



Maintaining the integrity of the standard-definition broadcast through dual-path mobile production

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As with all technology, HD mobile production is changing almost monthly with the release of new products. The realization of bigger and better ideas has become possible with the creation of incredible chip sets and micro-electronics. This is only a snapshot of the convergence of technologies at this juncture in history. These products will be obsolete tomorrow.

Taking 18 months for research and design, Core Digital Technologies/SWTV, with the assistance of 45 manufacturers, designed the first dual-path high-definition mobile production unit.

Feedback from major network broadcasters and production crews was used to try and overcome many inconvenient issues in high-definition broadcasting, including high production costs. In the past, SD/HD production was accomplished using two mobile production trucks, one high definition and the other standard definition, with two sets of equipment and operators. Our task, with regard to these dual broadcasts, was to produce high-definition television without compromising the integrity of the standard-definition show. This meant eliminating downconversion to 601 4:3 video.

The mobile unit was designed to maintain the integrity and pristine video path in high-definition and standard-definition broadcasts through the use of dual video paths. In the unit, one production crew uses two video switchers, two video routers and two wideband video distribution paths.

There are many areas to discuss concerning HD broadcasting. The first is "What is high-definition television?" Almost every major network has chosen a different standard. There are almost as many answers to this question as people you ask. In the design phase, we decided on a wideband video path for multiformat high-definition specifications and variable frame rates. As this book goes to press, the unit is using 1080i cameras and tape machines for a major sports network client.

Why a dual video path mobile unit? Today, many of the tools of remote production — digital disk recorders, video servers and graphics — are available only in the 601 serial digital world. These sources will have to be upconverted to 1080i for use in the HD world. If you think of video in layers, you have a layer of 601 video and a layer of HD video. The 601-source equipment is most effective for the 601 layer, as it keeps the signal pristine in the 601 layer and in the most common 4:3 aspect ratio. Using these 601 devices for the HD layer is a production call, based on the desired look for the video. Most live sports broadcasts are being produced in 601 serial digital video and 4:3 aspect ratio, or the video can be stretched and pulled to 16:9. Other choices for aspect ratio include black panels on the side of 16:9, edge, crop or anamorphic. This is also a production decision. The HD layer is a work in progress, from the available equipment to the limited HD audience.

There are serious production decisions to make during the dual-path broadcast. Which show is the primary show — HD 16:9 or 601 4:3? Which is the secondary broadcast? Your camera positions will be dependent on which format is primary for the look of the show and for the content you archive in stock footage after the live show.

Camera sources output both 1080i 16:9 video and standard-definition 4:3/16:9-selectable video, and the camera's viewfinder has a mask feature allowing for highlighted 4:3 area and grayed out 16:9, just 16:9, or just 4:3. This gives the cameraman flexibility to focus on and shoot the primary format show, which today seems to be 601 4:3 for the most part. We have both formats of video available from the camera and tape sources in both aspect ratios.

The difference in timing of the SD vs. the HD signals out of the camera was 90 lines. Overcoming this delay was done by using separate reference signals, shifted in time, for SD and HD signals.

The tape room is the heart of the truck in equipment and operation for a live sports broadcast. This is where the creative talent builds the elements for the show and provides the replays and edited pieces during the broadcast. The tape room must contain familiar monitoring, QC stations, dual-format waveform and vectorscopes, router, and intercom.

The real decisions come when the stock footage is 4:3 and you need to determine what you want the HD layer elements for the show to look like. All 601 4:3 video should be undisturbed, as with any standard-definition broadcast.

This mobile production unit uses a modular systems integration design leaving shelves and cables for up to 28 VTRs or DDRs to be added. With this design, we could simultaneously roll an HD machine and a 601 machine and maintain the highest picture quality in both video layers.

Monitoring in the control room became a major issue. A monitor wall with 16:9 CRTs would be unfamiliar for standard-definition clients. And most clients do not like the letterbox look that results from using 16:9 sources with 4:3 CRTs. This led us to consider virtual monitor walls. A custom monitor wall was the only solution to this problem, as it would offer flexibility for the producers and directors on their live broadcasts. Virtual monitor walls can be programmed to offer displays in any size, shape or aspect ratio, as well as providing multiple tallies, clocks, borders and fonts.



The video room uses familiar tools for added functionality. The master control panel for the HD cameras allows operators to control paint and detail circuits in the HD and 601 layers independently. The room also features dual-format waveform vectorscopes and QC monitoring. A custom system allows the cameras to be controlled and powered by SMPTE fiber camera cable or standard triax cable.

A SMPTE fiber camera patch panel in video means the operator does not have to leave the video room to change out camera drops during intermission.

Add a high-end digital audio console for entertainment shows, with the capability to also handle analog audio inputs/outputs. Now you have three live remote trucks in one trailer: an HD truck, a standard-definition truck and an audio truck.

This production unit was built and designed to handle this transition of dual-path, dual broadcasts for the indefinite future. ■

