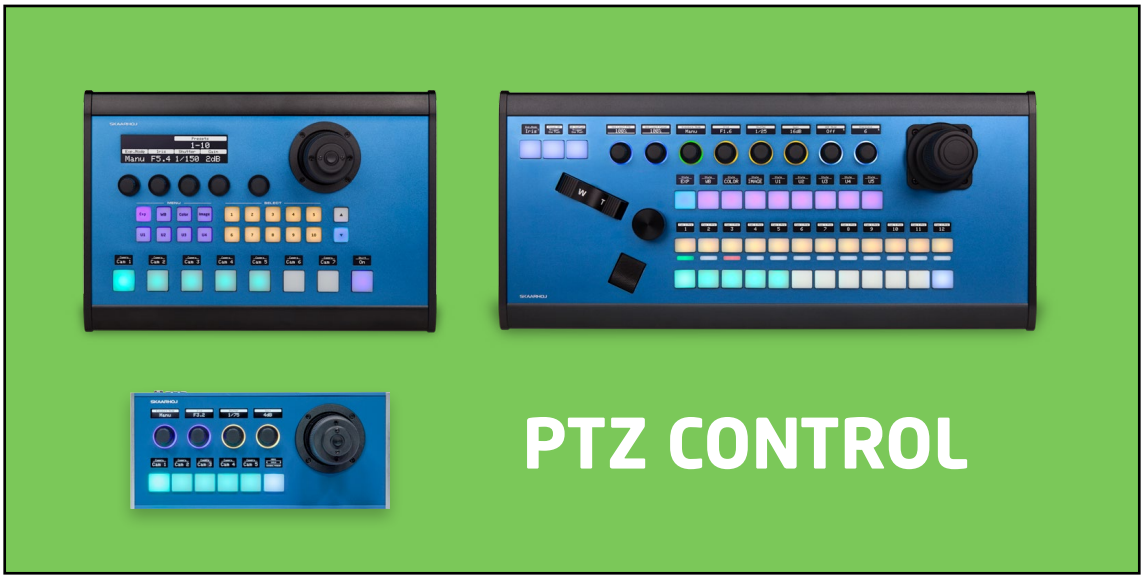
PTZ Control

SKAARHOJ controllers are able to control an ever increasing number of PTZ camera makes and models. Each camera comes with its own set of controllable parameters that are set by their internal protocols and design. We strive to give the user access to the largest range of the camera's features possible with some bonus SKAARHOJ exclusives!



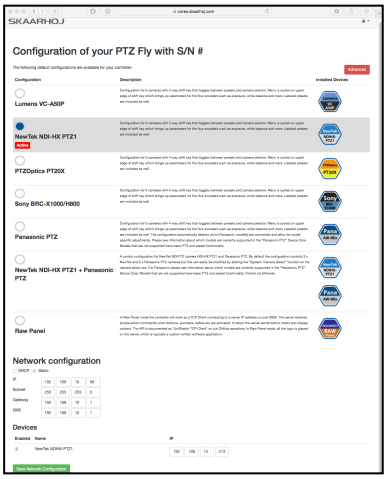
Contents

Getting Started

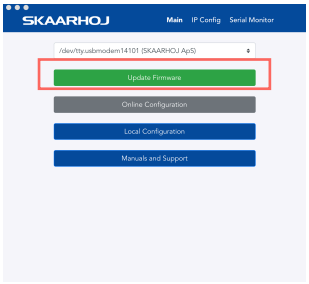
Select Default Configuration

Our controllers such as the PTZ Pro and the PTZ Fly comes with a range of default configurations. In order to select the one suited for your camera brand please use the **"Online Configuration"** functionality in our Firmware Application. You must connect your device to your computer with the USB cable and have internet access as well. For more details about using the Application and selecting the right Port please see the Installation and Operation Manual at www.skaarhoj.com/support/manuals/

Connect your controller with USB cable and press "Online Configuration".



