# Terramodel Software for Surveying

**FLEXIBLE SURVEY SOFTWARE FOR A CHANGING WORLD**

Today's surveying environment is changing fast, new technology emerges at frequent intervals, increasing the volume and variety of data that you need to contend with. Surveying instruments—GPS, total stations, and digital levels— are used together to provide data for surveying projects, and you have to cope with all of the data.

Trimble's powerful Terramodel® software is an integral component of the Trimble Office software suite. The system provides a complete solution for survey data processing, site and infrastructure design, plus construction project data management. Used internationally by surveyors, engineers, and contractors alike, Terramodel seamlessly communicates with all Trimble instruments and data collectors, as well as many third party data collection systems, design software, and CAD packages, to provide you with all the flexibility you need in today's changing world.

**⊗ Trimble**™

**TERRAMODEL DELIVERS SIGNIFICANT TIME-SAVINGS** through the provision of solutions to survey tasks, CAD, and drafting in a single integrated system. Data can flow from the original survey, through design to construction stakeout or machine control without the need for data exchange or the reformatting of information. This eliminates errors, improves quality and traceability, at the same time as increasing productivity. The system's modular approach allows you to utilize only the components you require at a given time, but gives you the flexibility to expand to meet new needs as they arise. Terramodel is the ideal package for all survey, design, and construction work. These Technical Notes focus on how Terramodel can be used for survey applications.

### SURVEY

The Terramodel software is ideal for a range of survey work including the processing of (conventional or RTK GPS) topographic surveys and control networks, as well as CAD editing, and digital terrain modeling. The Terramodel software is built around the concept that 3D points form the basis of a surveying project. Each point has properties of position, elevation, layer, color, name, and a unique point number/id.

The benefits of Terramodel's unique dynamic database for the surveyor are enormous. Creating a project is simple and straightforward. Raw survey data is automatically reduced to points and lines and is contained in a single project file. The final drafting is a reflection of your actual survey data.

Terramodel provides the following features for surveyors:

- Data reduction and control network computations
- Automated drafting
- Legal, cadastral, and boundary surveying tools
- Large data set processing e.g., Lidar or Swath bathymetry
- Building interior, elevation and architectural surveys
- Earthworks, mine, and waste cell design

- Deformation monitoring tools
- CAD editing, plotting, and digitizing
- Surface measurement, volumetrics, and contouring tools
- Profile and cross-section creation
- 3D Visualization—rendered scenes and AVI movies
- GIS support—Terramodel data can be used in GIS systems such as ArcView™

### DESIGN

Terramodel gives civil engineers a complete tool set for design that enhances your capabilities and productivity from the initial survey to final construction. Whether you are designing roads, bridges, railways, sewers, surfaces, commercial or residential sites, or new infrastructure Terramodel supports you with advanced design concepts by modeling a project using plan, profile and cross section views of the project. And the software easily handles hundreds of thousands of points and seamlessly integrates with surveying and construction by sharing all data in a single project file.

### CONSTRUCTION

The Terramodel software is ideal for the construction site. The software uses a single file, project-model database that supports all aspects of heavy construction—from estimation to the finished project. It provides you with one tool set that can be used for surveying and engineering tasks as well as construction tasks such as calculating cut/fill volumes, creating stakeout data and reports, calculating mass haul and construction phasing, preparing data for machine controlled construction, and producing as-built survey records during the construction phase. And because the software uses true models rather than just drawings, designs are straightforward to construct on site, allowing for work to be completed faster and more accurately. For more information about how Terramodel can be used for construction applications, see the Teramodel Software for Construction Technical Notes.

## INTRODUCTION

Terramodel is a software system comprising of multiple modules that can be purchased individually or as Solution Paks combining several modules. Adding modules to an existing system is easy, just use the form in Terramodel to email/fax your order. Trimble will provide you with the upgrade costs to activate the modules you need—it's that simple.

The Terramodel Field Data Module (FDM) is the entry level Terramodel system. FDM is provided as standard with all Trimble conventional total station instruments, and delivers a range of support, data management, and application functions. Data can be transferred to and from Trimble instruments in addition to a wide range of third-party instruments, and software systems. Tools are provided for: the computation, display and analysis of survey data, graphical preview, survey drafting, report generation, and data queries. FDM can be upgraded, by the addition of other Terramodel modules, to meet a wide range of survey tasks.

