

TCT 2014

Technical Overview

&

Production Requirements

Greetings Video Producers and Engineers!

The purpose of this document is to provide a succinct summary of the technical production requirements related to the live case transmissions into TCT 2014. Each site is being provided with a "Transmission Overview" which covers EVERYTHING related to the live case productions. This document is for the video production specialists.

Most of the sites for TCT 2014 have producers who have transmitted into the meeting before, so most of this information is already known. For new sites and producers, this should provide a good overview of what will be required for TCT level events.

In short, if a producer has a successful production system in place, that has transmitted live cases in the "Broadcast Video" production standard of 1920x1080i@59.94, using the HD-SDI video interface format, then most of the issues for TCT has been addressed. Use this document as a reference, and to supplement the current production system.

That said, there are some IMPORTANT issues that need to be addressed for this year's production:

1. There have been problems during productions where the Panasonic 400 series switchers – "vision mixers" (the AV-HS400, AV-HS450 and AV-HS410) have been used. Producers using this system – Med-Scene, L.L.C. is one of them – are being asked to genlock all their video sources.
 - a. NOTE: This is the recommendation of a Panasonic - USA field engineer!
2. HDMI cables are banned from use within the video production system. They can be used "downstream" of the video production switcher only, and then only if converted from an intervening signal format.
 - a. For instance: In-lab Doctors' Confidence monitors, where the video signal into the lab is HD-SDI, and is then converted to HDMI.
3. To help troubleshooting, each site needs to provide a Production Signal Diagram to Med-Scene, L.L.C.
4. A website will be online by the August 1st that will provide production resources and information.

Although this document is meant to be brief, I am a long-winded individual. Perhaps there is too much detail for some (or most). However, the general idea is for successful producers to continue what they are doing, and new producers to have a resource in which to join "the team".

I look forward to seeing your work! Please provide questions and comments as freely as you have in the past – most of us have been working together long enough that we all want the same thing: A successful production.

Sincerely,

Rob Langford - President
Med-Scene, L.L.C.

Production Details and Specifications

Production Logistics

Most sites who have transmitted into a TCT meeting previously, have a Standard Operating Procedure (“SOP”) when it comes to live case productions. If this is the case, then this production plan should be followed. However, it is the purpose of this overview to ensure that certain production standards are adhered to and level of performance quality maintained.

For sites new to the transmission of “Broadcast Quality” (HDTV) live cases, the following is a guideline of the space needed for the different production and transmission components. Also included are telephone and IT, power, security, and parking considerations

Lab and Space Allocation

- **Two Primary Labs** – two labs are to be wired, equipped, and staffed for the video production of live cases. They are considered to be “online.” Unless problems arise, they will be the only labs used during the transmission.
- **Video Control** – this is a 100 square foot (8 square meters) space needed for the primary video production equipment required for the transmission. This area should have ample power and at least four dedicated analog – or “**POTS**” – telephone lines nearby.

Telephones and Information Technology (IT) Requirements

- Four analog – or POTS – telephone lines are needed at the Video Control location.
 - **For those using “Voice Over IP” (“VOIP”) or ISDN based telephone systems, please make sure your system can connect to an international POTS telephone number.**
- An Internet Connection for transferring Patient History Slides or other media content.
- Access to a “Telephone Closet” should be taken into account when determining a location for Video Control.
 - This is for access to Fiber Optics provided by the local Telephone Company

Power

- Ample power is needed for Video Control
 - Usually six (6) 110 volt / 15 amp circuits for productions in North America.
 - All circuits must have “clean” power on the same ground.

Other Requirements

- The site’s security department should be contacted for the following:
 - Protection of television production equipment while on site
 - Possible parking of satellite trucks on the day of transmission
 - Access of television production personnel to labs during off-hours
- The site’s health and safety department should be contacted to provide guidelines for production crews and equipment.

