

XML Format Description Standards for Log Graphics - Proposal

Proprietary Notice

This information is confidential and is the trade secret property of Schlumberger. Do not use, disclose, or reproduce without the prior written permission of Schlumberger

Document Information:

Name: Kanai Pathak	Date: October 30, 1999
Phone: (512)-331-3419	Version: 1.0
Email: pathak@austin.apc.slb.com	Document Location:

©SCHLUMBERGER — UNPUBLISHED WORK
ALL RIGHTS RESERVED UNDER COPYRIGHT LAWS

Schlumberger is a trademark of Schlumberger Ltd.

Revision History

Version	Date	Action
1.0	October 30, 1999	First Proposal

Contents

1.	Introduction.....	6
1.1	Structure of the XML File.....	6
1.2	Internationalization.....	7
2.	Log Graphics Objects	8
2.1	UniqueId Attribute	9
2.2	Position and Thickness.....	9
2.3	Log Graphics Objects.....	10
2.3.1	LgAreaFill	10
2.3.1.1	Property Table	11
2.3.1.2	Example.....	12
2.3.2	LgAutoLabel	13
2.3.2.1	Table Property	14
2.3.2.2	Example.....	15
2.3.3	LgCurve.....	16
2.3.3.1	Table Properties.....	17
2.3.3.2	Child Elements	18
2.3.3.3	Example.....	18
2.3.4	LgFont	19
2.3.4.1	Table Properties.....	19
2.3.4.2	Example.....	19
2.3.5	LgFormat	20
2.3.5.1	Table Properties.....	20
2.3.5.2	Child Elements	20
2.3.5.3	Example.....	20
2.3.6	LgIndexGrid	22
2.3.6.1	Table Properties.....	23

2.3.6.2	Child Elements	23
2.3.6.3	Example.....	23
2.3.7	LgIndexLine	24
2.3.7.1	Table Properties.....	24
2.3.7.2	Child Elements	25
2.3.7.3	Example.....	25
2.3.8	LgIndexNumber	26
2.3.8.1	Table Properties.....	26
2.3.8.2	Example.....	27
2.3.9	LgLinearGrid.....	28
2.3.9.1	Table Properties.....	28
2.3.9.2	Example.....	29
2.3.10	LgLogarithmicGrid	30
2.3.10.1	Table Properties.....	30
2.3.10.2	Example.....	31
2.3.11	LgPip	32
2.3.11.1	Table Properties.....	32
2.3.11.2	Example.....	33
2.3.12	LgTimeIndexNumber	34
2.3.12.1	Table Properties.....	34
2.3.12.2	Example.....	35
2.3.13	LgTrack	36
2.3.13.1	Table Properties.....	36
2.3.13.2	Child Elements	37
2.3.13.3	Example.....	38
2.3.14	LgVerticalScale.....	39
2.3.14.1	Table Properties.....	39
2.3.14.2	Example.....	40
3.	Examples.....	41
3.1	Example 1 – Simple Format.....	41

3.1.1	SimpleFormat.xml file	42
4.	Schema for Log Graphics	44
4.1	Introduction	44
4.2	Data Types Used in the Schema.....	44
4.3	Log Graphics Schema File - LgSchema_v1.xml	46

1. Introduction

This document is an initial proposal for an ASCII oil field **log graphics description mechanism** based on the **eXtensible Markup Language (XML)**. It includes only the most basic log graphics entities and will be extended in the future to cover a richer suite of objects.

This proposal was motivated by the need for oil companies and service companies to be able to exchange the descriptions of their logs in a system independent way. The data used to actually draw the log is separated out in a separate database or file that is bound to by the description. That way, the description can be kept separately from actual data sets, and can be thus reused over and over.

Chapter 2 describes the log graphics format and all of its objects. Attributes and XML element tags are specified in detail for each object.

Chapter 3 provides an example of a simple log graphics format XML file.

Chapter 4 provides the schema used for validating the log graphics XML file on Microsoft Windows operating systems. This chapter also lists the data types used as part of the XML schema. The XML file schema provided here can also be validated using a Document Type Definition (DTD).

1.1 Structure of the XML File

One XML file contains one log graphics format. The root element of the XML file is `<LgFormat>`.

The structure of the XML file is hierarchical:

- Tracks are created using `<LgTrack>` as sub-elements of `<LgFormat>` element.
- Graphics objects such as curves (the `<LgCurve>` element) are created using sub-elements of the `<LgTrack>` element.

The properties of the objects are also created as element:

- The left limit for a curve is specified using `<LeftLimit>` as a sub-element of the `<LgCurve>` element.

An example of an XML file is shown below:

```
<LgFormat>
  <LgTrack>
    <Description>Track 1</Description>
    ...
```

```
    <LgCurve>
      <ChannelName>GR</ChannelName>
      <LeftLimit>0.2</LeftLimit>
      <RightLimit>200.0</RightLimit>
    </LgCurve>
  </LgTrack>

  <LgTrack>
    <Description>Track 2</Description>
    <LgCurve>
      <ChannelName>RES</ChannelName>
      ...
    </LgCurve>
  </LgTrack>
  ...
</LgFormat>
```

1.2 Internationalization

The XML file supports the UNICODE character set, this allows user to write strings in any language. The log graphics format specifications include font object, this allows drawing of text in any language.

2. Log Graphics Objects

Figure 1 illustrates the **Log Graphics Objects** and their containment hierarchical structure.

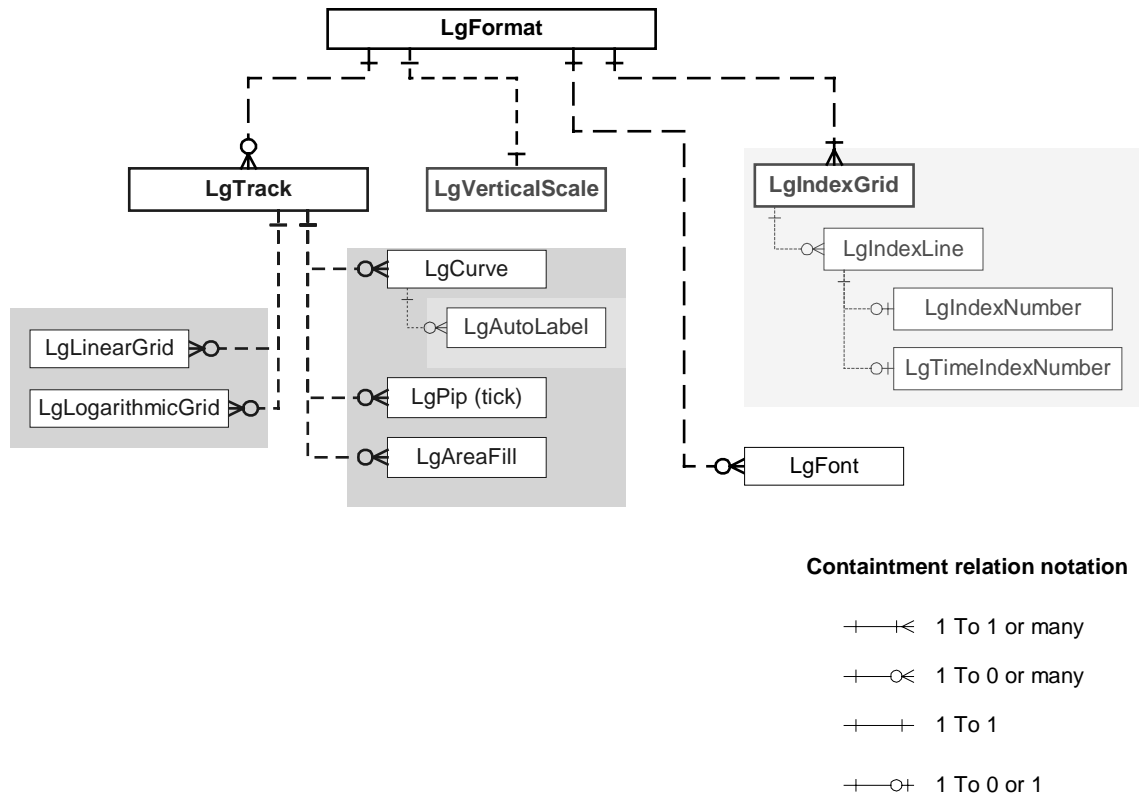


Figure 1. Log Graphics Object Containment

The structure of the **Log Graphics Objects** shown in Figure 1 is the basis for the design of the data schema used for validating the XML format description. Figure 1 shows containment relationship between objects.

The **Log Graphics Objects** are listed alphabetically in this chapter. The following sub-sections are provided for each graphical object:

1. **General Description** – a basic description of the graphical object.
2. **Figure** - an example or illustration of the object.
3. **Property Table** - contains a list of each property with the following information:

Name	Data Type	Description	Default	Optional
XML tag name for the property.	Data type of the property. See section 4.2.	A few lines description.	If the property is not set in XML, implementation will use the default value. The default value only applies if the property is optional.	Yes/No If the property is not optional, it must be supplied in the XML file.

4. **Child Element Table** –contains a list of child objects with the following information:

Name	Minimum Occurrences	Maximum Occurrences	Description
XML tag name for child element	Minimum occurrences for a child	Maximum occurrences for a child	A few lines description.

5. **Example** - an example of an XML segment for the graphical object.

2.1 UniqueId Attribute

To cross-reference objects, each graphical object has one unique identifier called UniqueId, which is of type ID. UniqueId must be distinct from other graphical objects in the same XML format.

2.2 Position and Thickness

Log Graphics Objects use the following for positioning:

- Inches along the horizontal axis for position.
- Inches and Centimeters (based on vertical scale) along the vertical axis are used.

The thickness of any line is expressed in points (1/72 of an inch).

2.3 Log Graphics Objects

The following is an alphabetical list of the Log Graphics Objects proposed for an ASCII oil field **log graphics description mechanism**.

