

INTERNATIONAL LASER DISPLAY ASSOCIATION

Technical Committee

The ILDA Standard Projector

Revision History **1**
Introduction **2**
ILDA Standard Projector **5**
30K Scanner Tuning **6**
DB-25 Connector and Signal Specification **7**
DMX-512 Effects Control **18**
Effects Specification **21**
ADAT Tape Playback and Track Assignments **24**
Glossary **26**

Revision 002, July 1999

©1999 International Laser Display Association

Permission is given to reproduce all or part of this document as long as credit is given to ILDA and the copyright is acknowledged as follows:
"This material is" [or "Portions of this material are"] copyright ©1999 by the International Laser Display Association and is used by permission."

Permission is given to reproduce all or part of this document as long as credit is given to ILDA and the copyright is acknowledged as follows:
"This material is" [or "Portions of this material are"] copyright ©1999 by the International Laser Display Association and is used by permission."

Revision History

Revision 001, December 1996:

- The initial publication of the ILDA Standard Projector.

Revision 002, August 1999:

- Clarified wording on all signal levels within ISP-DB25.
- Clarified wording for the projector interlock within ISP-DB25.
- Changed polarity of blanking signal within ISP-DB25.
- Replaced “USER4” with graphics shutter for Channel 20 of ISP-DMX.
- Added provisions for a sixth color channel to ISP-DB25.
- Added color wavelength and use tables to ISP-DB25.

Permission is given to reproduce all or part of this document as long as credit is given to ILDA and the copyright is acknowledged as follows:
"This material is" [or "Portions of this material are"] copyright ©1999 by the International Laser Display Association and is used by permission."

Introduction

As the trade organization for the laser display industry, ILDA's members represent the entire gamut of how laser shows have been produced. There have been almost as many hardware variations, configurations and protocols as there have been people producing laser light shows. The advantage of the association within ILDA is that over time, from the assortment of ideas and procedures amongst its members, gradually the best ideas percolate out and consensus of opinion is formed. From this consensus, standards have been and will continue to be established, which will be beneficial to all who use them.

The ultimate goal of these standards is to ensure the compatibility and interchangeability of hardware, software, and artware, in order that the results are predictable and that the artwork is faithfully reproduced from system to system. Additional benefits also arise from standardization, such as cheaper and more reliable hardware, immediate plug-and-play artware, simplified trouble-shooting, to mention just a few.

This document sets forth the general specifications for the manufacture and production of the ILDA Standard Projector, or "ISP". Defining the ISP has been a goal for some time and these specifications represent the culmination of the ILDA's work for the past few years. Utilizing standards already in place, in conjunction with new standards specifically tailored to the ISP, there is now a definition for a standard projector ensuring a platform that can faithfully reproduce artwork within the inherent limitations of the given projector.

The two key concepts here are "faithfully reproduce" and "the inherent limitations of the given projector." To illustrate these concepts, consider television. There are a great variety of television sets, ranging from monochrome, pocket-sized LCD sets to full-color projection TVs, all the way to video walls and Jumbotrons. But each of these operates within a set of standard parameters. They accept the same type of signal source and reproduce it within their inherent limitations.

The ILDA Standard Projector can be compared to television sets. Some would be monochromatic and offer graphics only, while others would be

Permission is given to reproduce all or part of this document as long as credit is given to ILDA and the copyright is acknowledged as follows:
"This material is" [or "Portions of this material are"] copyright ©1999 by the International Laser Display Association and is used by permission."

full-color RGB with a full complement of lumia, scan-through effects, and beam rails. Like television sets, each of these would operate from the same signals and reproduce as much as possible the original laser artwork.

To accomplish this, ILDA has defined the key parts of the projectors themselves. These elements, used in conjunction, constitute the ILDA Standard Projector. These parts are:

- Scanner tuning;
- DB-25 connector and signal specifications;
- DMX-512 effects control;
- Effects Specification; and
- ADAT tape playback track assignments.

The designation of a basic, one-scanner pair, graphics-only system, whether monochromatic or RGB, is “ISP Level One”. A single-scanner graphics system which has effects capability such as lumia, beam table, etc., is designated as “ISP Level Two.”

A rudimentary standard essentially already exists for laser graphics largely by virtue of the common base of equipment in use. For example, almost everyone utilizes X-Y scanners and PCAOM color control, and therefore an X-Y-R-G-B standard fundamentally already exists. For graphics-only applications, X-Y-R-G-B is fine. But laser shows may consist of much more than simply laser graphics. Lumia and diffraction effects can be used to punctuate graphics. Actuated beam positions can be used for atmospheric effects and other outboard devices such as fog machines and strobe lights are commonly used to accentuate the drama of a laser show. The specifications for the ISP allow all of these effects to be controlled in a consistent and predictable manner.

