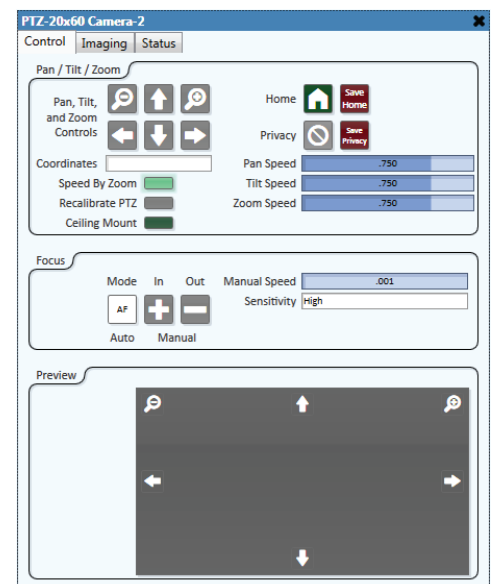




Application Guide

Q-SYS AV-to-USB Bridging Solutions Part 2: PTZ-IP camera and Q-SYS



THE Q-SYS™ PLATFORM'S INTEGRATED AV BRIDGING SOLUTIONS NOW INCLUDE CAMERAS.

Q-SYS networks can now support high-quality video streams using integrated QSC accessories that include the I/O-USB Bridge and the two PTZ IP conference camera models. This application guide will discuss the cameras in particular.

1. THE CAMERAS

The two camera models differ only in their optics—i.e., their lens and shroud, which affect the optical zoom and therefore the angle of view. They integrate with the Q-SYS Platform and Q-SYS bridging peripheral devices and have motorized pan and tilt—thanks to a two-axis gimbal system—and motorized zoom. The cameras connect directly to the Q-SYS network and can operate in unicast or multicast.



PTZ-12x72 (left)

This model features a 12× zoom range, with a maximum horizontal angle of view of 72.6 degrees.

PTZ-20x60 (right)

This model features a 20× zoom range, with a maximum horizontal angle of view of 60.7 degrees.

Both models have identical structure and connectivity. They produce video streams that can be received by a Q-SYS AV bridging device: the I/O-USB Bridge and the Core 110f.

2. INSTALLATION

The PTZ-IP cameras have several mounting options: flat horizontal surface (for example, a table), wall mount, or ceiling mount. Choose your mounting method.

Use either an external 12-volt DC power supply or a Power over Ethernet (PoE) switch or supply, or both for redundancy.

Using a standard Cat 5e or better cable, connect the camera to the network. You may also connect an external video display to the camera's HDMI or 3G-SDI outputs.

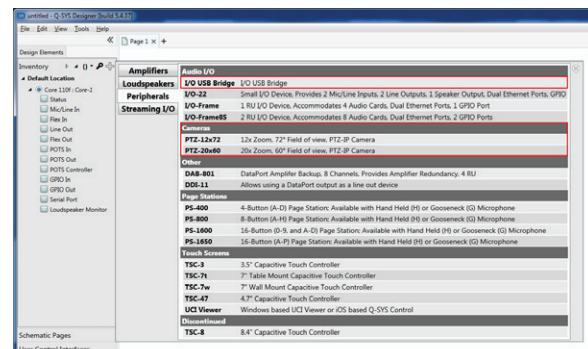
Adding the camera to the Q-SYS design

You must add any camera or cameras to the Q-SYS design and configure it or them in Q-SYS Designer. If you are familiar with adding devices to a Q-SYS design, you already know the basic procedure.

First, click the + symbol in the Inventory pane.

Select **Peripherals**. The two camera models are listed here, as is the I/O-USB Bridge (which will also be necessary in the design in order to view what the camera sees). Select the appropriate model; an instance of it will then appear in the Inventory pane.

Repeat this for any other cameras or I/O-USB Bridge devices to be added to the design.



Q-SYS Configurator and the camera web server

In its summary of discovered network devices, Q-SYS Configurator will display a list of PTZ-IP cameras in a section appropriately called **Cameras**. Unlike how Q-SYS discovers other devices on the network, the cameras are discovered using Web Services Directory.

Each camera has an internal web server that allows it to be accessed and configured through a web browser. The web server's default username is `admin`, with a null password. Q-SYS Configurator accesses the camera through its web page, and the configuration options are the same through either Q-SYS Configurator or the web page directly.

Camera properties

While the design is not running, when you click on a camera a table of its properties appears in the Properties pane (shown at right, from Q-SYS Designer 5.4.45; later versions may look somewhat different), to the right of the schematic in the Q-SYS Designer window. Here you can change the model number, if necessary.

