

Main Macro Instructions

Cisco Boardroom Multi-Aux Version 1.0.17

For multi-camera solutions, up to four local cameras and 4 auxiliary codecs with 1 QuadCam each.

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Main Concepts

- Compositions object: config
- PTZ Microphone Zones – Z1 / Z2 / etc

config is the main object where you define the various “compositions” which determine what camera and video input combinations to show when a particular set of microphones are activated.

PTZ Microphone Zones are used only for PTZ Cameras, if you have any.

Legal camera combinations

One to five Quad Cameras (or none at all). For each QuadCam beyond the one connected directly to the Codec Pro, an auxiliary codec (i.e. Codec Plus) is needed to accept that QuadCam and communicate with the main macro to be controlled by it.

One or more PTZ cameras

The total cannot exceed five cameras, because the Primary Codec has only six video inputs, and you must reserve at least one for content.

There must be at least two cameras that depend on microphones to activate them.

Camera combinations that don't require this solution!

One Quad Camera by itself

One Quad Camera and one PresenterTrack camera

One SpeakerTrack 60 by itself

One SpeakerTrack 60 and one PresenterTrack camera

Why are these listed as not requiring this solution? Because you don't need any type of macros for these installations, which means you don't need this document or anything you downloaded along with it. *They are standard, out-of-the-box, TAC-supported installations.*

The program in this solution provides automation – when a person is speaking, the appropriate camera is automatically engaged. This is done by monitoring the microphone inputs on the Codec Pro to determine which input has a person that is actively speaking.

When a microphone is active, it will trigger a change in the Main Video Input on the Codec Pro. If you are using one or two Quad Cameras, it will select one of them, and the Quad Camera will automatically zoom in on the person speaking. If you are using one or two PTZ cameras (PTZ 4K or Precision 60), it will trigger a camera preset for one of the cameras.

If you are using two PTZ cameras, you can have a primary preset (using one camera) and a backup preset (using the other camera) so that remote participants never see one camera moving from one preset to another. Instead, the available PTZ camera will always be used, so the far end sees a clean cut.

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For any installation that has two or more Quad Cameras, the design mandates the use of a Primary Codec Pro and an Auxiliary Codecs that are capable of having QuadCams connected to them like the Codec Plus and Codec EQ. You can also use Room Bars as auxiliary codecs if the camera in those is sufficient for your needs.

If your installation involves more than one codec, enter the following information into Section 1 of your copy of the main_codec.js file that will be installed in the main codec:

For **AUX_CODEC_USERNAME** and **AUX_CODEC_PASSWORD** enter a valid admin username and password for inter-codec communication.

- Whenever there are two codecs, they communicate with each other using HTTP messages.
- The admin must create identical admin-level accounts on all codecs, for use by the program.
- An example is username: CameraMacro and password: CameraMacro
- It is recommended to use these accounts only for the macros to use; create separate admin account(s) for the installer and local administrators

If your installation uses only one codec (a CodecPro as the main codec), you can leave **AUX_CODEC_USERNAME** and **AUX_CODEC_PASSWORD** blank

Set **USE_ST_BG_MODE** to true if you want keep QuadCams Speaker Tracking even while not being used

If you have PTZ cameras, this is where you define the PTZ Microphone Zones for them.

A simple example – let's say you need one PTZ camera to point toward the head of the table, where the executives sit, because the Quad Camera does not zoom in enough. You have on microphone input that covers that area and you intend to use preset ID 11. So – you would specify the actual preset IDs to use in Preset Zone 1 (Z1) as a constant as seen in the example:

```
const Z1 = { 'primary': 11, 'secondary': 11 } // These are ok to change
```

Why? Because you are only defining one microphone zone, and you have only one PTZ camera. You can't have a different secondary preset if there is only one PTZ camera. Currently, the code is always also looking for the 'secondary' key so you must specify it even if it's corresponding value is the same as the 'primary'.

What? The number 11 represents the PresetID that you are using on the codec. **Don't use PresetIDs 1 thru 10**, because your users will need the ability to set camera presets from the Cisco Navigator / Touch 10 user interface. Therefore, we recommend that you start with PresetID: 11 and go up from there.

