

Quality: You can't always 'fix it in post'

Station engineers, PBS join to identify best practices for DTV system

PBS has convened what it calls, for short, the Quality Group to improve the technical quality of digital signals the public TV gives to viewers. CPB has funded this year-long project to go where all broadcasters have had to go: into the chasms and wormholes of digital TV. The group will test public TV's program production and transmission chains, present findings and conduct workshops (the first in June at KQED in San Francisco) and publish a series of articles, including this introductory article and others in Current. Jim Kutzner, PBS's chief engineer and group manager of the QG, is author of this introductory article.

By Jim Kutzner

One of the big eye-openers at this year's Consumer Electronics Show was the significant improvement in the quality of consumer displays. This is great news for the consumer, but it also suggests a new obligation for everyone in public television — to create and transmit content that is equal to that quality.

For much of the past decade, staffs at member stations and PBS have been hard at work taking digital television from theory to reality. Public television led the development of HD, ATSC standards and HD distribution (for which PBS recently won a Technical Emmy), and turned DTV's multicasting capability into a major benefit to our audiences.

Now public television needs to take full advantage of the long-awaited leap in video and audio quality that was the major reason for the digital transition.

Some may ask, why is the quality of public television's signal so important right now? Aren't the images crystal-clear enough for our viewers?

To answer these questions about the importance of technical quality in our signals, this series of articles, to be published in *Current* and other publications over the coming year, will discuss the issues in the digital



television supply chain, from end to end, and their implications for everyone in public television.

We'll start by exploring the best ways to use the American television system from end to end.

It's a system, weak links and all

Following an old axiom that applies to practically everything that has more than one piece, the technical production and delivery of high-definition television is only as good as its weakest link. These links include how material is captured, processed and distributed, how it's handled in master controls and archives, how much transmission capacity is devoted to a program and what kind of receivers the viewers use.

Digital television has eliminated many of the technical problems that plagued us in distributing content for analog broadcast, but it has also introduced a new set we haven't had to address until now.

Newer solid-state image sensors coupled with more stringent requirements for lenses and newer technology flat panels allow broadcasters to capture and represent higher-definition video than ever before—and can now reveal flaws unless we take steps to prevent them.

That makes it imperative that we test, develop and implement standards to give viewers the best experience feasible right now and to future-proof our productions for their viewers in seasons to come.

Getting it right from the start

We often say "We'll fix it in post," but we usually know better. It's one of the grim facts of TV production. The fundamental rule: Get it right from the start, because we

shouldn't assume we can fix an impairment downstream. By that point, it's often very difficult to make it right. Every process along the way affects, often negatively, the quality of the signal. Occasionally you can find clever ways to cover up an impairment, but cleverness goes only so far: If you apply one clever fix on top of another, you're apt to find them conflicting in unexpected ways.

Consider the simple example illustrated by the following two images. On the left, the videographer didn't use the correct filter (a polarizing filter). No amount of postproduction magic can fix the shot. On the right is the result of a good field-production



practice.

When we follow good practices starting in production design and field shooting, we save resources that we'd otherwise have to spend on fixing problems. Otherwise we have the thankless job of spending time and money just to make a program viewable when we could be instead making it beautiful.

Here's another detail that needs attention before the first images are captured: aspect ratio.

High-definition video has an aspect ratio of 16:9, but we have more than 60 years of standard-definition video shot at a 4:3 ratio. To deal with this issue we have developed several means of adapting content in one aspect ratio to systems that display another. If we do nothing, or slip up, the images can

be distorted, making people appear tall and skinny or short and fat.

As long as some images are 16:9 and others are 4:3, even our best solutions are compromises that sometimes look like mistakes, and can look even worse if we don't pay attention. To make an older 4:3 image fit into the now-standard 16:9 frame, we need to make choices. Those decisions are informed by the quality of the source material, the artistic or journalistic intent of the producer, and the way the image will be displayed by monitors of different shapes.

