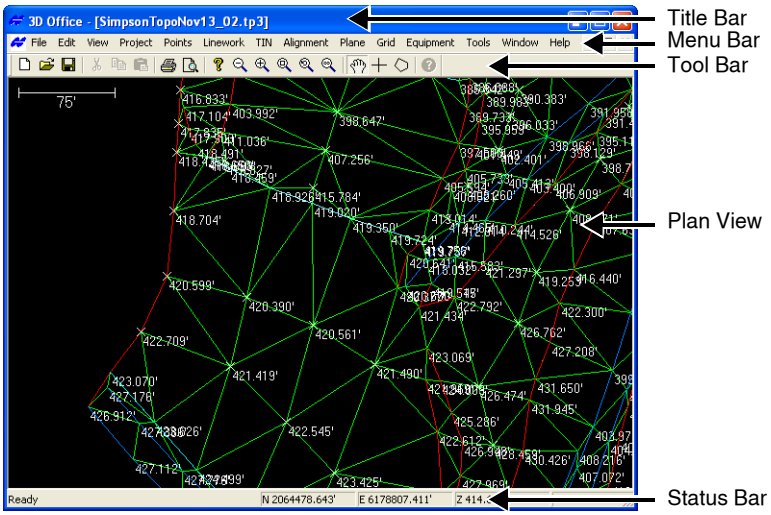


Figure 1-7. 3D-Office Main Screen

Menu Bar

Depending on the type of file open in 3D-Office, the menu bar displays different menus. Figure displays the menu bar for 3D Project files (*.tp3).

Menu Bar for Project Files Table 1-2 lists the menu bar for other file types.

Table 1-2. Types of Menus

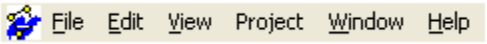
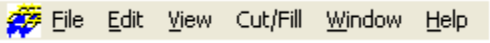
File Type	Menu Bar
3D Office file (*.tp3)	See Figure above.
Control file (*.gc3)	
TIN surface (*.tn3)	
Alignment (*.rd3)	
Points (*.pt3)	
Linework (*.ln3)	
Plane surface (*.pl3)	
Cut/fill plot (*.cf3)	
Grid surface (*.gd3)	

Table 1-3 describes the functions available in each menu. Some menu options depend on the file type open.

Table 1-3. 3D-Office Menu Options

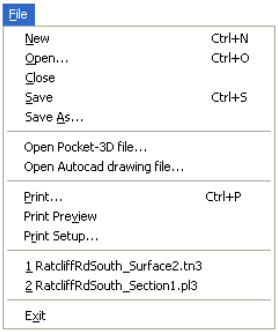
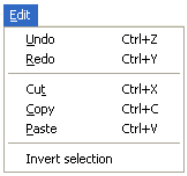
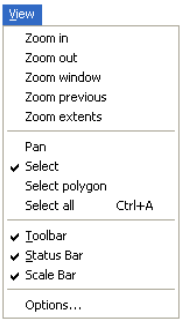
Menu	Functions
File menu 	Available for all file types, in general the File menu provides the following functions: • opens, saves, and closes a 3D-Office file • opens a file from a Pocket-3D controller or another program's file type • closes the active file • prints the contents of the current plan view • defines printing variables • provides fast access to recently opened files • exits and closes 3D-Office
Edit menu 	Available for all file types, in general the Edit menu provides the following functions: • allows a redo or undo of the last operation • cuts, copies, or pastes information • inverts selected/un-selected data in TIN surface files
View menu  In 3D simulation views, the View menu has specific functions for controlling the simulation. See "3D-view and Profile View Menu Bars" on page 1-13 for details.	Available for all file types, in general the View menu provides the following functions: • zooms in by 200% and zooms out by 50% on the display screen • zooms to a part of the design area indicated with a drawn window • displays the previous view magnification • displays the entire extents of the design area • sets the selection cursor to *Select* or *Pan* mode • selects points and lines or triangles for some file types • sets the view status for the Toolbar, Scale bar, and Status bar • sets unit options for some file types

Table 1-3. 3D-Office Menu Options (Continued)

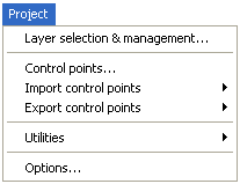
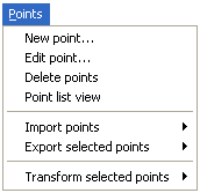
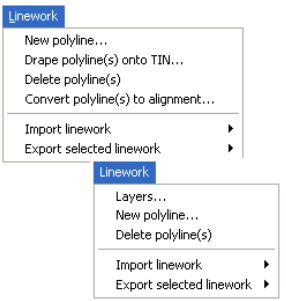
Menu	Functions
Project menu 	Available for 3D Project (*.tp3), the Project menu provides the following functions. For Control (*.gc3) files, only the "Control points" menu option is available. • sets and manages layer properties • displays control point and GPS localization information • imports and exports control points • calculates map-projection coordinates • defines a custom projection • sets unit options for Project files
Points menu 	Available for 3D Project (*.tp3) and Points (*.pt3) files, the Points menu provides the following: • sets layer properties • adds, edits, and deletes points • displays the point list • imports and exports control points • transforms coordinates • sets unit options for Project files
Linework menu 	Available for 3D Project (*.tp3) and Linework files (*.ln3) files, the Linework menu provides the following functions. For Linework (*.ln3) files, this menu also views and edits layers. • creates a new polyline • drapes selected polyline entities to the TIN • deletes selected polylines • converts polylines to a new alignment • imports linework files • exports selected linework

Table 1-3. 3D-Office Menu Options (Continued)

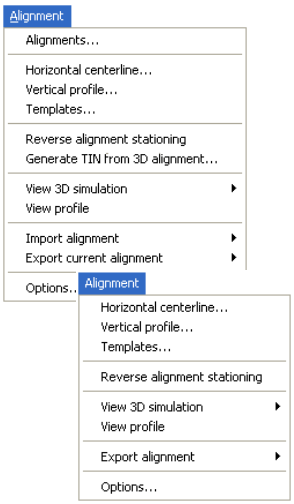
Menu	Functions
TIN menu 	Available for 3D Project (*.tp3) and TIN surface (*.tn3) files, the TIN menu provides the following functions: • displays TIN surface information • generates new TIN surfaces • deletes triangles • transforms the current TIN surface • consolidates duplicate TIN points • displays a 3D representation of the TIN surface • displays a profile through the TIN surface • imports and exports TIN surfaces • compares the current TIN surface with another surface • sets TIN options
Alignment menu 	Available for 3D Project (*.tp3) and Alignment (*.rd3) files, the Alignment menu provides the following functions. Only some menu items are available for *.rd3 files. • displays alignment information • defines horizontal elements and vertical curves • creates, edits, and places templates • reverses alignment stationing • generates a TIN surface from alignment information • displays a 3D representation of the alignment • displays a profile of the alignment surface • imports alignment information, horizontal centerlines, vertical profiles, and cross-sections • exports alignment information • sets alignment options

Table 1-3. 3D-Office Menu Options (Continued)

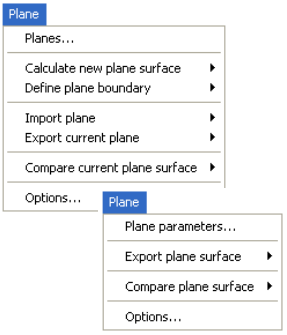
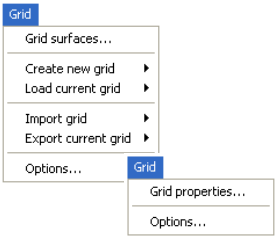
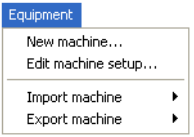
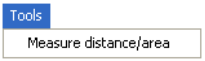
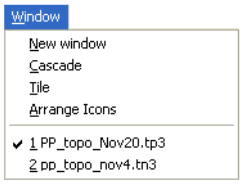
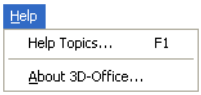
Menu	Functions
Plane menu 	Available for 3D Project (*.tp3) and Plane surface (*.pl3) files, the Plane menu provides the following functions: • displays plane information • sets plane parameters • calculates new plane surfaces • defines plane boundaries • imports and exports plane surfaces • compares a plane surface with another surface • sets plane options
Grid menu 	Available for 3D Project (*.tp3) and Grid surface (*.gd3) files, the Grid menu provides the following functions: • displays grid surface information • creates a new grid • removes all grid data • loads a current grid surface • imports and exports a grid surface • sets grid surface options.
Equipment menu 	Available for 3D Project (*.tp3) files, the Equipment menu provides the following functions: • creates or edits machine setup files • imports a machine setup from Pocket-3D • exports a machine setup to Pocket-3D
Tools menu 	Available for 3D Project (*.tp3) files, the Tools menu provides a tool to measure a distance or area in the plan view using the selection tool.

