

Cube-link Data transfer software **User Manual**

Stonex Software Cube-link – User Manual Vers. 3.0



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Contents

Software Introduction	2
1. Installing and uninstalling the Cube-link	4
1.1 Cube-link installation	4
1.2 Cube-link uninstallation	5
2.File	6
2.1 Open and save projects	6
2.2 Import and Export files	7
2.3 Settings	14
2.4 Activate Cube-manager	18
3. Home	19
3.1 In/Out	19
3.1.1 Import Cube-a	20
3.1.2 Import RW5	21
3.1.3 Import GeoGis	26
3.1.4 Import ASCII	28
3.1.5 Print	32
3.1.6 DXF/DWG In	34
3.1.7 DXF/DWG Out	35
3.2 Zoom, notes and layer	
4. CAD	
4.1 Draw CAD entities	40
4.2 Modify CAD entities	44
5. Measures	47
5.1 Coordinates, distance, angle, area and calculations	47
6. Topography	50
6.1 Topographic points	51
7. Tools and Commands	58
7.1 Tools and commands of the software	58



Software Introduction

The Cube-link application is based on two types of data: topographic points and CAD elements. Topographic points are graphically represented by a symbol and CAD entities can be lines, polylines, circles, arcs, etc. Topographic points are fundamental in the Cube-link data structure, they are generated either by importing data or graphically by creating new points.

The first operation can be performed from ASCII files, these must contain in each record at least the point identifier and its Cartesian coordinates (2D coordinates); creating points, otherwise, can be made through specific CAD operations provided in the application, which will be explained in more detail below.

The most significant topographic points imports are those surveyed in field with data-recorder devices. In this case, each set of topographic points imported from a job done in field creates a fieldbook.

For example, topographic points, as a result of importing a job done with GPS, will be represented by symbols and with different graphic properties. However, these must be considered as a data structure that contains all the information gained during topographical relief, regarding the position such as coordinates (east, north, height, latitude, longitude, elevation), but also regarding accuracy and control (epoch numbers) as well as information on working modes (e.g. RTK differential correction).

Cube-link work phases can be summarized in:

-data input (imports from devices or files);

-editing or creation of graphics and entity elements required to complete the project;

-data output on data-recorder devices (e.g. for stakeout operations), or printing.





· · · · · · · · · · · · · · · · · · ·	Cube-Ink - (United)
FLE HOME CAD MEASURES TOPOGRAPHY LINES/CONSTRAINTS 30 MODELS RAST	ER
🚔 🗋 🧐 🝓 📗 📠 🍰 🔚 🦓 🥄 🖞 🗤	n 📓 💼 🚰 🖉 From entities 👼 🐃
Lingort Import Import Import Crusic Section Print Dxf/Dwg Dxf/Dwg Linits Window Q Zoom Cube-a RWS Geo235 ASCE map AutoCAD In Out	Copy Paste Manage Meddy
In/Out Zoom	Note: Lever Create Database Language
Scale = 1000 + # Planimetry (1) 30 View 11 =	
Project	
Project manager	
	0 0
	Q 0
	e de la companya de l
4	
x x	
Command	
Meters X = -9.543 ; Y = 7.175 ; Z = 0.000 Elex 0.00 Otho Polar Osnap Thickness EParameters gri	d ins Tools bar +



1. Installing and uninstalling the Cube-link

1.1 Cube-link installation

To install the program just launch the installer, select the language (which can be changed at any time even to the installed program), read and accept the user license agreement; select the folder for the location of the shortcuts and eventually set any link to the program from the desktop. Before you click the Install button you can check and eventually change the program's folder location, the start menu folder, any additional tasks such as the link from the desktop. Once the installation is completed, the first time you launch the program you will be asked to register yourself, to do so just follow the instructions that appear in the window (*figure 1.1*) and start discovering the features of this useful program.

Activate Cube-link		
lf your der You will be se	Thank you for choosing to install Stonex Cube-link Activation of the program is required Please fill the form below (* mandatory fields) i/ce is online, send the data by pressing the SEND command The application will be activated in a short time Otherwise send the code to: Phone + 39 039 2783008 Fax + 039 039 2789576 Mail: support@stonex: it hot be transcribed in the box below on the left to confirm with the ACTIVATE command	
Enable	Name Surname (*)	
Activate 🖒	Company (*)	
	Address	
	(Street, House number)	
	(Posicode, City, State) Country (*)	
	E-mail (*)	
	Telephone	

Figure 1.1

4



1.2 Cube-link uninstallation

To uninstall, go to the folder where the program is located and press the uninstall button that will execute the operation (*figure 1.2*).



Figure 1.2



2. File

2.1 Open and save projects

The Cube-link project files have .cubelnk file extension and within them contain all the CAD and topographic entities used to work. It is possible to save template files (.cubetpl file extension) that contain all the settings used for a project (size variables, parameter settings, layers, etc.) so that for a new job it is possible to select a template file with the settings that are already appropriate to the type of work you are going to do.

Projects are saved in the recent projects list (<u>Open recent projects</u> button) in the <u>File</u> menu. Selecting a project from this list and hovering it over with the mouse will display a preview of the graphic works (*figure 2.1*).



Figure 2.1



2.2 Import and Export files

Cube-link allows you to import and export files in many formats, including the Cube-a format. To import, select a format from the list shown in <u>Import</u> menu (*figure 2.2*), each choice will open a new window (look at the relevant sections for details, Paragraph 3.1). You can also import Cube-link projects, this function will act as a normal opening of a Cube-link file.

RW5 files and GeoGis files use mobile devices while Cube-a files use Android devices. In the case of mobile devices, you can use the USB connection, which means that devices must always be first connected to the Windows Mobile Device Center.



Figure 2.2



The import for ESRI Shape files is also available; after clicking on the <u>ESRI</u> <u>Shape file (shp)</u> button, you will see a work window which will display a preview of the file to import (*figure 2.3*).



