VIDEO DISPLAY IMAGE OPTIMIZATION

General Principles

- Every projection or direct-view display must be optimized prior to completion of setup.
- Projected images (LCD/DLP projector) must be physically/geometrically aligned prior to optimizing image signal with projector panel.
  - Use internal test pattern/crosshatch grid when aligning projector geometry.
  - Projected image must completely fill screen.
  - Eliminate keystone distortion by physical means first (moving projector/stand in relation to screen, raising stand legs) before use of digital keystone correction.
- High-quality/high-bandwidth cables should be used whenever possible to connect image source/output device to display. VGA cables should be used only up to cable runs of 50’ or less. RGBHV or other high-bandwidth cable should be used for cable runs in excess of 50’.
- Display should always be connected using the best video conduit available for image source/output device (see AV Standard 0012):
- If multiple screens displaying the same output/image are viewable, brightness and color of screens must be matched such that each screen looks exactly the same. Use weakest projector/display as baseline for matching.
- If displaying a 4:3 aspect ratio image source on a 16:9 display (i.e. PDP/LCD monitor), the 4:3 image should fill the 16:9 screen using the display’s “Full” or “Stretch” functions unless the client requests the image appear undistorted (pillarboxed).

Optimizing Composite Source/CRT Monitor

- The following procedure is to be followed for each display connected using composite video:
  - Utilize test tape/DVD with selected test patterns or professional test pattern generator.
  - If alignment controls are available on the display, use crosshatch with safety circles test pattern to ensure image is correctly aligned on the screen (see below for instructions).
  - Use SMPTE color bars test pattern to set brightness (black level), contrast (picture/white level), chroma (color), and hue (tint/phase):
    1. Turn chroma all the way down, displaying black/white/grayscale pattern.
    2. Adjust brightness until the third (far right) PLUGE bar is barely visible.
    3. Adjust contrast as high as possible until blooming or tearing occurs between higher intensity bars (i.e. between white/yellow bars).
    4. Using blue filter (internal switch or primary-blue (Rosco 80) lighting gel held between eyes and screen), adjust chroma until white and blue bars appear equal in intensity.
    5. Using blue filter, adjust hue until cyan and magenta bars appear equal in intensity.
Optimizing Component or RGB Source/Digital Display

- **The following procedure is to be followed for each display connected using component video or RGB (computer/data signal):**
  - If using computer video source, output resolution must match native panel resolution of display device (i.e. XGA / 1024x768).
  - Utilize test tape/DVD with selected test patterns or test pattern generation hardware/software. If using scaler/switchers (i.e. Folsoms) for master output, use internal switcher test patterns for calibration and optimization.
  - Use **crosshatch (with safety circles, if available) test pattern** to align source video image with the display panel.
    1. Adjust **horizontal/vertical shift** and **size/clock** until outline/raster box appears on outermost pixels (“one pixel off / one pixel on” method).
    2. Circles should appear perfectly round, and squares should appear symmetrical (not rectangular) without distortion.
  - Use **multiburst/fine-line moire vertical test pattern** to align signal fine sync/phase.
    1. Adjust **horizontal size/clock** until burst/moire pattern appears evenly across entire screen (mapped).
      - If wide dark vertical bars appear, image is not correctly aligned horizontally.
      - If more bars are appearing as adjustment is being made, make adjustment in the opposite direction until pattern is even.
    2. Readjust **horizontal shift**, if necessary, to completely fill screen (may require return to crosshatch pattern for proper alignment).
    3. Adjust **fine sync/phase** until all visible horizontal noise is eliminated and burst/moire pattern is as bright as possible.
  - Use **grayscale bars test pattern** to adjust brightness, contrast, and color balance.
    1. Adjust **brightness/black level** as low as possible until the darkest gray bar appears just distinguishable from blackest bar. Use horizontal black line in middle of the pattern as a black reference.
    2. Adjust **contrast/picture** as high as possible until lightest gray bar appears just distinguishable from whitest bar.
    3. Evaluate color of middle gray bars. Adjust **red, green, and blue gain** and/or **color temperature** as appropriate until grays appear as neutral in color as possible.

**NOTE:** If utilizing digital conduits and output resolution is matched to native panel resolution, alignment occurs automatically in most flat-panel displays and display device alignment, sizing, and phase controls will likely be disabled. Brightness, contrast, and color balancing may still be required. Occasionally, a horizontal shift of 2-6 pixels may still be required to properly align the image in higher-end projectors.