Restricted Vendor Access Requirements

It is the site’s responsibility to coordinate and provide access to the video production vendor throughout the production process. This includes the following:

- Any and all access requirements specific to the transmission sites
- Any and all costs associated to providing said access
- Any coordination or costs of maintaining restricted vendor access after the TCT 2014 production

Scan-conversion

In order to keep the quality of medical images as high as possible, each site is encouraged to use high quality, new technology computer scan-converters where needed. For images requiring a high degree of detail (fluoroscopy, roadmaps, and 3D renderings) **scan-converters similar to the Barco (Folsom) ImagePro HD or 3G are highly recommended.**

In any situation, it is a **VERY** good idea to have each Transmission site's medical imaging provider(s) get involved in the TCT 2014 live case production as soon as possible.

Scan converters or direct video output should be used to show additional video images such as IVUS, OCT, FFR, NIRS, TTE, TEE, etc. These images should not be shown by pointing a camera at the video screen of the specific imaging device console; images recorded and transmitted in this manner tend to be inferior in quality and, at times, interpretable.

Therefore, it is important to get the medical imaging manufacturer(s) technicians – Siemens, Philips, Volcano, etc. – at each transmission site involved in the production as early as possible. The technician can designate a video out from the imaging system or – given enough time – and create an output as needed.

Technical Specifications

Production and Transmission Standards

We would like all sites to produce and transmit live cases in the following video standard:

- The High Definition Television standard for TCT 2014 is – 1920 by 1080i @59.94(interlaced)
- The signal format will be: HD-SDI (“High Definition via Serial Digital Interface.”)
- Up to four (4) channels of audio need to be embedded on the video signal.

Each site is asked to have resources on hand to transmit cases in the resolution of 1920 by 1080i @59.94i. The reason for this is to provide a uniform standard throughout the transmission and meeting-site signal distribution system.

However, **NEW for this year**, a site should transmit their cases in the country’s native video format. For instance: European sites will transmit cases in the 1080i/50 resolution. The TCT 2014 meeting will provide format conversion within the transmission stream.

Here is the reason TCT is trying this for this year’s meeting:

1. There have been problems with certain switchers providing signals with signal errors embedded within the data stream. The issue mostly revolves around the loss – or corruption of – sync signals in the HD-SDI signal, and does not appear until the signal arrives at the meeting site.
2. The problem appears to occur when downlinked satellite signals are transferred onto the USA’s fiber optic network for delivery into the meeting.
3. Having the video standards converted with the transmission stream means equipment that is purpose built for this task will be used for the conversion, as opposed to a less robust processor within the production switcher itself.

Transmission Coordination and Standards

- TCT 2014 will coordinate, provide, and pay for the services needed to transmit the live case signal to the Convention Center.
- TCT 2014 will provide – as necessary - whatever equipment and personnel are necessary to transmit in the 1080i @59.94 via HD-SDI video format.
- However, TCT 2014 will not pay for major technical infrastructure improvements to a facility necessary to meet broadcast quality, HDTV standards

Transmission Site Production Specifications

All budgets relating to TCT 2014 video production services need to address the following video and audio sources. TCT 2014 will reimburse transmission sites for the sources specified below.

Video Sources – TCT 2014 will reimburse the transmission sites for the production of the following video or computer sources. Any costs related to additional sources or equipment are the responsibility of the transmission site.

NOTE: Do not use HDMI cabling or connections “upstream” of the video production switcher (vision mixer)! There have been multiple instances where the “HDCP” copyright protection protocol within the HDMI signal flow has cause disruption or blocked video images during live case events. (See details in the “New Production Requirements” section.)

