

# New Features In TerraScan

What's New in Terrasolid v011?

Webinar

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# Run SETUP.EXE Automatically

- To create batch file for installing new versions
- README.TXT in setup package contains instructions

```
setup "c:\terra" "c:\msv8i\MicroStation"
```

- Same for TerraPhoto, TerraModeler and TerraMatch

## Fast Binary Format / Goals

- Additional attributes for laser data
  - Echo length from waveform
  - Echo normality
  - Distance value
  - Group identifier
  - Free parameter
  - Normal vector
- Speed
  - Task can read in only needed attributes
  - Task can write back classes only
  - Geographical tiling
  - Smaller file size
- Reduction (about 40%) on file size

## Fast Binary Attributes

### Same as LAS 1.2

- XYZ – only mandatory
- Intensity
- Echo
- Class
- Angle
- Scanner
- Line
- Time
- RGB color

### Additional

- Echo length
- Echo normality
- Distance
- Group identifier
- Free parameter
- Normal vector

# LAS

- Each record contains all the attributes of a point
- Software always has to read in whole file

XYZ	Intensity	Echo	Class	Angle	Scanner	Line	Time	XYZ	Intensity	Echo	Class
Angle	Scanner	Line	Time	XYZ	Intensity	Echo	Class	Angle	Scanner	Line	Time
XYZ	Intensity	Echo	Class	Angle	Scanner	Line	Time	XYZ	Intensity	Echo	Class
Angle	Scanner	Line	Time	XYZ	Intensity	Echo	Class	Angle	Scanner	Line	Time
XYZ	Intensity	Echo	Class	Angle	Scanner	Line	Time	XYZ	Intensity	Echo	Class
Angle	Scanner	Line	Time	XYZ	Intensity	Echo	Class	Angle	Scanner	Line	Time
XYZ	Intensity	Echo	Class	Angle	Scanner	Line	Time	XYZ	Intensity	Echo	Class
Angle	Scanner	Line	Time	XYZ	Intensity	Echo	Class	Angle	Scanner	Line	Time
XYZ	Intensity	Echo	Class	Angle	Scanner	Line	Time	XYZ	Intensity	Echo	Class
Angle	Scanner	Line	Time	XYZ	Intensity	Echo	Class	Angle	Scanner	Line	Time
XYZ	Intensity	Echo	Class	Angle	Scanner	Line	Time	XYZ	Intensity	Echo	Class
Angle	Scanner	Line	Time	XYZ	Intensity	Echo	Class	Angle	Scanner	Line	Time
XYZ	Intensity	Echo	Class	Angle	Scanner	Line	Time	XYZ	Intensity	Echo	Class
Angle	Scanner	Line	Time	XYZ	Intensity	Echo	Class	Angle	Scanner	Line	Time
XYZ	Intensity	Echo	Class	Angle	Scanner	Line	Time	XYZ	Intensity	Echo	Class
Angle	Scanner	Line	Time	XYZ	Intensity	Echo	Class	Angle	Scanner	Line	Time
XYZ	Intensity	Echo	Class	Angle	Scanner	Line	Time	XYZ	Intensity	Echo	Class
Angle	Scanner	Line	Time	XYZ	Intensity	Echo	Class	Angle	Scanner	Line	Time
XYZ	Intensity	Echo	Class	Angle	Scanner	Line	Time	XYZ	Intensity	Echo	Class
Angle	Scanner	Line	Time	XYZ	Intensity	Echo	Class	Angle	Scanner	Line	Time

