

Production Streaming Guide

a guide to video streaming at the ADC Theatre

Introduction

This document is intended to give an overview of the video streaming system at the ADC Theatre to help with planning productions for the Michaelmas 2020 season. As some parts of the system are still undergoing installation, this document will be updated regularly to provide up to date information on the system and advice on using it. However, if you have any specific questions, please email the Technical Manager, Eduardo, at eduardo@adctheatre.com. The most recent version of this document can be found at www.adctheatre.com/technical.

This document is intended to be used in conjunction with the **Pandemic Production Guidelines** (accessible at www.adctheatre.com/productionresources), and the social distancing measures described within.

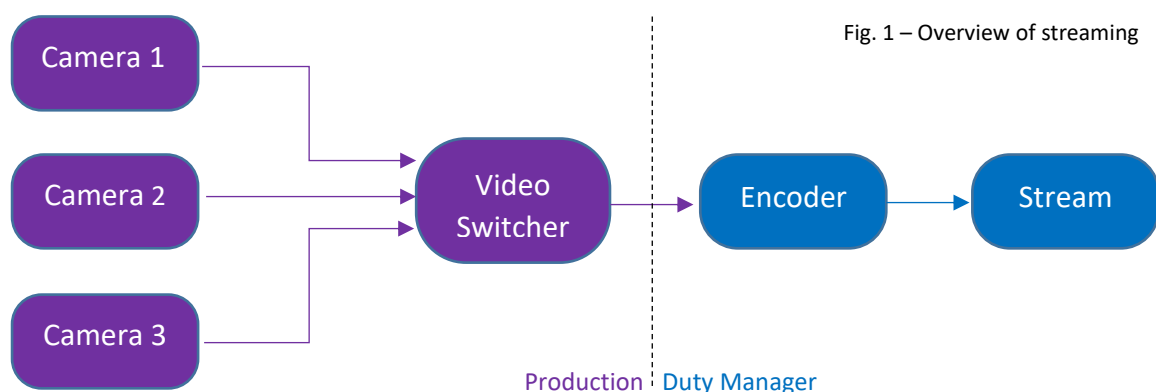
Summary of Changes

- 15/09/2020 – **Cabling > Video Points on Panels: US Stage Panel SDI cable runs** updated to two (originally one).
- 02/09/2020 – Document published.

An Introduction to the Streaming

Unlike normal film recording, livestreaming require their capture devices (cameras and microphones) to transmit their recording near-instantly to a central location, from which it is then encoded for transmission and streamed out over the internet. For this reason, all cameras have to be connected by cabling to a video switcher, which chooses which camera's output is sent to the encoder and broadcast to the stream.

The general architecture looks like this:



At the ADC, the cameras and switcher will be in the production's hands, but the encoder and stream will be run by the Duty Manager, so production teams don't need to worry about it. The key responsibility of the production is to provide a video and sound feed of the show

from the video switcher to the encoder, everything else will be taken care of by Management.

A Note on Video Cabling



HDMI Cable



SDI cable

There are two main types of cable in video transmission – HDMI and SDI. HDMI is far more widely used in everyday life, but cannot transmit HD video signal further than about 15 metres. SDI is more specialist, but can carry HD signal about 64 metres. This means that to get from stage to the lighting and sound boxes you have to use SDI. As a general rule the only camera that should run over HDMI to the switcher is the Rear of Auditorium bar wide-shot camera. HDMI can be converted into SDI and vice versa using a **Blackmagic Design Microconverter** (see below).

N.B. There is a third type of video cable – ‘composite’ – that can only carry standard definition feeds. Most of the ADC’s show relay screens run on this. As both SDI and Composite use the same connectors, it is easy to get confused between them. For this reason, please only plan for video cable runs using the SDI points specified in the **Cabling** section later in this document.