Signals sources for each site’s production are:

- Up to two (2) cameras per lab

- Live fluoroscopy
- Angiographic/fluoroscopic road map or reference
- Hemodynamics (a.k.a. “Vitals”)
- A shared channel for intravascular ultrasound (IVUS), optical coherence tomography (OCT), fractional flow reserve (FFR), near infrared spectroscopy (NIRS), intracardiac echocardiography (ICE), or transthoracic or transesophageal echocardiography (TTE or TEE)
- One spare video or computer-based image source such as old/stored angiogram, CT, or MRI
- Patient History Slides Computer (do **not** connect using HDMI!)

Audio Sources – It is essential that good, clean audio is provided from each site. While it may seem counter-intuitive, it is often harder to get good audio than good video. To help alleviate the problem with audio delay and “echo”, a mix-minus audio configuration must be maintained at all times.

- Up to three (3) doctors on microphone per lab.
 - Clean microphone placement – in terms of sterile field and technical placement – is vitally important!
 - Microphones should NOT be under sterile gowns.
- Two “Return audio” channels from the TCT venue for moderators and panelists via telephone interfaces.
- Music and audio “test tone” should be available for testing and calibration.

A SPECIAL NOTICE CONCERNING IN-LAB AUDIO! After many years of requesting that no audio speakers be used in the labs at a transmission site during a transmission, we are now making this *mandatory!* Therefore, the following rules apply for audio specifications:

- NO audio speakers are to be used in a lab that is transmitting live to TCT!
 - This often creates an echo effect that is heard by the attendees at the meeting and is so distracting as to ruin the educational content of the procedure.
- All microphone signals are to be equalized and tested in advance to make sure they provide a good clean signal.
- If any transmission site production requires assistance in adhering to these two VERY IMPORTANT specifications, CRF will provide audio specialists to assist in their production.

Good, clean and intelligible audio is vital to a successful live case transmission. Although a much simpler technology to utilize, audio production is the most prone to failure. PLEASE help us to help you to produce the best series of live cases ever!

New Requirements – as of TCT 2014

As of TCT 2014, there will be some addition video and transmission production requirements. NOTE: All of these requirements are based on real world situations during actual live case events.

TCT 2014 Updated Requirements

- 1. Please use “Genlock” (Black-burst of Tri-level Sync) throughout the entire production system.** Some video switchers (“vision mixers”) such as the Panasonic 400 series (the AV-HS400, AV-HS450 and AV-HS410) have claims that inputted video sources do not require genlock in order to switch cleanly. While for most production scenarios this may be true, there are been several episodes during live case transmissions where this is not the case.

The problems experienced include video distortion, image loss and complete signal loss (including audio). However, the problem is noticed at the receive end of the transmission only; the origination end – the hospital video production – does not experience any noticeable problem. All other factors being accounted for, 90% of the problems occurred when a Panasonic 400 series switcher was used, with no additional genlock between production components. Also, all problems occurred using a satellite truck as the means of transmission.

This being the case, we ask all engineers – and regardless of switcher type – to genlock (black-burst of tri-level sync) the following components together using the switcher’s generated sync signal, or a signal from a stand-alone generator:

- a. Video switcher
 - b. Audio embedder to satellite truck (or fiber-optic “POP”)
 - c. Upstream matrix router – as needed
 - d. Medical imaging scan-converter – Folsom Image Pro HD or similar
 - e. Cameras
- 2. Avoid using HDMI connections within the video production signal path.** In particular, no HDMI generated signals as video switcher inputs, nor as outputs from the switcher – or downstream component – to the medium of transmission.

The reason for this is the increased presence – or use of – HDCP Copyright protection protocols within the computer end of the video production industry, such as laptops used for Patient History Slides, video playback devices that use HDMI, and even switcher or production routers using HDMI. Replace any of these devices with a something similar that uses VGA (HD15), DVI or Display Port connections.

For those who have not experienced this problem, if a device using HDMI senses another device along the signal path that cannot be identified by the HDCP protocol, it will block the HDMI source device from providing an image. This if regardless of permissions or acknowledged rights of use. Even if all display devices are recognized, if the origination signal switches to new source content, HDCP can again block the signal.