A complex example – you have two Quad Cameras (leaving you only six Microphone Zones) and you have two PTZ cameras. And – you want to set up six Microphone Zones with both a Primary and a Secondary Camera Preset so that the macro has a chance to select the preset for a camera not currently in use to point to a microphone zone. This eliminates having to send video into the call of a camera re-positioning to another part of the room.

The assignment for PTZ Zones Z1-Z6 in Section 2 of the macro would start like this:

```
const Z1 = { 'primary': 11, 'secondary': 12 } // These are ok to change
const Z2 = { 'primary': 13, 'secondary': 14 } // These are ok to change
const Z3 = { 'primary': 15, 'secondary': 16 } // These are ok to change
const Z4 = { 'primary': 17, 'secondary': 18 } // These are ok to change
const Z5 = { 'primary': 19, 'secondary': 20 } // These are ok to change
const Z6 = { 'primary': 21, 'secondary': 22 } // These are ok to change
```

Notice that presets with ID 11,13,15,17,19 and 21 correspond to one physical camera and presets with ID 12,14,16,18,20 and 22 correspond to another physical camera so each present zone has two different cameras to choose when needing to point somewhere. Naturally, presets 11 and 12 have to point to the same place of the room, same for 13 and 14, 15 and 16 and so on.

Why? You have defined six different Microphone Zones, each with a primary and a backup camera preset. Remember: these zones are only used for PTZ cameras – they are not needed for Quad Cameras.

NOTE: If you need to replace a codec that was already configured with this macro and wish to preserve the Camera presets, consider using this macro to make a backup of the presets for later restoring:

<https://github.com/wxsd-sales/camera-presets-backup-restore-macros>

The config constant object contains general microphones and video sources and, alternatively, presetZones for both main and auxiliary codecs:

- '**monitorMics**' this is where you identify the physical analog microphone inputs on the main codec that you want to monitor. Any analog microphone input that is used to automate a camera selection is listed here. You can list any microphone input numbers – just a few or all eight.

The physical microphone inputs on the Codec Pro are used to trigger camera actions automatically. If you use Cisco Table Microphones, you can have up to eight connected to the Codec Pro. If you use an audio DSP, you can have up to eight analog inputs from the DSP into the Codec Pro. Each analog line from the DSP would represent the microphones that define the up-to-eight Microphone Zones that you need.

- '**usbMics**' this is where you identify the connected USB microphone inputs on the main codec that you want to monitor. Any USB microphone input that is used to automate a camera selection is listed here. The macro supports up to 4 USB microphones. To remain compatible with the existing microphone handling routines, USB microphones 1-4 should be specified using the range 101-104. This way, to monitor just one USB microphone connected to the codec, you would specify the value [101] for this constant.

- '**ethernetMics**' this is where you identify the ethernet microphone inputs on the main codec that you want to monitor. Any Ethernet microphone input that is used to automate a camera selection is listed here. The macro supports up to 8 ethernet microphones with up to eight sub-ids and to remain compatible with the existing microphone handling functions we use the ranges 11-18, 21-28 and so forth until 81-88 where the first digit is the main Ethernet mic ID and the second digit is the subId. That way, to specify ethernet microphone 1 and it's first 4 subIDs (this is what you would see if you only have one Cisco Microphone Pro connected to a codec) you would use [11,12,13,14] for this value.

- '**externalMics**' this refers to externally connected microphones where a controller sends the codec text messages over SSH or serial interface indicating which of those external microphones is currently active. The text message should be sent by the controller in the format "MIC_ACTIVE_XX" where XX is a distinct "microphone" id from 01 to 99. We are reserving 00 to indicate that there is relative silence in the room or that mute is active. Even though the receiving of unformatted "MIC_ACTIVE_XX" type strings is supported, for better logging it is strongly recommended that the controller sends the message wrapped as an object as shown in the following examples.

sending the MIC_ACTIVE_01 message via serial:

xCommand Message Send Text:

```
"{\x5C"App\x5C":\x5C"Creston\x5C",\x5C"Source\x5C":{\},\x5C"Type\x5C":\x5C"Command\x5C",\x5C"Value\x5C":\x5C"MIC_ACTIVE_01\x5C"}"\x0D\x0A
```

sending the MIC_ACTIVE_01 message via SSH:

xCommand Message Send Text:

```
"{\"App\":\"Creston\", \"Source\":{\}, \"Type\":\"Command\", \"Value\":\"MIC_ACTIVE_01\"}"
```

NOTE: Any combination of microphone types specified in the monitorMics, ethernetMics, usbMics and externalMics is supported by the macro, but given the differences in echo cancellation processing performed by the different microphone categories it is strongly advised to stick to only one type of microphone to use for each installation

The value for the 'compositions' key is an array of composition objects with values corresponding to the following keys:

- '**name**' The name of the composition. This is just used as an internal reference in the macro and is printing in the console logs.