Figure 2.3

To export click on the relevant format in <u>Export</u> menu window (*figure 2.4*), set and enter the correct information, e.g. name and path of the file.





Figure 2.4

In the export for the Cube-a format you need to declare the name and path of the file, after that, choose whether to export any content or just topographic points and then click <u>Proceed</u> (*figure 2.5*).

For exporting the RW5 file after defining its name and path, if you are going to do a post-processing you can also enter a name and path of the Raw Data file (EzSurv by Effigis). You can also create a CDR file from the project (*figure 2.6*).

The GeoGis file export window looks the same as the Cube-file export window and also has the same functionality. After setting the name and path to follow, you can choose whether to import the entire file or just the topographic points (*figure 2.7*).



Export	
Export to file Cube-a	
Name and path of the file to be created	
I	
Export all Export only topographic points	Proceed 🔶 🏹 Cancel

Figure 2.5

Export			
Export to fi	le RW5		
Name and path of the fi	le to be created		
Name and path of Raw	Data file (EzSurv) - Optional		
			<u> </u>
		Create CBD file	
		Froceed 🦻 😸 Ca	icei

Figure 2.6



Export	
Export to file GeoGis	
Name and path of the file to be created	
1	
 Export all Export only topographic points 	Proceed 🖝 🏹 Cancel

Figure 2.7



To create a text file just click on the <u>Export points on text file</u> button and define what features you want to give to the file. You can choose whether to include a header and you can decide which and how many data the file should contain. In addition to that, you can define the format of the geographic coordinates, the character to be used as the separator, and the characters at the beginning and end of the line (*figure 2.8*).

Create ASCII file	
Select options for creat	ing the ASCII file
ASCII file creation options	Character used to split :
Include the following data: Point name East/North Height Description Point code Latitude/Longitude Elevation Pole height State PDOP HDOP VDOP GDOP TDOP LatSDev	 (or) Tab Invert X with Y Geographic coordinates gg°pp'ss.ssss" gg.ddddddddddd Characters on start of line Characters on end of line
AltStDev	-
*	Exit 🔗 Done

Figure 2.8



By accessing the Export to Google (KMZ file) function, you can generate a KMZ file that can be viewed in Google Earth. The procedure is similar to the other exports of this application; first specify a name and a path for the file and then proceed with the selection of the features you want it to have. The structure of this window is convenient because you can indicate which data you want to export: CAD elements; GPS data; photo; database attributes (*figure 2.9*).

Export in Google	
G KMZ export File	
Name and path of KMZ file to create	
	✓ Export CAD graphic elements
	V Export main GPS survey data
	V Export photos
	V Export Database
	Proceed 📦 🗱 Cancel

Figure 2.9



2.3 Settings

In <u>Settings</u>, you can set the general program functions such as checking for updates on startup or the AutoCAD® version to use (*figure 2.10*). This feature is made up of 5 tabs that will be discussed below. The features available will allow you to fully customize the aesthetic, functional and practical aspects of the program.

rogram settin	gs				
General Ap	pearance	Help Sys	tem Reference g	grid	
General prog	gram settings				
Check f	or updates a	t startup			
🔽 Enable	autosave ev	ery	10	minutes	
Graphic inte	face	-	_	_	
Toolbars fo	nt size		9.75	-	
Data grids f	ont size		9.00	•	
Dptimiz	e interface fo	r tablets use			
Font size fo	r survey mod	e	11	•	
AutoCAD @					
AutoCAD®	version in us	e:			
AutoCAD	ver. 2008			-	
			* c	Cancel	Ok

Figure 2.10



In the <u>Appearance</u> tab (*figure 2.11*) of the program settings it is also possible to determine, for example, the background color of the workspace or enable the dynamic information on the cursor.

Program settings		
General Appearance Help System Reference grid		
Appearance and functionality of CAD	workspace	
Graphics background color	255	
Cursor axes size	100 %	
Cursor axes rotation	0.0000	
Zoom wheel magnification factor	100	
Dynamic information on cursor	Measures + Input + Instruct 👻	
Raster images quality	Standard 🗸	
Fnable/Disable Intellil ist		
Enable/Disable the display of vide	eo thicknesses	
Enable/Disable and adding of these understanded Enable/Disable cartesian axes icon		
Isplay solid faces of DTM triangles (3D faces)		
☑ Display raster images border		
Display raster images during dyna	mic zoom	
View raster images in 3D graphics		
Display selection break in level cu	irves	
	🗱 Cancel 🛷 Ok	

Figure 2.11



The <u>Help</u> tab (*figure 2.12*) is useful for setting whether to use the object snap and in which mode, it determines also if either enable or disable the polar pointing.

Program settings		
General Appearance Help S	System Reference grid	
Help on drawing		
Enable/Disable Orto mode		
Enable/Disable Object snap ((OSNAP)	
Object snap mode:		
🔲 🍾 Snap on ends	Snap on close position	
V 101 Snap on topographic p	point 🔲 🔔 Perpendicular snap	
🔲 💉 Snap on midpoint	Tangent snap	
🔲 💿 Snap on center	🗐 <u></u> Parallel snap	
🔲 💮 Snap on quadrant	Snap on intersection extension	
Snap on intersection	Control of the state of the sta	
🔲 Snap on parametric gri	rid 🔄 💿 Snap on cloud point	
Osnap symbol size	14 pixel	
Area selection size	6 pixel	
Enable/Disable polar pointing		
Polar pointing point	50.0000	
	🗱 Cancel 🔗 Ok	

Figure 2.12



In the <u>System</u> tab, it is possible to set topographic measurement units and decimal digits for the program to display parameters such as heights, coordinates, distances, etc. (*figure 2.13*)

Program settings	
General Appearance Help	System Reference grid
Measurement units - decimal digits	\$
Topographic measurement unit	Meters
Angle measurement unit	Grads
Cartesian Reference System	(X = East)
Catastral Reference System	(North = X)
Working plan elevation	0.000
Z height CAD plane	From setup elevation
Distances decimals	0.000 -
Angle grads decimals	0.0000 -
Sexagesimal seconds decimals	0.00000000 -
Coordinates decimals	0.000 -
Screen coordinates decimals	0.000 -
Heights decimals	0.000 -
Screen heights decimals	0.0000 -
Deviations decimals	0.000000 -
Others decimals	0.0001 -
	🗱 Cancel 🔗 Ok

Figure 2.13



In the last tab, the <u>Reference grid</u> (*figure 2.14*), you can indicate whether to display the reference grid and what features should have.

