



**INTERNATIONAL LASER  
DISPLAY ASSOCIATION**

**Technical Committee**

# ILDA Test Pattern

|  |   |
|--|---|
| ILDA Test Pattern.....                   | 1 |
| ILDA Test Pattern Key .....              | 3 |
| ILDA Test Pattern Tuning Procedure ..... | 4 |

## **ILDA Test Pattern**

Written by:

Casey Stack, Laser Fantasy International, 1992

Bob Mueller, Laser Fantasy International, 1992

Casey Stack, Lightspeed Design, Inc., 1995

Scott Huggins, Laser Fantasy International, 1995

Prepared by:

Kelly and Frank Plughoff, Full Spectrum Lasers, 1995

---

## ILDA Test Pattern

---

This procedure covers the 12K and 30K ILDA Standard Test Pattern tuning.

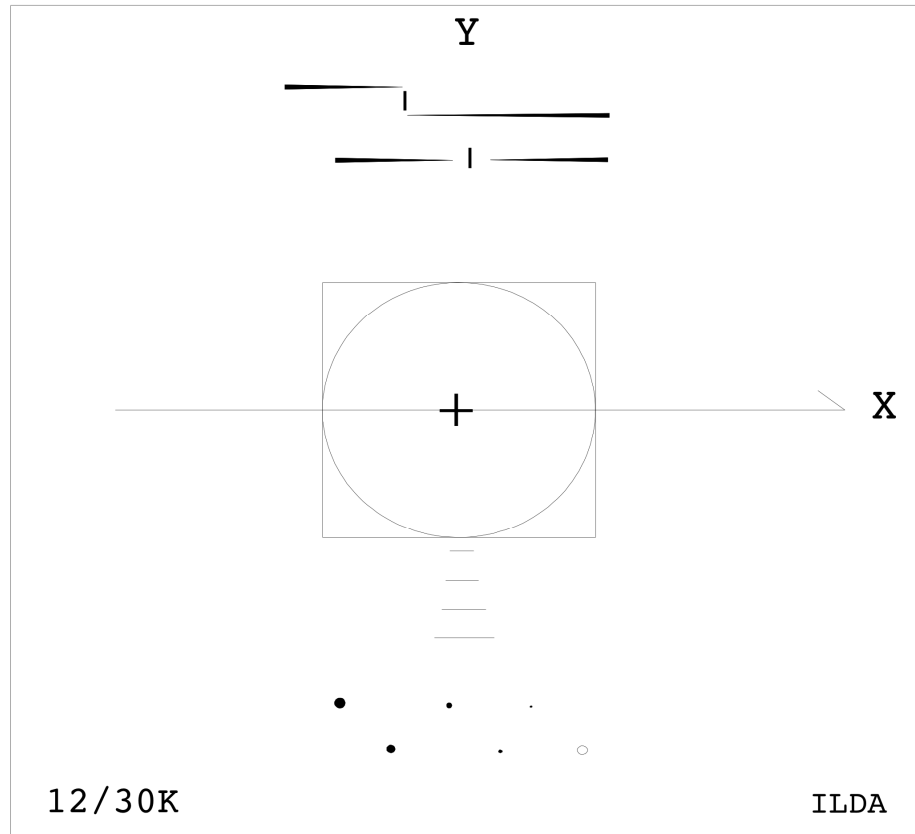


Figure 1

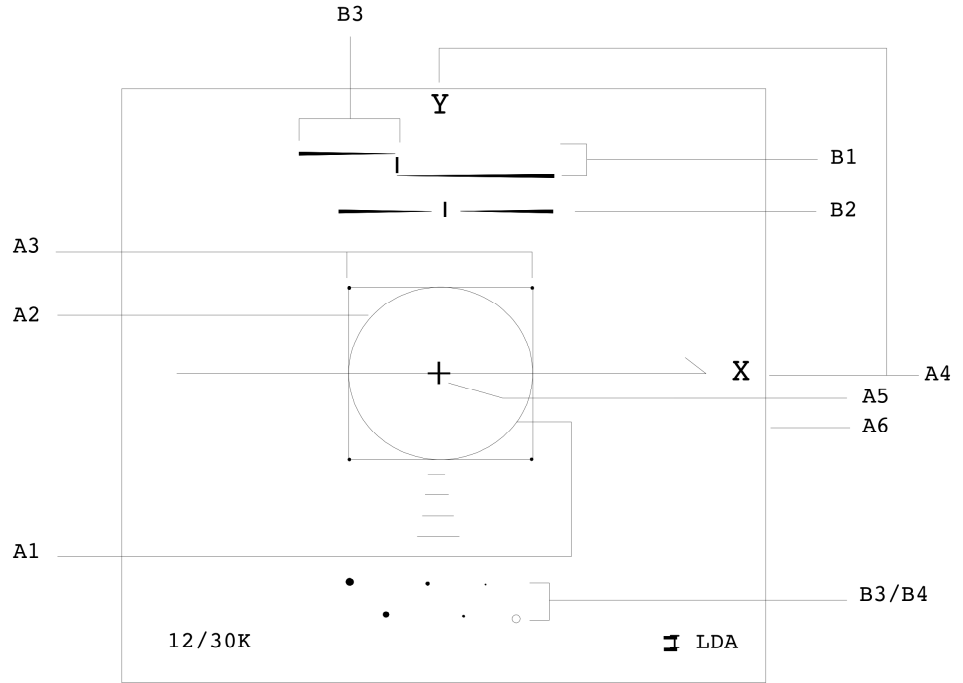
### Introduction

The ILDA test pattern very accurately defines mechanical laser scanner response. The test pattern's primary use is in alignment and calibration of galvanometer based laser vector graphic projection systems.

This known response is crucial to proper reproduction of interchanged imagery. Use this test pattern to calibrate programming and playback equipment prior to the commencement of image creation.

The point output rate associated with this ILDA Standard defines only the rate which must be used during scanner adjustment. This standard does not effect the point rate at which subsequent images may be generated or reproduced.

# ILDA Test Pattern Key



**Figure 2**

- |  |   |
|--|---|
| <p>A. XY scanner</p> <ol style="list-style-type: none"> <li>1) Correct scanner speed</li> <li>2) Correct damping</li> <li>3) Same scanner speed</li> <li>4) Inverts</li> <li>5) Amplitude</li> <li>6) Centering</li> </ol> | <p>B. Blanking Scanner</p> <ol style="list-style-type: none"> <li>1) Correct scanner speed</li> <li>2) Correct damping</li> <li>3) Amplitude</li> <li>4) DC offset</li> </ol> |
|--|---|

**Note:** The 12/30K indicates the output speed for this test pattern in points per second. Your image source must output points at 12,000 or 30,000 points per second (+/- 1%) for this test pattern to work.

---

## ILDA Test Pattern Tuning Procedure

---

### ***Adjust XY Scanners***

This procedure assumes scanners and blanking system are pre-tuned to a state of stable operation. Consult manufacturer's documentation for information on scanner start-up from a completely inoperative state.