This also is where to set the camera for unicast or multicast IP streaming.

Unicast Only—This is point-to-point streaming from camera to bridging device. It is the most secure method, but if there are more than two bridging devices that a camera can stream to, Q-SYS Designer will produce an error message when the design is compiled.

Compiler Choice—This setting lets Q-SYS Designer set the camera for either unicast or multicast when it compiles the design. It makes the selection depending on how many bridging devices can access the camera.

Multicast Only—With this setting the camera will produce a multicast RTP stream using RTSP. As many as 50 bridging devices can access each stream simultaneously. Software application such as VLC can also access the streams. Each stream has its own URL, which can be found in the Status tab of the camera's control panel in Q-SYS Designer. The URLs follow the format `rtsp://<camera_ip_address>/multicast1` and `rtsp://<camera_ip_address>/multicast2`

NOTE: Multicast streaming requires that the network switches be configured to support IGMPv2.

After the devices are placed in the design and configured, open **Q-SYS Administrator**. Select **Cameras**. This is where you set the resolutions, frame rate, and first multicast address for *all* the cameras in the design.

Camera Resolutions

1. **IP Stream 1 Resolution**—In this field, set the resolution of IP Stream 1; this value will be for all cameras in the design. The available values are **1920×1080** (i.e., 1080p or the default setting), **1280×720**, **1024×576**, and **None**.
2. **IP Stream 2 Resolution**—Set the resolution of IP Stream 2 for all the cameras in the design. Values are **640×360** (i.e., the default setting), **480×270**, **320×180**, and **None**.
3. **Frame Rate**—Set the frame rate of the cameras in the network. The IP stream's frame rate will be one half this rate. For example, if the cameras' frame rate is 60 fps, the IP stream will be 30 fps.

Camera Network

Radio buttons offer you the choice of setting up multicast mode automatically or manually. In Auto, Q-SYS Designer automatically assigns and keeps track of multicast IP addresses.

First Multicast Address—If you have manual multicast mode setup selected and one or more cameras is to be multicast, this is where to specify the start of the multicast address range for them. Q-SYS Administrator will assign two addresses for each multicasting camera—one for each IP stream (even if **None** is selected for a resolution).

After you type in the address, click elsewhere on the Q-SYS Designer window. A red banner that says **Settings have changed** will appear at the top. Click **Update**.

After updating the settings, Q-SYS Administrator will display the range of multicast IP addresses it has assigned to the cameras

Properties	
Camera Properties	
Name	Camera-1
Location	Default Location ▼
Is Required	Yes ▼
Model	PTZ-12x72 ▼
IP Streaming	Unicast Only ▼

Camera Settings

Camera Resolutions

IP Stream 1 Resolution: 1920x1080

IP Stream 2 Resolution: 640x360

Frame Rate: 60Hz

Note: All audio and video bridges in the design will restart when changing camera resolution or frame rates.

Camera Network

Multicast Mode: ☒ Auto ☐ Manual

First Multicast Address: 224.1.7.1

Using multicast addresses 224.1.7.1 through 224.1.7.4

Camera Media

Privacy Image

Click image to change

Clear

Offline Image

Click image to change

Clear

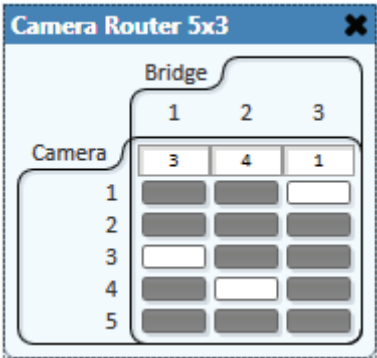
(indicated by the red box, in the diagram on the preceding page). Ensure that this range of multicast addresses used is unique and that none of them are used on the network by any other devices. Video will not stream correctly if the multicast addresses are not unique.

Camera Media

You can set the privacy and offline images here. To set an image, click on it. Then select the JPEG or PNG file to insert as the new image. To clear an image and revert to the factory default, click **Clear**.