Select the default configuration *and* set IP addresses. Press "Save Network Configurations"



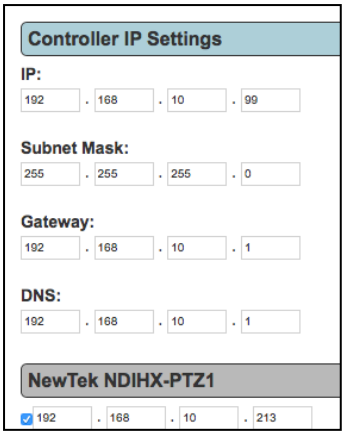
Press "Update Firmware". This will generate a new firmware with the chosen settings and download it to

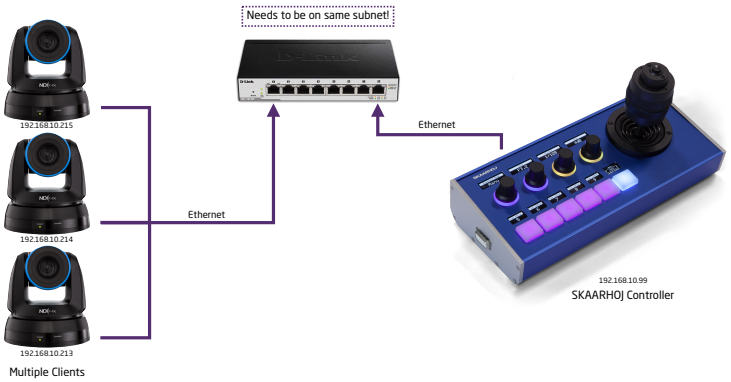
Setting IP for a Device Core / How our "Camera Selector" Works

For PTZ Control our Device Core works by setting a "Master IP" and the IP addresses of your cameras needs to be **sequential**. You do ***not*** need to add additional Device Cores. The controller will automatically connect to the additional cameras provided they are given consecutive IP addresses.

In this case just one NewTek Device Core is set to 192.168.10.213 which means the controller will connect to:

Cam 1 on 192.168.10.21**3**
Cam 2 on 192.168.10.21**4**
Cam 3 on 192.168.10.21**5**
And so forth





Avoid setting IP addresses so the PTZ range will interfere with either the controller it self or other clients connected. This could be if IP of the controller is set to 192.168.10.215 when a PTZ IP range starts from 192.168.10.213.

Camera Selector on Camera

Make sure the camera address selector is set to 0 on all cameras connected to our controller

Dip Switches and Dials

Various camera models uses dip switches and dial to set video format, protocol, or baud rate. Check the camera manufacturer's manual to verify the correct settings.

Typically our PTZ cameras use VISCA over IP or VISCA over Serial with a baud rate of 9600 or 11520 for serial communication.

Connected Cameras on PTZ Pro

When a PTZ Pro connects to cameras the buttons on the camera selector row will light up.

In this case Camera 1 and Camera 3 are connected.

Network Recommendations

Connection Stability and NDI

Background: People are moving to NDI video on a large scale and while it's a fantastic technology, it can lead to frustrating network issues which may first appear as faults on specific and seemingly unrelated devices like a SKAARHOJ controller. In general, the problem is that NDI used on a poorly configured network that is not "NDI ready" will lead to flooding of NDI video data to devices that doesn't want it and can't handle it. For a SKAARHOJ controller this means that the essential control data connection is killed by all the irrelevant video data it receives. Even a single lost control package can lead to poor of connection stability or the use of a joystick. In the worst case the control won't even connect. These cases can be frustrating because they are tipping-point issues where a small change cascades into large consequences.

In general: For any network control system to work - and certainly for a SKAARHOJ controller - you need to consider that your network is configured so that neither the SKAARHOJ controller nor the devices it communicates with and no link in between are congested with network traffic that can result in predictably poor performance. No matter how much error correction we build into a controller, lost communication information will lead to poor performance. When NDI video data and other Multicast data is shared on a network it will congest the network unless proper guidance have been taken. Use proper managed network switches with something called IGMP snooping enabled so the lovely NDI data is only sent to the devices that wants to receive it. If not - and this is the default unfortunately - all devices including your SKAARHOJ controllers will receive it too and spend incredibly amount of resources to filter it out.

Below you will find our recommendations as this present time. Please be aware suggestions might get updated as we get to understand and test further.

If you use our controllers on a network with NDI sources (Multicast) it is absolutely imperative to configure your network properly to ensure a stable connection.

Network Guidelines

Besides having taken proper network switch considerations such as Gigabit Ethernet on all network switch ports we recommend the following settings on your Managed Switch when possible:

- Enable IGMP Snooping (mDNS is automatically blocked by many switches when snooping is enabled – refer to documentation from your switch vendor)
- Enable Flow Control as Asymmetrical or simply as On
- Disable Quality of Service
- Disable Jumbo Frames
- CONFIGURE IGMP Querier and Query Interval for each switch in multi-switch networks when using multicast