Use caution when adjusting scanners. Galvanometer and motor scanners can be easily damaged through careless or rough adjustment. Tuning should be performed by personnel with suitable knowledge and experience. Always watch the output carefully, when images begin to break-up this is a warning that harm may be near. Never allow scanners to oscillate! Read manufacturers data on scanner adjustment carefully before commencing any tuning.

For additional information about use of the ILDA Test Pattern read, "Using the ILDA Standard Test Pattern".

#### ***1. Display Test Pattern***

Display the ILDA Test Pattern image at 12,000 (12K) or 30,000 (30K) points per second depending on desired tuning.

Increase the size of the test pattern until the inner circle begins to distort. Decrease the test pattern 10% from this size. To use the test pattern correctly, it must be scanned small to prevent distortion of the circle. For 30K tuning this about 8 degrees optical or less. For 12K tuning this can typically be as large as 15 degrees optical.

#### ***2. Adjust Inverts***

Refer to figure 2; A4.

The Y should appear at the top of the image. The X should appear at the right hand side of the image. If either of these is reversed, invert the signal at the driver card or at the source as appropriate.

### 3. Adjust Y Damping

Refer to figure 2; A2.

Observe the lower right corner of the inner square, adjust the low frequency damping until a small amount of “overshoot” is observed. See figure 3. The length of this overshoot should equal approximately  $2/3$  the height of the word “ILDA” in the test pattern.

For scanner drivers equipped with only a single damping control: Perform all adjustments for low frequency damping and omit high frequency damping procedures.

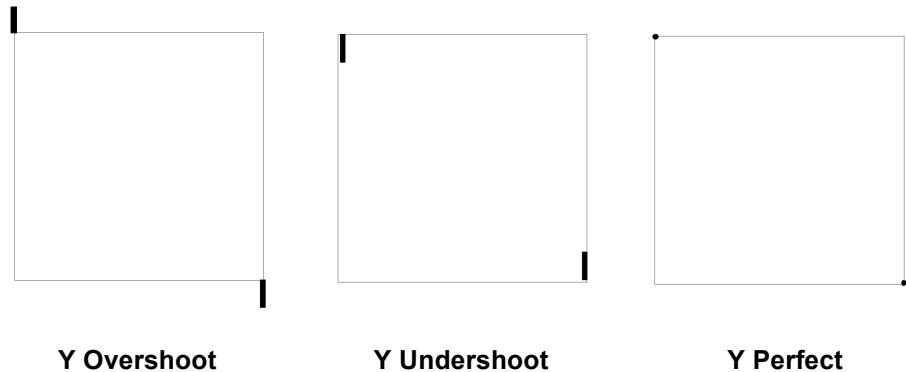


Figure 3

Adjust the high frequency damping up or down a small amount. Notice that the overshoot line becomes slightly longer or shorter as you do this. If you increase or decrease the high damping too far in either direction, the overshoot will become longer. By carefully adjusting in *both directions* you will find the point where the overshoot is at its shortest length.

