RECAP TOUR

Complete user guide

2026.11.42.1 · STANDARD / PRO · English

Inspect, edit and measure point clouds; create sections and CAD drawings; prepare terrain, 3D models and deliverables according to your edition. Use the Manual for command reference, How-To for task sequences and the User Guide for both together.

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Working with RECAP TOUR

Inspect, edit and measure point clouds; create sections and CAD drawings; prepare terrain, 3D models and deliverables according to your edition. Use the Manual for command reference, How-To for task sequences and the User Guide for both together.

Windows x64. 3D viewing requires a compatible graphics driver; the Gaussian viewer requires OpenGL 3.3. Available RAM, GPU memory and free disk space determine practical dataset size. There is no universal point-count or speed guarantee. Retain the complete application folder, including its supplied cloud and video components.

Instructions describe the available product functions. A valid license, the correct edition and suitable input data are required. A grey control may need a loaded cloud, a full-resolution section, a selection or an idle application.

1. Keep a survey folder containing the original clouds, the .rctour project and separate deliverables.
2. Activate the required edition, open a supported cloud and verify units, coordinate reference and extent.
3. Distinguish loaded source points, rendered points and extracted section points. Lower render density is not the same as deleting survey data.
4. Read COMMAND for the active target, selection method and point order. Finish a drawing before switching tools or panels.
5. Save before major edits and review an exported file independently before delivery.

STANDARD and PRO

In STANDARD the PRO panels remain visible for inspection, with their contents locked. Related toolbars, shortcuts and workflows follow the same license. Visual, Thinning and Regional Quality require a valid PRO license; the Visual tab in the 3D view is hidden without it. ORTHOPHOTO is first in EXPORT and remains available in STANDARD and PRO. The other PRO export products retain their restrictions; ordinary LAS/LAZ and section DXF output remain available.

Area / function	STANDARD	PRO
Point clouds, layers, clipping, filtering, cleanup and registration	Available	Available
Coordinates, HEPOS, survey POINTS, sections, 2D CAD and 3D DRAW	Available	Available
Orthophoto, scan quality, issues, common workflows and LAS/LAZ exports	Available	Available
Section DXF and survey-point TXT/DXF	Available	Available
TERRAIN: TIN, constraints, contours, terrain DXF and RTIN	Visible, locked	Available
TERRAIN CALC: volumes, profiles, TIN comparison and drainage	Visible, locked	Available
MODELING: meshes, solids, building/corridor tools and image drape	Visible, locked	Available
EXPORT: raster products, reports, tours, portable packages and BIM	Visible, locked	Available
EDIT > SHADOW CLEANUP	Visible, locked	Available
DRAW > GEOREFERENCED IMAGE	Visible, locked	Available

Area / function	STANDARD	PRO
TOOLS > FEATURE RECOGNITION and TARGET DETECTION	Visible, locked	Available
TOOLS > TEACH-BY-EXAMPLE; FILES > 3DGS	Visible, locked	Available
Splicing	Visible, locked	Available
Thinning, regional quality and visual digitizing	Visible, locked	Available
A.I. scene analysis (temporarily hidden)	Unavailable	Unavailable
Tunnel profiles and radial comparison	Visible, locked	Available
Engineering checks and IFC comparison	Visible, locked	Available

01 Activation, editions and license status

ABOUT > Activation / License details

STANDARD + PRO

One RECAP TOUR application provides STANDARD or PRO according to the active license. The title identifies the edition and any TRIAL or TEST entitlement. The license window shows expiry, remaining time and the available offline entitlement. License messages follow the application language. Expiry reminders help you arrange a new license or renewal; QUIT lets you close the application even without an active license. Choose Quick trial (3 days, when offered), Full trial (the displayed duration), or I have an activation code. Both trials require online activation, acceptance of the RECAP TOUR License Agreement and Terms of Use, and a separate acknowledgment of the Privacy Notice. Quick trial needs no personal details. Full trial requires Name and Company; Phone is optional. Email is optional unless you select email updates. Trial editions and deadlines come from the licensing service.

Procedure

1. On first use without a registered license, connect to the internet and wait for the trial options. Choose Quick trial, Full trial or I have an activation code. Quick trial is offered only when available; short TEST cycles use full registration.

2. For Quick trial, no Name, Company, Email or Phone is requested. For Full trial, enter Name and Company; Email and Phone may be left empty. Choose an available edition.

3. Open the linked License Agreement and Terms of Use and Privacy Notice. Select the two separate acknowledgments. For full registration only, you may also select the independent email-updates checkbox. It starts unchecked and requires a valid email only if selected. Its exact wording is displayed in your application language where available, otherwise in English.

4. Choose Start free trial and wait for online registration and license verification. No first-time trial starts offline. The activation code and expiry appear in License details.

5. To complete a Quick trial, open ABOUT > Activation / License details and choose Complete registration. Enter your details and confirm the documents; email updates remain optional. Completion is possible during or after the three-day quick period while the displayed full deadline remains.

6. Completion retains the same license and original start date. For a 14-day full period, completing after 3 elapsed days leaves 11 days; it does not start another 14 days. After the full deadline, contact RECAP for a possible

extension.

7. If you already have an activation code, use I have an activation code instead of registering a new trial. This option is also available under ABOUT > Activation / License details.

8. Enter the activation code and your name. Enter the email registered with the license; for a trial registered without email, leave it empty. Choose Activate and start.

9. Wait for verification. Check edition, license mode and expiry, then Continue / Close.

10. To change edition, save the project and activate the other valid code in the same window. Reinstallation is not required.

11. Before offline work, use Check / Start while connected and confirm the displayed offline-until time.

12. To leave without an active license, select QUIT in the activation window or locked-license screen. If prompted, save your project or cancel closing.

13. Find the activation code in ABOUT or Activation / License details and use Copy. An older paid activation that did not store the full code needs the original code entered once using Store previously used code.

Commands and parameters

STANDARD / PRO

The verified active license controls the title, panels, related toolbars and commands. STANDARD can browse PRO panels, but cannot run their tools.

Fixed / Floating

Fixed licenses occupy an authorised computer seat. Floating use depends on an available shared seat.

Offline use / Borrow

Offline work lasts only until the displayed entitlement deadline. Where offered for Floating, borrowing reserves a seat for the selected period, subject to license terms and expiry.

Release this PC

Use the license window to deactivate this computer when moving a seat. An existing offline reservation may remain until its stated expiry; contact support if a destination computer cannot acquire a seat.

Expiry

When use is locked, save the current project with the available save action, then renew or activate a valid entitlement.

Trial / TEST

Duration and edition depend on the issued entitlement. Activating another code does not add its time to a trial or restart the previous code's clock.

Fixed expiry date

Some licenses have a fixed calendar expiry that does not move when activated. Check the exact expiry shown in the license window; offline use cannot extend it.

QUIT

Available in the activation window and the locked-license screen. Closes RECAP TOUR without requiring an activation code. If the project has unsaved changes, choose whether to save, discard or cancel closing.

Expiry reminders

Annual, six-month and three-month licenses: one calendar month, then 20, 10, 5, 3, 2 and 1 days before expiry. Monthly licenses: 10, 5, 3, 2 and 1 days. Trials and short TEST licenses: 5, 3, 2 and 1 days, where the license duration allows.

Purchase / Renew

Opens https://recap-tour.com/pricing in your browser for a new license or renewal. License details opens the activation window so you can check the expiry or enter a new code. Continue dismisses the reminder without interrupting your project.

RECAP Tour website

The website button in ABOUT opens https://recap-tour.com.

Purchase / Upgrade

Buy @ Recap Tour website opens https://recap-tour.com/pricing. Buy Standard version @ Surveying.Shop opens https://surveying.shop/recap-tour-standard. Buy Professional version @ Surveying.Shop opens https://surveying.shop/recap-tour-pro. All three buttons are available for every license duration. Upgrade to PRO is shown for STANDARD and remains inactive. For assistance, contact support@recap-tour.com or support@recap-survey.com.

Quick / Full trial / Complete registration

Quick trial is 3 days when offered. Full duration is displayed before first activation. Completing quick registration retains the same license, activation code and original full deadline. Changes to the offered duration do not restart your existing trial.

Optional email updates

Available only with full registration or completion. Requires valid email only when selected. Providing email without selecting the checkbox never subscribes you. The choice does not alter trial duration, editions or features.

Practical notes

Keep activation codes private. A dash in the start-date field means no start date is supplied; use the displayed expiry and remaining time.

After a paid or TEST entitlement expires, or an entered code is rejected, restarting the application does not automatically restore an earlier trial. Enter a valid activation code to continue.

License messages follow the application language. Each expiry threshold is shown once for the current expiry date, including after restarting. If several thresholds passed while the application was closed, only the latest applicable reminder appears. Renewal or trial extension starts a new reminder schedule. Perpetual licenses have no expiry reminders.

Reminders appear while the application is running and licensed, when the main window is active and no operation is busy. They do not extend the license or the offline entitlement. For fixed-date licenses, the reminder schedule depends on their duration.

First-time trial registration requires internet access. If registration is unavailable or verification fails, use Reload trial information, activate an existing license, or select QUIT. The application remains locked until a valid license is available.

After successful registration and verification, offline use is possible only while an authorised offline license remains valid. Reinstalling or updating the application does not grant a new trial.

All acknowledgments start unchecked. Opening a document does not select its checkbox. If legal documents or email-consent wording changes, review the reloaded information and select your choices again. No marketing

consent is required. This is email-only consent, not SMS or telephone marketing.

A quick license changed, suspended, revoked or converted by RECAP cannot bypass that change by completing registration. Contact support when completion is unavailable.

Email ownership is not verified by trial registration. No confirmation or marketing email is automatically sent at registration. Your consent can be withdrawn; follow the unsubscribe option in future messages or contact RECAP.

Time remaining is displayed as calendar months, days and hours in both About and the license window. The calculation uses UTC expiry; it does not assume a 30-day month. A positive remainder below one hour appears as <1 hour; perpetual licenses show ∞. This changes only the display, not license expiry or offline entitlement.

With server 0.13.1, normal online closing returns a floating concurrent seat immediately while retaining the registered PC. Release this PC is for replacing a registered computer; explicit offline borrowing remains reserved.

Multiple RECAP TOUR windows may use the same activated license on this Windows user/device. Each window verifies its lease. Closing one keeps the other windows active. Close the other windows before deactivating the computer for a license transfer.

02 Software updates

ABOUT > Search for Updates

STANDARD + PRO

Check the published releases covered by your license. A release entitlement and a valid license are both required to run this version. One installer updates TOUR, Viewer, Merger and Resampler together.

Procedure

1. Open ABOUT > Search for Updates to check online and read release notes.
2. Enable or disable the daily background check in ABOUT. While TOUR is running, it checks again once 24 hours have elapsed since the last successful check. A background check does not install anything.
3. Choose Download / Resume for a covered release. Download size, SHA-256 and digital signature are verified.
4. Finish current operations and close the companion applications. Choose Install and close RECAP TOUR; save your project when prompted.
5. Approve the signed installer in Windows. Start TOUR after installation to verify your license and exact release entitlement.

Commands and parameters

Search for Updates

Displays update coverage and available releases.

Download / Resume

Continues a partial download with fresh server authorization.

Install and close RECAP TOUR

Rechecks the installer and offers project saving before setup.

Practical notes

An update-service outage does not remove an existing valid signed release entitlement. Normal license and offline limits still apply.

An unpublished version or one outside your coverage cannot be unlocked merely by copying its files. Contact RECAP if the version has no verified entitlement.

03 Opening LAS/LAZ with a double-click

ABOUT > LAS / LAZ file associations

STANDARD + PRO

Check the application currently associated with each extension and choose RECAP TOUR through Windows Default apps. The final choice belongs to the user.

Procedure

1. Keep the application folder at its intended permanent location.
2. Open ABOUT > LAS / LAZ file associations and review the current entries.
3. Select Choose RECAP TOUR as default, then choose it for both .las and .laz in Windows.
4. Return and select Check again. Close the application and double-click a sample file.
5. Use Do not ask again at startup if you prefer to manage associations only from ABOUT.

04 Opening clouds and managing projects

FILES > PROJECT

STANDARD + PRO

Open a supported point cloud or restore a .rctour project. A project retains workspace state, sections and drawings; keep its original cloud and linked image files accessible. Saving a project is distinct from exporting an edited cloud.

Procedure

1. Choose OPEN CLOUD and select one or more supported files. Later OPEN CLOUD calls add layers to the existing workspace; use NEW to start a different project.
2. Check point counts, extents, units and orientation; use FIT if needed.
3. Choose SAVE AS and save a .rctour project in the survey folder.
4. Use SAVE while working. Keep original clouds and linked images with your archive.
5. To resume use OPEN PROJECT. Use NEW for a blank workspace, or CLEAR CLOUD to remove only the cloud.

Commands and parameters

NEW

Start a blank workspace after responding to the unsaved-work prompt.

OPEN PROJECT

Restore a .rctour project.

SAVE / SAVE AS

Save the current project, or create a project with a new name.

OPEN CLOUD

Open LAS, LAZ, E57, PLY, PCD, PTX, PTS, XYZ, XYZRGB, TXT or CSV within the supported variants. Multiple selection adds independent layers at their original coordinates.

CLEAR / CLOSE POINT CLOUD

Remove the cloud while preserving independent drawing and terrain data.

LOAD REFERENCE DXF

Load a reference CAD drawing for section registration.

LOAD DEMO

Open a demonstration cloud to learn the controls.

Practical notes

Projects retain each layer, visibility, selection, display settings and clipping. Original unedited LAS files remain linked; keep them accessible. Temporary decoded sources and edited/generated layers are embedded. Missing linked files can be located when reopening. Older single-cloud projects remain readable.

05 Export all project vectors to DXF

FILES > DXF EXPORT

STANDARD + PRO

Create one layered 2D or 3D DXF containing vector geometry across the current project, including hidden objects and inactive saved sections. Original cloud and drawing data stay unchanged.

Procedure

1. Open FILES > DXF EXPORT and press Export all to DXF.
2. Choose 3D or one of the three 2D projections. Review the coordinate explanation.
3. Keep all available categories checked, or exclude categories you do not need. Numbers indicate source groups, not individual DXF entities.
4. Choose Export and a DXF filename. Esc cancels background writing. The status bar reports entity and layer counts.

Commands and parameters

3D · survey X/Y and datum H

Original world X/Y; H relative to the current elevation datum. 3D Draw, auto-tracing and section drawings retain their spatial geometry. Visual drawings keep explicit Z=0.

2D · each section in its own plane

Bulk 2D export sets Z=0 for all geometry. Horizontal plans retain survey X/Y; other sections use their drawing-plane X/Y, as in the 2D editor. Other geometry uses world X/Y. Section layers can overlap; isolate them in CAD.

2D · common world X/Y

All geometry projects onto world X/Y at Z=0. Vertical geometry can collapse in this top projection.

2D · current section plane

Project everything into the current section plane at Z=0, independently of camera rotation.

Include

Drawings, section CAD and inserted blocks, saved points, measurements, annotations, DXF references, terrain/contours/profiles, modeled surfaces/solids, analysis geometry and construction-guide traces. All available categories start selected.

Practical notes

Layers identify category and source, for example Drawings_Auto_tracing, Sections_Front_Window and Terrain_Contours. Duplicate names receive suffixes. Auto-trace projections are not exported twice: each saved trace is collected by its shared entity ID.

The current section uses the latest edits instead of older saved metadata. Other sections are collected without loading point caches. Hidden objects are included. Raw clouds, section point samples, raster images, selection fences and unaccepted recognition previews are excluded.

Starting export ends the active drawing command. For auto-tracing, the confirmed part is retained; export does not accept an unconfirmed gap bridge.

Blocks export as constituent geometry on source layers, not reusable INSERT definitions. Measurements export as linework and labels, not associative CAD dimensions. Circles and arcs stay native when projection permits; oblique projections and splines become sampled polylines. Surface meshes export as 3DFACE in 3D and triangle outlines in 2D. Construction guides export as XLINE traces on the current section; parallel guides have no trace.

Explicit entity colors, lineweights and linetypes are retained. Unstyled 2D lines use current drawing defaults; screen widths convert from pixels at 96 DPI to millimetres. A temporary file is written before replacing the destination; cancellation or failure preserves the previous file.

06 Search help in the application

Top bar > Search help (before INFO)

STANDARD + PRO

Use Search help before INFO to find commands and workflows in the installed manuals and user guides. Results stay inside RECAP TOUR and work offline.

Procedure

1. Type a question or command name, then press Enter or the magnifying glass.
2. Select a result on the left. Relevant excerpts shows whole paragraphs from the source, in their original order.
3. Choose Full section to read every step, parameter, prerequisite and limitation. Tables and numbered instructions are retained.
4. Refine the query in the help window; results refresh as you type. Escape or Close closes help without cancelling the active drawing command.

Commands and parameters

Search help

Searches headings, command paths and body text. English/Greek terms, accents and common inflections are recognized. Try “export section DXF”, “elevation datum” or “point display”.

Relevant excerpts / Full section

Excerpts are source text, not a generated answer. Always read the full section before applying a procedure. The source guide, language, release version and topic ID are shown below.

Practical notes

Current-language results are preferred. A result in another available language is labelled explicitly.

Only guides matching the application release are indexed. If they are missing, restore the Docs folder supplied with that release.

No internet, online model, uploads or API usage fee. Searching never executes a project command. Unknown queries display no documented match.

The search indexes installed HTML guides. It does not search customer projects, arbitrary PDF files or the web.

07 Point-cloud information and application resources

Top toolbar > INFO

STANDARD + PRO

Open INFO at the left of the top toolbar to inspect the loaded cloud and current application resource use. Keep the window open while you work; measurements refresh every two seconds.

Procedure

1. Choose INFO, then Point cloud for source metadata, bounds, loaded point counts and scalar ranges.
2. Open Application resources for current-process CPU, resident RAM, private committed memory, GPU use and GPU memory. System RAM and commit limits are shown separately.
3. Use Copy information to copy the displayed report, or Close to stop monitoring.

Commands and parameters

Point cloud

Source path, file size, LAS version and record format, scale and coordinate offsets where available; source extents, loaded preview points, scalar bounds, display settings and stored sections. Scalar bounds describe the loaded working data.

CPU

Percentage of total logical processor capacity used by this application process.

Memory

Resident RAM, peak resident RAM, private committed memory and managed heap. The managed heap is part of process memory and should not be added to it.

GPU

Active OpenGL renderer, busiest GPU engine for this process, local/shared process GPU memory and 3D point buffer allocation. Unsupported measurements show Not available.

3D rendering

Frame rate and time, points drawn and visible chunks. Idle indicates that the view is not continuously redrawing.

Practical notes

File details depend on the source format and accessibility. A preview point count can be smaller than the source count.

The point buffer allocation is not total GPU memory. Windows and driver support determine which GPU measurements are available.

Copy information includes the displayed source path; review it before sharing.

08 Compact tabs and command strip

2D / 3D / SPLICING / 2D SPLICING / CLOUD REGISTER > Tabs

STANDARD + PRO

Use compact tabs beside each viewport to display one command strip at a time. Icon buttons show their command names on hover.

Procedure

1. Right-click a tab to place the tab strip at the top, bottom, left or right. Set the command strip independently to top or bottom.
2. Drag a tab to change its order. Each viewport retains its own layout. Commands wrap onto another row when the available width is too small; related captions and inputs stay together.
3. In 2D use View, Select, Draw, Fit, Measure, Edit, Modify, Tools and Snap. In 3D use View, Navigate, Clip, Section, Select, 3D Draw, Draw Properties, Points, Measure and Orientation.
4. In CLOUD REGISTER and 2D SPLICING, each 3D pane has Model, Render, View, Clip and Section. Model contains color, palette, projection, X-Ray and EDL; Render contains density, quality, Motion LOD, transparency and point size.
5. In the main 3D viewport, 3D Draw contains shapes, vertex editing, Snap, Lock and Undo/Redo. Draw Properties contains Color, Width, Linetype, Magnet, Show 3D, Project to 2D and the two DXF exports.
6. Enable Show legacy toolbars in the tab context menu if you also want the previous toolbars. Orientation in the main 3D view and main TARGET/LAYOUT are visible initially.

Commands and parameters

Tabs / Toolbar context-menu entries

Choose docking independently. The toolbar is horizontal at the top or bottom even when tabs are vertical.

Icons and checkboxes

Hover for command names. Checkboxes and toggle buttons retain their state when switching tabs.

Command bar

Enter annotation text, Fillet radius and Offset/Join/Merge distances in the active command field. Enter accepts; Esc cancels.

Practical notes

The same compact controls are available in detached 2D/3D windows. Layout preferences do not change survey geometry.

BASE is the fixed coordinate reference: preparation, alignment and export never reposition it. Only FLOATING is transformed. Merged output retains BASE coordinates; normal LAS coordinate quantization still applies.

Default primary tab order: FILES, 3D MODEL, EDIT, GEOMETRY, SECTION, DRAW, TOPOGRAPHY, TOOLS, CHECKS, TERRAIN, TERRAIN CALC, TUNNEL, MODELING, EXPORT, SETTINGS. A.I. remains temporarily hidden.

09 Automatic recovery copies

FILES > PROJECT > AutoSave Project

STANDARD + PRO

AutoSave keeps the latest recovery copy for each working session. It complements deliberate project saves and still requires the original linked sources. Automatic saves wait for suitable idle periods.

Procedure

1. Enable AutoSave Project in FILES > PROJECT.
2. Choose 5 minutes, 10 minutes or a custom interval from 1 to 1440 minutes.
3. Select a writable recovery folder and inspect the last successful save status.
4. To recover, select a copy under AutoSaved projects and Load selected; respond to the unsaved-work prompt.
5. Review the restored project and use SAVE AS for a normal project file. Delete recovery copies only after confirming they are no longer needed.

10 Exporting clouds and section drawings

FILES > SAVE / EXPORT

STANDARD + PRO

Choose whether to save reusable project state or deliver geometry to another application. Point-cloud exports use the current edited and transformed state.

Procedure

1. Save the project before creating a deliverable.
2. For point clouds choose FILES > SAVE / EXPORT > EXPORT CURRENT POINT CLOUD (LAS / LAZ). Check the active/non-deleted-points choice and active clipping/filter scope.
3. Choose LAS for uncompressed exchange or LAZ for compressed delivery. Use a separate output name and allow free disk space for output and compression.
4. For section CAD choose EXPORT DXF or F8 QUICK DXF, and choose whether points and annotations are included.
5. Wait for successful completion. Open the result and check point count, extent, units and a known coordinate.

Commands and parameters

EXPORT DXF…

Write the current 2D drawing to DXF for CAD use. Check the point-export option before saving.

EXPORT CURRENT POINT CLOUD (LAS / LAZ)…

Exports the current edited point cloud state (remaining points + current transformed/georeferenced XYZ) as LAS/LAZ while preserving available LAS attributes.

Practical notes

LAS/LAZ export retains available source attributes and the current supported coordinate edits. LAZ compression can require additional temporary disk space. The duration depends on point count, filters and disk speed; a large page file does not itself accelerate export.

Section DXF coordinates: horizontal plans retain survey X/Y and the current datum H. Facades, vertical and inclined sections export flat in CAD XY with Z=0. X follows the section horizontal direction. In a vertical facade Y is datum height; in an inclined section Y is true in-plane distance plus the section origin datum height, not vertical height. They open face-on as a section drawing. Camera pan/zoom/Sync rotation does not redefine these coordinates. Explicit 3D DXF remains spatial. Re-export older files to use this convention.

Suggested export filenames and generated DXF layer names use the TOUR prefix. Existing user filenames are respected and older RECAP-prefixed drawing layers remain readable.

11 Terrain DXF access

FILES > DXF EXPORT

PRO

Select the terrain entities to include in the DXF. This terrain export panel is accessible from both FILES and TERRAIN; 2D drawing export is a separate command.

Procedure

1. In PRO, open FILES > DXF EXPORT or TERRAIN > DXF EXPORT. Both access terrain output.
2. Prepare a TIN or the terrain entities you want to export.
3. Select faces, edges, vertices, elevation labels, contours, boundaries or sections as required.
4. Export and check the chosen entities in CAD. Ordinary section DXF under SAVE / EXPORT remains available in STANDARD.

Commands and parameters

EXPORT TERRAIN DXF…

Export the enabled terrain components such as faces, edges, vertices, contours, labels and profiles to separate DXF layers.

12 Navigation, views and the command bar

3D > Navigate / Orientation; 2D > View; main LAYOUT

STANDARD + PRO

Use the view cube and standard views to orient the camera without changing cloud coordinates. Read COMMAND for the current selection method, point order and completion action. The active viewport receives navigation keys.

Procedure

1. Choose split, 3D or 2D in LAYOUT. Use Full Split View to move both views into one window, then choose side-by-side or stacked arrangement.
2. Detach 3D and Detach 2D are icons in the central LAYOUT toolbar; hover to identify them. Close the detached window to restore its view.
3. Use the orientation cube and Projection control for standard views and Perspective/Orthographic. In FPS · cursor zoom, middle-button dragging rotates; right-button behaviour is retained.

Commands and parameters

Navigation style

Ray pivot, Turntable, First person and FPS cursor zoom offer different camera behaviour.

Perspective / Orthographic

Perspective shows depth foreshortening; orthographic uses parallel projection.

FIT / F5

Frame the 3D model.

F10

Restore a clear top orthographic view, full opacity, X-Ray off and EDL off.

Mouse

In ordinary navigation, left-drag rotates and right-drag pans; wheel zoom follows the pointer. Active drawing and picking commands use their own mouse actions.

W / A / S / D / Q / E

In first-person navigation use movement keys; in FPS cursor zoom W/S follow the pointer ray, A/D move sideways and Q/E vertically. Shift increases speed.

Shift while rotating

Constrain rotation to the vertical Z axis while retaining the current tilt, pivot and zoom. Release Shift to resume normal rotation. This applies during an active rotation gesture; first-person movement retains its speed modifier.

2D quick Lasso

While navigating an extracted 2D section, double left-click enables point Lasso; double middle-click enables drawing-entity Lasso. Then drag with the left button. Delete removes the selected points or entities; Esc exits. Active drawing, polygon and measurement commands retain their own double-click completion.

Practical notes

Ray pivot (drag direction) rotates around the cloud point under the cursor and follows the mouse drag direction. The original Ray pivot remains available. Pick rotation centre explicitly fixes a centre using CLOUD / EDGE / CORNER. Double-clicking in 3D navigation keeps the selected navigation style. Show rotation centre toggles its cross. Picking a centre changes navigation to Picked pivot.

The 2D and 3D Aerial View backgrounds, borders, labels, preview geometry and viewport grips follow the active application theme immediately.

13 Reading coordinates under the pointer

3D viewport > E / N / H

STANDARD + PRO

The 3D readout reports survey E/N and H relative to the current datum at the nearest valid visible cloud return or terrain intersection. With no chosen datum, original elevations are shown. Empty background has no measured coordinate. This readout does not save a named point.

Procedure

1. Point at a clearly identifiable surface and read E/N/H.
2. Rotate or zoom and check the same feature again. Clipping, scalar filters and visibility determine which data can be read.
3. For a retained measurement use Pick 3D Point and verify its database coordinates.
4. If the pointer is over empty space, choose a real surface instead of treating a camera-plane position as survey data.

14 Workspace and detached windows

LAYOUT > LAYOUT

STANDARD + PRO

Work in split, 3D-only or 2D-only layouts. Detach a viewport or place both in a separate split window. View controls remain with their viewport.

Procedure

1. Choose split, 3D or 2D in LAYOUT. Use Full Split View to move both views into one window, then choose side-by-side or stacked arrangement.
2. Detach 3D and Detach 2D are icons in the central LAYOUT toolbar; hover to identify them. Close the detached window to restore its view.
3. Use the orientation cube and Projection control for standard views and Perspective/Orthographic. In FPS · cursor zoom, middle-button dragging rotates; right-button behaviour is retained.

Commands and parameters

LAYOUT

Choose the main 2D/3D arrangement.

Detach 2D / Detach 3D

Move the corresponding viewport into its own window; closing it restores the viewport.

Full Split View

Move both viewports into a common window, arranged horizontally or vertically.

Toolbar visibility

Use SETTINGS > APPLICATION to show the required toolbar. The 3D CLIP toolbar follows the 3D window.

Sidebar divider

Drag to adjust the width available to panel controls.

15 Linking the 2D section and 3D view

2D > View > Zoom 2D to 3D / 2D-3D link space

STANDARD + PRO

Focus the 3D camera on an area selected in the section. FOV overlays show the relationship between the views. These controls move or explain the camera; they do not transform survey geometry.

Procedure

1. Open the section and choose Zoom 2D to 3D.
2. Drag a rectangle around the area; a smaller rectangle produces a closer view. A click focuses a small local region.
3. Enable 2D-3D link space in the 2D View tab to show the linked camera footprint and 2D/3D indicators. In a legacy toolbar this is the FOV control.
4. Enable FOV in VIEW or the 2D toolbar. Inspect the camera footprint in the section and the corresponding view indicators in 3D.
5. Set overlay opacity from 0 to 50 percent; 0 hides fill but retains outlines. Turn 2D-3D link space off to hide the indicators completely.

16 Follow cursor between 2D and 3D

2D / 3D > View > Follow (beside Aerial view)

STANDARD + PRO

Show a cyan sphere at the corresponding cursor position in the other view while working with a section and its cloud.

Procedure

1. Enable Follow beside Aerial view in either View toolbar. Both checkboxes stay synchronized, and the preference is saved.
2. Move the cursor in 2D: the marker appears on the section plane in 3D. Move over visible cloud points in 3D: their position is projected into the 2D section.
3. The sphere also shows the projected position of points outside the section thickness.
4. Disable Follow to hide the markers. They also clear when you leave the source view or change the cloud or section.

Practical notes

Follow does not pan the other camera, select geometry or add drawing entities. A marker outside the other viewport is hidden. The existing cloud picking and clipping rules determine the 3D position.

17 Placing the camera with a view arrow

2D > View > View Arrow

STANDARD + PRO

Pick the target first and the observer second in the section. The camera moves to the observer position and looks towards the target in 3D.

Procedure

1. Choose View Arrow in the 2D View tab.
2. Click the point you want to look at; it becomes the arrow head.
3. Move the pointer and click the observer position at the tail. Active 2D SNAP and ORTHO apply.
4. Review the 3D result. Active clipping is preserved; adjust it deliberately if the target lies outside.
5. Backspace restarts target selection and Esc cancels. Changing sections cancels an unfinished arrow.

18 Point-cloud appearance and source density

3D MODEL > POINT CLOUD PROPERTIES

STANDARD + PRO

Inspect the cloud and adjust its appearance. Loading all source points affects the data available for analysis; render density controls display load. Inspect both counts before processing a large scan.Choose from 12 palettes with color previews. Independent saturation and display limits are stored per scalar field and project.

Procedure

1. Select the required quality preset and render density. ALL SOURCE POINTS controls the loaded source population; it is distinct from the points drawn in a frame.
2. Use APPLY RENDER DENSITY when offered. Saved display settings are applied on cloud load.
3. If navigation slows, inspect the reported GPU and reduce the working set deliberately. Full density cannot guarantee a fixed frame rate on every GPU.
4. Choose Elevation, GPS Time or Intensity, then select a palette by its color strip.
5. Under Saturation, turn off Automatic and enter Min and Max. Values below or above these limits use the first or last palette color.
6. Under Display Range, turn off Full range and enter independent Min and Max values. Values outside these limits appear gray and remain in the cloud.
7. Choose Apply or press Enter. Reset range restores automatic limits for the active scalar field only.
8. Save the project to retain the color mode, palette and ranges.

Commands and parameters

Show point cloud

Toggle the cloud independently of terrain and modeling overlays.

ALL SOURCE POINTS

Load the complete source for analysis and editing. Rendering density is configured separately.

Colour mode / Palette

Use uniform colour, RGB, elevation, intensity, GPS Time or classification where supplied by the source.

Point size / Opacity

Control readability and transparency without editing coordinates.

X-Ray point cloud

Show internal or obscured cloud structure with translucent rendering.

Eye-Dome Lighting (EDL)

Emphasise local depth discontinuities for visual inspection.

Palettes

Turbo, Viridis, Plasma, Spectral, Grayscale, Blue-Cyan-Yellow, Rainbow Red-Blue, Rainbow Blue-Red, Blue-White-Red, Survey spectrum, Terrain Green-Brown-White, Yellow-Orange-Brown.

Saturation

Numeric limits for mapping scalar values to colors, rather than RGB color saturation. Uses project elevation, raw LAS GPS time or raw LAS intensity.

Display Range

Independent inclusive color display interval. Points outside it appear gray. It does not change point selection, deletion or cloud export.

VIEW toolbar: X-RAY gain

Adjust X-Ray gain from 10% to 400%; synchronized with point cloud properties. FOV indicator opacity remains in point cloud properties.

Merge source

Automatically created when merging clouds or point-cloud sections, including multi-layer cloud export. One categorical ID/color per input; nested source groups remain distinct. Choose this mode in 3D or section appearance. Original RGB remains unchanged.

Practical notes

For intensity data spanning 0-255, Saturation 0-100 clamps values above 100 to the final color. Display Range 0-100 instead makes them gray. A constant scalar field uses the middle of the palette.

The closed Palette selector shows the color strip only. Open the list to see each palette name and its colors; hover over the selector to see the selected name.

Merge source uses fixed categorical colors; numeric saturation and display ranges do not apply. Zero/unassigned is gray. LAS/LAZ and section caches retain the field. Existing files merged without source IDs cannot recover their original inputs automatically.

CLOUD LAYERS > Layer display overrides the global color and point appearance for the highlighted layer. Global X-Ray, EDL, camera and quality remain scene settings. Merge source uses fixed categorical colors; the original RGB is preserved.

19 Clipping box

3D > Clip; 3D MODEL > VIEW / CLIPPING BOX

STANDARD + PRO

Limit the working cloud with a movable, resizable and rotatable 3D box. An active box protects points outside it during cloud selection and processing. It changes the working scope without deleting points by itself.

Procedure

1. Use Reset Clip Box to restore the full cloud. Resize the box or draw a clip lasso/polygon. Use Show Clip Box to hide only the outline.

Commands and parameters

EXPORT CLIPPED LAS / LAZ…

Export the selected layer scope through each layer’s own clipping volume. Untouched sources are streamed in full; edited layers use retained points.

Fit Box to Selected Cloud

Clear previous clip restrictions and fit a new box to the selected cloud layer.

Reset Clip Box

Restore the full cloud in one click: clear old box/lasso/polygon restrictions and create a box on the full cloud bounds.

Enable Clip Box

Enable or disable clipping. Turning it off restores points without deleting cloud data.

Centre / Dimensions

Position the box and set its extent along the model axes.

Yaw / Pitch / Roll

Rotate the clipping volume numerically.

Enable rotation grips

Display circular handles for direct rotation.

BOX FROM LASSO / POLYGON

Create a rectangular 3D box around selected cloud points. Empty or cancelled selections preserve the previous box.

Show Clip Box

Show or hide the outline and grips; clipping remains unchanged.

Face handles

Top/bottom use translucent circles, front/back rectangles and left/right triangles, with different colors. Drag a face handle to adjust that face; rotation handles retain their arrow shape.

Practical notes

Before creating, moving or resetting a clip, choose Apply display to layers in CLOUD LAYERS. The same world-space boundary is assigned only to that scope. Later visibility/selection changes do not transfer it to another layer.

20 Polygonal clipping and anchored selection

3D > Clip; 3D MODEL > CLIP POLYGON

STANDARD + PRO

CLIP POLYGON retains a polygon-shaped cloud volume. It differs from a rectangular box made from a selection. The confirmed volume stays fixed when the camera moves and is saved with the project.

Procedure

1. Choose a view that separates the intended region, then LASSO or POLYGON under CLIP POLYGON.
2. Draw the boundary. Placed vertices remain anchored while you pan, rotate or zoom. For lasso release the left button to finish; for polygon follow COMMAND to confirm.
3. Review the camera direction before completion: it determines the clipping volume. Perspective follows viewing rays; orthographic uses a parallel volume.
4. Enable Clip Polygon and inspect the retained region from another view. An active box intersects the polygon region.
5. Use EXPORT CLIPPED LAS / LAZ for an output subset. RESET removes the polygon restriction; it does not restore deliberately deleted points.

Practical notes

Cloud clipping can include occluded points inside the defined volume; it is not limited to frontmost visible pixels. Existing CAD entities and terrain meshes are not cut into new entities by cloud clipping.

Before creating, moving or resetting a clip, choose Apply display to layers in CLOUD LAYERS. The same world-space boundary is assigned only to that scope. Later visibility/selection changes do not transfer it to another layer.

21 Scalar-field filters

3D MODEL > SCALAR FIELD FILTER

STANDARD + PRO

Display or isolate points within an attribute interval. Select a scalar field available in the scan, then adjust its minimum and maximum values.

Procedure

1. Choose an attribute actually present in the cloud and set its minimum/maximum range.
2. Inspect the retained points using the appropriate colour mode.
3. Use RESET FULL RANGE to clear the interval or EXPORT FILTERED LAS / LAZ to deliver the retained subset.

Commands and parameters

RESET FULL RANGE

Restore the scalar filter to its full available range so values are no longer excluded by the selected interval.

EXPORT FILTERED LAS / LAZ…

Export the points retained by the current scalar-field filter to LAS or LAZ. Verify the selected scalar and interval before saving.

Scalar field

Choose an attribute that actually exists in the loaded data.

Enable display range filter

Use the selected minimum/maximum attribute range.

Minimum / Maximum

Set the retained interval and inspect which points remain before exporting.

22 Multiple clouds, layer scope and Quick Merge

3D MODEL > CLOUD LAYERS

STANDARD + PRO

OPEN CLOUD adds files to the scene as independent layers. SELECTED controls merging, EDIT controls point processing and VISIBLE controls the scene. Loading does not align or merge files.

Procedure

1. Select several files in OPEN CLOUD or add more later. Open the CLOUD LAYERS dropdown for the SELECTED, EDIT, VISIBLE, NAME and POINTS columns. Resize or reorder the columns as needed.
2. SELECTED is used only by Merge Selected. It never chooses layers for editing or display changes. A selected layer can be hidden or read-only and still participate in a new merge.
3. EDIT and VISIBLE are checked for every newly added layer. All layers with EDIT checked participate together in point processing. Unchecking EDIT leaves a visible cloud protected from deletion, denoise, sampling and workflow changes.
4. Unchecking VISIBLE also unchecks EDIT. Showing the layer again leaves EDIT off until you enable it explicitly. A hidden layer cannot be editable. These settings are saved with the project.
5. NAME shows the layer name. POINTS shows the full source count for an untouched layer, even when its preview is sampled; after editing, it shows the number of points remaining in the layer.
6. Apply display to layers chooses Active, Editable, Visible or All for clipping and full-density loading. Layer display affects only the highlighted row. Point processing always uses the editable layers and their individual clips. SELECTED has no effect on either scope.
7. Highlight the layer name, then choose Set Layer Display... for RGB, elevation, GPS Time, intensity, single color or Merge source, palette and range, opacity, point size and display density. Use global display removes only this layer’s independent settings.
8. Use Load full density in the Cloud Layers panel before processing that requires all original points. Edited layers keep their current points without restoring deleted data.
9. Check SELECTED for two or more layers and choose Merge Selected. The new merged layer becomes active; originals remain available and are hidden. Use Save Merged... in the same dropdown to write the active merged layer to a new LAS or LAZ file.

