# ILDA Image Data Transfer Format Specification


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# Contents



  

# 1. ILDA Image Data Transfer Format

This technical standard describes the official International Laser Display Association Data Transfer Format for exchanging laser show frames between systems. It has been developed by ILDA's Technical Committee.

The official name of this standard is "ILDA Image Data Transfer Format".

You can obtain frames from any program that correctly writes ILDA-format files, and transparently load them directly into any system that can load ILDA-format files. Similarly, you can save frames in ILDA format, to sell or trade with users of other systems that read ILDA format.

## 1.1. Scope of the ILDA File Format

The ILDA format is intended for frame exchange purposes only. A laser system is free to read and write its own proprietary format that best meets its features and requirements.

It is not optimized for space or speed, and it is not currently concerned with display issues such as point output rate. Also, the format does not include show information such as timing of frames. Generally, the highest function the ILDA format can provide is a sequence of frames which play back to form an animation.

  

# 2. Introduction

## 2.1. Nomenclature and Structure

Throughout this document, the word “SHALL” is used in capitals to stress required conformance with the ILDA Format. The word “SHOULD” in capitals indicates suggested conformance.

## 2.2. Binary vs. ASCII

The terms “binary 0” or “binary 1” refer to bit codes 0000 0000 and 0000 0001. They are used to avoid confusion with the ASCII characters “0” or “1”.

## 2.3. Byte Order

For values which span more than a single byte, the multiple byte ordering followed SHALL be that of the big endian standard. The most significant byte will occur first, the least significant byte last.

## 2.4. Point Data in ILDA Files

The ILDA format is intended for “point-oriented” frames only rather than “vector-oriented” frames. This means the data in an ILDA file is interpreted as data samples which are directly sent to the galvanometer scanners used in laser projectors. The data is NOT raw vector information which needs further processing.

## 2.5. Colors in ILDA Files

Assume that the RGB color values specified in this standard are linear and are color balanced. For linearity, this is visual linearity: a color value of 127 (50 %) appears half as bright to the eye as a setting of 255 (100 %).

  

# 3. File Structure

## 3.1. Layout

An ILDA file consists of sections which either contain a frame or a color palette. Each section consists of a fixed length header followed by a variable number of data records, which are either frame points or color palette colors.