An Introduction to the Equipment

There are two core components of the live video system – cameras and switchers. The ADC will have the following equipment available for use by shows next term:

- 1x Blackmagic Design ATEM Television Studio HD
 - 1x Blackmagic Design Pocket Cinema Camera 6K (*fixed in position on Rear of Auditorium Bar*)
 - 2x Blackmagic Design Microstudio Camera 4K
 - 3x Blackmagic Design Microconverter HDMI to SDI
 - 5x Blackmagic Design Microconverter SDI to HDMI
- **Video Switcher: The ATEM Television Studio HD**



Fig. 1 - ATEM Television Studio front and back

The purpose of a video switcher is to allow an operator to cut cleanly between different video inputs on a stream. The ATEM Television Studio has 4 HDMI inputs and 4 SDI inputs on the back, and outputs through the ‘PGM’ (‘Program’) SDI output, also on the back. Each input corresponds to one of the 8 input buttons on the front.

For simple operation you press a button to select that input as the ‘Preview’ (it will turn green), and when you want to cut to it you press ‘Cut’, turning the button red to indicate that input is live. That input will then be outputted out of the ‘PGM’ output on the back of the device. All the inputs are displayed via a display on a separate monitor (see Fig. 3), so you can see when to cut.

Pressing the ‘Auto’ button instead of ‘Cut’ triggers an auto transition – by default a 1 second fade between the Preview and Program inputs.

However, the switcher can be used for a wide variety of more sophisticated functions using a control software that runs on a connected PC. This allows features such as picture in picture, additional transitions and green screen. It also allows you to control the speed of transitions both automatically by changing their duration, and manually by controlling them with a virtual fader.

It can also be used to remotely control certain aspects of some cameras. Please see the section on the **Blackmagic Design Microstudio Camera 4K** for more information.

The Switcher also has two XLR inputs, so can receive a stereo input straight from a sound desk or other mixer.

More information on the ATEM Television Studio HD can be found [here](#). Please note we have the TV Studio HD, not the Pro or Pro 4K versions.



Fig. 3 - ATEM Television Studio preview display

- **Blackmagic Design Pocket Cinema Camera 6K**

The Pocket Cinema camera will be permanently mounted from the Rear of Auditorium bar for the duration of next term, and will be focused as a full stage wide-shot. **Do not remove it without consulting Management.** It connects to the video switcher using a direct single HDMI connection, so does not require patching. It cannot be controlled remotely using the Television Studio HD. As it is rigged from a bar, **this camera does not require an operator.**

More information on the Pocket Cinema Camera 6K can be found [here](#).

- **Blackmagic Design Microstudio Camera 4K**

The ADC has two Microstudio cameras for use by shows. These cameras can be positioned as suits the show, and can be operated for capturing close-ups or framing scenes. Two tripods will be available for these positions. Unfortunately, as moving camera position can take time, and cameras will require disinfection between shows, we currently cannot permit camera positions to be changed between the Mainshow and Lateshow. Please contact Management if you have any questions about this.

The cameras output over SDI not HDMI, so connect directly into the video lines in wall panels without need of an adapter. The cameras have 14-140mm MFT lenses. While the cameras do not have inbuilt displays, a display monitor will be fixed to the tripod for use by camera ops.

The Microstudio cameras can also be controlled remotely from the video switcher, via the control software (see Fig. 4). While several parameters can be controlled remotely (see image below), the most notable is lens focus. This means that the switcher operator can set the focus of a camera before cutting to that input, so camera ops just need to manage zoom and framing.



Fig. 4 - ATEM Television Studio remote camera control

Please note controlling cameras from the switcher requires two SDI cable runs: one from the camera to the switcher to carry the video, and one from the switcher 'SDI out' to the camera to carry remote instructions. This means that it is advisable to plan two video cable runs in advance, particularly if you are placing a camera on stage where you may not have two video sockets in a single wall panel.

More information on the Microstudio Cameras can be found [here](#).

- **Additional Cameras**

If a production would like any additional cameras, it will need to source them, most likely by hiring them. There are a few things to consider when looking for a suitable camera:

- It will need all accessories (e.g. monitors, tripods, and lenses) as the ADC does not have any spares of these. Lenses particularly can be expensive.
- It needs to output to the exact same resolution and framerate as the other cameras on the system or the switcher will not recognise it. Currently this is planned to be 1080p 60FPS.
- It must output "clean HDMI" or "clean SDI". This means that the video output will not have overlays, like focus marks, battery reads, or recording time counts, which would appear in the feed to the switcher.
- It must be able to record or operate for longer than 30 minutes without cutting out or overheating. (This problem particularly affects SLR cameras, or other primarily still photography cameras with a video output).

