Aliasing

When smooth curves/lines become rough/jagged because of a lower-resolution device.

Analog Video

Typically from interference between chroma and luma frequencies or between video and field scanning frequencies.

Moire, herringbone, wavy straight lines, rainbow.

Cross-color.

Digital Video

Insufficient sampling or poor filtering. Jagged edges on diagonal lines. Twinkling/brightening on picture detail.

Shimmer in video image (like Venetian blinds).

Phenomenon of CCD image sampling and scanning process.

Aliased components measured in both amplitude and actual frequency.

Multiburst sinewave chart used to measure.

One artifact of this is how car wheels can appear to rotate backward while the car is moving forward.

Detail

To enhance image, artificially sharpen brightness transitions by adding a correction signal.

Measurement quantifies correction amount, expressed as percentage of transition amplitude.

Both horizontal and vertical detail.

Any chart with a white patch to evaluate. Chip chart preferable.

Shading

Lens distortions, camera circuitry (including CCD).

Causes camera output level to vary within a field with constant input light level.

Measured across lines (horizontal), down fields (vertical).

Sony camera has the parabola curve for center adjustment, the sawtooth for

edge adjustments (DIAGRAM).

Errors expressed as percentage of peak white.

Shading is per color (R, G, and B).

Gamma

Input to output light transfer characteristic of camera.

Account for shading errors and eliminate from results (do shading before gamma).

Split R G and B.

Geometry and Registration

Geometry measures green channel the geometric distortions.

How well red and blue track green is registration error.

Both measured using registration chart.

Error results expressed as percentage of picture height.

Errors closer to image center much more noticed – use zones to evaluate (see DIAGRAM).

Vertical Smear

How camera handles excessive light amounts in input image.

Use black chart with centered small aperture to measure.

Monitors 3 regions of chart (for white referencing)

- aperture (for white referencing)
- above aperture (for smearing)
- below aperture (for smearing)

Today's cameras won't have much smear problem.

Faint ghosting through entire picture.

DIAGRAM.

Camera Encoder

Properly adjusted encoder confirms proper operation of remaining circuit.

.59G + .11B + .30R

Setup easy to confirm since built-in color bar generator self-tests.

To confirm:

1. If see this in waveform monitor (WFM), a thickening of the peak at full white, is subcarrier showing up, the shading is off, since RG and B are not equal. If see a color on in the area corresponding to the thickening, that color's shading is off.
2. Tune for sharpness of the trace in the WFM in the video portion of the signal.

Camera adjustments are independent (unlike monitors) by adjustment, and by color being adjusted.

When no color, there will be not subcarrier. This restriction/condition is very handy for us techs.

Encode confirmation:

1. Apply encoder output signal to WFM, VS, and picture monitor (high resolution, B/W 800 TVL or more resolution) (high res to do detail/resolution)
2. Terminate WFM, VS, monitor using discrete 75 ohm termination. Preferred tolerance is +/- 0.1%, but no greater than +/- 1%. Don't use internal built-in terminator since may be inaccurate. If 73 ohms instead of 75 ohms, signal level will be too low, and if set for 1.0 volt, actual voltage may be 1.1 volt. Terminate the other side of the pass through. Techs will often keep their own terminator to themselves for just this reason if they find a terminator that is highly accurate.
3. Select the color-bar mode on the camera.
4. Confirm on the VS that burst, I and Q vectors are of correct phase and amplitude.
5. Confirm that all color bar vectors fall with tolerance boxes on the VS. Small boxes are 2%, larger are 5%. No reason that all 6 color bars can't fall within the 2% tolerance boxes.
6. If all above confirms, encoder is OK.

Auto Black

Balances R and B to G automatically.

Before adjusting camera, ensure all controls on the corresponding CCU are centered in order to give the CCU operator some room to make adjustments once the camera is adjusted.

To confirm:

1. Activate auto black circuitry.
2. Confirm lens caps (i.e., the iris stops down fully to block all light).
3. Confirm character display in viewfinder (portable camera) to see that successful execution.
4. Select 0 dB, +9 dB, +18 dB gain settings in sequence, confirm black level adjustment is correct for all these gain settings. Cap the lens to get a solid black for this. Confirmed with VS, output signal should be a dot in center of display, with no position shift as gain is switched – only change should be an increase in noise with increased gain.

Lens Back Focus

Use Siemens star chart.

Trims lens to specific optical dimension of the camera.

How:

1. Set up chart at least 10 feet from camera, low light, iris wide open.
2. Using high res monitor, adjust lens zoom full closeup, focus with focus ring on lens, then zoom to max wide angle, focus with back focus adjustment. Repeat this several times.
3. Lock lens back focus adjustment in place.
4. Confirm lens stays in focus over full zoom range.

Tube-type cameras

Also, on a tube-type camera head, pickup tube has a back focus adjustment.

- Do the green first, then the other colors
- There are two adjustments: one to move the tube closer to and farther from the beam splitter, the other to rotate the tube on the axis of the incoming light.

Tube Grading

Tubes are graded. Start out the same at manufacturer before testing.

Best go to green. Next go to red. Last/worst go to blue.

Watch out for manufacturers putting an IR filter on a “red” tube.

More modern cameras block IR at the prism.

Black Shading

To confirm:

1. Cap lens
2. Raise master black level to about 10 or 12 IRE to avoid clipping.
3. Observe WFM in V display mode, then H display mode. If black level is thin H line, there is no black shading in any of three color components.
4. Restore master black level to its proper position (to 7.5 IRE).

Detail Circuit

Using 11-step gray scale chart, confirm amplitude of detail signal as required for the application. Each station could be different. “Make it a pleasing picture” - subjective.

A larger detail signal typically is required for a lower performance recorder and less for a higher performance recorder.

White Shading

To confirm:

1. Setup uniformly lit white test chart.
2. Use WFM, open lens to get ~ 70 IRE of video. Confirm iris is f/4.0 to f/5.6 (adjust lighting if needed). Confirm minimum of V then H shading.
3. Adjust as necessary using camera H & V white shading controls.

Lens Flare

Where bright lights facing lens, light strikes lens coating, secondary reflections occur.

Because flare occurs on lens, always appears to be in front of scene.

Flare dimmer a closer objects obscure a light source since less of light contributes to flare.

Effect most obvious in dark area of image.

Camera flare correction circuitry.

To confirm:

1. Frame chip chart that has a mustache
2. Adjust iris from fully closed until white chip at 100 IRE.

3. Adjusted OK if almost no rise in black level of mustache as white level increases to 100 IRE, and only a small rise in black level when iris is opened one more f-stop.
4. Adjust R, G, B flare controls according to service manual if needed.
5. Verify after adjustment.

Linear Matrix

When using two dissimilar models of cameras, use to obtain better colorimetry match between cameras.

Consult service manual.

Color Bar Test Patterns

Steve is skipping this for now.

Boards in Camera 5

AB = automatic beam. Discharges target, ha an auto optimizer.

VA = video amplifier. First thing pickup tubes do is send signal through this. No sync – intervals contain noise – would need to use external sync with o'scope.

SH = shading

DF = deflection – where set geometry

IE = interface electronics. A catchall board for Sony.

PR = processor – the main/central board (doesn't refer to a microprocessor)

AT = automatics – another Sony catchall.

(unmarked) = auto iris.

EN = encoder

SG = sync generator. Based on house sync fed through triax.

PS = power supply

IF = interface – viewfinder select, safety zone

Often, camera cases used to sink heat generated within the cameras.

LAB