Commands and parameters

Merge Selected

Combines entire selected layers, without deduplication or applying display clips. Untouched file-backed layers contribute full source records, regardless of preview density.

Reset layer clipping

Clear clipping on the chosen layer scope only.

EXPORT ACTIVE LAS…

Exports the active layer with retained original point attributes. An untouched source is streamed in full; edited layers export their current point population.

Practical notes

A merge does not align, rescale or reproject clouds. Confirm common units and coordinate reference first. Hidden layers are listed in CLOUD REGISTER, SPLICING and 2D SPLICING; choosing BASE/FLOATING makes them visible in that workspace.

Clip assignments remain attached to their layers after selection or visibility changes. Sections and scene picking use visible layers. Whole-project coordinate/georeferencing transforms require every layer to be visible and editable; otherwise the operation stops before changing data.

Original LAS attributes are retained for newly loaded points and newly extracted sections. Older section caches contain only the attributes saved by that version; re-extract from the source to include full original records.

23 Grid, ruler and view cube

3D MODEL > GRID / ORIENTATION

STANDARD + PRO

Use the metric grid, scales and view cube for orientation. Display references do not change source coordinates or constitute survey control.

Procedure

1. Enable the grid plane, horizontal scale and vertical ruler independently.
2. Adjust their colour and transparency to keep the cloud readable.
3. Use the orientation cube for a standard view; the compass shows direction and the scale labels follow the spatial axes.

Commands and parameters

Show metric grid

Toggle the model grid.

Grid spacing and appearance

Adjust the available spacing, colour, opacity and scale settings for the current view.

View cube

Choose a standard face or corner view. Assigned construction-guide axes can determine these views.

Ruler

Read viewport scale alongside actual measurements; use measurement tools for deliverable dimensions.

Orientation cube size

Use the slider in 3D MODEL > GRID / ORIENTATION to resize the cube and compass from 1× to 4×. The change appears immediately and the selected size is saved automatically. 1× is the minimum and default size.

Practical notes

Cube faces always show TOP, BOTTOM, FRONT, BACK, LEFT and RIGHT, with N/E/S/W compass labels, independently of the application language. Click a face or compass arrow to orient; double-click for an isometric view. Resizing the cube does not change the model or camera scale.

24 Processing target

EDIT > TARGET

STANDARD + PRO

Choose the destination and scope of destructive processing. A selected fence and a clipping box have different meanings; verify the highlighted region before applying a filter. The selected target applies consistently to DENOISE / OUTLIERS, CSF GROUND FILTER and SHADOW CLEANUP.

Procedure

1. Open EDIT > TARGET before selecting an operation.
2. Choose 3D cloud, 2D section or Auto; a section operation requires an extracted working section.
3. Follow COMMAND to choose All, Lasso, Polygon, Click or an existing selection where offered.
4. Review the target and highlighted region before applying the operation. Use the matching processing Undo if required.

Commands and parameters

UNDO LAST PROCESSING

Undo the most recent supported edit or processing operation in the current editing context. Use the dedicated CAD, terrain or modeling history for those geometry types.

25 Processing history

EDIT > PROCESSING STACK

STANDARD + PRO

Review the available cloud checkpoints. Restoring a checkpoint replaces the current processing state; clearing history removes recovery references rather than changing the current points. Non-destructive checkpoints for processing, transformations and clean-up. Restore an earlier state without overwriting the source LAS/LAZ.

Procedure

1. Save the current project before restoring a different processing state.
2. Open EDIT > PROCESSING STACK and Refresh the list.

3. Select the intended checkpoint and RESTORE SELECTED.

4. Inspect point count, alignment and the changed region.

5. Use CLEAR CHECKPOINT HISTORY only when recovery states are no longer needed; clearing history retains the current cloud.

Commands and parameters

REFRESH

Refresh the list of available processing checkpoints.

RESTORE SELECTED

Restore the cloud state represented by the selected checkpoint. Later processing results are replaced by that state.

CLEAR CHECKPOINT HISTORY

Keeps the current cloud unchanged and releases checkpoint references.

26 Selecting and deleting points

2D / 3D > Select / Edit

STANDARD + PRO

Select and remove points in the active view. Use DELETE INSIDE to remove a region or DELETE OUTSIDE to keep it. Bounding and clipping extents are recalculated after cloud changes.

Procedure

1. Set TARGET to 3D cloud or the intended 2D section.

2. Draw a LASSO or POLYGON around the unwanted region; inspect the highlighted selection from a suitable view.

3. Use DELETE INSIDE to remove it, or DELETE OUTSIDE to keep only the region. UNDO reverses the last supported edit; save before major cleanup.

Commands and parameters

NAVIGATE

Return to navigation mode so mouse gestures move the view rather than select or draw geometry.

LASSO

Works in 3D and 2D. DEL deletes and the tool remains active until ESC.

POLYGON

Select a region by clicking successive polygon vertices. Finish the fence and use DELETE INSIDE or DELETE OUTSIDE as required.

DELETE INSIDE

Delete points inside the active selection in the editing target. Review the selected target before confirming the operation.

DELETE OUTSIDE

Keep the selected region and delete points outside it in the active editing target.

UNDO

Undo the most recent supported edit or processing operation in the current editing context. Use the dedicated CAD, terrain or modeling history for those geometry types.

RESTORE 3D EDITS

Restore the source state of the 3D cloud edits. This is broader than undoing a single operation.

Practical notes

While drawing a 3D lasso with the left button held, middle-drag temporarily rotates and right-drag pans; wheel zoom keeps placed vertices anchored. Release the navigation button to continue, then release the left button to finish. Esc cancels.

Section noise cleanup and Restore raw 2D section are in SECTION > 2D SECTION CLEANUP. Start cleanup there, then choose ALL, LASSO or POLYGON in the bottom command bar for the extracted 2D working section. The processing boundary limits this scope; the 3D processing target is unchanged.

Cloud picking first tests foreground visibility in the current view, then chooses the nearest visible projected point to the click. A covered point on a rear surface cannot win just because it is closer to the cursor. All eligible source candidates in the search region are considered, with clipping and filters respected. Edge/Corner fitting also checks foreground visibility. On sparse or noisy data inspect the candidate and change view if the surface is ambiguous.

Select > Pick selects existing cloud points for editing; it does not create named survey points. Pick 3D point stores a new named coordinate. Both use the foreground visibility rule.

Picking searches the local cursor footprint. Edge/Corner holds the detected feature through small pointer movements, then releases it when the pointer moves farther away or the view, clipping, snap settings or drawing anchor changes. Check the highlighted candidate before clicking, especially on sparse surfaces.

The point picker searches near the cursor first and expands only when needed. Visible points on dense sloping surfaces remain selectable. Edge and Corner still require local geometric support; check the highlighted candidate before accepting.

27 Denoising and outliers

EDIT > DENOISE / OUTLIERS

STANDARD + PRO

Remove isolated or statistically inconsistent returns with Statistical, Radius, Hybrid or Remove isolated points. 3D work is processed sequentially in adjustable cubes. Preview the red candidates before applying; thin edges, cables and sparse valid surfaces need particular care.

Procedure

1. Choose the 3D target and start with Gentle. Set 3D cube edge (m), initially 5.
2. Choose SELECT & PREVIEW, then ALL, LASSO or POLYGON. Active clipping boundaries also limit the scope.
3. Watch selection progress, point-spacing measurement and filtering progress with the current cube count and point count.
4. Inspect the red candidates. Use EXCLUDE PREVIEW REGION for areas that must remain.
5. Choose APPLY DENOISE. The verified preview is reused; follow point-removal progress. If you changed the filter settings, cube size, scope or cloud, run SELECT & PREVIEW again.

6. Use UNDO if needed. Cancel during analysis or removal preparation leaves cloud points unchanged.

Commands and parameters

SELECT & PREVIEW

Estimate how many points would be removed without changing the cloud.

APPLY DENOISE

Apply the selected statistical, radius or other configured denoise method to the chosen scope. In RECORD mode this adds a workflow step instead.

CANCEL / CLEAR PREVIEW

Clear the current automatic preview selection without deleting points. Available for 2D and 3D processing targets.

EXCLUDE PREVIEW REGION

Select an area to protect from removal

Method / Neighbourhood

Choose the offered outlier method and its required neighbour count or statistical threshold.

AUTO radius from local point spacing

Estimate a radius for changing cloud density.

Radius

Define the local support distance; too large a value can combine different features.

EXCLUDE PREVIEW REGION

Protect a selected area from removal. Change the clipping scope before creating the final preview, then apply.

3D cube edge (m)

Initial maximum X/Y/Z cube edge in metres; default 5 and supported range 0.01-1000. Dense cubes subdivide automatically, aiming for approximately 65,000 points per processing cube where spatial separation permits. The setting does not change filter radius or point-cloud resolution. It is shared with EDIT > REMOVE CLUTTER and stored with preferences and workflow presets.

Practical notes

Adjacent cubes share enough neighbour support for the selected filter. Support may exceed 5% of the cube edge when required; a small fixed overlap must not remove valid border points.

The statistical threshold is common to the entire selected scope. Each point belongs to one processing cube, preventing repeated removals.

Smaller cubes can reduce local working memory but may increase repeated neighbour work. Try 5 m first, then 2 or 1 m on a representative area. Speed depends on density, radius and data distribution.

Processing operates on the loaded 3D working cloud. Cubes do not turn this into an out-of-core disk processor; leave enough RAM for the loaded cloud and undo state.

The cube setting also applies to 3D clutter classification and recorded denoise workflows. Automatic gentle denoise before upsampling uses 5 m cubes. Ground-aware figure/car shadow cleanup uses the same cube edge for neighbour searches while preserving a common ground reference.

Dense areas use smaller cubes automatically. Neighbour searches skip spatial regions outside the required support zone. Coincident points may prevent further spatial subdivision. Cube times still vary with density, neighbourhood size and available memory; smaller initial cubes do not guarantee a faster total run.

28 Thinning: reduce local point dispersion

EDIT > THINNING

PRO

Fit local planes or lines repeatedly and remove distant samples to reduce point-cloud thickness. Retained points keep their original coordinates and source attributes. Settings, preview results, Apply and Discard remain in the left THINNING panel.

Before you start: Valid PRO license. Loaded editable cloud layers. Load the full source population when the whole survey is required.

Procedure

1. Open EDIT > THINNING. Set the target full thickness or line diameter in millimetres, local patch size, minimum support, iteration limit and minimum retained percentage in the left panel.
2. Choose SELECT & PREVIEW in the left panel, then ALL, LASSO or POLYGON in the bottom COMMAND bar, using its buttons or A / L / P keys. Select the requested region in the 3D view. Current processing layers and clipping boundaries limit the scope.
3. Inspect the highlighted candidate removals and the reached, partial and protected patch counts in the same panel. Check thin objects, boundaries and separate nearby surfaces. Discard preview removes the preview without changing points.
4. Choose Apply thinning only after reviewing the result. Undo last processing restores the previous cloud. Changing a parameter invalidates the old preview; run a new preview. Cancel during analysis leaves points unchanged.

Commands and parameters

Target full thickness / line diameter (mm)

0.1-1000 mm. Full band around a fitted surface, not point spacing. Larger values are gentler; smaller values request stronger scatter reduction. Protection may stop above the target.

Local patch size (m)

0.01-10 m and at least 8 × target thickness in metres. Larger patches provide more context but can mix surfaces. Smaller patches follow finer detail but may lack support.

Minimum points supporting a fit

Whole number, 12-128. Higher values demand stronger support and protect more sparse patches. Lower values allow smaller samples, but do not make complex geometry suitable for thinning.

Maximum fitting iterations

Whole number, 1-20. More iterations allow further narrowing and take longer. Fewer iterations stop earlier. Support, geometry and coverage protections can stop any run before the limit.

Minimum retained points per patch (%)

10-90%. Higher means fewer allowed removals. Local coverage additionally keeps at least 50% in small subareas, with at least 3 points where available; values below 50% cannot disable that safeguard.

Candidate removals retained for local coverage

Number of removal candidates kept to preserve local point coverage. These points are not removed, even when the requested thickness remains unmet.

Practical notes

Hover a parameter for its range and effect, or open Parameter guide · ranges, effects and examples in the left panel for worked examples and report interpretation.

Preview never changes or deletes cloud points. First inspect the candidate removals, then choose Apply thinning or Discard preview. Apply thinning asks for confirmation before removing points from the working cloud; Undo last processing can restore them. Discard preview removes only the preview and leaves the cloud unchanged.

Sparse, ambiguous, crease and detected double-surface patches are protected. The requested thickness is not guaranteed in every patch.

Local coverage takes priority over the target thickness. Small fitted surface cells or line segments retain at least half of their original selected points and at least three points, or all points when fewer than three exist; a higher minimum retained percentage is respected. This reduces avoidable gaps but does not guarantee every detail. A patch reaches the thickness target only when all finally retained points fit inside the full requested band.

The before/after width is sampled selected-patch 95% thickness, computed from selected points before and after candidate removal. Preview markers are limited; removal analysis covers the selected loaded points.

Reduced scatter does not establish absolute survey accuracy. Inspect registration before thinning double surfaces.

29 Classify and remove clutter

EDIT > REMOVE CLUTTER

STANDARD + PRO

Preview unwanted points in a 3D cloud or 2D section, protect regions that must remain, then apply the reviewed result. The 2D classifier distinguishes geometry, probable clutter and uncertain points; 3D uses a hybrid outlier filter with automatic cube subdivision.

Before you start: A loaded 3D cloud or an extracted full-resolution 2D section.

Procedure

1. Open EDIT > REMOVE CLUTTER and select the processing target.
2. Set a modest strength and, for 3D, the initial cube edge. The active processing boundary limits the cloud scope; 2D uses the current section.
3. Press CLASSIFY and inspect the coloured candidates.
4. Use EXCLUDE PREVIEW REGION to protect valid details; include amber points only if appropriate for the 2D section.
5. Press REMOVE CLUTTER. Use UNDO LAST PROCESSING if the result is unsuitable.

Commands and parameters

Processing target

Choose Auto, 3D cloud or 2D section. This is the same processing target used by the other EDIT filters.

3D cube edge (m)

Initial cube edge, default 5 m. Dense regions subdivide automatically. Shared with DENOISE / OUTLIERS; not used by 2D classification.

Geometry-aware clutter

Classification strength from 0 to 200, initially 45. Higher strength can remove valid sparse details; inspect the preview.

CLASSIFY

Prepare a preview without deleting points. Red marks probable clutter; the 2D view can also show uncertain points in amber.

REMOVE CLUTTER

Apply the last valid classification, preserving excluded regions. Creates an UNDO step.

Include uncertain (amber, 2D)

Also remove the uncertain amber points from the 2D preview. Off by default; has no effect on the 3D filter.

CANCEL / CLEAR PREVIEW

Clear the displayed classification without applying it.

EXCLUDE PREVIEW REGION

Select a region to protect from removal.

Practical notes

Changing the cloud or classification parameters requires a fresh CLASSIFY preview. Existing CAD geometry is preserved when removing section points.

Cube subdivision changes how 3D work is grouped; neighbour support remains sufficient across cube boundaries.

30 CSF ground classification

EDIT > CSF GROUND FILTER

STANDARD + PRO

Classify ground and non-ground using a simulated cloth. Scene type, cloth resolution, iterations and classification threshold affect the result. Analyze-only previews classes; keep modes change the working cloud.

Procedure

1. Select the 3D processing target and choose Flat for level terrain, Relief for rolling ground or Steep for stronger slopes.
2. Start with 0.5-1 m cloth spacing, 500 iterations and a 0.2-0.3 m classification threshold. Finer cloth is not necessarily more accurate.
3. Use SELECT & PREVIEW with ALL, LASSO or POLYGON. Inspect roads, slopes, object boundaries and low vegetation in both classes.
4. Read the effective cloth spacing and iterations in the result. A memory-limited grid may be coarser than requested; use a smaller region for finer detail. If the cloth has not settled, increase iterations.
5. Choose the result mode, or preserve both classes as separate layers for All points, then run CSF. Keep the original source available.

Commands and parameters

SELECT & PREVIEW

Select ALL, LASSO or POLYGON and preview classification

RUN CSF

Run cloth-simulation ground classification with the displayed scene, resolution, iteration and threshold settings. The result mode controls which points are kept or previewed.

CANCEL / CLEAR PREVIEW

Clear the current automatic preview selection without deleting points. Available for 2D and 3D processing targets.

EXCLUDE PREVIEW REGION

Select an area to protect from removal

Scene / Cloth resolution

Match terrain character and the scale of features to separate.

Iterations / Classification threshold

Control the cloth solution and the distance used to classify points.

Output mode

Inspect classes first, then choose the intended keep/classification action.

Keep ground + non-ground as separate cloud layers

For All points, retain both classes as independent editable layers instead of discarding one.

Practical notes

The cloth uses aligned model Z as vertical. Classification threshold is a vertical distance in metres, not survey accuracy. Larger values can retain low vegetation and curbs.

Remove low outliers before CSF. A cloth cannot reconstruct unseen ground reliably, and elevated roads, roofs and terraces may require manual review. Regional selections should include surrounding terrain.

Contact nodes remain constrained to the observed lower envelope. Relief and Steep include slope recovery; holes use nearby supported heights instead of a global-minimum fallback.

31 Resampling point clouds

EDIT > SAMPLING

STANDARD + PRO

Downsampling reduces point density. Upsampling interpolates locally supported surfaces and creates synthetic points; it cannot recover unmeasured detail or hidden surfaces.

Procedure

1. Save the project and select the intended cloud or section processing target.

2. For reduction choose spacing or retention; for interpolation first remove obvious noise and set a realistic point limit.

3. Apply the chosen operation in a small representative region.

4. Inspect edges and thin features. Undo if detail is lost; export a separate LAS/LAZ when satisfied.

Commands and parameters

Minimum point distance

Set the spatial spacing used to reduce dense data.

Sampling rate / Retained points

Choose the amount to retain and inspect the resulting count.

APPLY DOWNSAMPLING

Apply reduction to the selected processing scope.

Interpolated point spacing

Set the intended spacing for interpolated points.

Maximum total output points

Bound the output size before upsampling.

APPLY UPSAMPLING

Interpolate within supported regions, then inspect the result.

32 Shadow cleanup

EDIT > SHADOW CLEANUP

PRO

Clean unwanted point patterns in a selected region using the available geometric cleanup parameters. Limit the fence tightly enough to preserve nearby surveyed detail. Fence the suspected person/car shadow. In 3D, cleanup first estimates the true ground from the surrounding cloud, protects ground points, then removes only elevated points that also look transient / weakly supported. 2D remains support-only.

Procedure

1. Use SELECT REGION to fence the suspected transient object.
2. Choose Support radius and Min neighbours for the actual point spacing. Start with a small region.
3. Run CLEAN SELECTED SHADOW and inspect the ground and permanent objects. The method estimates surrounding ground and removes weakly supported elevated points; it cannot recreate unmeasured ground.

Commands and parameters

SELECT REGION

Select the shadow area before cleaning

CLEAN SELECTED SHADOW

Apply the selected shadow-cleanup parameters within the processing region, preserving points outside the chosen scope.

33 Model orientation and level zero

GEOMETRY > ORIENTATION

STANDARD + PRO

Set useful model axes and a height reference. Axis alignment controls the model frame. The datum controls reported/exported H while original survey X/Y stay unchanged.

Before you start: A cloud with a known horizontal or vertical reference.

Procedure

1. Choose alignment from appropriate reference points or a vertical/horizontal reference offered in ORIENTATION.
2. Follow the command prompt for point order and inspect the resulting axes.
3. Use RESET ORIENTATION to reset alignment. Camera rotation only changes the view; model alignment changes the reference used by sections and related operations.

Commands and parameters

ALIGN XY

Pick two points in 3D or 2D. Their plan direction becomes model +X without removing any vertical alignment.

VERTICAL

Pick two points on a feature that must be vertical. The line becomes aligned model Z while the existing plan / yaw orientation is preserved.

HORIZONTAL

Pick two points on a feature that must be level. The line becomes horizontal (same aligned Z at both ends) while the existing plan / yaw orientation is preserved.

RESET ORIENTATION

Return model axes to the original survey frame.

FROM POINT

Click one point in 3D or 2D. Its aligned Z becomes LEVEL 0.00.

FROM SECTION

Use the current aligned-horizontal section as LEVEL 0.00.

RESET MIN Z

Reset level 0.00 to the active aligned model minimum Z.

Aligned Z of 0.00

The aligned model Z used as zero; the corresponding survey elevation defines the output height origin.

Datum position

Move the relative datum with the slider or enter its aligned Z numerically.

Show 0.00 datum plane in 3D

Display the chosen relative datum as a blue plane in the 3D view.

Practical notes

From point sets the reference H=0 for readouts and survey-coordinate exports; it does not move source geometry. See Set relative level zero from a point.

34 Global coordinate shift

GEOMETRY > GLOBAL SHIFT

STANDARD + PRO

Apply a numerical coordinate translation. Verify whether the task is a temporary registration placement or a permanent project coordinate correction before using this panel.

Procedure

1. Confirm the existing coordinate frame and save the project.
2. Open GEOMETRY > GLOBAL SHIFT and enter the required X, Y and Z offsets.
3. Apply the shift once, then inspect a known coordinate.
4. Export a new LAS/LAZ if a transformed cloud deliverable is required. A shift is not a change of coordinate reference system.

Commands and parameters

APPLY GLOBAL SHIFT

Translate the cloud by the entered coordinate offsets. Check the shift direction and units against a known point.

35 Georeferencing with control points

GEOMETRY > MANUAL GEOREFERENCE

STANDARD + PRO

Pair measured local controls with known coordinates and solve the selected transformation. Distribute control points across the project and inspect residuals; closely clustered controls give weak geometric checks.

Procedure

1. Enter matched source and target control points in MANUAL GEOREFERENCE.
2. Review the fitted transformation and residuals before applying. Check units, axis order and vertical reference.
3. For HEPOS, select the required transformation and available grid resources; validate on independent control points before export.

Commands and parameters

PICK SOURCE

Pick a local source control point and associate it with the target coordinates entered in the panel.

LOAD TARGETS CSV

Load target coordinates from CSV for the georeferencing control list. Check the column order and coordinate system.

REMOVE LAST

Remove the most recently added georeferencing control.

CLEAR

Clear the georeferencing control list so a new set of correspondences can be entered.

TRANSFORM

Solve and apply the transformation selected in the panel from the available source and target control points. Review residuals and geometry after applying it.

Transformation type

Choose the offered model appropriate to your controls; use scale only when justified.

Control residuals

Inspect each pair and the overall fit, not only the average error. Reserve independent points to verify the transformation.

Practical notes

All cloud-coordinate 3D picks share the full-resolution front-surface picker and CLOUD / EDGE / CORNER constraint, including Manual Georeference > PICK SOURCE, known elevation, measurements, section direction and registration. Set the constraint in TOPOGRAPHY > PICK POINTS; each registration preview has its own selector. Clipped or hidden cloud points are excluded. Mesh topology editing retains mesh vertex/face selection.

36 Set relative level zero from a point

GEOMETRY > ORIENTATION > Aligned Z of 0.00 / FROM POINT

STANDARD + PRO

Choose the elevation zero used by coordinate readouts and exports. From point makes the picked reference H=0. Survey Easting and Northing remain unchanged, including after model alignment or rotation.

Before you start: A loaded cloud. For a 2D pick, extract the section first.

Procedure

1. Open GEOMETRY > ORIENTATION and locate the level 0.00 controls.
2. Choose From point and indicate the reference point in 3D or the extracted 2D section.
3. Check that the reference reads H=0. Existing picked points and coordinate readouts use the new origin.
4. Check a second point. Survey-coordinate exports use H = survey Z minus the datum elevation, with unchanged survey X/Y. Existing drawings are evaluated against the current datum when exported.

Commands and parameters

From point

Pick a point in 3D or a fully extracted 2D section. Its survey elevation becomes the output height origin.

Aligned Z of 0.00

Set the datum in the aligned model; an anchor records the corresponding survey elevation.

From section

Use the current horizontal section as the datum.

Reset min Z

Use the minimum aligned Z of the active model.

Practical notes

The source cloud and stored geometry are not translated. Changing the datum does not accumulate coordinate shifts or modify source files.

Section-plane/grid coordinates remain in their stated analysis frame. Visual drawings retain their explicit Z=0 convention. Registration and Splicing preserve BASE coordinates and move only FLOATING.

37 HEPOS transformation

GEOMETRY > HEPOS TRANSFORMATION

STANDARD + PRO

Use the configured transformation resources for the supported HEPOS coordinate operation. Engine validation and the required resource files are prerequisites. Native HTRS07 geographic → HEPOS/EGSA87 transformation using the supplied dE/dN 2 km grids and GEOID_GR geoid.

Procedure

1. Identify the actual source datum and height type before using HEPOS.
2. Use original geographic input before applying Global Shift or manual georeferencing.
3. Run VALIDATE HEPOS ENGINE and inspect the available grid/model status.
4. Choose the required height convention and apply the supported transformation to the intended scope.
5. Check independent control points. Use COORDINATE ENGINE when defining complete source/target profiles or transforming a full source file.

Commands and parameters

VALIDATE HEPOS ENGINE

Check whether the configured HEPOS transformation engine and required resources are available before processing coordinates.

LAT/LON/h → HEPOS

Transform the supplied latitude, longitude and ellipsoidal height with the configured HEPOS engine. Check angular units and height reference.

38 Coordinate systems, grids and geoid heights

GEOMETRY > COORDINATE ENGINE

STANDARD + PRO

Audit the coordinate configuration and access the manual georeference tools. Check coordinate-system assumptions before exchanging survey data. Audit coordinate magnitude, axis order, floating-origin precision and georeference control residuals before applying a survey transformation.

Procedure

1. Open TRANSFORM FULL CLOUD and choose the actual source LAS/LAZ plus a different output filename. Export edited workspace data first if you want those edits included.
2. Define the SOURCE and TARGET CRS independently using EPSG search, WKT/PROJ or a named profile. Confirm units and axis order.
3. Add the required horizontal grid and vertical geoid separately. Do not apply the same correction twice.
4. Review the height convention: SOURCE geoid converts H to h; TARGET geoid converts h to H. Verify coverage and the actual source datum.
5. Run the transform and wait for success. Open the output manually and check independent control points.

Commands and parameters

RUN COORDINATE AUDIT

Analyze the active cloud coordinate setup and produce the coordinate audit shown in the panel.

OPEN GEOREFERENCE CONTROLS

Open the manual georeference controls to correct or establish the cloud coordinate relationship.

EXPORT AUDIT…

Save the coordinate audit for project records and quality review.

Practical notes

Open GEOMETRY > COORDINATE ENGINE > TRANSFORM FULL CLOUD. Select the actual LAS/LAZ input and a different output filename. This transforms every source point record; save an edited working cloud first if that is the data you intend to transform.

SOURCE and TARGET each have SEARCH EPSG. Search by code (for example 32634), partial name (UTM 34N), country or area (Greece). The coordinate-system catalogue is available offline, with deprecated definitions available through a separate checkbox. Catalogue availability does not imply that every optional transformation grid is bundled.

For WGS84 geographic input choose EPSG:4979 and X=longitude, Y=latitude, Z=ellipsoidal h. Use latitude-first only when the file stores the reverse order. UTM zone alone does not identify the datum. HTRS07 / UTM 34N and WGS84 / UTM 34N are different source profiles.

ADD GRID FILE selects a horizontal datum correction. For the supplied native HEPOS correction, choose either Greece_2km_V1-0.gsb OR Greece_HEPOS_dEast.grd followed by Greece_HEPOS_dNorth.grd. They contain the same corrections and must not be accumulated. This GSB stores linear METERS corrections, not ordinary angular NTv2 shifts.

Selecting the native HEPOS grid selects the verified native HTRS07-to-GGRS87/TM87 operation: seven parameters, then residual grid. Use an actual HTRS07 source. A WGS84 source requires its verified transformation to HTRS07 first; EPSG:2100 remains available as a separate standard EPSG target.

ADD GEOID FILE selects a vertical height model separately: the supplied EGM08_EU.UGF, GEOID_GR.UGF, GR_EGM96.ggf or HEPOS_GEOID.GGF, or a supported GTX grid. SOURCE adds N (H to h); TARGET subtracts N (h to H). Select one model for each side as appropriate. A horizontal EPSG definition alone does not establish an orthometric height datum.

For generic projections, verify the geographic CRS used to sample the geoid. Native HEPOS samples the supplied model in the HTRS07 geographic input. The bundled GEOID_GR checkbox is used only for native HEPOS when no separate geoid is selected. CLEAR GEOID also disables that fallback.

The supplied GEOID_GR.UGF lacks its final node. Its other covered cells can be used; a calculation requiring the missing node is rejected. TNL row direction is read from the file header. Missing values and out-of-coverage points are never silently replaced by zero.

PARAMETERS > IMPORT SURPAD SP fills the ellipsoid, Transverse Mercator parameters, converted seven parameters, and separate grid/geoid references. Review vendor operation direction/convention. The seven parameters are not automatically assumed to mean datum-to-WGS84. To use the supplied HEPOS correction, return to ADD GRID FILE and select the native GSB or GRD pair; this selects the native operation rather than treating that GSB as NTv2.

For other angular NTv2 grids, ADD GRID FILE writes the horizontal grid reference into the CRS. Full WKT / PROJ definitions remain editable for other projection methods or supported compound/vertical operations. Do not add a separate geoid when the definition already includes +geoidgrids; the duplicate configuration is rejected.

SAVE NAMED stores a reusable JSON profile and adds it to the local projection list. IMPORT also accepts the supplied SurPro CFG layout and EPSG/WKT/PROJ text. Use exported WKT/PROJ definitions for other proprietary profile formats. Carry external grid/geoid files with named profiles when moving computers.

The output is LAS 1.4 with target CRS metadata; all non-coordinate point-record bytes are preserved. A separate target geoid writes a 2D horizontal plus vertical compound CRS. Missing operations/grids or coverage errors stop the export without replacing an existing destination. LAZ uses the supplied LASzip component; waveform formats need a non-waveform export first. Check known control points before using a transformed survey.

39 Survey points and 3D picking

3D > Points > Pick 3D Point

STANDARD + PRO

POINTS stores named Easting, Northing and Elevation positions. Sphere, Checkerboard and Cross are display symbols centred on those coordinates, not measured physical solids.

Procedure

1. Open TOPOGRAPHY > PICK POINTS or use the POINTS toolbar.

2. Choose a name prefix and Cloud, Edge or Corner picking. Set the target appearance.

3. Enable Pick 3D Point, inspect the candidate and click. Repeat, then press Esc.

4. Alternatively choose Import, map columns and verify the preview before importing.

5. Review Points DB and compare an independent control coordinate before exporting.

Commands and parameters

Pick 3D Point

Start picking supported cloud positions; Esc ends picking. Cloud, Edge and Corner constrain the accepted result.

Import

Map Name, Easting, Northing and Elevation columns from a text file. Review separator, decimal convention and header handling.

Points DB

Review names, coordinates, appearance and origin; select records for editing or export.

Target style / Size / Colour / Opacity

Set the appearance of new points. Apply changes to existing points through Points DB.

TXT ALL / DXF ALL

Export all named survey points in their actual coordinates.

Practical notes

Imported reference points remain fixed under supported overall cloud transformations; picked points follow those transformations. Points are not attached to individual cloud layers: recheck them after independent layer registration.

Choose Cloud for the nearest visible measured point to the cursor. Choose Edge or Corner explicitly to fit supported surface intersections. A held edge follows the current cursor ray along the fitted line. New clouds need an initial preparation; changing the view reuses that preparation. The visibility check uses the point cloud, not a reconstructed opaque mesh: inspect the marker on sparse or ambiguous surfaces.

40 Point-picking settings

3D > Points > Pick Settings

STANDARD + PRO

Point picking searches a region around the pointer. Edge and Corner assistance estimate intersections of locally supported surfaces; verify candidates on noisy or sparse data.

Procedure

1. Open POINTS > Settings and choose a naming convention.
2. Set the pick radius for the visible point spacing. Select Cloud, Edge or Corner in the Snap list.
3. Adapt plane search radius and tolerance to the feature scale and scan noise.
4. Pick a known feature from two views and check the resulting coordinates.
5. Choose whether off-plane targets should be projected into the 2D section.

Commands and parameters

Name prefix / Automatic point names

Use sequential unique names or enter a name after each pick.

Snap: Cloud / Edge / Corner

Choose Cloud for the nearest visible measured point to the cursor.

Pick radius

Search footprint from 2 to 50 screen pixels; default 10.

Plane search radius

Neighbourhood for surface fitting, from 0.02 to 20 m; default 0.50 m.

Plane fit tolerance

Accepted point-to-plane distance, from 0.0001 to 0.50 m; default 0.015 m.

Project all visible points onto the 2D section

Show every visible target projected on the section, or only targets within its thickness. Projection does not move the stored point.

Minimum surface extent (m)

Minimum supported length and width of each fitted plane.

Minimum supported edge length (m)

Minimum overlapping length supported by the intersecting planes.

Minimum plane intersection angle (degrees)

Reject unstable intersections between nearly parallel planes.

Maximum gap to measured support (m)

Maximum distance from the proposed intersection to measured supporting points.

Minimum points per plane

Minimum number of points required to fit a supporting plane.

Practical notes

Cloud-coordinate picks in the main 3D viewport use the foreground picker with Cloud / Edge / Corner constraints. Set the constraint in TOPOGRAPHY > Pick points. Registration preview windows have their own selectors. Clipped or hidden cloud points are excluded; mesh editing retains mesh vertex/face selection.

Geometric support settings are saved with preferences and shared by the geometric Edge/Corner picker. Increase the search radius when larger surfaces are needed; a larger radius does not waive the support thresholds.

Choose Cloud for the nearest visible measured point to the cursor. Choose Edge or Corner explicitly to fit supported surface intersections. A held edge follows the current cursor ray along the fitted line. New clouds need an initial preparation; changing the view reuses that preparation. The visibility check uses the point cloud, not a reconstructed opaque mesh: inspect the marker on sparse or ambiguous surfaces.

41 Points database, averaging and coordinate exports

3D > Points / 2D > Tools > Points Database

STANDARD + PRO

Points DB contains survey points picked in 2D/3D or imported. Exported coordinates describe the survey positions, independently of the target symbols.

Before you start: Survey points in a common coordinate reference frame. Averaging requires at least two selected records.

Procedure

1. Use IMPORT POINTS... to open the TXT/CSV/XYZ importer. Map names and Easting/Northing/Elevation, review the preview and import.
2. Select rows with Ctrl/Shift. Edit the name or appearance fields and apply them to the selected records. Show/hide changes visibility without deleting points.
3. For averaging, select at least two points and choose Average Selected (XY), (XYZ) or (Z). Each operation creates one new point; it does not move the participants.

4. In XY mode choose the reference point whose elevation will be retained. In Z mode choose the reference point whose Easting/Northing will be retained. XYZ averages all three coordinates.

5. Review the proposed name, resulting coordinates and the differences from every participating point. Changing the reference updates the preview. Confirm creation, then choose whether to keep or delete the participants; keeping them is the default. Cancel changes nothing.

6. Use EXPORT... > All or Selected > TXT or DXF. Check a known point and its name in the receiving application. Undo point edit can reverse the complete averaging operation, including deletion of its participants.

Commands and parameters

Name / Easting / Northing / Elevation

Point identity and current output coordinates. Elevation follows the active output datum; X/Y remain fixed.

Symbol / Size / Colour / Opacity / Visible

Target appearance and visibility. Apply to selected or all points as required.

Origin

Shows whether a point was imported, picked on Cloud/Edge/Corner or created by averaging.

IMPORT POINTS...

Import TXT/CSV/XYZ coordinates through column mapping and preview.

EXPORT...

All > TXT, All > DXF, Selected > TXT or Selected > DXF. DXF includes point entities and labels.

Average Selected (XY)

Arithmetic mean of Easting and Northing, with elevation from the chosen reference point.

Average Selected (XYZ)

Arithmetic mean of all three coordinates.

Average Selected (Z)

Arithmetic mean elevation, with Easting and Northing from the chosen reference point.

Result and differences

Preview X/Y/H and per-point differences in X, Y and H, plus horizontal and spatial distance to the new point.

Delete selected / Undo point edit / Fit points

Delete records, reverse a supported point edit, or frame the points in the view.

Practical notes

Averages use equal weights. Combine observations of the same intended feature; the result is not a weighted survey adjustment or an accuracy certificate.

Imported coordinates must already use the cloud reference frame. Changing the elevation datum updates displayed/exported H while preserving survey X/Y.

42 Picking survey points from a section

2D > Tools > Pick 2D Point

STANDARD + PRO

Pick 2D Point creates a named point on the active section plane, using the same Points DB as 3D picking. Its stored coordinates are derived from the section position and orientation.

Procedure

1. Extract or open the required section and confirm its position and orientation.
2. Enable the required 2D SNAP modes, including endpoint, intersection or perpendicular when useful.
3. Choose Pick 2D Point and click the intended location in the section. Repeat and press Esc.
4. Review the point in Points DB and in 3D. A target projected from outside the section contributes its section projection, not its off-plane depth.
5. Export TXT or DXF and check a known coordinate.

43 Extracting a full-resolution section

3D > Section; SECTION > SECTION / SLICE

STANDARD + PRO

Position a plane and define the thickness of the retained band. Live section preview supports navigation; EXTRACT FULL-RES SECTION creates the editable 2D working section. Batch export repeats extraction over a position range.

Procedure

1. Select TOP, FRONT or SIDE, or define the desired section angles.
2. Drag the plane grip, position slider, thickness grip or thickness slider. Hold the up/down arrow for repeated movement using STEP.
3. While held, only the visual plane/band changes: no intermediate section extraction is queued. Release the mouse to calculate a preview for the final position and thickness; keyboard adjustment commits on key-up.
4. For final drafting use EXTRACT FULL-RES SECTION. A live preview is a bounded sample of available loaded points.
5. BATCH SECTIONS DXF uses a different truecolor per section layer. Lines and optional points are ByLayer, so editing the layer color in CAD recolors them. Enable Add batch sections to SECTION LIST to retain the extracted points and detected drawing in the project after successful export; leave it off for DXF only.

Commands and parameters

HORIZONTAL

Set a horizontal section plane. Use the position and thickness controls to select the required height band.

FRONT

Set the front vertical section orientation. Adjust position, azimuth or dip if a different vertical cut is required.

SIDE

Set the side vertical section orientation and position it through the feature of interest.

FROM VIEW

Choose the section preset associated with the current 3D view. Confirm the resulting plane in 3D before extraction.

FLIP NORMAL

Reverse the section normal and the associated viewing direction. Check the 2D orientation before exporting.

DIRECTION FROM 2 POINTS

Pick two points in the 3D viewport. Their horizontal direction defines a vertical section plane through their midpoint.

EXTRACT FULL-RES SECTION

Extract the points within the current plane thickness at full section resolution for 2D editing and fitting. The live preview is not the extracted working section.

USE FULL RANGE

Fill the batch start and end positions from the range of the current section orientation through the model.

