



PTZOPTICS

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Producer Kit

*a two (2) camera
solution*

for Streaming and
Recording

This document will walk you through the process of setting up your new PTZ Optics Producer Kit for use with two (2) cameras. This system is comprised of the main Producer Kit in addition to one (1) Producer Add-On Kit for an additional camera. If you have not purchased the add-on kit the steps will be the same just for a single camera.

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General Overview

There are many ways to design a multi-camera system; this article will focus on building a system that is easy to deploy and provides reliable results.

We will cover set up of the cameras for both video and control.

This guide will assume that there is an existing audio system, mixing board or microphone(s) available.

We will also cover adding redundancy into the system. This will allow the video feed from each of the cameras to be accessed in two (2) unique ways, just in case there is an issue during a recording or stream. Please note these steps in regards to networking your equipment are optional and not required for a fully operational system.

Understanding the Camera's Connections

Let's take a look at the different connections the camera has to offer and how you can use them.

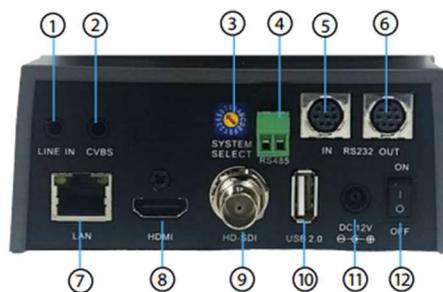
The SDI model of the camera has three (3) simultaneous outputs: 3G-SDI ⁽⁹⁾, HDMI ⁽⁸⁾, and RTSP / RTMP streaming via a Network ⁽⁷⁾.

For control, the camera features RS-232, in ⁽⁵⁾ and out ⁽⁶⁾, as well as RS-485 ⁽⁴⁾ and network ⁽⁷⁾ options.

The Rotary Dial ⁽³⁾ changes the resolution and framerate of your camera for the HDMI and SDI outputs but not for the RTSP / RTMP streaming.

The Line In ⁽¹⁾ allows for embedding true line-level audio over an RTSP / RTMP stream or HDMI.

For the purposes of this design, we will be using the SDI ⁽⁹⁾, RS-232 in ⁽⁵⁾ and out ⁽⁶⁾, the power connection ⁽¹¹⁾ and finally Network ⁽⁷⁾ for redundancy if desired.



1. Audio Line In (For embedding true line level audio over an HDMI and an RTSP or RTMP stream)
2. CVBS - Composite Video (Systems Select Dial must be on D or E / Only non-simultaneous output)
3. Rotary / Systems Select Dial (Allows for changing the HDMI and SDI output resolution and frame rate)
4. RS-485 Control Port
5. RS-232 In Control Port
6. RS-232 Out Control Port (Used for daisy chaining camera for multiple camera control)
7. Ethernet / RJ45 Port (Web Interface, Control and RTSP / RTMP streaming)
8. HDMI Output
9. 3G-SDI Output
10. USB 2.0 Port (Future Applications)
11. 12VDC Power Connection
12. On / Off Power Switch

For a flexible two (2) camera setup, we'll use a PTZOptics 20X-SDI camera and a PTZOptics 12X-SDI camera, since these cameras have different capabilities, such as zoom ranges and fields of view, to serve different needs.

The PTZOptics 20X-SDI camera can be placed on the back wall of your room (to zoom in on the presenter) while the PTZOptics 12X-SDI can be used for other shots such as an audience or choir, as it provides a wider field of view (The PTZOptics 12X-SDI has a 72.5° HFOV versus the PTZOptics 20X-SDI with a 61° HFOV)

Camera Control Options and using RS-232

To control the P/T/Z functionality of the cameras, we will use the HC-JOY-G2.

The HC-JOY-G2 is a small affordable joystick controller (well-suited for a variety of camera control applications)



A PTZOptics camera has three (3) different ways to gain remote control of the camera

- Serial Control
 - RS-232
 - RS-485
- IR control (IR remote included with camera)
- IP Control

We will be using serial control solely because it provides the most reliable and flexible method of controlling your camera.

IP control works by putting a PTZOptics camera on a network; once setup properly you are able to control it from anywhere on your network using an IP Joystick (PT-JOY), Software (Rocosoft or ONVIF Device Manager) or even the web interface of the camera. The downside to IP control is there is usually a small degree of latency when controlling the camera that can make it harder to get smooth panning shots.