General App	earance	Help	System	Reference grid			
Set type and o	haracteri	stics of re	eference g	nid			
✓ Enable/D	isable ref	erence g	rid				
Crosse	s and coo	rdinates	on everyt	hing			
Inner c	rosses + o	crosses a	ind coordi	nates on perimeter			
Crosse	s and coo	rdinates	only on pe	erimeter			
Framing	g and coo	rdinates					
Framing	g and inne	er crosse	s				
Graphics la	iyer	Variou	IS				
Font		Arial					
Font size		6		Cross size		6	
X Step	10			Y Step	10		
Extensions	:						
Min X =	-10			Max X =	10		
Min Y =	-10			Max Y =	10		

Figure 2.14

2.4 Activate Cube-manager

Cube-link is a free program that performs a part of Cube-manager functions. In your version (Cube-link) almost all the functions are visible but some are in gray and disabled (Pregeo commands are only visible when the Italian language is set), to have all the available features of Cube-manager, you can purchase a full version of it; contact Stonex Europe Srl for more details.



3. Home

3.1 In / Out

In the <u>In / Out</u> section (*figure 3.1*) are collected all the formats available for importing into the program and, for each of them, there is a button that opens a working window. The import is about data recorded on field, if there are graphic elements related to them, these will be imported as CAD entities. No data transformations will be made at this stage unless you select it before the import.

In this section, there is also the printing function and a button for importing/exporting Dxf/Dwg files.



Figure 3.1



3.1.1 Import Cube-a

To import a Cube-a file, after you connect the device to your computer, you can copy the folder called StonexCube/Projects, which will contain several other subfolders, in this way the system can understand, for example, whether there are photographs in the file and link them to your project. It is also possible to transform photographs into GeoTIFF files (*figure 3.2*).

Import Cube-a file	
Select Cube-a file to import	
Name and path of Cube-a file to import :	
	☑ Transform photos into GeoTIFF files
	Cocal system
	Coordinates defined on field
	Specify Datum - Projection - Geoid
	Proceed 📦 😂 Cancel

Figure 3.2



3.1.2 Import RW5

To import RW5 file, specify the file name and path and click on the search button (*figure 3.3*). A utility feature is the ability to select the CRD file and therefore only import the updated data recorded in field.

Import RW5 file	
Select RW5 file to import	
Name and path of RW5 file to import :	
Connect USB	
	Cocal system
	Coordinates defined on field
	Specify Datum - Projection - Geoid
	Check tagged points on CRD file
	Proceed 🖒 😣 Cancel

Figure 3.3



You can also read this file as a text file (editable) by clicking the <u>Edit file</u> button (*fiqure 3.4*).



Figure 3.4



If you want to use a USB connection click on the <u>Connect USB</u> button (*figure* 3.3). The data recorder used in field can be directly connected to the PC and through the dialog box (*figure* 3.5) it can directly download files from the portable device to the computer, or vice versa. By default, the system always sits in the recorded data folder, this location can be changed at will by clicking on the 3-dot button. You can select from which folder to take files; the structure is made to nodes and it is the representation of the actual device's aspect.

USB connection	
Select the RW5 file to import	Jobs 🗸
Device Folder of device Program Files\SurvCE\Data TEST.rw5 TEST2.rw5	Computer Folder of computer C:\work
Copy file to computer	Copy file to device

Figure 3.5



The data can be downloaded with original reference system or modified reference system. If you choose to change the reference system, just select the <u>Specify Datum - Projection - Geoid</u> entry that will give you access to the Datum reference system window (*figure 3.6*). In this workspace, you can select a Country of reference, once the nation is selected, all the Datum and Projections used in the nation are displayed. Then you can select a Geoid which is independent, so it means that the original coordinates will be translated into the selected reference system. (*figure 3.7-3.8*).

Datum reference system		
Select country - Projection - Datum		
Select Country		
World	•	
Select Projection - Datum		
UTM zone 33N / WGS 84	•	
Select Geoid		
AUSGeoid09_V1.01.geo	•	
		Show parameters
	Proceed 🔛	💥 Cancel

Figure 3.6



Datum reference system	
Select country - Projection - Datum	
Grid List	Selected tab
118_Milano.GK2	Minimum Roma40/ED50 geographic coordinates 45°15'0.0000"N 8°49'38.4000"E Maximum Roma40/ED50 geographic coordinates 45°40'0.0000"N 9°27'8.4000"E Minimum Roma40/ED50 geographic coordinates *
	Italy Fuso Ovest / Roma40
	Cartesian Geocentric Geographical From ETRF RTRF89=>ERTF2000 RTRF2000=>ERTF89
	Proceed 🏟 Cancel

Figure 3.7

Datum refe	rence system		
	Select country - Project	ion - Datum	
	Allow change 📃	Projection elements	Italy - Italy Fuso Ovest / Roma40
		Transformation	TransversalMercator 💌
1		Latitude origin	0
		Longitude origin	9
		False East	1500000
		False North	0
		Deformation Modulus	0.9996
		Latitude Parallel South	0
		Latitude Parallel North	0
		Azimut	0
		Angle correction grid	0
		Meridian	Greenwich
		Meridian Longitude	0
		Datum elements	
			Proceed 🏟 Cancel

Figure 3.8



3.1.3 Import GeoGis

The Import of GeoGis format provides all the features described in section 3.1.2 for the RW5 format (*figure 3.9*).