- **'codeclP'** is the IPv4 IP address of the Auxiliary codec that is the source that a particular composition will use. and the 'source' field is set to CODEC_AUX. The 'connectors' array for this composition should contain the ID of the connector of the tie line coming from that auxiliary codec into the main codec.
- **'mics'** is the array of active microphones that are considered to switch to that particular composition. Use the value [0] if you are configuring an “Overview” composition with source value CODEC_NONE (see below). You can have several “Overview” type compositions but only the first 4 configured will be used to give you a selector button in the Camera Control Panel to select which one to use. If only one ‘overview’ type composition is configured, there will be no selector for these in the Camera Control Panel since only the one configured can be used by the macro.
- **'connectors'** are the video connector IDs to use in conjunction with the 'layout' value to set the main video input when any microphone in the 'mics' array is the most active.
- **'source'** should be set to CODEC_AUX if any of the video connectors in the 'connectors' array correspond to tie lines coming in from an Auxiliary codec. If not, it should be set to CODEC_MAIN unless the composition corresponds to an Overview composition where the 'mics' array is set to [0] in which case it should be set to CODEC_NONE
- **'layout'** specified the Layout to use to arrange the input connectors specified in the 'connectors' array. This can be Prominent , Equal or PIP
- **'presetZone'** is an optional field that can be used instead of the 'connectors' array to specify a preset "zone" to use for that particular composition. Preset zones are explained above. Please set the value to Z0 to indicate it is not used.

For overview compositions (those where the mics field is set to [0]) this field is “overloaded” in that you can specify a combination of connectors IDs in the connectors field and an array of Preset IDs in the PresetZone field. This indicates to the macro to first invoke all presets listed in that array of integers in the presetZone field and then compose a layout using the connector IDs in the connectors field. This way, overview compositions can contain input from PTZ cameras with specific presets associated to them.

- The **'auto_top_speakers'** constant contains the settings to configure the “Top N Speakers” feature which shows people that are speaking at the same time and are assigned to different cameras as per the microphones associated to them. To turn it on, set the **'enabled'** attribute to **'true'**. You then edit the **'default_connectors'** array to provide an ordered list of the connectors to use when showing the top N speakers and also the layout to use in the **'layout'** attribute. The **'max_speakers'** corresponds to the N value of the Top N speakers feature, so it allows you to limit the number of top speakers to show. If you have presetZones in any of the compositions that could end up being selected for the top N composition, be sure to add the connector ID where the camera associated with the primary preset of that presetZone into the **'default_connectors'** array in the right position you want it.

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- This macro requires preset 30 to be present to be able to set the overview shots. If you do not manually create it as per instructions in Appendix A and you have a Quadcam, the macro will create a default preset 30 as a fully zoomed out view of that QuadCam. But you can specify the values for Pan, tilt and zoom for that macro in this section and define if the macro actually always re-creates the preset irrespective if already there by setting ALWAYS_CREATE_OV_PRESET to **true**.

If you leave OV_PRESET_PAN, OV_PRESET_TILT or OV_PRESET_ZOOM set to **0** the macro will just create the default zoomed out overview shot if needed.

Irrespective of you set the ALWAYS_CREATE_OV_PRESET constant in this section, you might want to copy the parameters of that preset if you manually created it or adjusted it in the command line into OV_PRESET_PAN, OV_PRESET_TILT and OV_PRESET_ZOOM here in case you lose the preset with an upgrade or reset or if someone manually removes it.

You can obtain the current values of that preset from the command line of the codec by issuing this command:

```
xCommand Camera Preset Show PresetId: 30
```

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```

MAIN_CODEC_QUADCAM_SOURCE_ID – Some functions of the macro rely on knowing if a QuadCam is configured on the main CodecPro. Please specify the SourceID where the QuadCam is connected or 0 if not is being used.