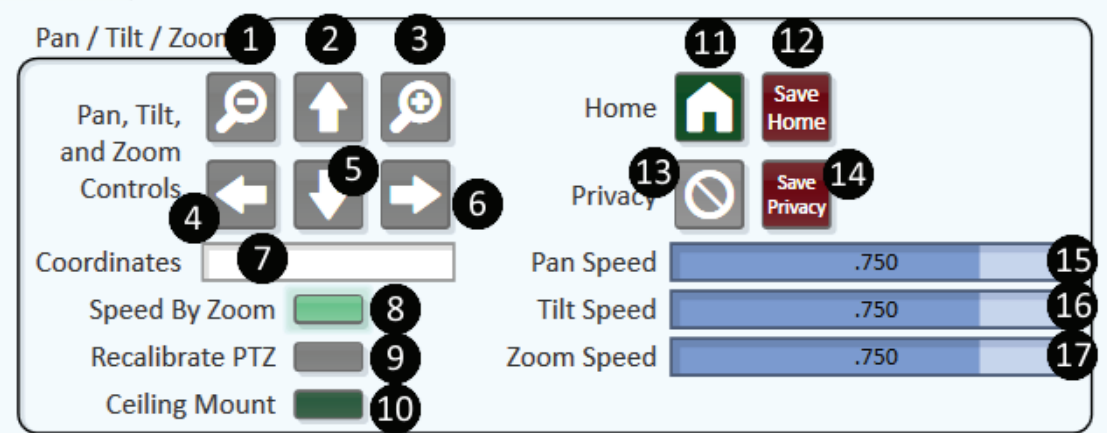
Properties	
Camera Router Properties	
Camera Count	5
Bridge Count	3
Image Buttons	Yes ▼
External Prefix	
External Prefix Mode	Native ▼



The Camera Router

In the **Schematic Elements** pane of Q-SYS Designer is a folder called **Video Components**. The **Camera Router** component lies in this folder. To place a camera router in the design, drag it from Schematic Elements onto the schematic.

This component is a matrix-type router that allows multiple cameras and multiple bridges to connect to the inputs and outputs, respectively. In **Camera Router Properties**, enter the number of inputs at **Camera Count** and the number of outputs at **Bridge Count**. When **Image Buttons** is set to Yes, the camera selection buttons will be filled with still preview images from their respective cameras. The previews will update once per second.

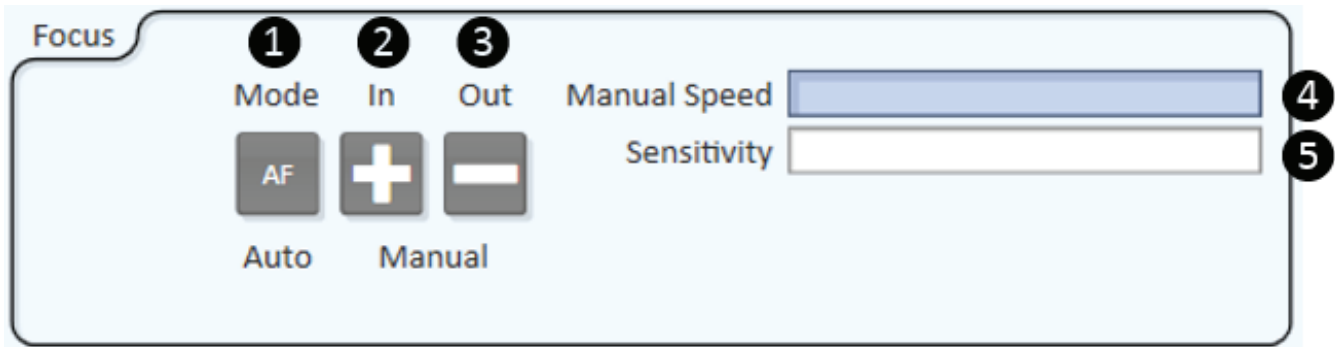


4. CAMERA CONTROLS

The control panel opens when you double click on a camera in the schematic. As with other Q-SYS control elements, they can be copied, pasted, moved, stretched, squeezed, etc., to form custom control panels and user control interfaces (UCIs). The panel has three tabs: Control, Imaging, and Status. The vast majority of the default camera settings will be suitable for most camera applications.