Table 1-3. 3D-Office Menu Options (Continued)

Menu	Functions
Window menu 	Available for all file types, the Window menu provides the following functions: • opens the current file in a new window; any changes made in the new window are made in all windows of the same file • arranges open files in cascade (stacked) or tile (adjacent) views and arranges icons • lists all open files; the active file is marked with a check mark
Help menu 	Available for all file types, the Help menu opens on-line help topics and gives 3D-Office version and copyright date information.

Standard Toolbar

The standard toolbar for 3D-Office (Figure 1-8) contains buttons for frequently used functions.

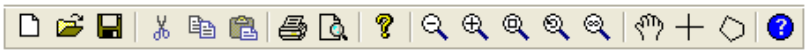


Figure 1-8. 3D-Office Toolbar

Upon start-up, the toolbar displays beneath the menu bar.

- To display or hide the Toolbar, click **View ▸ Toolbar**.
- To move the Toolbar, click and hold the "grab bar" on the left of the Toolbar, then drag the Toolbar to a new location and release the mouse button.

Table 1-4 describes the various buttons on the Toolbar.

Table 1-4. Standard Toolbar Button Functions

Button	Description	Button	Description
	New – Opens a new Project file window.		Zoom Out – Zooms out from the map by 50%.
	Open – Opens a project.		Zoom In – Zooms in on the map by 200%.

Table 1-4. Standard Toolbar Button Functions (Continued)

Button	Description	Button	Description
	Save – Saves files to the current folder.		Zoom rectangle – Zooms to a rectangular area drawn in the Plan View.
	Cut – Removes the selected information from the page or window, placing it on the Windows® clipboard.		Zoom previous – Displays the last magnification of the Plan View.
	Copy – Copies selected information from the page or window, placing it on the Windows clipboard.		Zoom extents – Displays the entire design area.
	Paste – Places selected information from the Windows clipboard to the current cursor position.		Pan – Changes the cursor to a "hand" with which to "grab" and move the map.
	Print – Prints the Plan View.		Select – Changes the cursor to a crosshairs with which to click and select individual entities, or to click and drag over an area, creating a rectangle that selects enclosed entities.
	Print preview – Displays how the Plan View will look when printed.		Poly-cursor – Changes the cursor to a crosshairs with which to draw a polygon around the entities to select.
	About – Displays the ***About 3D-Office*** dialog box.		Information – Displays a text editor window containing information about the selected entities.

3D-view and Profile View Menu Bars

The 3D-view and Profile view menu bars for 3D-Office (Figure 1-9) include menus for controlling the view and the machine. The available menus depend on the type of view selected.

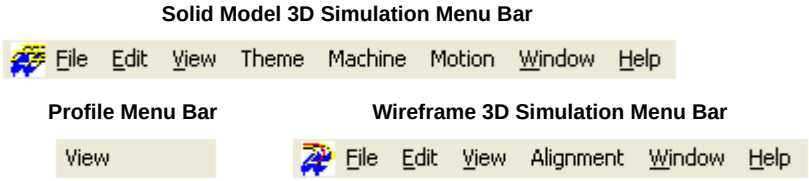


Figure 1-9. 3D-view and Profile View Menu Bars

The menu bar for solid model simulations (TIN and alignment) has the following menu selections:

- File and Edit menus – have standard menu selections
- View menu – zooms in and out, selects topography information to display, selects the view in relation to the cab, applies grid and contour interval options
- Theme menu – changes the look of the "ground" in the simulation
- Machine menu – changes the machine displayed in the simulation
- Motion menu – plays log files, follows the road alignment during movement, monitors machine movement during real time
- Window and Help menus – have standard menu selections

The menu bar for Profile views has only the View menu selection for zooming in/out, using the pan or select pointer, and exaggerating/decreasing the vertical view.

The menu bar for basic wireframe simulations (alignment) has the following menu selections:

- File and Edit menus – have standard menu selections
- View menu – zooms in/out, rotates the view left/right, decreases/increases the viewing angle, provides machine image controls
- Alignment menu – has plan, profile, and 3D simulation view options
- Window and Help menus – have standard menu selections

3D-view and Profile View Toolbars

The 3D-view toolbars for 3D-Office (Figure 1-10) includes buttons for controlling the view and machine. The available buttons depend on the type of 3D simulation, either solid model or wireframe.

Solid Model 3D Simulation Toolbar

Wireframe 3D Simulation Toolbar

Profile View Toolbar

Figure 1-10. 3D-view Toolbars

Upon start-up, the toolbar displays beneath the menu bar.

- To display or hide the Toolbar, click **View ▸ Toolbar**.
- To move the Toolbar, click and hold the "grab bar" on the left of the Toolbar, then drag the Toolbar to a new location and release the mouse button.

Table 1-5 describes the various buttons on the 3D-view toolbars.

Table 1-5. 3D-View Toolbar Button Functions

Button	Description	Button	Description
	Zoom In – zooms in on the 3D-view by 200%		Zoom Out – zooms out on the 3D-view by 50%
Solid Model Simulation		**Wireframe Simulation**	
	Rewind – during logfile playback, rewinds the logfile		Slow down – slows down the movement of the machine
	Fast forward – during logfile playback, speeds up the logfile		Speed up – starts and speeds up the movement of the machine
	Play – during logfile playback, plays the logfile		Rotate view left

Table 1-5. 3D-View Toolbar Button Functions (Continued)

Button	Description	Button	Description
	Pause – during logfile playback, pauses the logfile		Rotate view right
	Stop – stops the logfile playback		Lowers the viewing angle
	Record – during real-time monitoring, creates a logfile for the machine		Raises the viewing angle
			Stop – in a wireframe simulation, stops the movement of the machine
Profile View			
	Pan – changes the cursor to a "hand" with which to "grab" and move the map		Exaggerates the vertical scale
	Select – at the location of the crosshairs, Point, TIN, and Grade information display in a tip box.		Decreases the vertical scale
	Snap to Station – rotates the profile line perpendicular to the center line, positioning it up the alignment		Rewind – during logfile playback, rewinds the logfile
	Fast forward – during logfile playback, speeds up the logfile		Play – during logfile playback, plays the logfile
	Pause – during logfile playback, pauses the logfile		Stop – stops the logfile playback

File Operations

From the File menu, you can create, open, and save project files. You can also preview and print the display window, as well as enter title block information for any printed material.

The following sections describe opening and saving files, printing the display, and using the Print Setup feature.

Opening a File

3D-Office opens the following types of files:

- 3D Project (*.tp3)
- Control file (*.gc3)
- TIN surface (*.tn3)
- Alignment (*.rd3)
- Linework (*.ln3)
- Points file (*.pt3)
- Plane surface (*.pl3)
- Cut/fill plot (*.cf3)
- Grid surface (*.gd3)

By default, these files are saved to the last selected folder on the computer's hard drive. However, files can be saved to and opened from any selected folder.