Signals using auxiliary outputs – such as to the in-lab return monitor – can utilize HDMI, but only if converted from another signal type. For instance, using an HD-SDI cable to

deliver the signal into a lab, then converting the signal to HDMI as an input into a monitor.

3. **Please provide a quick sketch of the video production system's signal flow to Med-Scene, L.L.C.** As a way to keep track of problems as they arise, and to work towards a solution regarding the signal disruption episodes as described above, a quick sketch of each sites signal flow is required. Please include the following details:
 - a. Sources and resolutions of each
 - b. Cable type
 - c. Name and model number of all equipment with the production system
 - d. Which sources are receiving genlock
 - i. What is the source and signal type of the genlock.

TCT 2013 Updated Requirements – Still in effect

1. **For sites wishing to use wireless microphones and “in-ear monitors”**- please use a “Spectrum Analyzer” to determine the amount of frequency interference currently present in the procedure room. Medical imaging equipment, hospital paging systems and radio cardio monitors used in hospitals and during live case procedures generate a lot of “RF Noise”. Some of this noise hits on the same frequencies needed for wireless microphones and ear monitors. An analyzer will help determine the best frequency to use during the transmission.
2. **Also for wireless microphones and ear monitors** – please provide Robert Langford the equipment make, model and frequency blocks of the wireless equipment and an evaluation will be made as to what regional radio interference – via television and radio stations – may impact their use.
3. **All sites are required to utilize a “Return Monitor” from their satellite uplink of fiber connection to help resolve any transmission issues.** The return feed should include video and embedded audio. This greatly helps in diagnosing issues within the transmission chain.
4. **It is suggested that an internet connection be available at the video control location of each transmission site.** A new “video back-haul” system is being implemented that will stream a site's video and audio onto the internet. This will assist in resolving any transmission related issues that may arise during the “Connect and Test” phase of a transmission. This signal will be switched for diagnostic purposes only and should NOT be used as a return video feed.

Equipment and Service: What Costs Are Covered

In order to remain within budget for this event, CRF will pay each site for the following equipment and services:

- A professional HDTV video production system capable of outputting 1920 by 1080i @59.94 via HD-SDI and that cleanly switches between all necessary medical and production video sources
- Up to two professional video cameras per lab
- Production equipment needed to down-scan or scan-convert the necessary medical images to the 1920 by 1080i @59.94 via HD-SDI video format.
- The processing of additional medical sources such as histology slides

The following costs for equipment and services **will not be covered:**

- Character generators
- Video recording at the site
- Use of a facility's in-house cabling or fiber "backbone"
- The production of a site's opening video
- Improvement to a site's infrastructure
- Cost of providing or maintaining restricted vendor access
 - This includes tests, immunizations, or administrative fees

Cardiovascular Research Foundation will not pay for any costs not specified in writing on the finalized "Transmission Site Agreement."

A Standard HDTV Video Production System

For sites in North America, **Med-Scene, L.L.C.** – working with several vendors – has created a "Standard HDTV Video Production System" for TCT 2014. This system, that includes all equipment and technical crew needed to produce live cases in the HDTV format of 1920 by 1080i @59.94 via HD-SDI, can be delivered to any of the North American transmission sites and adheres to the budget guidelines specified by the CRF.

This system features the following:

- Two HDTV video cameras with three 1920 by 1080p, 1/2+” CCD or CMOS outputting on HD-SDI
- Camera controls
- Five Barco/Folsom ImagePro HD scan converters for switching between multiple in-lab sources
- All video terminal and engineering equipment
- All necessary video and audio encoders and embedders
- A fully qualified Chief Engineer – or Engineer in Charge – who travels with the system
- The latest portable HD-SDI video switcher from Panasonic, Grass Valley, Sony or FOR-A.

For more details on utilizing this system for your site, clarification and/or additional details related to technical aspects of the transmissions, please contact the following:

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