Control tab: Pan / Tilt / Zoom

1. **Zoom Out**—Zoom the camera's angle of view from narrow to wide, giving a wider shot.
2. **Tilt Up**—Shift the camera's view upward.
3. **Zoom In**—Zoom the camera's angle of view from wide to narrow, giving a tighter shot.
4. **Pan Left**—Shift the camera's view to the left.
5. **Tilt Down**—Shift the camera's view downward.
6. **Pan Right**—Shift the camera's view to the right.
7. **Coordinates**—Enter the positional coordinates for the PTZ (pan, tilt and zoom) stepper motors. You can drag this box into a Q-SYS Snapshot to create preset camera positions.
8. **Speed by Zoom**—When selected, the speed of the camera's motor movements is related to its zoom position. The camera movement slows for tighter shots and speeds up for wider ones. This allows finer precision and control in camera positioning.
9. **Recalibrate PTZ**—Recalibrates the camera's PTZ stepper motor coordinates and then returns the camera to home position.
10. **Ceiling Mount**—Selecting this button inverts the camera's image and positioning coordinates, making it suitable for ceiling mounting.
11. **Load Home**—Returns the camera to the home position. Use the **Save Home** button to define the home position.
12. **Save Home**—Saves the current camera position (the PTZ coordinates) as the home position. This is typically configured as the camera's default camera position for the room.
13. **Save Privacy**—Sets the present camera position as the preset privacy position.
14. **Privacy Mode**—When privacy mode is selected, the camera will move to its privacy position and all bridging devices and preview images will display the camera's privacy screen (which can be a custom graphic). When privacy mode is deselected, the camera will return to its most recent position and resume streaming video. If the camera is in privacy mode and a Q-SYS snapshot that involves the camera is recalled, it will exit privacy mode and move to the position recalled in the snapshot.
15. **Pan Speed**—Adjusts the speed of the camera's manual pan motion, but not the transitions between snapshots, home, or privacy positions.
16. **Tilt Speed**—Adjusts the speed of the camera's manual tilt motion, but not the transitions between snapshots, home, or privacy positions.
17. **Zoom Speed**—Adjusts the speed of the camera's manual zoom motion, but not the transitions between snapshots, home, or privacy positions.



Control tab: Focus

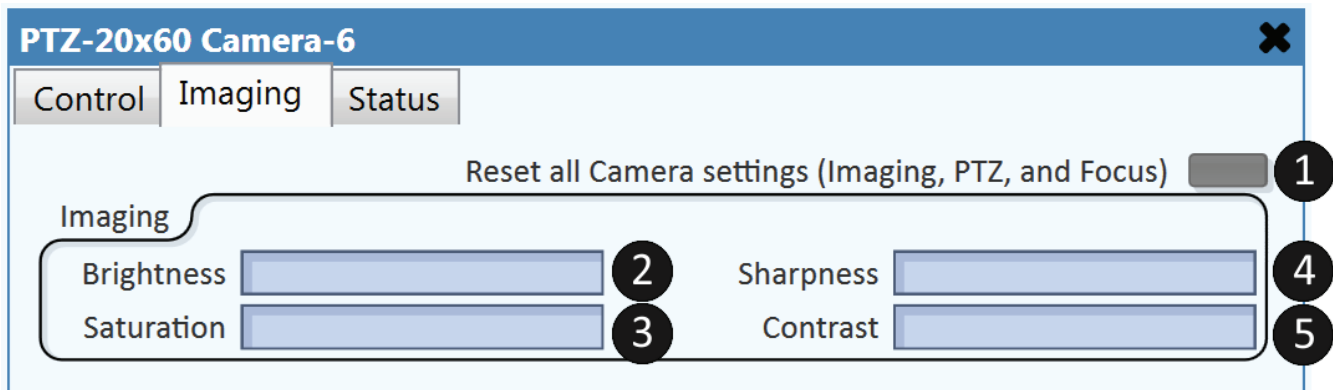
1. **Mode**—Toggles the focus mode between manual and automatic.
2. **In**—Changes to manual focus mode and shifts the point of focus further from the camera.
3. **Out**—Changes to manual focus mode and shifts the point of focus nearer to the camera.
4. **Manual Speed**—Adjusts the speed at which the focus changes using the manual Focus In and Focus Out buttons. It does not affect auto-focus.
5. **Sensitivity**—Controls how aggressively the auto-focus algorithm keeps the camera in focus. Too low a setting can cause a somewhat blurry image; too high can cause the focus to hunt, or vary about the point of optimum focus. It does not affect manual focus.



