

Trimble RealWorks Survey is editing and viewing software for 3D point-cloud data. The software empowers surveyors and engineers by providing a unique blend of tools and features for producing compelling deliverables from laser scanner data.

Trimble® RealWorks Survey™ is part of an integrated software suite for surveyors and engineers that takes advantage of the rich point cloud data sets provided by today's advanced 3D laser scanners. The software incorporates a series of precision tools and empowering features particularly suited to civil survey, building, heritage, forensic and other applications, and allows surveyors and engineers to produce numerous 2D and 3D deliverables for direct output or export to AutoCAD and MicroStation.

RealWorks Survey is Trimble's full-feature software for registering, visualizing, exploring and manipulating as-built or scene point cloud data, and for producing compelling 2D and 3D deliverables for immediate output or export to your preferred CAD package. With numerous innovative and unique features, Trimble RealWorks Survey software is exceptionally easy to learn, easy to use, intuitive, and flexible.

RealWorks Survey is complemented by **RealWorks Survey Lite**, a compact version that allows surveyors and engineers to offer enhanced 2D and 3D deliverables for clients to view, manipulate, print, and partially edit in the Lite software. RealWorks Survey Lite is also the ideal tool for learning the basics of point cloud data editing. Owning multiple licenses is an affordable and efficient way to enter the 3D laser scanning business.

To further enable surveyors and engineers to reach new levels of success, Trimble provides **RealWorks Viewer**, a complimentary utility that allows final clients, colleagues

and partners to view 3D deliverables in the native RealWorks environment.

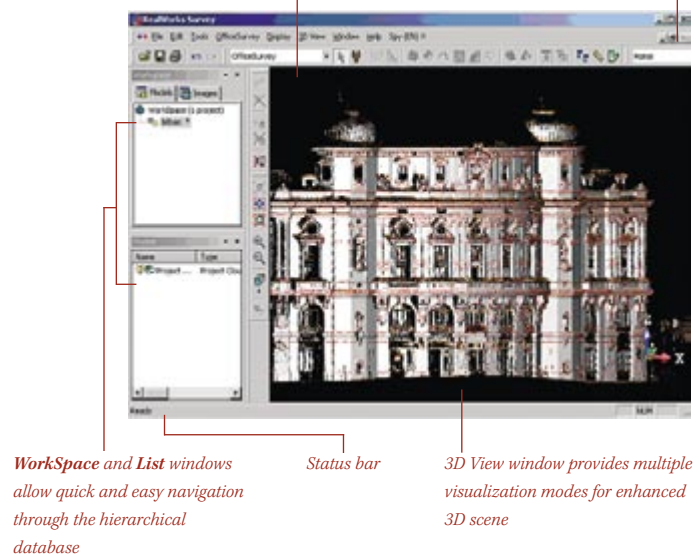
INTUITIVE VISUAL INTERFACE AND WORKFLOW

The comfort that comes with working in a familiar environment

RealWorks Survey provides a familiar Microsoft® Windows® look and feel. When you start a RealWorks Survey session, you see the main window with its active sub-window components. After you open a project, these components will activate, so you can start working with them right away. You can customize the settings of the different components inside the main window. By default, a RealWorks Survey session looks like the example below.

Tool Bars put common actions just a mouse click away

Familiar standard Windows interface





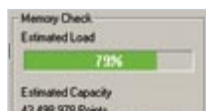
Simplicity of workflow and ease of use is a prime concern for all of Trimble's software solutions. RealWorks Survey follows in this tradition by providing an advanced tool set with unique step-by-step functionalities to ensure ease of learning and use, in addition to real productivity gains. Let RealWorks Survey guide you to the desired result with minimum risk and minimum delivery time.