Use extreme precision and diligence, the perceived change is very slight. This adjustment is of utmost importance for proper tuning.

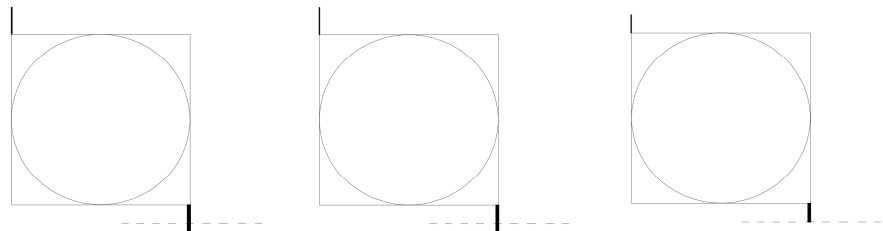


Figure 4

Return to the low frequency damping and decrease to “tuck” the overshoot back into the dot at the corner of the square. Use caution not to create undershoot which is very difficult to see. See figure 3.

If top and bottom of the circle touch the top and bottom edges of the square (regardless of the phase of the circle), skip to step 5, “ADJUST X DAMPING”. See figure 5.

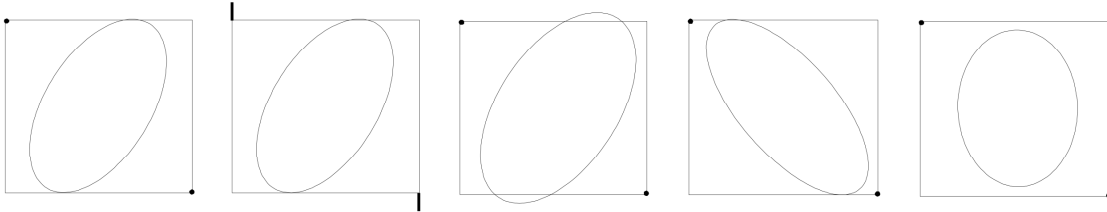


Figure 5

#### 4. Adjust Y Servo Gain

Refer to figure 2; A1

If top and bottom of circle are smaller, or inside the square, increase servo gain and return to step 3, “ADJUST Y DAMPING”.

If top and bottom of circle are larger, or outside the square, decrease servo gain and return to step 3, “ADJUST Y DAMPING”.

#### 5. Adjust X Damping

Now that the Y axis is correctly adjusted, do not adjust it again.

Observe the upper right corner of the inner square. Adjust the low frequency damping until a small amount of overshoot is observed. The amount of overshoot should equal approximately 2/3 the height of the word “ILDA” in the test pattern.

Adjust the high frequency damping to where the length of the overshoot line is minimized, as was done in step 3 for the Y axis.

Decrease the low frequency damping to “tuck” the overshoot back into the dot at the corner of the square. Again, use caution to not go too far and create undershoot.

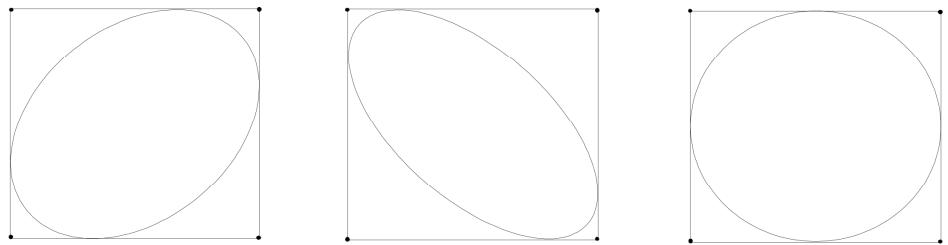


## 6. Adjust X Servo Gain

If the circle is smaller than the square in the X axis, increase the servo gain and return to step 5, “ADJUST X DAMPING”.

If the circle is larger than the square in the X axis, decrease the servo gain and return to step 5, “ADJUST X DAMPING”.

At this point the circle should touch the square at four points and be perfectly round. If so, go to step 7, “ADJUST IMAGE SIZE”.



