

Operator's Manual

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1 Introduction

The applications included in the product are separated into three functional components:

Data Logger which is responsible for acquiring data from the various tools and other sources and logging this data into the database.

2 Data Logger Operations

The Data Logger application is used to create a database for storage then acquire data and log this data into the database. The Data Logger is designed as a startup wizard-type application that will walk the user through each step in the creation of the database and the configuration of the tool and equipment used.

2.1 Equipment

The equipment supplied is used for depth tracking in conjunction with the Data Logger application. Equipment used for depth tracking operations are:

2.1.1 Geolograph Line Encoder

The Geolograph encoder has a resolution of 25 counts per foot of block travel and is Atex certified for hazardous area usage. The Geolograph encoder is scaled using the Data Logger 2 step calibration procedure.

2.1.2 Drum Shaft Encoder

The drum shaft encoder is Atex certified and is adaptable to either 1" – 14 UNS or 5/8" – 18 UNF threaded shafts. The resolution of the encoder is 25 counts per revolution and is scaled using the Data Logger 4 step calibration procedure.

2.1.3 Hookload Sensor

There are 2 hookload sensors available:

200 PSI for attaching to a pancake for deadline weight measurement

2000 PSI for attaching to the weight indicator at the driller's station

The hookload sensors are scaled using the Data Logger 2 step calibration procedure.

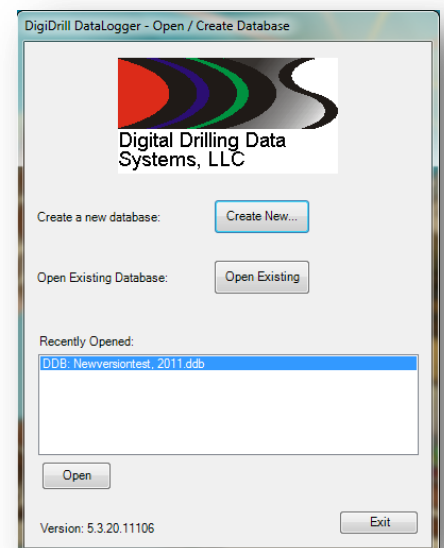
2.2 Setup

The Data Logger is implemented as a wizard-type startup application that simplifies the steps required for proper operation. Once each step is completed the wizard will automatically configure itself for the next step in the process.

2.2.1 Job Setup

The Data Logger is responsible for creating a master database for all recorded data. Since each database represents a unique job and track/side track the tie-in survey information will also be included here. The first step is to create a database for your project.

The second step in the startup process is to enter all the job information in the following screens. Once each screen is completed, press the next button.



2.2.2.1 Job Info

The following screen allows you to enter in the information about the rig into the database.

2.2.2.2 Tie-In

The second window contains any Tie-in information that is needed for the project. The current heading data, measured depth, tool offsets, log interval would be entered on the second page. Once the information has been entered, press the next button.

North Reference – This is used to identify what type of north reference is to be used for surveying. This will appear as a label on the **Survey Report** printout to either TRUE or GRID north.

Toolface – Used for steering tools, this defines the offset of the directional sensors to the high-side of the BHA.

Survey – The distance of the survey sensors to the bit

2.2.2.3 Gamma Configuration

Proper gamma sensor calibration requires that a standard-rate calibration source be used to scale the gamma data to API units. When a new database is created the parameters for the gamma calibration are adjusted so that there will not be any API calibration applied to the gamma data received from the tool. If the user prefers to use a single factor for calibration then this parameter may be entered into the Collar Attenuation Factor.

If API calibration is desired then the following steps describe the process required:

Background Counts – This is the count rate for the sensor being used and the environment the sensor is exposed to. The background counts will differ due to the following:

The natural gamma rays emitted from the earth at the current geographical location

Gamma rays emitted by the sun

The sensitivity of the gamma sensor used

Gamma ray attenuation of the tool housing

Gamma rays emitted by drill pipe or other materials in the immediate area.

The API factor calculation will use this as a baseline count rate. Measure this reading from the tool and record it.

Hot Counts – After the background count rate is acquired then wrap the calibration blanket around the tool and record the count rate.

API Calibrator Rate – This measurement is recorded on all calibration sources and will differ from one to another.

Background Counts – The count rate of the gamma sensor without any gamma source applied. (See below)


Hot Counts – The count rate of the gamma sensor with the calibration blanket wrapped around the tool. (See below)

API Calibrator Rate – The API count rate marked on the gamma blanket used for calibration. (See below)

Collar Attenuation Factor – The calculated amount of gamma ray attenuation that the drill collar will introduce. This factor may be calculated by pressing the Calculate button then entering the collar O.D. and I.D. or the user may enter their own factor manually.