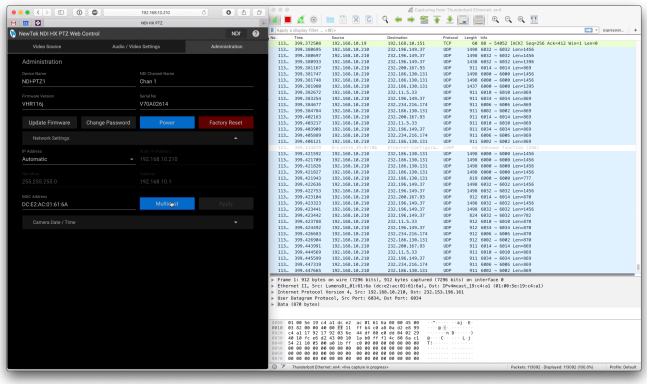
Additional Network Resources

- **NewTek:** NDI Network Guidelines
- **PTZOptics:** Setting up a Ubiquiti Network for use with PTZOptics Products
- **NewTek Network Settings**: https://support.newtek.com/hc/en-us/articles/115001705074-NETWORK-SETTINGS?mobile_site=true

Multicast Data on Network

If you are unsure if Multicast data is present on your network we recommend using a network protocol analyzer such as Wireshark. Many tutorials can be found online to filter to Multicast data on the network.

See a example here.



Camera Connection over VPN

Some VISCA camera have been unable to connect over a VPN, via a router or on a different subnet. It seems like the circumstances are that as soon as the camera is not placed on the same subnet, no connection can be made.

The cameras in question are VISCA over IP cameras and more specifically Sony cameras (BRC-X400 confirmed) and also Bolin VCC-7HD30S-3SMN.

This is a WireShark case for Sony BRC-X400 of an exchange between the controller (192.168.10.18) and the camera (192.168.10.149). The controller sends a request to the camera on port 52381 according to the specs. In return to this request the cameras sends a response back to the same port, 52381, but notice that the sending port on the camera side is random, in this case 35799.

118	4.634769	192.168.10.18	192.168.10.149	UDP	56	52381 → 52381 Len=14
119	4.641807	192.168.10.149	192.168.10.18	UDP	60	35799 → 52381 Len=12
120	4.744728	192.168.10.18	192.168.10.149	UDP	56	52381 → 52381 Len=14
121	4.754110	192.168.10.149	192.168.10.18	UDP	60	35799 → 52381 Len=12

This reply never reaches the camera in the mentioned circumstances where the controller is on another subnet. But it works fine on the same subnet. I believe the reason is that when the return communication happens from a different port than the receiving port, the router between the subnets will not let it through.

In the case of the Bolin camera, this is how a transaction looks and it exhibits the same issue, even with a new port for each return answer:

244…	616.541547	192.168.10.18	192.168.10.156	UDP	51	52381 → 52381 Len=9
244…	616.546491	192.168.10.156	192.168.10.18	UDP	60	58408 → 52381 Len=9
244…	618.912088	192.168.10.18	192.168.10.156	UDP	55	52381 → 52381 Len=13
244…	619.035241	192.168.10.156	192.168.10.18	UDP	60	41854 → 52381 Len=12

A Bolin 4K camera (4K12S) also requires to return traffic to the port 52381, but it will in fact send it out from the same port it received traffic on. This WORKS through a subnet:

284…	791.744118	192.168.10.18	192.168.10.170	UDP	56 52381 → 52381 Len=14
284…	791.790059	192.168.10.170	192.168.10.18	UDP	66 52381 → 52381 Len=24
284…	791.892317	192.168.10.18	192.168.10.170	UDP	56 52381 → 52381 Len=14
284…	791.950304	192.168.10.170	192.168.10.18	UDP	66 52381 → 52381 Len=24

Likewise will a Lumens A50P will work across subnets although that is the type of VISCA over IP camera that does not require return traffic to be sent to port 52381:

314…	928.673896	192.168.10.18	192.168.10.101	UDP	56 50000 → 52381 Len=14
314…	928.677334	192.168.10.101	192.168.10.18	UDP	66 52381 → 50000 Len=24
314…	928.782642	192.168.10.18	192.168.10.101	UDP	56 50000 → 52381 Len=14
314…	928.786212	192.168.10.101	192.168.10.18	UDP	66 52381 → 50000 Len=24

Disclaimer on VPN

Ultimately SKAARHOJ is not able to guarantee connection to PTZ cameras over VPN. We are not experts in network infrastructure and will not be able to offer assistance in setting up your VPN connections. We test and ensure that our controllers work in a standard local set up.

Fixed VISCA Return Source Port - Limitation for Multiple Device Cores

Please notice the below listed cameras have fixed VISCA return source ports.