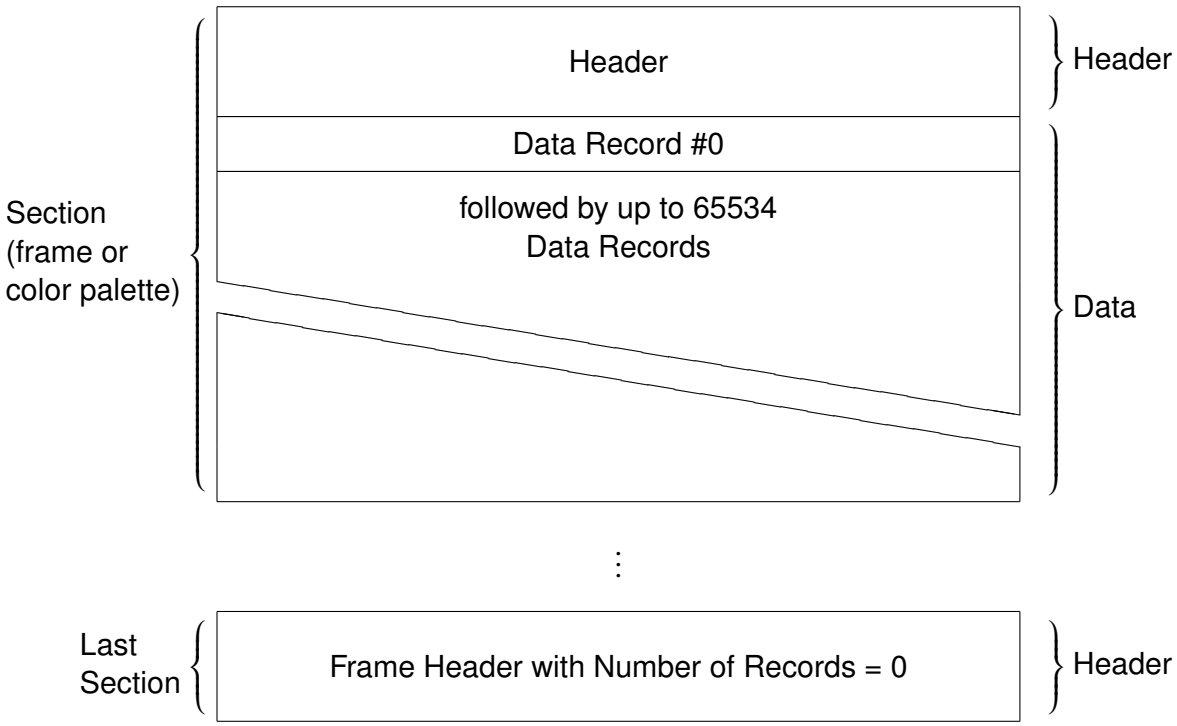


Figure 1: ILDA File Structure

The “Number of Records” field in the header defines how many data records will follow the header.

The end of the file is marked by a header with frame format code (Format 0, 1, 4 or 5) and zero number of records.

## 3.2. Format Codes

The type and data format of the section is defined by the format code. There are five different formats currently defined:

- Format 0 – 3D Coordinates with Indexed Color
- Format 1 – 2D Coordinates with Indexed Color
- Format 2 – Color Palette for Indexed Color Frames
- Format 4 – 3D Coordinates with True Color
- Format 5 – 2D Coordinates with True Color

Format 3 was proposed within the ILDA Technical Committee but was never approved. Therefore, format 3 is omitted in this ILDA standard.

Formats 0, 1, 4 and 5 define point data. Each point includes X and Y coordinates, and color information. The 3D formats 0 and 4 also include Z (depth) information.

The indexed color formats 0 and 1 use a data format where each point has a Color Index between 0 and 255 used as an index into a color palette. Format 2 specifies the color palette for use with indexed color frames. The true color formats 4 and 5 use a red, green and blue color component of 8 bits for each point. ILDA files may contain a mix of frames with several different format codes.

## 3.3. Application Requirements

An application which reads ILDA format files SHALL be able to read all five current formats (0, 1, 2, 4 and 5).

Newly created applications SHOULD primarily use the true color frame formats.

For compatibility with older versions of the ILDA file format applications SHOULD be able to write one of the indexed color frame formats, optionally including the color palette.

## 3.4. Color Palette Handling

For each projector there is a color palette which is used for indexed color frames.

The color palette used for a projector can be set using a format 2 color palette section. The color palette will then be used for all following frames for that projector. If another format 2 section is encountered for that projector, it will replace the projector's current color palette.

Often ILDA files contain indexed color frames without a format 2 color table preceding them. For this case the color palette has to be initialized to a user-defined color palette. One possible palette is given in Appendix A of this standard.

# 4. Header Section

## 4.1. Structure

The header has a fixed size of 32 bytes and the following structure:

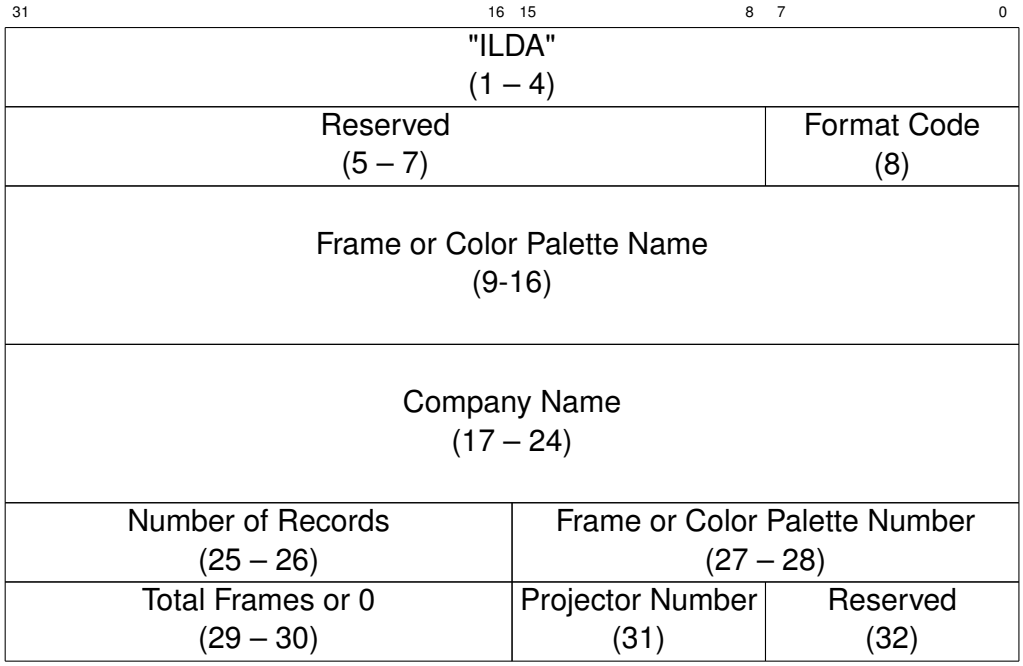


Figure 2: Header Structure
Byte numbers in parenthesis.

## 4.2. Field Description

### 4.2.1. "ILDA"

Bytes 1 – 4. The ASCII letters ILDA, identifying an ILDA format header.

### 4.2.2. Reserved

Bytes 5 – 7 and 32. Reserved for future use. When writing a file, this SHALL be set to 0. When reading a file, do not test the value of these bytes.

### 4.2.3. Format Code

Byte 8. One of the format codes defined in the Format Codes section.

### 4.2.4. Frame or Color Palette Name

Bytes 9 – 16. Eight ASCII characters with the name of this frame or color palette. If a binary zero is encountered, than any characters following the zero SHALL be ignored.

### 4.2.5. Company Name

Bytes 17 – 24. Eight ASCII characters with the name of the company who created the frame. If a binary zero is encountered, than any characters following the zero SHALL be ignored.

### 4.2.6. Number of Records

Bytes 25 – 26. Total number of data records (points or colors) that will follow this header expressed as an unsigned integer (0 – 65535).

If the number of records is 0, then this is to be taken as the end of file header and no more data will follow this header.

For color palettes, the number of records SHALL be between 2 and 256.

### 4.2.7. Frame or Color Palette Number

Bytes 27 – 28. If the frame is part of a group such as an animation sequence, this represents the frame number. Counting begins with frame 0. Range is 0 – 65534.

### 4.2.8. Total Frames in Sequence or 0

Bytes 29 – 30. Total frames in this group or sequence. Range is 1 – 65535. For color palettes this SHALL be 0.

#### 4.2.9. Projector Number

Byte 31. The projector number that this frame is to be displayed on. Range is 0 – 255. For single projector files this SHOULD be set 0.

# 5. Data Records

## 5.1. Data Record Structures

### 5.1.1. Format 0 – 3D Coordinates with Indexed Color

Format 0 records have a size of 8 bytes and the following structure:

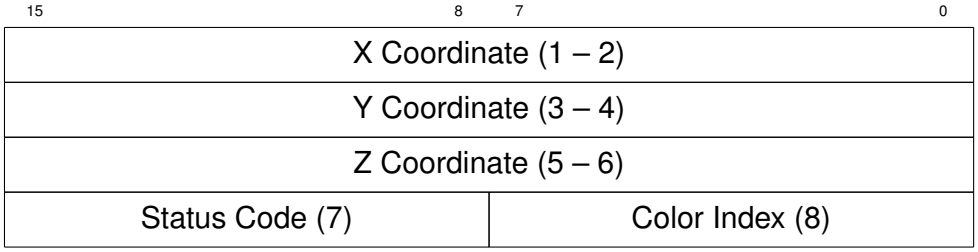


Figure 3: Structure of Point Format 0 -
3D Coordinates with “Indexed Color”
Byte numbers in parenthesis.

### 5.1.2. Format 1 – 2D Coordinates with Indexed Color

Format 1 records have a size of 6 bytes and the following structure:

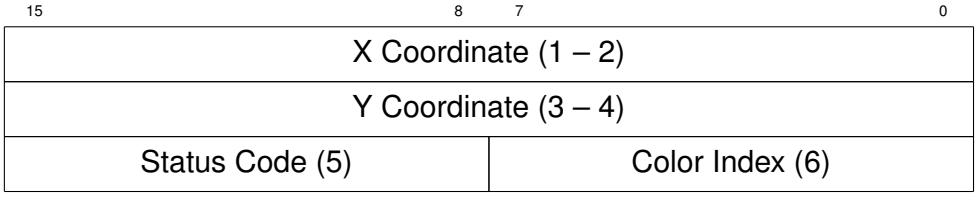


Figure 4: Structure of Point Format 1 -
2D Coordinates with “Indexed Color”
Byte numbers in parenthesis.