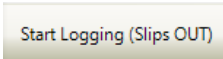
Gamma Offset To Bit – The distance of the gamma ray sensor to the bit.

2.2.2.4 Tools

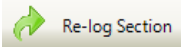
To add a tool to the project, click the  button and select the device that needs to be added to the project. You may also use the auto-detect button to have the data logger will listen and try to add the devices automatically. Once you have the settings complete, press the done button.

2.3 Option bar

2.3.1 Start Logging

To start the logger, press the  button to start gathering data.

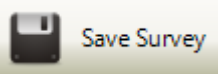
2.3.2 Re-Log Section

When it is necessary to re-log a section of data, the  button can be used to remove the old data that needs to be replaced. When clicked, the program will ask for a depth range to delete. It will prompt the user with a series of warnings and information on how to proceed.

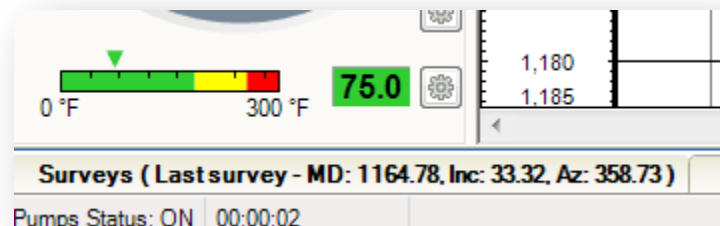
2.3.3 Data Editor

The details of the Data Editor will be covered in section 3

2.3.4 Save survey

The  button allows the user to quickly add a survey. The default value will be at the depth the user was at when the button was clicked.

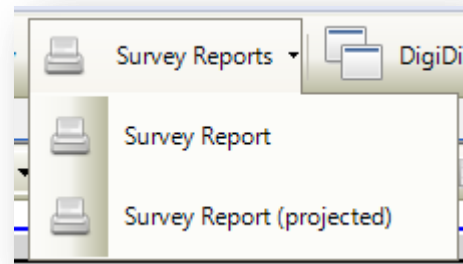
You can also see the list of surveys by highlighting the Surveys tab at the bottom of the screen.



2.3.5 Survey Reports

The survey report will show a clean picture of all the survey information on the current project.

The second option is the survey report that includes projection data on the report.



Survey Report
Digital Drilling Data Systems, LLC

Company: _____ Location: _____
Well: _____ Rig: _____
API or UWI: _____ Job Number: _____
State: _____ Operator: _____
County: _____ Magneto Declination: 0.00
Comment: _____ Proposed Azimuth: 0.00
North Reference: TRUE

Tie-In Data:

MD	Inclination	Azimuth	TVD	N/S	EW
0.00	0.00	0.00	0.00	0.00	0.00

Survey Data:

MD	Inclination	Azimuth	TVD	N/S	EW	CA	CD	V/S	DLS
1162.51	36.66	359.64	1004.80	359.39	-2.26	359.64	359.39	359.39	0.19
1163.70	33.90	357.93	1086.77	360.07	-2.27	359.64	360.00	360.07	248.33
1164.78	33.32	358.73	1086.67	360.67	-2.29	359.64	360.68	360.67	67.86

2.3 Real – Time Display

Descriptions for the data displayed on this screen are:

Block Height – Sent via the WITS system or generated internally by using the depth tracking equipment.

Bit Depth – Sent via the WITS system or generated internally by using the depth tracking equipment. Bit depth will only change if the slips are out. The Data Logger uses this depth for data logging.

When using the supplied depth tracking equipment the display to the right of Bit Depth indicates the bit status as **On Bottom** or **Off Bottom**. This is important when using a hookload sensor for automatic slips detection. If the bit is **On Bottom** and the hookload weight falls below the **Threshold Weight** defined earlier then the slips will **not** automatically be removed. This is to prevent errors in depth tracking when weight stacks up on long lateral drills.

A screenshot of a real-time display screen with a grid of 12 digital readouts (DROs) arranged in 4 rows and 3 columns. Above the grid are three status indicators: 'Slips In' (red dot), 'Off Bottom' (green dot), and 'Pumps Off' (green dot). Each DRO has a label above it and a numerical value displayed in green or red. The labels and values are as follows:

Block Height	Hookload	Pump Pressu...
0.0	0.0	0.0
Bit Depth	WOB	Rotary RPM
0.0	0.0	0.0
Hole Depth	ROP	Voltage
0.0	0.0	0.0
Inclination	Azimuth	API
0.0	0.0	0.0
Mag. Total	Grav. Total	Dip
0.0	0.0	0.0
Survey MD	Survey TVD	Survey VS
0.0	0.0	0.0

Hole Depth – Sent via WITS or generated internally by using the depth tracking equipment.