**Figure 6**

If the circle touches the square in both axis, but the circle is not perfectly round, very carefully fine tune damping and servo gain with step 5, “ADJUST X damping”, repeatedly, until circle is as round as possible.

If perfect circularity is still not attained, fine tune adjustments for damping and servo gain carefully for Y axis again. Return to step 3, “ADJUST Y DAMPING”.

If phase of circle is still not perfect, repeat damping and servo procedures for the X-axis while slowly increasing or decreasing the servo gain. In worst cases,

repeat previous step until the circle is perfectly phased and damping is correct. refer to figure 6.

## 7. Adjust Image Size

Refer to figure 2; A5.

Reset image signal size to normal at the signal source.

Adjust X and Y image amplitudes to fill screen. If screen area is not square, adjust sizes to fill the largest square that fits on the screen. The outside edge of the test pattern is the maximum scan area.

Note: Newer test patterns may appear with ILDA test pattern small inside a larger box. In this case, adjust the larger box to the maximum screen size.

### **8. Adjust DC Offset**

Adjust the DC offsets so the cross in the middle of the test pattern is at the center of the screen area. Make only minor adjustments with DC offsets. Larger adjustments should be made by physically rotating the scanners in their mounts.

#### **Tips:**

- Any time you adjust servo gain, the damping(s) must be adjusted as well. The inverse of this is also true.
- Scanners are inherently imperfect. A well adjusted XY set may be achieved with some compromise to perfection. However, the scanners of today are of higher quality and usually will tune near perfectly. Be patient, don't give up too soon!

### **Scanner Blanking**

If you do not utilize scanner blanking, skip to section on AO blanking.

This procedure can also be used for tuning color modulation scanners.

### **9. Adjust Blanking Damping**

Refer to figure 2; B2.

Assuming you have some blanking, adjust the blanking damping to evenly space the blank section of the horizontal line on either side of the vertical mark. See figure 7.

**Note:** Adjustment of the servo gain, dampening, and input gain may require an adjustment of the blanking offset in order to keep the image visible.

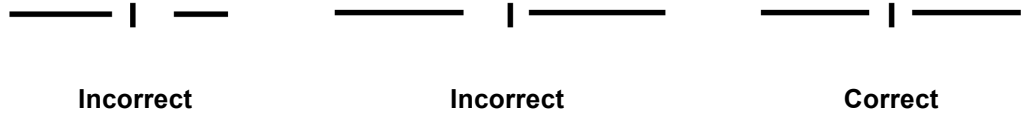


Figure 7

10. Blanking Servo Gain

With the damping correct, now examine the two horizontal lines of B1. They should appear to converge at some point. Regardless of whether they do or do not meet, this point can be visualized through either a quick visual average or extrapolation. See figure 8.

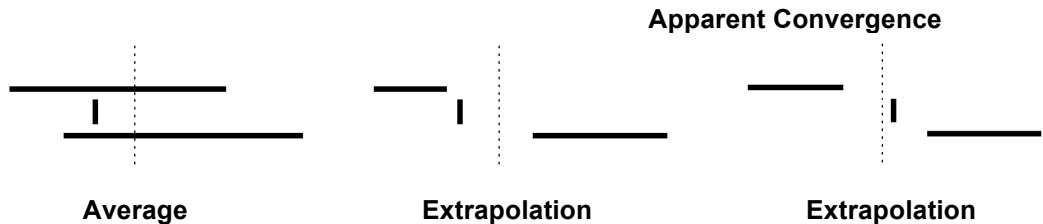


Figure 8

If the apparent convergence is to the right of the mark, increase the blanking servo gain unit it is closer to being correct, then return to step 9, “ADJUST BLANKING DAMPENING”.

If the apparent convergence is to the left of the mark, decrease the blanking servo gain until it is closer to being correct then return to step 9, “ADJUST BLANKING DAMPENING”.

When the apparent convergence is on the mark and the damping is correct, move to step 11.

11. Blanking Gain and DC Offset

Adjust the DC offset until the fifth dot is barely visible and the sixth dot is entirely blanked.

If the lines in B1 meet (roughly) at the mark, you are done. Otherwise, try a smaller input amplitude and adjust the DC offset again. Refer to figure 2; B1 and B3.

**AO Blanking****12. Adjust Blanking Filter**

If blanking filters are not utilized by the projection system being adjusted, no further adjustment is necessary. For AO systems without a blanking filter, a blanking shift of positive five will roughly emulate the blanking response defined by the ILDA Test Pattern. A blanking shift will not however, produce fading or blended lines or colors.

If a filter is used to process blanking signals, adjust filter to emulate response as defined in figures 7 and 8. Also adjust for blanking amplitude and offset as defined by figure 2; B3 and B4.