With these specifications, projector manufacturers will be able to produce many units of a standard model. They will be buying standard components in high volumes rather than a few non-standard components for a unique projector. They will be able to fine-tune their projector production line for higher quality and faster turn-around times. This will ultimately lead to lower cost in manufacturing, which in turn will be reflected in lower sales prices.

Permission is given to reproduce all or part of this document as long as credit is given to ILDA and the copyright is acknowledged as follows:
"This material is" [or "Portions of this material are"] copyright ©1999 by the International Laser Display Association and is used by permission."

Manufacturers of components, such as scanners, PCAOMs, and board-level devices such as geometric correctors, will benefit as well. Currently many of these manufacturers must concentrate on producing a wide variety of components to meet inconsistent market demands. With the ISP standard in place, these manufacturers will now be able to concentrate on improving a few specific models of their devices. This will result in higher quality, lower cost components, with greater interchangeability.

Software manufacturers will receive similar benefits relating to the consistent market needs that the ISP standards provide. They will now be able to create software which excels with a single projection standard rather than software which works adequately, or marginally, with numerous projector configurations. Now efforts can be focused on improving the usability and functionality of software rather than focusing on providing various interface and control schemes required by different types of projection systems. The resulting software interfaces will afford the end user a greater variety of software titles that offer more creative tools to work with and assure the end user that these programs will function similarly within the constraints of the ISP requirements.

The complexity of artwork creation is also greatly simplified by having predictable performance characteristic afforded by the utilization of standard scanner tuning. Designers will be able to spend more time improving and producing quality shows and less time worrying about the limitations or permutations of end-user equipment.

And the best benefit of all is to the end user. With the changes in projection systems, system components and software interfaces, show production will ultimately become more user friendly, less expensive, more accessible, and more creative than ever.

Permission is given to reproduce all or part of this document as long as credit is given to ILDA and the copyright is acknowledged as follows:
"This material is" [or "Portions of this material are"] copyright ©1999 by the International Laser Display Association and is used by permission."

ILDA Standard Projector

Standard Identifier: ISP

The ILDA Standard Projector - ISP is the hardware configuration which conforms to the following ILDA standards:

ILDA Standard	***Standard Identifier***
30K Scanner Tuning	ISP-30K
DB-25 Connector and Signal Specification*	ISP-DB25*
DMX-512 Effects Control	ISP-DMX
Effects Specification	ISP-EFX
ADAT Tape Playback and Track Assignments	ISP-TAPE

*Note: “The Mechanical and Electrical Interface for Laser Projection Devices,” Revision 001, August 1989, in *The ILDA Handbook and Technical Specifications*, is superseded by ISP-DB25.

Permission is given to reproduce all or part of this document as long as credit is given to ILDA and the copyright is acknowledged as follows:
"This material is" [or "Portions of this material are"] copyright ©1999 by the International Laser Display Association and is used by permission."

30K Scanner Tuning

Standard Identifier: ISP-30K

The ILDA Standard Projector shall have image response as defined by the ILDA Test Pattern properly displayed at 30,000 points per second. See the "ILDA Test Pattern", Revision 002, October, 1995, in the *ILDA Handbook and Technical Standards*.

©1999 International Laser Display Association

Permission is given to reproduce all or part of this document as long as credit is given to ILDA and the copyright is acknowledged as follows:
"This material is" [or "Portions of this material are"] copyright ©1999 by the International Laser Display Association and is used by permission."

DB-25 Connector and Signal Specification

Standard Identifier: ISP-DB25

DB-25 Connector

The DB-25 connector connects laser graphics signal sources to laser graphics projectors. The DB-25 pinout is designed so that the signals needed by most users are grouped together. It provides a logical ordering of signals to facilitate easy recollection in the field without a diagram.

DB-25 Connector Pinouts

Pin Number	*Signal Name*
1	X+
2	Y+
3	Intensity +
4	Interlock A
5	R+
6	G+
7	B+
8	User-defined signal 1+
9	User-defined signal 2+
10	User-defined signal 3+
11	User-defined signal 4+
12	Projector return signal
13	Shutter
14	X-
15	Y-

Permission is given to reproduce all or part of this document as long as credit is given to ILDA and the copyright is acknowledged as follows:
"This material is" [or "Portions of this material are"] copyright ©1999 by the International Laser Display Association and is used by permission."

16	Intensity -
17	Interlock B
18	R-
19	G-
20	B-
21	User-defined signal 1-
22	User-defined signal 2-
23	User-defined signal 3-
24	User-defined signal 4-
25	Ground

Signal sources such as computer or tape playback devices shall use a DB-25 female. Projectors shall use a DB-25 male.