LARGE DATABASE MANAGEMENT

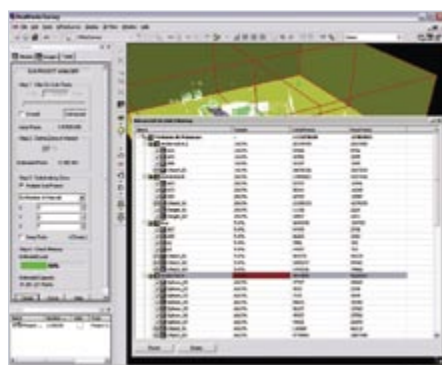
Manage hundreds of millions of points with ease

RealWorks Survey manages huge point databases with ease, and this capability enables users to subdivide large projects into data subsets in a variety of ways. Users can precisely control which points are loaded into memory and thus which points are available for editing with all the regular tools. These subsets (also called sub-projects) may be created based on scan, station, or zone of interest.

Users can visualize on screen the status of on-disk filtering, choose zone ratios for sub-division, and check for memory capability, all in the unique RealWorks step-by-step workflow. Resulting subsets can then be easily edited in a computer-memory-optimized environment.



Sub-project management on screen



Dynamic memory checking

REGISTRATION

Cloud-, target-, or known-point-based methodologies; analysis, quality control, and reporting

In RealWorks Survey, users can easily register scans together using one of several different methods: cloud-based, target-based, or via geo-referencing.

For cloud-based registration, users pick the same points in two different scans with the option of refining the registration in a second stage. In target-based registration (when appropriate), users benefit from fully automatic station-to-station registration, as well as quality control and reporting. Target-based registration applies to traverse/station setup and free stationing/resection, as well as un-leveled stationing.

For registration via the geo-referencing tool, users can assign known coordinates to various points in all scans to be registered. For example, the points can be target centers, known points, or survey points from other instruments. To further enhance the registration process, the Target Analyzer tool can be used to do one or all of the following: check if there are enough targets or survey points, modify or delete those



Registration and report on screen

that are incorrectly fitted, create additional targets in the point cloud where such a target is identified visually as having been scanned. For results reporting, use the Entity-Based Registration Report tool to generate a full quality control report in .rtf format.



Registration report in .rtf

ADVANCED INSPECTION TOOLS

Compare as-built to design, pre-event to post-event, and much more

Perform multiple inspection tasks with powerful RealWorks Survey tools: Twin-surface inspection, Surface-to-model inspection, and Surface-to-curve inspection. Generate

and visualize inspection maps using the customizable color bar. Obtain graphic visualizations of gaps and deformations. You can also import profiles and geometric primitives from a CAD design file in .dxf or .dwg, as well as export graphic files in .dxf and .dgn.

A variety of robust results can be extracted directly from the Inspection Map:

- Horizontal and vertical cross-sections
- 3D Point / 3D Polyline
- Volume / Surface calculation
- Iso-curves expressing deviations between inspected surfaces
- Mesh colored with inspection colors

And you can print your results directly using the integrated print-out interface.

Ideal for monitoring applications such as civil engineering and mining, these tools are designed to give surveyors and engineers powerful, compelling deliverables that give new meaning to the words “service provider”.

MULTI-ORTHOPROJECTION

Produce series of orthoimages on successive facades with this unique tool

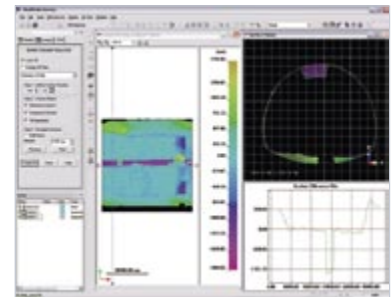
The multi-orthoprojection tool allows you to create aligned multi-orthoimages on successive facades of a building. You can either create or import a drawing, and then extrude the segments corresponding to the facade walls along the Z axis to define the successive projection planes. The resolution of the orthoimages is user-definable. You can choose to preview each orthoimage, and create them one by one or all at once. The final results can be exported to a DXF file with references to each orthoimage exported as a geo-TIFF file.