In RoomOS 11 there are multiple SpeakerTrack default behaviors to choose from on the navigator or Touch10 device. Set **ST_DEFAULT_BEHAVIOR** to the one you want this macro to use from these choices:

Auto: The same as BestOverview.

BestOverview: The default framing mode is Best overview.

Closeup: The default framing mode is Closeup (speaker tracking).

Current: The framing mode is kept unchanged when leaving a call.

Frames: The default framing mode is Frames.

REMOVE_EMPTY_SEGMENTS – When the macro is being used in a “Compass” room configuration where there are 4 QuadCams or RoomBars in a center island pointing in 4 different directions to cover tables that are arranged around the camera array, it is useful to remove empty segments of the table when showing an overview of the room so that the segments where there are people show bigger. To enable this functionality, set the REMOVE_EMPTY_SEGMENTS constant to true or false correspondingly.

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```

Timers and Thresholds

‘SIDE_BY_SIDE_TIME’ allows you to change the amount of time before the OVERVIEW shot is used when nobody is speaking. The default is 10 seconds, but this can be changed.

'NEW_SPEAKER_TIME' is the amount of time to wait before switching to another speaker. Two seconds works well.

'INITIAL_CALL_TIME' is the amount of time that the OVERVIEW shot is used at the beginning of a call.

'VIDEO_SOURCE_SWITCH_WAIT_TIME' is the amount of time that the codec will wait for the new camera to arrive at its preset before switching to it. It allows the camera to pan / tilt / zoom without being seen by remote participants. You should experiment with this value during commissioning.

‘MICROPHONELOW’ and **‘MICROPHONEHIGH’** are the minimum and maximum microphone level thresholds. The default values usually work well, but this should be experimented with during commissioning. The way it works is this:

- If a single microphone has an average value above the MICROPHONEHIGH threshold for two seconds, then action is taken to switch to the appropriate camera. If the camera is already there, no action is taken.
- If all of the microphones have an average value below the MICROPHONELOW threshold, then action is taken to switch to the OVERVIEW shot. If the camera is already there, then no action is taken.
- If the loudest microphone is between the LOW and HIGH thresholds, then there is not enough information, and no change happens from the previous time interval.

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PresenterTrack Q&A Mode

ALLOW_PRESENTER_QA_MODE – Set this constant to true to allow users to turn on the Q&A mode when using the custom panel to turn on/off PresenterTrack. When in Presenter Track mode with Q&A mode enabled, the macro will take care of keeping the focus on the presenter and if a question comes in from the audience it will compose the image of the presenter plus the audience member while they are talking and a few seconds afterwards (controlled by the PRESENTER_QA_KEEP_COMPOSITION_TIME configurable constant in the macro) it will focus back only on the presenter; this behavior is similar to the native "Classroom Mode" which is not compatible with this macro. If you select PresenterTrack without the Q&A mode option, the macro will make sure the presenter is always the one being shown in the call irrespective if anyone else in the room is speaking until you turn off PresenterTrack either via the custom panel or using the native camera controls of the codec.

NOTE: Even though the Q&A Mode for PresenterTrack should also work for compositions that include PTZ Zones, this has not been tested.

PRESENTER_QA_AUDIENCE_MIC_IDS – Specify in this array the microphone IDs of those microphones that are being used by audience members and should be the same that are used to trigger the switching of compositions depending on which part of the room is speaking. The idea is to leave out any microphones being used by the Presenter so that the macro can distinguish between the presenter speaking and someone in the audience asking a question.

PRESENTER_QA_KEEP_COMPOSITION_TIME -- is the time in microseconds that the macro will keep sending a composed image of the presenter and an audience member asking a question after the question has been asked by any audience member. If different audience members ask questions while the composition is being shown after NEW_SPEAKER_TIME milliseconds have passed, the composition will change to use that new audience member instead of the original. This will continue until no other audience members have spoken for PRESENTER_QA_KEEP_COMPOSITION_TIME milliseconds and then the code will resume sending only the full video feed from the Presenter camera

The rest of the macro should not be edited.