Signal Specification

The DB-25 graphics connector standard sets fourth certain signals. These are:

- Signals required to be present for proper projector operation;
- Signals which are optional; and
- User-defined signals, which are not required but are provided for flexibility.

Required Signals

The required signals are those which would typically be present on tape playback systems and laser graphics computer systems. These required signals are X, Y, R, G, B, Shutter, Ground and Interlock loop.

Permission is given to reproduce all or part of this document as long as credit is given to ILDA and the copyright is acknowledged as follows:
"This material is" [or "Portions of this material are"] copyright ©1999 by the International Laser Display Association and is used by permission."

Required Signals	Description
X	Controls the horizontal beam position. This is a bipolar analog signal whose voltage range is 10V peak-to-peak differential. A differential voltage level of -10V shall deflect the laser beam to the left side of the projection area. A differential voltage level of +10V shall deflect the signal to the right side. A differential voltage of +10V occurs if the normal signal line has a voltage level of +10V with respect to the voltage level of the inverted signal line. When compared to the ground level of the differential driver, the voltage level of the normal signal line shall be +5V and the voltage level of the inverted signal shall be -5V.
Y	Controls the vertical beam position. This is a bipolar analog signal whose voltage range is 10V peak-to-peak differential. A differential voltage level of -10V shall deflect the laser beam to the bottom of the screen. A differential voltage level of +10V shall deflect the signal to the top of the screen. A differential voltage level of 0V shall place the beam in the center of the screen vertically. A differential voltage of +10V occurs if the normal signal line has a voltage level of +10V with respect to the voltage level of the inverted signal line. When compared to the ground level of the differential driver, the voltage level of the normal signal line shall be +5V and the voltage level of the inverted signal shall be -5V.
R	Controls the red intensity. This is a unipolar analog signal whose voltage range is 5V peak-to-peak differential. A differential voltage level of 0V shall produce no red output. A differential voltage level of +5V shall produce maximum red output.

Permission is given to reproduce all or part of this document as long as credit is given to ILDA and the copyright is acknowledged as follows:
"This material is" [or "Portions of this material are"] copyright ©1999 by the International Laser Display Association and is used by permission."

	A differential voltage of +5V occurs if the normal signal line has a voltage level of +5V with respect to the voltage level of the inverted signal line. When compared to the ground level of the differential driver, the voltage level of the normal signal line shall be +2.5V and the voltage level of the inverted signal shall be -2.5V. See “Color Channel Usage” section, below.
G	Controls the green intensity. This is a unipolar analog signal whose voltage range is 5V peak-to-peak differential. A differential voltage level of 0V shall produce no green output. A differential voltage level of +5V shall produce maximum green output. A differential voltage of +5V occurs if the normal signal line has a voltage level of +5V with respect to the voltage level of the inverted signal line. When compared to the ground level of the differential driver, the voltage level of the normal signal line shall be +2.5V and the voltage level of the inverted signal shall be -2.5V. See “Color Channel Usage” section, below.
B	Controls the blue intensity. This is a unipolar analog signal whose voltage range is 5V peak-to-peak differential. A differential voltage level of 0V shall produce no blue output. A differential voltage level of +5V shall produce maximum blue output. A differential voltage of +5V occurs if the normal signal line has a voltage level of +5V with respect to the voltage level of the inverted signal line. When compared to the ground level of the differential driver, the voltage level of the normal signal line shall be +2.5V and the voltage level of the inverted signal shall be -2.5V. See “Color Channel Usage” section, below.

Permission is given to reproduce all or part of this document as long as credit is given to ILDA and the copyright is acknowledged as follows:
"This material is" [or "Portions of this material are"] copyright ©1999 by the International Laser Display Association and is used by permission."

Shutter	Optical shutter intended to extinguish all light from the graphics scanners. This is a unipolar analog signal whose voltage range is 5 volts peak. The shutter signal is referenced to the Ground pin. A voltage level of 0 volts shall close the shutter so that no light is emitted from the graphics scanners. A voltage level of +5 volts shall fully open the shutter.
Ground	0 voltage potential reference and signal shield.
Interlock A & Interlock B	These are intended to keep the projector from outputting light if inadvertently connected to non-laser signal sources such as SCSI, Parallel or serial connectors. These signals are also a fail-safe should other control measures fail. These signals are tied together at the signal source. If this loop is broken, it is required that projectors close a shutter or turn off the laser or take other actions that prevent light from being emitted from the projector. It is important to note that this portion of the ISP-DB25 is a projector interlock which may be separate from the remote interlock connector on a laser used with the projector.

Optional Signals

These signals are not required by the ILDA Standard Projector but are provided for flexibility and use of the DB-25 connector by other projectors.