The following table shows the modules and recommended Solution Paks for surveyors.

| Modules | Recommended Solution Paks | | |
|---|---|---|---|
| | Survey | Design | Survey and Engineering |
| Field Data Module | • | • | • |
| CAD Module | • | • | • |
| Contour Module | • | • | • |
| COGO Module | • | • | • |
| Site Design Module | | • | • |
| Road Design Module | | | • |
| ASAP Module (Automated Sheet Assembly and Production) | | | • |
| Sewer Design and Analysis Module | | | |
| Hydrology Module | | | |
| Image Manager Module | | | |
| Terramodel Visualizer Module | | | • |

## DATA COMPATIBILITY

Terramodel provides all the tools you need for data exchange in one package. Data can be imported from a wide range of third-party systems including:
- Raw survey data
- ASCII coordinate data
- Road geometry data
- Graphical exchange files (DXF, DWG, DGN)
- Geo-referenced and normal image data files (BMP, TIF, JPG)
- MX (MOSS) files, SDMS files, HecRas files

Exporting to the same third-party systems is just as flexible. You can export:
- Raw survey data
- ASCII coordinates
- Stakeout information
- Road design
- Image data
- Graphical exchange files (DXF, DWG, DGN, MX)

## SURVEY DATA REDUCTION AND COMPUTATIONS

As well as traditional survey reduction computations, Terramodel provides automated least squares network adjustment for control and monitoring projects.
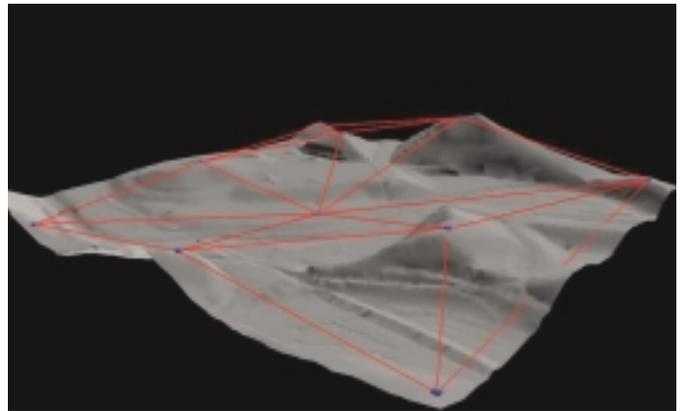


## REPORTING

Terramodel provides you with all the reporting tools you need to maintain quality. Standard reports include:
- Control computations and adjustment
- Detail reduction and coordinate listings
- Geometry reports
- COGO: Areas, distances, and bearings
- QA checks
- Stakeout control and cut sheet reports
- Volume reports

## CAD DRAFTING AND ANNOTATION

Powerful CAD tools allow you to produce professional plans quickly and easily. The standard CAD interface allows you to work with layers, colors, and linestyles. However, unlike most CAD systems, Terramodel stores attribute and feature code data with each point. This allows you to do global editing, enquiries, listing, or drafting. Additionally, attribute data can be used to create text annotations. The raw survey data, design data, and CAD data are integrated parts of the same database contained within a single project file. Changes to the survey data are immediately reflected in the DTM and CAD graphics, and point associated text is updated automatically.
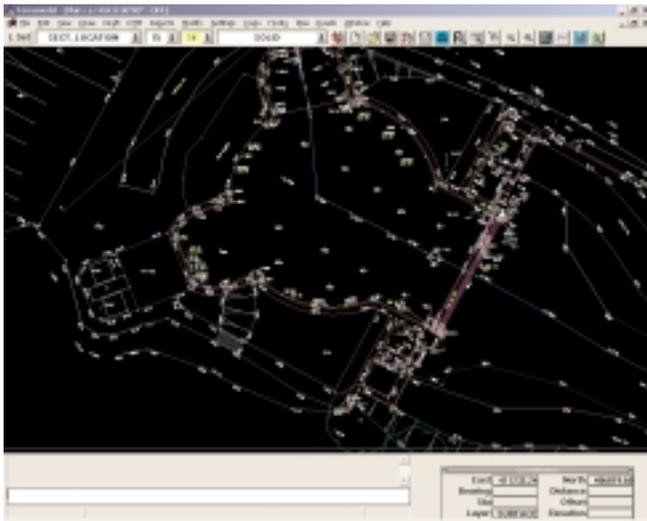


**CAD editing tools** include trim, extend, join, connect, break, move, rotate, and offset.

**CAD drafting tools** include sheet layout, drawing annotation, sheet titles, hatching, digitizing, and plotting

**Reference files** allow you to display multiple projects and previous surveys as background data to the current survey. Objects can be selected and copied from one project to another, or simply used as a basis for measurements or reports.

**Image management tools** let you organize background data, digital map tiles, quad sheets, and aerial and terrestrial photography.