Control tab: Preview

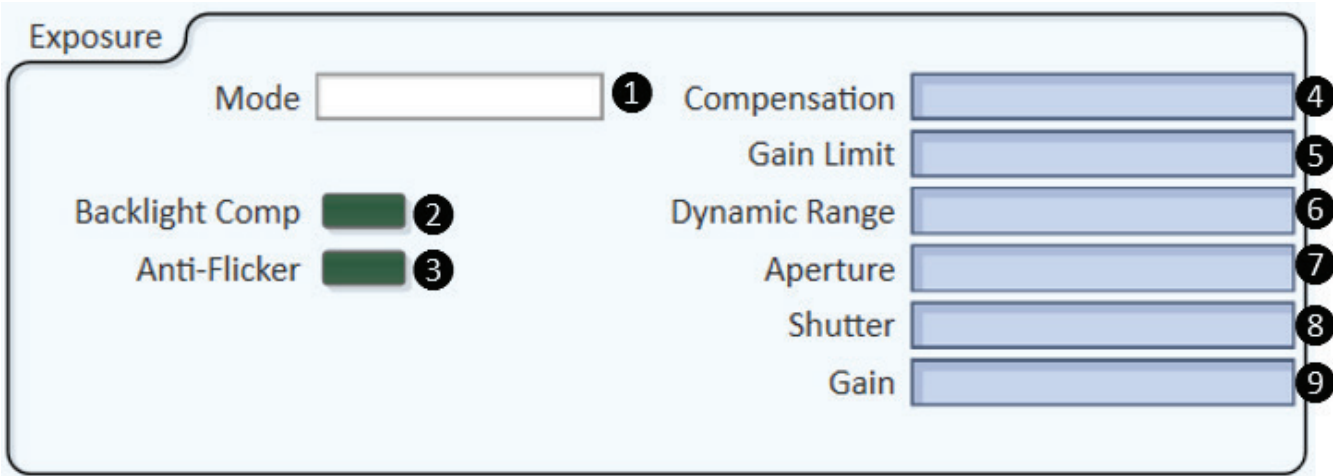
This tab displays a still JPEG preview image of what the camera sees, and it updates once per second. The preview panel also features a full set of camera pan, tilt, and zoom controls, and it can be dragged into a UCI to create a camera control interface.

1. **Zoom Out**—Zoom the camera's angle of view from narrow to wide, giving a wider shot.
2. **Pan Left**—Shift the camera's view to the left.
3. **Tilt Up**—Shift the camera's view upward.
4. **Tilt Down**—Shift the camera's view downward.
5. **Zoom In**—Zoom the camera's angle of view from wide to narrow, giving a tighter shot.
6. **Pan Right**—Shift the camera's view to the right.



Imaging tab: Imaging

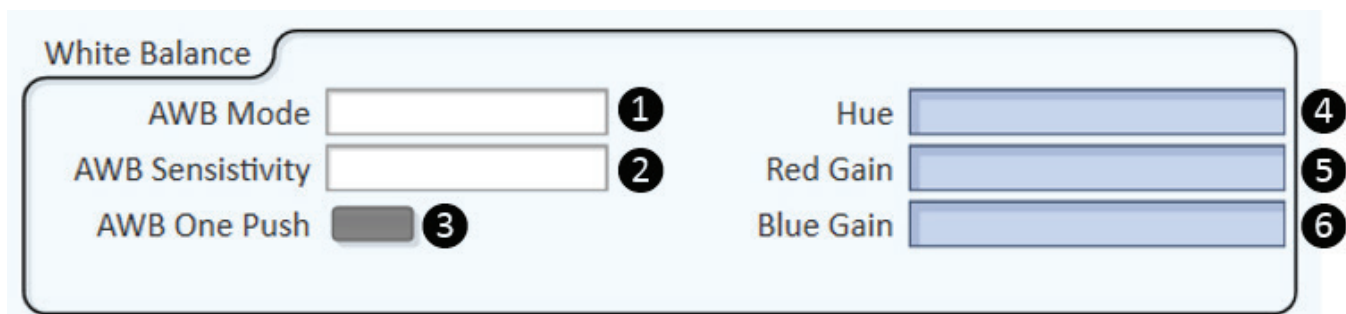
1. **Reset all Camera settings on the Control and Imaging tabs**—If adjusting the various camera parameters fails to produce the desired picture quality and you seem irreversibly lost in the process, all you need to do is click this button and all the settings on the Camera and Imaging tabs will revert to their factory default values and settings, and all manual modes will change to automatic.
2. **Brightness**—Adjusts the general intensity of light in the image while maintaining the black level as a fixed reference point.
3. **Saturation**—Adjusts the amount of color (chroma) in the image. Reducing the setting will dull or mute the colors. Increasing it will make colors more vivid and pronounced.
4. **Contrast**—Adjusts the ratio of light to dark in the image. It inversely affects the white level and the black level simultaneously.
5. **Sharpness**—Adjusts the emphasis on boundaries between different tones or colors. Increasing the setting will define the boundaries more highly, and decreasing it will dull them.



Imaging tab: Exposure controls

1. **Mode**—Select manual or auto exposure. Auto disables all the manually adjustable parameters; manual disables the auto-exposure adjustments.
2. **Backlight Comp**—Backlight compensation may be useful in viewing a dark subject against a bright background. Using it in normal lighting will tend to cause gross overexposure.
3. **Anti-Flicker**—Increases the camera shutter time to reduce the flicker effect of the frame rate beating against the frequency of an AC lighting source. Turn Anti-Flicker off when there is very bright lighting to avoid washing out the image.
4. **Compensation**—Adjusts the brightness of the camera's auto-exposure response.
5. **Gain Limit**—Imposes a limit on the sensor gain. If the gain limit is too high, the image may be noisy and grainy in low light. If it is too low, the camera might not adjust well to low light.