Optional Signals	***Description***
Intensity/ Blanking	This is intended for use by projectors which use an intensity signal or scanner blanking. This is a unipolar analog signal whose voltage range is 5V peak-to-peak differential. A differential voltage level of 0V indicates zero intensity and that the beam is fully blanked. A differential voltage level of +5V indicates full intensity and that the beam is not blanked.

Permission is given to reproduce all or part of this document as long as credit is given to ILDA and the copyright is acknowledged as follows:
"This material is" [or "Portions of this material are"] copyright ©1999 by the International Laser Display Association and is used by permission."

	A differential voltage of +5V occurs if the normal signal line has a voltage level of +5V with respect to the voltage level of the inverted signal line. When compared to the ground level of the differential driver, the voltage level of the normal signal line shall be +2.5V and the voltage level of the inverted signal shall be -2.5V.
Projector Return Signal	Return signal from the projector. This is intended as a photo-diode output so that the projector light output can be monitored by the signal source. However, this signal can be used for any projector return information as long as the maximum voltage ranges are observed.

User-Defined Signals

These signals are not required by the ILDA Standard Projector but are provided for flexibility when using the DB-25 connector. These are paired as differential analog signals. Although they can be used for any user application which meets the maximum voltage specifications, it is likely that they will be used for semi-standard purposes. The following recommendations are provided for these applications to ensure maximum compatibility between projector manufacturers.

User-Defined Signals	***Description***
Deep-blue	Where it is desired to have a separate signal which controls the deep-blue intensity, this signal shall be supplied on the “User-defined signal 1” pair. When used this way, this is a unipolar analog voltage whose range is 5 volts peak-to-peak differential. A differential voltage level of 0 volts shall produce no deep-blue output. A differential voltage level of +5 volts shall produce maximum blue output. A differential voltage of +5V occurs if the normal signal line has a voltage level of +5V with respect to the voltage level of the inverted signal line. When compared to the ground level of the differential driver, the voltage level of the normal signal line shall be +2.5V and the voltage level of the inverted signal shall be -2.5V.

Permission is given to reproduce all or part of this document as long as credit is given to ILDA and the copyright is acknowledged as follows:
"This material is" [or "Portions of this material are"] copyright ©1999 by the International Laser Display Association and is used by permission."

	See “Color Channel Usage” section, below.
Yellow	Where it is desired to have a separate signal which controls the yellow intensity, this shall be supplied on the “User-defined signal 2” pair. When used this way, this is a unipolar analog voltage whose range is 5 volts peak-to-peak differential. A differential voltage level of 0 volts shall produce no yellow output. A differential voltage level of +5 volts shall produce maximum yellow output. A differential voltage of +5V occurs if the normal signal line has a voltage level of +5V with respect to the voltage level of the inverted signal line. When compared to the ground level of the differential driver, the voltage level of the normal signal line shall be +2.5V and the voltage level of the inverted signal shall be -2.5V. See “Color Channel Usage” section, below.
Cyan	Where it is desired to have a separate signal which controls the cyan intensity, and where beam brush is not used, this shall be supplied on the "User-defined signal 3" pair. When used this way, this is a unipolar analog voltage whose range is 5 volts peak-to-peak differential. A differential voltage level of 0 volts shall produce no cyan output. A differential voltage level of +5 volts shall produce maximum cyan output. A differential voltage of +5V occurs if the normal signal line has a voltage level of +5V with respect to the voltage level of the inverted signal line. When compared to the ground level of the differential driver, the voltage level of the normal signal line shall be +2.5V and the voltage level of the inverted signal shall be -2.5V. See “Color Channel Usage” section, below.
Beam-Brush	Where it is desired to have a separate signal which controls the beam diameter, this shall be supplied on the “User-defined signal 3” pair. When used this way, this is a unipolar analog voltage whose range is 5 volts peak-to-peak differential.

Permission is given to reproduce all or part of this document as long as credit is given to ILDA and the copyright is acknowledged as follows:
"This material is" [or "Portions of this material are"] copyright ©1999 by the International Laser Display Association and is used by permission."