This system will be using serial control so now we must decide if RS-485 or RS-232 is better for this scenario. A majority of people will use RS-232 to control a camera, as it is a familiar industry standard. Unfortunately, RS-232 by spec does not travel far (around 100' / 30m). If you will have runs longer than 100' you may want to consider RS-485, which is capable of being run over 4000 feet (depending on the quality of the cable and the set baud rate).

This system will use RS-232 for control of the PTZOptics cameras because RS-232 is by far the easiest and most reliable method of control when less than 100 feet of cable is needed. Using RS-232 for control of two (2) PTZOptics cameras will involve two (2) different cables. The first cable is for connecting the joystick to the first camera and the second cable is for daisy-chaining from the first camera to the second camera to achieve control of both cameras. It is worth noting that, when using RS-485, you can run a separate cable to each camera directly from the joystick for multi-camera control.

Camera Locations and Installation

Now, we need to examine the mounting options for the PTZOptics camera. If you would like to use the PTZOptics camera on a camera tripod, they feature a standard 1/4 -20 threaded insert on the bottom of the camera. If a more permanent solution is needed, you can mount the PTZOptics cameras to the ceiling using our ceiling mount (*PT-CM-1-BK*) or to the wall using our wall mount (*HCM-1-BK* or *HCM-1-WH*). As mentioned earlier, the PTZOptics 12X camera has a wider field of view so it is better suited for wider shots, such as an audience or multiple presenters. A PTZOptics 20X has a narrower field of view, so it would be better suited for tight shots, such as that of a presenter at a podium or individuals on a stage.

Let's put the field of view information into some real-world examples...

When the PTZOptics 12X camera is placed 40' away from its subject, it will provide a view approximately 57' wide when completely zoomed out and covering only a 4.9' wide when completely zoomed in.

The PTZOptics 20x camera from the same 40' distance will cover a 48' wide area when zoomed out and will cover a 2.8' wide area when zoomed in.

Based on these viewing areas, you can see why using the PTZOptics 20X for the presenter / on-stage talent and using the PTZOptics 12X for capturing the crowd, choir or another complex scene is an ideal setup.

Now we need to examine running signal cables back to our Producer PC. The SDI models of the cameras will make working in any larger venue a non-issue as you can make extremely long SDI cable runs without any noticeable loss of quality or reliability. At the PC side of this system we will use high quality SDI frame grabbers made by Magewell. These will allow you to take that SDI signal and convert it to USB 3.0 for use on your Producer PC in high quality.



Some people might ask at this point why we wouldn't recommend use of our USB models instead. It is solely a matter of USB 3.0 extension being extremely difficult and ultimately unreliable at the distances needed by a typical large venue installation. This recommended solution, with SDI cameras and frame grabbers will end up being very similar in cost to the USB cameras with USB 3.0 extension solutions but will prove to be far more reliable.

Now to get the video into your Producer PC, you will need to run 3G-SDI cables from each camera location to the Producer PC. 3G-SDI cabling has maximum length limitations ranging from 81' – 393' (depending on the quality of the cable used). The PTZOptics Producer kit includes 3G-SDI cabling at 100' lengths and the same for the add-on camera packages. Once the 3G-SDI cable(s) have been routed to the Producer PC, a SDI frame grabber, per camera, will be required to convert the 3G-SDI signal(s) into USB 3.0 signal(s).

The “Producer PC” – Hardware

We’ve talked about a lot of the pieces that will attach to your Producer PC; however, we have yet to discuss the capabilities that your Producer PC will require to handle pulling in two (2) live video streams in addition to recording or streaming back out to Facebook, YouTube or another CDN. Two (2) HD (1080P@60) feeds, as well as audio and any other processing that needs to happen on the computer will require a powerful PC.

The Producer PC – Software

Now that we have examined the hardware required for a high quality and reliable show, we'll consider what software you will need on the Producer PC.