- All Sony PTZ Device Cores
- AIDA PTZ X12/X20 Device Core
- Bolin Device Cores

It is currently not possible for the Device Cores to connect if used in combination with each other. We are working on a solution to eradicate this limitation.

Camera Configuration

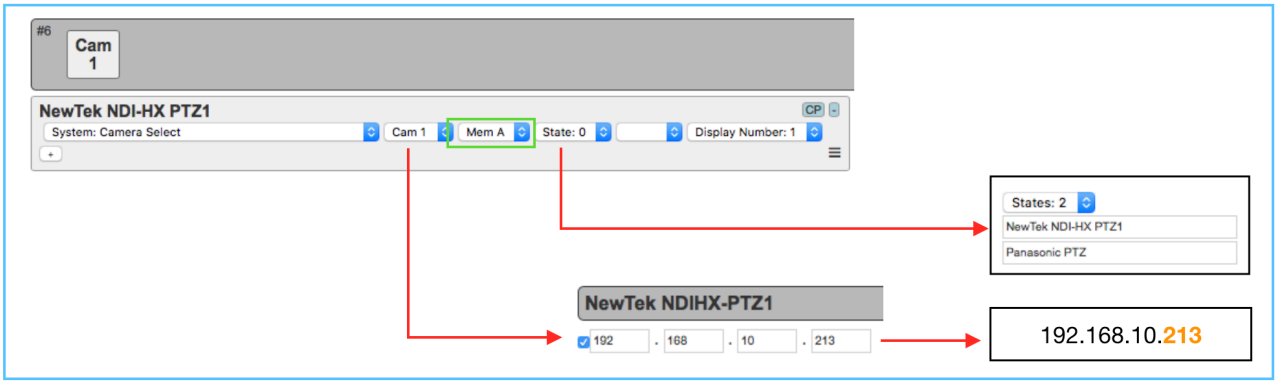
Configurations with Multiple PTZ Brand

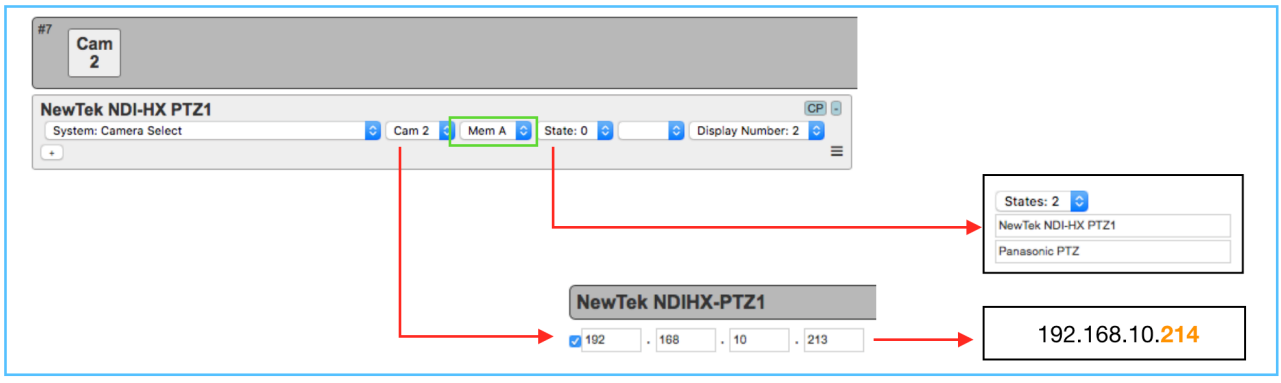
For default configurations such as "**NewTek NDI-HX PTZ1 + Panasonic PTZ**" and "**PTZOptics + Panasonic PTZ**" on the PTZ Pro the generic system action "System: Camera Select" are used instead of camera select on the specific Device Core level. Care must be taken in understanding how IP settings are set in UniSketch OS and how the system action works to make sure you can connect to your cameras. A example are given below for the "NewTek NDI-HX PTZ1 + Panasonic PTZ" default config:

Two states are used - each state control the different camera brand. In this case the first state (state 0) is NewTek whereas the second state (state 1) is Panasonic. The IP scheme is the same as a controller with just one Device Core installed (as explained in the section "Setting IP for a Device Core / How our "Camera Selector" Works".