1. To open a file, do one of the following:
   - click **File ▸ Open**
   - click **File** then a recently opened file
   - click the **Open** button on the toolbar
   - press **Ctrl+O**
2. On the ***Open*** dialog box, navigate to the location of the file, select the file type, select the desired file, and click **Open** (Figure 1-11).

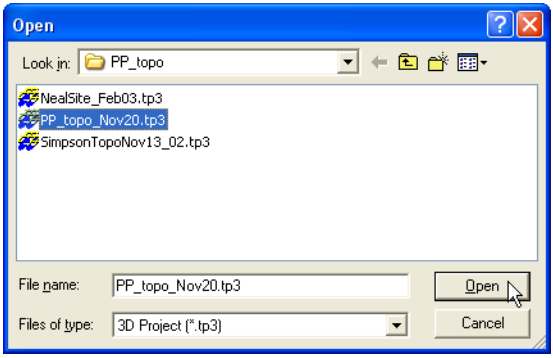


Figure 1-11. Select File to Open

Saving a File

To save a file, do one of the following:

- Click **File ▸ Save**
- click the **Save** button on the toolbar
- Press **Ctrl+S**

When closing a file or closing 3D-Office after making changes to the current file, a *Save changes* confirmation displays. Click **Yes**, to save the changes and complete the operation (Figure 1-12).

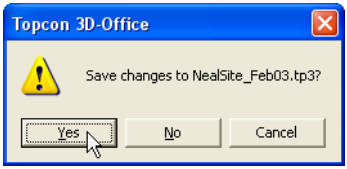


Figure 1-12. Save Changes

To save the file under a different name or to a different location,

click **File ▸ Save As**. Navigate to the location in which to save the file, enter a name for the file, then click **Save** (Figure 1-13).

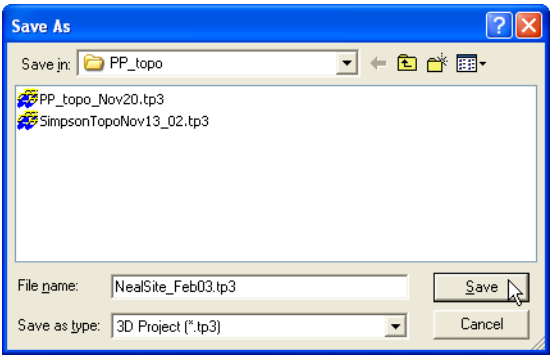


Figure 1-13. Save File with a Different Name or in Another Location

Save the file as a variant of the original file to keep a backup copy or to track progress.

Printing the Display

Before printing, view the display using Print Preview (see “Print Preview” on page 1-19 for details).

To print the Plan View, do one of the following:

- click **File ▸ Print**
- click the **Print** button on the toolbar
- press **Ctrl+P**

The current view prints, along with a title block (see “Print Setup” on page 1-20 for setting title block information).

Print Preview

Use the Print Preview function to see how printed information will look on paper. Use this preview to check orientation, font size, etc.

Depending on the parameters previously set in the Print dialog box, the Print Preview will be in either portrait or landscape orientation.

To view the print preview, click **File ▸ Print Preview** or click the **Print Preview** button on the toolbar.

The ***print preview*** dialog box displays the information that will be printed (Figure 1-14).

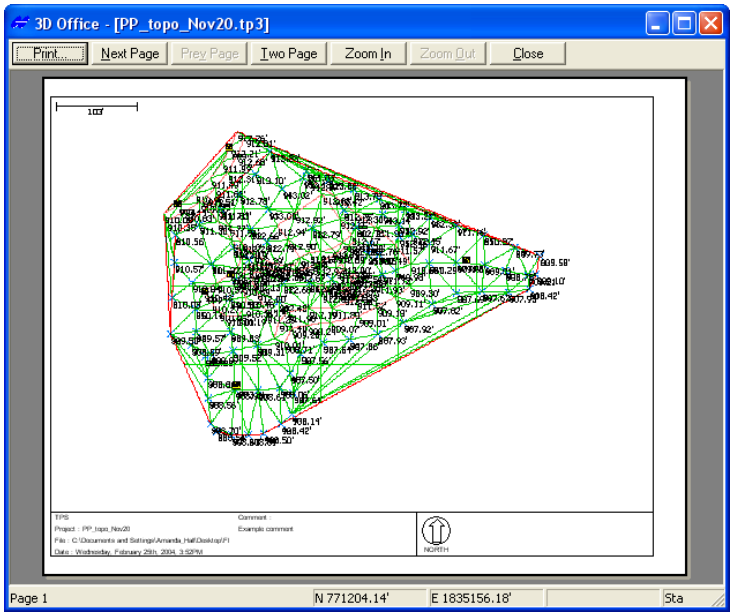


Figure 1-14. Print Preview of the Plan View

Print Setup

The Print Setup feature sets title block information and the size for text and map fonts. The title block information applied here is a global field and will be applied to all printed information.

Click **File ▸ Print Setup** to change title block information printed with display views.

Use the ***Print setup*** dialog box (Figure 1-15) to set the following:

- Company name – enter owner/user information to include in the title block
- Comment – enter desired information to include in the Comment area of the title block, such as the jobsite or location
- Text font – sets the text size in reports and title blocks
- Map font – sets the text size for entities viewed in the plan view, such as point names, coordinates, etc.

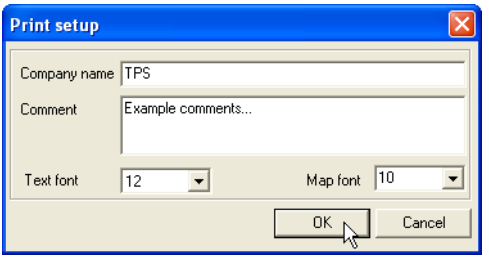


Figure 1-15. Print Setup

About 3D-Office

The About 3D-Office dialog box (Help ▸ About 3D-Office) contains the following information:

- Software version and copyright date
- Device identification number
- Registered user
- Authorization codes

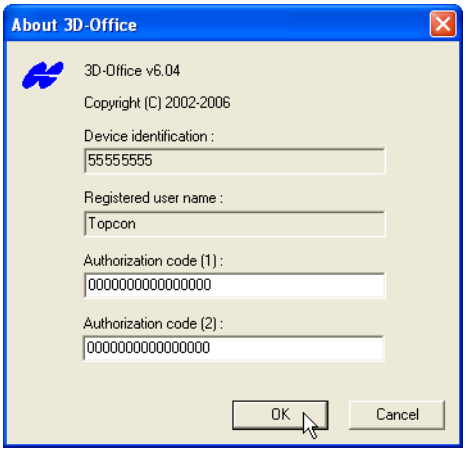


Figure 1-16. About 3D-Office

Occasionally, upgraded or different functionality may required different authorization codes to become active.

1. Contact your Topcon Dealer with the following information to receive authorization codes:
   - Device identification
   - Company name
   - Contact name
   - Company address
   - Contact phone number
   - Contact email address
   - Software Type (3D-Office)
2. Click **Help ▸ About 3D-Office** and enter the new codes.
3. Close and re-open 3D-Office to activate the updated codes.

Notes:

Working in 3D Project Files

3D Project files provide a way to incorporate the various individual components of a jobsite into a single, cohesive file. Much of the functionality available in 3D Project files is the same as in other respective file types. However, 3D Project files provide certain features useful to working with multiple sets of different information and 3D Project specific functions, including the following:

- selecting and managing layers
- calculating map-projection coordinates
- working with polylines
- creating, managing, and transforming TIN surfaces
- creating and managing plane surfaces
- creating machine configuration files
- measuring a distance or area
- setting units for the 3D Project

The following sections provide the procedures on functions specific to 3D Project files, as well as some features useful for working with multiple file types. When 3D-Office first opens, an empty 3D Project displays.