BATCH SECTIONS DXF…

Export successive sections into one DXF, with a different color per section. The LINES and optional POINTS layers for one section share a color; all entities are ByLayer.

Section level / position

Move the plane numerically or with the centre grip; up/down uses the selected step.

Thickness

Set the full band around the section plane. For example, 0.030 m is a 30 mm band.

Step

Set the movement increment used for successive positions.

Start / End / Step

Define the range and spacing of batch cloud sections.

Section plane handles

Drag position or thickness grips, then release to refresh the preview. Extract full resolution before detailed CAD work.

Add batch sections to SECTION LIST

Retain each batch section with raw points, working points and detected lines after successful DXF export. Off by default; the choice is remembered.

Horizontal section at point / between heights

The two buttons after Section from two 3D points extract horizontal sections. One picked cloud point sets the height and retains the current thickness (default 0.03 m). Two points set lower/upper aligned project heights in either order; their difference is the thickness. Esc cancels.

Repeat and thickness preview

Horizontal section picking stays active for repeated height changes until Esc. Between two heights, moving the cursor after the first point previews the vertical line and slab thickness only in 3D. The second click updates the 2D section and starts another pair.

Practical notes

Section DXF coordinates: horizontal plans retain survey X/Y and the current datum H. Facades, vertical and inclined sections export flat in CAD XY with Z=0. X follows the section horizontal direction. In a vertical facade Y is datum height; in an inclined section Y is true in-plane distance plus the section origin datum height, not vertical height. They open face-on as a section drawing. Camera pan/zoom/Sync rotation does not redefine these coordinates. Explicit 3D DXF remains spatial. Re-export older files to use this convention.

44 2D section cleanup

SECTION > 2D SECTION CLEANUP

STANDARD + PRO

Clean noise in the extracted working 2D section. The dedicated panel is in SECTION beside SECTION / SLICE. The cleanup button opens ALL / LASSO / POLYGON in the bottom command bar. ALL uses the whole working section within the processing boundary; LASSO or POLYGON restricts cleanup to the region selected in the 2D view.

Before you start: An extracted working 2D section. Check its processing boundary before applying cleanup.

Procedure

1. Extract the required 2D section, then open SECTION > 2D SECTION CLEANUP beside SECTION / SLICE. Alternatively, Ctrl + right-click in the 2D view and choose 2D Section Cleanup; this opens the settings without running the filter.
2. Set the section processing boundary to limit the available cleanup area when required.
3. Choose Noise strength from 0 to 300% and set the detached-cluster and surface-like-clutter options. The default strength is 48%. Enter a value in the numeric field and leave the field to commit it.
4. Choose CLEAN 2D SECTION NOISE, then ALL, LASSO or POLYGON in the bottom command bar. With LASSO or POLYGON, select the requested region in the 2D view. Esc cancels the scope command. Cleanup processes the chosen section points inside the processing boundary; inspect small genuine features and thin edges in the result.
5. Use RESTORE RAW 2D SECTION to return to the raw extracted section when reconsidering cleanup. This also clears detected lines; repeat detection after restoring if needed.

Commands and parameters

Noise strength

0-300%; default 48%. Increasing above 100 extends the actual cleanup settings rather than merely changing the display. Zero is the lightest setting, not Off. This number is not the percentage of points removed.

Reject small detached clusters

Include small disconnected point groups in the cleanup assessment. Inspect legitimate isolated features before keeping the result.

Reject surface-like / filled clutter

Include filled or surface-like clutter in the cleanup assessment. Strong settings can remove genuine detail.

CLEAN 2D SECTION NOISE

Choose ALL, LASSO or POLYGON in the bottom command bar, then clean the chosen 2D section region within the processing boundary. There is no separate preview stage.

RESTORE RAW 2D SECTION

Restore raw section points and clear detected lines.

Ctrl + right-click > 2D Section Cleanup

Open the dedicated panel and settings without immediately cleaning points.

Practical notes

Raise strength progressively and inspect the result. The operation acts on the 2D working section; the processing boundary defines its limit. Empty selections and cancellation make no change; an empty region never falls back to ALL. Undo is created only when points are successfully removed. Unselected points, source attributes and manual CAD drawings are preserved; existing drawings are not refitted to the cleaned section.

45 Stored sections and overlays

Central toolbar > SECTION LIST; SECTION > SECTION MANAGER

STANDARD + PRO

Browse stored sections and their drawing content. Opening a saved section restores it for 2D use; the 3D command locates its plane in the model. Every FULL-RES extraction is stored for the current project, including its edited points and 2D CAD work.

Procedure

1. Open SECTION LIST beside CLOUD LAYERS. Double-click a row to open its stored section for editing. A single click highlights it for Rename.
2. Check Select beside the sections to process; selection is shared with SECTION MANAGER. Select All / Clear Selection affect these checkboxes.
3. Use 2D for read-only backgrounds, 3D for section linework, and Color to set a project-persistent display color.
4. Use Merge Selected for at least two parallel sections, or Export Selected to save each checked section to a separate DXF.
5. Delete Selected removes whole sections after confirmation. Clear Selected Drawing asks separately and retains their points and placement.

Commands and parameters

OPEN

Open the selected stored section in the 2D viewer.

3D

Show the selected section plane and thickness in the 3D viewer.

DXF

Export the currently opened stored section to DXF.

RENAME SECTION…

Assign a descriptive name to the selected stored section. The displayed level remains a separate value referenced to the current datum.

×

Delete the selected stored section from the project.

Reference section opacity

Make background sections visually distinct from the active editable section.

Show current section drawing in 3D

Display the drawing at its actual section plane.

Select

Include this section in bulk operations. Highlighting a row and checking Select are independent.

Section export contents

Choose points, detected lines, fitted geometry, measurements and annotations as offered.

SHOW/HIDE SELECTED 2D / 3D

Apply visibility to the selected section backgrounds/drawings. OPEN activates one section for editing.

CLEAR SELECTED DRAWINGS / CLEAR SELECTION

CLEAR SELECTED DRAWINGS removes CAD, measurements and annotations after confirmation, keeping section points. CLEAR SELECTION only deselects list rows.

SECTION LIST grid

Open beside CLOUD LAYERS. Select, 2D, 3D and Color control the same stored sections as SECTION MANAGER. The compact grid shows name, plane/position, thickness, point count and drawing count, with room for at least five section rows.

Color

Choose a color for section references and 3D drawing. It is saved in the project; this display color does not change DXF export layer colors.

Select All / Clear Selection

Check or uncheck all sections for bulk operations. These commands do not change the active drawing.

Delete Selected...

Delete checked sections and their cached points/drawings after confirmation.

Merge Selected

Create a separate merged section from at least two checked parallel sections. Originals remain.

Export Selected...

Write one DXF per checked section, preserving its section coordinate plane. Choose whether to include section points. Multiple sections use a folder; duplicate/existing names get suffixes.

Rename...

Rename only the highlighted row, regardless of which Select boxes are checked.

Clear Selected Drawing

After confirmation, remove lines, fitted geometry, measurements and annotations from checked sections. Keep each section, point cache, plane, color and visibility.

Practical notes

Section DXF coordinates: horizontal plans retain survey X/Y and the current datum H. Facades, vertical and inclined sections export flat in CAD XY with Z=0. X follows the section horizontal direction. In a vertical facade Y is datum height; in an inclined section Y is true in-plane distance plus the section origin datum height, not vertical height. They open face-on as a section drawing. Camera pan/zoom/Sync rotation does not redefine these coordinates. Explicit 3D DXF remains spatial. Re-export older files to use this convention.

46 Section properties: density, size, grid and colors

2D > View > Section Properties

STANDARD + PRO

The first SECTION panel controls 2D point density and size, metric grid/axis values and independent section-point colors. CAD line appearance is in DRAW > PROPERTIES.

Procedure

1. Open SECTION > SECTION PROPERTIES on the active section.
2. Choose Single colour or an attribute such as RGB, elevation, GPS Time or intensity.
3. Set the uniform colour or numeric palette as appropriate.
4. Compare against the CAD line styling and adjust contrast. Missing attributes cannot be reconstructed by a colour choice.
5. For Elevation, GPS Time or Intensity, set Saturation and Display Range as in the 3D view, then Apply. Sections have their own settings, independent of the 3D view.

Commands and parameters

2D section density / 2D point size

Adjust display density and point size of the section.

Show metric grid / 2D grid / axes

Show the grid, choose axis values and set its color.

Color mode

Choose the section-point attribute or a uniform colour.

CHOOSE POINT COLOR

Set the uniform section-point colour.

Palette

Select an appropriate gradient for numeric values.

Palettes and ranges

The existing Spectral, Viridis and Grayscale palettes plus the six additional palettes are available for section scalar fields. Settings are stored in the project.

Practical notes

The closed Palette selector shows the color strip only. Open the list to see each palette name and its colors; hover over the selector to see the selected name.

The VIEW toolbar OPACITY control adjusts X-RAY gain. It is separate from per-cloud Transparency (%) in registration and per-image transparency.

View → Section Properties in the 2D toolbar also reveals the left panel when it is hidden.

47 2D drawing and guide properties

DRAW > PROPERTIES

STANDARD + PRO

The first DRAW panel contains independent styles for construction guides and CAD drawing lines.

Procedure

1. Open DRAW > PROPERTIES.
2. Under Extension / construction guides choose color, line type and screen thickness.
3. Under 2D drawing / CAD lines choose the independent drawing style.
4. Inspect the section. These controls change appearance, not coordinates.

Commands and parameters

Extension / construction guides

Set guide color, line pattern and on-screen thickness independently of CAD entities.

2D drawing / CAD lines

Set drawing color, line pattern and thickness. This styling does not change geometry.

48 Automatic line detection and drawing audit

DRAW > AUTOMATIC DRAWING

STANDARD + PRO

Prepare an extracted section and detect structural lines. Cleanup and classification help remove clutter, but must be checked against the surveyed points before accepting the drawing.

Procedure

1. Prepare a clean full-resolution section and limit detection to the intended region.
2. Choose the primitive types and thresholds; run AUTO DETECT BEST-FIT or the desired detection command.
3. Inspect support, gaps and junctions. Use AUDIT / CHECK to review proposed corrections rather than accepting unsupported geometry.
4. Enable Auto join nearby endpoints and set Join tolerance (m), initially 0.01. New detection results are checked against one another and against retained drawing vertices. Existing retained entities remain fixed, including during local detection.
5. For manual correction choose JOIN NEARBY ENDPOINTS, then ALL, LASSO or POLYGON in the command window and finish the entity selection. Every vertex of each selected polyline participates, including intermediate vertices and closed corners. UNDO restores the previous geometry.

Commands and parameters

2D drawing / CAD lines

At the top of this panel, choose Color, Line type and Thickness for the 2D drawing. These display settings do not change geometry.

AUTO-CLEAN BEFORE DETECTION

Applies the selected detection cleanup strength to the visible 2D section. Repeat as needed; every successful cleanup creates its own UNDO step.

UNDO LAST CLEANUP

Undo the most recent AUTO-CLEAN BEFORE DETECTION step. Repeated clicks walk back repeated cleanup passes.

FIND MISSING LINES

Second-pass recovery on points not already explained by detected wall lines.

AUTO DETECT BEST-FIT

Detect best-fit line segments from the current extracted section using the automatic drawing settings. Inspect discontinuities and unwanted segments before DXF export.

AUDIT / CHECK

AUDIT / CHECK · find interrupted collinear drawing entities and review merge proposals

CLEAR DETECTED LINES

Remove automatically detected line segments from the working drawing.

Detection detail / Length / Tolerance

Match feature scale and scan noise; increasing detail can also create unwanted short entities.

JOIN / AUDIT maximum gap

Limit accepted interruptions between collinear drawing segments; zero permits an unlimited gap and needs careful review.

Join tolerance (m)

Maximum 2D vertex distance in the active section drawing; Z/elevation is ignored. Default 0.01 m (1 cm). Vertices are compared with vertices, not edge interiors. Longer entities take priority, while existing shared junctions move together. A move that would collapse any incident segment is rejected.

Join results

A compact summary appears only below JOIN NEARBY ENDPOINTS, with no results popup: vertex moves, new polylines and merged entities, checked entities and tolerance. Skipped entities and rejected moves appear when nonzero. Zero moves can still produce polylines when endpoints already coincide.

Cell size (m) · ALL

Side length of square detection cells for ALL, with overlap along their boundaries. 15 m means 15 × 15 m cells. It controls the analysis area per cell, not snapping precision.

Practical notes

Local and full-area detection can find supported short details, including stair treads and risers. A missing or occluded edge is not guaranteed to be reconstructed. Review lines against the actual points, then correct endpoints and joins with CAD tools.

Both LINE endpoints are compared with both endpoints of other lines and with every vertex of other polylines. Polyline-to-polyline correction includes intermediate vertices on both entities. Moving an intermediate vertex updates both adjacent segments without splitting the polyline. Selection selects whole drawing entities; all their vertices participate.

Composite polylines keep their constituent lines and curves. Arc endpoints and spline fit points participate; sampled points used only to display a curve are not treated as extra junctions. When arc endpoints move, the circular arc is adjusted while retaining its sweep. Circles have no distinct vertices and are skipped. A corrected rectangle becomes a closed polygon when necessary.

After vertex correction, connected open LINE/POLYLINE endpoints automatically become one polyline, including endpoints already at the same 2D position. Intermediate polyline vertices are snapped but do not merge entities. Junctions with three or more branches and contacts with retained drawing entities remain separate. Closed chains become closed polylines. UNDO restores both coordinates and original entities; BREAK can separate the resulting components. Automatic detection merges only its new entities and preserves retained work.

49 Visual digitizing and recognition on a drawing plane

3D View > Visual / Visual Edit (DRAW > VISUAL DIGITIZING)

PRO

Use the Visual tab beside 3D Draw to trace density, RGB or raw-intensity features in Top view. Selecting a Visual drawing tool automatically switches to Top view and enables X-RAY, prepares the current view when needed, then starts drawing. Every new Visual vertex has actual elevation Z = 0. Properties is a fixed-size settings form; the drawing workspace and recognition review remain in the left sidebar.

Before you start: Valid PRO license and loaded processing points. RGB or raw intensity must be present for the corresponding source. Visual tools set Top view and X-RAY automatically.

Procedure

1. Open Visual > Properties to choose Density, RGB contrast, Raw intensity contrast or X-ray appearance · colour / brightness, analysis resolution, Sensitivity and minimum recognized line length. The compact fixed-size form uses Save and Cancel. The drawing plane remains Top at Z = 0. X-ray appearance approximates displayed colour and brightness; it is not an exact framebuffer capture or measured scanner intensity. Save retains settings without starting preparation.

2. Choose Line, Polyline, Spline, Arc, Circle, Rectangle or Polygon. The tool switches to Top view, enables X-RAY and prepares the whole current 3D view if the existing features are missing or stale, then starts drawing. A valid prepared view is reused; no region-selection step is needed. Canceling preparation does not start drawing. Prepare, the first toolbar icon, explicitly switches to Top/X-RAY and refreshes the whole view.

3. Pick the required points in Top view. Circles and arcs use three points. Rectangle uses an edge start, edge end and a third point for its width. Polygon and Polyline finish with Enter; Endpoint can close them at their first vertex. All new manual and accepted recognized geometry is created at Z = 0.

4. Set image Snap to Edges + corners, Corners only or No image snapping. Endpoint independently snaps to drawing vertices, including the first pending point. Alt temporarily bypasses both image and endpoint snaps.

5. Use Project to 2D to display the new Visual drawings in the 2D view. Their stored vertices already have Z = 0; this is not only an export setting.

6. Choose Review recognition. It also switches to Top/X-RAY and automatically prepares the current view when needed, then opens the sidebar review. When candidates exist, the first row is selected and previewed immediately in cyan. Selecting other rows updates the overlay; Ctrl selects several. No geometry is added until

Accept selected. Clear selection removes the preview; Close review leaves the drawing unchanged. Drawing Undo is available after acceptance.

7. Choose Export visual DXF and save the file. Visual DXF uses world X/Y at Z = 0 automatically, without an elevation question. Legacy Visual drawings from other views are excluded from this 2D output.

8. Pan and zoom remain available. Changing the view, processing data or saved settings can invalidate prepared features; the next Visual drawing tool returns to Top/X-RAY and prepares again when required.

9. Visual Edit provides Fillet, Move, Copy, Rotate, Offset, Scale and Mirror. Selected suitable Visual drawings are reused; otherwise choose All, Lasso, Polygon or Click in the command bar. Click selection finishes with Enter. Move/Copy use base and destination points. Rotate uses centre, reference and new direction; Mirror uses two axis points. Offset asks for distance and side; Scale asks for a factor and fixed base point. Inspect the live preview before the final click. Esc cancels the pending edit; Ctrl+Z restores a committed edit.

Commands and parameters

Prepare

First icon in Visual. Switches to Top view, enables X-RAY and refreshes features for the whole current view. Drawing tools do this automatically when preparation is missing or stale.

Properties / Density / RGB / raw intensity

Settings only, with Save and Cancel. The Top drawing plane and Z = 0 elevation are fixed; saving settings does not begin preparation.

Drawing plane / elevation

All new manual and accepted recognized Visual vertices use world X/Y at Z = 0. The drawing workflow is limited to Top view.

Endpoint / image Snap

Independent controls for drawing vertices and image features. Alt bypasses both. No image snapping still permits Endpoint when it is enabled.

Rectangle

Three picks: first corner, second corner along the intended edge, then the width side. The rectangle can be rotated in the Top plane.

Review recognition

Review line, polyline, circle and arc candidates with support and fit error. The first candidate is previewed initially; changing selection updates the overlay. Accept selected adds the chosen geometry.

Project to 2D / Export visual DXF

Show the new Top drawings in 2D, or save Visual DXF at Z = 0 automatically.

Sensitivity (0-100)

Higher sensitivity lowers the minimum contrast and includes weaker colour/brightness changes, potentially adding clutter. Lower sensitivity keeps stronger features. Adjust it in Properties or the Visual toolbar. Toolbar changes refilter prepared features while retaining pending drawing vertices; picking waits for the refresh.

Delete / Edit / Add vertex / Remove vertex

Delete asks for ALL, LASSO, POLYGON or CLICK in the command bar and affects Visual drawings only. Edit moves vertices; Add and Remove change vertices of Visual lines and polyline/polygon outlines, including rectangles. Changes retain Z = 0 and support Undo/Redo. Circles and arcs support whole-element deletion, not these vertex operations.

Visual Edit

After Properties and Visual, Visual Edit provides Trim / Extend (join two open ends), Trim (remove the picked portion against a boundary), Extend (extend an open end to a boundary), Perpendicular 90° (reference then target segment), and Balanced Perpendicular (outer, middle, outer segment). Follow COMMAND prompts. Edits keep Z=0 and support Undo/Redo. Esc cancels pending picks.

Show / Project to 2D

Show changes only Visual visibility in 3D and is saved in the project. Project to 2D controls projection independently.

Visual Parallel Line / Visual Vertical Line

Pick a straight reference segment, then any start and the end. The end is constrained parallel or perpendicular to the infinite reference line. Continue with another start or press Backspace to change the start/reference; Esc ends the command. Vertical Line is also available in 2D Draw.

Visual Edit / direct selection

Delete drawings and Move / Add / Remove vertex are in Visual Edit before Undo/Redo. When no other command is active, click Visual geometry in 3D to select it; Ctrl-click toggles selection. Delete removes selected Visual objects. Drag a selected line/polyline vertex freely at Z=0; Shift follows its original edge direction (the nearest adjacent direction at a polyline corner). Esc cancels the drag; Undo restores committed edits. Circles/arcs support whole-object selection and deletion, not vertex dragging.

Properties / line style

Choose a line colour (name or #RRGGBB) and thickness above 0 up to 10 mm for new manual and accepted recognition drawings. Optionally apply the style to selected Visual drawings. Cancel leaves style unchanged; Save remembers defaults.

Practical notes

Z = 0 is a drawing convention, not a measured physical elevation. Visual features can represent color changes, furniture, shadows or overlapping depths rather than physical edges. Inspect every accepted feature.

Existing Visual drawings created outside Top in older projects remain 3D-only and use LightSkyBlue. They do not appear in the 2D overlay or Visual DXF at Z = 0. The stored geometry and view classification persist with the project and drawing Undo.

Resolution and contrast affect recognition. Small or weak features may be missed, and automatic results do not replace review.

Standard 3D Draw behavior is unchanged. The Visual toolbar and DRAW > VISUAL DIGITIZING sidebar are separate from the physical CLOUD / EDGE / CORNER picker.

Fillet joins straight open ends of two lines or polylines with an exact circular arc. Enter a positive radius, then indicate the two ends; a radius that consumes an adjacent segment is rejected. Preselected drawings restrict the picking scope; end/side clicks remain necessary. Visual edits retain style and Z=0. Delete uses selected Visual drawings when available; ordinary 3D drawings are excluded.

Trim/Extend, Trim and Extend use the clicked straight segment of a multi-vertex polyline, including its closing segment. They share the 2D segment-editing behavior. Unaffected vertices and explicit styling are retained; a trim may produce separate pieces. Click the intended segment and side of the cut.

Visual Spline uses interpolated fit points and the same drawing workflow as 3D Spline, always in Top/X-ray at Z=0. Recognition combines smoothly continuing supported fragments into polylines and consolidates overlapping paths. Separate edges, unsupported gaps and ambiguous crossings remain separate. Review the proposed paths before accepting.

50 Best-fit geometry

2D > Fit > Best fit geometry

STANDARD + PRO

Fit a primitive to fenced support points. Choose a shape appropriate to the feature, avoid including unrelated objects and inspect residual departures visually. Tools remain active for repeated fitting until ESC.

Procedure

1. Fit is immediately after Draw. Its order is Local Auto Detect; Line, Circle, Arc, Polyline, Spline; Rectangle, Polygon; L-Shape, with separators between these groups. The same Draw/Fit separation applies to the main and detached 2D CAD, DIGITIZE and both registration CAD panes.
2. Extract a full-resolution section with sufficient support points.
3. In 2D > Fit choose Best fit line, circle, arc, spline, polyline, rectangle, polygon or L-Shape.
4. Fence only the points belonging to that feature and inspect the fitted result.
5. Repeat for the next feature, or press Esc to end the continuous command.
6. Correct joins and endpoints with CAD tools, then verify a known dimension before DXF export.

Commands and parameters

LINE

Continuous Best-Fit Line. Fence support points repeatedly; ESC exits.

CIRCLE

Continuous Best-Fit Circle. Fence support points repeatedly; ESC exits.

ARC

Continuous Best-Fit Arc. Fence arc support points repeatedly; ESC exits.

SPLINE

Continuous Best-Fit Spline. Fence curved support points repeatedly; ESC exits.

POLYLINE

Continuous Best-Fit Polyline. Fence support points repeatedly; ESC exits.

RECT

Continuous Best-Fit Rectangle. Fence support points repeatedly; ESC exits.

POLY

Continuous Best-Fit Polygon. Fence support points repeatedly; ESC exits.

CLEAR FITTED GEOMETRY

Clear the fitted primitives created by the Best Fit tools.

Practical notes

Best fit L-Shape requires at least six points distributed over two perpendicular sides. It fits two connected perpendicular segments; select only the intended corner support.

51 Measurements and annotations

2D / 3D > Measure

STANDARD + PRO

Measure distances, angles, areas, heights, volumes and section geometry; add notes and automatic dimension labels. Active SNAP modes and 3D constraints determine the picked positions.

Procedure

1. Choose the intended view/target and measurement type: distance, path, angle, height, area, thickness or a supported circular measurement.
2. Pick the requested points on actual geometry. For wall thickness, define the reference face and the opposite point as prompted.
3. Inspect units and annotation placement. Export the drawing/report that preserves the required measurement; a geometric volume is different from terrain cut/fill.

Commands and parameters

2D measurements

At the top of this panel, choose Color, Line type and Thickness for 2D measurements. Screen thickness ranges from 0.5 to 8 px.

DISTANCE

Pick two points to measure their distance in the active 2D or 3D view. In 3D, check the selected measurement constraint first.

POLYLINE

Pick successive vertices to measure the accumulated length of a path.

ANGLE

Pick the points defining two directions and their common vertex to measure the included angle.

AREA

Pick the perimeter of a closed region to report its area. Use snapping for repeatable corner positions.

VERT HEIGHT

Pick two points to report their height difference along the aligned vertical axis.

PERP TO LINE

Define a reference line and a point to measure the shortest perpendicular distance to that line.

VOLUME

Use the interactive volume measurement and its height parameter for a geometric volume estimate. Use TERRAIN CALC for terrain cut and fill.

THICKNESS

In 2D, define a face line and its parallel opposite face. In 3D, pick three non-collinear points on one face and a fourth on the opposite face; the result is perpendicular point-to-plane distance.

RADIUS

Pick a circle or arc and display its radius.

DIAMETER

Pick a circle or arc and display its diameter.

ARC LENGTH

Pick an arc for its true length, or a circle for its circumference.

CLEAR

Clear measurements. This is the last measurement button, immediately after ARC LENGTH; annotation controls are a separate group below.

PLACE NOTE

Enter the note text, then pick its placement in the active graphics view.

AUTO ANNOTATE

Generate drawing annotations according to the enabled length and area options.

CLEAR ANNOT.

Clear annotations created by the annotation tools.

FREE / SAME LEVEL / VERTICAL

Pick freely, keep the first elevation, or keep the first horizontal position for the relevant 3D measurement.

SNAP modes

Enable only the useful point, end, midpoint, perpendicular, nearest, intersection, centre and quadrant attractions.

Line lengths / Closed-area labels

Choose the automatic annotations required for the drawing.

Note text

Enter the intended text before PLACE NOTE.

52 Manual 2D drawing and modification

2D > Draw / Edit / Modify / Snap / Tools

STANDARD + PRO

Create and edit precise 2D geometry on an extracted section. Manual endpoints and active snaps define the drawing; fitting is a separate operation.

Procedure

1. Draw contains Line, Parallel Line, Polyline, Spline, Circle, Arc; Rectangle, Polygon; Text; Add Missing / Teach, with separators between these groups. Point-based detection and Best Fit tools are in the adjacent Fit tab.
2. Start from an extracted section or a correctly registered reference image/DXF.
3. Choose a shape in 2D > Draw. Polygon and Text (Annotation) are included; enter annotation text in the command bar.
4. Enable the required SNAP modes and ORTHO LOCK. Finish or cancel according to the command prompt, then review the entities before DXF export.

Commands and parameters

LINE / POLYLINE

Pick endpoints or successive vertices. Enter finishes an open polyline; C closes it after at least three vertices.

CIRCLE / ARC

Pick three non-collinear points for a circle, or start, intermediate and end points for an arc.

RECTANGLE / SPLINE

Pick opposite corners or successive fit points; follow COMMAND to finish.

COPY / MULTIPLE / MOVE

Select entities, then a base point and destination. MULTIPLE continues until Esc.

ROTATE

Pick a pivot, initial direction and final direction.

OFFSET

Set a distance and pick the required side; distance 0 uses the picked position.

TRIM / EXTEND

For the two-line tool click near the ends that should meet. One-sided Trim or Extend changes only the first entity against the second boundary.

FILLET

Set a radius and select two compatible lines.

JOIN / MERGE / BREAK

Join compatible endpoints, fit a common line or split geometry. Review the maximum permitted gap.

Perpendicular / Balanced perpendicular

Correct two segments, or balance the middle of three segments against its outer references.

Vertex tools

Move, insert or remove vertices in supported drawing entities.

HATCH

Toggle light display fill on closed shapes; it does not create DXF HATCH entities.

SNAP / ORTHO

Use point, endpoint, midpoint, perpendicular, nearest, intersection, centre and quadrant assistance. Alt temporarily bypasses snapping.

AUDIT / CHECK

Inspect interrupted collinear geometry before accepting proposed joins.

Polygon appearance

Right-click a Polygon button to enable shading and set transparency and color. These are shared application display settings for polygons in 2D/3D.

Closed-shape fill

Right-click Circle, Rectangle or Polygon to set Shaded, transparency and color in 2D or 3D. Open arcs remain unfilled.

Practical notes

Use a fully extracted SECTION to edit CAD. Choose COPY, MULTIPLE, MOVE, ROTATE or OFFSET in 2D MODIFY. Select Lasso, Polygon, Click, All or Existing selection in the command bar. For Click/Polygon, Enter completes the selection; releasing the mouse completes a lasso.

COPY: pick a base point, then a destination. MULTIPLE: pick the base point once, then successive destinations; Esc ends the command. The original entities remain in place.

MOVE: pick a base point, then its destination. The selected entities move together. The tool stays active for another base/destination pair until Esc.

ROTATE: pick the pivot, a point on the initial reference direction, then a point on the final direction. The rotating geometry is previewed live. The tool stays active for another rotation until Esc.

OFFSET: enter a distance, or enter 0 to determine the offset by the indicated position. Pick successive sides/positions until Esc. Copies are offset from the original selection. Lines, arcs, circles, polylines and supported composite geometry retain their appropriate shape.

Move the cursor after defining the base/reference points to see the proposed result. Each click commits a separate undoable step. Esc removes the pending preview and retains copies/transformations already committed.

Select a line or other CAD entity in the 2D view and press Delete. Text fields keep their normal text editing behavior. Auto Annotate adds segment lengths for polylines, radius/diameter for circles, analytic arc length and radius for arcs, and areas for closed polygons/circles.

Enable □ PERP in SNAP. Once a starting/base point exists, approaching the perpendicular foot displays a right-angle indicator; the foot may lie beyond an endpoint on a straight line extension.

HATCH toggles a light solid fill for closed polylines/polygons/rectangles. The display option is saved with the project. It does not add DXF hatch entities. DXF drawing, section-series and terrain exports use the RECAP_TOUR_ layer prefix.

Use Edit for Trim/Extend, Fillet and perpendicular tools; Modify for Copy/Move/Rotate, Offset, Join and Merge best fit lines. Offset exposes a distance field in COMMAND. Starting Join/Merge replaces the previous command field. In Tools, Export points to DXF determines whether Quick DXF includes points.

Break and Explode also accept polygons and rectangles. Explode creates independent line segments, including the closing side once; Break preserves analytic components of composite polylines. Undo restores the original shape.

Ctrl+click adds or removes a drawing from the selection in 2D and 3D. In 3D, Delete removes all selected drawing entities; a Ctrl+click on a vertex selects instead of moving it.

53 Drawing directly in 3D

3D > 3D Draw / Draw Properties

STANDARD + PRO

Draw lines, polylines, splines, circles, arcs and polygons on 3D cloud features. Use 3D Draw for geometry and Draw Properties for appearance and export.

Procedure

1. Open 3D > 3D Draw and choose a shape. Select Cloud, Edge or Corner under Snap; choose Free, Lock elevation or Lock position under Lock.

2. Open Draw Properties to set Color, Width and Linetype. Magnet enables endpoint snapping. Show 3D and Project to 2D control the two displays.

3. The first point establishes a locked height or horizontal position. Inspect the hover candidate before each click; a rubber-band preview alone does not confirm a valid cloud feature.

4. Finish the shape as prompted. Return to 3D Draw for Undo/Redo or Move/Add/Delete vertex.

5. In Draw Properties use DXF 3D for spatial drawing coordinates or DXF 2D for the section projection.

Commands and parameters

Snap / Lock

Snap chooses the feature type; Lock limits the allowed coordinate change.

Magnet

Snap to compatible existing endpoints; the candidate is marked in magenta.

Color / Width / Linetype

Set drawing appearance in one command strip.

Show 3D / Project to 2D

Control geometry visibility and section projection.

Vector

Pick two cloud points to draw a vector. The selected vector shows a measurement card beside it with 2D/3D length, dX, dY, dH, inclination and slope in aligned project axes. Click the vector in Navigate mode to select it, even when the 3D DRAW panel is closed. Delete removes it; Ctrl+Z/Ctrl+Y undo or redo. Click endpoint A/B or Move A/Move B in the card, then pick its new cloud position with the current snap/lock settings. Values update during the preview. Esc cancels the move.

Practical notes

TOPOGRAPHY > 3D DRAW remains available as a main-ribbon entry point.

In Navigate mode, click a visible 3D drawing to select it; Delete removes it. Selected line/polyline vertices support direct movement. Active point-selection commands retain priority.

Ctrl+click adds or removes a drawing from the selection in 2D and 3D. In 3D, Delete removes all selected drawing entities; a Ctrl+click on a vertex selects instead of moving it.

Choose Cloud for the nearest visible measured point to the cursor. Choose Edge or Corner explicitly to fit supported surface intersections. A held edge follows the current cursor ray along the fitted line. New clouds need an initial preparation; changing the view reuses that preparation. The visibility check uses the point cloud, not a reconstructed opaque mesh: inspect the marker on sparse or ambiguous surfaces.

New 3D drawing defaults use line width 0.50. Existing saved styles remain unchanged. Lock Elevation keeps the last vertex height while snapping searches at the constrained horizontal position; Lock Position keeps its X/Y and searches at the cursor-derived height. Changing lock mode keeps the current polyline and last vertex.

Spline uses picked fit points and interpolates through them. Enter finishes; Move/Add/Delete vertex and Undo keep the editable spline. Project files retain the fit points. DXF exports the displayed curve as a sampled polyline, not a native DXF SPLINE.

54 Editing 3D line and polyline vertices

3D > 3D Draw > Move vertex / Add vertex / Delete vertex

STANDARD + PRO

Move, insert or delete vertices of supported 3D lines and polylines. These commands edit drawing geometry, not cloud points.

Procedure

1. Select a visible line or polyline in 3D DRAW. Its vertices appear as square grips.
2. For Move vertex, click a vertex and then an accepted new position. For Add vertex, choose a segment and then the new position.
3. For Delete vertex, select the vertex to remove; the entity must retain a valid shape.
4. Inspect the live preview and active pick/axis constraints. Esc cancels a pending edit; Enter or Esc ends the tool.
5. Use Ctrl+Z/Ctrl+Y in the drawing context for undo/redo, then check the 3D DXF output.

55 Construction guides and view assignment

2D > View > Construction planes

STANDARD + PRO

Construction guides are shared 3D planes with 2D traces in every section. Each of up to three orthogonal families has a MASTER reference; other planes are parallel to that family.

Procedure

1. Open GUIDES from the 2D MODIFY toolbar.
2. Draw the first two-point guide along a known structural direction; use ORTHO only when appropriate.
3. Add parallel guides by signed master distance, or place a guide through a 3D point.
4. Select a guide and assign a standard view when its direction should define that view.
5. Use SECTION HERE to position a section, then extract it. Save the project to preserve guides and view assignments.

Commands and parameters

DRAW 2D TWO POINTS

Define a guide trace. The first establishes a family direction and becomes its master.

ORTHO

Constrain the first direction to the 2D axes; subsequent families follow the established frame.

Family / ADD AT DISTANCE

Choose a family and enter a signed offset from its master.

PICK IN 3D

Place a guide through a cloud position.

SET AS MASTER

Change the zero reference without moving existing planes.

ROTATE SYSTEM TWO POINTS

Rotate the guide frame and planes together around the chosen pivot.

RESET SYSTEM

Restore the X/Y/Z orientation while retaining master-relative offsets.

ASSIGN VIEW

Assign FRONT, BACK, LEFT, RIGHT, TOP or BOTTOM; all six views remain orthogonal without moving guide planes.

SECTION HERE

Place the section on a selected guide; extract it for full-resolution work.

APPLY / SHOW / HIDE / DELETE

Apply names and styles, control visibility or remove a guide.

SNAP to guides / section planes

Use visible guide traces and intersections while drafting.

Practical notes

Open GUIDES in the 2D MODIFY toolbar. Choose DRAW 2D · TWO POINTS. Pick a first point and a second point to set the first line direction. It becomes MASTER / 0 automatically. Each line represents a plane perpendicular to the current section, and is visible in 3D.

Continue picking pairs of points. The first point locates each new guide; the indicated direction selects the nearest existing parallel or perpendicular family. The resulting directions are constrained exactly. There are up to three orthogonal families, with one master in each nonempty family.

For a 3D plane, select X / side, Y / front or Z / top in the guide window. PICK IN 3D places it through a cloud point. ADD AT DISTANCE creates it at a signed offset from that family’s master. For the first guide in a family the entry is an absolute coordinate along its normal; that guide then becomes zero.

Master guides have a thicker solid line and a gold MASTER · 0.000 label. Other guides show their signed distance from the master. Positive/negative directions follow the frame established by the first line; for a line drawn upwards in a horizontal section, its right side is positive.

Drag the square grip in 2D or 3D to move a guide. In the list, select a guide to edit its name, distance, colour (color picker), width and pattern. APPLY EDIT commits the changes. For a selected master, a nonzero distance moves the master by that amount, after which its displayed value is zero again. Other planes remain at their world locations.

SET AS MASTER changes the zero reference without moving any plane. Deleting a master promotes another plane in its family. ROTATE SYSTEM · TWO POINTS sets a pivot and a new direction, rotating the common frame and all planes together while retaining orthogonality and pivot-relative offsets.

SHOW / HIDE controls one guide; the global checkbox controls the whole system. SNAP attracts drawing points to the visible guide traces/intersections and nearby parallel section planes. SECTION HERE places the section on the selected plane. Hold Alt while drawing to bypass point snapping.

TOP/BOTTOM, FRONT/BACK and LEFT/RIGHT orient to the guide frame. Horizontal/front/side section commands and FROM VIEW follow the corresponding guide directions. A plane parallel to a section has no unique intersection line, so it is not drawn as a line in that 2D section.

Guides belong to the entire project, not to a stored section. Opening another section reprojects the same planes into it. Save the project to preserve frame, masters, styles, visibility and snap settings.

Use Ctrl/Shift to select several construction planes in the list, or SELECT ALL. SHOW SELECTED, HIDE SELECTED, DELETE SELECTED, LOCK SELECTED and UNLOCK SELECTED act on the entire selection. A locked plane shows a closed padlock in the list and 2D/3D grips; it cannot be dragged or repositioned. Unlock all affected planes before rotating or resetting their common frame. Locks persist in the project. UNDO / REDO restores guide changes within the current geometry history.

Deleting construction guides clears their assigned view orientation and restores the normal section/view frame. Hiding guides only changes visibility and keeps the view assignments.

56 Reference DXF and registration

DRAW > DXF REGISTER

STANDARD + PRO

Register the cloud to a 2D reference DXF using corresponding positions. A camera change alone is not registration; ALIGN + REGISTER changes the complete cloud coordinates.

Procedure

1. Load the reference DXF and display the relevant section.
2. Select matching reference and measured points in the order requested by the registration tool.
3. Apply only after reviewing residuals and scale. Reference entities remain distinct from the authored section drawing.

Commands and parameters

LOAD REFERENCE DXF

Load the CAD reference without replacing the section drawing.

Show DXF / Fit DXF / Fit section

Control and compare the two displays.

ADD control pair

Pick a source point in the section, then a snapped DXF point or entered E/N/H.

Scale

Allow a uniform scale correction only when the data requires it.

ALIGN + REGISTER

Solve and apply the registration to the complete cloud.

Remove last / Clear pairs

Correct the control list before solving.