2.3.1 LgAreaFill

LgAreaFill fills colored-pattern between two curves. **LgAreaFill** can also fill a colored-pattern between a curve and a track. The curves associated with the area fill may be in different tracks. By using **FromCurve**, **ToCurve** and **Mode**, **LgAreaFill** can be set to:

1. Fill between two curves
2. Fill from one curve to another curve
3. Fill from a track to a curve
4. Fill from a curve to a track

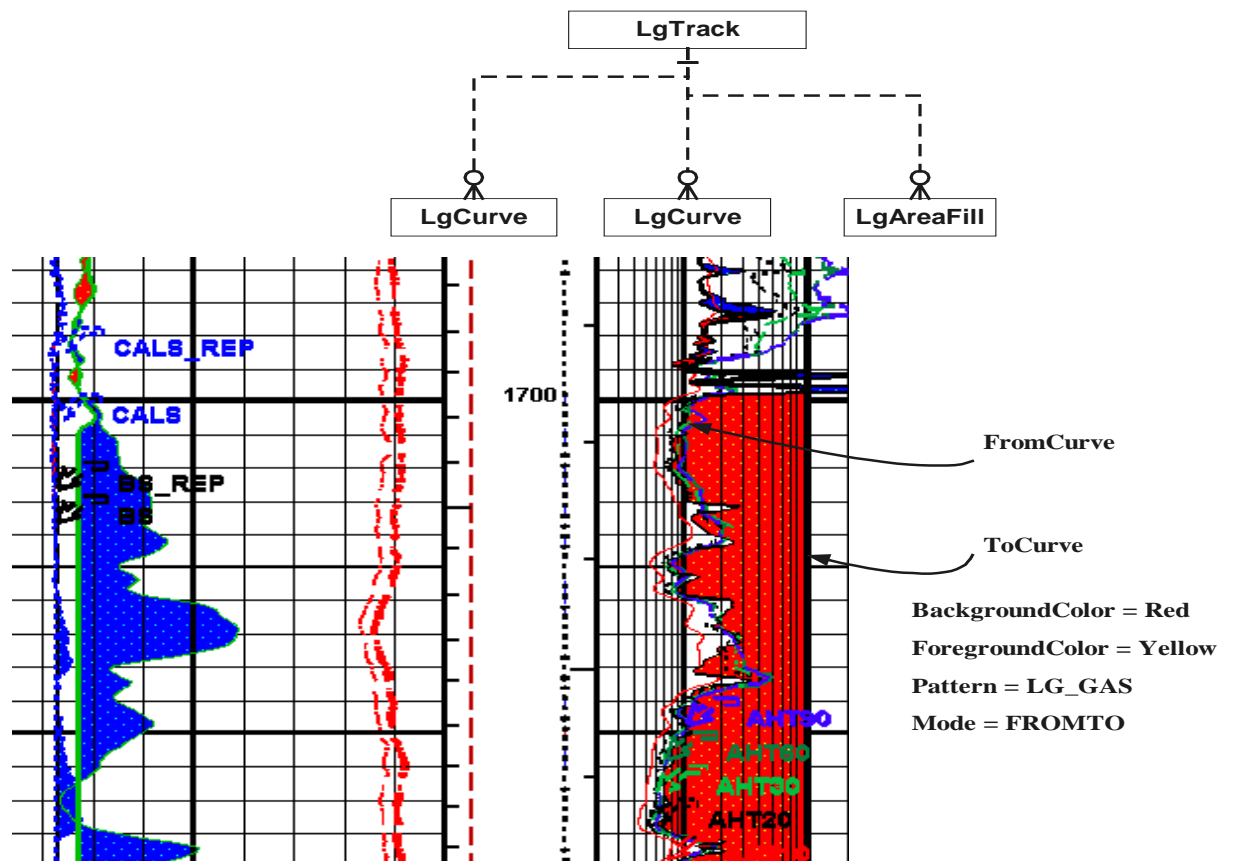


Figure 2. LgAreaFill Object

2.3.1.1 Property Table

Name	Data Type	Description	Default	Optional
BackgroundColor	Bin.hex	Background color for the area fill. Ignored if the BackgroundMode property is LG_TRANSPARENT_BG.	FFFFFF	Yes
BackgroundMode	LgBackgroundMode_t	If the value is set to LG_TRANSPARENT_BG, the background color is not used.	LG_TRANSLUCENT_BG	Yes
Description	String	Used for comment.	N/A	No
ForegroundColor	Bin.hex	Foreground color for the area fill.	000000	Yes
FromCurve	Reference	Reference to an LgCurve element. If omitted, the area fill should start from the left edge of the track.	Empty	Yes
Mode	AreaFillMode_t	Fills between two curves, or from one curve to another.	LG_BETWEEN	Yes
PatternNumber	Int	Area fill pattern for the foreground and background colors.	N/A	No
ToCurve	Reference	Reference to an LgCurve element. If omitted, the area fill should end at the right edge of the track.	Empty	Yes
Visible	Boolean	If set to false, the area fill is not	1	Yes

		area fill is not visible.		
--	--	---------------------------	--	--

2.3.1.2 Example

```
<LgTrack ...>
  <LgAreaFill UniqueId="areaFill11">
    <BackgroundColor>ffffff</BackgroundColor>
    <BackgroundMode>LG_OPAQUE</BackgroundMode>
    <Description>Coal</Description>
    <ForegroundColor>000000</ForegroundColor>
    <FromCurve>GR</FromCurve>
    <Mode>LG_BETWEEN</Mode>
    <PatternNumber>LG_COAL</PatternNumber>
    <ToCurve>RES</ToCurve>
  </LgAreaFill>
</LgTrack>
```

2.3.2 LgAutoLabel

LgAutoLabel is used to identify and list the name of the curve on a routine basis so that curves can be correctly identified on a long printout. **LgAutoLabel** uses the color property of its associated curve as a foreground color for the arrow, border and text. **LgAutoLabel** is drawn starting from StartIndex to StopIndex as specified by Interval.

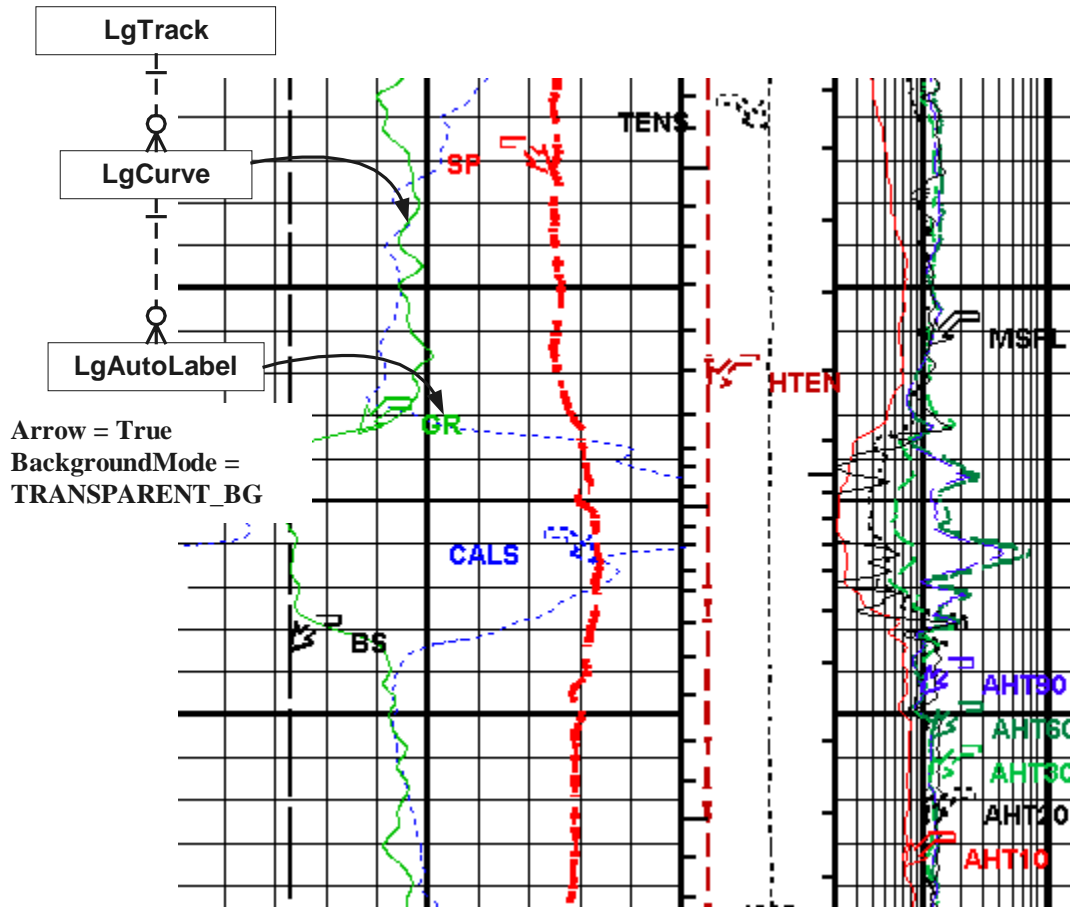


Figure 3. LgAutoLabel Object

2.3.2.1 Table Property

Name	Data Type	Description	Default	Optional
Arrow	Boolean	Draws an arrow from label to the curve.	1	Yes
BackgroundColor	Bin.hex	Background color for the box surrounding the label.	FFFFFF	Yes
BackgroundMode	LgBackgroundMode_t	Background mode for the box surrounding the label.	LG_TRANSPARENT_BG	Yes
BorderThickness	Number	Border thickness (in points) for the box surrounding the label.	Empty	Yes
Font	Reference	Font used for the label.	N/A	No
Interval	Number	Index interval at which the label is drawn.	N/A	No
Label	String	String for the label.	N/A	No
StartIndex	Number	Start index from where the labeling starts.	0.00	Yes
StopIndex	Number	Stop index from where the labeling stops. If the value is -1 or omitted, labeling continues until the end of the data points is reached.	-1	Yes

Visible	Boolean	If set to false, the label is not visible.	1	Yes
---------	---------	--	---	-----

2.3.2.2 Example

```

<LgFormat ...>
  <LgFont UniqueId="Font1">>
    <Name>Courier</Name>
    <Size>12</Size>
    <Bold>1</Bold>
  </LgFont>
  ...

  <LgTrack UniqueId="Track1">
    <LgCurve UniqueId="Gr1">
      ...
      <LgAutoLabel UniqueId="autoLabel1">
        <BorderThickness>0.5</BorderThickness>
        <Font>Font1</Font>
        <Interval>100</Interval>
        <Label>Gamma Ray</Label>
      </LgAutoLabel>
    </LgCurve>
  </LgTrack>
</LgFormat>

```

2.3.3 LgCurve

LgCurve represents indexed data. Each curve is bound to the data using the ChannelName property. Data points can be separated by any index interval.

LgCurve draws a straight line between two consecutive data points. If a data point for a given index is absent, a gap is left in the curve.

LgCurve is drawn between boundaries of the track. The LeftLimit and RightLimit of a curve correspond to LeftPosition and RightPosition of a track, respectively. If the data point value falls outside the track boundary, the curve is wrapped or clipped, depending on WrapCount and WrapMode properties.

LgCurve data points are linearly or logarithmically interpolated between the LeftLimit and RightLimit based on Transform property.