ROP – Sent via WITS or generated internally by using the depth tracking equipment. This data is also logged into the database for plotting.

Hook Load – Sent via WITS or generated internally using the hookload sensor. This data is also logged into the database.

Ref. Hkld – Also known as the **Off Bottom Weight**, this parameter is used to calculate the Weight On Bit (**WOB**) which is logged into the database. This parameter is only used if the hookload sensor is utilized in conjunction with the depth encoder.

The Data Logger assigns this value when the slips are automatically removed due to the hookload weight exceeding the threshold weight defined earlier. When the slips are removed the hookload weight will be averaged for 5 seconds then assigned as the **Reference Hookload**. Once drilling commences any deviation from the **Reference Hookload** would be considered **Weight On Bit**.

WOB – Sent via WITS or generated internally by using the hookload sensor and the slips in/out detection algorithms. (See **Ref. Hkld** above)

Gamma – Received from the tool and logged into the database.

Gamma API – Calculated internally by applying the **API Calibration Factor** and the

Pump Pressure – The pressure currently in the pump.

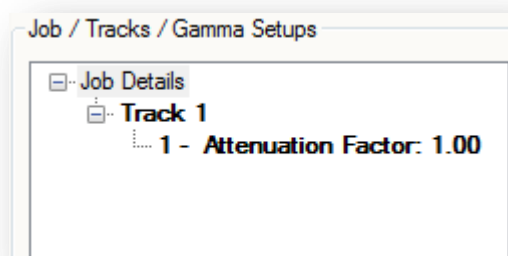
Temperature – Received from the tool and logged into the database for plotting.

2.3.3 Job Center

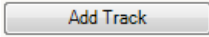
The job Center contains information about the current project and different tracks that have been drilled.

2.3.3.1 Job Details

If job details needs to be modified, IE field name, rig information, etc. You can do so by highlighting the job details on the left hand side of the job center.

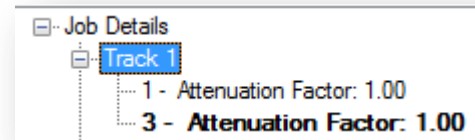


2.3.3.2 Adding tracks

When you have the job details highlighted, you will be able to click  button in order to add a track. It will prompt you two times with warnings. It will also make it the active track. You will also be able to change the Tie-in details on the right.

2.3.3.3 Adding Gamma setup

Additional Gamma Setups can be added to each track by selecting the Add Gamma Setup. Two warning prompts will appear asking if you wish to create the gamma and if you want to set it to the active gamma settings.



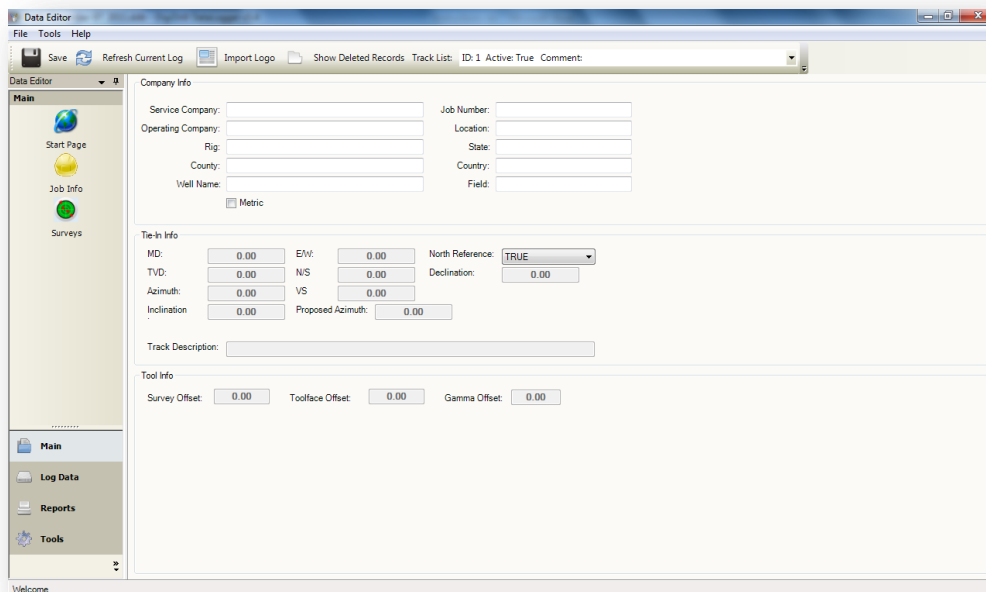
2.3.4 Job Center

The tool center holds the information about your current tools and allows you to change the settings for the devices you have selected.