	A differential voltage level of 0 volts shall produce the smallest beam diameter. A differential voltage level of +5 volts shall produce the maximum beam diameter. A differential voltage of +5V occurs if the normal signal line has a voltage level of +5V with respect to the voltage level of the inverted signal line. When compared to the ground level of the differential driver, the voltage level of the normal signal line shall be +2.5V and the voltage level of the inverted signal shall be -2.5V.
Stereoscopic and Depth Signals:	
X-prime	For stereoscopic applications where it is desired to have a separate signal for a second X scanner, this shall be supplied on the "User-defined signal 4" pair. When used this way, this signal shall represent the right-eye view and the "X" signal shall represent the left-eye view. The analog voltage range and polarity are identical to the "X" signal.
Z	For volumetric or stereoscopic applications where it is desired to have a separate signal which indicates depth, this shall be supplied on the "User-defined signal 4" pair. When used this way, this is a bipolar analog voltage whose range is 10V peak-to-peak differential. A differential voltage level of -10V shall represent "rear" or "far from the viewer". A differential voltage level of +10V shall represent "front" or "toward the viewer". A differential voltage level of 0V shall represent a neutral distance such as the plane of the screen. A differential voltage of +10V occurs if the normal signal line has a voltage level of +10V with respect to the voltage level of the inverted signal line. When compared to the ground level of the differential driver, the voltage level of the normal signal line shall be +5V and the voltage level of the inverted signal shall be -5V.
Field Change	For applications using sequential-field stereoscopic techniques, the field (selected polarization) shall be supplied on the "User-defined signal 4" pair. When used this way, this is a unipolar analog voltage whose

Permission is given to reproduce all or part of this document as long as credit is given to ILDA and the copyright is acknowledged as follows:
"This material is" [or "Portions of this material are"] copyright ©1999 by the International Laser Display Association and is used by permission."

	range is 5 volts peak-to-peak differential. A differential voltage level of 0 volts shall produce image polarization visible to the left eye and invisible to the right eye. A differential voltage level of +5 volts shall produce image polarization visible to the right eye and invisible to the left eye. A differential voltage of +5V occurs if the normal signal line has a voltage level of +5V with respect to the voltage level of the inverted signal line. When compared to the ground level of the differential driver, the voltage level of the normal signal line shall be +2.5V and the voltage level of the inverted signal shall be -2.5V.

Color Channel Usage

The ILDA Standard Projector assumes that the color device will be a polychromatic acousto-optic deflector (PCAOM) or a device with similar color-control and fast speed characteristics (example: direct modulation of laser diodes). Today's PCAOMs can control four or more laser wavelengths (colors) simultaneously. This can be used to give a wider color gamut (range) than if only three wavelengths -- red, green and blue -- are controlled. Here's how this is done:

Most full-color laser displays at present are ion lasers strong in red and green, but deficient in deep blue. The strongest blue line is really blue-green (cyan) at 488 nm. When there are only three color signals, it is impossible to get dark blues (476 nm) or vibrant violets (457 nm) alone. This is because the stronger cyan line predominates. Dark blues and violets look washed out.

In some situations, this is unavoidable. One example is with the ILDA ISP-ADAT standard, where there are only three color channels available on the ADAT tape. Depending on the laser wavelengths used, shows played from ADAT may be weak in dark blue and violet (without special hardware "tricks" on the projector).

Fortunately, many computer systems or custom playback systems (e.g. CD or DVD discs) can provide more than three color channels. For example, a digitizer can draw a shape using a "deep blue" color; when the show plays back, color channel 4 is used to display the shape. The Color

Permission is given to reproduce all or part of this document as long as credit is given to ILDA and the copyright is acknowledged as follows:
"This material is" [or "Portions of this material are"] copyright ©1999 by the International Laser Display Association and is used by permission."

Channel Usage chart below insures consistency when systems and projectors use more than three colors. In the example, it would not be good if each projector used color channel 4 to control a different laser wavelength.

The Color Channel Usage chart below shows the wavelengths to be used for 3-, 4-, 5- and 6-channel color systems. Here is how to use it.

- System designers: If you are designing a computer or custom playback system, ensure that your color output signals control the proper pins. Remember that the projector may have any number of channels (even just one if it does not have a color laser), so there should be an output option for each choice (e.g., 1-, 3-, 4-, 5- or 6-channel color).

- Projector manufacturers: Use a label next to the ILDA connector, or other means to clearly mark how many channels the projector can control. Think about "plug and play": a laserist should be able to plug their system into your projector, and instantly know how to set up the system to run your ILDA-compatible projector.

  Some advanced projectors may use circuits that map three color inputs (red, green and blue) into more than three color channels. (For example, 50% red and 50% blue might be displayed by a single violet line.) If so, add a switch or other means so this could be turned off or so the user can directly control more than three color channels.

- Laserists: Ensure that you have selected the proper number of channels for the particular projector/laser combination you are using. If your laser projection has missing colors, or the colors are mapped incorrectly, recheck your settings.

Color Channels	***Laser Color***
Standard RGB: (3 channel color)	Red 610nm to 690nm Green 510nm to 550nm Blue 450nm to 480nm
Enhanced RGB with Deep Blue (4 channel color)	Red 610nm to 690nm Green 510nm to 550nm Blue 470nm to 490nm

Permission is given to reproduce all or part of this document as long as credit is given to ILDA and the copyright is acknowledged as follows:
"This material is" [or "Portions of this material are"] copyright ©1999 by the International Laser Display Association and is used by permission."