- If it outputs HDMI, you should check the theatre has enough spare HDMI to SDI converters to convert it into SDI for transmission to the switcher.

If you think you will need additional cameras or plan to use any unusual video inputs, please email Eduardo at eduardo@adctheatre.com.

- **Blackmagic Design Microconverters**

As the name suggests, these convert from SDI to HDMI or vice versa. They require mains power to do this, so need to be stationary, but are small (76.5mm x 45.8mm x 24.8mm) so can be hidden fairly easily.

Notably the SDI model also has an 'SDI Loop Out' which refreshes the SDI signal, so it can travel approximately another 64 metres. This is especially useful for getting signal from the stage to the Lighting Box by taking SDI signal out of the Patch Bay patch, running it through a Microconverter, and connecting the 'Loop Out' to the line through to the Lighting Box.

Video Team Roles

- **Video Director**

The video director is in charge of the overall output of the stream. They will need to plan closely with both lighting and sound to ensure that the quality of the streamed video is good, as well as with the TD and set designer to set camera positions. They should also have a good knowledge of the blocking of the show to plan what angles would be best for different moments.

As the video switcher does not record cues and must be operated live, it is strongly advised for the video director to operate the switcher for every performance. If this is impossible a dedicated video switcher operator should be appointed and should have an excellent knowledge of the shot list and the show's blocking. The video switcher is operated from the Lighting Box.

The video switcher operator is also responsible for instructing camera ops over headsets throughout the performance on who or what to frame, as well as, where applicable, remotely focusing cameras.

- **Camera Op**

The camera op is responsible for framing shots and setting zoom. Camera ops should know the show, particularly if there are any difficult or time critical shots (e.g. during musical numbers) that need to be caught. However, as they are instructed live by the video switcher operator, if necessary another member of the production team can step into this.

In line with **Pandemic Production Guidelines** camera operators should sign in using the Google Form accessible via QR codes at each camera position.

They will have a display of their own camera's output and a headset for instructions. Given their proximity to audience they should avoid speaking back to the switcher operator during performances and should wear black.

Cabling

- **Patches**

The video system has two patches: one in the patch bay, and one in the Lighting Box. There are currently 3 SDI lines connecting these two patches that can be used in either direction. We intend to increase this to 4 lines before term begins.

Video cables passing through the Patch Bay should be refreshed using a **Blackmagic Design Microconverter SDI to HDMI** as described in **An Introduction to the Equipment**.

- **Video Points on Panels**

The video connectors that currently work for SDI transmission are:

- Floor box by seat F1 in auditorium – two SDI lines to Lighting Box patch
- Floor box by seat F14 in auditorium – two SDI lines to Lighting Box patch
- OP Juliet panel – two SDI lines to Patch Bay patch
- PS Juliet panel – two SDI lines to Patch Bay patch
- US Stage panel – two SDI lines to Patch Bay patch

Sound

For livestreaming, sound has to be captured live, mixed, and fed to the video switcher.

- **Capture**

There are two ways to capture stage sound:

- **float mics** – a system of microphones rigged and pointed at the stage to capture any sound from it.
- **personal mics** – individual radio mics given to each actor, that specifically capture that actor's voice.

Ahead of term Management will experiment with a standard float mic rig, and depending on the success of the rig, will advise shows whether personal mics are necessary. This document will be updated to account for these findings.

- **Mixing**

The sound desk (**Yamaha CL3**) will be used to mix the sound for both the PA system (auditorium) and the stream. The stream sound will be outputted from the sound desk and fed into two XLR inputs on the back of the video switcher. This will require two mixes, one for the PA and one for the stream, but the hope is that the stream

mix can largely exist untouched, with a balance and effects set-up before the show begins. This will be stored as a new “ADC Default” scene.

If we discover in testing that the stream mix requires frequent adjustment, we will supply a solution for adjusting that mix, probably using remote control of the CL3 over an iPad or other interface which the video switcher operator can use.

Sound designers that intend to use their own desk configuration are of course free to do so, but should account for any resources (inputs and mixes) that are required for the stream sound to function when planning.



Fig. 5: An Overview of the ADC Theatre Streaming System