3 Data Editor

The Data Editor application allows for data editing and exporting LAS files. It tightly integrates the all values (Gamma, ROP/WOB, Temperature, etc.) as well as job/company information and directional surveys. The Data Editor also allows the user to generate survey reports directly from the editor.

The Data Editor has an interface which is broken down into tabs which separate the data types being edited. When the application is being opened from the datalogger you will see the following screen.



3.1 Navigating the data editor

Along the left hand side you will see several options. By default you should see the main tab. Most of your data will be under log data and las tools will be located Tools tab. Additional reports can be found inside the reports tab.



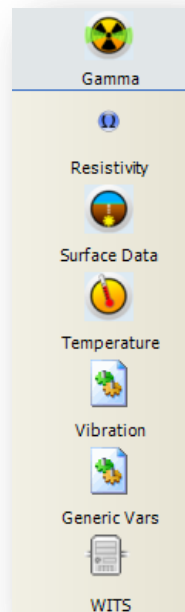
The start page is a screen that you can open databases from. When you open the data editor program from outside of the data logger, this will be the first page you see.



Job Info The job information tab will show you the company information you entered when first setting up the job. You may change your information here if so desired. Please note, you cannot change your Tie-In information here.



Surveys The survey button will display all the current surveys you have in the database. You can change the MD, Inclination and Azimuth on this screen.



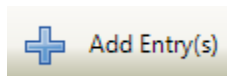
Under the Log data tab, you will see the different types of data that is currently being logged into your database. Each screen has a graph showing the data and different values at each point. Many of the values may be modified to fix any incorrect values you may find.



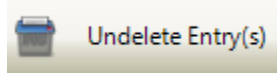
Import and las export options are the two features that allow you to create and import las data.

3.3 Manually changing data

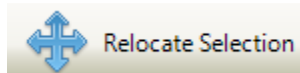
The options below are the same no matter what data type you're viewing. Each one will function in the same way.



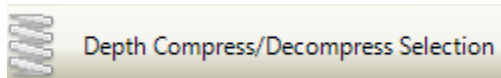
To add a new entry press this button and it will ask you for the values to place inside the field. Once you place the correct data, just press ok and it will add it into the database.



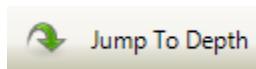
To recover deleted entries press undelete entries button. If you cannot see your deleted values make sure you press the show delete values button on the top of the data editor screen.



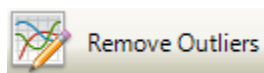
If you need to move a value to a different MD, you can change the entries using this command. The option needs to know by how much you need to change the value.



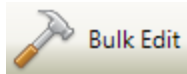
If you need to compress or decompress a selection, you may use this button. It will display the start and end depth in addition to the point in which you want to stretch it to.



Jump to depth is a handy tool that allows you to instantly move to the closest entry at a given depth.



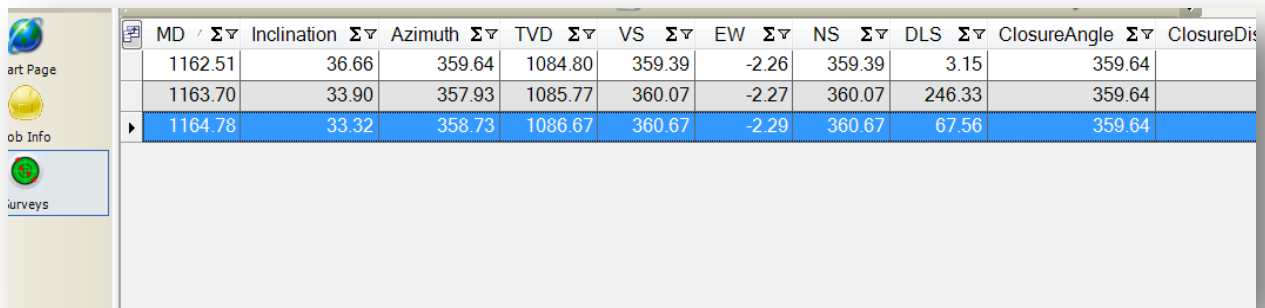
This option allows you to remove values that are on the extreme edges of the database. Simply place the min and max range for data and you can see how it will look before and after the suggested change.