Example 1

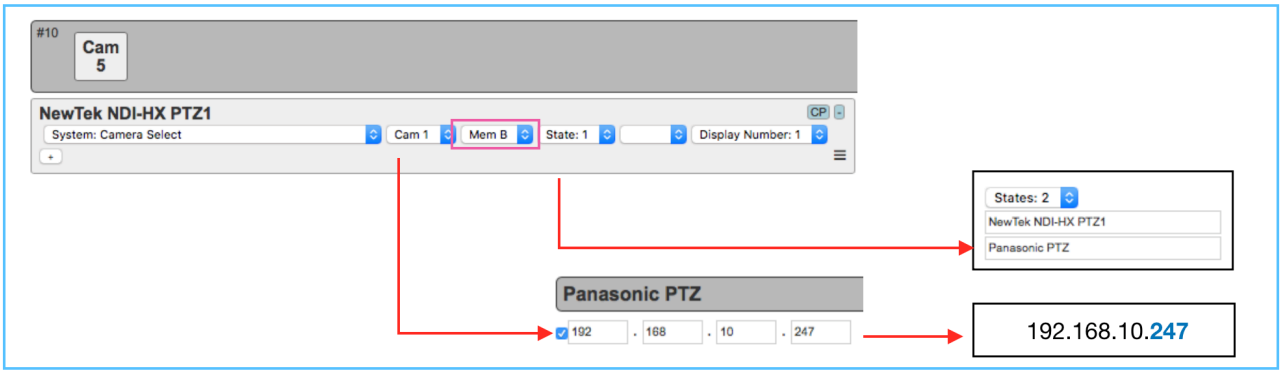
Below two examples for Cam1 and Cam2 for NewTek camera

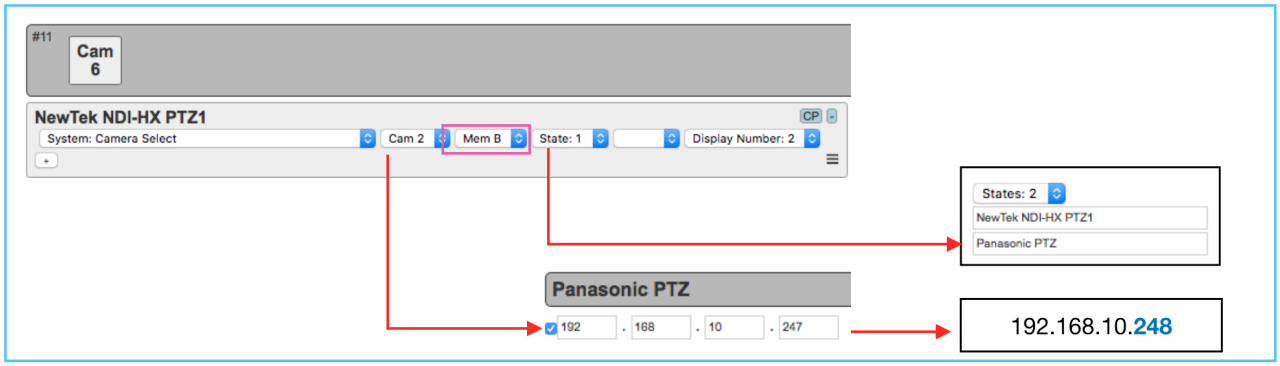




Example 2

Below two examples for Cam1 and Cam2 for Panasonic camera.



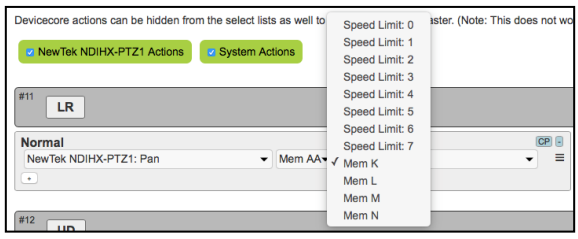


Note on Shutter Values

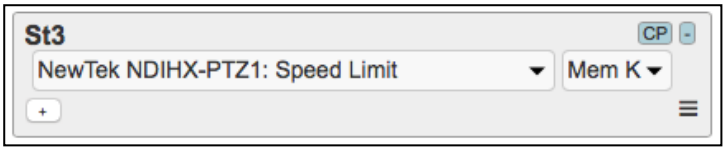
For our PTZ implementations, shutter values are normally displaced based on NTSC and not PAL. When working in PAL, you may notice the displayed shutter values are different then expected but the camera setting will be as expected.