When planning camera shots for 16:9 productions that could end up on 4:3 screens, we have to remember that we usually can't control how the downstream distribution systems will handle the images. The studio shot of the woman is relatively successful on screens of both shapes. On the 4:3 screen, we waste 25 percent of the image that's cropped off the sides, but the producer took care to keep the essential part of the image in the "protected" central area. However, putting the shot of the off-center man on a 4:3 screen causes what viewers recognize as an obvious mistake.

Whether to protect the 4:3 center or not has been an ongoing debate for some time. The Quality Group will discuss the good reasons for each approach—and the prospects for possible automated solutions, such as Active Format Description, a SMPTE-standard system—in a future article.

We'll discuss these among other issues:

■ **Image acquisition:** How to choose the right techniques and equipment, including lighting, lenses, filters and imagers.

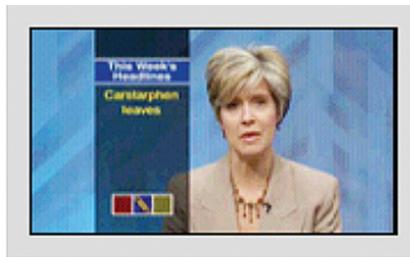
■ **PBS program submission:** We'll try to demystify the process and explain the steps as now required for DTV.

■ **Recording options:** Tape or solid state? P2, XDCAM, AVCHD? Tapes, disks or memory sticks? We know it's confusing. We'll explore options, including codecs and recording media.

■ **Up-, down- and cross-conversion:** We'll cover challenges such as analog conversion artifacts and remedies such as de-interlacing video.

■ **Audio:** We'll discuss program audio levels and pending federal legislation, the CALM Act. We'll also address 5.1 Channel Sound implementation, and an issue no one seems to be able to solve in digital TV: audio-video lip synchronization.

If your 16:9 image will be seen by many in 4:3 aspect ratio . . .



. . . this works

and this doesn't

■ **Coding for broadcasts—and other digital emissions:** Digital broadcasters now have the prospect of leasing out parts of their broadcast channel, or using parts for Mobile DTV. What are the best ways to allocate transmission capacity?

■ **Consumer displays:** No system is complete without the end point, so the Quality Group will explore quality tradeoffs involving station equipment and the new generation of home monitors.

This project also includes a testing and evaluation element. The Quality Group will test the public television delivery system from producer to the viewer's receiver to help producers and member stations optimize their video presentation.

Quality website, workshops

The Quality Group has established a new website open to the public at <http://pbsconnect.org/qualitygroup> to help collect and disseminate the large amounts of information the Quality Group process will produce. This public website will contain all information related to the Quality Workshops (including video of the sessions), technical papers, the testing program, and much more. If you have suggestions or questions for the Quality Group, please contact us at qg@pbs.org.

The first Quality Workshop will take place

June 8-9 at KQED in San Francisco. Please join us for a packed day-and-a-half to get the latest thinking in best practices and how your station can improve its video quality. Registration and agenda information is at <http://pbsconnect.org/qualitygroup>—click on "Workshops." The next workshop will be hosted by Twin Cities Public Television in St. Paul, July 8-9. Space is very limited for these workshops, so register soon to make sure you get a seat.

Quality Group members include: Wendy Allen, PBS; David Felland, WMVS-WMVT, Milwaukee; Gerry Field, American Public Television; Frank Graybill, WNET, New York; Shawn Halford, PBS; Terry Harvey, WSIU, Carbondale, Ill.; Michael Hunt, PBS; Bruce Jacobs, Twin Cities Public Television; Chris Lane, WETA, Washington; Dave MacCarn, WGBH, Boston; Tim Mangini, WGBH/*Frontline*; Ernie Neumann, Northern California Public Broadcasting; Mark Schubin, Metropolitan Opera (and other clients); Steve Scheel, PBS; Greg Tillou, National Educational Telecommunications Association (NETA); Steve Welch, NCPB; Eric Wolf, PBS; Ann Tucker (project manager), PBS; and Jim Kutzner (group manager) PBS.

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