	Deep Blue (supplied on user1) 450nm to 470nm

Enhanced RGB with Deep Blue and Yellow (5 channel color)	Red 610nm to 690nm Green 510nm to 550nm Blue 470nm to 490nm Deep Blue (supplied on user1) 450nm to 470nm Yellow (supplied on user2) 550nm to 570nm
Enhanced RGB with Deep Blue, Yellow and Cyan (6 channel color)	Red 610nm to 690nm Green 510nm to 550nm Blue 470nm to 480nm Deep Blue (supplied on user1) 450nm to 470nm Yellow (supplied on user2) 550nm to 570nm Cyan (supplied on user3) 480nm to 490nm

Additional Notes About Signals

The absolute maximum voltage on any pin with respect to ground shall be positive or negative 25 volts. Signal inputs shall be designed to accept this voltage without any damaging results.

Signal outputs shall be current limited so that if they are shorted to ground, damage will not result. It is also recommended that the impedance of these outputs be between 100 and 150 ohms so that the cable impedance can be accommodated without ringing or other transmission line effects.

Permission is given to reproduce all or part of this document as long as credit is given to ILDA and the copyright is acknowledged as follows:
"This material is" [or "Portions of this material are"] copyright ©1999 by the International Laser Display Association and is used by permission."

DMX-512 Effects Control

Standard Identifier: ISP-DMX

DMX-512 is a lighting communications standard. It was created in 1986 as a standardized method for connecting lighting consoles to dimmer packs and was revised in 1990 to allow more flexibility. Since that time, it has become the most common communication standard used by lighting equipment.

Up to 512 “channels” can be transmitted. Each of these channels were originally intended to control lamp dimmer levels. You can think of it as 512 sliders on a lighting console, connected to 512 light bulbs. The slider position is conveyed as a number between 0 and 255.

To enable laserists to use standard DMX equipment such as lighting consoles and DMX-to-analog converters, this same "single channel controls a single function" philosophy applies.

Examples of things that fit the "single channel controls a single function" philosophy are:

- Beam actuators that can fade beam positions on a beam table (or pop into the beam);
- Shutters and filters that can gradually occlude the beam (or pop into the beam);
- Lumia motor speed; and
- Scan-through device selection and speed.

Even though all 512 channels can be used, it is more common to use fewer channels. The ISP-DMX standard defines the use of 32 channels, and reserves 34 channels for future ILDA standardization.

Permission is given to reproduce all or part of this document as long as credit is given to ILDA and the copyright is acknowledged as follows:
"This material is" [or "Portions of this material are"] copyright ©1999 by the International Laser Display Association and is used by permission."

The DMX-512 specification (also called the USITT DMX512/1990 standard) is available from the following address:

USITT
10 West 19th Street, Suite 5A
New York, NY 10011-4206
Phone: (212) 924-9088
Fax: (212) 924-9343

DMX-512 Channel Assignments

The following channel assignments apply to the ILDA Standard Projector:

Channel Number	*Assigned Effect*
1	Effects fader, (controls beams and non-scan through effects)
2	Effect/beam red fader
3	Effect/beam green fader
4	Effect/beam blue fader
5	Lumia fader
6	Lumia speed
7	Scan through effect #1 engage, diffraction grating
8	Scan through effect #1 coarse speed control
9	Scan through effect #1 fine speed control
10	Scan through effect #2 engage, fuzz
11	Scan through effect #2 coarse speed control
12	Scan through effect #2 fine speed control
13	House lights
14	Fog
15	Strobe
16	Laser control (start or current up)
17	User 1
18	User 2
19	User 3
20	Graphics Shutter -- DMX-512 version of the analog

Permission is given to reproduce all or part of this document as long as credit is given to ILDA and the copyright is acknowledged as follows:
"This material is" [or "Portions of this material are"] copyright ©1999 by the International Laser Display Association and is used by permission."

	shutter signal found on the ISP-DB25
21	Beam diffraction effect 1
22	Beam diffraction effect 2
23	Beam actuator 1
24	Beam actuator 2
25	Beam actuator 3
26	Beam actuator 4
27	Beam actuator 5
28	Beam actuator 6
29	Beam actuator 7
30	Beam actuator 8
31	Beam actuator 9
32	Beam actuator 10
33-66	Reserved for future ILDA assignment

DMX-512 Connector and Pinouts

The DMX-512 connector is a 5-pin XLR with the following pinout:

Pin	***Signal Name***
1	Cable shield
2	Data complement (-) to projector
3	Data true (+) to projector
4	Optional data complement (-) from projector
5	Optional data true (+) from projector

Signal sources such as computers or tape playback devices shall use a female connector. Projectors shall use a male connector but may also have a female connector for DMX-512 pass-through.