If you need to change a large amount of values, this is the tool that's needed. You will be asked which values will be changed and to what you want to set them at.

3.3.2 Deleting an entry

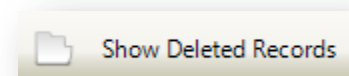
Surveys and data points can be deleted by selecting the row representing the point you wish to delete.



MD	Inclination	Azimuth	TVD	VS	EW	NS	DLS	ClosureAngle	ClosureDis
1162.51	36.66	359.64	1084.80	359.39	-2.26	359.39	3.15	359.64	
1163.70	33.90	357.93	1085.77	360.07	-2.27	360.07	246.33	359.64	
1164.78	33.32	358.73	1086.67	360.67	-2.29	360.67	67.56	359.64	

Then press the “del” key on the keyboard, and the data will be removed.

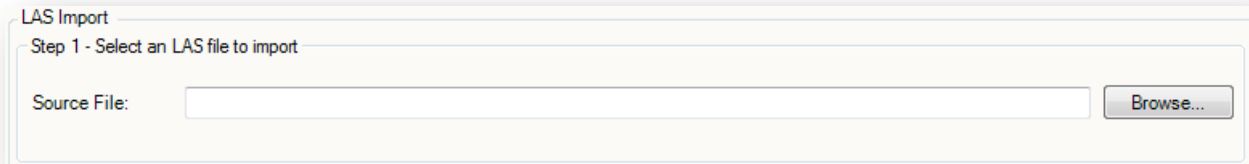
3.3.3 Seeing and recovering deleted Entries



In order to see deleted entries you must select the show deleted records button at the top of the screen. Once you have done so, you can see the values that have been removed. In order to recover them, simply press undelete entries button on the top hand bar.

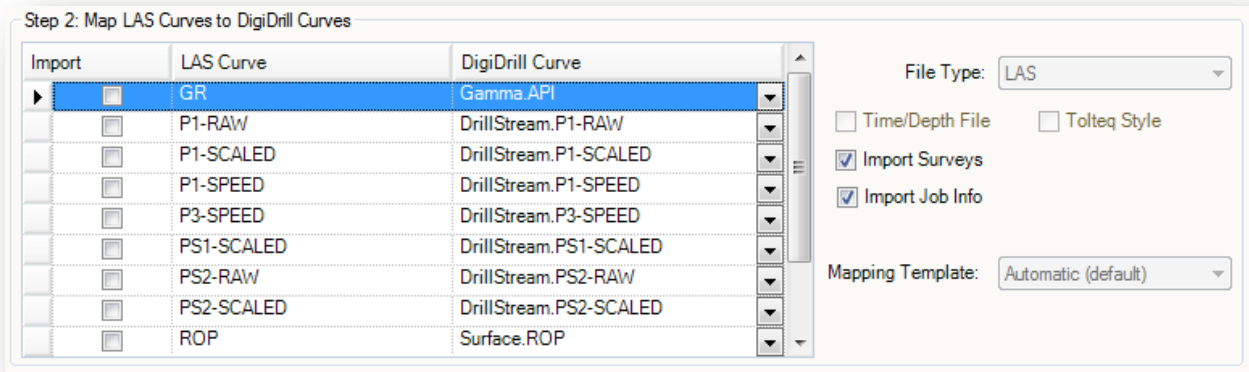
3.4 Importing LAS files

In order to import a las file into your database. You must select the tools on the left hand menu. Once you do this, you will see several options for exporting and importing your LAS files. Press the import to get the next set of options.



The screenshot shows a window titled "LAS Import" with a subtitle "Step 1 - Select an LAS file to import". It features a "Source File:" label followed by a text input field and a "Browse..." button.

On the screen to the right you will see three step processes in importing your data. The first step is to simply click the browse button and locate your LAS. Once you have the file selected you wanted head to the next steps.



The screenshot shows a window titled "Step 2: Map LAS Curves to DigiDrill Curves". It contains a table with three columns: "Import", "LAS Curve", and "DigiDrill Curve". The "Import" column has checkboxes for each row. The "LAS Curve" column lists various curves, and the "DigiDrill Curve" column shows the corresponding database location, with a dropdown arrow next to each. To the right of the table are settings for "File Type" (set to LAS), "Time/Depth File" (unchecked), "Toltec Style" (unchecked), "Import Surveys" (checked), "Import Job Info" (checked), and "Mapping Template" (set to Automatic (default)).