This unique RealWorks Survey tool represents an extensive productivity improvement in orthoimage generation.

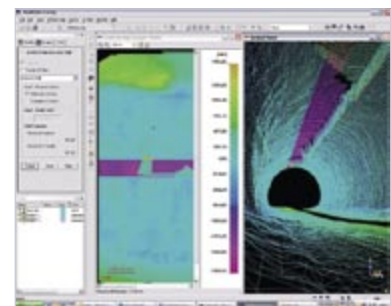
CONTOURING

The flexible way to produce contours

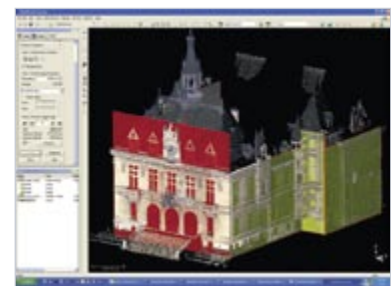
Contouring is based on measured points (whatever the number of captured points) to ensure the best fit achieved and that a real contour is produced. No pre-sampling or meshing is required; so workflow speed is dramatically increased. This impressive tool enables you to produce standard and 3D topographic maps that convey information at the highest level. Contours can be printed out in 2D or 3D view, or exported to AutoCAD and MicroStation. The choice between direct print-out with RealWorks integrated print interface, and export to AutoCAD or MicroStation, is always available at various stages of deliverables output.



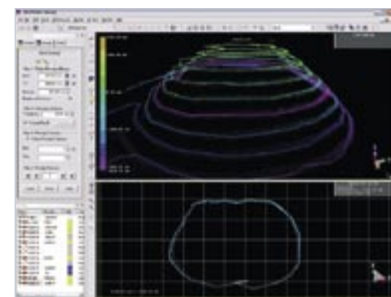
Tunnel Inspection Map.



Tunnel Inspection Map with mesh



Extruding successive façades in RealWorks



Contour generation on screen



PROFILES / CROSS-SECTIONS

User-definable profiles for inspection and monitoring, and unique profile generation with EasyProfile™

In RealWorks Survey, constraints can be applied when generating profiles and cross-sections. For example, tunnel analysis data can accurately follow the tunnel center line.

When a constraint is applied, three views are automatically generated:

- 3D view in which the profile and the data are displayed;
- profile depth view in which these depth values are developed in a 2D plane and fitted by a 2D polyline,
- cross-section view in which 2D polylines fitted to each cross-section are displayed.

With these three data sets, users are able to generate a complete report on a tunnel or highway inspection.

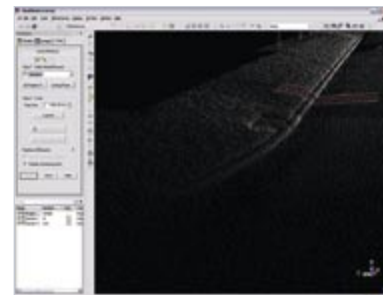
RealWorks Survey includes the EasyLine™ tool, which generates continuous single-plane polylines out of a point cloud, and the EasyProfile™ tool, which uses a pre-positioned profile (fitted to a cross-section of the point cloud) to track through the point cloud. Internally generated or imported profiles can be interactively positioned relative to the point cloud by using the Profile Matcher tool. When activated, EasyProfile uses the matched profile to track through the cloud in both directions. Feature lines are then automatically extracted according to break-points in the guide profile. Get one step closer to fully automatic creation of 2D drawings out of 3D data. EasyProfile automatically extracts rail tracks, side walks, street profiles, road median barriers and almost any other linear object.