# Fast Binary

- Can contain records with all the attributes of a point

XYZ	Time	Intensity	Line	Scanner	Echo	Angle	Class	XYZ	Time	Intensity	Line
Scanner	Echo	Angle	Class	XYZ	Time	Intensity	Line	Scanner	Echo	Angle	Class
XYZ	Time	Intensity	Line	Scanner	Echo	Angle	Class	XYZ	Time	Intensity	Line
Scanner	Echo	Angle	Class	XYZ	Time	Intensity	Line	Scanner	Echo	Angle	Class
XYZ	Time	Intensity	Line	Scanner	Echo	Angle	Class	XYZ	Time	Intensity	Line
Scanner	Echo	Angle	Class	XYZ	Time	Intensity	Line	Scanner	Echo	Angle	Class
XYZ	Time	Intensity	Line	Scanner	Echo	Angle	Class	XYZ	Time	Intensity	Line
Scanner	Echo	Angle	Class	XYZ	Time	Intensity	Line	Scanner	Echo	Angle	Class
XYZ	Time	Intensity	Line	Scanner	Echo	Angle	Class	XYZ	Time	Intensity	Line
Scanner	Echo	Angle	Class	XYZ	Time	Intensity	Line	Scanner	Echo	Angle	Class
XYZ	Time	Intensity	Line	Scanner	Echo	Angle	Class	XYZ	Time	Intensity	Line
Scanner	Echo	Angle	Class	XYZ	Time	Intensity	Line	Scanner	Echo	Angle	Class
XYZ	Time	Intensity	Line	Scanner	Echo	Angle	Class	XYZ	Time	Intensity	Line
Scanner	Echo	Angle	Class	XYZ	Time	Intensity	Line	Scanner	Echo	Angle	Class
XYZ	Time	Intensity	Line	Scanner	Echo	Angle	Class	XYZ	Time	Intensity	Line
Scanner	Echo	Angle	Class	XYZ	Time	Intensity	Line	Scanner	Echo	Angle	Class

- Can contain attribute streams
- Reading software can decide to read in only some attributes (=some parts of the file)
- Software can write out only classes

XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ
XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ
Time	Time	Time	Time	Time	Time	Time	Time	Time	Time	Time	Time
Time	Time	Time	Time	Time	Time	Time	Time	Time	Time	Time	Time
Intensity	Intensity	Intensity	Intensity	Intensity	Intensity	Intensity	Intensity	Intensity	Intensity	Intensity	Intensity
Intensity	Intensity	Intensity	Intensity	Intensity	Intensity	Intensity	Intensity	Intensity	Intensity	Intensity	Intensity
Line	Line	Line	Line	Line	Line	Line	Line	Line	Line	Line	Line
Line	Line	Line	Line	Line	Line	Line	Line	Line	Line	Line	Line
Scanner	Scanner	Scanner	Scanner	Scanner	Scanner	Scanner	Scanner	Scanner	Scanner	Scanner	Scanner
Scanner	Scanner	Scanner	Scanner	Scanner	Scanner	Scanner	Scanner	Scanner	Scanner	Scanner	Scanner
Echo	Echo	Echo	Echo	Echo	Echo	Echo	Echo	Echo	Echo	Echo	Echo
Echo	Echo	Echo	Echo	Echo	Echo	Echo	Echo	Echo	Echo	Echo	Echo
Angle	Angle	Angle	Angle	Angle	Angle	Angle	Angle	Angle	Angle	Angle	Angle
Angle	Angle	Angle	Angle	Angle	Angle	Angle	Angle	Angle	Angle	Angle	Angle
Class	Class	Class	Class	Class	Class	Class	Class	Class	Class	Class	Class
Class	Class	Class	Class	Class	Class	Class	Class	Class	Class	Class	Class

- Can contain attribute streams followed by point records

XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ	XYZ
Time	Time	Time	Time	Time	Time	Time	Time	Time	Time	Time	Time
Intensity	Intensity	Intensity	Intensity	Intensity	Intensity	Intensity	Intensity	Intensity	Intensity	Intensity	Intensity
Line	Line	Line	Line	Line	Line	Line	Line	Line	Line	Line	Line
Scanner	Scanner	Scanner	Scanner	Scanner	Scanner	Scanner	Scanner	Scanner	Scanner	Scanner	Scanner
Echo	Echo	Echo	Echo	Echo	Echo	Echo	Echo	Echo	Echo	Echo	Echo
Angle	Angle	Angle	Angle	Angle	Angle	Angle	Angle	Angle	Angle	Angle	Angle
Class	Class	Class	Class	Class	Class	Class	Class	Class	Class	Class	Class
XYZ	Time	Intensity	Line	Scanner	Echo	Angle	Class	XYZ	Time	Intensity	Line
Scanner	Echo	Angle	Class	XYZ	Time	Intensity	Line	Scanner	Echo	Angle	Class
XYZ	Time	Intensity	Line	Scanner	Echo	Angle	Class	XYZ	Time	Intensity	Line
Scanner	Echo	Angle	Class	XYZ	Time	Intensity	Line	Scanner	Echo	Angle	Class
XYZ	Time	Intensity	Line	Scanner	Echo	Angle	Class	XYZ	Time	Intensity	Line
Scanner	Echo	Angle	Class	XYZ	Time	Intensity	Line	Scanner	Echo	Angle	Class
XYZ	Time	Intensity	Line	Scanner	Echo	Angle	Class	XYZ	Time	Intensity	Line