Import GeoGis file	
Select GeoGis file to import	
Name and eath of GooGin file to imposit -	
Name and path of Geodis nie to import .	
Connect USB 4	
	☑ Transform photos into GeoTIFF files
	C Local system
	Coordinates defined on field
	Specify Datum - Projection - Geoid
	Proceed 🏟 😫 Cancel

Figure 3.9



The USB connection (*figure 3.10*) is also available and you can also convert images, if present, in the GeoTIFF format. Also, for this type of file, you can import using an original reference system, set up a local reference system, or select a different reference system (Specify Datum – Projection – Geoid). Please note that not only jobs but also other type of files (Raster, dxf, shp) can be imported.

Select the GeoGis file to import Jobs Device Computer Folder of device Program Files/GeoGis/Jobs 2017/09-25-1 gos 2017/09-25-3 gos 2017/09-25-4 gos 2017/09-25-5 gos 2017/09-25-5 gos 2017/09-26-4 gos 2017/09-26-5 gos 2017/09-26-5 gos 2017/09-26-1 gos 2017/09-28-1 gos 2017/10-29-29 2017/10-29-29 2017/10-29-29 2017/10-29-20 2017/10-29-20 2017/10-24-20 2017/10-24-20 2017/10-24-20 2017/10-24-20 2017/10-24-20 2017/10-24-20
Device Computer Folder of device Folder of computer Program Files\GeoGis\Jobs 2017-09-24-1 gps 2017-09-25-1 gps 2017-09-25-3 gps 2017-09-26-3 gps 2017-09-28-3 gps 2017-10-22-1 gps 2017-10-02-1 gps 2017-10-02-2 gps 2017-10-02-2 gps 2017-10-02-2 gps 2017-10-02-4 gps 2017-10-02-4 gps
2017-10-22-5.gps 2017-10-02-6.gps 2017-10-02-7.gps Copy file to computer Copy file to device

Figure 3.10



3.1.4 Import ASCII

Click the <u>Import ASCII</u> button to import ASCII files or generic text files. This function is composed of 4 steps. In the first, you have to search for the file to import by name and path, at this stage you can also edit the file. Before proceeding, you must select whether to create topographic points or CAD points from the imported file (*figure 3.11*).

Import generic ASCII file on graphics
Select file to import and data included into it
Step 1 of 4 :
Name and path ASCII file to import :
Edt file
Entities to import : Create topographic points (name, description, code, etc)
Create CAD points (3D location)
Back Next 🗭 😫 Cancel

Figure 3.11



In Step 2 (*figure 3.12*), you can choose a character to use to divide the data on the same row, in addition you can select the columns you want to exclude from the import and finally you can determine from which row you want to start reading data.

Import generic ASCII file on graphics	
Select the character used to slit data and the row to start reading	
Step 2 of 4 :	
Set the separator character: (character dividing the data to the same row)	Exclude selected columns
Comma (.)	from import
Semicolon (;)	Column 2
Slash (/)	Column 3
Backward slash (\)	Column 4
Colon (:)	Column 6
 Tabulation (TAB) 	Column 7
	Column 9
Group of annoan Amit in columna)	Column 10
	Column 12
O Other	Column 13
Name X.Y.Z	Column 14
× × × 7	Column 16
	Column 17
	Column 19
Start data import from row : 1	Column 20
Back Next	Cancel

Figure 3.12



In Step 3, you can attribute the content type (Point name; Coordinate X, Y, Z; Description; Code) to each column (*figure 3.13-3.14*).

Attr	ibute to ea	ch column t	the contain	ed type of a	data		
Step 3 of 4 :							
Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6		
NM161207	DT12-06	TM21:36:40					
AD0	UN1	SF1.0000	EC0	EO0.0	AU0		
S10	SN:S102	FW:0.5.1					
RA0.0700m	SHMP0.1	L10.1343m	L20.1269m	Integrate	GLONASS		
Device: G	Network:						
PN569	LA44.003	LN12.281	EL146.1320	AG0.0000	PA0.1531		
Vertical							
HR0.1343							
PN1001	LA43.593	LN12.250	EL147.46	MRT.SP			
PN1001	N 487884	E 774279	EL106.4096	MRT.SP			
THE 6 676	T (D 0 000	TUBARE					

Figure 3.13



Figure 3.14



In the last dialog box, step number 4 (*figure 3.15*), you can click on the <u>Import</u> button, and defined points that will be stored in memory.

To import the file click 'Import' (points will be stored in memory)										
Step 4 of 4 :										
Point	Х	Y	Z	Descrip.	Code					
NM161207	DT12-06	TM21:36:40								
AD0	UN1	SF1.0000	EC0	EO0.0	AU0					
S10	SN:S102	FW:0.5.1								
RA0.0700m	SHMP0.1	L10.1343m	L20.1269m	Integrate	GLONASS					
Device: G	Network:									
PN569	LA44.003	LN12.281	EL146.1320	AG0.0000	PA0.1531					
Vertical										
HR0.1343										
PN1001	LA43.593	LN12.250	EL147.46	MRT.SP						
PN1001	N 487884	E 774279	EL106.4096	MRT.SP						
TVD 0.070	7/00 000	TURANT	TOTO.							

Figure 3.15



3.1.5 Print

The <u>Print</u> command opens a window that includes three tabs: print settings; printing styles; printing tables. <u>Print Settings</u> (*figure 3.16*) is the tab where you can set the printer you want to use as well as the page to print. Scale, origin, print area, and print sizes can be set here.

Print settings Printing styles Printing tables		
Set printer and page : Xerox Phaser 6121MFP GDI Set page Advanced printer settings Scale, origin and print size : Printing scale : 1:200 • 100 mm 100 mm	▼ Size set: [A4 (Vertical)] [210 x 297] Set origin : X = 55 Y = 98 Center in the sheet	Print area : Print drawing extension Print window Select window X max. = 10.000 Y min. = -10.000 Y min. = -10.000 D Limit printing to single window
	Exit	t Preview and print

Figure 3.16



In the <u>Printing Styles</u> tab, you can choose whether to set styles including thickness, terminations, joints using layer settings or choosing them as new ones. You can also import previously saved styles or save new ones (*figure 3.17*).