57 Multiple georeferenced image backdrops

DRAW > GEOREFERENCED IMAGE

PRO

The six world-file parameters preserve translation, pixel scale and rotation, with pixel-centre coordinates handled explicitly. Classic GeoTIFF scale/tie-point and affine transformation tags are supported, including PixelIsArea and PixelIsPoint conventions. BigTIFF or unsupported embedded transforms require an external world file. Embedded CRS metadata does not cause reprojection; image and project coordinates must already agree. The display texture is reduced to at most 8192 pixels on its longest side. Georeferencing continues to use the original pixel dimensions. The original image bytes and transform are embedded in the project, so moving the project does not break the image link. Image-only projects can be saved. Use the image list to manage multiple underlays independently. REMOVE SELECTED IMAGES removes project references while preserving source files.

Procedure

1. Open DRAW > GEOREFERENCED IMAGE and ADD GEOREFERENCED IMAGES. Select one or more images. The matching world file is located automatically when available; otherwise choose the requested file or use supported GeoTIFF tags.
2. Select an image in the list. Show selected images controls its visibility; Transparency (%) runs from 0 (opaque) to 100 (invisible). Ctrl/Shift selects multiple images to change their appearance together.
3. FIT SELECTED IMAGES fits the selected image footprints. Later images draw over earlier ones; adjust transparency to inspect overlaps.
4. Save the project to retain each image, its georeferencing, name, visibility and transparency. Older single-image projects remain readable. Work in a horizontal 2D section and verify agreement with known coordinates.

Commands and parameters

Image list

Select, show/hide or remove any imported underlay.

Transparency (%)

Independent per image; applies to all selected list entries.

REMOVE SELECTED IMAGES

Removes the selected images from this project.

DIGITIZE: Open PDF / Open Image

Import an image or render a selected PDF page. Remove background by color and tolerance. Add common point pairs, then Fit to points: similarity needs 2+ pairs, affine 3+, quadratic polynomial 6+. Review residuals and use well-distributed points. Move image uses two points; Rotate image uses an angle about the centre.

Trace / Save georeferenced image

Trace dark or light line centres and review the preview before Accept or Cancel. Accepted lines use normal CAD editing and DXF export. PDF tracing uses the rendered image, not native PDF vector paths. Save a registered PNG with its world file and plane metadata; keep the files together. Polynomial registration is resampled. Background removal also works in the main section image editor.

Image contrast controls

Remove background uses the original image colors before inversion. Choose Invert colors, Grayscale, Solid contents or Clean background cut as needed. Black/white levels and Midtones adjust contrast; Auto contrast proposes levels. These settings are saved per image and apply to tracing and georeferenced image export. Removed or originally transparent pixels remain transparent.

Target coordinates and ties

Always pick the source on the image. In the target grid, type real survey coordinates or choose Pick target on screen. A dashed rubber line follows target picking; numbered source/target links remain visible afterward. Edit target, Pick source again, Remove and registration Undo/Redo revise the pairs. Show point links toggles their display.

Practical notes

Keep the image, world file and .ortho.txt sidecar together. Orthophotos exported by RECAP TOUR include their world plane, so TOP, FRONT, SIDE and custom view images reopen at the correct orientation. VIEW IMAGE PLANE activates that plane for 2D drawing. A world file alone supplies U/V placement but cannot identify a vertical plane. Older sidecars without depth use the current section anchor; verify and adjust the section position.

58 Feature recognition and example libraries

TOOLS > FEATURE RECOGNITION

PRO

Select one complete feature per example. Include varied scans and difficult NOT examples. Search uses loaded points; touching features may need a smaller search region. Add training examples or import a trained TOUR library. No pretrained semantic model is bundled.

Procedure

1. Choose a category and collect representative positive and NOT examples.
2. Inspect each sample in 3D; zoom, rotate and pan, then use LASSO/POLYGON deletion to remove unrelated points before saving it.
3. Train, inspect validation/model history and select the active model. Use SEARCH / RECOGNIZE with the required scope.
4. Review candidates before ACCEPT AS POSITIVE, REJECT AS NOT, DELETE or KEEP. Scores are not calibrated probabilities and connected objects may remain grouped.

Commands and parameters

ADD POSITIVE SAMPLE

Select All / Lasso / Polygon / Click: one example of this category

ADD NOT SAMPLE

Select one example that must NOT match this category

TRAIN / UPDATE TRAINING

Train from this category's positive and NOT samples; at least two of each. Creates a new version.

SEARCH / RECOGNIZE

Search the selected category in All / Lasso / Polygon / Click area using its active trained model

ACCEPT AS POSITIVE

Explicitly add selected detections as positive examples; retrain separately

REJECT AS NOT

Explicitly add selected false detections as NOT examples; retrain separately

DELETE SELECTED POINTS

Delete highlighted candidate points; Undo is available

KEEP SELECTED POINTS

Keep highlighted points in the active processing scope; Undo is available

IMPORT AS NEW

Open a portable library as the active library; preserves a backup of the current library

IMPORT / MERGE

Merge categories by name, skip duplicate samples, preserve existing active models

EXPORT LIBRARY

Export categories, positive / NOT point samples, model versions and validation results

Positive and NOT samples

Use at least two examples of each for a category; select representative geometry and avoid mislabeled clutter.

Model versions

Training creates a version; activate the intended model before searching.

IMPORT AS NEW / IMPORT-MERGE / EXPORT LIBRARY

Transfer categories, samples and trained models. Inspect imported content before recognition.

Candidate review

Accept or reject detections explicitly; adding feedback samples and retraining are separate actions.

59 Checking and repairing LAS/LAZ

TOOLS > LAS / LAZ REPAIR

STANDARD + PRO

Check source coordinates against the LAS header bounds (with rounding tolerance). Repair removes out-of-bounds records and recalculates counts and bounds. Incorrect header bounds can also reject valid points: review the check before saving. The original is preserved. All attributes of retained points are copied unchanged. Output: LAS. LAZ input uses the supplied LASzip component. Waveform formats are not supported.

Procedure

1. Open the suspect file in the repair workflow and inspect reported inconsistencies.

2. Choose the supported repair and write a separate output file.

3. Reopen the repaired cloud and check counts, extents and attributes. Preserve the original for comparison.

Commands and parameters

SELECT LAS / LAZ FILE

Choose a source file to check or repair

CHECK FILE

Count records outside the declared bounds without changing the file

REPAIR & SAVE COPY

Save valid records to a new LAS file

CANCEL

Cancel the current operation

60 3D Gaussian Splatting

FILES > 3DGS

PRO

Open prepared Gaussian scenes in an independent PRO viewer. It displays Gaussian PLY or SPLAT models; it does not train scenes from photographs or convert an ordinary coloured cloud into Gaussian splats.

Procedure

1. In PRO open FILES > 3DGS or press F9.
2. Open a supported model, wait for loading, choose the up axis and FIT VIEW.
3. Navigate to each intended view and ADD CAMERA. Use at least two cameras.
4. Choose transition duration and interpolation; PREVIEW the route and correct camera order.
5. Choose resolution and EXPORT MP4. Keep the viewer visible until completion; STOP/CANCEL or Esc cancels the operation.
6. Play the exported video and check the route before closing the model; camera keyframes are not retained between sessions.

Commands and parameters

OPEN 3DGS

Accept uncompressed ASCII or binary little-endian Gaussian PLY with SH degree 0-3, or standard 32-byte SPLAT. Ordinary mesh/point-cloud PLY, SPZ, SOG and compressed Gaussian containers are different formats.

Up axis

Choose Z up, Y up, -Z up or -Y up before recording cameras; changing it clears the camera list.

FIT VIEW / Home / F

Frame the loaded scene. Left-drag orbits; right/middle or Shift-drag pans; wheel zooms.

ADD / UPDATE / REMOVE CAMERA

Create at least two viewpoints, adjust a selected camera or remove it. MOVE UP/DOWN changes order.

Seconds per transition

Set 0.2-120 seconds between neighbouring cameras; Smooth or Linear controls interpolation.

PREVIEW / STOP

Review or stop the route.

EXPORT MP4

Choose 1920 x 1080 or 1280 x 720 at 30 fps. The supplied video component creates an H.264 video without audio.

CLOSE MODEL

Release the scene. Cameras are session-only and are not saved with the main project.

Practical notes

Scene capacity depends on available RAM, GPU texture-buffer capacity and supported address sizes. The viewer does not automatically downsample or stream a model. Use a smaller export if loading exceeds available resources.

61 Cloud registration in 3D and 2D

TOOLS > CLOUD REGISTER > Clouds / Constraints / Align / Save

STANDARD + PRO

Combine directions, XY points, XYZ points and elevation-only constraints in one joint Align 3D operation.

Before you start: Two distinct clouds with compatible units. Choose project layers or load source files inside the workspace.

Procedure

1. Open CLOUD REGISTER and choose or load BASE and FLOATING inside the workspace.
2. Set views and sections independently. Model contains color, X-Ray and EDL; Render contains Full density, density percentage, quality and Motion LOD.
3. In Constraints select Lines / Directions, 2D point · XY, 3D point · XYZ, 2D Elevation point or 3D Elevation point. Always pick FLOATING first, then BASE.
4. Click a constraint to display its references. Disable or delete incorrect constraints.
5. Run one Align 3D for all enabled constraints, then optionally Refine ICP 3D.
6. Inspect independent check features, then choose Save Aligned Floating or Save Merged.

Practical notes

2D matches may come from different section types. Conversion into the common frame contributes XY or H according to the constraint type. Directions alone do not fix position.

If cloud centres are more than 5000 m apart, FLOATING is initially moved near BASE. This transform is retained in the final output. Camera synchronization is optional.

The list remains after alignment. Underdetermined geometry is reported. ICP requires overlap and is rejected if it worsens a constraint beyond the allowed tolerance.

Use Section > Show / hide section plane fill in each 3D pane to toggle only the translucent fill. The perimeter and editing grips remain visible and usable; the extracted section and section settings are unchanged.

BASE is the fixed coordinate reference: preparation, alignment and export never reposition it. Only FLOATING is transformed. Merged output retains BASE coordinates; normal LAS coordinate quantization still applies.

62 Orthophoto export

EXPORT > ORTHOPHOTO

STANDARD + PRO

Export a scaled orthographic TIFF and its TFW world file from the selected view or section. Resolution is specified in centimetres per pixel; output width and height follow the extent and resolution, preserving model proportions. Current section uses the section plane. Export inherits the project reference and does not correct an unknown coordinate system.

Procedure

1. Open EXPORT > ORTHOPHOTO, the first panel in the EXPORT row. Orthophoto remains available in STANDARD and PRO.
2. Set the active View Box if output should be clipped.
3. Choose the required view or Current section.
4. Select Appearance and Resolution cm / pixel.
5. Check Clip to active View Box and export TIFF + TFW.
6. Confirm image dimensions, file size and memory estimate before creating the image.
7. Inspect image proportions, orientation and a known distance in the destination program. A perspective screenshot is not an orthophoto.

Commands and parameters

View

Choose Top, Bottom, Front, Back, Left, Right, Current 3D view or Current section.

Appearance

Use Current 3D settings, RGB, Elevation, Intensity, GPS Time, X-Ray or Single color.

Resolution cm / pixel

Set pixel size in centimetres. Smaller values increase raster dimensions and processing time.

Clip to active View Box

Restrict output to the active working box when enabled.

EXPORT TIFF + TFW…

Write the image and matching world file. Keep both files together.

Use all loaded points

Enabled by default. Uses all eligible loaded points instead of the viewer point budget. Does not load missing source points.

X-ray export gain

Exposure multiplier 0.25-12, default 3. X-ray follows density / preserve-colors mode and color source from 3D. A black background improves contrast in all UI themes. Higher gain brightens supported traces.

Practical notes

Scalar palettes and ranges follow the corresponding 3D scalar field. Points outside Display Range remain gray in the TIFF. View Box clipping is a separate setting.

A world file describes the raster in its two-dimensional export plane. Keep the .ortho.txt plane metadata as well as TIFF/TFW for automatic restoration of front, side and oblique image planes.

A 20 m width at 2 cm/pixel gives about 1,000 pixels. Halving the pixel size to 1 cm approximately quadruples the number of pixels over the same area.

Reimport the exported image through DRAW > GEOREFERENCED IMAGE with its matching world file and .ortho.txt. The projection-plane metadata is required for automatic placement of front, side and oblique images.

Export first scans eligible point extents without allocating image buffers. Review dimensions, megapixels, exact uncompressed TIFF size and estimated additional RAM, then choose Create image. Back returns without creating an image. The same confirmation is required for raster/orthophoto steps in recorded workflows.

The former 32/36 MP limits and automatic reduction of resolution are removed. Files of 200-400 MB and larger are supported. For example, a 10,000 × 10,000 RGBA image is about 400 MB. The current single-buffer exporter supports roughly 536 MP (2.15 GB of pixel data), subject to available memory. Larger requests are rejected explicitly; increase m/pixel or use a smaller region.

The TIFF is uncompressed 8-bit RGBA, written in strips without an extra full-image encoder copy. RAM is additional to the loaded point cloud and may be several times the file size. TIFF and georeference companions are staged together: cancellation or a write failure preserves previous output files.

X-ray exposure uses the 98th percentile of occupied-pixel density, so a few extreme point stacks do not darken the whole image. Viewer Gain, export gain and opacity affect exposure once. Higher resolution cannot create detail where no points were measured.

63 Scan quality analysis

CHECKS > SCAN QUALITY

STANDARD + PRO

Review numerical indicators of scan coverage and local consistency. Quality indicators support inspection and comparison; they do not replace independent survey control. Analyze density, coverage, spacing, isolated cells, coincident samples, RGB coverage and intensity range. The source cloud is never modified.

Procedure

1. Open CHECKS > SCAN QUALITY and select the intended active scan.

2. Run ANALYZE ACTIVE SCAN and inspect the reported density, spacing and quality indicators.

3. Review sparse or suspect regions in the viewport. Indicators are not a substitute for independent accuracy checks.

4. Use EXPORT QUALITY CSV to retain the analysis. A combined project report requires PRO.

Commands and parameters

ANALYZE ACTIVE SCAN

Compute scan-quality indicators for the active cloud using the sampling and neighborhood settings in the panel.

EXPORT QUALITY CSV…

Save the scan-quality results as CSV for comparison and reporting.

64 Regional quality and elevation bands

CHECKS > REGIONAL QUALITY

PRO

Assess point spacing, local scatter and approximate planar density by selected region and elevation band. Open the standalone REGIONAL QUALITY panel beside SCAN QUALITY in TOOLS. Its properties and analysis results stay in the left sidebar; no separate tool forms open. No source points are changed.

Before you start: Valid PRO license. Loaded processing points. Elevation bands use aligned project Z; local-sample X/Y/Z retain source-world coordinates.

Procedure

1. Open CHECKS > REGIONAL QUALITY and set the neighbourhood radius, required point spacing and 95% dispersion thickness in the left panel. Choose band height and origin, or enter strictly increasing manual boundaries separated by semicolons. Lock to front face is OFF by default; enable it only when you want to restrict analysis to front surfaces in the current 3D view.

2. Choose ANALYZE REGIONAL QUALITY, then ALL, LASSO or POLYGON in the bottom COMMAND bar, using its buttons or A / L / P keys. Select the region in the 3D view; current processing and clipping boundaries apply.

3. Review Elevation bands and Local samples inside the same sidebar. The evaluation criteria show the radius and requested spacing/95% thickness limits. Band spacing, thickness, RMS and density are medians; percentages describe sampled locations. Select a row to read its specific evaluation reason. A Poor band does not mean every point in that band is poor.

4. Use Show sample markers and Focus selected to inspect questionable areas. Flat colored dots show Good in green, Caution in gold, Poor in red and Unknown in gray, without a word label at each point. The viewport legend shows the colors and requested criteria. Unknown markers are hidden by default; enable Show Unknown markers to display them. They remain in the tables and CSV. Hide markers removes the overlay; Clear report closes the inline result and markers without changing the cloud.

5. Export CSV to retain the band and sample results with settings and limitations. Re-analyze after changing the cloud or alignment.

Commands and parameters

Neighbourhood radius (m)

0.01-10 m. Radius used to inspect neighbouring points. Increase on a sparse flat surface; decrease near edges or separate surfaces. Too large can mix geometry; too small can produce Unknown.

Requested maximum point spacing (mm)

Greater than 0 and no greater than radius × 1000. Threshold for the nearest distinct neighbour, not a resampling setting. Increasing is more permissive; decreasing is stricter. No points change.

Requested maximum 95% dispersion thickness (mm)

Greater than 0 and no greater than radius × 1000. Full local scatter thickness used for rating, not a removal band. Larger values are more permissive; smaller values are stricter.

Elevation band height (m)

0.01-10,000 m; up to 200 occupied bands. Larger bands give broader summaries; smaller bands expose vertical detail but may have too few samples. This changes grouping, not point coordinates.

Band origin in aligned project Z (m)

Any finite elevation in metres. Shifts automatic band boundaries without changing their height. Uses aligned project Z, which may differ from source-world Z. Ignored when manual boundaries are supplied.

Optional manual elevation boundaries

Leave blank for automatic bands, or enter 2-201 strictly increasing aligned-Z elevations separated by semicolons, e.g. 0; 2.8; 5.7. These replace band height/origin; points outside the range are counted separately.

Lock to front face

Optional, OFF by default; your choice is saved. Uses the captured 3D view to restrict both analyzed points and neighbour support to the front connected depth layer. Visible loaded layers provide occlusion. ALL / LASSO / POLYGON still chooses the analysis region; leaving this option off preserves the full-depth behavior.

Density / spacing

Approximate points per square metre for locally planar support and nearest distinct-point spacing. Density is unavailable for unsuitable geometry.

Thickness / RMS

Sampled local geometric scatter around a supported plane or line.

Recommendations

Sparse coverage suggests additional scanning; separate surfaces suggest registration inspection; confirmed scatter may justify conservative denoise or Thinning preview.

Practical notes

Hover a parameter for its range and effect, or open Parameter guide · ranges, effects and examples in the left panel for worked examples and report interpretation.

Local sample ratings are evaluated in this order: Poor for fewer than 6 distinct neighbours, unavailable spacing or spacing above twice the request; Caution for detected separate surfaces; Unknown when no reliable plane/line fit is available; Poor for 95% thickness above twice the request; Caution when spacing or thickness exceeds its request; otherwise Good. Unknown does not mean invalid points and is not a deletion criterion.

Band ratings are evaluated in this order: fewer than 8 sampled locations gives Unknown; at least 10% Poor samples gives Poor; any remaining Poor or Caution samples gives Caution; more than 30% Unknown gives Unknown; otherwise Good. These are sample proportions, not a classification of every cloud point. Inspect the local samples even when a band median looks acceptable.

Analysis uses bounded samples per band. Neighbour support can cross selection and band boundaries; with Lock to front face it is also restricted to the retained front layer. Manual bands report points outside their limits separately.

Markers are limited to 1,200 displayed samples. Review the complete sample table and CSV for the analysis result.

These indicators do not certify absolute accuracy or infer scanner distance. Independent control or scanner trajectory is required for those assessments. High elevation alone is not a reason to reject a floor.

Front-face locking uses a screen-grid approximation from the captured view and loaded data. Within the picking pixel tolerance, it chooses the nearest connected depth layer supported by at least three points; when none has that support, it uses the nearest layer. It retains the connected scatter of that layer, but disconnected or weakly supported portions can be excluded: the selected subset need not cover the entire physical face. Close connected faces can

remain inseparable; ambiguous overfull cells are excluded and reported. The report and CSV include the setting, grid size, retained front source and exclusion counts. Unloaded geometry cannot act as an occluder. Re-analyze for a changed view or data.

65 Target detection

TOOLS > TARGET DETECTION

PRO

Generate geometric target candidates, review them and accept only confirmed targets. Detector type and size tolerances should match the physical targets in the scan. Target-specific detection for reflective intensity targets, checkerboards and spheres. Results are previewed in 3D and require user review before acceptance.

Procedure

1. In PRO open TOOLS > TARGET DETECTION.
2. Set target type and scale to match the actual survey targets, then DETECT TARGET CANDIDATES.
3. Inspect candidates from several views and reject false positives.
4. ACCEPT SELECTED and EXPORT ACCEPTED CSV. Compare against independent control data.

Commands and parameters

DETECT TARGET CANDIDATES

Find candidate survey targets with the selected detector and geometric tolerances. Candidates require visual review.

ACCEPT SELECTED

Mark the selected target candidate as accepted for export.

EXPORT ACCEPTED CSV…

Export only the accepted target coordinates to CSV.

66 Recorded workflows and batch processing

TOOLS > WORKFLOWS / BATCH

STANDARD + PRO

Record reusable operations with their parameter snapshots. RECORD captures supported actions without executing them. STOP restores normal operation; inspect step order before applying a workflow to a new cloud. Save repeatable processing/render/section settings. Batch files are audited without opening or replacing the active project.

Procedure

1. Configure and save a workflow preset or the supported recorded steps.
2. Test on one file, then add the intended batch inputs and output folder.
3. Run and inspect reports/output before using the batch result. Not every interactive command can be replayed automatically; use the operations exposed by the workflow interface.

Commands and parameters

- **RECORD**

Start recording supported actions without executing them. A red application border indicates RECORD mode; press STOP to restore normal operation.

ADD STEP WITH CURRENT SETTINGS

Append the selected operation with a snapshot of its current parameters to the workflow list.

↑

Move the selected workflow step one position earlier. Keep prerequisite operations before the steps that need them.

↓

Move the selected workflow step one position later.

DELETE STEP

Remove the selected step from the workflow definition.

EDIT PARAMETERS

Edit the stored parameter values of the selected step independently of other steps.

SAVE WORKFLOW…

Save the ordered operation list and parameter snapshots as a reusable workflow file.

LOAD WORKFLOW…

Load a saved workflow definition for inspection, editing or execution.

RUN ON CURRENT CLOUD

Execute the configured workflow on the current cloud after leaving RECORD mode.

ADD LAS/LAZ…

Add LAS or LAZ files to the batch input queue.

CLEAR QUEUE

Clear the batch input queue without deleting the source files.

RUN BATCH

Run the saved sequence for each queued cloud, writing results to the configured output location.

Practical notes

A recorded workflow uses the permissions of the active license. Terrain creation, contours, drainage and terrain/raster exports require PRO. Orthophoto export is available in STANDARD. Check each step and its output folder before a batch.

67 Teach-by-example classification

TOOLS > TEACH-BY-EXAMPLE CLASSIFICATION

PRO

Provide labelled examples from the current 3D selection, train a classifier and preview its output. Use representative examples for each class and review predictions before applying changes. Label a few representative LASSO/POLYGON samples, preview similar scan points, then apply the result as non-destructive LAS-compatible classification layers.

Procedure

1. Select representative labelled examples from the intended cloud population.
2. Run the classification workflow with the available settings.
3. Review the proposed classes before applying bulk operations. Keep this workflow distinct from the FEATURE RECOGNITION object-sample library.

Commands and parameters

ADD CURRENT 3D SELECTION AS SAMPLE

Add the current 3D selection as a labelled training example for the selected class.

CLEAR TRAINING SAMPLES

Remove training examples from the current teaching session.

TRAIN + PREVIEW CLASSIFICATION

Train from the supplied examples and preview predicted classes before applying them.

APPLY

Apply the configured action to the predicted classification result.

UNDO / CLEAR

Undo or clear the teaching classification result as provided by the current session.

SAVE PROFILE…

Save the trained classification profile for later reuse.

LOAD PROFILE…

Load a previously saved classification profile.

68 Issues and inspection register

CHECKS > ISSUES / INSPECTION

STANDARD + PRO

Attach inspection records to 3D positions. Maintain their status and export the register for review and follow-up. Place georeferenced inspection issues directly on the 3D model, track severity/status and export the register.

Procedure

1. Create an inspection issue at the relevant location and add its description/status.
2. Review measurements and annotations associated with the issue.
3. Export the appropriate report and reopen it to verify that the intended content and units are present.

Commands and parameters

PICK ISSUE LOCATION IN 3D

Enter the issue details and pick a 3D location to create a spatial inspection record.

TOGGLE OPEN / CLOSED

Switch the selected inspection issue between open and closed.

DELETE ISSUE

Remove the selected inspection issue from the project register.

CLEAR ISSUES

Remove all inspection issues and their drawing markers. Save the project after reviewing the cleared result.

EXPORT ISSUE REGISTER…

Export the issue register with its recorded attributes and coordinates.

69 Importing terrain data

TERRAIN > IMPORT TERRAIN DATA

PRO

Load point lists, DXF terrain geometry or a native RTIN workspace. Imported points are previewed first and require an explicit BUILD TIN; imported DXF faces already define a mesh.

Procedure

1. In PRO, open TERRAIN > IMPORT TERRAIN DATA.
2. For TXT/CSV map the correct name, E, N and H columns and review the preview. For DXF select supported POINT, 3DFACE or closed-boundary data.
3. Inspect the imported points before BUILD TIN. DXF 3DFACE already supplies a mesh.
4. Alternatively use the open cloud as terrain source or open an RTIN workspace.
5. Save the terrain as RTIN to retain edits, constraints and contours.

Commands and parameters

IMPORT TXT / CSV POINTS…

Open survey points in arbitrary column order. Points are loaded and previewed first; set TIN parameters and press BUILD TIN explicitly.

IMPORT TERRAIN DXF…

Reads ASCII DXF POINT, 3DFACE and closed POLYLINE/LWPOLYLINE boundaries. POINT data waits for explicit BUILD TIN; 3DFACE is already a mesh.

OPEN RTIN…

Open a native lossless RECAP TIN, including triangle edits, boundaries, breaklines and contours.

SAVE ACTIVE RTIN…

Save the complete active terrain workspace in the native RTIN format.

USE OPEN POINT CLOUD AS TERRAIN SOURCE

Use the open cloud as the point source for terrain construction. Choose spacing and maximum edge length before building.

RESET TERRAIN…

Deletes all imported terrain points, triangles, contours, breaklines, boundaries, hulls, profiles and terrain-calculation polygons. The open LAS/LAZ cloud is preserved.

70 Building a TIN and editing source points

TERRAIN > CREATE SURFACE

PRO

Construct a terrain TIN from points. Spacing limits source density and maximum edge length helps prevent bridging across gaps. A terrain surface represents height over plan coordinates. Terrain editing is performed directly in the 3D viewer. Constraints, contours and profiles are real 3D entities. Creates the Delaunay dual from the current TIN vertices. The result is previewed independently and can be exported as CAD lines.

Procedure

1. Import survey points or choose the appropriate cloud source; remove non-ground points when modelling terrain.
2. In CREATE SURFACE, choose the construction settings and generate the Delaunay TIN.
3. Inspect long triangles, gaps and boundaries. Save the native terrain before further editing. A terrain TIN represents one elevation per XY location, unlike a general 3D mesh.

Commands and parameters

BUILD TIN

Build a Delaunay terrain TIN from the selected source using the configured spacing and edge limit. This is a height surface, not a full 3D object mesh.

CLEAR REGION

Remove the terrain build-region restriction.

SELECT POINTS…

Select imported TXT / CSV / DXF points using Lasso, Polygon or Click

PREVIEW VORONOI

Compute and open the Voronoi diagram for the terrain source using the configured settings.

EXPORT VORONOI DXF…

Export the computed Voronoi diagram to DXF.

Spacing / Maximum edge length

Control source sampling and prevent bridges across unsupported gaps.

DELETE SELECTED / KEEP SELECTED / UNDO POINT EDIT

Edit imported terrain source points before constructing the surface.

Build region

Limit the source region when required; CLEAR REGION removes that restriction.

71 Editing triangles

TERRAIN > EDIT SURFACE

PRO

Repair triangle connectivity and remove unwanted triangles. Preview long edges before deletion and inspect holes or boundary transitions after editing.

Procedure

1. Display the TIN and identify the triangles to repair.
2. Use CREATE 3 PTS to connect exactly three existing vertices, or DELETE TRIANGLES with the intended selection.
3. For oversized triangles choose a maximum edge length and PREVIEW LONG before DELETE LONG.
4. Inspect holes and boundary transitions from several views.
5. Undo unwanted changes and save the accepted terrain to RTIN.

Commands and parameters

CREATE 3 PTS

Create a triangle by snapping exactly three existing TIN vertices.

DELETE TRIANGLES

DELETE TRIANGLES · choose selection method in command window

UNDO

Undo the most recent supported triangle or terrain edit.

PREVIEW LONG

Highlight triangles exceeding the configured maximum edge length before deletion.

DELETE LONG

Delete triangles that exceed the edge-length threshold.

72 Boundaries, holes and breaklines

TERRAIN > CONSTRAINTS

PRO

Draw boundaries, holes and breaklines directly on the 3D terrain. Snap to vertices or use interpolated elevation where supported. Apply closed boundaries using the selected keep or delete mode. TIN vertex snap is highlighted before every click. Free on surface gets H by barycentric interpolation of the clicked triangle. ISLAND / HOLE / LASSO may be drawn before or after the TIN. APPLY first makes the closed perimeter a hard breakline, then removes only whole triangles according to the selected action. While drawing, hold the middle mouse button to rotate the 3D view.

Procedure

1. Use EDIT SURFACE to preview/remove long triangles or edit a fenced area.
2. Define hard constraints/breaklines and the intended outer boundaries or holes.
3. Rebuild where required, inspect both edges and faces, and use terrain UNDO to recover unintended changes.

Commands and parameters

ISLAND

Draw a closed island boundary directly on the 3D TIN.

BREAKLINE

Thick red dashed hard edge. After each breakline the command continues until ESC.

CLEAR

Clear the stored terrain constraints. Inspect the current mesh before applying or rebuilding constraints again.

APPLY BOUNDARY TO TIN

First recover the closed perimeter as a hard TIN constraint, then keep/delete whole triangles.

73 Convex and concave hulls

TERRAIN > HULLS

PRO

Create and manage enclosing terrain boundaries. Convex hulls bridge recesses; concave hulls follow them more closely according to the chosen parameter. Hulls are shown as outline-only pending ISLAND constraints. CONCAVE peels long triangles only from the outer TIN frontier, never from the interior. APPLY BOUNDARY clips outside the perimeter.

Procedure

1. Create or load the terrain point set and TIN.
2. Choose CONVEX HULL for an enclosing convex outline, or CONCAVE HULL to follow recesses.
3. Review the perimeter; concavity can change which external gaps are bridged.
4. Use SHOW / HIDE or DELETE BOUNDARY as needed. A pending hull is an outline until applied.
5. Use APPLY BOUNDARY TO TIN for the intended clipping action, then inspect the resulting triangles.

Commands and parameters

CONVEX HULL

Create an enclosing convex boundary from the terrain data.

CONCAVE HULL

Create a boundary that follows recesses in the terrain extent using the configured concavity control.

SHOW / HIDE

Show or hide the selected boundary without deleting it.

DELETE BOUNDARY

Remove the selected boundary from the terrain boundary list.

74 Contours and surfaces from contours

TERRAIN > CONTOURS

PRO

Generate level curves from the terrain. Use separate minor and major intervals, optional smoothing and major-contour labels. Display controls belong to TERRAIN / VIEW.

Procedure

1. Build or load a valid TIN and choose minor and major contour intervals.
2. Set smoothing conservatively and choose whether major contours receive elevation labels.
3. GENERATE CONTOURS and inspect continuity, elevations and gaps.
4. For a surface derived from contours, save the project first, choose stepped/solid options and maximum edge length, then CREATE CONTOUR SURFACE.
5. Review the replaced surface and export the intended contour or terrain entities.

Commands and parameters

GENERATE CONTOURS

Generate minor and major contours from the TIN using the interval, smoothing and label settings.

CLEAR CONTOURS

Remove generated contour geometry from the terrain workspace.

CLEAR LABELS

Remove contour labels while retaining the contour geometry.

CREATE CONTOUR SURFACE

Create a contour model, replacing the source TIN after confirmation. Save the project first. Maximum edge limits bridges across gaps.

Minor / Major interval

Set contour spacing and the major-curve frequency.

Smoothing / Elevation labels

Control curve presentation and label major contours; verify that smoothing remains appropriate to the data.

Stepped surface

Use the contour-surface option with a 0.01 m outward foot at the next lower level where intended.

Close sides and base

Choose a solid contour model when suitable, then inspect the resulting surface.

Area selection

Choose All, Lasso or Polygon in the command bar. Region selection includes terrain triangles by their projected centres.

75 Terrain display

TERRAIN > VIEW

PRO

Control terrain presentation independently of point-cloud display. Toggle points, triangles, edges, contours, labels and drainage as needed for inspection; appearance choices do not substitute for exporting the required entities.

Procedure

1. Open TERRAIN > VIEW with terrain data available.

2. Toggle TIN, points, contours, labels and drainage independently.

3. Select elevation colours and, if useful, align colour bands to the major contour interval.

4. Adjust the cloud visibility separately to inspect the terrain.

5. Use export options to select deliverable entities; hiding an overlay is not the same as deleting it.

76 Terrain DXF export

TERRAIN > DXF EXPORT

PRO

Select the terrain entities to include in the DXF. This terrain export panel is accessible from both FILES and TERRAIN; 2D drawing export is a separate command.

Procedure

1. Set contour interval and major contour frequency from the terrain scale.

2. Generate contours and inspect labels, boundary behaviour and any smoothing.

3. In DXF EXPORT choose the desired faces, edges, points, contours and labels. Check layers and elevation values in the receiving CAD.

Commands and parameters

EXPORT TERRAIN DXF…

Export the enabled terrain components such as faces, edges, vertices, contours, labels and profiles to separate DXF layers.

77 Cut/fill, elevation bands and balance

TERRAIN CALC > CUT / FILL VOLUME

PRO

Calculate cut and fill relative to a reference level inside a selected perimeter, quantities between absolute elevation bands and a balance level. Review the region, units and reference before interpreting results. The analysis does not change the visible TIN.

Procedure

1. Choose the existing terrain and reference plane/surface offered by the calculation.

2. Define the same boundary and units for the comparison; set the intended reference elevation.

3. Calculate and review cut, fill, net volume and area separately. Export the report/DXF and record which surface was treated as reference.

Commands and parameters

SELECT VOLUME REGION

SELECT VOLUME REGION · choose selection method in command window

USE SELECTED PERIMETER

Reuse a drawn perimeter, ISLAND, HOLE, convex/concave hull or TIN region.

CALCULATE CUT / FILL

Compute cut and fill between the terrain and the configured reference over the selected region. Inspect the result and preview before export.

EXPORT VOLUME DXF…

Export the computed volume geometry and results to DXF.

CALCULATE BAND

Calculate the configured terrain quantities between the absolute lower and upper elevation limits.

EXPORT BAND DXF…

Export the computed elevation-band result to DXF.

FIND BALANCE + PREVIEW

Find the reference level at which computed cut and fill balance within the chosen region, then open its preview.

EXPORT BALANCE DXF…

Export the balanced-level calculation result to DXF.

ANALYZE + PREVIEW

Analyze downhill flow accumulation and depressions from the terrain, then open the drainage preview. Contributing area uses plan area.

EXPORT DRAINAGE DXF…

Export the current drainage analysis lines and supported basin information to DXF.

CLEAR DRAINAGE

Clear the generated drainage analysis and its display.

Reference elevation / Perimeter

Define the comparison level and bounded area for cut and fill.

Band lower / upper elevation

Calculate quantities within the selected absolute height interval.

Balance level

Find a level that balances the reported cut and fill within the chosen region.

Preview / DXF outputs

Inspect the surfaces and regions before delivering the numerical and CAD results.

78 Single terrain profile

TERRAIN CALC > CROSS SECTION / PROFILE

PRO

Sample terrain elevations along a drawn 3D path. The profile window displays chainage and height; vertical exaggeration changes presentation, not measured elevations. Draw a line/polyline directly on the 3D TIN. The profile window supports wheel zoom, left-drag pan, fit and engineering DXF export with datum/grid/legend.

Procedure

1. Open TERRAIN CALC > CROSS SECTION / PROFILE on a valid TIN.
2. Choose DRAW 3D CROSS SECTION and define the required profile path.
3. Inspect the profile diagram and station/elevation values.
4. Review gaps where the path has no terrain coverage.
5. Export the available profile output and compare a known station and elevation.

Commands and parameters

DRAW 3D CROSS SECTION

Draw a section path on the 3D terrain and open the resulting chainage and elevation profile.

79 Multiple terrain cross sections

TERRAIN CALC > MULTIPLE CROSS SECTIONS

PRO

Generate successive terrain profiles within a selected boundary, perpendicular to a two-point axis. Keep section spacing separate from the vertical display scale. Generate a series of terrain sections perpendicular to a user-defined axis. Sections are clipped to the selected polygon boundary.

Procedure

1. Open MULTIPLE CROSS SECTIONS and choose an existing perimeter or draw a boundary.
2. Define the longitudinal axis with two points; generated sections are perpendicular to it.
3. Set station spacing and whether additional sections pass through boundary vertices.
4. GENERATE SECTIONS and review extent, direction and terrain coverage.
5. EXPORT SECTIONS DXF and inspect station order and elevations.

Commands and parameters

USE SELECTED

Use the selected terrain boundary as the extent for successive terrain sections.

DRAW NEW BOUNDARY

Draw a new boundary to limit the successive sections.

DEFINE AXIS DIRECTION (2 PTS)

Click two points on the TIN to define the longitudinal axis direction. Generated sections are perpendicular to this axis.

GENERATE SECTIONS

Generate terrain profiles perpendicular to the defined axis using the spacing and extent settings.

EXPORT SECTIONS DXF…

Write the generated terrain sections to DXF with the configured section display scale.

80 Comparing two TINs

TERRAIN CALC > TIN COMPARISON

PRO

Compare two terrain surfaces over their common coverage. The dedicated window supports cut and fill, regions, exports and dual-surface cross sections. Open two native RTIN or DXF 3DFACE surfaces in an independent workspace. Exact CUT/FILL uses the true triangle-overlay common coverage; optional polygon/lasso regions and dual-TIN multiple cross sections are supported.

Procedure

1. Load the two surfaces into the comparison workflow and identify their roles.
2. Check common coordinates, vertical datum and overlapping region before calculating differences.
3. Inspect difference/intersection and available profiles or volume results; non-overlapping areas do not provide a valid two-surface comparison.

Commands and parameters

OPEN TWO-TIN COMPARISON…

The active TIN is offered as TIN A. Load TIN B, calculate exact common coverage, preview and export CUT/FILL or multiple cross sections.

TIN A / TIN B

Load RTIN or DXF 3DFACE surfaces and identify the reference/comparison order.

Region

Use common coverage or an optional polygon/lasso restriction.

Calculate cut/fill

Inspect the true shared coverage and the sign convention. Areas without either surface are not inferred.

Dual-surface sections

Define stationing and inspect both profiles together before exporting.

81 Drainage and storage analysis

TERRAIN CALC > CUT / FILL VOLUME > Drainage

PRO

Analyse drainage directions, catchments and geometric storage from the terrain surface. These results describe surface geometry; rainfall, flow rates and pipe hydraulics are not modelled automatically.

Procedure

1. Use a checked terrain surface with appropriate boundaries.
2. Run the available drainage path, contributing area, depression/storage or balance-level operation with its requested inputs.
3. Inspect sinks and gaps in the TIN. Treat results as geometric terrain analysis; verify hydrological assumptions separately.

Commands and parameters

ANALYZE + PREVIEW

Calculate the selected drainage/storage analysis and inspect its overlay.

EXPORT DRAINAGE DXF

Save the generated analysis geometry.