Import	LAS Curve	DigiDrill Curve
<input checked="" type="checkbox"/>	GR	Gamma.API
<input type="checkbox"/>	P1-RAW	DrillStream.P1-RAW
<input type="checkbox"/>	P1-SCALED	DrillStream.P1-SCALED
<input type="checkbox"/>	P1-SPEED	DrillStream.P1-SPEED
<input type="checkbox"/>	P3-SPEED	DrillStream.P3-SPEED
<input type="checkbox"/>	PS1-SCALED	DrillStream.PS1-SCALED
<input type="checkbox"/>	PS2-RAW	DrillStream.PS2-RAW
<input type="checkbox"/>	PS2-SCALED	DrillStream.PS2-SCALED
<input type="checkbox"/>	ROP	Surface.ROP

You will see a list of different curves that digidrill has located in the LAS file. The checkmark boxes to the left-hand side allow you to hand pick which files will be imported into your database. The LAS curve simply gives the name of the column from your LAS file. The digidrill curve shows you where it will be placed into the database. If you need to change the location of where it is importing the data to, simply click the drop down icon on the digidrill curve.

Step 3: Select a destination DDB for imported data

Destination database (DDB):

Destination Track:

Destination Gamma Config:

The last step is to tell digidrill where you want to place the data. If you want it in the current database you may simply select your database from the browse button. You may also select the destination track and gamma configuration from this step.

3.5 Exporting LAS

When wanting to export an LAS, press the tools button on the Left-Hand menu near the bottom of the program. The options on the Left-Hand menu will change and allow you to select the Export LAS option.

The Screen to the right will update to show the following.

Export

Track:

Available Curves:

Curve Group	Name	Unit	Range
<input checked="" type="checkbox"/> Anadarko			
<input checked="" type="checkbox"/> DrillStream			
<input checked="" type="checkbox"/> Generic Variables			
<input checked="" type="checkbox"/> Gamma			
<input checked="" type="checkbox"/> Surface			
<input checked="" type="checkbox"/> Survey			
<input checked="" type="checkbox"/> Temperature			
<input checked="" type="checkbox"/> Vibration			

Column Settings and Layout (drag to re-order):

← Move Left

Move Right →

— Remove Curve

↺ Clear All

Depth Scale:

Start Depth:

Stop Depth:

Step:

Gap Fill:

Null Value:

☐ Include Surveys

☐ Project to bit

☐ Hide Log Column Headers

The options you see on the screen will show the different values you have in the database. If you have not started logging and have no gamma in the database, it will not display those values here for the LAS export. Once you do have values in the database you can select them from the expand/collapse options.


In order to add a curve you must select the value you wish to place into the LAS file. Once you have it highlighted, click “Add Curve” and the program will know to add the file.


Gamma			
API - API corrected gamma counts at...	API	1000.29 - 1285.19	
API_1 - API corrected gamma counts at...	API	1000.29 - 1285.19	
APIDown - API corrected gamma counts...	API	1001.60 - 1285.19	
APIDown_1 - API corrected gamma...	API	1001.60 - 1285.19	
+ Add Curve			


Once you have selected all the curves you wish to add. You can see near the bottom what will be placed into the LAS.


Column Settings and Layout (drag to re-order):

	Gamma.API	Surface.ROP
Apply Smoothing	<input type="checkbox"/>	<input type="checkbox"/>
Smoothing Level	1	1
Apply Formula	<input type="checkbox"/>	<input type="checkbox"/>
Formula	<input type="text"/>	<input type="text"/>
DisplayName	GR	ROP