Permission is given to reproduce all or part of this document as long as credit is given to ILDA and the copyright is acknowledged as follows:
"This material is" [or "Portions of this material are"] copyright ©1999 by the International Laser Display Association and is used by permission."

Effects Specification

Standard Identifier: ISP-EFX

Effects have been an important part of laser shows since their beginnings. Many early laser lightshows consisted mostly of effects with little or no scanned imagery. There are many visually stunning patterns and textures that can be produced with laser effects which are not achievable in other mediums. Due to their unique nature, this type of effect will always remain an important tool in the laserist's repertoire.

Effects are anything placed in to a laser beam to produce diffraction, refraction, reflection or diffusion of the beam. Examples of common effects are lumia and diffraction gratings.

This portion of the ISP specification defines default effects for the ILDA Standard Projector and provides mechanical definition of effects to allow interchangability and control.

Lumia Effect

The ILDA Standard Projector shall have at least one rotating lumia of medium angle and generic texture.

The lumia shall operate independently of image scanning, so as to be used simultaneously with scanning images.

Lumia brightness is controlled by DMX channel 5. A value of zero on DMX channel 5 indicates no light.

Lumia rotation speed shall be controlled by DMX channel 6. A value of zero on DMX channel 6 indicates no rotation.

 ©1999 International Laser Display Association

Permission is given to reproduce all or part of this document as long as credit is given to ILDA and the copyright is acknowledged as follows:
"This material is" [or "Portions of this material are"] copyright ©1999 by the International Laser Display Association and is used by permission."

Scan-Through Effect

The ILDA Standard Projector shall have at least two insertable rotating scan-through effects. These scan-through effects are to be located on the primary image scanners.

Although show designers can install any effect disk into any effect location, the default scan-through effects shall be:

1. Eight-point burst diffraction grating;

2. Small-angle fuzz (2-3 times the normal beam diameter).

Lumia and scan-through effects shall be circular disks with a diameter of 100mm (+0mm, -1mm).

Lumia and scan-through effects devices shall be designed to accept and adequately mount effects disks from less than 1mm to at least 5mm thickness.

Effects disks shall have bare edges without frames or other obstructions which would cause shadowing or interruption of light when inserted into an active image. This is a requirement of the actual effect disks, however this is not required of the effects insertion device. The insertion device may entirely encircle the effect for support and rotation.

Mounting and rotation to be accomplished from the outer edges of the disk. It is intended that the entire area of the disk is available for scanning. (The disk is not mounted from a center hub.)

Effects devices shall be designed to allow regular, quick and easy interchange of effects disks at any time.

Effect #1 insertion is controlled by DMX channel 7.

Effect #1 coarse speed is controlled by DMX channel 8.

Effect #1 fine speed is controlled by DMX channel 9.

Effect #2 insertion is controlled by DMX channel 10.

Effect #2 coarse speed is controlled by DMX channel 11.

Effect #2 fine speed is controlled by DMX channel 12.

Permission is given to reproduce all or part of this document as long as credit is given to ILDA and the copyright is acknowledged as follows:
"This material is" [or "Portions of this material are"] copyright ©1999 by the International Laser Display Association and is used by permission."

A value of zero on DMX insertion channels indicate effect fully removed from the scanning image path.

A value of zero on DMX coarse rotation speed channels indicates no rotation.

Implementation of the fine rotation speed channels is optional. The DMX fine speed control channels, where implemented, shall function as a vernier adjustment of the coarse speed control. It shall provide 255 levels of fine adjustment between each of the coarse speed control's 255 levels. In this manor, systems which do not implement the fine speed control will still reasonably reproduce intended speeds.

Scan-through effect insertion can be accomplished with multiple insertion devices, or by a single ring with multiple effects apertures. If a single ring is used, only one scan-through effect can be inserted into the scanned image at a time. If there is a conflict, where the DMX signal is indicating that both scan-through effects should be inserted, then the lowest numbered scan-through effect indicated shall be used.

Effects devices shall provide visible identification of all effect positions to facilitate proper insertion of effects. i.e., "effect #1", "effect #2" etc.

Additional scan-through effects may be implemented at the projector manufacturer's will. These shall be designated #3, #4, etc. Additional scan-through effects shall utilize insertion and rotation controls in the same fashion as effects #1 and #2.

 ©1999 International Laser Display Association

Permission is given to reproduce all or part of this document as long as credit is given to ILDA and the copyright is acknowledged as follows:
"This material is" [or "Portions of this material are"] copyright ©1999 by the International Laser Display Association and is used by permission."