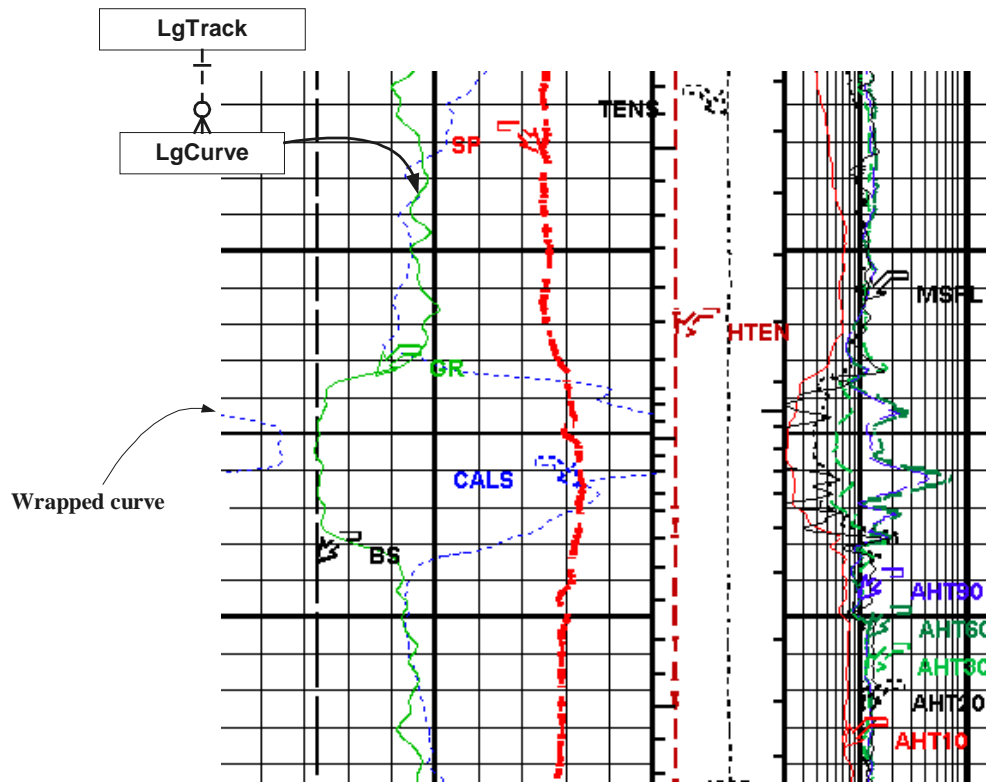


Figure 4. LgCurve Object

2.3.3.1 Table Properties

Name	Data Type	Description	Default	Optional
ChannelName	String	Name of a data channel that provides indexed values for the curve.	N/A	No
Color	Bin.hex	Color for the curve.	000000	Yes
LeftLimit	Number	Left limit corresponds to the left edge of the track. Should be set in the same units as the data values.	0.00	Yes
LineStyle	LgLineStyle_t	Oil field standard line style for the curve.	LG_SOLID_LINE	Yes
RightLimit	Number	Right limit corresponds to the right edge of the track. Should be set in the same units as the data values.	100.00	Yes
Thickness	Number	Line thickness for the curve (in points).	0.50	Yes
Transform	LgTransform_t	Performed on the channel data for the curve. If value is LG_LINEAR, channel data points are linearly plotted between LeftLimit and RightLimit of the curve. If the value is LG_LOGARITHMIC, channel data points are logarithmically plotted between LeftLimit and RightLimit of the curve.	LG_LINEAR	Yes
Visible	Boolean	If set to false, the curve is not visible.	1	Yes
WrapCount	Int	A numeric value between -1 to n, indicating the maximum number the curve would wrap if the data point were out of range. Data point is considered out of range if the value is not within the range defined by the left and right	0	Yes

		limits. The value -1 indicates infinite wraps. The value 0 indicates no wrap.		
WrapMode	LgWrapMode_t	If value is LG_WRAPPED, the curve wraps in from both sides of track. If the value is LEFT_ONLY, the curve wraps only from the left side. If the value is RIGHT_ONLY, the curve wraps only from the right side.	LG_WRAPPED	Yes

2.3.3.2 Child Elements

Name	Minimum Occurrences	Maximum Occurrences	Description
LgAutoLabel	0	Many	Indicates the name of the curve on a routine basis so that a curve can be correctly identified on a long printout.

2.3.3.3 Example

```

<LgTrack ...>
  <LgLogarithmicGrid ...>
    ...
  </LgLogarithmicGrid>
  <LgCurve UniqueId="Gr1">
    <ChannelName>Gr</ChannelName>
    <Color>0000ff</Color>
    <LeftLimit>0.2</LeftLimit>
    <LineStyle>LG_SOLID</LineStyle>
    <RightLimit>200.0</RightLimit>
    <Thickness>1.2</Thickness>
    <Transform>LG_LOGARITHMIC</Transform>
    <LgAutoLabel UniqueId="autoLabel1">
      ...
    </LgAutoLabel>
  </LgCurve>
</LgTrack>

```

2.3.4 LgFont

LgFont is used for specifying a character set used for text. Other objects, such as LgAutoLabel and LgIndexNumber, refer to the font object. If a device (screen, printer etc.) does not support the font specified, **LgFont** will select and display the font that most closely matches the font used by the device.

2.3.4.1 Table Properties

Name	Data Type	Description	Default	Optional
Bold	Boolean	Indicates whether the font is boldfaced.	0	Yes
Italic	Boolean	Indicates whether the font is italicized.	0	Yes
Name	String	Name of the font family.	N/A	No
Size	Number	Point size of the font.	N/A	No
Strikethrough	Boolean	Indicates whether the font is strikethrough.	0	Yes
Underline	Boolean	Indicates whether the font is underlined.	0	Yes

2.3.4.2 Example

```
<LgFormat ...>  
  <LgFont UniqueId="Font1">  
    <Bold>1</Bold>  
    <Name>Courier</Name>  
    <Size>12</Size>  
  </LgFont>  
  ...  
</LgFormat>
```

2.3.5 LgFormat

The **LgFormat** object is the root object that contains all other graphical objects, such as LgTrack, LgCurve, LgVerticalScale etc. The width of the format is determined by the tracks it contains.

2.3.5.1 Table Properties

Name	Data Type	Description	Default	Optional
BackgroundColor	Bin.hex	Background color for the bar.	FFFFFF	Yes
Description	String	One-line description for the format.	N/A	No
Visible	Boolean	If set to false, the format is not visible.	1	Yes

2.3.5.2 Child Elements

Name	Minimum Occurrences	Maximum Occurrences	Description
LgFont	0	Many	Format has several fonts, which are referred by objects, such as LgIndexNumber and LgAutoLabel.
LgIndexGrid	0	Many	Index grid for the format is used for drawing index lines and index numbers.
LgTrack	0	Many	Format contains tracks in which graphical objects, such as curves and pips, are plotted.
LgVerticalScale	1	1	The vertical scale determines the ratio of true measurement to the paper size.

2.3.5.3 Example

```
<LgFormat xmlns="x-schema:LgSchema.xml" UniqueId="format1">
  <Description>Example format 1</Description>
  ...
  <LgFont UniqueId="font1">
    ...
  </LgFont>
  <LgVerticalScale UniqueId="vScale1">
    ...
  </LgVerticalScale>

  <LgIndexGrid UniqueId="indexGrid1">
    ...
  </LgIndexGrid>
```

```
<LgTrack UniqueId="SurfaceTrack">
...
</LgTrack>
<LgTrack UniqueId="DepthTrack">
...
</LgTrack>
<LgTrack UniqueId="ResistivityTrack">
...
</LgTrack>
</LgFormat>
```

2.3.6 LgIndexGrid

LgIndexGrid plots index lines at different intervals, and consists of index lines and index numbers. Index numbers are associated with index lines.

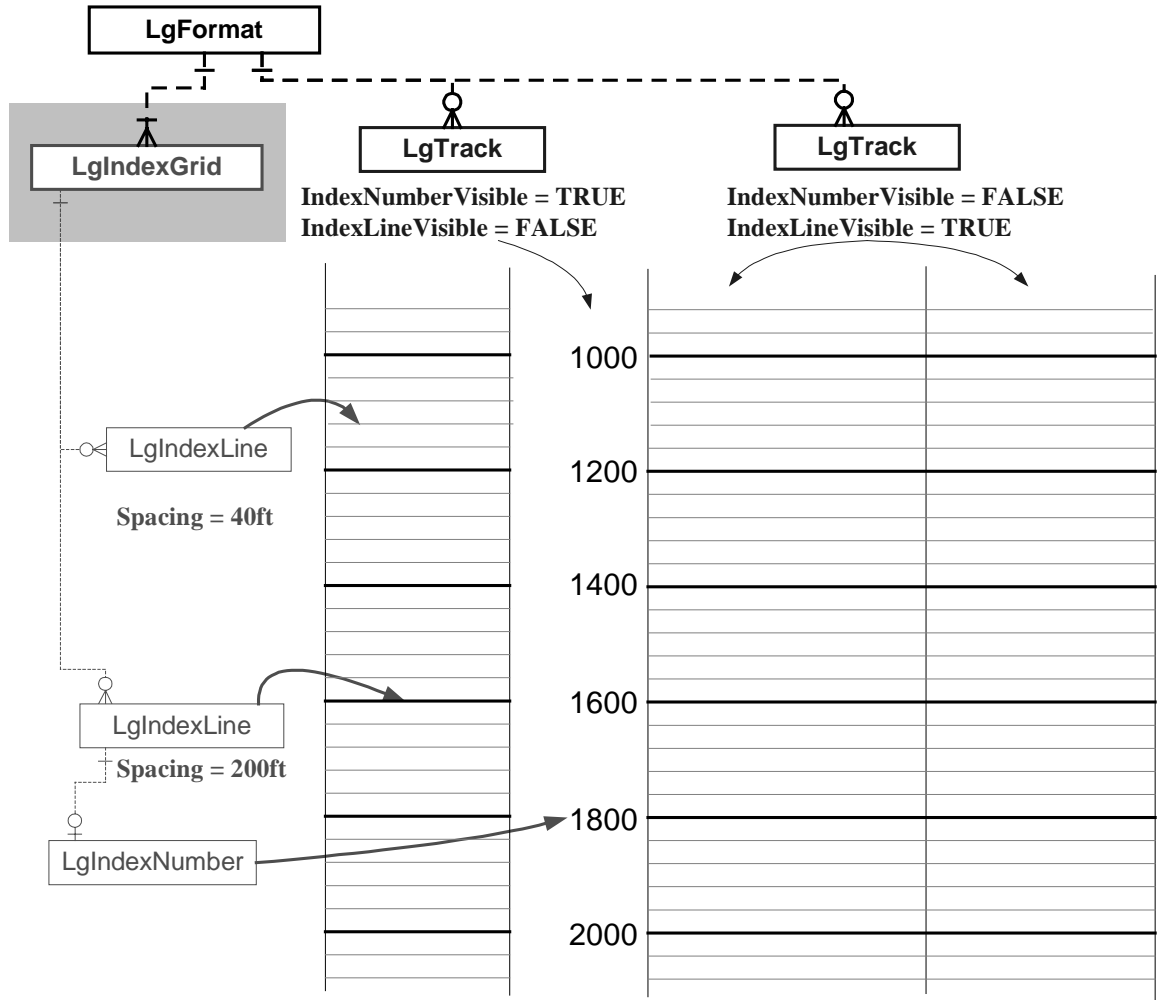


Figure 5. LgIndexGrid Object

2.3.6.1 Table Properties

Name	Data Type	Description	Default	Optional
Visible	Boolean	If set to false, the index grid and all of its children objects are not visible.	1	Yes

2.3.6.2 Child Elements

Name	Minimum Occurrences	Maximum Occurrences	Description
LgIndexLine	0	Many	Index grid consists of several index lines. Each index line is drawn at a different interval.