Speed of PTZ on Joystick

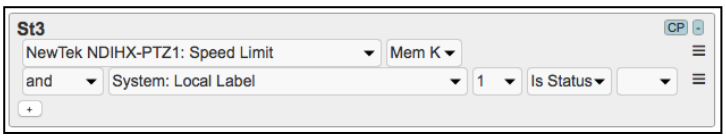
Two options exist for setting a Speed Limit for PTZ actions. Either a fixed value (between 0-7) where 0 have no reduction of the maximum speed and 7 have the highest reduction of the maximum speed. The alternative is setting the Speed Limit to a Memory parameter where the Speed Limit can be adjusted by a encoder or button controlling that specific Memory parameter. This is the case for many default configurations. In the example below the Pan action on the NewTek Device Core is set to "Mem K"



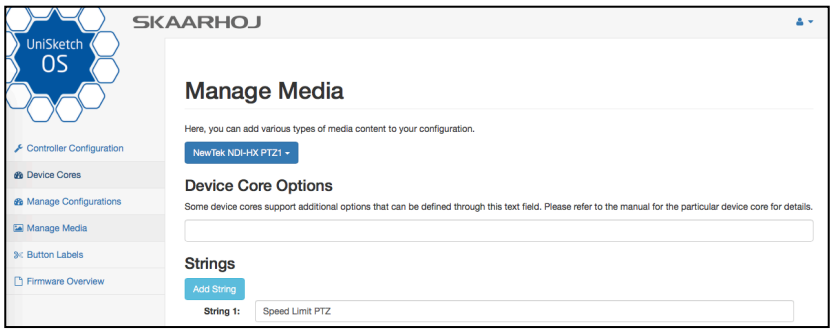
The "Mem K" is adjusted with the action "Speed Limit Mem K" on a rotary encoder so the limit can be adjusted on the fly.



You can apply a “Local Label” to change the naming from “Spd Lim K” to something easier to understand.



The “System: Local Label 1” will take the naming from “String 1” in the “Manage Media” tab on the config page



Many PTZ cameras we have integrated with uses VISCA as a control protocol, and natively in this protocol is speed limits between 0 and 7. The “Speed Limit” action in UniSketch is shown in percentage values and will jump (not be linear) to match the values between 0 and 7. The limitation is in the camera protocol itself and not in our integration.

Focus

The same methodology for “Speed of PTZ” applies to Focus. You can either set a fixed value to determine the amount Focus should be adjusted or you can assign it to a memory parameter so you can adjust it on the fly. In the example below the amount of Focus is adjusted by the parameter “Mem L”. This is assigned to a rotary encoder adjusting “Mem L”.

Action for adjusting Focus

Action for adjusting “Mem L”

By default focus adjustment are integrated with small steps with focus near/focus far where the step size is either set to a fixed value between 0 and 7 or set to a Memory parameter adjusting the step size between 0 and 7 on the fly.

If you prefer to initiate a focus near/focus far adjustment and stop the focus adjustment by turning the focus knob back to neutral position/holding down the focus knob, this can be achieved by using the action “System: Force HWC Type - Speed” prior to having the Focus action like below. This allows for very fine focus adjustments if the speed limit is sufficiently low.

See a video about this topic at: https://www.youtube.com/watch?v=iSov1zilBIk

Zoom Control

Zoom with Joystick

The same methodology for "Speed of PTZ" applies to Zoom. You can either set a fixed value to determine the speed zoom should be adjusted or you can assign it to a memory parameter so you can adjust it on the fly. In the example below the speed of zoom is adjusted by the parameter "Mem K". This is assigned to a rotary encoder adjusting "Mem K".

Action for adjusting Zoom

Action for adjusting "Mem K"

Zoom with Encoder - in steps

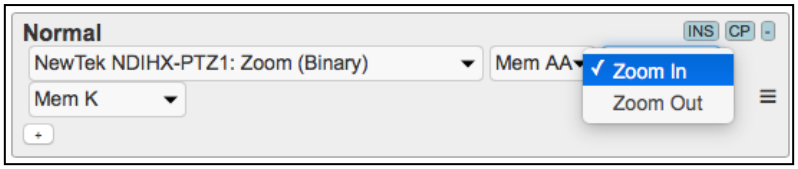
Zoom can also be controlled from an encoder instead of a Joystick. By just having the Zoom action you will zoom in/out in steps where the step size is determined by a fixed step size or by adjusting the step size on the fly using a memory parameter.

Zoom with Encoder - initiating zoom in/out (creep zoom)

By using the action "System: Force HWC Type - Speed" like in the Focus description you can change the zoom behavior to initiate a zoom in/out until you have rotated the encoder back to neutral position/by holding it down.

Zoom with Buttons

If you want to assign zoom functionality on a button you should use the "Zoom (Binary)" action instead of just the "Zoom" action.