- To create a new 3D Project file, click **File ▸ New**.
- To open a current 3D Project file, click **File ▸ Open**. Navigate to the location of the file, select a *.tp3 file, and click **Open**.

For working with data sets in a 3D Project file or with individual file types, see chapters 3 through 9.

Creating Custom Import/Export Formats for Text Files

Import/export formats for text files provide the information needed to identify specific elements so that the import/export process runs as intended. Text files (*.txt) provide a simple format for exchanging point information between software and platforms. Import/export formats are independent of project files and can be created or accessed when importing/exporting text files.

1. Navigate to the ***Select custom format*** dialog box and click **New format** (Figure 2-1). For example, click **Project ▸ Export control points ▸ To text file**.
2. On the ***Custom format definition*** dialog box, type a name for the new format and an extension of the file, then click **Add** on the *Line items* tab (Figure 2-1).

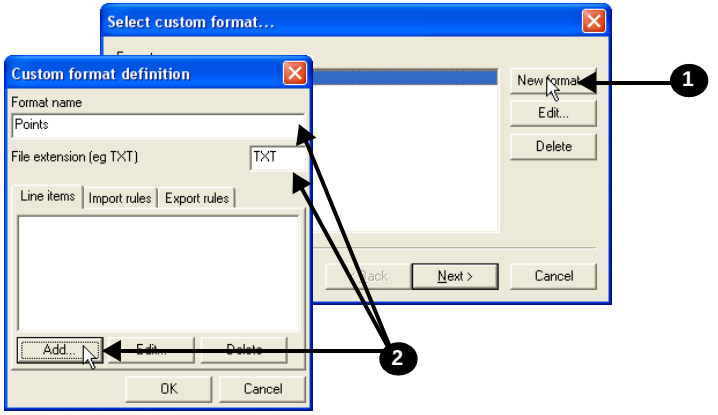


Figure 2-1. Create New Format

3. Select a line item *Type* and enter the desired parameters for the new format, then click **OK**. The available parameters depend on the type of line item selected (Figure 2-2 on page 2-3).

4. Repeat step 3 for each line item to add the desired number of line items (Figure 2-2).

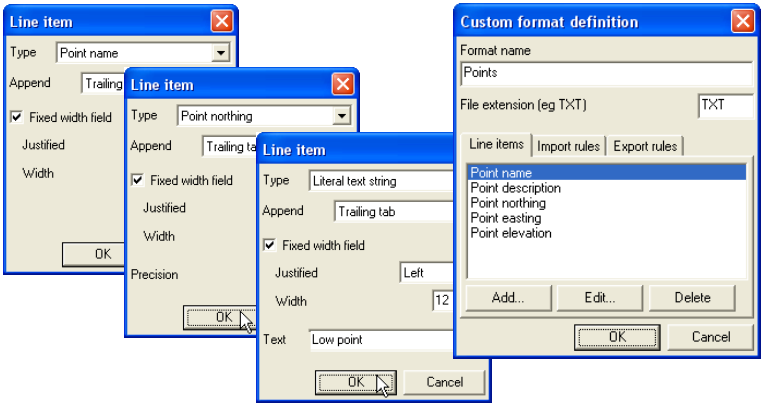


Figure 2-2. Add Line Items to Format

5. Click **Import rules** and click **Add**. Select the desired *Rule* and enter the applicable *Number of lines* to skip or lines with a certain *Prefix* to skip. Click **OK** (Figure 2-3).

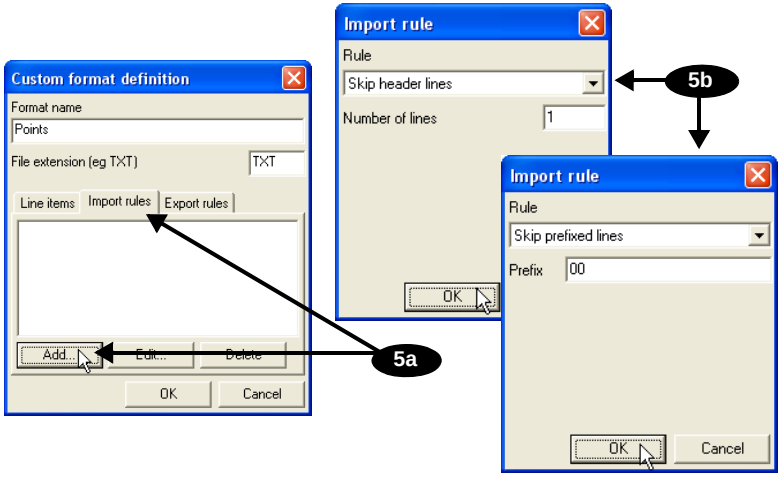


Figure 2-3. Add Import Rules

6. Repeat step 5 for each import rule.

7. Click **Export rules** and click **Add**. Select the desired *Rule* and type a number to start at for points with no number. Click **OK** (Figure 2-4).

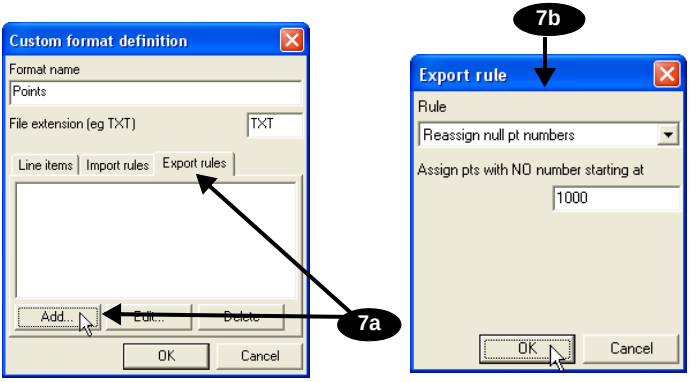


Figure 2-4. Enter Export Rules

8. Repeat step 7 for each export rule.
9. When finished adding the desired *Line items*, *Import rules* and *Export rules*, click **OK** to save the new format (Figure 2-5).

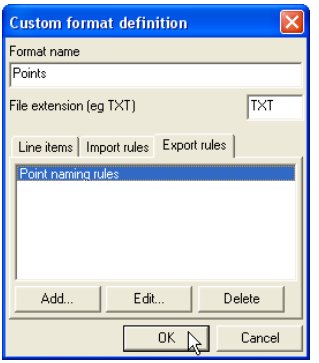


Figure 2-5. Save New Format

The newly created format can be used for subsequent import/export operations.

Managing Layers

3D Project files may consist of imported data sets, such as points, linework, alignments, etc., as well as any layers associated with the data file. Each 3D Project layer is identified with a name and color.

To view, add, or edit layers, click **Project ▸ Layer selection & management**. The ***View layers*** dialog box displays each layer in the 3D Project file (Figure 2-6).

- The enable/disable box next to each layer name indicates whether or not the layer's contents display on the Plan View.
- See the following sections for details on adding a layer, deleting a layer, setting layer colors, or setting point labels.
- *Show all* enables all layers for display on the Plan View.
- *Show none* disables all layers from being displayed on the Plan View.

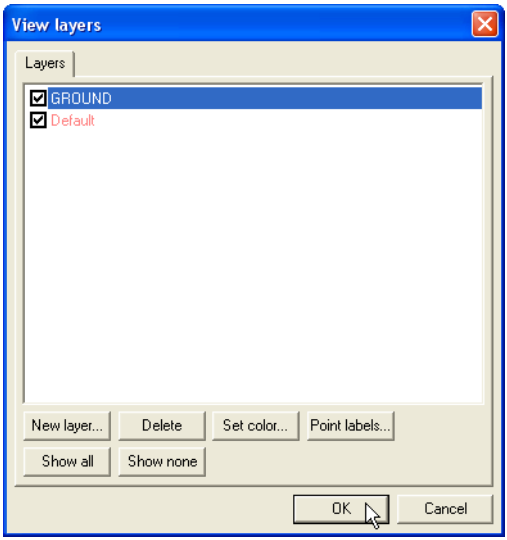


Figure 2-6. View Linework Layers

Adding Layers

Multiple layers are useful for distinguishing between the various land and project features.