 Use I Use I Print style 0 1 2 	layer settings print styles le settings tabl Video 0 1 2 3	e Print	Thickness 0.10 0.10 0.10 0.10	· ·	Teminations Square Round	-	Joints Join	lanager			Open style
 Use ; Print style 0 1 2 * 3 4 5 	print styles te settings tabl Video 0 1 2 3	e Print 1 2	Thickness 0.10 0.10 0.10 0.10	• •	Terminations Square Round	-	Joints Join	•			Open style
Print styl	le settings tabl Video 0 1 2 3	Print 1 2	Thickness 0.10 0.10 0.10	•	Teminations Square Round	•	Joints Join	•	*	2	Open style
0 1 2 	Video 0 1 2 3	Print	Thickness 0.10 0.10 0.10	• •	Teminations Square Round	-	Joints Join	•		2	Open style
0 1 2 3 4	0 1 2 3	2	0.10 0.10 0.10	• • •	Square Round	•	Join	-			oponogio
1 2 -/ 3 4	1 2 3	2	0.10	•	Round						
2 -/ 3 4	2 3	2	0.10	-		· ·	Blunt	-			
-× 3 4	3	2			Pointed	•	Circular	-			Save style
4		3	0.10	-	Truncated	-	Pointed	-			
5	4	4	0.10	-	Truncated	-	Join	-			
0	5	5	0.10	-	Truncated	-	Join	-			
6	6	6	0.10	-	Truncated	-	Join	-			
7	7		0.10	-	Truncated	-	Join	-			
8	8	8	0.10	-	Truncated	-	Join	-			
9	9	9	0.10	-	Truncated	-	Join	-			
10) 10	10	0.10	-	Truncated	-	Join	-			
11	11	11	0.10	-	Truncated	-	Join	-	-		
					2						

Figure 3.17



The last tab, the <u>Printing tables</u> is dedicated to saving, deleting or loading print tables. In each of the tabs just described, you can click the print preview button (<u>Preview and print</u>) to see a layout of how it will print (*figure 3.18*).

Print	
Print settings Printing styles Printing tables	
List of saved print tables	
	Save table
	Delete table
	Load table
Table name]
Ext	Preview and print

Figure 3.18

3.1.6 DXF/DWG In

This function allows the system to import graphic elements as they are and since there are no topographic point entities in these type of files, you can force this choice, so that entities with attributes become points with dimension.



3.1.7 DXF/DWG Out

The program also has the ability to create a DXF/DWG file (*figure 3.19*), the first important choice to make is the version of AutoCAD® that you want to use to create the file. Then you can select entity options, especially if you want to include raster images, hatches, and topographic points. Finally, you need to indicate what attributes you want to define for the points and also how you want to obtain them, for example if you want to get them from the point label. In the general options section, you can enter the text size and you can also choose whether to create a 2D DXF file.

Create DXF / DWG files	—X —
Entities options	DWG options
Include raster images	AutoCAD Version :
Include hatches	AutoCAD 2000 -
Include topographic points	
Attributes to associate with points	General options
Point name	Text size 1
Description	
Point code	Create 2D DXF file
Height	(Set all heights to zero)
X coordinate	
Y coordinate	
Containing layer	
Retrieve attributes from point label	
Attributes on different layers	
Add point separate from the block	
Add name separate from the block	✓Create dxf/dwg
Add height separate from the block	
Add a description separate from the block	💥 Cancel





3.2 Zoom, notes and layer

The zoom, notes and layer sections (*figure 3.20*) are located close to the In / Out section because they are useful in file processing. The zoom has a number of magnification and screen-view features (*figure 3.21*). In the notes section, you will find the classic copy-paste function. The layer function is used to manage the various layers that are in the project (*figure 3.22-3.23*).



Figure 3.20



Figure 3.21





Figure 3.22



Figure 3.23



Layers can be managed through <u>Layer property manager</u> window by clicking the related icon in the main screen (*figure 3.24*, icon in red circle). In this window (*figure 3.25*), you can create new layers and delete others. There are available layers displayed and their classic features such as color and line type. From this window, you can print the contents of a layer and decide whether or not to show present names and symbols (clicking on the eye icon).



Figure 3.24

L	ayer p	proper	ty ma	nager										
	4	New			Delete		In use							Search
			Sel.	Name		On/Off	Lock	Color	Line type	Scale	Thickness	Print	Names	Symbols
	۰.	1	1	LAYER	_DEFAULT	9	<u> </u>			1	0.10	4	۲	۲
											~ •			
											💥 Car	ncel		Ok
ιĽ														

Figure 3.25



4. CAD

Clicking on the <u>CAD</u> tab (*figure 4.1*), it is possible to enter the area dedicated to CAD design and processing which is intended to support and complement the topographic features.





These functions are almost identical to those of AutoCAD® and the numerous CAD clones. These functions can be used in combination with osnap (object snap) modes (such as osnap on ends or on mid points). Note that by default the program starts with an active osnap on ends. This setting can be switched at any time by clicking on the <u>Osnap</u> button (on / off), shown in *figure 4.2* in dark gray, that means to be active.

Command :		
Meters X = -1.518 ; Y = -9.892 ; Z = 0.000 Elev. 0.00	Ortho Polar	Osnap Thickness 👯 Parameters grid 🔤 Tools bar 🝷

Figure 4.2

All the osnap modes are represented by the icons in the *figure 4.3*, hover over with the mouse and you will see a tooltip that suggests the functionality of the command.





Figure 4.3

4.1 Draw CAD entities

In <u>Draw</u> section, you can find commands for drawing CAD entities such as lines, polylines, polygons, and so on. Once you select an item you want to draw, just follow the instructions (represented as tooltips that will appear on the screen and commands to enter in the command line) to complete the command (*figure 4.4*, example of a tooltip on the screen; *figure 4.5*, example of the command line).