6. **Dynamic Range**—Adjusts the range of the lightest and darkest picture elements the camera can successfully capture. Too much dynamic range can cause blurring and loss of detail, while too little may destroy contrast and separation of color between light and dark picture elements.
7. **Aperture**—Controls the iris in the camera lens. This is a mechanical means of adjusting exposure. A wide aperture lets in more light but decreases the depth of field in the image, while a narrow aperture decreases light but increases the depth of field.
8. **Shutter**—Controls the camera's exposure time. Longer exposure brightens the image, while shorter exposure darkens it.
9. **Gain**—Controls gain on the image sensor's output. Too much gain tends to cause noisy, grainy video images.



Imaging tab: White Balance

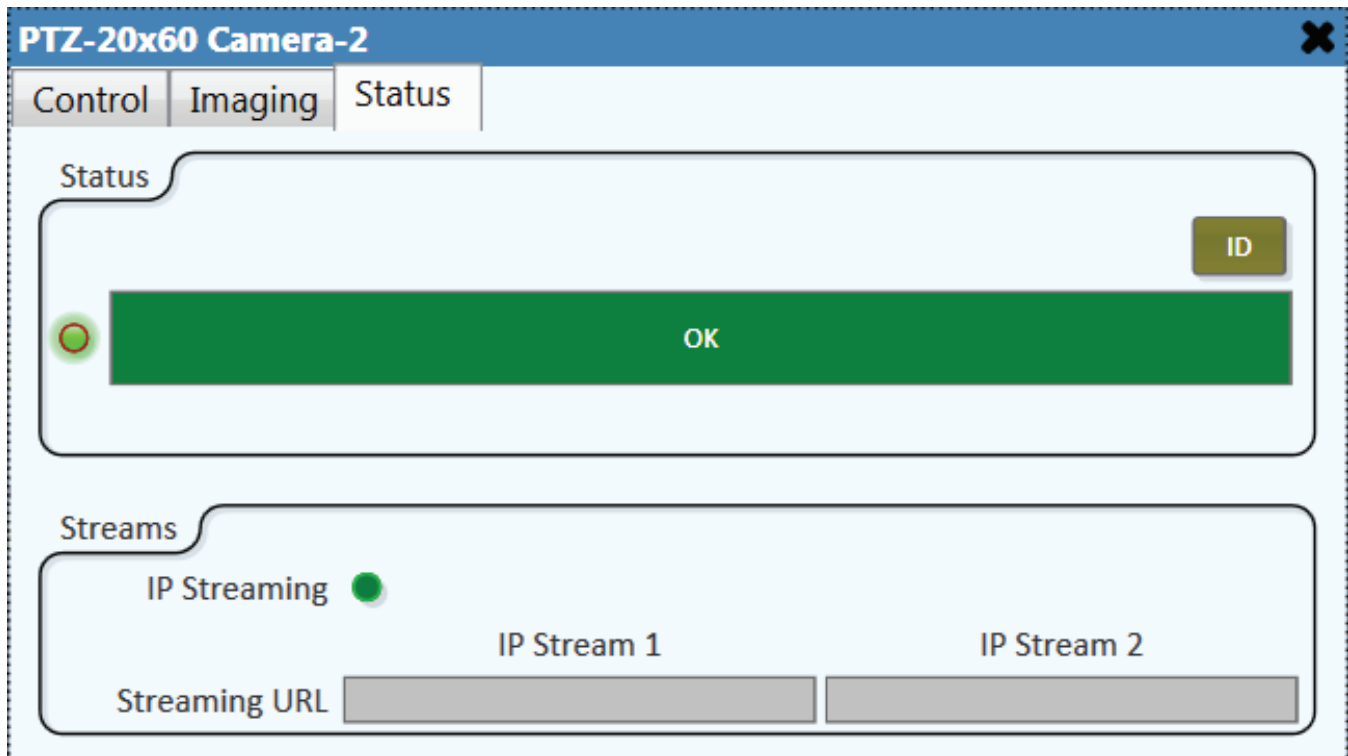
1. **AWB Mode**—Select the type of white balance: Auto, Manual, Indoor/3000K, Outdoor/5000K, or One Push.
 - **Auto**—Fully automatic white balance (AWB).
 - **Manual**—Fully manual white balance.
 - **Indoor/3000K**—A preset for lighting with a color temperature of around 3000 degrees Kelvin (typical indoor residential scenes).
 - **Outdoor/5000K**—A preset for lighting with a color temperature of around 5000 degrees Kelvin (typical lightly overcast sunlit day).
 - **One Push**—One-time automatic white balance calculation triggered by pressing the AWB One Push button. The camera holds the white balance setting until the next time the button is pressed. Pressing the AWB One Push button also puts the camera into the One Push mode.
2. **AWB Sensitivity**—Select Low, Medium, or High sensitivity. This adjusts the threshold that triggers the automatic recalculation of the white balance. With high sensitivity, the white balance recalculates often. With low sensitivity the recalculations will be less frequent.
3. **AWB One Push**—Triggers the One Push AWB (See One Push above).
4. **Hue**—Allows the user to balance the camera's colors manually.
5. **Red Gain**—Manually adjusts the level of red in the image (as in analog video, green is the non-adjustable reference).
6. **Blue Gain**—Manually adjusts the level of blue in the image (as in analog video, green is the non-adjustable reference).

