Tools, Tips, and Workflows
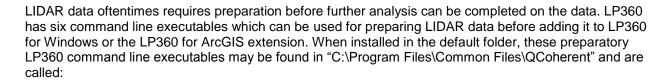# Command Line Executables For Preparing LIDAR Data
LP360

B S A U | A W G

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LIDAR data oftentimes requires preparation before further analysis can be completed on the data. LP360 has six command line executables which can be used for preparing LIDAR data before adding it to LP360 for Windows or the LP360 for ArcGIS extension. When installed in the default folder, these preparatory LP360 command line executables may be found in "C:\Program Files\Common Files\QCoherent" and are called:

- LDFltLine – Assign Point Source IDs (Flight line numbers)
- LDImport – Convert ASCII or MG4 data files to the LAS format
- LDMerge – Combine multiple LAS files into a single LAS file
- LDPyramid – Generate pyramid files for visualizing and processing in LP360
- LDReorder – Reorders the data spatially within the LAS file
- LDThin – Thin dataset removing every nth point

It is important to note that the type of LIDAR data itself (Mobile, Airborne or Terrestrial Scanner) may help determine which executables are needed for the preparation process. The collection criteria, such as nominal point spacing, and the desired analysis will also play a factor.

There are multiple advantages to using the LP360 command line executables, including:

1. The LD*.EXE command line executables use neither an LP360 nor an ArcGIS license and thus can be run on any machine which has the command line files installed.
2. Commands can be run on an entire folder of LAS files or specific files.
3. Commands can be batched with other LP360 command line executables.
4. Commands can be kicked off to run overnight or on a weekend.
5. Data is ready to be loaded directly into LP360 once complete.

LDPyramid is the most commonly used command line executable for preparing all three kinds of LIDAR data. It is designed to create the pyramid files that LP360 uses when displaying data. Generally the thinning factor is set to 16 as a default value, although this can be changed to be set anywhere between 2 and 99. The smaller the thinning factor, the fewer changes will occur when zooming into data within LP360. It is recommended to always pyramid data files before using them in LP360. LP360 by default will generate pyramids for files which do not have any when you first load the data into the software.

Example: LDPyramid.exe -f 16 E:\SampleData*.las	
LDPyramid.exe Command Line Parameters	
-h	Display usage information

-f	The thinning factor, i.e. the ratio of the number of points between adjacent thinning layers of the point pyramid.
las_files	LAS files, wildcards allowed, to pyramid.
qvr_files	QVR files, wildcards allowed. Corresponding LAS files will be repyramided.

Terrestrial Scanner LIDAR data will commonly require the most preparation before it can be used within LP360 due to the nature of how the data is structured. If the data is still in the original XYZ format, then the first preparation step is to run the **LDImport** command. This will convert the XYZ files into the LAS format needed for LP360.

Example: LDImport.exe -l 1.2 -o E:\Sample_Data\Seattle\LAS -s 1 -fc 2 -t1 x -t2 y -t3 z -d 1 E:\Sample_Data\Seattle*.xyz

LDImport.exe Command Line Parameters

-h	display usage information	-t<n>	Field type, where n is the field, or column
-l	LAS file version	x	X, or easting, coordinate (REQUIRED)
-m	Point record type	y	Y, or northing, coordinate (REQUIRED)
-mg4	Files to import are MG4 (LizardTech LIDAR) files	z	Z, or altitude, coordinate (REQUIRED)
-o	Output directory	i	Intensity
-p	Projected coordinate system, annotate with given EPSG code	c	Classification
-g	Geographic coordinate system, annotate with given EPSG code	m	Return number
-s	Start line, 1-based	n	Number of returns in this point's return set
-fc	Force classification attribute of all points to given value	r	Red band intensity
-d	Delimited file, with delimiter n	g	Green band intensity
	1	Space (" ")	b	Blue band intensity
	2	Tab	a	Infrared band intensity
	3	Whitespace (1 or more spaces or tabs)	tg	GPS Week Time timestamp
	4	Comma (",")	tp	Adjusted Standard GPS Time timestamp

	5	Colon (":")	u	Unknown/ignore
	6	Semicolon (";")	sc	Scanner channel
-w\<n\>		Field width, where n is the 1-based field number	sa	Scan angle
			ud	User data
			f	Flightline, or point source

Once the data has been converted to LAS format, it then needs to have the points re-ordered in such a manner that points close to each other spatially are near to one another in the LAS file, which is accomplished using the **LDReorder** command. The point of this step is to make processing and classification of the data easier in later steps. The process will result in the creation of a new set of LAS files.

Example: LDReorder.exe E:\Evaluation\Sample.las			
LDReorder.exe Command Line Parameters			
-h	display usage information	-x \<size\>	initial quadrant size in x dimension
-o	output filename	-y \<size\>	initial quadrant size in y dimension
-q	quiet	-z \<size\>	initial quadrant size in z dimension
-v	verbose		

Both Terrestrial Scanner and Mobile LIDAR data frequently have high point densities which can make analysis difficult. A user may wish to reduce the dataset by removing every so many points. For instance, if a user wishes to half the size of a LIDAR dataset, they would remove every other point. This is accomplished through the use of **LDThin** command. The process is run on all classes and all returns in the order that the data is arranged within the LAS file.

Example: LDthin.exe E:\Case_Data\Evaluation\13_62258585.las -d 2			
LDThin.exe Command Line Parameters			
-h	display usage information	-v	verbose
-o	output filename (default is \<input_base_name\>_thin.las)	-a	Remove all points
-q	quiet	-d n	Remove points, keeping 1 of n points

There are times when LIDAR points, particularly with airborne data, may not have flightline (point source) IDs assigned to them. This lack of ID on the flightline means that the data cannot be displayed nor filtered using the Point Source ID. Hence, instead of showing separate colors for each flightline when displaying the Point Source ID Legend Type, data without any flightline IDs will display as a single color. A flightline

ID is also required in order to reclassify by flightline within LP360. The **LDFltLine** command can be used to assign numbers to specific files incrementally based off a given start number.

Example: LDFltLine.exe E:\Sample_Data\Sources*.las -s 7			
LDFltLine.exe Command Line Parameters			
-h	Display usage information	-c	Copy flight line number from other point record field
-s	First flight line number	-ubf	Force writing flight line number to LAS 1.1's 2-byte point source ID

Should one wish to amalgamate several smaller files into a single larger file, then one would utilize the **LDMerge** command to prep the dataset. The smaller files may have been generated to accommodate other software that cannot handle large amounts of data in the same manner as LP360.

Example: LDMerge.exe –o E:\Case_Data\Evaluation\MergedLAS.LAS			
LDMerge.exe Command Line Parameters			
-h	display usage information	-q	quiet
-o	<output> output filename	-v	verbose

These six executables provide a basic introduction to LP360 command line executables and what they can accomplish outside of the LP360 GUI interface. The next step in the process of preparing the LIDAR data is to perform file analysis on the dataset. Look for additional information on these additional LP360 command line executables and point cloud tasks to be covered in a future publication of LP360 News.