

# Standards - ISP-BD25

## 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-
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.

Required Signals	Description of Signal
<b>X</b>	<p>Controls the horizontal beam position. This is a bipolar analogue signal whose voltage range is 10V peak-to-peak differential.</p> <p>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.</p> <p>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.</p> <p>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.</p>
<b>Y</b>	<p>Controls the vertical beam position. This is a bipolar analogue signal whose voltage range is 10V peak-to-peak differential.</p> <p>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 centre of the screen vertically.</p> <p>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.</p> <p>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.</p>
<b>R</b>	<p>Controls the red intensity. This is a unipolar analogue signal whose voltage range is 5V peak-to-peak differential.</p> <p>A differential voltage level of 0V shall produce no red output. A differential voltage level of +5V shall produce maximum red output.</p> <p>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.</p> <p>When compared to the ground level of the differential driver, the voltage</p>

	<p>level of the normal signal line shall be +2.5V and the voltage level of the inverted signal shall be -2.5V. See “Colour Channel Usage” section, below.</p>
<b>G</b>	<p>Controls the green intensity. This is a unipolar analogue 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 “Colour Channel Usage” section, below.</p>
<b>B</b>	<p>Controls the blue intensity. This is a unipolar analogue 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 “Colour Channel Usage” section, below.</p>
<b>Shutter</b>	<p>Optical shutter intended to extinguish all light from the graphics scanners. This is a unipolar analogue 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.</p>
<b>Ground</b>	0 voltage potential reference and signal shield.
<b>Interlock A &amp; Interlock B</b>	<p>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.</p>

## 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 of Signal
<p><b>Intensity/ Blanking</b></p>	<p>This is intended for use by projectors which use an intensity signal or scanner blanking. This is a unipolar analogue signal whose voltage range is 5V peak-to-peak differential.</p> <p>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.</p> <p>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.</p> <p>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.</p>
<p><b>Projector Return Signal</b></p>	<p>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.</p> <p>However, this signal can be used for any projector return information as long as the maximum voltage ranges are observed.</p>

## 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 analogue 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
<p><b>Deep-blue</b></p>	<p>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 analogue voltage whose range is 5 volts peak-to-peak differential.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>See “Colour Channel Usage” section, below</p>
<p><b>Yellow</b></p>	<p>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 analogue voltage whose range is 5 volts peak-to-peak differential.</p> <p>A differential voltage level of 0 volts shall produce no yellow output. A differential voltage level of +5 volts shall produce maximum yellow output.</p> <p>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.</p> <p>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.</p>

	See “Colour Channel Usage” section, below.
<b>Cyan</b>	<p>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 analogue voltage whose range is 5 volts peak-to-peak differential.</p> <p>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.</p> <p>See “Colour Channel Usage” section, below.</p>
<b>Beam-Brush</b>	<p>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 analogue voltage whose range is 5 volts peak-to-peak differential.</p> <p>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.</p> <p>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.</p>
<b>Stereoscopic and Depth Signals:</b>	
<b>X-prime</b>	<p>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 analogue voltage range and polarity are identical to the “X” signal.</p>
<b>Z</b>	<p>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 analogue voltage whose range is 10V peak-to-peak differential.</p> <p>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.</p> <p>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.</p>
<b>Field Change</b>	<p>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 analogue voltage whose range is 5 volts peak-to-peak differential.</p> <p>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</p>

	<p>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.</p>
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## Colour Channel Usage

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

Here's how this is done: Most full-colour 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 colour 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 colour 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 colour channels. For example, a digitiser can draw a shape using a "deep blue" colour; when the show plays back, colour channel 4 is used to display the shape. The Colour Channel Usage chart below insures consistency when systems and projectors use more than three colours. In the example, it would not be good if each projector used colour channel 4 to control a different laser wavelength.

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

- **System designers:** If you are designing a computer or custom playback system, ensure that your colour 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 colour laser), so there should be an output option for each choice (e.g., 1-, 3-, 4-, 5- or 6-channel colour).
- **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 colour inputs (red, green and blue) into more than three colour 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 colour 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 colours, or the colours are mapped incorrectly, recheck your settings.

<b>Colour Channels</b>	<b>Laser Colour</b>
<b>Standard RGB: (3 channel colour)</b>	Red 610nm to 690nm  Green 510nm to 550nm  Blue 450nm to 480nm
<b>Enhanced RGB with Deep Blue (4 channel colour)</b>	Red 610nm to 690nm  Green 510nm to 550nm  Blue 470nm to 490nm  Deep Blue (supplied on user1) 450nm to 470nm
<b>Enhanced RGB with Deep Blue and Yellow (5 channel colour)</b>	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
<b>Enhanced RGB with Deep Blue, Yellow and Cyan (6 channel colour)</b>	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.

**NOTE:** This is NOT an official ILDA document - contact ILDA for further information