CLEAR DRAINAGE

Remove the drainage overlay without deleting the TIN.

Area selection

Choose All, Lasso or Polygon in the command bar. Region selection includes terrain triangles by their projected centres.

82 True 3D mesh reconstruction

MODELING > MESH ENGINE

PRO

Reconstruct a spatial mesh from point data at a chosen voxel resolution. Unlike a terrain TIN, it can represent overhangs and multiple heights at the same plan position. Inspect the result for gaps, joined surfaces and loss of thin detail.

Procedure

1. Select a clean source region and the required mesh or primitive type.
2. Set the available resolution/fitting parameters, then generate or fit the object.
3. Inspect topology and dimensional agreement. Save/export the supported mesh format; check holes and normals before downstream use.

Commands and parameters

BUILD TRUE 3D SURFACE

Uses every loaded point at the selected 3D voxel resolution; no projection to a terrain plane.

ANALYZE ACTIVE MESH

Analyze the active 3D mesh for the available topology and geometry statistics.

EXPORT MESH…

Export the active mesh in one of the supported mesh formats.

Voxel resolution

Set the scale of the reconstructed surface; finer resolution uses more memory.

Safe coarser voxel

Permit a coarser effective resolution when needed; read the reported value.

Gap closing / Smoothing

Use conservatively because they change the reconstructed geometry.

ANALYZE ACTIVE MESH

Review the available mesh quality and topology information before export.

83 Extrusion and parametric geometry

MODELING > PARAMETRIC EXTRACTION

PRO

Fit the selected geometric model to a point source with the configured tolerances. Inspect the fitted element and its support before exporting it as CAD geometry. Width is centred on the profile. SOLID arcs close with their chord. UP/DOWN follow the section normal; on a horizontal section UP is positive elevation. Fit survey primitives to all, visible, selected or clipped scan points. Reports dimensions, axis, radius and RMS fitting error.

Procedure

1. Choose a valid closed profile for extrusion, or a 3D centreline for a pipe.
2. Enter elevation limits/distances or pipe dimensions as requested.
3. Review object selection before union, trim, intersection or EXCLUDE openings. Keep a saved project and inspect results after every topology change.

Commands and parameters

CREATE 3D OBJECTS

Extrude the selected drawing entities that match the type filter. UP and DOWN are independent offsets from the section plane. WIDTH applies to stroked profiles; circles, rectangles and arcs can alternatively be solid. With EXCLUDE checked, subtract the temporary extrusions from the existing solids selected in OBJECTS; do not create cutter objects. The complete operation supports modeling Undo.

EXTRACT PARAMETRIC GEOMETRY

Fit the selected parametric type to the configured point source and tolerances, then review the result.

EXPORT RESULT DXF…

Write the extracted parametric geometry to DXF.

Pick height limits

For a horizontal section, pick lower and upper cloud heights with the vertical elastic preview instead of entering Up/Down. The two limits must bracket the section.

84 Building reconstruction

MODELING > BUILDING RECONSTRUCTION

PRO

Generate candidate semantic building elements, fit selected elements and accept or reject them. Review the output before treating it as a deliverable building model. Thickness requires both faces in the scan. Otherwise an open surface is created. Object names and details identify measured thickness or unknown thickness. Review semantic candidates in OBJECTS. Draw a circle, rectangle, closed polygon/polyline or line in a horizontal section. Heights use the current LEVEL 0.00 datum. 3 points in 2D: triangular section surface. 2 points in 3D: rectangular surface centered on the picked axis. Width direction follows the active section plane where possible. Create an automatic watertight building envelope from scoped scan points. Uses a robust floor/roof range and a convex occupied-cell footprint; the source cloud remains untouched.

Procedure

1. Choose the building region and scale/resolution appropriate to the scan.
2. Run envelope reconstruction or fit the supported building element.
3. Review each object and opening against the cloud. Automated geometry is a proposal; remove unsupported surfaces before delivery.

Commands and parameters

AUTO DETECT 3D BUILDING OBJECTS

Select cloud scope in COMMAND. Create separate geometric candidates for review in OBJECTS; gaps can be scan occlusions.

EXTRACT FLOOR / CEILING FROM 2D

Select closed drawing profiles in a horizontal section. Find floor below and ceiling above from loaded 3D points inside each footprint.

PICK H IN 3D

Follow the command prompt to pick two heights in 3D or a vertical 2D section, or pick the start and end of a straight pipe in 3D. Height picking fills the elevation fields; pipe picking creates a cylinder using the configured diameter.

PICK H IN 2D

Follow the command prompt to pick two heights in 3D or a vertical 2D section, or pick the start and end of a straight pipe in 3D. Height picking fills the elevation fields; pipe picking creates a cylinder using the configured diameter.

EXTRUDE 2D PROFILE

Pick an existing profile in a horizontal section and extrude between the configured minimum and maximum elevations. A line requires a positive width. This elevation-based workflow is separate from the UP/DOWN batch profile workflow.

PICK PIPE START / END IN 3D

Follow the command prompt to pick two heights in 3D or a vertical 2D section, or pick the start and end of a straight pipe in 3D. Height picking fills the elevation fields; pipe picking creates a cylinder using the configured diameter.

PICK 3 POINTS IN 2D

Follow the command prompt to pick two heights in 3D or a vertical 2D section, or pick the start and end of a straight pipe in 3D. Height picking fills the elevation fields; pipe picking creates a cylinder using the configured diameter.

PICK 2 POINTS IN 3D

Follow the command prompt to pick two heights in 3D or a vertical 2D section, or pick the start and end of a straight pipe in 3D. Height picking fills the elevation fields; pipe picking creates a cylinder using the configured diameter.

RECONSTRUCT BUILDING ENVELOPE

Generate candidate building-envelope elements using the configured point source, dimensions and tolerances. Review and accept elements individually.

FIT SELECTED ELEMENT

Fits the forced semantic/geometric type to the current LASSO/POLYGON or clipping-box point source.

ACCEPT / REJECT

Toggle acceptance of the selected reconstructed building element.

DELETE ELEMENT

Remove the selected building element from the reconstruction result.

EXPORT BUILDING MODEL…

Export the reviewed building model in the selected supported format.

85 3D objects and solid operations

MODELING > MODELING OBJECTS

PRO

Manage the geometric objects created by modeling operations. The object history is separate from point-cloud processing checkpoints. Every object produced by MODELING is listed here. Delete one result or clear the full modeling scene without changing the source point cloud. 3D OBJECTS: CTRL-select two objects in order: first the object to modify, then the boundary/cutter. EXTEND continues a profile extrusion to the boundary hit along its centre axis. It does not deform the end cap to an irregular surface.

Procedure

1. Select the intended objects in MODELING OBJECTS and inspect their visibility and type.
2. Use JOIN / UNION, TRIM / SUBTRACT, INTERSECTION or EXTEND TO OBJECT with compatible solids and the required selection order.
3. Review the resulting faces and openings; use Undo/Redo for corrections.
4. Apply type colours where useful and delete only the intended selected objects.
5. Export selected solids in an offered format and inspect them in the receiving application.

Commands and parameters

DELETE SELECTED

Delete the selected modeling object from the project object list.

CLEAR ALL

Clear the modeling object collection.

UNDO

Undo the latest object-modeling edit.

REDO

Reapply the last undone object-modeling edit.

DELETE 3D OBJECT

Delete the selected 3D solids from the project and scene. Modeling Undo restores the deletion.

CLEAR 3D OBJECTS

Remove all profile/pipe/boolean solids from the project. Other reconstruction object families are managed by their own controls. Modeling Undo restores the cleared solids.

JOIN / UNION

Select two solids with CTRL, first the object to modify and then the boundary. JOIN/UNION replaces both with their union. TRIM/SUBTRACT removes the second volume from the first and keeps the cutter. INTERSECTION replaces both with their common volume. EXTEND increases the selected upper or lower extrusion end to the first boundary hit along the profile centre axis; it does not form a shaped end cap and requires an unmodified profile extrusion. Empty boolean results leave the originals unchanged.

TRIM / SUBTRACT

Select two solids with CTRL, first the object to modify and then the boundary. JOIN/UNION replaces both with their union. TRIM/SUBTRACT removes the second volume from the first and keeps the cutter. INTERSECTION replaces both with their common volume. EXTEND increases the selected upper or lower extrusion end to the first boundary hit along the profile centre axis; it does not form a shaped end cap and requires an unmodified profile extrusion. Empty boolean results leave the originals unchanged.

INTERSECTION

Select two solids with CTRL, first the object to modify and then the boundary. JOIN/UNION replaces both with their union. TRIM/SUBTRACT removes the second volume from the first and keeps the cutter. INTERSECTION replaces both with their common volume. EXTEND increases the selected upper or lower extrusion end to the first boundary hit along the profile centre axis; it does not form a shaped end cap and requires an unmodified profile extrusion. Empty boolean results leave the originals unchanged.

EXTEND TO OBJECT

Select two solids with CTRL, first the object to modify and then the boundary. JOIN/UNION replaces both with their union. TRIM/SUBTRACT removes the second volume from the first and keeps the cutter. INTERSECTION replaces both with their common volume. EXTEND increases the selected upper or lower extrusion end to the first boundary hit along the profile centre axis; it does not form a shaped end cap and requires an unmodified profile extrusion. Empty boolean results leave the originals unchanged.

APPLY 3D TYPE COLORS TO SELECTED OBJECTS

Apply the currently selected Line type color from the profile extrusion color controls to the selected existing solids.

EXPORT SELECTED SOLID…

Export a selected solid to OBJ, STL, PLY or DXF 3DFACE. These are mesh deliverables; verify units and appearance in the receiving application.

86 Road and corridor analysis

MODELING > ROAD / CORRIDOR

PRO

Analyze point data along a defined corridor axis. Choose the width and station spacing appropriate to the surveyed road and inspect the results before exporting stations. Station-based road and corridor analysis on an active TIN or scoped point cloud. The clipping box is always a hard processing boundary.

Procedure

1. Define the corridor axis and select the source cloud/terrain.

2. Set station spacing and half-width according to the required coverage.

3. Calculate, inspect cross-sectional coverage and export the supported station/geometry outputs.

Commands and parameters

DRAW CORRIDOR AXIS (2 PTS)

Pick two points to define the corridor axis used for station-based analysis.

ANALYZE CORRIDOR

Analyze the cloud along the defined axis using the corridor width, spacing and related settings.

EXPORT STATIONS CSV…

Export the calculated corridor stations and results to CSV.

87 Draping an image on a surface

MODELING > IMAGE DRAPE

PRO

Register an image to a surface using paired image/model positions. Choose XY, XZ or YZ and a transformation appropriate to the control distribution. Reported RMS is in image pixels.

Procedure

1. In PRO open MODELING > IMAGE DRAPE and select the image.

2. Select a plane and transformation method appropriate to the surface.

3. Add well-distributed image/model pairs, including controls near the boundary.

4. Review RMS and individual residuals; remove or correct mismatches.

5. Preview, apply and save the project. Verify a separate feature not used as a control.

Commands and parameters

REGISTER / DRAPE IMAGE

Open image registration from MODELING.

OPEN IMAGE

Load TIFF, PNG, JPG/JPEG or BMP.

Method

Similarity requires at least 2 pairs, affine 3 and second-order polynomial 6.

Plane

Choose the intended XY, XZ or YZ working plane.

PICK MODEL POINT / ADD PAIR

Associate each image control with its actual model position.

Control table

Inspect residuals and correct mismatched pairs.

PREVIEW / APPLY DRAPE

Review and commit the placement.

CANCEL / REMOVE DRAPE

Discard the proposed placement or remove the draped image.

88 Raster products

EXPORT > RASTER PRODUCTS

PRO

Generate the selected grid-based product at a specified resolution. Fine cells increase output size and may expose gaps where the source coverage is insufficient. Metric DSM, DTM, intensity, density and hillshade products from the active cloud. Active View Box is supported; every TIFF receives TFW + metadata.

Procedure

1. In PRO open EXPORT > RASTER PRODUCTS.
2. Select the required DSM, DTM or thematic product and suitable source data. Ground products require an appropriate ground selection or classification.
3. Set resolution and the intended extent, including active View Box clipping when wanted.
4. Export to the offered raster format and wait for completion.
5. Confirm image dimensions, file size and memory estimate before creating the image.
6. Check pixel size, georeferencing, coverage and no-data areas in GIS. A fine pixel size does not create finer measured detail.

Commands and parameters

EXPORT RASTER PRODUCT…

Generate the selected raster product from the cloud using the resolution and extent settings.

Product

Choose DSM, DTM, intensity, density or hillshade according to available source data.

Resolution / Extent

Set pixel size and coverage; inspect no-data regions rather than assuming complete coverage.

TIFF / TFW / metadata

Keep the generated files together for georeferenced delivery.

Practical notes

Export first scans eligible point extents without allocating image buffers. Review dimensions, megapixels, exact uncompressed TIFF size and estimated additional RAM, then choose Create image. Back returns without creating an image. The same confirmation is required for raster/orthophoto steps in recorded workflows.

The former 32/36 MP limits and automatic reduction of resolution are removed. Files of 200-400 MB and larger are supported. For example, a 10,000 × 10,000 RGBA image is about 400 MB. The current single-buffer exporter supports roughly 536 MP (2.15 GB of pixel data), subject to available memory. Larger requests are rejected explicitly; increase m/pixel or use a smaller region.

The TIFF is uncompressed 8-bit RGBA, written in strips without an extra full-image encoder copy. RAM is additional to the loaded point cloud and may be several times the file size. TIFF and georeference companions are staged together: cancellation or a write failure preserves previous output files.

89 Project reports

EXPORT > REPORTS

PRO

Compile the available project and analysis results into an HTML report. Choose the required sections and confirm the underlying calculations are current. Create a self-contained printable HTML report with project, cloud, QA, terrain, sections, measurements and inspection issues.

Procedure

1. Save the project and complete any required Scan Quality analysis and inspection register.

2. In PRO open EXPORT > REPORTS.

3. Choose whether to include the latest quality results and recorded issues.

4. CREATE HTML REPORT and select a destination.

5. Open the report, verify project names, units, coordinates and included results before sending it.

Commands and parameters

CREATE HTML REPORT…

Create an HTML report containing the selected project and analysis information.

90 Point-cloud video tours

EXPORT > VIRTUAL TOUR

PRO

Build a camera path from keyframes and preview it before exporting video. Frame the model and choose the intended display settings before adding each camera. Camera keyframes, duration, easing, preview and MP4 presentation export. The recorded view includes active cloud layers, TIN, contours and labels. 1. Set the first 3D view → ADD CAMERA. 2. Move/rotate/zoom → ADD CAMERA again. 3. Set seconds + easing → PREVIEW. 4. EXPORT MP4 (uses the supplied video component).

Procedure

1. Record/select camera positions and review the virtual tour before video export.
2. For interactive handover, choose the portable viewer point limit and export a .rctourviewer package.
3. Open the package with RECAP Tour Viewer and check the included data. The portable package is read-only and may contain a sampled subset.

Commands and parameters

ADD CAMERA

Capture the current 3D camera position as a tour keyframe.

REMOVE

Remove the selected camera keyframe from the tour.

PREVIEW

Play the camera path in the application to inspect framing and movement before export.

Stop virtual tour preview

STOP PREVIEW · Stop camera playback and keep the current view

EXPORT MP4…

Render the camera tour to MP4 using the export settings and the available video encoder.

91 Portable viewing packages

EXPORT > PORTABLE VIEWER

PRO

Package project content for read-only review. The point budget controls package density; keep the package together with the supplied viewer when distributing it. Create a compact read-only client package containing the visible point cloud, TIN, stored sections, measurements and annotations.

Procedure

1. In PRO open EXPORT > PORTABLE VIEWER.
2. Choose EXPORT PORTABLE PACKAGE and review the data and destination offered by the dialog.
3. Wait for packaging to complete and keep the complete package folder together.
4. Open it with OPEN PACKAGE READ-ONLY or the supplied RECAP Tour Viewer.
5. Verify on the recipient machine that the intended views and data are present before delivery. This is a viewing package, not the editable project archive.

Commands and parameters

EXPORT PORTABLE PACKAGE…

Create a read-only client package with the selected project content and point budget.

OPEN PACKAGE READ-ONLY…

Open an existing portable package in the read-only viewer.

92 Interoperability and BIM

EXPORT > INTEROPERABILITY / BIM

PRO

Exchange point clouds, terrain and meshes using the supported formats. E57 and GeoPackage point exports use bundled tools. Creating RCP/RCS requires an installed, licensed Autodesk ReCap Pro with DeCap.

Procedure

1. Choose the format and the data to export. Point-cloud exports use the selected region; OBJ and LandXML require an active surface.
2. Export E57 or GeoPackage directly. For RCP/RCS, the application checks DeCap first and offers E57 if it is unavailable.
3. Keep the entire generated ReCap folder together. Open the result in the receiving application and verify units, coordinates and attributes.

Commands and parameters

Import PTS / PTX / ASCII PLY

Loads supported point files into an editable cloud.

Export

Exchange point clouds, terrain and meshes using the supported formats. E57 and GeoPackage point exports use bundled tools. Creating RCP/RCS requires an installed, licensed Autodesk ReCap Pro with DeCap.

Practical notes

E57 contains one unstructured scan, double-precision coordinates, available RGB and intensity. Original scan stations and structured scan grids are not reconstructed.

GeoPackage stores POINT Z and point attributes with an undefined Cartesian CRS. Assign the actual CRS in your GIS when known; no reprojection is performed.

Native RCP/RCS creation depends on the installed Autodesk product and its license. An E57 fallback is an exchange file, not an RCP file.

SketchUp uses an OBJ exchange file; native SKP is unavailable. IFC output is limited to supported proxy/property records and is not a complete geometric BIM model.

93 3D performance settings

SETTINGS > 3D ENGINE

STANDARD + PRO

Balance visual detail against available graphics and memory resources. Check the graphics device actually used by the application, then choose display quality and density appropriate to the survey. Display settings do not change the measured source data.

Procedure

1. Select the required quality preset and render density. ALL SOURCE POINTS controls the loaded source population; it is distinct from the points drawn in a frame.

2. Use APPLY RENDER DENSITY when offered. Saved display settings are applied on cloud load.

3. If navigation slows, inspect the reported GPU and reduce the working set deliberately. Full density cannot guarantee a fixed frame rate on every GPU.

Commands and parameters

APPLY GPU PREFERENCE

Save the chosen Windows GPU preference and apply the process performance option. Restart the application to recreate its OpenGL context, then verify the reported active GPU.

WINDOWS GRAPHICS SETTINGS

Open Windows Graphics settings to select the executable and its preferred GPU, including devices not addressable by the standard high-performance or power-saving policy.

WINDOWS GAME MODE

Opens the optional Windows setting. Game Mode is not guaranteed to improve CAD or OpenGL rendering.

REFRESH GPU STATUS

Refresh the active renderer, saved Windows preference and process-performance status without changing the GPU context.

APPLY RENDER DENSITY

Rebuilds only the renderer working set and preserves the current camera.

Render mode / Density

Choose Adaptive LOD, a fixed point count or the offered full-density option. Compare loaded and rendered counts.

Quality preset

Choose the display quality required for inspection and navigation.

High performance process

Request higher CPU priority and reduced power throttling; it does not lock GPU clocks.

Cull off-screen spatial chunks

Avoid drawing cloud regions outside the current view.

Temporary interaction thinning

Reduce visible points during movement, then return to the selected density when navigation stops.

FXAA

Smooth visible point and TIN edges.

Renderer diagnostics

Inspect the active GPU and current display workload.

VIRTUAL MEMORY / PAGE FILE

Open Windows page-file management; disk-backed memory is distinct from RAM and GPU capacity.

94 Virtual memory on a local drive

SETTINGS > 3D ENGINE > VIRTUAL MEMORY / PAGE FILE

STANDARD + PRO

The Windows page file provides additional memory capacity on disk for all applications. It is slower than RAM and does not increase GPU memory. Automatic management and maximum sizes of 64, 128, 256, 512 GB or a custom size are available.

Procedure

1. Save your work and open VIRTUAL MEMORY / PAGE FILE. Review RAM, active memory limit and existing page files.
2. Keep Automatic management or choose a maximum size suitable for the workload and available disk space.
3. For a custom configuration select a local NTFS drive, preferably an SSD, and enter initial and maximum sizes in whole GB. The initial size must not exceed the maximum.
4. Review the free-space check; at least 10 GB must remain. Other page files are retained.
5. Select Apply to Windows, confirm the change and approve the Windows administrator prompt. Cancellation leaves the configuration unchanged.
6. Read the result and refresh status. Save all work and restart Windows when convenient for full application of the settings; RECAP TOUR does not restart the computer.

95 Interface language

SETTINGS > LANGUAGE

STANDARD + PRO

Use English or Greek for the interface and open the matching help from ABOUT. The Greek guides retain English command identifiers alongside their explanations so controls can be located in either language.

Procedure

1. Open SETTINGS > LANGUAGE.
2. Choose English or Greek from the enabled language options.
3. Review the translated interface and hover tooltips when identifying a command.
4. Use the matching language row in ABOUT to open the documentation. English command names are retained in the Greek guides for cross-reference.

Commands and parameters

EN

Select the English interface.

EL

Select the Greek interface.

UI language

Choose an enabled language; the quick selector changes EN/EL.

EXPORT LOCALIZATION AUDIT…

Export observed untranslated labels for support.

Practical notes

User-supplied file, point and section names are preserved. Technical identifiers such as DXF, LAS, RGB, ICP and BASE/FLOATING may remain in their original form.

96 Themes and typography

SETTINGS > UI

STANDARD + PRO

Switch between the available light and dark themes. GENERAL can override the background of each viewport independently.

Procedure

1. Enter a theme name and four #RRGGBB colors: Font, Special/accent, application Background and common 3D/2D Background. Use the color-picker buttons if preferred.
2. SAVE / APPLY saves the named theme and activates it; saving the same name updates it. Select a saved theme and use APPLY or DELETE.
3. Control borders, hover and selected-text contrast are derived automatically. Choose distinct font/background colors. Built-in Dark, Light and RECAP selectors return to built-in themes; the last custom theme is restored on restart when active.

Commands and parameters

CUSTOM NAMED COLORS…

Create or update named custom colors with the color picker. Saved colors supplement the built-in choices throughout the supported color controls, including extrusion type colors.

UI FONT SIZE / COLORS…

Set tab, panel and button font sizes and colors. Controls adapt to translated captions; excessive sizes can require more toolbar rows. Graphics labels retain the shared font family.

Dark / Light / RECAP Theme

Choose the main interface theme.

Custom themes

Save a named colour configuration and import/export it for reuse.

UI font size / Colours

Adjust readability without changing project units or geometry.

Viewport backgrounds

Set 2D and 3D backgrounds independently in GENERAL.

97 General display settings

SETTINGS > GENERAL

STANDARD + PRO

Set independent viewport backgrounds or reset application preferences. Section-plane visibility/transparency are in SECTION > SECTION / SLICE. Guide and CAD line appearance are in DRAW > PROPERTIES.

Procedure

1. Open SETTINGS > GENERAL.
2. Choose the 3D and 2D backgrounds independently.
3. Review both views. Display settings do not change coordinates.
4. Use Reset all settings only for a complete preferences reset, after saving work.

Practical notes

Guide and CAD line color, line type and thickness are in DRAW > PROPERTIES. Measurement appearance is in DRAW > MEASUREMENTS / ANNOTATIONS.

98 Mouse navigation sensitivity

SETTINGS > CONTROL

STANDARD + PRO

Adjust navigation sensitivity. Middle-button vertical dragging controls continuous zoom; terrain drawing may temporarily use the middle button for rotation. Middle button + mouse up = continuous zoom in. Middle button + mouse down = continuous zoom out. Terrain drawing keeps middle-drag as temporary rotation.

Procedure

1. Open SETTINGS > CONTROL.
2. Adjust rotate, pan and zoom sensitivity to suit the mouse and cloud scale.
3. Test the changes on a known feature in the intended navigation mode.
4. Reduce sensitivity for precise inspection and use Fit if the model moves out of view.

99 Organising tabs, panels and toolbars

SETTINGS > APPLICATION

STANDARD + PRO

Organise the workspace by changing the order and visibility of tabs, panels and toolbars. Layout changes do not modify survey data or license permissions.

Procedure

1. Hold a tab or panel for one second, then drag. The hand cursor and light border indicate movement.
2. In the APPLICATION tree, hold for 0.3 seconds before moving an item. Drop among compatible siblings.

3. Resize the left panel with its divider. Buttons move onto another row without splitting their labels; sliders span the panel width. Selecting a panel reveals a hidden sidebar.

Commands and parameters

Hold and drag

Hold a tab/panel for about one second, or an Application tree item for about 0.3 seconds, then drag to a compatible position.

Visibility checkboxes

Show or hide the corresponding workspace item.

RESTORE APPLICATION DEFAULTS

Restore workspace organisation and visibility; this is distinct from clearing a project or resetting all settings.

Show Pro

SETTINGS > APPLICATION > Show Pro adds PRO badges to Pro-only tabs and panels even with a Pro license. The choice is saved. It changes labels only; Standard retains its existing restricted-feature labels and permissions.

Practical notes

Viewport tabs have their own right-click docking menu and can be dragged directly to reorder. Command strips wrap to additional rows. Show legacy toolbars restores the previous toolbars without replacing compact tabs.

100 Resetting preferences

SETTINGS > GENERAL > Reset all settings

STANDARD + PRO

Reset all settings restores application preferences, custom themes, palettes, layouts and tool settings. Projects, recovery copies, imported files and license activation are retained. The application restarts.

Procedure

1. Save the current project and any custom appearance you wish to retain.
2. If only toolbar arrangement is wrong, first use the Application layout controls.
3. For a complete preference reset choose SETTINGS > GENERAL > Reset all settings.
4. Read and confirm the warning, then respond to the unsaved-project prompt.
5. After restart open the saved project and set your preferred language, layout and tool options.

101 Proposed facade sections

3D > Section > Detect Proposed sections / Proposed

STANDARD + PRO

Detect candidate facade sides from loaded point-cloud data and select a section plane along each side.

Procedure

1. Load enough points to represent the facade and choose the area with Lasso, Polygon, an existing selection or All.

2. Open PROPOSED SECTIONS. Set Minimum facade length (default 3 m), Footprint grid size (default 0.20 m) and Minimum vertical support (default 0.75 m).

3. Set minimum side coverage (80%), maximum unsupported gap (0.60 m) and maximum side deviation (0.10 m). Gaps split proposals; roof and ground returns alone cannot establish a facade.

4. Run Detect proposed sections and review the candidate lines in 3D.

5. At the end of 3D > Section, use the Proposed dropdown after Detect Proposed sections. You can also click a yellow dashed proposal in 3D: the list selection and 2D preview follow. Press Delete to remove the selected proposal.

6. Use Extract Full-Res Section when the position is correct.

7. Use Ctrl / Shift in the review list to select multiple proposals. Delete selected proposals or press Delete. Undo proposal deletion restores the last removal. This affects suggestions, not already extracted sections. A fresh detection replaces the proposal list.

Commands and parameters

Minimum facade length

Shortest accepted side, measured in metres.

Footprint grid size

Smaller cells retain more detail but require denser data.

Minimum vertical support

Required vertical spread of supporting scan points.

Minimum side coverage / Maximum unsupported gap / Maximum side deviation

Reject poorly supported sides, split long gaps and limit deviation from the fitted side. Review every proposal before extraction.

Delete selected proposals / Undo proposal deletion

Remove selected suggestions and restore the last deletion. Already extracted sections are managed separately in SECTION MANAGER.

Practical notes

Detection uses loaded points in the selected area. Increase display density when a facade is poorly sampled.

Candidates require visual review; vegetation, missing scans or neighbouring structures can affect the result.

102 Place a section with two points in 2D

2D > Tools > Section 2 Points; 3D > Section > Section from 2 points in 2D

STANDARD + PRO

Define a section position directly in the 2D viewport, including PREVIEW before extraction.

Procedure

1. Choose the 2D view in which you want to place the line.

2. Choose Section 2 Points in 2D > Tools, or Section from 2 points in 2D in 3D > Section.

3. Pick the first point. Move the pointer to see the rubber-band line, then pick a different second point.

4. Review the new preview, adjust thickness and extract when ready.

Practical notes

In a top view the section plane is vertical. In another section view, the new plane is perpendicular to that view and passes through both points.

Existing snapping and Ortho settings apply. ESC cancels; Backspace clears the first point.

These controls belong to the main application. The registration workspace has its own SECTION selector and is a separate workflow.

103 DXF background and editable drawing

DRAW > DXF IMPORT

STANDARD + PRO

Load model-space linework as a 3D/2D background or import it into the drawing tools.

Procedure

1. Open DXF IMPORT and set how many metres correspond to one DXF unit. For millimetres enter 0.001; RECAP section exports use metres (1).

2. Use Automatic for new RECAP section exports. The saved section reference restores their original position and direction even if another section is active. External DXFs use world XYZ in Automatic.

3. Older RECAP section DXFs have no saved reference. Activate the original section, then use Automatic or DXF XY → section coordinates. Explicit World XYZ and current-section modes remain available.

4. Load DXF background for a reference visible in 3D and 2D. Show or fit it from the same panel.

5. Select a loaded file and use Delete selected DXF background, or delete all backgrounds. This removes project geometry while retaining the source file. DXF backgrounds… in DXF / REGISTER opens these controls.

6. For editable geometry, choose Import into 3D DRAW, or extract a section first and choose Import into editable 2D drawing.

7. Use the drawing tools to edit or delete entities. Move selected 3D drawing applies a world-coordinate XYZ offset.

Practical notes

ASCII DXF LINE, LWPOLYLINE, ordinary 2D/3D POLYLINE, ARC, CIRCLE and 3DFACE outlines are supported. Curves become editable polylines.

Blocks, text, dimensions, hatches, splines and mesh/fitted polylines are not imported. Unsupported entities are reported; explode blocks to supported linework before import.

The background works in PREVIEW. Editable 2D geometry belongs to an extracted section. This is a linework import, not a full preservation of DXF styles and layers.

104 Recognize a surface from a picked point

MODELING > PICK SURFACE

PRO

Pick inside a flat face to find a connected planar patch, inspect its boundaries and optionally create a fitted surface.

Procedure

1. Select the loaded points to use and open PICK SURFACE.
2. Set plane tolerance, boundary resolution, initial search radius and minimum surface area. Defaults are 0.03 m, 0.10 m, 0.50 m and 0.20 square metres.
3. Choose Pick surface and click inside the face, away from edges and corners.
4. Inspect the boundary and surface preview. Extract boundaries to 3D DRAW, export supporting XYZ points or create the fitted surface.
5. Use Add section on this surface to place a section plane on the recognized face. A saved fitted surface can also be selected in MODELING OBJECTS.
6. Select a surface to edit its vertices, move it, delete it, undo changes or export DXF 3DFACE geometry.

Commands and parameters

Pick surface / Add section on this surface

Recognize the connected planar patch from an interior pick; then place a section on the accepted surface plane.

Extract boundary / Create best-fit surface / Export DXF

Choose a boundary drawing, a fitted surface or a DXF surface deliverable after checking the detected limits.

Practical notes

Empty or unobserved regions remain open. Boundary resolution and point density control the precision; inspect openings and edges before accepting.

Tolerance must be at least 0.001 m, grid size at least twice tolerance and search radius at least three grid cells.

Moving a planar surface retains its section plane. Arbitrary vertex edits or a non-linear coordinate transformation can invalidate the original plane; recognize the surface again before adding a fitted-plane section.

105 2D grid coordinates and color

SECTION > SECTION PROPERTIES > 2D grid / axes

STANDARD + PRO

Show metric grid values using survey X/Y or horizontal station and absolute elevation.

Procedure

1. Open 2D grid / axes and enable Show metric grid and Show grid axis values.
2. Choose Automatic, X/Y, Distance from section start / elevation, or Distance from section middle / elevation.

3. For start mode, zero is the left extent of the loaded section. For middle mode, zero is its midpoint and stations on either side have opposite signs. Pan and zoom do not reset zero.

4. Use the color picker or enter #RRGGBB. Automatic grid color follows the 2D background. Settings are saved automatically.

Practical notes

XY grid lines follow the actual survey coordinates even when the plan is rotated. H is absolute survey elevation. A geometrically incompatible mode adapts to the plane and the caption reports the active mode.

The origin is derived from loaded section data, including PREVIEW. It may be refined after full extraction or point edits. Empty data uses the default display extent.

These are display settings. They do not move geometry or add a grid to DXF exports.

106 Registration: color, transparency and orthographic views

TOOLS > CLOUD REGISTER > Model / Render / View / Clip

STANDARD + PRO

Set each cloud independently before choosing common features. BASE is the reference cloud; FLOATING is the cloud to transform.

Procedure

1. Open CLOUD REGISTER. Choose or load BASE and FLOATING in this window; no CLOUD LAYERS preselection is required.

2. In each Model tab choose RGB when available, or Single color with contrasting palettes. Set X-Ray type/gain and EDL strength/radius here.

3. In Render choose Full density to draw every loaded point, Fixed density for a percentage or Adaptive LOD. Set quality, transparency and point size. Motion LOD temporarily thins points during navigation when enabled.

4. In View choose Projection, orientation, Zoom Window or Fit 3D. Front/Side views can be used with a Top section. Synchronize 3D views links cameras only and is optional.

5. In Clip isolate the useful overlap. In Section set type, position and thickness. Changing section type updates the plane directly; Section extracts/reloads the section. The last toggle controls only the translucent plane fill; its perimeter and editing grips remain visible.

6. Right-click tabs to change docking and drag them to reorder. Commands wrap within the pane.

Practical notes

Display density and quality do not modify the loaded points. Load original source files for full data when project layers contain only sampled points. Clipping restricts display and picking, not Save Aligned Floating or Save Merged.

BASE is the fixed coordinate reference: preparation, alignment and export never reposition it. Only FLOATING is transformed. Merged output retains BASE coordinates; normal LAS coordinate quantization still applies.

107 Registration: common 3D points

TOOLS > CLOUD REGISTER > Clouds / Constraints / Align / Save

STANDARD + PRO

Combine directions, XY points, XYZ points and elevation-only constraints in one joint Align 3D operation.

Before you start: Two distinct clouds with compatible units. Choose project layers or load source files inside the workspace.

Procedure

1. Open CLOUD REGISTER and choose or load BASE and FLOATING inside the workspace.
2. Set views and sections independently. Model contains color, X-Ray and EDL; Render contains Full density, density percentage, quality and Motion LOD.
3. In Constraints select Lines / Directions, 2D point · XY, 3D point · XYZ, 2D Elevation point or 3D Elevation point. Always pick FLOATING first, then BASE.
4. Click a constraint to display its references. Disable or delete incorrect constraints.
5. Run one Align 3D for all enabled constraints, then optionally Refine ICP 3D.
6. Inspect independent check features, then choose Save Aligned Floating or Save Merged.

Practical notes

2D matches may come from different section types. Conversion into the common frame contributes XY or H according to the constraint type. Directions alone do not fix position.

If cloud centres are more than 5000 m apart, FLOATING is initially moved near BASE. This transform is retained in the final output. Camera synchronization is optional.

The list remains after alignment. Underdetermined geometry is reported. ICP requires overlap and is rejected if it worsens a constraint beyond the allowed tolerance.

Use Section > Show / hide section plane fill in each 3D pane to toggle only the translucent fill. The perimeter and editing grips remain visible and usable; the extracted section and section settings are unchanged.

BASE is the fixed coordinate reference: preparation, alignment and export never reposition it. Only FLOATING is transformed. Merged output retains BASE coordinates; normal LAS coordinate quantization still applies.

108 Registration: XY from matching sides

TOOLS > CLOUD REGISTER > Clouds / Constraints / Align / Save

STANDARD + PRO

Combine directions, XY points, XYZ points and elevation-only constraints in one joint Align 3D operation.

Before you start: Two distinct clouds with compatible units. Choose project layers or load source files inside the workspace.

Procedure

1. Open CLOUD REGISTER and choose or load BASE and FLOATING inside the workspace.

2. Set views and sections independently. Model contains color, X-Ray and EDL; Render contains Full density, density percentage, quality and Motion LOD.
3. In Constraints select Lines / Directions, 2D point · XY, 3D point · XYZ, 2D Elevation point or 3D Elevation point. Always pick FLOATING first, then BASE.
4. Click a constraint to display its references. Disable or delete incorrect constraints.
5. Run one Align 3D for all enabled constraints, then optionally Refine ICP 3D.
6. Inspect independent check features, then choose Save Aligned Floating or Save Merged.

Practical notes

2D matches may come from different section types. Conversion into the common frame contributes XY or H according to the constraint type. Directions alone do not fix position.

If cloud centres are more than 5000 m apart, FLOATING is initially moved near BASE. This transform is retained in the final output. Camera synchronization is optional.

The list remains after alignment. Underdetermined geometry is reported. ICP requires overlap and is rejected if it worsens a constraint beyond the allowed tolerance.

Use Section > Show / hide section plane fill in each 3D pane to toggle only the translucent fill. The perimeter and editing grips remain visible and usable; the extracted section and section settings are unchanged.

BASE is the fixed coordinate reference: preparation, alignment and export never reposition it. Only FLOATING is transformed. Merged output retains BASE coordinates; normal LAS coordinate quantization still applies.

109 Registration: match height after XY

TOOLS > CLOUD REGISTER > Clouds / Constraints / Align / Save

STANDARD + PRO

Combine directions, XY points, XYZ points and elevation-only constraints in one joint Align 3D operation.

Before you start: Two distinct clouds with compatible units. Choose project layers or load source files inside the workspace.

Procedure

1. Open CLOUD REGISTER and choose or load BASE and FLOATING inside the workspace.
2. Set views and sections independently. Model contains color, X-Ray and EDL; Render contains Full density, density percentage, quality and Motion LOD.
3. In Constraints select Lines / Directions, 2D point · XY, 3D point · XYZ, 2D Elevation point or 3D Elevation point. Always pick FLOATING first, then BASE.
4. Click a constraint to display its references. Disable or delete incorrect constraints.
5. Run one Align 3D for all enabled constraints, then optionally Refine ICP 3D.
6. Inspect independent check features, then choose Save Aligned Floating or Save Merged.

Practical notes

2D matches may come from different section types. Conversion into the common frame contributes XY or H according to the constraint type. Directions alone do not fix position.

If cloud centres are more than 5000 m apart, FLOATING is initially moved near BASE. This transform is retained in the final output. Camera synchronization is optional.

The list remains after alignment. Underdetermined geometry is reported. ICP requires overlap and is rejected if it worsens a constraint beyond the allowed tolerance.

Use Section > Show / hide section plane fill in each 3D pane to toggle only the translucent fill. The perimeter and editing grips remain visible and usable; the extracted section and section settings are unchanged.

BASE is the fixed coordinate reference: preparation, alignment and export never reposition it. Only FLOATING is transformed. Merged output retains BASE coordinates; normal LAS coordinate quantization still applies.

110 Registration: ICP, progress and cloud output

TOOLS > CLOUD REGISTER > Clouds / Constraints / Align / Save

STANDARD + PRO

Combine directions, XY points, XYZ points and elevation-only constraints in one joint Align 3D operation.

Before you start: Two distinct clouds with compatible units. Choose project layers or load source files inside the workspace.