1. On the ***View layers*** dialog box, click **New layer**. A new layer entry appears in the layer list.
2. Type a name for the layer (Figure 2-7) and press **Enter**.

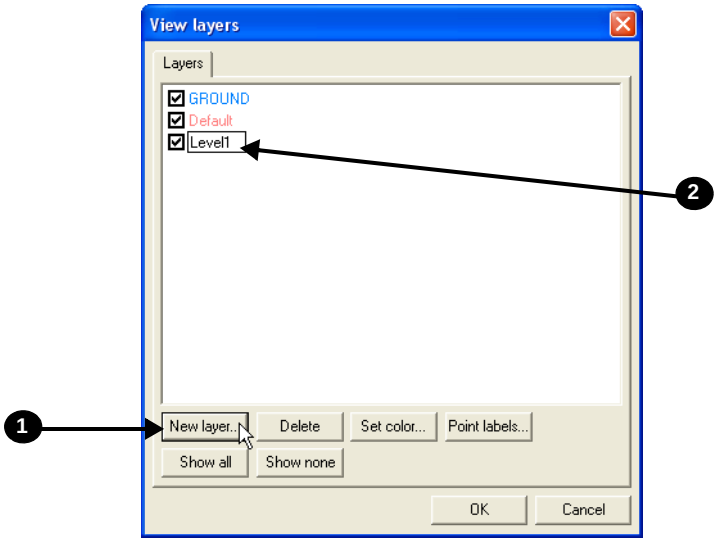


Figure 2-7. Add New Layer to 3D Project

When added, the new layer is "empty" until entities are manually added or imported. Use the procedures below to edit a layer's color or point attributes.

Setting a Layer's Color

Setting a unique color to individual layers in a 3D Project file helps to quickly differentiate between layers.

1. On the ***View layers*** dialog box, click the desired layer, then click **Set color**.
2. Select a color from the ***Color*** dialog box and click **OK** (Figure 2-8 on page 2-7).

The color of the layer's name changes to the selected color and the layer's information will appear in this color on the Plan View.

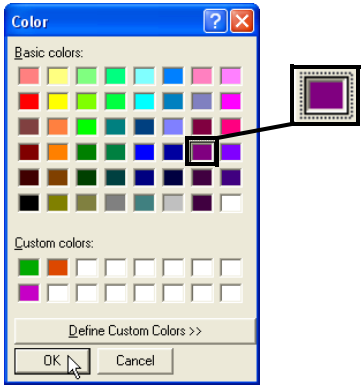


Figure 2-8. Select Layer's Color

3. To select a color not shown in the ***Basic colors*** grid, click **Define Custom Colors**. Define the custom color and click **Add to Custom Colors**.

Setting a Layer's Point Labels

Displaying point labels can help to identify points in the plan view.

1. On the ***View layers*** dialog box, click the desired layer, then click **Point labels**.
2. Check the desired label settings for the layer (or for all layers) and click **OK** (Figure 2-9).

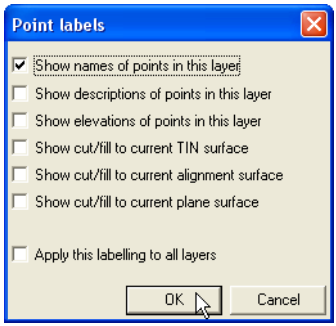


Figure 2-9. Select Point Labeling Parameters for Layer

Deleting Layers

Only delete a layer when the data it contains will never be needed again. If needed, save a backup copy of the file before deleting layers.

Deleting a layer will also delete all of its contents.

1. On the ***View layers*** dialog box, click the desired layer, then click **Delete**.
2. Click **OK** at the confirmation.

Calculating Geodetic and Grid Coordinates

The coordinate calculator utility in 3D Project files calculates map projection (grid) coordinates if given geodetic coordinates, and vice versa. 3D-Office calculates coordinates either directly using known geodetic coordinates or inversely using a known grid system.

If applying a geoid model to the elevation computations, a geoid file (*.gff) must be available. A geoid file provides information about the separation between the purely geometric, ellipsoidal representation of the earth and the physical model of the earth that closely approximates mean sea level (the geoid). For example, use a geoid model to obtain approximate mean sea level heights from GPS measured ellipsoidal heights.

Direct Coordinate Calculation

This procedure calculates grid coordinates based on given geodetic coordinates.

1. Click **Project ▸ Utilities ▸ Coordinate calculator**.
2. Select the projection and the geoid (optional) to use in the calculation (Figure 2-10 on page 2-9).

3. Click **Geodetic->Grid** to compute grid coordinates (Figure 2-10).

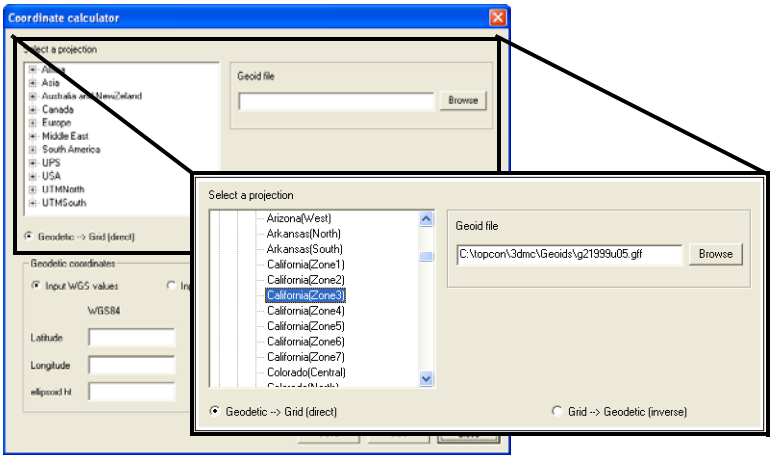


Figure 2-10. Select Projection, Geoid, and Transformation

4. Enter either WGS or Local geodetic coordinate values. Click the desired radio button, then type the *Latitude*, *Longitude*, and *ellipsoidal ht* value in each entry box (Figure 2-11 on page 2-10).
   - The input format for latitude and longitude is DDD.MMSSssss. Use negative values for West longitude and South latitude.
   - Enter the ellipsoid height in the same unit currently set for distances in the project.

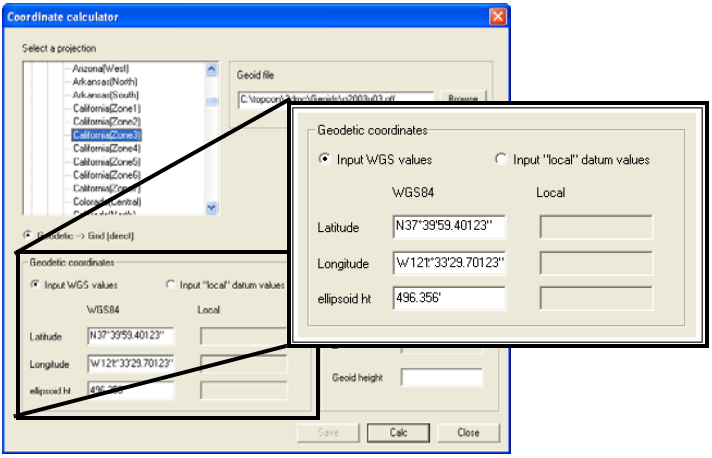


Figure 2-11. Enter Geodetic Coordinate Values and Geoid Height

5. Click **Calc**. 3D-Office calculates the corresponding geodetic coordinates (WGS or local datum) and the grid coordinates based on the selected projection (Figure 2-12).

