Light Display Project (.ldp) File Format Specification

Version 0.0.0.1 (Draft)

Summary

Byte Offset	Section
0x000	Configuration Block
0x200	Workspace Data

Section 0 - Configuration Block

Version is defined as A.B.C.D.

Byte Offset	Size (bytes)	Field	Value
0x00	1	Version A	0x00
0x01	1	Version B	0x00
0x02	1	Version C	0x00
0x03	1	Version D	0x01
0x04	508	Spare	0x00

Section 1 - Workspace Data

Subsections of workspace data begin at byte offset 512 and are laid out contiguously. The length of each subsection can be calculated from values contained in the section. The starting location of each subsection is determined by the lengths of the preceding sections.

Subsection Number	Section Name
0	Light System Parameters
1	Color Palette
2	LED Groups
3	Gradients
4	Timeline

Section 1.0 - Light System Parameters

The number of bytes in section 1.0 is N + 1, where N is the number of channels, defined by the first byte in the section.

Byte Offset	Field	Value
0x00	# of channels (N)	1 - 255
0x01	# of leds in channel 0	1 - 255
...	...	...
N	# of leds in channel N - 1	1 - 255

Section 1.1 - Color Palette

The color palette section contains 256 entries, with each entry consisting of three bytes representing R, G, and B values for each color entry. The total length of the section is 768 bytes.

Byte Offset	Field
0x000	Entry 1 Red
0x001	Entry 2 Green
0x002	Entry 3 Blue
...	...
0x2FD	Entry 1 Red
0x2FE	Entry 2 Green
0x2FF	Entry 3 Blue

Section 1.2 - LED Groups

The LED Groups section contains a number of LED group entries. The number of LED group entries is determined by the first two bytes in the section. The length of each entry varies, and can take on any of the formats defined by LED Group subtypes. For each subtype, the first byte in the entry defines which format is used by that entry.

Byte Offset	Size (bytes)	Field
0x00	2	LED Group Entries (N)
0x02	*varies*	Entry 0
...	...	...
varies	*varies*	Entry N - 1

LED Group Subtypes

LEDID

Byte Offset	Field	Value
0x00	Subtype	0 (LEDID)
0x01	Channel	0 - (N - 1), where N is the number of channels in the light system.
0x02	LED Index	0 - (M - 1), where M is the number of LEDs in the channel.

LEDRange

Byte Offset	Field	Value
0x00	Subtype	1 (LEDRange)
0x01	Channel	0 - (N - 1), where N is the number of channels in the light system.
0x02	Start Index	0 - (M - 1), where M is the number of LEDs in the channel.
0x03	End Index	0 - (M - 1), where M is the number of LEDs in the channel.

LEDGroup

Byte Offset	Size (bytes)	Field	Value
0x00	1	Subtype	2 (LEDGroup)
0x01	2	Subgroup Count (N)	1 - 65535
0x02	2	Subgroup ID 0	0 - (M - 1), where M is the number of group entries preceding this entry*
...	...	...	...
varies	2	Subgroup ID N - 1	0 - (M - 1), where M is the number of group entries preceding this entry*
varies	1	Group Name Size (S)	1 - 255
varies	S	Group Name	ASCII characters

* Each subgroup entry references a subgroup ID. The subgroup ID is an index which defines the entry number in the LEDGroups section. When a file is created, groups must be ordered such that no LEDGroup entry references a subgroup which occurs after it in the entry list.

Section 1.3 - Gradients

The Gradients section contains a number of gradient entries. The number of gradient entries is determined by the first two bytes in the section. The length of each entry varies, depending on the number of gradient point entries and color types.

Byte Offset	Size (bytes)	Field
0x00	2	Gradient Count (N)
0x02	*varies*	Gradient 0
...	...	...
varies	*varies*	Gradient N - 1

Gradient Entry

Each gradient entry must contain two or more gradient point entries. Each gradient point entry consists of a one-byte position value and a color value, which may take on the format of any color subtype. Gradient points are listed in ascending position order. The first gradient point always has a position value of 0. The last gradient point always has a position value of 100. Only one point entry may exist for a given position.

Byte Offset	Size (bytes)	Field	Value
0x00	1	Gradient Point Count (N)	2 - 101
0x01	1	Position 0	0
0x02	*varies*	Color 0	Color
varies	1	Position 1	1 - 99
varies	*varies*	Color 1	Color
...	...	...	...
varies	*varies*	Position N - 1	100
varies	*varies*	Color N - 1	Color
varies	1	Gradient Name Size (S)	1 - 255
varies	S	Gradient Name	ASCII characters

Color Subtypes

AbsoluteColor

AbsoluteColor entries are defined by explicit RGB values. Note that this format differs from values in the Color Palette, as the AbsoluteColor format includes the subtype as the first byte.

Byte Offset	Field	Value
0x00	Subtype	0 (AbsoluteColor)
0x01	Red	0 - 255
0x02	Green	0 - 255
0x03	Blue	0 - 255

PaletteColor

PaletteColor entries are defined by a reference to an index in the color palette. Changing a value in the palette will change the color of all PaletteColor objects which reference that index.