2.3.6.3 Example

```
<LgFormat ...>  
  <LgIndexGrid UniqueId="indexGrid1">  
    <Visible>1</Visible>  
    <LgIndexLine UniqueId="indexLine1">  
      ...  
    </LgIndexLine>  
  </LgIndexGrid>  
</LgFormat>
```

2.3.7 LgIndexLine

LgIndexLine appears as part of the index grid at every interval starting from an index value of 0. The interval is set using the Spacing property. Index lines are plotted in every track where the IndexLinesVisible property is set to TRUE. Each **LgIndexLine** can be plotted using different Color, Thickness and LineStyle. **LgIndexLine** is visible only if the LgIndexGrid is visible. LgIndexNumber can be created for **LgIndexLine**.

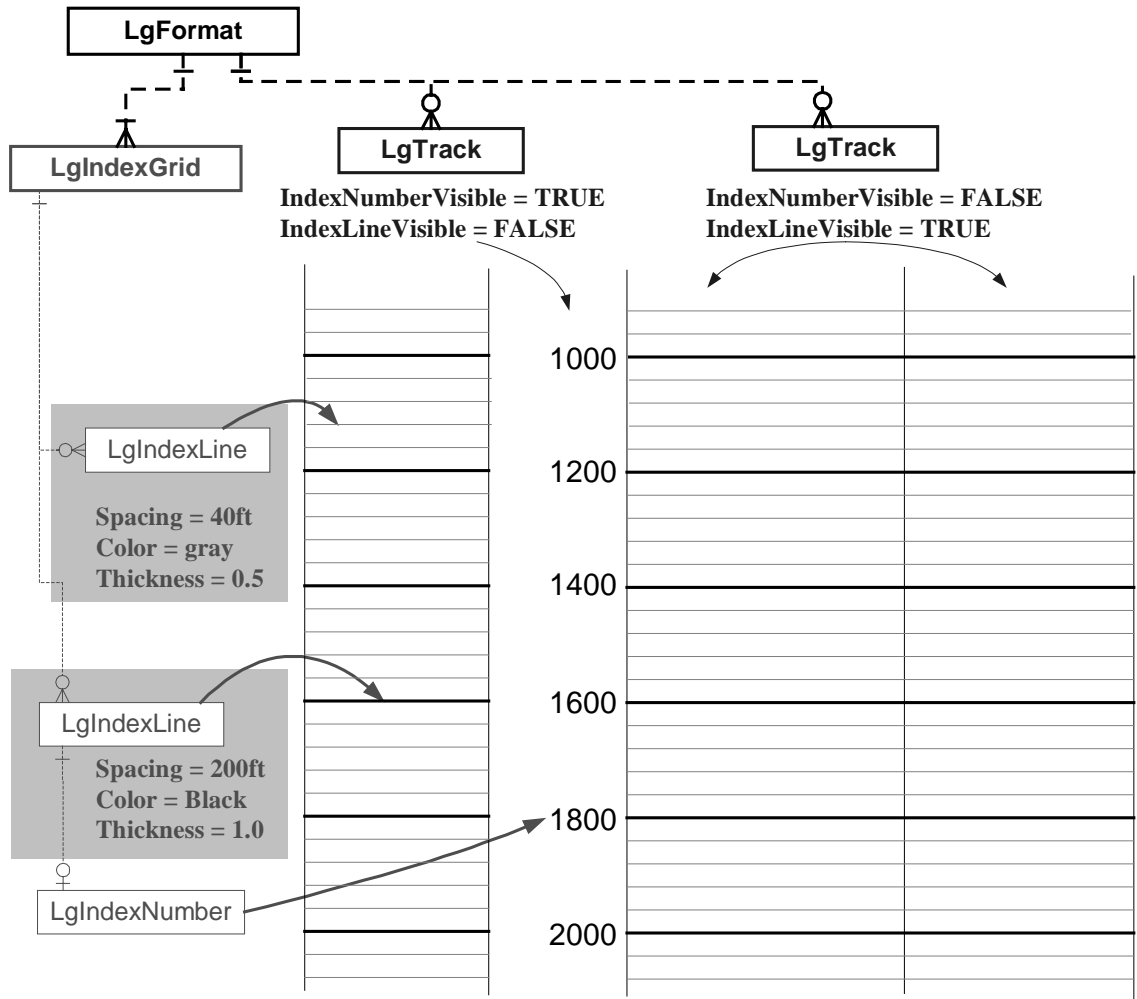


Figure 6. LgIndexLine Object

2.3.7.1 Table Properties

Name	Data Type	Description	Default	Optional
Color	Bin.hex	Color of the index line. The index number written next to the index line will also use this color.	000000	Yes

LineStyle	LgLineStyle_t	Line style for the index line.	LG_SOLID_LINE	Yes
Spacing	Number	Specifies how far apart index lines are drawn. To configure index lines, the spacing must be set to an appropriate value. Overlapping is possible if this value is too small.	0.00	No
SpacingUnit	String	Unit for the spacing.	N/A	No
Thickness	Number	Thickness of each index line (in points).	0.50	Yes
Visible	Boolean	If set to false, the index grid and all of its children objects are not visible.	1	Yes

2.3.7.2 Child Elements

LgIndexLine can only have index number associated with it, which could be either LgIndexNumber or LgTimeIndexNumber but not both.

Name	Minimum Occurrences	Maximum Occurrences	Description
LgIndexNumber	0	1	Used to write index numbers into a track.
LgTimeIndexNumber	0	1	Used specifically for time logs for writing index numbers into a track..

2.3.7.3 Example

```

<LgIndexGrid UniqueId="indexGrid1">
  <LgIndexLine UniqueId="indexLine1">
    <Color>0000ff</Color>
    <LineStyle>LG_SOLID</LineStyle>
    <Spacing>1000.0</Spacing>
    <SpacingUnit>Ft</SpacingUnit>
    <Thickness>1.0</Thickness>
    <LgIndexNumber UniqueId="indexNumber1">
      ...
    </LgIndexNumber>
  </LgIndexLine>
</LgIndexGrid>

```

2.3.8 LgIndexNumber

LgIndexNumber are used for writing index number in a tack. **LgIndexNumber** are created for an LgIndexLine. Index numbers are plotted in the track where the IndexNumberVisible property is TRUE. **LgIndexNumber** uses color from the associated LgIndexLine.

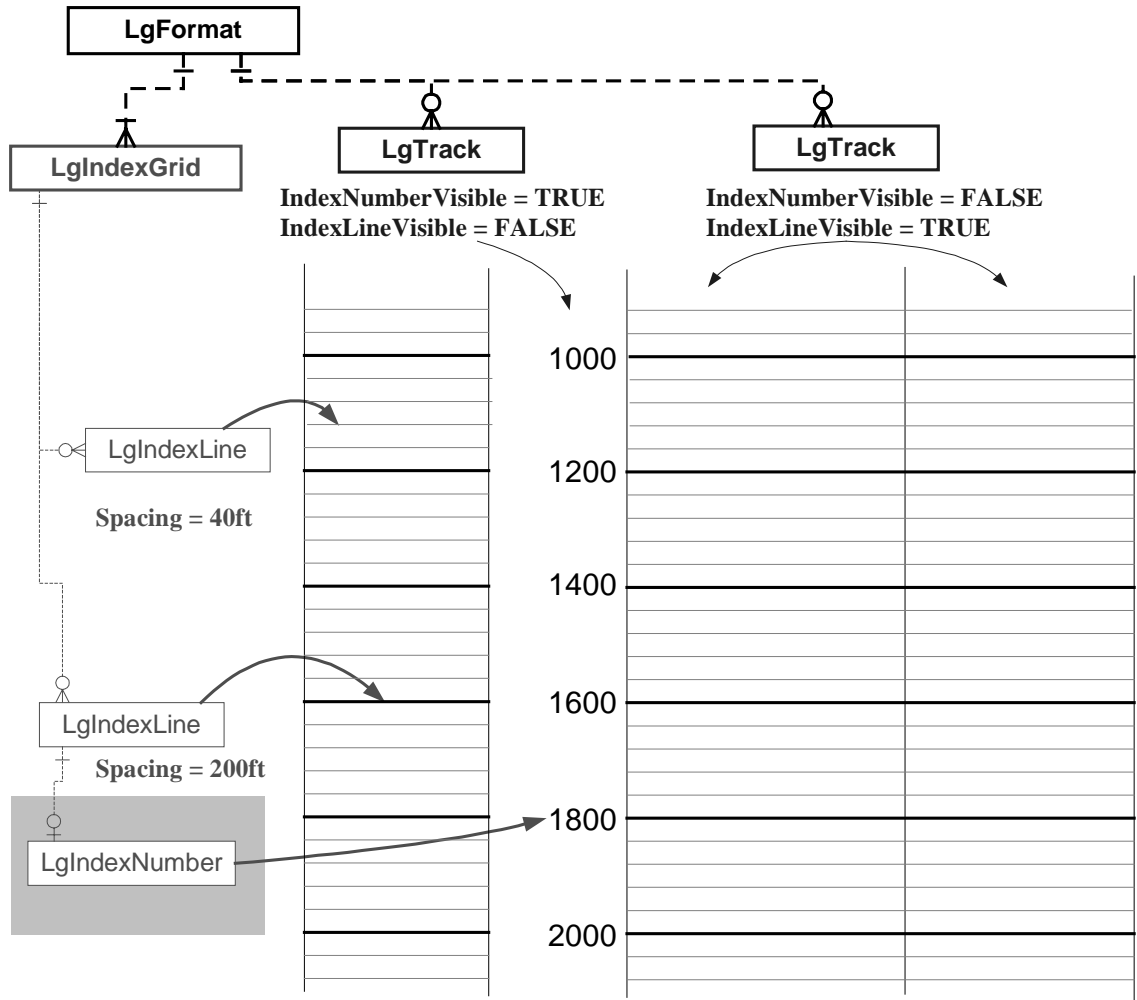


Figure 7. LgIndexNumber Object

2.3.8.1 Table Properties

Name	Data Type	Description	Default	Optional
Alignment	LgAlignment_t	Aligns the index number on the left, the right or in the center of a track.	LG_ALIGN _RIGHT	Yes
Font	Reference	Font for the index numbers.	N/A	No

2.3.8.2 Example

```
<LgIndexLine UniqueId="indexLine1">  
  <LgIndexNumber UniqueId="indexNumber1">  
    <Alignment>LG_ALIGN_RIGHT</Alignment>  
    <Font>minorFont</Font>  
  </LgIndexNumber>  
  ...  
</LgIndexLine>
```

2.3.9 LgLinearGrid

LgLinearGrid consists of equally-spaced vertical lines plotted in the track between LeftPosition and RightPosition. The linear grid is plotted starting from StartIndex to StopIndex.