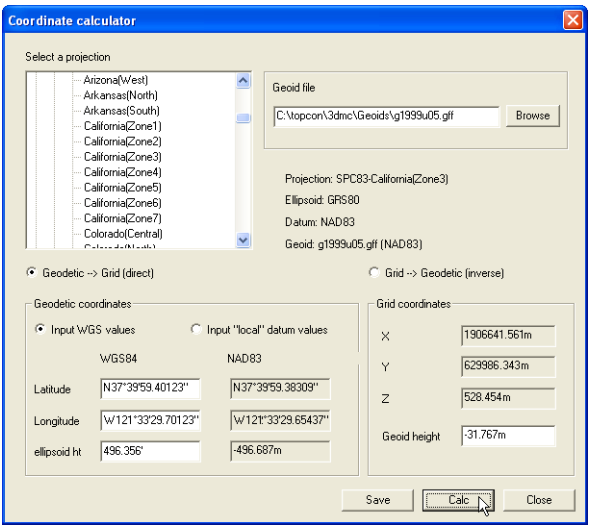


Figure 2-12. Coordinates Calculated

6. If desired, click **Save** to save the calculated grid coordinates as a text file.

Inverse Coordinate Calculation

This procedure calculates geodetic coordinates based on given grid coordinate.

1. Click **Project ▸ Utilities ▸ Coordinate calculator**.
2. Select the projection and the geoid (optional) to use in the calculation (Figure 2-13).
3. If the given coordinates are in a known grid system, click **Grid->Geodetic** to compute geodetic coordinates (Figure 2-13).

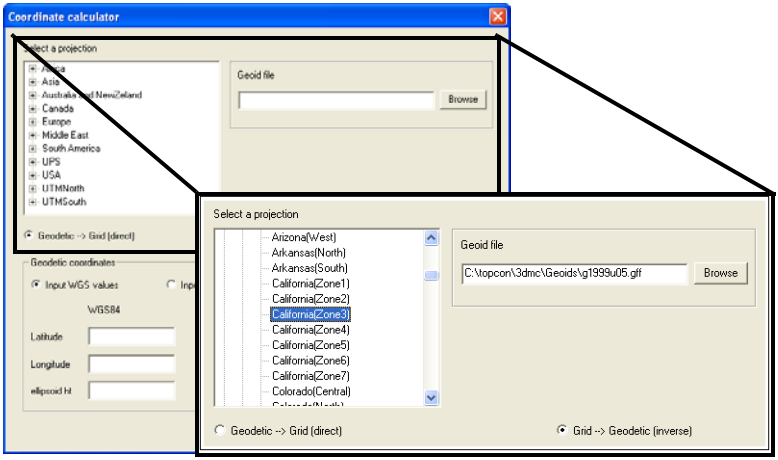


Figure 2-13. Select Projection, Geoid, and Transformation

4. Enter the XY grid coordinates and the elevation (Figure 2-14 on page 2-12).
   - If a geoid file has been specified, leave the *Geoid height* field blank; 3D-Office will enter the geoid height as determined from the geoid file.
   - If a geoid model is unavailable, manually enter the geoid height. Leave this blank if you do not know the value.

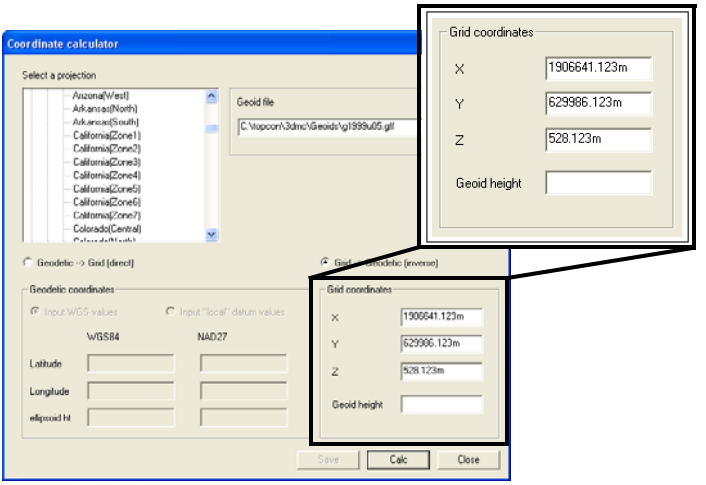


Figure 2-14. Enter Geodetic Coordinate Values and Geoid Height

5. Click **Calc**. 3D-Office calculates the geodetic coordinates and the geoid height (if applicable) (Figure 2-15).

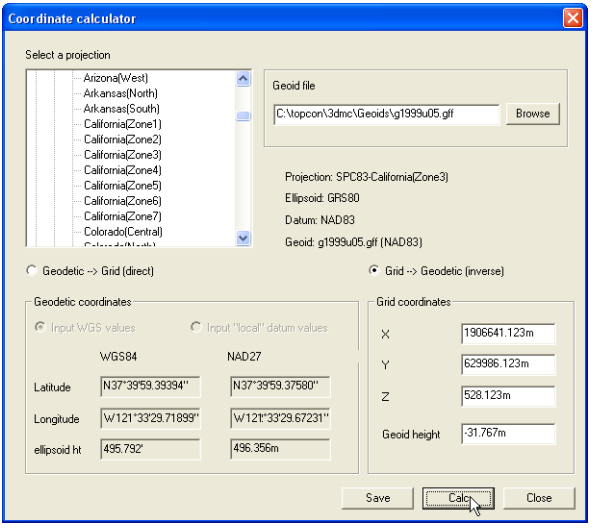


Figure 2-15. Coordinates Calculated

6. If desired, click **Save** to save the calculated geodetic coordinates as a text file.

Creating a Custom Projection

If a desired projection is not available, a custom projection can be created.

1. Click **Project ▸ Utilities ▸ Custom projection**.
2. Enter a name for the projection and select the type of project (Figure 2-16).
3. If needed, enter the following projection information, or keep the default values (Figure 2-16).
   - Central meridian
   - Scale
   - Latitude
   - East and North
4. Enter a description for the region, any notes, and select a datum (Figure 2-16). To create a custom datum, see “Creating a Custom Datum” on page 2-14 for details.
5. Click **Ok** to save the custom projection (Figure 2-16).

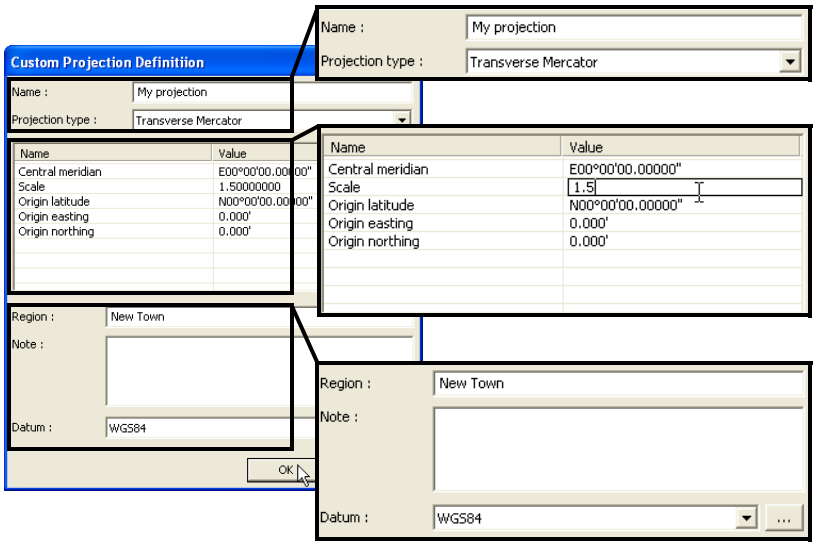


Figure 2-16. Create Custom Projection

Creating a Custom Datum

If a desired datum is not available, a custom datum can be created.