Procedure

1. Open CLOUD REGISTER and choose or load BASE and FLOATING inside the workspace.
2. Set views and sections independently. Model contains color, X-Ray and EDL; Render contains Full density, density percentage, quality and Motion LOD.
3. In Constraints select Lines / Directions, 2D point · XY, 3D point · XYZ, 2D Elevation point or 3D Elevation point. Always pick FLOATING first, then BASE.
4. Click a constraint to display its references. Disable or delete incorrect constraints.
5. Run one Align 3D for all enabled constraints, then optionally Refine ICP 3D.
6. Inspect independent check features, then choose Save Aligned Floating or Save Merged.

Practical notes

2D matches may come from different section types. Conversion into the common frame contributes XY or H according to the constraint type. Directions alone do not fix position.

If cloud centres are more than 5000 m apart, FLOATING is initially moved near BASE. This transform is retained in the final output. Camera synchronization is optional.

The list remains after alignment. Underdetermined geometry is reported. ICP requires overlap and is rejected if it worsens a constraint beyond the allowed tolerance.

Use Section > Show / hide section plane fill in each 3D pane to toggle only the translucent fill. The perimeter and editing grips remain visible and usable; the extracted section and section settings are unchanged.

Merged LAS/LAZ output preserves supported original LAS point fields and adds numeric Merge source provenance. File-backed unedited project layers are fully loaded when selected in this workspace. Deduplication, when explicitly enabled, removes records; choose zero/off to retain every point.

BASE is the fixed coordinate reference: preparation, alignment and export never reposition it. Only FLOATING is transformed. Merged output retains BASE coordinates; normal LAS coordinate quantization still applies.

111 Cancel, repeat and continuous commands

COMMAND / main and auxiliary graphical workspaces

STANDARD + PRO

Use the same command cycle in the main 2D/3D views and graphical workspaces.

Procedure

1. Start a command from its button. Drawing, picking and editing tools remain available for successive objects until you finish or cancel them.
2. Press ESC to cancel the unfinished operation. Supported background operations receive a cancellation request; already committed geometry is retained.
3. Press SPACE once to invoke the last available button command again. Holding SPACE does not generate repeated actions.
4. Press ENTER to finish an open polyline or supported variable-length draft and end that drawing tool. In a selection stage, ENTER confirms the selection and advances the current procedure.
5. Text boxes, numeric inputs, lists and dropdowns keep their native keyboard behavior. Use UNDO for a completed change; ESC does not undo a completed edit.

Practical notes

COPY can place several copies using the same base point. A completed All-selection operation waits for another explicit SPACE; it does not repeatedly modify the entire dataset automatically.

112 Registration: custom section from two points

TOOLS > CLOUD REGISTER > Section > Custom Section 2 Points

STANDARD + PRO

Define an arbitrary section graphically on either cloud.

Procedure

1. Choose CUSTOM in the SECTION dropdown for BASE or FLOATING. Click the adjacent two-point icon.
2. Pick two distinct points in that cloud’s 3D view or its current 2D section. The rubber line previews the direction.
3. The section contains the picked line and extends along the viewing direction. TOP/BOTTOM picks therefore define a vertical section; other views produce the corresponding orientation.
4. Adjust section position and thickness with the existing controls. Pick another pair to redefine it, or press ESC / ENTER to end.

5. Use the same point filters, clip controls and views to expose interior geometry before picking.

Practical notes

Existing temporary construction on the changed section is cleared. The original Cloud Registration tool remains separate from SPLICING.

BASE is the fixed coordinate reference: preparation, alignment and export never reposition it. Only FLOATING is transformed. Merged output retains BASE coordinates; normal LAS coordinate quantization still applies.

113 Splicing: manual placement and constrained fit

TOOLS > SPLICING

PRO

Open a separate workspace to place FLOATING against a fixed BASE, combine point and line constraints and review an automatic refinement.

Before you start: Professional license; BASE and FLOATING clouds in compatible units. BASE is the reference. Placement is rigid (translation and rotation); it does not rescale either cloud.

Procedure

1. Open TOOLS > SPLICING. Choose/load BASE and FLOATING in either order. BASE stays fixed; once both are available FLOATING is translated beside BASE with adjacent bounding boxes, even when coordinate origins are millions of metres apart. Continue with manual or constrained alignment.

2. Use MOVE FLOATING or ROTATE FLOATING and drag with the left button. Select Free, an axis or a plane; the colored X/Y/Z handles select axes. Middle/right mouse navigates. PICK PIVOT changes the rotation centre.

3. For precise placement use MOVE FLOATING · 2 PTS, or ROTATE FLOATING · 3 PTS: centre, source direction, target direction. CLOUD / EDGE / CORNER uses front-surface picking.

4. Smart fit from points: pick the same feature on FLOATING and BASE. It searches rotation in X/Y/Z and translation, respecting locks. You can retry from a displayed candidate without applying it; Reject still restores the original placement. If geometry cannot confirm a fit, the point translation is shown as Placement only, without inventing a rotation. Review before Apply.

5. Before ADD 3D PAIR choose XYZ, XY or Z. Pick FLOATING then BASE. Mixed masks can coexist in the list. Z uses only elevation; XY does not compare elevation.

6. Before ADD LINE PAIR choose LINE POSITION + DIRECTION, EXACT ENDPOINTS + DIRECTION or DIRECTION ONLY. Pick FLOATING A, FLOATING B, BASE A, BASE B. The chosen mode is stored with the pair. For exact lines A must correspond to A and B to B; for the other modes endpoints merely define a direction or supporting line. The detailed matching procedure below explains the differences.

7. Continue adding point and line pairs in any combination. Newly completed pairs join the current list selection. Finish an incomplete pick sequence or press ESC/ENTER, then use Ctrl/Shift in MATCHED CONSTRAINTS to choose the rows to use. EXECUTE NOW jointly fits all selected point and line rows, applying the FLOATING placement immediately with one Undo step. BASE remains fixed. The result reports point, exact-endpoint, supporting-line distance and direction RMS; a dash means that type was absent. For an unrestricted single line the direct placement rule is used, retaining unobservable freedoms.

8. Choose BASE or FLOATING in CLIP. Each cloud retains its own box and polygon/lasso. CLIP BOX reopens the existing box; drag face/rotation grips in FRONT, SIDE or ISO to reveal the floor or interior you need. CLIP ON /

OFF shows the whole cloud temporarily and restores the same saved cut when enabled. CLIP OUTLINE hides only frames and grips, leaving the cut active for CLOUD / EDGE / CORNER point and line picking. RESET CLIP alone clears the selected cloud limits. Both applies enable/outline/reset commands to both independent clips; select an individual cloud to edit box grips. Drawing a new polygon/lasso with Both selected deliberately applies that new region to both clouds. Partial clips are cancelled when switching target; existing cuts remain.

9. Set locked transformation components and control tolerances, then SOLVE CONSTRAINTS. A deficient or unstable configuration is rejected. Review the candidate against unchanged geometry; toggle Show candidate, then APPLY CANDIDATE or REJECT CANDIDATE.

10. REFINE ICP performs a robust multiscale point-to-plane refinement from a close initial placement. Enter maximum correspondence distance in metres. The point/line constraints and locked components remain part of the fit. Progress and cancellation are in this window.

11. SAVE ALIGNED FLOATING writes the positioned FLOATING; SAVE MERGED combines it with BASE. A positive duplicate tolerance removes nearby FLOATING points, preserving BASE. Zero keeps all points. Select LAS or LAZ.

12. SAVE SESSION stores transformation, constraints, pivot and clips. OPEN SESSION requires the same loaded BASE/FLOATING coordinates and point order. UNDO / REDO changes placement without modifying source arrays.

13. In the dockable VIEW toolbar choose Performance, Balanced, Quality or Ultra. Choose Full density and set each cloud to 100% to draw every loaded point while idle; Adaptive LOD instead applies a viewport/quality budget. Motion LOD temporarily thins the view while orbiting or dragging and restores the selected density when movement stops. Turn it off only when you want full density while moving as well. These options affect display only, not source points, picking, solving or export.

14. Use EDL and its strength/radius sliders for surface depth, point size for readability and FXAA for smoother edges. Each cloud has independent visibility, RGB/single color, transparency and display percentage. Selecting a named color switches that cloud out of RGB automatically. Switch RGB back on to restore its recorded colors. The controls continue to work after Execute, Undo/Redo and while reviewing an ICP/Solve candidate.

15. If a cloud remains cut after alignment, press RESTORE FULL CLOUDS in CLIP. This removes both box and polygon/lasso limits from BASE and FLOATING regardless of the selected target, shows both clouds and fits their complete current extents. It keeps placement, correspondences, Undo history, colors, transparency and density. RESET CLIP still clears only the current target. Both commands also work while a candidate preview is pending.

Commands and parameters

LOAD CLOUD

Load a full source file directly into the chosen slot. Project layers may already be sampled. Load BASE first. Both name lists use the same width; hover to read the full name/path.

Visible / RGB / Single color / Transparency

Independent appearance for each cloud. A hidden cloud cannot be picked. Transparency changes appearance, not coordinates, saved point count or clip geometry.

CLIP target: BASE / FLOATING / Both

Choose whose clip is edited. Both retains two independent boxes; select one cloud to use its grips. A new polygon/lasso in Both deliberately defines the same new region for both.

CLIP BOX / CLIP ON / OFF / CLIP OUTLINE / RESET CLIP

BOX opens saved limits or creates the first box. ON/OFF suspends/restores the cut. OUTLINE hides/shows only frames and grips. RESET deletes clip limits only on selected clouds.

EXACT ENDPOINTS + DIRECTION

Two corresponding physical endpoints and their ordered direction. Pick in matching order. Different measured lengths produce a compromise and nonzero endpoint RMS; scale is never changed.

DIRECTION ONLY

Only parallel orientation is constrained. Endpoint position and segment length contribute no position equation. Reversing a segment does not change the intended unoriented direction. Add positional references to determine translation.

LINE POSITION + DIRECTION

Matches supporting infinite lines in position and direction. It permits unequal lengths and arbitrary sample endpoints on the same physical side. This is stronger than direction-only matching.

ADD 3D PAIR: XYZ / XY / Z

XYZ compares all three coordinate components. XY compares horizontal coordinates only. Z compares elevation only, regardless of the target X/Y. The mask is retained per pair.

EXECUTE NOW / SOLVE CONSTRAINTS

EXECUTE applies a joint fit of selected rows immediately. SOLVE uses the whole list and presents an APPLY/REJECT candidate. Both keep BASE fixed and fit a rigid transform.

Locked components: Tx Ty Tz Rx Ry Rz

Checked components are held during joint optimization. Use locks for deliberately restricted work, such as elevation-only adjustment, not to conceal bad correspondences.

Distance (m) / angle (degrees)

Positive distance and angular tolerances normalize positional and directional residuals. Smaller values give that residual group greater influence. They are weighting parameters, not automatic acceptance thresholds.

REFINE ICP / APPLY CANDIDATE / REJECT CANDIDATE

ICP refines a close initial placement using visible clipped geometry and the full saved constraint list. Review the candidate before applying; rejection restores the preceding placement.

SAVE ALIGNED FLOATING / SAVE MERGED / SAVE SESSION

The first two export geometry. SESSION saves the placement and matching workflow, not the cloud files. Keep the original datasets. Clip visibility does not trim export.

VIEW quality / density / EDL

Full density + 100% draws every loaded point while idle. To use complete source data, load original files rather than a sampled project layer. Large full-density scans may render more slowly.

RESTORE FULL CLOUDS

Remove all clip geometry from both clouds and fit the complete current placement. This does not undo alignment or reload an original file.

3D Smart fit

Move FLOATING close to BASE or indicate a FLOATING source and BASE target contact point. Smart fit searches rotations and small position corrections from that placement. Auto fit after move can be bypassed with Alt. Review the proposal, then Apply or Reject; Undo restores the previous placement. Scale correction is optional and bounded, with all transform components unlocked. Flat or ambiguous geometry may not provide enough support for a reliable fit.

Practical notes

Export includes all points loaded in the workspace, including clipped points. Existing project layers may already be sampled or edited; load original files in this window when the complete source is needed. Display quality and density affect rendering only; point picking and export use the loaded dataset.

ICP is a local refinement, not automatic global recognition. Sparse, repetitive or nearly planar overlap can be ambiguous. Inspect residuals and independent features; a low RMS alone is not a survey-quality guarantee.

Saved LAS/LAZ coordinates use the original project/world reference frame. View orientation does not become an unintended export transformation. Source arrays and BASE are never overwritten by placement.

For two-storey buildings, lower the upper face of each cloud clip box below its roof to reveal interior references. Hide CLIP OUTLINE while picking correspondences; toggle CLIP ON / OFF to inspect the full scan and return to the same cut. Each cloud keeps separate enable and outline states in SAVE SESSION. Older sessions remain readable. Clipping restricts picking and ICP but does not delete points or trim exports.

EXECUTE NOW uses selected rows. SOLVE CONSTRAINTS and REFINE ICP use the full saved list; remove incorrect rows before using them. Newly saved sessions preserve line modes and require a version that understands them. Older sessions open with their original supporting-line interpretation. Changing the mode selector affects the next picking command, not previously stored rows.

Automatic adjacent placement happens on loading a dataset, not during navigation or when reopening a saved session. The actual FLOATING transform is used for picking, fitting, saving and export. SPLICING has no Section tab and never displays a section plane, fill or section grips in its common 3D viewport.

Merged LAS/LAZ output preserves supported original LAS point fields and adds numeric Merge source provenance. File-backed unedited project layers are fully loaded when selected in this workspace. Deduplication, when explicitly enabled, removes records; choose zero/off to retain every point.

BASE is the fixed coordinate reference: preparation, alignment and export never reposition it. Only FLOATING is transformed. Merged output retains BASE coordinates; normal LAS coordinate quantization still applies.

114 Splicing: choose and combine exact lines, directions and points

TOOLS > SPLICING

PRO

Build a mixed control set deliberately; different constraint types answer different geometric questions.

Procedure

1. Start with the clouds already near their correct relative position. Use distinct colors or partial transparency and examine TOP, FRONT, SIDE and ISO. Large rotations or repeated building features can produce plausible but wrong matches.
2. Identify the physical feature before choosing a mode. Two visible ends of the same beam or lintel support exact matching. Two samples along the same wall edge support infinite-line matching. Edges that only share a known orientation support direction-only matching.
3. For an exact line select EXACT ENDPOINTS + DIRECTION, then ADD LINE PAIR. Pick the first FLOATING endpoint A and second endpoint B. In BASE pick the same physical A, then the same physical B. Use the rubber line and status prompt to verify each step.

4. Do not use scan boundaries, arbitrary cropped ends or occluded beam ends as exact endpoints. They are not necessarily the same physical locations. Reversing the BASE endpoint order changes the exact correspondence and may rotate the cloud to the opposite direction.

5. For a supporting line select LINE POSITION + DIRECTION. Pick any two well-separated samples on the same straight feature in each cloud. For example, FLOATING may show only 2 m of an edge while BASE shows 5 m. The supporting lines are matched without pairing those sample endpoints.

6. For orientation alone select DIRECTION ONLY. The two samples in each cloud define a direction. Their lines may be at different positions and have different lengths. This mode does not bring the sampled endpoints or supporting lines to the same location.

7. A useful combination is two non-parallel direction pairs plus one reliable XYZ point pair: directions determine orientation and the XYZ point determines translation. For more redundancy, use additional well-distributed independent references. Parallel direction pairs alone leave a rotation freedom.

8. To add a point pair, choose XYZ, XY or Z before ADD 3D PAIR. Pick FLOATING first and BASE second. Use CLOUD on a clean surface, EDGE near a reliable edge or CORNER at a sufficiently defined corner; inspect the highlighted result before confirming.

9. XYZ uses all coordinates. XY deliberately ignores target elevation, suitable for a plan correspondence whose height is not reliable. Z deliberately ignores target horizontal position, suitable for the same elevation on a floor or datum that can be identified at different X/Y.

10. For elevation-only correction preserve an already accepted orientation and XY position: lock Tx, Ty, Rx, Ry and Rz, leave Tz free, select the Z pairs and execute. Do not leave all rotations free with insufficient height observations and expect a unique 3D placement.

11. For a plan-only rigid correction lock Tz, Rx and Ry, leave Tx, Ty and Rz free and use well-spaced XY pairs. To solve a full 3D placement using only point pairs, use at least three non-collinear XYZ correspondences and preferably more, spread over the scene.

12. After each pair inspect its row type. The mode selected when its picking command started is retained. To change the meaning of a stored pair, remove that row and recreate it with the correct mode. Changing the dropdown is not a retrospective conversion.

13. New pairs join the current selection automatically. Ctrl selects or deselects individual rows and Shift selects a range. Select the exact set of point and line rows to combine. A plain click selects only that row, so inspect the selection before EXECUTE NOW.

14. Complete or cancel any partial point sequence. EXECUTE NOW remains unavailable during partial picks, a running operation or an unapplied candidate. Apply or reject an existing candidate before executing another fit.

15. Execute, inspect the new placement and the separate RMS values, then check features that were not used as controls. UNDO restores the preceding placement in one step. Remove a wrong correspondence rather than forcing a low residual by unsuitable tolerances.

Practical notes

One unrestricted supporting line aligns infinite lines while retaining unobservable slide and twist. One exact line matches its endpoint midpoint and ordered direction, retaining twist; unequal lengths leave endpoint error. One direction-only line rotates around the current pivot and cannot determine translation. These direct cases are initial placements, not complete geometric confirmation.

A rejected unstable fit leaves the preceding placement intact. Add independent geometry or lock genuinely known freedoms. More points on one straight edge do not replace non-collinear information. Direction-only data cannot determine any translation without positional references or translation locks.

BASE is the fixed coordinate reference: preparation, alignment and export never reposition it. Only FLOATING is transformed. Merged output retains BASE coordinates; normal LAS coordinate quantization still applies.

115 Splicing example: two scans of a two-storey building

TOOLS > SPLICING

PRO

Expose interior references independently in each scan, combine geometric constraints, inspect the full building and export.

Procedure

1. Open SPLICING and load the most reliable or already georeferenced scan as BASE. Load the scan to reposition as FLOATING. Choose original files here if the project layer contains only a sampled preview.
2. Give BASE and FLOATING distinguishable single colors, or use RGB with controlled transparency. Use FIT 3D, then TOP and ISO to understand whether the scans are displaced, rotated or at different heights. BASE remains fixed throughout.
3. If necessary roughly position FLOATING with MOVE/ROTATE, using a suitable pivot. This preliminary placement makes the same room and floor easy to identify in both scans. Avoid fitting a repeated room or an identical facade on the wrong floor.
4. In CLIP choose BASE and open CLIP BOX. Use FRONT, SIDE or ISO so the upper Z face is easy to reach. Lower that face below the obstructing roof/ceiling, keeping the floor and wall references you want to see inside the box.
5. Change the CLIP target to FLOATING. Open its own CLIP BOX and adjust its upper face independently. The two scans can have different coordinates and initial elevations; do not assume their numeric clip limits must be identical.
6. Use side faces to isolate the required wing or room. For an irregular footprint use CLIP POLYGON or CLIP LASSO in a suitable view. Box and polygon constraints combine, so a point must satisfy both when both exist.
7. Finish a polygon with ENTER or end the lasso gesture. ESC cancels an unfinished operation. Changing BASE/FLOATING while drawing cancels the incomplete draft, keeping existing clip limits. A new region replaces the previous polygon for the targeted cloud only.
8. Hide CLIP OUTLINE to remove frames and grips from the picking area. The cut stays active: the frontmost eligible point is now on an exposed interior surface, rather than on the hidden roof. Keep CLOUD/EDGE/CORNER appropriate to the reference you are identifying.
9. Add two or more non-parallel wall-edge pairs using LINE POSITION + DIRECTION when their visible lengths differ. Alternatively combine two reliable DIRECTION ONLY pairs with an XYZ corner. Use exact lines only where both corresponding physical ends can be identified.
10. Add height references on the same floor with Z pairs if only elevation is trusted. Do not pair a ground-floor point with the first-floor slab. For a plan feature with uncertain height use XY instead of assigning a misleading XYZ constraint.
11. Finish picking, select the intended mixed rows and click EXECUTE NOW. Inspect walls, openings, floor and ceiling in multiple views. If the geometry is insufficient, add independent controls or use appropriate locks; do not accept a guessed full placement.
12. Toggle CLIP ON / OFF for BASE or FLOATING to inspect that complete scan temporarily. Toggle it on again to restore the same saved cut. With Both selected the same on/off command applies to both; their boxes remain

independent.

13. Check references on the other floor and farther from the control set. A good fit in one small room can hide an angular error that grows over the building. Inspect edges from several directions; one overlapping projection does not establish a 3D match.

14. If needed refine with ICP after removing incorrect saved constraints and choosing informative overlap with clips. Review the candidate, then APPLY or REJECT. Save a session before further experimentation and export the aligned FLOATING or merged cloud after inspection.

Practical notes

RESET CLIP is not needed to inspect the full building; use CLIP ON / OFF. Reopening CLIP BOX retains the previous limits. Turning off OUTLINE only hides the editor, not clipped data or stored correspondences.

The clipping limits are spatial regions in the workspace reference frame. After a large placement change inspect the chosen area again and adjust its limits if necessary. Clipping is for visibility/picking/refinement, not deletion; hidden points are included in export.

BASE is the fixed coordinate reference: preparation, alignment and export never reposition it. Only FLOATING is transformed. Merged output retains BASE coordinates; normal LAS coordinate quantization still applies.

116 Splicing: validate the fit, refine with ICP and save

TOOLS > SPLICING

PRO

Read the residuals by constraint type, detect ambiguous geometry and keep a recoverable workflow.

Procedure

1. Read the status in the Splicing window after execution. Point RMS refers only to coordinate components enabled by each XYZ/XY/Z mask; it is a per-component RMS, not always a full 3D point-distance RMS.

2. Endpoint RMS measures the 3D errors of corresponding A/B endpoints of exact lines. Supporting-line distance RMS measures perpendicular offsets from infinite target lines. Direction RMS is angular in degrees. Direction-only pairs have no position residual. A dash means no selected constraint supplied that metric.

3. Inspect mismatches independently of RMS. Errors can come from wrong endpoint order, different floors, different physical features, noise, short direction samples or unequal exact segment lengths. The fit combines selected observations; it does not know whether their physical interpretation was correct.

4. If a fit is unstable, inspect which degrees of freedom are actually constrained. Parallel-only lines leave slide unresolved; direction-only data leave translation unresolved; collinear point controls do not determine a general 3D rotation. Add independent geometry or lock only freedoms that should genuinely remain fixed.

5. Set distance tolerance in metres and angle tolerance in degrees according to the reliability of the identified features. Both must be finite and positive. Reducing the angle tolerance makes directions more influential; reducing the distance tolerance makes positions more influential. Neither is a promise of achieved accuracy.

6. Use UNDO after an unsuitable immediate placement and REDO only if you wish to restore it. These commands change the FLOATING transform, not source point arrays. Removing a correspondence does not automatically undo a transformation already applied from it.

7. Before ICP remove incorrect rows from the saved constraint list. Selecting a subset for EXECUTE NOW does not delete unselected rows. SOLVE CONSTRAINTS and REFINE ICP use the whole list, including the retained point

masks and line modes.

8. Choose overlapping clipped areas with several surface orientations: for example walls plus floor, not only one flat wall. Start from an already close placement. Set maximum correspondence distance in metres to cover the remaining error without including unrelated nearby surfaces.

9. Run REFINE ICP and follow local progress. ESC requests cancellation. Compare the proposed RMS, overlap and visual placement. Show candidate toggles the comparison; APPLY CANDIDATE commits and REJECT CANDIDATE restores the preceding placement. Check independent references again after applying.

10. SAVE SESSION stores transform, control pairs and modes, locks/tolerances, pivot and each cloud clip and outline state. It does not embed cloud files. OPEN SESSION requires the same original BASE/FLOATING datasets with the same point order and coordinates; preserve those source files.

11. SAVE ALIGNED FLOATING exports only the positioned FLOATING. SAVE MERGED writes BASE together with transformed FLOATING. A positive duplicate tolerance removes nearby FLOATING points while retaining BASE; zero retains all points. Review the tolerance according to required detail and source density.

12. Choose LAS or LAZ and inspect the output independently: bounds, coordinates, point count, attributes and several known features. Export uses the original project/world reference frame. Clipped and hidden points remain included because the clip is a working view, not an export crop.

Practical notes

ICP can mislead on repeated rooms, sparse overlap or a single plane; verify independent features against survey accuracy requirements. Hover over icons for tooltips. With viewport focus, ESC cancels, ENTER ends picking and SPACE repeats the last command. Text fields and lists retain their native keys.

Closing the workspace releases its temporary clouds, alignment copies, section samples, picking caches and GPU buffers, then runs the same full and aggressive memory cleanup as NEW. An active operation is cancelled and allowed to finish before automatic closure. Saved files and clouds still loaded in the main project remain available. Temporary merge memory is also collected after export completes or is cancelled.

BASE is the fixed coordinate reference: preparation, alignment and export never reposition it. Only FLOATING is transformed. Merged output retains BASE coordinates; normal LAS coordinate quantization still applies.

117 Splicing: drawing locks, 2D/3D directions and X-Ray

TOOLS > SPLICING

PRO

Keep the picking constraint separate from the type of observation used by the solver.

Procedure

1. Open TOOLS > SPLICING, next to CLOUD REGISTER. WORKFLOWS / BATCH is the last TOOLS panel. The existing Cloud Registration workspace is separate and unchanged.

2. In CONSTRAINTS choose the line matching mode, then 3D vector or 2D vector · XY, before ADD LINE PAIR. Each completed pair retains these choices. Changing a selector does not reinterpret rows already in the list.

3. Choose Free, Lock elevation or Lock position. Free accepts unconstrained 3D coordinates. Lock elevation holds the second point at the first point’s Z. Lock position holds the second point at the first point’s X/Y, creating a vertical line.

4. Pick FLOATING start and end, then BASE start and end. The lock is anchored separately at each line's start; it does not force the BASE line to have the FLOATING elevation. The rubber line and point marker show the constrained result. Cloud / Edge / Corner picking and active clips still apply; an unsupported point is not committed.

5. Use 3D vector to compare full spatial orientation. Use 2D vector · XY to compare projected azimuth only, ignoring slope/elevation in the direction equation. XY is the workspace plane, not the current screen plane; rotating the camera does not change it.

6. With LINE POSITION + DIRECTION and 2D vector, the positional residual is perpendicular distance in XY; Z is unconstrained. With DIRECTION ONLY, there is no positional residual. With EXACT ENDPOINTS, endpoint residuals remain full XYZ even when the direction comparison is 2D.

7. Vertical lines have no XY direction. Choose 3D vector with Lock position, or select a line with nonzero plan length. Several XY-only observations cannot determine a full six-component transform: add height/spatial references or explicitly lock Tz/Rx/Ry as appropriate.

8. Add more pairs continuously; ESC or ENTER ends picking. Select the rows to combine and click EXECUTE NOW, now the first button at the left of CONSTRAINTS. UNDO restores the previous placement.

9. In VIEW enable the X-Ray icon. X-Ray density shows accumulated depth layers as grayscale density; X-Ray colors preserves the clouds' RGB or selected single colors. Adjust X-Ray intensity from 0.1 to 4. Per-cloud transparency and density still apply.

10. X-Ray does not depth-occlude rear points and does not use EDL shading; returning to normal view restores depth and the selected EDL setting. Active clips remain effective. X-Ray changes display only: point picking still targets supported front geometry, and exports are unchanged.

Practical notes

Session files retain the vector type per line. Legacy sessions default to 3D directions. Newly saved sessions require an application version that supports these choices. Drawing locks are interactive tools, not transform component locks.

BASE is the fixed coordinate reference: preparation, alignment and export never reposition it. Only FLOATING is transformed. Merged output retains BASE coordinates; normal LAS coordinate quantization still applies.

118 Magic ICP: automatic common-facade matching and checked refinement

TOOLS > SPLICING

PRO

Refine an already close placement using detected common facades and a bidirectional overlap check.

Procedure

1. Load BASE and FLOATING and move/rotate FLOATING near the correct location. Magic ICP is local registration; it does not search an entire site for the correct building or floor.

2. Clip each cloud to the common part. Retain at least two non-parallel walls with vertical support; include a common floor or another independently inclined surface to determine elevation. Display density does not reduce the data used for this operation.

3. Remove incorrect manual constraints. Magic ICP retains the full saved point/line list and transformation locks during ICP, just like REFINE ICP; selection highlighting does not exclude rows.

4. Set ICP maximum correspondence distance, initially 0.50 m, to cover the remaining placement error. Avoid an unnecessarily large value that can match adjacent rooms. Expand Magic ICP settings: minimum facade length 3 m, height 0.75 m, grid cell 0.20 m and maximum angle difference 15° are the defaults.

5. Minimum length must be at least three cells. Smaller cells can preserve narrow detail but increase work; a larger cell can help broad, sparse clouds. Reducing minimum length accepts shorter faces but increases possible ambiguity.

6. Click MAGIC ICP. The window reports detection of BASE/FLOATING facades, matching, refinement and verification. ESC cancels without applying a candidate.

7. The command matches nearby, overlapping facade segments by direction and perpendicular distance. It requires reciprocal, unambiguous matches and at least two non-parallel common facades. Segment endpoints and unequal lengths do not become false exact controls.

8. The common facades provide an XY/yaw seed. Robust multiscale point-to-plane ICP then refines the nearby geometry, respecting locked components and manual observations. Unsupported components are not invented; an explicitly reported XY-only result retains the previous height and tilt.

9. Review detected and common facade counts, RMS before/after, overlap, sample count and facade RMS. 3D RMS is a trimmed nearest-neighbor distance in metres in both directions, evaluated on the same initially overlapping source samples; the largest 10% of distances are trimmed. Losing more than 5% of the initial overlap in either direction rejects the result.

10. The candidate must retain overlap, avoid a worse validation RMS and stay within a local correction range. Facade RMS is a separate perpendicular XY residual of matched facade lines. Neither number is a certified coordinate accuracy or a substitute for independent check points.

11. Use Show candidate to compare, APPLY CANDIDATE to accept or REJECT CANDIDATE to return. UNDO is available after applying. Save the session and export aligned FLOATING or MERGED only after inspecting corners, floor levels and independent features.

12. If common facades are missing, improve manual placement, clipping or minimum-length settings. If the result is XY-only, include a common floor/roof or reliable XYZ/Z controls for elevation. Repeated facades or insufficient overlap may require manual point/line correspondences instead.

Practical notes

BASE and source point arrays remain unchanged. Cloud Registration remains a separate tool. This is geometric recognition of wall support, not semantic identification of buildings.

BASE is the fixed coordinate reference: preparation, alignment and export never reposition it. Only FLOATING is transformed. Merged output retains BASE coordinates; normal LAS coordinate quantization still applies.

119 Surface Snap: magnetic placement of nearby surfaces

TOOLS > SPLICING

PRO

Snap a floating wall or floor to a nearby base surface while dragging, without arbitrary sliding along the plane.

Procedure

1. Load both clouds, show them and clip the area you want to match. Plane Snap supports measured planes in any orientation, including walls, floors and ceilings.
2. In FLOATING enable the Surface Snap icon (planes, intersections and corners). The command detects and caches finite planar patches in both clipped datasets. Wait for the local progress to finish; this analysis is not repeated on every mouse move.
3. Set maximum angle, initially 10°, and separation, initially 0.20 m. The angle is the smaller angle between the two unoriented normals. Both limits are configurable; the angle must be positive and no more than 30°.
4. Select MOVE FLOATING and drag with the left button. The current cloud placement is used to search cached patches. Only nearly parallel, nearby surfaces with finite overlap are eligible; spatially distant coplanar walls do not automatically snap.
5. A valid snap applies the smallest rotation aligning the normals around the floating patch centre, then translates perpendicular to the target plane until the planes coincide. Green outlines show the matched patches; status reports correction distance and angle.
6. One plane cannot determine sliding inside the plane or rotation about its normal. Those components retain the manual placement. Use another reference, line/point constraints or Magic ICP to complete the alignment.
7. Checked transformation components and the selected movement axes are respected. If the necessary correction violates a lock, that snap is not offered. Equal competing surfaces do not cause an arbitrary jump.
8. Release the mouse to retain the placement as one undoable move. ESC during dragging restores the pre-drag transform; UNDO after release restores the preceding placement. Turn the Plane Snap icon off for ordinary free dragging.
9. Changing a cloud or its clip geometry/enable state invalidates the cached planes and turns Plane Snap off. Enable it again after preparing the new common area. Hiding/showing clip outlines does not discard the cache. Plane Snap has no effect on source point arrays or export density.

Practical notes

The snap is a local geometric aid, not a complete cloud registration. Check the whole cloud, including independent corners and heights, before saving the aligned result.

The same switch also enables finite intersection-edge and three-plane corner snapping. See the following workflow for the stronger constraints and their priority.

BASE is the fixed coordinate reference: preparation, alignment and export never reposition it. Only FLOATING is transformed. Merged output retains BASE coordinates; normal LAS coordinate quantization still applies.

120 Surface Snap: intersecting planes, edges and 3D corner origins

TOOLS > SPLICING

PRO

Use intersections to constrain position as well as direction, with small automatic rotational correction.

Procedure

1. Clip and expose the actual common junction in both clouds. For a building corner, keep both adjoining walls. For a complete 3D origin, also retain the floor or ceiling where it physically meets both walls.
2. Enable Surface Snap and wait for preparation. The command detects finite measured plane patches, intersects pairs into bounded edges and identifies three independent planes meeting inside all three patches. An intersection outside the observed patch limits is not a snap feature.
3. Use the same maximum distance and angle controls: 0.20 m and 10° initially. These limits apply to the remaining displacement and the small rotation of the candidate. Internal consistency also requires the matched face orientations to agree within 2° after rotation; incompatible measured corner angles are not distorted to fit.
4. Choose MOVE FLOATING and drag near the matching junction. A common three-plane corner has first priority, an intersection edge second, and a single plane third. Competing targets that cannot be distinguished reliably do not produce an arbitrary choice.
5. Corner Snap aligns the common 3D point and the face orientations, applying the small required rotation. Two walls and a floor therefore fix both the spatial origin and the orientation. The matched planes appear green and the corner is marked in yellow.
6. Edge Snap aligns the intersection line and the orientations of its two incident planes, allowing a small rotation. Two vertical walls constrain the plan origin and orientation, while height along their vertical intersection remains at the manual placement. The matched edge is highlighted in yellow.
7. For other intersection directions, the free component is always slide along that line. To fix it, use a third independent plane, a corresponding XYZ point, an exact endpoint reference or an appropriate height control.
8. Locks and permitted movement axes remain effective. If a necessary translation or rotation is locked, the candidate is rejected. Neither plane intersections nor corner snapping estimate a scale or change the BASE cloud.
9. Release to commit the drag as one undoable move. ESC during the drag restores the original placement. Check other floors, corners and independent references before accepting the whole cloud; use Magic ICP afterward for a checked fine adjustment.

Practical notes

A geometric intersection is meaningful only when it represents the same physical junction in both scans. Scanning noise and different patch limits can affect the detected intersection. Snapping is an aid to placement; review the full result.

BASE is the fixed coordinate reference: preparation, alignment and export never reposition it. Only FLOATING is transformed. Merged output retains BASE coordinates; normal LAS coordinate quantization still applies.

121 2D Splicing: prepare two clouds and a shared section workspace

TOOLS > 2D SPLICING

PRO

Align FLOATING to fixed BASE using two independent 3D previews and one common 2D canvas. This separate PRO tool sits beside SPLICING; CLOUD REGISTER remains available.

Procedure

1. Open TOOLS > 2D SPLICING. Use LOAD BASE and LOAD FLOATING, or select a cloud already loaded in the project. The selectors have fixed width; hover to see the name/path. Imported files remain selectable while this window stays open.

2. BASE is the reference and does not move. FLOATING is a working copy: placement here does not overwrite either original file or the clouds in the main project. Loading a different cloud restarts the alignment and clears its placement history.

3. Choose VIEW and SECTION independently: FRONT/SIDE VIEW can display TOP SECTION, and TOP VIEW can display a vertical section. Changing either control never changes the other. Enable Synchronize 3D views beside LOAD BASE / LOAD FLOATING to link camera pan, rotation and zoom in both directions; it starts unchecked. With it off, navigate each camera independently.

4. Select TOP separately on each cloud. Each scan retains its own TOP height, including after XY acceptance and when returning from a vertical section. Choose corresponding parts of the same storey. Section thickness initially is 0.03 m (3 cm) and remains editable. Edit position/thickness and press SECTION, or use the slider/grips.

5. The shared 2D canvas shows the BASE and FLOATING sections in their respective single colors. Initially FLOATING is staged to the left, independently of the files' coordinate separation. This temporary display offset is not an alignment and cannot be saved until you place FLOATING.

6. Use CLIP separately on either 3D cloud to isolate the same room or floor. Box, polygon/lasso, clip enable and outline controls retain their existing registration behavior. Hiding an outline is separate from removing the cut.

7. RESTORE FULL CLOUDS clears all active clips on both previews without discarding the accepted FLOATING placement. Export always uses the full loaded clouds, not just their clipped display or sampled 2D sections.

8. If a section is empty, check position, thickness and active clips; restore the full clouds or move the section through the building. Give ICP common, recognizable geometry rather than unrelated floors or repeated rooms.

9. In each Model tab choose RGB when available, or Single color with contrasting palettes. Set X-Ray type/gain and EDL strength/radius here. In Render choose Full density to draw every loaded point, Fixed density for a percentage or Adaptive LOD. Set quality, transparency and point size. Motion LOD temporarily thins points during navigation when enabled.

Commands and parameters

LOAD BASE / LOAD FLOATING

Load independent working datasets. Failed or cancelled loading retains the preceding dataset.

SECTION

Select sections independently of VIEW. Vertical plane, orientation, position and thickness always synchronize in both directions, irrespective of XY lock and the camera checkbox. TOP choices/heights are independent.

FIT VIEW / ZOOM WINDOW / mouse wheel

Fit both sections, draw a zoom rectangle, or zoom around the cursor with the wheel. Right/middle mouse pans.

Synchronize 3D views

Optional camera synchronization only; never changes sections. Initially off.

Practical notes

Buttons use icons with hover tooltips. The original SPLICING and CLOUD REGISTER are separate tools. This workspace does not save a resumable session: export the aligned result before closing.

Use the final toggle in each Section tab to hide/show only the translucent fill. The perimeter and editing grips remain visible. Section position, extraction and synchronization are unchanged. Camera synchronization remains separate and optional.

Picking actions use a crosshair; dragging FLOATING uses move or rotate cursors. Dynamic scale uses a vertical resize cursor. A different cursor indicates the active command.

BASE is the fixed coordinate reference: preparation, alignment and export never reposition it. Only FLOATING is transformed. Merged output retains BASE coordinates; normal LAS coordinate quantization still applies.

122 2D Splicing: move, rotate, scale, snap and lock XY

TOOLS > 2D SPLICING

PRO

First align plan position and azimuth. Refine only after manual placement is close to the correct correspondence.

Procedure

1. Select MOVE FLOATING, then drag with the left button in the shared 2D view. Only FLOATING moves. Right/middle mouse navigate. Release to accept one move; ESC during dragging restores the pre-drag placement.