VOLUME AND SURFACE CALCULATION

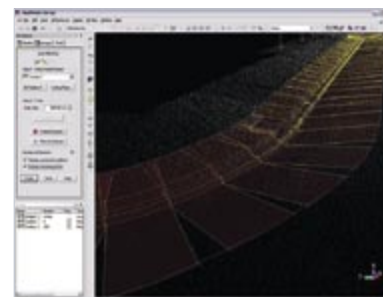
Super-fast calculations to keep work on the move in construction and mining

RealWorks Survey generates volume calculations based on a high-precision grid method, whatever the density of the point-cloud. Surface area and volume features are integrated into RealWorks Survey results, which are displayed directly on screen. Volume calculation includes cut and fill volume figures and can be calculated either between a scanned surface and a user-defined plane or between two scanned surfaces, the user being able to define the grid density. The scanned surface can be represented either by a point cloud or by a triangular mesh. The final calculated results can also be exported as slices i.e. automatically generated polylines at user-defined intervals.

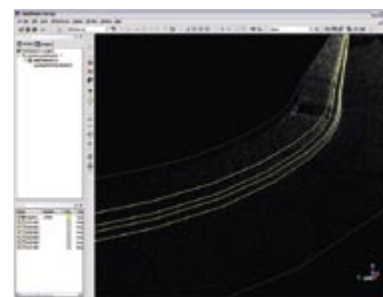
As always, users can choose direct print-outs, Word and Excel file generation, and export of data to AutoCAD and MicroStation.



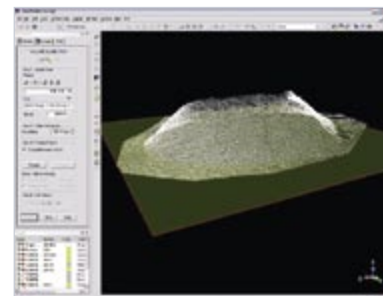
Guide profile fitted with Profile Matcher



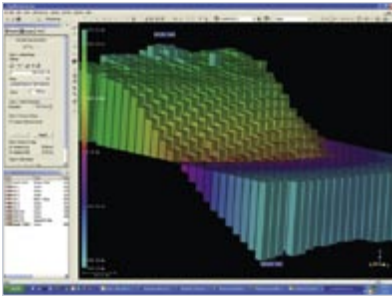
Auto tracking with EasyProfile



Final profiles generated by EasyProfile



Preparing a volume calculation



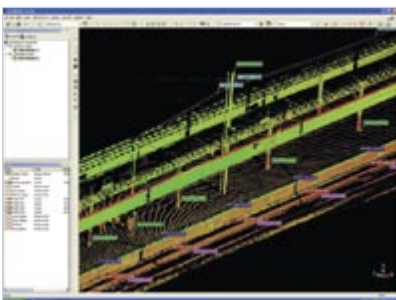
Volume calculation in 3D on screen

FEATURE CODE

Feature coding at your desk ... flexible and intuitive too

An effective way to unify the organization of a drawing and its labelling is via feature coding. RealWorks Survey enables users to either import existing feature code libraries or create their own. Working with 3D data sets generated by 3D scanners then becomes as easy and precise as measuring on site with traditional surveying instruments. Just pick points through the cloud. And if you miss an item, just return and insert—numbering will increment automatically. Feature codes can be exported directly to AutoCAD and MicroStation, or linked to a standard catalog.

Through feature coding in RealWorks Survey, a survey team's productivity (data collection and editing) increases by up to four times, and sometimes more (source: Trimble customer application analysis – RealWorks Survey used in combination with a GS Series scanner).

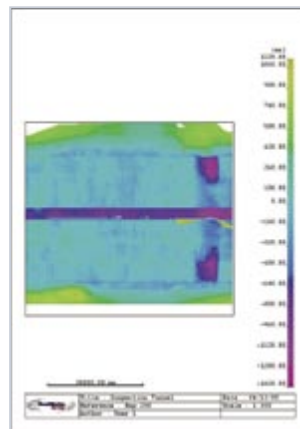


Selecting features in RealWorks

DIRECT PRINT-OUTS, EXPORT TO CAD, TEXT AND SPREADSHEET REPORTS

Compelling, graphic deliverables available on paper in minutes ... or export to your CAD package

All graphic results are available for printing and exporting directly from RealWorks Survey, using the print-out interface, including legend, title, map scale and inset. Results are also exportable into major CAD packages, such as AutoCAD and MicroStation. Written reports in text, Word and Excel formats can also be generated. RealWorks Survey allows maximum flexibility in your reporting requirements.