1. Click **Project ▸ Utilities ▸ Custom projection**.
2. Click the **Datum browse** button (Figure 2-17).
3. Enter a name for the datum and the following information (Figure 2-17) and click **Ok** to save the datum:
   - Name – enter a name for the datum
   - Ellipsoid – select the ellipsoid used to create the datum
   - DX, DY, DZ – enter the ellipsoid's shift parameters
   - RX, RY, RZ – enter the ellipsoid's angle rotation parameters
   - Scale – enter the scale to adjust the ellipsoid by
   - Notes – type any desired notes

These parameters (shifts, rotations, and scale) specify a coordinate transformation from the new datum to the selected ellipsoid (WGS-84) using the following equation:

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{WGS-84} = \begin{bmatrix} DX \\ DY \\ DZ \end{bmatrix} + (1 + Scale \cdot 10^{-6}) \cdot \begin{bmatrix} 1 & RZ & -RY \\ -RZ & 1 & RX \\ RY & -RX & 1 \end{bmatrix} \cdot \begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{new-datum}$$

Custom datums will be available in the Datum list on the ***Custom Projection Definition*** dialog box.

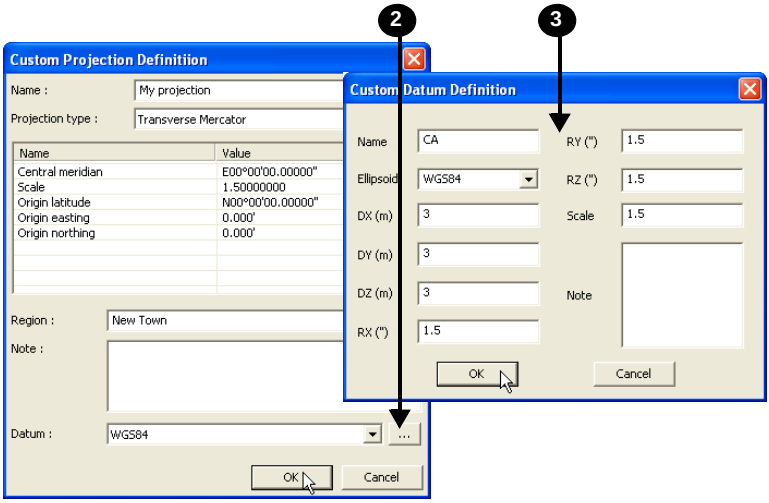


Figure 2-17. Create Custom Datum

Setting Project Units

The ***Project options*** dialog box sets the type of units to use for various quantities used in a 3D Project. When importing data contained in ASCII text, 3D-Office considers the data to be in the same units as that assigned to the project. To view or set the units for 3D Projects, click **View ▸ Options**.

On the *Units* tab, select the following information and click **OK** to apply the options to the file (Figure 2-18 on page 2-16):

- Select the linear unit to use for distances and coordinates, either Meters, US Survey feet, International feet, or Feet+Inches.

  If using Feet+Inches, all values will show as 1'11"1/2 where 12 inches equal 1 foot and any value smaller than an inch will show as a fraction of an inch.

- Select the decimal places to use for numbers with fractions of a measurement, from 0 to 4 decimal places.

- Select the angle unit to use, either DD°MM'SS", NDD°MM'SS"E, Gons, or DD.DDDD°.

- Select the grade format to use, either Percent (%), Run : Rise, or Rise : Run
- Select the area unit to use, either Square meters, Square feet, Acres, or Hectares.
- Select the volume unit to use, either Cubic meters or Cubic yards.
- Select the coordinate ordering to be displayed in 3D-Office, either North-East-Elev, East-North-Elev, or X-Y-Z.
- Select the stationing format to use, either 100.000, 1+00.000, or 10+0.00.

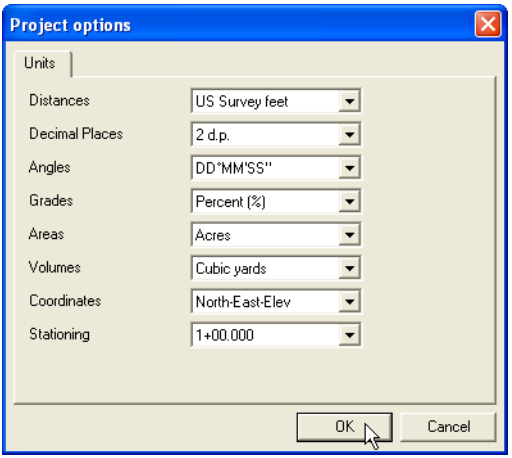


Figure 2-18. Set Project Options

Machine Equipment Files

From a 3D Project file, 3D-Office can create, edit, import, and export machine equipment files (*.mb3) for use in the System Five-3D control box or in Pocket-3D.

The Machine Equipment File provides vital information about the type of machine, the setup of the components on the machine, machine or component measurements, and radio configuration.

Creating and Editing Equipment Files

1. Click **Equipment ▸ New machine** to create a new equipment file. Click **Equipment ▸ Edit machine setup** to edit a current equipment file.
2. Type a name for the new equipment file (Figure 2-19), or select a current equipment file, and click **Open**.

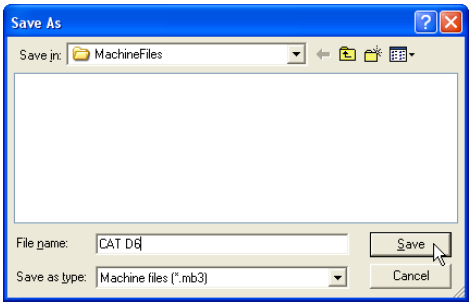


Figure 2-19. Create New Equipment File

3. Select the following information and click **Next** (Figure 2-20 on page 2-18):
   - Configuration name – if needed, type a new name for the equipment configuration
   - Machine type – the type of machine to be used in the configuration
   - Sensor – the type of sensor on the machine
   - Location – the location of the sensor on the machine

- Units – the units of measure used to specify the location of the sensor on the machine

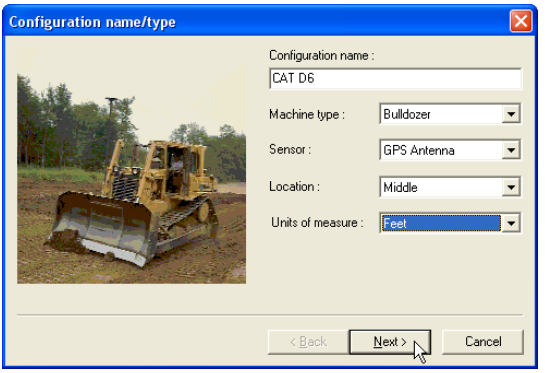


Figure 2-20. Equipment Configuration Type

4. Enter the measurements as described and illustrated on the screen (Figure 2-21), and click **Next**. The equipment measurements screen varies depending on the type of equipment and sensor selected.

NOTICE

Incorrect measurements or data entry errors directly affect grading accuracy. Take each measurement twice. and carefully review the entries before continuing.