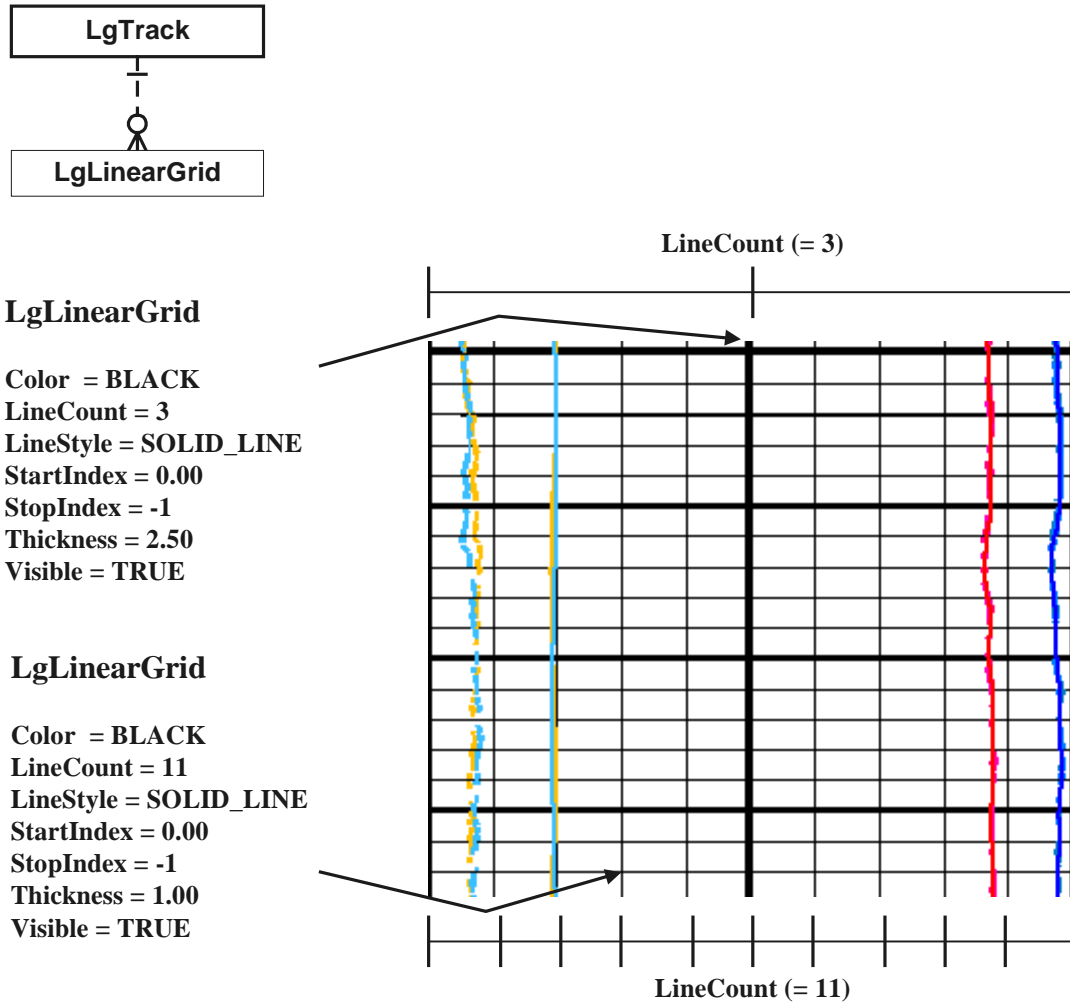


Figure 8. LgLinearGrid Object

2.3.9.1 Table Properties

Name	Data Type	Description	Default	Optional
Color	Bin.hex	Color of the linear grid	000000	Yes
LineCount	Int	Number of vertical lines on the track. Line counting starts from the left	N/A	No

		position to the right position of the track.		
LineStyle	LgLineStyle_t	Line style of the linear grid.	LG_SOLID_LINE	Yes
StartIndex	Number	Index where the linear grid starts in the track. Start index should be smaller than the stop index.	0.00	Yes
StopIndex	Number	Index where the linear grid stops in the track. Stop index should be larger than the start index. The exception is the value -1, which indicates that the linear grid will be plotted to the end of the track.	-1	Yes
Thickness	Number	Thickness of the linear grid (in points).	0.50	Yes
Visible	Boolean	If set to false, the linear grid is not visible.	1	Yes

2.3.9.2 Example

```

<LgTrack>
  <LgLinearGrid UniqueId="linearGrid1">
    <Color>000000</Color>
    <LineCount>11</LineCount>
    <LineStyle>LG_SOLID</LineStyle>
    <Thickness>0.5</Thickness>
  </LgLinearGrid>
  ...
</LgTrack>

```

2.3.10 LgLogarithmicGrid

LgLogarithmicGrid consists of vertical lines spaced using logarithmic function. The lines are drawn in the track between LeftPosition and RightPosition.

LgLogarithmicGrid is plotted starting from StartIndex to StopIndex.

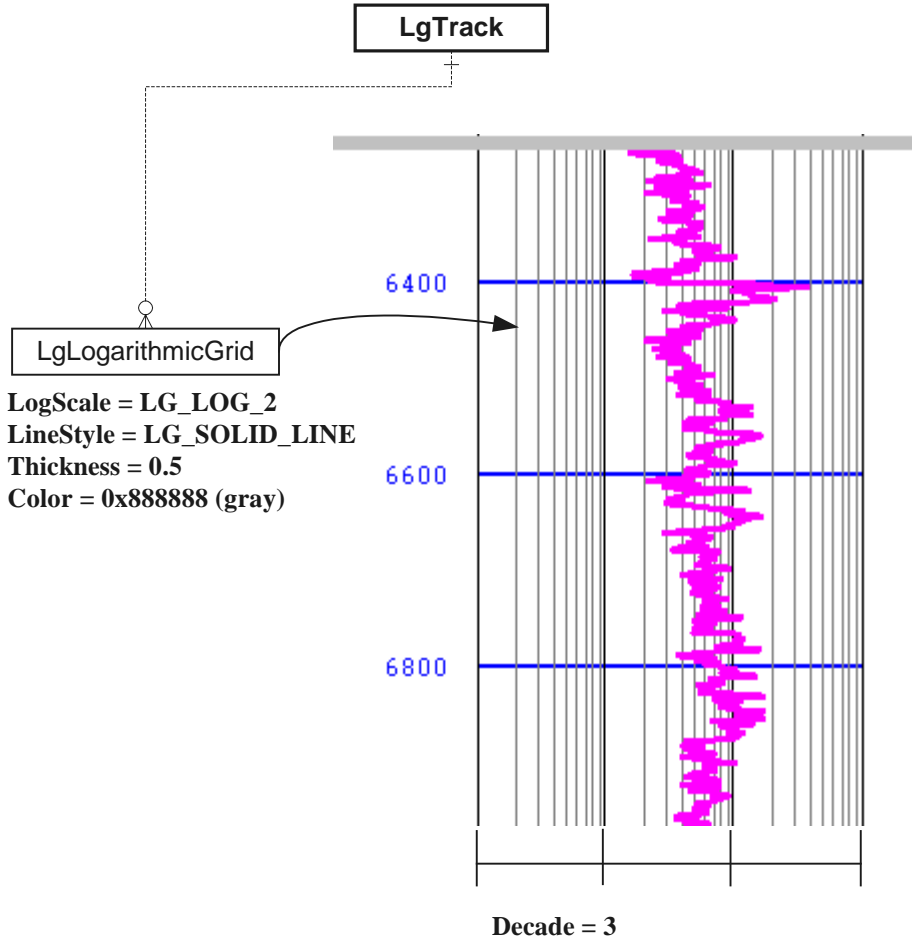


Figure 9. LgLogarithmicGrid Object

2.3.10.1 Table Properties

Name	Data Type	Description	Default	Optional
Color	Bin.hex	Color of the logarithmic grid.	000000	Yes
Decade	Int	The track is divided into an equal number of decades. In each decade, 10 lines are logarithmically plotted.	1	Yes
LineStyle	LgLineStyle_t	Line style for the logarithmic grid.	LG_SOLID_LINE	Yes
LogScale	LgLogScale_t	Logarithmic scale plotted for each decade.	LG_LOG_1	Yes

		decade.		
StartIndex	Number	Index where the logarithmic grid starts in the track. Start index should be smaller than the stop index.	0.00	Yes
StopIndex	Number	Index where the logarithmic grid stops in the track. StopIndex should be larger than StartIndex. The exception to this rule is - the value -1, which indicates that the logarithmic grid will be plotted to the end of the track.	-1	Yes
Thickness	Number	Thickness of the logarithmic grid (in points).	0.50	Yes
Visible	Boolean	If set to false, the logarithmic grid is not visible.	1	Yes

2.3.10.2 Example

```

<LgTrack UniqueId="ResistivityTrack">
  <LgLogarithmicGrid UniqueId="logGrid1">
    <Decade>3</Decade>
    <LineStyle>LG_SOLID</LineStyle>
    <LogScale>LG_LOG_2</LogScale>
  </LgLogarithmicGrid>
</LgTrack>

```

2.3.11 LgPip

LgPip is used to plot the density of indexed data. **LgPip** draws a pip (a small horizontal line) for every data point. One or more pip (tick) objects can be created within a track.