Figure 4.4



🔲 📃 1 en

 VV(7	1 ond	luno /	longth /	lond	drawing
 A, Y, 14	j enu	inte /	iengui /	renna	urawing
 					J

Figure 4.5

Often with the suggestions in the command line at bottom-left of the main screen, some other subcommands are available, they have a very intuitive use, however, there is a command that is worth analyzing, the <u>pro</u> command from properties (*figure 4.6*).

Select the entities to move ({confjirm / [pro]perties / points [fil]ter)		1 conf	2 pro	3 fil
--	--	--------	-------	-------

Figure 4.6

This command takes you to the <u>Quick entities selection</u> window, which consists of two tabs. The first, <u>CAD entities</u> (*figure 4.7*), allows you to select entities by referring to a characteristic or another, e.g. color and line type.



Quick entities selection	
CAD entities Topographic points	
Entities of the the layer :	Select layer
Entities that have the following color :	Select color
Entities that have the following line :	Select line type 🔻
Entities of the following type :	Select entity type
Overlapped CAD texts	
	😸 Cancel 🤣 Select

Figure 4.7

The second tab is called <u>Topographic points</u> and allows a selection of these according to the selected characteristic, as you can see in the *figure 4.8*, there is a wide range of characteristics to select, from points with a given symbol to points on the same fieldbook.



• Q	uick entiti	es selection		×			
CA	D entities	Topographic points					
	Points o	f the layer :		Select layer			
) Points v	whose text is of the follow	ving color :	Select color			
0	Points v	vith following symbol col	or :	Select color			
0	Points v	vhose symbol is :		Ż8Select symbol ▼			
0	Selection by point table						
0) Close ar	nd/or overlaped points -	Search Rad	ius =			
0) Points v	whose description includ	es :				
0) Points v	whose code contains :					
0) Point co	de corresponds to :					
0) Points v	whose name	Begins with				
0) Points o	f the fieldbook:	Select a fiel	ldbook			
0) Points v	vith associated resource	(image)				
			*	Cancel 🔗 Select			

Figure 4.8

Two commands in this CAD area also have subcommands, these are: <u>Circle</u> and <u>Arc</u> (*figure 4.6*). Subcommands are intended to provide alternative choices for drawing these two elements, for the circle for example, you can decide whether to draw it using 3 points, 2 points, or tangents and radius.





Figure 4.6

4.2 Modify CAD entities

In the <u>Draw</u> section, you can find all the functions for processing the CAD entities. Command names and icons are very intuitive, and each command has a tooltip that briefly explains what its functionality is. Among the available commands are fillet, join, explode and group, these commands are useful in working with CAD entity groups.

The <u>Properties</u> button opens a window that summarizes the properties of the selected entity, the system recognizes what kind of entity it is and down the window returns the entity type (*figure 4.7*, in this case it is the properties of a line).

There is also a command to copy the properties of an entity to another and a command to change the display order of the drawings (*figure 4.8*).



CAD entity properties		
Graphic layer	LAYER_DEFAULT	
Color	240	
Line type	From layer 👻	
Thickness	From layer 👻	
	· · · · · · · · · · · · · · · · · · ·	
		=
•••	· · · · · · · · · · · · · · · · · · ·	
•••		
	· · · · · · · · · · · · · · · · · · ·	
		-
Line properties	Cancel 🔗 Done	

Figure 4.7



Figure 4.8



In *figure 4.9* you can see the relative window of the <u>Edit poly</u>. command. The commands contained are used to modify a polyline, for example by inserting a vertex or removing it. The use is very simple, and like any other CAD command, just follow the suggestions that appear on the screen.



Figure 4.9



5. Measures

These functions (*figure 5.1*) are used to calculate and to have a set of information about survey data recorded.



Figure 5.1

5.1 Coordinates, distance, angle, area and calculations

The <u>Coordin</u> button when clicked will give you the option of choosing a point and then it will display the Cartesian coordinates (with the addition of the height) of that point, as shown in the *figure 5.2*.



Figure 5.2



The <u>Distance</u> button when clicked will give you the option to select two points and it will measure the distance between the two. The information provided by this function are the 3D distance, the horizontal distance, the component along the x-axis, the component along the y-axis, the azimuth angle and the zenith angle (*figure 5.3*).





The <u>Angle</u> button when clicked will give you the option to select 3 points, the starting point, the midpoint, and the end point. This function will calculate a clockwise angle and a counterclockwise angle and these measurements will then be displayed on screen as shown in *figure 5.4*.



Figure 5.4



The <u>Area</u> button when clicked will allow you to enter the first point where to start calculating the area, then the application will continue to ask you to select the next point (up to n points) to draw the shape of which you want to measure the area, after selecting the last point, just type the command <u>en</u> (from end command, in the command line) for the function to make up the calculation. The area and perimeter of the shape will then be displayed in the window (*figure 5.5*).





The <u>Entity list</u> button provides a list with the elements in the project, the list is presented as an editable text file. You can also select only few entities to be displayed in the list (*figure 5.6*).





Figure 5.6

6. Topography

In this section (*figure 6.1*), you can draw a new topographic point, change the features of an existing one, select the CAD entities to use for the new points and see all the points of the project grouped into a table. You can also create a printable file with a list of points.



Figure 6.1



6.1 Topographic points

The <u>New</u> command is used to insert new topographic points. By clicking on this button, you can open a working window (*figure 6.2*, Topographic point properties) and in this you can insert and customize the graphic properties you want the new point to have.

The properties are completely customizable (note that you can also create a point with the properties that the application sets by default, such as the cross as a symbol) and you can select the layer that you want the point to belong to. The <u>Select layer</u> window (*figure 6.3*) displays a list of available layers, all can be turned on or off, locked, and selected. You can also add new layers by clicking on the <u>Add Layer</u> button at the bottom left.