Cross-section print-out



Inspection Map print-out

... AND MUCH MORE

These are just a few of the things you can do with RealWorks Survey

The above features are just part of what RealWorks Survey has to offer. A full feature listing is provided on the following pages.

SPECIFICATIONS

Features available in RealWorks Survey **Lite** are marked **Lite**

Subproject Manager for Large Database

Management **NEW in V5**

- Create subprojects using
 - Overall on-disk filtering
 - Advanced on-disk filtering
- Define zone of interest
- Subdivide by zone
- Activate/Reload subproject
- Backup and restore subproject
- Merge subprojects

Registration / Geo-referencing

- Fully automatic global registration of multiple scans
- Survey target recognition
- Target analysis and correction
- Automatic Refinement System (A.R.S.™)
- Geo-referencing:
 - Data import from traditional surveying equipment **Lite**(Total station, GPS, etc.)
 - Advanced local/global frame creation (manual/automatic) **Lite**
 - Point-picking or survey target-based mode
 - Customizable text report available (.rtf file) **Lite**
 - Create 3D-point geometry version of targets for use in OfficeSurvey™ mode **New in V5**

OfficeSurvey Inspection Tools

- **Twin-surface inspection**
- **Surface to model inspection**
- **Surface to curve inspection (previously 1D inspection)**
 - Generate and visualize inspection map using customizable color bar
 - Inspection map analysis (Inspection Analysis Tool)
 - Cutting plane generation
 - 3D-point/3D-polyline creation
 - Volume/Surface calculation
 - Deviation iso-curve generation **New in V5**
 - Colored mesh creation **New in V5**
 - Section-area-based deformation analysis **New in V5**
 - As-built / as-designed comparison
 - Graphic visualization of gaps and deformations
 - Import of profiles and geometric primitives (.dxf, .dwg)
 - Export as graphic file (.dxf)
 - Inspection Map Export (TIFF, DXF, DWG) **New in V5**

OfficeSurvey™ Orthoprojection: Lite

- Plane-based projection
- User definable resolution
- Orthoprojection modes:
 - Elevation
 - Normal shading
 - Returned laser intensity
 - True color
- Preview mode
- Export as TIFF images

OfficeSurvey Multi-orthoprojection

- Projection planes determined from floor plan
- User definable height of projection planes
- User definable resolution
- Orthoprojection modes:
 - Elevation
 - Normal shading
 - Returned laser intensity
 - True color
- Preview mode for each projection
- Creation mode for all orthoprojection at same time
- Export as DXF file referencing to TIFF images

OfficeSurvey Contouring

- Create contours from mesh or directly from cloud
- Elevation range definition
- Contour creation preview
- Best fit through all points
- Preview mode

OfficeSurvey Profiles / Cross-sections

- Create sections from mesh or directly from cloud
- Tunnel center line and profile import (.dxf, .dwg)
- Definition of cutting positions by interval or imported segments (.dxf, .dwg)
- Set cross-sections perpendicular to horizontal plane or to center line
- Automatic polyline creation
- Thickness of profiles with tolerance definition
- Preview mode

OfficeSurvey Volume and surface calculation

- Grid-based method
- User-defined resolution
- Negative volume calculation
- Positive volume calculation
- Volume between scanned surface and user-defined plane
- Volume between two scanned surfaces
- Automated associated polyline generation
- Preview mode

OfficeSurvey EasyProfile

Extract profiles by setting 2D polylines on clouds, and tracking through break lines