### 5.1.3. Format 2 – Color Palette

Format 2 records have a size of 3 bytes and the following structure:


Figure 5: Structure of Format 2 -
Color Palette
Byte numbers in parenthesis.

### 5.1.4. Format 4 – 3D Coordinates with True Color

Format 4 records have a size of 10 bytes and the following structure:

| 15 8 | 7 0 |
|---|---|
| X Coordinate (1 – 2) | |
| Y Coordinate (3 – 4) | |
| Z Coordinate (5 – 6) | |
| Status Code (7) | Blue (8) |
| Green (9) | Red (10) |

Figure 6: Structure of Point Format 4 -
3D Coordinates with True Color
Byte numbers in parenthesis.

### 5.1.5. Format 5 – 2D Coordinates with True Color

Format 5 records have a size of 8 bytes and the following structure:

| 15 8 | 7 0 |
|---|---|
| X Coordinate (1-2) | |
| Y Coordinate (3-4) | |
| Status Code (5) | Blue (6) |
| Green (7) | Red (8) |

Figure 7: Structure of Point Format 5 -
2D Coordinates with True Color
Byte numbers in parenthesis.

## 5.2. Data Field Description

### 5.2.1. X Coordinate

A 16-bit binary twos complement (signed) integer.

Extreme left is -32768; extreme right is +32767. (All directions referenced to front projection.)

### 5.2.2. Y Coordinate

A 16-bit binary twos complement (signed) integer.

Extreme bottom is -32768; extreme top is +32767.

### 5.2.3. Z Coordinate

A 16-bit binary twos complement (signed) integer.

Extreme rear (away from viewer; behind screen) is -32768; extreme front (towards viewer; in front of screen) is +32767.

### 5.2.4. Status Code

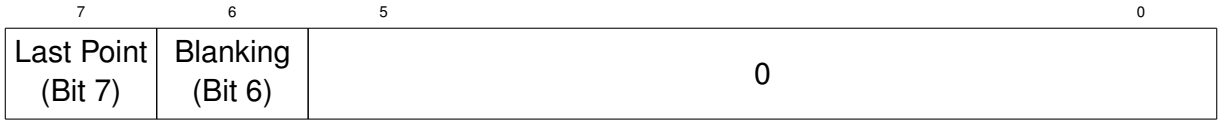


Figure 8: Status Code Format

**Bit 7 (MSB) – Last Point Bit:** This bit SHALL be set to 0 for all points except the last point of the image.

**Bit 6 – Blanking Bit:** If this is a 1, then the laser is off (blank). If this is a 0, then the laser is on (draw). Note that all systems SHALL write this bit, even if a particular system uses the color index for blanking/color information.

When reading files, the blanking bit takes precedence over the color from the color palette or the points RGB values. If the blanking bit is set, all RGB values SHOULD be treated as zero.

**Bits 0 – 5:** SHALL be set to 0. Do not test the value of these bits.

### 5.2.5. Color Index

Indicates the point's color number. This value is used as an index into the color palette.

### 5.2.6. Blue Color Component

This value is the point's blue color component. A value of 0 indicates "zero brightness" and a value of 255 indicates "maximum brightness".

### 5.2.7. Green Color Component

This value is the point's green color component. A value of 0 indicates "zero brightness" and a value of 255 indicates "maximum brightness".

### 5.2.8. Red Color Component

This value is the point's red color component. A value of 0 indicates "zero brightness" and a value of 255 indicates "maximum brightness".

# 6. Revision History

Not all versions are listed here.