 Move Left

Move Right 

 Remove Curve

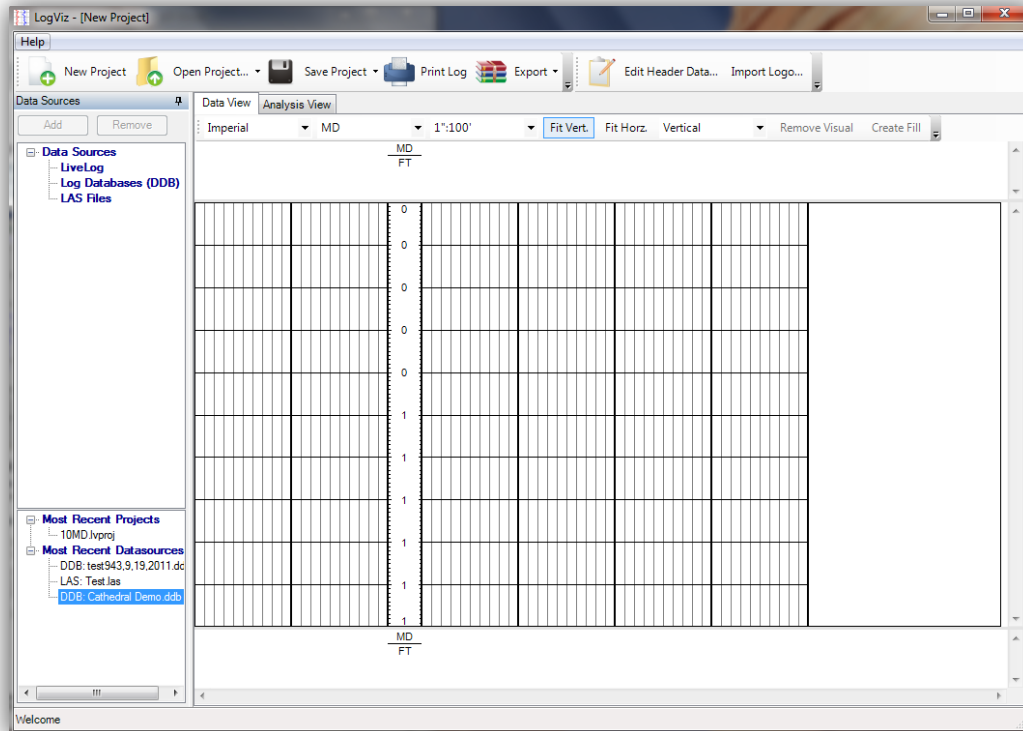
 Clear All

The order in which you see the values on the list above is the order they will appear on your LAS. You may move them left and right to your liking or even remove them.

Once you're ready, click the Export and it will ask for a name and save the file.

4 LogViz

The Logviz application is used to extract logging data from the database and generate MWD plots on continuous paper printers. Since this is a separate application from the Data Logger all logging functions will not be affected during this operation.

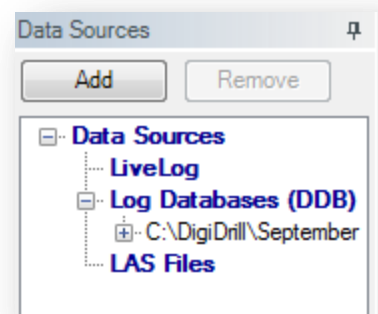


4.1 Adding a new project

To open a new project simply click the Open project button on the top right side of the window.

To open a database simply click on the add button on the data sources window.

Once you open your database, it will be added to the recent project list on the lower left hand side of logviz.

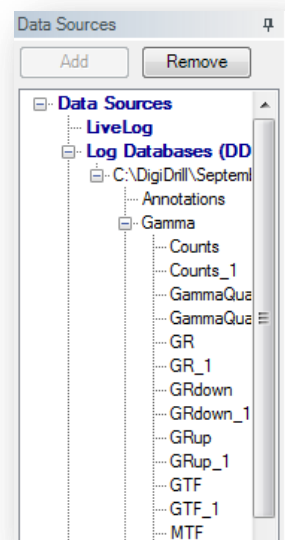


4.2 Adding a Curve to a Track

To add a data curve to a track:

Click on the database on the left hand side to see your values.

When you want to add a curve, drag the value to the graph.



4.3 Formatting a Curve

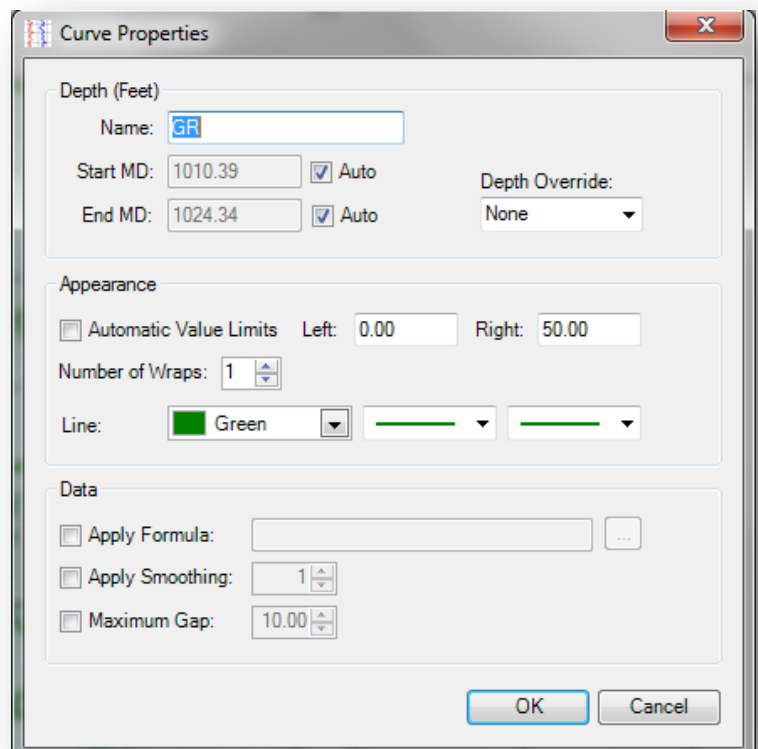
Once you have the curve properties menu opened. You can set the visual options for your curve.