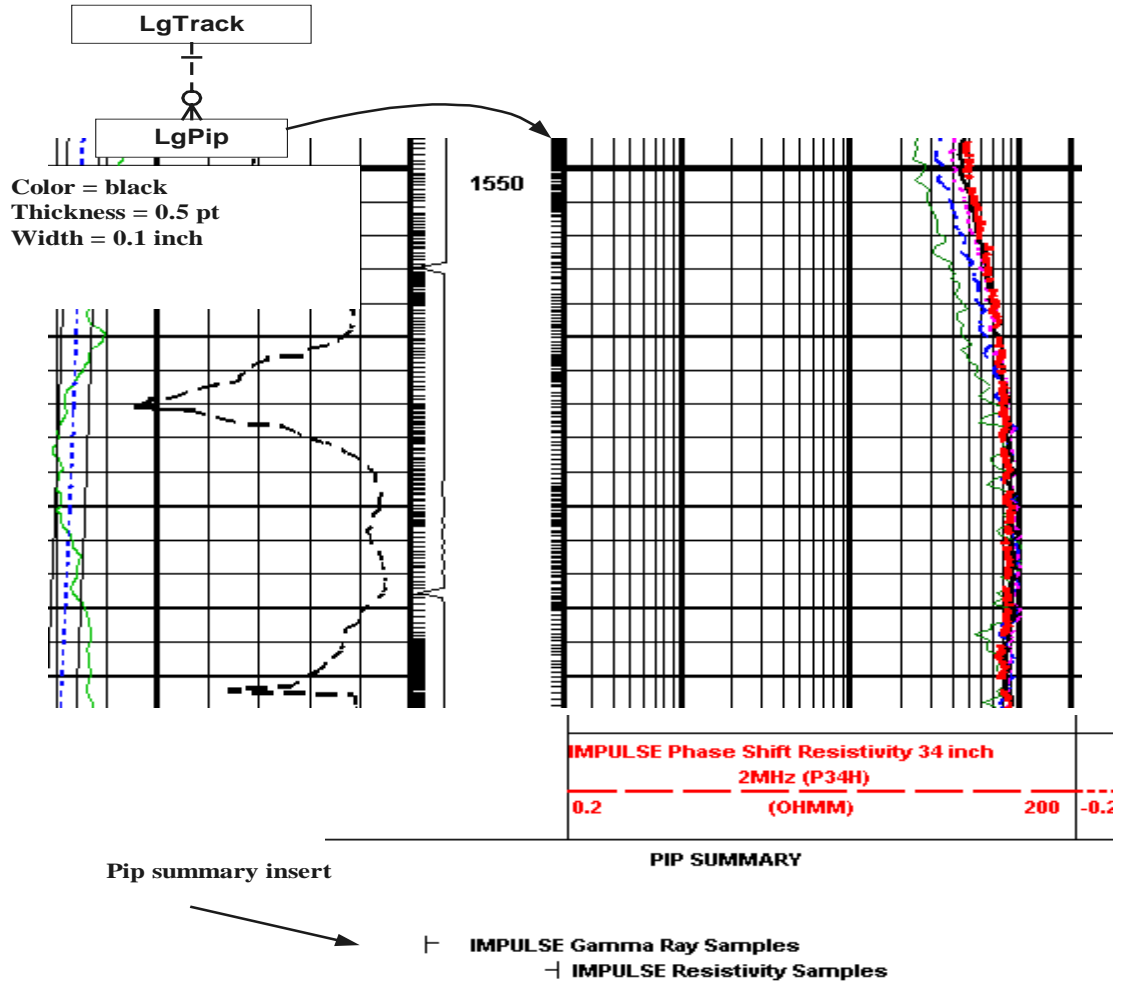


Figure 10. LgPip Object

2.3.11.1 Table Properties

Name	Data Type	Description	Default	Optional
Alignment	LgAlignment_t	The side of track where the pip is plotted.	LG_ALIGN_RIGHT	Yes
ChannelName	String	Name of the data channel that provides indexed data for the	N/A	No

		pip.		
Color	Bin.hex	Color of the pip.	000000	Yes
Thickness	Number	Thickness of the pip (in points).	0.50	Yes
Visible	Boolean	If set to false, the pip is not visible.	1	Yes
Width	Number	Width of the pip (in inches).	0.10	Yes

2.3.11.2 Example

```

<LgTrack UniqueId="Track1">
  <LgPip UniqueId="Gr1">
    <Alignment>LG_ALIGN_LEFT</Alignment>
    <ChannelName>Gr</ChannelName>
    <Color>0</Color>
    <Width>0.1</Width>
  </LgPip>
</LgTrack>

```

2.3.12 LgTimeIndexNumber

LgTimeIndexNumber presents the index value in various date and time formats. Time index numbers are plotted in the track for which `IndexNumberVisible` property is `TRUE`. Time index numbers are useful for time logs, and use color from the associated index line.

Note: No space is added between time and date string by the program. If space is required between the time and date string, it should be added it at the end of the `TimeFormat` or at the beginning of the `DateFormat`. See the XML example below:

```
<TimeFormat>HH:mm</TimeFormat>
<DateFormat> ddMMM</DateFormat>
```

The example shown above is the same as the example shown below:

```
<TimeFormat>HH:mm </TimeFormat>
<DateFormat>ddMMM</DateFormat>
```

The following feature allows the user to make a string separated by other characters, such as "-":

```
<TimeFormat>HH:mm-</TimeFormat>
<DateFormat>ddMMM</DateFormat>
```

The index number wraps if a track is not wide enough to contain the index number string. Wrapping logic breaks the string at a blank space only.

2.3.12.1 Table Properties

Name	Data Type	Description	Default	Optional
Alignment	LgAlignment_t	Align the index number on the left, the right or in the center of a track.	LG_ALIGN_RIGHT	Yes
DateFormat	String	Describes the date format for the time index numbers: M - month in letters m - month in digits d - date in digits y - year in digits	MMM/dd/yyyy	Yes
Font	Reference	Font for the index numbers.	N/A	No
TimeFormat	String	Describes the time format for the time index numbers: h - hours in digits m - minutes in digits s - seconds in digits	h:mm:ss t	Yes

2.3.12.2 Example

```
<LgIndexLine UniqueId="timeLines">  
  <LgTimeIndexNumber UniqueId="timeIndex1">  
    <DateFormat>ddMMM</DateFormat>  
    <TimeFormat>HH:mm</TimeFormat>  
    <Alignment>LG_ALIGN_LEFT</Alignment>  
  </LgTimeIndexNumber>  
</LgIndexLine>
```

2.3.13 LgTrack

LgTrack runs along the index axis dimension (vertical in the following example). **LgTrack** contains many objects, such as curves and pips. Objects in tracks are clipped by the track's boundaries defined by `LeftPosition` and `RightPosition`. Log graphics allows tracks to overlap.

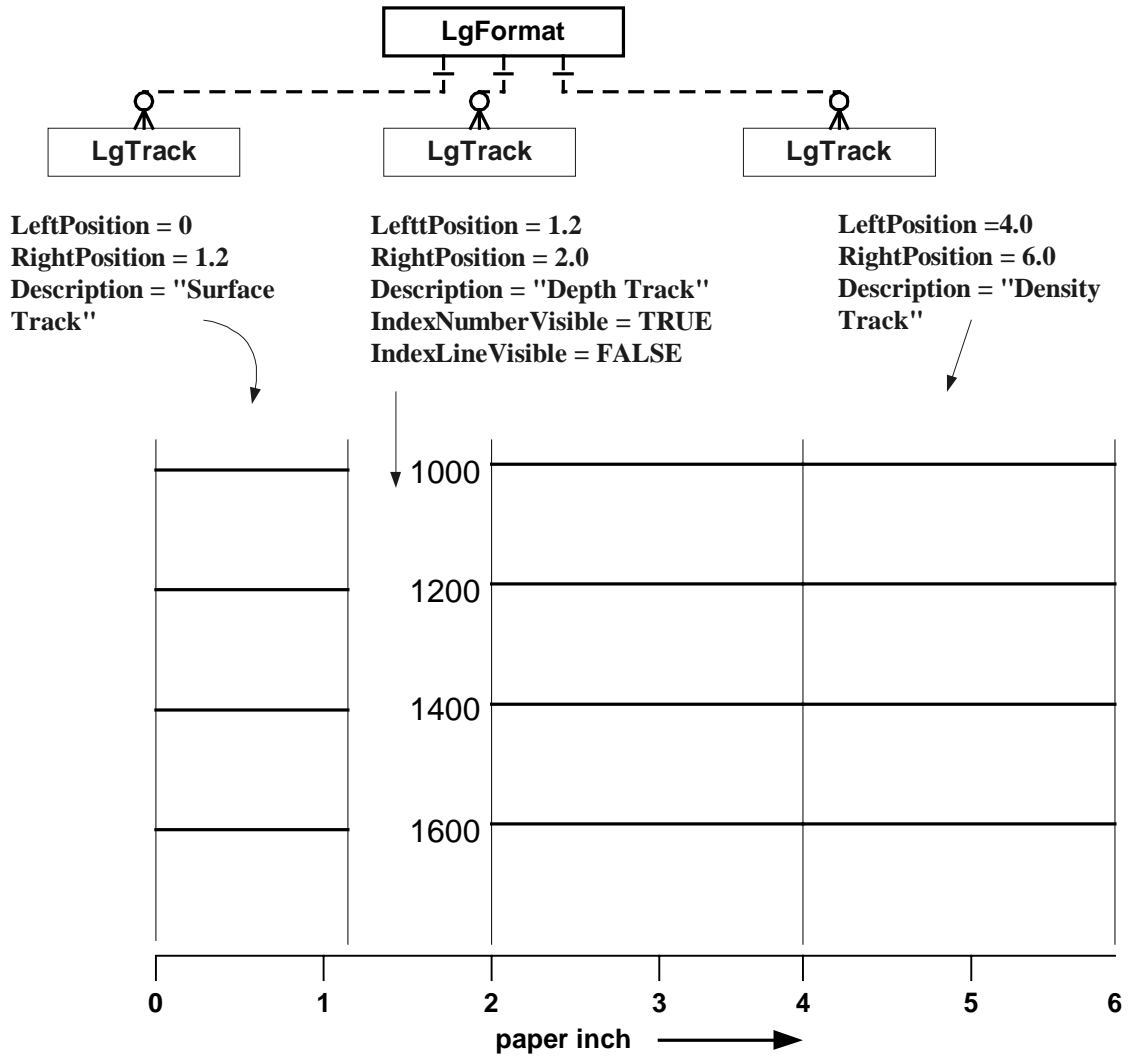


Figure 11. LgTrack Object

2.3.13.1 Table Properties

Name	Data Type	Description	Default	Optional
BackgroundColor	Bin.hex	Background color of the track.	FFFFFF	Yes

BackgroundMode	LgBackgroundMode_t	Background mode of the track.	LG_TRANSPARENT_BG	Yes
Description	String	Description for the track.	Empty	Yes
IndexLinesVisible	Boolean	Allows index lines in the track.	1	Yes
IndexNumbersVisible	Boolean	Allows index numbers in the track.	0	Yes
LeftPosition	Number	Left position of the track (in inches).	N/A	No
RightPosition	Number	Right position of the track (in inches).	N/A	No
Visible	Boolean	If visible is set to false, the track and all objects under it will not be drawn.	1	Yes

2.3.13.2 Child Elements

Name	Minimum Occurrences	Maximum Occurrences	Description
LgAreaFill	0	Many	Area fill between curves and/or tracks.
LgCurve	0	Many	Curve objects for indexed data.
LgLinearGrid	0	Many	Equally-spaced grid lines for a track.
LgLogarithmicGrid	0	Many	Logarithmically-spaced lines for a track.
LgPip	0	Many	Pip objects for indexed data.

2.3.13.3 Example

```
<LgFormat ...>
  <LgTrack UniqueId="ResTrack">
    <Description>Resistivity Track</Description>
    <IndexLinesVisible>TRUE</IndexLinesVisible>
    <IndexNumberVisible>FALSE</IndexNumberVisible>
    <LeftPosition>3.0</LeftPosition>
    <RightPosition>4.5</RightPosition>
    <LgCurve UniqueId="Res1">
      ...
    </LgCurve>
    <LgLogarithmicGrid UniqueId="logGrid1">
      ...
    </LgLogarithmicGrid>
    ...
  </LgTrack>
</LgFormat>
```

2.3.14 LgVerticalScale

LgVerticalScale determines the ratio of actual measurement to paper size for a given format. The vertical scale must be set for the LgFormat. **LgVerticalScale** can be set for time index, true vertical depth (TVD) index or any other index. The value of the IndexUnit must match the unit of the data.