## New Data Format in RAM

- Starting with version 011.001
- Each attribute is kept in its own memory area
- Your own MDL programs which see points loaded into TerraScan need to be modified – see User's Guide for more information
- FnScanGetTable() removed
- Use new functions instead:

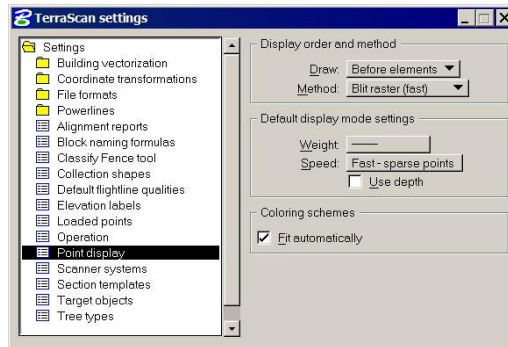
```
int FnScanGetPnt( Point3d **Tbl) ;
int FnScanGetCls( BYTE **Tbl) ;
int FnScanGetMrk( BYTE **Tbl) ;
int FnScanGetFlg( BYTE **Tbl) ;
int FnScanGetInt( USHORT **Tbl) ;
int FnScanGetLin( USHORT **Tbl) ;
int FnScanGetDbI( double **Tbl) ;
int FnScanGetEch( BYTE **Tbl) ;
int FnScanGetAng( char **Tbl) ;
int FnScanGetClr( RgbClr **Tbl) ;
int FnScanGetScr( BYTE **Tbl) ;
```

- tscanadd.dll sources need to be modified
- See addon.c for more information

## PowerMap, PowerCivil & Map PowerView

- Can run full versions of TerraScan, TerraPhoto, TerraMatch and TerraModeler
- Can run TerraScan Viewer, TerraPhoto Viewer and TerraModeler Field
- Same application as for V8i
- No need for dedicated installation packages
- Stripped down versions of MicroStation bundled with application specific tools:
  - PowerMap: Mapping / GIS
  - PowerCivil: Civil engineering
  - Map PowerViewer: Mapping / GIS
- Cheaper than full MicroStation

- **Fit automatically** setting in **Settings** tool
- Will fit elevation and intensity coloring schemes whenever software loads points
- You need to manually **Auto fit** only when you want to fit the coloring scheme to a specific class



- Started from zero January 06,1980
- Gives unique time stamps from which one can deduce:
  - Year, month and day
  - Time of day
- No roll-over problems in trajectories
- You can **Deduce lines** at any time
- Use LAS 1.2 or Fast Binary as project storage format
- LAS 1.2 & TerraScan subtract 1000000000.0 seconds from standard time values to improve numerical accuracy
- Standard time stamps are negative at the moment, will become positive during second half of 2011

- Trajectories, laser points and images must have time stamps in the same system
- You can convert trajectory time stamps during import or later using **Convert time stamps** menu command
- You can convert laser point time stamps during import into a project or with a macro
- You can convert image list time stamps using **Convert time stamps** menu command
- If reading SBET accuracy information, you must:
  - First import sbet\_XXXX.out
  - Then import accuracy smrmsg\_XXXX.out
  - Convert time stamps as last step

# Scanner Waveform Profile

- Stores properties of typical returns from a single hard surface
  - Background noise level
  - Pulse length at 50% of peak strength
  - Pulse length at 35% of peak strength
  - Shape of the return pulse
  - System derived point position relative to return pulse
- Classify points from hard surfaces into a dedicated class
  - Some intensity variation
  - Avoid edges of scan lines
- Click **Add** in **Settings / Scanner waveform profiles**
- Select profile for the right scanner in scanner system definition

## Waveform Capabilities

- View waveform of a point
- Extract echo length and echo normality values
- View points colored by echo length
- Classify points by echo length
- Extract returns for problem areas using specific logic:
  - **Last possible** return in dense short vegetation where default logic has not seen the ground
  - **All possible** or **All distinct** returns in places where one is missing some feature such as powerline wire
  - **First possible** return for tree tops?