Reverse Movement on Joystick

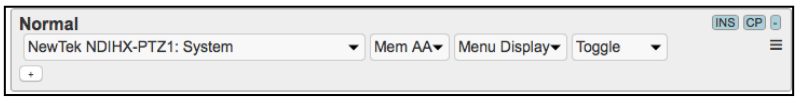
If you want to reverse movement on a joystick for pan/tilt/zoom you can for most Device Cores use the option "Reverse movement" for the Pan, Tilt and Zoom actions.

If this option does not exist on the Device Core you can use the action "System: Force HWC Type" - leave the type blank but choose "Invert" like below.

On Screen Displays

Access to OSD via Encoder

Often access to the OSD can be found in the Device Core action "System - Menu Display". Depending on how the manufacturer have implemented the VISCA command there are different ways to navigate the menu. In the case of the NewTek NDI-HX PTZ1 when the below action is assigned to an encoder the OSD is brought up by turning clockwise. With the joystick you can navigate up and down in the menu. By turning it clockwise again you enter the chosen menu. By turning anti-clockwise you go back a menu layer and ultimate exit the OSD.



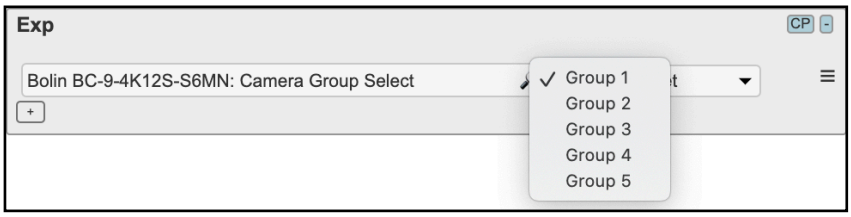
Access to OSD via Button

Again - variances can exist but if the OSD action is assigned to a button the OSD for NewTek NDI-HX PTZ is brought up by pressing the button. By pressing a second time you enter the menu. By pressing a holding you go back a menu layer and ultimate you exit the OSD.

PTZ Grouping

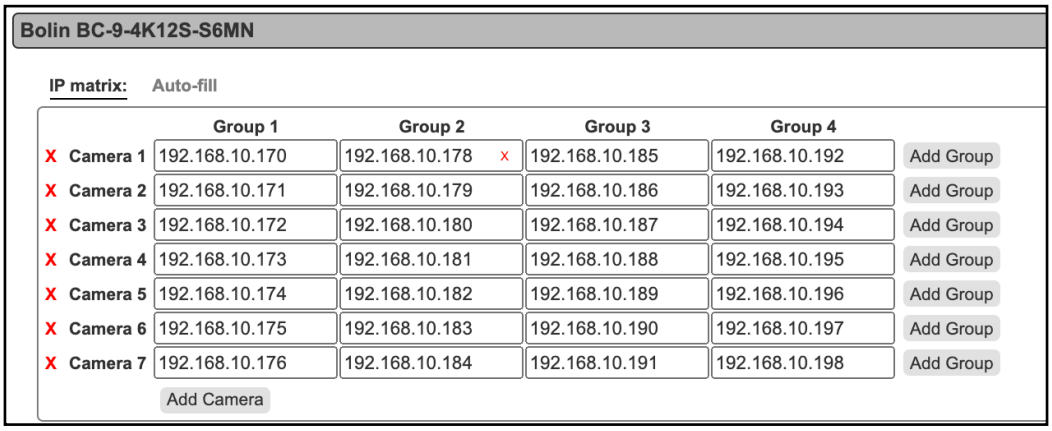
With PTZ Grouping it is possible to control more than 7x of a single model of camera from the same device core. This is by creating up to 5x groups of 7x cameras and switching between the groups. To do so you will need to combine the device core action for Camera Group Select and add the needed IP addresses in the IP matrix.

You will need to assign the action Camera Group Select, available for many VISCA device cores, to switch between your different groups. The individual camera select will be done from the same camera select buttons used in a standard configuration.



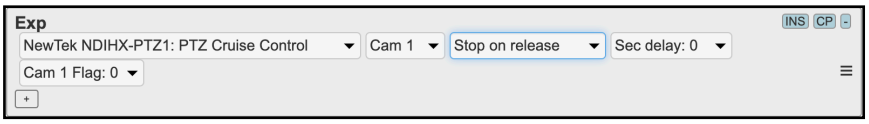
Setting up the Group IP addresses is done in the Device Cores Options section. You can add the number of cameras you want in each group up to 7 and the number of groups up to 5. If you leave the first IP address blank in a group, the next IP address listed will be camera 1 of that group.

Please note that once you use the IP matrix to assign IP addresses, the controller will no longer take the IP address from the device core IP under network configuration.