2. Select ROTATE FLOATING and drag around the active pivot. PICK ROTATION / XY ANCHOR chooses another pivot on FLOATING. A 3D PICK POINT button also selects the anchor using the existing CLOUD / EDGE / CORNER technique.

3. MOVE FLOATING · 2 PTS asks for the FLOATING reference and corresponding BASE destination. ROTATE FLOATING · 3 PTS asks for pivot, a point on the FLOATING direction, and the BASE target direction. A rubber line follows the cursor. Commands repeat until ESC or ENTER; SPACE repeats the most recent command.

4. PLACEMENT ends with Dynamic scale, Scale up, Scale down and Scale by reference. These change the real FLOATING geometry uniformly in X/Y/Z, including saved and merged clouds. The BASE geometry and camera zoom remain unchanged.

5. For Dynamic scale, drag up to enlarge or down to shrink around the active pivot. Release to accept one undoable change; ESC or lost mouse capture restores the preview. Scale up multiplies by 1.10; Scale down divides by 1.10. The header displays total scale relative to the loaded cloud.

6. Scale by reference asks for two FLOATING endpoints, then two BASE endpoints in the shared 2D view. The drawn lines show their lengths in metres. The factor is BASE length / FLOATING length and the first FLOATING endpoint stays fixed. Use Move/Rotate afterwards if needed. Zero-length references are rejected.

7. Scaling requires unlocked XY. Unlock XY asks for confirmation and retains the current placement. Subsequent rigid refinement preserves the chosen scale. TOP section heights remain independent.

8. Enable SNAP for detected section edges and finite corners. During dragging, close corresponding edges can coincide with a small rotation; a corner uses both adjoining directions to constrain position and angle. Equally plausible targets are rejected instead of making an arbitrary jump.

9. The snap/ICP distance starts at 0.20 m and snap angle at 10 degrees. Increase only enough to cover the remaining error; the snap angle is limited to 30 degrees. Hold Alt to bypass snapping temporarily. Reference picks also snap to nearby section points.

10. Keep two non-parallel sides or a corner in the overlap. A single straight wall does not determine sliding along it; XY ICP rejects such underconstrained data. A good starting placement is essential for repeated rooms or

symmetric outlines.

11. Click REFINE 2D ICP to propose a local rigid fit. Review before/after RMS in metres, retained overlap and match count. APPLY CANDIDATE accepts the preview; REJECT CANDIDATE restores the current placement. Failed, cancelled or worsening refinement is not committed.
12. After TOP alignment, choose REFINE AND LOCK XY, then APPLY CANDIDATE. If REFINE 2D ICP already produced a TOP candidate, Refine and Lock XY marks that candidate for locking without another fit. Apply commits the plan, locks XY and automatically selects FRONT views and one shared SIDE section for height alignment. Reject retains the current placement and does not switch stage. XY locking is optional before 3D ICP.
13. While XY is locked, only model-height translation is allowed. Drag and two-point Move ignore horizontal movement; rotation, scaling and TOP placement are disabled. Snap and 2D/3D ICP also retain every point's XY and the complete orientation. UNDO/REDO cannot cross back into a different or unlocked plan until you explicitly Unlock XY and confirm Yes.

Commands and parameters

REFINE 2D ICP

Preview a trimmed nearest-neighbour rigid fit; at least 30 section points per cloud are required.

REFINE AND LOCK XY

Lock the accepted plan and switch to FRONT views / shared SIDE section only after Apply Candidate.

APPLY / REJECT CANDIDATE

Explicitly accept or discard the proposed transform before continuing manual placement.

Auto fit / Smart fit

After moving FLOATING close to common geometry, Auto fit searches rotation and small position corrections. Smart fit repeats the search at the current placement. The snap distance defines the contact tolerance. Alt bypasses automatic fitting; Undo restores the previous placement. Ambiguous matches retain manual placement. Scale and camera zoom do not change.

Practical notes

RMS is a local sampled alignment metric, not an independent survey accuracy certificate. Section geometry and overlap matter more than a small number alone.

BASE is the fixed coordinate reference: preparation, alignment and export never reposition it. Only FLOATING is transformed. Merged output retains BASE coordinates; normal LAS coordinate quantization still applies.

123 2D Splicing: compatible sections and synchronized S-H alignment

TOOLS > 2D SPLICING

PRO

With XY unlocked, move/rotate freely in compatible sections. With XY locked, all placement and refinement are height-only; BASE and the accepted plan remain fixed.

Procedure

1. Select FRONT, SIDE or a vertical CUSTOM section in either SECTION selector. The identical world cutting plane is applied to both clouds, including position and direction, without changing either VIEW. S is horizontal distance along the section and H is model height in their common frame.
2. Moving or rotating the vertical section, or changing thickness, synchronizes the other cloud automatically. This is mandatory, even before REFINE AND LOCK XY or with Synchronize 3D views off. Establish a correct plan placement before using the shared section for height matching.
3. For CUSTOM, choose the two-point tool and pick two horizontally distinct points in 3D or the shared TOP section. The cutting plane is vertical, its S axis follows the picked line and H points upward. The same plane is applied to both scans.
4. With XY locked, drag MOVE FLOATING up/down or use MOVE FLOATING · 2 PTS for a height difference. Horizontal mouse movement is ignored in preview and on commit. Rotation and scaling require confirmed Unlock XY. When unlocked, S/H movement and section rotation remain available.
5. SNAP and REFINE 2D ICP obey the same lock: height translation only, with no tilt or horizontal slip. Include a floor, ceiling or sloping edge for height evidence. Review RMS/overlap and Apply or Reject the candidate.
6. Choose UNLOCK XY to regain free movement, rotation and scale. The confirmation defaults to No. No leaves the lock, candidate and placement unchanged; Yes unlocks while retaining the accepted position. There is no hidden ICP override of the lock.
7. Change to another compatible section and continue. Select TOP on each scan separately to restore its independently selected height. Mismatched planes and empty sections require a corrected section before placement; previous accepted transforms remain.
8. Use UNDO/REDO for accepted cloud placements. Inspect both the plan and at least two vertical directions before exporting. A single straight edge cannot determine a full 2D rigid transform; include a corner or non-parallel sides.

Commands and parameters

MOVE / ROTATE / SNAP / REFINE 2D

Unlocked: free section placement. Locked: Move/Snap/Refine change height only; Rotate is disabled.

CUSTOM SECTION · 2 POINTS

Define a common vertical plane from a horizontal trace.

PICK ROTATION / XY ANCHOR

Choose a manual rotation pivot while XY is unlocked. Changing the pivot cannot bypass the XY lock.

Automatic height fit

With XY locked, Auto fit and Smart fit change only height. Without the lock, small tilt follows the allow-tilt setting, up to 10 degrees. A vertical wall alone cannot reliably determine elevation; include shared horizontal features.

Practical notes

Changing section, cloud placement or dataset clears temporary measurements/notes to avoid keeping labels tied to stale geometry. Camera pan/zoom retains them.

BASE is the fixed coordinate reference: preparation, alignment and export never reposition it. Only FLOATING is transformed. Merged output retains BASE coordinates; normal LAS coordinate quantization still applies.

124 2D Splicing: match elevation with 3D reference points

TOOLS > 2D SPLICING > ALIGNMENT > Match Elevation

PRO

Use one or more FLOATING/BASE point pairs to find a single best-fit height translation. XY placement, rotation, scale and the existing XY lock are retained.

Before you start: Load both clouds and place FLOATING in XY first. Apply or reject an outstanding refinement candidate. The 2D sections may have different types or be empty.

Procedure

1. In the shared 2D ALIGNMENT tab, choose Match Elevation after the separator at the end.
2. Pick a 3D point on FLOATING, then the corresponding 3D point on BASE. Use the same physical level on both scans. Each accepted pair appears in the list and as H markers in the 3D views.
3. Continue adding pairs from FLOATING to BASE. One pair gives its exact height difference; multiple pairs give the equal-weight least-squares height translation. Review the proposed offset, RMS and each residual.
4. Select a list row to highlight its references. Remove an incorrect pair with Remove selected elevation pair. Outliers are not silently discarded.
5. Choose Apply elevation match or press Enter over a viewport when the last pair is complete. Only height changes. Esc cancels the pending picks without moving the cloud.
6. Inspect the result in front and side views. Undo restores the previous placement; Redo reapplies it. Save Aligned Floating or Save Merged includes the accepted height change.

Practical notes

Height follows the project H axis. The camera orientation, section type and plane-fill toggle do not change that axis. A new placement or a cancelled picking session clears these temporary elevation references.

BASE is the fixed coordinate reference: preparation, alignment and export never reposition it. Only FLOATING is transformed. Merged output retains BASE coordinates; normal LAS coordinate quantization still applies.

125 2D Splicing: final 3D ICP, review and full-cloud export

TOOLS > 2D SPLICING

PRO

Optionally refine the near-final fit in 3D, then save aligned FLOATING or merge with unchanged BASE.

Procedure

1. Place FLOATING in XY using TOP sections, then adjust height using FRONT/SIDE or a vertical CUSTOM section. Run REFINE ICP 3D directly from this accepted manual placement. REFINE AND LOCK XY is optional; no intervening XY candidate or lock is required.
2. Expose corresponding geometry in both clouds. ICP uses the full 3D geometry inside active clips, rather than only the currently displayed thin section. Include multiple non-parallel surfaces and a shared floor, ceiling or sloping surface for reliable height refinement.

3. With XY unlocked, ICP refines XYZ and heading, plus tilt when enabled, within the configured tilt limit. If common geometry cannot reliably determine height/tilt, it retains the manual height/tilt and attempts XY-only refinement, reporting that limitation. Insufficient overlap, rank-deficient XY, excessive tilt or worse bidirectional RMS/overlap is rejected without committing the proposal.

4. With XY locked, 3D ICP refines height only and preserves every point’s model XY, orientation and scale. Tilt controls are disabled. To refine XY or tilt again, press Unlock XY and confirm Yes first. No checkbox silently overrides the lock.

5. Inspect the proposed FLOATING 3D preview, reported before/after RMS and overlap. Use APPLY CANDIDATE to commit or REJECT CANDIDATE to retain placement. The original cloud arrays/files remain untouched. ESC cancels ongoing calculation.

6. Use RESTORE FULL CLOUDS to inspect the complete accepted result. Look for double edges at independent corners, floor differences, roof misalignment and matches to the wrong repeated room. A lower RMS alone does not prove the correct correspondence.

7. SAVE ALIGNED FLOATING writes only FLOATING in its accepted position. SAVE MERGED writes BASE plus transformed FLOATING. Choose LAS or LAZ. The full loaded point data is used regardless of preview density, section sampling or display clips.

8. For merging, set duplicate tolerance in metres; default 0.005 m. Zero retains all points. A positive tolerance removes near-duplicate points using the existing merge procedure; choose it in relation to scan spacing and required detail.

9. Wait for export progress to complete. The final destination is replaced only after a successful temporary export/compression; cancellation does not leave a partial final file. Reopen the result in the main application to inspect its extent and position before closing the workspace.

Commands and parameters

REFINE ICP · 3D

Local final refinement of already close geometry; not a global search for the correct building.

UNLOCK XY

Explicit confirmed return to free placement and full 3D refinement. Current accepted placement is retained.

SAVE ALIGNED FLOATING / SAVE MERGED

Export accepted full-cloud data in world coordinates; BASE remains unchanged.

Practical notes

Use clouds in compatible units and a common coordinate reference. Rigid splicing changes no scale and performs no coordinate-system conversion. Memory is needed for the full loaded datasets; preview sampling does not make export a reduced-density export.

Merged LAS/LAZ output preserves supported original LAS point fields and adds numeric Merge source provenance. File-backed unedited project layers are fully loaded when selected in this workspace. Deduplication, when explicitly enabled, removes records; choose zero/off to retain every point.

Closing the workspace releases its temporary clouds, alignment copies, section samples, picking caches and GPU buffers, then runs the same full and aggressive memory cleanup as NEW. An active operation is cancelled and allowed to finish before automatic closure. Saved files and clouds still loaded in the main project remain available. Temporary merge memory is also collected after export completes or is cancelled.

BASE is the fixed coordinate reference: preparation, alignment and export never reposition it. Only FLOATING is transformed. Merged output retains BASE coordinates; normal LAS coordinate quantization still applies.

126 2D Splicing: measurements on both section clouds

TOOLS > 2D SPLICING > MEASURE / NOTE

PRO

Measure the visible BASE/FLOATING sections without leaving the shared 2D canvas. The toolbar includes distance, polyline length, angle, area, extrusion volume, vertical distance, perpendicular distance, wall/slab thickness, radius, diameter, arc length and notes.

Procedure

1. For wall/slab thickness, pick two points along one face, then a third point on the opposite face. The result is perpendicular to the first face. It works in plan and vertical sections.
2. Distance and vertical distance use two picks; angle uses three, with the second at the vertex. For polyline length, area and volume, ENTER completes the shape. Volume uses the positive Depth (m) field.
3. Perpendicular distance uses two reference-line points and a third opposite point. Radius/diameter/arc length use three points along the curve; arc length follows their order. Collinear circle picks are rejected.
4. SNAP uses points in either visible section; Alt bypasses it. Labels remain visible during pan/zoom. For a note, enter text beside the toolbar and pick its position.
5. Use Delete measurement or Delete annotation and click near its label, or Clear measurements to clear the temporary measurement/note overlay. Changing sections or cloud placement clears it automatically.

Commands and parameters

MEASURE / NOTE

The full 2D measurement set, annotation placement and individual deletion.

Depth (m)

Positive extrusion depth used only for volume measurements.

Practical notes

Measurements refer to the displayed section plane, not an independent cloud-to-cloud accuracy test. They are temporary and are not exported with LAS/LAZ.

BASE is the fixed coordinate reference: preparation, alignment and export never reposition it. Only FLOATING is transformed. Merged output retains BASE coordinates; normal LAS coordinate quantization still applies.

127 Merger: combine LAS / LAZ files

RECAP Tour Merger

COMPANION

A small standalone companion with a file list, output options and processing progress.

Procedure

1. Drag two or more LAS/LAZ files into Merger, or choose Add files. Remove unwanted rows before starting.
2. Check the output filename and LAS/LAZ format. The first input folder is proposed; when inputs come from different folders choose the required destination.
3. Run Merge. Processing reads full records from disk and writes a new file. Existing input/output files are not overwritten. Progress and Cancel remain available.
4. Open the result in TOUR and select Merge source as the color mode. IDs 1, 2, 3… identify input origins; pre-existing source groups are remapped to distinct IDs.

Practical notes

Supported processing: standard LAS/LAZ 1.1-1.4, formats 0, 1, 2, 3, 6, 7 and 8. Waveform formats, COPC and LAS 1.5 require prior conversion. LASzip is included.

Merge retains XYZ precision, RGB/NIR, intensity, classification/flags, returns, GPS time, user data, point source IDs and compatible Extra Bytes. Conflicting CRS, GPS time conventions, Extra Bytes definitions or metadata stop the operation instead of silently dropping information. It performs no alignment or deduplication.

Allow temporary disk space for LAZ decompression, output and the spacing index. Minimum-distance selection follows input order and does not claim a maximal subset. Exact-count resampling does not create new points.

128 Resampler: percentage, exact count or spacing

RECAP Tour Resampler

COMPANION

A small standalone companion with a file list, output options and processing progress.

Procedure

1. Drag one LAS/LAZ file into Resampler or choose Add files.
2. Choose Percentage to retain the entered share using systematic record sampling; this follows acquisition order.
3. Choose Exact count and type any integer from 1 to the input point count. 20,000,000 is only an example/default. Spatial quotas distribute the requested count across occupied bins, reducing concentration in dense regions.
4. Choose Minimum distance and enter a positive spacing in the file’s coordinate units. Euclidean 3D separation is enforced; the final count follows the data and spacing, not an exact target.
5. Choose a new output beside the source or another folder and start. Remaining point records retain their attributes. Cancel leaves the original unchanged.

Practical notes

Supported processing: standard LAS/LAZ 1.1-1.4, formats 0, 1, 2, 3, 6, 7 and 8. Waveform formats, COPC and LAS 1.5 require prior conversion. LASzip is included.

Merge retains XYZ precision, RGB/NIR, intensity, classification/flags, returns, GPS time, user data, point source IDs and compatible Extra Bytes. Conflicting CRS, GPS time conventions, Extra Bytes definitions or metadata stop the operation instead of silently dropping information. It performs no alignment or deduplication.

Allow temporary disk space for LAZ decompression, output and the spacing index. Minimum-distance selection follows input order and does not claim a maximal subset. Exact-count resampling does not create new points.

129 Original display, merged export and multi-cloud Viewer

CLOUD LAYERS / RECAP Tour Viewer

STANDARD + PRO / standalone Viewer

Test build 2026.10.41.9 combines the revised Cloud Layers controls, original display preset, merged export and independent multi-file Viewer. Automatic updates remain deferred.

Procedure

1. Open the CLOUD LAYERS dropdown beside LAYOUT. SELECTED is only for merging; EDIT enables point processing; VISIBLE shows or hides the layer. Hiding also disables EDIT. NAME and POINTS show its name and point count.
2. Merge Selected creates a new active layer and preserves originals. Save Merged... in the same dropdown writes the active merged layer to a new LAS or LAZ file. Source records and attributes are retained. Existing edits and project alignment are applied; display clipping is not an export crop.
3. Use Reset To Original in the dropdown or Ctrl+F5 to load the full available source of visible layers, use RGB, 1 physical pixel and full opacity, and disable FXAA, EDL, X-Ray and section-point highlighting. Visibility and clipping are retained. Edited layers stay edited; missing or failed sources do not become full density. Read the loaded/source count.
4. In RECAP Tour Viewer, choose several LAS/LAZ/E57 files or drag them onto the start screen. Drop more files into an open cloud view to add them. Each file remains a separate visible/hidden/removable layer in its original coordinates.
5. Choose RGB, elevation, intensity, GPS time, single color or Merge source; adjust point size, EDL strength and X-Ray. Initial loading samples up to 2 million points per file. Load full density requests all valid points; the status shows loaded and source counts.
6. E57 uses the bundled importer and remains a test feature pending checks with your own scans on Windows. Existing .rctourviewer packages retain their sections and project information.

Commands and parameters

Save Merged...

Saves the active merged layer as LAS/LAZ without overwriting an input file.

Reset To Original (Ctrl+F5)

Applies the original display preset to visible clouds.

Cancel / Esc

Cancels import; clouds that already loaded remain available.

130 Custom viewport menus and standalone DIGITIZE

DRAW / DIGITIZE; SETTINGS / APPLICATION; CLOUD REGISTER; 2D SPLICING

STANDARD + PRO (existing PRO restrictions apply)

The local test includes configurable viewport menus, independent 2D CAD, optional registration section synchronization and selected-cloud save/unload. It adds precise drawing at survey coordinates, image-plane handling and grouped toolbar menus, while retaining the serviced runtime and NEW cleanup.

Procedure

1. Ctrl+right-click inside either a 2D or 3D viewport to open its menu. Ordinary right-drag pans the 2D view; ordinary 3D right-drag navigation remains available. During a 2D command, the menu also offers Finish (Enter) and Cancel (Esc).
2. Open SETTINGS > APPLICATION > Customize 2D pop-up or Customize 3D pop-up. Search for a command, add or remove it, change its order, add separators and named submenus. Select a submenu before adding children. Changes save automatically and are shared by matching viewports. Commands unavailable in the current viewport or edition are disabled. Commands are grouped by the matching viewport toolbars. The 2D menu also includes 2D Section Cleanup, which opens its settings. Obsolete application-panel shortcuts are removed from saved menus.
3. Open DRAW > DIGITIZE. Import a DXF, add georeferenced images, or draw in a blank world-XY document. Draw/Fit/Edit/Modify/Measure/Snap use the same CAD tools as the main 2D section. No point cloud or section is required. Georeferenced images retain the existing PRO entitlement. View Image Plane uses TOP, FRONT, SIDE or custom orthophoto plane metadata without requiring a cloud. A drawing retains its coordinate frame; use New drawing before digitizing a different nonparallel plane. Image-only CAD preserves precision at large survey coordinates.
4. Images and DXF must use the same coordinate system and units; no automatic CRS reprojection is performed. Set DXF unit scale before import. The importer converts curves into editable polylines and lists unsupported entities before accepting the import. Save the edited geometry as a new DXF; source DXFs are protected from replacement. Image attachments remain external.
5. In DIGITIZE, create points with Pick 2D Point or import ASCII DXF model-space POINT entities. Choose a Best Fit command, then All, Lasso, Polygon, Click or Existing selection. Visible points from both sources can be combined. Undo/Redo includes point edits/imports; Fit All includes points and Save DXF writes them as POINT entities. Points at other depths are projected into the document plane for 2D fitting and export. Block/INSERT expansion is not supported.
6. NEW clears the project and coordinate/view state. An open DIGITIZE document prompts to save before it closes. Outside DIGITIZE, Polygon follows the same extracted-section requirement as the other drawing tools.
7. In CLOUD REGISTER, sections are independent by default. Check Synchronize Sections to copy FLOATING's current plane and thickness to BASE; subsequent section edits on either side update both. Uncheck to keep the current sections and edit them independently. Both Clip strips still start with Show/Hide Clip box and Reset Clip box. Delete removes selected registration CAD entities.

Commands and parameters

Customize 2D / 3D pop-up

Persistent per-user menus with commands, separators and one submenu level.

DIGITIZE

Independent CAD window with DXF import/export and georeferenced image overlays.

SPLICING / 2D SPLICING / 3DGS / CLOUD REGISTER

Click the ribbon panel to open its workspace directly. The current left sidebar remains active when launching these windows. The 3DGS ribbon button uses a compact width.

Panel labels

3DGS, REPAIR, WORKFLOWS, INSPECTION, TERRAIN DATA and Properties. The ELEVATION panel is removed.

Drag and multi-select

Use Ctrl or Shift to select multiple commands. Drag commands from the left list into the menu; drag entries on the right to reorder them. Drop on the middle of a submenu heading to move inside it. Right-click for Add to submenu, Move to submenu or Remove. Alt+Up/Down retains selection. Changes save automatically, separately for 2D and 3D; Retry save appears if saving fails.

Practical notes

This is a portable local test, without setup or a production update publication. Automatic and manual software updates are disabled in this test flavor; a valid existing license is still required.

Interactive WPF/OpenGL testing must be performed on Windows. Geometry, menu configuration, runtime packaging and license/update policy are checked separately.

Command names use readable tooltip content. Older saved menus with a System.Windows.Controls.ToolTip prefix are cleaned when loaded, retaining their structure and command links.

2D menu groups: View, Select, Draw, Fit, Measure, Edit, Modify, Tools, Snap. 3D menu groups: View, Navigate, Clip, Section, Select, 3D Draw, Properties, Points, Measure, Orientation.

Closing CLOUD REGISTER, SPLICING or 2D SPLICING releases that workspace's temporary point-cloud memory. A main-project cloud selected as an input remains loaded in the main project. Large merge-export buffers are collected after export.

After closing a cloud workspace, Application resources includes WORKSPACE CLEANUP counters and any cleanup errors. Copy this report when reporting retained memory. Buffers borrowed from a still-open main project may legitimately remain alive.

BASE is the fixed coordinate reference: preparation, alignment and export never reposition it. Only FLOATING is transformed. Merged output retains BASE coordinates; normal LAS coordinate quantization still applies.

131 Independent registration sections and selected clouds

CLOUD REGISTER / Synchronize Sections; CLOUD LAYERS / Unload Selected / Save Selected

STANDARD + PRO

Section synchronization is optional, initially unchecked and separate from Synchronize 3D views. CLOUD LAYERS gains confirmed unload and individual-file export.

Procedure

1. With Synchronize Sections unchecked, choose different TOP heights or different FRONT, SIDE or CUSTOM sections in each model.

2. Check Synchronize Sections only when you want a common plane. FLOATING supplies the initial plane, axes and thickness. While linked, BASE 2D displays a green FLOATING section preview and cyan FLOATING cursor marker, projected in the shared coordinate frame. The reference overlay cannot be selected, snapped to or exported as BASE data.

3. Uncheck Synchronize Sections to return to independent editing. Current sections are retained. Camera linkage remains a separate checkbox. The existing 2D SPLICING synchronization behavior is unchanged.

4. In CLOUD LAYERS, check the SELECTED column for the clouds to act on. Highlighting a row, visibility and Edit status do not change this selection.

5. Unload Selected lists the selected names and asks for confirmation, with No as the default. It keeps source files on disk, independent CAD, saved sections and terrain. Unsaved cloud edits and point-processing undo history are discarded; unload cannot be undone. Clouds must be reloaded from their files to restore them.

6. After unload, live workers are cancelled, point references and caches are released, and the existing full plus aggressive GC sequence runs once at idle. Remaining clouds and independent project data still require memory.

7. Save Selected exports one selected cloud through the LAS/LAZ save dialog. For multiple clouds, choose a folder and LAS or LAZ in the batch dialog; each cloud receives a separate filename. Duplicate or existing names receive numeric suffixes.

8. Unchanged clouds export their full source records even if their preview is sparse. Edited clouds export their current records and coordinates. The current project alignment is applied consistently with Save Merged. Source files and existing output files are never overwritten. On cancellation, completed files remain; incomplete staging files are removed.

Commands and parameters

Synchronize Sections

Optional linkage for TOP, FRONT, SIDE and CUSTOM; off in each newly opened registration workspace.

Unload Selected…

Unload checked clouds after confirmation and reclaim unused managed memory.

Save Selected…

Save checked clouds individually; Save Merged remains the merged-cloud command.

Practical notes

This portable local test requires Windows acceptance for viewport behavior, large-cloud RAM/GPU reclamation and LAZ compression. It does not install or publish an update.

BASE is the fixed coordinate reference: preparation, alignment and export never reposition it. Only FLOATING is transformed. Merged output retains BASE coordinates; normal LAS coordinate quantization still applies.

132 Draw a forced parallel line

2D CAD > Draw > Parallel Line

STANDARD + PRO

Construct an ordinary editable CAD line parallel to an existing straight segment, in the main 2D CAD, DIGITIZE and auxiliary CAD panes.

Procedure

1. Choose Parallel Line in Draw. Select an existing straight line or a straight edge of a polyline, polygon or rectangle. A visible DXF reference segment can also define the direction. Curves are not used as straight references.
2. Click the start point. Move the pointer to see the elastic line: its endpoint is projected onto the parallel through that start. Click to commit. Snap can affect distance along the line but never overrides parallelism; Ortho does not change the reference direction.
3. The tool remains active for another line with the same direction. Backspace returns to the previous step; Esc or Enter ends the command. Use normal editing, Undo/Redo and DXF export for the finished line.
4. To place it in your Ctrl+right-click menu, open Customize 2D pop-up and add Parallel Line from Draw. Existing customized layouts are retained.

Practical notes

No point cloud is required in DIGITIZE. The main section CAD follows the same drawing availability rules as Line. Reference picking uses visible straight segments; image pixels alone do not define a CAD reference.

133 Personal DXF block library

DRAW > BLOCK LIBRARY

STANDARD + PRO

42 ready-made door, window and opening blocks in plan, section and elevation, plus your own DXF blocks organised by category. Inserted geometry is stored with the section/project independently of the personal library.

Procedure

1. Choose a category and block. Preview marker 1 is its insertion point; marker 2 defines the reference baseline across the full outside width. Flip across axis and Reverse along axis are independent; the preview shows the chosen orientation.
2. Place block: pick point 1 in the editable 2D section, then move to point 2. The preview changes scale and rotation together. Click point 2 to insert; repeat the two picks for another copy, or Esc to end. Width and height fields resize existing blocks.
3. Select a block piece for Move or Rotate: the whole block participates. Delete removes the grouped instance. Scale to size changes both dimensions; enter the desired dimensions in the library fields first.
4. Stretch X or Stretch Y: select one block, pick the cut position, then its destination. Vertices on the positive side of the local axis move, while the opposite side stays fixed. This is a cut-plane stretch, not an AutoCAD dynamic-block action.
5. For an existing block, choose Mirror across or Mirror along and select the block. Reflection uses its local Insert → Size axis, even after rotation. Undo restores the previous orientation.
6. Import DXF, enter a name, a new or existing category, view and DXF-unit-to-metre conversion. Save selection creates a custom block from existing editable geometry. Rename/category and Remove manage custom entries.
7. Export block DXF saves a template. Exporting placed drawing geometry preserves grouped instances as DXF BLOCK/INSERT entities.
8. Enable Pick height after width to add a third insertion pick: first position, then width/rotation, then independent height. Facade enables this by default. Block height (or Set height in the library) resizes an existing block along

its own height axis without changing width, rotation or insertion origin. Preview follows the cursor; click to commit and Undo to restore.

Commands and parameters

Place block

Snap insertion with repeat placement.

Move / Rotate / Scale to size

Transform complete instances.

Stretch X / Y

Keep one side fixed and move vertices beyond the cut in the block local axis.

Explode

Release the group into separate editable pieces; Undo restores it.

Practical notes

Personal entries are stored in %LOCALAPPDATA%/RECAP Tour/BlockLibrary/library.json. Back up this file to share or migrate the library.

Import uses planar XY ASCII DXF. Nested BLOCK/INSERT, arrays, lines, polylines, circles and arcs are supported; curves become polylines. Unsupported entities are reported for confirmation, including text, dimensions, hatch and spline entities.

The library is local to the Windows user. Placed blocks survive project save/load without the library file. No built-in categories are deleted when removing a custom block.

For filenames in the form category - name.dxf, import pre-fills the category and name for review.

Includes double hinged, sliding, pocket, folding and glazed doors; fixed, double casement, sliding and triple-pane windows; arched and recessed openings. These are schematic drafting symbols: adjust dimensions and details to the actual construction. New section symbols use a vertical insertion/reference baseline for height.

Insert and Size markers span the outside block dimensions along the insertion direction, including jambs and projections. Closed polyline outlines include the final closing edge in 2D.

134 Print layout and PDF sheets

EXPORT > PRINT LAYOUT

PRO

An independent sheet-composition window imports snapshots of the current section drawing, measurements, annotations, projected 3D/Visual drawing and visible raster layers. Sheet edits never modify CAD geometry.

Procedure

1. Click EXPORT > Print layout to open the sheet editor directly. Clicking again activates the existing layout window and keeps its contents.
2. Open Print layout. Choose A4-A0, portrait/landscape or custom paper dimensions and margins in millimetres.
3. Select a section viewport. Set its paper position/size, view centre, scale denominator, rotation, text size and optional coordinate grid. Fit view computes a scale; entering a scale preserves its exact value.

4. Toggle geometry, measurements, annotations, section points and rasters separately. Refresh section replaces the selected viewport with the current active section snapshot. Add additional section viewports after changing the active section in the main application.

5. Add notes, legend or title block. Double-click text for the visual editor: fonts, sizes in points, bold/italic/underline, colours, headings, alignment and tables. Table cells support fill colour and border width/colour. Apply stores the formatted result on the sheet.

6. All sheet items have eight resize grips. Drag a grip to resize; Shift preserves proportions. Drag the item to move it, or enter exact dimensions. Section grips resize the viewport without changing its scale. Undo restores a completed drag; Esc cancels an active drag.

7. Add 3D view to open an independent view of the currently loaded model with a white background and the section plane. Orbit, zoom, pan or choose a preset; Apply captures that view. Double-click its inset to edit it again. The saved camera can be reused with the same current model; the main viewport camera is unchanged.

8. Import legend reads a selected PDF page as an embedded image, or supported planar DXF linework with TEXT/MTEXT. Place and resize it on the sheet. DXF entities that cannot be rendered are reported.

9. Add a scale label from the selected viewport: it remains linked to that viewport scale. Save/open .rtlayout stores a complete sheet with snapshots and embedded images; original image files are not needed to reopen it.

10. Export PDF in colour or monochrome. Print the PDF at Actual size/100%, with Fit to page disabled.

Commands and parameters

Section / 3D view / Image

Add independent sheet items.

Legend / Note / Title block

Editable text in paper space.

Scale / Rotation / Fit view

Adjust a section viewport without altering source geometry.

Undo / Redo

Undo sheet composition changes.

Export PDF

Exact paper dimensions; vector CAD and outlined Unicode text; lossless raster images.

Practical notes

A .rtlayout is one sheet and may contain several section viewports. Save separate layouts for additional sheets.

Snapshots update only when you choose Refresh section or add a new 3D view. Check that the inset and section correspond before issue.

The coordinate grid uses the section drawing coordinate system. Its spacing is in model metres; text size and item positions are in paper millimetres.

CAD is exported as vectors. Unicode text is outlined to avoid missing fonts; it is not searchable text in the PDF. Section cloud points are composited into a transparent raster up to roughly 2401 pixels on the longer side. The 3D inset uses the current viewport resolution; other rasters use loaded image resolution.

The layout shows a warning for items outside paper margins. Cropped viewport content and objects outside the sheet are clipped in PDF. Raster monochrome is grayscale.

The 3D editor uses up to two million of the currently loaded points. Its saved inset remains an image when the layout is reopened; editing requires a loaded model. PDF legends remain raster images; DXF text is imported with basic size, angle and colour. Rich-text table cells do not merge or contain nested tables.

135 Custom keyboard shortcuts

SETTINGS > SHORTCUTS

STANDARD + PRO

Browse commands by category or search and assign a key with any practical Ctrl, Shift and Alt combination.

Procedure

1. Select a command, click the recording field and press the keys together: Ctrl+Q, Ctrl+Shift+O, Alt+4, Ctrl+Alt+S or D. Assign saves immediately.
2. If the keys belong to another command, Replace assignment moves them explicitly. Clear removes an assignment. Reset command restores its factory key; Reset all defaults removes custom assignments.
3. Settings are stored for the Windows user in %LOCALAPPDATA%/RECAP Tour/shortcuts.json outside installation folders, so updates retain them. Back up this file to transfer preferences.

Practical notes

Shortcuts do not execute while typing, recording a shortcut or choosing command-bar options. Active-command/navigation keys and reserved Windows combinations remain unavailable. Edition, data and busy-state requirements still apply.

The catalogue includes main workspace panels, viewport tools and authored sidebar actions, including controls in inactive tabs. Equivalent buttons share one command without duplicate rows; context-specific operations remain separate. Search by command name or category. A saved shortcut still obeys the command’s edition, selection and data requirements. Temporary Accept/Cancel choices remain in COMMAND.

136 Make lines horizontal or vertical

2D > Edit

STANDARD + PRO

Align independent lines and two-vertex polylines to the current 2D view axes.

Procedure

1. Choose Make horizontal or Make vertical. Select by Click, Lasso or Polygon in the command bar.
2. The midpoint and length of each eligible line remain unchanged. One Undo restores the entire operation.

Practical notes

Longer polylines, closed shapes, curved segments and grouped block pieces are skipped.

137 Explode polylines

2D > Modify > Explode

STANDARD + PRO

Convert selected polylines into separate line segments.

Procedure

1. Choose Explode. Select All, Lasso, Polygon, Click or an existing selection in the command bar.
2. Confirm the selection. Each polyline becomes individual lines; closed polylines keep their closing edge. One Undo restores the complete operation.

Practical notes

Curved composite parts use their existing displayed vertices to create straight segments. Use Break instead when you want to retain analytic arcs or splines.

Other entity types are skipped. Existing block membership is retained; use Explode in the block library to release a block group.

138 Fit stairs to section points

2D > Draw > Stairs / DRAW > STAIRS

STANDARD + PRO

Fit one straight stair flight with equal treads and equal risers in the current 2D view axes. This drafts measured geometry; it does not certify stair safety or building-code compliance.

Procedure

1. Choose Stairs, then select points with All, Lasso or Polygon in the command bar. Enclose the treads and risers of one flight; exclude landings, undersides and neighbouring flights.
2. Use 0 for automatic step count, or enter 2-80. Choose Automatic, Tread first or Riser first. Press Preview after changing the count.
3. Review the green preview, fitted tread/rise, 90% RMS and supporting-point percentage. Less than 50% support shows a warning; you can still accept after checking the result, or narrow the selection and adjust the count.
4. Accept in the panel or command bar, A, or Enter outside a text field creates an editable polyline with one Undo step. Enter inside Steps recalculates the preview. Cancel preview or Esc discards the candidate. No scan points are modified.

Practical notes

Direction and height are measured in the current 2D view. A later view rotation does not change the accepted geometry.

Automatic count is a best-fit estimate and must be reviewed on real scans. Separate flights need separate selections.

139 Point display: view density and appearance

3D model > Point display / 3D > View > Point display

STANDARD + PRO

View-only density and point appearance settings, saved per user and available before opening a cloud. The header icon and 3D View toolbar open the same panel. New-user defaults: 100% and a 300 million point frame cap. Existing saved values are preserved. This cap does not load additional source points or bypass renderer limits. Point display is the first panel in 3D model and replaces Cloud properties. View, X-ray and EDL retains Projection, X-Ray and EDL. Scalar color range retains the scalar palette limits. Source data retains metadata, source loading and All source points.

Procedure

1. Set 0-100% and a maximum frame count. Both limits apply together. Percentage 0 hides points; maximum 0 removes only the count cap. Counts accept K/M suffixes. Press Enter or leave a numeric field to apply.

2. The frame budget is redistributed among visible spatial chunks. Zooming in increases the local displayed fraction, up to the renderer source available in that region. Quality/motion settings may further reduce the frame count.

3. Choose RGB, elevation, intensity or single color; select palette, pixel size, opacity and Circle/Square/Diamond/Sphere/Cube. Sphere and Cube retain their built-in 3D shading with Lighting off. Optional lighting replaces the fixed shading while enabled; switching it off restores the original appearance. Point outline offers Fixed color or Point color: its slider runs from lighter on the left, through original color at the centre, to darker on the right. Width is in pixels; opacity 0 is fully transparent.

4. Compare Loaded, renderer source and shown counts. Source loading and renderer-source settings remain separate; lowering a display limit never deletes or reduces export/processing data.

5. Expand Lighting and enable Shade Sphere / Cube if desired. Lighting is off by default. Select Follow camera or Fixed in project, then adjust azimuth (0-360°), elevation (−90-90°), intensity (0-200%), ambient (0-100%) and light color. Sliders update immediately; numeric/color fields apply on Enter or focus loss.

6. Follow camera keeps the light direction on screen: azimuth 0° is up and 90° is right, elevation tilts towards the viewer. Fixed in project uses +Y at 0°, +X at 90° and elevation above aligned project XY. Reset lighting restores only lighting defaults, including the off switch.

Practical notes

The default adaptive renderer source is limited to 8 million loaded points. This is not out-of-core streaming of all LAS/LAZ points at arbitrary zoom. Increase source/renderer density when more detail is required.

Layer-specific color and size settings override global values. Use Layer display > Use global display to inherit them.

Lighting affects display only and preserves source RGB, point opacity and processing/export data. It is bypassed in X-ray, and Circle/Square/Diamond remain unlit. EDL is independent and can add contrast after lighting. All lighting preferences persist.

This is directional lighting of point sprites, without surface shadows or a physical light position in metres. It does not estimate surface normals from the cloud. Bright or colored light changes displayed RGB/scalar colors. Switch it off to restore the built-in shape shading; choose Circle to inspect colors without shape shading.