OfficeSurvey Profile Matcher

Move and scale profiles within a 3D scene
Determine thickness
Create profiles

OfficeSurvey Edge detection

Discontinuities detection **Lite**
Discontinuity tagging **Lite**
Sub-point cloud creation **Lite**
Automatic creation of 2D drawing (using EasyLine)
Export in major CAD packages

OfficeSurvey Feature Code Sets

User library import
Feature code library creation/editing/export
Snap-to-measured-point mode
Direct export to major CAD packages

OfficeSurvey 2D-EasyLine

Automatic creation of 2D drawing based on point clouds
Line creation: Segment only/ Segment and Arcs
User-definable tolerance
Preview mode

OfficeSurvey Generic Tools

Point Cloud segmentation: **Lite**

- Hierarchy segmented data organization
- Decimation of point clouds
- Random filter
- Spatial homogeneous filter
- Scan-based filter
- Intensity-based filter
- Discontinuity-based filter
- Topography-based filter
- Point slice generation using cutting plane

Measurements: **Lite**

- Distance, Angle, 3D coordinates, orientation
- Measurement text report (.rtf file)
- Measurement spreadsheet report

Mesh creation:

- Plane-based projection
- Screen-view-based projection
- Scan-based projection
- Cylinder-based projection
- Automatic discontinuities removal

Preview mode

Mesh editing

Smoothing

Peak removal

Automatic texture mapping

Digital camera picture import and mapping **Lite**

Object property box display **Lite**

Basic conceptual design and 2D drawing tools

Object annotation management

Create spheres, planes and cylinders with the Geometry Fitter tool **New in V5**

Inputs: Lite

Trimble exchange format (.rwp)
PointScape
PocketScape
ASCII (XYZ + true color + intensity)
Surveying Networks (.cr5, .crd)
AutoCAD (.dxf, .dwg)
Images (.jpg, .bmp, .tif)
Text files (.txt)
iQscan files

Outputs: Lite

Trimble exchange format (.rwp)
AutoCAD (.dxf)
MicroStation (.dgn)
Text files (.txt, .rtf)
Spreadsheets (.csv)
Images (.bmp, .tif)
Export for native "PointCloud" format (.ptc) **New in V5**
Direct printouts – includes legend, title, map scale, logo.

Display: Lite

Screen capture
Point Cloud display
Level of detail for fast visualization
Progressive return to full view after 3D decimation **New in V5**
False/Scan/True color
Grey scale / Color coded intensity
Display review modes: Walkthrough/ Examiner mode
Point magnifying visualization (1 to 5 zoom factor capability)
Customized lighting direction **New in V5**
Display/un-display 3D point labels **New in V5**



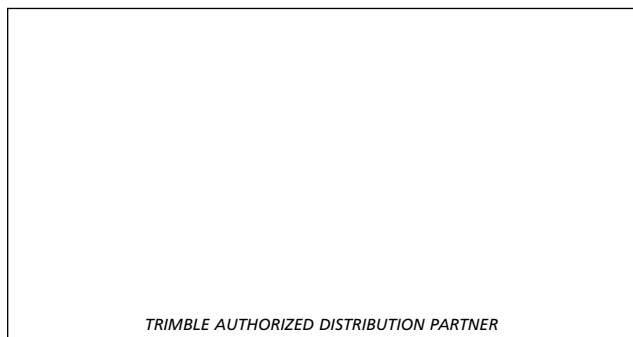
CONCLUSION

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SYSTEM REQUIREMENTS

- Intel® Pentium® 4 or later processor or compatible, 2 GHz (3 GHz or higher recommended)
- Microsoft Windows XP (Professional or Home Edition with SP1 or SP2), Windows 2000 Professional with SP4
- 1 GB RAM (2 GB or higher recommended)
- 128 MB 3D Open GL graphics board
- CD-ROM drive
- 3-button mouse

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