## Various Improvements

- **Follow 3D alignment** setting in **Travel Path**
- **Camera view** option in **Travel Path** for displaying a perspective view looking at cross section location
- Support for **Netherlands RD/NAP**
  - Produces orthometric heights
  - Requires x2c.grd, y2c.grd and nlgeo04.grd which we do not have permission to deliver
- **Inside fence only** option in importing points into project
- Support for South African geoid model 2010 in **Convert geoid model**
- **Derive** coordinate transformation reports average magnitude and RMS of residuals

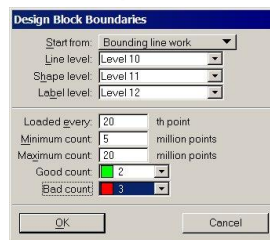


## Various Improvements

- **Output control** report supports multiple source classes
- **By height from ground** supports multiple classes as ground
- **Assign groups** menu command for assigning numbers
- **Assign Point Class** tool can classify all points belonging to same group
- **Smoothen points** is better at keeping relevant terrain changes
- Modification in model keypoints – fewer points at flat locations
- Lever arm values in scanner system definition are now always treated as meters regardless of design file unit
- **Derive** reports RMS and average magnitude values of residuals when deriving a coordinate transformation between two sets of coordinate points

## Design Block Boundaries

- Helps in laying out good project block boundaries
- Useful with data sets where point density varies and it is difficult to design nice block boundaries
- Can perform two tasks:
  - (Optional) Build closed polygons from line work drawn on a specific level
  - Display resulting point count inside each polygon
- Can be used without laser points to build polygons



The screenshot shows the 'Design Block Boundaries' dialog box with the following settings:

- Start from: Bounding line work
- Line level: Level 10
- Shape level: Level 11
- Label level: Level 12
- Loaded every: 20 th point
- Minimum count: 5 million points
- Maximum count: 20 million points
- Good count: 2
- Bad count: 3

Buttons: OK, Cancel

## Macro for repeated passes

- Finds time sequences with two or more closeby drive / flight passes
- Creates macro for classifying
- You usually classify out pass with worse accuracy

Macro for repeated passes

From class: Any class

To class: 13 - Overlap

Keep pass: Best xyz

Minimum interval: 10.00 sec

Classify interval if better pass

Xyz within: 4.00 m

Heading within: 30.0 deg +/-180

OK Cancel

## Scaling Intensity Values

- **View histogram** can display intensity histogram for selected scanner
- Shows average and median intensity values
- **Scale intensity** macro action for scaling intensity values
  - Match different scanners
  - Match different altitudes

Macro step

Action: Scale intensity

Lines: 0-65535 0-65535 for all

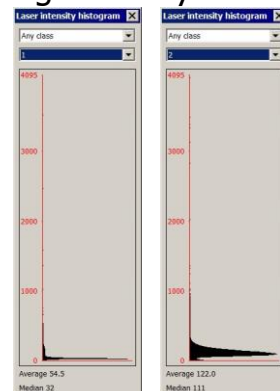
Scanners: 1 0-255 for all

Class: Any class

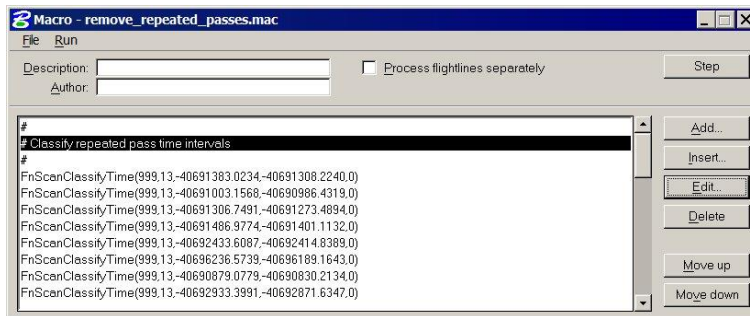
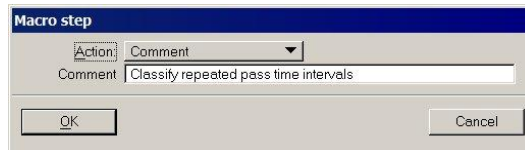
New value: 0.0 + 2.100 \* old value

Max value: 4095

OK Cancel



- **Insert** button for inserting a new row before selected row
- Comment rows in macros



- **From folder name** option for assigning scanner numbers during import -- takes the first number from folder name
- **Import directory** for importing files in a folder and all its sub folders
- Ability to assign flightline and scanner numbering when importing from TerraScan binary files
- Block naming formulas in **Settings** and project definition