140 A.I. scene analysis: temporarily unavailable

A.I. - temporarily unavailable / προσωρινά μη διαθέσιμο

PRO

The A.I. tab and its analysis commands are temporarily hidden while scene recognition is rebuilt. They cannot be enabled through workspace settings or shortcuts.

Procedure

1. Continue editing previously accepted geometry in 3D Draw.

2. Save and export accepted geometry with the normal project and drawing tools.

Practical notes

Previously saved drawing entities and their metadata remain in the project.

No online assistant is connected. Help search uses the installed guides locally, without uploads or API usage charges.

141 Fit doors and windows in 2D

2D > Floor plan / Facade (after Fit)

STANDARD + PRO

Two icon toolbars follow Fit: Floor plan, then Facade. Fit a single opening from section points, or insert a library block.

Procedure

1. Choose Door or Window. In the command bar choose Lasso or Polygon and surround one opening with some supporting wall points. Facade needs both jambs and the lintel; a window also needs its sill. Floor plan needs wall points on both sides of the gap.

2. Review the green preview, measured width/height (wall depth in plan), grid resolution and boundary support. Accept / A / Enter adds editable CAD with one Undo. Reselect / R starts a new region; Esc discards the preview.

3. Facade edges remain horizontal/vertical in the current 2D view. Floor plan follows the measured wall direction. The plan door swing is a conventional symbol, not a detected hinge or opening direction; use block editing/mirroring if required.

4. Right-click Block to choose an Elevation or Plan block in a category. Built-in and imported blocks with the matching View are included. Preview shows Insert and Size anchors; Flip across axis and Reverse along axis mirror the next insertion.

5. Choose Insert, click the insertion point and then the size point to set scale/rotation. Later left-clicks on Block reuse that toolbar’s chosen block for the current session. Custom blocks are managed in Draw > Block library.

6. Enable Pick height after width to add a third insertion pick: first position, then width/rotation, then independent height. Facade enables this by default. Block height (or Set height in the library) resizes an existing block along its own height axis without changing width, rotation or insertion origin. Preview follows the cursor; click to commit and Undo to restore.

Commands and parameters

Door

Fit a door in the selected section region.

Window

Fit a window in the selected section region.

Block

Insert the chosen block; right-click to choose a template.

Practical notes

This is local geometric fitting of supported scan gaps. It does not identify glass, closed leaves or hidden openings semantically. Select a tighter region when several openings or unrelated objects are present. Poorly supported regions are rejected. Grid resolution depends on region size; verify the preview against the cloud.

Sparse wall support is tested at several bounded grid resolutions. Paired jamb evidence helps with curved selections missing opening corners. The result remains a measured geometric proposal; include the actual sill/lintel and review before accepting.

142 Synchronize section views

2D / 3D > View > Sync

STANDARD + PRO

Sync links navigation independently from Follow. It never changes the section plane or extracts new section points.

Procedure

1. Enable Sync in either View toolbar. The two checkboxes agree and the setting is saved.
2. Pan and zoom in either view to synchronize the projected center and metres per screen pixel. In perspective, scale is evaluated at the 3D camera target.
3. Use Alt + wheel in 2D to rotate within the section plane. This changes 3D camera roll while retaining its orbit/tilt. Free 3D orbit remains independent from the 2D section rotation.
4. Turn off Sync to navigate independently. Follow can remain on to show only cursor correspondence.

Commands and parameters

Sync

Link pan, zoom and rotation within the section plane.

Practical notes

The same section stays active. Oblique 3D views are not a pixel-for-pixel match to a flat section; pan/scale refer to its plane.

Turning Sync off restores zero 2D view rotation while keeping pan, zoom and intentional mirroring. The Reset view icon beside Fit in 2D View also restores this orientation and switches Sync off. Neither action changes the section geometry or 3D camera.

143 Choose loading density for large clouds

Files > Open cloud

STANDARD + PRO

Files with more than 200 million source points ask how many points to load into memory. This is separate from the per-frame display budget.

Procedure

1. Choose Full density, or Limit loaded points and adjust the 0-100% slider. The count updates immediately.
2. 100% always means the entire source: 990,000,000 points at 100%, 495,000,000 at 50%. The 200-million threshold only triggers the dialog.
3. The initial limited suggestion is 200 million points. 0% links the source without loading display points. Open, drag/drop, folder import and file associations share this choice.
4. Projects retain the limit; automatic density refresh respects it. Cloud layers > Load full density explicitly loads the remainder.

Commands and parameters

Full density (100%)

Load every valid point from the source.

Limit loaded points

Choose the percentage of source points to load.

Open

Load the selected count and retain the original source.

Practical notes

The source stays unchanged. Full-resolution sections and source exports read it from disk. Preview sections and loaded-point filters use the loaded subset.

Invalid records are excluded. Full density requires enough RAM and an addressable count. LAS/LAZ counts are checked before decoding; other formats are counted during conversion.

144 Ortho priority and point outlines

2D > Ortho / 3D model > Point display

STANDARD + PRO

Ortho has priority over snapping and direction locks in 2D. Point outlines in 3D use an external pixel width independent of point body size.

Procedure

1. Enable Ortho in 2D before drawing, moving a vertex, placing a block or measuring. Coordinate picks stay on the section X/Y axes even when snapping or Shift direction locking is used.
2. A conflicting perpendicular measurement is rejected rather than violating Ortho. Rectangle opposite corners and region selection remain unconstrained.

3. In Point display > Point outline, change Width in pixels. The outline expands outside the point body; the numeric readout shows the applied pixel width.

Practical notes

Ortho is a checkbox: checked means the constraint is active; clear it to return to free directions. The visible state follows command and shortcut changes.

145 Position and Relate in 3D

3D > Points > Position / 3D Draw > Relate

STANDARD + PRO

Inspect source-survey coordinates with Position, or measure several targets from a fixed station with Relate. Picking alone does not save survey points.

Procedure

1. In 3D > Points choose Position. Pick a cloud feature using Cloud, Edge, Corner, Point or Endpoint snap. Read Easting (X), Northing (Y) and Elevation (H) beside the point.
2. Choose Save point to use the normal point naming, style and database workflow. The displayed precision does not round the stored coordinates.
3. In 3D Draw choose Relate beside Vector, immediately before Snap. Pick the fixed station first and then successive target points. Review the table and choose Save points when needed.
4. Use Remove selected to remove temporary rows, or New station to start another set. Close or Esc ends the command; points already saved remain. Save the project to retain saved points on disk.

Commands and parameters

Relate results

2D length, 3D length, delta X/Y/H, slope in percent, azimuth in degrees and grad.

Azimuth

Clockwise from survey North (+Y): North 0g, East 100g, South 200g, West 300g. A full turn is 400g = 360 degrees. Vertical directions show an undefined azimuth.

Practical notes

The table and temporary rays are a working session, not a saved report. Save points stores survey points, using the normal project workflow.

146 3D Draw · Auto-tracing

3D > 3D Draw > Auto-tracing

STANDARD + PRO

Right-click Auto-tracing and choose Kerbs, Building outline, Overhead wires or Color / markings. Pick two or three guide points on the feature, or continue an unfinished manual Polyline. Analysis runs locally; no online model or usage charge is involved.

Procedure

1. Kerbs and Building outline fit the intersection of two locally supported surfaces. They do not require vertical or perpendicular faces. A short kerb face can support the fit; place guide points on the upper or lower edge you intend to trace. Overhead wires fit an isolated 3D centre line, refitting along bends and sag. Color / markings follows the centre of a contrasting RGB or intensity stripe, including dashed markings. These are geometric proposals, not verified semantic classifications.

2. Settings retain search width (default 0.50 m), look ahead (10 m), approximate vertex spacing (0.20 m), maximum gap (3 m) and fit tolerance (8 mm; building preset initial tolerance 15 mm). Width accepts 0.05-5 m, look ahead 1-10 m, spacing 0.05-2 m, gaps 0-10 m and fitting 2-50 mm. Zero gap disables bridging. A smaller tolerance separates low kerbs and nearby surfaces but needs cleaner points. The feature is inspected more densely than output vertices. Settings are saved in user preferences.

3. A gap is searched along the current direction and must have matching supported sections beyond it. A proposed connection appears as a dashed orange preview. Tracing pauses: Accept / A / Enter / Space accepts the bridge and resumes; Reject / X removes only the provisional connection. Esc exits tracing, discards the unaccepted bridge and keeps the confirmed part of the polyline. Backspace rejects a pending bridge; subsequent presses remove one confirmed draft vertex at a time. Changing tools or saving the project never accepts a provisional bridge.

4. Esc exits Auto-tracing and keeps the confirmed line as an editable open polyline. A second Esc clears all workspace selections without deleting geometry. Holding Esc counts as one press. During an automatic pause, a new guide point or R resumes. Enter / Space also finishes the open polyline. Move/Add/Delete vertex and Delete selected remain available. Source/clipping changes, weak or ambiguous features and sharp turns pause for guidance. The worker also pauses after a bounded tracing batch for review.

5. Follow with pan keeps the current zoom and orientation unchanged. Analysis uses eligible loaded cloud points, respecting layers and clipping, independently of display density. It cannot recover unloaded detail. Output vertices are fitted geometry and may lie between measured points; inspect the result against your scan. No source points are modified.

Practical notes

2D View > Auto-tracing controls the projected traces independently of other 3D drawings. It is on by default and saved in user preferences. The current section plane defines the projection; Fit / Zoom extents includes these lines even when no full section is loaded.

Finish tracing with Esc or Enter / Space before editing. In 2D Navigate, click a trace, then drag a square vertex grip. Ctrl + right-click on the trace offers Move vertex, Add vertex, Delete vertex, Drawing style, Delete line, Undo and Redo. The 2D Edit add/delete vertex tools also work on traces. For insertion, pick the segment and then the new position. Delete removes the selected line; Ctrl+Z / Ctrl+Y use the same 3D drawing history.

The 2D and 3D views edit one shared polyline, not copies. A 2D vertex move preserves its perpendicular depth relative to the current section; insertion interpolates depth along the selected 3D segment. Ortho is applied after snapping. Esc cancels an unfinished edit; changing the section invalidates it. To change perpendicular depth, edit in 3D. Project save/load preserves the edited 3D coordinates and trace identity.

For PDF, finish the trace, enable 2D View > Auto-tracing, and open EXPORT > Print layout. Add a Section viewport, choose scale and paper, then Export PDF. Visible confirmed traces are vector strokes with their drawing color and width; hidden traces, temporary vertex edits and unconfirmed gap previews are excluded. A saved print viewport is a snapshot: Refresh it after changing a line.

147 Inspect and edit a drawing

2D > View > Properties

STANDARD + PRO

Turn on Properties in the 2D View toolbar, then select drawing geometry. The modeless inspector keeps the selected object visible while you review its coordinates and appearance. Apply commits the changes as one drawing undo step.

Procedure

1. Choose a selected entity from the list when several are selected. Edit its vertices or spline nodes, or its circle center and radius. Coordinates use the current drawing plane in metres.
2. Use drawing defaults keeps the shared drawing style. Turn it off to choose a color, line width in millimetres and line type for this object.
3. Apply validates and updates the object. Explode separates a polyline into lines or ungroups a block; Delete removes the object. Undo and Redo use drawing history.
4. For Trim, Extend or Trim / Extend on a polyline, click the intended segment of both objects. Other segments are retained; disconnected portions become separate open chains.
5. Selection prompts offer Use selection when a drawing or point selection already exists. Choose it or select a new region in the command bar.

Commands and parameters

Properties

Opens the inspector for the current drawing selection.

Apply

Commits validated geometry and appearance.

Explode

Available for polylines, polygons, rectangles and blocks.

Practical notes

Changes to an object or to the active section invalidate old inspector edits. Select the object again before editing.

The inspector has a fixed size with internal scrolling. Close or the title-bar X dismisses the form but keeps Properties enabled; the next drawing-selection interaction opens it again. Uncheck Properties in 2D View to disable inspection.

148 Image / PDF conversion and section comparison

DRAW > DIGITIZE > Raster to vector / PDF to DXF / Compare section

STANDARD + PRO (existing image-panel restrictions apply)

DIGITIZE provides local raster centre-line tracing, native PDF path extraction and a fixed-reference comparison with a snapshot of the current surveyed section. These are geometric tools, not an online AI service.

Procedure

1. Open DIGITIZE. Choose Raster to vector or PDF to DXF, then open an image or one PDF page. TIFF uses the first image frame. Select the intended image in the source list.

2. Use Calibrate distance: pick two points and enter their real distance in metres. For target coordinates, rotation or common-point fitting, open Georeference / rotate and use the existing image registration controls. Register before converting; later image transformations do not move already accepted CAD.

3. For a scanned page, choose Trace raster. Set the brightness threshold, light/dark lines, maximum analysis side (2048 / 4096 / 8192), simplification and minimum fragment length in analysis pixels. The dialog reports the effective resolution; decoded images are limited to 8192 pixels on their longest side.

4. For a vector PDF, choose Extract PDF vectors. Set curve tolerance in page-image pixels and optionally include filled outlines. Curves become polylines. Raster images and text are excluded and their counts reported. PDF layers, text, dimensions and hatch semantics are not reconstructed. Mixed PDFs may need separate tracing; avoid duplicating existing vectors.

5. Inspect the geometry over the image. Accept in the command bar to create editable CAD in one Undo step, or Cancel / Esc to discard the preview. Save DXF exports the document. Source files are protected from overwrite.

6. For comparison, first extract and open the survey section in the main window. In DIGITIZE > Compare section, choose Section U/V, or Survey X/Y for a horizontal section, and Use current section. The snapshot retains current section cleanup and extraction sampling; the point count and source slab count are reported. It does not load all raw slab points automatically.

7. Import and prepare the reference DXF or converted PDF/image. Use selected drawing or Use all drawing to freeze an independent reference copy. Use the same axes and metre units. Align reference uses picked source points and picked or typed targets; similarity fits uniform scale, rotation and translation and reports control residuals. Survey points never move.

8. Set distance tolerance, search distance, station spacing, local fit tolerance, minimum coverage and length / perimeter / area limits. Compare locally. Green is within tolerance, red exceeds, amber is ambiguous and gray is insufficient support.

9. Open Detailed results. Distances use P95 absolute perpendicular offsets. Signed offsets are left-positive relative to each directed reference edge. Closed straight contours yield measured corner-to-corner edge lengths, perimeter and area only when all edges and corners are supported. Open edges do not infer endpoint lengths; curved references provide sampled distance checks.

10. Export CSV for settings, source metadata, alignment pairs and per-edge / contour values. Export comparison DXF uses separate reference, result-status and deviation-link layers in the selected 2D axes. Blank measurements mean unavailable. Save DXF still exports the editable document, while comparison DXF exports the separately aligned reference copy.

Commands and parameters

Calibrate distance

Uniformly scale the selected image about the first picked point.

Trace raster

Preview local centre-line extraction from image pixels.

Extract PDF vectors

Read native page paths with crop / rotation handling.

Use current section

Copy current section points into the independent DIGITIZE view.

Align reference

Similarity fit of the reference copy; survey fixed.

Compare locally

Evaluate supported offsets and closed-contour dimensions.

Detailed results

Review edge support, deviations and contour measurements.

Export comparison DXF

Export the comparison by layer, without altering the source drawing.

Practical notes

Scanned drawings and PDFs may have lost original CAD precision. Registration error, scan uncertainty and pixel resolution must inform tolerance choices. Polynomial / affine image warps can alter dimensions; prefer uniform similarity for dimensional verification.

The current comparison is a local 2D geometric prototype. It does not classify rooms or resolve missing corners, hidden surfaces, wall thickness ambiguity, multi-loop areas or 3D tunnel volumes. Do not treat insufficient coverage as agreement.

Comparison copies and PDF underlays are session state. Export the report / comparison DXF before closing; they are not embedded into a normal drawing DXF.

Raster tracing offers Outlines for pipe/duct boundaries and Centre lines for line drawings, with scan presets, speckle/small-hole cleanup and full available image resolution up to 8192 pixels. It extracts visible image geometry, not semantic pipe networks. Native vector PDFs use their original paths instead of raster tracing; text and embedded images are not native CAD entities. Saving a pending geometry preview asks for acceptance and refuses an empty DXF.

149 Automatic tunnel axis and alignment editor

TUNNEL > ALIGNMENT > Axis from scan / Alignment editor

PRO

Build a reviewed as-surveyed axis from transverse scan strips, or define an analytical plan and height alignment. The scan remains fixed.

Procedure

1. Use editable processing layers, current clipping and optionally an open 3D guide through bends. Without a guide, the principal direction initializes the axis. Automatic axis sampling uses at most 200,000 loaded points and 3-2,000 supported strips.
2. Choose the horizontal centre and either Floor or Height centre. Floor means tunnel pavement, not scanner height. Positive delta S shifts right looking forward; positive delta H shifts upward. Both sides and crown need support; Floor also needs broad central bottom support. Missing internal strips stop the proposal.
3. Fit all supported centres globally. Review the observed centres, plan/profile plots and plan/height RMS, P95 and maximum residuals. Tangents, circles and clothoids share continuous curvature in plan; the height fit uses

tangents and parabolic transitions. P95 above tolerance requires explicit acceptance.

4. Open Alignment editor to edit horizontal PI coordinates, radii and entry/exit spiral lengths, or the actual curvature elements of a fitted axis. The vertical editor supports tangents, circular arcs and parabolas. Manual changes clear previous fit statistics.

5. Accept the reviewed axis and create the theoretical profile. Analytical position and tangent define the perpendicular section planes; the display polyline does not set their orientation. Save setup preserves alignment geometry and observations in version 3; older setup versions remain readable.

Commands and parameters

Axis from scan

Floor/height-centre mode, strip support, lateral/vertical offsets and global-fit tolerance.

Alignment editor

Horizontal PI or curvature elements plus a separate vertical profile.

Create profile

Circle, rectangle or circular-crown arch dimensions.

Practical notes

Fit residuals describe agreement with sampled centres, not absolute survey accuracy or compliance with road-design standards. A biased or incomplete scan may produce biased centres despite small residuals.

The curvature window helps discover changes; it is not a guaranteed minimum final element length. Use a suitable guide for bends, inspect the fit and validate on a known project.

Horizontal geometry controls the vertical start/end chainages automatically. Recalculating line, circle or spiral geometry updates the exact total plan length. Endpoint elevations remain editable. Spirals accept length L or clothoid parameter A, with $A^2=L \cdot R$ for a straight-to-circle transition; element mode uses $A^2=L/|k1-k0|$. Check the sign/direction and preview before acceptance. Vertical transitions accept length, circular radius, or parabola K/equivalent radius. K is length per percentage-point grade change; it is not a circular radius.

Import LandXML supports the implemented LandXML 1.1 / 1.2 alignment geometry and vertical profiles with validated units/direction. Unsupported station equations, spiral types and incomplete geometry are rejected explicitly. Validation with a real file from your design software remains necessary; not every exporter dialect is supported. Accepted geometry is visible in the main 3D view.

150 Tunnel profiles and deviation checks

TUNNEL > Alignment / Typical section / Compare / Results

PRO

Compare surveyed tunnel sections with theoretical profiles on a fixed accepted axis. Import an axis, design one in the alignment editor, or review a fitted proposal from the scan. Section analysis never moves the cloud or the accepted axis.

Procedure

1. In Alignment choose Choose axis, then select an existing open 3D line/polyline, import XYZ/CSV/TXT/DXF, or draw one. Use Import LandXML for supported analytical alignment data. Coordinates must match the source survey frame in metres, before the output datum offset. Vertex order defines forward direction.

2. Set chainage origin and direction. Imported polylines offer horizontal or 3D chainage; analytical designed/fitted alignments use horizontal chainage with exact position and tangent, including vertical grade. Profile X is right looking forward and Y is up; roll rotates the profile axes. Imported polylines need enough vertices through curves. Near-vertical shafts and abrupt bends above 60 degrees are rejected.

3. In Typical section, import DXF to see the complete cross-section as reference geometry. Choose the comparison layer or an individual outline from the lists or by clicking it. Pick the DXF point to place on the alignment (endpoint / intersection snapping), or enter its X/Y coordinates. Confirm metres per DXF unit. Apply the profile to the whole alignment or from a specified chainage until the next template. Only the chosen outline participates in comparison; the other layers remain reference geometry.

4. Create profile / Profile editor provides closed circle, rectangle and circular-crown profiles. Closed profiles must be radially visible from an interior comparison pole, which is found without moving the accepted axis. DXF outlines may remain open: no floor is invented. Open outlines use the selected alignment reference for rays; absent or multiple design intersections are excluded, and area/volume quantities are unavailable. Templates support U/V offsets, roll and Hold; Linear radial requires closed profiles. Set station range, step and slab thickness; exact template breakpoints are included, with a minimum step of 0.01 m and at most 5,000 stations per run.

5. Choose Radial or Shortest contour distance and set separate overbreak/underbreak limits for crown, walls and invert. Radial association still identifies the measured surface. Shortest contour distance is a signed distance to the 2D theoretical contour, not a full 3D mesh-normal distance.

6. Analyze sections uses visible layers, their clipping and the scalar filter. Unchanged layers read the full original source regardless of display density. Edited, split or merged layers use their current available geometry. Slabs use a 2 mm working grid with a 500,000-point capacity; accepted and analysis counts are shown. Work stays local; Esc cancels without replacing the previous completed run.

7. In Results select a station for its section and position in 3D. Inspect shows sector support. Underbreak is graded blue; overbreak is graded red. Within tolerance is green; ambiguous is violet and unknown gray. Design geometry has its own outline.

8. Open as section re-extracts the selected slab and adds its points and editable design/measured contours to the section list. Existing sections remain. Use the ordinary 2D editor and Print layout for CAD editing and PDF sheets. If source geometry or filters have changed, analyze again first.

9. Export CSV for provenance, settings, survey axis, section frames, sector residuals and quantities. 2D DXF places sections side by side with chainage labels and per-station result layers. 3D DXF retains survey X/Y and uses the current output elevation datum. Unknown / ambiguous rays remain marked on design geometry, not invented measured surfaces.

10. Save setup stores axis, profile and analysis settings in an .rtunnel file. Open setup restores these inputs; choose the appropriate surveyed cloud and run analysis again. Setup files do not embed the cloud or analysis results.

11. Use heatmap PNG, longitudinal diagram and multipage PDF. Large runs offer all individual section sheets or maps and complete numeric tables only. Display maps and 3D overview are bounded; CSV retains every computed result.

Commands and parameters

Choose axis

Choose a valid existing axis, import one or start drawing an axis.

Use axis range

Fill the station range from the axis and chainage origin.

Analyze sections

Extract and compare perpendicular slabs locally.

Inspect

Review sector support and radial offsets.

Open as section

Add a re-extracted slab and editable contours to the section list.

Export CSV / 2D DXF / 3D DXF

Export the completed comparison snapshot.

Templates along alignment

Chainage profiles, Hold / Linear radial, U/V offsets and roll.

Heatmap / Longitudinal / PDF

Review deviations and export all section pages with provenance.

Practical notes

The sign is positive outside the theoretical contour and negative inside. An interior comparison pole provides radial surface association; it does not relocate the axis. Machinery, services and competing surfaces may require interpretation.

Unknown means insufficient survey support within the search band. Ambiguous means competing survey surfaces or multiple design intersections. NoDesign means no theoretical outline in that direction. These states are not zero deviation. Open-profile coverage counts only directions with a unique theoretical intersection.

Measured area, overbreak area and underbreak area require a closed profile and support in every sector. Open outlines, missing or ambiguous sectors make these quantities unavailable. Finite angular resolution approximates the profile.

Interval volumes use average end areas and 3D axis distance. Missing/ambiguous sections and abrupt Hold-profile changes are excluded. These quantities approximate change between stations, not a continuous measured mesh.

The comparison does not measure hidden lining thickness, register the scan, or measure convergence between survey epochs. Axis from scan is a separately reviewed as-surveyed proposal, not a certified design. Validate support and quantities on a known survey.

Use the Profile editor for graphical/numeric line and arc editing and validation of closed sections. Supported LandXML cross-section surfaces and local XY import require closed profiles. Use the DXF preview to select layers, reference points and open or closed outlines. Accepted outlines follow the alignment in 3D. Display outline spacing and heatmap density are separate from analysis: smaller display cells do not create measurements. Set blue/red ranges and color bands for underbreak/overbreak.

151 Engineering checks and reports

MODELING / CHECKS > Engineering checks

PRO

Local architectural, construction, BIM, corridor and repeat-survey checks with grouped settings and shared results. The cloud and reference geometry remain fixed. No online AI service is used.

Before you start: Correct project frame and representative selected 3D points or processing layers within clipping. These checks use loaded points, up to 3 million per selection, independently of display density. They do not

automatically read unloaded source points.

Procedure

1. MODELING > Architectural schedule: add closed room outlines from a horizontal section, or accepted 3D openings. Optional design values provide area and dimension comparisons. Floor/ceiling height candidates remain for review; rooms are not automatically recognized here.
2. CHECKS > Construction checks: choose Wall, Floor, Round column or Rectangular column and set tolerances. Start the check, then choose All, Lasso or Polygon in the command bar; Use selection is offered when suitable points are already selected. The processing layers and active clipping still limit the input. Walls report verticality; floors report P95 flatness and slope. Columns need enough perimeter or face coverage.
3. MODELING > IFC comparison: open IFC, filter/select elements and confirm placement using its map conversion or explicit yaw and X/Y/Z. Inspect the geometry preview before comparing. Supported mesh surfaces provide coverage and deviations. Hidden or insufficiently observed faces remain unresolved. BCF issues retain IFC GlobalIds and viewpoints.
4. CHECKS > Corridor checks: use a fixed 3D alignment, set chainage stations, cross-section width and design slopes. Review left/right crossfall and curb candidates. This does not replace a complete road design model.
5. CHECKS > Repeat surveys: choose distinct Baseline and Repeat cloud layers, or load each cloud here, and set their survey dates. Select a common region with All, Lasso or Polygon before comparison. Both clouds stay in the established reference frame. Enter registration uncertainty; a signed surface-normal difference is flagged only when it exceeds both tolerance and uncertainty.
6. CHECKS > Engineering results: filter rows, inspect details and numbered markers, or add selected notes to the current section with Undo. Save/open .rqa result snapshots. Export CSV, PDF and layered 2D/3D DXF; active IFC comparisons also support BCF.

Commands and parameters

Source and scope

Selected 3D points or processing layers within clipping.

Limits

Per-category design thresholds, support and registration uncertainty.

Engineering results

Shared result table, markers, notes and exports.

Practical notes

Green means within limits or an informational measurement; red exceeds a limit; amber requires review; gray means insufficient support. Missing data is not automatically a defect.

Floor flatness is a geometric best-fit measurement, not an FF/FL certification. Clear heights and curbs are candidates to inspect.

CSV/PDF/3D DXF keep output X/Y and follow the active height datum. BCF uses IFC engineering coordinates. A .rqa file stores results and parameters, not source clouds or a resumable IFC session.

Only up to 1,000 markers are displayed; exports retain all result rows. Re-run after changes to geometry, placement or reference frame.

152 Repeat surveys: compare two clouds

CHECKS > REPEAT SURVEYS

PRO

Compare two dated surveys of the same area in one established reference frame. The comparison measures signed local surface-normal displacement; neither cloud is registered or moved automatically.

Before you start: Two different loaded cloud layers with compatible coordinates, units and adequate overlap. Analysis uses loaded data, not just displayed points, with at most 3 million analysis points per cloud.

Procedure

1. Choose Baseline cloud and Repeat cloud from the loaded layers, or use their Load cloud buttons. Set the acquisition dates. The same layer cannot be used for both surveys.
2. Set registration uncertainty and the required change limit. These are survey assumptions, not values estimated by aligning the clouds.
3. Choose Compare surveys and then All, Lasso or Polygon in the command bar. The same captured spatial region is applied to both clouds, intersected with active clip box/polygon and their applicable layer clipping. All respects clipping.
4. The comparison runs after region selection. Review eligible and analyzed point counts. The cap is applied after region selection, so use a smaller region or load full source density when more detail is needed.
5. Review the report in Engineering results. Inspect signed changes and support, then save .rqa or export CSV, PDF or DXF. Neither cloud is changed.

Commands and parameters

Baseline / Repeat

Independent cloud choices and dates, selected from loaded layers or loaded here.

Region

A common spatial selection for both surveys. Point indices from one cloud are not reused in the other.

Surface comparison

Up to 5,000 representative baseline locations with local surface fitting. This is a sampled normal-displacement check, not a dense cloud-to-cloud heatmap.

Change and uncertainty

A difference must exceed both the requested change limit and the 95% uncertainty allowance to be flagged. Insufficient or rough surface support requires review.

Practical notes

Use a common stable reference frame before comparing; a registration error can look like movement. Missing coverage is not zero movement. Re-run after changing layers, geometry, coordinates or clipping.

The report records survey sources, dates, selection settings and sample counts. It does not establish absolute accuracy or automatically identify changed objects.

153 Corridor checks: axis, crossfall and curbs

CHECKS > CORRIDOR CHECKS

PRO

Check left/right crossfall and possible curb steps in perpendicular cloud slabs along a fixed open 3D axis. The axis and cloud are never moved by the comparison. This is a sampled road check, not a complete design-corridor or earthworks comparison.

Before you start: An open 3D line/polyline with nonzero horizontal length and loaded survey points in the same coordinate frame.

Procedure

1. Choose axis opens a list of suitable 3D Draw lines/polylines and the current Tunnel axis, if available. Select a row and Use axis. One suitable preselected drawing is used directly. Import axis accepts TXT/CSV/XYZ or one open DXF polyline; Draw axis starts a 3D polyline, then return to Choose axis. Closed outlines are not axes. Selecting a list row highlights that axis in 3D with start/end markers. Highlight axis in 3D controls the accepted-axis overlay.

2. The axis is copied without moving it. Start/end initially become 0 and its total horizontal length. Vertex order defines increasing chainage, left and right. A Tunnel choice uses its sampled polyline. Confirm coordinate frame, direction and full extent. Full axis range restores the complete range. Display rounding to three decimals is accepted at the endpoints; genuine out-of-range values are rejected before region selection.

3. After Check corridor, choose All, Lasso or Polygon in the command bar; use an existing suitable selection when offered. Processing layers and active clip box/polygon remain in effect. Up to 3 million loaded editable points are analyzed, independently of display density. Unloaded original-source points are not automatically streamed here.

4. Set station spacing, slab thickness and half width. Defaults are 5 m, 0.3 m and 5 m respectively. Set the intended left/right outward slopes and their permitted difference. A negative outward slope falls away from the axis; default design is -2% on each side, tolerance 0.5 percentage points.

5. Optionally set expected curb offsets and their position tolerance (default 0.10 m). Run Check corridor. Each station produces left/right crossfall and curb rows, with support and reasons for unavailable results. Choose the input region in the command bar. Unavailable results explain missing lateral bins, coverage or excessive fitting residual, with the relevant threshold.

6. Open CHECKS > Engineering results. Filter rows, inspect the numeric details and markers, then export CSV, PDF or layered 2D/3D DXF. Save .rqa to retain the report snapshot.

Commands and parameters

Station spacing / Slab / Half width

Spacing along horizontal chainage; full longitudinal slab thickness; lateral extent on each side. Narrow slabs require sufficient density.

Crossfall

Median height per 0.15 m lateral bin, then a line fit to each half-width excluding the central 0.30 m. At least 6 bins, 55% side coverage and a P95 fit residual no greater than 0.04 m are required.

Curb

Looks for one supported height jump of 0.05-0.25 m between adjacent bins no more than 0.30 m apart. Several competing jumps give insufficient support. A candidate needs review even when its expected position agrees.

Result export

CSV/PDF contain numeric results and explanations. DXF contains result markers and text, not complete measured cross-section drawings.

Practical notes

Crossfall is fitted across the selected half-width, without separate lane, pavement or verge zones. Choose the region carefully: curbs and sidewalks can affect the fit. These are geometric checks, not automatic road-design certification.

The current Corridor checks importer uses polylines and does not import an analytical LandXML road design or theoretical profile schedule. LandXML alignment/profile import belongs to TUNNEL. The separate MODELING > Road / corridor tool has its own axis and outputs.

Markers identify station centers, not the measured curb point. Missing support is not zero deviation. Re-run after changing the axis, selected source or clipping.

A 1 m half width can be too narrow for the required 6 lateral bins beyond the central 0.30 m. Where the road surface permits, try 1.5-2 m, or select a better-supported road region. Increase slab thickness for sparse points, while avoiding curbs or unrelated surfaces in the crossfall fit.

154 Graphics compatibility and diagnostics

SETTINGS > 3D engine > Graphics compatibility

STANDARD + PRO

Automatic checks render synthetic test points for each active 2D/3D graphics context. Supported OpenGL compatibility contexts explicitly enable point sprites. The same renderer protection applies to the separate Viewer. Processing, original coordinates, source density and exports are unchanged.

Procedure

1. Choose Automatic for normal use. It uses standard rendering when the round-point test passes; otherwise it uses basic points if that test succeeds.
2. Choose Compatibility to force basic square points. Sphere/Cube shading, point outlines, EDL and FXAA are bypassed while this mode is active. Choose Standard to force the normal renderer. The choice is saved per user.
3. Test graphics repeats the checks in active views. Save graphics report writes GPU/context information and synthetic pixel results to JSON without cloud data. A passing test verifies offscreen rendering, not what appears on the monitor.
4. Official drivers opens the manufacturer support page for the GPU reported by OpenGL. When the active GPU is unknown, choose the manufacturer. Review the correct card and operating system before installing. No driver is downloaded or installed automatically.
5. In the separate Viewer, use the Graphics mode list, Graphics report and Graphics drivers. Merger and Resampler processing do not depend on this point renderer.

Practical notes

OpenGL 3.3 is still required. Compatibility is a simpler GPU point renderer, not a software-rendering fallback for unsupported cards.

If neither synthetic point test passes, the application reports the failure. Check the driver and active GPU, save a report and test locally if remote desktop is in use. The driver page does not guarantee a particular driver will fix the

problem.

Files and deliverables

Data	Input	Output	Use / limits
Main point clouds	LAS, LAZ, E57, PLY, PCD, PTX, PTS, XYZ, XYZRGB, TXT, CSV	LAS / LAZ	Input support depends on the file variant and available attributes. PCD supports ASCII, binary and binary_compressed. Cloud PLY is distinct from Gaussian PLY.
Projects	RCTOUR	RCTOUR	Keep linked clouds and images accessible. AutoSave is a recovery copy, not a replacement for your archive.
Survey points	TXT / CSV with column mapping	TXT / DXF	Review name, E, N, H, separator and decimal convention.
CAD / sections	Reference DXF	DXF	Select drawing, points and annotations deliberately; verify spatial versus section-plane coordinates.
Terrain (PRO)	TXT / CSV, DXF POINT / 3DFACE / boundaries, RTIN, cloud	RTIN / DXF / LandXML	Point imports need BUILD TIN; DXF faces already form a mesh.
Meshes and solids (PRO)	Point data / project geometry	OBJ / STL / PLY / DXF 3DFACE	Availability depends on the selected object and export command.
Images and rasters	Georeferenced image in PRO; TIFF / PNG / JPEG / BMP for drape	Orthophoto TIFF + TFW; raster products in PRO	Orthophoto is available in STANDARD; importing a georeferenced drawing image and image drape require PRO.
3DGS (PRO)	Gaussian PLY / SPLAT	MP4	Prepared Gaussian models only; scene capacity depends on RAM/GPU. Camera keyframes are session-only.
Presentations and BIM (PRO)	Project data	HTML / MP4 / portable package / IFC4	IFC export uses supported model elements; it is not a complete BIM authoring environment.
Workflows	RCWORKFLOW	RCWORKFLOW	Each step follows the active edition permissions.
Coordinate profiles	EPSG / WKT / PROJ / JSON / SP / CFG / PRJ / TXT	Named profiles / transformed LAS or LAZ	Grid/geoid references must be available and appropriate for the actual datum and coverage.
Unavailable native exports	-	E57 export / RCP-RCS / native SKP / GeoPackage	These are not built-in output formats. Use the supported exchange options; OBJ can be used for appropriate SketchUp exchange.

RGB, intensity, GPS Time and classification are available only when supplied and supported by the source. Support for importing a format does not imply support for exporting it.

Keyboard reference

Shortcuts apply in the appropriate active viewport. Text fields and lists retain their normal keyboard handling. COMMAND and the active tool can change the meaning of a key.

Key	Action
D	Delete 2D drawing entities
S	Lasso selection
P	Polygon selection
Z	Toggle datum plane
G	Toggle 3D grid
T	Two-entity Trim/Extend
L / I / R	Best-fit line / circle / rectangle
O	Offset
C	Toggle Clipbox; close an active 2D polyline
/	Extract section
Ctrl+A	Local automatic drawing, when not typing
M / J	Merge / Join drawing entities
Ctrl+L / Ctrl+P	Draw 2D line / polyline
Ctrl+2 / Ctrl+3	Detach 2D / 3D
Ctrl+V	Full Split View, when not typing
Up / Down	Move section by the configured step
Left / Right	Reduce / increase section thickness
Page Up / Page Down	Next / previous stored section
F1	Open cloud properties
F2 / F3	Processing target: 2D section / 3D cloud
F4	Open cloud layers
F5	Fit 3D
F6	Open CREATE SURFACE; execution requires PRO
F8	Quick section DXF

Key	Action
F9	Open 3DGS viewer (PRO)
F10	Clear top-view display preset
Ctrl+H	Toggle section visibility
Esc	Cancel the active command or supported running operation
Enter	Finish a drawing tool; confirm the current selection stage
Alt	Temporarily bypass drawing snapping
Ctrl+Z / Ctrl+Y	Undo / redo in the active supported drawing context
W / A / S / D / Q / E	First-person movement; Shift increases speed
Space	Repeat the last available command

In the separate 3DGS viewer, Home/F frame the scene and Esc stops the active operation. F9 opens that viewer from the main application in PRO.

Troubleshooting and support

Symptom	Action
PRO controls are grey	Check the active edition in ABOUT. STANDARD keeps PRO contents visible and locked; in PRO also check input data, selection and whether an operation is running.
The license cannot be verified	Check internet access and correct Windows date/time, then use Check / Start. If the offline deadline has passed, connect and obtain a valid entitlement. Do not change the system clock to extend a license.
LAS/LAZ or video component is missing	Restore the complete supplied application folder. LASzip is supplied in Tools/LASzip and FFmpeg, with its required files, in Tools/FFmpeg. Keep the files together; no separate download is needed for the supplied package.
Navigation or export is slow	Inspect loaded versus rendered point counts. Lower render density for navigation; for export use a writable local destination with room for output and compression. Check that the intended clipping/filter scope is selected.
A cloud or drawing seems missing	Use Fit, check visibility, active layer/section, clipping and scalar filters. F10 restores a clear top view but does not remove every data restriction.
Coordinates or scale do not match	Check units, actual source CRS, axis order, height convention and applied shifts/registration. Compare independent controls; do not repeat a transformation to compensate for an unidentified mismatch.
The application closed unexpectedly	Reopen a saved project or recovery copy. For support provide the version, operation and error message; diagnostic logs are under %LOCALAPPDATA%\RECAP Tour\Logs. Review files for private project details before sending them.

Support: support@recap-tour.com / support@recap-survey.com | +30 2310 328751. Include the version shown in ABOUT, the operation and the exact message. Do not expose activation codes in public screenshots.