If the curve needs to start or stop at a certain point, uncheck the Auto boxes and put in the values you wish to use.

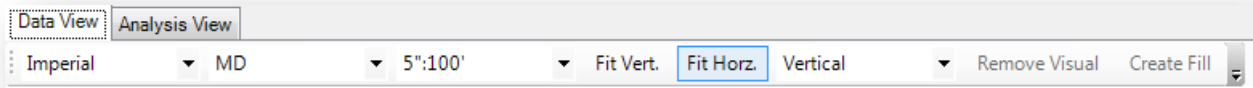
The appearance options allow you to change the color, thickness or style of the line. You may also instruct the program to wrap the curves around the sides of the graph.

Lastly, you may apply formulas and smoothing values to the graph.

Once done, press the ok button and a curve will be added according to your specifications.



4.4 Modifying the logviz report



The report can be modified in several different ways. Across the top of the report you will see the following options.

The first tab allows you to change between imperial and metric scales.

The second tab will show options for MD, TVD and VS modes.

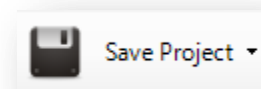
The next tab is the scale in how you want your graphs to be spaced. For instance, you can select 2 or 5 inch options. While given as an example it is not limited to those. If you select metric, you will be given corresponding options.

Fit Vert and Fit horz will shrink the graph to fit inside your screen.

Remove Visual is the how you can remove a selected curve from the graph.

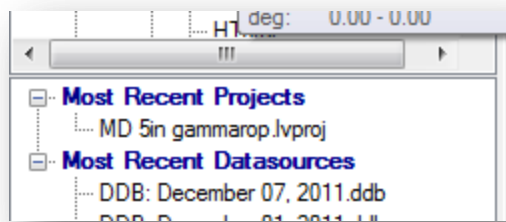
4.5 Saving a logvis project

When you have your data formatted in the manner you wish to use. You can press the save project button on the top of the screen. Once you do that, you can load it at any time. We recommend saving all digidrill related files inside the C:\DigiDrill location to avoid any issues.

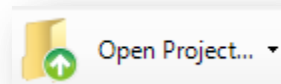


4.6 Loading a logvis project

When opening a created digidrill project you have two different options. If you had created the project file, you may simply open it from the most recent projects window on the lower left side.



The other option is to open it through the Open project button on the top of the option menu.



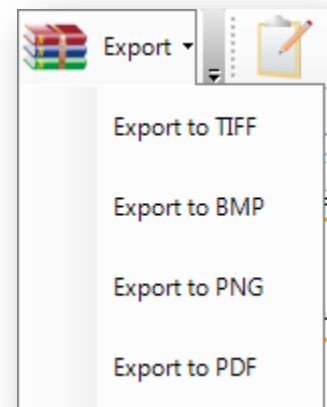
Once you have opened it in this manner it will add the option at the most recent projects window.

4.7 Exporting project

You have four options available to you for export. To the right is the icon and formats you may select. Simply left click on the format and you will be presented with header options.

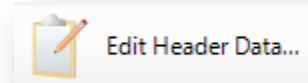
The header options include none, short and long.

Once you select your options, it will prompt you if you wish to see the file displayed into your default viewer.



4.8 Modifying Header information inside logviz

If you wish to change personal or location information inside logviz, you can select the header data located on the top right of the screen. You cannot change some information inside the edit header data field and will require you to change it inside the datalogger.



4.9 Importing Logos

If you want to add a logo to your logviz headers, simply click on the import logos icon on the upper right hand side of the logviz program. Once click, you will be presented with several options. The main option you will need is the browse button. Simply navigate to the logo and import. Logviz automatically resizes the logo by default.