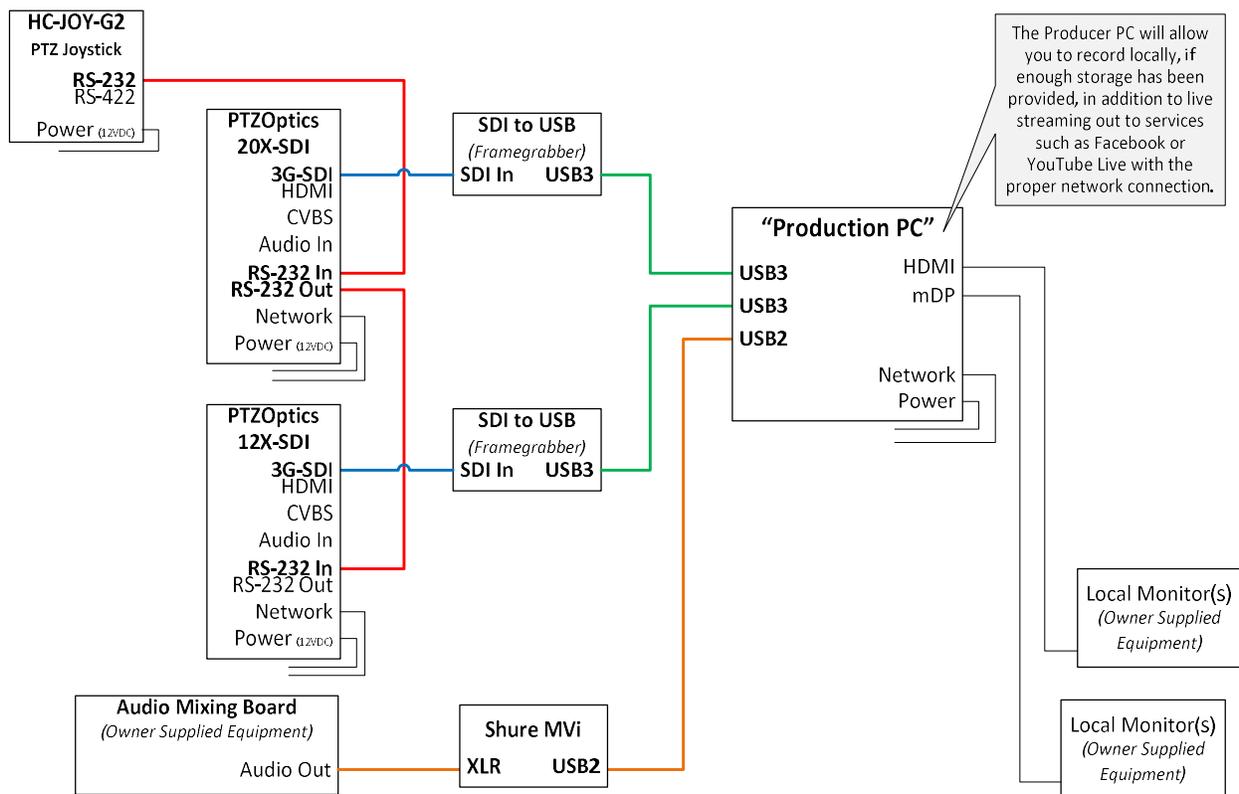
VMix is a high quality and affordable option for professional video production with their "HD Edition" coming in at only \$350. The "HD Edition" is the minimum of what would be *recommended* for a modern-day production, as it allows for HD resolutions in addition to multiple video / audio inputs. The more affordable options have a maximum resolution of 768 x 576 for content, which is not enough for a modern HD presentation that we have all come to expect. For alternatives to VMix, please research the following software options: Wirecast, X-Split or Open Broadcaster Software (OBS) which are also excellent options.

Integrating Existing Audio

So far we've examined the cameras, signal cabling, control (with its associated cabling) and finally the hardware and software necessary for a reliable and high quality production system - but we have yet to discuss audio. At the start of this article we mentioned an assumption that the venue already has some form of an audio system in place - with great likelihood the audio system will be an audio mixing board. Most audio boards / mixers will be able to accommodate a single audio output that will be connected to the Producer PC using the Shure MVi XLR / ¼" Input to USB 2.0.

Full Systems Review – Wiring Diagram

Using the wiring diagram provided below, let's look at how these parts connect to each other. Of note is the fact that we have not yet shown power or network, if you would like to setup for redundancy, directly plugging into outlets or network switches, which will be required for a successful system.



This may be a bit hard to read if you are not used to looking at wiring diagrams, so let's try to break it down piece by piece.

We're looking at two (2) PTZOptics cameras, each with the connections populated as follows: 3G-SDI, Network, RS-232 Control, and last but certainly not least, is Power.

The joystick controller (HC-JOY-G2) is connected to the first camera using a DB9 cable and then the first camera is connected to the second camera using a "VISCA cascade" cable.

The SDI signal out of each camera runs back to its own Magewell SDI to USB 3.0 frame grabber, present at the Producer PC, with the USB 3.0 connected directly to the Producer PC **without** the use of USB hubs or extension cables. USB Hubs and extension cables can reduce performance and reliability of the system.

The audio content from the audio mixing board is acquired from a spare output on the board and then is connected to the Producer PC via the Shure MVi XLR / ¼" Input with a final connection to the PC using USB 2.0