Creation of fully annotated survey drawings is easy with the automated drafting tool AutoDraft. AutoDraft produces drawings from feature coded survey data based on a feature code library and associated attributes.

## PLAN AND ELEVATION DRAWING PRODUCTION

Building surveys have never been quicker. Terramodel creates plans from data captured using Trimble DR and DR200+ Total Stations.
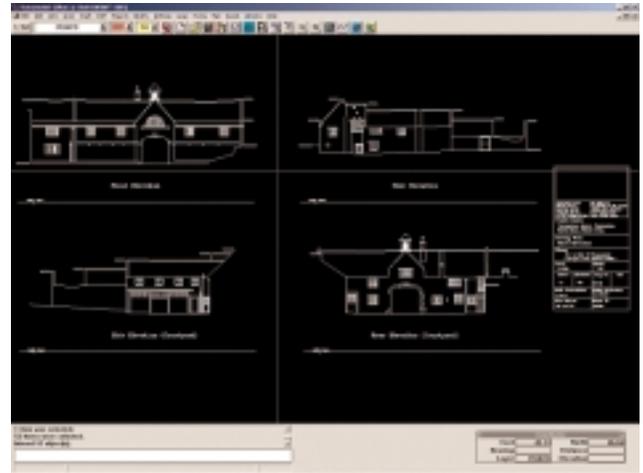


Data in the plan view is rapidly converted into elevation drawings. Digital imagery of architectural detail can be incorporated to provide the finishing touch.

## DIGITAL TERRAIN MODELING

Terramodel provides superior Digital Terrain Model (DTM) creation and manipulation tools for large projects—Terramodel is capable of forming TIN DTMs with up to 8 million points. This makes it the package of choice for manipulating data from airborne or terrestrial laser scanners, photogrammetry projects, and hydrographic multibeam bathymetry systems.
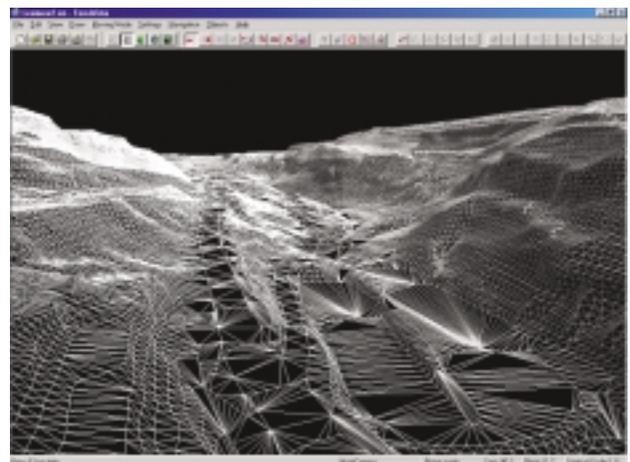


The intelligent DTM tools give you flexibility where you need it and also save you time by automating the creation of DTMs, and the sub-setting of large projects.
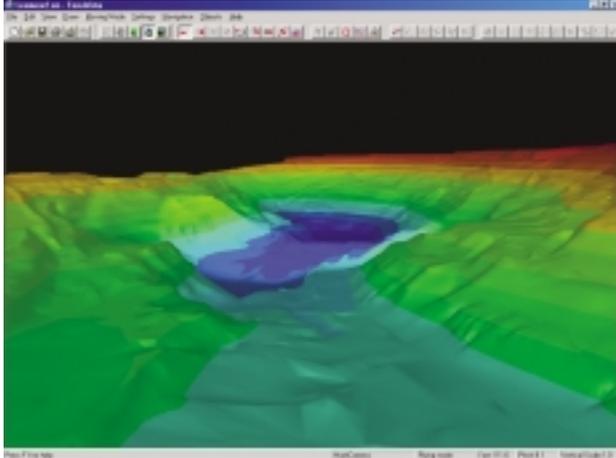
The DTM formation process works with the following controls:

- 3D breaklines
- DTM boundaries
- Dead zones of the model
- Link distances, flat triangles and edge angles

New DTM boundaries can be formed, and triangles deleted or switched to form a terrain model that is more representative of the surface.

DTM functions include:

- Every layer can be an independent DTM
- Multiple layers can be grouped to form a multi-layer DTM
- Single step, curve fitted contours with automatic or manual annotation
- Quick Profile for terrain evaluation
- 3D visualization of the surface model
- Surface area computation
- Volume measurements can be made between DTMs or to a datum, with or without breakdown by elevation slice or depth of cut
- Fully annotated cross and long sections through multiple surfaces
- Terramodel automatically creates the cross-section view and a sheeted layout of multiple cross-section drawings
- Cross-sections are created against a horizontal alignment and cross-section locations placed at critical points and regular intervals along the alignments
- Cross-sectional areas and volumes can be computed
- Underground and overhead utilities can be automatically placed in the cross-section drawings – e.g. pipes, cables, etc.