- Revision 004, June 1992 – Added Format 2 with color header table data.
- Revision 005.1, July 2006 – Corrected coordinate ranges and made a minor correction in one place.
- Revision 008, March 2007 – Added Formats 4 and 5. Limited distribution as a draft, within the ILDA Technical Committee
- Revision 009, October 2008 – No change to Formats. Extensive changes and additions to explanatory text.
- Revision 010A, April 2013 – Major update of layout and structure of this document.
- Revision 010B, September 2013 – Minor corrections.
- Revision 010C, June 2014 – Minor corrections.
- Revision 010D, October 2014 – No changes to Formats. Renamed "Scanner Number" to "Projector Number", various minor corrections.
- Revision 010E, October 2014 – No changes to Formats. Various minor corrections, added bytes numbers to tables.
- Revision 011, November 2014 – Release Version

# 7. Contributors

Many individuals have contributed to ILDA standards development and this document. These include the following contributors:

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# 8. Copyright

# Appendix

## A. Suggested Default Color Palette

The color palette described here was originally developed by LFI and Aura Technologies. It contains 64 colors of the full saturated hues and white.

This color palette is used by most ILDA files that do not contain a color palette, including the ILDA test pattern.

Table 1: Suggested Default Color Palette

| Color Number | Red | Green | Blue | Color name |
|---|---|---|---|---|
| 0 | 255 | 0 | 0 | Red |
| 1 | 255 | 16 | 0 | |
| 2 | 255 | 32 | 0 | |
| 3 | 255 | 48 | 0 | |
| 4 | 255 | 64 | 0 | |
| 5 | 255 | 80 | 0 | |
| 6 | 255 | 96 | 0 | |
| 7 | 255 | 112 | 0 | |
| 8 | 255 | 128 | 0 | |
| 9 | 255 | 144 | 0 | |
| 10 | 255 | 160 | 0 | |
| 11 | 255 | 176 | 0 | |
| 12 | 255 | 192 | 0 | |
| 13 | 255 | 208 | 0 | |
| 14 | 255 | 224 | 0 | |
| 15 | 255 | 240 | 0 | |
| 16 | 255 | 255 | 0 | Yellow |
| 17 | 224 | 255 | 0 | |

  

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|---|---|---|---|---|
| 18 | 192 | 255 | 0 | |
| 19 | 160 | 255 | 0 | |
| 20 | 128 | 255 | 0 | |
| 21 | 96 | 255 | 0 | |
| 22 | 64 | 255 | 0 | |
| 23 | 32 | 255 | 0 | |
| 24 | 0 | 255 | 0 | Green |
| 25 | 0 | 255 | 36 | |
| 26 | 0 | 255 | 73 | |
| 27 | 0 | 255 | 109 | |
| 28 | 0 | 255 | 146 | |
| 29 | 0 | 255 | 182 | |
| 30 | 0 | 255 | 219 | |
| 31 | 0 | 255 | 255 | Cyan |
| 32 | 0 | 227 | 255 | |
| 33 | 0 | 198 | 255 | |
| 34 | 0 | 170 | 255 | |
| 35 | 0 | 142 | 255 | |
| 36 | 0 | 113 | 255 | |
| 37 | 0 | 85 | 255 | |
| 38 | 0 | 56 | 255 | |
| 39 | 0 | 28 | 255 | |
| 40 | 0 | 0 | 255 | Blue |
| 41 | 32 | 0 | 255 | |
| 42 | 64 | 0 | 255 | |
| 43 | 96 | 0 | 255 | |
| 44 | 128 | 0 | 255 | |
| 45 | 160 | 0 | 255 | |

  

| | | | | |
|---|---|---|---|---|
| 46 | 192 | 0 | 255 | |
| 47 | 224 | 0 | 255 | |
| 48 | 255 | 0 | 255 | Magenta |
| 49 | 255 | 32 | 255 | |
| 50 | 255 | 64 | 255 | |
| 51 | 255 | 96 | 255 | |
| 52 | 255 | 128 | 255 | |
| 53 | 255 | 160 | 255 | |
| 54 | 255 | 192 | 255 | |
| 55 | 255 | 224 | 255 | |
| 56 | 255 | 255 | 255 | White |
| 57 | 255 | 224 | 224 | |
| 58 | 255 | 192 | 192 | |
| 59 | 255 | 160 | 160 | |
| 60 | 255 | 128 | 128 | |
| 61 | 255 | 96 | 96 | |
| 62 | 255 | 64 | 64 | |
| 63 | 255 | 32 | 32 | |