## Apply Correction

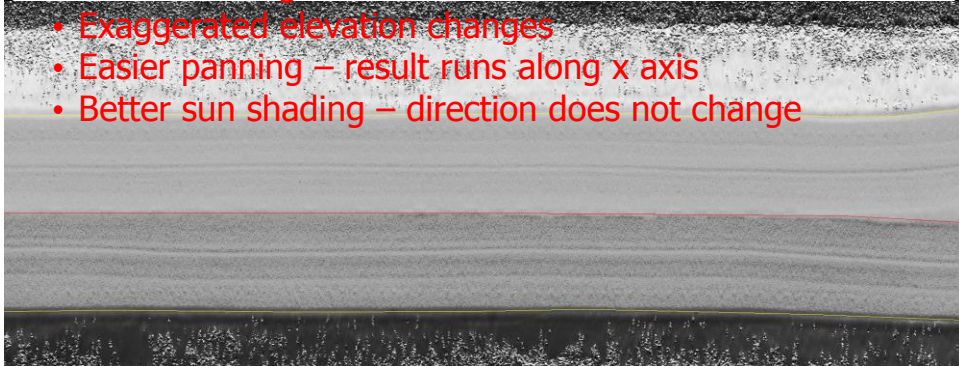
- Macro action for applying a TerraMatch solution
- Makes it possible to:
  - Apply multiple corrections in one operation
  - Execute some other actions in the same run
- Can reduce read/write operations on the project data
- Calls TerraMatch – can not be run by TerraSlave right now

## Classify Close To Line Key-in

- Keyin parameters for **Classify Close To Line**
- Example uses:
  - `classify close to line abovefrom=2/aboveto=3/abovetol=0.2`
  - `classify close to line closefrom=any/closeto=2/abovetol=0.1/belowtol=0.1`
  - `classify close to line belowfrom=2/belowto=6/abovetol=0.15`

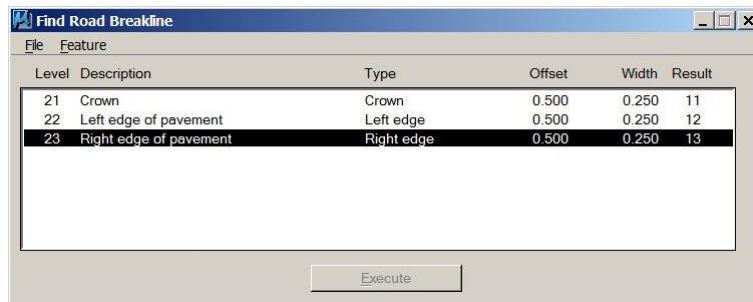
## Write section points

- Macro action for writing points suitable for viewing corridor object such as road
  - X = scaled station
  - Y = offset
  - Z = scaled elevation
- Faster viewing as road is shortened
- Exaggerated elevation changes
- Easier panning – result runs along x axis
- Better sun shading – direction does not change



## Find Road Breaklines

- Semi automatic tool for finding road breaklines
  - Edge of pavement
  - Crown of the road
  - Planar surface
- You have to place an approximate 2D vector
- Tool searches for best 3D breakline closeby



## Import Road Breaklines

1. Attach section design file as reference
2. Select section alignment
3. Draw fence around vectors in reference section design

- Converts vector elements from:

X = Scaled station

Y = Offset

Z = Scaled elevation

Back to normal coordinates

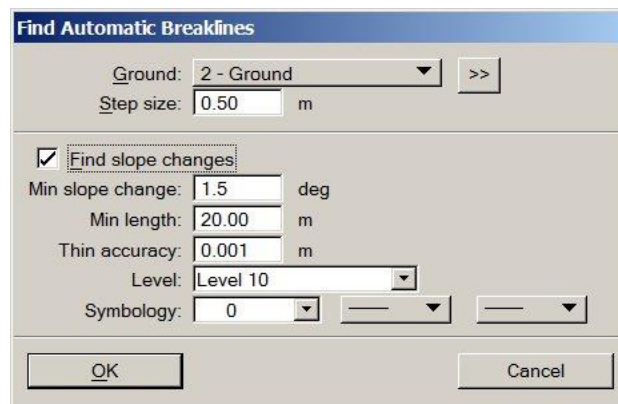
X = Easting

Y = Northing

Z = Elevation

## Find Automatic Breaklines

- Fully automatic tool for find road breaklines
- Currently only **Slope change** type implemented
- Curb stones will come soon



# Buildings

- **Classify buildings** less likely to classify tree hits as building
- **Draw Building Section** tool for drawing a cross section of a building (suitable for **Extrude Building**)
- **Set All Edges** can set all edges to be rectangular
- Bug fix in automatic vectorization – bug caused inner yards to be covered by roofs