## 3D INTERACTIVE VISUALIZATION

Using Terramodel you can view your DTM interactively from any position and distance. Surface color is controlled by point color—features can be colored differently resulting in realistic visualizations of the survey. Even more realistic 3D views can be created using surface rendering techniques and the placement of 3D objects in the scene. Alternatively, georeferenced aerial photography can be draped over the model as shown.
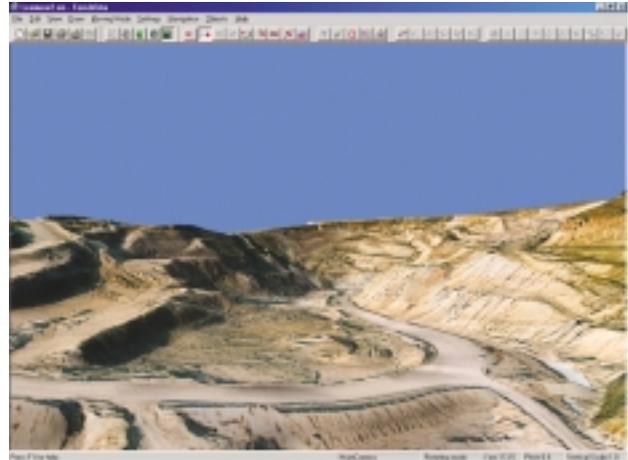


Plan view georeferenced images can be generated in the visualizer and superimposed on the CAD graphics providing a color relief model.

## ANNOTATION AND LEGAL PLAN PRODUCTION

Terramodel is the ideal tool for producing cadastral or legal plans, and boundary surveys. Lot lines can automatically be labeled with bearings and distances and the annotations dynamically update as points are moved or edited. Closed lots can be labeled with the enclosed area and boundary length. Again these automatically update to reflect changes in the database.

Terramodel automatically creates tables of lot corner positions, lot lines, and other important features. Terramodel will even create legal description reports of boundary surveys, eliminating time consuming tasks.

## GIS SYSTEMS COMPATIBILITY

Terramodel comes with a set of tools that allow Terramodel data to be used in the ArcView environment. In ArcView, the data can be modeled, contoured, and visualized in 3D. It can also be listed, queried, and edited with standard ArcView tools.

## RELATED TRIMBLE PRODUCTS

The Terramodel software can be used in conjunction with these Trimble products to give you more flexibility and to open up new areas of work:

- The Geodat® Win controller is a graphical field computer that utilizes the Terramodel database. Data can be stored, modeled, contoured, edited and viewed in real-time.
- For GPS data reduction, baseline processing, RTK data manipulation and geodetic transformation, Trimble Total Control™ and Trimble Geomatics Office™ are additional products in the Trimble Office suite of software.
- The 5700 GPS Total Station® and 5600 Total Station systems both use Terramodel data in the field for fast, accurate, single-person stakeout work. Field data (conventional and RTK GPS) from these systems can be downloaded into Terramodel.
- BladePro® 3D is a 3D machine control solution using GPS or ATS total station technology. The Control Box software reads Terramodel project files and interactively displays data in a format suited to machine operators. The machine position is used in combination with the Terramodel database to control the machine blade in terms of lift and tilt. Updates of up to 10 times per second provide a grade control system capable of millimeter precision.
- Design data from Terramodel can be used by the SiteVision™ GPS machine control system and the Trimble Survey Controller™ software for construction applications.
- When Terramodel is coupled with the Trimble HYDRO*pro*™ software, you have a complete turnkey solution for marine surveying and construction.

## CONCLUSION

Terramodel provides you with a complete solution for your survey data processing, design and drafting needs, automating many of the tasks so you can save time and money.

The flexibility of being able to add modules when you need them gives you the ability to carry out all types of survey work without having to learn how to use multiple software packages. The single software system also means that you eliminate data loss that is typically associated with transferring information between software packages.

There are fewer steps. There are fewer opportunities for mistakes. There is but one company for all your surveying needs.

## MINIMUM SYSTEM REQUIREMENTS

Terramodel will run on:

- Any Pentium-based computer
- Windows 95, 98, ME, NT 4.0, 2000 or later
- 800 x 600 resolution and 256 colors

Computer aided design and visualization are extremely demanding on a computer's processor, memory and graphics adapter. For huge data sets, Trimble recommends the fastest processor, the maximum amount of memory, and fastest graphics adapter available.

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