APPENDICES

APPENDIX A – How to set camera presets using the API

- Open an SSH session into the codec you are working on.
- Attach a Touch 10 or Navigator to the codec (in case there is not one already attached).
- Using the touch interface, select the desired camera and use the PTZ controls to get to the specific area you want to cover. Obviously, use full screen SelfView while you are doing this.
- To assist in lining up the camera settings between the Main and Aux codecs for this macro, you can issue this command on the Main code (Codec Pro) to be able to see both Camera 1 (QuadCam) on the CodecPro and the view coming from the Auxiliary codec into connector 2 side by side:
 - `xCommand Video Input SetMainVideoSource ConnectorId: 2 ConnectorId: 1 Layout: Equal`If you manually adjust the camera on the Main codec, it will revert to showing you Camera Input 1 full screen on your self-view or preview, just re-issue the above command on the command line to check again. Manually adjusting the camera on the Aux codec while in this manual side by side view will not reset the preview so you might want to do the fine adjustments on the Aux camera so line up with what you have for the main camera.
- Once you are satisfied with the camera view, use the API to store the preset - **do not use the Touch 10 or Navigator to store the preset.**
- Here is the API you need to use:
 - `xCommand Camera Preset Store`
 - `CameraId(r): <1..7>`
 - `Name: <S: 0, 255>`
 - `PresetId: <1..35>`
- The "Name" field is optional.
- **Example:** in order to set camera #1 with a preset number of 30, you would use this command:
 - `xCommand Camera Preset Store CameraId: 1 PresetId: 30`
- Repeat this process for each camera and every camera preset that you need to set.
- To make adjustments to a preset that you have already stored, again you would use the API. Let's use the same example:
 - `xCommand Camera Preset Activate PresetID: 30`
- Use the touch interface to correct the camera position, then store it again:
 - `xCommand Camera Preset Store CameraId: 1 PresetId: 30`

NOTES:

- Sometimes major RoomOS upgrades delete presets. So that you do not have to re-do the entire process described above, you might want to store away the Pan-Zoom-Tilt settings on the camera for each codec while the Preset30 is active by issuing this command on each and safely storing the values returned:
 - `xCommand Camera Preset Show PresetId: 30`You can later set the camera exactly to what the preset had stored before saving it again using this command:
 - `xCommand Camera PositionSet CameraId: value Pan: value Tilt: value Zoom: value`

More details on that command can be found here:

<https://roomos.cisco.com/xapi/Command.Camera.PositionSet>

You can also use this macro to make a backup of the presets for later restoring:

<https://github.com/wxsd-sales/camera-presets-backup-restore-macros>

- Normally the Primary Codec has the highest number of camera presets.
- It is perfectly OK to use identical preset ID numbers on *different* codecs.
 - For example, we normally use PresetID 30 for all Overview shots. In the case that you use two codecs - one Pro and one Plus - you would set PresetID 30 on both of them for the Overview shot.
 - To summarize - you cannot use identical Preset numbers on a single codec; but when you have multiple codecs it is a good practice to use identical preset numbers for identical purposes (like the Overview shot).

APPENDIX B – How to properly set up multiple cameras on a Codec Pro

- All of the cameras that are connected directly to the Primary Codec - the Quad Camera or SpeakerTrack 60 (if any) and the Precision 60 or PTZ 4K Cameras - **must** be controllable successfully from the Cisco user interface.
- The Quad Camera should **always** use HDMI input 1, and should **always** have CameraID 1.
- All of this requires that the cameras are correctly setup in the codec's web interface. Specifically, there are two areas of concern:
 - In the Video Input section, for each Connector that has a camera (Connectors 1-6 on the Codec Pro; Connectors 1-3 on the Codec Plus), the Input Source Type should be Camera, there should be a valid numeric CameraID, and Camera Control Mode should be On.
 - In the Settings / Camera section, enter the camera serial numbers into their corresponding CameraID sections.
 - Do not skip CameraID numbers! If you have five cameras, they must be numbered from 1 to 5.
 - If you are using SpeakerTrack 60, use CameraIDs 1 and 2 – because there are two P60 cameras.
- If all of this is done correctly, you will be able to control every camera from the Touch 10 / Navigator. Then you can proceed with setting camera preset ID numbers.
- If any Auxiliary codecs are used - such as a Codec Plus - the Quad Camera or SpeakerTrack 60 connected is also setup correctly as described above. It is not common to have any PTZ cameras on the Auxiliary codecs, but if they exist, they must also be set up correctly.

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Gerardo Chaves