ADAT Tape Playback and Track Assignments

Standard Identifier: ISP-TAPE

The ADAT is an SVHS cartridge-based 8-track digital audio recorder. Since the ADAT contains 8 “tracks” of information, all laser show information can be conveniently recorded on a single ADAT tape. Using the ADAT is also very convenient due to it’s familiar VCR-style control panel.

The ADAT is also a very economical, portable unit. For these reasons, ADAT quickly became the defacto-standard for laser show recording and playback after its introduction in 1992.

Permission is given to reproduce all or part of this document as long as credit is given to ILDA and the copyright is acknowledged as follows:
"This material is" [or "Portions of this material are"] copyright ©1999 by the International Laser Display Association and is used by permission."

ADAT Modification

There are several ADAT models available from both Alesis and Fostex. The original Alesis ADAT, introduced in 1992, has a black front. This was discontinued in 1996 in favor of the newer Alesis ADAT xt. The Fostex RD-8 is similar to the original Alesis ADAT, but has some additional capabilities. Fostex also makes a model CX-8 which is identical to the Alesis ADAT xt.

You can purchase specially modified ADATs which are capable of recording laser graphics and DMX-512 control signals from several ILDA members. Alternatively, you can purchase an unmodified unit and perform the modification yourself.

The modification for the original Alesis ADAT and Fostex RD-8 is covered by the "ADAT DC Coupling Modifications for Laser Graphic Recording", Revision 002, October 1995, in the *ILDA Handbook and Technical Specifications*.

The modification for the newer Alesis ADAT xt, or Fostex CX-8 are not covered by ILDA documents, but this modification is available commercially through several ILDA members.

ADAT Track Assignments

The ILDA Standard Track Assignments for ADAT recording is:

ADAT Track	***Signal Assignment***
1	X axis
2	Y axis
3	Red
4	Green
5	Blue
6	SMPTE time code and/or DMX projector control
7	Left Audio
8	Right Audio

Permission is given to reproduce all or part of this document as long as credit is given to ILDA and the copyright is acknowledged as follows:
"This material is" [or "Portions of this material are"] copyright ©1999 by the International Laser Display Association and is used by permission."

Glossary

This Glossary is included to define terms specific to this document. For definitions of other laser display terms, consult the ILDA Laser Glossary, Revision 002, November 1993, in the *ILDA Handbook and Technical Specifications*.

Bipolar Analog Signal

A signal which can go both positive and negative.

Differential Voltage

The potential difference measured between the noninverting and inverting signal lines as defined by the following equation: VDIF = V(+) - V(-).

Inverting Signal (-)

A signal which is a mirror-image of a noninverting signal. This signal is denoted by a (-) symbol placed immediately after a signal name.

Lumia

A gauze-like laser effect produced by shining a fixed laser beam through distorting material such as rippled glass. Lumia are often composed of fine parallel lines of light and dark, and they show the characteristic speckle of coherent light. There are many different lumia effects, depending on the type of distorting material.

Noninverting Signal (+)

The “true” sense of a signal definition. This signal is denoted by a (+) symbol placed immediately after a signal name.

Permission is given to reproduce all or part of this document as long as credit is given to ILDA and the copyright is acknowledged as follows:
"This material is" [or "Portions of this material are"] copyright ©1999 by the International Laser Display Association and is used by permission."

Recommended

Marks specifications which, while not mandatory, will provide the best performance.

Reserved

Used for signals that are set aside for future standardization.

Scan-Through Effect

An effect produced by placing a distorting material such as rippled glass after the X-Y graphics scanners. These effects are usually temporary, and only done during certain parts of a laser show.

Shall

Indicates a requirement that must be met to comply with the standard.

Single-ended Voltage

VDIF = V(+) - GND. The potential difference as measured between a signal and its reference ground potential.

Stereoscopic Applications

Sometimes called 3D applications, this is where two images are projected – one for the left eye and one for the right eye. These images may be projected simultaneously, or sequentially, depending on projector hardware.

Unipolar Analog Signal

A signal which can go only positive or negative. For purposes of this document, all unipolar signals only go positive.

Permission is given to reproduce all or part of this document as long as credit is given to ILDA and the copyright is acknowledged as follows:
"This material is" [or "Portions of this material are"] copyright ©1999 by the International Laser Display Association and is used by permission."

Volumetric Applications

Applications where an image is produced which can be viewed from several locations simultaneously. This is similar to stereoscopic applications but does not require glasses or any other similar viewing apperatus.

Permission is given to reproduce all or part of this document as long as credit is given to ILDA and the copyright is acknowledged as follows:
"This material is" [or "Portions of this material are"] copyright ©1999 by the International Laser Display Association and is used by permission."