Byte Offset	Field	Value
0x00	Subtype	1 (PaletteColor)
0x01	Index	0 - 255

Section 1.4 - Timeline

The timeline consists of a number of keyframe entries. Keyframe entries are listed in ascending order of frame index.

Byte Offset	Size (bytes)	Field	Value
0x00	4	Keyframe Count (N)	1 - 4294967296
0x05	*varies*	Keyframe 0	Keyframe
...	...	...	...
varies	*varies*	Keyframe N - 1	Keyframe

Keyframe Entry

Byte Offset	Size (bytes)	Field	Value
0x00	4	Frame Index	0 - 4294967296
0x04	2	Group ID	0 - 65535
0x06	2	Color Group Count (N)	1 - 65535
0x08	*varies*	Color Group 0	Color Group
...	...	...	...
varies	*varies*	Color Group N - 1	Color Group
varies	*varies*	Animation	Animation

Color Group Subtypes

SolidColorGroup

Byte Offset	Size (bytes)	Field	Value
0x00	1	Subtype	0 (SolidColorGroup)
0x01	4	Size	1 - 65535
0x03	*varies*	Color	Color

GradientColorGroup

Byte Offset	Size (bytes)	Field	Value
0x00	1	Subtype	1 (GradientColorGroup)
0x01	4	Size	1 - 65535
0x05	2	Gradient ID	0 - 65535
0x07	4	Start Index	0 - 4294967296
0x0B	4	End Index	0 - 4294967296
0x0F	1	Interpolation Mode	InterpolationMode

InterpolationMode

Value	Mode
0	Floor
1	Nearest
2	Linear
3	Cubic

IndividualColorGroup

Byte Offset	Size (bytes)	Field	Value
0x00	1	Subtype	2 (IndividualColorGroup)
0x01	4	Size (N)	1 - 65535
0x05	*varies*	Color 0	Color
...	...	...	...
varies	*varies*	Color N - 1	Color

Animation Subtypes

Static

Offset	Size (bytes)	Field	Value
0x00	1	Subtype	0 (Static)
0x01	2	Duration	1 - 65535

Blink

The blink animation defines a second color group (in addition to the colors assigned to the keyframe). The keyframe values are displayed for A Frames, and the B Color Group is displayed for B Frames, alternating for the duration of the animation.

Offset	Size (bytes)	Field	Value
0x00	1	Subtype	1 (Blink)
0x01	2	Duration	1 - 65535
0x03	2	A Frames	1 - 65535
0x05	2	B Frames	1 - 65535
0x06	*varies*	B Color Group	ColorGroup

Shift

The shift animation shifts in the specified direction by M LEDs every N frames. Values shifted in are taken from the Shift In Color Group. If the number of LEDs shifted in exceeds the length of the shift in color group, the color group is tiled.

Offset	Size (bytes)	Field	Value
0x00	1	Subtype	2 (Shift)
0x01	2	Duration	1 - 65535
0x03	1	Direction	Direction
0x04	2	LEDs Per Shift (M)	1 - 65535
0x06	2	Frames Per Shift (N)	1 - 65535
0x08	*varies*	Shift In Color Group	ColorGroup

Rotate

The Rotate animation is similar to the shift animation, but the colors shifted in are taken from the opposite end of the applicable group.

Offset	Size (bytes)	Field	Value
0x00	1	Subtype	3 (Rotate)
0x01	2	Duration	1 - 65535
0x03	1	Direction	Direction
0x04	2	LEDs Per Shift (M)	1 - 65535
0x06	2	Frames Per Shift (N)	1 - 65535

Wipe

The Wipe animation defines a second color group which is revealed M LEDs at a time, every N frames. If the duration is greater than the amount of time to reveal the second color group, the first color group is revealed in the same manner, and so on. If the size of the defined color group is less than the size of the referenced led group, the color group is tiled.

Offset	Size (bytes)	Field	Value

0x00	1	Subtype	4 (Wipe)
0x01	2	Duration	1 - 65535
0x03	1	Direction	Direction
0x05	2	LEDs Per Shift (M)	1 - 65535
0x07	2	Frames Per Shift (N)	1 - 65535
0x09	*varies*	Shift In Color Group	ColorGroup

Fade

The fade animation gradually transitions from one value to the other, using linear interpolation. The fade from color group A to color group B takes Fade Duration A frames. The fade from color group B to color group A takes Fade Duration B frames. If the duration of the animation is longer than Fade Duration A, the color fades back to color group A in Fade Duration B frames. The animation is looped for the full duration of the animation.

Offset	Size (bytes)	Field	Value
0x00	1	Subtype	5 (Fade)
0x01	2	Duration	1 - 65535
0x03	2	Fade Duration A	1 - 65535
0x05	2	Fade Duration B	1 - 65535
0x07	*varies*	B Color Group	ColorGroup