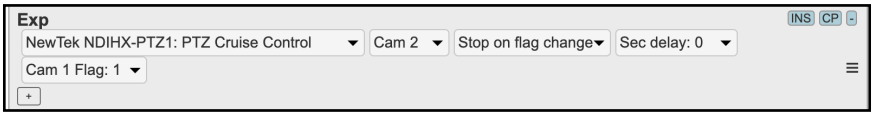
PTZ Cruise Control

On many of our PTZ camera implementations we have added a cruise control function to allow you to start a camera movement and have it continue for 0-100 seconds after you release the joystick.



This action is best used set for a specific camera and not a memory group. When set to Stop on release, the action will stop after the duration you set for Sec: Delay. When set to Stop on Flag Change the action will stop when a system flag has been activated.

In the example below Cam 2 will continue its movement after the joystick released until there is a flag change. Since it is set for Cam 1 to respond to Flag 1, then Cam 2 will respond to Flag 2, Cam 3 to Flag 3, and so on.



PTZ Trace

On many of our PTZ camera implementations we have added a trace function to allow you to record movements of up to 65 seconds to be play back. It is important to note that there are only 10x Trace Memories per controller **NOT** per camera. We suggest you set the Cam select for a specific camera and not for a Mem group.

Setting the function to Play/Record will play the record on a short button press while a 1 second press will start the record.

The PTZ Trace starts by recalling the start position from a preset saved on the camera. It is advised to use a high number preset to avoid conflict with regular camera presets already in use. This can cause the start position of the trace to be thrown off. Another factor that can cause problems in recalling the trace is the preset recall speed. The controller gives the camera 3 seconds to recall the starting position before starting the trace. If the preset recall speed is set too low, the trace will start playing back at the incorrect position.

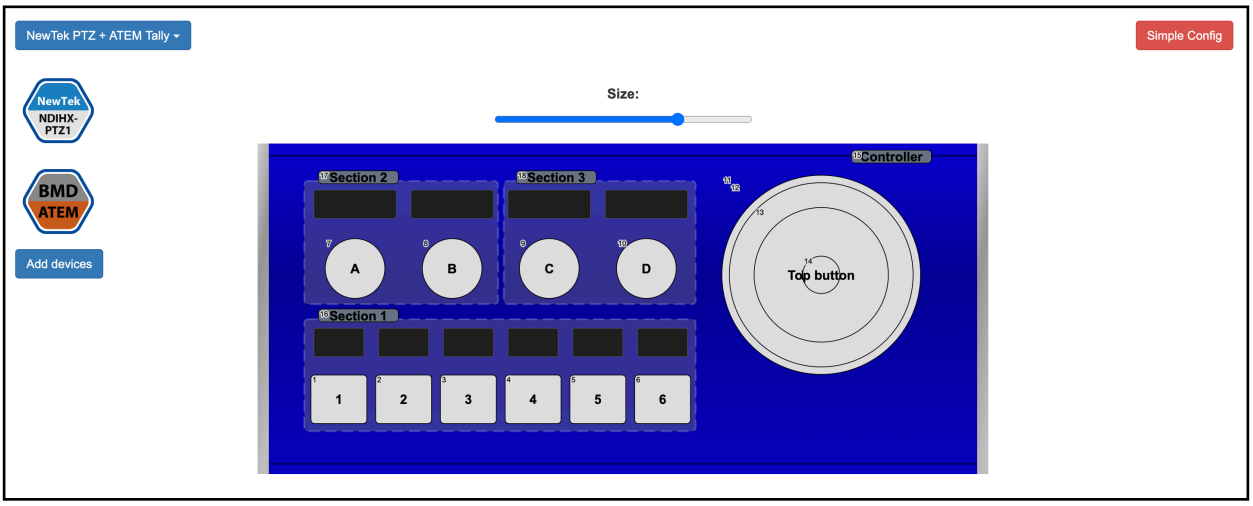
There are two options for when the playback of the trace will start. Play from 1st action will start the playback of the trace from the first movement you make while recording the trace. Play from Rec. start will start the playback of the trace from when you started the record, even if there are a few seconds without movement.

Tally

In some cases it can be desirable to route tally to the PTZ cameras based on tally from a video switcher. This can to some degree be done using Virtual Triggers, which are available on all of our UniSketch OS controller

In the case of adding ATEM Tally it would be done the following way:

- Add the ATEM Device Core and set IP Setting



- Under Virtual Tiggers in the Online Configuration, Select BMD ATEM: Program Src as your Source states.
- Set the operator to Active
- Add the Tally actions for your PTZ camera, set it as Hold Down so it gets released after the source changes