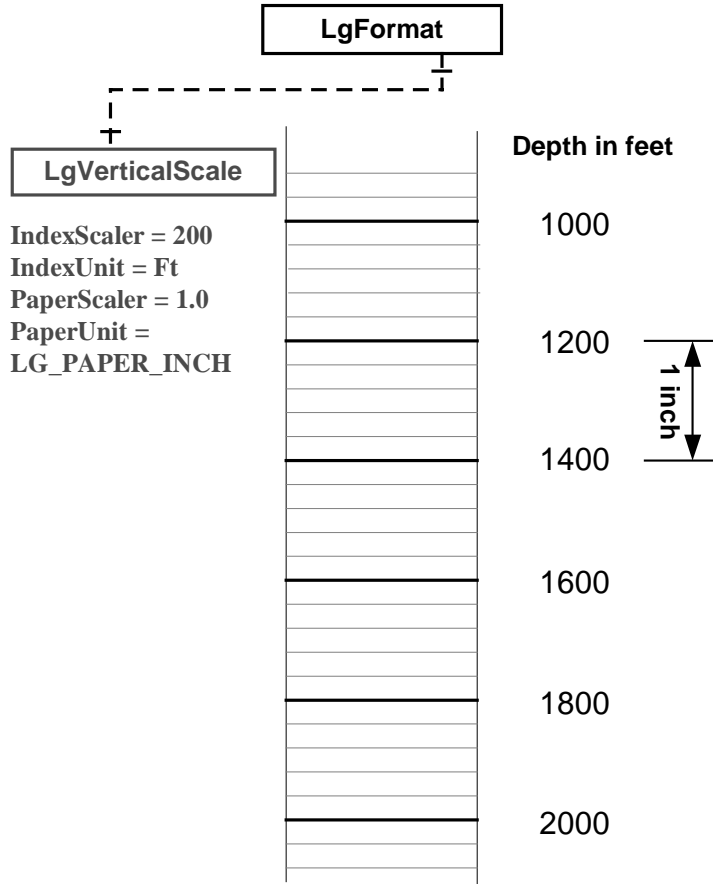


Figure 12. LgVerticalScale Object

2.3.14.1 Table Properties

Name	Data Type	Description	Default	Optional
IndexScaler	Number	Index scaler for the vertical scale.	N/A	No
IndexUnit	String	Index unit for the vertical scale.	N/A	No
PaperScaler	Number	Paper scaler for the vertical scale.	N/A	No
PaperUnit	LgPaperUnit_t	Paper unit for the vertical scale.	N/A	No

2.3.14.2 Example

Example vertical scale (200Ft per 1inch) for depth log

```
<LgFormat ...>  
  <LgVerticalScale UniqueId="vScale1">  
    <IndexScaler>200.0</IndexScaler>  
    <IndexUnit>Ft</IndexUnit>  
    <PaperScaler>1.0</PaperScaler>  
    <PaperUnit>LG_PAPER_INCH</PaperUnit>  
  </LgVerticalScale>  
  ...  
</LgFormat>
```

Example vertical scale (3600sec per 1inch) for time log

```
<LgFormat ...>  
  <LgVerticalScale UniqueId="vScale1">  
    <IndexScaler>3600</IndexScaler>  
    <IndexUnit>Sec</IndexUnit>  
    <PaperScaler>1.0</PaperScaler>  
    <PaperUnit>LG_PAPER_INCH</PaperUnit>  
  </LgVerticalScale>  
  ...  
</LgFormat>
```

3. Examples

The example XML files for log graphics format are validated using schema specified in previous chapter.

3.1 Example 1 – Simple Format

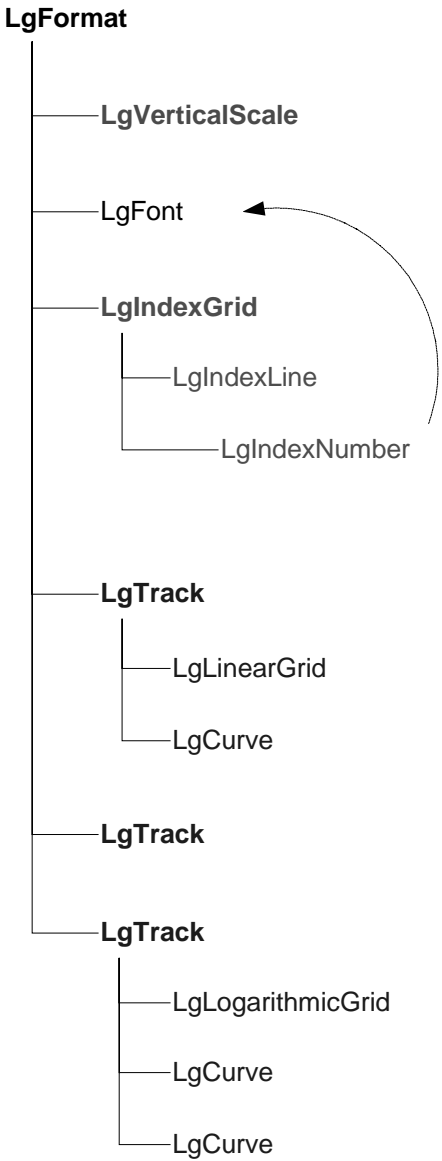


Figure 13. Simple Format Object Layout

3.1.1 SimpleFormat.xml file

```

= <LgFormat xmlns="x-schema:LgSchema_v1.xml"
  UniqueId="SimpleFormat1">
  = <LgVerticalScale UniqueId="VerticalScale1">
    <IndexScaler dt="number"
      dt="number">1000.0</IndexScaler>
    <IndexUnit dt="string" dt="string">Ft</IndexUnit>
    <PaperScaler dt="number" dt="number">1.0</PaperScaler>
    <Paperunit>LG_INCH</Paperunit>
  </LgVerticalScale>
  = <LgFont UniqueId="Font1">
    <Name dt="string" dt="string">Courier</Name>
    <Size dt="int" dt="int">12</Size>
    <Bold dt="boolean" dt="boolean">1</Bold>
  </LgFont>
  = <LgIndexGrid UniqueId="IndexGrid1">
    = <LgIndexLine UniqueId="IndexLine1">
      <Spacing dt="number" dt="number">1000.0</Spacing>
      = <LgIndexNumber UniqueId="IndexNumber1">
        <Font dt="string" dt="string">Font1</Font>
      </LgIndexNumber>
    </LgIndexLine>
  </LgIndexGrid>
  = <LgTrack UniqueId="T1">
    <Description dt="string" dt="string">Surface
      Track</Description>
    <LeftPosition dt="number" dt="number">0.0</LeftPosition>
    <RightPosition dt="number" dt="number">1.5</RightPosition>
  = <LgLinearGrid UniqueId="LinearGrid1">
    <LineCount dt="int" dt="int">5</LineCount>
  </LgLinearGrid>
  = <LgCurve UniqueId="RopCurve">
    <ChannelName dt="string"
      dt="string">ROP</ChannelName>
    <LeftLimit dt="number" dt="number">0.0</LeftLimit>
    <RightLimit dt="number" dt="number">150.0</RightLimit>
    <Color dt="bin.hex" dt="bin.hex">0000ff</Color>
  </LgCurve>
</LgTrack>
  = <LgTrack UniqueId="DepthTrack">
    <Description dt="string" dt="string">Depth
      Track</Description>
    <LeftPosition dt="number" dt="number">1.5</LeftPosition>
    <RightPosition dt="number" dt="number">2.0</RightPosition>

```

```

    <IndexLinesVisible dt="boolean"
      dt="boolean">0</IndexLinesVisible>
    <IndexNumbersVisible>1</IndexNumbersVisible>
  </LgTrack>
= <LgTrack UniqueId="T2">
  <Description dt="string" dt="string">Resistivity
    Track</Description>
  <LeftPosition dt="number" dt="number">2.0</LeftPosition>
  <RightPosition dt="number" dt="number">3.5</RightPosition>
  = <LgLogarithmicGrid UniqueId="LogGrid1">
    <Decade dt="int" dt="int">3</Decade>
    <LogScale dt="string" dt="string">LG_LOG_2</LogScale>
  </LgLogarithmicGrid>
  = <LgCurve UniqueId="GrCurve">
    <ChannelName dt="string" dt="string">Gr</ChannelName>
    <LeftLimit dt="number" dt="number">0.2</LeftLimit>
    <RightLimit dt="number" dt="number">200.0</RightLimit>
    <Transform dt="string"
      dt="string">LG_LOGARITHMIC</Transform>
    <Color dt="bin.hex" dt="bin.hex">ff0000</Color>
  </LgCurve>
  = <LgCurve UniqueId="ResCurve">
    <ChannelName dt="string"
      dt="string">RES</ChannelName>
    <LeftLimit dt="number" dt="number">0.1</LeftLimit>
    <RightLimit dt="number" dt="number">100.0</RightLimit>
    <Transform dt="string"
      dt="string">LG_LOGARITHMIC</Transform>
    <LineStyle dt="string"
      dt="string">LG_DASH_LINE</LineStyle>
  </LgCurve>
</LgTrack>
</LgFormat>

```

4.

Schema for Log Graphics

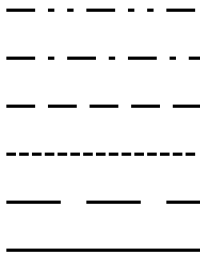
4.1 Introduction

To learn about Microsoft schema refer to Microsoft's web page
<http://msdn.microsoft.com//xml/xmlguide/schema-overview.asp>

4.2 Data Types Used in the Schema

The following table lists the data types used in the Schema:

Name	Valid Values	Description
Bin.hex	Hexadecimal numbers	Used for representing color as – rrggbb (red, greed. blue) where the maximum value for any one-color element is hexadecimal 0xff (256).
Boolean	0 (false) 1 (true)	Used for boolean flags.
Int	Integer numbers	
LgAlignment_t	LG_ALIGN_CENTER LG_ALIGN_LEFT LG_ALIGN_RIGHT	Used for alignment text and other objects (such as pip).
LgAreaFillMode_t	LG_BETWEEN LG_FROMTO	Used for LgAreaFill object.
LgBackgroundMode_t	LG_OPAQUE_BG LG_TRANSLUCENT_BG LG_TRANSPARENT_BG	Used for setting the background mode of a closed region, such as LgTrack and LgAreaFill.
LgFormation_t	LG_WATER LG_SAND etc. <i>to be specified later.</i>	Provides standard formation patterns. <i>We are investigating standards on patterns for petroleum industry.</i>

LgLineStyle_t	LG_DASHDOTDOT_LINE LG_DASHDOT_LINE LG_DASH_LINE LG_DOT_LINE LG_LONG_DASH_LINE LG_SOLID_LINE	
LgLogScale_t	LG_LOG_1 LG_LOG_2 LG_LOG_3 LG_LOG_4 LG_LOG_5 LG_LOG_6 LG_LOG_7 LG_LOG_8 LG_LOG_9 LG_LOG_10	Used for setting up scale for LgLogarithmicGrid.
LgPaperUnit_t	LG_PAPER_CM LG_PAPER_INCH	Used for setting paper unit for vertical scale. PAPER_CM refers to an actual 1-centimeter measurement on paper. PAPER_INCH refers to an actual 1-inch measurement on paper.
LgTransform_t	LG_LINEAR LG_LOGARITHMIC	Used for setting transform for a curve.
LgWrapMode_t	LG_LEFT_WRAPPED LG_RIGHT_WRAPPED LG_WRAPPED	Used for setting wrap mode for a curve.
Number	Floating point numbers	Used for setting values, such as depth and paper size.
Reference	A reference to a UniqueId value in the XML format.	Used for referring one object from another.
String	A free form string.	Used for description, unique identifier, channel name etc.