You can change the name of the point and the font used. You can also change the color of the text by selecting the choices in the window (*figure 6.4*, <u>Select</u> <u>color</u> window) that opens when you click the search button beside the Text color label. This window allows you to select a color from one of the available clusters, such as the grayscale or the work area background, or from the layer.

T	Topographic point properties					
	Point name	1				
	Graphic layer	LAYER_DEFAULT				
	Font	Arial				
	Text size (in ems)	4.000				
	Text color					
	Point symbol	+Cross -				
	Symbol size	2.000				
	Symbol color	1				
	Symbol angle (gon)	0.0000				
	Description	-				
	Point code	-				
	Offset X point - text	1.100				
	Offset Y point - text	0.667				
		🗱 Cancel 🛷 Done				

Figure 6.2



elect	layer							
List	of grap	hic layers:						
►	1	Name			On/Off	Lock	7	
1		X Add Laver] 🖕	Cancel		~ ·	Select	
	Ĺ			Curicer		× .	001000	

Figure 6.3



Figure 6.4



The symbol is another characteristic that can be personalized. You can choose an icon to attribute to the point (*figure 6.5*), you can define the size of the symbol, the color (with a selection window equal to the text color selection) and the rotation angle of the symbol. Offset X point-text and Offset Y pointtext are the positions of the text calculated from the point origin.

When all the graphic properties are set according to your needs, you can enter the point by locating the position with the mouse or entering the coordinates manually from the command line.

+ Cross	-
None	*
+ Cross	_
Circle	-
∆Triangle	
Square	
⊕Circle + Cross	
Gquare + Cross	
A Triangle + Cross	Ŧ

Figure 6.5

By clicking the <u>Characteristic points</u> button, you can select one or more CAD entities to create topographic points. In the <u>Characteristic points</u> window (*figure 6.6*), you can select a layer (having access to the Select layer window, as previously explained). You can enter the starting point name and delete the overlapping points. Within this feature you can filter even more thoroughly the CAD entities to use, you can do this by flagging the available choices.



Characteristic points						
Select CAD entities to use to create new topographic points						
Characteristic points						
Layer LAYER_DEFAULT						
Starting name for points 1						
☑ Delete overlapping points						
CAD entities to use for new points :						
End points of lines CAD Points						
Mid-point of the lines Center of the circumferences						
Vertices of polylines						
Vertices of hatches						
Vertices of 3D faces						
🗱 Ext 🤣 Done						

Figure 6.6

Particularly convenient is the <u>Properties</u> button (*figure 6.7*), once you select one or more topographic points you can use this feature to find out all their properties and also to modify them. The graphic aspect of this window is similar to that we encountered in creating a new point, but this also represents all the point coordinates and it will provide the possibility to change all the characteristics. You also have the opportunity to see if and what images are linked to a particular point (<u>Linked image</u> function).



Topographic point properties				
Description	- · · ·	-		
Point code	-			
Point text	[name]			
[name] -				
Insert 📦				
	*	ıl		
Offset X point - text	1.100			
Offset Y point - text	0.667			
Linked image				
r.m.s. X	0.000000			
r.m.s. Y	0.000000			
r.m.s. Z	0.000000			
Coordinate X (East)	1.429			
Coordinate Y (North)	0.622			
Coordinate Z (Height)	0.000			
Fieldbook measures	None	-		
Information :	Cancel V Done]		

Figure 6.7

By clicking <u>Point table</u>, you can create a table with all the points in the project that will be grouped together along with their coordinates, names, descriptions, codes, as shown in *figure 6.8* (an example of a table with 5 points in memory).



oint	X/East	Y/North	Z/Height	Description	Code
71	605767.614	5146874.880	1210.436		Fixed
2	605778.556	5146873.112	1210.300		Fixed
3 3	605800.002	5146871.970	1210.226		Fixed
7 4	605793.370	5146878.019	1209.994		Fixed
5	605781.887	5146873.739	1210.595		Fixed
<					

Figure 6.8

You can print the table with the <u>Print</u> button. This button will give you access to a text file editor where you will find the table with all the points (*figure 6.9*), at this stage the table can be changed in its fields, contents and graphic appearance.



S Cube-link editor							
File Edit View Insert Layout Tabella							
al I 🗅 🖨	🗎 🗠 🕞 🕹 🖿 🔒	00000					
					47 J 1008		
Nomal	 Verdana 	• 11	• u 1 <u>s</u> = s		3= 1004 ▼ ¶ ∟		
6.0							
Г							
*		Topograpi	nic Point Cor	ordinatos T	able		
	Point	Y	v	7	Description		
-	1001	774279 531	4878841 315	106.410	MRT SP		
	1002	774280 698	4878842 893	106.423	BSP		
	1002	774279 594	4878843.203	106.358	GRD SOM MRT		
	1004	774278 624	4878842.045	106 357	GRD SOM MRT		
	1005	774276 793	4878843 546	105 629	GRD SOM MRT 125		
	1006	774278.568	4878843.809	106.032	GRD.SOM.MRT		
	1007	774277,700	4878844.562	105.699	GRD.SOM.MRT		
	1008	774274.728	4878845.248	105.553	MRT.SP.L150		
	1009	774264.623	4878857.614	102.973	MRT.TG		
	1010	774262.814	4878856.732	104.900	MRT.TG		
	1011	774249.587	4878870.567	104.242	MRT.SP		
	1012	774245.929	4878873.939	104.219	MRT.SP.CRD		
	1013	774244.841	4878873.165	104.318	CRD		
	1014	774241.357	4878873.086	104.468	CRD		
	1015	774240.117	4878873.550	104.455	CRD		
	1016	774239.192	4878874.884	104.409	CRD.TG		
	1017	774242.307	4878872.946	104.476	CRD		
	1018	774245.379	4878858.276	105.126	CRD		
	1019	774245.494	4878859.594	105.051	CRD		

Figure 6.9



7. Tools and Commands

7.1 Tools and commands of the software

List of all commands that can be used by the command line (*figure 7.1*) of the program:

Command	Description		
OPEN	Opens projects (Cube-link files with extension .cubelnk)		
SAVE	Saves the project (with extension .cubelnk for a normal file, with extension .cubetpl for a template file)		
NEW	New project		
DXFIN	Imports dxf/dwg files		
ASCIIIN	Imports generic ASCII files		
SHAPEIN	Imports Esri Shape files		
RW5IN	Imports RW5 files		
CUBEAIN	Imports Cube-a files		
GEOGISIN	Imports GeoGis files		
DXFOUT	Creates dxf/dwg files		
KMLOUT	Creates a KML file for Google Earth		
SENDCAD	Sends selected entities to AutoCAD®		
PRINT	Prints the drawing		
COPYNOTES	Copies CAD entities to notes		
PASTENOTES	Pastes the CAD entities from notes		
SETTINGS	General program settings		
QUIT	Closes the program		
2DVIEW	Enables 2D view		
3DVIEW	Enables 3D view		
TABLETMODE	Enables or disables Tablet mode		
ZOOMLI	Zoom limits		
ZOOMIN	Zoom in		
ZOOMOUT	Zoom out		
ZOOMWI	Zoom window		
ZOOMPT	Zoom on topographic point		
DYNPAN	Activates dynamic pan		
ZOOMMA	Enables/disables zoom window		
AERIALVIEW	Enables/disables the panoramic view		



POINT	Draws a point at the selected location			
LINE	Line on2 points			
CIRCLE	Circle with choice of options			
CIRCLECE	Center and radius circle			
CIRCLE3P	3-point circle			
CIRCLE2P	2-point circle			
CIRCLETTR	Tangent, tangent and radius circle			
ARC	Enables arc design options			
ARC3P	Arc on 3 points			
ARCCE	Arc center, radius, beginning and end			
ARCBE	Arco beginning, end and radius			
POLYLINE	Draws polylines			
RECTANGLE	Draws a rectangle			
POLYGON	Draws a regular polygon			
ELLIPSE	Draws an ellipse			
DELETE	Deletes CAD entities			
MOVE	Moves CAD entities			
COPY	Copies CAD entities			
ROTATE	Rotates CAD entities			
OFFSET	Offset of the CAD entity			
JOIN	Connects to entities			
FILLET	Connects with arc			
EXTEND	Extends an entity to the limit			
TRIM	Trims entities			
BREAK	Breaks entities			
GROUP	Groups CAD entities			
UNGROUP	Ungroups CAD entities			
EXPLODE	Explodes complex CAD entities			
PROPERTIES	Modify the properties of CAD entities			
COPYPROP	Copies properties from a CAD entity			
DRAWINGORD	Changes view order			
FOREORDER	Brings to foreground			
BACKORDER	Sends to background			
INSPTONPOLY	Inserts polyline vertex or profile vertex			
DELPTONPOLY	Deletes a vertex from a polyline or a profile			
MERGEPOLY	Joins two polylines into a single polyline			
POLYINHEIGHT	Sets all the vertices of a polyline to a set height.			



LAYER	Opens the layer properties manager window	
LAYERFROMENT	Activates layer from entity properties	
CURRLAYER	Moves on current layer the selected entities	
ISOLALAYER	Isolates the layers of the selected entities	
LAYEROFF	Turns off the layers of the selected entities	
LOCKLAYER	Blocks the layers of the selected entities	
LAYERONOFF	Turns the current layer on or off	
ALLLAYERON	Enables all layers	
UNLOCKLAYERS	Unlocks all layers	
VIDEOTHICK	Displays video thicknesses	
SYMBOSNAP	Sets the osnap symbol size	
ROTAXES	Sets the cursor axes rotation	
AXESSIZE	Sets the cursor axes size	
VIDEOSCALE	Scales the video display	
GRAPHICBGROUND	Sets the background color of the graphic window	
CURSORINFO	Sets dynamic information on the cursor (values from 1 to 7)	
ORTHO	Enables/disables Ortho	
OSNAP	Enables/disables osnap	



Figure 7.1

In commands that involve selecting CAD entities or topographic points, with the right-click you can enter a menu that allows you to access a quick entity selection. Selection takes place through the choice of the respective properties and is divided into topographic and CAD entities. From this window, you can also quickly access the entity properties window (*figure 7.2*).



1	Confirm selection	
	Invert selection	
*	Undo selection	
	Select all	
4	Quick selection	
10	Properties	

Figure 7.2

The project manager panel (*figure 7.3*, middle-left part of the main screen), is a tree structure that contains all the topographic and raster entities present in the project. You can select topographic entities and use them as an alternative to graphic selection.



Figure 7.3



The project manager panel can be switched on or off by pressing the <u>Show/Hide</u> button at the bottom left (*figure 7.4*).



Figure 7.4

At the bottom of the screen, you can see the coordinates of the elements in the project, enable or disable the osnap mode, the ortho view and the polar view. Also thicknesses and grids can be activated or deactivated. By clicking the <u>Tools bar</u> button (*figure 7.5*), you can customize the layout and display of available shortcuts (*figure 7.6*, available shortcuts, to reposition them click on the 4 lateral points to drag and drop the commands).



Figure 7.5





Figure 7.6

Whenever you try to insert a new file with an existing project already open, a window will open (*figure 7.7*) and you can choose what to do, whether to add the file to the present or to proceed differently.



Figure 7.7



At any time, you can read the characteristics of the elements the project by hovering over the elements with the mouse, the application will display a window like the ones in figure 7.8 that will describe the element type and its characteristics.

- CAD entity -	- Topographic point -
CIRCLE	Name : Pt9
Layer : 0 Xc : 531461.629 Yc : 4996364.619 Zc : 35.231 Radius : 0.810 Circumference : 5.091 Area : 2.062	Layer : point X : 531460.337 Y : 4996363.391 Z : 33.020 Description : Code :

Figure 7.8



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