Imaging tab: Noise Reduction

1. **2D NR Mode**—Select the type of 2D (i.e., spatial) noise reduction: Off, Auto, or Manual. Auto lets the camera determine the amount of noise reduction. Manual enables the 2D NR control.
2. **3D NR Enable**—Engages 3D (temporal) noise reduction and enables the 3D NR control. A higher setting will remove more 3D temporal noise, but too much 3D NR may cause ghosting artifacts behind moving items in the image.
3. **Hot Pixel Enable**—Engages compensation for bad pixels in the image sensor and enables the Hot Pixel control. With a higher setting the camera will compensate for more consecutive bad pixels, but if the setting is too high the camera may suppress legitimate details in the image.
4. **2D NR**—Adjusts the amount of 2D (spatial) noise reduction—i.e., softening or blurring—the camera will perform on the image. The control is enabled only when the 2D NR Mode is set to Manual.
5. **3D NR**—Adjusts the amount of 3D (temporal) noise reduction the camera performs on the image. The control is enabled only when 3D NR Mode is engaged.
6. **Hot Pixel**—Adjusts the amount of hot pixel compensation—i.e., how many consecutive bad pixels it will filter out—the camera will perform on the image. The control is enabled only when Hot Pixel Enable is engaged.

Imaging tab: Video Formats

1. **IP Stream 1 Quality**—Select from **Good**, **Better**, or **Best** constant bit rate streams.
 - Best: 40 Mbps IP stream
 - Better: 35 Mbps IP stream
 - Good: 20 Mbps IP stream
2. **IP Stream 2 Quality**—Select from **Good**, **Better**, or **Best** constrained bit rate streams.
 - Best: 5 Mbps IP stream
 - Better: 3 Mbps IP stream
 - Good: 1 Mbps IP stream
3. **Apply and Reboot**—Applies any setting changes and reboots the camera to implement them.
4. **SDI/HDMI Enable**—Turns on the SDI and HDMI outputs.
5. **SDI/HDMI Format**—Select the video format. Use Q-SYS Administrator to set the frame rate. **NOTE:** IP stream formats and frame rates are configured in Q-SYS Administrator and apply to all the cameras in the design.



Status tab: Status

Status—Performs same function as the Status button/indicators on other Q-SYS devices do.

IP Streaming LED—Indicates that the camera is streaming video over the Q-SYS network, just as the green LED on the camera base does.

Streaming URLs—If the camera is producing multicast video streams, the URLs of the RTSP streams will appear in these boxes. If the camera is producing a unicast stream, these boxes for security reasons will display only the camera's IP address and the word "Unicast."

5. CAMERA CONTROL IN Q-SYS

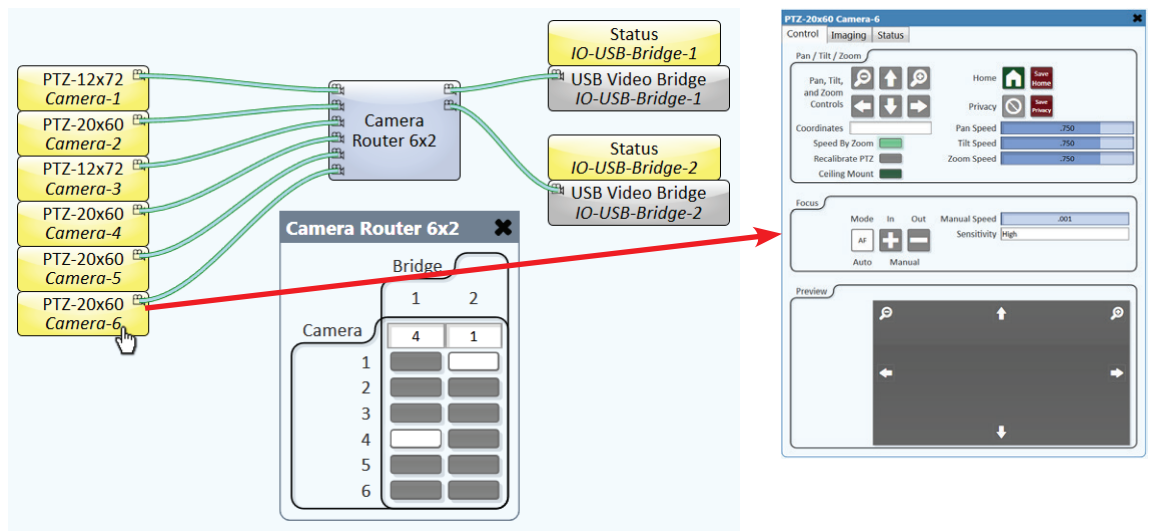
In a Q-SYS design you can exercise control of a camera in two ways:

- Control of a specific camera.
- Control of whatever camera is actively streaming to a bridge device.

Control of a specific camera

Double click on a camera to open its control panel. The control panel is for that camera only, regardless of where or to what bridge it streams.

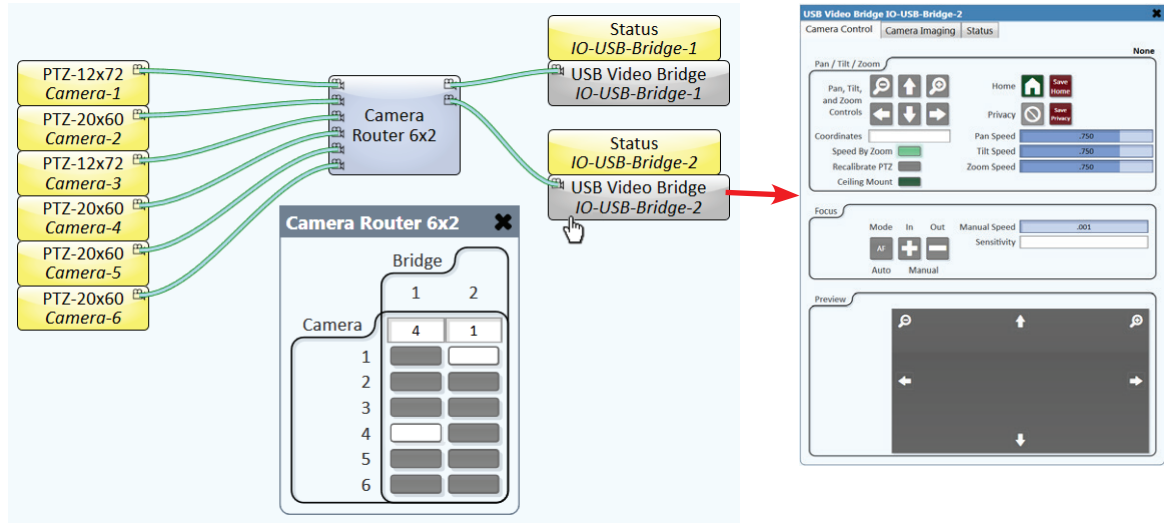
The design in this example contains six cameras. To open the control panel of one particular camera, double click on the camera. This example shows camera #6 being selected. When it is double clicked, its control panel opens. The camera router control panel shows that this camera's images are not going anywhere, but that does not preclude controlling it.



Control of a bridge device's active camera

Similar to double clicking on a camera in the design, you can also open a camera's control panel by double-clicking on the desired USB Video Bridge. This example shows the video bridge of IO-USB Bridge-2 being selected. Double clicking the video bridge opens the control panel of the camera that is actively streaming to it, either by direct connection or through a camera router. The camera router in the example shows that camera #1 is selected for that bridge;

therefore, the camera control panel associated with that bridge is that of camera #1. The bridge device cannot be switched to another camera through its own control panel; it would have to be done through the camera router. Note also that the control panel does not identify the camera.



Camera controls in custom control panels and user control interfaces (UCIs)

As with other Q-SYS control elements, the control elements of these control panels can be placed into custom control panels as well as UCIs created for Q-SYS touchscreen panels. If you wish to use controls associated with a particular camera, use elements from the camera's control panel.

If you use camera control elements from a bridge device control panel, they will only control the camera that is actively streaming to it. If you need to add camera selection to the control panel or UCI, simply add buttons from the camera router to the control panel or UCI.



(800) 854-4079 or (714) 957-7100
Outside the U.S. +1 (714) 754-6175
Fax: +1 (714) 754-6174

QSC, LLC
1675 MacArthur Boulevard
Costa Mesa, CA 92626 USA