4.3 Log Graphics Schema File - LgSchema_v1.xml

```
<?xml version="1.0" ?>
_ <Schema xmlns="urn:schemas-microsoft-com:xml-data"
  xmlns:dt="urn:schemas-microsoft-com:datatypes">
- <!--
  UniqueId is used for references between elements
  -->
  <AttributeType name="UniqueId" dt:type="id" required="yes" />
- <!--
  LgFormat is the root element
  -->
_ <ElementType name="LgFormat" content="eltOnly" model="closed"
  order="many">
  <attribute type="UniqueId" />
  <element type="BackgroundColor" minOccurs="0" />
  <element type="Description" />
  <element type="Visible" minOccurs="0" />
  <element type="LgFont" minOccurs="0" maxOccurs="*" />
  <element type="LgIndexGrid" minOccurs="0" maxOccurs="*" />
  <element type="LgTrack" minOccurs="0" maxOccurs="*" />
  <element type="LgVerticalScale" minOccurs="1" maxOccurs="1"
  />
  </ElementType>
- <!--
  LgFont declaration
  -->
_ <ElementType name="LgFont" content="eltOnly" model="closed"
  order="many">
  <attribute type="UniqueId" />
  <element type="Bold" minOccurs="0" />
  <element type="Italic" minOccurs="0" />
  <element type="Name" />
  <element type="Size" />
  <element type="Strikethrough" minOccurs="0" />
  <element type="Underline" minOccurs="0" />
  </ElementType>
- <!--
  LgIndexGrid declaration begin
  -->
_ <ElementType name="LgIndexGrid" content="eltOnly"
  model="closed" order="many">
  <attribute type="UniqueId" />
  <element type="Visible" minOccurs="0" />
  <element type="LgIndexLine" minOccurs="0" maxOccurs="*" />
  </ElementType>
- <!--
  LgIndexLine declaration begin
```

```

-->
- <ElementType name="LgIndexLine" content="eltOnly"
  model="closed" order="many">
  <attribute type="UniqueId" />
  <element type="Color" minOccurs="0" />
  <element type="LineStyle" minOccurs="0" />
  <element type="Spacing" />
  <element type="SpacingUnit" />
  <element type="Thickness" minOccurs="0" />
  <element type="Visible" minOccurs="0" />
  - <group minOccurs="0" order="one">
    <element type="LgIndexNumber" />
    <element type="LgTimeIndexNumber" />
  </group>
</ElementType>
- <!--
  LgIndexNumber declaration begin
  -->
- <ElementType name="LgIndexNumber" content="eltOnly"
  model="closed" order="many">
  <attribute type="UniqueId" />
  <element type="Alignment" minOccurs="0" />
  <element type="Font" />
</ElementType>
- <!--
  LgTimeIndexNumber declaration begin
  -->
- <ElementType name="LgTimeIndexNumber" content="eltOnly"
  model="closed" order="many">
  <attribute type="UniqueId" />
  <element type="Alignment" minOccurs="0" />
  <element type="DateFormat" minOccurs="0" />
  <element type="Font" />
  <element type="TimeFormat" minOccurs="0" />
</ElementType>
- <!--
  LgTrack declaration begin
  -->
- <ElementType name="LgTrack" content="eltOnly" model="closed"
  order="many">
  <attribute type="UniqueId" />
  <element type="BackgroundColor" minOccurs="0" />
  <element type="BackgroundMode" minOccurs="0" />
  <element type="Description" minOccurs="0" />
  <element type="IndexLinesVisible" minOccurs="0" />
  <element type="IndexNumberVisible" minOccurs="0" />
  <element type="LeftPosition" minOccurs="0" />
  <element type="RightPosition" minOccurs="0" />
  <element type="Visible" minOccurs="0" />
  <element type="LgAreaFill" minOccurs="0" maxOccurs="*" />

```

```

    <element type="LgCurve" minOccurs="0" maxOccurs="*" />
    <element type="LgLinearGrid" minOccurs="0" maxOccurs="*"
      />
    <element type="LgLogarithmicGrid" minOccurs="0"
      maxOccurs="*" />
    <element type="LgPip" minOccurs="0" maxOccurs="*" />
  </ElementType>
- <!--
  LgAreaFill declaration begin
-->
= <ElementType name="LgAreaFill" content="eltOnly" model="closed"
  order="many">
  <attribute type="UniqueId" />
  <element type="BackgroundColor" minOccurs="0" />
  <element type="BackgroundMode" minOccurs="0" />
  <element type="Description" />
  <element type="ForegroundColor" minOccurs="0" />
  <element type="FromCurve" minOccurs="0" />
  <element type="Mode" minOccurs="0" />
  <element type="PatternNumber" />
  <element type="ToCurve" minOccurs="0" />
  <element type="Visible" minOccurs="0" />
</ElementType>
- <!--
  LgCurve declaration begin
-->
= <ElementType name="LgCurve" content="eltOnly" model="closed"
  order="many">
  <attribute type="UniqueId" />
  <element type="ChannelName" />
  <element type="LeftLimit" minOccurs="0" />
  <element type="LineStyle" minOccurs="0" />
  <element type="RightLimit" minOccurs="0" />
  <element type="Thickness" minOccurs="0" />
  <element type="Transform" minOccurs="0" />
  <element type="Visible" minOccurs="0" />
  <element type="WrapCount" minOccurs="0" />
  <element type="WrapMode" minOccurs="0" />
  <element type="LgAutoLabel" minOccurs="0" maxOccurs="*" />
  <element type="Color" minOccurs="0" />
</ElementType>
- <!--
  LgAutoLabel declaration begin
-->
= <ElementType name="LgAutoLabel" content="eltOnly"
  model="closed" order="many">
  <attribute type="UniqueId" />
  <element type="Arrow" minOccurs="0" />
  <element type="BackgroundColor" minOccurs="0" />
  <element type="BackgroundMode" minOccurs="0" />

```



```

- <!--
  LgVerticalScale declaration begin
  -->
- <ElementType name="LgVerticalScale" content="eltOnly"
  model="closed" order="many">
  <attribute type="UniqueId" />
  <element type="IndexScaler" />
  <element type="IndexUnit" />
  <element type="PaperScaler" />
  <element type="PaperUnit" />
</ElementType>
- <!--
Enumerated Common ElementType declaration begin
-->
<ElementType name="Alignment" content="textOnly"
  dt:type="string" />
<ElementType name="BackgroundMode" content="textOnly"
  dt:type="string" />
<ElementType name="BorderLineStyle" content="textOnly"
  dt:type="string" />
<ElementType name="ClipMode" content="textOnly"
  dt:type="string" />
<ElementType name="FillMode" content="textOnly" dt:type="string"
  />
<ElementType name="LineStyle" content="textOnly"
  dt:type="string" />
<ElementType name="LogScale" content="textOnly"
  dt:type="string" />
<ElementType name="Mode" content="textOnly" dt:type="string" />
<ElementType name="PaperUnit" content="textOnly"
  dt:type="string" />
<ElementType name="Scale" content="textOnly" dt:type="string" />
<ElementType name="Transform" content="textOnly"
  dt:type="string" />
<ElementType name="WrapMode" content="textOnly"
  dt:type="string" />
- <!--
Reference declaration begin
-->
<ElementType name="Font" content="textOnly" dt:type="string" />
<ElementType name="FromCurve" content="textOnly"
  dt:type="string" />
<ElementType name="ToCurve" content="textOnly" dt:type="string"
  />
- <!--
Validated Common ElementType declaration begin
-->
<ElementType name="Arrow" content="textOnly" dt:type="boolean"
  />
<ElementType name="Bold" content="textOnly" dt:type="boolean"
  />

```

```

<ElementType name="IndexLinesVisible" content="textOnly"
  dt:type="boolean" />
<ElementType name="IndexNumberVisible" content="textOnly"
  dt:type="boolean" />
<ElementType name="Italic" content="textOnly" dt:type="boolean"
  />
<ElementType name="Strikethrough" content="textOnly"
  dt:type="boolean" />
<ElementType name="Underline" content="textOnly"
  dt:type="boolean" />
<ElementType name="Visible" content="textOnly"
  dt:type="boolean" />
<ElementType name="BackgroundColor" content="textOnly"
  dt:type="bin.hex" />
<ElementType name="BorderColor" content="textOnly"
  dt:type="bin.hex" />
<ElementType name="BorderThickness" content="textOnly"
  dt:type="number" />
<ElementType name="Color" content="textOnly" dt:type="bin.hex"
  />
<ElementType name="ForegroundColor" content="textOnly"
  dt:type="bin.hex" />
<ElementType name="ChannelName" content="textOnly"
  dt:type="string" />
<ElementType name="DateFormat" content="textOnly"
  dt:type="string" />
<ElementType name="Description" content="textOnly"
  dt:type="string" />
<ElementType name="IndexUnit" content="textOnly"
  dt:type="string" />
<ElementType name="Label" content="textOnly" dt:type="string" />
<ElementType name="Name" content="textOnly" dt:type="string" />
<ElementType name="SpacingUnit" content="textOnly"
  dt:type="string" />
<ElementType name="TimeFormat" content="textOnly"
  dt:type="string" />
<ElementType name="IndexScaler" content="textOnly"
  dt:type="number" />
<ElementType name="Interval" content="textOnly"
  dt:type="number" />
<ElementType name="LeftLimit" content="textOnly"
  dt:type="number" />
<ElementType name="LeftPosition" content="textOnly"
  dt:type="number" />
<ElementType name="PaperScaler" content="textOnly"
  dt:type="number" />
<ElementType name="Position" content="textOnly"
  dt:type="number" />
<ElementType name="RightLimit" content="textOnly"
  dt:type="number" />

```

```
<ElementType name="RightPosition" content="textOnly"
  dt:type="number" />
<ElementType name="Size" content="textOnly" dt:type="int" />
<ElementType name="Spacing" content="textOnly"
  dt:type="number" />
<ElementType name="StartIndex" content="textOnly"
  dt:type="number" />
<ElementType name="StopIndex" content="textOnly"
  dt:type="number" />
<ElementType name="Thickness" content="textOnly"
  dt:type="number" />
<ElementType name="Width" content="textOnly" dt:type="number"
  />
<ElementType name="Decade" content="textOnly" dt:type="int" />
<ElementType name="LineCount" content="textOnly" dt:type="int"
  />
<ElementType name="Number" content="textOnly" dt:type="int" />
<ElementType name="PatternNumber" content="textOnly"
  dt:type="int" />
<ElementType name="StdPatternNumber" content="textOnly"
  dt:type="int" />
<ElementType name="WrapCount" content="textOnly" dt:type="int"
  />
</Schema>
```