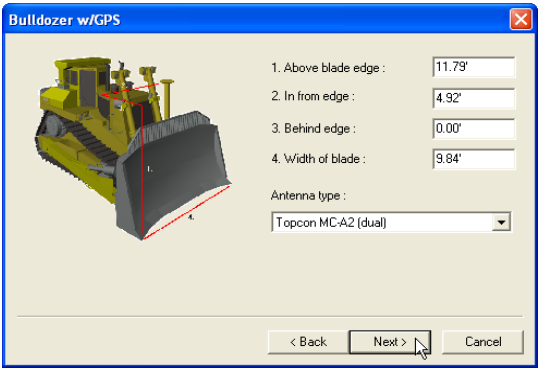


Figure 2-21. Enter Equipment and Sensor Measurements

5. For GPS/mmGPS applications, enter the maximum GPS errors allowed for measuring points. Click **Next**.

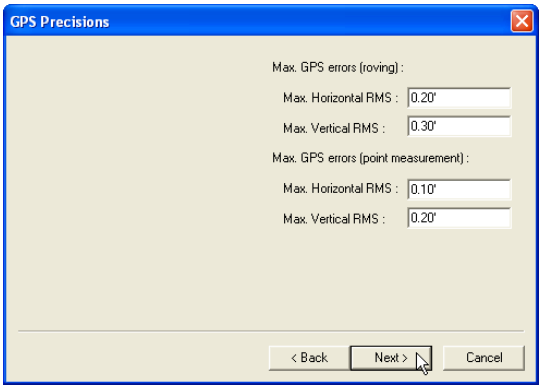


Figure 2-22. Enter GPS Point Measurement Precision Error Values

6. Specify the sensor configuration parameters (Figure 2-23), and click **Next**. The sensor options screen varies depending on the type of sensor selected.
7. Click **Finish** to complete the equipment configuration and save the file (Figure 2-23).

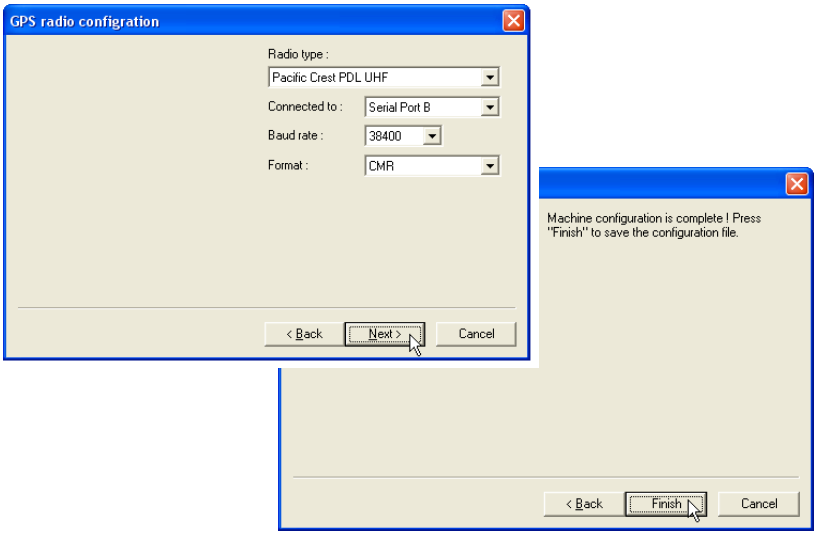


Figure 2-23. Enter Sensor Options and Save Equipment Configuration

Importing Equipment Files

Import equipment files from Pocket-3D to adapt an equipment type that was defined for another project.

1. Connect the Pocket-3D controller to the computer (see Appendix A for details). Run Pocket-3D on the controller.
2. With a 3D Project file open in 3D-Office, click **Equipment** ▸ **Import machine** ▸ **From Pocket-3D controller**.
3. On the ***Pocket-3D files*** dialog box, select the file to import and click **Open** (Figure 2-24). The file type is automatically selected.

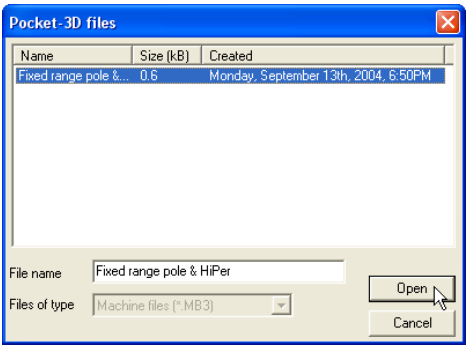


Figure 2-24. Select and Open Pocket-3D Equipment File

Exporting Equipment Files

Some activities, such as initializing a GPS+ system or starting an LPS station, require Pocket-3D to be loaded with an equipment file before proceeding. 3D-Office can export equipment files to Pocket-3D for use on the jobsite.

1. Connect the Pocket-3D controller to the computer (see Appendix A for details). Run Pocket-3D on the controller.
2. With a 3D Project file open in 3D-Office click **Equipment** ▸ **Export machine** ▸ **To Pocket-3D controller**.
3. Select the machine file to export and click **Open** (Figure 2-25 on page 2-21). 3D-Office connects with the Pocket-3D controller.

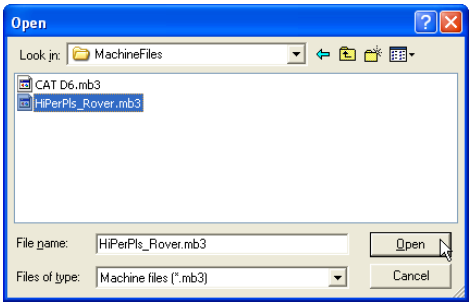


Figure 2-25. Select Machine to Export

4. On the ***Pocket-3D files*** dialog box, enter a new file name or keep the default file name (Figure 2-26). The file type is automatically selected.
5. Click **Save** to export the selected equipment file to the Pocket-3D controller's memory (Figure 2-26).

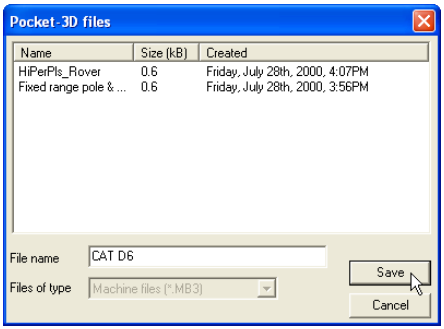


Figure 2-26. Save File to Pocket-3D Controller

Measuring a Distance or Area

The measuring tool computes distances between points and areas of polygons. For example, this tool can be used to determine the length along a route or to measure the area of a building pad.

1. With a 3D Project file open, click **Tools ▸ Measure distance/ area**. A check mark displays next to the menu option.

   The polygon cursor is automatically selected and a pop-up box displays running length and bearing.

2. Click at a point to begin the measurement. Move the polygon cursor to the next point and click. Continue in this manner until the desired distance or area has been delineated.

   - When measuring a distance, the length of the drawn line drawn displays (Figure 2-27).

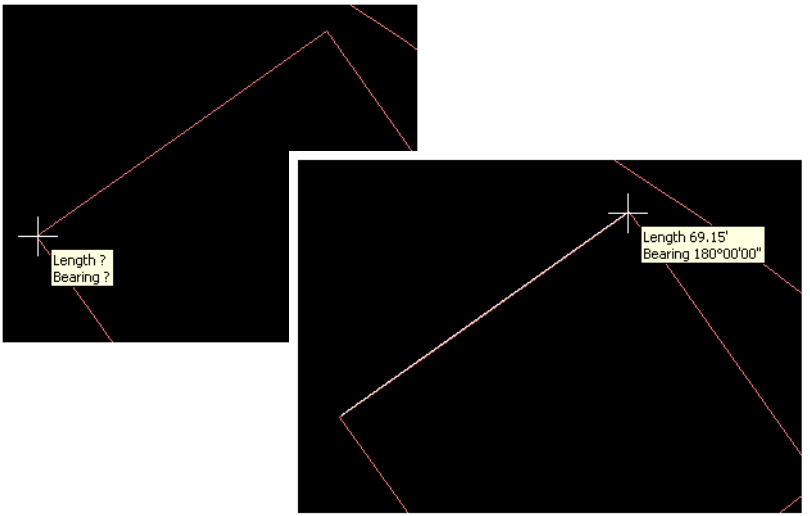


Figure 2-27. Measure Distance

   - When measuring an area click three or more points, then return the polygon cursor to the starting point to complete the polygon. The polygon perimeter length and its area display in the pop-up box (Figure 2-28 on page 2-23).

Figure 2-28. Measure Area

3. To quit this function, click **Tools ▸ Measure distance/area** or click one of the selection tools, or press **Esc**.

Notes: